

Operating Manual



R&S Coverage Measurement System

R&S[®] ROMES 3NG

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Dear Customer,

throughout this manual, R&S ROMES is generally used as an abbreviation for the coverage measurement system
R&S[®] ROMES 3NG.

R&S[®] is a registered trademark of Rohde & Schwarz GmbH & Co. KG.
Trade names are trademarks of the owners.

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Before putting the product into operation for the first time, make sure to read the following



Safety Instructions

All plants and locations of the Rohde & Schwarz group of companies make every effort to keep the safety standard of our products up to date and to offer our customers the highest possible degree of safety. Our products and the auxiliary equipment required for them are designed and tested in accordance with the relevant safety standards. Compliance with these standards is continuously monitored by our quality assurance system. The product described here has been designed and tested in accordance with the EC Certificate of Conformity and has left the manufacturer's plant in a condition fully complying with safety standards. To maintain this condition and to ensure safe operation, observe all instructions and warnings provided in this manual. If you have any questions regarding these safety instructions, the Rohde & Schwarz group of companies will be happy to answer them.

Furthermore, it is your responsibility to use the product in an appropriate manner. This product is designed for use solely in industrial and laboratory environments or in the field and must not be used in any way that may cause personal injury or property damage. You are responsible if the product is used for an intention other than its designated purpose or in disregard of the manufacturer's instructions. The manufacturer shall assume no responsibility for such use of the product.

The product is used for its designated purpose if it is used in accordance with its product documentation and within its performance limits (see data sheet, documentation, the following safety instructions). Using the product requires technical skills and a basic knowledge of English. It is therefore essential that the product be used exclusively by skilled and specialized staff or thoroughly trained personnel with the required skills. If personal safety gear is required for using Rohde & Schwarz products, this will be indicated at the appropriate place in the product documentation.

Symbols and safety labels

Observe product documentation	Weight indication for units >18 kg	Danger of electric shock	Warning! Hot surface	PE terminal	Ground	Ground terminal	Attention! Electrostatic sensitive devices

Supply voltage ON/OFF	Standby indication	Direct current (DC)	Alternating current (AC)	Direct/alternating current (DC/AC)	Device fully protected by double/reinforced insulation

Safety Instructions

Observing the safety instructions will help prevent personal injury or damage of any kind caused by dangerous situations. Therefore, carefully read through and adhere to the following safety instructions before putting the product into operation. It is also absolutely essential to observe the additional safety instructions on personal safety that appear in relevant parts of the product documentation. In these safety instructions, the word "product" refers to all merchandise sold and distributed by the Rohde & Schwarz group of companies, including instruments, systems and all accessories.

Tags and their meaning

DANGER	This tag indicates a definite hazard carrying a high risk of death or serious injury if not avoided.
WARNING	This tag indicates a possible hazard carrying a medium risk of death or (serious) injury if not avoided.
CAUTION	This tag indicates a hazard carrying a low risk of minor or moderate injury if not avoided.
ATTENTION	This tag indicates the possibility of incorrect use that can cause damage to the product.
NOTE	This tag indicates a situation where the user should pay special attention to operating the product but which does not lead to damage.

These tags are in accordance with the standard definition for civil applications in the European Economic Area. Definitions that deviate from the standard definition may also exist in other economic areas or military applications. It is therefore essential to make sure that the tags described here are always used only in connection with the related product documentation and the related product. The use of tags in connection with unrelated products or documentation can result in misinterpretation and thus contribute to personal injury or material damage.

Basic safety instructions

1. The product may be operated only under the operating conditions and in the positions specified by the manufacturer. Its ventilation must not be obstructed during operation. Unless otherwise specified, the following requirements apply to Rohde & Schwarz products:
prescribed operating position is always with the housing floor facing down, IP protection 2X, pollution severity 2, overvoltage category 2, use only in enclosed spaces, max. operation altitude 2000 m above sea level, max. transport altitude 4500 m above sea level.
Unless specified otherwise in the data sheet, a tolerance of $\pm 10\%$ shall apply to the nominal voltage and of $\pm 5\%$ to the nominal frequency.
2. Applicable local or national safety regulations and rules for the prevention of accidents must be observed in all work performed. The product may be opened only by authorized, specially trained personnel. Prior to performing any work on the product or opening the product, the product must be disconnected from the supply network. Any adjustments, replacements of parts, maintenance or repair must be carried out only by technical personnel authorized by Rohde & Schwarz. Only original parts may be used for replacing parts relevant to safety (e.g. power switches, power transformers, fuses). A safety test must always be performed after parts relevant to safety have been replaced (visual inspection, PE conductor test, insulation resistance measurement, leakage current measurement, functional test).
3. As with all industrially manufactured goods, the use of substances that induce an allergic reaction (allergens, e.g. nickel) such as aluminum cannot be generally excluded. If you develop an allergic reaction (such as a skin rash, frequent sneezing, red eyes or respiratory difficulties), consult a physician immediately to determine the cause.

Safety Instructions

4. If products/components are mechanically and/or thermally processed in a manner that goes beyond their intended use, hazardous substances (heavy-metal dust such as lead, beryllium, nickel) may be released. For this reason, the product may only be disassembled, e.g. for disposal purposes, by specially trained personnel. Improper disassembly may be hazardous to your health. National waste disposal regulations must be observed.
5. If handling the product yields hazardous substances or fuels that must be disposed of in a special way, e.g. coolants or engine oils that must be replenished regularly, the safety instructions of the manufacturer of the hazardous substances or fuels and the applicable regional waste disposal regulations must be observed. Also observe the relevant safety instructions in the product documentation.
6. Depending on the function, certain products such as RF radio equipment can produce an elevated level of electromagnetic radiation. Considering that unborn life requires increased protection, pregnant women should be protected by appropriate measures. Persons with pacemakers may also be endangered by electromagnetic radiation. The employer/operator is required to assess workplaces where there is a special risk of exposure to radiation and, if necessary, take measures to avert the danger.
7. Operating the products requires special training and intense concentration. Make certain that persons who use the products are physically, mentally and emotionally fit enough to handle operating the products; otherwise injuries or material damage may occur. It is the responsibility of the employer to select suitable personnel for operating the products.
8. Prior to switching on the product, it must be ensured that the nominal voltage setting on the product matches the nominal voltage of the AC supply network. If a different voltage is to be set, the power fuse of the product may have to be changed accordingly.
9. In the case of products of safety class I with movable power cord and connector, operation is permitted only on sockets with earthing contact and protective earth connection.
10. Intentionally breaking the protective earth connection either in the feed line or in the product itself is not permitted. Doing so can result in the danger of an electric shock from the product. If extension cords or connector strips are implemented, they must be checked on a regular basis to ensure that they are safe to use.
11. If the product has no power switch for disconnection from the AC supply, the plug of the connecting cable is regarded as the disconnecting device. In such cases, it must be ensured that the power plug is easily reachable and accessible at all times (corresponding to the length of connecting cable, approx. 2 m). Functional or electronic switches are not suitable for providing disconnection from the AC supply. If products without power switches are integrated in racks or systems, a disconnecting device must be provided at the system level.
12. Never use the product if the power cable is damaged. Check the power cable on a regular basis to ensure that it is in proper operating condition. By taking appropriate safety measures and carefully laying the power cable, ensure that the cable cannot be damaged and that no one can be hurt by e.g. tripping over the cable or suffering an electric shock.
13. The product may be operated only from TN/TT supply networks fused with max. 16 A (higher fuse only after consulting with the Rohde & Schwarz group of companies).
14. Do not insert the plug into sockets that are dusty or dirty. Insert the plug firmly and all the way into the socket. Otherwise, this can result in sparks, fire and/or injuries.
15. Do not overload any sockets, extension cords or connector strips; doing so can cause fire or electric shocks.
16. For measurements in circuits with voltages $V_{\text{rms}} > 30 \text{ V}$, suitable measures (e.g. appropriate measuring equipment, fusing, current limiting, electrical separation, insulation) should be taken to avoid any hazards.
17. Ensure that the connections with information technology equipment comply with IEC 950/EN 60950.
18. Unless expressly permitted, never remove the cover or any part of the housing while the product is in operation. Doing so will expose circuits and components and can lead to injuries, fire or damage to the product.

Safety Instructions

19. If a product is to be permanently installed, the connection between the PE terminal on site and the product's PE conductor must be made first before any other connection is made. The product may be installed and connected only by a license electrician.
20. For permanently installed equipment without built-in fuses, circuit breakers or similar protective devices, the supply circuit must be fused in such a way that suitable protection is provided for users and products.
21. Do not insert any objects into the openings in the housing that are not designed for this purpose. Never pour any liquids onto or into the housing. This can cause short circuits inside the product and/or electric shocks, fire or injuries.
22. Use suitable overvoltage protection to ensure that no overvoltage (such as that caused by a thunderstorm) can reach the product. Otherwise the operating personnel will be endangered by electric shocks.
23. Rohde & Schwarz products are not protected against penetration of water, unless otherwise specified (see also safety instruction 1.). If this is not taken into account, there exists the danger of electric shock for the user or damage to the product, which can also lead to personal injury.
24. Never use the product under conditions in which condensation has formed or can form in or on the product, e.g. if the product was moved from a cold to a warm environment.
25. Do not close any slots or openings on the product, since they are necessary for ventilation and prevent the product from overheating. Do not place the product on soft surfaces such as sofas or rugs or inside a closed housing, unless this is well ventilated.
26. Do not place the product on heat-generating devices such as radiators or fan heaters. The temperature of the environment must not exceed the maximum temperature specified in the data sheet.
27. Batteries and storage batteries must not be exposed to high temperatures or fire. Keep batteries and storage batteries away from children. Do not short-circuit batteries and storage batteries.
If batteries or storage batteries are improperly replaced, this can cause an explosion (warning: lithium cells). Replace the battery or storage battery only with the matching Rohde & Schwarz type (see spare parts list). Batteries and storage batteries must be recycled and kept separate from residual waste. Batteries and storage batteries that contain lead, mercury or cadmium are hazardous waste. Observe the national regulations regarding waste disposal and recycling.
28. Please be aware that in the event of a fire, toxic substances (gases, liquids etc.) that may be hazardous to your health may escape from the product.
29. The product can be very heavy. Be careful when moving it to avoid back or other physical injuries.
30. Do not place the product on surfaces, vehicles, cabinets or tables that for reasons of weight or stability are unsuitable for this purpose. Always follow the manufacturer's installation instructions when installing the product and fastening it to objects or structures (e.g. walls and shelves).
31. Handles on the products are designed exclusively for personnel to hold or carry the product. It is therefore not permissible to use handles for fastening the product to or on means of transport such as cranes, fork lifts, wagons, etc. The user is responsible for securely fastening the products to or on the means of transport and for observing the safety regulations of the manufacturer of the means of transport. Noncompliance can result in personal injury or material damage.
32. If you use the product in a vehicle, it is the sole responsibility of the driver to drive the vehicle safely. Adequately secure the product in the vehicle to prevent injuries or other damage in the event of an accident. Never use the product in a moving vehicle if doing so could distract the driver of the vehicle. The driver is always responsible for the safety of the vehicle. The manufacturer assumes no responsibility for accidents or collisions.
33. If a laser product (e.g. a CD/DVD drive) is integrated in a Rohde & Schwarz product, do not use any other settings or functions than those described in the product documentation. Otherwise this may be hazardous to your health, since the laser beam can cause irreversible damage to your eyes. Never try to take such products apart, and never look into the laser beam.



Por favor lea imprescindiblemente antes de la primera puesta en funcionamiento las siguientes



Informaciones de seguridad

El principio del grupo de empresas Rohde & Schwarz consiste en tener nuestros productos siempre al día con los standards de seguridad y de ofrecer a nuestros clientes el máximo grado de seguridad. Nuestros productos y todos los equipos adicionales son siempre fabricados y examinados según las normas de seguridad vigentes. Nuestra sección de gestión de la seguridad de calidad controla constantemente que sean cumplidas estas normas. El presente producto ha sido fabricado y examinado según el comprobante de conformidad adjunto según las normas de la CE y ha salido de nuestra planta en estado impecable según los standards técnicos de seguridad. Para poder preservar este estado y garantizar un funcionamiento libre de peligros, el usuario deberá atenerse a todas las informaciones, informaciones de seguridad y notas de alerta. El grupo de empresas Rohde & Schwarz está siempre a su disposición en caso de que tengan preguntas referentes a estas informaciones de seguridad.

Además queda en la responsabilidad del usuario utilizar el producto en la forma debida. Este producto solamente fue elaborado para ser utilizado en la industria y el laboratorio o para fines de campo y de ninguna manera deberá ser utilizado de modo que alguna persona/cosa pueda ser dañada. El uso del producto fuera de sus fines definidos o despreciando las informaciones de seguridad del fabricante queda en la responsabilidad del usuario. El fabricante no se hace en ninguna forma responsable de consecuencias a causa del mal uso del producto.

Se parte del uso correcto del producto para los fines definidos si el producto es utilizado dentro de las instrucciones de la correspondiente documentación de producto y dentro del margen de rendimiento definido (ver hoja de datos, documentación, informaciones de seguridad que siguen). El uso del producto hace necesarios conocimientos profundos y conocimientos parciales del idioma inglés. Por eso se deberá tener en cuenta de exclusivamente autorizar para el uso del producto a personas peritas o debidamente minuciosamente instruidas con los conocimientos citados. Si fuera necesaria indumentaria de seguridad para el uso de productos de R&S, encontrará la información debida en la documentación del producto en el capítulo correspondiente.

Símbolos y definiciones de seguridad

Ver documentación de producto	Informaciones para maquinaria con un peso de > 18kg	Peligro de golpe de corriente	¡Advertencia! Superficie caliente	Conexión a conductor protector	Conexión a tierra	Conexión a masa conductora	¡Cuidado! Elementos de construcción con peligro de carga electrostática

potencia EN MARCHA/PARADA	Indicación Stand-by	Corriente continua DC	Corriente alterna AC	Corriente continua/alterna DC/AC	El aparato está protegido en su totalidad por un aislamiento de doble refuerzo

Informaciones de seguridad

Tener en cuenta las informaciones de seguridad sirve para tratar de evitar daños y peligros de toda clase. Es necesario de que se lean las siguientes informaciones de seguridad concienzudamente y se tengan en cuenta debidamente antes de la puesta en funcionamiento del producto. También deberán ser tenidas en cuenta las informaciones para la protección de personas que encontrarán en el capítulo correspondiente de la documentación de producto y que también son obligatorias de seguir. En las informaciones de seguridad actuales hemos juntado todos los objetos vendidos por el grupo de empresas Rohde & Schwarz bajo la denominación de „producto“, entre ellos también aparatos, instalaciones así como toda clase de accesorios.

Palabras de señal y su significado

PELIGRO	Identifica un peligro directo con riesgo elevado de provocar muerte o lesiones de gravedad si no se toman las medidas oportunas.
ADVERTENCIA	Identifica un posible peligro con riesgo medio de provocar muerte o lesiones (de gravedad) si no se toman las medidas oportunas.
ATENCIÓN	Identifica un peligro con riesgo reducido de provocar lesiones de gravedad media o leve si no se toman las medidas oportunas.
CUIDADO	Indica la posibilidad de utilizar mal el producto y a consecuencia dañarlo.
INFORMACIÓN	Indica una situación en la que deberían seguirse las instrucciones en el uso del producto, pero que no consecuentemente deben de llevar a un daño del mismo.

Las palabras de señal corresponden a la definición habitual para aplicaciones civiles en el área económica europea. Pueden existir definiciones diferentes a esta definición en otras áreas económicas o en aplicaciones militares. Por eso se deberá tener en cuenta que las palabras de señal aquí descritas sean utilizadas siempre solamente en combinación con la correspondiente documentación de producto y solamente en combinación con el producto correspondiente. La utilización de las palabras de señal en combinación con productos o documentaciones que no les correspondan puede llevar a malinterpretaciones y tener por consecuencia daños en personas u objetos.

Informaciones de seguridad elementales

1. El producto solamente debe ser utilizado según lo indicado por el fabricante referente a la situación y posición de funcionamiento sin que se obstruya la ventilación. Si no se convino de otra manera, es para los productos R&S válido lo que sigue: como posición de funcionamiento se define principalmente la posición con el suelo de la caja para abajo, modo de protección IP 2X, grado de suciedad 2, categoría de sobrecarga eléctrica 2, utilizar solamente en estancias interiores, utilización hasta 2000 m sobre el nivel del mar, transporte hasta 4.500 m sobre el nivel del mar. A menos que se especifique otra cosa en la hoja de datos, se aplicará una tolerancia de $\pm 10\%$ sobre el voltaje nominal y de $\pm 5\%$ sobre la frecuencia nominal.
2. En todos los trabajos deberán ser tenidas en cuenta las normas locales de seguridad de trabajo y de prevención de accidentes. El producto solamente debe de ser abierto por personal perito autorizado. Antes de efectuar trabajos en el producto o abrirlo deberá este ser desconectado de la corriente. El ajuste, el cambio de partes, la manutención y la reparación deberán ser solamente efectuadas por electricistas autorizados por R&S. Si se reponen partes con importancia para los aspectos de seguridad (por ejemplo el enchufe, los transformadores o los fusibles), solamente podrán ser sustituidos por partes originales. Después de cada recambio de partes elementales para la seguridad deberá ser efectuado un control de seguridad (control a primera vista, control de conductor protector, medición de resistencia de aislamiento, medición de medición de la corriente conductora, control de funcionamiento).

Informaciones de seguridad

3. Como en todo producto de fabricación industrial no puede ser excluido en general de que se produzcan al usarlo elementos que puedan generar alergias, los llamados elementos alergénicos (por ejemplo el níquel). Si se produjeran en el trato con productos R&S reacciones alérgicas, como por ejemplo urticaria, estornudos frecuentes, irritación de la conjuntiva o dificultades al respirar, se deberá consultar inmediatamente a un médico para averiguar los motivos de estas reacciones.
4. Si productos / elementos de construcción son tratados fuera del funcionamiento definido de forma mecánica o térmica, pueden generarse elementos peligrosos (polvos de sustancia de metales pesados como por ejemplo plomo, berilio, níquel). La partición elemental del producto, como por ejemplo sucede en el tratamiento de materias residuales, debe de ser efectuada solamente por personal especializado para estos tratamientos. La partición elemental efectuada inadecuadamente puede generar daños para la salud. Se deben tener en cuenta las directivas nacionales referentes al tratamiento de materias residuales.
5. En el caso de que se produjeran agentes de peligro o combustibles en la aplicación del producto que debieran de ser transferidos a un tratamiento de materias residuales, como por ejemplo agentes refrigerantes que deben ser repuestos en periodos definidos, o aceites para motores, deberán ser tenidas en cuenta las prescripciones de seguridad del fabricante de estos agentes de peligro o combustibles y las regulaciones regionales para el tratamiento de materias residuales. Cuiden también de tener en cuenta en caso dado las prescripciones de seguridad especiales en la descripción del producto.
6. Ciertos productos, como por ejemplo las instalaciones de radiación HF, pueden a causa de su función natural, emitir una radiación electromagnética aumentada. En vista a la protección de la vida en desarrollo deberían ser protegidas personas embarazadas debidamente. También las personas con un bypass pueden correr peligro a causa de la radiación electromagnética. El empresario/usuario está comprometido a valorar y señalar áreas de trabajo en las que se corra un riesgo aumentado de exposición a radiaciones para evitar riesgos.
7. La utilización de los productos requiere instrucciones especiales y una alta concentración en el manejo. Debe de ponerse por seguro de que las personas que manejen los productos estén a la altura de los requerimientos necesarios referente a sus aptitudes físicas, psíquicas y emocionales, ya que de otra manera no se pueden excluir lesiones o daños de objetos. El empresario lleva la responsabilidad de seleccionar el personal usuario apto para el manejo de los productos.
8. Antes de la puesta en marcha del producto se deberá tener por seguro de que la tensión preseleccionada en el producto equivalga a la del la red de distribución. Si es necesario cambiar la preselección de la tensión también se deberán en caso dabo cambiar los fusibles correspondientes del producto.
9. Productos de la clase de seguridad I con alimentación móvil y enchufe individual de producto solamente deberán ser conectados para el funcionamiento a tomas de corriente de contacto de seguridad y con conductor protector conectado.
10. Queda prohibida toda clase de interrupción intencionada del conductor protector, tanto en la toma de corriente como en el mismo producto. Puede tener como consecuencia el peligro de golpe de corriente por el producto. Si se utilizaran cables o enchufes de extensión se deberá poner al seguro, que es controlado su estado técnico de seguridad.
11. Si el producto no está equipado con un interruptor para desconectarlo de la red, se deberá considerar el enchufe del cable de distribución como interruptor. En estos casos deberá asegurar de que el enchufe sea de fácil acceso y nabejo (según la medida del cable de distribución, aproximadamente 2 m). Los interruptores de función o electrónicos no son aptos para el corte de la red eléctrica. Si los productos sin interruptor están integrados en construcciones o instalaciones, se deberá instalar el interruptor al nivel de la instalación.

Informaciones de seguridad

12. No utilice nunca el producto si está dañado el cable eléctrico. Compruebe regularmente el correcto estado de los cables de conexión a red. Asegure a través de las medidas de protección y de instalación adecuadas de que el cable de eléctrico no pueda ser dañado o de que nadie pueda ser dañado por él, por ejemplo al tropezar o por un golpe de corriente.
13. Solamente está permitido el funcionamiento en redes de distribución TN/TT aseguradas con fusibles de como máximo 16 A (utilización de fusibles de mayor amperaje sólo previa consulta con el grupo de empresas Rohde & Schwarz).
14. Nunca conecte el enchufe en tomas de corriente sucias o llenas de polvo. Introduzca el enchufe por completo y fuertemente en la toma de corriente. Si no tiene en consideración estas indicaciones se arriesga a que se originen chispas, fuego y/o heridas.
15. No sobrecargue las tomas de corriente, los cables de extensión o los enchufes de extensión ya que esto pudiera causar fuego o golpes de corriente.
16. En las mediciones en circuitos de corriente con una tensión de entrada de $U_{\text{eff}} > 30 \text{ V}$ se deberá tomar las precauciones debidas para impedir cualquier peligro (por ejemplo medios de medición adecuados, seguros, limitación de tensión, corte protector, aislamiento etc.).
17. En caso de conexión con aparatos de la técnica informática se deberá tener en cuenta que estos cumplan los requisitos de la EC950/EN60950.
18. A menos que esté permitido expresamente, no retire nunca la tapa ni componentes de la carcasa mientras el producto esté en servicio. Esto pone a descubierto los cables y componentes eléctricos y puede causar heridas, fuego o daños en el producto.
19. Si un producto es instalado fijamente en un lugar, se deberá primero conectar el conductor protector fijo con el conductor protector del aparato antes de hacer cualquier otra conexión. La instalación y la conexión deberán ser efectuadas por un electricista especializado.
20. En caso de que los productos que son instalados fijamente en un lugar sean sin protector implementado, autointerruptor o similares objetos de protección, el circuito de suministro de corriente deberá estar protegido de manera que usuarios y productos estén suficientemente protegidos.
21. Por favor, no introduzca ningún objeto que no esté destinado a ello en los orificios de la caja del aparato. No vierta nunca ninguna clase de líquidos sobre o en la caja. Esto puede producir corto circuitos en el producto y/o puede causar golpes de corriente, fuego o heridas.
22. Asegúrese con la protección adecuada de que no pueda originarse en el producto una sobrecarga por ejemplo a causa de una tormenta. Si no se verá el personal que lo utilice expuesto al peligro de un golpe de corriente.
23. Los productos R&S no están protegidos contra el agua si no es que exista otra indicación, ver también punto 1. Si no se tiene en cuenta esto se arriesga el peligro de golpe de corriente para el usuario o de daños en el producto lo cual también puede llevar al peligro de personas.
24. No utilice el producto bajo condiciones en las que pueda producirse y se hayan producido líquidos de condensación en o dentro del producto como por ejemplo cuando se desplaza el producto de un lugar frío a un lugar caliente.
25. Por favor no cierre ninguna ranura u orificio del producto, ya que estas son necesarias para la ventilación e impiden que el producto se caliente demasiado. No pongan el producto encima de materiales blandos como por ejemplo sofás o alfombras o dentro de una caja cerrada, si esta no está suficientemente ventilada.
26. No ponga el producto sobre aparatos que produzcan calor, como por ejemplo radiadores o calentadores. La temperatura ambiental no debe superar la temperatura máxima especificada en la hoja de datos.

Informaciones de seguridad

27. Baterías y acumuladores no deben de ser expuestos a temperaturas altas o al fuego. Guardar baterías y acumuladores fuera del alcance de los niños. No cortocircuitar baterías ni acumuladores. Si las baterías o los acumuladores no son cambiados con la debida atención existirá peligro de explosión (atención células de Litio). Cambiar las baterías o los acumuladores solamente por los del tipo R&S correspondiente (ver lista de piezas de recambio). Las baterías y acumuladores deben reutilizarse y no deben acceder a los vertederos. Las baterías y acumuladores que contienen plomo, mercurio o cadmio deben tratarse como residuos especiales. Respete en esta relación las normas nacionales de evacuación y reciclaje.
28. Por favor tengan en cuenta que en caso de un incendio pueden desprenderse del producto agentes venenosos (gases, líquidos etc.) que pueden generar daños a la salud.
29. El producto puede poseer un peso elevado. Muévelo con cuidado para evitar lesiones en la espalda u otras partes corporales.
30. No sitúe el producto encima de superficies, vehículos, estantes o mesas, que por sus características de peso o de estabilidad no sean aptas para él. Siga siempre las instrucciones de instalación del fabricante cuando instale y asegure el producto en objetos o estructuras (por ejemplo paredes y estantes).
31. Las asas instaladas en los productos sirven solamente de ayuda para el manejo que solamente está previsto para personas. Por eso no está permitido utilizar las asas para la sujeción en o sobre medios de transporte como por ejemplo grúas, carretillas elevadoras de horquilla, carros etc. El usuario es responsable de que los productos sean sujetados de forma segura a los medios de transporte y de que las prescripciones de seguridad del fabricante de los medios de transporte sean tenidas en cuenta. En caso de que no se tengan en cuenta pueden causarse daños en personas y objetos.
32. Si llega a utilizar el producto dentro de un vehículo, queda en la responsabilidad absoluta del conductor que conducir el vehículo de manera segura. Asegure el producto dentro del vehículo debidamente para evitar en caso de un accidente las lesiones u otra clase de daños. No utilice nunca el producto dentro de un vehículo en movimiento si esto pudiera distraer al conductor. Siempre queda en la responsabilidad absoluta del conductor la seguridad del vehículo. El fabricante no asumirá ninguna clase de responsabilidad por accidentes o colisiones.
33. Dado el caso de que esté integrado un producto de laser en un producto R&S (por ejemplo CD/DVD-ROM) no utilice otras instalaciones o funciones que las descritas en la documentación de producto. De otra manera pondrá en peligro su salud, ya que el rayo laser puede dañar irreversiblemente sus ojos. Nunca trate de descomponer estos productos. Nunca mire dentro del rayo laser.

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DIN EN 9100 : 2003

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DQS REG. NO 001954 QM/ST UM

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DIN EN 9100:2003
DIN EN ISO 14001:1996

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you have decided to buy a Rohde & Schwarz product. You are thus assured of receiving a product that is manufactured using the most modern methods available. This product was developed, manufactured and tested in compliance with our quality management system standards.

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1 General Description

This chapter gives a general introduction to the Coverage Measurement System R&S ROMES 3NG with all its components. It describes the measurement principle, the basic system modules and available options, the measurement process, the file types used and the handling of BTS information stored in the internal database.

For a practical introduction to R&S ROMES 3NG refer to chapter 2, *Getting Started*. In this chapter a sample session is recorded including the basic configurations, a typical measurement and the essentials for evaluating and interpreting the measurement results.

The reference part describing all menus and functions in detail is split into several chapters: Chapter 3 gives a systematic overview of the user interface and all menu commands, chapter 4 describes the basic views and view configurations. The following chapters explain the system and hardware driver settings and the options for data export. Technical aspects and background information are relegated to chapters 8 and 9.

System Requirements

R&S ROMES 3NG runs under the *MS Windows XP* (SP2) operating system. A standard single-CPU PC with the following characteristics will ensure full functionality:

- 2 GHz CPU clock
- 512 MB RAM or more

Introduction to R&S ROMES 3NG

Due to its modular concept, R&S ROMES 3NG is a perfect solution for every coverage measurement task. *Rohde & Schwarz* offers various options which can be combined with R&S ROMES 3NG, e.g. the options for measuring digital mobile phone networks, for digital audio broadcasting, or analog signal strength measurement in almost every relevant frequency range. The latter can be used as a stand-alone solution or in combination with R&S ROMES.

Depending on the used devices, the complete system is either installed in a portable case or in a van.

The following picture gives an overview of the basic steps taken in a measurement tour.

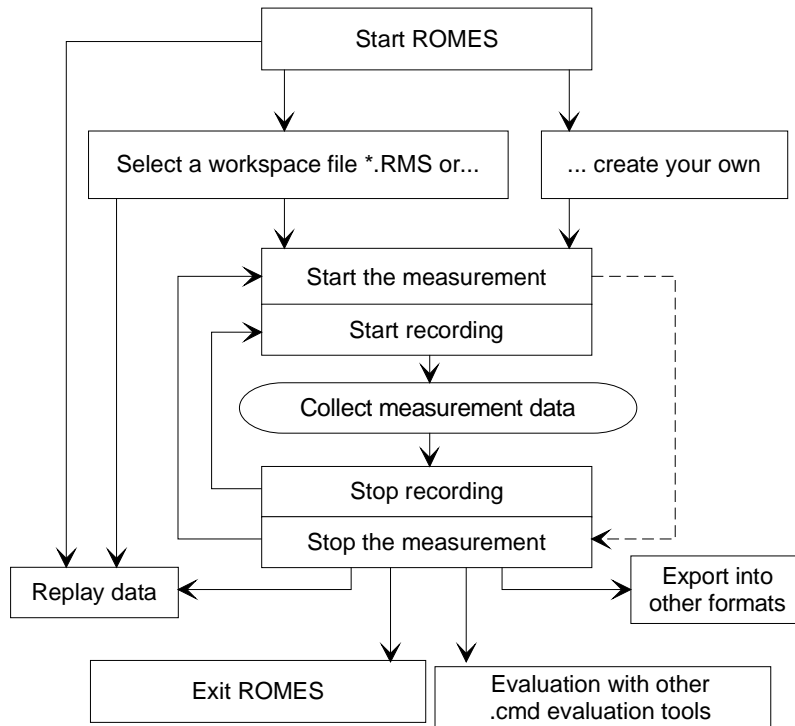


Fig. 1-1 Overview of a measurement tour

The *Replay* mode is an additional feature for pre-evaluation purposes. Replay means that you can load and analyze the stored measurement data after the measurement tour, using the different views that R&S ROMES 3NG provides for display and evaluation. You can pause the replay at points of special interest in order to analyze the data replayed so far, print the view contents or copy screen shots to the clipboard using *ALT+PrtSc* (for capturing the active window) or *PrtSc* (for the whole screen).

Performing a Measurement with R&S ROMES 3NG

With R&S ROMES 3NG, the actual measurement and the evaluation of results can be configured and carried out independently:

- The hardware driver settings determine how the measurement is performed
- The display configuration settings determine how the results are analyzed and viewed

The data can be viewed during the measurement without being stored (*measurement mode*), they can be viewed and stored at the same time (*recording mode*), or data recorded before can be loaded from a measurement file and analyzed (*replay mode*).

The *result file (measurement file)* contents depend on the kind of drivers and their settings, not on the display configuration. In particular, the parameter selections and settings in the *Configuration – Settings* menu generally don't have any influence on the *.cmd file.

There is only one exception: The *Info* tabs in various *Configuration* menus contains information on user-name, test vehicle description and vehicle ID which is saved with the *.cmd file.

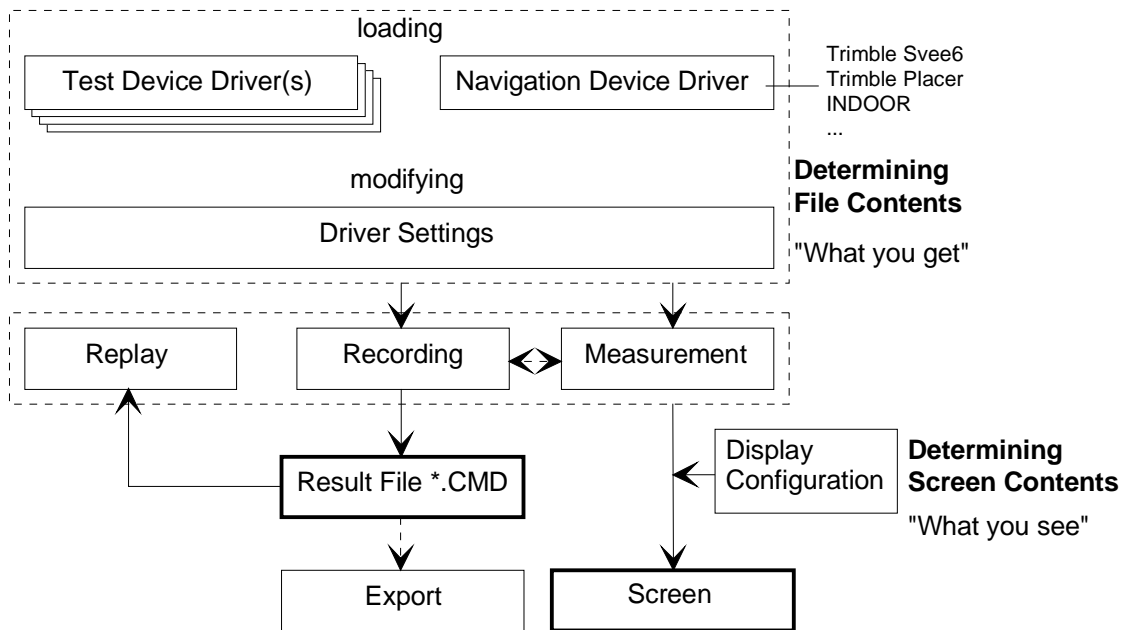


Fig. 1-2 Principle of a measurement

Basic Concepts of R&S ROMES

The following section is to make you familiar with R&S ROMES' basic operating concept, the representation of measurement data, and the file formats used. It also defines frequently encountered terms of the R&S ROMES user interface.

Workspace and Measurement Files

In the lower part of the *File* menu, R&S ROMES indicates the workspace (*.rms) and measurement (*.cmd) files used in the previous sections. The data in these two file types are complementary: Measurement files (*.cmd) contain the measured data, the workspace (*.rms) controls their visualization.

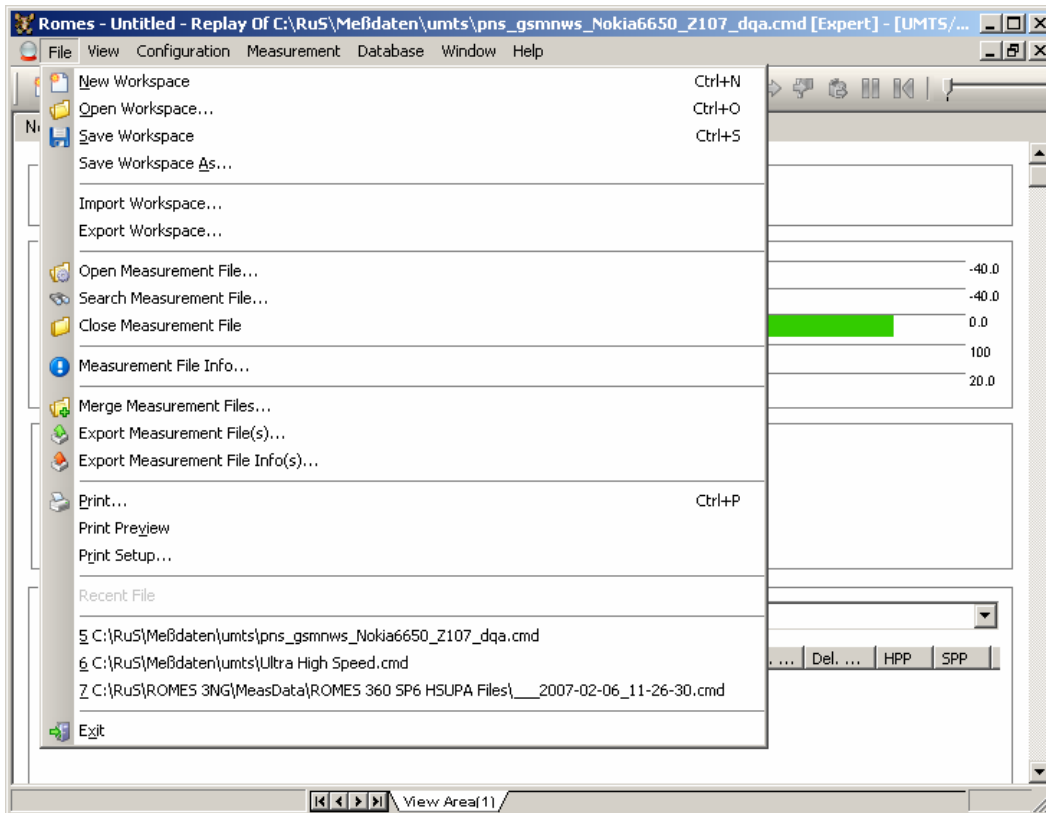


Fig. 1-3 Workspace and measurement files

Workspace

A workspace contains the device driver and screen settings for a R&S ROMES 3NG session, including the type, size, and position of all opened view windows, parameter types to be viewed in each view type (if applicable), and a bitmap archive for *Route Track Views*, if defined. A workspace must contain at least one view of every type. Data to be viewed are not part of the workspace.

The signal configurations defined in the *ROMES Configuration* menu (see section *Signal Configuration* in chapter 3) are stored in the Windows registry by default but can be alternatively included in the workspace.

During a R&S ROMES session, exactly one workspace is active. The workspace opened when R&S ROMES is started depends on the setting in the *General* tab of the *ROMES Configuration* menu (opened via the *Configuration – Preferences* command). R&S ROMES uses either the last workspace used in the previous session or the following default workspace: a view window of each type is opened, all windows are tiled across the main window. The main application window size of the previous session is preserved.

User-defined workspaces can be stored to a workspace file <file-name>.rms and recalled in later sessions. So, for each kind of measurement the matching control windows can be easily set, and each operator

can save and reuse his favorite constellations.

Workspace-related menu commands (see chapter 3):

New Workspace

Create a new workspace

Open Workspace

Load an existing workspace file

Save Workspace

Save current workspace with its current name

Save Workspace As...

Save current workspace with a new name

Measurement Data

As explained in section [Performing a Measurement](#) on page 1.2, a measurement file (*.cmd) contains the complete measurement data acquired on a tour.

During a R&S ROMES session, no measurement file needs to be open because many actions (such as view configurations etc.) are independent of the measurement data. A measurement file must be open if data is recorded, replayed, or exported. The corresponding commands (see below) take into account whether a measurement file is already open or not:

- If a measurement file is open already, the action is performed using the current measurement file (*Replay*), or the current measurement file is proposed as a default file for the action (*Recording, Export*).
- If no measurement file is open yet, a *File Open* dialog is opened first. In this dialog, a measurement file can be created or selected.

Measurement file-related menu commands (see chapter 3):

Open cmd file

Open a new measurement file

Close cmd file

Close the current measurement file

Export cmd file

Export the cmd file contents

Start Recording

Start a measurement and write the results to a measurement file.

Data Selection

In the configuration menus used to select data for viewing and exporting, the data of a measurement file is presented in hierarchical trees. The trees give a graphical representation of the correlation between the data that originates from different devices and technologies.

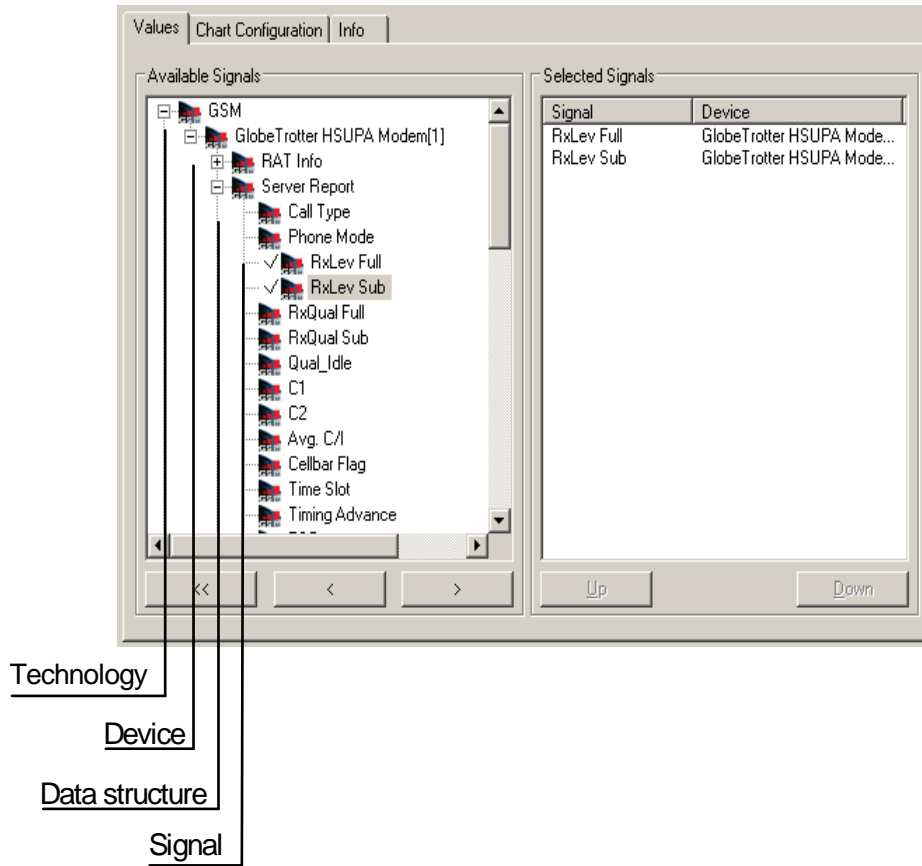


Fig. 1-4 Data tree and data selection

Use

The figure above shows the default data tree as is used in the view configuration menus as long as no measurement (cmd) file is open.

If a measurement file is open, the data tree is adapted to the file contents, the classifiers Device 1 to Device 4 being replaced by the actual device names (e.g. AEG[1], AEG[2] ...). Branches that are not occupied because the corresponding technologies, devices etc. are not available, are truncated. This is to make sure that any signal shown in the data is actually available in the current measurement data.

The data tree shown in the *ROMES configuration* menus (opened via the *Configuration – Preferences* command) don't show the device hierarchy level, because devices are selected elsewhere.

Available Signals

All signals (hierarchy level 4) of the data tree can be selected for display:

- To select a single signal for display, left-click this parameter (which will be highlighted in inverse video) and click the > button. Alternatively, double-click the parameter.
- To select all available signals at once, click the >> button.

Selected Signals

List of all signals selected for display.

- To remove a single signal from the list, left-click this parameter (which will be highlighted in inverse video) and click the < button. Alternatively, double-click the parameter.
- To remove all parameters at once, click the << button.

The order of the list can be changed using the two buttons below:

Up

Interchange the position of the selected signal with the signal located directly above. The first signal in the list can not be moved upwards.

Down

Interchange the position of the selected signal with the signal located directly below. The last signal in the list can not be moved downwards.

File Formats

Besides the measurement files and workspace files described in section [Workspace and Measurement Files](#) on page 1.4, R&S ROMES uses the following file formats:

Export formats

Data stored in a measurement (*.cmd) file can be exported to files with special data formats in order to be used in other applications. Several ASCII and other export formats (*.txt, *.ASC, *.MES, *.NT3, *.COX, *.PRO, *.MIF, *.NQA, *.NQ2, *.SRS, *.SER) are available, depending on the system configuration. Moreover, it is possible to export the layer 3 messages stored in a measurement file during replay.

A detailed description of file export and export formats can be found in chapter 7 Data Processing.

View result export format (*.csv)

Several views support the export of the displayed data to a *.csv (comma-separated values) file that can be opened and processed by Excel. The contents of the Excel lists and the delimiters (commas, semicolons etc.) are view-dependent. To adjust Excel to the actual delimiters of the *.csv file use the MS Excel *Data – Text to Columns...* wizard.

Image files In the *Route Track* window, arbitrary bitmap files (*.jpg, *.bmp, *.pcx, *.png, *.tif, *.gif) can be loaded and superimposed to a background world map. The bitmaps can be positioned onto the world map by means of a set of coordinates which are stored in a *.tab file, a short text file assigned to the bitmap.

A detailed description of bitmap positioning can be found in chapter 4 Display and Evaluation of Results.

Bitmap archive Bitmap archive files (*.arc) created in earlier R&S ROMES versions (TS51-K1 / TS55-K1 V2.x) can be imported and converted to *.tab files. In contrast to a *.tab file, the *.arc files generally contain the positioning information for several bitmaps. Consequently, when an archive consisting of several bitmaps and one *.arc file is imported, an equal number of *.tif bitmaps and *.tab files is created.

For further information refer to the description of the *Route Track* view in chapter 4.

Wave file R&S ROMES allows to use wave (*.wav) files to announce an event by an acoustic signal. The wave files can be selected in the *Available Events* tab of the *Event configuration* menu, see chapter 3.

**BTS list files,
Network data base** Base station data provided by the network operator can be imported from BTS list (*.txt) or ASCII table description (*.atd) files with definite file formats (see chapter 7 Data Processing), and information on the base stations can be indicated in the *Alphanumeric View*, *GSM Measurement Report*, or *Route Track* views (see chapter 4). The base station lists are selected via the *BTS Database* menu items of the *Database*

To be used internally the information on GSM base stations is imported to a Network Data Base (*.ndb) file. It is possible to edit the data within a network data base and export data to a new BTS list (*.txt).

Information on Node B BTSs for UMTS base stations is imported to Node B Data Base (*.nbdb) files.

Note:

The R&S ROMES root program directory contains a program file named BTSListGenerator.exe. This software tool uses a GSM measurement (.cmd) file to generate a dummy BTS list (*.txt) file that can be imported into R&S ROMES for demo purposes and to visualize measurement data.*

*The list generator can also generate Node B and CDMA database files from suitable *.cmd measurement files.*

The use of the tool is self-explanatory.

- C0 scan export files** If a Carrier-to-Interference (C/I) analysis is performed and the C0 analysis is active (see description of C/I driver in chapter 6), then a C0 scan export file (*.cox) file is automatically generated at the end of the measurement. The *.cox file is an ASCII file and contains information about the scanned C0 signals; see description in chapter 7 Data Processing.
- The *.cox file format is also available for an export of GSM network scan data (with option R&S ROMES-GS3, *GSM Network Scanner*).
- SC color files** In some of the *UMTS PNS* views a color scale can be loaded from an SC color file (*.scc) and user-defined color scales can be stored to *.scc files to be reused in a later session.
- ASCII Export Configuration File** When exporting measurement data to an ASCII file (see chapter 7), the export configurations can be stored to a *.rma file and reused later.
- Profile files** To improve the system performance, it is possible to disable R&S ROMES program components using the *ROMES Configurator* (see chapter 8). A particular configuration consisting of a list of all enabled and disabled components can be stored to a profile file (*.profile) and re-used later.

Other files are for internal use only.

General Description

R&S ROMES 3NG

Third Party Software for R&S ROMES 3NG

R&S ROMES 3NG uses the following third-party utility:

MapX 5

Map projection in the Route Track view

R&S ROMES 3NG needs an installed Internet Explorer Version 6.0 or higher and is distributed and tested with the following shared files:

File	Directory	OS	Version	Manufacturer	Remark
TVICPORT.VXD	Windows\System32	Win95/98	-	-	Parallel Port Access
TVICPORT.SYS	Windows\System32\Drivers	WinNT/2000	-	-	Parallel Port Access
SHLWAPI.DLL	Windows\System32	All	4.70.0.1215	Microsoft	Shell Light-weight Utility Library
URLMON.DLL	Windows\System32	All	4.70.0.1300	Microsoft	OLE32 Extensions for Win32
WININET.DLL	Windows\System32	All	4.70.0.1300	Microsoft	Internet Extensions for Win32
MGMTAPI.DLL	Windows\System32	All	5.0.2195.5349	Microsoft	Microsoft SNMP Manager API
WSNMP32I.DLL	Windows\System32	All	5.0.2195.5349	Microsoft	Microsoft WinSNMP v2.0 Manager API
SNMPAPI.DLL	Windows\System32	All	5.0.2195.4874	Microsoft	SNMP Utility Library
MFC42.DLL	Windows\System32	All	6.0.8665.0	Microsoft	MFCDLL Shared Library - Retail Version
MFC70.DLL	Windows\System32	All	7.0.9466.0	Microsoft	MFCDLL Shared Library - Retail Version
MSVCIRT.DLL	Windows\System32	All	6.0.8637.0	Microsoft	Microsoft (R) C++ Runtime Library
MSVCP50.DLL	Windows\System32	All	5.0.0.7051	Microsoft	Microsoft (R) C++ Runtime Library
MSVCP60.DLL	Windows\System32	All	6.0.8972.0	Microsoft	Microsoft (R) C++ Runtime Library
MSVCP70.DLL	Windows\System32	All	7.0.9466.0	Microsoft	Microsoft (R) C++ Runtime Library
MSVCRT.DLL	Windows\System32	All	6.1.9359.0	Microsoft	Microsoft (R) C++ Runtime Library
MSVCi70.DLL	Windows\System32	All	7.0.9466.0	Microsoft	Microsoft (R) C++ Runtime Library
MSVCR70.DLL	Windows\System32	All	7.0.9466.0	Microsoft	Microsoft (R) C++ Runtime Library

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2 Getting Started

The following chapter presents a sample session with R&S ROMES. It is intended to provide a quick overview of the most important functions and configurations.

The tests reported below include

- Preparations (i.e. startup of the system, configuration of the hardware drivers, loading a database containing system and network data),
- Evaluating the measurement results.

The steps to perform are explained with the menus required and the results obtained on the screen. We also point out alternative settings and related measurements which could not be reported in detail.

Section *Short Measurement Examples* on p. 2.4 ff. contains short operating sequences from various R&S ROMES applications.

Preparations

R&S ROMES is an application that runs under *MS Windows XP* with SP2. The recommended system controller for a 19" rack is the R&S TSPC2.



- Double-click the icon on your desktop to start R&S ROMES.

Loading the Hardware Drivers

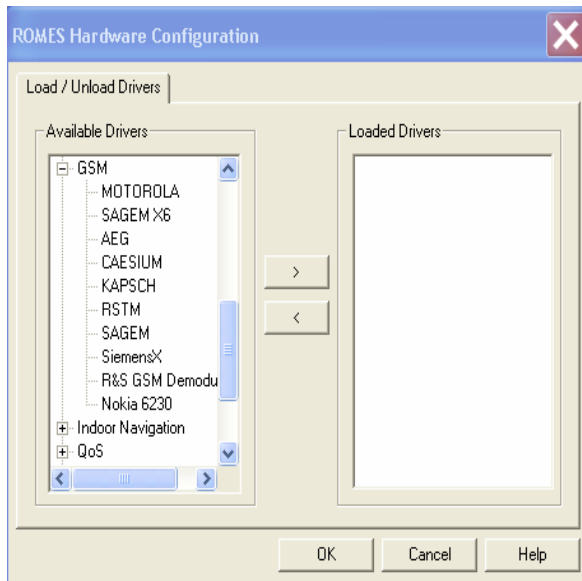
The hardware device drivers for your mobile phone, for the positioning system, and for the C/I interference measurement must be loaded and installed before the measurement is started.

In our example we use an Sagem OT-35 mobile for the GSM900 network connected to COM port 1 and a Trimble Placer positioning system connected to COM port 2 of the controller. If you have a different equipment, the steps can be performed in an analogous way.

To load the hardware drivers, perform the following steps:

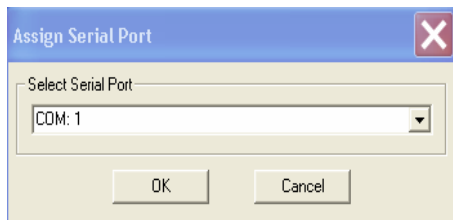
- Click the *Hardware...* command in the *Configuration* menu.

The *ROMES Hardware Configuration* window opens.



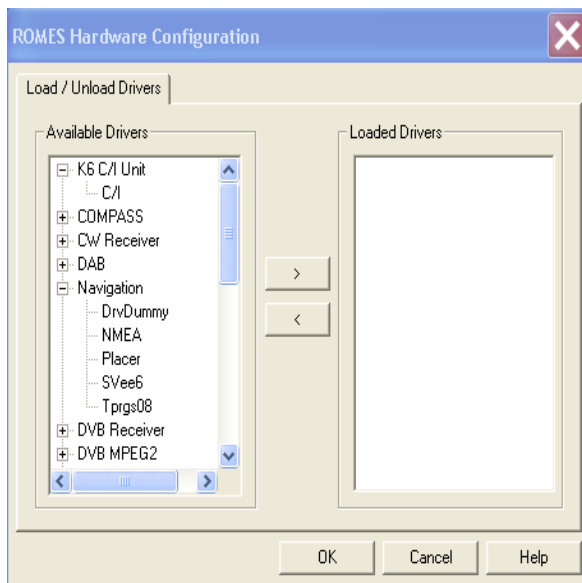
The *ROMES Hardware Configuration* window shows a list of all devices and hardware drivers available (the list varies according to the options of the coverage measurement system chosen).


- For the mobile driver select (click) the device class GSM.
- Select the manufacturer of your mobile phone.
- Click the button to initiate the installation.



The *Assign Serial Port* window shows the COM Port assigned to the mobile driver. Port 1 must be set.

- If the COM port 1 is not set, select it from the Combo box.
 - Press *OK*.
- A progress bar *showing* the initialization of the mobile appears.
- Click *Navigation* and select *Placer* from the list of *Available drivers*.



- Click the  button and proceed as described above to load the driver and assign it to COM Port 2.
- Load the driver.
- Click *OK* to confirm your choice and close the *ROMES Hardware Configuration* dialog.

Short Measurement Examples

The following sections are intended as a quick introduction to typical measurement tasks, listing the steps necessary to set up the drivers, obtain, display and interpret the basic results. The examples are taken from different R&S ROMES 3NG options and technologies.

Data Quality Tester

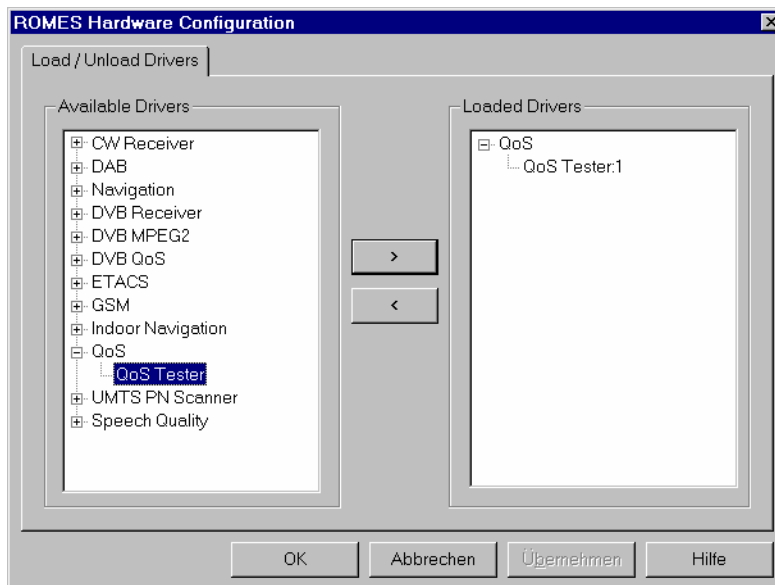
The purpose of the Data Quality Tester (DQA, option R&S ROMES-Z6) measurement is to evaluate the Quality of Service (QoS) of any kind of data transfer connection. Configuration of the driver is described in detail in chapter 6, section *UMTS PN Scanner Driver*. The QoS Views are described in chapter 4 Display and Evaluation of Results.

Setting up a Connection

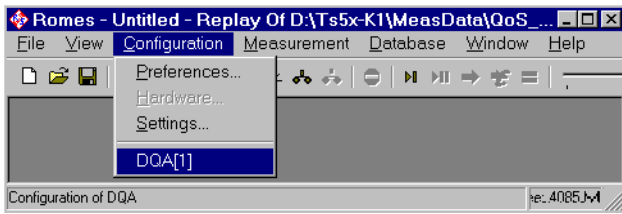
The DQA driver provides various jobs to define and establish a connection to a network provider or remote server. The procedure of setting up the connection is analogous for all jobs. In the following example an *FTP Download* connection to a remote server is set up.

Suppose that your local computer contains a R&S ROMES installation including the Data Quality Tester, that it is configured for ftp file transfer with a remote server (in case of doubt refer to your Windows help), and that a remote server can be accessed. To set up and test the *FTP Download* connection with R&S ROMES, perform the following steps:

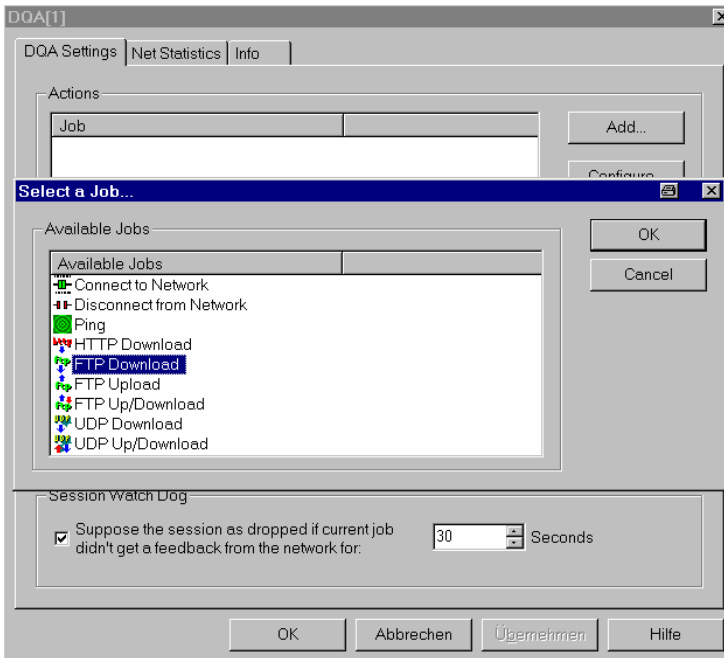
- Click the Hardware command in the Configuration menu to open the *ROMES Hardware Configuration* dialog.
- Expand the QoS driver section (click the + node) and double-click QoS Tester to load the driver.
- Click OK to close the *ROMES Hardware Configuration* dialog.



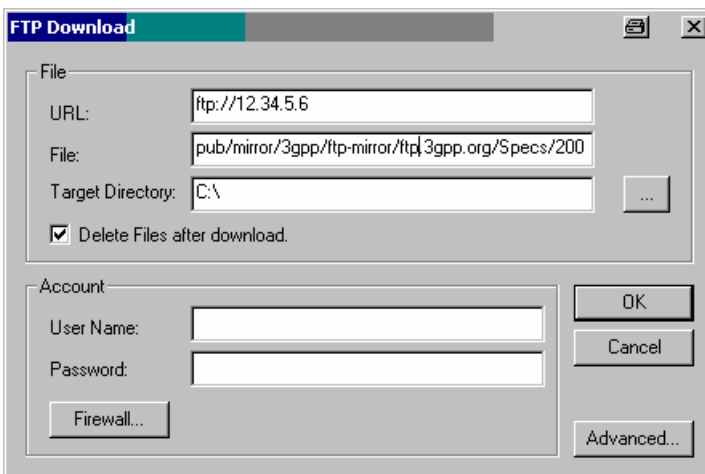
- In the *Configuration* menu, select the *DQA[1]* command to open the DQA driver configuration menu.



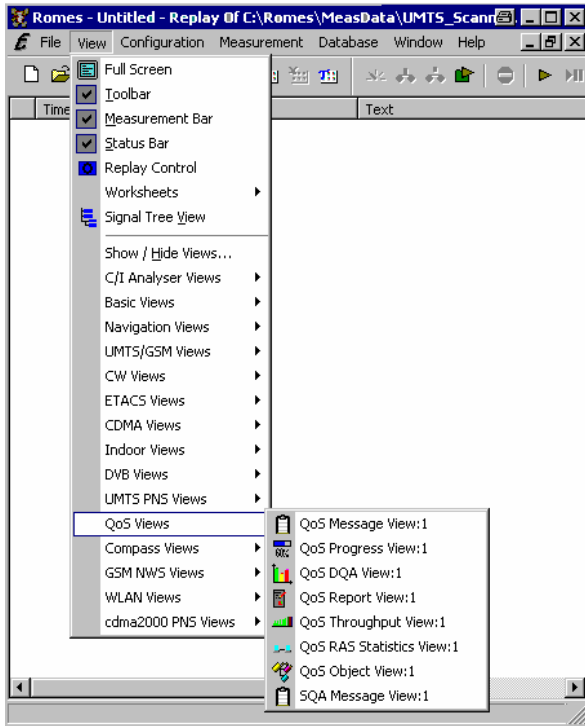
- Select the DQA Settings tab and click Add to open the list of available jobs. Select an FTP Download job.
- Double-click the selected FTP Download job or confirm with OK to open the FTP Download configuration menu.




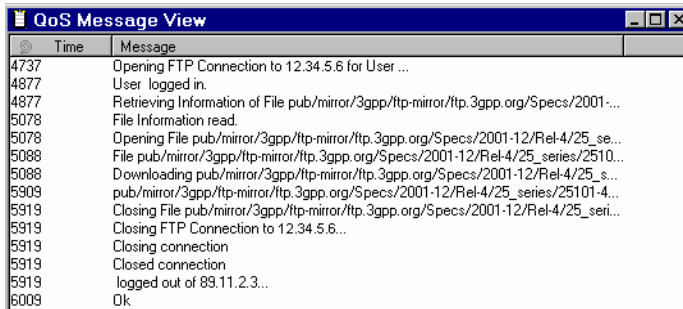
- In the configuration menu, enter the URL of the remote server (IP address as shown in the example or host name) and the name and directory of a file located on the remote server. Complete the settings as shown in the example. If the access is password-protected, specify the user name and password for your account. Open the *Firewall* settings dialog if needed.




- Press **OK** to confirm your settings, close the *FTP Download* menu and return to the *DQA Settings* tab of the DQA configuration menu. Press **OK** again to close this menu.
- In the *View* menu, select the *QoS Views – QoS Message View*.



- Click the  icon to start the DQA measurement.
The *QoS Message View* indicates the progress of the measurement.



The DQA measurement consists of opening the FTP connection to the remote server, downloading the file specified in the *FTP Configuration* menu, and closing the connection without keeping a copy of the downloaded file. As the session continues the job will be executed repeatedly until the DQA measurement is stopped, e.g. by clicking the  icon.

UMTS PN Scanner

An UMTS PNS (Pseudo Noise Scanner) measurement consists of performing alternate PN scans and spectrum measurements using the R&S UMTS PN Scanner driver. The driver controls R&S FSP spectrum analyzer, a R&S ESPI test receiver, or a R&S TSMU radio network analyzer. Configuration of the driver is described in detail in chapter 6, section *UMTS PN Scanner Driver*. The *UMTS PNS Views* are described in chapter 4 Display and Evaluation of Results.

In the following examples we suppose that an R&S FSP or R&S ESPI test device is available and properly connected to the trigger device and your PC as described in chapter 6 Hardware Components. The first step for any PN Scan measurement is then to load the driver and set the address of your test device.

To load the driver...

- Click the *Hardware* command in the *Configuration* menu to open the *ROMES Hardware Configuration* dialog.
- In the list of *Available Drivers*, expand the *UMTS PN Scanner* section (click the + node) and double-click *R&S PNS* to load the driver.
- Click *OK* to close the *ROMES Hardware Configuration* dialog.

To set the device address...

- In the *Configuration* menu, select the *R&S UMTS PNS[1]* command to open the *R&S UMTS PNS* driver configuration menu.
- Click the *Receiver* tab and set the IEC/IEEE bus address (for a connection via IEC/IEEE-bus interface) or IP address (for a connection via Ethernet/LAN interface) of your test device.

Performing a Spectrum Analysis

The spectrum analysis consists of a frequency sweep over a specified range to detect arbitrary UMTS downlink and uplink signals. Like any other R&S ROMES measurement, the spectrum analysis requires to load the hardware driver and set the driver parameters before you can start the measurement and evaluate the results. In the following example we suppose that these steps have been taken as described in section [UMTS PN Scan above](#) and that the driver configuration menu is still open.

Measurement task:

Measure the power in the nominal UMTS uplink and downlink bands. Set the test device to provide the maximum amount of data possible and view the downlink and uplink spectrum.

To set the test device parameters...

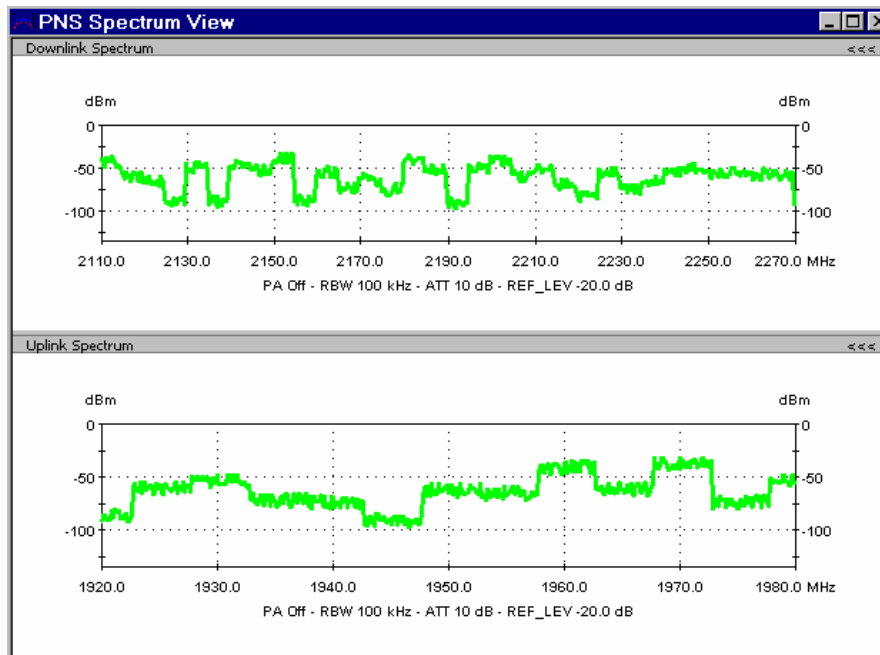
- In the *R&S UMTS PNS* driver configuration menu click the *Measurements* tab and check the settings in the *Uplink* and *Downlink* section of the *Spectrum* panel:
 - To repeat the spectrum measurements as quickly as possible, set the *Measurement Rate* to its maximum (20).
 - To speed up the individual spectrum measurements, ensure that a *Bandwidth* of 100 kHz is selected.
 - In the *Downlink* section, set the *Start* and *Stop* frequencies to 2110 MHz and 2170 MHz, respectively. In the *Uplink* section, set the *Start* and *Stop* frequencies to 1920 MHz and 1980 MHz, respectively.
- Click the *Receiver* tab and select one UMTS PN scan frequency in the *Frequency Table*.

The UMTS PN scan frequency is irrelevant for the current measurement task. However, R&S ROMES always performs a combination of spectrum measurements and UMTS PN scans and requires at least one scan frequency to be defined.
- Click *OK* to apply the settings and close the driver configuration menu.

To open the views and perform the measurement...

- In the View menu, click UMTS PNS Views – PNS Spectrum View:1 to open the PNS Spectrum View.
- In the Measurement menu, click *Start Recording* to initiate the measurement.

As R&S ROMES starts measuring, the downlink and uplink spectrum is displayed in the two subdiagrams of the *PNS Spectrum View*. Below each diagram, the settings at the test device are displayed. With the exception of the resolution bandwidth (RBW) which is identical with the *Bandwidth* set in the driver configuration menu, all parameters are set automatically according to the conditions of the measurement.

**To terminate the measurement...**

- In the Measurement menu, click Stop Recording.
- In the Comment dialog opened, briefly describe your measurement for later evaluations and confirm with OK.

ROMES terminates the measurement. The measurement data including the comment is stored in a measurement file named <current date>-<time>.cmd, e.g. __2006-07-15_12-36-44.cmd.

Performing a UMTS PN Scan

In an UMTS PN scan, the test device measures and identifies all UMTS downlink (Node B) signals in the air. The main purpose of this measurement is to test the receiving conditions of a mobile in an UMTS network and to analyze possible interferences. Like any other R&S ROMES measurement, the UMTS PN scan requires to load the hardware driver and set the driver parameters before you can start the measurement and evaluate the results. In the following example we suppose that these steps have been taken as described in section [UMTS PN Scan](#) on p. 2.6 and that the driver configuration menu is still open.

Measurement task:

Perform a comprehensive analysis of all Node B signals on UTRA ARFCN 10561 that can be received along a measurement tour, including multiple signals caused by reflections (and possible

sources of interference). Set the test device to provide the maximum amount of PN scan data possible and operate at maximum speed. View the signals with their power and relative timing.

To set the test device parameters...

- In the R&S UMTS PNS driver configuration menu click the *Receiver* tab and select the *Frequency* of 2112.2 MHz (click the checkbox), corresponding to ARFCN 10561. Deselect all other frequencies, if necessary.
- Click the *Measurements* tab and check the settings in the *Uplink* and *Downlink* section of the *Spectrum* panel. To repeat the spectrum measurements as rarely as possible, reserving the system resources for the PN scan, set the *Measurement Rate* to its minimum (0.1).
- Select *High Speed* in the *Measurement Mode* panel.
- To ensure that the system scans all signals, even those that are only received for a short time, set the *Synchronization Rate* to its maximum (20).
- To limit the size of the measurement file, reduce the *Update Rate for P-SCH View*.
- Click *OK* to apply the settings and close the driver configuration menu.

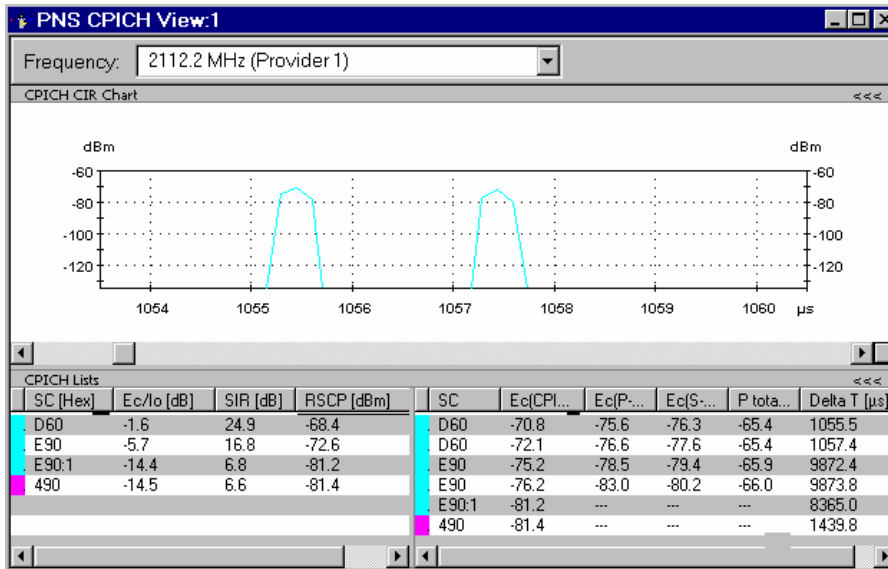
To open the views and perform the measurement...

- In the *View* menu, click UMTS PNS Views – PNS CPICH View:1 to open the PNS Spectrum View.
- In the *Measurement* menu, click *Start Recording* to initiate the measurement.

As R&S ROMES starts measuring, the average power of the P-CPICHs of all received signals with their relative timing is displayed in the *CPICH CIR Chart*. The table below contains a comprehensive list of properties for each measured signal.

To analyze the results...

- Mark a time delay range in the *CPICH CIR Chart* while the left mouse button is pressed to magnify the diagram in x-direction and separate the different peaks with a common scrambling code.
- Right-click on a point inside the view to open the context menu; click *Config...* to call up the view configuration menu.
- Click the *CPICH View* tab to adjust the *Dynamic Range* to the signals in the *CPICH CIR Chart*.
- In the *Node B List Columns* and *Peak List Columns* selection tables, deselect the quantities to be omitted in the *CPICH Lists*.
- Click *OK* to confirm your settings and close the configuration menu.



To interpret the results...

The figure above shows a typical result of an UMTS PN scan analyzed in the *CPICH View*:

- The *CPICH CIR Chart* shows two reflections with the same scrambling code (SC = D60), i.e. originating from the same Node B, and almost the same signal power, separated by a relative time delay of approx. 2 µs.
- The *CPICH List* shows that the system is currently able to identify signals from 4 different Node Bs. Of these 4 Node Bs, two use the same scrambling codes (namely E90; the signals are labeled E90 and E90:1) but the signals are received at different time delays.
- The signals from the Node Bs using SC = D60 and SC = E90 are each split into 2 reflections.

Some of the signal contributions of SC = E90:1 and SC = 490 are too weak to be accurately received: The left table shows invalid results.

To terminate the measurement...

- In the *Measurement* menu, click Stop Recording.
- In the *Comment* dialog opened, briefly describe your measurement for later evaluations and confirm with OK.

R&S ROMES terminates the measurement. The measurement data including the comment is stored in a measurement file named <current date>-<time>.cmd, e.g. __2006-07-15_12-36-44.cmd.

Using a Top N Pool

A top N pool contains up to N Node Bs with specific characteristics providing the strongest P-CPICH level at a given position and time. A top N pool can be used in the framework of a UMTS PN scan. It requires to load the hardware driver and set the driver parameters before you can start the measurement and evaluate the results. In the following example we suppose that these steps have been taken as described in section [UMTS PN Scan](#) on p. 2.6 and that the driver configuration menu is still open.

Measurement task:

Monitor and compare the properties of the three strongest signals on UTRA ARFCN 10561 along a measurement tour as accurately as possible, discarding the information about all other signals.

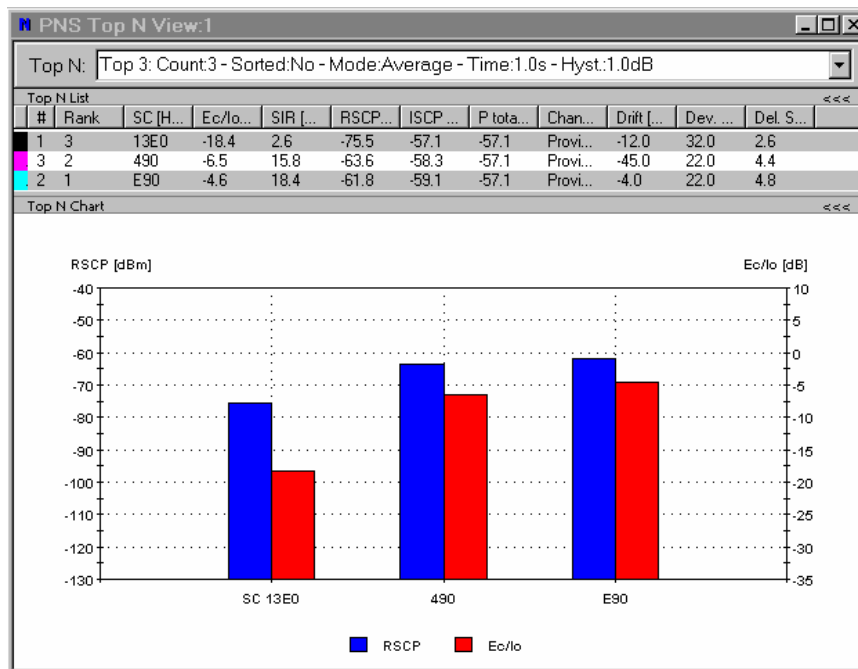
To set the test device parameters...

- In the R&S UMTS PNS driver configuration menu click the *Receiver* tab and select a valid UMTS provider frequency (in this example: 2112.2 MHz, corresponding to ARFCN 10561). Deselect all other frequencies, if any of them are checked.
- Click the *Measurements* tab and check the settings in the *Uplink* and *Downlink* section of the *Spectrum* panel. To repeat the spectrum measurements as rarely as possible, reserving the system resources for the PN scan, set the *Measurement Rate* to its minimum (0.1).
- Select *High Dynamic* in the *Measurement Mode* panel.
- To improve the system performance, set the *Synchronization Rate* to a rather small value, e.g. 0.1.
- To limit the size of the measurement file, reduce the *Update Rate for P-SCH View*.
- Select the *Top N* tab and click the *Add* button to generate a customized top N pool:
 - In the *Count* select field, limit the number of Node Bs that are member of the pool to 3.
 - Uncheck the *Sort* box to ensure that the pool members keep their rank within the pool until they are replaced by a new pool member.
- Click *OK* twice to confirm the settings and close the driver configuration menu.

To open the views and perform the measurement...

- In the *View* menu, click UMTS PNS Views – PNS Top N View:1 to open the PNS Top N View.
- In the *Measurement* menu, click *Start Recording* to initiate the measurement.

As R&S ROMES starts measuring, the *Top N Chart* displays the Received Signal Code Power (RSCP) and the average E_c/I_o of the P-CPICHs of the three top N signals. The table above contains a comprehensive list of properties for the three top N signals.

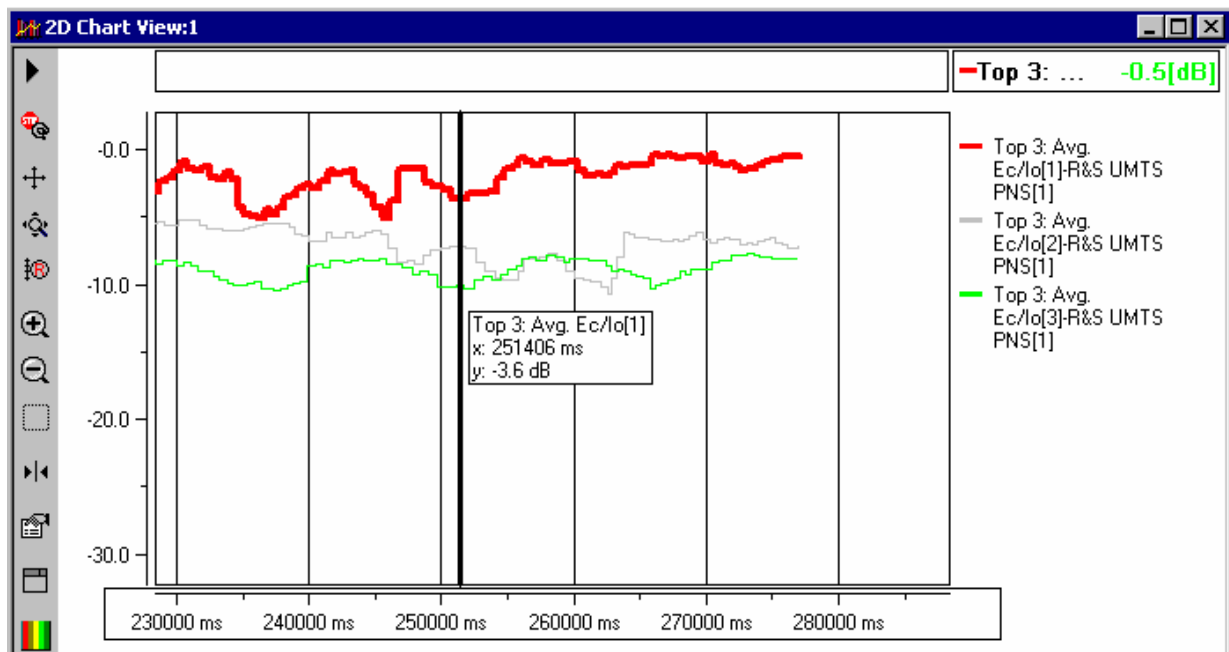


To analyze the results further ...

Besides the UMTS PNS views you can also use other R&S ROMES views to analyze the results of an UMTS PN scan. We pick just one example, plotting the average E_c/I_o of the three top N signals as a function of the time.

- In the *View* menu, click *Basic Views – 2D Chart View:1* to open a 2D Chart View.
- Right-click inside the view and select *Config...* to open the configuration menu. In the *Values* tab expand the data tree and select the signals *Top 3: Avg. $E_c/I_o[1]$* , *Top 3: Avg. $E_c/I_o[2]$* , and *Top 3: Avg. $E_c/I_o[3]$* to be displayed.
- Click *OK* to confirm the selection and close the configuration menu.

The 2D Chart view displays the three top N signals as a function of time. In the figure below the broad line, corresponding to *Top 3: Avg. $E_c/I_o[1]$* is not always the strongest signal, which is due to the fact that the considered pool is unsorted.

**To terminate the measurement...**

- In the *Measurement* menu, click *Stop Recording*.
- In the *Comment* dialog opened, briefly describe your measurement for later evaluations and confirm with *OK*.

R&S ROMES terminates the measurement. The measurement data including the comment is stored in a measurement file named <current date>-<time>.cmd, e.g. __2006-07-15_12-36-44.cmd.

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3 User Interface

This chapter describes R&S ROMES interface elements and their use. When the program is started, it opens the main window with all its working components. These components will activate depending on the loaded workspace.

Menus and Commands

The R&S ROMES main application window consists of the main elements listed below.

Tools to configure the different active elements of the main window and the views are provided in the [View Menu](#).

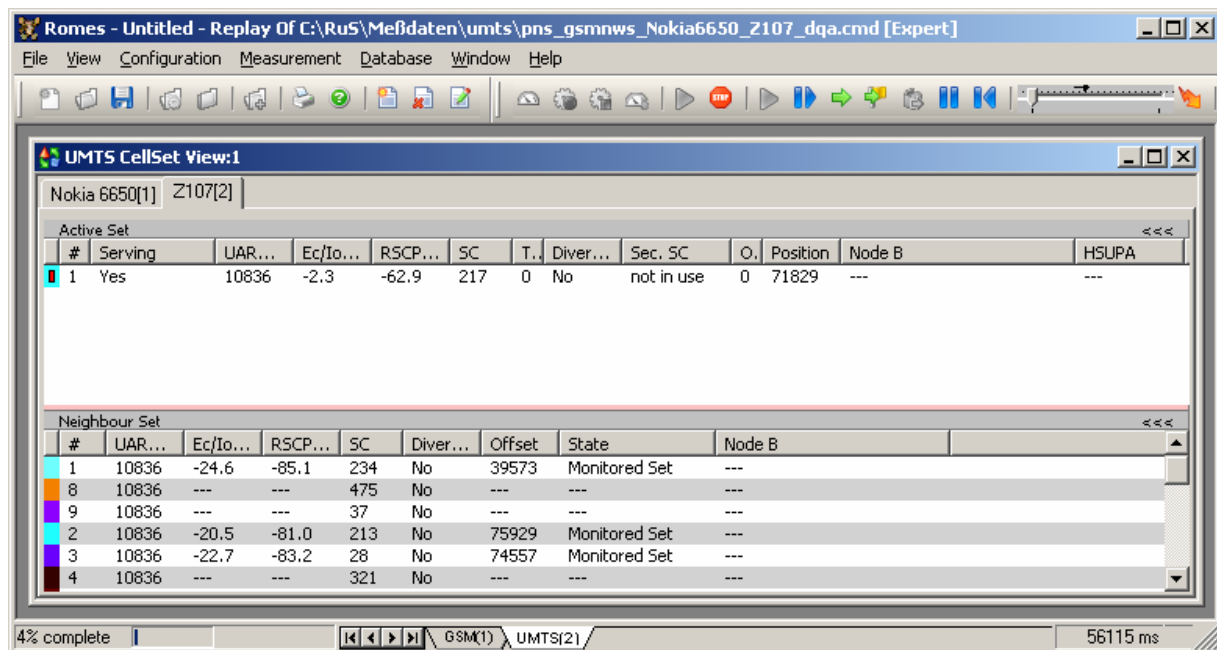


Fig. 3–1 R&S ROMES main window

Menu Bar

Below the title bar along the top of the screen, the program displays a menu bar with a variety of menu titles. Selecting a command from one of these menus either performs an action or displays a submenu or dialog. The menus – including dialogs that call for an explanation – are described in the following sections in this chapter.

Toolbar / Measurement bar

Directly below the menu bar is a bar with an array of buttons that provide access to the most commonly-used commands. The left part of the bar is to access the functions in the *File* and *Help* menu (*Toolbar*); the right part controls a *Measurement*. Toolbar and Measurement bar can be hidden or displayed separately; see [View Menu](#) on p. 3.21 ff.

Work Area

When the program is started with default settings, the main work area within the program window is empty (except for the *view area* name displayed in the center) and may be filled with one or several views (see [View Menu](#) on p. 3.21 ff.). One of the views is always active and displayed with a blue title bar so it is possible to customize the view and work with it.

The work area can be divided into different superimposed view areas in order to gain more space and arrange the views in different groups. Each view area has a name and is accessible by clicking the associated tab in the status bar below the work area. A right-click on one of the tabs opens a context menu with self-explanatory entries:

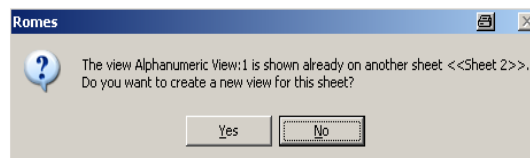


(complete list of views, see section [View Menu](#) on p. 3.21 ff.)...

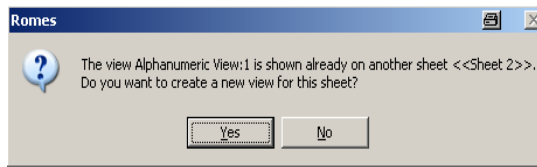
**Moving views between different view areas**

Suppose that a view area contains a view of a view type that can be opened several times (e.g. the *UMTS CellSet View:1* shown below).

- To move the view from the current area to a target area, use one of the following methods:
 - Right-click the view and click *Move to – <Target View Area>* in the context menu.
 - Open the target view area and select the view type (e.g. *Alphanumeric View:1*) in the *View* menu. In the message box opened, click *No*.



- To create a new view of the same type (e.g. *Alphanumeric View:2*) in another view area, use one of the following methods:
 - Right-click the existing view to open the context menu, click *New View*, then move the new view to the target view area.
 - Open the target view area and select the view type (e.g. *Alphanumeric View:1*) in the *View* menu. In the message box opened, click *Yes*.

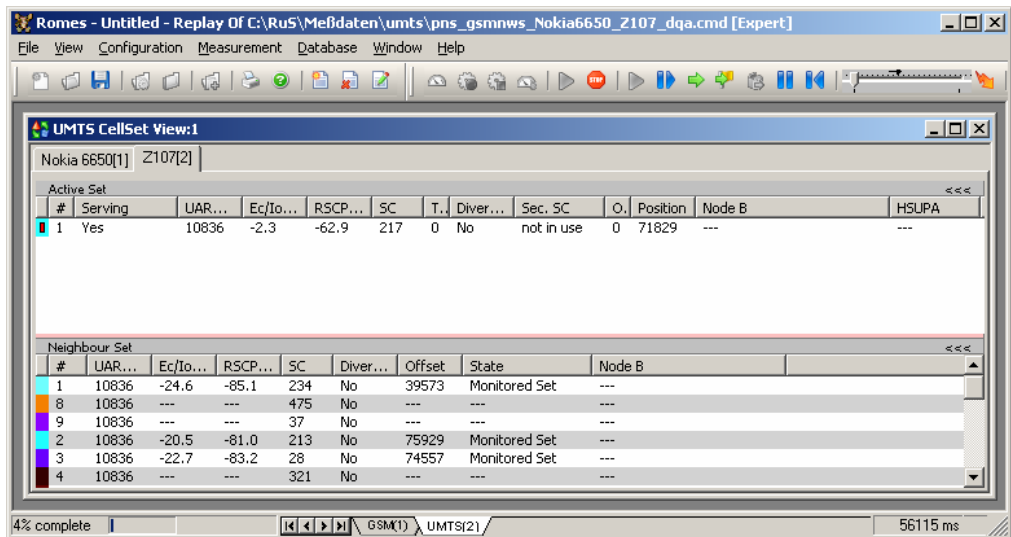


Saving and loading view areas

You can save your view area with all views and their settings to a file and re-use it in a later session. You can also save one or more default view areas that will be loaded automatically when R&S ROMES is started; see [View Areas](#) on p. 3.27.

Tools for configuring the different working elements of the main window and the views are provided in the [Window Menu](#) (see p. 3.115 ff.).

Title bar
Menu bar
Toolbar and Measurement bar



Work area with active view, divided into several view areas

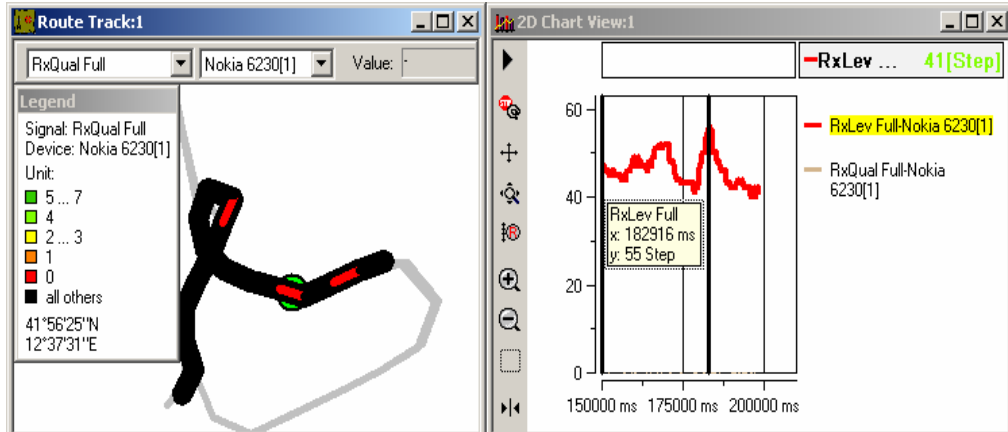
Status bar

Fig. 3-2 R&S ROMES main window

Coupled Focus


Many views provide graphical tools to highlight special areas and read a particular result. Examples are the marker line and the info field for the *2D Chart View* and the circular focus in the *Route Track* view shown below. The focus in several views can be coupled, which makes it easier to analyze different aspects of a coverage measurement at a particular position using a set of appropriate views.


In the example below, a local maximum of the *RxLevFull* reported by the test mobile is located in the *2D Chart View*, and the value (41) is read. The *Route Track* view shows the corresponding geographical position.



The following tools control the coupled focus:

- *Alt* plus a double-click inside a view activates the coupled focus.

The cursor changes to . Views without focus indicate *not synchronized*.

- The mouse cursor or the arrow keys move the focus within the view. To obtain different step widths you can combine the arrow keys with the *<SHIFT>* and the *<CTRL>* keys.
- The *Coupled Focus* settings in the *ROMES Configuration* dialog (see p. 3.59 ff.) specify which views are synchronized if the coupled focus is active and define the effect of the arrow keys.
- The *Release Coupled Focus* button  in the measurement bar or (equivalently) the menu command *Measurement – Release Coupled Focus* releases the coupled focus.

If no coupled focus is available for a view, the message *<<not synchronized>>* is displayed in the title bar, e.g.:



Menus and Commands

R&S ROMES provides seven menus opened by clicking one of the items in the menu bar on top of the main application window. The menus are used to access the functions and windows configuring and controlling the measurement and evaluation of results:

File Menu

Opens and saves workspace and measurement files, exports and prints data and closes the application.

View Menu

Customizes the main application window and offers the view windows used to visualize and evaluate measured data.

Configuration Menu

Installs the hardware drivers necessary for a measurement, configures the display and defines directories for the different types of files.

Measurement Menu

Starts and stops a measurement, starts and stops the replay of a measurement file and displays the list of event settings.

Database Menu

Customizes the internal database for GSM/UMTS data and Carrier to Interference (C/I) analysis.

Window Menu

Arranges and handles the different view windows.

Help Menu

Provides online help and general information on the coverage measurement system.

File Menu

The *File* menu opens and saves workspace and measurement files, exports and prints data and closes the application.

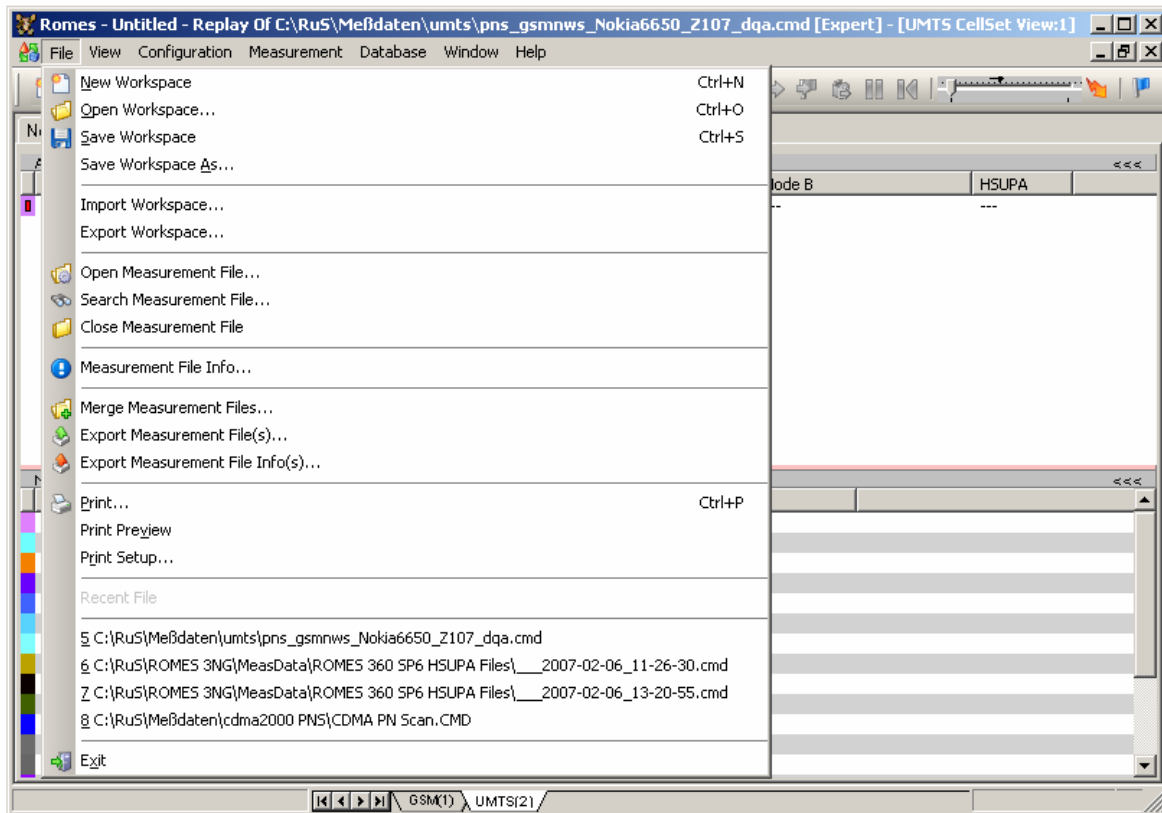


Fig. 3-3 File menu

New Workspace



Ctrl+N

Creates a new workspace.

A workspace contains the device driver and screen settings for a R&S ROMES session, including the type, size, and position of all opened view windows, parameter types to be viewed in each view type (if applicable), and a bitmap archive for *Route Track Views*, if defined. A workspace must contain at least one view of every type. Data to be viewed are not part of the workspace.

The workspace opened when R&S ROMES is started depends on the setting in the *General* tab of the *ROMES Configuration* menu. R&S ROMES uses either the last workspace used in the previous session or the following default workspace: a view window of each type is opened, all windows are tiled across the main window. The main application window size of the previous session is preserved.

User-defined workspaces can be stored to a workspace file <filename>.RMS and recalled in later sessions. So, for each kind of measurement the matching control windows can be easily set, and each operator can save and reuse his favorite constellations.

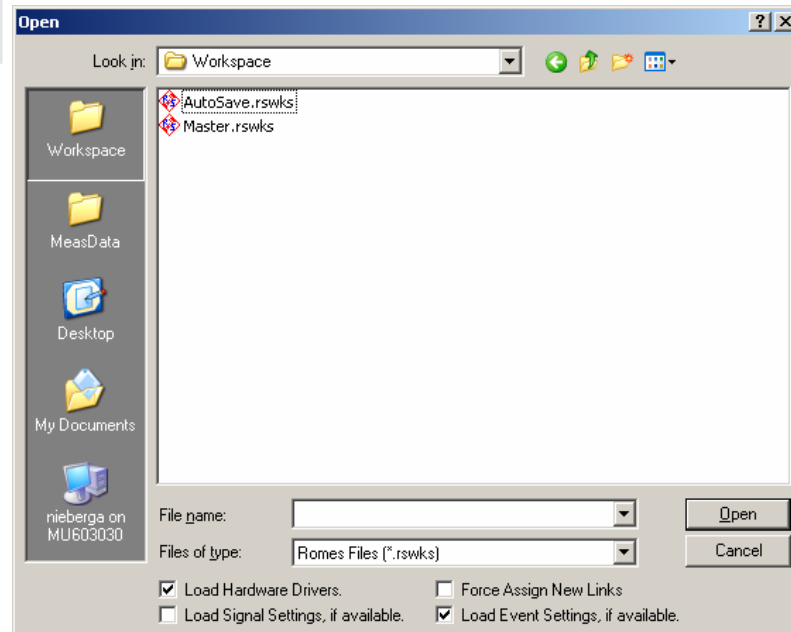
For a definition of the workspace see chapter 1.

Open Workspace

Ctrl+O

Loads an existing workspace from an *.rswks or a *.rscmd file.

The *Open* command calls up the *Open* dialog box.

**Look in:**

The *Look in:* pull-down directory window is used to search the directories accessible from your computer for workspace files.



The icons at the right side of the pull-down window form a simple file manager:

- 1 Go to last visited folder
- 2 Move up one level in the directory tree
- 3 Create a new directory
- 4 Show directory and file list as thumbnails, tiles, icons, list, or as detailed list

Files and directories may be selected and deleted using the *Delete* key of your keyboard.

File list

The file list shows all files within the current directory with the extension (*.rswks or *.rscmd) selected under *Files of type*.

- Click one of the files in the list to enter it in the *File name* window.

File name:

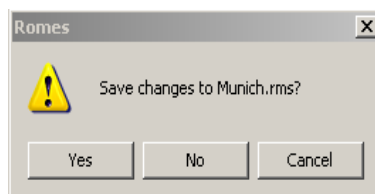
A file selected from the file list is entered in this field. Alternatively, a file name may be entered manually.

The *Open* button opens and loads a workspace. Equivalently, a workspace file may be double-clicked in the file list.

The *Cancel* button discards the file selection.

- Open button:** The *Open* button opens and loads a workspace. Equivalently, a workspace file may be double-clicked in the file list.
- Cancel button:** The *Cancel* button discards the file selection.
- Files of type:** Only files of the type selected in this field will be shown in the file list. The following file types may be selected:
- Workspace files (*.rswks)***
Standard workspace file type, contains the workspace but no measurement data.
- Measurement files (*.rscmd)***
Measurement file created with a R&S ROMES version \geq 3NG containing the workspace at the time when the file was recorded (*Start Recording*).
- Load Hardware Drivers** A workspace can be loaded with or without the hardware drivers required for the measurement. Loading without hardware drivers is faster and sufficient, e.g. for replay sessions.
- Force Assign New Links** An additional option in the load workspace file dialog allows the user specifying new physical driver links for each device during the load process. This is helpful, if the workspace was transferred from another computer with other physical driver link.
- An example:** A field setup of R&S ROMES 3NG has a Sagem x6 connected to COM 3 and GPS is connected to COM 5. The related workspace is copied to another R&S ROMES system where the Sabem driver is mapped to COM 2 and GPS is connected to COM 1, causing a loading failure of the drivers. Up to R&S ROMES V3.60 the loading of the drivers had to be canceled, which was very tedious for mobiles with custom settings.
- Now only the new link (the COM port) is changed and the workspace is loaded completely.
- Load Signal Settings, if available** Once checked, the available signal settings for the workspace are loaded.
- Load Event Settings, if available** Once checked, the available event settings for the workspace are loaded.

As only one workspace configuration can be active at one time, the current workspace is closed before a new one is opened. Before closing the workspace, R&S ROMES displays a message:



- The *Yes* button saves changes and closes the current configuration.
- The *No* button closes the current configuration without saving.
- The *Cancel* buttons returns to the current configuration.

Notes on older workspace files:

The *.rms workspace configuration files of measurement software versions 3.0 to 3.60 cannot be used in newer R&S ROMES versions as their format is completely different.

If an old workspace (*.rms) is loaded into R&S ROMES 3NG, the system occasionally prompts with an error message.

Save Workspace

Save a workspace file with its current name.

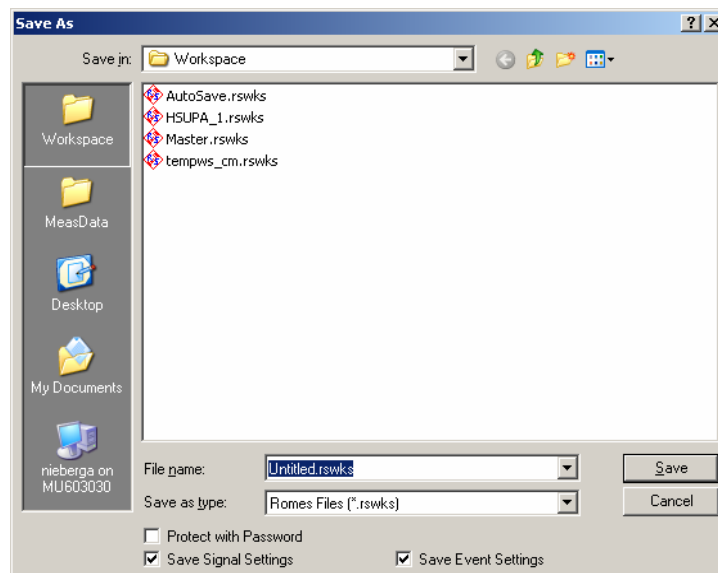


Ctrl+S

Save Workspace As...

Save a workspace file with a new name and directory.

The *Save Workspace As...* command calls up the *Save As...* dialog.



This dialog is analogous to the *Open* dialog, see above.

- Choose a file name with the extension *.rswks and a directory of your choice to save the current workspace for later use. If a file name is entered manually without extension, *.rswks is appended automatically.

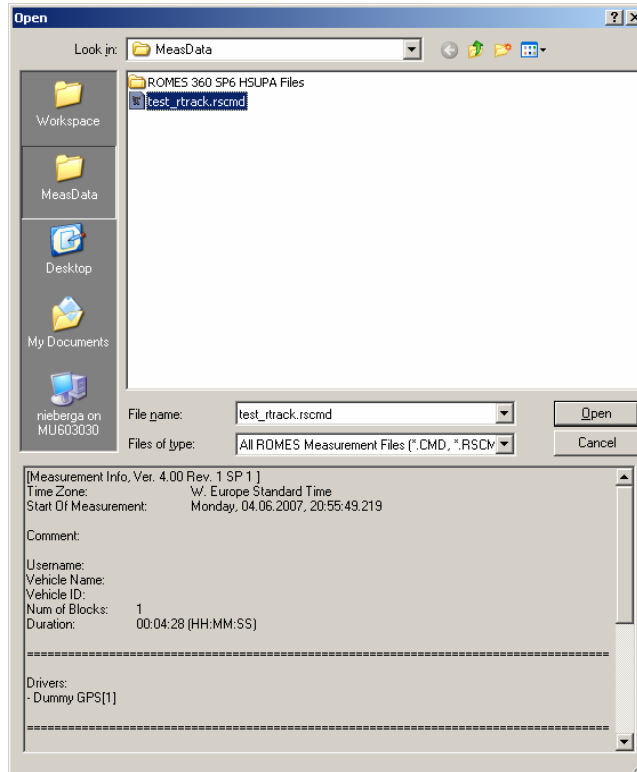
Open Measurement File...

Ctrl+S

Open a new measurement file.

The currently open measurement file is replayed when the *Start Replay* command in the *Measurement* menu (p. 3.104 ff.) is executed. It is also used as a default file to be exported (see *Export Measurement File* command below).

The *Open Measurement File...* command calls up an extended *Open* dialog.



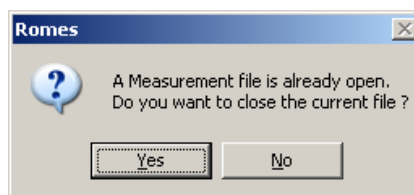
The upper part of the menu is analogous to the dialog used to open a workspace file (see above, *Open* command *Open Workspace*).

Files of type

Only files of the type selected in this field will be shown in the file list. The following file types may be selected:

- Measurement files ROMES 3 (*.cmd)
- Measurement files ROMES 3NG (*.rscmd)
- Standard measurement file type

Only one measurement file can be open at one time. If the *Open Measurement File* command is used while a measurement file is open, R&S ROMES prompts with a message:



- Click Yes to close the current workspace and open the selected one.
- Click No to return to the current measurement menu.

Open as read-only If the *Open as read-only* switch is checked, the measurement file opened is protected so that the file contents can not be overwritten.

File Info In the lower half of the *File Open* dialog, information stored with the measurement data of the selected file is displayed. See description of *Measurement File Info* command below.

File scan When opening a measurement file, R&S ROMES automatically scans the data, sorting the timestamps and extracting geographical information. After the scan, the entire measurement route can be displayed in the *Route Track* view.

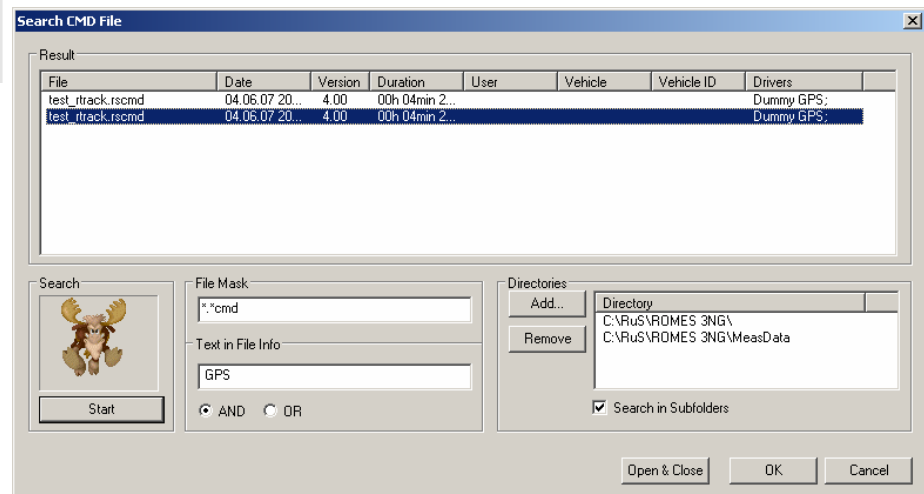
To disable the file scan, you can either press the *Ctrl* key while opening the file or disable measurement file scanning in the *General* tab of the *ROMES Configuration* menu (see section [General Settings](#) on p. 3.57 ff.). This can be necessary for older measurement files recorded with a R&S ROMES 2.x version.

Search Measurement File...



Search for a particular measurement file stored on your file system.

Search Measurement File... calls up a dialog.



The dialog is subdivided into three different panels:

Result

Contains a list of all measurement files in the selected *Directories*, meeting the search criteria defined in *Search in File Header*.

File Mask

Defines search criteria to find a particular file from an extensive list. The following criteria are provided:

A condition for the file name (*File Mask*)

A condition for *Text* stored in the *File Info*, complemented by a logical condition for the text elements/words (*AND* for a file info containing all words, *OR* for a file info containing at least one of the words).

Directories

Contains a list of all search directories, adds and removes directories. The checkbox provides a decision whether or not to include all subfolders of the selected directory in the search.

Open & Close

Closes the current measurement file, if applicable, and opens the selected measurement file from the search result.

Searching a file

To search a measurement file proceed as follows:

- In the *Directories* panel, click *Add* to open a *Browse for Folder* dialog and select the directory for your measurement files.
- Specify whether R&S ROMES should also search the subfolders of the selected directory.
- Click *Start*.
- If the result list is too long, specify a file mask or a search text in the file info and repeat the search.
- Right click a measurement file in the list to display the *File Info*, double click to open it; see [Open Measurement File...](#) on p. 3.10.

**Close Measure-
ment File...**

Close the current measurement file.

Measurement File Info



Display the file information of the current measurement file.

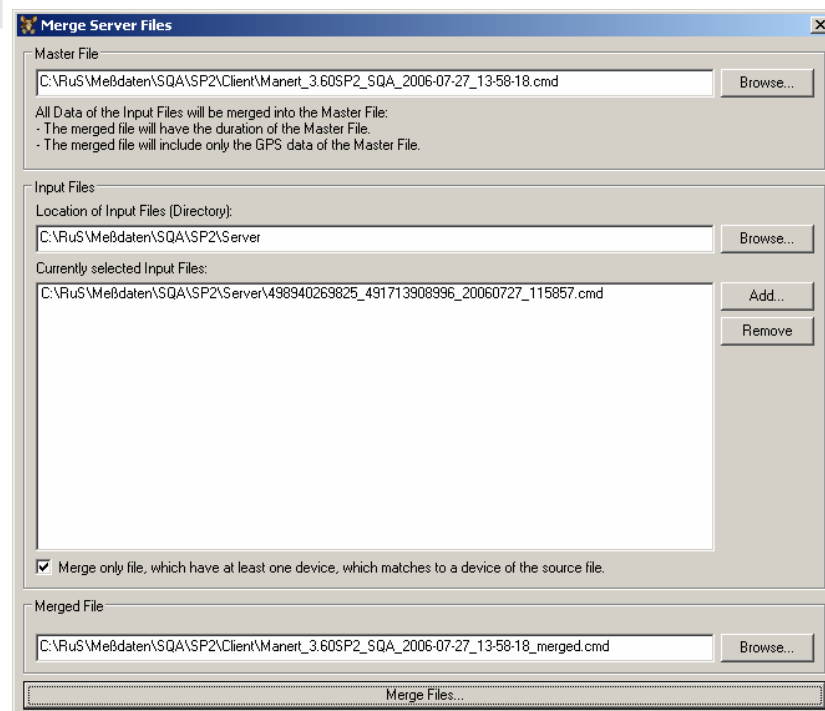
The file information is identical with the information displayed when a measurement file is opened (see above, *Open Measurement File* command). It includes:

- Date and time of the measurement.
- A user-defined comment.
- User name, vehicle type and ID, the file length in blocks, and the duration of the measurement.
- The drivers used and the most important driver settings made before the measurement was started (see chapter 6). Driver settings such as the Meas. Mode of a mobile or the frequency and trigger settings of a test receiver are essential for the type of data recorded and the available views.

Merge Measurement Files...

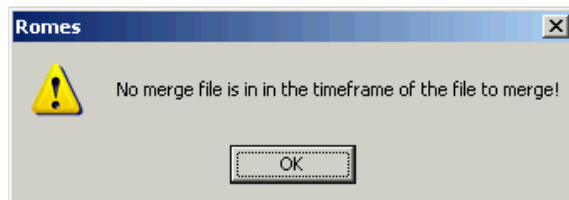


The *Merge Measurement Files...* function is available for speech quality or video quality measurements (SQA/VQA), where uplink and downlink data is measured simultaneously on separate hosts (stationary server for test data generation, and receiving mobile). The resulting client and server-side measurement files can be merged using the *Merge Server Files* dialog.

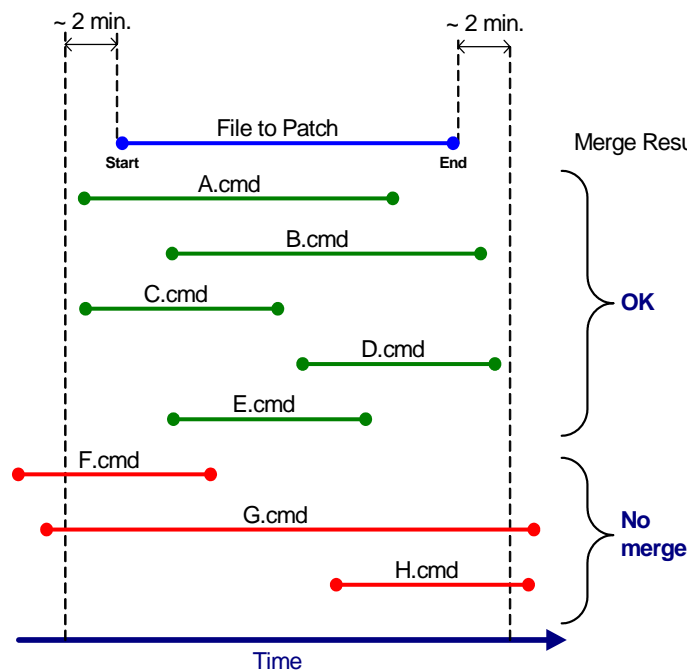


The buttons on the right side of the dialog control the file merger:

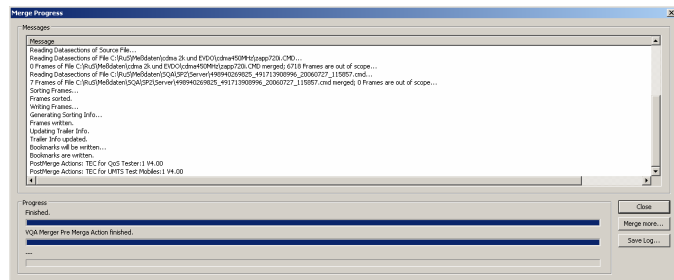
Command	Description
Master File - Browse...	Open a selection dialog window for the first measurement file to be merged. This file contains the GPS and time-related data, which defines the location(s) and the master time frame for all associated files to be merged.
Input Files - Browse...	Open a selection dialog window for the directory of the next measurement file.
Add	Show the available measurement files in the specified directory of the <i>Directory Server Files</i> . Note that the file to be merged with the <i>Input Files</i> must be within a similar time frame, otherwise the merger is refused with the following error message:



The allowed time frames of the measurement files for merges are shown in the following diagram:



Remove	Remove the previously selected measurement file from the list box.
Merge Files...	<p>Perform the file merge of the selected measurement files (the button becomes active when all required merge file information is provided, otherwise it is grayed).</p> <p>The progress of the file merger is displayed in a separate <i>Merge Progress</i> dialog, along with the log of the merge.:</p>



Once the measurement file merger is completed, the dialog offers:

- *Close* button, which closes the dialogs related to the file merger,
- *Merge more...* button, which returns to the *Merge Server Files* dialog, and
- *Save Log...* button, which opens a file Save dialog to define a name and storage location for the file merge log.

Merged Files -
Browse ...

Browse for Target File: Open a dialog window for the target file name and storage directory.

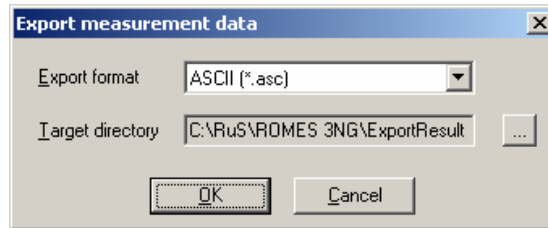
Please note that only the time frame of the files to be merged is checked for plausibility and that this function is only intended for SQA or VQA measurements. All kinds of other measurement data combinations within the merged files are possible, but not necessarily useful.

An example: It is not possible to activate more than one UMTS PNS TSMU driver at a time, which is the basis for multiple UMTS views. Now if two measurements are performed simultaneously with two different R&S TSMU drivers and the resulting measurement files are merged, then the R&S ROMES system replaying the merged file has a very high probability to hang or terminate.

Export Measurement File ...

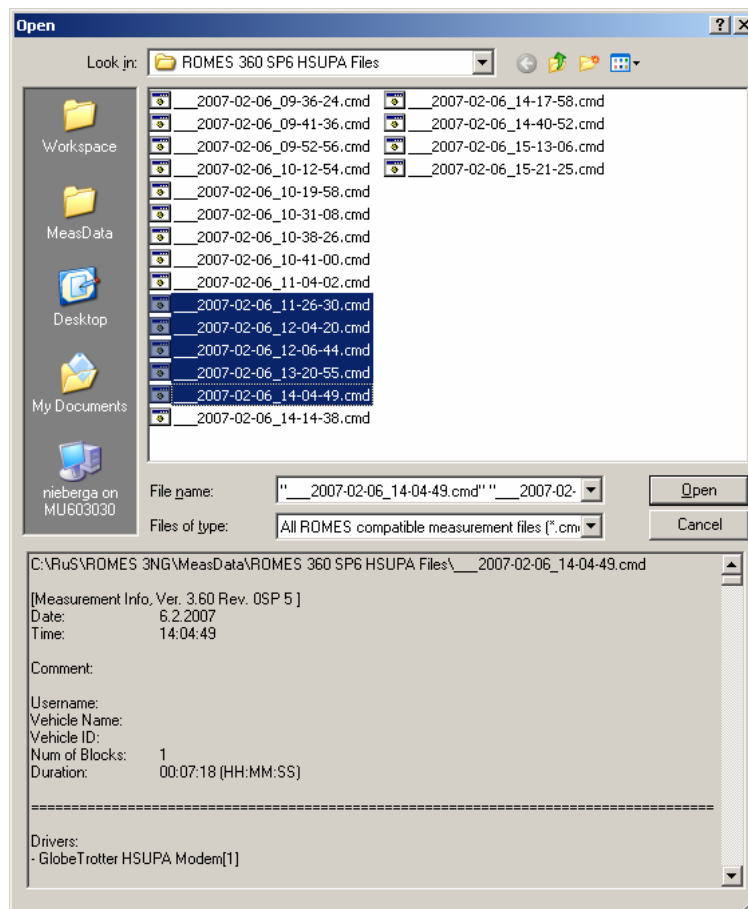
Export and save measurement data for later evaluation, e.g. with another application.

- The *Export Measurement File Info(s)* command first opens a dialog to select the export format and the target directory:

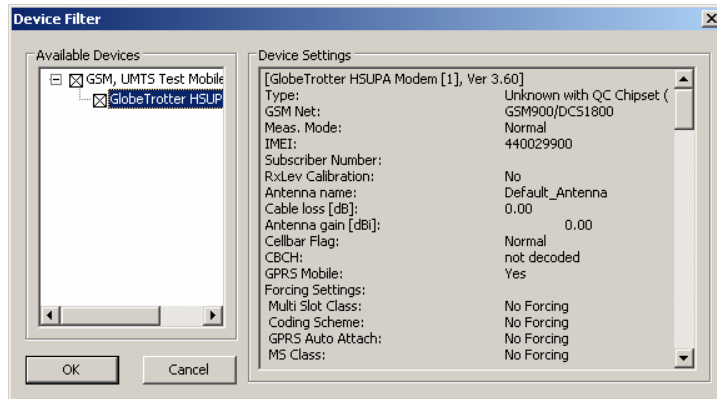


The measurement data may be stored to a file in a *target directory* and with one of the *export formats* offered. For more information on data export and the corresponding file formats exporting refer to chapter *Data Processing*.

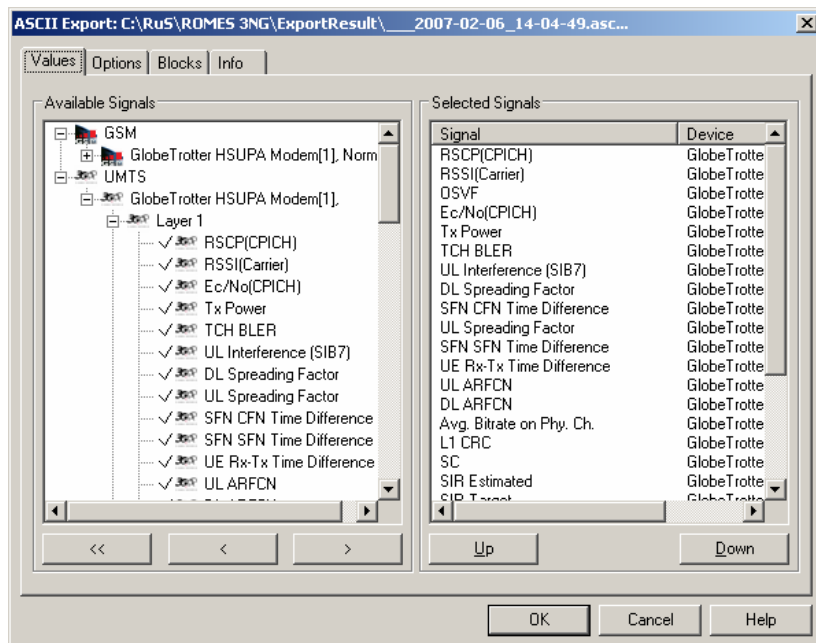
- When the export format and target directory is selected, a file *Open* dialog to select the measurement files for export is shown:



- After the measurement files are selected, a Device Filter dialog is displayed (only if several measurement devices are detected).



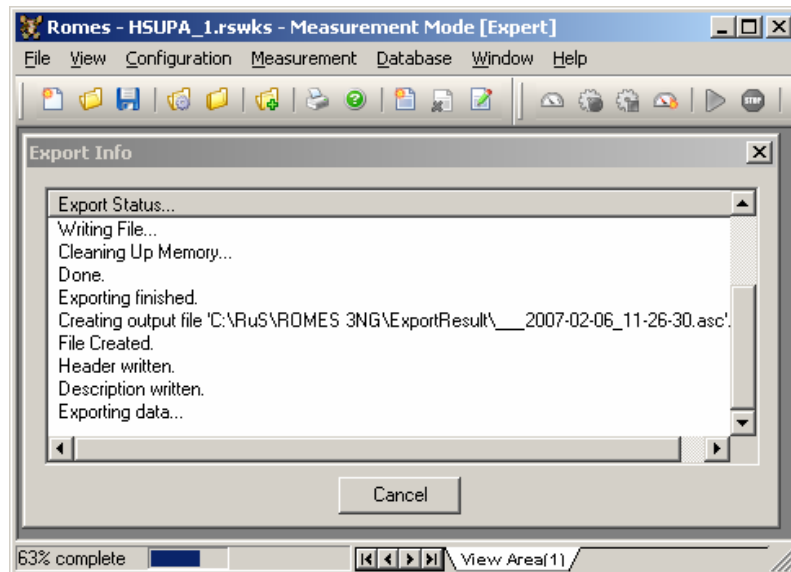
- Once the device(s) to be exported are selected, the related signals to be exported must be selected.



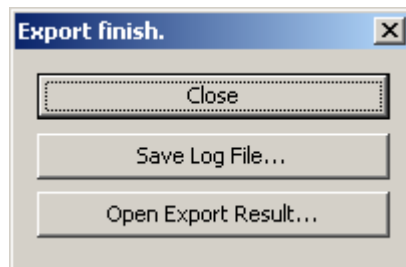
The signal selection has to be repeated for each of the selected measurement files, which is done analogous to the measurement signal selection described in section *Signal Configuration* on p. 3.61.

Additional information is available in chapter 7.

- The progress of the current export is shown as a bar graph in the status line of the workspace and relevant status messages are displayed in the Export Info dialog.



- When all selected measurement file are successfully exported, the following dialog is displayed.



Close finishes the export dialog windows and returns to the workspace.

Save Log File... opens a *Save file* dialog where the contents of the *Export Info* dialog can be stored in a file.

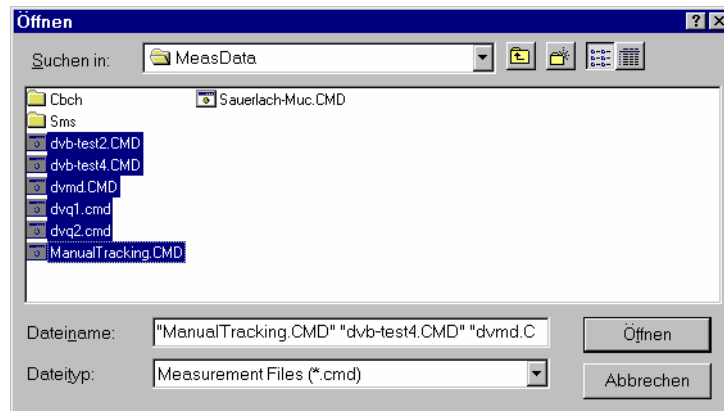
Open Export Result opens the export result file(s) in an ASCII text editor, where the results can be viewed and modified, if needed. When the text editor is closed, the user is returned to the workspace.

Export Measurement File Info(s)

Write the file information of several measurement files to a single text file.

The file information is identical with the information displayed when a measurement file is opened (see above, *Measurement File Info* command). It is exported in two steps:

- The *Export Measurement File Info(s)* command opens a file *Open* dialog to select the measurement files:



- After file selection, the *Open* button calls up a *Save As...* dialog to select a file name (*.txt) and a directory for the file information.

In the *.txt file, the file information of the individual files form separate consecutive sections. Each section starts with the name and path of the measurement file, e.g.:

```
*****D:\RuS\RomesV30\MeasData\dvb-test4.CMD*****
```

If a R&S ROMES 3NG measurement file is exported, the file extension is *.rscmd, older measurement files keep the *.cmd extension.

The text file can be regarded as a catalog providing an overview of a whole archive of measurement files. If it is viewed with a suitable text editor using functionality such as the text search function.

Print...

Ctrl + P

Print the contents of the active view.

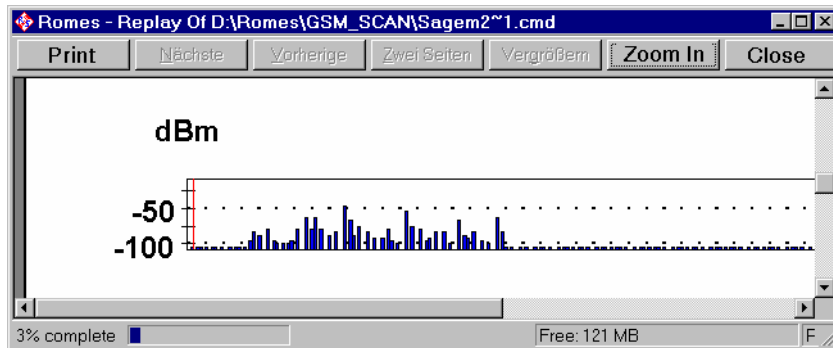
The *Print* option is an alternative to taking screenshots via the clipboard (see chapter 7). R&S ROMES uses the standard *Print* menu familiar from other MS Windows applications. Printing to a file or a configurable printer with selectable page numbers is possible. For details use the context-sensitive help.

To control the appearance of the hardcopy, a preview option is provided, see *Print Preview* below.

Print Preview

Show a preview of the hardcopy to be created.

The *Print preview* command opens a window showing one page (our example shows a section of such a page):



The buttons below the title bar of the window control the preview and printout:

Command	Description
Print	Print the previewed file with the current printer settings
Next	Show next page (if applicable, otherwise grayed)
Previous	Show previous page (if applicable, otherwise grayed)
Two pages	Show two pages (if applicable, otherwise grayed)
Zoom In	Magnify current page by a factor of 2 (2 steps possible)
Zoom Out	Reduce scale of current page by a factor of 2 (2 steps possible)
Close	Close the window without printing

Print Setup...

Modify the printer settings.

R&S ROMES uses the standard *Print Setup* menu familiar from other WINDOWS applications. For details use the context-sensitive help.

1 C:\...*.rswks

Open one of the workspace files saved before.

A maximum of four workspace files numbered 1 to 4 are listed in this field.

5 C:\...*.cmd (or *.rscmd)

Open one of the measurement files used before.

A maximum of four measurement files numbered 5 to 8 are listed in this field.

The currently open measurement file is replayed when the *Start Replay* command in the *Measurement* menu (p. 3.104 ff) is executed. It is also used as a default file to be exported (see *Export Measurement File* command above).

Exit

Close the application.

Before closing, R&S ROMES issues a warning if there are unsaved changes to the currently active workspace.



View Menu

The *View* menu customizes the main application window and offers the view windows used to visualize and evaluate measured data.

Note:

The selection of view windows is determined while ROMES is installed, depending on the system configuration and the available options. Fig. 3–4 below shows the maximum number of views possible.

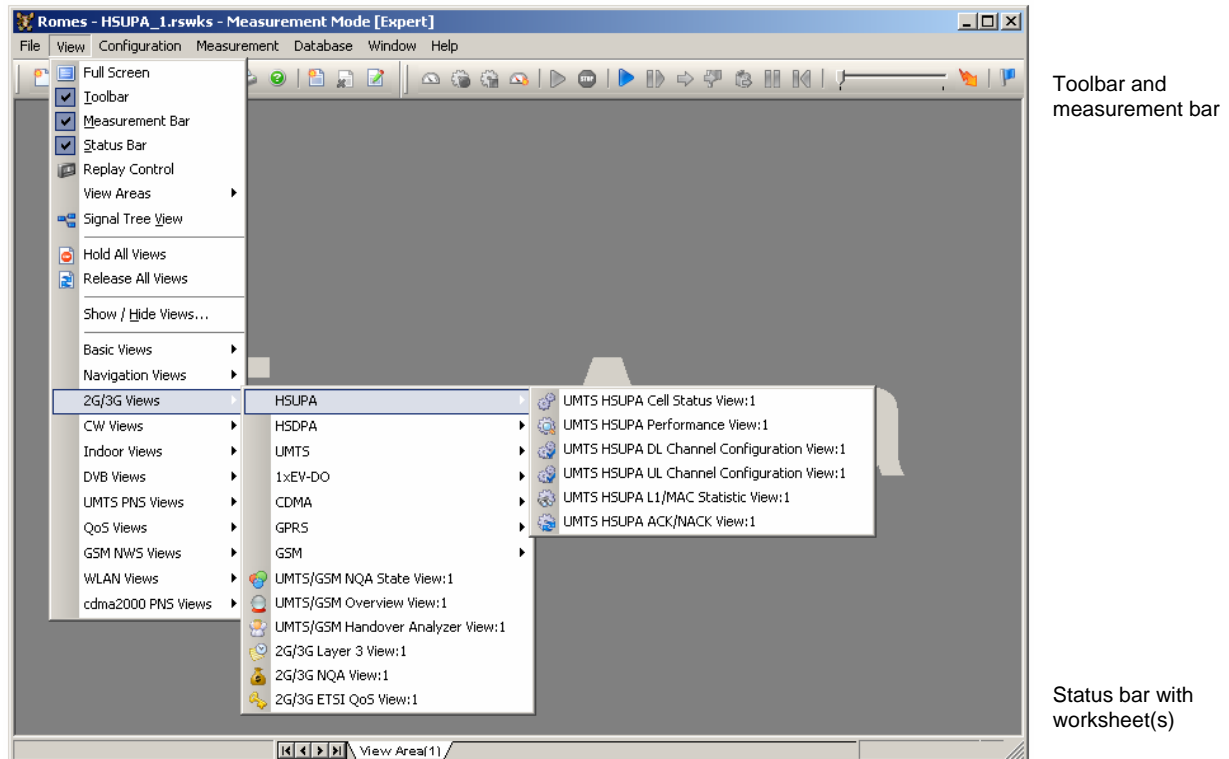


Fig. 3–4 View menu

Full Screen

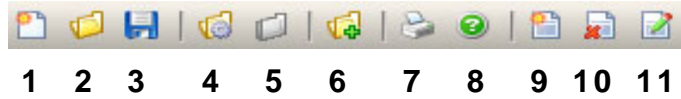
Maximize the main application window to full screen size.

The toolbar, the measurement bar and the status bar are hidden in full screen mode.

Toolbar

Display and hide the toolbar of the main application window.

The toolbar forms the left part of the upper margin of the main window and offers controls for the most common program tasks, otherwise offered in the *File* and *Help* menu and in the context menu of the main application window (see section [User Interface](#) on p. 3.1 ff.).



Control	Menu command	Shortcut
1	New workspace	Ctrl N
2	Open workspace	Ctrl O
3	Save workspace	Ctrl S
4	Open measurement file	
5	Close measurement file	
6	Merge measurement files	
7	Print...	Ctrl P
8	About ROMES...	Ctrl A
9	Create new view area	
10	Delete current view area	
11	Rename current view area	

The toolbar may be hidden together with the measurement bar in order to enlarge the main window. A checkmark next to the menu item shows that the toolbar is displayed (see [Fig. 3-4](#)).

Measurement Bar

Display and hide the measurement bar of the main application window.

The measurement bar forms the right part of the upper margin of the main window and offers controls for the most common program tasks, otherwise offered in the *Measurement* menu (see p. 3.104 ff.). Many of the icons are also available in the *Replay Control* dialog described on p. 3.25.



Control	Menu command
1	Start Measurement
2	Start Recording
3	Stop Recording
4	Continue Measurement
5	Restart Measurement
6	Stop
7	Start Replay
8	Step One Data Set Forward
9	Replay Jump
10	Replay Jump to the Next Event
11	Replay Jump to Block
12	Pause Replay
13	Restart Replay
14	Replay Speed
15	Enable and disable fast replay
16	Event Window
17	Set Voice Marker
18	Show/Hide Signal Tree View (see below)
19	Enable Coupled Focus (see p. 3.4)
20	Release Coupled Focus (see p. 3.4)
21	All views on hold (stops the measurement display for closer examination without stopping the measurement)
22	Release all views

The measurement bar may be hidden together with the toolbar bar in order to enlarge the main window. A checkmark next to the menu item shows that the measurement bar is displayed (see Fig. 3–4).

Status Bar

Display and hide the status bar of the main application window.

The status bar forms the lower margin of the main window and is divided into three different areas (see [Fig. 3–4](#)):

1. In the left-hand part of the status bar, a short explanation of the function of control elements appearing in the main window is given. This includes

- Menu items selected by the pointer or the cursor keys or click
- Toolbar buttons, either selected by the pointer (arrow points to the button) or clicked with the left mouse button

2. The next field of the status bar indicates the free disc space available for storing measurement data. During a measurement or during recording, the time elapsed since the start of the measurement and the data rate which is being written to the measurement file (during recording) is indicated in addition.

3. The next field of the status bar gives the status of data processing, i.e. it indicates the status of the current *temporary working data* set. Possible messages are:

Message	Description
<i>Ready</i>	Ready for measuring or data processing
<i>Replay</i>	Data measured before and stored to a measurement file are being processed and loaded
<i>Replay – Pause</i>	Replay process paused
<i>CMD file open</i>	A measurement (*.cmd) file is open and ready to be replayed or exported
<i>Load Drivers</i>	Drivers being loaded
<i>Measuring</i>	Measurement running (without data recording)
<i>Recording</i>	Measurement and data recording running

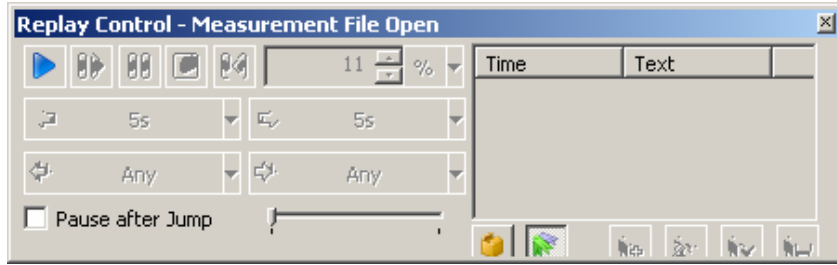
4. The fields in the right-hand part of the status bar indicate which of the following keys are latched:

Indicator	Description
<i>CAP</i>	The Caps Lock key is latched
<i>NUM</i>	The Num Lock key is latched
<i>SCRL</i>	The Scroll Lock key is latched

The status bar may be hidden in order to enlarge the main application window. A check mark left of the menu item indicates that the status bar is currently displayed.

Replay Control

Open or close a dialog to control the replay of a measurement file.



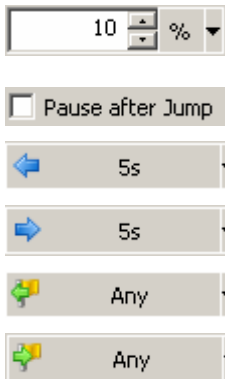
The *Replay Control* dialog is opened automatically each time a measurement file is replayed if *Show Replay Control Dialog Automatically...* is selected in the *ROMES configuration dialog*; see section [General Settings](#) on p. 3.57 ff.

Basic Functionality

The *Replay Control* menu contains the replay control icons of the *Measurement Bar*, corresponding to the following *Measurement Menu* commands (see p. 3.104 ff.):

-  Start Replay
-  Step One Data Set Forward
-  Pause Replay
-  Stop
-  Step One Data Set Backward

Replay Jump



The control element to the right of the measurement bar icons defines by which amount R&S ROMES can jump forward and back within the measurement file. Together with the *Pause after Jump* checkbox, it corresponds to the *Replay Jump* dialog described on p. 3.110.

The two buttons below the measurement bar icons initiate a replay jump by a selectable amount of time.

The two buttons below initiate a replay jump to the previous or next event. The pull-down lists select the relevant events; they give access to the list of available events in the *ROMES Configuration* menu; see section [Event Configuration](#) on p. 3.64 ff.

Block Mode



The *Show Block List* icon in the right half of the dialog displays the blocks in the measurement file and initiates a replay jump to the next block; if the file contains several blocks. The blocks are listed in the table above the icon; see *Replay Jump to Block* on p. 3.112. A double click on the block initiates a jump to the selected block.

Bookmark Mode

The *Show Bookmark List* icon in the right half of the dialog displays the bookmarks in the measurement file and initiates a replay jump to the next bookmark; if the file contains several bookmarks. The bookmarks are listed in the table above the icon. A double click on the bookmark initiates a jump to the selected bookmark.

Bookmarks can be added or manipulated in the *replay pause* state. The following buttons are related to bookmarks in measurement files:



Add a bookmark



Remove the selected bookmark



Edit selected bookmark



Save bookmark list to meas. file.

View Areas

Open a submenu to rename, create, delete, load and save view areas.

The submenu contains the entries in the context menu in the work area; see description on p. 3.2. In addition, it provides commands for saving and reusing view areas:

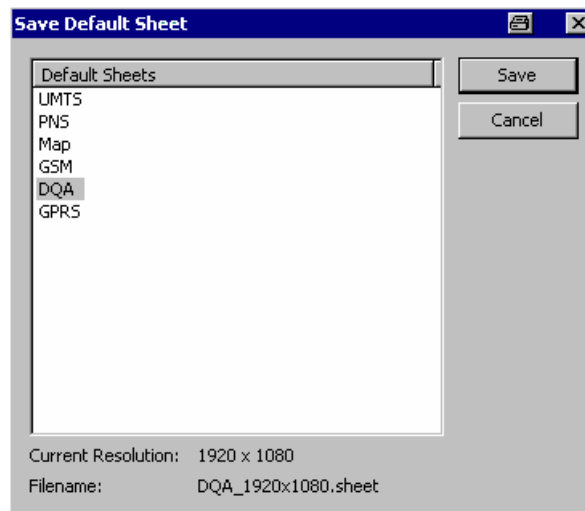


To reuse a default sheet after a change of the screen resolution, load it (Load View Area...) and save it again under a file name containing the new resolution.

Load Sheet... Calls up an Open dialog box to select and load a worksheet file saved before. Worksheet files are ASCII files with the extension *.sheet containing the sheet name, the current screen resolution, and information on all views in the sheet together with their size, position, and special configuration settings. A selection of standard view area files for typical measurement tasks and screen resolutions is available in the *Sheets* subdirectory of the R&S ROMES program directory.

Save Sheet... Calls up a Save As... dialog to save the current sheet with its views in a worksheet file (*.sheet).

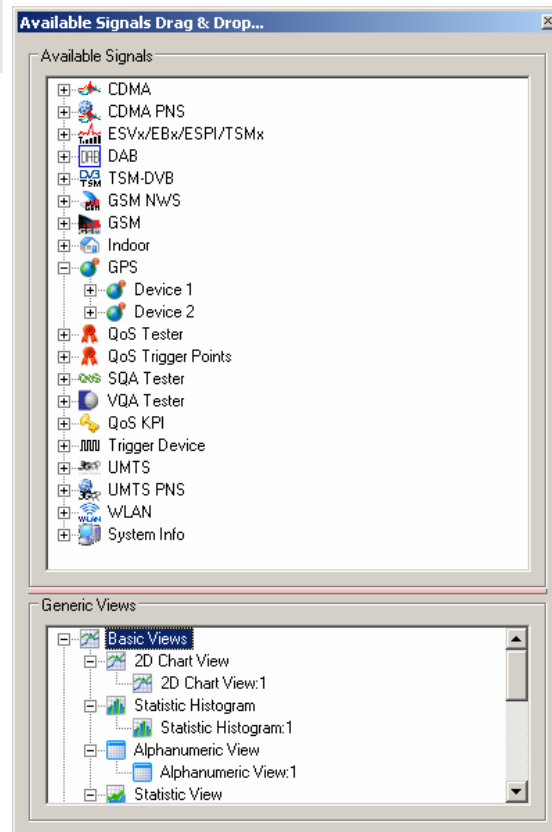
Save Sheet as Default... Save the current worksheet as default sheet, to be opened automatically when R&S ROMES is started, provided that this is selected as an option in the R&S ROMES Configuration dialog (see section [General Settings](#) on p. 3.57 ff.) and that the screen resolution is left unchanged. The file name of the default worksheet is assigned automatically according to the main technology and the current screen resolution. A separate default sheet can be created for each technology.



Signal Tree View



Call up the *Available Signals Drag & Drop...* menu.



The menu displays the branches of the data tree that are actually available in the current measurement file. The complete data tree (see chapter *Data Selection*) is displayed in the view configuration menus (e.g. *Route Track View*, *Alphanumeric View*, *2D Chart View*, *Statistic Histogram View*, see chapter 4). The signal tree view is a fast alternative for selecting a signal or a group of signals to be viewed without opening the view configuration menu:

- A click on a single signal selects the signal to be viewed.
- A click on several signals with pressed shift or control key selects a group of signals.
- A click on a technology, device, or data structure node selects all signals below the node.

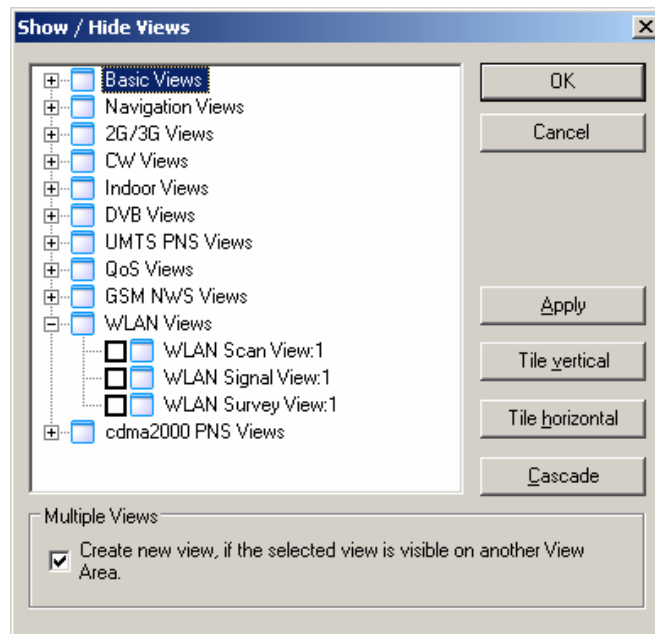
After dragging and dropping the selected signal(s) into the view area, they appear in the *Selected Parameter* list and in the list of *Selected Signals* in the *Values* tab of the view configuration menu. They can be removed by means of the context menu or the view configuration menu.

Generic Views

The lower part of the dialog shows a selection of views that are not specifically designed for a particular technology. In general, these generic, general purpose views can be used for arbitrary signals, irrespective of the selected measurement file.

- To display one or several signals in a generic view, select the signal(s) in the upper part of the dialog, drag and drop them to a generic view type icon.

Show/Hide Views... Show (open) and arrange or hide the individual R&S ROMES view windows.
The *Show/Hide Views* command opens a dialog with the same name:

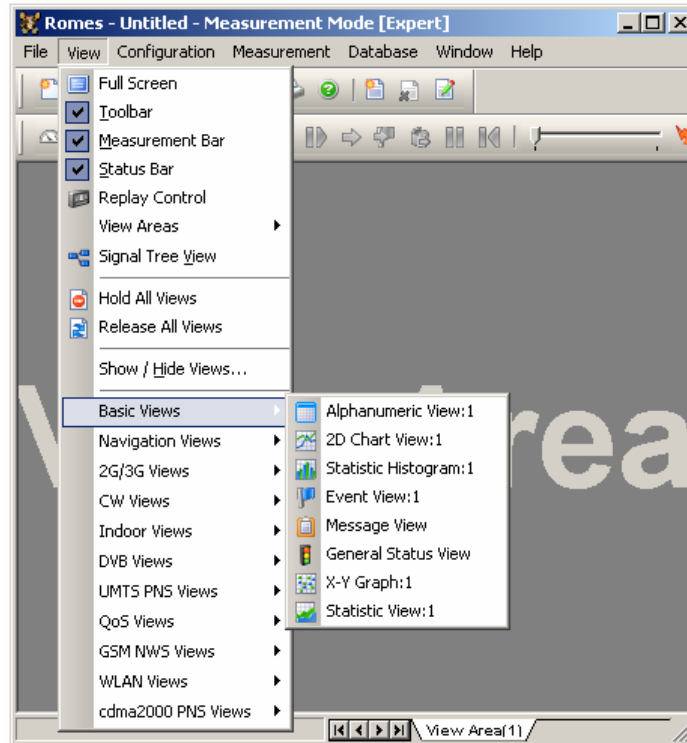
**Note:**

A view hidden by means of the *Show/Hide Views* window is temporarily removed from the main window and can be recalled any time. The ROMES workspace contains at least one view of every type. All views can be hidden but only multiple views of the same type (if available) can be destroyed, i.e. permanently removed.

<i>Tree view</i>	List of all view windows provided. A view is shown/opened if it is selected in the corresponding checkbox.
<i>OK</i>	Apply the current settings and close the <i>Show/Hide Views</i> dialog.
<i>Cancel</i>	Discard the current settings and close the <i>Show/Hide Views</i> dialog.
<i>Apply</i>	Apply (preview) the current settings without closing the <i>Show/Hide Views</i> dialog.
<i>Tile vertical / horizontal</i>	The selected views are tiled, i.e. placed side by side so they do not overlap (see also Window Menu on page 3.113 ff.)
<i>Cascade</i>	The selected views are superimposed such that all title bars are visible
<i>Multiple Views</i>	If “ <i>Create new view...</i> ” is selected, then R&S ROMES always creates new views on the current sheet and does not affect the views on the other sheets. Otherwise views from other sheets will be moved to the current sheet.

Basic Views

Offers a selection of views to show information from any technology.



A :1 is displayed behind each of the view types, indicating that several views of the same type with different configurations can be opened simultaneously. For detailed information about the basic views refer to chapter 4, section *Basic Views*.

Alphanumeric View List offering information about the selected parameters. Several *Alphanumeric Views* corresponding to different connected mobile stations can be opened simultaneously.

2D Chart View 2D-chart showing the current measurement data as a function of time. In practice, an unlimited number of 2D-charts can be defined simultaneously.

Statistic Histogram Collection of several diagrams to show a statistical evaluation of a signal.

Event View List of all events that occurred during the measurement

Message View Detailed, chronological list of the system messages generated during the measurement

General Status View List of device messages of general interest

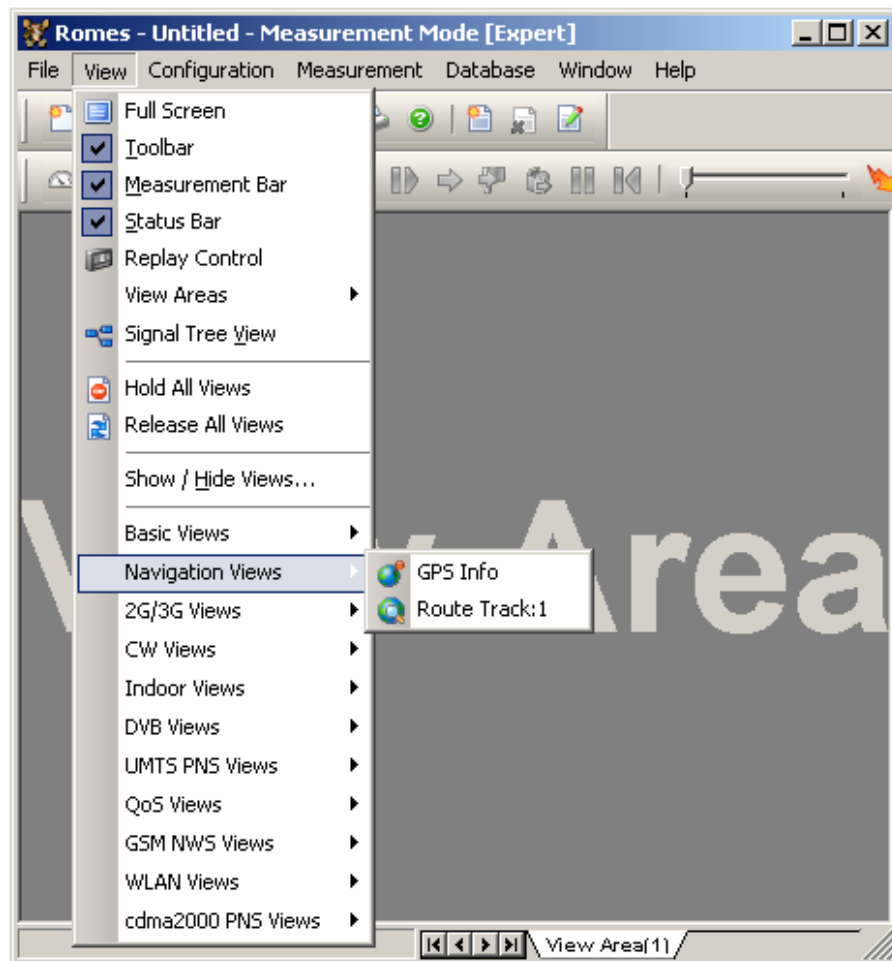
X-Y Graph The X-Y graph (or scatter plot) can be used to set two signals in correlation to each other. That is, the value of one signal is used as x value, the value of another signal as y value.

Statistic View Display the most common statistical key indicators of any R&S ROMES signal.

Navigation Views

Offers a selection of views to display data in a map.

The Geographic Positioning System (GPS) is used to visualize data with valid geographical information (longitude/latitude parameters) in a map or to retrieve geographic information assigned to the data points.



A :1 is displayed behind each of the view types, indicating that several views of the same type with different configurations can be opened simultaneously. For detailed information about the GPS views refer to chapter 4, Section *Navigation Views*.

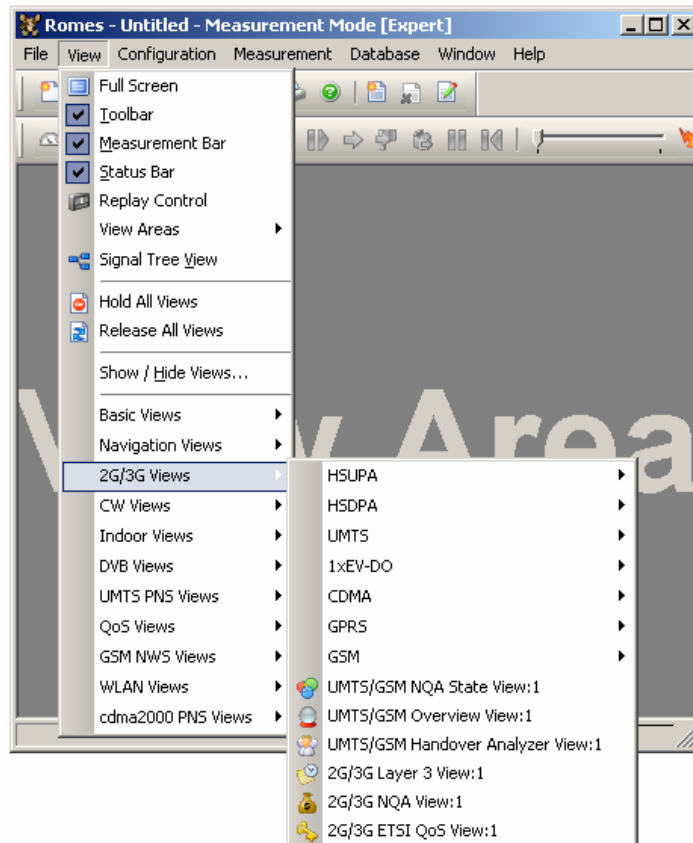
GPS Info List of the geographical coordinates and other information about a particular test point.

Route Track Map view showing measured data and various other information.

2G/3G Views

Offers a selection of views to show GSM and UMTS data.

The *2G/3G Views* are divided into several groups, depending on the selected *User Level*. One group of views is for HSDPA data (see p. 3.34), one for UMTS data (see p. 3.36), one for 1xEV-DO data (see p. 3.38), one for CDMA data (see p. 3.39), one for GPRS data (see p. 3.41), and another one for GSM data (see p. 3.42). The views in the last possible group are labeled *UMTS/GSM* or *2G/3G* to indicate that they can be used for both technologies.



A :1 is displayed behind each of the view types, indicating that several views of the same type with different configurations can be opened simultaneously.

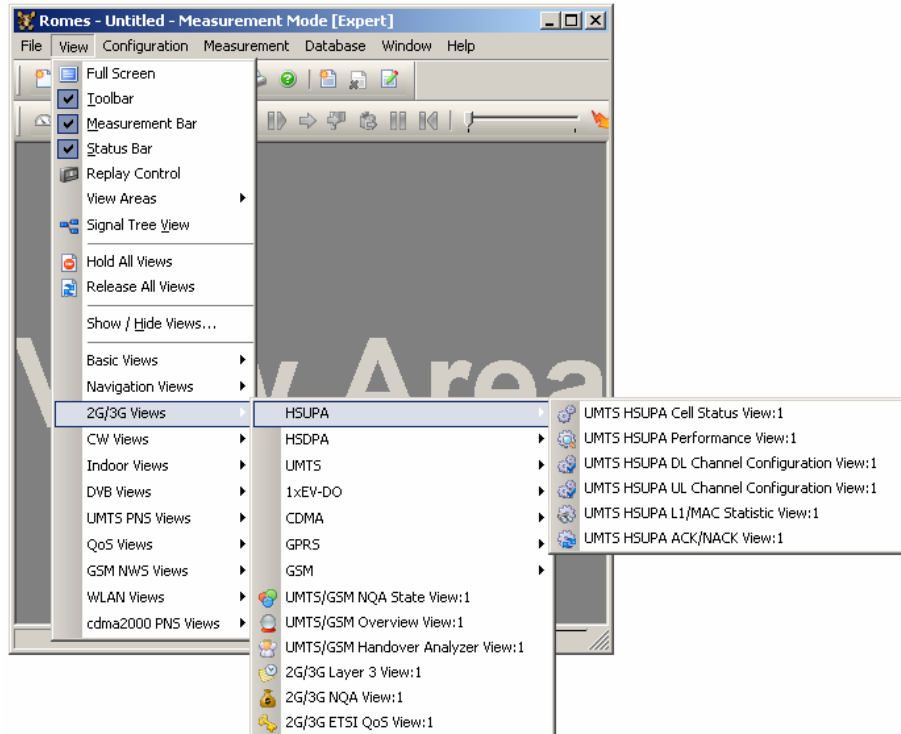
<i>UMTS/GSM NQA State View</i>	Detailed analysis of the NQA states and state transitions of each call.
<i>UMTS/GSM Overview View</i>	Summary of the test mobile state, power/quality, active set and system parameters, and, if applicable, results from a connected UMTS PN scanner.
<i>UMTS/GSM Handover Analyzer View</i>	Complete list of the handover procedures attempted by UMTS or GSM mobile phones and statistical evaluation.
<i>2G/3G Layer 3 View</i>	GSM Layer 3 messages, GPRS RLC/MAC control messages and UMTS RRC messages recorded .
<i>2G/3G NQA View</i>	Call statistics (percentage of Good, Blocked, Dropped and No Service calls) of each GSM or UMTS mobile.
<i>2G/3G ETSI QoS</i>	NQA classification for each UMTS or GSM call and Quality of Service parameters defined in the IREG

View specifications.

HSUPA

Offers a selection of views for UMTS HSUPA data.

HSUPA views may be opened any time, however, they are empty unless HSUPA data are available.



A :1 is displayed behind each of the view types, indicating that several views of the same type with different configurations can be opened simultaneously. For detailed information about the UMTS HSUPA views refer to chapter 4, Section UMTS HSUPA view.

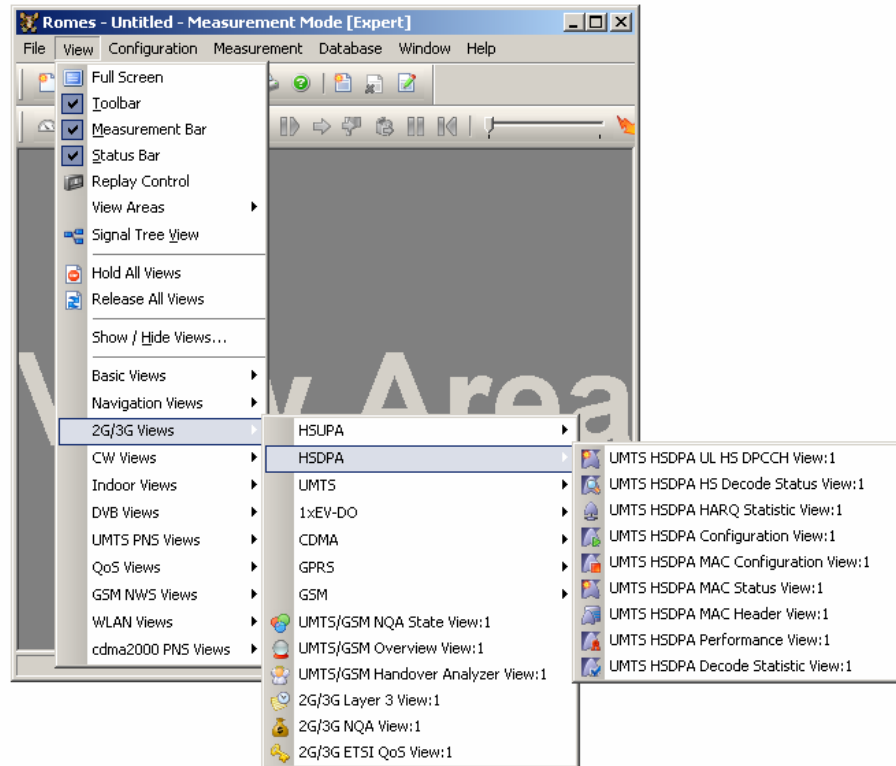
<i>UMTS HSUPA Cell Status View</i>	Shows events per TTI for HICH, RGCH, and AGCH for the mobile, serving cell and non-serving cells of the mobile.
<i>UMTS HSUPA Performance View</i>	Four preconfigured 2D charts showing signals related to the transmission performance in terms of the requested or achieved data throughput.
<i>UMTS HSUPA DL Channel Configuration View</i>	DL parameters of the active HSUPA connections, which were transmitted in the corresponding RRC messages. The power offset table shows the basic information on which the transmit power calculation of the mobile is based on.
<i>UMTS HSUPA UL Channel Configuration View</i>	UL parameters of the active HSUPA connections, which were transmitted in the corresponding RRC messages. The power offset table shows the basic information on which the transmit power calculation of the mobile is based on.
<i>UMTS HSUPA L1/MAC Statistic View</i>	Shows a configurable selection of the statistics parameters provided by the mobile itself.
<i>UMTS HSUPA ACK/NACK View</i>	Shows the used transport block sizes per TTI. The y-axis shows the TBS and the x-axis represents the

HSDPA

ACK/NACK View TTIs.

Offers a selection of views for UMTS HSDPA data.

HSDPA views may be opened any time, however, they are empty unless HSDPA data are available.



A :1 is displayed behind each of the view types, indicating that several views of the same type with different configurations can be opened simultaneously. For detailed information about the UMTS HSDPA views refer to chapter 4, section UMTS HSDPA view.

UMTS HSDPA UL HS DPCCH View CQI values reported by the test mobile in the last 100 HSDPA subframes.

UMTS HSDPA HS Decode Status View Status of the HS-SCCH demodulation and the decoded HS-SCCH information.

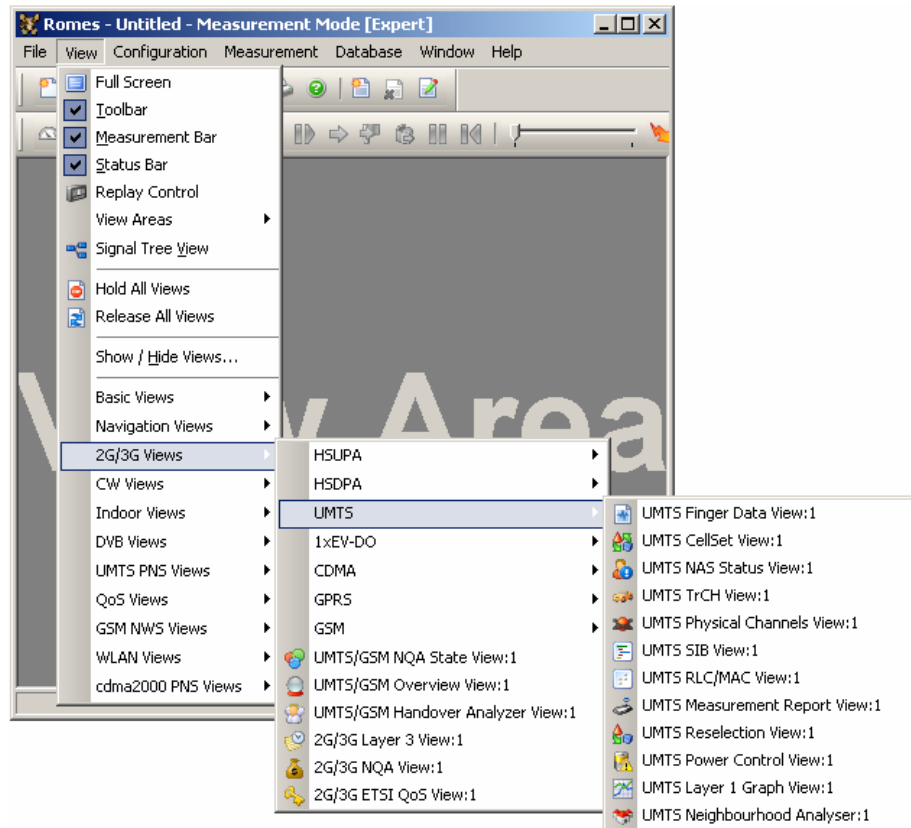
UMTS HSDPA HARQ Statistic View Characteristics of all HARQ processes of the test mobile.

<i>UMTS HSDPA Configuration View</i>	Configuration of the DL HSDPA channels received by the test mobile, the UL HS-DPCCH, and information related to the finger configuration command, the DL HS-SCCHs, and the active HARQ processes.
<i>UMTS HSDPA MAC Configuration View</i>	Configuration of the MAC-hs that the test mobile receives from the network.
<i>UMTS HSDPA MAC Status View</i>	Overview of the status of the reordering entity in the mobile receiver.
<i>UMTS HSDPA MAC Header View</i>	Mobile-specific subframe number and the corresponding (HS-DSCH) MAC-hs headers as defined in standard 2GPP TS 25.321.
<i>UMTS HSDPA Performance View</i>	Transmission performance parameters, given in terms of the requested or achieved data throughput.
<i>UMTS HSDPA Decode Statistic View</i>	Statistical evaluation of the received DL HS-DSCH transport blocks, together with the block error rate and the number of retransmissions needed to successfully decode the blocks of each size.

UMTS

Offers a selection of views for UMTS data.

UMTS views may be opened any time, however, they are empty unless UMTS data are available.



A :1 is displayed behind each of the view types, indicating that several views of the same type with different configurations can be opened simultaneously. For detailed information about the UMTS views refer to chapter 4, section UMTS views.

UMTS Finger Data View

Layer 1 parameters characterizing the different downlink WCDMA signals received by the mobile, captured with the different branches (fingers) of the test mobile UMTS RAKE receiver.

UMTS CellSet View

Layer 1 parameters of the serving cell and the neighbor cells.

UMTS NAS Status View

Higher-layer (Non-Access Stratum, NAS) parameters of the serving cell and the connection.

UMTS TrCH View

Channel coding parameters in the downlink and uplink Transport Channels (TrCHs).

UMTS Physical Channels View

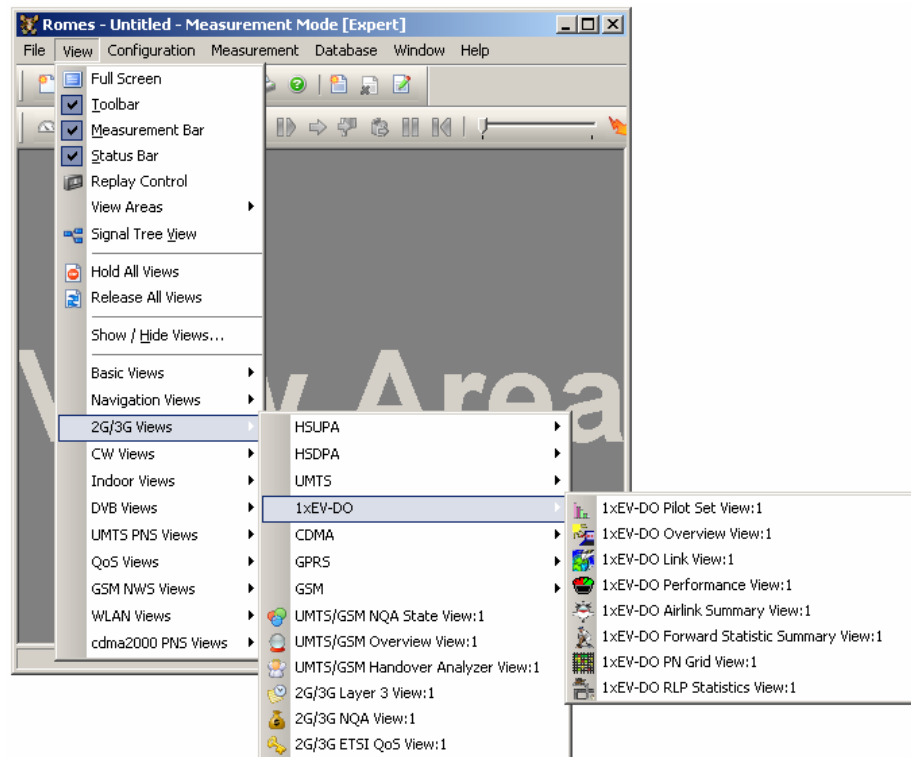
Physical channel parameters in the downlink and uplink WCDMA signals.

<i>UMTS SIB View</i>	Tree view of the exchanged System Information Blocks.
<i>UMTS RLC/MAC View</i>	Display of important Radio Link Control/Medium Access Control parameters of UMTS mobile phones.
<i>UMTS Measurement Report View</i>	Intra-frequency measurement results that the test mobile sends to the network in a Measurement Report RRC message.
<i>UMTS Reselection View</i>	Display of parameters that are used for cell reselection of UMTS mobile phones.
<i>UMTS Power Control View</i>	Transmitter output power and closed loop power control parameters of a Nokia UMTS mobile.
<i>UMTS Layer 1 Graph View</i>	Display of UMTS or GSM layer 1 parameters in a 2D chart.
<i>UMTS Neighborhood Analyzer View</i>	Results of the neighborhood analysis of option R&S ROMES-U1.

1xEV-DO

Offers a selection of views for 1xEV-DO data.

1xEV-DO views may be opened any time, however, they are empty unless 1xEV-DO data are available.



A :1 is displayed behind each of the view types, indicating that several views of the same type with different configurations can be opened simultaneously. For detailed information about the 1xEV-DO views refer to chapter 4, Section 1xEV/DO view.

1xEV-DO Pilot Set View

List and bar graph showing the pilot channel signal strength from the active and several neighbor base stations.

1xEV-DO Overview View

A summary of the test mobile state, power/quality, sector, airlink quality results, and, if applicable, results from a connected 1xEV-DO PN scanner.

1xEV-DO Link View

Information about access, connection and session attempts.

1xEV-DO Performance View

Transmission performance parameters, given in terms of the requested or achieved data throughput.

1xEVDO Airlink Summary View

The signals shown in these three preconfigured 2D charts are the pilot energy, the requested throughput, and the PER over the measurement time.

1xEV-DO Forward Statistic Summary View

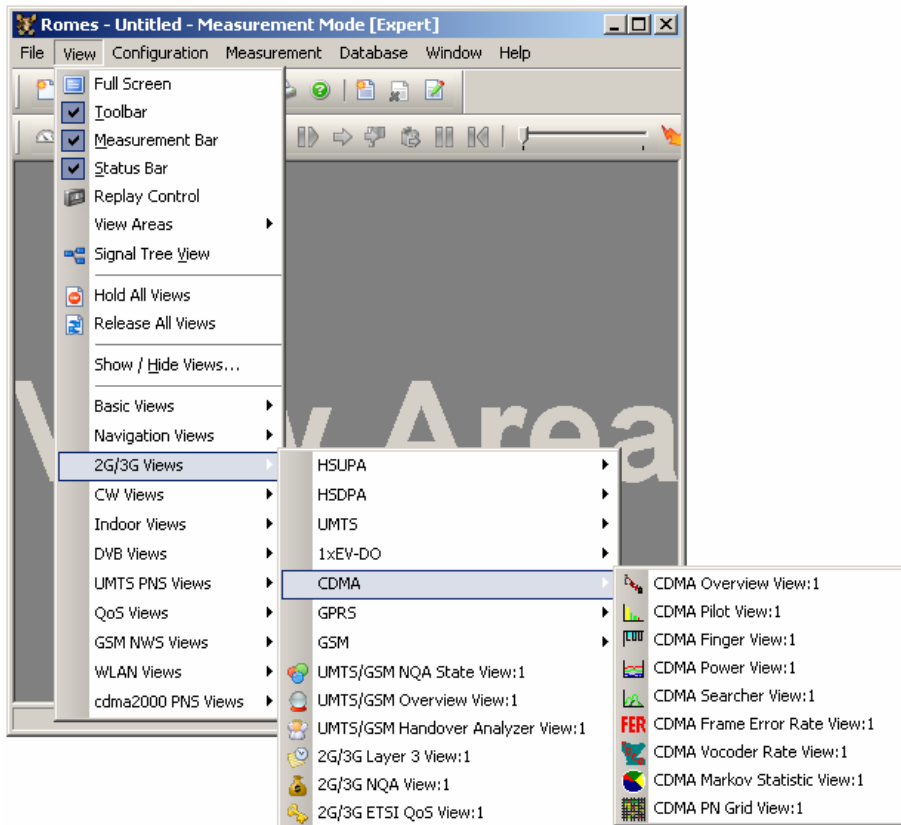
Shows the CRC success rates on the measured forward traffic and forward control channel slots.

- 1xEV-DO PN Grid View* Shows the forward channel PN offsets 0 to 511 as a matrix with 16 offsets in a row. Within this grid, the PN offsets in the currently active set, in the candidate set, and in the neighbor set are marked in different color shades.
- 1xEV-DO RLP Statistics View* Displays the parameters describing the reverse link performance during the measurement.

CDMA

Offers a selection of views for CDMAone (IS-95) measurements.

CDMA views may be opened any time, however, they are empty unless a CDMA measurement is performed.



A :1 is displayed behind each of the view types, indicating that several views of the same type with different configurations can be opened simultaneously. For detailed information refer to chapter 4, section *CDMA Views*.

CDMA Overview-View Displays a summary of the test mobile state, power/quality, active set and system parameters, and, if applicable, results from a connected CDMA PN scanner.

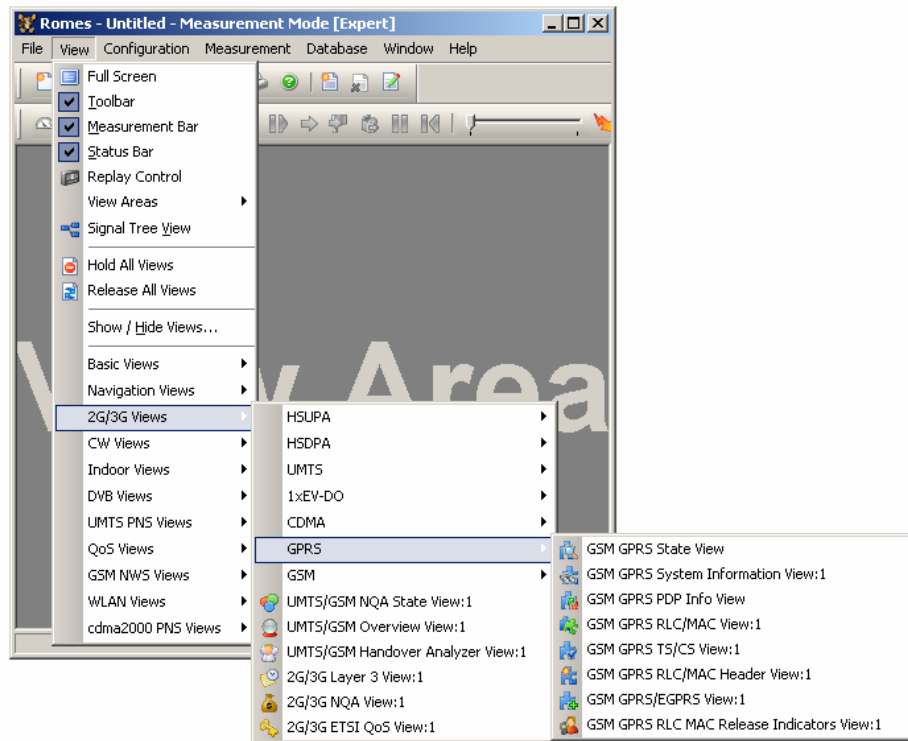
CDMA Pilot View List and bar graph showing the pilot channel signal strength from the active and several neighbor base stations.

<i>CDMA Finger View</i>	Relative strength of the different multipath signals of the pilot signal detected by the RAKE receiver of the CDMA mobile.
<i>CDMA Power View</i>	Relative TX and RX power at the CDMA mobile and related power levels as a function of time.
<i>CDMA Searcher View</i>	Relative strength of the different multipath signals of the pilot as a function of their time offset.
<i>CDMA Frame Error Rate View</i>	Percentage of erroneous CDMA frames detected and reported by the CDMA mobile station.
<i>CDMA Vocoder Rate View</i>	Date rate generated and received by the voice coders of the CDMA mobile station vs. time.
<i>CDMA Markov Statistic View</i>	Statistical evaluation of the call provided by the mobile.
<i>CDMA PN Grid View</i>	Forward channel PN offsets 0 to 511 as a matrix with 16 offsets in a row. Within this grid, the PN offsets in the currently active set, in the candidate set, and in the neighbor set are marked in different colors.

GPRS

Offers a selection of views for GPRS data.

GPRS views may be opened any time, however, they are empty unless GPRS data are available.



A :1 is displayed behind each of the view types, indicating that several views of the same type with different configurations can be opened simultaneously. For detailed information refer to chapter 4, section GPRS views.

GSM GPRS State View

List of parameters characterizing the operating state of mobile phones supporting GPRS.

GSM GPRS System Info. View

List of GPRS-related parameters contained in the layer 3 messages *System Information Type 1* to *System Information Type 13*.

GSM GPRS PDP Info View

List of important Packet Data Protocol (PDP) parameters of mobile phones supporting GPRS.

GSM GPRS RLC/MAC View

Overview of important Radio Link Protocol/Medium Access Control parameters of mobile phones supporting GPRS.

GSM GPRS TS/CS View

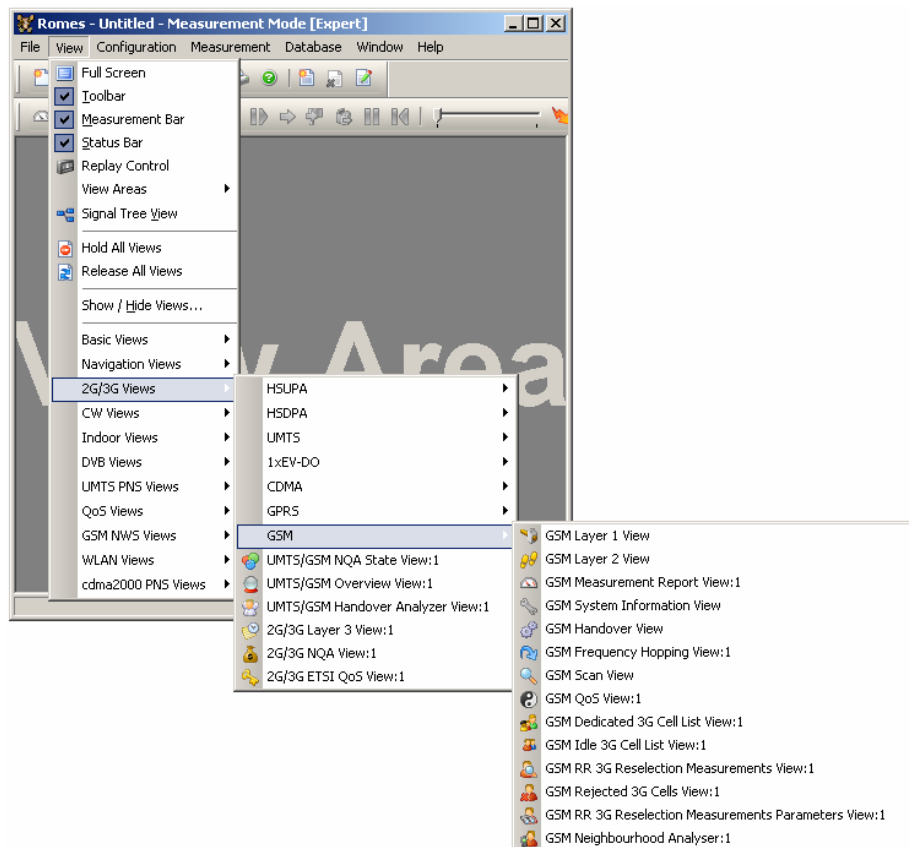
Statistical evaluation of the number of timeslots (*TS*) that are active in the connection and the Coding Scheme (*CS*) that is used for the transmission of radio blocks.

<i>GSM GPRS RLC/MAC Header View</i>	List of the exchanged RLC/MAC block header information.
<i>GSM GPRS/EGPRS View</i>	Control and physical parameters of a GPRS and EGPRS connection.
<i>GSM GPRS RLC MAC Release Indicators View</i>	Control and physical parameters of the connection release information, such as the cause of the release, statistical parameters and the release indicator description, if supplied.

GSM

Offers a selection of views for GSM data.

GSM views may be opened any time, however, they are empty unless GSM data are available.



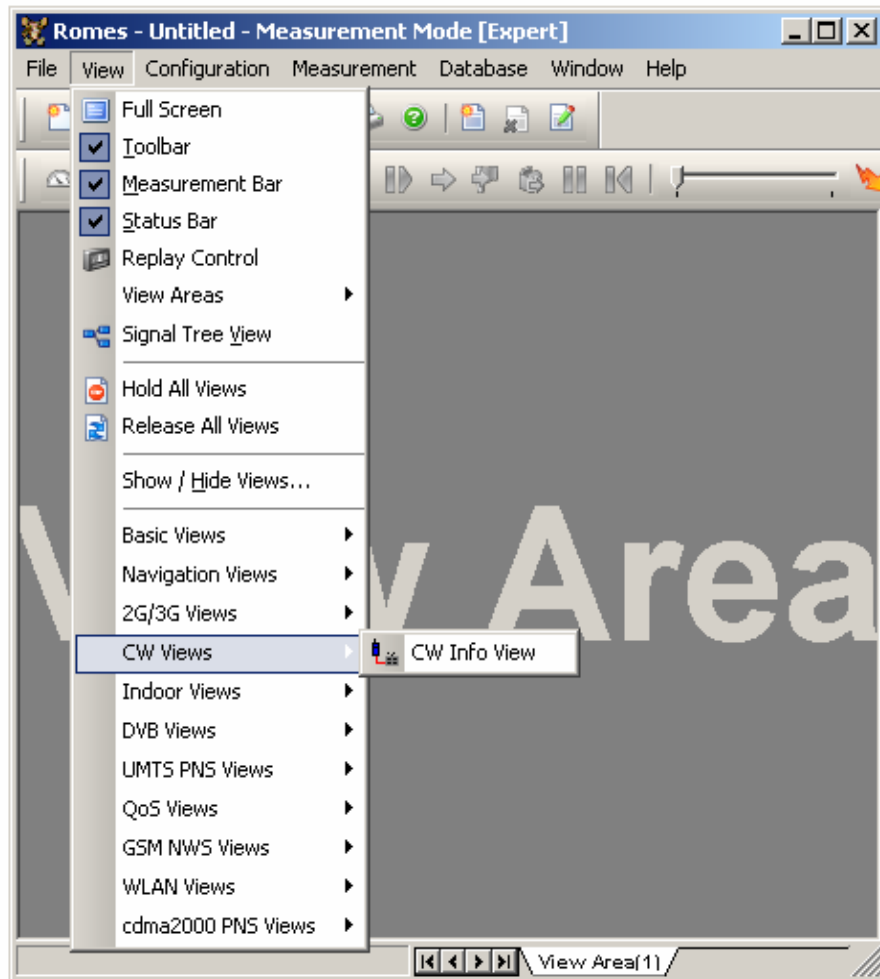
A :1 is displayed behind each of the view types, indicating that several views of the same type with different configurations can be opened simultaneously. For detailed information refer to chapter 4, section *GSM Views*.

<i>GSM Layer 1 View</i>	List of layer 1 (physical layer) parameters measured by the GSM mobile station and transferred to the BTS.
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<i>GSM Layer 2 View</i>	List of all layer 2 messages, scrolled during measurement or replay.
<i>GSM Measurement Report View</i>	Bar graphs and tabular overview of the MS measurement reports. Several <i>Measurement Report Views</i> corresponding to different connected mobile stations can be opened simultaneously.
<i>System Information View</i>	List of the GSM parameters in the Layer 3 messages <i>System Information Type 1 to 6</i> sent by the BTS.
<i>GSM Handover View</i>	List of the handover events performed by GSM mobile phones.
<i>GSM Frequency Hopping View</i>	List of the frequency hopping parameters of GSM mobile phones.
<i>GSM Scan View</i>	2D-chart displaying the signal strength of GSM channels.
<i>GSM QoS View</i>	Statistical evaluation of important layer 3 (<i>Location Update, GSM Handover</i>), mobility management (<i>GPRS Attach/Detach, Routing Area Update</i>) and packet routing (<i>Activate/Deactivate PDP Context</i>) procedures performed by mobile phones supporting GPRS.
<i>GSM Dedicated 3G Cell List View</i>	Overview of the measured dedicated 3G cell parameters.
<i>GSM Idle 3G Cell List View</i>	Overview of the measured idle 3G cell parameters.
<i>GSM RR 3G Reselection Measurements View</i>	An overview of the Radio Resource 3G reselection measurement results.
<i>GSM Rejected 3G Cells View</i>	Overview of the determined 3G cell parameters for rejected cells.
<i>GSM RR 3G Reselection Meas. Param. View</i>	An overview of the Radio Resource 3G reselection measurement parameters.
<i>GSM Neighbourhood Analyser View</i>	This view shows the results of the neighborhood analysis of option R&S ROMES-U1. The aim of this analysis is to reveal possible conflicts between the current best server and the transmitters in the neighborhood in order to assess the general condition of a UMTS / GSM network. To this end the neighborhood analyzer post-processes PN scanner, UMTS test mobile, and/or GSM scanner data and compares them with the information stored in a Node B and BTS data base (see description of ATD files in chapter 7, in particular the neighbor cell columns 2GNC and 3GNC). In case of a mismatch between the detected Node Bs and the Node Bs in the data base, an alarm is generated. The same holds if a missing neighbor of the best server or a potential interferer is found.

CW Views

Offers a view to monitor a CW measurement using a test receiver.



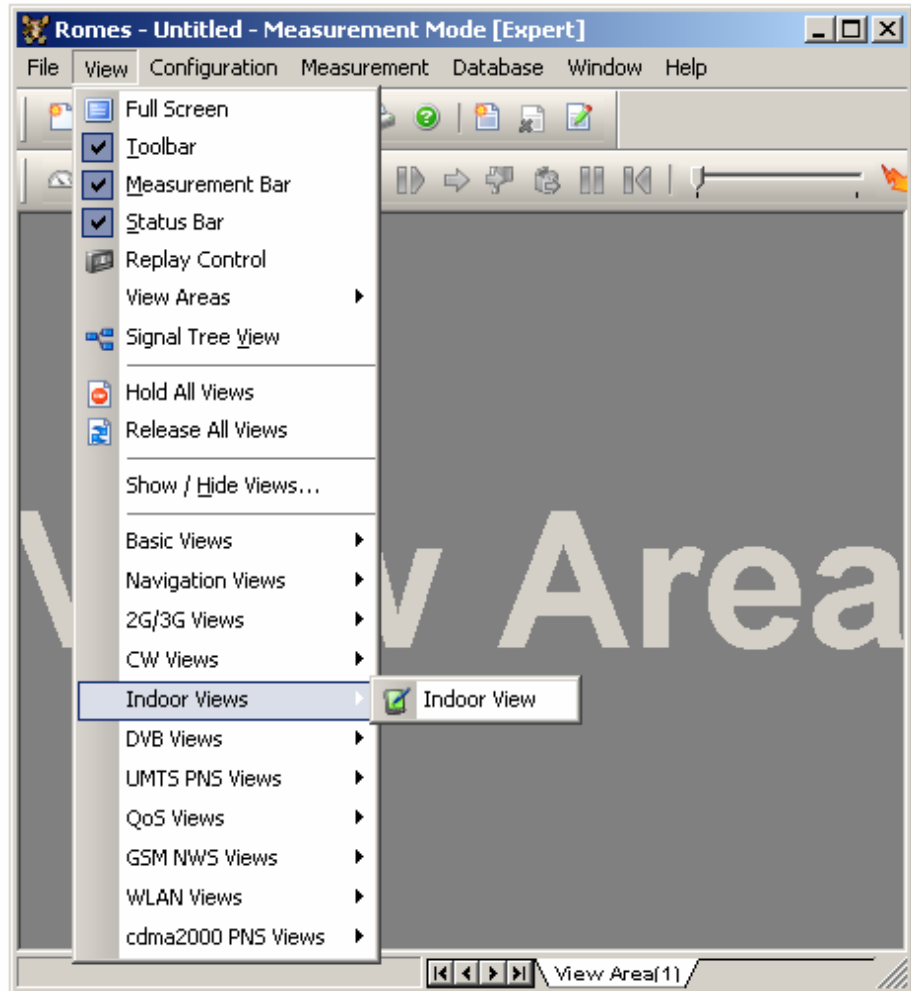
For detailed information about the *CW Info View* refer to chapter 4, section *CW Info View*.

CW Info View Measurement frequency of an ESVx or SBR receiver that operates in *Manual Tracking* mode.

Indoor Views

Offers a view to show data recorded with the Indoor navigation driver.

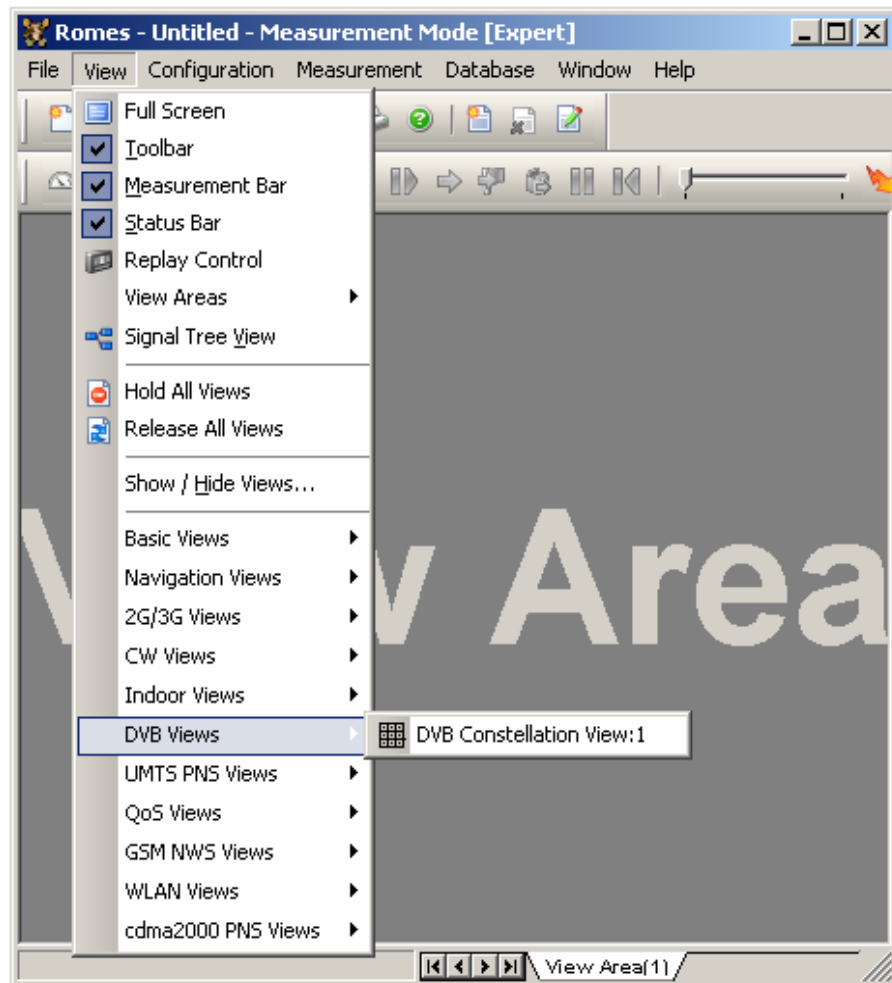
For detailed information refer to chapter 4, section *Indoor Views*.



DVB Views

Offers a selection of views for DVB (Digital Video Broadcasting) measurements.

DVB views are empty if no DVB measurement is performed, or if the measurement file replayed contains no DVB data.

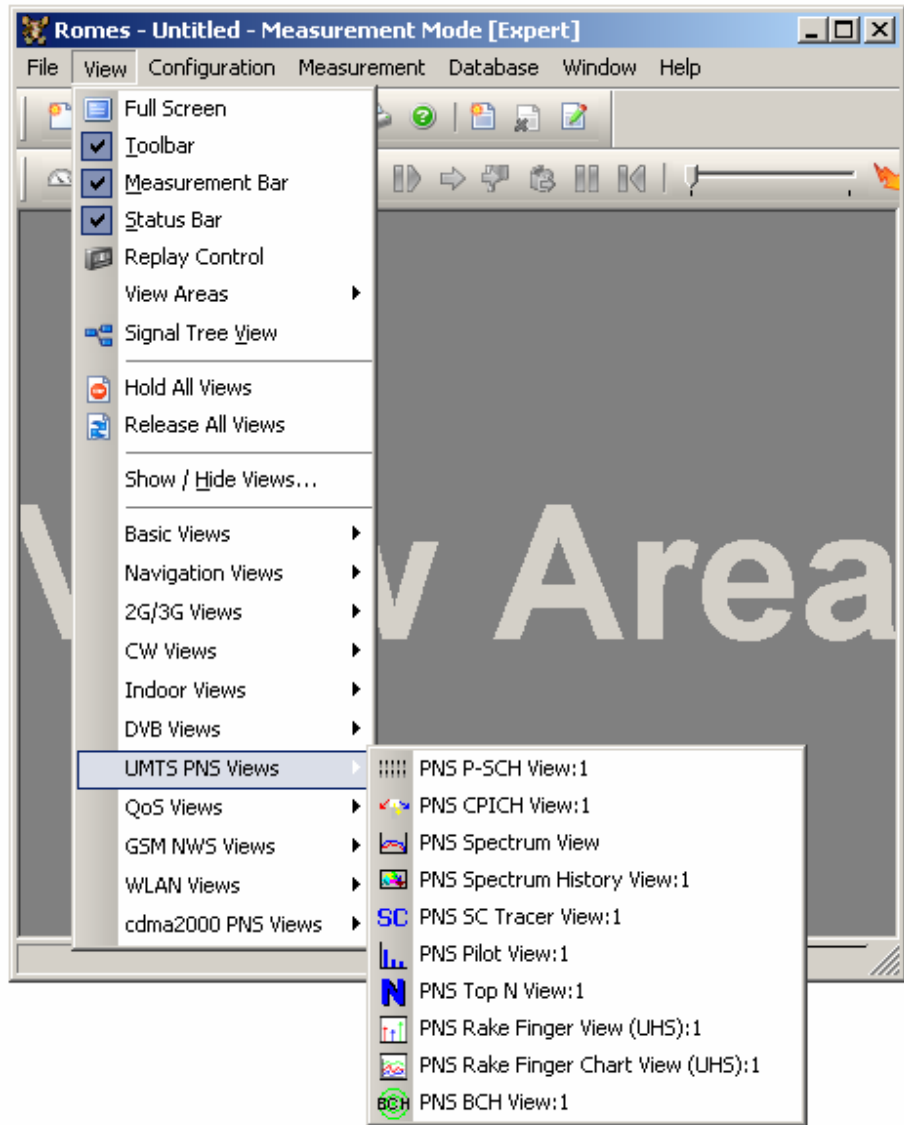


A :1 is displayed behind each of the view types, indicating that several views of the same type with different configurations can be opened simultaneously. For detailed information refer to chapter 4, section *DVB Views*.

UMTS PNS Views

Offers a selection of views to show UMTS Pseudo Noise Scanner data.

GSM views may be opened any time, however, they are empty unless GSM data are available.



A :1 is displayed behind each of the view types, indicating that several views of the same type with different configurations can be opened simultaneously. For detailed information views refer to chapter 4, section UMTS PSN.

PNS P-SCH View Properties of the Primary Synchronization Channel in the DL UMTS signal.

PNS CPICH View Average signal power of the received P-CPICHs and a comprehensive analysis of the properties of all DL signals received in the UMTS PN scan.

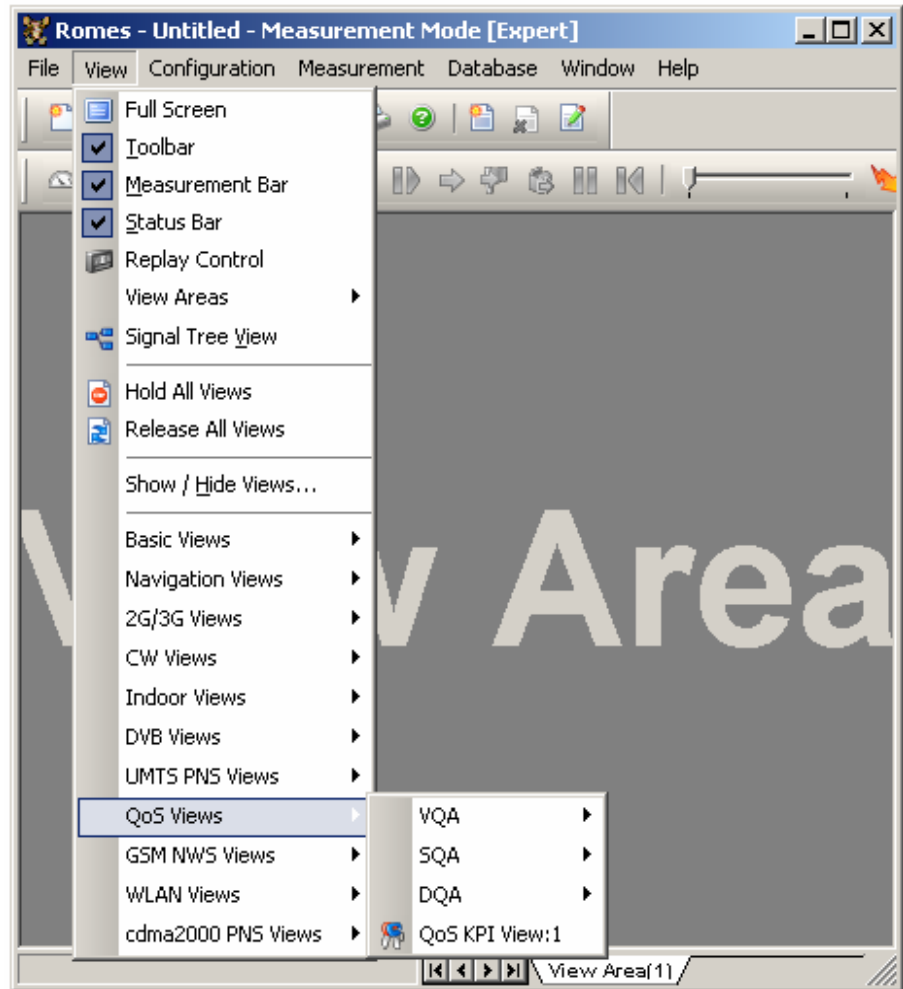
PNS Spectrum View Measured UMTS signal strength in two different frequency ranges.

<i>PNS Spectrum History View</i>	Evolution in time of the measured UMTS signal strength in a specified frequency range.
<i>PNS SC Tracer View</i>	Evolution of the delay time of a single CPICH relative to the frame boundary. Several <i>PNS SC Tracer Views</i> with different configurations can be opened simultaneously.
<i>PNS Pilot View</i>	Received Signal Code Power (RSCP) of the Common Pilot Channels (CPICHs) together with their scrambling codes. Several <i>PNS Pilot Views</i> with different configurations can be opened simultaneously.
<i>PNS Top N View</i>	Properties of the signals from the Node Bs that are elements of the <i>Top N Pools</i> defined in the driver configuration menu.
<i>PNS Rake Finger View (UHS)</i>	Power and timing of multiple echoes of the Node B signal received with the rake receiver of a R&S TSMU operating in ultra high speed mode.
<i>PNS Rake Finger Chart View (UHS)</i>	Evolution in time of the power of multiple echoes of the Node B signal.
<i>PNS BCH View</i>	System Information Blocks (SIBs) and Master Information Blocks (MIBs) decoded from the UMTS BCH with their full contents.

QoS Views

Offers a selection of views to evaluate the Quality of Service of a data connection measured with the available Quality Testers (xQA).

The QoS Views are divided into several groups, depending on the selected *User Level*. One group of views is for VQA data (see p. 3.34), one for SQA data (see p. 3.36), and one for DQA data, if activated (see p. 3.38):



A :1 is displayed behind each of the view types, indicating that several views of the same type with different configurations can be opened simultaneously. For detailed information refer to chapter 4, section QoS view.

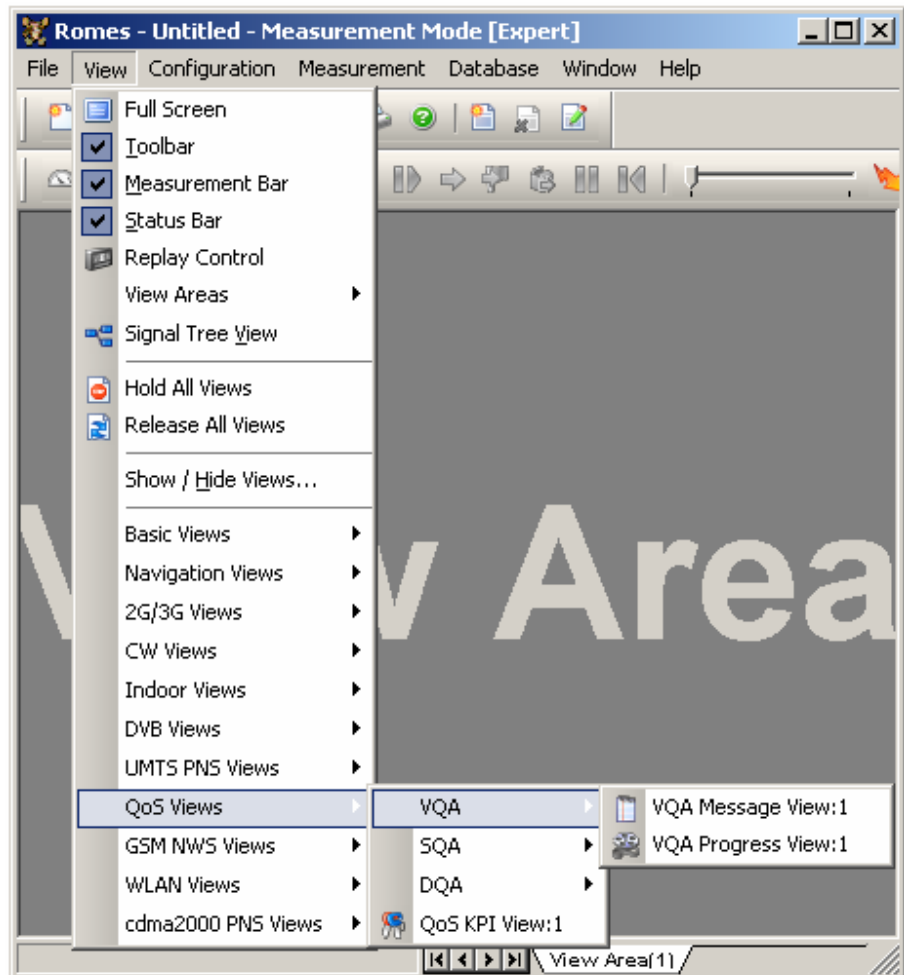
QoS KPI View

Shows Key Performance Indicators (KPIs) for the DQA jobs FTP (up-/download), HTTP and e-mail (up-/download) .

VQA

Offers a selection of views for QoS VQA data.

VQA views may be opened any time, however, they are empty unless VQA data are available.



A :1 is displayed behind each of the view types, indicating that several views of the same type with different configurations can be opened simultaneously. For detailed information about the VQA views refer to chapter 4, Section QoS VQA views.

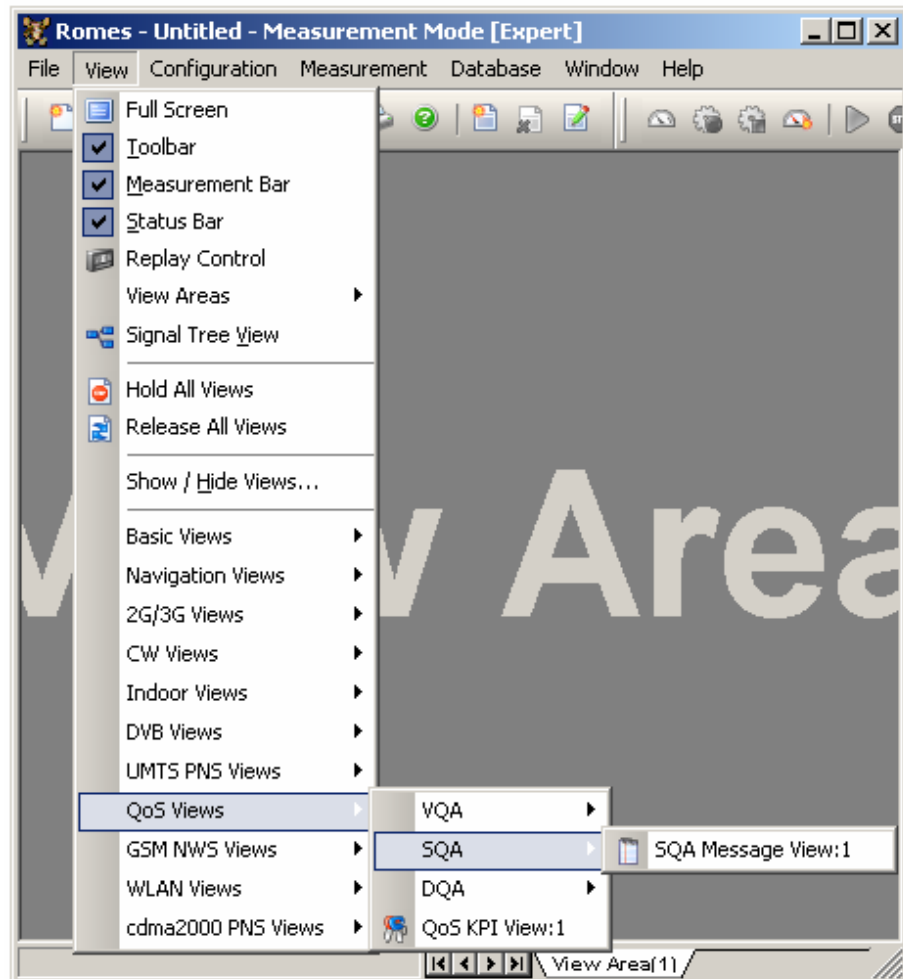
VQA Message View Chronological record of all actions of the current job.

VQA Progress View Bar graph and display of parameters to monitor the progress and the status of the current VQA job.

SQA

Offers a selection of views for QoS SQA data.

SQA views may be opened any time, however, they are empty unless SQA data are available.



A :1 is displayed behind each of the view types, indicating that several views of the same type with different configurations can be opened simultaneously. For detailed information about the SQA views refer to chapter 4, Section QoS SQA view.

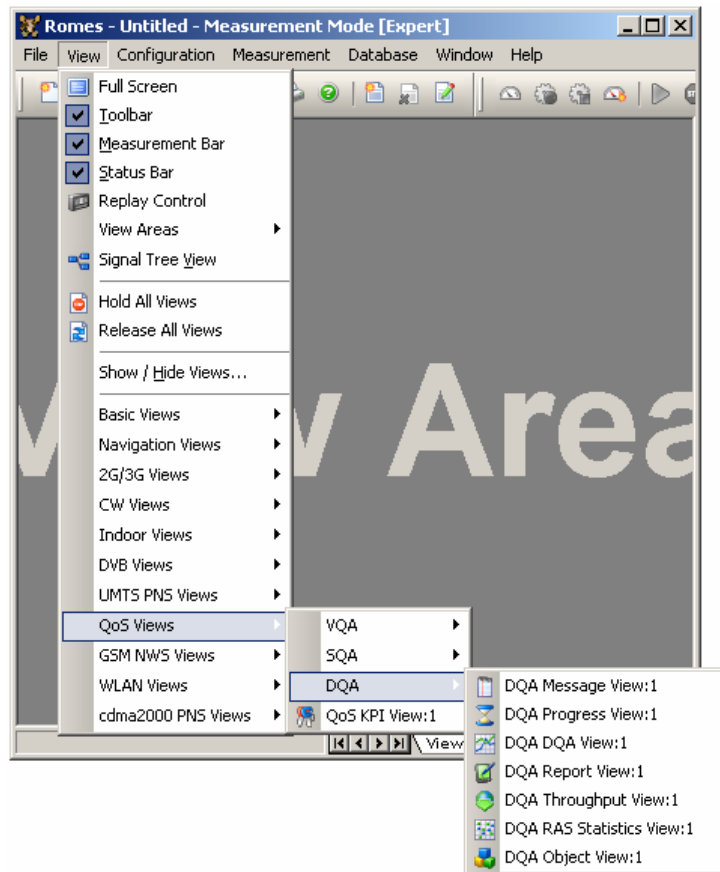
SQA Message View

Result of the Speech Quality Analysis (SQA, with option R&S ROMES-Z8, Voice Quality PESQ).

DQA

Offers a selection of views for QoS DQA data.

DQA views may be opened any time, however, they are empty unless DQA data are available.

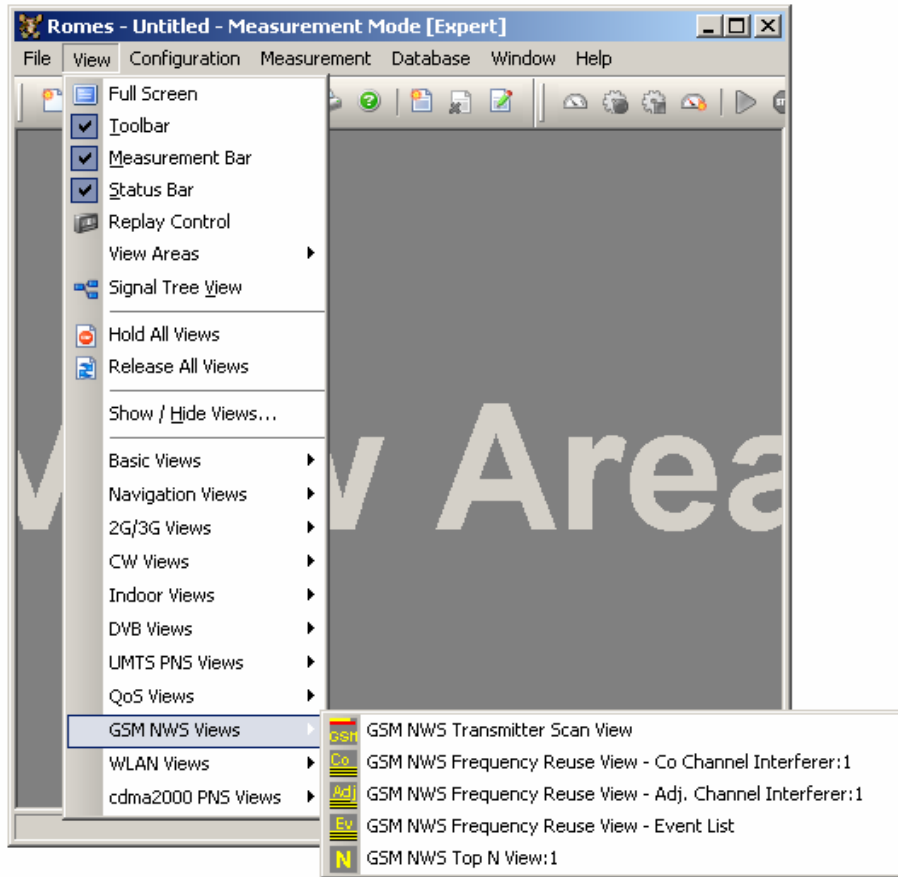


A :1 is displayed behind each of the view types, indicating that several views of the same type with different configurations can be opened simultaneously. For detailed information about the QoS DQA views refer to chapter 4, Section QoS DQA view.

<i>DQA Message View</i>	Chronological record of all actions of the current job.
<i>DQA Progress View</i>	Bar graph and display of parameters to monitor the progress and the status of the current DQA job.
<i>DQA DQA View</i>	Bar graph to monitor the percentage of <i>Good</i> , <i>Blocked</i> and <i>Dropped</i> data transfer jobs in the current session.
<i>DQA Report View</i>	Bar graph and display of parameters to monitor the jobs in the current session.
<i>DQA Throughput View</i>	Bar graphs to monitor the current and average data rate in upload and download direction.
<i>DQA RAS Statistics View</i>	Record of parameters describing the network traffic during the measurement.
<i>DQA Object View</i>	Tabular overview of the QoS actions performed with their duration and result for DQA.

GSM NWS Views

Offers a view to visualize GSM network scan data. GSM network scans require option R&S ROMES-GS3, *UMTS Network Scanner*.



A :1 is displayed behind each of the view types, indicating that several views of the same type with different configurations can be opened simultaneously. For detailed information refer to chapter 4, section *GSM NWS view*.

GSM NWS Transmitter Scan View

GSM data measured by the R&S TSMU radio network analyzer during the GSM Network Scan and demodulated.

GSM NWS Frequency Reuse View – Co Channel Interferer

Information about the serving cell, the potential co-channel interferers, and the characteristics of the interference situations.

GSM NWS Frequency Reuse View – Adj. Channel Interferer

Information about the serving cell, the potential adjacent channel interferers, and the characteristics of the interference situations.

GSM NWS Frequency Reuse View – Event List

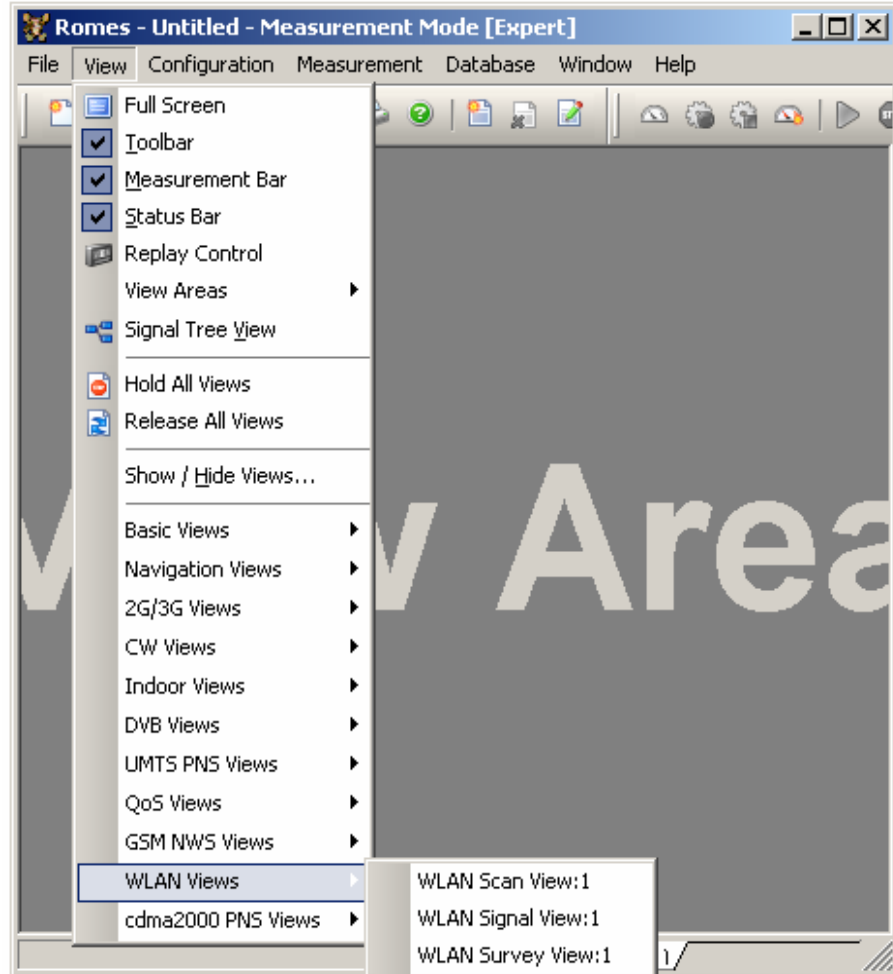
List of alarm messages generated according to the settings in the *Threshold Values* menu in the *Frequency Reuse View* configuration menu. These settings define when an alarm is triggered (e.g. C/I or RxLev/RxQual values) which are added to the event list.

GSM NWS Top N View

List of the properties of the signals from the base transceiver stations that are elements of the *Top N Pools*.

WLAN Views

Offers different views to analyze the WLAN information obtained in the network scans performed by a WLAN adapter in regular intervals.

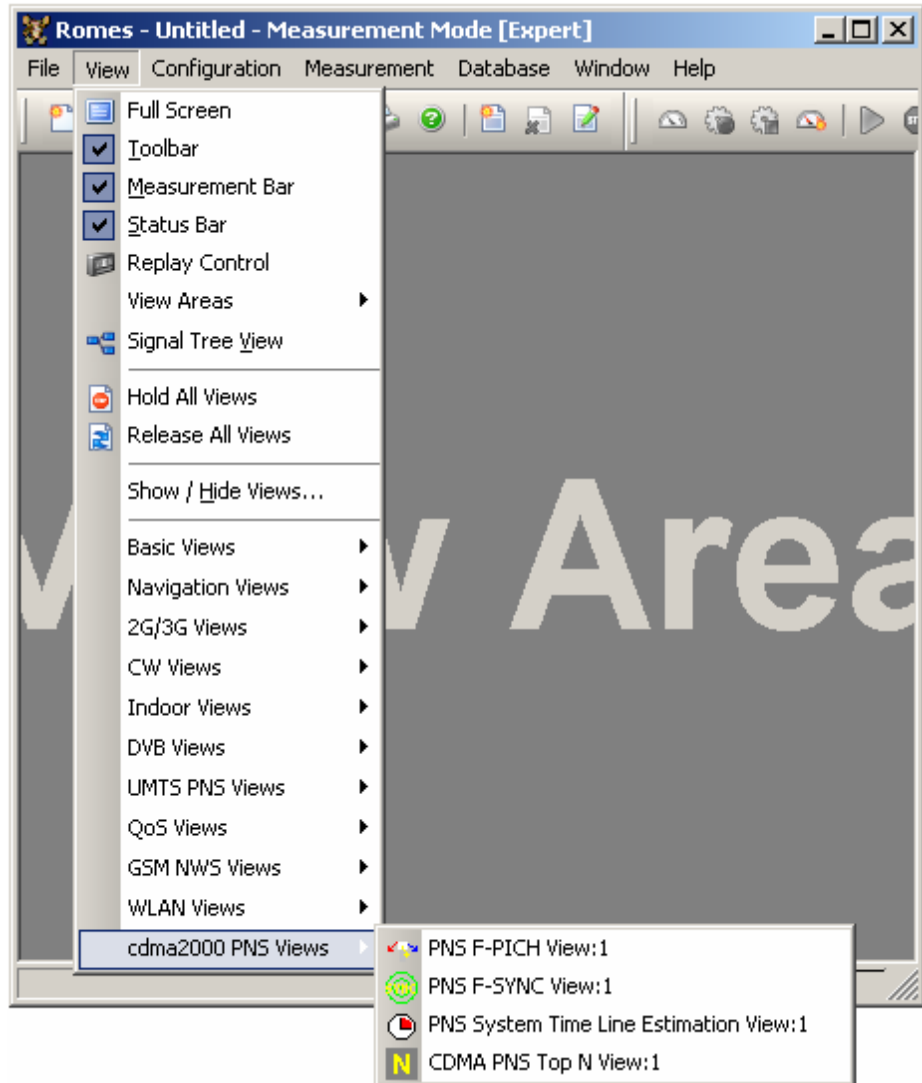


A :1 is displayed behind the view type, indicating that several views of the same type with different configurations can be opened simultaneously. For detailed information refer to chapter 4, section WLAN views.

- | | |
|-------------------------|--|
| <i>WLAN Scan View:</i> | Basic information acquired in a WLAN network scan (WLAN BSSID list information). |
| <i>WLAN Signal View</i> | RSSI of all received signals in a 3-dimensional bar graph. |
| <i>WLAN Survey View</i> | Statistical evaluation of the results in the other WLAN views. |

CDMA2000 PNS Views

Offers a selection of views to show CDMA2000 Pseudo Noise Scanner data.



A :1 is displayed behind each of the view types, indicating that several views of the same type with different configurations can be opened simultaneously. For detailed information refer to chapter 4, section CDMA2000 PNS views.

PNS F-PICH View Average signal power of the received Forward Pilot Channels (F-PICHs) and analysis of the properties of all DL signals received in the CDMA2000 PN scan.

PNS F-SYNC View Information that the R&S TSMU decoded from the Forward Synchronization Channel (F-SYNC).

PNS System Time Line Estimation View Shows the parameters used for the GPS-signal based CDMA system time line.

CDMA PNS Top N View List of the properties of the signals from the base transceiver stations that are elements of the *Top N Pools*.

Configuration Menu

The *Configuration* menu installs the hardware drivers necessary for a measurement, configures the display and defines directories for the different types of files used by the measurement system.

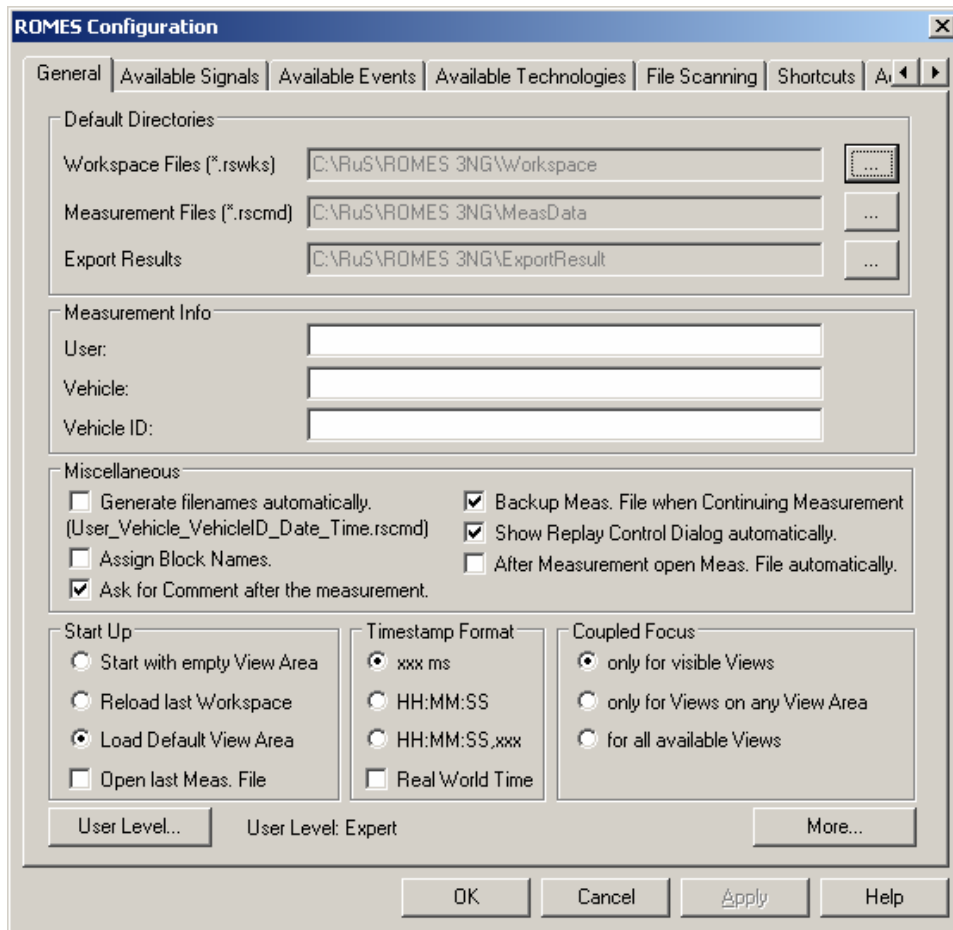


Fig. 3–5 Configuration menu

System Configuration (Preferences)

Configuration – Preferences opens the *ROMES Configuration* menu with the following settings:

- General system and measurement settings (*General* tab)
- Configuration of measured signals (*Available Signals*)
- Selection and definition of events (*Available Events*)
- Selection of technology-specific settings, in particular concerning the GSM BTS data base, UMTS Node B list, and the UMTS PNS and CW signals in the data tree (*Available Technologies*).
- Configuration of measurement file scanning and replay filter (*File Scanning*)
- Definition of shortcuts for common program tasks (*Shortcuts*)
- Maximum number of devices and registry entries (*Advanced Settings*)

The signal configuration and the event definitions can be stored to the current workspace. Some of the tabs in the *ROMES Configuration* menu are not available during a measurement or a replay.

General Settings

The *General* tab in the *ROMES Configuration* menu offers general measurement and system settings.

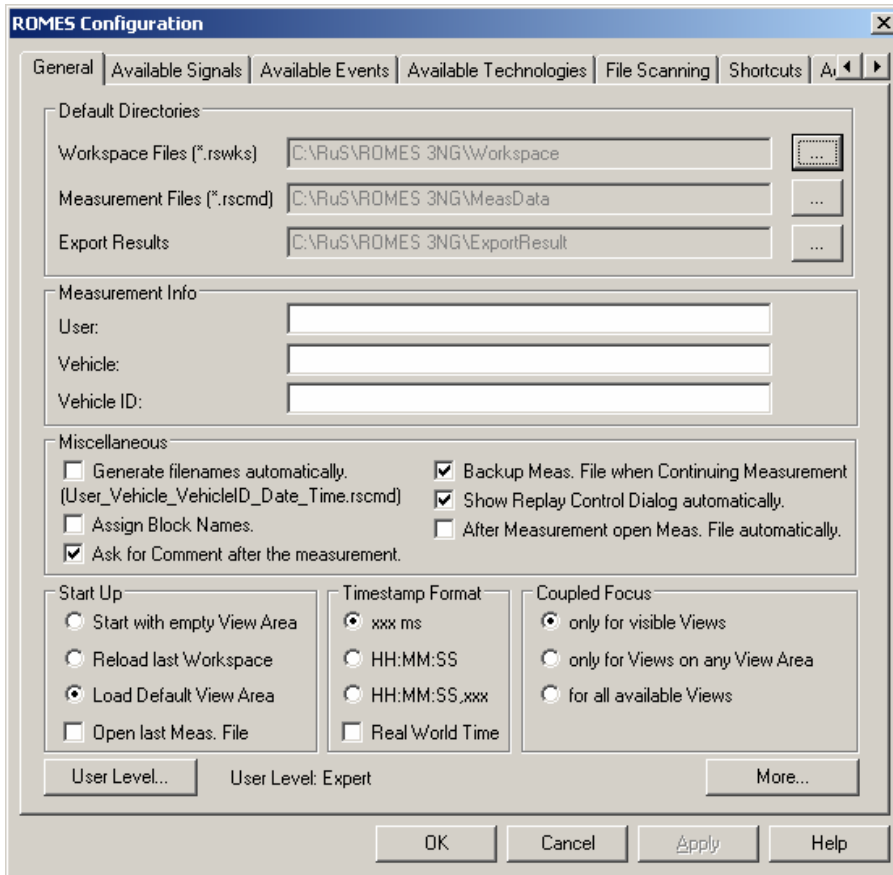


Fig. 3–6 R&S ROMES Configuration – General

Default Directories

The *Default Directories* panel indicates the current default directories for measurement (*.rscmd or *.cmd), workspace (*.rswks), and exported data files (see chapter 7). The directories can be changed in a *Look for Directory* dialog which is opened on clicking the browse (...) buttons.

Measurement Info

The *Measurement Info* panel contains three entry fields for the user name, the vehicle used for the measurement tour, and the vehicle ID. The entries are stored in the measurement file and displayed when a measurement file is opened (see *Open Measurement File...* command in section [File Menu](#) on p. 3.6 ff.).

Miscellaneous

The *Miscellaneous* panel contains several settings to control the recording of measurement files.

Generate filenames automatically

If the *Generate filenames automatically...* box for recording is checked, R&S ROMES automatically assigns a file name (User_Vehicle_VehicleID_Date_Time.rscmd) to any measurement file created on executing the *Start Measurement* or *Start Recording* commands. Otherwise, the two commands first open a dialog window to select the directory and define the name of the measurement file.

Assign Block Names

If the box is checked, a block name can be assigned every time that a new block in a measurement file is generated; see [Replay Jump To Block](#) on p. 3.112.

Ask for Comment after the Measurement

If the box is checked, a user-defined comment can be entered before the measurement file is closed on executing the Stop Measurement command.

Backup Meas. File when Continuing Measurement

If the box is checked, a backup version of the current measurement file is created each time a measurement is continued (Measurement – [Continue Measurement](#); see p. 3.105). The backup file prevents data loss; it is deleted automatically when the measurement is stopped without errors (*Stop Measurement*).

Show Replay Control Dialog automatically

If the box is checked, the Replay Control dialog is opened each time that a measurement file is replayed. Alternatively, the dialog can be opened using *View – Replay Control* (see p. 3.25).

After Measurement open Meas. file automatically...

If the box is checked, the measurement file from the last recorded measurement is opened automatically. Alternatively, the measurement file can be opened manually using the [Open Measurement File...dialog](#) (see p. 3.10)..

Start Up

Defines the workspace and measurement file to be loaded when R&S ROMES is started.

Start with empty View Area

Open a single view area with no views.

Reload last Workspace

Open the workspace with all sheets and views that was open in the last session.

Load Default View Area

Load all default view areas defined via *View – View Areas – Save View Area as Default...* (see [View Areas](#) p. 3.27). To load only part of the defined default sheets, press *More...* and use the *Default Sheets* selection in the extended general settings dialog (see below).

Open last Meas. File

Open the measurement file recorded or opened in the last session; see [Open Measurement File...](#) on p. 3.10.

Timestamp Format

The *Timestamp Format* panel defines the format of the *Timestamp* signal to be included in the measurement file. A timestamp of 36.123 s is displayed as follows:

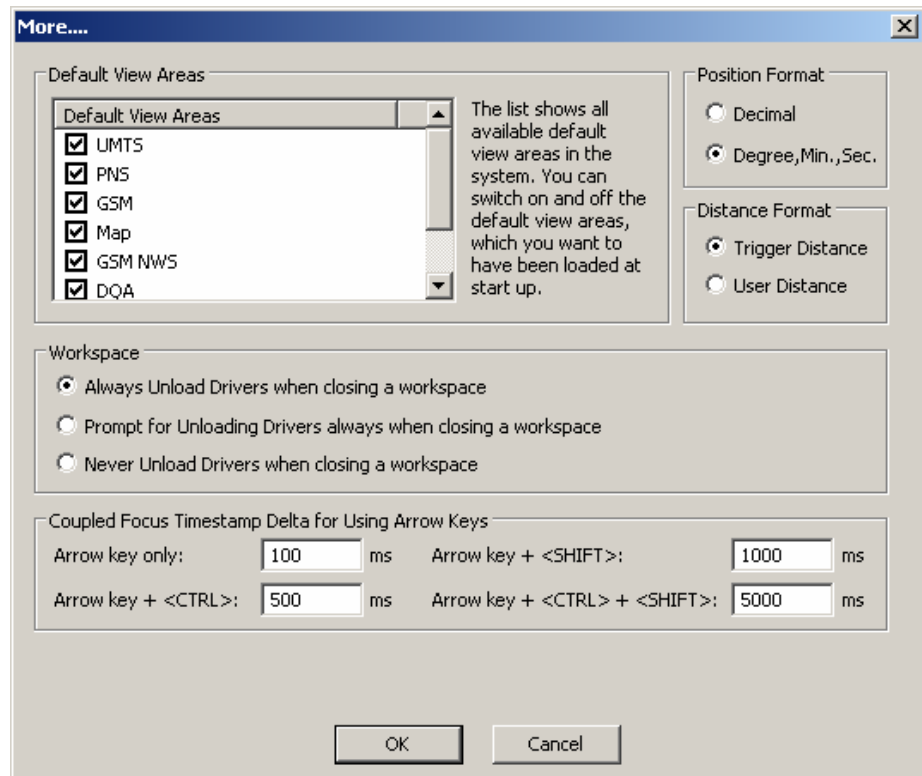
xxx ms	36123
HH:MM:SS	00:00:36
HH:MM:SS, xxx	00:00:36,123

If *Real World Time* is activated, the current time is used as timestamp, e.g.

been removed. This is covered by the user level definition files now.

More...

Opens an additional dialog with further general settings.



Default View Areas

Selects the default view area to be loaded on start up if *Load Default View Area* is selected in the *Start Up* panel of the *General* tab; see above.

Position Format

The *Position Format* panel defines whether the position coordinates used in the views are displayed in decimal or degree/minute/second format.

Distance Format

The *Distance Format* panel defines whether the trigger distance or a user-defined distance scale is used in the views, (e.g. in the *Event Views* see chapter 4). The *User Distance* is a generalized distance signal available with the *Trigger Box*; see chapter 6.

Workspace

The *Workspace* panel defines whether or not the loaded drivers and driver configurations are stored to be re-used when a workspace is closed.

The drivers and their configurations are part of the workspace. By default, they are unloaded when the workspace is closed and must be re-loaded into another workspace. With the alternative options, it is possible to keep the current drivers and driver configurations for the next workspace.

Coupled Focus Timestamp Delta...

The entries in the *Coupled Focus...* panel specify the effect of the arrow keys on the coupled focus (see p. 3.4). The larger the values the faster the focus moves when the arrow keys are pressed. To gain flexibility it is advisable to assign different timestamp intervals to the different key combinations.

Signal Configuration

The *Available Signals* tab in the *ROMES Configuration* menu displays and configures the signals available for viewing.

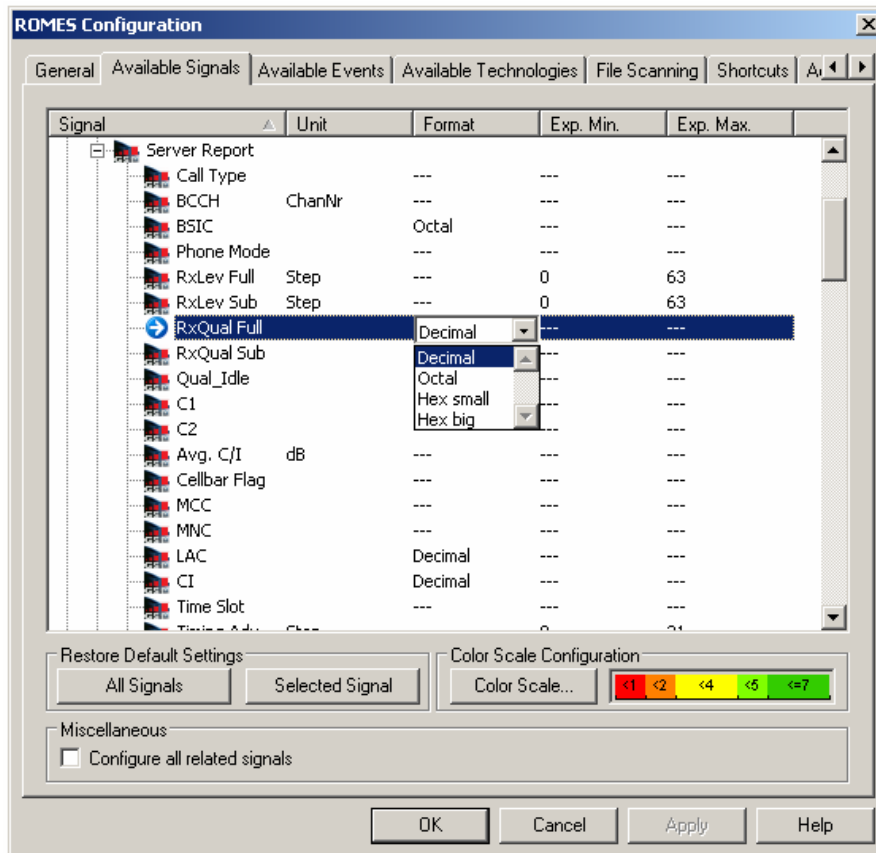


Fig. 3–7 R&S ROMES Configuration – Available Signals

Data tree

The data tree shows all signals available for viewing. By double-clicking the entries in the corresponding columns, the unit, display format, and the range of values to be displayed in the views (expected minimum and maximum) can be modified.



Exp. Min and Exp. Max defines the total y-axis scale of several views (e.g. the 2D Chart View). Manual scaling of the y-axis is particularly useful if the actual value range of a signal (or its range of interest) is considerably smaller than its "natural" scale (e.g. if only small GSM signal levels are measured so that the entire RxLev scale between 0 and 63 is not needed).

Restore Default Settings

The two buttons in the *Restore Default Settings* panel reset the unit, format, and the expected minimum and maximum to default.

All Signals

Default settings for all signals

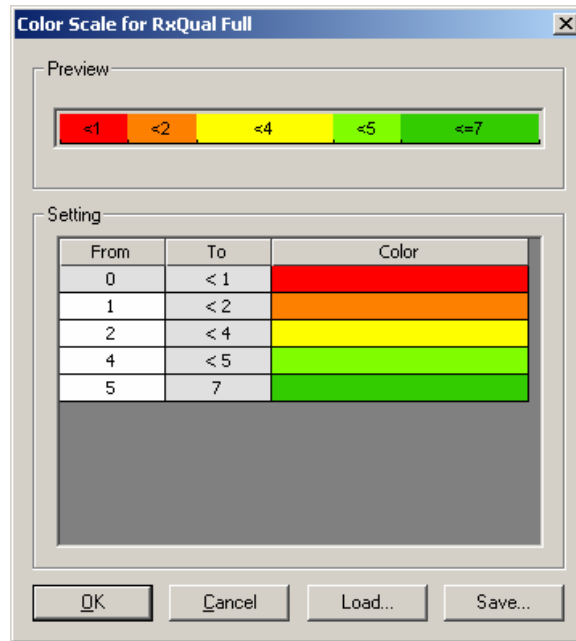
Selected Signal

Default settings for selected signal only

Color Scale Configuration

The *Color Scale* button determines in which way the current signal parameter is visualized in an *Indoor* or *Route Tracking* view. If no meaningful scale can be assigned to the selected signal, the button is disabled (grayed), and *Not Available* is indicated instead of a color scale.

The *Color Scale* button opens the *Color Scale for...* menu assigning display colors to five subranges of the selected parameter range.



Preview

Preview of the current color configuration

Setting

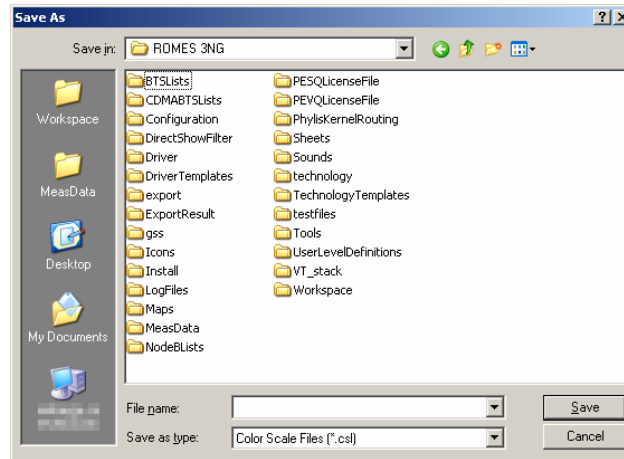
Tabular overview of the five subranges and associated colors. The lower limits (From) can be changed (double-click the white table fields and overwrite the entry) but must remain in ascending order. The colors can be changed in the Colors menu opened on double-clicking a color field. Refer to the context-sensitive help for information on the Colors menu.

Load

Opens a *File Open* dialog to load a color configuration from a color scale file defined previously. Color scale files are ASCII text files with the extension *.csl.

Save

Opens a file *Save As...* dialog to select a directory and define a file name for the current color configuration.



Color scale files are ASCII files with the extension *.csl. They contain the defined colors and the corresponding ranges, e.g.:

```
[Col]
NumberOfEntries=3
RangeMin=0.000000
RangeMax=33.000000
Type=0
Color_0=255
Value_0=0.000000
Color_1=33023
Value_1=12.000000
Color_2=65535
Value_2=25.000000
```

Miscellaneous

The *Miscellaneous* settings can be activated in order to configure related signals simultaneously and to save the signal configuration to the workspace.

Configure all related signals

Changing the properties of a signal affects the properties of all other related signals. Related signals contain the same type of measurement data but differ in one or more parameters so that they can be measured and displayed separately. In the data tree, related signals can belong to the same or to different parent nodes. Checking this function is useful especially for large groups of related signals; see examples below.

Examples for related signals

- GSM parameters such as *RxLev* are measured not only for the serving cell but also for up to 6 neighbor cells N1 to N6. All signals of the same parameter originating from different cells are related signals.
- The *UMTS – Finger Info* data structure contains signals for the *Scrambling Code (SC)*, E_c/I_0 and *Time Offset* of the signals captured with the different fingers of an UMTS RAKE receiver. All *SC*, E_c/I_0 and *Time Offset* signals are related signals.
- Part of the *UMTS PNS* data is arranged according to the different Top N Pools defined in the UMTS PNS driver configuration menu and their elements. Signals from different pools and elements containing the same type of data (*Rank*, *Power*, *SC*, ...) are related signals.
- The optional *CIR...* signals for different frequencies and downlink scrambling codes (see section [TEC for UMTS PNS](#) on p. 3.101 ff.) are all related signals.

Event Configuration

The *Available Events* tab in the *ROMES Configuration* menu selects the signal events to be recorded during the measurement and configures additional *User Events* and *Comment Events*.

- Signal events are automatically generated by the test system, according to the properties of a measured signal and the configuration settings made in the *Available Events* tab. Examples for signal events are sudden changes of a numeric signal value (e.g. a drop of the measured signal power, a channel change), or recorded actions (e.g. the start of a call or a handover).
- User and comment events must be both triggered manually during the measurement. They can be used to include information into the measurement file that is not automatically recorded but helps to interpret the measurement data.

If an event is activated, the Event symbols can be displayed in many general purpose and other view types, e.g. in a *Route Track*, in an *Indoor*, or in a *2D Chart* view. The *Event View* displays a chronological record of all events that occurred during the measurement.

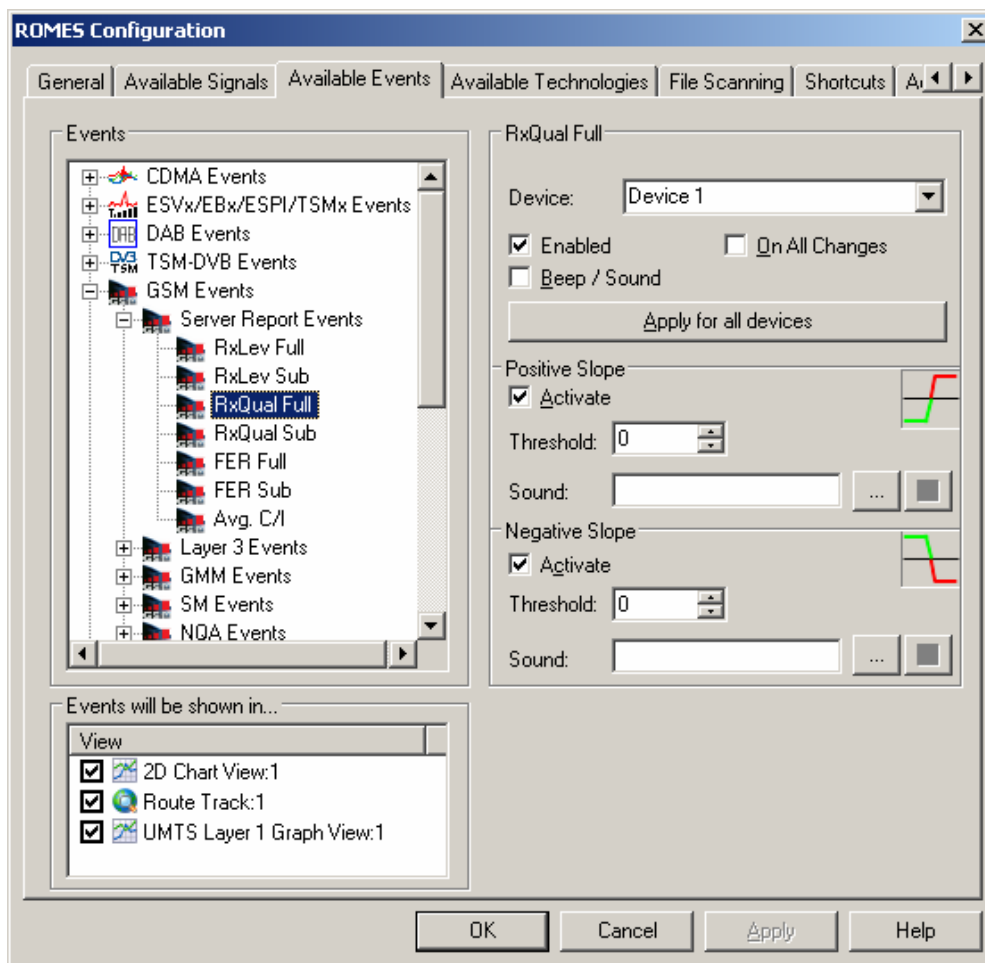


Fig. 3–8 R&S ROMES Configuration – Available Events

Events tree

The *Events* tree shows all events that can be generated by R&S ROMES together with their display symbols in the general purpose views. Selecting an event opens a specific configuration section in the right half of the menu.

Events are activated to be recorded by double-clicking; an activated event is preceded by a checkmark and indented.

<Event>

Depending on the selected (clicked) event, various settings are offered on the right side of the *Available Events* tab.

Device

Events can be generated for only one or for all devices used.

Enabled

Event recording is enabled for the selected device, provided that event recording is generally enabled in the event tree (the event is double-clicked, its symbol is preceded by a checkmark)

Beep/Sound

If the box is checked, a configurable sound announces that an event was triggered, see below.

On All Changes

If the box is checked, an event is selected whenever the value of the selected parameter changes. This function is useful, e.g., to indicate the change of channels, modes etc. It should not be used for measurement parameters that continuously vary in time, like RxLev etc.

Apply for all devices

If the button is clicked (and the label appears in a dashed frame), the event settings are valid for all devices used, not just to the device indicated in the Device field.

Finally, the user events *Event_1* to *Event_10* can be renamed for later identification in the <Event> panel.

Events will be shown in...

List of all open views which are capable of displaying events. The events appear in all selected views.

Positive Slope / Negative Slope

An event can be triggered when a signal parameter passes a given threshold in upward or downward direction (positive/negative slope). This feature is provided for numeric parameters that cover a range of (continuous or discrete) values, e.g. RxLev, FER etc.

Activate

If the box is checked, the positive or negative slope event is triggered, respectively.

Threshold

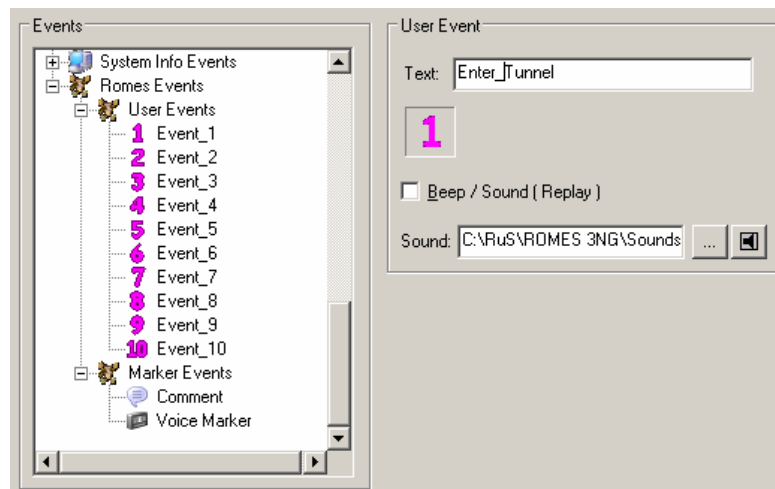
Entry of the positive/negative threshold. The units of the signal are selected automatically.

Sound

A sound to announce the event is activated by loading a *.wav file which can be selected via the browse (...) button. The selected *.wav file is indicated in the Sound window; at the same time, the gray square icon on the right side changes to an icon showing a megaphone. R&S ROMES provides a selection of *.wav files in the *Sounds* sub-directory of its program directory.

User Events

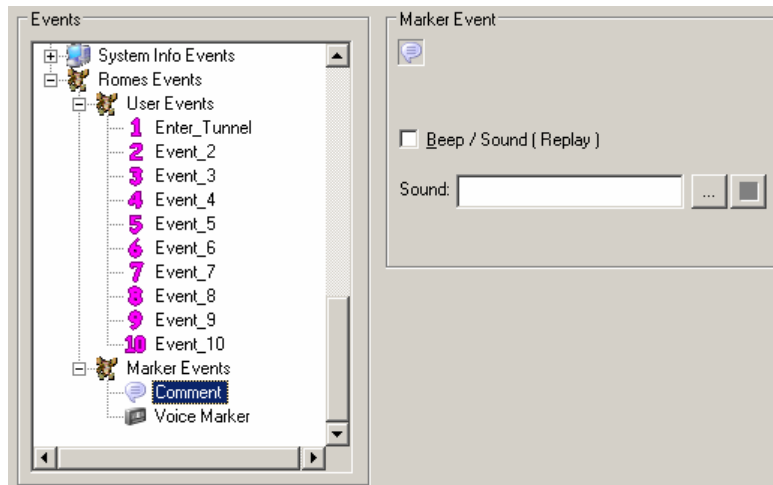
User events are located below the *Romes Events – User Events* node of the event tree. Their name can be changed for later identification (use names such as *Enter_tunnel*, *Leave_tunnel* etc. instead of the default event names *Event_1* to *Event_10*).



The new event names will show in the *User Events* list opened by the *Events* command in the *Measurement* menu or by the corresponding icon in the toolbar. To make event handling easier, shortcuts can be used to trigger the individual user events, see next section. The default shortcuts for user events no. 1 to 10 are the F1 to F10 keys.

Comment Event

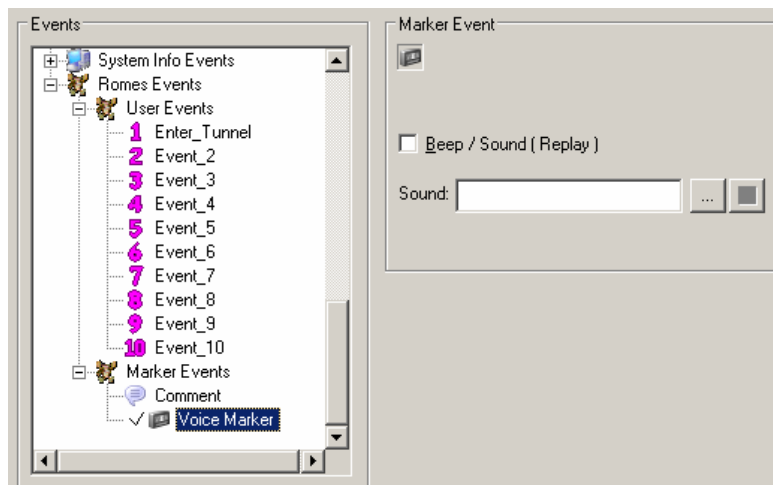
The comment events is located below the *Romes Events – Marker Events* node of the event tree.



The purpose of the comment event is to include written information into the measurement file that is related to a particular time or position. When recording measurement data (*Measurement – Start Recording*), you can trigger events using the *Set Marker* command in the *Measurement* menu (see p. [Error! Bookmark not defined.](#)) or using a shortcut assigned in the *Assignment of Shortcuts* tab (default: *Ctrl + F12*). After pressing the shortcut, you can enter the comment into a popup window. In the measurement file the comment is associated with the time when the event was triggered.

Voice Marker Event

The *Voice Marker* events is located below the *Romes Events – Marker Events* node of the event tree.



The purpose of the voice marker event is to include a spoken comment into the measurement file that is related to a particular time or position. When recording measurement data (*Measurement – Start Recording*), you can trigger voice marker events using the *Set Voice Marker* command in the *Measurement* menu (see p. [3.113](#)) or using a shortcut assigned in the *Assignment of Shortcuts* tab (default: *Ctrl + F11*). After pressing the shortcut, you can speak your comment into a connected microphone. In the measurement file the comment is associated with the time when the event was triggered.

Technology-Specific Settings

The *Available Technologies* tab in the *ROMES Configuration* menu defines technology-specific settings, in particular settings concerning the GSM BTS data base, UMTS Node B list, and the UMTS PNS and CW signals in the data tree. All settings are also accessible via *Configuration – Settings – TECs*. The pull-down list across the top of the tab contains the following entries:

- *TEC for GSM NWS* selects the GSM NWS Settings panel; see section [TEC for GSM NWS](#) on p. 3.77 ff.
- *TEC for CDMA PNS* selects the CDMA PNS Settings tab; see section [TEC for CDMA PNS](#) on p. 3.83 ff
- *TEC for GSM* selects the *GSM BTS List Database* tab; see section [GSM Technology](#) on p. 3.87 ff.
- *TEC for UMTS PNS* selects the *UMTS Technology Settings* tab; see section [TEC for UMTS PNS](#) on p. 3.101 ff.
- *TEC for UMTS Test Mobiles* selects the *UMTS Node B List Database* tab; see section [UMTS Technology](#) on p. 3.96 ff.
- *TEC for CW Devices* selects the *CW Technology* tab; see section [TEC for CW Devices](#) on p. 3.103 ff.
- *TEC for CDMA* opens the *CDMA BTS List Database* tab; see section [CDMA Technology](#) on p. 3.100 ff.

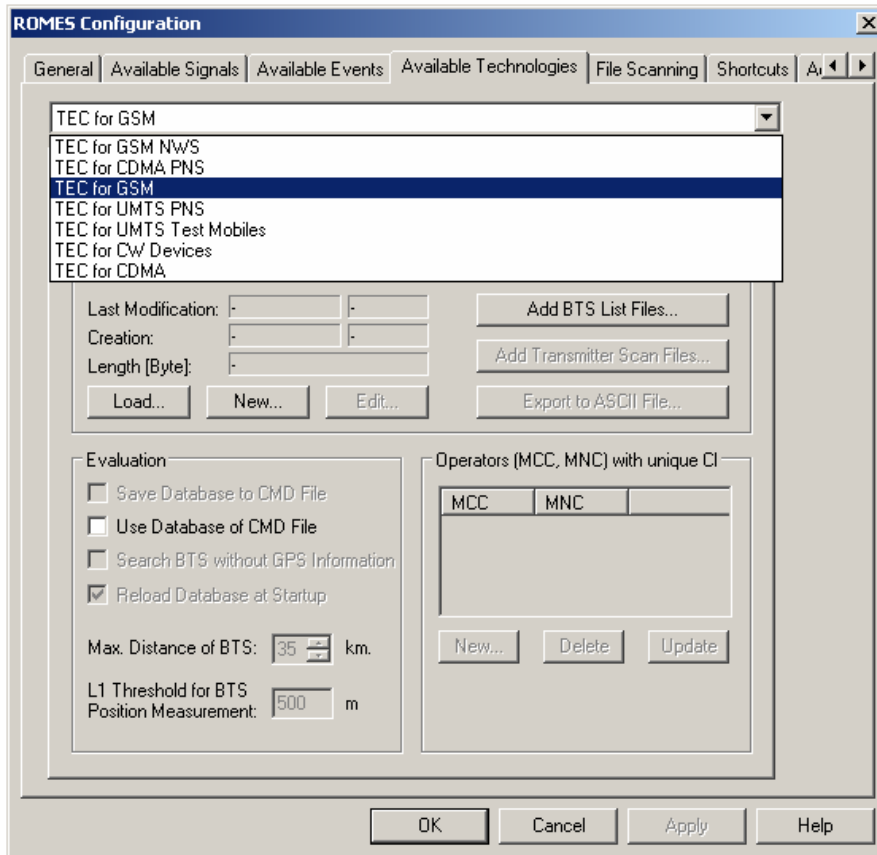


Fig. 3–9 R&S ROMES Configuration – Available Technologies

File Scanning Settings

The *File Scanning* tab in the *ROMES Configuration* menu controls the views and the measurement file scanning behaviour as well as the replay device filtering for new or opened measurement files.

If the *Enable File Scanning* box is checked, R&S ROMES performs a file scan (see p. 3.11) when opening a measurement file. After the scan, the entire measurement data is visible immediately in the active views.

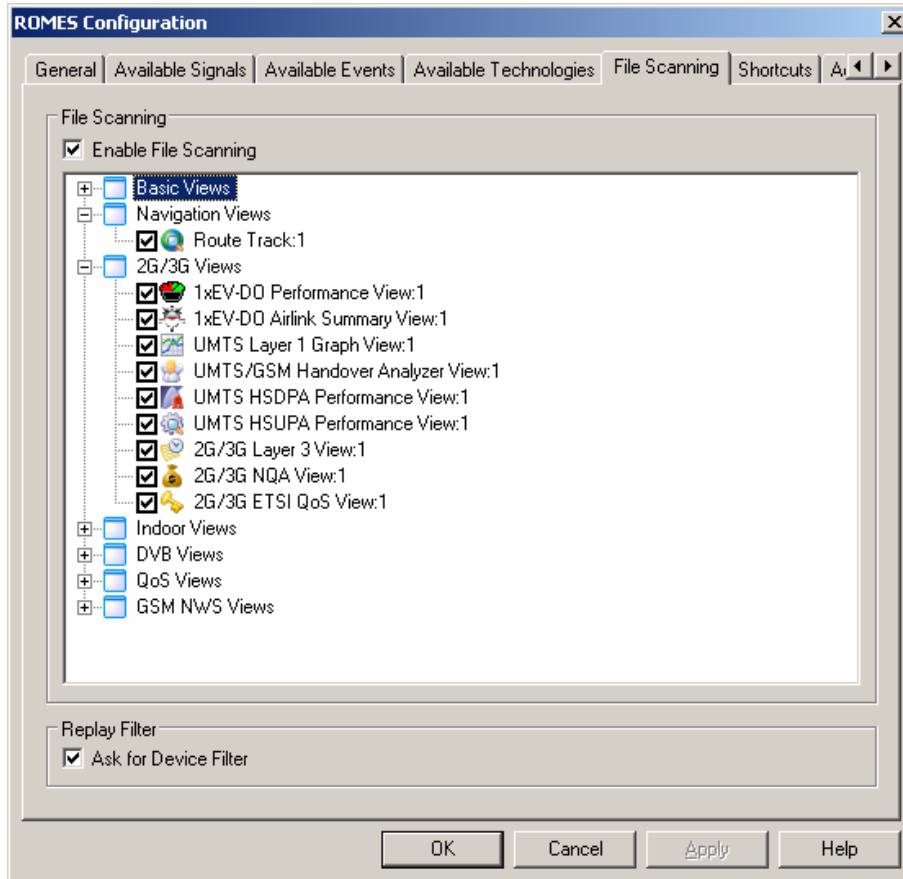


Fig. 3–10 R&S ROMES Configuration – File Scanning

If the *Ask for Device Filter* box is checked, the *Open Measurement File...* action (see p. 3.10) opens the *Device Filter* selection dialog.

Note:

If a measurement file is scanned for the first time, the device filter dialog is not shown. The first file scan has to be a complete scan, so that the user-defined device filter setting becomes active only after the first complete measurement file scan has been performed. After that, the device filter is dialog shown according to the Replay Filter setting (see Fig. 3–10 above).

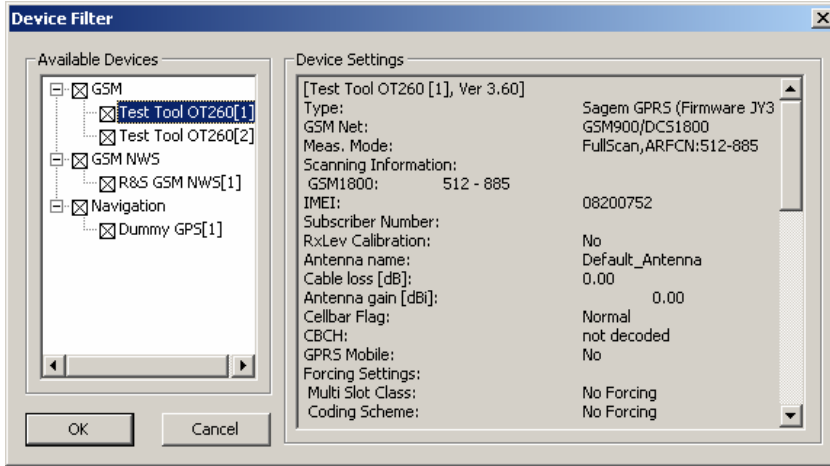


Fig. 3–11 R&S ROMES Configuration – Device Filter

The *Device Filter*, like the [Replay Device Filter](#) (see p. 3.110) shows the test devices of the currently active measurement file. If no measurement file is open, it shows the devices of the last file replayed. Measurement data from unchecked devices is excluded from the replay. The dialog is updated every time a new measurement file is loaded.

Assignment of Shortcuts

The *Shortcuts* tab in the *ROMES Configuration* menu assigns a shortcut (a combination of keys) to the user events and to the most common commands in the *Measurement* menu. Applying the shortcut (pressing the key combination) is then equivalent to triggering a user event and writing it to the measurement data or to executing a command. The default shortcuts for the *File* menu commands can not be changed.

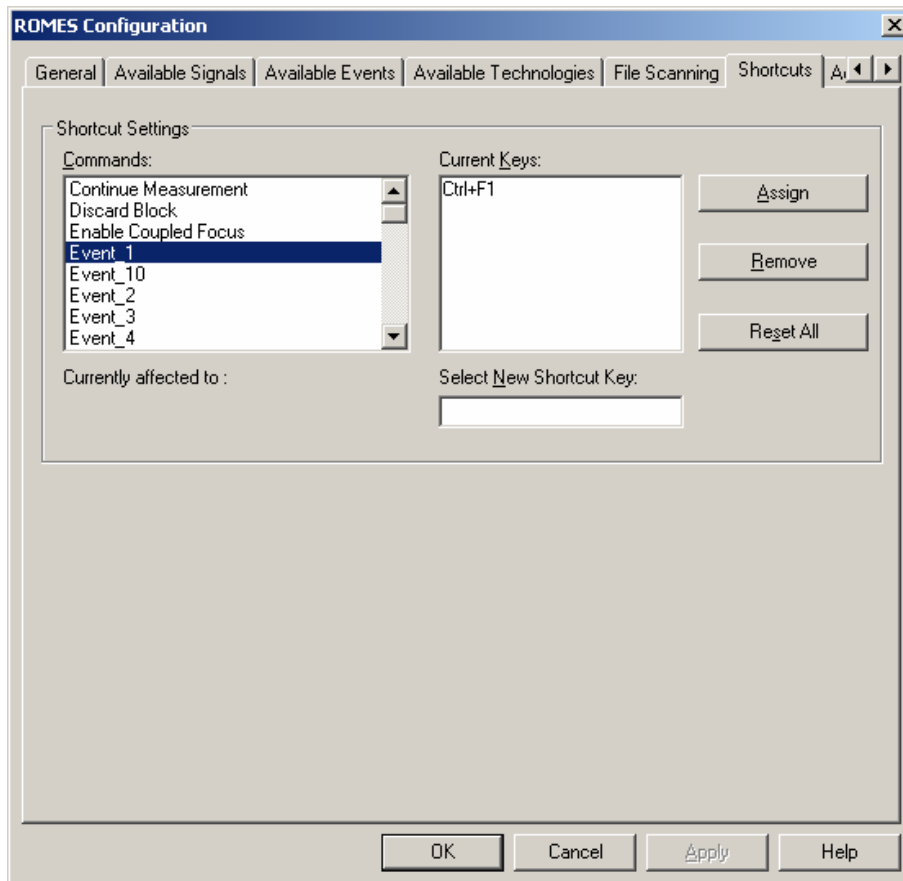


Fig. 3–12 R&S ROMES Configuration – Shortcuts

Advanced Settings

The *Advanced Settings* tab in the *ROMES Configuration* menu defines the maximum number of devices that can be used for each technology and reset registry entries concerning the workspace.

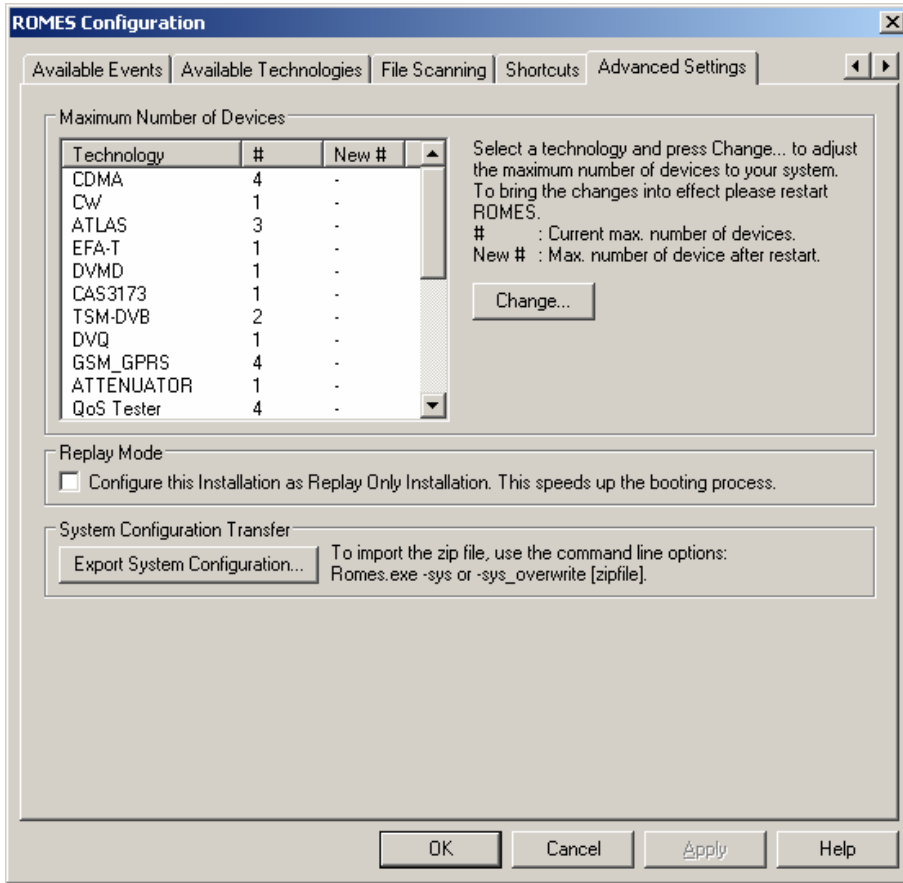


Fig. 3–13 R&S ROMES Configuration – Advanced Settings

Max. Number of Devices

The available technologies are listed in the *Technology* column of the *Max. Number of Devices* table together with the current number of devices (*#* column) and the changed max. number of devices (*New #* column, see below). To change the current number of devices for a technology, select the technology in the table and press the *Change* button.

Change

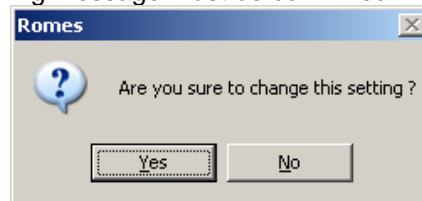
The *Change* button opens a popup window to change the current maximum number of devices assigned to the selected technology. It is possible to overwrite the number or increment/decrement it by clicking on the arrow buttons. Numbers between 1 and 32 are allowed for each technology.



In practice, the maximum number of devices will be limited by the number of interfaces (COM ports etc., see chapter 6) available. Also, a driver license is required for each device used. Increasing the maximum number of drivers is necessary, e.g., if additional licenses are purchased to extend the measurement system, or if measurement data acquired on a different system with more interfaces are replayed. Otherwise, it is recommended to keep the default settings in order to ensure optimum system performance.

OK

Change the current setting. Before this can be done, the following message must be confirmed:



On pressing OK, R&S ROMES reminds you that it must be restarted to bring the changes into effect:



Cancel

Discard the changes made and return to the Advanced Settings tab.

Replay Mode

If the box in the *Replay Mode* panel is checked, the current installation is configured as a *Replay Only* installation.

This setting is suitable if R&S ROMES is used to evaluate data recorded previously for some time, so that no measuring functionality is needed. In *Replay Only* mode, software components such as drivers will not be loaded so that booting is accelerated considerably.

Note:

In Replay Only mode, most of the CMD File Export modules are not available.

Selecting the *Replay Only* mode is reversible any time. It does not require a re-installation but only a simple restart of R&S ROMES.

System Configuration Transfer

R&S ROMES 3NG allows to export the R&S ROMES system configuration and to import it on another R&S ROMES installation on a different computer.

- The *Export System Configuration* button first requests an archive file name, and then saves the current R&S ROMES 3NG configuration in a zipped archive.

The system configuration zip file contains all files defined in *System-Status.XML*. It also contains an *rsreg* file with all relevant MS Windows registry entries. Which registry entries belong to the R&S ROMES system configuration can be defined in the *SystemStatus.XML* file, which is located in the Configuration directory.

On the other computer, the zip file has to be imported by using command line switches. Two different switches can be used:

```
Romes.exe -sys [file]
```

or

```
Romes.exe -sys_overwrite [file]
```

where

- sys Ask before overwriting any file on the target computer
- sys_overwrite Overwrites all files on the target computer without asking.

[file] the name of the zip file (optional). If it is not defined a file selection dialog will appear.

The *SystemStatus.XML* file can contain two different XML tags, which both have the attribute Name.

- RegKey:

The only attribute is *Name*, which specifies the sub branch of the R&S ROMES (HKEY_LOCAL_MACHINE\SOFTWARE\Rohde & Schwarz\%ROMES_DIR%) branch in the registry.

RegKey Example 1:

```
<RegKey Name="General\UMTS_PNS_SETTINGS\*" />
```

Copies all keys of the branch HKEY_LOCAL_MACHINE\SOFTWARE\Rohde & Schwarz\%ROMES_DIR%\General\UMTS_PNS_SETTINGS and its sub branches. ("*" is the wildcard for all below the specified branch)

RegKey Example 2:

```
<RegKey Name="General\ReplayOnlyVersion" />
```

Copies only one key HKEY_LOCAL_MACHINE\SOFTWARE\Rohde & Schwarz\%ROMES_DIR%\General\ReplayOnlyVersion

- FileKey

Analogous to the *RegKey* tag, the *FileKey* tag specifies files to be transferred.

FileKey Example 1:

```
<FileKey Name="DriverTemplates\*" />
```

Copies all files in the %ROMES_DIR%\DriverTemplates and its sub-directories

FileKey Example 2:

```
<FileKey Name="Driver\QualcommMobiles.xml" />
```

Copies only the file the %ROMES_DIR%\Driver\QualcommMobiles.xml

Driver Installation (Hardware)

The *Configuration – Hardware* command installs the hardware drivers necessary for a measurement.

Hardware drivers are required for the system and the different types of mobile phones before a measurement is started. They can be provided in two different ways:

- Implicitly, by loading a workspace file
- Explicitly, via the *Hardware* command

The installation process is menu-guided. For further information refer to chapter 6, *Hardware Components*.

Note:

It is not necessary to install drivers for evaluating data in the replay mode. On the other hand, the Hardware... command is disabled as long as a measurement file is open.

Overview of Settings (Settings)

The *Configuration – Settings* command selects the data to be displayed in the different types of views, shows the driver configuration and retrieves detailed information on the installed software modules. The *Settings* command calls up the *Configuration of Software Modules* menu:

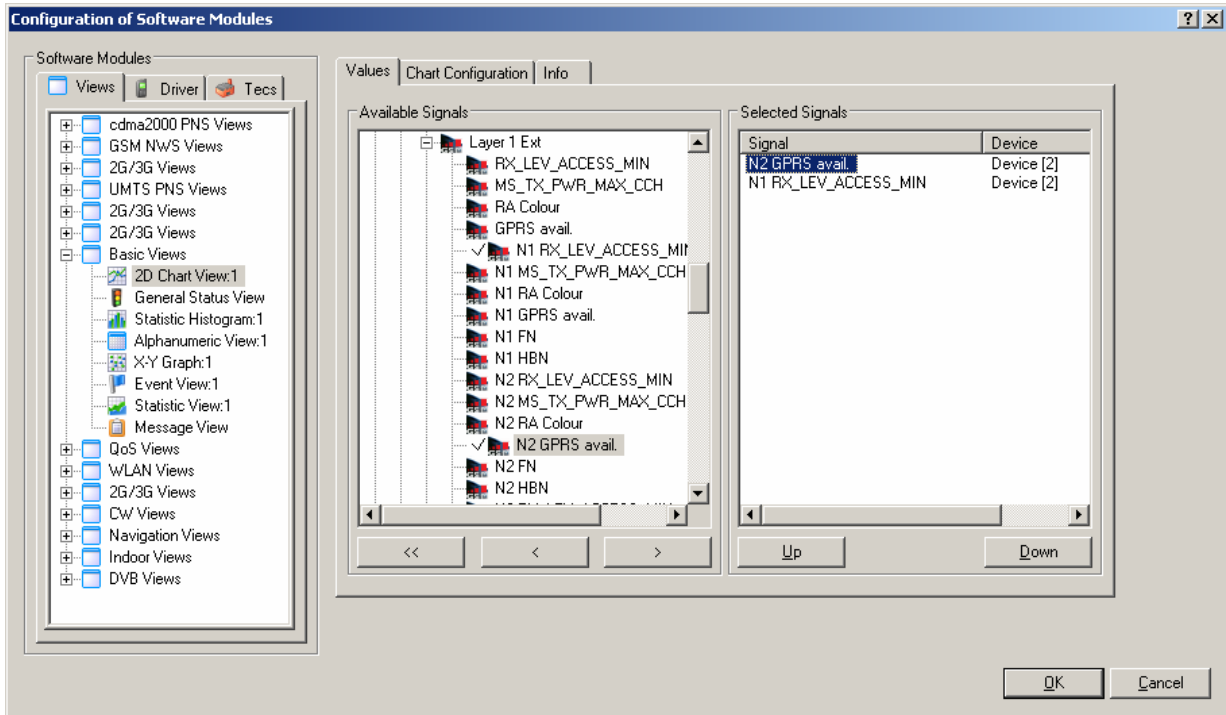


Fig. 3–14 Configuration of Software Modules – Views

The *Configuration of Software Modules* menu is divided into three tabs:

Views

The *Views* tab configures the different types of views used to visualize the measurement data. The data structure is generally shown in a tree view (*Available Signals*; for an explanation of data selection in trees refer to chapter 1, Data Selection) from which one or several nodes can be selected (*Selected Signals*). Alternatively, some classes of output parameters can be selected from lists. The view configuration menus are also accessible from the individual view menus (click the right mouse button and select *Configure...* from the popup window). They are explained in chapter 4, Section Display and Evaluation of Results together with the corresponding view windows.

Driver

The *Driver* tab shows the configuration of the different hardware drivers installed. It is identical with the *Serial Port Driver Info* tab of the driver configuration menus described in chapter 6. If no hardware drivers are installed, the menu is empty.

Tecs

The *Tecs* tab displays information on the installed technology modules. Besides, the *Tecs* tabs for several technologies contain particular configuration panels that are described in the following sections.

TEC for GSM/UMTS/CDMA Test Mobiles

The GSM, UMTS, and CDMA technologies each use a *BTS/Node B List Data Base* which can be loaded and modified in the corresponding panel as soon as one of the entries *TEC for GSM*, *TEC for UMTS Test Mobiles* or *TEC for CDMA* is selected. The data bases are completely independent from each other so that different measurements can be performed simultaneously using separate databases.

BTS/Node B data-bases

A BTS or Node B database contains the operator list (BTS list) including all information about the sectors and base stations in a particular area provided by the network operator. This information can be used in several view types; see e.g. description of *GSM Measurement Report View*, *GSM Frequency Hopping View*, *GSM Handover View*, *Alphanumeric View*, *Route Track View* in chapter 4.

TEC for GSM NWS

Clicking *TEC for GSM NWS* on the *ROMES Configuration – Preferences – Available Technologies* tab opens a panel with three tabs for the GSM NWS Top N Settings, the GSM NWS Scan Signal Settings, and for GSM NWS driver Info.

Note:

The *TEC for GSM NWS* tabs are also accessible from the *Configuration – Settings* menu.

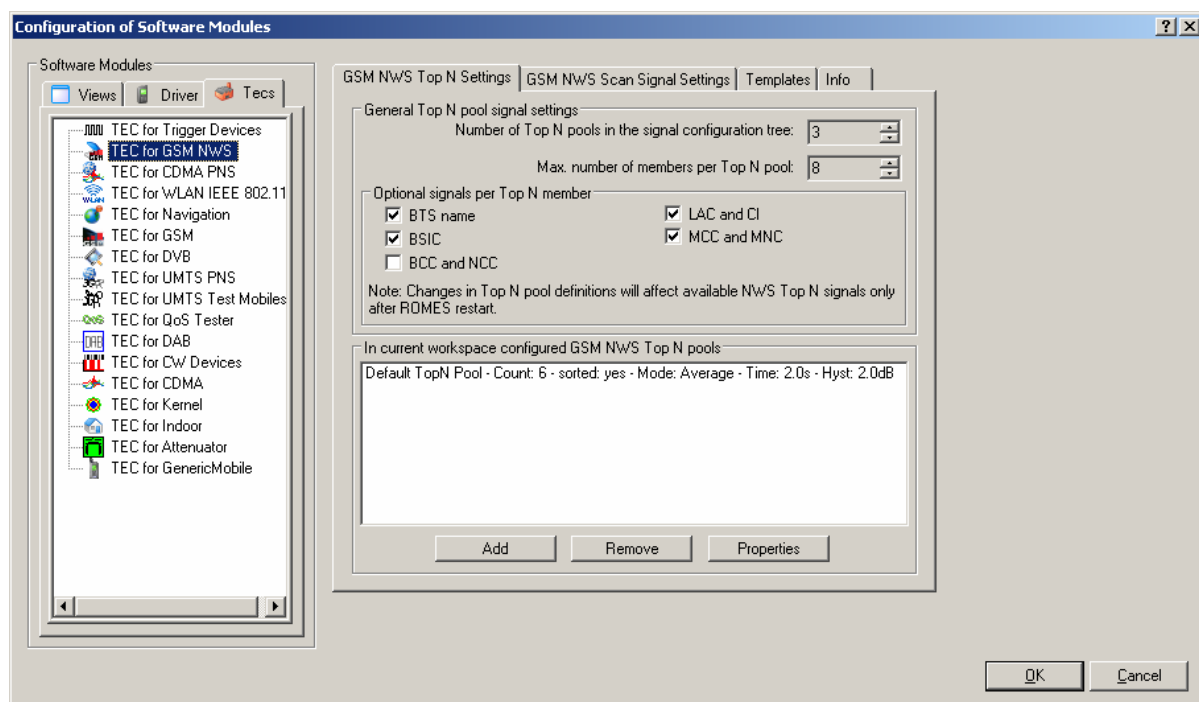


Fig. 3–15 Configuration of Software Modules – TEC for GSM NWS

GSM NWS Top N Settings

The *GSM NWS Top N Settings* tab is divided in an upper panel (*General Top N pool signal settings*) to set preferences for the General Top N pool signals and a lower panel (*In current workspace configured GSM NWS Top N pools*) to administrate the Top N pools of the current workspace.

General Top N pool signal settings

The changes in Top N pool definitions made on this panel will affect available NWS Top N signals only after R&S ROMES is restarted:

Number of Top N pools in the signal configuration tree

Defines the maximum number of Top N pools in the list of Available Signals (see section [Signal Configuration](#) on p. 3.61 ff.).

Max. Number of members per Top N pool

Defines the maximum members per pool in the list of Available Signals (see section [Signal Configuration](#) on p. 3.61 ff.).

Optional signals per Top N member

BTS Name

Name of the BTS, taken from the GSM BTS database (if available).

BSIC

Base transceiver station (BTS) identity code. In this view, the BSIC is always octal (so that BSIC = ab where a is the NCC and b is the BCC), irrespective of the format selected in the Available Signals tab of the Preferences menu (octal/decimal/hex).

BCC and NCC

BTS Color Code (BCC) and Network Color Code (NCC)

LAC and CI

Location Area Code (LAC) and Cell Identity (CI)

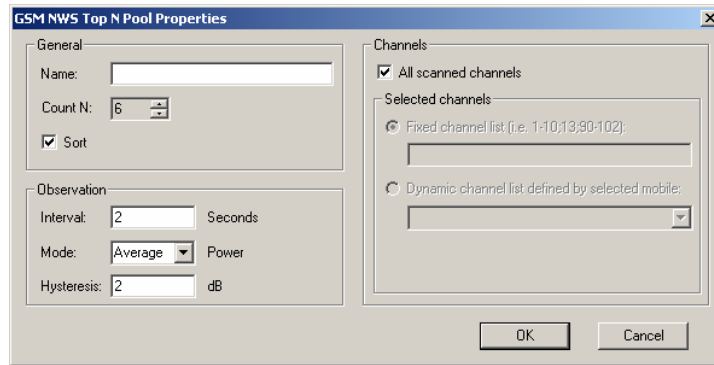
MCC and MNC

Mobile Country Code (MCC) and Mobile Network Code (MNC)

In current workspace configured GSM NWS Top N pools

This panel shows a list box with the GSM MWS Top N pools configured in the current workspace. The Top N pool list can be amended using the *Add* button, list items can be deleted using the *Remove* button, and the list entry properties can be viewed or modified using the *Properties* button:

Add Adds a user-defined Top N pools in the list of *Available Signals* (see section [Signal Configuration](#) on p. 3.61 ff.).



The *Add* dialog contains the following panels:

General

- Name* Name of the GSM NWS Top N pool.
- Count N* Number of pool elements (range 1 to 16). The display of pool elements in the in the list of *Available Signals* is limited to the *Max. Number of members per Top N pool*.
- Sort* If this is checked, the initial Top N View list is sorted by the averaged measured signal power during the observation in the Top N pool.

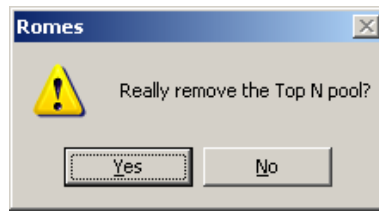
Observation

- Interval* Measurement interval in seconds (range 0 to 300)
- Mode* The measured power value defines the sort order for the Top N View. The sort mode can be set to Average/Max./Min.power values, which is not shown in the Top N View.
- Hysteresis* The hysteresis parameter (in dB) is used for FDD cells if the quality measure for cell selection and reselection is set to CPICH Ec/No.

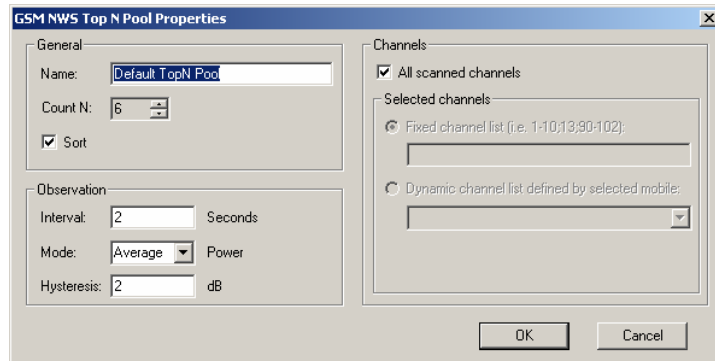
Channels / Selected Channels

- A list of RF channels to be displayed in the Top N list can be entered manually. In the channel list the absolute RF channel numbers are placed in increasing order of ARFCN.
- All scanned channels* All scanned BCCH channels are displayed in the Top N list.
- Selected channels* *Fixed Channel list* allows the manual entry of the RF channel numbers to be displayed in the Top N list. The channels or channel ranges for the scan signals are set separated by commas (e.g. 1-10,13,90-102)
- Dynamic channel list defined by selected mobile:* The displayed channels are defined by the configured test mobile.

Remove Deletes the selected GSM NWS Top N pool from the list, after the following dialog is confirmed.



Properties Allows the modification of the properties for the selected Top N pool.



The *Properties* dialog contains the same panels as the *Add* dialog, all field descriptions are defined there:

GSM NWS Scan Signal Settings

The *GSM NWS Scan Signal Settings* tab is divided into four panels (*General*, *Optional Signals per channel*, *Optional signals (per measurement station)*, and *Channel assignment*) to administrate the scan signal settings of the current workspace.

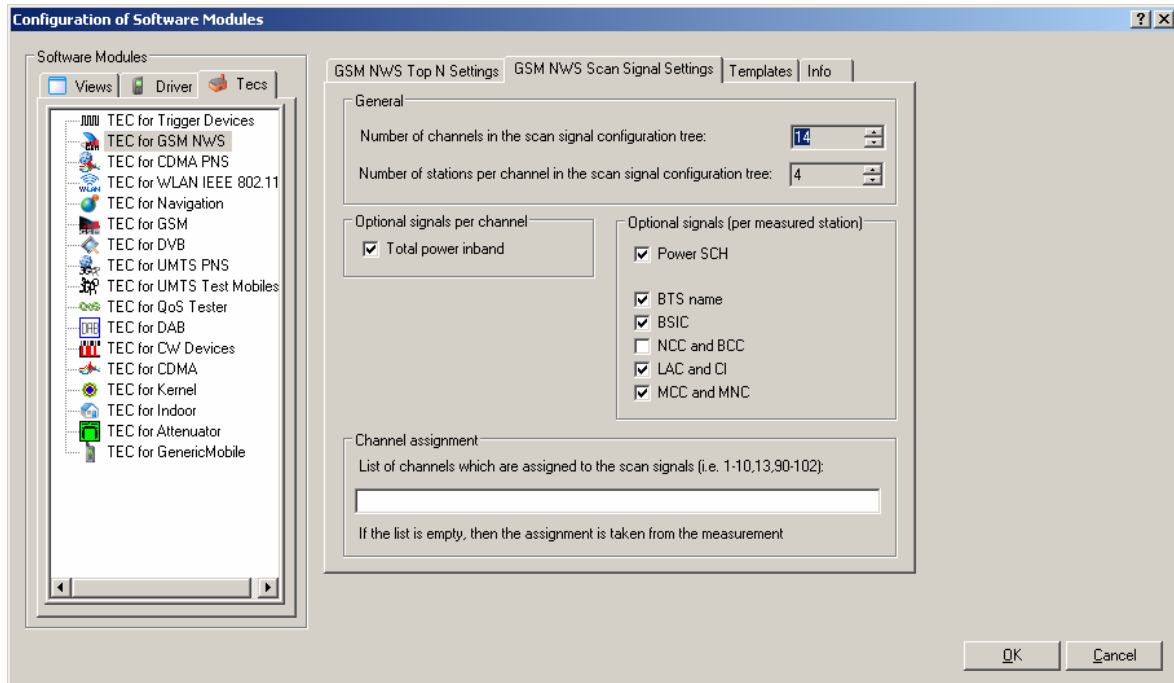


Fig. 3–16 Configuration of Software Modules – TEC for GSM NWS

General panel

The changes in scan signal settings made on this panel will affect available NWS scan signals only after R&S ROMES is restarted:

Number of channels in the scan signal configuration tree

Defines the maximum number of channels in the list of *Available Signals* (see section [Signal Configuration](#) on p. 3.61 ff.).

Number of stations per channel in the scan signal configuration tree

Defines the maximum number of stations per channel. This is e.g. the case if several stations are found on a given channel, a default of 4 stations can be shown by parameters.

Optional signals per channel panel

Total power inband

Total inband power (if available).

Optional signals (per measurement station) panel

Power SCH

Code power of the SCH (Synchronization Channel)

BTS Name

Name of the BTS, taken from the GSM BTS database (if available).

BSIC

Base transceiver station (BTS) identity code. In this view, the BSIC is always octal (so that BSIC = ab where a is the NCC and b is the BCC), irrespective of the format selected in the Available Signals tab of the Preferences menu (octal/decimal/hex).

NCC and BCC

BTS Color Code (BCC) and Network Color Code (NCC).

LAC and CI

Location Area Code (LAC) and Cell Identity (CI)

MCC and MNC

Mobile Country Code (MCC) and Mobile Network Code (MNC)

Channel assignment

This panel allows to enter a list of channels which are assigned to the scan signals. After assignment, e.g. 16 signal parameters are available for each channel in the tree view. If the channel assignment field is left blank, these are assigned to the first 16 found channels at run-time (e.g. 1, 2, 3, ..., 16 for GSM900 or 512, 513, 514, ... for GSM1800). The channel assignment fields or channel ranges for the scan signals are set, separated by commas (e.g. 1-10,13,90-95). If the channel assignment field is filled, the available signal parameters are assigned to the entered channels. The signal parameters can be displayed in the *Alphanumeric View*, for example.

Templates tab

The *Templates* tab is divided in an upper panel (*Available Templates*) to load or delete a user-defined template for the TEC for GSM NWS and a lower panel (*Save current settings as Template*) which allows the entry of a brief template description before saving the current settings defined in the TEC for GSM NWS tabs.

The *Save* button opens a *Save As...* dialog for the template file.

Info tab

The *Info* tab is divided in an upper panel (*Custom Name*) to set a user-defined name of the TEC for GSM NWS and a lower panel (*File Version*) which shows the GSM TEC for GSM NWS link library properties.

The *Info* panel shows file information of the dynamic link library which implements the selected TEC.

The *Info* tab includes the *Custom Name* field, which has no function in a view context. It is only useful in a driver context, where different connected devices can be associated with different custom names, e.g. for separate mobiles in different networks, or when simultaneously operated mobiles perform different tasks.

TEC for CDMA PNS

Clicking *TEC for CDMA PNS* on the *ROMES Configuration – Preferences – Available Technologies* tab opens a panel with four tabs for the *CDMA PNS Top N Settings*, the *CDMA PNS Top N Settings in the Registry*, the *Templates*, and for *CDMA PNS driver Info*.

Note:

The TEC for CDMA PNS tabs are also accessible from the Configuration – Settings menu.

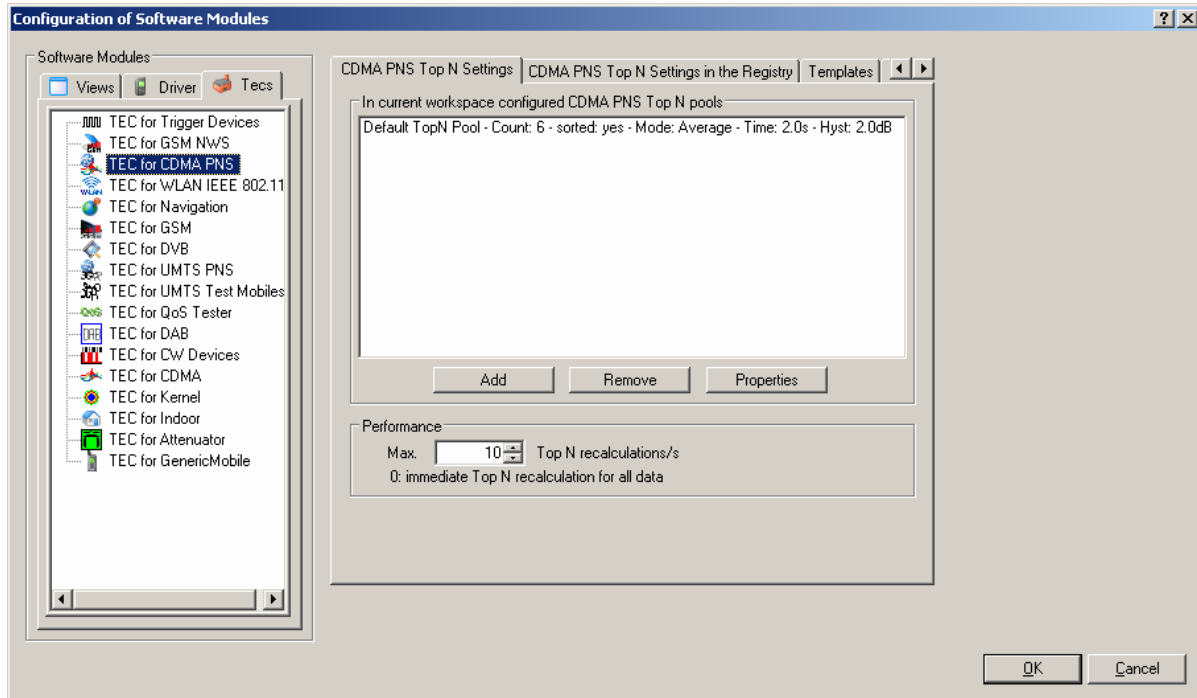


Fig. 3–17 Configuration of Software Modules – TEC for CDMA PNS

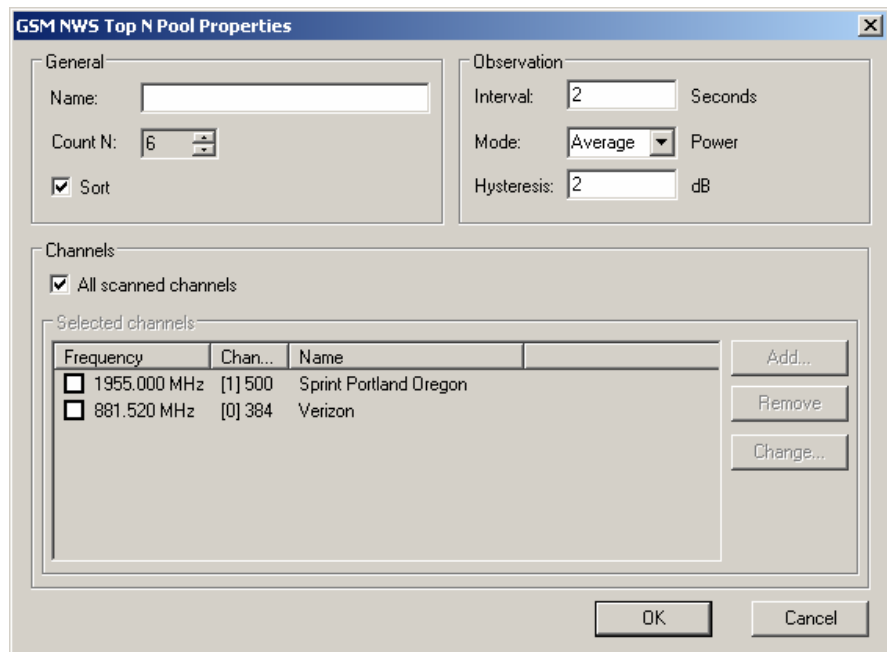
CDMA PNS Top N Settings

The *CDMA PNS Top N Settings* tab is divided in an upper panel (*In current workspace configured CDMA PNS Top N pools*) to administrate the Top N pools of the current workspace and a lower panel (*Performance*) to set the number of Top N recalculations per second.

In current workspace configured CDMA PNS Top N pools

This panel shows a list box with the CDMA PNS Top N pools configured in the current workspace. The Top N pool list can be amended using the *Add* button, list items can be deleted using the *Remove* button, and the list entry properties can be viewed or modified using the *Properties* button:

Add Adds user-defined Top N pools in the list of *Available Signals* (see section *Signal Configuration* on p. 3.61 ff.).



The *Add* dialog contains the following panels:

General

- Name* Name of the CDMA PNS Top N pool.
- Count N* Number of pool elements (range 1 to 16). The display of pool elements in the in the list of *Available Signals* is limited to the *Max. Number of members per Top N pool*.
- Sort* If this is checked, the initial Top N View list is sorted by the averaged measured signal power during the observation in the Top N pool.

Observation

- Interval* Measurement interval in seconds (range 0 to 300)
- Mode* The measured power value defines the sort order for the Top N View. The sort mode can be set to Average/Max./Min.power values, which is not shown in the Top N View.

Hysteresis The hysteresis parameter (in dB) is used for FDD cells if the quality measure for cell selection and reselection is set to CPICH Ec/No.

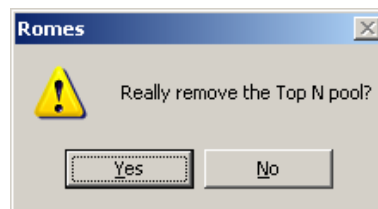
Channels / Selected Channels A list of RF channels to be displayed in the Top N list can be entered manually. In the channel list the absolute RF channel numbers are placed in increasing order of ARFCN.

All scanned channels All scanned BCCH channels are displayed in the Top N list.

