

R&S®FSQ Signal Analyzer

More bandwidth for analyzing digital transmission systems

Bandwidths of advanced digital transmission systems are steadily increasing. By offering a modulation bandwidth of 120 MHz over the entire frequency range, the R&S®FSQ-B72 broadband option now also provides sufficient capacity in the frequency range up to 3.6 GHz for analyzing mobile radio, wireless, and satellite communications systems.

Excellent dynamic range, level linearity and phase linearity

Bandwidths of modern transmission standards are increasing rapidly: While a bandwidth of 20 MHz was sufficient for WLAN 802.11g yesterday, the IEEE 802.16e WiMAX standard now requires 28 MHz, and 40 MHz and more are planned for the future. In mobile radio, the number of transmission channels for each transmit unit of the base station is also continuously growing. The algorithms for linearizing power amplifiers make use of the complex frequency spectrum around the carrier signals, including fifth-order or even seventh-order intermodulation products. At channel bandwidths of 5 MHz for UMTS, for example, the required analysis bandwidth quickly reaches 80 MHz and more.

Users of the R&S®FSQ signal analyzer therefore require the available modulation bandwidth to be a multiple of the useful signal bandwidth at the best possible dynamic range (FIG 1), level linearity and phase linearity. And this is exactly where the R&S®FSQ-B72 [*] option excels:

- ◆ 120 MHz modulation bandwidth over the entire frequency range

- ◆ 0.15 dB level linearity in the range from 0 dB to –70 dB
- ◆ $\pm 2^\circ$ phase linearity up to 80 MHz bandwidth ($\pm 3^\circ$ up to 120 MHz)
- ◆ >60 dBc (typ. 68 dBc) suppression of third-order intermodulation products
- ◆ >60 dBc (typ. 70 dBc) spurious-free dynamic range
- ◆ >135 dBfs signal-to-noise ratio, referenced to 1 Hz bandwidth

Taking UMTS signals as an example, the advantages become very clear. While up to now the R&S®FSQ was able to record the characteristics of a maximum of twelve channels simultaneously, it will in future easily handle 20 channels and more at a 10 dB higher dynamic range and with significantly improved linearity (FIG 2).

This opens up completely new possibilities for developers of multicarrier power amplifiers (MCPA), for example, to characterize the properties of the components used. The same applies to the production and verification of base stations, since with the R&S®FSQ-B72 option sufficient bandwidth is always available regardless of the transmission standard. Even with WiMAX signals, it is possible to record three adjacent transmission channels simultaneously with the transmit signal.

Excerpt from the specifications for the R&S®FSQ-B72 option.

Demodulation bandwidth (entire frequency range)	120 MHz
Sampling rate , selectable	10 kHz to 326.4 MHz
Level linearity (0 dB to –70 dB)	<0.15 dB
Phase linearity , bandwidth up to 80 MHz up to 120 MHz	$\pm 2^\circ$ $\pm 3^\circ$

New memory extensions for the R&S®FSQ signal analyzer enlarge its I/Q memory depth to a maximum of 705 Msamples – unrivaled among signal analyzers (page 36).

Today, the R&S®FSQ-B72 option already plays an important role in the monitoring of communications and TV satellites, as the task here is to ensure the signal quality of transponders with a bandwidth of 36 MHz and 72 MHz. Up to now, this has been possible in the RF range, but in the future the complete analysis bandwidth of 120 MHz will also be available in the preferred IF range at 2 GHz.

Summary

The new characteristics of the R&S®FSQ-B72 option put the R&S®FSQ in the first row of signal analyzers in terms of dynamic range, level linearity and phase linearity at wide bandwidths.

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FIG 1 Excellent dynamic range of the R&S®FSQ-B72 option at a bandwidth of 120 MHz, displayed as a spectrum using the R&S®FS-K7 option.

