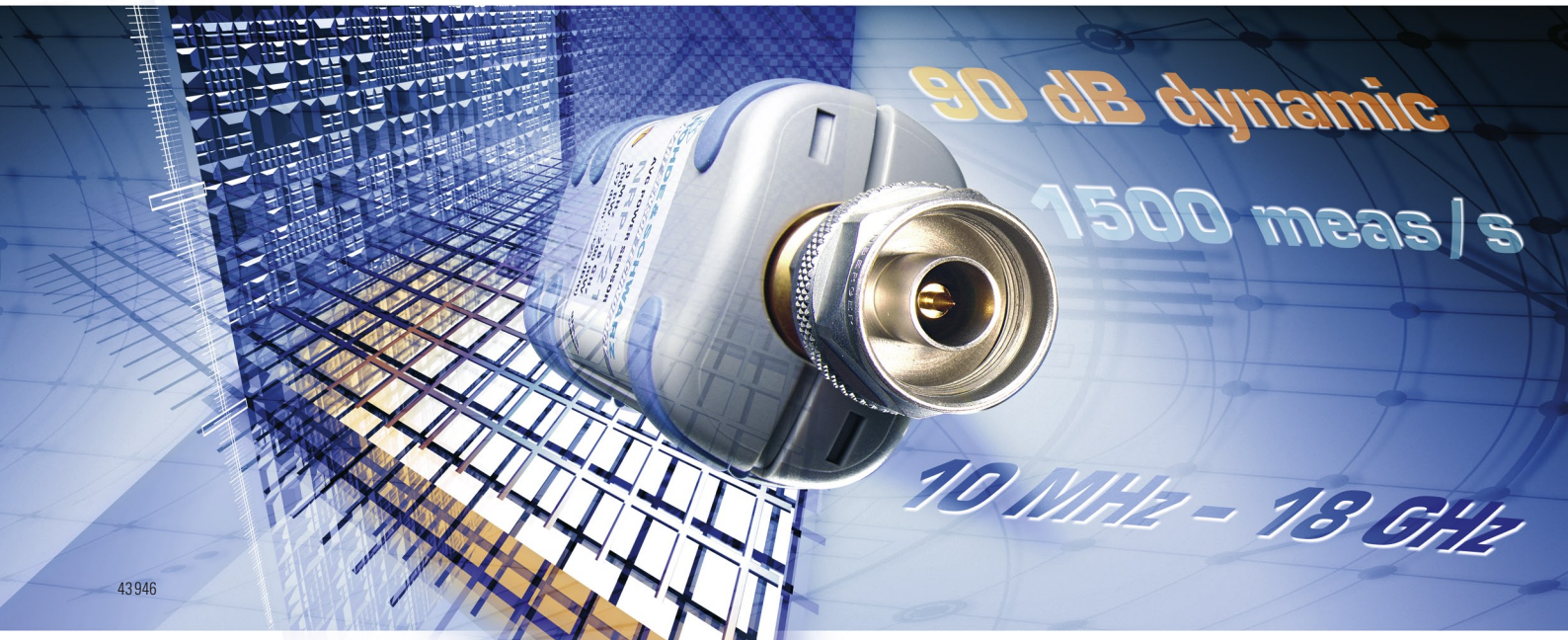

Spectrum and Signal Analyzers R&S®FSP / FSU / FSQ

High-precision measurement of absolute levels with spectrum analyzers

In the past, high-precision measurements of absolute signal level were usually performed by means of power meters such as the R&S®NRP from Rohde & Schwarz. However, this is now changing with the new option R&S®FS-K9, which also turns the Spectrum Analyzers R&S®FSP and R&S®FSU and the Signal Analyzer R&S®FSQ into precise power meters.