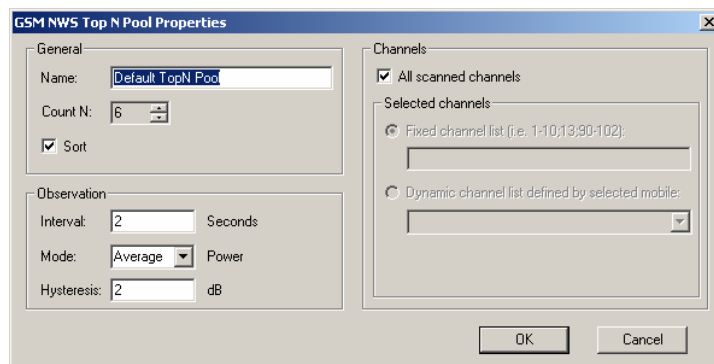
Selected channels *Fixed Channel list* allows the manual entry of the RF channel numbers to be displayed in the Top N list. The channels or channel ranges for the scan signals are set separated by commas (e.g. 1-10,13,90-102)

Dynamic channel list defined by selected mobile: The displayed channels are defined by the configured test mobile.

Remove Deletes the selected GSM NWS Top N pool from the list, after the following dialog is confirmed.



Properties Allows the modification of the properties for the selected Top N pool.



The *Properties* dialog contains the same panels as the *Add* dialog, all field descriptions are defined there:

CDMA PNS Top N Settings in the Registry

The *GSM NWS Scan Signal Settings* tab is divided into four panels (*General*, *Optional Signals per channel*, *Optional signals (per measurement station)*, and *Channel assignment*) to administrate the scan signal settings of the current workspace.

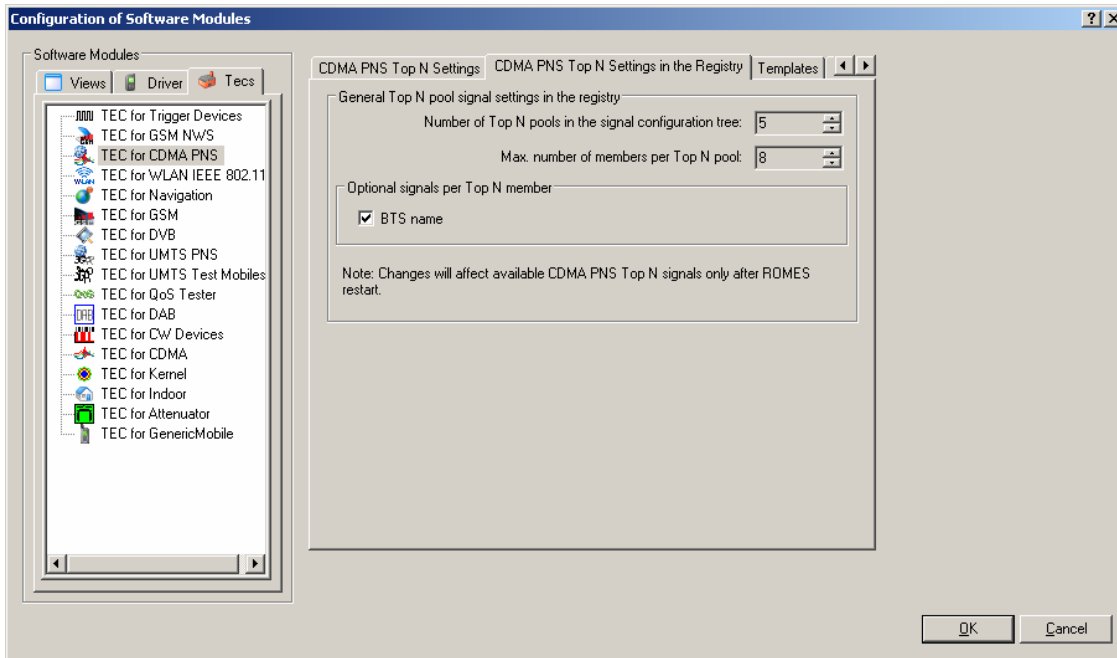


Fig. 3–18 Configuration of Software Modules – CDMA PNS Top N

General panel

Number of Top N pools in the signal configuration tree

Defines the maximum number of Top N pools in the list of *Available Signals* (see section *Signal Configuration* on p. 3.61 ff.).

Number of members per Top N pool

Defines the maximum number of members per pools in the list of *Available Signals* (see section *Signal Configuration* on p. 3.61 ff.).

Optional signals per Top N member panel

BTS Name

Name of the BTS, taken from the GSM BTS database (if available).

Templates tab

The *Templates* tab is divided in an upper panel (*Available Templates*) to load or delete a user-defined template for the TEC for CDMA PNS and a lower panel (*Save current settings as Template*) which allows the entry of a brief template description before saving the current settings defined in the TEC for CDMA PNS tabs.

The *Save* button opens a *Save As...* dialog for the template file.

Info tab

The *Info tab* is divided in an upper panel (*Custom Name*) to set a user-defined name of the TEC for CDMA PNS and a lower panel (*File Version*) which shows the TEC for CDMA PNS link library properties.

The *Info* panel shows file information of the dynamic link library which implements the selected TEC.

The *Info tab* includes the *Custom Name* field, which has no function in a view context. It is only useful in a driver context, where different connected devices can be associated with different custom names, e.g. for separate mobiles in different networks, or when simultaneously operated mobiles perform different tasks.

GSM Technology

Clicking *TEC for GSM* opens the *GSM BTS List Database* tab to create, select or modify the GSM BTS database, and to extend it by adding files.

The information of the GSM BTS data base must be stored in a .ndb (network data base) file to be used internally. Data from the .ndb file can be exported to an ASCII BTS list file (*.txt); on the other hand it is possible to import BTS data from BTS list files in one of the formats (*.txt, *.atd) described in chapter 7.

Note:

The GSM BTS List Database tab is also accessible from the Database – GSM BTS Database menu.

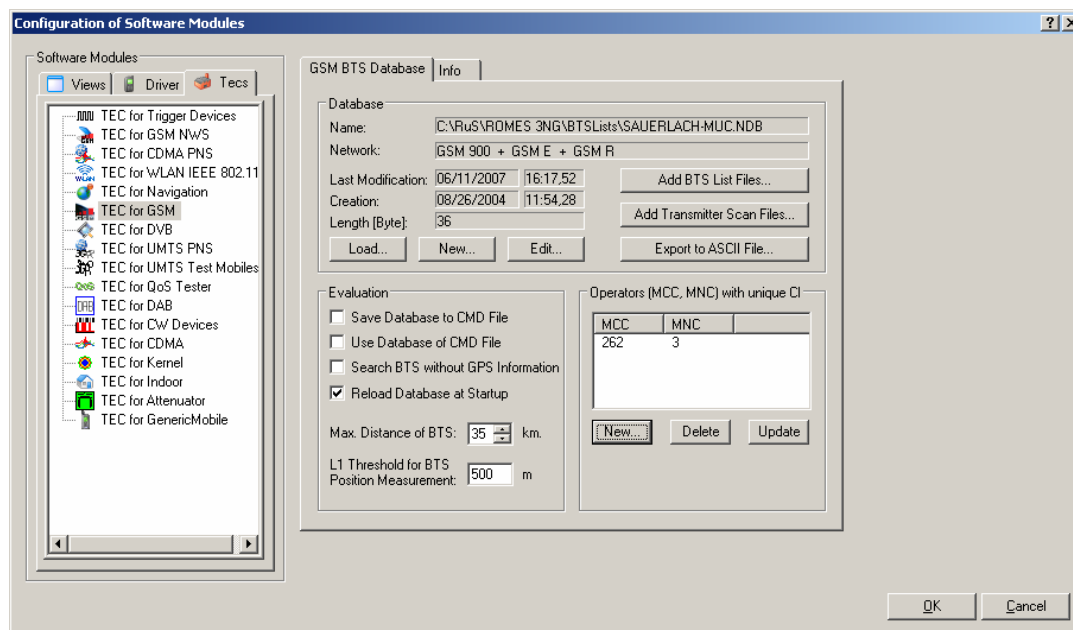


Fig. 3–19 Configuration of Software Modules – TEC for GSM

Creating a Database File

To create a new database file (*.ndb),

- In the *Database* panel, click *New* to open the *Create Database* dialog.
- Select your network from the *Network* pull-down list. For data bases containing both GSM900 and GSM1800 base stations, select *GSM Dualband*.

The selected network acts as a filter when the BTS data is imported into the data base file. If a particular GSM band is selected, data from all other bands will not be imported into the data base.

- Select a directory and enter a file name. The extension *.ndb will be appended automatically.
- Click *Open* to create the file and close the *Create Database* dialog.

See also [Importing a BTS List File into the Data Base](#) below.

Importing a BTS List File into the Data Base

To import an existing BTS list file (*.atd, *.buf, *.txt, *.vig) into the data base,

- Ensure that an empty or non-empty data base file (*.ndb) is available or create a *.ndb file (see [Creating a Database File](#)).
- If your BTS list file contains valid MCC and MNC information go to item no. 4. Otherwise click *New* in the Operators (MCC, NCC) with unique CI panel to open the *Add Network...* dialog box and enter your Mobile Country Code (MCC, e.g 262 for Germany) and Mobile Network Code (MNC). Click *OK* to confirm your entries and close the dialog box.
- Click *Update* to confirm the new entries and update the *MCC/MNC* list.
- In the *Database* panel, click *Add BTS List Files...*
- In the message box *Do you want to create a new database?* opened, click *No*.
- In the file selection dialog opened, select the BTS list file. If your BTS list file contains valid MCC and MNC information go to item no. 7. Otherwise check the *MCC* and *MNC* boxes and enter your MCC and MNC into the input fields.
- Click *Open* import the BTS list file.

The file import is terminated after you confirm the *BTS list successfully imported* message box. The new data extends the previous data base file.

Database Management

Database

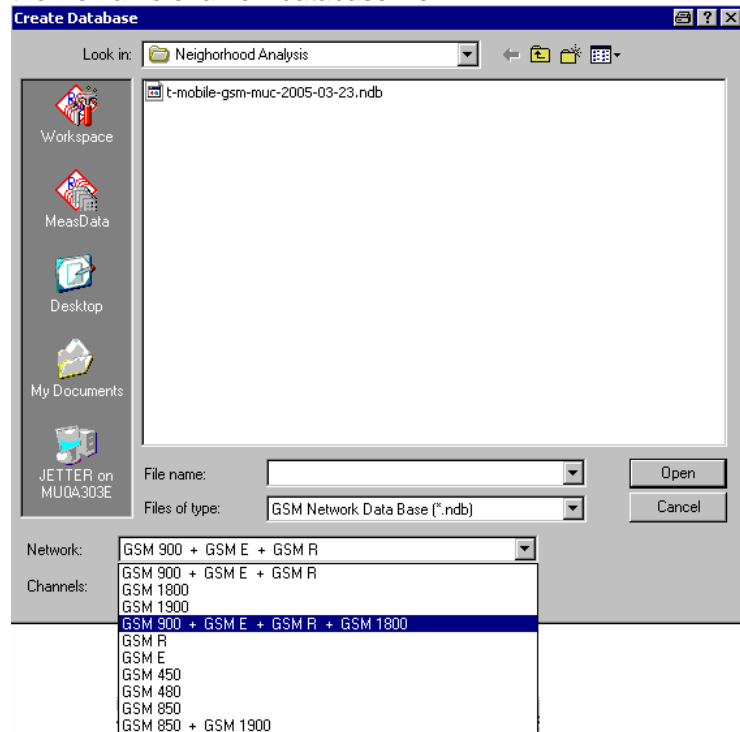
The *Database* panel shows the current *.ndb (network database) file with its properties and contains buttons to load, create or modify *.ndb files.

Load

Opens a dialog to select an existing database (*.ndb) file.

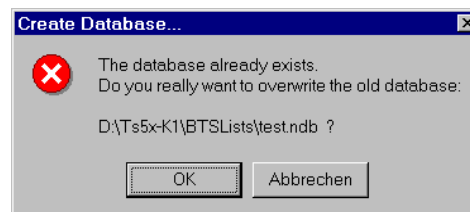
New

Opens a *Create Database* dialog to select a directory and define the file name of a new database file.



The Network pull-down list defines the GSM hyperband for the created BTS data base file. Band selection acts as a filter: BTSs from other bands will not be imported into the data base. Therefore, for data bases containing both GSM900 and GSM1800 base stations, GSM 900 +GSM E + GSM R + GSM 1800 must be selected.

Open creates the new (empty) data base file and closes the Create Database dialog. If the selected data base file already exists in the directory, R&S ROMES displays a message box:



OK deletes all entries in the old data base file and closes the message box. Cancel closes the box without overwriting the old data base file.

Edit

Opens the *BTS List Editor* dialog to modify the entries in the current data base file; see description on p. 3.94.

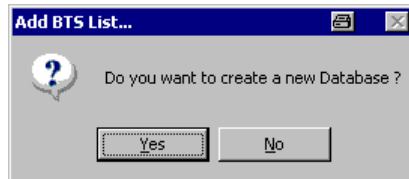
Database – Importing/Exporting data

The three buttons on the right side of the *Database* panel import data from a file into the data base or export the information stored in the data base to a file.

Add BTS List Files

Add BTS List Files

Imports data from an existing BTS list file into the BTS data base. Clicking the button first opens a message box:

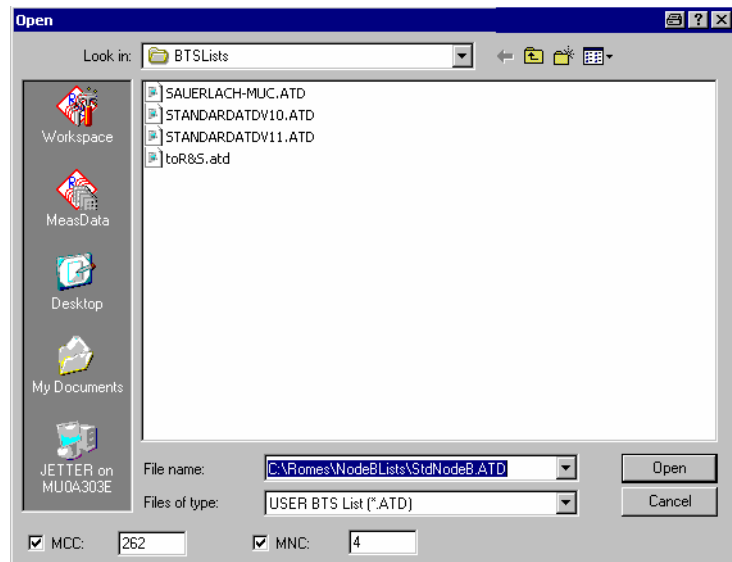


Yes

Opens the *Create Database* dialog to create a new *.ndb file (see above).

No

Opens a dialog to select the BTS list file to be imported and specify filter conditions:



Files of Type

Pull-down list providing all supported data formats for BTS list files (*.atd, *.buf, *.txt, *.vig; see description of data formats in chapter 7).

MCC/MNC

Check boxes with associated input fields assigning a specific Mobile Country Code (MCC) and Mobile Network Code (MNC) to the imported BTS data. They must be checked unless the MCC and MNC information is explicitly included in the BTS list file. In this case the MCC and MNC values must correspond to one of the MCC/MNC pairs defined in the Operators (MCC, MNC)... panel; see below.

Open

Starts the import of data from the selected file. An error message may be displayed if

- The imported file contains a syntax error (see chapter 7)
- The MCC/MNC is missing or invalid; see Operators (MCC, MNC)... panel below

Otherwise a message indicates that the BTS list was successfully imported.

Adding or replacing BTS sectors

When a BTS list is imported into an existing data base, base stations that are already included in the data base are replaced, and new base stations are added to the data base. Two BTSs are considered to be identical if both their geographical position and the clock codes of their sectors match. For more information see section *BTS List Formats* in chapter 7.

Add Transmitter Scan Files

Add a file containing data acquired within the framework of a transmitter scan data).

This feature can be used to include TS files taken by another measurement system or to add former TS data with improved position estimates to the database, see *L1 Threshold for BTS Position Measurement* below. The added TS-file is displayed in the *Message View* window (see section *Basic Views* in chapter 4).

Export to ASCII File

Exports all data in the current data base (*.ndb) file to an ASCII BTS list file (*.txt) including a header describing the different columns and additional columns (e.g. MCC/MNC) generated when the data base file was created or edited. This additional information means that the two actions *Add BTS List Files...* and *Export to ASCII File* are not simply inverse to each other.

Evaluation

The *Evaluation* panel specifies how R&S ROMES exploits the information in the GSM BTS data base during a measurement or replay. All settings come into effect when the next measurement is started using the *Measurement – Start Measurement* command.

Save Database to RSCMD File

The current BTS data base is included into the measurement file (*.cmd or *.rscmd) created for the next measurement.

Use Database of RSCMD File

The next replay does not use the current BTS data base but the BTS information included in an existing measurement file (*.cmd or *.rscmd).

Search BTS without GPS information

In the default case where the option is deselected, R&S ROMES checks each BTS for valid GPS information (geographical coordinates) and omits all BTSs without GPS information from the data base. Otherwise, no GPS plausibility checks are carried out and all BTSs are included in the data base.

Reload Database at Startup

The current BTS data base is stored and automatically loaded when R&S ROMES is started for the next time. If the option is deselected, R&S ROMES starts without loading the data base.

Max. Distance of BTS

Assume that only BTSs within a definite radius around the measurement position have any influence. Excluding distant base stations saves processing time. The maximum GSM cell radius of approx. 35 km is a good estimate for the maximum distance.

L1 Threshold for BTS Position Measurement

Estimated accuracy of the BTS position determined in a Transmitter Scan. The BTS position is determined by the time delays of the T51 at different measurement locations. The calculation is based on an iterative algorithm which stops once the standard deviation of the position falls below the L1 Threshold ... The threshold must assume a value between 50 m and 1 km.

If the accuracy can not be reached with the current TS data, the position estimate is continued as soon as there are more data available, either during the same measurement or even in a later one. For that purpose the necessary TS data can be stored in the network database; see Add Transmitter Scan Files button above.

For enhanced performance during measurement it is recommended to use a larger L1 Threshold ... while the measurement is running. A better estimate of the position can then be obtained by adding the same TS file offline, using small values for the L1 Threshold ...

Operators (MCC, MNC) with unique CI

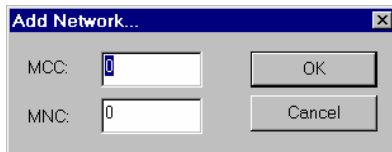
This panel defines pairs of Mobile Country Code (MCC) and Mobile Network Code (MNC) values to be assigned to the entries in the BTS data base. The values are imported into the data base together with the BTS list files; they are not needed for BTS list files that already contain MCC and MNC values.

The MCC and MNC are required to identify the base stations together with their Cell Identity (CI). The CI is usually unique within a country and a given network; however, providers assign the same CIs in different countries and networks. Only the combination of the CI, the MCC and the MNC is a unique identifier for any base station worldwide.

There are some exceptions where a CI occurs repeatedly within the same country and network. In those cases the Location Area Code (LAC) is required as a fourth identifier. This code number must be included in the BTS list file or entered in the BTS database by means of the *BTS List Editor* dialog; see p. 3.94.

New

Opens the Add Network... dialog box to define a new pair of MCC and MNC values:



OK closes the box and enters the two values in the MCC/MNC list. The list may contain several pairs of values.

Delete

Deletes a pair of values selected in the MCC/MNC list.

Update

Confirms the new entries and update the list: All MCC/MNC values are now available to be imported together with BTS list files.

BTS List Editor

The *BTS List Editor* dialog modifies the entries in the current GSM data base file. It is opened by means of the *Edit* button in the *GSM BTS List Database* tab.

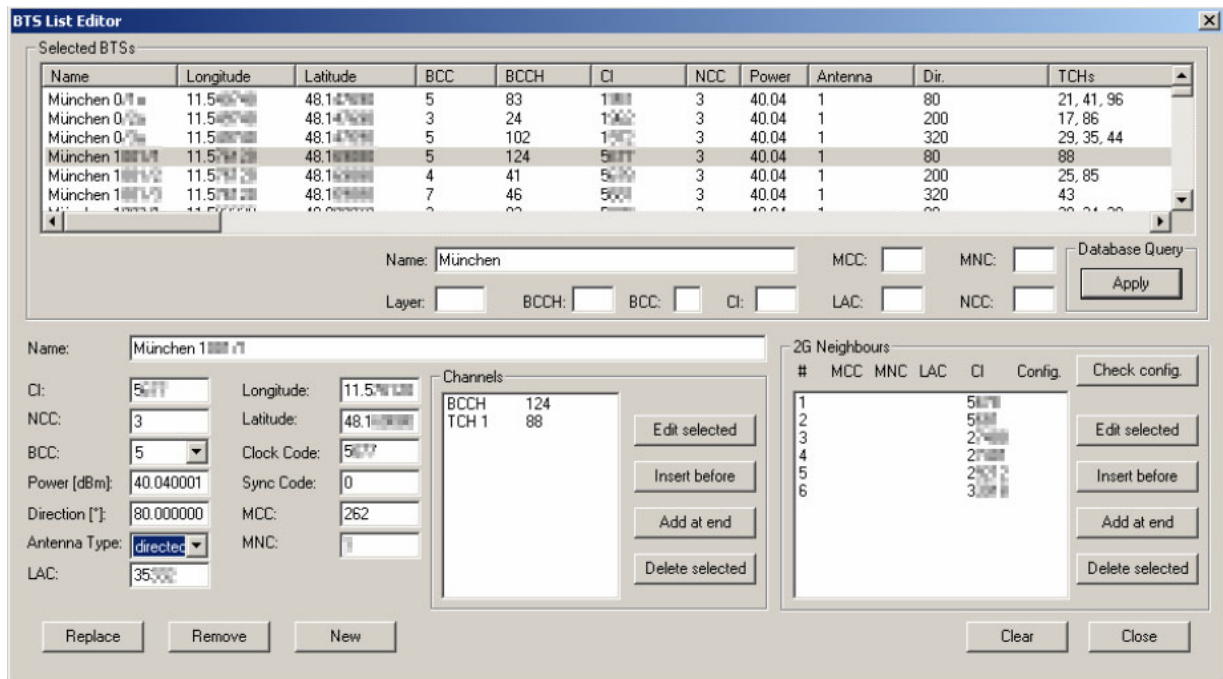


Fig. 3–20 BTS List Editor

The *BTS List Editor* is divided in an upper panel (*Selected BTSs*) to sort and select BTS sectors and a lower panel (*Edit BTS Sector*) to modify a particular entry.

Selected BTSs

The *Select BTSs* panel contains a table listing the base stations in the current data base file.

The input fields below the table restrict the BTS selection in the table to BTSs with a particular *Name*, *MCC*, *MNC* etc. or BTSs fulfilling a combination of filter conditions. With no entries made, all base stations in the current data base file are displayed. The *Apply* button in the *Database Query* area updates the contents of the table according to the current filter condition.

The table remains empty if no data base file is selected or if the current data base file contains no valid BTS sectors (e.g. because the import of a BTS list file failed).

Edit BTS Sector

The *Edit BTS Sector* panel modifies a particular sector (= table row) of the *Selected BTSs* table. Double-clicking the BTS sector copies it into the input fields in the *Edit BTS Sector* panel where the individual values can be edited. A dash "-" in an input field indicates that the parameter is currently undefined.

Replace

Copy the current BTS sector back into the *Selected BTSs* table. Sectors with identical clock code and position (lat./lon.) are internally grouped, such that a modification of the parameters latitude, longitude or clock code and then clicking "Replace" will modify all sectors of the group.

Remove

Removes the current BTS sector from the table. The action must be confirmed in a message box.

New

Copy the current BTS sector into the Selected BTSs table as a new BTS sector. If the parameters of the current BTS sector are inconsistent, the sector is not added to the data base but an error message is displayed in the in the *Message View* (see *Basic Views – Message View* in chapter 4).

Clear

Deletes all entries in the Edit BTS Sector panel.

Close

Close the BTS List Editor dialog.

UMTS Technology

Clicking *TEC for UMTS Test Mobiles* opens the *UMTS Node B List Database* tab to create, select or modify the UMTS Node B database, and to extend it by adding files.

The information of the UMTS Node B data base must be stored in a .nbdb (Node B data base) file to be used internally. Data from the .nbdb file can be exported to an ASCII BTS list file (*.txt); on the other hand it is possible to import Node B data from Node B list files in one of the formats (*.txt, *.atd, *.asc) described in chapter 7.

Note:

The *UMTS Node B List Database* tab is also accessible from the *Database – UMTS Node B Database* menu.

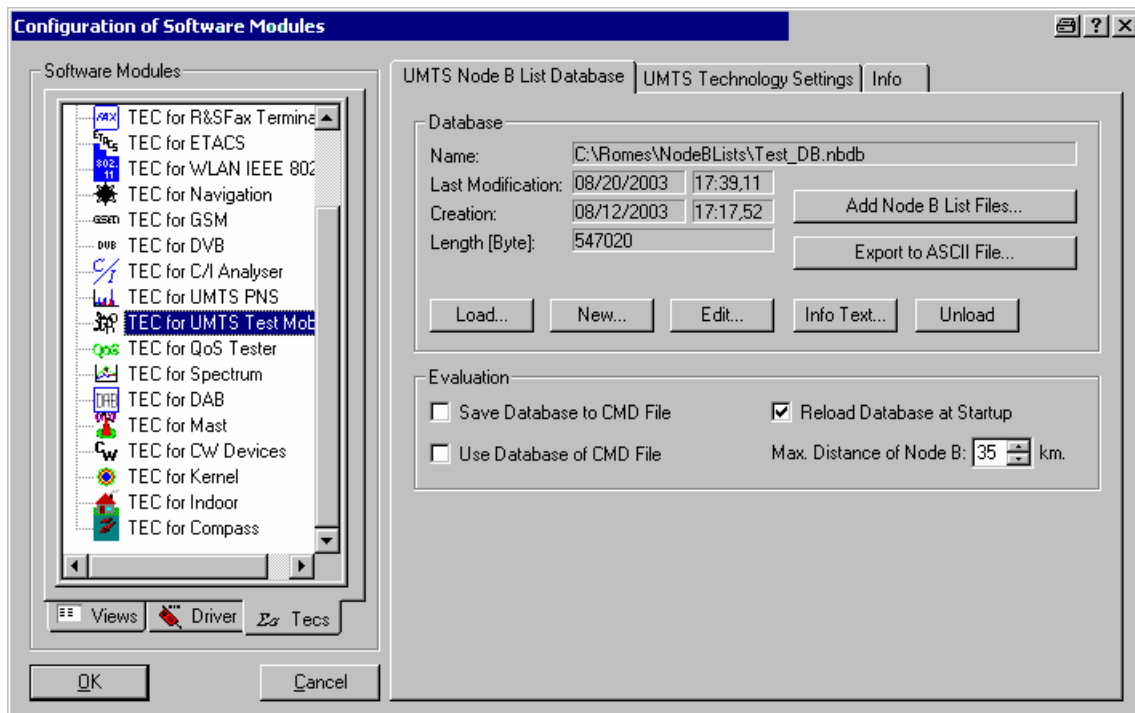


Fig. 3–21 TEC for UMTS Test Mobiles– Node B List Database

The data base is handled in analogy to the GSM data base described in section [Importing a BTS List File into the Data Base](#) on p. 3.88. In particular, the function of all controls in the *UMTS Node B List Database* dialog is identical to the corresponding GSM controls.

The *Info Text...* button opens a dialog to assign an alias text to the different parameters that characterize the Node Bs the columns in the *Tx Database Editor*; (see below) and to select them for the Node B info field in the UMTS layer of the *Route Track* view.

The Node B info field is displayed by clicking the hot zone around a Node B sector symbol in the *Route Track* view. The info field indicates all selected parameters with their alias names and current values.

Creating a Data Base File

To create a new data base file (*.nbdb),

- In the *Database* panel, click *New* to open the *Create Database* dialog.
- Select a directory and enter a file name. The extension *.nbdb will be appended automatically.
- Click *Open* to create the file and close the *Create Database* dialog.

See also [Importing a BTS List File into the Data Base](#) below.

Importing a Node B List File into the Data Base

To import an existing Node B list file (*.atd, *.buf, *.txt, *.vig) into the data base,

- Ensure that an empty or non-empty data base file (*.nbdb) is available or create a *.nbdb file (see [Creating a Data Base File](#)).
- In the *Database* panel, click *Add Node B Files...*
- In the file selection dialog opened, select the Node B list file.
- Click *Open* import the Node B list file.
- In the message box *Do you want to create a new database?* opened, click *No*.

The file import is terminated after you confirm the *Node B list successfully imported* message box. The new data extends the previous data base file.

Tx Database Editor

The *Tx Database Editor* dialog displays and modifies the entries in the current Node B list data base. It is opened by means of the *Edit* button in the *UMTS Node B List Database* tab.

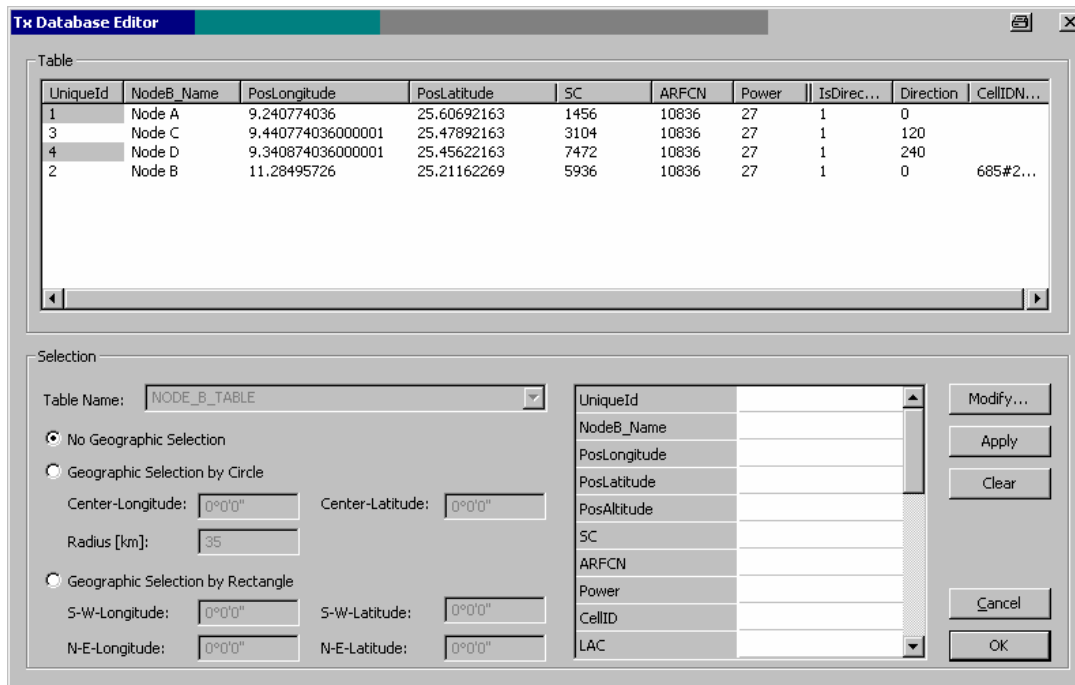


Fig. 3–22 Tx Database Editor

The *Tx Database Editor* is divided in an upper panel (*Table*) to sort and select Node B sectors and a lower panel (*Selection*) to modify a particular entry.

Table The table in the upper part of the dialog lists the Node B sectors in the current data base file. The format of the SC depends on the settings made in the *UMTS Technology Settings* tab (see p. 3.99).

The table remains empty if no data base file is selected or if the current data base file contains no valid Node B sectors (e.g. because the import of a Node B list file failed).

Selection The input fields below the table restrict the Node B selection in the table to Node Bs with a particular *UniqueID*, *NodeB:Name*, *PosLongitude* etc. or Node Bs in a particular geographic area. With no entries made, all Node Bs in the current data base file are displayed.

The buttons on the right side initiate the following actions:

Modify...

Open a dialog to edit the properties of the Node B selected in the upper table. The modifications update the Node B data base. As an alternative, it is possible to double click a line in the table.

Apply

Update the contents of the upper table according to the current filter condition.

Clear

Clear the current filter conditions.

Cancel

Discard all changes made and close the Tx Database Editor.

OK

Store all changes to the Node B data base and close the editor.

UMTS Technology Settings

The *UMTS Technology Settings* dialog defines the data format for the scrambling code. It is opened by means of the *Edit* button in the *GSM Node B List Database* tab.

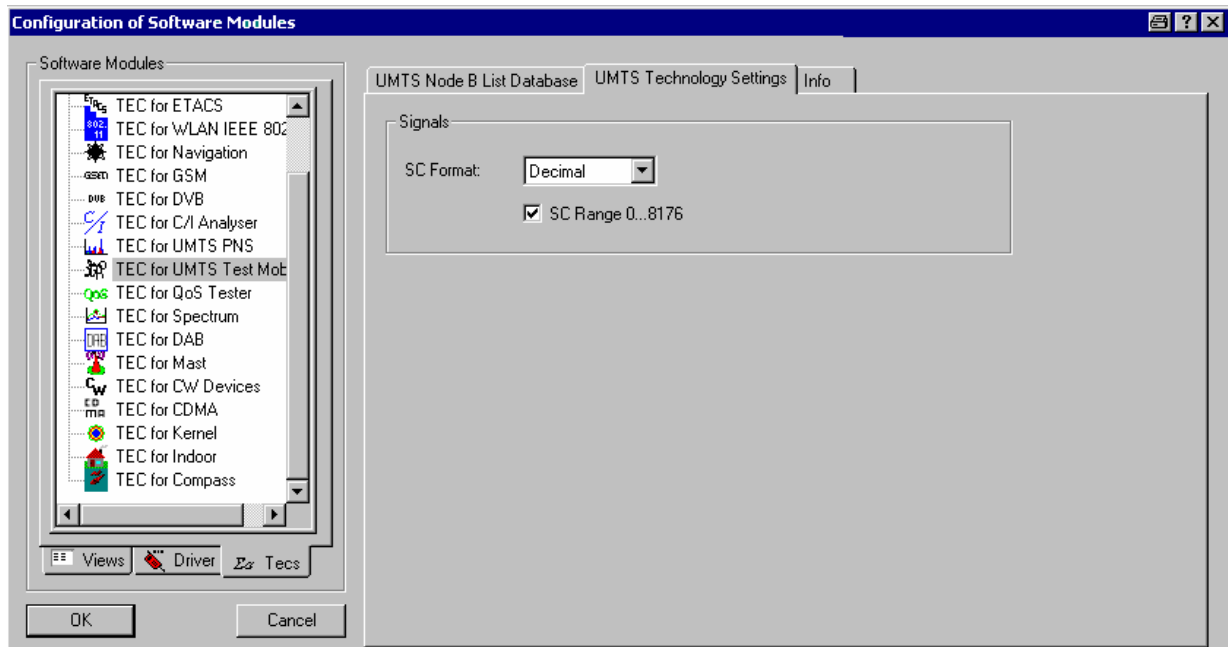


Fig. 3–23 TEC for UMTS Test Mobiles – UMTS Technology Settings

The settings are analogous to the settings in the *TEC for UMTS PNS* tab (see [SC Format](#) on p. 3.102), however, the SC format applies to the representation in the *Tx Database Editor*.

CDMA Technology

Clicking *TEC for CDMA* opens the *CDMA BTS List Database* tab to create, select or modify the *CDMA BTS List Database*, and to extend it by adding files.

The information of the *CDMA BTS List Database* must be stored in a *.cnadb* (CDMA data base) file to be used internally. Data from the *.cnadb* file can be exported to an ASCII BTS list file (*.txt); on the other hand it is possible to import Node B data from Node B list files in one of the formats (*.txt, *.atd, *asc) described in Chapter 7.

Note:

The CDMA BTS List Database tab is also accessible from the Database – CDMA BTS Database menu.

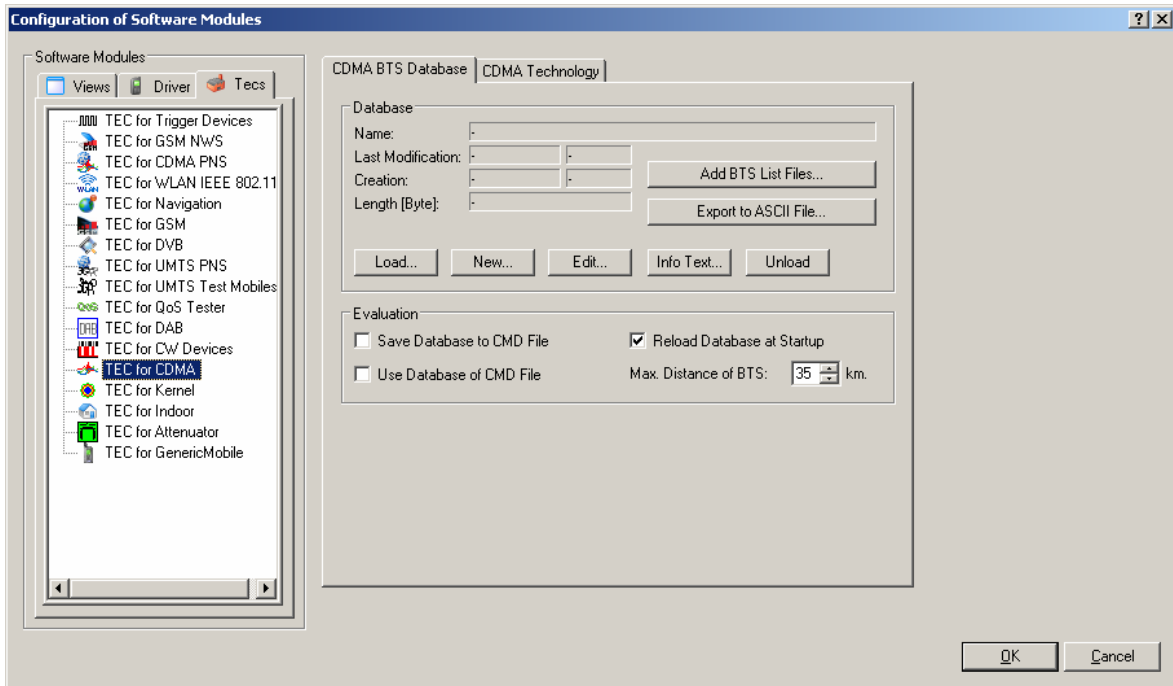


Fig. 3–24 TEC for CDMA – CDMA BTS List Database

The data base is handled in analogy to the UMTS data base described in section *UMTS Technology* on p. 3.96. In particular, the function of all controls in the *CDMA BTS List Database* dialog is identical to the corresponding UMTS controls.

TEC for UMTS PNS

The *UMTS Technology Settings* tab in the *TEC for UMTS PNS* dialog selects the number of signals that are displayed in the data trees and the data format of the scrambling code.

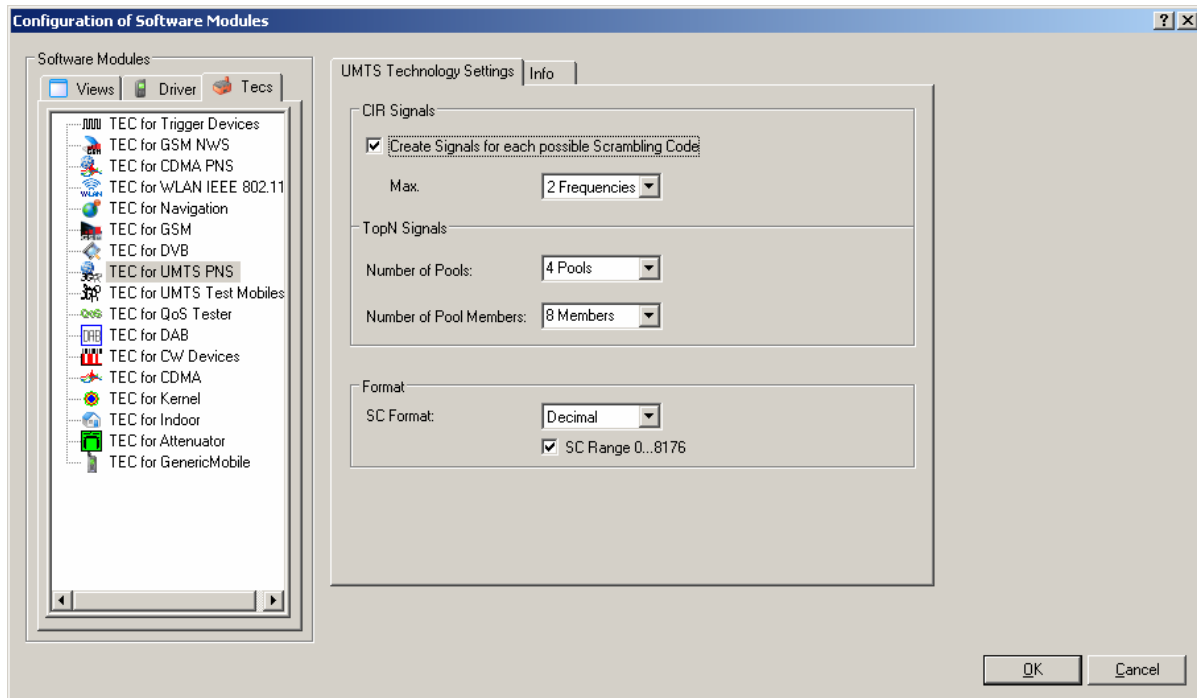


Fig. 3–25 Configuration of Software Modules – TEC for UMTS PNS

Create Signals for each Possible SC

If *Create Signals...* is checked, R&S ROMES creates a signal for each of the 512 Primary Scrambling Codes allowed for the downlink UMTS signal and for the number of frequencies selected in the *Max.* drop-down list. The number of created signals is $512 \cdot n$, where n denotes the selected number of frequencies.

The signals can be configured in the *Available Signals* tab of the *ROMES Configuration* menu (see p. 3.61 ff.) and analyzed in many generic views, e. g. the *2D Chart* view. The signals are displayed as follows:

Signal	Unit	Format	Exp. Min.	Exp. Max.
[-] CIR 0 [2. Freq.]				
[-] Ec/Io 0 [2. F., dB]	dB	---	-35.0	0.0
[-] SIR 0 [2. Fr..., dB]	dB	---	0.0	20.0
[-] RSCP 0 [2. ..., dBm]	dBm	---	-130.0	-40.0
[-] ISCP 0 [2. F..., dBm]	dBm	---	-130.0	-40.0
[-] P 0 [2. Freq..., dBm]	dBm	---	-130.0	-40.0
[+] CIR 16 [2. Freq.]				
[+] CIR 32 [2. Freq.]				
[+] CIR 48 [2. Freq.]				
[+] CIR 64 [2. Freq.]				

CIR stands for the Carrier to Interference Ratio and the numbers 0, 16, 32, ..., 8176 denote the SC. The signals are filled with data as soon as a measurement or replay session is started.

- To view signals conveniently, use the *Available Signals Drag & Drop* dialog described on p. 3.28.

Note:

To activate a changed signal configuration, ROMES must be closed and re-started.

Practical considerations

The number of signals leaves the test receiver driver configuration and the enabled options unchanged and therefore does not affect the measurement. In the replay session, however, a small number of displayed signals has several advantages:

- The data tree is easier to handle as unwanted signals are omitted.
- The performance is improved as less system resources are needed.

Omitting the CIR signals does not affect the functionality of the *UMTS PNS Views* described in Chapter 4.

Top N Signals

Defines the maximum no. of Top N pools and max. members per pool in the list of *Available Signals* (see section [Signal Configuration](#) on p. 3.61 ff.). the setting limits the signals that are available for display but has no impact on the Top N pools defined in the driver configuration menu.

SC Format

SC Format opens a drop-down list to select whether the Primary Scrambling Code in the signals and in the views (e. g. the *PNS CPICH View* described in Chapter 4) is displayed in decimal, octal, Hex small or Hex big format.

SC Range

According to standard 3GPP TS 35.213, the primary scrambling codes are numbered $n = 16 \cdot i$ ($i = 0$ to 512), whereas the $15 \cdot 512$ numbers $n = 16 \cdot i + k$ ($i = 0$ to 512 , $k = 1$ to 15) are reserved for the optional secondary scrambling codes. This convention is used if *SC Range 0 ... 8176* is checked.

In the alternative convention, the Primary Scrambling Codes numbers are divided by 16 and cover the range 0 to 511.

TEC for CW Devices

The *Number of Signals* panel in the *TEC for CW Devices* tab selects the number of CW test receiver signals that are displayed in the data trees (e.g. in the *Values* tab of the *2D Chart* configuration menu). This number leaves the test receiver driver configuration and the enabled options unchanged and therefore does not affect the measurement. In the replay session, however, a small number of displayed signals has several advantages:

- The data tree is easier to handle as unwanted signals are omitted.
- The performance is improved as less system resources are needed.

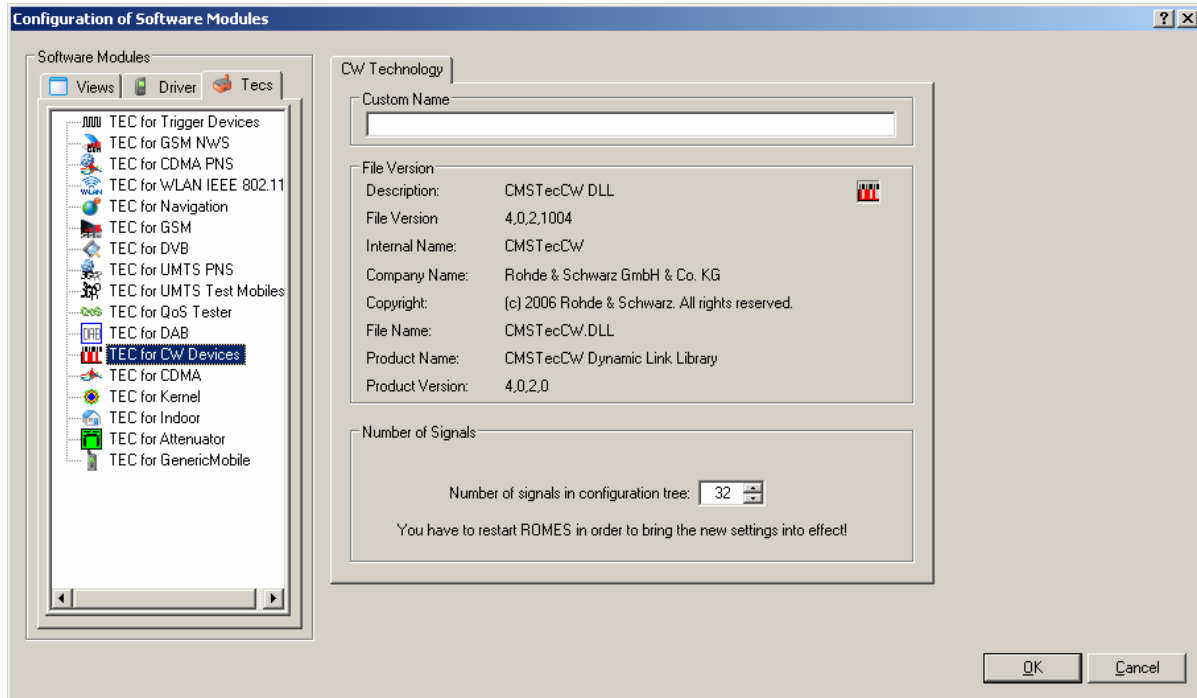


Fig. 3–26 Configuration of Software Modules – TEC for CW Devices

Measurement Menu

The *Measurement* menu starts and stops a measurement, starts and stops the replay of a measurement file and displays the list of event settings.

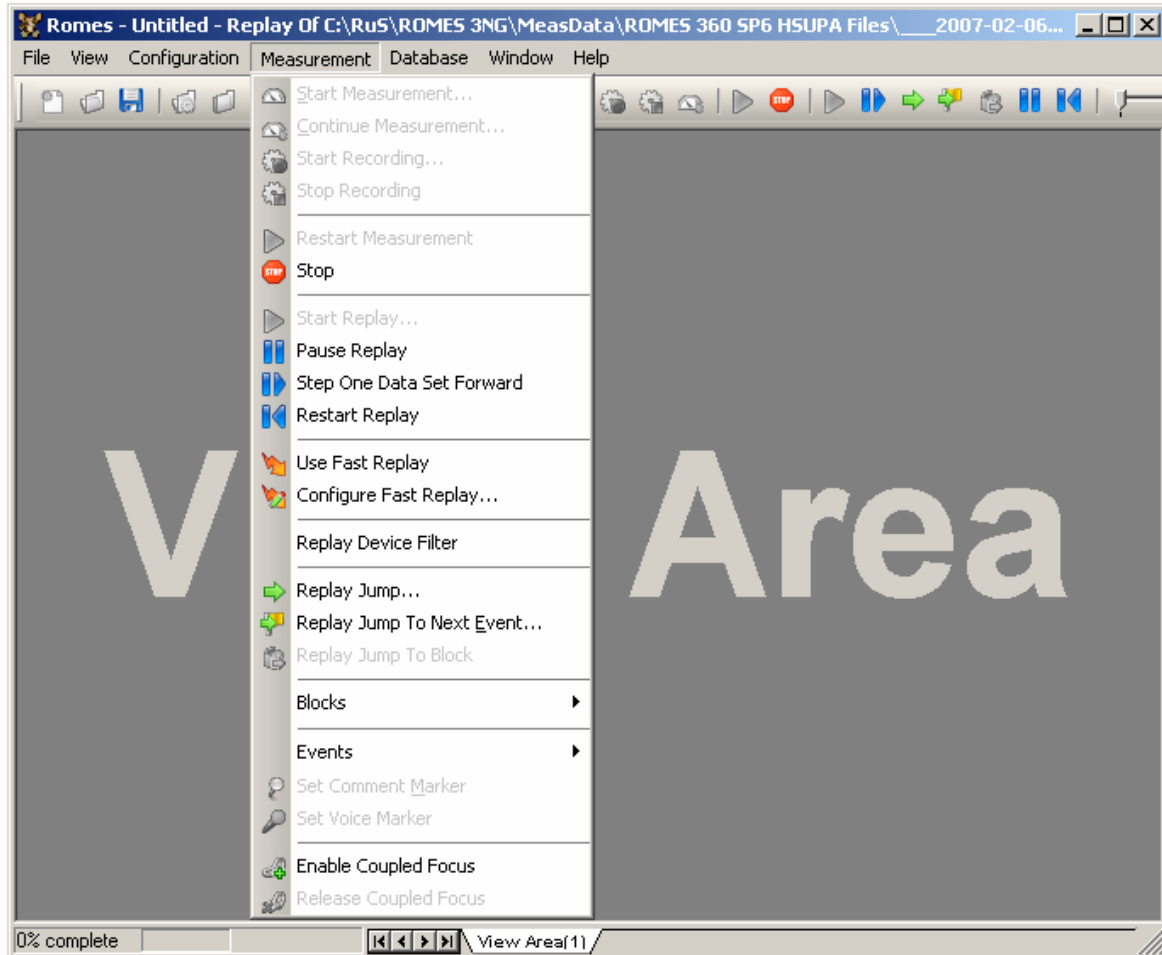


Fig. 3–27 Measurement menu

Start Measure- ment...



Starts the measurement without writing the data to a file.

A measurement can also be started with the *Start measurement* button on the measurement bar.

Note:

The Start Measurement command is disabled unless at least one device driver has been loaded using the Configuration – Hardware command.

Before the measurement starts, a temporary *measurement file* (extension *.rscmd or *.cmd) must be defined. To this end, the *Open* window (see *Open Workspace* command) pops up and offers a list of already existing data files.

- Select one of the existing files to overwrite previous measurement data.
- Define a new measurement file if you do not want to overwrite any existing data.
- Press the *Open* button to open the selected/defined file for writing and return to the measurement, which will now start immediately.

With a temporary *.rscmd (or *.cmd file) it is possible to switch over to *Recording* without delay while a measurement is running (see *Start Recording* command below). Otherwise, nothing is recorded and the temporary *.rscmd (or *.cmd) file will be deleted after the end of the measurement.

Continue Measurement...



Continues a measurement, adding the data to a measurement file created earlier.

A measurement can also be continued with the *Continue measurement* button on the measurement bar.

Note:

Continue Measurement is enabled irrespective of the current screen and driver configuration. ROMES performs all necessary settings using the workspace information stored in the measurement file.

Continue Measurement opens a standard *Save As* dialog to select an existing measurement file. The file must contain workspace settings, i.e. it must be created with a R&S ROMES version \geq V3.50. To prevent data loss a backup version of the selected file is created and kept until the continued measurement is stopped. The backup can be disabled in the *General* tab of the *ROMES Configuration* menu (see section [General Settings](#) on p. 3.57 ff.).

Start Recording



Starts the measurement (if not yet running) and writes the data to a measurement file so that a replay of the results is possible later.

Data recording can also be started the *Start recording* button on the measurement bar. A measurement file (not temporary this time) must be defined as explained in the *Start measurement* command.

Note:

The Start Recording command is disabled unless at least one device driver has been loaded using the Configuration – Hardware command.

Start Recording creates a new block in the measurement file; see *Replay Jump To Block* below.



For R&S ROMES versions \geq V3.50 the current workspace settings are stored with the measurement file. A workspace recorded in an *.rscmd (or *.cmd) file can be re-loaded using *Open Workspace* in the File menu.

Data recording rate:

The data recording rate depends on the number and kind of used devices and on the measurement settings.

Example:

A system with two GSM mobiles in Normal mode, using both the Autodial and NQA function, will roughly estimated generate 1 MB of data in about 20 minutes.

Note:

An exception is the time-triggered CW measurement recording raw data. Here, especially when only one channel is measured, the rate may rise up to 20 MB to 30 MB per hour. So take care of your disk storage capacity if you use a test receiver, and slow down the recording rate if possible without violating the test criterions - see also section Test receiver driver ESVx in chapter 6.

Measurement file

The *Start Recording* command overwrites the current measurement (*.cmd) file, i.e. the file opened via the *File – Open CMD File...* command (see section [File Menu](#) on page 3.6 ff). If no measurement file has been selected yet, the *Open CMD File..* command is executed first, i.e. an *Open* window is called up.

Stop Recording

Stops data recording without stopping the measurement.

Data recording can also be stopped with the *Stop recording* button on the measurement bar.

Stop Recording terminates the current block in the measurement file; see *Replay Jump To Block* below.

Restart Measurement

Stops the current measurement, requests the user-defined comment for the current measurement (if enabled) and the name for the new measurement *.cmd file, and then continues with the new measurement.

With long measurements, the risk of measurement data loss increases due to e.g. computer buffer problems. If a long measurement is split into several segments using the *Restart Measurement* function, the data loss is limited to the current measurement segment.

Stop

Stops the measurement and data recording or the replay.

An ongoing measurement or replay can also be stopped with the *Stop* button on the measurement bar.

If *Ask for Comment after the Measurement* is enabled in the *ROMES Configuration* dialog (see section [General Settings](#) on p. 3.57 ff.), a user-defined comment can be stored with the measurement file header.

Status of the measurement

The measurement bar indicates the current status of the measurement:

Measurement disabled

All icons except *Continue Measurement* are grayed. *Continue Measurement* works with previously defined workspace settings. For all other icons, you have to load and configure your device drivers first.

This status is always active after starting R&S ROMES.

Waiting for measurement

Buttons 1 and 2 are enabled because no measurement is running. Click one of these icons to start a measurement and/or recording.

Measurement without recording

The measurement is running, as button 1 is disabled. As button 2 is still active, no recording has started yet. You can either start recording or stop the measurement.

Recording data

Finally recording has started. Click button 3 to stop the recording or button 4 to stop recording *and* measurement.

Start Replay

Loads a measurement file and replays it on the screen.

The replay mode can also be started with the *Start Replay* button on the measurement bar. If *Show Replay Control Dialog Automatically...* is selected in the R&S ROMES Configuration dialog (see section [General Settings](#) on p. 3.57 ff.), *Replay* also opens the [Replay Control](#) dialog described on p. 3.25.

Hardware drivers

To replay a file, it is not necessary to load any device drivers. You only have to configure the desired views. The number of devices in the replayed file must not exceed the *Maximum Number of Devices* set in the [Advanced Settings](#) tab of the *ROMES Configuration* menu (see p. 3.72).

Measurement file

The *Replay* command replays the current measurement (*.cmd) file, i.e. the file opened via the *File – Open CMD File...* command (see section [File Menu](#) on page 3.6 ff). If no measurement file has been selected yet, the *Open CMD File...* command is executed first, i.e. an *Open* window is called up.

Note:

A replayed measurement file must not have the file attribute Read Only. To replay files from a CD-ROM the files must be copied to the hard disk or another appropriate medium and the file attributes must be changed.

Monitoring the replay process

Two different tools are indicated while the measurement file is replayed:

- In the measurement bar, next to the icons controlling the replay mode, the *Replay Speed* is indicated on a marker bar with an arrow symbol:



By default the measurement file is loaded at *Min* speed (arrow at the left end of the scale). The replay speed may be enhanced by dragging and dropping the arrow symbol on the marker bar to the right. Minimum and maximum speed depend on your system resources.

- In the left-hand part of the status bar a bar graph indicates the progress of the replay, i.e. the percentage of data already loaded.



Pause Replay



Pauses (interrupts) the replay process.

A pause can also be initiated with the *Pause* button on the measurement bar. This function is available irrespective of the replay speed set. The replay process is resumed by pressing *Pause* again.

Status of the replay process

The measurement bar indicates the current status of the replay process:

No replay active



All icons are grayed except the *Start replay* icon. This is the status after starting the measurement system or after a replay was completed or stopped.

Replay running or paused



A measurement file is being replayed. You can now pause, jump to another position in the file, pause, or stop the replay. A paused replay can be continued by clicking the *Pause* icon again or stopped.

Step One Data Set Forward



Pauses (interrupts) the replay process after the next data frame.

A pause after the next data frame (i.e. the next time when data were recorded) can also be initiated with the *Step One Data Set Forward* button on the measurement bar. This function is available while a measurement file is being replayed. If applied repeatedly, it can be used to step through the measurement file and monitor the individual data frames recorded.

Restart Replay

Stops and re-starts the current replay process.

A restart can also be initiated with the *Restart Replay* button on the measurement bar. This function is available while a measurement file is being replayed. It corresponds to the command sequence *Stop – Start Replay*.

Use Fast Replay

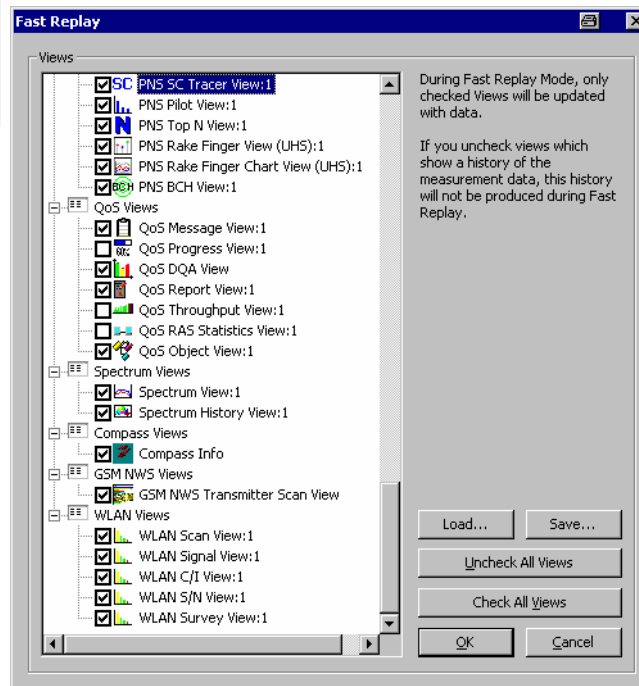
Enables or disables the fast replay mode.

In the fast replay mode, the replay speed is enhanced because only part of the views are filled with data and continuously updated. The updated views can be selected via *Configure Fast Replay...* (see below). In the default configuration, views that show current values (e.g. the *Alphanumeric View*) are typically excluded from the replay; views that show the progression of signals (e.g. the *2D Chart View*) are included.

Please note that there are certain display limitations when *Fast Replay* is used with the *Route Track View*.

Configure Fast Replay...

Opens the configuration menu for the fast replay mode.



If the fast replay mode is active, only the views checked in the tree view are updated. If all views are checked (*Check All Views*), the fast replay mode is effectively deactivated.

It is possible to store (*Save...*) the current fast replay configuration to a file and re-load (*Load...*) it in other R&S ROMES sessions. Fast replay configuration files are ASCII files with the extension *.fr*.



You can select or de-select many views for fast replay using the context menu; see *Fast replay* in section *General View Properties* in chapter 4.

Replay Device Filter

Opens the *Replay Device Filter* dialog for the test devices in the replayed file.

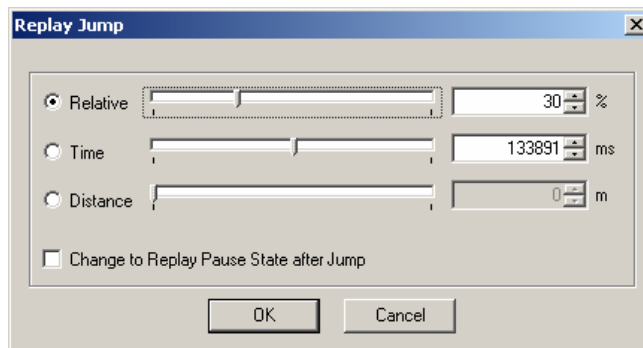
The *Replay Device Filter* shows the test devices of the currently replayed measurement file. If no measurement file is open, it shows the devices of the last file replayed. Measurement data from unchecked devices is excluded from the replay. The dialog is updated each time a new measurement file is loaded.

Replay Jump



Jumps forward and backward in the measurement file.

A replay jump can also be initiated with the *Replay Jump* button on the measurement bar. The *Replay Jump* window is opened:



The current position within the measurement file, the current measurement time, and the current driven distance is indicated in the three fields to the right of the *Relative/Time/Distance* radio buttons. The position of the arrows on the marker bar corresponds to the relative time needed to replay the file up to this position/the time relative to the total measurement time/the current distance relative to the total distance.

After selecting one of the three parameters *Relative/Time/Distance*, the current position in the measurement file can be changed by overwriting the value in the field, by incrementing/decrementing the indicated value with the up/down buttons on the right side, or by dragging the arrow across the marker bar.

Measurement files are recorded such that a later measurement time corresponds to a later file position of the measurement data. The *Replay Jump* function can therefore be used to select a particular stage of the measurement tour.

If the *Change to Replay Pause State after Jump* box is checked, the replay is paused after the jump; otherwise, it will be continued.



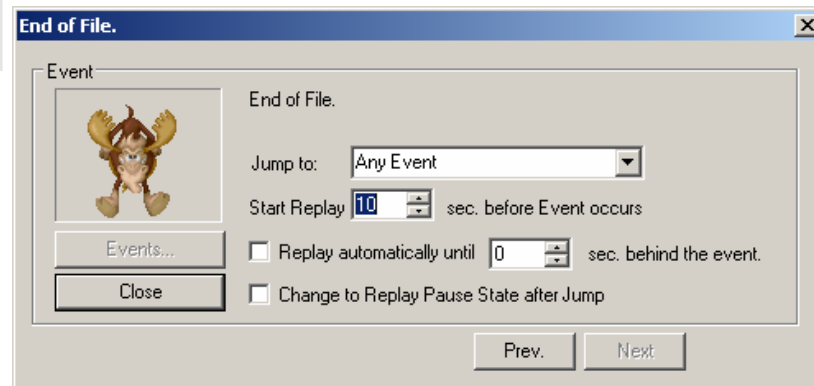
In many views it is possible to initiate a replay jump to a particular timestamp in the measurement file; see *Replay jump to timestamp* in section *General View Properties* in chapter 4.

Replay Jump To Next Event



Jumps forward to the next event in the measurement file.

A event jump can also be initiated with the *Event Jump* button on the measurement bar. The *Jumping... Event found* window is opened:



The events to be searched for must be defined in the *Available Events* tab of the *ROMES Configuration* menu (see section [Event Configuration](#) on p. 3.64 ff.) before the replay is started. The event found is indicated in the *Event* panel, together with its time stamp in the measurement file and the name of the measuring device.

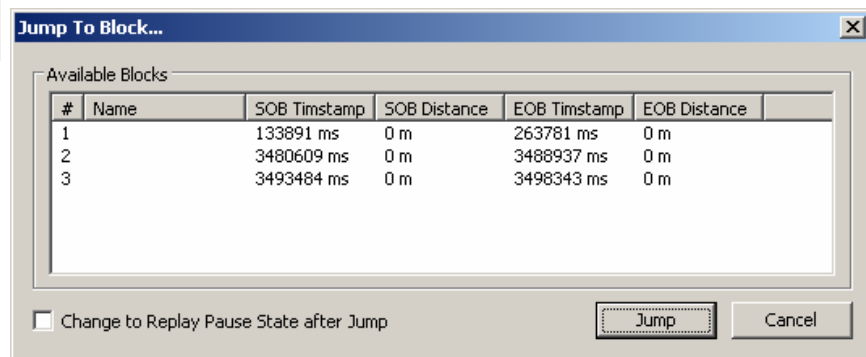
<i>Jump to</i>	List of events, according to the current Event Configuration .
<i>Start Re- play...</i>	Defines the start time of the Replay to be initiated after a particular event is found.
<i>Replay</i>	Closes the Event found window and resumes the replay session, refreshing the contents of all views. The replay is paused or re-started at the Start Replay... time, depending on whether Change to Replay Pause... is enabled or disabled. At the end of the file, the Replay button is replaced by Close, the title bar of the window indicates End of File.
<i>Prev. / Next</i>	Jumps to the previous or to the next event in the measurement file. This button is disabled if no event is found.
<i>Events...</i>	Opens the <i>Available Events</i> tab of the R&S ROMES Configuration menu to change the current event selection. This button is disabled if no event is found.

Replay Jump To Block



Jumps to a block in the measurement file.

A event jump can also be initiated with the *Block Jump* button on the measurement bar. Recording is interrupted and the *Jump to Block* dialog is opened:



Note:

Replay Jump to Block is only enabled if a measurement file recorded with ROMES V3.22 or higher containing several blocks is replayed. The blocks must be defined during the measurement using the *Blocks* submenu; see below. A new block is defined each time that recording is started (*Start Recording*). *Stop Recording* closes the current block. A name can be assigned to each block if this feature is enabled in the ROMES Configuration dialog; see section [General Settings](#) on p. 3.57 ff.

The blocks in a measurement file can be exported separately; see description of data export in chapter 8.

The *Jump to Blocks* dialog displays a complete list of the blocks in the replayed measurement file. Each block is characterized by the timestamp for the start (SOB) and end of the block (EOB). An SOB and EOB distance is available in addition if the *Trigger Box* is used for the measurement (see chapter 6).

Jump Jumps to the selected block and closes the dialog. The replay is resumed or pauses at the start of the selected block, depending on whether *Change to Replay Pause State after Jump* box is checked. *Jump* is disabled if no block is selected in the list.

Cancel Closes the dialog without any further action.

Blocks

Opens a submenu to define blocks within a measurement file.

The *Blocks* submenu is enabled only while a measurement is running. The menu commands *Start Block* and *Close Block* define the start and end of a block, respectively. *Discard Current Block* is enabled after *Start Block*.

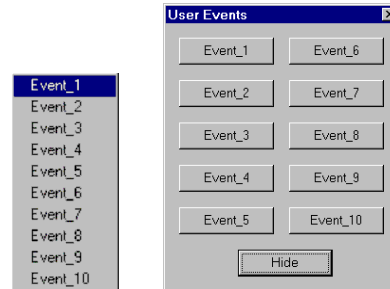
Blocks represent a useful navigation tool within the replayed measurement file; see *Replay Jump to Block* above.

Events

Triggers a user-defined event which is stored in the measurement file currently recorded.

A list of up to 10 user event types is shown in a pop-up list displayed on the right of the *Measurement* menu as soon as the cursor is placed on the *Events* command line. This menu is equivalent to the *User Events* menu opened via the corresponding icon in the measurement bar. Both menus are enabled only during measurement recording. The event names *Event_1* to *Event_10* can be changed via the *Configurations – Preferences* command, see [Event Configuration](#) on p. 3.64 ff.

Event_1 Triggers an event of type Event_1 and includes it in the measurement data.

**Set Voice Marker**

Triggers or stops a voice marker event to be included in the measurement file.

The purpose of the voice marker event is to include a spoken comment into the measurement file that is related to a particular time or position. After *Set Voice Marker* is activated, the *On Air* message in the status bar indicates that R&S ROMES is ready for recording the comment spoken into a connected microphone:



At the end of the comment, click *Set Voice Marker* again to continue the measurement. *Set Voice Marker* is enabled after *Start Recording*. For [Voice Marker Event](#) configuration refer to p. 3.67.

Please note that the measurement recording cannot be stopped unless the Voice Marker is closed or disabled.

Enable Coupled Focus

Enables the coupled focus between several views (see p. 3.4).

Release Coupled Focus

Releases the coupled focus between several views (see p. 3.4).

Database Menu

The *Database* menu offers a command for creating or modifying the GSM BTS data base that can be used for GSM measurements as well as for the GSM Carrier-to-Interference (C/I) analysis (with option R&S ROMES-GS) and the UMTS Node B database.

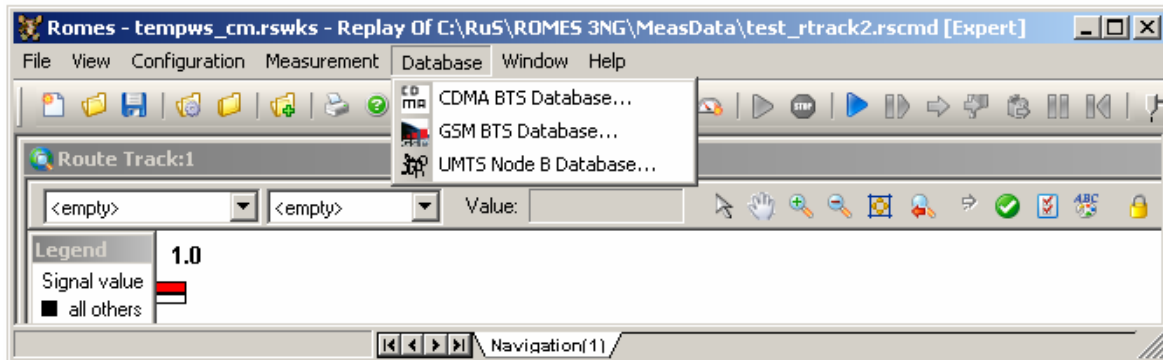


Fig. 3–28 Database menu

CDMA BTS Database

Open the TEC for CDMA dialog.

The TEC for CDMA dialog is used to create or modify a CDMA BTS List data base. It is identical with the dialog opened by means of the *Configuration – Settings* command; see section [CDMA Technology](#) on p. 3.100.

GSM BTS Database

Open the TEC for GSM dialog to create or modify a GSM BTS data base.

The TEC for GSM dialog is identical with the dialog opened by means of the *Configuration – Settings* command; see section [GSM Technology](#) on p. 3.87.

UMTS Node B Database

Open the TEC for UMTS Test Mobiles dialog.

The TEC for UMTS Test Mobiles dialog is used to create or modify a UMTS Node B data base. It is identical with the dialog opened by means of the *Configuration – Settings* command; see section [UMTS Technology](#) on p. 3.96.

Window Menu

The *Window* menu offers commands for arranging and handling the view windows and shows a list of all open views.

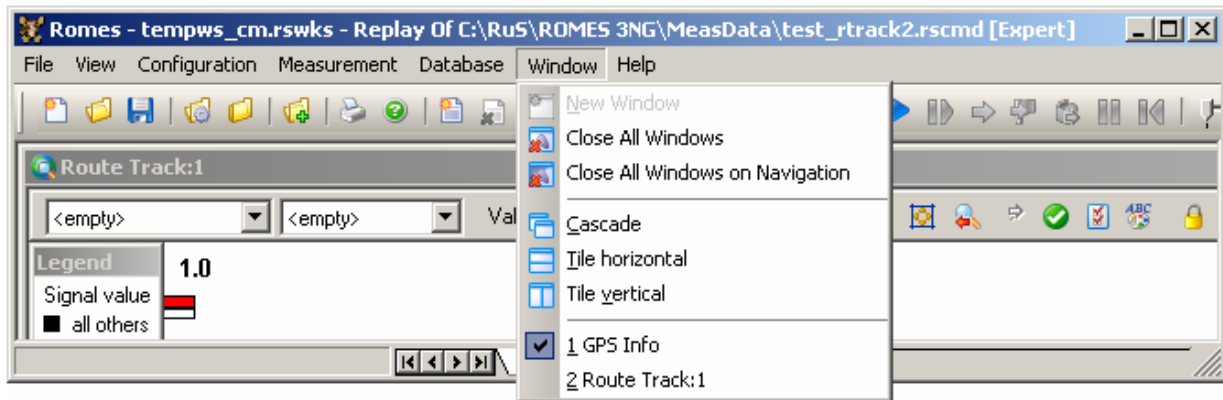


Fig. 3–29 Window menu

New Window

Create a new view of the same type as the active window.

The *New Window* command is enabled for multiple view types. Those types are characterized by a current number behind the view title (e.g. *Measurement Report View: 1*). The *New Window* is also available in the context menu associated to multiple views.

Close All Windows

Close all windows on all worksheets.

Close All Windows on <S>

Close all windows on the worksheet named <S>.

Cascade

Superimpose all open view windows showing each one's title bar. The active window is placed in the foreground.

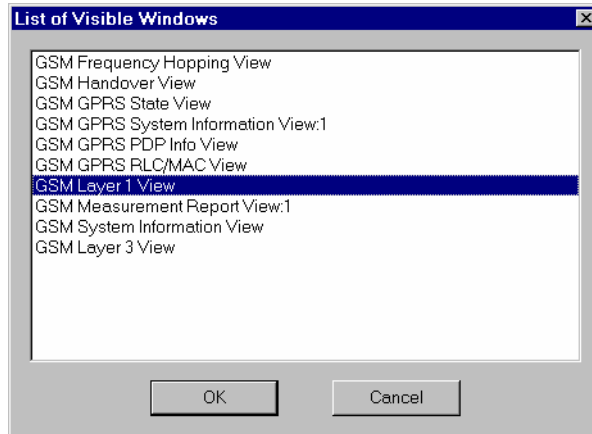
Tile horizontal / vertical

Place all open view windows side by side (or stacked vertically) so that they don't overlap.

**1 <ViewName>
View**

List of all open view windows.

A view selected in the list is activated and appears in the foreground, if the *Cascade* display option is selected. If more than 10 views are available, the last entry, *All Window*, opens a popup window showing all open windows.



A view that is selected in the *List of Visible Windows* appears in the foreground and is moved on top of the list.

Help Menu

The *Help* menu provides online help and general information about the measurement system.

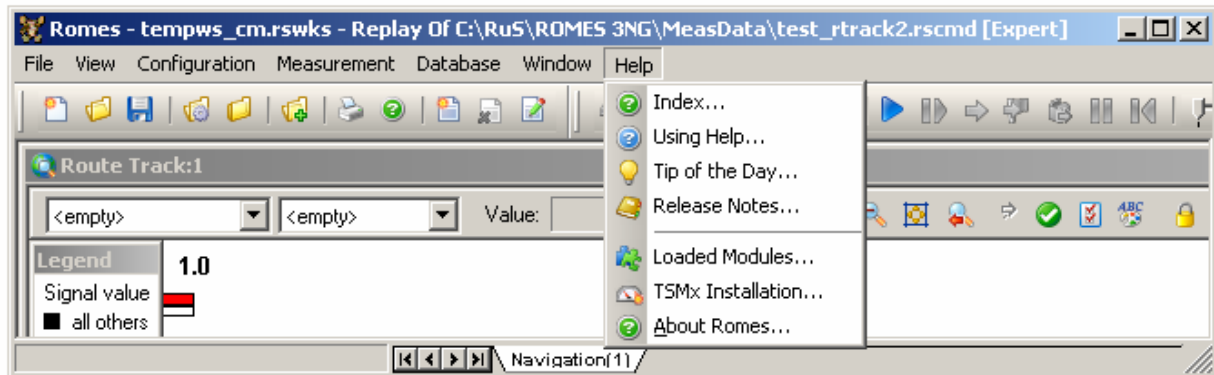


Fig. 3–30 Help menu

Index

Opens the online help.

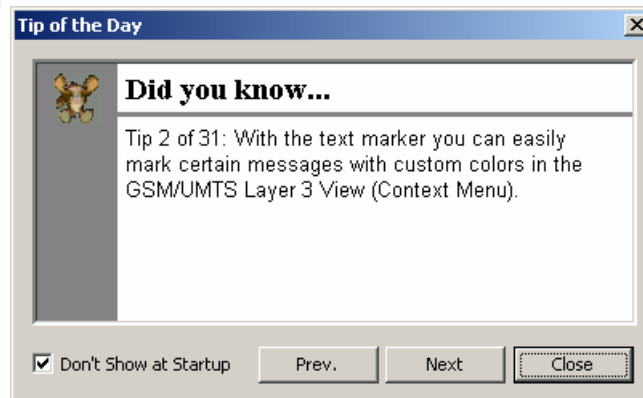
From the opening screen, navigation tools such as a table of contents, index of keywords, and hyperlinks will help you quickly find all information needed for using the measurement system.

Using Help

Opens a help topic on the online help. The online help system itself is accessible from the help page.

Tip of the Day

Opens the *Tip of the Day* window.



The *Tip of the Day* is a small window that displays a new tip each time R&S ROMES is started. These tips are a convenient way to learn more about what you can do in the program. If you do not want the Tip of the Day to display the next time you start the program, select the *Don't Show at Startup* check box.

Loaded Modules

Opens the *Loaded Modules* dialog showing all software modules available in the current R&S ROMES installation.

Detailed information on the modules can be obtained by clicking on a module name.

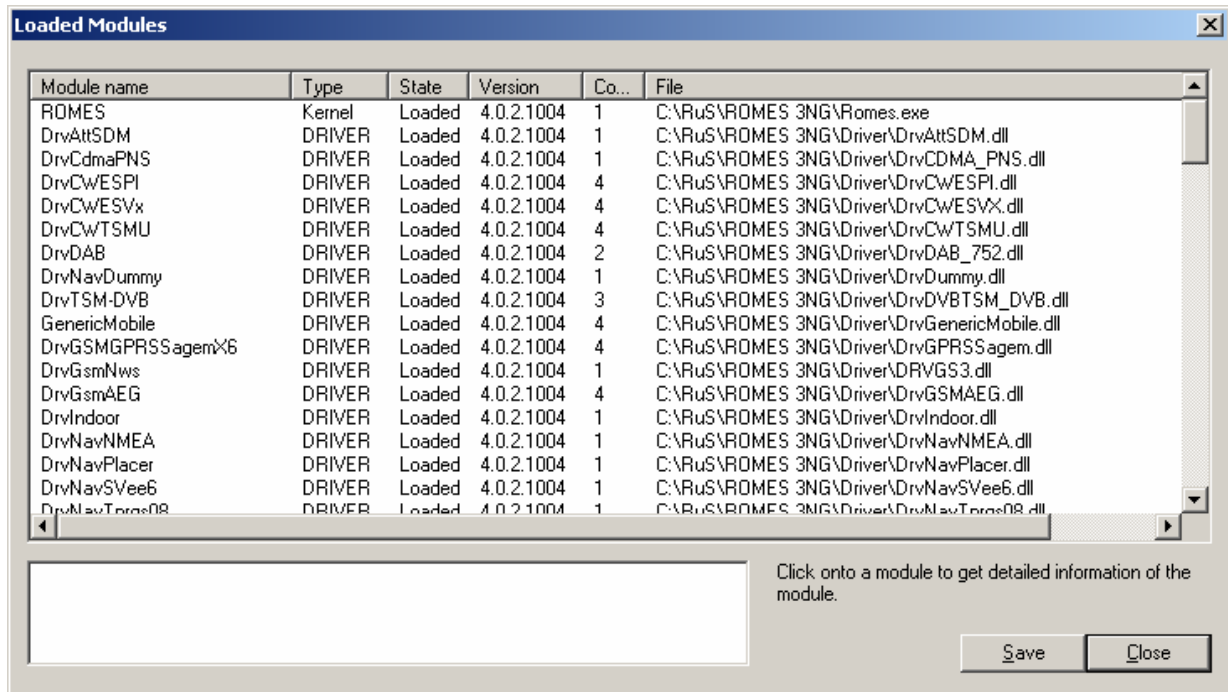
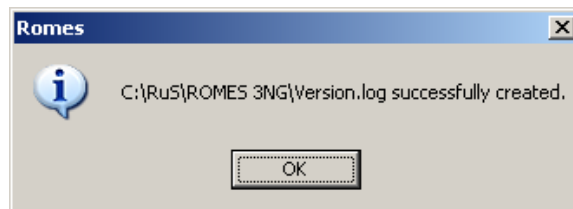


Fig. 3–31 Loaded Modules dialog

Save Writes the module list shown in the *Loaded Modules* dialog to a text file. The name and directory of the file are shown in a popup window.



Close Closes the *Loaded Modules* dialog.

TSMx Installation Opens the *TSMx Installation* dialog showing all R&S TSMx-related software modules available in the current R&S ROMES installation.

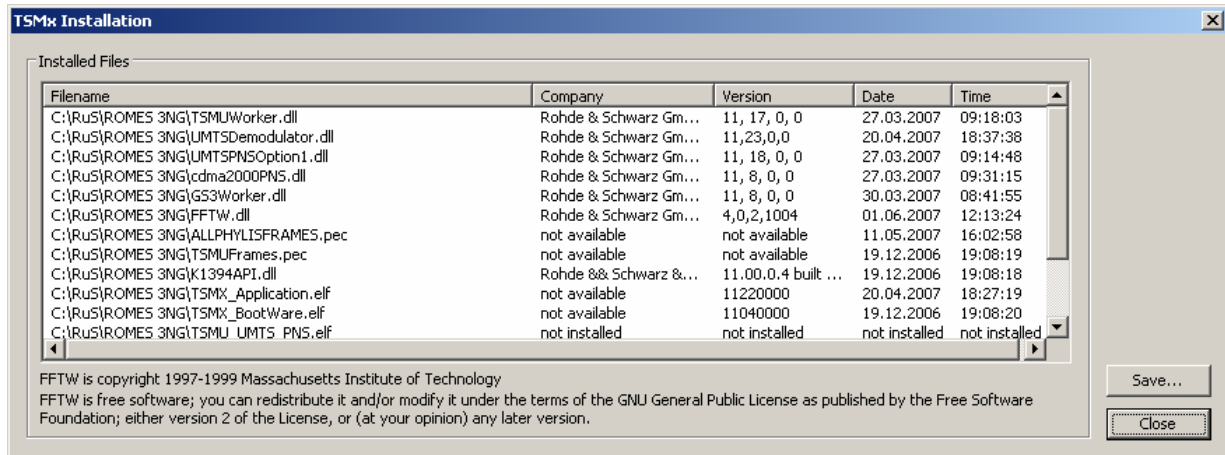
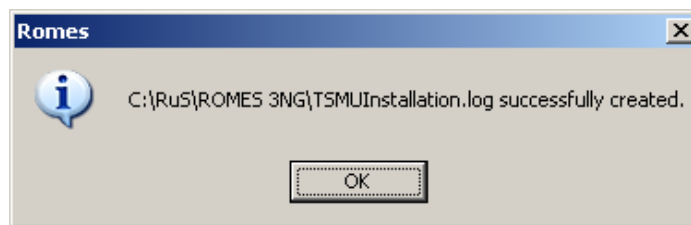


Fig. 3–32 R&S TSMx Installation dialog

Save Writes the module list shown in the *TSMx Installation* dialog to a text file. The name and directory of the file are shown in a popup window.



Close Closes the *TSMx Installation* dialog.

About ROMES

Displays the R&S ROMES startup window indicating the name and version number of your R&S ROMES copy. In addition the window provides a selection of useful URL links.



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4 Display and Evaluation of Results

This chapter describes how to display and analyze the data measured or stored in a measurement file and replayed. Data selection and configuration of the view properties is performed in the *Configuration of Software Modules* menu opened via the *Settings* command in the *Configuration* menu. The view configuration menus are also accessible from the individual view menus (click the right mouse button and select *Configure...* from the popup window). The view windows can be called up in the *View* menu.

For an overview of all menus and menu commands refer to chapter 3.

General View Properties

The views are optimized for different data types from different sources and therefore vary in appearance and functionality. In spite of the differences, some properties are common to many or all views.

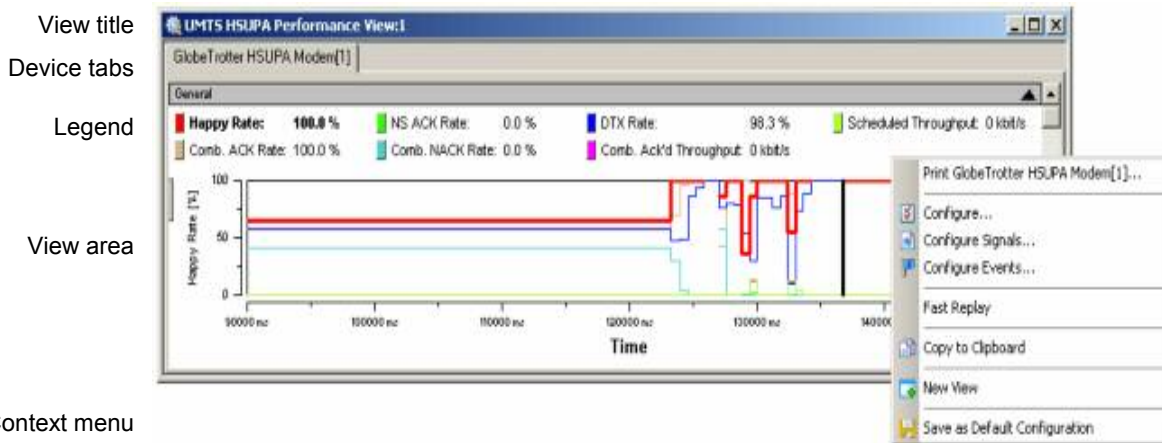


Fig. 4-1 General view properties

View title The title bar contains the name of the view and three icons to minimize, maximize and close the view. A sequence number (: 1) behind the name indicates that it is allowed to open several views of the same type.

Device tabs Many views are divided into separate tabs to display the data originating from different test devices (e.g. different test mobiles, receivers etc.). A mouse click on a tab places it into the foreground.

The device tabs in all open views are coupled: Selecting a device tab in any one view activates the same tab in all other views. The *Control* key disables this coupling mechanism.

Context menu

Most views provide a context menu to access typical configurations and perform actions. A right click on a point anywhere in the view area opens the context menu. The following context menu commands are often used:



Print ... Opens the Print menu to print the contents of the view or a part of it. A preview of the pages to be printed is accessible via the Print preview command in the File menu, see chapter 3.

Configure... Opens the configuration menu associated with the view; see below.

Configure Signals Opens the Available Signals tab of the R&S ROMES Configuration menu (see chapter 3) to configure the signals available for viewing.

Configure Events Opens the Available Events tab of the R&S ROMES Configuration menu (see chapter 3) to select the signal events to be recorded during the measurement and configure additional *User Events* and *Comment Events*.

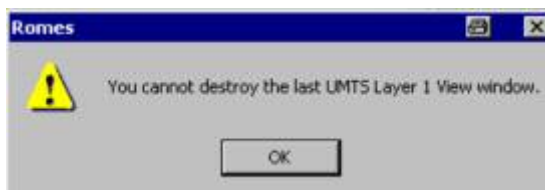
Fast Replay Select or de-select the current view for the fast replay mode. If *Fast Replay* is disabled the view is not updated when a measurement file is replayed. To select arbitrary views for fast replay use *Measurement – Configure Fast Replay...*

Hold This function "freezes" the current measurement display for examination purposes without stopping the measurement. A view on hold can be released, which updates the view to reflect the actual measurement status.

Copy to Clipboard Copy a screenshot of the current view to the clipboard in order to paste it into another application.

New View... Opens an additional view of the same type. A practically unlimited number of views can be opened at the same time. Views of the same type are distinguished by the current number in the title bar (e.g. the 1 in the above figure) indicating the order in which they have been created.

Destroy View... Deletes the active view with its contents. New View can not restore a deleted view. A workspace must contain at least one view of each type, so *Destroy View...* is disabled for the last view of each type. R&S ROMES generates a warning:



Save as Default Configuration	<p>Save the current configuration of the view to an ASCII file named <i>Master.rms</i> in the Workspace subdirectory of R&S ROMES program directory. The configuration comprises everything that is defined in the configuration menu associated with the view, including the selected signals.</p> <p>The default view configuration is used whenever a new view of the same type is created, irrespective of the current workspace. It is changed when a new default configuration is saved; it is reset by deleting the configuration file <i>Master.rms</i>.</p>
Move to	<p>Move the view to one of the worksheets to be selected in the submenu (see description of worksheets at the beginning of chapter 3). This command is not available if the current workspace contains only one sheet.</p>
Remove Signals	<p>Opens a secondary context menu with all signals selected to be displayed. Clicking a signal removes it from the <i>Selected Param.</i> list. <i>Remove Signal</i> is not shown when the <i>Selected Param.</i> list is empty.</p>

Configuration menu

Most views are associated with a configuration menu that can be opened from the context menu. The configuration menus provide view-specific settings.

Each configuration menu contains an *Info* tab listing information on the current view version.

The *Info* tabs include the *Custom Name* field, which in a view context changes the name in the view title section of the active view. In a driver context, it is used where different connected devices can be associated with different custom names, e.g. for separate mobiles in different networks, or when simultaneously operated mobiles perform different tasks.

The *Info* tabs are analogous for all view types and will be omitted in the following.

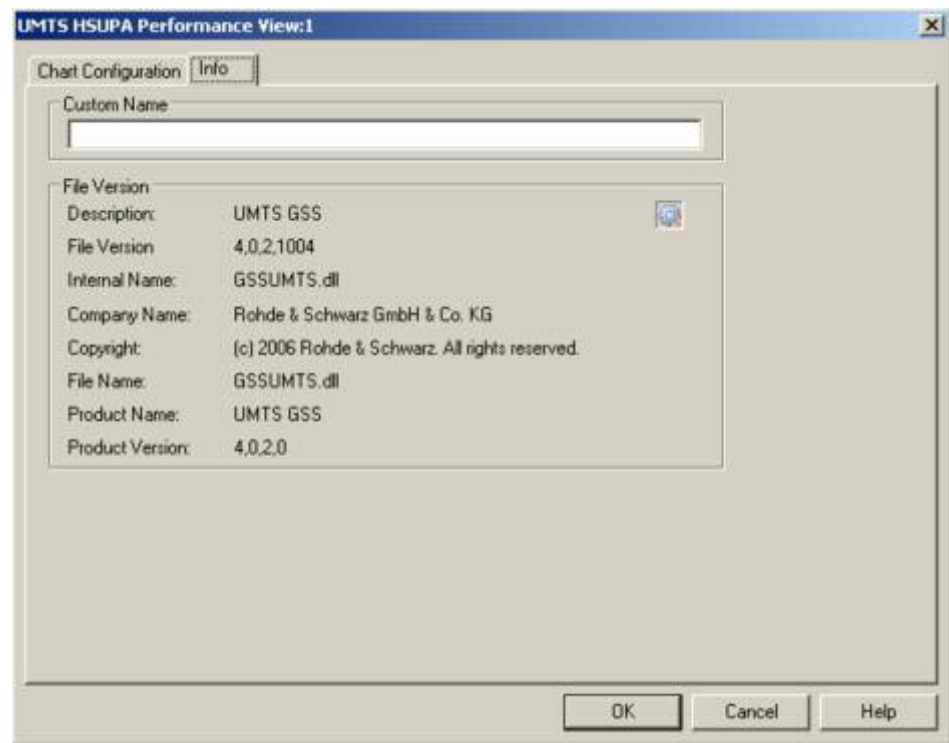




Fig. 4-2 Info tab

Replay jump to timestamp


In many views (e.g. the *GSM/UMTS Layer 3 View*, *2D Chart View*, *Route Track View etc.*), it is possible to initiate a replay jump to a particular message, event, or characteristic position spotted in the view (in general, to a particular timestamp in the message file). This type of replay jump must be initiated during a replay pause. The replay is continued at the selected timestamp.

To initiate a replay jump to a timestamp (e.g. in the *GSM/UMTS Layer 3 View*), proceed as follows:

1. Open the view, replay a measurement file (*Measurement – Replay* or ) and pause the replay (*Measurement – Replay Pause* or ).
2. Keep the *Ctrl* key on your keyboard pressed.

A clock symbol is added to the cursor icon.

3. Double-click a particular message.

The screen is refreshed. After clicking *Measurement – Replay Pause* or  again, the replay starts with the message selected in the last step.


Coupled Focus

Many views provide graphical tools to highlight special areas and read a particular result. The focus in several views can be coupled, which makes it easier to analyze different aspects of a coverage measurement at a particular position using a set of appropriate views. For details see description of the coupled focus at the beginning of chapter 3.

Basic Views

The *Basic Views* can be used to analyze data from various sources. Basic views are available irrespective of the kind of measurement performed or of the type of measurement data replayed.



Click the  icon in the measurement bar and use the Available Signals Drag & Drop.. dialog to display signals in the basic views.

The *Basic views* can be selected from a submenu displayed on the right side of the *View* menu when the mouse pauses over *Basic Views*.

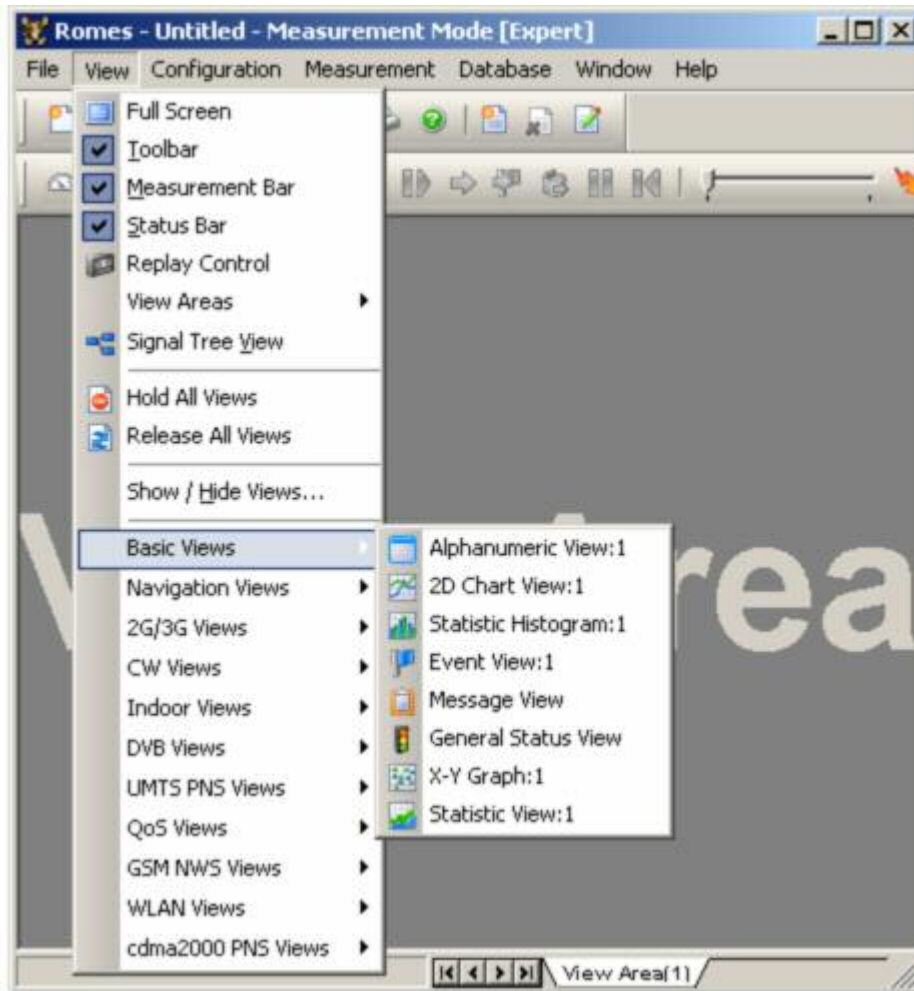


Fig. 4-3 View – Basic menu

Alphanumeric View

The *Alphanumeric View* displays current values of the signals selected in the corresponding configuration menu. The values are continuously updated while the measurement or replay session is going on.

Example for several devices:

Parameter	[Unit]	Device #1	Device #2	Device #3
BCCH	ChanNr	765	104	23
BSIC		31	74	35
Phone Mode		Dedicated	Dedicated	Dedicated
RxLev Full	Step	53	39	39
RxLev Sub	Step	55	40	39
RxQual Full		0	63	3
RxQual Sub		0	0	3
Qual_idle		-	-	-
C1		-	-	-
C2		-1	-1	-1
Ch1[936.00 MHz]	dBm	-86.16		
Ch2[937.60 MHz]	dBm	-86.47		

Fig. 4-4 Alphanumeric View

In the *Alphanumeric View*, signals from different measurement devices (e.g. from different GSM or CDMA devices) are displayed in different columns. If only mobile phone parameters are viewed, the device name for each column is unambiguous and therefore indicated in the table heading.

Device parameters from other technologies, e.g. from test receivers or GPS receivers, are always displayed in the first column. If the first column contains parameters from several devices, the table headings read *Device #1*, *Device #2* etc. The device for each parameter value can still be obtained: It is indicated in a yellow popup window as soon as the pointer is placed on the parameter value; see figure above.

After clicking a parameter (or selecting a group of parameters using the shift or control keys), it is possible to change the order or remove the parameters from the view.

Note that the *Serving Cell* name can only be displayed if a correct BTS list is provided. In this case, also the distance to the BTS will be displayed (example: BTS1 (2.6 km)).

Context menu

A right mouse click on any point in the view opens the context menu to access the configuration menus, (de-)select the view for fast replay, copy the current view to the clipboard, create or delete views, save the current configuration, or move to another worksheet; see [Context menu](#) description on p. 4.2.



Alphanumeric View Configuration

The *Alphanumeric View* configuration menu defines the signals to be viewed, sets the display colors, and shows information on the current view version. It is opened via a right mouse click on a point inside *Alphanumeric View* or via the *Configuration – Settings* command (see chapter 3).

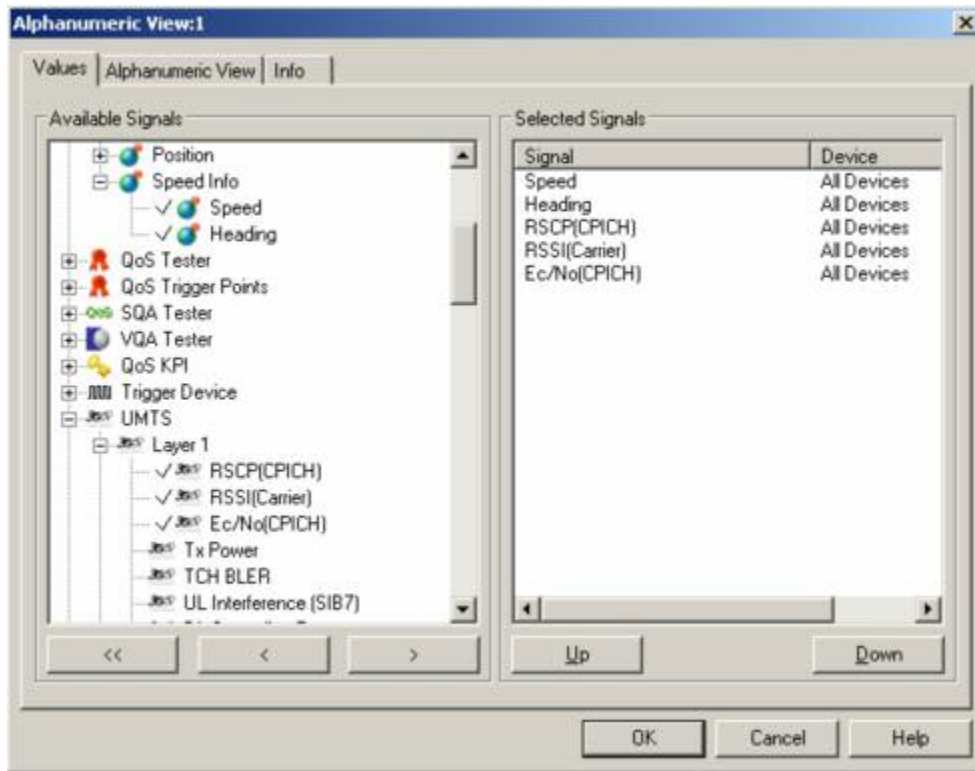


Fig. 4-5 Alphanumeric View: Configuration

The *Values* tab is analogous to the *Values* tab of the 2D Chart View configuration menu, see figure on p 4.13. The devices for many signals are also indicated in the *Selected Signals* list.

Some comments concerning the signals are in order:

DTX

In the *GSM Server Report*, the *DTX* parameter indicates the current DTX mode of the GSM mobile station (uplink DTX). The *GSM System Information View* and the detailed information in the *UMTS/GSM Layer 3* view show the DTX mode that the network commands the mobile station to use (*shall* or *shall not* or *may use DTX*). Downlink DTX can be detected indirectly; see section [GSM Measurement Report View](#) on page 4.250.

The *Alphanumeric View* tab defines the colors for the text and the background. A colored background or text makes it easier to distinguish when a signal value changes.

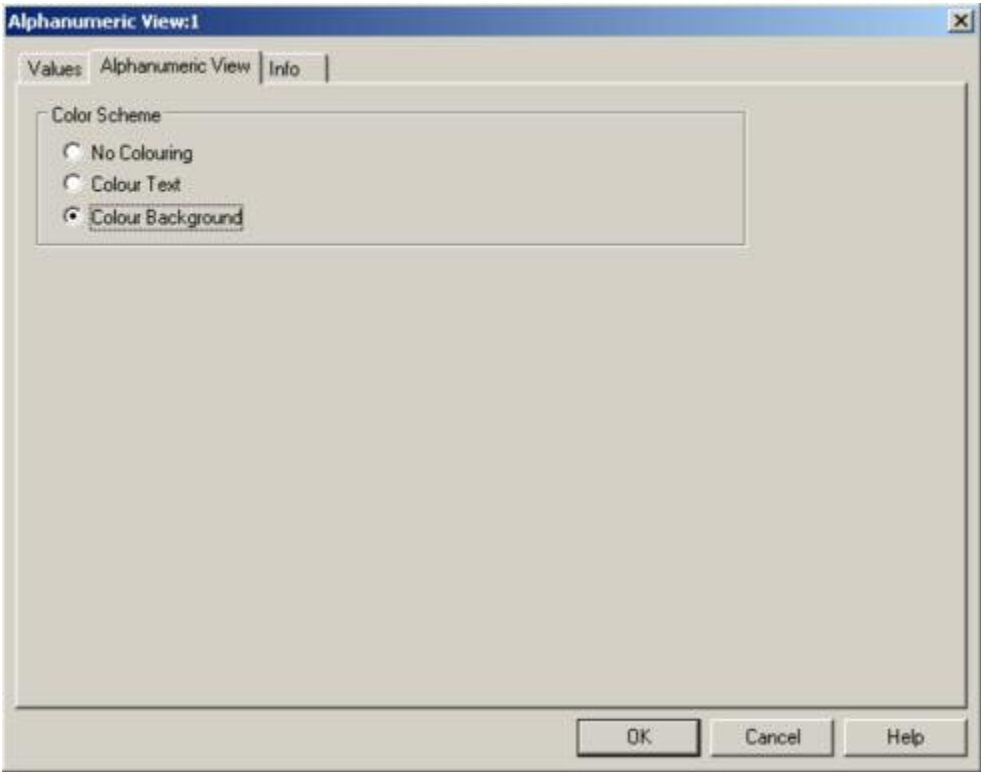


Fig. 4-6 Alphanumeric View: Configuration

2D Chart View

A *2D Chart View* contains a Cartesian diagram showing one or several signals as a function of time. If a signal for which no data is available is selected (e.g. RxQual while the mobile is in *Scan(ning)* mode), no trace is plotted. As an alternative to superimposing many quantities in the same diagram, R&S ROMES allows to open several independent diagrams simultaneously.

To complement the *2D Chart View*, the *Statistic Histogram View* (see p. 4.16) provides a statistical evaluation of a signal.

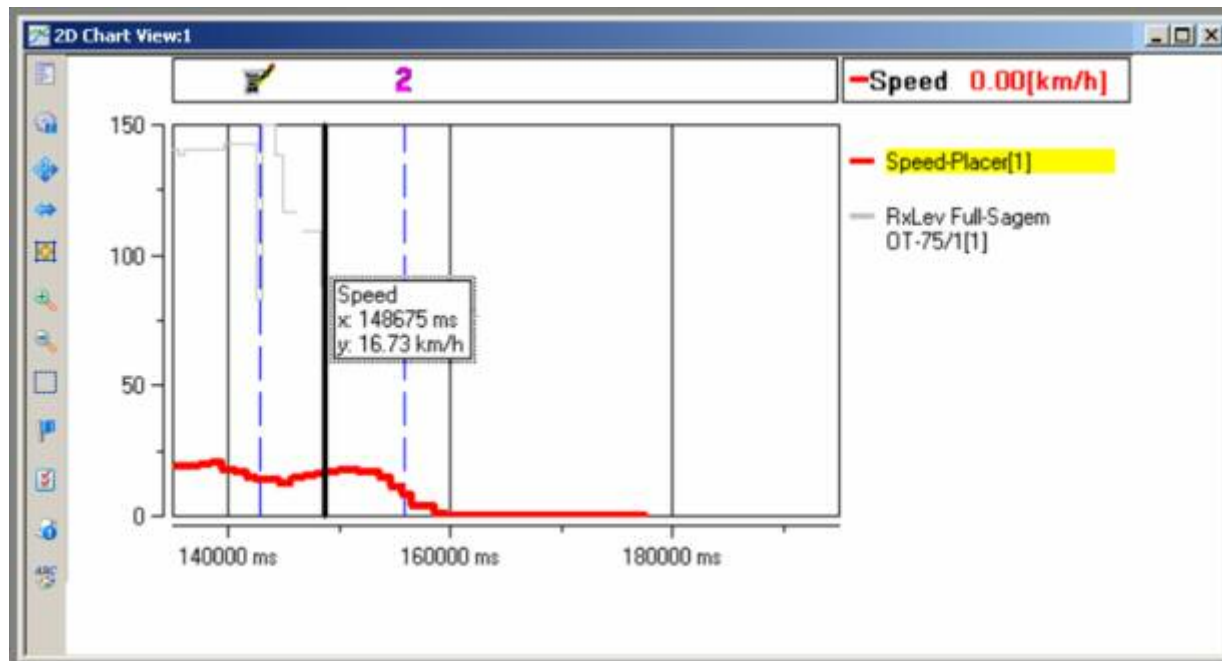


Fig. 4-7 2D Chart View

Diagram

The diagram may contain a selected curve (the signal, the mobile type, and the current value is shown in the legend to the right of the diagram) plus a practically unlimited number of secondary curves. The curves are step functions with different line colors; the selected curve is distinguished by its line width. In addition to the curves, events (represented by the icons shown in the Available Events tab of the R&S ROMES configuration menu, see chapter 3) can be displayed.

The time information stored in the measurement file provides the x-axis scaling. If the measurement data is recorded with a trigger device (see section *Test Receiver Drivers* in chapter 6), it is possible to select the distance driven between the individual data points as x-axis scale. This is done in the *Chart Configuration* tab of the configuration menu, see figure on page 4.14.

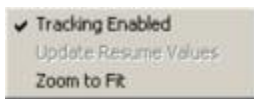
The y-axis is scaled by the value range of the selected curve (many signals provide a "natural" scale, e.g. the RxLev step scale of a GSM mobile is between 0 and 63). To display the scale of a secondary curve, this curve can be selected in the legend.



To change the y-axis scale manually, you can use the tools across the left diagram edge. Alternatively, open the Available Signals tab in the R&S ROMES Configuration menu (Configuration – Preferences or Configure Signals... in the context menu) and adjust the expected minimum and maximum value (Exp. Min, Exp. Max) of the signal. Manual scaling is particularly useful if the actual value range of a signal (or its range of interest) is considerably smaller than its "natural" scale (e.g. if only small signal levels are measured).

The curves are plotted from the left to the right at the pace of the measurement or replay. If the end of the display range is reached while the measurement or replay is still going on, the whole diagram is shifted to the left so the curves can be continued. This may occur repeatedly until the end of the measurement file is reached.

Context menus for the axes



The context menus of the axes (opened upon a right-click) provide additional scaling options for the diagram:

- *Tracking* means that the axes are dynamically scaled so that the current measurement results fit into the diagram. See also [Signal Tracking](#) on p. 4.15.
- *Zoom to Fit* adjusts the scale of the axes so that the entire measurement curve fits into the diagram.

Legend

The legend to the right of the diagram shows all signals in the current *2D Chart View* together with their display color, the type and current number of the test device. The selected signal appears on a colored background. The ordinate is labeled with the range of the selected signal, the corresponding curve is highlighted.

The signal selection is defined in the configuration menu, see below.

Events and Title

The two fields above the diagram and the legend show the displayed events and the signal and current value of the selected curve, respectively.

Marker



If the marker symbol in the toolbar is clicked, a marker line and a info field is displayed. The marker line and the info field can be shifted horizontally and vertically using a drag and drop mechanism.

Info Field



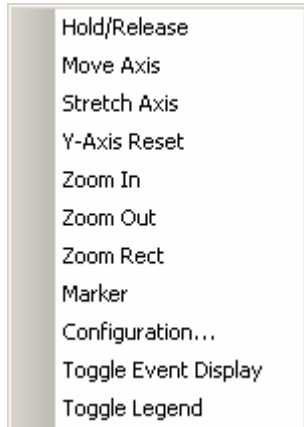
In the default configuration the info field shows the plotted signal of the selected curve, the marker position, and the signal value. The contents and position of the info field can be changed in the associated context menu (right-click):

- *Channel* selects one of the displayed signals for evaluation.
- *Style* selects the marker style (single line for absolute marker values, two lines for ranges) and the displayed values (x, y, distances, frequencies within an interval).
- *Options* configures the display options (color, visibility only while the marker line is clicked).
- *Flip Alignment* changes the relative position of marker line and info field.

Tool Bar



The tool bar to the right of the diagram provides scaling tools for the diagram, displays or hides the marker line, opens the configuration menu, and displays or hides the headings and the legend. The symbol on top of the tool bar opens a context menu with a short description of each icon.



Context menu



A right mouse click on any point in the view opens the context menu to access the configuration menus, (de-)select the view for fast replay, copy the current view to the clipboard, create or delete views, save the current configuration, move to another worksheet, or remove signals; see [Context menu](#) description on p. 4.2.



Phone Mode of a GSM or UMTS mobile in a 2D-chart view

The *Phone Mode* signal shows the GSM RR (Radio Resource) modes and the UMTS RRC (Radio Resource Control) states of a mobile phone. It is convenient to view the phone mode in a 2D-chart view, e.g. to monitor the periodic attempts to set up a connection while the test mobile operates in *Autodial* mode. The phone mode can be selected from the *GSM - <device> - Server Report* branch of the signal tree. The *CELL DCH* RRC state corresponds to the GSM *Dedicated* state.

The phone mode is also displayed in the [UMTS/GSM NQA State View](#) described on p. 4.289.

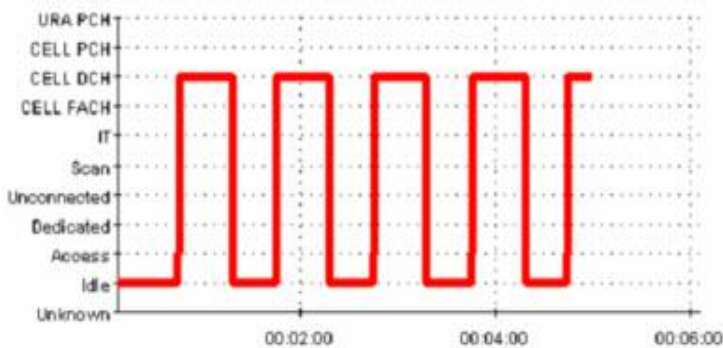


Fig. 4-8 UMTS phone mode during autodial

2D Chart View Configuration: Values Tab

The *2D Chart View* configuration menu defines the signals to be viewed and shows information on the current view version. It is opened via a right mouse click on a point inside *2D Chart View* or via the *Configuration – Settings* command (see chapter 3).

The *Values* tab selects the signals to be displayed.

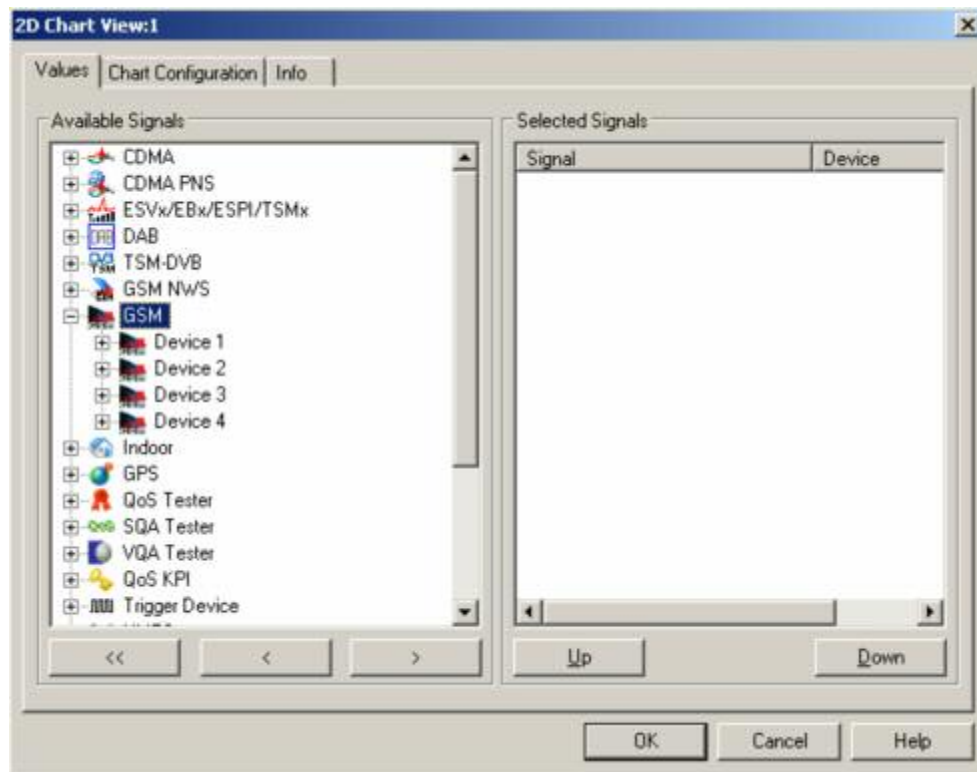


Fig. 4-9 2D Chart View: Parameter selection

Available Signals Data tree (see chapter 1) showing all available signals (hierarchy level 4 of the data tree).

- To select a single signal for display, left-click this signal (which will be highlighted in inverse video) and click the > button. Alternatively, double-click the signal.
- Select a parent node of higher hierarchy level (level 1, 2, or 3) and click > if you wish to select all signals below the node.

Selected Signals List of all signals selected for display.

- To remove a single signal from the list, left-click this signal (which will be highlighted in inverse video) and click the < button. Alternatively, double-click the signal or use the *Remove Signal* command in the view context menu.
- To remove all signals at once, click the << button.

The order of the list can be changed using the two buttons below. This order is relevant especially if the list contains more signals than can be displayed in the 2D Chart View, see *2D Chart View* tab below.

2D Chart View Configuration: Chart Configuration

The *Chart Configuration* tab scales the axes of the chart and defines its contents and its appearance.

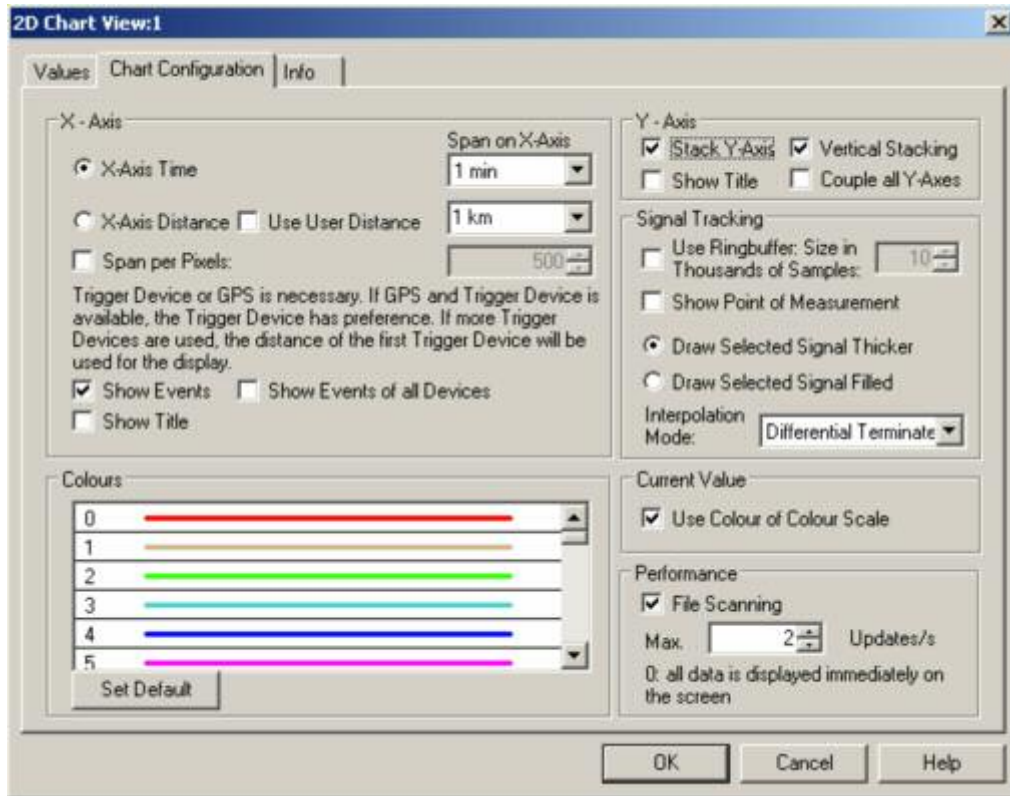


Fig. 4-10 2D Chart View: configuration

X-Axis: Time/Distance/ Pixels

The *X-Axis* panel contains two alternative option buttons to scale the x-axis by the time or distance information stored with the measurement data. A distance information is available only if the measurement data is recorded with a trigger device (see section *Test Receiver Drivers* in chapter 6). If *X-Axis Distance* is selected but no trigger is available, R&S ROMES will not generate the *2D Chart View* but display the message:

Trigger Device Missing


as soon as the measurement or replay is started.

The *User Distance* is a generalized distance signal with a finite number of marker points where the distance values may jump and/or change their direction. Unlike the real distance the *User Distance* is a composite signal that globally does not have to be continuous and monotonically increasing or decreasing. For test receivers, user distance signals can be generated using the options in the driver configuration menus (see chapter 6).

The time interval or distance corresponding to the full x-axis scale of the *2D Chart View* can be selected from the two pull-down lists *Span on X-Axis* located in the right half of the *X-Axis* panel.

Span per Pixels sets the diagram width to a fixed number of pixels.

Event and title display

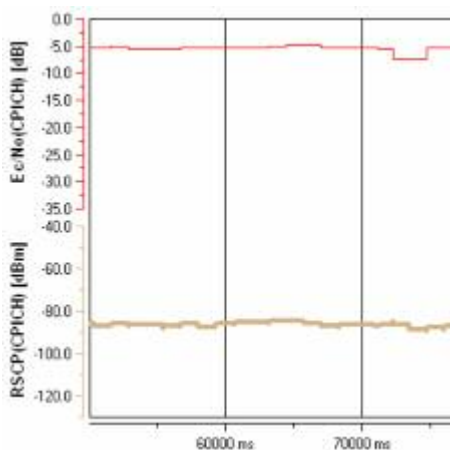
- *Show Events* and *Show Events of all Devices* display or hide the events above the diagram (equivalent to the *Toggle Events* icon  in the toolbar).
- *Show Title* shows or hides the x-axis title (only visible if the view is high enough).

Colors

The colors of up to 699 signal curves can be defined in the *Colors* menu opened on double-clicking a field in the *Colors* panel (see p. 4.351). The *Set default* button resets all colors to their default values.

Y-Axis

- *Stack Y-Axis* displays the y-axis scales for all selected signals. This setting is effective only if more than one signal is selected.
- *Show Title* shows or hides the y-axis title (only visible if the view is high enough).
- *Vertical Stacking* changes the display of the graph to a similar layout as shown in the figure below. Each graph is then displayed in a separate part of the chart area with its own y-axis, and each y-axis can be scrolled independently (as long as coupling of y-axes is deactivated).



- *Couple all Y-Axes* can be used to synchronize the scrolling of stacked y-axes. This means that if one y-axis is scrolled, the other y-axes move in a similar way through their range of values. The movements are relative to the defined signal range. That means that if one signal has a range from 0 to 100 and a second one from 0 to 10, a scrolling action on the first signal to display 10 to 110 would lead to a range of 1 to 11 on the second signal. The same applies to zoom activities on one y-axis when the *Couple all Y-Axes* option is active. The zoom also calculates the relative change on the zoomed axis and applies this to all other visible y-axes.

Signal Tracking

The *Signal Tracking* settings modify the display of the measurement curve:

- The *Ring Buffer* can be used to limit the number of samples to be displayed in the view. The ring buffer size defines a moving window with a definite number of values. Clear the check box to display the entire set of measurement data.
- *Show Point of Measurement* displays a dot at the position of each measurement point on the curve.

- *Draw Selected Signal Thicker* increases the line width of the selected curve.
- *Draw Selected Signal Filled* fills the area below the selected curve with the color of the curve.

The *Interpolation Mode* for the selected signal can be specified using the listbox with supported interpolation modes. Possible modes are *Straight Line*, *Cubic Spline*, *Polynomial*, *Rational*, *Differential*, and *Differential Terminated* (default).

Current Value If the check box is on, the current value of the selected curve above the diagram is displayed with the colors of the color scale. If the check box is cleared the current value is black.

Performance Limits the maximum update rate of the view results. An update rate of 0 means that every new result causes an immediate update of the view (not recommended for performance reasons).

OK Apply all *2D Chart View* settings and close the configuration menu.

Cancel Discard all *2D Chart View* settings and close the configuration menu.

Statistic Histogram View

A *Statistic Histogram View* provides several diagrams to show a statistical evaluation of a signal. If an invalid signal is selected (e.g. RxQual while the mobile is in *Scan(ning)* mode), the diagrams remain empty. R&S ROMES allows to open several independent *Statistic Histogram Views* simultaneously.

The *Statistic Histogram View* is a complement to the *2D Chart View* (see p. 4.10) where the actual values of different signals are displayed.

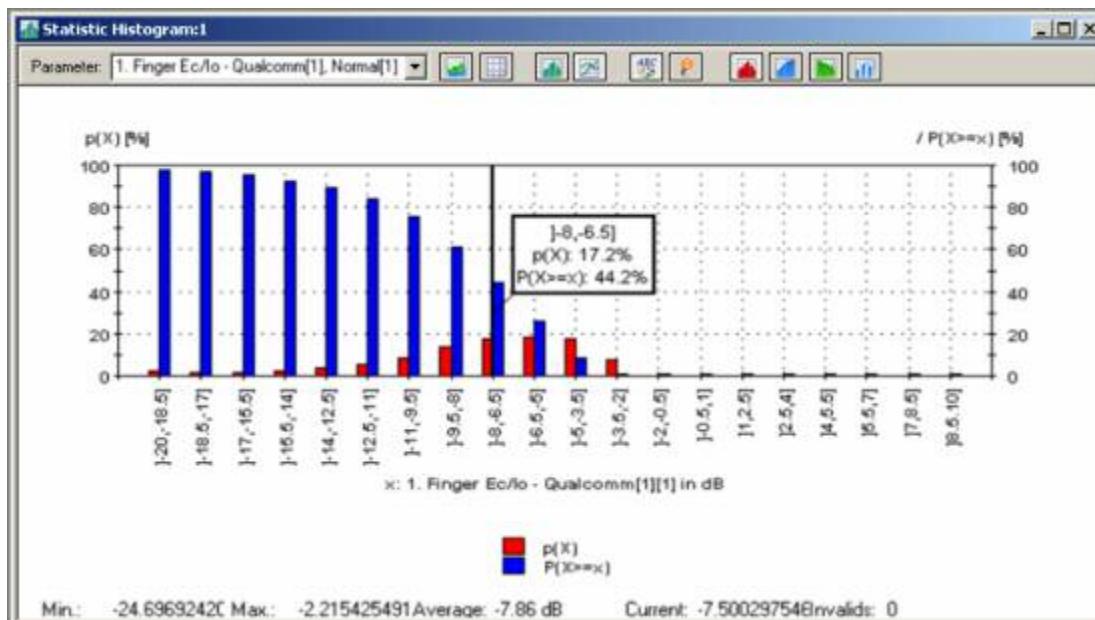


Fig. 4-11 Statistic Histogram View

Diagram / Table

The diagram or table shows the distribution of the signal values. The available signals appear in the *Parameter* pull-down list after they have been selected in the configuration menu. The two icons to the right of the *Parameter* list choose between a diagram or a table:



The values are displayed in a diagram



The values are displayed in a table. The following table corresponds to the bars in the figure above:

Qualcomm[1]		
1. Finger Ec/No in dB	%	#
] -20,-18.5]	1.9%	55
] -18.5,-17]	2.6%	74
] -17,-15.5]	3.6%	102
] -15.5,-14]	2.5%	70
] -14,-12.5]	3.4%	95
] -12.5,-11]	4.9%	138
] -11,-9.5]	8.1%	229
] -9.5,-8]	17.9%	506
] -8,-6.5]	15.5%	440
] -6.5,-5]	16.2%	458
] -5,-3.5]	15.9%	449
] -3.5,-2]	6.8%	193
] -2,-0.5]	0.0%	0
] -0.5,1]	0.0%	0
] 1,2.5]	0.0%	0
] 2.5,4]	0.0%	0
] 4.5,5]	0.0%	0
] 5.5,7]	0.0%	0

Diagram types

The remaining icons are enabled only if a diagram is selected. The next two icons select the diagram types:



The values are displayed in a bar chart



The values are displayed in a 2D-chart with a continuous (polygonal) curve

Legend and marker

The next two icons show or hide the legend and marker:



Displays or hides the legend on the right side of the diagram



Displays or hides the marker line and a info field. The info field shows the x-axis variable and the value of the relative and accumulated bars/curves (if activated) at the marker line. The marker line can be shifted to the left and to the right by means of the corresponding cursor keys. Besides a double click places the marker to the desired position.

Accumulated bars

The following icons display or hide the bars or curves for the relative or accumulated frequency of each value. Several types of bars/curves may be active at the same time:



Displays the relative frequency of all values in percent ($p(X)$ in the figure above:).



Displays the accumulated frequency in ascending order, i.e. the sum of the frequencies of all signal values below the current value ($P(X < x)$ in the figure above:).



Displays the accumulated frequency in descending order, i.e. the sum of the frequencies of all signal values above and including the current value ($P(X \geq x)$ in the figure above:). The first bar/first value of the curve always starts at 100%. The sum of the accumulated frequencies equals to 100% for all signal values:

$$P(X < x) + P(X \geq x) = 100\% \quad \text{for all } X$$



Shows or hides the device name in the legend and the marker.

The colors of the bars or curves and the scale of the y-axis are set in the *Settings* tab of the configuration menu.

Scaling

The x-axis is scaled by the expected value range of the analyzed signal. The expected range is set automatically for each signal but can be changed in the *Available Signals* tab of the *ROMES Configuration* menu (opened via *Configuration – Preferences*; see chapter 3). In this tab, *Exp. Min.*, and *Exp. Max.* define the first and last value of the x-axis.

The intermediate x-axis values depend on the nature of the analyzed signal:

Many signals are defined on a step scale with a fixed number of discrete values, e.g. the RxLev of a GSM mobile is an integer number between 0 and 63. For those signals, *Step* is displayed in the legend below the diagram; the x-axis is labeled by all values between the minimum and the maximum expected value. Each step represents a class for the statistical evaluation, i.e. it is represented by a single bar or point on the view curve.

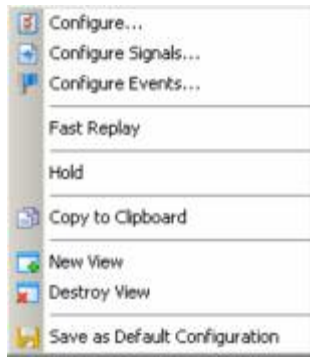
For continuous signals, classes are defined by dividing the expected value range by an integer number (*Number of Classes*) set in the *Settings* tab of the configuration menu. The classes are thus intervals of equal width; the center values of each interval labels the x-axis.

Legends

The diagram displays two types of legends:

On the right side, the types of bars/curves are indicated together with their colors.

Across the bottom of the diagram, the statistical parameters of the current signal are displayed: Minimum and maximum value ever measured or replayed (*Min. / Max.*), arithmetic mean value of all values ever measured (*Average*); *Current* value, and number of invalid values in the signal (*Invalid*). The invalid values are excluded from the diagram; the sum of all individual frequencies $p(X)$ always amounts to 100%.

Context menu

A right mouse click on any point in the view opens the context menu to access the configuration menus, (de-)select the view for fast replay, copy the current view to the clipboard, create or delete views, save the current configuration, move to another worksheet, or remove signals; see [Context menu](#) description on p. 4.2.

Statistic Histogram View Configuration

The *Statistic Histogram View* configuration menu defines the signals to be viewed, configures the diagram and shows information on the current view version. It is opened via a right mouse click on a point inside *Statistic Histogram View* or via the *Configuration – Settings* command (see chapter 3).

The *Values* tab selects the signals to be displayed. The figure below shows the signals provided by a GSM mobile phone. For an explanation of the signals refer to section *GSM Abbreviations* in chapter 8.

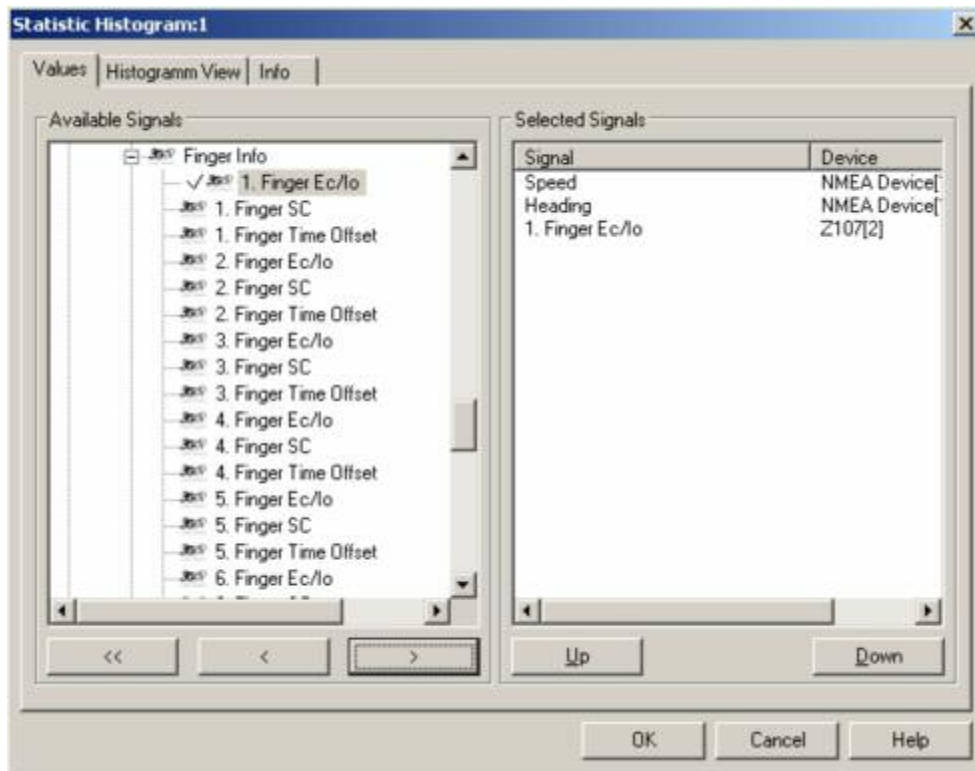


Fig. 4-12 Statistic Histogram View: parameter selection

The *Values* tab is analogous to the *Values* tab of the 2D Chart View configuration menu, see figure on p 4.13.

- Available Signals** Data tree showing all available signals (hierarchy level 4 of the data tree).
- To select a single signal for display, left-click this signal (which will be highlighted in inverse video) and click the > button. Alternatively, double-click the signal.
 - Select a parent node of higher hierarchy level (level 1, 2, or 3) and click > if you wish to select all signals below the node.

Selected Signals List of all signals selected for display.

- To remove a single signal from the list, left-click this signal (which will be highlighted in inverse video) and click the < button. Alternatively, double-click the signal or use the *Remove Signal* command in the view context menu.
- To remove all signals at once, click the << button.

The order of the list can be changed using the two buttons *Up* and *Down*. This order is relevant especially if the list contains more signals than can be displayed in the *Static Histogram View*.

The *Histogram View* tab defines how many classes are created to evaluate a continuous signal and selects the bar types/curves to be displayed, the display colors and the y-axis scale.

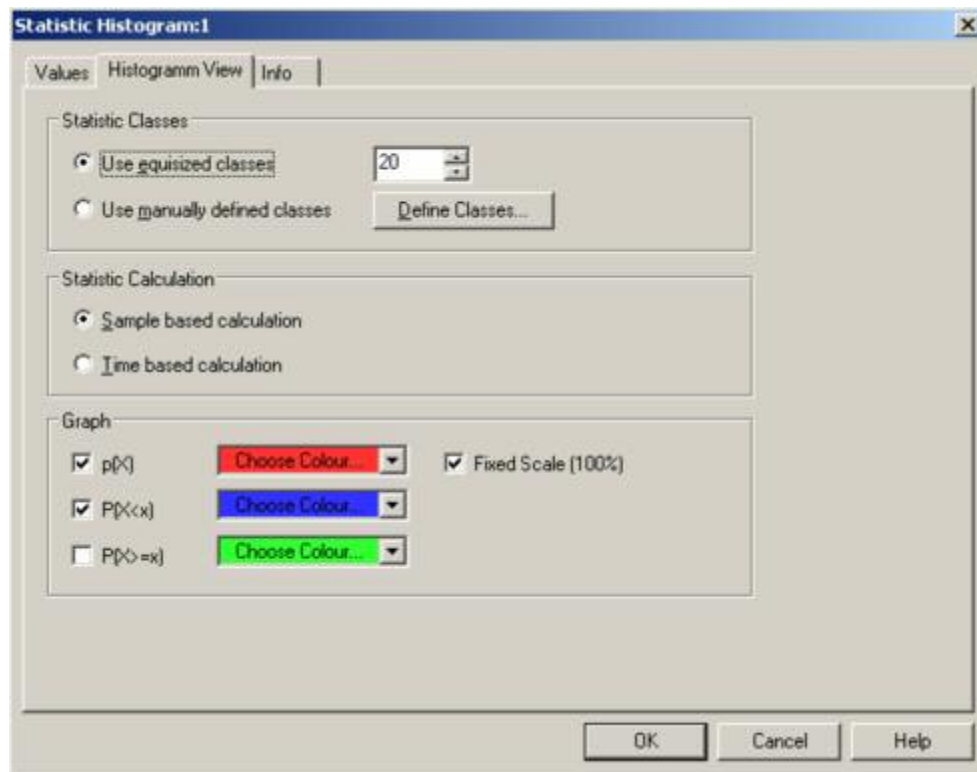
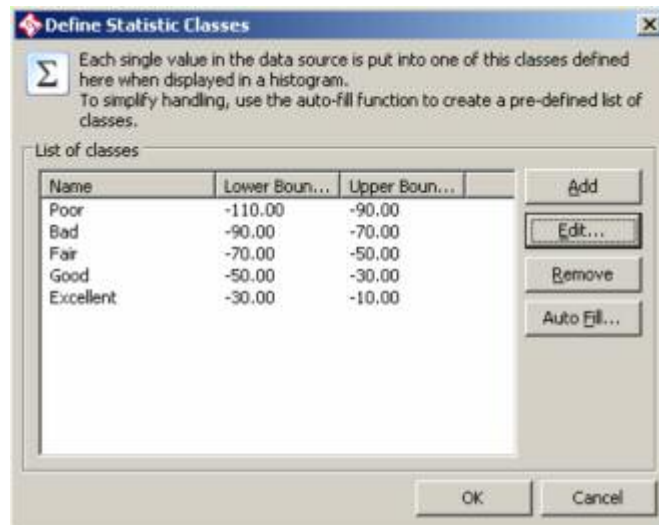


Fig. 4-13 Statistic Histogram View: Configuration

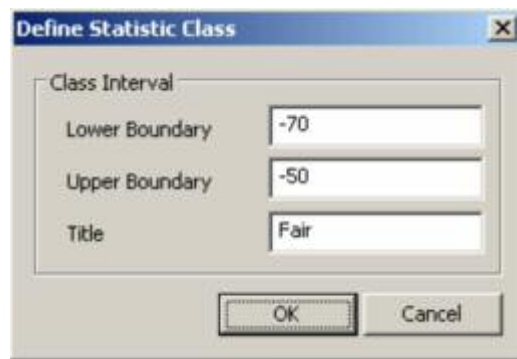
Statistic Classes If *Use equisized classes* is checked, a number of 2 to 256 classes for the statistical evaluation of a continuous signal can be selected. The classes are obtained by dividing the expected total value range of the signal by the entered *Number of Classes*; they correspond to intervals of the signal value of equal width. The intervals label the x-axis.

Use manually defined classes allows the definition of a number of classes that have different sizes, which are configured using the *Define Classes* button:

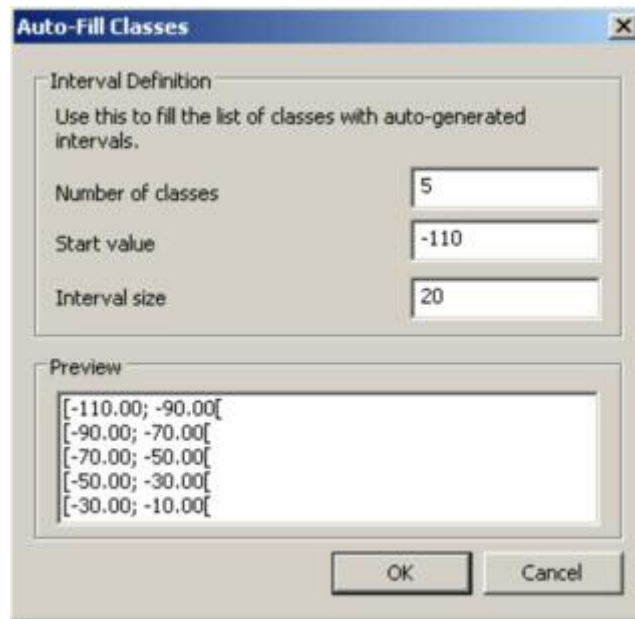


Each histogram class has a lower and an upper boundary, where the lower boundary is inclusive, the upper one exclusive. A title that is displayed on the histogram x axis can be defined optionally.

The classes can be created, modified and deleted using the *Add*, *Edit*, and *Remove* buttons on the right side of the class table. The *Add* and *Edit* dialogs are identical:



To simplify the process of manual definition of the individual classes, the dialog provides an Auto-Fill function. When the button is pressed, a new dialog is opened:



Here a whole set of (equally-sized) classes can be created by specifying the number of classes, the first lower boundary and the interval size. The i -th class has then a range from

$StartValue + i * InterValSize$

up to

$StartValue + (i+1) * InterValSize$, **excluded**.

The generated classes can then be modified to suit the measurement purpose.

Statistic Calculation

The height of the bars can be calculated in two alternative ways:

If *Sample based calculation* is selected the height of each bar is proportional to the number of samples in the class.

If *Time based calculation* is selected the height of each bar is proportional to the amount of time that the signal values fall inside the class.

The *Number of Classes* is ignored for step parameters.

Graph

Selects the bar types/curves to be displayed, the display colors and the y-axis scale. The three checkboxes $p(X)$, $P(X < x)$ and $P(X \geq x)$ show (if checked) or hide the bar graphs or curves for the relative frequency of the values per class and the accumulated frequencies; they are equivalent to the corresponding icons in the *Statistic Histogram View* (see above). The *Choose Color* pull-down lists select the display color for each bar graph or curve:



The *More Colors* button calls up the *Colors* menu described on p. [4.351](#).

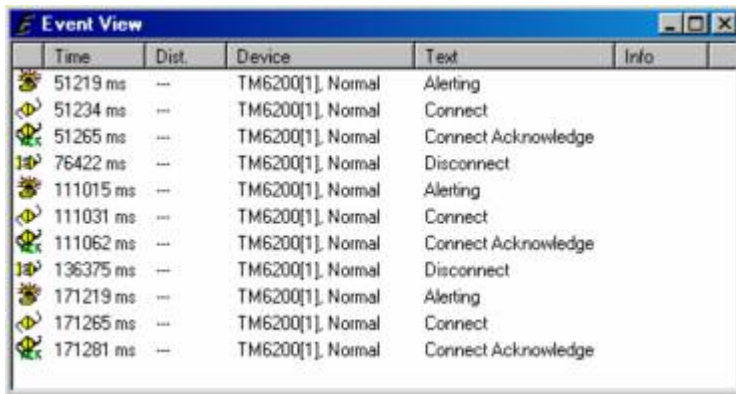
The *Fixed Scale* checkbox fixes (if checked) the y-axis scale of the diagram to the range between 0% and 100%, irrespective of the range of displayed values. Otherwise the $p(X)$ scale is adapted to the largest displayed value. The value range and thus the scale for the accumulated frequencies $P(X < x)$ and $P(X \geq x)$ is always fixed to the range between 0% and 100%.

OK Apply all *Statistic Histogram View* settings and close the configuration menu.

Cancel Discard all *Statistic Histogram View* settings and close the configuration menu.

Event View

The *Event View* displays a chronological record of all events that occurred during the measurement. What represents an event is defined in the *Available Events* tab of the *ROMES Configuration* menu, see chapter 3.



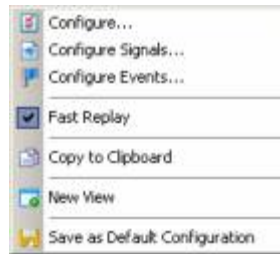
Event Symbol	Time	Dist.	Device	Text	Info
[Symbol]	51219 ms	---	TM6200[1]. Normal	Alerting	
[Symbol]	51234 ms	---	TM6200[1]. Normal	Connect	
[Symbol]	51265 ms	---	TM6200[1]. Normal	Connect Acknowledge	
[Symbol]	76422 ms	---	TM6200[1]. Normal	Disconnect	
[Symbol]	111015 ms	---	TM6200[1]. Normal	Alerting	
[Symbol]	111031 ms	---	TM6200[1]. Normal	Connect	
[Symbol]	111062 ms	---	TM6200[1]. Normal	Connect Acknowledge	
[Symbol]	136375 ms	---	TM6200[1]. Normal	Disconnect	
[Symbol]	171219 ms	---	TM6200[1]. Normal	Alerting	
[Symbol]	171265 ms	---	TM6200[1]. Normal	Connect	
[Symbol]	171281 ms	---	TM6200[1]. Normal	Connect Acknowledge	

Fig. 4-14 Event View

View table

The events are displayed in tabular form:

<i>Event symbol</i>	Graphical symbol for the event, also used in the <i>Available Events</i> tab to configure event selection
<i>Time</i>	Time of the event, the scale is relative to the start time of the measurement
<i>Distance</i>	The traveled distance between the shown events
<i>Device</i>	Device (mobile phone type, fax terminal, test receiver etc.) that triggered the event
<i>Text</i>	Event type
<i>Info</i>	Additional event information, e.g. the entered event comment.

Context menu

A right mouse click on any point in the view opens the context menu to access the *Configure Events* dialog (see chapter 3), (de-)select the view for fast replay, copy the current view to the clipboard, or move to another view area; see [Context menu](#) description on p. 4.2.

Event View Configuration

The *Event View* configuration menu defines the device events to be viewed, and shows information on the current view version. It is opened via a right mouse click on a point inside *Event View* or via the *Configuration – Settings* command (see chapter 3).

The *Event View Configuration* tab selects the devices of which the events are displayed.

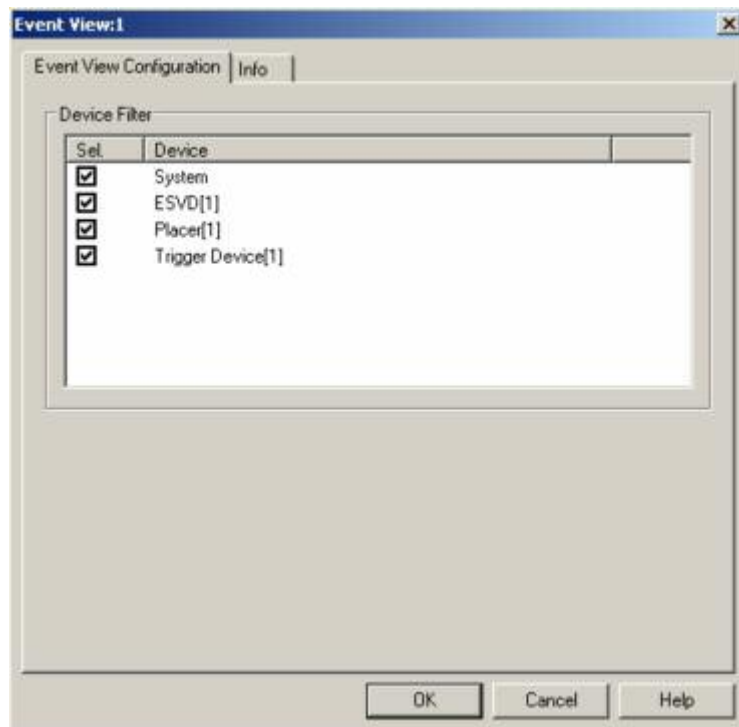


Fig. 4-15 Event View: Device Filter selection

The *Info* tab can be accessed via the *Configuration – Settings* command.

Message View

The *Message View* displays a detailed chronological record of the system messages generated during the measurement.



Fig. 4-16 Message View

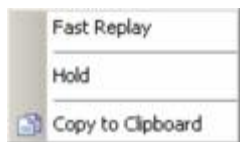
View contents The messages are displayed in consecutive lines together with the time when they were recorded. In general all messages are self-explanatory.

The messages generated during a Carrier-to-Interference analysis (with option PCSD-K6/-K7) deserve some particular attention and are explained below.



Clicking the icon in the lower left corner of the view deletes all messages in the view and clears a space for new messages.

Context menu A right mouse click on any point in the view opens the context menu to (de-)select the view for fast replay, to put the view on hold, or to copy the current view to the clipboard, or move to another worksheet; see [Context menu](#) description on p. 4.2.



The *Message View* has no configuration menu. The *Info* tab can be accessed via the *Configuration – Settings* command.

C:\Ru\ROMES\ID1026T17.58 created

A new Transmitter Scan file with the given name was created.

BTS appended

A BTS was appended successfully to the database. This message occurs only when the BTS was appended via the BTS edit function.

BTS deleted

Indicates that a BTS was deleted successfully from the database.

BTS time offset evaluation started

Starts the update of the database.

COX export finished

The GSM NWS measurement data export to a *.cox file is completed successfully.

Database updated

This message shows the update of the database, which usually occurs every two minutes.

Frequency correction started

In regular time intervals, the system performs a frequency correction to the R&S ESVD. Especially, if the R&S ESVD was cold at the beginning of the measurement, this correction is very important and can take larger values.

Frequency correction = ... Hz

The result of this frequency correction.

Frequency correction stopped

The frequency correction is calculated with help of at least 4 sectors. If less than 4 sectors are available, the frequency correction could not be performed and this message appears.

Just ... MB memory left

In order to be able to run the software there must be at least 80 MByte of free disk space available. If this message occurs, check your free disk space and verify that the disk is not fragmented.

Problems with Transmitter Scan

This message appears if there are problems during the assignment of a Transmitter Scan (TS), e.g. due to unusual propagation conditions at the measurement location.

If this message appears in regular intervals, e.g. every two minutes, synchronization of the TS was not possible. To be synchronized, a TS must contain common BTS sectors with the database that can be compared to obtain a common reference time. In practice, this means that the areas of a new TS must overlap with one of the areas measured before (see section *Measurement Process* in chapter 1). PCSD-K6 tries to overlap a new TS with the existing database for 15 minutes. If the synchronization fails, the TS is stopped and a new one is initiated. The message *Problems with Transmitter Scan* is displayed every two minutes as long as the overlap is attempted.

To make sure that an overlap is possible, start your measurement from a point inside an area that was already measured.

- If the message disappears after 15 minutes, the new TS could be synchronized. Nothing else must be done.
- If the message continues to be displayed, drive back to an area that was already measured.
- If the synchronization still fails, create a new database.

Sector skipped: (Reason)

After reading a sector from the base station text file, the program checks, whether all entries have consistent values. E.g. if there is a sector in the GSM band with channel 1283, the sector is not taken into the database.

Skip sector

During reading a base station text file, a sector did not have all mandatory entries. The corresponding sector is skipped and the program continues with reading the next sector.

Start COX export of file ...

The GSM Network Scanner measurement data is capable to export the measurement data to a GSM NWS *.cox export file. Detailed export-related messages are available in the Message View, which show more details than the usual logfiles.

System nonlinear to network

One or more BTS have a drift beyond the allowed range. In this case, a new Transmitter Scan file is created.

Transmitter Scan Overlap: m Sectors, n Identified Sectors

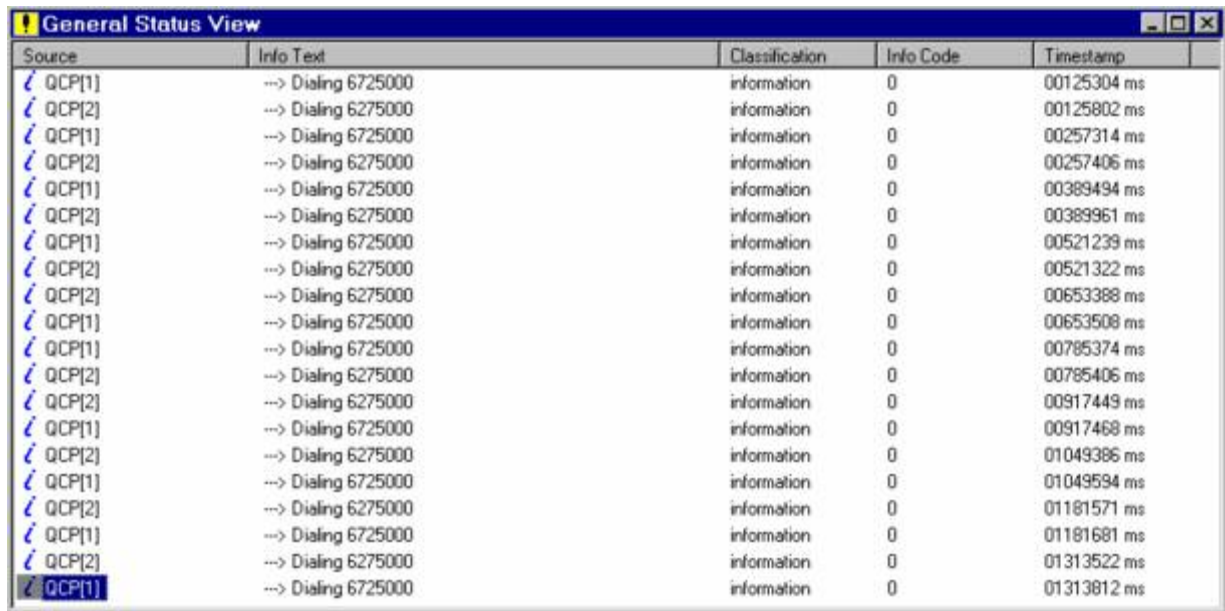
When a new Transmitter Scan file is opened, m recently measured BTS are also taken in the new file in order to avoid a loss of overlap. On n of these sectors the CI could be identified.

TS File ... added to database

Every Transmitter Scan file which is manually added to the database is shown.

General Status View

The *General Status View* displays text messages of general interest, e.g. application events reported during the measurement. NQA messages can be displayed in the *General Status View* if the *NQA monitoring active* option in the *NQA* tab of the GSM driver configuration menu is enabled (see chapter 6).



Source	Info Text	Classification	Info Code	Timestamp
QCP[1]	--> Dialing 6275000	information	0	00125304 ms
QCP[2]	--> Dialing 6275000	information	0	00125802 ms
QCP[1]	--> Dialing 6275000	information	0	00257314 ms
QCP[2]	--> Dialing 6275000	information	0	00257406 ms
QCP[1]	--> Dialing 6275000	information	0	00389494 ms
QCP[2]	--> Dialing 6275000	information	0	00389961 ms
QCP[1]	--> Dialing 6275000	information	0	00521239 ms
QCP[2]	--> Dialing 6275000	information	0	00521322 ms
QCP[2]	--> Dialing 6275000	information	0	00653388 ms
QCP[1]	--> Dialing 6275000	information	0	00653508 ms
QCP[1]	--> Dialing 6275000	information	0	00785374 ms
QCP[2]	--> Dialing 6275000	information	0	00785406 ms
QCP[2]	--> Dialing 6275000	information	0	00917449 ms
QCP[1]	--> Dialing 6275000	information	0	00917468 ms
QCP[2]	--> Dialing 6275000	information	0	01049386 ms
QCP[1]	--> Dialing 6275000	information	0	01049594 ms
QCP[2]	--> Dialing 6275000	information	0	01181571 ms
QCP[1]	--> Dialing 6275000	information	0	01181681 ms
QCP[2]	--> Dialing 6275000	information	0	01313522 ms
QCP[1]	--> Dialing 6275000	information	0	01313812 ms

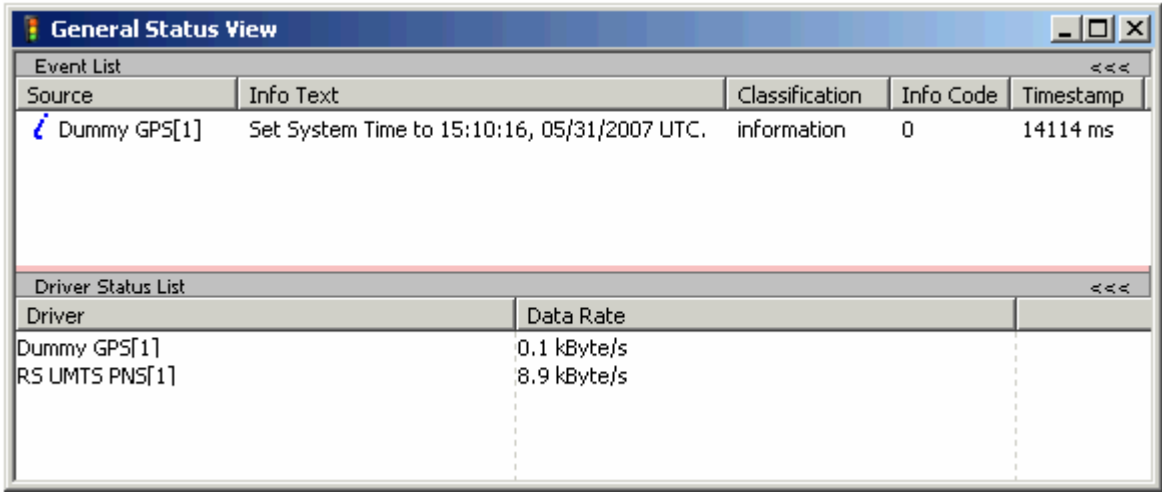


Fig. 4-17 General Status View

Note:

Events will show in the General Status window during recording and replay only, not during the measurement. If the measurement runs without problems, no messages might appear for an extended period.

Context menu



A right mouse click on any point in the view opens the context menu to access the configuration menus, (de-)select the view for fast replay, copy the current view to the clipboard, save the current configuration, or move to another worksheet; see [Context menu](#) description on p. 4.2.

General Status View Configuration

The *General Status View* configuration activates the remote display and shows information on the current view version. It is opened via a right mouse click on a point inside the *General Status* or via the *Configuration – Settings* command (see chapter 3).

The remote display TS95-RD makes it easier to monitor the process of data recording. It can be ordered from Rohde & Schwarz with stock no. 1122.9350.02 and is simply connected to the measurement system via a printer connector. During the measurement tour, the LEDs of the remote display inform the driver whether the measurement yields valid data, a warning, or an error.

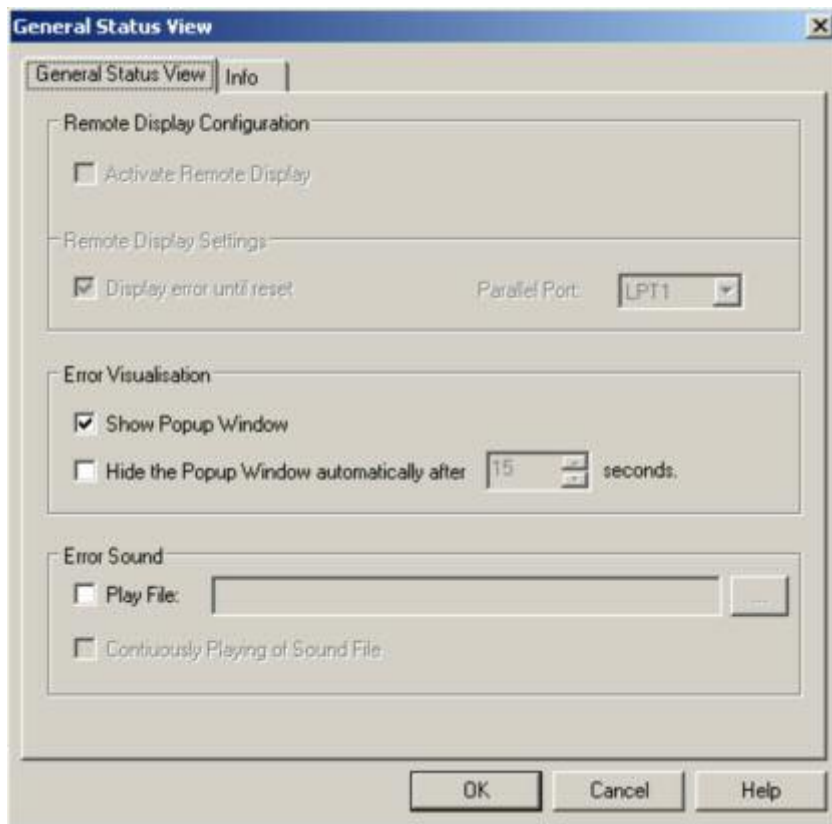


Fig. 4-18 General Status View: Configuration

Activate Remote Display The *Activate Remote Display* switch activates (box checked) or deactivates the remote display. If the box is checked the *Remote Display Settings* are enabled.

Remote Display Settings The *Remote Display Settings* panel configures the remote display and assigns it to a printer connector.

Display error... If this box is checked and an error is detected, the error LED lights and an acoustic signal sounds until an explicit reset via the *Acknowledge* key of the remote display. Otherwise, the error LED goes out as the measurement continues.

Parallel port Parallel port used to connect the remote display

Error Visualization For each error detected, an error message can be displayed in a popup window that will either remain on screen or be automatically closed after a definite time (option *Hide the Popup...* checked). The display time of the popup is set in the *after...seconds* field.

Error Sound For each error detected, an error sound is played if the *Play File* box is checked. A wave file (*.wav) can be selected by means of the "..." button. If the *Continuously Playing...* option is checked the sound is continuously repeated.

X-Y Graph View

The X-Y Graph (or scatter plot) can be used to set two selectable signals in correlation to each other, i.e. the value of one signal is used as x value, the value of another signal as y value. For example, the correlation between RxQual and RxLev may be of interest. This configuration is shown in the figure below.

Note that the quantity of an x-y-pair is shown using the color and the radius of the circle. The larger the radius, the more samples have been found for that pair. Same applies to the darkness of the color: The darker the color, the more pairs were detected.

To calculate these indicators, all pairs found are set in relation to each other, i.e. their quantity is normalized.

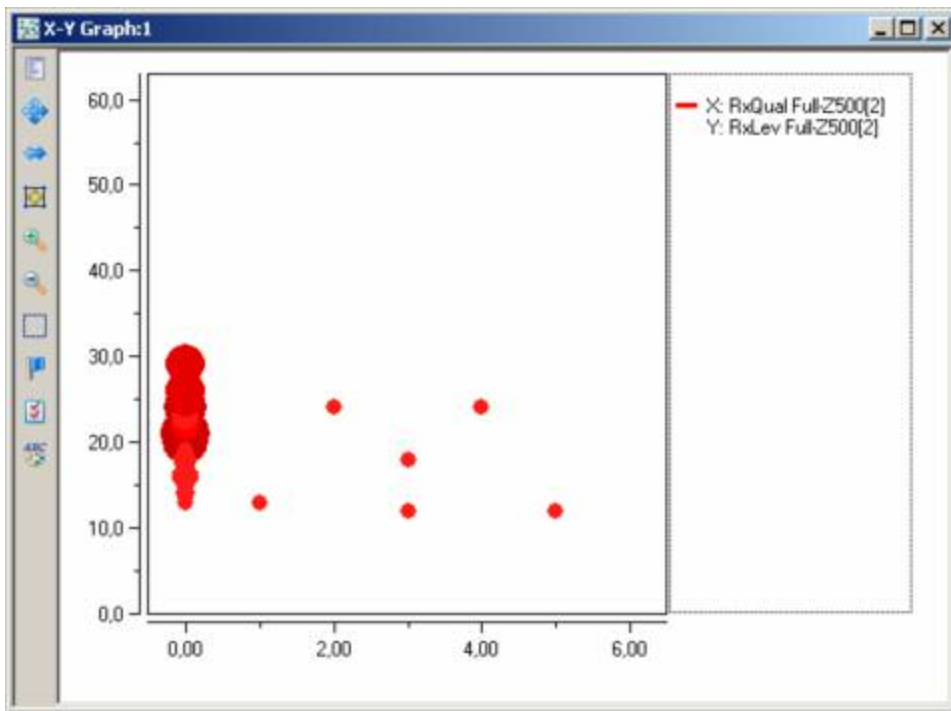
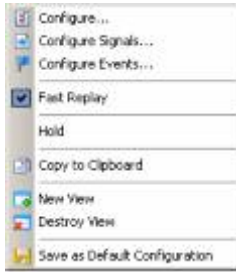


Fig. 4-19 X-Y Graph View

Context menu

A right mouse click on any point in the view opens the context menu to access the configuration menus, (de-)select the view for fast replay, copy the current view to the clipboard, or save the current configuration; see *Context menu* description on p. 4.2.



X-Y Graph View Configuration

The *X-Y Graph View* configuration selects and controls the signals to be displayed and shows information on the current view version. It is opened via a right mouse click on a point inside the *X-Y Graph View* or via the *Configuration – Settings* command (see chapter 3).

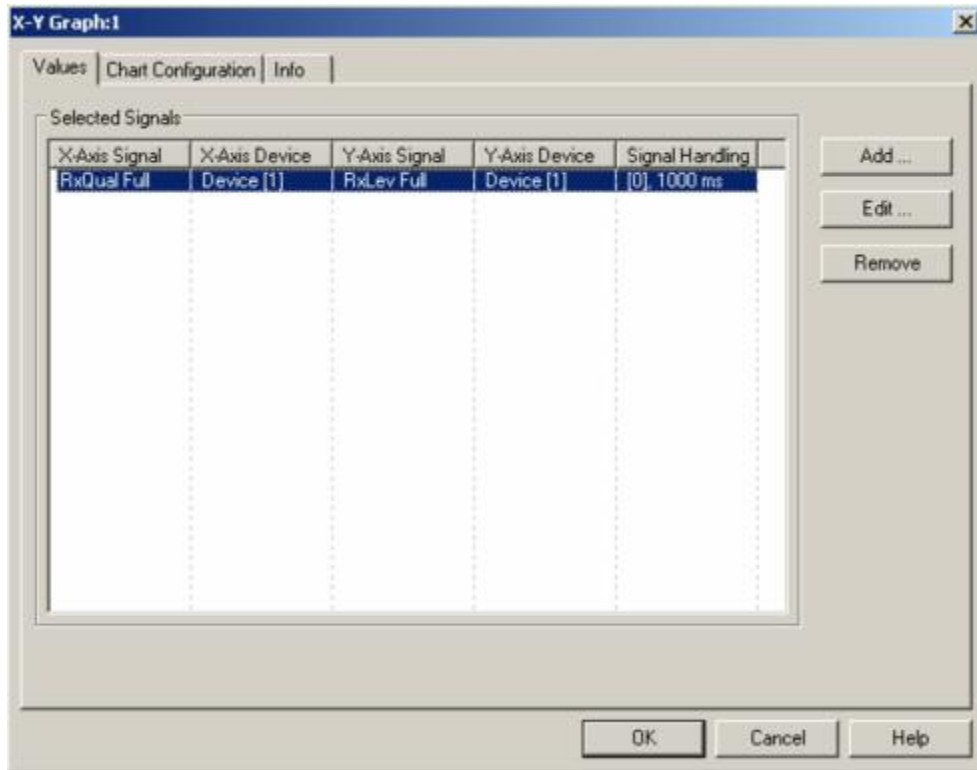


Fig. 4-20 X-Y Graph View: Configuration - Values

Selected Signals The *Selected Signals* table on the *Values* panel shows the configured signals and associated devices of the scatter plot axes

X-Axis Signal List of all signals selected for display on the X-axis.

X-Axis Device Associated device of the signal selected for display on the X-axis.

Y-Axis Signal List of all signals selected for display on the Y-axis.

Y-Axis Device Associated device of the signal selected for display on the Y-axis.

Signal Handling This column shows the plot mode number and the selected timeslot (see description below).

Available Signals *Add...* This button opens a menu to add the signals available for the X and Y-axes.

Edit... This button opens a menu to modify the signals available for the X and Y-axes.

Remove Removes the complete signal row from the table



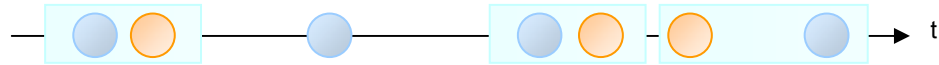
Signal Handling

Since many signals cannot be matched directly because they are measured/reported at different points in time, the scatter plot can be configured how to match an x-y pair.

These signal handling modes are available:

Last Value [0]:

X, Y values are matched without the need of any time-constraint, the time slice is preset to 1s. Once an x-y pair is available it is displayed by the graph:



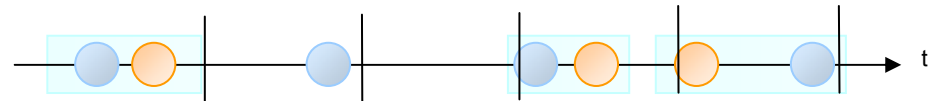
Time Slots [1]:

X, Y values are matched if both occur within a given time interval, i.e. if one signal has a valid value, then a pair is built if the other signal reports a valid value within a specified time range.



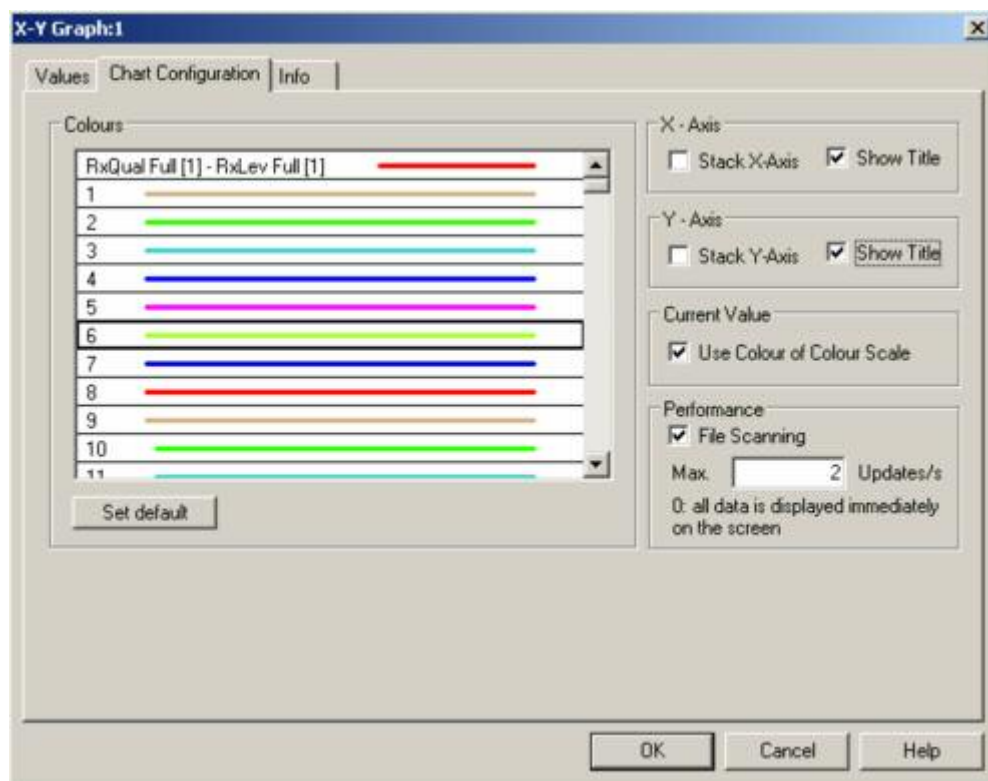
Equidistant Time Slices (last value)[2]:

The time axis is split in time-slots of the same size. If in each time-slot at least one value for each X and Y signal is found, then this pair is used as input for the graph. Only one pair per time-slot is built and the most-recent values for each signal are used. The length of the time slot is defined by the time slice value entry field.



Equidistant Time Slices (average value)[3]:

Similar to the mode [2] above, but all reported values in a time-slot for one signal are averaged. The length of the time slot is defined by the time slice value entry field.



Colors The colors of up to 199 signal curves can be defined in the *Colors* menu opened on double-clicking a field in the *Colors* panel (see p. 4.351). The *Set default* button resets all colors to their default values.

X-Axis

- *Stack X-Axis* displays the x-axis scales for all selected signals. This setting is effective only if more than one signal is selected.
- *Show Title* shows or hides the x-axis title (only visible if the view window is high enough for the title display).

Y-Axis

- *Stack Y-Axis* displays the y-axis scales for all selected signals. This setting is effective only if more than one signal is selected.
- *Show Title* shows or hides the y-axis title (window is high enough for the title display).

Statistic View

The *Statistic View* displays the most common statistical key indicators of any R&S ROMES signal. The view is available as basic view and can therefore be configured per drag & drop similar to e.g. the chart and alphanumeric views.



Parameter	Unit	Count	Inva...	Mean	Dev.	Min.	1%	5%	50%	95%	99%	Max.	Eval. mode
RxLev Full	Step	147	6	24.36	4.1	12	12	16	25	29	29	29	Sample
RxLev Sub	Step	147	60	71.89	4.5	11	11	13	23	28	30	30	Sample
RxQual Full		147	58	0.58	0.8	0	0	0	0	2	5	5	Sample
RSCP(CPICH)	dBm	451	0	-80.33	2.3	-85.4	-85.2	-83.9	-80.7	-76.2	-75.4	-74.4	Sample
Ec/No(CPICH)	dB	451	0	-4.30	0.8	-6.2	-5.6	-5.3	-4.6	-2.7	-2.4	-2.2	Sample
RSSI(Carrier)	dBm	451	0	-76.04	2.0	-81.9	-81.1	-79.0	-76.3	-72.7	-71.7	-71.3	Sample
Tx Power	dBm	451	368	-0.00	2.6	-23.1	-23.1	-20.4	-17.4	-11.1	-9.3	-9.3	Sample

Fig. 4-21 Statistic View

Table

The diagram or table shows the statistical key indicators of the signal values. The available signals appear in the *table* after they have been selected in the configuration menu. The two icons above the *Parameter* list control the update behavior of the view.



During a measurement, this icon resets the view content.



This icon enables or disables (pauses) the update of the view when new data is obtained.

These statistical indicators are calculated:

- Number of Samples (Valid & Invalid)
- Number of invalid Samples
- Mean
- Standard Deviation
- Minimum and Maximum
- Percentiles (1%, 5%, 50%, 95%, 99%)

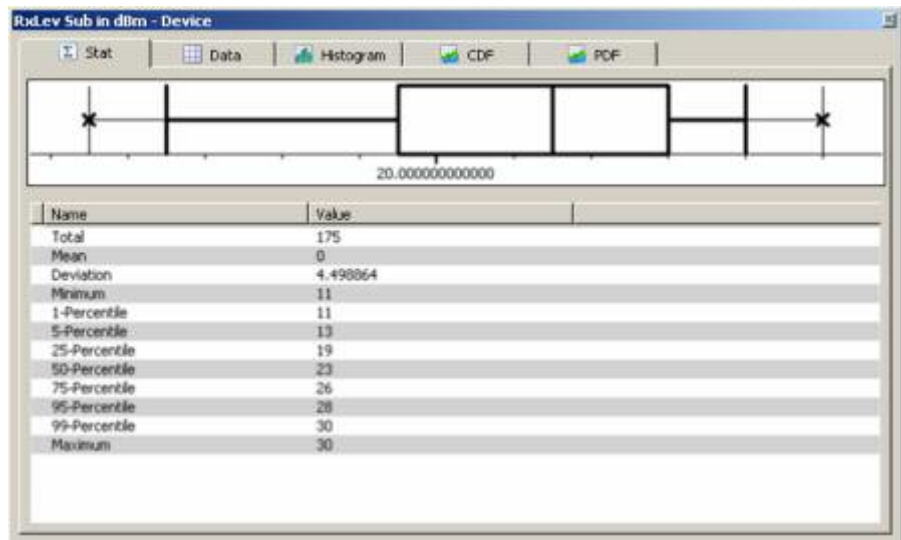
Analyzer

For each configured signal, a specialized analyzer window can be opened that provides additional views on the signal data.

A double click on a signal table row opens the analyzer tab panel. Alternatively, a single mouse click on the row and a right click with the *Open Analyzer* item of the context menu also opens the analyzer:

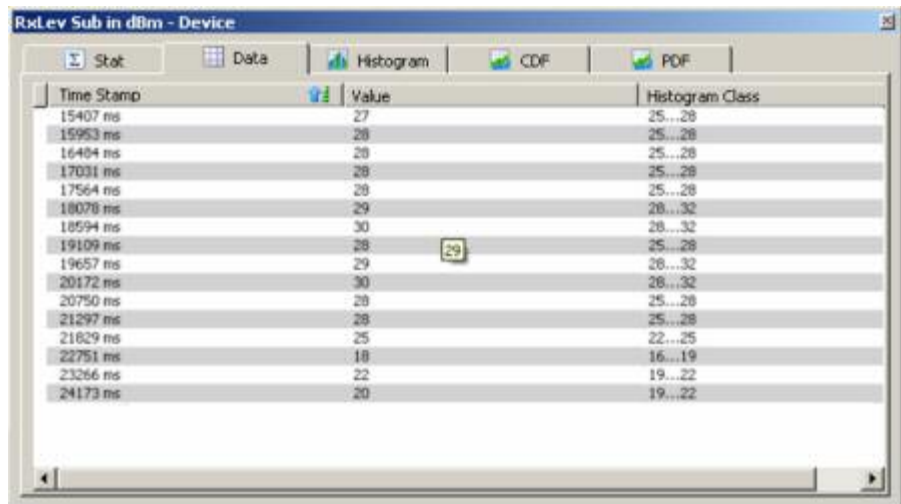
Analyzer *Stat* panel:

The upper part of the *Stat* panel shows a chart visualizing the statistical indicators, the lower part shows the associated indicators in a table.



Analyzer *Data* panel:

The *Data* panel displays the time stamps of the related signal, the value of the statistical parameter and the label of the class the parameter value belongs to.



The number of the most recent values displayed can be configured using the Performance configuration, see p. 4.39.

Analyzer *Histogram* panel:

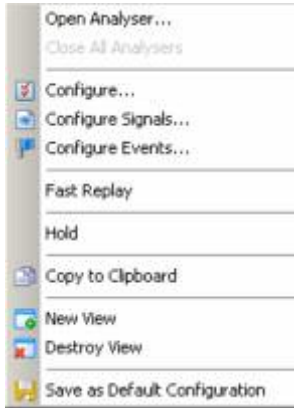
The *Histogram* panel shows the signal parameter values as bar charts, where the diagram types, the legend, and the accumulated bars are analogous to the *Statistic Histogram View* described on p. 4.16.

Analyzer *CDF* panel:

This panel displays the *Cumulative Distribution Function* (CDF) of the selected signal data.

Analyzer PDF panel:

This panel displays the *Probability Distribution Function* (PDF) of the selected signal data.

Context menu

A right mouse click on any point in the view opens the context menu to open or close the Analyzer view, to access the configuration menus, (de-)select the view for fast replay, copy the current view to the clipboard, create or destroy views, save the current configuration, or remove signals; see *Context menu* description on p. 4.2.

Statistic View Configuration

The *Statistic View* configuration selects and controls the signals to be displayed and shows information on the current view version. It is opened via a right mouse click on a point inside the *Statistic View* or via the *Configuration – Settings* command (see chapter 3).

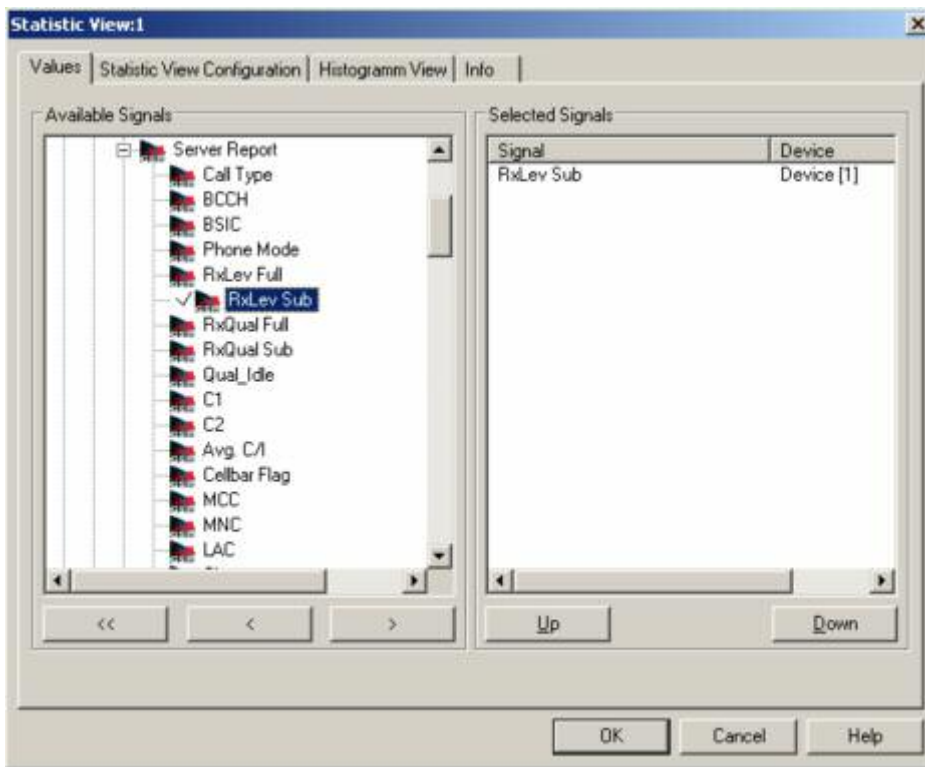


Fig. 4-22 Statistic View: Configuration - Values

The *Values* tab is analogous to the *Values* tab of the *2D Chart View* configuration menu, see figure on p 4.13.

- Available Signals** Data tree (see chapter 1) showing all available signals (hierarchy level 4 of the data tree).
- To select a single signal for display, left-click this signal (which will be highlighted in inverse video) and click the > button. Alternatively, double-click the signal.
 - Select a parent node of higher hierarchy level (level 1, 2, or 3) and click > if you wish to select all signals below the node.

- Selected Signals** List of all signals selected for display.
- To remove a single signal from the list, left-click this signal (which will be highlighted in inverse video) and click the < button. Alternatively, double-click the signal or use the *Remove Signal* command in the view context menu.
 - To remove all signals at once, click the << button.
- The order of the list can be changed using the two buttons *Up* and *Down*. This order is relevant especially if the list contains more signals than can be displayed in the *Statistic View*.

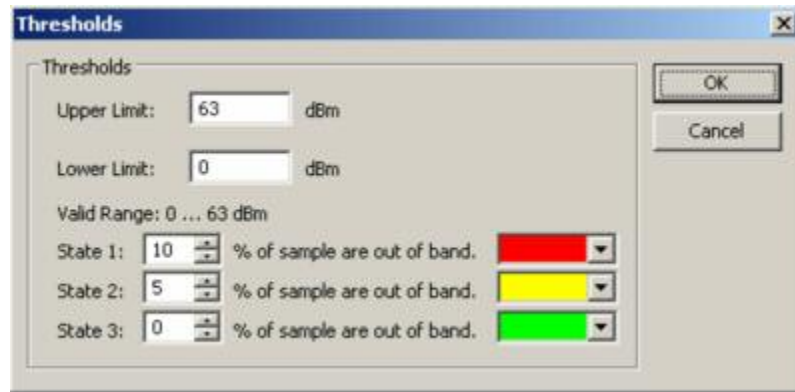
The *Statistic View Configuration* tab defines the colors associated with upper and lower threshold signal values, the signal evaluation mode and the number of stored signal values for performance control purposes.



Fig. 4-23 Statistic View: Configuration

Thresholds and evaluation mode

When the checkbox of the signal is checked, the corresponding signal thresholds can be defined with the dialog opened by a click on the *Change Thresholds..* button:



The *Upper* and *Lower Limits* must be within the valid range that is displayed for the signal. The signal states and the state indicating colors can be defined using the percentiles and the color selection listboxes below the limit entry fields.

The Evaluation mode of the signal can either be defined as *Sample based*, where the number of samples in the measurement is used, or as *Time based*, where the amount of time determines the number of samples.

Performance

The number of *Lines per data list* limits the stored results shown in the Analyzer *Data* panel (see p. 4.36). The *Updates/s* field defines the refresh rate of the signal display, where a value of "0" means that the signal data is displayed immediately (i.e. as soon as the data is available).

OK

Apply all *Statistic View* settings and close the configuration menu.

Cancel

Discard all *Statistic View* settings and close the configuration menu.

Help

Opens the online help for R&S ROMES 3NG.

The *Histogram View* tab defines how many classes are created to evaluate a continuous signal and selects the bar types/curves to be displayed, the display colors and the y-axis scale.

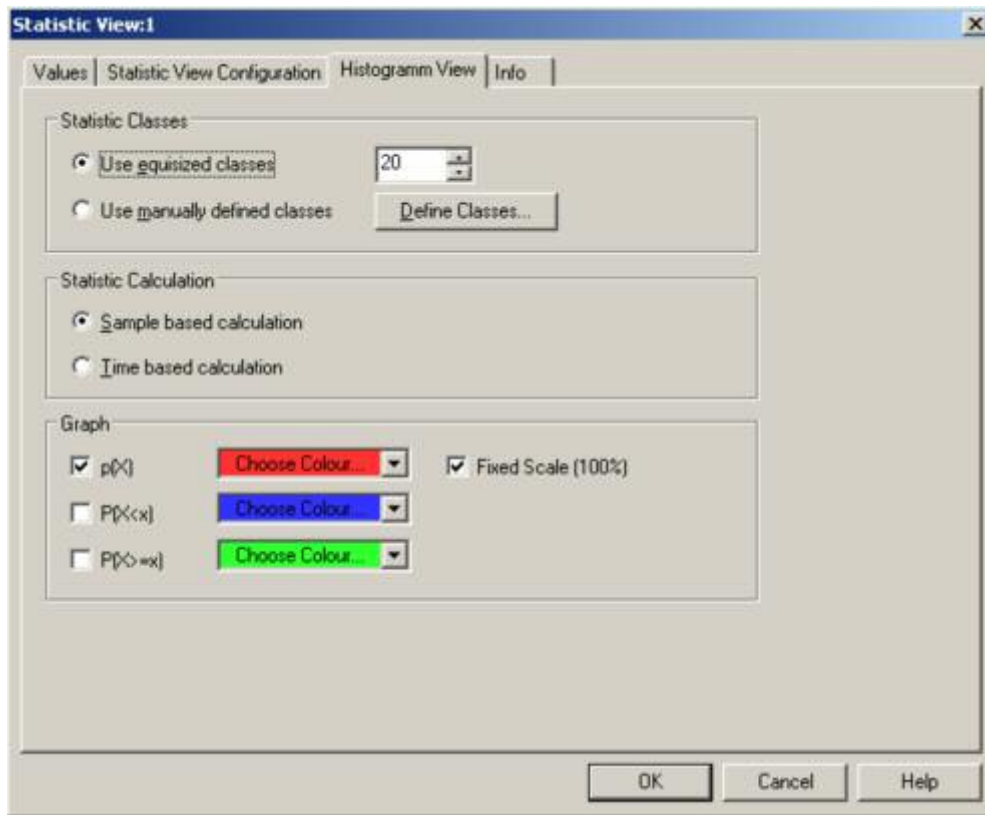
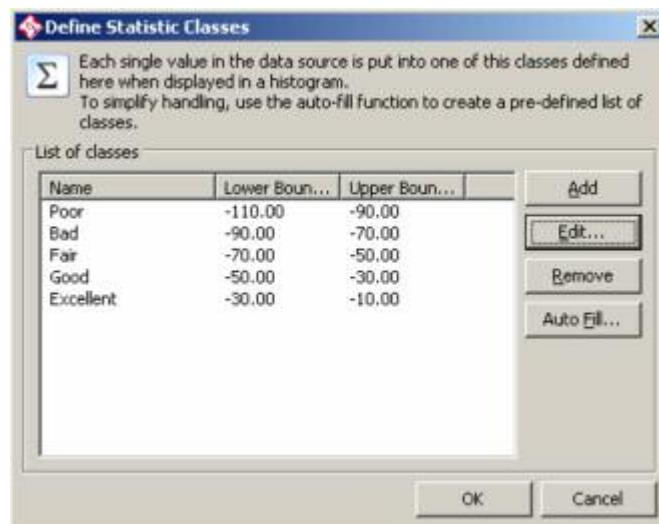


Fig. 4-24 Statistic Histogram View: Configuration

Statistic Classes If *Use equisized classes* is checked, a number of 2 to 256 classes for the statistical evaluation of a continuous signal can be selected. The classes are obtained by dividing the expected total value range of the signal by the entered *Number of Classes*; they correspond to intervals of the signal value of equal width. The intervals label the x-axis.

Use manually defined classes allows the definition of a number of classes that have different sizes, which are configured using the *Define Classes* button:



Each histogram class has a lower and an upper boundary, where the lower boundary is inclusive, the upper one exclusive. A title that is displayed on the histogram x axis can be defined optionally.

The classes can be created, modified and deleted using the *Add*, *Edit*, and *Remove* buttons on the right side of the class table. The *Add* and *Edit* dialogs are identical:

To simplify the process of manual definition of the individual classes, the dialog provides an Auto-Fill function. When the button is pressed, a new dialog is opened:

Here a whole set of (equally-sized) classes can be created by specifying the number of classes, the first lower boundary and the interval size. The i -th class has then a range from

$StartValue + i * InterValSize$

up to

$StartValue + (i+1) * InterValSize$, **excluded**.

The generated classes can then be modified to suit the measurement purpose.

Statistic Calculation

The height of the bars can be calculated in two alternative ways:

If *Sample based calculation* is selected the height of each bar is proportional to the number of samples in the class.

If *Time based calculation* is selected the height of each bar is proportional to the amount of time that the signal values fall inside the class.

The *Number of Classes* is ignored for step parameters.

Graph

Selects the bar types/curves to be displayed, the display colors and the y-axis scale. The three checkboxes $p(X)$, $P(X<x)$ and $P(X\geq x)$ show (if checked) or hide the bar graphs or curves for the relative frequency of the values per class and the accumulated frequencies; they are equivalent to the corresponding icons in the *Statistic Histogram View* (see above). The *Choose Color* pull-down lists select the display color for each bar graph or curve:



The *More Colors...* button calls up the *Colors* menu described on p. 4.351.

The *Fixed Scale* checkbox fixes (if checked) the y-axis scale of the diagram to the range between 0% and 100%, irrespective of the range of displayed values. Otherwise the $p(X)$ scale is adapted to the largest displayed value. The value range and thus the scale for the accumulated frequencies $P(X<x)$ and $P(X\geq x)$ is always fixed to the range between 0% and 100%.

OK

Apply all *Statistic Histogram View* settings and close the configuration menu.

Cancel


Discard all *Statistic Histogram View* settings and close the configuration menu.

The *Info* tab can be accessed via the *Configuration – Settings* command; see p. 4.4.

Navigation Views

The *Navigation Views* can be used to visualize measured quantities with valid geographic coordinates and to retrieve the geographic coordinates of an individual measured value.



Click the  icon in the measurement bar and use the Available Signals Drag & Drop... dialog to display signals in the Navigation Views.

The navigation views can be selected from a submenu displayed to the right of the *View* menu when the mouse pauses over *Navigation Views*.

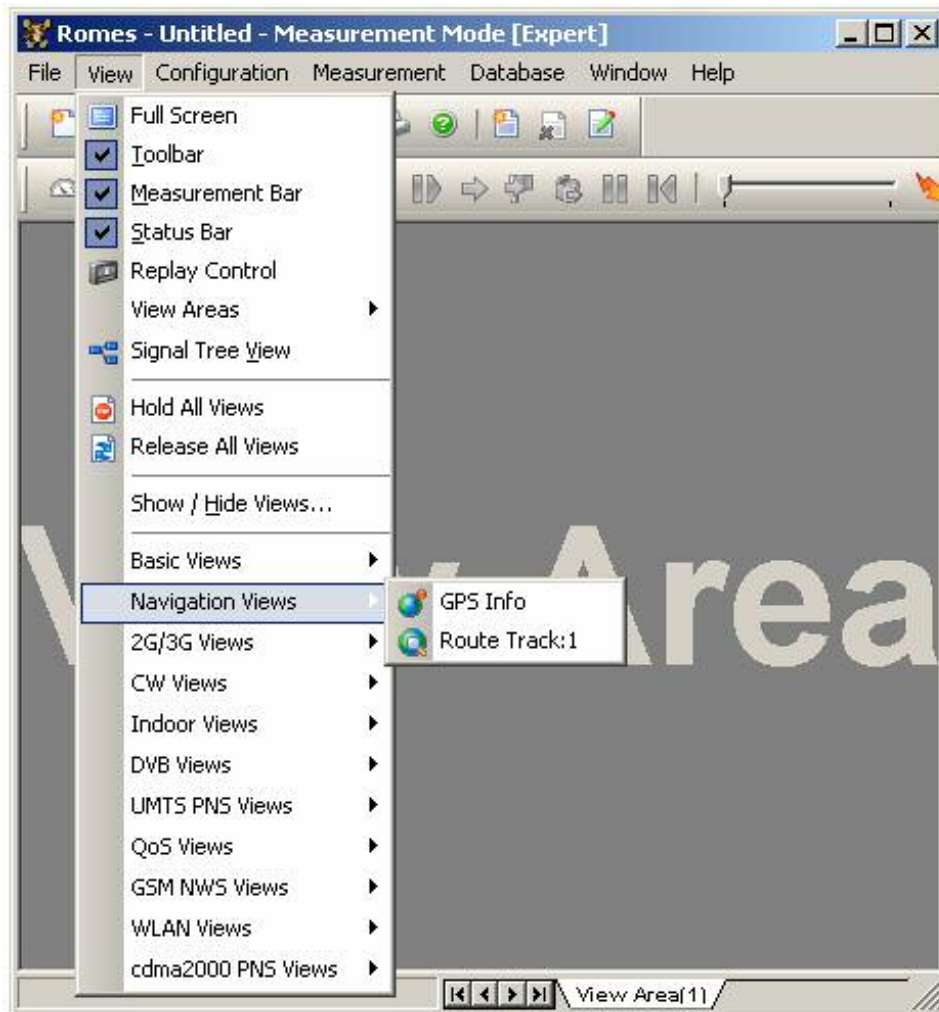


Fig. 4-25 Navigation Views

GPS Info

The *GPS Info* window shows the recorded GPS information and the calculated direction and speed of the test vehicle. Compass heading and speed are displayed in a compass and speedometer if the GPS receiver provides these quantities.

The detected GPS satellites are shown with their IDs. The bar graphs show the relative quality of the received GPS signals.

If the R&S ROMES measurement setup is equipped with a U-BLOX GPS receiver, additional car sensor information is shown in the *GPS Info* window, if available.

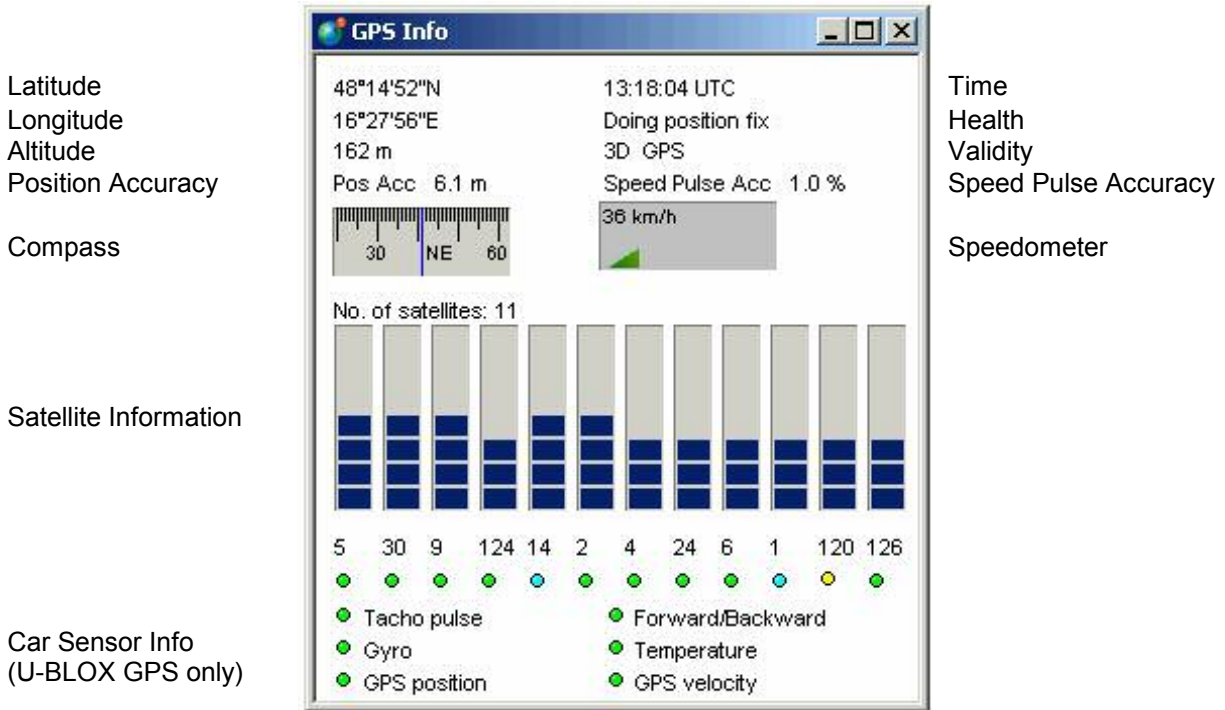


Fig. 4-26 GPS Info view

**Latitude/Longitude/
Altitude**

The left column of the view shows the geographic coordinates of the current measurement point.

Time

The first entry in the right column represents the Universal Time Coordinated (UTC) of the current measurement point.

Health

The second entry in the right column describes the operating conditions of the GPS receiver. The *GPS Info* view displays messages such as *Doing position fix*, *No usable satellite*, *Only 1 satellite*, ...

Validity

The third entry in the right column describes the validity of the current results. The following status messages are possible:

<i>2D GPS</i>	Data with valid longitude and latitude coordinates
<i>3D GPS</i>	Data with valid longitude and latitude and altitude coordinates
<i>2D DGPS</i>	Data with valid longitude and latitude coordinates, only with DGPS (differential GPS) receiver
<i>3D DGPS</i>	Data with valid longitude and latitude and altitude coordinates, only with DGPS (differential GPS) receiver
<i>DR</i>	Dead Reckoning, only Trimble Placer or GINA by Rohde & Schwarz.

Compass and Speedometer

Display of the compass and speedometer is optional; see configuration menu below. Only GPS receivers supporting the RMC protocol (\$GPRMC) provide the direction and speed of the test vehicle.

Satellite Information

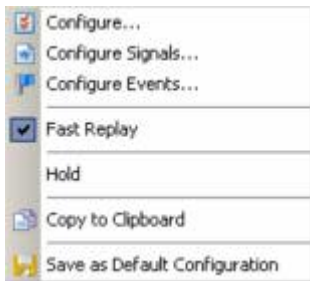
These bar graphs show the relative signal quality of up to 11 satellites within range of the GPS receiver. The satellite ID numbers are displayed below the associated bar graph.

Note that this information is only available if this is supported by the used GPS receiver.

Car Sensor Info

The Car Sensor Info is only available with an installed U-BLOX GPS receiver unit. This unit is supported, but it is not available from Rohde & Schwarz.

Context menu



A right mouse click on any point in the view opens the context menu to access the configuration menus, (de-)select the view for fast replay, to put the view on hold, or to copy the current view to the clipboard, or move to another worksheet; see [Context menu](#) description on p. 4.2.

GPS Info Configuration

The *GPS Info* configuration menu shows or hides the compass and speedometer, the satellite information, and the car sensor info described in the *GPS Info* menu. It is opened via a right mouse click on a point inside the *GPS Info* or via the *Configuration – Settings* command (see chapter 3).

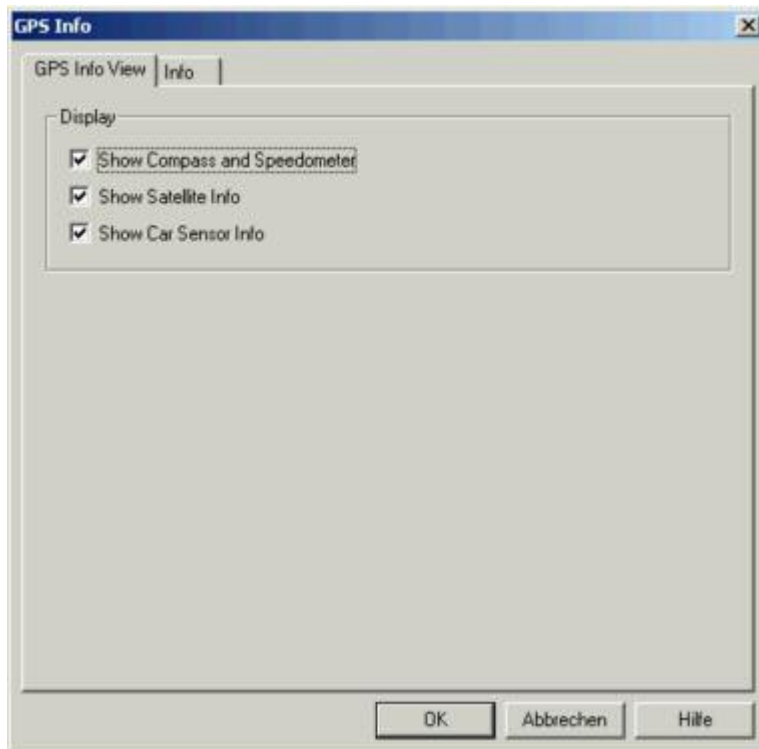


Fig. 4-27 GPS Info configuration

Route Track

The *Route Track* diagram visualizes a measurement tour and the behavior of the measured signals using a projection onto a background map that can be loaded and positioned into the view.

In addition to the signal, the events recorded along the route and the base station located in the vicinity can be displayed.

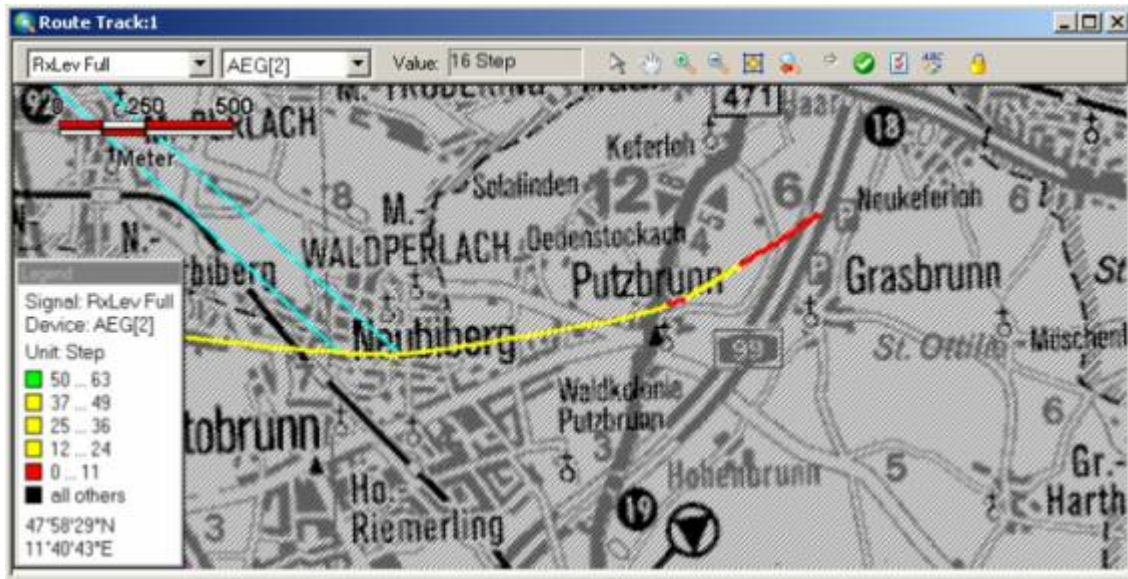


Fig. 4-28 Route Track

Diagram

By default, the diagram shows a (vector) background map of the whole world together with a length scale. The signals along a measurement tour, event symbols, base stations, and arbitrary bitmaps of the explored area can be projected onto the background map.

Measurement curve

Polygonal curve connecting the individual measurement points projected onto the background map. The color of the curve indicates the signal value as explained in the legend. The signal plotted, the device type and number, and the signal value of the current measurement point is indicated above the diagram. In the legend, the geographic coordinates of the current measurement point are displayed.



You can display the entire measurement route stored in a measurement (CMD) file immediately when opening the file, provided that CMD file scanning is enabled in the *General* tab of the *ROMES Configuration* menu.

Display limitations with Fast Replay mode

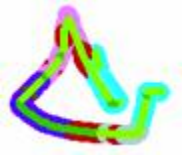
Please note that if the measurement curve is generated from a measurement file using the *Fast Replay* mode, certain limitations apply:

- For GSM and UMTS signals, no connections to the BTS/Node B are shown (e.g. *Line to Serving Cell*)
- PNS information, like the colored frame around the RSCP of the test mobile, is not displayed.

Without *Fast Replay* these limitations do not apply.

Scrambling Code indication

Curves obtained by means of UMTS equipment (UMTS test mobiles or UMTS PN scanner) are displayed with a colored frame.



The frame color indicates the primary scrambling code(s) connected with the signal:

- A measurement curve obtained in a PN scan shows the primary SC of the 1st top N element (the strongest signal measured). The color scheme is defined in the configuration menus of the *PNS* views. If the measurement contains also UMTS test mobile data, a second frame shows the SC of the serving cell.
- A measurement curve of a UMTS test mobile parameter shows the primary SC of the serving cell. The color scheme is defined in the configuration menus of the *UMTS* views. If the measurement contains also PNS data, a second frame shows the SC of the 1st top N element.

In areas where the serving cell does not provide the strongest signal, the PNS and UMTS SCs are different. Display of the SC frames can be switched off in the *PNS Settings* and *Mobile Settings* tabs of the *UMTS Layer* configuration menu. Moreover, it is possible to qualify which of the frames laid over the other (see *General Settings* tab of the *UMTS Layer* configuration menu).

Please note the [Display limitations](#) when *Fast Replay* is used.

Bitmap

Map of the explored area loaded as a file in one of the standard bitmap formats. Several overlapping or non-overlapping bitmaps can be collected in an archive and loaded simultaneously, see *Archive* tab in the configuration menu, When loaded for the first time, a bitmap must be positioned onto the world map using one of the methods described below (see section [Bitmap Handling and Positioning \(Calibration\)](#) on page 4.57.

Toolbar

The toolbar offers the selected signal and device list, shows the signal value at the current measurement point, and provides the map tools.

Parameters Pull-down list of all signals selected in the configuration menu, see p. 4.51. The current signal is visualized in the diagram.

Devices Pull-down list of all devices measured or contained in the measurement file replayed. The measurement curve in the diagram shows the signal for the current device.

Signal value Value of the current signal and device at the current measurement point.

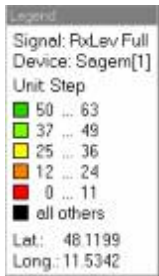
Icons



1 2 3 4 5 6 7 8 9 10 11

- 1 – 4 The icons set the view tools are described in section [Bitmap Handling and Positioning \(Calibration\)](#) on page 4.57 ff.
- 5 *Show/Hide Layer Mover* opens or closes the *Layer Mover* dialog as described on p. 4.50.
- 6,7 *Restore/Redo last bounds* resets or repeats the last zoom or move actions.
- 8 Enables or suppresses the display of the measurement curve.
- 9 Calls up the configuration dialog (see section [Route Track Configuration](#) on p. 4.51)
- 10 Shows the legend of the measurement curve (see below)
- 11 If this icon is enabled (as shown above), the view follows the geographical measurement position so that the current location is always visible.

Legend

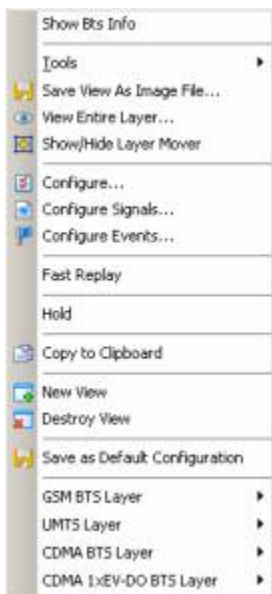


The legend window explains the signal ranges symbolized by the different colors of the measurement curve. Up to seven colors can be defined via the *Route Tracking* tab of the configuration menu, see section [Route Track Configuration](#) on p. 4.51.

The current signal and device is indicated above the color legend.

Below the color legend, the geographic coordinates of the current measurement point are indicated. More detailed information on this point can be retrieved via the *GPS Info* menu, see p. 4.44.

Context menu

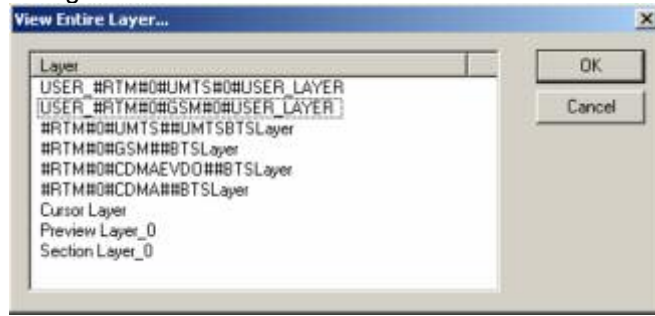


A right mouse click on any point in the view opens the context menu to access the configuration menus, (de-)select the view for fast replay (please note the *Display limitations* when *Fast Replay* is used.), to put the view on hold, to copy the current view to the clipboard, create or delete views, save the current configuration, move to another worksheet, or remove a signal; see [Context menu](#) description on p. 4.2. In addition the context menu provides the following commands:

Tools Opens a submenu providing tools for customizing the current view. The map tools are also accessible via the *Calibration* menu, see section [Bitmap Handling and Positioning \(Calibration\)](#) on page 4.57.

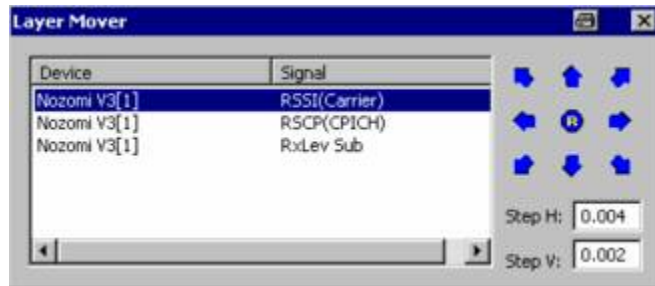
Save View As... Opens a standard dialog to save the current view to an image file. The dialog defines the file name and directory and selects a standard bitmap format (*.tif, *.bmp, *.pcx, *.png, *.gif) for the file. A *.tab file defining the geographic coordinates of the image is created together with the bitmap file; see [Raster image map](#) on p. 4.58. This means that the image can be re-used as a background map in later sessions; see section [Bitmap Handling and Positioning \(Calibration\)](#) on p. 4.57.

View Entire Layer Zooms the *Route Track* view to a size where one of the layers is displayed entirely. The layer to be viewed must be selected in a dialog:

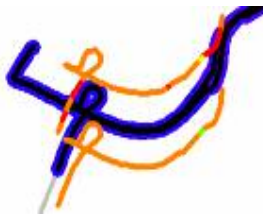


Show/Hide Layer

Mover Opens or closes the *Layer Mover* dialog. This dialog contains all signals selected in the *Values* tab of the *RouteTrack* configuration dialog.



This dialog can be used to display different signals along a route with a relative offset so that the signal values can be “read” simultaneously. Simply select a signal in the list and click the arrow buttons. Click **R** to reset (superimpose) the signals.



GSM BTS Layer Opens a submenu used to select the GSM base stations located in the vicinity of the measurement route and set their display options; see section [GSM BTS Layer Configuration](#) on page 4.63.

UMTS Layer Opens a submenu used to select the UMTS Node Bs located in the vicinity of the measurement route, select UMTS mobile and PNS scanner data, and set display options; see section [UMTS Layer Configuration](#) on p. 4.69.

CDMA BTS Layer Opens a submenu used to select the CDMA base stations located in the vicinity of the measurement route and set their display options; see section [CDMA BTS Layer Configuration](#) on page 4.76.

CDMA 1xEV-DO BTS Layer Opens a submenu used to select the 1xEV-DO base stations located in the vicinity of the measurement route and set their display options; see section [CDMA 1xEV-DO BTS Layer Configuration](#) on page 4.83.

Route Track Configuration

The *Route Track* configuration menu defines the signals to be viewed and shows information on the current view version. It is opened via a right mouse click on a point inside *Route Track* or via the *Configuration – Settings* command (see chapter 3).

Route Track Configuration: Values Tab

The *Values* tab selects the signals to be displayed.

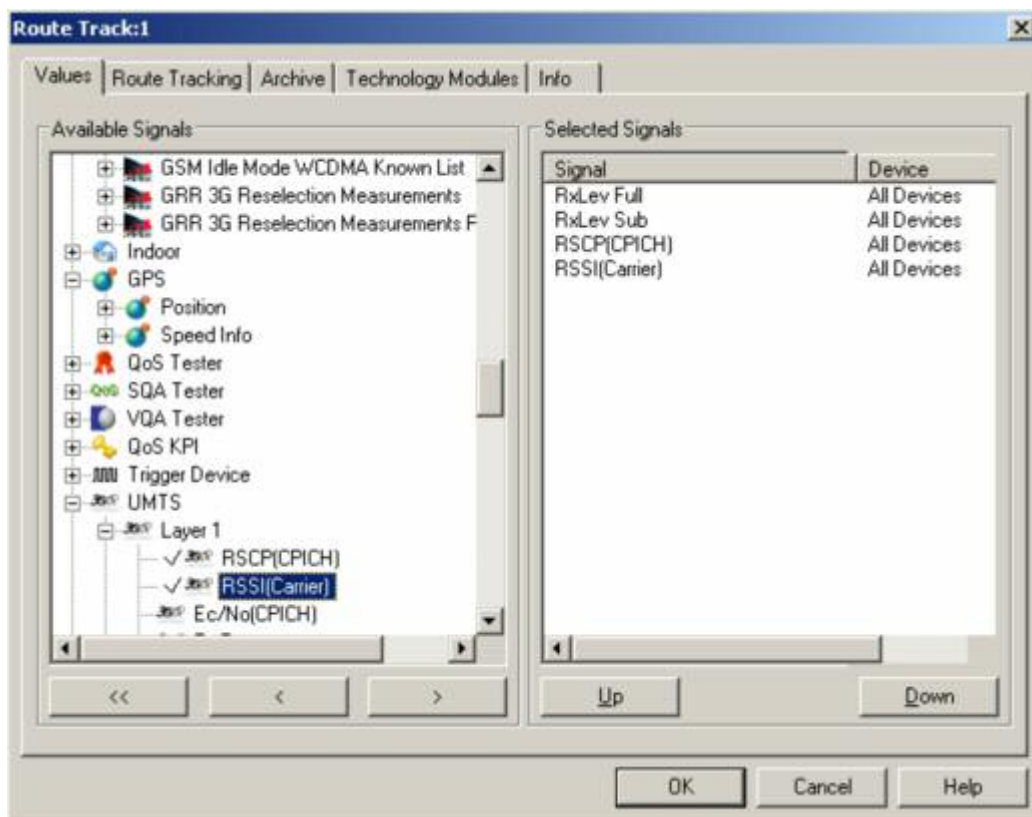


Fig. 4-29 Route Track configuration: Values

The *Values* tab is analogous to the *Values* tab of the *2D Chart View* configuration menu, see figure on p 4.13.

Route Track Configuration: Route Tracking Tab

The *Route Tracking* tab configures the map and opens the menu for loading and positioning raster images (e.g. background maps).



Fig. 4-30 Route Track configuration: Route Tracking

Map units In the *Map units* panel, the length units for the *distance tool* (see section [Bitmap Handling and Positioning \(Calibration\)](#) on page 4.57) can be selected (kilometers or miles).

Map positioning The *Map positioning* panel defines how the *Route Track* view is updated when a measurement point falls outside the viewed area. Both settings are valid only while the measurement/replay is running. In this case, they replace the map tools *Zoom In*, *Zoom Out*, and *Pan*:

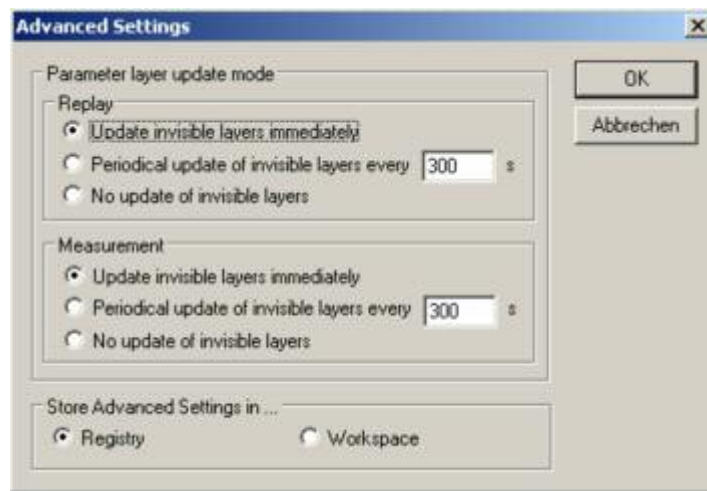
Change scale

The scale of the diagram is reduced such that the whole measurement tour can be viewed.

Move map

The map is shifted at constant scale such that the area currently measured/replayed can be viewed.

- Value visualizing** The *Value visualizing* panel determines in which way events and signals are visualized in the *Route Track* view. The settings must be defined before a diagram is generated:
- Display events*
If the box is checked, the events selected in the *Available Events* tab of the *Configuration – Preferences* menu (see chapter 3) are displayed along the measurement tour.
- Erase route...*
Clears the lines for the displayed signals before the replay restarts at a new position. The view shows the signal values between two consecutive jumps only. If *Erase route...* is cleared, the view always shows the signal values from the beginning of the measurement.
- Line thickness*
Sets the line thickness of the polygonal curve along the measurement tour on a scale between 1 (thin line) and 7 (thick line). With *Automatic* setting, the line width is adapted to the shape of the curve.
- Signal Check Distance*
GPS distance after which a position point is drawn in the *Route Track* view, even if no valid result is available for the current parameter (e.g. if no UMTS signal from a particular cell/with a particular scrambling code can be detected in an area that is far away from the transmitting Node B). Invalid results are indicated with black color.
- Calibration** The Enter Calibration Mode button opens the menu for bitmap handling and positioning, see p. 4.57.
- Preview** The *Preview* panel configures the appearance of the preview of the driven route in the *Route Track* view. The preview is a curve with configurable thickness and color which is opened at the beginning of the replay.
- Enable Preview...*
Must be selected in order to obtain a preview
- Show Entire Preview...*
Rescales the view when a measurement file is opened so that the view area can show the complete measurement route.
- The color scale for the individual signals can be modified in the *Color Scale* menu which is opened via the *Preferences – Available Signals* tab; see chapter 3.
- Directory for temporary MapX files** The Directory for temporary MapX files panel indicates the directory used to store temporary MapX files. Another directory can be selected by pressing the "... " button. This is particularly important if the MapX files are stored to a RAM disk in order to improve the system performance; see section RAMDisk in chapter 8.
- Advanced Settings** The *Advanced Settings* button opens a menu to control the display of the invisible layers, i.e. the signals that have been selected in the *Values* tab but are not currently viewed.



The invisible layers are controlled separately for replay and measurement sessions:

Update immediately

All layers are permanently updated, so switchover between the layers by means of the signal or device pull-down lists in the toolbar of the *Route Track* view is possible any time without delay.

Periodical update

The invisible layers are updated after a fixed period of time set in the input field (in s).

Periodical update

The invisible layers are not updated unless they are selected as current layers. This implies a delay time on switchover to an invisible layer but saves system resources if only a single layer is viewed.

Store ... settings in

The advanced settings can be stored in the system registry (in the *General* subdirectory of your R&S ROMES directory) or in the current workspace. Settings stored in the registry represent default settings for all R&S ROMES workspaces; they are superseded by explicit settings stored in a given workspace.

Route Track Configuration: Archive Tab

The *Archive* tab configures a bitmap archive containing an arbitrary number of bitmap files with valid information on their geographic position.

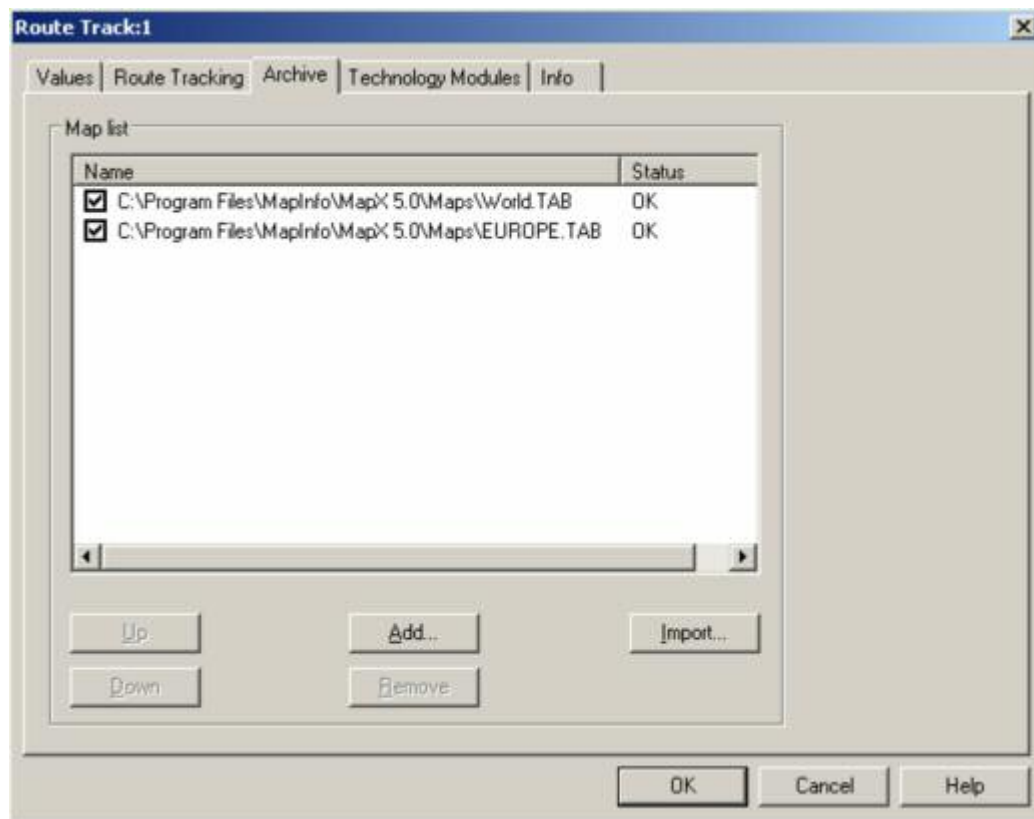


Fig. 4-31 Route Track configuration: Archive

Map list

The *Map list* shows all files belonging to the archive together with their display and status information. An archive map is shown in the *Route Track* view if the corresponding box is checked. The position and scale of an archive file can not be changed. The map list is part of the workspace configuration.

Up

Interchanges the selected (clicked) archive bitmap with the previous one in the list. In the *Route Track* view, bitmaps are superimposed to all bitmaps with a lower position in the list.

Down

Interchanges the selected (clicked) archive bitmap with the next one in the list.

Add

Add a new bitmap file (a *.tab file or one of the standard bitmap formats) to the archive using an *Open file* dialog.

Remove

Remove the selected (clicked and highlighted) bitmap file from the archive.

Import

Import a bitmap archive (*.arc) created in an earlier version of R&S ROMES to the current application.

Route Track Configuration: Technology Modules Tab

The *Technology modules* tab provides a list of the technology modules loaded and information on each module.

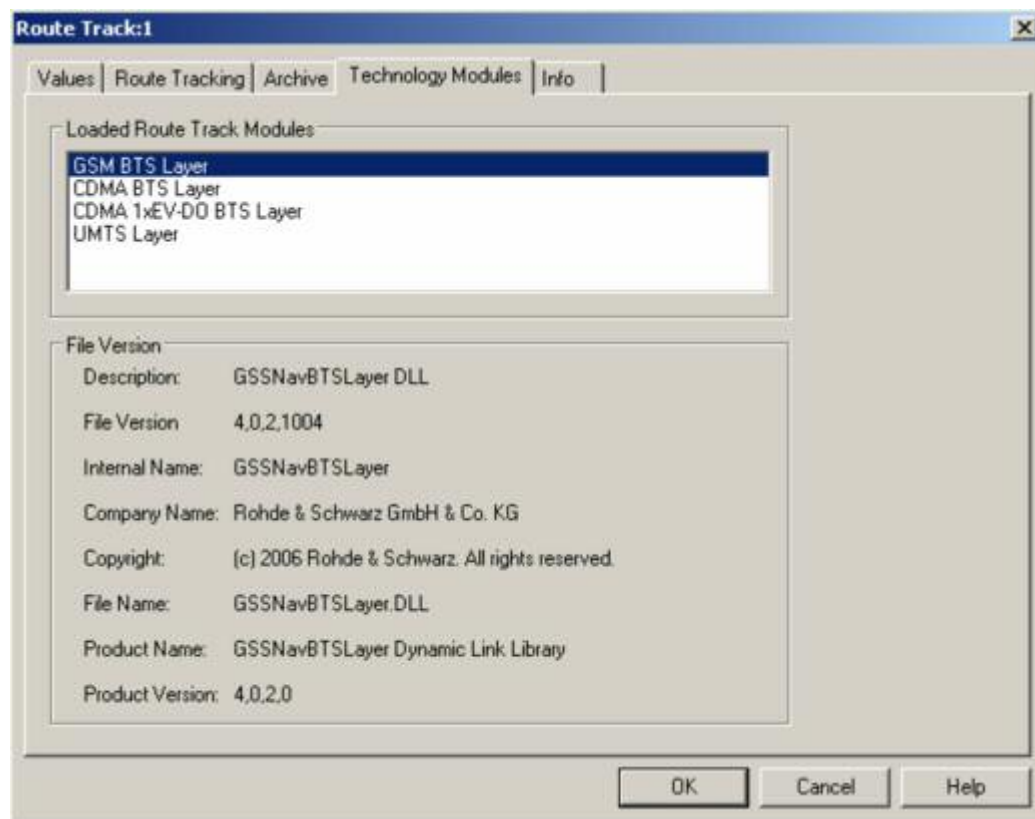


Fig. 4-32 Route Track configuration: Technology modules

To use the *GSM* or *CDMA BTS Layer*, a valid base station list must be imported and a BTS data base created. This is done in the *TEC for GSM/CDMA* tab of the *Configuration of Software Modules* menu; refer to section *Configuration Menu* in chapter 3.

- GSM BTS layer configuration is described in section [GSM BTS Layer Configuration](#) on p. 4.63.
- CDMA BTS layer configuration is described in section [CDMA BTS Layer Configuration](#) on p. 4.76.
- CDMA 1xEV-DO BTS layer configuration is described in section [CDMA 1xEV-DO BTS Layer Configuration](#) on p. 4.83.
- UMTS layer configuration is described in section [UMTS Layer Configuration](#) on p. 4.69.

Bitmap Handling and Positioning (Calibration)

The *Calibration* submenu offers the functions for loading, positioning, saving, and closing a bitmap file. Besides, it selects the map tools that are also accessible via the context menu in the *Route Track* view.

The *Calibration* menu is opened via the *Enter calibration mode* button in the *Route Tracking* tab of the *Route Track* calibration menu. Control elements used to interact with the current image map (cursor modes, tools for bitmap positioning) are active only after the calibration menu is closed.



Fig. 4-33 Route Track configuration: Calibration of raster image maps

Cursor modes

The *Cursor modes* panels offers tools used to customize the map view. By clicking one of the symbols, the cursor takes the corresponding shape; at the same time, the following actions can be carried out:

Set anchor

Shift a loaded bitmap relative to the world map and the measurement curve. This tool is also used to re-scale the map using its position frame.

Point

Select a single object on the map. The pointer coordinates are indicated in the legend.

Move map

Shift the entire map, i.e. the world map including loaded bitmaps and measurement curves. When moved, a loaded bitmap appears with a shaded pattern which is removed when the *Set anchor* tool is set.

Center

Shift the entire map to place the selected point to the center of the view. When centered, a loaded bitmap appears with a shaded pattern which is removed when the *Set anchor* tool is set.

Zoom in

Magnify the entire map. When zoomed, a loaded bitmap appears with a shaded pattern which is removed when the *Set anchor* tool is set. The following two options are available:

- a. Put the *Zoom in* icon to the center of the area you want to magnify. The map will be magnified by a factor of 2, the position of the icon becoming the center of the magnified map window.
- b. Left-click a point on the map, keep the mouse button pressed and move to another point to draw a rectangle. On releasing the mouse button, the border of the rectangle becomes the border of the magnified map window.

Zoom out

Scale down the entire map. When zoomed, a loaded bitmap appears with a shaded pattern which is removed when the *Set anchor* tool is set. Proceed as follows:

Put the *Zoom in* icon to the center of the area you want to make smaller. The map will be scaled down by a factor of 2, the position of the icon becoming the center of the scaled down map window.

Calc. Dist.

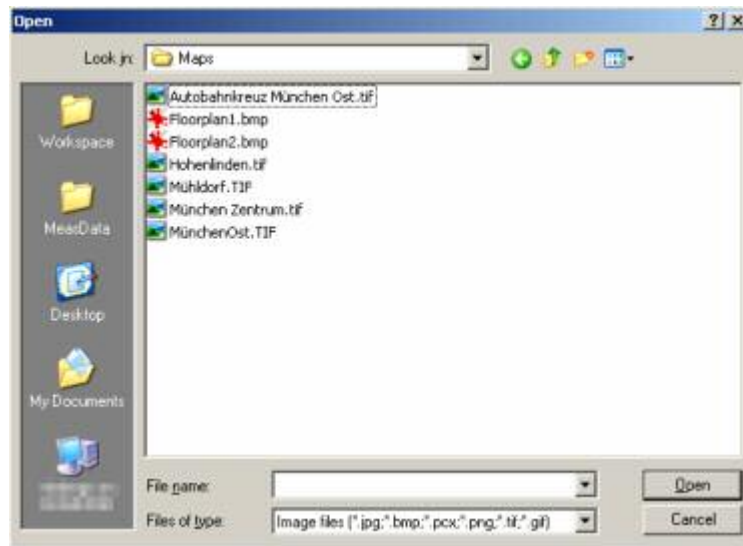
Set the distance tool. This tool calculates the distance along a polygonal curve to be marked on the map by repeated left-click. The distance is indicated in the view legend; the length unit (km or miles) can be set in the *Route Tracking* tab of the configuration menu.

Raster image map

The three buttons in the *Raster image map* panel are used to load, save, and close (clear) a bitmap file:

Add

Calls up an *Open* file dialog to load a bitmap file. Valid bitmaps are in a standard bitmap format (see figure below). The geographic positioning information assigned to a bitmap is stored in a TAB file, i.e. a text file with the same name but with the extension (*.tab). Instead of being added individually, several TAB files and the corresponding bitmaps can be stored in an archive and loaded together (see *Archive* tab in the configuration menu).



Clear Removes the current bitmap file from the *Route Track* view. Archive files must be cleared in the *Archive* tab of the configuration menu.

Save Saves the positioning information of the current bitmap in a TAB file.

Example of a TAB file defining four anchor positions:

```
!table
!version 300
!charset WindowsLatin1
Definition Table
File "München Zentrum.tif"
Type "RASTER"
(11.612009,48.125907) (414,518) Label "Anchor1",
(11.615401,48.136615) (434,443) Label "Anchor2",
(11.615547,48.128851) (440,468) Label "Anchor3",
(11.678717,48.137394) (705,446) Label "Anchor4"
CoordSys Earth Projection 1, 0
Units "degree"
```

Positioning soft-keys

The three remaining buttons on the right side of the *Calibration* menu are used to position the bitmap file:

Undo change

Undoes the last change made to the current bitmap. The *Undo* function may be used several times in a row to undo several changes made.

Remove anchors

Remove all anchors set to project the bitmap onto the background map, see below.

**Bitmap position-
ing**

Min. deviation

Shifts and re-scales the bitmap such that the sum of the deviations of all anchor points is minimized, see below.

The position and scale of a bitmap which is not an archive file can be adjusted in three different ways:

- Shift and scale the bitmap manually using its position frame
- Enter the known geographic coordinates of several objects marked in the bitmap
- Place the bitmap onto a known measurement tour

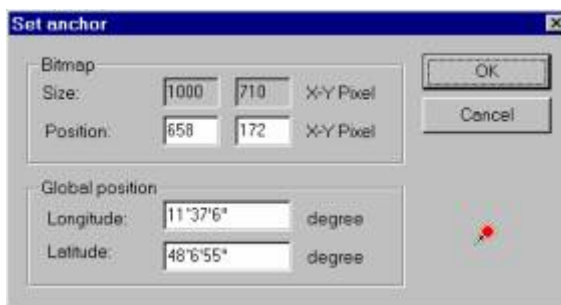
For each of these methods, the *Set anchor* cursor mode must be selected.

**Entry of coordi-
nates**

One or several objects with known geographic position can be used to anchor the bitmap onto the background map. An anchor links one point on the bitmap to one point of the background map.

- Select the *Set anchor* cursor mode.
- To set an anchor for a known object, double-click the desired position on the bitmap.

The *Set Anchor* dialog indicating the bitmap coordinates and the geographic (global) coordinates of the anchor is opened.



Bitmap Size of the whole bitmap in pixel units and current position of the anchor on the bitmap. The current position can be adjusted by overwriting the two *Position* input fields.

Global position

Current geographic coordinates of the anchor (according to the position of the bitmap relative to the background map). The actual geographic coordinates of the anchor must be entered here. Double-clicking the coordinate input fields toggles between decimal and degree/minute/second format display of the coordinate.

Cancel Discard the entries and close the *Set Anchor* dialog. No anchor point is created.

OK Link the anchor point to its global position and close the *Set Anchor* dialog.

The anchor displayed in the Route Track view consists of a pin linked to a cross. The pin marks the position on the bitmap, the cross marks the corresponding global position.



An arbitrary number of anchors can be set. Ideally, if the bitmap is correctly positioned and all anchors are accurately defined, the deviation of the anchors should be zero, i.e. the pins and the crosses should coincide. The *Deviation min.* command in the *Map* submenu (see above) sets the scale and position of the bitmap such that the sum of the deviations of all anchors is minimized.

Identifying a measurement tour

A known measurement tour can be used to anchor the bitmap onto the background map. The role of the anchors is as in the previous method of bitmap positioning:

- Select the *Set anchor* cursor mode.
- To set an anchor for a measurement tour, press the *Ctrl* key and double-click a point on the measurement curve.
- Move to the corresponding point on the bitmap and click to set the anchor.
- Repeat the procedure for the next point.



Again, an arbitrary number of anchors can be set. The *Deviation min.* command in the *Map* submenu (see above) sets the scale and position of the bitmap such that the sum of the deviations of all anchors is minimized. In the example above using 2 anchors the following result is obtained:



The map is positioned with an offset which makes it easier to identify the streets and the position of areas with equal signal values.

Minimization of the deviation

To position the bitmap, R&S ROMES varies the overall position and a scaling factor which is the same in x and y direction (see *Deviation min.* command in the *Map* submenu). This means that three coordinates are varied at maximum; the mathematical problem to solve depends on the number of anchors used:

- If only one anchor is defined, the scaling factor of the bitmap is preserved, the bitmap is shifted such that the anchor point coincides with its geographic position. The deviation is zero.
- If two or more anchors are used, the scaling factor of the bitmap is varied as well, however, it is generally not possible to achieve zero deviation of all anchors.

GSM BTS Layer Configuration

The submenu of the *GSM BTS Layer* command in the *Route Track* context menu provides display settings for the GSM base stations in the view.

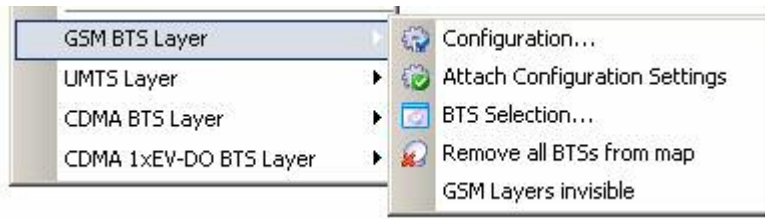


Fig. 4-34 GSM BTS Layer submenu

Note:

Before any configurations can be made, a valid base station list must be imported and a BTS data base created. For GSM base stations, this is done in the TEC for GSM tab of the Configuration of Software Modules menu; refer to section Configuration Menu in chapter 3.

BTS display

In the *Route Track view*, the position and transmission characteristics of the base stations in the view area is indicated with colored symbols. A BTS with an omnidirectional antenna is symbolized by a circle; a BTS with directed antennas is symbolized by a dot with up to three triangles indicating the sectors with their maximum transmission directions. The color and size of the BTS symbols can be modified in the *GSM BTS Layer* dialog, see [GSM BTS Layer](#) on page 4.64.

Info field

A click with the left mouse button into the hot zone around a sector symbol (triangle) opens an info field. For GSM base stations, this field indicates the sector name, the BCCH channel number, the BTS color code (BCC), the network color code (NCC), and the cell identity (CI). The radius of the hot zone can be configured in the *GSM BTS Layer* dialog.



The detailed information window is totally independent of the view, so you can move, resize and scroll it as you like. Click the printer symbol in the lower right corner to generate a hardcopy of the detailed information.

Configuration Opens the *GSM BTS Layer* dialog to set the BTS display options.

The **Settings** tab of the *GSM BTS Layer* dialog selects the serving cell lines to be drawn and defines their display options.

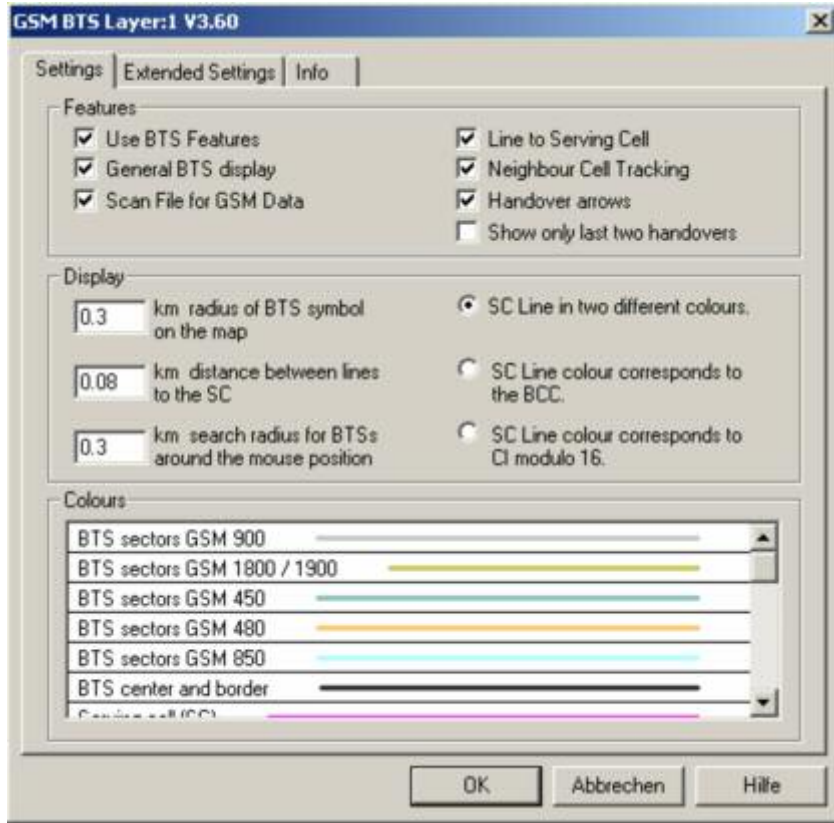
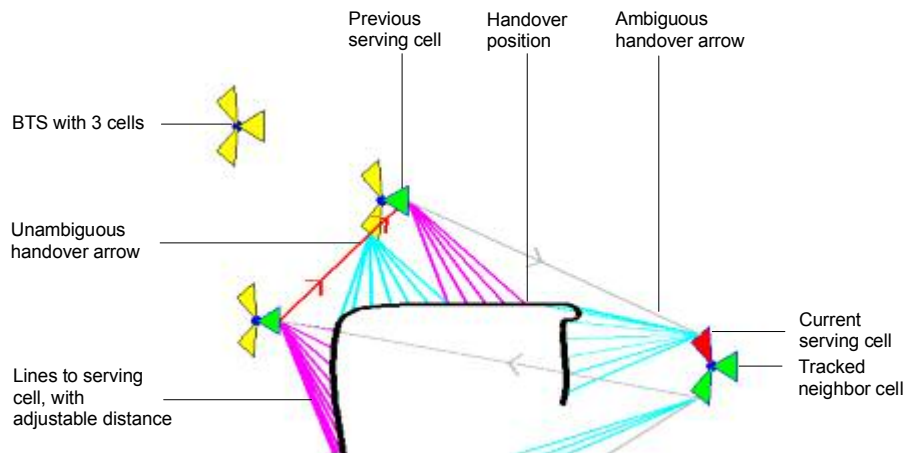


Fig. 4-35 GSM BTS Layer dialog: Settings

Example for BTS display

The dialog provides different display options for GSM networks. They are best explained with an example.



Features (GSM)

In the *Features* panel the following display elements can be switched off individually or altogether (*Use BTS Features* cleared):

- General display of the BTS symbols, leaving only the symbols for the serving cells and for the cells being tracked
- Enables or disables the automatic scan for GSM-related data in the active CMD file.
- All lines to the serving cells
- The indication of cells being tracked
- All handover arrows
- All handover arrows except for the last two

Display and Colors (GSM)

In the *Display* panel the size of the BTS symbols, the distance between the serving cell lines, the radius of the hot zone that can be clicked to open an info field can be adjusted. The option buttons in the right half of the panel provide three alternative options for drawing the Serving Cell (SC) lines.

The *Colors* panel changes the colors of all display elements. Double-clicking an element of the list opens the [Colors](#) dialog (see p. 4.351) to modify the current display color.

Note:

A distinction is made between unambiguous and ambiguous handovers. A handover is classified ambiguous if the change of two signals characterizing the serving cell is reported with a time delay exceeding a fixed limit.

The **Extended Settings** tab of the *GSM BTS Layer* dialog selects the serving cell lines to be drawn and defines their display options.

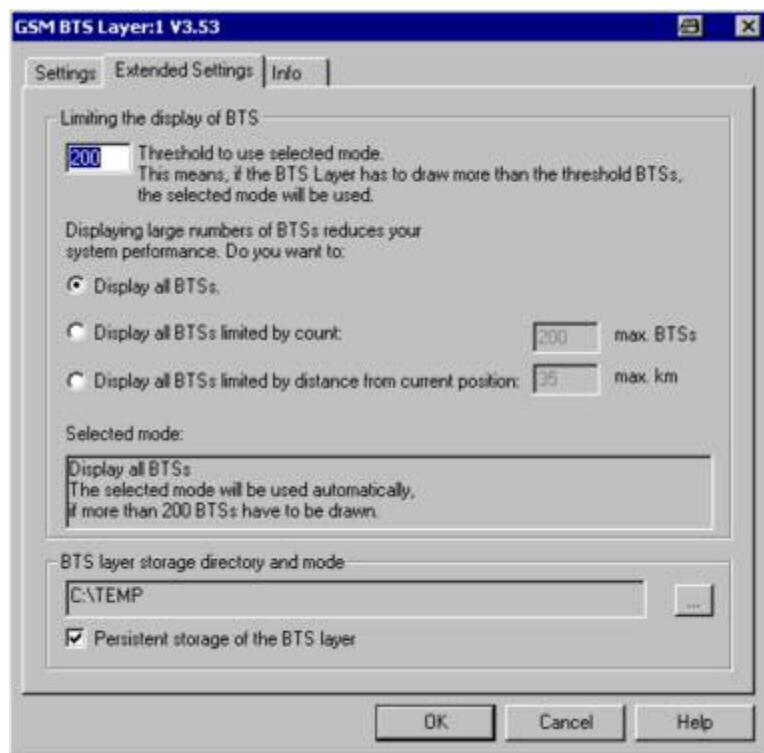


Fig. 4-36 GSM BTS Layer dialog: Extended Settings

BTS display limit

The Limiting the display of BTS panel contains an input field to limit the number of BTS symbols displayed in the Route Track view. A small number of BTS symbols improves the system performance.

R&S ROMES counts the number of BTS symbols to be drawn. A limiting condition is imposed as soon as this number exceeds the threshold set in the input field. Below the threshold, all symbols are drawn.

Display all BTSs

All BTS symbols displayed, i.e. no limiting condition set

Display ... limited by count

Only a fixed number of BTS symbols around the current position are displayed. The fixed number is equal to the threshold value for the limiting condition.

Display ... limited by distance

Only the BTS symbols within a given radius (between 1 km and 1000 km) around the current position are displayed.

The limit settings are valid after an update of the BTS layer. R&S ROMES indicates the limiting condition set when updating the BTS layer.

BTS layer storage directory and mode

If the Persistent storage of the BTS layer box is checked, R&S ROMES stores the current BTS layer (containing all information on the BTS symbols to be displayed in the current view) to the directory indicated in the (unavailable) input field. This avoids reloading of the BTS list and recalculating of the layer when the workspace with the current Route Track view is opened for the next time.

The directory can be changed using the "..." button. This is particularly important if the BTS layer is stored to a RAM disk in order to improve the system performance; see section *RAMDisk* in chapter 8.

Attach Configuration Settings

Includes the current GSM BTS layer configuration in the measurement file. The attached configuration settings can be re-used in a later replay session.

BTS Selection

Opens the *BTS Selection* dialog to select BTSs with particular properties.

The *BTS Selection* dialog offers a variety of options to select a subset of base stations in the BTS list with particular properties or position.

BTS Sectors: GSM

For GSM networks *BTS Selection* opens the following dialog:

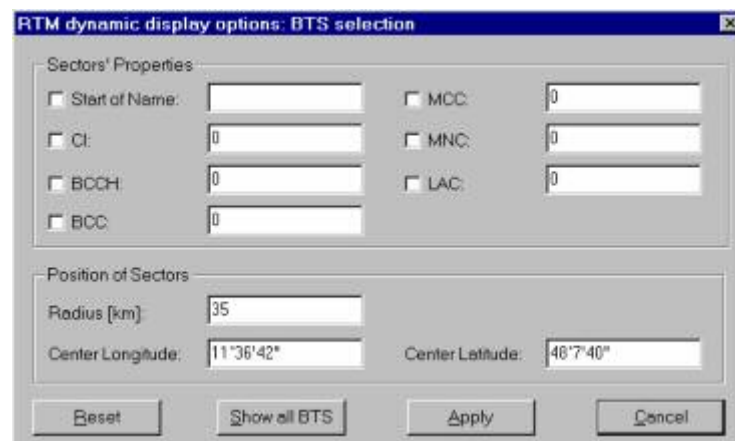


Fig. 4-37 BTS Selection dialog (GSM networks)

Sectors' Properties

In the *Sectors' Properties* panel one or several of the following conditions can be set (click one of the option buttons and enter the desired value (name or integer number) in the input field on the right side):

<i>Start of Name</i>	Select BTS with a particular name or with a name starting with a particular combination of characters
<i>CI</i>	Select BTS with a particular Cell Identity
<i>BCCH</i>	Select BTS transmitting on a particular Broadcast Control Channel
<i>BCC</i>	BTS Color Code
<i>MNC</i>	Mobile Network Code
<i>MCC</i>	Mobile Country Code
<i>LAC</i>	Location Area Code

Position of Sectors	<p>The Position of Sectors panel defines a circle of variable size and position to limit the number of BTS symbols displayed in the Route Track view. BTSs outside the circle are not displayed. A small number of BTS symbols improves the system performance.</p> <p>The size of the circle is defined by the Radius [km]. Its position is defined by the longitude and latitude coordinates of the center (<i>Center Longitude, Center Latitude</i>). The default <i>Center Longitude</i> and <i>Center Latitude</i> are the coordinates of the pointer on the <i>Route Track</i> view when the context menu and the <i>BTS Selection</i> dialog was called up. The default radius corresponds to the maximum GSM cell radius.</p>
Reset	<p>Reset the current display in the <i>Route Track</i> view; delete all BTS displayed (disabled during a measurement or replay).</p>
Show all BTS in this area	<p>Show all BTS from the BTS list in the Route Track view. With this button, the BTS can be viewed without starting a measurement or a replay session (disabled during a measurement or replay).</p>
Apply selection	<p>Apply the current condition.</p>
Remove all BTS from map	<p>Removes all BTS symbols currently displayed.</p> <p>A warning message must be confirmed before this command is executed. The function is disabled during a measurement or replay.</p>
GSM Layers Invisible	<p>Temporarily hide the entire BTS layer currently displayed.</p> <p>A checkmark before the command indicates that a GSM BTS layer is currently available, but hidden. The layer reappears if the command is clicked for the second time.</p> <p>GSM Layers Invisible is disabled if the current view contains no GSM BTS layer.</p>

UMTS Layer Configuration

The submenu of the *UMTS Layer* command in the *Route Track* context menu provides display settings for base stations and UMTS or PNS signals.

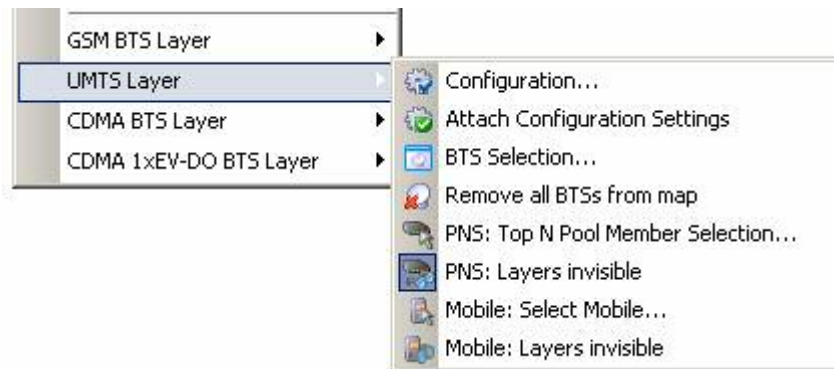


Fig. 4-38 UMTS Layer submenu

Note:

Before any configurations can be made, a valid base station list must be imported and a BTS data base created. For UMTS base stations, this is done in the TEC for UMTS tab of the Configuration of Software Modules menu; refer to section Configuration Menu in chapter 3.

BTS display	UMTS BTSs are displayed in analogy to GSM or CMDA base stations; see section GSM BTS Layer Configuration on p. 4.63.
Configuration	Opens the <i>UMTS Layer</i> dialog to set the display options.

The *PNS Settings* tab of the *UMTS Layer Configuration* dialog selects the display options for PN scanner data.

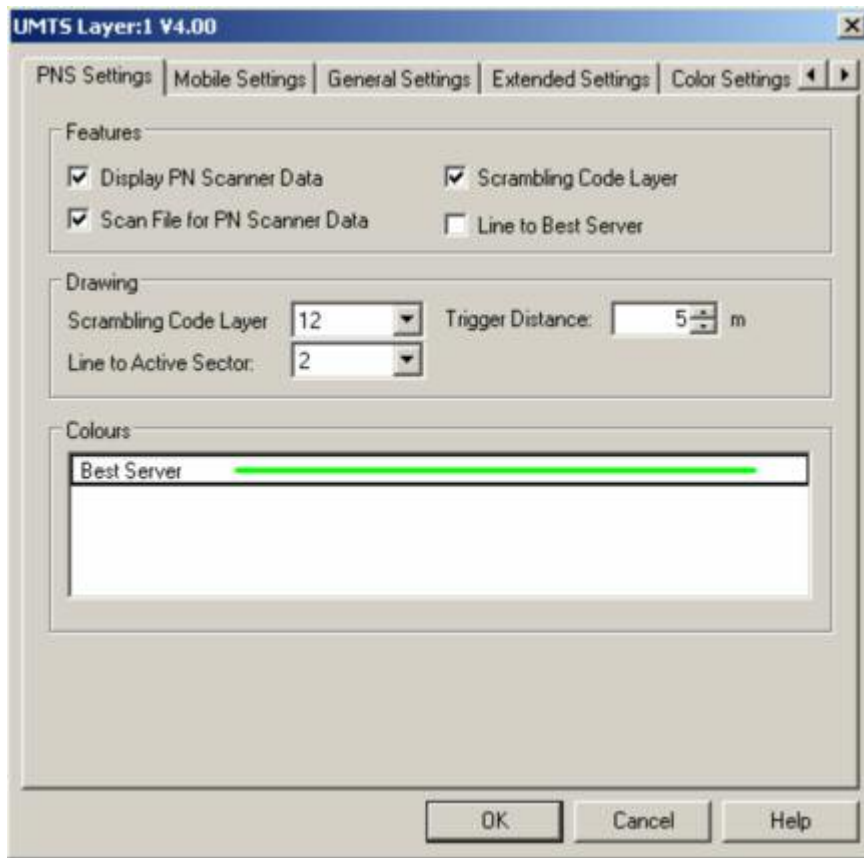


Fig. 4-39 UMTS Layer dialog: PNS Settings

The *PNS Settings* are analogous to the BTS layer configurations for GSM, see *Example for BTS display* on p. 4.64.

Features

The following checkboxes select the displayed PN scanner information:

Display PN Scanner Data

Show the best server, i.e. the 1st top N element, using the color selected below. The following display options are only effective if the PN scanner data is displayed.

Scan File for PN Scanner Data

Enable or disable the automatic scan for UMTS PNS data in the active CMD file.

SC Layer

Show the scrambling codes of the serving cell using the color codes of the *Color Settings* tab. The scrambling codes are visualized by means of a colored frame around the measurement curve; see [Scrambling Code](#) indication on p. 4.48.

Line to Best Server

Draw lines between the measurement position and the active sector (best server).

Drawing

Line thickness of the signal route and of the lines between the signal route and the active sector. *Trigger Distance* is the distance between two consecutive drawn results on the signal route.

Colors

Color of the best server in the active sector.

The *Mobile Settings* tab of the *UMTS Layer* dialog selects the display options for UMTS mobile data.

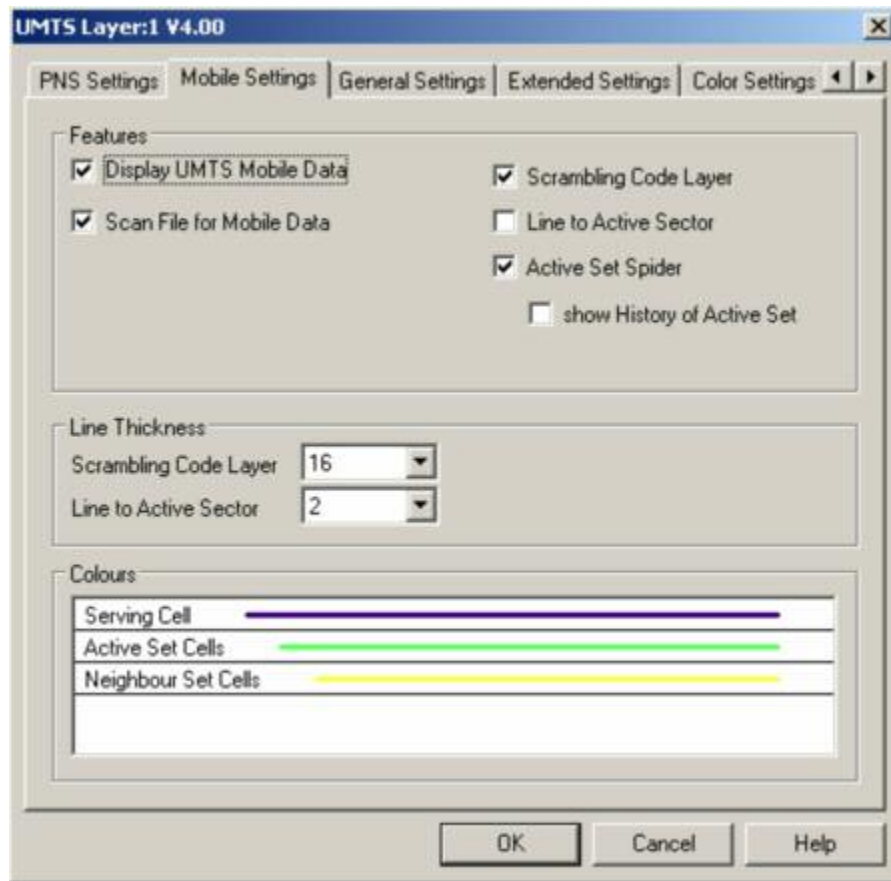


Fig. 4-40 UMTS Layer dialog: Mobile Settings

The **Mobile Settings** are analogous to the BTS layer configurations for GSM, see *Example for BTS display* on p. 4.64.

Features

The following checkboxes select the displayed mobile information:

Display UMTS Mobile Data

Show the serving cell, the active cell set and the neighbor cell set reported by the mobile using the colors selected below for the Node B sectors. The following display options are only effective if the mobile data is displayed.

Scan File for Mobile Data

Enables or disables the automatic scan for UMTS mobile data in the active CMD file.

Line to Active Sector

Draw lines between the mobile position and the active Node B sectors.

SC Layer

Show the scrambling codes of the serving cell using the color codes of the *Color Settings* tab. The scrambling codes are visualized by means of a colored frame around the measurement curve; see [Scrambling Code](#) indication on p. 4.48.

Active Set Spider

Draw temporary lines between the mobile position and the cell sectors in the active set. If *Show History of Active Set* is active, the lines are no longer removed as the active set changes.

Line Thickness Line thickness of the SC layer around the signal route and of the lines between the signal route and the active sector.

Colors Color of the serving cell, the cells in the active cell set and the cells in the neighbor cell set.

The **General Settings** tab of the *UMTS Layer* dialog selects display options that are either independent of the test device data or concern both the PNS and the mobile data.

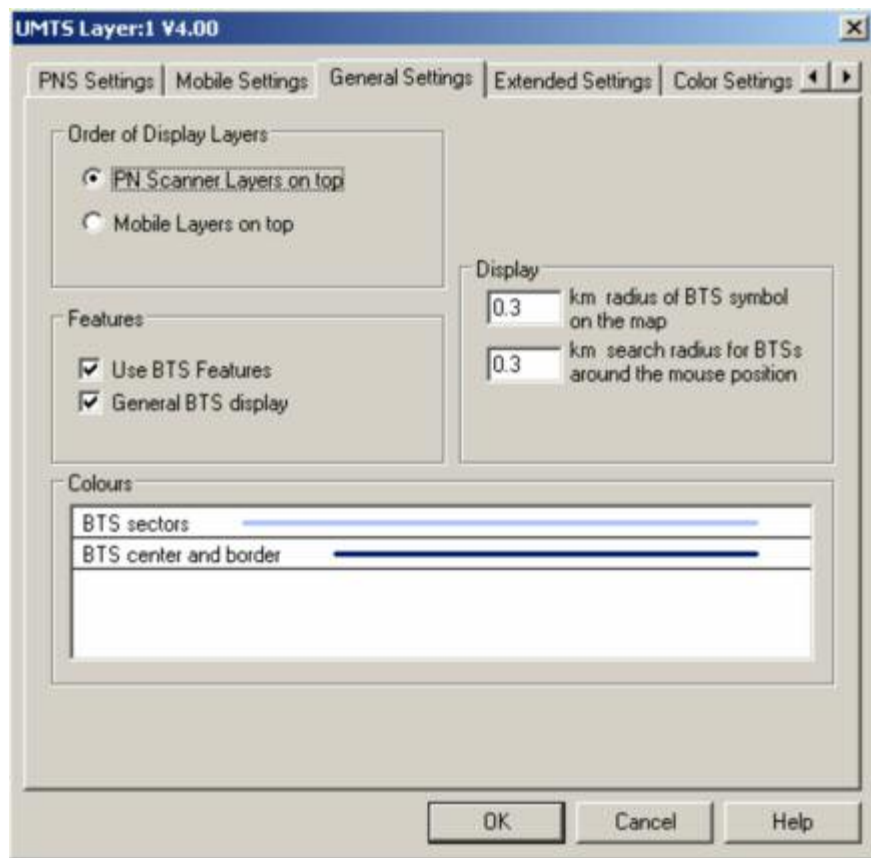


Fig. 4-41 UMTS Layer dialog: General Settings

Most of the *General Settings* are also provided for GSM layers; see figure on p. 4.64. The following settings are UMTS-specific:

Order of Display Layers Defines which one of the frames indicating the PNS and UMTS scrambling codes is laid over the other; see description of SC indication on p. 4.48.

The *Extended Settings* tab of the *UMTS Layer* dialog selects the serving cell lines to be drawn and defines their display options. It is identical to the *Extended Settings* tab of the *GSM BTS Layer* configuration menu; see Fig. 4-36 on p. 4.66. If *Display BTS Labels* is checked, every cell sector is labeled with its scrambling code (use e.g. *Attach Configuration Settings* to update the screen display).

The *Color Settings* tab of the *UMTS Layer* dialog is analogous to the *PNS CPICH* configuration menu; see section *PNS CPICH View* on p. 4.339. The dialog defines the colors of the SC frame around the measurement curve; see *Scrambling Code* indication on p. 4.48.

Attach Configuration Settings Includes the current UMTS layer configuration in the measurement file.
The attached configuration settings can be re-used in a later replay session.

BTS Selection Opens the *BTS Selection* dialog to select BTSs with particular properties.
The *BTS Selection* dialog offers a variety of options to select a subset of base stations in the BTS list with particular properties or position.

BTS Sectors: UMTS For UMTS networks *BTS Selection* opens the following dialog:

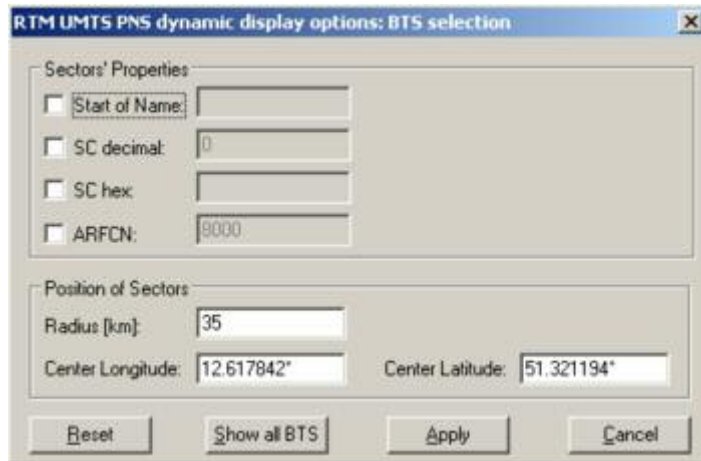


Fig. 4-42 BTS Selection dialog (UMTS networks)

Sectors' Properties In the *Sectors' Properties* panel one or several of the following conditions can be set (click one of the option buttons and enter the desired value (name or integer number) in the input field on the right side):

Start of Name

Select BTS with a particular name or with a name starting with a particular combination of characters

SC decimal

Select BTS sectors using a particular Primary Scrambling code (to be entered in decimal notation)

SC hex

Select BTS sectors using a particular Primary Scrambling code (to be entered in hexadecimal notation)

ARFCN

Absolute Radio Frequency Channel Number of the received DL signal. The carrier frequency is equal to $f = 0.2 \text{ MHz} * \text{ARFCN}$.

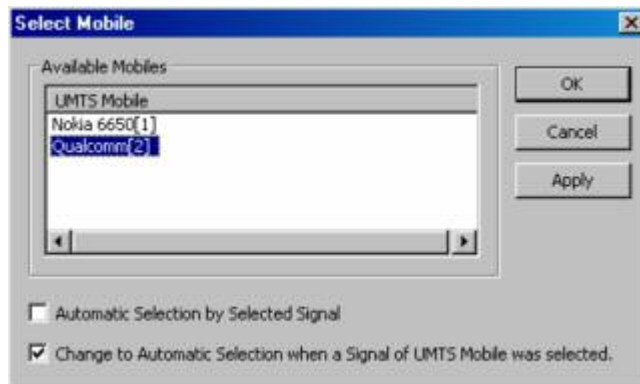
Note:

SC decimal and SC hex are alternative options and should not be activated at the same time.

Position of Sectors The *Position of Sectors* panel defines a circle of variable size and position to limit the number of BTS symbols displayed in the Route Track view. BTSs outside the circle are not displayed. A small number of BTS symbols improves the system performance.

Mobile: Select Mobile Select the mobile for which the mobile layer is displayed.

The *Select Mobile* dialog contains a list of all mobiles available in the current measurement.



The mobile layer indicates the serving cell for a mobile along the measurement tour; see *Mobile: Layers* invisible below. The checkmarks below the mobile list can be used to select one of the following alternative modes:

- *Automatic mobile layer selection* (upper box checked, lower box unavailable): The mobile layer always corresponds to the mobile that provided the selected signal. While a PNS signal is selected, the mobile layer is invisible so that the PNS layer can be displayed.
- *Automatic mobile layer selection while mobile signals are viewed* (upper box cleared, lower box checked): The mobile layer of the mobile selected in the list of *Available Mobiles* is displayed. This mobile layer is maintained if a PNS signal is selected. Selecting a signal from a UMTS mobile switches back to automatic mobile selection, so there can be no mismatch between a UMTS mobile signal and the mobile layer displayed in the *Route Track* view.
- *Fixed mobile layer* (upper and lower box cleared): The mobile layer of the mobile selected in the list of *Available Mobiles* is displayed, irrespective of the PNS or UMTS mobile signal selection.

Mobile: Layers Invisible

Temporarily hide the entire mobile layer.

A checkmark before the command indicates that a mobile layer is currently available, but hidden. The layer reappears if the command is clicked for the second time.

Definition:

The mobile layer contains the frames around the signal tour for scrambling code indication and the lines to the active sector but not the signal tour itself. The Node Bs are only displayed if either the PNS layer or the mobile layer (or both) are visible.

Mobile Layers Invisible is disabled if the current view contains no mobile layer.

CDMA BTS Layer Configuration

The submenu of the *CDMA BTS Layer* command in the *Route Track* context menu provides display settings for the CDMA base stations in the view.

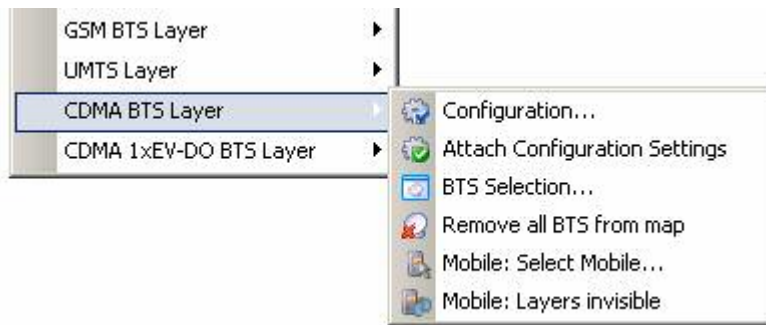


Fig. 4-43 CDMA BTS Layer submenu

Note:

Before any configurations can be made, a valid base station list must be imported and a BTS data base created. For CDMA base stations, this is done in the TEC for CDMA tab of the Configuration of Software Modules menu; refer to section Configuration Menu in chapter 3.

BTS display CDMA base stations are displayed in analogy to GSM or UMTS base stations; see section [GSM BTS Layer Configuration](#) on p. 4.63.

Configuration Opens the *CDMA BTS Layer* dialog to set the BTS display options.

The *cdma Settings* tab of the *CDMA BTS Layer* dialog defines the display options for cdma and 1xEV-DO scanner data.

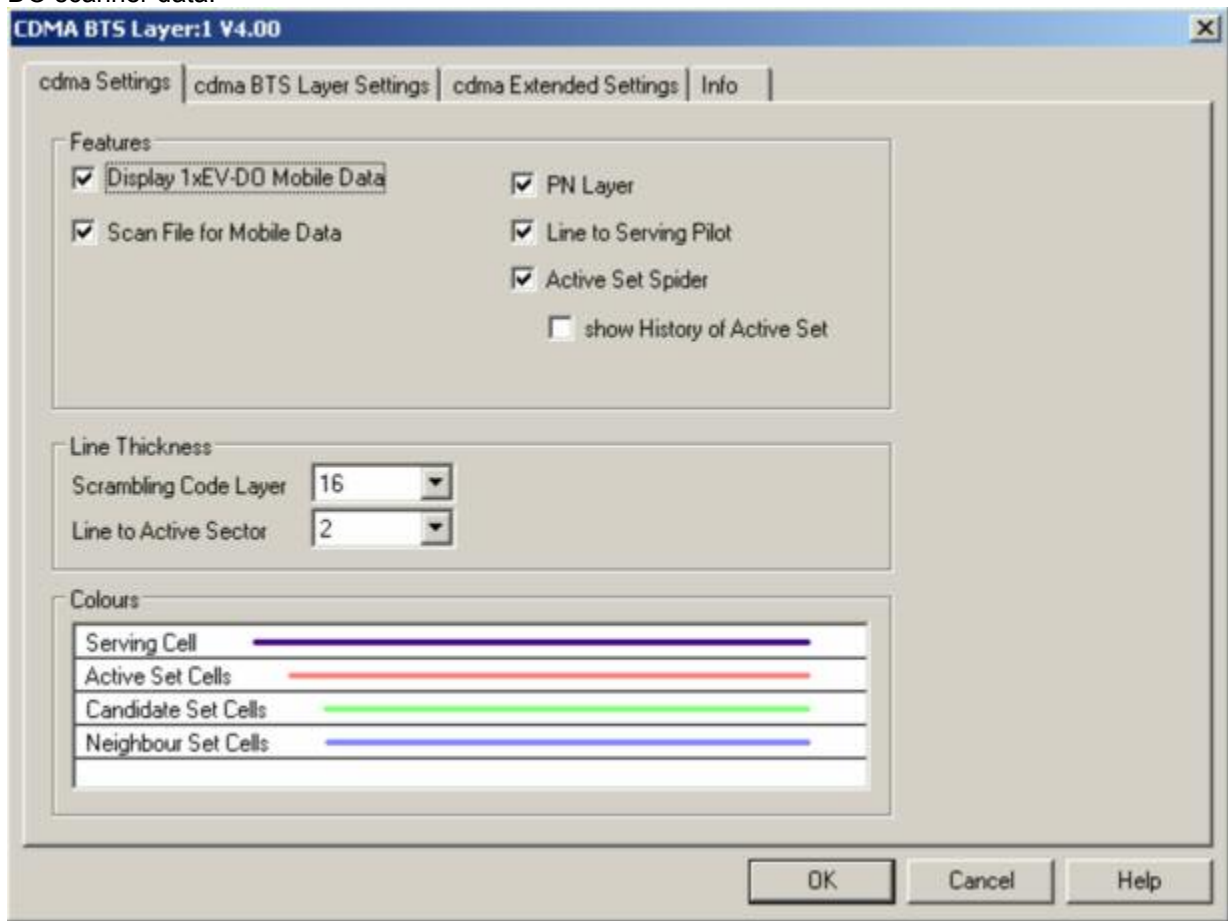
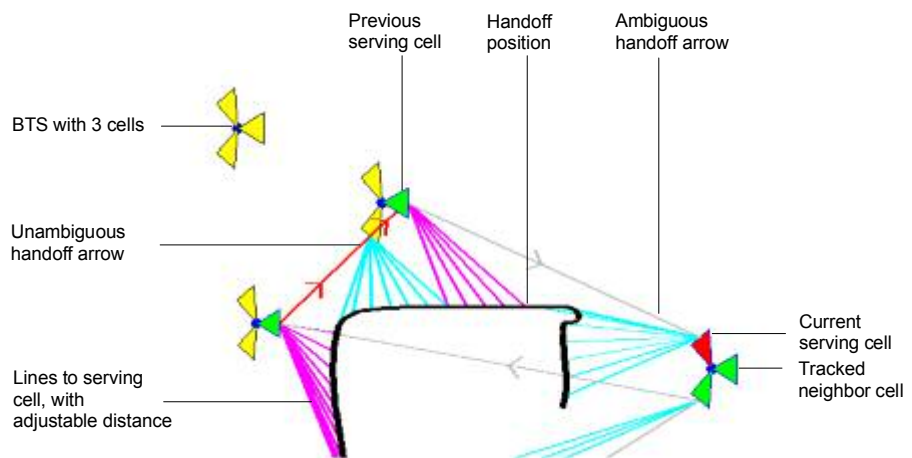


Fig. 4-44 CDMA BTS Layer dialog: cdma Settings

Example for BTS display

The dialog provides different display options for CDMA networks. They are best explained with an example.



The *cdma Settings* are analogous to the BTS layer configurations for GSM, see *Example for BTS display* on p. 4.64.

Features To improve the stability of the radio connection and the handoff procedures, a CDMA mobile may be connected to several base stations or BTS sectors at the same time (soft handoff). However, only the connecting lines to the current (i.e. the most recently connected) BTS sector are drawn. Due to this simplification, the visualization of a CDMA route track is similar to GSM.

The following display elements can be switched off individually or altogether:

Display 1xEV-DO Mobile Data

General display of the 1xEV-DO symbols, leaving only the symbols for the serving cells and for the cells being tracked.

Scan File for Mobile Data

Enable or disable the automatic scan for mobile data in the active CMD file.

PN Layer

Hide or show the PN layer.

Line to Serving Pilot

Draw lines to the current cell (serving pilot cells)

Active Set Spider

Draw temporary lines between the mobile position and the cell sectors in the active set. If *Show History of Active Set* is active, the lines are no longer removed as the active set changes.

Line Thickness Line thickness of the scrambling code layer and of the lines between the signal route and the active sector.

Colors Color of the active sector.

The **cdma BTS Layer Settings** tab of the *CDMA BTS Layer* dialog defines the general options for the BTS layer data.

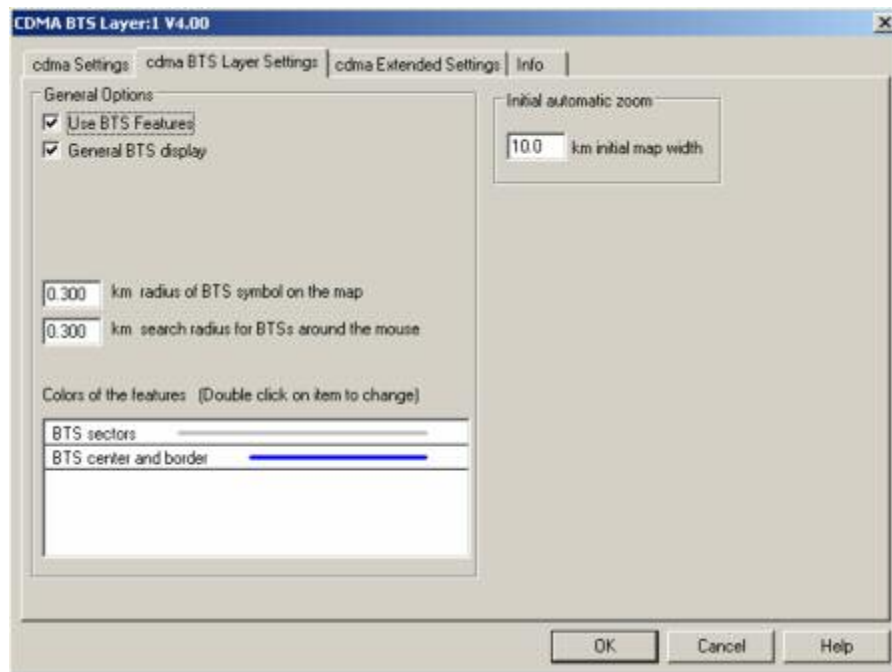


Fig. 4-45 CDMA BTS Layer dialog: cdma BTS Layer Settings

General Options In the *Features* panel the following display elements can be switched off individually or altogether (*Use BTS Features* cleared):

General BTS display

Enables or disables the general display of the BTS symbols, leaving only the symbols for the serving cells and for the cells being tracked

Radius of BTS symbol on the map

The size of the BTS symbol on the displayed map can be adjusted by entering a proportional symbol radius here. This is useful in measurement areas with a high BTS density to avoid symbol overlapping.

Search radius for BTSs around the mouse

The radius of the hot zone that can be clicked to open an info field can be adjusted.

Colors of the features The *Colors* panel changes the colors of the display elements. Double-clicking an element of the list opens the *Colors* dialog (see p. 4.351) to modify the current display color.

Initial automatic zoom The Initial automatic zoom panel contains an input field for the width of the Route Track view window. This setting is applied in a measurement session as soon as R&S ROMES receives the first position coordinates. The first measurement point also marks the center of the map.

The *cdma Extended Settings* tab of the *CDMA BTS Layer* dialog selects the cell lines to be drawn and defines their display options.

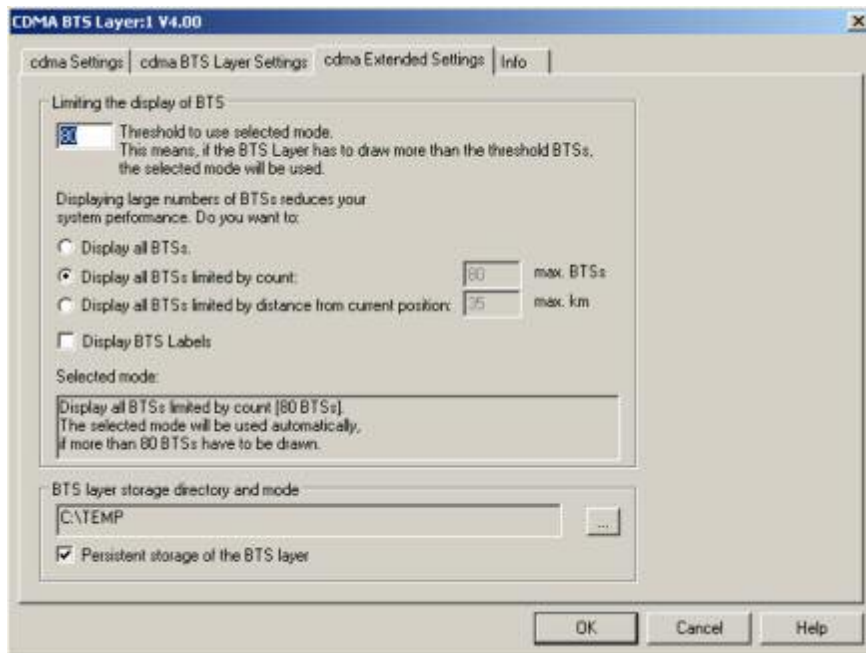


Fig. 4-46 CDMA BTS Layer dialog: cdma Extended Settings

BTS display limit	<p>The Limiting the display of BTS panel contains an input field to limit the number of BTS symbols displayed in the Route Track view. A small number of BTS symbols improves the system performance.</p> <p>R&S ROMES counts the number of BTS symbols to be drawn. A limiting condition is imposed as soon as this number exceeds the threshold set in the input field. Below the threshold, all symbols all drawn.</p> <p><i>Display all BTSS</i> All BTS symbols displayed, i.e. no limiting condition set</p> <p><i>Display ... limited by count</i> Only a fixed number of BTS symbols around the current position are displayed. The fixed number is equal to the threshold value for the limiting condition.</p> <p><i>Display ... limited by distance</i> Only the BTS symbols within a given radius (between 1 km and 1000 km) around the current position are displayed.</p> <p>The limit settings are valid after an update of the BTS layer. R&S ROMES indicates the limiting condition set when updating the BTS layer.</p>
BTS layer storage directory and mode	<p>If the Persistent storage of the BTS layer box is checked, R&S ROMES stores the current BTS layer (containing all information on the BTS symbols to be displayed in the current view) to the directory indicated in the (unavailable) input field. This avoids reloading of the BTS list and recalculating of the layer when the workspace with the current Route Track view is opened for the next time.</p> <p>The directory can be changed using the "..." button. This is particularly important if the BTS layer is stored to a RAM disk in order to improve the system performance; see section <i>RAMDisk</i> in chapter 8.</p>
Attach Configuration Settings	<p>Includes the current CDMA BTS layer configuration in the measurement file.</p> <p>The attached configuration settings can be re-used in a later replay session.</p>
BTS Selection	<p>Opens the <i>BTS Selection</i> dialog to select BTSs with particular properties or position.</p>

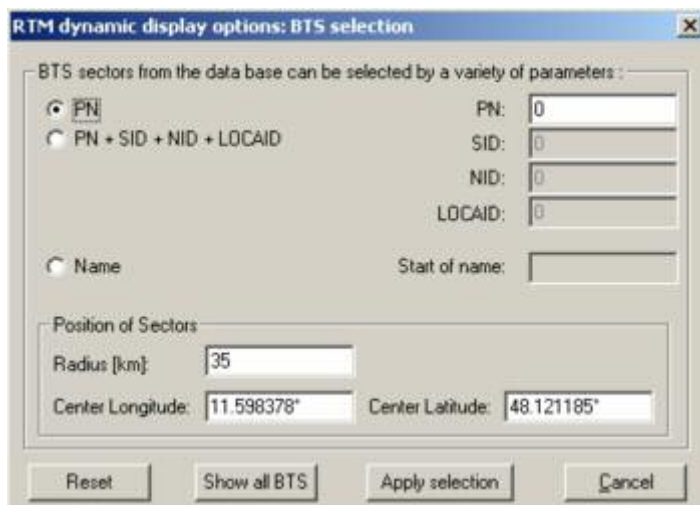


Fig. 4-47 BTS Selection dialog (CDMA networks)

Sectors' Properties

In the upper part of the dialog one or several of the following conditions can be set (click one of the option buttons and enter the desired value (name or integer number) in the input field on the right side):

PN

Select BTS with a particular pilot number

PN+SID+NID+LOCAID

Pilot number plus system identity plus network identity plus location area identity

Name

Select BTS with a particular name or with a name starting with a particular combination of characters

Position of Sectors

The Position of Sectors panel defines a circle of variable size and position to limit the number of BTS symbols displayed in the Route Track view. BTSs outside the circle are not displayed. A small number of BTS symbols improves the system performance.

The size of the circle is defined by the *Radius [km]*. Its position is defined by the longitude and latitude coordinates of the center (*Center Longitude*, *Center Latitude*). The default *Center Longitude* and *Center Latitude* are the coordinates of the pointer on the *Route Track* view when the context menu and the *BTS Selection* dialog was called.

Reset

Reset the current display in the *Route Track* view; delete all BTS displayed (disabled during a measurement or replay).

Show all BTS

Show all BTS from the BTS list in the Route Track view. With this button, the BTS can be viewed without starting a measurement or a replay session (disabled during a measurement or replay).

Apply Selection

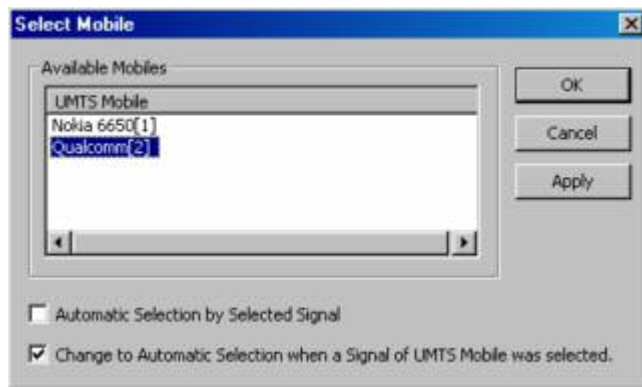
Apply the current condition.

Remove all BTS from map

Removes all BTS symbols currently displayed.
 A warning message must be confirmed before this command is executed.
 The function is disabled during a measurement or replay.

**Mobile:
 Select Mobile...**

Select the mobile for which the mobile layer is displayed.
 The Select Mobile dialog contains a list of all mobiles available in the current measurement.



The mobile layer indicates the serving cell for a mobile along the measurement tour; see Mobile: Layers invisible below. The checkmarks below the mobile list can be used to select one of the following alternative modes:

Automatic Selection by Selected Signal

(upper box checked, lower box unavailable): The mobile layer always corresponds to the mobile that provided the selected signal. While a PNS signal is selected, the mobile layer is invisible so that the PNS layer can be displayed.

Change to Automatic Selection when a Signal of UMTS Mobile was selected

(upper box cleared, lower box checked): The mobile layer of the mobile selected in the list of *Available Mobiles* is displayed. This mobile layer is maintained if a PNS signal is selected. Selecting a signal from a UMTS mobile switches back to automatic mobile selection, so there can be no mismatch between a UMTS mobile signal and the mobile layer displayed in the *Route Track* view.

Fixed Mobile Layer

(upper and lower box cleared): The mobile layer of the mobile selected in the list of *Available Mobiles* is displayed, irrespective of the mobile signal selection.

**Mobile:
 Layers invisible**

Temporarily hide the entire BTS layer currently displayed.
 A checkmark before the command indicates that a CDMA BTS layer is currently available, but hidden. The layer reappears if the command is clicked for the second time.

Layers Invisible is disabled if the current view contains no CDMA BTS layer.

CDMA 1xEV-DO BTS Layer Configuration

The submenu of the *CDMA 1xEV-DO BTS Layer* command in the *Route Track* context menu provides display settings for the *1xEV-DO* base stations in the view.

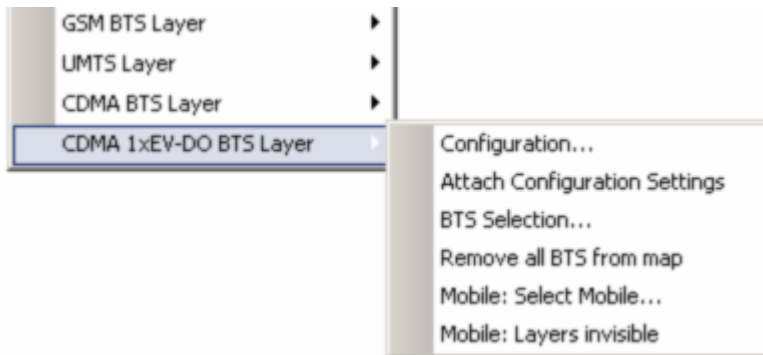


Fig. 4-48 CDMA 1xEV-DO BTS Layer submenu

Note:

Before any configurations can be made, a valid base station list must be imported and a BTS data base created. For CDMA base stations, this is done in the *TEC for CDMA* tab of the *Configuration of Software Modules* menu; refer to section *Configuration Menu* in chapter 3.

Configuration

Opens the *CDMA 1xEV-DO BTS Layer* dialog to set the BTS display options.

The *cdma/1xEV-DO Settings* tab of the *CDMA BTS Layer* dialog defines the display options for 1xEV-DO scanner data.

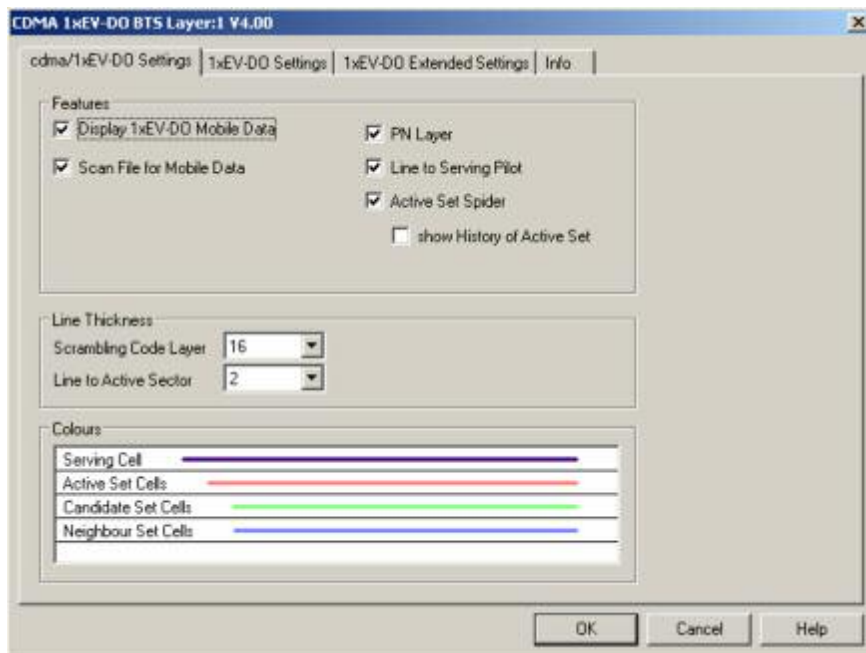


Fig. 4-49 CDMA 1xEV-DO BTS Layer dialog: cdma/1xEV-DO Settings

The *cdma/1xEV-DO Settings* are analogous to the BTS layer configurations for cdma BTS as described above:

Features To improve the stability of the radio connection and the handoff procedures, a 1xEV-DO mobile may be connected to several base stations or BTS sectors at the same time (soft handoff). However, only the connecting lines to the current (i.e. the most recently connected) BTS sector are drawn. Due to this simplification, the visualization of a CDMA/1xEV-DO route track is similar to GSM.

The following display elements can be switched off individually or altogether:

Display 1xEV-DO Mobile Data

General display of the 1xEV-DO symbols, leaving only the symbols for the serving cells and for the cells being tracked.

Scan File for Mobile Data

Enables or disables the automatic scan for mobile data in the active CMD file.

PN Layer

Hide or show the PN layer.
Line to Serving Pilot
Draw lines to the current cell (serving cells)

Active Set Spider

Draw temporary lines between the mobile position and the cell sectors in the active set. If *Show History of Active Set* is active, the lines are no longer removed as the active set changes.

Line Thickness Line thickness of the scrambling code layer and of the lines between the signal route and the active sector.

Colors Color of the active sector.

The *1xEV-DO Settings* tab of the *CDMA 1xEV-DO BTS Layer* dialog defines the general options for the BTS layer data.

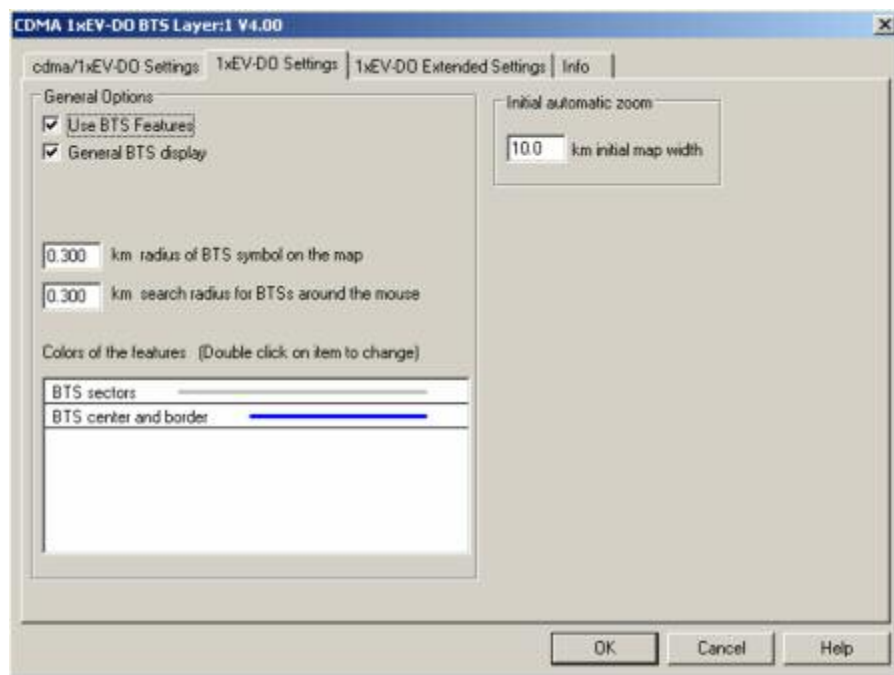


Fig. 4-50 CDMA 1xEV-DO BTS Layer dialog: 1xEV-DO Settings

General Options In the *Features* panel the following display elements can be switched off individually or altogether (*Use BTS Features* cleared):

General BTS display

Enables or disables the general display of the BTS symbols, leaving only the symbols for the serving cells and for the cells being tracked

Radius of BTS symbol on the map

The size of the BTS symbol on the displayed map can be adjusted by entering a proportional symbol radius here. This is useful in measurement areas with a high BTS density to avoid symbol overlapping.

Search radius for BTSs around the mouse

The radius of the hot zone that can be clicked to open an info field can be adjusted.

Colors of the features The *Colors* panel changes the colors of the display elements. Double-clicking an element of the list opens the [Colors](#) dialog (see p. 4.351) to modify the current display color.

Initial automatic zoom The Initial automatic zoom panel contains an input field for the width of the Route Track view window. This setting is applied in a measurement session as soon as R&S ROMES receives the first position coordinates. The first measurement point also marks the center of the map.

The *1xEV-DO Extended Settings* tab of the *CDMA 1xEV-DO BTS Layer* dialog selects the cell lines to be drawn and defines their display options.

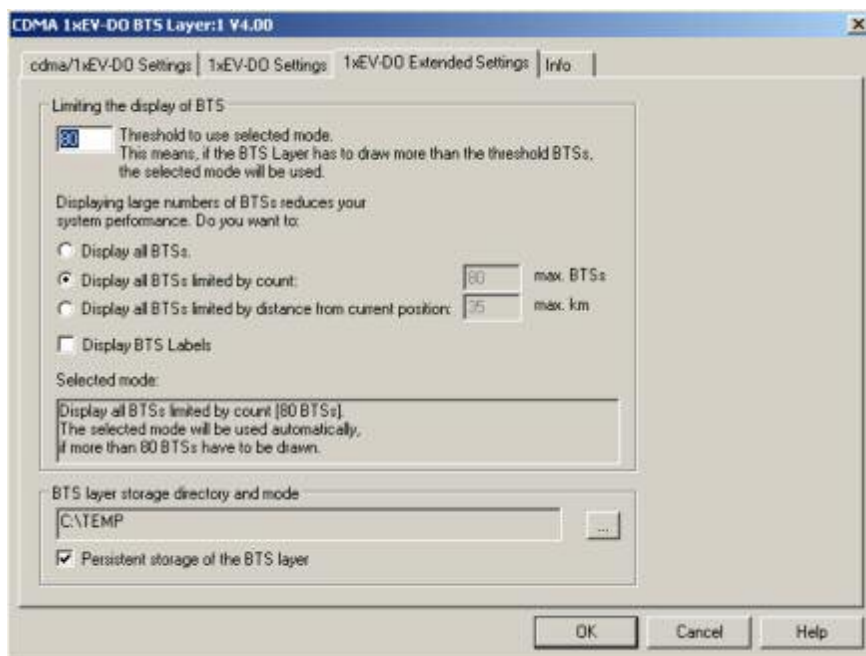


Fig. 4-51 CDMA 1xEV-DO BTS Layer dialog: 1xEV-DO Extended Settings

BTS display limit

The Limiting the display of BTS panel contains an input field to limit the number of BTS symbols displayed in the Route Track view. A small number of BTS symbols improves the system performance.

R&S ROMES counts the number of BTS symbols to be drawn. A limiting condition is imposed as soon as this number exceeds the threshold set in the input field. Below the threshold, all symbols are drawn.

Display all BTSs

All BTS symbols displayed, i.e. no limiting condition set

Display ... limited by count

Only a fixed number of BTS symbols around the current position are displayed. The fixed number is equal to the threshold value for the limiting condition.

Display ... limited by distance

Only the BTS symbols within a given radius (between 1 km and 1000 km) around the current position are displayed.

The limit settings are valid after an update of the BTS layer. R&S ROMES indicates the limiting condition set when updating the BTS layer.

BTS layer storage directory and mode

If the Persistent storage of the BTS layer box is checked, R&S ROMES stores the current BTS layer (containing all information on the BTS symbols to be displayed in the current view) to the directory indicated in the (unavailable) input field. This avoids reloading of the BTS list and recalculating of the layer when the workspace with the current Route Track view is opened for the next time.

The directory can be changed using the "..." button. This is particularly important if the BTS layer is stored to a RAM disk in order to improve the system performance; see section *RAMDisk* in chapter 8.

Attach Configuration Settings

Includes the current CDMA 1xEV-DO BTS layer configuration in the measurement file.

The attached configuration settings can be re-used in a later replay session.

BTS Selection

Opens the *BTS Selection* dialog to select BTSs with particular properties or position.

