Application Note

TD-SCDMA Measurement Software

MT8820B
Radio Communication Analyzer

Contents

1. TD-SCDMA Measurement Software

1.1. Specifications

Table1.1-1 TD-SCDMA Measurement Software Specifications

Measurement Item	Specifications
Modulation Analysis	Frequency: 300 to 2700 MHz Input level: −30 to +35 dBm(Main) Carrier frequency accuracy: ±(Setting frequency × Reference oscillator accuracy + 10 Hz) Modulation accuracy (residual vector error): ≤ 2.5% (when Single Code is input)
RF Power	Frequency: 300 to 2700 MHz Input level: −70 to +35 dBm(Main) Measurement accuracy: ±0.5 dB(−25 to +35 dBm), ±0.7 dB(−55 to −25 dBm), ±0.9 dB(−70 to −55 dBm), after calibration Linearity: ±0.2 dB(0 to −40 dB, ≥ −55 dBm), ±0.4 dB(0 to −40 dB, ≥ −65 dBm) Measurement object: DPCH, UpPCH
Occupied bandwidth	Frequency: 300 to 2700 MHz Input level: −10 to +35 dBm(Main)
Adjacent channel Leakage power	Frequency: 300 to 2700 MHz Input level: −10 to +35 dBm(Main) Measurement point: ±1.6 MHz, ±3.2 MHz Measurement range: ≥ 50 dB(± 1.6 MHz), ≥ 55 dB(± 3.2MHz)
RF signal generator	Output frequency: 300 to 2700 MHz (1Hz step) Channel level(DPCH): −30.0 to 0.0 dB[0.1 dB step, level relative to the total level (Ior)] Channel level accuracy: ±0.2 dB(level accuracy relative to Ior) AWGN level: Off, −20 to +5 dB(0.1 dB step) AWGN level accuracy: ±0.2 dB(level accuracy relative to Ior)
Error rate measurement	Function: Applying PN9 or PN15 pattern to DTCH Measurement item: BER, BLER BER measurement object: Loop Back data applied to uplink DTCH BLER measurement object: Loop Back data applied to uplink DTCH
Call processing	Call control: Location registration, call origination, call termination, handover, network-side release, UE-side release (Execution of the operation conforming to the 3GPP standard and pass/fail judgment can be performed) UE control: Output level, loopback (UE control conforming to the 3GPP standard can be performed)

Table 1.1-2 TD-SCDMA HSDPA Measurement Software Option Specifications

Measurement Item	Specifications
Throughput measurement	Function: Transferring HS-SCCH and HS-PDSCH according to fixed reference channel Measurement item: BLER, Throughput Measurement object: ACK and NACK applied to HS-SICH
CQI measurement	Measurement object: Periodically reported CQI value applied to HS-SICH
Call processing	Call control: Location registration, Fixed reference channel (Execution of the operation conforming to the 3GPP standard and pass/fail judgment can be performed) UE control: Output level (UE control conforming to the 3GPP standard can be performed)

Table 1.1-3 TD-SCDMA HSUPA Measurement Software Option Specifications

Measurement Item	Specifications
Call processing	Call control: Location registration, FRC1, FRC2 (Execution of the operation conforming to the 3GPP standard and pass/fail judgment can be performed) UE control: Output level (UE control conforming to the 3GPP standard can be performed)

1.2. 3GPP Measurement Specification (3GPP TS 34.122 V8.2.0) Table

	Item	Comment	
5	**Transmitter Characteristics**		
5.2	User Equipment maximum output power		√√
5.3	UE frequency stability		√√
5.4	**Output Power Dynamics**		
5.4.1.3	Open loop power control		√√
5.4.1.4	Closed loop power control		√√
5.4.2	Minimum output power		√√
5.4.3	Transmit OFF power		√√
5.4.4	Transmit ON/OFF Time mask		√√
5.4.5	Out-of-synchronisation handling of output power for continuous transmission		√√
5.4.6	Out-of-synchronisation handling of output power for discontinuous transmission		√√
5.5	**Output RF spectrum emissions**		
5.5.1	Occupied bandwidth		√√
5.5.2	Out of band emission		
5.5.2.1	Spectrum emission mask		√√
5.5.2.2	Adjacent Channel Leakage power Ratio (ACLR)		√√
5.5.3	Spurious Emissions	Requires SPA	√
5.6	Transmit Intermodulation	Requires SG and SPA	√
5.7	**Transmit Modulation**		
5.7.1	Error Vector Magnitude		√√
5.7.1A	Error Vector Magnitude with E-DCH 16QAM	MX882007C-021	√√
5.7.2	Peak code domain error		√√
6	**Receiver Characteristics**		
6.2	Reference sensitivity level		√√
6.3	Maximum Input Level		√√
6.3A	Maximum Input Level for HS-PDSCH Reception (16QAM)	MX882007C-011	√√
6.4	Adjacent Channel Selectivity (ACS)	Requires SG	√
6.5	Blocking Characteristics	Requires SG	√
6.6	Spurious Response	Requires SG	√
6.7	Intermodulation Characteristics	Requires SG	√
6.8	Spurious Emissions	Requires SPA	√
7	**Performance Requirements**		
7.2	Demodulation in static propagation conditions	Support 12.2kbps only	√√
7.5	Power control in downlink	Requires Fading Simulator	√
9	**Performance requirements for HSDPA**		
9.3	Performance **Requirements** for 1.28 Mcps TDD option		
9.3.1	HS-DSCH Throughput for Fixed Reference Channels	MX882007C-011 Requires Fading Simulator	√
9.3.2	HS-DSCH Throughput for Variable Reference Channels	MX882007C-011 Requires Fading Simulator	√
9.3.3	Reporting of HS-DSCH Channel Quality Indicator	MX882007C-011 Requires Fading Simulator	√
9.3.4	HS-SCCH Detection Performance	MX882007C-011 Requires Fading Simulator	√
11	**Performance Requirement (E-DCH)**		
11.1	Detection of E-DCH HARQ ACK Indicator Channel (E-HICH)	MX882007C-021 Requires Fading Simulator	√
11.2	Demodulation of E-DCH Absolute Grant Channel (E-AGCH)	MX882007C-021 Requires Fading Simulator	√

√√: Support | √: Requires external equipment (SPA or SG) | F: Future Support | –: Not Support

1.3. TRX Measurement (Fundamental Measurement)

Hereafter, control software is presupposed created by GPIB. See operation manual for details of GPIB commands and manual operations. GPIB commands are written in red. UE power class is presupposed 2.

1.3.1. Test Loop Mode Connection (Single Code)

Measurement is performed by connecting to Test Loop Mode1. The connection procedures are below. Start from step 4 when location registration is already executed.

1. Execute **PRESET** to set default parameter.
2. Turn on UE power.
3. Execute **CALLSTAT?** and wait until the response becomes 2(=Idle(Regist)).
4. Execute **CALLSA** to connect to Test Loop Mode1.
5. Execute **CALLSTAT?** and wait until the response becomes 7(=Test Loop Mode).

Call Status can be confirmed using CALLSTATIC?.
The confirmation procedures using **CALLSTATIC?** are below.

1. Execute **PRESET** to set default parameter.
2. Turn on UE power.
3. Execute **CALLSTATIC?** to confirm Call Status. When Call Status will be 2(=Idle(Regist)), the response will be returned.
4. Execute **CALLSA** to connect to Test Loop Mode1.
5. Execute **CALLSTATIC?** to confirm Call Status. When Call Status will be 7(=Test Loop Mode), the response will be returned.

1.3.2. Test Loop Mode Disconnection

1. Execute **CALLSO** to disconnect from Test Loop Mode1.
2. Execute **CALLSTAT?** and wait until the response becomes 2(=Idle(Regist)).

The confirmation procedures using **CALLSTATIC?** are below.

1. Execute **CALLSO** to disconnect from Test Loop Mode1.
2. Execute **CALLSTATIC?** to confirm Call Status. When Call Status will be 2(=Idle(Regist)), the response will be returned.

1.3.3. Switching Channel Coding during Connection

Channel Coding can be switched during Connection. The switching procedures are below.

1. Connect to Test Loop Mode1.
2. Execute **CHCODING RMC_SINGLE** to set Channel Coding to RMC (Single Code).
3. Execute TRX measurement.
4. Execute **CHCODING RMC_MULTI** to set Channel Coding to RMC (Multi Code).
5. Execute TRX measurement.

1.3.4. Channel Switching by Handover

Measurement is normally performed at three frequency points (L, M and H). Channel can be switched quickly without reconnection by changing it at handover. Output Level must be set higher to avoid failing handover. Also, the GPIB commands, which transmitted during handover, stand by until the handover ends.

1. Execute TRX measurement at L channel.
2. Execute **CHAN 10087** to handover to M channel.
3. Execute TRX measurement.
4. Execute **CHAN 10121** to handover to H channel.
5. Execute TRX measurement.

1.3.5. Switching Channel and Channel Coding (Single Code/Multi Code) by Handover

Measurement is normally performed at three frequency points (L, M and H) and Channel Coding (Single Code or Multi Code). Channel and Channel Coding can be switched quickly without reconnection by changing it at handover. Output Level must be set higher to avoid failing handover. Also, the GPIB commands, which transmitted during handover, stand by until the handover ends.

1. Execute **HO 10053, RMC_SINGLE** to handover to L channel and Single Code.
2. Execute TRX measurement.
3. Execute **HO 10053, RMC_MULTI** to handover to L channel and Multi Code.
4. Execute TRX measurement.
5. Execute **HO 10087, RMC_SINGLE** to handover to M channel and Single Code.
6. Execute TRX measurement.
7. Execute **HO 10087, RMC_MULTI** to handover to M channel and Multi Code.
8. Execute TRX measurement.
9. Execute **HO 10121, RMC_SINGLE** to handover to H channel and Single Code.
10. Execute TRX measurement.
11. Execute **HO 10121, RMC_MULTI** to handover to H channel and Multi Code.
12. Execute TRX measurement.