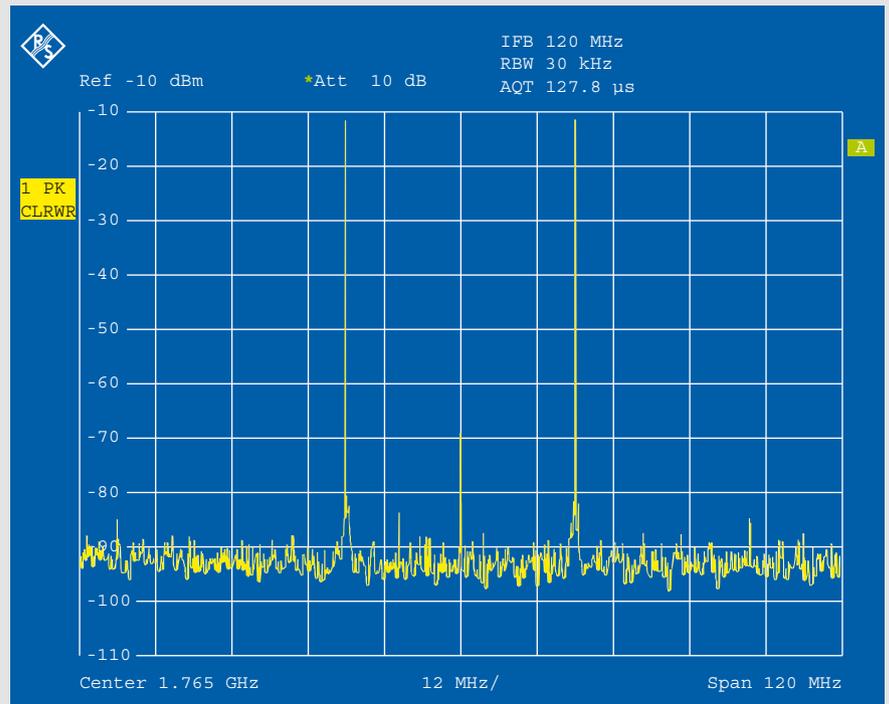
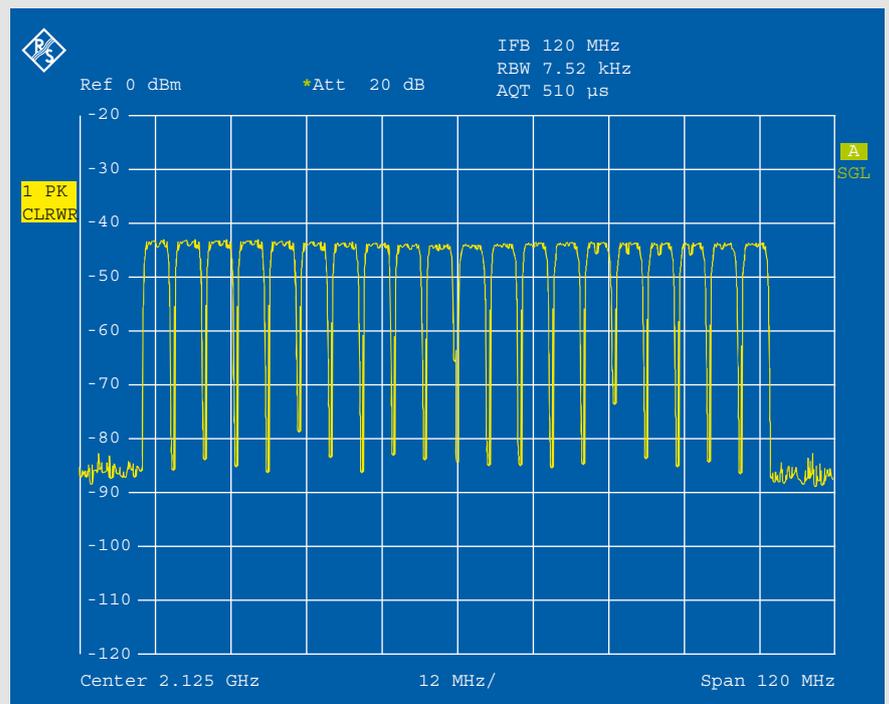


FIG 2 Twenty UMTS channels with 5 MHz channel spacing, generated with the R&S®SMU200A vector signal generator (two paths) by means of a power combiner.



More information, product brochure
and specifications at
www.rohde-schwarz.com
(search term: FSQ)



REFERENCES

[*] Signal Analyzer R&S®FSQ: Broadband signal analysis up to 120 MHz. News from Rohde & Schwarz (2004) No. 181, pp 30–31