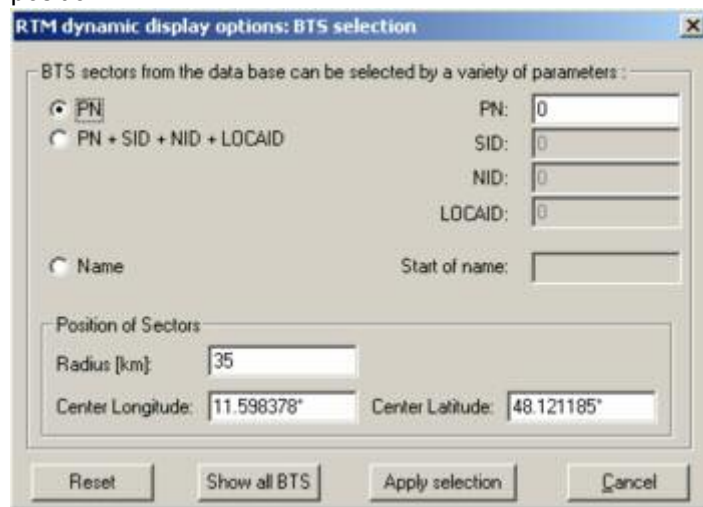
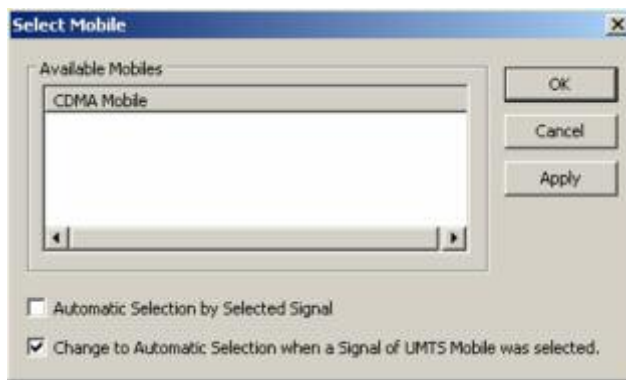


Fig. 4-52 BTS Selection dialog (CDMA 1xEV-DO networks)

Sector Properties	<p>In the upper part of the dialog one or several of the following conditions can be set (click one of the option buttons and enter the desired value (name or integer number) in the input field on the right side):</p> <p><i>PN</i> Select BTS with a particular pilot number</p> <p><i>PN+SID+NID+LOCAID</i> Pilot number plus system identity plus network identity plus location area identity</p> <p><i>Name</i> Select BTS with a particular name or with a name starting with a particular combination of characters</p>
Position of Sectors	<p>The Position of Sectors panel defines a circle of variable size and position to limit the number of BTS symbols displayed in the Route Track view. BTSs outside the circle are not displayed. A small number of BTS symbols improves the system performance.</p> <p>The size of the circle is defined by the Radius [km]. Its position is defined by the longitude and latitude coordinates of the center (<i>Center Longitude, Center Latitude</i>). The default <i>Center Longitude</i> and <i>Center Latitude</i> are the coordinates of the pointer on the <i>Route Track</i> view when the context menu and the <i>BTS Selection</i> dialog was called up.</p>
Reset	<p>Reset the current display in the <i>Route Track</i> view; delete all BTS displayed (disabled during a measurement or replay).</p>
Show all BTS	<p>Show all BTS from the BTS list in the Route Track view. With this button, the BTS can be viewed without starting a measurement or a replay session (disabled during a measurement or replay).</p>
Apply Selection	<p>Apply the current condition.</p>
Remove all BTS from map	<p>Removes all BTS symbols currently displayed.</p> <p>A warning message must be confirmed before this command is executed. The function is disabled during a measurement or replay.</p>
Mobile: Select Mobile...	<p>Select the mobile for which the mobile layer is displayed.</p> <p>The Select Mobile dialog contains a list of all mobiles available in the current measurement.</p>



The mobile layer indicates the serving cell for a mobile along the measurement tour; see Mobile: Layers invisible below. The checkmarks below the mobile list can be used to select one of the following alternative modes:

Automatic Selection by Selected Signal

(upper box checked, lower box unavailable): The mobile layer always corresponds to the mobile that provided the selected signal. While a PNS signal is selected, the mobile layer is invisible so that the PNS layer can be displayed.

Change to Automatic Selection when a Signal of UMTS Mobile was selected

(upper box cleared, lower box checked): The mobile layer of the mobile selected in the list of *Available Mobiles* is displayed. This mobile layer is maintained if a PNS signal is selected. Selecting a signal from a UMTS mobile switches back to automatic mobile selection, so there can be no mismatch between a UMTS mobile signal and the mobile layer displayed in the *Route Track* view.

Fixed Mobile Layer

(upper and lower box cleared): The mobile layer of the mobile selected in the list of *Available Mobiles* is displayed, irrespective of the mobile signal selection.

**Mobile:
Layers invisible**

Temporarily hide the entire BTS layer currently displayed.

A checkmark before the command indicates that a CDMA 1xEV-DO BTS layer is currently available, but hidden. The layer reappears if the command is clicked for the second time.

Layers Invisible is disabled if the current view contains no CDMA 1xEV-DO BTS layer.

2G/3G Views

2G/3G views can be used to view 2G (GSM) as well as 3G (UMTS) data. Some of the views evaluate processes that are independent of the technology (e.g. the NQA call statistics), others show information that is exchanged between the 3G and 2G systems to ensure interoperability (e.g. the layer 3 messages).

The 2G/3G Views can be selected from a submenu displayed on the right side of the *View* menu when the mouse pauses over 2G/3G Views.

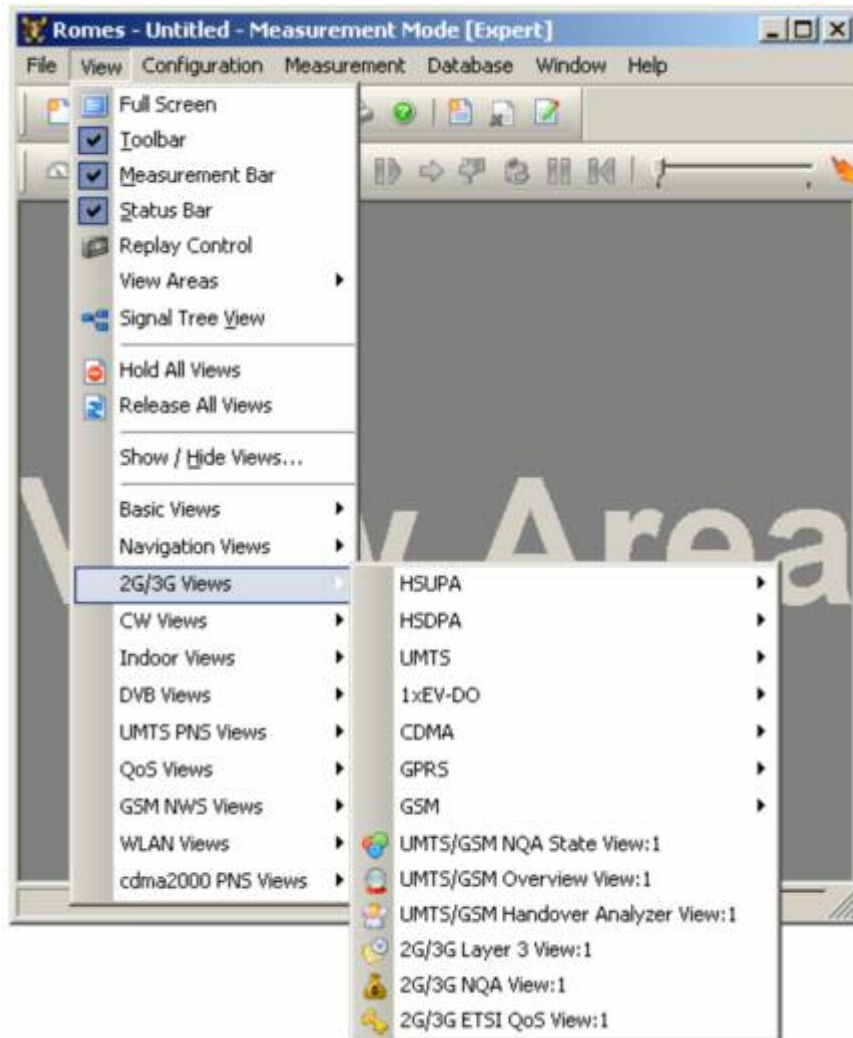


Fig. 4-53 2G/3G Views

UMTS HSUPA Views

The *UMTS HSUPA Views* display High Speed Uplink Packet Access (HSUPA)-specific information acquired with a UMTS test mobiles or data cards supporting HSUPA and using the UMTS driver. HSUPA measurements require option R&S ROMES-UM4. In general, recording of the different message types shown in the *UMTS Views* must be explicitly activated in the driver configuration menu:

- Enable UMTS HSUPA in the Configuration tab.
- Select the HSUPA node in the Expert Mode tab.

R&S ROMES supports the HSUPA test mobile TM7200 and data card prototypes.

The HSUPA views can be selected from a submenu displayed on the right side of the *View* menu when the mouse cursor hovers over *HSUPA*.

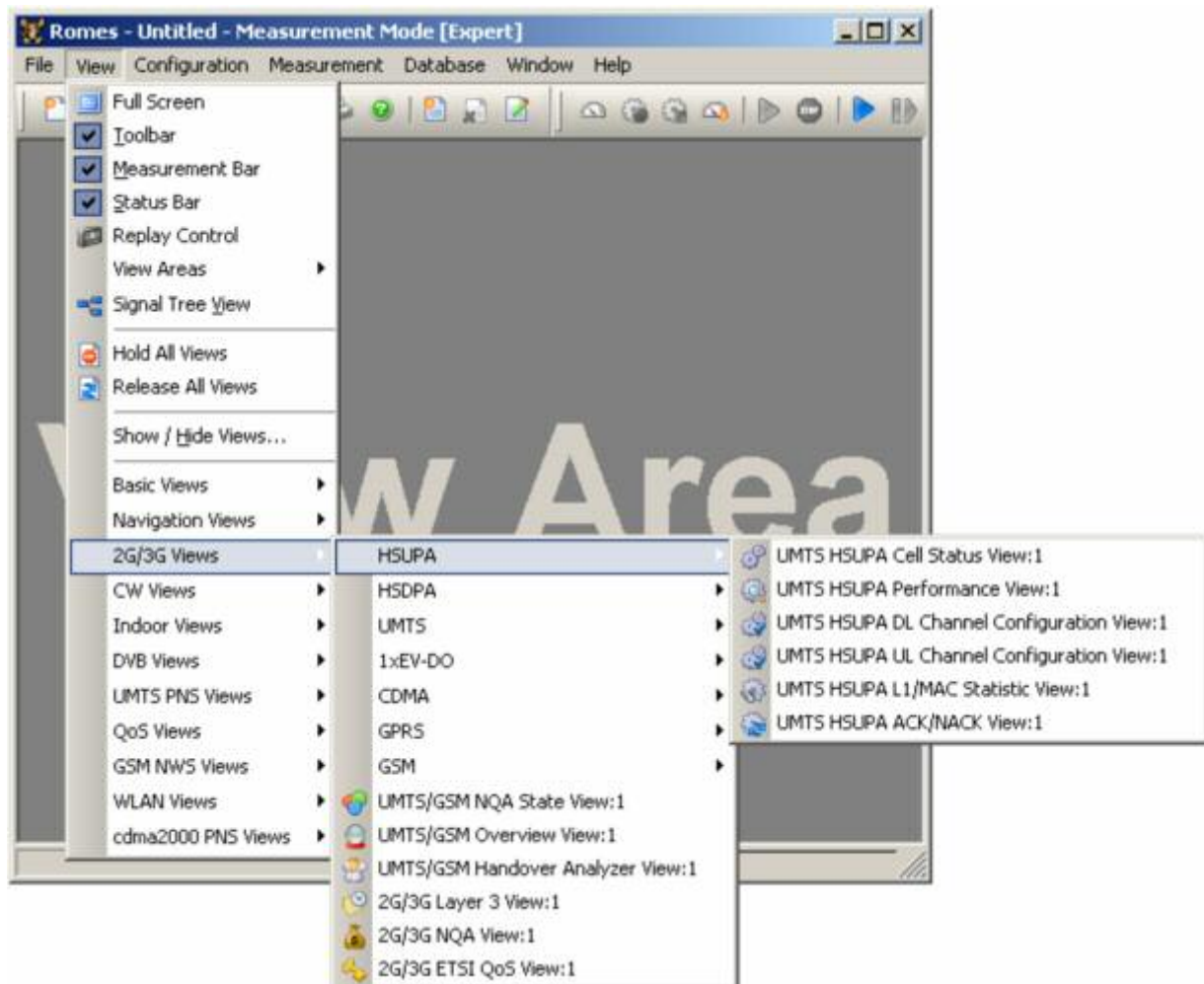


Fig. 4-54 UMTS HSUPA views

UMTS HSUPA Cell Status View

The Cell Status views show the events per TTI. Each column reflects one TTI. The background color corresponds to the Happy Bit (green = happy, red = unhappy, all other colors = DTX).

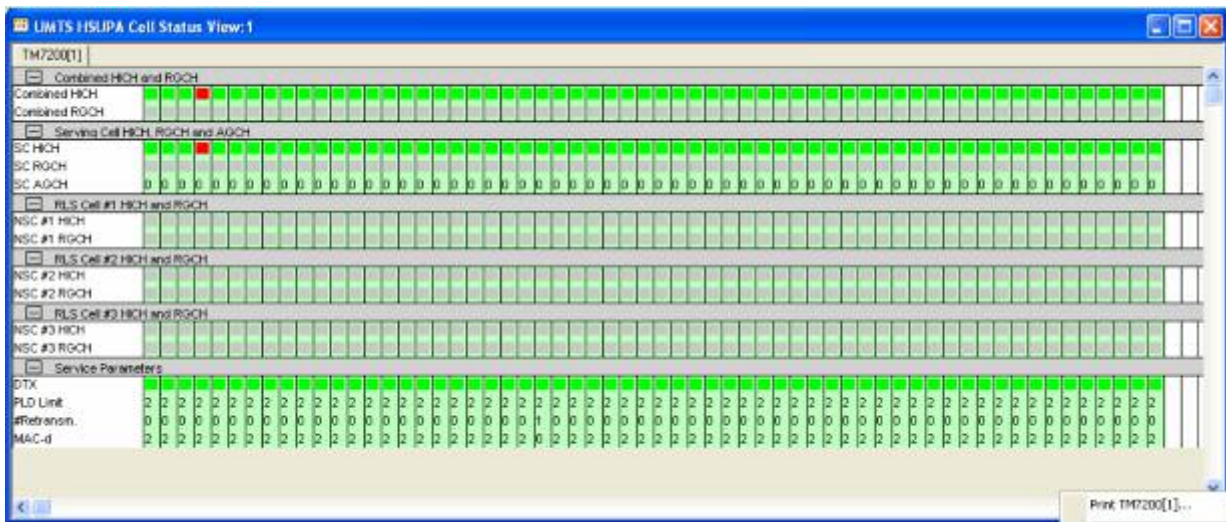


Fig. 4-55 UMTS HSUPA Cell Status View

The first two rows show the result of the combination of the received HICH and RGCH.

Combined HICH and RGCH

Each row of the sub-diagram shows one TTI. The chart contains the following results:

Combined HICH

The first row shows the result of the combination of the received Hybrid ARQ Indicator Channel (HICH), where the color of the Happy Bit can be:

- Green: ACK
- Red NACK
- Yellow DTX

This parameter shows whether or not the mobile is "happy". The mobile is considered happy if it can transmit the currently available data within a certain time frame signalled by an RRC message.

Combined RGCH

The second row shows the result of the combination of the received Relative Grant Channel (RGCH), where the color of the Happy Bit can be:

- Green: Up
- Red Down
- Yellow Hold
- Gray no RGCH received

Serving Cell HICH, RGCH and AGCH The sub-diagram shows the same values and colors described for the Combined HICH and RGCH on a cell basis, in this case for the serving cell (SC).

The chart contains the following results:

SC HICH

The background colors are identical to those described for *Combined HICH* above.

SC RGCH

The background colors are identical to those described for *Combined RGCH* above.

SC AGCH

This additional row shows the Absolute Grant channel (AGCH) values which were transmitted in a certain TTI.

RLS Cell #<nr.> HICH and RGCH The sub-diagram shows the same values and colors described for the Combined HICH and RGCH on a cell basis, in this case for a non-serving cell (NSC), where #<nr.> could be #1, #2, or #3.

The chart contains the following results:

NSC #<nr.> HICH

The background colors are identical to those described for *Combined HICH* above.

NSC #<nr.> RGCH

The background colors are identical to those described for *Combined RGCH* above.

Service Parameters

The last sub-diagram shows additional parameters for the given TTIs.

Context menu



A right mouse click on any point in the view opens the context menu to access the configuration menus, (de-)select the view for fast replay, or to copy the current view to the clipboard, or to move to another worksheet; see [Context menu](#) description on p. 4.2.

The *UMTS HSUPA Cell Status View* has no context menu for configurations assigned. The *Info* tab can be accessed via the *Configuration – Settings* command.

UMTS HSUPA Performance View

The *UMTS HSUPA Performance View* contains four preconfigured 2D charts. The signals in these charts are related to the transmission performance, given in terms of the requested or achieved data throughput.

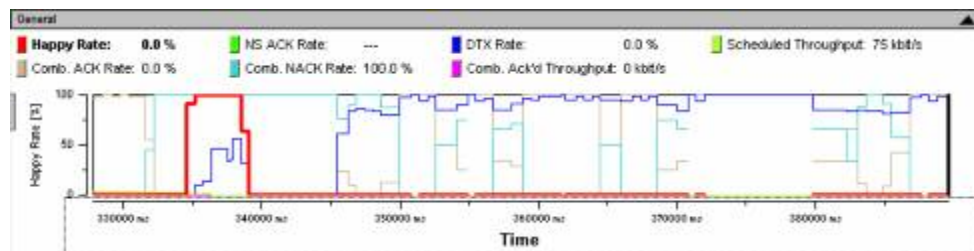


Fig. 4-56 UMTS HSUPA Performance View

A double-click on the title bars of the sub-diagrams opens or closes them in the performance view. The functionality of all sub-diagrams is analogous to the *2D Chart View* described on p. 4.10, however, an additional *Plot* dialog (see below) provides additional settings to control the diagram content and appearance.

General

The *General* sub-diagram shows the most important parameters regarding throughput. The requested throughput is calculated from the CQI messages that the mobile transmits on the UL HS-DPCCH; see *UMTS HSDPA UL HS-DPCCH View* on p. 4.110. The results are averaged over the number of subframes (100) shown in the *UMTS HSDPA HS-DPCCH* view.



The chart contains the following results:

Happy Rate

This parameter shows whether or not the mobile is "happy". The mobile is considered happy if it can transmit the currently available data within a certain time frame signalled by an RRC message.

NS ACK Rate

The rate of TTIs which were acknowledged by "other cell", which are not belonging to the radio link set.

DTX Rate

Rate of TTIs in which no data was transmitted.

Scheduled Throughput

Data throughput based on the transport block sizes of sent TTIs.

Comb. ACK Rate

The rate of acknowledged TTIs. A TTI is counted as acknowledged when the corresponding combination of the different HICH of the radio link set results in an ACK.

Comb. NACK Rate

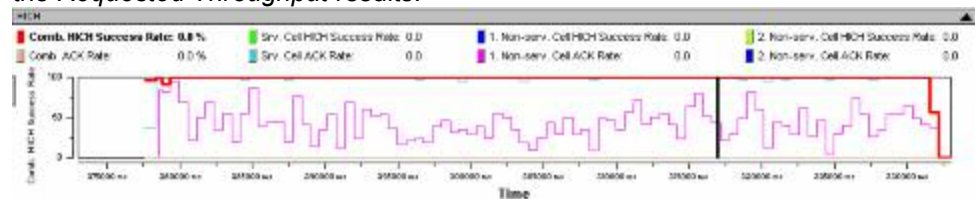
The combined NACK rate is calculated as
 $100\% - \text{Comb. ACK Rate}$

Comb. ACK'd Throughput

Data throughput based on the transport block sizes of the acknowledged TTIs.

HICH

The *HICH* sub-diagram shows information about the Hybrid ARQ Indicator Channel (HICH) of the related cells in the radio link set. The results are analogous to the *Requested Throughput* results.



The chart contains the following results:

Comb. HICH Success Rate

Rate of the successful reception of a HICH information of one of the cells, which belong to the radio link set.

Srv. Cell HICH Success Rate

Rate of the successful reception of a HICH information of the serving cell.

1. Non-serv. Cell HICH Success Rate

Rate of the successful reception of a HICH information of the first non-serving cell.

2. Non-serv. Cell HICH Success Rate

Rate of the successful reception of a HICH information of the second non-serving cell.

Comb. ACK Rate

The rate of acknowledged TTIs. A TTI is counted as acknowledged when the corresponding combination of the different HICH of the radio link set results in an ACK.

Srv. Cell ACK Rate

Rate of the successful reception of acknowledged TTIs of the serving cell.

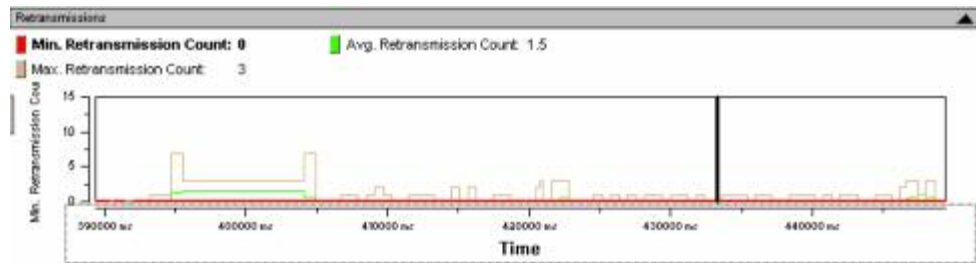
1. Non-serv. Cell ACK Rate

Rate of the successful reception of acknowledged TTIs of the first non-serving cell.

2. Non-serv. Cell Rate

Rate of the successful reception of acknowledged TTIs of the second non-serving cell.

Retransmissions The *Retransmissions* sub-diagram shows the minimum, average, and maximum number of retransmissions within the update rate.



The chart contains the following results:

Min. Retransmission Count

Counter for the minimum number of retransmissions.

Avg. Retransmission Count

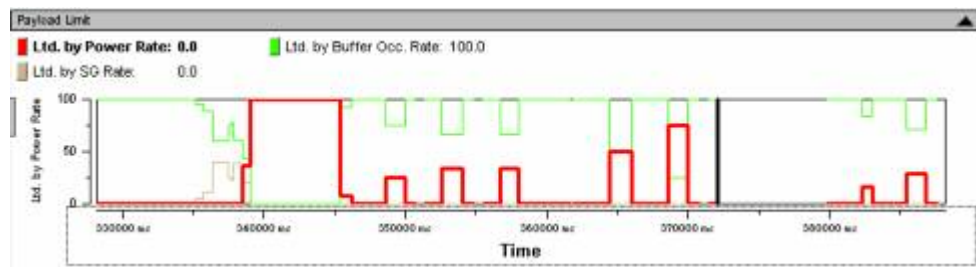
Calculated average number of retransmissions.

Max. Retransmission Count

Counter for the maximum number of retransmissions.

Payload Limit

The *Payload Limit* sub-diagram shows information about the reasons of the throughput limitation. Qualcomm specified the values 0, 1, 2. However, also the value '3' was reported during tests, which explains why the sum of the three values sometimes does not add up to 100%.



The chart contains the following results:

Ltd. by Power Rate

The max. allowed transmit power limits the throughput.

Ltd. by Buffer Occ. Rate

The data buffer in the mobile is empty. There is no more data to transmit.

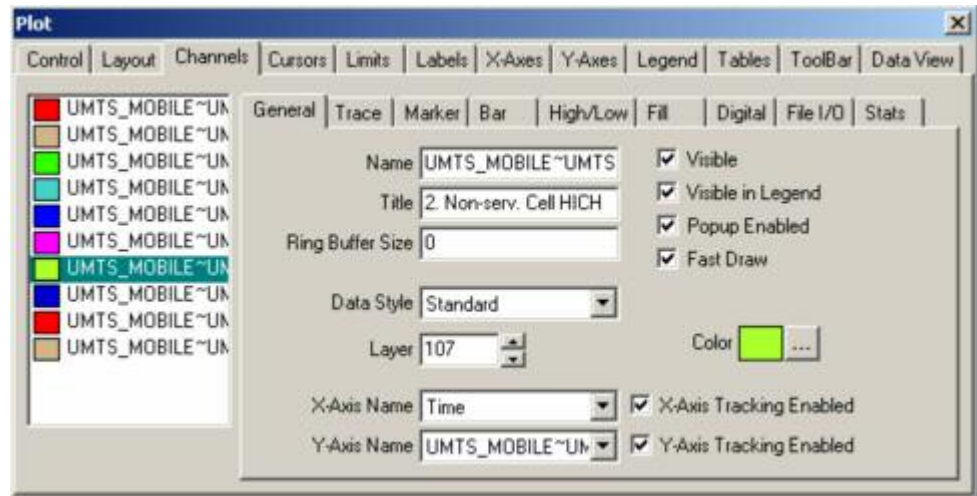
Ltd. by SG Rate

The current serving grant limits the throughput.

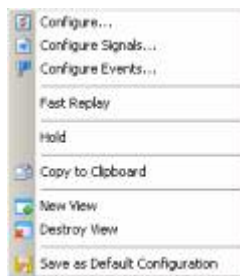
View Configuration

Edit...

The *Plot* dialog provides additional settings to control the diagram content and appearance. The dialog is opened from a context menu; this menu appears after a right-click on the y-axis labels or on one of the curves in the diagram.



Context menu



A right mouse click on any point in the view opens the context menu to access the configuration menus, activate the fast replay mode, to put the view on hold, to copy the view contents to the clipboard, create or delete views, or to save the current configuration; see *Context menu* description on p. 4.2.

UMTS HSUPA Performance View Configuration

The *UMTS HSUPA Performance View* configuration menu scales the axes of the chart and defines its contents and its appearance. All controls are also available in the *Chart Configuration* tab of the *2D Chart Configuration* menu and have the same effect; see figure on p. 4.14.

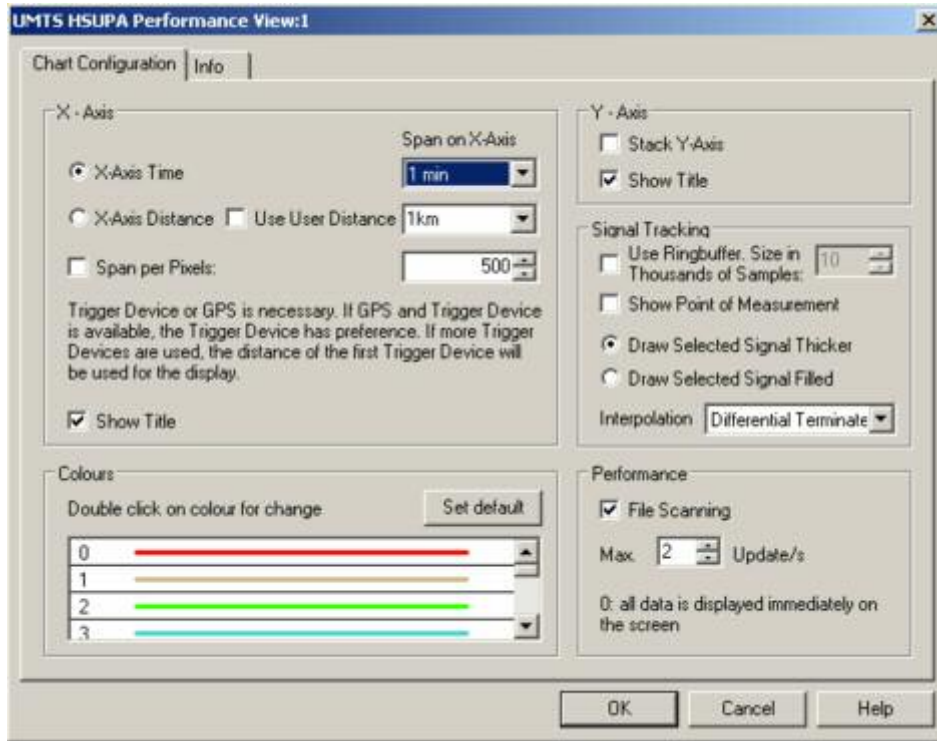


Fig. 4-57 UMTS HSUPA Performance View - Configuration

UMTS HSUPA DL Channel Configuration View

The *UMTS HSUPA DL Channel Configuration View* shows the most important DL parameters of the active HSUPA connections, which were transmitted in the corresponding RRC messages. The power offset table shows the basic information on which the transmit power calculation of the mobile is based on. For detailed information please refer to TS25.331 and TS25.212.

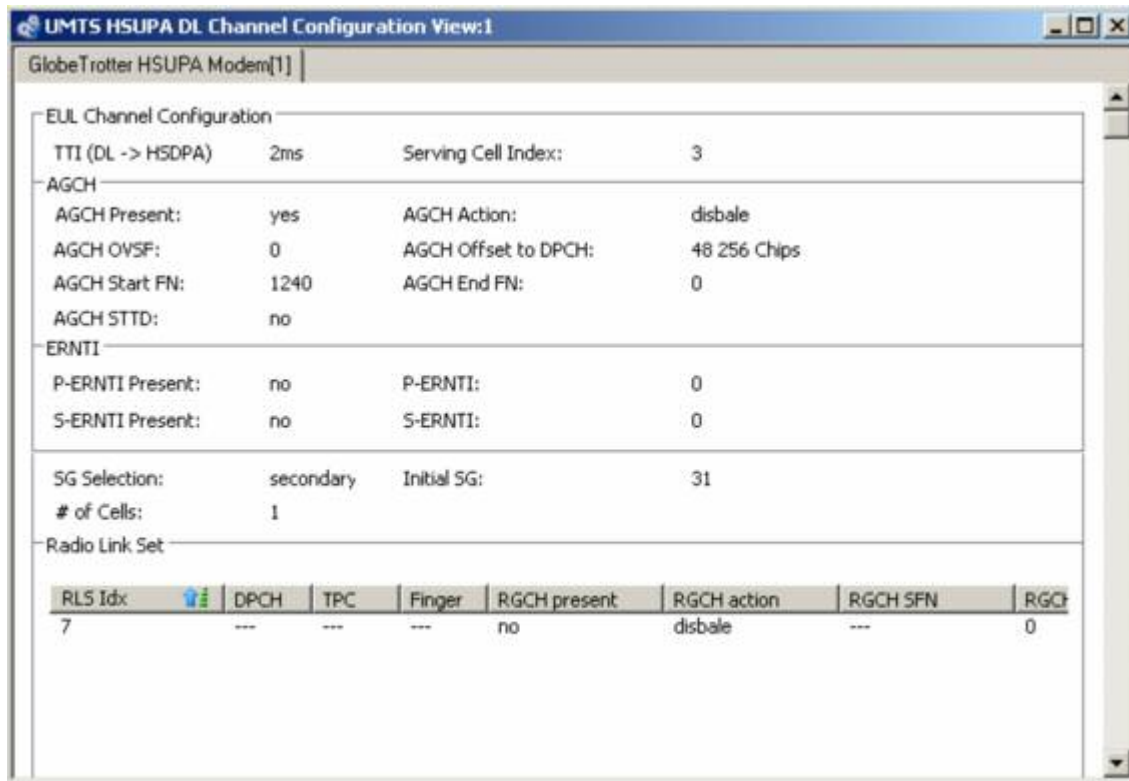


Fig. 4-58 UMTS HSUPA DL Channel Configuration View

The channel configuration data is displayed in different panels.

EUL Channel Configuration The following EUL (Enhanced Uplink) channel information is displayed in the view:

TTI (DL -> HSDPA)

Transmission Time Interval for the E-DCH. The standard 3GPP TS 25.321 allows a TTI of e.g. 2 ms, which is one HSUPA subframe comprising 3 slots.

Serving Cell Index

Serving cell index in the range 0 to 7.

AGCH

The following information is related the UL HS-DPCCH. This channel carries the ACK/NACK and CQI messages that the mobile reports to the network; see *UMTS HSDPA UL HS-DPCCH View* on p. 4.110:

Radio Link Set	<i>RLS Idx</i>	Radio Link Set (RLS) index
	<i>DPCH</i>	DPCH channel
	<i>TPC</i>	TPC Index
	<i>Finger</i>	Reference Finger
	<i>RGCH present</i>	Relative Grant Channel (RGCH) is present (yes/no)
	<i>RGCH action</i>	RGCH action is enabled or disabled
	<i>RGCH SFN</i>	RGCH Start Frame Number (SFN)
	<i>RGCH EFN</i>	RGCH End Frame Number (EFN)
	<i>RGCH DPCH Offset</i>	Relative Grant Channel DPCH Offset
	<i>RGCH Sign.</i>	Relative Grant Channel Signature
	<i>HICH present</i>	Hybrid Indicator Channel (HICH) is present (yes/no)
	<i>HICH action</i>	Hybrid Indicator Channel action is enabled or disabled
	<i>HICH SFN</i>	HICH Start Frame Number (SFN)
	<i>HICH EFN</i>	HICH End Frame Number (EFN)
	<i>HICH OVSF</i>	HICH OVSF
	<i>HICH DPCH Offset</i>	Hybrid Indicator Channel DPCH Offset
	<i>HICH Sign.</i>	Hybrid Indicator Channel Offset
	<i>HICH STTD</i>	Hybrid Indicator Channel STTD

Context menu

A right mouse click on any point in the view opens the context menu to print the view, access the configuration menus, activate the fast replay mode, copy the view contents to the clipboard, create new views, or save the current configuration; see [Context menu](#) description on p. 4.2.



UMTS HSUPA DL Channel Configuration View Configuration

The *UMTS HSUPA DL Channel Configuration View* configuration menu defines the list elements for the Radio Link Set (RLS) table and shows information on the current view version. It is opened via a right mouse click on a point inside the *UMTS HSUPA DL Channel Configuration View* or via the *Configuration – Settings* command (see chapter 3).

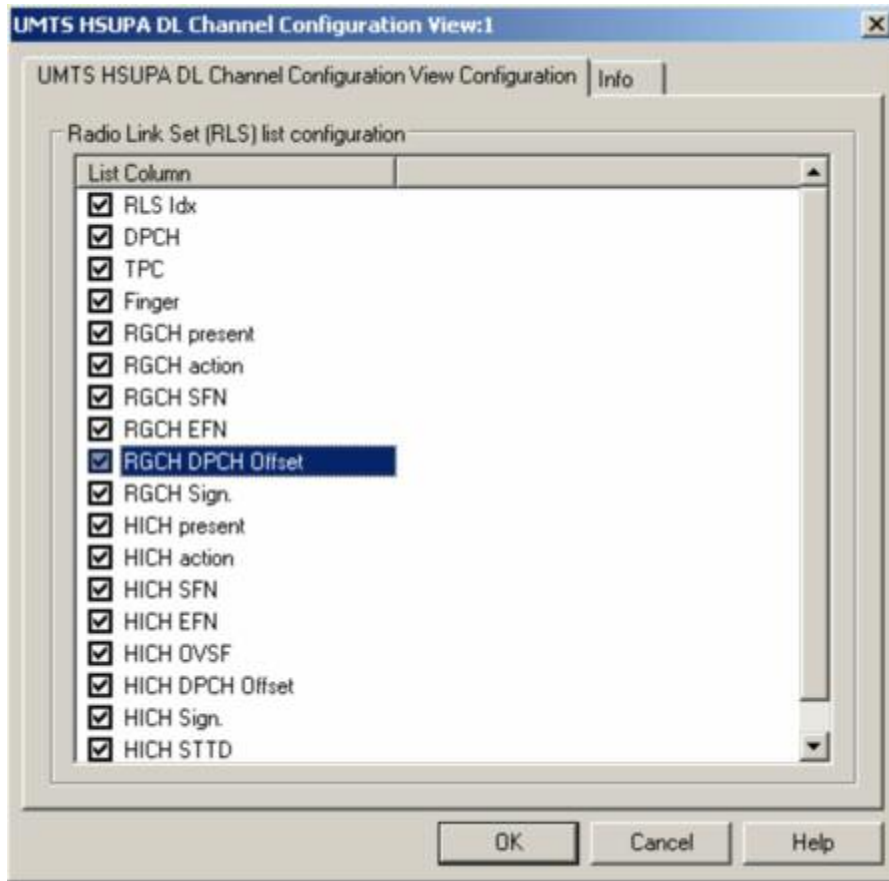


Fig. 4-59 UMTS HSUPA DL Channel Configuration View - Configuration
The *Info* tab can be accessed via the *Configuration – Settings* command.

UMTS HSUPA UL Channel Configuration View

The HSUPA UL Channel Configuration Views shows the most important UL parameters of the active HSUPA connections, which were transmitted in the corresponding RRC messages. The power offset table shows the basic information on which the transmit power calculation of the mobile is based on. For detailed information please refer to TS25.331 and TS25.212.

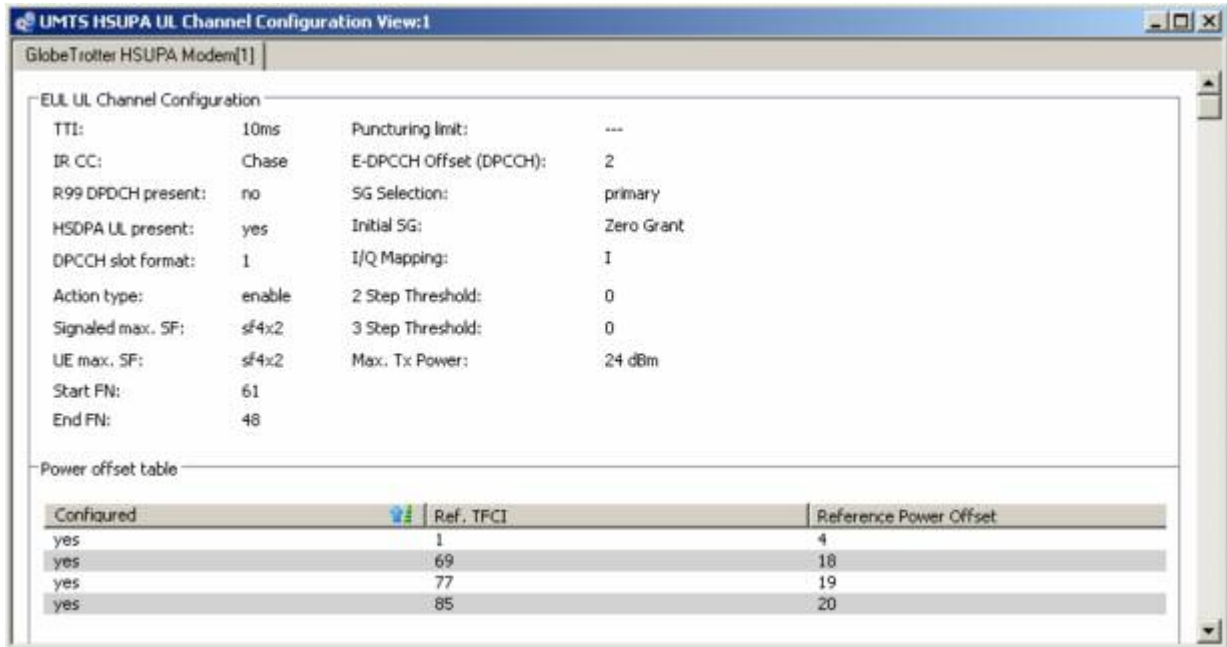


Fig. 4-60 UMTS HSUPA UL Channel Configuration View

The channel configuration data is displayed in different panels.

EUL ULChannel Configuration The EUL UL channel information is displayed in the view:

Power offset table The *Power offset table* displays the following parameters.

Configured

Configured state of the related *Reference E-TFCI*.

Ref. TFCI

Reference E-TFCI

Reference Power Offset

Context menu

A right mouse click on any point in the view opens the context menu to print the view, access the configuration menus, activate the fast replay mode, copy the view contents to the clipboard, create new views, or save the current configuration; see [Context menu](#) description on p. 4.2.



UMTS HSUPA UL Channel Configuration View Configuration

The *UMTS HSUPA UL Channel Configuration View* configuration menu defines the list elements for the Radion Link Set (RLS) table and shows information on the current view version. It is opened via a right mouse click on a point inside the *UMTS HSUPA UL Channel Configuration View* or via the *Configuration – Settings* command (see chapter 3).

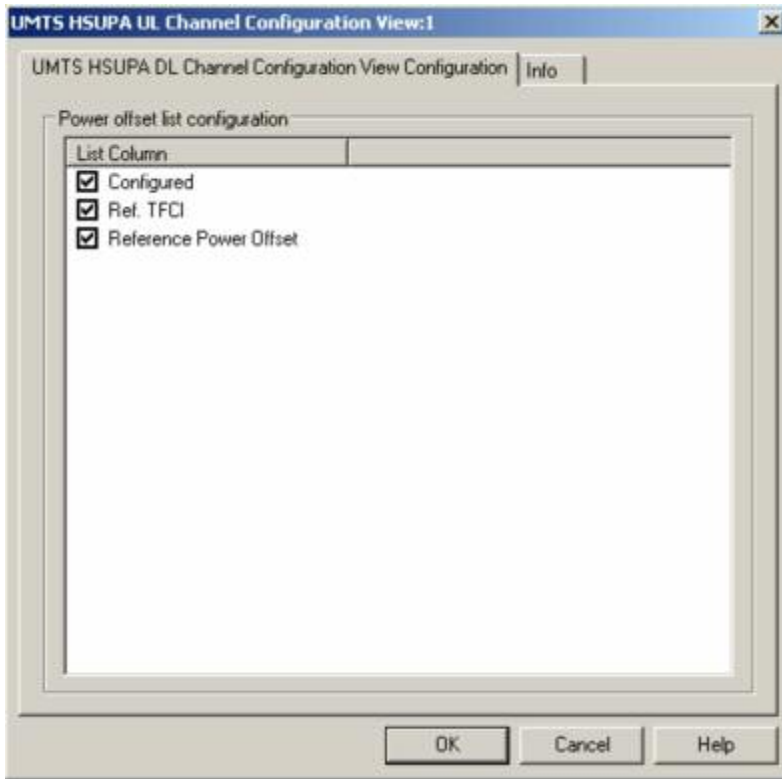


Fig. 4-61 UMTS HSUPA UL Channel Configuration View - Configuration
The *Info* tab can be accessed via the *Configuration – Settings* command.

UMTS HSUPA L1/MAC Statistic View

The *UMTS HSUPA L1/MAC Statistic View* shows a configurable selection of the statistics parameters provided by the mobile itself.

Parameter	Value	Value in percent	Alarm Thr.	Alarm Count
TTI	10ms	100.00	off	0
Serv. RG Up Rate	0.0 %	0.00	off	0
Happy Rate	0.0 %	0.00	off	0
Avg. Number of E-DCH cells	0	0.00	off	0
Serv. RG Down Rate	0.0 %	0.00	off	0
Serv. RG Hold Rate	100.0 %	100.00	off	0
Non-Serv. RG Down Rate	0.0 %	0.00	off	0
Serv. RG Hold Rate	100.0 %	100.00	off	0
AGCH Success Rate	0.0 %	0.00	off	0
Mean. rec. AGCH Commands	0	0.00	off	0
Mean. Serving Grant	0	0.00	off	0
New Transmission Rate	---		off	0
Retransmission Rate	0.0 %	0.00	off	0
DTX Rate	100.0 %	100.00	off	0
Residual BLER	0.0 %	0.00	off	0
First Attempt BLER	0.0 %	0.00	off	0
Power Limited Rate	0.0 %	0.00	off	0
SG Limited Rate	0.0 %	0.00	off	0
Buffer Limited Rate	---		off	0
Mean. scheduled transmitted bits	11796	11.00	off	0
Mean. non-scheduled transmitted bits	6015	5.18	off	0
Avg. Supported Bits	0	0.00	off	0
Avg. DPCH Power	0 %	81.25	off	0
Max. Power Allowed	0 %	81.25	off	0
Avg. Beta d/c	---		off	0
Avg. Beta hs/c	---		off	0
Avg. Beta ec/c	0 %	50.00	off	0
Avg. Beta ed/c	0 %	50.00	off	0
Scheduled Buffer Empty Rate	0.0 %	0.00	off	0
Non-Scheduled Buffer Empty Rate	0.0 %	0.00	off	0
Mean. scheduled buffer status	6144 %	5.38	off	0
Mean. non-scheduled buffer status	0 %	0.00	off	0
Avg. AGCH Qual	0 %	0.00	off	0
Avg. RGCH Qual	0 %	0.00	off	0
Avg. HICH Qual	0 %	0.00	off	0
MAC Resets	0	0.00	off	0
Mean. E-TFCI	0	0.00	off	0

Fig. 4-62 UMTS HSUPA L1/MAC Statistic View

Diagram

Each parameter is shown in one row, and the alarm thresholds can be configured separately for each parameter. The following parameter properties are shown by default, the list columns can be configured using the *List format* tab of the configuration dialog as described on p. 4.106.

Parameter

Name of the HSUPA L1/MAC statistic parameter.

Value

Absolute value of the HSUPA L1/MAC statistic parameter.

Value in percent

The percent Value visualized as a bar diagram. The minimum and maximum of the value range are as defined in the definition of the signal.

Alarm Thr.

The value of the alarm threshold (or *Off*).

Alarm Count

The count of processed values in alarm state *On*.

The L1/MAC statistic parameters comprise the following values, which can be configured using the *Parameters* tab of the configuration dialog as described on p. 4.106:

TTI

Transmission Time Interval for the E-DCH. The standard 3GPP TS 25.321 allows a TTI of 2 ms (10 ms (WCDMA) relevant), which is one HSUPA subframe comprising 3 slots. The valid range is 0 to 1, alarm threshold default is 0.5.

Serv. RG Up Rate

The valid range is 0 to 100%, alarm threshold default is 50.

Happy Rate

The valid range is 0 to 100%, alarm threshold default is 50.

Avg. Number of E-DCH cells

The valid range is 0 to 254, alarm threshold default is 127.

Serv. RG Down Rate

The valid range is 0 to 100%, alarm threshold default is 50.

Serv. RG Hold Rate

The valid range is 0 to 100%, alarm threshold default is 50.

AGCH Success Rate

The valid range is 0 to 100%, alarm threshold default is 50.

Mean rec.AGCH Commands

The valid range is 0 to 65534, alarm threshold default is 32767.

Mean Serving Grant

The valid range is 0 to 37, alarm threshold default is 18.5.

New Transmission Rate

The valid range is 0 to 100%, alarm threshold default is 50.

Retransmission Rate

The valid range is 0 to 100%, alarm threshold default is 50.

DTX Rate

The valid range is 0 to 100%, alarm threshold default is 50.

Residual BLER

The valid range is 0 to 100%, alarm threshold default is 50.

First Attempt BLER

The valid range is 0 to 100%, alarm threshold default is 50.

Power Limited Rate

The valid range is 0 to 100%, alarm threshold default is 50.

SG Limited Rate

The valid range is 0 to 100%, alarm threshold default is 50.

Buffer Limited Rate

The valid range is 0 to 100%, alarm threshold default is 50.

Mean scheduled transmitted bits

The valid range is 0 to 65534, alarm threshold default is 32767.

Mean non-scheduled transmitted bits

The valid range is 0 to 65534, alarm threshold default is 32767.

Avg. Supported Bits

The valid range is 0 to 65534, alarm threshold default is 32767.

Avg. DPCCH Power

The valid range is -130 to +30 dBm, the alarm threshold default is -50.

Max. Power allowed

The valid range is -130 to +30 dBm, the alarm threshold default is -50.

Avg. Beta d/c

The valid range is -30 to +30, the alarm threshold default is 0.

Avg. Beta hs/c

The valid range is -30 to +30, the alarm threshold default is 0.

Avg. Beta ec/c

The valid range is -30 to +30, the alarm threshold default is 0.

Avg. Beta ed/c

The valid range is -30 to +30, the alarm threshold default is 0.

Scheduled Buffer Empty Rate

The valid range is 0 to 100%, alarm threshold default is 50.

Non-Scheduled Buffer Empty Rate

The valid range is 0 to 100%, alarm threshold default is 50.

Mean scheduled buffer status

The valid range is 0 to 65534, alarm threshold default is 32767.5.

Mean non-scheduled buffer status

The valid range is 0 to 65534, alarm threshold default is 32767.5.

Avg. AGCH Qual.

The valid range is 0 to 65534, alarm threshold default is 32767.

Avg. RGCH Qual.

The valid range is 0 to 65534, alarm threshold default is 32767.

Avg. HICH Qual.

The valid range is 0 to 65534, alarm threshold default is 32767.

MAC Resets

The valid range is 0 to 254, alarm threshold default is 127.

Mean E-TFCI

"Transport Format Combination Indicator". The valid range is 0 to 254, alarm threshold default is 127

Context menu

A right mouse click on any point in the view opens the context menu to print the view, access the configuration menus, activate the fast replay mode, copy the view contents to the clipboard, create new views, or save the current configuration; see [Context menu](#) description on p. 4.2.

UMTS HSUPA L1/MAC Statistic View Configuration

The *UMTS HSUPA L1/MAC Statistic View* configuration menu defines the list parameters and alarm threshold settings, the list format options and shows information on the current view version. It is opened via a right mouse click on a point inside the *UMTS HSUPA L1/MAC Statistic View* or via the *Configuration – Settings* command (see chapter 3).

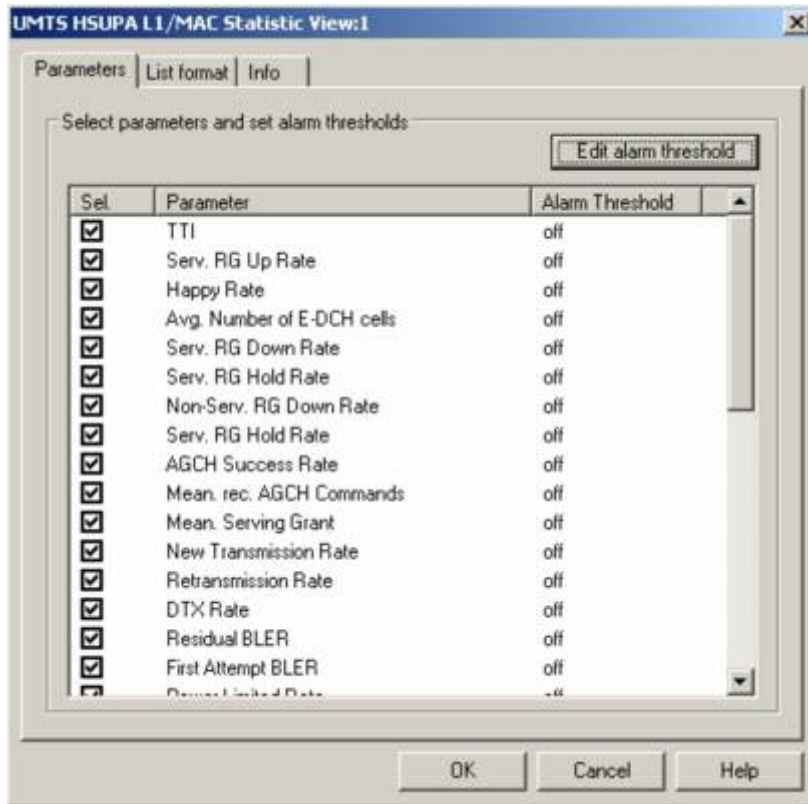


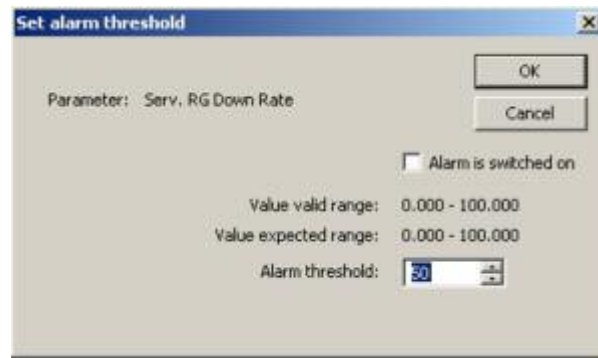
Fig. 4-63 UMTS HSUPA L1/MAC Statistic View configuration: Parameters

Parameters

The *Parameters* panel offers checkboxes to select the elements displayed in the UMTS HSUPA L1/MAC Statistic view.

Edit Alarm Threshold

With the *Edit Alarm Threshold* button the setting of an alarm can be defined for each selected parameters:



The valid and expected value ranges for each parameter of the mobile is shown on the dialog.

Alarm is switched on.

This checkbox toggles the state of the alarm between *On* and *Off*.

Alarm threshold

The valid value range of the threshold is shown above the entry field.

OK

Stores the alarm threshold setting and the alarm state.

Cancel

Aborts the current alarm threshold setting action and closes the dialog.

The *List format* tab of the *UMTS HSDPA L1/MAC Statistic View* configuration menu selects the information to be displayed.

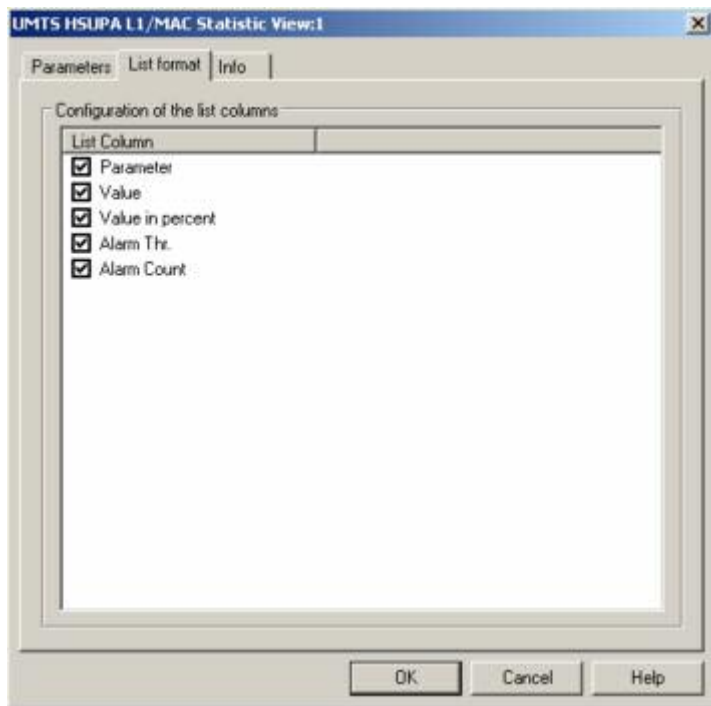


Fig. 4-64 UMTS HSUPA L1/MAC Statistic View configuration: List format

List Column

The *List Column* offers checkboxes to select the columns displayed in the UMTS HSUPA L1/MAC Statistic view.

UMTS HSUPA ACK/NACK View

The *UMTS HSUPA ACK/NACK View* shows the used transport block sizes per TTI. The y-axis shows the TBS and the x-axis represents the TTIs.

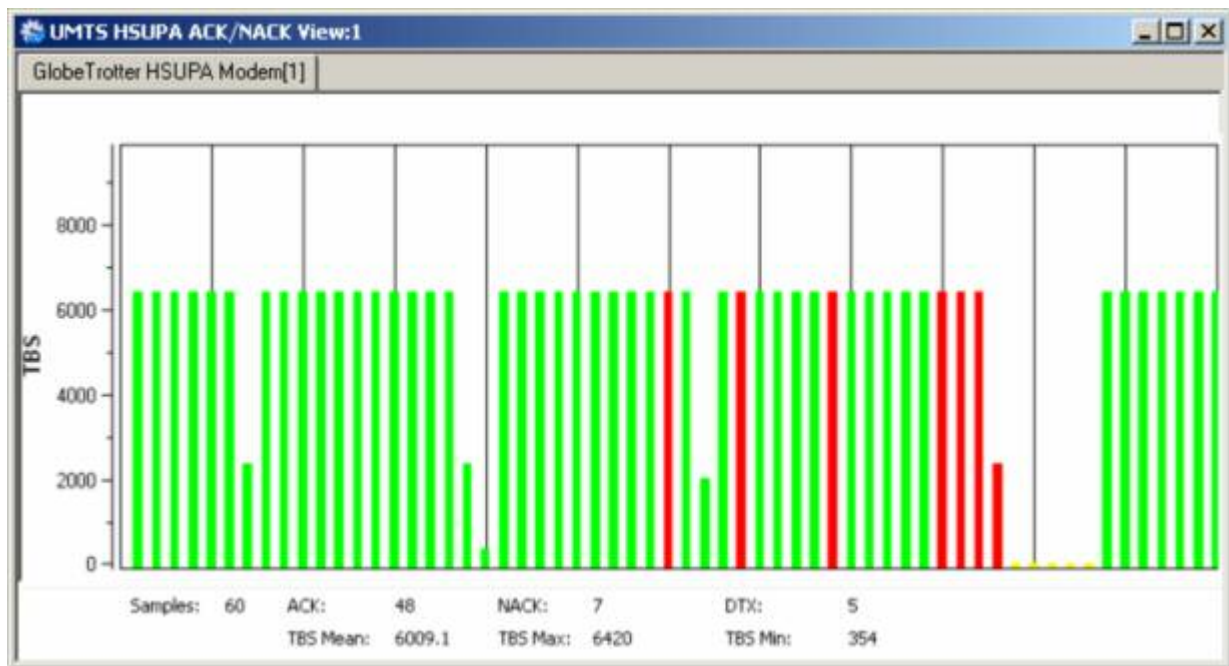


Fig. 4-65 UMTS HSUPA ACK/NACK View

Diagram

The view shows a bar graph with fixed scale. Each bar corresponds to a TTI value reported by the mobile.

- A green bar denotes an acknowledged TTI: The mobile sends an *ACK* message after a successful CRC check of a received HS-DSCH packet.
- A red bar denotes an unacknowledged TTI: The mobile sends a *NACK* message after a failed CRC check.
- A yellow bar denotes a subframe that was neither acknowledged nor unacknowledged: no answer was received from the mobile. This is most likely because the mobile could not correctly demodulate the downlink HS-SCCH. Note that the mobile can use DTX independently in the ACK/NACK and CQI slots.



Use the [UMTS HSUPA Cell Status View](#) (see p. 4.91) to analyze the cause for an unacknowledged or DTX frame.

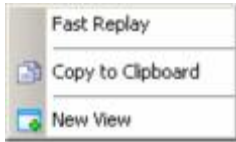
Statistical Results

Below the diagram the view shows the most important values per update cycle (Samples) in the diagram and the number of ACK, NACK, and DTX subframes (see above; ACK + NACK + DTX = Samples).

The arithmetic mean value of the displayed TBS values, the maximum, and the minimum TBS values are displayed below.

Context menu

A right mouse click on any point in the view opens the context menu to activate the fast replay mode, copy the view contents to the clipboard, or create a new views; see [Context menu](#) description on p. 4.2.



The *UMTS HSUPA ACK/NACK View* has no context menu for configurations assigned. The *Info* tab can be accessed via the *Configuration – Settings* command.

UMTS HSDPA Views

The *UMTS HSDPA Views* display HSDPA-specific information acquired with an UMTS test mobile supporting HSDPA and using the UMTS driver. HSDPA measurements require option R&S ROMES-UM4. In general, recording of the different message types shown in the *UMTS Views* must be explicitly activated in the driver configuration menu:

- Enable UMTS HSDPA in the Configuration tab.
- Select the HSDPA node in the Expert Mode tab.

R&S ROMES supports HSDPA test mobiles based on the Qualcomm 6275 chipset.

The HSDPA views can be selected from a submenu displayed on the right side of the *View* menu when the mouse cursor hovers over *HSDPA*.

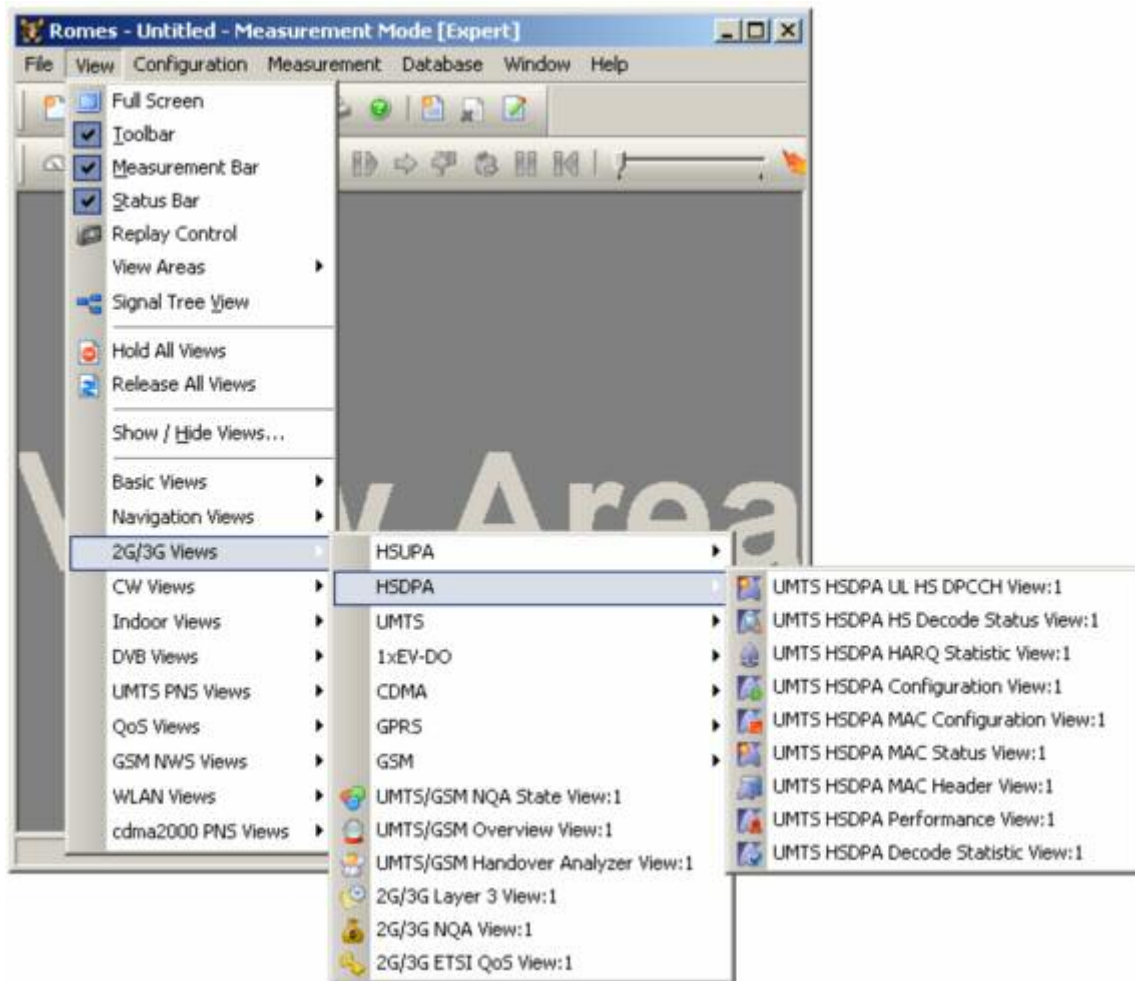


fig. 4-66 UMTS HSDPA views

In addition to the *HSDPA Views* described in this section, R&S ROMES provides an extensive selection of HSDPA signals. These signals appear below the *UMTS* node of the data tree (*Configuration – Preferences – Available Signals*) and can be analyzed in the appropriate *Basic Views* (see p. 4.6) and exported to ASCII files (see chapter 7). Many signals are also displayed in the *HSDPA Views*.

Signal	Unit	Format	Exp. Min.	Exp. Max.
UMTS RLC UL Statistics				
HSDPA Modulator Control Table				
Start Global Sub. FN		---	0	1279
No. Subframes		---	0	244
HSDPA SCCH Statistics				
No. Subframes		---	0	1024
No. Subframes SCCH Decodin...		---	0	1024
No. Subframes SCCH valid		---	0	1024
HS-SCCH Success Rate	%	---	0.0	100.0
HSDPA DSCH HARQ Statistics				
HARQ-BLER	%	---	0.0	100.0
HARQ-Throughput	kbit/s	---	0.0	512.0
HARQ-Retransmission Rate	%	---	0.0	100.0
HSDPA DSCH HARQ				
No. Subframes		---	0	1024
No. HARC Processes		---	1	8
ProcessID [0]		---	0	7
Mn. received Rbcs [0]		---	0	479496770

Fig. 4-67 HSDPA signals



In addition to the HSDPA views described in this section the following views can display HSDPA data: UMTS/GSM Handover Analyzer View, UMTS Finger Data View. HSDPA-related information in these views is only available with option R&S ROMES-UM4.

UMTS HSDPA UL HS-DPCCH View

The *UMTS HSDPA UL HS-DPCCH View* shows the CQI values reported by the test mobile in the last 100 HSDPA subframes. In the network, the Channel Quality Indicator (CQI) is transmitted on the UL High Speed Dedicated Physical Control Channel (HS-DPCCH), which is a fixed rate channel with a spreading factor of 256. The first slot of each UL HS-DPCCH subframe contains the ACK/NACK messages, the following two slots carry the CQI. The frame structure of the uplink HS-DPCCH is shown in the figure below.

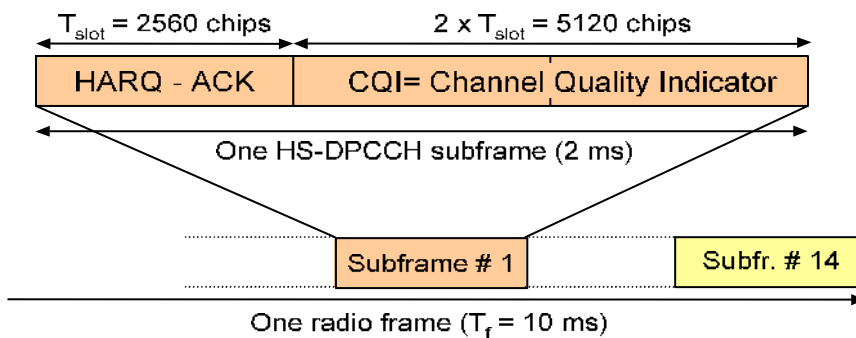


Fig. 4-68 HS-DPCCH frame structure

The CQI values are integer numbers between 0 and 30; see CQI mapping tables in standard 3GPP TS 25.214. Large CQI numbers denote a good channel quality and a high potential DL data throughput.

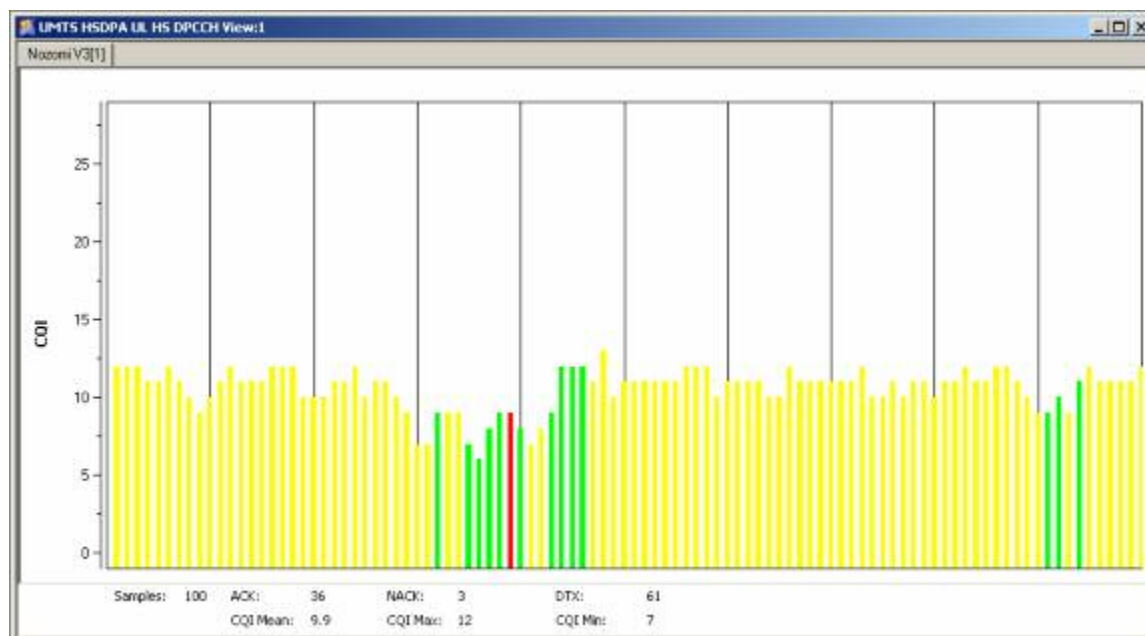


Fig. 4-69 UMTS HSDPA UL HS-DPCCH View

Diagram

The view shows a bar graph with fixed scale. Each bar corresponds to a CQI value reported by the mobile. The colors of the bars distinguish between the messages transmitted in the first (HARQ-ACK) slot of the HS-DPCCH subframe that carried the CQI value:

- A green bar denotes an acknowledged subframe: The mobile sends an *ACK* message after a successful CRC check of a received HS-DSCH packet.
- A red bar denotes an unacknowledged subframe: The mobile sends a *NACK* message after a failed CRC check.
- A yellow bar denotes a subframe that was neither acknowledged nor unacknowledged: no answer was received from the mobile. This is most likely because the mobile could not correctly demodulate the downlink HS-SCCH. Note that the mobile can use DTX independently in the ACK/NACK and CQI slots.



With a CQI Feedback Cycle of more than 1 subframe, the CQI information is no longer available in all subframes. ACK/NACK messages can still be transmitted. In the HS-DPCCH view, small colored bars of length 0 are used to visualize the ACK/NACK message content of subframes without CQI information.

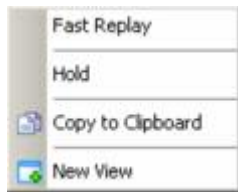


Use the [UMTS HSDPA HS Decode Status View](#) (see p. 4.112) to analyze the cause for an unacknowledged or DTX frame.

Statistical Results Below the diagram the view shows the total number of CQI bars (Samples) in the diagram and the number of ACK, NACK, and DTX subframes (see above; ACK + NACK + DTX = Samples).

The arithmetic mean value of the displayed CQI values, the maximum, and the minimum CQI values are displayed below.

Context menu



A right mouse click on any point in the view opens the context menu to activate the fast replay mode, put the view on hold, copy the view contents to the clipboard, or to create new views, or move to another worksheet; see [Context menu](#) description on p. 4.2.

The *UMTS HSDPA UL HS-DPCCH View* has no context menu for configurations assigned. The *Info* tab can be accessed via the *Configuration – Settings* command.

UMTS HSDPA HS Decode Status View

The *UMTS HSDPA HS Decode Status View* shows the status of the HS-SCCH demodulation and the decoded HS-SCCH information. The view contains a table with up to 100 of the newest samples (sets of results) provided by the test mobile.

The HS-SCCH is a downlink physical channel used to carry downlink signalling information related to HS-DSCH transmission. This includes the channelization code set, the modulation scheme, the transport block size and HARQ related information (see standard 3GPP TS 25.212).

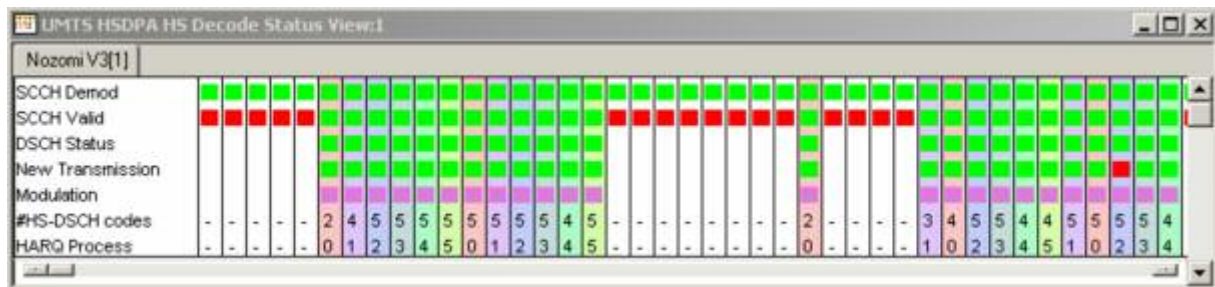


Fig. 4-70 UMTS HSDPA HS Decode Status View

Diagram

The view shows a table with fixed scale. Each column corresponds to a HS-SCCH sample comprising the following information:

- SCCH Demod*
Indicates whether the mobile attempted to demodulate the HS-SCCH
- SCCH Valid*
Indicates whether the mobile was able to decode consistent signaling information from the demodulated HS-SCCH

DSCH Status

Status of the CRC check for the transmitted and decoded HS-DSCH packet: *CRC pass* (successful transmission) causes an ACK message in the UL HS-DPCCH, *CRC fail* causes a NACK message, no CRC check (because no valid HS-SCCH information could be obtained) causes DTX. See also [UMTS HSDPA UL HS-DPCCH View](#) on p. 4.110.

New Transmission

Transmission of a new HS-DSCH packet or retransmission of a packet transmitted earlier.

Modulation

Modulation scheme (*QPSK* or *16QAM*)

#HS-DSCH Codes

Number of HS-(P)DSCH channelization codes in the range between 1 and 15. The HS-PDSCH is a fixed rate (SF = 16) physical channel with channelization code numbers ranging from 1 to 15 (ch. code C_{16,0} is barred because the channelization codes C_{256,0} and c_{256,1} are reserved for the P-CPICH and P-CCPCH, respectively). The HS-PDSCH channelization codes are allocated contiguously starting from the first code.

HARQ Process

HARQ Process ID, number of the HARQ process that the transmission belongs to (range 0 to 7). The HARQ process ID defines the background color of the column.

The meaning of the colors in the diagram is listed in the table below. Note that a red square will often cause red or white squares in the cells below (e.g. a failed SCCH demodulation means that the mobile cannot start receiving the HS-DSCH, so all the following cells are white).

Table 1 Color codes in the UMTS HSDPA HS Decode Status View

Decoding Stage	Green	Red	White
SCCH Demod	Attempted	Not attempted (because the SCCH did not carry the proper UE ID)	n/a
SCCH Valid	Yes	No	n/a
DSCH Status	CRC Pass	CRC Fail	n/a
New Transmission	New Transmission	Retransmission	n/a
Modulation	16QAM	QPSK (violet)	n/a

Details Window



A double-click on any of the table columns opens a details window for the corresponding sample. The window repeats the information in the table and contains the following additional entries :

HARQ Process ID

Value of the HARQ process identifier (0 to 7)

Redundancy Version

Value X_{rv} in the range 0 to 7. X_{rv} jointly codes the redundancy version (RV) parameters r, s and the constellation version parameter b.

Transport Block Size

Size of the HS-DSCH transport blocks in bit, calculated from the 6-bit transport block size index; see 3GPP TS 25.321.

Context menu



A right mouse click on any point in the view opens the context menu to print the view, access the configuration menus, activate the fast replay mode, put the view on hold, copy the view contents to the clipboard, create or delete views, or to save the current configuration; see [Context menu](#) description on p. 4.2.

The *UMTS HSDPA HS Decode Status View* configuration menu contains a single *Info* tab; see p. 4.4.

UMTS HSDPA HARQ Statistic View

The *UMTS HSDPA HARQ Statistic View* shows the characteristics of all HARQ processes of the test mobile. HARQ processes control the transmission and (possibly) retransmission of data blocks. Up to 8 parallel HARQ processes can be active per mobile.

Process	RxBits	NewTx	BLERs
0	211400	108	0
1	317797	98	0
2	235649	71	0
3	230858	70	0
4	215735	65	0
5	209889	64	0

Fig. 4-71 UMTS HSDPA HARQ Statistic View

Diagram

The view shows a list of the different HARQ processes of the test mobile. The following information is displayed:

Number of Sub Frames

Averaging length for the statistical results, mobile-specific parameter.

Process

HARQ process identifier. The list is sorted so that the identifiers are in the range 0 to n ($n \leq 7$).

RX Bits

Number of received bits per process.

New Tx

New data indicator; the number of new data blocks transmitted within the HARQ process (not counting retransmissions, i.e. data blocks received in error).

BLERs

Block Errors, the number of blocks received in error.

Either the *BLERs* (red) or the *New TX* (green) can be visualized with horizontal, colored bars. The selection of bars and the scales are defined in the configuration menu.

Context menu

A right mouse click on any point in the view opens the context menu to print the view, access the configuration menus, activate the fast replay mode, put the view on hold, copy the view contents to the clipboard, create new views, or to save the current configuration, or move to another worksheet; see [Context menu](#) description on p. 4.2.

UMTS HSDPA HARQ Statistic View Configuration

The *UMTS HSDPA HARQ Statistic View* configuration menu selects and scales the colored *BLER* or *New Tx* bars in the diagram.

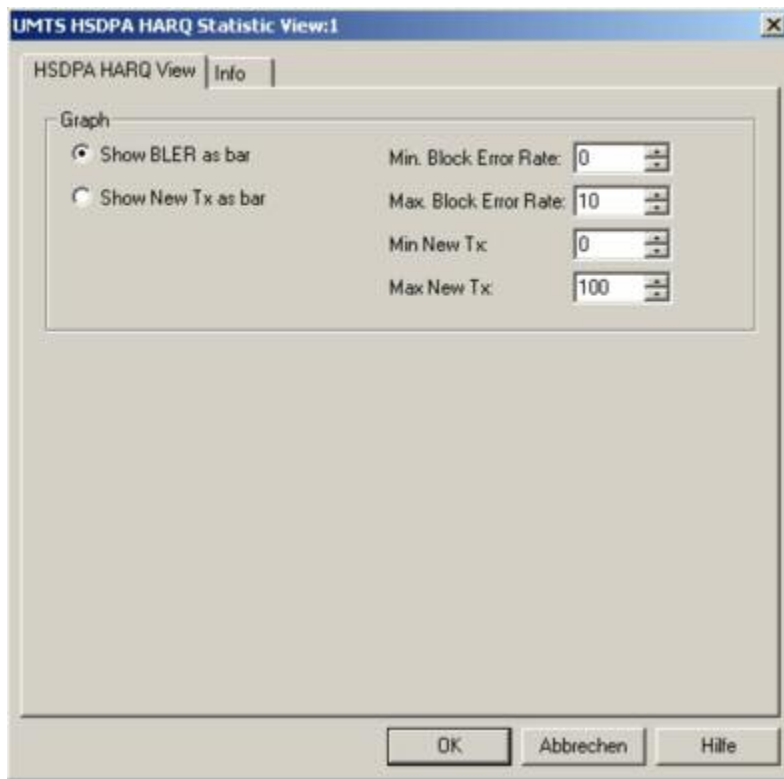


Fig. 4-72 UMTS HSDPA HARQ Statistic View Configuration

Graph *Show BLER as bar* or *Show New TX as bar* select the visualized quantity. The input fields on the right side set the scale of the bars.

UMTS HSDPA Configuration View

The *UMTS HSDPA Configuration View* shows the configuration of the DL HSDPA channels received by the test mobile, the UL HS-DPCCH, and information related to the finger configuration command, the DL HS-SCCHs, and the active HARQ processes. This configuration data is generated whenever there is a L1 reconfiguration related to HSDPA.

Most of the displayed information is mobile-specific and primarily intended for monitoring the status of the test mobile.

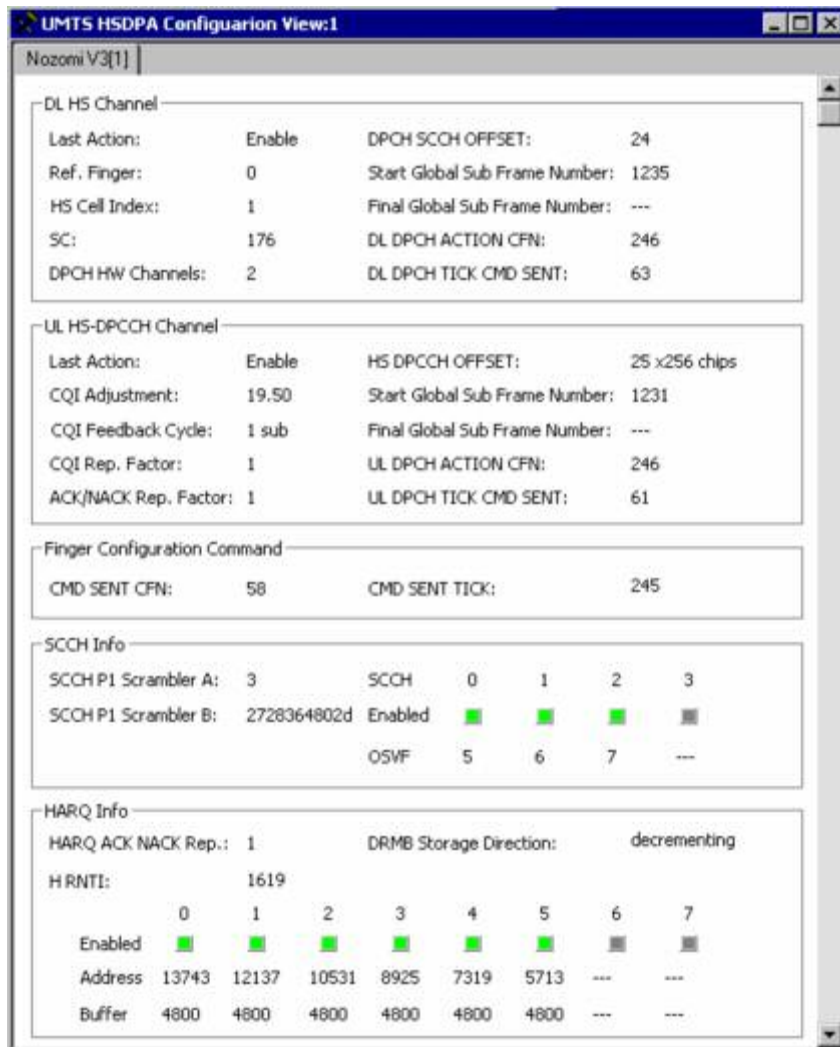


Fig. 4-73 UMTS HSDPA Configuration View

The configuration data is displayed in different panels:

DL HS Channel The following information is related the DL High Speed Channels (HS-DPCH and HS-SCCH):

Last Action

Status of the DL transmission. *Enable, Disable, or Reslam.*

Ref. Finger

Reference finger (values 0 to 11).

HS Cell Index

High speed cell index in the range 0 to 7.

SC

Common scrambling code for all DL HSDPA channels.



Use the [UMTS Finger Data View](#) (see p. 4.134) to view the preceding parameters together with the time offset and E_c/I_o of all signals captured by the different fingers of the mobile receiver.

DPCH HW Channels

Values 0 to 3.

DPCH SCCH Offset

Corresponds to starting global sub frame number, values 0 to 149 (256 chip periods).

Start Global Sub Frame Number

Mobile-specific subframe no. in the range 0 to 1279.

Final Global Sub Frame Number

Mobile-specific subframe no. in the range 0 to 1279, only relevant for *Last Action: Reslam*.

DL DPCH ACTION CFN

Mobile-specific parameter, 0 to 255.

DL DPCH TICK CMD SENT

Mobile-specific parameter, 0 to 149.

UL HS-DPCCH Channel

The following information is related the UL HS-DPCCH. This channel carries the ACK/NACK and CQI messages that the mobile reports to the network; see [UMTS HSDPA UL HS-DPCCH View](#) on p. 4.110:

Last Action

Status of the UL transmission. *Enable*, *Disable*, or *Reslam*.

CQI Adjustment

Adjustment applied to SIR measurement before quantization. CQI Adjustment = [12.04 + DSCH to CPICH offset (signaled to the mobile) + SNR to CQI offset (constant for a software build, e.g. 4.0)].

CQI Feedback Cycle

Time (in multiples of HSDPA subframes with a length of 2 ms) after which the mobile repeats the transmission of CQI symbols on the HS-DPCCH. Possible values are 0, 1, 2, 4, 5, 10, 20, 40, 80.

CQI Rep. Factor

Number of repeated CQI transmissions (1 to 4).

ACK/NACK Rep.

Factor Number of repeated ACK/NACK transmissions (1 to 4).

HS-DPCCH Offset

Corresponds to starting global sub frame number, values 0 to 149 (256 chip periods).

Start Global Sub Frame Number

Mobile-specific subframe no. in the range 0 to 1279.

Final Global Sub Frame Number

Mobile-specific subframe no. in the range 0 to 1279, only relevant for *Last Action: Reslam*.

UL DPCH ACTION CFN

Mobile-specific parameter, 0 to 255.

UL DPCH TICK CMD SENT

Mobile-specific parameter, 0 to 149.

Finger Configuration Command

The following information is mobile-specific.

CMD SENT CFN

Counter in the range 0 to 255.

CMD SENT TICK

Counter in the range 0 to 149.

SCCH Info

The *SCCH Info* field provides information about the channels in the HS-SCCH set which is allocated to the mobile. A HS-SCCH set is a set of 1 to 4 HS-SCCHs. The mobile continuously monitors all the HS-SCCHs in the allocated set.

The panel shows the number of enabled SCCHs together with their channelization codes (*OSVF*). The SCCHs are fixed rate channels (SF = 128) with code numbers ranging from 1 to 127.

The remaining information is mobile-specific.

HARQ Info

The *HARQ Info* field provides information about the active HARQ processes together with the internal address and the size of the physical buffer associated with each process. In addition the following information is displayed:

HARQ ACK/NACK Rep.

Mobile-specific parameter.

DRMB Storage Direction

Mobile-specific parameter.

H RNTI

HS-DSCH RNTI, 16-bit identity, identifies the mobile for which data is transmitted in the corresponding HS-DSCH TTI.

Context menu



A right mouse click on any point in the view opens the context menu to print the view, activate the fast replay mode, copy the view contents to the clipboard, or create or delete views; see [Context menu](#) description on p. 4.2.

The *UMTS HSDPA Configuration View* has no context menu for configurations assigned. The *Info* tab can be accessed via the *Configuration – Settings* command.

UMTS HSDPA MAC Configuration View

The *UMTS MAC Configuration View* shows the configuration of the MAC-hs that the test mobile receives from the network. The MAC-hs is the MAC entity that handles the high speed downlink shared channel (HS-DSCH); see standard 3GPP TS 25.321. The view is updated every time the MAC-hs is reconfigured.

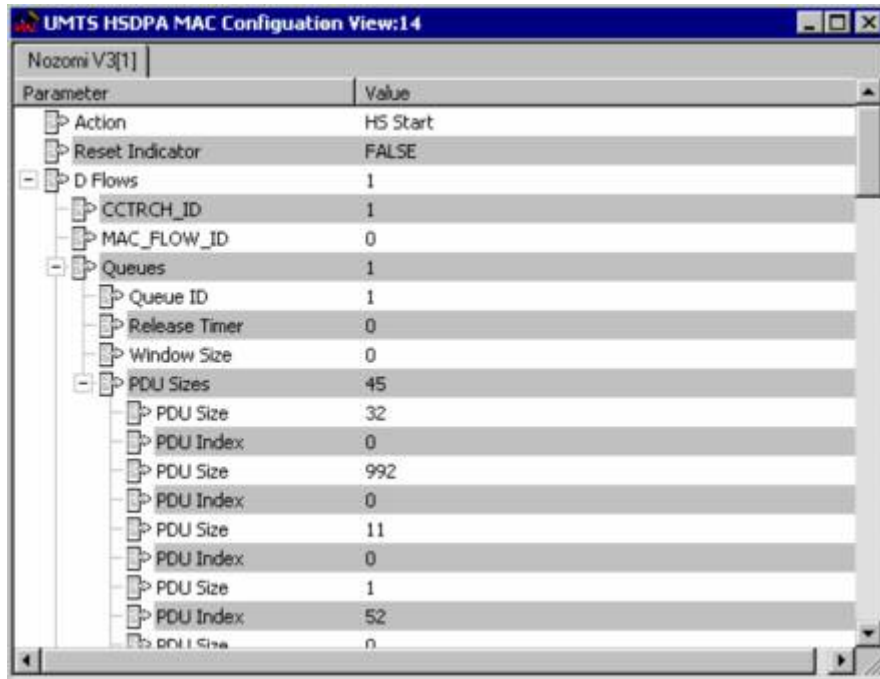


Fig. 4-74 UMTS MAC Configuration View

Diagram

The view shows the following Mac-hs parameters with their values:

Action

Indicates the last action that the MAC-hs entity was requested to perform by upper layers: *Start*, *Stop*, or *Reconfigure*.

Reset Indicator

TRUE indicates that a reset of the MAC-hs entity has been requested.

CCTRCH_ID

Unambiguous identifier for the Coded Composite Transport Channel (CCTrCH) inside the radio link (range 0 to 7).

MAC_FLOW_ID

Mobile-specific parameter, range 1 to 8.

Queue / Queue ID

The Queue ID provides identification of the reordering queue in the receiver, in order to support independent buffer handling of data belonging to different reordering queues (range 1 to 8).

Release Timer

Value of the reordering release timer (T1). The release timer controls the stall avoidance in the mobile's reordering buffer; see 3GPP TS 25.321, section 11.6.2.3.2. Possible values are 10, 20, 30 ... 100, 120, 140, 160, 200, 300, 400.

<i>Window Size</i>	Size of the receiver window, given in terms of a TSN range
<i>PDU Size</i>	Size of the Protocol Data Units (PDUs) that can be transferred to MAC within a transmission time interval in the range 0 to 5000 (bits).
<i>PDU Index</i>	MAC PDU Size Index in the range 0 to 7
<i>Logical Channel / RLC ID</i>	Mobile-specific parameter, range 0 to 17.
<i>Type</i>	Channel type: BCCH, PCCH, CCCH, DCCH, CTCH, or DTCH.
<i>Mode</i>	Channel Mode: Transparent mode (<i>TM</i>), Unacknowledged mode (<i>UM</i>), or Acknowledged mode (<i>AM</i>)

Context menu



A right mouse click on any point in the view opens the context menu to print the view, activate the fast replay mode, copy the view contents to the clipboard, create or delete views, or move to another worksheet; see [Context menu](#) description on p. 4.2.

The *UMTS MAC Configuration View* has no context menu for configurations assigned. The *Info* tab can be accessed via the *Configuration – Settings* command.

UMTS HSDPA MAC Status View

The *UMTS MAC Status View* gives an overview of the status of the reordering entity in the mobile receiver. The different state variables are described in standard 3GPP TS 25.321. The mobile collects this information in up to 100 consecutive samples which are displayed in a table.

#	ID	Received TSN	Next TSN	WUE	T1 TSN
1	0	8	9	8	---
2	0	9	10	9	---
3	0	10	11	10	---
4	0	11	12	11	---
5	0	12	13	12	---
6	0	13	14	13	---
7	0	14	15	14	---
8	0	15	16	15	---
9	0	16	17	16	---
10	0	17	18	17	---
11	0	18	19	18	---
12	0	19	20	19	---
13	0	20	21	20	---
14	0	21	22	21	---
15	0	22	23	22	---
16	0	23	24	23	---
17	0	24	25	24	---
18	0	25	26	25	---
19	0	26	27	26	---
20	0	27	28	27	---
21	0	28	29	28	---
22	0	29	30	29	---
23	0	30	31	30	---
24	0	31	32	31	---
25	0	32	33	32	---
26	0	33	34	33	---
27	0	34	35	34	---
28	0	35	36	35	---
29	0	36	37	36	---
30	0	37	38	37	---
31	0	38	39	38	---
32	0	39	40	39	---
33	0	40	41	40	---
34	0	41	42	41	---
35	0	42	43	42	---
36	0	43	44	43	---

Fig. 4-75 UMTS HSDPA MAC Status View

Diagram

The view displays the following information elements:

#

Current number of the sample, assigned in the range 1 to 100.

ID Queue ID (0 to 7).

The Queue ID provides identification of the reordering queue in the receiver, in order to support independent buffer handling of data belonging to different reordering queues.

Received TSN

Transmission Sequence Number (TSN, 0 to 63) of the last received (HS-DSCH) MAC-hs PDU.

Next TSN

Next expected TSN. The TSN following the R&S TSM of the last in-sequence MAC PDU received.

WUE

WUE (Window Upper Edge) represents the TSN at the upper edge of the receiver window. While timer T1 is active, the number is equal to the *Received TSN*. Otherwise it is invalid.

T1 TSN

TSN used in the reordering procedure. The TSN of the latest MAC-hs PDU that cannot be delivered to the disassembly entity, when the timer T1 is started.

Context menu

A right mouse click on any point in the view opens the context menu to print the view, access the configuration menus, activate the fast replay mode, put the view on hold, copy the view contents to the clipboard, create or delete views, or save the current configuration; see [Context menu](#) description on p. 4.2.



UMTS HSDPA MAC Status View Configuration

The *UMTS HSDPA MAC Status View* configuration menu selects the information to be displayed.

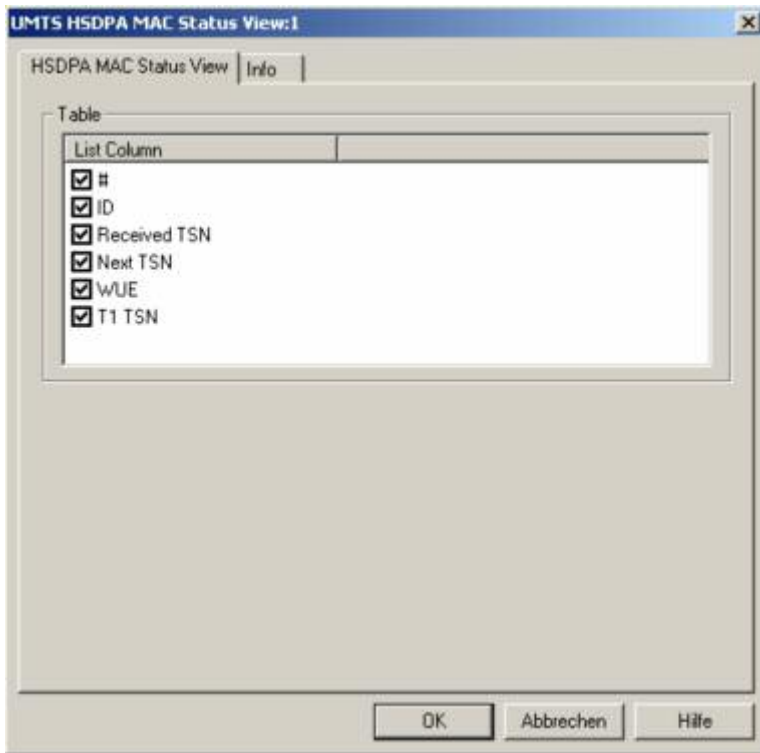


Fig. 4-76 UMTS HSDPA Status View Configuration

UMTS HSDPA MAC Header View

The *UMTS MAC Header View* shows the mobile-specific subframe number and the corresponding (HS-DSCH) MAC-hs headers as defined in standard 2GPP TS 25.321, sections 9.1.4 and 9.2.2.

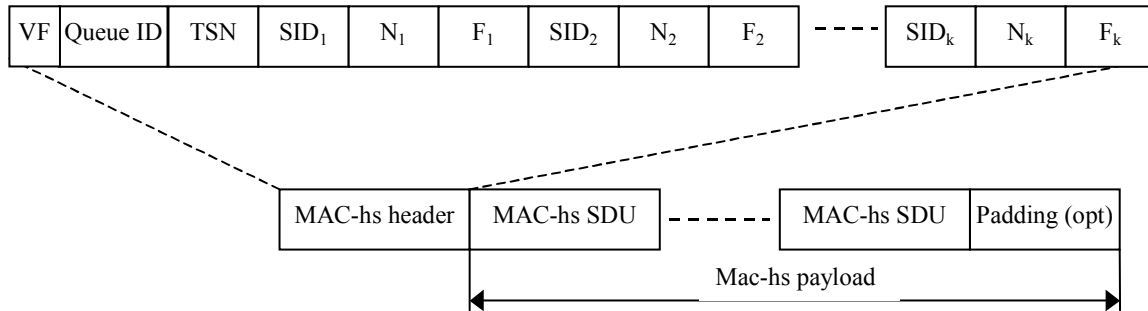


Fig. 4-77 UMTS MAC-hs PDU



For an overview of the last 100 MAC-hs PDUs use the [UMTS HSDPA MAC Status View](#) (see p. 4.122).

#	FN	VF	ID	TSN	SID(1)	N(1)	SID(2)	N(2)	SID(3)
1	685	0	0	28	0	9			
2	686	0	0	29	0	9			
3	687	0	0	30	0	9			
4	688	0	0	31	0	9			
5	689	0	0	32	0	9			
6	690	0	0	33	0	9			
7	691	989	0	34	0	9			
8	692	0	0	35	0	9			
9	693	0	0	36	0	9			
10	694	0	0	37	0	9			
11	695	0	0	38	0	9			
12	696	0	0	39	0	9			
13	697	0	0	40	0	9			
14	698	0	0	41	0	9			
15	699	0	0	42	0	9			
16	700	0	0	43	0	9			
17	701	0	0	44	0	9			
18	702	0	0	45	0	9			
19	703	0	0	46	0	9			
20	704	0	0	47	0	9			
21	705	0	0	48	0	9			
22	706	0	0	49	0	7			
23	707	0	0	50	0	9			
24	709	0	0	52	0	9			
25	710	0	0	53	0	9			
26	711	0	0	54	0	5			
27	712	0	0	55	0	4			
28	714	0	0	51	0	9			
29	715	0	0	57	0	3			
30	716	0	0	58	0	5			
31	717	0	0	59	0	2			

Fig. 4-78 UMTS HSDPA MAC Header View

Diagram

The MAC-hs header contains the following information elements:

FN

Internal subframe number, range 0 to 1279.

VF

Version flag, at present set to zero.

ID

Queue ID (0 to 7). The Queue ID provides identification of the reordering queue in the receiver, in order to support independent buffer handling of data belonging to different reordering queues.

TSN Transmission

Sequence Number (TSN, 0 to 63) on the HS-DSCH. The TSN field is used for reordering purposes to support in-sequence delivery to higher layers.

SID(n)

Size Index Identifier (0 to 7), identifies the size of a set of consecutive MAC-d PDUs. The MAC-d PDU size for a given SID is configured by higher layers and is independent for each Queue ID.

N(n)

Number of MAC-D PDUs (0 to 63), the number of consecutive MAC-d PDUs with equal size.

The flag fields (*F*) in the figure above indicate whether the MAC-hs header contains additional *SID* and *N* fields. They are not relevant for the *MAC Header View* because the number of columns in the table is selected in the configuration menu.

Context menu

A right mouse click on any point in the view opens the context menu to print the view, access the configuration menus, activate the fast replay mode, copy the view contents to the clipboard, create or delete views, save the current configuration, or move to another worksheet; see [Context menu](#) description on p. 4.2.

UMTS HSDPA MAC Header View Configuration

The *UMTS HSDPA MAC Header View* configuration menu selects the information to be displayed.

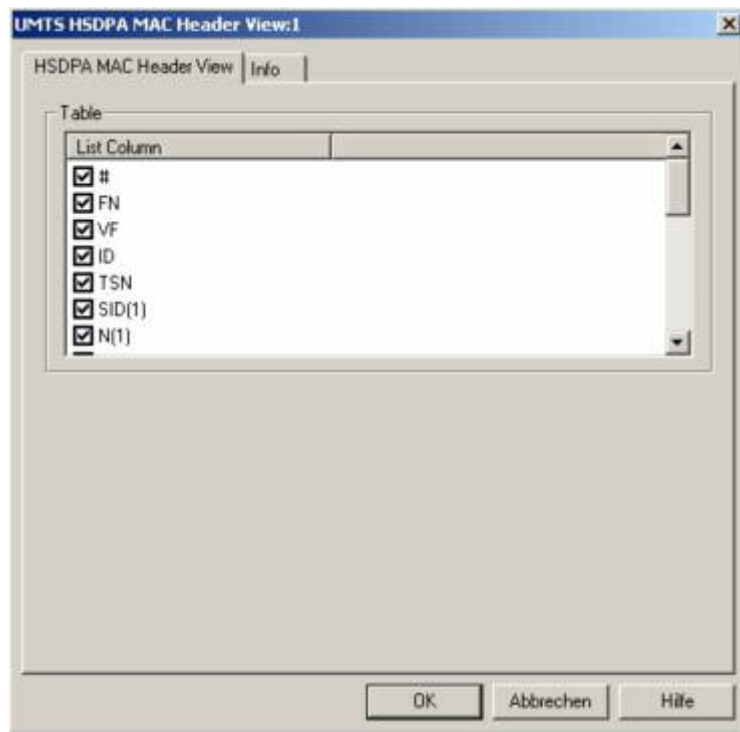


Fig. 4-79 UMTS HSDPA Header View Configuration

UMTS HSDPA Performance View

The *UMTS HSDPA Performance View* contains five preconfigured 2D charts. The signals in these charts are related to the transmission performance, given in terms of the requested or achieved data throughput.

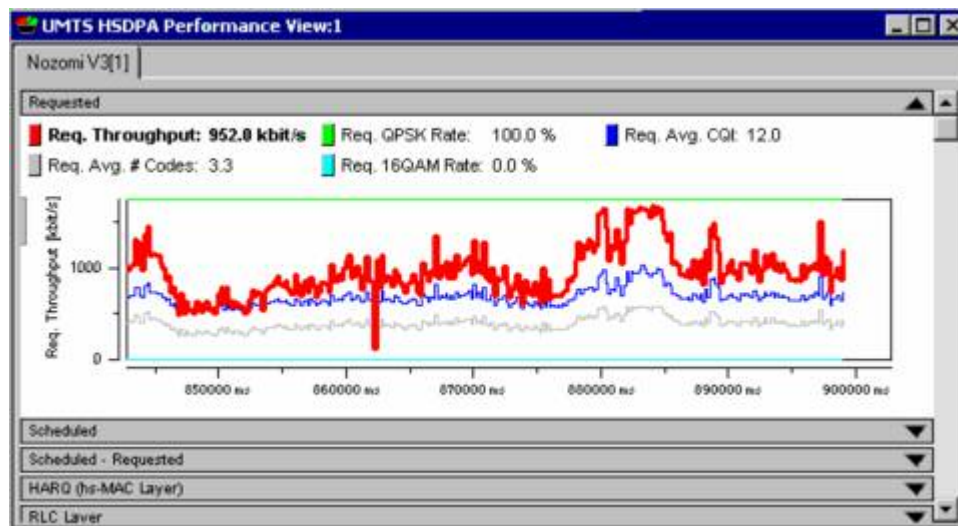


Fig. 4-80 UMTS HSDPA Performance View

A double-click on the *Requested*, *Scheduled*, title bars opens or closes the sub-diagrams in the performance view. The functionality of all sub-diagrams is analogous to the *2D Chart View* described on p. 4.10, however, an additional *Plot* dialog (see below) provides additional settings to control the diagram content and appearance.

Requested The *Requested* throughput (see figure above:) is the data throughput that the mobile requests according to the measured channel quality. The requested throughput is calculated from the CQI messages that the mobile transmits on the UL HS-DPCCH; see [UMTS HSDPA UL HS-DPCCH View](#) on p. 4.110. The results are averaged over the number of subframes (100) shown in the *UMTS HSDPA HS-DPCCH* view.

The chart contains the following results:

Req. Throughput

Requested total throughput

Req. Avg. # Codes

Number of HS-(P)DSCH channelization codes in the range between 1 and 15. See [UMTS HSDPA HS Decode Status View](#) on p. 4.112.

Req. QPSK Rate

Percentage of the requested throughput that should be transferred on QPSK-modulated data blocks.

Req. 16QAM Rate

Percentage of the requested throughput that should be transferred on 16QAM-modulated data blocks.

Req. Avg. CQI

Average CQI value received from the mobile.

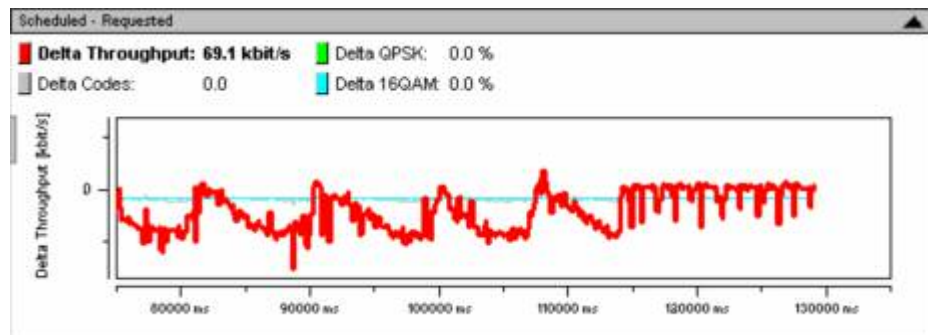
Scheduled

The *Scheduled* throughput is the data throughput that the network uses according to the requests (CQI messages) from the mobile. The results are analogous to the *Requested Throughput* results.



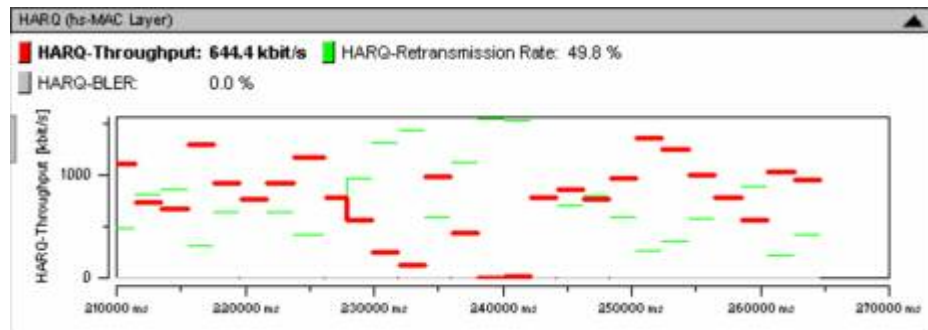
Scheduled – Requested

The *Scheduled – Requested* throughput is the difference between the scheduled and the requested throughputs. The results are analogous to the *Requested Throughput* results. If there is no network congestion, the delta results are close to zero.



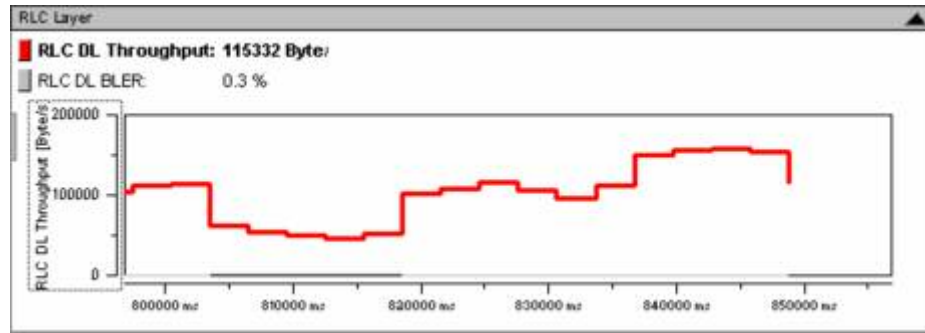
HARQ (hs-MAC Layer)

The *HARQ (hs-MAC Layer)* throughput is the actual DL data throughput achieved. The HARQ throughput depends on the scheduled throughput and the percentage of data blocks that the network has to re-transmit (*HARQ Retransmission Rate*): The larger the retransmission rate, the smaller the HARQ Throughput.



RLC Layer

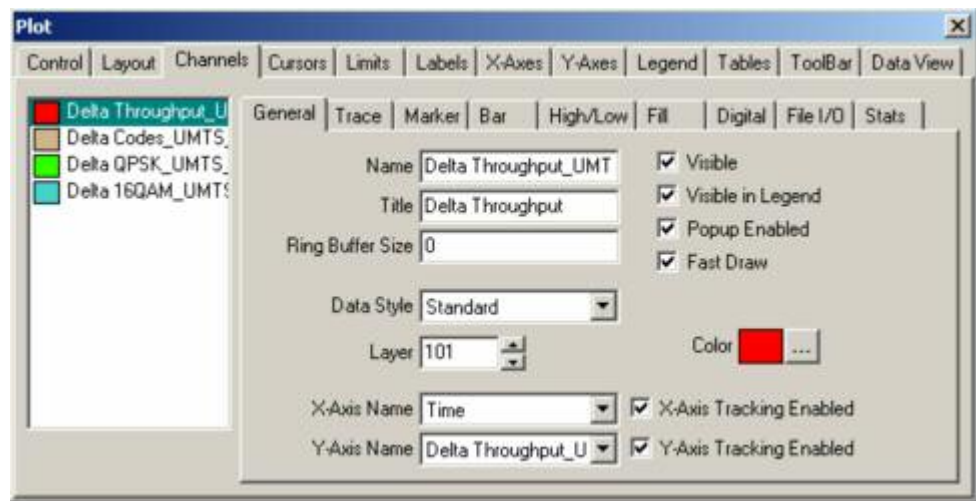
The *RLC Layer* throughput is the data throughput of the RLC blocks that the mobile receives from the network. The *RLC DL BLER* is the percentage of RLC blocks that the UE received in error.



View Configuration

Edit...

The *Plot* dialog provides additional settings to control the diagram content and appearance. The dialog is opened from a context menu; this menu appears after a right-click on the y-axis labels or on one of the curves in the diagram.



Context menu



A right mouse click on any point in the view opens the context menu to print the view, access the configuration menus, activate the fast replay mode, put the view on hold, copy the view contents to the clipboard, create views, or to save the current configuration; see [Context menu](#) description on p. 4.2.

UMTS HSDPA Performance View Configuration

The *UMTS HSDPA Performance View* configuration menu scales the axes of the chart and defines its contents and its appearance. All controls are also available in the *Chart Configuration* tab of the *2D Chart Configuration* menu and have the same effect; see figure on p. 4.14.

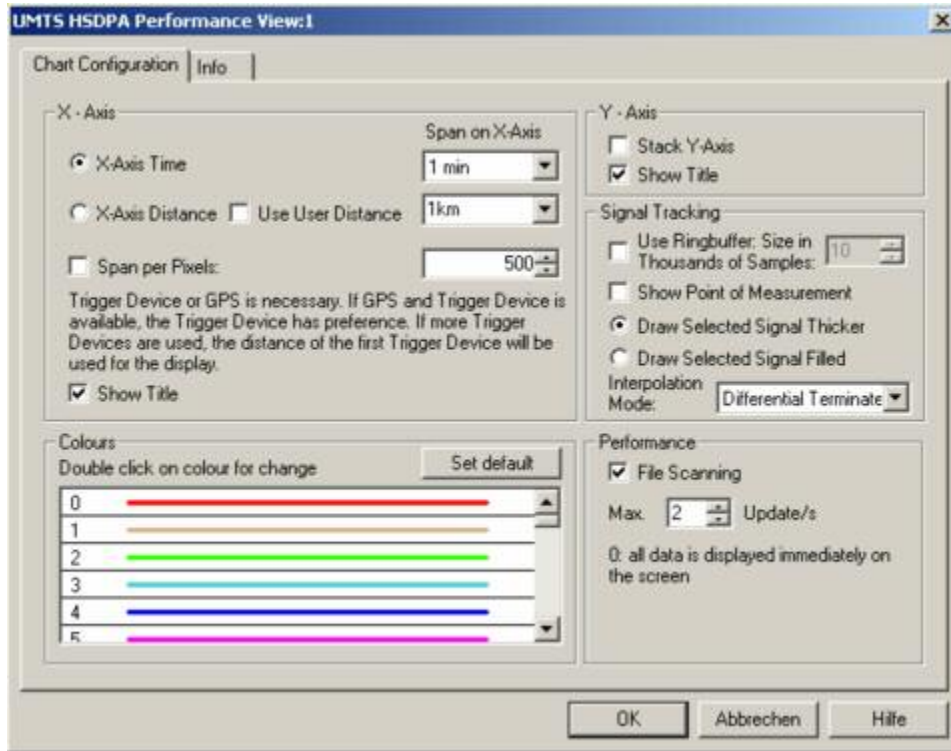


Fig. 4-81 UMTS HSDPA Performance View Configuration

Graph *Show BLER as bar* or *Show New TX as bar* select the visualized quantity. The input fields on the right side set the scale of the bars.

UMTS HSDPA Decode Statistic View

The *UMTS Decode Statistic View* shows a statistical evaluation of the received DL HS-DSCH transport blocks, together with the block error rate and the number of retransmissions needed to successfully decode the blocks of each size. The transport block size depends on the CQI values that the mobile reported to the network; see standard 2GPP TS 25.214 and section [UMTS HSDPA UL HS-DPCCH View](#) on p. 4.110. The results are averaged over the number of subframes (100) shown in the *UMTS HSDPA HS-DPCCH view*.

TBS	SB+	SB++	SB-	SBLER [%]	BL+	BL-	BLER [%]	# 1 [%]	# 2 [%]	# 3 [%]	# 4 [%]	# 5 [%]	# >5 [%]
93	---	---	---	---	---	---	---	---	---	---	---	---	---
377	3	0	0	0.00	3	0	0.00	100.00	0.00	0.00	0.00	0.00	0.00
461	---	---	---	---	---	---	---	---	---	---	---	---	---
650	1	0	0	0.00	1	0	0.00	100.00	0.00	0.00	0.00	0.00	0.00
792	10	0	0	0.00	10	0	0.00	100.00	0.00	0.00	0.00	0.00	0.00
931	5	0	0	0.00	5	0	0.00	100.00	0.00	0.00	0.00	0.00	0.00
1262	24	0	0	0.00	24	0	0.00	100.00	0.00	0.00	0.00	0.00	0.00
1405	---	---	---	---	---	---	---	---	---	---	---	---	---
1483	23	0	0	0.00	23	0	0.00	100.00	0.00	0.00	0.00	0.00	0.00
1742	21	0	2	8.70	21	0	0.00	90.48	9.52	0.00	0.00	0.00	0.00
2279	25	0	5	16.67	25	1	3.85	78.26	21.74	0.00	0.00	0.00	0.00
2583	35	0	8	18.60	35	0	0.00	75.00	25.00	0.00	0.00	0.00	0.00
3440	97	0	25	20.49	97	0	0.00	75.79	23.16	1.05	0.00	0.00	0.00

Fig. 4-82 UMTS HSDPA Decode Statistic View

Diagram

The table contains the following columns:

TBS	Transport block size in bits, in ascending order. The results in each row are relating to blocks of the same size.
SB+	Number of successfully decoded sub-blocks. A sub-block is a mobile-specific unit comprising the HS-DSCH data of one subframe.
SB++	Number of duplicate sub-blocks. Duplicate sub-blocks are sub-blocks that the network retransmitted although they were received correctly (usually because no ACK message was received from the mobile).
SB-	Number of sub-blocks which could not be decoded successfully and had to be retransmitted. These blocks contribute to the <i>SBLER</i> but not necessarily to the <i>BLER</i> ; see below.
SBLER	Sub-block error rate, $SBLER = SB- / (SB+ SB-)$.
BL+	Number of successfully decoded blocks
BL-	Number of blocks which could not be decoded successfully until the maximum number of retransmissions was reached.
BLER	Block error rate, $BLER = BL- / (BL+ BL-)$. The BLER is usually smaller than the SBLER because it counts only the blocks that could not be decoded until the end of the HARQ process (until the maximum number of retransmissions was reached).
# 1 [%]	Number of blocks successfully decoded without retransmission.
# n [%]	Number of blocks successfully decoded after one initial transmission and (n-1) retransmissions.

Context menu

A right mouse click on any point in the view opens the context menu to print the view, access the configuration menus, activate the fast replay mode, put the view on hold, copy the view contents to the clipboard, create views, save the current configuration, or move to another worksheet; see [Context menu](#) description on p. 4.2.

UMTS HSDPA Decode Statistic View Configuration

The *UMTS HSDPA Decode Statistic View* configuration menu selects the information to be displayed.

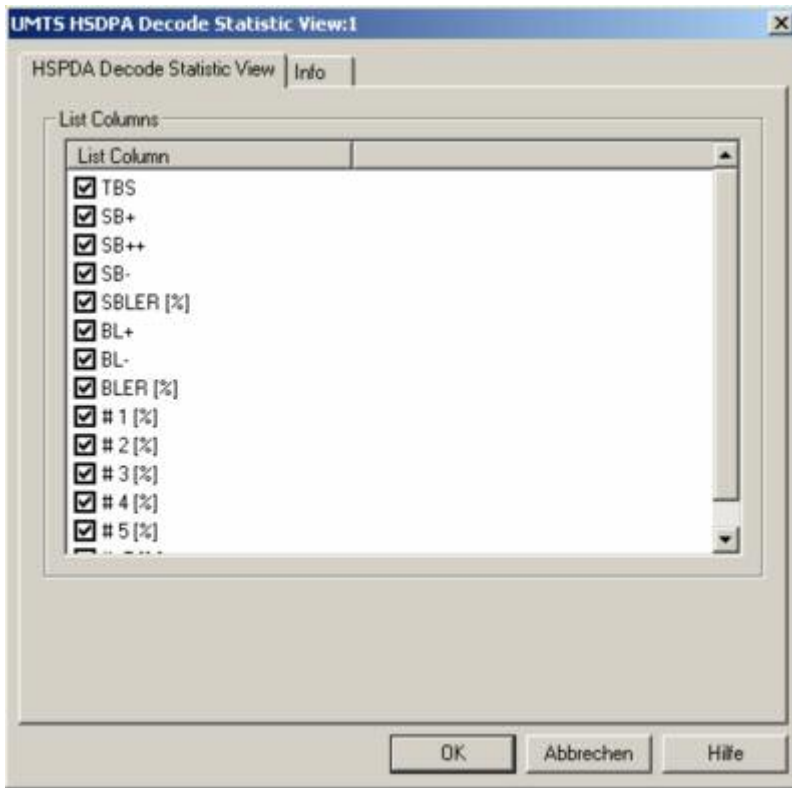


Fig. 4-83 UMTS HSDPA Decode Statistic View Configuration

UMTS Views

The *UMTS Views* display UMTS-specific information acquired with an UMTS test mobile and using the UMTS driver. In general, recording of the different message types shown in the *UMTS Views* must be explicitly activated in the *Configuration* and *Expert Mode* tabs of the driver configuration menu; refer to the relevant description in chapter 6.

The UMTS views can be selected from a submenu displayed on the right side of the *View* menu when the mouse pauses over *UMTS*.

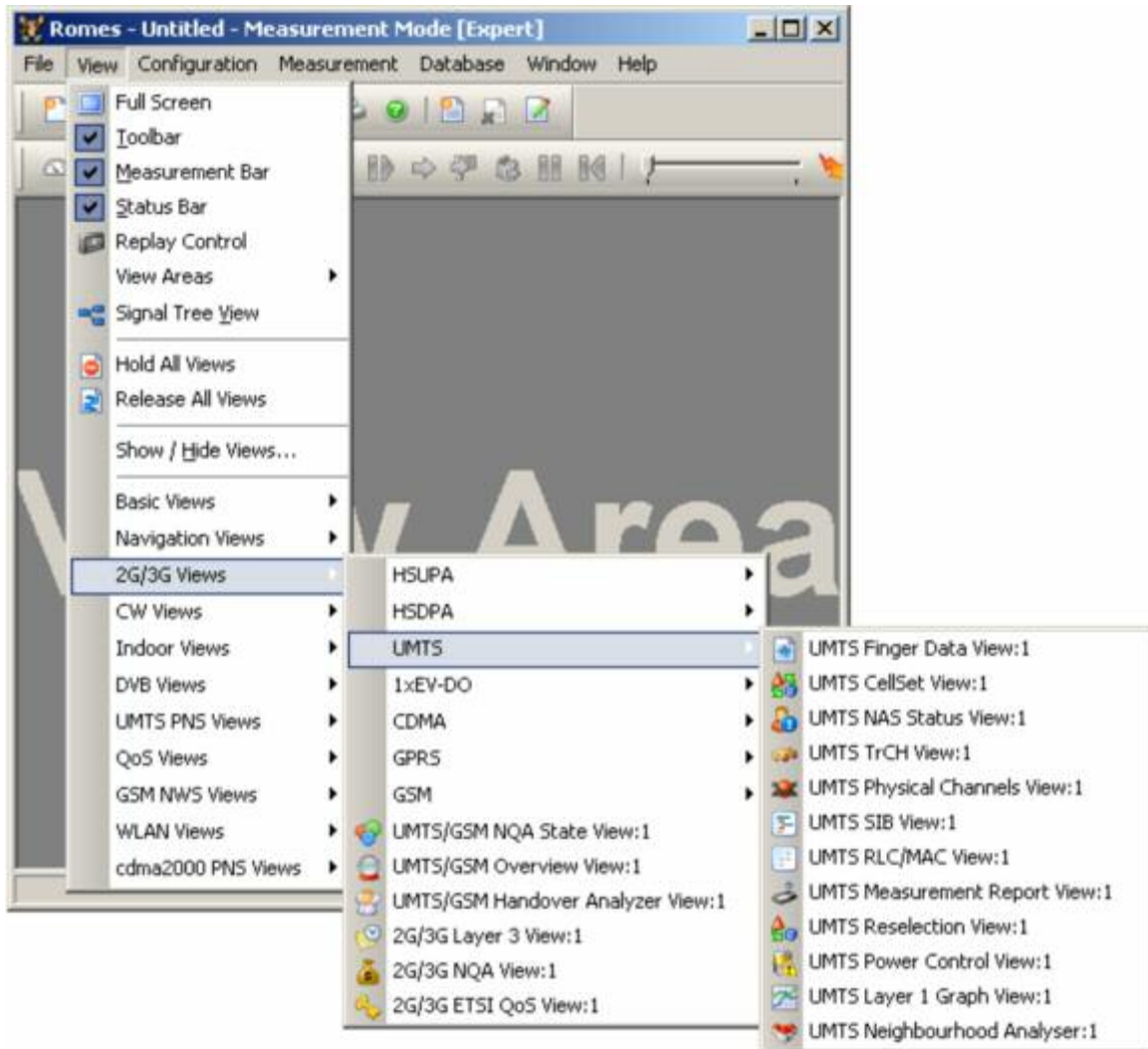


Fig. 4-84 UMTS views

UMTS Finger Data View

The *UMTS Finger Data View* shows the most important layer 1 parameters characterizing the different downlink WCDMA signals received by the mobile, captured with the different branches (fingers) of the test mobile UMTS RAKE receiver. The value of the critical quantity E_c/I_o for each signal is visualized in addition by horizontal bars. A mobile with a Qualcomm chipset must be used to record the data.

The view is empty unless the test mobile is configured to record the *WCDMA Finger Info*; see description of the *Expert Mode* tab of the driver configuration menu in chapter 6.

The screenshot shows a window titled "UMTS Finger Data View:1" with a tab "TM6280[1] GlobeTrotter HSUPA Modem[2]". The window contains a table with the following data:

SC	Offset	Status	Div.	OVSF	E_c/I_o	HSDPA	HSUPA
1088	75895	LTDP	No STTD	0	-3.1	A,1,R	A,7,R,SC
1088	75917		No STTD	0	-27.1	A,1	A,7,SC
1088	75896	LTDP	No STTD	0	-3.2	A,1	A,7,SC
1088	75905	LTD	No STTD	0	-23.4	A,1	A,7,SC
1088	75873		No STTD	0	-28.1	A,1	A,7,SC
1088	75876	LTD	No STTD	0	-24.9	A,1	A,7,SC
1088	75813		No STTD	0	-30.8	A,1	A,7,SC
1088	75813		No STTD	0	-30.6	A,1	A,7,SC

Fig. 4-85 UMTS Finger Data View

The results for each mobile are arranged in a separate tab.

Results

Table of the most important layer 1 parameters of the captured downlink WCDMA signals. Each table row represents a signal. The maximum number of rows/signals can be set in the configuration menu. The signals are sorted according to the signal-to-noise ratio E_c/I_o , the strongest signal appears on top of the list.

SC	Primary scrambling code of the signal in the format selected in the <i>TEC for UMTS Test Mobiles</i> tab of the <i>Configuration of Software Modules</i> menu; refer to section <i>Configuration Menu</i> in chapter 3.. The primary SC is used to identify the cell.
Offset	Time offset of the signal in 1/8-chip units relative to the system time (hardware-dependent). The difference between the offsets of different signals provides important information: Two signals with equal SC, Status, Div., and OVSF but different offset and E_c/I_o originate from the same source but propagated along different paths.
Status	Status of the receiver fingers; one or several of the following characters: <i>L (Lock Detection State)</i> This shows whether the finger RSSI is > high threshold regardless of whether the given type of lock is enabled

<i>T (Time Tracking Lock)</i>	This shows when time tracking lock is enabled, that the finger RSSI > upper lock threshold
<i>D (Data Combining Lock)</i>	This shows when the data combining lock is enabled, that the finger RSSI > upper lock threshold
<i>P (Power Control Bit Lock)</i>	This shows when the data combining lock is enabled, that the finger RSSI > power control bit threshold.
<i>Div.</i>	Downlink transmit diversity scheme for the CPICH: <i>STTD</i> (Space Time Transmit Diversity), <i>TSTD</i> (Time Switched Transmit Diversity), <i>SSDT</i> (Site Selection Diversity Transmit Power Control), or <i>No Diversity</i>
<i>OVSF</i>	Orthogonal Variable Spreading Factor, code number of the signal
<i>Ec/Io</i>	Ratio of the received energy per PN chip for the signal to the total received power spectral density at the mobile antenna connector. <i>Ec/Io</i> is obtained in an unbiased measurement, i.e. the contribution of the noise floor to the powers is subtracted.

The *SC*, *Offset*, and *Ec/Io* values for each finger generate signals in the *UMTS – <Device> – Finger Info* branch of the data tree.

HSDPA results

The HSDPA-related results are available with option R&S ROMES-UM4. They are closely related to the *Last Action*, *Ref. Finger*, and *HS Cell Index* parameters in the [UMTS HSDPA Configuration View](#) (see p. 4.116). Note that signals from the same source (equal *SC*) have the same *HSDPA* status and *HS Cell Index*, but only a single signal can be the reference signal.

The results are comma delimited in the following order:

"A" (or "-")	Active (or not)
1 .. n	Cell index in the range 0 to 7
R	Reference finger

HSUPA results

The HSUPA-related results are available with option R&S ROMES-UM4. Note that signals from the same source (equal *SC*) have the same *HSUPA* status and *Cell Index*, but only a single signal can be the reference signal.

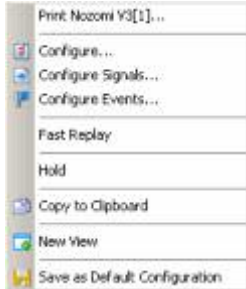
The results are comma delimited in the following order:

"A" (or "-")	Active (or not)
1 .. 7	Radio link set in the range 0 to 7
R	Reference finger
SC	Serving Cell

Ec/Io bars

A colored bar overlaid to each table row shows the signal strength, expressed by its Ec/Io. The scale of the Ec/Io bars is defined in the configuration menu, the colors denote the SCs of the different signals; they can be customized in the Colors tabs of the UMTS view configuration menus (e.g. the one linked to the UMTS CellSet View). If the signal strength falls below the selected minimum, the bar is replaced by a narrow line at the left edge of the diagram.

The SC color codes are also shown in the *Route Track* menu; see paragraph on scrambling code indication on p. 4.48.

Context menu

A right mouse click on any point in the view opens the context menu to print the view contents, access the configuration menus, (de-)select the view for fast replay, put the view on hold, copy the current view to the clipboard, create views, or to save the current configuration; see *Context menu* description on p. 4.2.

UMTS Finger Data View Configuration

The *UMTS Finger Data View* configuration menu defines the maximum number of table rows in the *UMTS Finger Data View* and the scale the E_c/I_o bars and displays information about the view version. It is opened via a right mouse click on a point inside *UMTS Finger Data View* or via the *Configuration – Settings* command (see chapter 3).

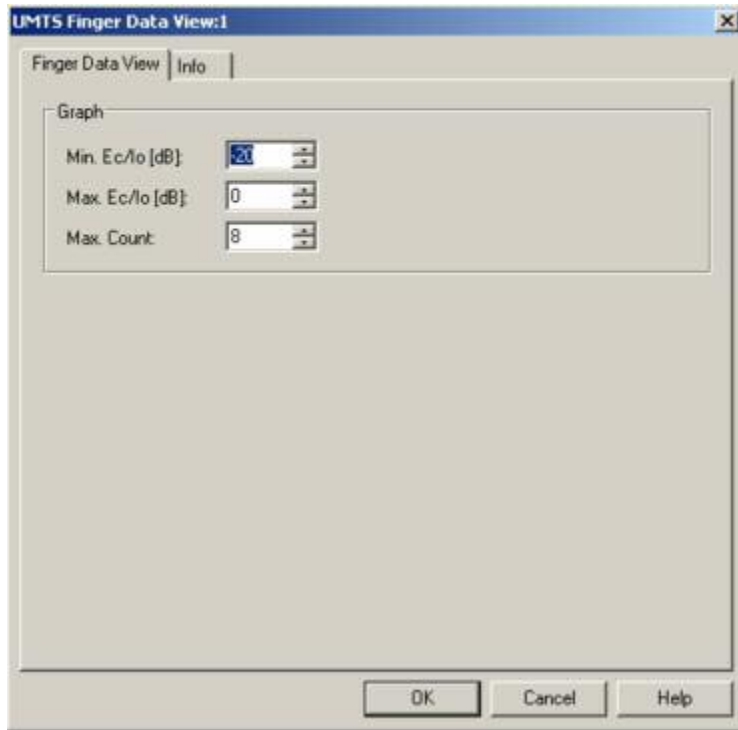


Fig. 4-86 UMTS Finger Data View: Finger Data View Configuration

Graph

The *Graph* panel in the *Finger Data View Configuration* tab contains three input fields:

Min. Ec/Io [dB]

Value of E_c/I_o at the left edge of the diagram. The length L of the bars increases with the value of E_c/I_o , it is given by the linear formula:

$$L = L_{\max} \cdot \frac{E_c / I_o - \min(E_c / I_o)}{\max(E_c / I_o) - \min(E_c / I_o)}; \quad 0 \leq L \leq L_{\max}$$

where L_{\max} denotes the diagram width.

Max. Ec/Io [dB]

Value of E_c/I_o at the right edge of the diagram; see above.

Max. Count

Maximum number of signals displayed in the view (= maximum number of table rows). The signals are sorted according to their E_c/I_o , so a small number eliminates weak signals that may be of minor interest.

UMTS CellSet View

The *UMTS CellSet View* shows an overview of the layer 1 parameters of the serving cell and the neighbor cells.

The view is empty unless the test mobile is configured to record the *WCDMA Active Set*, the *WCDMA Neighbor Set*, or the *WCDMA List Searcher* parameters; see description of the *Expert Mode* tab of the driver configuration menu in chapter 6.

The screenshot shows a window titled "UMTS CellSet View: 1" with a text field containing "TM7200[1]". Below the text field are two tables. The first table, "Active Set", is expanded and shows one row with the following data:

#	Serving	UAR...	Ec/Io...	RSCP...	SC	T.	Diver...	Sec. SC	O.	Position	Node B	HSUPA
1	Yes	10564	---	---	4736	0	No	not in use	0	152406	---	SC

The second table, "Neighbour Set", is compressed and shows six rows with the following data:

#	UAR...	Ec/Io...	RSCP...	SC	Diver...	Offset	State	Node B
2	10564	---	---	4752	No	178109	---	---
1	10564	---	---	3152	No	176061	---	---
4	10564	---	---	3136	No	---	---	---
5	10564	---	---	2672	No	---	---	---
6	10564	---	---	4272	No	---	---	---

Fig. 4-87 UMTS CellSet View

The results for each mobile are arranged in a separate tab.

View area The entire view area is horizontally split to accommodate two different tables for the *Active (Cell) Set* and the *Neighbor Set*.

A click on the *Active Set* or *Neighbor Set* title bars compresses and expands the corresponding table. A compressed table leaves more space for the other table. A compressed table is characterized by the symbol >>> (instead of <<<) in its title bar. On pausing on one of the title bars, the cursor displays a compress symbol.

The contents of both tables can be selected in the configuration menu.

Active Set Table of the most important parameters of the downlink WCDMA signals from the UTRAN cells in the active cell set. The active set comprises the serving cell and all other cells that are currently used for the connection; its members are permanently monitored and updated by the network.

Each table row represents a cell. Clicking an entry in the table heading sorts the cells according to the corresponding parameter. A gray triangle in the heading pointing upward (downward) indicates that the table is sorted in ascending (descending) order.

Color Symbol

Color code for the Primary SC as defined in the *Colors* tab of the configuration menu. The SC color codes are also shown in the *Route Track* menu; see paragraph on scrambling code indication on p. 4.48.

#	Sequence number for the cell, assigned in chronological order and always starting with 1.
<i>Serving</i>	Indication whether or not the cell is the serving cell (<i>Yes/No</i>).
<i>UARFCN</i>	UTRAN Absolute Radio Frequency Channel Number (ARFCN) of the received DL signal. The carrier frequency is equal to $f = 0.2 \text{ MHz} * \text{UARFCN}$
E_c/I_o	Ratio of the received energy per PN chip for the signal to the total received power spectral density at the mobile antenna connector. E_c/I_o is obtained in an unbiased measurement, i.e. the contribution of the noise floor to the powers is subtracted.
<i>RSCP</i>	CPICH Received Signal Code Power in dBm; the received power on one code, measured on the Primary CPICH.
<i>SC</i>	Primary scrambling code of the signal in the format selected in the <i>TEC for UMTS Test Mobiles</i> tab of the <i>Configuration of Software Modules</i> menu; refer to section <i>Configuration Menu</i> in chapter 3. The primary SC is used to identify the cell.
<i>TPC</i>	Cell Transmission Power Control value in the range 0 to 5.
<i>Diversity</i>	Downlink transmit diversity scheme for the CPICH: <i>STTD</i> (Space Time Transmit Diversity), <i>TSTD</i> (Time Switched Transmit Diversity), <i>SSDT</i> (Site Selection Diversity Transmit Power Control), or <i>No Diversity</i>
2^{nd} <i>SC</i>	Secondary Scrambling code number. "not in use" is displayed if the cell uses only primary scrambling codes.
<i>OVSF</i>	Orthogonal Variable Spreading Factor, code number of the signal.

<i>Position</i>	Active cell position						
<i>Node B</i>	Name of the node B, taken from the UMTS Node B database (if available).						
<i>HSUPA</i>	In case of HSUPA is active, this column shows which EUL set the <i>Node B</i> belongs to: <table> <tr> <td><i>SC</i></td> <td>Serving Cell</td> </tr> <tr> <td><i>RLS</i></td> <td>Radio Link Set</td> </tr> <tr> <td><i>Other</i></td> <td>other cells</td> </tr> </table>	<i>SC</i>	Serving Cell	<i>RLS</i>	Radio Link Set	<i>Other</i>	other cells
<i>SC</i>	Serving Cell						
<i>RLS</i>	Radio Link Set						
<i>Other</i>	other cells						

The *SC* and E_c/I_o values for each active set element generate signals in the *UMTS* – *<Device>* – *Active Set* branch of the data tree.

Neighbor Set

Table of the most important parameters of the downlink WCDMA signals from all UTRAN cells that are in the neighbor set and not currently used for the connection. The members of the neighbor set are permanently monitored and updated by the network. Most of the parameters are also available for the Active Set; see above. Besides the following information is displayed:

State

Indication whether the neighbor cell is Monitored, Detected, Undetected, Not Listed or Detected.

Offset

Time offset of the signal in 1/8-chip units relative to the system time (hardware-dependent).

A Qualcomm mobile must be used to record the neighbor set data.

Context menu

A right mouse click on any point in the view opens the context menu to print the view contents, access the configuration menus, (de-)select the view for fast replay, put the view on hold, copy the current view to the clipboard, create new views, or to save the current configuration; see [Context menu](#) description on p. 4.2.



UMTS CellSet View Configuration

The *UMTS CellSet View* configuration menu selects the columns in the view tables, defines the SC color scheme and displays information about the view version. It is opened via a right mouse click on a point inside *UMTS CellSet View* or via the *Configuration – Settings* command (see chapter 3).

The *Cell Set List Configuration* tab displays the complete parameter set to be displayed in the *Active Set* and *Neighbor Set* tables (see description in the [Active Set](#) paragraph on p. 4.138). Clearing a parameter hides the column in the table.



Restricting the viewed results makes it easier to read the tables if only a subset of the available parameters is needed. To restrict the number of parameters measured and enhance the system performance, use the settings in the driver configuration menu (see chapter 6).

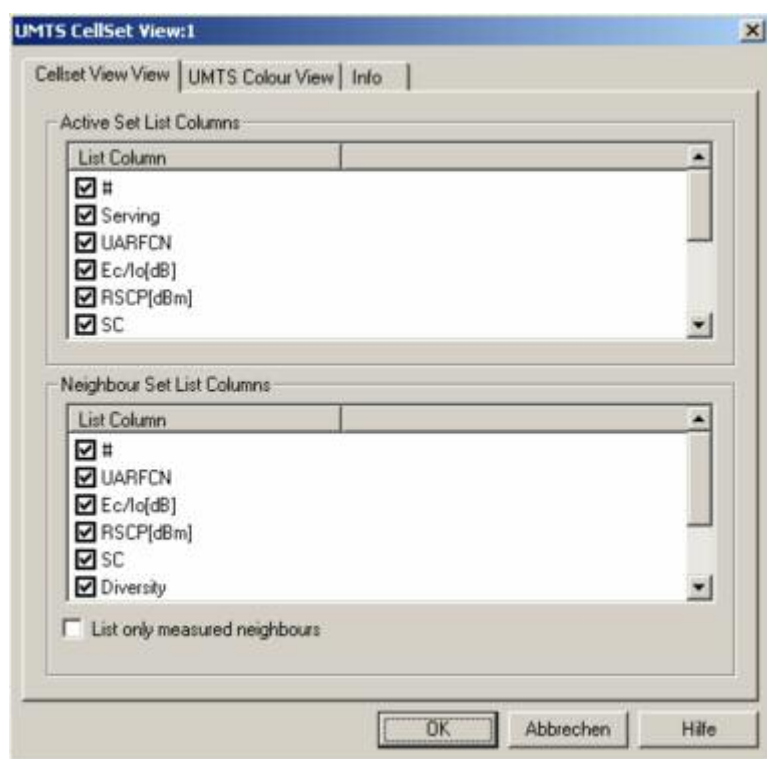


Fig. 4-88 UMTS CellSet View: CellSet List Configuration

The *Cellset View View* tab of the *UMTS CellSet View* dialog selects the list information to be displayed in the active and neighbor sets.

Neighbor Set List Columns The checkbox selects the neighbors to be displayed:

If *List only measured neighbors* is activated, then only measured neighbor cells are displayed, otherwise all neighbors from the Node B database are shown.

The *UMTS Color View* tab of the *UMTS CellSet* configuration menu is analogous to the *Color Settings* tab of the *PNS CPICH* configuration menu; see section [PNS CPICH View](#) on p. 4.339.

UMTS NAS Status View

The *UMTS NAS Status View* shows an overview of higher-layer (Non Access Stratum, NAS) parameters of the serving cell and the connection. A Qualcomm mobile must be used to record the data (the Nokia test mobile only provides the *Cell ID* and *Name* of the serving cell).

The view is empty unless the test mobile is configured to record the *UMTS NAS GMM State*, *UMTS NAS MM State*, *UMTS NAS REG State*, or *UMTS NAS MM Characteristics* data; see description of the *Expert Mode* tab of the driver configuration menu in chapter 6.

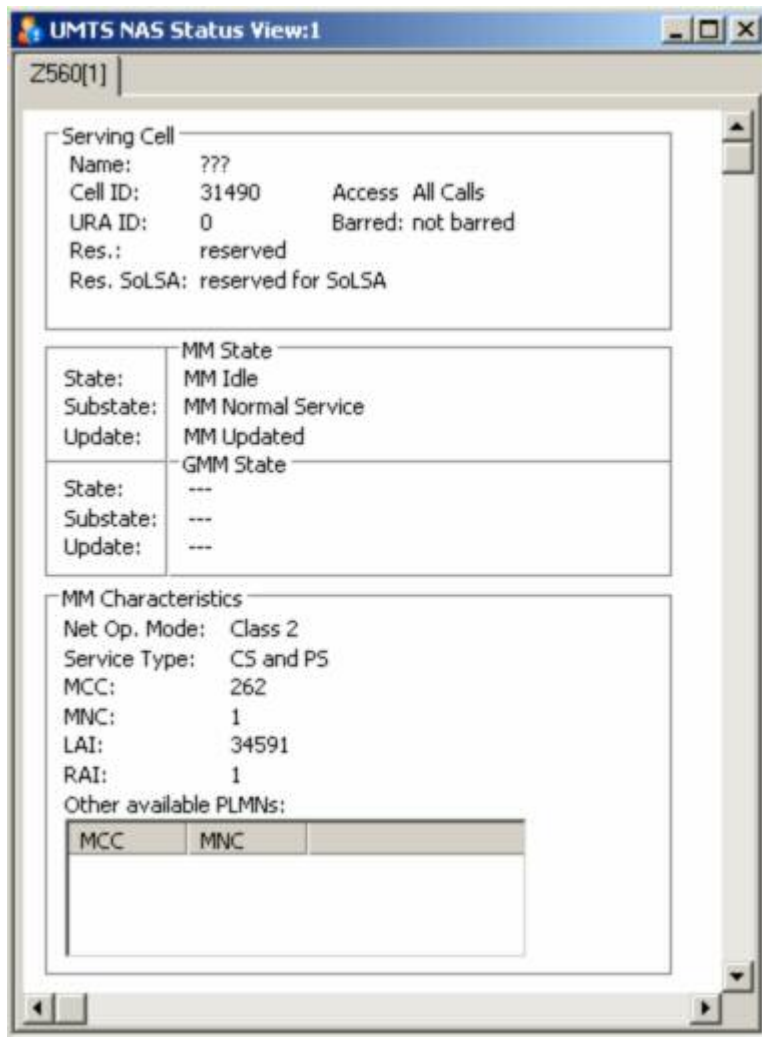


Fig. 4-89 UMTS NAS Status View

The results for each mobile are arranged in a separate tab. Each tab consists of several panels.

Serving Cell	Table of the most important higher layer (NAS) parameters of the serving cell.
<i>Name</i>	Name of the serving cell Node B, taken from the UMTS Node B database (if available).
<i>Cell ID</i>	Cell Identity of the serving cell.
<i>URA ID</i>	UTRAN Registration Area
<i>Res.</i>	Cell totally reserved or not reserved
<i>Res. SoLSA</i>	Cell reserved for Support of Localized Service Area
<i>Access</i>	Indication of possible cell access restrictions: <i>Access for All Calls</i> or <i>Emergency Calls Only</i>
<i>Barred</i>	Indication whether the cell is barred (for all calls, including emergency calls) or not barred
MM / GMM State	Overview of the current Mobility Management (MM) and GPRS Mobility Management (GMM) states, substates and updates of the mobile. The GMM results are available for test mobiles supporting GPRS functionality (which is true for the R&S ROMES-UM1 test mobile). MM and GMM are described in standard 3GPP TS 24.008.

**MM
Characteristics**

Table of additional MM parameters:

Net Op. Mode

Network operation mode Class I, II or III, see standard 3GPP TS 123 060. The operation mode is indicated as system information to the mobile.

Service type

Circuit switched service (*CS*), packet switched service (*PS*) or both (*CS and PS*) or *Limited Service*

MCC

Mobile Country Code

MNC

Mobile Network Code

LAI

Location Area Identity

RAI

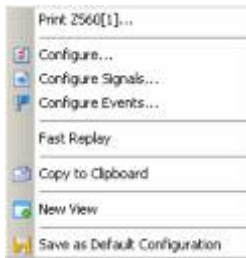
Routing Area Identity

Other available

PLMNs

MCC and MNC of other networks detected by the mobile

The *NAS* values generate signals in the *UMTS* – *<Device>* – *NAS State* branch of the data tree.

Context menu

A right mouse click on any point in the view opens the context menu to print the view contents, access the configuration menus, (de-)select the view for fast replay, copy the current view to the clipboard, create new views, or to save the current configuration, or move to another worksheet; see [Context menu](#) description on p. 4.2.

The configuration menu displays information about the view version.

UMTS TrCH View

The *UMTS TrCH View* shows an overview of the channel coding parameters in the downlink and uplink Transport Channels (TrCHs). A Qualcomm mobile must be used to record the data.

The view is empty unless the test mobile is configured to record the *WCDMA TrCH Downlink* or the *WCDMA TrCH Uplink* parameters; see description of the *Expert Mode* tab of the driver configuration menu in chapter 6.

The screenshot shows a window titled "UMTS TrCH View:1" with a tab labeled "Qualcomm[1], Normal". It contains two tables: "TrCH Downlink" and "TrCH Uplink".

TrCH Downlink Table:

CCTrCH ID	TrCH ID	Type	Code Rate	CRC Bits	TTI Format	RM	BLER
0	0	SBCH	1/2 Convol...	16	20ms	1	0
1	1	PCH	1/2 Convol...	16	10ms	230	---

TrCH Uplink Table:

TrCH ID	Type	Code Rate	CRC Bits	TTI Format	RM
0	RACH	1/2 Convolutional	16	20ms	150
0	DCH	1/3 Convolutional	16	40ms	185
0	DCH	1/3 Convolutional	16	40ms	185
0	DCH	1/3 Convolutional	12	20ms	180
0	DCH	1/3 Convolutional	0	20ms	170
0	DCH	1/2 Convolutional	0	20ms	215
0	DCH	1/3 Convolutional	16	40ms	185
0	DCH	1/3 Convolutional	12	20ms	180
0	DCH	1/3 Convolutional	0	20ms	170
0	DCH	1/2 Convolutional	0	20ms	215
0	DCH	1/3 Convolutional	16	40ms	185

Fig. 4-90 UMTS TrCH View

The results for each mobile are arranged in a separate tab.

View area The entire view area is horizontally split to accommodate two different tables for the *TrCH Downlink* and the *TrCH Uplink*.

A click on the *TrCH Downlink* or *TrCH Uplink* title bars compresses and expands the corresponding table. A compressed table leaves more space for the other table. A compressed table is characterized by the symbol >>> (instead of <<<) in its title bar. On pausing on one of the title bars, the cursor displays a compress symbol.

The contents of both tables can be selected in the configuration menu.

TrCH Downlink Table of the channel coding parameters of the downlink TrCHs received by the test mobile.

Each table row represents a single transport channel that has been added during the measurement (and possibly removed). A new table row is created each time that a new transport channel is added. On the other hand, a table row for a removed transport channel is deleted after the *Time Window for DL/UL* set in the configuration menu.

Clicking an entry in the table heading sorts the cells according to the corresponding parameter. A gray triangle in the heading pointing upward (downward) indicates that the table is sorted in ascending (descending) order.

CCTrCH ID

Composite Coded Transport Channel ID in the range 0 to 15, identifies unambiguously a CCTrCH inside a Radio Link.

TrCH ID

Transport channel number assigned to L1 by L2. Transport channels are multiplexed to the CCTrCH in the ascending order of these IDs.

Type

Transport channel type, e.g. Paging Channel (PCH), Slow Broadcast Channel (SBCH), Random Access Channel (RACH), Dedicated Channel (DCH), Downlink Shared Channel (DSCH), Forward Access Channel (FACH)

Code Rate

Coding rate and type of error protection/channel coding (convolutional coding, turbo coding)

CRC Bits

Number of CRC bits per transport block.

TTI Format

Length of the Transmission Time Interval in ms.

RM

Rate matching attribute, assigned by higher layers and used when the number of bits to be repeated or punctured is calculated.

BLER

Estimation of the transport channel block error rate (BLER) based on evaluating the CRC on each transport block.

A double-click on a table row opens a popup window with detailed information about the transport block format:

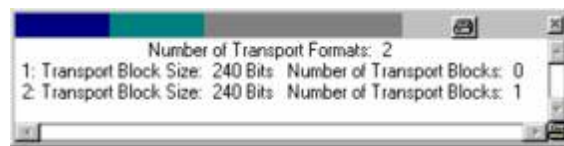
**TrCH Uplink**

Table of the most important parameters of the uplink WCDMA TrCHs transmitted by the test mobile. The parameters are a subset of the TrCH Downlink parameters. Uplink transport channel types are Dedicated Channel (DCH), Random Access Channel (RACH), Common Packet Channel (CPCH).

Context menu

A right mouse click on any point in the view opens the context menu to print the view contents, access the configuration menus, (de-)select the view for fast replay, copy the current view to the clipboard, create new views, or to save the current configuration; see [Context menu](#) description on p. 4.2.

UMTS TrCH View Configuration

The *UMTS TrCH View* configuration menu selects the columns in the view tables, defines the time window and displays information about the view version. It is opened via a right mouse click on a point inside *UMTS TrCH View* or via the *Configuration – Settings* command (see chapter 3).

The *TrCH View Configuration* tab displays the complete parameter set to be displayed in the *TrCH Uplink* and *TrCH Downlink* tables (see description in the *TrCH Downlink* paragraph on p. 4.145). Clearing a parameter hides the column in the table.



Restricting the viewed results makes it easier to read the tables if only a subset of the available parameters is needed. To restrict the number of parameters measured and enhance the system performance, use the settings in the driver configuration menu (see chapter 6).

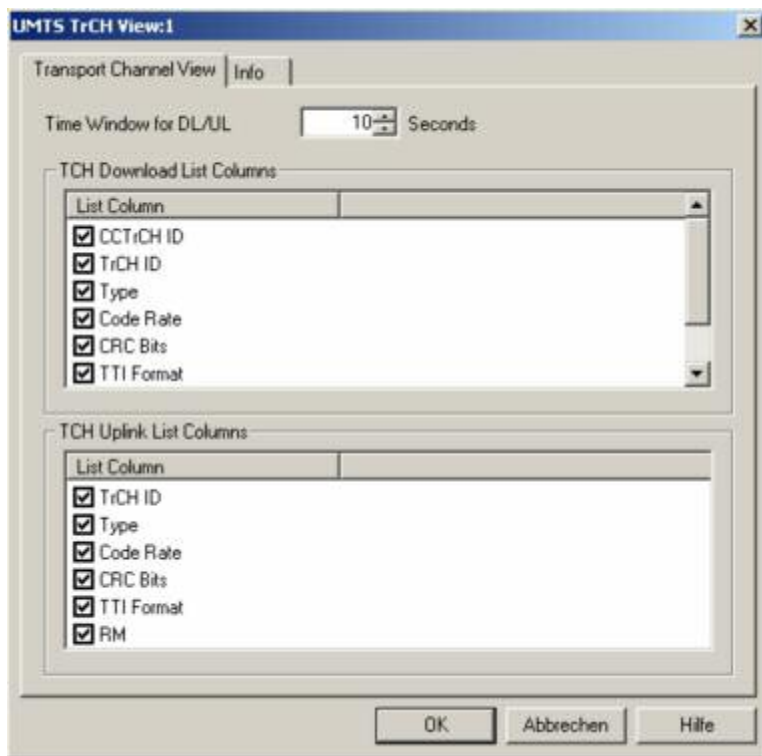


Fig. 4-91 UMTS TrCH View: TrCH List Configuration

Time Window for DL/UL

Time after which a table row for a removed TrCH channel is cleared in the *TrCH View* tables. Cleared table rows leave room for new entries.

UMTS Physical Channels View

The *UMTS Physical Channels View* shows an overview of the physical channel parameters in the downlink and uplink WCDMA signals. A Qualcomm mobile must be used to record the data.

The view is empty unless the test mobile is configured to record the *WCDMA Common Physical Channels Downlink*, *WCDMA Dedicated Physical Channels Downlink*, *WCDMA Physical Channels Uplink*, or *WCDMA PRACH* parameters; see description of the *Expert Mode* tab of the driver configuration menu in chapter 6.

Common Physical Channels										
#	State	Type	Slot Format	SC	Diversity	CCTrCH ID	T Offset	Code	T Add	T Released
0	Released	PCCPCH_N	---	250	No	0	---	1	42040	42220
0	Released	PCCPCH_N	---	250	No	0	---	1	45375	45505
0	Released	PCCPCH_N	---	250	No	0	---	1	45525	45645
0	Released	PCCPCH_N	---	250	No	0	---	1	45996	46156
0	Released	PCCPCH_N	---	250	No	0	---	1	46196	46366

Dedicated Physical Channels																
State	CCTrCH ID	Slot Format	Diversity	# RL	SC	T Offset	2nd SC	Code	2nd SC (1.DPCH)	Code (1.DPCH)	2 ₁	C ₁	2 ₂	C ₂	T Add	T Released
Released	0	8	No	1	250	113	---	---	---	---	---	---	---	---	12387	49120
				2	321	204	---	---	---	---	---	---	---	---	12387	49120

Uplink Physical Channels												
Tx Power Max.	Power Offset	PCP Length	PC	TPC	TFCI	FBI	Punc. Limit	Tx Power Init.	Slot Format	SC Type	SC	SF Min.
24 dBm	-76 dB	0	PCA1	1	present	0	1.0	28 dBm	0	Long	1065633	0

PRACH								
Tx Power Max.	Mask 1	Mask 2	SF Min.	SC Index	Punc. Limit	TrCH ID	PWF	Max. Retrans.
24 dBm	4000	FFF	64	0	1.0	1	1 dB	64

Fig. 4-92 UMTS Physical Channels View

The results for each mobile are arranged in a separate tab.

View area The entire view area is horizontally split to accommodate four different tables for the *Common Physical Channels* (downlink), *Dedicated Physical Channels* (downlink), *Uplink Physical Channels*, or *PRACH*.

A click on one of the title bars compresses and expands the corresponding table. A compressed table leaves more space for the other tables. A compressed table is characterized by the symbol >>> (instead of <<<) in its title bar. On pausing on one of the title bars, the cursor displays a compress symbol.

The contents of both tables can be selected in the configuration menu.

**Common
Physical Channels**

Parameters of the downlink common physical channels.

Each table row represents a single physical channel that has been added during the measurement (and possibly removed). A new table row is created each time that a new physical channel is added. On the other hand, a table row for a removed physical channel is deleted after the *Time Window for DL/UL* set in the configuration menu.

Clicking an entry in the table heading sorts the cells according to the corresponding parameter. A gray triangle in the heading pointing upward (downward) indicates that the table is sorted in ascending (descending) order.

#

Color scheme to distinguish channels with different scrambling codes and sequence number

State

Physical channel state: *Added* (allocated) or *Released*

Type

Physical channel type: PICH, AICH, DPCH, PDSCH, SCCPCH0, SCCPCH1 (on FACH), AICH, PCCPCH_S(serving), PCCPCH_N(eighbor),

Slot Format

Slot format of the SCCPCH in the range 0 to 16

SC

Primary scrambling code of the signal in the format selected in the *TEC for UMTS Test Mobiles* tab of the *Configuration of Software Modules* menu; refer to section *Configuration Menu* in chapter 3. The primary SC is used to identify the cell.

Diversity

Downlink transmit diversity scheme for the CPICH: *STTD* (Space Time Transmit Diversity), *TSTD* (Time Switched Transmit Diversity), *SSDT* (Site Selection Diversity Transmit Power Control), or *No Diversity*

CCTrCH ID

Composite Coded Transport Channel ID in the range 0 to 15, identifies unambiguously a CCTrCH inside a Radio Link.

T Offset

Time offset of the channel relative to the frame boundary, in 156-chip units (corresponding to 1/10 slot or 1/150 frame).

Code

Channelization code number assigned to the channel

T Add

Time when the physical channel was added

T Released

Time when the channel was removed/released

Dedicated Physical Channels	<p>Parameters of the downlink dedicated physical channels (DPCHs). In addition of the parameters for the Common Physical Channels, the table contains the following entries:</p> <p><i>#RL</i> Sequence number for the radio links that the test mobile establishes to the network</p> <p><i>2nd SC</i> Secondary Scrambling code number. “---” or “0” is displayed if a primary scrambling code is used.</p>
Uplink Physical Channels	<p>Parameters of the uplink physical channels (DPCCH/DPDCH). The table contains the following entries:</p> <p><i>Tx Power Max</i> Maximum transmit power of the test mobile (+33 dBm, +27 dBm, +24 dBm or +21 dBm for power class 1, 2, 3, or 4 mobiles)</p> <p><i>Power Offset</i> DPCCH power offset in dB. The DPCCH power offset is a reference value for the initial DPCCH power:</p> <p>$P_{DPCCH} = \text{Power Offset} - CPICH_RSCP$</p> <p><i>PCP Length</i> Length of the Power Control Preamble in slots</p> <p><i>PC</i> Power control algorithm (PCA1 or PCA2)</p> <p><i>TPC</i> Transmit Power Control step size in dB</p> <p><i>TFCI</i> Presence of the optional Transport Format Combination Indicator</p> <p><i>FBI</i> Number of Feedback Information bits (0 to 2)</p> <p><i>Punc. Limit</i> Uplink puncturing limit, limits the amount of puncturing that can be applied in order to minimize the number of physical channels.</p> <p><i>TX Power Init.</i> Initial TX power of the test mobile</p> <p><i>Slot Format</i> UL DPCCH slot format</p> <p><i>SC Type</i> Scrambling code type (Long or Short)</p> <p><i>SC</i> UL scrambling code number</p> <p><i>SF Min.</i> Minimum allowed spreading factor</p>

PRACH

Parameters of the uplink Physical Random Access Channel (PRACH), relevant for the physical random access procedure of the test mobile (3GPP TS 25.214). Some of the parameters are analogous to the Uplink Physical Channel parameters. Besides the table contains the following entries:

Mask 1

PRACH preamble signature in the range 0 to 15

Mask 2

PRACH subchannel in the range 0 to 11; see 3GPP TS 25.216.

SC Index

PRACH scrambling code index

TrCH ID

Transport channel number assigned to L1 by L2. Transport channels are multiplexed to the CCTrCH in the ascending order of these IDs

PWF

PRACH preamble power step size, transmit power difference between two consecutive PRACH preambles

Max. Retrans.

Maximum number of preambles to be transmitted before a single preamble cycle is terminated.

Context menu

A right mouse click on any point in the view opens the context menu to print the view contents, access the configuration menus, (de-)select the view for fast replay, put the view on hold, copy the current view to the clipboard, create or delete views, and to save the current configuration; see [Context menu](#) description on p. 4.2.

UMTS Physical Channels View Configuration

The *UMTS Physical Channels View* configuration menu selects the columns in the view tables, defines the time window and displays information about the view version. It is opened via a right mouse click on a point inside *UMTS Physical Channels View* or via the *Configuration – Settings* command (see chapter 3).

The *Physical Channel View* tab displays the complete parameter set to be displayed in the view tables (see description in the [Dedicated Physical Channels](#) paragraph on p. 4.150). Clearing a parameter hides the column in the table.



Restricting the viewed results makes it easier to read the tables if only a subset of the available parameters is needed. To restrict the number of parameters measured and enhance the system performance, use the settings in the driver configuration menu (see chapter 6).

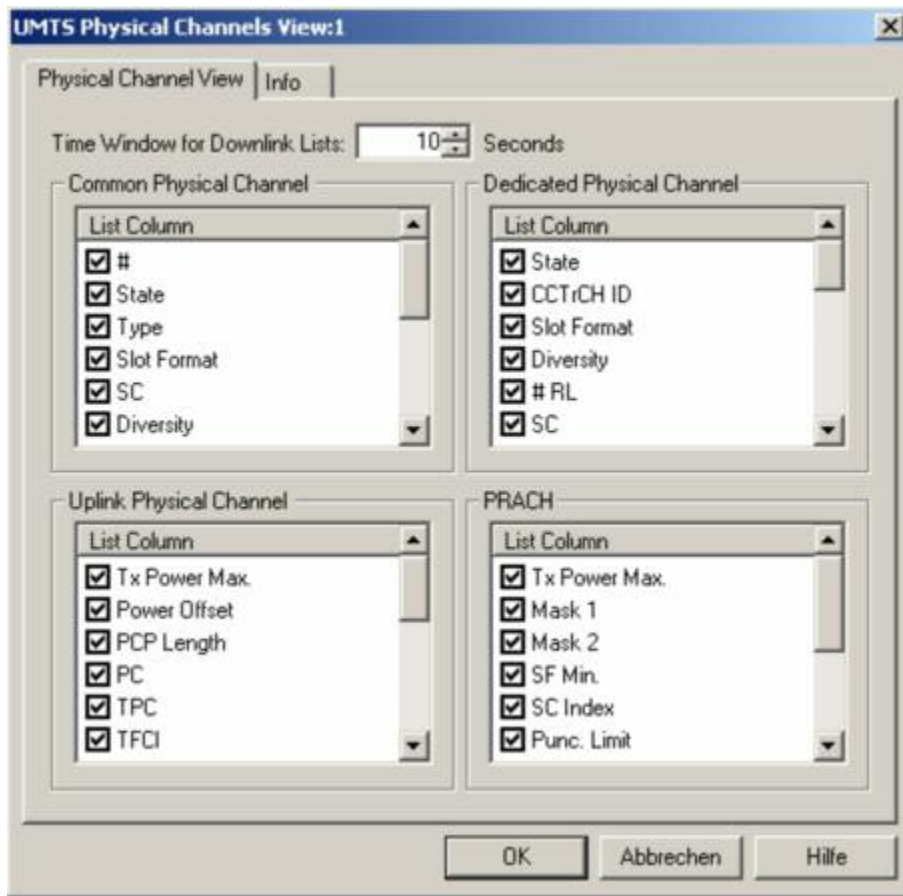


Fig. 4-93 UMTS Physical Channels View: Physical Channel View

Time Window for Downlink Lists Time after which a table row for a removed physical channel is cleared in the *Common Physical Channel* and *Dedicated Physical Channel* tables. Cleared table rows leave room for new entries.

UMTS SIB View

The *UMTS SIB View* shows a tree view of the exchanged System Information Blocks. The block type (*Master Information Block, Scheduling Block 1 and 2, System Information Block type 1 to 18*) can be selected from a pull-down list. The SIB types and their information elements are described in standard 3GPP TS 25.331.

The view is empty unless the test mobile is configured to record the *Layer 3 – WCDMA RRC Signaling Messages*; see description of the *Expert Mode* tab of the driver configuration menu in chapter 6.



Fig. 4-94 UMTS SIB View

The results for each mobile are arranged in a separate tab.

Context menu



A right mouse click on any point in the view opens the context menu to access the configuration menus, (de-)select the view for fast replay, copy the current view to the clipboard, create new views, or to save the current configuration; see [Context menu](#) description on p. 4.2. The context menu contains the following additional command:

Export <Device>

Opens a *Save As...* dialog to export the contents of the view to a file. The export file is an ASCII file in *.txt format. In the *Save As...* dialog R&S ROMES suggests a default file name and directory (*ExportResult*).

The configuration menu displays information about the view version.

UMTS RLC/MAC View

The *UMTS RLC/MAC View* displays important Radio Link Control/Medium Access Control parameters of UMTS mobile phones. To record the RLC/MAC parameters, a Qualcomm test mobile must be used and recording of all layer 2 RLC and MAC messages must be enabled in the driver configuration menu (see chapter 6).

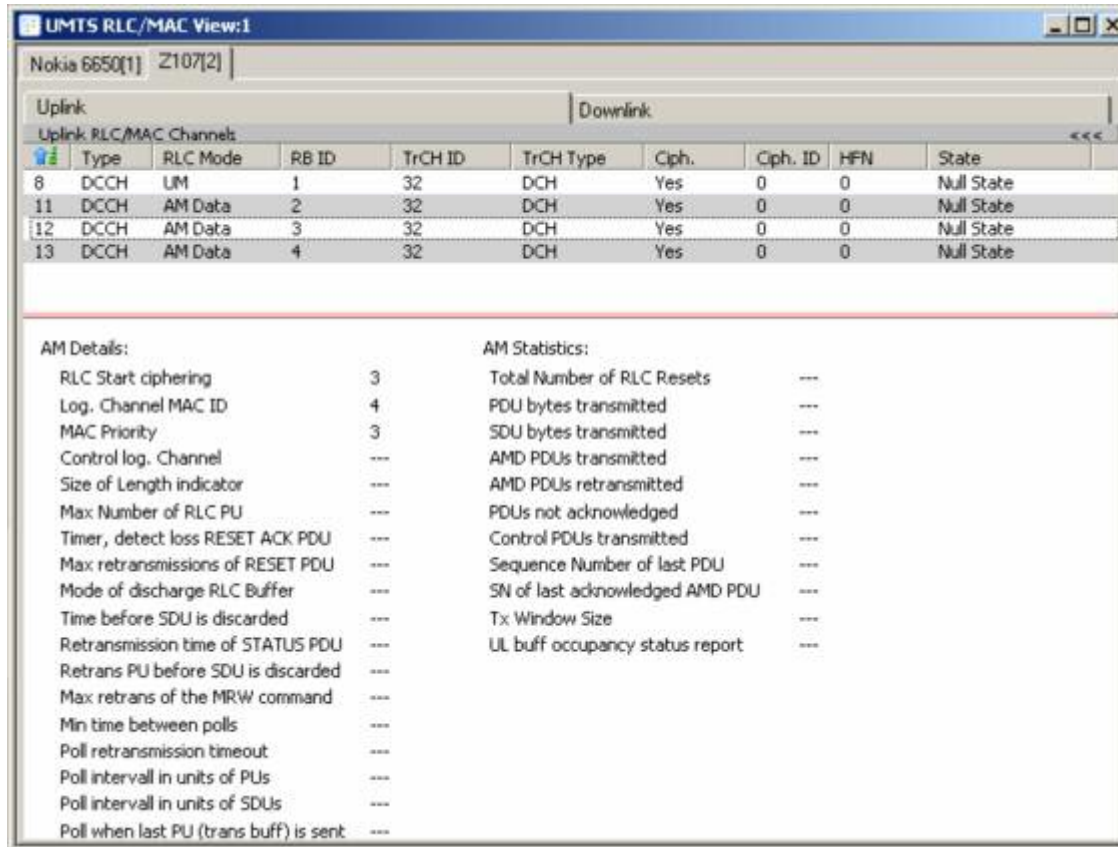


Fig. 4-95 UMTS RLC/MAC View

View

The RLC/MAC parameters for each mobile and for the uplink and downlink are arranged in separate tabs. Each tab is divided into a RLC/MAC channel list in the upper part plus a detailed message section in the lower part.

A click on the *Uplink (Downlink) RLC/MAC Channels* title bar shows or hides the RLC/MAC channel list. A hidden list leaves more space for the detailed message section. A hidden list is characterized by the symbol >>> (instead of <<<) in the title bar. On pausing on the title bar, the cursor displays a compress symbol.

The contents of the RLC/MAC channel list can be selected in the configuration menu.

RLC/MAC Channels

The channel lists monitor the RLC/MAC channels in uplink (mobile station towards base station) and downlink (base station towards mobile station) direction, respectively. The MAC and RLC protocols are specified in standards 3GPP TS 25.321 / TS 25.322 and related standards.

ID

Logical channel identifier.

Type

Logical channel type: *CCCH*, *SHCCH*, *DCCH* or *DTCH* in uplink direction, *BCCH*, *PCCH*, *SHCCH*, *CCCH*, *DCCH*, *DTCH*, *CTCH* in downlink direction. The logical channels depend on the *RLC Mode*.

RLC Mode

Type of service that the RLC provides to higher layers: *AM Data (Acknowledged Mode Data transfer)*, *TM (Transparent Mode data transfer)*, *UM (Unacknowledged Mode data transfer)*.

RB ID

Radio Bearer identity, required by RLC for ciphering.

TrCH ID

Transport Channel identity of the TrCH on which the MAC operates.

TrCH Type

Transport Channel type: *DCH*, *DSCH*, *FACH*, *RACH*, *PCH*, *BCH*, (*in FDD: CPCH, USCH*).

Ciphering

Ciphering mode: Information whether or not ciphering is used in RLC.

Ciph. ID

Ciphering key

HFN RLC

Hyper Frame Number (*RLC AM HFN* or *RLC UM HFN*)

State

RLC state, protocol state for RLC modes AM Data and TM (*AM/TM Data Transfer Ready*, *Null State*)

Detailed Messages

The detailed message section is filled when a RLC/MAC channel is selected in the list. The detailed messages depend on the *RLC Mode* and the signal direction (uplink/downlink). An example is shown in the figure [above](#).

Context menu

A right mouse click on any point in the view opens the context menu to print the view contents, access the configuration menus, (de-)select the view for fast replay, copy the current view to the clipboard, create new views, or to save the current configuration; see [Context menu](#) description on p. 4.2.

UMTS RLC/MAC View Configuration

The *UMTS RLC/MAC View* configuration menu selects the columns in the view tables and displays information about the view version. It is opened via a right mouse click on a point inside *UMTS RLC/MAC View* or via the *Configuration – Settings* command (see chapter 3).

The *RLC/MAC View* tab displays the complete parameter set to be displayed in the RLC/MAC channel lists (see description in the [RLC/MAC Channels](#) paragraph on p. 4.155). Clearing a parameter hides the column in the table.



Restricting the viewed results makes it easier to read the tables if only a subset of the available parameters is needed. To restrict the number of parameters measured and enhance the system performance, use the settings in the driver configuration menu (see chapter 6).

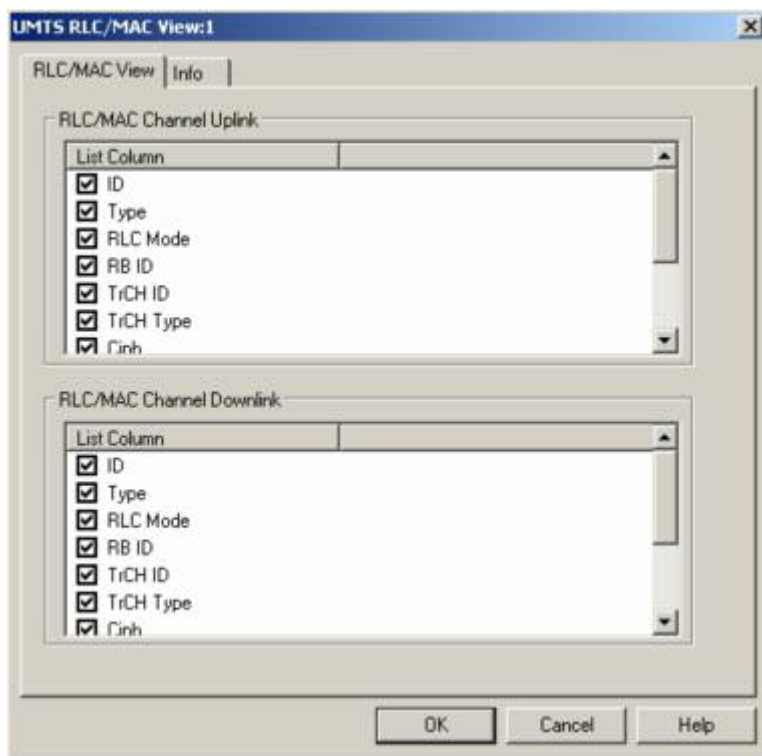


Fig. 4-96 UMTS RLC/MAC View Configuration: RLC/MAC View

UMTS Measurement Report View

The *UMTS Measurement Report View* shows the intra-frequency measurement results that the test mobile sends to the network in a *Measurement Report* RRC message. The message contents are described in standard 3GPP TS 34.108.

The view is empty unless the test mobile is configured to record the *Layer 3 – WCDMA RRC Signaling Messages*; see description of the *Expert Mode* tab of the driver configuration menu in chapter 6.

#	SC	Ec/Io[dB]	RSCP	PL	COUNT-C-SFN	OFF	Tm	SFN-CFN
4	236	-14.0	---	---	0	1	3072	41472
6	5	-21.5	---	---	0	236	31973	9094373
2	9	-11.5	---	---	0	123	17474	4740674
3	503	-12.5	---	---	0	85	17620	3281620
7	265	-23.5	---	---	0	37	2073	1422873
8	69	-23.5	---	---	0	126	20106	4858506
1	400	-9.5	---	---	0	85	18644	3282644
5	366	-16.0	---	---	0	36	24922	1407322

Fig. 4-97 UMTS Measurement Report View

The results for each mobile are arranged in a separate tab.

Intra Frequency Measurements

Parameters of the downlink common physical channels.

Each table row represents a physical channel of a definite channel type that has been allocated without interruption. Clicking an entry in the table heading sorts the cells according to the corresponding parameter. A gray triangle in the heading pointing upward (downward) indicates that the table is sorted in ascending (descending) order.

#

Color scheme to distinguish channels with different scrambling codes and sequence number

SC

Primary scrambling code of the signal in the format selected in the *TEC for UMTS Test Mobiles* tab of the *Configuration of Software Modules* menu; refer to section *Configuration Menu* in chapter 3. The primary SC is used to identify the cell.

E_c/I_o [dB]

Ratio of the received energy per PN chip for the signal to the total received power spectral density at the mobile antenna connector. E_c/I_o is obtained in an unbiased measurement, i.e. the contribution of the noise floor to the powers is subtracted off.

RSCP

CPICH Received Signal Code Power in dBm; the received power on one code, measured on the Primary CPICH.

PL

Downlink pathloss: P-CPICH power reported by the Node B minus RSCP.

COUNT-C-SFN

Value of the *COUNT-C-SFN high* parameter transmitted in the *cell synchronization information*; see standard 3GPP TS 25.331, section 10.3.7.6. The value is an integer number of frames between 0 and 3840.

OFF

Value of the *OFF* parameter transmitted in the *cell synchronization information*; see standard 3GPP TS 25.331, section 10.3.7.6. The value is an integer number of frames between 0 and 255.

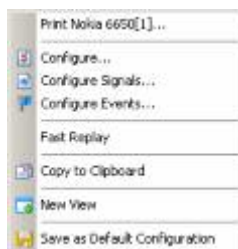
 T_m

Value of the *T_m* parameter transmitted in the *cell synchronization information*; see standard 3GPP TS 25.331, section 10.3.7.6. The value is an integer number of frames between 0 and 38399.

SFN-CFN

System Frame Number (SFN) – Connection Frame Number (CFN) observed time difference in chips, given by
 $SFN-CFN = OFF * 38400 + T_m$

See standard 3GPP TS 25.215, section 5.1.8.

Context menu

A right mouse click on any point in the view opens the context menu to print the view contents, access the configuration menus, (de-)select the view for fast replay, copy the current view to the clipboard, create new views, or to save the current configuration; see [Context menu](#) description on p. 4.2.

The configuration menu displays information about the view version.

UMTS Reselection View

The *UMTS Reselection View* shows parameters that are used for cell reselection of UMTS mobile phones. The reselection process and the parameters are described in standard 3GPP TS 25.304. To record the parameters, *Cell Reselection* must be enabled in the *Expert Mode* tab of the UMTS mobile driver configuration menu (see chapter 6).

The screenshot shows a window titled "UMTS Reselection View:1" with a tab labeled "Qualcomm[1], Normal". It contains two tables. The top table, "UMTS Reselection Parameters", has columns: #, UARFCN, SC, RSCP[dBm], Rank RSCP, Ec/Io[dB], Rank Ec/Io, and Node B. The bottom table, "GSM Reselection Parameters", has columns: #, ARFCN, BCC, NCC, RSSI[dBm], Rank, and BTS Name. The UMTS table has three rows with colored headers (blue, cyan, red).

UMTS Reselection Parameters							
#	UARFCN	SC	RSCP[dBm]	Rank RSCP	Ec/Io[dB]	Rank Ec/Io	Node B
2	10836	336	---	---	-33	-39	---
3	10836	3472	---	---	-43	-49	---
1	10836	5696	---	---	-37	-43	---

GSM Reselection Parameters						
#	ARFCN	BCC	NCC	RSSI[dBm]	Rank	BTS Name

Fig. 4-98 UMTS Reselection View

View

The view is divided into a UMTS cell list in the upper part plus a GSM neighbor cell list in the lower part.

A click on the *UMTS (GSM) Reselection Channels* title bar shows or hides the corresponding cell list. A hidden list leaves more space for the other list. A hidden list is characterized by the symbol >>> (instead of <<<) in the title bar. On pausing on the title bar, the cursor displays a compress symbol.

The contents of the cell lists can be selected in the configuration menu.

UMTS Reselection Parameters	The UMTS cell list shows the reselection parameters of the UMTS cells, listed in the order they are detected and reported by the mobile.
<i>Color Symbol</i>	Color code for the Primary SC as defined in the <i>Colors</i> tab of the configuration menu. The SC color codes are also shown in the <i>Route Track</i> view; see paragraph on scrambling code indication on p. 4.48.
#	Sequence number for the cell, assigned in chronological order and always starting with 1.
<i>UARFCN</i>	UTRAN Absolute Radio Frequency Channel Number (ARFCN) of the received DL signal. The carrier frequency is equal to $f = 0.2 \text{ MHz} * \text{UARFCN}$
<i>SC</i>	Primary scrambling code of the signal in the format selected in the <i>TEC for UMTS Test Mobiles</i> tab of the <i>Configuration of Software Modules</i> menu; refer to section <i>Configuration Menu</i> in chapter 3. The primary SC is used to identify the cell.
<i>RSCP</i>	CPICH Received Signal Code Power in dBm; the received power on one code, measured on the Primary CPICH.
<i>Rank RSCP</i>	Cell reselection criterion (cell ranking) R_s or R_n for serving cell or neighbor cell, computed as per 3GPP TS 25.304. Range 0 to 200 or '---' if ranking is not done.
E_c/I_o	Ratio of the received energy per PN chip for the signal to the total received power spectral density at the mobile antenna connector. E_c/I_o is obtained in an unbiased measurement, i.e. the contribution of the noise floor to the powers is subtracted off.
<i>Rank E_c/I_o</i>	Cell reselection criterion (cell ranking) R_s or R_n for serving cell or neighbor cell, computed as per 3GPP TS 25.304. Range 0 to 200 or '---' if ranking is not done.
<i>Node B</i>	Name of the node B, taken from the UMTS Node B database (if available).

GSM Reselection Parameters

The GSM cell list shows the reselection parameters of the GSM neighbor cells, listed in the order they are detected and reported by the mobile.

- # Sequence number for the cell, assigned in chronological order and always starting with 1.
- ARFCN* Absolute Radio Frequency Channel Number of the received GSM neighbor cell signal.
- BCC* BTS Color Code
- NCC* Network Color Code
- RSSI* Received Signal Strength Indicator, the received GSM channel power in dBm.
- Rank* Determines how much better is the neighbor cell relative to the serving cell (range 0 to 200).
- BTS Name* Name of the BTS, taken from the GSM BTS database (if available).

Context menu

A right mouse click on any point in the view opens the context menu to print the view contents, access the configuration menus, (de-)select the view for fast replay, copy the current view to the clipboard, create new views, or to save the current configuration; see [Context menu](#) description on p. 4.2.



UMTS Reselection View Configuration

The *UMTS Reselection View* configuration menu selects the columns in the view tables, defines the SC color scheme and displays information about the view version. It is opened via a right mouse click on a point inside *UMTS Reselection View* or via the *Configuration – Settings* command (see chapter 3).

The *Reselection View* tab displays the complete parameter set to be displayed in the reselection parameter lists (see description in the [UMTS Reselection Parameters](#) paragraph on p. 4.160). Clearing a parameter hides the column in the table.



Restricting the viewed results makes it easier to read the tables if only a subset of the available parameters is needed. To restrict the number of parameters measured and enhance the system performance, use the settings in the driver configuration menu (see chapter 6).

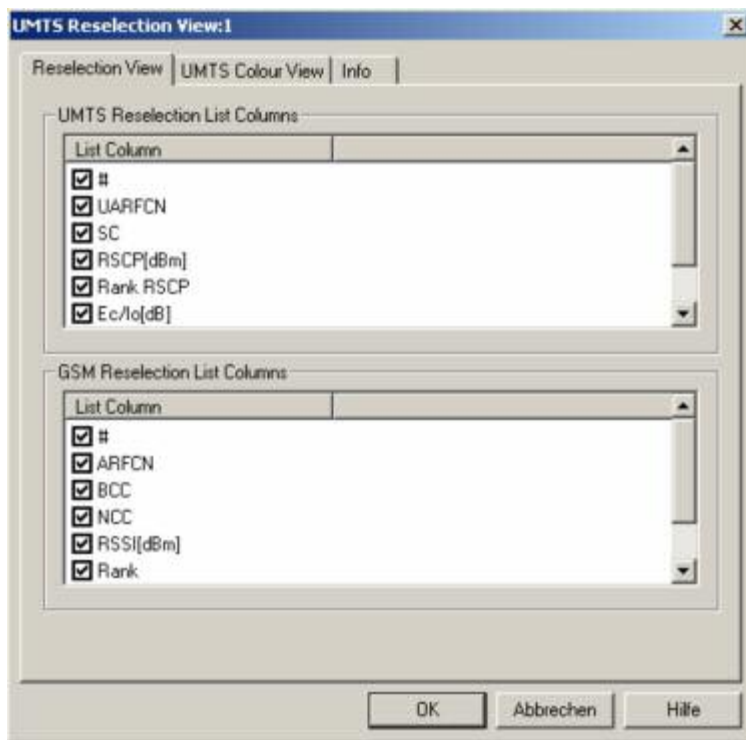


Fig. 4-99 UMTS Reselection View: Reselection View Configuration

The *Color Settings* tab of the *UMTS Reselection* configuration menu is analogous to the *PNS CPICH* configuration menu; see section [PNS CPICH View](#) on p. 4.339.

UMTS Power Control View

The *UMTS Power Control View* shows the transmitter output power of a Nokia UMTS mobile and the parameter that the network uses for closed loop power control.

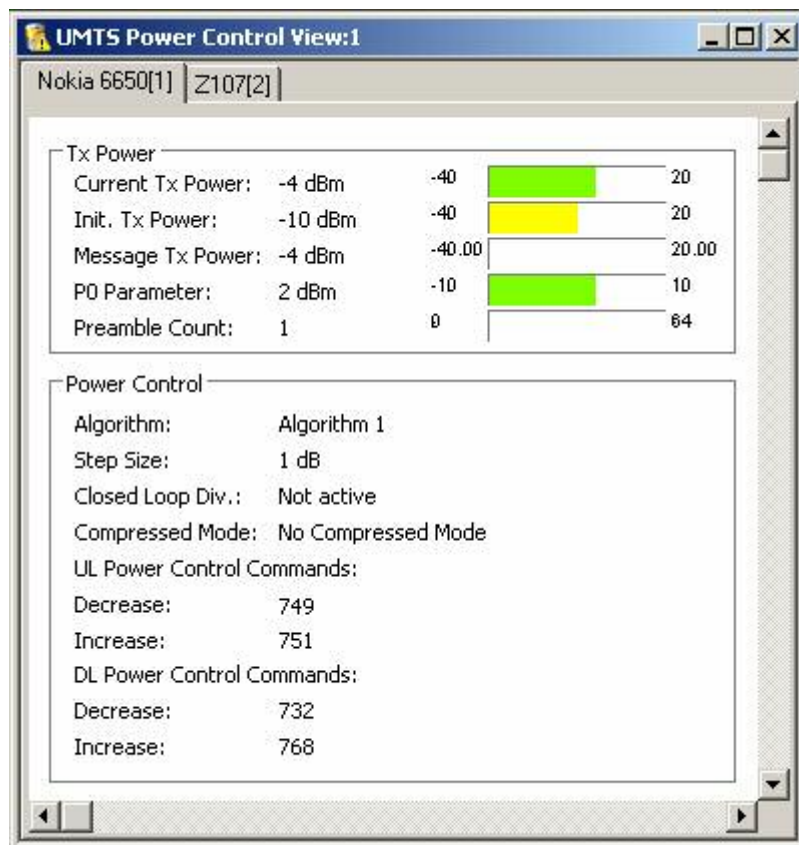


Fig. 4-100 UMTS Power Control View

The results for each mobile are arranged in a separate tab. Each tab consists of two panels.

Tx Power Series of bar graphs showing the transmitter output power parameters of the UMTS mobile during its last random access procedure. The parameters are updated after each random access procedure.

Current Tx Power

Current Tx power of the mobile in dBm.

Init. Tx Power

1st PRACH preamble power

Message Tx Power

Tx power after the end of the preamble sequence, used for transmission of the RACH message part.

P0 Parameter

Optional downlink power control parameter. If P0 is not present, then downlink power control is not used.

Preamble Count

Number of PRACH preambles transmitted by the test mobile

Power Control Table of closed loop power control parameters. The parameters are updated while a connection is maintained.

Algorithm

Power control algorithm used to control the uplink power. Algorithm 1 means that the mobile power changes after each slot by the *Step Size*. Algorithm 2 means that the mobile power only changes if the same Transmit Power Control (TPC) command is received in a group of 5 consecutive slots.

Step Size

Power step that the mobile transmitter performs according to the received TPC pattern and the power control algorithm.

Close Loop Div.

Information whether the mobile uses closed loop mode transmit diversity.

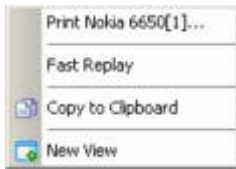
Compressed Mode

Information whether the mobile operates in compressed mode. In compressed mode the mobile transmitter is switched off in periodic gaps so that the mobile can monitor UMTS and GSM neighbor cells.

UL/DL Power Control Commands

Total number of power-down (decrease) and power-up (increase) commands among the last 1500 transmit power control (TPC) commands. If power control algorithm 1 is active, the difference between both DL numbers indicates the net power change of the mobile.

Context menu



A right mouse click on any point in the view opens the context menu to print the view contents, (de-)select the view for fast replay, copy the current view to the clipboard, or to create new views; see [Context menu](#) description on p. 4.2.

The UMTS Power Control View has no configuration menu assigned. The Info tab can be accessed via the Configuration – Settings command.

UMTS Layer 1 Graph View

The *UMTS Layer 1 Graph View* contains a Cartesian diagram to display UMTS or GSM layer 1 parameters as a function of time. It corresponds to the *2D Chart View* (described on p. 4.10) with a special selection of signals in the configuration menu. The controls in the view, in the context menu, and in the configuration menu are identical with the *2D Chart View*.

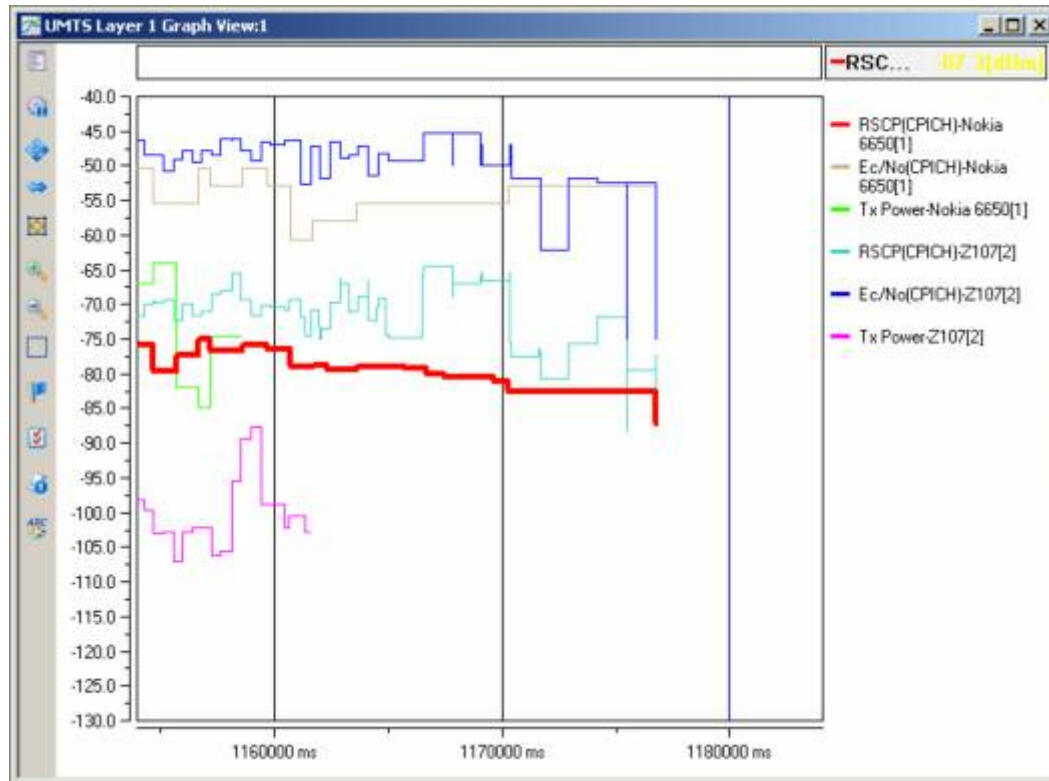


Fig. 4-101 UMTS Layer 1 Graph View

UMTS Neighborhood Analyzer View

The *UMTS Neighborhood Analyzer View* shows the results of the neighborhood analysis of option R&S ROMES-U1. The aim of this analysis is to reveal possible conflicts between the current best server and the transmitters in the neighborhood in order to assess the general condition of a UMTS / GSM network. To this end the neighborhood analyzer post-processes PN scanner, UMTS test mobile, and/or GSM scanner data and compares them with the information stored in a Node B and BTS data base (see description of ATD files in chapter 7, in particular the neighbor cell columns 2GNC and 3GNC). In case of a mismatch between the detected Node Bs and the Node Bs in the data base, an alarm is generated. The same holds if a missing neighbor of the best server or a potential interferer is found.

The neighborhood analysis requires option R&S ROMES-U1, *Handover and Neighborhood Analysis*. PN scanner data recorded with a R&S TSMU are needed; moreover the R&S TSMU must be equipped with option R&S TSMU-K14, *BCH Demodulation*, in order to decode the SIB type 11 blocks received from the UMTS node Bs (see description of the UMTS PNS driver configuration menu in chapter 6). Data from a UMTS test mobile and GSM scanner data can be used in addition to refine and extend the analysis.

The neighborhood analyzer is a performance-critical tool which must be activated explicitly in the *UMTS/GSM Neighborhood Analyzer View* configuration menu.



The *UMTS/GSM Handover Analysis*, which is also part of option *R&S ROMES-U1*, is evaluated in the *UMTS/GSM Handover Analyzer View*; see p. 4.295.

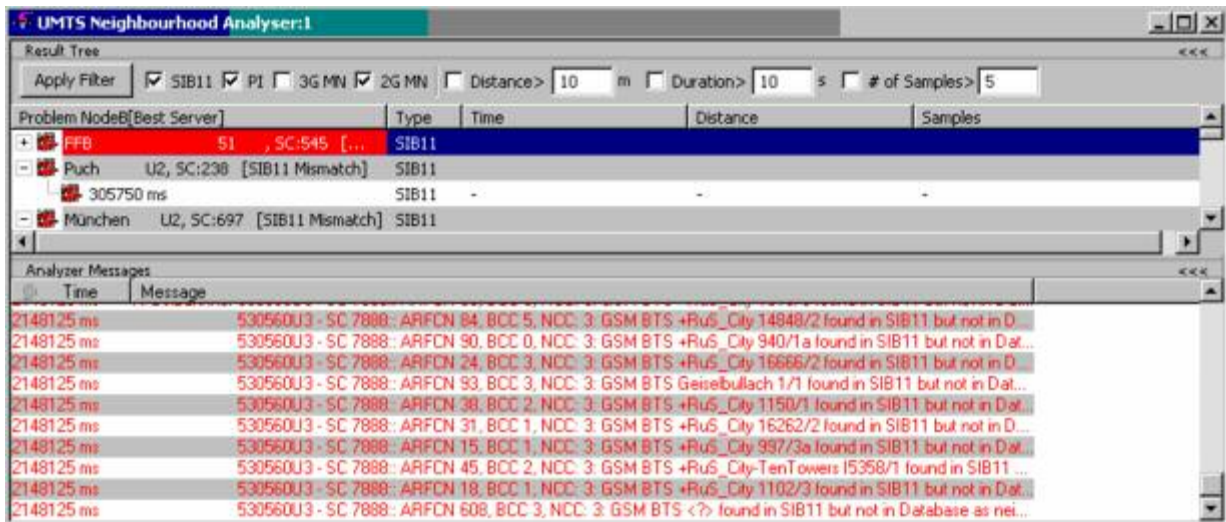


Fig. 4-102 UMTS Neighborhood Analyzer View

Neighborhood analysis

The PN scanner results for a particular top N pool (configured in the UMTS PNS driver configuration menu and selected for the neighborhood analysis using the *UMTS Neighborhood Analyzer View*) provide the essential data for the neighborhood analysis. The analysis involves several steps:

1. The top N pool member with the strongest CPICH level (1st top N member) is rated as the best server; its UARFCN, SC, and geographical position (and CI, if the PN scanner is able to decode the SIB3) is compared with the entries in the node B data base.
2. If possible, the SIB11 of the best server is decoded, and the neighbors list is compared with the neighbors list in the node B data base.
3. For the remaining top N members the analyzer checks whether they are missing neighbors or potential interferers; see below.

The results are updated whenever the top N pool members change. R&S ROMES creates one of the events described below whenever a problem is detected. The conditions for the analysis can be modified in the *UMTS Neighborhood Analyzer View*.

Node B not found

A *Node B not found in database* event can be generated in step 1 of the analysis: The detected best server is not listed in the node B data base.



SIB11 mismatch

An *SIB11 mismatch* can be detected in step 2 of the analysis: A particular node B is found in the data base but not in the SIB11 or vice versa.



**Missing neighbor/
Potential interferer**

Node Bs that are detected with sufficient signal strength but not listed as neighbors can be missing neighbors or potential interferers. They are detected in step 3 of the analysis. The conditions for potential interferers and missing neighbors are defined in the view configuration menu; see description of the [Active Set Parameters](#) on p. 4.172.

View

The view is divided into an upper *Result Tree* and a lower *Analyzer Messages* section. A click on one of the title bars shows or hides the corresponding section. A hidden section leaves more space for the other section. A hidden section is characterized by the symbol >>> (instead of <<<) in the title bar. On pausing on the title bar, the cursor displays a compress symbol.

Result tree: Filter

The checkboxes across the top of the result tree define filter conditions for the problem nodes displayed in the result tree. E.g. if *SIB11* is cleared, all problem nodes of type *SIB11* mismatch are not displayed in the tree.

Apply Filter updates the result tree in accordance with the current filter conditions.

Result tree

The result tree consists of the following columns:

Problem Node B [Best Server]

Name of the best server for which a problem occurred together with the scrambling code (SC, for UMTS node Bs) and description of the problem. GSM base stations (if available) are listed with their name, BCCH, and BSIC. Detailed information (e.g. the time when the problem node was detected) is listed below the problem node. It is possible to expand or collapse the detailed information for a single problem node (click the + / – symbols or double-click the line) or all handovers (use the context menu).

Type

Short description of the problem type, e.g. *SIB11* for SIB11 mismatch.

The remaining columns are used for missing neighbors and potential interferers:

Time

Time during which a neighbor was classified as a missing neighbor or potential interferer. The accuracy depends on the time and distance trigger settings in the view configuration menu; see below.

Distance

Covered distance during which a neighbor was classified as a missing neighbor or potential interferer. The accuracy depends on the time and distance trigger settings in the view configuration menu; see below.

Samples

Number of samples acquired while a neighbor was classified as a missing neighbor or potential interferer.

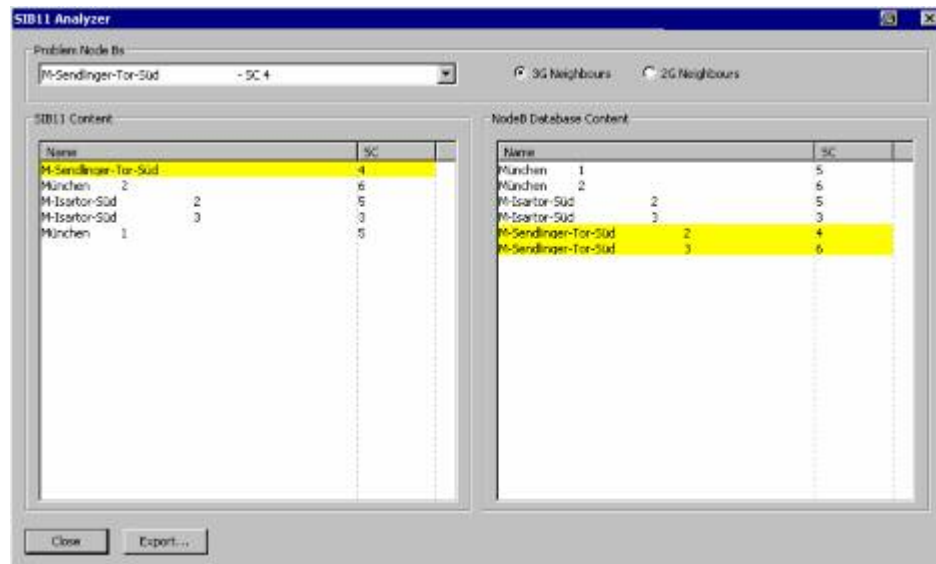
Analyzer Messages

The Analyzer Messages section shows the problem report in chronological order (Time). A Message is generated whenever a problem is detected.

- For a *Node B not found* event, the name, UARFCH, and SC of the node B is listed.
- For the other events, a pair of best server and neighbor (2nd to Nth element of the top N pool) is displayed.

Further analysis

The *SIB11 Analyzer...* command in the context menu (see below) opens an overview of all node Bs / base stations decoded from the SIB11 of the best server, and all node Bs / base stations in the Bs / BTS data bases. Node Bs and base stations that are not listed in both the SIB11 and the data base appear on a colored background.



The *SIB11 Analyzer* dialog provides the following control elements:

Problem Node Bs

Selects the best server for which the neighbors are shown.

3G / 2G Neighbors

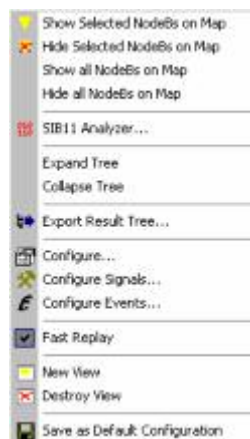
Changes between Node B and GSM BTS display in the *SIB11 Content* and *Node B Database Content* lists.

Export

Selects a file for exporting the contents of the *SIB11 Analyzer*. The export file is an ASCII table in *.csv format that can be opened and processed by Excel. The table contains all problem node Bs together with the corresponding *SIB11 Content* and *Node B Database Content*. Node Bs and base stations that are not listed in both the SIB11 and the data base are preceded by **!!!!**.

A shorter export file can be generated from the context menu; see below.

It is also instructive to monitor the measurement route and the node Bs / base stations in the [Route Track](#) view (see p. 4.47). Best servers, potential interferers, and missing neighbors can be displayed with different colors using the Show Node Bs/BTSs on Map command in the context menu. The color code can be configured in the UMTS/GSM Neighborhood Analyzer View configuration menu; see below.

Context menu

A right mouse click on any point in the view opens the context menu to access the configuration menus, (de-)select the view for fast replay, copy the current view to the clipboard, create or delete views, activate the fast replay mode, save the current configuration, or move to another worksheet; see [Context menu](#) description on p. 4.2. The context menu provides the following additional, view-specific commands:

Show Node B...

Use the color code defined in the *UMTS/GSM Neighborhood Analyzer View* configuration menu (see below) to visualize the best servers, potential interferers, and missing neighbors in the *Route Track* view. This feature is only available while a best server is selected in the result tree. The UMTS layer / GSM BTS layer in the *Route Track* view must be visible to use this feature.

Hide Node B...

Remove the previous action, display the selected cell symbol with standard colors.

Show all Node B...

Display all cell symbols with the color code defined in the *UMTS/GSM Neighborhood Analyzer View* configuration menu.

Hide all Node B...

Display all cell symbols with standard colors.

SIB 11 Analyzer...

Open the *SIB11 Analyzer* dialog described above.

Expand/Collapse Tree

Show or hide the additional information for each best server in the *Results Tree*.

Export...

Export the information in the result tree or in the message list to a *.csv export file that can be opened and processed by Excel. An extended export file can be generated from within the *SIB11 Analyzer* dialog; see above.

UMTS/GSM Neighborhood Analyzer View Configuration

The *UMTS/GSM Neighborhood Analyzer View* configuration menu enables the neighborhood analyzer, defines criteria for the analysis, and specifies the color scheme for the Node B / BTS symbols in the *Route Track View*. It is opened via a right mouse click on a point inside *UMTS/GSM Neighborhood Analyzer View* or via the *Configuration – Settings* command (see chapter 3).

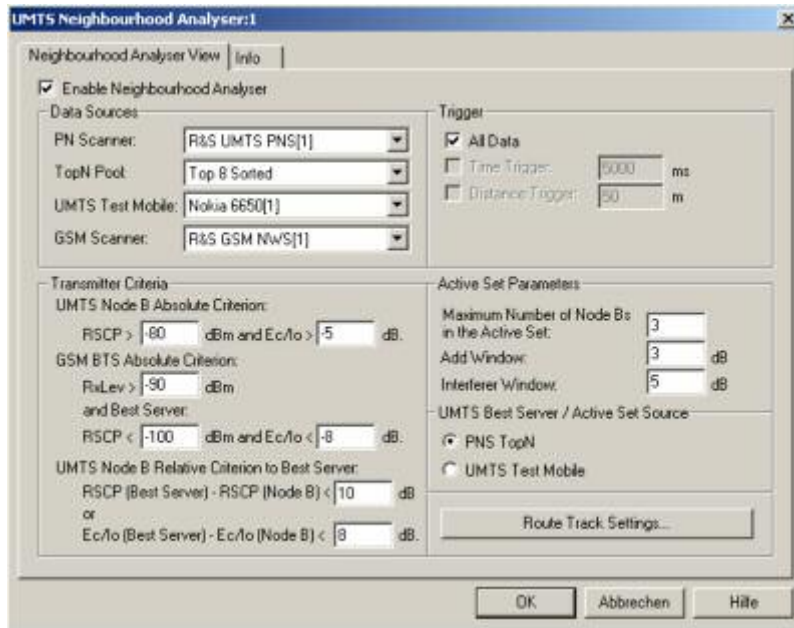


Fig. 4-103 UMTS/GSM Neighborhood Analyzer View: Configuration

Enable Neighborhood Analyzer

The neighborhood analyzer must be enabled explicitly in order to post-process the measured data and obtain the results in the *UMTS Neighborhood Analyzer View*.

For this option a separate licence is required, otherwise it cannot be enabled.

This holds for the data viewed during the measurement tour as well as for replayed measurement files. The *UMTS Neighborhood Analyzer View* is empty if the neighborhood analyzer is disabled.

The necessary hardware drivers must be loaded or a measurement (.cmd) file must be open in order to enable the neighborhood analyzer, select the data sources, or define the criteria for the analysis. After starting up R&S ROMES, only the *Route Track Settings* are accessible.

Data Sources The four drop-down lists in the *Data Sources* panel contain all UMTS and GSM test devices involved in the measurement. The lists are populated when the device drivers are loaded or when a measurement file is opened for replay.

Note:

The neighborhood is automatically disabled when the selected data sources are no longer available, e.g. because a new measurement file is loaded.

PN Scanner and Top N Pool

The neighborhood analysis requires a PN scanner with a *Top N* pool containing the N observed Node Bs with the strongest signal level. The top N pools can be configured in the *UMTS PNS* driver configuration menu as described in chapter 6.

UMTS Test Mobile

Use of an UMTS test mobile in addition to the PN scanner is optional. The test mobile can be used to determine (and possibly replace) the best server and the cells in the active set otherwise determined by the PN scanner; see *UMTS Best Server / Active Set Source* below.

GSM Scanner

A GSM scanner is only required if GSM base stations are to be included in the neighborhood analysis. GSM scanner data can be provided by a GSM test mobile in *Scan* mode or by a GSM network scanner.

Note:

In addition to the measured data the neighborhood analysis requires a node B list and a (separate) GSM BTS list with included neighbor cell information (see description of ATD files in chapter 7). For a unique identification of the node Bs the list must contain the columns named 2GNC (for GSM BTS lists) and 3GNC (for UMTS BTS lists). The column 2GNC must contain the LAC, MNC, and MCC of each GSM BTS. The column 3GNC must contain MNC, MCC, CI, and LAC. The import of node B and BTS list files is described in chapter 3.

Trigger

The PN scanner provides the top N pool data in periodic intervals (up to once per second for the R&S TSMU). Trigger settings can reduce the amount of data considered and speed up the analysis.

All

Evaluate all top N data sets provided by the PN scanner.

Time Trigger

Evaluate a new top N data set only after the specified time has elapsed.

Distance Trigger

Evaluate a new top N data set only after the test vehicle has covered the specified distance.

Transmitter Criteria

To limit the amount of data processed, UMTS node Bs or GSM base stations are only considered if their signal strength exceeds a specified limit. R&S ROMES provides absolute criteria that every node B and BTS must fulfill and relative criteria for the elements no. 2, ..., N of the top N pool.

UMTS Node B Absolute Criterion

Minimum Received Signal Code Power of the DL P-CPICH (*CPICH RSCP*) and minimum ratio of the received energy per PN chip of the DL P-CPICH to the total transmit power spectral density (*Ec/Io*).

GSM BTS Absolute Criterion

Minimum received signal level (RxLev) at the GSM test mobile. An additional condition is that the best UMTS server is so weak that a GSM handover is likely to occur.

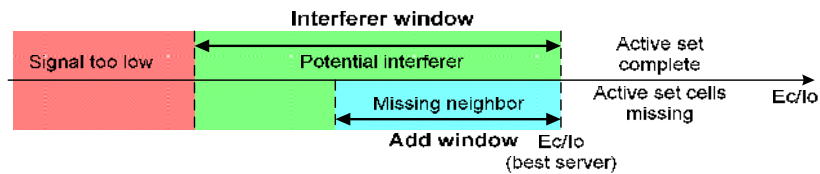
UMTS Node B Relative Criterion to Best Server

Maximum difference between the best server *RSCP* or *Ec/Io* and the *RSCP* or *Ec/Io* of any other node B in the top N pool. If both limits are exceeded the signal strength of the node B is deemed too low so that the node B is excluded from the analysis.

Active Set Parameters

The *Active Set Parameters* provide the criteria for classifying the node Bs no. 2, ..., N of the top N pool. Each of these node Bs can be a *missing neighbor* or a *potential interferer*, provided it is detected with a sufficient signal strength (i.e. it meets the *Transmitter Criteria* described above) and is **not** listed as a neighbor in the node B data base.

- A UMTS cell is a *missing neighbor* if its CPICH *Ec/Io* is within the *add window* **and** if the number of cells in the active set is below a specified *maximum number*.
- A cell is a *potential interferer* if it does not meet the criteria for a *missing neighbor* and if its CPICH *Ec/Io* is within the *interferer window*. GSM cells can be potential interferers but no missing neighbors.



Maximum Number of Node Bs...

Size of the active set. If the actual number of Node Bs in the active set is below this maximum number, a node B which is of listed in the SIB11 can be a *missing neighbor*.

Add Window

Size of the *add window* in dB; see figure above.

Interferer Window

Size of the *interferer window* in dB; see figure above.

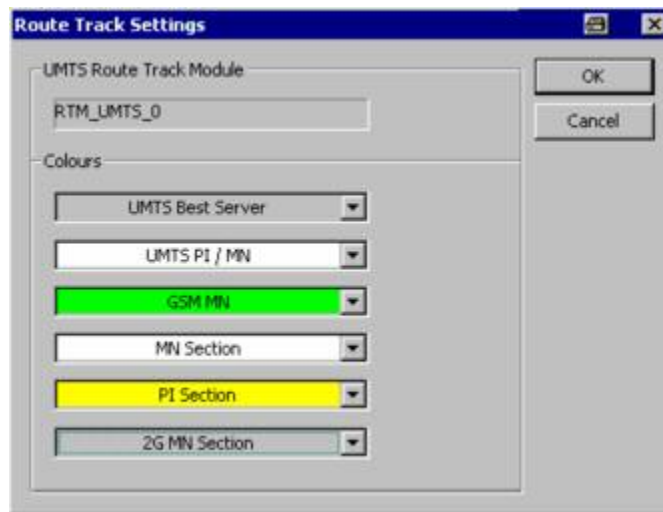
UMTS Best Server / Active Set Source

The best server and the cells in the active set are usually determined by the PN scanner. The best server corresponds to the first element of the top N pool.

As an alternative, it is possible to use the best server and active set determined by a UMTS test mobile. This can be desirable e.g. if the test mobile is suspected to assess the network conditions more realistically.

Route Track Settings

The *Route Track Settings...* button opens a dialog to define the color scheme for the Node B / BTS symbols in the *Route Track View*.



The *UMTS Route Track Module* panel is reserved for future extensions. The *Colours* distinguish the following UMTS Node Bs and GSM base stations:

UMTS Best Server

UMTS best server

UMTS PI/MN

UMTS potential interferers and missing neighbors

GSM MN

GSM missing neighbors

The remaining color codes are used for the sections of the route that correspond to the problem node B selected in the *Problem Node (Best Server)* list.

1xEV-DO Views

The *1xEV-DO Views* show 1xEV-DO-specific information included in the measurement data of 1xEV-DO mobiles. 1xEV-DO data can be acquired using one of the CDMA2000/1xEV-DO drivers described in chapter 6. Before a measurement is recorded, data acquisition for most views must be explicitly enabled in the *Define Measurement* tab of the CDMA2000 configuration menu (for an overview see chapter 6).

The 1xEV-DO views can be selected from a submenu displayed on the right side of the *View* menu when the mouse pauses over *1xEV-DO Views*.

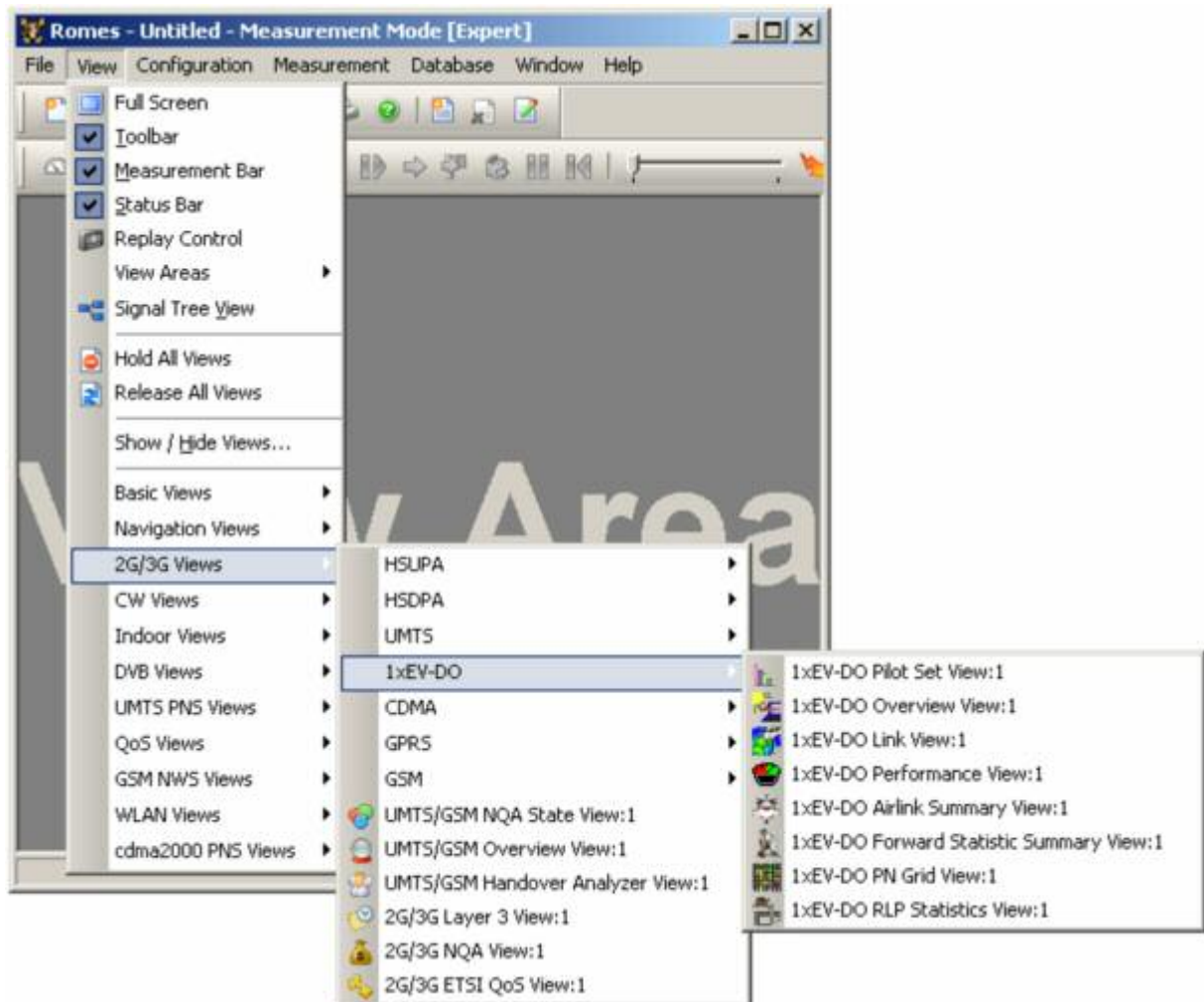


Fig. 4-104 1xEV-DO views

1xEV-DO Pilot Set View

The *1xEV-DO Pilot Set View* contains a list and a bar graph showing the pilot channel signal strength from the active and several neighbor base stations. The diagram is empty unless the *Pilot Sets* check-box in the *Define Measurement* tab of the Expert Mode tab of the corresponding Qualcomm Driver (e.g. for the Z720) menu is enabled.

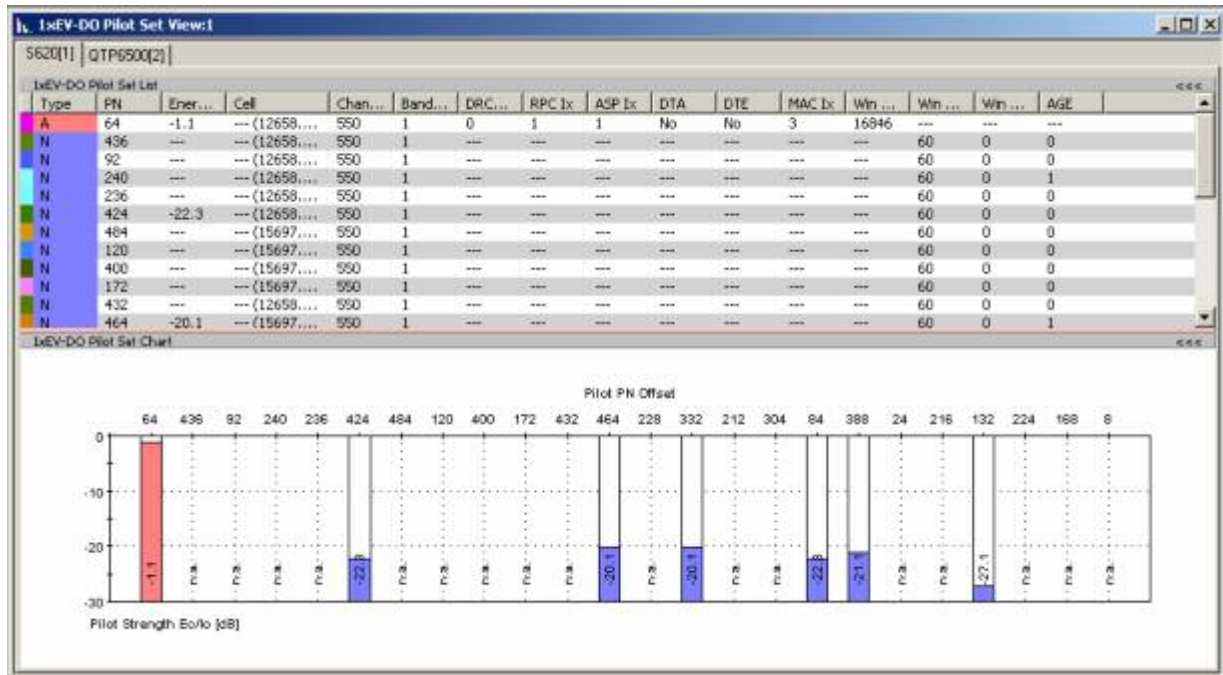


Fig. 4-105 1xEV-DO Pilot Set View

Pilot Set List

The 1xEV-DO Pilot Set List panel displays the following information:

Type

Cell type as detected by the test mobile: active (A), neighbor (N), or candidate (C)

PN

The pilot PN sequence offset for the current sector in units of 64 PN chips.

Energy (dB)

Measured strength of the pilot per chip (in dB).

Cell

Name of the cell

Channel

1xEV-DO pilot channel number

BandClass

The band class number corresponding to the frequency assignment of the specified channel

DRCCover

Index of the DRC cover associated with the measured sector used to transmit DRC.

<i>RPC Ix</i>	Reverse Power Control Index
<i>ASP Ix</i>	Active Set Pilot Index
<i>DTA</i>	The drop timer is activated whenever the measured pilot strength becomes less than the value threshold of the pilot drop. If the strength of the pilot returns above the pilot drop threshold before the timer expires, the pilot drop timer is reset. DTA (Drop Timer Active) indicates whether or not the drop timer is active.
<i>DTE</i>	(Drop Timer Expired) indicates whether or not the drop timer is expired.
<i>MAC Ix</i>	The 7-bit MAC Index for each pilot in the active set, ranging from 0 to 127.
<i>Win Center</i>	For the active set, the search window is centered around the earliest usable multipath component for pilots. For neighbor sets, the search window is centered around the pilot PN sequence offset plus the search window offset.
<i>Win Size</i>	The search window size is specified by attribute for pilots in the active set and candidate set. For each pilot in the neighbor set, the search window size specified by the corresponding neighbor structure in the route update neighbor list is shown.
<i>Win Offset</i>	The displayed search window offset is defined by the corresponding neighbor structure in the route update neighbor list.
<i>AGE</i>	Maximum AGE value beyond which members from the neighbor set are dropped



A click on the arrows in the title row of the *Pilot Set List* closes the display panel of the list.

Pilot Set Chart

The diagram is a bar graph showing the relative strength of a variable number of pilot, candidate and neighbor cell signals. The 1xEV-DO channel numbers of the signals are indicated above the bars. The channel strength is expressed as the ratio E_c/I_o in dB where E_c denotes the chip energy of the pilot signal, I_o denotes the noise level. The diagram has a fixed y-axis scale of -30 dB to -0 dB.

The update rate of the diagram and the number of signals displayed depend on the mobile station and its operating conditions.



A click on the arrows in the title row of the *Pilot Set Chart* closes the display panel of the diagram.

Context menu

A right mouse click on any point in the view opens the context menu to access the configuration menus, (de-)select the view for fast replay, copy the current view to the clipboard, or to save the current configuration; see [Context menu](#) description on p. 4.2.

1xEV-DO Pilot Set View Configuration

The *1xEV-DO Pilot Set View* configuration menu defines the list settings, chart cell colors and shows information on the current view version. It is opened via a right mouse click on a point inside the *1xEV-DO Pilot Set View* or via the *Configuration – Settings* command (see chapter 3).



Fig. 4-106 1xEV-DO Pilot Set View configuration: Pilot View

List Settings

The *List Settings* panel offers checkboxes to select the elements displayed in the Pilot Set view.

Chart Settings

With the *Chart Settings* panel the colors for the pilot set cell types (active, candidate, neighbor) can be defined.

Min./Max.

With the *Min./Max.* selection field the y-axis scale of the 1xEV-DO pilot set chart can be defined within the range between -30 dB to 0 dB.

The *Color Settings* tab sets the color scale for the possible PN offsets.

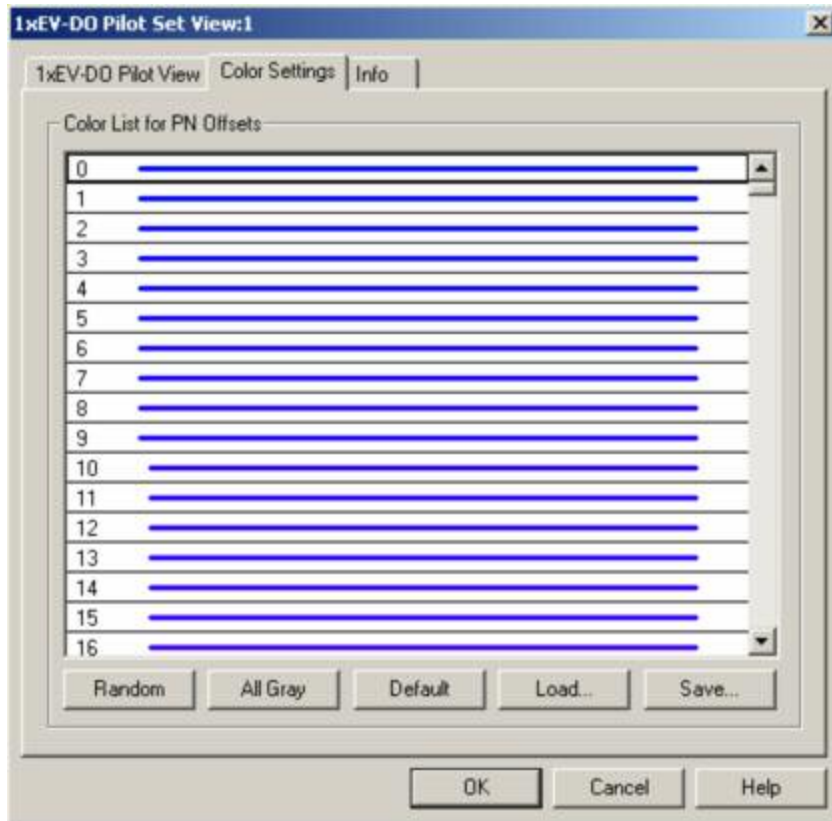


Fig. 4-107 1xEV-DO Pilot Set View configuration: Color Settings

The colors are displayed in the diagram (power peaks) and in the first table column (pilot set list). A double-click on a line in the *Color List* opens the *Colors* dialog (see p. 4.351) to change the current display color.

Random

No ordering; colors are assigned to the PN offsets at random.

All Gray

Color scale suppressed; all colors are gray. This option is suitable e.g. to distinguish a single PN offset (or a small number of PN offsets), colored different, from all other codes, colored gray.

Default

Predefined color scale: Colors change continuously as the PN offsets increase.

Load/Save

A color scale can be loaded from an SC color file (*.scc) and user-defined color scales can be stored to *.scc files to be reused in a later session.

1xEV-DO Overview View

The 1xEV-DO Overview view displays a summary of the test mobile state, power/quality, sector, airlink quality results, and, if applicable, results from a connected 1xEV-DO PN scanner.

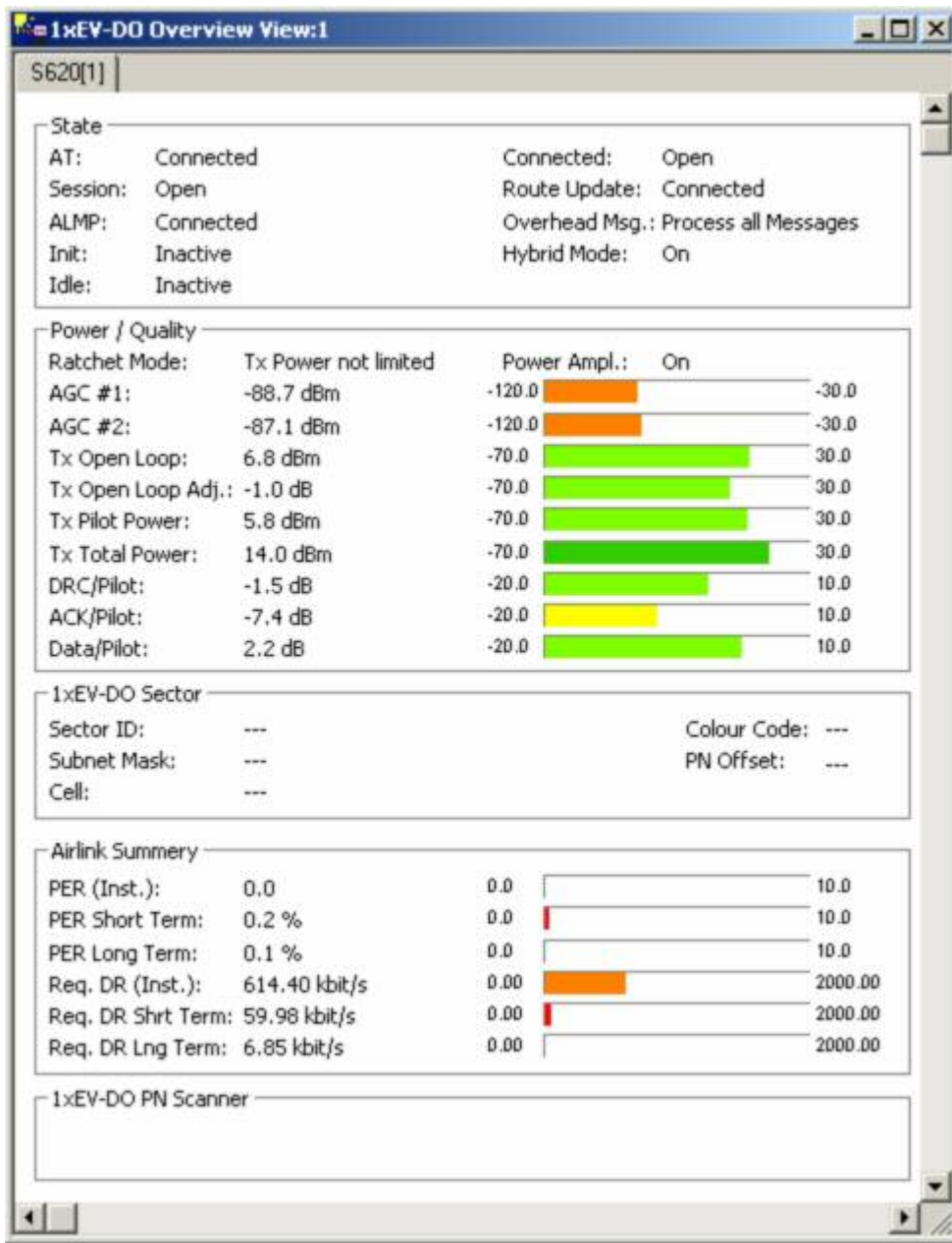


Fig. 4-108 1xEV-DO Overview View

The 1xEV-DO PN Scanner field group is only filled if an actual scanner is configured and running.

State	The 1xEV-DO state parameters of the access terminal and the traffic session on the connection layer are arranged in a field with 2 columns: Some of the parameters may not be provided by all test mobiles.
<i>AT</i>	Signaling state of the access terminal.
<i>Session</i>	State of the current session.
<i>ALMP</i>	The Air Link Management protocol (ALMP) maintains the overall connection state in the AT and the AN. The protocol can be in one of three states, corresponding to whether the AT has yet to acquire the network (Initialization State), has acquired the network but the connection is closed (Idle State), or has an open connection with the AN (Connected State).
<i>Init</i>	The Initialization State Protocol provides the procedures that an AT follows to acquire a network and that an AN follows to support network acquisition. It has the possible states <i>Inactive</i> , <i>Network Determination</i> , <i>Pilot Acquisition</i> , or <i>Synchronization</i>
<i>Idle</i>	In the Idle State, the AT autonomously maintains the Active Set. Route update messages from the AT to the AN are based on the distance between the current serving sector of the AT and the serving sector at the time the AT last sent an update. It has the possible states <i>Inactive</i> , <i>Sleep</i> , <i>Monitor</i> , and <i>Connection Setup</i> .
<i>Connected</i>	State of the Connected State protocol (ALMP) of the radio link between mobile and access terminal (Open / Inactive/ Close).
<i>Route Update</i>	State of the Route Update Protocol, which performs the actions associated with keeping track of an AT location and maintaining the radio link between the AT and the AN (.Connected / Idle / Inactive).
<i>Overhead Msg.</i>	This protocol performs supervision on the messages necessary to keep the Connection Layer functioning. It can be in two states: <i>Wait for link</i> (Inactive) or <i>Process all Messages</i> (Active).
<i>Hybrid Mode</i>	If the mobile station is able to support services on both the IS-2000/IS-95 (CDMA) and IS-856 (1xEV-DO) systems, a hybrid mode MS/AT can connect services available on either system. This is useful to e.g. to monitor voice calls when in a 1xEV-DO data connection.

Power / Quality	<p>The field group displays a summary of power and quality measurement-related results:</p> <p><i>Ratchet Mode</i> The RatchetMode register shows the state of the Tx power limiting: 0 – Tx power not limited 1 – Tx power is limited</p> <p><i>Power Ampl.</i> Power amplification (On/Off)</p> <p><i>AGC #1/2</i> Automatic Gain Control, the field shows the total receive power as seen by antenna 1/2</p> <p><i>Tx Open Loop</i> The Tx power determined by the open loop adjust mechanism (range is –70 to +30 dBm)</p> <p><i>Tx Open Loop Adj.</i> Open loop adjustment value (dB).</p> <p><i>Tx Pilot Power</i> The Tx power determined by the closed loop adjust mechanism (range is –70 to +30 dBm). The value represents the pilot power that is transmitted over the pilot channel; this is calculated based on the Tx Open Loop power and the Tx Closed Loop Adjustment.</p> <p><i>Tx Total Power</i> Tx Total Power holds the total Tx power as determined by the entire Tx AGC mechanism (range –70 to +30 dBm).</p> <p><i>DRC/Pilot</i> DRC channel gain</p> <p><i>ACK/Pilot</i> ACK channel gain</p> <p><i>Data/Pilot</i> Data channel gain</p>
1xEV-DO Sector	<p>The measured 1xEV-DO sector data and sector-related settings are displayed in this field group:</p> <p><i>Sector ID</i> This field displays the 128-bit sector address of the serving sector</p> <p><i>Subnet Mask</i> The sector subnet identifier (default 104). The AN sets this field to the number of consecutive 1's in the subnet mask of the subnet to which the corresponding sector belongs.</p> <p><i>Cell</i> Number of cells in the active set.</p> <p><i>Color Code</i> The color code corresponding to the related sector.</p> <p><i>PN Offset</i> <i>PN Offset</i> sets the offset of the PN sequence. Changing the PN offset (default 0) changes the timing of the short code spreading, the contents of the Sync message on the Control Channel.</p>

Airlink Summary The field group shows the receiver quality-related measurement information:

PER (Inst.)

Current Packet Error Rate

PER Short Term

Short-term Packet Error Rate

PER Long Term

Long-term Packet Error Rate

Req. DR (Inst.)

Currently requested Data Rate

Req. DR Shrt Term

Short-term Data Rate as defined by Qualcomm

Req. DR Lng Term

Long-term Data Rate as defined by Qualcomm

Part of the information on this view is also displayed in the [1xEV-DO Airlink Summary View](#); see p. 4.192 .

1xEV-DO PN Scanner

If a 1xEV-DO PN scanner is configured and running, this panel displays the Top Ns of the scanner..

The *1xEV-DO Overview* view has no context menu for configurations assigned. The *Info* tab can be accessed via the *Configuration – Settings* command.

1xEV-DO Link View

The *1xEV-DO Link View* shows the attempt-related information for access, connection and session attempts.

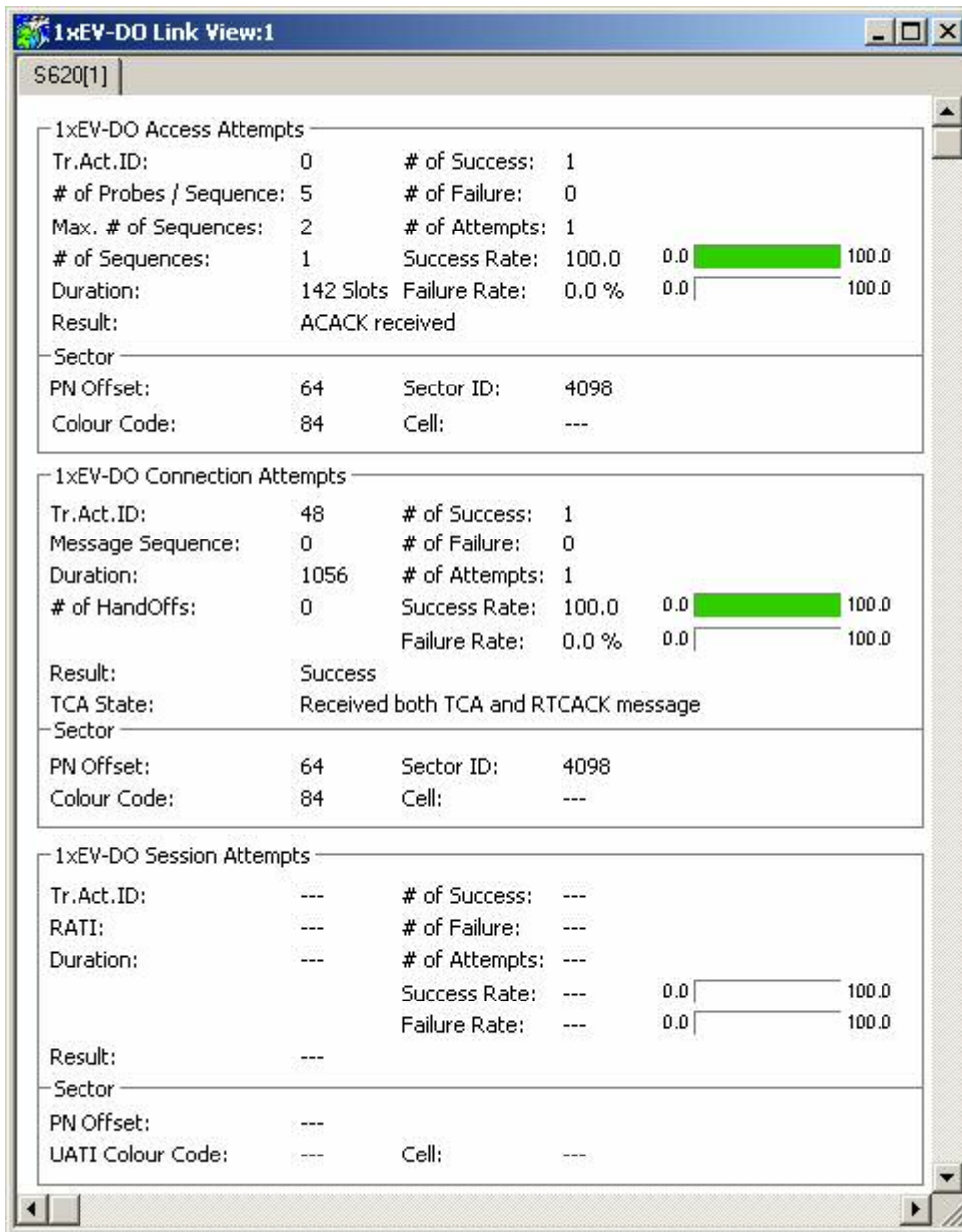


Fig. 4-109 1xEV-DO Link View

The measurement results for each attempt are arranged in a separate panel. The panels show the attempt information first, then the relevant sector parameters are appended.

1xEV-DO Access Attempts The *1xEV-DO Access Attempts* panel display the summary of the access attempt-related measurement results:

Tr.Act.ID

Transaction ID of the connection request sent by the AT.

of Probes / Sequence

Access Probes allow the setting of the AN to ignore or acknowledge the access probes from the AT, where "Acknowledge" is the default value. The AT transmits access probes during its power on cycle, at the AN timer based registration setting and when the AT initiates a call. This column shows the number of probes in the current measurement sequence.

Max. # of Sequences

Maximum number of test sequences.

of Sequences

Number of actually transmitted access test sequences.

Duration

Indication of the time needed for successful access attempts.

Result

Result indication of the access attempt:

- 0 – ACAck not received
- 1 – ACAck received
- 2 – TCA message received
- 3 – Probe Interrupted

Other values are reserved

of Success

Number of successful access attempts.

of Failure

Number of unsuccessful access attempts.

of Attempts

Total number of access attempts.

Success Rate

Percentage of successful access attempts relative to the total number of access attempts. The success rate percentage is also shown as a histogram chart which is colored according to the rate result.

Failure Rate

Percentage of successful access attempts relative to the total number of access attempts. The failure rate percentage is also shown as a histogram chart which is colored according to the rate result.

Sector – PN Offset

PN of the sector that sends the ACAck or the TCA message. If the *Result* field equals 0 or 3, then this field is reserved.

Sector – Colour Code

Sector Colour Code on which the access probe was sent.

Sector – Sector ID

Sector ID on which the access probe was sent.

Sector – Cell

Number of the active cell.

1xEV-DO Connection Attempts The *1xEV-DO Connection Attempts* panel display the summary of the connection attempt-related measurement results:

Tr.Act.ID

Transaction ID associated with the *ConnectionDeny* message. If there is no response from the AN or a *ConnectionDeny* message is not received, this field represents the Transaction ID that was used to send the *ConnectionRequest* message.

Message Sequence

The message sequence present in the received TCA message. This field is valid only if a TCA message is actually received, that is, if the most significant nibble of result field equals 1 or 2.

Duration

Time (in slots) needed to complete the attempt

of Handoffs

Number of handoffs during the connection attempt analysis.

Result

The least significant nibble of this field indicates the following possible connection attempt outcomes:

- 0 – ConnectionDenyReceived with DenyReason "General"
- 1 – ConnectionDenyReceived with DenyReason "Network Busy"
- 2 – ConnectionDenyReceived with DenyReason "Authentication or billing failure"
- 3 – Maximum access probes
- 4 – System lost (supervision failures)
- 5 – Not preferred (SD told OVHD to switch systems, QC redirect, Access network ID)
- 6 – Redirect (ALMP received a redirect message)
- 7 – Connection setup timeout
- 8 – PowerDownReceived
- 9 – OfflineReceived
- A – NAMChangeReceived
- B – UserAbort
- C – AccessHandoff
- D through E – Reserved
- F – Success

The most significant nibble of this field indicates the following reception status of the TCA and RTCACK messages:

- 0 – Not received either TCA or RTCACK message
- 1 – Received TCA message but not received RTCACK message
- 2 – Received both TCA and RTCACK messages

TCA State

The most significant nibble of this field indicates the following reception status of the TCA and RTCACK messages:

- 0 – Received neither TCA nor RTCACK message
- 1 – Received TCA message but not RTCACK message
- 2 – Received both TCA and RTCACK messages

- # of Success*
Number of successful connection attempts.
- # of Failure*
Number of unsuccessful connection attempts.
- # of Attempts*
Total number of connection attempts.
- Success Rate*
Percentage of successful connection attempts relative to the total number of connection attempts. The success rate percentage is also shown as a histogram chart which is colored according to the rate result.
- Failure Rate*
Percentage of successful connection attempts relative to the total number of connection attempts. The failure rate percentage is also shown as a histogram chart which is colored according to the rate result.
- Sector – PN Offset*
If the *Result* field indicates that a *ConnectionDeny* message was received then the PN Offset represents the PN of the sector that sent the *ConnectionDeny* message. If the *Result* field indicates that a TCA message was received then it represents the PN of the sector that sent the TCA message. For all other cases, it represents the PN of the sector at the time when the connection setup failed.
- Sector – Color Code*
Sector Colour Code on which the access probe was sent.
- Sector – Sector ID*
Sector ID on which the access probe was sent.
- Sector – Cell*
Number of the active cell.

1xEV-DO Session Attempts

The *1xEV-DO Session Attempts* panel display the summary of the session attempt-related measurement results:

- Tr.Act.ID*
Transaction ID associated with the UATI request message
- RATI*
Random Access Terminal Identifier
- Duration*
Time (in slots) needed to complete the attempt
- Result*
Result indication of the session attempt:
0 – Received UATIAssignment message
1 – Did not receive UATIAssignment message
- # of Success*
Number of successful session attempts.
- # of Failure*
Number of unsuccessful session attempts.
- # of Attempts*
Total number of session attempts.
- Success Rate*
Percentage of successful session attempts relative to the total number of session attempts. The success rate percentage is also shown as a histogram chart which is colored according to the rate result.
- Failure Rate*
Percentage of unsuccessful session attempts relative to the total number of session attempts. The failure rate percentage is also shown as a histogram chart which is colored according to the rate result.
- Sector – PN Offset*
PN of the sector that sent the UATI assignment message.
- Sector – UATI Color Code*
Color code of the Unicast Access Terminal Identifier
- Sector – Cell*
Number of the active cell.

Context menu

A right mouse click on any point in the view opens the context menu to print the view data, access the configuration menus, (de-)select the view for fast replay, copy the current view to the clipboard, or to save the current configuration; see [Context menu](#) description on p. 4.2.



The *1xEV-DO Link View* has no specific context menu for configurations assigned. The *Info* tab can be accessed via the *Configuration – Settings* command.

1xEV-DO Performance View

The *1xEV-DO Performance View* contains four preconfigured 2D charts. The signals in these charts are related to the transmission performance, given in terms of the requested or achieved data throughput.

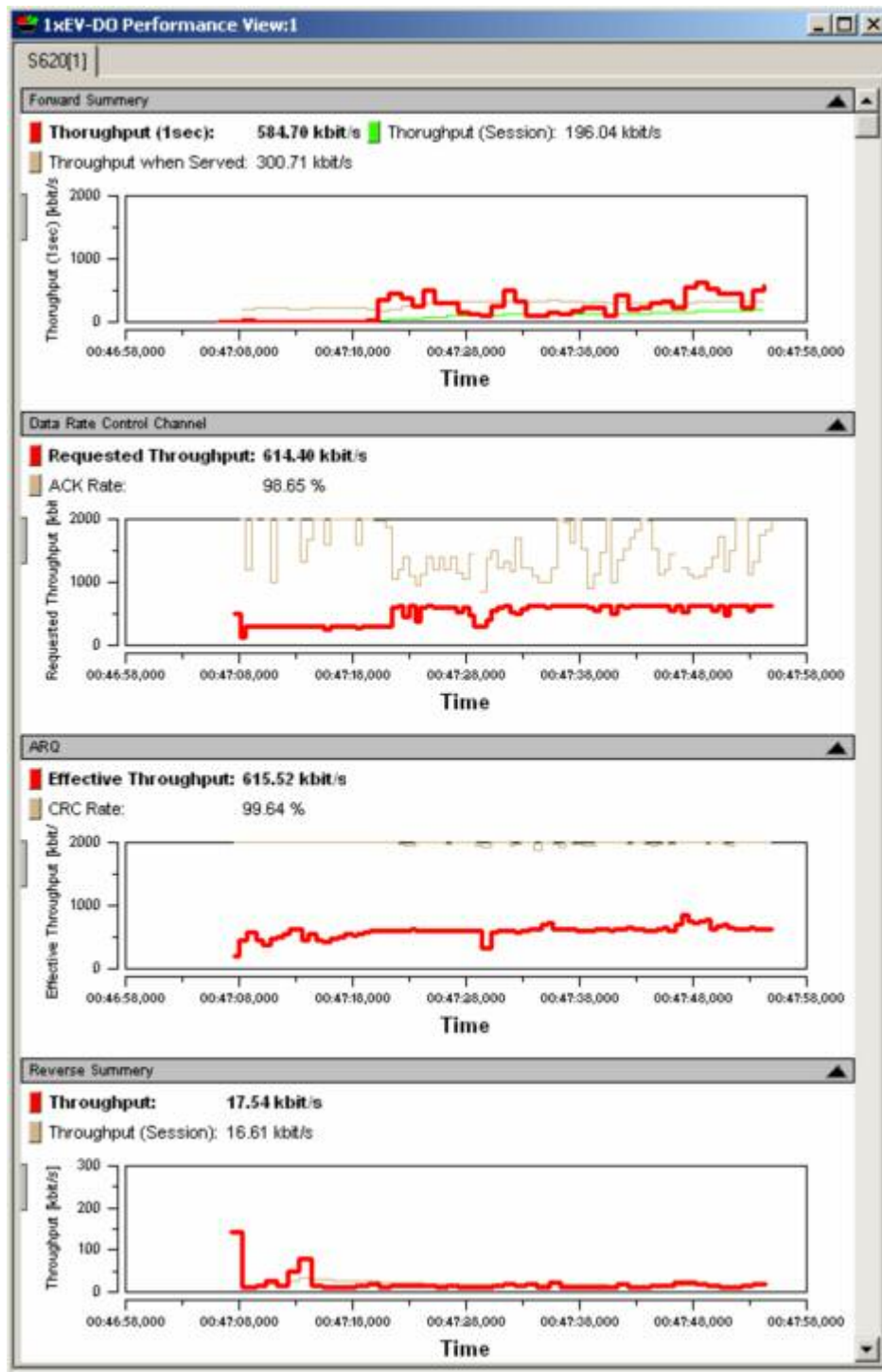


Fig. 4-110 1xEV-DO Performance View

A double-click on the *Forward Summary*, *Data Rate Control Channel*, *ARQ*, or *Reverse Summary* title bars opens or closes the sub-diagrams in the performance view. The functionality of all sub-diagrams is analogous to the *2D Chart View* described on p. 4.10, however, an additional *Plot* dialog (see below) provides additional settings to control the diagram content and appearance.

Forward Summary The total throughput (see figure above:) of the forward channel is the data throughput that the mobile receives according to the measured forward channel quality.

The forward throughput is calculated from the the FTAP MAC layer packets transmitted on the forward traffic channel that the mobile could receive successfully. This includes the information about the forward channel frame counts. It contains the good and bad CRC counters for Control and Traffic Channel packets. It also contains the number of forward link traffic channel and control channel packets received at various rates. These values are updated if the CRC has passed for the decoded packets. Each rate counter name also includes the SlotsDecoded part that indicates the number of slots taken to decode the particular rate packet.

The chart contains the following results:

Throughput (1 sec)

The throughput during the last second of the measurement is displayed [kBit/s]

Throughput

(Session)

The averaged throughput for the current AT session.

Throughput when Served

The *Throughput when Served* is calculated from a Qualcomm-specific formula when the AT is actually receiving data.

The most recent *1 sec*, *session*, and *when served* throughput values are displayed in the legend above the diagrams. Selecting one of the items in the legend will highlight the corresponding curve.

Data Rate Control Channel The DRC Channel is used by the access terminal to indicate to the access network the requested Forward Traffic Channel data rate and the selected serving sector on the Forward Channel.

The requested throughput (see figure above:) by the DRC channel is shown together with the corresponding ACK rate:

Requested

Throughput

Requested data rate as determined from the reverse DRC channel.

ACK Rate

The percentage of ACKnowledged data rate requests.

ARQ

Each sector of an access network transmits a positive acknowledgment (ACK) or a negative acknowledgment (NAK) in response to a physical layer packet using the ARQ Channel, which is a part of the reverse MAC channel.

The chart contains the following results:

Effective Throughput

The effective receive rate (throughput) is calculated as:

$$\text{RateDecoded} * \text{Slots}_{\text{alloted}} / \text{Slots}_{\text{required}}$$

For example, if a 38.4 kbps packet needs 8 slots to decode instead of the allotted 16 slots, then the effective rate is $38.4 * 2 = 76.8$ kbps.

CRC Rate

The percentage of successful CRCs for the ARQ channel throughput..

Reverse Summary

The total throughput (see figure above:) of the reverse channel is the data throughput that the access network receives according to the measured reverse channel quality.

Data rate per unit of time (in kBit/s) of the RTAP RTC MAC packets from the mobile that the R&S CMU could receive successfully

The chart contains the following results:

Throughput

The throughput during the last second of the measurement is displayed [kBit/s]

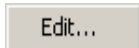
Throughput

(*Session*)

The averaged throughput for the duration of the current AT session is shown.

Context menu

A right mouse click on any point in the view opens the context menu to access the configuration menus, activate the fast replay mode, copy the view contents to the clipboard, create or delete views, save the current configuration, or move to another worksheet; see [Context menu](#) description on p. 4.2.

View Configuration

The *Edit...* dialog provides additional settings to control the diagram content and appearance. The dialog is opened from a context menu; this menu appears after a right-click on the y-axis labels or on one of the curves in the diagram.



<i>Hold/Release</i>	This option pauses and resumes the display of the resulting measurement output.
<i>Axes Move</i>	Here the axes of the chart can be scrolled by panning the mouse cursor over the axis area of the chart.
<i>Axes Stretch</i>	This option enables the dynamic increase or decrease of the axis scale
<i>Y-Axis Reset</i>	This option resets the y-axis scale to its default value, which resets all previous zooming, stretching or moving y-axis activities
<i>Zoom In</i>	Zoom into the graph by positioning and clicking the looking-glass cursor.
<i>Zoom Out</i>	Zoom out of the graph by positioning and clicking the looking-glass cursor.
<i>Zoom Rect</i>	Select a rectangle within the graph to be zoomed.
<i>Marker</i>	This option creates a vertical line with an associated information dialog which shows the associated absolute values of the selected measurement curve.

1xEV-DO Performance View Configuration

The *Chart Configuration* tab of the *1xEV-DO Performance View Configuration* dialog is analogous to the *Chart Configuration* tab of the 2D Chart View configuration menu, see figure on p 4.14.

1xEV-DO Airlink Summary View

The 1xEV-DO Airlink Summary View contains three preconfigured 2D charts. The signals in these charts are the pilot energy, the requested throughput, and the PER over the measurement time.

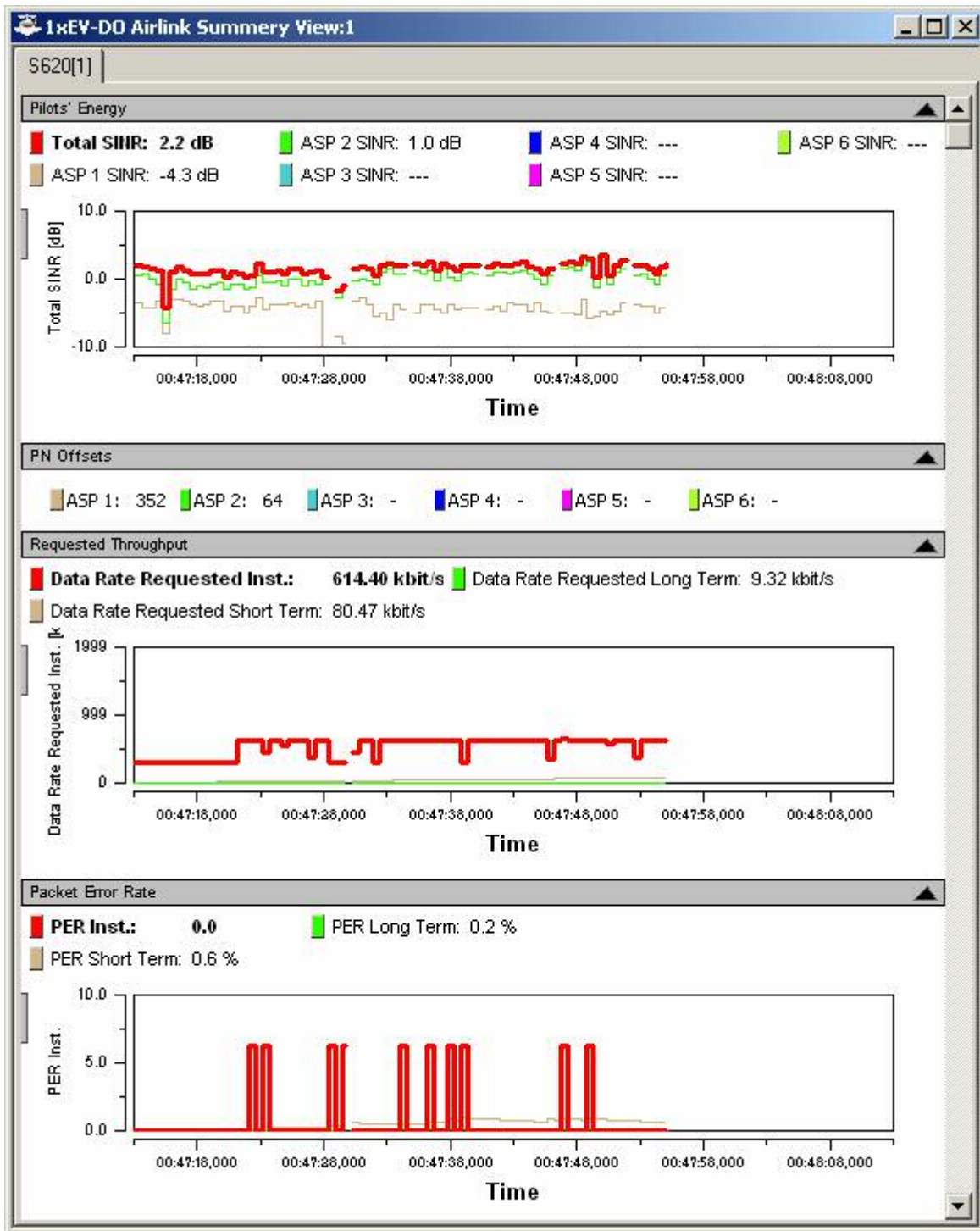


Fig. 4-111 1xEV-DO Airlink Summary View

A double-click on the *Pilots' Energy*, *PN Offsets*, *Requested Throughput*, or *Packet Error Rate* title bars opens or closes the sub-diagrams in the airlink summary view. The functionality of all sub-diagrams is analogous to the *2D Chart View* described on p. 4.10, however, an additional *Edit* dialog (see below) provides additional settings to control the diagram content and appearance.

Pilot's Energy

The chart contains the following results:

<i>Total SINR [dB]</i>	Signal-to-Interference-plus-Noise Ratio. When the mouse cursor is located over the y-axis, it changes its shape to a hand. The scroll wheel or dragging the hand cursor shifts the y-axis left or right, depending on the direction of dragging or scrolling.
<i>ASP 1 to 6 SINR [dB]</i>	Signal-to-Interference-plus-Noise Ratio of the Active Set Pilots 1 through 6.
<i>Time</i>	Timeline of the measurement. When the mouse cursor is located over the time axis, it changes its shape to a hand. The scroll wheel or dragging the hand cursor shifts the time axis left or right, depending on the direction of dragging or scrolling.

PN Offsets

The chart shows the following settings:

<i>ASP 1 to ASP 6</i>	Active Set Pilots PN Offset
-----------------------	-----------------------------

Requested Throughput

The *Requested* throughput (see figure above:) is the data throughput that the mobile requests according to the measured channel quality.

The chart contains the following results:

<i>Data Rate Requested Inst.</i>	The currently requested data rate as determined from the reverse DRC channel.
<i>Data Rate Requested Long Term</i>	The requested data averaged over the long term as calculated using Qualcomm specifications.
<i>Data Rate Requested Short Term</i>	The requested data averaged over the short term as calculated using Qualcomm specifications.
<i>Time</i>	Timeline of the measurement. When the mouse cursor is located over the time axis, it changes its shape to a hand. The scroll wheel or dragging the hand cursor shifts the time axis left or right, depending on the direction of dragging or scrolling.

Packet Error Rate The *Packet Error Rate* panel shows the PER-related measurement results with the packet errors instead of the received packets, as the standard specifies. Packet errors are calculated as the difference between the sent and received packets, but they ignore lost packets at a data rate of 0.0 kBit/s. The advantage of this approach is that the overall PER will not be influenced by these "lost" packets, since this is a valid and normal condition.

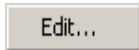
The chart contains the following results:

<i>PER Inst.</i>	Current Packet Error Rate
<i>PER Long Term</i>	Long-term Packet Error Rate as defined by Qualcomm
<i>PER Short Term</i>	Short-term Packet Error Rate as defined by Qualcomm
<i>Time</i>	Timeline of the measurement session. When the mouse cursor is located over the time axis, it changes its shape to a hand. The scroll wheel or dragging the hand cursor shifts the time axis left or right, depending on the direction of dragging or scrolling.

Context menu



A right mouse click on any point in the view opens the context menu to access the configuration menus, activate the fast replay mode, put the view on hold, copy the view contents to the clipboard, create new views, or to save the current configuration; see [Context menu](#) description on p. 4.2.

View Configuration

The *Edit...* dialog provides additional settings to control the diagram content and appearance. The dialog is opened from a context menu; this menu appears after a right-click on the y-axis labels or on one of the curves in the diagram.



<i>Hold/Release</i>	This option pauses and resumes the display of the resulting measurement output.
<i>Axes Move</i>	Here the axes of the chart can be scrolled by panning the mouse cursor over the axis area of the chart.
<i>Axes Stretch</i>	This option enables the dynamic increase or decrease of the axis scale
<i>Y-Axis Reset</i>	This option resets the y-axis scale to its default value, which resets all previous zooming, stretching or moving y-axis activities
<i>Zoom In</i>	Zoom into the graph by positioning and clicking the looking-glass cursor.
<i>Zoom Out</i>	Zoom out of the graph by positioning and clicking the looking-glass cursor.
<i>Zoom Rect</i>	Select a rectangle within the graph to be zoomed.
<i>Marker</i>	This option creates a vertical line with an associated information dialog which shows the associated absolute values of the selected measurement curve.

1xEV-DO Airlink Summary View Configuration

The *Chart Configuration* tab of the *1xEV-DO Airlink Summary View Configuration* dialog is analogous to the *Chart Configuration* tab of the 2D Chart View configuration menu, see figure on p 4.14.

1xEV-DO Forward Statistic Summary View

The *1xEV-DO Forward Statistic Summary View* shows the CRC success rates on the measured forward traffic and forward control channel slots.

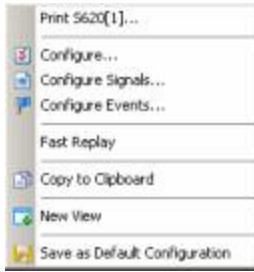
Type	CRC Success	S1	S2	S3	S4	S5	S6	S7	S8	S9
TC: 38400	---	0	0	0	0	0	0	0	0	0
TC: 76800	100.0%	0	2	0	0	0	0	0	0	---
TC: 153600	100.0%	5	4	0	0	---	---	---	---	---
TC: 307200S	99.8%	1941	242	---	---	---	---	---	---	---
TC: 307200L	99.9%	11	2192	46	0	---	---	---	---	---
TC: 614400S	99.1%	11594	---	---	---	---	---	---	---	---
TC: 614400L	99.3%	544	8963	---	---	---	---	---	---	---
TC: 921600	75.9%	0	44	---	---	---	---	---	---	---
TC: 1228800S	---	0	---	---	---	---	---	---	---	---
TC: 1228800L	---	0	0	---	---	---	---	---	---	---
TC: 1843200	---	0	---	---	---	---	---	---	---	---
TC: 2457600	---	0	---	---	---	---	---	---	---	---
CC: 38400	---	0	0	0	0	0	0	0	0	0
CC: 76800	100.0%	77	283	3	1	0	0	0	0	---

Fig. 4-112 1xEV-DO Forward Statistic Summary View

Forward Statistic Summary View

The 1xEV-DO Forward Statistic Summary View measurement results are shown as a list panel displaying the following information:

- Type* This column shows the channel type (TC = traffic channel, CC = control channel) and the channel rate (in bit/s). An S or L after the rate denotes Short or Long.
- CRC Success* This column shows the CRC success rate calculated as [Good / (Good + Bad)]. The field backgrounds also contain a relative bar graph showing the *CRC Success* rate colored green and red.
- S1 to S16* These columns contain the information about the forward channel frame counts, the good and bad CRC counters for Control and Traffic Channel packets, and the number of forward link traffic channel/control channel packets received at various rates for the 16 available channel slots. These values are updated if the CRC has passed for the decoded packets. Each rate counter name also includes the SlotsDecoded part that indicates the number of slots taken to decode the particular rate packet. Data for this packet is both sampled and logged every second.

Context menu

A right mouse click on any point in the view opens the context menu to print the view, access the configuration menus, activate the fast replay mode, copy the view contents to the clipboard, create new views, or to save the current configuration; see [Context menu](#) description on p. 4.2.

The *1xEV-DO Statistic Summary View* configuration menu contains an *Info* tab as described on p. 4.4.

1xEV-DO Forward Statistic Summary View Configuration

The *1xEV-DO Forward Statistic Summary View Configuration* menu defines the list information to be viewed and selects the data set displayed for the current view. It is opened via a right mouse click on a point inside *1xEV-DO Forward Statistic Summary View* or via the *Configuration – Settings* command (see chapter 3).

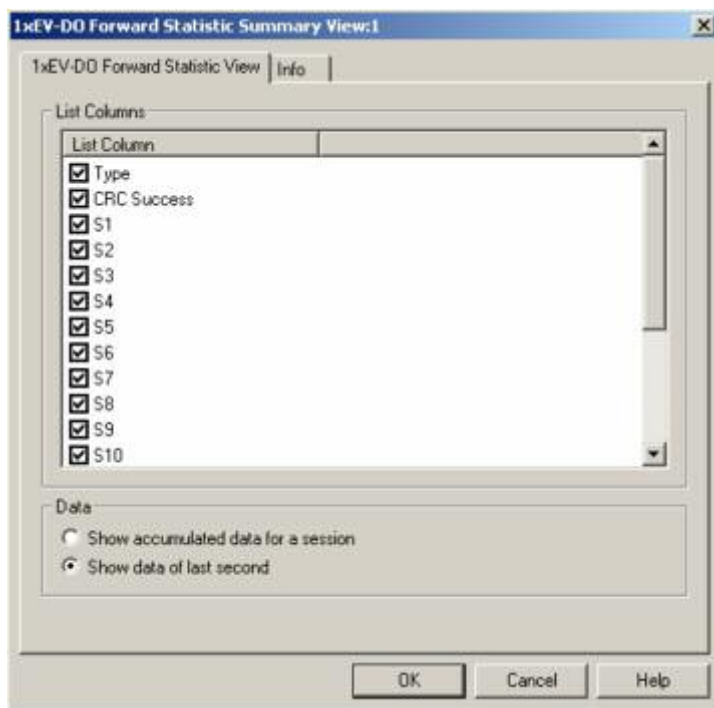


Fig. 4-113 1xEV-DO Forward Statistic Summary View Configuration

List Columns The checkbox selects the summary view elements to be displayed on the list panel:

Data The radio buttons select whether the accumulated data of the current session is displayed or just the data from the last second of the measurement.

1xEV-DO PN Grid View

The 1xEV-DO PN Grid View shows the forward channel PN offsets 0 to 511 as a matrix with 16 offsets in a row. Within this grid, the PN offsets in the currently active set are marked in shades of pink (default), the candidate set is marked in shades of green (default) and the neighbor set is marked in shades of blue (default).

Depending on the defined energy limits of the sets, the darker color shade is defined per default to show limit shortfalls, the lighter color shade shows limit exceedance.

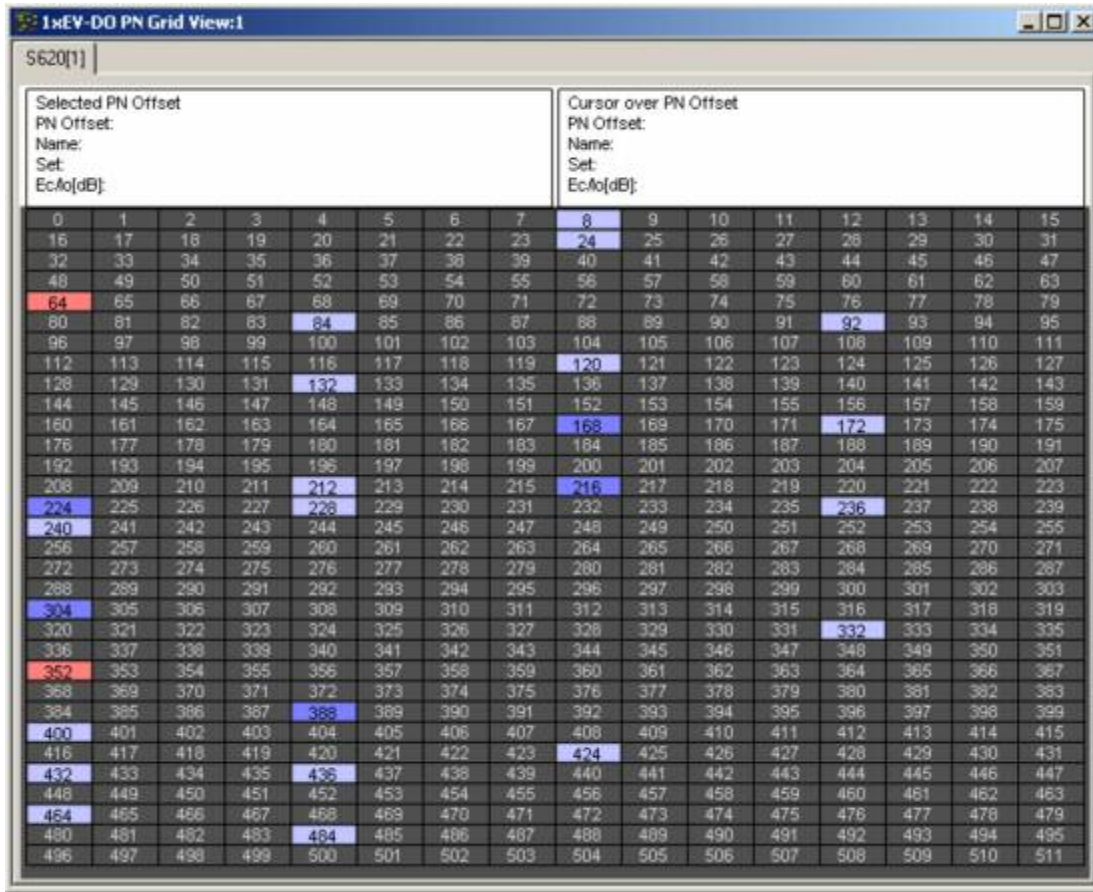


Fig. 4-114 1xEV-DO PN Grid View

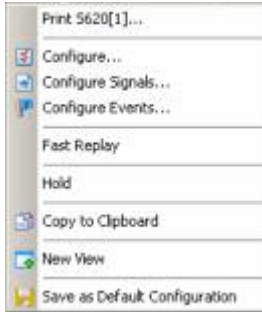
Grid Header

The header above the grid is divided into two halves, the first one displaying information of the currently selected PN offset grid element. Any grid element can be selected by clicking on it. The other half shows the corresponding information of the grid element over which the mouse cursor is currently hovering, which allows the direct comparison between any two PN offset grid elements.

- PN Offset* The number of the current grid element is displayed.
- Name* Here the name of the current grid element is displayed, if applicable. If no name is available, "---" is shown. In some cases, this field also displays auxiliary information, e.g. "No GPS" if this is the case during the measurement.
- Set* The current set (active / candidate / neighbor) of the selected PN offset grid element is shown.
- Ec/Io [dB]* The ratio of the average power of the forward channel to the total power comprised of signal plus interference, within the signal bandwidth. It is expressed in dB units.

PN Offset Grid

The PN Offsets from 0 to 511 are arranged as a grid with 16 elements in a row. With the corresponding grid cell background colors for active, candidate, and neighbor set energy limits it is quickly possible to see the related sets of the individual PN offsets.

Context menu

A right mouse click on any point in the view opens the context menu to print the view, access the configuration menus, (de-)select the view for fast replay, put the view on hold, copy the current view to the clipboard, create new views, or to save the current configuration; see [Context menu](#) description on p. 4.2.

1xEV-DO PN Grid View Configuration

The *1xEV-DO PN Grid View* configuration menu sets the energy limits for the active, candidate, and neighbor sets for the PN offsets displayed in the PN grid view.



Fig. 4-115 1xEV-DO PN Grid View: Configuration

Grid Colors

The *Grid Colors* option fields define the energy limits and the corresponding background colors for the PN offsets of the cell sets in the grid view.

Active / Candidate / Neighbor Set Energy Limit [dB]

These list boxes allow the definition of the energy limits for the grid display of the active, candidate, and neighbor sets in a range from -20 to +20 dB. The default values are:

- 2 dB for the Active Set,
- 8 dB for the Candidate Set, and
- 12 dB for the Neighbor Set.

< *Limit*

Opening this list box shows a color selection dialog, where a background color for the PN Offset grid elements can be selected. The grid cell will show the background color defined here when the measured active / candidate / neighbor set energy limit falls short of the defined value.

> *Limit*

Opening this list box shows a color selection dialog, where a background color for the PN Offset grid elements can be selected. The grid cell will show the background color defined here when the measured active / candidate / neighbor set energy limit exceeds the defined value.

1xEV-DO RLP Statistics View

The *1xEV-DO RLP Statistics View* displays important parameters describing the reverse link performance during the measurement.

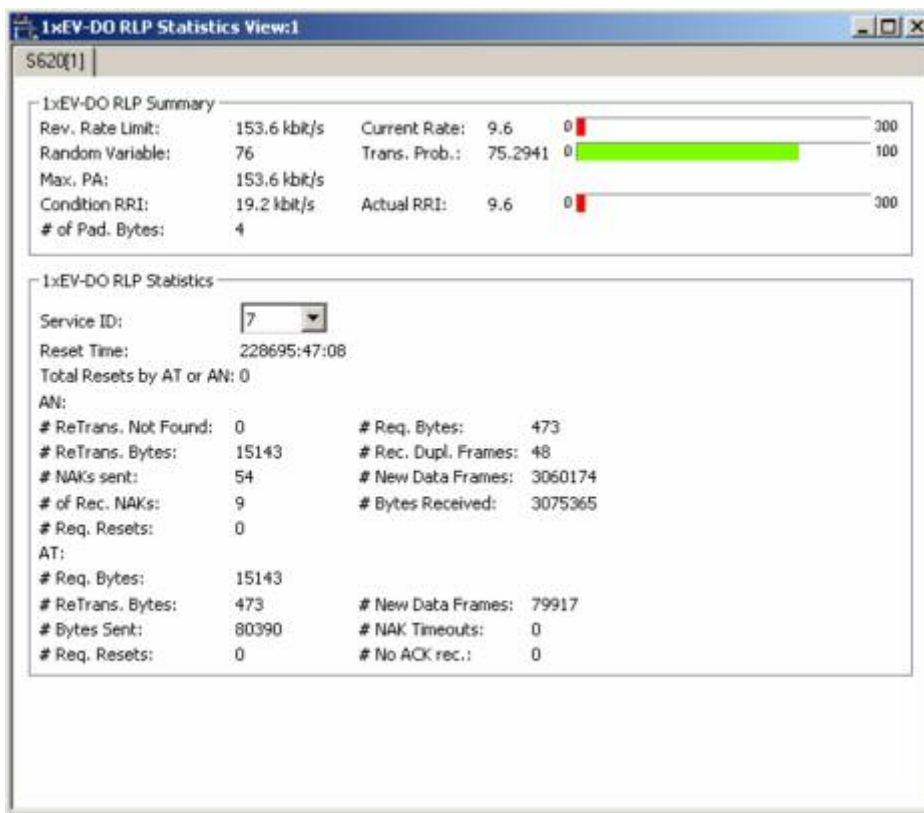


Fig. 4-116 1xEV-DO RLP Statistics View

1xEV-DO RLP Summary

The 1xEV-DO RLP Summary panel displays several parameters describing the measured reverse link performance.

<i>Rev. Rate Limit</i>	The theoretically possible data rate for the reverse traffic channel is shown. Possible values are 9.6, 19.2, 38.4, 76.8, or 153.6 kbit/s
<i>Current Rate</i>	The measured data rate for the reverse traffic channel is displayed as an absolute value and as a bar graph showing the percentage relative to the <i>Rev. Rate Limit</i> .
<i>Random Variable</i>	Value of the random variable used to calculate the new reverse rate; it is multiplied by a factor of 255 to produce a value from 0 to 255
<i>Trans. Prob.</i>	Transition probability used to calculate the new reverse rate; it represents the probability that satisfies the condition specified in section 8.5.6.1.5.2 of standard IS-856.
<i>Max. PA</i>	The maximum PA headroom at which the AT is restricted to transmit (in kbit/s)
<i>Condition RRI</i>	The RRI channel is only active for 1/8 of a slot, which results in the <i>Condition RRI</i> of one eighth of the Reverse Rate Limit.

<i>Actual RRI</i>	The measured reverse traffic data rate from the Reverse Rate Indicator (RRI) channel that is used by the AT to indicate the data rate at which the reverse traffic channel is transmitted.
<i># of Pad. Bytes</i>	Number of pad bytes included in the reverse link packets.

1xEV-DO RLP Statistics

The *1xEV-DO RLP Summary* panel displays the RLP Statistics measurement parameters and results. The RLP procedures and frame types are described in standard 3GPP2 C.S0017-0-2.10.

<i>Service ID</i>	Service identification number which identifies the RLP service
<i>Reset Time</i>	Time stamp when statistics were last reset to 0.
<i>Total Resets by AT or AN</i>	Sum of performed resets by AT and AN
AN: <i># ReTrans. Not Found</i>	Number of retransmitted frames not found
AN: <i># Req. Bytes</i>	Number of bytes requested by the AN for re-transmission
AN: <i># ReTrans Bytes</i>	Number of bytes transmitted.
AN: <i># Rec. Dupl. Frames</i>	Number of received duplicate frames
AN: <i># NAKs sent</i>	Number of NAK messages sent
AN: <i># New Data Frames</i>	Number of new data frames received
AN: <i># Req. NAKs</i>	Number of NAK bytes requested by the AT for re-transmission
AN: <i># Bytes Received</i>	Number of new data frames received
AN: <i># Req. Resets</i>	Number of times the reset was requested by the AN
AT: <i># Req. Bytes</i>	Number of bytes requested for retransmission from AN
AT: <i># ReTrans Bytes</i>	Number of transmitted retransmitted bytes
AT: <i># New Data Frames</i>	Number of new data frames received
AT: <i>#Bytes Sent</i>	Total number of bytes transmitted
AT: <i># NAK Timeouts</i>	Nak timeouts or aborts
AT: <i># Req. Resets</i>	Number of resets requested by the AT
AT: <i># No ACK rec.</i>	Number of ACKs received from the AN

The *1xEV-DO RLP Statistics View* has no context menu for configurations assigned. The *Info* tab can be accessed via the *Configuration – Settings* command.

CDMA Views

The *CDMA Views* show CDMA-specific information included in the measurement data of cdma2000 as well as CDMA (IS-95) mobiles. CDMA data can be acquired using one of the CDMA drivers described in chapter 6. Before a measurement is recorded, data acquisition for most views must be explicitly enabled in the *Define Measurement* tab of the CDMA configuration menu (for an overview see chapter 6).

Due to the different measurement data result sets returned by cdma2000 and CDMA (IS-95) mobiles, some fields of the described views may be empty.

The CDMA views can be selected from a submenu displayed on the right side of the *View* menu when the mouse pauses over *CDMA Views*.

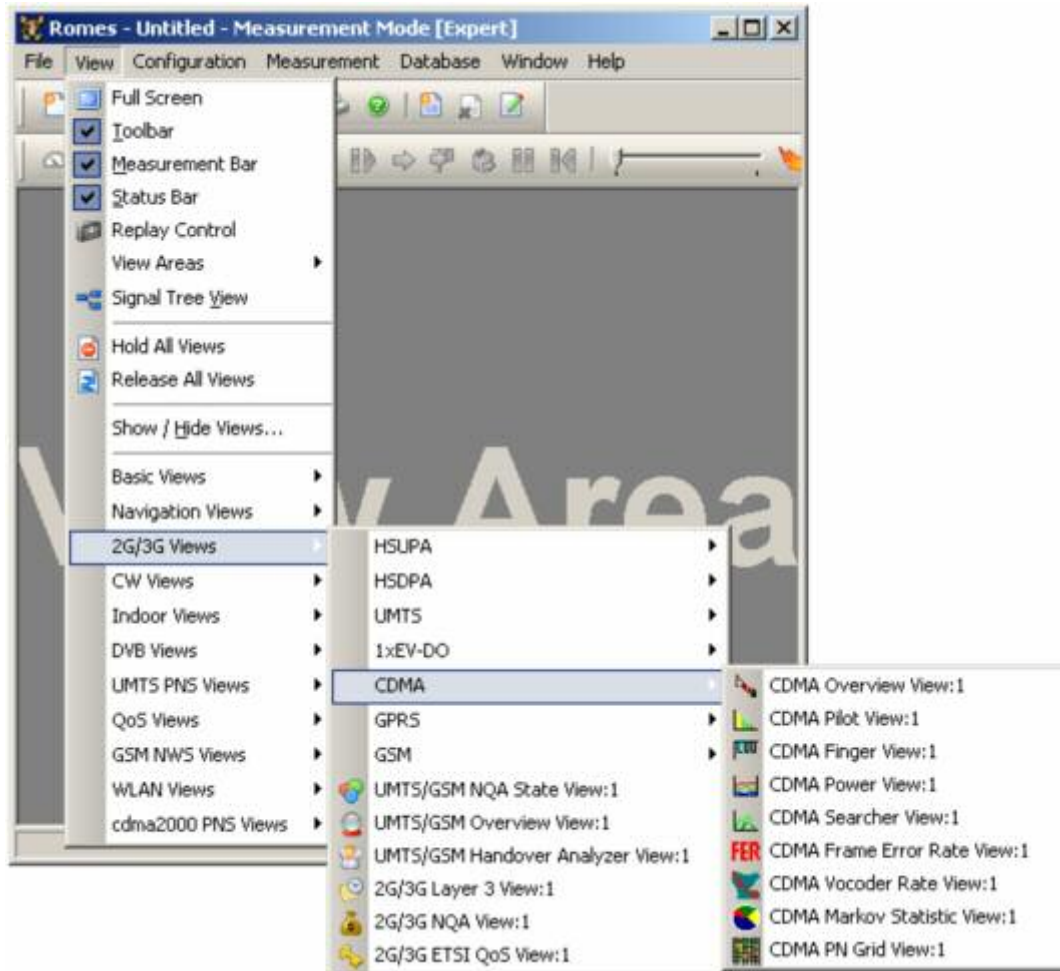


Fig. 4-117 CDMA views

Important Note on CDMA Measurements:

The CDMA Test Mobile Kyocera QCP3035A-B is allowed only for use outside Europe. It is not allowed to put this mobile into operation inside Europe.

CDMA Overview View

The *CDMA Overview View* displays a summary of the test mobile state, power/quality, active set and system parameters, and, if applicable, results from a connected CDMA PN scanner.

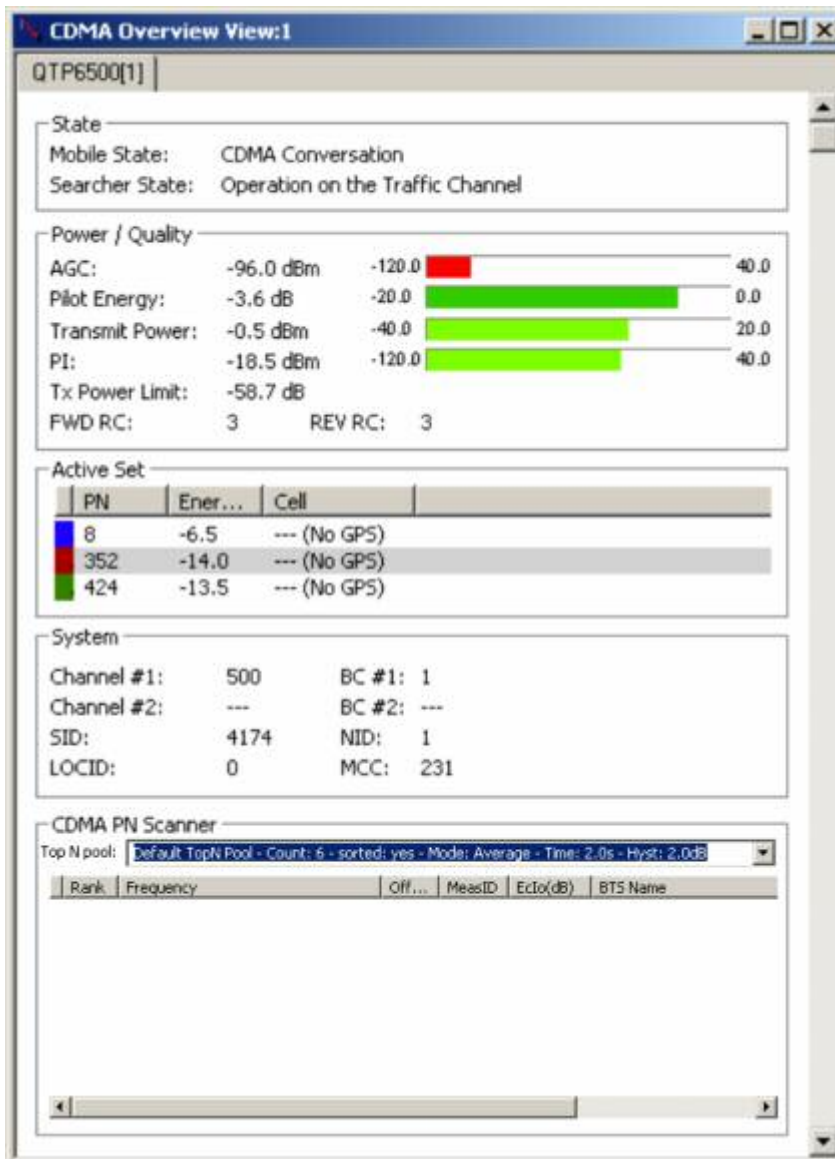


Fig. 4-118 CDMA Overview View

The *CDMA PN Scanner* field group is only filled if an actual scanner is configured and running.

State This field group contains the mobile state and the CDMA mobile searcher state.

Mobile State Possible CDMA of the mobile are:

- 0x81 – Initialization
- 0x82 – Idle
- 0x83 – Voice channel initialization
- 0x84 – Waiting for order
- 0x85 – Waiting for answer
- 0x86 – Conversation
- 0x87 – Release
- 0x88 – Update overhead information
- 0x89 – Mobile station origination attempt
- 0x8a – Page response
- 0x8b – Order/message response
- 0x8c – Registration access
- 0x8d – Message transmission
- 0x8E – Use subsystem cmd 75 (subsys 30, cmd_code 2) to obtain detailed state information 1xEV (HDR) states:
- 0x10 – Phone is offline
- 0x11 – Phone is offline HDR
- 0x12 – Phone is offline analog
- 0x13 – Reset ! 0x14 – Powerdown
- 0x15 – Powersave
- 0x16 – Powerup
- 0x17 – Low Power mode
- 0x18 – Dedicated System Measurement mode (searcher)
- 0x40 – 1xEV mode

Searcher State The state of the CDMA mobile searcher component which measures the relative strength of the different multipath components of the pilot signal as a function of their time offset. Possible searcher states are:

- 0 – Raw initialization state
- 1 – Deep sleep in start state
- 2 – Initial state for CDMA operation
- 3 – Acquisition of the pilot channel
- 4 – Reception of the sync channel
- 5 – Transition from sync to paging channel (slew)
- 6 – Operation on the paging channel
- 7 – Slotted mode sleep state
- 8 – Operation on the traffic channel
- 9 – Return from paging or traffic to sync channel (unslew)
- 10 – Operation in PCG state
- 11 – Powerup state



The mobile states correspond to the *Phone Mode* signal; see p. 4.12.

Power / Quality The Power/Quality panel displays several parameters describing the signal power and quality reported by the test mobile (see standard 3GPP TS 25.225).

<i>AGC</i>	<i>Automatic Gain Control (range –120 to +40 dBm)</i>
<i>Pilot Energy</i>	Received pilot energy per chip (E_c , energy per modulating bit, range –20 to +0 dBm)
<i>Transmit Power</i>	CDMA transmit power during the call. (range –20 to +0 dBm)
<i>PI</i>	Problem Indicator
<i>Tx Power Limit</i>	Max. transmitted power of the mobile during the call.
<i>FWD RC</i>	Forward Radio Configuration
<i>REV RC</i>	Reverse Radio Configuration

The power results are obtained in an unbiased measurement, i.e. the contribution of the noise floor to the powers is subtracted.

Active Set The Active Set panel shows information of the PN Offsets which are currently in the active, candidate, or neighbor set of the test mobile.

<i>Pilot PN Offset Color Code</i>	The coloring of the first row element is defined in the <i>Chart Settings</i> panel of the CDMA Pilot View Configuration described on p. 4.211. By default, the Active Set is marked orange, the Candidate Set is marked green, and the Neighbor Set is marked blue.
<i>PN</i>	Pilot PN Offset number (range 0 to 511)
<i>Energy [dB]</i>	Measured Pilot Energy in dB
<i>Cell</i>	Cell name, if applicable. The field also contains auxiliary information (e.g. "No GPS")...

System The System panel shows network-related parameters of the test mobile.

<i>Channel #1</i>	First CDMA Channel
<i>BC #1</i>	Band Class of the first CDMA channel
<i>Channel #2</i>	Second CDMA Channel
<i>BC #2</i>	Band Class of the second CDMA channel
<i>SID</i>	System ID communicated to the mobile under test.
<i>NID</i>	16-bit Network Identification number communicated to the mobile under test.
<i>LOCID</i>	Location ID
<i>MCC</i>	Mobile Country Code

CDMA PN Scanner If a CDMA PN scanner is configured and running, this panel displays the Top Ns of the scanner. The *Top N List* gives an overview of the received signals in the current top N pool together with their scrambling codes, different power parameters, frequency and timing information. On mouse rollover, each cell in the table header provides a short explanation of the corresponding column. Most of the results in the *Top N List* are also displayed in the *Peak List* in the *PNS CPICH View*.

For a detailed explanation of the parameters refer to section [PNS CPICH View](#) on p. 4.339, or to the [CDMA PNS Top N View](#) on p. 4.442.

Context menu

A right mouse click on any point in the view opens the context menu to print the view, access the configuration menus, (de-)select the view for fast replay, put the view on hold, copy the current view to the clipboard, or to save the current configuration; see [Context menu](#) description on p. 4.2.



CDMA Overview View Configuration

The *CDMA Overview View Configuration* menu defines the list information to be viewed. It is opened via a right mouse click on a point inside *CDMA Overview View* or via the *Configuration – Settings* command (see chapter 3).

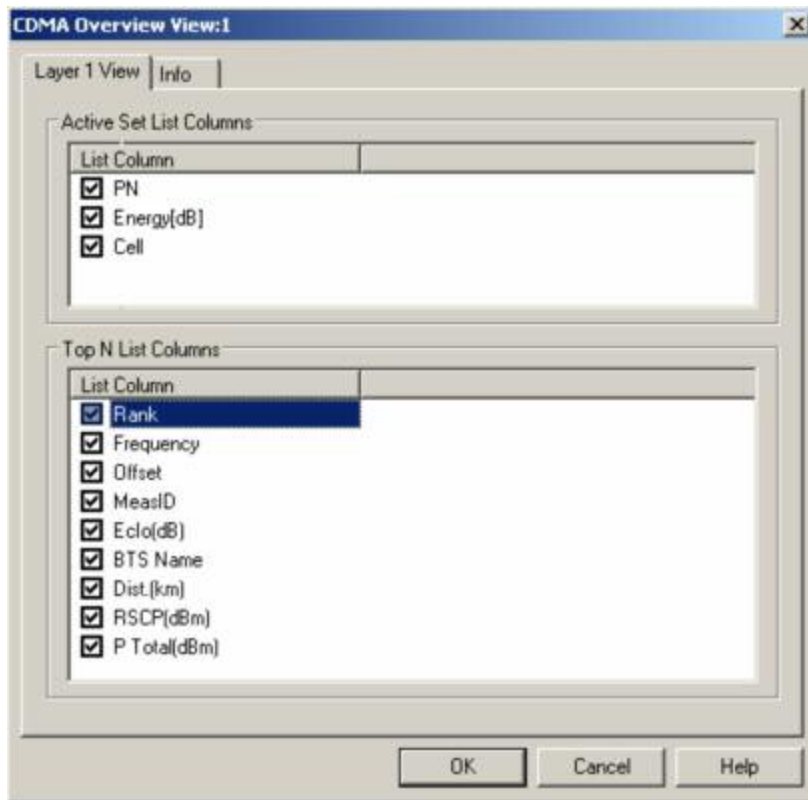


Fig. 4-119 CDMA Overview View: Layer 1 View Configuration

- Active Set List Columns** The checkboxes select the view list elements to be displayed on the list panel:
- | | |
|--------------------|---|
| <i>PN</i> | Pilot PN Offset number (range 0 to 511). |
| <i>Energy [dB]</i> | Measured Pilot Energy in dB |
| <i>Cell</i> | Cell name, if applicable. If no name is available, "---" is shown. In some cases, this field also displays auxiliary information, e.g. "No GPS" if this is the case during the measurement. |
- Top N List Columns** The checkboxes select the view list elements to be displayed on the list panel.
- For a detailed explanation of the parameters refer to section *PNS CPICH View* on p. 4.339, or to the [CDMA PNS Top N View](#) on p. 4.442.

CDMA Pilot View

The *CDMA Pilot View* contains a list and a bar graph showing the pilot channel signal strength from the active and several neighbor base stations. The diagram is empty unless the *Pilot Sets* checkbox in the *Define Measurement* tab of the CDMA configuration menu is enabled.

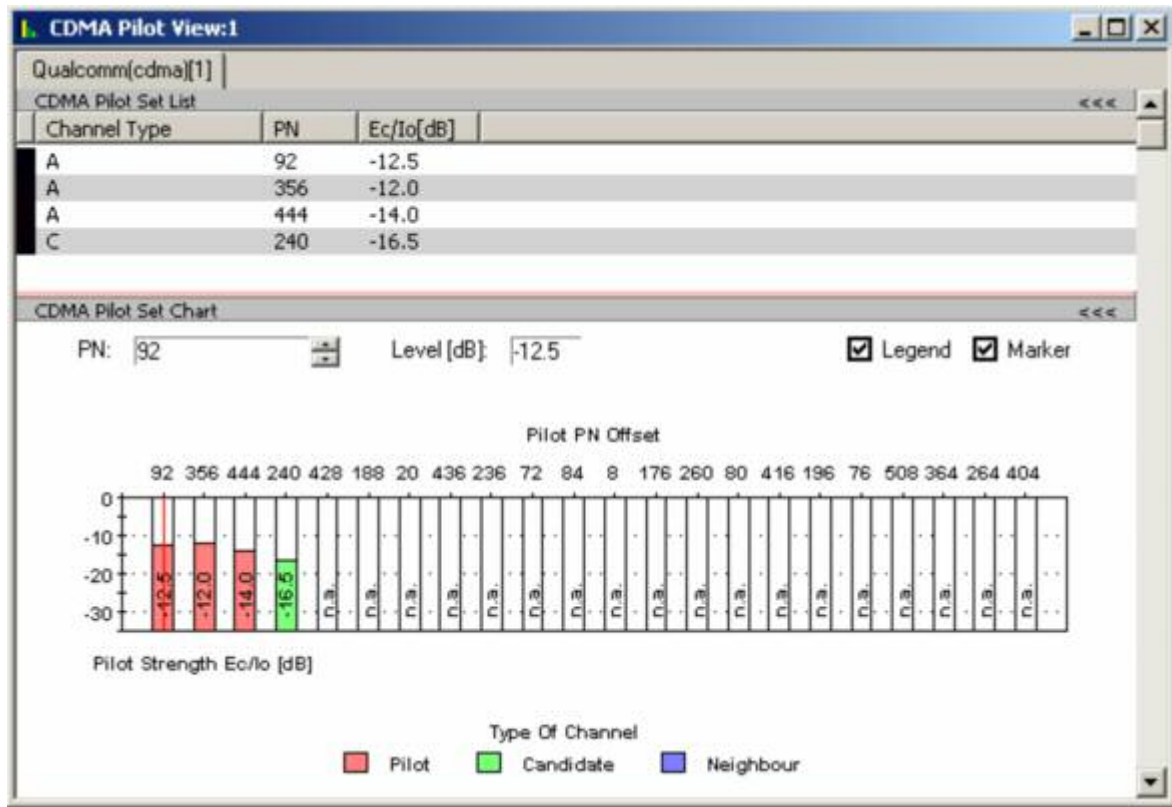


Fig. 4-120 CDMA Pilot View

CDMA Pilot Set List The CDMA Pilot Set List panel displays several parameters of the current PN offset-related sets

Channel Type The type of channel associated with the PN Offset (A = Active, C = Candidate, N = Neighbor)

PN Pilot PN Offset number (range 0 to 511)

Ec/Io [dB] The pilot energy is expressed as the ratio E_c/I_o in dB where E_c denotes the energy density of the pilot signal, I_o denotes the noise level.

The power results are obtained in an unbiased measurement.

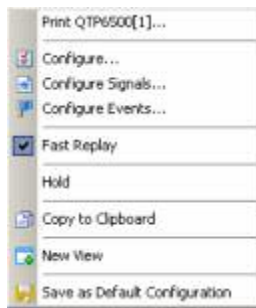
CDMA Pilot Set Chart

The diagram is a bar graph showing the relative strength of a variable number of pilot, candidate and neighbor cell signals. The CDMA channel numbers of the signals are indicated above the bars. The channel strength is expressed as the ratio E_c/I_o in dB where E_c denotes the chip energy of the pilot signal, I_o denotes the noise level. The diagram has a fixed y-axis scale of -35 dB to -0 dB.

The update rate of the diagram and the number of signals displayed depend on the mobile station and its operating conditions.

- Device** The pull-down list on the left side above the diagram shows all mobiles measured. The pilot strength of the selected mobile is shown in the diagram.
- PN / Level [dB]** The fields to the right of the device list show the current pilot channel number and the corresponding relative level (strength) of the current signal. If a marker is switched on, it is placed to the current signal.
- Marker** If the box is checked, a marker line is displayed in the diagram. The PN and the strength of the marked signal is indicated in the corresponding fields in the toolbar. The marker line can be shifted to the left and to the right by means of the cursor keys or by varying the channel number in the toolbar. Besides, a double click places the marker on a particular bar.
- Legend** If the box is checked, a legend showing the different channel types and the associated colors is displayed below the diagram:
- | | |
|------------------|--|
| <i>Pilot</i> | Active pilot channel, available in the dedicated mode only (during a call) |
| <i>Candidate</i> | Channel considered as a possible future pilot channel |
| <i>Neighbor</i> | Neighbor cell channel |
- The number of *Pilots* and *Candidates* depends on the operating mode of the mobile station.

Context menu



A right mouse click on any point in the view opens the context menu to access the configuration menus, (de-)select the view for fast replay, copy the current view to the clipboard, or save the current configuration; see [Context menu](#) description on p. 4.2.

CDMA Pilot View Configuration

The *CDMA Pilot View Configuration* menu defines the list information to be viewed and the set colors for the pilot view chart. It is opened via a right mouse click on a point inside *CDMA Pilot View* or via the *Configuration – Settings* command (see chapter 3).

