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R&S®FSU
Spectrum Analyzer
High-end spectrum analysis

Product Brochure | 11.01



ROHDE&SCHWARZ

R&S®FSU Spectrum Analyzer

At a glance

To handle the wide variety of measurement tasks in product development, an instrument must offer ample functionality and excellent performance in all areas of interest. The R&S®FSU fully meets these requirements.

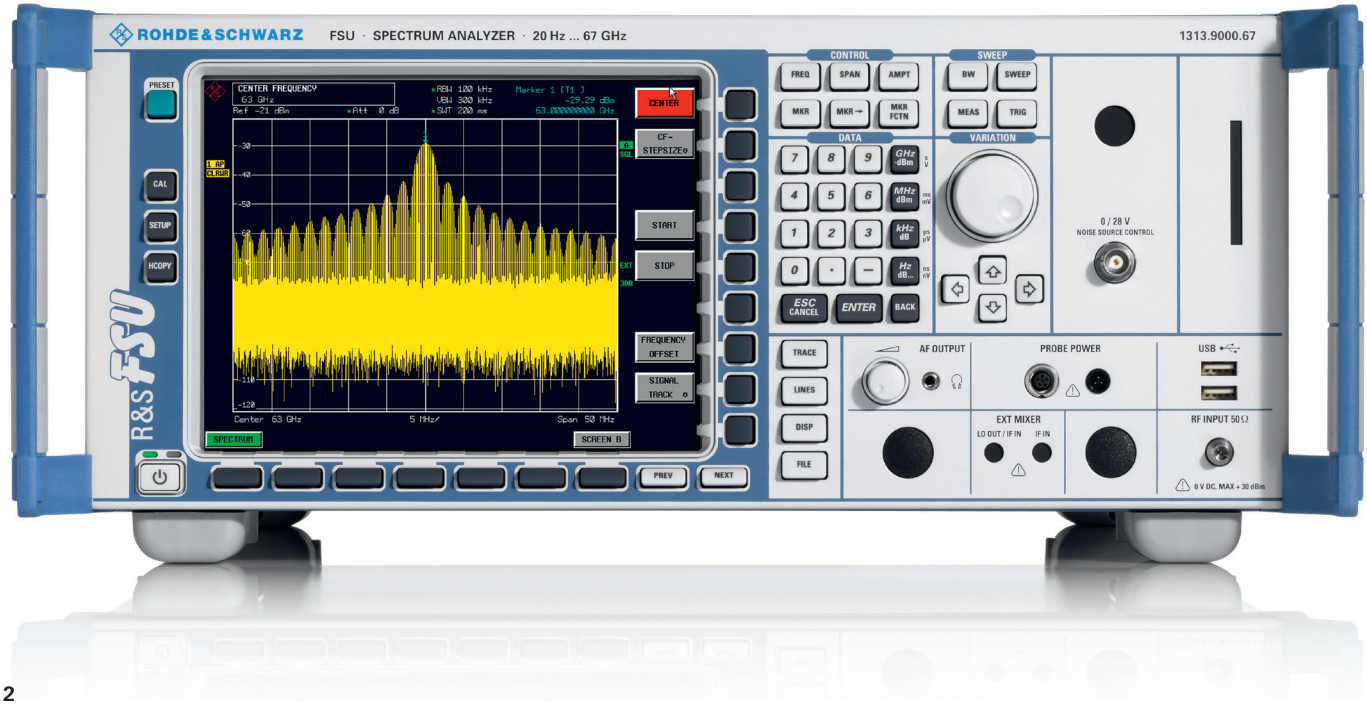
Its wide dynamic range makes the R&S®FSU an ideal tool for base station development and testing. That plus the excellent characteristics already incorporated in the standard model, e.g. < 0.3 dB total measurement uncertainty, gated sweep and IF power trigger.

Due to its low phase noise and low noise floor, the R&S®FSU is the ideal instrument for measurement tasks in RADAR development and when searching for spurious emissions.

A full choice of detectors for adaptation to a wide range of signal types, versatile resolution filters and additional applications make the R&S®FSU a multi-purpose easy-to-use measurement tool.

