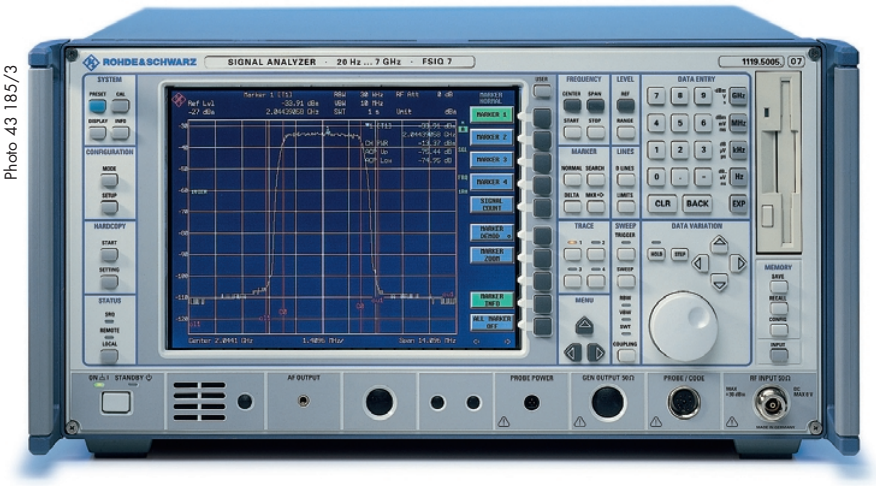

Photo 43 185/3

Advantest and Rohde & Schwarz have been cooperating in sales and design since 1992. The products of the two partners, particularly the spectrum analyzer families, are aimed at different market segments and customers and so perfectly complement each other. This strategy continues with the introduction of Spectrum Analyzers R 3267 and R 3273 and Signal Analyzer FSIQ [1], specially developed for measurements on mobile radios of the third generation. The two instrument families suit any requirement and budget and come from a single source.

Signal Analyzer FSIQ

Two spectrum analyzer families for third-generation mobile radio …

Application	Family FSIQ	Family R3267/R3273
Development	•	
Verification	•	
Production test of base stations	•	
Production test of mobile stations		•
Quality assurance	•	
Installation		•
Service		•

… an ideal match offering solutions for every requirement

Spectrum Analyzer R 3267/R 3273

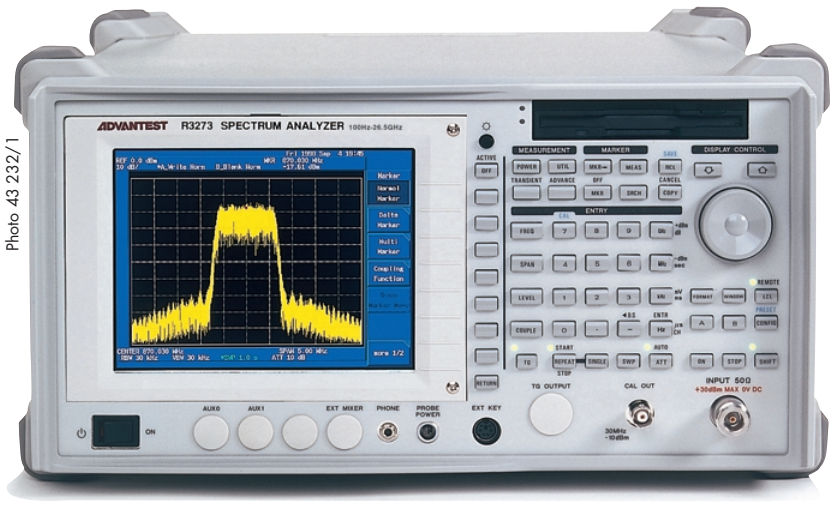

Photo 43 232/1

With its extremely wide dynamic range, minimal measurement uncertainty and high flexibility, FSIQ from Rohde & Schwarz is the ideal instrument for development, verification and quality assurance but also in the production of base stations.

By contrast, the new Analyzer Families R3267/3273 from Advantest are especially suitable for service and installation and for the production of mobile stations. Features of the units that particularly count here are portability, standard-conformal test routines and price.