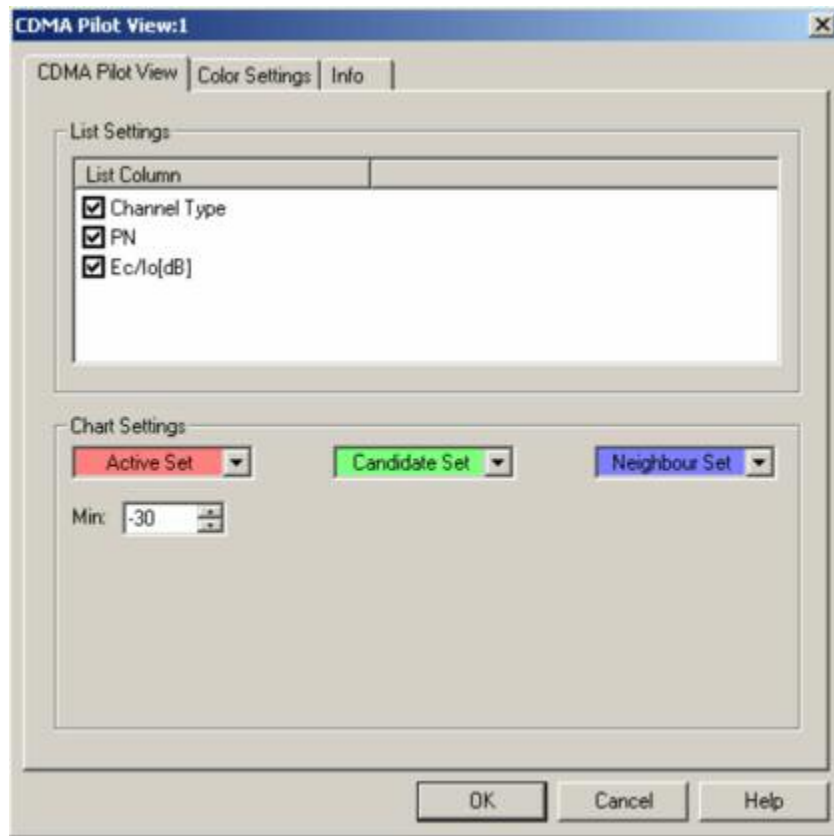


Fig. 4-121 CDMA Pilot View: Layer 1 View Configuration

List Settings

The CDMA Pilot View List Settings panel selects the channel-related list elements:

Channel Type The type of channel associated with the PN Offset (A = Active, C = Candidate, N = Neighbor)

PN Pilot PN Offset number (range 0 to 511)

Ec/Io [dB] The channel strength is expressed as the ratio E_c/I_o in dB where E_c denotes the energy density of the pilot signal, I_o denotes the noise level.

The power results are obtained in an unbiased measurement.

Chart Settings

The colors distinguish the following sets:

Active Set / Candidate Set / Neighbor Set Opening this list box shows a color selection dialog, where a background color for the PN Offset grid elements can be selected. The grid cell will show the background color defined here when the measured active / candidate / neighbor set energy limit exceeds the defined value.

Min. Least value of channel strength E_c/I_0 (dB)

The list box backgrounds for the sets display the currently active color selection.

The *Color Settings* tab sets the color scale for the PN Offsets 0 to 511.

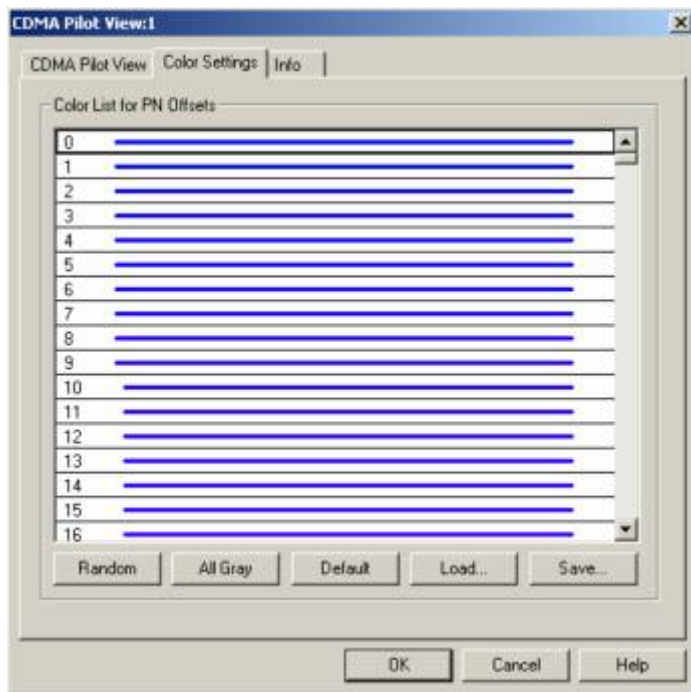


Fig. 4-122 CDMA Pilot View Configuration: Color Settings

The colors are displayed in the diagram (power peaks) and in the first table row (current set of the PN Offset). A double-click on a line in the *Color List* opens the *Colors* dialog (see p. 4.351) to change the current display color.

Random No ordering; colors are assigned to the scrambling codes at random.

All Gray Color scale suppressed; all colors are gray. This option is suitable e.g. to distinguish a single scrambling code (or a small number of scrambling codes), colored different, from all other codes, colored gray.

Default Predefined color scale: Colors change continuously as the scrambling codes increase.

Load/Save A color scale can be loaded from an SC color file (*.scc) and user-defined color scales can be stored to *.scc files to be reused in a later session.

CDMA Finger View

The *CDMA Finger View* shows the finger info, i.e. the relative strength of the different multipath components of the pilot signal detected by the RAKE receiver of the CDMA mobile. The diagram is empty unless the *Finger info* checkbox in the *Define Measurement* tab of the CDMA configuration menu is enabled.

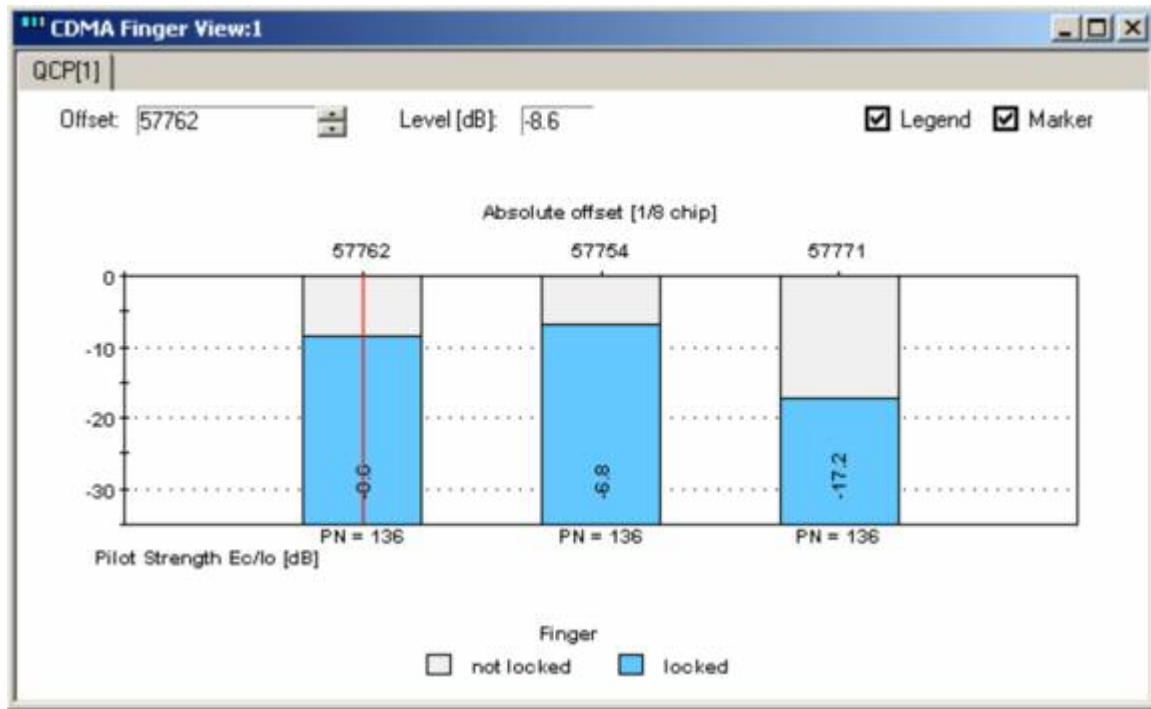


Fig. 4-123 CDMA Finger View

- Diagram** The diagram is a bar graph showing the relative strength of the multipath components the number of which is given by the fingers of the mobile station RAKE receiver. The signals are detected with different time offsets that are indicated above the bars as an absolute multiple of 1/8 chip periods. The pilot channel number for the signals is displayed below the x-axis. The channel strength is expressed as the ratio E_c/I_0 in dB where E_c denotes the energy density of the pilot signal, I_0 denotes the noise level. The diagram has a fixed y-axis scale of -35 dB to -0 dB. The update rate of the diagram depends on the mobile.
- Offset / Level [dB]** The fields to the right of the device list show the current time offset and the corresponding strength of the current signal. If a marker is switched on, it is placed to the current signal.
- Marker** If the box is checked, a marker line is displayed in the diagram. The time offset and the strength of the marked signal is indicated in the corresponding fields. The marker line can be shifted to the left and to the right by means of the cursor keys or by varying the Offset in the toolbar. Besides, a double-click places the marker on a particular bar.
- Legend** If the box is checked, a legend showing the colors denoting locked and unlocked fingers is displayed below the diagram. A locked finger means that a distinct multipath component could be unambiguously detected.

The *CDMA Finger View* has no context menu for configurations assigned. The *Info* tab can be accessed via the *Configuration – Settings* command.

CDMA Power View

The *CDMA Power View* shows the (relative) TX and RX power at the CDMA mobile and related power levels as a function of time. The diagram is empty unless the *Sparse ACP power control* checkbox in the *Define Measurement* tab of the CDMA configuration menu is enabled.

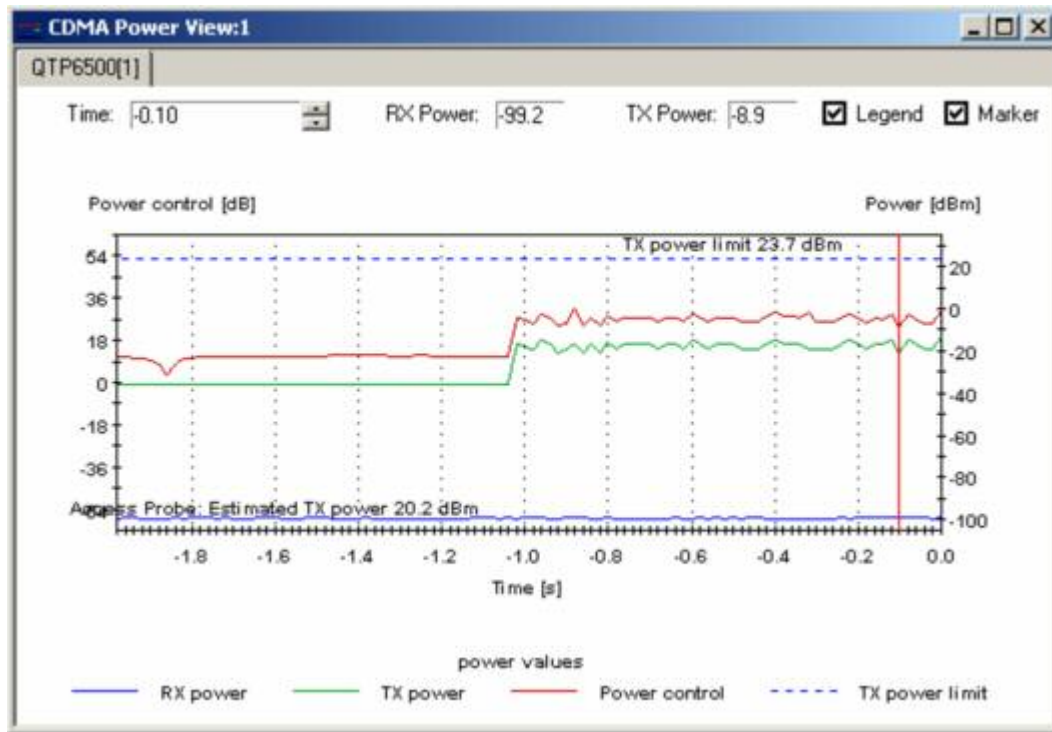


Fig. 4-124 CDMA Power View

Diagram

The diagram shows three traces, representing the evolution in time of three different quantities:

<i>RX power</i>	Absolute received power at the CDMA mobile (in dBm)
<i>TX power</i>	Absolute output power of the CDMA mobile (in dBm)
<i>Power control</i>	Information on the dynamic power control of the CDMA mobile (in dB; accumulated power control bits). If power control works correctly, the shape of the power control curve is similar to the TX power curve.

In addition, the diagram shows the (absolute) maximum output power that the mobile is allowed to transmit under its current operating conditions (closed loop power control, *TX power limit*) and the allowed output power that the mobile estimates from its RX power (open loop control, *Access Probe: Estimated TX power*; this quantity is available only if the *Access probe info* box in the *Define Measurement* tab of the CDMA configuration menu is checked).

The time display range is -2 s to 0 s. The update rate of the diagram depends on the mobile.

Time / RX Power / TX Power

The fields below the tab of the diagram show the current x-axis value (time) and the current RX and TX power of the mobile. If a marker is switched on, it is placed to the current x-axis value.

- Marker** If the box is checked, a marker line is displayed in the diagram. The time and the mobile RX and TX power at the marker position are indicated in the corresponding fields. The marker line can be shifted to the left and to the right by means of the cursor keys or by incrementing/decrementing the value in the Time field. Besides a double click places the marker to the desired position.
- Legend** If the box is checked, a legend showing the indicated powers together with the line colors is displayed below the diagram.

The *CDMA Power View* has no context menu for configurations assigned. The *Info* tab can be accessed via the *Configuration – Settings* command.

CDMA Searcher View

The *CDMA Searcher View* shows the CDMA mobile searcher information, i.e. the relative strength of the different multipath components of the pilot signal as a function of their time offset. The diagram is empty unless the *Searcher info* checkbox in the *Define Measurement* tab of the CDMA configuration menu is enabled.

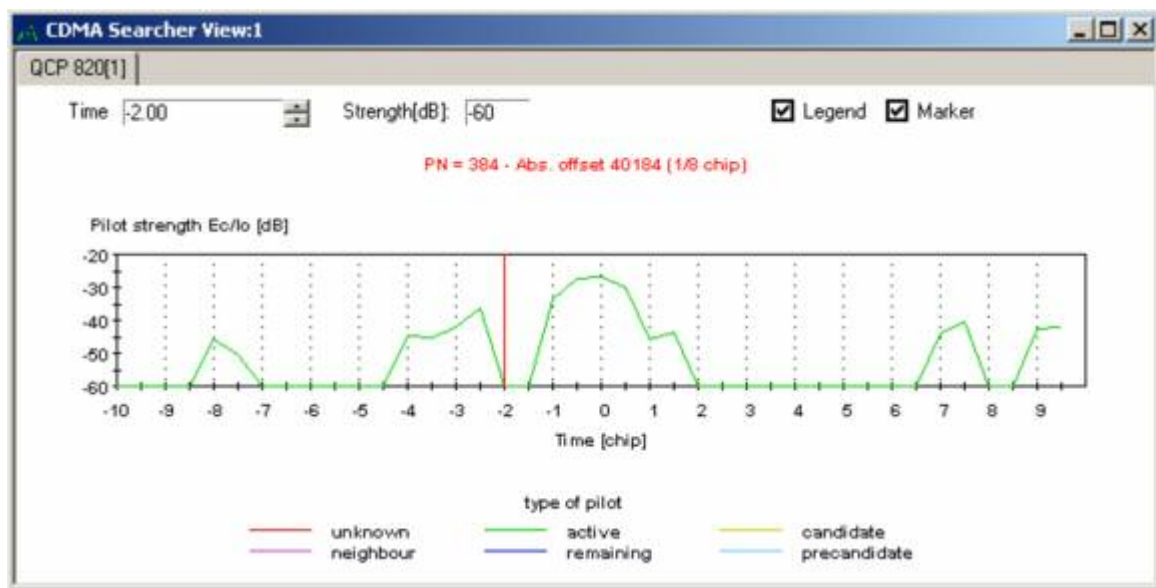


Fig. 4-125 CDMA Searcher View

- Diagram** The diagram shows the strength of the different components of the pilot signal as a function of their time offset. The time offset is expressed in units of chip periods; its display range depends on the mobile. The center of the x-axis (Time (chip) = 0) corresponds to the strongest component (maximum signal power). The pilot strength is expressed as the ratio E_c/I_0 in dB where E_c denotes the energy density of the pilot signal, I_0 denotes the noise level. The diagram has a fixed y-axis scale of -60 dB to -20 dB. The update rate of the diagram depends on the mobile.

Diagram header	The current pilot number (<i>PN</i>) and the corresponding absolute offset time are indicated in the diagram header. <i>Not referenced !</i> after the <i>PN</i> means that the timing information, which is equivalent to the <i>PN</i> , is questionable.
Time / FER	The fields below the diagram tab show the current x-axis value (time) and the current pilot strength rate. If a marker is switched on, it is placed to the current x-axis value.
Marker	If the box is checked, a marker line is displayed in the diagram. The time and the frame error rate at the marker position are indicated in the corresponding fields in the toolbar. The marker line can be shifted to the left and to the right by means of the cursor keys or by incrementing/decrementing the value in the Time field. Besides a double click places the marker to the desired position.
Legend	If the box is checked, a legend showing the different possible types of pilot channels together with the line colors is displayed below the diagram: <i>unknown</i> Not identified <i>active</i> Pilot channel of a current serving cell <i>(pre)candidate</i> Channel considered as a possible future pilot <i>neighbor</i> Neighbor cell channel <i>remaining</i> Channel fits in none of the previous categories.

The *CDMA Searcher View* has no context menu for configurations assigned. The *Info* tab can be accessed via the *Configuration – Settings* command.

CDMA Frame Error Rate View

The *CDMA Frame Error Rate View* shows the frame error rate, i.e. the percentage of erroneous CDMA frames detected and reported by the CDMA mobile station. The diagram is empty unless the *Temporal Analyzer* checkbox in the *Define Measurement* tab of the CDMA configuration menu is enabled.

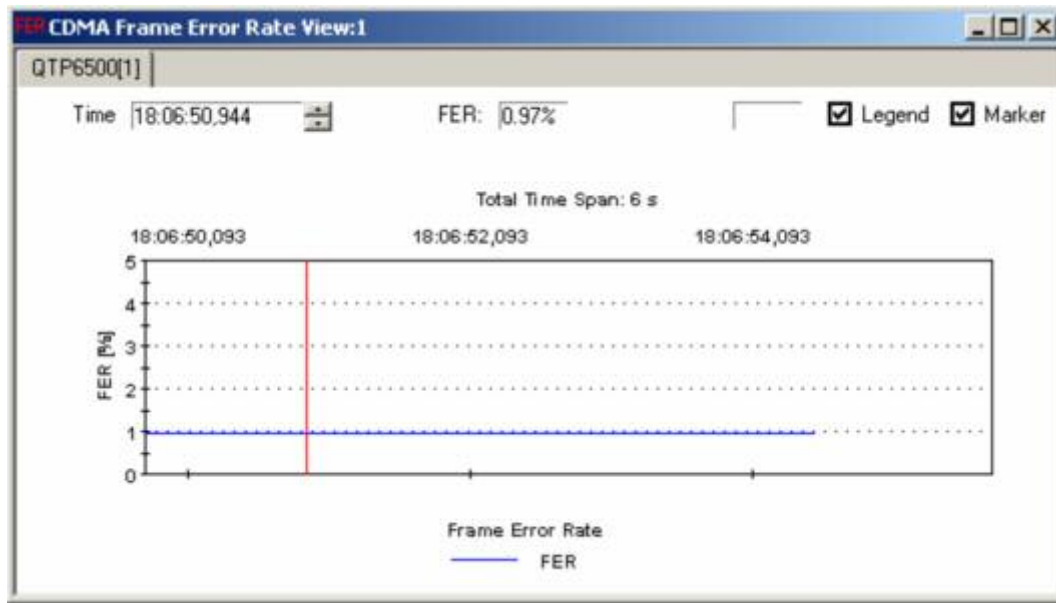


Fig. 4-126 CDMA Frame Error Rate View

Diagram

The diagram shows the CDMA frame error rate as a function of time. The time information stored in the measurement file provides the x-axis scaling. The total time span of the diagram (i.e. the x-axis display range) can be changed in the configuration menu; see below.

The curves are plotted from the left to the right at the pace of the measurement or replay. If the end of the display range is reached while the measurement or replay is still going on, the whole diagram is shifted to the left by one full time span so the curves can be continued. This may occur repeatedly until the end of the measurement (file) is reached.

Time / FER

The fields above the diagram show the current x-axis value (time) and the current frame error rate. If a marker is switched on, it is placed to the current x-axis value.

Marker

If the box is checked, a marker line is displayed in the diagram. The time and the frame error rate at the marker position are indicated in the corresponding fields in the toolbar. The marker line can be shifted to the left and to the right by means of the cursor keys or by incrementing/decrementing the value in the *Time* field. Besides a double click places the marker to the desired position.

Legend

If the box is checked, a legend showing the two displayed curves together with the line colors is displayed below the diagram.

Context menu



A right mouse click on any point in the view opens the context menu to print the view, access the configuration menus, (de-)select the view for fast replay, put the view on hold, copy the current view to the clipboard, or to save the current configuration; see [Context menu](#) description on p. 4.2.

The configuration menu is analogous to the [CDMA Vocoder Rate View Configuration](#) menu described on page 4.220.

CDMA Vocoder Rate View

The *CDMA Vocoder Rate View* shows the data rate (full rate, 1/2 rate, 1/4 rate, or 1/8 rate) generated and received by the voice coders (vocoders) of the CDMA mobile station vs. time. The diagram is empty unless the *Temporal Analyzer* checkbox in the *Define Measurement* tab of the CDMA configuration menu is enabled.

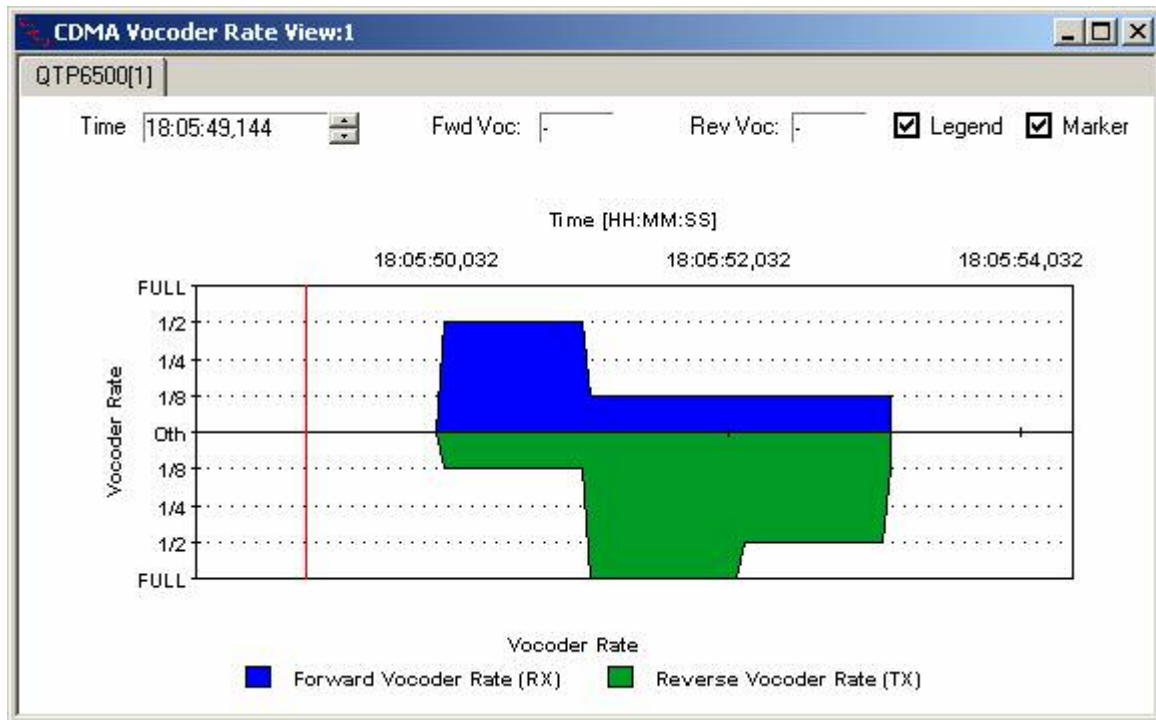


Fig. 4-127 CDMA Vocoder Rate View

Diagram

The diagram is split into an upper and a lower part, showing the vocoder rate in the forward channel (mobile station receiver) and in the reverse channel (mobile station transmitter), respectively. The time information stored in the measurement file provides the x-axis scaling. The total time span of the diagram (i.e. the x-axis scale) can be changed in the configuration menu; see below. While the vocoders encode/decode a particular channel (full rate, $\frac{1}{2}$ rate, $\frac{1}{4}$ rate, or $\frac{1}{8}$ rate), the curves are at the corresponding level. Level 0th (or no curve) denotes that the vocoder is not active.

The curves are plotted from the left to the right at the pace of the measurement or replay. If the end of the display range is reached while the measurement or replay is still going on, the whole diagram is shifted to the left by one full time span so the curves can be continued. This may occur repeatedly until the end of the measurement (file) is reached.

Time / Fwd Voc / Rev Voc

The fields below the diagram tab show the current x-axis value (time) and the current forward and reverse vocoder rates. If a marker is switched on, it is placed to the current x-axis value.

Marker

If the box is checked, a marker line is displayed in the diagram. The time and the two vocoder rates at the marker position are indicated in the corresponding fields in the toolbar. The marker line can be shifted to the left and to the right by means of the cursor keys or by incrementing/decrementing the value in the *Time* field. Besides a double click places the marker to the desired position.

Legend

If the box is checked, a legend showing the two displayed curves together with the line colors is displayed below the diagram.

Context menu

A right mouse click on any point in the view opens the context menu to print the view, access the configuration menus, (de-)select the view for fast replay, put the view on hold, copy the current view to the clipboard, or to save the current configuration; see [Context menu](#) description on p. 4.2.

CDMA Vocoder Rate View Configuration

The *CDMA Vocoder Rate View* configuration menu defines the timespan of the diagram and shows information on the current view version. It is opened via a right mouse click on a point inside the *CDMA Vocoder Rate View* or via the *Configuration – Settings* command (see chapter 3).

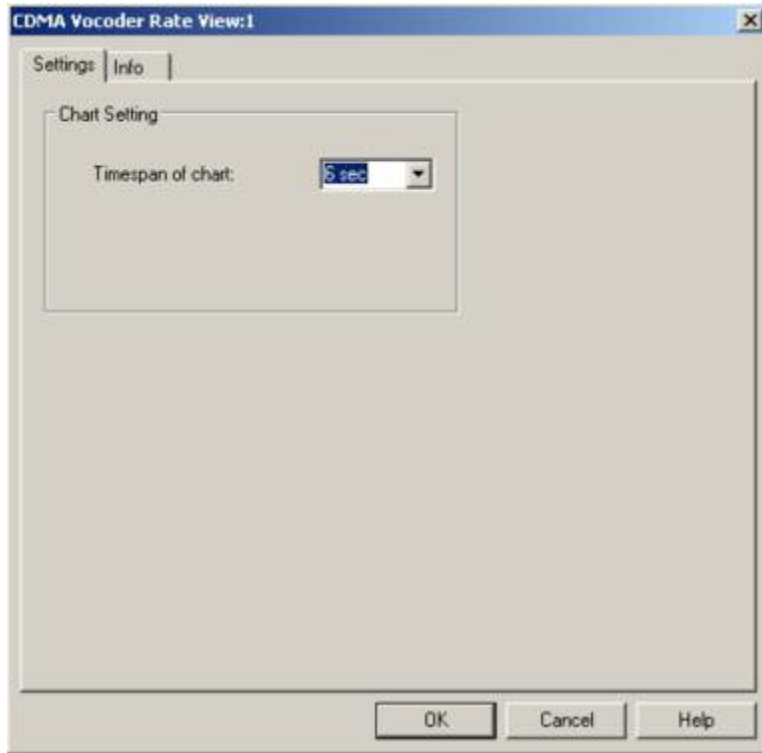


Fig. 4-128 CDMA Vocoder Rate View configuration

Timespan of chart The *Timespan ...* input field defines the total time span of the *Vocoder Rate View*, i.e. the time interval corresponding to the full diagram width. Either 6 s or 1 minute can be selected from the pull-down list.

CDMA Markov Statistic View

The *CDMA Markov Statistic View* displays a statistical evaluation of the call provided by the mobile. The diagram is empty unless an appropriate *Service Option* is set in the *Define Measurement* tab of the CDMA configuration menu; see chapter 6.

General		Total Frames:	Bad Frames:	Error Rate [%]:	Bit errors:
Mode:	EVRC (CAI SO 0x0003)	0	0	0	0
State:	Traffic Channel				
Markov Rate:	Variable				

Frames expected:	Frames received:					Bit errors	Erasures
	Full	Half	Quarter	Eighth	Signalling		
Full rate	0	0	0	0	0	0	0
Half rate	0	0	0	0	0	0	0
Quarter rate	0	0	0	0	0	0	0
Eighth rate	0	0	0	0	0	0	0

Fig. 4-129 CDMA Markov Statistic View

General

The General output fields indicate the following information describing the Markov statistics evaluation:

Mode

RX software mode (service option)

State

Receive task state

Markov Rate

Rate for Markov processing

Total Frames

Total number of Markov frames

Bad Frames

Total number of bad frames (erasures and full rate with bit errors)

Error Rate [%]

Percentage of wrong bits

Bit errors

Total number of bit errors

Context menu

A right mouse click on any point in the view opens the context menu to access the configuration menus, (de-)select the view for fast replay, copy the current view to the clipboard, create or delete views, save the current configuration, or move to another worksheet; see [Context menu](#) description on p. 4.2.

The *CDMA Markov Statistic View* has no context menu for configurations assigned. The *Info* tab can be accessed via the *Configuration – Settings* command.

CDMA PN Grid View

The *CDMA PN Grid View* shows the forward channel PN offsets 0 to 511 as a matrix with 16 offsets in a row. Within this grid, the PN offsets in the currently active set are marked in shades of pink (default), the candidate set is marked in shades of green (default) and the neighbor set is marked in shades of blue (default).

Depending on the defined energy limits of the sets, the darker color shade is defined per default to show limit shortfalls, the lighter color shade shows limit exceedance.

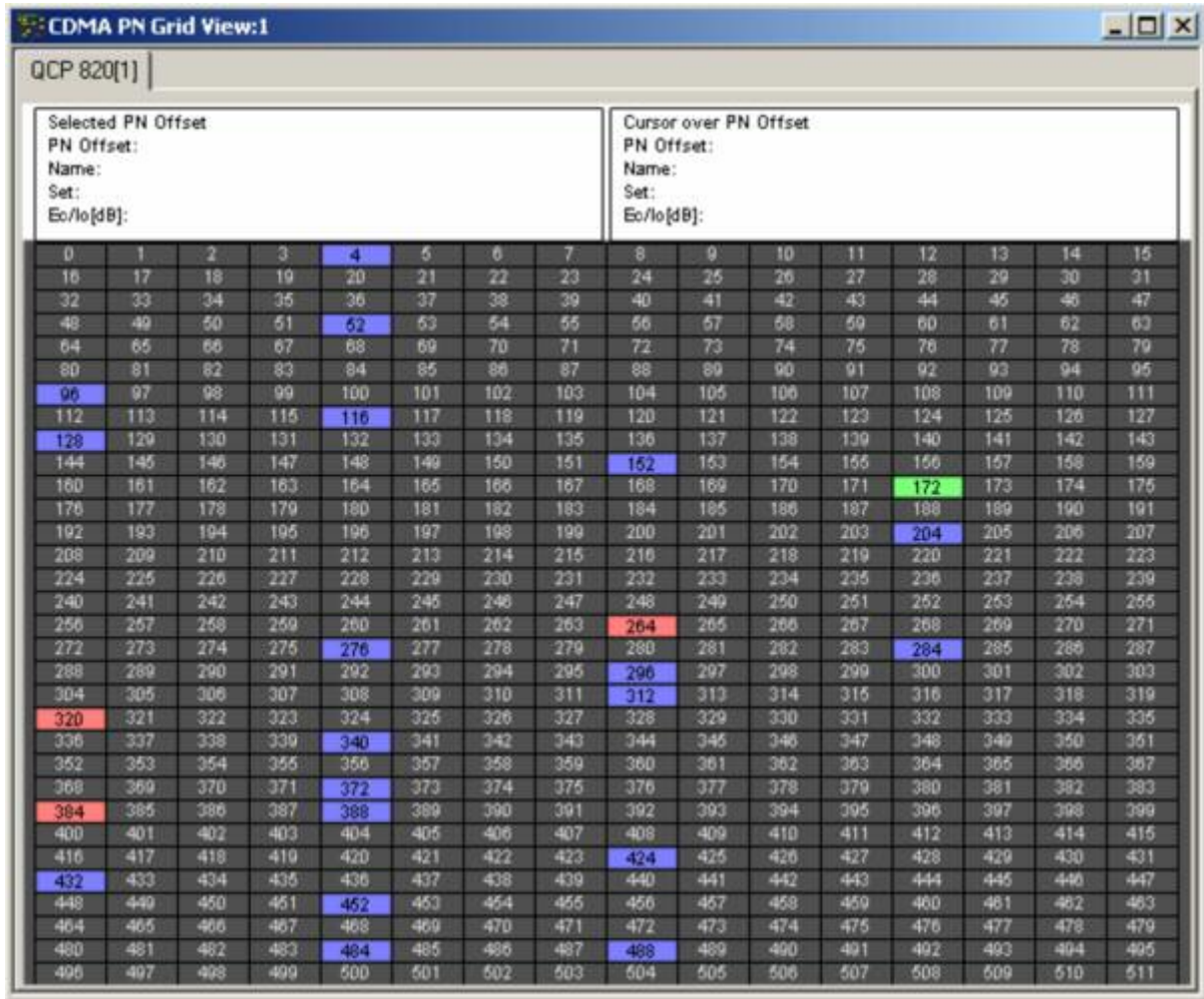


Fig. 4-130 CDMA PN Grid View

Grid Header

The header above the grid is divided into two halves, the first one displaying information of the currently selected PN offset grid element. Any grid element can be selected by clicking on it. The other half shows the corresponding information of the grid element over which the mouse cursor is currently hovering, which allows the direct comparison between any two PN offset grid elements.

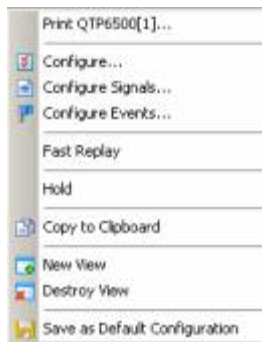
<i>PN Offset</i>	The number of the current grid element is displayed.
<i>Name</i>	Here the name of the current grid element is displayed, if applicable. If no name is available, "---" is shown. In some cases, this field also displays auxiliary information, e.g. "No GPS" if this is the case during the measurement.
<i>Set</i>	The current set (active / candidate / neighbor) of the selected PN offset grid element is shown.
<i>Ec/Io [dB]</i>	The ratio of the average power of the forward channel to the total power comprised of signal plus interference, within the signal bandwidth. It is expressed in dB units.

PN Offset Grid

The PN Offsets from 0 to 511 are arranged as a grid with 16 elements in a row. With the corresponding grid cell background colors for active, candidate, and neighbor set energy limits it is quickly possible to see the related sets of the individual PN offsets.

Context menu

A right mouse click on any point in the view opens the context menu to print the view, access the configuration menus, (de-)select the view for fast replay, put the view on hold, copy the current view to the clipboard, create or delete views, or to save the current configuration; see [Context menu](#) description on p. 4.2.



CDMA PN Grid View Configuration

The *CDMA PN Grid View* configuration menu sets the energy limits for the active, candidate, and neighbor sets for the PN offsets displayed in the PN grid view.

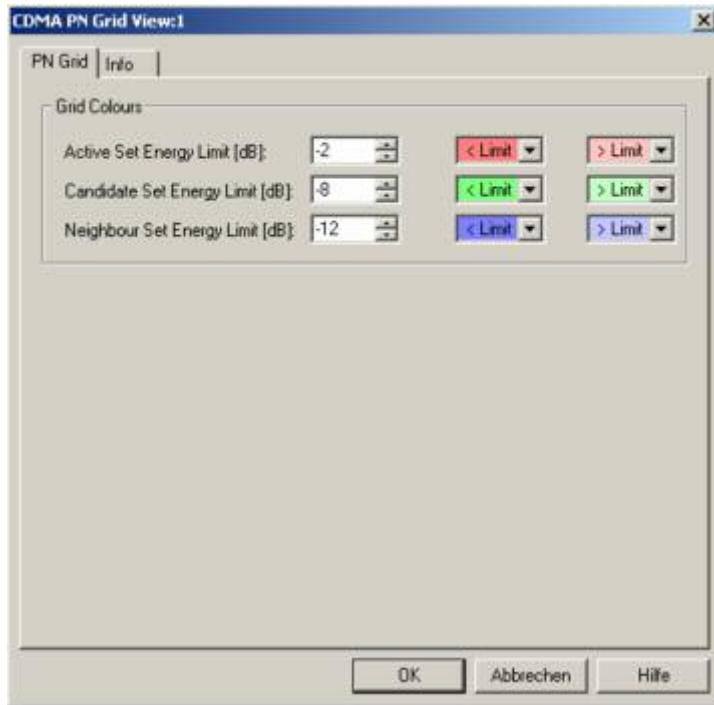


Fig. 4-131 CDMA PN Grid View: Configuration

Grid Colors

The *Grid Colors* option fields define the energy limits and the corresponding background colors for the PN offsets of the cell sets in the grid view.

Active / Candidate / Neighbor Set Energy Limit [dB]

These list boxes allow the definition of the energy limits for the grid display of the active, candidate, and neighbor sets in a range from -20 to $+20$ dB. The default values are:

- 2 dB for the Active Set,
- 8 dB for the Candidate Set, and
- 12 dB for the Neighbor Set.

< Limit

Opening this list box shows a color selection dialog, where a background color for the PN Offset grid elements can be selected. The grid cell will show the background color defined here when the measured active / candidate / neighbor set energy limit falls short of the defined value.

> Limit

Opening this list box shows a color selection dialog, where a background color for the PN Offset grid elements can be selected. The grid cell will show the background color defined here when the measured active / candidate / neighbor set energy limit exceeds the defined value.

GPRS Views

The *GPRS Views* display parameters of the operating state of GPRS-supporting mobile phones, related parameters contained in the layer messages, Packet Data Protocol (PDP) parameters, Radio Link Control/Medium Access Control parameters, a statistical evaluation of the number of timeslots (TS) that are active in the connection, exchanged RLC/MAC block header information, control and physical parameters of a GPRS/EGPRS connection, and the RLC or MAC Release indicators,

The GPRS views can be selected from a submenu displayed on the right side of the *View* menu when the mouse pauses over *GPRS Views*.

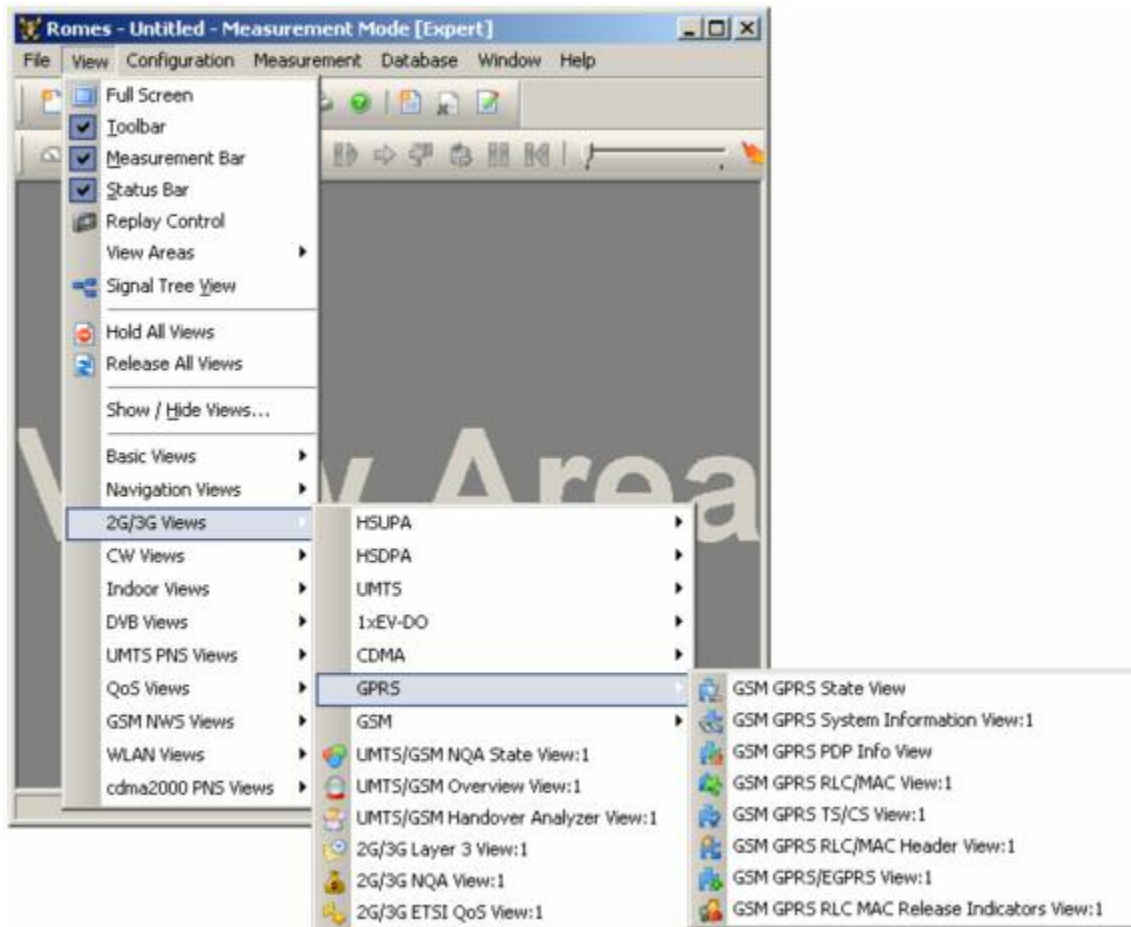


Fig. 4-132 GPRS views

Mobiles to provide GPRS Parameters

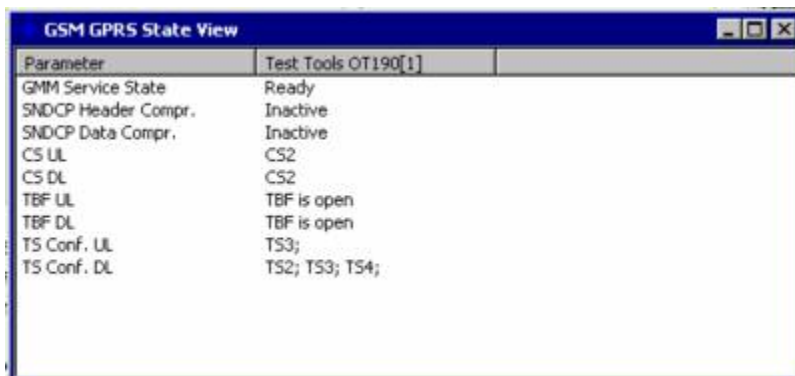
The GPRS views described in this section require corresponding mobiles. The following test mobiles are known to provide GPRS parameters (but no EGPRS parameters):

- SAGEM (OT 96-M GPRS, OT190 GPRS, OT 290 GPRS) and Siemens (S55, S55-R) mobiles must be used in *Data/Trace* mode and the splitter box must be connected to provide two COM ports (see chapter 6).

- Nokia test mobiles (Nokia 6230/6500/6630/6650/7600), Qualcomm test mobiles (TM6200/6250/6275), and Qualcomm-compatible test mobiles such as Samsung Z105, Z107, Z130 are connected via USB interface.

GSM GPRS State View

The *GSM GPRS State View* displays parameters characterizing the operating state of mobile phones supporting GPRS. The parameters are shown for all mobiles that are used in the current measurement or recorded in the replayed measurement file.



Parameter	Test Tools OT190[1]
GMM Service State	Ready
SNDCP Header Compr.	Inactive
SNDCP Data Compr.	Inactive
CS UL	CS2
CS DL	CS2
TBF UL	TBF is open
TBF DL	TBF is open
TS Conf. UL	TS3;
TS Conf. DL	TS2; TS3; TS4;

Fig. 4-133 GSM GPRS State View

For each mobile, the state parameters are arranged in a table with 2 columns. The width of the columns can be varied with a drag-and-drop mechanism in the header of the table. Part of the information is also displayed in the [GSM GPRS RLC/MAC View](#); see p. 4.231.

GMM Service State	GPRS Mobility Management service state: Ready, Idle or Stand-by.
SNDCP Header Compr.	Compression information from the Subnetwork Dependent Convergence Protocol: Header compression <i>Used</i> or <i>Not used</i> .
SNDCP Data Compr.	Compression information from the Subnetwork Dependent Convergence Protocol. Data compression <i>Used</i> or <i>Not used</i> .
CS UL / CS DL	Channel coding scheme (CS1 to CS4) used in uplink (UL) and downlink (DL) direction.
TBF UL / TBF DL	Status of the Temporary Block Flow (TBF) in uplink (UL) and downlink (DL) direction: open (during data transfer) or closed.
TS Conf. UL / DL	Timeslot configuration in uplink (UL) and downlink (DL) direction.

The *GSM GPRS State View* has no context menu for configurations assigned. The *Info* tab can be accessed via the *Configuration – Settings* command.

GSM GPRS System Information View

The *GSM GPRS System Information View* displays a selection of GPRS-related parameters contained in the layer 3 messages *System Information Type 1* to *System Information Type 13*. The parameters are shown for all mobiles that are used in the current measurement or recorded in the replayed measurement file.

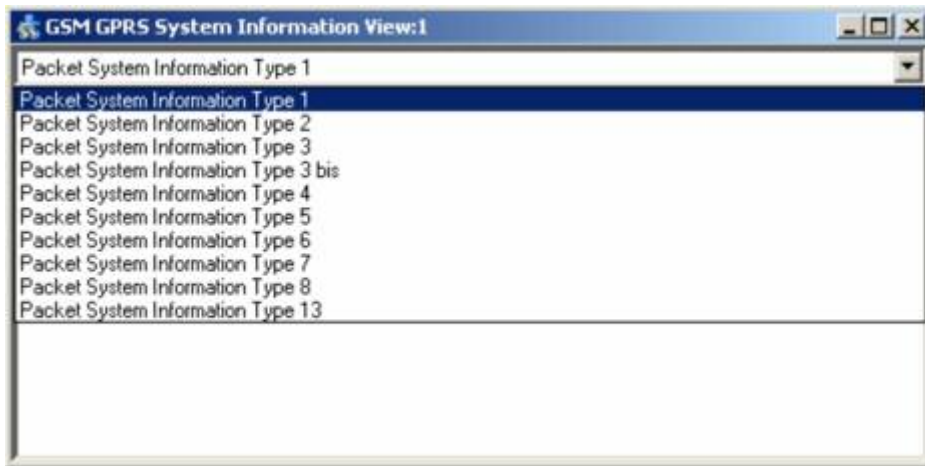
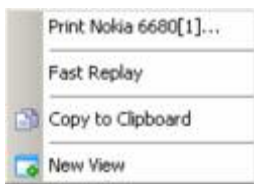


Fig. 4-134 GSM GPRS System Information View

The system information for each mobile is displayed in a separate column. Moreover, the system information type can be selected in a pull-down list.

Context menu

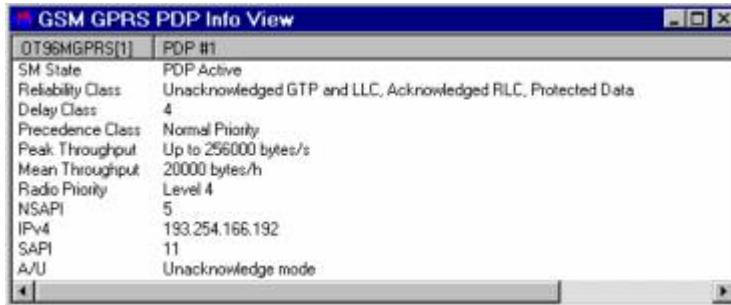


A right mouse click on any point in the view opens the context menu to print the view contents, (de-)select the view for fast replay, copy the current view to the clipboard, or to create new views; see [Context menu](#) description on p. 4.2.

The *GSM GPRS System Information View* has no configuration menu assigned. The *Info* tab can be accessed via the *Configuration – Settings* command.

GSM GPRS PDP Info View

The *GSM GPRS PDP Info View* displays important Packet Data Protocol (PDP) parameters of mobile phones supporting GPRS. The parameters are shown for all mobiles that are used in the current measurement or recorded in the replayed measurement file.



OT96MGPRS[1]	PDP #1
SM State	PDP Active
Reliability Class	Unacknowledged GTP and LLC, Acknowledged RLC, Protected Data
Delay Class	4
Precedence Class	Normal Priority
Peak Throughput	Up to 256000 bytes/s
Mean Throughput	20000 bytes/h
Radio Priority	Level 4
NSAPI	5
IPv4	193.254.166.192
SAPI	11
A/U	Unacknowledge mode

Fig. 4-135 GSM GPRS PDP Info View

For each mobile, the PDP parameters are arranged in a table with 2 columns. The width of the columns can be varied with a drag-and-drop mechanism in the header of the table.

SM State One of the four values PDP Active, PDP Active Pending, PDP Inactive, PDP Inactive Pending. If SM State = PDP Inactive or PDP Active Pending, then some of the other parameters of the view are invalid.

The following five parameters indicate the Quality of Service (QoS) of the PDP:

Reliability Class The reliability class indicates the probability of loss, duplication, mis-sequencing or corruption of Service Data Units (SDU). This translates into the transmission characteristics that are required by an application. The reliability classes are as specified in GSM 04.08:

Acknowledged GTP, LLC, and RLC, Protected data

Unacknowledged GTP, Acknowledged LLC and RLC, Protected data

Unacknowledged GTP and LLC, Acknowledged RLC, Protected data

Unacknowledged GTP, LLC and RLC, Protected data

Unacknowledged GTP, LLC and RLC, Unprotected data

Delay Class Defines the maximum delay to be incurred by the transfer of data through the GPRS network. Four delay classes 1 (smallest delay) to 4 (largest delay; maximum delay not specified) are defined.

Precedence Class Indicates the relative priority of maintaining the service. The following three precedence classes are defined:

High Priority

Service commitments will be maintained ahead of all other priority levels.

Normal Priority

Service commitments will be maintained ahead of low priority users.

Low Priority

Service commitments will be maintained after the high and normal priority commitment have been fulfilled.

Peak Throughput Maximum user data throughput (bit rate) requested by the user.

Mean Throughput Mean user data throughput (bit rate) requested by the user, including periods in which no data is transmitted.

Radio Priority Radio priority of the requested TBF; one of the levels between *Level 1* (highest priority) and *Level 4* (lowest priority, corresponding to the highest throughput).

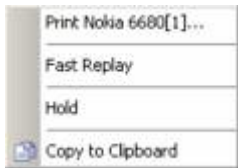
NSAPI Network layer Service Access Point Identifier; integer number that, together with the Temporary Logical Link Identity (TLLI), is used for network layer routing.

IPv4 Internet Protocol address according to the IETF convention.

SAPI Network Service Access Point Identifier. An integer value in the range [0; 15], identifying a PDP context belonging to a specific MM Context ID.

A/U *Acknowledge mode* or *Unacknowledge mode*.

Context menu A right mouse click on any point in the view opens the context menu to print the view contents, (de-)select the view for fast replay, put the view on hold, or to copy the current view to the clipboard; see [Context menu](#) description on p. 4.2.



The *GSM GPRS PDP Info View* has no configuration menu assigned. The *Info* tab can be accessed via the *Configuration – Settings* command.

GSM GPRS RLC/MAC View

The *GSM GPRS RLC/MAC View* displays important Radio Link Control/Medium Access Control parameters of mobile phones supporting GPRS. The parameters are shown for all mobiles that are used in the current measurement or recorded in the replayed measurement file.

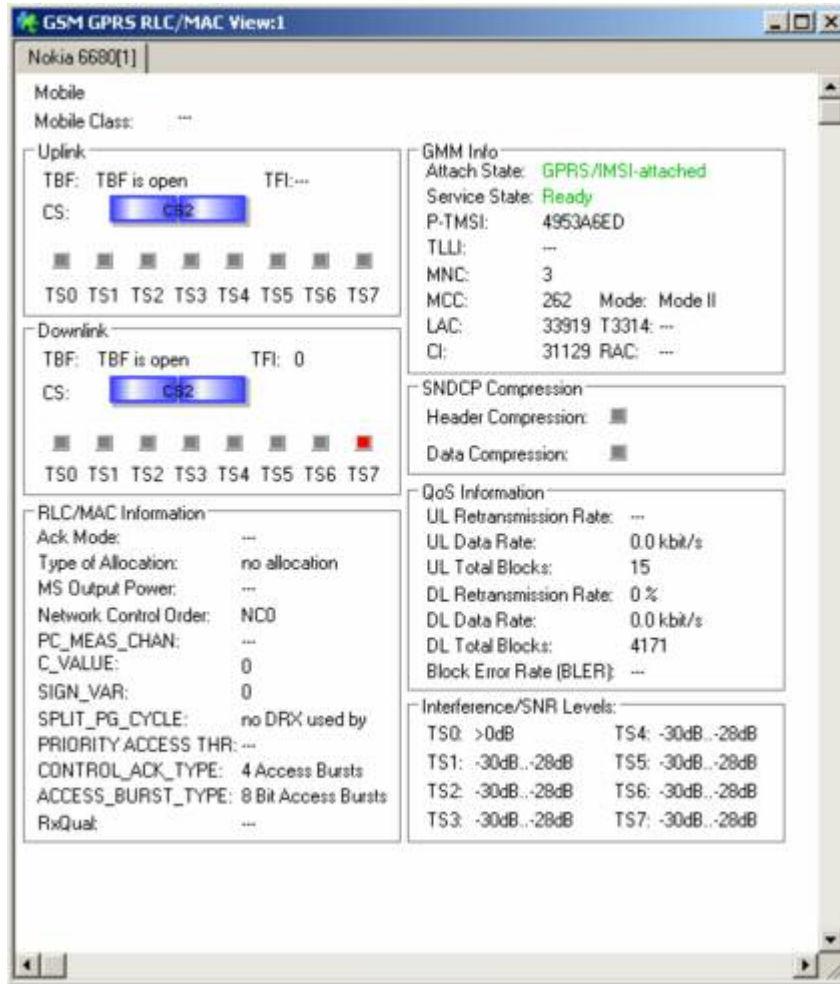


Fig. 4-136 GSM GPRS RLC/MAC View

For each mobile, the RLC/MAC parameters are arranged in six panels. The mobile type and its power class are indicated above the *Uplink* panel.

Uplink / Downlink The *Uplink* and *Downlink* panels monitor the Temporary Block Flow (TBF) in uplink (mobile station towards base station) and downlink (base station towards mobile station) direction, respectively. The TBF is a temporary physical connection between the mobile and the base station that is maintained only for the duration of the data transfer.

TBF

Status of the TBF: open (during data transfer) or closed.

TFI

Temporary Flow Identity. Together with the direction (uplink or downlink), the TFI uniquely identifies a RLC data block.

CS

GPRS channel coding scheme (CS1 to CS4) or EDGE modulation and coding scheme (MCS1 to MCS9). A diagram makes it easy to notice changes of the coding scheme. In the configuration menu, it is possible to adjust the diagram for GPRS or EDGE coding schemes.

TS

Timeslot used for the TBF. The LED symbols light while the TBF occupies one or several of the timeslots 0 to 7.

RLC/MAC Information

The *RLC/MAC Information* panel displays the following information:

Ack Mode

RLC mode: Acknowledge mode or Unacknowledge mode.

Type of Allocation

MAC mode; medium access method to be used during the TBF: *Dynamic allocation*, *Fixed allocation* or *No allocation*

MS

Output Power Output power of the mobile station in dBm.

Netw. Control Order

Current value of the NETWORK_CONTROL_ORDER parameter defined in GSM 05.08. This parameter controls the measurement reports provided by the mobile and its cell re-selection. Possible values are:

NC0 Normal MS control: MS performs autonomous cell re-selection

NC1 Normal MS control with measurement reports

NC2 Network control. MS sends measurement reports but does not perform autonomous cell re-selection

RESET

The MS returns to the broadcast parameters. Only sent on PCCCH or PACCH

PC_MEAS_CHAN

Channel where the measurements for power control are made: BCCH or PDCH.

C_VALUE

Value of the C parameter calculated by the mobile station; relevant for the channel quality report.

<i>SIGN_VAR</i>	Value of the signal variance parameter calculated by the mobile station; relevant for the channel quality report.
<i>SPLIT_PG_CYCLE</i>	Optional parameter specified in GSM 05.08 controlling the occurrence of paging blocks on CCCH or PCCCH belonging to the mobile station in DRX (Discontinuous Reception) mode.
<i>PRIORITY_ACCESS_THR</i>	Control parameter indicating whether packet access is allowed and for which priority level it is allowed.
<i>CONTROL_ACK_TYPE</i>	Default format of the PACKET CONTROL ACKNOWLEDGMENT message: either <i>4 Access Bursts</i> or <i>RLC/MAC Control Block</i> .
<i>ACCESS_BURST_TYPE</i>	Access burst format: <i>8 Bit Access Bursts</i> or <i>11 Bit Access Bursts</i> .
<i>RxQual</i>	Received signal quality reported by the mobile; see section GSM Measurement Report View on page 4.250.
GMM Info	The <i>GMM Info</i> panel displays the following GPRS Mobility Management information:
<i>Attach State</i>	GPRS operating mode of the mobile: – (not available), Attached, IMSI Attached, Combined Attached, Not Attached
<i>Service State</i>	GPRS operating mode of the mobile: – (idle/not available), Stand By or Ready.
<i>P-TMSI</i>	Packet TMSI of the mobile, transferred to the network during a GPRS attach.
<i>TLLI</i>	Temporary Logical Link Identity, code number to identify the mobile at the RLC/MAC layer.
<i>MNC</i>	Mobile Network Code
<i>MCC</i>	Mobile Country Code
<i>LAC</i>	Location Area Code
<i>CI</i>	Cell Identity
<i>Mode</i>	Network mode of operation 1, 2, or 3.
<i>T3314</i>	Ready timer used in the MS and in the network for each assigned P-TMSI to control the cell updating and paging process.
<i>RAC</i>	Routing Area Code; fixed length code (of 1 octets) identifying a routing area within a location

**SNDCP
Compression**

The *SNDCP Compression* panel indicates whether or not the mobile uses compression of the Subnetwork Dependent Convergence Protocol (SNDCP) information (GSM 04.65). Protocol control information compression is an optional SNDCP feature that helps to improve channel efficiency.

The *TCP/IP Header Compression* and *Data Compression* is indicated in separate boxes. A red box indicates that compression is enabled.

**QoS
Information**

The *QoS Information* panel indicates parameters describing the user data throughput and reliability of the GPRS connection. The parameters characterize the quality of service (QoS); see GSM 02.60.

UL Retransmission Rate

Number of unacknowledged uplink (UL) frames that the mobile had to retransmit for error recovery

UL Data Rate

UL data rate in bytes/s

UL Total Blocks

Total number of UL data blocks transferred

DL Retransmission

Rate Number of unacknowledged downlink (DL) frames that the base station had to retransmit for error recovery

DL Data Rate

DL data rate in bytes/s

DL Total Blocks

Total number of DL data blocks transferred

Block Error Rate

Ratio of blocks received in error at the mobile to total number of received blocks (GSM 11.10).

**Interference
Levels**

Carrier to Interference ratio C/I in dB and for each timeslot (TS0 to TS7) provided by the mobile. The result is invalid (---) if the mobile does not provide any C/I result or if the timeslot is not active. The C/I is provided by the Sagem test mobile OT190 and newer types.

Context menu

A right mouse click on any point in the view opens the context menu to print the view contents, access the configuration menus, (de-)select the view for fast replay, copy the current view to the clipboard, create or delete views, save the current configuration, or move to another worksheet; see [Context menu](#) description on p. 4.2.

The *GSM GPRS RLC/MAC View* has no specific configuration menu assigned. The *Info* tab can be accessed via the *Configuration – Settings* command.

GSM GPRS TS/CS View

The *GSM GPRS TS/CS View* provides a statistical evaluation of the number of timeslots (TS) that are active in the connection and of the Coding Scheme (CS) that is used for the transmission of radio blocks. Both parameters are shown for the uplink and downlink.

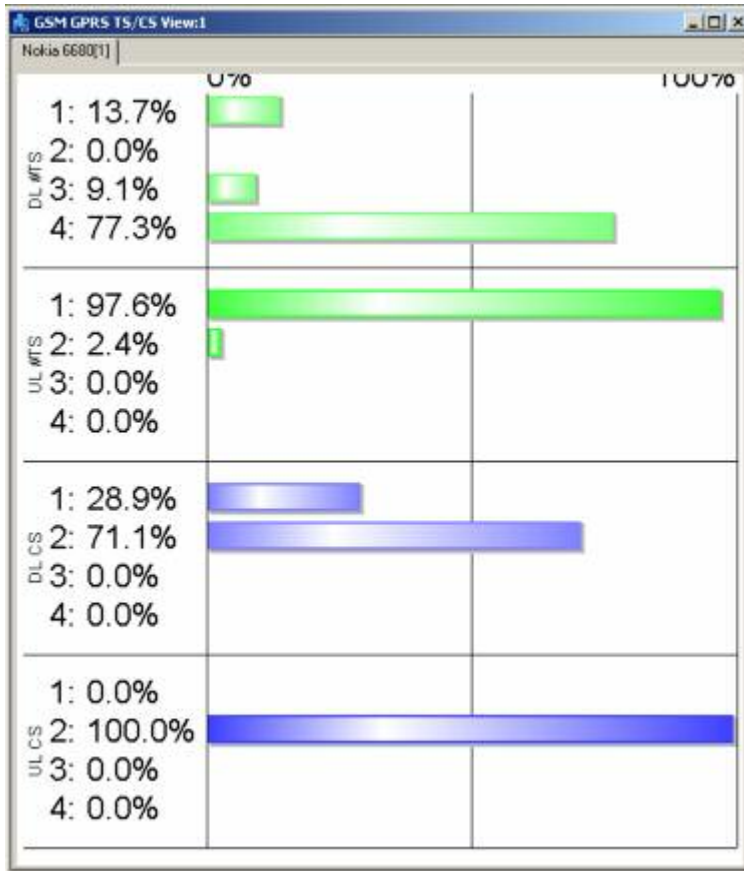


Fig. 4-137 GSM GPRS TS/CS View

UL TS / DL TS

Distribution in time of the number of timeslots used in the connection: Ratio of the time during which each number of timeslots is active to the total connection time. The ratios are expressed as percentages and visualized with colored bars. The length of the bars is proportional to the percentages; the sum of all percentages adds up to 100 %.

The maximum number of timeslots displayed can be selected in the configuration menu.

UL CS / DL CS

Distribution in time of the coding scheme used in the connection: Ratio of the time during which each coding scheme is used to the total connection time. The ratios are expressed as percentages and visualized with colored bars. The length of the bars is proportional to the percentages; the sum of all percentages adds up to 100 %.

The maximum CS number displayed can be selected in the configuration menu.

Context menu

A right mouse click on any point in the view opens the context menu to print the view contents, access the configuration menus, (de-)select the view for fast replay, copy the current view to the clipboard, create or delete views, save the current configuration, or move to another worksheet; see [Context menu](#) description on p. 4.2.

GSM GPRS TS/CS View Configuration

The *GSM GPRS TS/CS View Configuration* tab of the configuration menu defines the contents of the view.

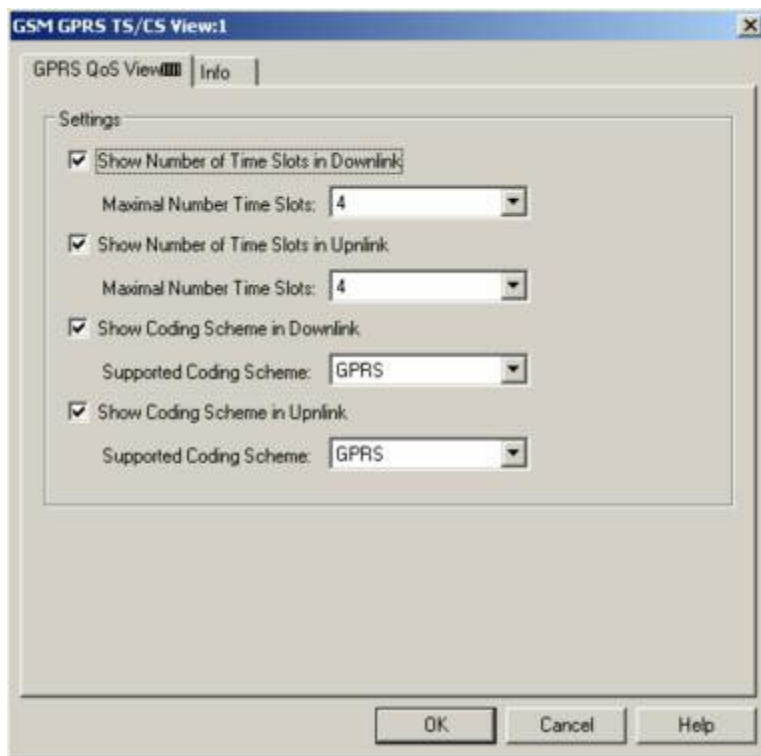


Fig. 4-138 GSM TS/CS View: GPRS TS/CS View Configuration

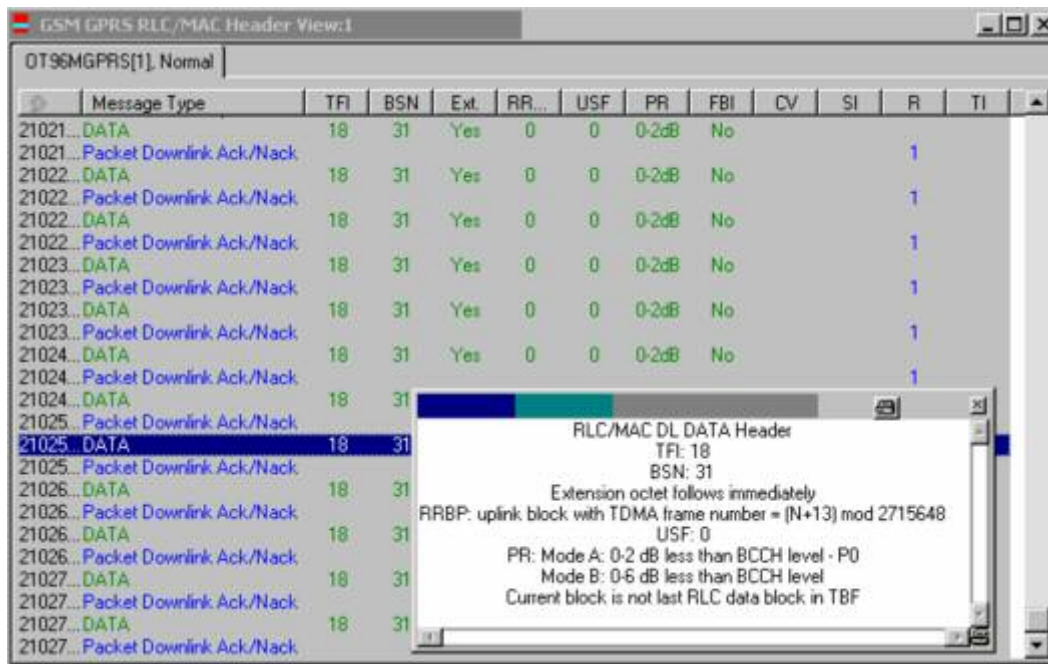
Settings Clearing one of the *Show Number of Time Slots...* or *Show Coding Scheme...* boxes entirely hides the corresponding diagram in the view.

In addition, it is possible to simplify the diagrams by restricting the maximum number of time slots to less than 8 or the coding scheme number to less than 4. This makes it easier to read the diagram, especially if the maximum number of TS and maximum CS is known.

GSM GPRS RLC/MAC Header View

The *GSM GPRS RLC/MAC Header View* shows the exchanged RLC/MAC block header information. The RLC/MAC header contents depend on the transmission direction (UL/DL); they are described in standard 3GPP TS 44.060.

Moreover, recording of the *RLC/MAC Headers* must be enabled in the *General Settings* tab of the SAGEM x6 driver configuration menu.



Message Type	TFI	BSN	Ext.	RR...	USF	PR	FBI	CV	SI	R	TI
21021... DATA	18	31	Yes	0	0	0-2dB	No				
21021... Packet Downlink Ack/Nack										1	
21022... DATA	18	31	Yes	0	0	0-2dB	No				
21022... Packet Downlink Ack/Nack										1	
21022... DATA	18	31	Yes	0	0	0-2dB	No				
21022... Packet Downlink Ack/Nack										1	
21023... DATA	18	31	Yes	0	0	0-2dB	No				
21023... Packet Downlink Ack/Nack										1	
21023... DATA	18	31	Yes	0	0	0-2dB	No				
21023... Packet Downlink Ack/Nack										1	
21024... DATA	18	31	Yes	0	0	0-2dB	No				
21024... Packet Downlink Ack/Nack										1	
21024... DATA	18	31									
21025... Packet Downlink Ack/Nack											
21025... DATA	18	31									
21025... Packet Downlink Ack/Nack											
21026... DATA	18	31									
21026... Packet Downlink Ack/Nack											
21026... DATA	18	31									
21026... Packet Downlink Ack/Nack											
21027... DATA	18	31									
21027... Packet Downlink Ack/Nack											
21027... DATA	18	31									
21027... Packet Downlink Ack/Nack											

RLC/MAC DL DATA Header
 TFI: 18
 BSN: 31
 Extension octet follows immediately
 RRBP: uplink block with TDMA frame number = (N+13) mod 2715648
 USF: 0
 PR: Mode A: 0-2 dB less than BCCH level - P0
 Mode B: 0-6 dB less than BCCH level
 Current block is not last RLC data block in TBF

Fig. 4-139 GSM GPRS RLC/MAC Header View

For each mobile, the RLC/MAC header information is arranged in a table. The width of the columns can be varied with a drag-and-drop mechanism in the header of the table.

Table entries	Each RLC/MAC header forms a table row with the entries described below. Some of the values are only available for a particular direction (uplink or downlink).
@	Timestamp assigned to the header
<i>Message Type</i>	Data block or message type transmitted in the RLC/MAC block
<i>TFI 5-bit</i>	Temporary Flow Identity, identifies the Temporary Block Flow (TBF) to which the RLC data block belongs.
<i>BSN</i>	Block Sequence Number, carries the sequence absolute Block Sequence Number (BSN) modulo Sequence Number Space (SNS) (128 in GPRS and 2 048 in EGPRS) of each RLC data block within the TBF.
<i>Ext.</i>	Extension bit, indicates the presence of an optional octet in the RLC data block header (0: Extension octet follows immediately; 1: No extension octet follows).
<i>RRBP</i>	Relative Reserved Block Period, specifies a single uplink block in which the mobile station shall transmit either a PACKET CONTROL ACKNOWLEDGEMENT message or a PACCH block to the network.
<i>USF</i>	Uplink State Flag, sent in all downlink RLC/MAC blocks, indicates the owner or use of the next uplink radio block on the same time-slot.
<i>PR</i>	Power Reduction field, indicates the power level reduction of the current RLC block.
<i>FBI</i>	Final Block Indicator, indicates whether the downlink RLC data block is the last RLC data block of the downlink TBF.
<i>CV</i>	4-bit Countdown Value, sent by the mobile station to allow the network to calculate the number of RLC data blocks remaining for the current uplink TBF.
<i>SI</i>	Stall Indicator bit, indicates whether the mobile's RLC transmit window can advance (i.e. is not stalled, value 0) or can not advance (i.e. is stalled, value 1).
<i>R</i>	Retry bit, indicates whether the mobile station transmitted the CHANNEL REQUEST message, PACKET CHANNEL REQUEST message, or EGPRS PACKET CHANNEL REQUEST message one time or more than one time during its most recent channel access.
<i>TI</i>	TLLI Indicator bit, indicates the presence of an optional TLLI field within the RLC data block.

Detailed information

An upper case D appears to the right of the cursor arrow when it is placed in the active (gray) zone of the view. This symbol indicates that there is detailed information to be retrieved for the current RLC/MAC header. A double-click opens the detailed information window; see

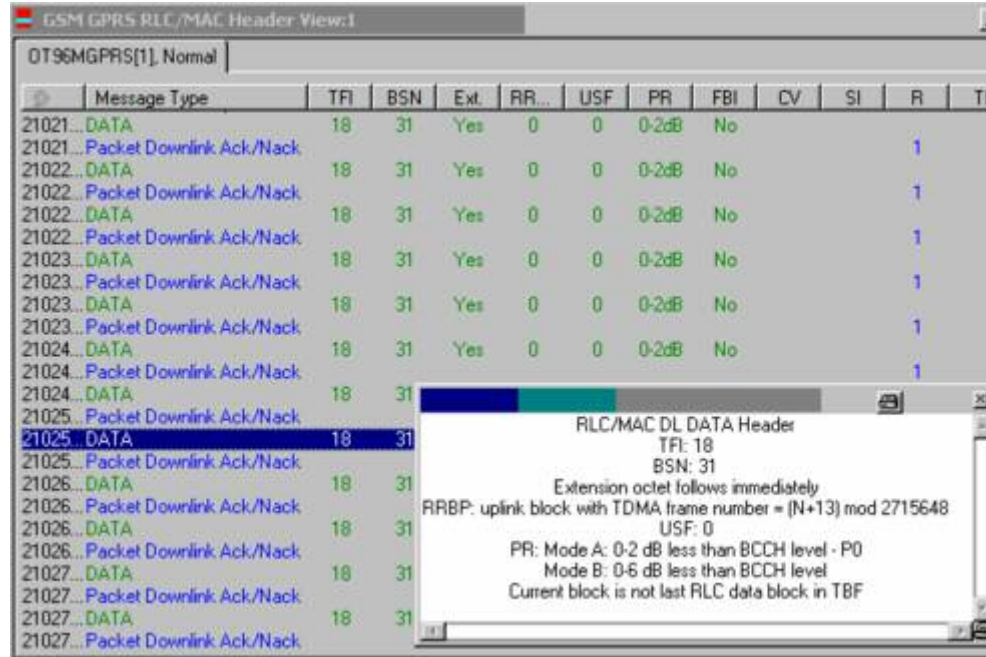
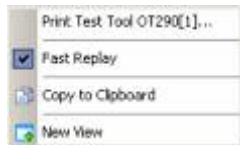


Fig. 4-139 above.



The detailed information window is totally independent of the GSM GPRS RLC/MAC Header View, so you can move, resize and scroll it as you like. Click the printer symbol in the lower right corner to generate a hardcopy of the detailed information. Alternatively, you can write the detailed information into the table (e.g. if you wish to create a hardcopy), see the ...Messages tabs of the configuration menu.

Context menu



A right mouse click on any point in the view opens the context menu to print the view contents, (de-)select the view for fast replay, copy the current view to the clipboard, and to create new views; see [Context menu](#) description on p. 4.2.

The *GSM GPRS RLC/MAC Header View* has no configuration menu assigned. The *Info* tab can be accessed via the *Configuration – Settings* command.

GSM GPRS/EGPRS View

The *GSM GPRS/EGPRS View* shows control and physical parameters of a GPRS and EGPRS connection.

The Nokia 6230 test mobile provides both GPRS and EGPRS parameters.

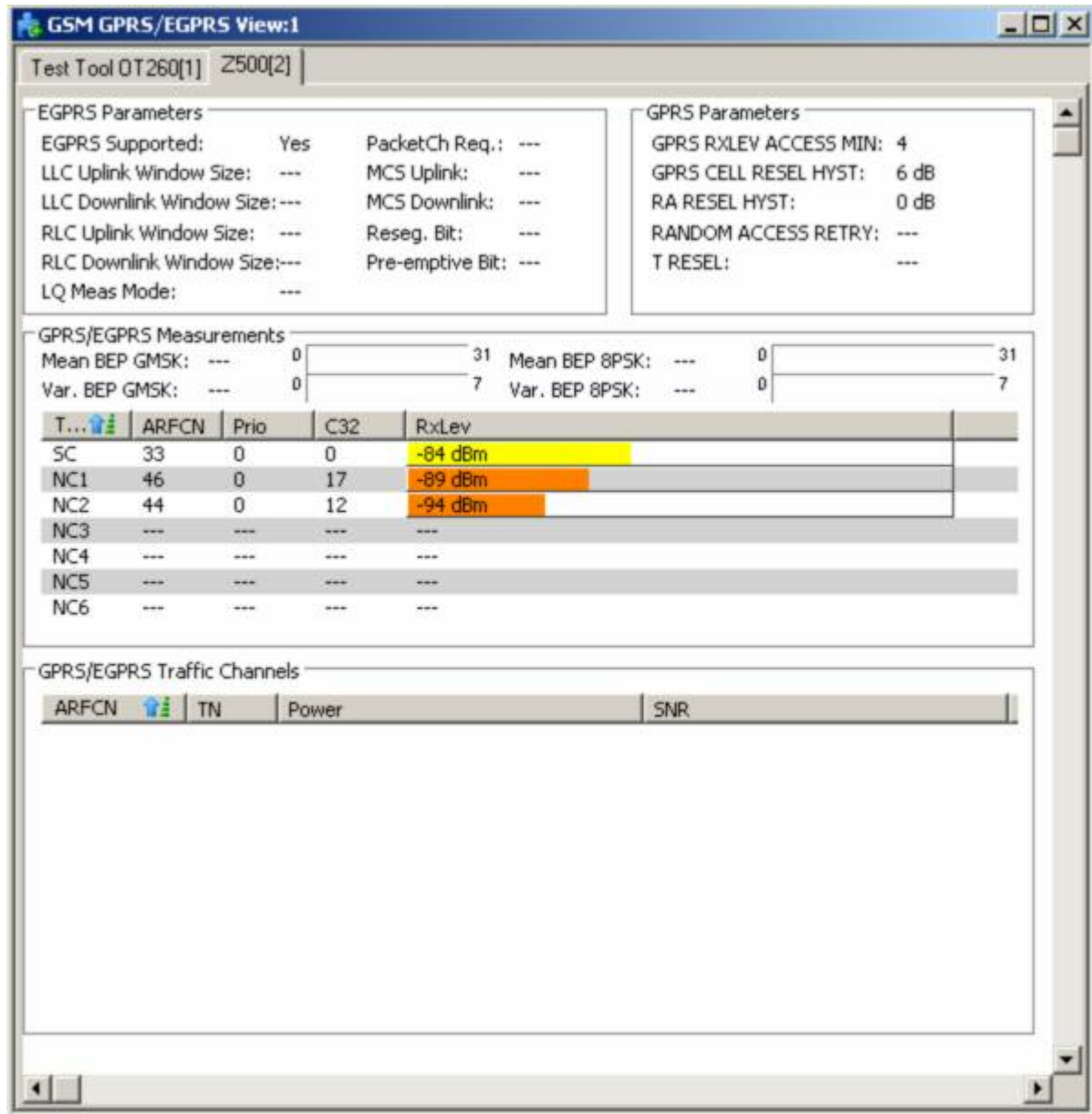


Fig. 4-140 GSM GPRS/EGPRS View

For each mobile, the GPRS and EGPRS parameters are arranged in two panels and two tables below.

EGPRS Parameters

The upper left panel shows the following EGPRS-related control parameters:

EGPRS Supp.

EGPRS capability of the mobile phone (Yes or No). Most of the following parameters are only available if EGPRS is supported.

LLC Uplink/Downlink Window Size

LLC window size, i.e. the maximum number of sequentially-numbered uplink/downlink I frames that may be outstanding at any time. The window size is in the range 1 through 255 (see standard 3GPP TS 04.64).

RLC Uplink/Downlink Window Size

RLC window size (no. of RLC data blocks) that the network selects for the uplink/downlink, depending on the number of timeslots allocated (see standard 3GPP TS 44.060). For GPRS, a fixed window size of 64 is used.

LQ Meas. Mode

Link Quality Measurement Mode (0 to 3), see standard GPP TS 04.60, subclause 11.2.7.2.

PacketCh Req.

EGPRS packet channel request supported in serving cell (Yes/No).

MCS Uplink/Downlink

GPRS channel coding scheme (CS1 to CS4) or EGPRS modulation and coding scheme (MCS1 to MCS9) used in the uplink and downlink.

Reseg. Bit

Value of the resegment bit sent in the PACKET UPLINK ACH/NACK message, indicating whether or not the transmitted RLC blocks shall be resegmented (see standard 3GPP TS 51.010).

Pre-emptive Bit

Value of the pre-emptive transmission bit sent in the PACKET UPLINK ACH/NACK message, indicating whether or not pre-emptive transmission shall be used.

GPRS Parameters

The upper left panel shows a list of GPRS-related control parameters. The parameters are relevant for cell reselection and described in standard 3GPP TS 04.60 and related standards.

GPRS RXLEV ACCESS MIN

Minimum received signal level at the MS required for access to the system (value range: 0 to 63).

GPRS CELL RESEL HYST

Additional hysteresis applied in *Ready* state for cells in the same Routing Area (value range: 0 dB, 2 dB,..., 14 dB).

RA RESEL HYST

Additional hysteresis applied for cells in different Routing Areas (value range: 0 dB, 2 dB,..., 14 dB).

RANDOM ACCESS RETRY

1-bit value, if set to 1, it indicates that the mobile station is allowed to try to access another cell if available.

T RESEL

Delay time before a mobile is allowed to reselect a cell after an abnormal release of the connection to this cell. *T RESEL* can be set to 8 discrete values between 5 seconds and 300 seconds.

GPRS/EGPRS Measurements

Below the parameter panels of the *GSM GPRS/EGPRS View* presents an evaluation of physical parameters of the GPRS/EGPRS connection that the mobile reports to the network (see standard 3GPP TS 04.60 and related standards).

Mean BER

Mean value of the Bit Error Probability of the channel averaged over all timeslots in the TBF. Range 0 to 31; see 3GPP TS 04.60 and 3GPP TS 05.08.

Var BER

Variation coefficient for the Bit Error Probability averaged over all time slots of the TBF. Range 0 to 7; see 3GPP TS 05.08.

Type

The table shows results from the serving cell (*SC*) and up to six neighbor cells (*NC1*, ..., *NC6*), if available.

ARFCN

Absolute Radio Frequency Channel Number used in the serving cell and the neighbor cells.

Prio

GPRS priority class, 3-bit value to indicate the HCS priority for the call.

C32

Flag indicating an exception rule for GPRS_RESELECT_OFFSET according to 3GPP TS 05.08.

RxLev

RxLev of the serving cell and the neighbor cells

GPRS/EGPRS Traffic Channels

The last part of the *GSM GPRS/EGPRS View* presents traffic channel related information:

ARFCN

Absolute Radio Frequency Channel Number used in the serving cell and the neighbor cells.

TN

Time Slot

Power

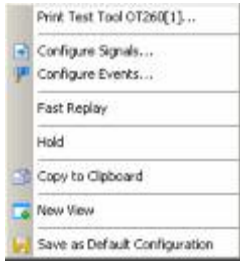
Received Power (in dBm)

SNR

Signal-to-Noise ratio (in dB)

Context menu

A right mouse click on any point in the view opens the context menu to print the view contents, access the configuration menus, (de-)select the view for fast replay, put the view on hold, copy the current view to the clipboard, create new views, or to save the current configuration; see [Context menu](#) description on p. 4.2.



GSM GPRS RLC MAC Release Indicators View

The *GSM GPRS RLC MAC Release Indicators View* shows control and physical parameters of the connection release information, such as the cause of the release, statistical parameters and the release indicator description, if supplied.

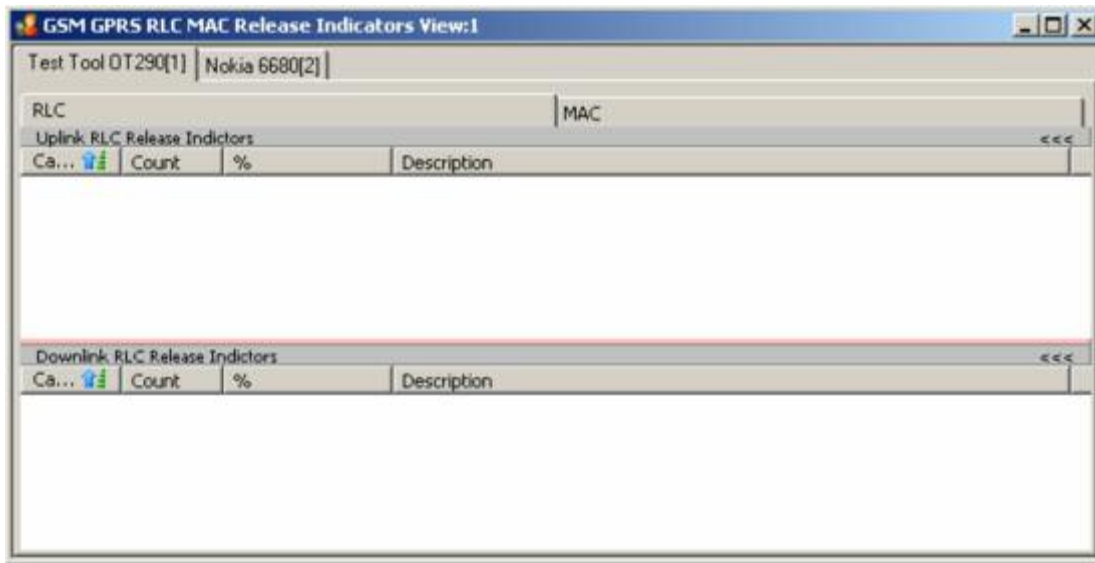


Fig. 4-141 GSM GPRS RLC MAC Release Indicators View

For each mobile, the RLC or MAC Release indicators are arranged in two lists. The width of the columns can be varied with a drag-and-drop mechanism in the header of the table.

Uplink / Downlink Table entries Each RLC or MAC release indicator forms a table row with the entries described below.

Cause

The cause of the RLC/MAC release.

Count

The number of measured release indicators of the current session.

%

Percentage of the related cause

Description

Release indicator description

Context menu



A right mouse click on any point in the view opens the context menu to print the view contents, access the configuration menus, (de-)select the view for fast replay, put the view on hold, copy the current view to the clipboard, create new views, or to save the current configuration; see [Context menu](#) description on p. 4.2.

GSM GPRS RLC MAC Release Indicators View Configuration

The *GSM GPRS RLC MAC Release Indicators View Configuration* tab of the configuration menu defines the contents of the view.

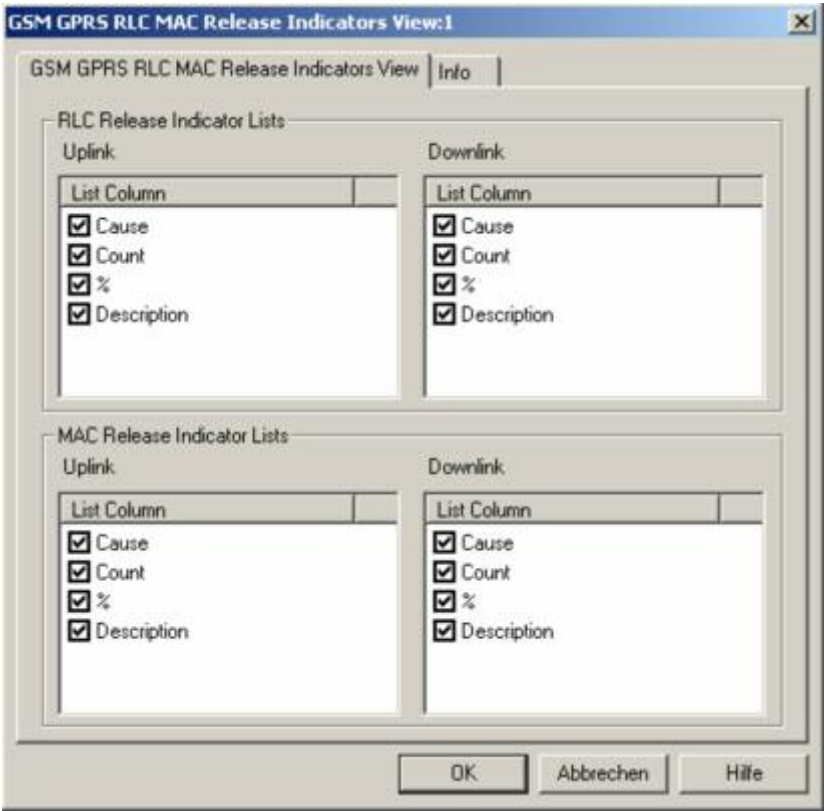


Fig. 4-142 GSM GPRS RLC MAC Release Indicators View: Configuration

RLC/MAC Release Indicator Lists

The *Release Indicators Lists Settings* panel offer checkboxes to select the elements displayed in the release indicator view tables.

GSM Views

The *GSM Views* display GSM-specific information included in the measurement data. GSM data can be acquired using one of the GSM drivers described in chapter 6. Some of the views require a particular measurement mode or a GSM mobile supporting special features (e.g. GPRS).

The GSM views can be selected from a submenu displayed on the right side of the *View* menu when the mouse pauses over *GSM*.

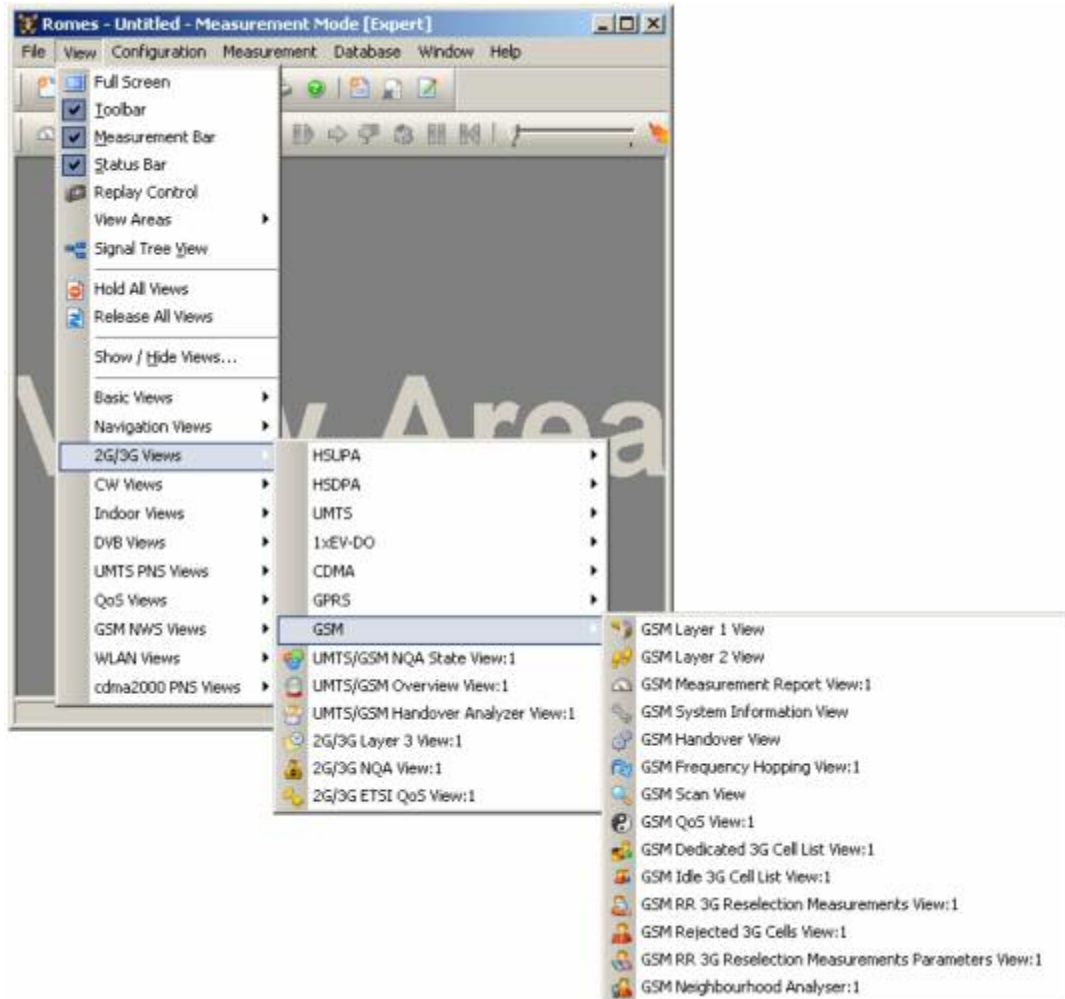


Fig. 4-143 GSM views

GSM Layer 1 View

The *GSM Layer 1 View* displays the values of layer 1 (physical layer) parameters that are constantly measured and transferred to the base station while the GSM mobile station operates in the network. The layer 1 parameters are shown for all mobiles used. They are not available in *Scan* mode; the mobile must be in *Normal*, *Camp*, or *Test Transmitter* mode.

Test Tool OT29...							Nokia 6680[2] [...]						
	SC	NC 1	NC 2	NC 3	NC 4	NC 5		SC	NC 1	NC 2	NC 3	NC 4	NC 5
BCCH	80[...]	75	73	748	1	730	BCCH	80[...]	75	55	732	65	730
BSIC	42	74	35	75	41	60	BSIC	42	74	57	60	37	60
RxLev(F)	-79...	-80...	-80...	-89...	-93...	-95...	RxLev(F)	-65...	-80...	-80...	-80...	-83...	-88...
RxLevS	-75...	--	--	--	--	--	RxLevS	-64...	--	--	--	--	--
RxQualF	0	--	--	--	--	--	RxQualF	0	--	--	--	--	--
RxQualS	0	--	--	--	--	--	RxQualS	0	--	--	--	--	--
TimingAdvance	1[5...	--	--	--	--	--	TimingAdvance	1[5...	--	--	--	--	--
TX Power	14	--	--	--	--	--	TX Power	11	--	--	--	--	--
RX BCCH	-67...	--	--	--	--	--	RX BCCH	--	--	--	--	--	--
Frame Number	--	12...	14...	10...	14...	12...	Frame Number	--	--	--	--	--	--
HBN	--	1175	1057	1303	825	1361	HBN	--	--	--	--	--	--

Fig. 4-144 GSM Layer 1 View

The layer 1 parameters provided by each mobile are arranged in a separate list. The width of the individual lists can be varied with a drag-and-drop mechanism in the header of the table.

<Mobile type and number>

List of the layer 1 parameters provided by an individual mobile. The parameters to be displayed are selected in the GSM Layer 1 Parameters tab of the configuration menu, see below. Behind each mobile, its current mode (idle or dedicated) is indicated. The mode determines which type of layer 1 parameters can be measured, so the table and the parameter list is updated every time a mobile changes its mode.

SC, NC1 to NC6

Column SC contains the layer 1 parameters of the serving cell, columns NC1 to NC6 contain the layer 1 parameters of up to 6 neighbor cells. The number of neighbor cells can be set in the GSM Layer 1 Parameters tab of the configuration menu, see below.

Context menu



A right mouse click on any point in the view opens the context menu to access the configuration menus, (de-)select the view for fast replay, put the view on hold, copy the current view to the clipboard, or to save the current configuration; see [Context menu](#) description on p. 4.2.

GSM Layer 1 View Configuration

The *GSM Layer 1 View* configuration menu defines the parameters to be viewed and shows information on the current view version. It is opened via a right mouse click on a point inside *GSM Layer 1 View* or via the *Configuration – Settings* command (see chapter 3).

The *GSM L1 Parameters* tab selects the layer 1 parameters to be displayed.

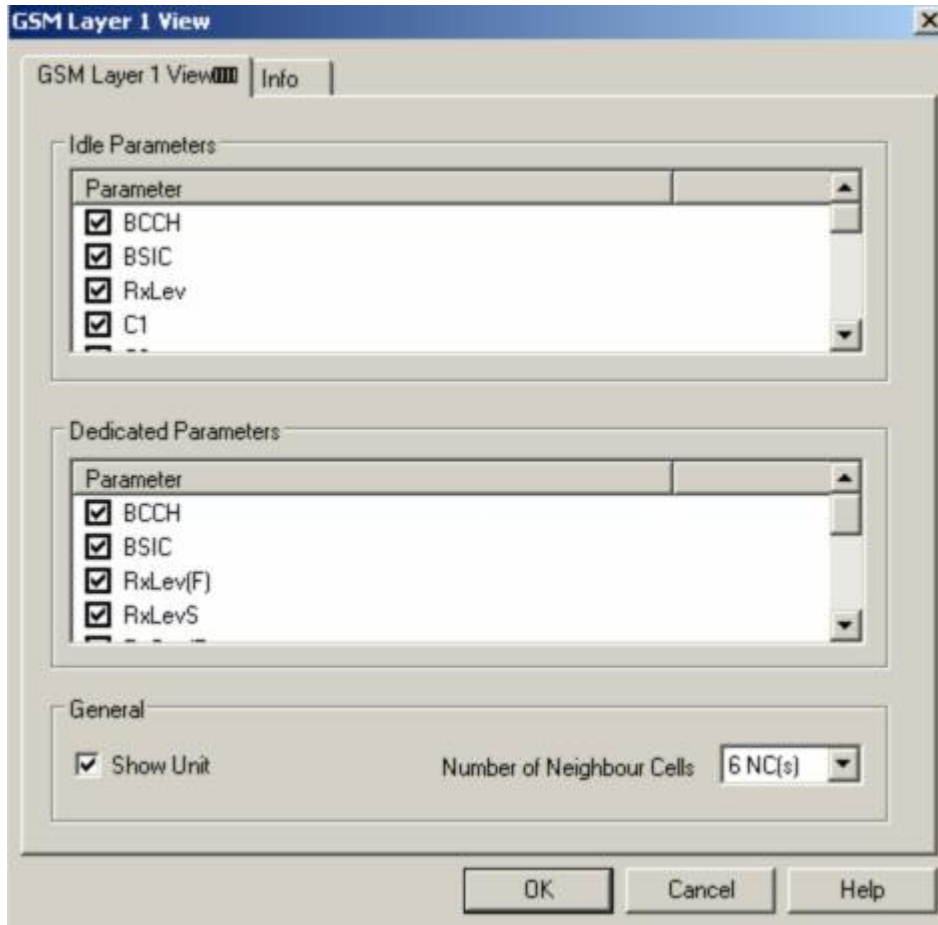


Fig. 4-145 GSM Layer 1 View: GSM Layer 1 Parameters

Idle Parameters List of layer 1 parameters that are available while the mobile is in idle mode. In this mode, no RR (Radio Resource) connection exists. The mobile is not allocated any dedicated channel; it listens to the CCCH and BCCH.

Dedicated Parameters List of layer 1 parameters that are available while the mobile is in dedicated mode. In this mode an RR connection exists that allows a point-to-point dialog between the mobile station and the network.

- General** The *General* settings configure the *Layer 1 View* table:
- Show Unit*
If the box is checked, the physical units of the layer 1 parameters are shown in the *GSM Layer 1 View* table. The units appear in angular brackets behind the parameter values. Exceptions are parameters with no or trivial units, e.g. the BSIC.
- No of Neighbor C.*
Selects a number of 0 (*No NC*) to 6 (*6 NC(s)*) neighbor cells to be monitored in the *GSM Layer 1 View* table.
- OK** Apply all *GSM Layer 1 View* settings and close the configuration menu.
- Cancel** Discard all *GSM Layer 1 View* settings and close the configuration menu.

GSM Layer 2 View

The *GSM Layer 2 View* displays all layer 2 messages contained in the recorded data. The messages can not be configured; furthermore, recording must be enabled in the *Measurement Mode* or *General Settings* tab of the *Driver Configuration* menu (*Layer 2 messages* box, see section *GSM Mobile Drivers* in chapter 6).

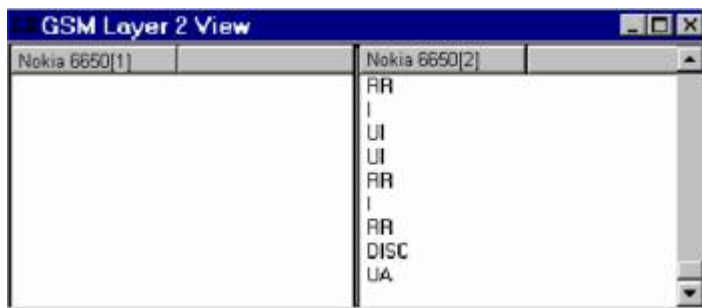


Fig. 4-146 GSM Layer 2 View

For each mobile, the layer 2 messages are arranged in its own table containing a maximum of 100 lines. After this limit is reached, every new message added deletes the oldest message in the table. The width of the individual tables can be varied with a drag-and-drop mechanism.

- Context menu** A right mouse click on any point in the view opens the context menu to print the view contents, access the configuration menus, (de-)select the view for fast replay, copy the current view to the clipboard, save the current configuration, or move to another worksheet; see [Context menu](#) description on p. 4.2.



GSM Layer 2 View Configuration

The *GSM Layer 2 View* configuration menu switches the autoscroll mechanism on or off and shows information on the current view version. It is opened via a right mouse click on a point inside the *GSM Layer 2 View* or via the *Configuration – Settings* command (see chapter 3).



Fig. 4-147 GSM Layer 2 View configuration

Autoscrolling

If the boxes are checked, the *GSM Layer 2* tables are scrolled down automatically as soon as the bottom of the view window is reached. Otherwise, the scrollbar can be used to move up and down in the table. Autoscrolling can be enabled/disabled separately for replay and measurement sessions.

GSM Measurement Report View

The *GSM Measurement Report View* gives an overview of the receiver reports of all used mobiles, i.e. the values of *RxQual* and *RxLev*. The number of the BCCH, the BSIC, the C1 and C2 parameters, and the name of the base station are displayed in addition. The data are shown for the serving cell and (except for *RxQual*) up to 6 neighbor cells N1 to N6. R&S ROMES allows to open several independent *GSM Measurement Report Views* simultaneously.

Display of most results in the *GSM Measurement Report View* is optional; they can be switched off in the configuration menu.

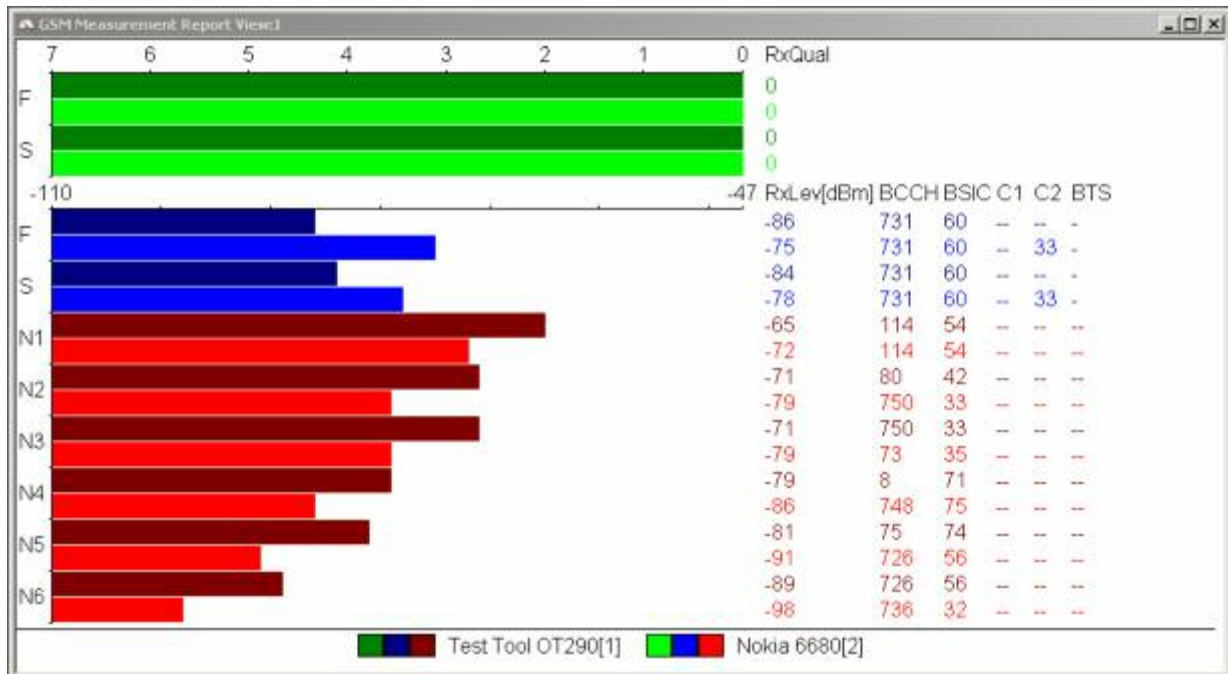


Fig. 4-148 GSM Measurement Report (for 2 test mobiles)

RxQual

The first group of bars represents the values of RxQual in the serving cell:

F

RXQUAL_FULL, assessed over the full range of TDMA frames within a SACCH block

S

RXQUAL_SUB, assessed over a subset of 12 TDMA frames

By definition, the RxQual values range from 0 to 7, 0 corresponding to the best received signal quality (see table in chapter 8). If the inverse scale is used to represent the values for RxQual a longer bar corresponds to a better signal quality (see *Show good RxQual* in the GSM measurement report configuration menu). The numeric values of RxQual are listed to the right of the bars. The scale can be inverted in the configuration menu, see below.

Downlink and up-link

DTX mode

A large difference between the RXQUAL_FULL and RXQUAL_SUB values indicates that the BTS (downlink) signal shows strong variations in time. One possible reason is that the BTS uses discontinuous transmission (DTX). In the DTX mode, the BTS transmitter is switched off during time periods where no information needs to be transferred. The relevant received signal quality is given by RXQUAL_SUB; the averaged parameter RXQUAL_FULL is generally larger (in extreme cases, RXQUAL_FULL can be equal to 7 while RXQUAL_SUB is equal to 0!) and underestimates the signal quality.

The current DTX mode of the GSM mobile station (uplink DTX) can be indicated in the *Alphanumeric View* (*used* or *not used*). The *GSM System Information View* and the detailed information in the *2G/3G Layer 3* view show the DTX mode that the network commands the mobile station to use (*shall* or *shall not* or *may use DTX*).

RxLev	<p>The second group of bars represents the values of RxLev in the serving cell:</p> <p><i>F</i> RXLEV_FULL, assessed over the full range of TDMA frames within a SACCH block</p> <p><i>S</i> RXLEV_SUB, assessed over a subset of 12 TDMA frames</p> <p>By default, the RxLev values range from 0 to 63, 63 corresponding to the highest received signal level (see table in chapter 8). This means that a longer bar corresponds to a better signal quality. The numeric values of RxLev are listed to the right of the bars. The RxLev values can be converted to absolute power units (dBm), see <i>Romes configuration – Available Signals</i> tab in chapter 3.</p> <p>The received signal levels of neighbor cells 1 to k are labeled N1 to Nk. The total number k of neighbor cells displayed is set in the <i>Graph</i> panel of the configuration menu (<i>Number of shown neighbor cells</i>).</p>
BCCH	Number of the broadcast control channel of the cell and mobile.
BSIC	Base transceiver station (BTS) identity code. In this view, the BSIC is always octal (so that BSIC = ab where a is the NCC and b is the BCC), irrespective of the format selected in the <i>Available Signals</i> tab of the <i>Preferences</i> menu (octal/decimal/hex).
C1	C1 parameter, relevant for cell selection.
C2	C2 (reselect) parameter, relevant for cell selection (GSM phase II).
BTS	Name of the base station. This parameter is displayed if a valid BTS list is available. Detailed information can be obtained by double-clicking the BTS name.

Note:

R&S ROMES uses the BCCH and the BSIC to identify the BTS name. If the BTS assignment is ambiguous because several BTS with the same BCCH and BSIC are encountered, then a plus “+” sign precedes the BTS name.

Context menu

A right mouse click on any point in the view opens the context menu to access the configuration menus, (de-)select the view for fast replay, put the view on hold, copy the current view to the clipboard, create new views, or to save the current configuration; see [Context menu](#) description on p. 4.2.

GSM Measurement Report Configuration

The *GSM Measurement Report* configuration menu defines the parameters to be viewed and shows information on the current view version. It is opened via a right mouse click on a point inside *GSM Measurement Report View* or via the *Configuration – Settings* command (see chapter 3).

The *Configuration* tab selects the devices and their parameters to be displayed.



Fig. 4-149 GSM Measurement Report View: Configuration

- Mobiles** List of all mobiles measured with their measurement mode. An arbitrary number of mobiles can be selected from the list (click checkboxes). Only the receiver reports for selected mobiles are displayed in the *GSM Measurement Report View*.
- Graph** The *Graph* panel controls which type of measurement results are displayed. The number of neighbor cells must be in the range between 0 and 6. The *Show Bad RXQual* option button inverts the RxQual scale such that a long bar corresponds to a bad signal quality (0 is left, 7 is right). The checkboxes below switch the display of the corresponding measurement results on and off.
- Legend** To enlarge the diagram space, the legend below can be switched off.
- OK** Apply all *GSM Measurement Report View* settings and close the configuration menu.
- Cancel** Discard all *GSM Measurement Report View* settings and close the configuration menu.

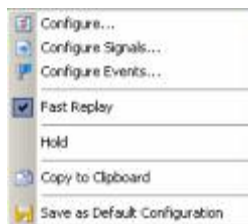
GSM System Information View

The *GSM System Information View* displays a selection of GSM parameters contained in the layer 3 messages *System Information Type 1* to 6 sent by the BTS, according to GSM recommendation 04.08. The values are shown for all mobiles used.

Parameter	Test Tool OT290[1]	Nokia 6680[2]
DTX use	shall	-
PWRC	1	-
RL_TO	24	-
PLMN	F8	-
T3212	-	-
CCCH-Cfg	-	-
BA Ind. ext	-	-
Reestabl	-	-
BsAgBktsRes	-	-
Tx Int	-	-
Emerg.Call	-	-
BsPaMulFrms	-	-
CellBarAcc	-	-
MstxPwrMaxCCH	-	-
RxLev-AccMin	-	-
CellResHyst[dB]	-	-
CellIdentity(hex)	2688	-
LAC (hex)	366	366
MCC	262	262
MNC	2	2
CA No.	-	-
BA No.	0	0
BA Ind.	0	0
CA ARFCN	-	-
BA ARFCN	1 4 8 10 53 63 65 69 73 1...	4 8 10 51 53 59 61 63 65 ...
BA No. ext	2	2
BA Ind. ext	0	0
BA ARFCN ext	732 734 741	732 734 741

Fig. 4-150 GSM System Information View

Context menu



A right mouse click on any point in the view opens the context menu to access the configuration menus, (de-)select the view for fast replay, put the view on hold, copy the current view to the clipboard, or to save the current configuration; see [Context menu](#) description on p. 4.2.

GSM System Information Configuration

The *GSM System Information View* configuration menu defines the parameters to be viewed and shows information on the current view version. It is opened via a right mouse click on a point inside the *GSM System Information View* or via the *Configuration – Settings* command (see chapter 3).

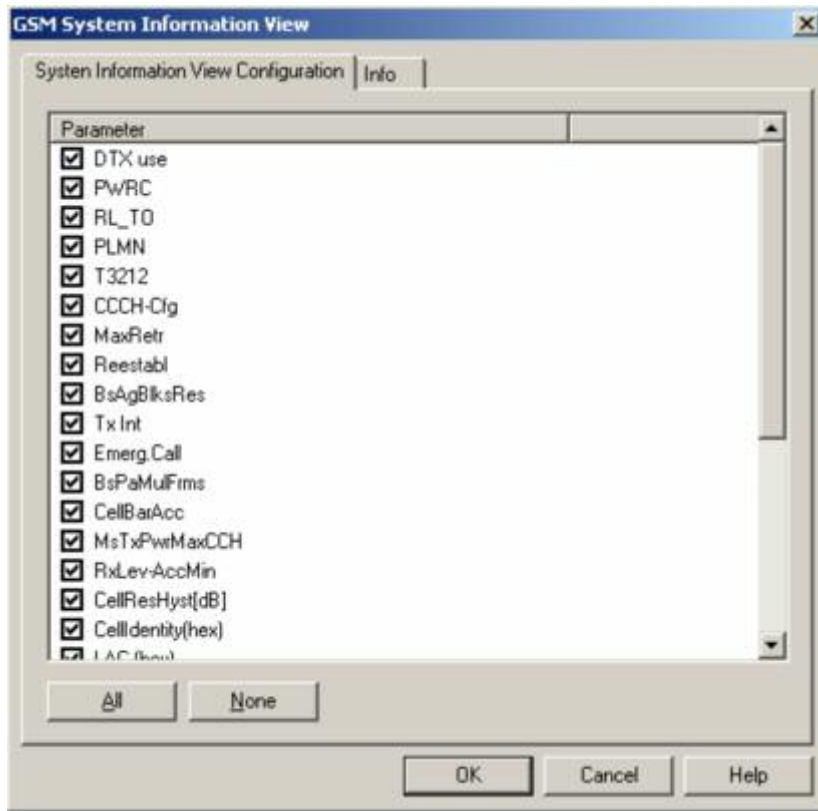


Fig. 4-151 GSM System Information View configuration: parameter list

In the *Parameters* list, the different types of information conveyed via layer 3 messages *System Information Type 1* to 6 can be selected by clicking the corresponding checkboxes. The list contains all parameters listed in the following table:

Table 4-2 GSM System Information Type 1 to 6 parameters

DTX	Discontinuous Transmission	RxLev-AccMin	Min. received signal level at a MS for access to a cell
PwRC	Power Control Indicator	CellResHyst [dB]	RxLev hyster. required for Cell Reselection
RL_TO	Radio Link Timeout	CellIdentity [hex]	Cell Identity code
PLMN	Public Land Mobile Network	LAC [hex]	Location Area Code
T3212	Timeout Value	MCC	Mobile Country Code
Reestabl	Reestablishment Indicator	MNC	Mobile Network Code
BsAgBlksRes	No. of blocks on each CCCH reserved for access grant messages	CA No.	RF channel number in a particular cell (Numbering in a Cell Allocation)
CCCH-Config	Common Control Channel Configuration	BA No.	BCCH Allocation Number
Tx Int	Number of slot to spread transm.	BA Ind.	BCCH Allocation sequence number indication

Emerg.Call	Emergency call permission	CA ARFCN	Cell Allocation ARFCN
BsPaMulFrms	Transmission of the same paging messages to MSs of the same paging group	BA ARFCN	BCCH Allocation ARFCN
CellBarAcc	Cell Access Barred	BA No. ext	extended BCCH Allocation Number
MsTxPwrMaxCCH	Max. allowed transmitted RF power	BA Ind. ext	extended BCCH Allocation sequence number indication
		BA ARFCN ext	extended BCCH Allocation ARFCN

See also GSM abbreviations in chapter 8. The extended BA parameters are relevant for network operators who work with two GSM bands (GSM900 and GSM1800) identified by two parameter sets, respectively.

GSM Handover View

The *GSM Handover View* shows a list of the handover events performed by GSM mobile phones together with the GSM cell parameters.



The GSM Handover View shows the parameters for handovers between two GSM cells. To analyze handover procedures between GSM and UTRAN cells (inter-RAT handovers) use the [UMTS/GSM Handover Analyzer View](#); see p. 4.295.

BCCH1	BSIC1	TS1	TCH1	LAC1	CI1	Test Tool OT260[1]	BCCH2	BSIC2	TS2	TCH2	LAC2	CI2
83	32	1	-	34567	27880	->	590	32	6	590	34567	53E
590	33	6	590	34567	53510	->	18	33	2	-	34567	26E
18	37	2	-	34567	26952	->	21	37	6	21	34567	26E
21	31	6	21	34567	26954	->	18	37	1	87	34567	26E
21	31	0	87	34567	26954	->	16	31	4	-	34567	26E
16	33	4	-	34567	26953	->	19	31	6	-	34568	20E
19	31	6	-	34568	2057	->	92	31	7	92	34568	20E
92	32	7	92	34568	2099	->	123	31	0	32	34568	62E
123	31	0	32	34568	62928	->	22	31	5	-	34568	207
22	31	5	-	34568	2079	->	18	33	0	38	34568	62E
18	33	0	38	34568	62965	->	587	33	2	587	34568	117
587	36	2	587	34568	11736	->	17	36	0	20	34568	30E

Fig. 4-152 GSM Handover View

For each mobile, the handover events are listed in a table with several columns. The width of the columns can be varied with a drag-and-drop mechanism in the header of the table. Their number and contents can be selected in the configuration menu; see below.

In a typical configuration, the current line in the handover list shows the channels, timeslot numbers and base station identity code of the previous cell (before the last handover, left side of the table) and of the current cell (after handover, right side of the table). The values on the right side of each line are therefore identical with the values on the left side of the next line. Failed handover events appear in red color.

Context menu

A right mouse click on any point in the view opens the context menu to print the view contents, access the configuration menus, (de-)select the view for fast replay, put the view on hold, copy the current view to the clipboard, or to save the current configuration; see [Context menu](#) description on p. 4.2.

GSM Handover View Configuration

The *GSM Handover View* configuration menu selects the information to be displayed in the *GSM Handover View*. It is opened via a right mouse click on a point inside the *GSM Handover View* or via the *Configuration – Settings* command (see chapter 3).

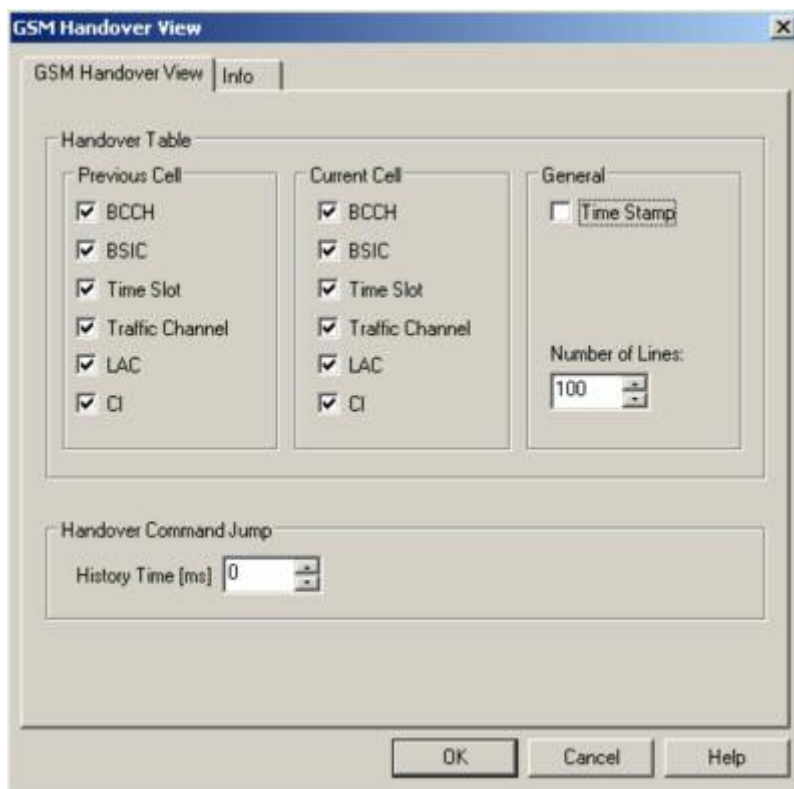


Fig. 4-153 GSM Handover View configuration

The contents of the *GSM Handover View* are defined in the *Handover Table* panel:

- Previous Cell / Current Cell** The *Previous Cell (Current Cell)* panel defines which type of information is displayed on the left (right) side of the handover table. The *BCCH* carrier number, the Base Transceiver Station Identity Code (*BSIC*), the *Time Slot* number, the *Traffic Channel* carrier number, the Location Area Code (*LAC*), and the Cell Identity (*CI*) can be selected for display.
- General** The *General* panel defines the first column and the size of the handover table:
- Time Stamp*
If the box is checked, the time stamp associated with each handover event is displayed in an additional first column of the handover table.
- Number of Lines*
Maximum number of lines/handover events displayed in the handover table. After this limit is reached, every new line deletes the oldest line in the table.
- Handover Command Jump** The *Handover Command Jump* panel defines a time period in ms preceding a handover event (*History Time*). During a replay session, the behavior of arbitrary GSM signals during the history time can be monitored in the following way:
- Pause the replay (select *Pause Replay* in the *Measurement* menu).
 - Double-click a handover event line in the *GSM Handover View*.
- The replay jumps to the time of the handover event minus the *History Time*.
- Use *Step One Data Set Forward* repeatedly to step through the history time. Monitor the parameters of interest in an arbitrary view, e.g., use the *2D Chart View* to display the behavior of RxLev and RxQual in the time preceding a failed handover attempt.

GSM Frequency Hopping View

The *GSM Frequency Hopping View* shows the channel information of a GSM connection that may or may not be operated in frequency hopping mode. The parameters are shown for all mobiles that are used in the current measurement or recorded in the replayed measurement file.

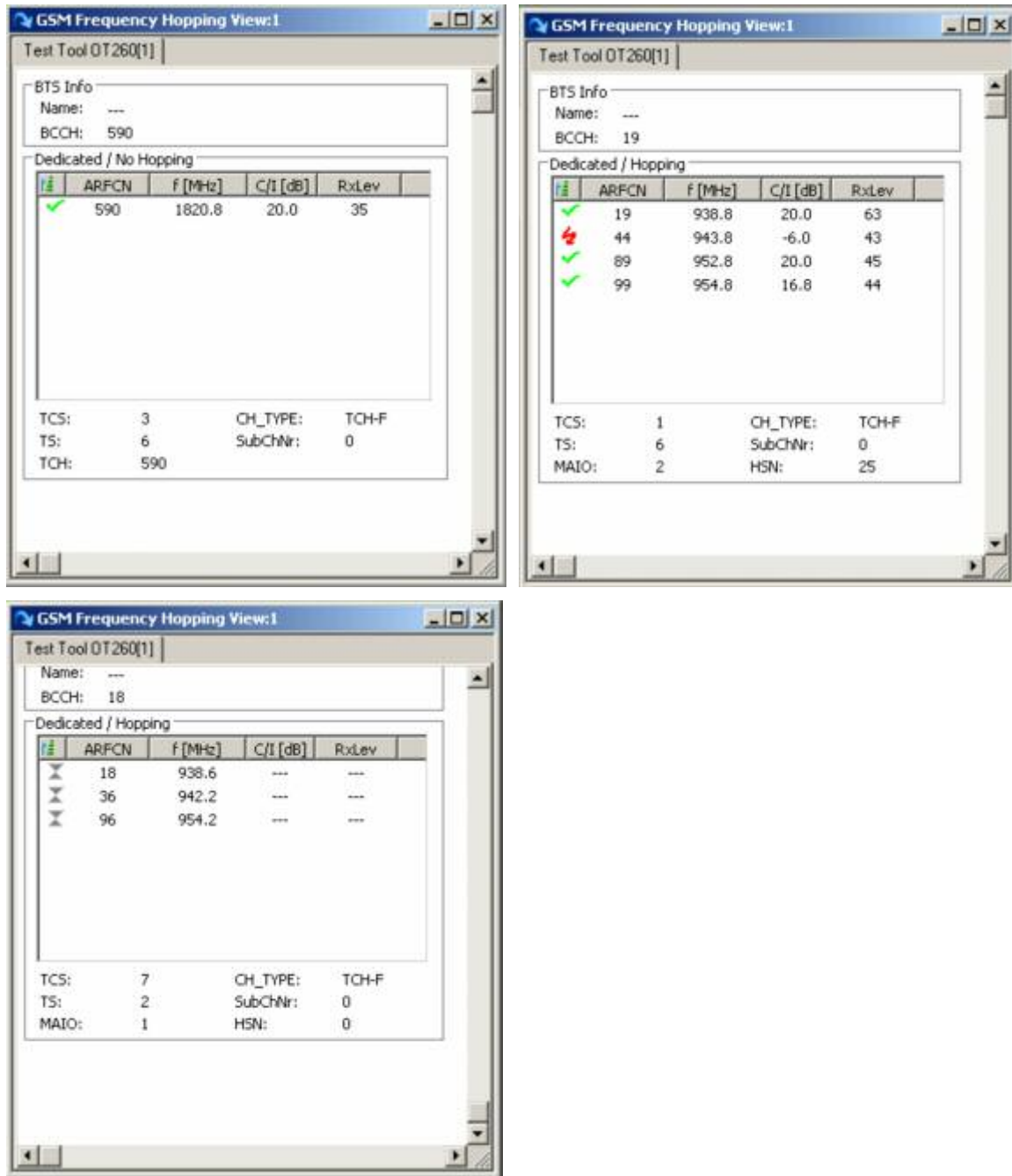



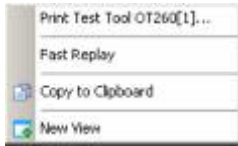


Fig. 4-154 GSM Frequency Hopping View

The hopping information provided by each mobile is displayed in a separate tab. Each tab is divided into two panels showing the properties of the BTS and the channel parameters of the RF connection, respectively.

BTS Info	The upper panel indicates the channel number of the Broadcast Control Channel (BCCH) plus the base station name, if a BTS list is available.
Dedicated / Hopping	<p>The panel below the BTS Info shows the parameters of the RF connection. The heading of the panel indicates the frequency hopping status:</p> <p><i>Idle</i> MS is not connected to the network.</p> <p><i>Dedicated / Hopping</i> MS maintains a dedicated connection with the BTS and is in frequency hopping mode</p> <p><i>Dedicated / No Hopping</i> MS maintains a dedicated connection with the BTS but does not use frequency hopping</p>
Channel list	<p>The channel list shows the sequence of GSM channel numbers (<i>ARFCN</i>) and frequencies used, together with the carrier-to-interference ratio (<i>C/I</i>) and RxLev value for each hopping frequency. Clicking an entry in the table heading sorts the cells according to the corresponding parameter. A gray triangle in the heading pointing upward (downward) indicates that the table is sorted in ascending (descending) order.</p> <p>Some of the parameters may not be provided by all test mobiles. The <i>C/I</i> is provided by the Sagem test mobile OT190 and newer types. The icons  and  denote <i>C/I</i> values below or above 10 dB;  is displayed if no <i>C/I</i> value is available. If frequency hopping is off, the list consists of a single frequency.</p>
Parameter list	<p>The parameter list below the hopping channel list shows the properties of the dedicated connection. It is not shown while the connection is <i>Idle</i>. Some of the parameters may not be provided by all test mobiles.</p> <p><i>TSC</i> Training sequence code of the RF channel.</p> <p><i>TS</i> Traffic channel timeslot number of the connection.</p> <p><i>MAIO</i> Mobile Allocation Index Offset in the range 0 to 63. The MAIO is only displayed if frequency hopping is on.</p> <p><i>CH_Type</i> Channel type allocated for the connection: <i>TCH-F</i> (full-rate traffic channel), <i>TCH-H</i> (half-rate traffic channel), <i>SDCCH/4</i> or <i>SDCCH/8</i>.</p> <p><i>SubChNr</i> SDCCH sub-channel number as defined in section 7, tables 3 and 4 of standard 3GPP TS 05.02.</p> <p><i>HSN</i> Hopping Sequence Number in the range 0 to 63. The HSN is only displayed if frequency hopping is on.</p>

Context menu

A right mouse click on any point in the view opens the context menu to print the view contents, (de-)select the view for fast replay, copy the current view to the clipboard, or to create new views; see [Context menu](#) description on p. 4.2.

The *GSM Frequency Hopping View* has no configuration menu. The *Info* tab can be accessed via the *Configuration – Settings* command.

GSM Scan View

The *GSM Scan View* contains a diagram showing the signal level of every mobile in all GSM channels measured. The channel range depends on the mobile type (GSM900/GSM-R/E-GSM/GSM1800/GSM1900; see channel tables in chapter 8, *GSM Channels and Power Classes*) and of a possible restriction made in the *Measurement Mode* menu – see section *GSM Mobile Drivers* in chapter 6.

Note:

This control window is only useful in the Scan(ning) mode where the signal level in each channel but no other information is recorded. The GSM Scan View is empty for mobiles which are not set to Scan(ning) mode. On the other hand, a mobile in Scan(ning) mode does not contribute any information to be viewed in the 2G/3G Layer 3 View or 2G/3G NQA View.

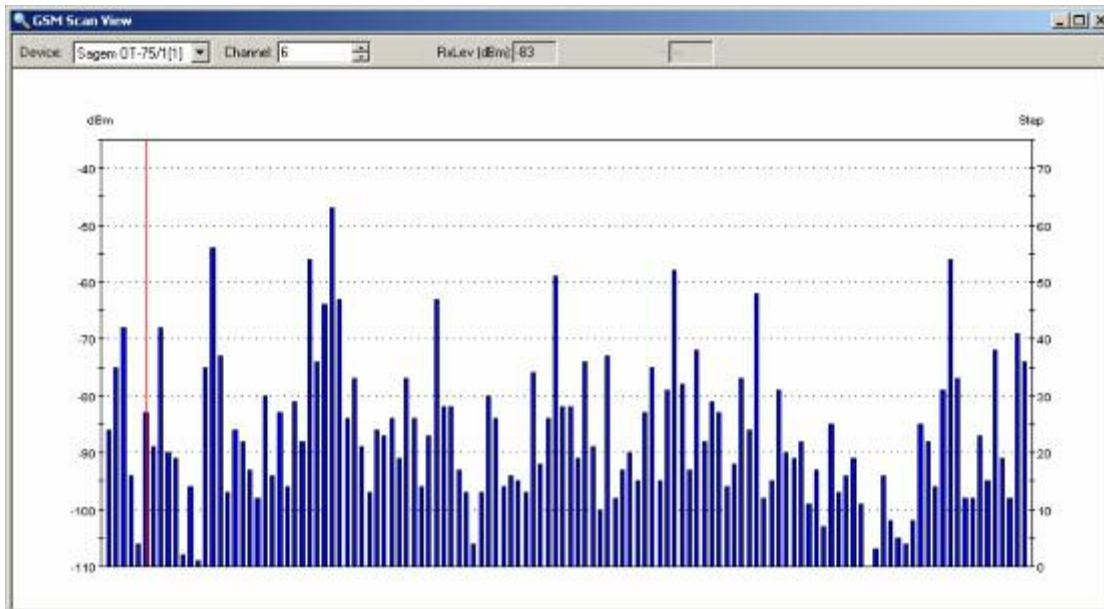


Fig. 4-155 GSM Scan View

Diagram

The diagram shows a colored bar for each channel and for the mobile indicated above. The channels are arranged in ascending order from the left to the right of the diagram; the length of each line corresponds to the signal strength recorded in the channel. The ordinate on the left side is labeled with a linear dBm scale defined in the configuration menu, the right ordinate with an inverse, linear step scale, 0 corresponding to -110 dB, 100 corresponding to -10 dB.

A red, vertical line marks the channel selected in the *Channel* input field above the diagram. The corresponding signal level is indicated in the *RxLev (dBm)* field. If available, the BSIC of the base station transmitting on the channel is indicated above the level bar.

Device list

The pull-down list on the left side above the diagram shows all mobiles measured. The signal power of the selected mobile is shown in the diagram.

Channel

The *Channel* field to the right of the mobile list is used to select a single channel the level of which will be displayed in the *RxLev (dBm)* field. The channel position in the diagram is marked with a red, vertical line.

BSIC

The BSIC of the transmitting BTS can be decoded from each channel and displayed in the diagram (integer numbers on top of the bars). The BSIC of the selected channel is shown in the BSIC output box. This feature is available with Sagem OT1xx, and Sagem OT2xx test mobiles provided that BCCH Scan (Sagem) is selected in the Measurement Mode tab of the driver configuration menus (see chapter 6).

Context menu



A right mouse click on any point in the view opens the context menu to access the configuration menus, (de-)select the view for fast replay, copy the current view to the clipboard, or to save the current configuration; see [Context menu](#) description on p. 4.2.

GSM Scan View Configuration

The *GSM Scan View* configuration menu defines the y-axis scale, i.e. the minimum (*Min [dBm]*) and the maximum (*Max [dBm]*) level to be displayed in the *GSM Scan view*. It is opened via a right mouse click on a point inside the *GSM Scan View* or via the *Configuration – Settings* command (see chapter 3).



Fig. 4-156 GSM Scan View configuration: parameter list

GSM QoS View

The *GSM QoS View* displays a statistical evaluation of important layer 3 (*Location Area Update*, *GSM Handover*), mobility management (*GPRS Attach/Detach*, *Routing Area Update*) and packet routing (*Activate/Deactivate PDP Context*) procedures performed by mobile phones supporting GPRS. The procedures are described in standard 3GPP TS 23.060.

The statistical evaluation is a measure for the Quality of Service of a packet data connection. It is made for all mobiles that are used in the current measurement or recorded in the replayed measurement file. Several types of GSM test mobiles provide GSM QoS data:

- To record GPRS data, SAGEM (OT 96-M GPRS, OT190 GPRS, OT 290 GPRS) and Siemens (S55, S55-R) mobiles must be used in *Data/Trace* mode and the splitter box must be connected to provide two COM ports (see chapter 6). Moreover recording of the RLC/MAC control messages must be enabled in the *QoS Statistics* tab of the driver configuration menu for the SAGEM mobiles supporting GPRS. The SAGEM mobiles also provide *GSM Handover* and *Location Area Update* information.
- To record GPRS data, Nokia test mobiles (Nokia 6230/6500/6630/6650/7600), Qualcomm test mobiles (TM6200/6250/6275), and Qualcomm-compatible test mobiles such as Samsung Z105, Z107, Z130 are connected via USB interface.



In the QoS Tests tab of the SAGEM x6 driver configuration menu, GPRS attach/detach, PDP context activate/deactivate and location area update can be set to be initiated periodically.

The QoS parameters describing the data throughput of a GPRS connection can be displayed in other views; see e.g. section [GSM GPRS RLC/MAC View](#) on p. 4.231.



Fig. 4-157 GSM QoS View

Only actions that actually occur during the measurement are shown in the view (e.g. if no GSM handover is done, then the *GSM Handover* section is not displayed). Moreover, the view contents and the diagram size can be selected in the configuration menu.

The evaluation is analogous for all actions. The results are displayed in a diagram area and a table comprising three rows:

Diagrams

The diagram area is divided into two sections:

- The left diagram shows the total number of actions attempted by the GPRS mobile or the network (*blue, question mark*), the number of successful actions (*green, checkmark*), and the number of failed actions (*red, cross*). In each category, the time statistics is visualized by means of a bar: The minimum, average, and maximum time needed to perform the actions corresponds to the bottom, the black horizontal line and the top of the bar. The time for mobile-initiated actions is measured from the time the mobile transmits the ... *REQUEST* message to the time it receives the response from the network.
- The right diagram represents a pie chart showing the relative numbers of *Success* and *Failed* actions.

Short times indicate a good Quality of Service. The number of attempted actions (*Count*) equals to the sum of *Success*, *Failed* and *No Response* actions; see below.

- Success** Number of actions that could be successfully terminated, together with the minimum (*Min. Time*), average (*Avg. Time*), and maximum time (*Max. Time*) of all these actions, expressed in ms. A large percentage of actions in this category indicates a good Quality of Service.
- Failed** Number of actions that were started but had to be unsuccessfully terminated, together with the minimum (*Min. Time*), average (*Avg. Time*), and maximum time (*Max. Time*) of all these actions, expressed in ms.
- No Response** Number of actions that failed because the mobile could not get any response from the network.
- Context menu** A right mouse click on any point in the view opens the context menu to access the configuration menus, (de-)select the view for fast replay, copy the current view to the clipboard, create new views, or to save the current configuration; see [Context menu](#) description on p. 4.2.



GSM QoS View Configuration

The *GSM QoS View Configuration* tab of the configuration menu selects the actions to be evaluated in the view and defines the size of the diagrams. It is opened via a right mouse click on a point inside the *GSM QoS View* or via the *Configuration – Settings* command (see chapter 3).

Clearing a procedure in the *Available QoS Actions* list hides the corresponding section in the view.



Restricting the viewed actions makes it easier to read the view if only a subset of the available actions is needed. To restrict the number of actions measured and enhance the system performance, use the settings in the driver configuration menu (see chapter 6).

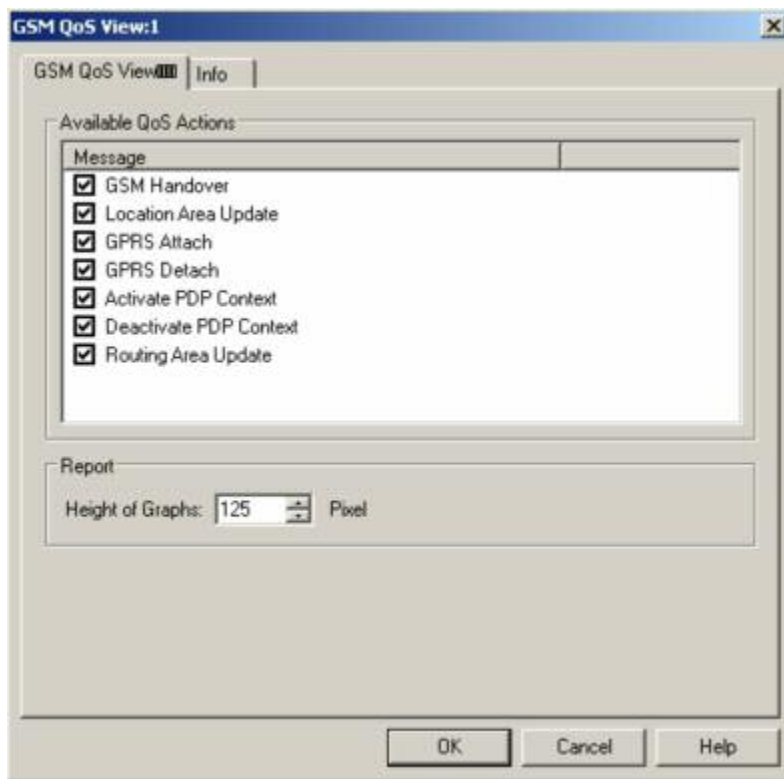


Fig. 4-158 GSM QoS View: GSM QoS View Configuration

Report - Height of Graphs Height of each graph in the range between 100 and 1000 pixels. The view can be scrolled if the height of the graphs and their number is increased.

GSM Dedicated 3G Cell List View

The *GSM Dedicated 3G Cell List View* shows an overview of the measured 3G cell parameters.

The view is empty unless the test mobile is configured to record the GSM 3G cell-related messages; see description of the *Expert Mode* tab of the driver configuration menu in chapter 6.

#	3G NC Index	UARFCN	SC	Diversity	PN Pos(Chips)	RSSI[dBm]	Ec/Io[dB]	RSCP[dBm]	Expires(ms)	Q Search P	3G Search Prio	Node B
1	---	10836	37	No	---	---	---	---	---	Always	No	---
2	---	10836	53	No	---	---	---	---	---	Always	No	---
3	---	10836	58	No	---	---	---	---	---	Always	No	---
4	---	10836	131	No	---	---	---	---	---	Always	No	---
5	---	10836	162	No	---	---	---	---	---	Always	No	---
6	---	10836	197	No	---	---	---	---	---	Always	No	---
7	---	10836	213	No	---	---	---	---	---	Always	No	---
8	---	10836	217	No	---	---	---	---	---	Always	No	---
9	---	10836	321	No	---	---	---	---	---	Always	No	---
1.	---	10836	353	No	---	---	---	---	---	Always	No	---
1.	---	10836	402	No	---	---	---	---	---	Always	No	---
1.	---	10836	453	No	---	---	---	---	---	Always	No	---
1.	---	10836	460	No	---	---	---	---	---	Always	No	---

Fig. 4-159 GSM Dedicated 3G Cell List View

The results for each mobile are arranged in a separate tab.

Cell List

The cell list comprises the most important parameters of the serving cell and all other cells that are currently used for the connection; its members are permanently monitored and updated by the network.

Each table row represents a cell. Clicking an entry in the table heading sorts the cells according to the corresponding parameter. A gray triangle in the heading pointing upward (downward) indicates that the table is sorted in ascending (descending) order.

Color Symbol

Color code for the Primary SC as defined in the *Colors* tab of the configuration menu. The SC color codes are also described in the paragraph on scrambling code indication on p. 4.48.

#

Sequence number for the cell, assigned in chronological order and always starting with 1.

3G NC Index

Index of the cell in the 3G Neighborhood Cell List.

UARFCN

UTRAN Absolute Radio Frequency Channel Number (ARFCN) of the received DL signal.

The carrier frequency is equal to $f = 0.2 \text{ MHz} * \text{UARFCN}$

SC

Primary scrambling code of the signal in the format selected in the *TEC for UMTS Test Mobiles* tab of the *Configuration of Software Modules* menu; refer to section *Configuration Menu* in chapter 3. The primary SC is used to identify the cell.

Diversity

Downlink transmit diversity scheme for the CPICH: *STTD* (Space Time Transmit Diversity), *TSTD* (Time Switched Transmit Diversity), *SSDT* (Site Selection Diversity Transmit Power Control), or *No Diversity*

PN Pos. [Chips]

PN position in Chips, ranging from 0 to 38399.

RSSI [dBm]

The received signal strength indicator of the cell on the forward traffic channel, ranging from -109 to -21 dBm.

E_c/I_o [dB]

Ratio of the received energy per PN chip for the signal to the total received power spectral density on the P-CPICH. E_c/I_o is obtained in an unbiased measurement, i.e. the contribution of the noise floor to the powers is subtracted.

RSCP

CPICH Received Signal Code Power in dBm; the received power on one code, measured on the Primary CPICH.

Expires [ms]

Time until this cell loses its known status.

Q Search P

Quality threshold for reselection. L1 searches for 3G cells if the signal level is below or above the threshold value.

3G Search Prio

Flag indicating if the idle frames in dedicated or packet transfer mode can be used with priority for 3G measurements, when BSIC decoding is required.

Node B

Name of the node B, taken from the UMTS Node B database (if available).

The SC value for each active set element generates signals in the *UMTS – <Device> – Active Set* branch of the data tree.

Context menu

A right mouse click on any point in the view opens the context menu to print the view contents, access the configuration menus, (de-)select the view for fast replay, put the view on hold, copy the current view to the clipboard, create new views, or to save the current configuration; see [Context menu](#) description on p. 4.2.

GSM Dedicated 3G Cell List View Configuration

The *GSM Dedicated 3G Cell List View* configuration menu selects the columns in the view tables, defines the SC color scheme and displays information about the view version. It is opened via a right mouse click on a point inside *GSM Dedicated 3G Cell List View* or via the *Configuration – Settings* command (see chapter 3).

The *GSM Dedicated 3G Cell List View* tab displays the complete parameter set to be displayed in the *cell list*. Clearing a parameter hides the column in the table.



Restricting the viewed results makes it easier to read the tables if only a subset of the available parameters is needed. To restrict the number of parameters measured and enhance the system performance, use the settings in the driver configuration menu (see chapter 6).

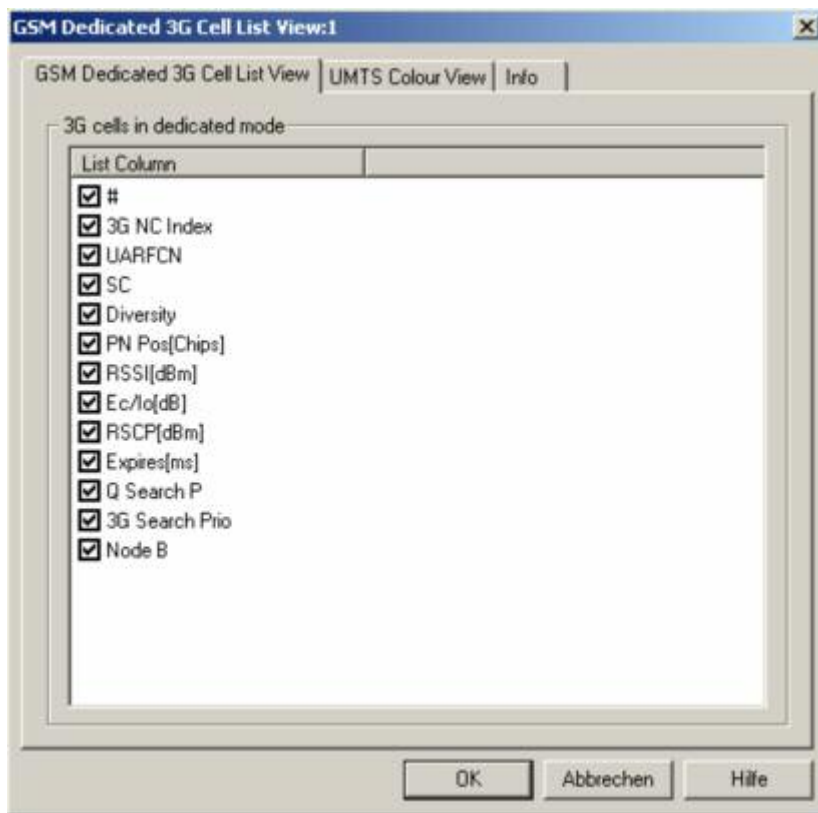


Fig. 4-160 GSM Dedicated 3G Cell List View: Configuration

The *GSM Dedicated 3G Cell List View* tab selects the list information to be displayed in the cell list.

The *UMTS Color View* tab of the *GSM Dedicated 3G Cell List View* configuration menu is analogous to the *Color Settings* tab of the *PNS CPICH* configuration menu; see section [PNS CPICH View](#) on p. 4.339.

GSM Idle 3G Cell List View

The *GSM Idle 3G Cell List View* shows an overview of the 3G cell parameters for measured idle cells.

The view is empty unless the test mobile is configured to record the GSM 3G idle cell-related messages; see description of the *Expert Mode* tab of the driver configuration menu in chapter 6.

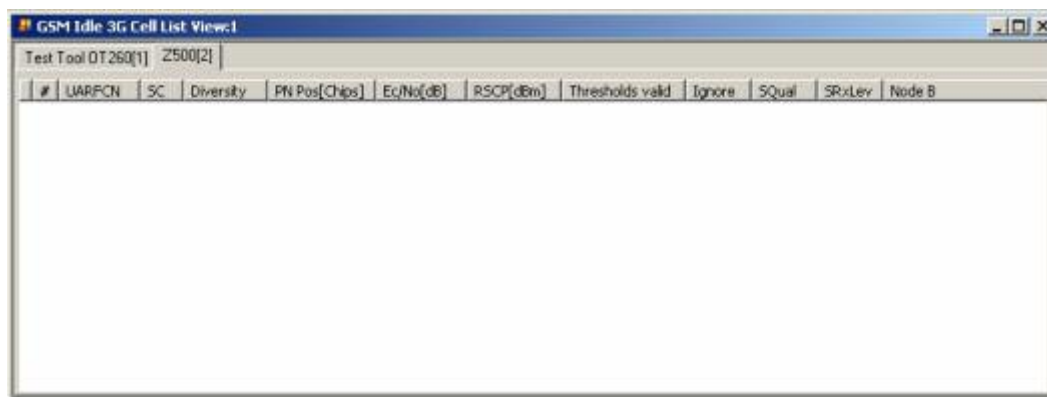


Fig. 4-161 GSM Idle 3G Cell List View

The results for each mobile are arranged in a separate tab.

Cell List

The cell list comprises the most important parameters of the 3G cells that are currently available for the connection; its members are permanently monitored and updated by the network.

Each table row represents a cell. Clicking an entry in the table heading sorts the cells according to the corresponding parameter. A gray triangle in the heading pointing upward (downward) indicates that the table is sorted in ascending (descending) order.

Color Symbol

Color code for the Primary SC as defined in the *Colors* tab of the configuration menu. The SC color codes are also described in the paragraph on scrambling code indication on p. 4.48.

#

Sequence number for the cell, assigned in chronological order and always starting with 1.

UARFCN

UTRAN Absolute Radio Frequency Channel Number (ARFCN) of the received DL signal.

The carrier frequency is equal to $f = 0.2 \text{ MHz} * \text{UARFCN}$

SC

Primary scrambling code of the signal in the format selected in the *TEC for UMTS Test Mobiles* tab of the *Configuration of Software Modules* menu; refer to section *Configuration Menu* in chapter 3. The primary SC is used to identify the cell.

Diversity

Downlink transmit diversity scheme for the CPICH: *STTD* (Space Time Transmit Diversity), *TSTD* (Time Switched Transmit Diversity), *SSDT* (Site Selection Diversity Transmit Power Control), or *No Diversity*

PN Pos. [Chips]

PN position in Chips, ranging from 0 to 38399.

 E_c/N_o [dB]

Ratio of the received energy per chip to the total received power density in the band.

RSCP [dBm]

Unbiased Integral Received Signal Code Power for all measured peaks in dBm.

Thresholds valid

Indicates if GSM L1 should apply cell reselection criterion S to be reported to the RR layer (see standard 3GPP TS 25.304).

Ignore

Indicates if GSM L1 is not supposed to report this cell to the RR layer.

SQual

Cell Selection Quality quality value, this parameter is used in the cell reselection criterion S.

SRxLev

Cell Selection RxLevel value, this parameter is used in the cell reselection criterion S.

Node B

Name of the closest node B with the corresponding SC and ARFCN.

Context menu

A right mouse click on any point in the view opens the context menu to print the view contents, access the configuration menus, (de-)select the view for fast replay, copy the current view to the clipboard, create new views, or to save the current configuration; see [Context menu](#) description on p. 4.2.



GSM Idle 3G Cell List View Configuration

The *GSM Dedicated 3G Cell List View* configuration menu selects the columns in the view tables, defines the SC color scheme and displays information about the view version. It is opened via a right mouse click on a point inside *GSM Dedicated 3G Cell List View* or via the *Configuration – Settings* command (see chapter 3).

The *GSM Dedicated 3G Cell List View* tab displays the complete parameter set to be displayed in the *cell list*. Clearing a parameter hides the column in the table.

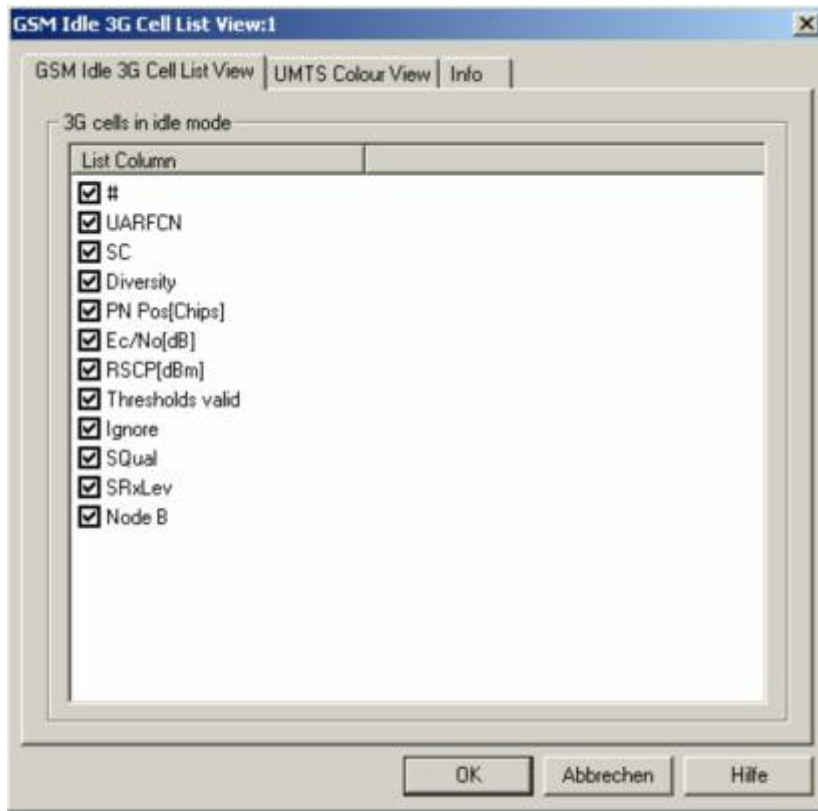


Fig. 4-162 GSM Idle 3G Cell List View: Configuration

The *GSM Idle 3G Cell List View* tab selects the list information to be displayed in the cell list.

The *UMTS Color View* tab of the *GSM Idle 3G Cell List View* configuration menu is analogous to the *Color Settings* tab of the *PNS CPICH* configuration menu; see section [PNS CPICH View](#) on p. 4.339.

GSM RR 3G Reselection Measurements View

The *GSM RR 3G Reselection Measurements View* shows an overview of the measured Radio Resource 3G reselection parameters.

The view is empty unless the test mobile is configured to record the GSM RR-related messages; see description of the *Expert Mode* tab of the driver configuration menu in chapter 6.

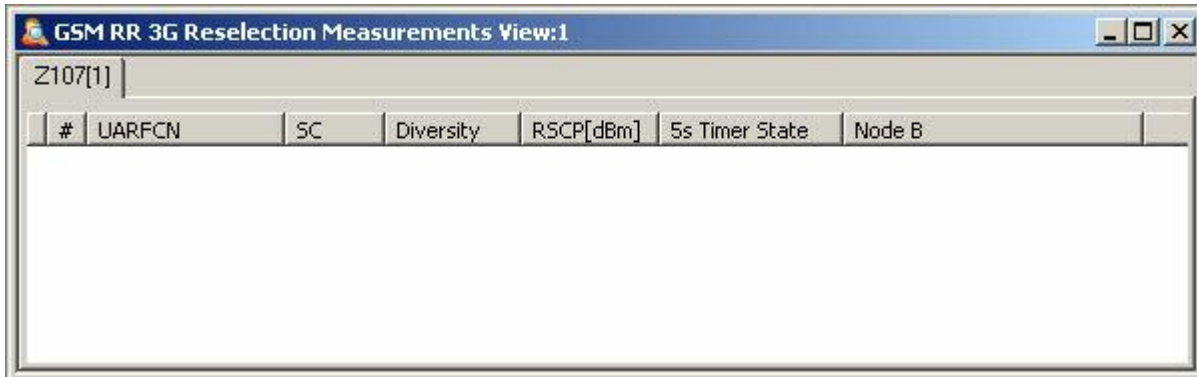


Fig. 4-163 GSM RR 3G Reselection Measurements View

The results for each mobile are arranged in a separate tab.

Cell List

The cell list comprises the most important parameters of the 3G cells that are involved in layer 3 RR reselection measurements.

Each table row represents a cell. Clicking an entry in the table heading sorts the cells according to the corresponding parameter. A gray triangle in the heading pointing upward (downward) indicates that the table is sorted in ascending (descending) order.

Color Symbol

Color code for the Primary SC as defined in the *Colors* tab of the configuration menu. The SC color codes are also described in the paragraph on scrambling code indication on p. 4.48.

#

Sequence number for the cell, assigned in chronological order and always starting with 1.

UARFCN

UTRAN Absolute Radio Frequency Channel Number (ARFCN) of the received DL signal.

The carrier frequency is equal to $f = 0.2 \text{ MHz} * \text{UARFCN}$

SC

Primary scrambling code of the signal in the format selected in the *TEC for UMTS Test Mobiles* tab of the *Configuration of Software Modules* menu; refer to section *Configuration Menu* in chapter 3. The primary SC is used to identify the cell.

Diversity

Downlink transmit diversity scheme for the CPICH: *STTD* (Space Time Transmit Diversity), *TSTD* (Time Switched Transmit Diversity), *SSDT* (Site Selection Diversity Transmit Power Control), or *No Diversity*

RSCP [dBm]

Unbiased Integral Received Signal Code Power for all measured peaks in dBm.

5s Timer State

State of the 5s Timer (Stopped / Running / Expired)

Node B

Name of the closest node B with the corresponding SC and ARFCN.

Context menu

A right mouse click on any point in the view opens the context menu to print the view contents, access the configuration menus, (de-)select the view for fast replay, put the view on hold, copy the current view to the clipboard, create new views, or to save the current configuration, or move to another worksheet; see [Context menu](#) description on p. 4.2.



GSM RR 3G Reselection Measurements View Configuration

The *GSM RR 3G Reselection Measurements View* configuration menu selects the columns in the view tables, defines the SC color scheme and displays information about the view version. It is opened via a right mouse click on a point inside *GSM RR 3G Reselection Measurements View* or via the *Configuration – Settings* command (see chapter 3).

The *GSM RR 3G Reselection Measurements View* tab displays the complete parameter set to be displayed in the cell list. Clearing a parameter hides the column in the table.

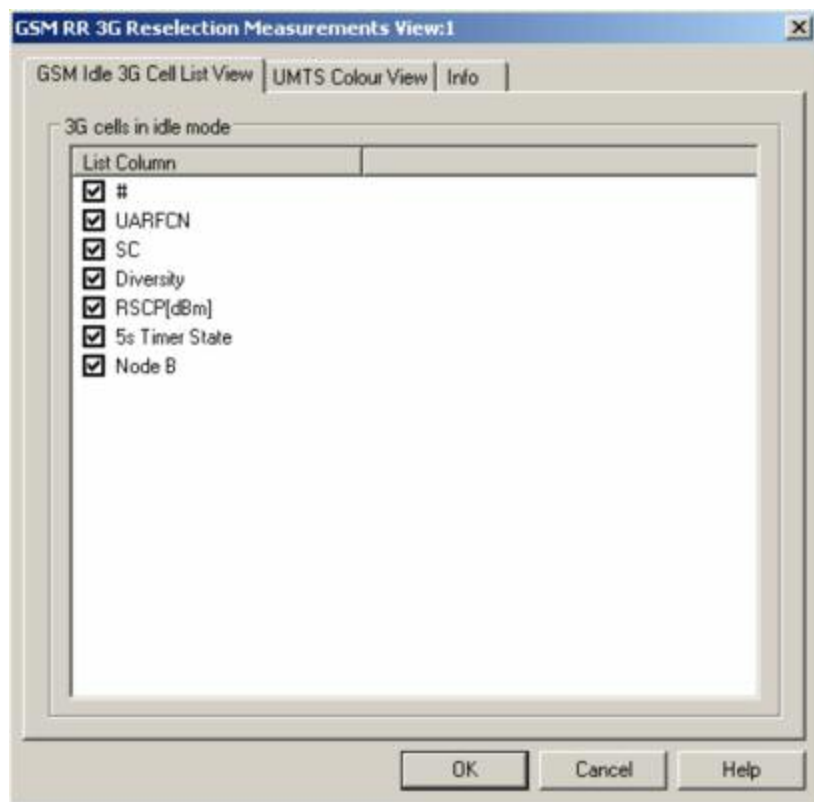


Fig. 4-164 GSM RR 3G Reselection Measurements View: Configuration

The *GSM RR 3G Reselection Measurements View* tab selects the list information to be displayed in the cell list.

The *UMTS Color View* tab of the *GSM RR 3G Reselection Measurements View* configuration menu is analogous to the *Color Settings* tab of the *PNS CPICH* configuration menu; see section [PNS CPICH View](#) on p. 4.339.

GSM Rejected 3G Cells View

The *GSM Rejected 3G Cells View* shows an overview of the determined 3G cell parameters for rejected cells.

The view is empty unless the test mobile is configured to record the GSM L3 RR 3G rejected cell-related messages; see description of the *Expert Mode* tab of the driver configuration menu in chapter 6.

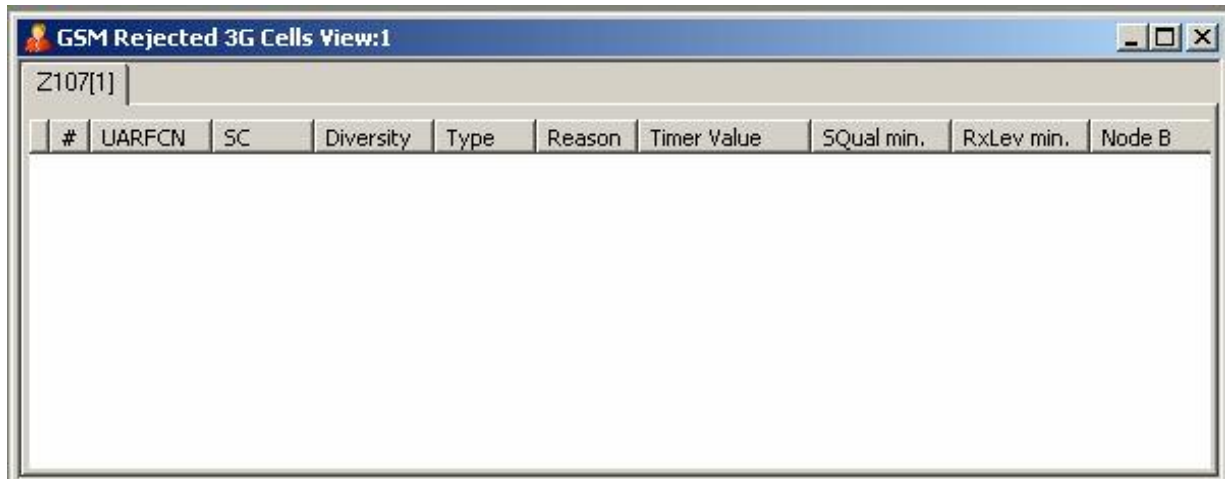


Fig. 4-165 GSM Rejected 3G Cells View

The results for each mobile are arranged in a separate tab.

Cell List

The cell list comprises the most important parameters of the 3G cells that have a registration result of "rejected"; its members are permanently monitored and updated by the network.

Each table row represents a cell. Clicking an entry in the table heading sorts the cells according to the corresponding parameter. A gray triangle in the heading pointing upward (downward) indicates that the table is sorted in ascending (descending) order.

Color Symbol

Color code for the Primary SC as defined in the *Colors* tab of the configuration menu. The SC color codes are also described in the paragraph on scrambling code indication on p. 4.48.

#

Sequence number for the cell, assigned in chronological order and always starting with 1.

UARFCN

UTRAN Absolute Radio Frequency Channel Number (ARFCN) of the received DL signal.

The carrier frequency is equal to $f = 0.2 \text{ MHz} * \text{UARFCN}$

SC

Primary scrambling code of the signal in the format selected in the *TEC for UMTS Test Mobiles* tab of the *Configuration of Software Modules* menu; refer to section *Configuration Menu* in chapter 3. The primary SC is used to identify the cell.

- Diversity* Downlink transmit diversity scheme for the CPICH: *STTD* (Space Time Transmit Diversity), *TSTD* (Time Switched Transmit Diversity), *SSDT* (Site Selection Diversity Transmit Power Control), or *No Diversity*
- Type* Reject type as defined by Radio Resource Control (RRC): *Threshold* (RRC delivered a threshold) or *Timer* (RRC delivered a timer value)
- Reason* Reason for the rejection. Possible reasons include:
 NONE, INVALID_STATE, CELL_BARED, PLMN_MISMATCH, LOW_S_VALUE, AQUISITION_FAIL, SIBS_FAILED_LOWER_LAYERs, INVALID_SIBS, SIBS_TIMEOUT, SIBS_FAILED_OTHER, FORBIDDEN_LA, CELL_QUAL_FAILURE, CELL_NOT_SUITABLE, CELL_NOT_EVALUATED, or CELL_CHANGE_FAILURE
- Timer Value* Time (in seconds) when the same cell should be reconsidered.
- SQual min.* Minimum Cell Selection Quality value [dB], the parameter is used in the cell reselection criterion S for FDD cells.
- RxLev min.* Threshold value [dBm] to be applied to Ec/No measurements
- Node B* Name of the closest node B with the corresponding SC and ARFCN.

Context menu

A right mouse click on any point in the view opens the context menu to print the view contents, access the configuration menus, (de-)select the view for fast replay, put the view on hold, copy the current view to the clipboard, create new views, or to save the current configuration; see [Context menu](#) description on p. 4.2.



GSM Rejected 3G Cells View Configuration

The *GSM Rejected 3G Cells View* configuration menu selects the columns in the view tables, defines the SC color scheme and displays information about the view version. It is opened via a right mouse click on a point inside *GSM Rejected 3G Cells View* or via the *Configuration – Settings* command (see chapter 3).

The *GSM Rejected 3G Cells View* tab displays the complete parameter set to be displayed in the cell list. Clearing a parameter hides the column in the table.

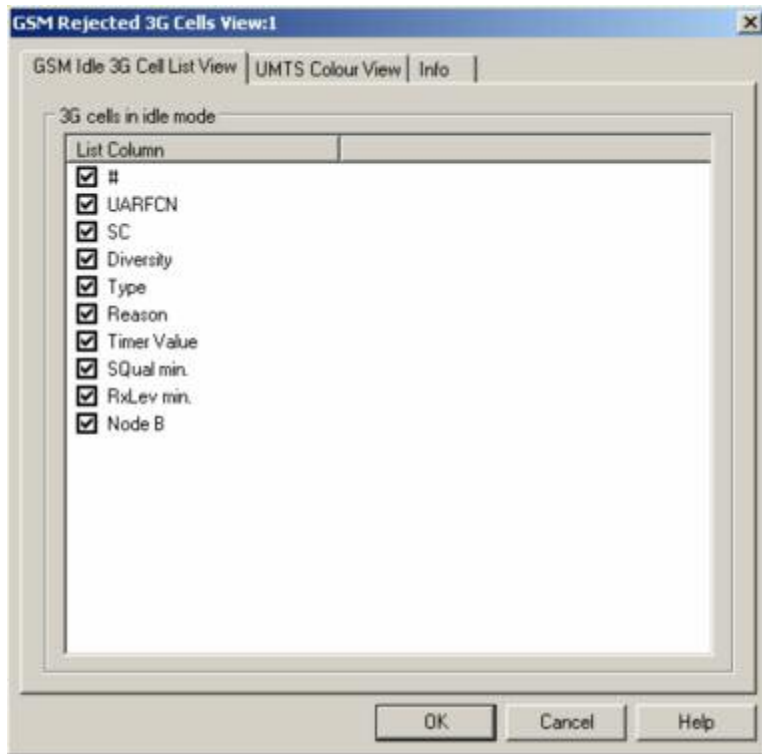


Fig. 4-166 GSM Rejected 3G Cells View: Configuration

The *GSM Rejected 3G Cells View* tab selects the list information to be displayed in the cell list.

The *UMTS Color View* tab of the *GSM Rejected 3G Cells View* configuration menu is analogous to the *Color Settings* tab of the *PNS CPICH* configuration menu; see section [PNS CPICH View](#) on p. 4.339.

GSM RR 3G Reselection Measurements Parameters View

The *GSM RR 3G Reselection Measurements Parameters View* shows the parameters used for the Radio Resource 3G Reselection measurements described in the previous sections.

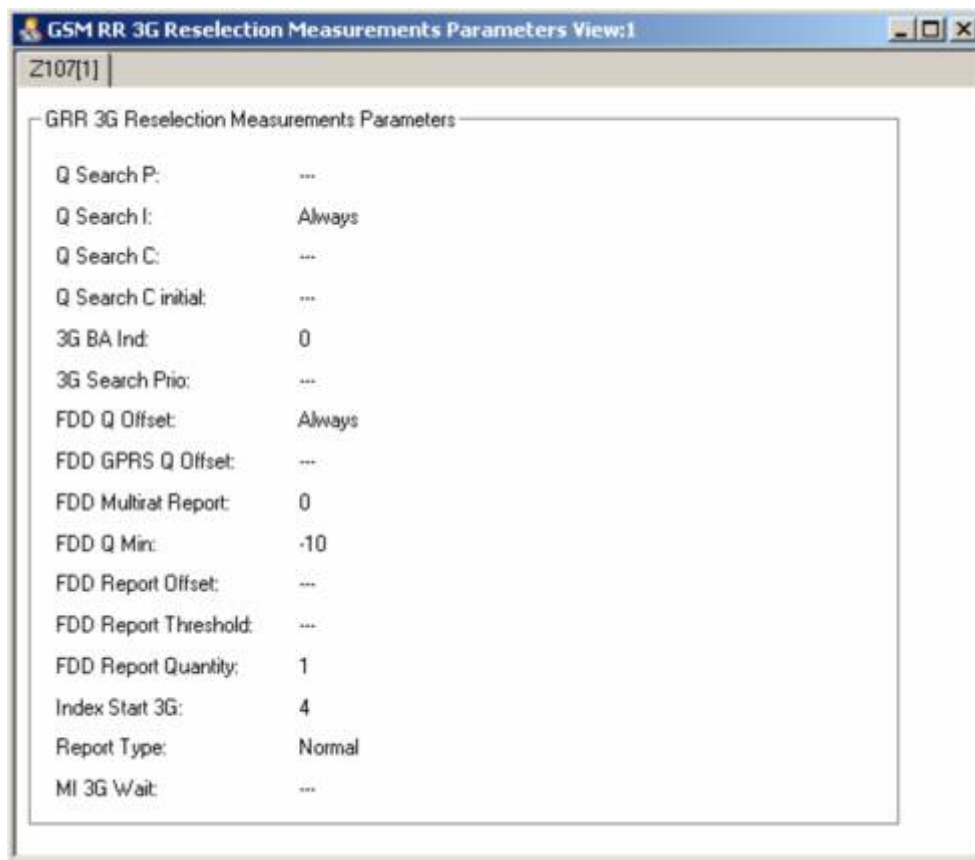


Fig. 4-167 GSM RR 3G Reselection Measurements Parameters View

GSM 3G Reselection Measurement Parameters

The GSM RR 3G Reselection Measurements Parameters View panel displays the parameters used for the Radio Resource 3G Reselection measurements described above. Additional information on these parameters is available in standard 3GPP TS 51.010.

<i>Q Search P</i>	<i>Q Search P</i> defines a threshold and also indicates whether these measurements shall be performed when RLA_P of the serving cell is below or above the threshold.
<i>Q Search I</i>	For a multi-RAT MS, cells or frequencies with other radio access technologies may be included in 3G Cell Reselection list (see 3GPP TS 04.18). The network controls the measurements for reselection of idle cells by the parameter Qsearch_I broadcast on BCCH. Qsearch_I defines a threshold and also indicates whether these measurements shall be performed when RLA_C of the serving cell is below or above the threshold. The value of 7 indicates to always search for neighboring 3G cells, a value of 15 disables the search. Search for 3G cells if signal level is below (0-7) or above (8-15) threshold

	0 = - 98 dBm, 1 = - 94 dBm, ... , 6 = - 74 dBm, 7 = ∞ (always), 8 = - 78 dBm, 9 = - 74 dBm, ... , 14 = - 54 dBm, 15 = ∞ (never). Default value = ∞ (never).
<i>Q Search C</i>	As defined in 3GPP TS 45.008, the Q Search C parameter defines a threshold and also indicates whether the mobile measures 3G cells when the average signal level (RxLevel) of the BCCH carrier is below (0-7) or above the threshold (8-15). The value of 7 indicates to always search for neighboring 3G cells, a value of 15 disables the search. Search for 3G cells if signal level below threshold (0-7): - 98, - 94, ... , - 74 dBm, ∞(always) or above threshold (8-15): - 78, - 74, ... , - 54 dBm, ∞(never)
<i>Q Search C initial</i>	Indicates the Q Search C value to be used in connected mode before Q Search C is received, 0 = use Q Search I, 1 = ∞(always). Default value = use Q Search I.
<i>3G BA Ind.</i>	The 3G_BA_IND message type parameter is needed to identify set of 3G Neighbour Cell information used for reporting in dedicated mode. The value received is reflected in the Measurement Report and Enhanced Measurement Report messages as described in standard 3GPP TS 04.18.
<i>3G Search Prio</i>	This parameter indicates if 3G cells may be searched when BSIC decoding is required. With 3G Search Prio set to On, the MS attempts to demodulate the SCH on the BCCH carrier of as many surrounding cells as possible, and to decode the BSIC as often as possible, as a minimum at least once every 10 seconds. A multi-RAT MS is allowed to extend this period to 13 seconds, if the neighbour cell list contains cells from other RATs. With 3G Search Prio set to Off, the BSIC is also decoded, but only 2G neighbor cells are monitored.
<i>FDD Q Offset</i>	<i>FDD Q min</i> , <i>FDD Q Offset</i> and optionally <i>FDD RSCP min</i> and <i>FDD Qmin Offset</i> are broadcast on BCCH of the serving cell. <i>FDD Q Offset</i> applies an offset to <i>FDD Q min</i> value: 0 = 0 dB, 1 = 2 dB, 2 = 4 dB, 3 = 6 dB, 4 = 8 dB, 5 = 10 dB, 6 = 12 dB, 7 = 14 dB. Default value = 0 dB.
<i>FDD GPRS Q Offset</i>	Applies an offset to RLA_P for cell re-selection to access technology/mode: default is -12dB.
<i>FDD MultiRAT Report</i>	The parameter <i>FDD MultiRAT Report</i> indicates a number of cells to be reported in a measurement, e.g. "1" (one cell) report message and does not include the number of places taken by RSSI reporting in the measurement report message. If no measurements have been performed on a cell since last report, the cell shall not be included in the report.

	The <i>FDD MultiRAT Report</i> parameter is broadcast on BCCH and PBCCH. An MS attached to GPRS uses the parameter broadcast on PBCCH if it exists. In all other cases, the MS uses the parameters broadcast on BCCH.
<i>FDD Q Min.</i>	<i>FDD Q min</i> is defined as the minimum threshold for E_c/N_0 for UTRAN FDD cell reselection, its default value is -12 dB.
<i>FDD Report Offset</i>	The <i>FDD Report Offset</i> parameter applies an offset to the reported value when prioritising the cells for reporting for GSM frequency band or access technology/mode FDD. Possible values are: 0 (0 dB), 1 (6 db), ... , 7 (42 dB). The default value is 0 dB.
<i>FDD Report Threshold</i>	The <i>FDD Report Threshold</i> parameter applies priority reporting if the reported value is above the thus defined threshold for GSM frequency band or access technology/mode FDD. The default value is "always"
<i>FDD Report Quantity</i>	The parameter FDD Report Quantity is used to specify whether the MS reports the results of the P-CPICH level measurement of the neighboring 3G cells as RSCP or as E_c/N_0 . e.g. 0 = RSCP, 1 = E_c/N_0
<i>Index Start 3G</i>	Each 3G Neighbour Cell Description received is added to the 3G Neighbour Cell list, starting with the index equal to the parameter <i>Index Start 3G</i> . If this parameter is not present then the value 0 is used. For each 3G Neighbour Cell Description, the cells are indexed in the following order: <ol style="list-style-type: none"> 1) UTRAN FDD cell ARFCNs are indexed in the order of occurrence in the 3G Neighbour Cell description. Then, for each FDD ARFCN, the cells are indexed in the order of increasing values of the decoded FDD_CELL_INFORMATION parameters. 2) UTRAN TDD cell ARFCNs are indexed in the order of occurrence in the 3G Neighbour Cell description. Then, for each TDD ARFCN, the cells are indexed in the order of increasing values of the decoded TDD_CELL_INFORMATION parameters. 3) CDMA 2000 cells are indexed in the order of occurrence in the 3G Neighbour Cell description.
<i>Report Type</i>	The condition for sending the Packet Enhanced Measurement Report message instead of the Packet Measurement Report message is based on the <i>Report Type</i> parameter and if the MS has received BSIC information for all cells.
<i>MI 3G Wait</i>	The 3G Neighbour Cell list (either from SI2quater or from PSI3quater) is used for reporting when the MS enters dedicated mode, until the MS has received a given number of instances of Measurement Information (MI) messages that contain 3G Neighbour Cell Description. This number of instances is defined by the <i>MI 3G-Wait</i> parameter.

Context menu

A right mouse click on any point in the view opens the context menu to print the view contents, access the configuration menus, (de-)select the view for fast replay, put the view on hold, copy the current view to the clipboard, create new views, or to save the current configuration; see *Context menu* description on p. 4.2.

The *GSM RR 3G Reselection Measurements Parameters View* has no specific configuration menu. The *Info* tab can be accessed via the *Configuration – Settings* command.

GSM Neighborhood Analyzer View

The *GSM Neighborhood Analyzer View* shows the results of the neighborhood analysis of option R&S ROMES-U1. The objective of this analysis is to reveal possible conflicts between the current serving cell and the transmitters in the neighborhood in order to assess the general condition of a UMTS / GSM network. To this end the neighborhood analyzer post-processes GSM test mobile, and GSM scanner data (e.g. TopN data) and compares them with the information stored in a BTS database (see description of ATD files in chapter 7, in particular the neighbor cell column 2GNC). In case of a mismatch between the detected BTSs and the BTSs in the database, an alarm is generated. The same holds if a missing neighbor of the serving cell is found.

The neighborhood analysis requires option R&S ROMES-U1, *Handover and Neighborhood Analysis*. PN scanner data recorded with a R&S TSMx are needed. Data from a UMTS test mobile and GSM scanner data can be used in addition to refine and extend the analysis.

The neighborhood analyzer is a performance-critical tool which must be activated explicitly in the *GSM Neighborhood Analyzer View* configuration menu.



The UMTS/GSM Handover Analysis of inter-RAT handovers, which is also part of option R&S ROMES-U1, is evaluated in the [UMTS/GSM Handover Analyzer View](#); see p. 4.295.. GSM 2G/2G handovers are evaluated in the [GSM Handover View](#); see p. 4.256.

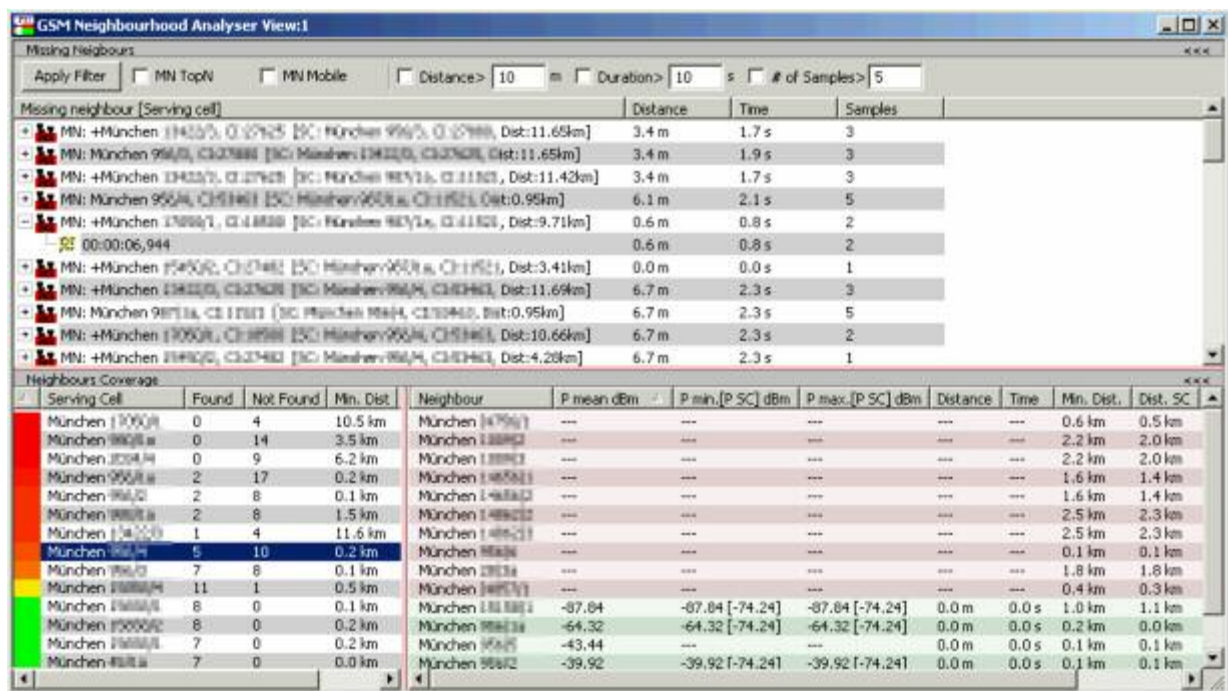


Fig. 4-168 GSM Neighborhood Analyzer View

Neighborhood analysis	<p>The PN scanner results for a particular top N pool (configured in the GSM PNS driver configuration menu and selected for the neighborhood analysis using the <i>GSM Neighborhood Analyzer View</i>) provide the essential data for the neighborhood analysis. The analysis involves several steps:</p> <ul style="list-style-type: none"> • The top N pool member with the strongest PSCH level (1st top N member) is rated as the best server; its ARFCN, SC, and geographical position (and CI, if the PN scanner is able to decode it) is compared with the entries in the BTS database. • If possible, the best server is determined, and the neighbors list is compared with the neighbors list in the BTS database. • When a Top N serving cell is removed from the pool, the related nmissing neighbor conditions are dropped. For the remaining top N members the analyzer checks the related neighbor coverage; see below. <p>The results are updated whenever the top N pool members change. R&S ROMES creates one of the events described below whenever a problem is detected. The conditions for the analysis can be modified in the <i>GSM Neighborhood Analyzer View</i>.</p>
View	<p>The view is divided into an upper <i>Missing Neighbors</i> and a lower <i>Neighbors Coverage</i> section. A click on one of the title bars shows or hides the corresponding section. A hidden section leaves more space for the other section. A hidden section is characterized by the symbol >>> (instead of <<<) in the title bar. On pausing on the title bar, the cursor displays a compress symbol.</p>
Filter	<p>The checkboxes across the top of the result tree define filter conditions for the missing neighbors displayed in the result tree.</p> <p><i>Apply Filter</i> updates the result tree in accordance with the current filter conditions.</p>
Missing Neighbors	<p>The missing neighbor result tree consists of the following columns:</p> <p>Missing Neighbor [Serving Cell] Name of the serving cell for which a missing neighbor was detected. GSM base stations are listed with their name, BCCH, and BSIC. Detailed information (e.g. the time when the missing neighbor was detected) is listed below the missing neighbor. It is possible to expand or collapse the detailed information for a single missing neighbor (click the + / – symbols or double-click the line) or all missing neighbors (use the context menu).</p> <p>Distance Covered distance during which a neighbor was classified as a missing neighbor. The accuracy depends on the time and distance trigger settings.</p> <p>Time Time during which a neighbor was classified as a missing neighbor. The accuracy depends on the time and distance trigger settings.</p> <p>Samples Number of samples acquired while a neighbor was classified as a missing neighbor.</p> <p>Every row in the <i>Missing Neighbors</i> list has a starting time which can be used with the <i>Coupled Focus</i> functionality (see chapter 3) to synchronize with other views, e.g. with the <i>GSM NWS Top N View</i> and the <i>GSM Measurement Report View</i>.</p>

Neighbors Coverage

The Neighbors Coverage panel is divided in two lists:

- The list on the left half of the panel shows a color code (ranging from red to green, depending on the ratio of measured to total neighbors), the related serving cell, the number of found neighbors (from the measurement) the number of neighbors not found (from comparison with the BTS database) and the minimum distance of the Serving cell from the measurement route. A click on a row fills the Neighbor detail list on the right side, a double-click (when a Tooltip-"D" is visible on the mouse cursor) shows a popup window with the BTS cell information from the BTS database.
- The list on the right half of the panel shows all neighbor cells of the selected serving cell. The neighbors which were no found have a pale pink row background, the found neighbors have a pale green row background. The following values are displayed, if they were measured:

Neighbor

Name of the neighbor GSM base station.

P mean [dBm]

Averaged RxLev of the serving cell, calculated from the PNS scanner data.

P min [P SC] dBm

Minimum measured RxLev of the serving cell at the current route position.

P max [P SC] dBm

Maximum measured RxLev of the serving cell at the current route position.

Distance

Covered distance during which a neighbor was classified as a missing neighbor.

Time

Time during which a neighbor was classified as a missing neighbor. The accuracy depends on the time and distance trigger settings.

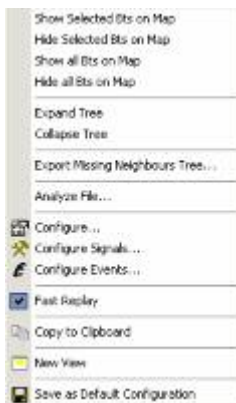
Min. Dist.

Minimum distance between the cell and the route.

Dist. SC

Distance between the serving cell and the route.

Context menu



A right mouse click on any point in the view opens the context menu to access the configuration menus, (de-)select the view for fast replay, copy the current view to the clipboard, create or delete views, activate the fast replay mode, save the current configuration, or move to another worksheet; see [Context menu](#) description on p. 4.2. The context menu provides the following additional, view-specific commands:

Show Selected BTS...

Use the color code defined in the *GSM Neighborhood Analyzer View* configuration menu (see below) to visualize the best servers, potential interferers, and missing neighbors in the *Route Track* view. This feature is only available while a best server is selected in the result tree. The GSM BTS layer in the *Route Track* view must be visible to use this feature.

Hide Selected BTS...

Remove the previous action, display the selected cell symbol with standard colors.

Show all BTS...

Display all cell symbols with the color codes defined in the *GSM Neighborhood Analyzer View* configuration menu.

Hide all BTS...

Display all cell symbols with standard colors.

Expand/Collapse Tree

Show or hide the additional information for each serving cell in the *Results Tree*.

Export...

Export the information in the result tree or in the message list to a *.csv export file that can be opened and processed by MS Excel.

Analyze File...

With an active *Missing Neighbors* list, the measurement data in the current CMD file is analyzed and the results are displayed.

GSM Neighborhood Analyzer View Configuration

The *GSM Neighborhood Analyzer View* configuration menu enables the neighborhood analyzer, defines criteria for the analysis, and specifies the color scheme for the BTS symbols in the *Route Track View*. It is opened via a right mouse click on a point inside *GSM Neighborhood Analyzer View* or via the *Configuration – Settings* command (see chapter 3).

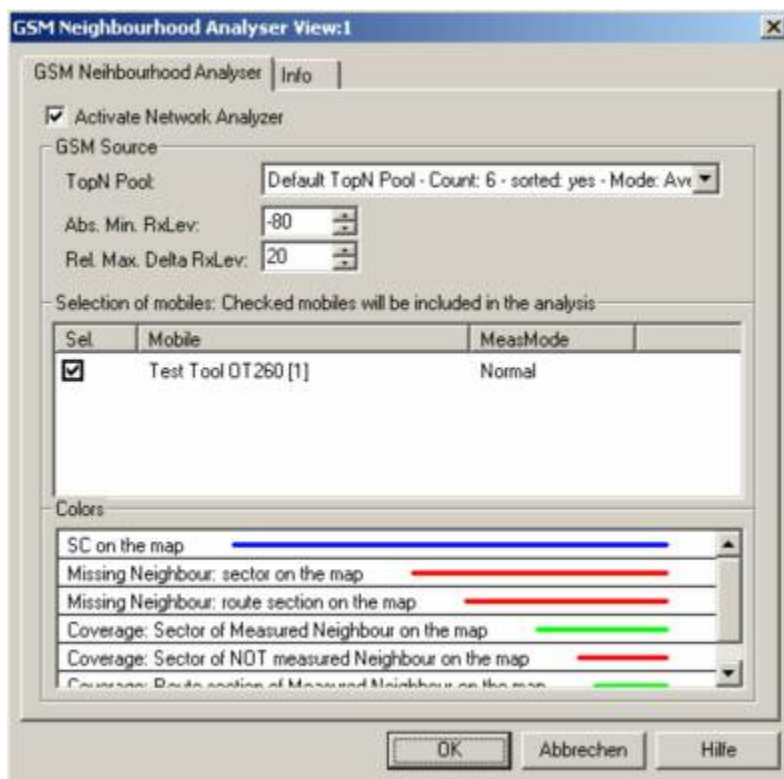


Fig. 4-169 GSM Neighborhood Analyzer View: Configuration

Activate Network Analyzer

The network analyzer must be enabled explicitly in order to post-process the measured data and obtain the results in the *GSM Neighborhood Analyzer View*. This holds for the data viewed during the measurement tour as well as for replayed measurement files. The *GSM Neighborhood Analyzer View* is empty if the neighborhood analyzer is disabled.

The necessary hardware drivers must be loaded or a measurement (.cmd) file must be open in order to enable the network analyzer, select the data sources, or define the criteria for the analysis. After starting up R&S ROMES, only the *Route Track Settings* are accessible.

GSM Sources

The drop-down list in the *GSM Sourcs* panel contain all GSM test devices involved in the measurement. The list is populated when the device drivers are loaded or when a measurement file is opened for replay.

Note:

The neighborhood is automatically disabled when the selected data sources are no longer available, e.g. because a new measurement file is loaded.

Top N Pool

The neighborhood analysis requires a PN scanner with a *Top N* pool containing the N observed BTSs with the strongest signal level. The top N pools can be configured in the *GSM PNS* driver configuration menu as described in chapter 6.

Abs. Min. RxLev

BTSs measured with values below the defined *Abs. Min. RxLev* threshold are not considered in the neighborhood analysis scan.

Rel. Max. Delta RxLev

For every evaluated BTS serving cell it is checked whether or not the other members of the Top N pool as neighbors yield a better Delta RxLev than defined here. If such a BTS is found which is not declared as a neighbor cell, a list entry with all relevant data is created (similar to the entry of a problem Node B in the UMTS neighborhood analysis).

Note:

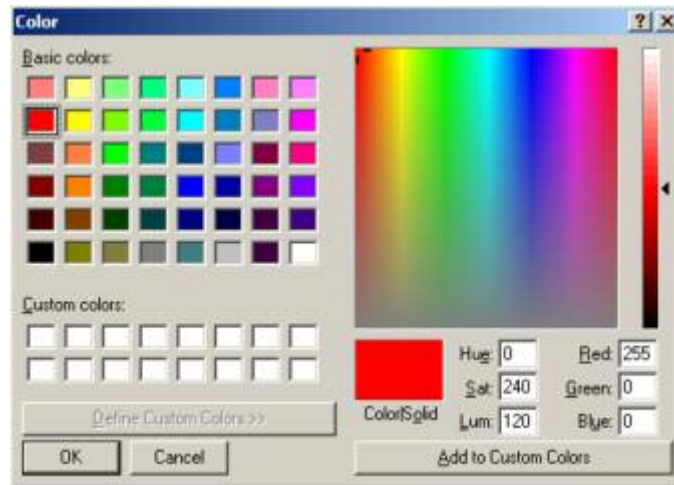
In addition to the measured data the neighborhood analysis requires a separate GSM BTS list with included neighbor cell information (see description of ATD files in chapter 7). The column 2GNC must contain the LAC, MNC, and MCC of each GSM BTS. The import of BTS list files is described in chapter 3.

Selection of mobiles

List of all mobiles measured with their measurement mode. An arbitrary number of mobiles can be selected from the list (click checkboxes). Only the measurement reports for selected mobiles are displayed in the *GSM Neighborhood Analyzer View*.

Colors

The *Colors* panel changes the colors of all display elements. Double-clicking an element of the list opens the *Colors* dialog (see p. 4.351) to modify the current display color.



The resulting elements are then colored accordingly in the related *Route Track* view (see p. 4.47).

UMTS/GSM NQA State View

The *UMTS/GSM NQA State View* tracks the NQA states and state transitions of each call in detail.

The view is empty unless the *Network Quality Analysis (NQA)* was active during recording. Moreover, it requires one of the measurement modes *NORMAL* or *CAMP* to be set and the *Autodial* function to be active. To obtain the complete information, a *Constant Call Pattern (ETSI Specification)* must be selected in the *Autodialing* tab of the driver configuration menu and the data must be recorded with a R&S ROMES version V3.25 or higher. All driver settings and call classes are explained in chapter 6.

The *UMTS/GSM NQA State View* is complemented by the [2G/3G NQA View](#) (see p. 4.315), representing the call statistics during the entire measurement.

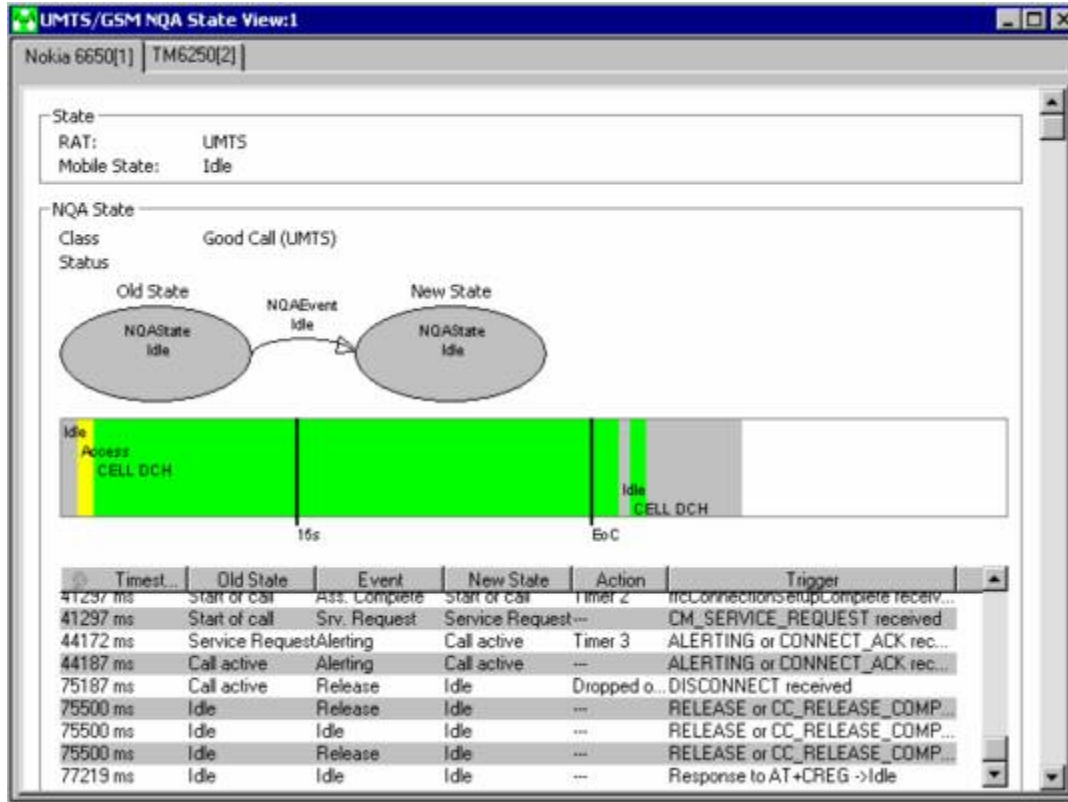


Fig. 4-170 UMTS/GSM NQA State View

State Current Radio Access Technology (RAT, either UMTS or GSM) and mobile state.



The mobile states correspond to the *Phone Mode* signal; see p. 4.12.

NQA State Diagrams

Call class of the current call (*Start of Call, Good Call, Dropped Call, Blocked Call, No Service Call*; see description of NQA driver settings in chapter 6) and status (no indication or *Noisy*).

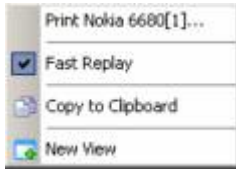
The upper diagram displays the previous NQA state (*Old State*), the NQA event that caused a state transition, and the current NQA state (*New State*). The contents of the diagram change after each mobile state transition.

The lower diagram shows the evolution in time of the current call. The consecutive mobile states are plotted with different colors. The timing parameters are defined in the *Autodialing* tab of the driver configuration menu:

<i>Time zero</i>	Start of the call
<i>First vertical line</i>	<i>Max. Access Time</i>
<i>Second vertical line</i>	Expected end of the call = actual access time + <i>Call Duration</i>
<i>Diagram width</i>	Duration of the <i>Call Window</i> .

NQA State Table

All state transitions are listed in the table below the NQA state diagrams. Each table row describes one state transition. In addition to the information in the NQA state diagrams, the list also displays the exact reason for the state transition (*Action* and *Trigger* columns).

Context menu

A right mouse click on any point in the view opens the context menu to print the view contents, (de-)select the view for fast replay, copy the current view to the clipboard, or to create new views; see [Context menu](#) description on p. 4.2.

The *UMTS/GSM NQA State View* has no configuration menu. The *Info* tab can be accessed via *Configuration – Settings*.

UMTS/GSM Overview View

The *UMTS/GSM Overview View* displays a summary of the test mobile state, power/quality, active set and system parameters, and, if applicable, results from a connected UMTS PN scanner.

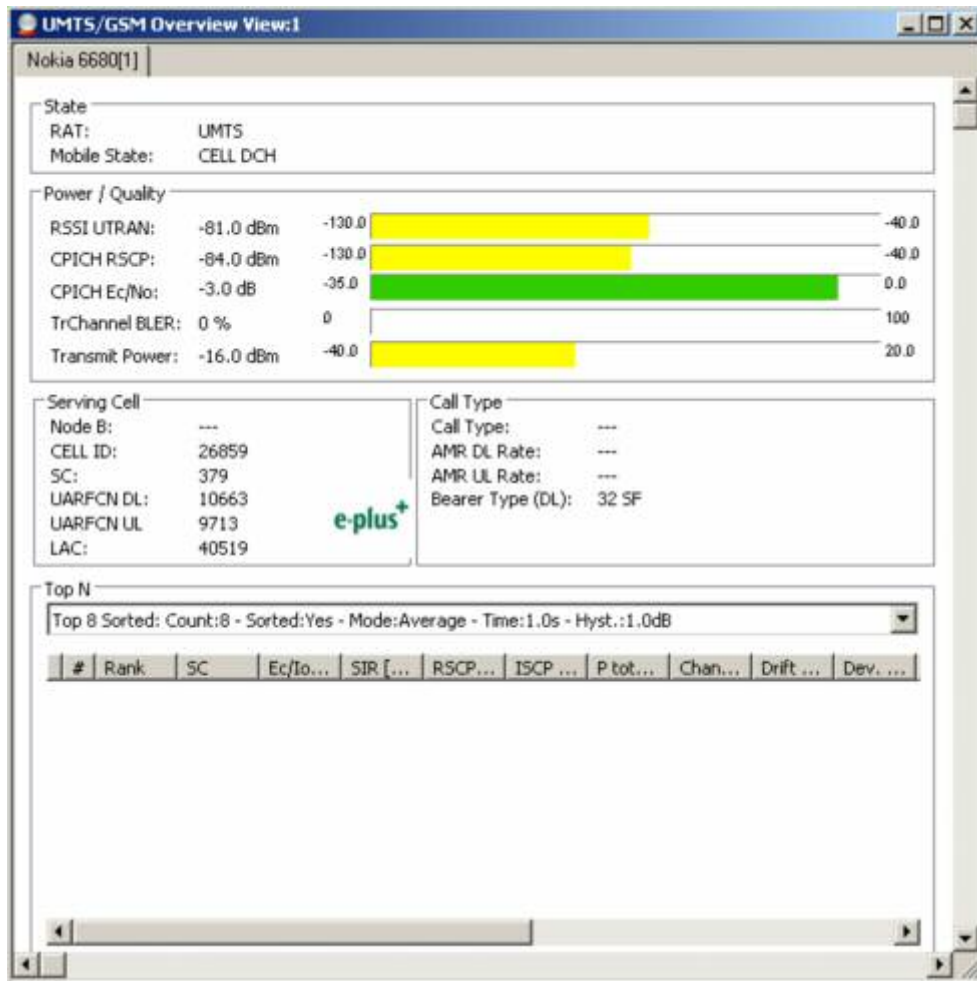


Fig. 4-171 UMTS/GSM Overview View

The *Top N Scanner* field group is only filled if an actual scanner is configured and running.

State This field group contains the mobile state and the CDMA mobile searcher state.

RAT Current Radio Access Technology (either UMTS or GSM)

Mobile State States of the mobile



The mobile states correspond to the *Phone Mode* signal; see p. 4.12.

Power / Quality The Power/Quality panel displays several parameters describing the signal power and quality reported by the test mobile (see standard 3GPP TS 25.225).

RSSI UTRAN

The received wide band power in dBm, including thermal noise and noise generated in the receiver.

CPICH RSCP

CPICH Received Signal Code Power in dBm; the received power on one code, measured on the Primary CPICH.

CPICH Ec/No

The received energy per chip divided by the power density in the band. The *CPICH Ec/No* is identical to *CPICH RSCP* divided by the *RSSI UTRAN*.

TrChannel BLER

Estimation of the transport channel block error rate (BLER) based on evaluating the CRC on each transport block.

Transmit Power

Total mobile transmitted power on one carrier in dBm.

The power results are obtained in an unbiased measurement, i.e. the contribution of the noise floor to the powers is subtracted.

Serving Cell The Serving Cell panel displays the following parameters describing the serving cell:

Node B

Name of the node B, taken from the UMTS Node B database (if available).

Cell ID

Cell Identity of the serving cell.

SC

Primary scrambling code of the cell in the format selected in the *TEC for UMTS Test Mobiles* tab of the *Configuration of Software Modules* menu; refer to section *Configuration Menu* in chapter 3. The primary SC is used to identify the cell.

UARFCN DL

UTRAN Absolute Radio Frequency Channel Number (ARFCN) of the received DL signal. The carrier frequency is equal to

$$f = 0.2 \text{ MHz} * \text{UARFCN}.$$

UARFCN UL

UTRAN Absolute Radio Frequency Channel Number (ARFCN) of the transmitted UL signal

LAC

Location Area Code

Call Type The Call type panel displays the parameters describing the serving cell:

Top N

The Top N panel displays UMTS PNS scanner data recorded by means of an FSP spectrum analyzer or an R&S ESPI test receiver and the UMTS PN scanner driver R&S PNS. It shows the properties of the signals from the Node Bs that are elements of the current Top N Pools. The data is also displayed in the PNS Top N View described on p. 4.361.

Context menu

A right mouse click on any point in the view opens the context menu to print the view, access the configuration menus, (de-)select the view for fast replay, put the view on hold, copy the current view to the clipboard, create new views, or to save the current configuration; see [Context menu](#) description on p. 4.2.

**UMTS/GSM Overview View Configuration**

The *UMTS/GSM Overview View Configuration* selects the columns in the Top N table and displays information about the view version. It is opened via a right mouse click on a point inside *UMTS Layer 1 View* or via the *Configuration – Settings* command (see chapter 3).

The **TOP N List Configuration** tab displays the complete parameter set to be displayed in the *Top N* table (see description in the *PNS Top N View* section on p. 4.361). Clearing a parameter hides the column in the table.



Restricting the viewed results makes it easier to read the tables if only a subset of the available parameters is needed. To restrict the number of parameters measured and enhance the system performance, use the settings in the driver configuration menu (see chapter 6).

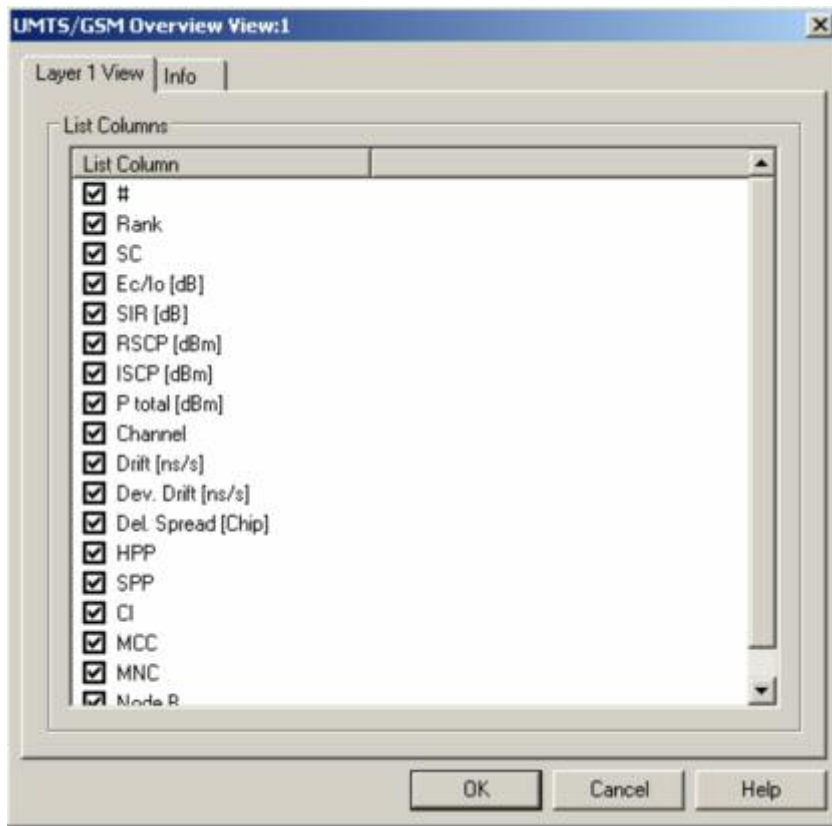


Fig. 4-172 UMTS/GSM Overview View: Configuration

**Top N List
Columns**

The checkboxes select the view list elements to be displayed on the Top N list panel. For a detailed explanation of the parameters refer to section [PNS CPICH View](#) on p. 4.339, or to the [PNS Top N View](#) on p. 4.361.

UMTS/GSM Handover Analyzer View

The *UMTS/GSM Handover Analyzer View* shows a list of the UMTS (3G → 3G), GSM (2G → 2G), and inter-RAT (3G → 2G) handover procedures attempted by UMTS or GSM mobile phones and provides a statistical evaluation. The list and the statistics are displayed in two alternative views. It is possible to open several *UMTS/GSM Handover Analyzer Views* simultaneously in order to observe the list and the statistical views in parallel.

The handover analysis requires option R&S ROMES-U1, *Handover and Neighborhood Analysis*. The view is empty unless the test mobile records the *Layer 3 Messages*; see description of the *Expert Mode* or *Nokia Settings* tabs in the UMTS mobile driver configuration menus. Moreover, the handover analysis must be activated in the *HOA* tab of the driver configuration menu.



The UMTS/GSM Handover Analyzer View shows the handover types that can occur between GSM cells and between GSM and UTRAN cells. To analyze handover procedures between two GSM cells and list the GSM cell parameters use the [GSM Handover View](#); see p. 4.256.

The UMTS Neighborhood Analysis, which is also part of option R&S ROMES-U1, is evaluated in the [UMTS Neighborhood Analyzer View](#); see p. 4.165.

Handover	Time	Event	Result	Add	Remove
1. measurementReport	1069281 ms				
2. activeSetUpdate	1069781 ms				
3. activeSetUpdateComplete	1069781 ms				
109. 3G->3G CS	1070047 ms	Event 1c	Complete	M-Thalkirchen	M-Isarvorstadt
1. measurementReport	1070047 ms				
2. activeSetUpdate	1070562 ms				
3. activeSetUpdateComplete	1070578 ms				
110. 3G->3G CS	1073500 ms	Event 1b	Event Change		
1. measurementReport	1073500 ms				
2. measurementReport	1073703 ms				
111. 3G->3G CS	1073703 ms	Event 2f	Timeout		
1. measurementReport	1073703 ms				
2. Time Out	1084016 ms				
112. 2G->2G CS	1141734 ms	2G->2G HO	Complete	BCCH: 9 , BSIC: 3	BCCH: 1 , BSIC: 3 , CI...
1. HANDOVER COMMAND...	1141734 ms				
2. HANDOVER COMPLETE (Up)	1141969 ms				
113. 3G->3G CS	1202344 ms	Event 2f	Timeout		
1. measurementReport	1202344 ms				
2. Time Out	1212672 ms				
114. 3G->3G CS	1244484 ms	Event 2f	Event Change		
1. measurementReport	1244484 ms				
2. measurementReport	1253844 ms				
115. 3G->3G CS	1253844 ms	Event 1a	Complete	M-Überseebrunn Nord 56	

Fig. 4-173 UMTS/GSM Handover Analyzer View (list)

The complete list of the recorded handovers is selected via *Show List* in the context menu.

Handover List

The handover list consists of the following columns:

Handover

Current number and handover type. The handover analyzer reports GSM (2G → 2G), UMTS (3G → 3G soft/softer handover) and inter-RAT (3G → 2G) handovers. CS and PS denote the circuit switched and packet switched domains, respectively. 3G → 3G hard handovers and 2G → 3G handovers are not recorded in the current software version.

The following layer 3 messages which are relevant for the handover process are listed below the handover event:

3G → 3G handovers (CS):

Measurement report with one of the events (1a, 1b, ..., uplink) described below,

ACTIVE SET UPDATE (downlink),

ACTIVE SET UPDATE COMPLETE (uplink)

3G → 3G handovers (PS):

CELL UPDATE (downlink),

CELL UPDATE CONFIRM (uplink)

3G → 2G handovers (CS):

Measurement report with event 3a described below (uplink) or Cancel event,

HANDOVER FROM UTRAN COMMAND (to GSM, downlink),

HANDOVER COMPLETE (uplink)

2G → 2G handovers (CS):

GSM HANDOVER COMMAND (downlink),

HANDOVER COMPLETE (uplink)

3G → 3G handovers (HSDPA):

TRANSPORT CHANNEL RECONFIGURATION REQUEST / ACCEPT

The analysis of HSDPA handovers requires option R&S ROMES-UM4.

It is possible to expand or collapse the messages for a single handover (click the + / – symbols or double-click the line) or all handovers (use the context menu). Double-click for a detailed analysis of the layer 3 messages. For a complete list of layer 3 messages use the [2G/3G Layer 3 View](#) described on p. 4.302.

Time

Handover start time, the time of the first layer 3 message (see above) which initiated the handover report.

Event

Handover type or one of the measurement reporting events that the UMTS test mobile received from the network. The events are used to notify a UMTS UE in which instance it should transmit a measurement report. They described in standard 3GPP TS 25.331:

Event 1a (for intra-frequency measurements: a primary CPICH enters the reporting range)

Event 1b (a primary CPICH leaves the reporting range)

Event 1c (a non-active primary CPICH becomes better than an active primary CPICH)

Event 1e (a primary CPICH becomes better than an absolute threshold)

Event 1f (a primary CPICH becomes worse than an absolute threshold)

Event 2d (for inter-frequency measurements: the estimated quality of the currently used frequency is below a certain threshold)

Event 2f (the estimated quality of the currently used frequency is above a certain threshold)

Event 3a (for inter-RAT measurements: the estimated quality of the currently used UTRAN frequency is below a certain threshold and the estimated quality of the other system is above a certain threshold)

Result

Status of the handover attempt: *Start, Pending, Complete* for successful handovers. *Timeout* indicates that the handover time exceeded the timeout specified in the *HOA* tab of the UMTS mobile driver configuration menu (see chapter 6). *Event Change* indicates that the network changed the measurement reporting event during the handover.

Add

GSM: BCCH and BSIC of the source base station.

UMTS: Name of a UTRAN cell added to the active set, taken from the node B database (if available). To monitor the complete active set and neighbor set, use the [UMTS CellSet View](#) (see p. 4.138).

Remove

GSM: BCCH, BSIC, CI, and LAC of the target BTS and cell.

UMTS: Name of a UTRAN cell removed from the active set, taken from the node B database (if available).

Filter options

The icons in the toolbar above the list display or hide handovers with specific results and handovers of different type. A colored icon means that the handover events are shown in the list, a unavailable icon means that they are hidden.

- The icons in the first group denote handovers with the following results: *Complete, Failed, Timeout, Error, Event Change*.



- The icons in the second group denote handovers of the following types: *3G → 3G CS, 3G → 2G CS, 3G → 2G PS, 2G → 2G CS, 2G → 3G Reselection, 3G → 3G HSDPA*.



Further analysis An upper case D appears to the right of the cursor arrow when it is placed on a layer 3 message. This symbol indicates that there is detailed information to be retrieved for the current layer 3 message. The detailed information window is opened by double-clicking on the message, e.g.:



It is also instructive to monitor the measurement route and the node Bs / base stations in the *Route Track* view (see p. 4.47). The cells in the Add and Remove columns can be displayed with different colors using the Show Node Bs/BTs on Map command in the context menu. The color code can be configured in the UMTS/GSM Handover Analyzer view configuration menu; see below.

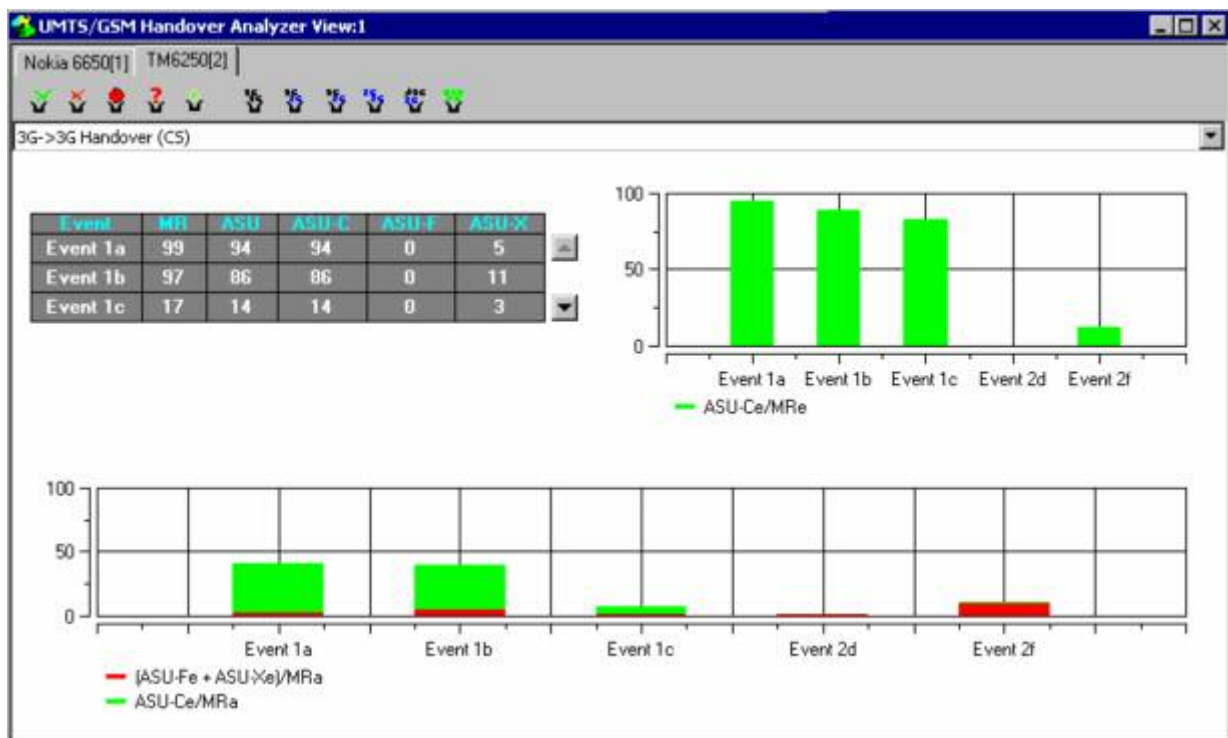


Fig. 4-174 UMTS/GSM Handover Analyzer View (statistics, 3G → 3 G handover)

The statistical evaluation of the recorded handovers is selected via *Show Statistics* in the context menu. There are three versions of the statistics tab, corresponding to the three handover types 3G → 3 G, 3G → 2G (inter-RAT), 2G → 2 G. The versions are selected in the drop-down list across the top of the view.

The 3G → 3G Handover tab shows the following results:

Event table

The table lists the total number of detected handovers with their measurement reporting event class and the handover result.

- Handovers with the same active event appear in the same row. The last row (*All*) shows the sum of all previous rows. *Event Change* handovers are classified according to the event at the start of the handover.
- Handovers with the same result appear in the same column. The following categories are defined: *MR* (Measurement Report; the sum of the *ASU*, *ASU-F*, and *ASU-X* columns), *ASU* (Active Set Update, handovers with an update of the active cell set), *ASU-C* (Active Set Update Complete, ASU handovers that could be completed without error), *ASU-F* (Active Set Update Failure, ASU handovers that failed before the timeout), *ASU-X* (all other handovers, e.g. the *Timeout* or *Event Change* handovers).

Overview of the GSM handovers and handovers between different Radio Access Technologies (inter-RAT handovers, 3G/UMTS → 2G (GSM) and 2G (GSM) → 3G/UMTS).

SR

Success Rate, ratio of the successful handover attempts (*Result: OK*) to the total number of handover attempts for each handover type. A handover is classified successful if it could be achieved before the *Handover Timeout* defined in the configuration menu elapsed.

Attempts

Total number of handover attempts for each handover type.

The distribution of the duration of the handover procedures (i.e. the time between a HO command and a HO response) is shown in two bar graphs:

GSM Handover [s]

Time for GSM handovers.

Inter-RAT Handover [s]

Time for inter-RAT handovers including 3G → 2G and 2G → 3G handovers.

The diagram scales and the number of classes (bars) are fixed.

Successful handover distribution

The upper bar graph shows the percentage of successful (completed) handover attempts for each event class, i.e. the number of *ASU-C* handovers divided by the number of *MR* handovers. In the example of the figure above, all *Event 1a* and *Event 1b* handovers but none of the *Event 2f* handovers were successful.

The diagram scales and the number of classes (bars) are fixed.

General handover distribution

The lower bar graph shows the percentage of (completed and failed) handover attempts for each event class. The red portion of each bar corresponds to the failed, the green portion to the successful attempts. The added length of all bars is 100 %.

The *3G → 2 G Handover* and *2G → 2 G Handover* tabs are similar to the previous one. The following properties of the network standard simplify the tables and diagrams:

- An inter-RAT handover can only occur while the measurement reporting event 3a is active, so the *3G → 2 G Handover* view only shows the percentage of successful and failed handovers within the event class 3a.
- No reporting events are defined for GSM (2G) networks, so the *2G → 2 G Handover* view only shows the percentage of successful and failed handovers.

Context menu



A right mouse click on any point in the view opens the context menu to print or preview the view contents, access the configuration menus, (de-)select the view for fast replay, copy the current view to the clipboard, create or delete views, or move to another worksheet; see [Context menu](#) description on p. 4.2. The context menu provides the following additional, view-specific commands:

Show Node B...

Use the color code defined in the *UMTS/GSM Handover Analyzer View* configuration menu (see below) to mark the UMTS/GSM cell for the selected handover in the *Route Track* view. This feature is only available while a handover process is selected in the handover list. The colored cells are the ones listed in the *Add* and *Remove* columns, respectively. The UMTS layer / GSM BTS layer in the *Route Track* view must be visible to use this feature.

Hide Node B...

Reverse the previous action, display the selected cell symbol with standard colors.

Hide all Node B...

Display all cell symbols with standard colors.

Show List/Statistics

Toggle between the list of the recorded handovers and the statistical evaluation.

Close all Details...

Remove all open details windows from the view. This action is convenient for removing several open windows pinned over the view; see section [General View Properties](#) on p. 4.1.

Expand/Collapse All

Show or hide the layer 3 messages for each handover in the list.

Export

Export the handover analyzer data to a *.csv export file that can be opened and processed by Excel. The file contains the information in the statistics view.

UMTS/GSM Handover Analyzer View Configuration

The *UMTS/GSM Handover Analyzer View* configuration menu defines the CMD file scanning behavior and the color scheme for the Node B / BTS symbols in the *Route Track View*. It is opened via a right mouse click on a point inside *UMTS/GSM Handover Analyzer View* or via the *Configuration – Settings* command (see chapter 3).

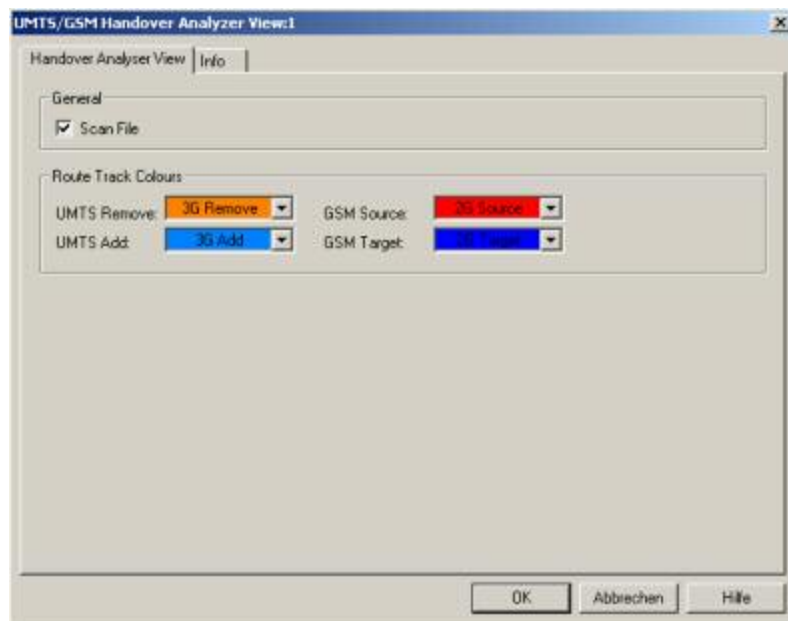


Fig. 4-175 UMTS/GSM Handover Analyzer View Configuration

General	The <i>Scan File</i> checkbox enables or disables the automatic scan for 2G/3G-related handover data in the active CMD file.
Route Track Colors	The colors distinguish the following UMTS Node Bs and GSM base stations:
	<i>UMTS Remove</i> UTRAN source cell of the handover
	<i>UMTS Add</i> UTRAN target cell of the handover
	<i>GSM Source</i> GSM target cell of the handover
	<i>GSM Target</i> GSM target cell of the handover

2G/3G Layer 3 View

The 2G/3G Layer 3 View displays the recorded GSM Layer 3 messages, the GPRS RLC/MAC control messages, and the UMTS RRC messages. The messages are shown for all mobiles used. The messages are not available in *Scan* mode; the mobile must be in *Normal*, *Camp*, or *Test Transmitter* mode.

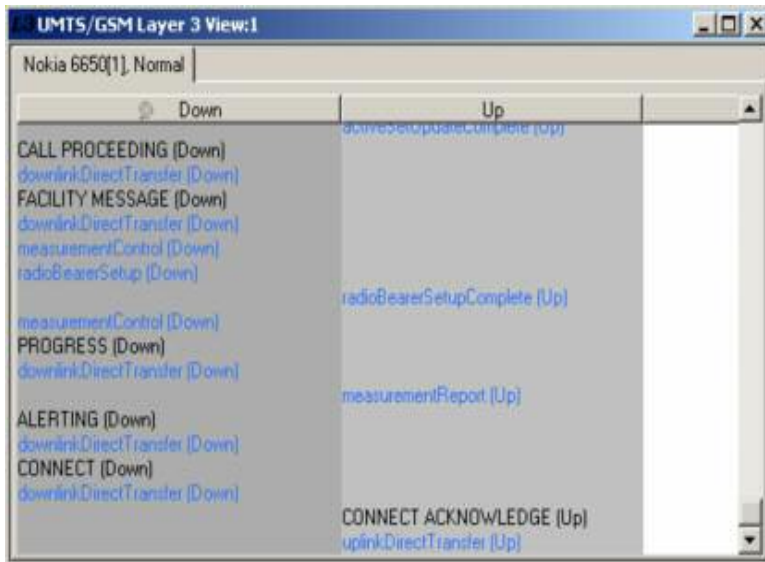


Fig. 4-176 2G/3G Layer 3 View

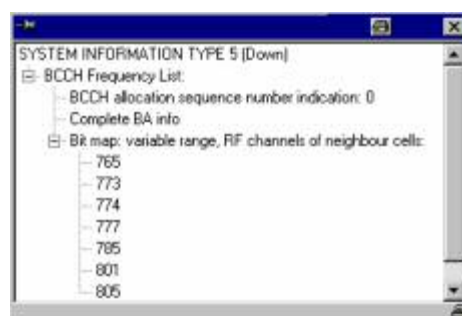
The layer 3 messages for each mobile are arranged in a separate list. Moreover, uplink and downlink messages appear in separate columns unless this feature is switched off in the configuration menu (see *Separate Up/Downlink Columns* parameter on page 4.305). The width of the individual lists can be varied with a drag-and-drop mechanism in the header of the table.

<Mobile type and number>

List of the layer 3 messages of an individual mobile. The message types are selected in the Layer 3 Messages tab of the configuration menu, see below.

Detailed information:

An upper case D may appear to the right of the cursor arrow when it is placed on a layer 3 message. This symbol indicates that there is detailed information to be retrieved for the current layer 3 message. The detailed information window is opened by double-clicking on the message, e.g.:





The detailed information window is totally independent of the 2G/3G Layer 3 View, so you can move, resize and scroll it as you like. Click the printer symbol in the lower right corner to generate a hardcopy of the detailed information. Alternatively, you can write the detailed information into the table (e.g. if you wish to create a hardcopy), see the ...Messages tabs of the configuration menu.

A click on the pin symbol in the title bar of the detailed information window fixes the window so that you can open several windows at the same time.

Stop display:

Each individual list of layer 3 messages can be stopped and released at any time by left-clicking on its title bar. A stopped list is indicated by a red STOP symbol left of the mobile type.

Note:

Detailed messages are only displayed during a Replay session because of performance requirements during the measurement and during recording.

On the other hand switching between different L3 messages is also possible during Pause and even after Stop.

Context menu



A right mouse click on any point in the view opens the context menu to print the view contents, access the configuration menus, (de-)select the view for fast replay, put the view on hold, copy the current view to the clipboard, create or delete views, save the current configuration, to refresh the view, or to add a bookmark; see [Context menu](#) description on p. 4.2. In addition the context menu provides the following menu commands:

Set Text Marker...

Opens a dialog to define a text marker using the selected message as a search text; see [Text Markers](#) on p. 4.306.

Find...

Opens a standard Windows *Find* dialog to search the entire message list for a keyword or an expression.



2G/3G Layer 3 View Configuration

The *2G/3G Layer 3 View* configuration menu selects the messages to be viewed or exported and shows information on the current view version. It is opened via a right mouse click on a point inside *2G/3G Layer 3 View* or via the *Configuration – Settings* command (see chapter 3).

The *Display* tab defines the display mode of the GSM L3, GPRS RLC/MAC, and UMTS RRC messages and controls the text markers and the detail filter.

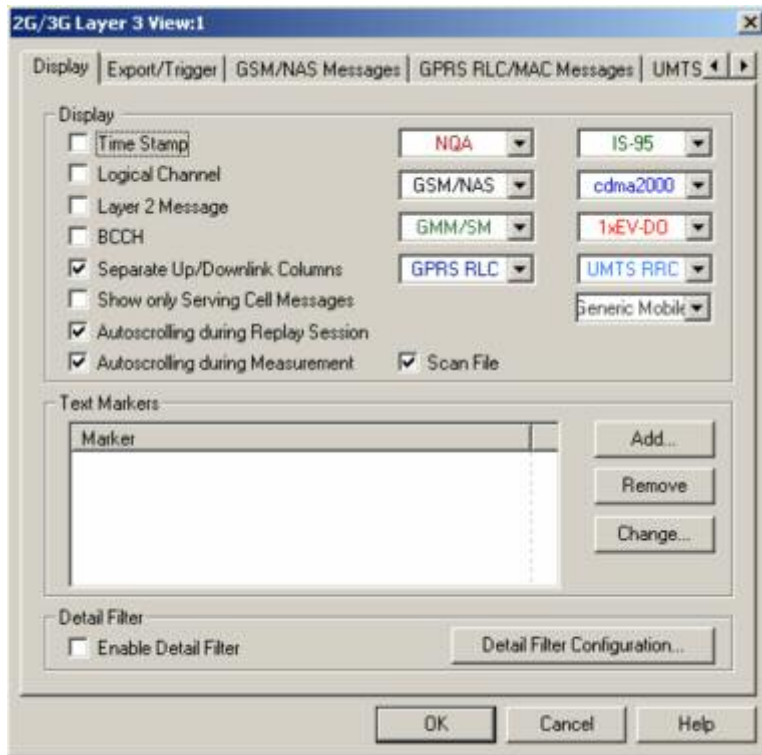


Fig. 4-177 2G/3G Layer 3 View Configuration: Display

Display

The controls in the *Display* panel define which type of information is displayed in the *2G/3G Layer 3 View* and how the messages are displayed.

Time Stamp

If the box is checked, the time stamp associated with the message occupies the first column of the *2G/3G Layer 3 View* tables.

Logical Channel

If the box is checked, the logical channel associated with the message occupies the second column of the *2G/3G Layer 3 View* tables.

Layer 2 Message

If the box is checked, layer 2 messages associated with the layer 3 message are displayed in an additional column of the *2G/3G Layer 3 View* tables. Only some SAGEM devices are capable of recording layer 2 messages. Recording must be enabled in the *Measurement Mode* or *General Settings* tab of the *Driver Configuration* menu.

BCCH

If the box is checked, the BCCH associated with the layer 3 message is displayed in an additional column of the *2G/3G Layer 3 View* tables.

Separate Up/Downlink Columns

If the box is checked, uplink and downlink messages appear in separate columns of the *2G/3G Layer 3 View* as shown in

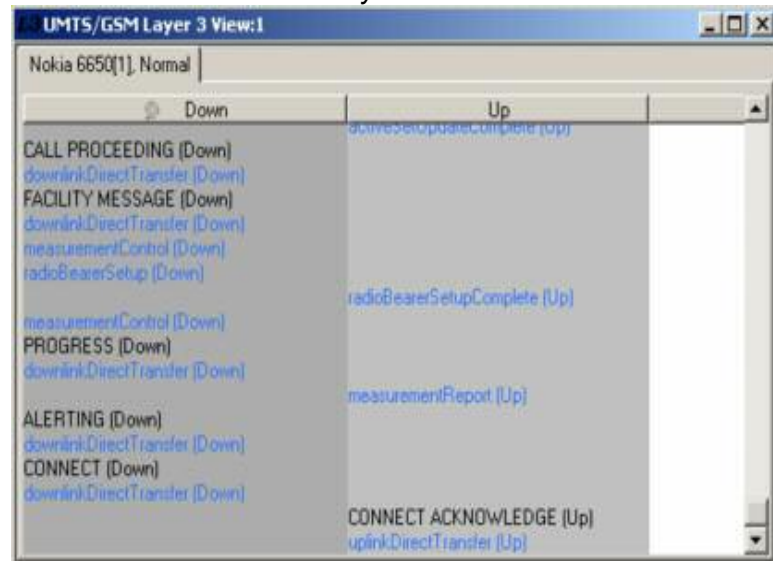


Fig. 4-176. Otherwise, all messages from one mobile are written in a single column in chronological order. An (Up) or (Down) identifier after each message indicates which transmission direction the message belongs to.

Show only Serving Cell Messages

If the box is checked, layer 3 messages exchanged with the serving cell are displayed only. Otherwise, the *2G/3G Layer 3 View* shows all layer 3 messages recorded.

Autoscrolling

If the boxes are checked, the *2G/3G Layer 3 View* tables are scrolled down automatically as soon as the bottom of the view window is reached. Otherwise, the scrollbar can be used to move up and down in the table. Autoscrolling can be enabled/disabled separately for replay and measurement sessions.

Scan File

The *Scan File* checkbox enables or disables the automatic scan for *2G/3G Layer 3-related* QoS data in the active CMD file.

Color Scheme

The different message types (*NQA, GSM/NAS, GMM/SM, GPRS RLC, IS-95, cdma2000, 1xEV-DO, UMTS RRC, Generic Mobile*) can be displayed with different colors to be more easily distinguished. Each of the pull-down lists opens a *Colors* dialog; see p. 4.351.

Text Markers

The controls in the *Text Markers* panel define markers that can be used to highlight keywords or expressions in the list of displayed messages. *Add...* opens the following dialog:





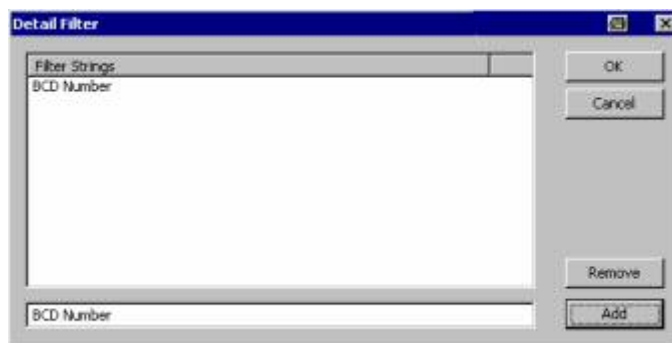
The *Configure Text Marker* can be opened from the context menu of the *2G/3G Layer 3 View*. A text marker highlights the search text entered in the *Text* input field using the selected *Text Color* and *Background Color*. The options *Match whole word* and *Match case* refine the text selection.


It is possible to define several text markers with different attributes, *Remove* or *Change* a text marker.

Detail Filter

The detail filter filters the detailed information displayed in the view and can be used to limit the amount of information displayed and search for particular information types. To activate the filter, proceed as follows:

1. In one of the *Messages* tabs of the configuration menu, enable the details for a particular message (select *Yes* in the *Details* column, e.g. for the *SETUP* message in the *GSM L3 Messages* tab).
2. Replay the (*Measurement – Replay* or ) measurement file and pause the replay (*Measurement – Replay Pause* or ) as soon as the message details are displayed for the first time.
3. Open the *Display* menu of the configuration menu and press *Detail Filter Configuration*.
4. Enter the detailed information you wish to display into the dialog opened, e.g. type *BCD Number* into the line across the bottom and click *Add*.



5. Click *OK* to close the *Detail Filter* dialog, then click *Enable Detail Filter* and *OK* to close the configuration menu.
6. Continue the replay (*Measurement – Replay Pause* or ). The next *SETUP* message is displayed with the *BCD Number* information only.

```

SETUP (?)
- Optional IE "Calling party BCD Number" missing
- Called party BCD Number:
- BCD Number: 1133
  
```

The *Export/Trigger* tab controls the export of data during a replay session and defines the trigger for selecting a range of messages to be displayed.

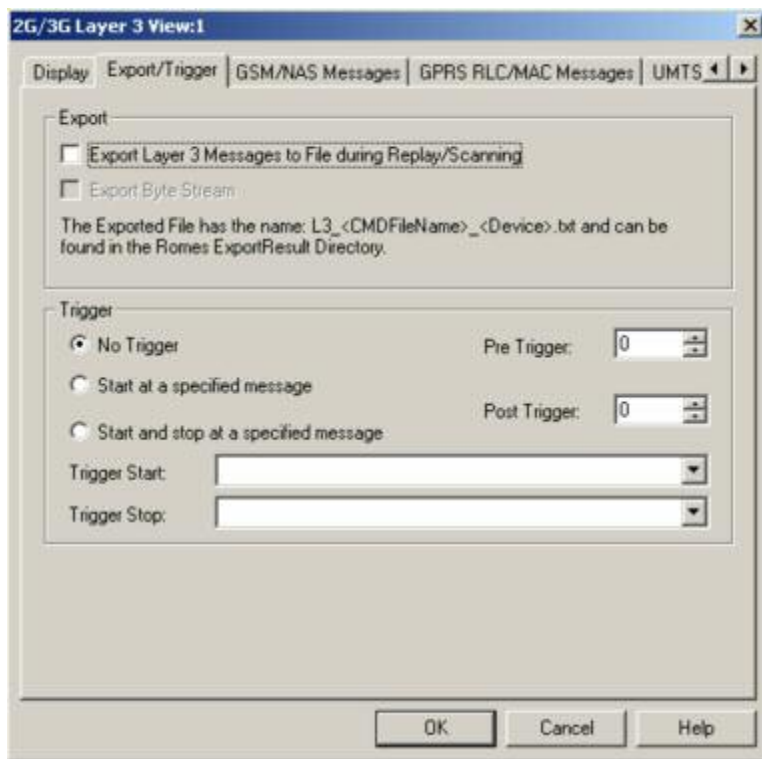


Fig. 4-178 2G/3G Layer 3 View Configuration: Export / Trigger

Export

The three checkboxes in the *Export* panel select one of the following export modes:

- No data export (upper box cleared, lower box unavailable): Data export during replay disabled.
- Export messages only (upper box checked, lower box cleared): A quasi-chronological record of the layer 3 messages is written to an ASCII text file named *L3_<CMDFileName>_<Device>*, located in the *ExportResult* subdirectory of the R&S ROMES program directory.

```
2844 ms ; measurementControl (Down)
3719 ms ; IDENTITY REQUEST (Down)
3188 ms ; measurementReport (Up)
3203 ms ; securityModeCommand (Down)
3203 ms ; securityModeComplete (Up)
3500 ms ; measurementReport (Up)
3719 ms ; downlinkDirectTransfer (Down)
3750 ms ; IDENTITY RESPONSE (Up)
```

- Export messages and byte stream (upper and lower box checked): The export file also contains the raw bytes encoding the messages and their information elements.

```
2844 ms ; measurementControl (Down)
HEX: 0x01ff09010d00208e81a01414220240ae231620
3719 ms ; IDENTITY REQUEST (Down)
HEX: 0x0f0000000000032701000b00051803
3188 ms ; measurementReport (Up)
HEX: 0x02ff0902130022500250019200452d05001940046cc8000528
3203 ms ; securityModeCommand (Down)
HEX: 0x01ff11011000d08a2c110c0600018001481c300e6018
3203 ms ; securityModeComplete (Up)
HEX: 0x02ff15020900d66707718d21000000
3500 ms ; measurementReport (Up)
HEX: 0x02ff090218009a4dda771225a0250019200452ce5001940046cca0005280
3719 ms ; downlinkDirectTransfer (Down)
HEX: 0x01ff06010b00f11c5f0e89400040a30060
```

Export files are overwritten when the replay is repeated.



Use the Details button in the GSM L3 Messages, GPRS RLC/MAC Messages or UMTS RRC Messages tabs to include the message details in the export file.

Layer 3 Message Trigger

Instead of listing all messages of a given type recorded during the measurement, it is possible to select a range of messages:

No trigger

All messages recorded are displayed

Start at ...

Display starts when the first *Trigger Start* message is detected and continues until the end of the measurement

Start and stop ...

Display starts when the first *Trigger Start* message is detected and stops at the first *Trigger Stop* message

Trigger Start

Pull-down list to select the message type triggering the start of the display

Trigger Stop

Pull-down list to select the message type triggering the stop of the display

PreTrigger

Number of messages displayed before the *Trigger Start* message

PostTrigger

Number of messages displayed after the *Trigger Stop* message

The *GSM/NAS Messages* tab selects the GSM/NAS layer 3 messages to be displayed.

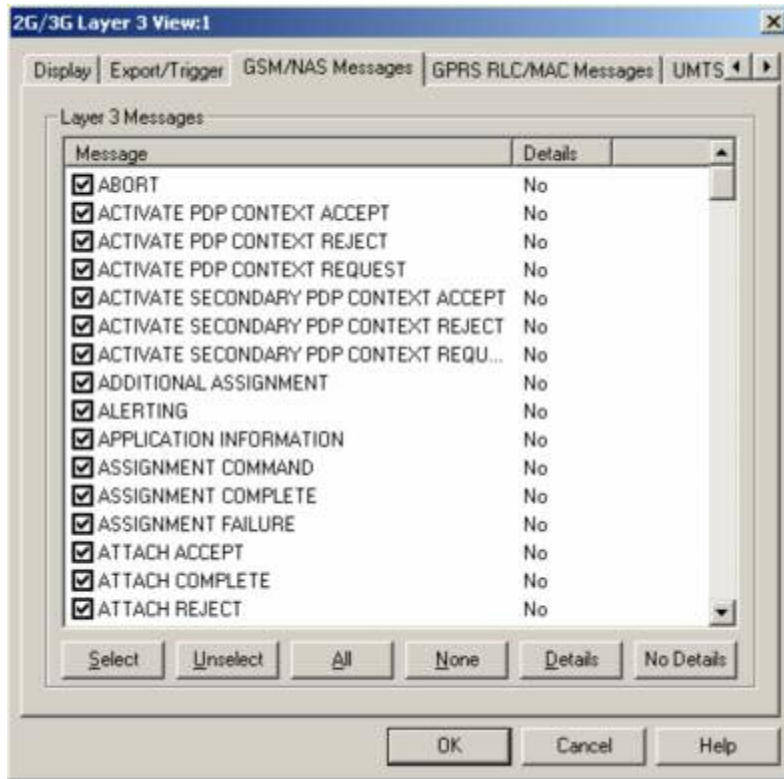


Fig. 4-179 2G/3G Layer 3 View Configuration: GSM/NAS Messages

Message list

List of all layer 3 message types defined in GSM/NAS. The second column of the table indicates whether the detailed information concerning a message type is displayed in the *2G/3G Layer 3* view.

Select

Displays the selected, highlighted message type (left-click) in the *2G/3G Layer 3* view. As an alternative, the box on the left of the message type can be checked (left-click).

Unselect

Hides the selected, highlighted message type (left-click) in the *Layer 3* view. As an alternative, the box on the left of the message type can be cleared (left-click the checked box).

All

Display all layer 3 messages in the *2G/3G Layer 3* view.

None

Display no layer 3 messages in the *2G/3G Layer 3* view.

Details

Displays the detailed information concerning the selected message type in the *2G/3G Layer 3* view from where it can be printed.

No Details

Removes the detailed information from the *2G/3G Layer 3* view so that it can not be printed. The detailed information can still be retrieved on screen by double clicking an individual message.



Details selected for display will also be included in an export file generated during a replay; see Fig. 4-177 on p. 4.304 .

The *GPRS RLC/MAC Messages* tab selects the RLC/MAC control messages to be displayed.

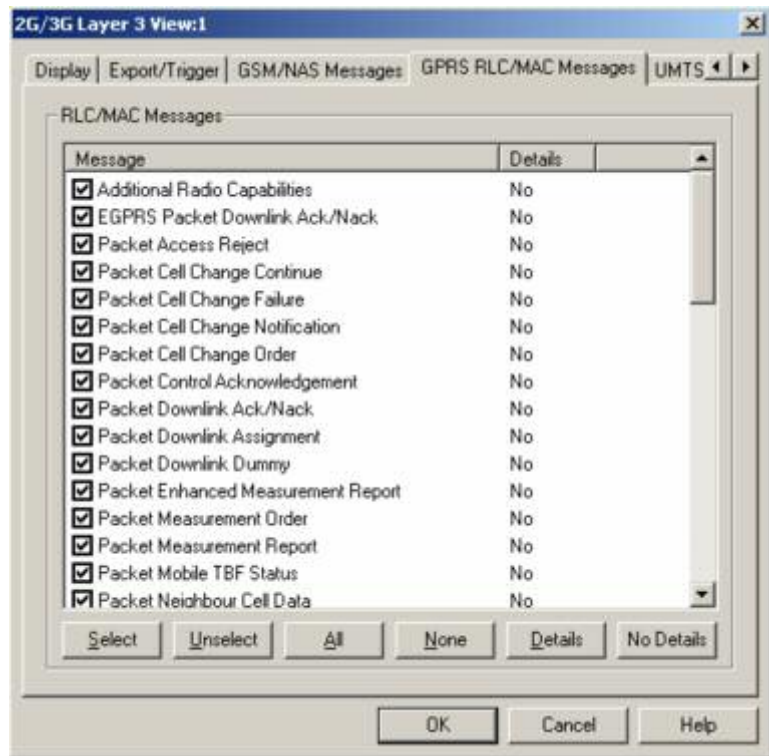


Fig. 4-180 2G/3G Layer 3 View Configuration: GPRS RLC/MAC Messages

Message list

List of all RLC/MAC (Radio Link Protocol/Medium Access Control) control message types defined for GPRS. The second column of the table indicates whether or not the detailed information concerning a message type is displayed in the *2G/3G Layer 3* view.

The buttons below the table are the same as in the *GSM L3 Messages* tab; see above.

The *UMTS RRC Messages* tab selects the UMTS RRC control messages to be displayed.

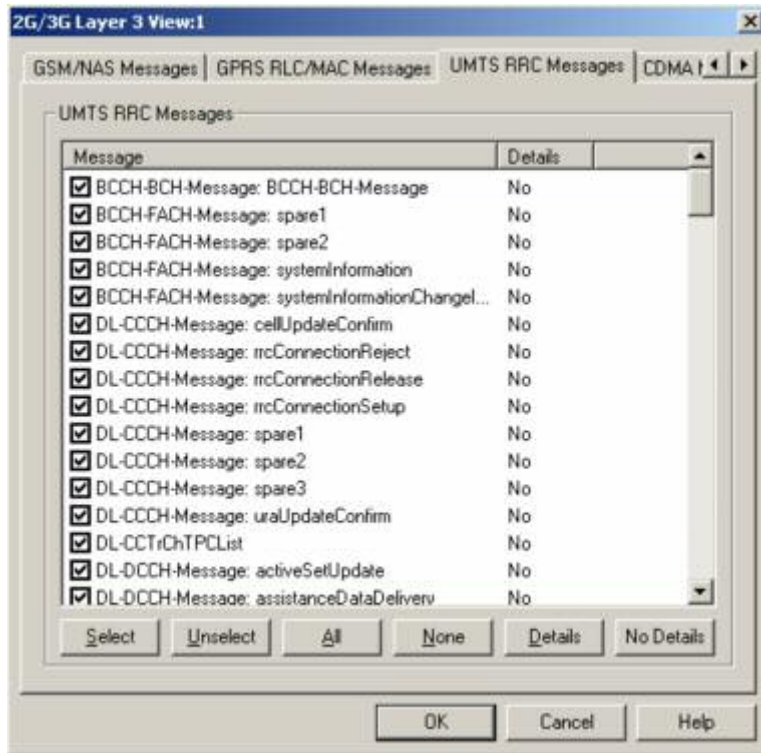


Fig. 4-181 2G/3G Layer 3 View Configuration: UMTS RRC messages

Message list

List of all RRC (Radio Resource Control) message types defined for UMTS. The second column of the list indicates whether or not the detailed information concerning a message type is displayed in the *2G/3G Layer 3* view.

The buttons below the list are the same as in the *GSM L3 Messages* tab; see above.

The *CDMA Messages* tab selects the cdma2000 messages to be displayed.

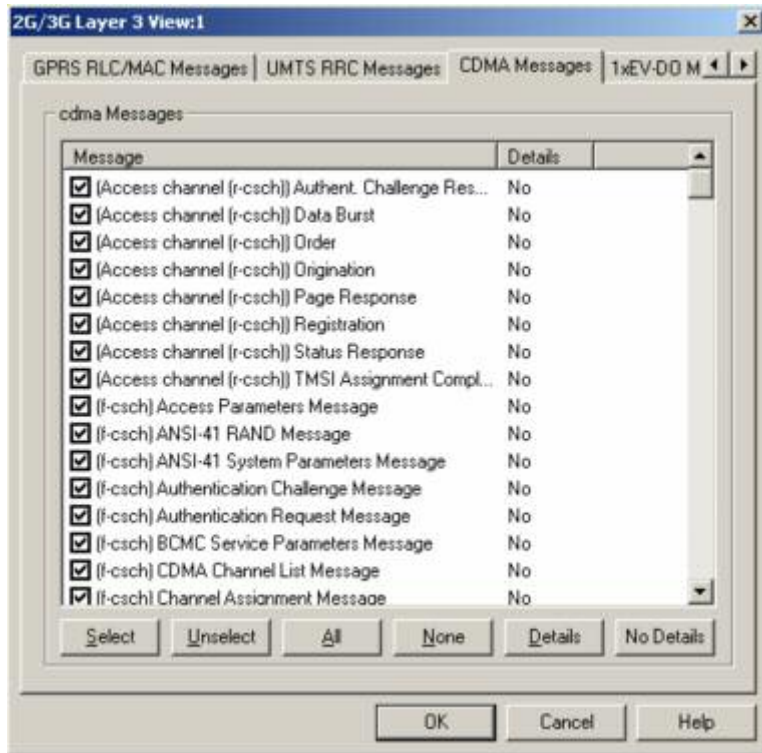


Fig. 4-182 2G/3G Layer 3 View Configuration: CDMA Messages

Message list

List of all cdma2000 control message types defined for CDMA. The second column of the table indicates whether or not the detailed information concerning a message type is displayed in the *2G/3G Layer 3* view.

The buttons below the table are the same as in the *GSM L3 Messages* tab; see above.

The *1xEV-DO Messages* tab selects the 1xEV-DO messages to be displayed.

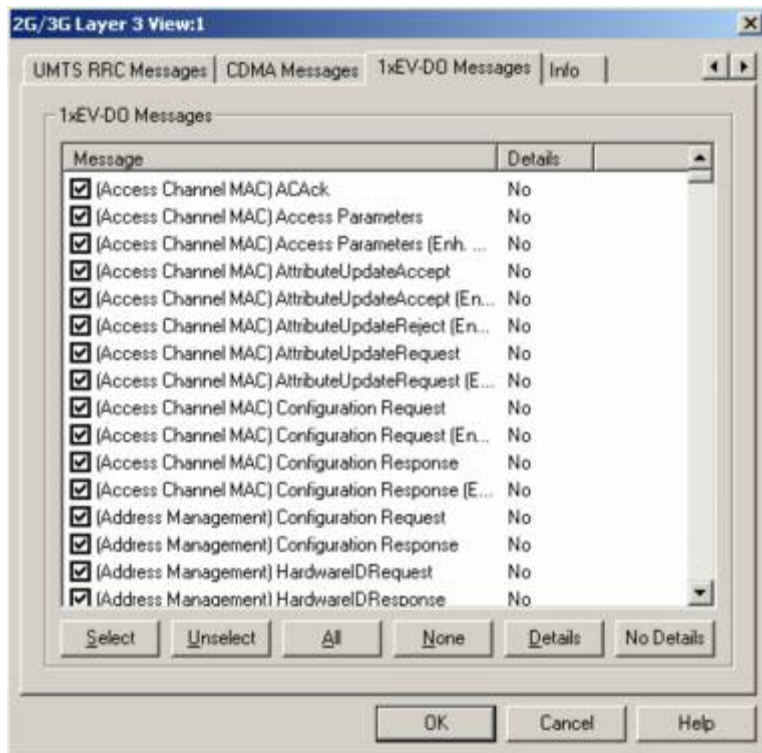


Fig. 4-183 2G/3G Layer 3 View Configuration: 1xEV-DO Messages

Message list

List of all defined 1xEV-DO control message types. The second column of the table indicates whether or not the detailed information concerning a message type is displayed in the *2G/3G Layer 3* view.

The buttons below the table are the same as in the *GSM L3 Messages* tab; see above.

2G/3G NQA View

The *2G/3G NQA View* shows a bar graph representing the call statistics, i.e. the number of *Good*, *Blocked*, *Dropped*, and *No service* calls of each GSM or UMTS mobile used. The absolute number of calls is displayed on the bars.

The view is empty unless the *Network Quality Analysis (NQA)* is active. Moreover, it requires one of the measurement modes *NORMAL* or *CAMP* to be set and the *Autodial* function to be active. All driver settings and call classes are explained in chapter 6.

To complement the *2G/3G NQA*, the *UMTS/GSM NQA State View* (see p. 4.289) tracks the NQA states and state transitions of each call in detail.

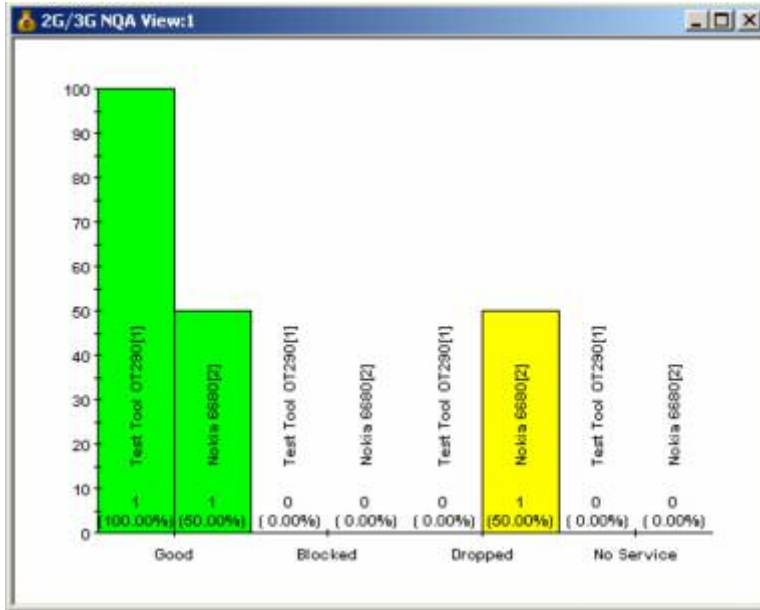


Fig. 4-184 2G/3G NQA View (for 3 mobiles)

Context menu



A right mouse click on any point in the view opens the context menu to access the configuration menus, (de-)select the view for fast replay, copy the current view to the clipboard, create new views, or to save the current configuration; see [Context menu](#) description on p. 4.2.

The *2G/3G NQA View* has no configuration menu assigned. The *Info* tab can be accessed via the *Configuration – Settings* command.

2G/3G ETSI QoS View

The 2G/3G ETSI QoS View shows the NQA classification for each 3G (UMTS) or 2G (GSM) call (*Good*, *Blocked*, *Dropped*, and *No service*) and displays a set of Quality of Service parameters defined in the ETSI/IREG specifications.

IREG is an ETSI committee developing specifications for the Quality of Service evaluation. Quality of Service (QoS) is a general notion, defined as “the collective effect of service performance which determines the degree of satisfaction of a user”. A critical technical aspect related to QoS is Network Performance (NP), i.e. “the ability of a network portion to provide the functions related to communication between users”.

Parameters to assess the QoS of various services are defined in document TS 102.250-3 (formerly: PRD IR.42) and related documents.

The view is empty unless the *Network Quality Analysis (NQA)* is activated in the driver configuration menu. Moreover, it requires one of the measurement modes *NORMAL* or *CAMP* (GSM) to be set and the *Autodial* function to be active. All driver settings and call classes are explained in chapter 6.

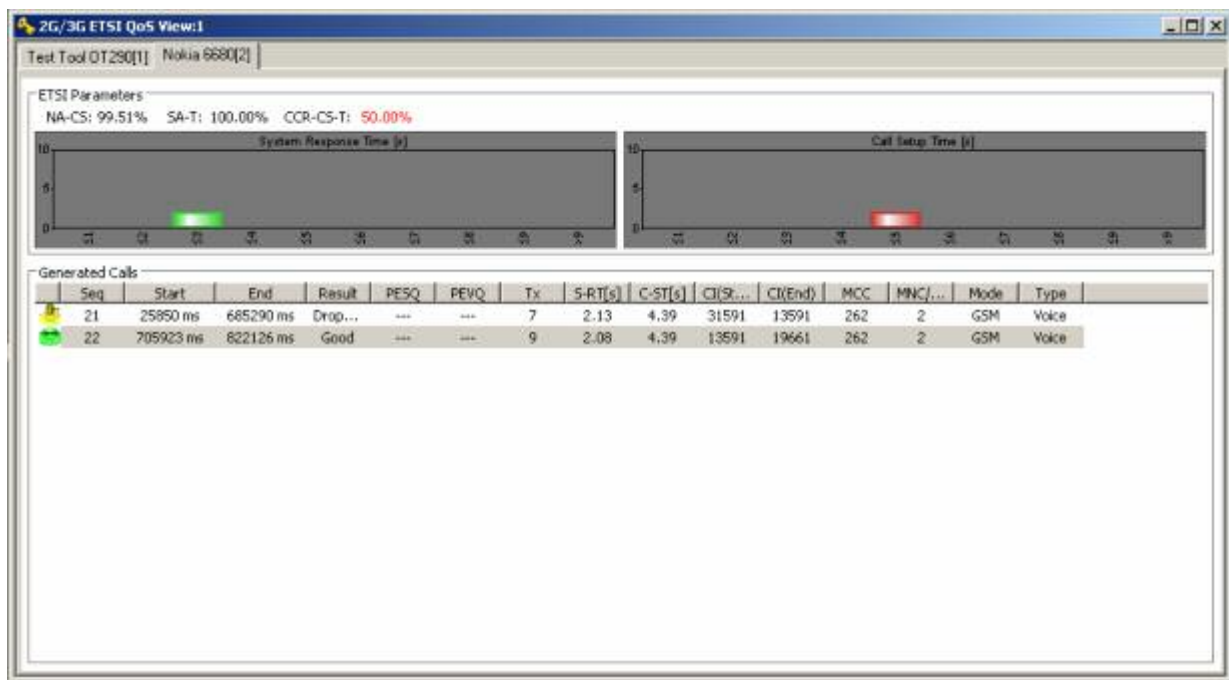


Fig. 4-185 2G/3G ETSI QoS View

The measurement results for each mobile are arranged in a separate tab. The tabs are divided into two panels. The upper panel provides a statistical evaluation of the whole measurement (*IREG IR.42 Parameters*), the lower panel a list with the results of each individual call (*Generated Calls*). The list can be replaced by the *Call Details* for a selected call.

**IREG IR.42
Parameters**

Overview of QoS service-independent and telephony-related parameters defined in TS 102.250-3 (formerly: PRD IR.42) and statistical evaluation of the timing parameters. The following values are displayed in percent:

NA-CS

Network Accessibility Circuit Switched, ratio of the number of successful GSM network access attempts to the total number of network access attempts. The criterion for successful network access is that the path loss criterion parameter C1 is larger than 0 (see standard 3GPP TS 05.08).

NA-PS

Network Accessibility Circuit Switched, ratio of the number of successful GPRS network access attempts (with GPRS enabled for cell) to the total number of network access attempts. The criterion for successful network access is that the path loss criterion parameter C1 is larger than 0.

SA-T

Service Accessibility Telephony, ratio of the number of successful call attempts (after successful network access) to the total number of call attempts.

CCR-CS-T

Call Completion Rate Circuit Switched Telephony, ratio of the number of intentionally terminated telephony calls to the number of successful telephony calls.

The larger the four values, the better the QoS. The values turn red if they fall below the limits defined in the configuration menu.

The distribution of the following timing parameters is shown in two bar graphs:

System Response Time

Time between the start of a call attempt and indication of successful network access.

Call Setup Time

Time between the start of a call setup attempt (after successful network access) and indication of call setup success.

Short times indicate a good QoS. The diagram scales and the number of classes are defined in the configuration menu.

Generated Calls List of all calls with their characteristics and QoS parameters. The table contains the following rows::



Colored symbols to distinguish the *Good*, *Dropped*, *Blocked* and *No Service* calls

Start/End

Start and end time of the call

Result

Call class: *Good*, *Dropped*, *Blocked* and *No Service* call; see description of *NQA* tab of the driver configuration menu in chapter 6.

Quality

Call quality according to the settings in the *NQA* tab: *OK*, *Noisy*, *Excessive HO*, *Delayed Call*.

Tx

Maximum transmit power of the mobile during the call

S-RT, C-ST

System response time and call setup time, see above

MCC, MNC

Mobile Country Code and Mobile Network Code

Mode

Call mode: *GSM* or *UMTS*

Call Details

A double-click on a row in the *Generated Calls* table opens the *Call Details*, providing the entries in the *Generated Calls* table plus three bar graphs to assess the distribution of the following parameter values:

RxQual/BLER

Indication of the Bit Error Rate (*GSM*) or Block Error Rate (*UMTS*)

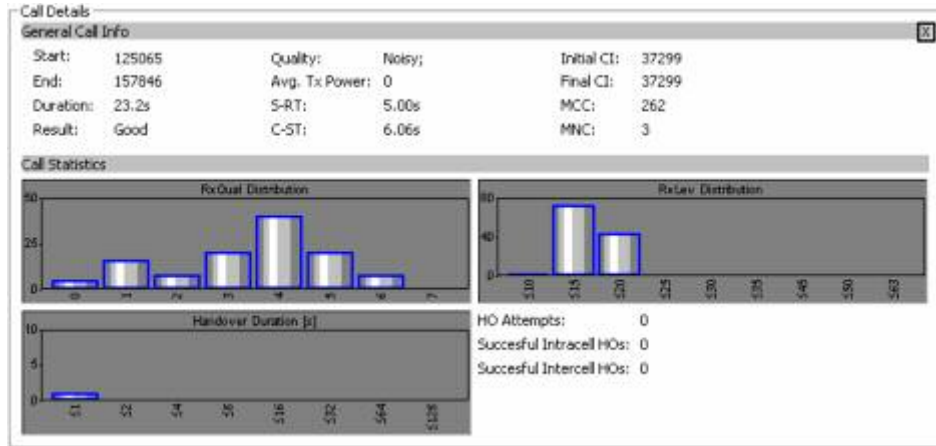
RxLev/Ec/Io


Indication of the downlink signal strength received by the mobile

Handover Duration

Indication of the time needed for successful handover attempts

The handover statistics (number of *Handover Attempts* and *Successful In-tracell/Intercell HOs*) is indicated in addition.



Clicking  closes the *Call Details* and displays the *Generated Calls* table.

Context menu



A right mouse click on any point in the view opens the context menu to print the view contents, access the configuration menus, (de-)select the view for fast replay, put the view on hold, copy the current view to the clipboard, create or destroy views, or to save the current configuration; see [Context menu](#) description on p. 4.2.

2G/3G ETSI QoS View Configuration

The *2G/3G ETSI QoS View* configuration menu defines limits for the QoS parameters and configures the bar graphs. It is opened via a right mouse click on a point inside *2G/3G ETSI QoS View* or via the *Configuration – Settings* command (see chapter 3).

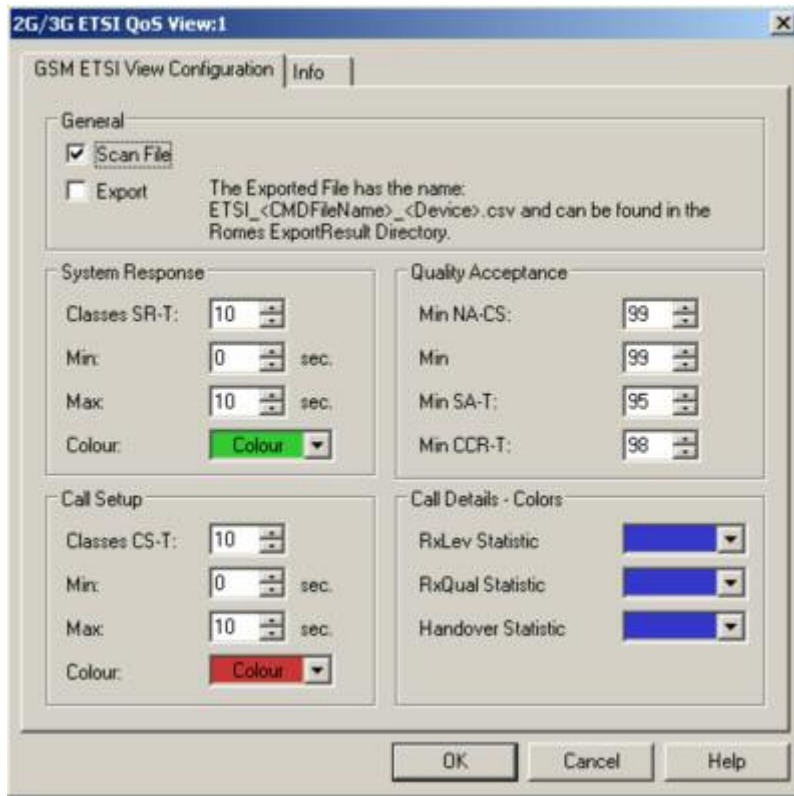


Fig. 4-186 2G/3G ETSI QoS View: Configuration

General

The *Scan File* checkbox enables or disables the automatic scan for *ETSI-related* QoS data in the active CMD file.

Select the *Export* option to export the results of the *Generated Calls* table to a *.csv export file that can be opened and processed by Excel, e.g.:

```
Start;End;Result;Quality;Tx;S-RT[s];C-ST[s];CI(Start);CI(End);
MCC;MNC;Mode;Type
63813 ms;132000 ms;Good;OK;-6.0 dBm;0.44;6.55;-;-;262;1;UMTS;---
```

System Response / Call Setup The *System Response / Call Setup* panel defines the number of classes (i.e. the maximum number of bars) in the *System Response Time* and *Call Setup Time* diagrams, sets the scale of the y-axis and the colors of the bars.

With a number n of classes and a SR or CS time interval between *Min* and *Max* seconds, the classes correspond to the following sub-intervals:

Class 1 [0 s, $(\text{Max} - \text{Min}) / n$]

Class k [$(k - 1) * (\text{Max} - \text{Min}) / n$, $k * (\text{Max} - \text{Min}) / n$], $2 \leq k \leq (n - 1)$

Class n [$(n - 1) * (\text{Max} - \text{Min}) / n$, ∞ s]

The sub-interval width $(\text{Max} - \text{Min}) / n$ must be equal to or larger than 1 s.

Quality Acceptance The four input fields in the *Quality Acceptance* panel contain lower limits for the QoS Parameters displayed in the *IREG IR.42 Parameters* panel. A measurement result turns red if it is below the limits.

Call Details - Colors The *Call Details* panel sets the colors of the bars in the *RxQual/BLER Distribution*, *RxLev/Ec/Io Distribution* and *Handover Duration* diagrams.

CW Views

The *CW Info View* shows the measurement frequency of a test receiver (*R&S R&S ESVx*, *R&S ESPI*, *R&S R&S TSMx*, see test receiver driver description in chapter 6) that operates in *Manual Tracking* mode.

The *CW Info View* can be selected from a submenu displayed on the right side of the *View* menu when the mouse pauses over *CW Views*.

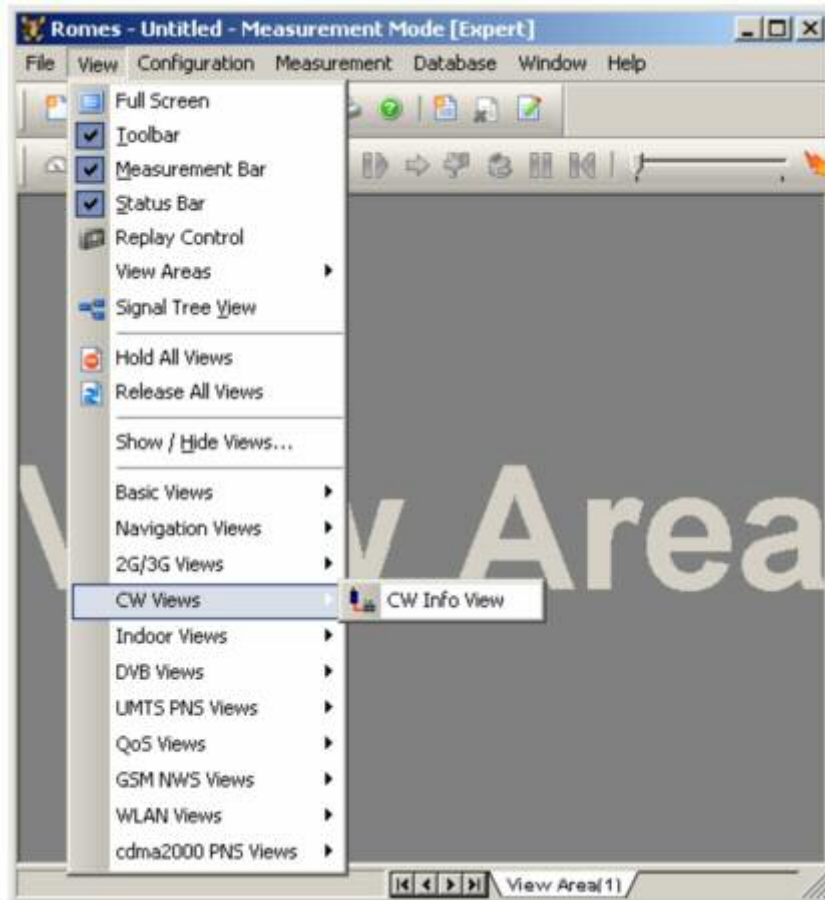



Fig. 4-187 CW views

Indoor Views

The *Indoor View* shows measurement results recorded using the *INDOOR* navigation driver. This driver is suitable in areas where no GPS navigation signal is available, in particular inside buildings.



Click the  icon in the measurement bar and use the Available Signals Drag & Drop... dialog to display signals in the *Indoor View*.

The *Indoor View* can be selected from a submenu displayed on the right side of the *View* menu when the mouse pauses over *Indoor Views*.

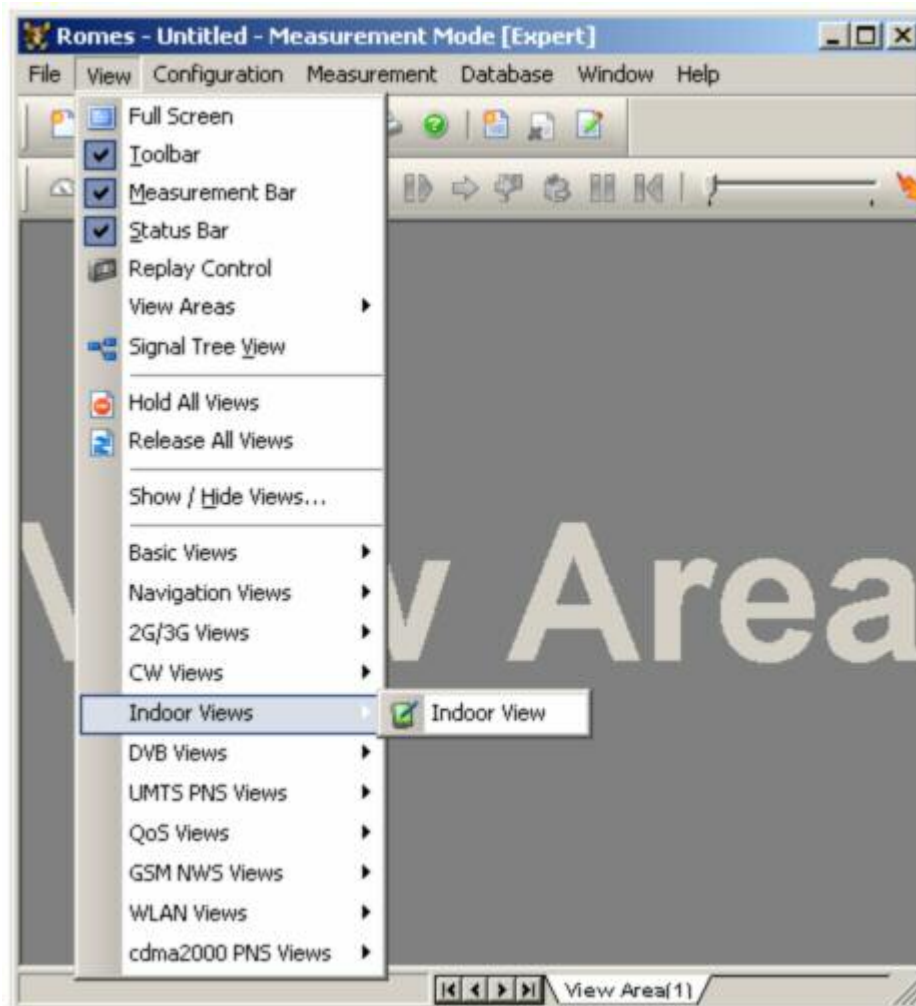


Fig. 4-189 Indoor views

Indoor View

The *Indoor View* visualizes a measurement which is performed at a set of points located on a background map. To perform a measurement, the Indoor navigation driver must be loaded as explained in chapter 6. In addition, a background map must be loaded and assigned geographical coordinates via the *Indoor Navigation* configuration menu (see section *Indoor Navigation Driver INDOOR* in chapter 6). The measurement points can be defined in the configuration menu (*Waypoints* navigation mode) or during the measurement (*Stream input* navigation mode).

Measured indoor results can be recorded in a file together with the configuration settings and replayed later. In this case, there is no need to load a driver; the configuration of the background map is part of the measurement file.

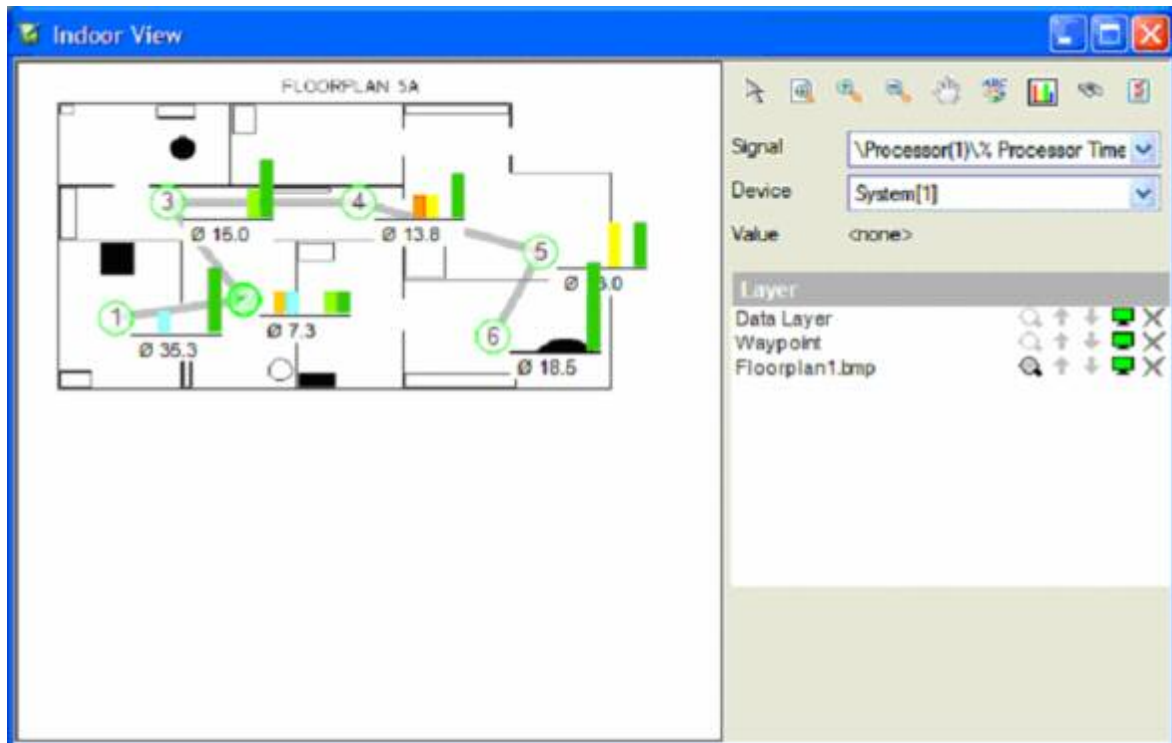


Fig. 4-190 Indoor View

Diagram

The diagram shows the loaded background map where measurement points are placed as defined in the *Indoor View Configuration* menu.

Depending on the *measurement mode* selected in the configuration menu the measurement results are either indicated at fixed points (hot spots, see

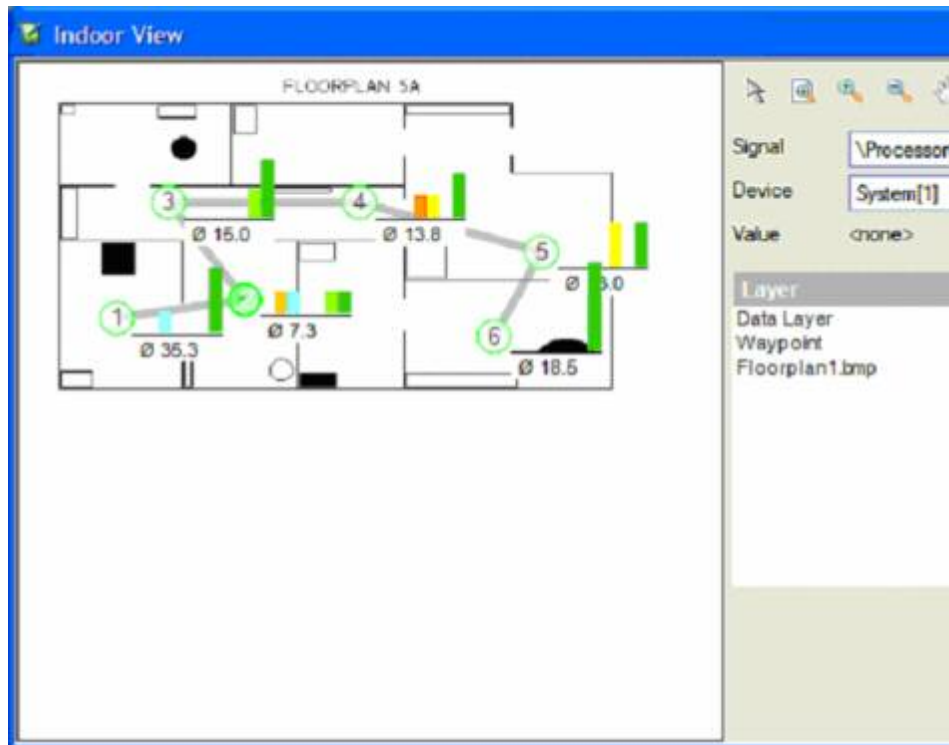


Fig. 4-190) or visualized along the way between the waypoints with a user-defined color scale (continuous measurement). For more information see section *Measurement Mode* in chapter 6.

The *Indoor View* now supports R&S ROMES coupled focus (see p. 4.5). The focus indicator for continuous measurement mode is a red rectangle.

Control field

The control field of the Indoor view contains icons for the pointer tool, to fit the map to the size of the display, to zoom in/out and to move the map, to toggle the legend and diagram data display, it contains information about the displayed signal and the measurement device and it contains the layer management list.

The control field itself can be activated/deactivated using the *Show Info...* item in the context menu of the diagram.




To set positions or to activate waypoints in the Indoor Control map display, the pointer tool cursor must be active.



A click on this icon resizes the current map to fit into the current map display area.



To zoom into the map, click this icon and mark a rectangle in the diagram to define the area to zoom. The marking of a rectangle is done by keeping the left mouse key pressed while moving from top left to down right. Different from the *Route Track View*, a **single click is not working**.

To reset the map scale after zooming, click the reset icon  in the Layer management field.



To zoom out of the map, click this icon and single click on the diagram.


To reset the map scale after zooming, click the reset icon  in

the Layer management field.



To move the map, click this icon, click on a starting point on the background map and then move to the end point of the desired map scroll. After the starting point on the map is clicked, the scroll is shown by a thick line between the mouse cursor and the starting point.

Once the end point of the desired scroll is clicked, the map is scrolled accordingly.

To reset the map position after scrolling, click the reset icon  in the Layer management field.




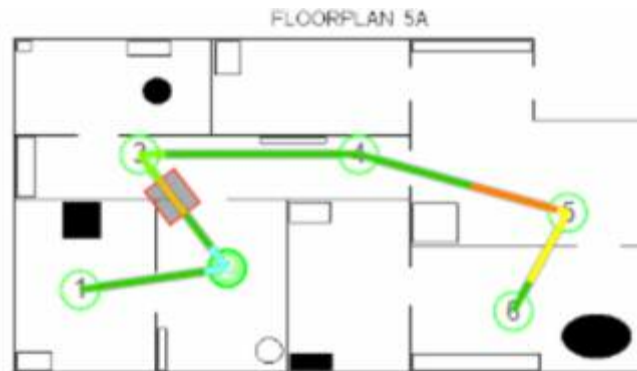
This icon toggles the display of the legend in the diagram view area.





or

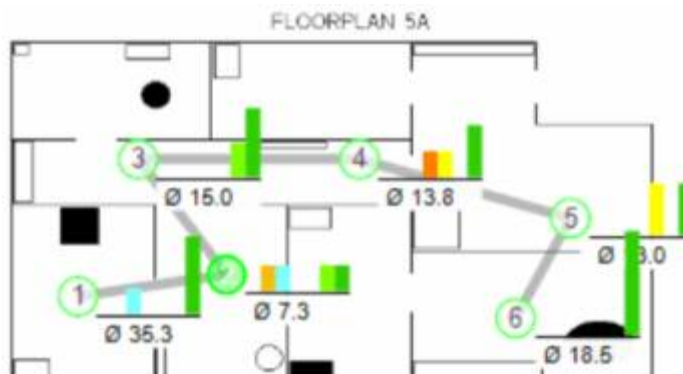
This icon toggles the measurement result display format type in the diagram.


Clicking on  switches to interpolation mode display:



In interpolation mode, the icon changes to .

Clicking on  switches to histogram mode display:



Now the icon has changed back to .

The availability of both modes is **independent** from the selected measurement mode (Hot Spot or Continuous).



or



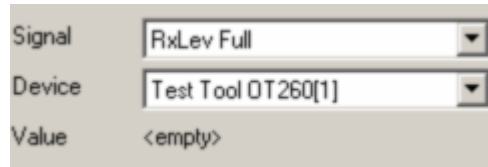
This icon toggles the tracking of waypoints on or off.

This icon opens the Indoor View *Configuration* dialog analogous to the *Configure...* option in the *Context Menu*.

Signal This field group shows the active device and signal data:

Device

Value



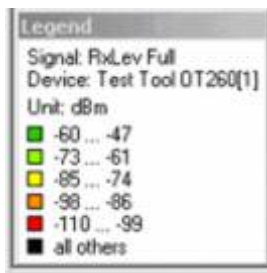
The *Device* pull-down list below the *Signal* field shows all mobiles measured. The selected *Signal* of the *Device* is displayed in the diagram.

When a waypoint or a segment of the measurement path is clicked, the *Value* field shows the measured data value at this point.

Layer This layer management field displays all loaded layer names or map filenames and offers a series of icons for layer display:

	A click on this icon resets the effects from the last map zoom or map scroll action. This icon is only active for background map layers, for other layers the icon is disabled ().
	Single-clicking on these icons moves the corresponding layer one level up or down. With background map layers, only the top active map layer is visible.
	This icon shows that the corresponding layer is active. To disable the layer, click on the icon. The icon is greyed () and the corresponding layer becomes invisible. If the top map layer is disabled, the next map layer becomes visible, if defined.
	Clicking on this icon removes the corresponding layer from view and list.

Legend



The legend window explains the signal ranges symbolized by the different colors of the measurement curve. Up to seven colors can be defined via the *Indoor Configuration* tab of the configuration menu, see *Available Signals* data tree (*Configuration – Preferences*; in section *Signal Configuration* in chapter 3).

The current signal and device is indicated above the color legend.


Context menu

A right mouse click on any point in the view opens the context menu to access the configuration menus, (de-)select the view for fast replay, put the view on hold, copy the current view to the clipboard, or to save the current configuration; see [Context menu](#) description on p. 4.2. The following additional menu commands are available:

Show Info

Activates/deactivates the display of the control field of the Indoor View

Indoor View Configuration

The *Indoor View* configuration menu offers the selection of the Indoor measurement file directory, because if R&S ROMES is configured as 'Replay Only' (no dongle required), the Indoor driver menu is not available. It is opened via click on the  icon of the control field, via right mouse click on a point inside the *Indoor View* or via the *Configuration – Settings* command (see chapter 3).

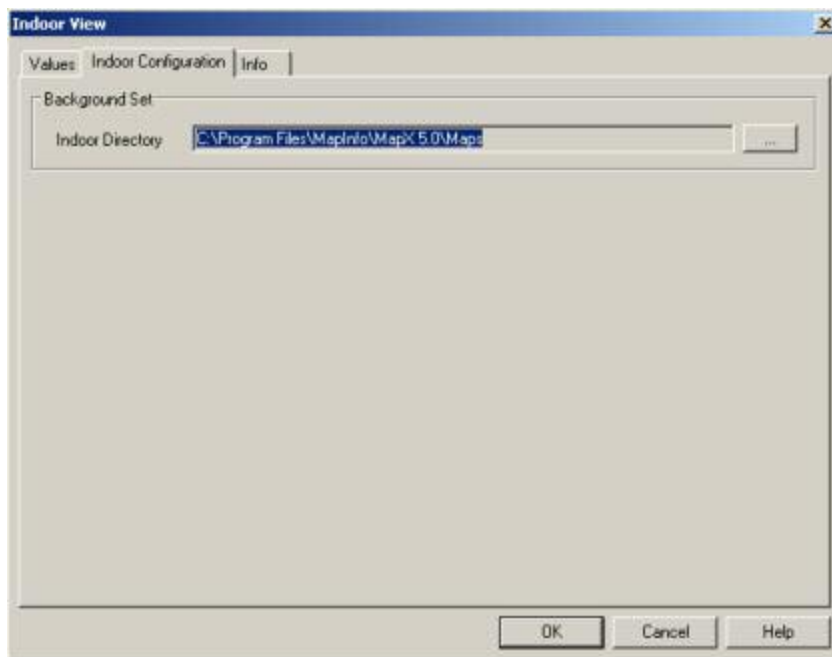


Fig. 4-191 Indoor View configuration: Configuration tab

The *Values* tab is analogous to the *Values* tab of the 2D Chart View configuration menu, see figure on p 4.13.

Indoor Measurement Control

When an indoor measurement is started, the new **Indoor Control** view pops up, additionally to the Indoor view:

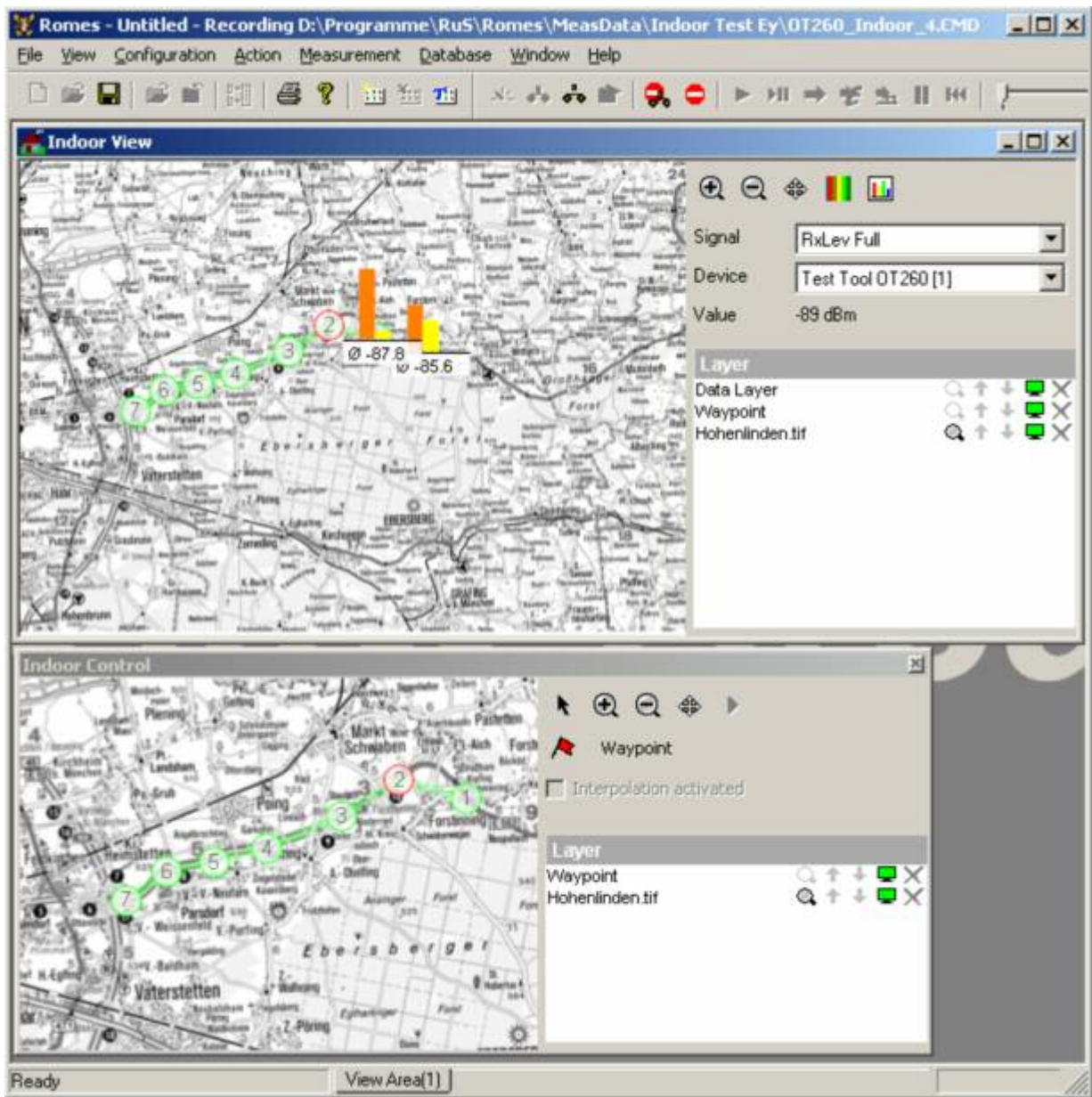


Fig. 4-192 Indoor Measurement: Indoor Control view

The *Indoor Control* view contains a control field which is different from the Indoor view:

Control field The control field of the Indoor view contains buttons to zoom in/out and to move the map, to toggle the legend and diagram data display, it contains information about the displayed signal and the measurement device and it contains the layer management list.

The control field itself can be activated/deactivated using the *Show Info...* item in the context menu of the diagram.



To set positions or to activate waypoints in the Indoor Control map display, the arrow mouse cursor must be active.




To zoom into the map, click this button and mark a rectangle in the diagram to define the area to zoom. The marking of a rectangle is done by keeping the left mouse key pressed while moving from top left to down right. Different from the *Route Track View*, a **single click is not working**.




To zoom out of the map, click this button and single click on the diagram.



To reset the map scale after zooming, click the reset icon  in the Layer management field.

To scroll the map, click this button, click on a starting point on the background map and then move to the end point of the desired map scroll. After the starting point on the map is clicked, the scroll is shown by a thick line between the mouse cursor and the starting point.

Once the end point of the desired scroll is clicked, the map is scrolled accordingly.

To reset the map position after scrolling, click the reset icon  in the Layer management field.



If there is more than one map layer defined in the Geoset, the measurement always starts with the top layer map.

Waypoint navigation mode measurements continue to measure up to the last defined waypoint on the top layer map, then the active layer will automatically switch to the next one down, and the measurement continues with the first waypoint on that layer.


Stream input mode measurements stop at the end of the top layer measurement route, the switch to the next layer has to be done manually using the arrow button.

The order is **always from the highest to the lowest layer**, for both Waypoint navigation and Stream input.



To toggle the map display of the Indoor Control View on or off, which is useful to save space in the view area.

Waypoint

The waypoint flag is either greyed out or active ( Waypoint), depending on the measurement mode (see chapter 6).

When the button is active (during all modes except **Continuous mode** with **Stream navigation mode**) it can be clicked to trigger a new measurement for the predefined time period. While the measurement is performed, the flag is greyed and a countdown is visible instead of the normal button caption:



During the countdown it is not possible to activate other waypoints.

Interpolation activated

To activate the interpolation of position data (in **Continuous mode** and **Waypoint navigation** only), select the according click box in the Indoor driver menu:









Then the Indoor Control view has an activated interpolation check-box (where it can be temporarily deactivated again):



Layer

This field displays all loaded layer names or map filenames and offers a series of icons for layer display:

-  A click on this icon resets the effects from the last map zoom or map scroll action. This icon is only active for background map layers, for other layers the icon is disabled ().
-  Single-clicking on these icons moves the corresponding layer one level up or down. With background map layers, only the top active map layer is visible.
-  This icon shows that the corresponding layer is active. To disable the layer, click on the icon. The icon is greyed () and the corresponding layer becomes invisible. If the top map layer is disabled, the next map layer becomes visible, if defined.
-  Clicking on this icon removes the corresponding layer from view and list.

DVB Views

The *DVB Views* show Digital Video Broadcasting (DVB) specific information included in the measurement data. DVB data can be acquired using ~~one of the DVB drivers~~ described in chapter 6.



The R&S TSM-DVB data is not displayed in the DVB Views. To analyze R&S TSM-DVB data select the R&S TSM-DVB signals in the data tree (Configuration – Settings – Available Signals) and use the basic views (Alphanumeric View, 2D Chart View...).

The DVB views can be selected from a submenu displayed on the right side of the *View* menu when the mouse pauses over *DVB Views*.

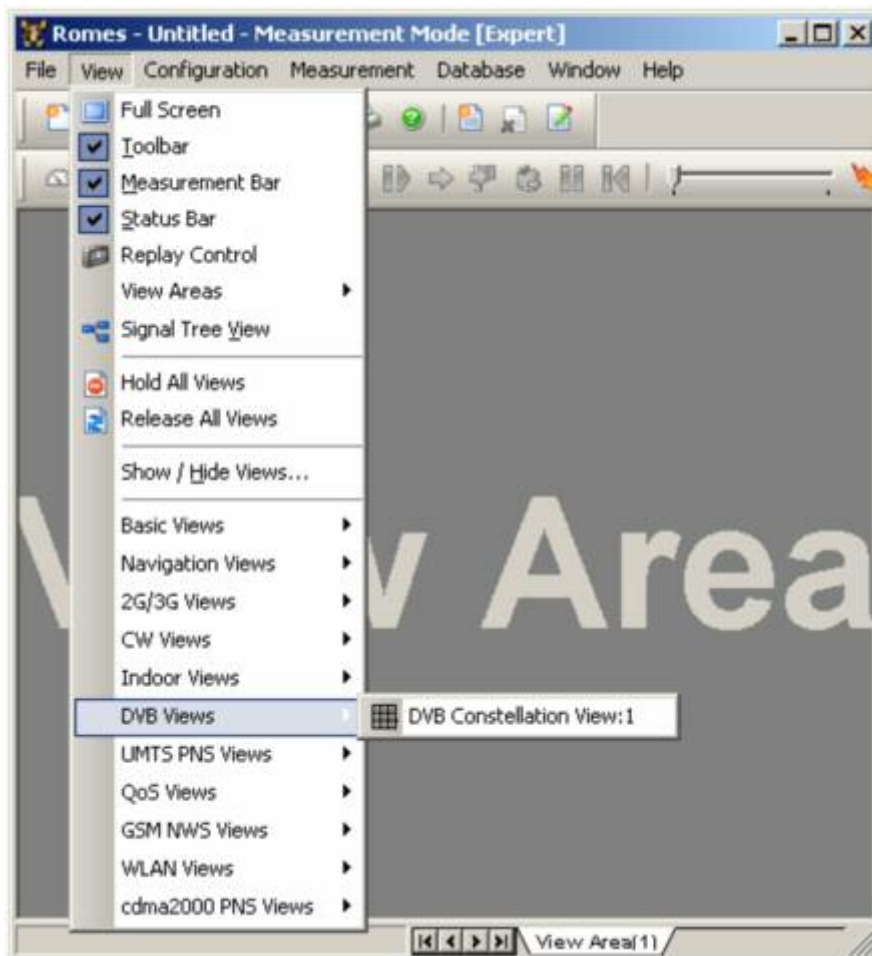


Fig. 4-193 DVB views

DVB Constellation View

The *DVB Constellation View* shows the results from DVB-H signal measurement as configured with the new R&S TSM-DVB (see chapter 6).