Key facts

- 3.6/8/26/43/46/50/67 GHz
- TOI > 20 dBm, typ. +25 dBm
- 1 dB compression: +13 dBm (0 dB RF attenuation)
- Displayed average noise level: –152 dBm at 2 GHz; –148 dBm at 26 GHz (1 Hz bandwidth)
- Typ. 77 dB ACLR for 3GPP, typ. 84 dB with noise correction
- Phase noise: typ. –160 dBc (1 Hz) at 10 MHz carrier offset
- Noise correction



R&S®FSU Spectrum Analyzer Benefits and key features

Shorter development cycles through versatile functions, wide dynamic range and performance

- Full choice of detectors
- Versatile resolution filters
- Full range of analysis functions
- High dynamic range

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Innovative solutions through customized options

- Measuring frequency deviation after settling
- Power measurement
- Scalar network analysis with wide dynamic range

▷ page 6

Spectrum analysis up to 67 GHz/110 GHz

- Direct frequency range up to 67 GHz
- Easy expansion of the frequency range to 110 GHz with external mixers from Rohde&Schwarz
- Support of external mixers up to 1 THz

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High throughput in production

- Short test cycles, high throughput
  - Fast time domain power measurement
  - List mode: combined measurement of various parameters with a single command
  - Up to 70 measurements/s in zero span via IEC/IEEE bus, including trace data transfer
  - Fast frequency counter: 0.1 Hz resolution for a measurement time of < 30 ms
- 859x/8566-compatible IEC/IEEE bus command set
- High measurement speed

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Shorter development cycles through versatile functions, wide dynamic range and performance

Whether in synthesizer development or frontend design, additional applications add to the R&S®FSU functionality while user-friendliness is maintained.

Full choice of detectors

Full choice of detectors for adaptation to a wide range of signal types

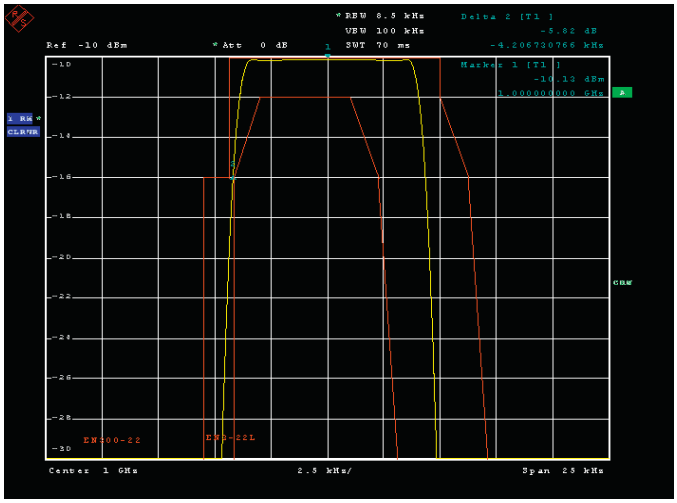
- RMS
- auto peak
- max. peak
- min. peak
- sample
- average
- CISPR-AV
- CISPR-RMS
- QPK (quasi-peak)

Versatile resolution filters

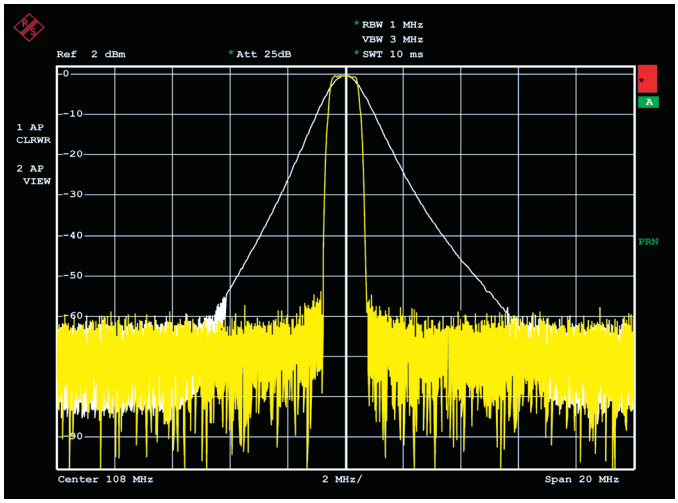
The most versatile resolution filter characteristics and largest bandwidth found in a spectrum analyzer:

- Standard resolution filters from 10 Hz to 50 MHz in steps of 1, 2, 3, 5
- FFT filters from 1 Hz to 30 kHz
- 39 channel filters with bandwidths from 100 Hz to 5 MHz
- RRC filters for NADC and TETRA
- EMI filters: 200 Hz, 9 kHz, 120 kHz, 1 MHz
- Channel filter in line with most standards, e.g. EN 300 328

The R&S®FSU channel filters meet the requirements for transient power measurements in accordance with EN 300 220. They allow users to perform transient power measurements without any additional expense.