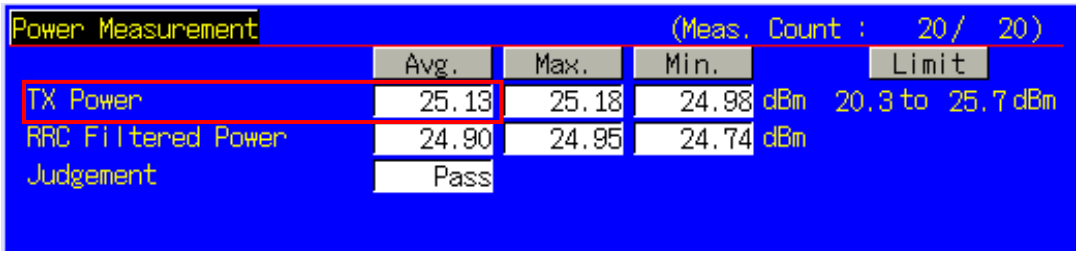
1.3.6. Test Item Selection

All measurement items are turned on in the default setting of MT8820B. In order to reduce measurement time, unnecessary items, such as BER and BLER measurements, should be turned off (**BER_MEAS OFF**, **BLER_MEAS OFF**) before measurement.

All measurement items can be turned off when setting **ALLMEASITEMS_OFF**.

1.3.7. 5.2 User Equipment maximum output power

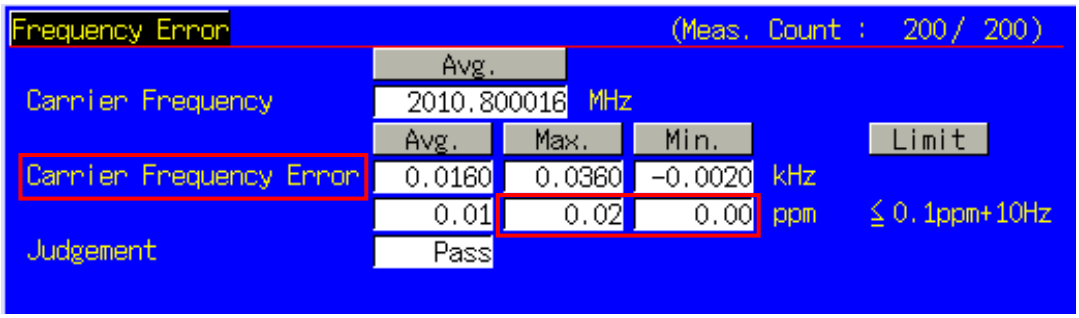
1. Connect to Test Loop Mode1.
2. Execute **CHCODING RMC_SINGLE** to set Channel Coding to RMC (Single Code).
3. Execute **TESTPRM CALL_MAXPWR** to set Test Parameter to Call – Maximum Output Power.
4. Wait until UE power reaches the maximum.
5. Execute **PWR_AVG 20** to set the average count of power measurement at 20 times.
6. Execute **SWP** to perform power measurement.
7. Execute **AVG_POWER?** to read the power measurement result.
8. Check the measurement result is +24 dBm(+1.7 dB/-3.7 dB).
9. Execute **CHCODING RMC_MULTI** to set Channel Coding to RMC (Multi Code).
10. Execute **SWP** to perform power measurement.
11. Execute **AVG_POWER?** to read power measurement result.
12. Check the measurement result is +21 dBm(+1.7 dB/-3.7 dB).



TX Power corresponds to Mean Power (2MHz band).

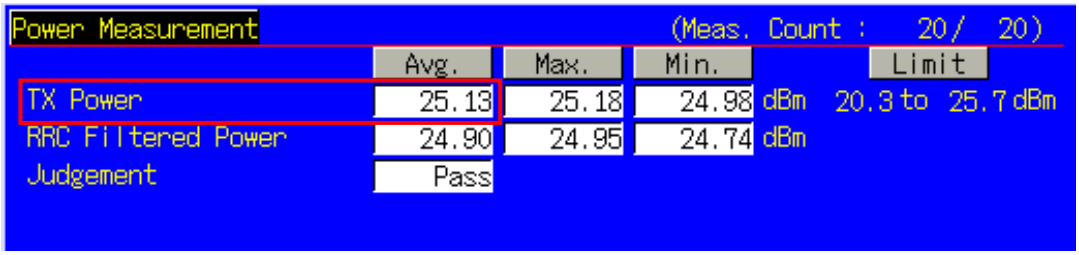
1.3.8. 5.3 UE frequency stability

1. Connect to Test Loop Mode1.
2. Execute **CHCODING RMC_SINGLE** to set Channel Coding to RMC (Single Code).
3. Execute **TESTPRM CALL_BERSENS** to set Test Parameter to Call – BER (Reference Sensitivity Level).
4. Wait until UE power reaches the maximum.
5. Execute **FREQ_AVG 200** to set the average count of Frequency measurement at 200 times.
6. Execute **SWP** to perform Frequency measurement.
7. Execute **MAXABS_CARRFERR? PPM** to read Frequency Error measurement result.
8. Check the measurement result is lower than (0.1 ppm + 10 Hz).



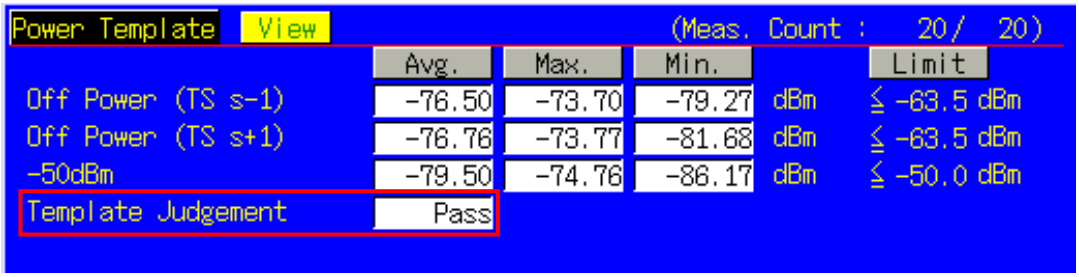
1.3.9. 5.4.2 Minimum output power

1. Connect to Test Loop Mode1.
2. Execute **CHCODING RMC_SINGLE** to set Channel Coding to RMC (Single Code).
3. Execute **TESTPRM CALL_MINPWR** to set Test Parameter to Call – Minimum Output Power.
4. Wait until UE power reaches the minimum.
5. Execute **PWR_AVG 20** to set the average count of power measurement at 20 times.
6. Execute **SWP** to perform Power measurement.
7. Execute **AVG_POWER?** to read the measurement result.
8. Check the measurement result is lower than -48 dBm.



1.3.10. 5.4.3 Transmit OFF power, 5.4.4 Transmit ON/OFF Time mask

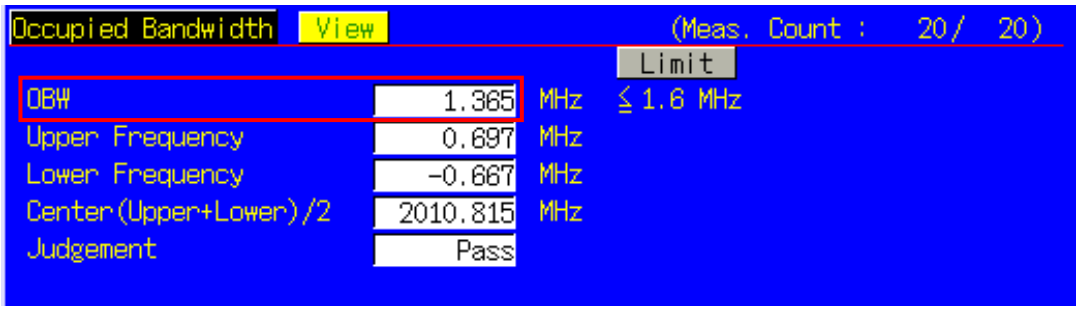
1. Connect to Test Loop Mode1.
2. Execute **CHCODING RMC_SINGLE** to set Channel Coding to RMC (Single Code).
3. Execute **TESTPRM CALL_OFFPWR** to set Test Parameter to Call – Off Power.
4. Wait until UE power reaches the maximum.
5. Execute **PWRTEMP_AVG 20** to set the average count of Power Template measurement at 20 times.
6. Execute **SWP** to perform Power Template measurement.
7. Execute **POWERPASS?** to read Power Template measurement result.
8. Check the measurement result is PASS.



Transmit OFF Power is measured with lower Input Level to avoid the effect of floor noise. Although the measurement status is Level Over, it does not affect the measurement result.

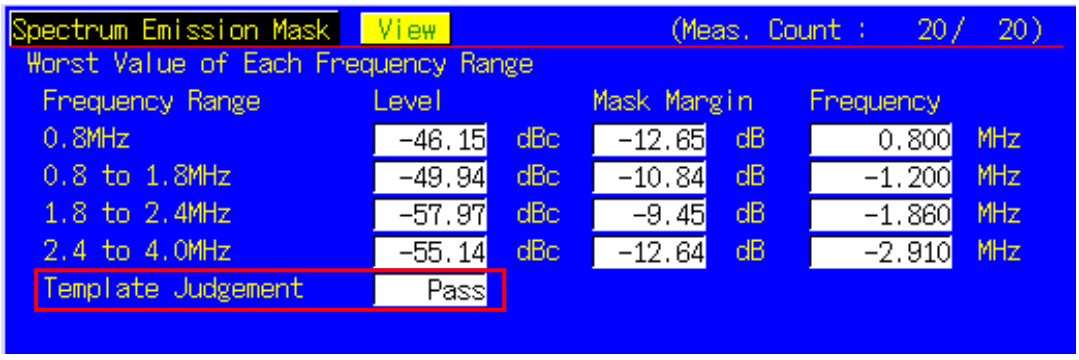
1.3.11. 5.5.1 Occupied bandwidth

1. Connect to Test Loop Mode1.
2. Execute **CHCODING RMC_SINGLE** to set Channel Coding to (Single Code).
3. Execute **TESTPRM CALL_MAXPWR** to set Test Parameter to Call – Maximum Output Power.
4. Wait until UE power reaches the maximum.
5. Execute **OBW_AVG 20** to set the average count of OBW measurement at 20 times.
6. Execute **SWP** to perform OBW measurement.
7. Execute **OBW?** to read OBW measurement result.
8. Check the measurement result is lower than 1.6MHz.



