



It's been a year since Rohde & Schwarz introduced the new R&S® NRP [∗]

power meter family for fast and accurate measurements on the complex RF signals of modern communication technology. Its dynamic range of 90 dB for modulated signals, high measurement accuracy as well as its future-oriented instrument concept where each sensor is a T&M instrument that can be remote-controlled via USB (FIG 1) were outstanding. Since then, a lot has happened ...

FIG 1 The R&S® NRP power meter family features a broad scope of different sensors.

Power Meter R&S® NRP

Evolution in motion – new functions and sensors

Now even better

The extremely positive market response was one of the decisive factors for continuously enhancing this family. As a result, firmware revision 3.0 provides the following new functions for the R&S® NRP base unit: time-domain display with possible gate measurements, fast configuration for standard signals, remote control via USB interface,

Ethernet LAN operation (with option R&S® NRP-B4) and the capability to test connected sensors at a keystroke. Moreover, the sensor portfolio has been expanded, so that multiple-path diode sensors that are staggered according to power (up to 30 W) are now available as well as a thermal sensor up to 18 GHz. Standard drivers (VXI Plug & Play, Lab-View, HP VEE) are provided for the base unit and all sensors.

Time-domain display, measurement in time windows

Due to the complex signal shapes of today's communications standards, displaying the power envelope has become indispensable for visualizing signal details or for defining time windows (gates) for important power parameters (FIG 2). Operating this new functionality, which is available for all sensors of the R&S®NRP-Z11 and -Z2x type, on the R&S®NRP base unit is child's play: Select the Scope mode and graphical result display, set the trigger and horizontally and vertically define the required size of the screen window. In the time-domain display, as in normal operation, the wide dynamic range of the sensors is impressive. It allows measurements down to -50 dBm at a video bandwidth of 100 kHz.

For measurements in time windows, up to four different gates can be defined on the R&S®NRP in the Scope mode; the average power (AVG), the displayed peak value (PK) and the PK/AVG ratio can be numerically displayed for each gate. The power meters' capability of producing and displaying the ratio of the gated measurement results of two different sensors is unprecedented. It is thus, for example, quite simple to measure the gain or gain compression of a power amplifier in specific sections of a test signal and display it together with the envelope (FIG 3).

Signal-specific configuration

Some measurement functions such as the display of the envelope power as a function of time and power measurements in gates or entire frames require a multitude of signal-specific settings. This can be quite tedious and presupposes some knowledge about the measurement signal. For this reason, the entire configuration of a signal can now be

loaded at a keystroke on the R&S®NRP base unit by selecting and activating the signal type from a list of common communications standards (FIG 4). Since the user can still change all parameters after the configuration, the optimum setting can be found in no time, and setting errors are minimized.

New sensors

Based on the Power Sensor R&S®NRP-Z21 (10 MHz to 18 GHz, -67 dBm to +23 dBm), there are now also new versions for directly measuring the output signal of mobile and base stations, amplifiers and other powerful sources, specifically in the following power classes

- ◆ 2 W R&S®NRP-Z22
- ◆ 15 W -Z23
- ◆ 30 W -Z24

FIG 2 Scope mode on the R&S®NRP: Display of a GSM/EDGE frame with markers and measured values.

FIG 3 Scope mode on the R&S®NRP: Simultaneous display of a section of the power envelope together with the measured value for the compression of a power amplifier in a timeslot, measured by two R&S®NRP-Z11 sensors.

FIG 4 Configuration at a keystroke: The R&S®NRP base unit knows almost all common communications standards.

FIG 5 The differences between the sensor and the R&S®NRP-B1 power reference as determined by means of the sensor test can be output, if required.