1 MHz channel filter versus normal 1 MHz resolution filter.



Full range of analysis functions

- Time domain power in conjunction with channel or RRC filters turn the R&S®FSU into a fully-fledged channel power meter
- TOI marker
- Noise/phase-noise marker
- Versatile channel/adjacent-channel power measurement functions with wide selection of standards, user-configurable
- CCDF measurement function
- Split-screen mode with selectable settings
- Peak list marker for fast search of all peaks within the set frequency range (search for spurious)
- Spurious emissions
- Harmonic distortion

High dynamic range

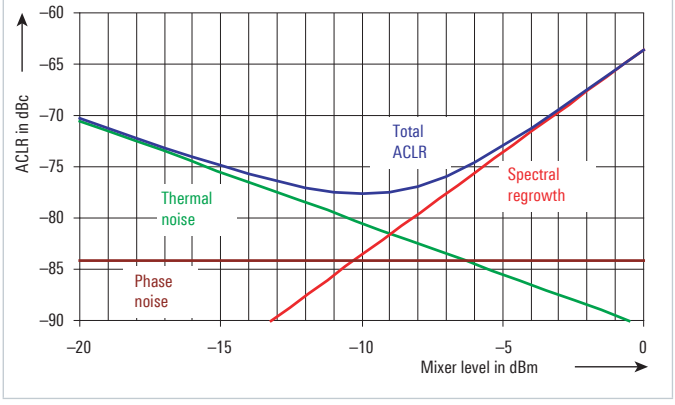
The wide dynamic range comes in handy when solving difficult measurement problems. For 3GPP adjacent-channel power measurements, a figure of 77 dB ACLR – or 84 dB ACLR with noise correction – allows very good adjacent-channel power ratios to be easily and accurately verified and demonstrated. The proof: A higher-performance node B can be built.

The high harmonic second-order intercept point means optimum dynamic range for multichannel cable TV measurements.

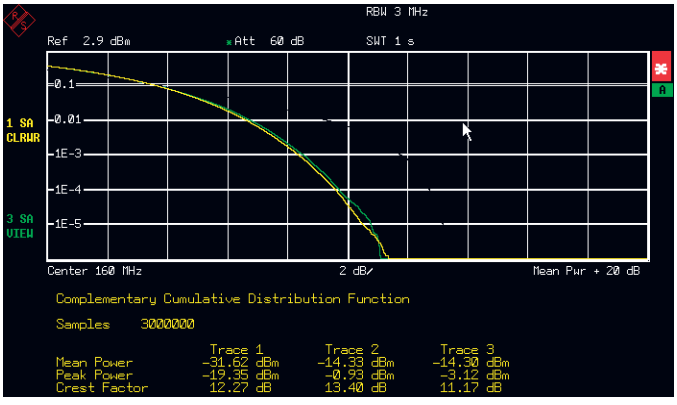
- TOI typ. +25 dBm
- 1 dB compression +13 dBm
- Phase noise:
  typ. –133 dBc (1 Hz) at 640 MHz offset
  typ. –160 dBc (1 Hz) at 10 MHz offset
- Excellent display linearity < 0.1 dB
- 84 dB ACLR/3GPP with noise correction

The inherent noise level of the R&S®FSU can be reduced by using noise correction, during which the instrument measures its own noise at the current operation mode, and then through signal processing removes it from the trace and enables measurements of weak signals close to the thermal noise.

Dynamic range of the R&S®FSU for adjacent-channel power measurement on a WCDMA signal without noise correction



CCDF measurement function.



Innovative solutions through customized options

Measuring frequency deviation after settling

The R&S®FS-K7 option adds a universal AM/FM/φM measurement demodulator to the R&S®FSU for determining not only the frequency deviation but also, for example, the frequency settling of oscillators (AM/φM, audio distortion, THD/SINAD).