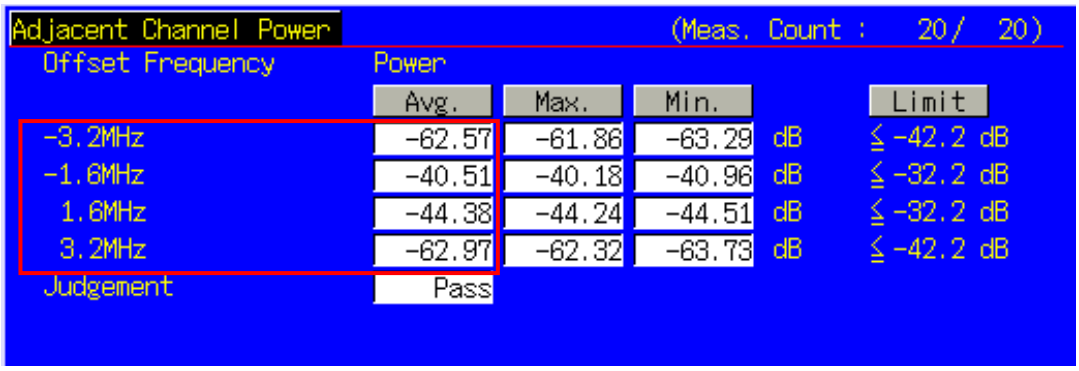
1.3.12. 5.5.2.1 Spectrum emission mask

1. Connect to Test Loop Mode1.
2. Execute **CHCODING RMC_SINGLE** to set Channel Coding to (Single Code).
3. Execute **TESTPRM CALL_MAXPWR** to set Test Parameter to Call – Maximum Output Power.
4. Wait until UE power reaches the maximum.
5. Execute **SMASK_AVG 20** to set the average count of SEM measurement at 20 times.
6. Execute **SWP** to perform SEM measurement.
7. Execute **SMASKPASS?** to read SEM measurement result.
8. Check the measurement result is PASS.



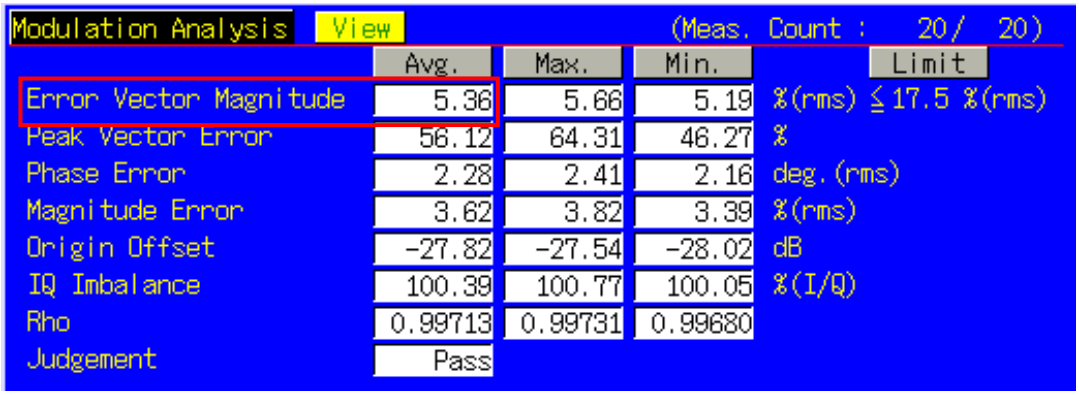
1.3.13. 5.5.2.2 Adjacent Channel Leakage power Ratio (ACLR)

1. Connect to Test Loop Mode1.
2. Execute **CHCODING RMC_SINGLE** to set Channel Coding to (Single Code).
3. Execute **TESTPRM CALL_MAXPWR** to set Test Parameter to Call – Maximum Output Power.
4. Wait until UE power reaches the maximum.
5. Execute **ADJ_AVG 20** to set the average count of ACLR measurement at 20 times.
6. Execute **SWP** to perform ACLR measurement.
7. Execute **AVG_MODPWR? LOW16; AVG_MODPWR? UP16** to read ACLR measurement result.
8. Check the measurement result is lower than -32.2 dB.
9. Execute **AVG_MODPWR? LOW32; AVG_MODPWR? UP32** to read ACLR measurement result.
10. Check the measurement result is lower than -42.2 dB.



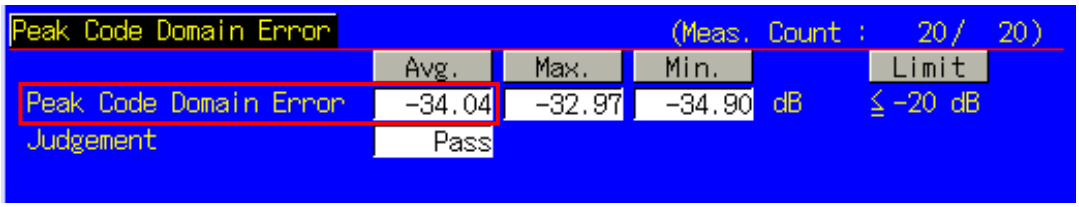
1.3.14. 5.7.1 Error Vector Magnitude

1. Connect to Test Loop Mode1.
2. Execute **CHCODING RMC_SINGLE** to set Channel Coding to (Single Code).
3. Execute **TESTPRM CALL_20DBM** to set Test Parameter to Call – EVM & PCDE@-20 dBm.
4. Wait until UE power reaches -20 dBm.
5. Execute **MOD_AVG 20** to set the average count of Modulation Analysis measurement at 20 times.
6. Execute **SWP** to perform Modulation Analysis measurement.
7. Execute **AVG_EVM?** to read EVM measurement result.
8. Check the measurement result is lower than 17.5%.



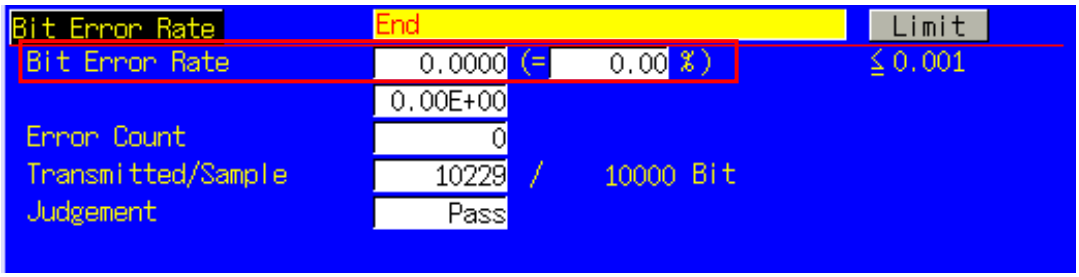
1.3.15. 5.7.2 Peak code domain error

1. Connect to Test Loop Mode1.
2. Execute **CHCODING RMC_MULTI** to set Channel Coding to RMC (Multi Code).
3. Execute **TESTPRM CALL_20DBM** to set Test Parameter to Call – EVM & PCDE@-20 dBm.
4. Wait until UE power reaches -20 dBm.
5. Execute **PCDE_AVG 20** to set the average count of Peak Code Domain Error measurement at 20 times.
6. Execute **SWP** to perform Peak Code Domain Error measurement.
7. Execute **AVG_PCDERR?** to read Peak Code Domain Error measurement result.
8. Check the measurement result is lower than -20 dB.



1.3.16. 6.2 Reference sensitivity level

1. Connect to Test Loop Mode1.
2. Execute **CHCODING RMC_SINGLE** to set Channel Coding to (Single Code).
3. Execute **TESTPRM CALL_BERSENS** to set Test Parameter to Call – BER (Reference Sensitivity Level).
4. Wait until UE power reaches the maximum.
5. Execute **BER_SAMPLE 10000** to set the number of BER measurement samples at 10000 bits.
6. Execute **SWP** to perform BER measurement.
7. Execute **BER?** to read BER measurement result.
8. Check the measurement result is lower than 0.001.



1.3.17. Reduction of measurement time by batch processing

Measuring time can be reduced by measuring same parameter items at once.

[Maximum Output Power, OBW, ACLR, SEM]
1. Connect to Test Loop Mode1.
2. Execute **CHCODING RMC_SINGLE** to set Channel Coding to (Single Code).
3. Execute **ALLMEASITEMS ON,20,ON,20,ON,200,ON,20,ON,20,ON,20,ON,20,ON,20,ON,OFF** to turn on measurements (excluding BLER), to set the average count of Frequency Error measurement at 200 times, to set the average count of other measurements at 20 times.
4. Execute **TESTPRM CALL_MAXPWR** to set Test Parameter to Call – Maximum Output Power.
5. Wait until UE power reaches the maximum.
6. Execute **SWP** to perform measurement.
7. Execute **AVG_POWER?** to read Power measurement result.
8. Execute **OBW?** to read OBW measurement result.
9. Execute **AVG_MODPWR? LOW16; AVG_MODPWR? UP16** to read ACLR measurement result.
10. Execute **AVG_MODPWR? LOW32; AVG_MODPWR? UP32** to read ACLR measurement result.
11. Execute **SMASKPASS?** to read SEM measurement result.

[Frequency Error, BER]
12. Execute **TESTPRM CALL_BERSENS** to set Test Parameter to Call – BER (Reference Sensitivity Level).
13. Execute **BER_SAMPLE 10000** to set the number of BER measurement samples at 10000 bits.
14. Execute **SWP** to perform measurement.
15. Execute **MAXABS_CARRFERR? PPM** to read Frequency Error measurement result.
16. Execute **BER?** to read BER measurement result.

[Transmit ON/OFF Time mask]
17. Execute **TESTPRM CALL_OFFPWR** to set Test Parameter to Call – Off Power.
18. Execute **SWP** to perform measurement.
19. Execute **POWERPASS?** to read Power Template measurement result.