The device driver allows setup with 4K mode and bandwidth of 5 MHz. The following new signals are available:

- DVB-H signaling preformed/not preformed
- Time slicing is used/not used on HP/LP stream
- MPE-FEC is used/not used on HP/LP stream

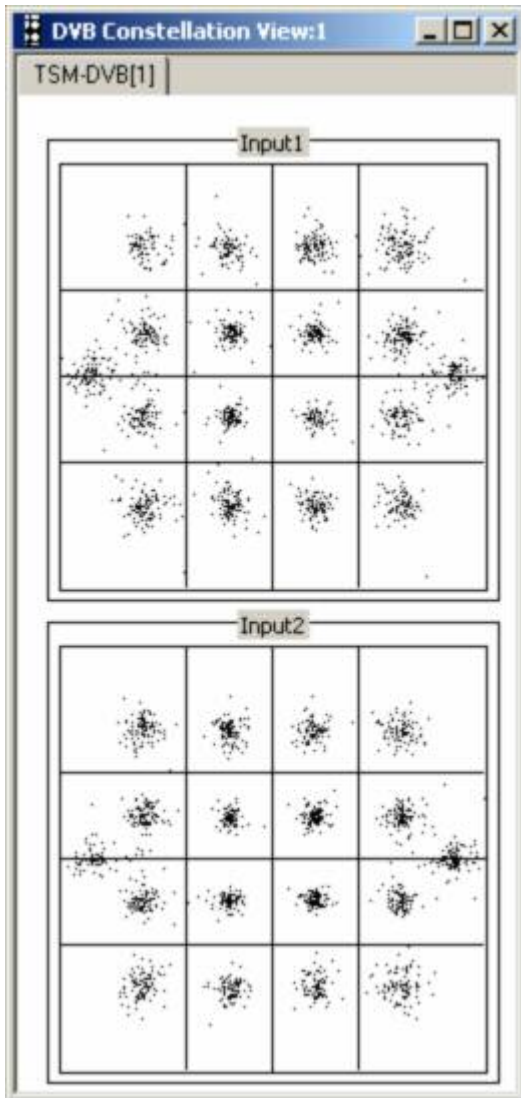


Fig. 4-194 DVB Constellation View

Input1 Shows the signal matrix of *Input.1*

Input2 Shows the signal matrix of *Input2*.

Context menu



A right mouse click on any point in the view opens the context menu to print the view contents, access the configuration menus, (de-)select the view for fast replay, copy the current view to the clipboard, create new views, or to save the current configuration; see [Context menu](#) description on p. 4.2.

The *DVB Constellation View* has no configuration menu assigned. The *Info* tab can be accessed via the *Configuration – Settings* command.

UMTS PNS Views

The *UMTS PNS Views* display information about UMTS Pseudo Noise (PN) data. UMTS PNS measurements are performed using the UMTS PN Scanner driver R&S PNS (see chapter 6). The driver controls a R&S FSP spectrum analyzer, a R&S ESPI test receiver, or a R&S R&S TSMU radio network analyzer in order to alternate between UMTS Pseudo Noise (PN) scans and a spectrum analysis. Most of the results obtained with the different test instruments are equivalent.

- In an UMTS PN scan, the test device measures and identifies all UMTS downlink (Node B) signals in the air. The main purpose of this measurement is to test the receiving conditions of a mobile in an UMTS network and to analyze possible interferences. Results of the UMTS PN scans are displayed in all PNS views except the *PNS Spectrum View* and in the *PNS Spectrum History View*.
- The spectrum analysis consists of a frequency sweep over a specified range to detect arbitrary UMTS downlink and uplink signals. Results of the UMTS PN scans are displayed in all PNS views except the *PNS Spectrum View* and in the *PNS Spectrum History View*.

Many of the UMTS PN Scanner results can also be displayed in other R&S ROMES views, e.g. in the *Alphanumeric View*, the *2D Chart View*, the *Route Track View*, and the *Statistic Histogram View*. Some measurement examples using the UMTS PN Scanner are outlined in chapter 2.

The UMTS PNS views can be selected from a submenu displayed on the right side of the *View* menu when the mouse pauses over *UMTS PNS Views*.

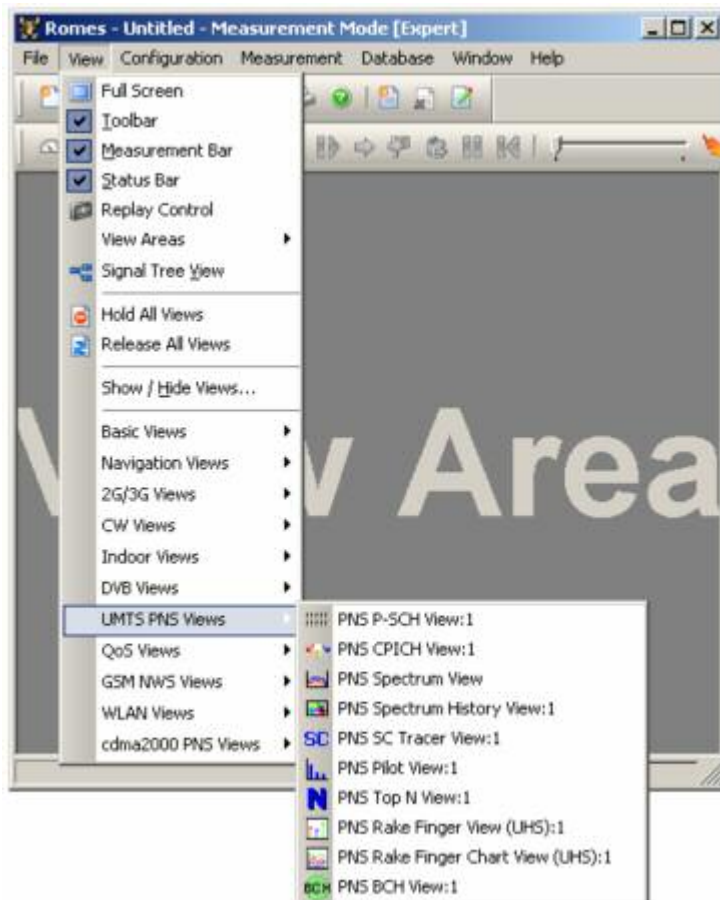


Fig. 4-195 View – UMTS PNS menu

PNS P-SCH View

The *PNS P-SCH View* displays the signal power of the Primary Synchronization Channel of all recorded DL UMTS signals. Additional information is displayed in a table below the diagram.

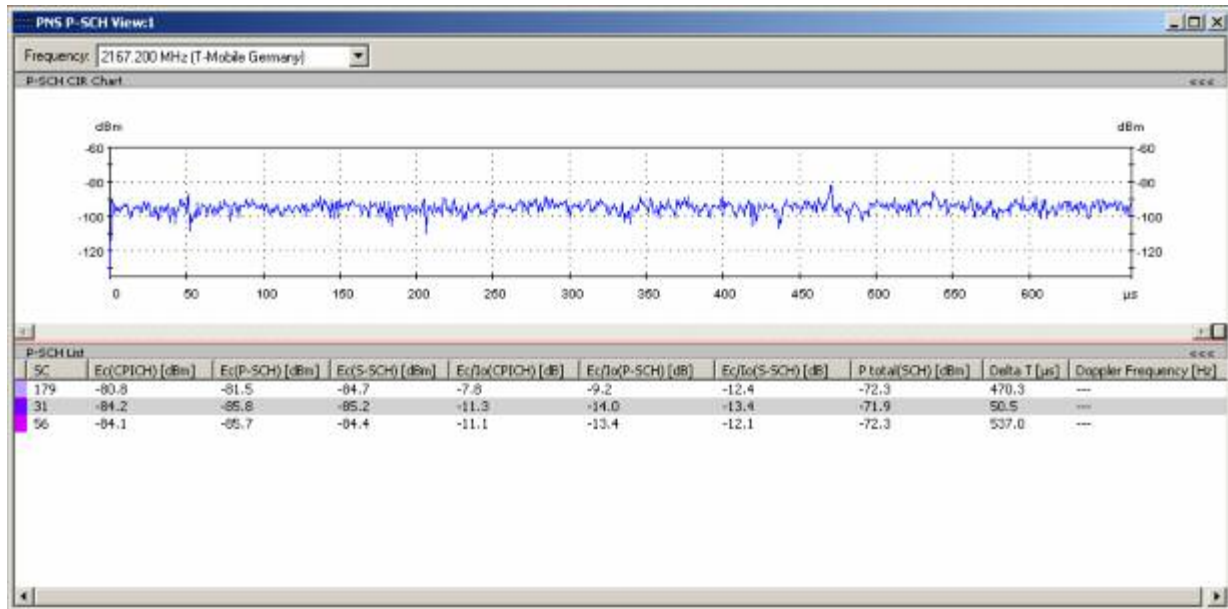


Fig. 4-196 PNS P-SCH View

Frequency

Below the view title, the *Frequency* pull-down list contains all measured frequencies selected in the *Receiver* tab of the driver configuration menu. The list is also provided in the *PNS CPICH View*, *PNS Pilot View* and *PNS SC Tracer View*.

Changing the frequency in one of these views automatically adapts the frequencies in all other views, provided they have the same current number in their title bar (e.g. the 1 in the figure above). Using this feature, it is possible to generate different groups of views with the same current number (opened by means of the context menu; see below) and select frequencies for an entire group with a single mouse click.

View area

The entire view area is horizontally split to accommodate a chart and a table/list. The *P-SCH CIR Chart* shows the power of the received P-SCHs in all recorded DL UMTS signals over the time. This power is measured when the system correlates to the P-SCHs (1st synchronization step; see section [PNS CPICH View](#) on p. 4.339.) and therefore always available. The *P-SCH List* below shows only the signals to which the system could synchronize in order to determine the SC. Typically the tallest peaks of the diagram correspond to the values of E_c (*P-SCH*) displayed in the table.

A click on the *P-SCH CIR Chart* or *P-SCH Lists* title bars compresses and expands the 2D-chart or table. A compressed chart leaves more space for the table and vice versa. Moreover, the tables appear in several PNS views so that compressing them can help to avoid redundancies. A compressed subdiagram is characterized by the symbol >>> (instead of <<<) in its title bar. On pausing on one of the title bars, the cursor displays a compress symbol.

Diagram scale

The diagram is opened with a default x-axis scale of one UMTS slot ($2/3 \text{ ms} \approx 666 \mu\text{s}$). If placed inside the diagram area the cursor takes the shape of a zoom-in icon (a magnifying glass with a '+' inside), and a vertical line is displayed at the cursor position.

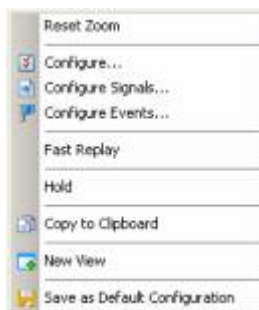
A left mouse click magnifies the diagram in x-direction around the cursor position, *Ctrl* plus left mouse click causes the opposite. An area to become the new x-axis range (e.g. the area around a peak) can be marked while the left mouse button is pressed. *Reset Zoom* in the context menu restores the default scale. A scrollbar is provided to move the magnified diagram to the right or left.

The scale of the y-axis (power in dBm) can be set in the configuration menu.

Table

Below the diagram, the *P-SCH List* gives an overview of the received signals together with their scrambling codes, different power parameters, frequency and timing information. On mouse hover-over, each cell in the table header provides a short explanation of the corresponding column. The *P-SCH List* is identical with the *Peak List* in the *PNS CPICH View*. For a detailed explanation of the parameters refer to section [PNS CPICH View](#) on p. 4.339.

In the configuration menu, it is possible to show or hide each individual table row.

Context menu

A right mouse click on any point in the view opens the context menu to access the configuration menus, (de-)select the view for fast replay, put the view on hold, copy the current view to the clipboard, create new views, or to save the current configuration; see [Context menu](#) description on p. 4.2.

The context menu provides the following additional commands:

Reset Zoom Resets the x-axis scale to 0 ms to 2/3 ms.

PNS P-SCH Configuration

The *PNS P-SCH* configuration menu defines the y-axis scale, i.e. the minimum (*Min [dBm]*) and the maximum (*Max [dBm]*) level to be displayed in the *PNS P-SCH View*, and the contents of the table. It is opened via a right mouse click on a point inside the *PNS P-SCH View* or via the *Configuration – Settings* command (see chapter 3).

All settings are analogous to the settings in the *PNS CPICH* configuration menu; see section [PNS CPICH View](#) on p. 4.339.

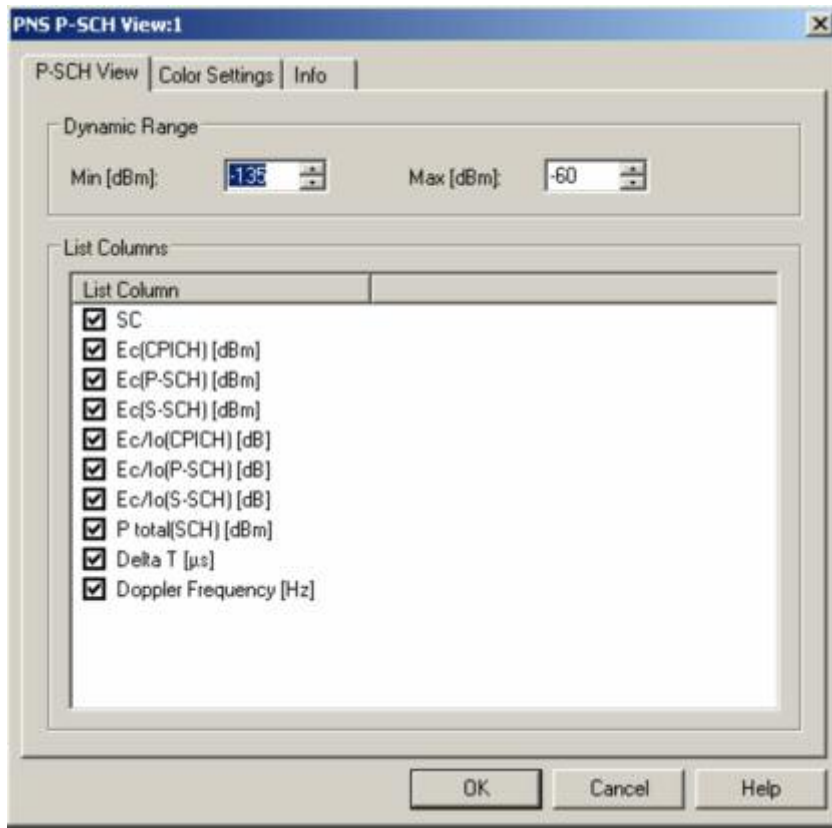


Fig. 4-197 PNS P-SCH configuration: P-SCH View

The *Color Settings* tab of the *PNS P-SCH* configuration menu is analogous to the *PNS CPICH* configuration menu; see section [PNS CPICH View](#) on p. 4.339.

PNS CPICH View

The *PNS CPICH View* shows the average signal power of the received P-CPICHs and a comprehensive analysis of the properties of all DL signals received in the UMTS PN scan.

Different signals are distinguished by their slot timing (the beginning of the slot detected by the receiver of the test instrument). Signals from different Node Bs are distinguished by their primary scrambling codes (SC), transmitted over the CPICH. Signals with different slot timing but equal SC originate from the same Node B but propagated along different paths. A comparison of those signals provides important information on reflections and possible interferences.

The analysis requires synchronization to each received signal, which is performed in a 3-step process:

1. The test device searches for the Primary Synchronization Channel (P-SCH) to obtain the slot timing. The start of the P-SCH marks the beginning of the slot.
2. The Secondary Synchronization Channel (S-SCH) is analyzed to obtain the scrambling code group (CG) and the frame timing.
3. The SC within the CG is determined by correlating with the pilot bits of the CPICH.

Steps 2 and 3 are modified if *High Speed* is selected in the *Measurements* tab of the driver configuration menu (see chapter 6). This tab also defines the *Synchronization Rate*.

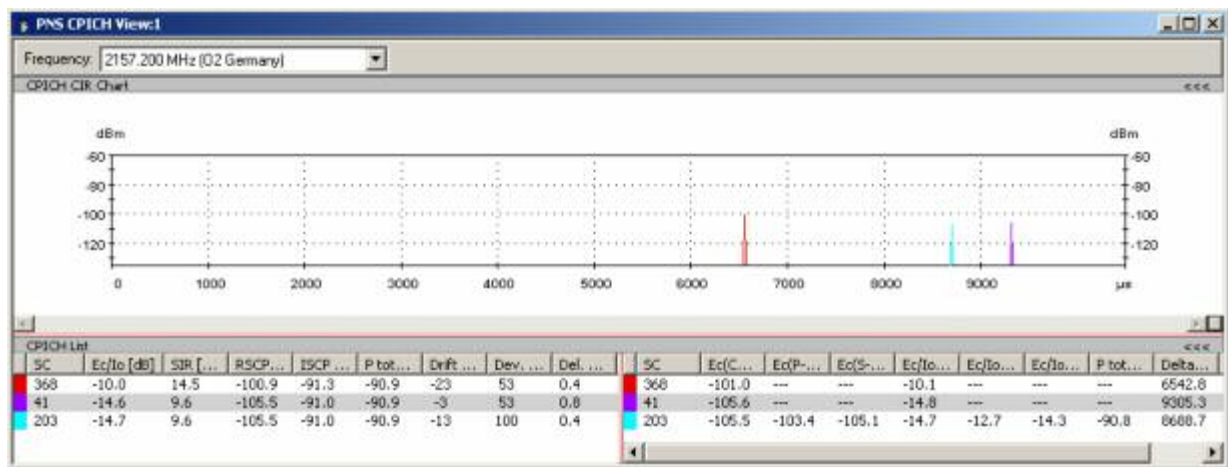


Fig. 4-198 PNS CPICH View

Frequency

Below the view title, the *Frequency* pull-down list contains all measured frequencies selected in the *Receiver* tab of the driver configuration menu. The list is also provided in the *PNS P-SCH View*, *PNS Pilot View* and *PNS SC Tracer View*.

Changing the frequency in one of these views automatically adapts the frequencies in all other views, provided they have the same current number in their title bar (e.g. the 1 in the figure above). Using this feature, it is possible to generate different groups of views with the same current number (opened by means of the context menu; see below) and select frequencies for an entire group with a single mouse click.

View area	<p>The entire view area is horizontally split to accommodate a chart and a table/list. The <i>CPICH CIR Chart</i> (Carrier to Interference Ratio) shows the average signal power of the P-CPICHs of all received signals over the time. The displayed powers and times correspond to the <i>Ec (CPICH) [dBm]</i> and <i>Delta T[μs]</i> values listed in the <i>Peak List</i> (right-hand part of the <i>CPICH List</i>).</p> <p>A click on the <i>CPICH CIR Chart</i> or <i>CPICH Lists</i> title bars compresses and expands the 2D-chart or table. A compressed chart leaves more space for the table and vice versa. Moreover, the tables appear in several PNS views so that compressing them can help to avoid redundancies. A compressed subdiagram is characterized by the symbol >>> (instead of <<<) in its title bar. On pausing on one of the title bars, the cursor displays a compress symbol.</p>
Diagram scale	<p>The diagram is opened with a default x-axis scale of little more than one UMTS frame (10 ms). If placed inside the diagram area the cursor takes the shape of a zoom-in icon (a magnifying glass with a '+' inside), and a vertical line is displayed at the cursor position.</p> <p>A left mouse click magnifies the diagram in x-direction around the cursor position, <i>Ctrl</i> plus left mouse click causes the opposite. An area to become the new x-axis range (e.g. the area around a peak) can be marked while the left mouse button is pressed. <i>Reset Zoom</i> in the context menu restores the default scale. A scrollbar is provided to move the magnified diagram to the right or left.</p> <p>The scale of the y-axis (power in dBm) can be set in the configuration menu.</p>
Table entries	<p>Below the diagram, the <i>CPICH Lists</i> give an overview of the received signals together with their scrambling codes, different power parameters, frequency and timing information. On mouse hover-over, each cell in the table header provides a short explanation of the corresponding column.</p> <p>The entire table is divided into the <i>CPICH List</i> and the <i>Peak List</i>. In the configuration menu, it is possible to show or hide each individual table row in both lists</p>
CPICH List	<p>The <i>CPICH List</i> (left-hand part of the <i>CPICH Lists</i>) provides a general description of the received CPICH signals from each Node B. Each signal is characterized by its SC, corresponding to the transmitting Node B, and includes all possible peaks (reflections) indicated in the <i>Peak List</i> on the right-hand side. The list can contain the following CPICH-related values (see also standard 3GPP TS 25.215 and related standards. All power results in the CPICH List and Peak List are obtained in an unbiased measurement: The contribution of the noise floor to the powers is subtracted.):</p> <p><i>SC [Hex]</i></p> <p>Primary scrambling code no. of the CPICH signal in the format selected in the <i>TEC for UMTS PNS</i> tab of the <i>Configuration of Software Modules</i> menu; refer to section <i>Configuration Menu</i> in chapter 3. In decimal representation, the primary scrambling code numbers are multiples of 16: $SC[dec] = 16 * i$ where $i=0$ to 511, so the least significant digit of the hex numbers is always 0 (see also PNS SC Tracer View on p. 4.352). Sequence numbers :1, :2 behind a code distinguish multiple reflections.</p> <p>Each SC is identified by a color, to be customized in the configuration menu. The SC color codes are also shown in the <i>Route Track</i> menu; see paragraph on scrambling code indication on p. 4.48.</p>

Signal power

Ec/lo [dB]

Ratio of the received energy per PN chip of the CPICH and of the entire Node B signal to the total transmit power spectral density. The value equals to the sum of the *Ec/lo (CPICH) [dB]* values of all individual peaks of the same SC displayed in the *Peak List*; see below.

SIR [dB]

Signal-to-Interference Ratio of the CPICH, $RSCP/ISCP \cdot 256$ where 256 is the CPICH spreading factor.

RSCP [dBm]

CPICH Received Signal Code Power; sum of the received powers of all peaks on one code, measured on the pilot bits of the Primary CPICH.

ISCP [dBm]

Interference Signal Code Power, the interference on the received signal measured on the pilot bits. Both the orthogonal and the non-orthogonal parts of the interference are included in the measurement.

P total [dBm]

Total received wide-band power in the channel, measured within the correlation sections of the P-CPICH. The observed signal section is the same for all signals, so *P total* is the same for all Node Bs. *P total* is equal to *lo* during the CPICH chips so that the following relation holds:

$$P \text{ total} + Ec/lo = RSCP$$

Signal timing

Drift [ns/s]

Averaged change of the time delay of the CPICH peaks of a Node B signal over the time. A drift translates into a lateral deviation of the signal in the [PNS SC Tracer View](#) (see p. 4.352). It may be due to one or several of the following effects:

- Doppler effect due to a relative movement of the test vehicle and the Node B.
- Drift of the system time compared to the nominal UMTS timing
- Drift of the Node B timing compared to the nominal UMTS timing



A measurement at fixed position eliminates the Doppler effect and thus allows to isolate and assess the two other effects. To disentangle system time and Node B drift it is sufficient to compare signals from several Node Bs: If several signals are measured with the same drift this common drift is very likely to be due to the system time. After subtraction of this common system time drift, one is left with the drift of the individual Node Bs.

Dev. Drift [ns/s]

90% confidence interval width of the average time drift. A small value indicates that the drift measurement is estimated to be relatively accurate.

Note:

The accuracy of the drift measurement increases with the number of measured values. Consequently, the Dev. Drift values (and often also the Drift values) typically decrease as the measurement progresses.

Del. Spread [Chip]

RMS delay spread in chip periods: Standard deviation of the time delay ΔT at all CPICH measurement points weighted with the measured powers E_c (CPICH). A small delay spread indicates that the individual CPICH peaks of the Node B signal are relatively close or that the power of peaks with different time delay is very low.

The CPICH List is also displayed in the PNS Top N View.

Peak List

The rows of the Peak List (right-hand part of the CPICH Lists) describe the single peaks (reflections) that contribute to the different Node B signals. The list can contain the following values (see also standard 3GPP TS 25.215 and related standards):

SC [Hex]

Primary scrambling code no. of the CPICH in the format selected in the TEC for UMTS PNS tab of the Configuration of Software Modules menu; refer to section Configuration Menu in chapter 3.

Signal power **E_c (<Ch>) [dBm]**

Average energy per transmitted PN (Pseudo Noise) chip for channel <Ch>, divided by the chip period and thus converted into an average received signal power (in dBm). E_c is displayed for the (Primary) CPICH, P-SCH and S-SCH.

 E_c/I_0 (<Ch>) [dB]

Ratio of the received energy per PN chip for channel (<Ch>) to the total transmit power spectral density. E_c/I_0 is displayed for the (Primary) CPICH, P-SCH and S-SCH.

 P total (SCH)...

Total averaged received signal power for the duration of the SCH. P total contains the contributions of all channels during the observation period and is therefore always greater than E_c (P-SCH) or E_c (S-SCH). The following relations hold:

$$P \text{ total} + E_c/I_0 \text{ (P-SCH)} = E_c \text{ (P-SCH)}$$

$$P \text{ total} + E_c/I_0 \text{ (S-SCH)} = E_c \text{ (S-SCH)}$$

Signal timing*Delta T [μ s]*

Time delay of the signal's slot timing relative to the system time or GPS time (hardware-dependent). The reference time (left edge of the diagram) is of minor importance as the diagram extends over more than one frame, which is enough to display and separate all received signals.

Doppler Freq.

Frequency offset of the measured P-CPICH carrier frequency compared to the nominal UMTS channel frequency. In a coverage measurement on a moving test vehicle, an important source of frequency offsets is the Doppler shift due to the speed of the receiver relative to the transmitter. Constant frequency offsets do not originate from the Doppler shift and can be corrected in the configuration menu.

The *Doppler Frequency* is available only if *High Dynamic* is selected in the *Measurements* tab of the driver configuration menu (see chapter 6).

The *Peak List* is also displayed in the *PNS P-SCH View*.

Special table entries

Depending on the conditions of the measurement the tables may show some particular results:

- An invalid result "---" denotes that a peak or the entire Node B signal was too weak to be accurately measured. Selecting *High Dynamic* mode in the measurements tab of the driver configuration menu generally reduces the number of invalid results.
- A number (:1, :2 etc., e.g. the *E90:1* in the figure [above](#)) behind the scrambling code denotes that signals with the same scrambling code but with a significant difference in their time delays were received. Two different scenarios can cause multiple scrambling codes:
 - If several of those signals occur at the same time, they are likely to belong to different Node Bs that accidentally use the same SC.
 - Two signals with different numbers behind their scrambling codes that are received at different times can belong to the same Node B but actually indicate a strong time drift.

Context menu

A right mouse click on any point in the view opens the context menu to access the configuration menus, (de-)select the view for fast replay, put the view on hold, copy the current view to the clipboard, create or delete views, or to save the current configuration; see [Context menu](#) description on p. 4.2.

The context menu provides the following additional commands:

Reset Zoom Resets the x-axis scale to 0 ms to approx. 10.5 ms.

PNS CPICH Configuration

The *PNS CPICH* configuration menu customizes the diagram in the *PNS CPICH View* and the contents of the table. It is opened via a right mouse click on a point inside the *PNS CPICH View* or via the *Configuration – Settings* command (see chapter 3).

The *CPICH View* tab sets the *y-axis* scale of the *PNS CPICH View*, selects the information to be displayed in the table and corrects the Doppler frequency.

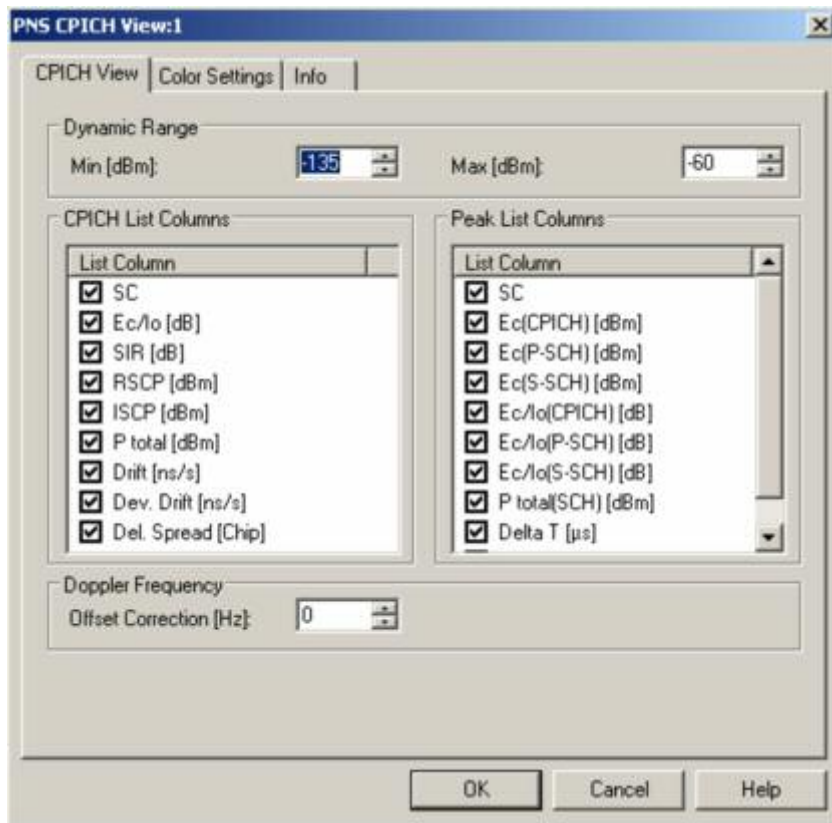


Fig. 4-199 PNS CPICH configuration: CPICH View

Dynamic Range The two input fields in the *Dynamic Range* panel define the minimum (*Min [dBm]*) and the maximum (*Max [dBm]*) level to be displayed in the *PNS CPICH View*.

CPICH List The *CPICH List* and *Peak List* panels select which information is displayed in the tables below the *PNS CPICH* diagram (see the figure [above](#)). Clearing a box hides the corresponding row in the diagram

Peak List

Doppler Frequency The *Doppler Frequency* panel provides an input field to correct the *Doppler Frequency* displayed in the *Peak List*. The purpose of the correction is to subtract out constant frequency offsets that can not originate from the speed of the test vehicle relative to the signal source.

Possible sources of constant frequency offsets are de-tuned Node B transmitters and test device receivers.



A measurement at fixed position eliminates the Doppler effect and thus allows to assess the frequency offset of the test device receiver and the different Node Bs. A de-tuned receiver causes the same frequency offset on signals from different Node Bs. Therefore, if several Node B signals are measured with the same Doppler frequency in a fixed-position measurement, the Doppler frequency measured is due to the receiver. If this common frequency offset is entered as an Offset Correction, the CPICH View table indicates the frequency offset of the individual Node Bs.

The *Color Settings* tab sets the color scale for the scrambling codes. The SC color codes are also shown in the *Route Track* menu; see paragraph on scrambling code indication on p. 4.48.

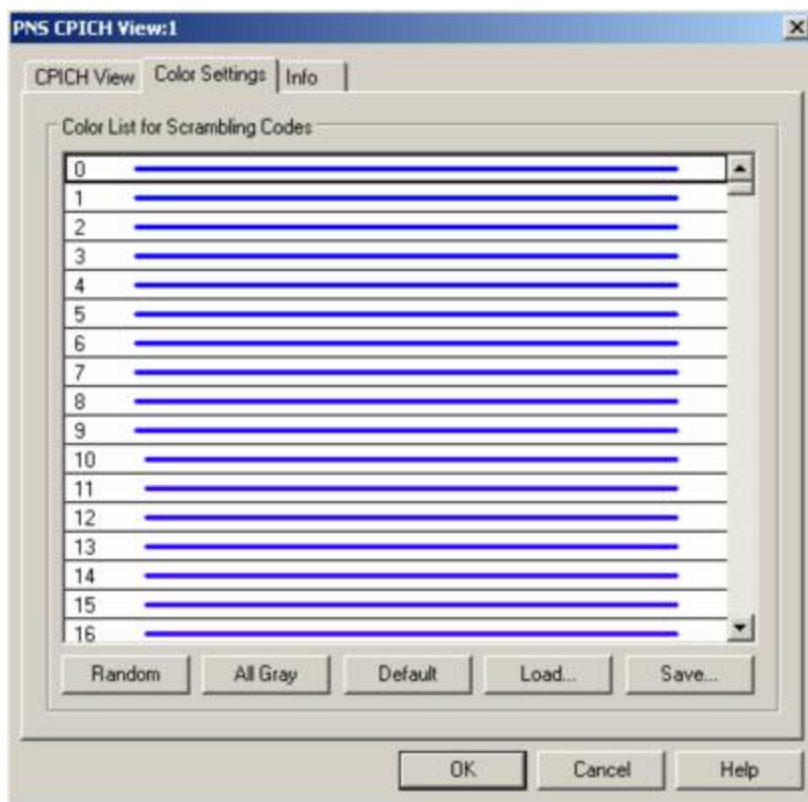


Fig. 4-200 PNS CPICH configuration: Color Settings

The colors are displayed in the diagram (power peaks) and in the first table row (scrambling code scale). A double-click on a line in the *Color List* opens the *Colors* dialog (see p. 4.351) to change the current display color.

Random	No ordering; colors are assigned to the scrambling codes at random.
All Gray	Color scale suppressed; all colors are gray. This option is suitable e.g. to distinguish a single scrambling code (or a small number of scrambling codes), colored different, from all other codes, colored gray.
Default	Predefined color scale: Colors change continuously as the scrambling codes increase.
Load/Save	A color scale can be loaded from an SC color file (*.scc) and user-defined color scales can be stored to *.scc files to be reused in a later session.

PNS Spectrum View

The *PNS Spectrum View* displays the total signal power in two different frequency ranges. By default the frequency ranges comprise the entire nominal UMTS uplink and downlink band, exceeding the nominal UMTS carrier spacing of 5 MHz. The representation allows to analyze several channels/networks or adjacent channel contributions in the uplink and downlink band at the same time.

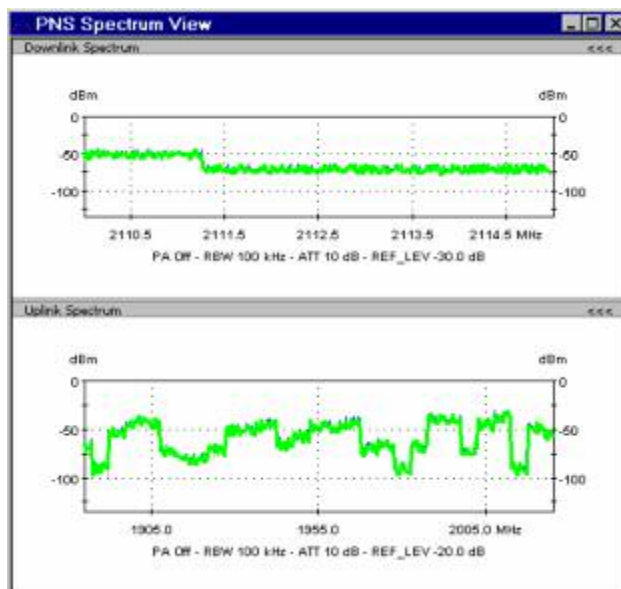


Fig. 4-201 PNS Spectrum View

View area The entire view area is horizontally split to accommodate two different 2D-charts for the received downlink and uplink signals, respectively. The 2D-charts show the received UMTS signal strength as a function of the frequency. The diagrams are separately updated with the *Measurement Rates* set in the *Measurements* tab of the driver configuration menu:

X-axis (frequency)

Measured uplink or downlink frequency range. In the driver configuration menu, the measurement range for uplink and downlink signals is set independently, so the scales of the two 2D-charts can be different.

Y-axis (power)

Received total signal power. The result is a function of the *Spectrum* analyzer settings specified in the driver configuration menu. A common scale (*Dynamic Range*) for both 2D-charts can be set in the configuration menu; see below.

A click on the *Downlink Spectrum* or *Uplink Spectrum* title bars compresses and expands the corresponding 2D-charts. A compressed downlink chart leaves more space for the uplink chart and vice versa. A compressed chart is characterized by the symbol >>> (instead of <<<) in its title bar. On pausing on one of the title bars, the cursor displays a compress symbol.

Diagram subtitles

The parameters displayed below the downlink and uplink spectrum diagrams represent test device settings that are important for the interpretation of the results.

PA

Setting of the preamplifier (*On* or *Off*). The preamplifier is automatically set at the test device.

RBW

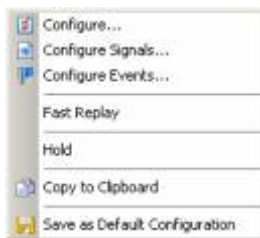
Resolution bandwidth of the measurement (IF) filter of the test device as set in the driver configuration menu. The wideband signal power measured by a spectrum analyzer is a function of the RBW.

ATT

Setting of the receiver attenuator; a large attenuation factor (i.e. a low mixer level) suppresses distortions but increases the noise level and reduces the dynamic range.

REF_LEV

Reference level of the test device: Input signals will not overload the input path of the receiver as long as they are below the reference level.

Context menu

A right mouse click on any point in the view opens the context menu to access the configuration menus, (de-)select the view for fast replay, put the view on hold, copy the current view to the clipboard, or to save the current configuration; see [Context menu](#) description on p. 4.2.

PNS Spectrum Configuration

The *PNS Spectrum* configuration menu defines the y-axis scale, i.e. the minimum (*Min [dBm]*) and the maximum (*Max [dBm]*) level to be displayed in the *PNS Spectrum View*. It is opened via a right mouse click on a point inside the *PNS Spectrum View* or via the *Configuration – Settings* command (see chapter 3).



Fig. 4-202 PNS Spectrum configuration

Dynamic Range

The two input fields in the *Dynamic Range* panel define the minimum (*Min [dBm]*) and the maximum (*Max [dBm]*) level to be displayed in the *PNS Spectrum View*.

PNS Spectrum History View

The *PNS Spectrum History View* displays the evolution in time of the total signal power in one of two specified frequency ranges. By default the frequency ranges comprise the entire nominal UMTS uplink and downlink band, exceeding the nominal UMTS carrier spacing of 5 MHz. The representation allows to analyze several channels/networks or adjacent channel contributions in the uplink and downlink band at the same time.

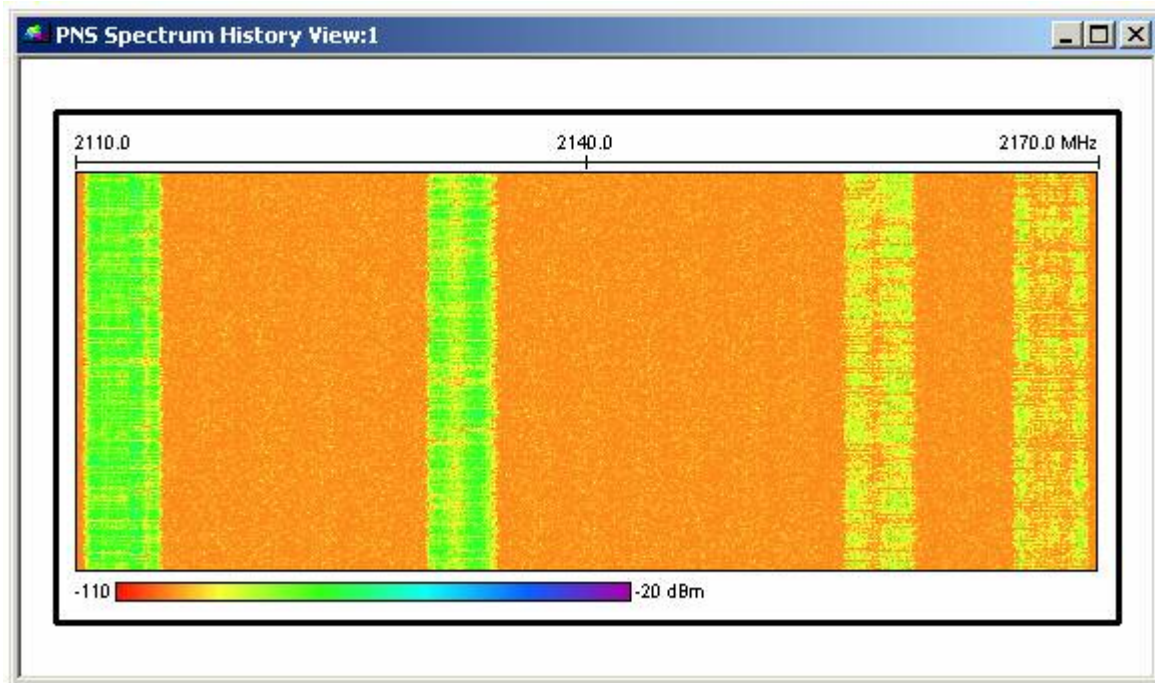


Fig. 4-203 PNS Spectrum History View

View area

The colored rectangular diagram shows the total signal power received in consecutive frequency sweeps. The result is a function of the *Spectrum* analyzer settings specified in the *Measurements* tab of the driver configuration menu. The signal power is displayed as a function of the frequency and time using the color scheme defined in the configuration menu. The configuration menu also defines which of the two frequency ranges (termed uplink or downlink) are displayed. The rectangular view area represents the time/frequency plane:

X-axis (frequency)

Measured uplink or downlink frequency range as defined in the driver configuration menu. If the view window is narrower than the diagram width, a scrollbar appears across the bottom of the diagram.



If the PNS spectrum is measured with a R&S TSMU test receiver, the number of measurement points per sweep and thus the diagram width can be varied; see description of the Measurements tab of the R&S UMTS PNS driver configuration menu in chapter 6.

Y-axis (time)

Linear time scale of the measurement. The diagram consists of 100 to 800 lines, arranged from top to bottom. Each line shows the result of a single sweep across the specified frequency range. The diagram is continuously updated during the measurement or replay by adding new lines. It is automatically scrolled as soon as a line reaches the bottom of the diagram.

Context menu



A right mouse click on any point in the view opens the context menu to access the configuration menus, (de-)select the view for fast replay, copy the current view to the clipboard, create or delete views, save the current configuration, or move to another worksheet; see [Context menu](#) description on p. 4.2.

PNS Spectrum History Configuration

The *PNS Spectrum History* configuration menu defines the number of lines, selects the frequency range and sets the colors in the *PNS Spectrum History View*. It is opened via a right mouse click on a point inside the *PNS Spectrum History View* or via the *Configuration – Settings* command (see chapter 3).

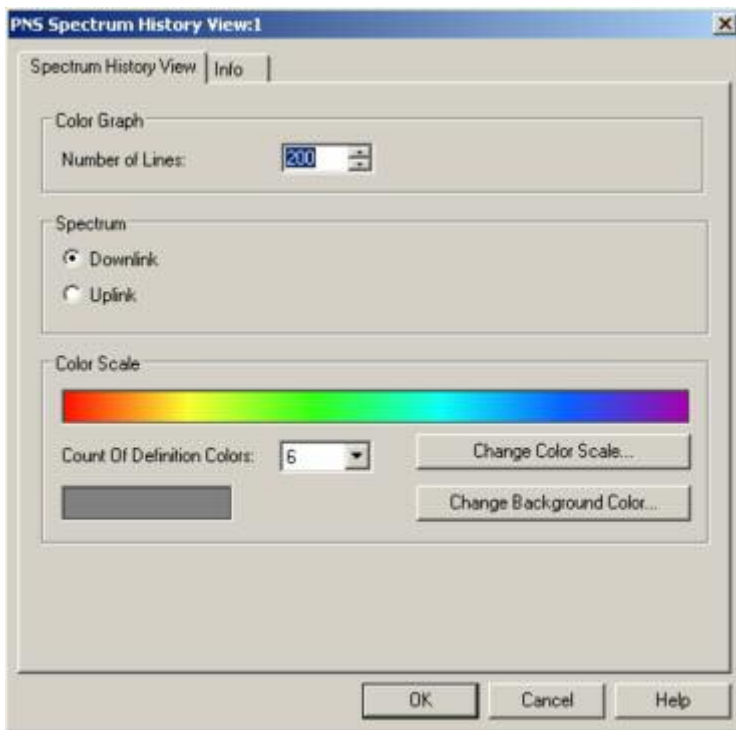


Fig. 4-204 PNS Spectrum History configuration

Color Graph The *Color Graph* panel defines the *Number of Lines* to be displayed in the *PNS Spectrum History View*. A line corresponds to a single frequency sweep. The corresponding frequency range and the measurement rate is set in the *Measurements* tab of the driver configuration menu. The *Number of Lines* parameter defines the height of the *PNS Spectrum History View*.

Spectrum The *Spectrum* panel contains two option buttons to select either the downlink or the uplink spectrum to be displayed. The downlink and uplink frequency ranges are defined in the driver configuration menu. They are measured simultaneously and recorded in a common measurement file, however, they can be analyzed separately in the *UMTS PNS Spectrum ...* views.

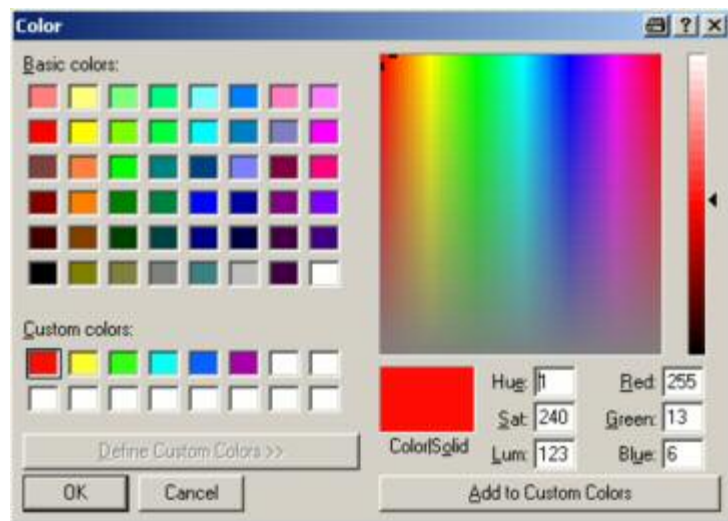
Color Scale The *Color Scale* panel defines a color scale for the lines in the *PNS Spectrum History View* and for the background. The scale is derived from 2 to 16 *definition colors*. The definition colors are entered at equidistant positions on the color scale, the first and last color defining the beginning and the end of the scale. Between the definition colors, the hue changes continuously.

Count of Definition Colors

Pull-down list to select the number of definition colors in the range 2 to 16.

Change Color Scale

Opens the *Colors* dialog to select or define the definition colors.



The current definition colors are displayed in the Custom Colors section. The F1 function key provides help about the remaining control elements in the dialog.

Change Background Color

Opens the Colors dialog to select or define a background color for the diagram; see above.

PNS SC Tracer View

The *PNS SC Tracer View* shows the evolution in time of the time delay and CPICH signal power of all received UMTS peaks with a particular primary scrambling code (SC) or a particular rank in a top N pool.

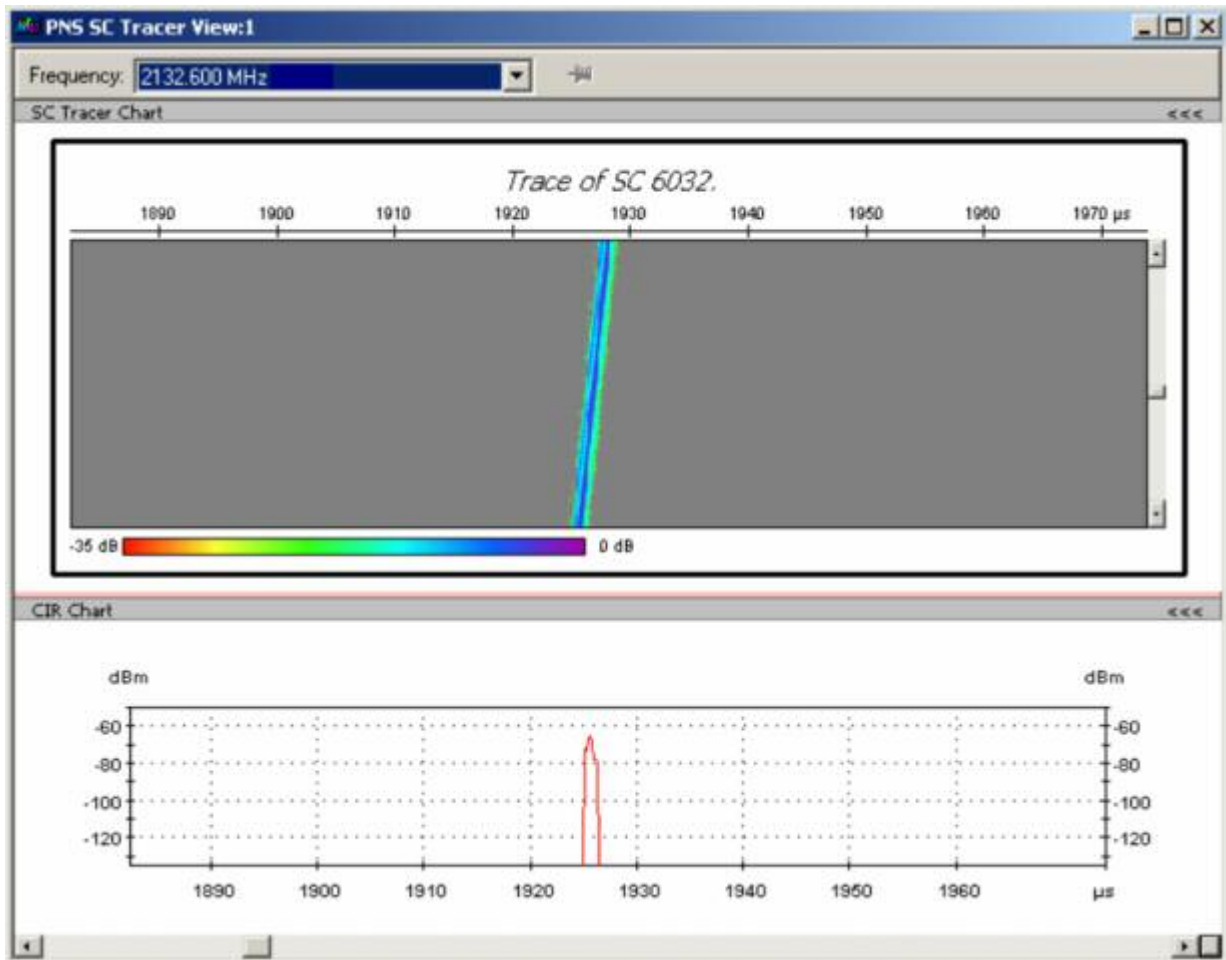


Fig. 4-205 PNS SC Tracer View

Frequency

Below the view title, the *Frequency* pull-down list contains all measured frequencies selected in the *Receiver* tab of the driver configuration menu. The list is also provided in the *PNS P-SCH View*, *PNS Pilot View* and *PNS CPICH View*.

Changing the frequency in one of these views automatically adapts the frequencies in all other views, provided they have the same current number in their title bar (e.g. the 1 in the figure above). Using this feature, it is possible to generate different groups of views with the same current number (opened by means of the context menu; see below) and select frequencies for an entire group with a single mouse click.

Fix current scrambling code

The pin icon to the right of the *Frequency* list forces the system to trace the current scrambling code, even if *Trace Top N Element* is selected in the configuration menu. In fixed SC mode the icon is crossed out with red color and *Fixed Top N...* is indicated in the title of the *SC Tracer Chart*.

Clicking the crossed-out icon again releases the fixed SC: The system continues tracing the selected top N element. If *Trace a Fixed SC* is selected in the configuration menu the pin icon has no effect.

View area

The entire view area is horizontally split to accommodate two different charts.

A click on the *SC Tracer Chart* or *CIR Chart* title bars compresses and expands the corresponding chart. A compressed chart leaves more space for the other chart. A compressed chart is characterized by the symbol >>> (instead of <<<) in its title bar. On pausing on one of the title bars, the cursor displays a compress symbol.

SC Tracer Chart

The colored rectangular diagram shows the evolution in time of the power E_c (CPICH) [dBm] and the time delay ΔT [μs] using the color scheme defined in the configuration menu. E_c (CPICH) [dBm] and ΔT [μs] are listed in the *Peak List* in the [PNS CPICH View](#) (see 4.339). The rectangular diagram area represents the time/delay time plane.

In this plane, the signals with the same SC form one or several traces that change their slot timing (horizontal position) and strength (color). All signals can be assumed to originate from the same Node B (see explanation at the beginning of section [PNS CPICH View](#) on p. 4.339); multiple traces indicate multiple signals with different timing but the same SC and thus reflections. The example of the figure [above](#) shows a single (direct) signal. The time delay of the signal decreases (increases) while the test vehicle approaches (goes away from) the transmitting Node B; the signal strength can be expected to reach its maximum where the distance to the Node B is close to its minimum. The slope of the trace corresponds to the *Drift* which is also displayed in the [PNS CPICH View](#).

X-axis (del. time)

Symmetric range centered around the first relative slot timing measured. The delay time span is fixed and equals to 90 μs (13.5% of a slot).

Y-axis (time)

Linear time scale of the measurement. The diagram consists of 100 to 800 lines, arranged from top to bottom. Each line shows the result of a single scan or sweep with a frequency range of 5 MHz. The diagram is continuously updated during the measurement or replay by adding new lines. It is scrolled and a scrollbar is added along the right border as soon as a line reaches the bottom of the diagram.

Display line

On moving across the *SC Tracer Chart* area, the cursor displays a black, horizontal line. A left mouse click on the chart updates the *CIR Chart* which now displays the peaks at the time corresponding to the position of the display line.

CIR Chart

The *CIR Chart* (Carrier to Interference Ratio) shows the average signal power of the P-CPICHs of all received peaks over the time. The displayed powers and times correspond to the E_c (CPICH) [dBm] and ΔT [μ s] values listed in the *Peak List* in the [PNS CPICH View](#) (see 4.339).

The diagram is opened with a default x-axis scale of 90 μ s (13.5% of a slot). If placed inside the diagram area the cursor takes the shape of a zoom-in icon (a magnifying glass with a '+' inside), and a vertical line is displayed at the cursor position.

A left mouse click magnifies the diagram in x-direction around the cursor position, *Ctrl* plus left mouse click causes the opposite. An area to become the new x-axis range (e.g. the area around a peak) can be marked while the left mouse button is pressed. *Reset Zoom* in the context menu restores the default scale. A scrollbar is provided to move the magnified diagram to the right or left.

The scale of the y-axis (power in dBm) can be set in the configuration menu.

By default the diagram shows current results, corresponding to the last line in the *SC Tracer Chart*. To select a previous result for viewing, the display line in the *SC Tracer Chart* can be used; see above.

Context menu

A right mouse click on any point in the view opens the context menu to access the configuration menus, (de-)select the view for fast replay, copy the current view to the clipboard, create or delete views, save the current configuration, or move to another worksheet; see [Context menu](#) description on p. 4.2. The context menu provides the following additional commands:

Select SC...

Opens a dialog box to select the primary scrambling code associated with the signal to be viewed.



The scrambling code is defined in the format selected in the *TEC for UMTS PNS* tab of the *Configuration of Software Modules* menu; refer to section *Configuration Menu* in chapter 3. *Select SC...* is unavailable if a particular top N element is traced; see description of the configuration menu.

PNS SC Tracer Configuration

The *PNS SC Tracer* configuration menu selects the signals displayed in the *PNS SC Tracer View*, scales the diagrams and defines the colors in the view. It is opened via a right mouse click on a point inside the *PNS SC Tracer View* or via the *Configuration – Settings* command (see chapter 3).

The *SC Tracer Target Selection* tab selects the signals displayed in the *PNS SC Tracer View*.

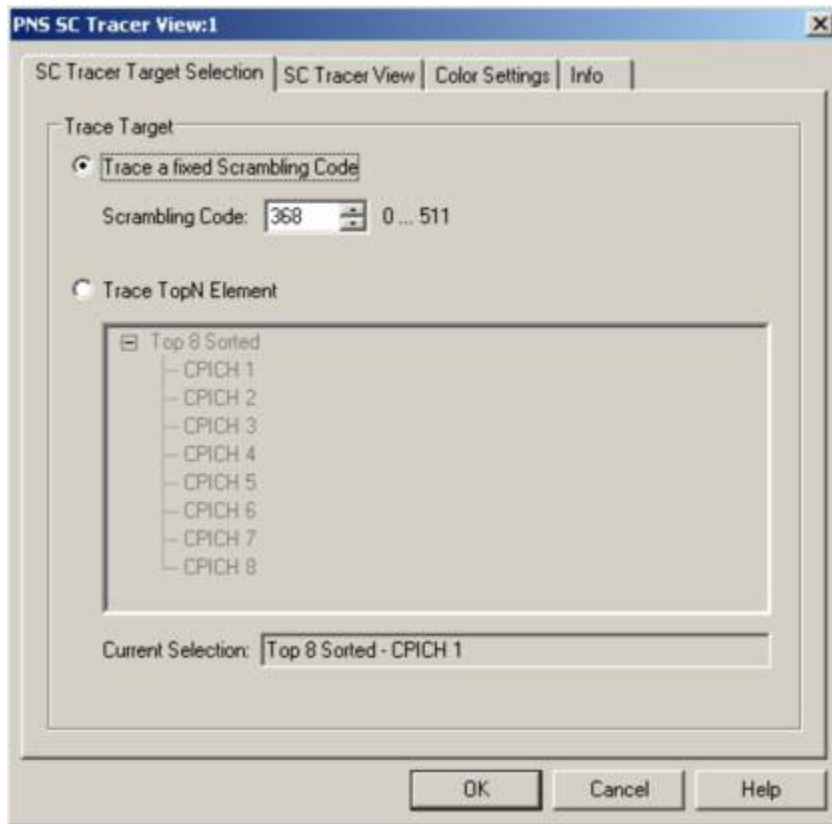


Fig. 4-206 PNS SC Tracer configuration – SC Tracer Target Selection

Trace Target

The *Trace Target* option buttons select either a signal with a definite scrambling code or a particular top N element to be traced.

Fixed SC

The scrambling code is defined in the format selected in the *TEC for UMTS PNS* tab of the *Configuration of Software Modules* menu; refer to section *Configuration Menu* in chapter 3. In decimal representation, the primary scrambling codes are multiples of 16: $SC[\text{dec}] = 16 * i$ where $i=0$ to 511, so the least significant digit of the hex numbers must be 0, preceded by a hex value between 0 and 1FF.

If a scrambling code that is not assigned to any measured signal is selected the *PNS SC Tracer View* remains empty.

Top N Element

List of all top N pools defined in the driver configuration menu (see chapter 6). The current top N pool selection is indicated below the list.

The *SC Tracer View* tab scales the diagrams and defines the colors in the view.

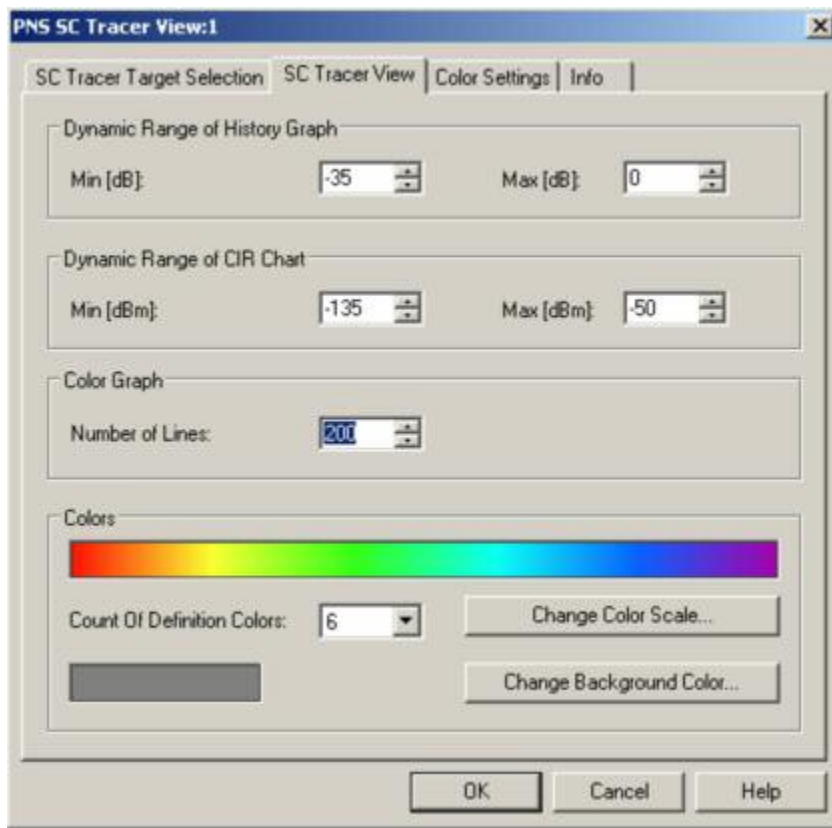


Fig. 4-207 PNS SC Tracer configuration – SC Tracer View

Dynamic Range... The input fields in the *Dynamic Range...* panels define the minimum (*Min [dBm]*) and the maximum (*Max [dBm]*) signal level displayed in the diagrams of the *PNS SC Tracer View*. Signals exceeding the dynamic range will not be displayed.

Colors The color settings in the remaining panels of the configuration menu are identical with the *PNS Spectrum History View* color settings; see section [PNS Spectrum History View](#) on p. 4.349.

The *Color Settings* tab of the *PNS Top N* configuration menu is analogous to the *PNS CPICH* configuration menu; see section [PNS CPICH View](#) on p. 4.339.

PNS Pilot View

The *PNS Pilot View* displays the Received Signal Code Power (RSCP) of the Common Pilot Channels (CPICHs) together with their scrambling codes.

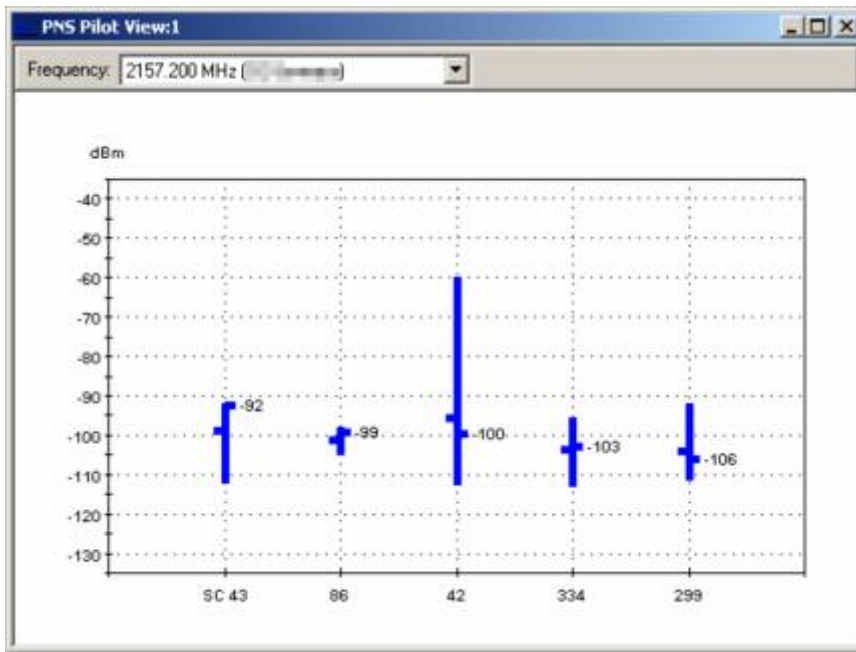


Fig. 4-208 PNS Pilot View: Min - Max - Average - Current Graph

Frequency

Below the view title, the *Frequency* pull-down list contains all measured frequencies selected in the *Receiver* tab of the driver configuration menu. The list is also provided in the *PNS P-SCH View*, *PNS CPICH View* and *PNS SC Tracer View*.

Changing the frequency in one of these views automatically adapts the frequencies in all other views, provided they have the same current number in their title bar (e.g. the 1 in the figure above). Using this feature, it is possible to generate different groups of views with the same current number (opened by means of the context menu; see below) and select frequencies for an entire group with a single mouse click.

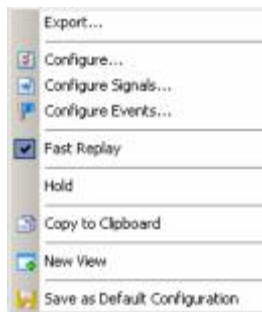
View area

The view contains a pull-down list to select one of the receiver frequencies selected in the *Receiver* tab of the driver configuration menu and a chart.

The chart shows the CPICH Received Signal Code Power; i.e. the received signal power measured on the pilot bits of a Primary CPICH which is identified by its primary scrambling code. The x-axis shows the primary scrambling code (SC) numbers; the scale of the y-axis (power in dBm) can be set in the configuration menu.

In the default configuration the diagram represents a Min.-Max.-Average-Current chart: Each signal generates a vertical bar with a marking to the right and to the left. The lower and upper ends of the bar indicate the minimum and maximum RSCP of the signal ever measured, the marking to the left the average RSCP since the start of the measurement and the marking to the right (with numeric value) the current RSCP. All four values are constantly updated while the measurement or replay is running.

In the configuration menu the diagram can be converted to a bar chart.

Context menu

A right mouse click on any point in the view opens the context menu to access the configuration menus, (de-)select the view for fast replay, copy the current view to the clipboard, create or delete views, save the current configuration, or move to another worksheet; see [Context menu](#) description on p. 4.2. The context menu provides the following additional commands:

Export

Opens a *Save As* dialog to export the current RSCP values to a text file; see below. This function is unavailable while a measurement or replay is running; it can be activated after *Stop*, *Stop Recording* or *Pause Replay*. The export function is not affected by a change of the chart type.

Export file format

The export file is an ASCII table in *.csv format that can be opened and processed by Excel. The table headings form the first line of the file. Each of the following lines corresponds to a single signal with definite SC. The values in the lines are separated by semicolons.

The file contains current measurement values as indicated in the Min.-Max.-Average-Current chart. The values form the following columns:

SC

Primary scrambling code of the signal in the format selected in the *TEC for UMTS PNS* tab of the *Configuration of Software Modules* menu; refer to section *Configuration Menu* in chapter 3. Sequence numbers :1, :2 behind a code distinguish multiple reflections.

RSCP...

Minimum, maximum and average RSCP in dBm

The last four columns contain the timestamps describing the recording history of each signal.

Tfirst

Time when the signal was detected for the first time. This can coincide with the beginning of the measurement.

Tlast

Time when the signal was detected for the last time. This can coincide with the time when recording or replay was stopped.

Tmin/Tmax

Time when the minimum/maximum RSCP was measured

SC	RSCPmin[dBm]	RSCPavg[dBm]	RSCPmax[dBm]	Tfirst	Tlast	Tmin	Tmax
233:01:00	-81.3	-71.4	-63.0	214188	312740	214188	312740
190	-85.8	-74.3	-63.4	214188	312740	214188	312740
318:01:00	-82.6	-74.5	-64.0	224433	312740	224433	312740
214	-82.6	-71.8	-61.8	11437	284900	284900	174652
233	-88.6	-70.4	-61.1	11437	274645	274645	140913
73	-93.2	-69.2	-58.5	11437	274645	269859	102748



To ensure that the export file contains all signals ever recorded in the measurement, deactivate the History parameter in the configuration menu.

PNS Pilot Configuration

The *PNS Pilot* configuration menu defines the y-axis scale, i.e. the minimum (*Min [dBm]*) and the maximum (*Max [dBm]*) level to be displayed in the *PNS Pilot View*, and the diagram type (*Graph*). It is opened via a right mouse click on a point inside the *PNS Pilot View* or via the *Configuration – Settings* command (see chapter 3).

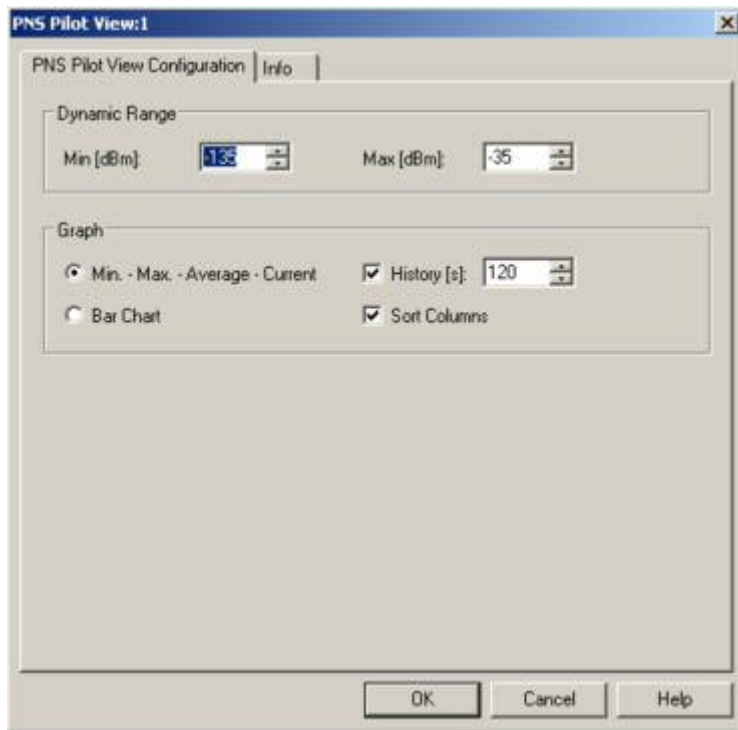


Fig. 4-209 PNS Pilot configuration

Dynamic The two input fields in the *Dynamic* panel define the minimum (*Min [dBm]*) and the maximum (*Max [dBm]*) level to be displayed in the *PNS Pilot View*.

Graph The *Graph* panel selects the diagram type. The two alternative graphs *Min-Max.-Average-Current* and *Bar Chart* are described above (see [View area](#) on p. 4.358).

History [s]

Excludes all results that are older than the specified number of seconds from the statistical evaluation in the *Min-Max.-Average-Current* view. The history time is not used in a bar chart. Clearing this parameter corresponds to an infinite history time; this ensures that all signals ever recorded in the current measurement are displayed in the view and can be exported to an ASCII table.

Sort Columns

Sorts the bars/columns according to their RSCP: The strongest signal is displayed on the left side, the weakest on the right side. If the box is cleared, the signals and SC numbers keep their position irrespective of the evolution of their signal power.

PNS Top N View

The *PNS Top N View* displays the properties of the signals from the Node Bs that are elements of the *Top N Pools* defined in the driver configuration menu. A Top N Pool contains up to N Node Bs with specific characteristics providing the strongest P-CPICH level at a given position and time; for more information refer to the description of the driver configuration menu in chapter 6.

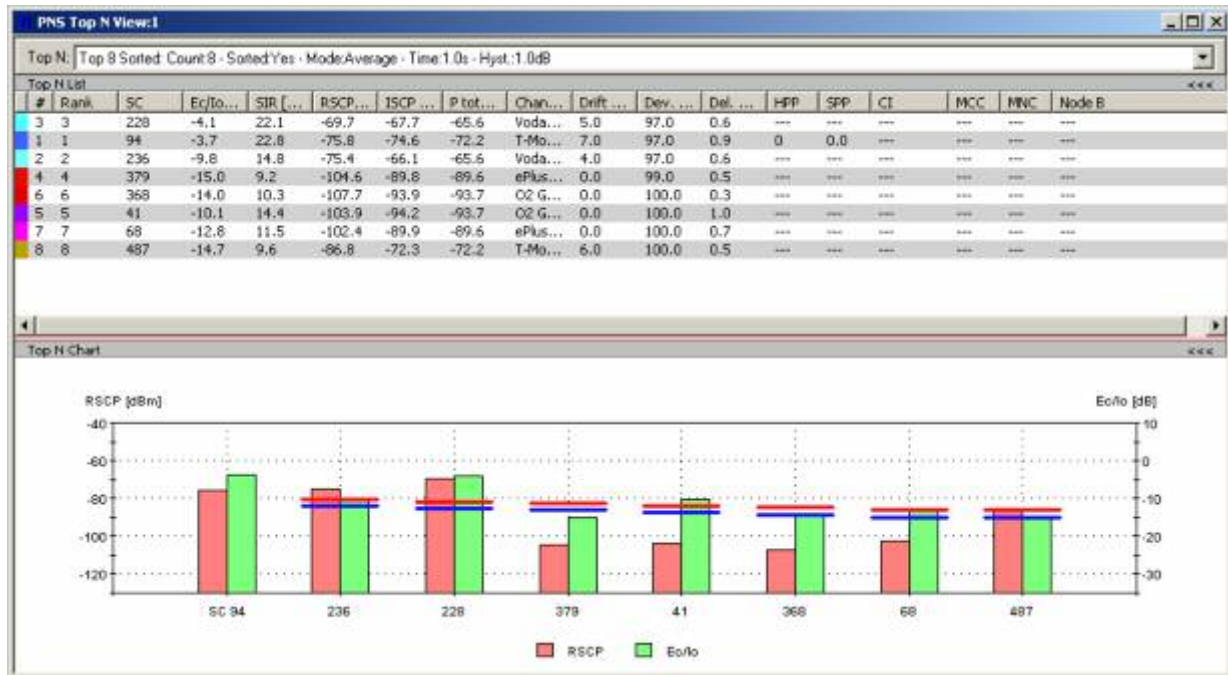


Fig. 4-210 PNS Top N View

View area

The entire view area is horizontally split to accommodate a pull-down list with all defined *Top N* measurements, a table and a bar chart.

A click on the *Top N List* or *Top N Chart* title bars compresses and expands the table or chart. A compressed chart leaves more space for the table and vice versa. Moreover, most of the information in the table is also displayed in the [PNS CPICH View](#) (see p. 4.339) so that compressing it can help to avoid redundancies. A compressed subdiagram is characterized by the symbol >>> (instead of <<<) in its title bar. On pausing on one of the title bars, the cursor displays a compress symbol.

Top N

Below the view title, the *Top N* pull-down list contains all top N pools defined in the *Top N* tab of the driver configuration menu. The results in the table and the *Top N Chart* refer to the top N pool selected in the list.

Table

The *Top N List* gives an overview of the received signals in the current top N pool together with their scrambling codes, different power parameters, frequency and timing information. On mouse rollover, each cell in the table header provides a short explanation of the corresponding column. Most of the results in the *Top N List* are also displayed in the *Peak List* in the *PNS CPICH View*. For a detailed explanation of the parameters refer to section [PNS CPICH View](#) on p. 4.339. The *Top N List* contains the following additional columns:

#

Current number of a Node B within the measurement. Node Bs are numbered in ascending order, according to the time when they enter the top N pool. This means that the current numbers tend to increase as the measurement progresses.

Rank

Current rank of a Node B within the pool, according to its average or maximum E_c/I_0 (see driver configuration menu). The ranks are reassigned every time the pool is updated; they are in the range $1 \leq Rank \leq N$.

Channel

Name of the channel and channel frequency of the Node B

HPP

Hard Pilot Pollution of the Node B signal as defined in the driver configuration menu (see chapter 6)

SPP

Soft Pilot Pollution of the Node B signal as defined in the driver configuration menu

The following information is available only if the PN scanner data are recorded with a R&S TSMU equipped with option R&S TSMU-K14, *BCH Demodulation* (see description of the UMTS PNS driver configuration menu in chapter 6), and if SIB3 decoding is enabled.

CI

Cell Identity

MCC

Mobile Country Code

MNC

Mobile Network Code

In the view configuration menu, it is possible to show or hide each individual table row.

Diagram

Below the table, the *Top N Chart* shows the ratio E_c/I_o and the Received Signal Code Power (*RSCP*) for all Node B signals in the current top N measurement (see section [PNS CPICH View](#) on p. 4.339).

Signals from different Node Bs are distinguished by their primary scrambling codes (SC), displayed along the x-axis. The scales for the two parameters RSCP and E_c/I_o are displayed on the left and right edge of the diagram. Both y-axis scales (RSCP in dBm and E_c/I_o in dB) can be set independently in the configuration menu.

In the configuration menu, it is also possible to select the display colors for the RSCP and E_c/I_o bars and to choose whether the pilot pollution limits are displayed in the diagram. The pilot pollution limits are displayed as two horizontal lines across all Node B bars except the ones with the highest rank (1).

Context menu

A right mouse click on any point in the view opens the context menu to access the configuration menus, (de-)select the view for fast replay, put the view on hold, copy the current view to the clipboard, create new views, or to save the current configuration; see [Context menu](#) description on p. 4.2.

PNS Top N Configuration

The *PNS Top N* configuration menu defines the y-axis scale, i.e. the minimum (*Min [dBm]*) and the maximum (*Max [dBm]*) level to be displayed in the *PNS Top N View*, defines the display colors for the RSCP and Ec/Io bars, shows or hides the pilot pollution limits, and selects the contents of the table. It is opened via a right mouse click on a point inside the *PNS Top N View* or via the *Configuration – Settings* command (see chapter 3).

All RSCP settings are analogous to the settings in the *PNS CPICH* configuration menu; see section [PNS CPICH View](#) on p. 4.339. The pilot pollution limits are identical with thresholds providing the criteria for HPP and SPP (see description of the driver configuration menu in chapter 6).

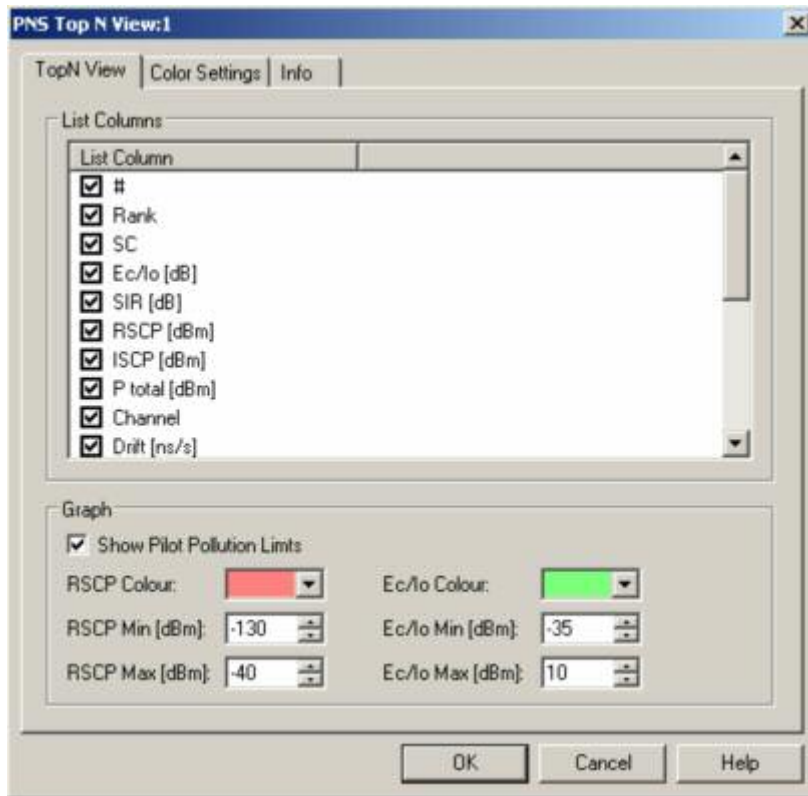


Fig. 4-211 PNS Top N configuration: Top N View

The *Color Settings* tab of the *PNS Top N* configuration menu is analogous to the *PNS CPICH* configuration menu; see section [PNS CPICH View](#) on p. 4.339.

PNS Rake Finger View

The *PNS Rake Finger View* displays the power and timing of several multipath echoes of a single Node B signal captured with the rake receiver of a R&S TSMU operating in ultra high speed mode. The ultra high speed mode must be enabled explicitly in the UMTS PNS driver configuration menu; see description in chapter 6.



The PNS Rake Finger View is complemented by the *PNS Rake Finger Chart View* (see p. 4.368) showing the evolution in time of the signal powers.

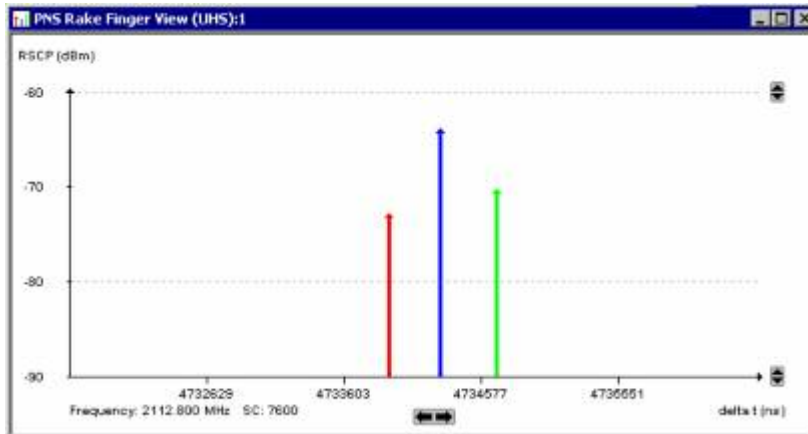


Fig. 4-212 PNS Rake Finger View



Diagram

The diagram shows the power and timing of the different multipath echoes of a Node B signal. The carrier frequency/UTRAN channel and scrambling code (SC) of the cell are displayed below the diagram; they must be selected in the UMTS PNS driver configuration menu (see chapter 6).

Each captured echo generates a vertical arrow. The length of the arrows corresponds to the signal power (RSCP in dBm); their horizontal position corresponds to the timing. The time scale is relative to the (P-CPICH) frame timing of the received DL signal, so it is 10 ms-periodic. The color scale for the arrows is defined in the *PNS Rake Finger View* configuration menu.

The maximum number of captured signals is limited by the properties of the R&S TSMU rake receiver (maximum number of rake fingers) and depends on the measurement rate. It is 4 for a 333 Hz measurement rate, 8 for 250 Hz, and 12 for all other rates.

Diagram scaling

The diagram can be scaled vertically using the  buttons. A mouse click or a rectangle drawn with the cursor zooms in on the diagram, *Ctrl* plus a mouse click into the view zooms out.  shifts the diagram in vertical direction. Additional scaling options are provided in *PNS Rake Finger View* configuration menu described below.

The relative timing offset for different echoes is due to propagation paths of different lengths. For typical multipath propagation conditions, horizontal diagram divisions of approx. 1 μ s are appropriate.

R&S ROMES generates a warning *Not all data is in visible area!* if one of the captured signals is outside the diagram area.

Context menu

A right mouse click on any point in the view opens the context menu to access the configuration menus, (de-)select the view for fast replay, copy the current view to the clipboard, create new views, activate the fast replay mode, or to save the current configuration; see [Context menu](#) description on p. 4.2.

PNS Rake Finger View Configuration

The *PNS Rake Finger View* configuration menu sets zoom options and defines the color scheme for the signal arrows in the *PNS Rake Finger View*. It is opened via a right mouse click on a point inside the view or via the *Configuration – Settings* command (see chapter 3).



Fig. 4-213 PNS Rake Finger View Configuration

Dynamic Range Defines the scale of the vertical (RSCP) axis, i.e. the minimum and maximum RSCP for a single echo.

Time Scale Modifies the scaling mechanism for the time axis. If *Auto Increase* is on (recommended) the diagram can be scaled as described in the view description.

The *Color Settings* tab of the *PNS Rake Finger View* configuration menu is analogous to the *PNS CPICH* configuration menu; see section [PNS CPICH View](#) on p. 4.339. Note that the colors are assigned to rake fingers rather than to a particular echo. An changed color in the view may indicate a finger exchange.

PNS Rake Finger Chart View

The *PNS Rake Finger Chart View* displays the evolution in time of the RSCP and E_c/I_0 of several multipath echoes of a single Node B signal. The signals must be captured with the rake receiver of a R&S TSMU operating in ultra high speed mode. The ultra high speed mode must be enabled explicitly in the UMTS PNS driver configuration menu; see description in chapter 6.



The PNS Rake Finger Chart View is complemented by the [PNS Rake Finger View](#) (see p. 4.365) showing the timing and power of the signals at a fixed time.

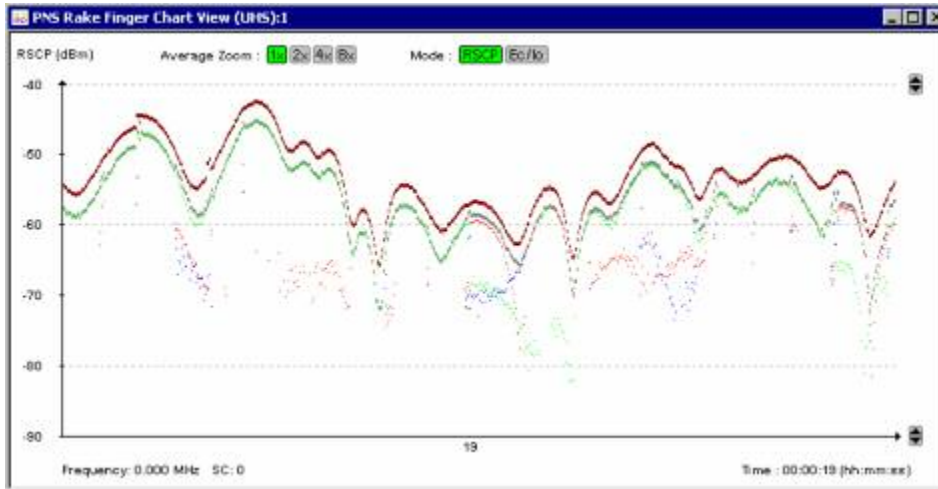


Fig. 4-214 PNS Rake Finger Chart View






Diagram

The diagram shows the Received Signal Code Power (RSCP) or the ratio of the received energy per PN chip of the CPICH to the total transmit power spectral density (E_c/I_0) as a function of time. The results are displayed for the different multipath echoes of a Node B signal and for the complete signal:

- The upper (brown) trace represents the total received power on all channels, including the data channels.
- The second (gray) trace represents the aggregated P-CPICH power, i.e. the CPICH code power of all individual echoes captured by the different rake fingers. The aggregated power is not exactly equal to the sum of the individual measured CPICH code powers because a correction for each pair of signals with similar timing is taken into account.
- The remaining traces represent the CPICH power of the individual echoes. The color scale for these signals is defined in the *PNS Rake Finger Chart View* configuration menu.


Diagram settings

The carrier frequency/UTRAN channel and scrambling code (SC) of the cell are displayed below the diagram; they must be selected in the UMTS PNS driver configuration menu (see chapter 6).

The signal powers are displayed as dots. The vertical position of the dots corresponds to the power (RSCP in dBm or E_c/I_0 , depending on the Mode: RSCP  selection); their horizontal position corresponds to the measurement time. The horizontal spacing between the dots depends on the *Display Update Rate* defined in the *Measurements* tab of the *R&S UMTS PNS* driver configuration menu. The *Average Zoom* buttons     smooth the traces, replacing the raw signal powers by the arithmetic mean value of 2, 4, or 8 consecutive powers. If an average is calculated, then the individual echo traces are all gray to avoid misleading results in the case of rake finger exchanges.

The maximum number of captured signals is limited by the properties of the R&S TSMU's rake receiver (maximum number of rake fingers) and depends on the measurement rate. It is 4 for a 333 Hz measurement rate, 8 for 250 Hz, and 12 for all other rates.

Diagram scaling

The diagram can be scaled vertically using the  buttons. Additional scaling options are provided in *PNS Rake Finger Chart View* configuration menu described below.

Interpreting the traces**Lost echoes**

A dip in the traces indicates a temporary decrease of the RF channel quality. In such a situation, some of the rake fingers may no longer be able to trace their echo.

In the example to the left, the weakest (blue) echo was lost when the RSCP suddenly decreased. As a result of the missing contribution one the difference between the total received power (brown trace) and the aggregated CPICH power (gray trace).

Finger exchange

The colors of the echo traces are assigned to rake fingers rather than to individual signals. A changed trace color therefore indicates that the signal was received by another finger.

Typically the fingers for two signals with a small relative timing delay are simply exchanged. In the example to the left this happened for the blue and red traces.

Context menu

A right mouse click on any point in the view opens the context menu to access the configuration menus, (de-)select the view for fast replay, copy the current view to the clipboard, create or delete views, activate the fast replay mode, save the current configuration, or move to another worksheet; see [Context menu](#) description on p. 4.2.

PNS Rake Finger Chart View Configuration

The *PNS Rake Finger Chart View* configuration menu sets zoom options and defines the color scheme for the traces in the *PNS Rake Finger Chart View*. It is opened via a right mouse click on a point inside the view or via the *Configuration – Settings* command (see chapter 3).

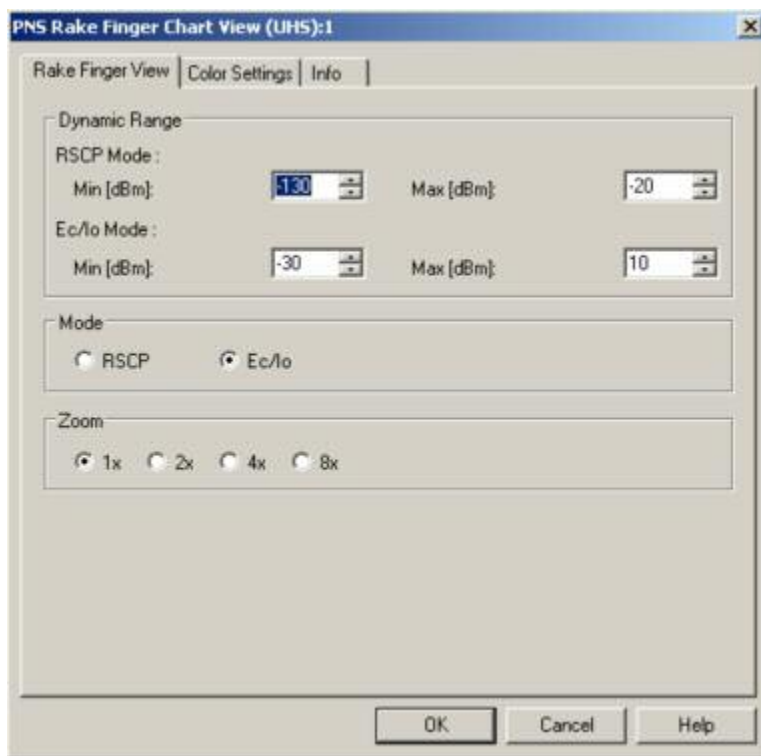




Fig. 4-215 PNS Rake Finger Chart View Configuration

Dynamic Range Defines the scale of the vertical (RSCP or Ec/Io) axis, i.e. the minimum and maximum RSCP or Ec/Io displayed.

Mode Selection of the diagram scaling in terms of either the RSCP or the Ec/Io. The two option buttons are equivalent to the Mode:   buttons in the diagram.

Zoom Selection of a factor for smoothing the curves in the diagram. The four option buttons are equivalent to the     buttons in the diagram.

The *Color Settings* tab of the *PNS Rake Finger Chart View* configuration menu is analogous to the *PNS CPICH* configuration menu; see section [PNS CPICH View](#) on p. 4.339. Note that the colors are assigned to rake fingers rather than to a particular echo. An changed color in the view may indicate a finger exchange (see p. [Error! Bookmark not defined.](#)).

PNS BCH View

The *PNS BCH View* shows a list of all System Information Blocks (SIBs) and Master Information Blocks (MIBs) decoded from the UMTS BCH. The contents of each block appears in a tree view as soon as the block is selected. The SIB types and their information elements are described in standard 3GPP TS 25.331.

The SIB and MIB information is available only if the PN scanner data are recorded with a R&S TSMU equipped with option R&S TSMU-K14, *BCH Demodulation*. Decoding of each SIB type must be enabled explicitly in the UMTS PNS driver configuration menu; see description in chapter 6.

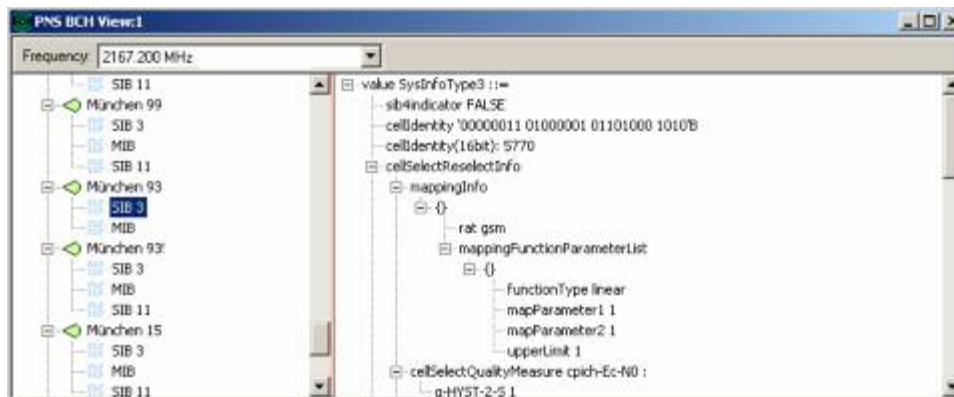
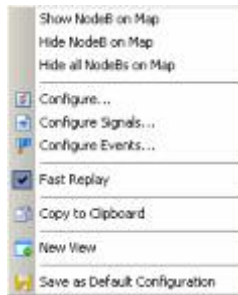


Fig. 4-216 PNS BCH View

Note:

In the tree view the scrambling code is always displayed in decimal format, irrespective of the format settings made in the TEC for UMTS PNS tab of the R&S ROMES Configuration menu.

Context menu

A right mouse click on any point in the view opens the context menu to access the configuration menus, (de-)select the view for fast replay, copy the current view to the clipboard, create new views, activate the fast replay mode, or to save the current configuration, or move to another worksheet; see [Context menu](#) description on p. 4.2. The context menu provides the following additional, view-specific commands:

Show Node B ...

Use the color selected in the *PNS BCH View* configuration menu (see below) to mark the selected UMTS cells in the *Route Track* view. This feature is only available while a cell is selected in the view. The UMTS layer / GSM BTS layer in the *Route Track* view must be visible to use this feature.

Hide Node B...

Hide the selected UMTS cell in the *Route Track* view.

Hide all Node Bs...

Hide all selected UMTS cells in the *Route Track* view.

PNS BCH View Configuration

The *PNS BCH View* configuration menu defines the color for the selected Node B / BTS symbols in the *Route Track View*. It is opened via a right mouse click on a point inside *PNS BCH View* or via the *Configuration – Settings* command (see chapter 3).

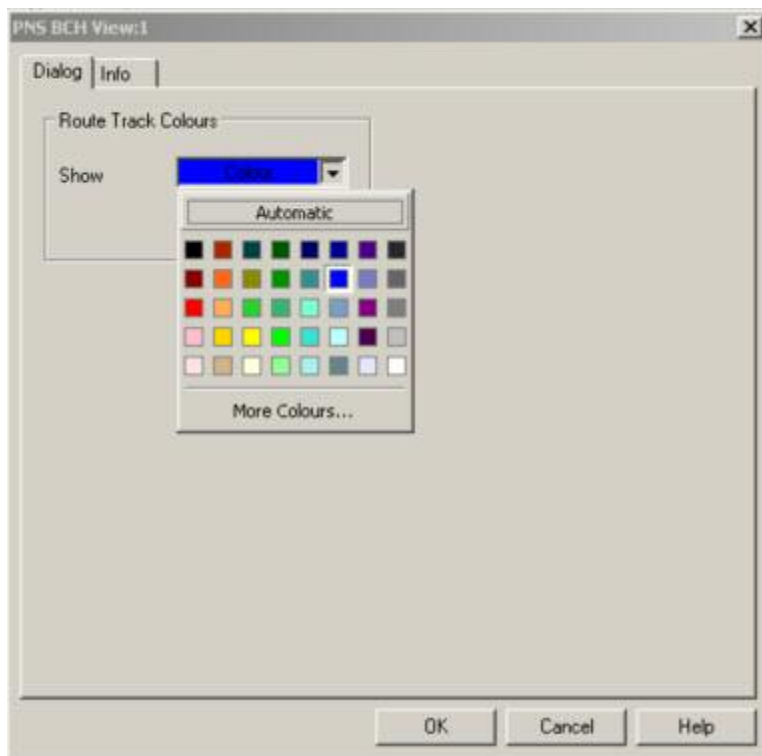


Fig. 4-217 PNS BCH View Configuration

QoS Views

The QoS Views display the results of the Data Quality Tester (DQA) R&S ROMES-Z6. The purpose of the DQA measurement is to evaluate the Quality of Service (QoS) of any kind of data transfer connection.

DQA measurements are performed using the DQA driver (see chapter 6, Hardware Components). Loading the driver does not require any hardware or additional test devices. An example procedure for setting up and testing a connection is described in chapter 2; see section *Data Quality Tester*.

Many of the QoS results can also be displayed in other R&S ROMES views, e.g. in the *Alphanumeric View*, the *2D Chart View*, and in the *Route Track View*.

The QoS views can be selected from a submenu displayed on the right side of the *View* menu when the mouse pauses over *QoS Views*.

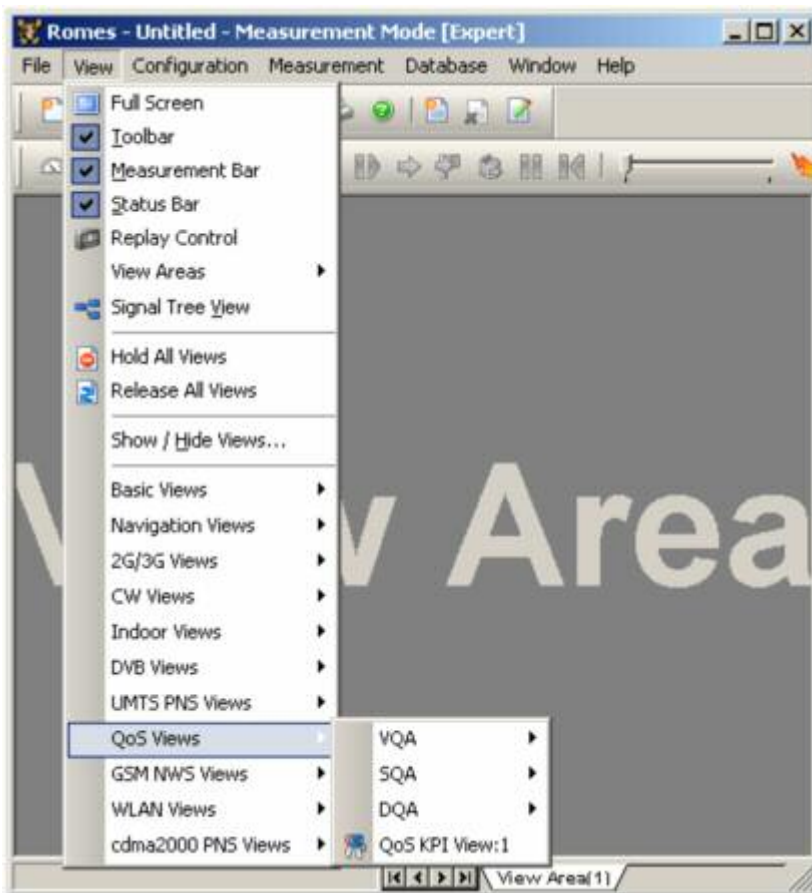


Fig. 4-218 QoS views

QoS VQA Views

R&S ROMES 3NG allows to setup and evaluate Video Calls, which requires a VQA driver and a video server, as described in chapter 6). The QoS VQA Views contain the VQA Message view and the VQA Progress view.

The QoS VQA views can be selected from a submenu displayed on the right side of the View menu when the mouse pauses over VQA.

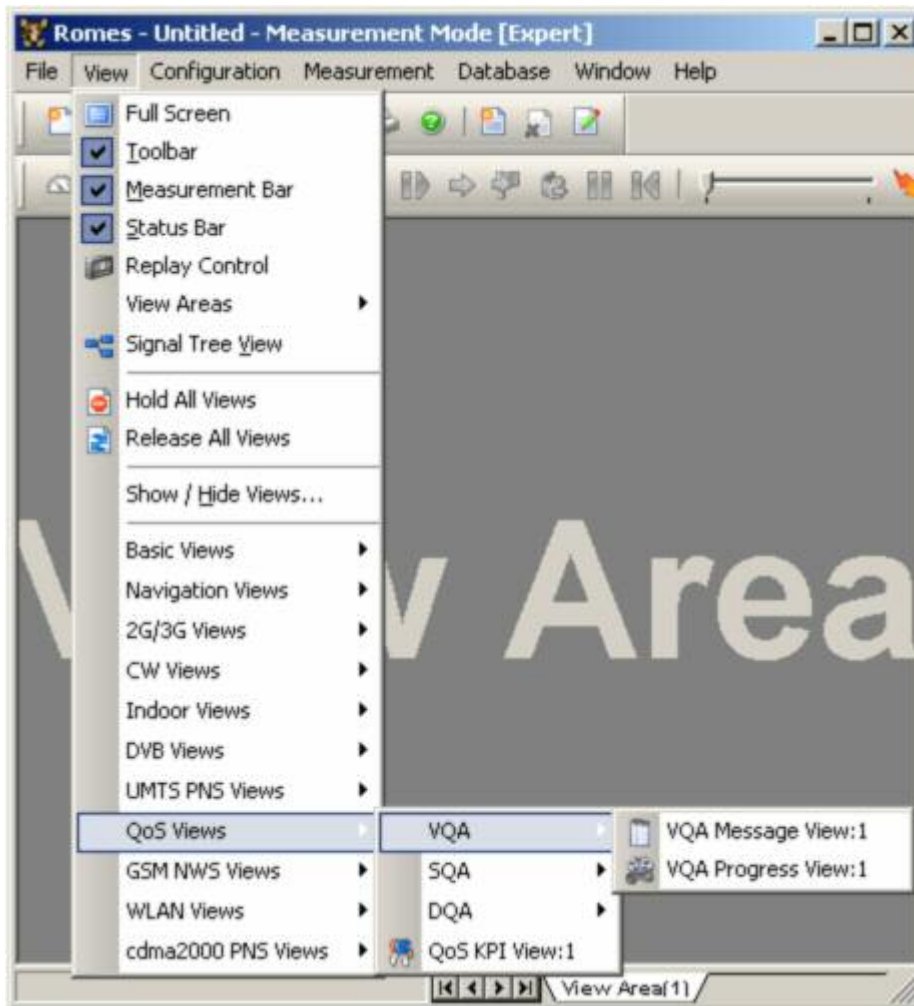


Fig. 4-219 QoS VQA views

VQA measurement

A VQA measurement process contains two steps. The first step is to make the measurements themselves, and the second to evaluate and calculate the KPIs.

The VQA needs a counterpart to communicate with. This can be either the R&S VQA Server or another mobile. Both sides create measurement files during the measurement. These files have to be merged for evaluation.

In addition, both involved measurement systems have to be synchronized with GPS or NTP.

The setup of a VQA measurement is described in detail in chapter 6.

VQA Message View

The QoS VQA Message View monitors all actions of the current job. Each action is described with a message and the associated time. The causes of possible errors are reported with the messages.

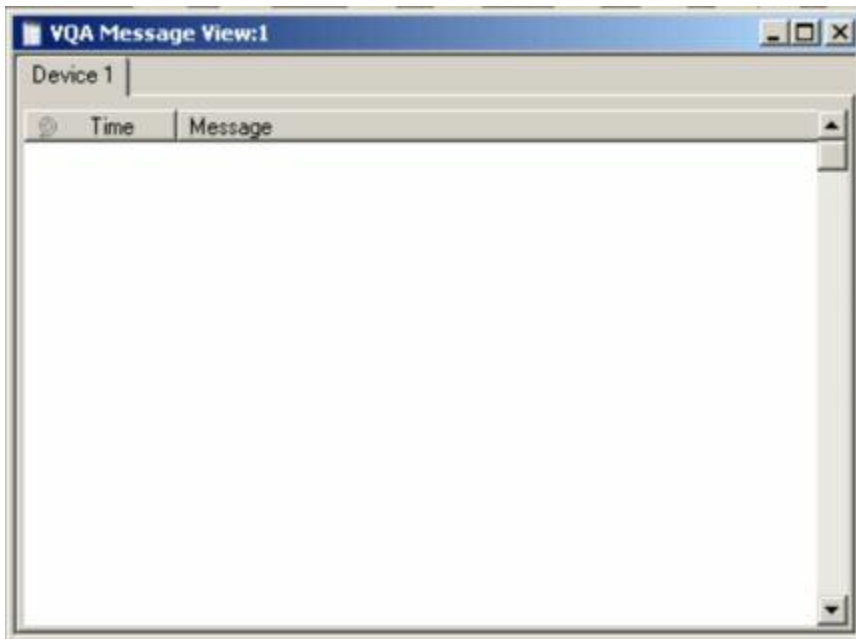


Fig. 4-220 QoS VQA Message View

View contents

The messages depend on the job that is being executed but are all self-explanatory.



Fig. 4-220 above shows the messages generated during a *Connect to Network* job.

Context menu

A right mouse click on any point in the view opens the context menu to print the view contents, (de-)select the view for fast replay, put the view on hold, copy the current view to the clipboard, or to create or delete views, see *Context menu* description on p. 4.2.

The *QoS VQA Message View* has no configuration menu assigned. The *Info* tab can be accessed via the *Configuration – Settings* command.

VQA Progress View

The *QoS VQA Progress View* monitors the progress and the status of the current job. The view contents depend on the job that is being executed. For *Video Streaming*, the current frame rate and the video quality is displayed in two bar graphs.

Video Streaming is available with option R&S ROMES-Z7. A packet-switched network connection is set up to a server using a GPRS or UMTS test mobile or commercial mobile. The server provides a stream of MP4 video data at constant frame rate. The test system performs an analysis of the received data, evaluates the received frame rate and estimates the quality of the transferred video stream. No data is returned or retransmitted.

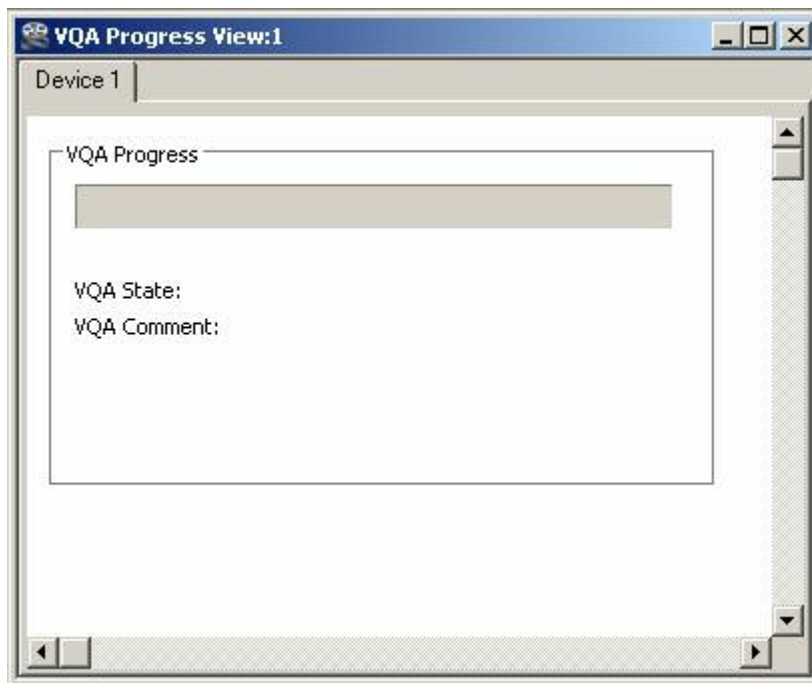


Fig. 4-221 QoS VQA Progress View

View contents

While the data connection to the video server is being set up, the *QoS Progress View* displays a series of messages to comment the progress. As soon as the test system receives video data, the quality of the connection is monitored by means of the following parameters:

Frame Rate

Number of frames that the mobile actually receives per second. The received frame rate is smaller or equal to the transmitted frame rate of the video source, depending on the transferred MP4 file. The frame rate is shown in a bar graph and in the statistics table.

Video Quality

Quality of the received video, as it would be experienced by an end user. The video quality is displayed on a scale between excellent and bad; its evaluation relies on a comparison of the adjacent pixels at the block borders of the transmitted image, where transmission errors introduce visible transitions. For more information refer to the operating manual for the *Digital Video Quality Analyzer R&S DVQ*, available for download on the Rohde & Schwarz internet.

Spatial/Temporal

Degree of variation of the video picture in space and time.

The statistical evaluation of the four parameters is based on the moving *Time window for Averaging* defined in the driver configuration menu. The *Average* column contains the results averaged over the last n ms, where n is the width of the time window. *Min* and *Max* denote the smallest and largest values ever measured. The numbers for the video *Quality* translate the values in the bar graph, 0 corresponding to bad, 100 to excellent quality.

Note:

Video Streaming can be monitored in some of the other QoS views as well. The QoS Message View indicates whether or not a video streaming job was successful, depending on the video quality criterion defined in the driver configuration menu.

Context menu

A right mouse click on any point in the view opens the context menu to print the view contents, (de-)select the view for fast replay, copy the current view to the clipboard, put the view on hold, or to create or delete views, see *Context menu* description on p. 4.2.

The *QoS VQA Progress View* has no configuration menu assigned. The *Info* tab can be accessed via the *Configuration – Settings* command.

QoS SQA Views

The *QoS SQA Views* currently only contain the *SQA Message View*, which displays the result of the *Speech Quality Analysis (SQA, with option R&S ROMES-Z8, Voice Quality PESQ)*.

The *QoS SQA* views can be selected from a submenu displayed on the right side of the *View* menu when the mouse pauses over *SQA*.

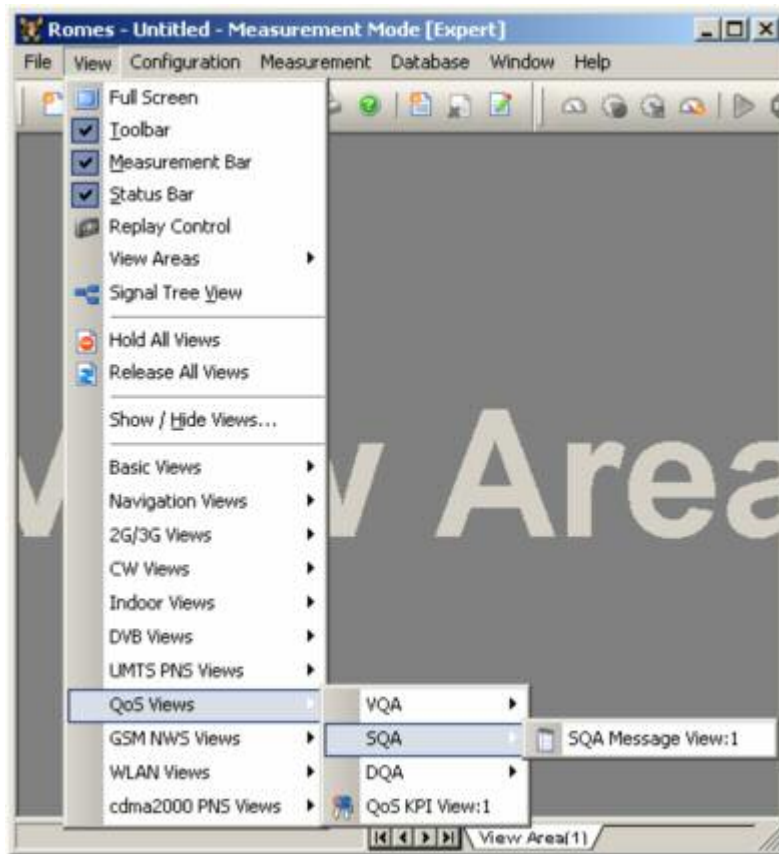


Fig. 4-222 QoS SQA views

QoS SQA Message View

To obtain results for the *SQA Message View*, the SQA must be enabled and configured using the *Speech Quality* tab of the test mobile drivers. For a detailed description of the driver configuration, the SQA procedure, and the test setup refer to chapter 6. SQA is provided for many mobile types and technologies (GSM, GPRS, UMTS, cdmaOne/IS-95, CDMA2000).



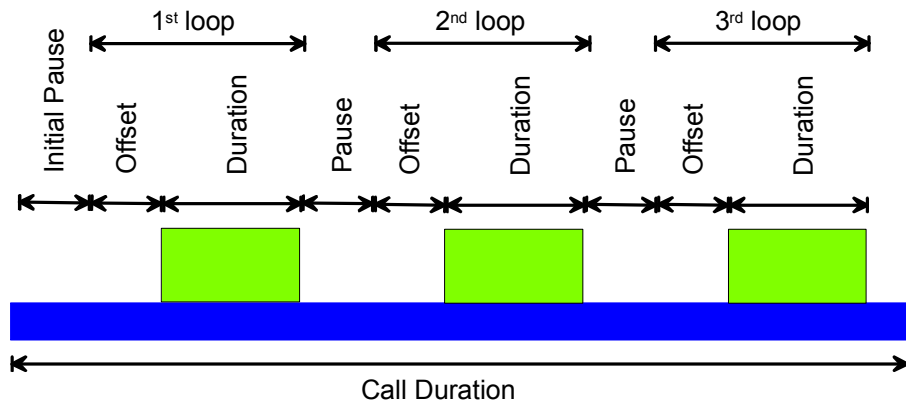
In addition to the results in the SQA Message View, R&S ROMES generates a wide range of SQA signals. The signals are under the SQA Tester node of the data tree (Configuration – Preferences – Available Signals). You can analyze the signals in one of the basic views, e.g. you can display the PESQ score in a series of consecutive loops and calculate average, minimum and maximum values using the Statistic Histogram view.



Fig. 4-223 SQA Message View

SQA measurement

An SQA measurement consists of a specified number of test loops. In each test loop, R&S ROMES uploads or downloads voice data for a specified duration and calculates the PESQ score according to ITU-T recommendation P.862. An offset time precedes each data transfer. Moreover the individual loops are separated by a pause time. All timing parameters can be set in the driver configuration menu.



SQA messages	The <i>SQA Message View</i> contains a chronological record of the generated SQA messages. An SQA message either describes an event (i.e. the beginning of a particular stage of the measurement), a measurement result, or an error. The messages depend on the measurement mode (download, upload). The basic events and results are repeated for each loop.
Events and Results: Downlink	<p><i>Entering loop <nr></i> Start time of the loop, beginning of the transferred file. The actual data transfer starts after the <i>Offset</i> defined in the configuration menu. The system waits until enough data have been transferred to start the PESQ evaluation.</p> <p><i>Performing pesq evaluation</i> Start time of the PESQ evaluation in the current loop.</p> <p><i>Resulting delays: ...</i> Time delay between reference file and acquired sample in ms. The speech codec can introduce variable delays within the sample, therefore the PESQ result contains the minimum, average, and maximum delay. If the average delay exceeds 30 ms, the system corrects the timing and repeats the PESQ evaluation.</p> <p><i>PESQ Result</i> <i>Offset</i> between the start of the loop and the calculation of the result. The offset includes the transmission time through the communication system; it is not identical to the offset defined in the driver configuration menu. The <i>PESQ P862.1</i> result is the calculated PESQ score which is converted to a scale between 1 and approx. 4.55; see Table 3 and the following background information.</p> <p><i>Searching for next valid sample data</i> The PESQ evaluation failed or crashed in a first attempt, however, the system tries to repeat the evaluation in the current loop with a shifted evaluation interval.</p> <p><i>Repeating this sample using new delay information</i> The PESQ evaluation failed or crashed in a first attempt, the delay between the acquired sample and the reference file was larger than 30 ms. The system tries to repeat the evaluation in the current loop with a shifted evaluation interval.</p> <p><i>Using new delay information for next sample</i> The delay between the acquired sample and the reference file was larger than 30 ms, the evaluation of the current sample cannot be repeated (e.g. because the beginning of the sample was lost). The system tries to synchronize to the next sample (next loop) using the delay information; the PESQ result in the current loop is omitted.</p> <p><i>Waiting till data threshold is reached</i> <i>Audio data is acquired (recorded) until the length of the recorded sample is identical to the length of the reference sample.</i></p>

- Events and Results: Uplink**
- Playing initial silence*
Initial pause before the start of the first loop (loop 0). The length of the initial pause is defined in the driver configuration menu.
 - Playing sample*
The loop was started; the sample file (play file) is being played.
 - Playing silence between samples*
Pause time between two consecutive loops of the sample file (play file).
- Errors: Downlink**
- PESQ evaluation failed*
The system could not determine a PESQ result, e.g. because the delay between the acquired sample and the reference file was too big, or because the two files were hardly correlated. The PESQ evaluation is repeated with a shifted evaluation interval until the end of the loop is reached.
 - PESQ evaluation crashed...*
The system crashed during the PESQ evaluation (possible reason see above). The PESQ evaluation is repeated with a shifted evaluation interval until the end of the loop is reached.
 - Abort requested*
The measurement was aborted.
- Errors: Uplink**
- Abort requested*
The measurement was aborted.

Table 3 ITU P.800 PESQ scale

PESQ 826.1	Speech Quality	Impairments
5	Excellent	Imperceptible
4	Good	Perceptible, but not annoying
3	Fair	Slightly annoying
2	Poor	Annoying
1	Bad	Very annoying

Mapping of PESQ score and ITU P.800 values

The PESQ score according to ITU-T recommendation P.862 expresses the speech quality on a scale between -0.5 and $+4.5$. The PESQ score values can be mapped to the ITU P800 scale of [Table 3](#); an appropriate conversion formula has been standardized by the ITU in P.862.1. The conversion formula maps the PESQ score values to a range between approx. $+1$ and $+4.55$; R&S ROMES displays the converted values as *PESQ P862.1* results.

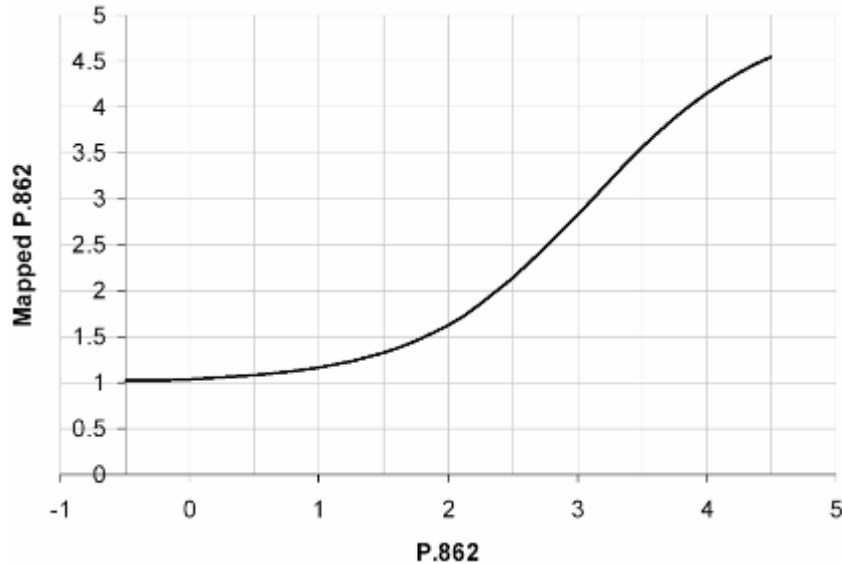


Fig. 4-224 Mapping of PESQ score (P862) and ITU P.800 values according to ITTU P862.1

Context menu



A right mouse click on any point in the view opens the context menu to print the view contents, (de-)select the view for fast replay, copy the current view to the clipboard, create or delete views, or move to another worksheet; see [Context menu](#) description on p. 4.2.

The *SQA Message View* has no configuration menu assigned. The *Info* tab can be accessed via the *Configuration – Settings* command.

QoS DQA Views

The QoS DQA Views display the result of the Data Quality Analysis (DQA, with option R&S ROMES-Z8, Voice Quality PESQ).

The QoS DQA views can be selected from a submenu displayed on the right side of the View menu when the mouse pauses over DQA.

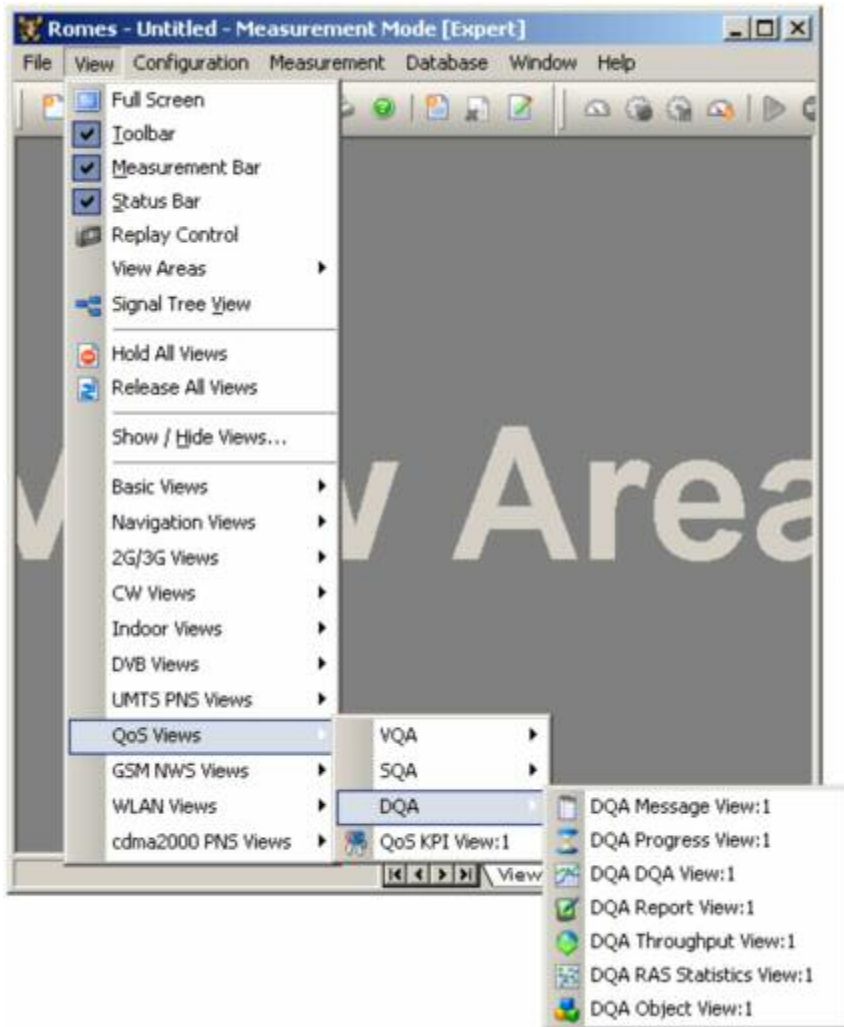
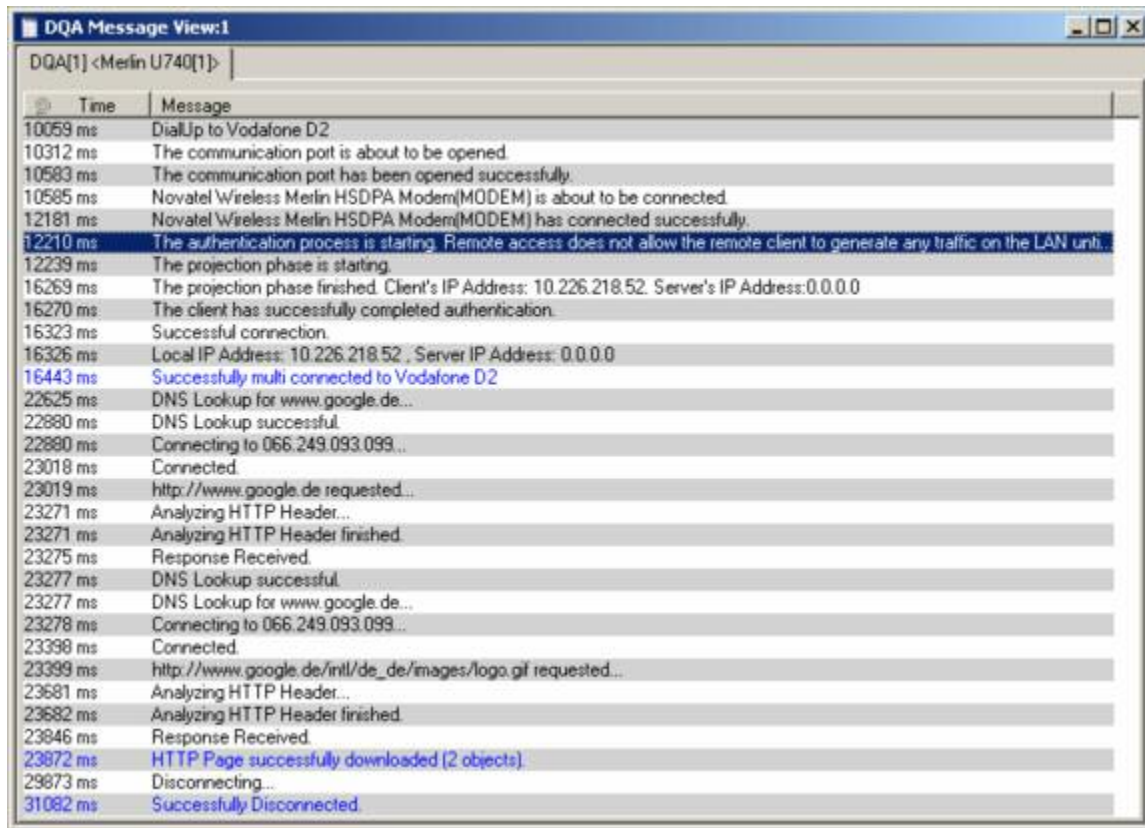


Fig. 4-225 QoS DQA views

QoS DQA Message View

The *QoS DQA Message View* monitors all actions of the current job. Each action is described with a message and the associated time. The causes of possible errors are reported with the messages.



Time	Message
10059 ms	DialUp to Vodafone D2
10312 ms	The communication port is about to be opened.
10583 ms	The communication port has been opened successfully.
10585 ms	Novatel Wireless Merlin HSDPA Modem(MODEM) is about to be connected.
12181 ms	Novatel Wireless Merlin HSDPA Modem(MODEM) has connected successfully.
12210 ms	The authentication process is starting. Remote access does not allow the remote client to generate any traffic on the LAN unit.
12239 ms	The projection phase is starting.
16269 ms	The projection phase finished. Client's IP Address: 10.226.218.52. Server's IP Address: 0.0.0.0
16270 ms	The client has successfully completed authentication.
16323 ms	Successful connection.
16326 ms	Local IP Address: 10.226.218.52, Server IP Address: 0.0.0.0
16443 ms	Successfully multi connected to Vodafone D2
22625 ms	DNS Lookup for www.google.de...
22880 ms	DNS Lookup successful.
22880 ms	Connecting to 066.249.093.099...
23018 ms	Connected.
23019 ms	http://www.google.de requested...
23271 ms	Analyzing HTTP Header...
23271 ms	Analyzing HTTP Header finished.
23275 ms	Response Received.
23277 ms	DNS Lookup successful.
23277 ms	DNS Lookup for www.google.de...
23278 ms	Connecting to 066.249.093.099...
23398 ms	Connected.
23399 ms	http://www.google.de/img/de_de/images/logo.gif requested...
23681 ms	Analyzing HTTP Header...
23682 ms	Analyzing HTTP Header finished.
23846 ms	Response Received.
23872 ms	HTTP Page successfully downloaded (2 objects).
29873 ms	Disconnecting...
31082 ms	Successfully Disconnected.

Fig. 4-226 QoS DQA Message View

View contents

The messages depend on the job that is being executed but are all self-explanatory. The figure *above* shows the messages generated during an *Connect to Network* job with the download of an image file..

Context menu



A right mouse click on any point in the view opens the context menu to print the view contents, (de-)select the view for fast replay, put the view on hold, copy the current view to the clipboard, or to create or delete views; see *Context menu* description on p. 4.2.

The *QoS DQA Message View* has no configuration menu assigned. The *Info* tab can be accessed via the *Configuration – Settings* command.

QoS DQA Progress View

The *QoS DQA Progress View* monitors the progress and the status of the current job. The view contents depend on the job that is being executed.

For more information refer to the description of the DQA driver configuration menu in chapter 6.

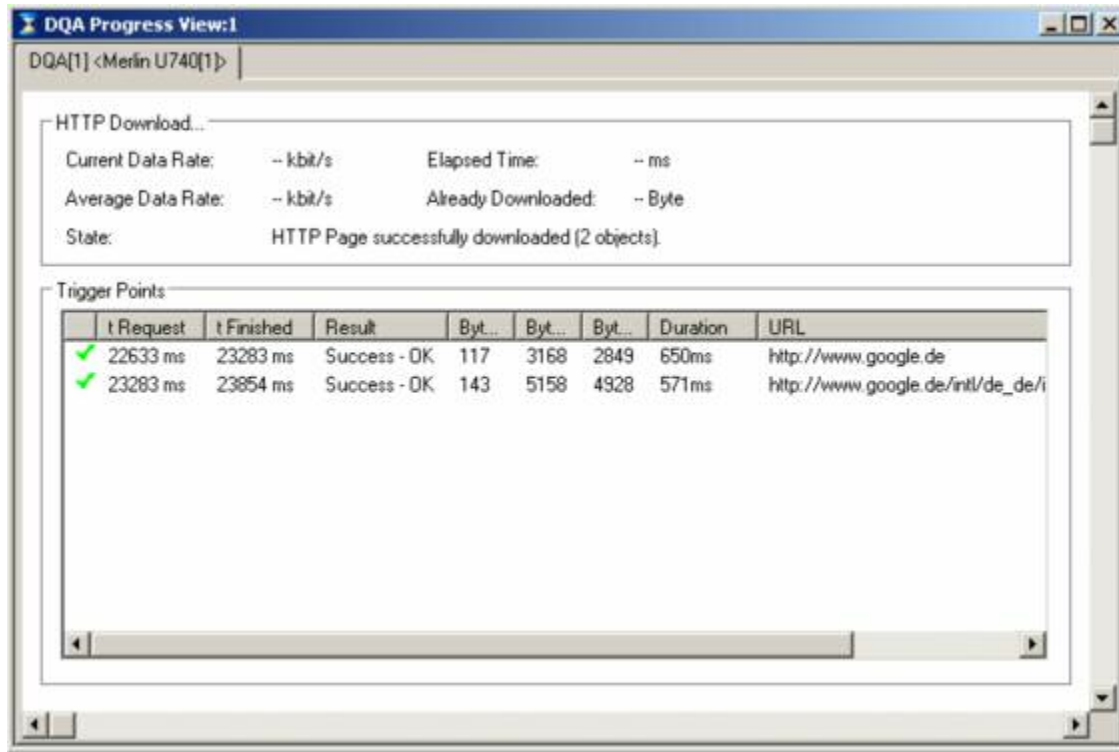


Fig. 4-227 QoS DQA Progress View (HTTP download)

View contents

The job name forms the heading of the upper panel, which also shows the most important properties of the job and its current state.

A detailed list of the different actions involved in the job is given in the *Trigger Points* table. The entries in the table are self-explanatory. In particular, the table contains the duration of each action and the number of transmitted and received bytes.



An alternative record of the actions of all jobs in the measurement including detailed timing information is provided in the *QoS DQA Object View*; see section [QoS DQA Object View](#) on p. 4.393.

Context menu



A right mouse click on any point in the view opens the context menu to print the view contents, (de-)select the view for fast replay, copy the current view to the clipboard, create new views, or move to another worksheet, see [Context menu](#) description on p. 4.2.

The *QoS DQA Progress View* has no configuration menu assigned. The *Info* tab can be accessed via the *Configuration – Settings* command.

QoS DQA DQA View

The QoS DQA DQA View shows a bar graph to monitor the percentage of *Good*, *Blocked*, and *Dropped* data transfer jobs in the current session. Only connections that the system sets up to a remote network are evaluated. In principle a remote network connection can be a radio link to a network established by means of test mobiles or a connection via dial-up network. At present the *Session* tab evaluates the *Connect to Network/Disconnect from Network* jobs; it is empty for all other jobs.

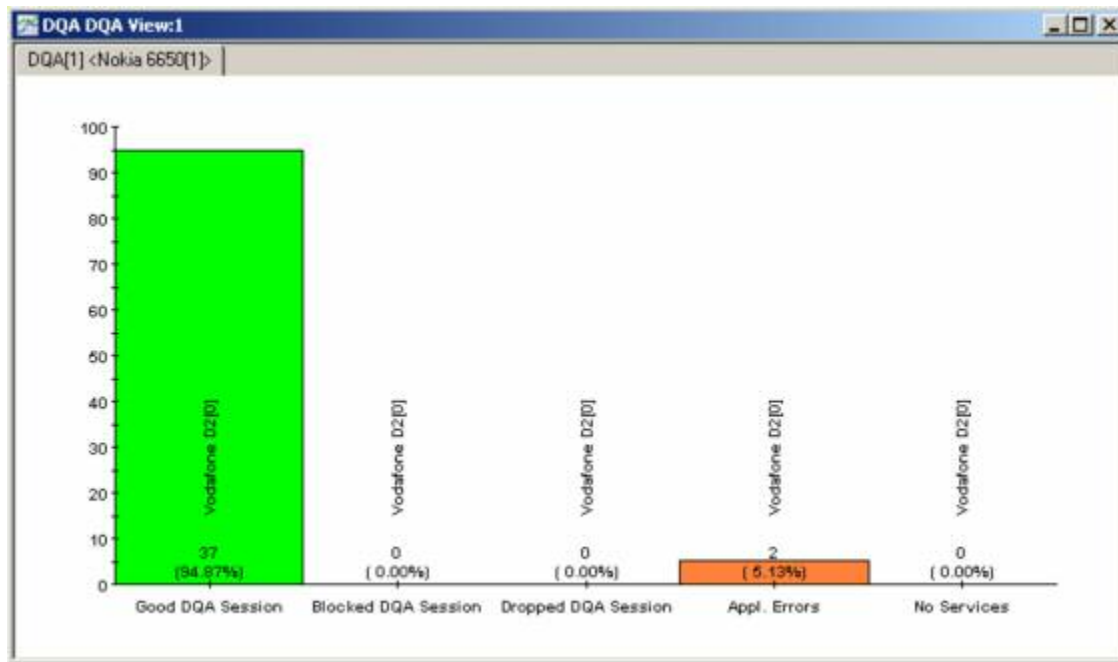


Fig. 4-228 QoS DQA DQA View

The definition of *Good Sessions*, *Blocked Sessions*, *Dropped Sessions* and *No Services* is analogous to the call classes in the GSM Network Quality Analysis (NQA); see chapter 6. *No Services* and *Application Error* are similar; they both mean that the remote network was out of service:

- *No Services* counts the failed connection setups via a radio link.
- *Application Error* counts the failed connection setups due to problems with other system components (e.g. because a wrong e-mail address was used, authentication failed, an addressed server was out of service).

Context menu

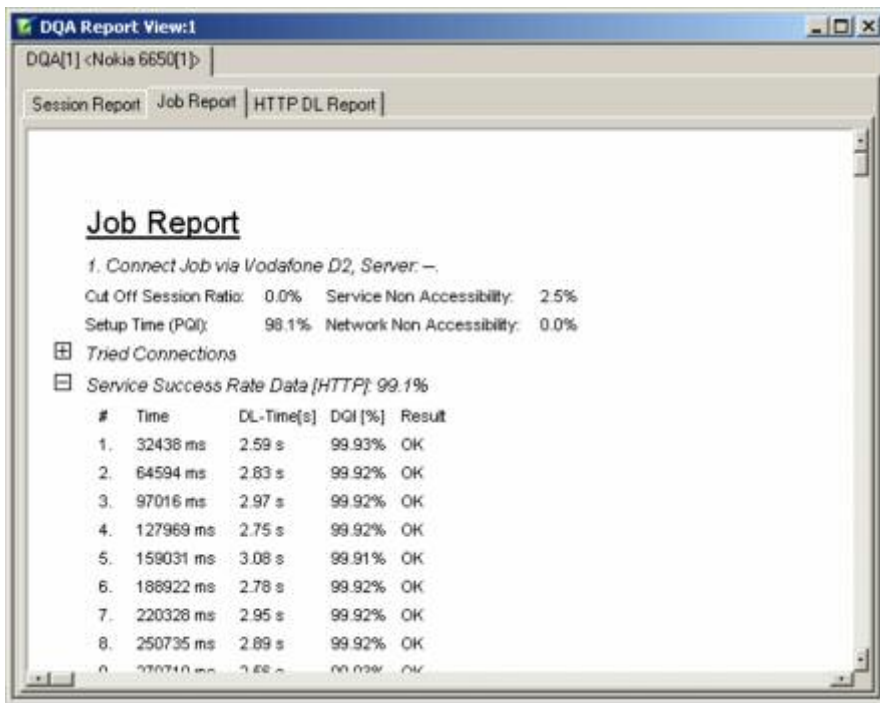
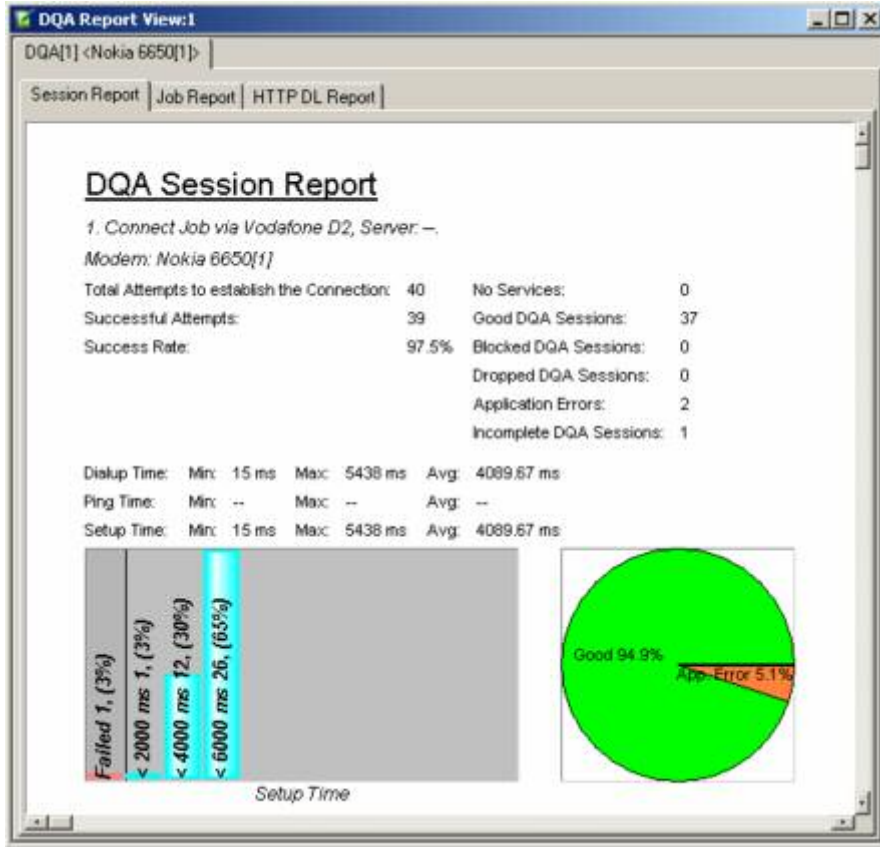


A right mouse click on any point in the view opens the context menu to print the view contents, (de-)select the view for fast replay, copy the current view to the clipboard, or move to another worksheet; see [Context menu](#) description on p. 4.2.

The QoS DQA DQA View has no configuration menu assigned. The *Info* tab can be accessed via the *Configuration – Settings* command.

QoS DQA Report View

The QoS DQA Report View contains several tabs to separately monitor the jobs in the current session.



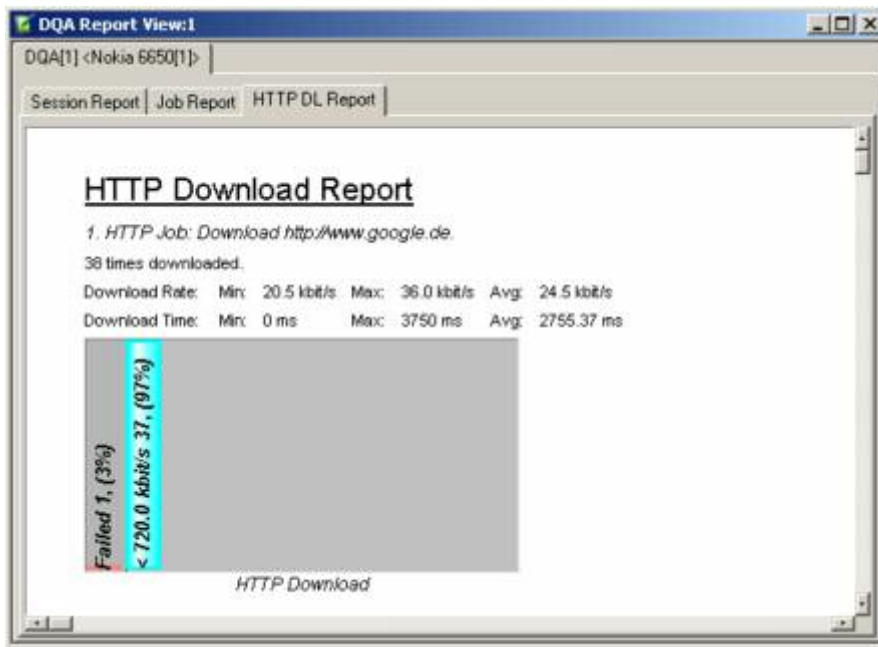


Fig. 4-229 QoS DQA Report View – Session, Job Report, and HTTP Download

**View contents:
Session Report**

The *Session Report* tab (see figure [above](#)) monitors the statistics of a connection that the system sets up to a remote network. This can be a radio link to a network established by means of test mobiles or a connection via dial-up network. At present the *Session Report* tab evaluates the *Connect to Network/Disconnect from Network* jobs. Connections via existing links, e.g. for *FTP Download* from a local network server, can be monitored in the other tabs.

The view shows the name of the job as set in the driver configuration menu, an overview of the attempted connections and the time statistics of the connections. The definition of *No Services*, *Application Errors*, *Good Sessions*, *Blocked Sessions* and *Dropped Sessions* is analogous to the call classes in the GSM Network Quality Analysis (NQA); see chapter 6 and section [QoS DQA DQA View](#) on p. [4.386](#).

The *Session Report* tab contains a bar graph showing the percentage of good, blocked, failed and no service/application error sessions classified according to their time. The percentage of the session classes is also visualized in a pie chart. A bar graph corresponding to the pie chart is shown in the [QoS DQA DQA View](#); see p. [4.386](#).

**View Contents:
Job Report** The *Job Report* monitors the success rate of the HTTP, FTP, or UDP connection that the system attempts to a remote network. For network connections the *Job Report* shows a weighted evaluation of the success rate.

R&S ROMES uses a model where the success rate is described by a single percentage depending on the criteria *Cut-off Session Ratio*, *Service Non Accessibility*, *Set-up Time*, *Network Non Accessibility*, and *Data Quality* displayed in the *Job Report*. Each criterion enters into the calculation of the success rate with a coefficient or weighting factor between 0% (criterion does not influence the success rate) and 100% (criterion fully contributes to the success rate). The coefficients can be set in the *QoS Report View* configuration menu; refer to this section for more information.

**View Contents:
Local Network connections** The tabs for the *Ping*, *HTTP Download*, *FTP and UDP Upload and Download*, *EMail Upload and Download* jobs show an overview of the attempted local connections and the time statistics. A bar graph shows the successful and failed connections together with their time statistics.

Context menu



A right mouse click on any point in the view opens the context menu to print the view contents, (de-)select the view for fast replay, copy the current view to the clipboard, access the configuration menus, create or delete views, save the current configuration, or move to another worksheet; see [Context menu](#) description on p. 4.2.

QoS DQA Throughput View

The *QoS DQA Throughput View* monitors the current, maximum and mean/average data rate in uplink/upload and downlink/download direction. To obtain valid results, the option *Record the computer network throughput* must be enabled in the *Connection Statistics* tab of the DQA driver configuration menu (see chapter 6). The data is recorded and displayed with the update rate selected in the driver configuration menu.

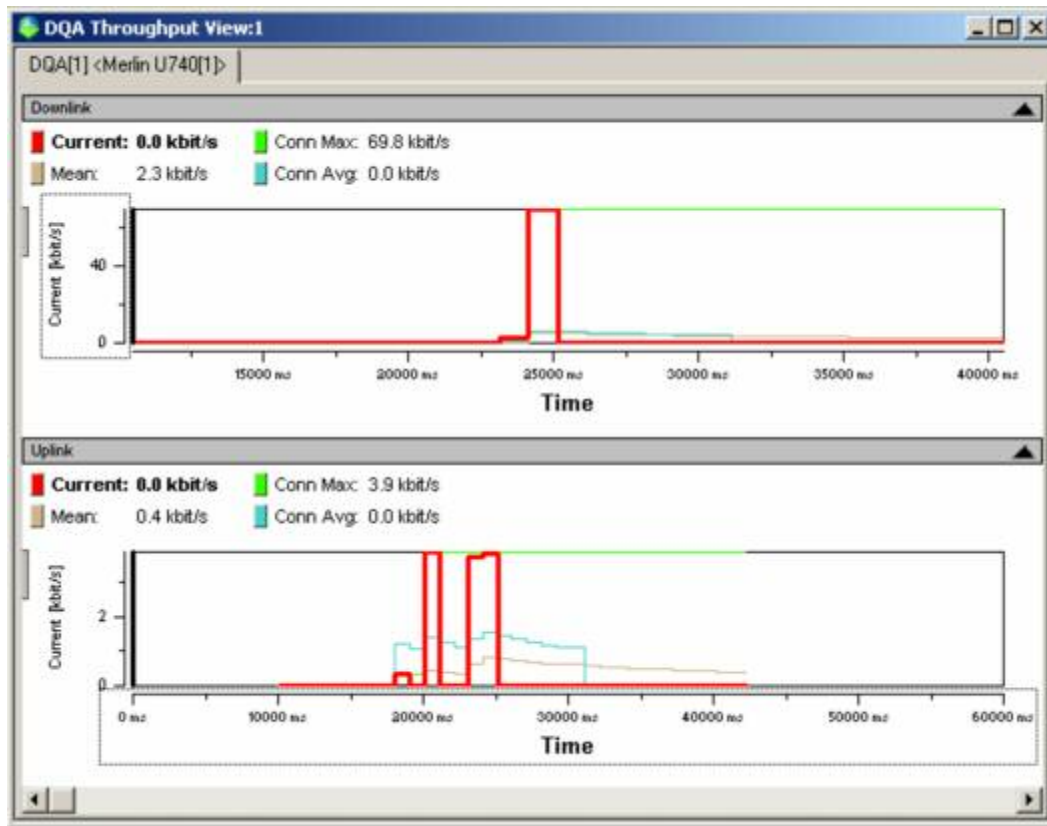


Fig. 4-230 QoS DQA Throughput View

View contents

The uplink and downlink data rate is shown in two 2D charts. The scale and appearance of the two diagrams (downlink and uplink throughput) can be modified using the configuration menu and various context menus. The diagram configuration is analogous to the *2D Chart View* described on p. 4.10.

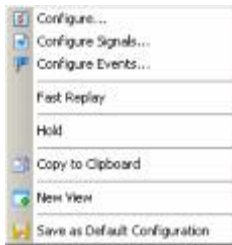
In the diagrams, the most recent data rates are always displayed at the right edge of the diagram. Each diagram contains four curves, corresponding to the following results:

- The *Current* curve shows the net throughput vs. time.
- The *Mean* curve shows the average throughput since the beginning of the current job, DQA session, or measurement session, depending on the *Throughput View Configuration* settings in the configuration menu.
- The *Job Max.* curve shows the maximum throughput since the beginning of the current job.
- The *Job Avg.* curve shows the average throughput since the beginning of the current job.

The most recent *Current*, *Mean*, *Job Max*, and *Job Avg* values are displayed in the legend above the diagrams. Selecting one of the items in the legend will highlight the corresponding curve.

In the configuration menu, it is possible to modify the *Mean* calculation and the appearance of the diagram.

Context menu



A right mouse click on any point in the view opens the context menu to print the view contents, (de-)select the view for fast replay, put the view on hold, copy the current view to the clipboard, access the configuration menus, create new views, save the current configuration, or move to another worksheet; see [Context menu](#) description on p. 4.2.

QoS DQA Throughput View Configuration

The *QoS DQA Throughput View* configuration menu selects the range for the average calculation, modifies the appearance of the diagrams, and provides information about the view version. It is opened via a right mouse click on a point inside the *QoS DQA Throughput View* or via the *Configuration – Settings* command (see chapter 3).

The *Throughput View Configuration* tab selects the range for the average calculation.

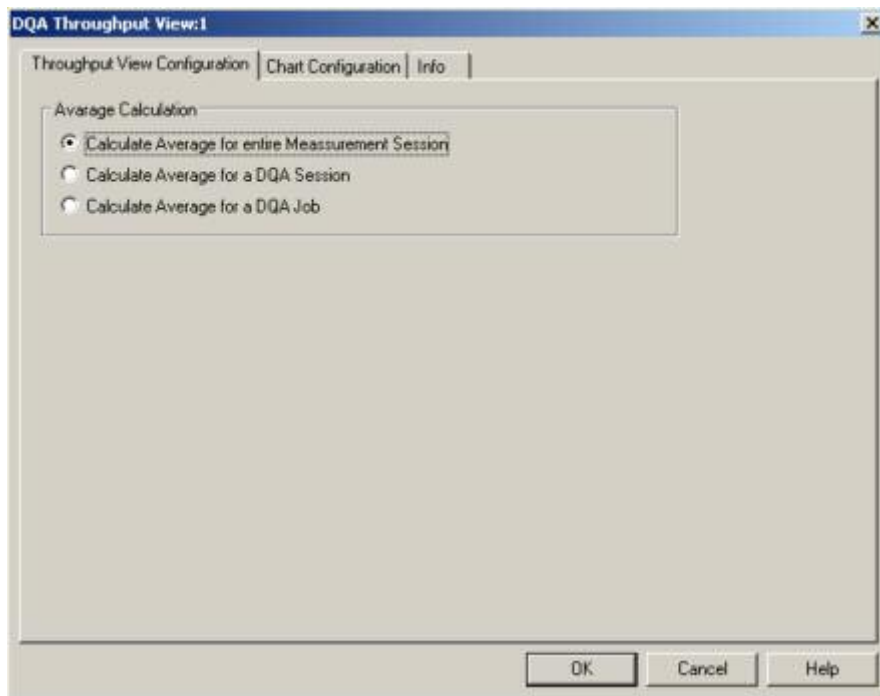


Fig. 4-231 QoS DQA Throughput View configuration

Average Calculation Defines whether the *Mean* curves in the *QoS Throughput View* are calculated over the entire measurement session or over a shorter time interval (DQA session or single DQA job). A measurement sessions consists of an arbitrary number of periodically repeated DQA sessions, each DQA session contains one or more DQA jobs; see description of the Data Quality Tester driver in chapter 6.

The *Chart Configuration* tab scales the axes of the chart and defines its contents and its appearance. All controls are also available in the *Chart Configuration* tab of the *2D Chart Configuration* menu and have the same effect; see figure on p. 4.14.

QoS DQA RAS Statistics View

The *QoS RAS Statistics View* displays important parameters describing the network traffic during the measurement. To obtain valid results, the option *Record the connection statistics* must be enabled in the *Connection Statistics* tab of the DQA driver configuration menu (see chapter 6). The data is recorded and displayed with the update rate selected in the driver configuration menu.

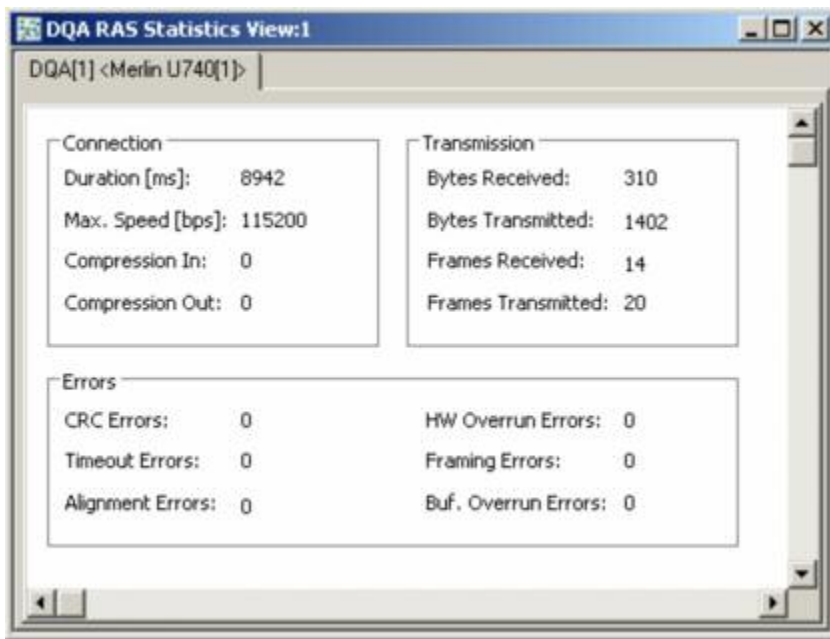


Fig. 4-232 QoS DQA RAS Statistics View

The Remote Access Service (RAS) parameters are grouped together in three panels, describing the characteristics of the *Connection*, the data traffic (*Transmission*), and the data quality (*Errors*).

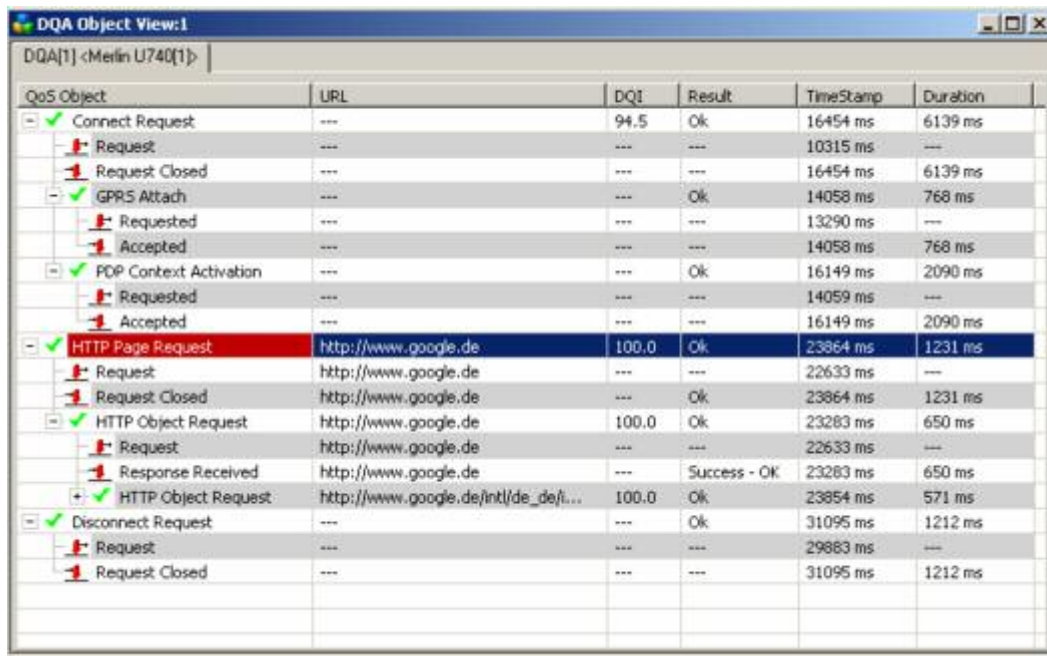
Context menu A right mouse click on any point in the view opens the context menu to print the view contents, (de-)select the view for fast replay, copy the current view to the clipboard, create or delete views, or move to another worksheet; see [Context menu](#) description on p. 4.2.



The *QoS DQA RAS Statistics View* has no configuration menu assigned. The *Info* tab can be accessed via the *Configuration – Settings* command.

QoS DQA Object View

The *QoS Object View* displays a record of the different actions involved in all DQA jobs of the measurement.



QoS Object	URL	DQI	Result	TimeStamp	Duration
[-] ✓ Connect Request	---	94.5	Ok	16454 ms	6139 ms
[-] Request	---	---	---	10315 ms	---
[-] Request Closed	---	---	---	16454 ms	6139 ms
[-] ✓ GPRS Attach	---	---	Ok	14058 ms	768 ms
[-] Requested	---	---	---	13290 ms	---
[-] Accepted	---	---	---	14058 ms	768 ms
[-] ✓ POP Context Activation	---	---	Ok	16149 ms	2090 ms
[-] Requested	---	---	---	14059 ms	---
[-] Accepted	---	---	---	16149 ms	2090 ms
[-] ✓ HTTP Page Request	http://www.google.de	100.0	Ok	23864 ms	1231 ms
[-] Request	http://www.google.de	---	---	22633 ms	---
[-] Request Closed	http://www.google.de	---	Ok	23864 ms	1231 ms
[-] ✓ HTTP Object Request	http://www.google.de	100.0	Ok	23283 ms	650 ms
[-] Request	http://www.google.de	---	---	22633 ms	---
[-] Response Received	http://www.google.de	---	Success - OK	23283 ms	650 ms
[-] ✓ HTTP Object Request	http://www.google.de/intl/de_de/i...	100.0	Ok	23854 ms	571 ms
[-] Disconnect Request	---	---	Ok	31095 ms	1212 ms
[-] Request	---	---	---	29883 ms	---
[-] Request Closed	---	---	---	31095 ms	1212 ms

Fig. 4-233 QoS DQA Object View

The entries in the table are self-explanatory. In particular, the table contains detailed timing information about each action. The Data Quality Indicator (DQI) is a measure for the quality of the transmission, calculated in analogy to the success rate; it is in the value range between 0 and 100.



An alternative record of the actions in a particular job including the number of exchanged bytes is displayed in the *QoS Progress View*; see section [QoS DQA Progress View](#) on p. 4.385.

Context menu



A right mouse click on any point in the view opens the context menu to print the view contents, access the configuration menus, (de-)select the view for fast replay, copy the current view to the clipboard, create or delete views, save the current configuration, or move to another worksheet; see [Context menu](#) description on p. 4.2.

The *QoS DQA Object View* has no configuration menu assigned. The *Info* tab can be accessed via the *Configuration – Settings* command.

QoS KPI View

The Key Performance Indicators (KPIs) for the DQA jobs FTP (up-/download), HTTP and e-mail (up-/download) are shown in the KPI View. The following example shows an FTP download:

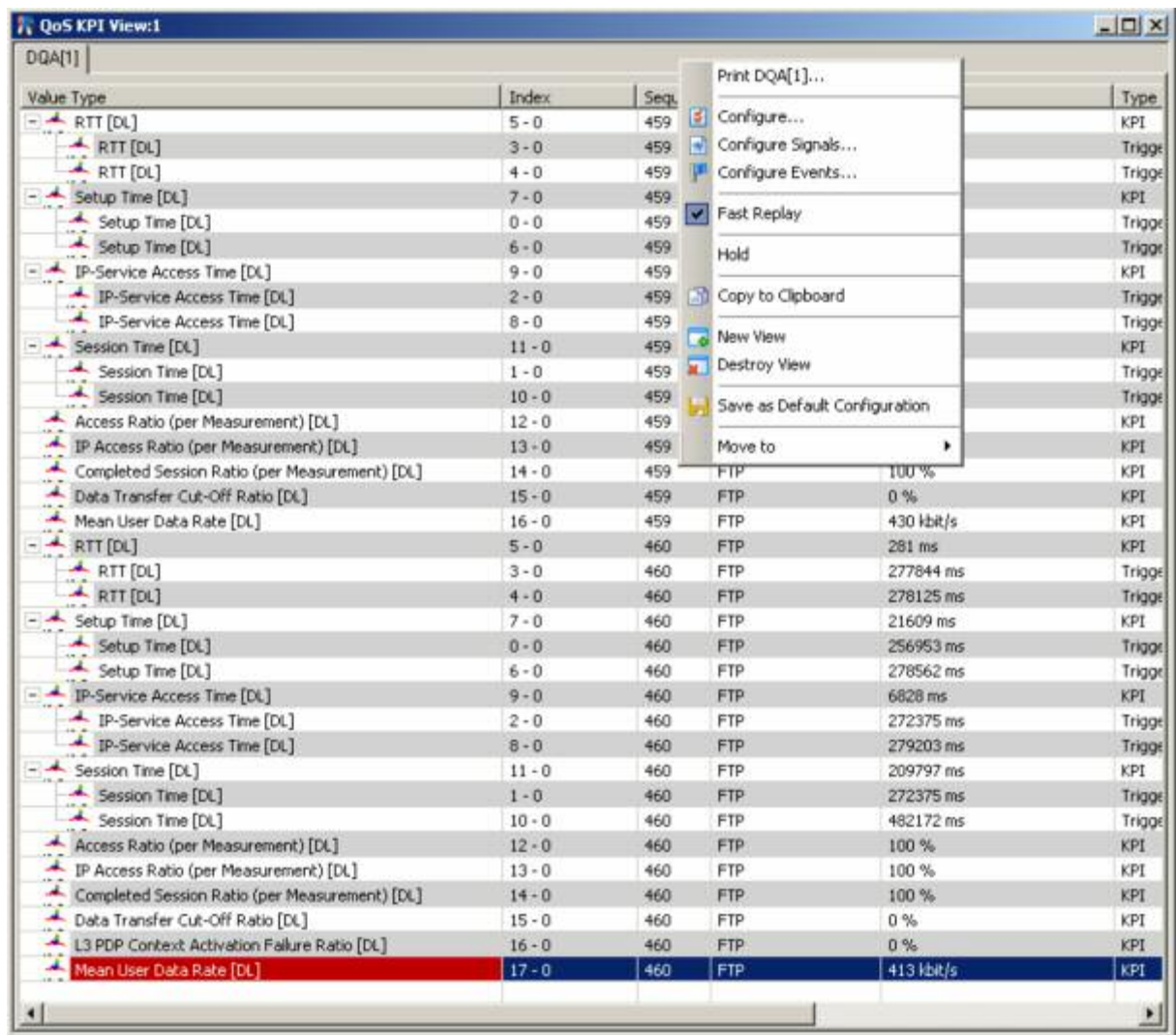
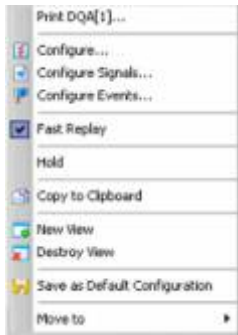


Fig. 4-234 QoS KPI View

View contents

The displayed values depend on the job that is being executed but are all self-explanatory. The figure above shows the messages generated during an *Connect to Network* job with the download of an image file..

Context menu

A right mouse click on any point in the view opens the context menu to print the view contents, access the configuration menus, (de-)select the view for fast replay, put the view on hold, copy the current view to the clipboard, or to create or delete views, save the current configuration, or move to another worksheet; see *Context menu* description on p. 4.2.

The *Info* tab can be accessed via the *Configuration – Settings* command.

QoS KPI View Configuration

The *KPI View* configuration menu customizes the table contents in the *QoS KPI View*. It is opened via a right mouse click on a point inside the *QoS KPI View* or via the *Configuration – Settings* command (see chapter 3).

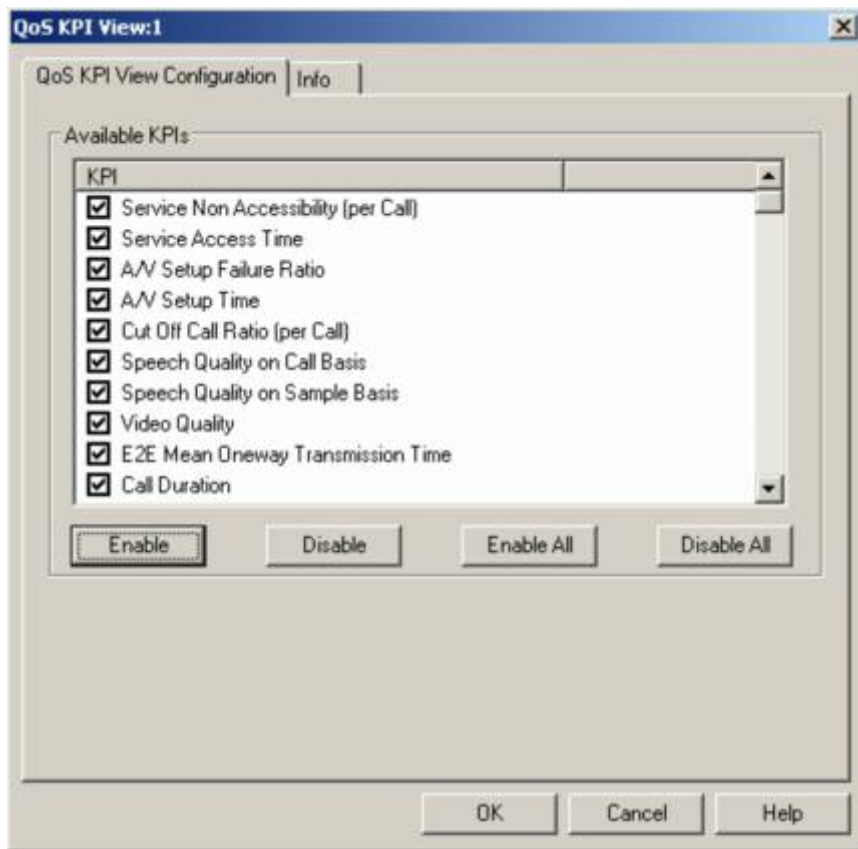


Fig. 4-235 QoS KPI View configuration: Available KPIs

Available KPIs

The *Available KPIs* panel defines which indicators are displayed in the table of the *QoS KPI View* (see figure above). Clearing a box hides the corresponding row in the diagram.

The available KPIs are also included in the signal tree, which can be accessed via *Configure Signals...* in the context menu of the KPI view.

The following example shows the available KPIs displayed in the *Statistic View* (see p. 4.35)

First, select the KPIs in the *Values* panel of the Statistic View configuration:

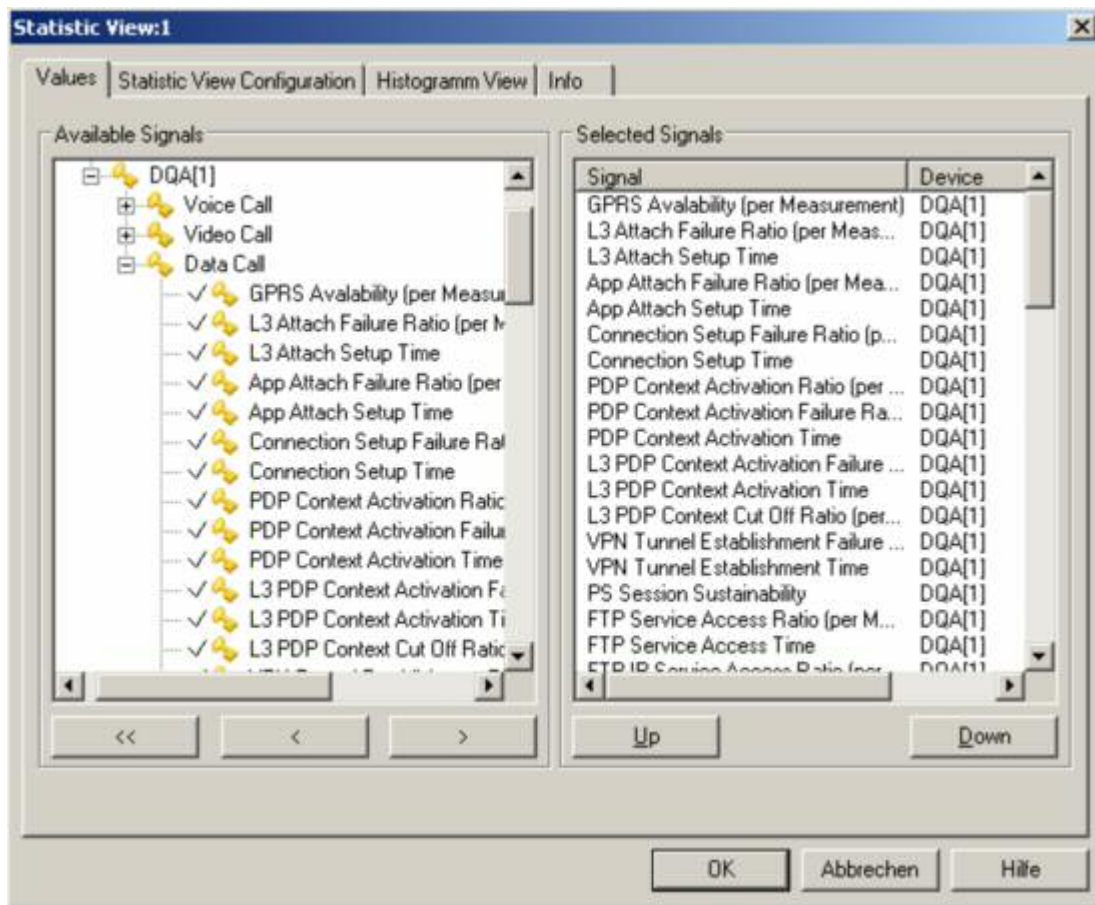


Fig. 4-236 Statistic View configuration: Available DQA KPIs

The QoS DQA KPIs are then displayed for the selected measurement file in the Statistic View:

Parameter	Unit	Count	Invalids	Mean	Dev.	Min.	1%	5%	50
GPRS Availability (per Measurement)	%								
L3 Attach Failure Ratio (per Measurement)	%								
L3 Attach Setup Time	ms								
App Attach Failure Ratio (per Measurement)	%								
App Attach Setup Time	ms								
Connection Setup Failure Ratio (per Measurement)	%								
Connection Setup Time	ms								
PDP Context Activation Ratio (per Measurement)	%								
PDP Context Activation Failure Ratio (per Measurement)	%								
PDP Context Activation Time	ms								
L3 PDP Context Activation Failure Ratio (per Measurement)	%								
L3 PDP Context Activation Time	ms								
L3 PDP Context Cut Off Ratio (per Measurement)	%								
VPN Tunnel Establishment Failure Ratio (per Measurement)	%								
VPN Tunnel Establishment Time	ms								
P5 Session Sustainability	ms								
FTP Service Access Ratio (per Measurement)	%	2	0	100.00	-	100.0	100.0	100.0	10
FTP Service Access Time	ms	4	0	77910.25	11	4625	4625	4625	22
FTP IP-Service Access Ratio (per Measurement)	%	2	0	100.00	-	100.0	100.0	100.0	10
FTP IP-Service Access Failure Ratio (per Measurement)	%								
FTP IP-Service Access Time	ms	4	0	82093.75	11	7750	7750	7750	20
FTP Completed Session Ratio (per Measurement)	%	2	0	100.00	-	100.0	100.0	100.0	10
FTP Session Failure Ratio (per Measurement)	%								
FTP Session Time	ms	5	0	240090.60	1655...	20250	20250	20250	22
FTP Data Transfer Cut Off Ratio (per Measurement)	%	2	0	0.00	-	0.0	0.0	0.0	0.0
FTP Mean User Data Rate	kbit/s	2	0	421.50	12.0	413	413	413	41
FTP Transfer Time	ms								
FTP First Socket RTT	ms								
FTP RTT	ms	4	0	82578.00	1307...	297	297	297	25
HTTP Service Access Ratio (per Measurement)	%								
HTTP Service Access Time	ms								
HTTP IP-Service Access Ratio (per Measurement)	%								
HTTP IP-Service Access Failure Ratio (per Measurement)	%								
HTTP IP-Service Access Time	ms								
HTTP Completed Session Ratio (per Measurement)	%								
HTTP Session Failure Ratio (per Measurement)	%								
HTTP Session Time	ms								
HTTP Data Transfer Cut Off Ratio (per Measurement)	%								
HTTP Mean User Data Rate	kbit/s								
HTTP Transfer Time	ms								
HTTP Page Compression Ratio (per Measurement)	%								
HTTP First Socket RTT	ms								
HTTP RTT	ms								
Ping First Socket RTT	ms								
Ping RTT	ms								
POP3 Service Access Ratio (per Measurement)	%								
POP3 Service Access Time	ms								
POP3 IP-Service Access Ratio (per Measurement)	%								
POP3 IP-Service Access Failure Ratio (per Measurement)	%								
POP3 IP-Service Access Time	ms								
POP3 Completed Session Ratio (per Measurement)	%								
POP3 Session Failure Ratio (per Measurement)	%								
POP3 Session Time	ms								
POP3 Data Transfer Cut Off Ratio (per Measurement)	%								
POP3 Mean User Data Rate	kbit/s								
POP3 Transfer Time	ms								
POP3 First Socket RTT	ms								
SMTP Service Access Ratio (per Measurement)	%								
SMTP Service Access Time	ms								
SMTP IP-Service Access Ratio (per Measurement)	%								
SMTP IP-Service Access Failure Ratio (per Measurement)	%								
SMTP IP-Service Access Time	ms								
SMTP Completed Session Ratio (per Measurement)	%								
SMTP Session Failure Ratio (per Measurement)	%								
SMTP Session Time	ms								
SMTP Data Transfer Cut Off Ratio (per Measurement)	%								
SMTP Mean User Data Rate	kbit/s								
SMTP Transfer Time	ms								
SMTP First Socket RTT	ms								

Fig. 4-237 Statistic View: Available DQA KPIs

The signal names displayed in the *Parameters* column above can be modified in the XML file CMSTecQoS.XML, which can be ordered from Rohde & Schwarz, Dept. 1SP6.

GSM NWS Views

The *GSM NWS Views* shows the GSM information obtained in the GSM network scans performed by a R&S TSMU radio network analyzer. GSM network scans require option R&S ROMES-GS3, *GSM Network Scanner*. The GSM Network Scanner driver is described in chapter 6.

The *GSM NWS Views* can be selected from a submenu displayed on the right side of the *View* menu when the mouse hovers over *GSM NWS Views*.

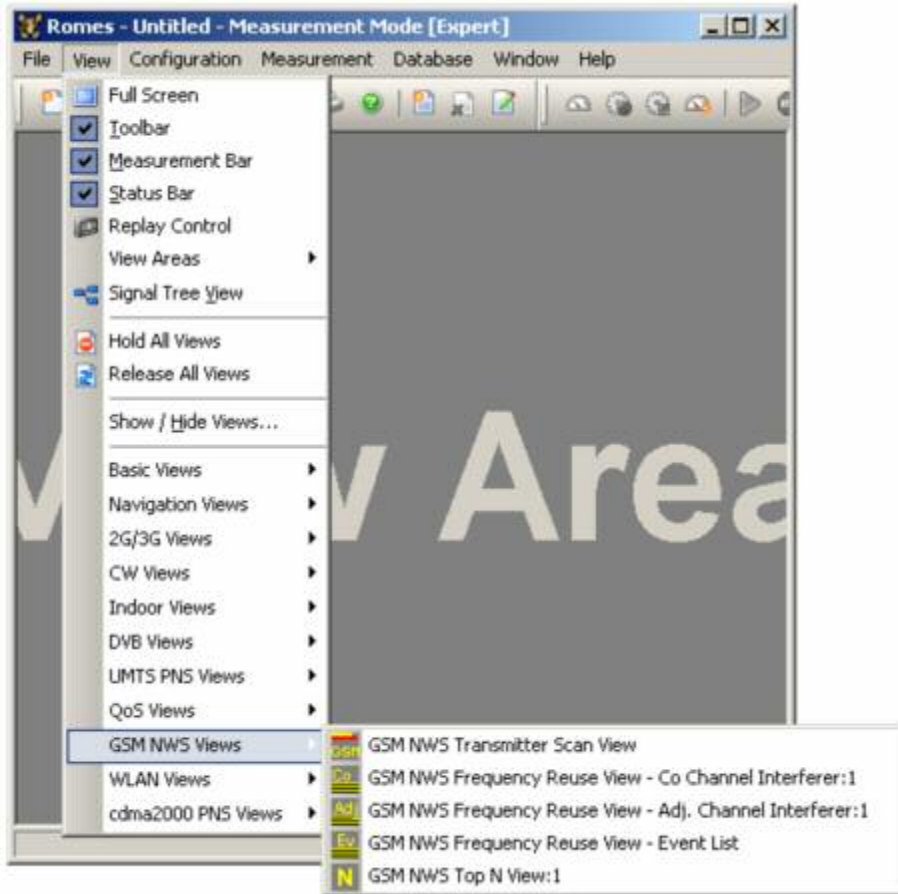
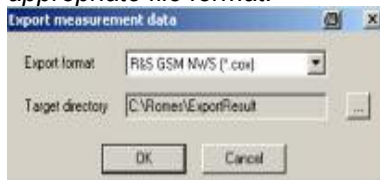


Fig. 4-238 GSM NWS views



The GSM network scan data can be exported to a C0 scan export file; see description in chapter 7. To export the data, use the File – Export CMD File(s)... command and select the appropriate file format:



Note that a GSM BTS List Database must be loaded in order to export scan data. The database does not have to contain any BTS entries, it is sufficient to load an empty database. For this export to a C0 scan export file it is recommended to open an instance of the [Message View](#), which contains useful information in case of problems.

GSM NWS Transmitter Scan View

The *GSM NWS Transmitter Scan View* displays the demodulated data acquired by the R&S TSMU radio network analyzer during the GSM Network Scan. The data also contains information transmitted on the Synchronization Channel (BSIC and TDMA frame number) and the *System Information Type 3* of the BCCH.

The measured and detected sectors in the air are displayed, sorted and updated in different rows:

CH	POWER	BSIC	CI	LAC	MNC	MCC	T (MEAS)	T (TDMA)	FN	T3	
1	-80.36	41	5941	870	002	262	16315 ms	0.409	2327539	1	
4	-84.76	54	9671	870	002	262	16315 ms	1.660	2085425	35	
8	-83.96	75	19742	890	002	262	16315 ms	5.742	422903	11	
8	-72.36	71					16315 ms	0.784	2341192	37	
8	-76.12	53	24023	890	002	262	16315 ms	6.871	720902	17	
12	-73.72	62	19612	890	002	262	16393 ms	2.800	31250	38	
51	-99.40	36					15498 ms	2.864	1427081	50	
53	-82.52	34	23461	890	002	262	15498 ms	7.098	883234	16	
55	-99.40	57					15498 ms	6.465	2057938	37	
57	-79.08	42	10251	890	002	262	15498 ms	7.911	2111052	9	
59	-77.96	56	10252	890	002	262	15498 ms	7.913	2111052	9	
65	-54.44	37	10253	890	002	262	15587 ms	7.913	2111052	9	
73	-63.88	35	31592	870	002	262	15676 ms	0.783	2341192	37	
75	-69.08	74	26012	890	002	262	15676 ms	0.973	2111661	6	
90	-63.72	42	23463	890	002	262	15765 ms	7.099	883234	16	
114	-57.80	54	31591	870	002	262	15943 ms	0.783	2341192	37	
725	-99.08	54					15069 ms	3.709	1063060	16	
726	-87.56	56	31597	870	002	262	16047 ms	0.535	2341189	34	
727	-91.08	54	19565	870	002	262	16047 ms	1.211	626385	3	
731	-57.00	60	31595	870	002	262	16047 ms	0.535	2341189	34	
736	-65.80	32					16120 ms	1.177	1890156	45	
741	-83.48	75					16120 ms	6.335	1062258	30	
744	-94.92	42					16120 ms	6.333	1062258	30	
	-110	-100	-90	-80	-70	-60	-50	-40	-30	-20	dBm

Fig. 4-239 GSM NWS Transmitter Scan View

Each table row corresponds to a GSM downlink signal received from one BTS. It is underlined with a gray or colored bar, where the color denotes the measured BCC (the second digit of the octal BSIC), where the color denotes the measured BCC of the signal in this channel. If no color code could be measured an empty bar is drawn. Gray bars and brackets in the table row characterize how complete or how recent the displayed results are; refer to the description of the *Info Levels* below. The length of this bar corresponds to the received SCH power, according to the dBm scale displayed across the bottom of the view.

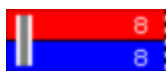


The power bars in the GSM NWS Transmitter Scan view indicate the power on the Synchronization Channel (SCH). This power generally differs from the GSM downlink signal power obtained in a CW measurement.

Several BTSs can be measured on the same channel, provided that their signal power does not differ by more than a few dB so that the R&S TSMx can still decode the data. Signals with the same channel number but different BSIC are marked with a vertical gray bar (e.g. the two signals with channel no. 8 in the figure above)

The columns contain the following information:

CH The number of the measured channel. If two or more consecutive lines are measurements on the same channel, they are marked with a vertical bar:



POWER	The SCH power of the signals is displayed in the second column, with a dynamic range from -120 dBm to 0 dBm.
BSIC	BSIC in octal representation. The first digit denotes the NCC, the second the BCC.
CI	Cell Identity.
LAC	Location Area Code (decimal).
MNC	Mobile Network Code (in BCD code format).
MCC	Mobile Country Code (in BCD code format).
	The four preceding elements uniquely identify a BTS worldwide. So this set of information is especially useful in border regions where two network operators may share the same frequency range, to identify a BTS of a network when there is no base station list available.
T(MEAS)	Time (hh:mm:ss) indicating the last measurement update of the displayed line. The time is counted from the start of the measurement. Although <i>T(MEAS)</i> is displayed in seconds it is internally stored in μ s. This is important when <i>T(MEAS)</i> is used for sorting, see <i>Sort Sequence</i> on page 4.404.
T(TDMA)	Time offset of the correlated burst. This time is given by <i>T(MEAS)</i> modulo one TDMA frame. The unit is the length of one time slot, so the range is $0 \leq T(\text{TDMA}) < 8$.
FN	TDMA frame number of the correlated burst in the range 0 to FN_MAX where $\text{FN_MAX} = (26 \times 51 \times 2048) - 1 = 2715647$ (one hyperframe length) as specified in GSM 05.02. The FN is obtained from the measured Synchronization Channel (SCH). The <i>FN</i> column shows the FN at <i>T(TDMA)</i> which is calculated from the FN at the SCH time <i>T(SCH)</i> and the time offset between <i>T(SCH)</i> and <i>T(TDMA)</i> ; see figure below.
T3	Frame number FN modulo 51 (one multiframe length).

Notes:

In case that two sectors are synchronized, both values T3 and T(TDMA), are identical up to a measurement error. Synchronization can be checked this way. For the interference analysis identical values of T3 and T(TDMA) imply that the signals in the interference diagram are on identical positions and cannot be distinguished.

Context menu

A right mouse click on any point in the view opens the context menu to access the configuration menus, (de-)select the view for fast replay, copy the current view to the clipboard, or move to another worksheet; see context menu description at the beginning of chapter 4. The context menu contains the following additional commands:

**Freeze Input**

Additional input from the measurement or replay is not displayed. Meanwhile, the data is still stored during measurement. Sorting of the data and changes in the parameter settings are possible during input freezing.

Enable Input

Terminates the input freezing.

Frame Timing

The values $T(MEAS)$, $T(TDMA)$ and FN are visualized in the following figure:

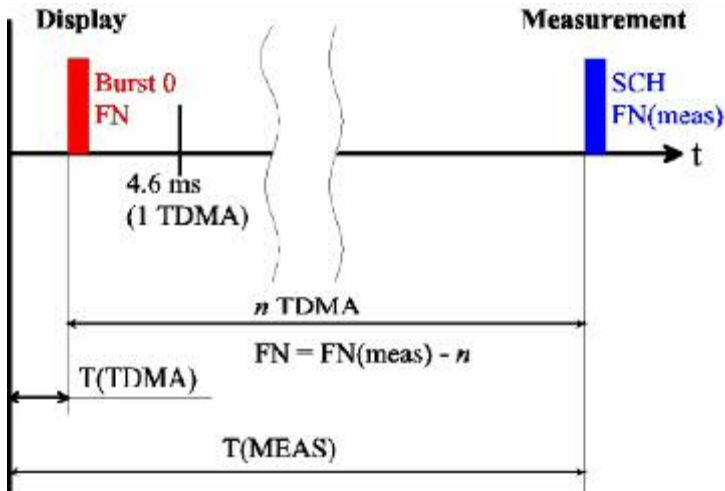


Fig. 4-240 Display of the GSM NWS Transmitter Scan View time measurements

The start of the measurement is shown as a vertical bar on the left side of the diagram. At $T(MEAS)$ a SCH is detected and demodulated, giving the information about the BSIC and the TDMA frame number $FN(MEAS)$. $T(MEAS)$ is shifted back to the time period of the first TDMA frame after the start of the measurement by subtracting the duration of n TDMA frames. This yields the value $T(TDMA)$. In the same way, the demodulated frame number is reduced by n (modulo 2715648). So, both values, $T(TDMA)$ and FN denote the measurement time and frame number of a BTS if it would have been measured within the first TDMA frame period after the start of the measurement assuming no drift of both the BTS and the test receiver and assuming no timing advance due to different measurement locations.

The advantage of this definition of frame numbers and measurement times is that the values for one BTS are approximately constant with only small changes produced by:

- Drift of the BTS
- Drift of the test receiver
- Time shift on different measurement locations due to the finite speed of light
- Different offset times when repeater signals are received
- Additional time delay produced by reflections

Info Levels

The Transmitter Scan distinguishes three different info levels, depending on the amount of information that could be extracted from the received signal. At level 3 the most complete information is available.

Info level 1 A C0 channel of a BTS could be identified by correlating the FCCH and the extended training sequence of a SCH burst. As a result, the C0 channel number, the measured power of the BCCH signal and the frame synchronization time are known.

Info level 2 This info level is reached when the SCH could be reliably demodulated. The validity of the demodulated data is checked with the 10 parity bits available, so the probability that an error is not detected is about 1/1000. However, as the values have restricted ranges, this probability can be improved to an estimated 1/3000.

Because this probability is still too high, the data is only considered to be reliable if there are at least two independent SCH demodulations of one BTS reducing the error rate to a negligible value. The probability that an error is not detected is reduced to less than the factor $(1/3000)^2$, because the comparison of the SCH content of both signals provides an additional constraint.

The additional information obtained at this info level is the BCC, NCC and frame number. As soon as this info level is reached, the bars showing the measured power become colored.

Info level 3 The info level 3 is reached when the system information type 3 on the BCCH channel could be demodulated. The additional information obtained is the Cell Identity (CI), Location Area Code (LAC), Mobile Network Code (MNC) and Mobile Country Code (MCC).

By default, every new measurement result is compared with those already shown in the list. The values of a measurement in the list matching with the new one are updated. If the older measurement had a higher info level, the old values missing in the new measurement are kept in the display, indicated by values in brackets. This behavior can be changed in the configuration menu; see description of *Matching Entries: Action* panel on p. 4.405. The decision algorithm for two measurements belonging to the same BTS is described on p. 4.405.

GSM NWS Transmitter Scan View Configuration

The *GSM NWS Transmitter Scan* configuration menu defines criteria for the Transmitter Scan, sets conditions to decide whether two measurements belong to the same BTS and shows information on the current view version. It can be accessed via right mouse click at a point inside *GSM NWS Transmitter Scan* or via the *Configuration – Settings* command (see chapter 3).

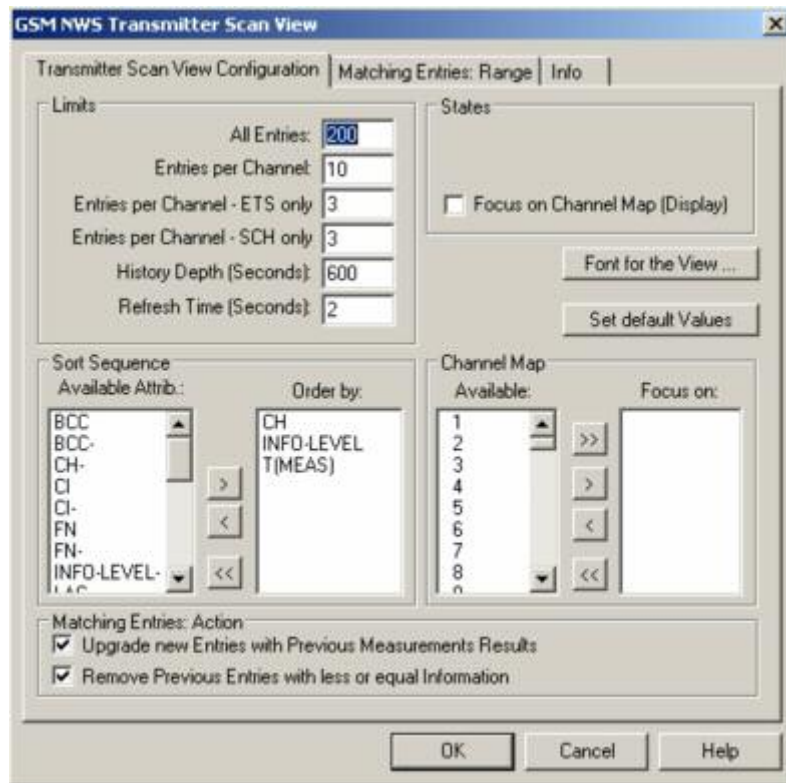


Fig. 4-241 Transmitter Scan View Configuration

This configuration dialog contains the following panels:

Limits

Limits the displayed data. The entries denote the following limitations:

- All Entries: The maximum number of signals displayed.
- Entries per Channel: The maximum number of signals displayed for each channel.
- Entries per Channel – ETS only: The maximum number of entries per channel which only have reached info level 1 (ETS: Extended Training Sequence).
- Entries per Channel – SCH only: The maximum number of entries per channel which only have reached info level 2.
- History depth (Minutes): Entries which have not been updated during the given amount of time are discarded from the display.
- Refresh Time (Seconds): The display is refreshed every time the Refresh Time has passed. Using higher values avoids the flickering of the diagram.

When the number of measurement data exceeds the above limitations, the oldest entries are discarded in the view.

Sort Sequence Specifies the criteria how the lines in the display are sorted.

Available Attrib.

List of available criteria (attributes). Any attribute can be selected to be appended to the end of *Order by:* list; see description of buttons below.

Order by

Specifies how the lines are sorted. In the example of the figure *above* the list is sorted according to channel numbers, all lines with the same channel number are sorted according to their info level, and so on. Sorting is always in ascending order.

The buttons between the two lists move a selected entry from one list to the other:



Removes the elements from the *Order by:* list and loads the default values.



A selected element in the Available Attributes list is moved to the end of the *Order by:* list. Alternatively, the element can be double clicked.



A selected element in the *Order by:* list is moved to the *Available Attrib.* list. Alternatively, the element can be double clicked.



Empties the *Order by:* list.

Note:

The measurement time T(MEAS) is stored internally in microseconds, although it is displayed in seconds. So it is recommended to use T(MEAS) only as a last sorting criteria in the Order by: list.

States

The *States* panel can be used to restrict the measurement (and display) range. Note that these restrictions can be changed even during a running measurement.

Focus on Channel Map (Display)

Restricts the displayed channels to those on which the focus is set in the *Channel Map* panel (see below).

Channel Map

The *Channel Map* is used to select the channels on which a focus can be set in the *States* panel (see above). It consists are two lists: The list with the available channels, and a list of channels specifying the focus when a corresponding item in the *States* field is selected.

The buttons between the two lists move a selected entry from one list to the other; see *Sort Sequence* above.

Matching Entries: Action

The *Matching Entries: Action* panel determines how a new entry to the *GSM NWS Transmitter Scan* view is displayed if it matches with one that was recorded before.

Upgrade new Entries with Previous Measurement Results

If this box is checked the entries in the old measurement are updated even if the new measurement has reached a lower info level. The missing entries in the new measurement result are taken over from the old entry and displayed in brackets. If the box is not checked, a new measurement with a lower info level is displayed in a separate line.

Remove Previous Entries with less or equal Information

A new measurement only updates the old one if this item is selected, otherwise it is displayed in a separate line. Deselecting this item allows e.g. to investigate the drift behavior of a BTS.

Matching Entries: Range

For the decision whether two measurement results originate from the same BTS the following criteria apply:

- The decoded information available in both signals (info level 2 or 3) must correspond.
- The offset times of both bursts must match to some measurement error.

The *Matching Entries: Range* tab sets the criteria for the allowed measurement error in order to decide whether criterion 2 is fulfilled. In case of doubt it is recommended to keep the default values.



Fig. 4-242 GSM NWS Scan View Configuration: Matching Entries: Range

The matching entries are illustrated in the following figure:

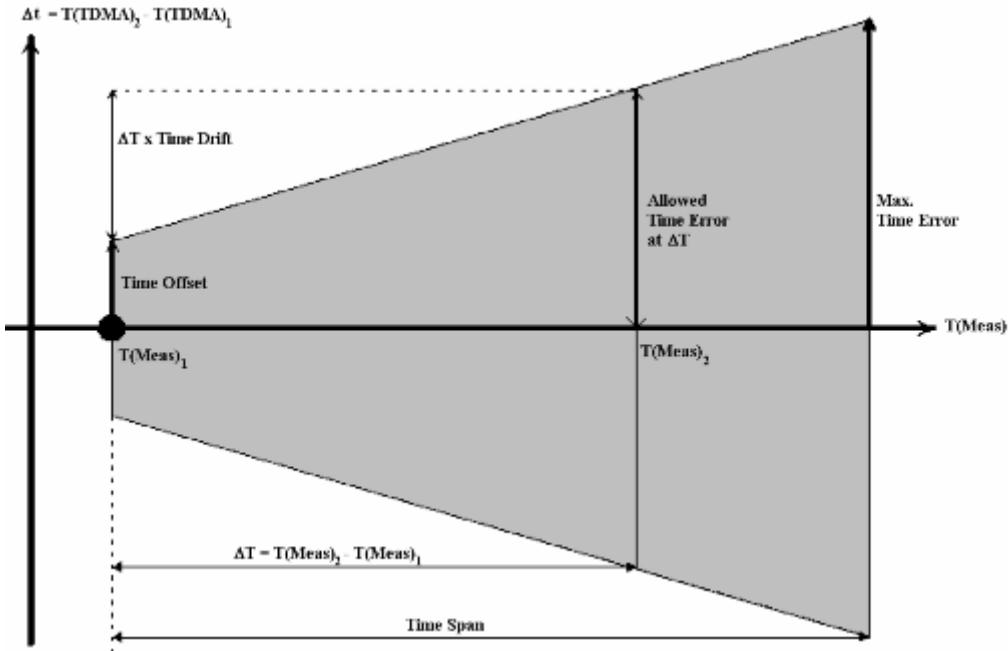


Fig. 4-243 Matching Entries: Range Parameter Explanation

The decision whether two detected signals originate from the same BTS is based on a comparison of the measurement times $T(\text{Meas})$ for both signals and of their measured time offsets $T(\text{TDMA})$. The figure above shows the matching entries in the $T(\text{Meas})$ - $T(\text{TDMA})$ -plane: If the large dot at $T(\text{Meas})_1$ corresponds to the measurement result for signal 1 and the result for signal 2 is within the shaded area, then the two signals are considered to originate from the same BTS. If both signals contain at least info level 2, then the TDMA frame number is compared in addition, which extremely enhances the accuracy.

Matching Area The shaded matching area in the figure above is bordered by the measurement time of the first signal detected $T(\text{Meas})_1$, the measurement time $T(\text{Meas})_1$ plus the *Time Span*, and the straight lines parametrized by the equations

$$\Delta t = \pm (\langle \text{Time Offset} \rangle + \langle \text{Time Drift} \rangle \times [T(\text{Meas}) - T(\text{Meas})_1]) \quad (\text{Equation 1})$$

The *Time Offset*, *Time Drift*, and *Time Span* can be entered in the input fields in the *Matching Entries: Range* tab. They provide estimates for possible errors from different sources that might cause the measured time offsets $T(\text{TDMA})$ for two signals from the same BTS to be different.

Time Offset Difference of the measured time offsets $T(\text{TDMA})$ for two signals due to measurement inaccuracies, e.g. caused by reflections.

Time Drift Drift of $T(\text{TDMA})$ in time, caused by the BTS, the receiver, or a time delay due to a location update.

- Time Span for...** Maximum difference of the measurement time beyond which two signals are generally considered to be different. The *Time Span* can be set independently for the case that at least one signal has only reached info level 1 (*Time Span for ETS*) and for the case that both signals have reached at least info level 2 (*Time Span for SCH*). In the latter case, higher values for the *Time Span* are reasonable, because the inclusion of the TDMA frame number minimizes the accidental time offset coincidences considerably.
- Max. Time Error** Maximum time error allowed calculated according to Equation 1 above, where $T(\text{Meas}) = \text{Time Span}$; for information only.

GSM NWS Frequency Reuse Views

Interference in Mobile Networks is either caused by co-channel or adjacent channel, broadcast control channel or traffic channel Interference, or other sources like spurious emissions and intermodulation.

The *GSM NWS Frequency Reuse View* is an analysis tool for the interference situations detected with a GSM test mobile and with a R&S TSMx radio network analyzer (GSM network scanner).

The scanner continuously measures the bands and delivers the base data for the interference process when a potential interference situation has been reported from the mobile. This can be either specific RxLev/RxQual combinations or exceed C/I thresholds on C0 and Cx of the serving cell.

When this is the case, the interference analysis process accesses the scanner data and combines it with the Test Mobile data and the Base Station database, so that an immediate picture on the interference situation on co-channel and adjacent channels is given. This way interference on C0/C0, C0/Cx, Cx/C0 and Cx/Cx can be detected, the source of interference analyzed and possibly eliminated.



The GSM network scanner-based interference analysis with option R&S TSMU-K13/ROMES-GS3 is different from the interference analysis based on the option R&S ROMES-GS1 described in chapter 2. Details and an example for the interference analysis are available in the R&S newsletter No. 190 - 2006/II.

The *GSM NWS Frequency Reuse View* lists all events during interference analysis, which include time-stamp, details of the interference event, description of the serving cell, channel / frequency hopping, C/I value from the test mobile (if available), and the test mobile triggering the interference analysis.

R&S ROMES provides three different versions of the view named *Co Channel Interferer*, *Adj. Channel Interferer*, and *Event List*.

GSM NWS Frequency Reuse View – Co Channel Interferer

The *GSM NWS Frequency Reuse View – Co Channel Interferer* provides detailed information about the serving cell, the potential co-channel interferers, and the characteristics of the interference situations encountered during the measurement tour.

A co-channel interferer is a neighbor cell that has a C0 channel (BCCH, SCH...) or a Cx channel (TCH) in common with one of the channels of the serving cell. To analyze possible adjacent channel interferers use the *GSM NWS Frequency Reuse View – Adj. Channel Interferer* described on page 4.414.

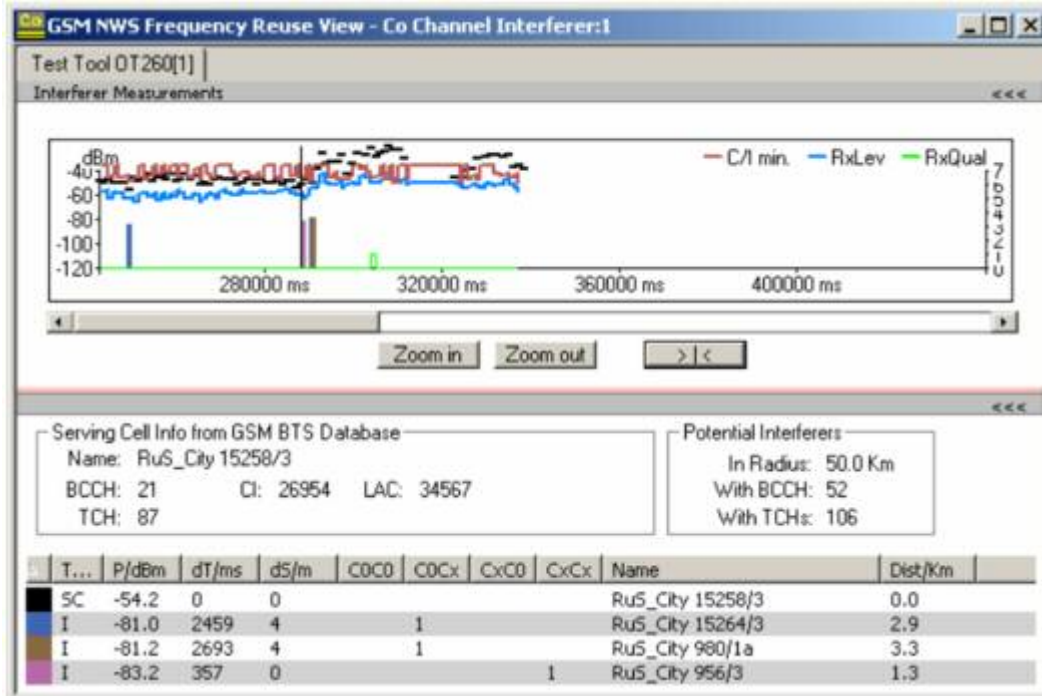


Fig. 4-244 GSM NWS Frequency Reuse View: Co Channel Interferer

View area The entire view area is horizontally split to accommodate a 2D chart (*Interferer Measurements*) and different tables with detailed information about the current serving cell and interference situation.

A click on the upper (*Interferer Measurements*) or lower title bar compresses and expands the corresponding section in the view area. A compressed section leaves more space for the other section. A compressed table is characterized by the symbol >>> (instead of <<<) in its title bar. On pausing on one of the title bars, the cursor displays a compress symbol.

Various settings in the configuration menu control the contents and the appearance of the view areas.

2D Chart (Interferer Measurements)

The diagram in the upper view section shows the changes of the interference situation over time. The diagram contains measurement curves with the following mobile data:

- Carrier-to-Interference ratio *C/I* measured by the mobile in dedicated mode. This value is only measured by Sagem test mobiles. In frequency hopping mode, the minimum *C/I* value of all channels is displayed.
- *RxLev* and *RxQual* values from the mobile measurement reports, measured in dedicated mode.

In addition, colored bars show the following R&S TSMx network scanner data:

- Measured SCH power of the serving cell in dBm (horizontal, black bars).
- Measured SCH power of the potential interferers in dBm (vertical, colored bars). The colors distinguish between the different interferers; they are also used in the top N list below.

The *Zoom In* and *Zoom out* buttons shrink or enlarge the chart. If *Scan File* is activated, the "> | <" button restores the original view scale.



Clicking a colored interferer bar opens a window with the SCH power of the serving cell, the name of the interferer, and the exact SCH power result. The view also supports the coupled focus (use *ALT* plus a double-click inside the view). A BTS data base is required to obtain these results.

Serving Cell Info

The *Serving Cell Info...* panel shows the parameters of the current serving cell extracted from the GSM BTS database: serving cell name (*Name*), *BCCH* channel number, *TCH* channel number, cell identity (*CI*), Location Area Code (*LAC*). The parameters are not available if no BTS data base is provided.

Potential Interferers

The *Potential Interferers...* panel shows the number of the potential interferers in the vicinity of the serving cell. Potential interferers are extracted from the network data base:

- In Radius* Maximum distance between the current position and the potential interferer as specified in the *Threshold Values* tab of the configuration menu.
- BCCH* Number of neighbor base stations using the same *BCCH* as the serving cell.
- TCH* Number of neighbor base stations using one or more *TCH* in common with the serving cell.

The parameters are not available if no BTS data base is provided.

Top N List

The table below the *Serving Cell Info* and the *Potential Interferers* panels shows the parameters of the serving cell and the strongest neighbor cells (Top N pool), sorted according to their SCH power (*P/dBm*). In contrast to the information above, the values are measured by the test mobile and the R&S TSMU network scanner. The contents of the list, in particular the number of displayed cells, can be configured in *Threshold Values* tab of the configuration menu.

<i>Type</i>	Cell type as detected by the test mobile: SC (serving cell) or I (interferer)
<i>P/dBm</i>	Measured SCH power in dBm. The top N pool for the <i>GSM NWS Frequency Reuse View</i> contains the cells with the strongest SCH power.
<i>dT/ms</i>	BCCH time offset of the interferers relative to the serving cell, obtained by the network scanner.
<i>dS/m</i>	Distance between the measurement position of the SC and the interferer. 0 means that both cells were measured in the same network scan.
<i>C0C0</i>	A channel number (ARFCN) indicates a C0C0 interference: The BCCH numbers of the interferer and the serving cell are equal.
<i>C0Cx</i>	A channel number (ARFCN) indicates a possible C0Cx interference: One of the TCH channel numbers of the interferer is equal to the BCCH number of the serving cell.
<i>CxC0</i>	A channel number (ARFCN) indicates a possible CxC0 interference: One of the TCH channel numbers of the serving cell is equal to the BCCH number of the interferer.
<i>CxCx</i>	A list of channel numbers (ARFCNs) indicates possible CxCx interferences: One or more of the TCH numbers of the interferer and the serving cell are equal.
<i>Name</i>	BTS name and sector number from the BTS data base.
<i>Dist./km</i>	Distance between the potential interferer and the serving cell in km, calculated from the BTS data base. 0 km means that the interferer is a different sector of the same BTS.

A click on an interferer highlights the SC and the interferer in the *Route Track* view. A click on a SC highlights this SC.

Context menu

A right mouse click on any point in the view opens the context menu to print the view contents, access the configuration menus, (de-)select the view for fast replay, copy the current view to the clipboard, create or delete views, save the current configuration, or move to another worksheet; see [Context menu](#) description on p. 4.2.

GSM NWS Frequency Reuse View – Co Channel Interferer Configuration

The *GSM NWS Frequency Reuse View – Co Channel Interferer* configuration menu selects the contents of the view tables, sets general view options, and defines conditions for the generated alarm messages and the displayed potential interferers. It is opened via a right mouse click on a point inside *GSM NWS Frequency Reuse View – Co Channel Interferer* or via the *Configuration – Settings* command (see chapter 3).

The *Frequency Reuse View Configuration* tab selects the contents of the view tables and sets general view options

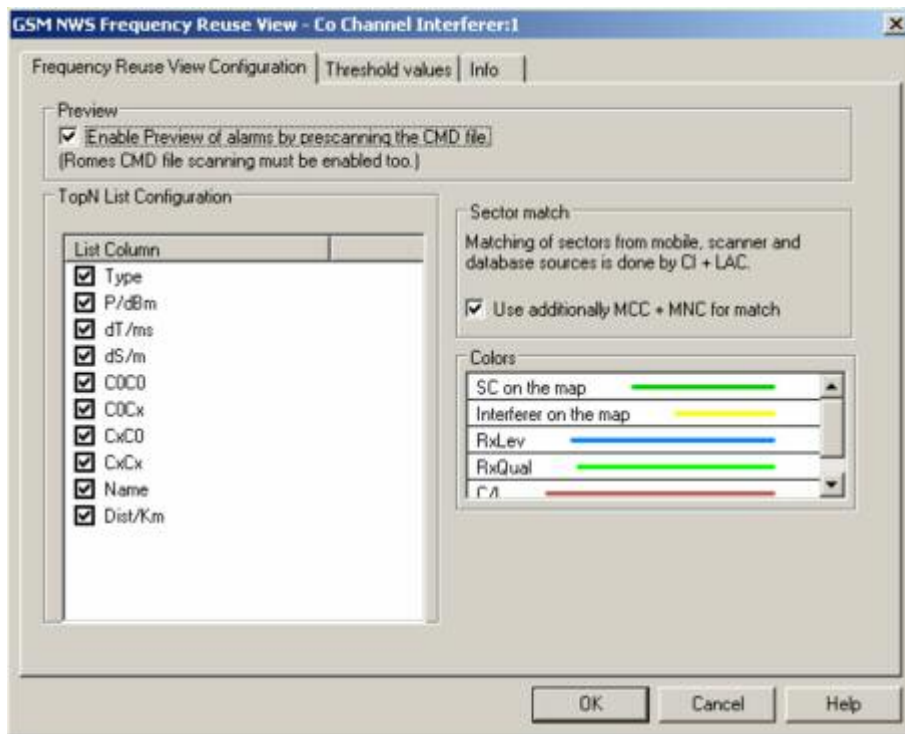


Fig. 4-245 GSM NWS Frequency Reuse View: Configuration

Preview

Enables a prescan of the CMD file at the beginning of the replay session in order to display all alarm messages in the *GSM NWS Frequency Reuse View – Event List*. As a precondition, *Enable CMD File Scanning* must be enabled in the *General* tab of the *ROMES Configuration* menu (*Configuration – Preferences*).

An alarm is created if the conditions specified in the *Threshold Values* tab are met. The coupled focus can be used to place the marker line in the diagram to the time of the alarm and study the top N table for a detailed analysis of the interferer situation.

Top N list configuration

All results selected as *List Columns* are displayed in the top N list in the lower section of the view. Cleared results are omitted.



Restricting the viewed results makes it easier to read the tables if only a subset of the available parameters is needed; it also saves system resources required for post-processing of measured data. To restrict the number of parameters measured and enhance the system performance during the measurement, use the settings in the driver configuration menus (see chapter 6).

Sector match

Defines the way R&S ROMES assigns a measured signal to a BTS sector in the GSM BTS database:

- If the MCC and MNC is not considered, the assignment is based on a matching Cell Identity (CI) and Location Area Code (LAC). This may result in ambiguities because providers assign the same CIs in different countries and networks.
- If the MCC and MNC is considered in addition, the assignment is unambiguous, however, the BTS database must contain the MCC and MNC information.

Colors

Selects the color scheme for the displayed elements in the *Interferer Measurements* chart.

The *Threshold Values* tab sets conditions for the generated alarm messages and the displayed potential interferers.

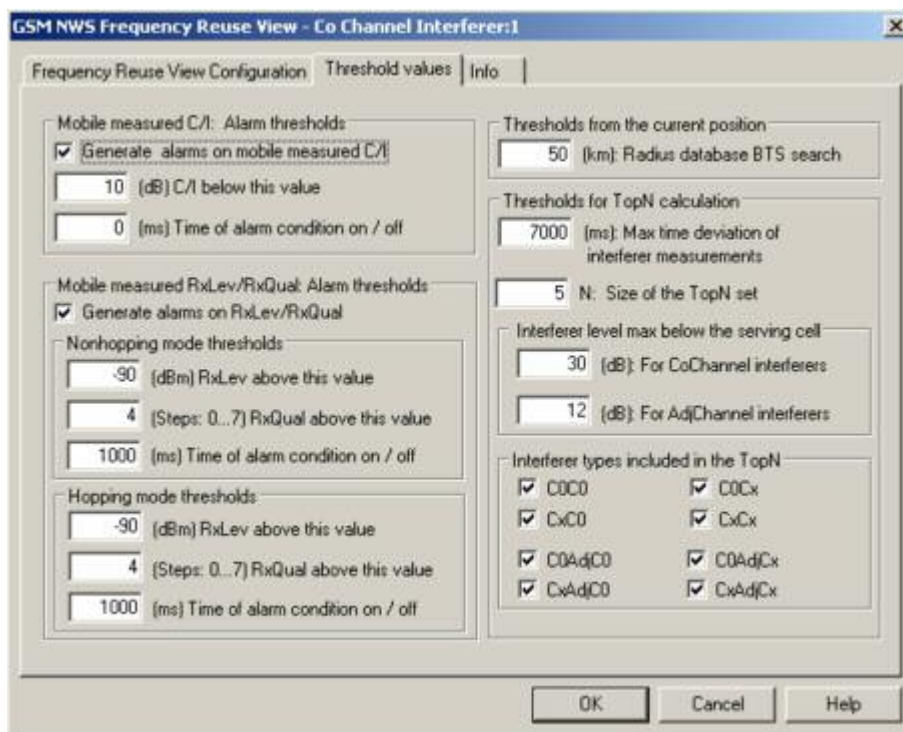


Fig. 4-246 GSM NWS Frequency Reuse View: Threshold Values

Alarm thresholds Depending on the parameters for the reception quality that the mobile provides in its measurement reports, R&S ROMES can generate two different and independent alarm types:

- A C/I alarm can be generated if the reported C/I values fall below a specified threshold. C/I alarms require a Sagem or Siemens mobile phone.
- A dedicated mode alarm can be generated if the reported RxQual is above a specified value (i.e. the bit error rate is high) although RxLev is sufficiently high (see definition of RX Level and RX Quality in chapter 8). A bad RxQual at high RxLev is likely to be caused by interfering signals.

For both alarm types it is possible to specify a minimum time interval during which the alarm conditions must be met. A zero time of alarm means that the alarm is already generated if the alarm conditions are met in a single measurement.

The alarm events are displayed in the *GSM NWS Frequency Reuse View – Event List*. The list remains empty while no alarm situation is detected.

Thresholds from the current position

The BTS search threshold limits the database search for potential interferers to a circle around the current position with specified radius. Base stations outside this radius are not considered as Potential Interferers. They are also discarded for the top N list in the lower part of the NWS Frequency Reuse View.

Thresholds for top N calculation

The values in this panel limit the number of entries in the top N list in the lower part of the NWS Frequency Reuse View.

Max. time dev....

Maximum time offset between 0 and 60 s. The selected value should at least cover a measurement cycle.

Size of the Top N set

Maximum number of entries (BTS sectors) in the top N list.

Interferer level...

Minimum interferer level relative to the carrier level. In general there is no need to analyze very weak interfering signals. The effect of adjacent channel interferers is due to their out-of-channel emissions, so it makes sense to select a larger threshold for them.

Interferer Types...

Restriction of the top N lists to interferers of specific types (see description of the top N lists). The interferer types for co-channel and adjacent channel interferers can be selected independently.

GSM NWS Frequency Reuse View – Adj. Channel Interferer

The *GSM NWS Frequency Reuse View – Adj. Channel Interferer* provides detailed information about the serving cell, the potential adjacent channel interferers, and the characteristics of the interference situations encountered during the measurement tour.

An adjacent channel interferer is a neighbor cell that has a C0 channel (BCCH, SCH...) or a Cx channel (TCH) adjacent to one of the channels of the serving cell (the channel numbers differ by ± 1). To analyze possible co-channel interferers use the *GSM NWS Frequency Reuse View – Co Channel Interferer* described on page 4.408.

The view contents of the *Adj. Channel Interferer* view are analogous to the *Co Channel Interferer* view. Both views use the same configuration menu (i.e. all configuration settings are valid for both views).

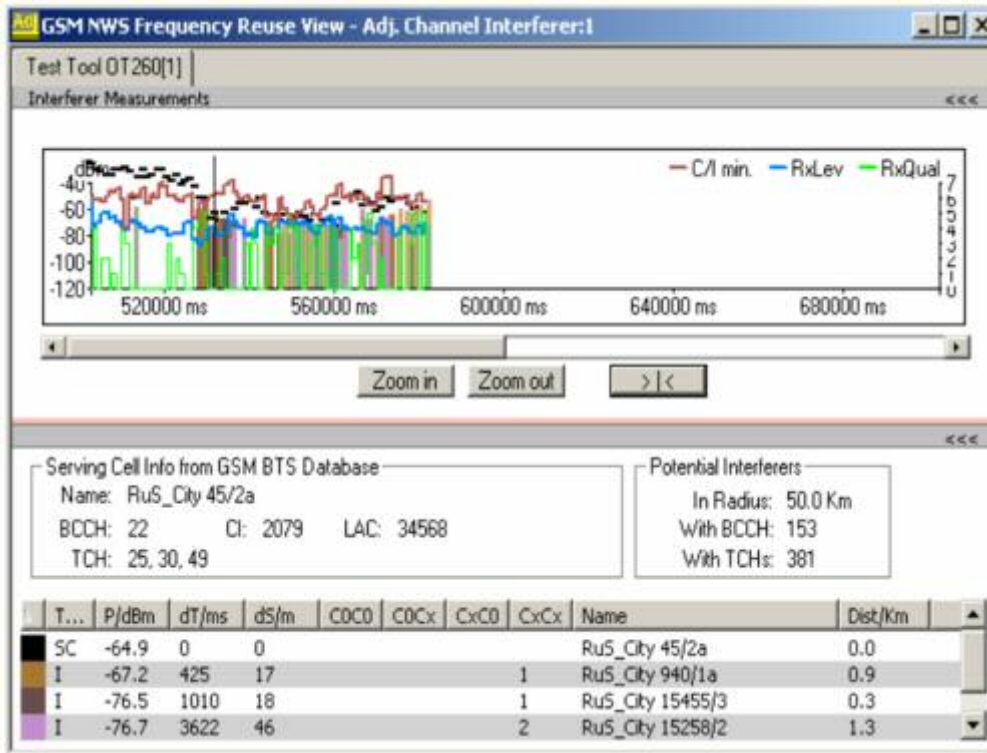


Fig. 4-247 GSM NWS Frequency Reuse View: Adj. Channel Interferer

GSM NWS Frequency Reuse View – Event List

The *GSM NWS Frequency Reuse View – Event List* contains a list of alarm messages generated according to the C/I and RxQual values measured by the test mobile. Conditions for alarm messages (alarm thresholds) can be set in the *Thresholds* tab of the *Co Channel Interferer* configuration menu; see figure on p. 4.412. Therefore, the contents of the *Event List* are not fixed for a given measurement file but vary depending on the alarm thresholds.



Activate the preview feature in the *Frequency Reuse View Configuration* tab of the *co-channel or adjacent channel interferer configuration* menu (see figure on p. 4.411) if you want to prescan the .CMD file in order to display all alarm messages at the beginning of the replay session.

Time	Details	Serving cell	Chan.	C/I dB	Mobile
410924 ms	Mobile measured C/I < threshold value	RuS_City 45/1a	89	9.0	Test Tool OT260[1]
416455 ms	Mobile measured C/I < threshold value	RuS_City 45/1a	44	9.4	Test Tool OT260[1]
418971 ms	Mobile measured C/I < threshold value	RuS_City 45/1a	44	9.8	Test Tool OT260[1]
422486 ms	Mobile measured C/I < threshold value	RuS_City 45/1a	44	9.9	Test Tool OT260[1]
426518 ms	RxLev/RxQual thresholds in dedicated mode exceeded	RuS_City 45/1a	-	-	Test Tool OT260[1]
495970 ms	Mobile measured C/I < threshold value	RuS_City M5456/1	32	5.8	Test Tool OT260[1]
496970 ms	RxLev/RxQual thresholds in dedicated mode exceeded	RuS_City M5456/1	-	-	Test Tool OT260[1]
510564 ms	Mobile measured C/I < threshold value	RuS_City 45/2a	30	1.6	Test Tool OT260[1]
526673 ms	Mobile measured C/I < threshold value	RuS_City 45/2a	49	5.3	Test Tool OT260[1]
527673 ms	Mobile measured C/I < threshold value	RuS_City 45/2a	25	9.3	Test Tool OT260[1]
528189 ms	RxLev/RxQual thresholds in dedicated mode exceeded	RuS_City 45/2a	-	-	Test Tool OT260[1]
529188 ms	Mobile measured C/I < threshold value	RuS_City 45/2a	30	9.0	Test Tool OT260[1]
543783 ms	Mobile measured C/I < threshold value	RuS_City 45/2a	49	5.8	Test Tool OT260[1]
544797 ms	Mobile measured C/I < threshold value	RuS_City 45/2a	22	6.3	Test Tool OT260[1]
547814 ms	Mobile measured C/I < threshold value	RuS_City 45/2a	22	8.8	Test Tool OT260[1]
554359 ms	Mobile measured C/I < threshold value	RuS_City 45/2a	22	9.2	Test Tool OT260[1]
555361 ms	Mobile measured C/I < threshold value	RuS_City 45/2a	30	6.3	Test Tool OT260[1]
567939 ms	RxLev/RxQual thresholds in dedicated mode exceeded	RuS_City 45/2a	-	-	Test Tool OT260[1]
577502 ms	Mobile measured C/I < threshold value	RuS_City 45/2a	49	9.6	Test Tool OT260[1]
578516 ms	RxLev/RxQual thresholds in dedicated mode exceeded	RuS_City 45/2a	-	-	Test Tool OT260[1]
612735 ms	Mobile measured C/I < threshold value	RuS_City 15858/4	587	-6.0	Test Tool OT260[1]

Fig. 4-248G SM NWS Frequency Reuse View: Event List

Alarm List

The event list indicates all alarm events during the measurement. The alarm messages are displayed together with a timestamp, the serving cell name (if a BTS data base is available), and the name of the test mobile. For C/I alarms, the channel number and the C/I value in dB is displayed in addition.

The test mobile and PN scanner can generate the C/I and RxQual alarm types described on p. 4.413 (see paragraph on [Alarm thresholds](#)).

GSM NWS Frequency Reuse View – Event List Configuration

The *GSM NWS Frequency Reuse View – Event List* configuration menu selects the contents of the event list and shows information about the view version.

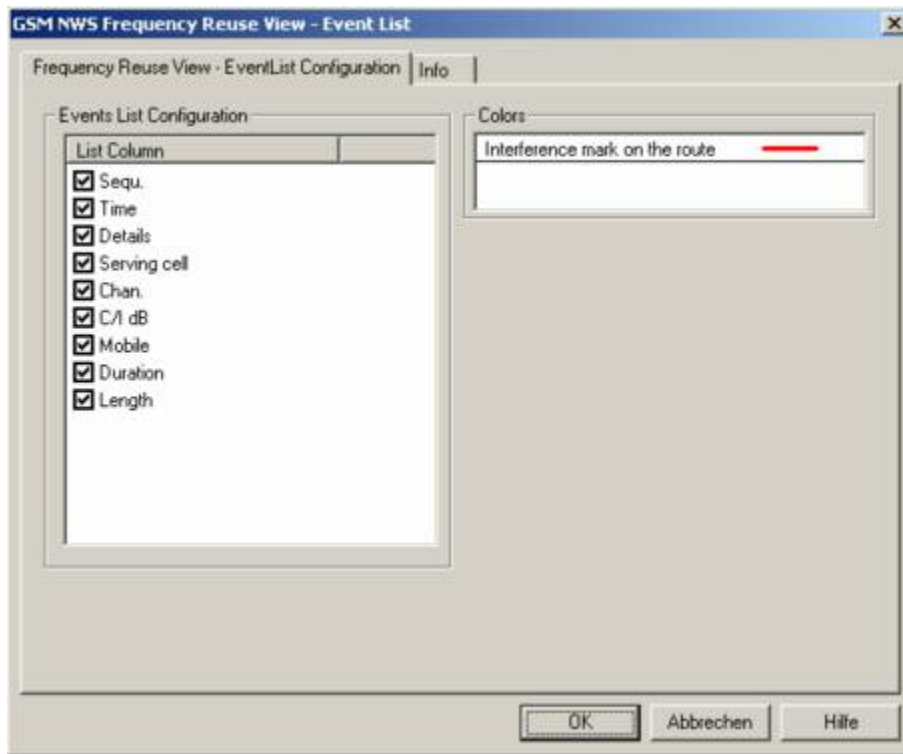


Fig. 4-249 GSM NWS Frequency Reuse View: Event List Configuration

Colors Selects the color scheme for the displayed elements in the *event list*.

GSM NWS Top N View

The *GSM NWS Top N View* displays the properties of the signals from the base transceiver stations that are elements of the *Top N Pools* defined in the driver configuration menu. A Top N Pool contains up to N BSICs with specific characteristics providing the strongest synchronization channel P(SCH) level at a given position and time; for more information refer to the description of the driver configuration menu in chapter 6.

The view area is divided into a list and a chart panel:

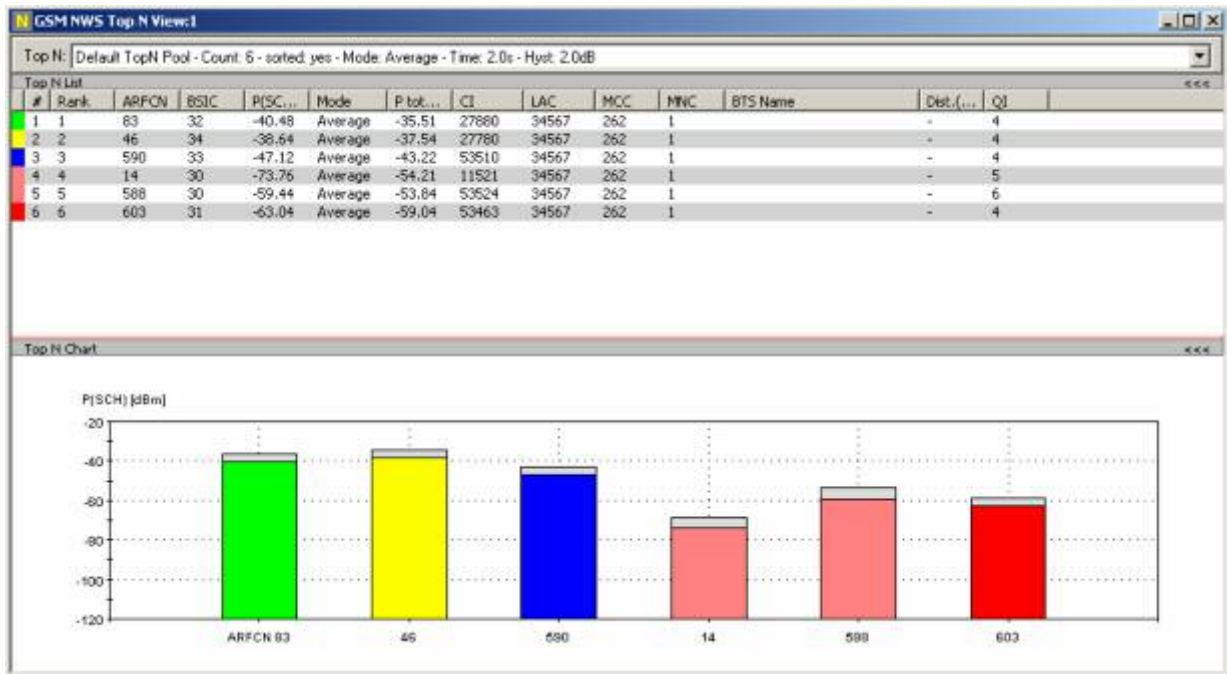


Fig. 4-250 GSM NWS Top N View

View area

The entire view area is horizontally split to accommodate a list with all defined *Top N* measurements, and a bar chart.

A click on the *Top N List* or *Top N Chart* title bars compresses and expands the table or chart. A compressed chart leaves more space for the table and vice versa. A compressed subpanel is characterized by the symbol >>> (instead of <<<) in its title bar. On pausing on one of the title bars, the cursor displays a compress symbol.

Top N List

Below the view title, the *Top N* list contains all top N pools defined in the *Top N* tab of the driver configuration menu.

The *Top N List* gives an overview of the received signals in the current top N pool together with their measured power parameters, frequency and timing information. On mouse rollover, each cell in the table header provides a short explanation of the corresponding column. The *Top N List* contains the following columns:

#	Number of the measured SCH within the Top N pool. The SCHs are numbered in ascending order, according to the time when they enter the Top N pool. This means that the current numbers tend to increase as the measurement progresses.
Rank	Current rank of the measured SCH within the Top N pool, according to its average or maximum Ec/Io (see driver configuration menu). The ranks are reassigned every time the pool is updated; they are in the range $1 \leq Rank \leq N$.
ARFCN	Absolute Radio Frequency Channel Number, the GSM channel number of the measured SCH.
BSIC	Base transceiver station (BTS) identity code. In this view, the BSIC is always octal (so that BSIC = ab where a is the NCC and b is the BCC), irrespective of the format selected in the <i>Available Signals</i> tab of the <i>Preferences</i> menu (octal/decimal/hex).
P(SCH) [dBm]	Code power of the measured SCH (synchronization channel)
Mode	Valuation method (average, min./max.)
P total [dBm]	Max. slot power measured in the GSM channel
CI	Cell Identity (16 bit)
LAC	Location Area Code
MCC	Mobile Country Code
MNC	Mobile Network Code
BTS Name	Name of the closest base transceiver station with matching MNC, MCC, LAC, and CI. This parameter is displayed if a valid BTS list is available. Detailed information can be obtained by double-clicking the BTS name.

Note:

R&S ROMES uses the BCCH and the BSIC to identify the BTS name. If the BTS assignment is ambiguous because several BTS with the same BCCH and BSIC are encountered, then a plus "+" sign precedes the BTS name.

Dist. (km)	Distance to the BTS (in kilometers)
QI	Quality Indicator

In the view configuration menu, it is possible to show or hide each individual table column.

Diagram

Below the table, the *Top N Chart* shows the code power of the measured SCH (synchronization channel) for all ARFCN signals in the current top N measurement as a bar chart.

In the configuration menu, it is also possible to select the upper and lower P(SCH) levels for the y-axis of the chart.

Context menu



A right mouse click on any point in the view opens the context menu to access the configuration menus, (de-)select the view for fast replay, put the view on hold, copy the current view to the clipboard, create or delete views, or save the current configuration; see [Context menu](#) description on p. 4.2.

GSM NWS Top N Configuration

The *GSM NWS Top N* configuration menu defines the y-axis scale, i.e. the minimum (*P(SCH) Min [dBm]*) and the maximum (*P(SCH) Max [dBm]*) level to be displayed in the *GSM NWS Top N View* and selects the contents of the table. It is opened via a right mouse click on a point inside the *GSM NWS Top N View* or via the *Configuration – Settings* command (see chapter 3).

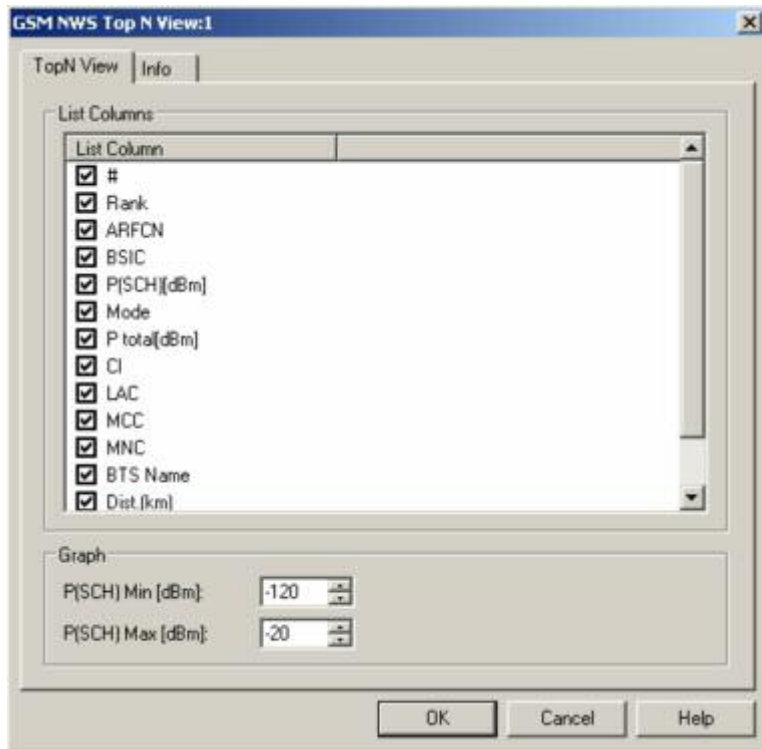


Fig. 4-251 GSM NWS Top N configuration: Top N View

Graph

P(SCH) Min/Max [dBm]

Sets the upper and lower P(SCH) levels for the y-axis of the chart.

WLAN Views

The *WLAN Views* show the WLAN information obtained in the network scans performed by a WLAN adapter in regular intervals. WLAN data can be acquired with Wireless LAN Client Adapters supporting Network Device Interface Specification (NDIS) V5.1 or higher using the *R&S IEEE 802.11 Wireless LAN NDIS* driver.

The *WLAN Views* can be selected from a submenu displayed on the right side of the *View* menu when the mouse pauses over *WLAN Views*.

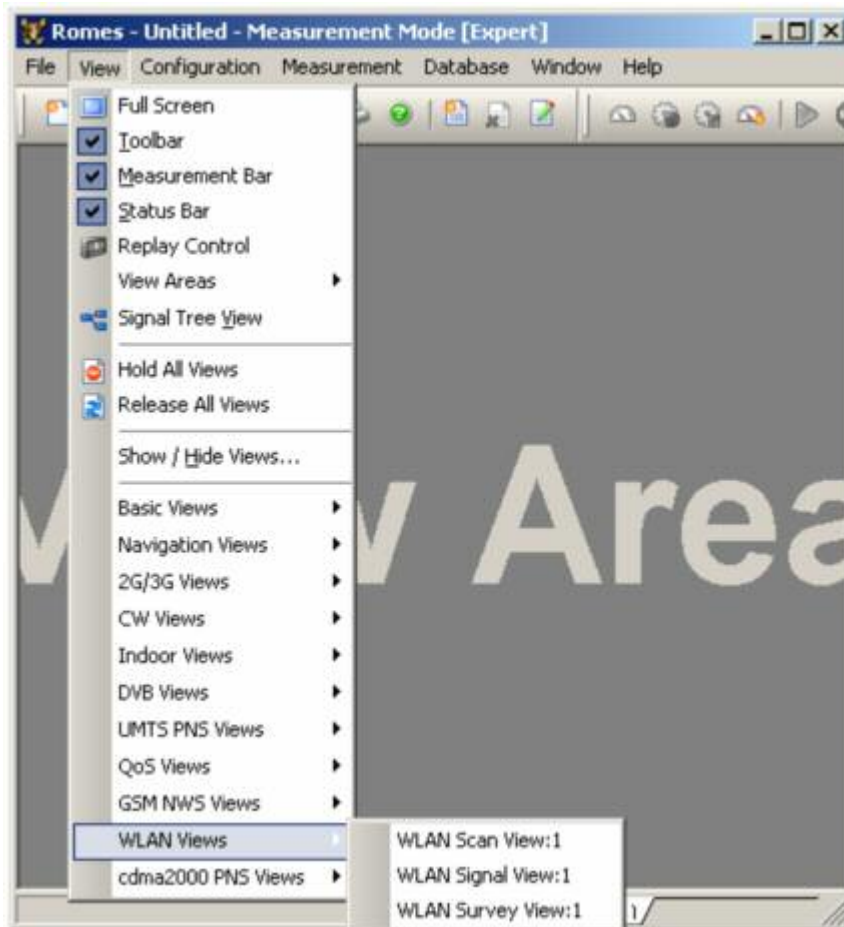


Fig. 4-252 WLAN views

WLAN adapters constantly monitor and report a large number of parameters describing the current signal quality and data traffic. The parameters are used to generate the signals in the WLAN section of the data tree. The signals complement the WLAN network scan information; they can be viewed in the *Basic Views*.

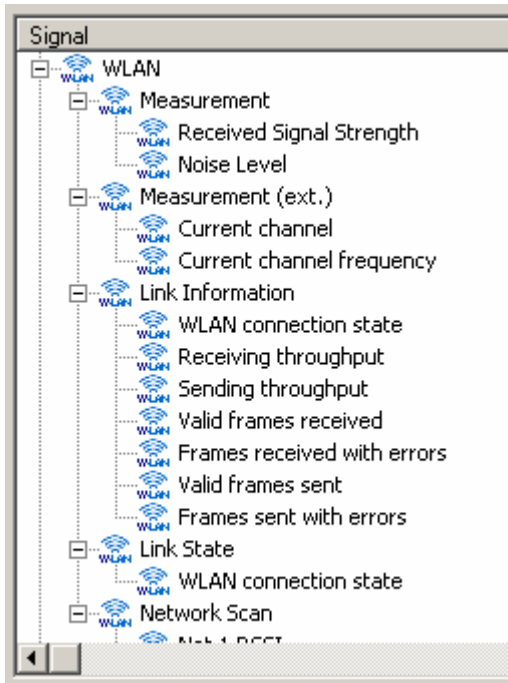


Fig. 4-253 WLAN signals

Note:

The data to be displayed in the WLAN views is collected by the test device during the network scan. It is only transferred to R&S ROMES and stored to a measurement file after the network scan is complete. In contrast the Received Signal Strength, the Link Information and the Link State signals (see figure above) are continuously monitored. As a consequence, the current Received Signal Strength is generally not equal to the RSSI displayed in the Scan View.

WLAN Scan View

The WLAN Scan View displays basic information acquired in a WLAN network scan (WLAN BSSID list information).

Network	MAC Address	MHz	Chan.	WEP	Mode	Type	Supported Rates [M...	Beacon[Kqs]	ATIM[Kqs]	dBm
Kabeldeutschland-20	00:02:6F:20...	2412	1	No	Infrastructure	OFDM 2.4 GHz	1/2/5.5 6/9/11 12/1...	100	0	-79
RUSTRAIN	00:0B:85:5A...	2412	11	Yes	Infrastructure	OFDM 2.4 GHz	1/2/5.5/11 6/9/12/18...	100	0	-72
Kabeldeutschland-20	00:02:6F:20...	2472	13	No	Infrastructure	OFDM 2.4 GHz	1/2/5.5/11 6/9/12/18...	100	0	-80
Kabeldeutschland-20	00:02:6F:20...	2432	5	No	Infrastructure	OFDM 2.4 GHz	1/2/5.5/11 6/9/12/18...	100	0	-84
Kabeldeutschland-20	00:02:6F:20...	2452	9	No	Infrastructure	OFDM 2.4 GHz	1/2/5.5 6/9/11 12/1...	100	0	-77
RUSTRAIN	00:0B:85:5A...	2412	1	Yes	Infrastructure	OFDM 2.4 GHz	1/2/5.5/11 6/9/12/18...	100	0	-86
Verizon Wi-Fi	E2:98:F5:63...	2457	10	No	Ad Hoc	DS	1/2/5.5/11	100	0	-95

Fig. 4-254 WLAN Scan View

The results provided by each test device are displayed in a separate tab. Each tab shows the WLAN parameters of the signals from the access points detected by the test device in a network scan. The results are updated every time the test device terminates a network scan.

WLAN Parameters

Each access point generates a table row with a colored analog bar. The columns displayed and the maximum number of rows (access points) can be limited in the configuration menu. The length of each bar is a measure for the received signal strength (*RSSI*) of the signal from the access point; the numeric *RSSI* value appears in the *dBm* row. The scale settings in the configuration menu define the length of the bars.

The table contains the following parameters:

<i>Network</i>	Network name
<i>MAC Address</i>	Media Access Control (MAC) address of the access point or other client, depending on whether the test device operates in infrastructure or ad hoc mode. The MAC is a unique serial number assigned to a networking device by the manufacturer.
<i>Chan.</i>	Channel identifier of the radio channel that the test device uses for communication.
<i>MHz</i>	Center frequency of the used channel. According to standard IEEE 802.11b, the channel numbers 1 to 14 correspond to center frequencies of 2412 MHz, 2417 MHz ... 2484 MHz. Depending on the regulatory domain, the channel range may be restricted.
<i>WEP</i>	Use of Wired Equivalent Privacy (<i>Yes/No</i>). WEP is an optional security mechanism defined within the 802.11 standard designed to protect the data as it is transmitted through the wireless network.
<i>Mode</i>	<i>Infrastructure</i> or <i>Ad hoc</i> mode. In <i>Infrastructure</i> mode the test device can communicate with access points and other network infrastructure devices; in <i>Ad hoc</i> mode, it can also communicate with other client devices.
<i>Type</i>	Spread-spectrum type used for the physical layer: Direct Sequence (<i>DS</i>) or Frequency Hopping (<i>FS</i>).
<i>Rates [MBit/s]</i>	Data rate at which the test device should transmit or receive data. <i>1/2/5/11/18/24/36/54</i> means that a 5-GHz test device uses Auto Rate Selection.
<i>Beacon [Kμs]</i>	Beacon period in the range between 20 K μ s and 976 K μ s, specifies the duration between beacon packets, which are used to help clients find each other in ad hoc mode. (K μ s is a measurement unit in software terms, K = 1024, μ = 10 ⁻⁶ , s = seconds, therefore 1 K μ s = 0.001024 seconds = 1.024 ms.)
<i>ATIM [Kμs]</i>	Wake duration, specifies the amount of time following a beacon that the test device stays awake to receive announcement traffic indication message (ATIM) packets, which are sent to the adapter to keep it awake until the next beacon.
<i>dBm</i>	Signal strength for all received packets (<i>RSSI</i>).
<i>Hop Set</i>	Frequency hopping set including up to 78 pattern used in <i>FS</i> type transmission.
<i>Hop Pattern</i>	Hopping pattern number used in <i>FS</i> type transmission.

Context menu

A right mouse click on any point in the view opens the context menu to print the view contents, access the configuration menus, (de-)select the view for fast replay, copy the current view to the clipboard, create or delete views, save the current configuration, or move to another worksheet; see [Context menu](#) description on p. 4.2.

WLAN Scan View Configuration

The *WLAN Scan View Configuration* menu specifies the scale and the contents of the view, defines the color settings, and displays information about the view version. It is opened via a right mouse click on a point inside the *WLAN View* or via the *Configuration – Settings* command (see chapter 3).

The *Configuration* tab defines the scale for the bars in the *WLAN Scan View*, specifies the maximum number of bars and selects the parameters shown in the table.

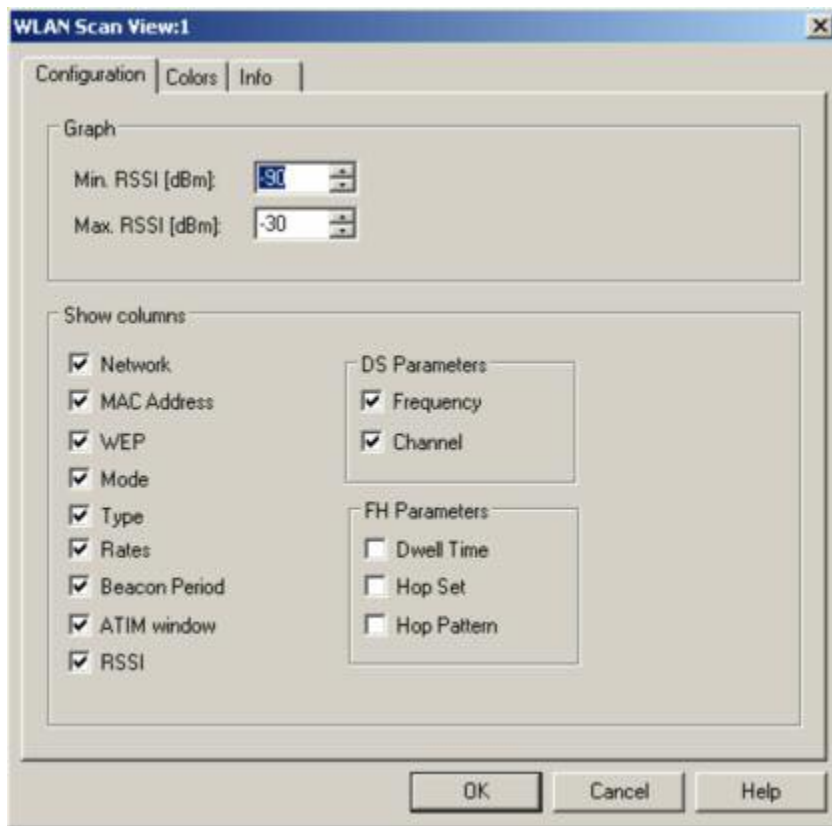


Fig. 4-255 WLAN Scan View configuration: Configuration

Graph The three input fields in the *Graph* panel define the RSSI levels corresponding to bars of zero length and full length. The actual length of the bars in the *WLAN Scan View* is equal to:

$$L = \text{RSSI [dBm]} * \text{<full length>} / (\text{Max. RSSI [dBm]} - \text{Min. RSSI [dBm]})$$

Max. Count

Maximum number of bars/access points displayed in the *WLAN Scan View*. The actual number can be smaller, if less than *Max. Count* access point signals are detected.

Show Columns Selects the parameters to be displayed in the *WLAN Scan View* table.

The *Colors* tab of the *WLAN Scan View* configuration menu defines the colors for all WLAN views.

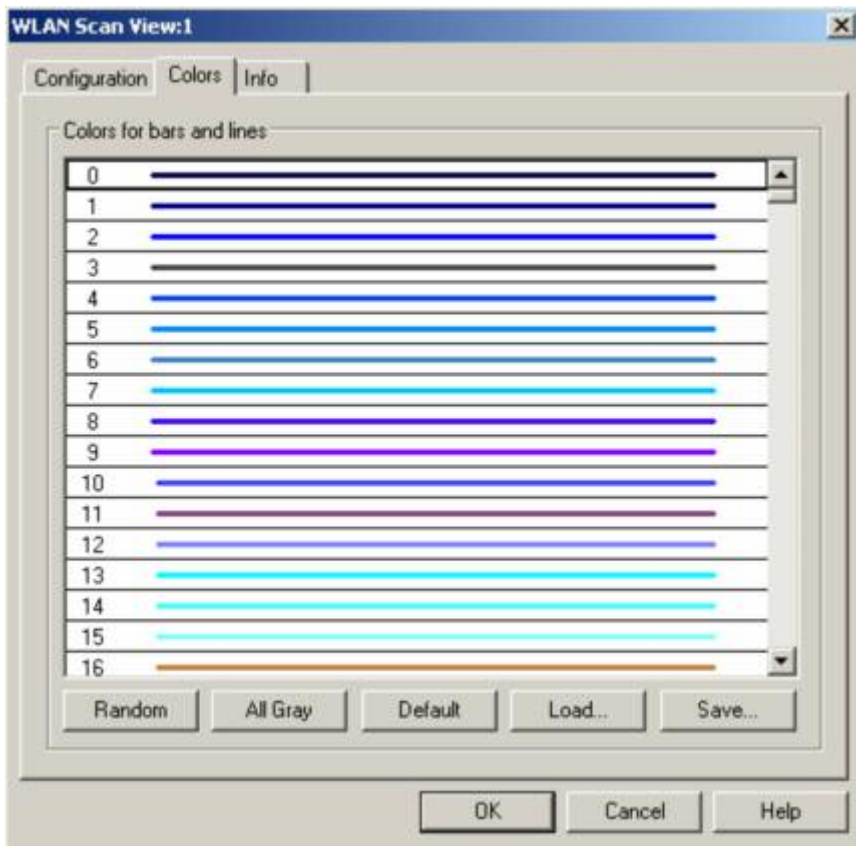


Fig. 4-256 WLAN Scan View configuration: Colors

The *Colors* menu is analogous to the *PNS CPICH* configuration menu; see section [PNS CPICH View](#) on p. 4.339. Note the following special features of the WLAN color settings:

- The color no. 0 is always used for the noise signal which is measured in a single, fixed channel defined in the NDIS driver configuration menu.
- The colors no. 1 to 500 can be assigned to signals from access points or other clients (the maximum number of signals received simultaneously is 39). The assignment is chronological: The first detected signal is displayed with color code no. 1, the second with color code no. 2, etc.
- The color settings in the WLAN configuration menus apply to all WLAN views; color definitions overwrite each other.

WLAN Signal View

The *WLAN Signal View* displays the RSSI of all received signals in a 3-dimensional bar graph.

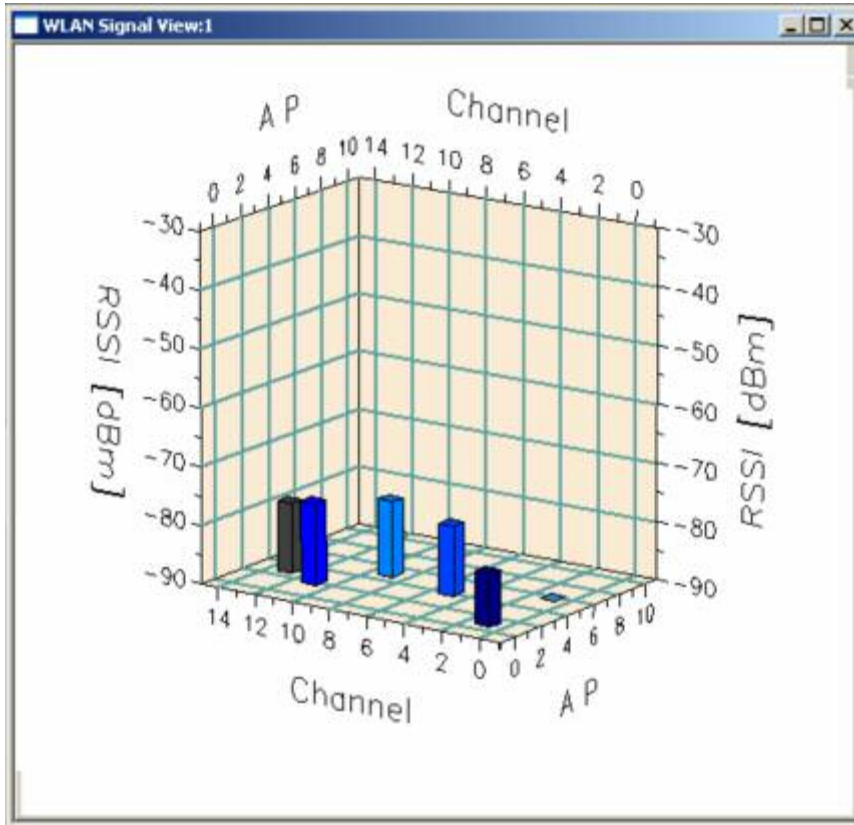


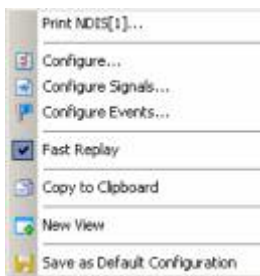
Fig. 4-257 WLAN Signal View

In the bar graph, the signals are sorted according to their channel number (*Channel*) and access point (*AP*). Each received signal generates a colored bar. The length of the bars is a measure for the received signal strength (*RSSI*); the numeric *RSSI* value appears in the *dBm* row of the *WLAN Scan View* (see p. 4.421).

Note:

A test device operating in Ad hoc mode can also communicate with other clients. The Signal View does not only show access point signals but all signals used for communication.

Context menu



A right mouse click on any point in the view opens the context menu to print the view contents, access the configuration menus, (de-)select the view for fast replay, copy the current view to the clipboard, create or delete views, save the current configuration, or move to another worksheet; see *Context menu* description on p. 4.2.

The configuration menu is analogous to the *WLAN Scan View Configuration* menu. It defines the scale for the bars in the *WLAN Signal View*.

WLAN Survey View

The *WLAN Survey View* gives an overview of the measured WLAN parameters from all access points including the distribution of the RSSI, C/I, and S/N values.



If a replayed measurement file was recorded in Block Mode, the WLAN Survey View generates block-specific statistical results. Blocks are defined in the Indoor View as described in section [Indoor Measurement Control](#) on p. 4.330.

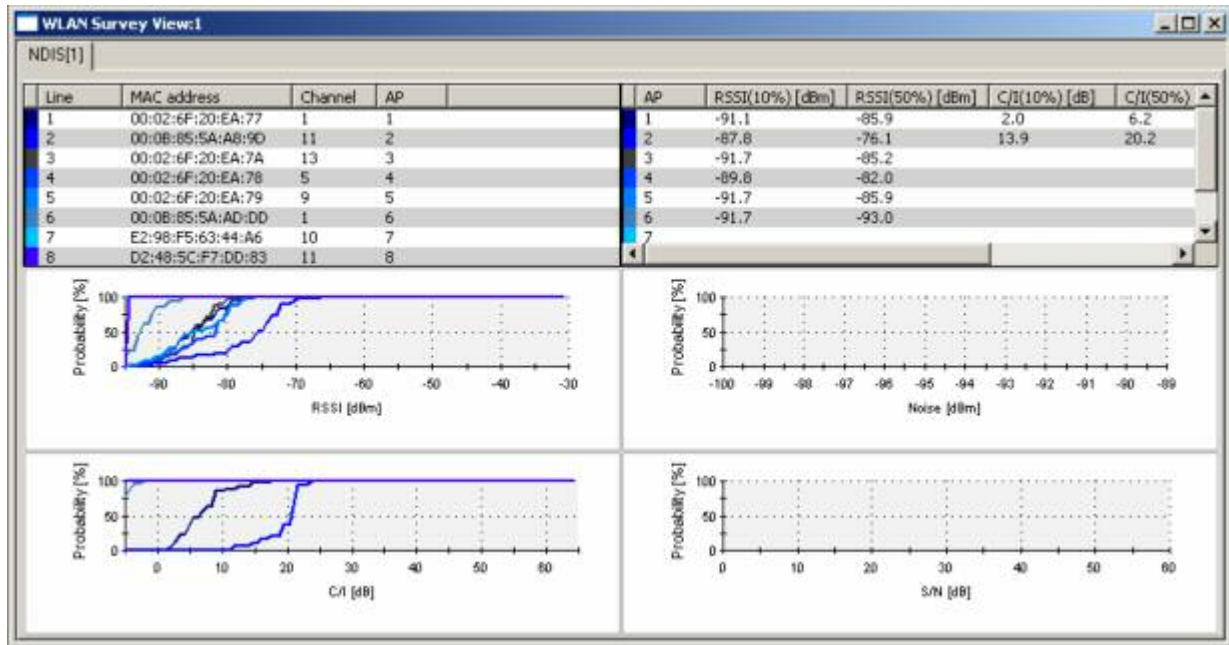


Fig. 4-258 WLAN Survey View

The *WLAN Survey View* contains an access point table, a percentage table, and four 2D chart diagrams.

Access point table In the two tables, each access point generates a table row with a color code. The columns displayed and the colors can be defined in the configuration menu. The access point table in the left half of the view contains the following parameters:

<i>Line</i>	Number of the table row, assigned in the order the row is created. If n rows are displayed, the line numbers are 1 to n.
<i>AP</i>	Number of the access point, assigned in ascending order according to the detection time of the access point signal. New access points always receive a new (higher) AP number, so the AP numbers and line numbers can be different as soon as a signal is no longer detected.
<i>MAC Address</i>	Media Access Control (MAC) address of the access point. The MAC is a unique serial number assigned to a networking device by the manufacturer.
<i>Channel</i>	Channel number that the access point uses for communication.

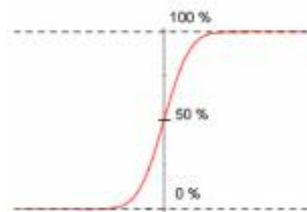
Percentage table The percentage table in the right half of the view contains the following parameters:

<i>AP</i>	Number of the access point, assigned in the order the access point signal is detected.
<i>RSSI (10%)</i>	RSSI that is reached or exceeded by 90% of the measured values (10% of the measured RSSIs are below RSSI (10%)). RSSI denotes the received signal strength of the signal from the access point in dBm.
<i>RSSI (50%)</i>	RSSI that is reached or exceeded by 50% of the measured values.
<i>C/I (10%)</i>	C/I that is reached or exceeded by 90% of the measured values (10% of the measured C/I are below C/I (10%)). C/I denotes the ratio of the RSSI of the strongest (carrier) signal to the sum of the RSSIs of all other signals in the channel.
<i>C/I (50%)</i>	C/I that is reached or exceeded by 50% of the measured values.
<i>S/N (10%)</i>	S/N that is reached or exceeded by 90% of the measured values (10% of the measured S/N are below S/N (10%)). S/N denotes the ratio of the RSSI of the strongest (carrier) signal in the noise channel to the noise level.
<i>S/N (50%)</i>	S/N that is reached or exceeded by 50% of the measured values.

RSSI chart

Shows the integrated distribution of the measured RSSI values from all access points. For a given RSSI, the curves show the percentage of measured RSSI values that fall below this RSSI. The complement, i.e. 100% minus the *Probability [%]*, corresponds to the percentage of measured RSSIs above this RSSI. The color of the curves correspond to the color codes in the access point table.

For a Gaussian distribution of the measured RSSI values around the center value RSSI (50%), the integrated distribution corresponds to an error function:



The curve which rises at the highest RSSI values (i.e. in the right side of the diagram) corresponds to the access point with the strongest signal.

C/I chart

Shows the integrated distribution of the measured C/I values from all access points. The diagram is analogous to the RSSI chart.

Noise chart

Shows the integrated distribution of the measured noise level in dBm in a single, fixed channel defined in the NDIS driver configuration menu. The noise channel number is stored in the *Current Channel* signal in the WLAN section of the data tree. The noise measurement and the channel definition requires a *CISCO Aironet Series 350 IEEE 802.11 Wireless LAN Client Adapter*. The diagram contains a single curve.

S/N chart

Shows the integrated distribution of the measured S/N values in the noise channel. The diagram contains a single curve.

Context menu

A right mouse click on any point in the view opens the context menu to print the view contents, access the configuration menus, (de-)select the view for fast replay, copy the current view to the clipboard, create or delete views, save the current configuration, or move to another worksheet; see [Context menu](#) description on p. 4.2.

WLAN Survey View Configuration

The *WLAN Survey View Configuration* menu specifies the contents of the access point and percentage tables, defines the color settings, and displays information on the view version. It is opened via a right mouse click on a point inside the *WLAN View* or via the *Configuration – Settings* command (see chapter 3).

The *Access Points* tab selects the contents of the access point table. The *Percentage table* tab is analogous to the *Access Points* tab.

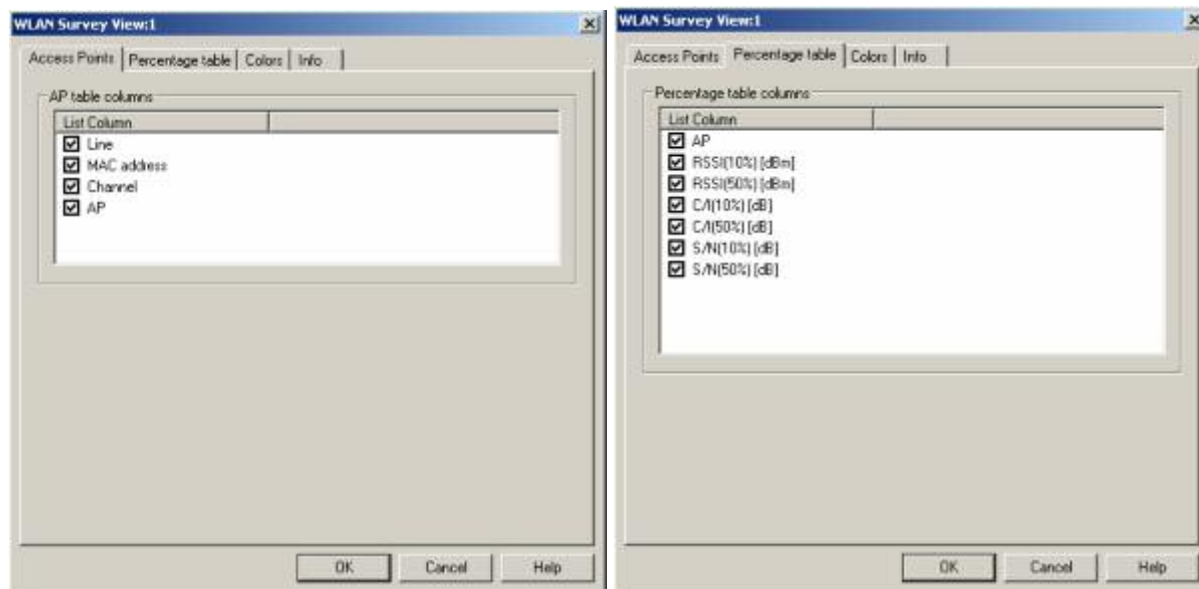


Fig. 4-259 WLAN Survey View configuration

The *Colors* tab of the *WLAN Survey View* configuration menu corresponds to the same tab in the *WLAN Scan View* configuration menu; see figure on p. 4.424.

CDMA2000 PNS Views

The *CDMA2000 PNS Views* shows the CDMA2000 information obtained in the CDMA2000 network scans performed by a R&S TSMU radio network analyzer. The CDMA2000 Network Scanner driver is described in chapter 6.

The *CDMA2000 PNS Views* can be selected from a submenu displayed on the right side of the *View* menu when the mouse hovers over *CDMA2000 PNS Views*.

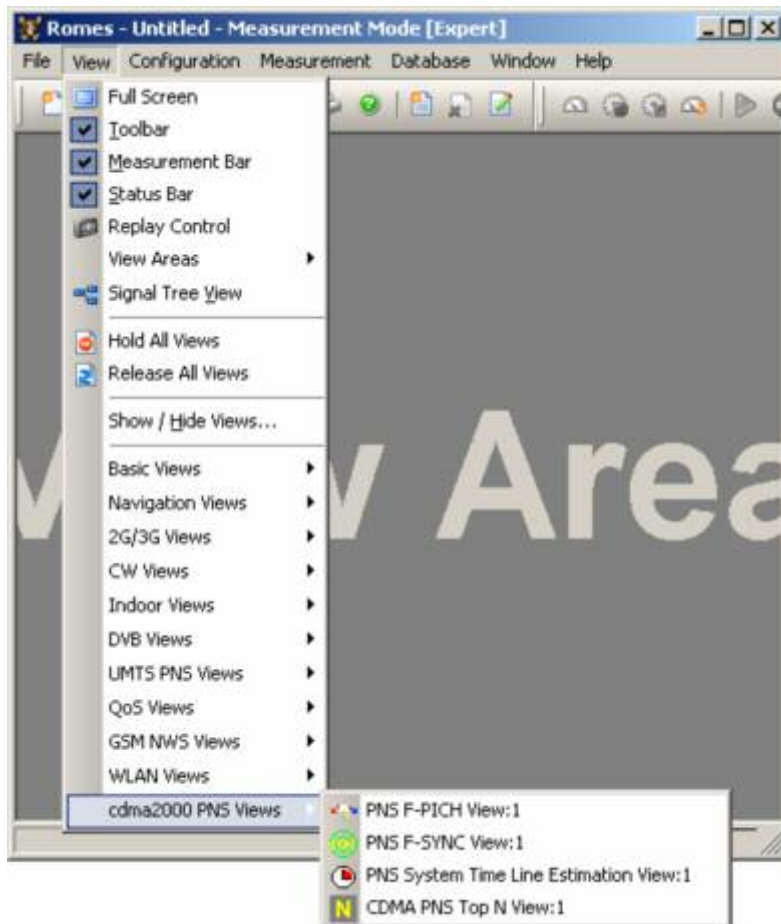


Fig. 4-260 CDMA2000 PNS views

PNS F-PICH View

The *PNS F-PICH View* shows the average signal power of the received Forward Pilot Channels (F-PICHs) and a comprehensive analysis of the properties of all DL signals received in the CDMA2000 PN scan.

The F-PICH is an unmodulated, direct-sequence spread spectrum signal transmitted continuously by each CDMA base station. The Pilot Channel allows a mobile station to acquire the timing of the Forward CDMA Channel, provides a phase reference for coherent demodulation, and provides a means for signal strength comparisons between base stations for determining when to handoff and for forward link signal strength measurement.

Different base stations are identified by different pilot PN sequence time phases (*Offset* values). Signals with different timing but equal PN offset originate from the same BTS but propagated along different paths. A comparison of those signals provides important information on reflections and possible interferences.

The R&S TSMU provides different synchronization modes for CDMA2000 signals.

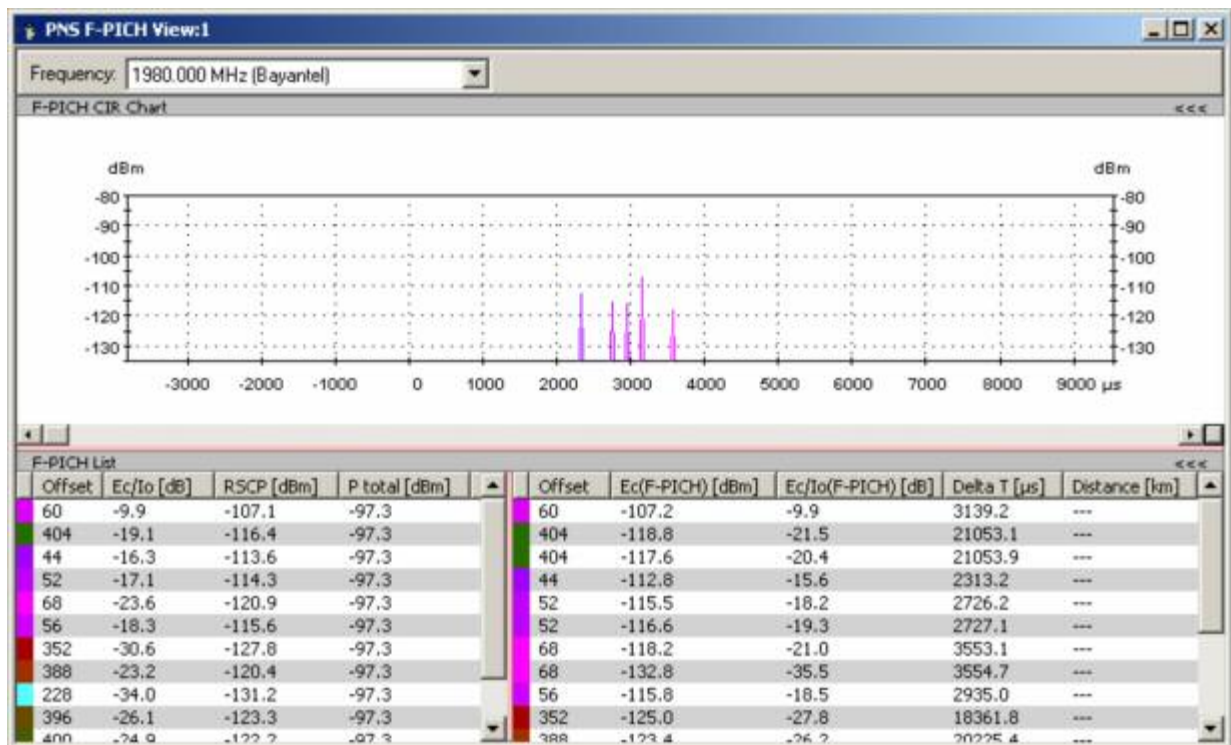


Fig. 4-261 PNS F-PICH View

- Frequency** Below the view title, the *Frequency* pull-down list contains all measured frequencies selected in the *Receiver* tab of the driver configuration menu. The list is also provided in the *PNS F-SYNC View*.
- Changing the frequency in one of these views automatically adapts the frequencies in all other views, provided they have the same current number in their title bar (e.g. the 1 in the figure above). Using this feature, it is possible to generate different groups of views with the same current number (opened by means of the context menu; see below) and select frequencies for an entire group with a single mouse click.
- View area** The entire view area is horizontally split to accommodate a chart and a table/list. The *F-PICH CIR Chart* (Carrier-to-Interference Ratio) shows the average signal power of the F-PICHs of all received signals over the time. The displayed powers and times correspond to the *Ec (F-PICH) [dBm]* and *Delta T[μs]* values listed in the *Peak List* (right-hand part of the *F-PICH List*).
- A click on the *F-PICH CIR Chart* or *F-PICH Lists* title bars compresses and expands the 2D-chart or table. A compressed chart leaves more space for the table and vice versa. Moreover, the tables appear in several PNS views so that compressing them can help to avoid redundancies. A compressed subdiagram is characterized by the symbol >>> (instead of <<<) in its title bar. On pausing on one of the title bars, the cursor displays a compress symbol.
- Diagram scale** The diagram is opened with a default x-axis scale of little more than one F-SYNC frame length (25.666 ms, the F-PICH frame is 20 ms long). If placed inside the diagram area the cursor takes the shape of a zoom-in icon (a magnifying glass with a '+' inside), and a vertical line is displayed at the cursor position.
- A left mouse click magnifies the diagram in x-direction around the cursor position, *Ctrl* plus left mouse click causes the opposite. An area to become the new x-axis range (e.g. the area around a peak) can be marked while the left mouse button is pressed. *Reset Zoom* in the context menu restores the default scale. A scrollbar is provided to move the magnified diagram to the right or left.
- The scale of the y-axis (power in dBm) can be set in the configuration menu.
- Table entries** Below the diagram, the *F-PICH List* gives an overview of the received signals together with their scrambling codes, different power parameters, frequency and timing information. On mouse rollover, each cell in the table header provides a short explanation of the corresponding column.
- The entire table is divided into the *F-PICH List* and the *Peak List*. In the configuration menu, it is possible to show or hide each individual table row in both lists.

F-PICH List

The *F-PICH List* (left-hand part of the *F-PICH Lists*) provides a general description of the received F-PICH signals from each BTS. Each signal is characterized by its PN sequence offset, corresponding to the transmitting BTS, and includes all possible peaks (reflections) indicated in the *Peak List* on the right-hand side. The list can contain the following F-PICH-related values (see also standard TIA-2000.2-D and related standards. All power results in the F-PICH List and Peak List are obtained in an unbiased measurement: The contribution of the noise floor to the powers is subtracted off.);

Offset

Pilot PN sequence offset index; time offset of the Forward Pilot Channel from CDMA System time, as transmitted by the base station. The offset is expressed in units of 64 PN chips of the F-PICH; it is in the range 0 to 511.

Each offset is identified by a color, to be customized in the configuration menu. The offset color codes are also shown in the *Route Track* menu; see paragraph on scrambling code indication on p. 4.48.

Signal power*Ec/Io [dB]*

Ratio of the received energy per PN chip of the F-PICH to the total inband power spectral density. The value equals to the sum of the *Ec/Io (F-PICH) [dB]* values of all individual peaks of the same PN offset displayed in the *Peak List*; see below.

RSCP [dBm]

F-PICH Received Signal Code Power; sum of the received powers of all peaks on one code, measured within the correlation section of the F-PICH.

P total [dBm]

Total received wide-band power in the channel, measured within the correlation sections of the F-PICH. The correlation section is the same for all signals, so *P total* is the same for all BTSs. *P total* is equal to *Io* within the F-PICH correlation section so that the following relation holds:

$$P \text{ total} + Ec/Io = RSCP$$

Peak List

The rows of the *Peak List* (right-hand part of the *F-PICH Lists*) describe the single peaks (reflections) that contribute to the different BTS signals. The list can contain the following values (see also standard TIA-2000.2-D and related standards):

Offset

Pilot PN sequence offset index.

Signal power

Ec (F-PICH) [dBm]

Average energy per transmitted PN (Pseudo Noise) chip for the F-PICH, divided by the chip period and thus converted into an average received signal power (in dBm).

Ec/Io (<Ch>) [dB]

Ratio of the received energy per PN chip for the F-PICH to the total transmit power spectral density.

Signal timing *Delta T* [μ s]

Time delay of the signal slot timing relative to the CDMA system time or GPS time (hardware-dependent). The reference time (left edge of the diagram) is of minor importance as the diagram extends over more than one frame, which is enough to display and separate all received signals.

Distance (km)

Distance to BTS in kilometers.

Special table entries Depending on the conditions of the measurement the tables may show some particular results:

- An invalid result "---" denotes that a peak or the entire BTS signal was too weak to be accurately measured. Selecting *SR1 High Dynamic* mode in the measurements tab of the driver configuration menu generally reduces the number of invalid results.
- A number (:1, :2 etc.) behind the offset denotes that signals with the same PN offset but with a significant difference in their time delays were received. Two different scenarios can cause multiple PN offsets:
 - If several of those signals occur at the same time, they are likely to belong to different BTSs that accidentally use the same PN offset.
 - Two signals with different numbers behind their PN offsets that are received at different times can belong to the same BTS but actually indicate a strong time drift.

Context menu



A right mouse click on any point in the view opens the context menu to access the configuration menus, (de-)select the view for fast replay, copy the current view to the clipboard, create new views, save the current configuration, or move to another worksheet; see [Context menu](#) description on p. 4.2.

The context menu provides the following additional commands:

Reset Zoom Resets the x-axis scale to 0 ms to approx. 26.5 ms.

PNS F-PICH Configuration

The *PNS F-PICH* configuration menu customizes the diagram in the *PNS F-PICH View* and the contents of the table. It is opened via a right mouse click on a point inside the *PNS F-PICH View* or via the *Configuration – Settings* command (see chapter 3).

The *F-PICH View* tab sets the y-axis scale of the *PNS F-PICH View*, selects the information to be displayed in the table and corrects the Doppler frequency.

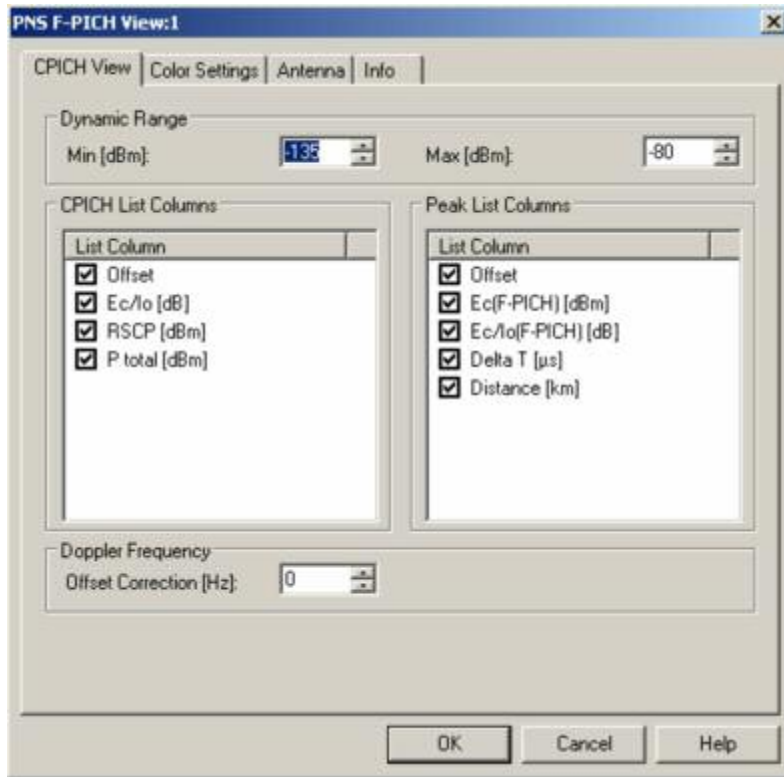


Fig. 4-262 PNS F-PICH configuration: F-PICH View

Dynamic Range The two input fields in the *Dynamic Range* panel define the minimum (*Min [dBm]*) and the maximum (*Max [dBm]*) level to be displayed in the *PNS F-PICH* view diagram.

CPICH List The *CPICH List* and *Peak List* panels select which information is displayed in the tables below the *PNS F-PICH* diagram (see figure above). Clearing a box hides the corresponding column in the diagram

Peak List

The **Color Settings** tab sets the color scale for the different PN offsets. The color codes are also shown in the *Route Track* menu; see paragraph on scrambling code indication on p. 4.48.

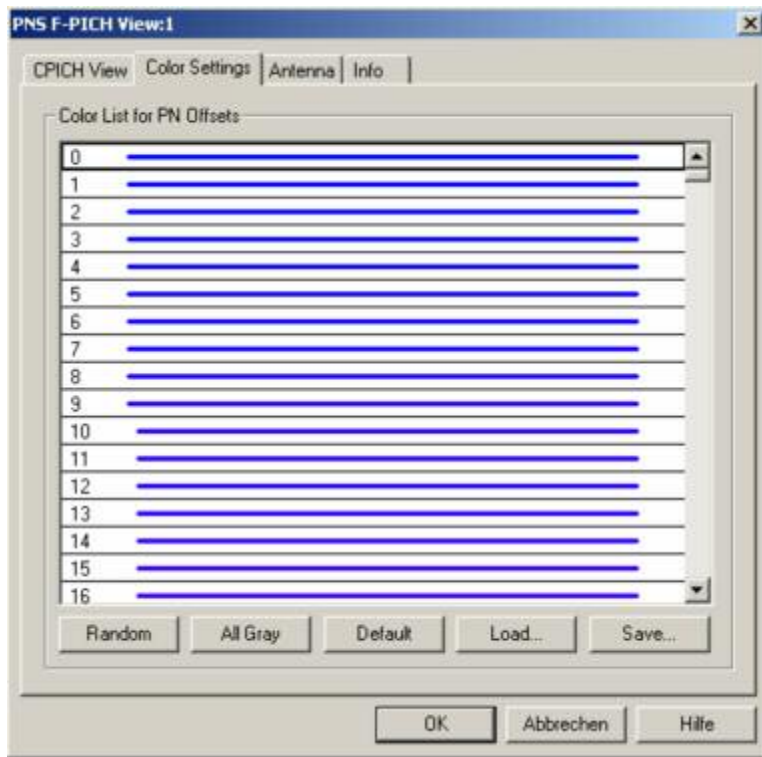


Fig. 4-263 PNS F-PICH configuration: Color Settings

The colors are displayed in the diagram (power peaks) and in the first table row (scrambling code scale). A double-click on a line in the *Color List* opens the *Colors* dialog (see p. 4.351) to change the current display color.

Random	No ordering; colors are assigned to the scrambling codes at random.
All Gray	Color scale suppressed; all colors are gray. This option is suitable e.g. to distinguish a single scrambling code (or a small number of scrambling codes), colored different, from all other codes, colored gray.
Default	Predefined color scale: Colors change continuously as the scrambling codes increase.
Load/Save	A color scale can be loaded from an SC color file (*.scc) and user-defined color scales can be stored to *.scc files to be reused in a later session.

PNS F-SYNC View

The *PNS F-SYNC View* shows the information that the R&S TSMU decoded from the Forward Synchronization Channel (F-SYNC). The F-SYNC corresponds to code channel 32 in the forward CDMA channel which transports the synchronization message to the mobile station.

The screenshot shows a window titled "PNS F-SYNC View:1" with a frequency dropdown set to "1980.000 MHz (Bayantel)". The main area contains a table with three columns: Offset, Field, and Value. The table lists various synchronization parameters and their decoded values.

Offset	Field	Value
60	PILOT_PN	56
404	P_REV	6
68	MIN_P_REV	1
52	SID	10626
44	NID	65535
388	LC_STATE	2705368978273
56	SYS_TIME	10442661751
	LP_SEC	13
	LTM_OFF	16
	DAYLT	0
	PRAT	0
	CDMA_FREQ	1000
	EXT_CDMA_FREQ	1000
	SR1_BCCH_NON_TD_INCL	0
	SR1_TD_INCL	0
	SR3_INCL	0
	DS_INCL	0
	BER	0.000

Fig. 4-264 PNS F-SYNC View

Frequency

Below the view title, the *Frequency* pull-down list contains all measured frequencies selected in the *Receiver* tab of the driver configuration menu. The list is also provided in the *PNS F-PICH View*.

Changing the frequency in one of these views automatically adapts the frequencies in all other views, provided they have the same current number in their title bar (e.g. the 1 in the figure above). Using this feature, it is possible to generate different groups of views with the same current number (opened by means of the context menu; see below) and select frequencies for an entire group with a single mouse click.

View area

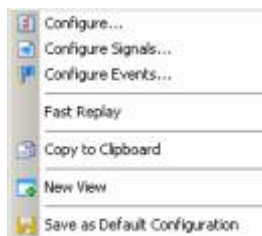
The entire view area is vertically split in two parts:

- The left part displays all PN offset values decoded from the F-SYNC. The frequency of F-SYNC demodulation can be set in the *Measurements* tab of the CDMA PNS driver configuration menu (once for each frequency, once for each new pilot, or once for each new pilot but not more than once per 30 s; see chapter 6). The color code is set in the *PNS F-SYNC View* configuration menu.
- The left part displays the name of the different information elements in the synchronization message and the last decoded values.

Information elements

The contents of the synchronization message are described in standard TIA-2000.5-D.

<i>PILOT_PN</i>	Pilot PN sequence offset index (see description of the <i>PNS F-PICH</i> view on p. 4.431).
<i>P_REV</i>	Protocol revision level
<i>MIN_P_REV</i>	Minimum protocol revision level
<i>SID</i>	System identification
<i>NID</i>	Network identification
<i>LC_STATE</i>	Long code state
<i>SYS_TIME</i>	System time
<i>LP_SEC</i>	Number of leap seconds that have occurred since the start of the system time
<i>LTM_OFF</i>	Offset of local time from system time
<i>DAYLT</i>	Daylight savings time indicator
<i>PRAT</i>	Paging channel data rate
<i>CDMA_FREQ</i>	Frequency assignment
<i>EXT_CDMA_FREQ</i>	Extended frequency assignment
<i>SR1_BCCH_NON_TD_INCL</i>	SR1 Non-TD BCCH support indicator
<i>SR1_TD_INCL</i>	SR1 TD BCCH support indicator
<i>SR3_INCL</i>	SR3 support indicator
<i>DS_INCL</i>	Direct spread (DS) system and information available

Context menu

A right mouse click on any point in the view opens the context menu to access the configuration menus, (de-)select the view for fast replay, copy the current view to the clipboard, create new views, save the current configuration, or move to another worksheet; see [Context menu](#) description on p. 4.2.

PNS F-SYNC Configuration

The *PNS F-SYNC* configuration menu customizes the diagram in the *PNS F-SYNC View*. It is opened via a right mouse click on a point inside the *PNS F-SYNC View* or via the *Configuration – Settings* command (see chapter 3).

The **Color Settings** tab sets the color scale for the different PN offsets. The color codes are also shown in the *Route Track* menu; see paragraph on scrambling code indication on p. 4.48.

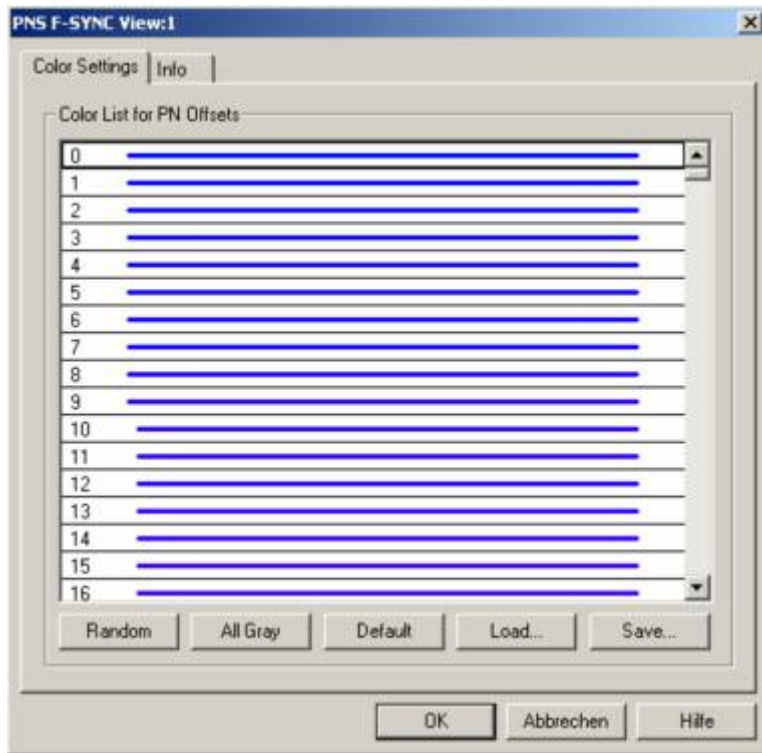


Fig. 4-265 PNS F-SYNC configuration: Color Settings

The colors are displayed in the left (PN offset) column of the diagram. A double-click on a line in the *Color List* opens the *Colors* dialog (see p. 4.351) to change the current display color.

Random	No ordering; colors are assigned to the scrambling codes at random.
All Gray	Color scale suppressed; all colors are gray. This option is suitable e.g. to distinguish a single scrambling code (or a small number of scrambling codes), colored different, from all other codes, colored gray.
Default	Predefined color scale: Colors change continuously as the scrambling codes increase.
Load/Save	A color scale can be loaded from an SC color file (*.scc) and user-defined color scales can be stored to *.scc files to be reused in a later session.

PNS Time Line Estimation View

The *PNS Time Line Estimation View* shows information about the time estimation of the PN offset arrival time intervals.

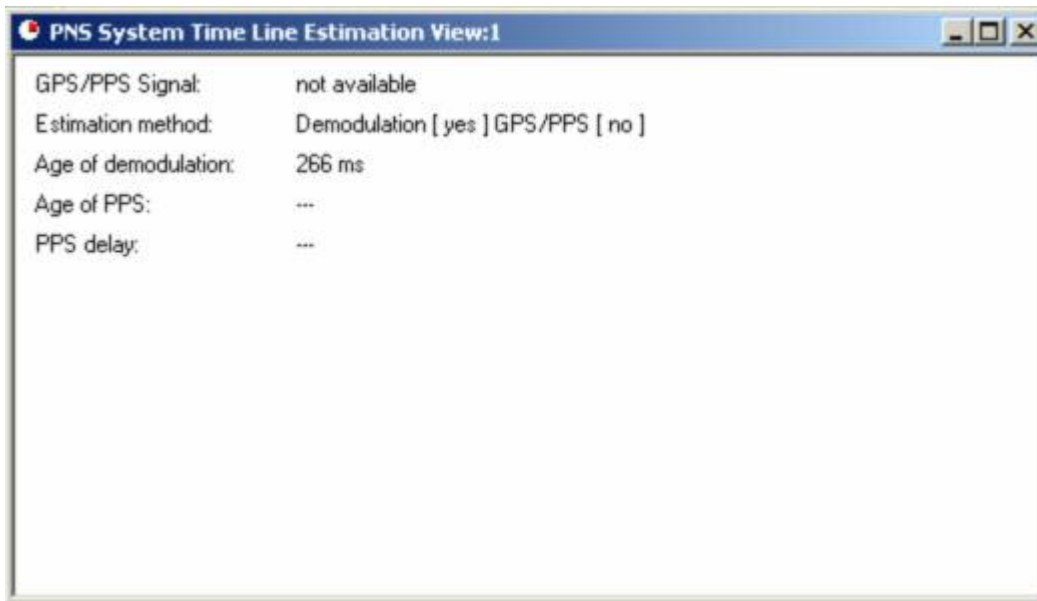


Fig. 4-266 PNS Time Line Estimation View

View area The pulse-per-second (PPS) signal from GPS and its delay have to be assessed continuously even when the GPS signal is not available.

This view shows the parameters related to the CDMA time line measurement. The *PNS Time Line Estimation View* has no configuration menu assigned.

Information elements

The contents of the PNS Time Line Estimation View are described below:

GPS/PPS Signal

Shows if arrival time was measured via GPS.

Estimation Method

The following combinations are possible:

1. *No Demod. / no GPS PPS: Offset value is random, transmit time is estimated by receive time.*

[2. No Demod. / GPS PPS: not used]

3. *Demod. / no GPS PPS: Offset value is correct, transmit time was estimated by received pilots.*

4. *Demod. / GPS PPS: Offset value is correct, transmit time has GPS PPS accuracy.*

Age of demodulation

Age of the last GPS PPS demodulation

Age of PPS

Age of the last PPS signal from GPS.

PPS Delay

Measured GPS PPS pulse time difference in [ns].

Range: -1 ms (-1000000) ... 999 ms (999000000)

The *PPS Delay* shows the GPS arrival time for the case that the measurement results (delays) are correct. If a time delay for a BTS signal is known, the measurement error of the PN Scanner result can be calculated. The same error applies to this value.

Example: PN Offset 271 was measured. The frame of this signal is transmitted $271 \cdot 64 / 1228800$ sec = 14114.58 μ s after a frame with offset 0.

Assumption: The distance to the BTS is 5 km. So a measurement result of 14114.58 μ s + 16.67 μ s = 14131.31 μ s is the expected measurement value. If, for instance, a delay of 14141.31 μ s is measured as a delay value for this BTS, the measurement result has an error of +10 μ s. Now both delay value and PPS delay value can be reduced by 10 μ s to obtain the correct results.

See also *Calibration of the PPS Delay*, in *CDMA2000 PNS Driver Settings*.

CDMA PNS Top N View

The *CDMA PNS Top N View* displays the properties of the signals from the Node Bs that are elements of the *Top N Pools* defined in the driver configuration menu. A Top N Pool contains up to N Node Bs with specific characteristics providing the strongest P-CPICH level at a given position and time; for more information refer to the description of the driver configuration menu in chapter 6.

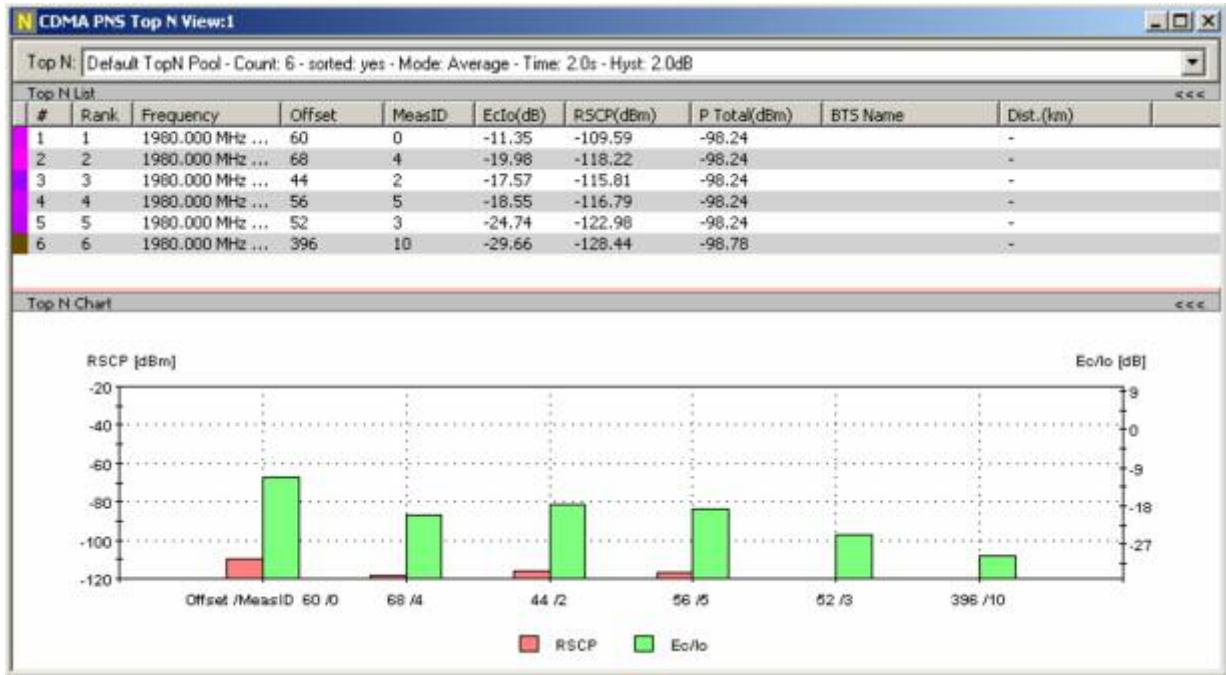


Fig. 4-267 CDMA PNS Top N View

View area

The entire view area is horizontally divided to accommodate a pull-down list with all defined *Top N* measurements, a table and a bar chart.

A click on the *Top N List* or *Top N Chart* title bars compresses and expands the table or chart. A compressed chart leaves more space for the table and vice versa. Moreover, most of the information in the table is also displayed in the [PNS CPICH View](#) (see p. 4.339) so that compressing it can help to avoid redundancies. A compressed subdiagram is characterized by the symbol >>> (instead of <<<) in its title bar. On pausing on one of the title bars, the cursor displays a compress symbol.

Top N

Below the view title, the *Top N* pull-down list contains all top N pools defined in the *Top N* tab of the driver configuration menu. The results in the table and the *Top N Chart* refer to the top N pool selected in the list.

Table

The *CDMA Top N List* gives an overview of the received signals in the current top N pool together with different power parameters, frequency and timing information. On mouse rollover, each cell in the table header provides a short explanation of the corresponding column. For a detailed explanation of the parameters refer to section [PNS CPICH View](#) on p. 4.339. The *Top N List* contains the following additional columns:

#	Current number of a Node B within the measurement. Node Bs are numbered in ascending order, according to the time when they enter the top N pool. This means that the current numbers tend to increase as the measurement progresses.
Rank	Current rank of a Node B within the pool, according to its average or maximum E_c/I_o (see driver configuration menu). The ranks are reassigned every time the pool is updated; they are in the range $1 \leq Rank \leq N$.
Offset	Channel offset
MeasID	Measurement ID for measurements of a specific BTS
BTS Name	BTS name and sector number from the BTS database.
Dist. (km)	Distance between the potential interferer and the serving cell in km, calculated from the BTS data base. 0 km means that the interferer is a different sector of the same BTS.

In the view configuration menu, it is possible to show or hide each individual table row.

Diagram

Below the table, the *Top N Chart* shows the ratio E_c/I_o and the Received Signal Code Power (*RSCP*) for all Node B signals in the current top N measurement (see section [PNS CPICH View](#) on p. 4.339).

Signals from different Node Bs are distinguished by their *Offset* and *MeasID* displayed along the x-axis. The scales for the two parameters RSCP and E_c/I_o are displayed on the left and right edge of the diagram. Both y-axis scales (RSCP in dBm and E_c/I_o in dB) can be set independently in the configuration menu.

In the configuration menu, it is also possible to select the display colors for the RSCP and E_c/I_o bars and to choose whether the pilot pollution limits are displayed in the diagram. The pilot pollution limits are displayed as two horizontal lines across all Node B bars except the ones with the highest rank (1).

Context menu

A right mouse click on any point in the view opens the context menu to access the configuration menus, (de-)select the view for fast replay, put the view on hold, copy the current view to the clipboard, create new views, or to save the current configuration; see [Context menu](#) description on p. 4.2.

The Info tab can also be accessed via the Configuration – Settings command.

CDMA PNS Top N Configuration

The *CDMA PNS Top N* configuration menu defines the y-axis scale, i.e. the minimum (*Min [dBm]*) and the maximum (*Max [dBm]*) level to be displayed in the *CDMA PNS Top N View*, and selects the contents of the table. It is opened via a right mouse click on a point inside the *PNS Top N View* or via the *Configuration – Settings* command (see chapter 3).

All RSCP settings are analogous to the settings in the *PNS CPICH* configuration menu; see section [PNS CPICH View](#) on p. 4.339.

5 Reserved for future use

This section is reserved for future use.

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6 Hardware Components

In the following, the hardware devices necessary for interference measurements and their installation and configuration is described. Note that, before any measurement is started, drivers for the mobile phone (see section [Test Devices](#) on page 6.22 ff.) and for the positioning system (see section [Navigation](#) on page 6.143 ff.) must be loaded.

Driver Installation

The hardware device drivers can be installed either by via the *Configuration – Hardware...* menu, or simply by loading the desired configuration file. They are not necessary if the measurement data is simply replayed from a measurement file.

The following examples show how to install and remove hardware drivers and to assign them to a physical or virtual COM port. These actions are analogous for all drivers with a few exceptions:

- Loading the R&S Indoor driver and QoS Tester does not require any hardware or port assignments.
- The Rohde & Schwarz test receivers R&S ESVx, and R&S ESPI can be connected via IEC/IEEE bus interface, LAN interface or a dial-up connection; see section [Test Receiver Drivers](#) on p. 6.8 ff.
- The IEEE1394 Firewire interface is required for the Rohde & Schwarz TSMx.
- A PCMCIA slot is used i.e. for WLAN cards or for the Merlin U530 UMTS data card.

Configuration of the drivers is explained in the following sections (see page 6.22 ff.).

Connection via COM Port

Loading the drivers is initiated by the *Hardware...* command in the *Configuration* menu. This command opens the *ROMES Hardware Configuration* menu.