More information and data sheets at
www.rohde-schwarz.com
(search term: type designation)

A powerful combination

Every developer knows the problem that arises during power measurements: Spectrum analyzers can measure signal levels precisely and with high linearity relative to a specific reference power. But as soon as high absolute level accuracy is required for the reference power, power meters with precise sensors have always been preferred, since their absolute level accuracy exceeds the specifications of spectrum analyzers by a factor of five to ten.

Yet if the focus is on dynamic range, measurement speed or selectivity, spectrum analyzers gain the upper hand. The ideal solution would therefore be a combination of an analyzer and a power meter, thus offering the advantages of both worlds in one instrument.

This is exactly where the option Power Sensor Measurements R&S®FS-K9 comes into play. With this new option, you can connect the sensors for the Power Meter R&S®NRP directly to the Analyzers R&S®FSP, R&S®FSU and R&S®FSQ. The precise measurement results of the sensors are displayed on the screen of the analyzers (FIG 1). This converts the analyzers into power meters that offer functions such as zeroing, variable measurement time and a display unit directly from their operating

menus. To make level measurements as accurate as possible, you can link the frequency response correction of the sensor to either the current center frequency or the frequency of the marker.

Suddenly, your dreams will come true: The spectrum analyzer will perform power measurements with the same absolute level accuracy as the power sensor. To achieve this, you merely have to measure the signal under consideration using first the power sensor with the R&S®FS-K9 option, and then the spectrum analyzer. If a power splitter is available, both measurements can even be performed simultaneously. After the measured level difference has been converted into a correction factor (transducer), the marker will display the same value as the power meter (FIG 2). If you now vary the level of the signal source, you can measure the absolute level stages with the analyzer very accurately.

Summary

The R&S®FS-K9 option converts the spectrum analyzers from Rohde&Schwarz into high-precision power meters with variable selectivity, high sensitivity and maximum measurement speed – even if thermal power sensors are used. Due to the large number of available sensors (FIG 3), an optimum combination is available for almost any application. Due to their low measurement uncertainty, any of the sensor types is basically suitable for the reference measurement. Of course, the lowest measurement uncertainties will be achieved by using the Thermal Power Sensors R&S®NRP-Z51 and R&S®NRP-Z55. However, as a rule of thumb for all sensors, the reference level should be at least 15 dB above the lower measurement limit of the power sensor. This keeps the effects of zero drift and noise negligible.

Ottmar Steffke

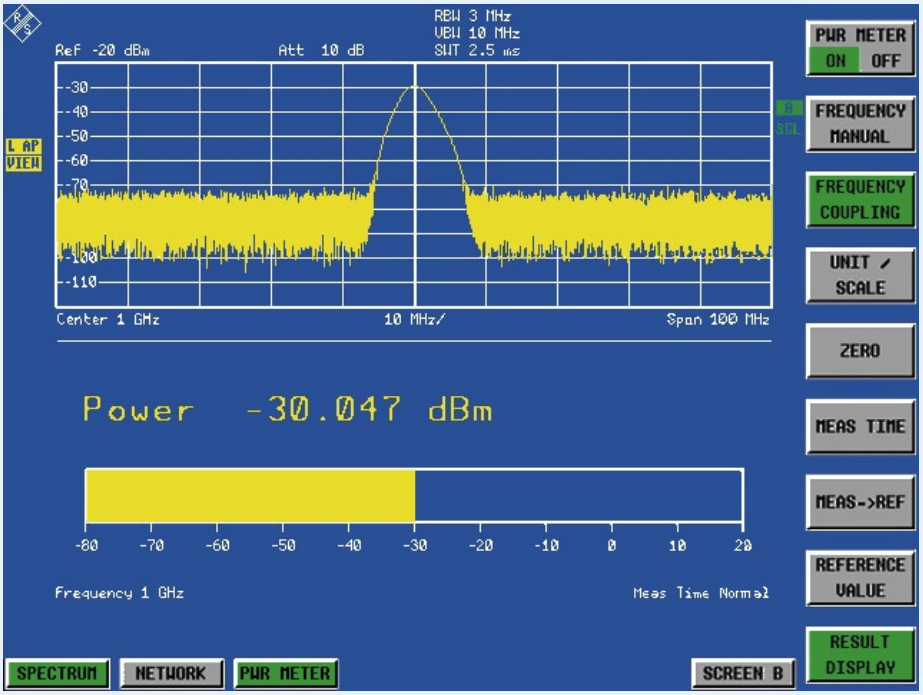

FIG 1 The measured power is shown on the screen of the spectrum analyzer.