[Minimum Output Power]
20. Execute **TESTPRM CALL_MINPWR** to set Test Parameter to Call – Minimum Output Power.
21. Wait until UE power reaches the minimum.
22. Execute **SWP** to perform measurement.
23. Execute **AVG_POWER?** to read Power measurement result.

[EVM]
24. Execute **TESTPRM CALL_20DBM** to set Test Parameter to Call – EVM & PCDE@-20 dBm.
25. Wait until UE power reaches -20 dBm.
26. Execute **SWP** to perform measurement.
27. Execute **AVG_EVM?** to read EVM measurement result.

[PCDE (Multi Code)]
28. Execute **OLVL –66.0** to set Output Level at -66.0 dBm.
29. Execute **CHCODING RMC_MULTI** to set Channel Coding to RMC(Multi Code).
30. Execute **OLVL -93.0** to set Output Level to −93.0 dBm.
31. Execute **SWP** to perform measurement.
32. Execute **AVG_PCDERR?** to read Peak Code Domain Error measurement result.

[Maximum Output Power (Multi Code)]
33. Execute **TESTPRM CALL_MAXPWR** to set Test Parameter to Call – Maximum Output Power.
34. Wait until UE power reaches the maximum.
35. Execute **SWP** to perform measurement.
36. Execute **AVG_POWER?** to read Power measurement result.

1.4. Open Loop Power Control Measurement

The following measurements are performed by setting Measurement Object of Fundamental Measurement Parameter to Open Loop Power Control.

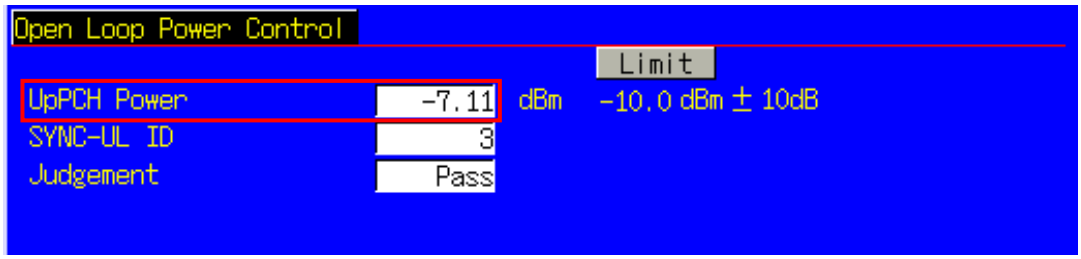
1. Execute **MEASOBJ OLPC** to set Measurement Object to Open Loop Power Control.
2. Execute **MAXULPWR 24** to set Maximum Allowed UL TX Power at 24 dBm.
3. Execute **RABCONNECT OFF** to turn off RAB Connection.

Maximum Allowed UL TX Power is the basic parameter of Cell Selection and Reselection. UE Power Class must be set lower than Maximum TxPower, so the UE can perform Cell Selection and Reselection using Sensitivity Level. For example, when Power Class is 2, MAXULPWR should be 24.

The call status can be returned to Idle in Test Loop Mode without connecting RAB by turning off RAB Connection so measurement is faster.

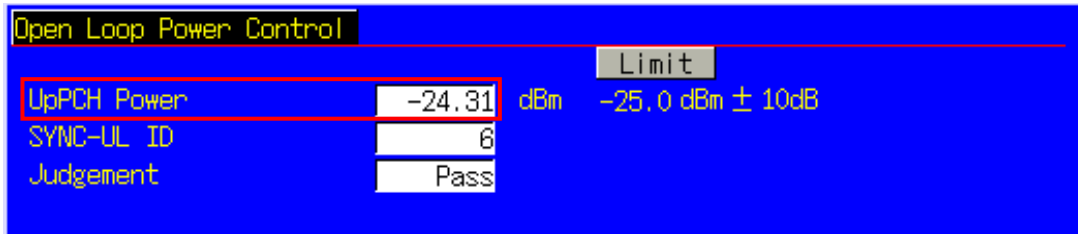
1.4.1. 5.4.1 Open Loop Power Control in the Uplink (RX-middle)

1. Execute **TESTPRM IDLE_MIDDLE** to set Test Parameter to Idle – RX middle.
2. Turn on UE power to perform Registration.
3. Execute **SWPANDPG** to perform UpPCH measurement in Test Loop Mode.
4. Execute **UPPCHPWR?** to read Power measurement result of UpPCH.
5. Check the measurement result is -10 dBm(±10 dB).



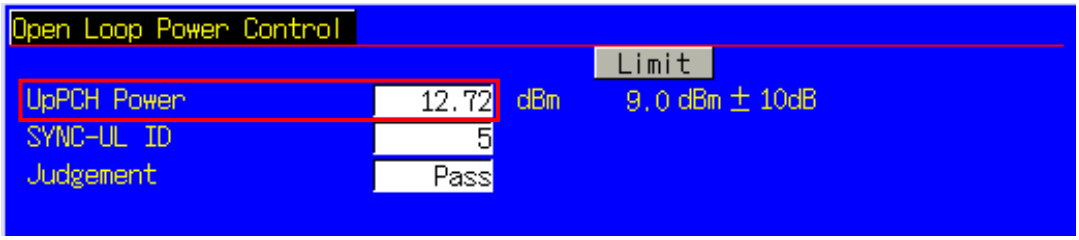
1.4.2. 5.4.1 Open Loop Power Control in the Uplink (RX Upper dynamic end)

1. Execute **TESTPRM IDLE_UPPER** to set Test Parameter to Idle – RX Upper Dynamic End.
2. Turn on UE power to perform Registration.
3. Execute **SWPANDPG** to perform UpPCH measurement in Test Loop Mode.
4. Execute **UPPCHPWR?** to read Power measurement result of UpPCH.
5. Check the measurement result is -25 dBm(+/-10 dB).



1.4.3. 5.4.1 Open Loop Power Control in the Uplink (RX-Sensitivity level)

1. Execute **TESTPRM IDLE_SENS** to set Test Parameter to Idle – RX Sensitivity Level.
2. Turn on UE power to perform Registration.
3. Execute **SWPANDPG** to perform UpPCH measurement in Test Loop Mode.
4. Execute **UPPCHPWR?** to read Power measurement result of UpPCH.
5. Check the measurement result is +9 dBm(±10 dB).



1.4.4. Continuous measurement of Open Loop Power Control

Although Open Loop Power Control measurement is performed by changing Primary CCPCH TX Power and PRXUpPCHdes, these parameters are for broadcast information use and are not reflected at UE side immediately after the change. In order to perform Open Loop Power Control measurement continuously, the parameters must be reflected at UE by any of the following methods.

1) Wait about 5 seconds after changing parameters. When changing parameters, the MT8820B transmits BCCH modification info to UE with PAGING TYPE1 message. However, it takes about 5 seconds until the parameters are reflected on UE side.

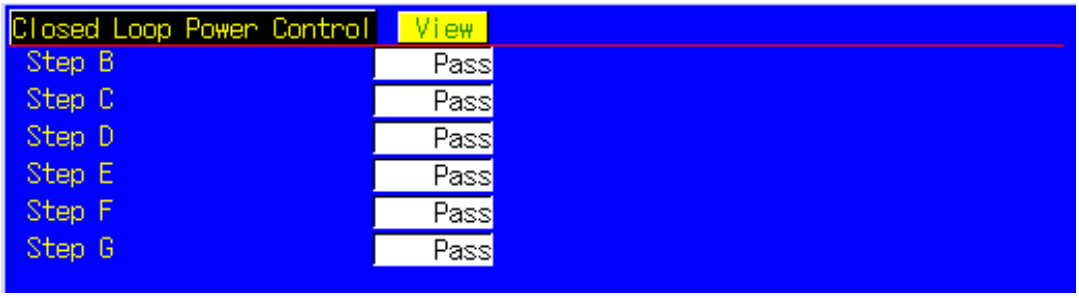
2) After changing parameters, turn on UE power again, and wait until UE performs Registration.

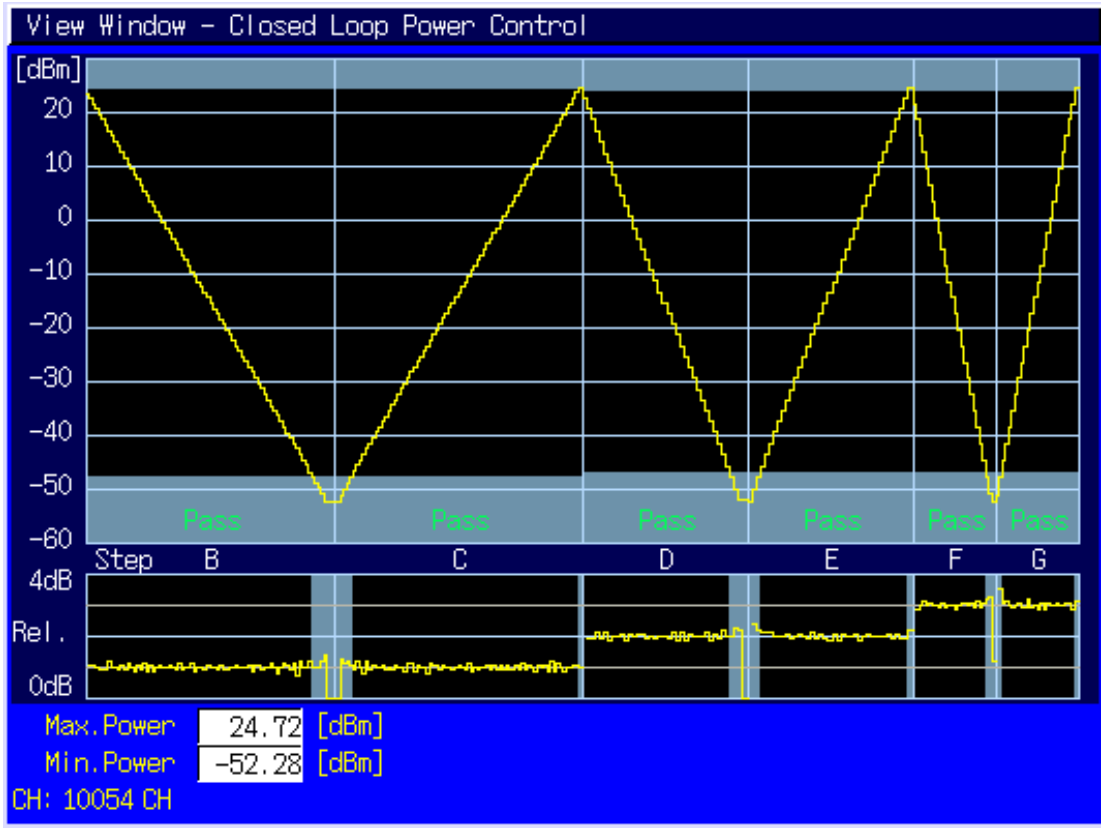
3) Change LAC parameter along with the above parameter, and wait until UE performs Registration.
The LAC value can be incremented when performing LACINC.