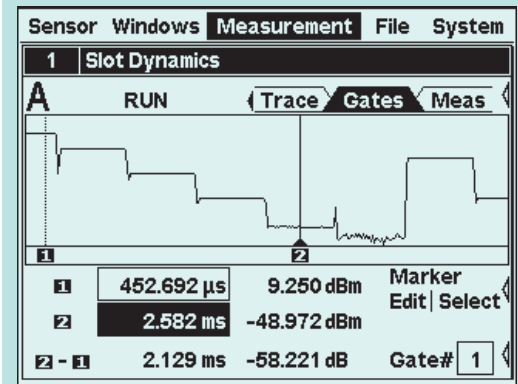


FIG 2

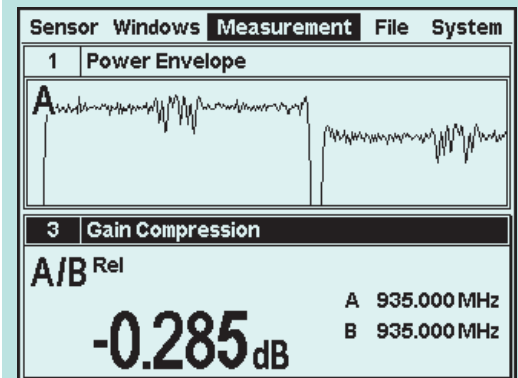


FIG 3

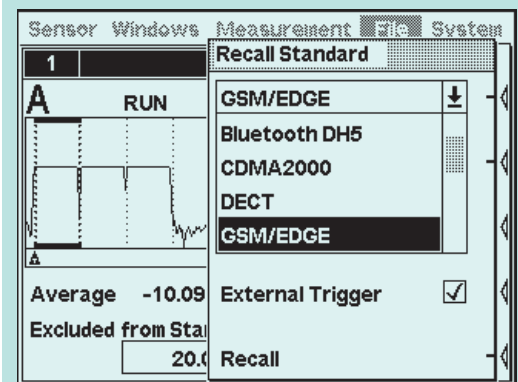


FIG 4

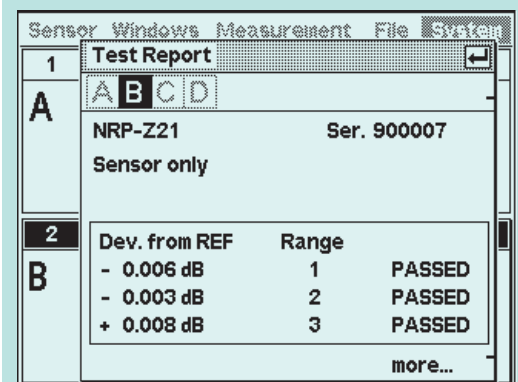


FIG 5

- The rugged attenuators – which have been successfully used by Rohde & Schwarz for well over ten years now – ensure reliable measurement results. Needless to say, effective thermal shielding in the 15 W and 30 W power classes as well as a low shape factor make handling as easy as with a standard sensor.

The fact that thermal sensors can still hold their ground against diode sensors – despite their lower dynamic range and lower measurement speed – is due less to nostalgia than several substantial advantages. With thermal sensors, the signal shape has absolutely no influence on the measurement result, and numerous characteristics such as linearity, frequency response and matching are completely temperature-independent. Moreover, the thermal sensors from Rohde & Schwarz feature excellent linearity due to customized correction of each sensor, plus DC coupling of the test cell, allowing measurements at almost any low frequencies as well as referencing the measurement result to DC.

All these are substantial reasons to offer new thermal sensors also for the R&S® NRP power meter family, at first for the frequency range of DC to 18 GHz and a nominal power of 100 mW (R&S® NRP-Z51). For the most part, the new sensor corresponds to the well-known predecessor R&S® NRV-Z51 but offers still more advantages: standalone operation on PCs as well as higher reproducibility of the measurement results by using only one measurement range and omitting the influence of the base unit.

Even with careful handling, the input of the sensor may be fed a power level that is too high, causing damage or even destruction. For this reason, a quick and simple test can now be performed on the base unit. In this case, the measurement error of the sensor compared to the power reference (option

R&S® NRP-B1) is checked and, if necessary, a warning is output (FIG 5). The warning threshold is user-definable; the test covers all measurement ranges. In the case of sensors with attenuators, the latter can be included in the test.

Remote control

The R&S® NRP base unit comes with an IEC/IEEE bus and a USB interface as standard. The USB connection was originally intended only for the firmware update, but has by now been expanded to a fully-fledged remote-control interface. A prerequisite was the introduction of a new equipment class (USBTMC) by the USB Implementers Forum at the beginning of this year. As with the IEC/IEEE bus, it allows the interconnection of different measuring instruments to one measurement system, with the virtual instrument software architecture (VISA) library acting as the software interface to the application program of the user. The USB remote control functionality can be subsequently added to each R&S® NRP base unit by means of firmware revision 3.0. Customers intending to operate the base unit in a local area network (LAN) are now provided with an Ethernet interface with the VXI 11 protocol layer (option R&S® NRP-B4).

Right from the start, each sensor of the R&S® NRP family could be operated even without a base unit – by using one of the USB Adapters R&S® NRP-Z3 or -Z4 directly via the USB interface of a PC. A DLL provided by Rohde & Schwarz acted as the software interface. Due to the outstanding customer feedback on this operating mode, the software interface was developed further and simplified: The sensor can now also be addressed via standard drivers (VXI Plug & Play, LabView, HP VEE). Simultaneous operation of several sensors on a PC is now possible without any restrictions.

Evolution continues

Many Rohde & Schwarz customers have already earmarked the R&S® NRP family as their new power meter standard. The R&S® NRP family is continuously being developed with a view to functionality, new frequency bands and in particular the requirements of future communications standards. As Europe's largest T&M manufacturer, Rohde & Schwarz is committed to satisfying its customers.

Thomas Reichel

More information and data sheet at
www.rohde-schwarz.com
 (search term: NRP)



REFERENCES

- [*] Power Meter R&S® NRP – Evolution in power measurement – intelligent sensor technology. News from Rohde & Schwarz (2002) No. 174, pp 12–16