Power measurement

The R&S®FS-K9 option transforms the R&S®FSU into a highly accurate power meter. The R&S®NRP-Z4 and R&S®NRP-Z3 USB adapters as well as the R&S®NRP-Z11 and R&S®NRP-Z21 power sensors are supported. The measurement result is displayed during ongoing measurements. Calibration factors for the sensors are automatically taken into account in accordance with the set center frequency, or are derived from the marker position.

Scalar network analysis with wide dynamic range

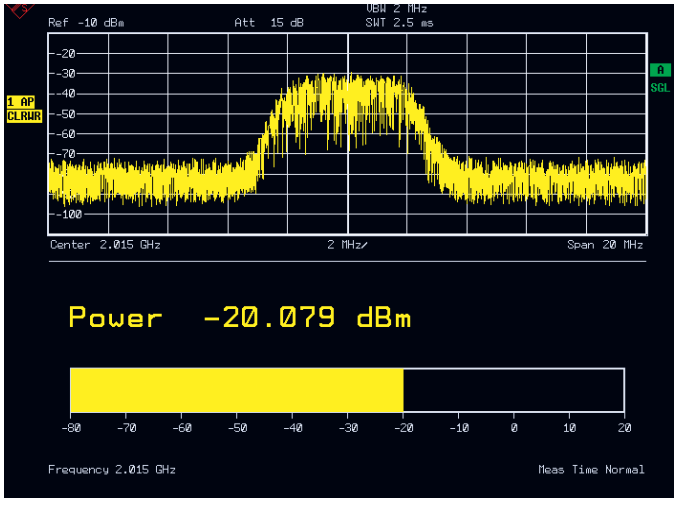
The optional R&S®FSU-B9 (internal tracking generator up to 3.6 GHz) and R&S®FSP-B10 (external generator control) turn the R&S®FSU spectrum analyzer into a scalar network analyzer. Through selective measurement, the gain, frequency response, insertion loss and return loss can be measured with a wide dynamic range without being influenced by harmonics or spurious from the generator. The internal R&S®FSU-B9 tracking generator can be implemented in all R&S®FSU models and covers the frequency range from 100 kHz to 3.6 GHz; a frequency offset for measuring frequency-converting modules of ±150 MHz can be set. The tracking generator can be broadband-modulated using an external I/Q baseband signal.

The R&S®FSP-B10 option uses conventional RF signal generators as an external tracking source, controlled via GPIB or a TTL bus. Together with microwave generators such as the R&S®SMR or R&S®SMP, the frequency range can be expanded up to 50 GHz for scalar transmission, loss and reflection measurements.

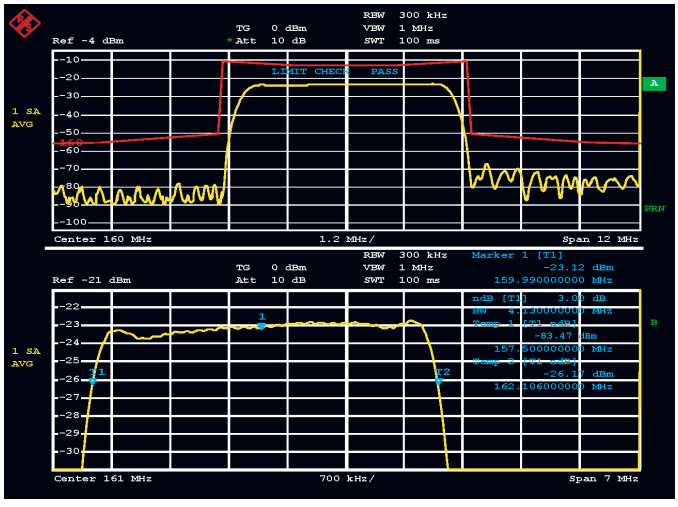
Settling of a synthesizer.



Power measurement of a 3GPP HSDPA signal.



Split-screen mode with selectable settings.



Spectrum analysis up to 67 GHz/110 GHz

Direct frequency range up to 67 GHz

The R&S®FSU67 is the first spectrum analyzer with a direct frequency range up to 67 GHz and fundamental mixing. It allows measurements up to 67 GHz without the need for cumbersome setups with external mixers.