1.5. Closed Loop Power Control Measurement (automatic measurement)

1.5.1. 5.4.1.4 Closed loop power control

1. Connect to Test Loop Mode1.
2. Execute **TESTPRM CALL_CLPC** to set Test Parameter to Call – Closed Loop Power Control.
3. Execute **CLPC_MEAS AUTO_ALL** to set CLPC Measurement Method to Auto(Step All).
4. Execute **SWP** to perform measurement.
5. Execute **CLPC_PASS? ALL** and check the measurement result is PASS.

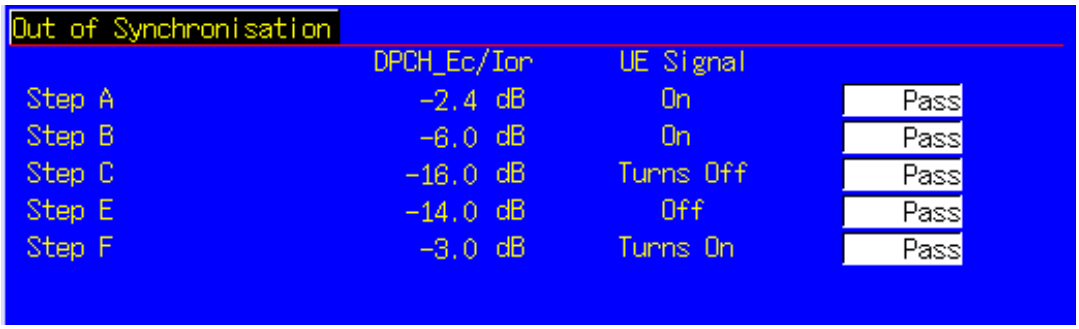




1.6. Other Measurement

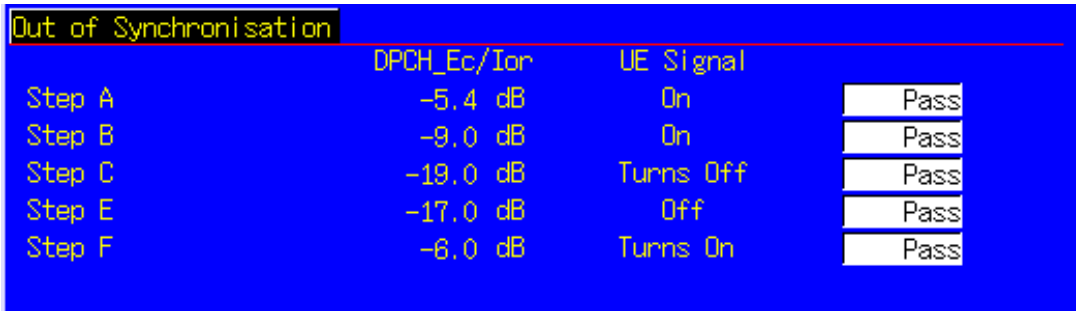
1.6.1. 5.4.5 Out-of-synchronisation handling of output power for continuous transmission

1. Execute **TESTPRM IDLE_OSYNC_SET** to set Test Parameter to Idle – Out-of-Sync. Idle Setting.
2. Turn on UE power to perform Registration.
3. Connect to Test Loop Mode1.
4. Execute **TESTPRM CALL_OSYNC_CONT** to set Test Parameter to Call – Out-of-Sync. Continuous.
5. Execute **SWP** to perform Power measurement.
6. Execute **OUTSYNC_PASS? ALL** and check the measurement result is PASS.



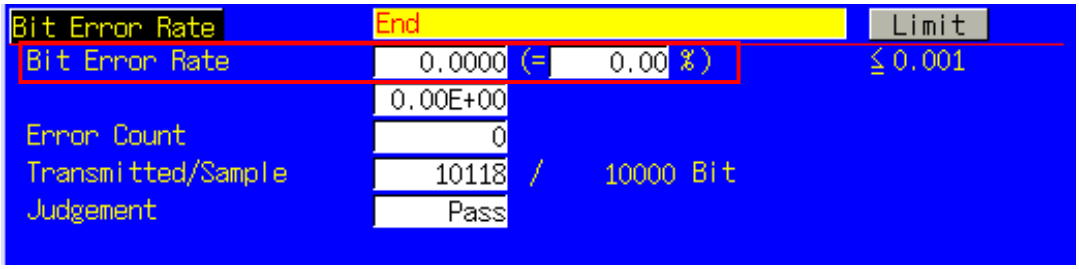
1.6.2. 5.4.6 Out-of-synchronisation handling of output power for discontinuous transmission

1. Execute **TESTPRM IDLE_OSYNC_SET** to set Test Parameter to Idle – Out-of-Sync. Idle Setting.
2. Turn on UE power to perform Registration.
3. Connect to Test Loop Mode1.
4. Execute **TESTPRM CALL_OSYNC_DISC** to set Test Parameter to Call – Out-of-Sync. Discontinuous.
5. Execute **SWP** to perform Power measurement.
6. Execute **OUTSYNC_PASS? ALL** and check the measurement result is PASS.



1.6.3. 6.3 Maximum Input Level

1. Connect to Test Loop Mode1.
2. Execute **TESTPRM CALL_BERMAX** to set Test Parameter to Call – BER (Maximum Input Level).
3. Execute **BER_SAMPLE 10000** to set the number of BER measurement samples at 10000 bit.
4. Execute **SWP** to perform BER measurement.
5. Execute **BER?** to read BER measurement result.
6. Check the measurement result is lower than 0.001.



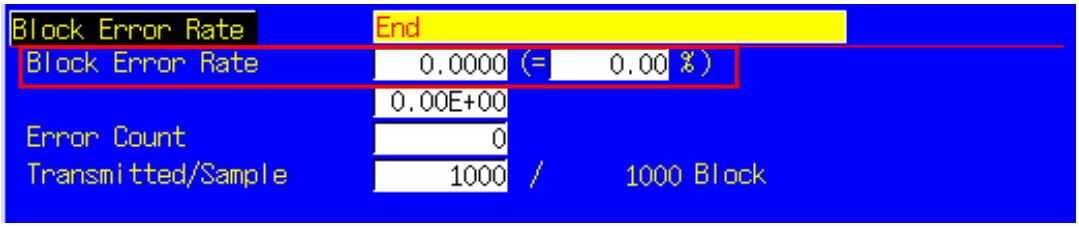
1.6.4. 6.8 Spurious Emissions

1. Execute **RRCSTATE CELLFACH** to set RRC State to CELL_FACH.
2. Execute **SINTRASCHSW ON** to turn on Sintrasearch.
3. Execute **SINTERSCHSW ON** to turn on Sintersearch.
4. Execute **SSCHRATSW ON** to turn on Ssearch,RAT.
5. Execute **MAXULPWR 24** to set Maximum Allowed UL TX Power to 24dBm.
6. Turn on UE power to perform Registration.
7. Execute **OLVL -52.0** to set Output Level to -52.0dBm.
8. Execute **AWGNLVL ON** to turn on AWGN output.
9. Execute **AWGNPWR -9.0** to set Ior/Ioc to 9.0dB.
10. Execute **PCCPCHLVL -3.0** to set PCCPCH Ec/Ior to -3.0dB.
11. Execute **DWPCHLVL 0.0** to set DwPCH Ec/Ior to 0.0dB.
12. Execute **CALLSA**, UE becomes to CELL_FACH state.
13. It is possible to measure Spurious Emissions with an external Spectrum Analyzer.

1.6.5. 7.2 Demodulation in static propagation conditions

[Test1]

1. Execute **TESTMODE MODE2** to set Test Loop Mode to Mode2.
   When UE does not support Test Loop Mode2, execute **TESTMODE MODE1AM** to set Test Loop Mode to Test Mode1(AM).
2. Execute **CHCODING RMC_SINGLE** to set Channel Coding to RMC (Single Code).
3. Connect to Test Loop Mode.
4. Execute **OLVL -56.1** to set Output Level at -56.1 dBm.
5. Execute **AWGNLVL ON** to turn on AWGN output.
6. Execute **AWGNPWR -3.9** to set Ior/Ioc at -3.9 dB.
7. Execute **DDPCHPWR -7.0** to set DPCH_Ec/Ior at -7.0 dB.
8. Execute **ALLMEASITEMS OFF,1,OFF,1,OFF,1,OFF,1,OFF,1,OFF,1,OFF,1,OFF,1,OFF,ON** to turn on only BLER measurement.
9. Execute **BLER_SAMPLE 1000** to set the number of BLER measurement samples at 1000 block.
10. Execute **SWP** to perform BLER measurement.
11. Execute **BLER?** to read BLER measurement result.
12. Check the measurement result is lower than 0.01.