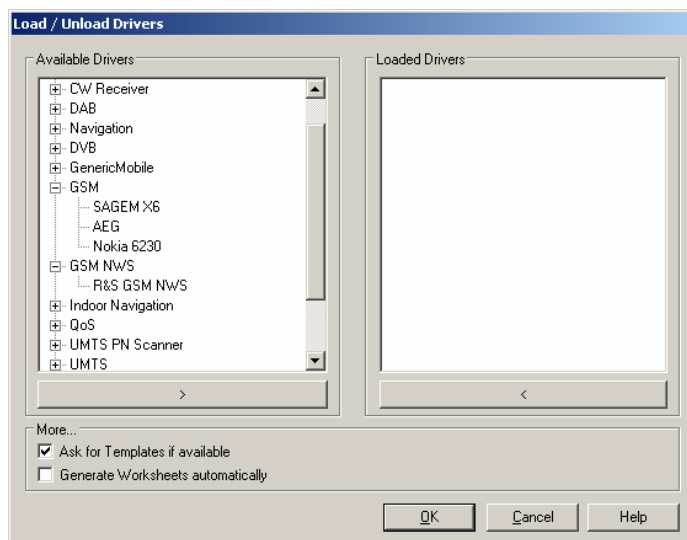
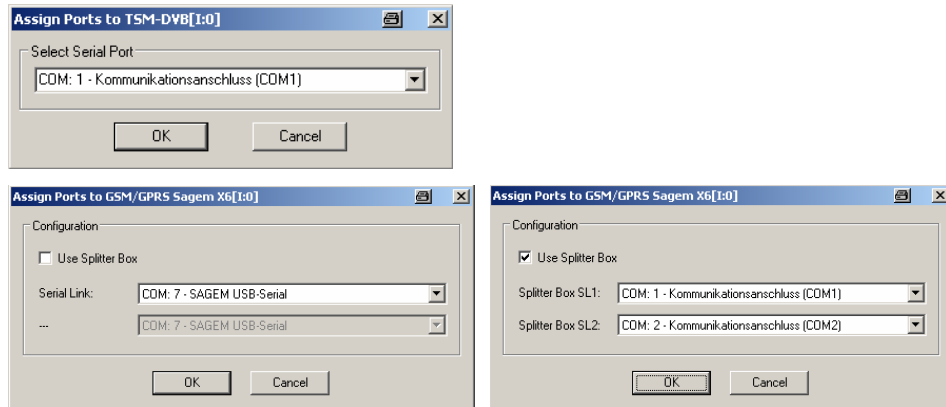


Fig. 6-1 ROMES Hardware Configuration

Multiple drivers It may be necessary to add one driver type several times, e.g. if several mobiles of the same type are used. The number in square brackets displayed behind the device node denotes the number of drivers allowed. In the example of Fig. 6-1, it is possible to use up to 4 GSM mobiles (the number can be increased on request). The same GSM mobile driver can be assigned to several different ports.

Available drivers The left-hand field shows a list of all available devices and installed drivers.

> button For applicable drivers, the > button opens the *Assign Ports to ...* window. For AEG drivers, the used device type must be selected from a *Mobile* list, for SAGEM and RS TM, the mobile type is automatically recognized. The entry SAGEM is for models SAGEM X6. The *Assign Ports to ...* windows for non-GSM drivers are analogous (see also section *Test Receiver Drivers* on p. 6.8 ff.).



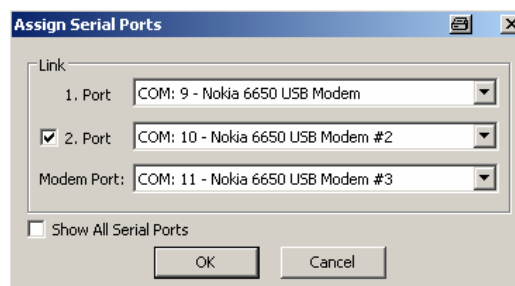
The *Driver resources* window assigns a COM port to the selected driver. It provides three buttons:

Serial Port Assigns a port to the driver to be loaded. Select a port from the pull-down list if the current assignment is to be changed.

OK Confirms the port assignment and closes the window. The driver previously selected (clicked) in the *Available drivers* list is initialized (loaded) and finally entered in the *Loaded drivers* list of the *ROMES Hardware Configuration* window. The progress of the procedure is monitored in a popup window.

Cancel Discards the changes made and closes the window

There is an automatic verification if the COM port is still available; only free ports are offered in the pull-down list. Drivers can be assigned to different ports by repeating the process, which leads to a *Assign Serial Ports* dialog:



Splitter box (Sagem mo- biles support- ing GPRS)

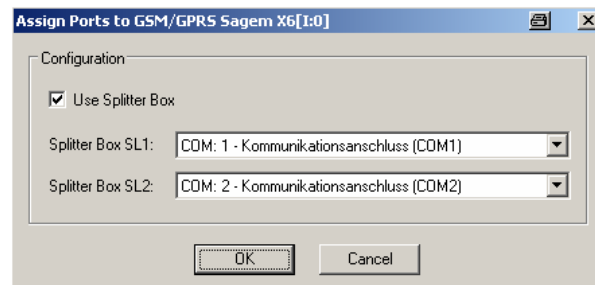
Instead of being directly connected to one of the COM ports, the Sagem mobile supporting GPRS may be used in combination with a splitter box. This additional device is connected to the mobile and to the power supply as shown below.



The splitter box separates the trace and data interface of the mobile. The trace interface corresponds to the normal GSM test mobile mode except GPRS, the data interface represents an extension that is used for GPRS data transfer. Three different modes can be set at the mobile:

- Trace* Route the trace interface to SL1
- Data* Route the data interface to SL1
- Trace/Data* Route the data interface to SL1, the trace interface to SL2

The two outputs *SL 1* and *SL 2* of the splitter box can then be connected to two separate COM ports. The COM ports can be assigned in the *Assign Ports to ...* after the *Use Splitter box ...* option is checked:



Note:

To measure, record and view GPRS data, the mobile must be used in Trace/Data mode and the trace and data interfaces must be routed to different COM ports. Therefore, the splitter box is a prerequisite for GPRS measurements using Sagem test mobiles.

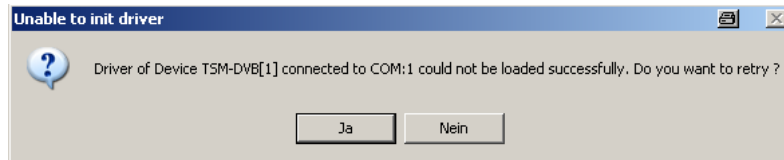
GPRS test mobiles from Nokia and Qualcomm can be connected via USB interface; see section [Connection via USB Interface](#) on p. 6.5 ff.

Failed Initialization

If the initialization of the mobile driver fails (e.g. because no mobile of appropriate type is available at the serial port), ROMES displays the following messages:



(AEG only)



- In this case, check the connection and click *Repeat* to return to the *Assign Ports to ...* window.

< button

The < button removes a selected driver from the *Loaded drivers* list.

More...

These settings control the loading options for the available drivers:

Ask for Templates if available

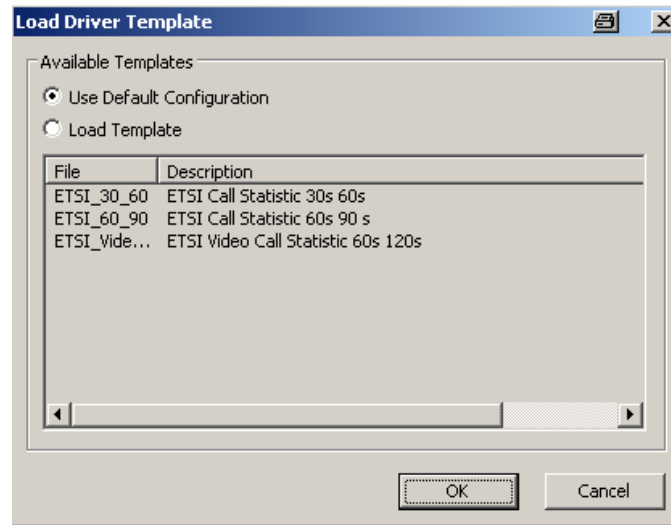
If this checkbox is activated, ROMES checks whether or not a driver template is stored in the *Driver Templates* subdirectory of ROMES program directory (see [Templates](#) on p. 6.59 ff.) and displays a list of the templates found.

Generate Worksheets automatically

If this checkbox is activated, ROMES generates a view area automatically depending on the loaded hardware. After loading one or more drivers, ROMES will propose automatically some view areas with the most important views concerning the loaded drivers.

Driver Templates

When a driver is loaded ROMES checks whether a driver template is stored in the *Driver Templates* subdirectory of ROMES program directory (see [Templates](#) on p. 6.59 ff.) and displays a list of the templates found.



The driver can be loaded with default settings or with the settings stored in any of the templates found.

OK

Confirms the port assignments made, loads the drivers with the configuration settings suitable for the connected mobile type, and closes the *Hardware drivers* window.

Cancel

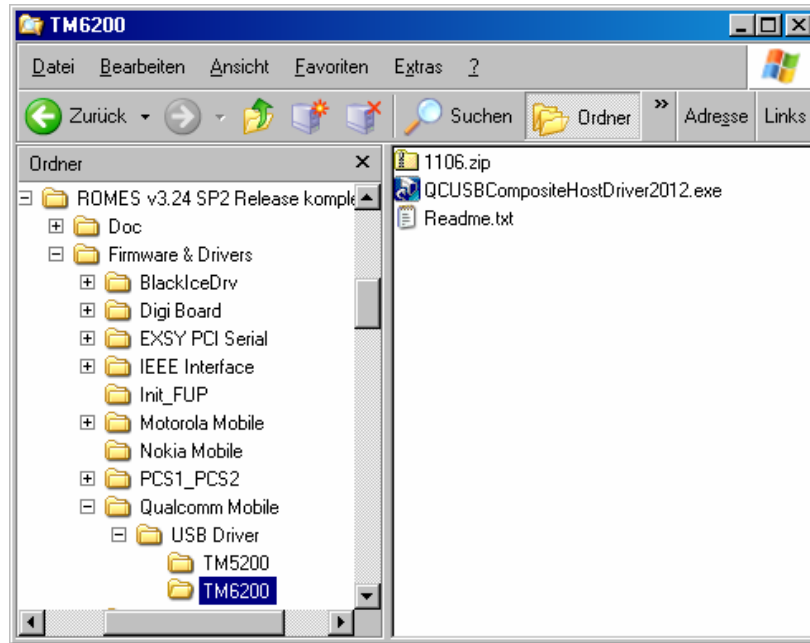
Cancels the installations made and closes the *Hardware drivers* window.

Connection via USB Interface

Some newer test mobiles (e.g. the Motorola, Nokia and Qualcomm models) can be connected via USB cable using an appropriate driver. Physical COM ports are not needed. The USB drivers are already pre-installed on controllers from Rohde & Schwarz. They can also be installed from the ROMES CD-ROM.

Installing the drivers

The USB drivers are mobile-specific and located in the *Firmware & Drivers* subdirectory on the ROMES CD-ROM, see the following example for the Qualcomm TM6200 test mobile.



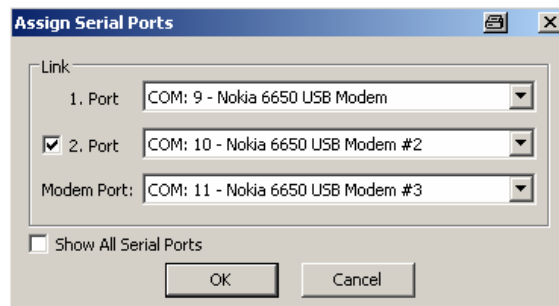
To install the driver(s) for your test mobile(s):

- Go to the relevant subdirectory for your test mobile type.
- Follow the instructions in the *Readme.txt* files or in the *.pdf installation instructions.

During the installation, Windows creates the necessary number of virtual COM ports and attaches them to the mobiles. Therefore, test mobiles connected via USB interface do not need a splitter box to separate the trace and data interface.

Loading the drivers (Nokia)

Once the USB drivers are installed on the system, they can be loaded following the procedure outlined in section [Connection via COM Port](#) (see p. 6.1 ff.). When one of the Nokia drivers is loaded (*Nokia 6230, Nokia 6630, Nokia 6650, Nokia 6680, Nokia 7600*), ROMES opens the following dialog box:



One of the virtual COM ports created during USB driver installation can be assigned to the 1st port (data interface), the 2nd port (AT interface) and the *Modem Port* (data interface). The three virtual COM port numbers must be different.

The second port is optional but is required for autodialing. Besides it is recommended to always assign all three ports.



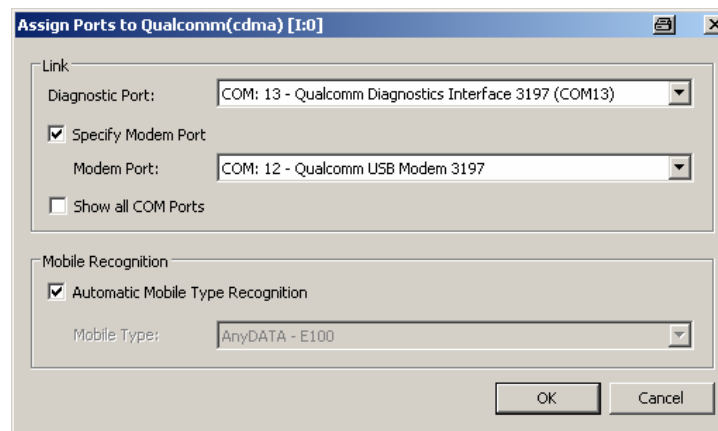
The operating system does not reliably delete unused virtual COM ports if USB devices are connected and disconnected repeatedly. It is recommended to delete redundant USB ports using the Special Device Manager (see chapter 8) if the assigned port numbers exceed values around 30.

Connecting several Qualcomm mobiles

The supported Qualcomm mobiles (e.g. TM6200 etc.) are composite devices which require two virtual COM ports. To install the driver, the test mobile must be connected to the USB port of the PC (see the installation information supplied with the driver). During installation, Windows will enumerate the mobile in order to add it to the USB device list.

Under Windows XP several mobiles can be connected to the host PC without any modifications as long as they all use the same USB hub. The number of devices is limited by the number of ports on the hub.

Once the USB drivers are installed on the system, they can be loaded following the procedure outlined in section [Connection via COM Port](#) (see p. 6.1 ff.). When one of the Qualcomm drivers is loaded (e.g. TMx200), ROMES opens the following dialog box:



To connect more devices, use the method described below.

Connecting different USB hubs

Several Qualcomm test mobiles (e.g. TM6200) can only be enumerated when each one has a different product ID. It is recommended to use only 4-port hubs and to limit the number of devices connected simultaneously to 32. Moreover, a firmware release 5.0 or higher of the TM6200 is required.

To set the appropriate product ID,

1. Connect one device to the host PC at a time.
2. Load the TMx200 driver following the procedure described above.
3. In the *Configuration* tab of the TMx200 driver configuration menu (accessible via *Configuration – TMx200*), click the *Advanced* button to open the *Advanced Options* dialog (see [Fig. 6-40](#) on p. 6.75).
4. Click *Advance USB ID*.
5. Open the Windows *Device Manager* (e.g. from the *Hardware* tab of the *Con-*

trol Panel – System Properties dialog) to check whether the device is enumerated and installed correctly with the new USB ID.

6. Disconnect the device from the host PC.

To connect several test mobiles,

7. Repeat steps 1 to 6 for all test mobiles, assigning each one a different USB ID offset. Reload the driver each time before you advance the USB ID.
8. Connect the devices all together to the USB hubs (4-port hubs).
9. Check the Windows *Device Manager* to make sure that all devices are enumerated correctly.

IMPORTANT

The Samsung Z105/Z107/Z130/Z500/Z560/... mobiles rely on the USB interface for its power supply. A supply current of up to 0.5 A is required. Check the specification of your USB interface, especially when connecting several Z... mobiles or other power-consuming devices in parallel. If necessary, use a self-powered USB hub.

Test Receiver Drivers

When a test receiver driver is loaded (*R&S ESPI*, *R&S ESVx*, *R&S TSMx*), ROMES checks whether the driver configuration settings comply with the connected receiver. If they do not, the *Receiver settings* tab of the test receiver configuration menu is opened to adjust the driver settings. Test receivers must be switched on to be identified by the drivers.

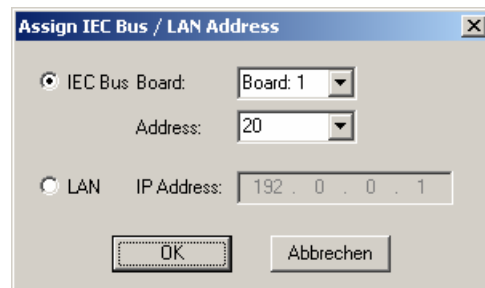
Interfaces

The Rohde & Schwarz test receivers *R&S ESPI* and *R&S ESVx* are not simply connected to a serial COM port but controlled via either an IEC/IEEE bus interface, a LAN interface, or a serial RS232 interface:

- The R&S ESVx is always controlled via IEC/IEEE interface.
- The R&S ESPI can be controlled either via IEC/IEEE interface or via LAN interface.
- The R&S TSMx is always controlled via IEEE 1394 Firewire interface.

R&S ESPI Driver

The LAN interface is provided as an option for the R&S ESPI receiver (option FSP-B16, LAN Interface). Loading the R&S ESPI driver opens the *Assign IEC Bus/LAN Address* window:



The window chooses between the IEC/IEEE bus interface and the LAN interface and defines the IEC bus or IP address of the test receiver. See paragraph *Allocating a valid IP Address* below.

IP Addresses

Allocating a valid IP address

To establish a LAN connection, the IP address of the test instrument and the controller must be compatible. In practice, the IP address of the test instrument is adapted to the IP address of the controller. Determining the addresses that can be potentially used for the test instrument (if they are not yet assigned to another host in the LAN) involves the following steps:

Determine the IP configuration of your controller.

Use the IP address and the subnet mask to determine the available network IDs.

Note:

The following procedure is appropriate for a standalone, dedicated connection between a controller and a test device. If you intend to connect through an established network (e.g. a company intranet), contact your network administrator to obtain the required IP addresses.

Determining the IP configuration

To determine the IP configuration of your controller,

1. Open the *Start* menu of your Windows operating system and select *Run...*

In the *Run* dialog opened, enter *CMD* and click *OK*.

In the DOS box opened, type *ipconfig.exe* and press *Enter*.

The IP address information of your controller is displayed:



```

C:\WINNT\System32\cmd.exe
C:\>ipconfig.exe

Windows IP Configuration

Ethernet adapter Local Area Connection:

    Connection-specific DNS Suffix  . : 
    IP Address . . . . .               : 89.10.48.62
    Subnet Mask . . . . .             : 255.0.0.0
    Default Gateway . . . . .         : 89.0.0.2

C:\>_
  
```

IP address and subnet mask

The IP address (IPv4) consists of four 8-bit values, called octets, that are written as decimal numbers (0 to 255) and separated by dots. The IP address consists of the network ID and the host ID:

- The *network ID* identifies the LAN and must be common to the controller and the test instrument.
- The *host ID* identifies a controller, test instrument or other TCP/IP host within the LAN. The address for each host must be unique to the network ID.

The subnet mask is a 32-bit value that is used to distinguish the two parts of an arbitrary IP address:

- A 1 in the subnet mask (written in binary notation) means that the corresponding bit in the IP address belongs to the network ID.
- A 0 in the subnet mask (written in binary notation) means that the corre-

sponding bit in the IP address belongs to the host ID.

The 1s in the subnet mask are always chosen in a contiguous fashion from the high order bits.

The IP Address numbers 10.a.b.c, 172.d.b.c, 192.168.b.c (where a = 0 to 255, b = 0 to 255, c = 1 to 254, d = 16 to 31) are reserved for private addresses; they are not reachable on the Internet.

Special subnet mask values

In decimal notation, a subnet mask octet value of 255 (= 11111111 binary) means that the entire octet belongs to the network ID, so the corresponding octets of the controller and the connected test device must be equal. A subnet mask octet value 0 means that they must be different.

Example:

IP address of the controller: 192.168.48.62

Subnet mask of the controller: 255.255.255.0

The first three octet values in the IP addresses must be equal. An example for a valid IP address for the test device is 192.168.48.52.

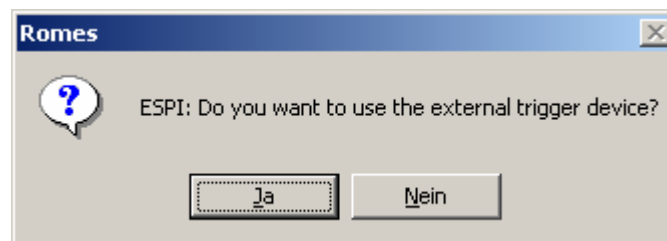
Note:

Host IDs must not consist of all zeros or all ones (in binary notation) because these values are reserved. For subnet mask values other than 0 or 255, a conversion into binary notation is helpful.

External Trigger Device

Trigger Box

The Rohde & Schwarz test receivers R&S ESPI and R&S ESVx can be operated with the Trigger Box, an external trigger device to be connected to a serial port. The Trigger Box is mandatory for the R&S ESVx receivers, optional for the R&S ESPI receivers. Clicking *OK* in the *Assign IEC Bus/LAN Address* window opens the following message box:



After clicking Yes, ROMES asks for a serial COM port to be assigned to the Trigger Box and terminates the installation. Both the test receiver and the Trigger Box configuration menus can be accessed from the *Configuration* menu; see [Fig. 6-85](#) on p. 6.125.

R&S TSMx Firewire Driver and Firmware Installation

Firewire Driver (R&S TSMx) - Information

The R&S TSMU and R&S TSML-x options are controlled via IEEE 1394 Firewire interface. Due to measurement requirements, a special driver from Rohde & Schwarz is required for the operation.

When the R&S TSMU was introduced for ROMES, the original Microsoft driver file **ohci1394.sys** was replaced by a modified R&S file with the same name.

Two major disadvantages were observed:

- The R&S driver file was not digitally signed, as opposed to the original MS files. And since MS Windows always prefers its own signed files – if not fooled by some smart tricks, performed by the R&S installer tool *R&S_OHCI1394_InstallationTool.exe*. However, on some PCs this did not work, and sometimes MS Windows re-installed the original file later, as it is not possible to remove it from the system completely.
- The modified R&S driver did not work with all IEEE1394 interface hardware. Some devices were successfully tested and therefore recommended, but it can happen that a manufacturer e.g. changes the chipset without announcement – and without notification on the label.

So the idea to use the original driver file again and install an additional R&S driver instead was pursued, providing the required R&S TSMx functions.

To keep it simple, we call the first one (replacement of the original ohci1394.sys by a R&S file) the **Old FireWire driver**, and the installation of an additional driver the **New FireWire driver**.

However, there are two important conditions for both Old and New driver: The R&S TSMx firmware version and the ROMES version. This diagram shows the relationships between ROMES version, FireWire driver and R&S TSMx firmware:

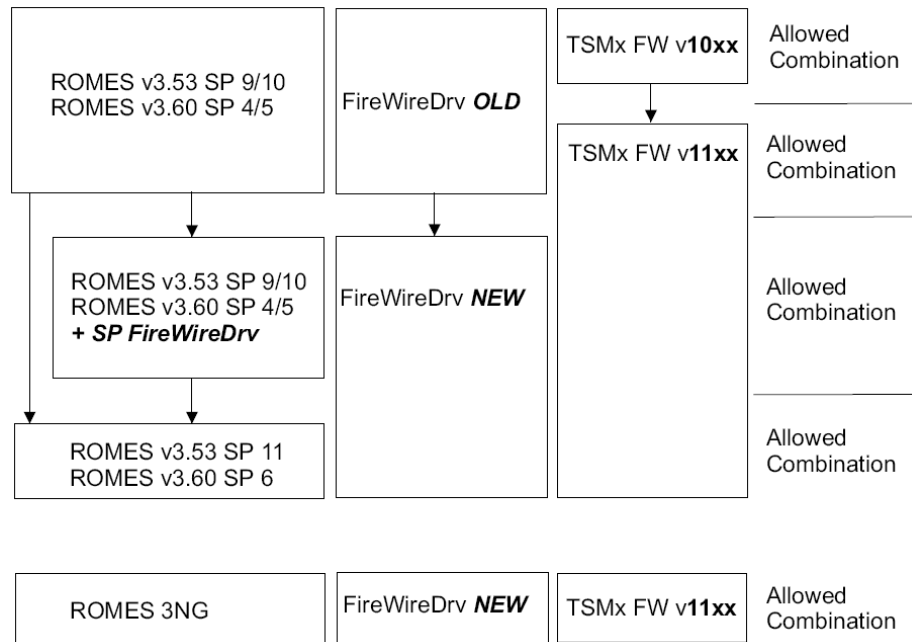
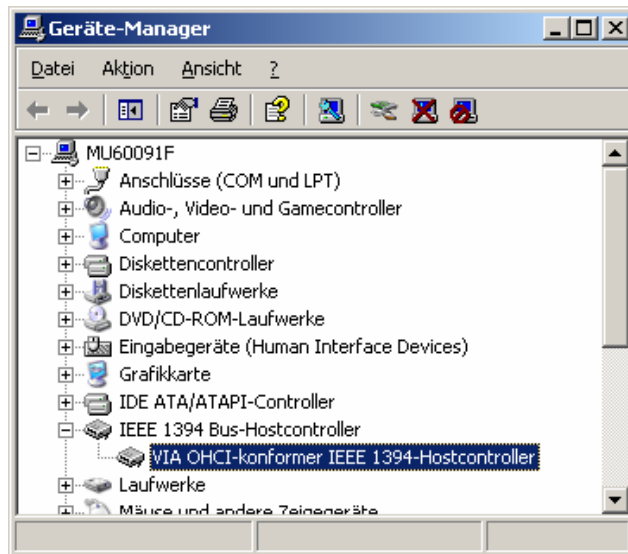
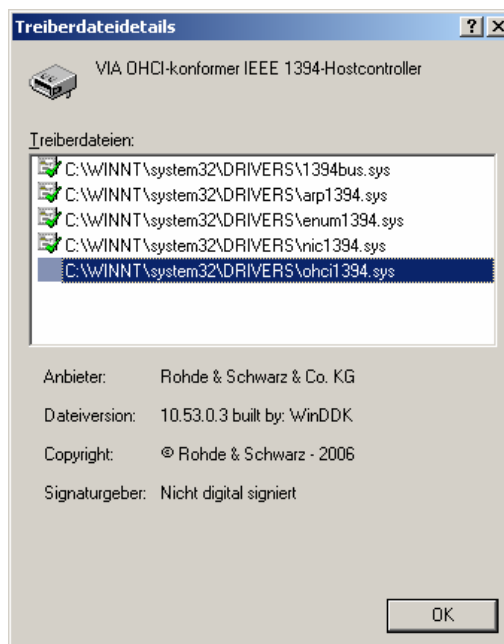


Fig. 6-2 ROMES version, FireWire driver and R&S TSMx firmware dependencies

To determine the currently installed FireWire driver version, go to the MS Windows Device Manager and select the IEEE1394 controller:

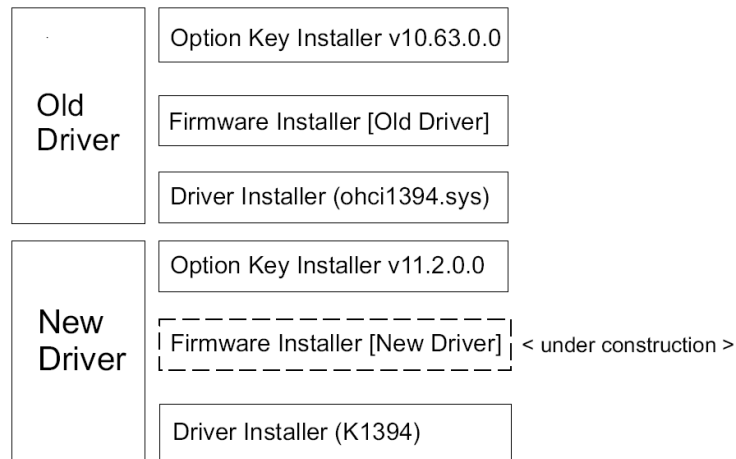


Right-click the controller, select *Driver*, then *Driver Details*:



Select the **ohci1394.sys** file list entry to view its properties. If the file originates from Rohde & Schwarz, then the old driver will be installed.

To resolve the installation difficulties, another set of R&S TSMx tools is included on the ROMES 3.60 and 3NG CDs). Here is an overview of the available old and new R&S TSMx tools:



Note that the firmware version numbers are subject to change, but v10.xxxx always refers to the **Old** and v11.xxxx to the **New** Firewire driver.

The *Option Key* and *Firmware Installer* tools only work with the related driver.

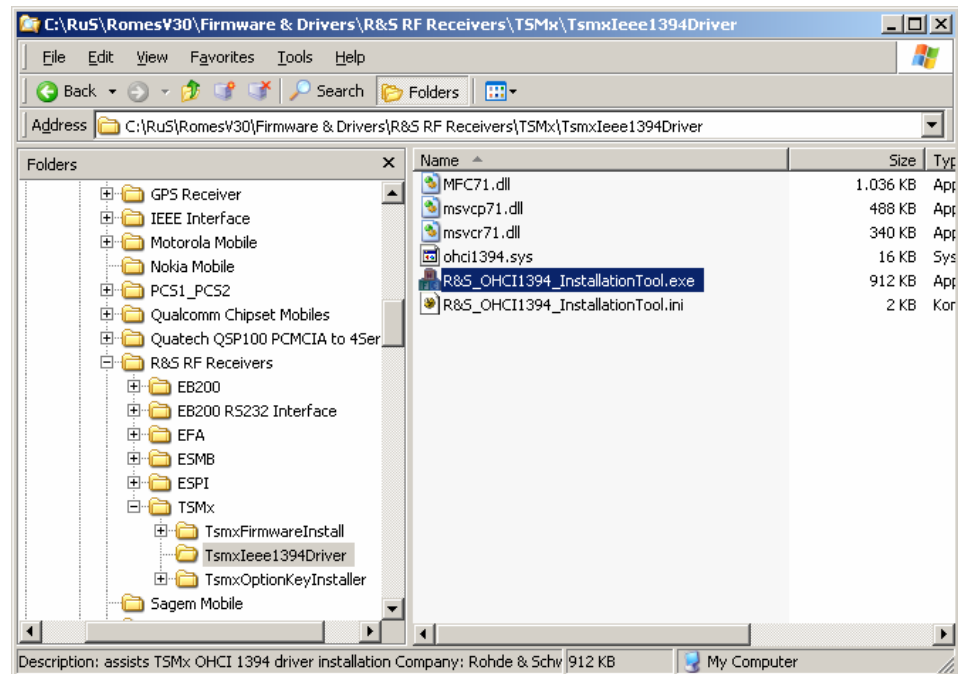
As long as the *Firmware Installer* for the *New* driver is not available, all firmware updates have to be done with the old tool and the old driver, also e.g. an update from FW 11.04 to 11.05.

For this reason, the ROMES 3NG CD contains the old driver as well, as a possible fallback position.

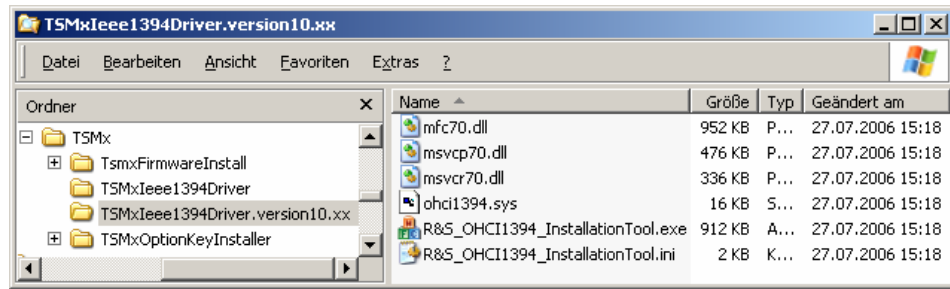
Old Firewire Driver (TSMx) - Installation

Please consult [Fig. 6-2 ROMES version, FireWire driver and R&S TSMx firmware dependencies](#) first to confirm that the old Firewire driver is to be installed.

The old TSMx IEEE 1394 Firewire driver is located in the *Firmware and Drivers\R&S RF Receivers\TSMx\TSMx\IEEE1394Driver* subdirectory of the ROMES CD-ROM:



If a new TSMx IEEE 1394 Firewire driver is available, the directory structure shown above is slightly different:



In case of the presence of a new driver, the directory of the old driver is named "TSMxIEEE1394Driver.version10.xxx".

- To install the old driver, double-click *R&S_OHCI1394_InstallationTool.exe* and follow the directions in the installation wizard.

The old TSMx IEEE 1394 Firewire driver replaces the Microsoft driver delivered with the IEEE 1394 hardware and reserves the IEEE 1394 functionality for R&S TSMx operation. The original Microsoft driver is restored by deleting the system file C:\WINNT\system32\drivers\ohci1394.sys.

To prevent Windows from accessing its own installation sources while the driver is installed, it is necessary to disable network and dial-up connections and block the Windows file protection mechanism. Once the installation is complete, the driver can be enabled in the Windows Control Panel or by simply restarting the computer. For details refer to the information in the installation wizard.

New Firewire Driver (TSMx) - Installation

Please consult [Fig. 6-2 ROMES version, FireWire driver and R&S TSMx firmware dependencies](#) first to confirm that the new Firewire driver is to be installed.

The installation of the new Firewire driver can either be done from scratch (new installation) or as a migration from old to new version (if a ROMES update is performed).

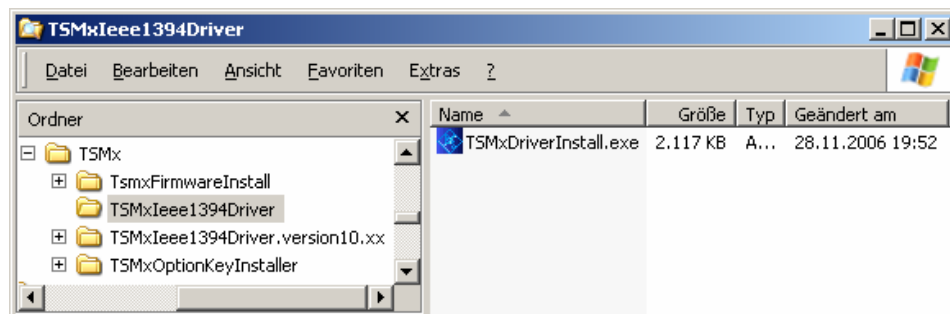


The R&S TSMx Firmware Installer for the new driver is still under development, so for all firmware updates the old tool has to be used, which makes it necessary to switch back to the old driver temporarily, even if you go i.e. from FW 11.04 to 11.05. This is described in step 3.).

For this reason, the installation tool for the old driver is available as well.

1.) Installation of the New Firewire Driver from Scratch

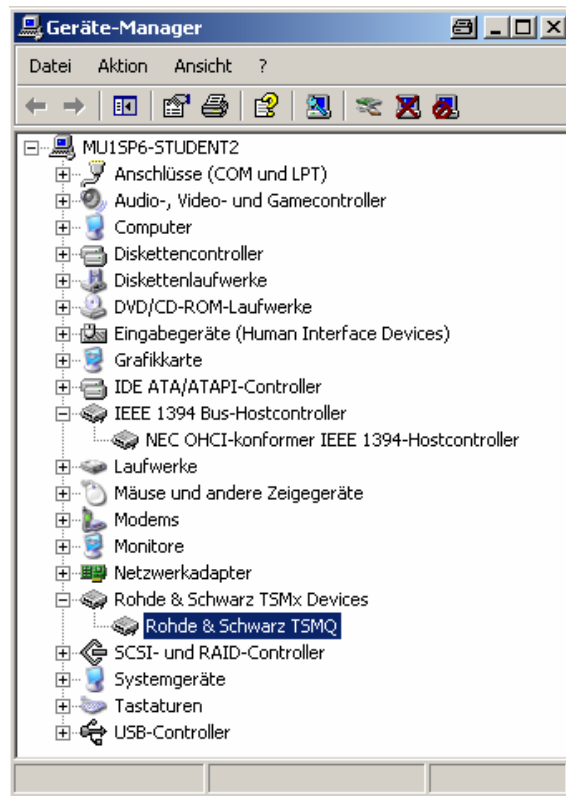
The new TSMx IEEE 1394 Firewire driver is located in the *Firmware and Drivers / R&S RF Receivers / TSMx / TSMxIEEE1394Driver* subdirectory of the ROMES CD-ROM:



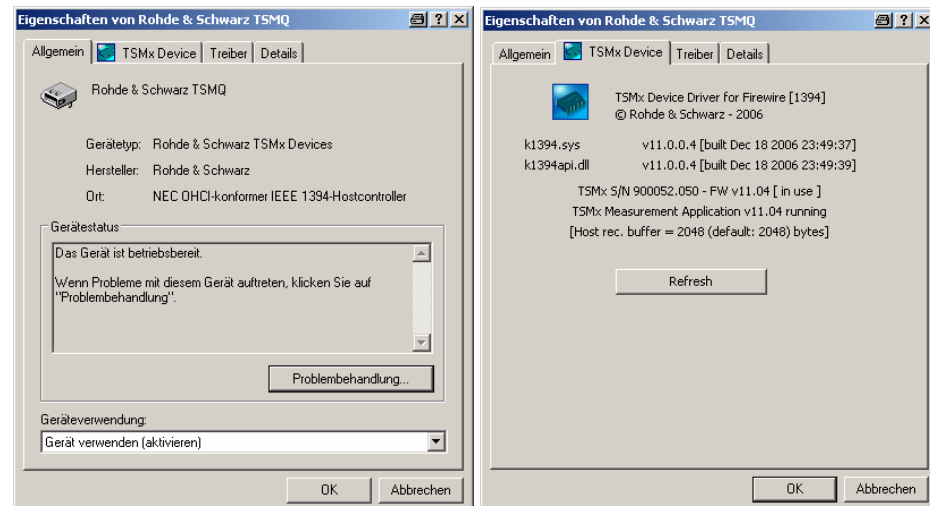
- To install the new driver, double-click *TSMxDriverInstall.exe* and follow the

directions in the installation wizard.

The installation of the new Firewire driver verifies that the original ohci1394.sys from MS is restored and installs the new add-on driver. The add-on driver is activated as soon as the R&S TSMx is connected to the ROMES computer. The MS Windows Device Manager shows the driver, e.g. for a R&S TSML-CW.



The driver properties are available using the context menu of the Device Manager entry:

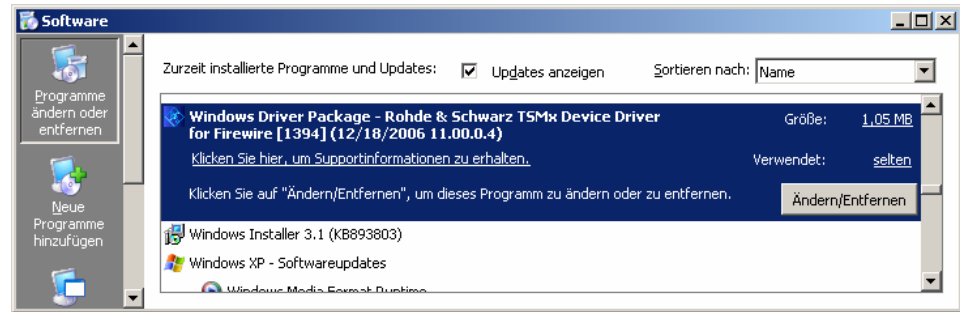


According to the driver file name, the new driver can be referred to as **K1394** driver.

Checking the driver details shows that the K1394.sys file is still not signed digitally, but now the file is ignored by the Windows file protection mechanism.

The new K1394 add-on driver is also available in the *Windows Software man-*

ager.



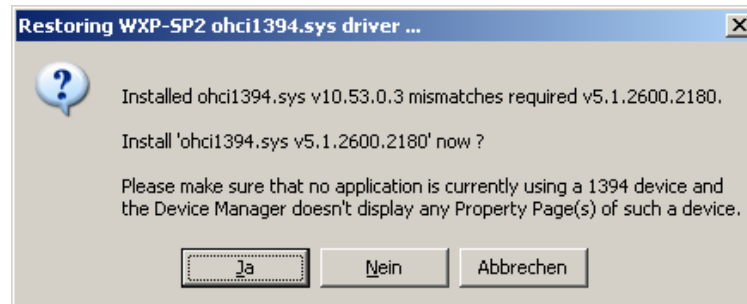
Every time the new driver detects a R&S TSMx with a new serial number, it will initiate the “New hardware found” dialog and install itself in the device manager. If the serial number is already known this will be done silently.

2.) Migration from Old to New Firewire Driver

Since the new R&S TSMx driver only complies with firmware v11.xx or above, it is advised that first all R&S TSMx units are upgraded to the latest available firmware while the old firewire driver is in operation. This is done with the [Firmware Installer](#) as described below.

In case the New driver is already installed and a R&S TSMx still running on Firmware v10.xx must be updated, you have to go back to the old driver, upgrade the R&S TSMx to FW v11.xx, and then re-install the new driver. This will become obsolete as soon as the *Firmware Installer* for the *new* driver becomes available.

After all R&S TSMx devices are updated to firmware v11.xx or above, the new driver is installed by double-clicking *TSMxDriverInstall.exe* as described in step 1.). No R&S TSMx needs to be connected. When the old driver is detected, the following message is shown:



Click on Yes to restore the original ohci1394.sys from Microsoft.

After that, the K1394 driver is installed.

If ROMES 3NG is used, the driver migration is now finished.

With ROMES 3.53 SP10 or ROMES 3.60 SP5 the special Service Pack for the new FireWire driver has to be installed before ROMES is restarted.

3.) If needed: Return from New to Old Firewire Driver

If it is necessary to return to the old driver for firmware updates, just use the driver install tool *R&S_OHCI1394_InstallationTool.exe*. After that the necessary firmware update(s) can be performed.

Then the new K1394 driver can be reinstalled as described above.



This rollback is sufficient for the firmware updates from v10.xx to v11.xx, but NOT for ROMES measurements with the *Old* driver.

Certain DLLs in the ROMES path are changed with the update from *Old* to *New* driver, and these will not be re-stored by reinstalling the *Old* driver. If only the firmware installer is run, the old DLL versions are provided in its path – but ROMES is run, the ROMES program path DLLs are used.

If the old version of Romes is required, it is necessary to re-install ROMES .

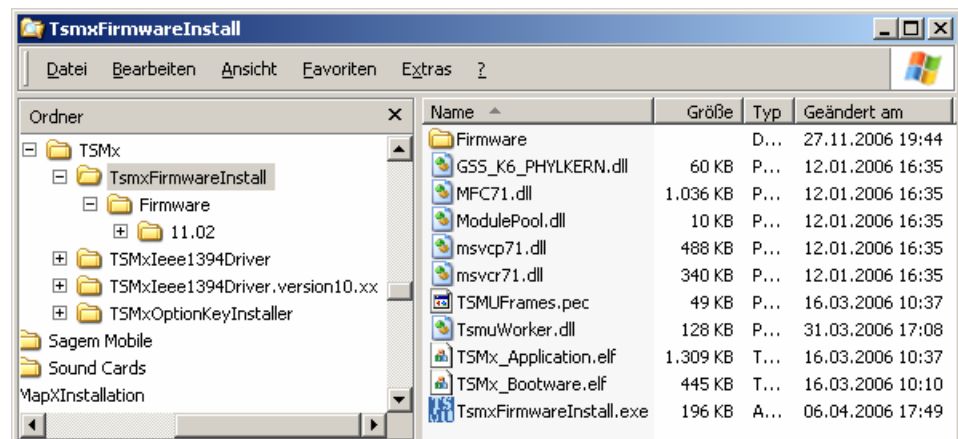
R&S TSMx Tools - Firmware Installer

To install a different firmware on a R&S TSMx. the following steps have to be conducted:

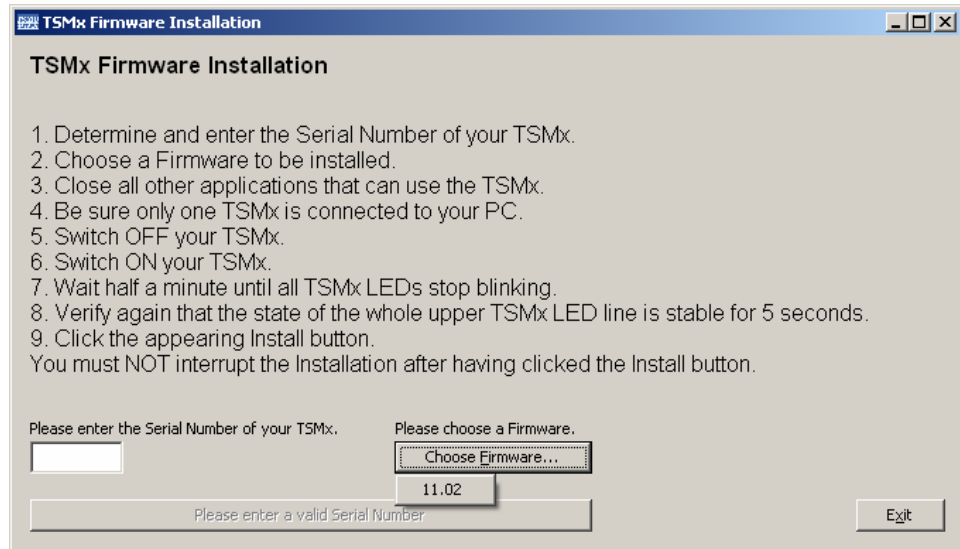
The ROMES program directory contains a subdirectory

...\Firmware & Drivers\R&S RF Receivers\TSMx

where the R&S TSMx tools are available.



To install a new firmware version on a connected R&S TSMx, change to the subdirectory "TsmxFirmwareInstall" and run the "TsmxFirmwareInstall.exe" executable, which opens a control dialog similar to the following:



Follow the given instructions closely to install the selected firmware version.

Note:

In case you are already running the New driver, and receive a R&S TSMx still running on Firmware v10.xx, you have to go back to the Old driver, upgrade the R&S TSMx to FW v11.xx, and then re-install the New driver.

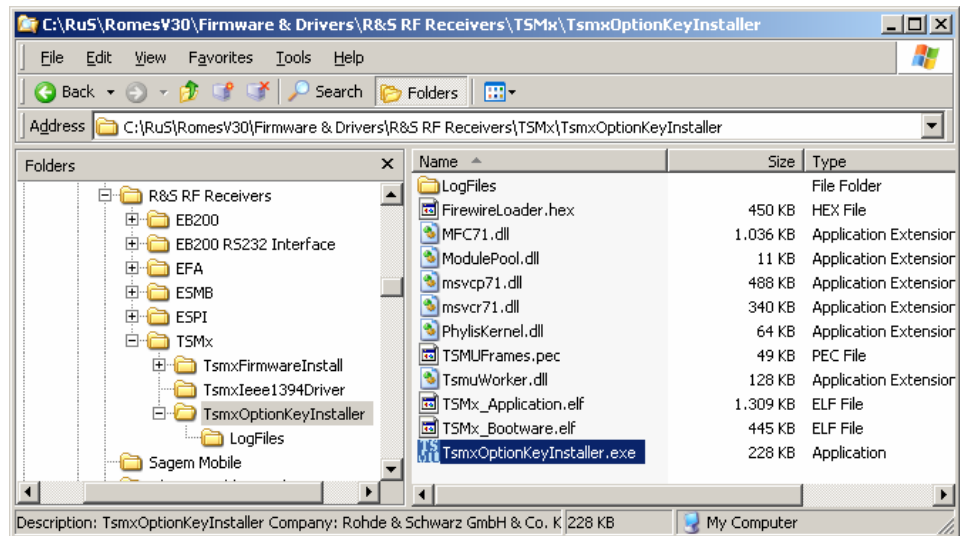
R&S TSMx Tools - Option Key Installer

To activate an option key for a R&S TSMx. the following steps have to be conducted:

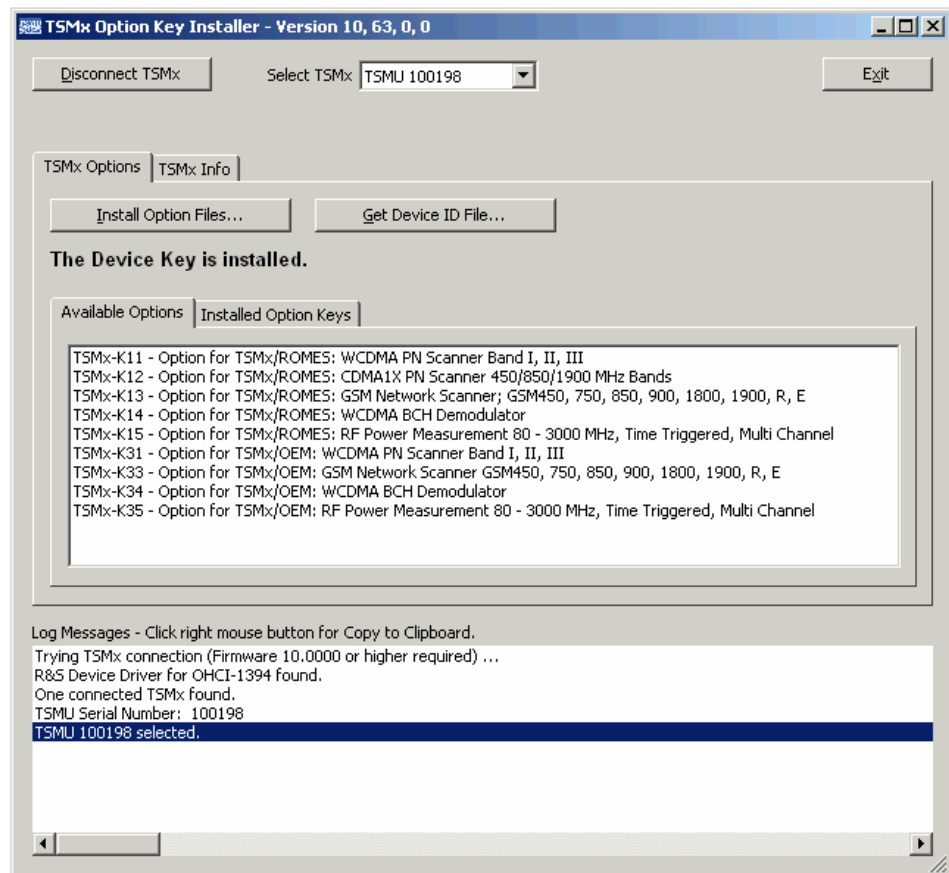
The ROMES program directory contains a subdirectory

...\\Firmware & Drivers\\R&S RF Receivers\\TSMx

where the R&S TSMx tools are available.



To activate an option key for a connected R&S TSMx, change to the subdirectory "TSMxOptionKeyInstaller" and run the "TsmxOptionKeyInstaller.exe" executable, which opens a control dialog similar to the following:



Connect TSMx / Disconnect TSMx After a connected TSMx from the *Select TSMx* list is marked, the *Connect TSMx* button queries the installed and available options for this R&S TSMx. The results are displayed in the related fields of the option key installer dialog.

After a R&S TSMx is selected, the button changes to *Disconnect TSMx*.

Select TSMx A list can be opened which contains the available R&S TSMx for selection.

Exit Saves the modifications and closes the dialog.

TSMx Options This panel contains information about the available and installed options and it allows the installation of the purchased option files.

Install Option Files... Opens a *File Open...* dialog to load the option key files which were delivered after purchase of the desired option for the selected R&S TSMx.

Get Device ID File... Creates a file named `DevID_TSMx_XXXXXX.hex`, which is used for the identification of the device. In some cases, e.g. when additional options are ordered, the file has to be sent to R&S.

Available Options Lists the options for the selected R&S TSMx.

Installed Option Keys Lists the installed and currently enabled options.

TSMx Info This panel contains a list of information of the R&S TSMx device (hardware, serial numbers, firmware version, calibration data).

Log Messages... The message log of the activities related to the option key installation is shown.

Device Chooser (R&S TSMx)

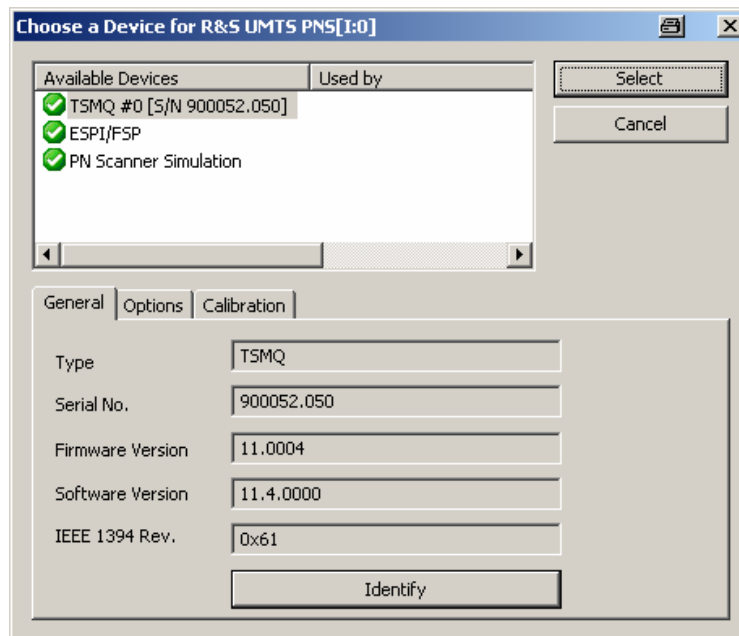


The R&S TSMx can be used as a *CW Receiver*, as a *GSM Network Scanner (GSM NWS)*, or as a *UMTS PN Scanner*. Whenever one of the three drivers is loaded, ROMES displays the *Device Chooser* dialog with a list of available test devices, their general properties, and the enabled options.

Note:

The two IEEE 1394 (Firewire) connectors on the rear panel of the R&S TSMx can be used to cascade several units together and perform different measurements in parallel. One unit can be used as a GSM network scanner, one as a PN scanner, and more as CW receivers. The position of a R&S TSMx unit in the cascade is irrelevant for its use, just check whether the unit is equipped with the required options.

In the following *UMTS PN Scanner* example, one can choose between a R&S TSMx test receiver, the simulation (which is always available), and an R&S ESPI/FSP test receiver. The *Device Chooser* is closed after selecting the device; the installed driver is configured in an independent driver configuration menu.



Configuration of Installed Drivers

All added drivers are shown in the *Loaded Drivers* list of the *ROMES Hardware Configuration* menu. Additionally, they appear in the *Configuration* menu. To distinguish multiple drivers (i.e. drivers assigned to various COM ports) from each other, they are assigned a number in the command line (*Z500 [1] ... , Z500 [2] ...*).

If a *Custom Name* was assigned to the device (see section [Driver Configuration GSM – Serial Port Driver Info](#), p. 6.68), it is displayed in a column of the *Device Chooser* list above. The *Custom Name* can be used to assign a name to a mobile, e.g. to make a quick association of a test mobile to its designated test network provider.

An example for a Sagem OT260 mobile with an assigned *Custom Name* of "This_is_my_mobile" is shown below:

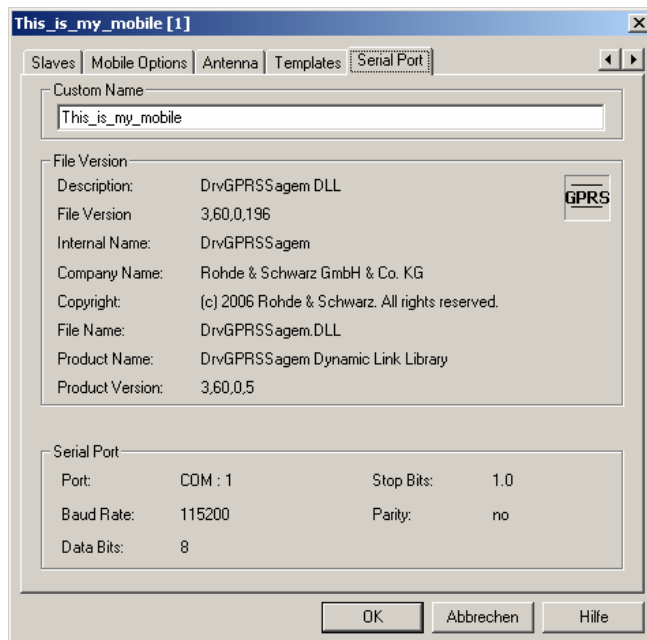


Fig. 6-3 Custom name

For many device drivers the *Action* menu is also added to the menu bar. It contains driver-specific functions for control during measurement and recording (see subsections [Action Menu](#) in the corresponding mobile driver sections).

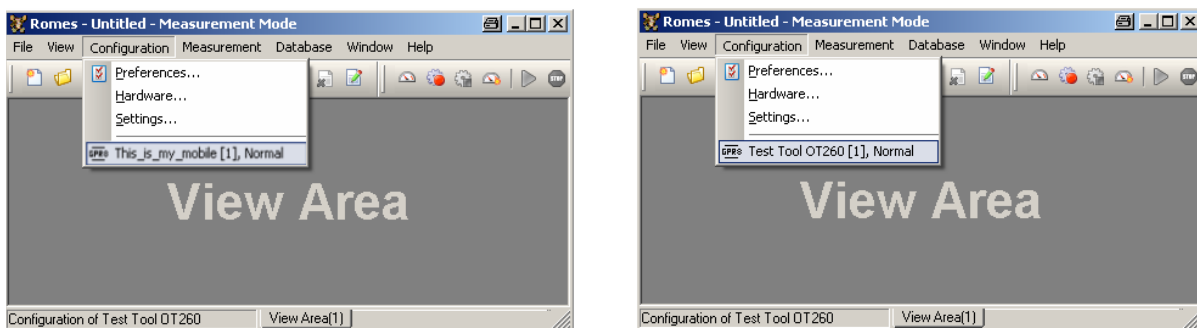


Fig. 6-4 Driver indication with Custom Name ...without Custom Name

The *Driver* commands in the *Configuration* menu open the driver-specific configuration menus described in section [Driver Configuration Menu](#) on page 6.33 ff.

System Monitor and Performance Counters

The *System* driver is a hardware-independent driver that stores Windows performance counters to the measurement file. Monitoring this information during the measurement can be helpful for assessing the validity of measurement results.

Example:

Suppose that a DQA job involving an FTP download from a remote server fails. Monitoring the local processor time together with the measurement data helps to decide whether the failure is due to local performance problems rather than to an unstable data connection.

The *System* driver is installed from the *ROMES Hardware Configuration* menu (see Fig. 6-1 on p. 6.1) like any other driver. The driver configuration menus are accessible from the *Configuration* menu.

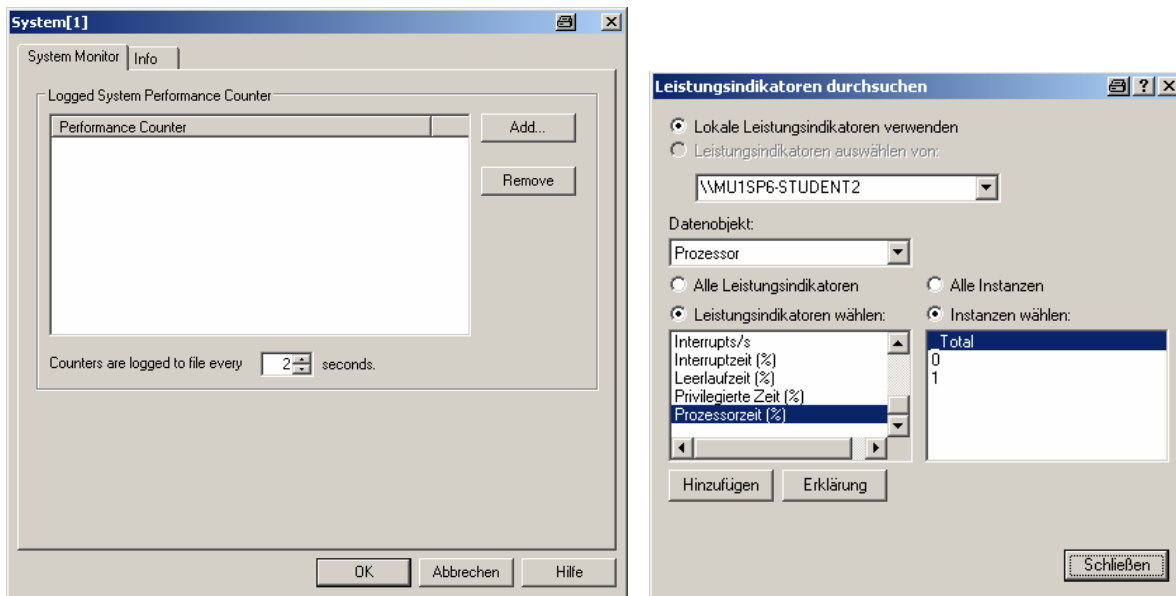


Fig. 6-5 System driver configuration

The *System Monitor* tab selects the performance counters to be stored to the measurement file and the time interval between two consecutive loggings. *Add* opens the *Browse Performance Counters* selection dialog. A selected local computer counter is directly written into the *Performance Counter* list in the *System* dialog.

ROMES generates a signal for each selected counter. The signals are displayed in the *Available Signals* tab of the *ROMES Configuration* menu. They can be viewed in correlation with other signals using an appropriate view (e.g. the *2D Chart View* or *Alphanumeric View* in the *General Views* section of the *View* menu).

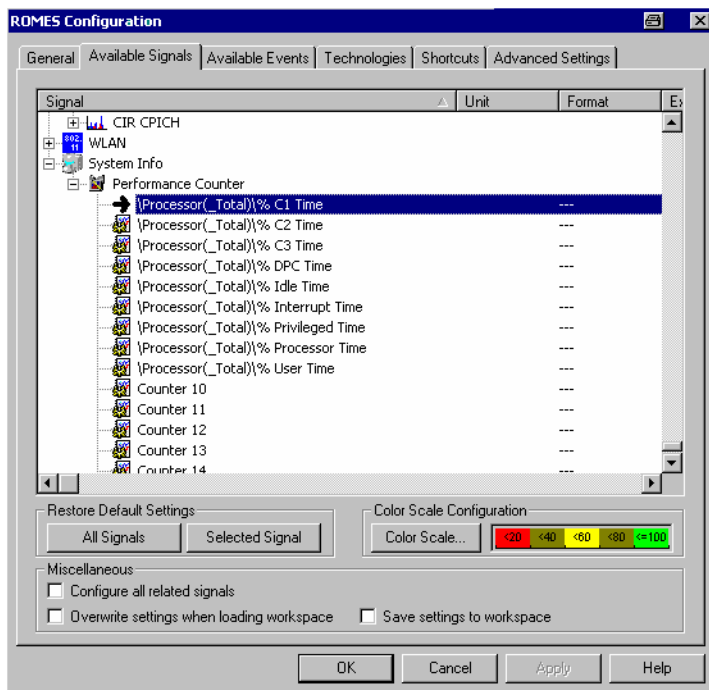


Fig. 6-6 Performance counter signals

Test Devices

The measurement system supports a wide range of devices that can be used to perform measurements and provide the desired results:

- Mobile phones for various networks and of various types
- A selection of test receivers and analyzers

The drivers needed for the test devices and their configuration is described in the following sections.

Generic Mobile Drivers

The selection of generic mobile test devices is performed similar to the GSM hardware selection. This is shown in the *Hardware Configuration - Load Drivers* screenshot below, where the *GenericMobile* menu item loads a generic driver.

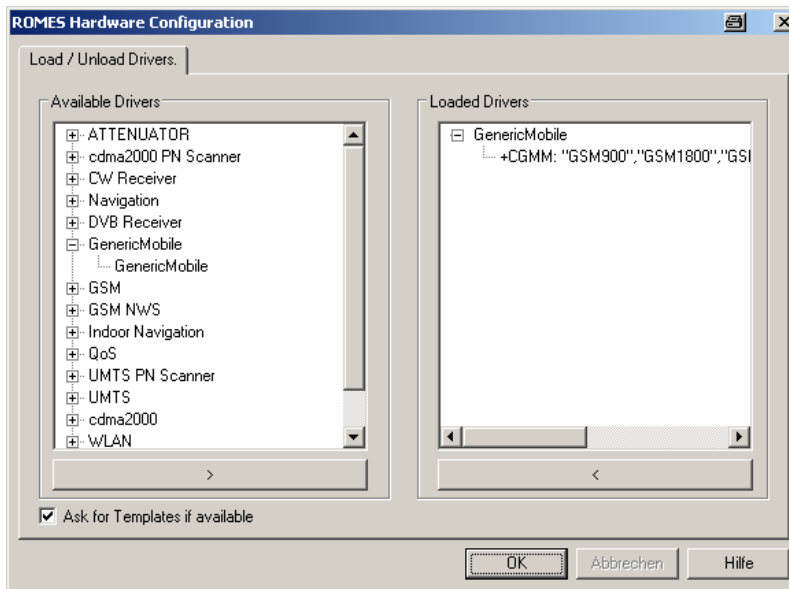


Fig. 6-7 Hardware Configuration – Load/Unload Drivers tab

The measurement system provides a generic mobile driver for the test mobiles not covered by the GSM or UMTS drivers.

Configuration Menu Generic Mobile

The *Generic Mobile* driver configuration menu contains various tabs to select the measurement and message types evaluated by the test system (*GM Settings*, *Communication Item List Editor*, *Mobile Options*), to configure the autodialing and autoanswer call mode (*Autodialing*), to set up the Speech Quality and Video Quality Analysis (*SQA/VQA*), to define the characteristics of the antenna used (*Antenna*), and to display information on the driver and the serial port assigned (*Serial Port Driver Info*). It can be opened by clicking the *Driver* command line of the *Configuration* menu which is available as soon as a mobile driver is loaded (see Fig. 6-4) or via the *Driver* tab in the *Configuration of Software Modules* menu opened via the *Configuration – Settings* command.

Generic Mobile (GM) Settings

The *CGM Settings* tab defines the PIN number, if applicable.

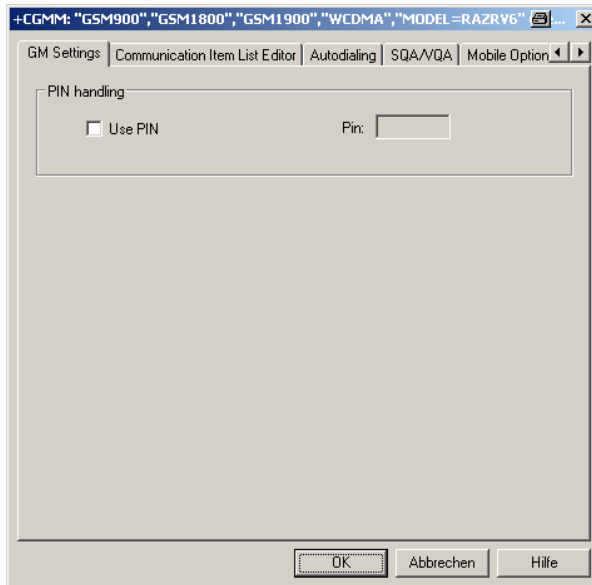


Fig. 6-8 Generic Mobile (GM) driver configuration – GM Settings

PIN handling

If *Use PIN* is checked, the PIN number for identification after switching on the test mobile can be entered in the *GM Settings* panel of the configuration dialog. If nothing is entered, the SIM must be entered manually at the mobile each time it is started.

Communication Item List Editor

The *Communication Item List Editor* tab shows the message commands, requests, and responses to be recorded to the measurement file.

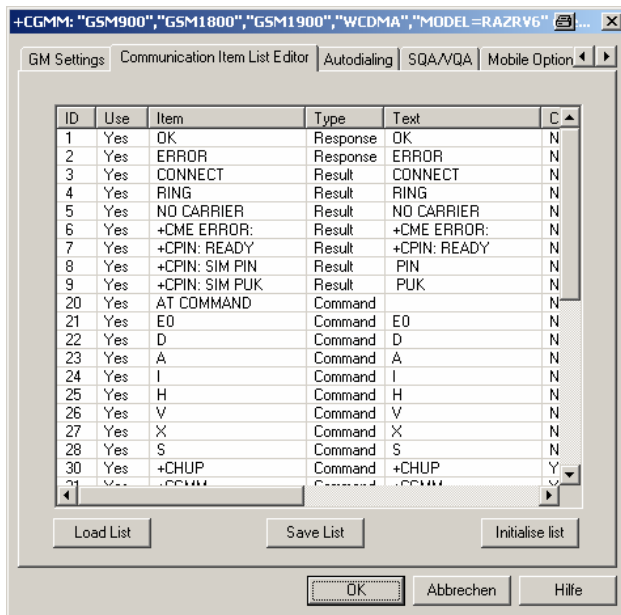


Fig. 6-9 Generic Mobile driver configuration – Communication Item List Editor

Communication Item List

The communication item list displays the following columns:

ID

Internal list number of the communication item.

Use

Toggles the use of the selected list item.

Item

Communication item descriptor (or AT command).

Type

Qualifies the list item to be a command, request, or result.

Text

Additional optional description of the list item.

Check

Sets whether or not the communication item is supported by the mobile, a setting of *Yes* indicates that there is active feedback from the mobile.

Get Par.

List item parameter is requested by the generic mobile.

Set Par.

List item parameter is sent to the mobile (e.g. PIN).

Term.

Termination of the mobile response, i.e. the item defines the end of the mobile response.

Delim.

Sets the delimiter for parts of multi-part responses from the mobile.

Time [ms]

Defines the time to wait for the response from the mobile.

Response

This represents the value of the response, e.g. 0 means "Response is a valid value", 1 usually means "OK".

Load List

Clicking the *Load List* button calls a *Load List* dialog window to select a previously saved list to be loaded.

Save List

Clicking the *Save List* button calls a *Save List* dialog window to store the current list.

Initialise List

Clicking the *Initialise List* button loads the default list (unsaved manual changes are lost).

Autodialing Generic Mobile

The *Autodialing* tab configures the mode where a definite phone number is dialed periodically, and a call is set up to the mobile phone. This mode is relevant for the network quality analysis described on page 6.52. All settings are analogous to the GSM driver settings described on p. 6.48 ff.

If a 2nd virtual COM port is needed to be operated in *autodial* mode; see the paragraph on [Loading the drivers](#) on p. 6.6.

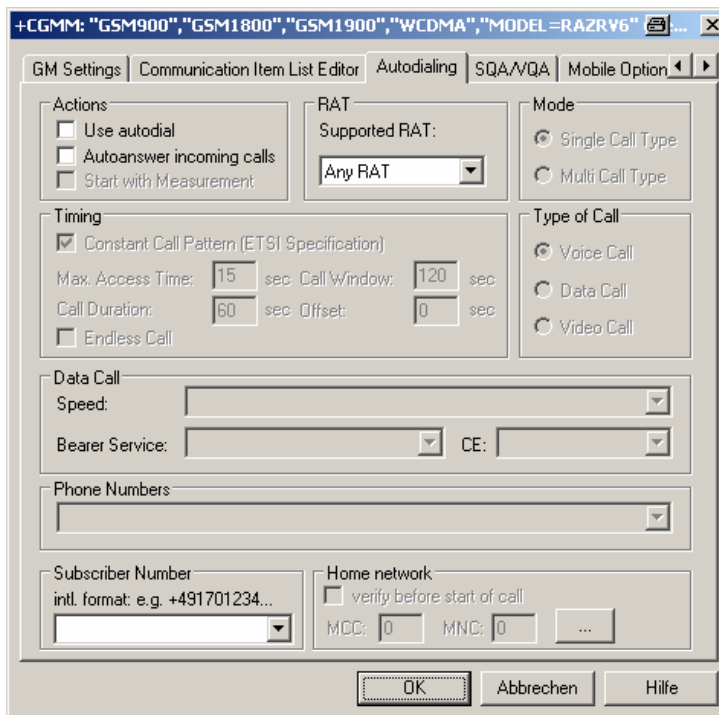


Fig. 6-10 Generic Mobile driver configuration – Autodialing tab

SQA/VQA Settings Generic Mobile

The SQA/VQA tab enables and configures the Speech Quality and Video Quality Analysis (SQA/VQA, with option ROMES-Z8, *Voice Quality PESQ*). SQA results can be displayed in the *SQA Message* view (see chapter 4). VQA results can be obtained as described in section [Speech / Video Quality Tester Driver \(SQA/VQA\)](#) on p. 6.207. All settings are analogous to the GSM driver settings described on p. 6.60 ff.

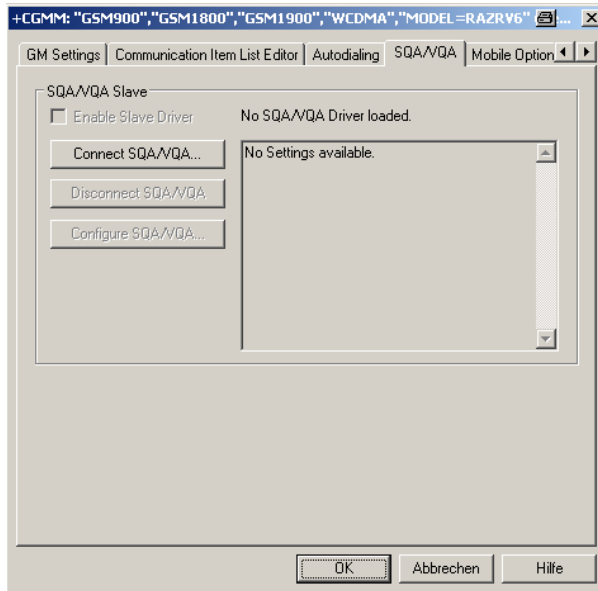


Fig. 6-11 Driver Configuration – Speech Quality tab

Antenna Generic Mobile

The *Antenna* tab defines *Antenna Name*, *Antenna Gain* and *Cable Loss*. These values have no impact on the measurement but are stored in the measurement file header so they can be taken into account for the calculation of correction factors.

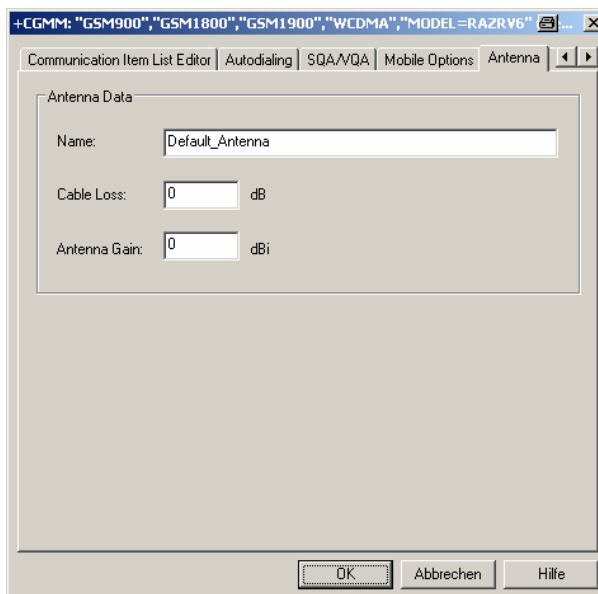


Fig. 6-12 Driver Configuration – Antenna tab

Templates Generic Mobile

The *Templates* tab stores the current driver configuration as a template, lists, loads or deletes driver templates. All settings and buttons are analogous to the GSM driver settings described on p. 6.59 ff.

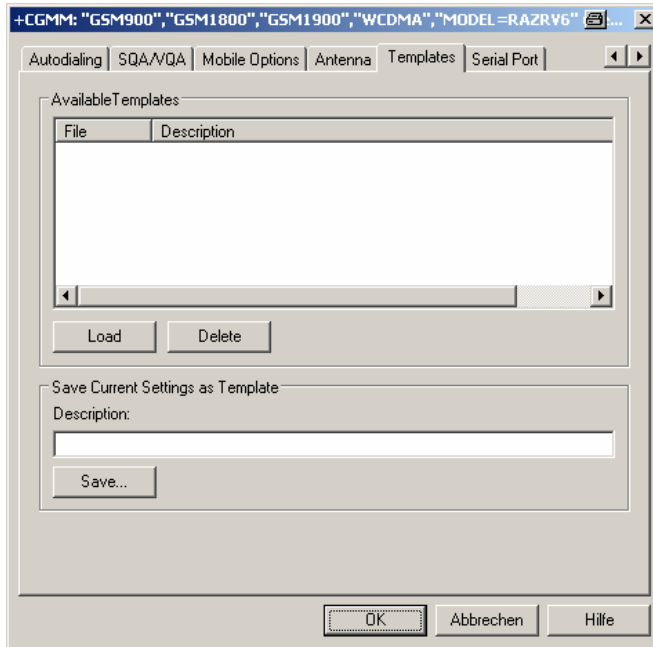


Fig. 6-13 Driver Configuration – Templates tab

Serial Port Driver Info Generic Mobile

The *Serial Port Driver Info* tab displays the custom name of the device, information on the file version of the generic mobile driver, the serial port assigned to it and the transfer parameters.

The *Custom Name* is used to assign a name to a mobile, e.g. to make a quick association of a test mobile to its designated test network provider. An example is provided in section [Configuration of Installed Drivers](#) on p. 6.21.

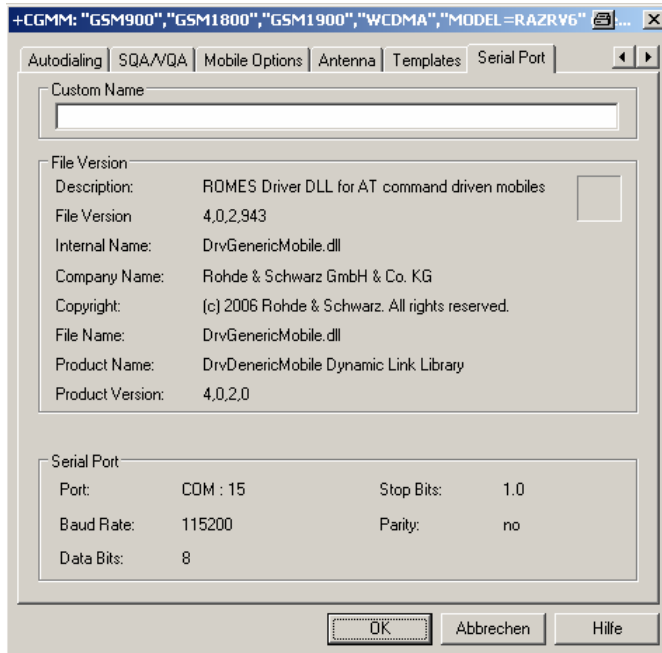


Fig. 6-14 Driver Configuration – Serial Port Driver Info tab

Action Menu Generic Mobile

The *Action* menu opens popup boxes used to set up a call or show the contents of the mobile display. It is added to the menu bar as soon as a mobile driver has been successfully installed (see section [Driver Installation](#) on page 6.1 ff). If several mobiles are connected, separate command lines are displayed for each of them.

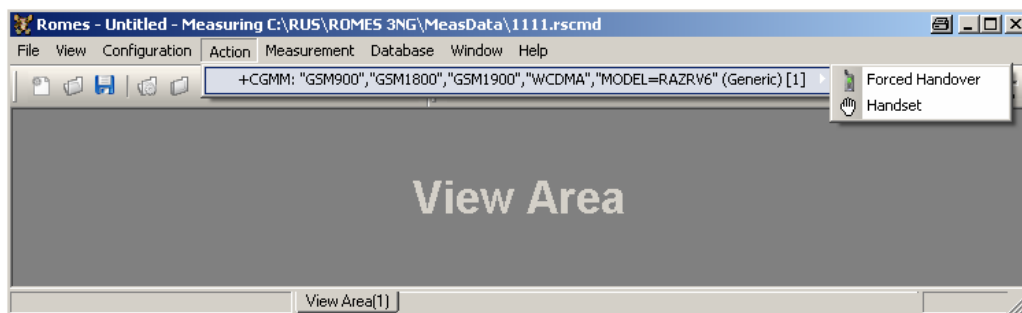
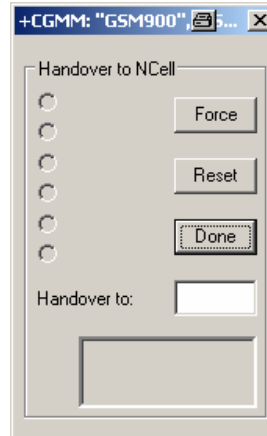


Fig. 6-15 Action menu for different driver types

Forced Handover

Switches over to one of the six neighbor cells if possible.

Handover is possible in dedicated mode (during a call) only. The *Forced Handover* command opens the following dialog box .



NCell BCCH channel numbers of the neighbor cells. The available neighbor cells might be less than six. One of the cells must be selected for handover.

Force Initiates a forced handover to the selected neighbor cell. This can be done several times in succession. After a forced handover the mobile is locked on the former neighbor cell which is now the serving cell.

Reset Cancel all forced handover procedures and return to Normal measurement mode.

Done Closes the Handover window.

The current action is indicated in the two output fields below the buttons.

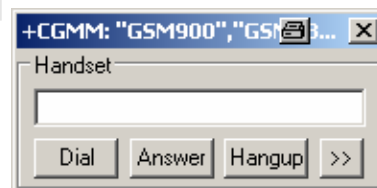
Note:

This function is only possible in NORMAL measurement mode (see Fig. 6-19 on page 6.40).

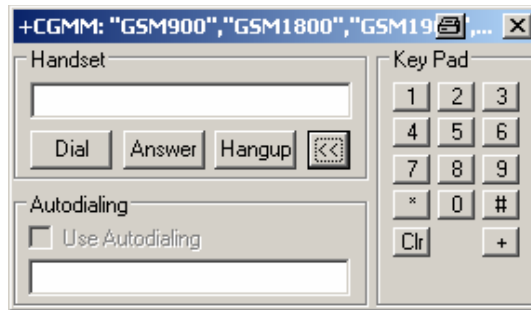
Handset Generic Mobile

Activates the entry of a number to dial, set up and terminate a call .

The *Handset* command opens the following dialog box:



The >> button enlarges the dialog box, giving access to the Key pad and the *Autodialing* option:



Dialed number The number to be dialed can be entered either via the keyboard and the input field or by clicking the on-screen keypad.

 Closes the window without any further action.

Dial Starts dialing the number entered before.

Answer Instructs the phone to accept the call.

Hangup Drops the line.

Autodialing If the box is checked, the phone number entered below is called periodically, the Dial, Answer, and Hangup buttons are disabled (grayed). The autodialing mode (see p. 6.27) can be set even during the measurement, but only in Idle mode. This item starts *Autodialing* if the *Start with Measurement* option was not checked in the driver configuration autodialing panel.

GSM Mobile Drivers

Several different GSM mobile drivers are provided with the measurement system: AEG, Sagem, Chase. Each of the drivers supports a set of mobile types. Installation of all drivers is analogous (see section [Driver Installation](#) on page 6.1 ff.); differences concerning the configuration are pointed out in the following sections. The devices listed in the following tables are either hand-portable or vehicle-mounted mobile phones (AEG, Sagem) or modules for system integration.

The mobile drivers and mobiles are now grouped into the R&S support classes 1 and 2. The mobiles of R&S support class 1 are continuously tested with new ROMES versions and service packs, they are permanently available to our testing staff. The mobiles of R&S support class 2 are not always available for testing, but they have been tested successfully at least once with the current ROMES software release. The introduction of the R&S support classes is necessary due to the sheer number of supported mobiles. The mobile types with R&S support class 1 are listed with normal title typeface in the tables below, the mobiles with R&S support class 2 are marked with *italic* title typeface.

All GSM channels and frequencies are listed in chapter 8, section GSM Channels and Power classes.

Table 6-1 GSM mobile drivers and supported devices

Manufacturer: AEG	Manufacturer: Nokia	Manufacturer: Sagem
<p>HT901 GSM Mobile¹ Hand-portable GSM900 mobile Power classes: 4-5 Channel numbers: 1-124</p> <p>D902 GSM Portable Vehicle-mounted GSM900 mobile Power classes: 2-5 Channel numbers: 1-124</p> <p>HT1801 DCS Mobile Hand-portable GSM1800 mobile Power classes: 1-2 Channel numbers: 512-885</p> <p>HT1901 PCS Mobile Hand-portable GSM1900 mobile Power classes: 1-2 Channel numbers: 512-735</p> <p>911 GSM Mobile</p> <p>1811 DCS Mobile</p> <p>1911 PCS Mobile</p>	<p>Nokia 6230 GSM900 / 1800 / 1900 or GSM 850 / 1800 / 1900 triple-band mobile supporting GPRS and EGPRS. The test mobile must be connected via USB port, see section Connection via USB Interface on p. 6.5 ff and does not support Scanning.</p>	<p>SAGEM OT 76-M/OT 96-M GPRS² SAGEM OT 96-MW/OT 96-RBAND³ Hand-portable GSM900/1800 dual-band mobiles Power classes: 4-5 | 1-2 Channel numbers: 512-885</p> <p>SAGEM OT 160/190⁴ Hand-portable GSM900/1800 dual-band mobiles Channel numbers: 1-124, 975-1023 | 512-885</p> <p>SAGEM OT 169/199 Hand-portable GSM900/1900 dual-band mobiles Channel numbers: 1-124, 975-1023 | 512-810</p> <p>SAGEM OT 260/290⁴ Hand-portable GSM900/1800/1900 triple-band mobiles Channel numbers: 1-124, 975-1023 | 512-885 Models OT 76, OT 96, OT 160/190, OT 169/199, and OT 260/290 require the SAGEM x6 driver, the other models require the SAGEM driver.</p>

Driver Configuration Menu GSM

The *Driver Configuration* menu contains various tabs configuring the mobile type (*Setup*) and *Measurement Mode*, the autodialing and autoanswer call mode (*Autodialing*), the network quality analysis (*NQA*), the characteristics of the antenna used (*Antenna*), a fax terminal driver connected (*Slaves*), and displays information on the driver and the serial port assigned (*Serial Port Driver Info*). It can be opened by clicking the *Driver* command line of the *Configuration* menu which is available as soon as a mobile driver is loaded or via the *Driver* tab in the *Configuration of Software Modules* menu opened via the *Configuration – Settings* command.



Many mobile drivers support template files. These files store a complete driver configuration which can be re-used independent of the workspace; see [Templates](#) on p. 6.59 ff.

¹ **Note:** Mobile Devices in italic typeface are R&S Support Class 2 (see above)

² The OT 76 and OT 96-M GPRS mobiles support the P-GSM and the E-GSM band (channels 975 to 1023). The OT 96-M GPRS mobile supports GPRS and can be used to record GPRS data.

³ The OT 96-RBAND mobile supports the P-GSM, the E-GSM and R-GSM band (channels 955 to 974) but no GPRS.

⁴ The OT 190 and OT290 mobiles support GPRS and can be used to record GPRS data.

Driver Configuration GSM – Setup

The *Setup* tab defines the device type used, its power class and the PIN number (not for all drivers). In addition it opens the menu configuring the Rx Level Calibration.

For mobiles supporting GPRS (e.g. SAGEM OT 96-M GPRS, OT190 GPRS, OT 290 GPRS), the *Setup* tab is replaced by the *GPRS Forcing* tab; see section [GPRS Forcing](#) on page 6.38.

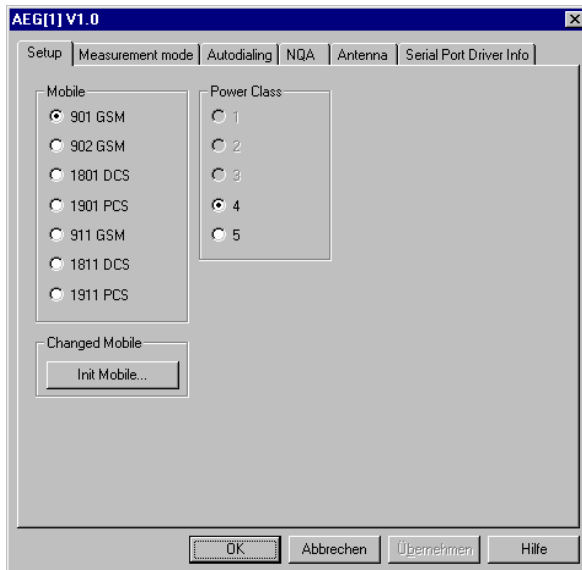


Fig. 6-16 Driver configuration – Setup (AEG)

Mobile List of the mobile types supported by the driver (see section [GSM Mobile Drivers](#) on page 6.32). To select a mobile type click the corresponding radio button. The COM port assigned to the driver is indicated below the *Mobile* list.

Power Class Power class of the mobile phone used. The GSM standard defines power classes 1 to 5:

Power class	GSM900	GSM/GSM1800	GSM/GSM1900
1	-	1 W / 30 dBm	1 W / 30 dBm
2	8 W / 39 dBm	0.25 W / 24 dBm	0.25 W / 24 dBm
3	5 W / 37 dBm	4 W / 36 dBm	2 W / 33 dBm
4	2 W / 33 dBm	-	-
5	0.8 W / 29 dBm	-	-

The power class may be decreased, however, it is not possible to go beyond the highest supported power class of the selected mobile type. See also overview of power classes and power control levels in chapter 8.

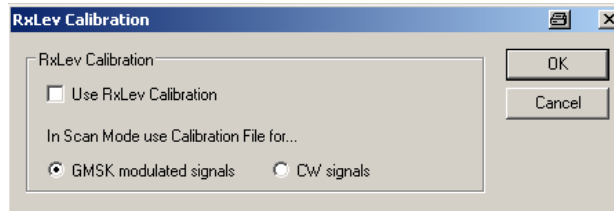
Changed Mobile The *Init Mobile...* button in the *Changed Mobile* panel starts the initialization if a mobile (even of the same type) was changed.

Speaker In the *Speaker* panel, one of the two speaker connections of the RS TM mobile can be selected.

PIN Some driver types allow to enter the PIN number in the configuration dialog:

In the Sagem driver configuration menu the PIN number is directly entered into the *PIN* input field. Alternatively, the PIN can be entered via the mobile phone.

RxLev Calibration The *RxLev Calibration* button, which is available for AEG, Sagem, and Nokia mobiles, opens a dialog to activate the calibration of the received signal level reported by the mobile:



The RxLev Calibration is based on a comparison between the RX level values reported by the mobile and the actual RX levels applied to the mobile receiver. This comparison can be drawn with a CMD Digital Radio Communication Tester and the *MobCal* software tool from Rohde & Schwarz.

Presently, RxLev calibration is implemented only with GSM900 and GSM1800. The calibration can be used for single-band as well as for GSM900/1800 dual-band mobiles. For GSM-E or GSM-R calibration, the values of BCCH 1 are used.

For dual-band mobiles two separate correction table files have to be created for the two GSM bands, and they must be stored in the \driver\ subdirectory of the ROMES program directory.

In order to be recognized as two files belonging to the same mobile, the two correction tables must be named as follows:

for GSM900: <IMEI 8 last significant digits>.<ext> (e.g. 12345678.cm)

for GSM1800: <IMEI 8 last significant digits>_D.<ext> (e.g. 12345678_D.cm)

If the file name does not follow this convention, a file open dialog prompts for the wanted .<ext> file at start of measurement.

The file extensions are used as follows:

<ext>	is used for ...
.CM	Normal and Camp measurements
.SC	Scan measurements with GMSK signal form (a special scan mode only available at RSTM, AEG)
.CW	Scan measurements with CW signal form (a special scan mode only available at RSTM, AEG)
.IT	Test transmitter mode (a special scan mode only available at RSTM, AEG)

Please note:

- A correction table file (ASCII) contains a maximum of 50 different channels.
- Channels others than 1..124 in the first file and 512..855 in the second file are not allowed and could lead to crashes
- Level lines are between -110dB and -35dB in 1dB steps in a 3 dimensional matrix.
- Between the channels the calibration value will be linear interpolated. Out-

side the last valid value will be extrapolated. Between two level lines the calibration value will be linearly interpolated.

Example a simple .CM file:

The following file is an example with 3 channels (Ch 1, 40, and 124) and 9 level lines. The shown calibration values change linearly from 1.0dB to 1.2dB.

```
{ [D] };15.09.104;12:05:55;11:16:52
{ [T] }25;25;25
{ [M] }GSM; 350639.07.031008.0; 206.10.2000005178;4
{ [F] }CM;GMSK;0.00
{ [O] }1;-110;10
{ [O] }1;-101;10
{ [O] }1;-77;10
{ [O] }1;-57;10
{ [O] }1;-53;10
{ [O] }1;-51;10
{ [O] }1;-50;10
{ [O] }1;-49;10
{ [O] }1;-48;10
{ [ ] }
{ [O] }40;-110;11
{ [O] }40;-101;11
{ [O] }40;-77;11
{ [O] }40;-57;11
{ [O] }40;-53;11
{ [O] }40;-51;11
{ [O] }40;-50;11
{ [O] }40;-49;11
{ [O] }40;-48;11
{ [ ] }
{ [O] }124;-110;12
{ [O] }124;-101;12
{ [O] }124;-77;12
{ [O] }124;-57;12
{ [O] }124;-53;12
{ [O] }124;-51;12
{ [O] }124;-50;12
{ [O] }124;-49;12
{ [O] }124;-48;12
{ [ ] }
```

Explanation of the line identifiers:

Identifier	Meaning of succeeding parameters
{ [D] }	User ^{*)} ;Date ^{*)} ;Time ^{*)} ;Duration of creation ^{*)}
{ [T] }	Room temp ^{*)} ;Mobile temp. (start ^{*)});Mobile temp. (end ^{*)}
{ [B] }	CMD TxPower (start ^{*)});TCH (start ^{*)});Tslot (start ^{*)});used Tslot(dBm ^{*)});unused Tslot (offset dB ^{*)}
{ [M] }	Network type ^{*)} ;IMEI ^{*)} ;IMSI ^{*)} ;Powerclass ^{*)}
{ [F] }	CM; GMSK; 0.00 // Type of corr.file CM; GMSK|CW ^{*)} ; FreqOffset in KHZ ^{*)}
{ [O] }	Channel;Level line RxLev in dB; calibration offset in 1/10 dB
{ [] }	Separator

^{*)} not used so far

Driver Configuration – Nokia Settings

The *Nokia Settings* tab selects GSM and GPRS-related parameters to be measured and recorded by Nokia 6230 mobile phones. It replaces the *Setup* tab provided for mobiles that do not support GPRS; see section [Setup](#) on page 6.34.

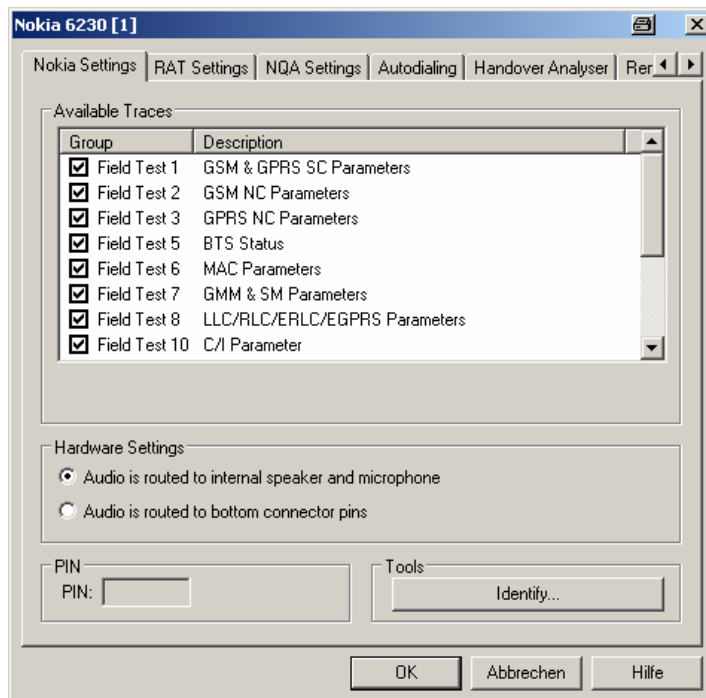


Fig. 6-17 Driver configuration – Nokia Settings

The available message types are arranged in the groups listed in the table [Table 6-2 below](#), together with the names of the corresponding views and data structures/signals in the data tree. For an explanation of the recorded parameters refer to the description of the GSM and GSM/GPRS views in chapter 4. The table below indicates the most important views and signals which use the different message types.

All parameters are selected by default. Deselecting some of the groups reduces the size of the measurement file but does not speed up the measurement.

Hardware settings The input and output signals of the mobile audio circuit are usually routed to the speaker and microphone. As an alternative it is possible to route the signals to the bottom connector pins of the mobile to be tapped off and analyzed.

Table 6-2 GSM/GPRS message types, views and signals

Message type	View	Data structure / signal
Field Test 1: GSM & GPRS SC Parameters	GSM Measurement Report, GSM System Information, GSM GPRS/EGPRS, GSM Layer 1	Measurement Report, Server Report, Packet Server Report Layer 1 Ext
Field Test 2: GSM Neighbor Cell Parameters	GSM Measurement Report, GSM Layer 1	Measurement Report, Server Report
Field Test 3: GPRS Neighbor Cell Parameters	GSM GPRS/EGPRS	Packet Server Report
Field Test 5: BTS Status		
Field Test 6: MAC Parameters	GSM GPRS PDP Info	GPRS LLC Info GPRS MAC Info

Message type	View	Data structure / signal
Field Test 7: GMM & SN Parameters		
Field Test 8: LLC/ RLC/ERLC/EGPRS Parameters	GSM GPRS/EGPRS	Packet Server Report, EGPRS Info
Field Test 10: C/I Parameters		
Field Test 17: GSM System Information Messages	GSM System Information View GSM GPRS System Information View	
Field Test 18: GSM Layer 3 Messages	UMTS/GSM Layer 3 View	Layer 3
Field Test 19: GSM & GPRS Parameters		
Field Test20: GSM & EGPRS Configuration Parameters	GSM GPRS/EGPRS View	
Field Test 21: GPRS Context & GMM/SM Messages		

Driver Configuration – GPRS Forcing

The *GPRS Forcing* tab selects GSM and especially GPRS-related parameters that can be set at the Sagem mobile phones supporting GPRS. It replaces the *Setup* tab provided for mobiles that do not support GPRS; see section [Setup](#) on page 6.34.

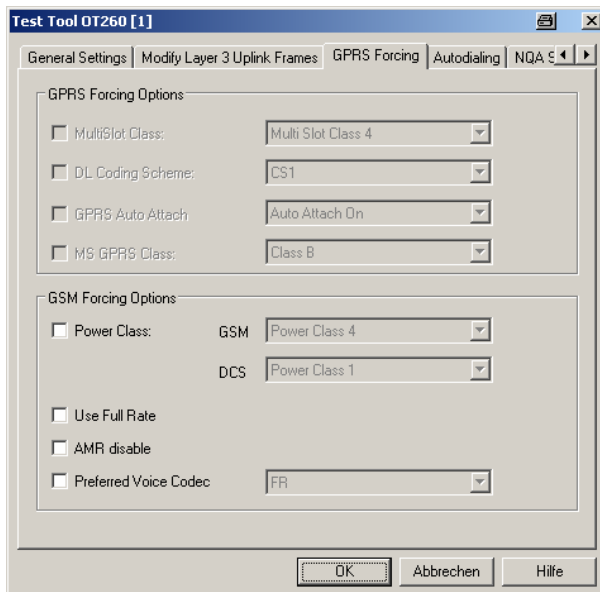


Fig. 6-18 Driver configuration – GPRS Forcing

The GPRS parameters to be forced at the mobile can be selected in the *GPRS Forcing Options* panel from several pull-down lists. Each of the lists is activated by checking the box associated to the parameter. Otherwise, the parameter will not be enforced and the mobile will use its default value.

Multislot Class GPRS multislot class according to GSM 05.02. The list indicates the MS class no. (1, 2, 4) plus (in brackets) the maximum number of receive and transmit timeslots that the MS can use per TDMA frame.

DL Coding Scheme Coding scheme (CS1 to CS4) for downlink data transfer.

GPRS Auto Attach This function allows to specify whether the mobile station shall automatically attach to the GPRS network at power-up (*On*) or not (*Off*). If it is set to *Off*, the mobile station only attaches upon PDP Context Activation.

MS GPRS Class GPRS class of the mobile station (*Class B* or *Class C*).

General GSM parameters can be set in the *GSM Forcing Options* panel:

Power Class Power class of the mobile while in GSM900 or GSM1800 mode. See list of power classes on page 6.34 and overview of power classes and power control levels in chapter 8.

Use Full Rate If this box is checked, the mobile is forced to use either Full Rate or Half Rate but not Enhanced Full Rate (EFR) data transfer mode. *Use Full Rate* becomes unavailable if an EFR codec is selected explicitly.

The following voice codec selections are available for SAGEM OT 2xx test mobiles only. They ensure that the test mobile does not change its voice codec, which might have an undesired impact on the measurement results:

AMR Disable Prevent the test mobile from activating an Adaptive Multi Rate (AMR FR or AMR HR) codec. The test mobile uses either its Full Rate (FR), Half Rate (HR), or Enhanced Full Rate (EFR) codec.

AMR Disable becomes unavailable as soon as an AMR codec is selected explicitly.

Preferred Voice Codec Explicit selection of a voice codec that the mobile will use. The explicit voice codec selection might possibly overwrite the *AMR Disable* and *Use Full Rate* settings.

Driver Configuration – General Settings / RAT Settings

The *General Settings* tab configures the measurement mode, synchronization channel, scan settings, call broadcast settings and RxLev correction. For the Motorola driver, the tab is labeled *Motorola Settings*; for the Nokia driver, it is labeled *RAT Settings* (Radio Access Technology Settings).

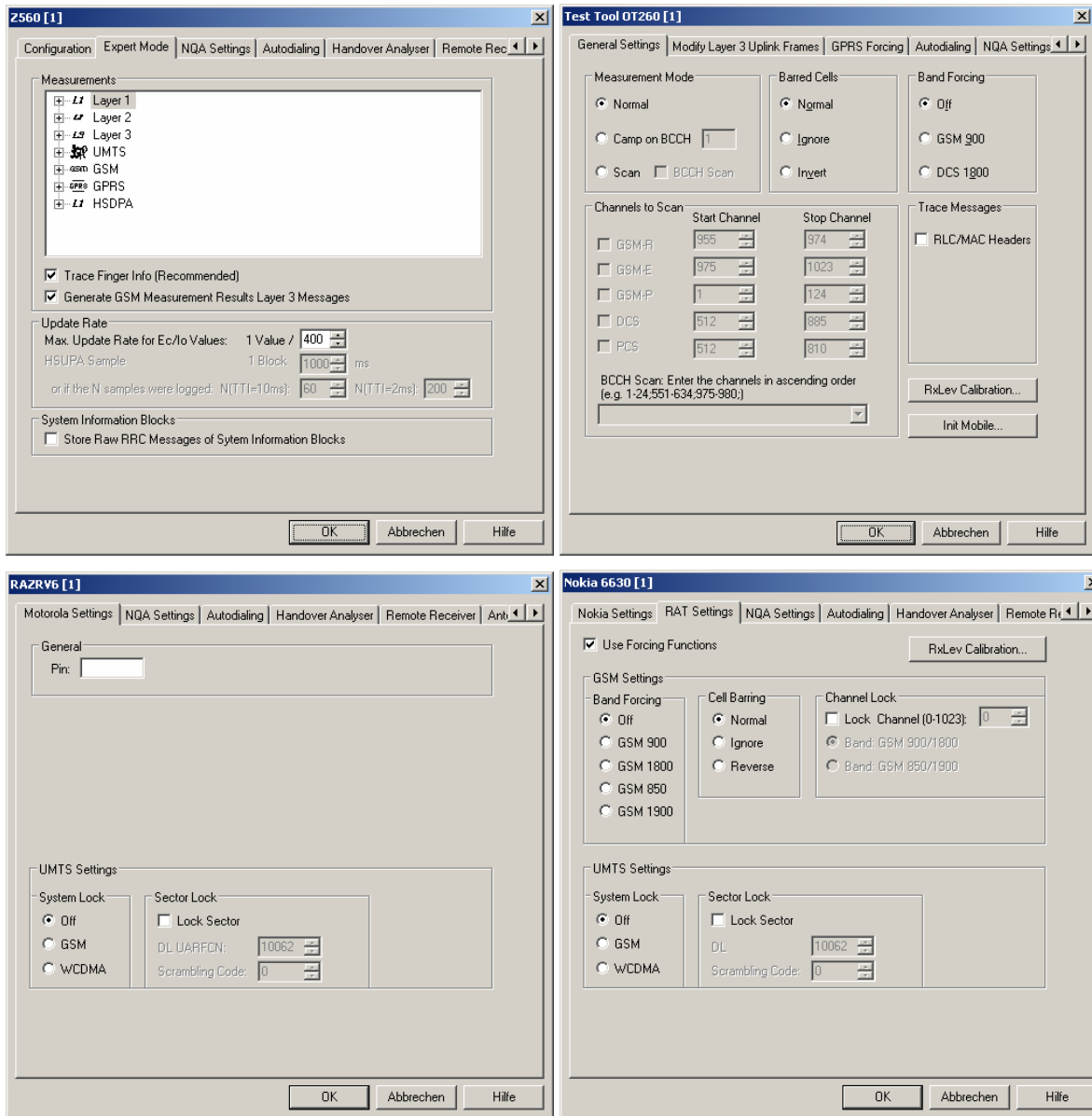


Fig. 6-19 Measurement mode (Sagem, Nokia, Motorola)

**(Measurement)
Mode**

The drivers provide the four measurement modes *Normal*, *Camp*, *Scan(ning)* and *Test Transmitter*. Some test mobiles do not support all test modes. The SAGEM mobiles can be used in *Test Transmitter mode* by using the *Ignore Barred Cells* feature in the *Camp* mode.

Normal measurement mode

The measurements are performed in the selected network. A valid SIM card must be inserted in the mobile phone, and the correct PIN number must be entered.

Forced handover: During the measurement, and during a call (dedicated mode), it is possible to switch over to one of the six neighbor cells by force if the conditions in the desired cell are appropriate. If several mobiles are installed, switching can be performed separately for each one. See *Handover* command in the *Action* menu (page 6.70).

Camp Mode

In Camp mode, the access to all cells except the one with a particular BCCH is denied for the mobile. Handover attempts are thus suppressed. Therefore the Camp mode is recommended for cell boarder determinations.

When the measurement is started, the mobile initiates a *Cell Reselect process* and tries to register to the BCCH and BSIC set in the *Synch. Channel* panel of the *Measurement Mode* menu (for the Sagem X6 driver, the BCCH in the entry field behind the *Camp on BCCH* radio button). Obviously this will not be successful unless the selected BCCH number and BSIC is available. For RS TM devices, selection of a definite BSIC can be disabled.

A valid SIM card has to be inserted and the correct PIN number must be entered.

Scan(ning) Mode

The scan(ning) mode allows to scan the complete frequency band or part of it. In this measurement mode the operator can get a quick overview on the current activities of the channels within the used frequency band. By default, only the signal strength of each channel in *dBm* is measured.

For this mode it is necessary to select the desired channel range in the *Scan Settings* or *Channels to Scan* panel; see below. Typically, *Start BCCH* and *Stop BCCH* define the scan range, which must be completely within the used frequency band.

The Sagem x6 driver provides a special *BCCH Scan* mode where the mobile also decodes the BSIC in a specified channel range; see *BCCH Scan* below.

The *Samples* parameter available for AEG devices defines the sampling rate, i.e. the number of measured values to be taken for the average. A high sampling rate improves the accuracy of the result but slows down the measurement. A sampling rate of 2 or 3 is recommended.

A valid SIM card has to be inserted and the correct PIN number must be entered (not for AEG).

Test Transmitter Mode

The *Test* or *Interims Transmitter* mode is used in combination with the TS9953 *Test Transmitter System* from Rohde & Schwarz to test the geographical conditions for a proposed place to build up a new transmitter station. In this mode, a low-level signal is transmitted on the downlink path from the test transmitter to the test mobile, so that already here the *RxQual* parameter can be detected.

The desired channel is to be set via the BCCH parameter in the *Measurement Mode* menu. In addition, either the corresponding modulation type, frequency and output level must be set at the SME or SMIQ signal generator of the TS9953 system or the TS9953 GMSK test transmitter must be used with internal GMSK modulation.

Note:

Test transmitter measurements can be performed in regions with operational GSM networks without influences on those - you just have to select an available channel. To avoid any conflicts, the channels on the left and right of the used channel (adjacent channels) must also be available. So first use the Scanning mode to look for a gap you can use.

After synchronization of the test mobile on the test transmitter signal, the program flow is similar to the *Camp* mode, however, only the downlink will be performed.

In this mode, no SIM card is needed for the AEG phones.

Synch. Channel

BCCH number and octal BSIC to which the mobile has access in the *Camp* mode.

Use RxLev Correction

If this function is active, the system uses the calibration file generated for the connected mobile. This file has to be located in the subdirectory `\Driver\`. The software needed to generate the file is available from Rohde & Schwarz on request.

Scan Settings / Channels to Scan

The *Start BCCH* and *Stop BCCH* channel numbers determine the measurement range in the *Scan(ning)* mode. This range must be within the supported channel range (e.g. 1 to 124 for GSM900). The SAGEM and other dual-band mobiles support the two bands between 1 and 124 and between 512 and 885. The Sagem x6 driver provides an overview of channel ranges that can be set depending of the GSM band used. Moreover, it supports the *BCCH Scan* with BSIC decoding over an arbitrary combination of single BCCH channels and channel ranges; see *BCCH Scan* below.

The *Samples* parameter (not for SAGEM) defines the number of measured values to be acquired in each channel – see *Scanning Mode* above.

Decode BSIC	For RS TM devices: If this function is active, the test mobile tries to decode the BSIC from all channels. The decoded BSIC values are displayed in the <i>GSM Scan View</i> (see chapter 4).
	<hr/> <p>Note: <i>Decoding requires a certain minimum amount of samples per channel. Allowed range: 1...50; recommended for this feature: 20 or more. Decoding is improved if the number of channels to be measured is reduced.</i></p> <hr/>
BCCH Scan	For the Sagem x6 driver: If this function is active, the test mobile tries to decode the BSIC in the <i>BCCH Scan</i> channel range entered in the <i>Channels to Scan</i> panel. The decoded BSIC values are displayed in the <i>GSM Scan View</i> (see chapter 4).
	<hr/> <p>Note: <i>While the BCCH scan is active the mobile measures each channel until the BSIC has been successfully decoded. This can cause a considerable extension of the measurement time.</i></p> <hr/>
Barred Cells / Cell Barring / Cell Bar Flag	For Nokia and SAGEM devices: This function allows to ignore or even invert the cell bar flag: <ul style="list-style-type: none"> <i>Normal</i> Only cells that are not barred are accessible for the mobile <i>Ignore</i> Cell bar flag ignored – all cells are accessible <i>Invert</i> Cell bar flag inverted – only barred cells are accessible
Band Forcing	For all SAGEM dual-band mobiles and Nokia mobiles, one of the supported GSM bands can be selected: <ul style="list-style-type: none"> <i>Off</i> All supported GSM bands allowed <i>GSM900/1800/850/1900</i> Use a specific GSM band <i>DCS 1800</i> Use DCS 1800 band (Sagem, corresponds to GSM1800)
Misc.	
RLC/MAC Headers	For SAGEM OT 190 / 290 (GPRS) devices: If this function is active, the information in the RLC/MAC headers of the transmitted radio blocks is included in the measurement data and can be displayed in the <i>GSM RLC/MAC Header View</i> .
RxLev Calibration	For SAGEM mobiles using the Sagem X6 driver: The <i>RxLEV Calibration...</i> button opens a dialog to activate the calibration of the received signal level reported by the mobile; see description of RxLev Calibration on p. 6.35.
Init Mobile	For SAGEM mobiles using the Sagem x6 driver: The <i>Init Mobile...</i> button starts the initialization if a mobile (even of the same type) was changed.

Channel Lock For Nokia 6230 mobiles: *Lock Channel* forces the test mobile to use a specified existing GSM channel. In the different GSM bands, the same channel numbers are used for different frequencies (see overview of GSM channels in chapter 8). The ambiguities in the channel-frequency assignment are resolved by specifying one of the two band combinations *GSM900/1800* or *GSM 850/1900*.

Driver Configuration – Remote Receiver

The *Remote Receiver* tab configures the tracking mode where the mobile phone controls a CW test receiver and sets its receive frequency. In tracking mode, the measurement must be performed on a single frequency channel although most test receivers are able to measure at several frequencies simultaneously. The *Remote Receiver* tab is identical for all GSM and UMTS mobile drivers.

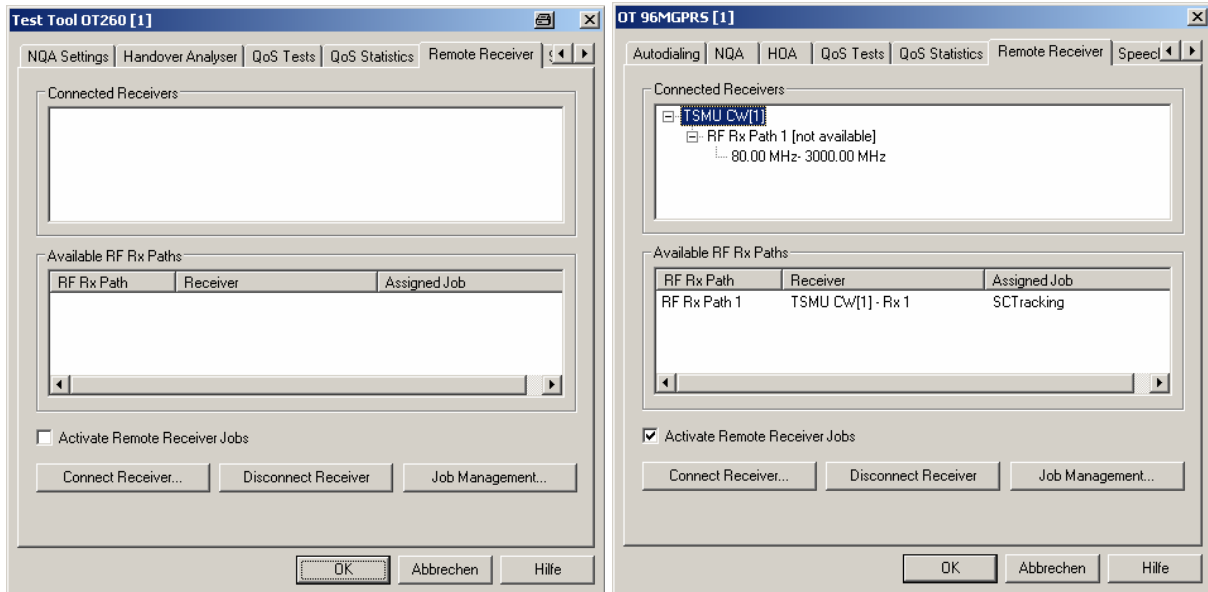


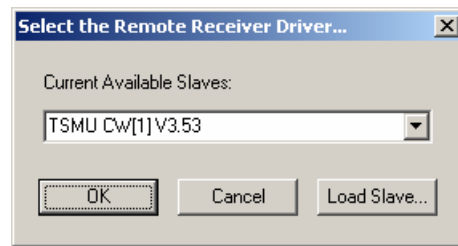
Fig. 6-20 Driver Configuration – Remote Receiver tab (all drivers)

Connected Receivers List of test available receivers. To connect an additional test receiver, click the *Connect Receiver...* button. To remove a test receiver from the list, select the receiver and click the *Disconnect Receiver...* button.

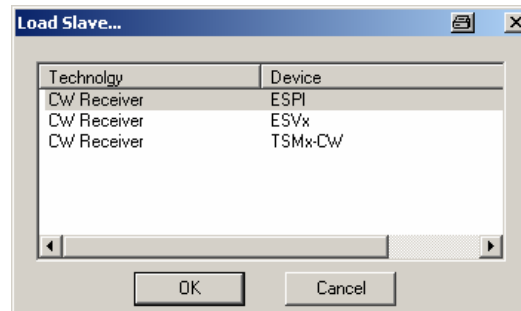
Available RF Rx Paths List of receiver signal paths, receiver, and receiver jobs assigned to each path. To select an additional job to be done, click the *Job Management...* button.

Activate Rem. Rec. Jobs If the box is checked, the jobs that are shown in the *Available RF Rx Paths* table will be done after *OK* is clicked and the configuration menu is closed.

Connect Receiver... The *Connect Receiver...* button opens a selection dialog showing all test receivers available as slaves.



Test receivers are not shown in the pull-down list before the test receiver drivers are loaded. This can be done by clicking the *Load Slave* button to call up the *Load Slave* window and select a test receiver to be loaded.



The following receiver drivers can be used for tracking: *R&S ESPI*, *R&S ESVx*, *R&S TSMU*.

OK Connect the selected test receiver, add it to the list of *Connected Receivers* in the *Remote Receiver* tab and close the *Load Slave* window.

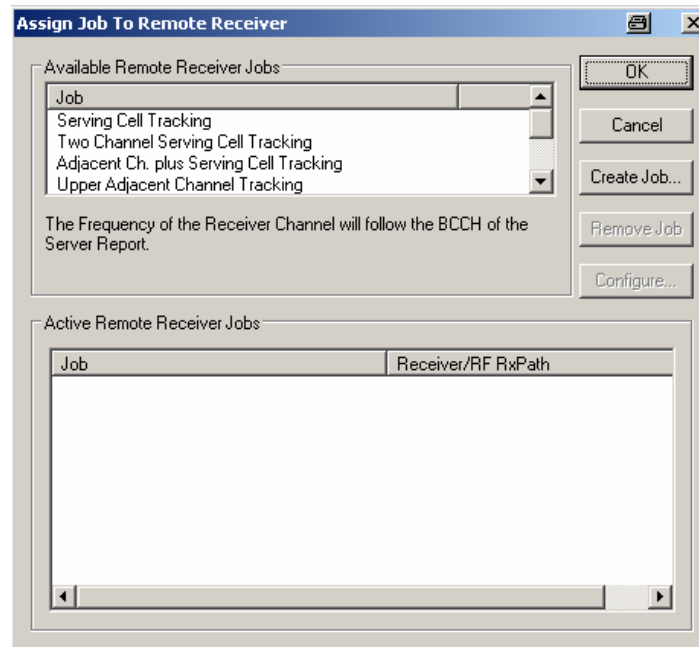
Cancel Close the *Load Slave* window without connecting a test receiver.

Disconnect Receiver...

The *Disconnect Receiver...* button disconnects the receiver selected in the list of *Connected Receivers*.

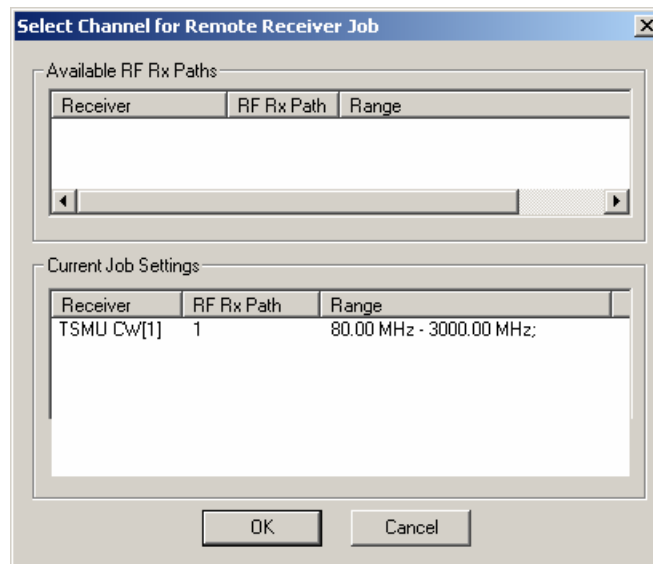
Job Management...

The *Job Management...* button opens the *Assign Job to Remote Receiver* dialog to create or select a job and assign it to a remote test receiver.



The job to be assigned to the remote receiver can be selected from the list of *Available Remote Receiver Jobs*. A description of each job is displayed below the list when the job is selected.

- | | |
|----------------------|---|
| OK | Assign the selected job to the receiver selected in the list of <i>Connected Receivers</i> in the <i>Remote Receiver</i> tab and close the current dialog. |
| Cancel | Discard the current selection and close the dialog. |
| Create Job... | Activate the selected job and add it to the list of <i>Active Remote Receiver Jobs</i> . |
| Remove Job | Remove the selected job from the list of <i>Active Remote Receiver Jobs</i> . This softkey is disabled if the list is empty or if no job is selected in the list. |
| Configure | Open the <i>Select Channel...</i> dialog to assign one or several receiver channels (<i>RF Rx Paths</i>) to the job selected in the list of <i>Active Remote Receiver Jobs</i> . The <i>Configure</i> softkey is disabled if the list is empty or if no job is selected in the list. Some jobs require several channels which can be provided by one or several test receivers. |



The *Select Channel...* dialog displays all channels that are available but not yet assigned (*Available RF Rx Paths*) and the channels that are already assigned to the current job (*Current Job Settings*). Double-click on a channel in one of the tables to move it to the other table.

Remarks about the Tracking Mode

The tracking mode has an impact on some driver configuration menus and views.

- In the tree views for data selection (e.g. in the *Values* tab of the *2D Chart View* configuration menu), the master of a channel (i.e. the mobile phone controlling the test receiver) is indicated instead of the measurement frequency.
- The settings of test receiver channels controlled by a master cannot be changed in the *Measurement Settings* tab of the test receiver driver configuration menus; see section [Test Receiver Configuration](#) on page 6.125 ff.
- Each channel change and each receiver used generates an event in the measurement data. These events can be viewed together with all other events in the *Event View*, in the *Route Track View* and in the *2D Chart View*. In addition, each channel change is indicated in the *General Status View*.

Driver Configuration – Autodialing

The *Autodialing* tab configures the mode where the mobile periodically attempts a call to the network dialing a definite phone number. This mode is relevant for the network quality analysis described on page 6.52. The *Autodialing* tab is similar for all GSM mobile drivers.

The Nokia test mobile needs a 2nd virtual COM port to be operated in *autodial* mode; see paragraph on [Loading the drivers \(Nokia\)](#) on p. 6.6.

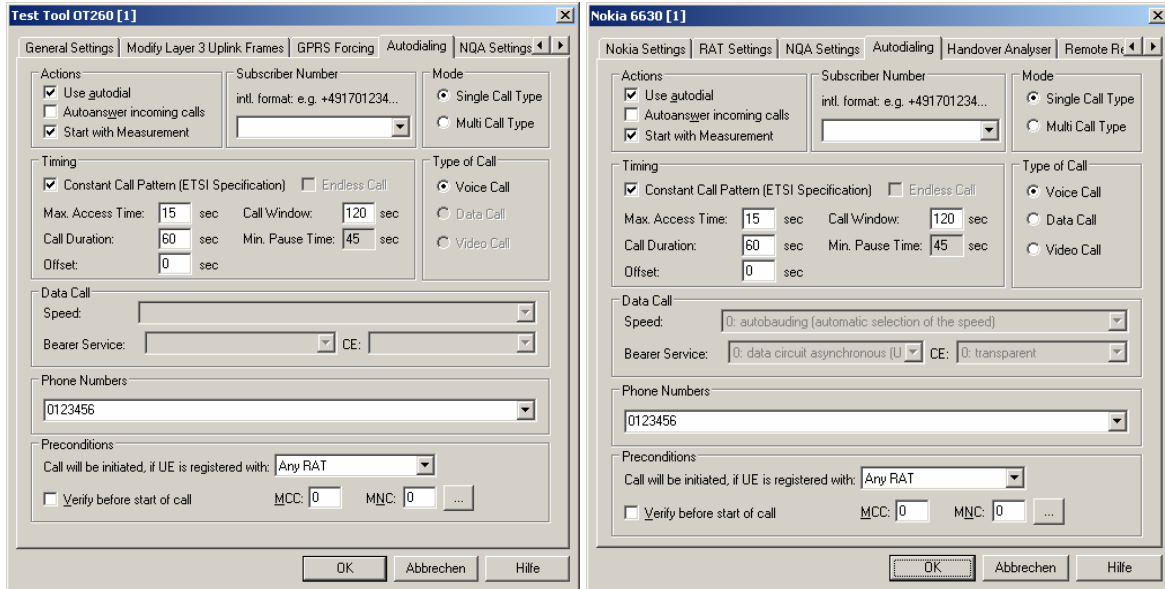


Fig. 6-21 Driver Configuration – Autodialing tab (all drivers, single call type)

Actions

The check boxes in the *Actions* panel activate automatic call options:

Use autodial

If the box is selected the mobile sets up periodic calls using the parameters in the remaining panels of the Autodialing tab. The autodial function is useful for many applications, in particular for the Network Quality Analysis.

Autoanswer incoming calls

If the box is selected the mobile automatically accepts all incoming calls after a certain number of ring tones.

Start with Measurement

If the box is selected autodialing starts automatically with the measurement.

RAT

Supported RAT

The RATs can be filtered using the selections *Any RAT*, *Only UMTS*, *Only GSM*, or *Only CDMA*.

Subscriber number Selects the subscriber number.

- Mode (Sagem x6)** To option buttons switch between a single call type and a multi call type:
- A single call is set up according to the settings in the remaining panels of the *Autodialing* tab (see [Fig. 6-21](#) on p. 6.48). The call is periodically repeated if *Use autodial* is selected.
 - A multi call is a sequence of calls with individual call settings, to be configured in the multi call version of the *Autodialing* tab (see [Fig. 6-22](#) on p. 6.51). The call sequence is periodically repeated if *Use autodial* is selected.

**Type of Call
(Sagem X6, Nokia
etc.)**

Several drivers display the *Type of Call* panel:

- All test mobiles support voice calls.
- Data calls can be set up with Nokia devices, provided that *Use autodial* is active. They can also be used with Qualcomm test devices; see [Fig. 6-45](#) on p. 6.87 ff, with the Samsung Z105 test mobile, and with all other test devices supporting GSM and UMTS. When the driver is loaded, ROMES automatically initializes the data call service using an appropriate AT command.
- Some test devices (e.g. the Samsung Z105) support video calls. To test this call type, the called party must be configured for video calls as well and *Autoanswer incoming calls* must be enabled.

Data and video calls are not supported by Sagem mobiles, even if the splitter box is used.

Timing

Defines the periodicity of the autodial process.

*Constant Call Pattern
(ETSI Specification)*

If this option is enabled (box checked), the calls are repeated in the fixed Call duration/Call Window pattern, no matter whether a connection is released or lost before the end of the Call duration. This setting is in accordance with IREG specifications and ensures that several connected test mobiles operate synchronously. It is required for an analysis of the calls in the UMTS/GSM NQA State View.

In the alternative setting, the call duration ends and the next Idle Time starts at the moment when a call is lost. This ensures that a maximum number of calls per unit of time can be set up at fixed call duration and idle time.

Max. Access Time

Maximum time allowed for cell access. If no call can be established within this time, the call is classified as a blocked call.

Call Duration

Time between start and release of a call in the range between 15 s and 86400 s. For some mobiles it may be necessary to set the Call duration time higher than 15 s to get a Good Call, e.g. to 25 s. Therefore check the call statistics in the GSM NQA View before you start the measurement tour.

<i>Idle Time</i>	Time between release of a call or connection loss and dialing for the next call in the range between 10 s and 86400 s. For an endless call, which is usually intended to be continued without interruption, it is advisable to set the idle time to a minimum. This ensures that a dropped connection is restored as quickly as possible. The Idle Time is available while Constant Call Pattern is disabled.
<i>Call Window</i>	Time between two subsequent call attempts, including the access time, the call duration and a possible idle time until the next call is initiated. The Call Window is available while Constant Call Pattern is enabled.
<i>Offset</i>	Time offset for dialing. Different Offset times for different test mobiles (e.g. 0 s for the first, 20 s for the second mobile etc.) ensure that the test mobiles will not dial simultaneously. Possible problems in the connection setup are avoided.
<i>Endless call (only Nokia)</i>	For an endless call (box checked), the call duration is set to infinity; the Call duration input field is disabled. Endless call is disabled while Constant Call Pattern (ETSI Specification) is selected.

The timing of the calls can be monitored in the *UMTS/GSM NQA State View*.

Data Call

If a data call is selected, then the input fields in the *Data Call* panel are enabled. They provide a subset of the possible parameters for the +CBST call control command described in standard 3GPP TS 07.07. The values depend on the test mobile type.

<i>Speed</i>	Baud rate of the data connection. The test mobile provides automatic baud rate selection according to the quality of the radio link.
<i>Bearer Service</i>	The value <i>data circuit asynchronous (UDI or 3.1 kHz modem)</i> cannot be changed.
<i>CE</i>	Connection Element; the value <i>non-transparent</i> cannot be changed.

Subscriber Number

The Subscriber Number, which is mandatory for S/VQA, is entered or selected in this list field.

The number must be entered using the international format, e.g. (089) 12345678 would be entered as "+498912345678" without fillers (such as blanks or hyphens).

Home network Home network identified by the mobile country code (MCC) and the mobile network code (MNC). If *verify before start of call* is checked, the mobile will be out of service if a call is attempted from a foreign network (e.g. during a measurement tour near the border of a network where roaming is possible). This ensures that calls from foreign networks will not impair the network quality analysis; see next section.

By default, the *verify before start of call* function is not active.

Phone Numbers One or more phone number(s) can be entered via the keyboard and the input field.

The *Autodialing* tab driver configuration menu changes if a *Multi Call Type* is selected.

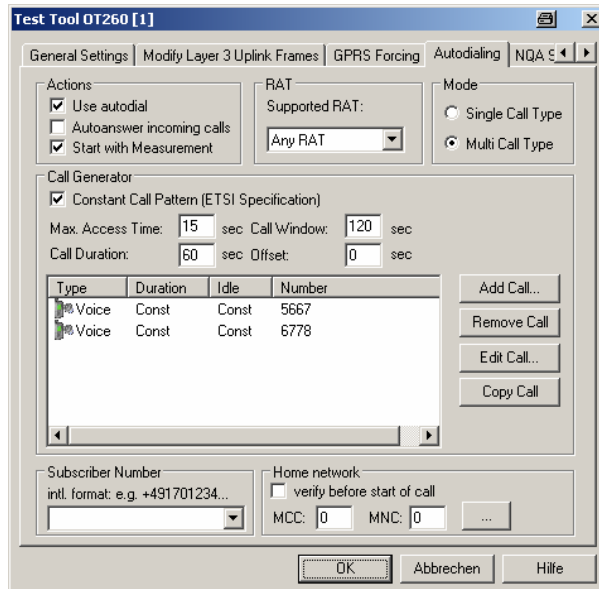


Fig. 6-22 Driver Configuration – Autodialing tab (Sagem x6, multi call type)

A multi call is sequence of single calls with independent call settings. The settings for each call are identical with the single call settings described above. The individual calls are listed in the center of the *Call Generator* panel. If *Constant Call Pattern* is active, the timing settings in this panel are valid for all calls in the list.

The buttons to the right of the list add or remove calls from the list and edit or modify a selected call. *Add Call...* or *Edit Call* opens the following *Call Settings* dialog:

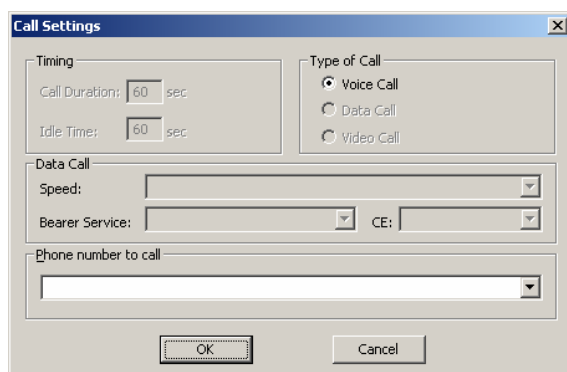


Fig. 6-23 Call Settings (Sagem x6, multi call type)

The *Timing* settings in the *Call Settings* dialog are unavailable if a *Constant Call Pattern* is active.

Driver Configuration – NQA Settings

The *NQA Settings* tab provides the parameters for *Network Quality Analysis*. NQA is a prerequisite for drawing up a call statistics where the calls are classified and the classes are visualized separately (see *UMTS/GSM NQA View* window in chapter 3). The *NQA Settings* tab is identical for all GSM mobile drivers.

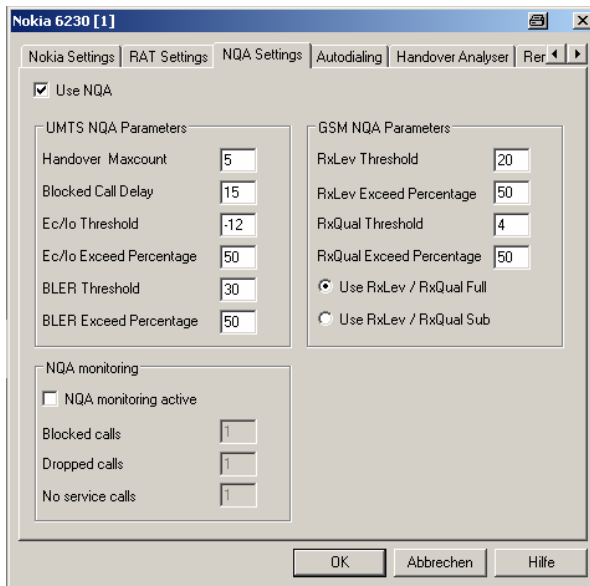


Fig. 6-24 Driver Configuration – NQA Settings tab (all drivers)

Use NQA If checked, the box activates the network quality analysis (default).

UMTS/GSM NQA Parameters

The following numeric parameters configure the NQA by defining conditions and limits for the different call classes (the ranges for all parameters are quoted; default values are underscored)

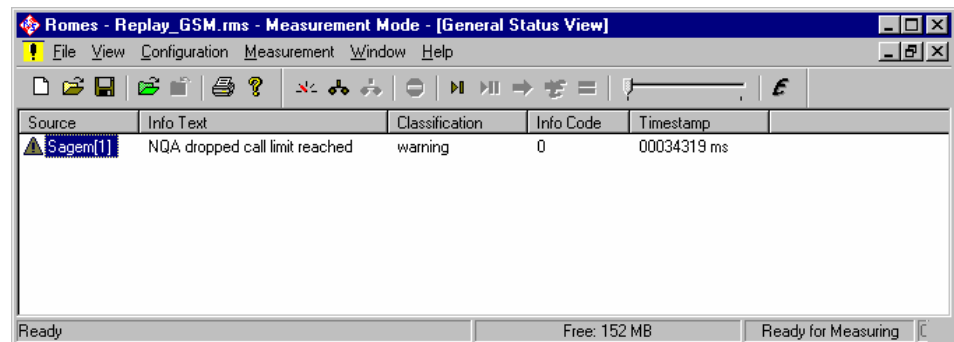
<i>Handover Maxcount</i>	Maximum number of handover procedures during a call in the range 1 to <u>5</u> to 100. If the defined value is exceeded, the call will be classified as EXCESSIVE HO.
<i>Blocked Call Delay</i>	Maximum delay (in seconds) between CM_SERV_REQ and ASSIGNMENT_COMMAND in the range 1 (s) to <u>15</u> (s) to 63 (s). If the defined delay is exceeded, the call will be classified as DELAYED CALL.
<i>RxLev Threshold</i>	Minimum received signal input level in the range 1 to <u>20</u> to 63. RxLev values which fall below this threshold contribute to NOISY.
<i>RxLev Exceed Perc.</i>	Minimum ratio (in percent) of reported RxLev values falling below the RxLev Threshold in the range 1 (%) to <u>50</u> (%) to 99 (%). If the actual ratio falls below the <i>specified percentage the call is classified as NOISY</i> .
<i>RxQual Threshold</i>	Maximum value of RxQual (i.e. minimum received signal quality) in the range 1 to <u>4</u> to 7. RxQual values above this threshold contribute to NOISY.

RxQual Exceed Perc. Minimum ratio (in percent) of reported RxQual values exceeding the RxQual Threshold in the range 1 (%) to 50 (%) to 99 (%). If the actual ratio exceeds the specified percentage the call is classified as NOISY.

NQA monitoring

If checked, the *NQA monitoring active* box activates NQA monitoring. In this mode, a message is displayed in the *General Status* view (see chapter 3) as soon as the number of *Blocked Calls*, *Dropped Calls*, or *No Service Calls* entered in the three input fields of the *NQA monitoring* panel is reached.

Example for a *General Status* view message:



RxLev/RxQual Source

The radio buttons in the *RxLev/RxQual Source* field determine the type of values used for the NQA:

<i>Use RxLev/RxQual Full</i>	Both parameters are assessed over the full range of TDMA frames within a SACCH block
<i>Use RxLev/RxQual Sub</i>	Both parameters are assessed over a subset of 12 TDMA frames

The full and sub values are displayed separately in the *GSM Measurement Report View*, see chapter 3.

Important note on NQA in downlink DTX mode:

If the BTS uses discontinuous transmission (DTX), the BTS transmitter is switched off during time periods where no information needs to be transferred. The BTS (downlink) signal shows strong variations in time resulting in a large difference between the measured *RXLev/RXQual Full* and *RXLev/RXQual Sub* values. The NQA must be performed with the *Use RxLev/RxQual Sub* option, otherwise it will generally underestimate the network quality.

Display of results

If NQA is active during a measurement (*Use NQA* box checked), the *NQA View* displays a bar graph showing the percentages of the current call statistics, i.e. the percentage of *Good*, *Blocked*, *Dropped* and *No Service* calls.

Call Classes

The *NQA View* shows the following call classes:

<i>Good:</i>	Every call successfully established and terminated by the system after exactly the <i>Call duration</i> set in the <i>Autodialing</i> tab.
<i>Blocked:</i>	A call is qualified as blocked if one of the following applies: An idle message was detected during call setup but the call was not canceled. This happens in all cases where a call

setup was performed at least up to the layer-3 message SERVICE REQUEST, but not up to ALERTING / CONNECT, and where no DISCONNECT, RELEASE or CHANNEL RELEASE was executed **or...**

The call was canceled, call setup was not performed up to ALERTING and/or CONNECT **or...**

A dial command has been sent to the mobile, but because of insufficient coverage no call could be established: The NQA machine remains IDLE. On the next dialing the system recognizes that no call could be established and one blocked call is added.

Dropped: A call is qualified as dropped if one of the following applies:

An established call is cancelled before the *Call duration* set in the *Autodialing* tab has passed **or...**

An established call is terminated not to order. A NQA data package will be generated when an *Idle or Error (No Service)* state is detected after a call was completely established and the *Call duration* has not passed yet.

No service: A *No service* call is added every time the system wants to dial but the mobile is out of service. If the mobile remains out of service the time interval between two subsequent *No service* calls is equal to the *Call duration* plus the *Idle time*, both set in the *Autodialing* tab.

Note:

A single call can fit into more than one class and can therefore contribute to several bars. The percentages do not necessarily sum up to 100 %.

Extensions

For an extended NQA evaluation, *Rohde & Schwarz* offers the NQA evaluation software *TS9954 NQA* for use with MS EXCEL. The software is described in chapter 7 of this manual.

Driver Configuration GSM – Antenna

The *Antenna* tab defines *Antenna Name*, *Antenna Gain* and *Cable Loss*. These values have no impact on the measurement but are stored in the measurement file header so they can be taken into account for the calculation of correction factors. The *Antenna* tab is identical for all GSM mobile drivers.

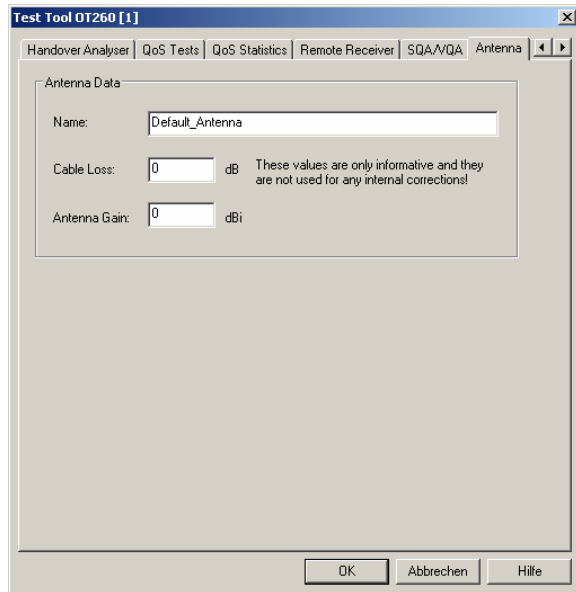


Fig. 6-25 Driver Configuration – Antenna tab (all drivers)

Driver Configuration – Layer 3 Uplink frames

The *Layer 3 Uplink frames* tab modifies up to four layer 3 messages that the Sagem mobile sends to the network.

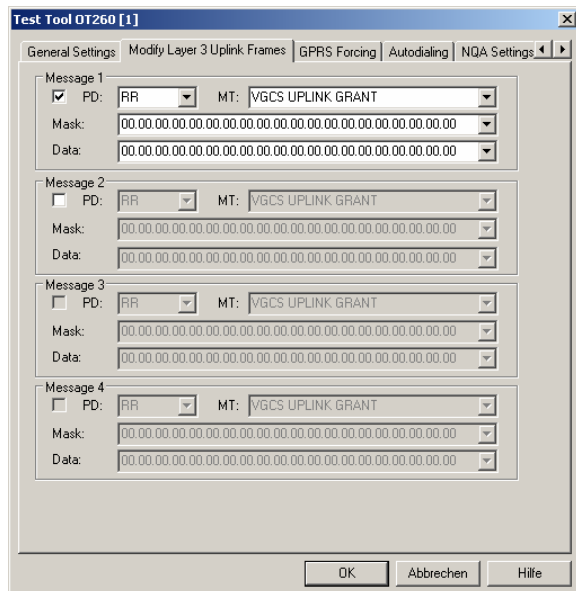


Fig. 6-26 Driver Configuration – Layer 3 Uplink frames tab

The layout of the *Layer 3 Uplink frames* tab depends on the mobile type, however, all functions are equivalent.

Protocol discriminator / PD and MT	This column indicates the <i>Protocol Discriminator</i> (PD, first two characters) and <i>Message Type</i> value of the GSM or GPRS layer 3 message that shall be modified; see GSM 04.08.
Mask [Hex]	Mask to be applied on the GSM or GPRS layer 3 message for the modification.
Data [Hex]	Data for the modification. For further reference see also user documentation of the Sagem mobile.

Driver Configuration – QoS Tests

The *QoS Tests* tab configures the mode where important GPRS mobility management actions (*GPRS Attach/Detach*, *Routing Area Update*), GPRS packet routing actions (*Activate/Deactivate PDP Context*), GSM layer 3 actions (*Location Area Update*), or *Cyclic Handover* procedures of a GPRS mobile in dedicated mode are initiated periodically. A statistical evaluation of the actions provides an overview of the Quality of Service (QoS), e.g. the amount of network resources given to the mobile. It can be displayed in the *GSM QoS View*.

Note:

To be recorded and evaluated, the actions must be enabled in the *QoS Statistics* tab of the driver configuration menu; see [Fig. 6-28](#) on p. 6.58.

The *QoS Tests* tab is only provided for the SAGEM x6 driver.

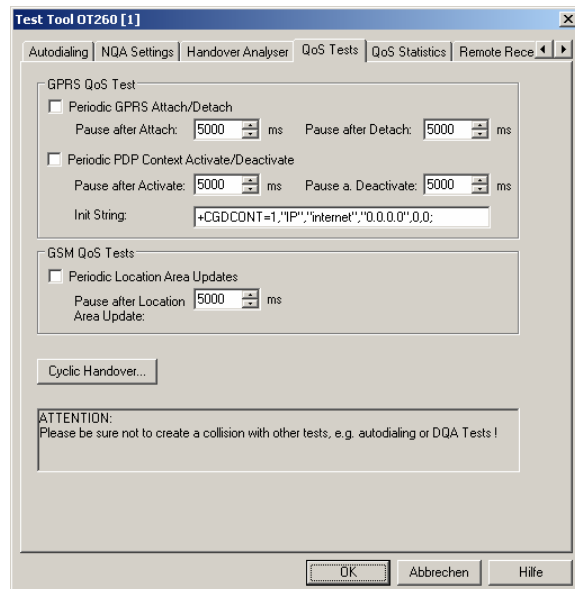


Fig. 6-27 Driver Configuration – QoS Tests tab (all drivers)

The entries to control *Periodic GPRS Attach/Detach*, *Periodic PDP Context Activate/Deactivate* and *Periodic Location Update* are analogous.

Enable/Disable The three types of periodic actions can be activated independently; they are compatible with each other.

Note:

GSM test mobiles can be used for various automatically controlled, periodic tests, e. g. Autodialing, DQA analysis. Some of the periodic tests cause conflicts when activated simultaneously. E.g. the QoS test functions can not be performed after the autodialing function has released the call.

Pause after... Defines the periodicity of the actions:

- The *GPRS Attach/Detach* cycle consists of an attach, followed by the *Pause after Attach*, detach, *Pause after Detach*.
- The *PDP Context Activate/Deactivate* cycle consists of a PDP context activate, followed by the *Pause after Activate*, PDP context deactivate, *Pause after Deactivate*.
- The *Location Area Update* cycle consists of an location update procedure followed by the *Pause after Location Update*.

Init String *PDP Context +CGDCONT* command, specifies PDP context parameter values for a PDP context identified by the (local) context identification parameter (first numeric parameter after “=”). The command is described in standard 3GPP TS 07.07 and is preset as shown in [Fig. 6-27](#) above.

In most networks, adjusting the third string parameter (*Access Point Name (APN)*, preset as “internet”) will be sufficient to activate a PDP context.

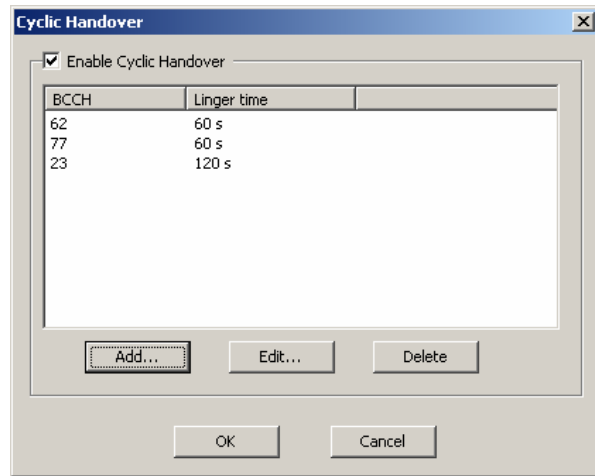
Cyclic Handover Configures the neighbor cell BCCH and timing parameters necessary for cyclic handover that a GPRS mobile can initiate while it is in dedicated mode (during a call).

For a cyclic handover the mobile manipulates the received signal strengths in its receiver reports in such a way that the network periodically initiates a handover to a given neighbor cell. The cells are arranged in a BA list. The mobile cycles through the list, lingering in each cell for a definite amount of time.

The process is stopped if one of the cells is no longer detected, so cyclic handover is typically tested on a fixed location. Cyclic handover and manual handover exclude each other. It is recommendable to perform cyclic handover tests in autodial mode and with an endless call duration (see [Autodialing](#) tab on p. 6.48).

If the network fails to initiate a handover, the *General Status View* displays a timeout warning. Other warnings and error messages (e.g. *Autodial switched off*, *Telephone number is empty*, *No endless call selected*, *BA list empty*) are also displayed in the *General Status View*.

The *Cyclic Handover...* button opens the following dialog:



Cyclic handover must be enabled explicitly (*Enable Cyclic Handover*). The BA list contains the BCCH channel numbers of all cells to be allocated during the cyclic handover process. The mobile dwells in each cell for a definite *Linger time*. The *Add...*, *Edit...*, and *Delete* buttons are used to modify the BA list and its entries.

Driver Configuration – QoS Statistics

The QoS tab selects special layer 3 and RLC/MAC actions performed by a Sagem GPRS mobile to be recorded in the measurement file. The *QoS Statistics* tab selects special layer 3 actions performed by a RS TM mobile to be recorded.

A statistical evaluation of the actions initiated by these messages provides an overview of the Quality of Service (QoS), e.g. the amount of network resources given to the mobile. It can be displayed in the *GSM QoS View*.

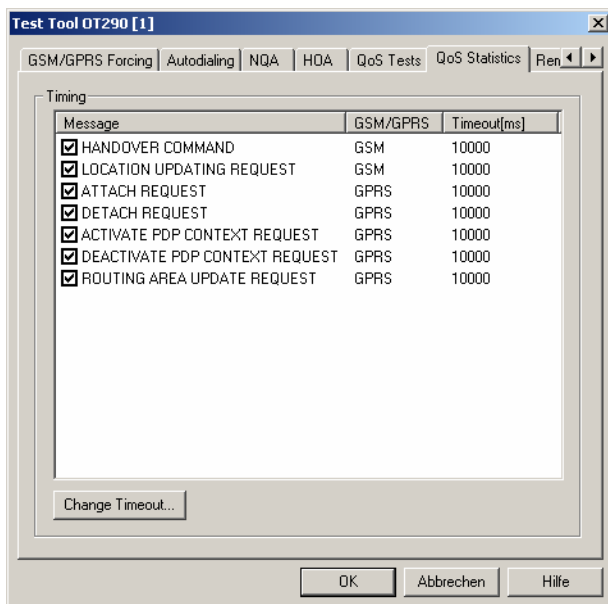


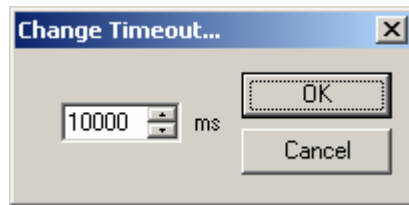
Fig. 6-28 Driver Configuration – QoS Statistics tab

Message / GSM/GPRS

List of layer 3 and RLC/MAC control messages generated or received by the mobile. The actions initiated by the checked messages will be included in the measurement file. The messages are related to either GSM or GPRS service.

Timeout

Maximum time that the selected actions can take until they are classified as *No Response* actions. For mobile-initiated actions, the time is measured from the time the mobile transmits the ... *REQUEST* message to the time it receives the response from the network.



An individual timeout can be set for each selected action.

Driver Configuration GSM – Templates

The *Templates* tab stores the current driver configuration as a template, lists, loads or deletes driver templates. It is provided for many GSM mobile drivers and is identical for all of them.

Note:

When a driver is loaded using *Configuration – Preferences – Hardware* (see section [Driver Installation](#) on p. 6.1 ff.) ROMES checks whether a driver template is stored in the *Driver Templates* directory and its subdirectories (see below). The driver can be loaded with default settings or with the settings stored in any of the templates found.

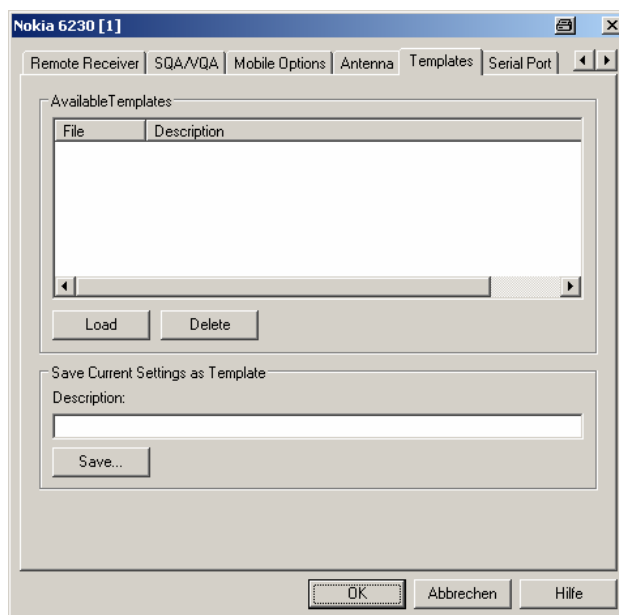
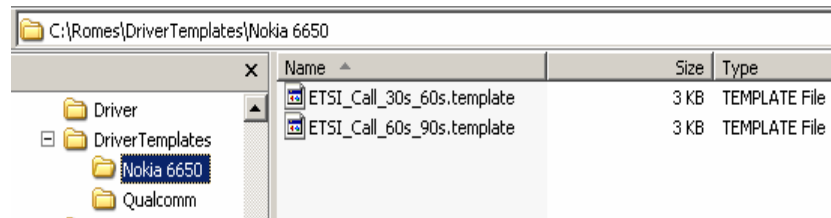


Fig. 6-29 Driver Configuration – Templates

Load/Delete

Loads or deletes a driver template or deletes a template displayed in the list of *Available Templates*. Template files are ASCII files with the extension *.template. The template definition is independent from the workspace. A selection of template files for different drivers is supplied with the ROMES installation.



Save Saves the current driver settings together with the *Description* to a selected template file.

Driver Configuration – Handover Analyzer

The *Handover Analyzer* tab (HOA) enables or disables the handover analyzer (option ROMES-U1) and sets the timeout for the HO analysis. The HO analysis and the meaning of the timeout is described in chapter 4, section *UMTS/GSM Handover Analyzer View*. The *HOA* tab is provided for many GSM mobile drivers and is identical for all of them.

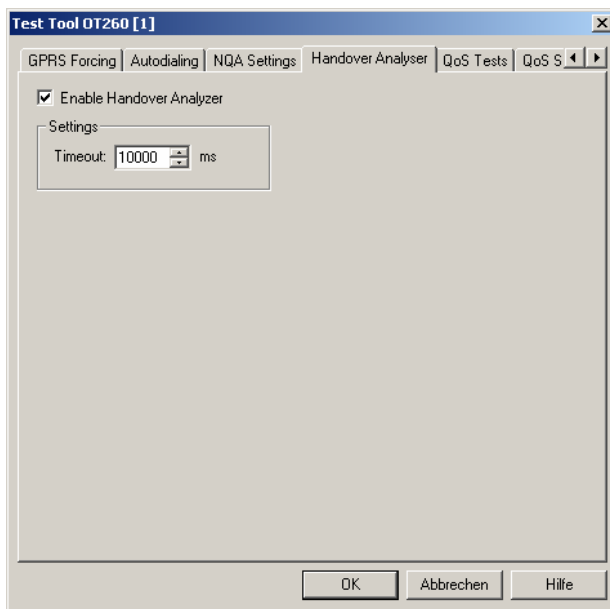


Fig. 6-30 Driver Configuration – Handover Analyzer

Driver Configuration – Speech Quality

The *Speech Quality* tab enables and configures the Speech Quality Analysis (SQA, with option ROMES-Z8, *Voice Quality PESQ*). SQA results can be displayed in the *SQA Message* view (see chapter 4). The *Speech Quality* tab is provided for many mobile types and technologies (GSM, GPRS, UMTS, cdmaOne/IS-95, CDMA2000) and is identical for all of them.

The purpose of the SQA is to test the quality of the speech codec while the mobile operates in the network; see section [SQA – Principle and Test Setup](#) on p. 6.64. The SQA involves the following steps:

1. Establish the basic test setup according to [Fig. 6-33](#) on p. 6.65, ensuring that the answering machine/SQA server and the local PC contain copies of the same *.wav file.
2. Load the appropriate mobile driver, e.g. the GSM driver, as described in section [Driver Installation](#) on p. 6.1.

3. In the *Autodialing* tab of the driver configuration menu, select *Use Autodial* and set an appropriate *Call Duration*.
4. Open the *Speech Quality* tab, click *Connect SQA*, and load the SQA slave driver as described below.
5. Click *Configure SQA...* and select the measurement mode and the appropriate configuration settings.
6. Back in the *Speech Quality* tab, select *Enable Speech Quality* and click *OK*.
7. Open the *SQA Message* view (*View – QoS Views – SQA Messages View*) and observe the displayed results.

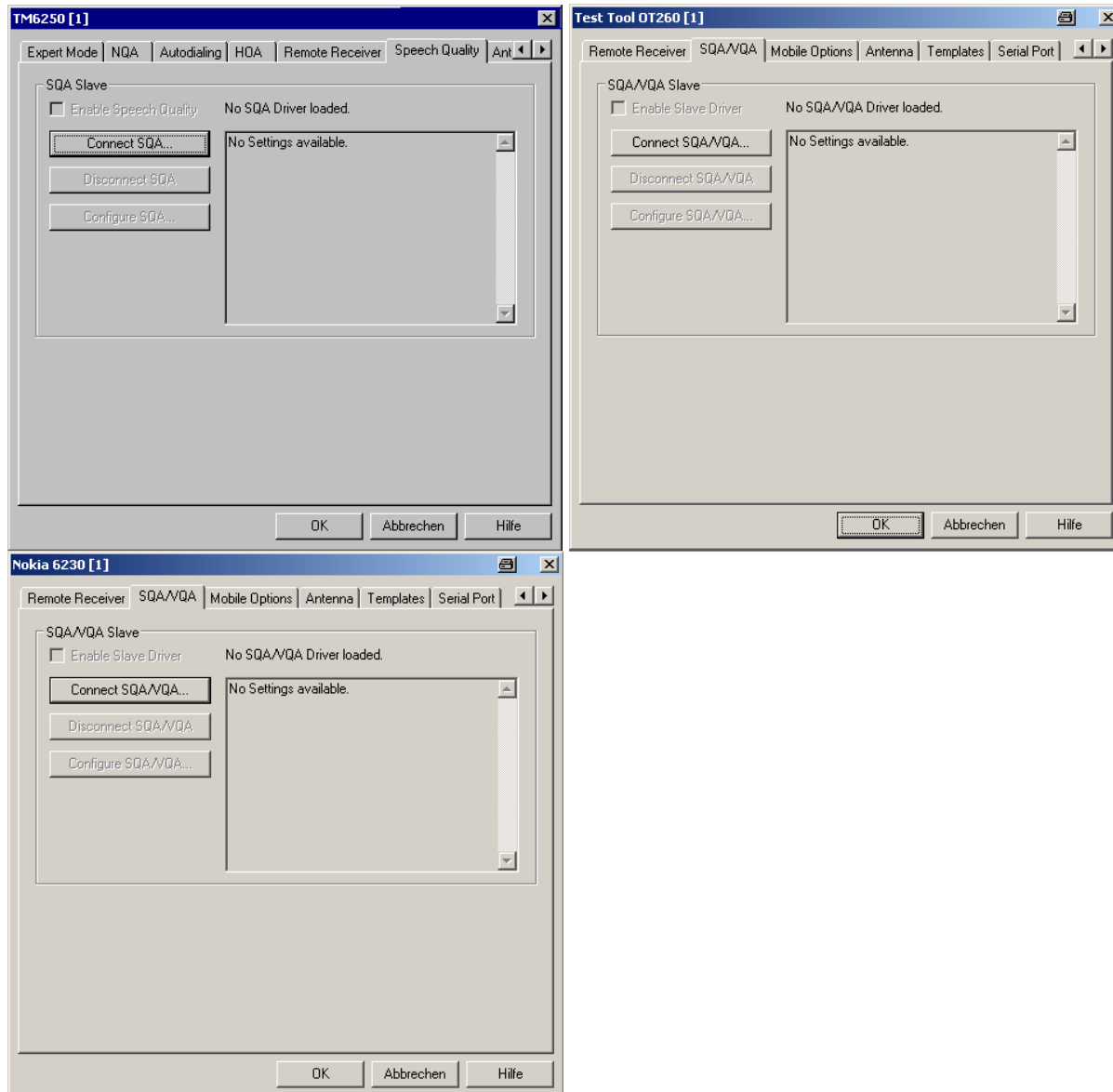


Fig. 6-31 Driver Configuration – Speech / Video Quality

Enable Slave Driver Enables the SQA/VQA slave, causing ROMES to initiate the data transfer and the analysis as soon as the test mobile has set up a call. It is recommended to use the autodial feature (see p. 6.48) in order to repeat a call of fixed duration in periodic time intervals.

Connect SQA/VQA...

Loads the SQA Tester driver. The driver must be selected in the following dialog box:



After loading the driver ROMES displays its name and parameters in the settings table of the *Speech Quality* tab; see right side of the figure above. The parameters can be changed using the configuration menu. The *Disconnect SQA...* and *Configure SQA...* buttons are available as soon as a driver has been loaded. Only one SQA driver can be active at one time.

Disconnect SQA/VQA...

Releases/disconnects the loaded SQA/VQA driver.

Configure SQA/VQA

Opens the configuration menu for the loaded SQA/VQA driver. The SQA/VQA configuration menu provides all settings for downlink or uplink SQA/VQA tests and displays information about the driver version.

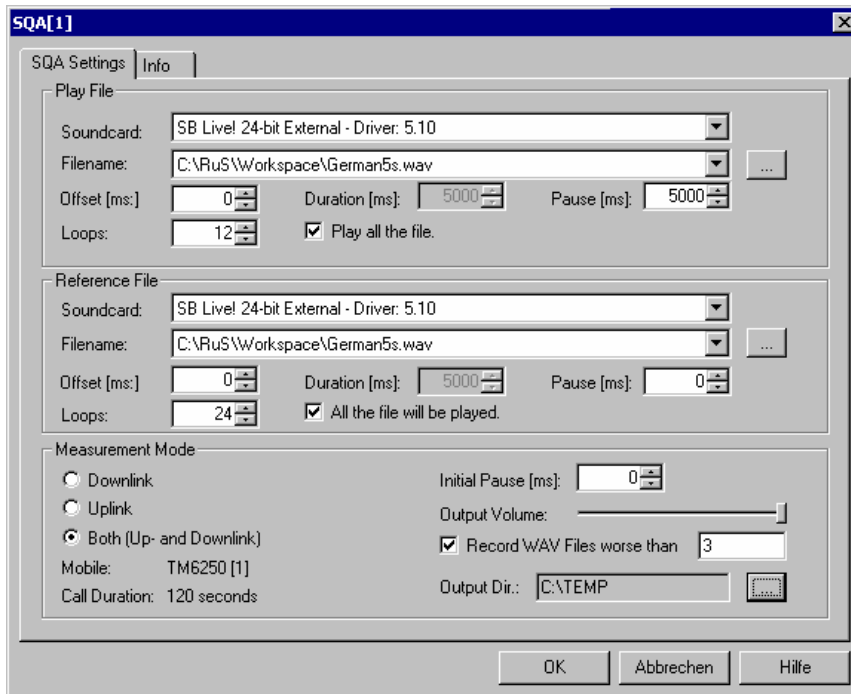
SQA Settings

Fig. 6-32 SQA Settings

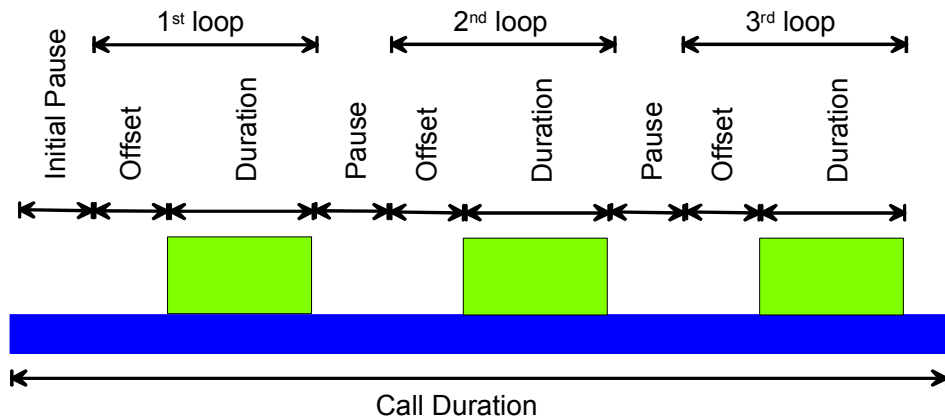
The *SQA Settings* tab is divided into three panels. The lower panel (*Measurement Mode*) selects the signal direction and global test parameters. The *Play File* and *Reference File* panels are relevant for downlink and uplink tests, respectively. They are only available after the corresponding measurement mode has been selected.

Play File

Configures the *Uplink SQA* test. The uplink test consists of a repeated conversion of a test file located on the local PC to an analog speech signal and the transmission of this signal to a remote device using the test mobile speech coder (see section [SQA – Principle and Test Setup](#) on p. 6.64). The *Play File* parameters determine how often and how long the sound card will play the test file.

- Sound card** Selection of the sound card used to play the local test file and convert it into an analog signal.
- Filename** Name and location of the played test file.
- Offset [ms]** Delay from the beginning of the loop (beginning of the play file) until the sound card starts playing the file. During the offset time, the sound card plays silence. In contrast to the *Initial Pause*, this offset is used once at the beginning of each loop.
- Duration [ms]** Duration of the played section of the file. If *Play all the file* is selected, *Duration* is unavailable and shows the time needed to play the entire file.
- Pause [ms]** Pause time after each test loop, i.e. after each single transmission of the test file. During the pause the sound card plays silence.
- Loops** Number of test loops.

The configured measurement time must be smaller or equal than the *Call Duration* defined in the *Autodialing* tab of the driver configuration menu.



The entire call is periodically repeated if autodialing is enabled.

Reference file

Configures the *Downlink SQA* test. The downlink test consists of a repeated transmission of a test file from a remote device (typically: an answering machine) to the local PC using the test mobile speech decoder and a subsequent conversion of the analog speech signal to a digital sample file.

The parameters are analogous to the uplink parameters in the *Play File* section.

If parallel SQA tests are performed with different test mobiles, each test mobile must be configured with its own copy of the reference file.

Measurement mode Selects the measurement mode (*Downlink* test, *Uplink* test or combined, simultaneous *Up- and Downlink*); see section [SQA – Principle and Test Setup](#) on p. 6.64) and specifies the following global settings:

Initial Pause [ms] Delay time between the start of each call and the beginning of the first loop. An initial pause can be set in order to allow the hardware to settle at the beginning of the call before the actual SQA measurement is started.

Output Volume Volume at the analog output of the sound card (minimum value to maximum value). The output volume is relevant for uplink tests where it controls the input level at the mobile's audio input.

Record WAV Files worse than Store the downloaded files (or the part of the files used for the PESQ evaluation) provided their speech quality is below a specified PESQ score (for downlink tests only). If the highest PESQ value is entered, all files will be stored.

Output Dir. Selection of an output directory for the downloaded files.
If parallel SQA tests are performed with different test mobiles, each test mobile must be configured with its own output directory to avoid file access conflicts.

The *Call Duration* defined in the *Autodialing* tab of the driver configuration menu and the test mobile type is displayed for information.

SQA – Principle and Test Setup

The objective of the Speech Quality Analysis is to assess the subjective quality of speech codecs operating in a real network. The SQA is carried out as a cyclic end-to-end measurement in downlink and/or uplink direction.

Downlink In downlink mode, a remote device (typically an answering machine) plays a known .wav file. The output of the test mobile speech decoder is digitalized using a sound card and the acquired sample file is compared to a copy of the original played file (reference file). ROMES assesses the quality of the mobile's speech decoder using the PESQ algorithm described below.

Uplink In uplink mode, a file is played on a sound card; the analog output of the sound card is fed to the mobile speech coder. The speech coder data is transferred to a remote device (typically an SQA server) where it can be compared to a copy of the original play file.

PESQ algorithm The PESQ (Perceptual Evaluation of Speech Quality) algorithm compares an original .wav file with a degraded file .wav' that is obtained by passing the original file through a communication system. The result of the comparison is translated into a PESQ score in the range between -0.5 and $+4.5$ ($+1$ to approx. $+4.55$ after conversion), where low values indicate poor speech quality, high values indicate good quality (see description of the *SQA Message View* in chapter 4).

The PESQ model was built with the aim of ensuring that the objective PESQ score is closely correlated to subjective scores of the speech quality acquired in listening tests with real subjects. For a description of the PESQ method, its use and its limitations refer to the ITU-T recommendation P.862.

Preconditions The SQA requires option ROMES-Z8, *Voice Quality Test PESQ*. A test file (.wav) must be stored both on the local PC (reference file, play file) and on the remote device. The test mobile must be equipped with an appropriate connector so that its audio circuit can be fed to the analog input/output of a sound card. The basic test setup is shown below.

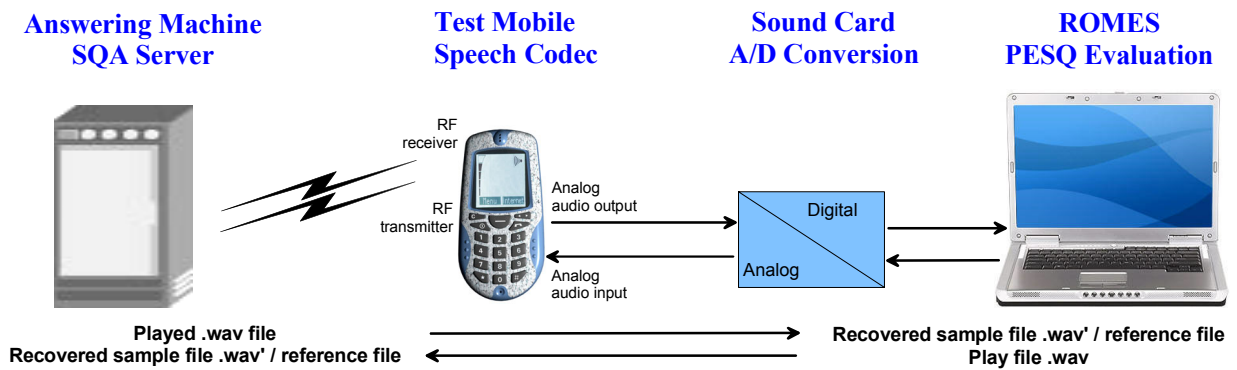


Fig. 6-33 Basic SQA Test Setup

Driver Configuration – Video Quality

VQA Settings

The call setup has to be configured in the VQA configuration. The mobile call setup will be ignored during VQA measurements.

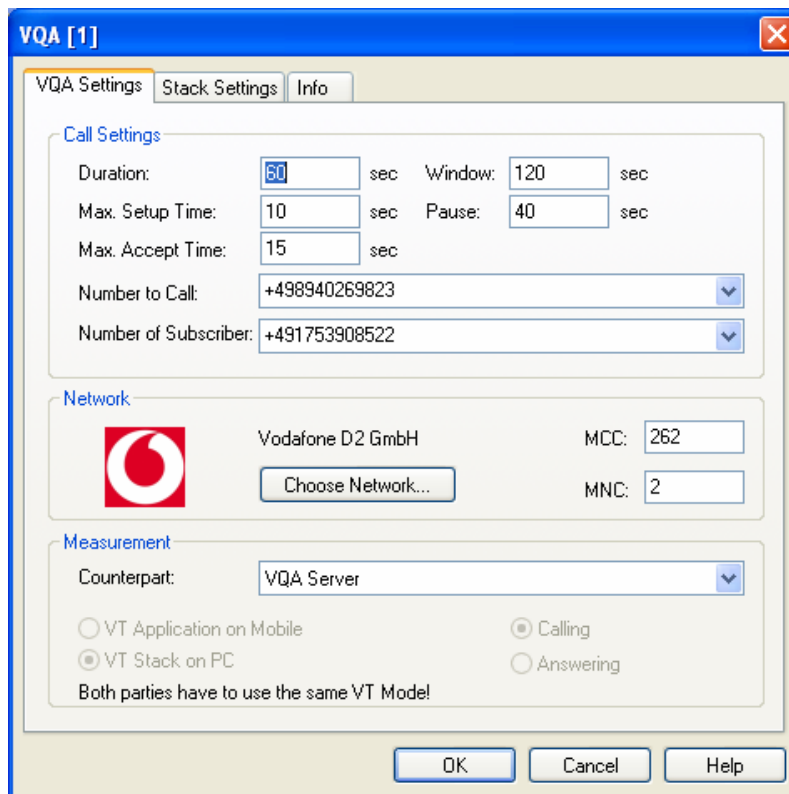


Fig. 6-34 VQA driver configuration – VQA settings

Call Settings

Provides various call settings:

<i>Duration</i>	Evaluated Call Duration. The effective duration will be Duration + Media TimeOut. This is necessary to be able to check for Media Timeouts at the end of the call.
<i>Max. Setup Time</i>	Max. Time until ALERTING was received
<i>Max. Accept Time</i>	Max. Time between ALERTING and CONNECTED
<i>Call Window</i>	Call pattern.
<i>Pause</i>	Min. Pause after call
<i>Number to Call</i>	Number of counterpart.
<i>Number of Subscriber</i>	Number of dedicated mobile.

Network

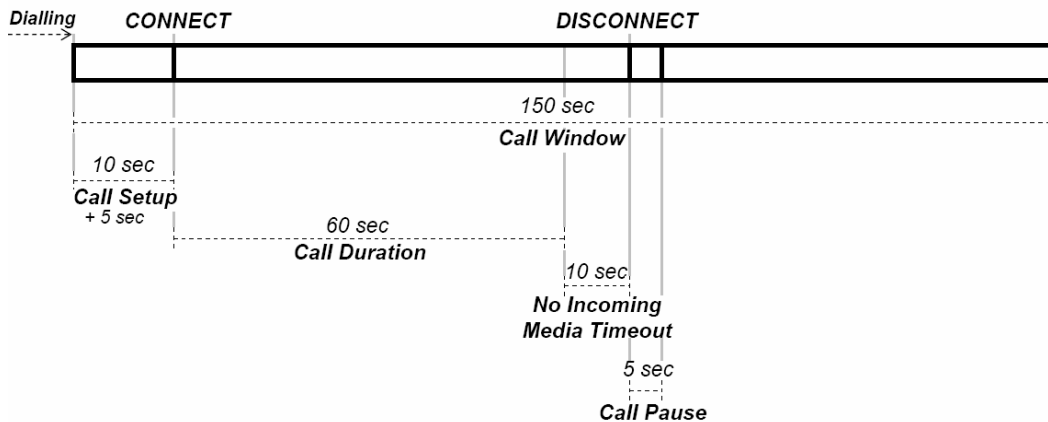
A network has to be chosen. This information is mandatory for the evaluation process.

Measurement

Select a counterpart for the measurement. If Server is chosen, all other settings are done automatically. If Mobile is chosen, the VT Mode and Calling/Answering have to be selected.

The general sequence for an SQA / VQA call is shown in the figure below:

Call Timing Overview



Example for a call that takes 60 seconds

- Call Accept Timeout is added to Call Setup Time (5 seconds). This is the timeout after Alerting message has been received for the call to be accepted
- No Incoming Media Timeout is added (10 seconds)
- Final Call Pause is added (5 seconds)

Fig. 6-35 SQA / VQA Call Timing Overview

VQA Stack Settings

On the Stack Settings Page the following Setting have to be done.

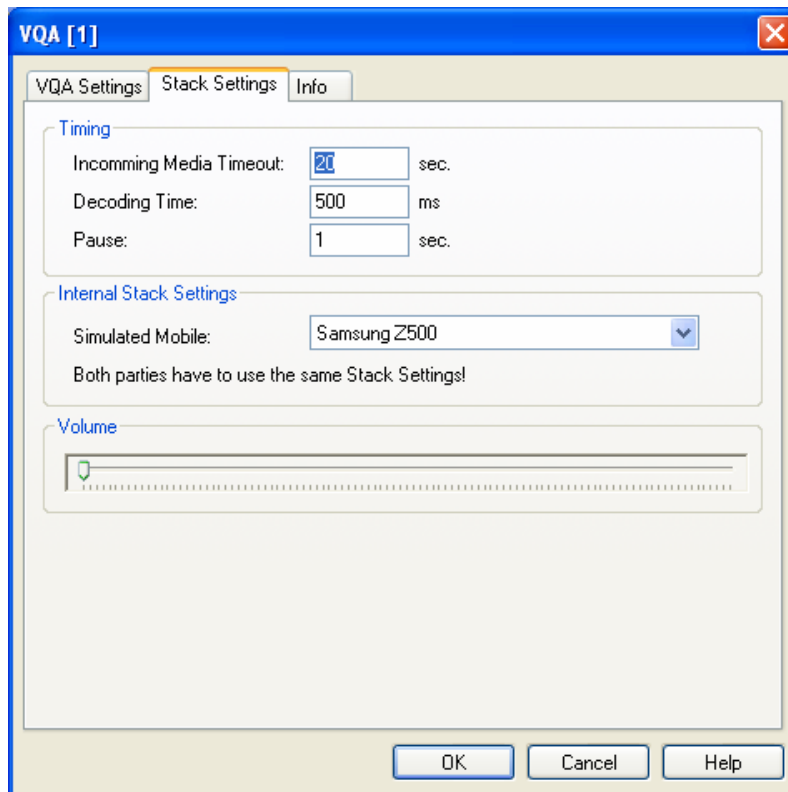


Fig. 6-36 VQA driver configuration – VQA Stack Settings

Timing	Provides various call time settings:	
	<i>Incomming Media Timeout</i>	Max. Time between CONNECT and the first incoming Media Packet.
	<i>Decoding Time</i>	It is an estimated time that can be configured to consider the delay of the decoder. This time will be added to the audio/video setup time.
	<i>Pause</i>	The speakers of both parties speak alternating. So the pause defines the time when one party starts speaking after the other one has finished.
Internal Stack Settings	<i>Simulated Mobile</i>	Defines, which Mobile Stack will be simulated, the setting is ignored in Mobile Mode. It is necessary, that both sides are configured to simulate the same Mobile Stack .
Volume	The slider controls the output volume of the video call	

Driver Configuration GSM – Serial Port Driver Info

The *Serial Port Driver Info* tab displays information on the file version of the GSM driver, the serial port assigned to it and the transfer parameters. It is identical for all GSM mobile drivers.

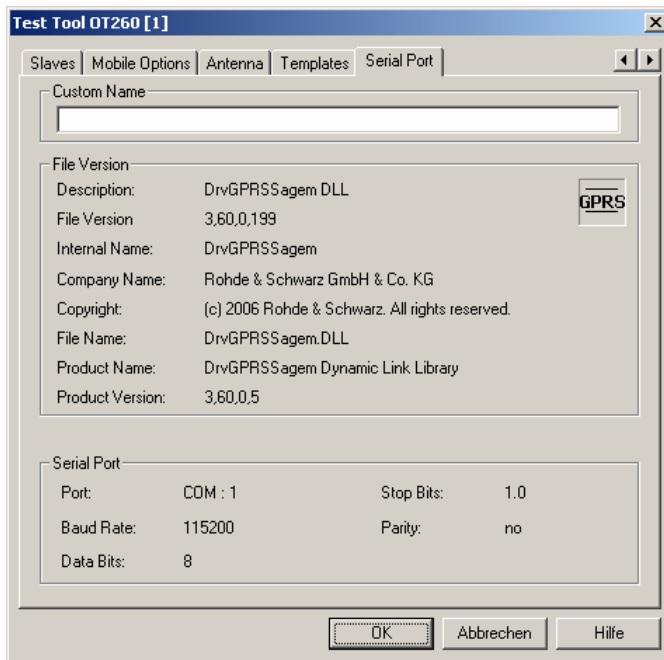


Fig. 6-37 Driver Configuration – Serial Port Driver Info tab (all drivers)

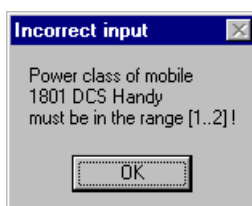
Custom Name Used to assign a name to a mobile, e.g. to make a quick association of a test mobile to its designated test network provider.
An example is provided in section [Configuration of Installed Drivers](#) on p. 6.21.

OK Confirms all settings made in the *Driver Configuration* menu and closes the menu.
If any of the settings made are wrong (i.e. not compatible with the connected device) an error message box pops up – see section [Settings Check and Loading of a Symbol File](#) below.

Cancel Discards all changes made and closes the *Driver Configuration* menu.

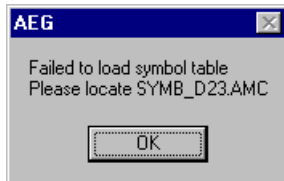
Settings Check and Loading of a Symbol File

On closing the *Driver Configuration* menu (see *OK* button above), the system checks whether the configuration to be saved conforms to the connected mobile. (Analogously, the driver configurations are checked when a driver is loaded, see section [Driver Installation](#) on page 6.1 ff). If there is any incompatibility an error message pops up as in the following example (wrong power class):



On clicking *OK* the message box is closed, and the wrong setting can be corrected in the *Driver Configuration* menu. This procedure must be repeated for all wrong settings.

For AEG mobiles the system will then automatically search for the **symbol file**. If this file, located in the *Driver* subdirectory, is found immediately, no message will appear. Otherwise:



On clicking *OK* an *Open file* box opens. Here all detected symbol files are shown, the one which corresponds to the current configuration is entered in the *File name:* field.

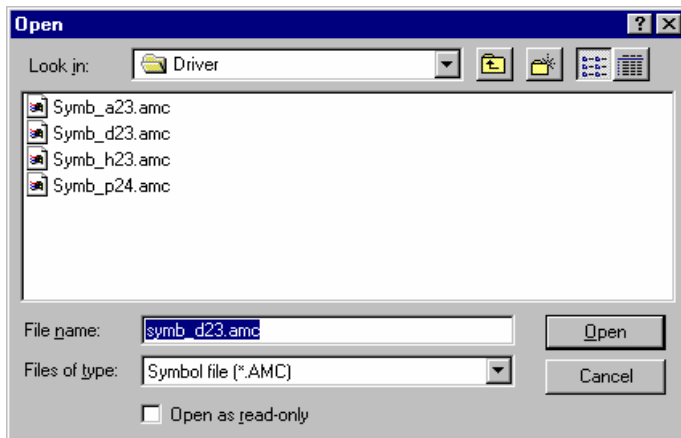


Fig. 6-38 Loading of symbol files

Symbol files

Symbol files are only used with AEG mobiles. They contain all information about the connected mobile, such as type, firmware version or software communication parameters.

The matching firmware version of the mobile is indicated in the name of the symbol file, e.g.:

`SYMB_D23.AMC` where *D* denotes a DCS (GSM1800) mobile and *23* the firmware version. The extension *.AMC* stands for AEG mobile company.

If any problems concerning the test mobile should occur, please include the firmware version number in your service request. Also add the *ROMES* software version number indicated in the *About ROMES* box (see section *Help menu* in chapter 2).

Note:

The firmware version of all AEG mobiles must be 16, 23 or 24 to operate with ROMES.

OK

Loads the selected symbol file. If all settings are correct the *Open file* dialog is closed.

Cancel

Does not load any new symbol file.

Action Menu GSM

The *Action* menu opens popup boxes used to perform various actions at the mobile phone, e.g. set up a call, force a handover to a neighbor cell, perform a location update. It is added to the menu bar as soon as a mobile driver has been successfully installed (see section *Driver Installation* on page 6.1 ff). The *Action* menu and its functionality depends on the driver and mobile type; the examples in *Fig. 6-39 below* have been taken from the Sagem OT 95-M (driver SAGEM) and the Sagem OT 96-M GPRS mobile (driver SAGEM x6). If several mobiles are connected, separate command lines are displayed for each of them.

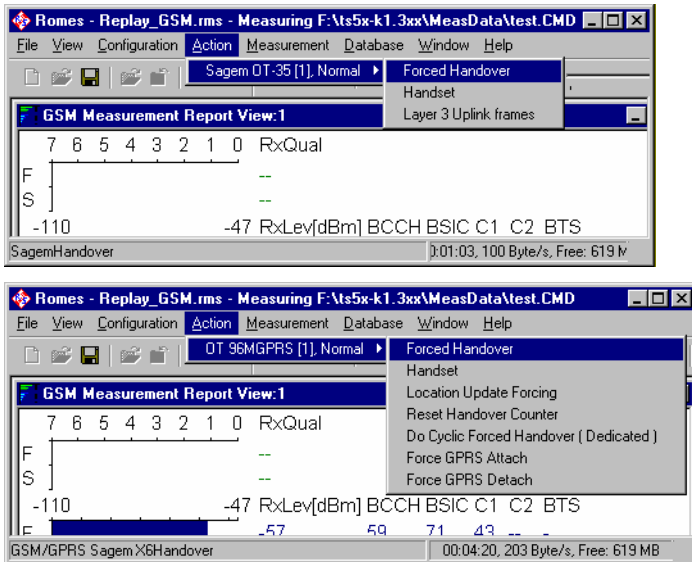
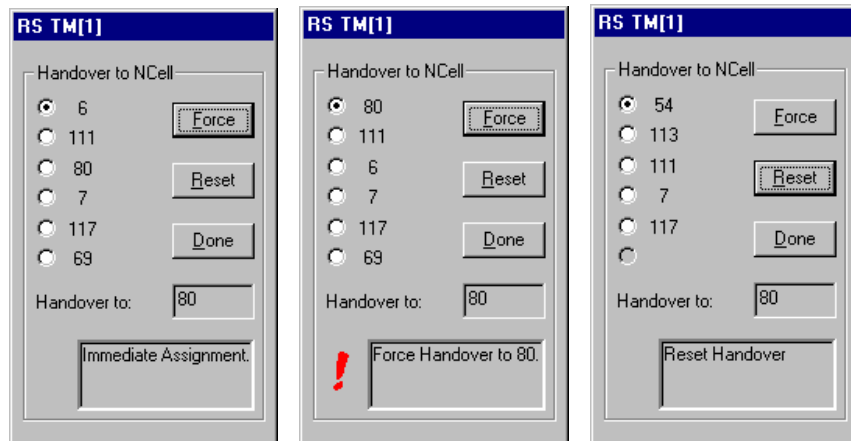


Fig. 6-39 Action menu for different driver types

Handover

Switches over to one of the six neighbor cells if possible.

Handover is possible in dedicated mode (during a call) only. The *Handover* command opens a dialog box (equal for all drivers).



NCell BCCH channel numbers of the neighbor cells. The available neighbor cells might be less than six. One of the cells must be selected for handover.

- Force** Initiates a forced handover to the selected neighbor cell. This can be done several times in succession. After a forced handover the mobile is locked on the former neighbor cell which is now the serving cell.
- Reset** Cancel all forced handover procedures and return to Normal measurement mode.
- Done** Closes the Handover window.

The current action is indicated in the two output fields below the buttons.

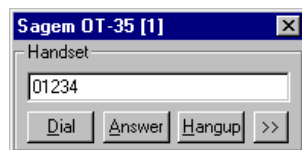
Note:

This function is only possible in NORMAL measurement mode (see Fig. 6-19 on page 6.40).

Handset

Activates the entry of a number to dial, set up and terminate a call .

The *Handset* command opens a dialog box (equal for all drivers).



The >> button enlarges the dialog box, giving access to the Key pad and the *Autodialing* option.



Dialed number The number to be dialed can be entered either via the keyboard and the input field or by clicking the on-screen keypad.

 Closes the window without any further action.

Dial Starts dialing the number entered before.

Answer Instructs the phone to accept the call.

Hangup Drops the line.

Autodialing If the box is checked, the phone number entered below is called periodically, the Dial, Answer, and Hangup buttons are disabled (grayed). The autodialing mode (see p. 6.48) can be set even during the measurement, but only in Idle mode.

Layer 3 Uplink Frames

Opens a dialog to modify up to four layer 3 messages that the Sagem OT95-M mobile sends to the network.

The *Layer 3 Uplink Frames* dialog corresponds to the tab of the same name in the GSM driver configuration menu; see [Fig. 6-26](#) on p. 6.55. This option is provided for the Sagem OT95-M mobile only. For OT35, OT55 and OT75 mobiles, the dialog can be opened but is not effective.

Location Update Forcing

Forces the mobile phone to attempt a location update.

This option is provided for SAGEM mobiles supporting GPRS only.

Reset Handover Counter

Resets the counter for handovers during the current call to 0.

This option is provided by the SAGEM X6 driver only. A reset of the handover counter has an influence on the Network Quality Analysis (NQA); see *Handover Maxcount parameter* in [Fig. 6-24](#).

Do Cyclic Forced Handover

Forces the mobile to cyclically attempt a handover procedure.

This option is provided by the SAGEM X6 driver only; see [Cyclic Handover](#) on p. 6.57. It is grayed unless the mobile is in dedicated mode (during a call).

Force GPRS Attach

Forces the mobile phone to attempt a GPRS attach.

This option is provided by the SAGEM X6 driver only. It is grayed unless a SAGEM mobile supporting GPRS is used.

Force GPRS Detach

Forces the mobile phone to attempt a GPRS detach.

This option is provided by the SAGEM X6 driver only. It is grayed unless a SAGEM mobile supporting GPRS is used.

UMTS Mobile Drivers

The measurement system provides UMTS mobile drivers for the following UMTS test mobiles:

- Devices based on the Qualcomm MSM6200 chipset, e.g. the Qualcomm TM6200 test mobile (dual mode UMTS 2100 MHz/GSM900/1800 + GPRS), the Samsung Z105 test mobile or the Novatel or Option PCMCIA cards.
- Devices based on the Qualcomm MSM6250 chipset, e.g. the Qualcomm TM6250 test mobile or the Samsung Z500 test mobile.
- Devices based on the Qualcomm MSM6275 chipset, e.g. the Qualcomm TM6275 test mobile.
- Nokia test mobiles Nokia 6630, 6650, 6680, or Nokia 7600.
- Motorola test mobiles E1000, V1100, RAZRV3x, and RAZRV6.
- For HSUPA, only prototypes of data cards and the TM7200 are currently supported.

The driver is installed as described in section [Driver Installation](#) on page 6.1 ff.; its configuration is described in the following sections. The maximum number of test mobiles to be used simultaneously is limited by the option file, the number of interfaces and the performance of the controller. The test mobiles must be connected via USB interface; see section [Connection via USB Interface](#) on p. 6.5.

Caution:

The Samsung mobiles rely on the USB interface for their power supply. A supply current of approx. 0.5 A is required. Check the specification of your USB interface, especially when connecting several Samsung mobiles or other power-consuming devices in parallel. If necessary, use a self-powered USB hub.

All UMTS channels and frequencies are listed in chapter 8, section [UMTS Channels](#).

The Nokia and Qualcomm test mobiles can be used to acquire data for most of the UMTS and UMTS/GSM views described in chapter 4. Limitations are listed in the following table.

Table 6-3 Views for Nokia, Qualcomm and Motorola test mobiles

View	NOKIA 6650/6630/ 6680/7600	Qualcomm MSM6200-based Qualcomm MSM6250-based	Qualcomm MSM6275-based	Motorola E1000, V1100, RAZRV3x and RAZRV6
UMTS Finger Data View	No	Yes	Yes	Yes
UMTS Layer 1 View	Yes	Yes	Yes	Yes
UMTS Cell Set View	Yes, only active, monitored set	Yes, active set and neighbor set	Yes, active set and neighbor set	Yes
UMTS NAS Status View	No (only Cell Id, Name)	Yes	Yes	No (only Cell Id, Name)
UMTS TrCH View	No	Yes	Yes	No
UMTS Physical Chan- nel View	No	Yes	Yes	No
UMTS SIB View	Yes	Yes	Yes	Partly
UMTS RLC/MAC View	No	Yes	Yes	Yes
UMTS Measurement Report View	Yes	Yes	Yes	No
UMTS Reselection View	Yes	Yes	Yes	

View	NOKIA 6650/6630/ 6680/7600	Qualcomm MSM6200-based Qualcomm MSM6250-based	Qualcomm MSM6275-based	Motorola E1000, V1100, RAZRV3x and RAZRV6
UMTS Power Control View	Yes	Yes	Yes	Yes
UMTS Layer 1 Graph View	Yes	Yes	Yes	Yes
UMTS Neighborhood Analyzer View	Yes	Yes	Yes	
All UMTS HSDPA Views	No	No	Yes	In development
UMTS/GSM Layer 3 View	Yes	Yes	Yes	Yes
UMTS/GSM NQA View	Yes	Yes	Yes	Yes
UMTS/GSM ETSI QoS View	Yes	Yes	Yes	Yes
UMTS/GSM Handover Analyzer View	Yes	Yes	Yes	
UMTS/GSM NQA State View	Yes	Yes	Yes	Yes

Analogous to GSM, the UMTS test mobiles and drivers are now grouped into the R&S support classes 1 and 2. The mobiles of R&S support class 1 are continuously tested with new ROMES versions and service packs, they are permanently available to our testing staff. The mobiles of R&S support class 2 are not always available for testing, but they have been tested successfully at least once with the current ROMES software release. The introduction of the R&S support classes is necessary due to the sheer number of supported mobiles. The mobile types with R&S support class 1 are listed with normal title typeface in the table below, the mobiles with R&S support class 2 are marked with *italic* title typeface.

Table 6-4 UMTS properties of UMTS test mobiles

Manufacturer: Nokia	Manufacturer: Qualcomm	Manufacturer: Samsung	Manufacturer: Motorola ⁵
<p>Nokia 6630 UMTS 2100 MHz GSM900/1800/1900 + GPRS + EDGE</p> <p>Nokia 6650 UMTS 2100 MHz GSM900/1800 + GPRS</p> <p>Nokia 6680 UMTS 2100 MHz GSM900/1800/1900 + GPRS + EDGE</p> <p>Nokia 7600 UMTS 2100 MHz GSM900/1800/1900 + GPRS</p> <p>Nokia N80 UMTS800/1900/2100 MHz + HSDPA GSM850/900/1800/1900 + GPRS + EDGE</p>	<p>Qualcomm TM6200 UMTS 2100 MHz GSM900/1800 + GPRS</p> <p>Qualcomm TM6250 UMTS 2100 MHz GSM850/900/1800 + GPRS</p> <p>Qualcomm TM6275 UMTS 2100 MHz (platform 1) or 1900/850 (platform 2) + HSDPA GSM850/900/1800/1900 + GPRS + EDGE</p> <p>Qualcomm TM6280 UMTS800/1900/2100 MHz + HSDPA GSM850/900/1800/1900 + GPRS + EDGE</p> <p>Qualcomm TM7200 UMTS800/1900/2100 MHz + HSDPA + HSUPA GSM850/900/1800/1900 + GPRS + EDGE</p>	<p>Samsung Z105/107 UMTS 2100 MHz GSM900/1800 + GPRS</p> <p>Samsung Z130/Z500/ ZV10/ZV50 UMTS 2100 MHz GSM900/1800/1900 + GPRS</p> <p>Samsung Z560 UMTS 2100 MHz + HSDPA GSM900/1800/1900 + GPRS</p>	<p>Motorola E1000 UMTS 2100 MHz GSM900/1800/1900 + GPRS + EDGE</p> <p>Motorola V1100 UMTS 2100 MHz GSM900/1800/1900 + GPRS + EDGE</p> <p>Motorola RAZRV3x UMTS 2100 MHz GSM900/1800/1900 + GPRS + EDGE</p> <p>Motorola RAZRV6 UMTS 2100 MHz + HSDPA GSM900/1800/1900 + GPRS + EDGE</p>

⁵ The support classes of the Motorola test mobiles are not defined yet.

Recently UMTS services have become available for PCMCIA slot-based data cards, therefore the following cards (based on the Qualcomm chipset) are now supported.

Table 6-5 UMTS properties of UMTS test data cards

Manufacturer: Novatel Wireless	Manufacturer: Option	Manufacturer: Sierra Wireless
Merlin U740 UMTS 2100 MHz + HSDPA 1.8 MBit GSM850/900/1800/1900 + GPRS + EDGE Merlin U870 UMTS 2100 MHz + HSDPA 7.2 MBit GSM850/900/1800/1900 + GPRS + EDGE	Globetrotter GT 3G + EMEA UMTS 2100 MHz + HSDPA 1.8 MBit GSM 900/1800 + GPRS	A850 UMTS 2100 MHz GSM 900/1800 + GPRS

Driver Configuration Menu UMTS (Qualcomm)

The *Qualcomm* driver configuration menu contains various tabs to select the message types evaluated by the test system (*Configuration*, *Expert Mode*), configure the network quality analysis (*NQA*) and the autodialing and autoanswer call mode (*Autodialing*), define the characteristics of the antenna used (*Antenna*), and display information on the driver and the serial port assigned (*Serial Port Driver Info*). It can be opened by clicking the *Driver* command line of the *Configuration* menu which is available as soon as a mobile driver is loaded (see Fig. 6-4) or via the *Driver* tab in the *Configuration of Software Modules* menu opened via the *Configuration – Settings* command.

Configuration UMTS (Qualcomm)

The *Configuration* tab defines the PIN number and allows a rough pre-selection of the evaluated message type. The message type selection can be refined in the *Expert Mode* tab (see p. 6.77 ff.).

Note:

The UMTS test mobiles provide a wealth of information that the test system is able to store and evaluate. In many applications, only a subset of this information is actually needed. Restricting the recorded data saves system resources and reduces the size of the measurement files.

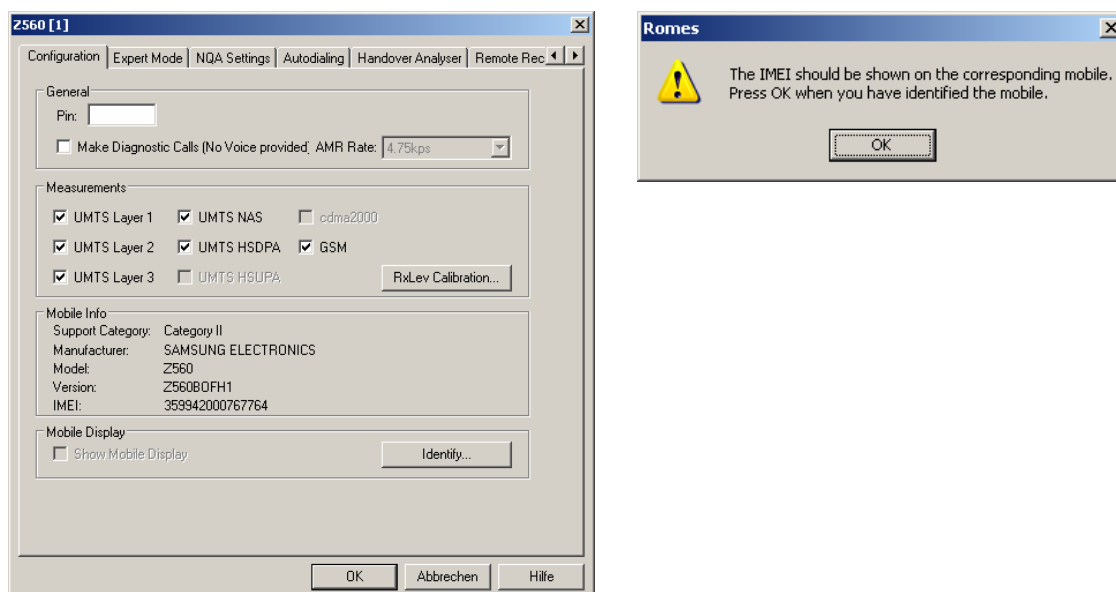


Fig. 6-40 UMTS driver configuration – Configuration

General

The PIN number for identification after switching on the test mobile can be entered in the *General* panel of the configuration dialog. If nothing is entered, the SIM must be entered manually at the mobile each time it is started.

If *Make Diagnostic Calls...* is selected, the mobile will set up connections (no voice calls) at a fixed data rate. This option is particularly suitable for connections with test devices that are not equipped with an audio circuit.

Measurements

The six UMTS/GSM-related checkboxes in the *Measurements* group are used for a rough preselection of the messages and information types to be recorded and written to the measurement (*.cmd) file. The selection can be refined in the *Expert Mode* tab. For an overview of available messages, views and signals see [Table 6-6 below](#).

Mobile Display

Show Mobile Display opens a view of the test mobile so that it is possible to observe the display, dial numbers and browse the menu from the controller while a measurement is performed. This function is also provided in the *Action* menu; see section [Action Menu](#) on p. 6.90 ff.



Expert Mode UMTS (Qualcomm)

The *Expert Mode* tab selects the message types to be recorded to the measurement file. A *Layer 1*, *Layer 2*, *Layer 3*, or *UMTS* message type can be selected only if the driver has been configured to do *Layer 1*, *Layer 2*, *Layer 3*, or *UMTS* measurements; see description of the *Configuration* tab above.

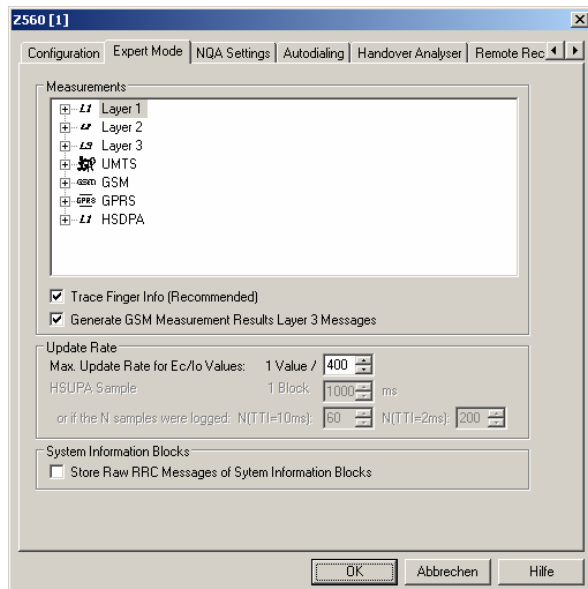


Fig. 6-41 UMTS driver configuration – Expert Mode

The available message types are listed in the table [Table 6-6 below](#), together with the names of the corresponding views and data structures/signals in the data tree. For an explanation of the recorded parameters refer to the description of the UMTS and UMTS/GSM views in chapter 4.

Table 6-6 UMTS message types, views and signals

Message type	View	Data structure / signal
Layer 1 Messages		
WCDMA AGC	UMTS Layer 1	Layer 1
WCDMA RACH Parameters	Only general purpose views (e.g. Alphanumeric View)	RACH Parameters
WCDMA DRX Mode	Only general purpose views (e.g. Alphanumeric View)	DRX Mode
WCDMA TrCH Downlink	UMTS TrCH	
WCDMA TrCH Uplink	UMTS TrCH	
WCDMA Common Physical Channels Downlink	UMTS Physical Channels	
WCDMA Common Dedicated Physical Channels Downlink	UMTS Physical Channels	
WCDMA Physical Channels Uplink	UMTS Physical Channels	
WCDMA PRACH	UMTS Physical Channels	
WCDMA Active Set	UMTS CellSet, UMTS Network Analyzer	Active Set
WCDMA Neighbour Set		
WCDMA BLER		
WCDMA SIR Estimation		SIR

Message type	View	Data structure / signal
WCDMA Cell Reselection	UMTS Reselection View	
WCDMA List Searcher		
WCDMA compressed mode interfre- quency Step 1 search		
WCDMA compressed mode interfre- quency list search		
Layer 2 Messages	–	–
Layer 3 Messages	UMTS SIB, UMTS Layer 3, UMTS Meas- urement Report, all	Layer 3, RRC Message
UMTS		
UMTS NAS GMM State	UMTS NAS Status	NAS State
UMTS NAS MM State	UMTS NAS Status	NAS State
UMTS NAS REG State	UMTS NAS Status	NAS State
UMTS NAS CS Connection Management		CS Call Management
UMTS NAS MM Characteristics	UMTS NAS Status	MM Info
UMTS NAS OTA Messages		NAS Message
UMTS NAS QoS		NAS QoS
UMTS NAS Connection Bearer Capability		Connection Bearer Capability
UMTS NAS AMR Uplink (only older firmware versions)		AMR Uplink
UMTS NAS AMR Downlink (only older firmware versions)		AMR Downlink

The *NQA State Machine* signals require several layer 3 and layer 1 messages; they are available in the default configuration of the driver configuration menu.

Table 6-7 GSM/GPRS message types, views and signals

Message type	View	Data structure / signal
GSM Messages		
GSM surround cell BA list	MMR	MMR, SVR
GSM serving cell info	MMR	MMR, SVR
GSM TxLev Timing Advance		SVR
GSM L3 RR state		SVR
GSM L3 RR protocol error	-	-
GSM L3 RR signaling message	GSM/UMTS Layer 3	Layer 3
GSM L3 RR cell selection and reselection parameters	GSM Layer 1	Layer 1 ext.
GSM L3 RR RACH control parameters		SVR
GSM L3 RR control channel description parameters		MM Info
GSM L3 RR cell options		SVR
GSM L3 RR cell information	MMR	MMR, SVR
GSM L3 RR channel configuration		SVR, MM Info
GSM L3 RR ciphering mode		MM Info

Message type	View	Data structure / signal
GSM L3 RR cell selection and reselection measurements	MMR	MMR, SVR
GSM L3 RR downlink signaling counter		SVR
GSM L3 RR radio link timeout counter		SVR
GSM L3 RR SACCH report	MMR	MMR, SVR
GSM L3 RR 3G rejected cells	Rejected 3G Cells	RR 3G Rejected Cells
GSM L3 idle WCDMA known list	Idle 3G Cell List	Idle Mode WCDMA Known List
GSM L3 dedicated WCDMA cell list	Dedicated 3G Cell List	3G Dedicated Measurements
GSM 3G dedicated measurements	Dedicated 3G Cell List	3G Dedicated Measurements
GPRS Messages		
GPRS indicators	GSM Layer 1	Layer 1 ext.
GPRS general parameters	RLC/MAC	MAC Info
GPRS cell options	RLC/MAC	MAC Info
GPRS power control parameters	RLC/MAC	MAC Info
GPRS mobile allocation		
GPRS PBCCH description		
GPRS GRR State		
GPRS RR cell reselection parameters	GSM Layer 1	Layer 1 ext.
GPRS RR cell reselection measurements	GSM Layer 1	Layer 1 ext.
GPRS RR packet system information 1	RLC/MAC	GPRS RR Info
GPRS RR packet system information 2	RLC/MAC	GPSR MM Info
GPRS RLC-UL statistics	RLC/MAC	QoS Info
GPRS RLC-DL statistics	RLC/MAC	QoS Info
GPRS RLC-UL Release Indicators		
GPRS RLC-DL Release Indicators		
GPRS LLC ME information	RLC/MAC	QoS Info
GPRS LLC PDU statistics	RLC/MAC	QoS Info
GPRS LLC XID Information		
GPRS SNDCP PDP context information		SNDCP Info
GPRS MAC signaling message	GSM/UMTS Layer 3	GPRS RLC Msg.
GPRS MAC UL TBF establish	RLC/MAC	MAC Info, RLC Info
GPRS MAC UL TBF release	RLC/MAC	MAC Info, RLC Info
GPRS MAC DL TBF establish	RLC/MAC	MAC Info, RLC Info
GPRS MAC DL TBF release	RLC/MAC	MAC Info, RLC Info
GPRS SM/GMM OTA signaling message	GSM/UMTS Layer 3	GPRS GMM Msg.
GPRS air interface summary		RAT Info
GPRS timing advance		SVR
GPRS power control	RLC/MAC	RLC Info
GPRS transfer summary	RLC/MAC	MAC Info, RLC Info
GPRS L1 Message Metrics A	RLC/MAC	MAC Info, RLC Info
GPRS L1 Message Metrics B	RLC/MAC	MAC Info, RLC Info
GPRS L1 Message Metrics C	RLC/MAC	MAC Info, RLC Info
GPRS L1 Message Metrics D	RLC/MAC	MAC Info, RLC Info
GPRS L1 Burst Metrics A		
GPRS L1 Burst Metrics B		

Message type	View	Data structure / signal
GPRS L1 Burst Metrics C		
GPRS L1 Burst Metrics D		
GPRS RR 3G reselection measurements parameter	RR 3G Reselection Measurements Parameters	GRR 3G Reselection Measurements Parameters
GPRS RR 3G reselection measurements	RR 3G Reselection Measurements	GRR 3G Reselection Measurements
GPRS/EGPRS RLC Uplink Header	GPRS/EGPRS	EGPRS Info
GPRS/EGPRS RLC Downlink	GPRS/EGPRS	EGPRS Info
GPRS/EGPRS RLC Uplink	GPRS/EGPRS	EGPRS Info
HSDPA Messages (only 6275, 6280, and 7200 chipsets)		
HSDPA Configuration	UMTS HSDPA Configuration	HSDPA DL Configuration HSDPA DL Configuration Disable HSDPA UL Configuration HSDPA UIL Configuration Disable HSDPA Finger Configuration
HSDPA UL Beta Gain Table	–	–
HSDPA Demodulator Control Table	–	–
HSDPA Modulator Control Table	–	HSDPA Modulator Control Table
HSDPA Decode Status	UMTS HSDPA Decode Status	HSDPA Decode Summary
HSDPA HS-SCCH Statistics		HSDPA SCCH Statistics
HSDPA HS-DSCH HARQ Statistics	UMTS HSDPA HARQ Statistic	HSDPA DSCH HARQ Statistics HSDPA DSCH HARQ
HSDPA UL HS DPCCH Information	UMTS HSDPA UL HS DPCCH	
HSDPA MAC HS Configuration	UMTS HSDPA MAC Configuration	
HSDPA MAC HS Headers	UMTS HSDPA MAC Header	
HSDPA MAC HS Status	UMTS HSDPA MAC Status	
HSUPA Messages (7200 chipset only)		
HSUPA EUL DL Channel Configuration		
HSUPA EUL UL Channel Configuration		
HSUPA EUL UL E-DPCH		
HSUPA EUL combined L1/MAC		
HSUPA EUL L1/MAC statistics		
HSUPA EUL MAC-e/es Configuration		
HSUPA EUL MAC-e/es Header		
HSUPA EUL UL UM PDU		
HSUPA EUL DL UM PDU		
HSUPA EUL Ciphering		

Trace Finger Info

The WCDMA finger info is necessary for the *UMTS Layer 1 View*, *UMTS Finger View*, and the *UMTS Network Analyzer View*. It must be selected as well to obtain the *Finger Info* signals.

Generate GSM Layer 3 Messages

The GSM L3 "Measurement Report" messages are actually not reported by a phone with Qualcomm chipset, despite the fact that the message is defined in the Qualcomm message list (siehe driver configuration). However, the phone sends the "GSM RR SACCH Report" messages, which basically contain the same information.

If this option is activated, the Qualcomm reports "GSM surround cell BA list" and "GSM L3 RR SACCH report" (see GSM message tree in *Measurements*), both

of which have to be enabled are used to create GSM Measurement Layer 3 Messages. These can be analyzed in the Layer 3 View as usual.

If this option is deactivated, no GSM Measurement Layer 3 Messages are created.

Update Rate

Max. Update Rate for Ec/Io Values

Sets the maximum update rate for Ec/Io values. A lower update rate decreases the size of the measurement file.

HSUPA Sample

Sets the *Max. Update Rate for Ec/Io Values* for HSUPA samples. Additional option fields are provided for the case when N samples are logged for a TTI of 10 ms or 2 ms.

System Information Blocks

Layer 3 Radio Resource Control (RRC) messages are broadcast in system information blocks of various types (see standard 3GPP TS 25.331). If the box *Store Raw RRC Messages...* is checked, the complete information transmitted in the layer 3 RRC signaling messages is stored to the measurement file.

If only the system information blocks are needed, the default configuration (box unchecked) is sufficient. This will reduce the size of the measurement file.

Driver Configuration – Nokia Settings

The *Nokia Settings* tab selects GSM/GPRS and UMTS-related parameters to be measured and recorded by Nokia mobile phones.

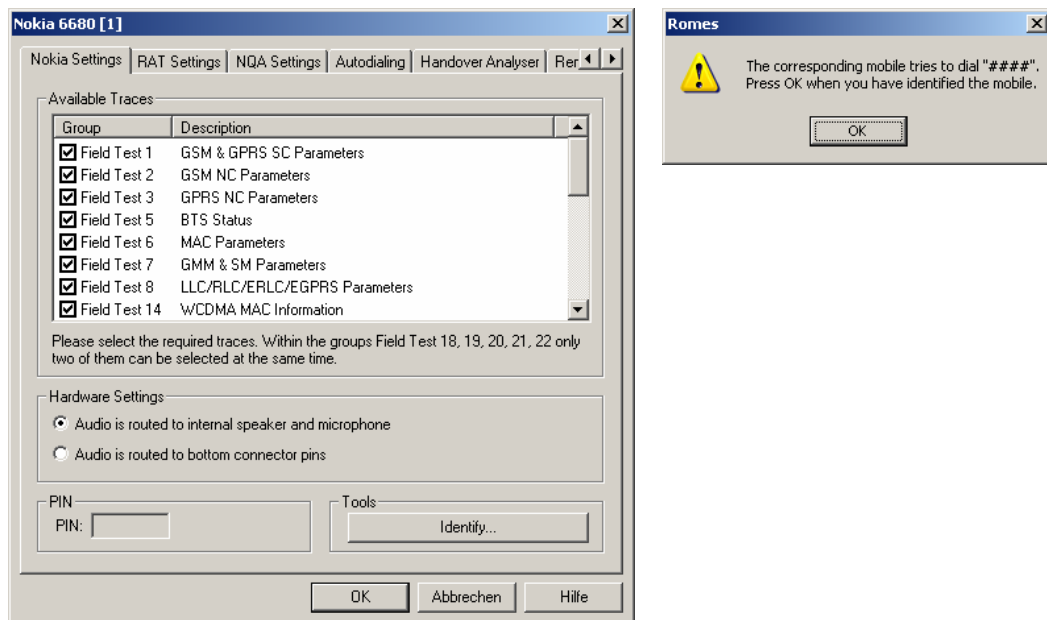


Fig. 6-42 UMTS driver configuration – Nokia Settings

The available message types are arranged in the groups listed in the table [Table 6-8 below](#), together with the names of the corresponding views and data structures/signals in the data tree. For an explanation of the recorded parameters refer to the description of the GSM and UMTS views in chapter 4.

All parameters are selected by default. Deselecting some of the groups reduces the size of the measurement file but does not speed up the measurement.

Hardware settings The input and output signals of the mobile audio circuit are usually routed to the speaker and microphone. As an alternative it is possible to route the signals to the bottom connector pins of the mobile to be tapped off and analyzed.

Table 6-8 GSM/GPRS message types, views and signals

Message type	View	Data structure / signal
Field Test 1: GSM & GPRS SC Parameters	GSM Measurement Report, GSM System Information, GSM GPRS/EGPRS, GSM Layer 1	Measurement Report, Server Report, Packet Server Report Layer 1 Ext
Field Test 2: GSM Neighbor Cell Parameters	GSM Measurement Report, GSM Layer 1	Measurement Report, Server Report
Field Test 3: GPRS Neighbor Cell Parameters	GSM GPRS/EGPRS	Packet Server Report
Field Test 5: BTS Status		
Field Test 6: MAC Parameters	GSM GPRS PDP Info	GPRS LLC Info GPRS MAC Info
Field Test 7: GMM & SN Parameters		
Field Test 8: LLC/ RLC/ERLC/EGPRS Parameters	GSM GPRS/EGPRS	Packet Server Report, EGPRS Info
Field Test 14: WCDMA MAC Information	–	–
Field Test 15:WCDMA RRC Information	UMTS Layer 1	UMTS Layer 1
Field Test 18: General WCDMA Information	UMTS Layer 1	UMTS Layer 1
Field Test 19: Inter-System GSM Neighbor information		
Field Test 20: WCDMA Intra-Frequency Neighbor information	UMTS Cellset View	Active Set, Neighbor Set
Field Test 21: WCDMA Inter1- Frequency Neighbor information	UMTS Cellset View	Neighbor Set
Field Test 22: WCDMA Inter2- Frequency Neighbor information	UMTS Cellset View	Neighbor Set
Trace 1: GSM System Information Messages		
Trace 2: GSM Layer 3 Messages		
Trace 3: GSM & GPRS Parameters		
Trace 4: GPRS & EGPRS Configuration Parameters		
Trace 5: LLC PDU Size Information		
Trace 6: GPRS Context & GMM/SM Messages		
Trace 7: WCDMA Layer 3 Parameters		
Trace 8: WCDMA RLC Messages		

Table 6-9 GSM/GPRS message types, views and signals (Nokia 6630, older firmware versions)

Message type	View	Data structure / signal
Field Test 1: GSM & GPRS SC Parameters	GSM Measurement Report, GSM System Information, GSM GPRS/EGPRS, GSM Layer 1	Measurement Report, Server Report, Packet Server Report Layer 1 Ext
Field Test 2: GSM NC Parameters	GSM Measurement Report, GSM Layer 1	Measurement Report, Server Report
Field Test 3: GPRS NC Parameters	GSM GPRS/EGPRS	Packet Server Report
Field Test 4: BTS Status		
Field Test 5: MAC & GPRS Parameters	GSM GPRS PDP Info	GPRS LLC Info GPRS MAC Info

Message type	View	Data structure / signal
Field Test 6: GMM & SN Parameters	–	–
Field Test 7: LLC/RLC/ERLC/EGPRS Parameters	GSM GPRS/EGPRS	Packet Server Report, EGPRS Info
Field Test 10: WCDMA MAC Information	–	–
Field Test 11: WCDMA RRC Information	GSM Layer 3	
Field Test 12: General WCDMA Information	UMTS Layer 1	
Field Test 13: Inter System GSM Neighbor Information	–	–
Field Test 14: WCDMA Intra Freq. Neighbor Information	UMTS Cellset View	Active Set, Neighbor Set
Field Test 15: WCDMA Inter1 Freq. Neighbor Information	UMTS Cellset View	Neighbor Set
Field Test 16: WCDMA Inter2 Freq. Neighbor Information	UMTS Cellset View	Neighbor Set
Field Test 17: GSM System Information Messages	GSM System Information View GSM GPRS System Information View	
Field Test 18: GSM Layer 3 Messages	UMTS/GSM Layer 3 View	Layer 3
Field Test 19: GSM & GPRS Parameters	RLC MAC View	
Field Test 20: GSM & EGPRS Configuration Parameters	GSM GPRS/EGPRS View	
Field Test 21: GPRS Context & GMM/SM Messages	RLC MAC View	
Field Test 22: WCDMA Layer 3 Messages	UMTS/GSM Layer 3 View	Layer 3
Field Test 23: WCDMA RLC Messages (recommended: disable this message group)	–	–

Driver Configuration – RAT Settings

The *RAT Settings* (Radio Access Technology Settings) tab restricts the GSM bands, the channels or technologies that the mobile is allowed to use.

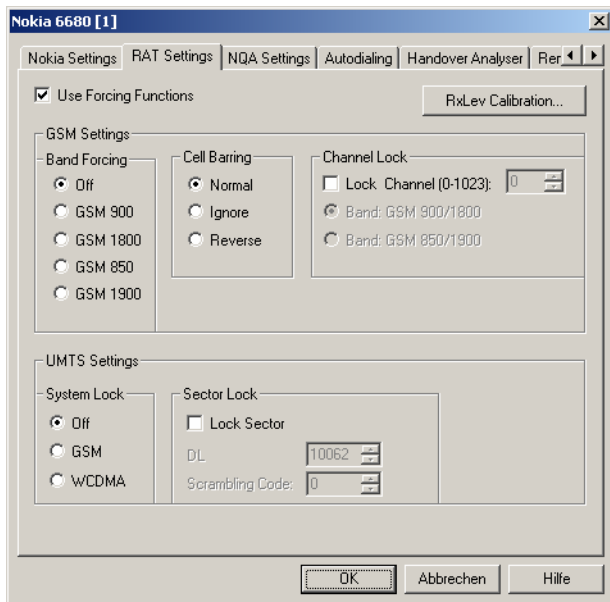


Fig. 6-43 UMTS driver configuration – RAT Settings

All settings are only effective if *Use Forcing Functions* is selected.

- RxLev Calibration...** Open the dialog of the same name in order to calibrate the GMSK modulated or CW input signals against a calibration file; see [RxLev Calibration](#) on p. 6.35.
- GSM Settings – Band Forcing** Selects one of the supported GSM bands for communication:
- Off* All supported GSM bands allowed
 - GSM900/1800/850/1900* Use a specific GSM band
- Cell Barring** This function allows to ignore or invert the cell bar flag:
- Normal* Only cells that are not barred are accessible for the mobile
 - Ignore* Cell bar flag ignored – all cells are accessible
 - Invert* Cell bar flag inverted – only barred cells are accessible
- Channel Lock** *Lock Channel* forces the test mobile to use a specified GSM channel. In the different GSM bands, the same channel numbers are used for different frequencies (see overview of GSM channels in chapter 8). The ambiguities in the channel-frequency assignment are resolved by specifying one of the two band combinations *GSM900/1800* or *GSM 850/1900*.
- UMTS Settings – System Lock** Locks a particular technology for the mobile:
- Off* The mobile can access GSM and UMTS cells.
 - GSM* GSM cells enforced, only GSM cells allowed.
 - UMTS* UMTS cells enforced, only UMTS cells allowed.
- Sector Lock** *Sector Lock* forces the test mobile to use a specified UTRAN cell. If *Lock Sector* is selected, the *DL* channel number and Primary *Scrambling Code* of the locked (enforced) cell can be entered below.

Qualcomm / Nokia – NQA Settings

The *NQA Settings* tab provides the parameters for *Network Quality Analysis*. NQA is a prerequisite for drawing up a call statistics where the calls are classified and the classes are visualized separately (see *2G/3G NQA View* in chapter 4).

The driver settings for Qualcomm and Nokia devices are identical.

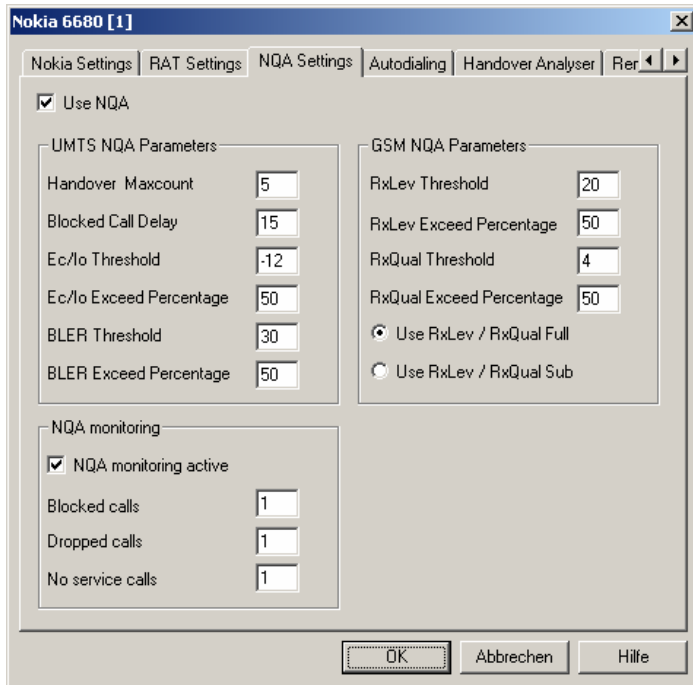


Fig. 6-44 Driver Configuration – NQA Settings tab

The parameters in the *GSM NQA Parameters* and *NQA Monitoring* sections are identical to the NQA parameters for GSM; see section *Driver Configuration – NQA* on p. 6.52 ff.

Use NQA If checked, the box activates the network quality analysis (default).

UMTS NQA Parameters

The following numeric parameters configure the UMTS NQA by defining conditions and limits for the different call classes (we quote the ranges for all parameters; default values are underscored)

- | | |
|---------------------------|---|
| <i>Handover Maxcount</i> | Maximum number of handover procedures during a call in the range 1 to <u>5</u> to 100. If the defined value is exceeded, the call will be classified as EXCESSIVE HO. |
| <i>Blocked Call Delay</i> | Maximum delay (in seconds) between CM_SERV_REQ and ASSIGNMENT_COMMAND in the range 1 (s) to <u>15</u> (s) to 63 (s). If the defined delay is exceeded, the call will be classified as DELAYED CALL. |
| <i>Ec/Io Threshold</i> | Minimum signal to noise ratio in dB and in the range –20 (dB) to <u>–12</u> (dB) to 0 (dB). Ec/Io values which fall below this threshold contribute to NOISY. |

- Ec/Io Exceed Perc.* Minimum ratio (in percent) of reported RxLev values falling below the RxLev Threshold in the range 0 (%) to 50 (%) to 100 (%). If the actual ratio falls below the specified percentage the call is classified as NOISY.
- BLER Threshold* Maximum Block Error Rate in percent in the range 0 (%) to 30 (%) to 100 (%). BLER values above this threshold contribute to NOISY.
- BLER Exceed Perc.* Minimum ratio (in percent) of reported BLER values exceeding the BLER Threshold in the range 0 (%) to 50 (%) to 100 (%). If the actual ratio exceeds the specified percentage the call is classified as NOISY.

**GSM
NQA Parameters**

Configures the GSM NQA, see [NQA](#) on p. 6.52 ff.

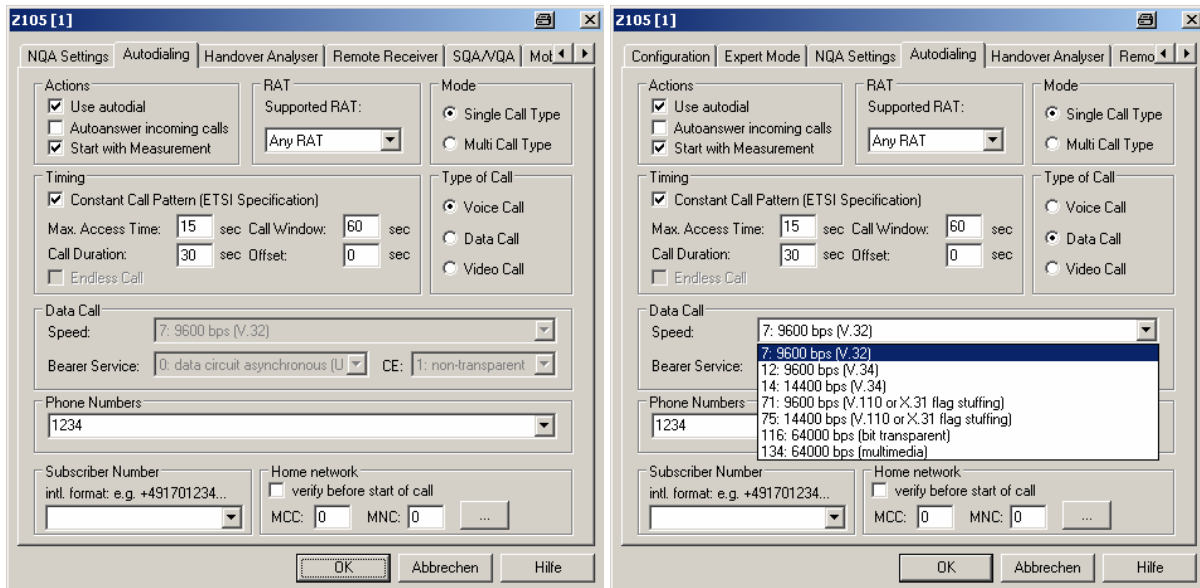
NQA Monitoring

Activates NQA monitoring and displays the number of *Blocked Calls*, *Dropped Calls*, and *No Service Calls*, see [NQA](#) on p. 6.52 ff.

Qualcomm / Nokia – Autodialing

The *Autodialing* tab configures the mode where a definite phone number is dialed periodically, and a call is set up to the mobile phone. This mode is relevant for the network quality analysis described on page 6.52. All settings are analogous to the GSM driver settings described on p. 6.48 ff.

The driver settings for Qualcomm and Nokia devices are identical. The Nokia test mobiles need a 2nd virtual COM port to be operated in *autodial* mode; see paragraph on [Loading the drivers \(Nokia\)](#) on p. 6.6.



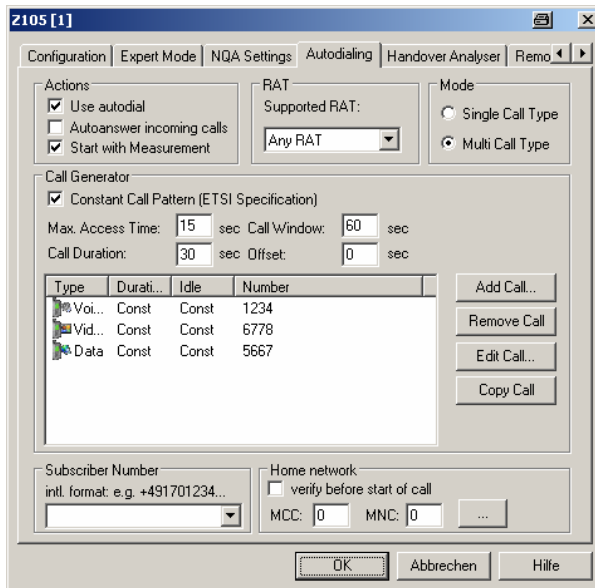


Fig. 6-45 Driver Configuration – Autodialing tab

Qualcomm / Nokia – Handover Analyzer

The *Handover Analyzer* tab enables or disables the handover analyzer (option ROMES-U1) and sets the timeout for the HO analysis. The HO analysis and the meaning of the timeout is described in chapter 4, section *UMTS/GSM Handover Analyzer View*.

The driver settings for Qualcomm and Nokia devices are identical.

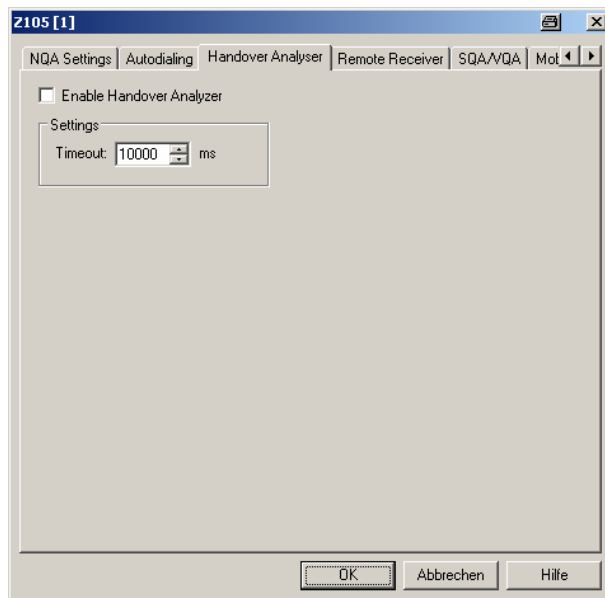


Fig. 6-46 Driver Configuration – Handover Analyzer tab

Qualcomm / Nokia – Remote Receiver

The *Remote Receiver* tab configures the tracking mode where a the mobile phone controls a CW test receiver and sets its receive frequency. All settings are analogous to the GSM driver settings described on p. 6.44 ff.

The driver settings for Qualcomm and Nokia devices are identical.

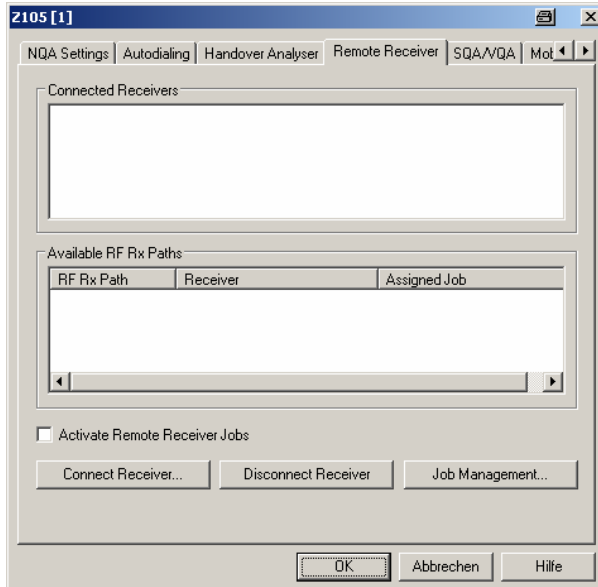


Fig. 6-47 Driver Configuration – Remote Receiver tab

Qualcomm / Nokia – Speech Quality

The *SQA/VQA* tab enables and configures the Speech Quality Analysis (SQA, with option ROMES-Z8, *Voice Quality PESQ*) and *Video Quality Analysis (VQA)*, as described on page 6.65 ff. SQA results can be displayed in the *SQA Message* view (see chapter 4). All settings are analogous to the GSM driver settings described on p. 6.60 ff.

The driver settings for Qualcomm and Nokia devices are identical.

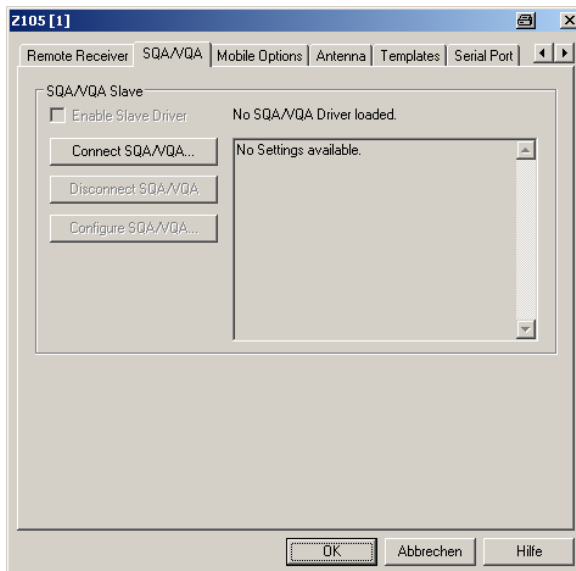


Fig. 6-48 Driver Configuration – SQA/VQA tab

Qualcomm / Nokia – Antenna

The *Antenna* tab defines *Antenna Name*, *Antenna Gain* and *Cable Loss*. These values have no impact on the measurement but are stored in the measurement file header so they can be taken into account for the calculation of correction factors.

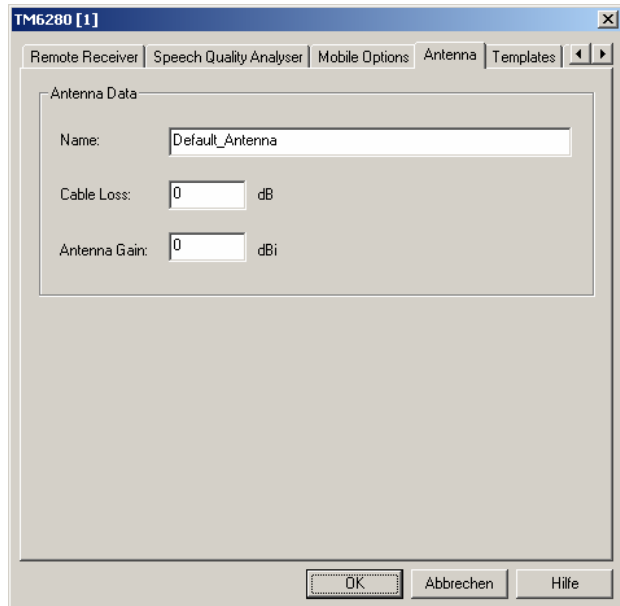


Fig. 6-49 Driver Configuration – Antenna tab

Qualcomm / Nokia – Templates

The *Templates* tab stores the current driver configuration as a template, lists, loads or deletes driver templates. All settings are analogous to the GSM driver settings described on p. 6.59 ff.

The driver settings for Qualcomm and Nokia devices are identical.

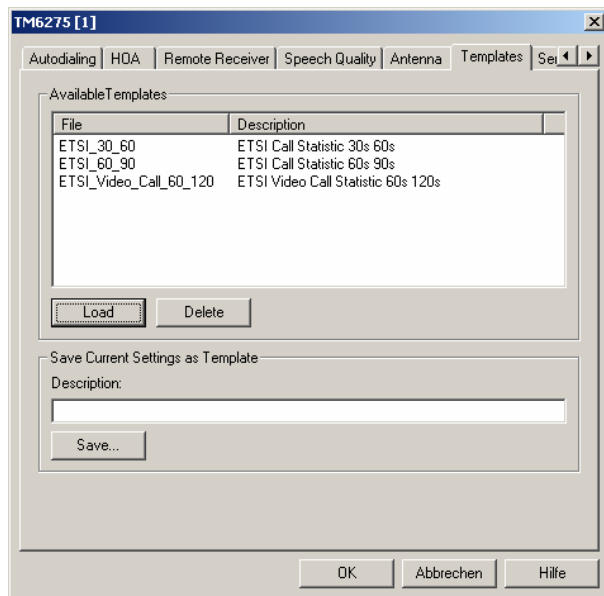


Fig. 6-50 Driver Configuration – Templates tab

Qualcomm / Nokia – Serial Port Driver Info

The *Serial Port Driver Info* tab displays the custom name of the device, information on the file version of the UMTS driver, the serial port assigned to it and the transfer parameters.

The *Custom Name* is used to assign a name to a mobile, e.g. to make a quick association of a test mobile to its designated test network provider. An example is provided in section [Configuration of Installed Drivers](#) on p. 6.21.

The tabs for Qualcomm and Nokia devices are identical.

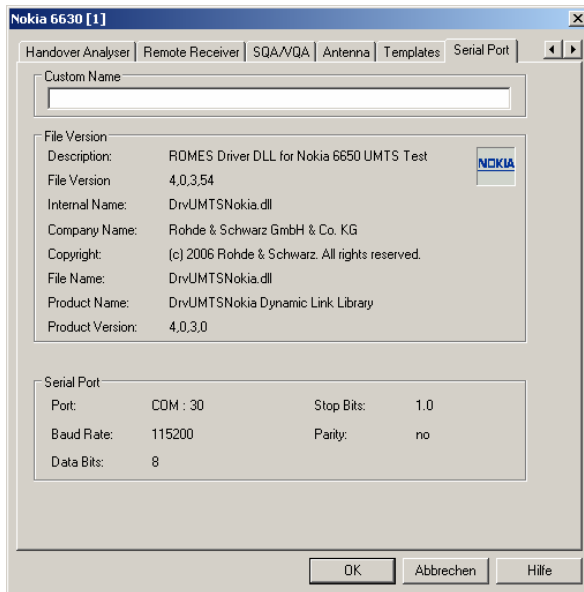


Fig. 6-51 Driver Configuration – Serial Port Driver Info tab

Action Menu UMTS

The *Action* menu opens popup boxes used to set up a call or show the contents of the mobile display. It is added to the menu bar as soon as a mobile driver has been successfully installed (see section [Driver Installation](#) on page 6.1 ff). If several mobiles are connected, separate command lines are displayed for each of them.

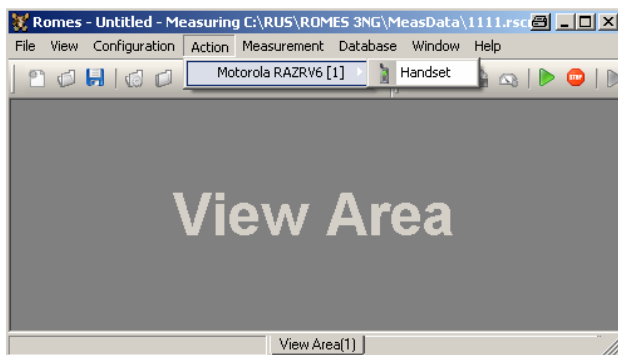
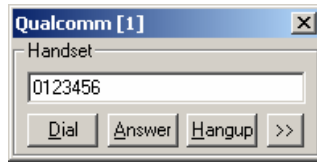


Fig. 6-52 Action menu for different driver types

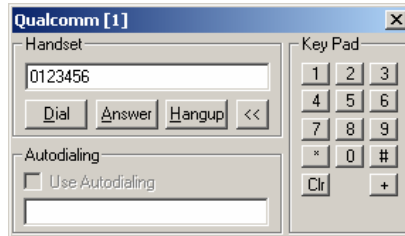
Handset UMTS

Activates the entry of a number to dial, set up and terminate a call .

The *Handset* command opens the following dialog box:



The >> button enlarges the dialog box, giving access to the Key pad and the *Autodialing* option:



Dialed number The number to be dialed can be entered either via the keyboard and the input field or by clicking the on-screen keypad.

 Closes the window without any further action.

Dial Starts dialing the number entered before.

Answer Instructs the phone to accept the call.

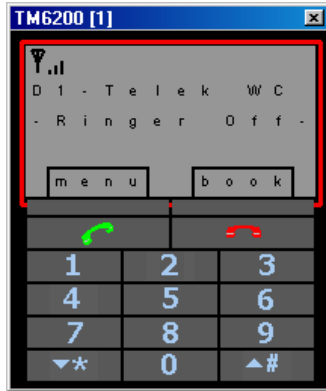
Hangup Drops the line.

Autodialing If the box is checked, the phone number entered below is called periodically, the Dial, Answer, and Hangup buttons are disabled (grayed). The autodialing mode (see p. 6.48) can be set even during the measurement, but only in Idle mode.

Show/Hide Mobile Display UMTS

Shows or hides a view of the test mobile.

With the view it is possible to observe the display, dial numbers and browse the menu from the controller while a measurement is performed (for Qualcomm mobiles only).



Motorola – Configuration

The *Motorola Settings* tab defines the PIN number and allows UMTS system and sector lock related settings.

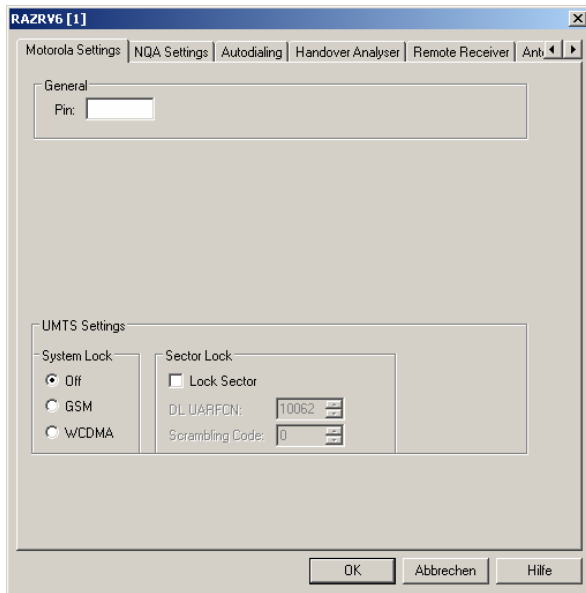


Fig. 6-53 UMTS driver configuration – Configuration

General

The PIN number for identification after switching on the test mobile can be entered in the *Motorola Settings* panel of the configuration dialog. If nothing is entered, the SIM must be entered manually at the mobile each time it is started.

UMTS Settings – System Lock

Locks a particular technology for the mobile:

- Off* The mobile can access GSM and UMTS cells.
- GSM* GSM cells enforced, only GSM cells allowed.
- UMTS* UMTS cells enforced, only UMTS cells allowed.

UMTS Settings – Sector Lock – *Sector Lock* forces the test mobile to use a specified UTRAN cell. If *Lock Sector* is selected, the *DL channel number* and *Primary Scrambling Code* of the enforced (locked) cell can be entered below.

Motorola – NQA Settings

The *NQA Settings* tab provides the parameters for *Network Quality Analysis*. NQA is a prerequisite for drawing up a call statistics where the calls are classified and the classes are visualized separately (see *2G/3G NQA View* in chapter 4).

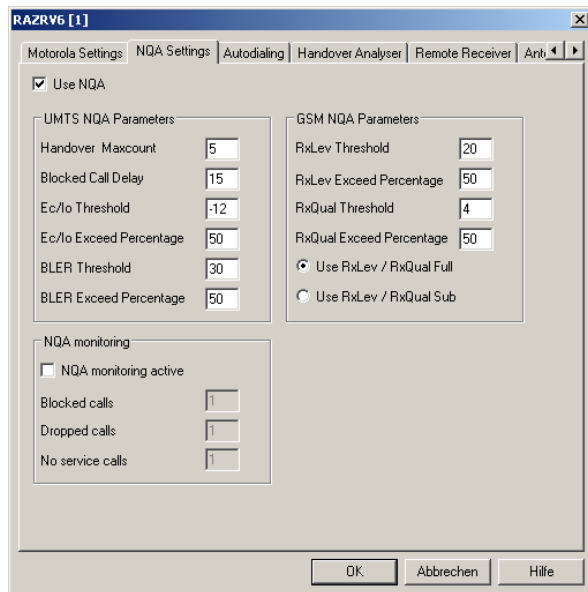


Fig. 6-54 Driver Configuration – NQA Settings tab

The parameters in the *GSM NQA Parameters* and *NQA Monitoring* sections are identical to the NQA parameters for GSM; see section *Driver Configuration – NQA* on p. 6.52 ff.

Use NQA If checked, the box activates the network quality analysis (default).

UMTS NQA Parameters

The following numeric parameters configure the UMTS NQA by defining conditions and limits for the different call classes (we quote the ranges for all parameters; default values are underscored)

- Handover Maxcount* Maximum number of handover procedures during a call in the range 1 to 5 to 100. If the defined value is exceeded, the call will be classified as EXCESSIVE HO.
- Blocked Call Delay* Maximum delay (in seconds) between CM_SERV_REQ and ASSIGNMENT_COMMAND in the range 1 (s) to 15 (s) to 63 (s). If the defined delay is exceeded, the call will be classified as DELAYED CALL.
- Ec/Io Threshold* Minimum signal to noise ratio in dB and in the range –20 (dB) to –12 (dB) to 0 (dB). Ec/Io values which fall below this threshold contribute to NOISY.

- Ec/Io Exceed Perc.** Minimum ratio (in percent) of reported RxLev values falling below the RxLev Threshold in the range 0 (%) to 50 (%) to 100 (%). If the actual ratio falls below the specified percentage the call is classified as NOISY.
- BLER Threshold** Maximum Block Error Rate in percent in the range 0 (%) to 30 (%) to 100 (%). BLER values above this threshold contribute to NOISY.
- BLER Exceed Perc.** Minimum ratio (in percent) of reported BLER values exceeding the BLER Threshold in the range 0 (%) to 50 (%) to 100 (%). If the actual ratio exceeds the specified percentage the call is classified as NOISY.

**GSM
NQA Parameters**

Configures the GSM NQA, see [NQA](#) on p. 6.52 ff.

NQA Monitoring

Activates NQA monitoring and displays the number of *Blocked Calls*, *Dropped Calls*, and *No Service Calls*, see [NQA](#) on p. 6.52 ff.

Motorola – Autodialing

The *Autodialing* tab configures the mode where a definite phone number is dialed periodically, and a call is set up to the mobile phone. This mode is relevant for the network quality analysis described on page 6.52. All settings are analogous to the call modes and types described for [Qualcomm / Nokia – Autodialing](#) on p. 6.86 ff.

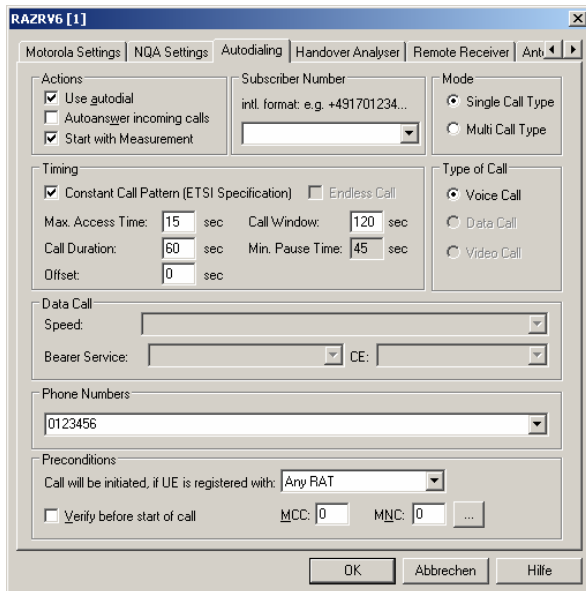


Fig. 6-55 Driver Configuration – Autodialing tab

Motorola – Handover Analyzer

The *Handover Analyzer* tab enables or disables the handover analyzer (option ROMES-U1) and sets the timeout for the HO analysis. The HO analysis and the meaning of the timeout is described in chapter 4, section *UMTS/GSM Handover Analyzer View*.

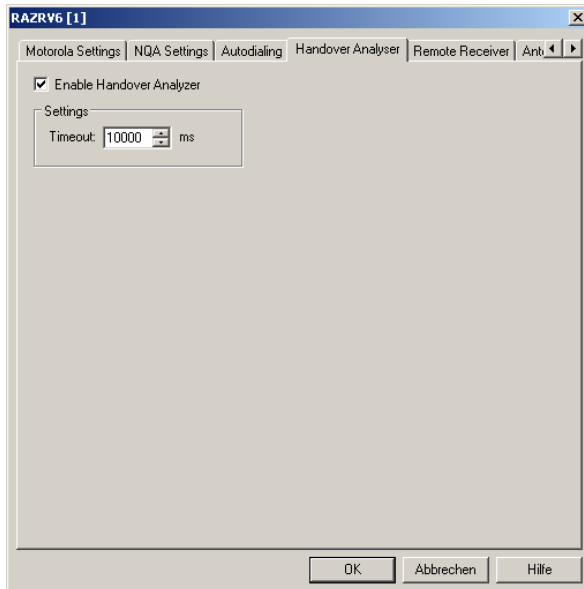


Fig. 6-56 Driver Configuration – Handover Analyzer tab

Motorola – Remote Receiver

The *Remote Receiver* tab configures the tracking mode where a the mobile phone controls a CW test receiver and sets its receive frequency. All settings and the *Connect Receiver...*, *Disconnect Receiver...*, and *Job Management...* buttons are analogous to the GSM driver configuration settings for remote receivers described on p. 6.44 ff.

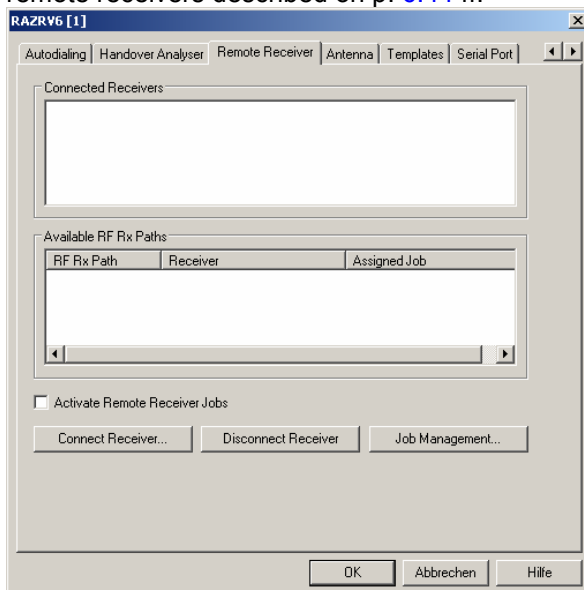


Fig. 6-57 Driver Configuration – Remote Receiver tab

Motorola – Speech Quality Analyser

The *Speech Quality Analyser* tab enables and configures the Speech Quality Analysis (SQA, with option ROMES-Z8, *Voice Quality PESQ*). SQA results can be displayed in the *SQA Message* view (see chapter 4). All settings are analogous to the GSM driver settings described on p. 6.60 ff.

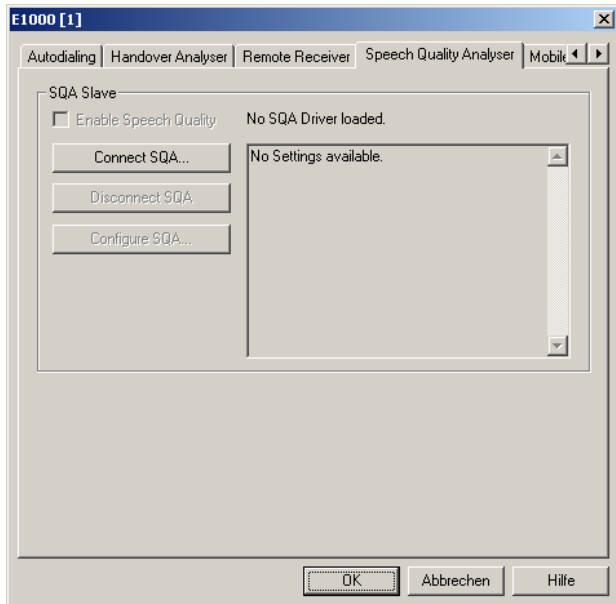


Fig. 6-58 Driver Configuration – Speech Quality Analyser tab

Motorola – Antenna

The *Antenna* tab defines *Antenna Name*, *Antenna Gain* and *Cable Loss*. These values have no impact on the measurement but are stored in the measurement file header so they can be taken into account for the calculation of correction factors.

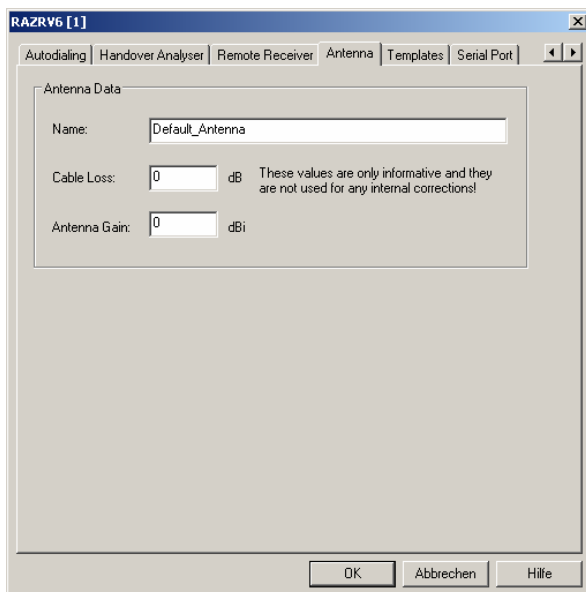


Fig. 6-59 Driver Configuration – Antenna tab

Motorola – Templates

The *Templates* tab stores the current driver configuration as a template, lists, loads or deletes driver templates. All settings and buttons are analogous to the GSM driver settings described on p. 6.59 ff.

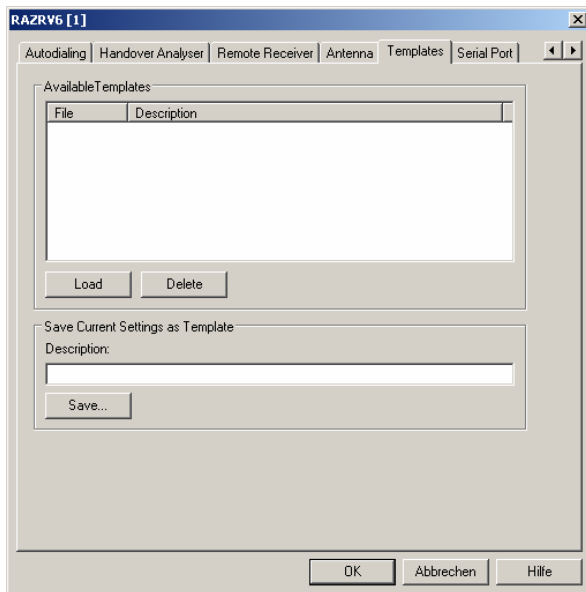


Fig. 6-60 Driver Configuration – Templates tab

Motorola – Serial Port Driver Info

The *Serial Port Driver Info* tab displays the custom name of the device, information on the file version of the UMTS driver, the serial port assigned to it and the transfer parameters.

The *Custom Name* is used to assign a name to a mobile, e.g. to make a quick association of a test mobile to its designated test network provider. An example is provided in section [Configuration of Installed Drivers](#) on p. 6.21.

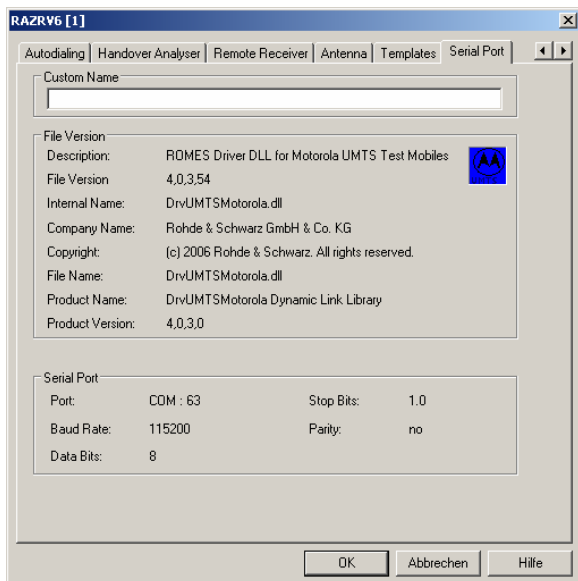


Fig. 6-61 Driver Configuration – Serial Port Driver Info tab

CDMA2000 and 1xEV-DO Mobile Drivers

The selection of CDMA2000/1xEV-DO-capable test devices is performed separately from the IS-95 CDMA hardware selection. This is shown in the *Hardware Configuration - Load Drivers* screenshot below, where the *CDMA/QCP* menu item loads the IS-95 related driver (see section [CDMA IS-95 Mobile Drivers](#) on p. 6.107), and the *cdma2000/Qualcomm* menu item loads the CDMA2000/1xEV-DO related driver.

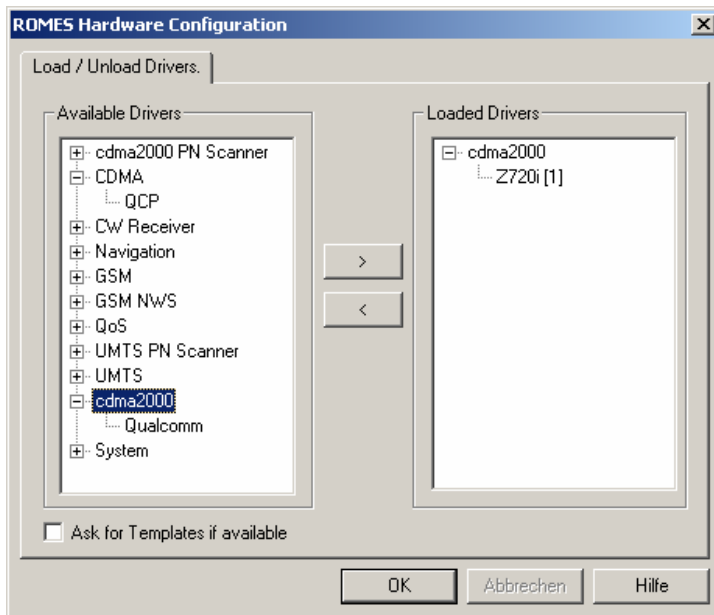


Fig. 6-62 Hardware Configuration – Load/Unload Drivers tab

The measurement system provides CDMA2000 and 1xEV-DO mobile drivers for the following test mobiles:

- Devices based on the Qualcomm MSM6500 chipset, e.g. the Qualcomm TM6500 test mobile (dual mode GSM 850 / 900 / 1800 / 1900 MHz, CDMA2000 Cell 850 / JCDMA 800 / KPCS 1700 / PCS 1900 MHz + GPRS),
- Devices based on the Qualcomm 5100 and 6025 chipset, e.g. the Pantech Zapp Z720i test mobile (GSM 450 MHz, CDMA2000 450, 1xEV-DO), the Huawei ETS310 (GSM 450 MHz, CDMA2000 450), or the Zapp EVDO Modem Z010 (GSM 450 MHz, CDMA2000 450, 1xEV-DO),
- Devices based on the Qualcomm 60xx chipsets, e.g. the Samsung SCH-A-940 / SCH-A-890 (GSM 800 / 1900 MHz, CDMA2000 850/1900, 1xEV-DO) or the Huawei ETS318 (GSM 800 MHz, CDMA2000 450),
- Hyundai test mobile Zapp H-150 (CDMA2000 450)

The CDMA2000/Qualcomm driver is installed by selecting *cdma2000* in the *Hardware Drivers* window (see [Fig. 6-62](#) on page 6.98). It is possible to load up to four CDMA mobile drivers at the same time.

Caution:

The Samsung mobiles rely on the USB interface for their power supply. A supply current of approx. 0.5 A is required. Check the specification of your USB interface, especially when connecting several Samsung mobiles or other power-consuming devices in parallel. If necessary, use a self-powered USB hub.

The configuration menus and additional settings are explained below.

The CDMA2000/1xEV-DO test mobiles can be used to acquire data for most of the CDMA and 1xEV-DO views described in chapter 4.

Analogous to GSM, the CDMA2000 / 1xEV-DO test mobiles and drivers are now grouped into the R&S support classes 1 and 2. The mobiles of R&S support class 1 are continuously tested with new ROMES versions and service packs, they are permanently available to our testing staff. The mobiles of R&S support class 2 are not always available for testing, but they have been tested successfully at least once with the current ROMES software release. The introduction of the R&S support classes is necessary due to the sheer number of supported mobiles. The mobile types with R&S support class 1 are listed with normal title typeface in the table below, the mobiles with R&S support class 2 are marked with *italic* title typeface.

Table 6-10 Properties of CDMA2000 / 1xEV-DO test mobiles

Chipset: MSM6500	Chipset: 5100 and 6025	Chipset: 60xx	Chipset: xxxx
Qualcomm TM6500 GSM 850 / 900 / 1800 / 1900 MHz, CDMA2000 Cell 850 / JCDMA 800 / KPCS 1700 / PCS 1900 MHz + GPRS	Pantech Zapp Z720i GSM 450 MHz, CDMA2000 450, 1xEV-DO Huawei ETS310 GSM 450 MHz, CDMA2000 450 Zapp EVDO Modem Z010 GSM 450 MHz, CDMA2000 450, 1xEV-DO	Huawei ETS318 GSM 800 MHz, CDMA2000 450 Samsung SCH-A-940/ SCH-A-890 GSM 800 / 1900 MHz, CDMA2000 850/1900, 1xEV-DO	Hyundai Zapp H-150 CDMA2000 450

Configuration Menu CDMA2000/1xEV-DO

The *Qualcomm* driver configuration menu contains various tabs to select the measurement and message types evaluated by the test system (*Configuration, Expert Mode*), to configure the network quality analysis (*NQA*) and the autodialing and autoanswer call mode (*Autodialing*), to define the characteristics of the antenna used (*Antenna*), and to display information on the driver and the serial port assigned (*Serial Port Driver Info*). It can be opened by clicking the *Driver* command line of the *Configuration* menu which is available as soon as a mobile driver is loaded (see Fig. 6-4) or via the *Driver* tab in the *Configuration of Software Modules* menu opened via the *Configuration – Settings* command.

Configuration CDMA2000/1xEV-DO

The *Configuration* tab defines the PIN number and allows a rough pre-selection of the evaluated message type. The message type selection can be refined in the *Expert Mode* tab (see p. 6.101 ff.).

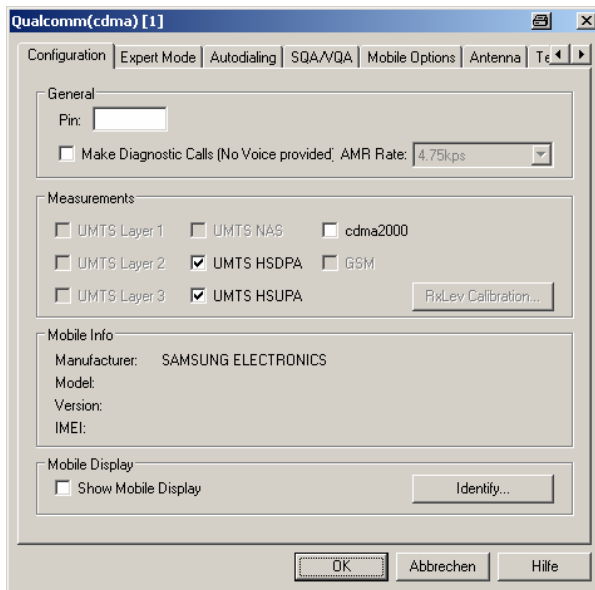


Fig. 6-63 CDMA2000 / 1x EV-DO driver configuration – configuration

General

The PIN number for identification after switching on the test mobile can be entered in the *General* panel of the configuration dialog. If nothing is entered, the SIM must be entered manually at the mobile each time it is started.

If *Make Diagnostic Calls...* is selected, the mobile will set up connections (no voice calls) at a fixed data rate. This option is particularly suitable for connections with test devices that are not equipped with an audio circuit.

If several Qualcomm mobiles are connected to a Windows based test system; see the paragraph on [Connecting several Qualcomm mobiles](#) on p. 6.7.

Measurements

The available CDMA2000 checkbox in the *Measurements* is used to enable CDMA2000 messages and information types to be recorded and written to the measurement (*.rscmd) file. The selection can be refined in the *Expert Mode* tab. For an overview of available messages, views and signals see [Table 6-6](#) above.

All other options are automatically greyed out, unless the mobile is actually capable to support one of the listed technologies.

Please note that the *RXLev Calibration...* button is permanently greyed out, because the calibration is only useful in a GSM context.

Mobile Display

Show Mobile Display opens a view of the test mobile so that it is possible to observe the display, dial numbers and browse the menu from the controller while a measurement is performed. This function is also provided in the *Action* menu; see section [Action Menu](#) on p. 6.90 ff.

The *Identify...* button is useful when several test mobiles are connected. Clicking the button causes the currently active test mobile to identify itself by showing its IMEI on the mobile display, and the following message box pops up:



After confirmation with OK the IMEI on the mobile display disappears.

Expert Mode CDMA2000/1xEV-DO

The *Expert Mode* tab selects the message types to be recorded to the measurement file. A *Layer 1 cdma2000* message type can be selected only if the driver has been configured to do *cdma2000* measurements; see description of the *Configuration* tab above.

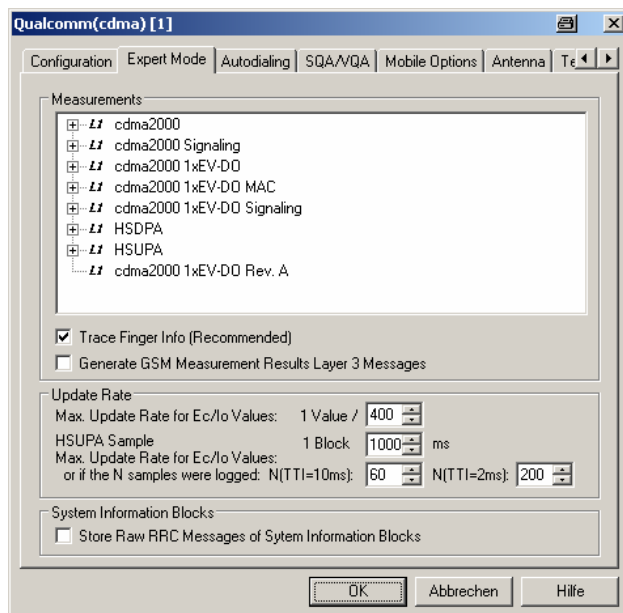


Fig. 6-64 CDMA2000 / 1x EV-DO driver configuration – Expert Mode

For an explanation of the recorded parameters refer to the description of the CDMA200 and 1xEV-DO views in chapter 4.

Trace Finger Info The CDMA finger info is necessary for the *CDMAFinger View*. It must be selected as well to obtain the *Finger Info* signals.

Generate GSM Layer 3 Messages The checkbox has no effect in a CDMA2000/1xEV-DO context.

Update Rate

Max. Update Rate for Ec/Io Values
Sets the maximum update rate for Ec/Io values. A lower update rate decreases the size of the measurement file.

HSUPA Sample
Sets the *Max. Update Rate for Ec/Io Values* for HSUPA samples. Additional option fields are provided for the case when N samples are logged for a TTI of 10 ms or 20 ms.

System Information Blocks Radio Resource Control (RRC) messages are broadcast in system information blocks of various types (see standard 3GPP TS 25.331). If the box *Store Raw RRC Messages...* is checked, the complete information transmitted in the RRC signaling messages is stored to the measurement file.

If only the system information blocks are needed, the default configuration (box unchecked) is sufficient. This will reduce the size of the measurement file.

Autodialing CDMA2000/1xEV-DO

The *Autodialing* tab configures the mode where a definite phone number is dialed periodically, and a call is set up to the mobile phone. This mode is relevant for the network quality analysis described on page 6.52. All settings (except for SID and NID in the *Home Network* group as described below) are analogous to the GSM driver settings described on p. 6.48 ff.

The driver settings for the CDMA2000/1xEV-DO devices are identical. If a 2nd virtual COM port is needed to be operated in *autodial* mode; see the paragraph on *Loading the drivers* on p. 6.6.

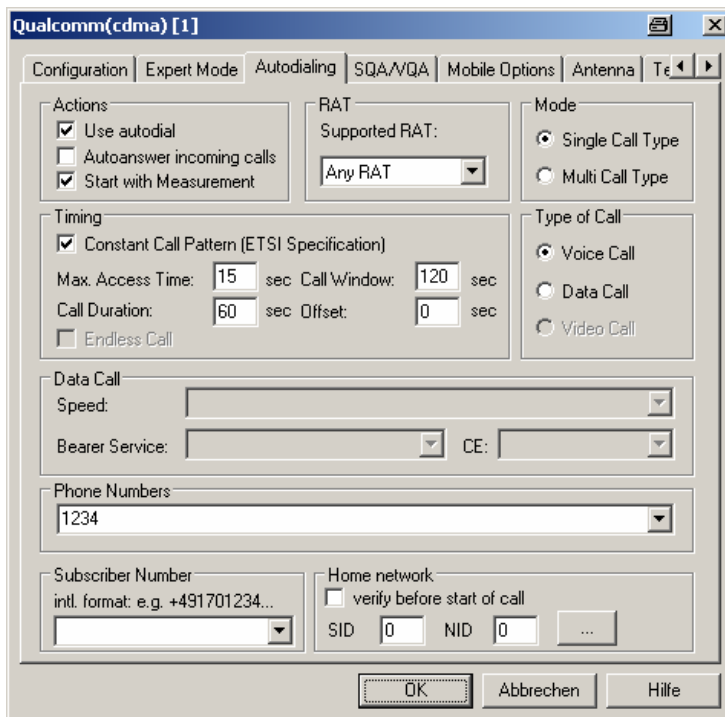


Fig. 6-65 Driver Configuration – Autodialing tab

Home network The home network identified by the system identification code (SID, range 0 to 32767) and the network identification code (NID, range 0 to 65535).

If *verify before start of call* is checked, the mobile will be out of service if a call is attempted from a foreign network (e.g. during a measurement tour near the border of a network where roaming is possible). This ensures that calls from foreign networks will not impair the network quality analysis; see next section.

By default, the *verify before start of call* function is not active.

SQA/VQA Settings CDMA2000/1xEV-DO

The *Speech Quality Analyzer* tab enables and configures the Speech Quality and Video Quality Analysis (SQA/VQA, with option ROMES-Z8, *Voice Quality PESQ*). SQA results can be displayed in the *SQA Message* view (see chapter 4). VQA results can be obtained as described in section [Speech / Video Quality Tester Driver \(SQA/VQA\)](#) on p. 6.207. All settings are analogous to the GSM driver settings described on p. 6.60 ff.

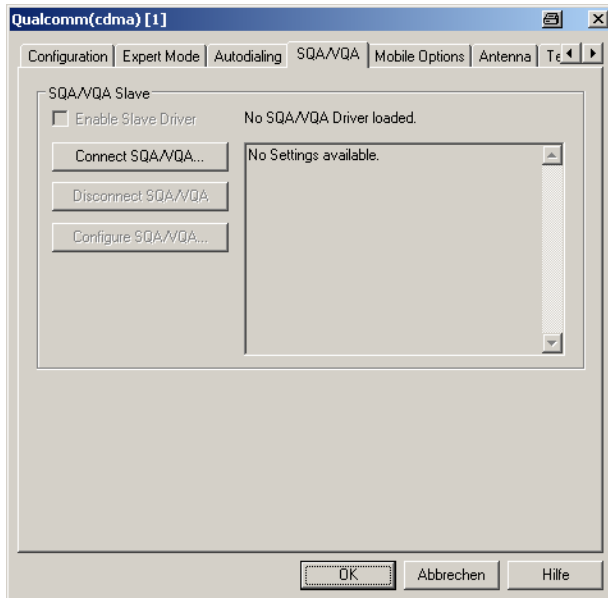


Fig. 6-66 Driver Configuration – SQA/VQA tab

Antenna CDMA2000/1xEV-DO

The *Antenna* tab defines *Antenna Name*, *Antenna Gain* and *Cable Loss*. These values have no impact on the measurement but are stored in the measurement file header so they can be taken into account for the calculation of correction factors.

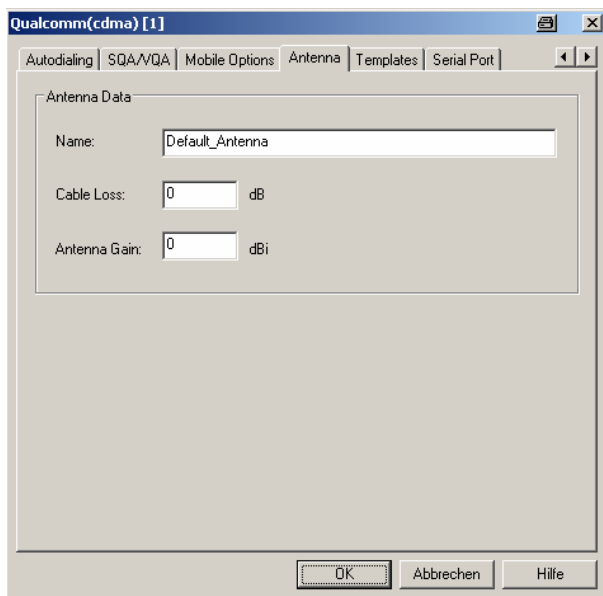


Fig. 6-67 Driver Configuration – Antenna tab

Templates CDMA2000/1xEV-DO

The *Templates* tab stores the current driver configuration as a template, lists, loads or deletes driver templates. All settings and buttons are analogous to the GSM driver settings described on p. 6.59 ff.

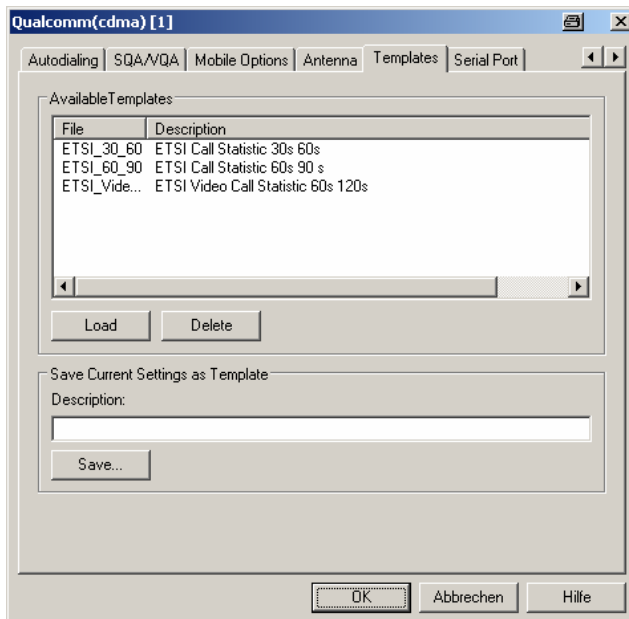


Fig. 6-68 Driver Configuration – Templates tab

Serial Port Driver Info CDMA2000/1xEV-DO

The *Serial Port Driver Info* tab displays the custom name of the device, information on the file version of the UMTS driver, the serial port assigned to it and the transfer parameters.

The *Custom Name* is used to assign a name to a mobile, e.g. to make a quick association of a test mobile to its designated test network provider. An example is provided in section [Configuration of Installed Drivers](#) on p. 6.21.

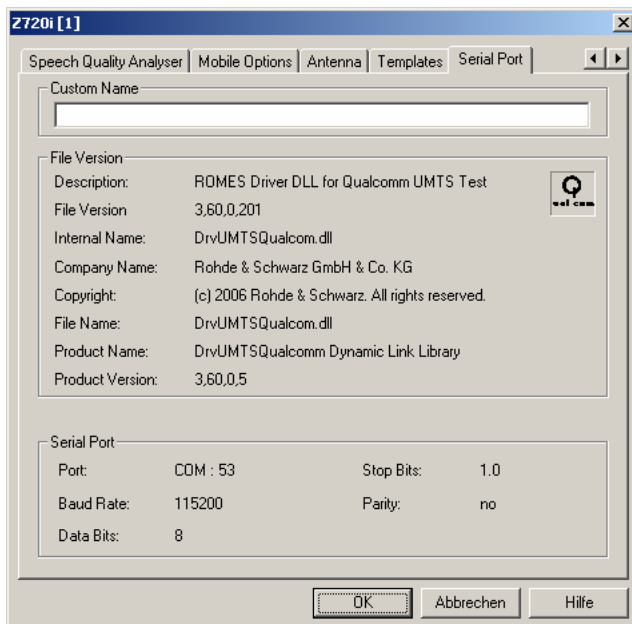


Fig. 6-69 Driver Configuration – Serial Port Driver Info tab

Action Menu CDMA2000/1xEV-DO

The *Action* menu opens popup boxes used to set up a call or show the contents of the mobile display. It is added to the menu bar as soon as a mobile driver has been successfully installed (see section [Driver Installation](#) on page 6.1 ff). If several mobiles are connected, separate command lines are displayed for each of them.

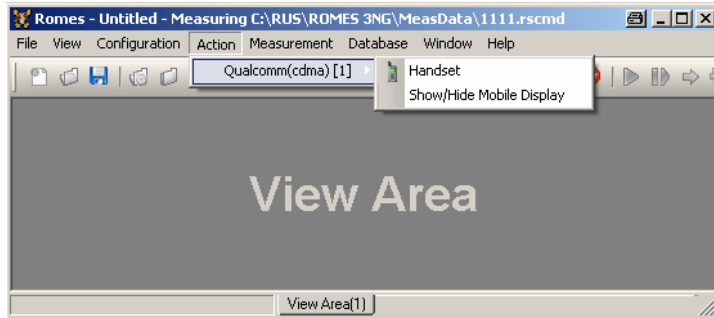
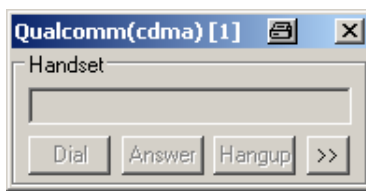


Fig. 6-70 Action menu for different driver types

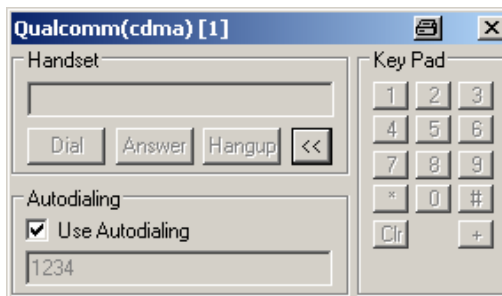
Handset CDMA2000 / 1xEVDO

Activates the entry of a number to dial, set up and terminate a call .

The *Handset* command opens the following dialog box:



The >> button enlarges the dialog box, giving access to the Key pad and the *Autodialing* option:



Dialed number The number to be dialed can be entered either via the keyboard and the input field or by clicking the on-screen keypad.

 Closes the window without any further action.

Dial Starts dialing the number entered before.

Answer Instructs the phone to accept the call.

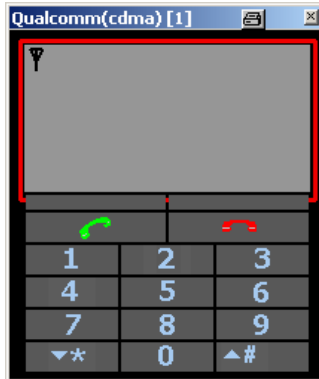
Hangup Drops the line.

Autodialing If the box is checked, the phone number entered below is called periodically, the Dial, Answer, and Hangup buttons are disabled (grayed). The autodialing mode (see p. 6.48) can be set even during the measurement, but only in Idle mode.

**Show/Hide
Mobile Display
CDMA2000 /
1xEV-DO**

Shows or hides a view of the test mobile.

With the view it is possible to observe the display, dial numbers and browse the menu from the controller while a measurement is performed (for Qualcomm mobiles only).



CDMA IS-95 Mobile Drivers

The CDMA (IS-95) mobile driver provided with the measurement system supports the following devices manufactured by Qualcomm Inc.:

Table 6-11 Supported CDMA mobile phones

Type	Description	According to Standard
pdQtm 800	CDMA digital and analog cellular phone	IS-95-A
pdQtm 1900	CDMA digital PCS phone	J-STD-008
Qtm 800	CDMA digital and analog cellular phone	IS-95-A
Qtm1900	CDMA digital PCS phone	J-STD-008
QCM 800	CDMA digital and analog cellular phone	IS-95-A
QCM1900	CDMA digital PCS phone	J-STD-008
QCP 800	CDMA digital and analog cellular phone	IS-95-A
QCP 820	CDMA digital and analog cellular phone	IS-95-A
QCP 860	CDMA digital and analog cellular phone	IS-95-A
QCP 1900	CDMA digital PCS phone	J-STD-008
QCPtm 1920	CDMA digital PCS phone	J-STD-008
QCP 2700	CDMA digital PCS and analog cellular phone	J-STD-008
QCPtm 2760	CDMA digital PCS and analog cellular phone	J-STD-008
QCP 3035 ^{a)}	CDMA digital PCS, digital cellular and analog cellular phone (trimode)	J-STD-008 and IS-95-A
QCT 1000	CDMA digital cellular phone	IS-95-A
QCTtm 1200	CDMA digital PCS phone	J-STD-008
QCT 6000	CDMA digital cellular phone	IS-95-A
QCTtm 6200	CDMA digital PCS phone	J-STD-008
QCTtm 7000	CDMA digital cellular phone	IS-95-A
QCTtm 7200	CDMA digital PCS phone	J-STD-008

The CDMA driver is installed by selecting *CDMA* in the *Hardware Drivers* window (see [Fig. 6-1](#) on page 6.1). It is possible to load up to four CDMA mobile drivers at the same time. The configuration menus and additional settings are explained below.

Note:

The CDMA Test Mobile Kyocera QCP3035A-B is allowed only for use outside Europe. It is not allowed to put this mobile into operation inside Europe.

Configuration Menu CDMA IS-95

The *QCP Configuration* menu contains three tabs configuring the measurement (*Define Measurement*), the *Autodialing* mode, and the RF parameters of the connected *Antenna*.

The *QCP Configuration* menu is opened by clicking the *Driver* command line in the *Configuration* menu which is available as soon as a receiver driver is loaded. Besides, it is opened automatically whenever a driver for a mobile which does not conform to the default configuration settings is loaded, i.e. on confirming the driver selection and port assignment made in the *Hardware Drivers* menu (see [Fig. 6-1](#) on page 6.1).

Define Measurement CDMA IS-95

The *Define Measurement* tab sets measurement control parameters and selects the measurements that are performed and the kind of data and messages that are recorded during the measurement. All options can be selected concurrently, however, it is advisable to make a selection to improve system performance.

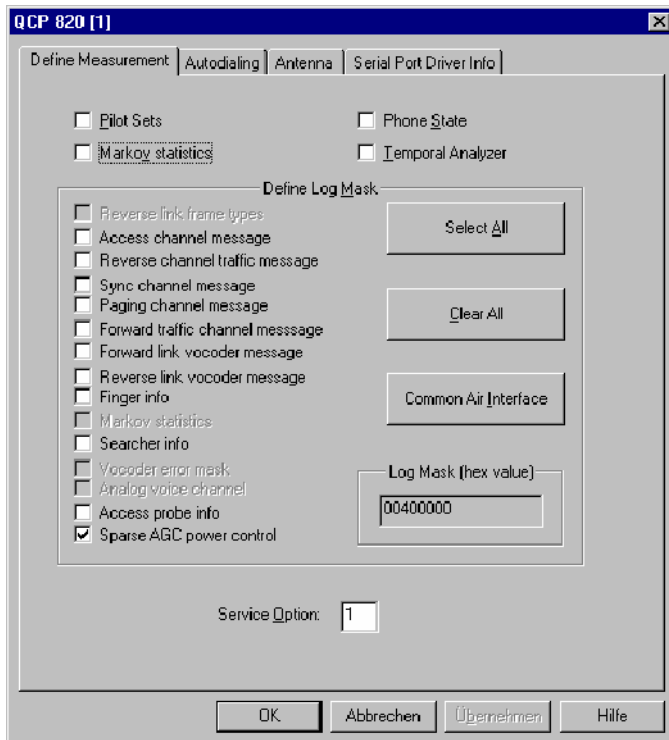


Fig. 6-71 CDMA driver configuration – Define Measurement

Setting	Meaning	Necessary for View Type, Remarks
Pilot Sets	Enables monitoring of active pilot and neighbor cell channel strengths	CDMA Pilot View; the Pilot Sets Measurement mode may impair the system performance, especially if you select an extended range of measurements in the Log Mask (see below).
Phone State		It is always recommended to select <i>Phone State Measurement</i> (no performance problem).
Markov statistics	Perform a statistical evaluation of the call	CDMA Markov Statistic View. To enable the measurement, an appropriate service option must be set in addition.
Temporal Analyzer	Acquire data determining the vocoder rate, frame error rate, RX power, TX power	CDMA Frame Error Rate View CDMA Vocoder Rate View With Temporal Analyzer, the following signals are generated: Bad frames received Total frames received Forward vocoder rate Reverse vocoder rate AGC power value (RX power) TX power
Define Log Mask		
In the Log Mask panel, a variety of measurements can be selected from a list. All selected measurements are performed. The buttons on the right side of the list make the selection more convenient:		
Reverse link frame types	Not used	–
Access channel message	CAI message	CDMA CAI View (at least one CAI message switched on)

Reverse channel traffic message	CAI message	CDMA CAI View (at least one CAI message switched on)
Sync channel message	CAI message	CDMA CAI View (at least one CAI message switched on)
Paging channel message	CAI message	CDMA CAI View (at least one CAI message switched on)
Forward traffic channel message	CAI message	CDMA CAI View (at least one CAI message switched on)
Forward link vocoder message	Not used	–
Reverse link vocoder message	Not used	–
Finger info	Record info from the mobile's RAKE receiver	CDMA Finger view
Markov statistics	Perform a statistical evaluation of the call	CDMA Markov Statistic View. To enable the measurement, an appropriate service option must be set in addition.
Searcher info	Record the multipath components	CDMA Searcher View
Vocoder error mask	Not used	–
Analog voice channel	Not used	–
Access probe info	Record estimated TX power (open loop power control)	CDMA Power View (Access probe: Estimated TX power)
Sparse AGC power control	Record RX and TX power, power control info and TX power limit (closed loop power control)	CDMA Power View
Select All	Activate all measurements	All views. To avoid performance problems, it is recommended to limit the selection to the measurements really needed.
Clear All	Deselect all measurements	All views are empty.
Common Air Interface	Clear the log mask and select the CAI type messages	CDMA CAI View. Further log mask options can be added after the <i>Common Air Interface</i> button has been pressed.
Log Mask (hex value)	Number encoding the selected log mask options, to be transmitted to the CDMA mobile station	Control field only, cannot be edited
Service Option	Set service option	<p>Service option 1: Voice (IS-96) for all measurements except Markov statistics</p> <p>Service option 3: Markov Statistic View</p> <p>Service option 7: Rate Set 2 Markov (new 13k)</p> <p>Service option 8: Rate Set 1 Markov (new 8k)</p> <p>Service option 10: Markov (old 13k)</p> <hr/> <p>Note: <i>The CDMA Test Mobile Kyocera QCP3035A-B requires a service option 2 or 3. With other service options, especially the default option 1, autodial is not possible.</i></p> <hr/>

Autodialing CDMA IS-95

In the autodial mode, a phone number is dialed periodically and a call is set up to the mobile phone (see also section *GSM Mobile Drivers*).

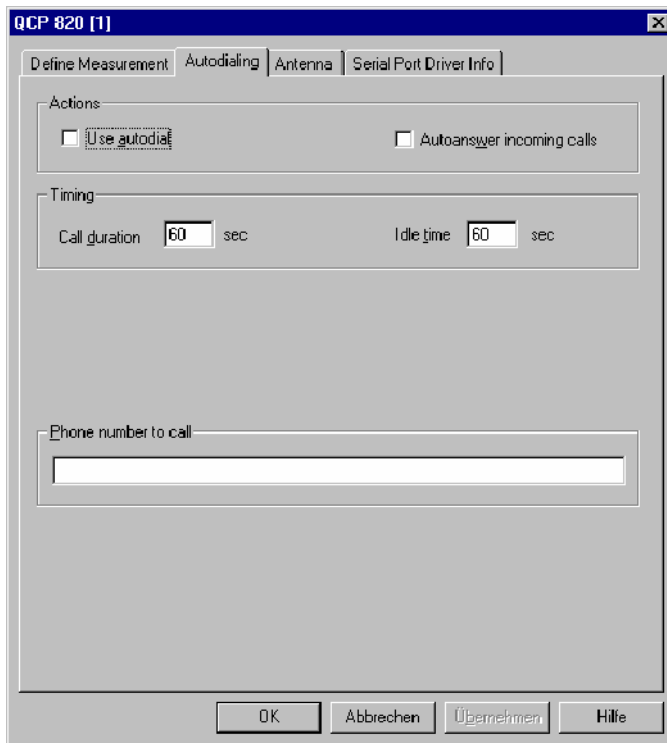


Fig. 6-72 CDMA driver configuration – Autodialing

Use autodial	If checked, the box activates the autodial mode. By default, the autodial mode is not active.				
Autoanswer incoming calls	If checked, the box activates the autoanswer mode where after a certain number of rings, the call will be automatically accepted by the mobile phone. By default, the autoanswer mode is not active.				
Timing	Defines the periodicity of the autodial process.				
<table border="0" style="width: 100%;"> <tr> <td style="padding-left: 20px;">Call duration</td> <td>Time between start of a call and hang up in the range between 15 s (default) and 86400 s. For some mobiles it may be necessary to set the Call duration time higher than 15 s to get a Good Call, e.g. to 25 s. Therefore check the call statistics in the CDMA NQA View before starting the measurement tour.</td> </tr> <tr> <td style="padding-left: 20px;">Idle time</td> <td>Time between hang up and dialing for the next call in the range between 15 s (default) and 86400 s.</td> </tr> </table>	Call duration	Time between start of a call and hang up in the range between 15 s (default) and 86400 s. For some mobiles it may be necessary to set the Call duration time higher than 15 s to get a Good Call, e.g. to 25 s. Therefore check the call statistics in the CDMA NQA View before starting the measurement tour.	Idle time	Time between hang up and dialing for the next call in the range between 15 s (default) and 86400 s.	
Call duration	Time between start of a call and hang up in the range between 15 s (default) and 86400 s. For some mobiles it may be necessary to set the Call duration time higher than 15 s to get a Good Call, e.g. to 25 s. Therefore check the call statistics in the CDMA NQA View before starting the measurement tour.				
Idle time	Time between hang up and dialing for the next call in the range between 15 s (default) and 86400 s.				
Phone number to call	A phone number can be entered via the keyboard and the input field.				

Antenna CDMA IS-95

The *Antenna* tab sets RF parameters such as the cable loss caused by the test setup, the type and gain of an antenna used. These values have no impact on the measurement but are stored in the measurement file header so they can be taken into account for the calculation of correction factors.

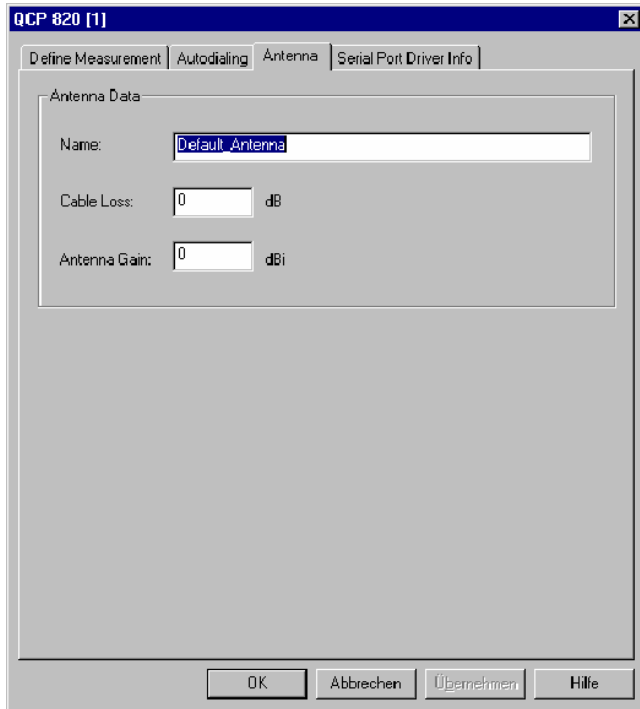


Fig. 6-73 CDMA driver configuration – Antenna

Serial Port Driver Info CDMA IS-95

The *Serial Port Driver Info* tab of the configuration menu displays information about the file version of the current driver, the product name, and the manufacturer. In addition, it shows the serial port assigned to the driver and the transmission parameters.

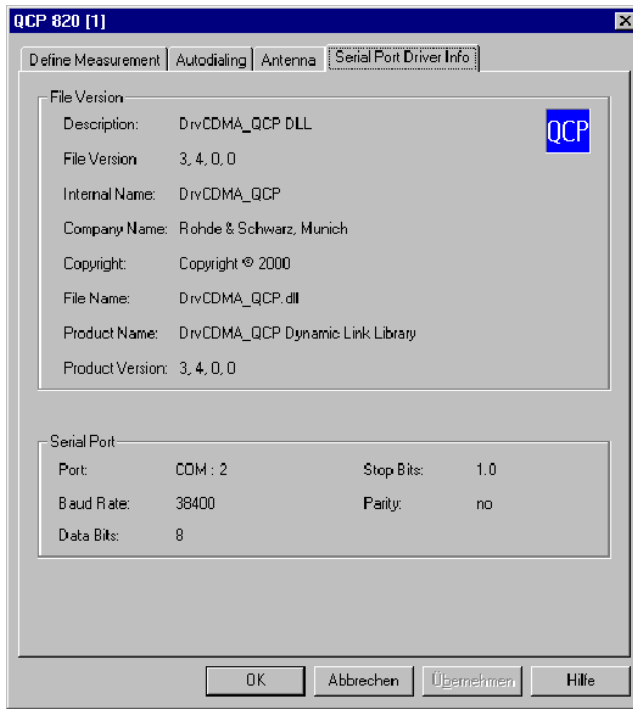


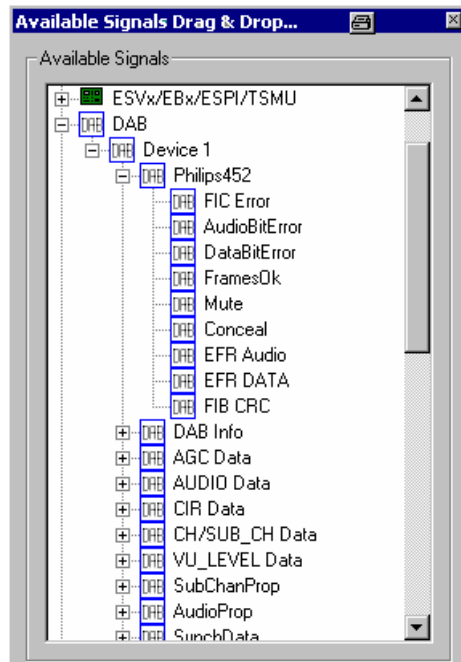
Fig. 6-74 CDMA driver configuration – Serial Port Driver Info

DAB752 Driver

The DAB driver provided with the measurement system supports the Philips752 DAB test receiver. An earlier type, the Philips452 DAB test receiver, is supported by ROMES versions V2.xx, however, measurement data recorded with this receiver can also be replayed and evaluated in ROMES 3.xx. The DAB driver is installed by selecting *DAB* in the *Hardware Drivers* window (see [Fig. 6-1](#) on page 6.1).

Note:

In the data tree, data recorded by the Philips452 receiver appears in a separate data structure. In particular the Philips452 signals are not overwritten by Philips752 DAB test receiver data.



The DAB receiver provides a wealth of data that can be viewed in all *Basic Views* (see chapter 3). The configuration menus and additional settings are explained below.

Configuration Menu Philips752

The configuration menu contains two tabs to configure the measurement (*Philips752 Configuration*) and define the characteristics of the antenna used (*Antenna*).

The *Driver Configuration* menu is opened by clicking the *Driver* command line in the *Configuration* menu which is available as soon as a receiver driver is loaded. Besides, it is opened automatically whenever a driver for a receiver which does not conform to the default configuration settings is loaded, i.e. on confirming the driver selection and port assignment made in the *Hardware Drivers* menu (see [Fig. 6-1](#) on page 6.1).

Configuration Philips752

The *Philips752 Configuration* tab controls the receiver frequency, the sampling rate (*Measurement Period*), and further test receiver parameters.