- Simplified test setups with just one connection – from 20 Hz to 67 GHz
- Full span sweep of 67 GHz
- Unambiguous frequency indication without the image response and multiple responses known from external harmonic mixers
- Wider level range with a much higher permissible reference level than with harmonic mixers
- Good level accuracy up to 67 GHz
- Low noise floor:
  - –152 dBm (1 Hz) at 2 GHz
  - –130 dBm (1 Hz) at 65 GHz

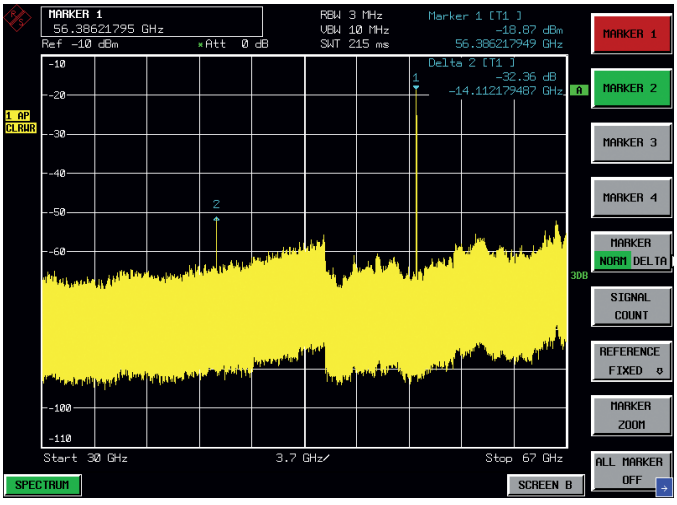
Easy expansion of the frequency range to 110 GHz with external mixers from Rohde&Schwarz

The R&S®FSU-B21 option LO/IF ports for external mixers and external harmonic mixers, such as the R&S®FS-Z60/-Z75/-Z90/-Z110, expand the frequency range of the R&S®FSU to 110 GHz and above.

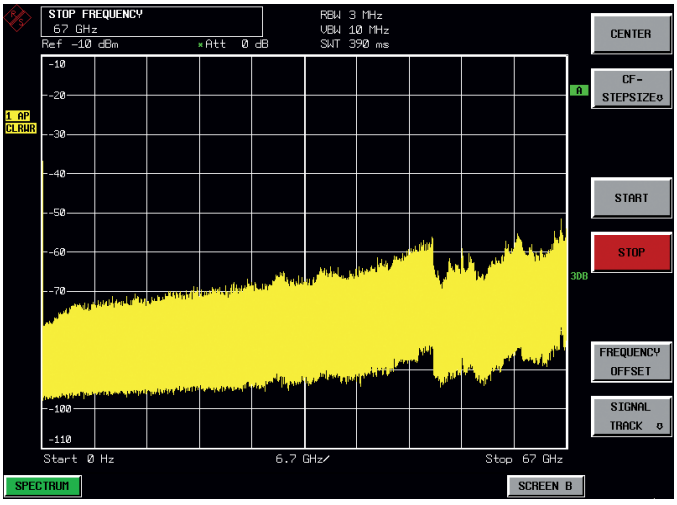
An easy-to-use software preselector that identifies and suppresses unwanted signals arising from image frequency response or from reception with a harmonic number other than the one set. It supports two-port and three-port mixers that can operate with an IF of 404.4 MHz and an LO frequency range from 7 GHz to 15.5 GHz. The maximum harmonic number that can be selected is n = 66 (or 1.022 THz).

The high LO frequency range allows low harmonic numbers to be used; fewer unwanted products are created, and the phase noise remains lower.

If subharmonics of multipliers are present despite filtering, they can easily be measured in one sweep in relation to the wanted signal – even for a 50 GHz to 67 GHz signal.

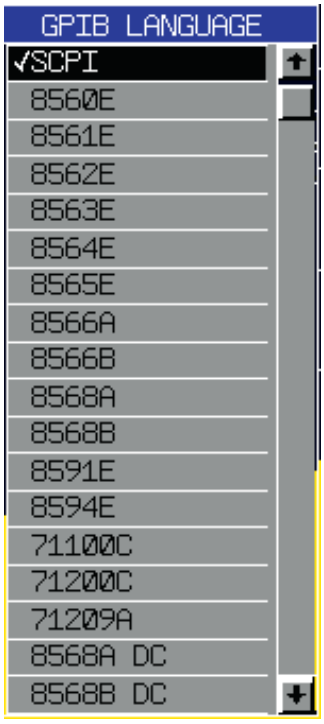


The full span sweep of the R&S®FSU67 shows a low noise floor up to 67 GHz.