1.6.6. 7.5 Power control in downlink

1. Execute **TESTMODE MODE2** to set Test Loop Mode to Mode2.
   When UE does not support Test Loop Mode2, execute **TESTMODE MODE1AM** to set Test Loop Mode to Test Mode1(AM).
2. Execute **CHCODING RMC_SINGLE** to set Channel Coding to RMC (Single Code).
3. Connect to Test Loop Mode.
4. Execute **ALLMEASITEMS OFF,1,OFF,1,OFF,1,OFF,1,OFF,1,OFF,1,OFF,1,OFF,1,OFF,ON** to turn on only BLER measurement.
5. Execute **BLER_SAMPLE 1000** to set the number of BLER measurement samples at 1000 block.
6. Execute **AWGNLVL ON** to turn on AWGN output.
7. Execute **DDPCHPWR 0.0** to set DPCH_Ec/Ior to 0.0dB.
8. Execute **OLVL -52.5** to set Output Level to -52.5dBm.
9. Execute **AWGNPWR -7.5** to set Ior/Ioc to 7.5dB.
10. Execute **DLPWRCTRL ON** to turn on DPCH Downlink Power Control.
11. Execute **SWP** to perform BLER measurement.
12. Execute **BLER?** to read BLER measurement result.
13. Check the measurement result is 0.01%±30%.

1.7. HSDPA Measurement

Hereafter, control software is assumed to be created by GPIB. See the operation manual for details of GPIB commands and manual operations. GPIB commands are in red.

1.7.1. HSDPA RMC Connection

When connecting with HSDPA, Location registration must be performed using PS. Set Registration Mode to Combined or CS&PS, and connect at HSDPA RMC.

1. Execute **PRESET** to set the default parameters.
2. Execute **REGMODE COMBINED** to set Registration Mode to Combined.
3. Execute **CHCODING HSDPA_RMC** to set Channel Coding to HSDPA RMC.
4. Turn on the UE power.
5. Execute **CALLSTAT?** and wait until the response becomes 2 (= Idle (Regist)).
6. Execute **CALLSA** to perform HSDPA RMC connection.
7. Execute **CALLSTAT?** and wait until the response becomes 6 (= Communication).

Call Status can be confirmed using CALLSTATIC?.
The confirmation procedures using **CALLSTATIC?** are below.

1. Execute **PRESET** to set the default parameters.
2. Execute **REGMODE COMBINED** to set Registration Mode to Combined.
3. Execute **CHCODING HSDPA_RMC** to set Channel Coding to HSDPA RMC.
4. Turn on the UE power.
5. Execute **CALLSTATIC?** to confirm Call Status. When Call Status becomes 2(=Idle(Regist)), the response is returned.
6. Execute **CALLSA** to perform HSDPA RMC connection.
7. Execute **CALLSTATIC?** to confirm Call Status. When Call Status becomes 6(=Communication), the response is returned.

1.7.2. HSDPA RMC Disconnection

1. Execute **CALLSO** to disconnect from HSDPA RMC.
2. Execute **CALLSTAT?** and wait until the response becomes 6 (= Communication).

The confirmation procedures using **CALLSTATIC?** are below.

1. Execute **CALLSO** to disconnect from HSDPA RMC.
2. Execute **CALLSTATIC?** to confirm Call Status. When Call Status becomes 2(=Idle(Regist)), the response is returned.

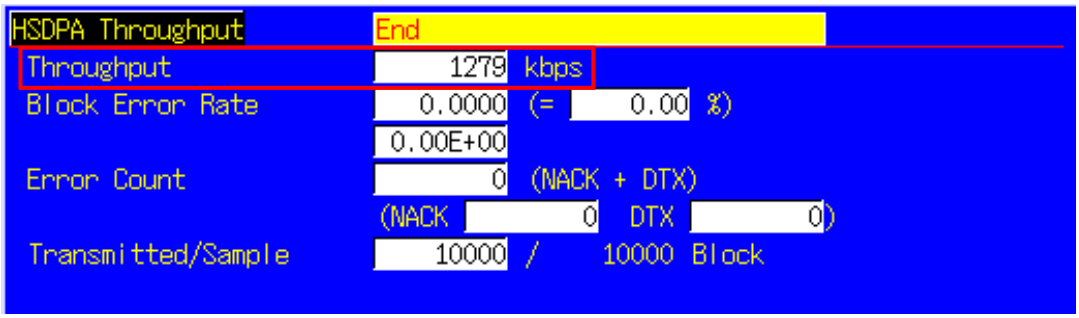
1.7.3. Switching HSDPA Data Rate during connection.

HSDPA Data Rate can be switched during Connection. The switching procedures are below.

1. Connect to HSDPA RMC.
2. Execute **HSRATE 0.5M_QPSK** to set HSDPA Data Rate to 0.5 Mbps UE Class (QPSK).
3. Execute TRX measurement.
4. Execute **HSRATE 1.1M_16QAM** to set HSDPA Data Rate to 1.1 Mbps UE Class (16QAM).
5. Execute TRX measurement.

1.7.4. 6.3A Maximum Input Level for HS-PDSCH Reception (16QAM)

1. Execute **HSTYPE FRC** to set HSDPA Data Type to FRC.
2. Execute **MAXHARQTX 1** to set Maximum number of HARQ transmissions to 1.
3. Execute **RVCODINGALL 6,2,1,5** to set Redundancy and Constellation Version to 6, 2, 1, 5.
4. Connect at HSDPA RMC.
5. Execute **HSRATE 1.1M_16QAM** to set HSDPA Data Rate to 1.1 Mbps UE Class (16QAM).
6. Execute **OLVL -25.0** to set Output Level to −25.0 dBm.
7. Execute **TPUT_MEAS ON** to set HSDPA Throughput measurement to On.
8. Execute **TPUT_TYPE TPUT** to set HSDPA Throughput Measurement Type to Throughput.
9. Execute **TPUT_SAMPLE 10000** to set the number of HSDPA Throughput measurement samples to 10000 blocks.
10. Execute **SWP** to measure HSDPA Throughput.
11. Execute **TPUT?** to read the measured Throughput result.
12. Check the measured result is 500 kbps or more.

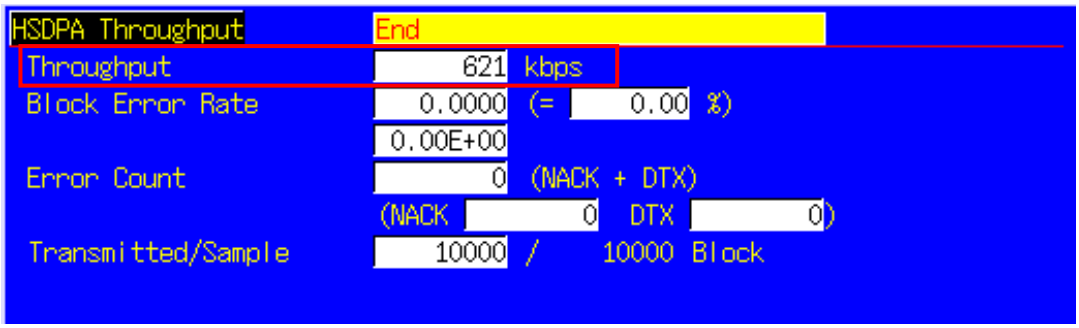


1.7.5. 9.3.1 HS-DSCH throughput for Fixed Reference Channel

The following measurement is premised on Propagation Condition being PA3 (Test 1).

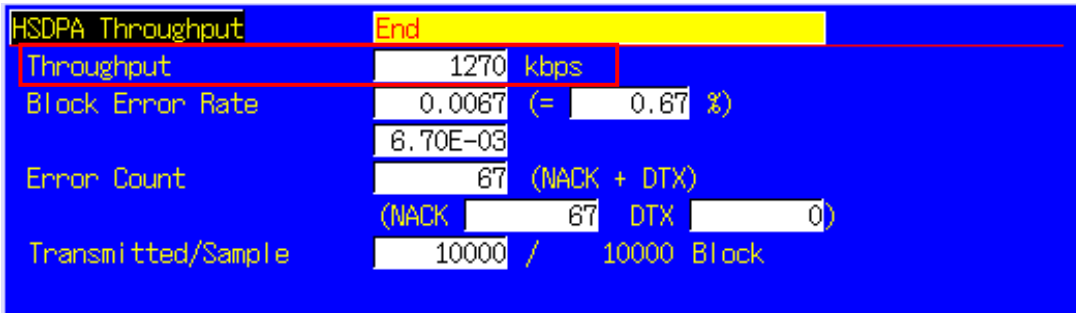
[0.5 Mbps Class UE (QPSK)]

1. Execute **HSTYPE FRC** to set HSDPA Data Type to FRC.
2. Execute **SCRCODEID 1** to set Scrambling Code ID to 1.
3. Execute **MAXHARQTX 4** to set Maximum number of HARQ transmissions to 4.
4. Execute **RVCODINGALL 0,0,0,0** to set Redundancy and Constellation Version to 0, 0, 0, 0.
5. Connect at HSDPA RMC.
6. Execute **HSRATE 0.5M_QPSK** to set HSDPA Data Rate to 0.5 Mbps UE Class (QPSK).
7. Execute **AWGNLVL ON** to set AWGN Output to On.
8. Execute **AWGNPWR -10.6** to set AWGN Level to -10.6 dB.
9. Execute **OLVL -49.4** to set Output Level to -49.4 dBm.
10. Wait until UE output is stabilized.
11. Execute **TPUT_MEAS ON** to set HSDPA Throughput measurement to On.
12. Execute **TPUT_TYPE TPUT** to set HSDPA Throughput Measurement Type to Throughput.
13. Execute **TPUT_SAMPLE 10000** to set the number of HSDPA Throughput measurement samples to 10000 blocks.
14. Execute **SWP** to measure HSDPA Throughput.
15. Execute **TPUT?** to read the measured Throughput result.
16. Check the measured result is 160 kbps or more.