Spectrum Analyzer Family FSIQ from Rohde & Schwarz

The FSIQ family is a follow-on development from spectrum analyzers of the FSE series. Characteristics like dynamic range, accuracy and phase noise were further improved for highly demanding measurements on W-CDMA signals. FSIQ comes in three models

- FSIQ3 20 Hz to 3.5 GHz
- FSIQ7 20 Hz to 7 GHz
- FSIQ26 20 Hz to 26 GHz

Because of the CDMA transmission used in mobile radio of the third generation, adjacent-channel power measurement is of particular importance. FSIQ's wide dynamic range is an essential feature especially when components like high-power output stages are measured, whose specifications must be far superior to those of the overall system. With a TOI of 20 dBm (FSIQ7), noise figure of 15 dB and typical phase noise of –153 dBc/Hz at 5 MHz from the carrier and –155 dBc/Hz at 10 MHz, FSIQ achieves more than 75 dB dynamic range in the adjacent channel and more than 85 dB in the alternate channel. In response to customer requests, phase noise at 5 MHz and 10 MHz from the carrier was improved by more than 5 dB compared to first-generation FSIQ. This ensures that the analyzer is 10 dB better than the DUT even when measuring a component in the alternate channel, so measured results are not influenced. Built-in routines simplify simultaneous measurement of adjacent-channel power in up to five channels.

Due to the improved phase noise, even spurious emissions of GSM base stations can be measured without any need for complex external filtering.

The amplitude distribution of a W-CDMA signal – which considerably deviates from white noise – means that reliable and reproducible power measurement results can only be achieved on an rms basis. For this reason FSIQ and the analyzers of the FSE family comprise an rms trace detector as standard, which is able to accurately measure signal power at any point of the trace.

(cont'd on next page)

New spectrum analyzer family from Advantest

The concept of the new analyzers is based on a traditional spectrum analyzer with a digital section for the different digital telecommunication standards in use today and intended for the near future. Model R 3267 covers a frequency range of 100 Hz to 8 GHz, model R 3273 through to 26.5 GHz.

All mobile-radio standards are available as software options: GSM 900, GSM 1800/1900, DECT, PDC, PHS, IS-136, IS-95, W-CDMA (NTT DoCoMo, ARIB, 3 GPP), etc, and upgrades can be loaded from disk drive. Up to three standards at a time can be combined in the same analyzer.

To meet the high RF performance requirements of the new digital standards GSM+ (HSCSD, GPRS), GSM++ (EDGE) and W-CDMA, Advantest enhanced the specifications of its spectrum analyzers. Major specifications such as a noise floor of –150 dBm/Hz at frequencies up to 3.6 GHz, phase noise down to –148 dBc/Hz at 5 MHz and <–153 dBc/Hz at 10 MHz from the carrier, plus typical TOI of +15 dBm meet the most stringent demands on ACPR (adjacent-channel power ratio) measurements. Typical ACPR values achievable for W-CDMA signals with 16 code channels are –72 dBc/Hz for the adjacent channel (5 MHz) and –80 dBc/Hz for the alternate channel (10 MHz). The analyzers additionally feature input attenuation in 5 dB steps, which also helps to meet requirements for a wide dynamic range.

Advantest spectrum analyzers comprise a 3.5" disk drive, a 6.5" TFT colour display and are equipped with GPIB, RS-232-C interfaces, parallel ports and a VGA output. Weight: 17 kg.

The analyzers offer a large number of keystroke functions such as adjacent-channel power, occupied bandwidth, power (channel, total, average), spurious emissions, harmonics and frequency counter. Also provided are four detectors, two of which can be simultaneously displayed on the screen, eg for

(cont'd on next page)

Signal Analyzer FSIQ (cont´d)

With a measurement uncertainty of <±1 dB up to 2.2 GHz or <±0.5 dB when the increased level accuracy option is used, FSIQ can be employed in many applications instead of a thermal power meter. An additional advantage is that power can be measured selectively and in a much wider range than with a thermal power meter.

Four traces – even with different detectors – can be simultaneously displayed, so the crest factor of W-CDMA signals, for instance, is very easily determined. FIG 1 illustrates this on a signal with 15 code channels. One trace shows the average power measured with an rms trace detector, the second the peak power using a peak detector. The crest factor depends very much on the code channels used, besides playing an important role in the design of amplifiers and meeting adjacent-channel power specifications, so fast and simple measurements are of particular importance in development.

A vector signal analyzer capable of measuring modulation errors up to a symbol rate of 6.4 Msymbol/s with very low inherent error (<1 % for QPSK, 4.096 Mchip/s) is standard equipment in FSIQ. Preset standards (GSM, PDC/PHS, DECT, IS-95 and many others) can be called up, or modulation parameters can be user-selected (demodulator, symbol rate, baseband filtering, etc). Analog modulation too can be analyzed, the settling and spurious FM of synthesizers with the FM demodulator for instance. This high flexibility in modulation measurements is enhanced by application software packages. FSE-K4 for instance supports automatic measurement of phase noise. Using the noise measurement software option, noise

Spectrum Analyzer R3267/R3273 (cont´d)

measurement of crest factor. Fast time domain sweep down to 1 µs and gated sweep are standard functions.