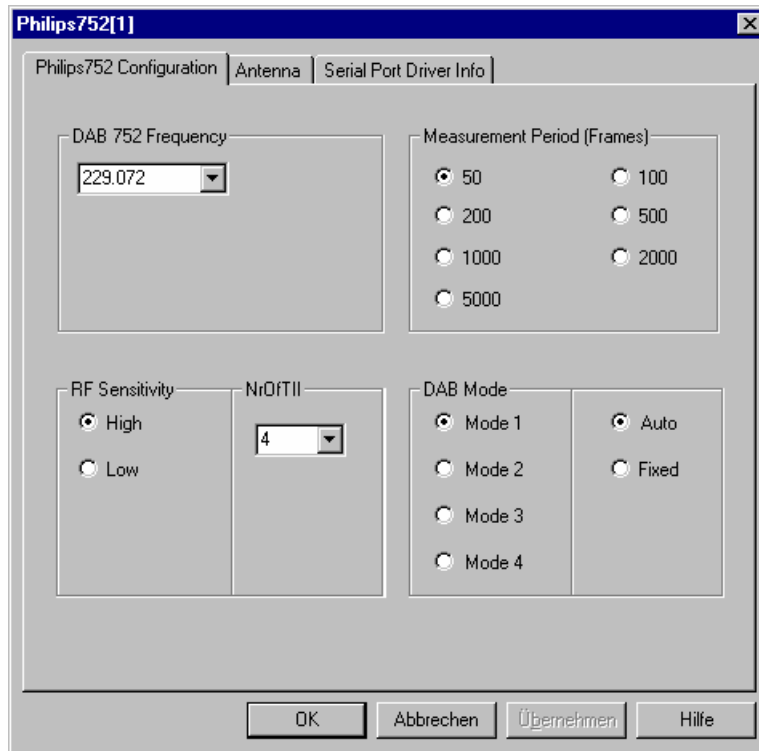


Fig. 6-75 Philips752 driver configuration – Measurement settings

DAB 752 Frequency The *DAB 752 Frequency* panel contains an input field to specify the frequency the receiver is tuned to. The frequency entered determines the ensemble tested; see section [DAB Action Menu](#) on page 6.116.

Measurement Period The *Measurement Period* specifies the number of logical frames that are processed to produce a measurement summary of the monitored DAB signal. The measurement speed is 1.2 s per 50 frames. A longer measurement period reduces the data rate.

RF Sensitivity The *RF Sensitivity* radio buttons switch the receiver between high (min. –95 dBm, typ. –98 dBm) and low sensitivity (typ. –45 dBm). The default setting is *High*. *Low* RF sensitivity is recommended for very strong received signals (e.g. due to a direct connection of the receiver via test cable or a measurement in the vicinity of the BTS). In addition, it avoids detection of weak unwanted signals when the DAB signal disappears.

NrOfTII Number of TII signals generated in the measurement file in the range 1 to 8. The number can be reduced to accelerate the measurement.

DAB Mode One of four *DAB Modes* can be selected (*Fixed* setting). Alternatively, the mode is set by the system according to the test conditions (*Auto* setting).

Antenna Philips752

The *Antenna* tab sets RF parameters such as the cable loss caused by the test setup, the type and gain of an antenna used. These values have no impact on the measurement but are stored in the measurement file header so they can be taken into account for the calculation of correction factors.

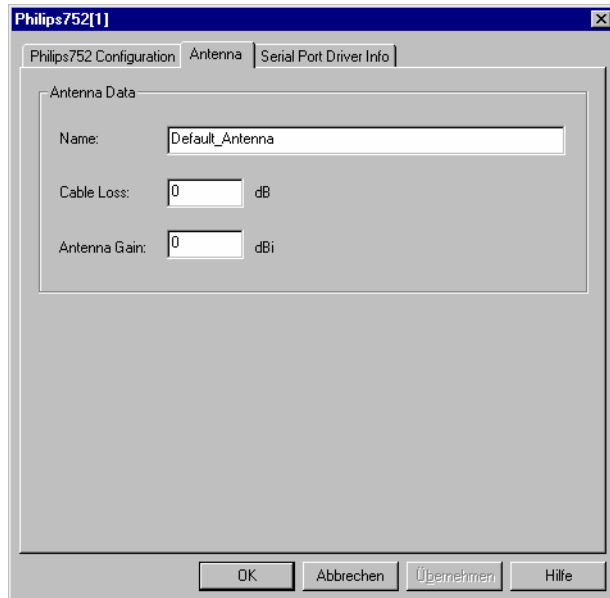


Fig. 6-76 Philips752 driver configuration – Antenna

Serial Port Driver Info Philips752

The *Serial Port Driver Info* tab of the configuration menu displays information about the file version of the current driver, the product name, and the manufacturer. In addition, it shows the serial port assigned to the driver and the transmission parameters.

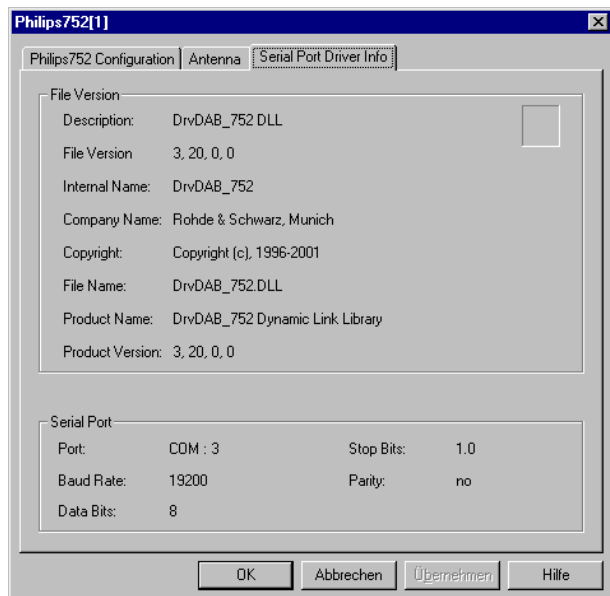


Fig. 6-77 Philips752 driver configuration – Serial Port Driver Info

DAB Action Menu

The *Action* menu opens a popup box used to select the service and displaying information on the DAB connection. It is added to the menu bar as soon as a mobile driver has been successfully installed (see section *Driver Installation* on page 6.1 ff). If several mobiles are connected, a separate command line is displayed for each of them.

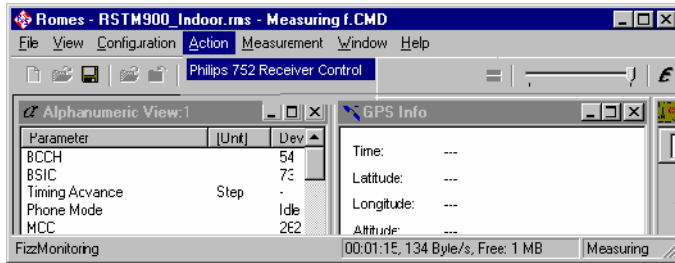
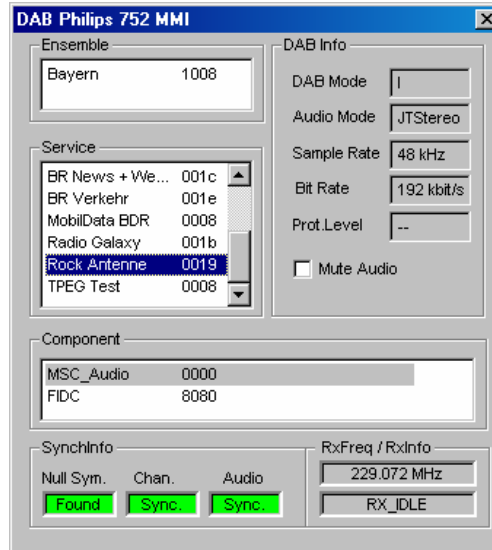


Fig. 6-78 Action menu (DAB driver)

Receiver Control DAB

Selects the service and displays information on the connection.

The *Receiver Control* command opens the *DAB Philips 752 MMI* dialog box:



Ensemble Indicates the DAB ensemble determined by the DAB 752 Frequency selected in the Philips 752 Configuration tab.

Service List to select among several DAB services.

DAB Info Indicates several transmission parameters of the DAB receiver.

Component List to select among several DAB service components (click the arrow buttons).

SynchInfo Indicates the synchronization of different system components. Synchronization is complete when all output fields are green; otherwise, an output field is red and an appropriate message is displayed.

**RXFreq/
RXInfo** Indicates the received carrier frequency (identical with the DAB 752 Frequency selected in the Philips 752 Configuration tab) and the receiver state.

DVB Driver

The DVB (Digital Video Broadcasting) driver provided with the measurement system supports the R&S TSM-DVB diversity test receiver by Rohde & Schwarz. The DVB driver is installed by selecting *DVB...* in the *Hardware Drivers* window (see [Fig. 6-1](#) on page [6.1](#)).

The DVB receivers and analyzers provide a wealth of data that can be viewed in the *DVB View* and in all *Basic Views* (see chapter 3). The configuration menus and additional settings are explained below.

Configuration Menu DVB

The configuration settings vary depending on the analyzer or receiver type.


















Configuration R&S TSM-DVB

The DVB-T diversity test receiver R&S TSM-DVB is controlled by the R&S TSM-DVB driver (option ROMES3DVB). The R&S TSM-DVB is equipped with two independent antenna connectors RF IN 1 and RF IN 2. An RS-232 interface is used for the communication with the controller; see also [Fig. 6-80](#) on p. [6.120](#).

The driver configuration menu is divided into several tabs.



The R&S TSM-DVB data is not displayed in the DVB Constellation View. To analyze R&S TSM-DVB data select the R&S TSM-DVB signals in the data tree (Configuration – Settings – Available Signals) and use the basic views (Alphanumeric View, 2D Chart View...). The following information is available for channel 1 and 2:

 TSM-DVB	RF level
  RF Measurement 1	Modulation Error Rate (MER)
  Meas. Data 1	BER after Reed Solomon error correction
  Signal Status 1	Packet Error Rate (PER, MPEG packets per second)
  TPS Info 1	Various status indicator signals
  RF Measurement 2	Various transport signal (TPS) information signals
  Meas. Data 2	
  Signal Status 2	
  TPS Info 2	

Configuration R&S TSM-DVB

The *Configuration* tab selects the operating mode of the R&S TSM-DVB diversity test receiver and configures both RF channels.

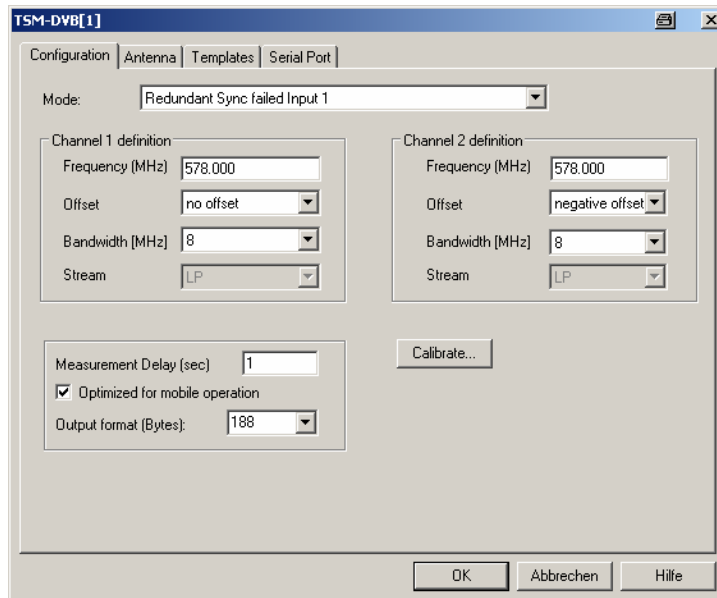


Fig. 6-79 R&S TSM-DVB Configuration

Mode

Selects the operating mode of the diversity test receiver. The R&S TSM-DVB receiver has two antenna inputs (input connectors RF IN 1 and RF IN 2 at the rear panel) for two independent demodulation channels, providing two separate MPEG transport streams (MPEG-TS). The MPEG-TS are converted to ASI format in accordance with the DVB-ASI recommendation and fed to the output connectors ASI 1 and ASI 2. The operating mode controls the switching between the two MPEG-TS.

Diversity

The two demodulator channels have the same frequency, offset and bandwidth. The MPEG-TS are switched internally; no stream priority is defined. The ASI output stream is available at both ASI outputs

Dual input

The two demodulator channels are independent and can be configured with different parameters. Each MPEG-TS has its own ASI output (RF IN 1 –> ASI 1 and RF IN 2 –> ASI 2). This mode can be used for redundant input with external switching.

Hierarchical

The two demodulator channels differ by their stream priority settings. The frequency, offset, and bandwidth settings can be the same or different. Each MPEG-TS has its own ASI output (RF IN 1 –> ASI 1 and RF IN 2 –> ASI 2).

Redundant Manual Switch Input 1/2

The two demodulator channels are independent; internal automatic switching is disabled. The same output stream is available on both ASI outputs.

<i>Redundant Sync failed Input 1/2</i>	The two demodulator channels are independent and switched internally whenever synchronization is lost at input RF IN 1 or RF IN 2. The same output stream is available on both ASI outputs.
<i>Redundant DRS failed Input 1/2</i>	The two demodulator channels are independent and switched internally whenever an uncorrected packet (remaining error Data packet after Reed Solomon, DRS) is detected at input RF IN 1 or RF IN 2. The same output stream is available on both ASI outputs.
Channel 1 / 2 definition	The R&S TSM-DVB provides the same receiver settings for the two input channels 1 and 2. Some parameters might be unavailable, depending on the operating mode.
<i>Frequency</i>	Nominal RF carrier frequency in MHz. The DVB-T signal can be received on VHF frequencies 170 to 230 MHz or UHF frequencies 470 to 862 MHz. The frequency ranges are as follows: 170 MHz to 230 MHz and 470 MHz to 862 MHz
<i>Offset</i>	These frequency offsets are used to minimize interference from adjacent channels. The DVB-T signal may be transmitted with a frequency offset of 0 MHz (<i>no offset</i>), +1/6 MHz or -1/6 MHz for 8 MHz bandwidth (UHF) and with a frequency offset of 0 MHz, +1/8 MHz or -1/8 MHz for 7 MHz bandwidth (VHF) (<i>negative offset or positive offset</i>).
<i>Bandwidth [MHz]</i>	Bandwidth of the DVB-T channel: 6 MHz, 7 MHz or 8 MHz. A 7 MHz bandwidth is used in the VHF band, the 8 MHz bandwidth is used in the UHF band.
<i>Stream</i>	Priority setting for <i>Hierarchical</i> mode: high or low priority.
Measurement Delay	<p><i>Measurement Display (sec)</i> Sets the delay between consecutive measurements.</p> <p><i>Optimized for mobile operation</i> When activated, this activates an optimization for the mobile.</p> <p><i>Output format (Bytes)</i> Defines the output format (in bytes).</p>
Calibrate...	<p>Opens a submenu for an RF input level calibration of the R&S TSM-DVB using an external signal generator R&S SFQ. The signal generator provides an RF input signal for the R&S TSM-DVB that is varied over its entire input power and frequency range. The known input power is used for a correction of the R&S TSM-DVB <i>RF Level</i> reading.</p> <p>The R&S SFQ must be connected to the local PC using the GPIB (IEEE)</p>

bus connector. The entire calibration procedure is controlled automatically via GPIB bus; no additional settings at the R&S SFQ are required. The R&S TSM-DVB also provides a calibration verification procedure that can serve as a quick check whether a new complete calibration is necessary.

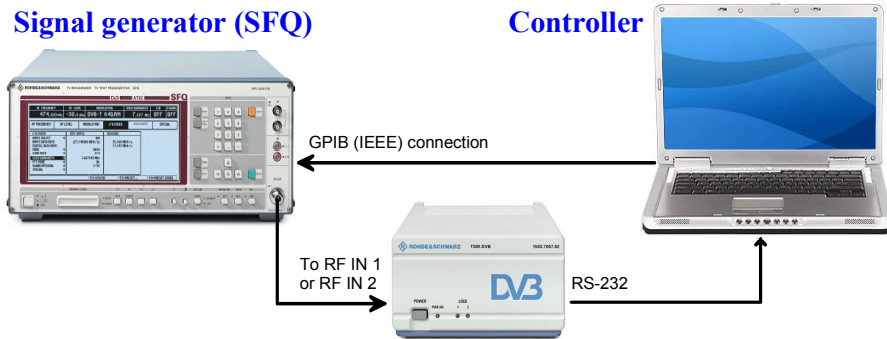


Fig. 6-80 R&S TSM-DVB calibration – test setup

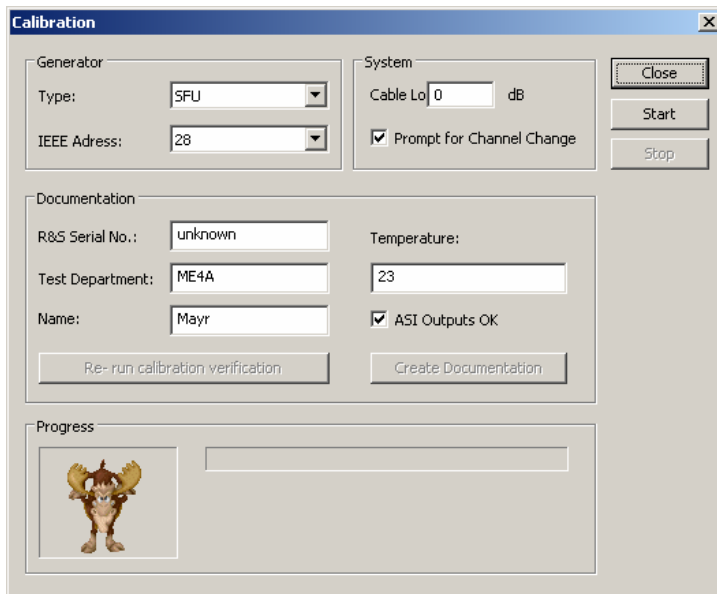


Fig. 6-81 R&S TSM-DVB Configuration – Calibration

Generator Generator type (SFQ) and GPIB/IEEE address of the signal generator in the test system.

System ROMES can take into account a known cable loss between the generator output and the R&S TSM-DVB RF input. The R&S SFQ RF signal must be applied to both RF inputs of the R&S TSM-DVB. This can be done in two different ways:

- If *Prompt for Channel Change* is selected, then the inputs are calibrated one after another. A message indicates the RF input to be connected to the R&S SFQ RF output connector.
- If *Prompt for Channel Change* is cleared, then the inputs are calibrated simultaneously. A power splitter is used to feed the generated RF signal to both RF inputs.

Documentation

Input of user information to be included in the calibration documentation. In addition to the user information the documentation file contains the calibration verification data acquired in an automatic verification procedure after the end of the calibration.

The documentation is stored in a file named *TC_xxxx.RTF* where *xxxx* denotes the Teamcast serial no. of the receiver module. This file is stored in the *Driver* subdirectory of the ROMES program directory. The *Documentation* panel provides the following additional control elements:

- *ASI Outputs OK* can be written to the documentation file after a manual change of the R&S TSM-DVB ASI outputs.
- *Re-run Calibration Verification* initiates a new verification procedure (duration: approx. 3 minutes). The verification information indicates whether a new calibration is needed.
- *Create Documentation* updates the documentation file using the current user and verification information.

Start / Stop / Progress The calibration can be started after completing the test setup and performing the necessary settings at the signal generator. The progress is monitored in the *Calibration* dialog. The complete calibration takes approx. 80 minutes.

Antenna R&S TSM-DVB

The *Antenna* tab sets RF parameters such as the cable loss caused by the test setup, the type and gain of the antenna(s) used. These values have no impact on the measurement but are stored in the measurement file header so they can be taken into account for the calculation of correction factors.

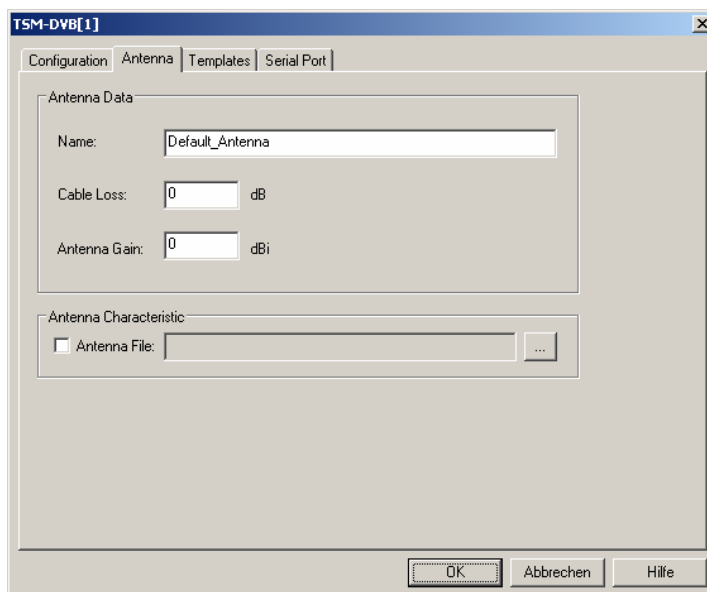


Fig. 6-82 R&S TSM-DVB driver configuration: Antenna

Antenna Characteristic

If the checkbox to use an antenna file is activated, an antenna frequency response file can be imported, e.g. in order to calculate the RF power in basic views.

The antenna file is in .csv format (Comma Separated Values)

```
f1 [MHz], Delta Level 1 [dB]
f2 [MHz], Delta Level 2 [dB]
f3 [MHz], Delta Level 3 [dB]
...
fn [MHz], Delta Level n [dB]
```

where $n \geq 2$ and f is formatted as $x.xx$ (the number of decimals does not matter, but the period is mandatory, e.g. "345" is not a valid frequency value, but "345.0" is). Values between frequency values in the list are interpolated.

Here is an example for a csv antenna file for typical R&S TSM-DVB frequencies:

```
320.0, -1.5
345.5, -1.1
362.5, -0.65
385.0, 0.5
410.0, -0.5
455.0, -0.8
460.0, -1.15
470.0, -1.65
485.5, -2.1
492.5, -2.0
505.0, -1.5
```

Templates R&S TSM-DVB

The *Templates* tab stores the current driver configuration as a template, lists, loads or deletes driver templates. It is provided for many test device drivers and is identical for all of them.

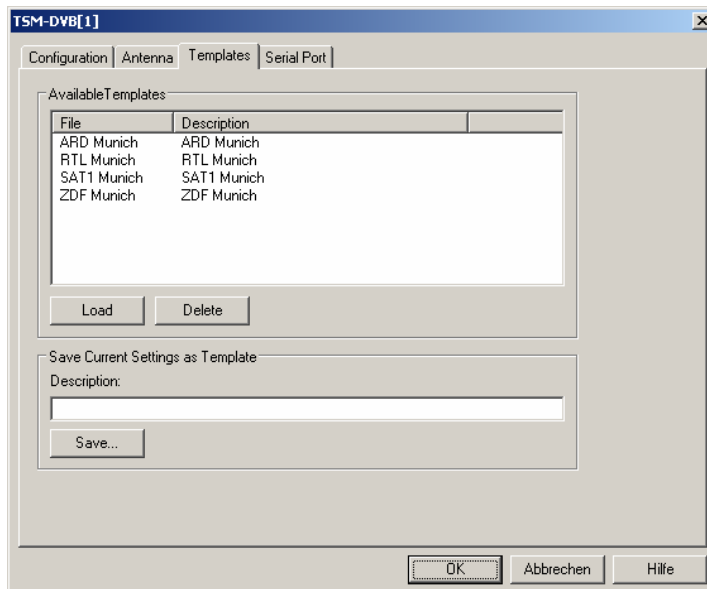


Fig. 6-83 R&S TSM-DVB driver configuration: Templates

Serial Port Driver Info R&S TSM-DVB:

The *Serial Port Driver Info* tab of the configuration menu displays information about the file version of the current driver, the product name, and the manufacturer. In addition, it shows the serial port assigned to the driver and the transmission parameters.

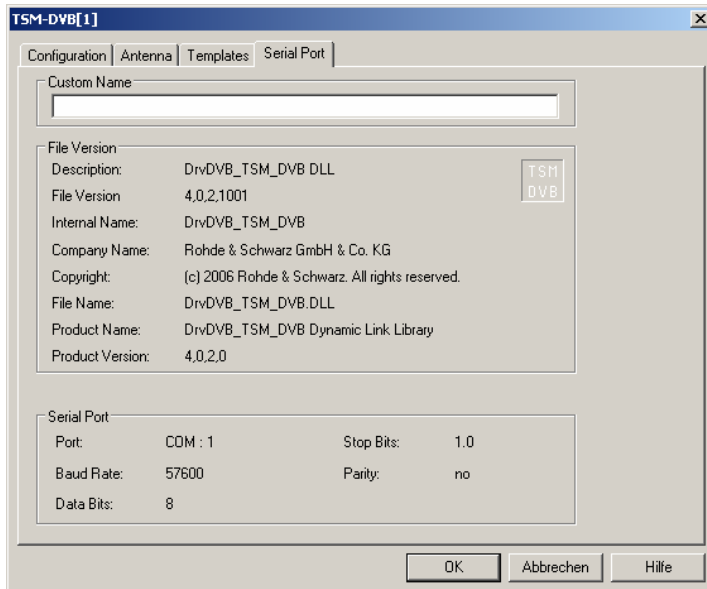


Fig. 6-84 R&S TSM-DVB driver configuration: Serial Port

Test Receiver Drivers

The measurement system offers three different test receiver drivers to be used with the test receivers from Rohde & Schwarz (R&S ESPI, R&S ESVx, R&S TSMx).

ROMES offers drivers for all types of test receivers. Installation of the drivers is explained in section [Driver Installation](#) on page 6.1; their configuration is explained below. The test receiver data can be viewed in all *Basic Views* (see chapter 3).

Supported Devices Test Receiver

The R&S ESVx driver supports the receivers of the ESxx family by Rohde & Schwarz listed in the following table.

Table 6-12 Test receiver family ESxx

Receiver type	Bandwidths supported by ROMES / kHz	Detectors available
ESVD	10, 120, 300, 1000	Peak, Average
ESVB	10, 120, 300, 1500	Peak, Average, RMS
ESVB12	10, 120, 300, 8000	Peak, Average, RMS
ESVS10	10, 120	Peak, Average
ESVS20	10, 120	Peak, Average
ESVS30	10, 120, 300, 1000	Peak, Average
ESN	1, 3, 9, 15, 120, 250	Peak, Average, RMS
ESVN20	1, 3, 9, 15, 120, 250	Peak, Average, RMS
ESVN30	1, 3, 9, 15, 120, 250	Peak, Average, RMS
ESVN40	1, 3, 9, 15, 120, 250	Peak, Average, RMS
ESPC	10, 120	Peak, Average

- The R&S ESPI driver supports the R&S ESPI test receiver from Rohde & Schwarz.
- The R&S TSMx driver supports the R&S TSMU/R&S TSML-CW test receivers. For ROMES 3NG, R&S TSMx firmware version 11.xx or higher is required.

Resources Configuration Test Receiver

The test receiver drivers are installed by selecting *CW Receiver* in the *ROMES Hardware Configuration* window (see [Fig. 6-1](#) on page 6.1). The resources needed differ according to the test receiver. The installation of all test receiver drivers is described in section [Test Receiver Drivers](#) on p. 6.8 ff.

R&S ESVx Driver

The R&S ESVx driver requires:

- The IEC/IEEE bus interface (here: GPIB7210) with the corresponding driver. GPIB7210 driver versions for different operating systems are located on the hard disk after ROMES installation, see subdirectory `Install\IEEE Interface` of the program directory.
- The trigger unit. In older systems, the IMC Board (a slot card in the controller that is no longer supported by ROMES 3; only by TS55-K1 V2.x) serves as trigger unit; all other systems – including the current ROMES version – use the Trigger Box.

R&S ESPI Driver

The R&S ESPI driver requires:

- Either the IEC/IEEE bus interface (GPIB7210) or LAN interface with the corresponding driver. The LAN interface is provided as an option (option FSP-B16). GPIB7210 driver versions for different operating systems are located on the hard disk after ROMES installation, see subdirectory Install\IEEE Interface of the program directory.
- The Trigger Box which serves as an external trigger unit.

The R&S ESPI receiver can also be used without the Trigger Box (*Internal Trigger* option).

R&S TSMx Driver

The R&S TSMx driver requires:

- An IEEE 1394 Firewire interface, controlled by means of the Rohde & Schwarz Firewire driver.
- The Trigger Box cannot be used together with the R&S TSMU/R&S TSML-CW units, because these have a built-in triggering unit.

The *Trigger Box* is connected to a COM port as described in section [Test Receiver Drivers](#) on p. 6.8 ff., no additional driver is necessary.

Configuration Menus Test Receiver

ROMES provides configuration menus for the test receiver drivers and for the Trigger Box. Both configuration menus are accessed by clicking the corresponding *Driver...* command lines in the *Configuration* menu that are available as soon as the drivers are loaded.

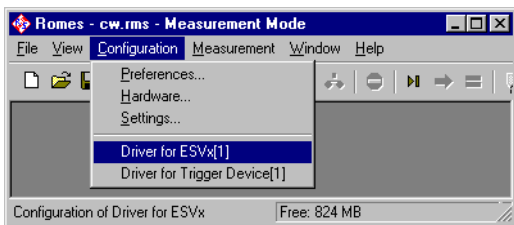


Fig. 6-85 Accessing the test receiver driver configurations

Note:

The number of test receiver signals that are displayed in the data trees can be limited in the *Configuration of Software Modules* menu; see section *TEC for CW Devices* in chapter 2.

Test Receiver Configuration

The test receiver configuration menus contain several tabs to display information on the test receiver driver and configure the *Receiver settings*, the *Measurement settings* (channel selection and trigger), and the *Antenna* parameters.

The *Driver Configuration* menus are opened by clicking the *Driver...* command lines in the *Configuration* menu which are available as soon as a receiver driver is loaded (see [Fig. 6-85](#)). Besides, they are opened automatically whenever a driver for a receiver which does not conform to the default configuration settings is loaded, i.e. on confirming the driver selection and port assignment made in the *Hardware Drivers* menu (see [Fig. 6-1](#) on page 6.1).

R&S ESVx/R&S ESPI/R&S TSMx

The R&S ESVx//R&S ESPI/R&S TSMx tabs indicate the driver version and the slave trigger.

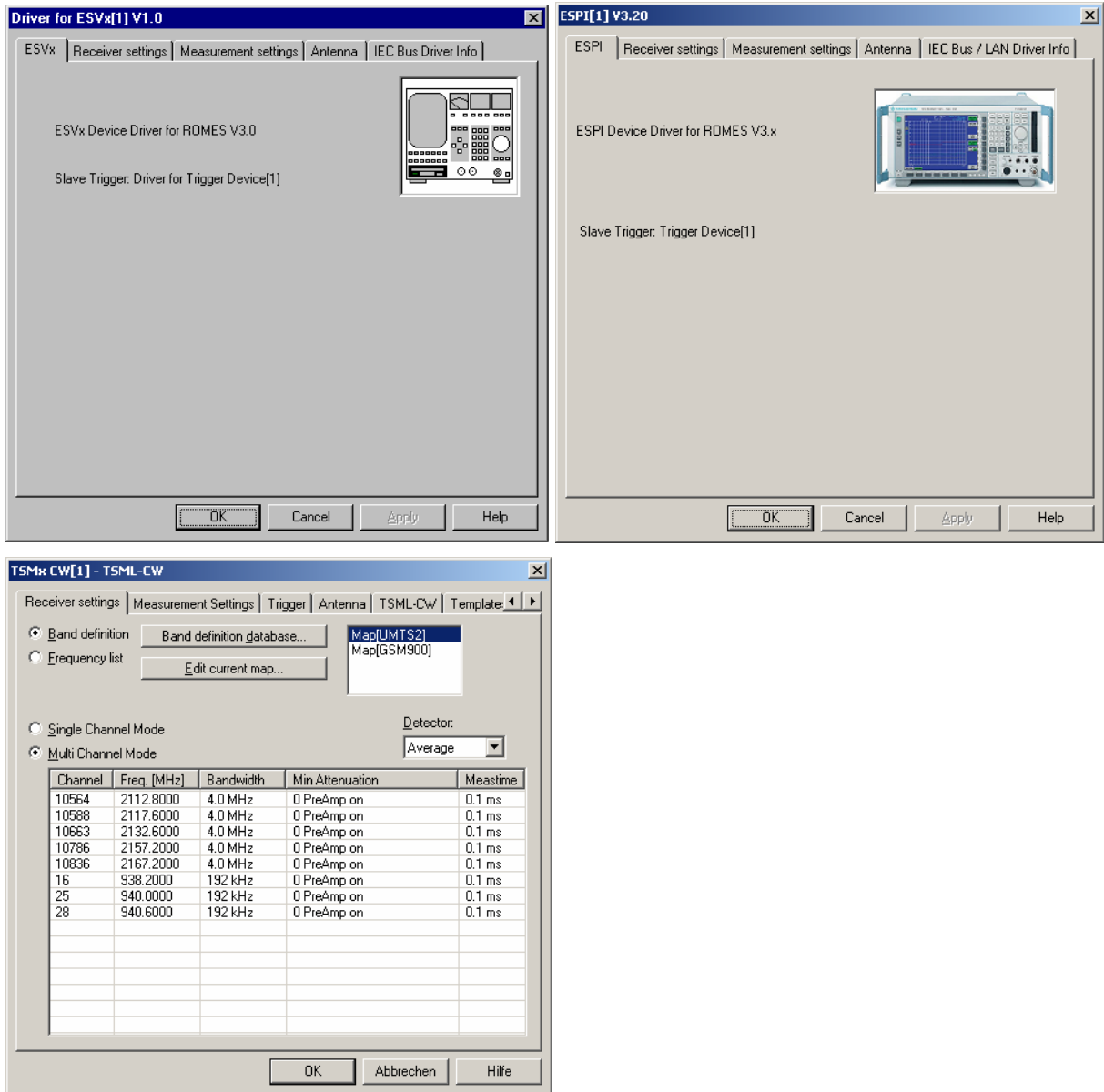


Fig. 6-86 Test receiver driver configuration – R&S ESVx/R&S ESPI/R&S TSMx

The R&S TSMx properties and available options are also displayed in the *Device Chooser* described on p. 6.20.

Receiver settings

The *Receiver Settings* tab selects the receiver type and receiver parameters. All settings are explained in more detail in the test receiver manuals.

If the settings in the *Receiver Settings* tab do not comply with the connected test receiver, the tab is opened automatically while the driver is installed; see section [Test Receiver Drivers](#) on p. 6.8 ff.

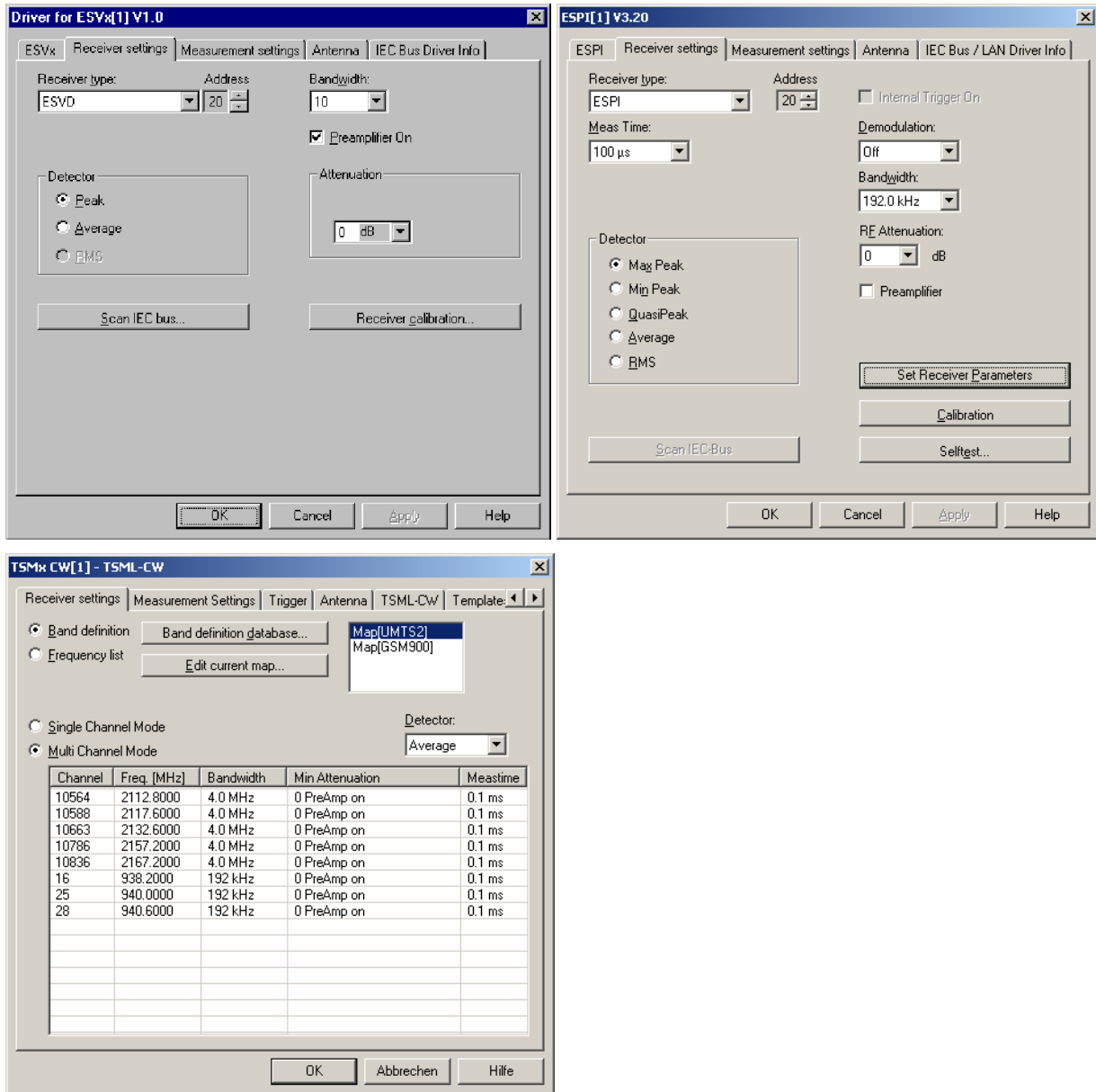


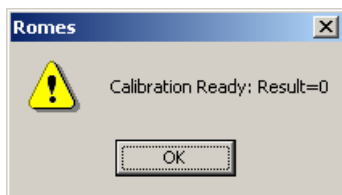
Fig. 6-87 Test receiver driver configuration – Receiver settings

Receiver type/ Receiver Option

The *Receiver (type)* pull-down list indicates all receiver types supported by the driver (see section [Supported Devices](#) on page 6.124). The used receiver can be selected from the list.

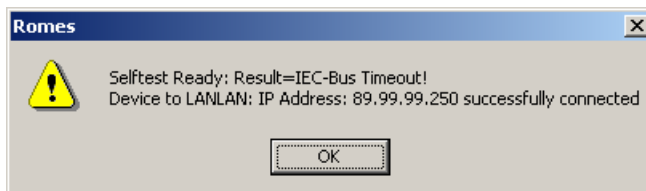
The R&S ESPI driver configuration menu also indicates whether an internal trigger is used. With internal trigger, no Trigger Box is used and the measurement must be triggered by time (see p. 6.135).

Address TCP/IP Address	The <i>Address</i> input field sets the IEC/IEEE bus address of a test receiver that is connected via IEC/IEEE bus interface, see paragraph entitled <i>Allocating a valid IP address</i> on p. 6.9. This input field is available for R&S ESVx and R&S ESPI drivers only. If the R&S ESPI driver is assigned to a LAN interface (see section <i>Test Receiver Drivers</i> on p. 6.8 ff.) the IEC/IEEE bus address is ignored.
Attenuation	Autoranging is switched off at the start of a measurement and the attenuation is set to the fixed value entered here.
Preamplifier	The internal preamplifier of the ESVD and R&S ESPI can be switched on (box checked) or off.
Bandwidth	Pull-down list of all available receiver bandwidth settings (in kHz) for the selected receiver type. For CW measurements in GSM networks, where the channel spacing is 200 kHz, a bandwidth of 300 kHz is sufficient. A bandwidth of 120 kHz should be used if the neighbor channels are at high signal power.
<hr/> Note: <i>A small bandwidth reduces the measurement speed when more than one channel is used.</i> <hr/>	
Detector	The <i>Detector</i> panel selects a method of weighting the received signal levels and deriving the measurement curve from the entire set of measurement results. The test receivers provide different detectors described in the receiver manuals.
Demodulation	The <i>Demodulation</i> field provides a pull-down list to select the type of demodulation or switch off the demodulation completely. The test receivers provide different demodulation types described in the receiver manuals.
Meas. Time	The <i>Meas. Time</i> field provides a pull-down list to select the time during which the test receiver acquires the measurement points that its detector weights and processes together; see receiver manuals.
GC	Selects a gain control factor to control the sensitivity of the receiver. In the AGC (Automatic Gain Control) setting the GC factor is automatically adapted to the input signal level; see receiver manual.
Scan IEC bus...	The <i>Scan IEC bus</i> button detects all connected devices and their IEC(IEEE)-bus addresses, see receiver manuals.
Receiver calibration.../ Calibration	The <i>Receiver calibration</i> or <i>Calibration</i> buttons start the short receiver calibration, see receiver manual and section <i>R&S Test Receiver Calibration</i> on p. 6.146 ff. A message indicates the end of the calibration:



**Selftest.../
Test**

The *Selftest* or *Test* buttons initiate a selftest of the test receiver. In the case of the R&S ESPI receiver, ROMES displays the following report when the selftest is terminated:



**Channel selection
(R&S TSMx)**

The channels selection for the R&S TSMx is analogous to the other test receivers. For a description of the *Band definition* and *Frequency list* refer to the [Channel selection](#) paragraph on p. 6.130.

The R&S TSMx provides the most flexible receiver settings of all test receivers:

Several bands (GSM900/GSM-P, GSM-E, GSM-R, GSM1800 etc.) and even several technologies (GSM, UMTS,...) can be measured simultaneously.

The *Bandwidth* and the *Min. Attenuation* can be selected individually for each channel. A click on the cells in the channel list opens pull-down menus, e.g.:

Channel	Freq. [MHz]	Bandwidth	Min Atte		Bandwidth	Min Attenuation
15	938.0000	192 kHz	0 PreArr		192 kHz	0 PreAmp on
24	939.8000	192 kHz	0 PreArr		192 kHz	0 PreAmp on
26	940.2000	50(48) kHz	0 PreArr		192 kHz	0 PreAmp on
33	941.6000	192 kHz	0 PreArr		192 kHz	0 PreAmp on
37	942.4000	200 kHz	0 PreArr		192 kHz	0 PreAmp on
		300 kHz				1 PreAmp off
		500 kHz				2 PreAmp off + 10dB IFAtt
		1 MHz				3 PreAmp off + 15dB IFAtt
		1.23 MHz				
		1.5 MHz				

For more information refer to the Technical Information for the R&S TSMU CW Driver ROMES-AS6.

Measurement settings Test Receiver

The *Measurement Settings* tab controls the channel selection, data storage, and provides a variety of trigger options.

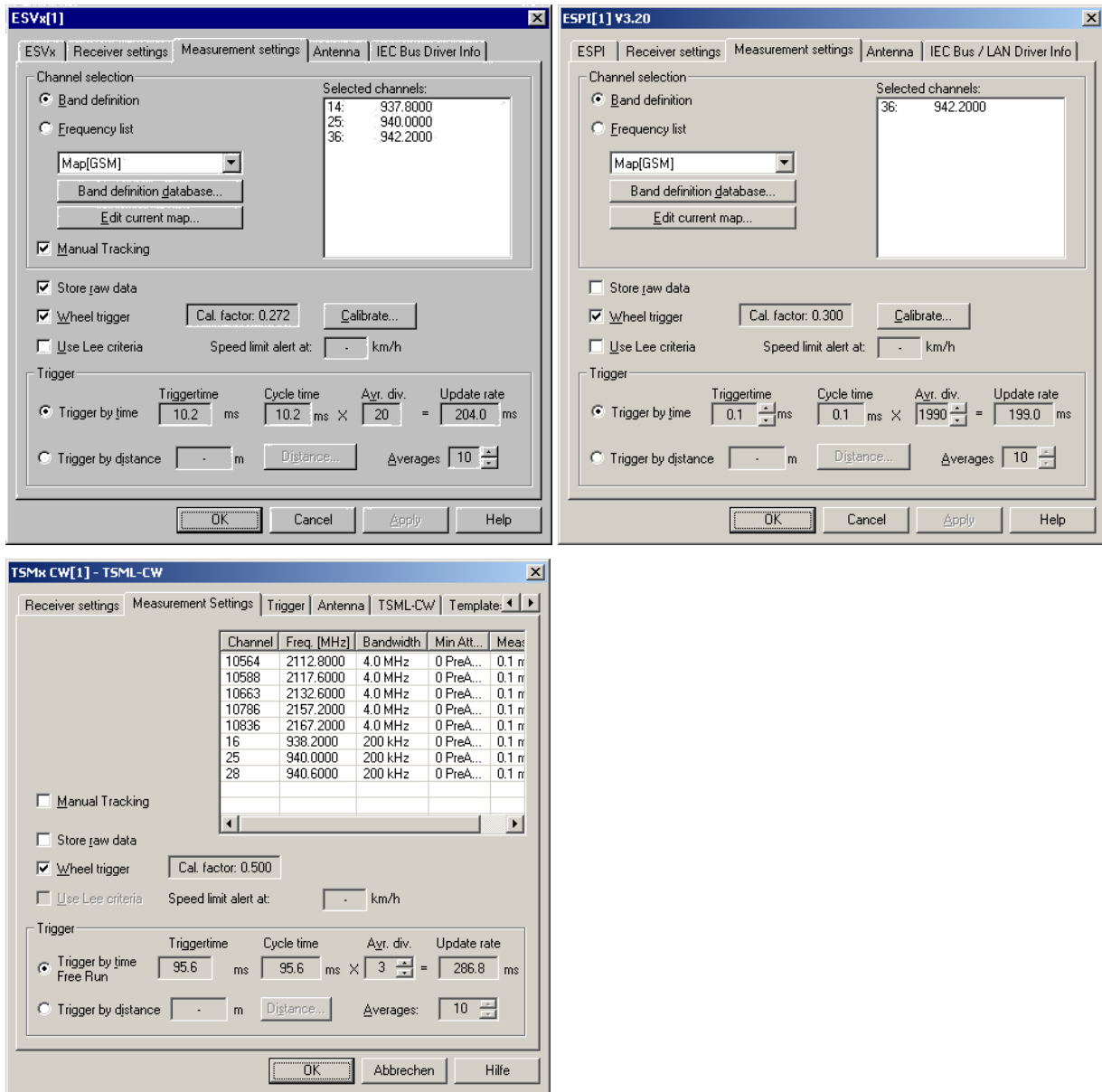


Fig. 6-88 Test receiver driver configuration – Measurement settings

Channel selection

The *Channel selection* panel specifies the radio channels to be measured. The channels can be selected in two alternative ways:

- Band definition** Channels are selected from a band, i.e. a continuous range of channels with constant spacing. This method is appropriate for radio networks with equidistant channels such as GSM.

Frequency list Channels are selected from a list of specific frequencies. This method is appropriate for radio networks with non-equidistant channels such as DAB.

The panel provides further controls and output fields:

Selection window Pull-down list showing all available *Band definition* and *Frequency list* channel maps.

Selected channels Channel numbers and frequencies in the map shown in the selection window.

Note on R&S TSMx:

The selected channels are shown in the Measurement Settings tab, however, the selection is made in the Receiver Settings tab.

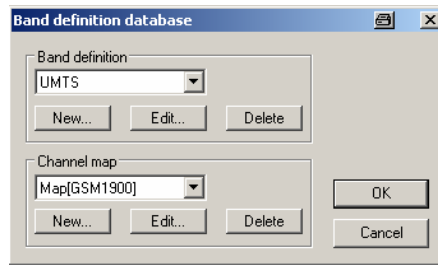
Manual Tracking

If the box is checked, the R&S ESVx, R&S ESPI, or R&S TSMx test receiver is set to manual tracking mode. In this mode, a channel list is defined using the *Band definition* or *Frequency list* options, however, the receiver measures on only one channel that can be selected or changed manually. To change the channel, the *Action* menu must be used; see section [Action Menu](#) on p. 6.144 ff. The current measurement frequency can be viewed in the *CW Tracking Info View*; see chapter 3.

The buttons below the selection window depend on the way the channels are selected:

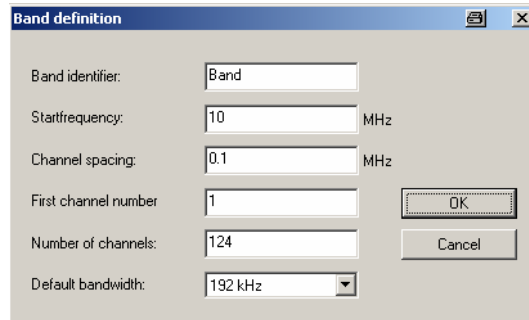
Band Definition Database

Opens the menu for editing the database containing all channel selections created via *Band definition*.



In the *Band definition database* dialog, the existing *Band definitions* and corresponding *Channel maps* are shown in the pull-down lists of two analogous panels. The three buttons below create a new element of the list (*New...*), view without editing (*View...*), *Edit*, or delete (*Delete...*) the selected element.

The *New...* button in the *Band definition* panel opens the *Band definition* dialog:

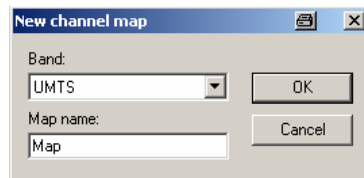


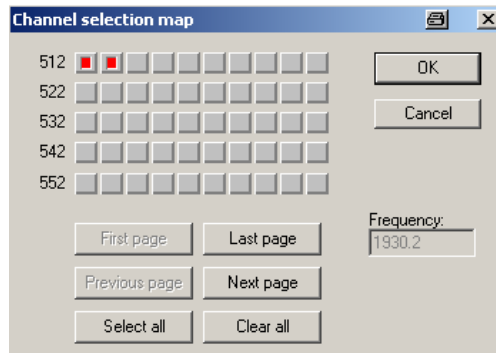
A band is specified by a *Start frequency* (f_{init}) with corresponding *First channel number* (n_{init}), a constant *Channel spacing* (Δf), and the *Number of channels* (n). For n_{init} through $n_{init} + n$, the channel frequencies f_i are determined according to the linear equation:

$$f_i = f_{init} + (i - n_{init})\Delta f ; \quad i = n_{init} \dots n_{init} + n$$

The *Band identifier* is a user-defined name which allows to distinguish between different bands. Note that, in contrast to the channel map, the band definition can not be modified after it is stored via the *OK* button.

The *New...* button in the *Channel map* panel opens the *Channel selection map* dialog:





The *Channel selection map* dialog shows all channels defined in the current band, represented by small square buttons arranged in several rows. If necessary, the diagram consists of several pages that can be scrolled using the *First page*, *Last page*, *Previous page*, and *Next page* buttons. An individual channel can be selected via mouse-click; moreover, it is possible to select all channels or clear the current selection. If a channel is selected, the corresponding frequency is shown in the *Frequency* field.

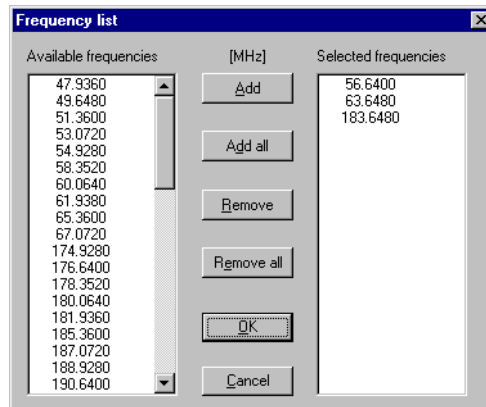
An existing channel map can be modified via the *Edit..* button of the *Band definition* database dialog or via the *Edit current map...* button of the *Measurement Settings* tab. It can be renamed in the *Channel map* entry field of the *Band definition database* window.

After quitting the *Channel selection map* with *OK*, the selected channels will be shown in the *Selected channels* field of the *Driver Configuration* menu.

Frequency list

Opens the menu for editing the database containing all channel selections created via *Frequency list*.

In the *Frequency list* dialog, the frequencies to be measured can be selected from a list of *Available frequencies*.



Store raw data

If the *Store raw data* box is checked the raw data, i.e. all measurement data taken by the test receiver, are saved with the measurement file. Otherwise, only the averaged data is saved.

(Use) Wheel Trigger

If the *Wheel trigger* box is checked, a wheel trigger is used to monitor the distance driven with the measurement vehicle.

Calibrate...

A *calibration factor* (equal to the distance driven per trigger pulse) can be determined to convert the trigger pulse scale into a length scale. Calibration of the wheel trigger is also accessible from the *Trigger Box* configuration menu; for more information see section [Trigger Box Configuration](#) on p. 6.140 ff.

Use Lee criteria

If the *Use Lee criteria* checkbox is checked a speed limit alert message will be issued when the vehicle drives faster than the Lee speed. When distance trigger is in use (see below), the trigger distance will be corrected at the same time.

The Lee speed is indicated in the output field to the right of the *Use Lee criteria* checkbox.

The Lee criteria are derived from a statistical model describing the geographical distribution of the field strength in mobile communication networks and its variation in time. The model provides an averaging procedure for the field strength in typical coverage situations, where random, non-reproducible variations are smoothed out but the relevant information (e.g. the attenuation of the field strength due to long-term fading) is preserved in the averaged data.

Lee's averaging model

According to Lee, the field strength should be averaged over a length of approx. $L = 40\lambda$ (where λ denotes the carrier wavelength of the network); a reasonable number of test points is $N = 50$ for each radio channel measured. Assuming an average measurement time for a single test point of $T = 2.5$ ms and n different channels, this yields a maximum speed of the test vehicle (Lee speed) of

$$V_{Lee} = \frac{L}{NnT} = \frac{40 \times 10^3}{n \times 50 \times 2.5s} \lambda \approx \frac{360 \text{ km}}{n \text{ h}} \quad \text{for GSM900} \quad (\text{Equation 1})$$

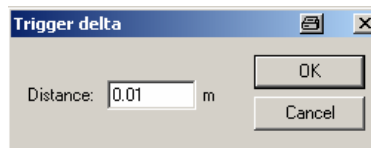
The Lee speed decreases as λ gets smaller (e.g. for GSM1800) or as the number of test points N is increased for the sake of accuracy. It also decreases if the number of channels or the measurement time of the test receiver increases, e.g. due to a reduction of the resolution bandwidth.

Trigger

The *Trigger* panel specifies how the measurement is triggered. This can be done in two alternative ways:

Trigger by time The time between two measurements (trigger time) is specified.

Trigger by distance The distance driven between two measurements (trigger distance) is specified in a dialog



All controls of the *Trigger* panel depend on the trigger mode.

Trigger by time

The *trigger time* is the time between two consecutive measurement data sets containing the data for all selected channels. The default trigger time corresponds to the fastest trigger rate (minimum measurement time) of the used test receiver, i.e. to the quantity nNT in (Equation 1).

Enlarging the trigger time reduces the amount of raw data generated such that a doubled trigger time results in about half as large a data file. The Lee speed limit decreases according to (Equation 1).

The following parameters configure the time trigger:

Trigger time Time between two measurements (see above), to be adapted to the expected maximum speed of the test vehicle.

Averages Number of samples (measurements) taken per fixed distance for each channel (i.e. the quantity N in (Equation 1) in the range of 1 to 100. In the Trigger by time mode, this value can also be changed to modify the Lee speed limit. A low value increases the Lee speed limit at the expense of accuracy.

<i>Cycle Time</i>	Measurement time for all selected channels (fixed). This is roughly equal to the step width (i.e. minimum trigger time for one channel) multiplied by the number of selected channels.
<i>Average divider</i>	Number of data collected for averaging (different from the quantity N in Equation 1 , adjustable). The minimum value is automatically set such that the Update rate (see below) is not below 100 ms. This parameter does not depend on the raw data and has therefore no impact on the Lee criterion.
<i>Update rate</i>	Time needed to collect an averaged measurement data set for all selected channels (fixed). The update rate must not fall below 100 ms, otherwise the average divider is increased.

Trigger by distance

The *trigger distance* is the distance between two measurement sets containing the data for all selected channels. The default setting is the maximum distance according to Lee.

The following parameters configure the distance trigger:

<i>Distance...</i>	Trigger distance, can be modified if no Lee trigger criterion is used (the <i>Use Lee criteria</i> checkbox is unchecked). With the Lee criterion, the trigger distance is calculated as a function the <i>Averages</i> value set, see below.
<i>Averages</i>	Number of samples (measurements) taken per fixed distance for each channel (i.e. the quantity N in Equation 1) in the range of 1 to 100. If the Lee criterion is applied, a higher <i>Averages</i> value reduces both the trigger distance and the Lee speed limit.

The maximum speed according to Lee is always shown in the *Speed limit alert at: ...* field, see above. Before starting the measurement tour, check whether the speed limit is sufficiently high. E.g. a limit of 20 km/h is far too low for reasonable driving. In this case

- Increase the receiver bandwidth (a larger bandwidth reduces the measurement time T and thus enhances the speed limit), if possible
- Reduce the number n of channels
- Reduce the number N of samples (*Averages*, in *Trigger by Distance* mode only)

The distance trigger is not available for the R&S TSMU.

Antenna Test Receiver

The *Antenna* tab defines *Antenna Name*, *Antenna Gain* and *Cable Loss*. These values have no impact on the measurement but are stored in the measurement file header so they can be taken into account for the calculation of correction factors.

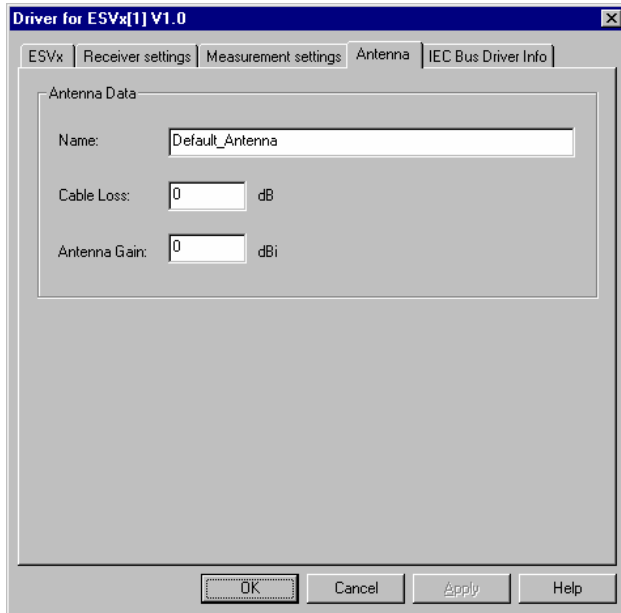


Fig. 6-89 Test receiver driver configuration – Antenna

Templates (R&S TSMx)

The *Templates* tab stores the current R&S TSMx driver configuration as a template, lists, loads or deletes driver templates.

Note:

When a driver is loaded using Configuration – Preferences – Hardware (see section [Driver Installation](#) on p. 6.1 ff.) ROMES checks whether or not a driver template is stored in the Driver Templates directory and its subdirectories (see below). The driver can be loaded with default settings or with the settings stored in any of the templates found.

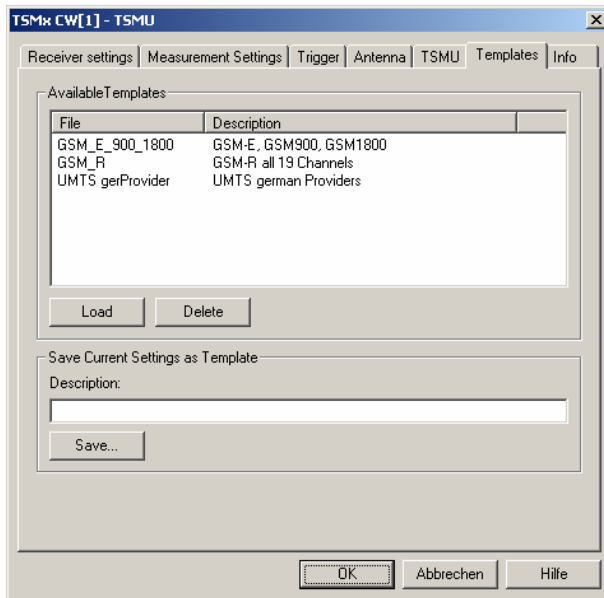
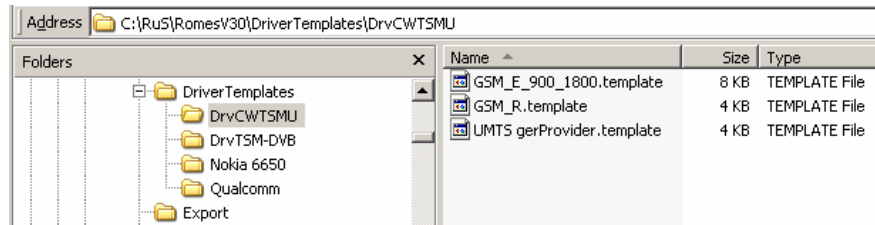


Fig. 6-90 Test receiver driver configuration – Templates

Load/Delete

Loads a driver template or deletes a template displayed in the list of *Available Templates*. Template files are ASCII files with the extension *.template. The template definition is independent of the workspace. A selection of template files for the R&S TSMx is supplied with the ROMES installation:



Save

Saves the current driver settings together with the *Description* to a selected template file.

Info Test Receiver

The *Info* tabs display information on the software versions of the different drivers and the different types of connections. The R&S TSMx drivers display no connection information. The R&S ESVx driver shows the IEC/IEEE bus board number. The R&S ESPI driver shows IEC/IEEE bus or IP address, depending on the selected connection type.

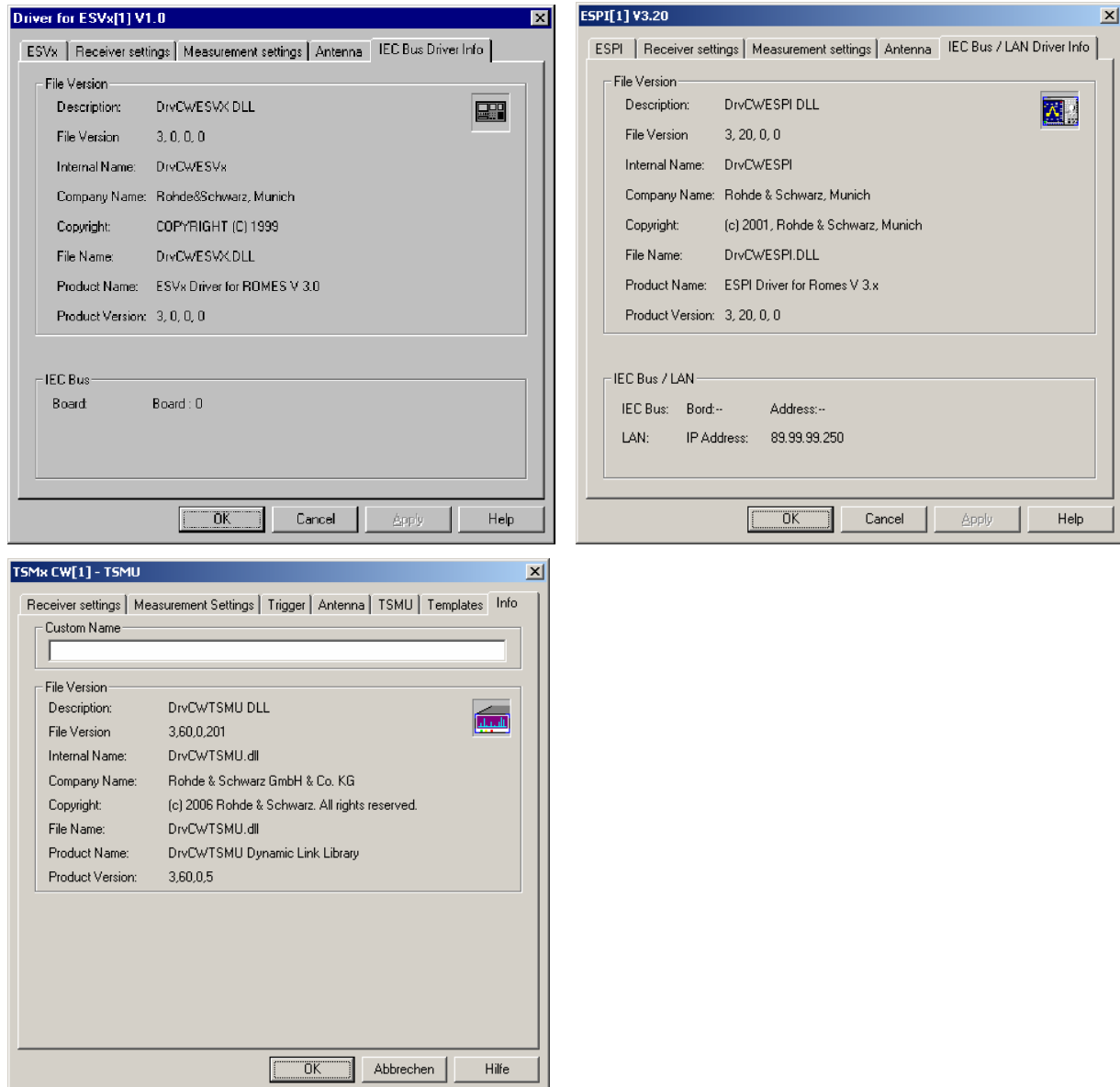


Fig. 6-91 Test receiver driver configuration – Driver Info

OK Saves all settings made in the test receiver driver configuration menu and closes the menu.

Cancel Discards all settings made in the test receiver driver configuration menu and closes the menu.

Trigger Box Configuration

The *Trigger Device* configuration menus are equal for the R&S ESVx and R&S ESPI drivers. They contain two tabs to define the calibration factor and user distance and to display information on the trigger driver.

The *Driver Configuration* menu is opened by clicking the *Driver* command line in the *Configuration* menu which is available as soon as a receiver driver is loaded (see [Fig. 6-85](#)).

Note:

For R&S ESVx and R&S ESPI devices, the trigger box is a separate externally connected unit. This configuration is described with the menus in the following section.

These devices all support external triggering by loading the trigger box driver as a slave.

The R&S TSMx devices have an integrated triggering unit, which are configured as described in section [Trigger \(R&S TSMx\)](#) on p. 6.143.

Triggerbox (external)

The *Triggerbox* tab defines the calibration factor for the wheel trigger and a user distance signal.

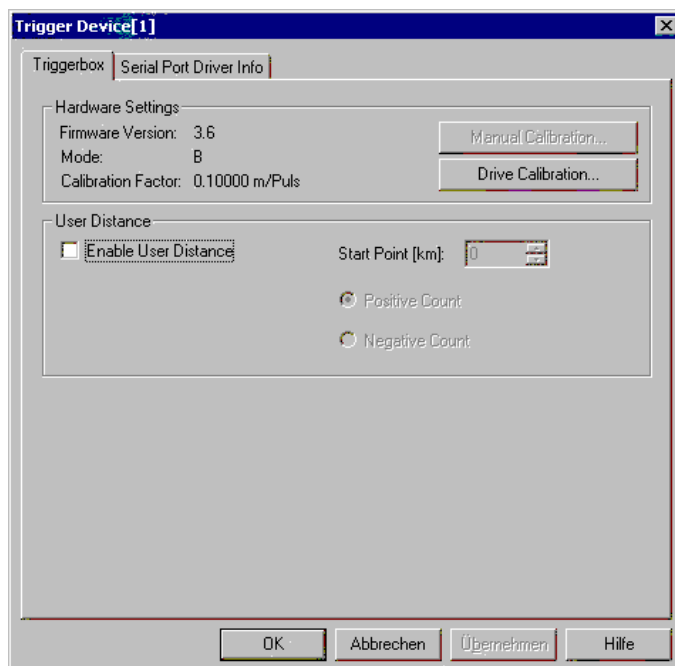


Fig. 6-92 Trigger Box driver configuration (for the R&S external trigger box)

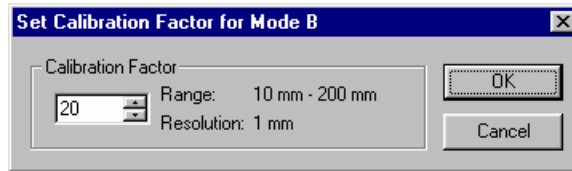
Hardware Settings

The *Hardware Settings* panel indicates the current ROMES *Firmware Version*, the *Mode* (B or C; both modes are equivalent as far as their function for ROMES is concerned; not to be changed by the user because new measurement systems are delivered with optimized settings), and the current *Calibration Factor*. A calibration factor is needed to convert the trigger pulse scale into a length/distance scale if a *Wheel trigger* is used (see p. 6.133). The calibration factor can be defined in two different ways:

Manual Calibration.

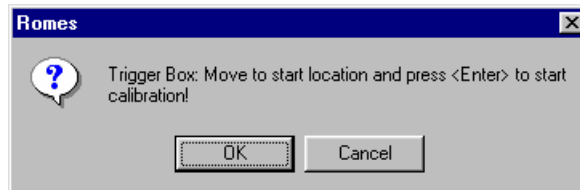
For Trigger Box firmware versions $\geq V3.7$: The calibration factor (distance driven in mm per trigger pulse) is entered manually. This option is suitable if the calibra-

tion factor is known; otherwise a *Drive Calibration* must be performed.



Drive Calibration

The calibration factor (distance driven in mm per trigger pulse) is determined experimentally by driving a particular distance while counting the number of trigger pulses.



The procedure is identical with the calibration from the *Measurement Settings* tab of the driver configuration menu. The calibration factor is entered into the Trigger Box and the registry, therefore it is valid for all drivers. A calibration must be carried out only once with the R&S ESVx test receiver driver.

User distance

If *User Distance* is enabled, a new marker point can be defined during the measurement where the *Start Point* (reference) and the direction (*Positive/Negative Count*) of the user distance may change. The same settings are provided in the *Action* menu; see p. 6.144 ff.

Serial Port Driver Info

The *Serial Port Driver Info* tab displays information on the file version of the Trigger Device driver, the serial port assigned to it, and the transmission parameters.

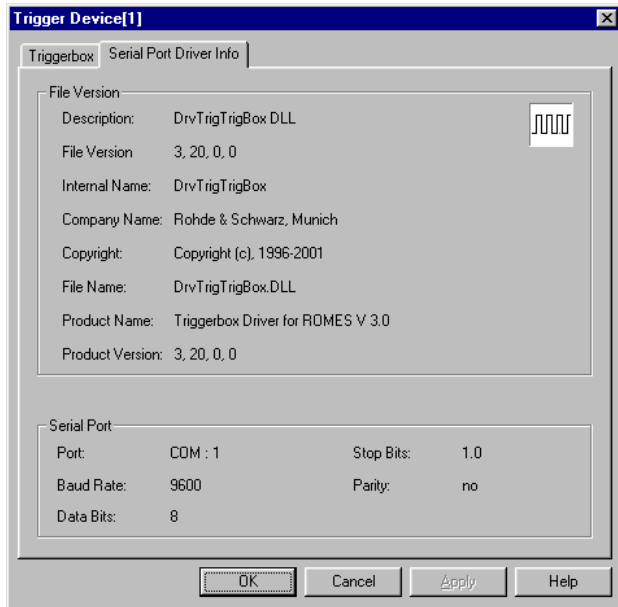


Fig. 6-93 Trigger Box configuration – Serial Port Driver Info

OK Saves all settings made in the *Driver for Trigger Device* configuration menu and closes the menu.

Cancel Discards all settings made in the *Driver for Trigger Device* configuration menu and closes the menu.

Trigger (R&S TSMx)

The *Trigger* tab defines the calibration factor for the wheel trigger. The user distance signal is provided automatically in R&S TSMx devices.

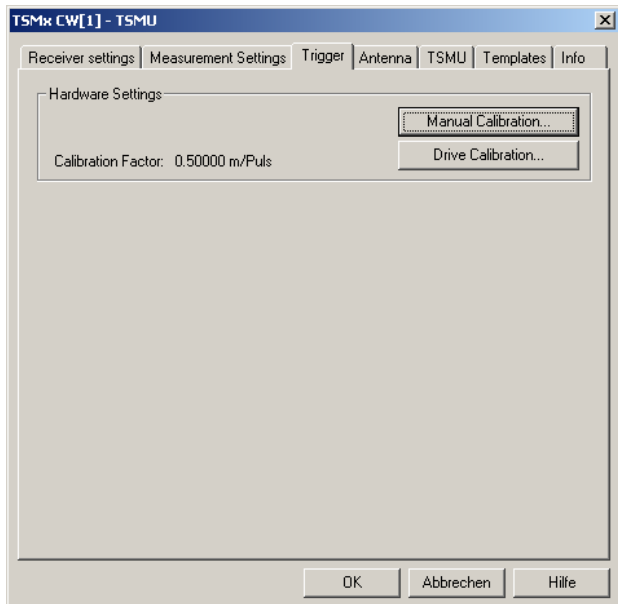
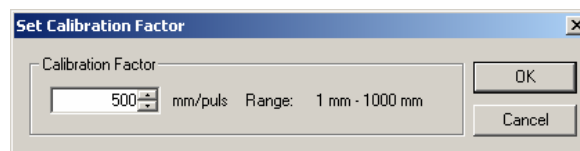


Fig. 6-94 Trigger configuration for R&S TSMx driver

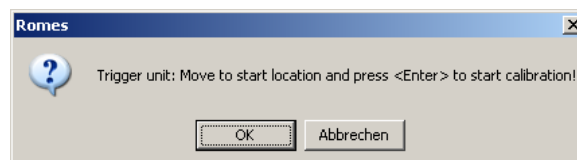
Hardware Settings

The *Hardware Settings* panel indicates the current *Calibration Factor*. The calibration factor is needed to convert the trigger pulse scale into a length/distance scale for *Wheel triggers* (see p. 6.133). The calibration factor can be defined in two different ways:

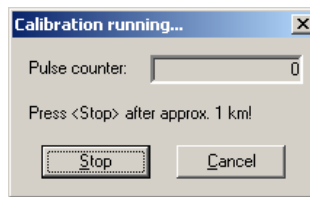
Manual Calibration The calibration factor (distance driven in mm per trigger pulse) is entered manually. This option is suitable if the calibration factor is known; otherwise a *Drive Calibration* must be performed.



Drive Calibration The calibration factor (distance driven in mm per trigger pulse) is determined experimentally by driving a particular distance while counting the number of trigger pulses.



The procedure is identical with the calibration from the *Measurement Settings* tab of the driver configuration menu.



The running *Drive Calibration* pulse counter is shown during the actual calibration. The pressing of the *Stop* button determines the applicable calibration factor.

Action Menu Test Receiver

The *Action* menu controls the *Manual Tracking* mode (for R&S ESVx receivers) and configures the *Trigger Device*. It is added to the menu bar as soon as a mobile driver has been successfully installed (see section *Driver Installation* on page 6.1 ff.). If several test receivers are connected, a separate command line is displayed for each of them.

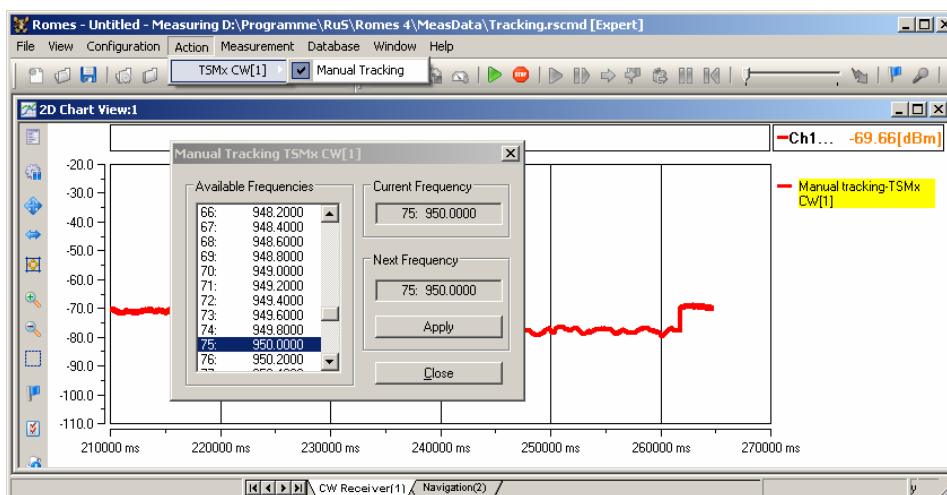


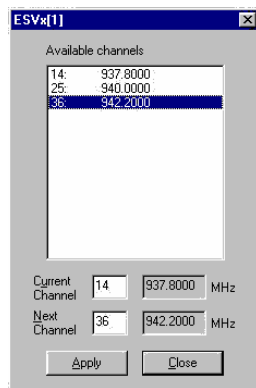
Fig. 6-95 Action menu (test receiver drivers)

Manual Tracking

Controls the *Manual Tracking* mode for R&S ESVx, R&S ESPI or R&S TSMx receivers.

Manual Tracking is a test mode where the receiver can change between several measurement channels listed in a frequency/channel list (see p. 6.131). *Manual Tracking* must be activated in the *Measurement Settings* tab of the driver configuration menu where also a channel list can be defined.

The *Manual Tracking* command in the *Action* menu opens then a menu to change the current measurement channel:



Below the list of *Available Channels/Frequencies*, the *Current Channel/Frequency* and the selected channel (that is to become the *Next Channel/Frequency*) is indicated. The measurement is continued on the *Next Channel* after the *Apply* button is pressed.

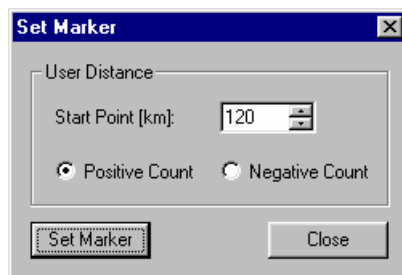
A message in the *General Status View* indicates when the channel was changed. The current measurement frequency can be viewed in the *CW Tracking Info View*. Moreover, *Manual tracking* is indicated in the list of available signals within the *2D Chart View* and *Alphanumeric View* configuration menus. The figure [Fig. 6-95](#) above shows an example for displaying a *Manual tracking* signal in a *2D Chart View*.

Trigger Device – Set Marker

Changes the reference point (*Start Point*) or direction of the user distance.

The *User Distance* is a generalized distance signal with a finite number of marker points where the distance values may jump and/or change their direction. Unlike the real distance the *User Distance* is a composite signal that globally does not have to follow a continuous and monotonic ascending or descending curve. However, in each section between two consecutive marker points, the *User Distance* is a linear (ascending or descending) function of the real distance.

The *Trigger Device – Set Marker* command opens the *Set Marker* dialog box to define a new section of the *User Distance* signal during the measurement:



Start Point [km] Definition of a (new) reference/start point for the user distance.

Positive Count/Negative Count The values in the new user distance section are counted in ascending (positive)/descending (negative) order.

<i>Set Marker</i>	Define the current position during the measurement as a marker for the <i>User Distance</i> signal and close the <i>Set Marker</i> dialog. The next section of the <i>User Distance</i> will start with the settings made in the <i>User Distance</i> panel.
<i>Close</i>	Close the <i>Set Marker</i> dialog without defining a new marker.

R&S Test Receiver Calibration

To ensure the accuracy of CW measurements, the Rohde & Schwarz test receivers provide different calibration methods. The CW level calibration can be performed for all receiver types (R&S ESVx, R&S ESPI).

The following section give an overview of the calibration methods.

Note:

It is recommended to create backups of the calibration files (i.e. in a separate directory), especially of the ones where a generator (SME, SMHU) is required for the calibration.

CW Level Calibration

A CW level calibration ensures the accuracy of a general CW measurement. The calibration method differs according to the Rohde & Schwarz receiver type.

R&S ESVx/R&S ESPI

Two different calibration types are provided:

- The short calibration can be done with the R&S ESVx and R&S ESPI driver, see ROMES operating manual, or with the R&S ESVx itself.
- The total calibration is only necessary if the short calibration indicates it (i.e. the message “CAL TOTAL required” at the R&S ESVx front panel display is shown).

For more information on both calibration types see R&S ESVx operating manual.

Calibration	Equipment required	Calibration file(s)
Short calibration	R&S ESVx / R&S ESPI (+ ROMES R&S ESVx/R&S ESPI driver)	–
Total calibration	R&S ESVx / R&S ESPI	–

R&S TSMx

The R&S TSMx receiver family devices are calibrated by R&S. If a new calibration is desired, please contact the R&S Service.

UMTS PN Scanner Driver

The UMTS PNS (Pseudo Noise Scanner) driver controls a R&S FSP spectrum analyzer, a R&S ESPI test receiver, or the R&S TSMU/R&S TSML-W radio network analyzers in order to alternate between UMTS Pseudo Noise (PN) scans and a spectrum analysis.

In an UMTS PN scan, the test devices measure and identify all UMTS downlink (Node B) signals in the air. The spectrum analysis consists of a frequency sweep over a specified range to detect arbitrary UMTS downlink and uplink signals.

Installation of the driver is explained in section [Driver Installation](#) on page 6.1; its configuration is explained below. The UMTS PN data can be viewed in the *UMTS PNS Views* (see chapter 3). Some measurement examples using the UMTS PN Scanner are outlined in chapter 2.

Resources Configuration UMTS PNS

The UMTS PNS driver is installed by selecting *UMTS PN Scanner – R&S PNS* in the *ROMES Hardware Configuration* window (see [Fig. 6-1](#) on page 6.1).

A *Device Chooser* dialog is opened when the UMTS PNS driver is loaded. The *Device Chooser* is used to select the test device and to define the essential connection parameters, if necessary.

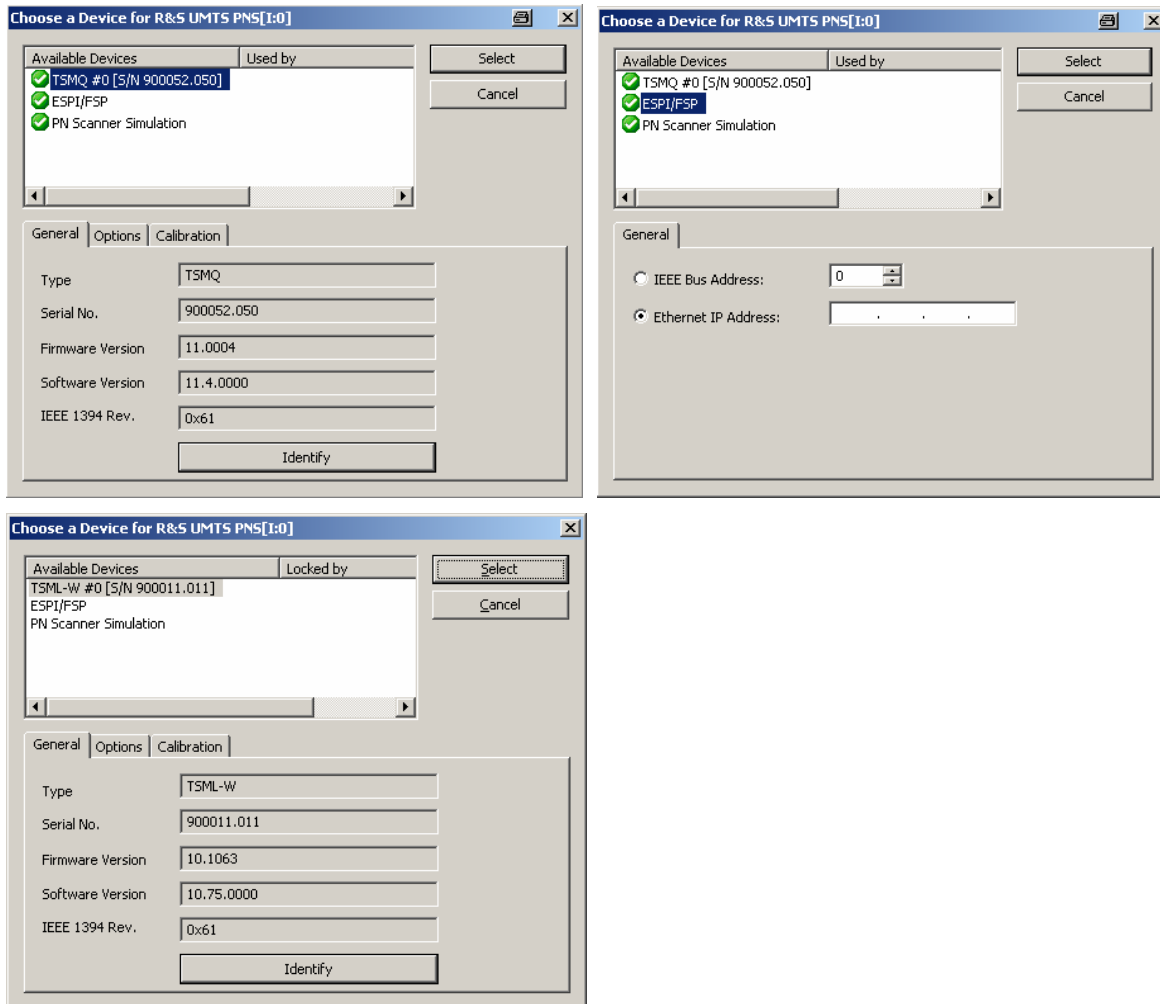


Fig. 6-96 UMTS PNS Device Chooser

The tabs on the *Device Chooser* dialog contain subsets of the receiver setting tabs described in section [Configuration Menus](#) below.

**R&S ESPI,
FSP**

The resources needed are identical for the FSP spectrum analyzer and the R&S ESPI test receiver; they are listed in section *Resources Configuration* on p. 6.124 ff. (see paragraph on *R&S ESPI Driver*). No Trigger Box is needed, however, the *Synchronization Unit for UMTS PN Scanner* TS-PNSYNC must be used instead to provide an external trigger signal to the FSP or R&S ESPI.

TS-PNSYNC is an external trigger device that divides and converts the 10-MHz reference frequency from the test instrument (FSP or R&S ESPI) into a TTL trigger signal with 1, 2, 5, 10 or 20 pulses per second. The trigger signal is fed back to the external trigger input *EXT TRIG* of the test instrument. The trigger device can be power-supplied by the 5 V DC current from the *MOUSE* connector of the FSP or R&S ESPI. The test setup is shown below.

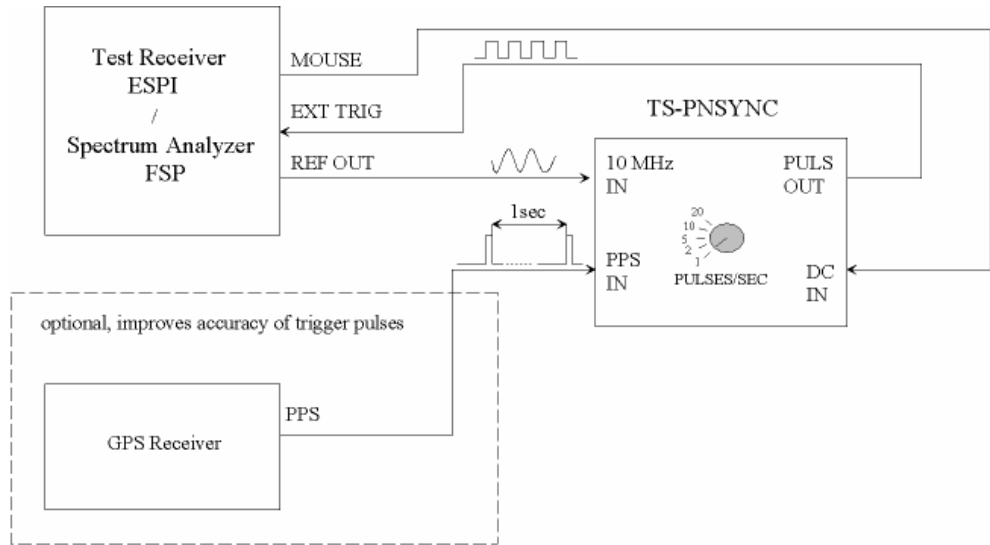


Fig. 6-97 Test setup for UMTS PN Scanner with TS-PNSYNC

The performance and accuracy of the UMTS PN Scanner measurement can be improved by adding a high-precision PPS (pulse per second) signal from a GPS receiver (e.g. GINA, Trimble Placer).

R&S TSMU/R&S TSML-W

The R&S TSMx devices must be connected to the controller via one of the Firewire interfaces (IEEE1394) on the rear panel. No external trigger unit is needed, however, the performance and accuracy of the UMTS PN Scanner measurement can be improved by adding a high-precision PPS (pulse per second) signal from a GPS receiver (e.g. GINA, Trimble Placer). The synchronization mode (*Time Base*) is selected in the *Measurements* tab of the driver configuration menu (*TSMx Advanced Settings*).



The PPS signal from the GPS receiver is directly fed to the BNC connector labeled *PULSE IN* at the rear panel of the R&S TSMx. No additional synchronization unit is required.



The R&S TSMx operating manual and an installation tool for the Firewire Interface is provided on the ROMES CD-ROM. Refer to the directory *Firmware & Drivers\R&S RF Receivers\R&S TSMU*. See also the paragraph about the [Firewire Driver](#) on p. 6.10.

Configuration Menus UMTS PNS

ROMES provides a configuration menu for the UMTS PNS driver that is opened by clicking the *RS UMTS PNS[1]* command line in the *Configuration* menu. The command line is available as soon as the driver has been loaded.

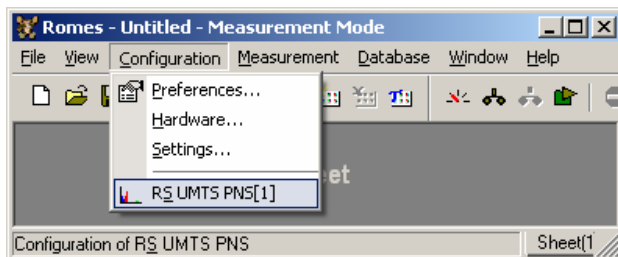


Fig. 6-98 Accessing the UMTS PNS driver configurations

The UMTS PNS driver configuration menu contains several tabs to display information on the test receiver driver (*Info*), configure the *Receiver* and the two alternate *Measurements*, define *Top N* pools to be scanned, load driver *Templates*, and specify *Antenna* settings.

Receiver Settings UMTS PNS

The *Receiver* tab selects the type of connection, the receiver address and the frequencies measured in an UMTS PN scan.

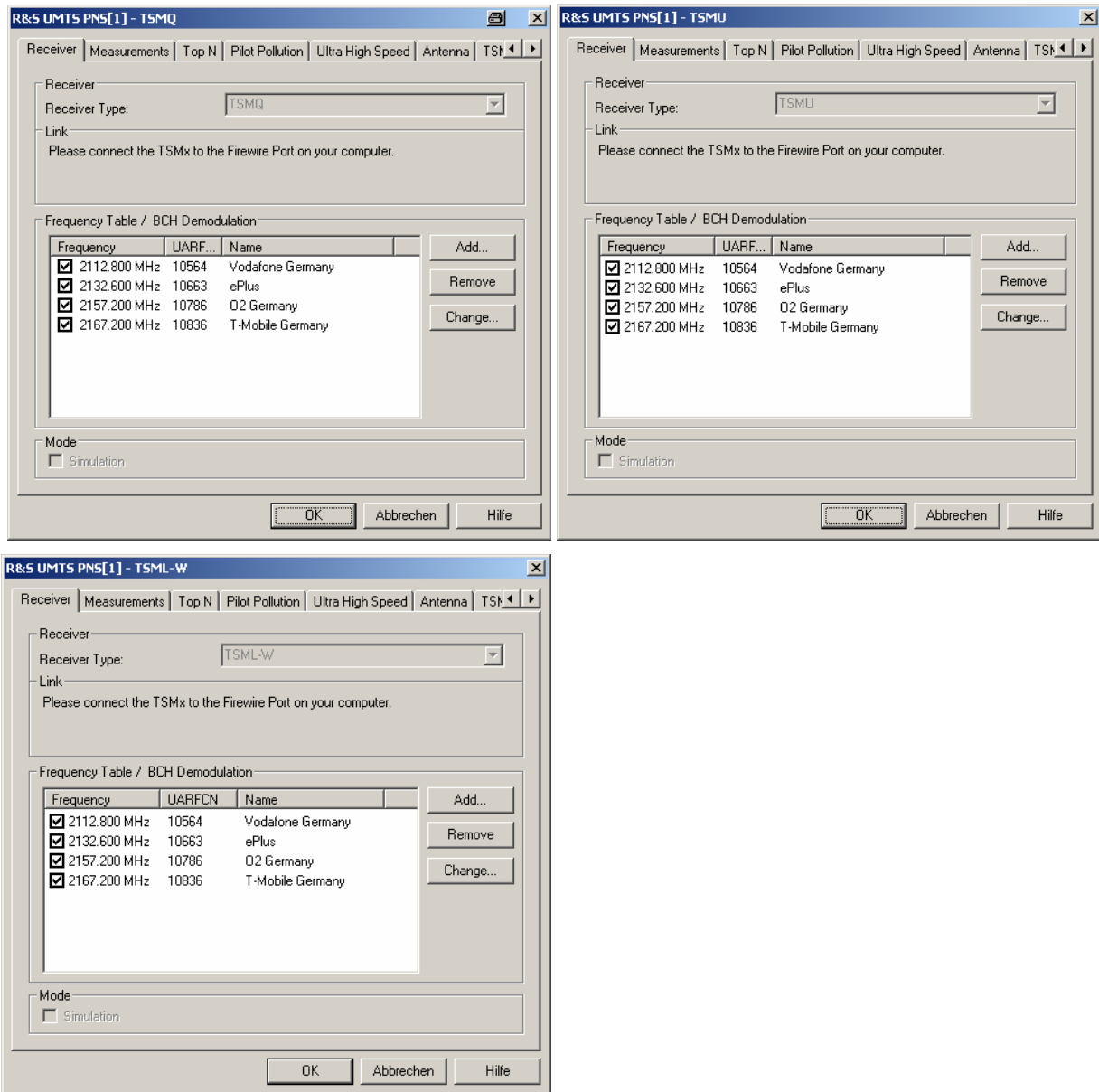


Fig. 6-99 UMTS PNS configuration – Receiver (R&S TSMQ, R&S TSMU, and R&S TSML-W)

Receiver type

The UMTS PNS driver depends on the test receiver type (*R&S ESPI/FSP*, *R&S TSMx*, or *Simulation* mode). The receiver type is selected in the *Device Chooser* dialog which is opened during driver installation (see p. 6.20). In the *Receiver Type* field it is only displayed for information.

The R&S ESPI/FSP and R&S TSMx driver versions differ in a few settings in the *Receiver* and *Measurements* tab; moreover the R&S TSMU additionally provides the *Ultra High Speed* mode. Note that the R&S TSML-W does not support the *Ultra High Speed* mode. The measurement results are equivalent for all test instruments.

Link (R&S ESPI/FSP)

The two *Link* radio buttons select the interface used for the connection of the test instrument and the IEC/IEEE bus address (for a connection via IEC/IEEE-bus interface) or IP address (for a connection via Ethernet/LAN interface; see paragraph entitled *Allocating a valid IP address* on p. 6.9). The LAN interface is provided as an option for both the FSP spectrum analyzer and the R&S ESPI receiver (option FSP-B16, LAN Interface).

A R&S TSMU/R&S TSML-W analyzer is directly connected to the Firewire port of the controller; no address information is needed.

Frequency Table

The *Frequency Table* displays a selection of predefined channels to be measured. The WCDMA-related channel frequencies are in the nominal UMTS downlink band, depending on the WCDMA band (1 to 9) or the channel frequency can be defined freely from 80 to 3000 MHz. The channel frequencies differ by the UMTS carrier spacing of 5 MHz:

- All WCDMA Bands (I – IX) and free configurable measurements on one TSMU

WCDMA Band	Uplink (MHz) (Spectrum)	Downlink (MHz) (Spectrum & Measurement)
I	1920 – 1980	2110 – 2170
II	1850 – 1910	1930 – 1990
III	1710 – 1785	1805 – 1880
IV	1710 – 1755	2110 – 2155
V	824 – 849	869 – 894
VI	830 – 840	875 – 885
VII	880 – 915	925 – 960
VIII	2500 – 2570	2620 – 2690
IX	1750 – 1785	1845 – 1880
Free (10 kHz Resolution)	80 – 3000	80 – 3000

Clicking a checkbox activates the measurement on the associated channel.

- Add** Opens a dialog for adding a new channel frequency to the table and configure the BCH demodulation (R&S TSMx); see section [Add Frequency / BCH Demodulation](#) below.
- Remove** Removes a selected channel from the list.
- Change** Opens an input field to change the *Name* of the current channel or assign a new name. The *Change* dialog also allows access to the SIB Decoder Settings Menu for the current channel (see [Add Frequency / BCH Demodulation](#) on p. 6.152). Double-clicking a channel on the frequency table also opens the [Add Frequency / BCH Demodulation](#) dialog.

Simulation

The *PN Scanner Simulation* represents an operating mode where ROMES generates UMTS PN Scanner data and writes it to a measurement file, if so desired. At least one frequency must be activated in the *Frequency* list to run the simulation.

The simulation mode is selected in the *Device Chooser* dialog which is opened during driver installation (see p. 6.20).

Data generation is initiated by the *Start Measurement* or *Start Recording* commands in the *Measurement* menu. The UMTS PN Scanner data can be viewed in one of the *UMTS PNS Views* while the simulated measurement is running. With *Start Recording*, the data is written to a measurement file. The *.cmd measurement file name is generated automatically if this was specified in the Measurement Info field group of the Romes Configuration - General Settings tab (see chapter 3). A comment can be added to the measurement file preamble before

the simulated measurement is manually stopped.

The simulated measurement illustrates many aspects and features of the UMTS PN scanner. It can be used for test and demo purposes even if no hardware is available and no real measurement can be performed.

Add Frequency / BCH Demodulation UMTS PNS

The *Add Frequency / BCH Demodulation* dialog adds frequencies to the frequency table in the *Receiver* tab (see above) and selects the system information to be demodulated and decoded from the UMTS Broadcast Channel (BCH). For new channels, it is opened by the *Add...* button in the *Receiver* tab of the R&S UMTS PNS driver configuration menu, for existing channels the dialog can be accessed from the *Change...* button on the same tab (or by simply double-clicking the channel on the list).

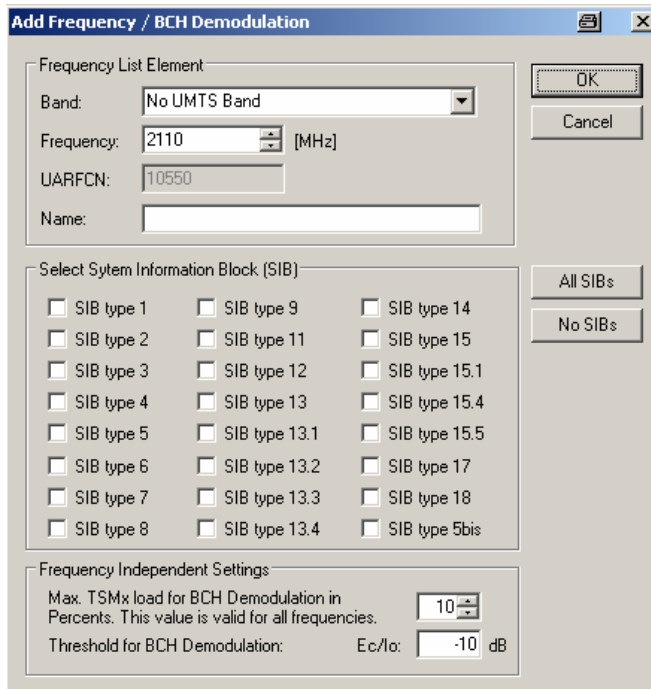


Fig. 6-100 UMTS PNS configuration – Add Frequency/BCH Demodulation

Frequency List Element Adds frequencies to the frequency table in the *Receiver* tab. It is possible to select frequencies off the nominal UMTS downlink band, however, all frequencies must be in multiples of 0.2 MHz, corresponding to specified UARFCNs (UTRA Absolute Radio Frequency Channel Numbers).

The nominal UMTS bands are listed in chapter 8. The measured frequencies can be selected in the measurement range of the used test device.

Select SIB The remaining panels in the *Add Frequency / BCH Demodulation* tab are only enabled for a R&S TSMx is equipped with option R&S TSMU-K14, *BCH Demodulation*.

The *Select System Information Block (SIB)* panel provides the SIBs to be demodulated and decoded from the UMTS BCH. Selecting at least one SIB type enables BCH demodulation. If any SIB type is selected, SIB type 3 is also enabled automatically, because it is necessary to determine the Cell Identity (CI). BCH decoding is performance critical, therefore it is recommended to restrict the selec-

tion to the SIBs of interest.

Example:

SIB type 11 and SIB type 3 is necessary (and sufficient) for the UMTS neighborhood analysis (with option ROMES-U1); see description of the *UMTS Neighborhood Analyzer View* in chapter 4.

Note:

The SIB contents can be displayed in the PNS BCH View, see chapter 4.

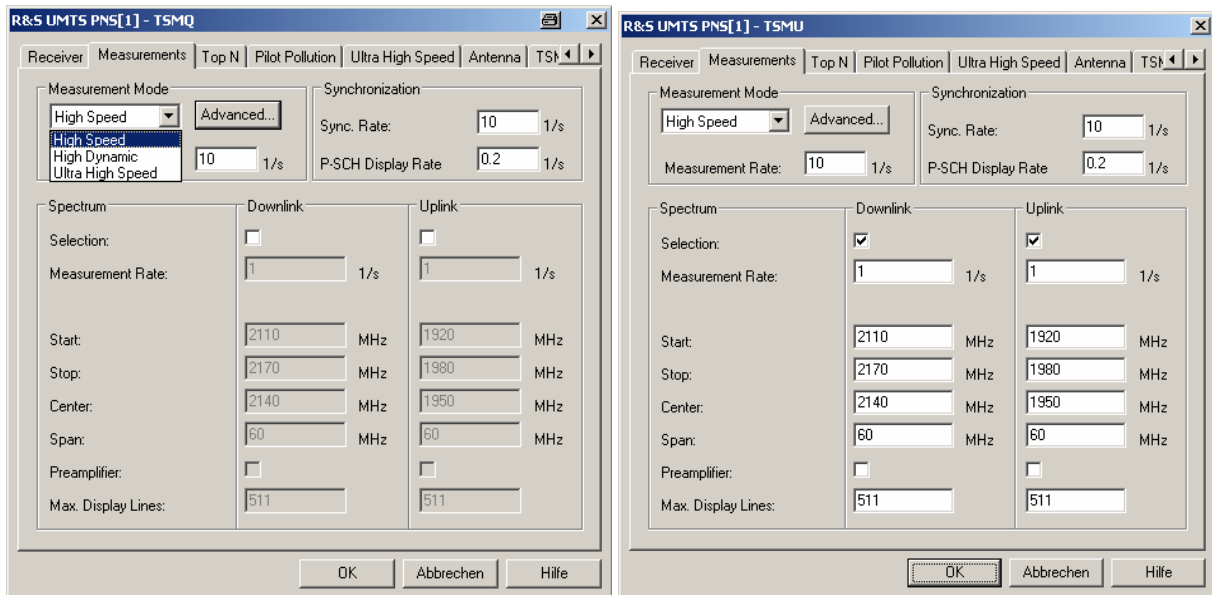
Frequency Independent Settings

The following settings restrict the system resources reserved for BCH demodulation:

- Max. TSMx load...* Sets the maximum load that the R&S TSMx reserves for BCH demodulation. The load is expressed as a percentage (between 10% and 50%) of the total R&S TSMx performance. The performance leftover is used for PN Scanning.
- Threshold...* Defines a minimum signal strength E_c/I_0 for BCH demodulation. Only signals above this threshold will be decoded.

Measurements UMTS PNS

The *Measurements* tab defines general measurement settings for the UMTS PN scan and configures the spectrum analysis.



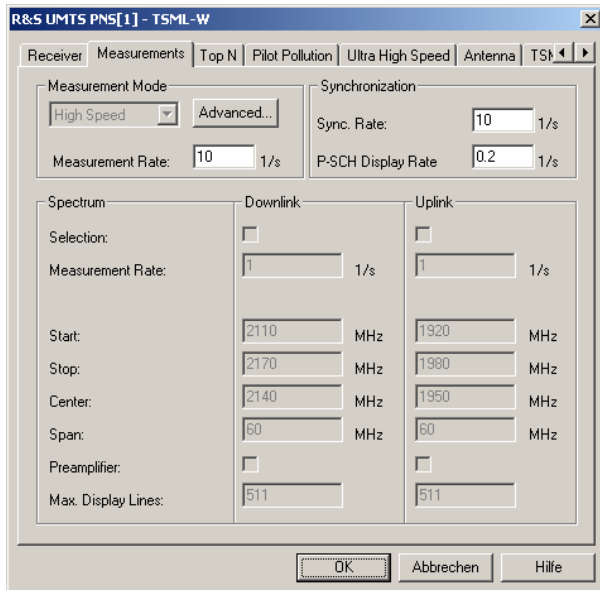


Fig. 6-101 UMTS PNS configuration – Measurements (R&S TSMQ, R&S TSMU and R&S TSML-W)

The test devices (R&S TSMQ and R&S TSMU) alternate between UMTS PN scans that are continuously repeated and single frequency sweeps (*Spectrum* measurements).

- The settings in the *Measurement mode* and *Synchronization* panels are relevant for the UMTS PN scans. Results of the UMTS PN scans are displayed in all PNS views except the *PNS Spectrum View* and in the *PNS Spectrum History View*.
- The *Spectrum* settings configure the spectrum analysis for R&S TSMQ and R&S TSMU. The results are displayed in the *PNS Spectrum View* and in the *PNS Spectrum History View*.

The supported measurement modes for the R&S TSMQ, R&S TSMU and R&S TSML-W test devices are shown in the table below:

	R&S TSMQ	R&S TSML-W	R&S TSMU
High Speed	Yes	Yes	Yes
High Dynamic	Yes	-	Yes
Ultra High Speed	-	-	Yes

Measurement Mode

The controls in the *Measurement Mode* panel define how ROMES processes the baseband (I/Q) data for an UMTS PN scan. The measurement mode has an impact on the measurement speed, the dynamic range, the synchronization procedure and the measured quantities (see also description of *UMTS PNS CPICH View* in chapter 4).

<i>High Speed</i>	For R&S TSMQ, R&S TSMU and R&S TSML-W: The analysis is based on a limited amount of data and optimized for fast evaluation
<i>High Dynamic</i>	For R&S TSMQ and R&S TSMU: Refined analysis using a larger amount of data, slowing down the measurement but increasing its dynamic range. The SC is determined by correlation with the pilot bits of the CPICH; the <i>Doppler Offset</i> frequency is available.
<i>Ultra High Speed</i>	For R&S TSMU: Measurement on a single frequency with known scrambling code but with highest measurement rate (up to 333/s). The Ultra High Speed Mode is mainly intended for measuring different echoes of a single Node B signal. It is configured in a special <i>Ultra High Speed</i> tab (see p. 6.164). The results can be displayed in the <i>PNS Rake Finger View</i> and in the <i>PNS Rake Finger Chart View</i> (see chapter 4).



In Ultra High Speed mode, the R&S TSMU always uses UMTS Network synchronization, see below.

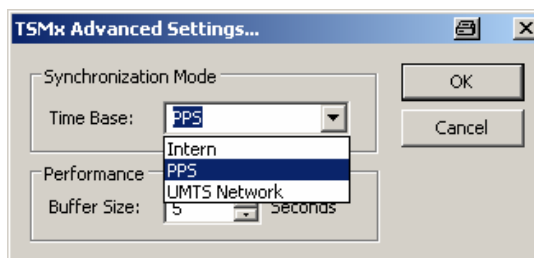
Measurement Mode (R&S TSMU)

The following measurement mode settings are available for the R&S TSMU analyzer only:

Measurement Rate Number of PN scans per second in the range between 0.1 and 20 (in *High Speed* mode) or 0.1 and 1.2 (High Dynamic mode). The actual measurement time is smaller than 1/20 s or 1/1.2 s for all provided test device settings so that even a large measurement rate never blocks the spectrum measurement completely.

In *Ultra High Speed* mode, the R&S TSMU achieves measurement rates up to 333/s, corresponding to a measurement time of 3 ms. At normal vehicle speed the maximum measurement time of 10 ms usually guarantees that the R&S TSMU rake receiver can still trace the signal. A higher measurement rate increases the measurement file.

Advanced... Opens a subdialog to configure additional measurement settings. The settings are not valid for the *Ultra High Speed* mode.



Time Base Signal source providing the time base for the R&S TSMx measurements. The (default) PPS (pulse per second) signal from an external GPS receiver provides maximum accuracy. The time base settings are described in the shaded paragraph *R&S TSMx Time Base* below.

Buffer Size Time for which the raw measurement data is stored in the R&S TSMx, should ROMES be unable to process it immediately (e.g. due to temporary low performance of the controller). If the ROMES buffer continues to be blocked after the buffer size time, the oldest data in the buffer is deleted and overwritten by new data. Data transfer starts as soon as ROMES is ready again to receive and process data.

A large buffer size increases the probability that no measurement data is lost, even though ROMES may be blocked for an extended time. On the other hand, storage and transfer of large amounts of buffer data increase the possible delay between data recording and evaluation/display in the views.

The buffer size for the *Ultra High Speed* mode can be set independently; see description of the *Ultra High Speed* tab on p. 6.164.

TSMx Time Base The R&S TSMx must synchronize to a reference signal at the beginning of each measurement. In the UMTS PN scan, the R&S TSMx provides the following methods for synchronization:

PPS Use GSM Network or PPS synchronization, if one of these signal types is available. If none of the signals is available, use Internal synchronization. If both signal types are available and almost synchronous to each other, use the PPS signal. If both signal types are available but not synchronous, assume that the PPS signal is inaccurate (e.g. because the GPS receiver cannot detect a sufficient number of satellites so that it must use its internal reference signal) and use the GSM signal.

The PPS (pulse per second) signal from an external GPS receiver fed to the PULSE IN connector at the rear panel of the R&S TSMx (see section [Resources Configuration](#) on p. 6.147 ff.) provides maximum accuracy.

In the GSM network scanner driver or CDMA PNS driver, this synchronization mode is referred to as GSM Network | PPS synchronization. This mode is always used while no measurement is active.

Internal Synchronization by means of the reference signal generated by the internal quartz oscillator of the analyzer. The internal time base is activated automatically if no PPS signal is available. While a network time base is selected, the network signals constantly correct the frequency and phase of the internal oscillator in order to compensate for a possible drift. If the network signals are affected by a systematic error (e.g. due to a Doppler shift in a moving test vehicle), Internal time base can be used to prevent this correction.

UMTS Network Synchronization by means of approx. 2/3 of the received UMTS signals, discarding the signals with the strongest timing deviation and time drift. This mode remains active as long as the standard deviation of the time drift of all detected (and not discarded) UMTS signals is below 60 ns/s. If this condition is no longer met, or if no UTRAN cell

is detected any more, the R&S TSMx automatically switches to Internal time base. UMTS Network is the recommended setting if no PPS signal is available.

UMTS Network synchronization is always used while the R&S TSMU operates in Ultra High Speed mode.

Synchronization

The two input fields in the *Synchronization* panel define how often the system synchronizes to the received UMTS PN signals and updates the measurement file:

<i>Synchronization Rate</i>	Number of synchronization processes per received channel and per second. A low synchronization rate improves the system performance, especially if ROMES receives a large number of channels, at the risk of missing Node B signals that are only received for a short time.
<i>Update Rate for P-SCH View</i>	Rate by which the data for the <i>PNS P-SCH View</i> is stored to the measurement file and the view itself is updated. The P-SCH data is always acquired during synchronization so that the update rate must be smaller or equal to the <i>Synchronization Rate</i> . A smaller update rate has no impact on the measurement but can considerably reduce the size of the measurement file.
<i>Display Update Rate</i>	Rate by which the results in the <i>PNS Rake Finger View</i> and the <i>PNS Rake Finger Chart View</i> are updated if the R&S TSMU operates in <i>Ultra High Speed</i> mode. A high update rate prevents sudden jumps of the traces in the <i>PNS Rake Finger Chart View</i> but requires a higher system performance.

Spectrum (R&S TSMQ and R&S TSMU)

The input fields in the *Spectrum* panel configure the single frequency sweeps for the spectrum analysis and defines how often they are repeated, interrupting the UMTS PN scan. The parameters for downlink and uplink signal measurements can be set independently; their frequency ranges may overlap.

<i>Selection</i>	Enables (if checked) or disables the data entry for the downlink or uplink.
<i>Measurement Rate</i>	Number of sweeps per second in the range between 0.1 and 20. The actual sweep time is smaller than 1/20 s for all provided test device settings so that even a large measurement rate never blocks the UMTS PN scan completely.
<i>Resolution Bandwidth</i>	Bandwidth of the IF resolution filter of the analyzer or receiver. Possible bandwidths can be selected from a pull-down list.

Start/Stop/Center/Span Definition of the measurement range/sweep range of the analyzer or receiver. The sweep range is a continuous frequency interval which is either defined by a *Start* and *Stop* value or by a *Center* frequency and *Span*. *Start/Stop* and *Center/Span* are alternative settings and overwrite each other according to:

$$\text{Center} = (\text{Start} + \text{Stop})/2$$

$$\text{Span} = \text{Stop} - \text{Start} \text{ (must be positive)}$$

Depending on the sweep range, the test device automatically sets the number of sweep points and their position.

The following settings are provided for the R&S TSMU:

Preamplifier Switches the preamplifier in the R&S TSMU on or off.

Max. Display Lines Sets the number of displayed measurement points per sweep and thus the frequency resolution of the measurement curves in the spectrum views. Increasing the value broadens the *Spectrum History View*.



The maximum frequency resolution of the R&S TSMU is approx. 48 kHz. The *Max. Display Lines* setting is ignored if it results in a frequency resolution beyond this value. At a measurement span of 20 MHz, the maximum number of display lines is $20 \text{ MHz} / 48 \text{ kHz} \approx 420$.

Top N UMTS PNS

The *Top N* tab defines the top N pools to be evaluated in the *PNS Top N View*; see chapter 3. Top N pools also appear in the data tree so they can be analyzed in general ROMES views, e.g. in the *Alpha-numeric View*, the *2D Chart View*, the *Route Track View*, and the *Statistic Histogram View*.

Definition:

*Suppose that, at a given position and time, a test device receives several UMTS downlink signals from different Node Bs. The **Top N** signals are the N (N = 1,2,...) signals with the strongest P-CPICH level. A **Top N Pool** contains up to N Node Bs with specific characteristics providing the strongest P-CPICH level at a given position and time.*

Top N and *Top N Pool* are dynamic concepts: The signal level from a specific Node B varies in time and according to the measurement position. The elements of a top N pool are exchanged accordingly and even their number may change, if the system detects less than N signals.

On loading the UMTS PNS driver, ROMES generates a default top N pool with the following properties:

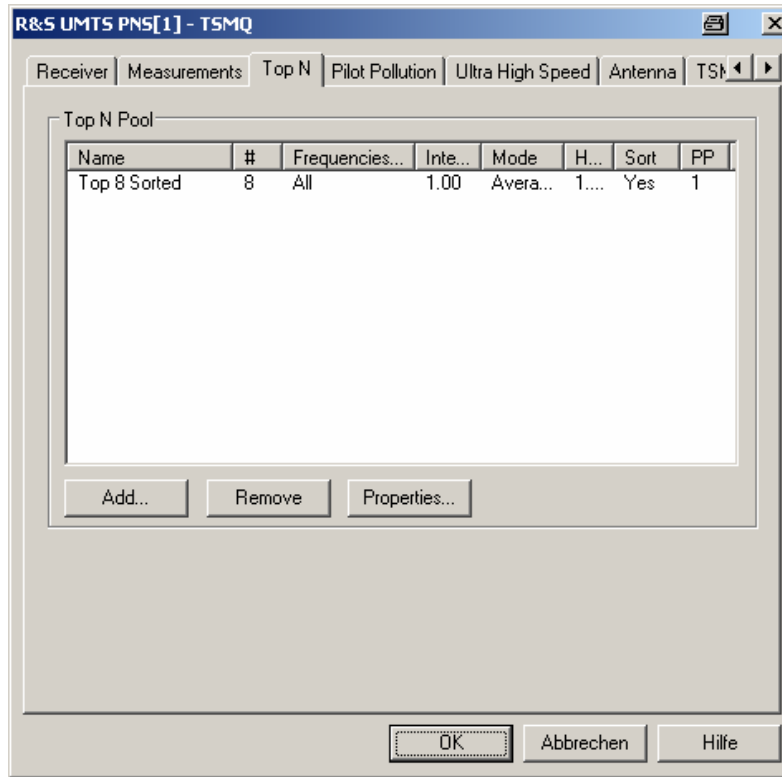
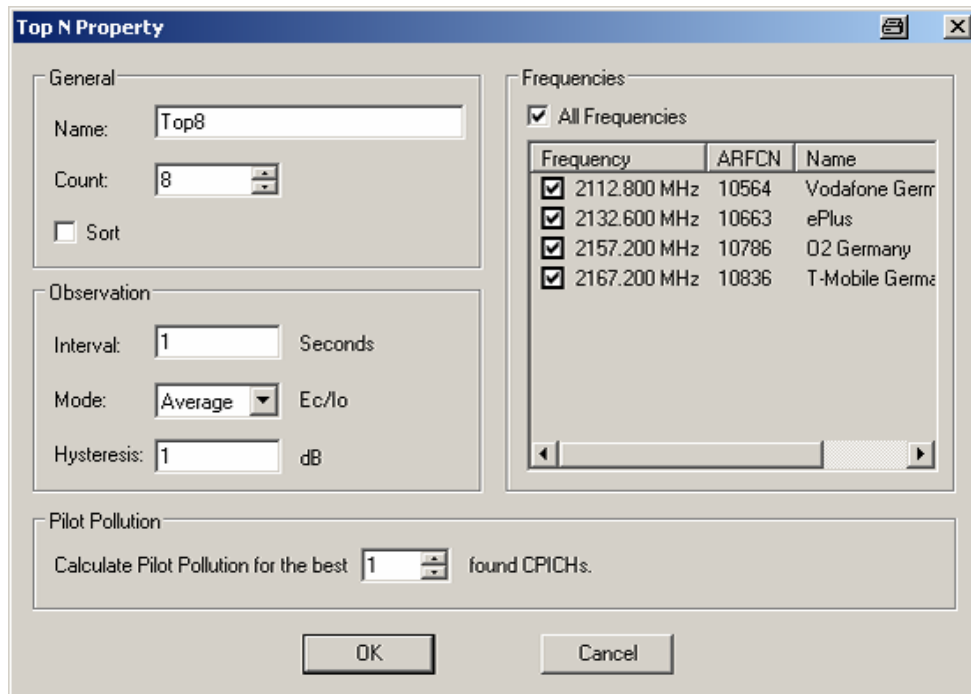


Fig. 6-102 UMTS PNS configuration – Top N

Top N Pool Table of the defined top N pools with their *Name*, the (maximum) number of elements (*#*), the allowed *Frequencies*, and the update and sorting criteria. The parameters are set when a new pool is created (*Add*) or when a selected pool is changed (*Properties*); see below.

Add Opens the *Top N Property* dialog to generate a new top N pool.



The following parameters are set in the *General* panel:

- Name** Name of the top N pool. The name identifies the pool in the views and in the data tree, so it is worth selecting meaningful names
- Count** Maximum number N of elements/Node Bs in the top N pool. The actual number of elements can fall below N and vary if the system is not able to detect and analyze enough signals.
- Sort** In an unsorted pool (box unchecked), the elements remain at fixed positions unless they are replaced by a new element with a stronger CPICH. Unsorted pools are suitable for monitoring a Node B or a fixed set of Node Bs for an extended period of time; they are particularly easy to monitor in graphical diagrams where fixed positions always correspond to the same Node Bs.

In a sorted pool (box checked), the elements are sorted according to their CPICH signal strength. The positions are re-distributed after each update, according to the current signal strengths. Sorted pools are suitable for monitoring or comparing signals with definite strength, e.g. the strongest and second-strongest signal along a measurement tour, irrespective of the transmitting Node Bs.

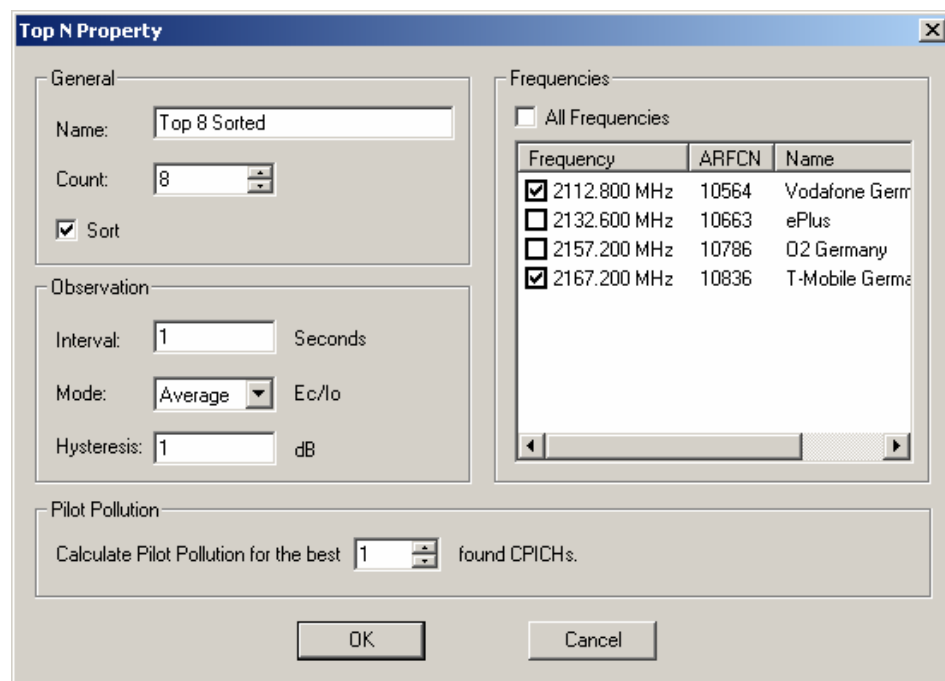
The parameters in the *Observation* panel define the update and sorting criteria for the top N pool:

- Interval** Moving evaluation period for the average or maximum of the quantity E_c/I_o (CPICH) for all signals. The average or maximum value is re-calculated and the pool is updated every time the system receives new UMTS PN scan data. All E_c/I_o values received within the evaluation *Interval* before the current time enter into the calculation. Large evaluation *Intervals* tend to stabilize the pool by delaying the exchange of pool elements.

- Mode** Update and sorting criterion for the pool: *Average* or *Maximum* value of E_c/I_0 (CPICH) in the moving evaluation *Interval*. E_c/I_0 (CPICH) is the ratio of the received energy per PN chip for the P-CPICH to the total transmit power spectral density; see also section *PNS CPICH View* in chapter 4.
- Hysteresis** Minimum level difference between the E_c/I_0 of a pool candidate and the lowest E_c/I_0 in the pool. A pool candidate becomes a pool element and replaces a previous element if
- $$E_c/I_0 (\text{candidate}) \geq E_c/I_0 (\text{previous}) + \text{Hysteresis}$$
- A large hysteresis stabilizes the pool, preventing elements from being replaced because of small fluctuations in the measurement results.

Frequencies

The *Frequencies* panel shows all frequencies selected for measurement in the *Frequency Table* of the *Receiver* tab. It is possible to select *All Frequencies* in the list or only a number of specific frequencies, e.g. to generate a pool with Node Bs from a particular provider., as shown below:



- Pilot Pollution** The *Pilot Pollution* panel contains an input field to select the number of reference CPICHs for which a pilot pollution analysis is performed (see *Pilot Pollution* tab below). The pilot pollution is always calculated for the k signals in the top N pool with the strongest P-CPICH level, where $0 \leq k \leq N$. A selected number $k > N$ is replaced by N upon pressing *OK*.

- Remove** Removes the current *Top N* from the *Top N Pool*. *Remove* is disabled while no *Top N* is selected.

- Properties** Opens the *Top N Property* dialog showing the properties of the current *Top N*. *Properties* is disabled while no *Top N* is selected. The properties of the current *Top N* can be edited and changed.

Pilot Pollution UMTS PNS

The *Pilot Pollution* tab defines the thresholds for the calculation of the Hard Pilot Pollution (HPP) and the Soft Pilot Pollution (SPP). HPP and SPP are weighted sums of the Received Signal Code Powers (RSCP) of all measured CPICHs relative to a reference CPICH signal and thus a measure of the potential interference/pollution of the reference CPICH.

The HPP and SPP is indicated in the *PNS Top N View*; see chapter 3. Pilot pollution signals also appear in the data tree so they can be analyzed in general ROMES views, e.g. in the *Alphanumeric View*, the *2D Chart View*, the *Route Track View*, and the *Statistic Histogram View*.

The same thresholds apply to all reference pilot signals selected in the *Top N Property* dialog.

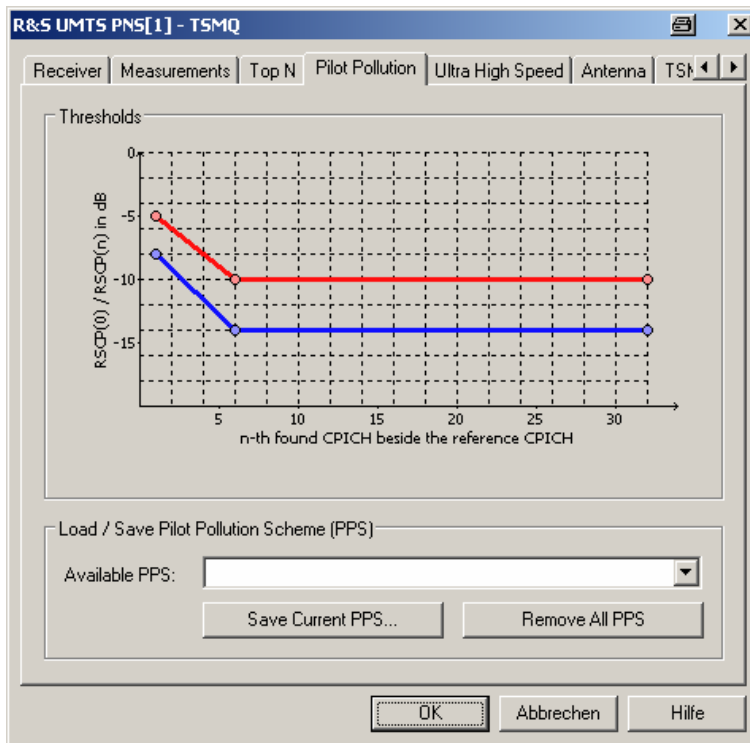


Fig. 6-103 UMTS PNS configuration – Pilot Pollution

Thresholds

Graphical representation of the upper threshold T_{high} and the lower threshold T_{low} for the calculation of the pilot pollution. To calculate the pilot pollution for a given reference signal CPICH(0), all other detected CPICHs are sorted according to their signal strength and compared with T_{high} and T_{low} :

HPP(0) is equal to the total number of received channels CPICH(n) ($n=1,2,3\dots$) exceeding the upper threshold $T_{high}(n)$.

SPP(0) is equal to HPP(0) plus the sum of all received channels CPICH(n) between the lower threshold $T_{low}(n)$ and the upper threshold $T_{high}(n)$, each weighted by the ratio $(RSCP(n) - T_{low}(n)) / (T_{high}(n) - T_{low}(n))$.

Signals below $T_{low}(n)$ contribute to neither HPP nor SPP. This definition shows that $HPP(0) \leq SPP(0)$ irrespective of the reference CPICH and that both quantities are minimized for the strongest CPICH in the top N pool ($CPICH(j) > CPICH(k) \Rightarrow HPP(j) \leq HPP(k)$ and $SPP(j) \leq SPP(k)$).

Threshold Settings

The thresholds $T_{\text{high}}(n)$ and $T_{\text{low}}(n)$ are both defined by means of two polygonal curves in the range $1 \leq n \leq 32$. The cursor shows an **A** symbol when pausing over one of the circles separating the straight sectors of the curves. It can then be used to drag the circle in vertical direction. Double-clicking a point on a curve inserts a new point or removes the current point. $T_{\text{high}}(n)$ and $T_{\text{low}}(n)$ can be modified with the following restrictions:

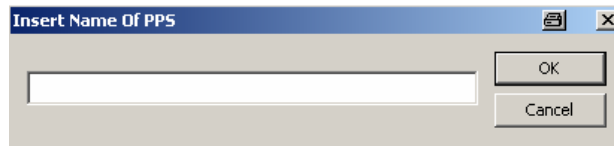
$T_{\text{high}}(n)$ must be larger than $T_{\text{low}}(n)$ for all n .

Both functions must be monotonically descending: $n > m \Rightarrow T_{\text{high}}(n) \leq T_{\text{high}}(m)$ and $T_{\text{low}}(n) \leq T_{\text{low}}(m)$.

Load/Save PPS Once defined in the *Thresholds* diagram, a pilot pollution scheme can be named and stored for later reuse.

Available PPS List of all defined pilot pollution schemes. A selected PPS appears in the *Thresholds* diagram. *OK* applies the selected PPS.

Save current PPS Opens an input box for the name of the current PPS. The saved PPS is added to the list of available PPS.



Remove all PPS Clears the list of available PPS.

Ultra High Speed (R&S TSMU) UMTS PNS

The *Ultra High Speed* tab configures the R&S TSMU for a measurement on a single frequency with known scrambling code but with highest measurement rate (up to 333/s). The *Ultra High Speed Mode* is mainly intended for measuring different echoes of a single Node B signal. It must be activated explicitly in the *Measurements* tab of the driver configuration menu. The results can be displayed in the *PNS Rake Finger View* and in the *PNS Rake Finger Chart View* (see chapter 4).

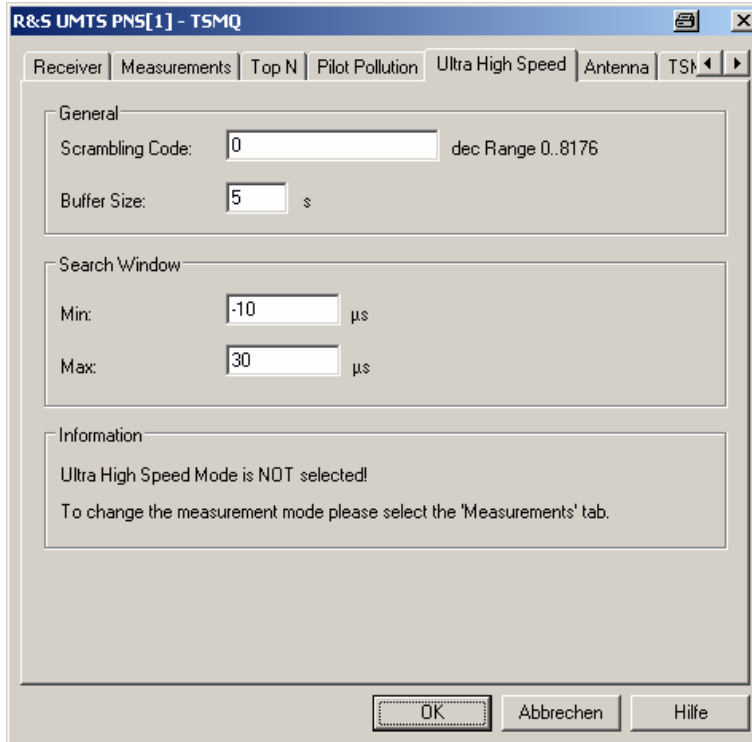


Fig. 6-104 UMTS PNS configuration – Ultra High Speed (R&S TSMU)

- General** Provides basic measurement settings for the R&S TSMU:
- Scrambling Code* Scrambling code of the measured cell signal in decimal format.
 - Buffer Size* Time for which the raw measurement data is stored in the R&S TSMU, should ROMES be unable to process it immediately (e.g. due to temporary low performance of the controller). This buffer size is only valid for the ultra high speed mode where it replaces the buffer size in the *Measurement* tab (for a detailed description see [Buffer Size](#) on p. 6.156).
- Search Window** Minimum and maximum time delay of the measured echoes relative to the strongest echo. A signal with a negative time delay arrives prior to the strongest echo, which is a typical situation if there is an obstacle in the direct path between the node B transmitter and the receiver. A small search window limits the number of echoes measured.
- The maximum number of echoes measured simultaneously is 12. This maximum number decreases for very high measurement rates (8 for 250 Hz, 4 for 333 Hz).

R&S TSMQ UMTS PNS

The *R&S TSMQ* tabs display the properties of the R&S TSMx devices and available options. This information is also displayed in the *Device Chooser* described on p. 6.20.

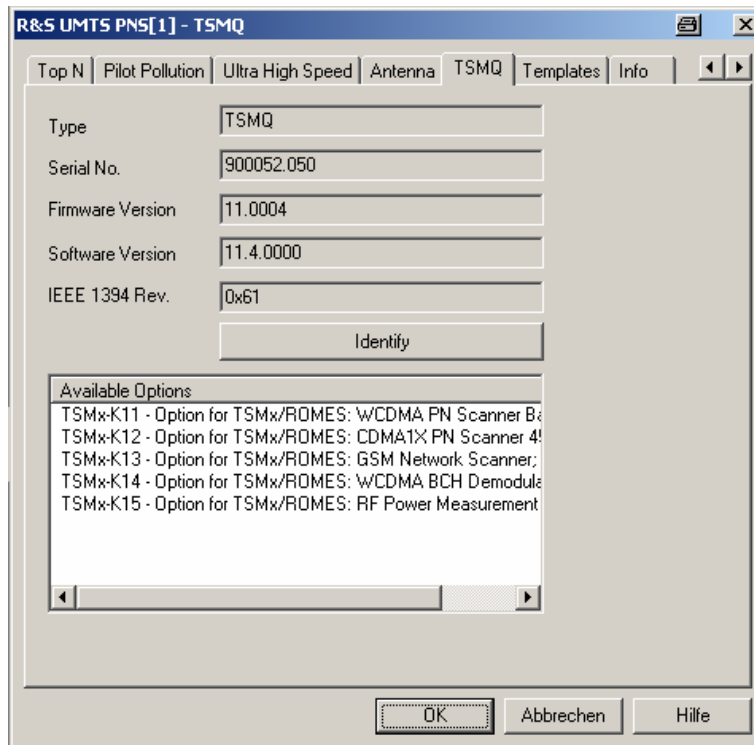


Fig. 6-105 UMTS PNS configuration – R&S TSMQ

Templates UMTS PNS (R&S TSMQ)

The *Templates* tab stores the current R&S TSMQ driver configurations as a template, lists, loads or deletes driver templates.

Note:

When a driver is loaded using *Configuration – Preferences – Hardware* (see section [Driver Installation](#) on p. 6.1 ff.) ROMES checks whether a driver template is stored in the *Driver Templates* directory and its subdirectories (see below). The driver can be loaded with default settings or with the settings stored in any of the templates found.

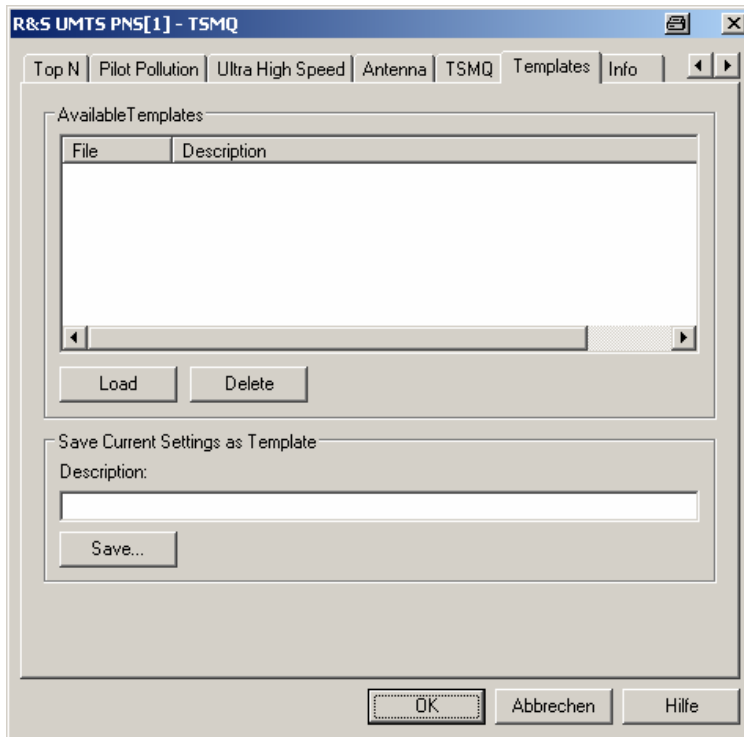
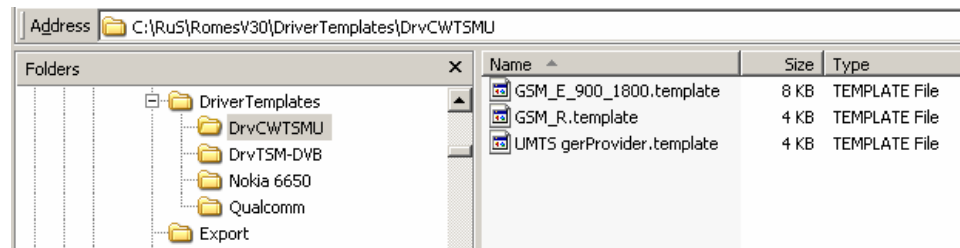


Fig. 6-106 UMTS PNS configuration – Templates

Load/Delete

Loads a driver template or deletes a template displayed in the list of *Available Templates*. Template files are ASCII files with the extension *.template. The template definition is independent of the workspace. A selection of template files for the R&S TSMx is supplied with the ROMES installation:



Save

Saves the current driver settings together with the *Description* to a selected template file.

Antenna UMTS PNS

The *Antenna* tab defines *Antenna Name*, *Antenna Gain* and *Cable Loss*. These values are used to correct the received signal powers:

- If a *Cable Loss* of n dB is specified, the system assumes the received signals to be attenuated by n dB. n dB is added to all measured signal powers so that the displayed results correspond to the unattenuated signal.
- If an *Antenna Gain* of n dB is specified, the system assumes the received signals to be amplified by n dB. n dB is subtracted from all measured signal powers so that the displayed results correspond to the unamplified signal

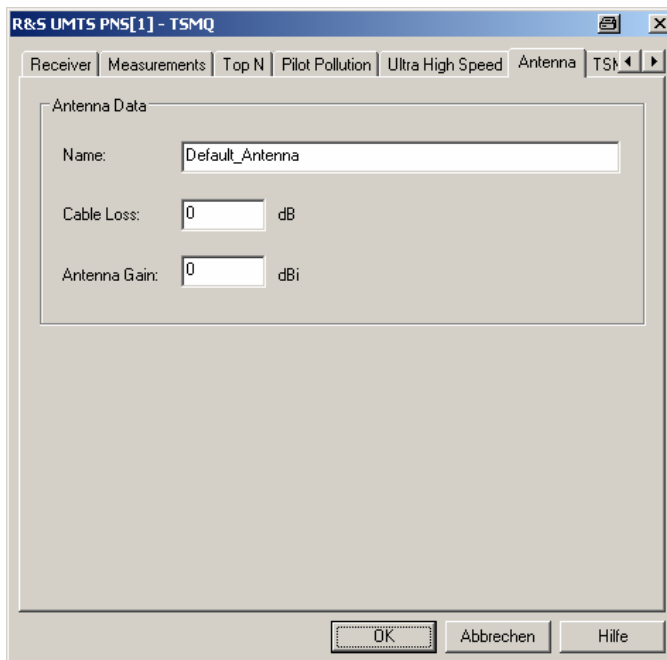


Fig. 6-107 UMTS PNS configuration – Antenna

GSM Network Scanner Driver

The GSM NWS (Network Scanner) driver controls a R&S TSMQ / R&S TSMU / R&S TSML-G radio network analyzer to measure and identify all GSM downlink signals in the air. The driver is available with option R&S ROMES-GS3, *GSM Network Scanner*.

Installation of the driver is explained in section [Driver Installation](#) on page 6.1; its configuration is explained below. The GSM NWS data can be viewed in the *GSM NWS Views* (see chapter 4). A special export format for GSM NWS data is described in chapter 7.

Resources Configuration GSM NWS

The GSM NWS driver is installed by selecting *GSM NWS – R&S GSM NWS* in the *ROMES Hardware Configuration* dialog (see [Fig. 6-1](#) on page 6.1).

A *Device Chooser* dialog is opened when the UMTS PNS driver is loaded. The *Device Chooser* is used to select the test device and the necessary options.

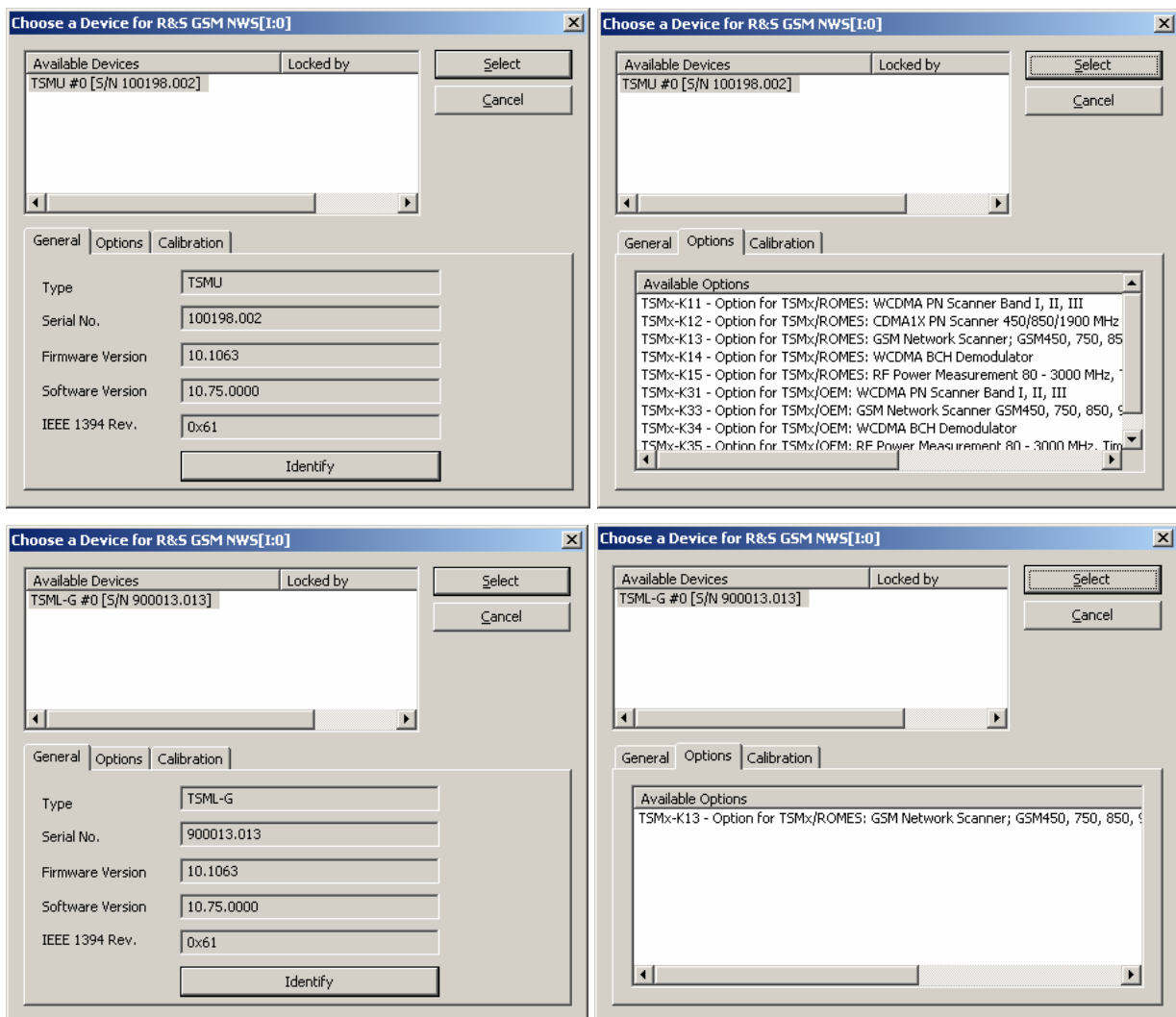
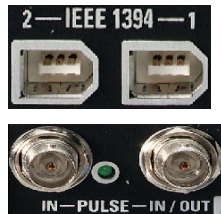


Fig. 6-108 GSM NWS Device Chooser R&S TSMQ / R&S TSMU / R&S TSML-G

R&S TSMx

The R&S TSMx must be connected to the controller via one of the Firewire interfaces (IEEE1394) on the rear panel. No external trigger unit is needed, however, the performance and accuracy of the GSM NWS Scanner measurement can be improved by adding a high-precision PPS (pulse per second) signal from a GPS receiver (e.g. GINA, Trimble Placer). The synchronization mode is selected in the *Setup GSM NWS Driver* tab of the driver configuration menu.



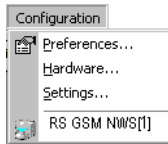
The PPS signal from the GPS receiver is directly fed to the BNC connector labeled *PULSE IN* at the rear panel of the R&S TSMU. No additional synchronization unit is required.



*The R&S TSMx operating manual and an installation tool for the Firewire Interface is provided on the ROMES CD-ROM. Refer to the directory *Firmware & Drivers\R&S RF Receivers\R&S TSMx*. See also the paragraph about the [Firewire Driver](#) on p. 6.10.*

Configuration Menus GSM NWS

ROMES provides a configuration menu for the GSM NWS driver that is opened by clicking the *RS GSM NWS[1]* command line in the *Configuration* menu. The command line is available as soon as the driver has been loaded.



The GSM NWS driver configuration menu contains several tabs to select the measured channels, the measurement rate, and the synchronization mode, to display information on the test receiver driver (*Info*), and to store the settings to a template.

Setup GSM NWS Driver

The *Setup GSM NWS Driver* tab selects the measured channels, the measurement rate, and the synchronization mode.

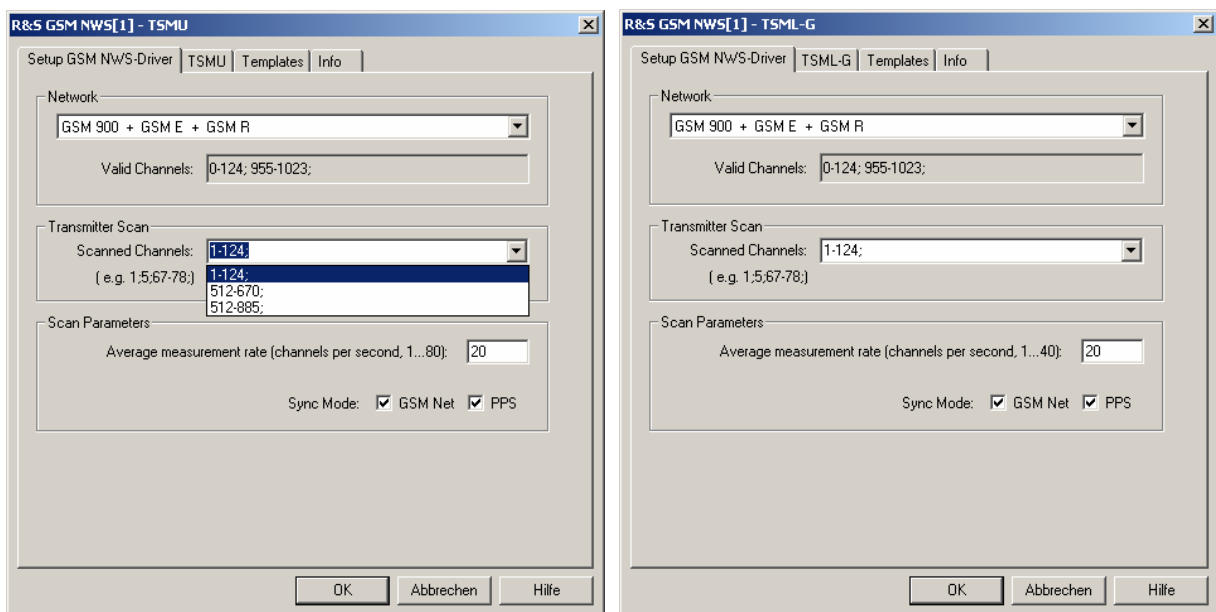


Fig. 6-109 GSM NWS configuration – Setup GSM NWS Driver

Network Selection of the measured GSM band or a combination of bands. The GSM channel numbers (ARFCNs) for the selected bands are displayed below (*Valid Channels*).

For an overview of GSM bands, channels, and frequencies refer to chapter 8.

Transmitter Scan Selection of the scanned channels within the selected GSM bands. The channels are scanned periodically with the measurement rate selected below. A warning *The channel list is invalid* indicates that one or more channels do not belong to any of the selected GSM bands.

Scan Parameters

Measurement rate and synchronization mode for the R&S TSMU:

and for R&S TSML-G:

Average measurement rate...

Number of GSM channels measured per second.

Please note that the R&S TSMU supports measurement rates up to 80 channels per second, and the R&S TSML-G supports up to 40 channels per second.

A lower measurement rate limits the size of the measurement file. If the system performance is not sufficient, ROMES reduces the amount of evaluated data by discarding part of the results acquired by the R&S TSMx.

Sync. Mode

Selection of the signal source providing the time base for the network scan measurements. In the default configuration where both checkboxes are selected, the GSM Netw. | PPS synchronization mode is used. If the GSM Net checkbox is cleared, PPS synchronization is used. If the PPS checkbox is cleared, GSM Network synchronization is used. If both checkboxes are cleared, the R&S TSMx uses internal synchronization.

R&S TSMx Synchronization

In addition to the default *PPS* time base setting described above, the R&S TSMx provides the following synchronization types for GSM network scans:

GSM Netw. | PPS

Use GSM Network or PPS synchronization, if one of these signal types is available. If none of the signals is available, use Internal synchronization. If both signal types are available and almost synchronous to each other, use the PPS signal. If both signal types are available but not synchronous, assume that the PPS signal is inaccurate (e.g. because the GPS receiver cannot detect a sufficient number of satellites so that it must use its internal reference signal) and use the GSM signal.

This mode is always used while no measurement is active.

GSM Network Synchronization by means of approx. 2/3 of the received GSM signals, discarding the signals with the strongest timing deviation and time drift. This mode remains active as long as the R&S TSMx is capable of measuring the signals from at least 3 GSM cells and the standard deviation of the time drift of all used signals is below 60 ns/s. If at least one of the two conditions is no longer met, the R&S TSMx automatically switches to Internal time base.

The R&S TSMx synchronizes either to the GSM900/1800 or GSM850/1900 dual band. When it is switched on the instrument automatically scans the entire frequency range and selects the dual band where signals are available. GSM Network is the recommended setting if no PPS signal is available.

PPS The PPS (pulse per second) signal from an external GPS receiver fed to the PULSE IN connector at the rear panel of the R&S TSMx is used for synchronization (see section [Resources Configuration](#) on p. 6.147 ff.). This signal provides maximum accuracy.

Internal Synchronization by means of the reference signal generated by the internal quartz oscillator of the analyzer. The internal time base is activated automatically if no PPS signal is available. While a network time base is selected, the network signals constantly correct the frequency and phase of the internal oscillator in order to compensate for a possible drift. If the network signals are affected by a systematic error (e.g. due to a Doppler shift in a moving test vehicle), Internal time base can be used to prevent this correction.

R&S TSMU / R&S TSML-G GSM NWS

The *TSMU* / *TSML-G* tabs display the properties of the R&S TSMU / R&S TSML-G devices and available options. This information is also displayed in the *Device Chooser* described on p. 6.20.

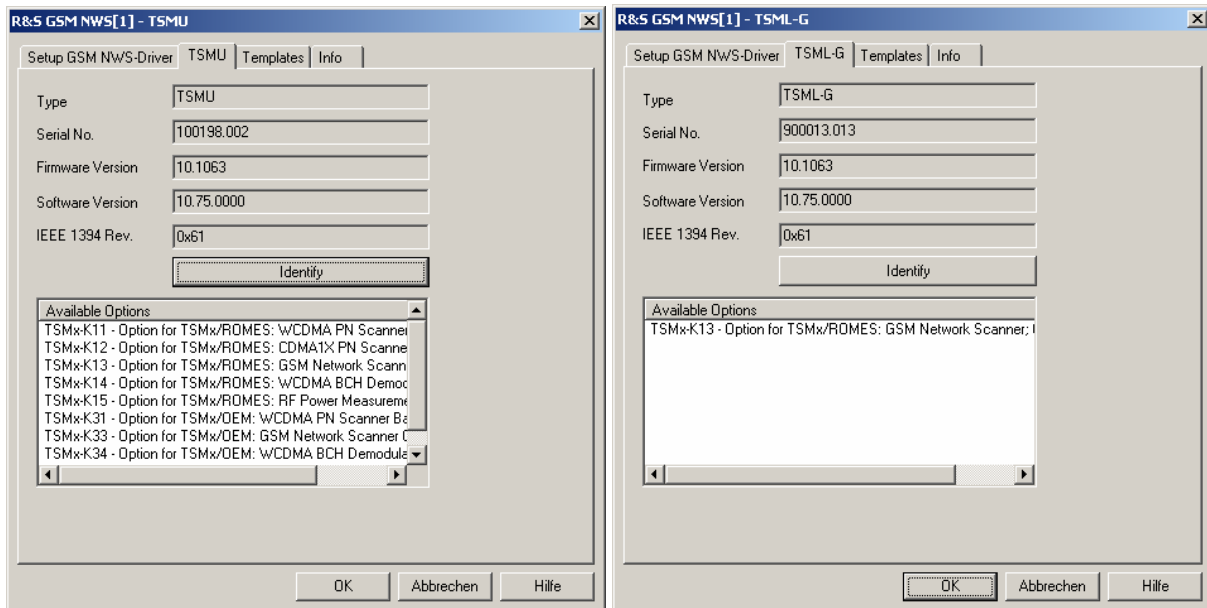


Fig. 6-110 GSM NWS configuration – R&S TSMU / TMSL-G

Templates GSM NWS

The *Templates* tab stores the current GSM NWS driver configuration as a template, lists, loads or deletes driver templates.

Note:

When a driver is loaded using *Configuration – Preferences – Hardware* (see section [Driver Installation](#) on p. 6.1 ff.) ROMES checks whether a driver template is stored in the *Driver Templates* directory and its subdirectories (see below). The driver can be loaded with default settings or with the settings stored in any of the templates found.

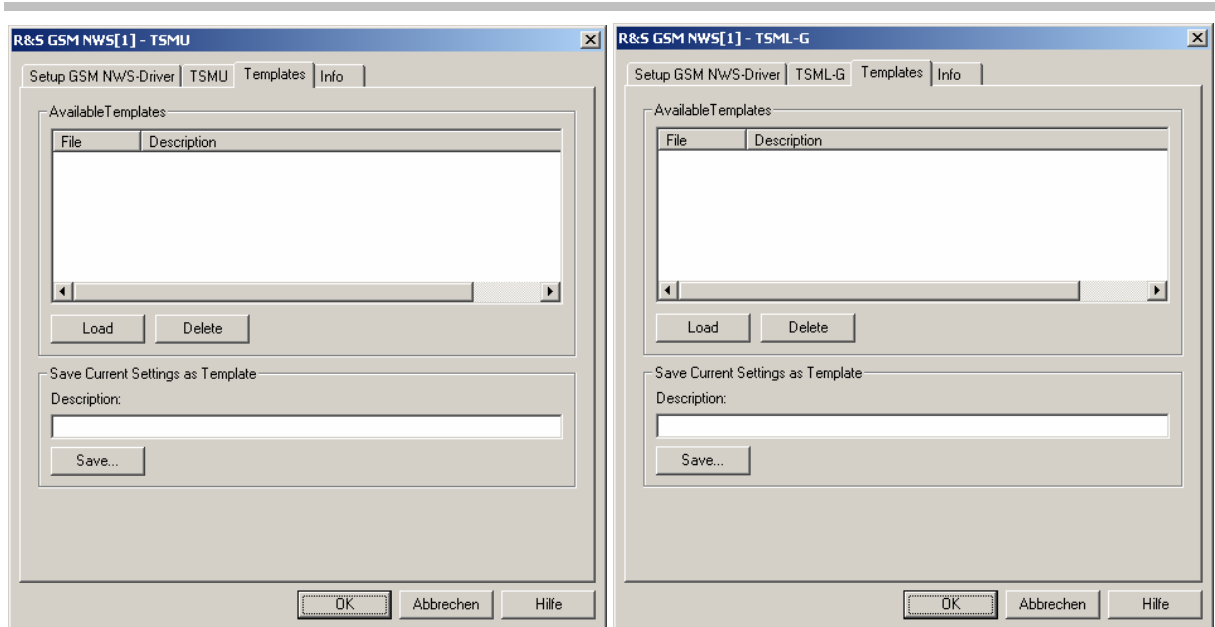
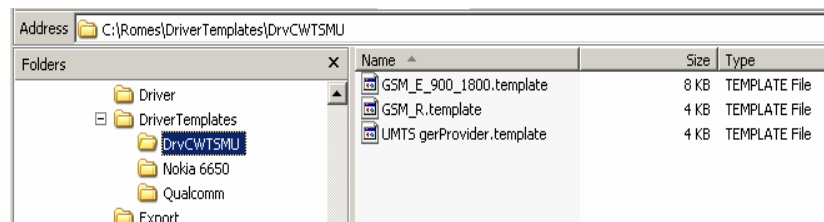


Fig. 6-111 GSM NWS configuration – Templates

Load/Delete

Loads a driver template or deletes a template displayed in the list of *Available Templates*. Template files are ASCII files with the extension *.template. The template definition is independent of the workspace. A selection of template files for the R&S TSMx is supplied with the ROMES installation:



Save

Saves the current driver settings together with the *Description* to a selected template file.

CDMA2000 PN Scanner (PNS) Driver

The CDMA PNS (Pseudo Noise Scanner) driver controls an R&S TSMQ / R&S TSMU / R&S TSML-C radio network analyzer in order to perform CDMA Pseudo Noise (PN) scan. In a CDMA PN scan, the test device measures and identifies all CDMA2000 downlink (BTS) signals in the air.

Installation of the driver is explained in section [Driver Installation](#) on page 6.1; its configuration is explained below. The CDMA PN data can be viewed in the *CDMA PNS Views* (see chapter 3).

Resources Configuration CDMA PNS

The CDMA PNS driver is installed by selecting *CDMA2000 PN Scanner – R&S PNS* in the *ROMES Hardware Configuration* window (see [Fig. 6-1](#) on page 6.1).

A *Device Chooser* dialog is opened when the CDMA PNS driver is loaded. The *Device Chooser* is used to select the test device and to define the essential connection parameters, if necessary.

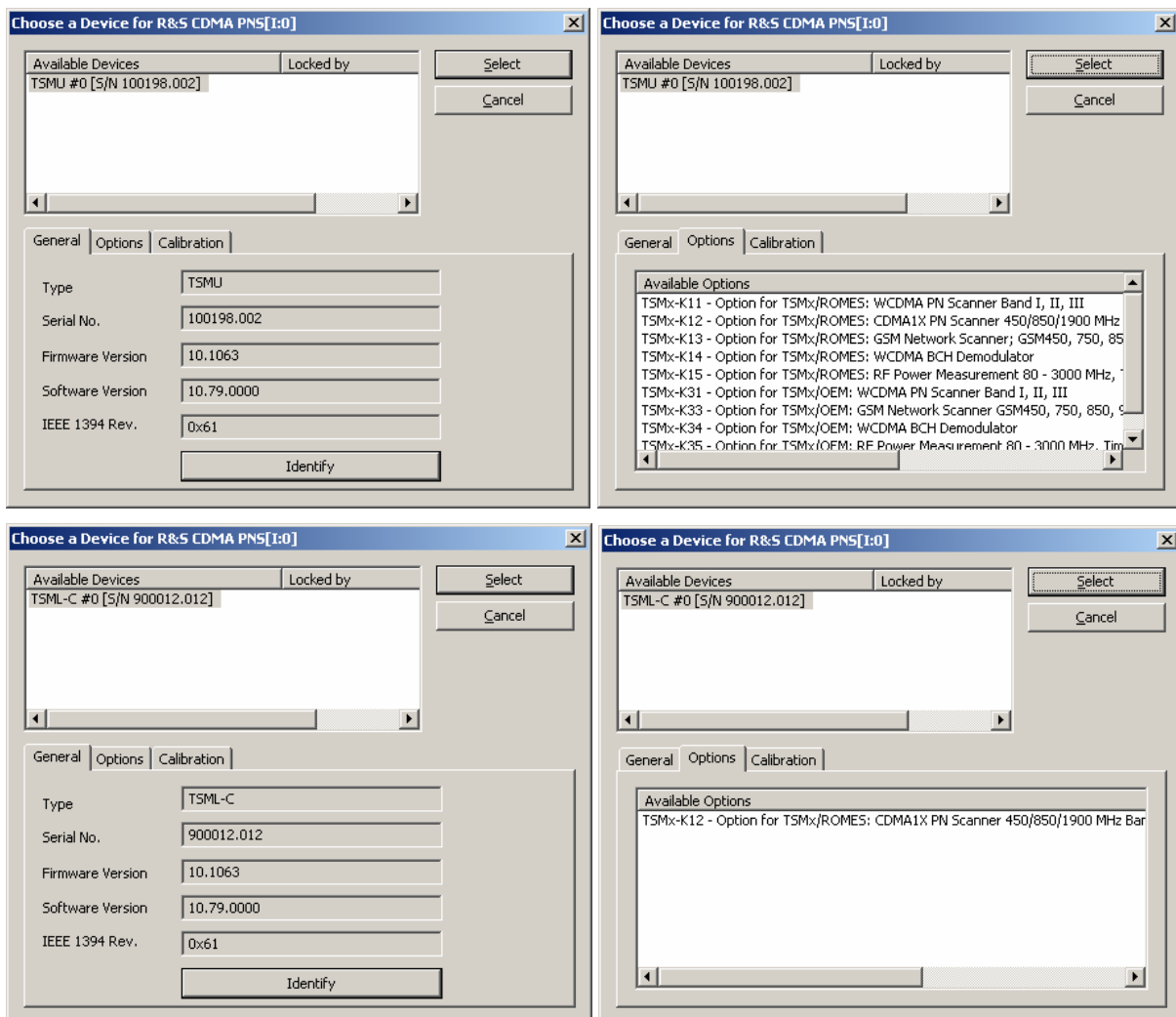
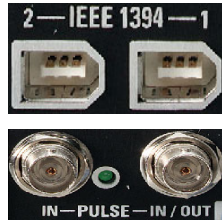


Fig. 6-112 CDMA PNS Device Chooser R&S TSMQ / R&S TSMU / R&S TSML-C

TSMx

The R&S TSMx must be connected to the controller via one of the Firewire interfaces (IEEE1394) on the rear panel. No external trigger unit is needed, however, the performance and accuracy of the CDMA PN Scanner measurement can be improved by adding a high-precision PPS (pulse per second) signal from a GPS receiver (e.g. GINA, Trimble Placer). The synchronization mode (*Time Base*) is selected in the *Measurements* tab of the driver configuration menu (*TSMx Advanced Settings*).



The PPS signal from the GPS receiver is directly fed to the BNC connector labeled *PULSE IN* at the rear panel of the R&S TSMx. No additional synchronization unit is required.



The R&S TSMx operating manual and an installation tool for the Firewire Interface is provided on the ROMES CD-ROM. Refer to the directory *Firmware & Drivers\R&S RF Receivers\R&S TSMx*. See also the paragraph about the [Firewire Driver](#) on p. 6.10.

Configuration Menus CDMA PNS

ROMES provides a configuration menu for the CDMA PNS driver that is opened by clicking the *RS CDMA PNS[1]* command line in the *Configuration* menu. The command line is available as soon as the driver has been loaded.

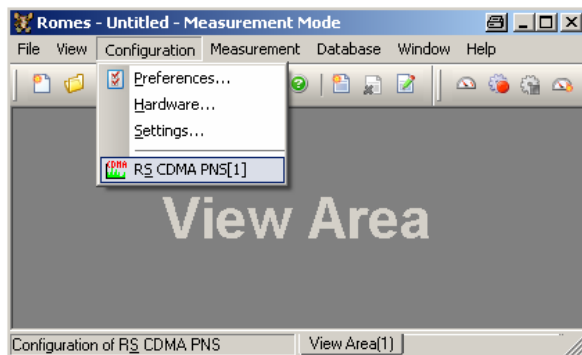


Fig. 6-113 Accessing the CDMA PNS driver configurations

The CDMA PNS driver configuration menu contains several tabs to display information on the test receiver driver (*Info*), configure the *Receiver* and the two alternate *Measurements*, identify the connected R&S TSMU / R&S TSML-C and their options, and load driver *Templates*.

Receiver settings CDMA PNS

The *Receiver* tab selects the frequencies measured in an CDMA PN scan.

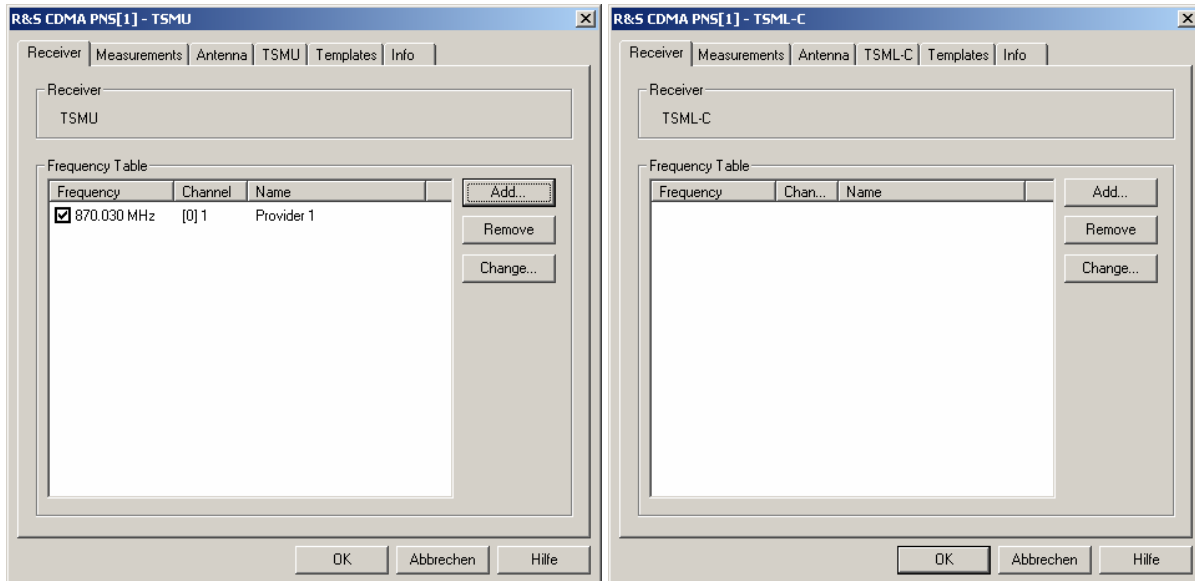


Fig. 6-114 CDMA PNS configuration – Receiver

Frequency Table The *Frequency Table* displays a selection of forward CDMA frequencies with their channel numbers. In the *Channel* columns, the SR 1 band class of the channel is displayed in angular brackets. To modify or extend the list use the *Add Frequency* dialog; see below. The R&S TSMU / R&S TSML-C measure all channels with selected check boxes.

Add Opens a dialog for adding a new channel frequency to the table; see section [Add Frequency](#) below.

Remove Removes a selected channel from the list.

Change Opens an input field to change the *Name* of the current channel or assign a new name.

Add Frequency CDMA PNS

The *Add Frequency* dialog adds frequencies to the frequency table in the *Receiver* tab (see above). It is opened by the *Add...* button in the *Receiver* tab of the R&S CDMA PNS driver configuration menu.

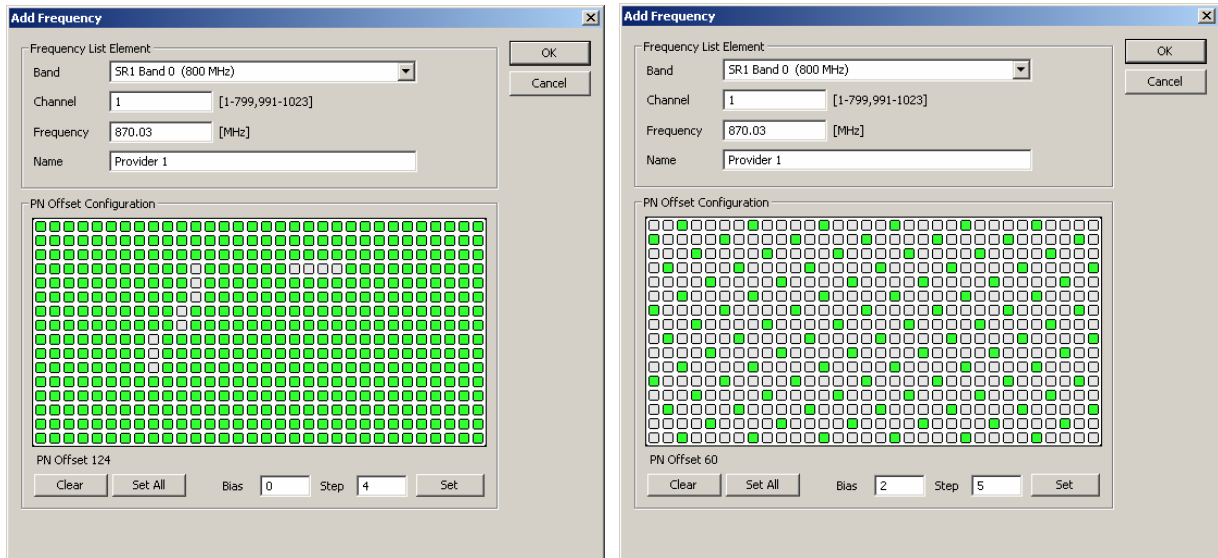


Fig. 6-115 CDMA PNS configuration – Add Frequency

Frequency List Element

Adds frequencies to the frequency table in the *Receiver* tab. The driver supports all Spreading Rate 1 (SR 1) band classes 0 to 10 specified in standard 3GPP2 C.S0002. It is even possible to select frequencies off the nominal CDMA downlink bands.

- Band** Selection of the SR 1 band class (0 to 10).
- Channel** CDMA channel number within the selected band. If an undefined channel number is specified, the frequency becomes invalid.
- Frequency** Either the frequency calculated according to the selected *Band* and *Channel*, or any frequency within the R&S TSMU frequency range. *Out of Band !* indicates that the frequency entered is an off-band frequency.
- Name** Arbitrary, optional identification string for the selected frequency.

PN Offset Configuration

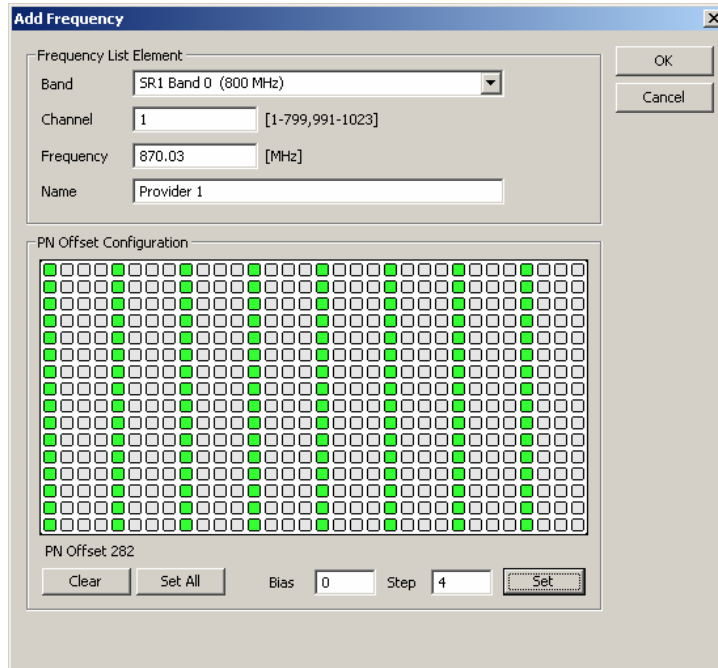
Different CDMA cells and cell sectors all use the same short code, but use different phases of it, which is how the mobile differentiates them from each other. The phase is known as the *PN Offset*, which defines the offset of the PN sequence. Changing the PN offset changes the timing of the pilot channel, the timing and contents of the sync channel message, and the long code mask of the paging channel.

Each square represents one unit of 64 PN chips. The squares can either be selected manually (clicking on a square toggles its value) or they can be defined by entering values into the *Bias* and *Step* entry fields, which are activated by the *Set* button.

- PN Offset** Shows the selected value for the PN Offset as configured (range from 0 to +511)
- Clear** Clears all unit squares in the PN Offset Configuration table.
- Set All** Sets all unit squares in the *PN Offset Configuration* table.

- Bias** The bias value sets the number of cleared unit squares at the beginning of the *PN Offset Configuration* table. The change becomes active after *Set* is clicked.
- Step** The step value defines the interval of the set unit squares as a sequence. The change becomes active after *Set* is clicked.
- Set** Activates the defined settings for *Bias* and *Step*.

An example for a setup with a Bias of 0 and a Step of 4, resulting in a PN Offset of 282, is shown below:



Measurements CDMA PNS

The *Measurements* tab defines general measurement settings for the CDMA PN scan.

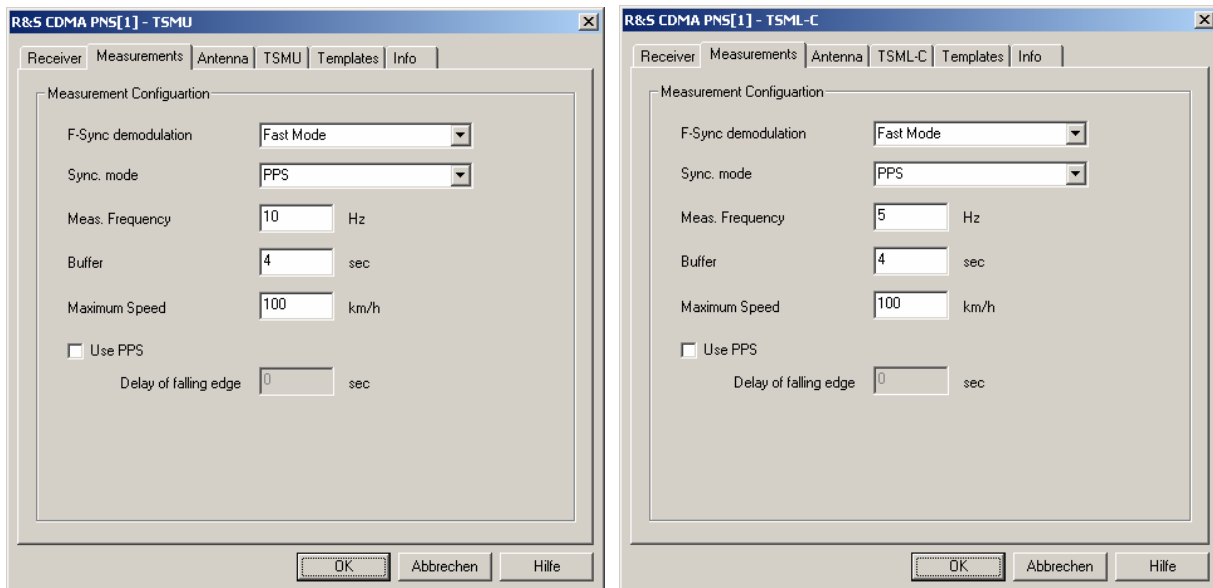


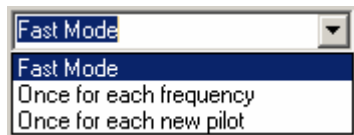
Fig. 6-116 CDMA PNS configuration – Measurements

Measurement Configuration

The settings in the *Measurement Configuration* panel define how ROMES processes the baseband (I/Q) data for an CDMA PN scan.

F-SYNC Demodulation

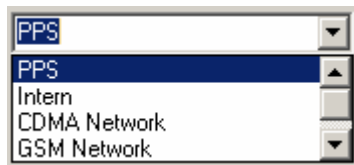
Determines how often the R&S TSMU will demodulate the Forward Synchronization Channel (F-SYNC) and decode the information elements in the synchronization message (see description of the *CDMA PNS F-SYNC View* in chapter 4).



The synchronization message is demodulated at least once per measured frequency. A smaller F-SYNC demodulation rate has no impact on the measurement but can considerably reduce the size of the measurement file.

Sync. Mode

Signal source providing the time base for the R&S TSMx measurements. The R&S TSMx must synchronize to a reference signal at the beginning of each measurement. The R&S TSMx provides the following methods for synchronization:

**PPS**

The PPS (pulse per second) signal from an external GPS receiver fed to the *PULSE IN* connector at the rear panel of the R&S TSMx is used for synchronization (see section [Resources Configuration](#) on p. 6.147 ff.). This signal provides maximum accuracy.

Intern

Synchronization by means of the reference signal generated by the internal quartz oscillator of the analyzer. The internal time base is activated automatically if no PPS signal is available. While a network time base is selected, the network signals constantly correct the frequency and phase of the internal oscillator in order to compensate for a possible drift. If the network signals are affected by a systematic error (e.g. due to a Doppler shift in a moving test vehicle), *Internal* time base can be used to prevent this correction.

CDMA Network

Synchronization by means of the received CDMA signals. *CDMA Network* is the recommended setting if no PPS signal is available.

GSM Network Synchronization by means of approx. 2/3 of the received GSM signals, discarding the signals with the strongest timing deviation and time drift. This mode remains active as long as the R&S TSMx is capable of measuring the signals from at least 3 GSM cells and the standard deviation of the time drift of all used signals is below 60 ns/s. If at least one of the two conditions is no longer met, the R&S TSMx automatically switches to *Internal* time base.

The R&S TSMx synchronizes either to the GSM900/1800 or GSM850/1900 dual band. When it is switched on the instrument automatically scans the entire frequency range and selects the dual band where signals are available. *GSM Network* is the recommended setting if no PPS signal is available.

GSM Netw. | PPS Use *GSM Network* or *PPS* synchronization, if one of these signal types is available. If none of the signals is available, use *Internal* synchronization. If both signal types are available and almost synchronous to each other, use the PPS signal. If both signal types are available but not synchronous, assume that the PPS signal is inaccurate (e.g. because the GPS receiver cannot detect a sufficient number of satellites so that it must use its internal reference signal) and use the GSM signal.

This mode is always used while no measurement is active.

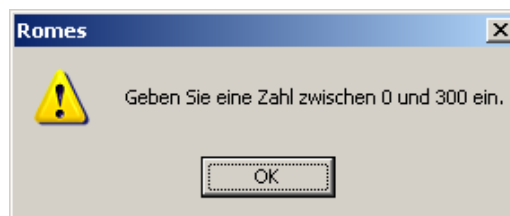
Buffer

Time for which the raw measurement data is stored in the R&S TSMx, should ROMES be unable to process it immediately (e.g. due to temporary low performance of the controller). If the ROMES buffer continues to be blocked after the buffer size time, the oldest data in the buffer is deleted and overwritten by new data. Data transfer starts as soon as ROMES is ready again to receive and process data.

A large buffer size increases the probability that no measurement data is lost, even though ROMES may be blocked for an extended time. On the other hand, storage and transfer of large amounts of buffer data increase the possible delay between data recording and evaluation/display in the views.

Maximum Speed

The value for the maximum speed of the measurement vehicle is used for improved evaluation of fading channel measurements. The range is between 0 and 300 km/h, otherwise an error message is displayed:



(Please enter a number between 0 and 300)

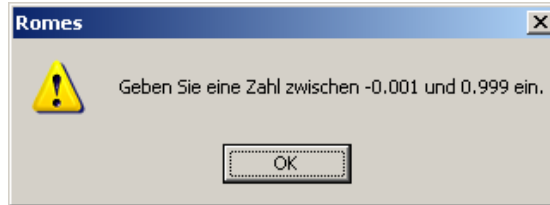
Use PPS

The checkbox toggles the use of the PPS (pulse per second) signal from an external GPS receiver.

If *Use PPS* is activated, the delay of the falling edge of the PPS signal can be manually set in the corresponding field. This is useful for the calibration of the

PPS propagation delay as described below.

The possible range is between -0.0010000 and 0.9999999 s, otherwise an error message is displayed:



(Please enter a number between -0.001 and 0.999)

Calibration of the PPS Delay CDMA PNS

The calibration of the PPS delay is done by first performing a measurement of a base station with a known distance. This measurement is configured such that "Use PPS" is deactivated:

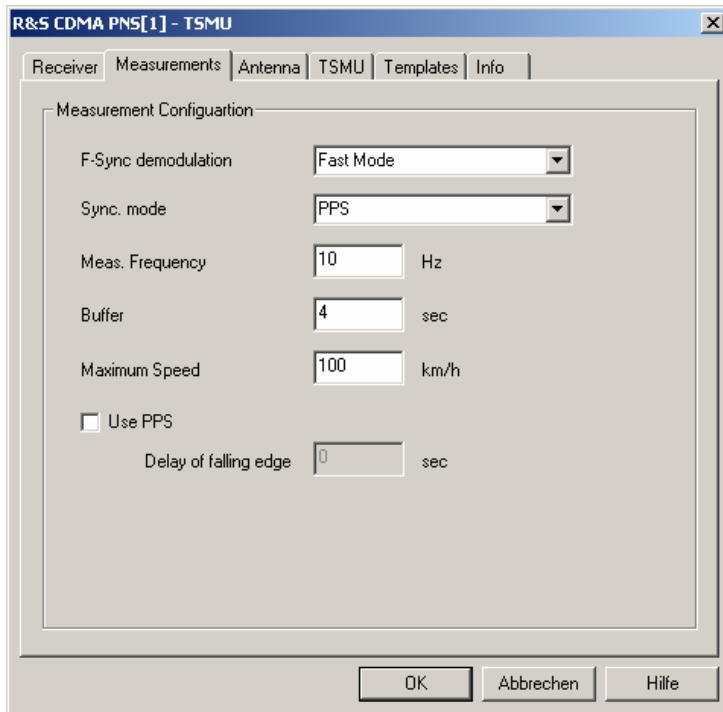
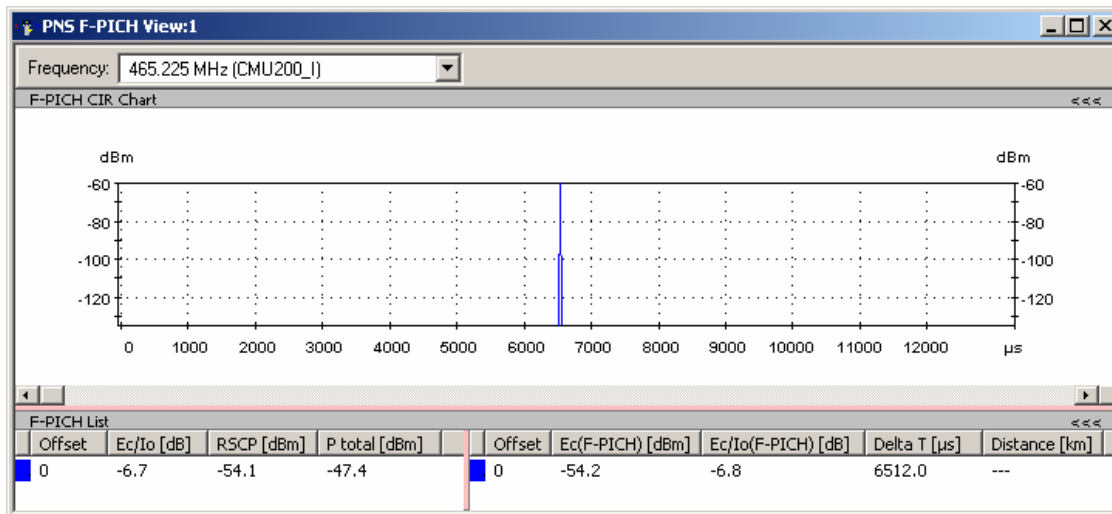


Fig. 6-117 CDMA PNS R&S TSMU configuration – PPS Calibration

The measurement of the station with known distance yields the reference signal propagation time (ΔT_{Ref}). In the *PNS F-PICH View* list the measured ΔT (the time delay of the signal slot timing relative to the CDMA system time or GPS time) is shown.

In this example the $\Delta T_{Meas.}$ is 6512 μ s.



Also, the *PNS System Time Line Estimation View* shows the measured PPS Delay without calibration.

With these values, return to the CDMA PNS R&S TSMU measurement configuration tab (see [Fig. 6-117](#)).

an enter the *Delay of falling edge*, which is calculated as follows:

$$\text{Delay of falling edge} = \text{PPS Delay}_{\text{Meas.}} - (\text{Delta T}_{\text{Meas.}} - \text{Delta T}_{\text{Ref.}})$$

The entered value should be as exact as possible (**at least 7 decimal places**), because 0,1 μs corresponds to 30 m distance, even though the dialog window only suggests three decimal places.

Note that as long as the measurements are performed in the same network using the same GPS/PPS signal source, the calibration is not necessary. For measurements in different networks, the calibration can be useful and if a different GPS signal source is used, the PPS calibration is recommended.

Antenna CDMA PNS

The *Antenna* tab defines *Antenna Name*, *Antenna Gain* and *Cable Loss*. These values are used to correct the received signal powers:

- If a *Cable Loss* of n dB is specified, the system assumes the received signals to be attenuated by n dB. n dB is added to all measured signal powers so that the displayed results correspond to the unattenuated signal.
- If an *Antenna Gain* of n dB is specified, the system assumes the received signals to be amplified by n dB. n dB is subtracted from all measured signal powers so that the displayed results correspond to the unamplified signal

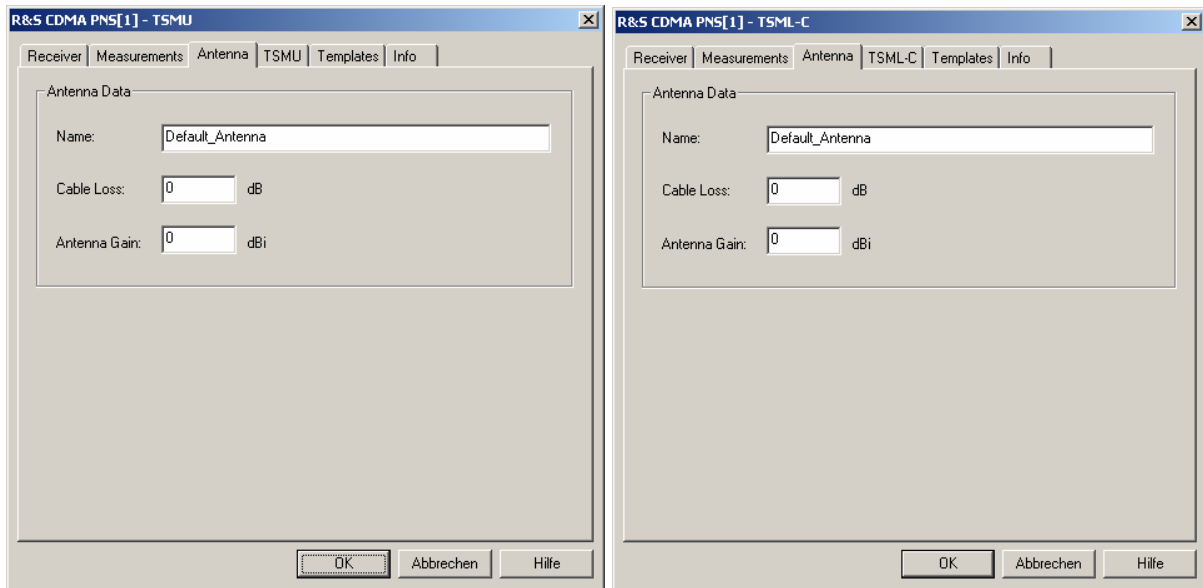


Fig. 6-118 CDMA PNS configuration – Antenna

R&S TSMU / R&S TSML-C CDMA PNS

The *TSMU* / *TSML-C* tabs display the properties of the R&S TSMU or R&S TSML-C and their available options. This information is also displayed in the *Device Chooser* described on p. 6.20.

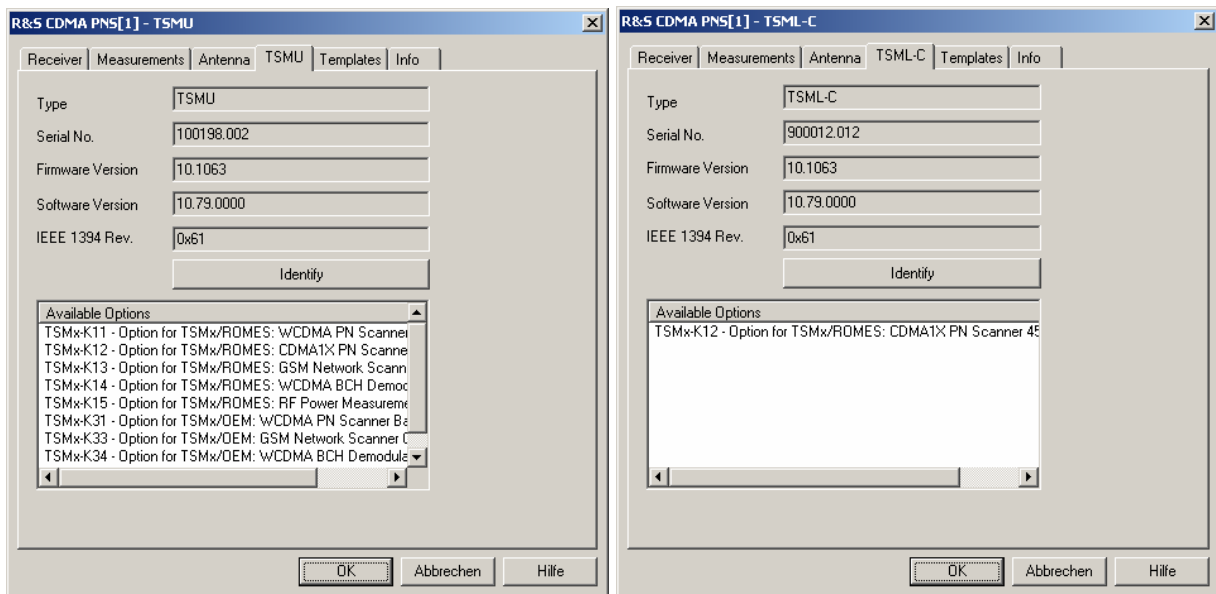


Fig. 6-119 CDMA PNS configuration – R&S TSMU / R&S TSML-C

Templates R&S TSMQ / R&S TSMU / R&S TSML-C CDMA PNS

The *Templates* tab stores the current R&S TSMQ / R&S TSMU / R&S TSML-C driver configuration as a template, lists, loads or deletes driver templates.

Note:

When a driver is loaded using *Configuration – Preferences – Hardware* (see section [Driver Installation](#) on p. 6.1 ff.) ROMES checks whether a driver template is stored in the *Driver Templates* directory and its subdirectories (see below). The driver can be loaded with default settings or with the settings stored in any of the templates found.

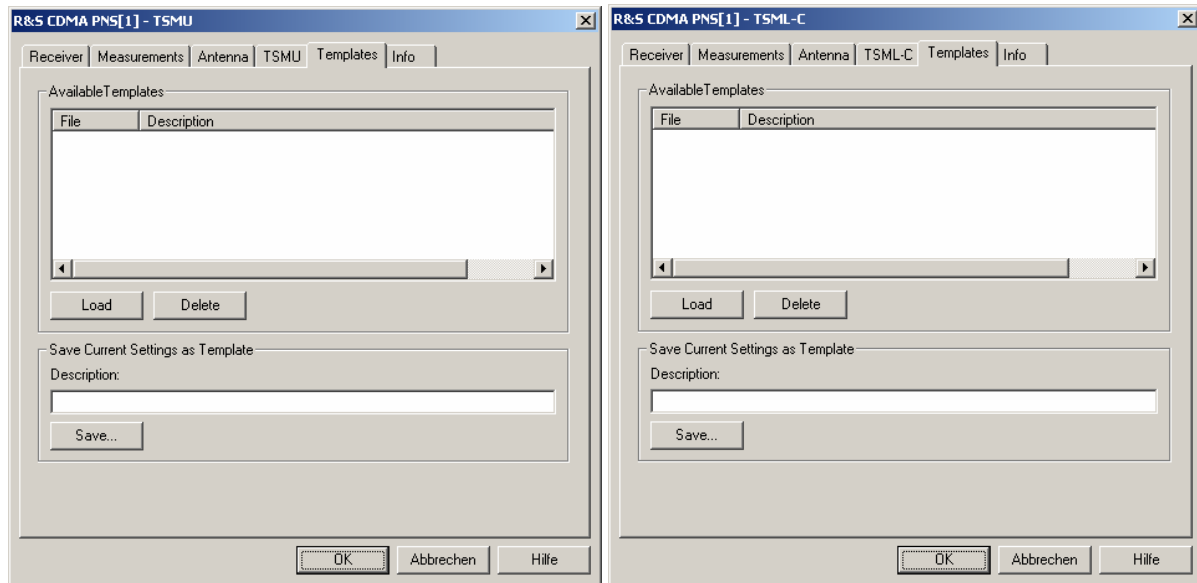


Fig. 6-120 CDMA PNS configuration – Templates

Load/Delete

Loads a driver template or deletes a template displayed in the list of *Available Templates*. Template files are ASCII files with the extension *.template. The template definition is independent of the workspace. A selection of template files for the R&S TSMx is supplied with the ROMES installation:

Address		C:\Romes\DriverTemplates\DrvCWTSMU	
Folders	Name	Size	Type
Driver	GSM_E_900_1800.template	8 KB	TEMPLATE File
DriverTemplates	GSM_R.template	4 KB	TEMPLATE File
DrvCWTSMU	UMTS gerProvider.template	4 KB	TEMPLATE File
Nokia 6650			
Qualcomm			
Export			

Save

Saves the current driver settings together with the *Description* to a selected template file.

WLAN (NDIS) Driver

The *IEEE 802.11 WLAN (NDIS)* driver controls the data transfer from Wireless LAN client adapters supporting Network Device Interface Specification (NDIS) V5.1 or higher, in particular the *CISCO Aironet Series 350 IEEE 802.11 Wireless LAN Client Adapter*.

Installation of the driver is explained in section [Driver Installation](#) on page 6.1; its configuration is explained below. The measured WLAN data can be viewed in the *WLAN Views* and in many general purpose views (see chapter 4).

Resources Configuration WLAN (NDIS)

The *WLAN (NDIS)* driver is installed by selecting *WLAN – NDIS* in the *ROMES Hardware Configuration* dialog (see [Fig. 6-1](#) on page 6.1). ROMES uses the adapter as it is configured by the manufacturer or by means of the manufacturer's configuration utility. Important adapter configuration parameters are displayed in the driver configuration menu.

The *CISCO Aironet Series 350 IEEE 802.11 Wireless LAN Client Adapter* supports the full functionality of the ROMES WLAN option.

Configuration Menus WLAN (NDIS)

ROMES provides a configuration menu for the *WLAN (NDIS)* driver that is opened by clicking the *WLAN (NDIS) [1]* command line in the *Configuration* menu. The command line is available as soon as the driver has been loaded.

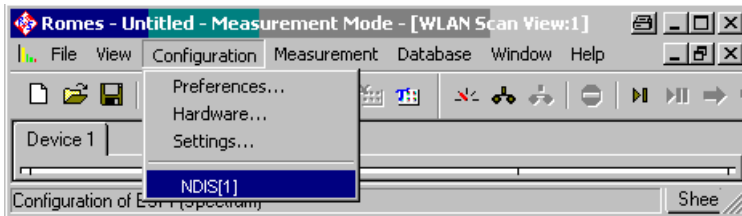


Fig. 6-121 Accessing the WLAN (NDIS) driver configurations

The *WLAN (NDIS)* driver configuration menu and configures the measurement interval and channel (*Device Setup*) and provides information on the test receiver driver (*Info*) and the device (*Device Info*).

Device Setup WLAN (NDIS)

The *Device Setup* tab selects the measurement interval and channel.

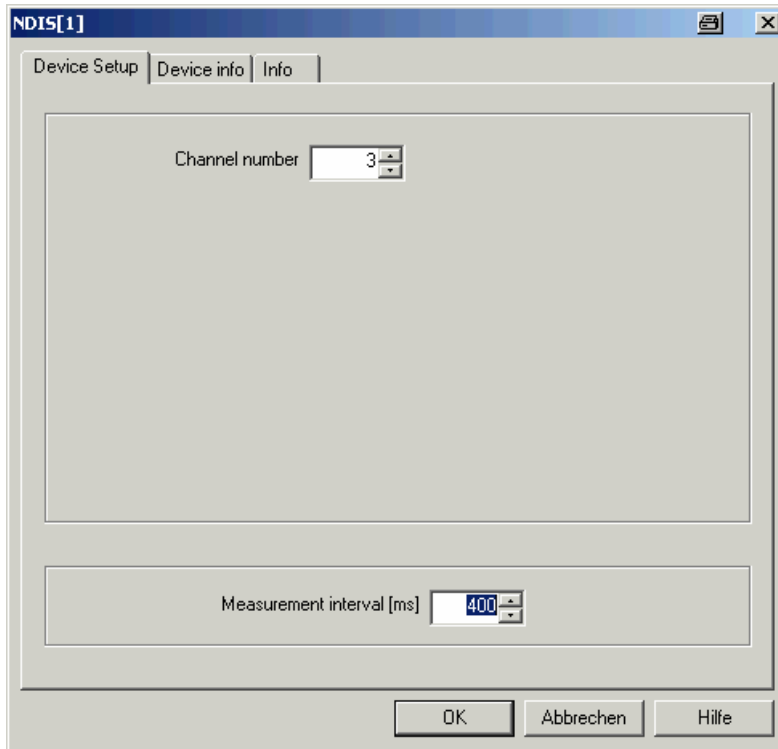


Fig. 6-122 WLAN (NDIS) configuration – Device Setup

Channel number Channel used for the noise measurement, providing the *Noise* and *S/N* results in the *WLAN Survey View* and the *WLAN S/N View*. The noise measurement and the channel definition requires a *CISCO Aironet Series 350 IEEE 802.11 Wireless LAN Client Adapter*.

Measurement interval [ms] The *Measurement interval* is the time in ms after which ROMES records and evaluates a new set of measurement data from the test device. A short measurement interval allows to analyze quick variations of the signal quality and the data traffic but causes large measurement files and requires more ROMES system capacity.

The actual update interval of the data in the test device is generally shorter than the *Measurement interval* so that ROMES skips part of the available information. This update interval is not influenced by the driver settings.

Device Info WLAN (NDIS)

The *Device Info* tab displays information about the test device.

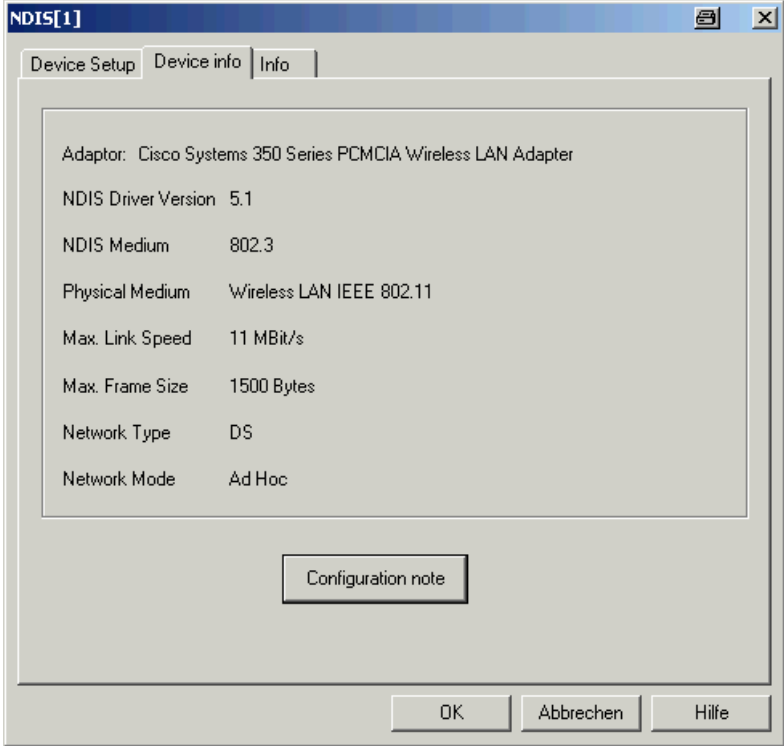


Fig. 6-123 WLAN (NDIS) configuration – Receiver

Device-Independent Drivers (QoS)

The drivers in this section do not depend on a particular test device or technology. They can be loaded as explained in section [Driver Installation](#) on page 6.1, however, the ports (if needed) are assigned in the driver configuration menus.

Data Quality Tester Driver (DQA)

The DQA driver controls the measurement of parameters assessing the Quality of Service (QoS) of any kind of data transfer connection by means of the Data Quality Tester (DQA) ROMES-Z6.

Installation of the driver is explained in section [Driver Installation](#) on page 6.1; its configuration is explained below. The DQA data can be viewed in the *QoS Views* (see chapter 3). An example procedure for setting up and testing a connection is described in chapter 2; see section *Data Quality Tester*.

Resources Configuration DQA

The DQA driver is installed by selecting *QoS – QoS Tester* in the *ROMES Hardware Configuration* window (see [Fig. 6-1](#) on page 6.1). Loading the driver does not require any hardware or additional test devices. In fact the Data Quality Tester can be used to test the QoS of any kind of physical connection between the test system and a remote address. The connection can be a network connection established by means of test mobiles of any supported technology (GSM, GPRS, HSCSD, EDGE, UMTS, ...) or a fixed connection to a remote server accessible from the test system. The driver provides configuration menus to configure and set up the different types of connections.

If test mobiles are used, the results of the DQA complement the information acquired by means of the test mobile drivers.

Configuration Menus DQA

ROMES provides a configuration menu for the DQA driver that is opened by clicking the *DQA[1]* command line in the *Configuration* menu. The command line is available as soon as the driver has been loaded.

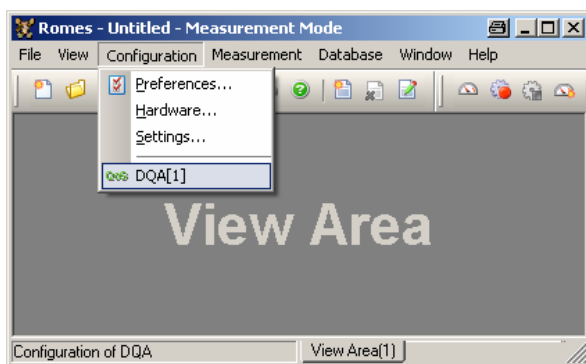


Fig. 6-124 Accessing the DQA driver configurations

The DQA driver configuration menu contains several tabs to define the connections to be set up and closed during the measurement, select connection and network-related parameters to be recorded, define patch files and display information on the current DQA driver version.

DQA Settings

The *DQA Settings* tab arranges and configures a list of jobs, each of them defining a connection to be set up or closed and defines a test file of definite size to be transferred.

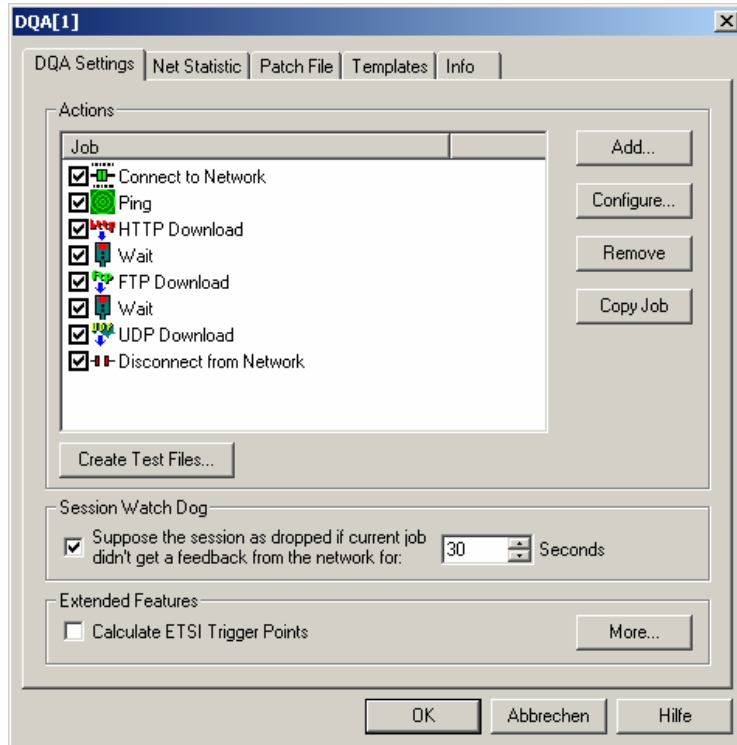


Fig. 6-125 DQA driver configuration – DQA settings

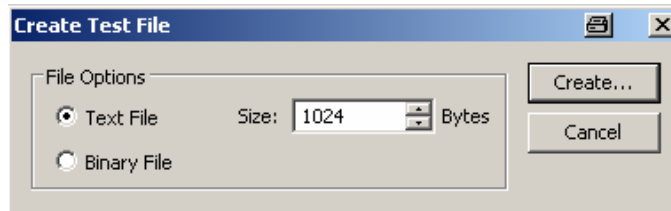
Job list

The list shows the jobs to be executed in the DQA measurement. The jobs will be executed in the order of the list. According to the example of [Fig. 6-125 above](#), ROMES will first set up a call to a network provider, then send a ping to a remote server, access an URL and download a HTTP site, wait for a predefined time period, download a file from a remote FTP server, wait for a predefined time period, download a file using UDP, download an e-mail, and finally release the call to the network provider. The entire job list is executed repeatedly while the DQA measurement is running.

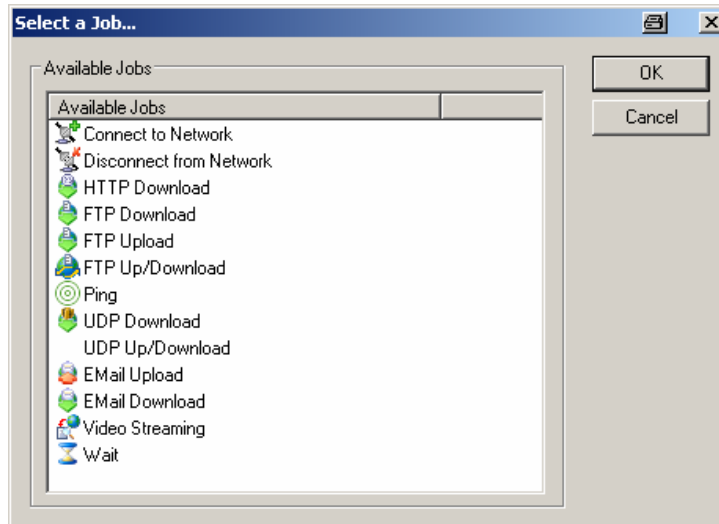
A click on a job selects the job for further actions; see description of *Add...*, *Configure...*, *Remove* and *Copy Job* buttons below. A double-click opens the configuration menu for the job; see below.

Create Test Files...

The *Create Test Files* button to define the size and file format (*Text File* or *Binary File*) of a test file that can be stored to a local directory and used for file transfer to a remote location. The contents of the file are random. A file of definite size is useful for many DQA applications.

**Add**

The *Add* button opens a list of jobs to be added to the current job list.



A new job is added at the end of the list (if no existing job is selected in the list) or directly before the selected job. The configuration menus for each job are opened before this is done.

Configure

The *Configure* button opens the configuration menu for the selected job. It is disabled as long as no job is selected in the *Job* list. The configuration menus provide input fields for the remote addresses to access and additional settings like timeouts. A separate configuration menu is provided for each job; see section

[Configuration menus for the DQA jobs.](#)

Copy Job

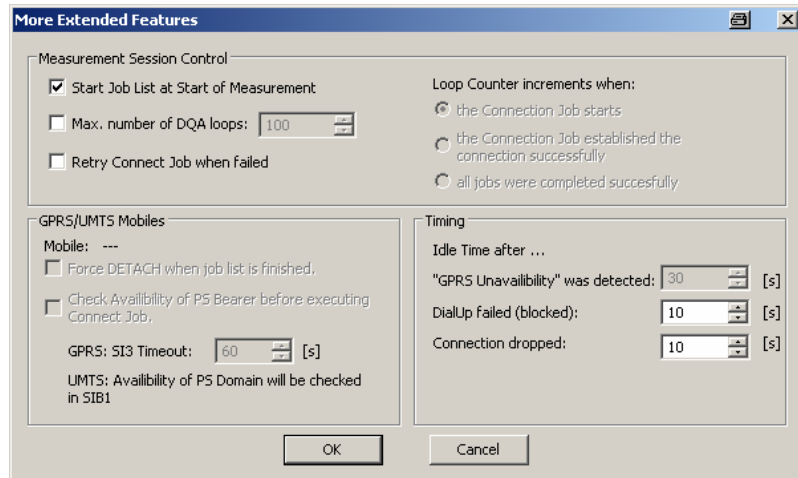
Duplicates the job selected in the job list.

Extended Features

Provides various settings to control the timing and statistics of the DQA session.

<i>Calculate ETSI Trigger Points</i>	Calculate trigger points according to the ETSI (IREG) specification; this provides parameters such as the <i>FTP Setup Time</i> , <i>GPRS Setup Time</i> etc. This feature is not time or performance critical. If the ETSI trigger points are disabled, the corresponding parameters in the QoS views are not available. For more information refer to the ETSI specifications, e.g. TS 102.250-3 (formerly: PRD IR.42) and related documents.
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More... Opens the *More Extended Features* dialog.



The two checkboxes in the *Measurement Session Control* panel define how and how often the job list is executed:

Start Job List ... If active, the entire job list is automatically started when the DQA measurement is initiated (*Measurement – Start Measurement*). Otherwise it is paused and can be initiated via *Action – DQA – Enable DQA*.

Max. Number of... Limits the scope of the DQA measurement to a maximum number of job lists (loops) to be executed. In addition it is possible to specify whether all loops or just the successful loops are counted.

Retry Connect... If this check box is selected ROMES will try to dial up to the network repeatedly if the previous connection fails.

GPRS/UMTS Mobiles Controls a packet switched (PS) data connection through a GPRS or UMTS mobile. The panel is enabled after an appropriate GSM or UMTS driver is loaded and the virtual COM ports have been assigned; see section [Connection via USB Interface](#) on p. 6.5 ff. In the panel, it is possible to force the PS service to be detached after each job, to check whether the network supports the PS service (*Check Availability of ...*). PS support is indicated through layer 3 System Information messages or blocks. For GSM/GPRS networks it is possible to specify a timeout after which a network will be considered as not supporting the PS service. An additional idle time after *GPRS Unavailability was detected* can be set in the *Timing* panel.

Timing Defines an idle time to be inserted each time the connection failed because the cell was blocked, and each time the connection was dropped.

Configuration menus for the DQA jobs

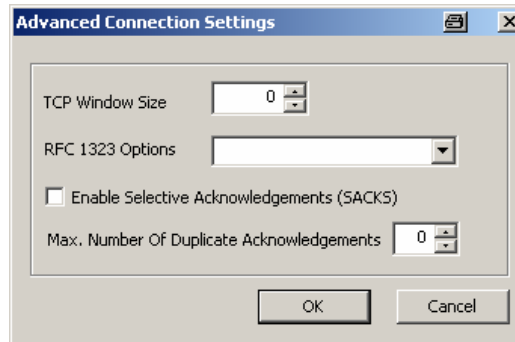
The configuration menus described below are opened when a job is added to the list in the *DQA Settings* dialog (*Add Job...*) or if a job selected in the list is re-configured (*Configure...*).

Connect to Network

The *Connect to Network* configuration menu selects a network link and a reference server and defines the idle time intervals for redialing.

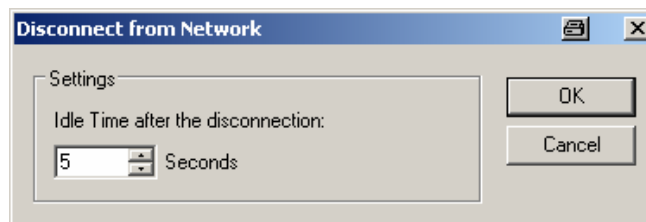
- | | |
|----------------------------------|--|
| <i>Con-
nec-
tion</i> | List of available network connections. |
| <i>Mode</i> | Type of connection: circuit switched or packet switched. |
| <i>User
Name/
Passw.</i> | Optional input fields for authentication at the network. |
| <i>Ping Ref.
Server</i> | Name of the reference server to ping; host name like in the example above or IP address. The reference server is used to check whether a packet switched connection could be established and to define a time limit for setting up the connection; see also explanation in the configuration menu. |
| <i>Max. No.
of Tries</i> | Maximum no. of pings sent to the reference server before the system assumes that the dial-up has failed and aborts the job. |
| <i>Timing</i> | Idle time interval between the start of the job and dialing (The <i>QoS Message View</i> displays the message <i>Waiting <n> seconds before dialing</i>) and after a successful connection. |

Advanced Opens a dialog to define additional connection settings.



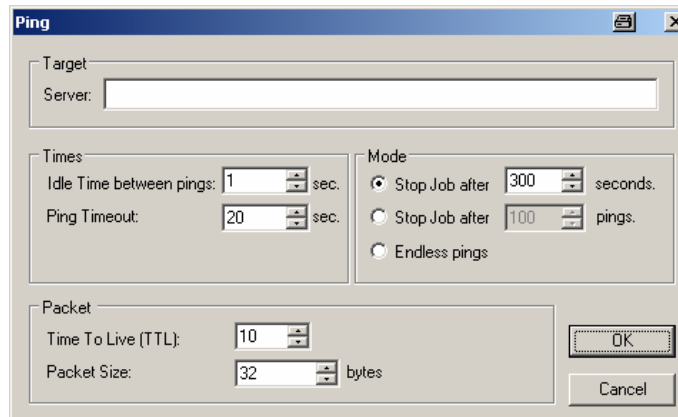
Disconnect from Network

The *Disconnect from Network* configuration menu defines an idle time in seconds between disconnection from the network and start of the next job in the *Job* list.



Ping

The *Ping* configuration menu defines a target server to ping (using an ICMP protocol), the timing and the number of pings to send.



Server Name of the target server to ping; IP address like in the example above or host name.

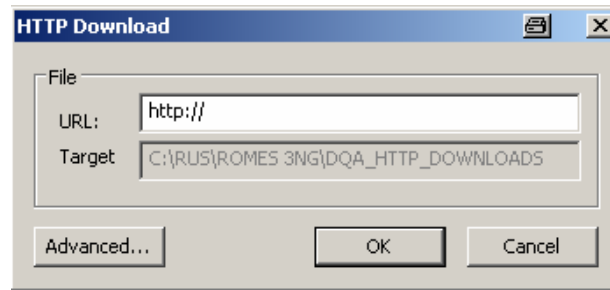
Idle Time between pings Time elapsed between reception of a response from the target server and start of the next ping.

Ping Timeout Maximum time between the start of a ping and reception of a response from the target server. After the *Ping Timeout* the ping is classified as unsuccessful.

<i>Mode</i>	Defines the scope of the ping job: Either a time limit in seconds or a maximum number of pings can be set.
<i>Time to Live</i>	Time_of_life parameter allocated to the transmitted data packets. Packets are discarded if their time to live has expired.
<i>Packet Size</i>	Packet size in the range between 32 and 1024 bytes.

HTTP Download

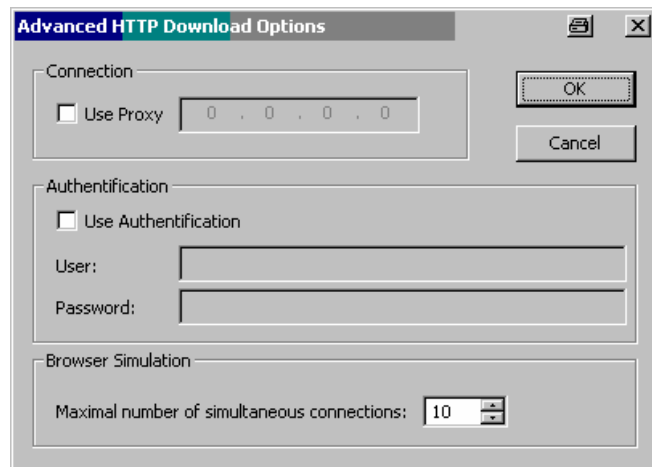
The *HTTP Download* configuration menu defines a file on a target web server to be downloaded using TCP/IP. The downloaded file can be displayed in a HTTP browser and printed using the *Action* menu.



URL Universal Resource Locator encoding the link to the file to be downloaded.

Target Directory Standard directory (subdirectory of the ROMES program directory) where the downloaded file is stored.

Advanced Opens an additional dialog with more connection settings.



Connection Use a proxy server to access the internet and download the HTTP site. If the option is checked, the IP address of the proxy can be entered.

Authentication Use of authentication procedure to access and download protected HTTP sites. If the option is checked, the user name and password can be entered.

Browser Simul. Limitation of the maximum number of HTTP connections.

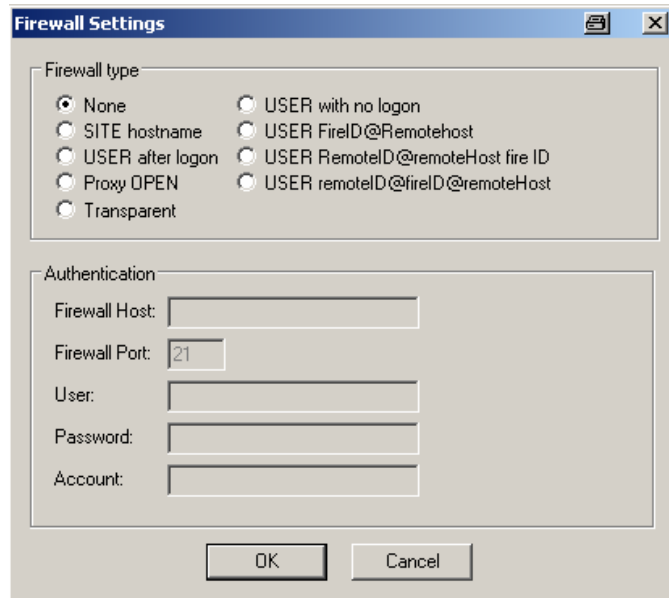
FTP Download

The *FTP Download* configuration menu defines a file on a remote server to be downloaded using FTP.

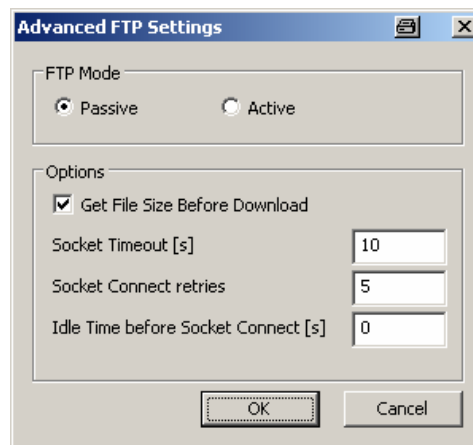
- URL** Universal Resource Locator (host name) or IP address identifying the remote server.
- File** File to be downloaded including the directory path.
- Target Directory** Directory accessible from the test system (e.g. the harddisk of the PC) where the downloaded file is stored. The ... button provides a tree view of all available directories.
- Store Data in File** If this option is selected, the downloaded data is stored in a file that is copied to the local hard disk. If it is cleared, the data can be kept in memory (see *Delete Files...* below) but are not processed, which generally improves the system performance.
- Delete Files...** If this option is selected, no copy of the downloaded file is kept after the job is finished. Otherwise ROMES creates multiple copies of the downloaded file when the *FTP Download* job is performed repeatedly. For a downloaded file <file_name>.<extension>, the copies are named <file_name>_0.<extension>, <file_name>_1.<extension> etc.
- Account** Optional input fields for authentication at the remote server (*User Name* and *Password*). The *Anonym...* button inserts the user name *anonymous* and an arbitrary password. The password can be overwritten, if required.

Firewall

Opens an additional dialog to define the authentication information necessary to access a remote server protected by a firewall. For all firewall types (except *None* for non-protected servers) the fields in the *Authentication* panels must be filled in.

*Advanced*

Opens a dialog to define additional file transfer parameters. If the option *Get File Size before Download* is selected, the size of the transferred file is indicated in the *QoS Progress View* together with downloaded number of bytes.



The *Options* panel contains the following settings:

Socket Timeout [s]

The time, when the socket should close the connection without having received data. This can be used to limit the transfer time and thus the amount of information transferred.

Socket Connect Retries

Number of retries, if socket connection fails.

Idle Time before Socket Connect [s]

Some Dialup Connections need some idle time to establish a successful socket connections.

FTP Upload

The *FTP Upload* configuration menu defines a target server and a file to be uploaded using FTP.

Target URL Universal Resource Locator (host name) or IP address identifying the target server

Target Directory Directory name and path on the target server.

Source File File to be uploaded including the directory path.

Append File Index to Source File If this option is selected the source file name is extended by an index before the file is transferred. The index is incremented before each FTP upload so the target server receives multiple copies of the same file with different file names.

Account Optional input fields for authentication at the remote server (*User Name* and *Password*). The *Anonym...* button inserts the user name *anonymous* and an arbitrary password. The password can be overwritten, if required.

Firewall Opens an additional dialog to define the authentication information necessary to access a remote server protected by a firewall; see *FTP Download*.

Advanced Opens a dialog to define additional file transfer parameters; see *FTP Download* above. *Get File Size...* is not available for uploaded files.

FTP Up/Download

The *FTP Up/Download* configuration menu defines a remote server and two files on the remote server and the local file system to be uploaded and downloaded using FTP. The configuration menu combines the *FTP Upload* and *FTP Download* menus.

UDP Download

The *UDP Download* configuration menu defines a remote server to be accessed for downloading data using the User Datagram Protocol (UDP) and configures the data transfer options. This job requires a remote server which is configured as a ROMES measurement server. This is done by installing the *ROMES DQA Measurement Server* software, which serves the measurement job with the expected data.

Address Type Host name or IP address identifying the measurement server.

Address Server address, conforming to the selected *Address Type*

Port Measurement server port number

Local Socket Port numbers of the local ports used to download data (*Download Port*).

The following *Options* define transfer parameters and timeouts:

Duration Time (s) Time to execute the job (download time) in seconds

Packet Size Size of the transferred data packets

Data Rate Number of bytes transferred per second

Wait. for answer Timeout for an attempted connection to a measurement server that does not respond. ROMES will retry a connection several times (see *No. retries* below) with the same timeout before the job is aborted.

No. retries Number of times that ROMES tries to connect to the remote server, using the *Waiting for answer* time, before the job is aborted.

UDP Up/Download The *UDP Up/Download* configuration menu defines a remote server to be accessed for downloading data using the User Datagram Protocol (UDP) and configures the data transfer options. In addition it specifies a file on the local file system to be uploaded to the remote server and defines the file options.

This job requires a remote server which is configured as a ROMES measurement server. This is done by installing the *ROMES DQA Measurement Server* software, which serves the measurement job with the expected data.

The settings concerning the measurement server, the ports, and the down-link options are identical with the *UDP Download* configuration menu; see above. The *General Options* are valid for both the download and upload.

Besides the configuration menu defines a packet size and data rate for the upload and the name of the file to be uploaded from the local file system to the measurement server.

E-Mail Download

The *E-Mail Download* configuration menu defines the addresses, contents and connection parameters for e-mail transfer from a remote POP3 server.

POP3 Server Name of a Post Office Protocol Version 3 (POP3) server of the service provider that will send the downloaded e-mail.

Port Port number of the POP3 server (in most cases: 110)

User Name / Password Authentication information for accessing the server.

Delete... If the option is checked, the downloaded e-mail is deleted on the POP3 server. Otherwise the same e-mail can be downloaded repeatedly. Deleting the downloaded e-mail makes sense if the DQA job contains an upload/download cycle which is continuously repeated.

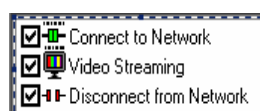
Video Streaming

The *Video Streaming* configuration menu defines the source addresses, the file transfer options, and evaluation criteria for a video stream download.

Video Streaming is available with option ROMES-Z7. A packet-switched network connection is set up to a server using a GPRS or UMTS test mobile or commercial mobile. The server provides a stream of MP4 video data at constant frame rate, using the Real Time Streaming Protocol (rtsp). The test system performs an analysis of the received data, evaluates the received frame rate and estimates the quality of the transferred video stream. No data is returned or retransmitted.

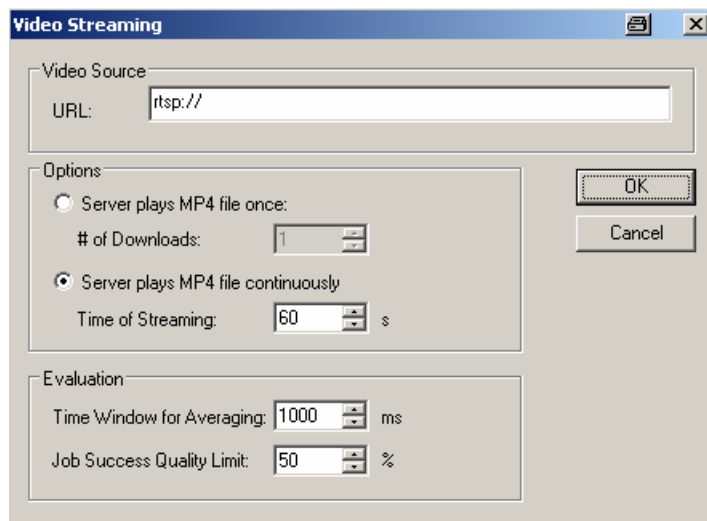
The video streaming results can be viewed in several QoS views, in particular the *QoS Progress View* (see chapter 4).

Video streaming is tested with a network connection through a mobile phone in packet data mode, i.e. with the job sequence:



Note:

To set up a connection to a server and test video streaming, the server must support the required (virtual) COM ports for the mobile connection (see section [Connection via USB Interface](#) on p. 6.5), and the network must support the rstp protocol. To exclude other sources of errors, first test the connection with an ordinary MP4 player before using ROMES.



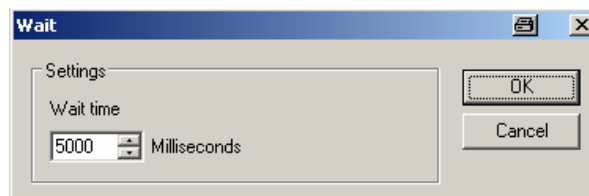
Video Source MP4 file name and location (URL) on the remote server (mount point) providing the video stream.

Options Defines the duration of the video stream measured in a single job. It is possible to specify either a definite amount of transmitted data (*number of downloads*) or a definite *Time of Streaming*.

Evaluation Defines the *Time Window...* for the calculation of the average *Frame Rate*, *Video Quality*, and *Spatial* and *Temporal* variation displayed in the *QoS Progress View*. *Job Success Limit* is the minimum video quality beyond which a job is considered to be successful; see description of *QoS Progress View* in chapter 4.

Wait

The *Wait* configuration menu defines a wait time between two jobs. A wait job can be used to provide the necessary time for system (re-)configurations before the next job is started.



Net Statistic

The *Net Statistic* tab selects the data to be recorded in a DQA measurement.

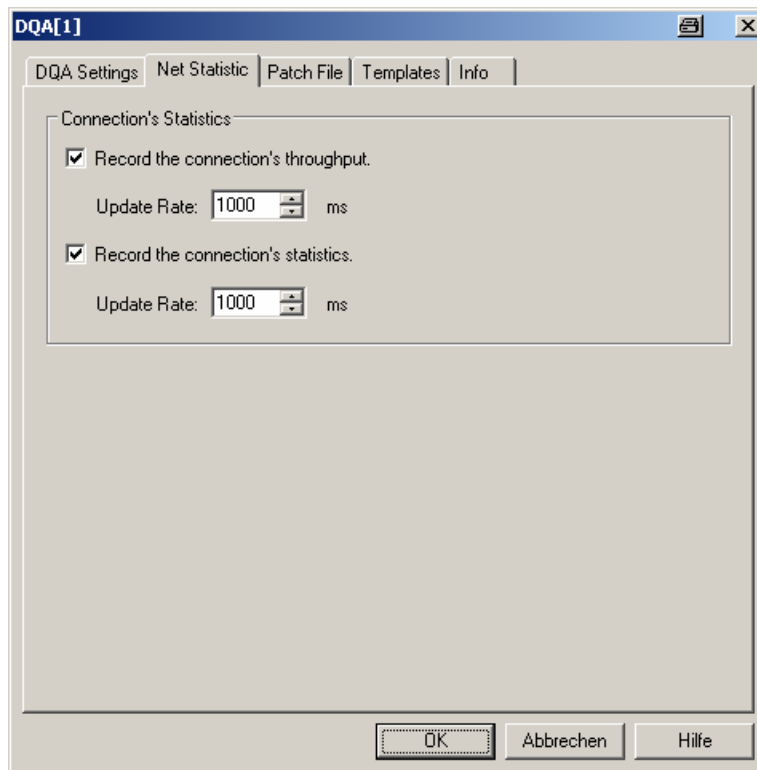


Fig. 6-126 DQA driver configuration – Net Statistic

Record the connection throughput

Selects the current and average data rate in uplink/upload and downlink/download direction to be recorded. The throughput is displayed in the *QoS Throughput View* which is empty if recording is disabled.

The data is recorded with a selectable update rate: An update rate of n milliseconds means that the throughput values are updated every n milliseconds.

Record the connection statistics

Selects the parameters describing the network traffic to be recorded. The statistics is displayed in the *QoS RAS Statistics View* which is empty if recording is disabled.

The data is recorded with a selectable update rate: An update rate of n milliseconds means that the statistics values are updated every n milliseconds.

Patch File DQA



The *Patch File* tab controls the transfer of DQA measurement data from the remote server back to a local measurement file.

Retrieving measurement data from the remote server is an essential step in assessing the QoS of an upload job. Every time an upload job is executed, the DQA software evaluates the results and stores them in a separate DQA measurement file (*.cmd) generated on the remote server. To view the results,

the remote files are transferred to a local directory, and the measurement data is merged into a single measurement file.

Without the results evaluated on the remote server, there is still some information about an upload job available, however, it is obtained indirectly and therefore less accurate.

To evaluate the QoS of an upload connection...

1. Set up a connection to a remote server and configure an upload job (*FTP Upload, UDP Upload, UDP Up/Download*), specifying a prefix for the measurement files to be created on the remote server. See chapter 2, section *Data Quality Tester*, for further details.
2. Click the  icon to start the DQA measurement. Wait until the job has been repeated 10 times (the measurement progress can be monitored in the *QoS Message View*), then terminate the measurement by clicking the  icon.
3. Transfer the measurement files from the remote server to a local directory, e.g. via FTP.
4. Open the *Patch File* tab of the DQA driver configuration menu and patch the downloaded files to a single measurement file (*File to Patch*) as described below.
5. Open any of the QoS Views (see chapter 4) and replay the *File to Patch*.

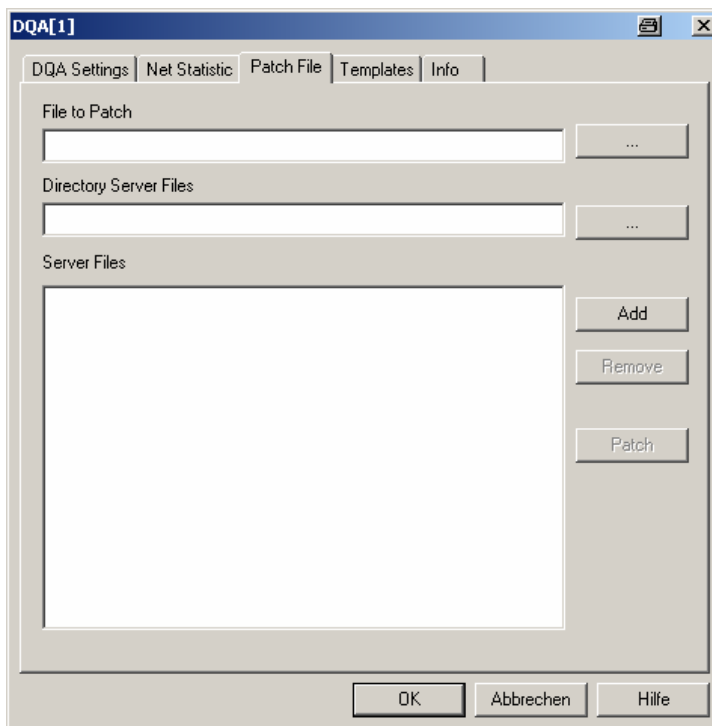


Fig. 6-127 DQA driver configuration – Patch File

File to Patch

Name and (local) directory of an existing *.cmd file containing DQA data, preferably from a UDP Up/Download job. The file to patch is the target file for the DQA results retrieved from the remote server.

Directory Server Files

Name and path of the local directory containing the DQA measurement files downloaded from the remote server.

Server Files

List of all files on the remote server that contain information to be merged into the file to patch. The list is generated automatically according to the predefined measurement file names but can be modified with the buttons on the left side:

- Add* Add a file to the list, e.g. a file that was (erroneously or temporarily) removed before

- Remove* Remove a selected file from the list

- Patch* Patch the current file list to the file to patch: Merge the file information into a common file to be subsequently replayed

Templates DQA

The *Templates* tab stores the current driver configuration as a template, lists, loads or deletes driver templates. It is provided for many test device drivers and is identical for all of them.

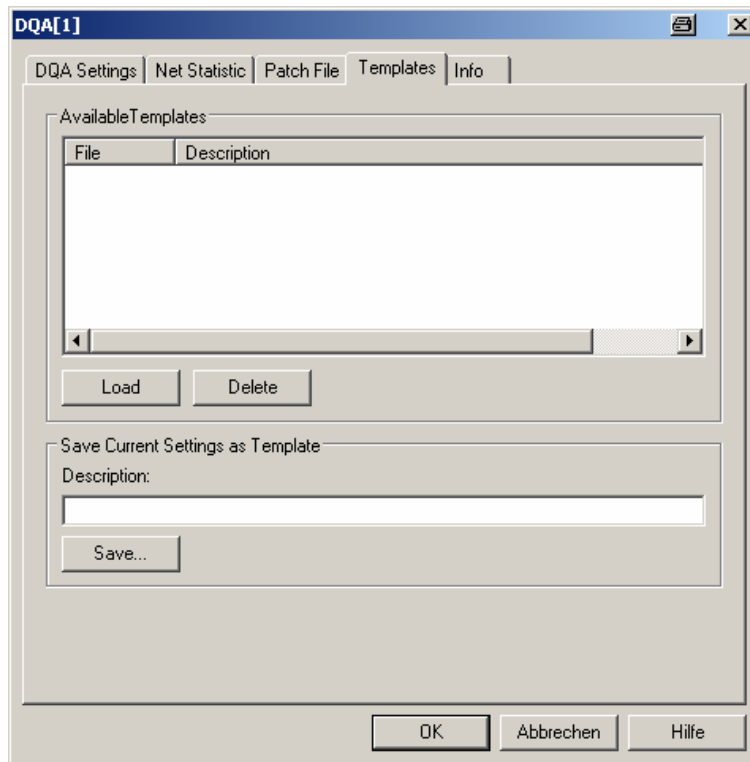


Fig. 6-128 DQA driver configuration: Templates

Action Menu DQA

The *Action* menu provides DQA session control commands. It is added to the menu bar while a DQA measurement is running (*Measurement – Start Measurement* or *Start Recording*). If the DQA driver has been loaded several times in order to define several DQA sessions, a separate command line is displayed for each of them.

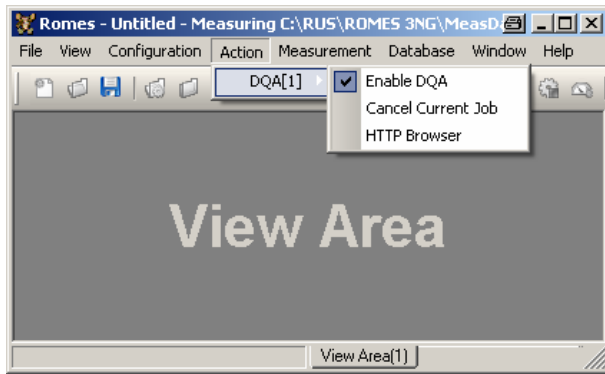


Fig. 6-129 Action menu (DQA driver)

Enable DQA

Starts a DQA measurement that is paused.

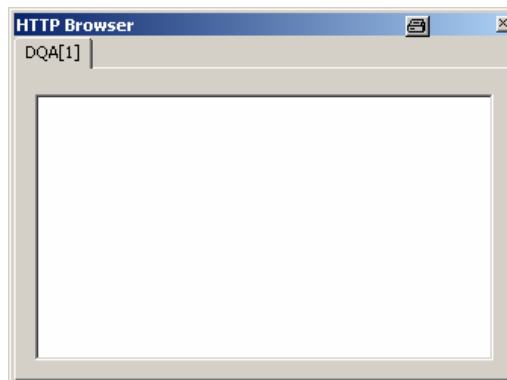
This command is relevant if *Start Job List at Start of Measurement* has been deactivated in the *More Extended Settings* dialog.

Cancel Current Job

Aborts a running DQA session.

HTTP Browser

Opens a HTTP browser window to display and print a HTML file transferred in a *HTTP Download* job. :



Speech / Video Quality Tester Driver (SQA/VQA)

In outgoing wave mode, the external SQA / VQA server plays sound files to a calling device. In incoming wave mode the SQA server measures speech quality of sound coming from a calling device. The measurement results are stored in *.RSCMD files which can later be merged into a destination *.RSCMD file by the ROMES application as described in section 3.13 of this manual.

The installation, setup and configuration of the external SQA / VQA server is described in the document "User Manual for ROMES SQA / VQA Server". The complete SQA measurement setup is described in the document "Configuration of SQA measurements with ROMES.pdf". Both documents are available on the ROMES 3NG CD. Once the SQA / VQA server is configured as described, the ROMES SQA / VQA driver can be configured.

The external R&S VQA server answers to calls of a ROMES client, sends videos to the calling counterpart and evaluates the incoming videos. The measurement results from both client and server are stored in *.CMD files which can later be merged into a destination *.RSCMD file by the ROMES application as described in section 3.13 of this manual. To ensure a successful file merge, both involved Measurement Systems have to be synchronized by GPS or NTP.

The measurement work process is divided in two steps. The first step is to make the measurements, and the second to evaluate and calculate the KPIs.

SQA / VQA Settings

The VQA and SQA drivers are slave drivers of a mobile driver and can be loaded within the client mobile configuration.

The SQA / VQA tab of a suitable mobile offers slave driver control and configuration functions, and displays slave driver parameter values.

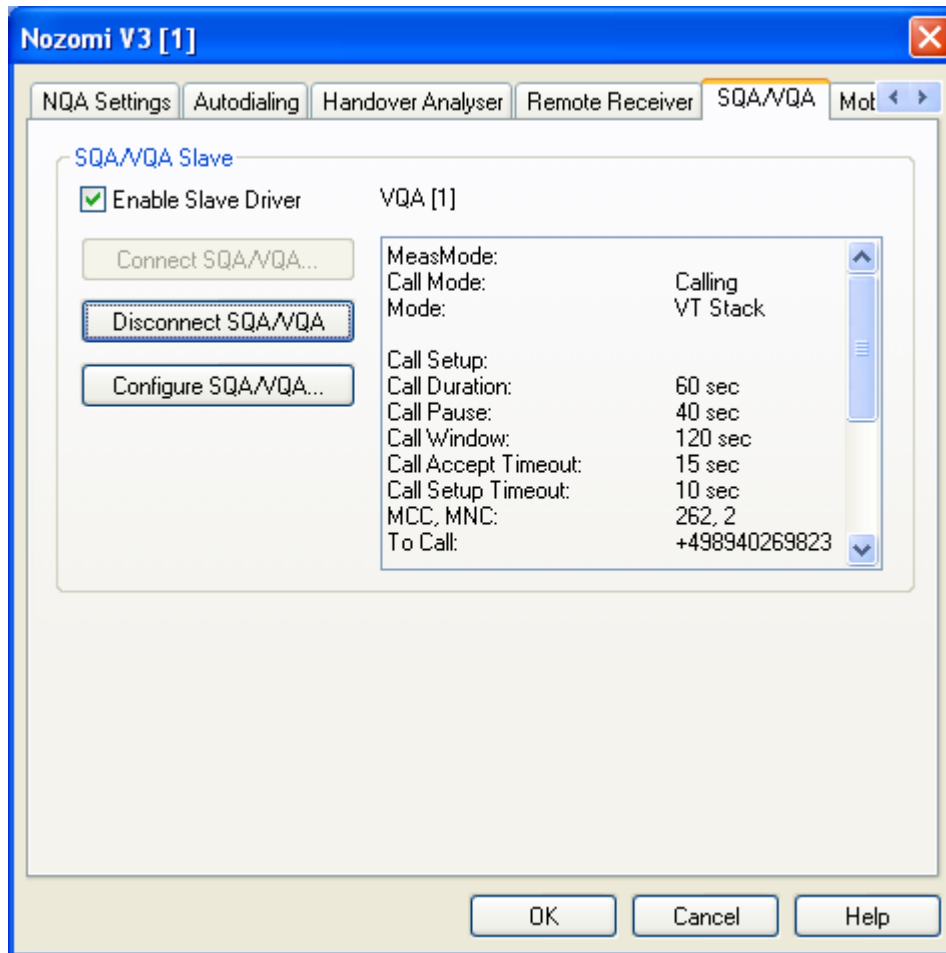


Fig. 6-130 SQA / VQA driver configuration – Settings

It allows operating as MO or MT side.

The following VT Modes are available.

1. The dedicated mobile can be used as a simple modem (StackMode). In this case the VT stack is running on the PC. Only in this scenario the PEVQ evaluation is available.
2. The video telephony application on the mobile can be used (MobileMode).

The R&S VQA server currently can only handle the MT side. The server always runs in StackMode.

It is necessary, that both sides are using the **same VT Mode**.

The following measurement setups are valid.

A-Party	B-Party
Mobile	Mobile
<ul style="list-style-type: none"> • StackMode 	<ul style="list-style-type: none"> • StackMode

<ul style="list-style-type: none"> • Calling 	<ul style="list-style-type: none"> • Answering
Mobile <ul style="list-style-type: none"> • MobileMode • Calling 	Mobile <ul style="list-style-type: none"> • MobileMode • Answering
Mobile <ul style="list-style-type: none"> • StackMode • Calling 	VQA Server

Setup of VQA Driver

The call setup has to be configured in the VQA configuration. The mobile call setup will be ignored during VQA measurements.

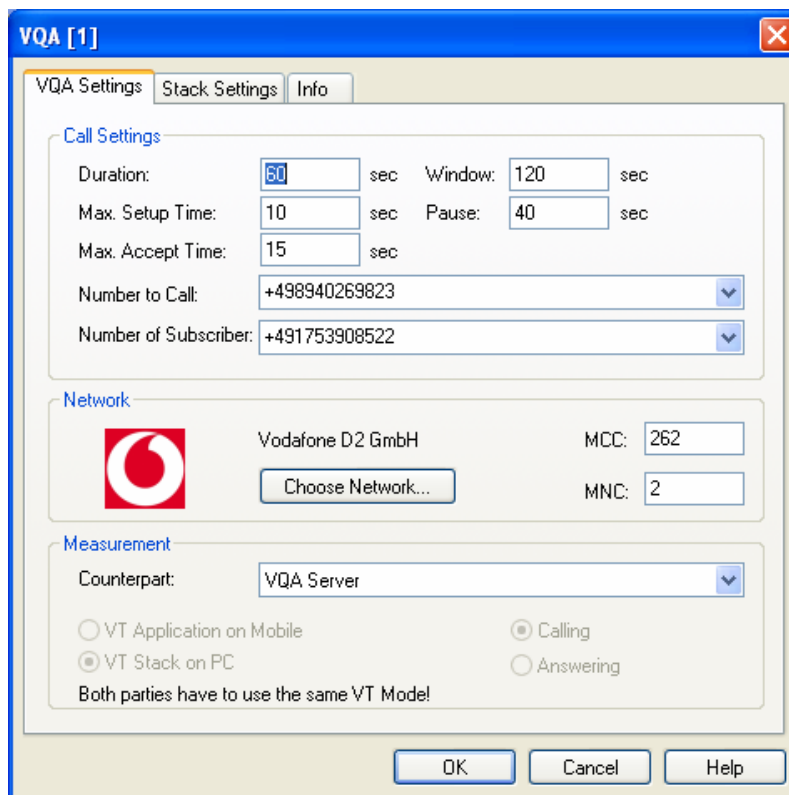


Fig. 6-131 VQA driver configuration – VQA settings

Call Settings

Provides various call settings:

- Duration** Evaluated Call Duration. The effective duration will be Duration + Media TimeOut. This is necessary to be able to check for Media Timeouts at the end of the call.
- Max. Setup Time** Max. Time until ALERTING was received
- Max. Accept Time** Max. Time between ALERTING and CONNECTED

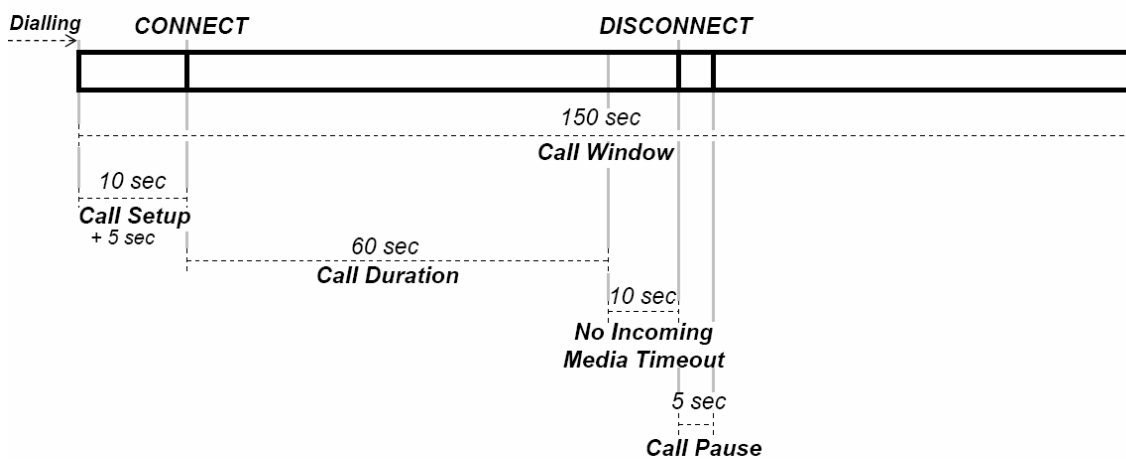
<i>Call Window</i>	Call pattern.
<i>Pause</i>	Min. Pause after call
<i>Number to Call</i>	Number of counterpart.
<i>Number of Subscriber</i>	Number of dedicated mobile.

Network A network has to be chosen. This information is mandatory for the evaluation process.

Measurement Select a counterpart for the measurement. If Server is chosen, all other settings are done automatically. If Mobile is chosen, the VT Mode and Calling/Answering have to be selected.

The general sequence for an SQA / VQA call is shown in the figure below:

Call Timing Overview



Example for a call that takes 60 seconds

- Call Accept Timeout is added to Call Setup Time (5 seconds). This is the timeout after Alerting message has been received for the call to be accepted
- No Incoming Media Timeout is added (10 seconds)
- Final Call Pause is added (5 seconds)

Fig. 6-132 SQA / VQA Call Timing Overview

VQA Stack Settings

On the Stack Settings Page the following settings can be defined.

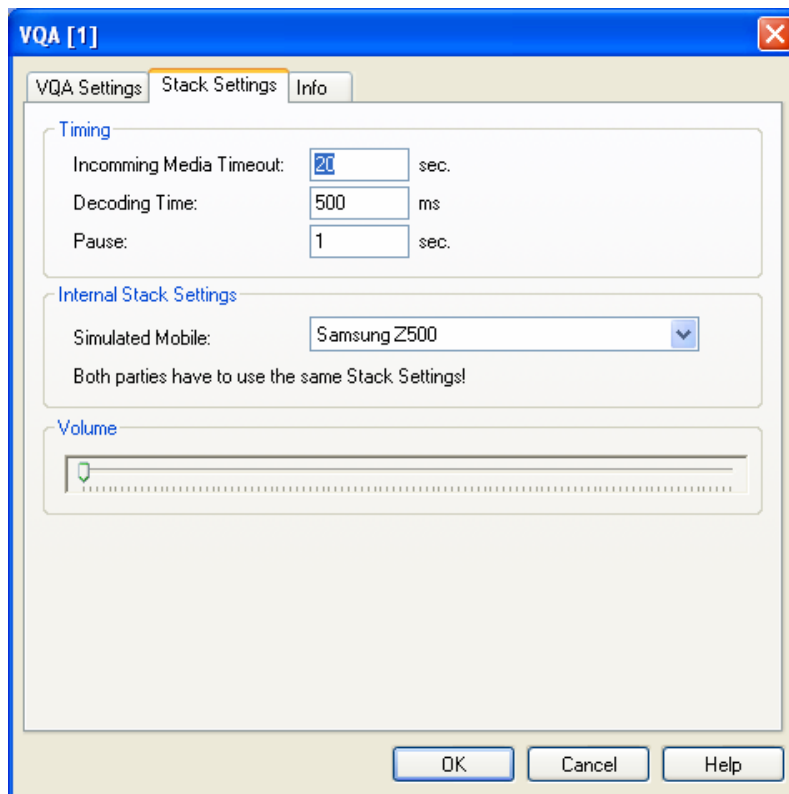


Fig. 6-133 VQA driver configuration – VQA Stack Settings

Timing	Provides various call time settings:
<i>Incoming Media Timeout</i>	Max. Time between CONNECT and the first incoming Media Packet.
<i>Decoding Time</i>	It is an estimated time that can be configured to consider the delay of the decoder. This time will be added to the audio/video setup time.
<i>Pause</i>	The speakers of both parties speak alternating. So the pause defines the time when one party starts speaking after the other one has finished.
Internal Stack Settings	<p><i>Simulated Mobile</i> Defines, which Mobile Stack will be simulated, the setting is ignored in Mobile Mode.</p> <p>It is necessary, that both sides are configured to simulate the same Mobile Stack.</p>
Volume	The slider controls the output volume of the video call

During the measurement, the video can be shown in a view, which can be enabled via the action menu. This menu also allows to change the PC speaker volume.

The screenshot shows the Romes VQA software interface. The main window is titled "QoS KPI View: 1" and displays a table of measurement data for "VQA [1] <Nozomi V3 [1]>". The table has columns for Value Type, Index, Seq..., Service, Value, Type, and TimeStamp. A video call window titled "VQA [1]" is overlaid on the right side of the table, showing a person wearing a cap.

Value Type	Index	Seq...	Service	Value	Type	TimeStamp
Start of Call	20 - 0	73	VT	30.10.200...	Trigger Point	15:48:44,387
rrcConnectionRequest	15 - 0	73	VT	30.10.200...	Trigger Point	
Service Response Time	44 - 0	73	VT	327 ms	KPI	
Start of Call	20 - 0	73	VT	30.10.200...	Trigger Point	
rrcConnectionRequest	15 - 0	73	VT	30.10.200...	Trigger Point	
E2E Mean Oneway Transmission Time (Online)	0 - 0	74	VT	523 ms	KPI	
E2E Mean Oneway Transmission Time (Online)	1 - 1	74	VT	468 ms	KPI	
E2E Mean Oneway Transmission Time (Online)	2 - 2	74	VT	523 ms	KPI	
E2E Mean Oneway Transmission Time (Online)	3 - 3	74	VT	555 ms	KPI	
E2E Mean Oneway Transmission Time (Online)	4 - 4	74	VT	492 ms	KPI	
E2E Mean Oneway Transmission Time (Online)	5 - 5	74	VT	531 ms	KPI	
E2E Mean Oneway Transmission Time (Online)	6 - 6	74	VT	484 ms	KPI	
E2E Mean Oneway Transmission Time (Online)	7 - 7	74	VT	531 ms	KPI	15:49:38,512
E2E Mean Oneway Transmission Time (Online)	8 - 8	74	VT	484 ms	KPI	15:49:43,418
E2E Mean Oneway Transmission Time (Online)	9 - 9	74	VT	531 ms	KPI	15:49:48,528
E2E Mean Oneway Transmission Time (Online)	10 - 10	74	VT	477 ms	KPI	15:49:53,403
E2E Mean Oneway Transmission Time (Online)	11 - 11	74	VT	531 ms	KPI	15:49:58,512

Merging the Server and Client Measurement Files

The measurement file of both client and server sides have to be merged for proper evaluation. This is done in the ROMES File Merger as described in section 3.13 of this manual.

During the merge process a VQA evaluator calculates all relevant KPIs, including PESQ and PEVQ values.

The merger associates the KPIs to the VQA of the calling party.

The master file has to be the file of the MO party. As *Input File* specify the file(s) of the MT party.

Check the box to merge only files which fit together, i.e. only files which were involved with the measurement. This will be VERIFIED by the number of the MT side.

The merger will extract all relevant data and start the evaluation process.

Due to PEVQ evaluation, this may take some time; generally a 60 second call takes about 60 seconds for evaluation.

If you are not interested in PESQ and/or PEVQ, the evaluation can be switched off by adding the following registry keys.

```
Key:      "HKEY_LOCAL_MACHINE\SOFTWARE\P3\Evaluator"
String:   "Pesq" -> „false“
String:   "Pevq" -> „false“
```

Navigation

ROMES uses two different methods to determine the geographic coordinates of a measurement position:

- For ordinary outdoor applications, a GPS receiver is used to detect the satellite signals of the *Global Positioning System* (GPS).
- In areas where no GPS signals can be detected, e.g. inside closed buildings, the position is defined by means of a user-defined map.

GPS and indoor drivers and their configuration is described in the following sections.


GPS Drivers

The measurement system offers five different GPS (global positioning system) receiver drivers to be used with the different GPS receivers.

GPS drivers are installed by selecting *Positioning system* in the *Hardware Drivers* window (see Fig. 6-1 on page 6.1). The configuration menus are explained below.

GPS Driver Types and Supported Devices

Table 6-13 GPS drivers and supported devices

Trimble Svee6/ Trimble Placer	Travel Pilot RGS08 Pro	NMEA
Six-channel GPS receiver Manufacturer: <i>Trimble Navigation</i> company  The ROMES GPS driver accepts the following protocol settings of the Trimble GPS receivers: Svee6 TSIP (Trimble Standard Interface Protocol) Placer TAIP (Trimble ASCII Interface Protocol)	Car navigation system Manufacturer: <i>BOSCH</i> company Description: The system uses GPS information as well as CD-ROM based road map data and shows the current car position on an additional display, mounted in sight of the driver.	All GPS receivers supporting the NMEA (<i>National Marine Electronics Association</i>) protocol. This driver is required for GINA, the standard GPS receiver for ROMES running in a test vehicle.

In addition, a *Dummy GPS* driver is provided with each ROMES configuration. This driver assigns fictitious geographic information to a set of measurement data so that they can be displayed in the *Route Track View*. No GPS receiver is required; the COM port suggested during the installation will not be used.

Configuration Menus GPS

The *GPS Driver Configuration* menus offer device-specific driver settings. They can be opened by clicking the *Driver* command line of the Configuration menu which is available as soon as a mobile driver is loaded (see Fig. 6-4).

Trimble Svee6

The *Svee6* configuration menu configures the Trimble SveeSix driver and indicates the current file version.

Svee6 Configuration

The *Svee6 configuration* tab selects the *DGPS Mode (Differential GPS)* and the corresponding port settings.

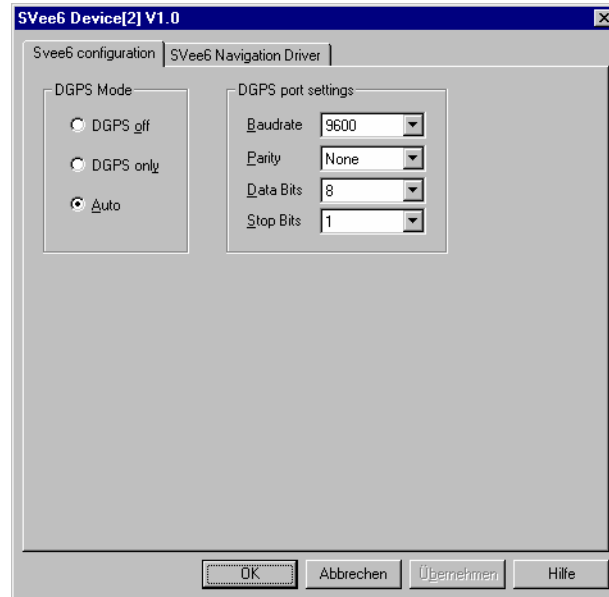


Fig. 6-134 Svee6 driver configuration

If a DGPS signal for maximum resolution is provided either the *DGPS only* or the *Auto* mode must be set. Otherwise, select *DGPS off*.

Inconsistent settings:

The DGPS settings are checked for consistency when the configuration menu is closed via *OK*. If the settings are incorrect, a message window is called up explaining the detected mistake. In this case the configuration window remains open so that the correct setting can be entered.

For more information see the GPS glossary in chapter 8.

Svee6 Navigation Driver

The *Svee6 Navigation Driver* tab indicates the current file version and allows to use the GPS time:

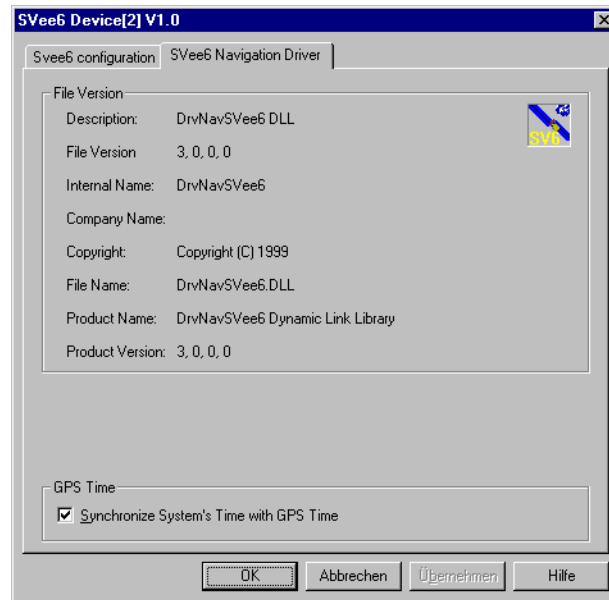


Fig. 6-135 Svee6 driver configuration –Info

GPS Time

If the *GPS Time* box is checked, the system time is synchronized with the GPS time so that the PC clock can be set according to the accurate GPS clock. This implies that the measurement can be started only after a string containing the time information has been received. This time delay can be avoided, however, by switching the correction off and starting the measurement immediately.

Trimble Placer

The *Trimble Placer* configuration menu configures the Trimble Placer driver and indicates the current file version.

Calibration Data

The *Calibration Data* tab handles the dead reckoning (calibration) data of the placer.

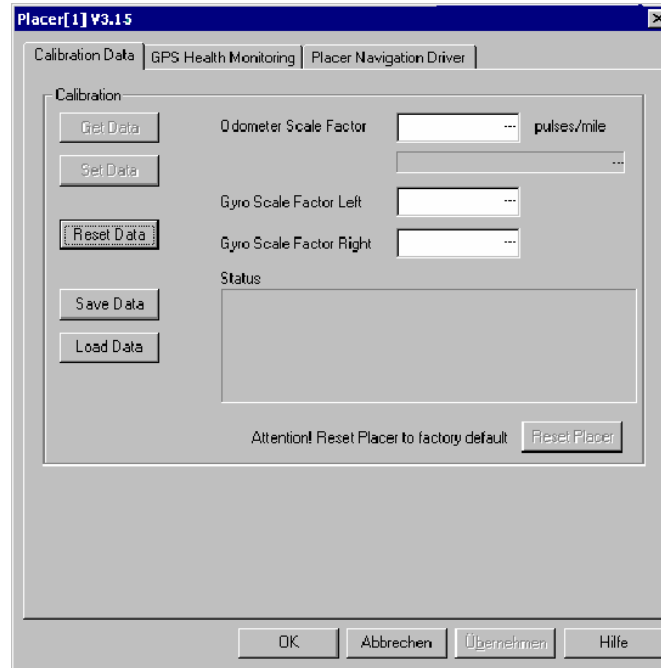


Fig. 6-136 Trimble Placer configuration: Calibration Data

Dead reckoning is used to calculate the geographic position of the test vehicle in situations where the GPS signal is not available. The calculation is based on the distance from a known position and the direction of the test vehicle; the placer determines both values by means of a calibrated odometer and a gyroscope. Usually, the three calibration data (the odometer scale factor and the left and right gyroscope scale factor) do not have to be changed.

In the *Calibration* panel, it is possible to retrieve the calibration data from the placer (*Get Data*) and replace the placer data by the current values entered in the three input fields (*Set Data*). The *Reset Data* button sets the current data to default. *Save Data* writes the current data to a file named *Placer.dat* in the application program directory; *Load Data* loads the values in *Placer.dat* to the input fields. The factory calibration data of the placer are resident in the system; they can be used any time to reset the placer (*Reset Placer*).

GPS Health Monitoring

The *GPS Health Monitoring* tab switches health monitoring in the *General Status View* on or off.

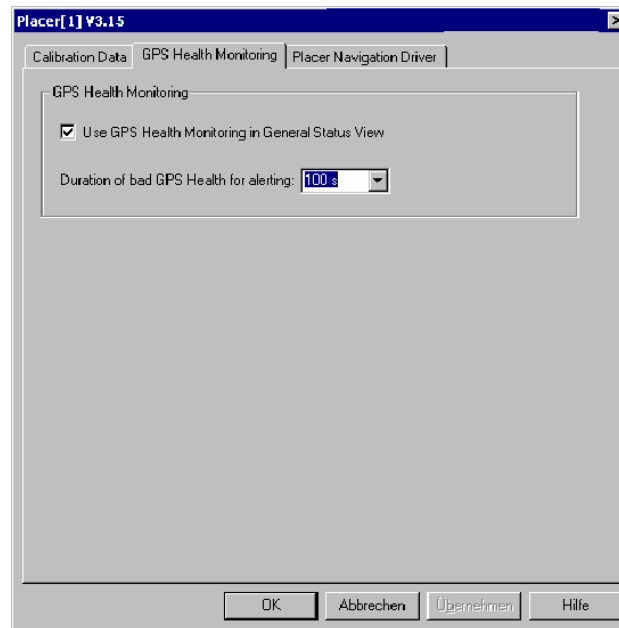


Fig. 6-137 Trimble Placer configuration: GPS Health Monitoring

Bad GPS health means that the GPS signal received is low. Bad health situations can frequently occur during an ordinary test trip, e.g. if the vehicle crosses an underpass or a tunnel. If *Use GPS Health Monitoring...* is checked, bad health situations will cause a warning message to be displayed in the *General Status View*, provided that they last longer than the time selected in the *Duration of bad GPS Health...* entry field.

Placer Navigation Driver

The *Placer Navigation Driver* tab indicates the file version and selects either the active or the inactive communication mode.

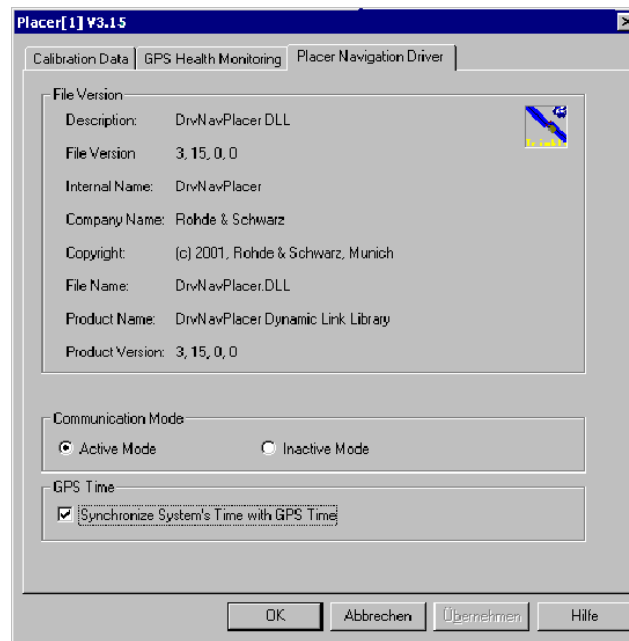


Fig. 6-138 Trimble Placer configuration: Placer Navigation Driver

Communication Mode:

The *Communication Mode* defines in which mode a connected system works:

- Active mode* Basic (and default) mode; the system reads and sends data
- Inactive Mode* System only reads data

Use of inactive mode:

The inactive mode allows to connect a second measurement system or one working in active mode without using a second *Trimble Placer*.

- Select communication mode active in system I, inactive in system II.
- Connect the devices as follows:

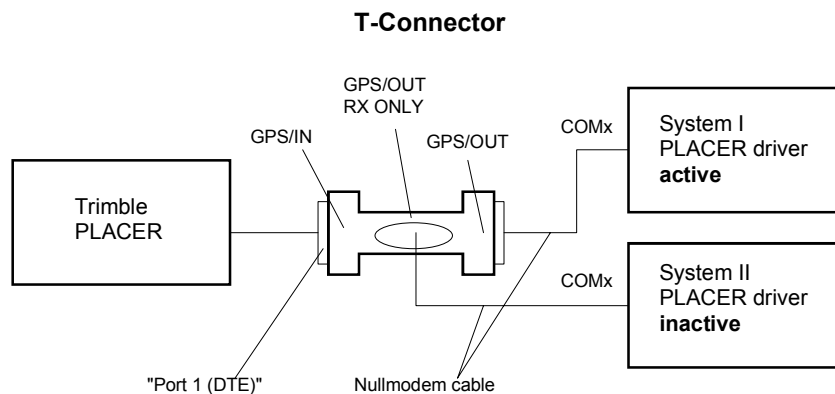


Fig. 6-139 Test setup for inactive GPS driver

Antennas, power supply etc. are not shown in [Fig. 6-139](#).

Note:

As the inactive driver only reads data, the system cannot automatically detect cabling errors or wrong COM port settings. So check if correct GPS data is displayed on both systems in the *Route Track* window before starting the measurement tour.

It is indispensable to have one System working in active mode.

Do not load the *Placer* driver into the inactive system when it is connected to an active system while a measurement is running. The reason is, that the default setting is active I/O Mode, and two active systems will collide with each other. So disconnect the inactive system before loading.

Cabling of the T-Connector (stock no. 1086.5331):

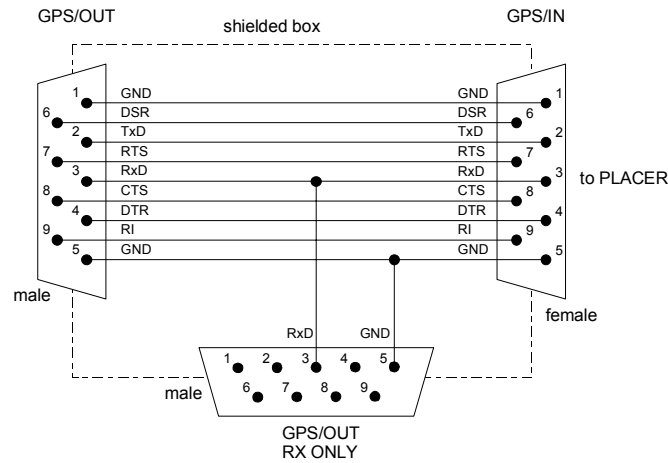


Fig. 6-140 Cabling of the T-connector

Inconsistent settings:

The *communication Mode* settings are checked for consistency when the configuration menu is closed via *OK*. If the settings are incorrect, a message window is called up explaining the detected mistake. In this case the configuration window remains open so that the correct setting can be entered.

For more information see the GPS glossary in chapter 8.

GPS Time

If the *GPS Time* box is checked, the system time is synchronized with the GPS time so that the PC clock can be set according to the accurate GPS clock. This implies that the measurement can be started only after a string containing the time information has been received. This time delay can be avoided, however, by switching the correction off and starting the measurement immediately.

The *Travel Pilot IDS* has no actual configuration menu assigned because no configuration settings are necessary. The corresponding message box indicates the associated COM port and detects the hardware at this port. If this fails, check the COM port and the device power supply.



Travel Pilot RGS08

The Travel Pilot RGS08 offers the configuration settings shown below.

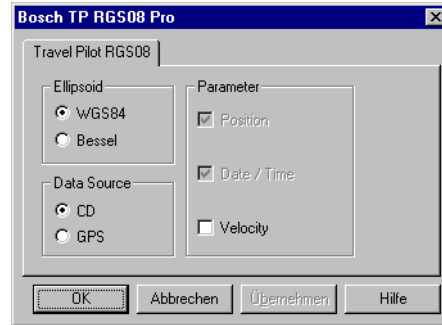


Fig. 6-141 Travel pilot – COM port messages

For more information, especially on the RGS08 settings, see the *Travel Pilot* user manual.

NMEA Driver

The NMEA driver is required for GINA, the standard GPS receiver for ROMES running in a test vehicle.

The ROMES NMEA driver version supports the following NMEA protocol versions: GSA, GGA, RMC, ZDA. Protocol versions not listed here are ignored. The format of the NMEA data depends on the protocol version. The following example shows a comparison of the RMC, GGA and VTG (not supported) protocols:

```
$GPRMC,144732,A,4807.530037,N,01136.650214,E,0,144,070800,001.0,E*76
$GPGGA,144732,4807.530037,N,01136.650214,E,1,09,1.1,546.6,M,46.8,M,,*4F
$GPVTG,144,T,069.3,M,0,N,0,K*5D
$GPRMC,144733,A,4807.530037,N,01136.650214,E,0,144,070800,001.0,E*77
$GPGGA,144733,4807.530037,N,01136.650214,E,1,09,1.1,546.6,M,46.8,M,,*4E
$GPVTG,144,T,080.7,M,0,N,0,K*5E
$GPRMC,144734,A,4807.530037,N,01136.650214,E,0,144,070800,001.0,E*70
$GPGGA,144734,4807.530037,N,01136.650214,E,1,09,1.1,546.7,M,46.8,M,,*48
$GPVTG,144,T,074.7,M,0,N,0,K*55
```

...

The NMEA *Navigation Driver* menu displays information on the current driver version. If the *GPS Time* box is checked, the system time is synchronized with the GPS time so that the PC clock can be set according to the accurate GPS clock. This implies that the measurement can be started only after a string containing the time information has been received. This time delay can be avoided, however, by switching the correction off and starting the measurement immediately. No other configuration settings are required.

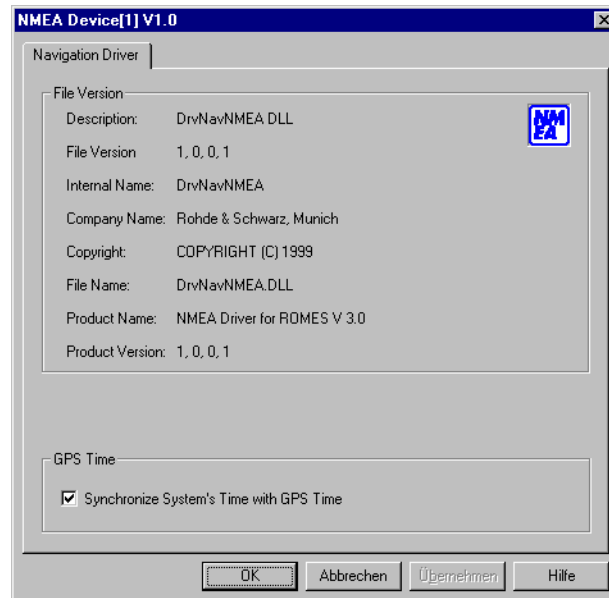


Fig. 6-142 NMEA Configuration

The system will detect any NMEA device at the selected COM port. If not, check the COM port and the device power supply.

Dummy GPS

The *Dummy GPS* configuration menu configures the *Dummy GPS* driver and indicates the current file version.

The *Position* tab selects a geographical start position and the speed and direction of the measurement curve on the map. It also assigns attributes to the measurement data.

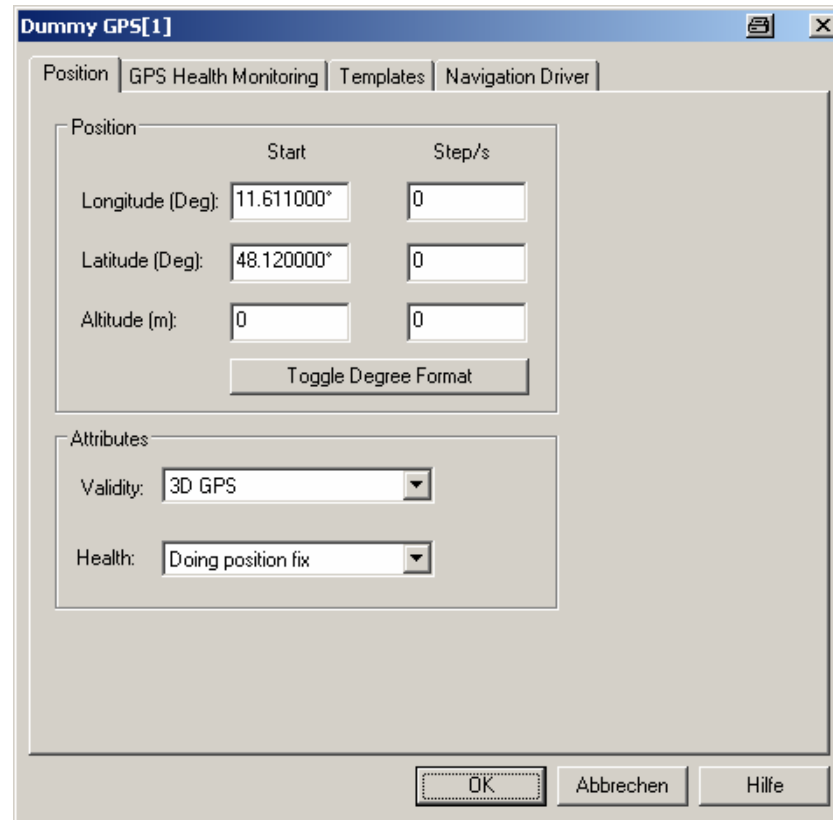


Fig. 6-143 Dummy GPS driver configuration

The *Position* panel defines the position of the measurement data on the map:

- Start** The first measurement point will be assigned the three geographic coordinates in the *Start* column. If the data is displayed in the *Route Track View*, then the *Altitude* coordinate does not contribute to the representation but is shown in the *GPS Info* view.
- Step/s** The three coordinates in the *Step/s* column define the geographical distance of a data point from another that was recorded 1 s earlier. The *Altitude* coordinate is not taken into account. The ratio between *Longitude* and *Latitude* determines the angle of the measurement curve on the map; the sum of the squares of both values is proportional to the square of the speed of the measurement curve on the map.

The *Attributes* panel assigns a (fictitious) *Validity* and *Health* value to the measurement. Both values are shown in the *GPS Info* view.

The settings in the *GRS Health Monitoring* tab are not used for the measurement. The *Navigation Driver* tab displays information on the current driver version.

Indoor Navigation Driver INDOOR

The INDOOR driver is used to perform measurements in areas where no GPS navigation signal is available, e.g. inside buildings. To visualize the measurement route, one or more user-defined maps, e.g. floor plans, are used, which are contained in a Geoset file (see [Background Set](#) paragraph on p. 6.224).

The INDOOR driver itself does not need additional hardware.

Note:

As opposed to all other hardware drivers, the Indoor driver must be loaded before indoor measurement data can be replayed. On loading the driver the Indoor submenu is added to the View menu, see below. At the same time, the Configuration menu is extended by the Indoor Navigation command line, see section [Driver Configuration Menu](#) on page 6.224.

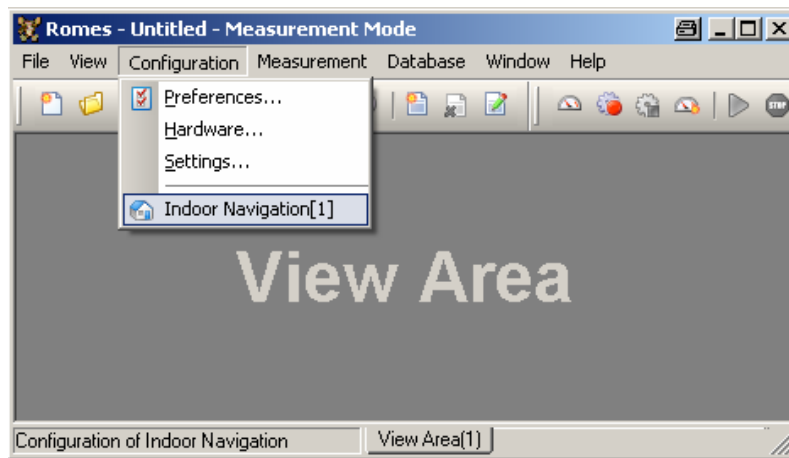


Fig. 6-144 Indoor Navigation - Configuration

Driver Configuration Menu INDOOR

Indoor Navigation - Setup

The *Indoor Navigation* configuration menu is used to select the background bitmap set from an archive, to select the measurement mode and the navigation mode. The configuration menu can be opened by selecting the *Indoor* command line in the *Configuration* menu which is available after loading the Indoor driver.

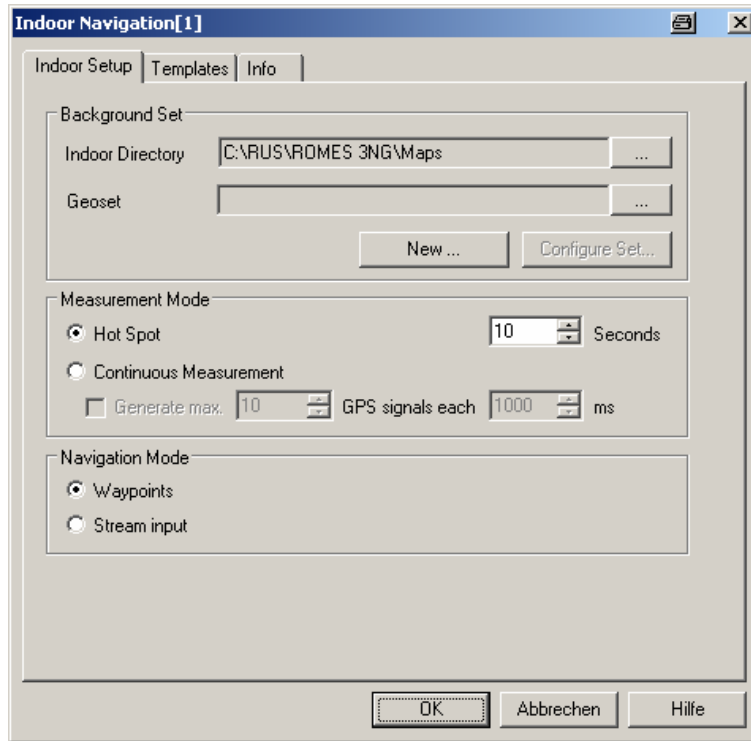



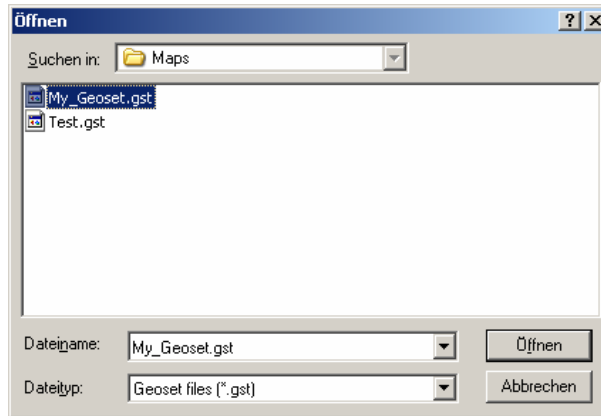
Fig. 6-145 Indoor driver configuration

Back-ground Set The *Background Set* panel contains the fields and buttons to select or create a so-called Geoset file (*.gst). Geosets can include several background floorplans, which makes it very easy to change the background map without stopping the measurement.

Indoor Directory First check if the displayed directory is the one where the background maps and Geosets are stored. Only from this directory Geoset files and maps can be selected later.

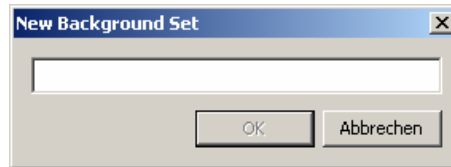
You may change the directory with the  button next to the *Indoor Directory* field.

Geoset Using the  button next to the *Geoset* field opens a standard *File Open* dialog (see chapter 2) to select one of the Geoset files available.



After selection, the file is indicated in the Geoset output field and the *Configure Set* button is enabled.

New The *New* button opens a dialog to define a new Geoset (*.gst) file:



Enter a name for the new Geoset file (*.gst) and click *OK*. The *Configure Set* dialog is the opened automatically.

Configure Set Once a Geoset file is selected or created, this button opens the Geoset configuration menu:

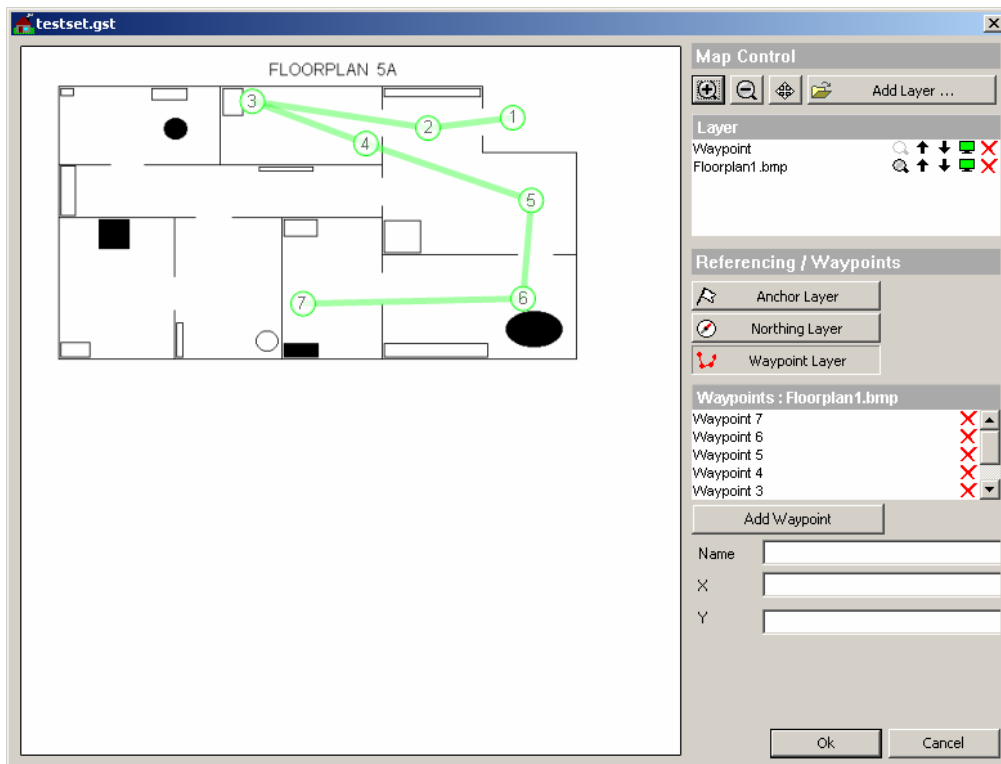



Fig. 6-146 Geoset configuration dialog

Map
Control

The *Map Control* area consists of four buttons:




To zoom into the map, click this button and mark a rectangle in the background map to define the area to zoom. The marking of a rectangle is done by keeping the left mouse key pressed while moving from top left to down right. Different from the *Route Track View*, **a single click is not working**.

To reset the map scale after zooming, click the reset icon  in the Layer management field.




To zoom out of the map, click this button and single click on the background map.

To reset the map scale after zooming, click the reset icon  in the Layer management field.



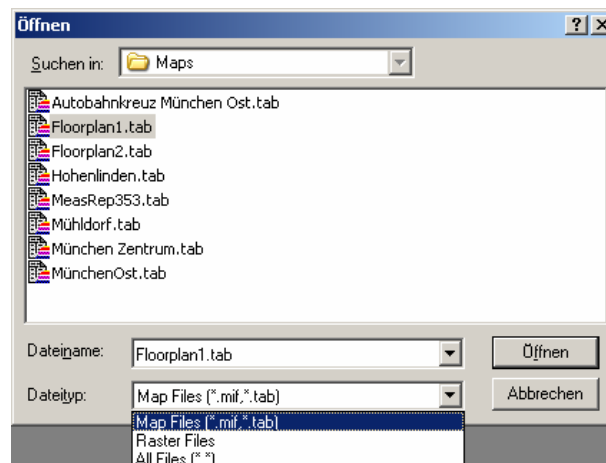
To scroll the map, click this button, click on a starting point on the background map and then move to the end point of the desired map scroll. After the starting point on the map is clicked, the scroll is shown by a thick line between the mouse cursor and the starting point.

Once the end point of the desired scroll is clicked, the map is scrolled accordingly.

To reset the map position after scrolling, click the reset icon  in the Layer management field.

Add
Layer...

Clicking this button an *Open File* dialog for background maps is displayed, where the directory is fixed to the previously defined *Indoor Directory*.



This example shows that already referenced maps as well as unreferenced ones can be loaded

The Indoor bitmap files are positioned and stored according to the scheme used for *Route Track* background maps; refer to section *Bitmap Handling and Positioning* in chapter 3: The coordinates are defined in a separate configuration menu (see *Referencing* below) and stored in a *.tab* file asso-

ciated to the bitmap.

Once selected, the map is visible in the Geoset configuration menu and the Layer management field shows the related filename:









If a second background map is added using the *Add Layer...* button, the new map is inserted on the top layer, which causes the previously added map layer to disappear:



Layer display and management is described below.

Layer This field displays all loaded layer names or map filenames and offers a series of icons for layer display:


-  A click on this icon resets the effects from the last map zoom or map scroll action. This icon is only active for background map layers, for other layers the icon is disabled ().
-  Single-clicking on these icons moves the corresponding layer one level up or down. With background map layers, only the top active map layer is visible.
-  This icon shows that the corresponding layer is active. To disable the layer, click on the icon. The icon is greyed () and the corresponding layer becomes invisible. If the top map layer is disabled, the next map layer becomes visible, if defined.
-  Clicking on this icon removes the corresponding layer from view and list.

Referencing To reference a map, the according layer must be on top, because only the top layer is selected for referencing.

Either **set three anchors** can be set directly; or **one anchor, northing and scale** can be used, similar to the previous Indoor version (in ROMES V.3.53).

1.) Referencing by setting three anchors:

First select the Layer to be referenced and ensure that it is the top background map layer.

Then click on the *Anchor Layer* button 

This creates a new layer caled "*Geo Referencing*" and changes the dialog content below the layer management list.

Now move the mouse pointer to the position where Anchor 1 should be placed and left-click to set the first anchor position. This inserts an anchor symbol into the map display and fills the reference list and the an-

Anchor property fields as shown below:

The anchor can be removed from the background map reference list by clicking on the **X** to the right of the anchor name.

The anchor can be moved in two ways: Either by clicking on the map anchor symbol and dragging it to the new position on the map, or by clicking on the map anchor symbol and clicking on the new position.

Once the anchor is on the desired map position, the geographic latitude and longitude of this position must be entered. With a connected GPS receiver, the anchor Lon/Lat can be taken from the receiver by clicking the **Retrieve current Lon/Lat by GPS.** button.

Alternatively, the anchor Lon/Lat can be entered manually, using either degree-minute-second or degree-minute-decimal or degree-minute-second-decimal formats:

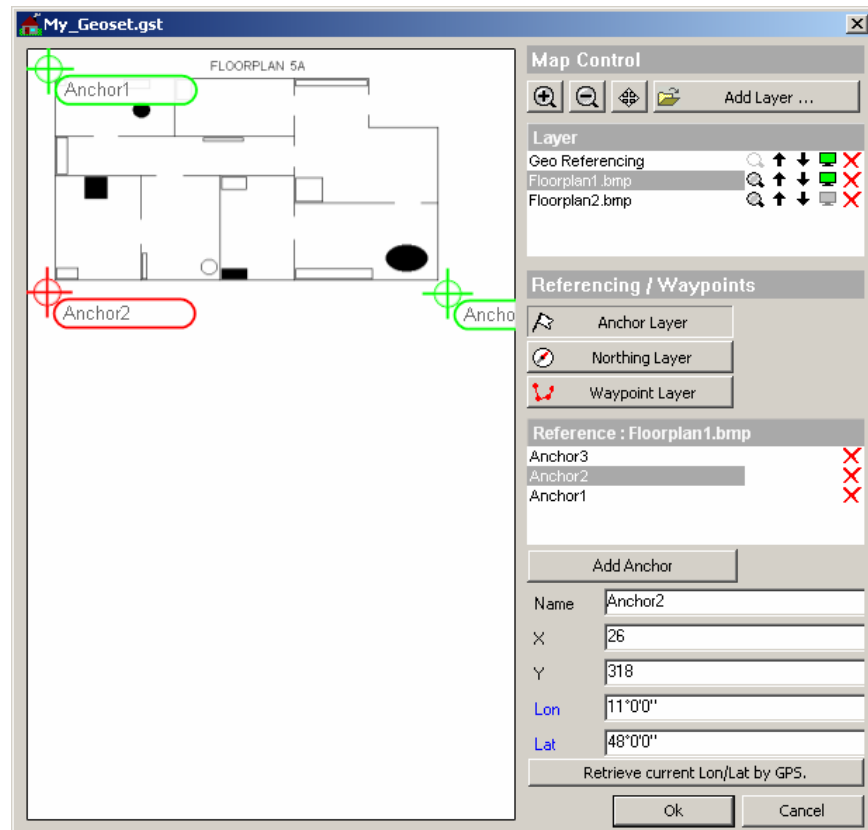
Lon	0°0'0"	Lon	0°0.00000'	Lon	0°0'0.00000"
Lat	0°0'0"	Lat	0°0.00000'	Lat	0°0'0.00000"

To switch between these formats, double-click in the area marked by the blue rectangle:

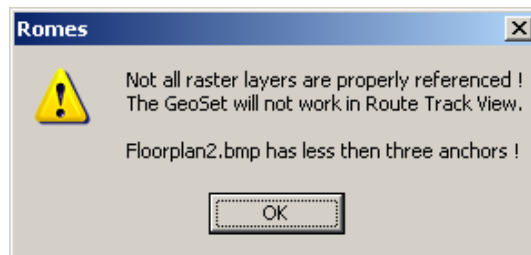
To place the second anchor, either click on *Add Anchor* and generate a new anchor in the top left corner which can then be moved to the wanted position, or click the *Anchor Layer* key again and then on the wanted position of the new anchor. Otherwise only the first anchor is moved to the clicked position. Repeat for the third Anchor.

Once all three anchors are set, the map display looks similar to the

screenshot below, where the red anchor is currently selected:



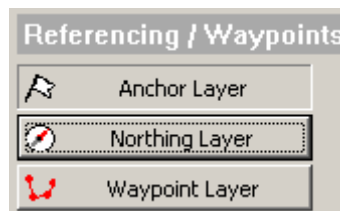
Save your changes to the Geoset by clicking the *OK* button. If there is a second background map layer that has not been referenced, the following warning appears:



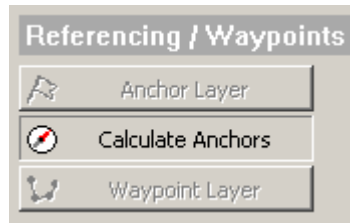
For the sake of clarity, the second background map is referenced using the second map layer referencing method:

2.) Referencing by setting one anchor, scale, and northing:

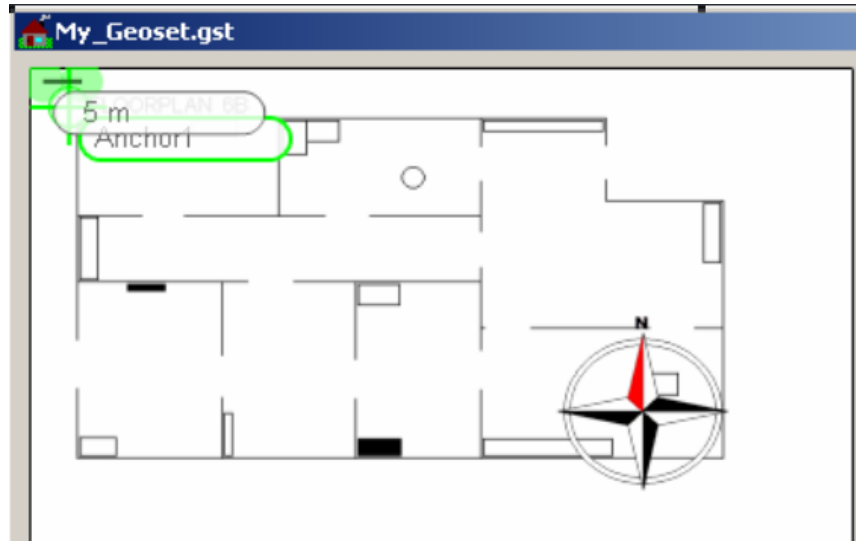
First select the second layer to be referenced and ensure that it is the top background map layer. Then click on *Northing Layer*:



The *Northing Layer* button now changes to *Calculate Anchors*:



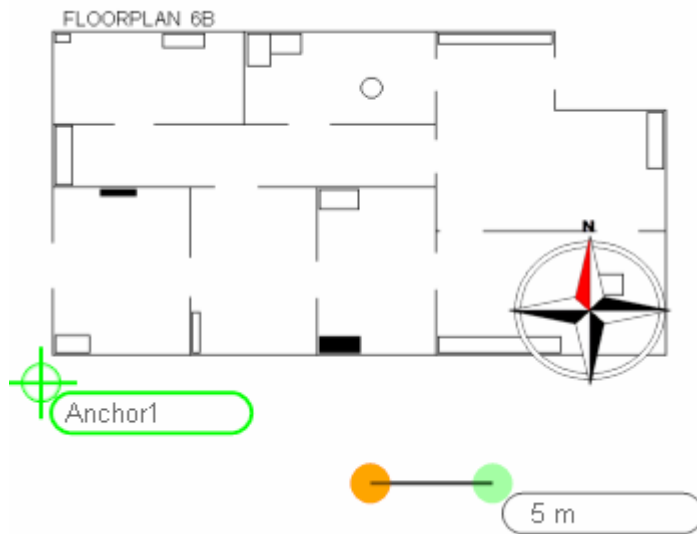
The map display now contains an anchor, a scale icon, and a compass:



Also instead of the list of anchors, the north direction (in degrees) and the scale distance value is shown (5 m default value).