[2.8 Mbps Class UE (16QAM)]

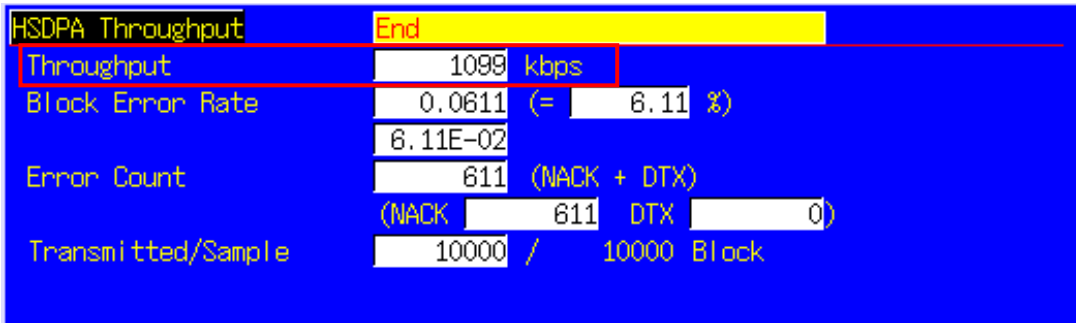
1. Execute **HSTYPE FRC** to set HSDPA Data Type to FRC.
2. Execute **SCRCODEID 1** to set Scrambling Code ID to 1.
3. Execute **MAXHARQTX 4** to set Maximum number of HARQ transmissions to 4.
4. Execute **RVCODINGALL 6,2,1,5** to set Redundancy and Constellation Version to 6, 2, 1, 5.
5. Connect at HSDPA RMC.
6. Execute **HSRATE 2.8M_16QAM** to set HSDPA Data Rate to 2.8 Mbps UE Class (16QAM).
7. Execute **AWGNLVL ON** to set AWGN Output to On.
8. Execute **AWGNPWR -15.6** to set AWGN Level to -15.6 dB.
9. Execute **OLVL -44.4** to set Output Level to -44.4 dBm.
10. Wait until UE output is stabilized.
11. Execute **TPUT_MEAS ON** to set HSDPA Throughput measurement to On.
12. Execute **TPUT_TYPE TPUT** to set HSDPA Throughput Measurement Type to Throughput.
13. Execute **TPUT_SAMPLE 10000** to set the number of HSDPA Throughput measurement samples to 10000 blocks.
14. Execute **SWP** to measure HSDPA Throughput.
15. Execute **TPUT?** to read the measured Throughput result.
16. Check the measured result is 890 kbps or more.



1.7.6. 9.3.2 HS-DSCH throughput for Variable Reference Channel (2.8 Mbps UE)

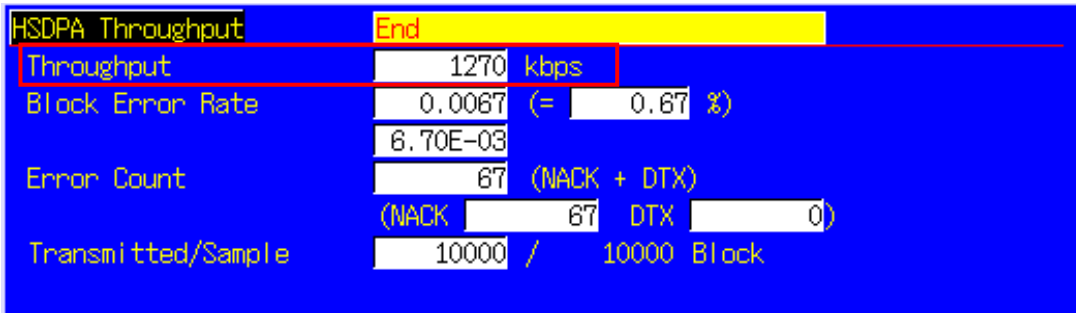
The following measurement is premised on Propagation Condition being PA3 (Test 1).

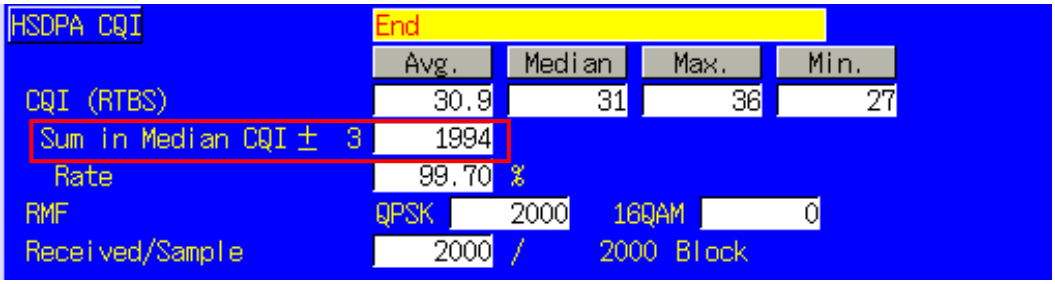
1. Execute **HSTYPE VRC** to set HSDPA Data Type to VRC.
2. Execute **SCRCODEID 1** to set Scrambling Code ID to 1.
3. Execute **MAXHARQTX 1** to set Maximum number of HARQ transmissions to 1.
4. Execute **RVCODINGALL 0,0,0,0** to set Redundancy and Constellation Version to 0, 0, 0, 0.
5. Connect at HSDPA RMC.
6. Execute **HSRATE 2.8M_16QAM** to set HSDPA Data Rate to 2.8 Mbps UE Class (16QAM).
7. Execute **AWGNLVL ON** to set AWGN Output to On.
8. Execute **AWGNPWR -15.0** to set AWGN Level to -15.0 dB.
9. Execute **OLVL -45.0** to set Output Level to -45.0 dBm.
10. Wait until UE output is stabilized.
11. Execute **TPUT_MEAS ON** to set HSDPA Throughput measurement to On.
12. Execute **TPUT_TYPE TPUT** to set HSDPA Throughput Measurement Type to Throughput.
13. Execute **TPUT_SAMPLE 10000** to set the number of HSDPA Throughput measurement samples to 10000 blocks.
14. Execute **SWP** to measure the HSDPA Throughput.
15. Execute **TPUT?** to read the measured Throughput result.
16. Check the measured result is 783 kbps or more.



1.7.7. 9.3.3 Reporting of HS-DSCH Channel Quality Indicator (2.8 Mbps UE)

1. Execute **HSTYPE VRC** to set HSDPA Data Type to VRC.
2. Execute **MAXHARQTX 1** to set Maximum number of HARQ transmissions to 1.
3. Connect at HSDPA RMC 2.8 Mbps UE Class (16QAM).
4. Execute **AWGNLVL ON** to set AWGN Output to On.
5. Execute **AWGNPWR -1** to set AWGN Level to -1 dB.
6. Execute **OLVL -59.0** to set Output Level to -59.0 dBm.
7. Wait until UE output is stabilized.
8. Execute **TPUT_MEAS ON** to set HSDPA Throughput measurement to On.
9. Execute **TPUT_TYPE CQI** to set HSDPA Throughput Measurement Type to CQI.
10. Execute **TPUT_SAMPLE 10000** to set the number of HSDPA Throughput measurement samples to 10000 blocks.
11. Execute **CQI_MEAS ON** to set CQI measurement to On.
12. Execute **CQI_SAMPLE 2000** to set the number of CQI measurement samples to 2000 blocks.
13. Execute **CQI_RANGE 3** to set CQI counting range to 3.
14. Execute **SWP** to measure HSDPA Throughput.
15. Execute **TPUT_BLER?** to read the measured Throughput result.
16. Check the measured result is 0.1 or less.
17. Execute **CQI_SUM?** to read the CQI measurement result.
18. Checkt the measured result is 1800 or more.

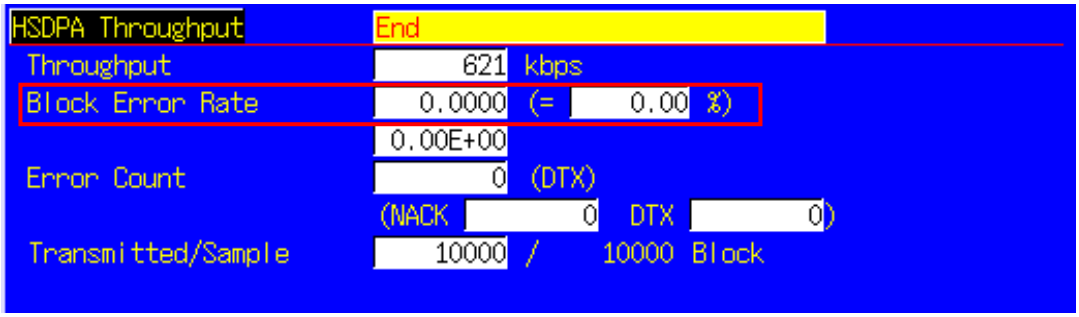




1.7.8. 9.3.4 HS-SCCH Detection Performance

The following measurement is premised on Propagation Condition being PA3 (Test 1).

1. Execute **HSTYPE FRC** to set HSDPA Data Type to FRC.
2. Execute **SCRCODEID 0** to set Scrambling Code ID to 0.
3. Connect at HSDPA RMC 1.1 Mbps UE Class (QPSK).
4. Execute **AWGNLVL ON** to set AWGN Output to On.
5. Execute **AWGNPWR -16.6** to set AWGN Level to -16.6 dB.
6. Execute **HSSCCH2 ON** to set Downlink HS-SCCH #2 - #4 to On.
7. Execute **OLVL -43.4** to set Output Level to -43.4 dBm.
8. Wait until UE output is stabilized.
9. Execute **TPUT_MEAS ON** to set HSDPA Throughput measurement to On.
10. Execute **TPUT_TYPE SCCHDET** to set HSDPA Throughput Measurement Type to HS-SCCH Detection.
11. Execute **TPUT_SAMPLE 10000** to set the number of HSDPA Throughput measurement samples to 10000 blocks.
12. Execute **SWP** to measure HSDPA Throughput.
13. Execute **TPUT_BLER?** to read the measured Throughput result.
14. Check the measured result is 0.01 or less.



1.8. HSUPA Measurement

Hereafter, control software is assumed to be created by GPIB. See the operation manual for details of GPIB commands and manual operations. GPIB commands are in red.

1.8.1. HSUPA RMC Connection

When connecting with HSUPA, Location registration must be performed using PS. Set Registration Mode to Combined or CS&PS, and connect at HSUPA RMC.