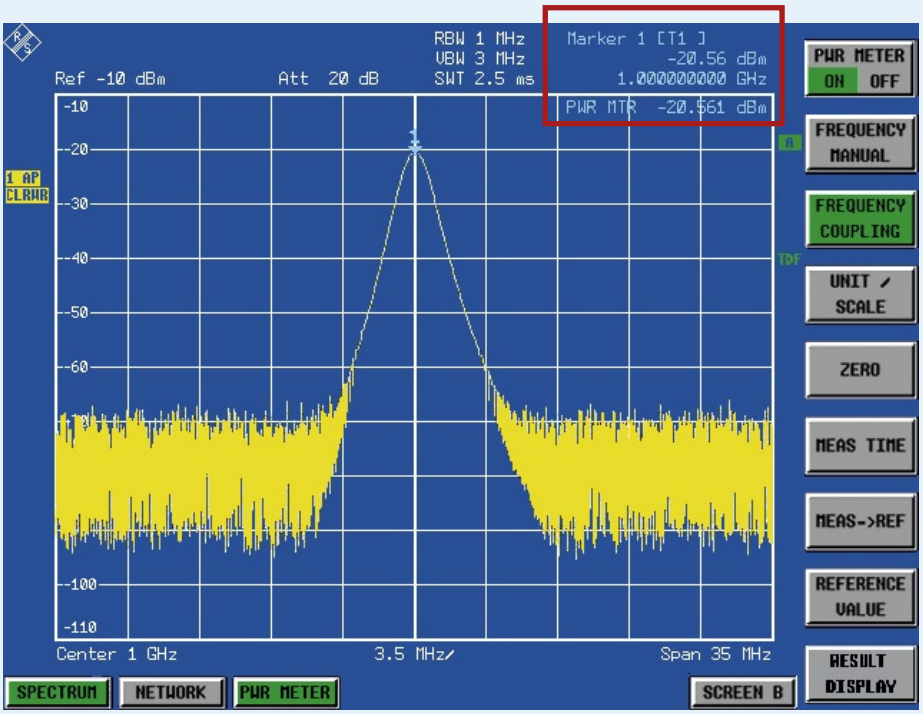

FIG 2 Adjustment of the marker display with the power meter by means of the correction factor (marked in red).

Sensor	Function / technology	Measurement range	Frequency range
R&S®NRP-Z11	Universal Power Sensor	–67 dBm to 23 dBm	10 MHz to 8 GHz
R&S®NRP-Z21	Universal Power Sensor	–67 dBm to 23 dBm	10 MHz to 18 GHz
R&S®NRP-Z22	Universal Power Sensor	–57 dBm to 33 dBm	10 MHz to 18 GHz
R&S®NRP-Z23	Universal Power Sensor	–47 dBm to 42 dBm	10 MHz to 18 GHz
R&S®NRP-Z24	Universal Power Sensor	–42 dBm to 44 dBm	10 MHz to 18 GHz
R&S®NRP-Z51	Thermal Power Sensor	–30 dBm to 20 dBm	DC to 18 GHz
R&S®NRP-Z55	Thermal Power Sensor	–30 dBm to 20 dBm	DC to 40 GHz
R&S®NRP-Z91	Average Power Sensor	–67 dBm to 23 dBm	9 kHz to 6 GHz

FIG 3 These power sensors can be connected to the Spectrum Analyzers R&S®FSU and R&S®FSP and to the Signal Analyzer R&S®FSQ.