The anchor and the two ends of the distance line can be placed individually now:



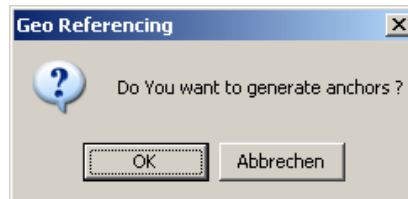
Enter another distance value if applicable, then select the anchor, and

enter its Longitude/Latitude. If the compass is clicked, it can be rotated using the mouse.

Alternatively, position the anchor, and enter the North direction as well as the scale distance manually in the *North* and *Distance* entry fields.

Now that the necessary references have been entered, click on *Calculate Anchors* to generate three anchors, which is the internally used map positioning reference.

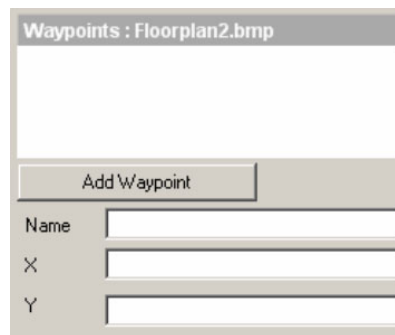
Verify the dialog



and save your changes to the Geoset by clicking the *OK* button.

Waypoints A series of predefined positions on the indoor map is specified before the measurement is started. During the measurement, the operator informs the system by clicking on the waypoint when it has been reached.

To configure waypoints, click on the *Waypoint Layer* button. The layer management list now displays a layer called "Waypoint", and the dialog area below the button looks similar to this:



To add a *Waypoint*, either click on the desired map position, or click on the *Add Waypoint* button, which creates a waypoint in the top left corner of the map.

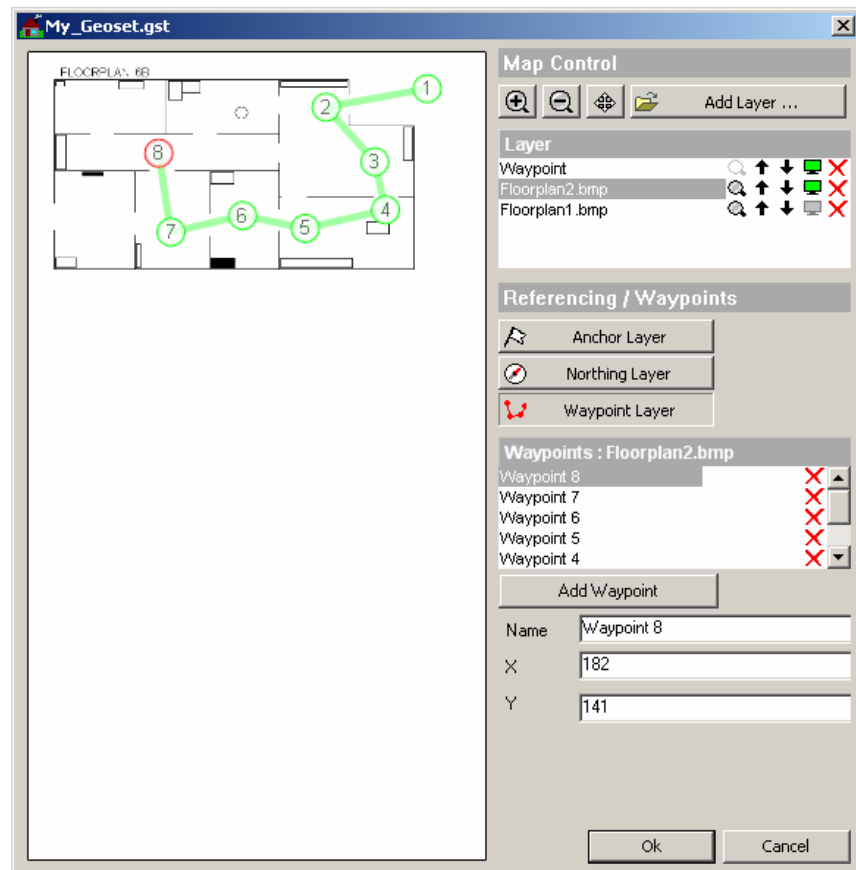
As with anchors, the waypoints can be moved by moving the mouse pointer on it and keeping the left mouse key pressed while dragging the waypoint icon to its desired position.

Inserting the next waypoint increases its index automatically.

The waypoints can be created intuitively:

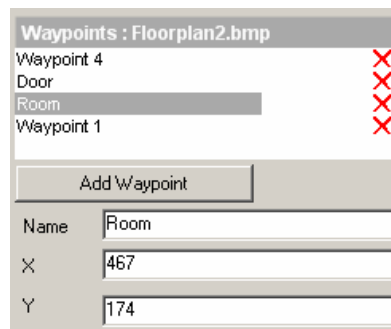
- Every click on the map *adds* a waypoint at the cursor position with a link to the previous waypoint.
- Every click on an existing waypoint *deletes* it and connects its former neighbors with each other.
- Drag-and-drop with the mouse *moves* a waypoint.

Create as many waypoints as necessary to obtain a map display similar to the following:



Waypoints can be removed from the waypoints reference list by clicking on the **X** to the right of the waypoint name.

By filling the Name field for a waypoint in the list, this waypoint is re-named accordingly:



NOTE:

If you would remove e.g. the 2nd waypoint ("Room") now, "Waypoint 4" becomes the **logically third** waypoint, although the name remains the same. The automatically issued names from the waypoint creation are **static**.

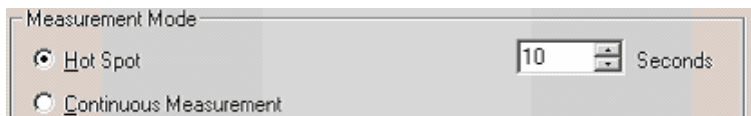
- Measurement Mode** Selects either a measurement in a fixed time interval (*Hot Spot*) or a measurement which lasts for an undetermined time unless restarted explicitly (*Continuous*).
- Like in the previous Indoor version, *Hot Spot / Continuous Measurement* can be combined individually with *Waypoints / Stream Input*, see following table.
- See also section [Measurement Mode](#) on page 6.234.
- If the *Generate Max. ... GPS signals each ... ms* checkbox is checked, the position interpolation is activated during the measurement, which is available only in Continuous mode. The frequency and number of GPS signals define the granularity of the interpolation.
- Navigation Mode** Defines how the position of a measurement location is reported to the measurement system:
- Waypoints** During the measurement, the current measurement position is set on the map by clicking on the waypoint button of the control menu, see following table.
 - Stream input** During the measurement, the current measurement position is set on the map of the control menu, via the mouse or trackball, see following table.
- OK** Applies the current configuration (if it is valid) and closes the *Indoor Navigation* menu.
- Cancel** Discards the configurations made and closes the *Indoor Navigation* menu.

Table 6-14 Indoor measurements in different navigation and measurement modes

Navigation Mode	Measurement Mode	
	Hot Spot (measurement with time limit)	Continuous (measurement without time limit)
Waypoints (predefined measurement points)	<ul style="list-style-type: none"> ➤ Go to next waypoint ➤ Click the waypoint button in the control menu to initiate new measurement after preset second count. <p>The result is shown at the waypoints (discrete values)</p>	<ul style="list-style-type: none"> ➤ Go to next waypoint ➤ Click waypoint button in the control menu to initiate new measurement <p>The result is shown between the waypoints (color scale)</p>
Stream input (measurement points defined ad hoc)	<ul style="list-style-type: none"> ➤ Go to next measurement point ➤ Use mouse to mark the measurement point (current position) on the Indoor view ➤ Click position to initiate new measurement after preset second count <p>The result is shown at the measurement points (discrete values)</p>	<ul style="list-style-type: none"> ➤ Go to next measurement point ➤ Use mouse to mark the measurement point on the Indoor view ➤ Clickmap location to initiate new measurement. <p>The result is shown between the measurement points (color scale)</p>

Measurement Mode INDOOR

The *Measurement Mode* panel of the *Indoor Navigation* configuration menu offers two different measurement modes, the *Hot Spot* and *Continuous* measurement:



Hot Spot Performs a measurement that is terminated after a fixed time but can be restarted at each measurement position (hot spot). The fixed measurement time is set in the input field to the right of the *Hot Spot* radio button. Values between 1 s and 10 s are allowed.

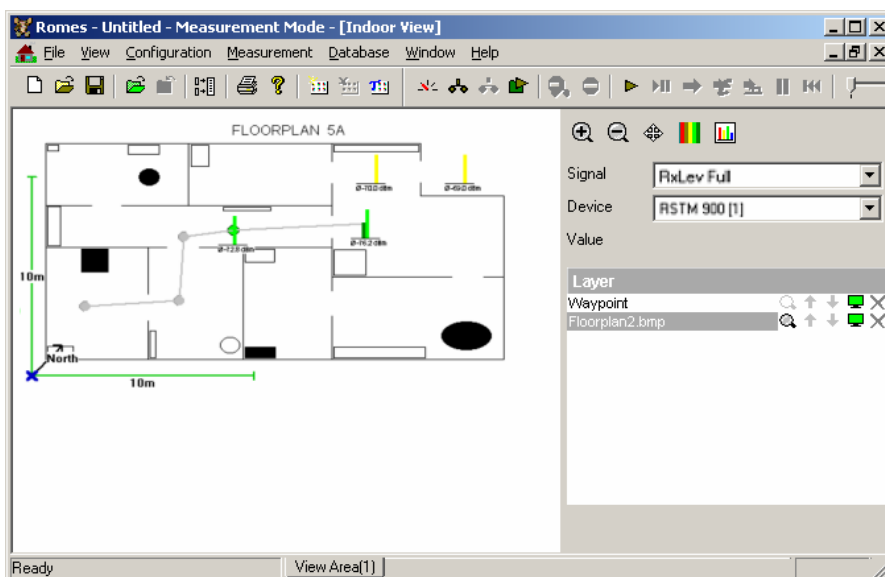


Fig. 6-147 Performing a hot spot measurement

Depending on the *navigation mode* set (see p. 6.233) the hot spots are either the waypoints defined before the actual measurement (see

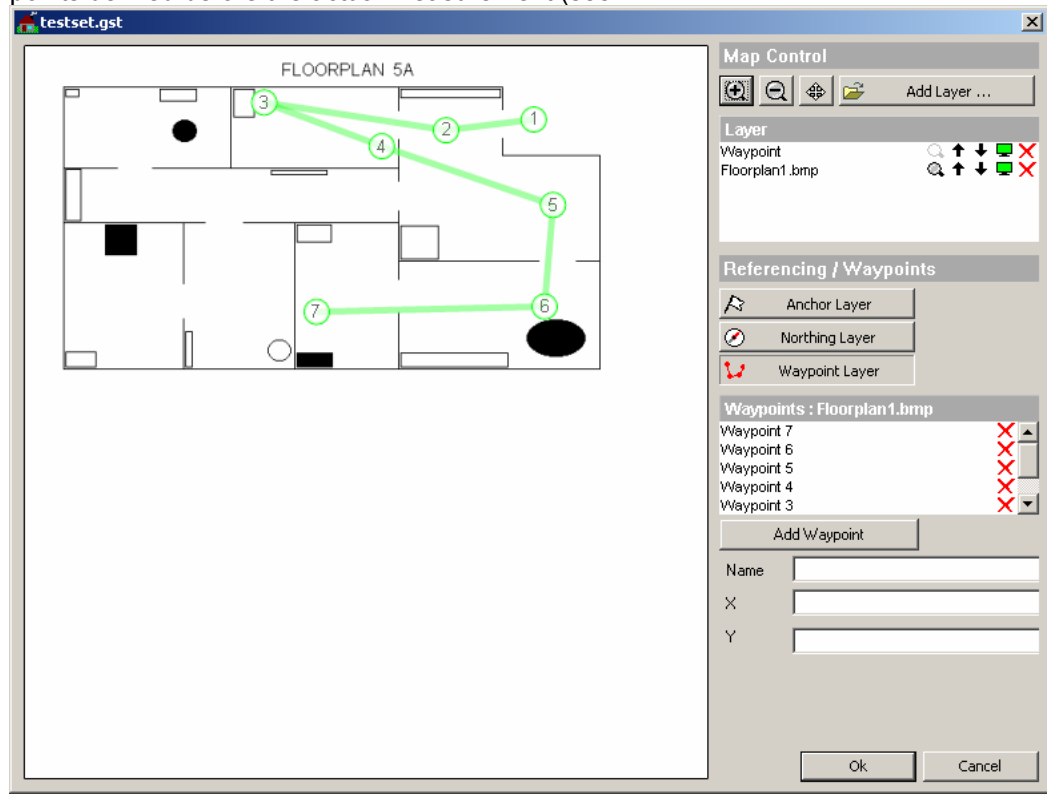


Fig. 6-146 on page 6.225) and stored in the waypoints configuration file or arbitrary points on the map that are defined during the measurement via the mouse or trackball.

Every single measurement is initiated via the Waypoint button of the Indoor Control view.

Note:

A measurement can be started and the next hot spot can be defined only after the end of the previous measurement, i.e. after the measurement time has elapsed.

Continuous Performs a measurement without time limit at previously defined waypoints. The *Check Point* button is to be clicked every time the operator reaches a waypoint.

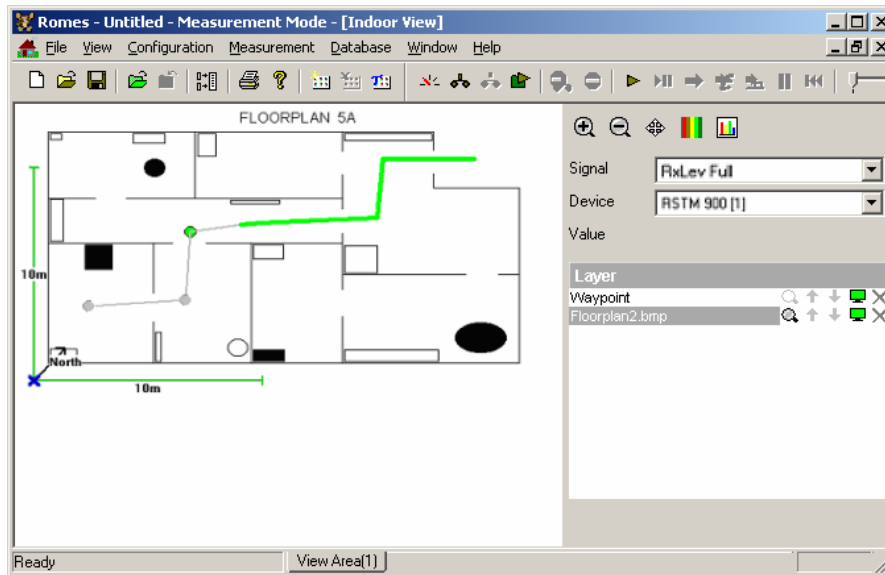


Fig. 6-148 Performing a continuous measurement

In this mode, the measured data is visualized along the way between two waypoints according to the color scale shown in the legend of the view window. To achieve this graphical representation, ROMES interpolates the measurement data along the straight lines between each pair of consecutive waypoints.

Note:

After the last waypoint is reached, the measurement is not stopped automatically. To terminate, click the Stop Measurement button or the corresponding command line in the Measurement menu.

ROMES uses the measurement results at the predefined waypoints to interpolate intermediate points and measurement results and store them in the measurement file. The number of the interpolated points is controlled by entering a time difference Δt (in ms) in the *Seconds* field associated to the *Measurement Mode* field: The number of interpolated values between two waypoints numbered n and $n+1$ equals to the integer number closest to the ratio $(t_{n+1} - t_n) / \Delta t$. The smaller Δt , the larger the number of interpolated values stored in the measurement file.

The interpolated positions and measurement results are not visible in the *Indoor View*. They can be exported though to an ASCII file or evaluated and viewed by an appropriate .cmd evaluation and post-processing software.

Indoor Navigation - Templates

The *Templates* tab stores the current indoor driver configuration as a template, lists, loads or deletes driver templates.

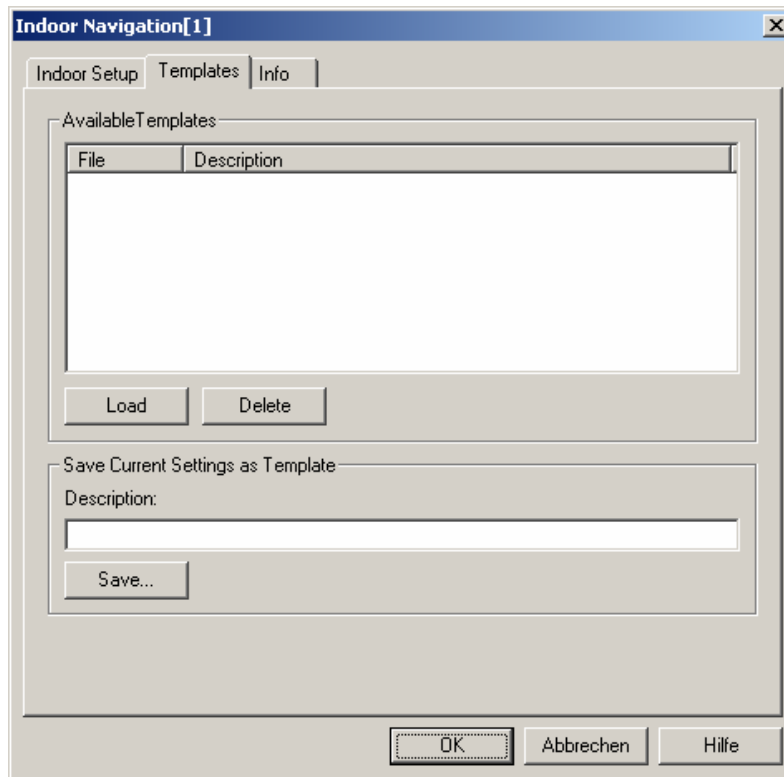
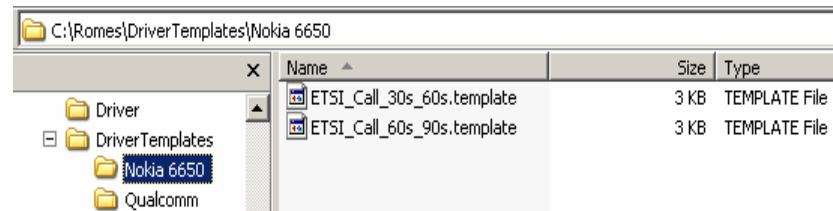


Fig. 6-149 Indoor Navigation - Templates

Load/Delete

Loads a driver template or deletes a template displayed in the list of *Available Templates*. Template files are ASCII files with the extension *.template. The template definition is independent from the workspace.



Save

Saves the current driver settings together with the *Description* to a selected template file.

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7 Data Processing

The following chapter describes the various options offered for saving and exporting measurement data.

The steps taken for data acquisition and for the data analysis are independent in principle. R&S ROMES uses its own standard format for measurement files (*.CMD files) but offers various options for printing results or interchanging the data with other applications:

- The *.CMD file can be directly used by an appropriate .cmd evaluation and post-processing software.
- The contents of a view can be printed to a file or hardcopy using the Print options in the File menu (see chapter 3).
- The *.CMD data can be converted into other file formats and exported.
- A screenshot of the whole screen or part of the screen (= active window) can be generated.

Saving Data with R&S ROMES

Data Recording

If a measurement is started via *Start recording* (see chapter 3), the recorded data is automatically saved under the selected file name with the extension *.CMD. Only this format provides the *Replay* feature. The *.CMD format is also supported by other software tools.

Care has to be taken when starting a measurement via *Start measurement* (see chapter 3) without recording. In this case the system asks you to enter a measurement file name. This name will be used at the moment you start recording. If you do not record any data, the file will be deleted and not be stored as an empty file after the measurement is terminated.

Attention:

If you select an existing measurement file it will be deleted if no data is recorded and overwritten if data is recorded.

Export

For further evaluation with other applications, e.g. with the *TS9954* NQA evaluation software, the required data formats must be generated via the *Export* function.

Save Workspace

The *Save Workspace* and *Save Workspace as* functions in the *File* menu and the corresponding floppy disk icon in the tool bar are only used for saving workspace files (*.RMS).

Exporting Data

The export of measurement files is carried out in several steps:

- Selection of the target file format and directory
- Selection of the measurement CMD file
- Export configuration (selection of signal parameters, export options)
- Generation of the export file

The export process is described in the following section. The configuration menus depend on the selected export file format; they are described on page 7.7 ff.

Export Procedure

Measurement data files (*.CMD) can be exported via the *Export CMD File* command in the *File* menu.

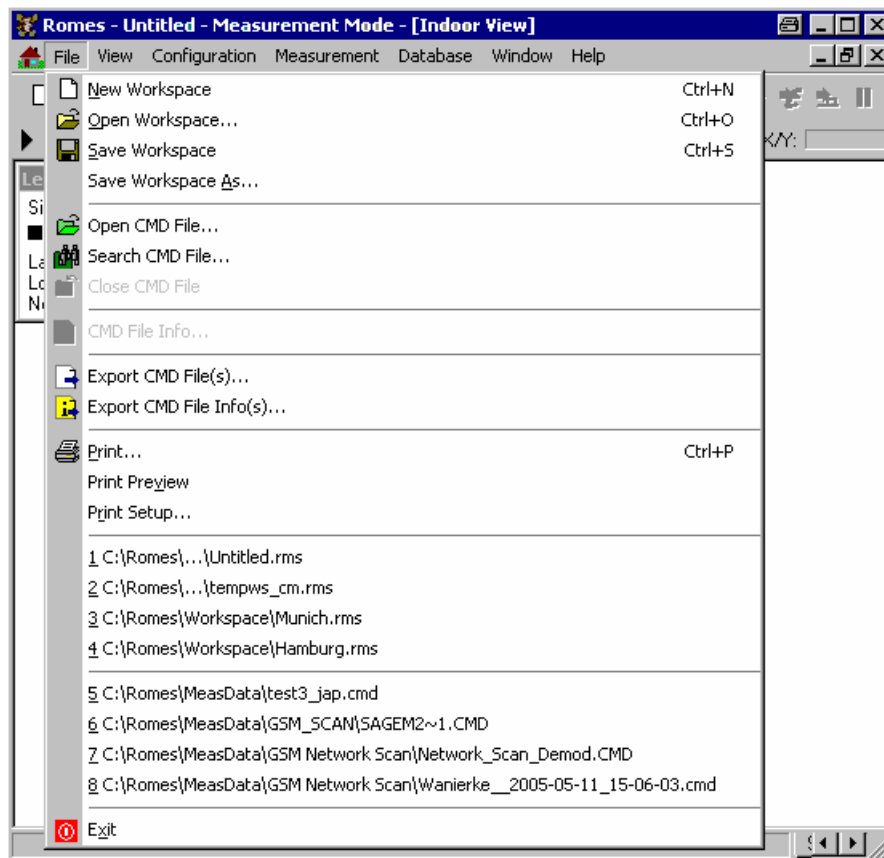


Fig. 7-1 Export CMD File...

The Export CMD File command opens the *Export measurement data* dialog. With this dialog, an arbitrary measurement file can be converted and stored to a file in a *target directory* and with one of the *export formats* offered.

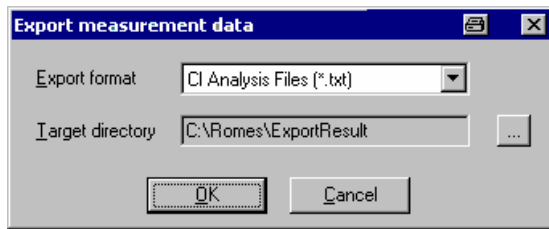
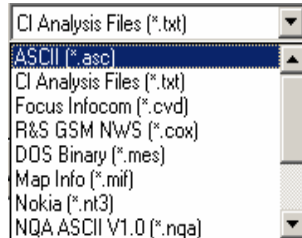


Fig. 7-2 Export measurement data

Export format

The *Export format* pull-down list offers the file formats for the target files. Which formats are available depends on your system options:

**ASCII (*.ASC)**

ASCII tables, e.g. for import into an MS Excel chart; see p. 7.7 f.

R&S GSM NWS (*.cox)

For GSM Network Scan data acquired with the R&S TSMU. The format is identical with the *.cox format for C0 scan export files described on p. 7.35. Note that an empty GSM network data base (*.ndb) must be loaded before scan data is exported to a *.cox file. It is recommended to monitor the export messages in the *Message View* while a data export is in progress.

Map Info (*.MIF)

MapInfo Interchange Format for evaluation in MapInfo; see p. 7.15 f.

NQA ASCII V1.0 (*.NQA)

Network Quality Analysis ASCII; see p. 7.18 f.

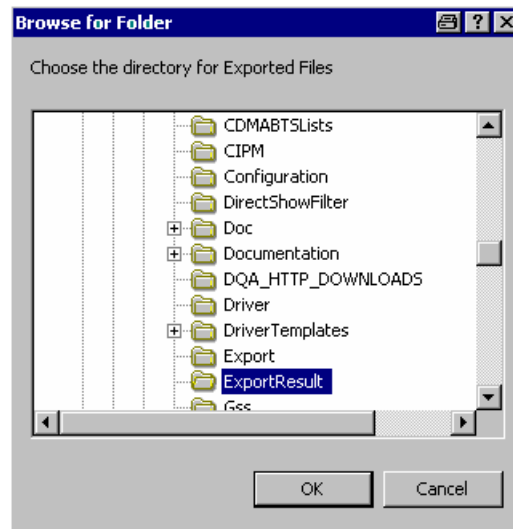
NQA ASCII V2.0 (*.NQ2)

Network Quality Analysis ASCII; recommended format for MS Excel 8.0 and higher; see p. 7.18 f.

These formats are explained in the following sections.

Target directory

The *Target directory* field shows the current target directory for the export file. The directory can be changed via the browse (...) button on the right side. A *Browse for Folder* dialog is opened:



Directory tree

Overview of all available directories. A selected directory is highlighted and represented by a changed icon.

OK

Close the *Change directory* dialog using the selected directory as the export target directory.

Cancel

Close the Change directory dialog discarding any changes.

OK

Export a measurement file with the format and target directory selected. The OK button opens a standard *Open* file dialog (see *Open Workspace* command in chapter 3) where the measurement file(s) to be exported is (are) selected, followed by the *Export Configuration* menu for the selected file format. The configuration menus depend on the export format; they are described in the following sections (p. 7.7).

Several CMD files can be selected simultaneously (use the *Shift* or *Ctrl* key) and exported to several target files. If a CMD file is already open (e.g. because an *Open CMD File* command was executed before starting the file export), the open file is selected by default. Otherwise, an arbitrary CMD file can be selected in the *File Open* dialog.

The names of the export files are assigned automatically; the extension of the exported *.cmd file is simply replaced by the selected export format. It is possible to modify the default export file names using a *File Pre/Suffix*; see description of the *Export Configuration* menu. The *Export Info* window logs the file creation process:

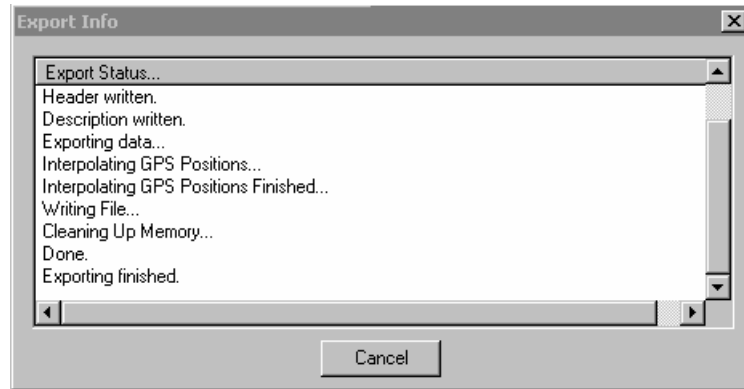


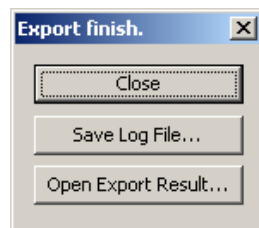
Fig. 7-3 Export Info

Cancel

Cancel the file export and close all corresponding dialogs.

Export Info

After successful termination of the file export, or after its interruption by means of the *Cancel* button, the following message box is displayed:



Close

Terminates the file export without saving the logging info to a file or opening the result.

Save Log File...

Saves the logging information shown in the *Export Info* window in a text (*.TXT) file to be specified in a *File Open* dialog and terminates the file export.

Open Export Result...

Open the generated export file using the standard application for the export file type. If no standard application is defined for the export file type, use MS Windows Explorer to assign an appropriate application (e.g. Notepad, MS Excel,...). To assign an application, open the context menu for the file and select *Properties – General – Opens with... – Change*.



In general it is more convenient to select (open) a CMD file before the file export (Export CMD File). An open CMD file does not have to be selected again during the export and the file header appears in the Open file dialog.

Export Configuration Menus

Every export format is assigned its own *Export configuration* menu which is opened automatically during the file export, see previous section. In contrast to other configuration menus (e.g. for views), the *Export configuration* menus can not be accessed unless a file is being exported. Therefore, switchover between the menus for different export formats is not possible. However, all selections and settings made in a particular *Export configuration* menu are saved and can be re-used.

User-defined ASCII format (*.ASC)

With the *.ASC format, a user-defined ASCII measurement data table, useful e.g. to import the data into an MS Excel chart can be created. The file starts with a header, containing all useful information about the tour, see example file at the end of this section. The *ASCII Export* configuration dialog contains three tabs:

Values Tab

The *Values* tab offers a list of all parameters in the selected measurement file (*.CMD).

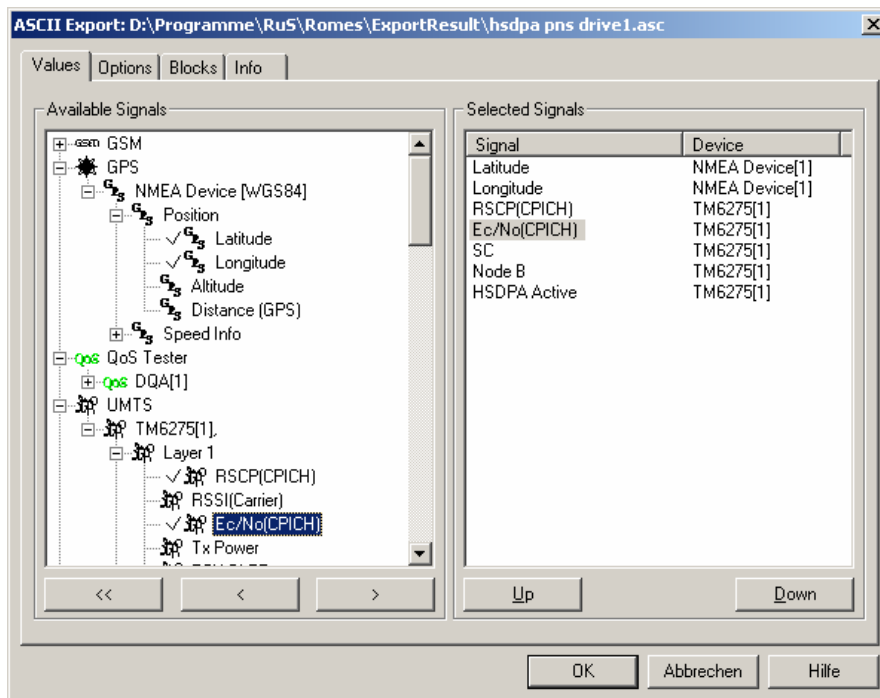


Fig. 7-4 ASCII Export configuration: Values

Available Signals Data tree (see chapter 1) showing all available signal parameters (hierarchy level 4 of the data tree).

Selected Signals List of all signal parameters selected for display.

The order of the list can be changed using the two buttons below. Each selected signal forms a column in the ASCII file; the order of columns is equal to the order of signals in the *Selected Signals* list.

Option Tab

In the *Option* tab, the data selection can be refined by imposing additional selection criteria to the exported signal values. This is suitable (or even inevitable) to handle large amounts of data.

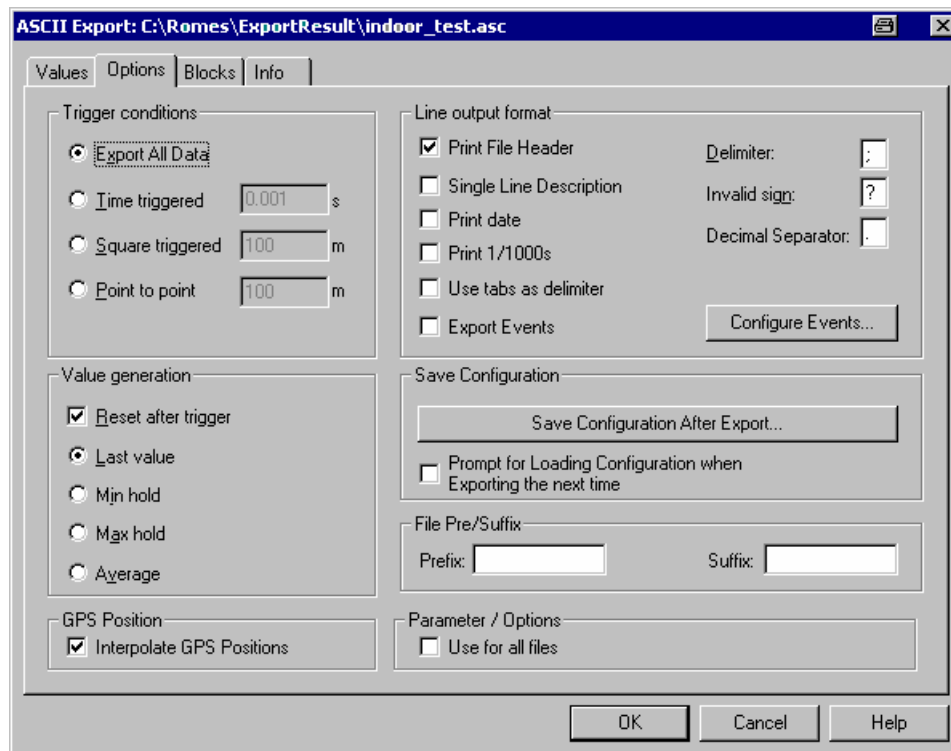


Fig. 7-5 ASCII Export configuration: Options

Trigger conditions The *Trigger conditions* panel defines a parameter interval in which exactly one value per output signal is written to the target export file.

Export All Data

No reduction of the original data; the unchanged values are exported.

Time triggered

A time interval between 0.001 s and 60 s is specified.

Square triggered

A square surface with a side length between 1 m and 10000 m is specified

The Square Trigger period is not distance-related but depends on the actual position in a field of squares. A value is generated whenever a square is left. As a consequence, the last square does not contribute to the export file.

The amount of data collected used for export value generation and the time between two trigger events may differ extremely from one square to another: In the B square of the figure below, Fig. 7-6, very much time is spent and a lot of data may be collected, but in C, D and E this is obviously different. The number of data points actually measured in a square does not have any influence on the length of the export file.

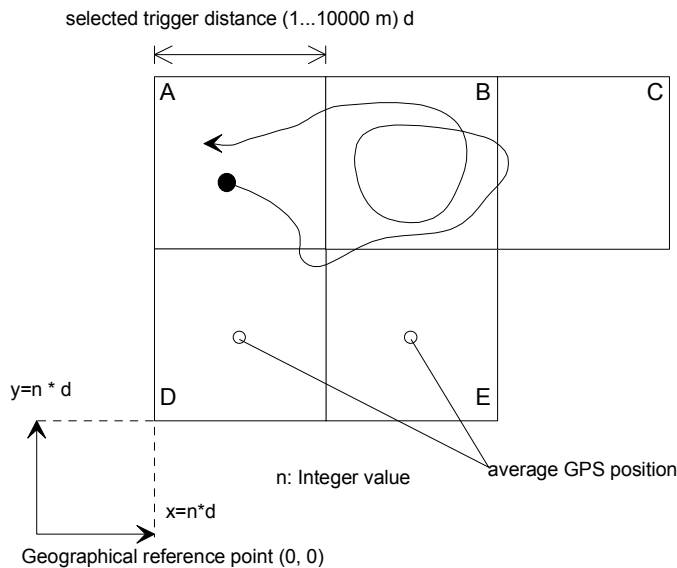


Fig. 7-6 Square Trigger condition

If large squares are defined, it is not recommended to use the time stamp in combination with the average GPS position to determine the vehicle speed, as this will lead to a high error rate.

Point to point

A driven distance between 10 m and 1000 m is specified.

Value generation The *Value generation* panel defines how the value exported in a trigger period is calculated.

Reset after trigger

If the box is checked the buffer is cleared after each trigger period. If not, the export value (i.e. the last value, minimum, maximum, or

average, whichever is selected) in each trigger period is stored in the buffer. If only invalid values are detected in one trigger period, the buffer value (i.e. the value of the previous trigger period) is exported.

Last value

If only invalid values are detected in one trigger period, the last valid value is exported

Min hold

The minimum value within one trigger period is exported

Max hold

The maximum value within one trigger period is exported

Average

The average value within one trigger period is exported.

GPS Position

If *Interpolate GPS Positions* is checked, R&S ROMES calculates the position of each measurement record by linear interpolation of the closest position data provided by the GPS receiver. Otherwise, a position remains valid until a new GPS result is available.

GPS position data are updated about once per second. Interpolating the positions is suitable, especially if the measurement rate of the other test devices is much larger than 1/s (e.g. CW receivers), or at high speed of the test vehicle.

Line output format

The *Line output format* panel defines the format of an ASCII table line:

Print File Header

If the box is checked, the file header information is included in the target file. The file header comprises the information retrieved with the *File – CMD File Info...* command (see chapter 3).

Single Line Description

If the box is checked, the description of all parameters is written into a single line, the entries are separated by the *Delimiter* that is used for the data. This option is suitable for an import of the target file into MS Excel, where each parameter description forms a table heading.

If the box is unchecked, each parameter description is written into a separate line.

Print date

If the box is checked, the date will be added to the beginning of every data line.

Print 1/100 s

The 1/100 s data will be added to every data line start.

Use tabs as delimiter

Two signals in the export file are separated by tabs; the *Delimiter* field below is disabled.

Export Events

Events included in the measurement file are included in the export file.

Delimiter

This character separates the values of two signals in the export file. The *Delimiter* field is disabled if the *Use tabs as delimiter* option is checked.

Invalid sign

The invalid sign shows that no valid value was detected.

Decimal Separator

This character should be different from the *Delimiter* to avoid conflicts when post-processing the exported data.

Configure Events

Opens the Available Events tab of the R&S ROMES Configuration menu; see chapter 3, Configuration – Preferences – Available Events.

Save Configuration

The *Save Configuration After Export* button opens a file *Save As...* dialog to save the current configuration in an ASCII export configuration file. ASCII export configuration files have the extensions *.rma and can be reused when exporting next time. If the box below the button is checked, the system prompts for loading the current configuration file when the ASCII export configuration menu is called up.

File Pre/Suffix

Defines two text strings which can be used to modify the file names and distinguish several exported files. The prefix is inserted at the beginning of the file name, the suffix at the end:

<file name>.asc

<prefix><file name><suffix>.asc

Parameter / Options

If more than one file is selected for export, this click box offers to use the configuration settings for all of the selected files.

Blocks Tab

The *Blocks* tab shows a list of all blocks in the measurement file and selects the blocks to be exported. Measurement files recorded with R&S ROMES V3.22 and higher can be divided into several blocks; see description of *Replay Jump to Next Block* command in chapter 3. The *Blocks* tabs are analogous for all export formats and will be omitted in the following.

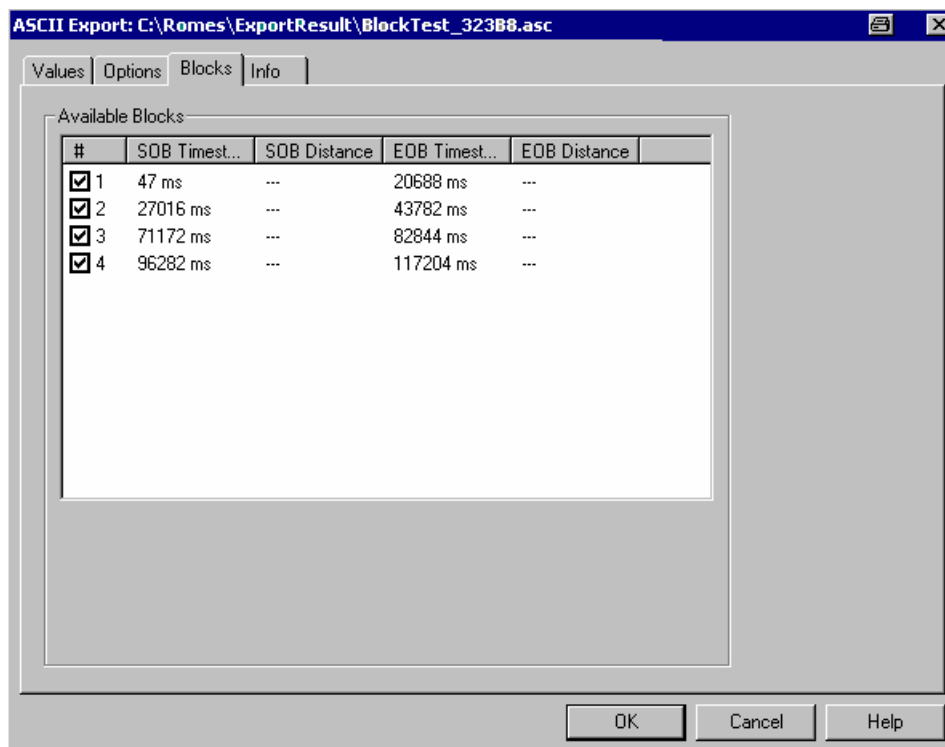


Fig. 7-7 ASCII Export configuration: Info

Info Tab

The *Info* tab shows information on the current ASCII export software module. The *Info* tabs are analogous for all export formats and will be omitted in the following.

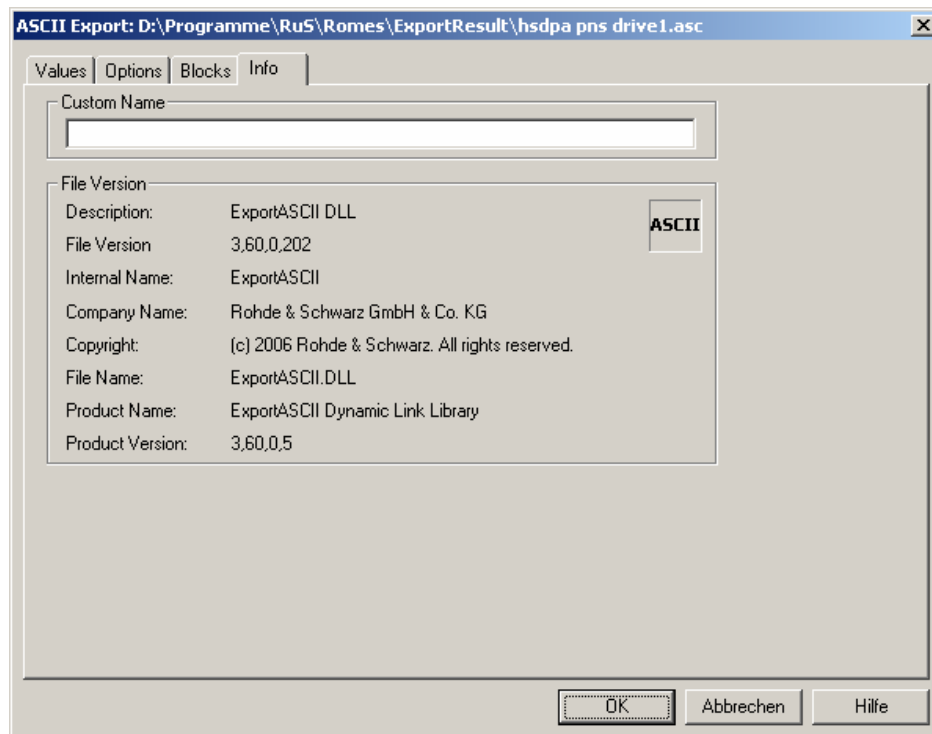


Fig. 7-8 ASCII Export configuration: Info

Example File

Example for an ASCII export file: (OT290, 1 GSM/GPRS Mobile)

```
[Measurement Info, Ver. 3.53 Rev. 0 SP5]
Date: 22.2.2006
Time: 18:23:24
```

Comment:Test with AMR

```
Username:John Doe
Vehicle Name: Testmobile
Vehicle ID:M - RS 123
Num of Blocks:1
Duration:00:03:50 (HH:MM:SS)
```

=====

```
Drivers:
- NMEA Device[1]
- Test Tool OT290[1]
```

=====

```
[GPS Ver 3.53]
Type: NMEA Device
Ellipsoid: WGS84
```

Nav.Proc.Version: not available
Sig.Proc.Version: not available
Driven area: 51.233633 (Lat. up left)
6.750633 (Long. up left)
51.232250 (Lat. bottom right)
6.752883 (Long. bottom right)

=====

[Test Tool OT290 [1], Ver 3.53]
Type: Sagem GPRS (Firmware JY3,Bj 315)
GSM Net: GSM900/DCS1800
Meas. Mode: Normal
IMEI: 08202501
Auto Dial Timing:
 Call Window: 60 sec
 Call Duration: 40 sec
 Max. Access Time: 15 sec
Call Window Offset: 0 sec
Type of Call: Voice Call
NQA Rx Source: Full
RxLev Calibration: No
Antenna name: Default_Antenna
Cable loss [dB]: 0.00
Antenna gain [dBi]: 0.00
Cellbar Flag: Normal
CBCH: not decoded
GPRS Mobile: Yes
Forcing Settings: Multi Slot Class:No Forcing
 Coding Scheme: No Forcing
 GPRS Auto Attach: No Forcing
 MS Class: No Forcing
 GSM Power Class: No Forcing
 DCS Power Class: No Forcing
 EFR: Off
GSM/GPRS QoS Actions Evaluation
 1. GSM Handover:
 Timeout: 10000 ms
 2. Location Area Update:
 Timeout: 10000 ms
 3. GPRS Attach:
 Timeout: 10000 ms
 4. GPRS Detach:
 Timeout: 10000 ms
 5. Activate PDP Context:
 Timeout: 10000 ms
 6. Deactivate PDP Context :
 Timeout: 10000 ms
 7. Routing Area Update:
 Timeout: 10000 ms

Handover Analyzer
 Enabled: No

Port Settings
 1. Port:
 Type: Trace
 Name: COM1

=====

[EXPORT OPTIONS]
Exported by version:3,60,0,207
Trigger type: All Data is Exported

```

Delimiter: ;
Invalid Sign: ?
Created during multiple file export: no
Parameter selection: copied from other file

```

```

[DESCRIPTION]
Timestamp [hh:mm:ss]
GSM\Server Report\MCC : [1]
GSM\Server Report\MNC : [1]
GSM\Server Report\LAC : [1]
GSM\Server Report\CI : [1]
GSM\Measurement Report\BCCH [ChanNr] : [1]
GSM\Measurement Report\BSIC : [1]
GSM\Measurement Report\RxLev Full [dBm] : [1]

```

```

[DATA]
18:23:30;?;?;?;31129;830;37;-84
18:23:32;262;3;33919;31129;830;37;-81
18:23:34;262;3;33919;31129;830;37;-80
18:23:36;262;3;33919;31129;830;37;-77

```

MapInfo Interchange Format (*.MIF)

MIF is a particular ASCII file format that stores graphical information to be displayed in a MapInfo table. The *MIF Export* configuration dialog contains four tabs. The *Blocks* and *Info* tabs are analogous to the *ASCII Export* tabs; see p. 7.12 ff.

The *Values* tab offers a list of all parameters in the selected measurement file (*.CMD).

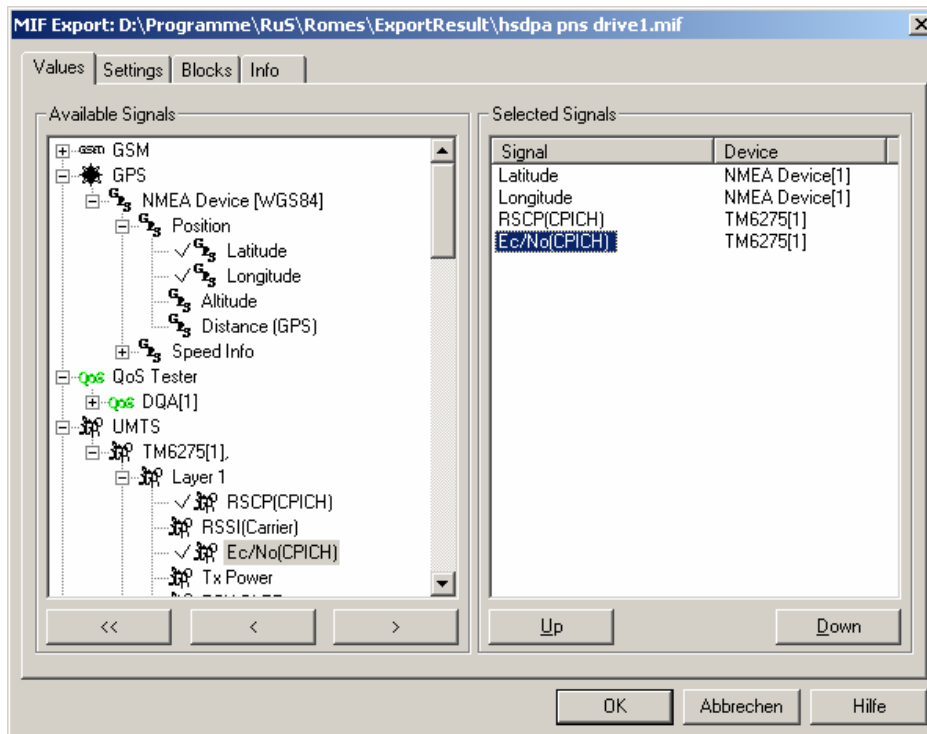
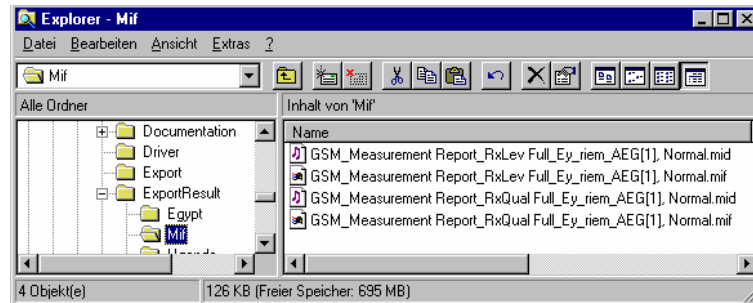


Fig. 7-9 MIF Export configuration: Values

Available Signals Data tree (see chapter 1) showing all available signal parameters (hierarchy level 4 of the data tree).

Selected Signals List of all signal parameters selected for display.

The order of the list can be changed using the two buttons below. For each selected signal, a separate *MIF plus a *.MID file is generated.



The *.MIF file contains a file header followed by the geographic coordinates of each exported data point and the code for the symbols to be used for display in MapInfo; see description of *Settings* tab below. This file can be imported into MapInfo as described in section [Importing *.MIF files to MapInfo](#) on p. 7.1.

The *.MID file contains two columns for the exported signal values and a general signal, e.g. the time stamp associated to each signal value.

The *Settings* tab selects the symbols to display the data in MapInfo and the data to be exported to the *.MIF file.

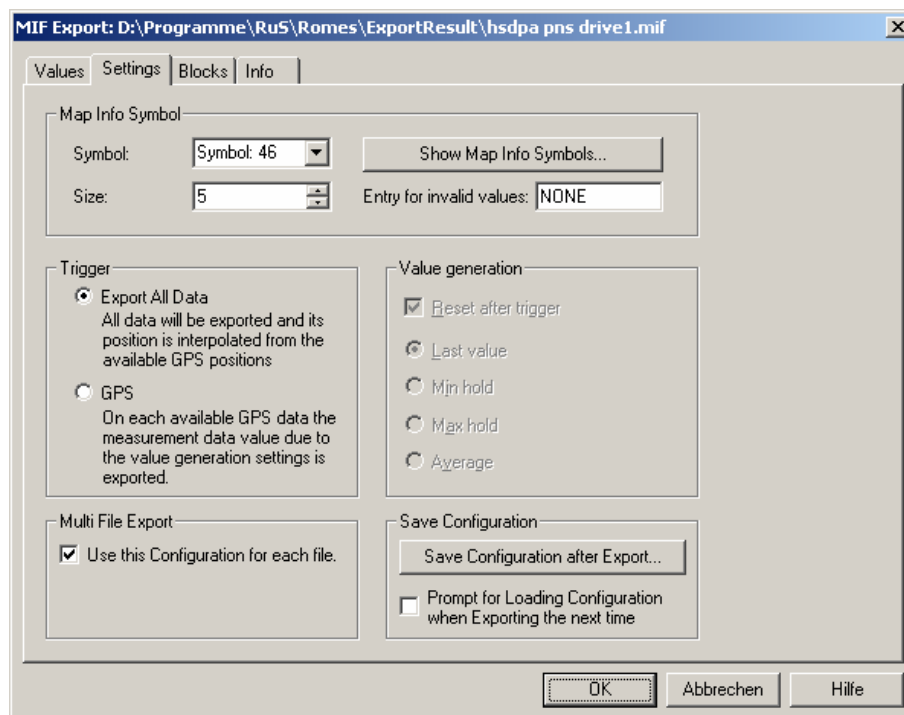
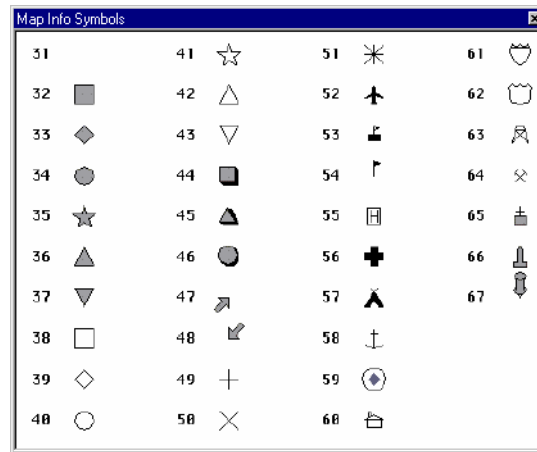


Fig. 7-10 MIF Export configuration: Settings

MapInfo Symbol Selects the symbol to display the data in a MapInfo view and the symbol size. The symbols can be defined with their code number (*Symbol*) and *Size* or selected from a list that is opened on clicking the *Show Map Info Symbols...* buttons.



Trigger

Defines which values in the selected signals are exported and how the geographical coordinates assigned to the exported values are calculated. The following alternative options are provided:

Export All Data

Export all values of the selected signals to the *.MIF file. Use an appropriate interpolation method to determine the position of each value from the GPS data available in the measurement file.

GPS

Export one signal value for each GPS position stored in the measurement file using the *Value Generation* settings; see below.

Value generation

Defines how the signal value assigned to a definite GPS position is calculated. The panel is active only if the *GPS* trigger condition is set. One trigger period corresponds to the time between two consecutive GPS positions.

Reset after trigger

If the box is checked the buffer is cleared after each trigger period. If not, the export value (i.e. the last value, minimum, maximum, or average, whichever is selected) in each trigger period is stored in the buffer. If only invalid values are detected in one trigger period, the buffer value (i.e. the value of the previous trigger period) is exported.

Last value

If only invalid values are detected in one trigger period, the last valid value is exported

Min hold

The minimum value within one trigger period is exported

Max hold

The maximum value within one trigger period is exported

Average

The average value within one trigger period is exported. This option is not applied to parameters where averaging does not make sense, e.g. channel numbers or station codes.

Multi File Export If the box is checked the current *MapInfoSymbol*, *Trigger* and *Value generation* settings are also used for future *.MIF export files. Otherwise, R&S ROMES will reset the settings to default after the current file export.

Save Configuration The *Save Configuration After Export* button opens a file *Save As...* dialog to save the current configuration in a MIF export configuration file. MIF export configuration files have the extensions *.rma and can be reused when exporting next time. If the box below the button is checked, the system prompts for loading the current configuration file when the MIF export configuration menu is called up.

Importing *.MIF files to MapInfo

The .MIF file can be imported to MapInfo and converted to a MapInfo table file (*.TAB) to be viewed in a MapInfo table. This involves several steps:

1. Open MapInfo and select the *Import* command in the *Table* menu.
2. In the *Import File* dialog opened, select the file type *MIF and the *.MIF file to be imported and press *Open* to start the file import.
3. In the *Import into Table* dialog opened, select a name and directory for the *TAB file to be created and press *Save*.

By default, the *TAB file is stored in the same directory and uses the same file name as the *MIF file.

4. In the *File* menu, select *Open Table* to display an *Open Table* dialog and select the created *TAB file.
5. To display all data points stored in the *.MIF file, use the *View Entire Layer* command in the *Map* menu.

For more information refer to the MapInfo help.

NQA ASCII format (*.NQA)

The NQA (**N**etwork **Q**uality **A**nalysis) ASCII format is used with the *TS9954 NQA* evaluation software. This software offers an extended analysis of GSM data allowing, e.g., to combine the NQA view with the complete MS Excel functionality. For detailed information see section [Evaluation of NQA Data with TS9954 NQA](#) on p. 7.37 ff. The following program and file format versions are available:

NQA format version	TS9954 NQA version	MS Excel version
V1.0 (*.NQA)	V2.10	V5.0 or higher
	V3.00, V3.01	V8.0 or higher
V2.0 (*.NQ2, recommended format)	V3.00, V3.01	V8.0 or higher

To generate and evaluate NQA data, a GSM mobile must be used and both *NQA* and *Autodialing* must be enabled in the corresponding hardware driver configuration menus (see chapter 6). If the selected measurement file contains no NQA data, an error message will appear when you try to use the *.NQA export format.

Export via MS Windows Command Line

If you actually do not intend to perform any measurement or replay on your system, but just want to export some measurement files, you may do this also from the command line (except for user-defined ASCII format *.ASC).

General command line export syntax:

```
[C:\ROMES\]ROMES.exe [[/mes] [/srs] [/nqa] <file(s) *.CMD> [/o output filenames][/r report file]]
```

Note: Wildcards (*, ?) are not allowed.

If the paths of the used files (ROMES.exe, *.cmd) are reported to the system by the PATH=... command in the AUTOEXEC.BAT, you do not need to add them to the file names.

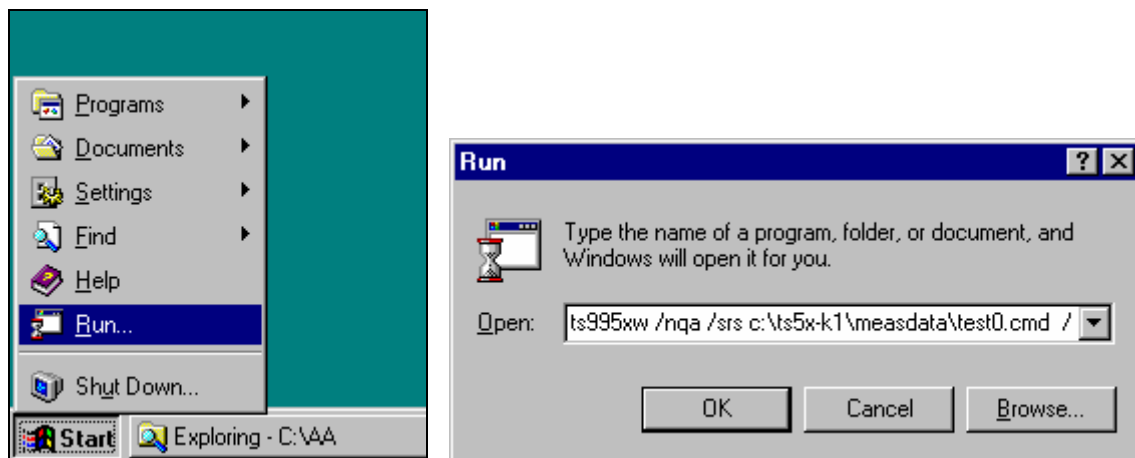
To export the data, one of the formats [/mif], [/pro], [/asc], [/nqa] or [/nq2] must be selected. Multiple selection is allowed.

If an input file name has no related output file name after the /o switch, the input file name will be used for the output file.

If more output file names than input files are specified, the spare output files are ignored. If less output files than input files are specified, the *n* given output file names are used for the first *n* input files. The names of remaining files are unchanged, only the default extension is used.

If the /r option is used, all text output (e.g. error messages) produced during export is diverted into a report file. If no report file name is specified, the default name *error.txt* will be used.

Enter the MS Windows command line into the input field of the *Run* dialog box which is accessible from the *Start* menu:



You can also start from the DOS box. **Here you may also use a batch file, if desired.** If you do so, start every new line with the CALL command, otherwise only the first line of the batch file will be executed.

BTS / Node B List Formats

BTS (base transceiver station) and UMTS Node B data are imported via the *Configuration of Software Modules* menu (see *Configuration – Settings* command in chapter 3) from a BTS / Node B list file. BTS list files are ASCII files characterized by one of the extensions *.txt, *.atd, *.buf or *.vig. Information on the base stations can be indicated e.g. in the *Alphanumeric View, Measurement Report, or Route Track* views (see chapter 4). An example for a base station list is shown on page 7.26.

File formats

The formats *.buf and *.vig are customized, fixed formats and not intended for general use. *.atd and the two *.txt versions are BTS list file formats which can be configured as described in the following sections. The information in all BTS files is arranged in a table. Each column of the table corresponds to a BTS parameter, each line to a particular BTS sector.

- The extensible *.txt format is available for R&S ROMES software versions \geq V3.20. The BTS parameters in the file can be selected at will; their number and order is described in a header line.
- The old *.txt format is available for R&S ROMES software versions $<$ V3.20 but will be also supported in future versions. Compared to the extensible *.txt format, the old format uses a header line with a different syntax and a number of mandatory BTS parameters in a fixed order.
- The *.atd format is available for R&S ROMES software versions $<$ V3.20 but will be also supported in future versions. The names of the BTS parameters in the file are fixed. This file format can be used also for UMTS Node B list files.

Starting with R&S ROMES software V3.20, it is recommended to use the new flexible and extensible *.txt format for GSM BTS list files; see section [Extensible BTS List \(*.txt\) Format below](#). This extensible file format is also used as an export format for GSM data from an internal network data base (*.ndb) file (see *Configuration – Settings* command in chapter 3). The *.atd format must be used for UMTS Node B network data bases.

Alternatively, it is possible to write a DLL file defining a new, user-defined BTS list format; see section [User-Defined List Format](#) on p. 7.32 ff.

Identification of base stations

The assignment of different sectors to a particular BTS in a Carrier-to-Interference measurement is based on the measured geographical position of each sector: Up to three sectors with a distance of less than 5 meters are considered to belong to the same base station. It is assumed that the 51-multiframes (T_{51} frames) of all sectors of the BTS are time-synchronized, i.e. that the starting time of their M51 multiframe is the same. In the case of asynchronous sectors or a number of sectors larger than three, individual clock codes are required; see below.

Update of the BTS data base

The BTS list data base can be updated by adding a new BTS list file; see description of *Configuration – Settings* command in chapter 3. In the update process base stations that are already included in the data base are replaced, and new base stations are added to the data base. Two BTSs are considered to be identical if both their geographical position and the clock codes of their sectors match.

Clock codes Up to three sectors with a distance of less than 5 meters are considered to be time-synchronized if their clock codes are equal. A maximum of three sectors with the same position and the same clock codes are allowed.

If a the BTS list data base and the added BTS list file contain the same BTS with different clock codes, the system will erroneously assume that the BTS in the list file is new and add it to the data base for a second time. In order to avoid such a situation an automatically generated clock code should never be used. To clearly indicate whether two base stations are identical and whether or not their sectors are time-synchronized we recommend the following choice:

- If the sectors are not synchronized, use the Cell Identity (CI) of the individual sectors as clock codes.
- If the sectors are synchronized, use the smallest of the CIs of all sectors as a common clock code.

This problem is reduced when option is the *R&S GSM Demodulator* driver included in R&S ROMES -GS is loaded. Once the Cell Identity (CI) and the complete Location Area Information (LAI) is available the comparison is taken using these values.

Extensible BTS List (*.txt) Format

The extensible *.txt format is the standard GSM BTS list format for R&S ROMES software versions \geq V3.20. It is also used as an export format for GSM data from an internal network data base (*.ndb) file (see *Configuration – Settings* command in chapter 3). For older software versions it is recommended to use the old *.txt format described in section *Old BTS List (*.txt) Format* on p. 7.23 ff.

The extensible *.txt format provides the advantage that BTS parameters can be selected at will; their number and order is described in a header line containing an arbitrary number of descriptors. Consecutive descriptors are separated by exactly one tab or semicolon and introduced by a **hash sign #**, e.g.:

#BTS_Name; #C0; #BCC; #NCC; #CI; #Lon; #Lat

In order to interpret and process the BTS parameters correctly R&S ROMES must be able to clearly identify the meaning of the descriptors. To this end a list of keywords has been defined; see *Table 7-1 below*. A descriptor is assigned to a keyword if the leading characters of the descriptor are identical to the keyword. The comparison of descriptors and keywords is not case-sensitive; blanks preceding a # are ignored.

Example:

The descriptors #Longitude, #LON oder #LoNgit in degrees are equivalent. R&S ROMES assigns all these descriptors to the keyword #Lon and interprets the values in the associated column as geographical longitude values.

Each of the table rows below the header line contains the parameters of one BTS sector. All numbers must be entered in decimal format. Like in the header table rows must be separated by tabs (ASCII code: 0x09) or semicolons; lines are separated by a line feed (CR/LF ASCII code:0x0D/0x0A). The following example shows a valid *.txt file:

```
#SectorName ; #Longitude; #Latitude;#BCC;#BCH
Base station 11; 11.672931; 47.921935; 4; 790
Base station 4 ; 11.684844; 47.940659; 7; 784
Base station 17; 11.635992; 47.992432; 4; 799
```

Table 7-1 Keywords for the extensible *.txt format

Keyword	Description	Remarks
#Lon	Geographical Longitude	Format: Decimal with dot, e.g. 11.34179
#Lat	Geographical Latitude	Format: Decimal with dot, e.g. 47.89407
#BCC	BTS Color Code	0 to 7 decimal
#NCC	Network Color Code	0 to 7 decimal
#CI	Cell Identity	1 to 65535 decimal
#LAC	Location Area Code	
#MNC	Mobile Network Code	
#MCC	Mobile Country Code	
#BTS #SEC #Nam	Name of a BTS sector	e.g. BTS_Name e.g. Sector Name e.g. Name of BTS
#C0 #BCCH	Channel no. of the C0 carrier/BCCH	
#Cx #TCHx	Channel no. of the TCHs	x = 1 to 63
#CC #CIk #Clock	Clock code	1 to 65535 decimal. Up to three sectors with a distance of less than 5 meters are considered to be synchronized if their clock codes are equal. A maximum of three sectors with the same position and the same clock codes are allowed.
#Power #EIRP	Transmitter output power/ antenna power	Equivalent Isotropically Radiated Power
#Ant	Antenna type	0 omnidirectional 1 directed (120° sectors)
#Dir	Direction of maximum transmitter power	Direction in °, 0..360, North = 0°, East=90°
#SyncCode	Synchronization code	Sectors with identical Sync Codes are grouped to facilitate the calculation of the statistical time deviation. For each group of identical Sync Codes the statistical drift is calculated and used in the interference analysis. The measurement accuracy can be augmented in cases where different types of BTS show a different drift behavior, by differentiating the BTSs using different Sync Codes.
#Lay #Hir	Layer of the BTS in the network	Relevant for handovers.
#Man #Pro #Ven	Manufacturer of the BTS	0 unknown 1 Motorola 2 Siemens 3 Nokia 4 Ericsson 5 Lucent

The following keywords/descriptors are generated when data in a network data base (*.ndb) file are exported to a BTS list file (see description of *Configuration – Settings* command in chapter 3). They are usually not part of a user-defined *.txt file.

Table 7-2 Keywords for *.ndb export

Keyword	Description	Remarks
#MainErrDir	Main direction of position error	Direction in °, 0..360, North = 0°, East=90°
#PosErr1	Position error in main direction in meters	
#PosErr2	Position error orthogonal to the main direction in meters	
#SourceST1	Source for BTS data from <i>System Information Type 1</i>	Values: INVALID, BTS_LIST, USER_EDIT, MEASURED
#SourceST3	Source for BTS data from <i>System Information Type 3</i>	Values: INVALID, BTS_LIST, USER_EDIT, MEASURED
#ValidityST1 #ValST1	Validity for BTS data from <i>System Information Type 1</i>	Values: IIS_VALID, TO_BE_VERIFIED
#ValidityST3 #ValST3	Validity for BTS data from <i>System Information Type 3</i>	Values: IIS_VALID, TO_BE_VERIFIED
#TimeSector	Time for the last check of entered values for a sector in s since 1970	E.g. time of the measurement or time of last change of BTS list files.
#TimeST1	Time for the last check of <i>System Information Type 1</i> values for a sector in s since 1970	
#TimeST3	Time for the last check of <i>System Information Type 3</i> values for a sector in s since 1970	

Old BTS List (*.txt) Format

The old *.txt BTS list format is available for R&S ROMES software versions < V3.20 but will be also supported in future versions. Compared to the extensible *.txt format (see section [Extensible BTS List \(*.txt\) Format](#) on p. 7.21 ff.), the old format uses a header line with a different syntax and a number of mandatory BTS parameters in a fixed order.

The header line of the file contains the descriptors for the BTS parameters. It is possible to use arbitrary descriptors (exception: \n indicates the end of a line and must not be used as a descriptor), however, the assignment of many BTS parameters to table columns is fixed and the order of many rows must not be changed (see [Table 7-3 below](#)). The descriptors are not introduced by a **hash sign**. The following example shows a valid header line:

```
Name Longitude Latitude BCC BCCH TCH1 TCH2 TCH3 TCH4 TCH5 TCH6
TCH7 TCH8 TCH9 TCH10 TCH11 TCH12 TCH13 TCH14 TCH15 CI NCC ClkCode
Power Antenna Direction FixVal LAX MNC MCC TCH16 TCH17 ... \n
```

Each of the table rows below the header line contains the parameters of one BTS sector. Numbers must be entered in decimal format. Table rows must be separated by tabs (ASCII code: 0x09) or semicolons; the end of a line is indicated by an \n, and lines are separated by a line feed (CR/LF ASCII code:0x0D/0x0A).

Table 7-3 BTS List

Label	Format	Description
Name	1..23 ASCII Chars	Unique identification of the sector
Longitude	[+,-]#[#]#[#].[#[#]#[#]#[#]#[#]#[#]]	Geographical longitude in degrees, -360.0000000° ... +360.0000000°
Latitude	[+,-]#[#]#[#].[#[#]#[#]#[#]#[#]#[#]]	Geographical latitude in degrees, -90.0000000° ... +90.0000000°
BCC	#	BCC 0..7, decimal
BCCH	#[#]#[#]	C0 Carrier 1...124 or 512...887
TCH1	#[#]#[#]	C1 Carrier 1...124 or 512...887, or 0, if not available
TCH2	#[#]#[#]	"
TCH3	#[#]#[#]	"
TCH4	#[#]#[#]	"
TCH5	#[#]#[#]	"
TCH6	#[#]#[#]	"
TCH7	#[#]#[#]	"
TCH8	#[#]#[#]	"
TCH9	#[#]#[#]	"
TCH10	#[#]#[#]	"
TCH11	#[#]#[#]	"
TCH12	#[#]#[#]	"
TCH13	#[#]#[#]	"
TCH14	#[#]#[#]	"
TCH15	#[#]#[#]	"
CI	#[#]#[#]#[#]#[#]	Cell Identity, 1..65535, decimal
NCC	#	NCC 0...7, decimal
ClkCode	###	Clock code: 1..65534, decimal If no clock code is assigned, the internal default value of 65535 is used. For sectors differing by less than 5 meters in position and identical clock code (e.g. default), synchronous transmission of the SCHs is assumed (normal). If the sectors of a BTS work asynchronously or if several BTSs use the same location, individual clock codes must be given for each sector (special).
Power	#[#]#[#].[#[#]#[#]]	EIRP power in dBm, 5 dBm .. 66 dBm
Antenna	#	Antenna type: 0: omnidirectional 1: 120° Sector
Direction	#[#]#[#]	Direction in °, 0..360, North = 0°, East=90°

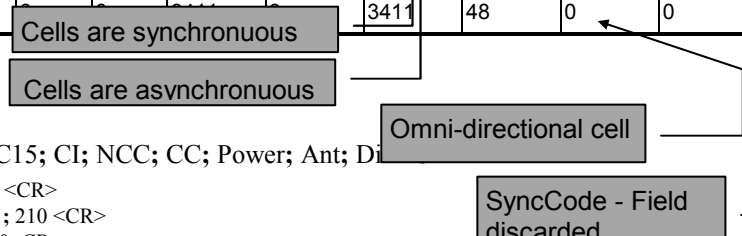
Label	Format	Description
Sync Code	#[#][#]	Synchronization identification: 1..25 decimal Sectors with identical Sync Codes are grouped to facilitate the calculation of the statistical time deviation. If no value is given a default value of 0 is used. For each group (of identical Sync codes) the statistical drift is calculated and used in the interference analysis. The measurement accuracy can be augmented in cases where different types of BTS show a different drift behavior, by differentiating the BTSs using different Sync Codes.
FixVal	#	Denotes how many of the following data fields LAC, MNC and MCC are defined for this sector. These data fields must be in the given order.
LAC	#[#][#][#][#]	Location are code. Value 65535 if not available.
MNC	#[#][#]	Mobile network code. Value 65535 if not available. If available, the MNC overwrites the default value, which can be given in the <i>DB Settings/Query – Init</i> dialog.
MCC	#[#][#]	Mobile country code. Value 65535 if not available. If available, the MNC overwrites the default value, which can be given in the <i>DB Settings/Query – Init</i> dialog.
TCH16	#[#][#]	Traffic channel 16, values 1...124 or 512...887, or 0, if not available
...	#[#][#]	Every entry for one sector denotes an additional traffic channel.
#	Number 0..9	
[...]	optional value	

All fields up to the *Direction* field are mandatory, further values only extend the measurement result. However, in order to use the additional data given by the K7 driver, the LAC, MNC and MCC must be specified for each sector.

Example for Base Station Lists (Old *txt Format)

Using MS-Excel (Tab-separated file must be saved in ASC/TXT format !!)

Name	Lon	Lat	BCC	C0	C1	C2	C3		C14	C15	CI	NCC	CC	Power	Ant	Dir
Station1/Cell1/90	14.123354	48.196572	0	84	51	33	0	filled with zeroes and TABs	0	0	3356	3	3356	38	1	90
Station1/Cell2/210	14.123354	48.196572	2	96	10	0	0		0	0	3367	3	3367	38	1	210
Station1/Cell3/330	14.123354	48.196572	2	101	0	0	0		0	0	3361	3	3361	38	1	330
MUC_Cent1	13.95700	47.843251	4	91	46	13	0		0	0	3477	3	3451	44	1	60
MUC_Cent2	13.95700	47.843251	1	111	70	8	0		0	0	3451	3	3451	44	1	180
MUC_Cent3	13.95700	47.843251	3	106	11	0	0		0	0	3460	3	3451	44	1	300
Example/Omni_1	14.934562	48.798645	7	83	17	4	14		0	0	3411	3	3411	48	0	0



ASC/TXT format (separated by semicolon)

```
Name; Lon; Lat; BCC; C0; C1; C2; C3; C4; C5; C6; C7; C8; C9; C10; C11; C12; C13; C14; C15; CI; NCC; CC; Power; Ant; Dir
Station1/Cell1/90; 14.123354; 48.196572; 0; 84; 51; 33; 0; 0; 0; 0; 0; 0; 0; 0; 0; 0; 0; 0; 0; 0; 0; 3356; 3; 3356; 38; 1; 90 <CR>
Station1/Cell2/210; 14.123354; 48.196572; 2; 96; 10; 0; 0; 0; 0; 0; 0; 0; 0; 0; 0; 0; 0; 0; 0; 0; 0; 0; 3367; 3; 3367; 38; 1; 210 <CR>
Station1/Cell3/330; 14.123354; 48.196572; 2; 101; 0; 0; 0; 0; 0; 0; 0; 0; 0; 0; 0; 0; 0; 0; 0; 0; 0; 0; 3361; 3; 3361; 38; 1; 330 <CR>
MUC_Cent1; 13.95700; 47.843251; 4; 91; 46; 13; 0; 0; 0; 0; 0; 0; 0; 0; 0; 0; 0; 0; 0; 0; 0; 0; 3477; 3; 1; 44; 1; 60 <CR>
MUC_Cent2; 13.95700; 47.843251; 1; 111; 70; 8; 0; 0; 0; 0; 0; 0; 0; 0; 0; 0; 0; 0; 0; 0; 0; 0; 3451; 3; 1; 44; 1; 180 <CR>
MUC_Cent3; 13.95700; 47.843251; 3; 106; 11; 0; 0; 0; 0; 0; 0; 0; 0; 0; 0; 0; 0; 0; 0; 0; 0; 0; 3460; 3; 1; 44; 1; 300 <CR>
Example/Omni_1; 14.934562; 48.798645; 7; 83; 17; 4; 14; 0; 0; 0; 0; 0; 0; 0; 0; 0; 0; 0; 0; 0; 0; 0; 0; 3411; 3; 3411; 48; 0; 0 <CR>
```

ASC/TXT format (separated by tabs)

```
Name      Lon      Lat      BCC  C0  C1  C2  C3  .....  C14  C15  CI  NCC  CC  Power  Ant  Dir<CR>
Station1/Cell1/90  14.123354  48.196572  0    84  51  33  0    .....  0    0    3356  3    3356  38    1    90<CR>
Station1/Cell2/210  14.123354  48.196572  2    96  10  0    0    .....  0    0    3367  3    3367  38    1    210<CR>
Station1/Cell3/330  14.123354  48.196572  2    101 0    0    0    .....  0    0    3361  3    3361  38    1    330<CR>
MUC_Cent1         13.95700  47.843251  4    91  46  13  0    .....  0    0    3477  3    1     44    1    60<CR>
MUC_Cent2         13.95700  47.843251  1    111 70  8    0    .....  0    0    3451  3    1     44    1    180<CR>
MUC_Cent3         13.95700  47.843251  3    106 11  0    0    .....  0    0    3460  3    1     44    1    300<CR>
Example/Omni_1    14.934562  48.798645  7    83  17  4    14  .....  0    0    3411  3    3411  48    0    0<CR>
```



ASCII Table Description (*.ATD) Format

ATD (ASCII Table Description) files control the import of ASCII tables, in particular BTS / Node B lists, into R&S ROMES V3.0 and higher versions. In R&S ROMES V3.20 and higher versions, it is recommended to use the extensible *.txt format described in section [Extensible BTS List \(*.txt\) Format](#) on p. 7.21 ff. to import data into a GSM network data base. However, the *.atd format must be used for UMTS Node B data bases.

Since R&S ROMES allows flexible import of different ASCII table formats, a description format is required to explain the table attributes. This format (*.ATD) is a plain text file, which can be edited with any text editor (e.g. Notepad) that does not insert format commands into the text (like MS Word does into the *.doc format files). The table attributes can be defined at will, however, R&S ROMES uses fixed names to identify the parameters in the individual columns (see paragraph on [Column Names](#) on p. 7.30).

Note:

*Example *.atd files are provided in the BTSLists and NodeBLists subdirectories of the R&S ROMES program directory.*

Example of an ATD file

```
[Main]
Type=ATD
[Table1]
Name=CellData
File=celldata.txt
Columns_Size=5
Columns0_Name=BTS_Name
Columns0_Type=utFixedChar
Columns0_Size=25
Columns0_boIndexed=1
Columns0_boPrimaryKey=1
Columns1_Name=Longitude
Columns1_Type=utDouble
Columns1_boIndexed=1
Columns2_Name=Latitude
Columns2_Type=utDouble
Columns2_boIndexed=1
Columns3_Name=BCC
Columns3_Type=utTInt
Columns3_boIndexed=1
Columns4_Name=C0
Columns4_Type=utSInt
```

Entry	Required/ Optional	Remarks
[Main]	req.	
Type=ATD	req.	
[Table{TableIndex}] TableIndex: index of table (> 0)	req.	More than one tables can be imported using one ATD file; table index is one-based, thus the first table entry is [Table1]; TableIndex numbers have to be in consecutive order; the tables after a gap will not be used.
Name={TableName} TableName: name of the table, as it should be imported and appear inside R&S ROMES ; use only letter characters, numbers and '_' to form a valid table name;	req.	Attention! SQL keywords used as ASCII table or column names cause an error when the ASCII file is loaded.
File={FilePath} FilePath: relative or absolute file path of the ASCII table file; relative path root is the location of the ATD file, this means a mere file name without directory has to be located in the same directory as the ATD file	req.	Examples: File=c:\data\cells.txt File=..\cell.asc
Columns_Size={NumOfColumns} NumOfColumns: Number of columns of this table (>0)	req.	The table must contain at least NumOfColumns column entries; if more column entries exist, only the first NumOfColumns will be used.
Columns{ColumnIndex}_{Attrib} column attribute entry; ColumnIndex: index of column (zero based) the attribute belongs to; Attrib: attribute of column as specified below;	-	Multiple of these attribute entries belong to one column with the same index.
Columns{ColumnIndex}_Name= {ColumnName} ColumnName: name of column, as it should be imported and appear in the data tree; use only letter characters, numbers and '_' to form a valid column name;	req.	Attention! SQL keywords used as ASCII table or column names cause an error when the ASCII file is loaded. The column names must be unique to be identified by the measurement system; see list on p. 7.30.
Columns{ColumnIndex}_Type = {ColumnType} ColumnType: data type of the column (refer to reference table below)	req.	
Columns{ColumnIndex}_Size = {TypeSize} TypeSize: size of fixed size data	req. for fixed size data;	Specify it only for types „utFixedChar“ and „utFixedArray“; the maximum size is 4000 Bytes.
Columns{ColumnIndex}_boIndexed={IndexedFlag} IndexedFlag: 0 or 1; indicating if column will have an index (1) or not (0)	opt.; default 0	Selections will be much faster if columns used as search criteria are indexed; thus index columns which are often used as selection or join criterion! Indexed columns need slightly more disk space.
Columns{ColumnIndex}_boPrimaryKey={PrimaryKeyFlag} PrimaryKeyFlag: 0 or 1; indicating if column is used as primary key (1) or not (0)	opt.; default 0	all columns with primary key flag set will form the primary key; only one record with the same primary key may exist inside the database, otherwise an exception will be thrown during import; (this can be used to ensure consistent data even when appending data to an already existing table); primary keys may also have an advantageous influence on selection performance.

The following ASCII table is compatible with the example *.atd file listed above:

```
Cell1:1      12.774      50.038      2      814
Cell2:1      12.397      49.991      1      ?
Cell2:2      12.397      49.991      2      807
```

The records are separated by <NewLine>, the columns by <TAB>.

The last line must also be terminated with <NewLine>, otherwise it will be ignored!

If an attempt is made to import an ASCII table which does not match the ATD description file, an error message describing the kind and position of the erroneous statement(s) is produced. The error messages are self-explanatory.

Attributes

The attributes must correspond to the type specified in the table description according to the following type reference:

Table 7-4 Attributes in an *.atd file

Type Identifier	Description	Range / Representation in ASCII table file
utInt	1 byte integer	-128 ... 127
utSInt	2 byte integer	-32 768 ... 32 767
utLInt	4 byte integer	-2 147 483 648 ... 2 147 483 647
utFloat	4 byte floating point	3.4E-38 ... 3.4E+38 (7 digits) (decimal or scientific notation)
utUInt	1 byte unsigned integer	0 ... 255
utUSInt	2 byte unsigned integer	0 ... 65 535
utULInt	4 byte unsigned integer	0 ... 4 294 967 295
UtDouble	8 byte floating point	1.7E-308 ... 1.7E+308 (15 digits) (decimal or scientific notation)
utFixedChar	Character string of fixed size as specified by ,size' attribute.	In single quotes or without: ['string'] or [string] (first way is more secure); an empty string has always to be represented by ""; the string may be shorter than the given size, but must not exceed it.
utDynChar	Character string of variable size (variant by record).	Refer to utFixedChar, except that there is no size limitation other than the 4000 Bytes maximum.
utFixedArray	Array of fixed size as specified by ,size' attribute.	Hexadecimal literal, e.g. 0x341a5bc2 for a 4 Bytes vector; all ,size' bytes have to be specified.
utDynArray	Array of variable size (variant by record);	Hexadecimal literal, e.g. 0x341a5bc2 for a 4 Bytes vector.
utBlob	Large array of variable size (variant by record); may be bigger than 4000 Bytes.	Not supported in version 3.0 !

Column Names

The column names in an ATD file must be unambiguous in order to be clearly identified by the test system. In analogy to the conventions in the *.txt files the following names may be used for GSM BTS data bases (see also [Table 7-3](#) on p. 7.24 and BTS list example on page 7.26):

Column Name	Type	Range	Description
Uniqueid	utULInt	0 to 4 294 967 295	Unique Identifier of the BTS sector for the database (The easiest way of providing a UniqueID is to use the line (record) number)
Longitude	utDouble	-180 to 180	Longitude of the position of the BTS
Latitude	utDouble	-90 to 90	Latitude of the position of the BTS
BTS_Name	utFixedChar	-	Name of BTS sector
BCC	utTInt	0 to 7 decimal	BTS Color Code
C0	utSInt	See chapter 8	C0 carrier channel number
C1 to C15	utSInt	See chapter 8	Cn carrier channel number
CI	utLInt	1 to 65535 decimal	Cell Identity
NCC	utTInt	0 to 7 decimal	Network Color Code
CC	utLInt	1 to 65535 decimal	Clock Code
Ant	utLInt	-	Antenna type
Power	utFloat	See chapter 8	EIRP power
MNC	utUSInt	0 to 999	Mobile Network Code
MCC	utUSInt	0 to 999	Mobile Country Code
LAC	utUSInt	1 to 65533 and 65535	Location Area Code
2GNC	utDynChar	-	GSM neighbor cell list for neighborhood analysis (option R&S ROMES-U1). MCC, MNC, LAC, CI for each neighbor cell, a # character separates two cells, e.g. 262,1,1234,5678#262,1,1234,5679#262,1,1234,5680
3GNC	utDynChar	-	UMTS neighbor cell list for neighborhood analysis (option R&S ROMES-U1). MCC, MNC, LAC, CI for each neighbor cell, a # character separates two cells, e.g. 262,1,1234,5678#262,1,1234,5679#262,1,1234,5680

The columns MNC through 3GNC are required for the UMTS neighborhood analysis; see description of the *UMTS Neighborhood Analyzer View* in chapter 4.

The following names may be used for UMTS Node B data bases:

Column Name	Type	Range	Description
UniquelD	utULInt	0 to 4 294 967 295	Unique Identifier of the Node B sector for the database (The easiest way of providing a UniquelD is to use the line (record) number)
PosLongitude	utDouble	-180 to 180	Longitude of the position of the Node B in degrees
PosLatitude	utDouble	-90 to 90	Latitude of the position of the Node B in degrees
NodeB_Name	utDynChar	-	Name of Node B sector
CellID	utULInt	-	Cell Identity
SC	utUSInt	0 to 8176	Scrambling Code. It must be in the range of 0...8176, and SC modulo 16 has to be equal to 0
ARFCN	utUSInt	8 000 to 12 000	Channel Number
IsDirected	utUTInt	0 to 1	1: Antenna is directed 0: Antenna is omni directional
Direction	utUSInt	0 to 360	Direction of the directed antenna in degrees
Power	utDouble	-10 to 100	Power of CPICH in dBm
CellIDNeighborsList	utDynChar	-	Information about the cell identities of the neighbor cells; list of numbers separated by # characters , e.g. 67#861#14558.
MNC	utUSInt	0 to 999	Mobile Network Code
MCC	utUSInt	0 to 999	Mobile Country Code
LAC	utUSInt	1 to 65533 and 65535	Location Area Code
2GNC	utDynChar	-	GSM neighbor cell list for neighborhood analysis (option R&S ROMES-U1). MCC, MNC, LAC, CI for each neighbor cell, a # character separates two cells, e.g. 262,1,1234, 5678#262,1,1234,5679#262,1,1234,5680
3GNC	utDynChar	-	UMTS neighbor cell list for neighborhood analysis (option R&S ROMES-U1). MCC, MNC, LAC, CI for each neighbor cell, a # character separates two cells, e.g. 262,1,1234, 5678#262,1,1234,5679#262,1,1234,5680

In UMTS Node B data bases, the columns *UniquelD* to *Power* are mandatory. Column *CellID-NeighborsList* is optional but is also recognized by the measurement system. If it is provided, R&S ROMES checks for differences between the entries and the real network. Each time that the UMTS test mobile fails to detect the signal from one of the neighbor cells in the list, a *Neighbor List Alarm* is generated. The alarms can be displayed e.g. in the *UMTS Network Analyzer View*; see description in chapter 4.

The columns MNC through 3GNC are required for the UMTS neighborhood analysis; see description of the *UMTS Neighborhood Analyzer View* in chapter 4.

In general, R&S ROMES is not able to process data in columns with user-defined names other than the ones listed above. The UniquelD parameter is explained in section [Speeding up the File Import below](#).

Missing entries

If a value to be entered in the ASCII table file is not available, a question mark (?) can be used instead. R&S ROMES interprets question marks as missing entries, the corresponding table cells in the views and dialogs of the application are left empty.

Speeding up the File Import

R&S ROMES has to assign numbers to all lines of the BTS lists every time the list is opened. This time-consuming line numbering can be bypassed by adding the *UniqueID* column to the BTS list. The *UniqueID* entries (e.g. 1, 2, 3, ...) can be added with a tool like MS Excel.

Example for the modification of the ATD file:

```
Columns12_Name=UniqueID
```

```
Columns12_Type=utLInt
```

```
Columns12_Size=4
```

```
Columns12_boIndexed=1
```

```
Columns12_boPrimaryKey=0
```

Important Note:

All numbers in the UniqueID column must be unique. Any number that is used more than once will cause problems. So it is recommended to use a unique scheme like the line numbers from MS Excel to fill the UniqueID column.

User-Defined List Format

Instead of using the *.txt and *.atd formats described in the previous sections, it is also possible to define new formats for the base station list. To be distinguished from the standard BTS list formats the user-defined list files must have extensions different from *.txt or *.atd. Additionally, a dynamic link library (DLL) with the name "GSS_K6_Import_xxx.dll" must be written, where "xxx" is the extension of the format file.

The DLL must contain a class (e.g. "Import"), derived from the following abstract class AsciiImport:

```
class AsciiImport
{
public:
enum NEXT_LINE_STATUS {SECTOR_VALID, SECTOR_INVALID, END_OF_FILE, SKIP_SECTOR};

AsciiImport(){};
virtual ~AsciiImport(){};

// Open the file "pFilename":
virtual bool Start(char* pFilename) = 0;

// load next sector:
virtual NEXT_LINE_STATUS NextSector(char** ppErrorString) = 0;

// number of the sector in the Ascii file
virtual unsigned int* GetSectorNr() = 0;

virtual char *GetSectorName() = 0;           // Name
virtual double* GetLongitude() = 0;        // Longitude
virtual double* GetLatitude() = 0;        // Latitude
virtual unsigned short* GetBCC() = 0;      // Base station color code
virtual unsigned short* GetChannelArray(int index) = 0; // index = 0 points to the C0 carrier

// index points to TCH index
virtual unsigned int* GetCI() = 0;         // Cell Identity
virtual unsigned int* GetNcc() = 0;       // National color code
virtual unsigned int* GetClockCode() = 0; // ClockCode
};
```



```

virtual double* GetPower() = 0;           // EIRP
virtual unsigned int* GetAntennaType() = 0; // Antenna type
virtual double* GetDirection() = 0;      // Direction of the antenna
virtual unsigned int* GetSyncCode() = 0;  // Synchronisation Identification
virtual unsigned short* GetLAC() = 0;    // Location area code
virtual unsigned short* GetMNC() = 0;    // Mobile network code
virtual unsigned short* GetMCC() = 0;    // Mobile country code
};

```

(The file is installed in the *Installation* subdirectory of the main directory.)

The function "bool Start(char* pFilename)" opens the ASCII file. The return value is "true" if the file could be successfully opened. If the return value is "false" the program returns to the calling menu.

Each call of the function „NEXT_LINE_STATUS NextSector(char** ppErrorString)" loads the next sector, or the first one if it is called after "Start(char* pFilename)" has been called. When the return value is "END_OF_FILE", the DLL is deallocated and the loading of the operator information is considered to be finished.

The return value "SECTOR_INVALID" is used to indicate an error in loading the sector. An error message is displayed including a message in a character string, to which "ppErrorString" points. The memory of this character string must be defined and allocated in the DLL and the content of this string can be specified arbitrarily. After that error message the loading of the operator information is stopped and the sectors already loaded are canceled.

The return value "SKIP_SECTOR" can be used to skip a sector if, e.g., the sector contains some invalid data and should not be loaded. However, the program does not stop loading the base station list but reads the next sector instead. A message will be written into the file *Ctol_Reports.txt* stored in the *Test-Files* subdirectory.

The return value SECTOR_VALID implies that the sector has been loaded successfully. In this case there must be access to its data, described in table [Table 7-3, BTS List](#), on page 7.24 via the remaining functions pointing to them. The name of the sector, as well as its geographical position, BCC and C0 carrier (obtained by the value of GetChannelArray(0)) as well as the sector number are mandatory, the remaining values are for additional information. In case that some of the latter are not included in the sector information, the corresponding access functions must return the NULL pointer. The sector number is necessary for ROMES-GS to monitor possible inconsistencies in the data.

The declaration of exported DLL functions is realized via the file "Import_xxx.def":

```

LIBRARY IMPORT_xxx.DLL
DESCRIPTION "Reading the operator info of the BTS stations"
EXPORTS
ImportConstruction@1
ImportDestruction@2

```

where xxx has to be replaced by the file extension.

„ImportConstruction" is a function which takes no arguments. It allocates memory for the class "Import" and returns a pointer to this memory. "ImportDestruction" is a function taking a reference to a pointer to "Import" as an argument and deleting the allocated memory. The return value of this function is of type "void".

The following example of the corresponding *DLLStart.cpp* is a possible realization of the *.txt format file:

```
# include "ImportTxt.h"
```

```
ImportTxt* ImportConstruction()  
{  
    return (new ImportTxt());  
}  
void ImportDestruction(ImportTxt* & Import)  
{  
    if(Import != NULL)  
        delete Import;  
}
```

where "ImportTxt.h" is the header file declaring the class.

C0 Scan Export Files

If a Carrier-to-Interference (C/I) analysis is performed and the C0 analysis is active (see description of C/I driver in chapter 6), then a C0 scan export file (*.cox) file is automatically generated at the end of the measurement. The *.cox file is an ASCII file which can be opened and evaluated with standard tools, e.g. with MS Excel. The entries are separated by semicolons:

Scan;	T1970[Sec]	Latitude[deg]	Longitude[deg]	ARFCN;	Pow[dBm]	NCC;	BCC;	CI;	LAC;	MNC;	MCC;	ST3_Source
1;	105844483	48.763000	11.234000	11;	-106.2;	;	;	;	;	;	;	-
1;	105844483	48.763000	11.234000	12;	-103.8;	;	;	;	;	;	;	-
1;	105844483	48.763000	11.234000	13;	-112.3;	;	;	;	;	;	;	-
1;	105844483	48.763000	11.234000	14;	-107.8;	;	;	;	;	;	;	-
1;	105844483	48.763000	11.234000	16;	-109.6;	;	;	;	;	;	;	-
1;	105844483	48.763000	11.234000	15;	-100.1;	7;	1;	279;	31568;	1;	262;	T-Scan
1;	105844483	48.763000	11.234000	15;	-100.7;	7;	1;	279;	31568;	1;	262;	T-Scan

Each row in the C0 scan export file corresponds to a scanned C0 signal on a specific GSM channel (ARFCN). The rows contain the following information:

Scan Sequence number for the C0 scan, comprising a sequence of channels selected in the driver menu.

T1970 [Sec] Time of the channel measurement in s since 1970.

**Latitude [deg],
Longitude [deg]** Geographic coordinates of the measurement position.

**ARFCN, Pow [dBm],
Pow [dBm]** Absolute Radio Frequency Channel Number (see tables in chapter 8) of the GSM channel and measured power of the C0 carrier. In the driver menu, channels below a specified power threshold can be excluded from the measurement.

NCC, BCC Network Color Code and BTS Color Code demodulated from the signal. If the code numbers are not available, the system was not able to identify the signal: The measured power is the total channel power and therefore an upper limit for the actual C0 carrier power.

CI, LAC, MNC, MCC Cell Identity, Location Area Code, Mobile Network Code and Mobile Country Code. These code number are part of the System Information Type 3; they are either demodulated from the C0 signal (with option *R&S GSM Demodulator*) or determined by comparing the power, BCC and timing of the measured signal with the entries in the BTS data base (see description of the *Measurement Process* in chapter 1). The source of the data is indicated in the last column (*ST3_Source*) of the table.

ST3_Source Source of the parameters that are part of the System Information Type 3 (CI, LAC, MNC, MCC); see above:

T-Scan

Parameters demodulated during the scan, with option *R&S GSM Demodulator*

NDB

Parameters obtained from a comparison with the data in the network data base

–

Parameters not available

Obtaining Screenshots

R&S ROMES fully supports the *Print* functionality familiar from many other MS Windows applications. The contents of all views can be printed to a file or sent to a printer; an extended selection of print options is available. In addition, all pages can be previewed before they are sent to the printer.

If you still wish to obtain an accurate copy of your application screen, there are two ways to obtain screenshots:

- Copy the whole screen to the clipboard (<PrtSc>) or
- Copy the active window to the clipboard (<Alt> + <PrtSc>)

Note:

In R&S ROMES, the active window is always the frame application, not the individual views which are so-called child windows.

Now you can switch to another MS Windows application (<Alt> + <TAB>), like MS Word or MS PowerPoint, and insert the shot via <Shift> + <Insert>. From this application you may also obtain hardcopies. All the screenshots in this documentation have been created this way.

If the *Clipboard viewer* is active, you can save your screenshots from there in the *.CLP format to disk and use it later. Some graphic tools like the shareware Jasc PaintShopPro® are able to load the *.CLP format and convert it into another format.

You may also copy the *.CLP files to another Windows system, start the clipboard viewer and load the file into the other clipboard.

Note:

*If both operating systems differ very much in the graphic card settings (resolution and number of colors used), it might be possible that the target system is not able to deal with the *.CLP files. In this case modify the settings of the target system and try again.*

Evaluation of NQA Data with TS9954 NQA

TS9954 NQA is an evaluation software for NQA data supplied with each *Export to NQA/NQ2* option (ROMES-G1). The software is based on Microsoft® Excel. The NQA data are loaded into an MS Excel folder with several worksheets providing tables and graphical diagrams. The worksheets can be modified using the full MS Excel functionality and stored to files.

Network Quality Analysis

The Network Quality Analysis data (NQA data) are the result of automatically performed telephone calls between the measuring GSM Test Mobile Station (TMS) and a fixed landline partner station. Each call is analyzed and the results are saved to a data file.

For each performed call a data package will be added to the generated NQA data file (“*.NQA“, “*.NQ2“).

Measurement Parameters

To generate the NQA data file, both *NQA* and *Autodialing* must be enabled in the GSM driver configuration menus. The *NQA* and *Autodialing* tabs of the driver configuration menu provide parameters to define conditions and limits for the different call classes; see detailed information in chapter 6.

The measurement parameters used in the test are indicated in the *Header* MS Excel sheet which is the first sheet displayed when the TS9954 NQA MS Excel table *Nqa-mak.xls* is opened. See section [Header](#) on p. 7.44 ff.

The NQA Data Package

After the end of each performed call a NQA data package containing the following parameters is generated:

Table 7-5 NQA parameters

Number	NQA parameter	Available in MS Excel sheet DATA ¹ as	Explanation
1	Time	Time	HH:MM:SS
2	Position Latitude	---	+ = North / - = South
3	Position Longitude	---	+ = East / - = West
4	Class	Class	0 = Good Call 1 = Blocked Call 2 = Dropped Call 3 = No Service 4 = Start_of_Call 5 = reserved 6 = Start Of Dialing

Number	NQA parameter	Available in MS Excel sheet DATA ^{*)} as	Explanation
5	Status	Status	0x0001 = Noisy 0x0002 = Excess_HO 0x0004 = Roaming 0x0010 = Delayed 0x0020 = RxLev_Noisy (only with Noisy) 0x0040 = RxQual_Noisy (only with Noisy)
6	Blocking Cause	Bl Cause	Reason for <i>Blocked Call</i>
7	AVG PWR	Avg	Average transmitting power
8	RxQual Total	RxQ Total	Number of <i>RxQual</i> values
9...16	RxQual distribution	RxQ1...RxQ8	Distribution values of <i>RxQual</i>
17	RxLev Total	RxLev Total	Number of <i>RxLev</i> values
18...26	RxLev distribution	RxLev1...9	Distribution values of <i>RxLev</i> . Coding: 0 = RxLev of [0...10], dBm: <=-100 1 = RxLev of [10...15], dBm:]-100...-95] 2 = RxLev of [15...20], dBm:]-95...-90] 3 = RxLev of [20...25], dBm:]-90...-85] 4 = RxLev of [25...30], dBm:]-85...-80] 5 = RxLev of [30...35], dBm:]-80...-75] 6 = RxLev of [35...45], dBm:]-75...-65] 7 = RxLev of [45...50], dBm:]-65...-60] 8 = RxLev of [50...63], dBm: >-60
27	HO Attempt	HO Attempt	Number of <i>Handover</i> attempts
28	HO Success inter	HO Suc inter	Number of successful InterCell Handover attempts
29...36	HO Success distribution	HO Suc d1... ...HO Suc d8	Distribution values
37	HO Success intra	HO Suc intra	Number of successful IntraCell Handover attempts
38	SysResptime	SysResptime	Time between <i>Service Request</i> and <i>Assignment Command</i> in 1/18 seconds
39	CallResptime	CallResptime	Time between <i>Service Request</i> and <i>Alerting</i> in 1/18 seconds
40	EffectiveCallDuration	EffCall	Measured Call Duration in 1/18 seconds
41	Initial CI	Initial CI	<i>Cell Identity at Start of Call</i>
42	Final CI	Final CI	<i>Cell Identity at End of Call</i>
43	MCC	MCC	Mobile Country Code
44	MNC	MNC	Mobile Network Code
45	Mobile No.	Mobil Nr	Mobile number in the Measurement system

*) See section [DATA Table](#) on p. 7.57 ff.

Call Class and Status

For each call a *Class* and *Status* value is generated. The meaning of the values is listed in the following code table:

Class	0 = Good Call 1 = Blocked Call 2 = Dropped Call 3 = No Service 4 = Start_of_Call 5 = reserved 6 = Start Of Dialing
Status	Bit 0 = Noisy Bit 1 = Excess_HO Bit 2 = Roaming Bit 4 = Delayed Bit 5 = RxLev_Noisy (only with <i>Noisy</i>) Bit 6 = RxQual_Noisy (only with <i>Noisy</i>)

The *Class* parameter can own only one of the listed states at the same time, while *Status* consists of several bits and may contain any combination of values, with the exception of bit 5 and 6 (only with *Noisy*, bit 0).

The calls can be categorized in terms of the *Class* and the *Status* parameters. The following table shows the most important combinations used by TS9954 NQA. It is also shown as a legend in the description of every worksheet containing class/status combined parameters used in formulas; see section [Worksheets](#) on p. 7.44 ff.

Class

Good (0)		Blocked (1)	Dropped (2)		No Service (3)
CallResp-time >... s	CallResp-time <=...s		CallResp-time >... s	CallResp-time <=...s	

Status

not Noisy 0xXXX0	GR	G	BC	DR	D	NC
Noisy 0xXXX1	GRN	GN		DRN	DN	

Example:

DRN means a *Dropped Call* has been classified as *Noisy* and its *Call Response Time* is beyond a certain limit.

The *Call Class* is the most important NQA parameter of the NQA data. The following classes are defined.

Class = Start of Dialing

A NQA data package with *Class = Start of Dialing* is generated every time the *Autodialing* function dials a number. The *Idle Time* to be set in the *Autodialing* tab of the driver configuration menu delays the beginning of the dialing relative to the start of the measurement or the last call. After the *Idle Time* a dial sequence is started and a *Start of Dialing* event is generated.

Class = Start of Call

A NQA data package with *Class = Start of Call* is generated every time dialing is finished and a call is established by the *Autodialing* function.

- Class = Good Call** A NQA data package with *Class = Good* is generated every time the successfully started call (ALERTING and/or CONNECT reached) is terminated by the system after the time defined by *Call Duration* in the *Autodialing* tab of the driver configuration menu has passed.
- The package is generated after the first of the three messages DISCONNECT, RELEASE or CHANNEL RELEASE.
- Class = Blocked Call** *Class = Blocked* is generated every time that
- An idle message was detected during call setup but the call was not canceled. This happens in all cases where a call setup was performed at least up to the layer-3 message SERVICE REQUEST, but not up to ALERTING / CONNECT, and where no DISCONNECT, RELEASE or CHANNEL RELEASE was executed or....
- The call was canceled, call setup was not performed up to ALERTING and/or CONNECT or...
- A dial command has been sent to the mobile, but because of insufficient coverage no call could be established: The NQA machine remains IDLE. On the next dialing the system recognizes that no call could be established and one *Blocked call* is added.
- Class = Dropped Call** *Class = Dropped* is generated every time that
- An established call is cancelled before the *Call duration* set in the *Autodialing* tab has passed or...
- An established call is terminated not to order. A NQA data package will be generated when an *Idle or Error (No Service)* state is detected after a call was completely established and the *Call Duration* has not passed yet.
- Class = No Service** *Class = No Service* is generated every time the system wants to dial but the mobile is out of service.
- If the mobile remains out of service the time interval between two subsequent *No service* calls is equal to the *Call duration* plus the *Idle time*, both set in the *Autodialing* tab.

Installation and Use of the NQA Software

The Network Quality Analysis software TS9954 NQA is an MS Excel application. All functions and formula have been developed using this product. TS9954 is available in different versions that are compatible with different MS Excel versions:

- TS9954 NQA version V2.1 for MS Excel V5.0 or higher
- TS9954 NQA version V3.0x for MS Excel V8.0 or higher

The version number of the software is displayed in the upper left corner of the *Header* sheet; see section [Header](#) on p. 7.44 f. The application files of both versions and the used file formats are listed in the following table.

Table 7-6 Comparison of TS9954 NQA V2.1 and V3.0x

	TS9954 NQA V2.1	TS9954 NQA V3.0x
Required MS Excel Version	V5.0 or higher	V8.0 or higher
Operating system	Windows 3.1 (16-bit application)	Newer Windows systems (32-bit application)
Data file formats	*.NQA, see p. 7.18	*.NQA, *, NQ2 (recommended), see p. 7.18
Max. number of mobiles	3	16
Application files	<p>NQA-MAK.XLS Application startup file, containing basic settings and program functions. This file is hidden in MS Excel but can be unhidden and edited; see section <i>Special Functions</i> on p. 7.56 ff.</p> <p>MOB1-NQA.XLT MS Excel sheet with all charts and parameter tables for the evaluation of the mobile 1 data.</p> <p>MOB2-NQA.XLT MS Excel sheet with all charts and parameter tables for the evaluation of the mobile 2 data.</p> <p>MOB3-NQA.XLT MS Excel sheet with all charts and parameter tables for the evaluation of the mobile 3 data.</p>	<p>NQA-MAK.XLS Application startup file, containing basic settings and program functions, including the settings for language and logo. This file is hidden in MS Excel but can be unhidden and edited; see section <i>Special Functions</i> on p. 7.56 ff.</p> <p>MOB-NQA.XLT MS Excel template with all charts and parameter tables for the evaluation of all mobile data. This template is multiplied according to the number of mobiles included in the loaded measurement data.</p>

Note:

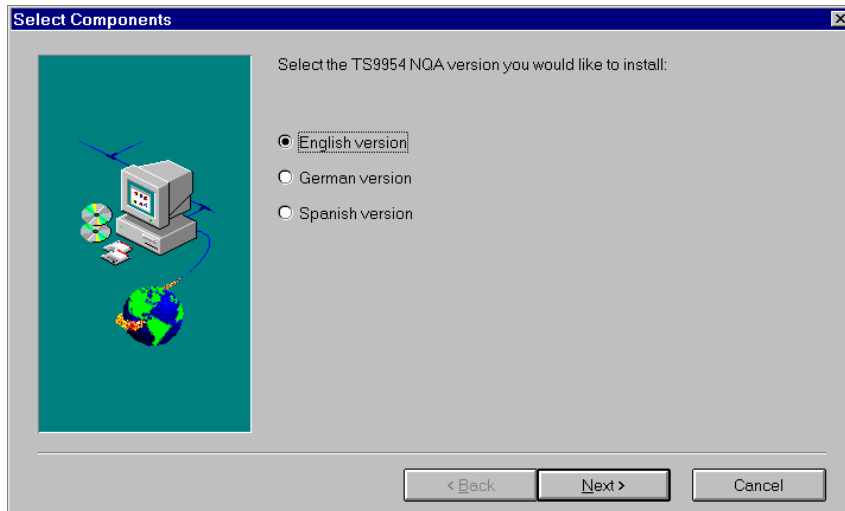
Unless otherwise stated the information given in the following sections holds for TS9954 NQA V3.0x. However, it is also valid for TS9954 NQA V2.1 with minor modifications. In particular, all worksheets provided are identical in both versions.

Installing the Software

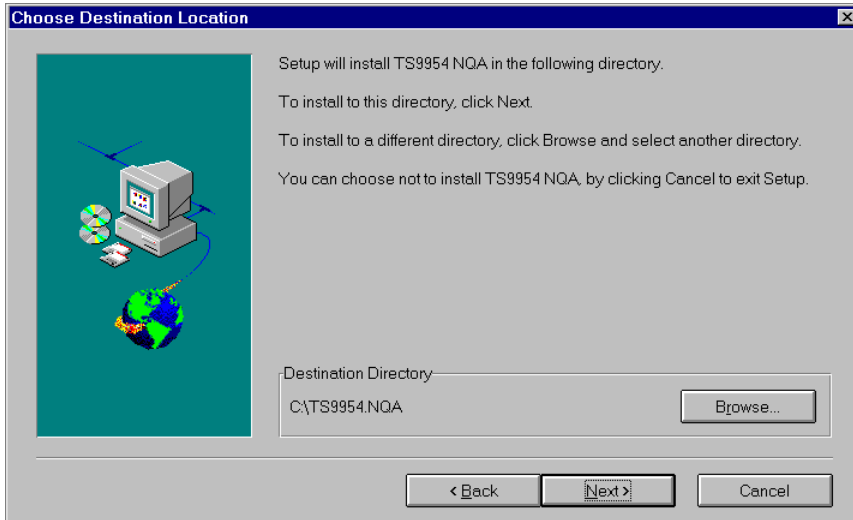
Installation of TS9954 NQA is menu-guided. We point out the essential steps.

1. Copy the installation version into a directory and run the setup file *Setup.exe* (double-click or use the *Run* command in the Windows *Start* menu).

The setup program opens a blue *Setup* screen and a dialog to select the preferred language:



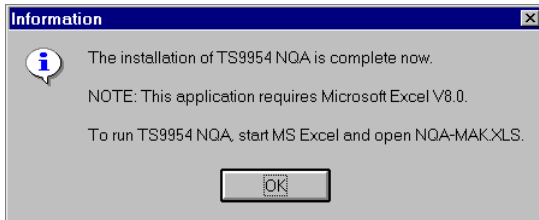
2. Click one of the three radio buttons to select your language and click *Next >* to continue.



The language can still be changed after the software is installed; see section [Language and Logo](#) on p. 7.57 ff.

3. In the *Choose Destination Location* dialog, use the *Browse* button to select a directory for the application files NQA-MAK.XLS and MOB-NQA.XLT.
4. Click *Next >* to continue and finish the setup procedure.

The application displays the following message box:



5. Click OK to confirm the message and close the *Setup* screen.

Note:

All application files have to remain in the same directory and are necessary part of the application. Missing or renamed files will cause an error message File ... not found.

Starting and Operating TS9954 NQA

The installed application is simply started by loading the application file NQA-MAK.XLS into the appropriate MS Excel version. Doing this opens a dialog to select the NQA data file (*.NQA or *.NQ2; see [Table 7-6](#) on p. 7.41) to be analyzed. The NQA data file can be located in any directory of any drive accessible from the PC.

Loading the data can take some time, during which the current status is shown in the bottom line. Irrespective of the number of data files to be viewed and the number of mobiles included in each data file, the file NQA-MAK.XLS has to be loaded only once. It provides all necessary functions for the current MS Excel session.

NQA-MAK.XLS generates a separate MS Excel folder for every mobile analyzed. The folders are divided into several individual worksheets; see section [Worksheets](#) on p. 7.44 ff. The worksheets can be modified and extended using the full MS Excel functionality; for information refer to the MS Excel help system. To facilitate data handling and switchover between different folders the application adds some functionality to MS Excel:

**File –
Read NQA Data ...** In the *File* menu, the additional command *Read NQA Data* is added. This command calls up an *Open NQA Data File* dialog to select and open a new NQA data file .

Loading a new NQA data file initiates a new evaluation, independent from the previous ones. MS Excel creates a new folder for each mobile in the new data file and numbers the folders in ascending order.

**Window –
MOBn-NAQm** The *Windows* menu contains a list of all current folders. The names of the folders *MOBn-NAWm* are automatically generated when a NQA data file is opened:
n numbers the mobiles within a data file, starting with 1 ($n \leq 16$).
m numbers the folders in order of their creation.

Two folders can have the same mobile number n but always differ by their folder number m. Selecting a folder activates it and displays either the worksheet that was active last time when the folder was opened or the (default) *Header* worksheet.

Saving Folders A folder can be saved to an MS Excel file using the *Save* or *Save As...* commands in the *File* menu. The default folder file name is NQA-MAK.XLS for software version 2.1 (see warning below) and MOB-NQAm.XLS (where m numbers the folders generated in a session) for software version 3.0x. Saved folder files can be reused and modified.



Caution!

Be sure not to overwrite the application files when saving your evaluated NQA charts ! In software V2.1, the default file name for saving a folder is identical with the name of the startup file NQA-MAK.XLS.

It is therefore recommended to keep a backup of the application files before starting the software for the first time.

The default values for the chart entries can be modified after unhiding NQA-MAK.XLS, which is hidden by default; see section [Special Functions](#) on p. 7.56 ff. The folder files are not write-protected and can be modified.

Worksheets

In software version V3.0x, NQA-MAK.XLS generates a separate MS Excel folder for every mobile analyzed; see section [Starting and Operating TS9954 NQA](#) on p. 7.43 ff. The folder is divided into several individual worksheets. The worksheets can be activated by clicking the tabs across the bottom of the MS Excel main application window:



The *Header* worksheet is opened by default. All worksheets contain the data for one mobile.

In software 2.1 one folder for up to three mobiles is created. The *Header* sheet describes all mobiles ; the other worksheets are mobile-specific. Besides, the contents and use of the worksheets does not depend on the software version.

Note:

Many of the worksheets contain pie charts or bar charts to visualize the distribution of a quantity. Clicking a point inside a diagram opens dialog boxes to customize the diagram or one of its elements. For more information refer to the MS Excel What's this...? help.

Header

This sheet contains general information about the measurement tour, the mobile used and the NQA settings:

C:\TS9954\DD2MU3.DIR\MEASDATA\DD2MU302.NQA		NQA data filename
03/18/02		Date
14:09:06		Time
DEMOCASE		Operator
		Comment line 1
		Comment line 2
		Comment line 3
		Comment line 4
Name:	AEG9020_104	Mobile Name
FW Version:	2.00	Mobile Firmware Vers.
Mobile Configuration:	GSM	Net type
MCC:	262	Mobile Country Code (Three-digit number, e.g. 262 for Germany)

MNC:	01	Mobile Network Code (Two-digit number, e.g. 01 = D1 Net (GSM 900), 02 = D2 Net (GSM 900), 03 = E Net (DCS 1800) in Germany))
Call Delay [sec]:	10	
Call Duration [sec]:	10	(Parameter set in the Autodialing tab of the driver configuration menu)
HO Maxcnt:	2	(Parameter set in the NQA tab of the driver configuration menu)
Call Delay Limit [sec]:	10	(Identical with the Blocked Call Delay pa- rameter set in the NQA tab of the driver configu- ration menu)
RxLev Threshold:	20	
RxLev Exceed:	50	
RxQual Threshold:	5	
RxQual Exceed:	50	

Call Statistics

This sheet displays the number of calls for each call class and the relative frequency of call classes:

Good	Blocked	Dropped	No Service
58,8%	2,0%	39,2%	0,0%
117	4	78	0

+ Pie chart showing the relative frequency of call classes.

Column	Row	Meaning	Formula (see legend below)
Good	abs	Number of calls with Class = Good (0)	G+GR+GN+GRN
Blocked	abs	Number of calls with Class = Blocked (1)	BC
Dropped	abs	Number of calls with Class = Dropped (2)	D+DR+DN+DRN
No Service	abs	Number of calls with Class = No Service (3)	NC
Good	rel	Ratio of Good calls to Sum of all calls	(G+GR+GN+GRN) / all calls
Blocked	rel	Ratio of Blocked calls to Sum of all calls	BC / all calls
Dropped	rel	Ratio of Dropped calls to Sum of all calls	(D+DR+DN+DRN) / all calls
No Service	rel	Ratio of NoService calls to Sum of all calls	NC / all calls

Status		Class					
		Good (0)		Blocked (1)	Dropped (2)		No Service (3)
		CallResp-time >...s	CallResp-time <=...s		CallResp-time >...s	CallResp-time <=...s	
not Noisy 0x0000		GR	G	BC	DR	D	NC
Noisy 0x0001		GRN	GN		DRN	DN	

RxQual

This sheet displays information about the distribution of RxQual values measured by the mobile phone and transferred to the test system. In GSM networks the mobile provides a new RxQual value about every 480 ms.

RxQual	0	1	2	3	4	5	6	7
relative	68,9%	4,8%	3,7%	4,4%	4,4%	3,4%	1,7%	9,0%
absolute	4352	302	231	275	275	214	105	566

+ Bar chart showing the relative frequency of all RxQual values.

Column	Row	Meaning
RxQual 0	abs	Number of RxQual = 0 values
RxQual 1	abs	Number of RxQual = 1 values
RxQual 2	abs	Number of RxQual = 2 values
RxQual 3	abs	Number of RxQual = 3 values
RxQual 4	abs	Number of RxQual = 4 values
RxQual 5	abs	Number of RxQual = 5 values
RxQual 6	abs	Number of RxQual = 6 values
RxQual 7	abs	Number of RxQual = 7 values
RxQual 0	rel	Ratio of RxQual = 0 values to total number of recorded RxQual values
RxQual 1	rel	Ratio of RxQual = 1 values to total number of recorded RxQual values
RxQual 2	rel	Ratio of RxQual = 2 values to total number of recorded RxQual values
RxQual 3	rel	Ratio of RxQual = 3 values to total number of recorded RxQual values
RxQual 4	rel	Ratio of RxQual = 4 values to total number of recorded RxQual values
RxQual 5	rel	Ratio of RxQual = 5 values to total number of recorded RxQual values
RxQual 6	rel	Ratio of RxQual = 6 values to total number of recorded RxQual values
RxQual 7	rel	Ratio of RxQual = 7 values to total number of recorded RxQual values

RxQual (Range)

This sheet contains information about the distribution of RxQual values in different ranges of the RxQual scale (ranging from 0 to 7). In GSM networks the mobile provides a new RxQual value about every 480 ms. The three default RxQual ranges are 0 to 3, 4, and 5 to 7.

RxQual	0 to 3	4	5 to 7				
relative	81,6%	4,4%	14,0%				
absolute	5160	275	885				

+ Pie chart showing the relative frequency of RxQual values in the current ranges.

Up to 8 ranges can be defined in the table below the pie chart. Overwriting a number in the white cells changes the results in the upper table and the pie chart. Clicking the *Default* cell restores the default ranges. These ranges are stored in the NQA-MAK.XLS file; see section [Special Functions](#) on p. 7.56 ff.

Default	B1	B2	B3	B4	B5	B6	B7	B8
from	0	4	5					
to	3	4	7					

Column	Row	Meaning
RxQual 0...3	abs	Number of RxQual = 0...3
RxQual 4	abs	Number of RxQual = 4
RxQual 5...7	abs	Number of RxQual = 5...7
...
RxQual 0...3	rel	Ratio of RxQual = 0...3 values to total number of recorded RxQual values
RxQual 4	rel	Ratio of RxQual = 4 values to total number of recorded RxQual values
RxQual 5...7	rel	Ratio of RxQual = 5...7 values to total number of recorded RxQual values
...

RxLev

This sheet contains information about the distribution of RxLev values in different ranges of the RxLev scale (ranging from 0 to 63). In GSM networks the mobile provides a new RxLev value about every 480 ms.

+ Bar chart showing the relative frequency of all RxLev values in the current ranges.

RxLev / dBm	<=-100	]-100...-95]	]-95...-90]	]-90...-85]	]-85...-80]	]-80...-75]	]-75...-65]	]-65...-60]	>-60
relative	0,3%	1,7%	3,4%	5,4%	9,9%	14,2%	31,0%	15,5%	18,7%
absolute	18	113	218	350	643	920	2011	1007	1211

Column	Row	Meaning
<=-100	abs	Number of RxLev = 0
] -100...-95]	abs	Number of RxLev = 1
] -95...-90]	abs	Number of RxLev = 2
] -90...-85]	abs	Number of RxLev = 3
] -85...-80]	abs	Number of RxLev = 4
] -80...-75]	abs	Number of RxLev = 5
] -75...-65]	abs	Number of RxLev = 6
] -65...-60]	abs	Number of RxLev = 7
>-60	abs	Number of RxLev = 8
<=-100	rel	Ratio of RxLev = 0 values to total number of recorded RxLev values
] -100...-95]	rel	Ratio of RxLev = 1 values to total number of recorded RxLev values
] -95...-90]	rel	Ratio of RxLev = 2 values to total number of recorded RxLev values
] -90...-85]	rel	Ratio of RxLev = 3 values to total number of recorded RxLev values
] -85...-80]	rel	Ratio of RxLev = 4 values to total number of recorded RxLev values
] -80...-75]	rel	Ratio of RxLev = 5 values to total number of recorded RxLev values
] -75...-65]	rel	Ratio of RxLev = 6 values to total number of recorded RxLev values
] -65...-60]	rel	Ratio of RxLev = 7 values to total number of recorded RxLev values
>-60	rel	Ratio of RxLev = 8 values to total number of recorded RxLev values

PWR-Time

This sheet contains information about the average transmitter output power of the mobile and the system times.

	Avg-PWR	Avg-PWR [dBm]	Mobile Configuration
Min	6	18	GSM1800
Max	0	30	
Avg	1,59		
Std. dev.	1,81		

	SysResptime	CallResptime	EffectiveCallDuration
Min	4,83	6,56	3,11
Max	8,83	11,22	15,22
Avg	5,71	7,69	10,47
Std. dev.	0,39	0,47	1,48

Column	Row	Meaning
Avg-PWR (The average transmitter output power Avg-PWR is expressed in Power Control Level (PCL) units; see PCL tables in chapter 8.)	Min	Maximum of the average PWR values of all Good (0) or Dropped (2) calls
	Max	Minimum of the average PWR values of all Good (0) or Dropped (2) calls
	Avg	Average of the average PWR values of all Good (0) or Dropped (2) calls
	Std. dev.	Standard deviation of the average PWR values of all Good (0) or Dropped (2) calls

Column	Row	Meaning
Avg-PWR [dBm] (The average transmitter output power Avg-PWR [dBm] is derived from the PCLs (Avg-PWR) as follows: GSM900: Avg-PWR [dBm] = 43 - 2* Avg-PWR GSM1800/1900: Avg-PWR [dBm] = 30 - 2* Avg-PWR)	Min	Maximum of the average PWR values of all Good (0) or Dropped (2) calls in [dBm]
	Max	Minimum of the average PWR values of all Good (0) or Dropped (2) calls in [dBm]
Mobile Configuration		Taken from <i>Header</i> sheet : <i>Mobile Configuration</i> of the actual mobile
SysResptime (Calculation: SysResptime [sec] = System response time / 18)	Min	Minimum SysResptime of all Good (0) or Dropped (2) calls
	Max	Maximum SysResptime of all Good (0) or Dropped (2) calls
	Avg	Average SysResptime of all Good (0) or Dropped (2) calls
	Std. dev.	Standard deviation of the SysResptime of all Good (0) or Dropped (2) calls
CallResptime (Calculation: CallResptime [sec] = Call response time / 18)	Min	Minimum CallResptime of all Good (0) or Dropped (2) calls
	Max	Maximum CallResptime of all Good (0) or Dropped (2) calls
	Avg	Average CallResptime of all Good (0) or Dropped (2) calls
	Std. dev.	Standard deviation of the CallResptime of all Good (0) or Dropped (2) calls
EffectiveCallDuration (Calculation: Effective-CallDuration [sec] = Effective call duration / 18)	Min	Minimum EffectiveCallDuration of all Good (0) or Dropped (2) calls
	Max	Maximum EffectiveCallDuration of all Good (0) or Dropped (2) calls
	Avg	Average EffectiveCallDuration of all Good (0) or Dropped (2) calls
	Std. dev.	Standard deviation of the EffectiveCallDuration of all Good (0) or Dropped (2) calls

HO Info

This sheet contains a statistical evaluation of all recorded handover attempts and handovers.

	absolute	relative	relative
Sum of Calls	195		
Sum of HO trials	111	100%	
Successful HOs	111	100%	100%
InterCell	75		68%
IntraCell	36		32%
Trials/Call Min	0		
Trials/Call Max	2		
Trials/Call Avg	0,57		

Column	Row	Meaning	Formula (see legend below)
abs	Sum of calls	Number of Good (0) or Dropped (2) calls	G+GR+GN+GRN+D+DR+DN+DRN
abs	Sum of HO trials	Total number of handover attempts in all Good (0) or Dropped (2) calls	
abs	Successful HOs	Total number of all InterCell and IntraCell handovers in all Good (0) or Dropped (2) calls	
abs	InterCell	Total number of all successful InterCell handovers in all Good (0) or Dropped (2) calls	
abs	IntraCell	Total number of all successful IntraCell handovers in all Good (0) or Dropped (2) calls	
abs	Trials/Call Min	Minimum Number of handover attempts during a Call in all Good (0) or Dropped (2) calls	
abs	Trials/Call Max	Maximum Number of handover attempts during a Call in all Good (0) or Dropped (2) calls	
abs	Trials/Call Avg	Ratio of Sum of HO trials to Sum of calls	
rel	Sum of HO trials	100 %	
rel	Successful HOs	Ratio of Successful HOs to HO attempts	
rel	Successful HOs	100 %	
rel	InterCell	Ratio of InterCell HOs to successful HOs	
rel	IntraCell	Ratio of IntraCell HOs to successful HOs	

Status	Class					
	Good (0)		Blocked (1)	Dropped (2)		No Service (3)
	CallResp-time >... s	CallResp-time <=... s		CallResp-time >... s	CallResp-time <=... s	
not Noisy 0x0000	GR	G	BC	DR	D	NC
Noisy 0x0001	GRN	GN		DRN	DN	

SysResptime

This sheet contains information about the distribution of the System Response Time values :

t/s	[0...2[	[2...4[	[4...6[	[6...8[	[8...10[	[10...12[	[12...14[	[14...16[	[16...18[	[18...
relative	0,0%	0,0%	83,1%	16,4%	0,5%	0,0%	0,0%	0,0%	0,0%	0,0%
absolute	0	0	162	32	1	0	0	0	0	0

+ Bar chart showing the relative number of calls with a System Response Time in the defined ranges.

The ranges can be defined in the table below the bar chart. Overwriting a number in the white cells changes the results in the upper table and the pie chart. Clicking the *Default* cell restores the default ranges. These ranges are stored in the NQA-MAK.XLS file; see section [Special Functions](#) on p. 7.56 ff.

Column	Row	Meaning
[0...2 [	abs	Number of calls with SysResptime/18 in the range 0 ... 2 in all Good (0) or Dropped (2) calls
[2...4 [	abs	...
[4...6 [	abs	...
[6...8 [	abs	...
[8...10 [	abs	...
[10...12 [	abs	...
[12...14 [	abs	...
[14...16 [	abs	...
[16...18 [	abs	...

[18...	abs	...
[0...2 [	rel	Ratio: Number of calls with SysResptime/18 in the range of 0 ... 2 divided by the Sum of all Good (0) or Dropped (2) calls
[2...4 [	rel	...
[4...6 [	rel	...
[6...8 [	rel	...
[8...10 [	rel	...
[10...12 [	rel	...
[12...14 [	rel	...
[14...16 [	rel	...
[16...18 [	rel	...
[18...	rel	...

Call Resptime

This sheet contains information about the distribution of the Call Response Time values :

t/s	[0...2[	[2...4[	[4...6[	[6...8[	[8...10[	[10...12[	[12...14[	[14...16[	[16...18[	[18...
relative	0,0%	0,0%	0,0%	78,3%	21,2%	0,5%	0,0%	0,0%	0,0%	0,0%
absolute	0	0	0	159	43	1	0	0	0	0

+ Bar chart showing the relative number of calls with a Call Response Time in the defined ranges.

The ranges can be defined in the table below the bar chart. Overwriting a number in the white cells changes the results in the upper table and the pie chart. Clicking the *Default* cell restores the default ranges. These ranges are stored in the NQA-MAK.XLS file; see section [Special Functions](#) on p. 7.56 ff.

Column	Row	Meaning
[0...2 [	abs	Number of calls with CallResptime/18 in the range 0 ... 2 in all Good (0) or Dropped (2) calls
[2...4 [	abs	...
[4...6 [	abs	...
[6...8 [	abs	...
[8...10 [	abs	...
[10...12 [	abs	...
[12...14 [	abs	...
[14...16 [	abs	...
[16...18 [	abs	...
[18...	abs	...
[0...2 [	rel	Ratio: Number of calls with CallResptime/18 in the range of 0 ... 2 divided by the Sum of all Good (0) or Dropped (2) calls
[2...4 [	rel	...
[4...6 [	rel	...
[6...8 [	rel	...
[8...10 [	rel	...
[10...12 [	rel	...
[12...14 [	rel	...
[14...16 [	rel	...
[16...18 [	rel	...
[18...	rel	...

Noisy

This sheet gives information about the *Noisy* calls:

	absolute	relative
Total Calls	213	100%
Noisy Calls	8	3,8%
Noisy RxLev	8	3,8%
Noisy RxQual	2	0,9%

Column	Row	Meaning	Formula (see legend below)
abs	Total Calls	Number of Good (0) or Dropped (2) calls	G+GR+GN+GRN + D+DR+DN+DRN
abs	Noisy Calls	Number of Noisy calls among the Good (0) or Dropped (2) calls	GN+GRN +DN+DRN
abs	Noisy RxLev	Number of RxLev Noisy calls among the Good (0) or Dropped (2) calls	Subset RxLev Noisy of (GN+GRN +DN+DRN)
abs	Noisy RxQual	Number of RxQual Noisy calls among the Good (0) or Dropped (2) calls	Subset RxQual Noisy of (GN+GRN +DN+DRN)
rel	Total Calls	100 %	100 %
rel	Noisy Calls	Ratio of Number of Noisy calls among all Good (0) or Dropped (2) calls to Sum of all Good (0) or Dropped (2) calls	$(GN+GRN +DN+DRN) / (G+GR+GN+GRN + D+DR+DN+DRN)$
rel	Noisy RxLev	Ratio of Number of RxLev Noisy calls among all Good (0) or Dropped (2) calls to Sum of all Good (0) or Dropped (2) calls	$(\text{Subset RxLev Noisy of } (GN+GRN +DN+DRN)) / (G+GR+GN+GRN + D+DR+DN+DRN)$
rel	Noisy RxQual	Ratio of Number of RxQual Noisy calls among all Good (0) or Dropped (2) calls to Sum of all Good (0) or Dropped (2) calls	$(\text{Subset RxQual Noisy of } (GN+GRN +DN+DRN)) / (G+GR+GN+GRN + D+DR+DN+DRN)$

Status	Class					
	Good (0)		Blocked (1)	Dropped (2)		No Service (3)
	CallResp-time >... s	CallResp-time <=... s		CallResp-time >... s	CallResp-time <=... s	
not Noisy 0x0000	GR	G	BC	DR	D	NC
Noisy 0x0001	GRN	GN		DRN	DN	

SucRate

This sheet contains information about the Success Rate, i.e. the absolute and relative frequency of the different call classes. In contrast to the *SucRate 100%* (see p. 7.53) the SucRate is not normalized. A call may contribute to more than one call class, so the sum of Good, Dropped, Blocked, No Service and Noisy calls may exceed the total number of calls. In particular, the Noisy calls contribute to the Good as well as to the Dropped calls.

	absolute	relative
Total Calls	217	100%
Good	213	98,2%
Dropped	0	0,0%
Blocked	4	1,8%
No Service	0	0,0%
Noisy	8	3,7%

+ Bar chart showing the relative frequencies of Good, Dropped, Blocked, No Service, and Noisy calls.

Column	Row	Meaning	Formula (see legend below)
Abs	Total Calls	Sum of all Good (0), Dropped (2), Blocked (1) and No Service (3) calls, including the Noisy calls among the Good (0) or Dropped (2) calls	G+GR+GN+GRN+D+DR+DN+DRN+BC+NC
Abs	Good Calls	Number of Good (0) calls	G+GR+GN+GRN
Abs	Dropped	Number of Dropped (2) calls	D+DR+DN+DRN
Abs	Blocked Calls	Number of Blocked (1) calls	BC
Abs	No Service	Number of No Service (3) calls	NC
Abs	Noisy	Number of Noisy calls among the Good (0) or Dropped (2) calls	GN+GRN+DN+DRN
rel	Total Calls	100 %	100 %
rel	Good Calls	Ratio of Good (0) Calls to Total Calls	$(G+GR+GN+GRN) / (G+GR+GN+GRN+D+DR+DN+DRN+BC+NC)$
rel	Dropped	Ratio of Dropped (2) Calls to Total Calls	$(D+DR+DN+DRN) / (G+GR+GN+GRN+D+DR+DN+DRN+BC+NC)$
rel	Blocked Calls	Ratio of Blocked (1) Calls to Total Calls	$BC / (G+GR+GN+GRN+D+DR+DN+DRN+BC+NC)$
rel	No Service	Ratio of No Service (3) Calls to Total Calls	$NC / (G+GR+GN+GRN+D+DR+DN+DRN+BC+NC)$
rel	Noisy	Ratio of Noisy calls among the Good (0) or Dropped (2) Calls to Total Calls	$(GN+GRN+DN+DRN) / (G+GR+GN+GRN+D+DR+DN+DRN+BC+NC)$

Status	Class					
	Good (0)		Blocked (1)	Dropped (2)		No Service (3)
	CallResp-time >... s	CallResp-time <=... s		CallResp-time >... s	CallResp-time <=... s	
not Noisy 0x0000	GR	G	BC	DR	D	NC
Noisy 0x0001	GRN	GN		DRN	DN	

SucRate 100%

This sheet contains information about the normalized Success Rate. In contrast to the *SucRate* (see p. 7.52) the SucRate 100% is normalized in such a way that the sum of Good, Dropped, Blocked, No Service and Noisy calls plus the Good calls exceeding a definite Call Response Time is equal to the total number of calls. The Noisy calls and the calls exceeding a definite Call Response Time are not included in the Good calls.

Default	absolute	relative
Total Calls	217	100%
No Service	0	0,0%
Blocked	4	1,8%
Dropped	0	0,0%
CallResptime >15s	0	0,0%
Noisy	8	3,7%
Good	205	94,5%

The CallResptime (Call Response Time) parameter can either be changed via keyboard or by clicking the *Default* button, which inserts the default value taken from the application file NQA-MAK.XLS; see section *Special Functions* on p. 7.56 ff.

+ Bar chart showing the relative frequencies of Total (100%), No Service, Blocked, CallRespTime, Noisy, and Good Calls.

Column	Row	Meaning	Formula (see legend below)
abs	Total Calls	Sum of all Good (0), Dropped (2), Blocked (1) and No Service (3) calls	G+GR+ GN+GRN+ D+DR+ DN+DRN+ BC+NC
abs	No Service	Number of No Service (3) calls	NC
abs	Blocked Calls	Number of Blocked (1) calls	BC
abs	Dropped	Number of Dropped (2) calls	D+DR+DN+DRN
abs	CallResptime > 15 s	Number of Good (0) calls with Call Response time exceeding the selected value	GR+GRN
abs	Noisy	Number of Good (0) calls with Call Response time below the selected value that are also Noisy	GN
abs	Good Calls	Number of Good (0) calls with Call Response time below the selected value that are not Noisy	G
rel	Total Calls	100 %	100 %
rel	No Service	Ratio: Number of No Service (3) calls divided by the Sum of all Good (0), Dropped (2), Blocked (1) and No Service (3) calls plus the Noisy calls among the Good (0) or Dropped (2) calls	NC / (G+GR+GN+GRN+ D+DR+DN+DRN+ BC+NC)
rel	Blocked Calls	Ratio: Number of Blocked (1) calls divided by the Sum of all Good (0), Dropped (2), Blocked (1) and No Service (3) calls plus the Noisy calls among the Good (0) or Dropped (2) calls	BC / (G+GR+GN +GRN+ D+DR+DN+DRN+ BC+NC)
rel	Dropped	Ratio: Number of Dropped (2) calls divided by the Sum of all Good (0), Dropped (2), Blocked (1) and No Service (3) calls plus the Noisy calls among the Good (0) or Dropped (2) calls	(D+DR+DN+DRN) / (G+GR+GN+GRN+ D+DR+DN+DRN+ BC+NC)
rel	Call Response Time > 10 s ¹⁾	Ratio: Number of Good (0) calls with Call Response time exceeding the selected value divided by the Sum of all Good (0), Dropped (2), Blocked (1) and No Service (3) calls plus the Noisy calls among the Good (0) or Dropped (2) calls	(GR+GRN) / (G+GR+GN+GRN + D+DR+DN+DRN+ BC+NC)
rel	Noisy	Ratio: Number of Good (0) calls with Call Response time below the selected value that are also Noisy, divided by the Sum of all Good (0), Dropped (2), Blocked (1) and No Service (3) calls plus the Noisy calls among the Good (0) or Dropped (2) calls	GN / (G+GR+GN+GRN+ D+DR+DN+DRN+ BC+NC)
rel	Good Calls	Ratio: Number of Good (0) calls with Call Response time below the selected value that are not Noisy, divided by the Sum of all Good (0), Dropped (2), Blocked (1) and No Service (3) calls plus the Noisy calls among the Good (0) or Dropped (2) calls	G / (G+GR+GN+GRN+ D+DR+DN+DRN+ BC+NC)

Class					
Good (0)		Blocked (1)	Dropped (2)		No Service (3)
CallResptime >... s	CallResptime <=...s		CallResptime >... s	CallResptime <=...s	
GR	G	BC	DR	D	NC
GRN	GN		DRN	DN	

Status
not Noisy 0x0000
Noisy 0x0001

Each call is assigned exclusively to one single type of call. As some calls can possibly be assigned to more than one class, priorities must be assigned to the classes :

Priority	Call type	Formula
6	No Service	NC
5	Blocked	BC
4	Dropped	D+DR+DN+DRN
3	Call Response Time > 10 s	GR+GRN
2	Noisy	GN
1	Good	G

6 is the top priority, 1 is the lowest priority. Therefore, if a call is Dropped and Noisy at the same time, it will be classified as a *Dropped* call.

SucRate (switch.)

This sheet defines and evaluates a Success Rate with selectable contributions. The sheet provides switches to select the calls that are classified as successful calls.

Call Trials	Call SucRate
100%	100.0%

Filter	Dropped	Blocked	Noisy	No Service	Call Resp. Time	Syst. Resp. Time
On/Off	Off	Off	Off	Off	Off (>10s)	Off (>10s)

S1
S2
S3
S4
S5
S6
← Switch

+ Bar chart showing the percentage of call trials and the user-defined Call Success Rate.

The parameter list for setting the switches S1 to S6 and the Response Times is located directly underneath the bar chart. The *Default* button assigns the default values taken from the *Default* sheet in NQA-MAK.XLS; see section [Special Functions](#) on p. 7.56 ff.

Column	Meaning	Formula (see legend below)
Call Trials = All Calls	Sum of the Good (0), Dropped (2), Blocked (1) and No Service (3) calls.	G+GR+GN+GRN+D+DR+DN+DRN+BC+NC
Call Success Rate	Depending on the switch position, the single types of calls are subtracted from the total number of Call Trials.	See below

$$\text{Call Success Rate} = \frac{\text{All Calls} - \sum_{\text{All Calls}} \text{Flag}}{\text{All Calls}}$$

The Call Success Rate is a number between 0% and 100%. The *Flag* is calculated for every single call according to the following formula:

$$\text{Flag} = (S1 \cap \text{Dropped}) \cup (S2 \cap \text{Blocked}) \cup (S3 \cap \text{Good} \cap \text{Noisy}) \cup (S3 \cap \text{Dropped} \cap \text{Noisy}) \cup (S4 \cap \text{No Service}) \cup (S5 \cap \text{Good} \cap \text{Call Response Time} > \text{selected value}) \cup (S5 \cap \text{Dropped} \cap \text{Call Response Time} > \text{selected value}) \cup (S6 \cap \text{Good} \cap \text{System Response Time} > \text{selected value}) \cup (S6 \cap \text{Dropped} \cap \text{System Response Time} > \text{selected value})$$

S1 to S6 are switches, to be set independently in the parameter list to either ON (1) or OFF (0). ∩ denotes an "AND" combination, ∪ denotes an "OR" combination.

Status	Class					
	Good (0)		Blocked (1)	Dropped (2)		No Service (3)
	CallResp-time >...s	CallResp-time <=...s		CallResp-time >...s	CallResp-time <=...s	
not Noisy 0x0000	GR	G	BC	DR	D	NC
Noisy 0x0001	GRN	GN		DRN	DN	

Examples: In the default setting where all switches S1 to S6 are set to OFF (0), the Call Success Rate is always 100%.

If only S1 is set to ON (1), all Dropped calls (DR + D + DRN + DN) are classified as being not successful. If the data set contains any Dropped calls, the Call Success Rate is smaller than 100%.

If only S3 is set to ON (1), all Dropped calls that are also Noisy (DRN + DN) are classified as being not successful; the Dropped calls that are not Noisy (DR + D) are still classified as being successful.

If the data set contains any Dropped calls that are also Noisy, the Call Success Rate is smaller than 100%.

Special Functions

The evaluation software TS9954 NQA provides a number of additional functions to customize the worksheets, change the language and the logo, modify the data and print the contents of a worksheet.

The NQA-MAK.XLS file contains three sheets to edit default values and select the language and the logo displayed on top of each worksheet. Within MS Excel this file is hidden by default but can be displayed and edited using the *Window - Unhide* menu item. The file provides a folder with three tabs to select the three worksheets *Default*, *Language*, and *Logo*.



All three sheets are protected with a password that must be entered into a dialog window following the instructions displayed by MS Excel.

Note:

The password to be used at the first time after installing TS9954 NQA is "a". After typing in "a" to access and modify a NQA-MAK.XLS sheet it is possible to renew the protection using another password or omit the password protection altogether.

Default Values

The *Default* worksheet in the NQA-MAK.XLS file displays the following **Default values:**

RxQual (Range)	B1	B2	B3	B4	B5	B6	B7	B8
from (incl.)	0	4	5					
to (incl.)	3	4	7					

CallResptime	B1	B2	B3	B4	B5	B6	B7	B8	B9	B10
from (incl.)	0	2	4	6	8	10	12	14	16	18
to (excl.)	2	4	6	8	10	12	14	16	18	

SysResptime	B1	B2	B3	B4	B5	B6	B7	B8	B9	B10
from (incl.)	0	2	4	6	8	10	12	14	16	18
to (excl.)	2	4	6	8	10	12	14	16	18	

SucRate 100%	
CallResptime	>15s

SucRate (switch.)		On(1)/Off(0)
Dropped		0
Blocked		0
Noisy		0
No Service		0
CallResptime	>15s	0
SysResptime	>10s	0

The headers *RxQual (Range)* etc. denote the worksheets where the default values are used. A default value can be modified after double-clicking on the cell.

Language and Logo

The *Language* worksheet in the NQA-MAK.XLS file displays a German, English, and a Spanish dictionary. It is possible to select one of the three languages and modify the vocabulary.

In the *Logo* worksheet, it is possible to select a logo to be displayed on each worksheet and define its position.

DATA Table

When the NQA data files are loaded the data are evaluated and the results written into the DATA table. The DATA table provides easy access to the data and can be used to modify the data and create new charts.

Printing

All sheets have a pre-defined printing area set for DIN A4 landscape format. Hardcopies can be printed using the MS Excel printer settings. A print preview is available in the file menu or on clicking the corresponding button in the MS Excel toolbar.

Modification of the Worksheets

The *MOB1...* folder files (see section [Starting and Operating TS9954 NQA](#) on p. 7.43 ff.) are visible and not protected. They can be modified for your own personal requirements.

All functions used are standard MS Excel functions. Every experienced MS Excel user can modify and extend the formula. Knowledge about database, matrix and VBA macro functions are indispensable, knowledge in software programming is useful.

Sheet concept The sheets depend on each other, data links have been installed between them.

Hidden cells In some sheets several areas are hidden. These areas are used for matrix definitions and interim calculations.

Macros In the VBA macro a special item is to be found: It is not possible to detect missing mobile data before loading is finished, and copying functions on empty cells in this macro would lead to error messages. So, during this time, error messages are suppressed. When you face problems modifying the software, switch off this function.

The 'Bit' function contains an AND function for the comparison of two values. MS Excel compares on a bit by bit basis but returns a TRUE value as soon as two bits are found due to this result. Therefore this function is used twice in 'NOISY' evaluations to compare two set bits.

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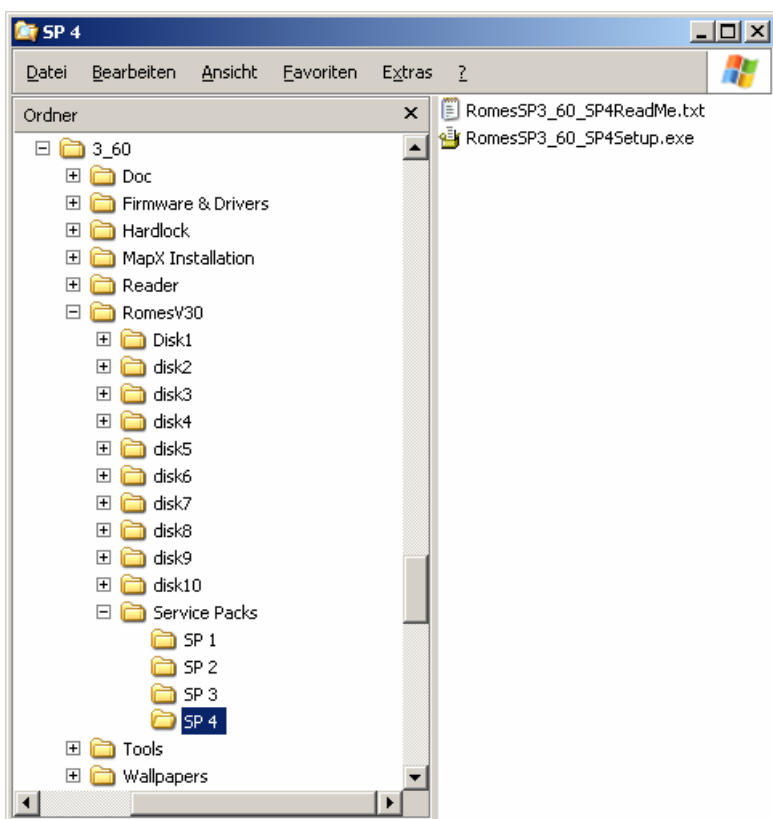
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8 Installation Instructions and Background Information

This chapter explains how to install R&S ROMES and third-party utilities that might be useful or necessary for the operation of some R&S ROMES components and contains useful information on coordinate systems for geographical projections, GSM and GPS. Appended are lists of all terms and abbreviations used throughout this manual.

R&S ROMES Installation

R&S ROMES is an application software to be run on a controller with a MS Windows XP operating system. The application is supplied on a CD-ROM containing all program parts and utilities necessary for operation including the additional hardware drivers:



The CD is organized in several directories:

- *Doc* provides documentation on various devices of the measurement system, including the present R&S ROMES operating manual in printable (*.pdf) version and a delta list of new features. Further information (readme files) can be found in the *Firmware and Drivers* directory.
- *Firmware and Drivers* contains driver software and documentation for various purposes; see [Table 8-1](#) below.
- *Hardlock* contains the hardlock driver and instructions for manually installing the driver (only relevant if the automatic installation fails).
- *IE6* contains an installation version of Microsoft Internet Explorer 6.0.

- *MapX Installation* contains an installation version of the third-party utility *Max X 5* that R&S ROMES uses for the map projection in the *Route Track View*.
- *Reader* contains a German and an English version of **Adobe** Acrobat Reader.
- *RomesV30* contains the coverage measurement system R&S ROMES including possible service packs.
Please note that the service packs have to be installed manually. A service pack usually consists of an executable installer file and the associated release notes as a text file. The service pack can be installed from any location on the target computer, because the required R&S ROMES installation directory is obtained from the MS Windows registry.
- *Tools* contains various utilities for R&S ROMES as described on p. 8.8 ff.
- *Wallpapers* provides various screen background bitmaps.

Table 8-1 List of drivers and further utilities

Drivers for ...	Purpose	Installation file	Reference
DekTec FantASI DTU225	Decoder required for the TSM-DVB DVB-T receiver to watch the selected programm on TV monitor	Firmware & Drivers\ DekTec FantASI DTU225*.zip	Firmware & Drivers\ DekTec FantASI DTU225\Readme.txt
Digi Board	ISA plug-in card with 4 or 8 additional COM ports	<i>Firmware & Drivers\ Digi Board\AccelePort Xr - W2K & WXP\40002207_A.exe</i>	<i>Firmware & Drivers\ Digi Board\Readme.txt</i>
Edgeport USB to 8Serial Converter	Edgeport/8 301-1002-08 USB to 8x serial Converter	<i>Firmware & Drivers\ Edgeport USB to 8Serial Converter\ip4n5340.exe</i>	<i>Firmware & Drivers\ Edgeport USB to 8Serial Converter\Readme.txt</i>
EXSY PCI Serial	PCI plug-in card with 4 or 8 additional COM ports	<i>Firmware & Drivers\ EXSY PCI Serial...*.exe</i>	<i>Firmware & Drivers\ EXSY PCI Serial...\Readme.txt</i>
GPS Receiver	Various drivers for GPS receivers with USB interface	<i>Firmware & Drivers\ GPS Receiver...*.exe</i>	<i>Firmware & Drivers\ GPS Receiver...*.pdf</i>
IEEE Interface	GPiB bus driver for NI and R&S card	<i>Firmware & Drivers\ IEEE Interface...*.exe</i>	Section <i>Hardware Recognition: GPiB Drivers below</i> .
Motorola Mobile	Various utilities and USB drivers for Motorola test mobiles	<i>Firmware & Drivers\Motorola Mobile\...</i>	<i>Firmware & Drivers\Motorola Mobile\...</i>
Nokia Mobile	DKU2 (USB) driver for Nokia mobiles	<i>Firmware & Drivers\Nokia Mobile*.exe</i>	<i>Firmware & Drivers\Nokia Mobile\...</i>
PCS1_PCS2	Drivers for channel sounder cards PCS1 and PCS2	<i>Firmware & Drivers\PCS1_PCS2\Win2k...</i>	Section <i>Hardware Recognition: PCS Drivers below</i>
Qualcomm Chipset Mobiles	USB driver for Qualcomm mobiles	<i>Firmware & Drivers\Qualcomm Chipset Mobiles*.exe</i>	<i>Firmware & Drivers\Qualcomm Chipset Mobiles\...</i> , chapter 6 of this manual.
Quatech...	PCMCIA card for 4 additional COM ports	Firmware & Drivers\Quatech QSP100 PCMCIA to 4SerialWin2k_Xp	
R&S RF Receivers, TSMx IEEE1394 driver	Current firmware, utilities and documentation for R&S RF test receivers, including the IEEE 1394 firewire driver for the TSMx	<i>Firmware & Drivers\R&S RF Receivers\<Type>...</i>	<i>Firmware & Drivers\R&S RF Receivers\<Type>....</i> , chapter 6 of this manual (<i>Test Receiver Drivers</i>).
Sagem Mobile	USB driver for Sagem OT290, required for use with Splitter Box only	<i>Firmware & Drivers\Sagem Mobile*.exe</i>	
Silicom Double Serial	Old PCMCIA card for 2 additional COM ports	<i>Firmware & Drivers\Silicom Double Serial*.exe</i>	<i>Firmware & Drivers\Silicom Double Serial\Readme.txt</i>
Sound Cards	Drivers for Sound Cards used for Speech Quality measurements (SQA)	<i>Firmware & Drivers\Sound Cards...*.exe</i> (or *.zip)	<i>Firmware & Drivers\Sound Cards\...</i>
Trigger Box	Firmware and Tools for the R&S Trigger Box	<i>Firmware & Drivers\Trigger Box\TriggerBoxSetup.exe</i>	<i>Firmware & Drivers\Trigger Box\Readme.txt</i>

Installing R&S ROMES

Installation of the software is controlled by a setup program. All necessary settings are configured automatically during the installation process. Please take the following steps:

- Connect the external CD-ROM drive (if no internal CD-ROM drive is available on your controller).
- Turn on your controller and start your MS Windows operating system.
- If the program Hardcopy is running on your machine, stop this program.
- Insert the CD-ROM in your drive. Unless the autostart option is disabled on your operating system the setup routine on the CD-ROM starts automatically. Otherwise start the setup.exe program in the root directory of the CD-ROM.

The R&S ROMES installation guide is opened:



- Click *Install ROMES 3...* and follow the instructions on the screen.
- If a corresponding message is displayed, restart your computer.
- If the software is not installed in the default directory *c:\Romes*, avoid using a directory name with a blank as e.g. *Program Files*.

Operating R&S ROMES without Local Admin Rights

In case you want to operate R&S ROMES with a “Limited Account” (without Admin rights) it is necessary to perform the following steps to grant additional rights needed to ensure full functionality.

The steps described here are valid for the MS Windows XP operating system.

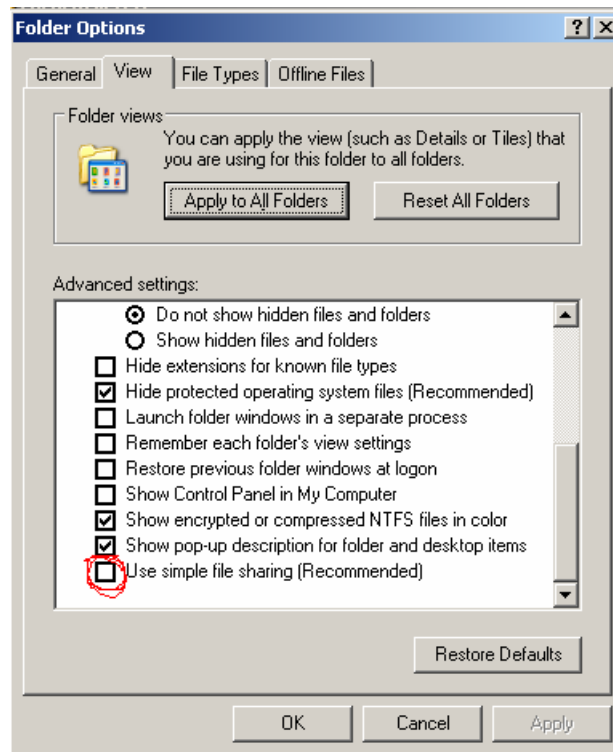
File Sharing Settings

The limited account user without local administration rights needs full file control for the following directories:

- Default R&S ROMES directory (e.g. C:\RuS or C:\ROMES)
- MapInfo directory (e.g. C:\Programme\MapInfo)
- R&S ROMES temporary directory for route track modules (C:\TEMP)

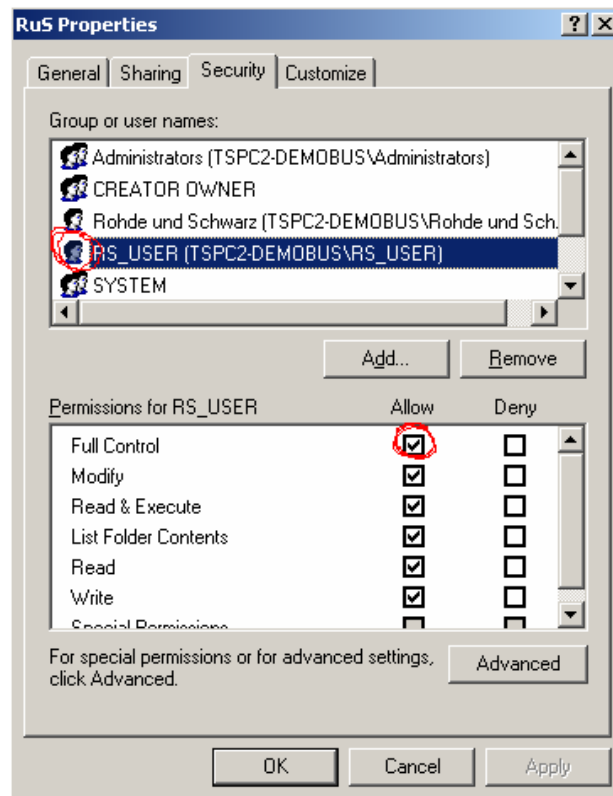
This involves the following steps:

- 1.) Open the Windows Explorer and select the menu item "Tools"->"Folder Options...". Select the tab "View" and scroll down until the "Use simple file sharing" list item is visible as shown below:



Deselect the "Use simple file sharing" checkbox and "Apply" the change.

- 2.) Back in the Windows Explorer, select the default R&S ROMES directory (e.g. e.g. C:\RuS) and right-click it. In the resulting context menu, select the item "Properties", which leads to a dialog window for the selected directory. Click on tab "Security" to obtain a dialog similar to the one shown below:



In the upper list, select the user with limited account privileges (RS_USER in this example). Then select "Allow" in the "Full control" list item of the lower list. "Apply" the change. and repeat this step for all directories listed at the beginning of this section.

- 3.) When Step 2.) is completed, modify the registry as described below.

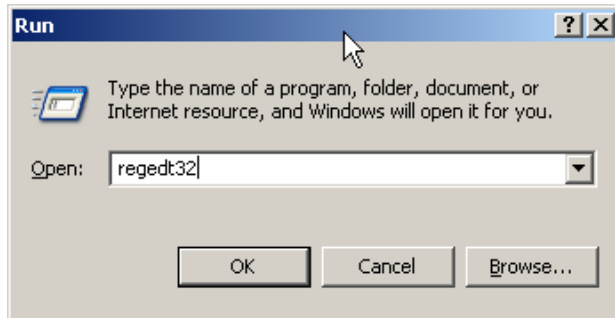
Registry Modifications

To operate R&S ROMES with a limited account user as described above, the following registry keys need to be updated:

- R&S ROMES Registry Key:
HKEY_LOCAL_MACHINE\SOFTWARE\Rohde & Schwarz
- MapInfo Registry Key:
HKEY_LOCAL_MACHINE\SOFTWARE\MapInfo

This involves the following steps:

- 4.) Open the "Start" menu and select "Run..." to obtain the following dialog.



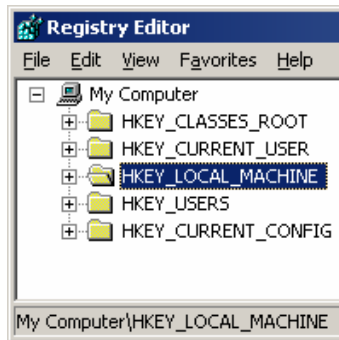
Type "regedt32", as shown above and click "OK" to start the MS Windows Registry editor.



Do not use "regedit" as this tool does not support security settings for registry entries.

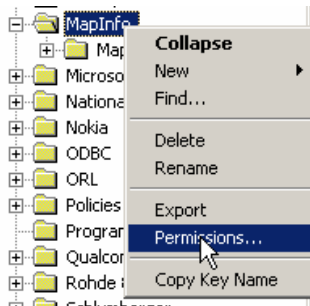
Alternatively, call C:\WINNT\SYSTEM32\regedt32.exe from the command prompt.

The Registry Editor starts with a window similar to the following:

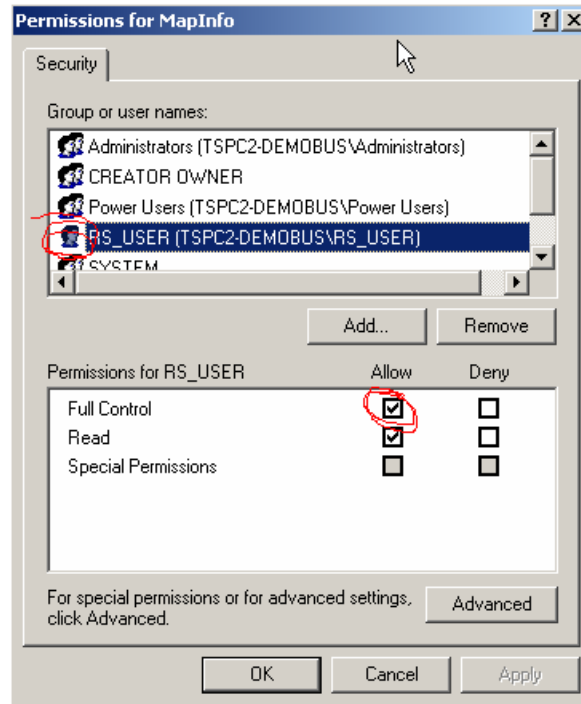


Click on "HKEY_LOCAL_MACHINE", then on "SOFTWARE".

- 5.) In the "SOFTWARE" list, locate the "Rohde & Schwarz" and "MapInfo" items. Right-click an item to obtain a context menu similar to the following:



- 6.) Select "Permissions..." to open the following dialog:



In the upper list, select the user with limited account privileges (RS_USER in this example). Then select "Allow" in the "Full control" list item of the lower list. "Apply" the change. and repeat this step for all SOFTWARE items listed at the beginning of this section.

These changes allow the full functionality of the R&S ROMES software in the context of a limited user account.

R&S ROMES Tools

Together with the main application, R&S ROMES installs additional useful software tools. The tools are accessible in the *Tools* submenu of the R&S ROMES program menu:

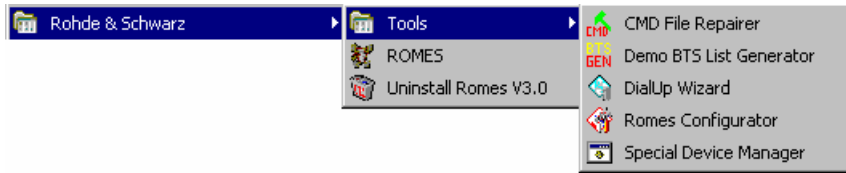


Fig. 8-1 R&S ROMES Tools

CMD File Repairer

The *CMD File Repairer* can repair measurement (*.cmd) files that are corrupted, e.g. because of a system crash or a sudden voltage drop during the measurement. Successfully repaired measurement files can be used again for evaluation in a replay session. The success of the repair algorithm depends on the state of the measurement file.

Installation The *CMD File Repairer* is automatically installed together with the test system. An executable file *CMDRepair.EXE* is stored in the R&S ROMES program directory.

Repairing a CDM file

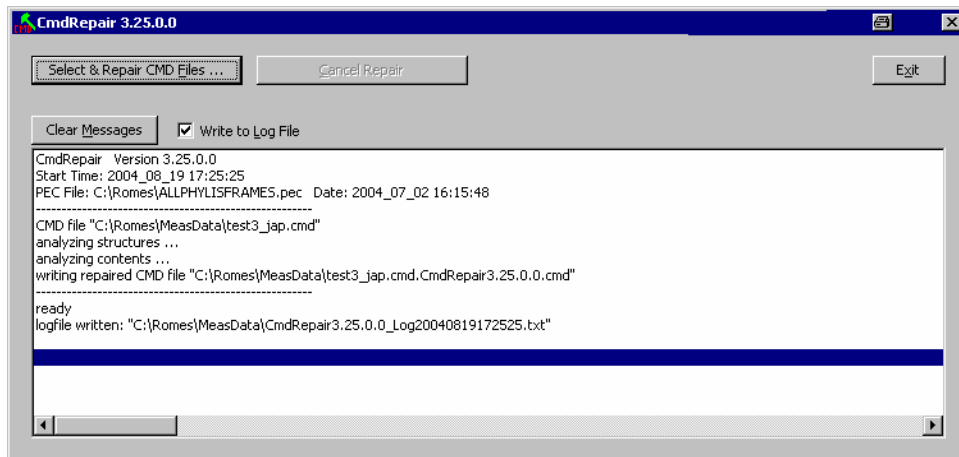
To repair a CMD file...

Make sure that R&S ROMES is closed.

Select *CMD File Repairer* in the *Tools* program subdirectory; see Fig. 8-1 on p. 8.8.

In the dialog opened, click *Select & Repair CMD Files* to call up an *Open File* dialog and choose the corrupted measurement file <file>.cmd.

If it is able to open the file, the file repair tool automatically assigns an output file name <file>.cmd.CmdRepair3.25.0.0.cmd and writes it to the CMD file directory. The progress of the file repair process is reported in the main application window but can also be written to a separate *.txt file (check *Write to Log File*).



The tool indicates *ready* as soon as the file is successfully repaired. If a non-corrupted file is repaired, the repaired file is identical to the original file.

BTS List Generator

The *BTS List Generator* is a software utility which can be used to generate a sample BTS/Node B list from a GSM/CDMA/UMTS measurement (*.cmd) file. The sample BTS/Node B list is adjusted to the contents of the measurement file, it is a useful tool for demo purposes and for exploring the part of R&S ROMES functionality that depends on a BTS/Node B list.

Installation The *BTS List Generator* is automatically installed together with the test system. An executable file *BTSListGenerator.EXE* is stored in the R&S ROMES program directory.

Generating a sample BTS list

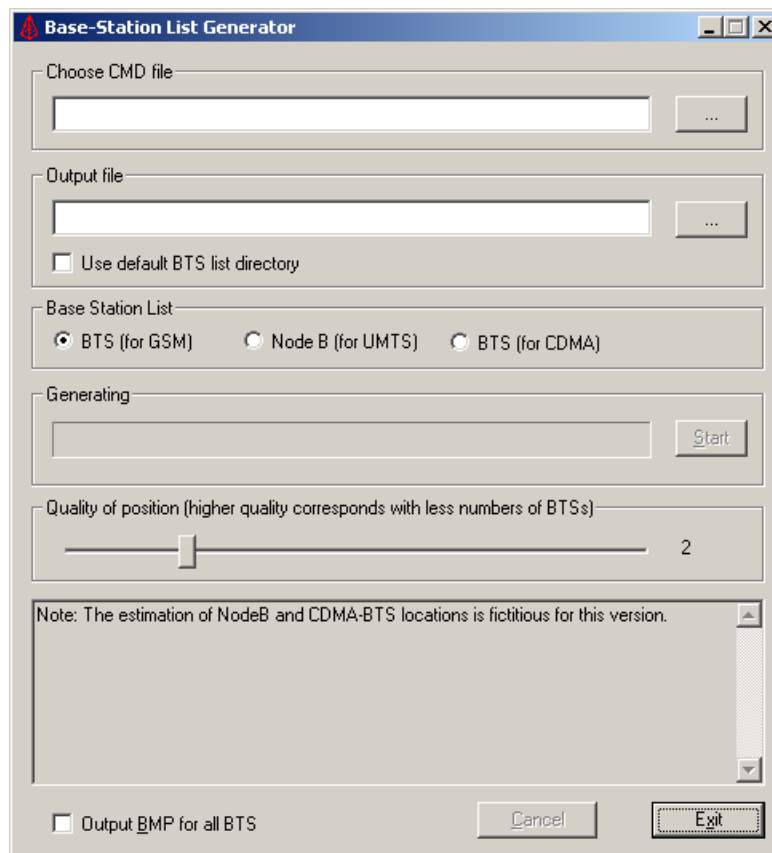
To generate a sample BTS or Node B list...

1. Make sure that R&S ROMES is closed.

Double-click *BTSListGenerator.EXE* (or select *Demo BTS List Generator* in the *Tools* program subdirectory; see [Fig. 8-1](#) on p. 8.8).

In the dialog opened, click the *Choose CMD file* "...“ button to choose the GSM, CDMA or UMTS <file>.cmd file to be used for the BTS/Node B list generation.

The list generator automatically assigns an output file name <file>.txt and selects the folder of the measurement file as default BTS list file location. The *.txt BTS list file format is described in chapter 7.



If you wish to use another file name or file location, click the *Output file* "...“ button or check *Use default BTS List directory*.

The default BTS list directory is the *BTSLists* subdirectory of the R&S ROMES program directory.

Select either *BTS (for GSM)* or *Node B (for UMTS)* or *BTS (for CDMA)*,

depending on the technology of your CMD file.

Click *Start* and check the messages displayed in the *Generating* panel and in the lower section of the dialog.

BTSs detected in the measurement file are displayed as a scrollable list. The *Generating* panel displays a *Ready!* message when the BTS list is generated. The BTS list file can be imported into the GSM BTS data base as described in chapter 3.

Further program settings

The *BTS List Generator* provides additional parameters to control the generated output. The parameters are related to the calculation of the BTS position, which is based on the route of the test vehicle and the measured timing advance of the signals. The geometry and varying test conditions introduce a specific uncertainty to the position estimation of each BTS.

Quality of position

The BTSs are ordered according to the estimated accuracy of their position, BTSs with large inaccuracies are discarded. The condition for discarding BTSs can be varied on a scale between 1 and 6. Larger numbers cause more BTSs to be discarded so that the BTS list becomes shorter.

Output BMP for all BTS

If the box is checked, a bitmap file named *<PositionEstimation_<n>.bmp* for each BTS in the BTS list is written to the output directory. The bitmap shows a graphical code for the estimated accuracy of the BTS position.

Error Messages

The measurement file must contain valid GSM or UMTS data. If an invalid measurement file is selected, file generation is stopped and the *BTS List Generator* displays the following message:

```
No GSM information found!  
Could not calculate BTS!
```

Example

An example BTS list file named *SAUERLACH_MUC.TXT* generated with the *BTS List Generator* is provided together with the application. The file has been generated from the sample measurement file *SAUERLACH_MUC.CMD* and is stored in the *BTSLists* subdirectory of the R&S ROMES program directory.

DialUp Wizard

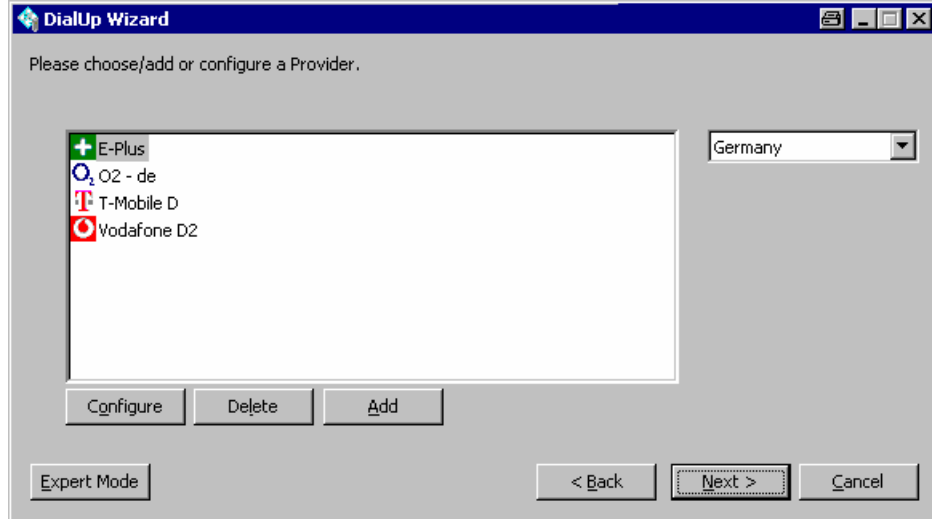
The *DialUp Wizard* offers a preconfigured list of connections to internet providers all over the world. To establish a dial-up connection from your local PC, it is sufficient to select a provider and a country. The wizard allows you to change the parameters of an existing connection or add new connections in an easy way.

Installation

The *DialUp Wizard* is automatically installed together with the test system. An executable file *DialUp Wizard.exe* is stored in the R&S ROMES program directory.

Setting up connection

- a To disable unused views, technologies, or drivers...
2. Select *DialUp Wizard* in the *Tools* program subdirectory; see Fig. 8-1 on p. 8.8.
3. In the country list on the right side of the wizard, select your country.
4. In the provider list, select your provider.

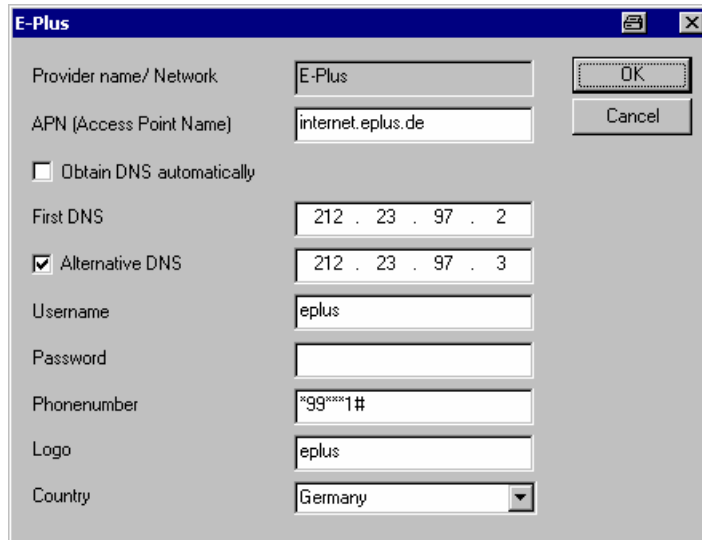


5. Click *Next* to proceed to the next dialog of the wizard and select a modem.
6. Click *Finish* to attempt the connection and close the wizard.
- 7.

Customizing the DialUp Wizard

The buttons in the *DialUp Wizard* dialog allow you to perform the following configurations:

- *Configure* opens a dialog to modify or complement the connection parameters of the selected provider.



- *Delete* removes the selected connection from the list.
- *Add* opens the dialog shown above where you can add the name and the parameters for a new connection. The connection parameters are usually

published in the internet.

- *Expert Mode* opens a dialog where you can again change your connection configuration, look up or change your modem settings, or configure a Remote Access Service (RAS) connection. In expert mode, you can also set up a *GPRS Connection* to the internet using a GPRS mobile phone connected to your local PC.

R&S ROMES Configurator

The *ROMES Configurator* temporarily disables R&S ROMES program components and stores the restricted R&S ROMES configuration as a user profile. In view of the large number of supported views, technologies, and drivers, a restricted configuration can significantly improve the system performance. R&S ROMES does not have to load, reset or reconfigure unused views, technologies, and drivers whenever the application is started or an action affecting the workspace settings is performed.



Disabling components which are not needed for some time makes navigation within R&S ROMES easier because the disabled components no longer appear in the R&S ROMES menus. The ROMES Configurator allows you to re-enable any disabled component whenever you need it again.

Installation

The *ROMES Configurator* is automatically installed together with the test system. An executable file *RomesConfigurator.exe* is stored in the R&S ROMES program directory.

Disabling components

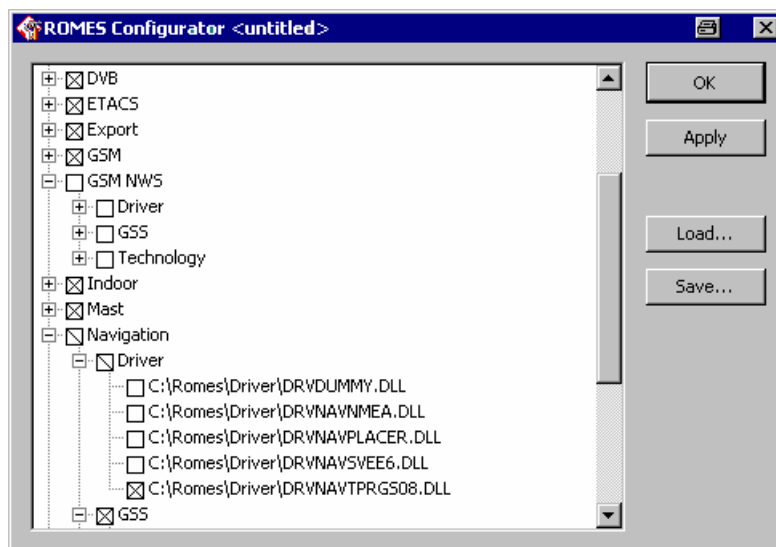
To disable unused views, technologies, or drivers...

1. Make sure that R&S ROMES is closed.
2. Select *ROMES Configurator* in the *Tools* program subdirectory; see [Fig. 8-1](#) on p. 8.8.

The application displays the consecutive messages *Scanning Driver*, *Scanning GSS* and *Scanning Technology* before it opens the main window.

3. Expand the nodes in the *ROMES Configurator* window, expand the parent nodes, and clear the components you want to disable.

In the following example, all GSM network scanner components (driver, views/GSS, and technology) and all but the Tprgs08 GPS driver are disabled.



4. Click *OK* to close the configurator.

Your settings will take effect when you start R&S ROMES for the next time.

Enabling components

To re-enable a previously disabled components, simply select it again in the *ROMES Configurator* window. The re-enabled component will be part of your R&S ROMES installation after you start R&S ROMES again.

Using profile files

A profile file stores a R&S ROMES configuration in ASCII format. The profile file (*.profile) contains a list of all installed R&S ROMES components. A 1 behind an entry means that it is enabled, a zero that it is disabled.

```
[ModuleStates]
C:\Romes\Driver\DRVATTSDM.DLL=1
C:\Romes\Technology\CMSTECHATTENUATOR.DLL=1
C:\Romes\Driver\DRV_K6_DRIVERBASIC.DLL=1
C:\Romes\Driver\DRV_K7.DLL=1
C:\Romes\GSS\GSS_K6_BASIC.DLL=1
C:\Romes\GSS\GSSNAVK6LAYER.RTM=1
C:\Romes\Technology\CMSTECH_K6.DLL=1
C:\Romes\Driver\DRVCDMA_QCP.DLL=1
```

- To store your current configuration to a file, click *Save...* and select a file name (*.profile).
- To re-use a stored configuration, click *Load...*, select the file, and click *OK* to close the configurator and put the configuration into effect.

Special Device Manager

The *Special Device Manager* helps to remove redundant USB drivers that R&S ROMES used in previous measurement sessions. A USB driver must be loaded and assigned to several virtual COM ports whenever a USB device (in particular, a Nokia or Qualcomm UMTS test mobile) is connected; see section *Connection via USB Interface* in chapter 6.

The operating system does not delete unused virtual COM ports if USB devices are connected and disconnected repeatedly. As a result, the virtual COM port numbers for new devices (*Assign Serial Ports* dialog) tend to increase, which in the long run may cause connection problems. It is recommended to delete redundant USB ports using the *Special Device Manager* if the assigned port numbers exceed values of 30, or if holes in the sequence of the COM port numbers are noticed.

The *Special Device Manager* is the standard Device Manager from Microsoft with the environment variable SET DEVMGR_SHOW_NONPRESENT_DEVICES set to 1

Installation

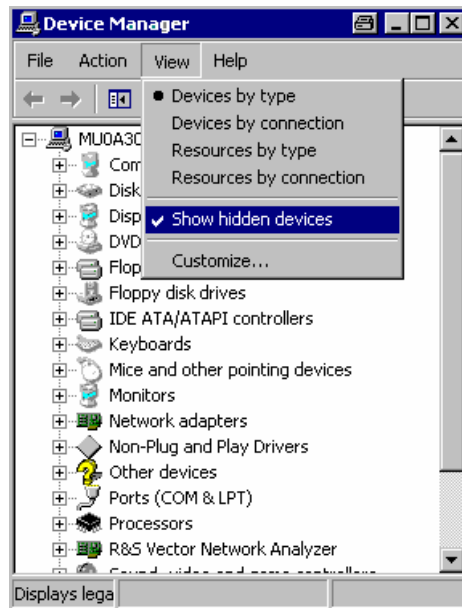
The *Special Device Manager* is automatically installed together with the test system. An executable file *DeviceManager.bat* is stored in the *Tools\DeviceManager* subdirectory of the R&S ROMES program directory.

Removing unused drivers

To remove unused drivers...

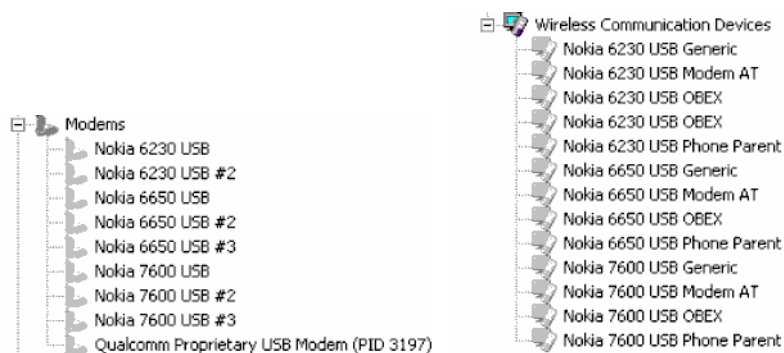
1. Select *Special Device Manager* in the *Tools* program subdirectory; see Fig. 8-1 on p. 8.8.

In the dialog opened, select *View – Show hidden devices*.



The entry must be ticked after each program start.

2. Expand the *Modems* and *Wireless Communication Devices* nodes in the *Device Manager* window.



Unused drivers and port assignments are displayed with gray icons.

3. Delete redundant entries, e.g. all *Nokia* and *Qualcomm* entries, all Qualcomm COM ports and “compound devices”, and all other drivers that are listed several times and no longer needed.
4. Close the *Special Device Manager*.

The lower virtual COM port numbers are available once again; you can use them for the connection of new USB devices.

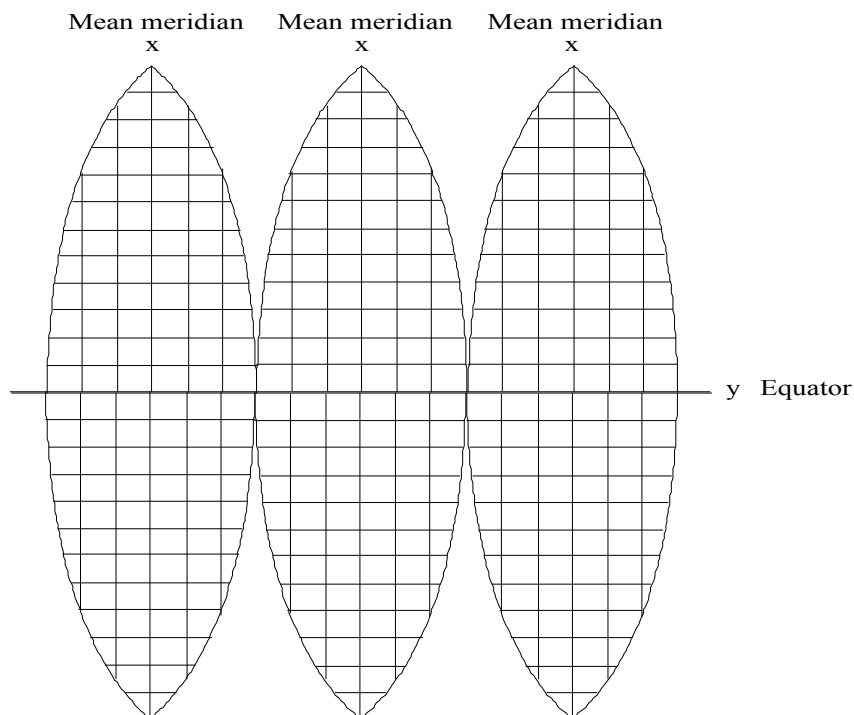
Coordinate Systems

The measured field strength values can be displayed in a variety of coordinate systems, depending on the needs of the user. Digitized data on the location coordinates can be obtained with a GPS system or with a digitizer, which is moved over an appropriate land map.

Gauß Coordinate Systems

The mathematical principles for this type of coordinate system were developed by Gauß, and its adaptation for practical application was completed by Krüger. This projection can be seen more or less as a cylindrical projection on a quadrature axis, where a cylinder is rotated over the earth ellipsoid at right angles to the rotational axis of the ellipsoid. The surface of the earth is then translated through a central projection to the inside of the cylinder. The position of the cylinder is chosen in such a manner that a tangential meridian forms a distortion-free straight line. The equator, perpendicular to the meridian, also forms a straight line. As distance from the tangential meridian increases, there is some distortion. This is also noticeable in the representation of the earth's surface to the east and to the west of the tangential meridian.

To keep the distortion as low as possible, the projection is limited to a strip 1.5° to the side of the tangential meridian (for this reason also referred to as the mean or main meridian). A ellipse is thus created on the surface of the cylinder, the extremities of which are the poles. The entire surface of the earth is divided into 60 meridian strips, which, by "opening up" the cylinder, can be represented as follows:



The Gauß-Krüger System

With the Gauß quadrature axis projection the surface of the earth can be represented on one level in meridian strips. The mean meridian is represented by the y-axis (abscissa) and the equator by the x-axis (ordinate). Both axes are perpendicular to each other. The result is a rectangular coordinate system in each meridian strip (cf. diagram above). The abscissa to the north of the equator are vertical values, the ordinates to the east of the mean meridian are horizontal values.

To avoid negative values for the ordinates, every main meridian is given the value of 500000 meters. As a means of identification, this is prefaced by its degree of longitude divided by three.

To reduce to acceptable values the distortions occurring as distance from the tangential meridian increases, strip systems were introduced in Germany which assume the degrees of longitude (meridians) at 6°, 9°, 12°, etc. to be main meridians true to longitude and represent them as abscissa axes. Every partial system has an extension of 1.5 degrees of longitude in both directions (approx. 100 km).

A point which is 30500 m to the west of the mean meridian at 6° is assigned the horizontal value $500000 \text{ m} - 30500 \text{ m} = 469500 \text{ m}$.

The UTM System

The Universal Transversal Mercator projection (UTM) is a transversal cylindrical projection used mainly for NATO and USA military maps. The UTM system covers the earth between 80° north and south with 60 meridian systems (zones). The main meridians of each zone lying at 3°, 9°, 15°, etc. are numbered from west to east, beginning with the mean meridian at 177° west. In each zone intervals of approx. 8° are selected and marked with capital letters, beginning at 80° south. All of the fields produced in this way are then divided by grids with round 100 km values in the x and y directions from the mean meridian to form squares with a width of 100 km. These squares are marked with two letters according to their row and column position. Coordinates are then used to determine an exact position within one of the squares. The coordinates are marked E (east, corresponding to y or the horizontal value) and N (north, corresponding to x or the vertical value). The resulting structure is a universal grid.

The Coordinate System of the East European States

For average-scale maps the East European states use Gauß-Krüger meridian systems with a longitudinal extension of 6° and a mean meridian true to longitude on the basis of Krassovskij earth ellipsoid. For maps with scales of 1:5000 and more, strips of 3° are used.

The Geographical Grid

In the geographical grid positional information is given by measuring the degrees of longitude and latitude in degrees, minutes and seconds.

The Decimal Grid

In the decimal grid positional information is given by measuring the degrees of longitude and latitude in decimal figures.

GSM Channels and Power Classes

Table 8-2 Frequency ranges

Band	Subband	Uplink [MHz]	Downlink [MHz]
GSM400	GSM450	450.4 to 457.4	460.4 to 467.4
	GSM480	478.8 to 486.0	488.8 to 496.0
GSM700	GSM 750	747 to 762	777 to 792
GSM900	P-GSM900 (primary GSM)	890 to 915	935 to 960
	E-GSM (extended GSM)	880 to 890	925 to 935
	R-GSM (Railways GSM)	876 to 880	921 to 925
GSM1800	GSM1800	1710 to 1785	1805 to 1880
GSM850	GSM850	824 to 849	869 to 894
GSM1900	GSM1900	1850 to 1910	1930 to 1990

Table 8-3 Channel numbers (ARFCN)

(Sub)band	Uplink [MHz]	Downlink [MHz]	n Range
GSM450	$450.6 + 0.2 * (n - 259)$	$460.6 + 0.2 * (n - 259)$	$259 \leq n \leq 293$
GSM480	$479.0 + 0.2 * (n - 306)$	$489.0 + 0.2 * (n - 306)$	$306 \leq n \leq 340$
GSM 750	$747.2 + 0.2 * (n - 438)$	$777.2 + 0.2 * (n - 438)$	$438 \leq n \leq 511$
P-GSM900	$890 + 0.2 * n$	$935 + 0.2 * n$	$1 \leq n \leq 124$
E-GSM900	$880.2 + 0.2 * (n - 975)$	$925.2 + 0.2 * (n - 975)$	$975 \leq n \leq 1023$
R-GSM900	$876.2 + 0.2 * (n - 955)$	$921.2 + 0.2 * (n - 955)$	$955 \leq n \leq 974$
GSM1800	$1710.2 + 0.2 * (n - 512)$	$1805.2 + 0.2 * (n - 512)$	$512 \leq n \leq 885$
GSM850	$824.2 + 0.2 * (n - 128)$	$869.2 + 0.2 * (n - 128)$	$128 \leq n \leq 251$
GSM1900	$1850.2 + 0.2 * (n - 512)$	$1930.2 + 0.2 * (n - 512)$	$512 \leq n \leq 810$

n: Channel number (ARFCN)

Table 8-4 Downlink channels in P-GSM900 (primary GSM)

Channel	f [MHz]	Channel	f [MHz]	Channel	f [MHz]	Channel	f [MHz]
1	935.2	41	943.2	81	951.2	121	959.2
2	935.4	42	943.4	82	951.4	122	959.4
3	935.6	43	943.6	83	951.6	123	959.6
4	935.8	44	943.8	84	951.8	124	959.8
5	936	45	944	85	952		
6	936.2	46	944.2	86	952.2		
7	936.4	47	944.4	87	952.4		
8	936.6	48	944.6	88	952.6		
9	936.8	49	944.8	89	952.8		
10	937	50	945	90	953		
11	937.2	51	945.2	91	953.2		
12	937.4	52	945.4	92	953.4		
13	937.6	53	945.6	93	953.6		
14	937.8	54	945.8	94	953.8		
15	938	55	946	95	954		
16	938.2	56	946.2	96	954.2		
17	938.4	57	946.4	97	954.4		
18	938.6	58	946.6	98	954.6		
19	938.8	59	946.8	99	954.8		
20	939	60	947	100	955		
21	939.2	61	947.2	101	955.2		
22	939.4	62	947.4	102	955.4		
23	939.6	63	947.6	103	955.6		
24	939.8	64	947.8	104	955.8		
25	940	65	948	105	956		
26	940.2	66	948.2	106	956.2		
27	940.4	67	948.4	107	956.4		
28	940.6	68	948.6	108	956.6		
29	940.8	69	948.8	109	956.8		
30	941	70	949	110	957		
31	941.2	71	949.2	111	957.2		
32	941.4	72	949.4	112	957.4		
33	941.6	73	949.6	113	957.6		
34	941.8	74	949.8	114	957.8		
35	942	75	950	115	958		
36	942.2	76	950.2	116	958.2		
37	942.4	77	950.4	117	958.4		
38	942.6	78	950.6	118	958.6		
39	942.8	79	950.8	119	958.8		
40	943	80	951	120	959		

Table 8-5 Downlink channels in GSM900: E-GSM and R-GSM

R-GSM Channel	f [MHz]	E-GSM Channel	f [MHz]	E-GSM Channel	f [MHz]
955	921.2	975	925.2	1000	930.2
956	921.4	976	925.4	1001	930.4
957	921.6	977	925.6	1002	930.6
958	921.8	978	925.8	1003	930.8
959	922	979	926	1004	931
960	922.2	980	926.2	1005	931.2
961	922.4	981	926.4	1006	931.4
962	922.6	982	926.6	1007	931.6
963	922.8	983	926.8	1008	931.8
964	923	984	927	1009	932
965	923.2	985	927.2	1010	932.2
966	923.4	986	927.4	1011	932.4
967	923.6	987	927.6	1012	932.6
968	923.8	988	927.8	1013	932.8
969	924	989	928	1014	933
970	924.2	990	928.2	1015	933.2
971	924.4	991	928.4	1016	933.4
972	924.6	992	928.6	1017	933.6
973	924.8	993	928.8	1018	933.8
974	925	994	929	1019	934
		995	929.2	1020	934.2
		996	929.4	1021	934.4
		997	929.6	1022	934.6
		998	929.8	1023	934.8
		999	930		

Table 8-6 Downlink channels in GSM1800

Channel	f [MHz]	Channel	f [MHz]	Channel	f [MHz]	Channel	f [MHz]
512	1805.2	551	1813	591	1821	631	1829
513	1805.4	552	1813.2	592	1821.2	632	1829.2
514	1805.6	553	1813.4	593	1821.4	633	1829.4
515	1805.8	554	1813.6	594	1821.6	634	1829.6
516	1806	555	1813.8	595	1821.8	635	1829.8
517	1806.2	556	1814	596	1822	636	1830
518	1806.4	557	1814.2	597	1822.2	637	1830.2
519	1806.6	558	1814.4	598	1822.4	638	1830.4
520	1806.8	559	1814.6	599	1822.6	639	1830.6
521	1807	560	1814.8	600	1822.8	640	1830.8
522	1807.2	561	1815	601	1823	641	1831
523	1807.4	562	1815.2	602	1823.2	642	1831.2
524	1807.6	563	1815.4	603	1823.4	643	1831.4
525	1807.8	564	1815.6	604	1823.6	644	1831.6
526	1808	565	1815.8	605	1823.8	645	1831.8
527	1808.2	566	1816	606	1824	646	1832
528	1808.4	567	1816.2	607	1824.2	647	1832.2
529	1808.6	568	1816.4	608	1824.4	648	1832.4
530	1808.8	569	1816.6	609	1824.6	649	1832.6
531	1809	570	1816.8	610	1824.8	650	1832.8
532	1809.2	571	1817	611	1825	651	1833
533	1809.4	572	1817.2	612	1825.2	652	1833.2
534	1809.6	573	1817.4	613	1825.4	653	1833.4
535	1809.8	574	1817.6	614	1825.6	654	1833.6
536	1810	575	1817.8	615	1825.8	655	1833.8
537	1810.2	576	1818	616	1826	656	1834
538	1810.4	577	1818.2	617	1826.2	657	1834.2
539	1810.6	578	1818.4	618	1826.4	658	1834.4
540	1810.8	579	1818.6	619	1826.6	659	1834.6
541	1811	580	1818.8	620	1826.8	660	1834.8
542	1811.2	581	1819	621	1827	661	1835
543	1811.4	582	1819.2	622	1827.2	662	1835.2
544	1811.6	583	1819.4	623	1827.4	663	1835.4
545	1811.8	584	1819.6	624	1827.6	664	1835.6
546	1812	585	1819.8	625	1827.8	665	1835.8
547	1812.2	586	1820	626	1828	666	1836
548	1812.4	587	1820.2	627	1828.2	667	1836.2
549	1812.6	588	1820.4	628	1828.4	668	1836.4
550	1812.8	589	1820.6	629	1828.6	669	1836.6
		590	1820.8	630	1828.8	670	1836.8

Channel	f [MHz]	Channel	f [MHz]	Channel	f [MHz]	Channel	f [MHz]	Channel	f [MHz]	Channel	f [MHz]
671	1837	711	1845	751	1853	791	1861	831	1869	871	1877
672	1837.2	712	1845.2	752	1853.2	792	1861.2	832	1869.2	872	1877.2
673	1837.4	713	1845.4	753	1853.4	793	1861.4	833	1869.4	873	1877.4
674	1837.6	714	1845.6	754	1853.6	794	1861.6	834	1869.6	874	1877.6
675	1837.8	715	1845.8	755	1853.8	795	1861.8	835	1869.8	875	1877.8
676	1838	716	1846	756	1854	796	1862	836	1870	876	1878
677	1838.2	717	1846.2	757	1854.2	797	1862.2	837	1870.2	877	1878.2
678	1838.4	718	1846.4	758	1854.4	798	1862.4	838	1870.4	878	1878.4
679	1838.6	719	1846.6	759	1854.6	799	1862.6	839	1870.6	879	1878.6
680	1838.8	720	1846.8	760	1854.8	800	1862.8	840	1870.8	880	1878.8
681	1839	721	1847	761	1855	801	1863	841	1871	881	1879
682	1839.2	722	1847.2	762	1855.2	802	1863.2	842	1871.2	882	1879.2
683	1839.4	723	1847.4	763	1855.4	803	1863.4	843	1871.4	883	1879.4
684	1839.6	724	1847.6	764	1855.6	804	1863.6	844	1871.6	884	1879.6
685	1839.8	725	1847.8	765	1855.8	805	1863.8	845	1871.8	885	1879.8
686	1840	726	1848	766	1856	806	1864	846	1872		
687	1840.2	727	1848.2	767	1856.2	807	1864.2	847	1872.2		
688	1840.4	728	1848.4	768	1856.4	808	1864.4	848	1872.4		
689	1840.6	729	1848.6	769	1856.6	809	1864.6	849	1872.6		
690	1840.8	730	1848.8	770	1856.8	810	1864.8	850	1872.8		
691	1841	731	1849	771	1857	811	1865	851	1873		
692	1841.2	732	1849.2	772	1857.2	812	1865.2	852	1873.2		
693	1841.4	733	1849.4	773	1857.4	813	1865.4	853	1873.4		
694	1841.6	734	1849.6	774	1857.6	814	1865.6	854	1873.6		
695	1841.8	735	1849.8	775	1857.8	815	1865.8	855	1873.8		
696	1842	736	1850	776	1858	816	1866	856	1874		
697	1842.2	737	1850.2	777	1858.2	817	1866.2	857	1874.2		
698	1842.4	738	1850.4	778	1858.4	818	1866.4	858	1874.4		
699	1842.6	739	1850.6	779	1858.6	819	1866.6	859	1874.6		
700	1842.8	740	1850.8	780	1858.8	820	1866.8	860	1874.8		
701	1843	741	1851	781	1859	821	1867	861	1875		
702	1843.2	742	1851.2	782	1859.2	822	1867.2	862	1875.2		
703	1843.4	743	1851.4	783	1859.4	823	1867.4	863	1875.4		
704	1843.6	744	1851.6	784	1859.6	824	1867.6	864	1875.6		
705	1843.8	745	1851.8	785	1859.8	825	1867.8	865	1875.8		
706	1844	746	1852	786	1860	826	1868	866	1876		
707	1844.2	747	1852.2	787	1860.2	827	1868.2	867	1876.2		
708	1844.4	748	1852.4	788	1860.4	828	1868.4	868	1876.4		
709	1844.6	749	1852.6	789	1860.6	829	1868.6	869	1876.6		
710	1844.8	750	1852.8	790	1860.8	830	1868.8	870	1876.8		

Table 8-7 Downlink channels in GSM850

Channel	f [MHz]	Channel	f [MHz]	Channel	f [MHz]	Channel	f [MHz]
		167	877	207	885	247	893
128	869.2	168	877.2	208	885.2	248	893.2
129	869.4	169	877.4	209	885.4	249	893.4
130	869.6	170	877.6	210	885.6	250	893.6
131	869.8	171	877.8	211	885.8	251	893.8
132	870	172	878	212	886		
133	870.2	173	878.2	213	886.2		
134	870.4	174	878.4	214	886.4		
135	870.6	175	878.6	215	886.6		
136	870.8	176	878.8	216	886.8		
137	871	177	879	217	887		
138	871.2	178	879.2	218	887.2		
139	871.4	179	879.4	219	887.4		
140	871.6	180	879.6	220	887.6		
141	871.8	181	879.8	221	887.8		
142	872	182	880	222	888		
143	872.2	183	880.2	223	888.2		
144	872.4	184	880.4	224	888.4		
145	872.6	185	880.6	225	888.6		
146	872.8	186	880.8	226	888.8		
147	873	187	881	227	889		
148	873.2	188	881.2	228	889.2		
149	873.4	189	881.4	229	889.4		
150	873.6	190	881.6	230	889.6		
151	873.8	191	881.8	231	889.8		
152	874	192	882	232	890		
153	874.2	193	882.2	233	890.2		
154	874.4	194	882.4	234	890.4		
155	874.6	195	882.6	235	890.6		
156	874.8	196	882.8	236	890.8		
157	875	197	883	237	891		
158	875.2	198	883.2	238	891.2		
159	875.4	199	883.4	239	891.4		
160	875.6	200	883.6	240	891.6		
161	875.8	201	883.8	241	891.8		
162	876	202	884	242	892		
163	876.2	203	884.2	243	892.2		
164	876.4	204	884.4	244	892.4		
165	876.6	205	884.6	245	892.6		
166	876.8	206	884.8	246	892.8		

Table 8-8 Downlink channels in GSM1900

Channel	f [MHz]	Channel	f [MHz]	Channel	f [MHz]	Channel	f [MHz]	Channel	f [MHz]
		551	1938			591	1946		
512	1930.2	552	1938.2	592	1946.2	631	1954	671	1962
513	1930.4	553	1938.4	593	1946.4	632	1954.2	672	1962.2
514	1930.6	554	1938.6	594	1946.6	633	1954.4	673	1962.4
515	1930.8	555	1938.8	595	1946.8	634	1954.6	674	1962.6
516	1931	556	1939	596	1947	635	1954.8	675	1962.8
517	1931.2	557	1939.2	597	1947.2	636	1955	676	1963
518	1931.4	558	1939.4	598	1947.4	637	1955.2	677	1963.2
519	1931.6	559	1939.6	599	1947.6	638	1955.4	678	1963.4
520	1931.8	560	1939.8	600	1947.8	639	1955.6	679	1963.6
521	1932	561	1940	601	1948	640	1955.8	680	1963.8
522	1932.2	562	1940.2	602	1948.2	641	1956	681	1964
523	1932.4	563	1940.4	603	1948.4	642	1956.2	682	1964.2
524	1932.6	564	1940.6	604	1948.6	643	1956.4	683	1964.4
525	1932.8	565	1940.8	605	1948.8	644	1956.6	684	1964.6
526	1933	566	1941	606	1949	645	1956.8	685	1964.8
527	1933.2	567	1941.2	607	1949.2	646	1957	686	1965
528	1933.4	568	1941.4	608	1949.4	647	1957.2	687	1965.2
529	1933.6	569	1941.6	609	1949.6	648	1957.4	688	1965.4
530	1933.8	570	1941.8	610	1949.8	649	1957.6	689	1965.6
531	1934	571	1942	611	1950	650	1957.8	690	1965.8
532	1934.2	572	1942.2	612	1950.2	651	1958	691	1966
533	1934.4	573	1942.4	613	1950.4	652	1958.2	692	1966.2
534	1934.6	574	1942.6	614	1950.6	653	1958.4	693	1966.4
535	1934.8	575	1942.8	615	1950.8	654	1958.6	694	1966.6
536	1935	576	1943	616	1951	655	1958.8	695	1966.8
537	1935.2	577	1943.2	617	1951.2	656	1959	696	1967
538	1935.4	578	1943.4	618	1951.4	657	1959.2	697	1967.2
539	1935.6	579	1943.6	619	1951.6	658	1959.4	698	1967.4
540	1935.8	580	1943.8	620	1951.8	659	1959.6	699	1967.6
541	1936	581	1944	621	1952	660	1959.8	700	1967.8
542	1936.2	582	1944.2	622	1952.2	661	1960	701	1968
543	1936.4	583	1944.4	623	1952.4	662	1960.2	702	1968.2
544	1936.6	584	1944.6	624	1952.6	663	1960.4	703	1968.4
545	1936.8	585	1944.8	625	1952.8	664	1960.6	704	1968.6
546	1937	586	1945	626	1953	665	1960.8	705	1968.8
547	1937.2	587	1945.2	627	1953.2	666	1961	706	1969
548	1937.4	588	1945.4	628	1953.4	667	1961.2	707	1969.2
549	1937.6	589	1945.6	629	1953.6	668	1961.4	708	1969.4
550	1937.8	590	1945.8	630	1953.8	669	1961.6	709	1969.6
						670	1961.8	710	1969.8

Channel	f [MHz]	Kanal	f [MHz]	Kanal	f [MHz]
711	1970	751	1978	791	1986
712	1970.2	752	1978.2	792	1986.2
713	1970.4	753	1978.4	793	1986.4
714	1970.6	754	1978.6	794	1986.6
715	1970.8	755	1978.8	795	1986.8
716	1971	756	1979	796	1987
717	1971.2	757	1979.2	797	1987.2
718	1971.4	758	1979.4	798	1987.4
719	1971.6	759	1979.6	799	1987.6
720	1971.8	760	1979.8	800	1987.8
721	1972	761	1980	801	1988
722	1972.2	762	1980.2	802	1988.2
723	1972.4	763	1980.4	803	1988.4
724	1972.6	764	1980.6	804	1988.6
725	1972.8	765	1980.8	805	1988.8
726	1973	766	1981	806	1989
727	1973.2	767	1981.2	807	1989.2
728	1973.4	768	1981.4	808	1989.4
729	1973.6	769	1981.6	809	1989.6
730	1973.8	770	1981.8	810	1989.8
731	1974	771	1982		
732	1974.2	772	1982.2		
733	1974.4	773	1982.4		
734	1974.6	774	1982.6		
735	1974.8	775	1982.8		
736	1975	776	1983		
737	1975.2	777	1983.2		
738	1975.4	778	1983.4		
739	1975.6	779	1983.6		
740	1975.8	780	1983.8		
741	1976	781	1984		
742	1976.2	782	1984.2		
743	1976.4	783	1984.4		
744	1976.6	784	1984.6		
745	1976.8	785	1984.8		
746	1977	786	1985		
747	1977.2	787	1985.2		
748	1977.4	788	1985.4		
749	1977.6	789	1985.6		
750	1977.8	790	1985.8		

Table 8-9 GSM power classes and output powers

	GSM900		1800/1900	
TxPower Level (PCL)	Nominal output power / dBm	Power Class/ Max. output power	Nominal output power / dBm	Power Class/ Max. output power
0	43	1 / 20 W	30	1 / 1 W
1	41		28	
2	39	2 / 8 W	26	
3	37	3 / 5 W	24	2 / 0.25 W
4	35		22	
5	33	4 / 2 W	20	
6	31		18	
7	29	5 / 0.8 W	16	
8	27		14	
9	25		12	
10	23		10	
11	21		8	
12	19		6	
13	17		4	
14	15		-	
15	13		-	
16	11		-	
17	9		-	
18	7		-	
19	5		-	

GSM Phase 1: $0 \leq \text{TxPower} \leq 15$

GSM Phase 2 (since 1996): $0 \leq \text{TxPower} \leq 19$

Table 8-10 Definition of RX Level and RX Quality

Value of RX Level	Corresponding signal strength
63	> -48 dBm
62	-49 dBm to -48 dBm
62	-50 dBm to -49 dBm
...	...
...	...
2	-109 dBm to -108 dBm
1	-110 dBm to -109 dBm
0	< -110 dBm

Value of RX Quality	Corresponding bit error rate
0	0% to 0.2%
1	0.2% to 0.4%
2	0.4% to 0.8%
3	0.8% to 1.6%
4	1.6% to 3.2%
5	3.2% to 6.4%
6	6.4% to 12.8%
7	12.8% to 100%

UMTS Channels

The assignment between UMTS UARFCNs (UTRA Absolute Radio Frequency Channel Numbers) N , carrier frequency F , and frequency offset F_{offset} is defined in the 3GPP specification (TS 21.141). The following relation holds for both directions of transmission (uplink and downlink) and all operating bands (I to IX):

$$N = 5 \cdot (F / \text{MHz} - F_{offset}), \quad 0.0 \text{ MHz} \leq F \leq 3276.6 \text{ MHz}$$

The downlink and uplink channels assigned in the operating bands I to IX are listed in the tables below. Note that in operating bands II, IV and VI additional center frequencies are specified. These additional channels are outside of the normal 200 kHz raster and are calculated with different offsets according to the formula above, they must be specified with their channel frequency.

Table 8-11 UTRA operating bands and channel numbers: Downlink

Operating Band	DL Frequency Band (MHz)	DL Frequency Offset (MHz)	Assigned Channels (UARFCNs)	Assigned Center Frequencies (MHz)
I	2110 to 2170	0.0	10562 to 10838	2112.4 to 2167.6
II	1930 to 1990	0.0 1850.1	9662 to 9938, Additional channels: 412, 437, 462, 487, 512, 537, 562, 587, 612, 637, 662, 687	1932.4 to 1987.6, 1932.5, 1937.5, 1942.5, 1947.5, 1952.5, 1957.5, 1962.5, 1967.5, 1972.5, 1977.5, 1982.5, 1987.5
III	1805 to 1880	1575.0	1162 to 1513	1807.4 to 1877.6
IV	2110 to 2155	1805.0 1735.1	1537 to 1738, Additional channels: 1887, 1912, 1937, 1962, 1987, 2012, 2037, 2062, 2087	2112.4 to 2152.6, 2112.5, 2117.5, 2122.5, 2127.5, 2132.5, 2137.5, 2142.5, 2147.5, 2152.5
V	869 to 894	0.0 670.1	4357 to 4458, Additional channels: 1007, 1012, 1032, 1037, 1062, 1087	871.4 to 891.6, 871.5, 872.5, 876.5, 877.5, 882.5, 887.5
VI	875 to 885	0.0 670.1	4387 to 4413, Additional channels: 1037, 1062	877.4 to 882.6, 877.5, 882.5
VII	2620 to 2690	2175 2105.1	2237 to 2563 Additional channels: 2587, 2612, 2637, 2662, 2687, 2712, 2737, 2762, 2787, 2812, 2837, 2862, 2887, 2912	2622.4 to 2687.6, 2622.5, 2627.5, 2632.5, 2637.5, 2642.5, 2647.5, 2652.5, 2657.5, 2662.5, 2667.5, 2672.5, 2677.5, 2682.5, 2687.5
VIII	925 to 960	340	2937 to 3088	927.4 to 957.6
IX	1844.9 to 1879.9	0.0	9237 to 9387	1847.4 to 1877.4
Free (10 kHz resolution) ¹	80 to 3000	–	–	–

¹ freely configurable measurement with TSMU

Table 8-12 UTRA operating bands and channel numbers: Uplink

Operating Band	UL Frequency Band (MHz)	UL Frequency Offset (MHz)	Assigned Channels (UARFCNs)	Assigned Center Frequencies (MHz)
I	1920 to 1980	0.0	9612 to 9888	1922.4 MHz to 1977.6 MHz
II	1850 to 1910	0.0 1850.1	9262 to 9538, Additional channels: 12, 37, 62, 87, 112, 137, 162, 187, 212, 237, 262, 287	1852.4 MHz to 1907.6 MHz, 1852.5, 1857.5, 1862.5, 1867.5, 1872.5, 1877.5, 1882.5, 1887.5, 1892.5, 1897.5, 1902.5, 1907.5
III	1710 to 1785	1525.0	937 to 1287	1712.4 MHz to 1782.6 MHz
IV	1710 to 1755	1450.0 1380.1	1312 to 1513, Additional channels: 1662, 11687, 1712, 1737, 1762, 1787, 1812, 1837, 1862	1712.4 MHz to 1752.6 MHz, 1712.5, 1717.5, 1722.5, 1727.5, 1732.5, 1737.5, 1742.5, 1747.5, 1752.5
V	824 to 849	0.0 670.1	4132 to 4233, Additional channels: 782, 787, 807, 812, 837, 862	826.4 MHz to 846.6 MHz, 826.5, 827.5, 831.5, 832.5, 1 827.5, 842.5
VI	830 to 840	0.0 670.1	4162 to 4188, Additional channels: 812, 837	832.4 MHz to 837.6 MHz, 832.5, 837.5
VII	2500 to 2570	2100.0 2030.1	2012 to 2338 Additional channels: 2362, 2387, 2412, 2437, 2462, 2487, 2512, 2537, 2562, 2587, 2612, 2637, 2662, 2687	2502.4 MHz to 2567.6 MHz 2502.5, 2507.5, 2512.5, 2517.5, 2522.5, 2527.5, 2532.5, 2537.5, 2542.5, 2547.5, 2552.5, 2557.5, 2562.5, 2567.5
VIII	880 to 915	340	4412 to 4563	882.4 MHz to 912.6 MHz
IX	1749.9 to 1784.9	0.0	8762 to 8912	1752.4 MHz to 1782.4 MHz
Free (10 kHz resolution) ²	80 to 3000	–	–	–

² freely configurable measurement with TSMU

Table 8-13 Downlink channels in UMTS operating band I

Channel	f [MHz]	Channel	f [MHz]	Channel	f [MHz]	Channel	f [MHz]	Channel	f [MHz]
10562	2112,4	10622	2124,4	10682	2136,4	10742	2148,4	10802	2160,4
10563	2112,6	10623	2124,6	10683	2136,6	10743	2148,6	10782	2156,4
10564	2112,8	10624	2124,8	10684	2136,8	10744	2148,8	10783	2156,6
10565	2113	10625	2125	10685	2137	10745	2149	10784	2156,8
10566	2113,2	10626	2125,2	10686	2137,2	10746	2149,2	10785	2157
10567	2113,4	10627	2125,4	10687	2137,4	10747	2149,4	10786	2157,2
10568	2113,6	10628	2125,6	10688	2137,6	10748	2149,6	10787	2157,4
10569	2113,8	10629	2125,8	10689	2137,8	10749	2149,8	10788	2157,6
10570	2114	10630	2126	10690	2138	10750	2150	10789	2157,8
10571	2114,2	10631	2126,2	10691	2138,2	10751	2150,2	10790	2158
10572	2114,4	10632	2126,4	10692	2138,4	10752	2150,4	10791	2158,2
10573	2114,6	10633	2126,6	10693	2138,6	10753	2150,6	10792	2158,4
10574	2114,8	10634	2126,8	10694	2138,8	10754	2150,8	10793	2158,6
10575	2115	10635	2127	10695	2139	10755	2151	10794	2158,8
10576	2115,2	10636	2127,2	10696	2139,2	10756	2151,2	10795	2159
10577	2115,4	10637	2127,4	10697	2139,4	10757	2151,4	10796	2159,2
10578	2115,6	10638	2127,6	10698	2139,6	10758	2151,6	10797	2159,4
10579	2115,8	10639	2127,8	10699	2139,8	10759	2151,8	10798	2159,6
10580	2116	10640	2128	10700	2140	10760	2152	10799	2159,8
10581	2116,2	10641	2128,2	10701	2140,2	10761	2152,2	10800	2160
10582	2116,4	10642	2128,4	10702	2140,4	10762	2152,4	10801	2160,2
10583	2116,6	10643	2128,6	10703	2140,6	10763	2152,6	10802	2160,4
10584	2116,8	10644	2128,8	10704	2140,8	10764	2152,8	10803	2160,6
10585	2117	10645	2129	10705	2141	10765	2153	10804	2160,8
10586	2117,2	10646	2129,2	10706	2141,2	10766	2153,2	10805	2161
10587	2117,4	10647	2129,4	10707	2141,4	10767	2153,4	10806	2161,2
10588	2117,6	10648	2129,6	10708	2141,6	10768	2153,6	10807	2161,4
10589	2117,8	10649	2129,8	10709	2141,8	10769	2153,8	10808	2161,6
10590	2118	10650	2130	10710	2142	10770	2154	10809	2161,8
10591	2118,2	10651	2130,2	10711	2142,2	10771	2154,2	10810	2162
10592	2118,4	10652	2130,4	10712	2142,4	10772	2154,4	10811	2162,2
10593	2118,6	10653	2130,6	10713	2142,6	10773	2154,6	10812	2162,4
10594	2118,8	10654	2130,8	10714	2142,8	10774	2154,8	10813	2162,6
10595	2119	10655	2131	10715	2143	10775	2155	10814	2162,8
10596	2119,2	10656	2131,2	10716	2143,2	10776	2155,2	10815	2163
10597	2119,4	10657	2131,4	10717	2143,4	10777	2155,4	10816	2163,2
10598	2119,6	10658	2131,6	10718	2143,6	10778	2155,6	10817	2163,4
10599	2119,8	10659	2131,8	10719	2143,8	10779	2155,8	10818	2163,6
10600	2120	10660	2132	10720	2144	10780	2156	10819	2163,8
10601	2120,2	10661	2132,2	10721	2144,2	10781	2156,2	10820	2164
10602	2120,4	10662	2132,4	10722	2144,4	10782	2156,4	10821	2164,2
10603	2120,6	10663	2132,6	10723	2144,6	10783	2156,6	10822	2164,4
10604	2120,8	10664	2132,8	10724	2144,8	10784	2156,8	10823	2164,6
10605	2121	10665	2133	10725	2145	10785	2157	10824	2164,8
10606	2121,2	10666	2133,2	10726	2145,2	10786	2157,2	10825	2165
10607	2121,4	10667	2133,4	10727	2145,4	10787	2157,4	10826	2165,2
10608	2121,6	10668	2133,6	10728	2145,6	10788	2157,6	10827	2165,4
10609	2121,8	10669	2133,8	10729	2145,8	10789	2157,8	10828	2165,6
10610	2122	10670	2134	10730	2146	10790	2158	10829	2165,8
10611	2122,2	10671	2134,2	10731	2146,2	10791	2158,2	10830	2166
10612	2122,4	10672	2134,4	10732	2146,4	10792	2158,4	10831	2166,2
10613	2122,6	10673	2134,6	10733	2146,6	10793	2158,6	10832	2166,4
10614	2122,8	10674	2134,8	10734	2146,8	10794	2158,8	10833	2166,6
10615	2123	10675	2135	10735	2147	10795	2159	10834	2166,8
10616	2123,2	10676	2135,2	10736	2147,2	10796	2159,2	10835	2167
10617	2123,4	10677	2135,4	10737	2147,4	10797	2159,4	10836	2167,2
10618	2123,6	10678	2135,6	10738	2147,6	10798	2159,6	10837	2167,4
10619	2123,8	10679	2135,8	10739	2147,8	10799	2159,8	10838	2167,6
10620	2124	10680	2136	10740	2148	10800	2160		
10621	2124,2	10681	2136,2	10741	2148,2	10801	2160,2		

Table 8-14 Downlink channels in UMTS operating band II

Channel	f [MHz]	Channel	f [MHz]	Channel	f [MHz]	Channel	f [MHz]	Channel	f [MHz]
9662	1932.4	9722	1944.4	9782	1956.4	9842	1968.4	9902	1980.4
9663	1932.6	9723	1944.6	9783	1956.6	9843	1968.6	9882	1976.4
9664	1932.8	9724	1944.8	9784	1956.8	9844	1968.8	9883	1976.6
9665	1933	9725	1945	9785	1957	9845	1969	9884	1976.8
9666	1933.2	9726	1945.2	9786	1957.2	9846	1969.2	9885	1977
9667	1933.4	9727	1945.4	9787	1957.4	9847	1969.4	9886	1977.2
9668	1933.6	9728	1945.6	9788	1957.6	9848	1969.6	9887	1977.4
9669	1933.8	9729	1945.8	9789	1957.8	9849	1969.8	9888	1977.6
9670	1934	9730	1946	9790	1958	9850	1970	9889	1977.8
9671	1934.2	9731	1946.2	9791	1958.2	9851	1970.2	9890	1978
9672	1934.4	9732	1946.4	9792	1958.4	9852	1970.4	9891	1978.2
9673	1934.6	9733	1946.6	9793	1958.6	9853	1970.6	9892	1978.4
9674	1934.8	9734	1946.8	9794	1958.8	9854	1970.8	9893	1978.6
9675	1935	9735	1947	9795	1959	9855	1971	9894	1978.8
9676	1935.2	9736	1947.2	9796	1959.2	9856	1971.2	9895	1979
9677	1935.4	9737	1947.4	9797	1959.4	9857	1971.4	9896	1979.2
9678	1935.6	9738	1947.6	9798	1959.6	9858	1971.6	9897	1979.4
9679	1935.8	9739	1947.8	9799	1959.8	9859	1971.8	9898	1979.6
9680	1936	9740	1948	9800	1960	9860	1972	9899	1979.8
9681	1936.2	9741	1948.2	9801	1960.2	9861	1972.2	9900	1980
9682	1936.4	9742	1948.4	9802	1960.4	9862	1972.4	9901	1980.2
9683	1936.6	9743	1948.6	9803	1960.6	9863	1972.6	9902	1980.4
9684	1936.8	9744	1948.8	9804	1960.8	9864	1972.8	9903	1980.6
9685	1937	9745	1949	9805	1961	9865	1973	9904	1980.8
9686	1937.2	9746	1949.2	9806	1961.2	9866	1973.2	9905	1981
9687	1937.4	9747	1949.4	9807	1961.4	9867	1973.4	9906	1981.2
9688	1937.6	9748	1949.6	9808	1961.6	9868	1973.6	9907	1981.4
9689	1937.8	9749	1949.8	9809	1961.8	9869	1973.8	9908	1981.6
9690	1938	9750	1950	9810	1962	9870	1974	9909	1981.8
9691	1938.2	9751	1950.2	9811	1962.2	9871	1974.2	9910	1982
9692	1938.4	9752	1950.4	9812	1962.4	9872	1974.4	9911	1982.2
9693	1938.6	9753	1950.6	9813	1962.6	9873	1974.6	9912	1982.4
9694	1938.8	9754	1950.8	9814	1962.8	9874	1974.8	9913	1982.6
9695	1939	9755	1951	9815	1963	9875	1975	9914	1982.8
9696	1939.2	9756	1951.2	9816	1963.2	9876	1975.2	9915	1983
9697	1939.4	9757	1951.4	9817	1963.4	9877	1975.4	9916	1983.2
9698	1939.6	9758	1951.6	9818	1963.6	9878	1975.6	9917	1983.4
9699	1939.8	9759	1951.8	9819	1963.8	9879	1975.8	9918	1983.6
9700	1940	9760	1952	9820	1964	9880	1976	9919	1983.8
9701	1940.2	9761	1952.2	9821	1964.2	9881	1976.2	9920	1984
9702	1940.4	9762	1952.4	9822	1964.4	9882	1976.4	9921	1984.2
9703	1940.6	9763	1952.6	9823	1964.6	9883	1976.6	9922	1984.4
9704	1940.8	9764	1952.8	9824	1964.8	9884	1976.8	9923	1984.6
9705	1941	9765	1953	9825	1965	9885	1977	9924	1984.8
9706	1941.2	9766	1953.2	9826	1965.2	9886	1977.2	9925	1985
9707	1941.4	9767	1953.4	9827	1965.4	9887	1977.4	9926	1985.2
9708	1941.6	9768	1953.6	9828	1965.6	9888	1977.6	9927	1985.4
9709	1941.8	9769	1953.8	9829	1965.8	9889	1977.8	9928	1985.6
9710	1942	9770	1954	9830	1966	9890	1978	9929	1985.8
9711	1942.2	9771	1954.2	9831	1966.2	9891	1978.2	9930	1986
9712	1942.4	9772	1954.4	9832	1966.4	9892	1978.4	9931	1986.2
9713	1942.6	9773	1954.6	9833	1966.6	9893	1978.6	9932	1986.4
9714	1942.8	9774	1954.8	9834	1966.8	9894	1978.8	9933	1986.6
9715	1943	9775	1955	9835	1967	9895	1979	9934	1986.8
9716	1943.2	9776	1955.2	9836	1967.2	9896	1979.2	9935	1987
9717	1943.4	9777	1955.4	9837	1967.4	9897	1979.4	9936	1987.2
9718	1943.6	9778	1955.6	9838	1967.6	9898	1979.6	9937	1987.4
9719	1943.8	9779	1955.8	9839	1967.8	9899	1979.8	9938	1987.6
9720	1944	9780	1956	9840	1968	9900	1980		
9721	1944.2	9781	1956.2	9841	1968.2	9901	1980.2		

The 12 additional downlink channels of the 200 MHz raster are listed in [Table 8-11](#) on p. 8.26.

Table 8-15 Downlink channels in UMTS operating band III

Channel	f [MHz]	Channel	f [MHz]	Channel	f [MHz]	Channel	f [MHz]	Channel	f [MHz]	Channel	f [MHz]
1162	1807,4	1231	1821,2	1300	1835	1368	1848,6	1436	1862,2	1475	1870
1163	1807,6	1232	1821,4	1301	1835,2	1369	1848,8	1408	1856,6	1447	1864,4
1164	1807,8	1233	1821,6	1302	1835,4	1370	1849	1409	1856,8	1448	1864,6
1165	1808	1234	1821,8	1303	1835,6	1371	1849,2	1410	1857	1449	1864,8
1166	1808,2	1235	1822	1304	1835,8	1372	1849,4	1411	1857,2	1450	1865
1167	1808,4	1236	1822,2	1305	1836	1373	1849,6	1412	1857,4	1451	1865,2
1168	1808,6	1237	1822,4	1306	1836,2	1374	1849,8	1413	1857,6	1452	1865,4
1169	1808,8	1238	1822,6	1307	1836,4	1375	1850	1414	1857,8	1453	1865,6
1170	1809	1239	1822,8	1308	1836,6	1376	1850,2	1415	1858	1454	1865,8
1171	1809,2	1240	1823	1309	1836,8	1377	1850,4	1416	1858,2	1455	1866
1172	1809,4	1241	1823,2	1310	1837	1378	1850,6	1417	1858,4	1456	1866,2
1173	1809,6	1242	1823,4	1311	1837,2	1379	1850,8	1418	1858,6	1457	1866,4
1174	1809,8	1243	1823,6	1312	1837,4	1380	1851	1419	1858,8	1458	1866,6
1175	1810	1244	1823,8	1313	1837,6	1381	1851,2	1420	1859	1459	1866,8
1176	1810,2	1245	1824	1314	1837,8	1382	1851,4	1421	1859,2	1460	1867
1177	1810,4	1246	1824,2	1315	1838	1383	1851,6	1422	1859,4	1461	1867,2
1178	1810,6	1247	1824,4	1316	1838,2	1384	1851,8	1423	1859,6	1462	1867,4
1179	1810,8	1248	1824,6	1317	1838,4	1385	1852	1424	1859,8	1463	1867,6
1180	1811	1249	1824,8	1318	1838,6	1386	1852,2	1425	1860	1464	1867,8
1181	1811,2	1250	1825	1319	1838,8	1387	1852,4	1426	1860,2	1465	1868
1182	1811,4	1251	1825,2	1320	1839	1388	1852,6	1427	1860,4	1466	1868,2
1183	1811,6	1252	1825,4	1321	1839,2	1389	1852,8	1428	1860,6	1467	1868,4
1184	1811,8	1253	1825,6	1322	1839,4	1390	1853	1429	1860,8	1468	1868,6
1185	1812	1254	1825,8	1323	1839,6	1391	1853,2	1430	1861	1469	1868,8
1186	1812,2	1255	1826	1324	1839,8	1392	1853,4	1431	1861,2	1470	1869
1187	1812,4	1256	1826,2	1325	1840	1393	1853,6	1432	1861,4	1471	1869,2
1188	1812,6	1257	1826,4	1326	1840,2	1394	1853,8	1433	1861,6	1472	1869,4
1189	1812,8	1258	1826,6	1327	1840,4	1395	1854	1434	1861,8	1473	1869,6
1190	1813	1259	1826,8	1328	1840,6	1396	1854,2	1435	1862	1474	1869,8
1191	1813,2	1260	1827	1329	1840,8	1397	1854,4	1436	1862,2	1475	1870
1192	1813,4	1261	1827,2	1330	1841	1398	1854,6	1437	1862,4	1476	1870,2
1193	1813,6	1262	1827,4	1331	1841,2	1399	1854,8	1438	1862,6	1477	1870,4
1194	1813,8	1263	1827,6	1332	1841,4	1400	1855	1439	1862,8	1478	1870,6
1195	1814	1264	1827,8	1333	1841,6	1401	1855,2	1440	1863	1479	1870,8
1196	1814,2	1265	1828	1334	1841,8	1402	1855,4	1441	1863,2	1480	1871
1197	1814,4	1266	1828,2	1335	1842	1403	1855,6	1442	1863,4	1481	1871,2
1198	1814,6	1267	1828,4	1336	1842,2	1404	1855,8	1443	1863,6	1482	1871,4
1199	1814,8	1268	1828,6	1337	1842,4	1405	1856	1444	1863,8	1483	1871,6
1200	1815	1269	1828,8	1338	1842,6	1406	1856,2	1445	1864	1484	1871,8
1201	1815,2	1270	1829	1339	1842,8	1407	1856,4	1446	1864,2	1485	1872
1202	1815,4	1271	1829,2	1340	1843	1408	1856,6	1447	1864,4	1486	1872,2
1203	1815,6	1272	1829,4	1341	1843,2	1409	1856,8	1448	1864,6	1487	1872,4
1204	1815,8	1273	1829,6	1342	1843,4	1410	1857	1449	1864,8	1488	1872,6
1205	1816	1274	1829,8	1343	1843,6	1411	1857,2	1450	1865	1489	1872,8
1206	1816,2	1275	1830	1344	1843,8	1412	1857,4	1451	1865,2	1490	1873
1207	1816,4	1276	1830,2	1345	1844	1413	1857,6	1452	1865,4	1491	1873,2
1208	1816,6	1277	1830,4	1346	1844,2	1414	1857,8	1453	1865,6	1492	1873,4
1209	1816,8	1278	1830,6	1347	1844,4	1415	1858	1454	1865,8	1493	1873,6
1210	1817	1279	1830,8	1348	1844,6	1416	1858,2	1455	1866	1494	1873,8
1211	1817,2	1280	1831	1349	1844,8	1417	1858,4	1456	1866,2	1495	1874
1212	1817,4	1281	1831,2	1350	1845	1418	1858,6	1457	1866,4	1496	1874,2
1213	1817,6	1282	1831,4	1351	1845,2	1419	1858,8	1458	1866,6	1497	1874,4
1214	1817,8	1283	1831,6	1352	1845,4	1420	1859	1459	1866,8	1498	1874,6
1215	1818	1284	1831,8	1353	1845,6	1421	1859,2	1460	1867	1499	1874,8
1216	1818,2	1285	1832	1354	1845,8	1422	1859,4	1461	1867,2	1500	1875
1217	1818,4	1286	1832,2	1355	1846	1423	1859,6	1462	1867,4	1501	1875,2
1218	1818,6	1287	1832,4	1356	1846,2	1424	1859,8	1463	1867,6	1502	1875,4
1219	1818,8	1288	1832,6	1357	1846,4	1425	1860	1464	1867,8	1503	1875,6
1220	1819	1289	1832,8	1358	1846,6	1426	1860,2	1465	1868	1504	1875,8
1221	1819,2	1290	1833	1359	1846,8	1427	1860,4	1466	1868,2	1505	1876
1222	1819,4	1291	1833,2	1360	1847	1428	1860,6	1467	1868,4	1506	1876,2
1223	1819,6	1292	1833,4	1361	1847,2	1429	1860,8	1468	1868,6	1507	1876,4
1224	1819,8	1293	1833,6	1362	1847,4	1430	1861	1469	1868,8	1508	1876,6
1225	1820	1294	1833,8	1363	1847,6	1431	1861,2	1470	1869	1509	1876,8
1226	1820,2	1295	1834	1364	1847,8	1432	1861,4	1471	1869,2	1510	1877
1227	1820,4	1296	1834,2	1365	1848	1433	1861,6	1472	1869,4	1511	1877,2
1228	1820,6	1297	1834,4	1366	1848,2	1434	1861,8	1473	1869,6	1512	1877,4
1229	1820,8	1298	1834,6	1367	1848,4	1435	1862	1474	1869,8	1513	1877,6
1230	1821	1299	1834,8								

The GPS Receiver

The Global Positioning System (GPS) is a satellite-supported navigation system which enables the current position of a user to be determined to within a few meters. In this system, a GPS receiver calculates the coordinates of the user from the satellite signals which contain the known positions of the satellites. To minimize disturbance the satellite signals are transmitted simultaneously on two frequencies.

The satellite signal consists of a message and codes. The message describes the position of the satellite and its path. The distances from the satellites can be calculated using the codes (spread spectrum technique). The correlation between the internal code copy and the code received enable a period of time corresponding to the distance being sought to be determined. The codes must also be decodable (correlated) for the message to be received. The GPS receiver evaluates the information and calculates its position on this basis.

GPS Data Transmission

The GPS receiver can be used to read the satellite signals into a processor via a serial interface. The signals can then be processed. The type of data format to be used for transferring the signals from the GPS receiver to the processor can be set at the receiver. Two frequently used formats are described below, the NMEA and the NAV string format:

(To get information in general and of the actual used GPS format please look up in the GPS manual)

Sample NMEA format

NMEA data has a format such as this: \$GPGLL,1111.11,N,2222.222,W

\$GPGLL	start mark and code for the longitude and latitude data
1111.11	geographical latitude
N	N = north, S = south
2222.222	geographical longitude
W	W = west, E = east

Sample NAV string

A navigation (NAV) string data block consists of 8 individual strings with a total of 110 ASCII characters.

String	Content	ASCII character
1	Reference time in UTC	13
2	Position (latitude, longitude, height [m])	27
3	3-D speed [m/s]	19
4	Current satellite	19
5	Test values	19
6	Status and BIT information	9
7	Check sum	2
8	End mark	2

GPS Glossary

2-D, 3-D	Refers to two-dimensional and three-dimensional positions. A 2-D position fix provides latitude and longitude. Altitude is assumed to be fixed. Only three satellites are required to provide a 2-D position with a user-supplied altitude. A 3-D position provides the altitude in addition to LAT/LON and requires four satellites.
Almanac	Data transmitted by a GPS satellite which includes orbit information on all the satellites, clock correction, and atmospheric delay parameters. This data is used to facilitate rapid SV acquisition. The orbit information is a subset of the ephemeris data with reduced accuracy.
Ambiguity	The unknown integer number of cycles of the reconstructed carrier phase contained in an unbroken set of measurements from a single satellite pass at a single receiver.
Argument of latitude	The sum of the true anomaly and the argument of perigee.
Argument of perigee	The angle or arc from the ascending node to the closest approach of the orbiting body to the focus or perigee point, as measured at the focus of an elliptical orbit, in the orbital plane in the direction of motion of the orbiting body.
Ascending node	The point at which an object's orbit crosses the reference plane (e.g. equatorial plane) from south to north.
Azimuth	A horizontal direction expressed as the angular distance between a fixed direction, say North, and the direction of the object.
Bandwidth	A measure of the information-carrying capacity of a signal, expressed as the width of the spectrum of that signal (frequency domain representation) in Hertz.
Baseline	The three-dimensional vector distance between a pair of stations for which simultaneous GPS data has been collected and processed with differential techniques. The most accurate GPS result.
Beat frequency	Either of the two additional frequencies obtained when signals of two frequencies are mixed. The beat frequencies are equal to the sum or difference of the original frequencies.
Bias	See Integer Bias Terms.
Binary biphase modulation	Phase changes of either 0 or 180 degrees on a constant frequency carrier (representing a binary 0 or 1 respectively). GPS signals are bi-phase modulated.

Binary pulse code modulation	Pulse modulation using a string of binary numbers (codes). This coding is usually represented by ones and zeros with definite meanings assigned to them, such as changes in phase or direction of a wave.
C/A code	The Coarse/Acquisition (or Clear/Acquisition) code modulated onto the GPS L1 signal. This code is a sequence of 1023 pseudo random binary bi-phase modulations on the GPS carrier at a chipping rate of 1.023 MHz, thus having a code repetition period of one millisecond. This code was selected to provide good acquisition properties.
Carrier	A radio wave having at least one characteristic (such as frequency, amplitude, phase) which may be varied from a known reference value by modulation.
Carrier beat	phase The phase of the signal which remains when the incoming Doppler-shifted satellite carrier signal is beat (the difference frequency signal is generated) with the nominally constant reference frequency generated in the receiver.
Carrier frequency	The frequency of the unmodulated fundamental output of a radio transmitter. The GPS L1 carrier frequency is 1575.42 MHz.
Celestial equator	The great circle that is the projection of the Earth's geographical equator of rotation onto the celestial sphere. Its poles are the North and South Celestial Poles.
Celestial meridian	That vertical circle through the elevated celestial pole. It also passes through the other celestial pole, the astronomical zenith, and the nadir.
Channel	The receiver hardware that is required to lock to a satellite, make the range measurements and collect data from the satellite.
Chip	The length of time to transmit either a zero or a one in a binary pulse code.
Chip rate	Number of chips per second (e.g., C/A code = 1.023 MHz).
Clock offset	Constant difference in the time reading between two clocks.
Code division multiple access (CDMA)	A method of frequency reuse whereby many radios use the same frequency but with each one having a separate and unique code. GPS uses CDMA techniques with Gold's codes for their unique cross-correlation properties.
Conventional international origin (CIO)	Average position of Earth's rotation axis during the years 1900- 1905.
Correlation-type	A GPS receiver channel which uses a delay lock loop to maintain an

channel	alignment(correlation peak) between the replica of the GPS code generated in the receiver and the received code.
Datum	A mathematical model of the earth. Many local data model the earth for a small region: e.g., Tokyo datum, OSGB-36 (Ordnance Survey of Great Britain 1936), NAD-27(North American). Others, WGS-84, for example, model the whole earth. See also Geodetic Datum
Deflection of the vertical	The angle between the normal to the ellipsoid and the vertical (true plumb line). Since this angle has both a magnitude and a direction, it is usually resolved into two components: one in the meridian and the other perpendicular to it in the prime vertical.
Delay lock	The technique whereby the received code (generated by the satellite clock) is compared with the internal code (generated by the receiver clock) and the latter is shifted in time until the two codes match. Delay lock loops can be implemented in several ways; tau dither and early-minus-late gating.
Delta pseudo-range	See reconstructed carrier phase.
DGPS	Differential GPS operation. The use of a reference station to provide corrections using the RTCM SC-104 protocol for one or more mobile receivers. This may be carried out in real time over a telemetry link or by storing the data and post processing (see below).The accuracy of position measurement may be improved from 100 meters 2dRMS under Selective Availability conditions to 1 - 15 meters depending on the choice of sensors and telemetry.
Differential processing	<p>GPS measurements can be differenced between receivers, satellites, and epochs. Although many combinations are possible, the present convention for differential processing of GPS phase measurements is to take differences between receivers(single difference), then between satellites (double difference), then between measurement epochs (triple difference).</p> <p>A single-difference measurement between receivers is the instantaneous difference in-phase of the signal from the same satellite, measured by two receivers simultaneously.</p> <p>A double-difference measurement is obtained by differencing the single difference for one satellite with respect to the corresponding single difference for a chosen reference satellite.</p> <p>A single-difference measurement is the difference between a double difference at one epoch of time and the same double difference at the previous epoch of time.</p>
Differential (relative) positioning	Determination of relative coordinates of two or more receivers which are simultaneously tracking the same satellites. Static differential GPS involves determining baseline vectors between pairs of receivers. See also DGPS.

Dilution of precision (DOP)	<p>A description of the purely geometrical contribution to the uncertainty in a position fix, given by the expression $DOP = \sqrt{\text{TRACE}(A^{-1})}$ where A^{-1} is the design matrix for the instantaneous position solution (dependent on satellite-receiver geometry). The DOP factor depends on the parameters of the position-fix solution. Standard terms for the GPS application are:</p> <p>GDOP Geometric (three position coordinates plus clock offset in the solution)</p> <p>PDOP Position (three coordinates)</p> <p>HDOP Horizontal (two horizontal coordinates)</p> <p>TDOP Time (clock offset only)</p> <p>VDOP Vertical (height only)</p> <p>RDOP Relative (normalized to 60 seconds)</p>
Doppler aiding	The use of Doppler carrier-phase measurements to smooth code-phase position measurements.
Doppler shift	The apparent change in frequency of a received signal due to the rate of change of the range between the transmitter and receiver. See reconstructed carrier phase.
Double-difference method	A method to determine that set of ambiguity values which minimizes the variance of the solution for a receiver pair baseline vector.
Dynamic positioning	Determination of a timed series of sets of coordinates for a moving receiver, each set of coordinates being determined from a single data sample, and usually computed in real time.
Earth-centered earth-fixed (ECEF)	Cartesian coordinate system where the X direction is the intersection of the prime meridian (Greenwich) with the equator. The vectors rotate with the earth. Z is the direction of the spin axis.
Eccentric anomaly E	The regularizing variable in the two-body problem. E is related to the mean anomaly M by Kepler's equation: $M = E - e \cdot \sin E$ (e stands for eccentricity).
Eccentricity	The ratio of the distance from the center of an ellipse to its focus to the semimajor axis. $e = (1 - b^2/a^2)^{0.5}$ where a and b are the semimajor and semiminor axes of the ellipse.
Ecliptic	The earth-sun orbital plane. North is the direction of the system angular momentum. Also called the ecliptic pole.
Elevation	Height above mean sea level. Vertical distance above the geoid.
Elevation Mask Angle	That angle below which satellites should not be tracked. This varies according to the task and location, e.g. for land surveying it is normally set to 15 degrees to

	avoid interference problems caused by buildings, trees and multipath errors. For marine navigation on the other hand, the angle can be lowered to 5 degrees. Please note that, because of the greater thickness of the ionosphere and troposphere traversed by the signal at low angles together with the increased distance of the satellite, the signal is weaker.
Ellipsoid	In geodesy, unless otherwise specified, a mathematical figure formed by revolving an ellipse about its minor axis. It is often used interchangeably with spheroid. Two quantities define an ellipsoid; these are usually given as the length of the semimajor axis, a , and the flattening, $f = (a - b)/a$, where b is the length of the semiminor axis. Prolate and triaxial ellipsoids are invariably described as such.
Ellipsoid height	The measure of vertical distance above the ellipsoid. Not the same as elevation above sea level. GPS receivers output position-fix height in the WGS-84 datum.
Ephemeris	A list of (accurate) positions or locations of a celestial object as a function of time. Available as "broadcast ephemeris" or as post processed "precise ephemeris." For GPS navigation purposes the broadcast ephemeris is always used and is updated every hour. It is sent as a set of 8 elements of the Keplerian orbital equation (qv) and used by the receiver to compute the instantaneous position of that satellite.
Epoch	Measurement interval or data frequency, as in making observations every 15 seconds. Loading data using 30-second epochs means loading every other measurement.
Fast switching channel	A switching channel with a sequence time short enough to recover (through software prediction) the integer part of the carrier beat phase.
Flattening	$f = (a - b)/a = 1 - (1 - e^2)^{1/2}$ where: a = Semimajor axis b - Semiminor axis e = Eccentricity
Frequency band	A range of frequencies in a particular region of the electromagnetic spectrum.
Frequency spectrum	The distribution of amplitudes as a function of frequency of the constituent waves in a signal.
Fullwave	Term used to differentiate between measurements made with signal-squared (codeless) and code-tracking receivers. Specifically, a receiver tracking L2 P-code can make measurement using the whole L2 wavelength (23 cm): the full wave.
Fundamental frequency	The fundamental frequency used in GPS is 10.23 MHz. The carrier frequencies L1 and L2 are integer multiples of this fundamental frequency. $L1 = 154F = 1575.42$ MHz $L2 = 120F = 1227.60$ MHz

GDOP	Geometric Dilution of Precision. The relationship between errors in user position and time and in satellite range. $GDOP^2 = PDOP^2 + TDOP^2$
Geocenter	The center of the earth.
Geodetic datum	A mathematical model designed to best fit part or all of the geoid. It is defined by an ellipsoid and the relationship between the ellipsoid and a point on the topographic surface established as the origin of datum. This relationship can be defined by six quantities, generally (but not necessarily) the geodetic latitude, longitude, and the height of the origin, the two components of the deflection of the vertical at the origin, and the geodetic azimuth of a line from the origin to some other point. The GPS uses WGS-84.
Geoid	The actual physical shape of the earth which is hard to describe mathematically because of the local surface irregularities and sea-land variations. In geodetic terms it is the particular equipotential surface which coincides with mean sea level, and which maybe imagined to extend through the continents. This surface is everywhere perpendicular to the force of gravity.
Geoid height	The height above the geoid is often called elevation above mean sea level.
GPS	Global Positioning System, consisting of: <ol style="list-style-type: none"> 1) A Space Segment (up to 24 NAVSTAR satellites in 6 different orbits) 2) The Control Segment (5 monitor stations, 1 master control station and 3 upload stations) 3) The User Segment (GPS receivers) NAVSTAR satellites carry extremely accurate atomic clocks and broadcast coherent simultaneous signals.
GPS ICD-200	The GPS Interface Control Document is a government document that contains the full technical description of the interface between the satellites and the user. GPS receivers must comply with this specification if they are to receive and process GPS signals properly.
GPS Time	The length of the second is fixed and is determined by primary atomic frequency standards. Leap-seconds are not used, as they are in UTC. Therefore, GPS time and UTC differ by a variable whole number of seconds. See also Universal Time.
Gravitational constant	The proportionality constant in Newton's Law of Gravitation: $G = 6.672 \times 10^{-11} \text{ Nm}^2/\text{K}^2$.
Greenwich mean time (GMT)	See Universal Time. They are often used interchangeably, although Universal Time is now defined as the accepted standard. Halfwave - Measurements made using L2-squared measurements. The squaring process results in only half of the original L2 wavelength being available.
HDOP	Horizontal Dilution of Precision. See DOP and PDOP.

HOW	Handover word. The word in the GPS message that contains time synchronization information for the transfer from the C/A code to the P-code.
Inclination	The angle between the orbital plane of a body and some reference plane (e.g., equatorial plane).
INS	Inertial Navigation System, which contains an inertial measurement unit (IMU).
Integer Bias Terms	The receiver counts the radio waves from the satellite, as they pass the antenna, to a high degree of accuracy. However, it has no information on the number of waves to the satellite at the time it started counting. This unknown number of wavelengths between the satellite and the antenna is the integer bias term.
Integrated Doppler	A measurement of Doppler shift frequency or phase over time.
IODE	Issue Of Data, Ephemeris. Part of the navigation data. It is the issue number of the ephemeris information. A new ephemeris is available usually on the hour. Especially important for Differential GPS operation that the IODE change is tracked at both the reference station and mobile stations.
Ionospheric delay	A wave propagating through the ionosphere [which is a non homogeneous (in space and time) and dispersive medium] experiences delay. Phase delay depends on electron content and affects carrier signals. Group delay depends on dispersion in the ionosphere as well, and affects signal modulation (codes). The phase and group delay are of the same magnitude but opposite sign.
ipar soln	Values giving the difference in each of delta X, delta Y, delta Z vector components.
JPO	Joint Program Office for GPS located at the USAF Space Division at El Segundo, California. The JPO consists of the USAF Program Manager and Deputy Program Managers representing the Army, Navy, Marine Corps, Coast Guard, Defense Mapping Agency and NATO.
Kalman Filter	A numerical method used to track a time-varying signal in the presence of noise. If the signal can be characterized by some number of parameters that vary slowly with time, then Kalman filtering can be used to tell how incoming raw measurements should be processed to best estimate those parameters as a function of time.
Kinematic surveying	A form of continuous differential carrier-phase surveying requiring only short periods of data observations. Operational constraints include starting from or determining a known baseline, and tracking a minimum of four satellites. One receiver is statically located at a control point, while others are moved between points to be measured.

Keplerian orbital elements	Allow description of any astronomical orbit: a: semimajor axis l: right ascension of ascending node e: eccentricity i: inclination o: argument of perigee t: true anomaly
L1	The primary L-band signal radiated by each NAVSTAR satellite at 1575.42 MHz. The L1 beacon is modulated with the C/A and P-codes, and with the NAV message. L2 is centered at 1227.60 MHz and is modulated with the P-code and the NAV message.
Lane	The area (or volume) enclosed by adjacent lines (or surfaces) of zero phase of either the carrier beat phase signal, or of the difference between two carrier beat phase signals. On the earth's surface a line of zero phase is the locus of all points for which the observed value would be an exact integer for the complete instantaneous phase measurement. In three dimensions, this locus becomes a surface. Lane counts are used extensively also in terrestrial radio navigation systems such as Loran or Decca to define position.
L band	The radio-frequency band extending from 390 MHz to (nominally) 1550 MHz.
LLA	A topocentric spherical coordinate system, whose coordinates are Latitude, Longitude, and Altitude. Note that altitude can be expressed with respect to any particular ellipsoid or geoid model and generally depends on the model.
MCX	A small RF coaxial cable antenna connector system produced by several companies, e.g. Huber & Suhner.
Mean anomaly	$M = n(t - T)$ where: n is the mean motion, t is the time and T is the instant of perigee passage.
Mean motion	$n = 2\pi / P$ where P is the period of revolution.
Microstrip	Antenna. A two-dimensional, flat, precisely cut piece of metal foil glued to a substrate.
Monitor station	Worldwide group of stations used in the GPS control segment to monitor satellite clock and orbital parameters. Data collected here is linked to a Master Station where corrections are calculated and controlled. This data is uploaded to each satellite at least once per day from an Upload Station.
Multichannel receiver	A receiver containing many independent channels. Such a receiver offers highest SNR because each channel tracks one satellite continuously.
Multipath	Interference similar to "ghosts" on a television screen which occurs when GPS

	signals arrive at an antenna having traversed different paths. The signal traversing the longer path will yield a larger pseudo range estimate and increase the error. Multiple paths may arise from reflections from structures near the antenna.
Multipath error	A positioning error resulting from interference between radio waves which have traveled between the transmitter and the receiver by two paths of different electrical lengths.
Multiplexing channel	A receiver channel which is sequenced through several satellite signals (each from a specific satellite and at a specific frequency) at a rate which is synchronous with the satellite message bit-rate (50 bits per second, or 20 milliseconds per bit). Thus, one complete sequence is completed in a multiple of 20 milliseconds.
NAD-83	North American Datum, 1983.
NAVDATA	The 1500 bit Navigation Message broadcast by each satellite at 50 bps on both L1 or L2 beacons. This message contains system time, clock correction parameters, ionospheric delay model parameters, and the vehicle's ephemeris and health. This information is used to process GPS signals to obtain user position and velocity.
NAVSTAR	The name given to GPS satellites, built by Rockwell International (Block I) or GE (Block II), which is an acronym formed from NAVigation System with Time And Ranging.
N-type	A large diameter screwed coaxial antenna connector, normally used with RF cables such as RG213 or RG58 where the mechanical strain relief is taken through the connector.
Observing session	The period of time over which GPS data is collected simultaneously by two or more receivers.
Outage	The occurrence in time and space of a GPS dilution of precision value exceeding a specified maximum.
P-code	The protected or precise code used on both L1 and L2 GPS beacons. This code will be made available by the DOD only to authorized users. The P-code is a very long (about 10 ¹⁴ bits) sequence of pseudo random binary biphasic modulations on the GPS carrier at a chipping rate of 10.23 MHz which does not repeat itself for about 38 weeks. Each satellite uses a one-week segment of this code which is unique to each GPS satellite, and is reset each week.
PDOP	Position Dilution of Precision, a unitless figure of merit expressing the relationship between the error in user position and the error in satellite position. Geometrically, PDOP is proportional to 1 divided by the volume of the pyramid formed by lines running from the receiver to four satellites observed. Values

	considered "good" for positioning are small, say 3. Values greater than 7 are considered poor. Thus, small PDOP is associated with widely separated satellites. Small PDOP is important in navigation and positioning, but much less so in surveying. PDOP is related to horizontal and vertical DOP by $PDOP^2 = HDOP^2 + VDOP^2$.
Parity error	A digital message is composed of 1s and 0s. Parity can be defined as the sum of these bits within a word unit. A parity error results when one of the bits is changed so that the parity calculated at reception is not the same as it was at transmission of the message.
PCB	Printed Circuit Board. Reference is also made to flexible PCBs, a method of providing flexible connector ribbons to normal PCBs.
Pengee	That point in a geocentric orbit when the geometric distance is a minimum. The closest approach of a body.
Phase lock	The technique whereby the phase of an oscillator signal is made to follow exactly the phase of a reference signal by first comparing the phases of the two signals, and then using the resulting phase difference signal to adjust the reference oscillator frequency to eliminate phase difference when the two signals are next compared.
Phase observable	See reconstructed carrier phase.
Point positioning	A geographic position produced from one receiver in a stand-alone mode. At best, position accuracy obtained from a stand-alone receiver is 15-25 meters, depending on the geometry of the satellites. With Selective Availability in operation the best that can be expected is 100 meters 2dRMS.
Polar motion	Motion of the instantaneous axis of the rotation of the Earth with respect to the solid body of the Earth. Irregular but more or less circular motion with an amplitude of about 15m and a main period of about 430 days (called Chandler Wobble).
Precise positioning service (PPS)	The highest level of military dynamic positioning accuracy that will be provided by GPS, based on the dual-frequency P-code and having high anti-jam and anti-spoof qualities.
Prime vertical	The vertical circle perpendicular to the celestial meridian.
PRN	Pseudorandom noise, a sequence of digital 1s and 0s which appears to be randomly distributed like noise, but which can be exactly reproduced. The important property of PRN codes is that they have a low autocorrelation value for all delays or lags except when they are exactly coincident. Each NAVSTAR satellite has its own unique C/A and P pseudorandom-noise codes.

Pseudolite	A ground-based GPS transmitter station which broadcasts a signal with a structure similar to that of an actual GPS satellite.
Pseudorange	<p>A measure of the apparent propagation time from the satellite to the receiver antenna, expressed as a distance. Pseudorange is obtained by multiplying the apparent signal-propagation time by the speed of light. Pseudorange differs from the actual range by the amount that the satellite and user clocks are offset, by propagation delays, and other errors.</p> <p>The apparent propagation time is determined from the time shift required to align (correlate) a replica of the GPS code generated in the receiver with the received GPS code. The time shift is the difference between the time of signal reception (measured in the receiver time frame) and the time of emission (measured in the satellite time frame).</p>
Pseudorange difference	See reconstructed carrier phase.
Range rate	The rate of change of range between the satellite and receiver. The range to a satellite changes due to satellite and observer motions. Range rate is determined by measuring the Doppler shift of the satellite beacon carrier.
RDOP	<p>Relative Dilution Of Precision, defined as:</p> $\frac{(_DX^2 + _DY^2 + DZ^2)^{1/2}}{_DD}$ <p>usually in units of m/cycle. Multiplying RDOP by the uncertainty of a double-difference measurement yields the spherical relative-position error.</p>
Reconstructed carrier phase	<p>The difference between the phase of the incoming Doppler-shifted GPS carrier and the phase of a nominally constant reference frequency generated in the receiver. For static positioning, the reconstructed carrier phase is sampled at epochs determined by a clock in the receiver.</p> <p>The reconstructed carrier phase changes according to the continuously integrated Doppler shift of the incoming signal, biased by the integral of the frequency offset between the satellite and receiver reference oscillators.</p> <p>The reconstructed carrier phase can be related to the satellite-to-receiver range, once the initial range (or phase ambiguity) has been determined. A change in the satellite-to-receiver range of one wavelength of the GPS carrier (19 cm for L1) will result in a one-cycle change in the phase of the reconstructed carrier.</p>
Relative navigation	A technique similar to relative positioning except that one or both, of the points may be moving. The pilot of a ship or aircraft may need to know his position relative to a harbor or runway. A data link is used to relay the error terms to the moving vessel to allow real-time navigation.

Relative positioning	The process of determining the relative difference in position between two marks with greater precision than that to which the position of a single point can be determined. Here, a receiver (antenna) is placed over each spot and measurements are made by observing the same satellite at the same time. This technique allows cancellation (during computations) of all errors which are common to both observers, such as satellite clock errors, propagation delays, etc. See also Translocation and Differential Navigation.
Right ascension of ascending node	The angular distance measured from the vernal equinox, positive to the east, along the celestial equator to the ascending node. Typically denoted by a capital omega (Ω). Used to discriminate between orbital planes.
RTCM	Radio Technical Commission for Maritime Services. Commission set up to define a differential data link to relay GPS correction messages from a monitor station to a field user. RTCM SC-104 recommendations define the correction message format and 16 different correction message types.
SA	See Selective Availability SATNAV - A local term referring to use of the older TRANSIT system for satellite navigation. One major difference between TRANSIT and GPS is that the TRANSIT satellites are in low-altitude polar orbits with a 90-minute period.
Selective Availability(SA)	A DoD program to control the accuracy of pseudorange measurements, whereby the user receives a false pseudorange which is in error by a controlled amount. Differential GPS techniques can reduce these effects for local applications.
Semimajor axis	One half of the major axis of an ellipse.
SEP	Spherical Error Probable, a statistical measure of precision defined as the 50th percentile value of the three-dimensional position error statistics. Thus, half of the results are within a 3-D SEP value.
Sidereal day	Time between two successive upper transits of the vernal equinox.
Simultaneous measurements	Measurements referenced to time-frame epochs which are either exactly equal, or else so closely spaced in time that the time misalignment can be accommodated by correction terms in the observation equation, rather than by parameter estimation.
Slope distance	The three-dimensional vector distance from station one to station two. The shortest distance (a chord) between two points.
Slow switching channel	A switching channel with a sequencing period which is too long to allow recovery of the integer part of the carrier beat phase.
SMA, SMB, SMC	Small diameter RF coaxial cable connectors with various fastening mechanisms. See manufacturers' catalogues for details.

Solar day	Time between two successive upper transits of the sun.
Spheroid	See ellipsoid.
Spread spectrum	The received GPS signal is a wide bandwidth, low-power signal (-1 60dBW). This property results from modulating the L-band signal with a PRN code in order to spread the signal energy over a bandwidth which is much greater than the signal information bandwidth. This is done to provide the ability to receive all satellites unambiguously and to provide some resistance to noise and multipath.
Spread spectrum systems	A system in which the transmitted signal is spread over a frequency band much wider than the minimum bandwidth needed to transmit the information being sent.
Squaring-type channel	A GPS receiver channel which multiplies the received signal by itself to obtain a second harmonic of the carrier which does not contain the code modulation. Used in so-called codeless receiver channels.
Standard positioning service (SPS)	The level of dynamic- or static-positioning capability that will be provided by GPS, based on the single-frequency C/A-code. The accuracy of this service will be set at a level consistent with national security.
Static positioning	Positioning applications in which the positions of static or near static points are determined.
SV	Satellite Vehicle or Space Vehicle.
Switching channel	A receiver channel which is sequenced through a number of satellite signals (each from a specific satellite and at a specific frequency) at a rate which is slower than, and asynchronous with, the message data rate.
TAIP	Trimble ASCII Interface Protocol. A protocol used to interface with Trimble vehicle navigation sensors such as the Starfinder and SVeeSix. It is designed for bi-directional use with communication modems and radio data telemetry systems which have problems with binary or hexadecimal data packets. Each packet is preceded by two letters, followed by a sequence of alphanumeric information. A full specification of the protocol is contained Appended.
TANS	Trimble Advanced Navigation Sensor. A family of rugged 6 channel GPS sensors. Used also to refer to the protocol, also known as TSIP, Trimble Standard Interface Protocol (q.v.).
TDOP	Time Dilution of Precision. See DOP.
TOW	Time of week, in seconds, from midnight Sunday UTC.

Translocation	A version of relative positioning which makes use of a known position, such as a national survey authority mark, to aid in the accurate positioning of a desired point. Here, the position of the mark, determined using GPS, is compared with the accepted value. The three-dimensional differences are then used in the calculations for the second point.
Trop	Tropospheric correction. The correction applied to the measurement to account for tropospheric delay. This value is obtained from the modified Hopfield model.
True anomaly	The angular distance, measured in the orbital plane from the earth's center (occupied focus) from the perigee to the current location of the satellite (orbital body).
TSIP	Trimble Standard Interface Protocol. A binary/hex packet bi-directional protocol, also known as the TANS protocol. Used by a large number of Trimble sensors. TSIP is the subset of TANS which is recognized by all sensors except those of the 4000 series. The protocol is defined in full in the TSIP Appendix.
Universal time	Local solar mean time at Greenwich Meridian. Some commonly used versions of Universal Time are: <ul style="list-style-type: none"> UTO Universal Time as deduced directly from observations of stars and the fixed numerical relationship between Universal and Sidereal Time; 3 minutes 56.555 seconds. UTI UTO corrected for polar motion. UT2 UTI corrected for seasonal variations in the earth's rotation rate. UTC Universal Time Coordinated; uniform atomic time system kept very close to UT2 by offsets. Maintained by the US. Naval Observatory. GPS time can be directly related to UTC. UTC GPS = seconds. (changing constant = 7 seconds in 1991).
User range accuracy (URA)	The contribution to the range-measurement error from an individual error source (apparent clock and ephemeris prediction accuracy's), converted into range units, assuming that the error source is uncorrelated with all other error sources. Values less than 10 are preferred. Block II satellites operating under Selective Availability are usually set to 32.
UTM	Universal Transverse Mercator Map Projection. A special case of the Transverse Mercator projection. Abbreviated as the UTM Grid, it consists of 60 north-south zones, each 6 degrees wide in longitude.
VDOP	Vertical Dilution of Precision. See DOP and PDOP.
Vernal equinox	The intersection of the celestial equator with the ecliptic, with the positive sense being from the earth to the sun, as the sun crosses the equator from south to north.

Vertical	The line perpendicular to the geoid at any point. The direction of the force of gravity at that point. Plumb line.
WGS-72	World Geodetic System (1972); the mathematical reference ellipsoid previously used by GPS, having a semimajor axis of 6378.135 km and a flattening of 1/298.26.
WGS-84	World Geodetic System (1984); the mathematical ellipsoid used by GPS since January 1987. The shift from WGS-72 to WGS-84 in Sunnyvale CA (370 N, 1220 W) is about 13.6 meters east, 45 meters north and 2.7 meters up.
Widelane	A linear combination of L1 and L2 observations (L1-L2) used to partially remove ionospheric errors. This combination yields a solution in about one-third the time of a complete ionosphere-free solution.
Z-count	The GPS satellite clock time at the leading edge of the next data subframe of the transmitted GPS message (usually expressed as an integer number of 6 seconds).

GSM Abbreviations

A

A3	Authentication Algorithm A3
A5/1	Encryption Algorithm A5
A5/2	Encryption Algorithm A5
A8	Algorithm A8
AB	Access Burst
AC	- Access Class (C0 to C15) - Application Context
ACC	Automatic Congestion Control
ACCH	Associated Control Channel
ACK	ACKnowledgement
ACM	Address Complete Message
ACU	Antenna Combining Unit
ADC	- ADministration Centre - Analogue to Digital Converter
ADN	Abbreviated Dialling Number
ADPCM	Adaptive Differential Pulse Code Modulation
AE	Application Entity
AEC	Acoustic Echo Control
AEF	Additional Elementary Functions
AGCH	Access Grant CHannel
Ai	Action indicator
AoCC	Advice of Charge (Charging) supplementary service
AoCI	Advice of Charge (Information) supplementary service
ASE	Application Service Element
ASN.1	Abstract Syntax Notation One
ARFCN	Absolute Radio Frequency Channel Number
ARQ	Automatic Request for Retransmission
ATT (flag)	Attach
AU	Access Unit
AuC	Authentication Centre
AUT(H)	Authentication

B

BA	BCCH Allocation
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BAIC	Barring of All Incoming Calls supplementary service
BAOC	Barring of All Outgoing Calls supplementary service
BCC	Base Transceiver Station (BTS) Colour Code
BCCH	Broadcast Control Channel
BCCH_FREQ_NCELL	Frequency of the RF carrier on which the BCCH of a neighbouring cell is transmitted
BCD	Binary Coded Decimal
BCF	Base Station Control function
BCIE	Bearer Capability Information Element
BCU	(See GSM 08.56)
BER	Bit Error Ratio
BFI	Bad Frame Indication
BI	all Barring of Incoming call services
BIC-Roam	Barring of Incoming Calls when Roaming outside the HOME PLMN country supplementary service
Bm	Full-rate traffic channel
BN	Bit Number
BO	all Barring of Outgoing call services
BOIC	Barring of Outgoing International Calls supplementary service
BOIC-exHC	Barring of Outgoing international Calls except those directed to the Home PLMN Country supplementary service
BS	- Basic Service (group) - Bearer Service
BS_AG_BLK_RES	Number of blocks on each common control channel reserved for access grant messages
BS_BCCH_SDCCH_COMB	Logical variable that indicates the combination of dedicated and associated control channels on the same physical channel
BS_CC_CHANS	Number of basic physical channels supporting common control channels
BSG	Basic Service Group
BS_G_BLK_RES	Number of blocks on each common control channel reserved for access grant messages
BS_PA_MFRMS	Number of multiframes between two transmissions of the same paging message to MSs of the same paging group
BSC	Base Station Controller
BSIC	Base Transceiver Station Identity Code
BSIC-NCELL	BSIC of an adjacent cell
BSS	Base Station System
BSSAP	Base Station System Application Part
BSSMAP	Base Station System Management Application Part
BSSOMAP	Base Station Operation and Maintenance Application Part

BTS	Base Transceiver Station
C	
C	Conditional
CA	Cell Allocation
CAI	Charge Advice Information
CA_BAND_NUMB	Number of the frequency band that contains the cell allocation
CBC	Cell Broadcast Centre
CBCH	Cell Broadcast CHannel
CC	Country Code
CC	Call Control
CCBS	Completion of Calls to Busy Subscribers supplementary service
CCCH	Common Control CHannel
CCCH_GROUP	Group of MSs in idle mode
CCF	Conditional Call Forwarding
CCH	Control CHannel
CCITT	Comité Consultatif International Télégraphique et Téléphonique
CCPE	Control Channel Protocol Entity
Cct	Circuit
CED	called station identifier
CELL-BAR-ACCESS	Cell Access Barred
CELL_RESELECT_HYSTERESIS	RXLEV Hysteresis required for Cell Reselection
CEPT	Conférence des administrations Européennes des Postes et Telecommunications
CFC	Conditional Call Forward
CF	- Conversion Facility - All Call Forwarding services
CFB	Call Forwarding on mobile subscriber Busy supplementary service
CFNRc	Call Forwarding on MS Not Reachable supplementary service
CFNRy	Call Forwarding on No Reply supplementary service
CFU	Call Forwarding Unconditional supplementary service
CHV	Card Holder Verification
CI	- Cell Identity - CUG Index
CIR	Channel Interference Ratio
CKSN	Ciphering Key Sequence Number
CLI	Calling Line Identity
CLIP	Calling Line Identification Presentation supplementary service

CLIR	Calling Line Identification restriction supplementary service
CM	Connection Management
CMD	Command
CMM	Channel Mode Modify
CNG	calling tone
COLI	Connect Line Identity
CoLP	Connected Line Identification Presentation supplementary service
CoLR	Connected Line identification Restriction supplementary service
COM	Complete
CONNACK	CONNect ACKnowledgement
C/R	Command/Response field bit
CRC	Cyclic Redundancy Check (3 bit)
CRE	Call RE-establishment procedure
CS	Coding Scheme
CSPDN	Circuit Switched Public Data Network
CT	Channel Tester
CUG	Closed User Group supplementary service
CW	Call Waiting supplementary service

D

DAC	Digital to Analogue Converter
DB	Dummy Burst
DCCH	Dedicated Control Channel
DCE	Data Circuit terminating Equipment
DCF	Data Communication Function
DCN	Data Communication Network
DET	Detach
DISC	DISConnect
DL	- Data Link (layer),
- Downlink (base station to mobile)	
DLCI	Data Link Connection Identifier
DLD	Data Link Discriminator
Dm	Control Channel (ISDN terminology applied to mobile service)
DMR	Digital Mobile Radio
DNIC	Data Network Identifier
DP	Dial/Dialled Pulse
DRX	Discontinuous Reception (Mechanism)

DSE	Data Switching Exchange
DSI	Digital Speech Interpolation
DSS1	Digital Subscriber Signalling No1
DTAP	Direct Transfer Application Part
DTE	Data Terminal Equipment
DTMF	Dual Tone Multi-Frequency (signalling)
DTX	Discontinuous Transmission (Mechanism)

E

EA	External Alarms
EBSG	Elementary Basic Service Group
ECM	Error Correction Mode (facsimile)
Ec/No	Ratio of energy per modulating bit to the noise spectral density
ECT	Explicit Call Transfer supplementary service
EEL	Electric Echo Loss
EIR	Equipment Identity Register
EL	Echo Loss
EMMI	Electrical Man Machine Interface
ERP	Ear Reference Point
ERR	ERRor
ETR	ETSI Technical Report
ETS	European Telecommunication Standard
ETSI	European Telecommunications Standards Institute

F

FA	- Full Allocation - Fax Adapter
FAC	Final Assembly Code
FACCH	Fast ACCH
FACCH/F	Full rate Fast Associated Control Channel
FACCH/H	Half rate Fast Associated Control Channel
FB	Frequency correction Burst
FCCH	Frequency Correction CHannel
FCS	Frame Check Sequence
FDM	Frequency Division Multiplex
FEC	Forward Error Correction
FER	Frame Erasure Ratio
FH	Frequency Hopping

FN	Frame Number
FR	Full Rate
ftn	forwarded-to number

G

GMSC	Gateway Mobile services Switching Centre
GMSK	Gaussian Minimum Shift Keying (modulation)
GPA	GSM PLMN Area
GPRS	General Packet Radio Service
GSA	GSM System Area
GSM	Global System for Mobile communication
GSM MS	GSM Mobile Station
GSM PLMN	GSM Public Land Mobile Network
GT	Global Title

H

HANDOVER	Handover
HDLC	High Level Data Link Control
HLC	High Layer Compatibility
HLR	Home Location Register
HO_MARGIN	SDL Message name for Handover Margin
HOLD	Call Hold supplementary service
HPLMN	Home PLMN
HPU	Hand Portable Unit
HR	Half Rate
HSN	Hopping Sequence Number

I

I	Information (frames)
IA	Incoming Access (closed user group SS)
IAM	Initial Address Message
IC	Interlock Code (CUG SS)
ICB	Incoming Calls Barred
IC(pref)	Interlock Code of the preferential CUG
ICM	In-Call Modification
ID	Identification / Identity
IDN	Integrated Digital Network

IE	Signalling Information Element
IEI	Information Element Identifier
IMEI	International Mobile station Equipment Identity
IMSI	International Mobile Subscriber Identity
IN	Interrogating Node
IPv4	Internet Protocol version 4
ISC	International Switching Centre
ISDN	Integrated Services Digital Network
ISUP	ISDN User Part (of signalling system No.7)
ITC	Information Transfer Capability
IWF	InterWorking Function
IWMSC	InterWorking MSC
IWU	InterWorking Unit

K

K	Constraint Length of the Convolutional Code
Kc	Ciphering Key
Ki	Individual subscriber authentication key

L

L1	Layer 1
L2ML	Layer 2 Management Link
L2R	Layer 2 Relay
L2R BOP	L2R Bit Orientated Protocol
L2R COP	L2R Character Orientated Protocol
L3	Layer 3
LA	Location Area
LAC	Location Area Code
LAI	Location Area Identity
LAN	Local Area Network
LAPB	Link Access Protocol Balanced
LAPDm	Link Access Protocol on the Dm channel
LCN	Local Communication Network
LE	Local Exchange
LI	- Length Indicator - Line Identity
LLc	Low Layer Compatibility
Lm	Traffic channel with capacity lower than Bm

LMSI	Local Mobile Station Identity
LPLMN	Local PLMN
LR	Location Register
LSTR	Listener Sidetone Rating
LTE	Local Terminal Emulator
LV	Length and Value
M	
MA	Mobile Allocation
MAC	Medium Access Control (GPRS)
MACN	Mobile Allocation Channel Number
MAF	Mobile Additional Function
MAH	Mobile Access Hunting supplementary service
MAI	Mobile Allocation Index
MAIO	Mobile Allocation Index Offset
MAP	Mobile Application Part
MCC	Mobile Country Code
MCI	Malicious Call Identification supplementary service
MCS	Modulation and Coding Scheme
MD	Mediation Device
MDL	(mobile) Management (entity) - Data Link (layer)
ME	- Maintenance Entity - Mobile Equipment
MEF	Maintenance Entity Function
MF	MultiFrame
MHS	Message Handling System
MIC	Mobile Interface Controller
MM	- Man Machine - Mobility Management
MME	Mobile Management Entity
MMI	Man Machine Interface
MNC	Mobile Network Code
MO	Mobile Originated
MoU	Memorandum of Understanding
MPH	(mobile) Management (entity) - PHysical (layer) [primitive]
MPTY	MultiParTY supplementary service
MRP	Mouth Reference Point
MS	Mobile Station

MS_PWR_CLASS	MS PoWeR Class. Parameter defining the power class of an MS expressed in the same way as the R parameters
MS_RANGE_MAX	Mobile Station Range Maximum. Handover criterion to determine serving cell
MS_RXLEV_L	Lower Receive Level. Threshold of RXLEV received from the serving BS below which either power control or handover must take place to improve the cell quality
MS_TXPWR_CONF MS	Transmitted RF Power Confirmation. Parameter sent by the MS to indicate its current transmitted RF power level
MS_TXPWR_MAX_CCH	Maximum Allowed Transmitted RF Power for MSs to Access the System until commanded otherwise
MS_TXPWR_REQUEST	MS Transmitted RF Power Request. Parameter sent by the BSS that commands the required MS RF Power Level
MSC	Mobile-services Switching Centre, Mobile Switching Centre
MSCM	Mobile Station Class Mark
MSCU	Mobile Station Control Unit
MSISDN	Mobile Station ISDN Number
MSRN	Mobile Station Roaming Number
MT	- Mobile Terminated
MT (0,1,2)	- Mobile Termination
MTM	Mobile-To-Mobile (call)
MTP	Message Transfer Part
MUMS	Multi User Mobile Station

N

N/W	Network
NB	Normal Burst
NBIN	A parameter in the hopping sequence
NC0, NC1, NC2	NETWORK_CONTROL_ORDER options defining the measurement reports provided by the mobile and its cell re-selection
NCC	Network (PLMN) Colour Code
NCELL	Neighbouring (or current serving) Cell
NDC	National Destination Code
NDUB	Network Determined User Busy
NE	Network Element
NEF	Network Element Function
NET	Norme Européenne des Télécommunications
NF	Network Function
NIC	Network Independent Clocking
NM	Network Management
NMC	Network Management Centre

NMSI	National Mobile Station Identification number
NPI	Number Plan Identifier
NSAP	Network Service Access Point
NSAPI	Network layer Service Access Point Identifier
NT	- Network Termination - Non Transparent
NUA	Network User Access
NUI	Network User Identification
NUP	National User Part (of signalling system No7)
O	
O	Optional
OA	Outgoing Access (CUG SS)
O&M	Operations & Maintenance
OACSU	Off-Air-Call-Set-Up
OCB	Outgoing Calls Barred within the CUG
OD	Optional for operators to implement for their aim
OLR	Overall Loudness Rating
OMC	Operations & Maintenance Centre
OML	Operations and Maintenance Link
OS	Operating System
OSI	Open System Interconnection
OSI RM	OSI Reference Model
P	
PABX	Private Automatic Branch eXchange
PAD	Packet Assembly/Disassembly facility
PAGING_GROUP	The set of MSs monitoring a particular paging block
PCH	Paging CHannel
PCM	Pulse Code Modulation
PD	- Protocol Discriminator - Public Data
PDN	Public Data Networks
PH	- Packet Handler - PHysical (layer)
PHI	Packet Handler Interface
PI	Presentation Indicator
PIN	Personal Identification Number

PLMN_PERMITTED	PLMN Permitted for handover purposes
PLMN	Public Land Mobile Network
PNE	Présentation des Normes Européennes
POI	Point Of Interconnection (with PSTN)
PP	Point-to-Point
PPE	Primitive Procedure Entity
Pref CUG	Preferential CUG
Ps	Location Probability
PSPDN	Packet Switched Public Data Network
PSTN	Public Switched Telephone Network
PW	Pass Word
Q	
QA	Q (Interface) - Adapter
QAF	Q - Adapter Function
QoS	Quality Of Service
R	
[R]	Value of Reduction of the MS Transmitted RF Power relative to the maximum allowed output power of the highest power class of MS (A)
RA	RANdom mode request information field
RAB	RANdom Access Burst
RACH	RANdom Access CHannel
RADIO_LINK_TIMEOUT	The timeout period for radio link failure. Maximum value of the radio link timer
RADIO_LINK_TIMER	Parameter which is incremented or decremented according to the success with which SACCH messages are decoded
RAND	RANdOm Number (used for authentication)
RBER	Residual Bit Error Ratio
REC	RECommendation
REJ	RejEct(ion)
REL	RELease
REQ	REQuest
RESELECT_INTERVAL_MIN	Minimum time between cell reselections
RFC	Radio Frequency Channel
RFCH	Radio Frequency CHannel
RFN	Reduced TDMA Frame Number
RLC	Radio Link Control (GPRS)
RLP	Radio Link Protocol

RLR	Receiver Loudness Rating
RMS	Root Mean Square (value)
RNTABLE	Table of 128 integers in the hopping sequence
RPOA	Recognised Private Operating Agency
RR	Radio Resource
RSE	Radio System Entity
RSL	Radio Signalling Link
RTE	Remote Terminal Emulator
RXLEV	Received Signal Level
RXLEV_ACCESS_MIN	The minimum received signal level at a MS for access to a cell
RXLEV_MIN	The minimum received signal level at a MS from a neighbouring cell for handover to be permitted
RXLEV_NCELL	Received signal level of neighbouring or current serving cell measured on the BCCH carrier
RXLEV_SERVING_CELL	Received signal level in the serving cell measured on the BCCH carrier
RXQUAL	Received Signal Quality
RXQUAL_FULL	Received signal quality assessed over the full set of TDMA frames within a SACCH block
RXQUAL_SERVING_CELL	Received signal quality of serving cell
RXQUAL_SUB	Received signal quality assessed over a subset of 12 TDMA frames

S

S/W	SoftWare
SABM	Set Asynchronous Balanced Mode
SACCH	Slow Associated Control CHannel
SACCH/C4	Slow, SDCCH/4 Associated, Control CHannel
SACCH/C8	Slow, SDCCH/8 Associated, Control CHannel
SACCH/T	Slow, TCH-Associated, Control CHannel
SACCH/TF	Slow, TCH/F-Associated, Control CHannel
SACCH/TH	Slow, TCH/H-associated, Control CHannel
SAP	Service Access Point
SAPI	Service Access Point Indicator/Identifier
SB	Synchronization Burst
SC	- Service Centre (used for SMS) - Service Code
SCCP	Signalling Connection Control Part
SCH	Synchronization CHannel
SCN	Sub-Channel Number

SDCCH	Stand-alone Dedicated Control CHannel
SDCCH/4	Stand-alone Dedicated Control CHannel/4
SDCCH/8	Stand-alone Dedicated Control CHannel/8
SDL	Specification Description Language
SDU	Service Data Unit
SE	Support Entity
SEF	Support Entity Function
SFH	Slow Frequency Hopping
SI	- Screening Indicator - Service Interworking - Supplementary Information (SIA Supplementary Information A)
SID	Silence Descriptor
SIM	Subscriber Identity Module
SLR	Send Loudness Rating
SLTM	Signalling Link Test Message
SME	Short Message Entity
SMS	Short Message Service
SMSCB	Short Message Service Cell Broadcast
SMS-SC	Short Message Service - Service Centre
SMS/PP	Short Message Service / Point-to-Point
Smt	Short message terminal
SN	Subscriber Number
SNDCP	Subnetwork Dependent Convergence Protocol
SNR	Serial Number
SOA	Suppress Outgoing Access
SP	- Service Provider - Signalling Point - Spare
SPC	Signalling Point Code
SPC	Suppress Preferential (CUG)
SRES	Signed RESponse (authentication)
SS	- Supplementary Service - System Simulator
SSC	Supplementary Service Control string
SSN	Sub-System Number
SS7/SS#7	Signalling System No 7
STMR	Sidetone Masking Rating
STP	Signalling Transfer Point

T

T	- Timer
	- Transparent
	- Type only
TA	Terminal Adapter
TAC	Type Approval Code
TAF	Terminal Adaptation Function
TBF	Temporary Block Flow
TC	Transaction Capabilities
TCH	Traffic CHannel
TCH/F	A Full-rate TCH
TCH/F2.4	A Full-rate data TCH (< 2.4kbit/s)
TCH/F4.8	A Full-rate data TCH (4.8kbit/s)
TCH/F9.6	A Full-rate data TCH (9.6kbit/s)
TCH/FS	A Full-rate Speech TCH
TCH/H	A Half-rate TCH
TCH/H2.4	A Half-rate data TCH (2.4kbit/s)
TCH/H4.8	A Half-rate data TCH (4.8kbit/s)
TCH/HS	A Half-rate Speech TCH
TCI	Transceiver Control Interface
TDMA	Time Division Multiple Access
TE	Terminal Equipment
Tei	Terminal endpoint identifier
TFA	Transfer Allowed
TFI	Temporary Flow Identity
TFP	Transfer Prohibited
TI	Transaction Identifier
TLV	Type, Length and Value
TMN	Telecommunications Management Network
TMSI	Temporary Mobile Subscriber Identity
TN	Timeslot Number
TON	Type Of Number
TRX	Transceiver
TS	- Time Slot
	- Technical Specification (see ETS)
	- Teleservice
TSC	Training Sequence Code
TSDI	Transceiver Speech & Data Interface

TUP	Telephone User Part (of signalling system No7)
TV	Type and Value
TXPWR	Transmit power; Tx power level in the MS_TXPWR_REQUEST and MS_TXPWR_CONF parameters

U

UDI	Unrestricted Digital Information
UDUB	User Determined User Busy
UI	Unnumbered Information (Frame)
UL	Uplink (mobile to base station)
UPCMI	Uniform PCM Interface (13-bit)
UPD	Up to Date
USSD	Unstructured SS Data
UUS	User-to-User Signalling supplementary service

V

V	Value only
VAD	Voice Activity Detection
VAP	Videotex Access Point
VLR	Visitor Location Register
VMSC	Visited MSC, (recommendation not to be used)
VPLMN	Visited PLMN
VSC	Videotex Service Centre
V(SD)	SenD state Variable
VTX host	The components dedicated to Videotex service

W

WS	Work Station
WPA	Wrong Password Attempts (counter)

X

XID	eXchange IDentifier
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9 Messages

This chapter describes the messages shown during database maintenance procedures. Some of the choice list dialogs do not appear during measurement, they are only shown during manual database manipulations. Those messages are written to the file *Ctol_Reports.txt* in the *TestFile* subdirectory of the main directory.

Message Dialogs

- *DB Init: Database Init OK:* A database has been successfully loaded.
- *DB Init: Init Failed:* The database could not be loaded. See the accompanying choice list dialog for details.
- *DB Init: Transmitter Scan is nonlinear:* There are several Transmitter Scan values out of the allowed deviation. See the accompanying choice list dialog for details.

The other Message Dialogs are self explanatory.

Choice List Dialogs

Message #1

Info

Unexpected network type
Database: DCS1800
BTS_INFO frame: GSM

Abort

Reason: A database was loaded which contains a network type different from the one chosen in the *network* field in the *DB Settings/Query* dialog.

Effect: The new database was not loaded.

Message #2

Info

Missing DLL
No DLL GSS_K6_Import_... is available in the path

Abort

Reason: If the user takes the opportunity to write a dynamical linked library (DLL) to define the loading of a network operator file of its own format (see chapter 5) this DLL must be in the main directory or in a directory being in the path so that automatic loading is possible.

Effect: The database is not created or updated.

Message #3**Info****Skip sector <nr> (name)****Abort****Suppress this message for the next sectors****OK**

Reason: If the user takes the opportunity to write a dynamical linked library (DLL) to define the loading of a network operator file of its own format (see chapter 5) and has defined a situation where loading yields the return value SKIP_SECTOR this message appears, showing the sector number <nr> and, if defined, the sector name.

Effect: Abort selected: The database remains unchanged
 Suppress this message for the next sectors: During loading of the ASCII file, this message is not shown anymore on screen. Instead, all subsequent messages are written into the file *Dummy.chl* in the subdirectory *TestFiles*.

OK selected: This sector is not loaded, but the program continues loading the next sector.

Message #4**Format error****Wrong BCC****At value: 8****In line 33****BTS1 | 22.33454 | 44.5666 | 8 | 120 | 34 | 77****Abort**

Reason: Format error was found in ASCII text.

Effect: The database remains unchanged.

Remarks: The error is specified in more detail by the name (here BCC), the value (here 8), the line number in the text file (here 33, where caption line is line number 0) and the contents of the complete line.

Message #5**Info****Line buffer too small while reading antenna type list****Abort**

Reason: The length of one line in the antenna type list text file exceeds 256 bytes.

Effect: The database remains unchanged.

Remarks: The end-of-line character is Line Feed (= 0x0A)

Message #6**Info****More than 3 sectors at one position with the same clock code.****Ok**

Reason: The database can handle up to 3 synchronized sectors at one position. If more than 3 sectors at one position share the same clock code, the PCSD will try to separate the sectors by their name. If that is not possible a message occurs.

Effect: The database remains unchanged.

Message #7

Info

Skip invalid position value:

34.5566 -> 34.5578

11.2345 -> 11.4345

22.2 km (distance) > 0.6 km (max. range)

Ok

All

Reason: Before processing any Transmitter Scan data the system checks whether a valid position value was obtained during the last 3 evaluated seconds. A position value is valid if it lies inside a circle of radius $r = 100 \text{ m} + 120 \text{ km/h} * (t - t_1)$ around the position measured at time t_1 . Message no. 10 indicates that an invalid position value was detected.

Effect: OK selected: The indicated position value will be skipped.
 All selected: The indicated position value and all subsequent invalid position values will be skipped.

Remarks: Parameters displayed: position measured at time t_1 (here: 34.5566, 11.2345)
 invalid position at time t (here: 34.5578, 11.4345)
 distance between the position values (here: 22.2 km)
 allowed distance (here: 0.6 km)

Message #8

Info

Measurement not related to database.

Ok

Reason: No Transmitter Scan was assigned to a BTS in the database.

Effect: The database remains unchanged.

Remarks: Possible reasons
 1) The GPS was not working properly during the Transmitter Scan. In this case no position data for the Transmitter Scan are found and an assignment to a BTS is not possible
 2) The Transmitter Scan was performed in an area for which no BTSs are available in the database
 3) The network has been provided with a new channel configuration, but the database has not been updated with this new configuration.
 4) If there is a finite reset probability per month for a BTS, the total reset probability might be above a threshold where an assignment is still reasonable. In this case, a new database should be created.

Message #9

Info

Drift time evaluation failed.

Abort

Reason: There is not enough input data to calculate the time drift of the ESVD. This might e.g. occur, if the number of Transmitter Scan data with strong drift is larger than 5%.

Effect: The database remains unchanged.

Message #10

Info
1.10% measurements out of time range
Abort
Discard wrong values and continue

Reason: There are two reasons for obtaining values out of time range
 1) The ESVD time drift is not constant. This may occur if the ESVD was cold in the beginning of the measurement or strong temperature changes occurred.
 2) One or more base stations transmit signals with a time stability out of specification (0.05 ppm)

Effect: Discard the wrong values or interrupt the update process without changing the database

Remarks: To evaluate the time drift of the ESVD against the network a group of Transmitter Scan values is used and the time drift is evaluated by means of linear approximation. It is assumed that the time drift of the ESVD is constant and the time drift of the used BTS signals is smaller than 0.05 ppm. If the time drift has been evaluated, all completed measurements will be checked to test the validity of the assumption.

Message #11

Info
Start time evaluation failed.
Ok

Reason: Synchronization between previous Transmitter Scans and the new one failed.

Effect: The database remains unchanged.

Remarks: No common BTSs were found or the reset probability for the BTSs found was too high.

Message #12

Example 1 Different timing for one base station:

BTS_A1 [25: 7]
[C0:BCC] Probability T51(TS)/us Distance/km Power/dBm
[25: 7] 99.7% 011234 3.5 -77
[25: 7] 98.4% 123567 4.7 -88
Do not use 1st measurement.
Do not use 2nd measurement.
Do not use either measurement.

BTS_A1 [25: 7]	BTS name [C0: BCC]
[C0:BCC]	Channel and BCC of measurement value
Probability	Probability that the measurement belongs to the given BTS
T ₅₁ (TS)/us	Synchronization time of the T ₅₁ frame within the Transmitter Scan. <i>Note: This time (TS) is not the time in the database because the start time of the Transmitter Scan file was not evaluated while this message was produced.</i>
Distance/km	Distance of measurement to the BTS
Power/dBm	Received power in Transmitter Scan

Example 2 Different timing for one base station:

```

BTS_B1 [27: 7 ]
BTS_B2 [33: 7 ]
BTS_B3 [49: 3 ]
[ C0:BCC] Probability T51(dB)/us Distance/km Power/dBm
[ 33: 7 ] 99.3% 055534 3.5 -61
[ 49: 3 ] 97.4% 177777 4.7 -85
    
```

**Do not use 1st measurement.
 Do not use 2nd measurement.
 Do not use either measurement.**

BTS_B1 [27: 7] BTS_B2 [33: 7] BTS_B3 [49: 3]	Names of synchronized sectors and [C0: BCC] information.
[C0:BCC]	Channel and BCC of measurement value
Probability	Probability that the measurement belongs to the given BTS (one of the sectors)
T ₅₁ (dB)/us	Synchronization time of the T ₅₁ frame within the Transmitter Scan. <i>Note: This time (dB) is the time in the database because the start time of the Transmitter Scan file was evaluated before this message was produced.</i>
Distance/km	Distance of measurement to the BTS
Power/dBm	Received power in Transmitter Scan

- Reason:
- 1) The BTS list is not complete or the C0 channel number or BCC value has been changed.
 - 2) During the Transmitter Scan a signal from BTS A [C0, BCC] was received next to BTS B. The power of the signal was high with respect to the distance to BTS A and C0, BCC is reused for BTS B. In this case the evaluated probability value that the received signal belongs to BTS B was higher than 95%. At another location next to BTS B the signal of BTS B was received. So there are two measurements for BTS B.
 - 3) If 2 or 3 sectors are given and the measurements have been performed on different channels (as in example 2) the clock code setting for this BTS may be wrong. In this case the given sectors have the same clock code and the PCSD is forced to assign the same synchronization time to each sector. If the sectors are not synchronized, then this message is displayed.

Effect: Either the first, the second or both measurements can be discarded.

Remarks: To assign a Transmitter Scan value to a BTS the probability that the measurement belongs to the BTS is calculated and assessed. The assignment is made if this probability exceeds 95%. In the case that two measurements with different synchronization times for the T₅₁ frames belong to the same BTS with a probability greater than 95%, message no. 13 will appear.

Message #13**Example 1 Difficult assignment:**

TS from: 06.22.97 15.30.07 P =-88 dBm T51 = 098840

Sector name	p(P)	p(P, T51)	d/km	T51/us
BTS_A1	98.0%	1.5%	3.7	123456
BTS_B2	2.0%	98.5%	17.8	098883

Use first assignment

Do not use first assignment

Example 2 Difficult assignment:

TS from: 06.22.97 15.30.07 P =-69 dBm T51 = 05789

Sector name	p(P)	p(P, T51)	d/km	T51/us
BTS_A1	98.0%	3.5%	3.7	123456
BTS_B2	2.0%	96.5%	19.5	-----

Use first assignment

Do not use first assignment

TS from: 06.22.97 15.30.07	Date and time of the measurement
P = -88 dBm	Measured power
T ₅₁ = 098840	Measured synchronization time for T ₅₁ frame
Sector name	Name of the sector of both BTSs the measurement may belong to
p(P)	Probability of received power
p(P, T ₅₁)	Probability of received power and T ₅₁ synchronization time
d/km	Distance from the measurement position to the location of BTS
T ₅₁ /us	Last synchronization time value assigned to the BTS

Reason: In both examples, the first given BTS has the higher power probability, whereas the second has the higher probability with respect to power **and** time.

In example 1 it is highly probable that the measurement belongs to the BTS_B2 due to the matching of the old and new measured T₅₁ time.

In example 2 the new measured T₅₁ value does not match the value in the database for BTS_A1. For the BTS_B2 no previous synchronization time measurement exists. This is why the probability p(P, T51) for BTS_B2 is higher than for BTS_A1.

Effect: Example 1: <Do not use first assignment> may be a good choice

Example 2: If it is positively known that BTS_A1 was hit by a reset between the last and the new Transmitter Scan, or if it is not probable that the signal from BTS_B2 was received with a power of -67 dBm at a distance of 19.5 km, then it may be the right choice to assign the measurement value to BTS_A1 by selecting <Use first assignment>.

Remarks: To assign a Transmitter Scan to a BTS, two probabilities p(P) and p(P, T51) will be evaluated if some BTSs already have synchronization time values obtained from other measurements in the same Transmitter Scan file or other measurements in the database.

The probability p(P) takes into account the received power and position of the measurement and location, transmitted power, antenna type and direction for all the BTSs listed in the database which match the C0 and BCC of the Transmitter Scan.

For the probability p(P, T51) will be used in addition to the measured synchronization time of the T₅₁ frame and the probability function for this synchronization time for each BTS which depend on the existence of a previous T₅₁ measurement, the age of this measurement, the drift of the BTS and the reset probability. In case that p(P) and p(P, T₅₁) contradict each other, message no. 13 will be produced.

Message #14

Info

... sectors were discarded in the validation of its values

Ok

Reason: After reading a base station list, the program checks, whether the entries are consistent (e.g. channel 150 does not denote a valid channel). If the data are not consistent, a message appears in the *K6 Message View* window for each sector containing such inconsistent data.

Effect: These sectors are not included in the database.

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