1. Execute **PRESET** to set the default parameters.
2. Execute **REGMODE COMBINED** to set Registration Mode to Combined.
3. Execute **CHCODING HSUPA_RMC** to set Channel Coding to HSUPA RMC.
4. Turn on the UE power.
5. Execute **CALLSTAT?** and wait until the response becomes 2 (= Idle (Regist)).
6. Execute **CALLSA** to perform HSUPA RMC connection.
7. Execute **CALLSTAT?** and wait until the response becomes 6 (= Communication).

Call Status can be confirmed using CALLSTATIC?.
The confirmation procedures using **CALLSTATIC?** are below.

8. Execute **PRESET** to set the default parameters.
9. Execute **REGMODE COMBINED** to set Registration Mode to Combined.
10. Execute **CHCODING HSUPA_RMC** to set Channel Coding to HSUPA RMC.
11. Turn on the UE power.
12. Execute **CALLSTATIC?** to confirm Call Status. When Call Status becomes 2(=Idle(Regist)), the response is returned.
13. Execute **CALLSA** to perform HSUPA RMC connection.
14. Execute **CALLSTATIC?** to confirm Call Status. When Call Status becomes 6(=Communication), the response is returned.

1.8.2. HSUPA RMC Disconnection

1. Execute **CALLSO** to disconnect from HSUPA RMC.
2. Execute **CALLSTAT?** and wait until the response becomes 6 (= Communication).

The confirmation procedures using **CALLSTATIC?** are below.

1. Execute **CALLSO** to disconnect from HSUPA RMC.
2. Execute **CALLSTATIC?** to confirm Call Status. When Call Status becomes 2(=Idle(Regist)), the response is returned.

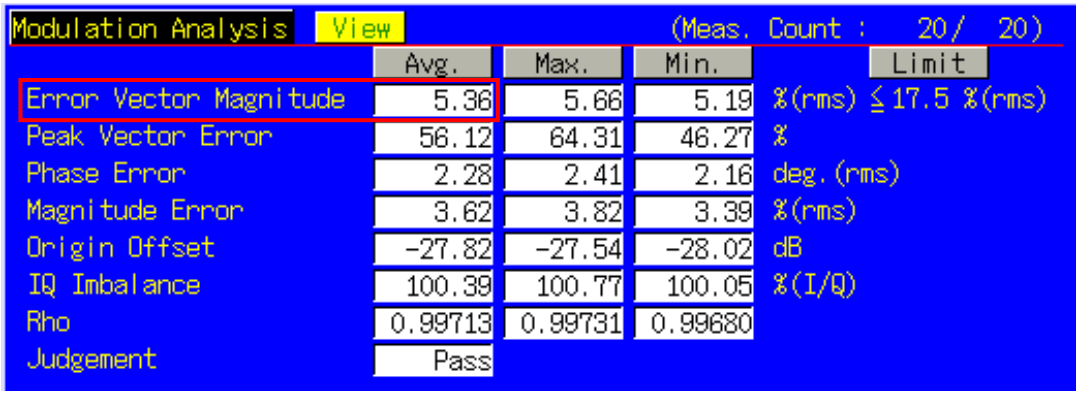
1.8.3. Switching HSUPA Data Rate during connection.

HSUPA Data Rate can be switched during Connection. The switching procedures are below.

1. Connect to HSUPA RMC.
2. Execute **HSURATE FRC1_CAT3_6** to set HSUPA Data Rate to FRC1 (Category3-6).
3. Execute TRX measurement.
4. Execute **HSURATE FRC2** to set HSUPA Data Rate to FRC2.
5. Execute TRX measurement.

1.8.4. 5.7.1A Error Vector Magnitude with E-DCH 16QAM

1. Connect to HSUPA RMC.
2. Execute **HSURATE FRC2** to set HSUPA Data Rate to FRC2.
3. Execute **TESTPRM CALL_20DBM** to set Test Parameter to Call – EVM & PCDE@-20 dBm.
4. Wait until UE power reaches -20 dBm.
5. Execute **MOD_AVG 20** to set the average count of Modulation Analysis measurement to 20 times.
6. Execute **EPUCH_MEAS_SLOT 4** to set E-PUCH Measurement Measurement Slot to 4.
7. Execute **SWP** to perform Modulation Analysis measurement.
8. Execute **AVG_EVM?** to read EVM measurement result.
9. Check the measurement result is lower than 14.0%.



1.8.5. 11.1 Detection of E-DCH HARQ ACK Indicator Channel (E-HICH)

1. Connect to HSUPA RMC.
2. Execute **HSURATE FRC1_CAT3_6** to set HSUPA Data Rate to FRC1 (Category3-6).
   When UE does not support FRC1 (Category3-6), execute **HSURATE FRC1_CAT1_2** to set HSUPA Data Rate to FRC1 (Category1-2).

[Test1]

3. Execute **EHICHPAT NACK** to set E-HICH Pattern to NACK.
4. Execute **OLVL -60.0** to set Output Level to -60.0dBm.
5. Execute **AWGNLVL ON** to turn on AWGN output.
6. Execute **AWGNPWR 0.0** to set Ior/Ioc to 0dB.
7. Execute **EHICHLVL -7.5** to set E-HICH Ec/Ior to -7.5dB.
8. Execute **ALLMEASITEMS_OFF** to turn off all measurement items.
9. Execute **PERFORM_MEAS ON** to turn on HSUPA Performance measurement.
10. Execute **PERFORM_SAMPLE 1000** to set the number of HSUPA Performance measurement samples at 1000 block.
11. Execute **SWP** to perform HSUPA Performance measurement.
12. Execute **FALSE_ACK_NACK_PROB? EXP** to read False ACK Probability measurement result.
13. Check the measurement result is lower than 2E-3.

[Test2]

14. Execute **EHICHPAT ACK** to set E-HICH Pattern to ACK.
15. Execute **OLVL –60.0** to set Output Level to -60.0dBm.
16. Execute **AWGNLVL ON** to turn on AWGN output.
17. Execute **AWGNPWR 0.0** to set Ior/Ioc to 0.0dB.
18. Execute **EHICHLVL -7.5** to set E-HICH Ec/Ior to -7.5dB.
19. Execute **ALLMEASITEMS_OFF** to turn off all measurement items.
20. Execute **PERFORM_MEAS ON** to turn on HSUPA Performance measurement.
21. Execute **PERFORM_SAMPLE 1000** to set the number of HSUPA Performance measurement samples at 1000 block.
22. Execute **SWP** to perform HSUPA Performance measurement.
23. Execute **FALSE_ACK_NACK_PROB? EXP** to read False NACK Probability measurement result.
24. Check the measurement result is lower than 2E-2.

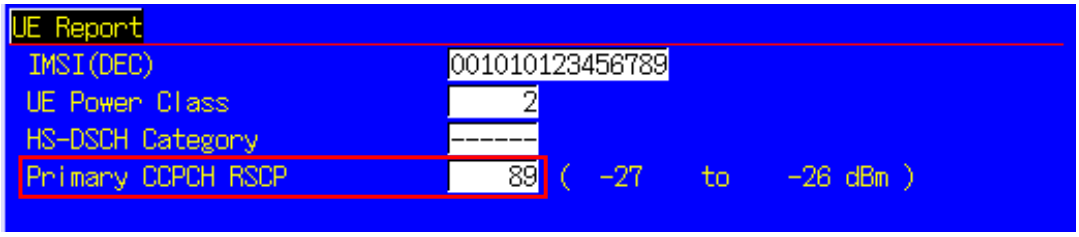
1.8.6. 11.2 Demodulation of E-DCH Absolute Grant Channel (E-AGCH)

1. Connect to HSUPA RMC.
2. Execute **HSURATE FRC1_CAT3_6** to set HSUPA Data Rate to FRC1 (Category3-6).
   When UE does not support FRC1 (Category3-6), execute **HSURATE FRC1_CAT1_2** to set HSUPA Data Rate to FRC1 (Category1-2).
3. Execute **EHICHPAT ACK** to set E-HICH Pattern to ACK.
4. Execute **ABSGNTVAL 31** to set E-AGCH Absolute Grant Value to 31.
5. Execute **OLVL -51.4** to set Output Level to -51.4dBm.
6. Execute **AWGNLVL ON** to turn on AWGN output.
7. Execute **AWGNPWR -8.6** to set Ior/Ioc to 8.6dB.
8. Execute **EAGCHLVL -3.0** to set E-AGCH Ec/Ior to -3.0dB.
9. Execute **ALLMEASITEMS_OFF** to turn off all measurement items.
10. Execute **PERFORM_MEAS ON** to turn on HSUPA Performance measurement.
11. Execute **PERFORM_SAMPLE 1000** to set the number of HSUPA Performance measurement samples to 1000 block.
12. Execute **SWP** to perform HSUPA Performance measurement.
13. Execute **MISSED_DTCTN_PROB? EXP** to read Missed E-AGCH Detection Probability measurement result.
14. Check the measurement result is lower than 0.01(1E-2).

1.9. UE Report

Measurement Report can be sent to UE. The following explains how to acquire the report value of Primary CCPCH RSCP.

1. Connect to Test Loop Mode1.
2. Execute **MEASREP ON** to report Measurement Report to UE.
3. Execute **CALLRFR** to initialize UE Report value.
4. Execute **PCCPCH_RSCP? FLAG**. When response is 1,,report is returned.
5. Execute **PCCPCH_RSCP?** to read P-CCPCH Ec/N0 value.
6. When reading Report value again, return to 3.



UE Report is updated at regular interval. When using PCCPCH_RSCP? 1 to 10, the latest updated value is returned after UE Report is updated for specified counts.

1. Connect to Test Loop Mode1.
2. Execute **MEASREP ON** to report Measurement Report to UE.
3. Execute **OLVL -90.0** to set Output Level to -90.0 dBm.
4. Execute **PCCPCH_RSCP? 3** to read P-CCPCH Ec/N0 value after UE Report is updated for three times.

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Specifications are subject to change without notice.

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