The software options for the digital communication standards are continually updated to satisfy future developments. A precondition for their use is digital modulation analysis (option 01), which uses DSPs and a fast A/D converter for six-fold oversampling (approx. 24 Msample/s). W-CDMA signals can thus be measured on the uplink or downlink without any constraint on the number of coded channels (128 with W-CDMA). Digital modulation analysis can also be performed for QPSK signals provided they are not spread or coded in a complex way. The same signals can also be measured on I/Q baseband inputs (DC to 2.5 MHz/channel).

Using the W-CDMA option, modulation analysis can be performed and the error vector magnitude (EVM), rho, the power of the individual codes and their timing determined. In conjunction with the ACP test, which requires a wide RF dynamic range, and other special W-CDMA measurements such as VOX on/off, time synchronization error, OBW, transmit power (calculated rms) and out-of-band spurious, the analyzers from Advantest cover all relevant W-CDMA measurements.

FIG 1 shows the power in the code domain of a signal with one perch channel (code 0) and three DPCHs (dedicated physical channels, code 16, 32, 64). By analyzing the time domain power of each individual code, the power of each pilot, TPC and data symbol can be evaluated for instance.

figures throughout the frequency range of the particular analyzer can be detected. The two programs run under Windows™ on an external computer or under the FSIQ's internal Windows NT™.

Herbert Schmitt

REFERENCES

[1] Wolf, J.: Signal Analyzer FSIQ – The ideal analyzer for the third mobile-radio generation. News from Rohde & Schwarz (1998) No. 160, pp 4–6

[2] Wolf, J.: Spectrum Analyzer FSEM/FSEK – Fast spectrum analysis now through to 40 GHz. News from Rohde & Schwarz (1996) No. 152, pp 7–9

Reader service card 163/04 for further information on Signal Analyzer FSIQ

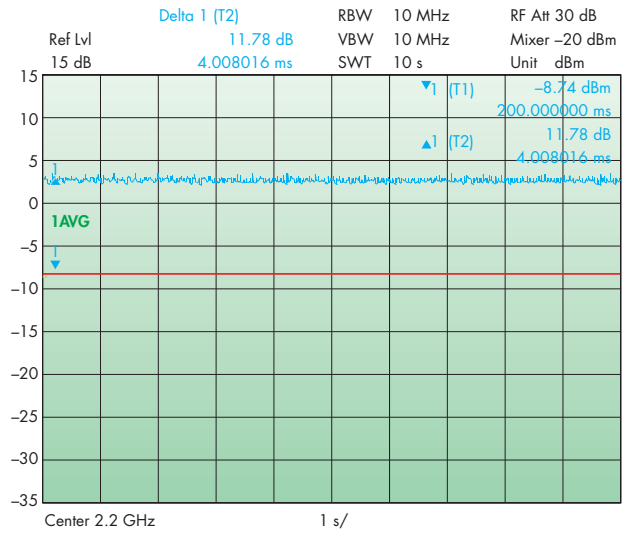

FIG 1 Signal with 15 code channels. One trace shows average power measured with rms trace detector, the second peak power with peak detector

The W-CDMA option allows simultaneous numeric listing of waveform quality, time alignment error, I/Q origin offset as well as phase, modulation and frequency errors in tabular form. Graphic presentations such as constellation diagram, eye pattern, EVM vs time, etc can also be selected for either complex-coded or QPSK signals.

Jan Bo Nielsen

Reader service card 163/05 for further information on Spectrum Analyzers R3267/R3273

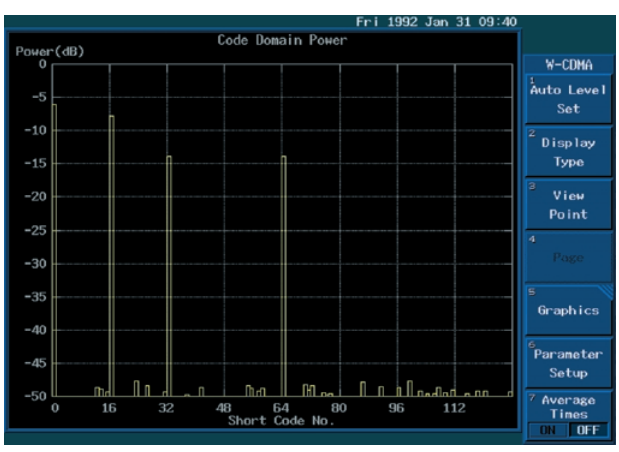

FIG 1 Power in code domain of signal with one perch channel (code 0) and three DPCHs (code 16, 32, 64)