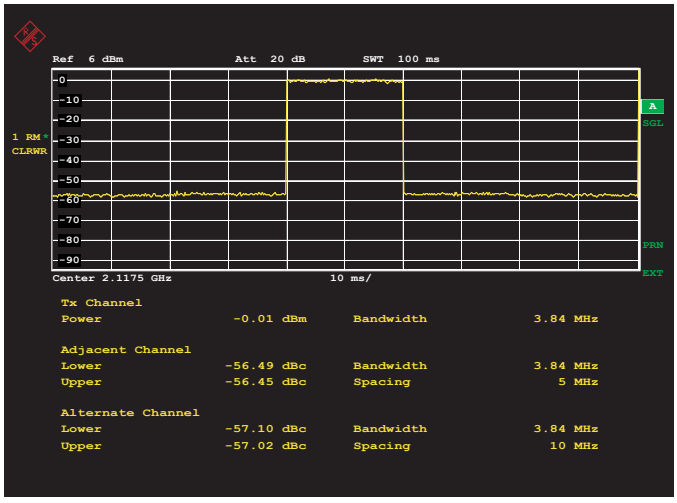


High throughput in production

The R&S® FSU supports a wide range of remote control command sets.



Measurement of adjacent-channel power in time domain: fast ACP.



Short test cycles, high throughput

The R&S®FSU is just the right instrument for this purpose. Fast data transfer on the IEC/IEEE bus or an Ethernet LAN plus intelligent routines optimized for speed make for very short measurement times:

- Fast ACP: for the major mobile radio standards with high reproducibility and accuracy
- List mode: combined measurement of various parameters with a single command
- Fast time domain power measurement using channel or RRC filters
- Up to 70 measurements/s in zero span via IEC/IEEE bus, including trace data transfer
- Fast-sweeping FFT filters for spurious measurement at low levels
- Fast frequency counter: 0.1 Hz resolution for a measurement time of < 30 ms

859x/8566-compatible IEC/IEEE bus command set

In many applications, existing test software is to be used in automatic test systems with new devices. For this reason, the R&S®FSU comes with an IEC/IEEE bus command set that is compatible with the 859x/8566 series spectrum analyzers. It was of utmost importance to achieve maximum compatibility in order to minimize the effort required to change from one analyzer to the other:

- Approx. 175 commands in IEEE 488.2 format (incl. CF, AT, ST)
- The most important commands in IEEE 488.1 format (8566A, for exclusive use only)
- Selectable presets
- Selectable trace format

The IEC/IEEE bus commands in IEEE488.2 format can be used together with the R&S®FSU command set, so that it is possible to enhance and complete available software by using the innovative instrument functions of the R&S®FSU (such as list mode, channel filters) without having to redesign the test software.

High measurement speed

With 80 measurements/s in manual mode, minimum sweep time of 2.5 ms and 1 µs (zero span) as standard, the R&S®FSU is ideal for time-critical applications. The highly selective, fast-sweeping digital filters featuring analog response allow measurements on pulsed signals as well as use of the built-in frequency counter.

Application

Phase noise and noise figure measurement

Phase noise

The R&S®FS-K40 application firmware for phase noise measurement automates measurement over a complete offset frequency range and determines residual FM from the phase noise characteristic. In conjunction with the extremely low phase noise of the R&S®FSU, this eliminates in many cases the need for an extra phase noise measurement system that may be difficult to operate.

Noise figure measurement

The R&S®FS-K30 application firmware for noise figure and gain measurements is a convenient tool for determining the noise figure of amplifiers and frequency-converting DUTs throughout the frequency range of the R&S®FSU. This provides the measurements needed for complete documentation.

The high linearity and extremely accurate power measurement routines of the R&S®FSU provide precise and reproducible results, making a separate noise figure meter unnecessary.

Phase noise measurement with the R&S®FS-K40 application firmware.



Noise figure measurement with the R&S®FS-K30 option.



Transmitter and modulation measurements in mobile communications systems

Measurement applications/ technology	Power	Modulation quality	Spectrum measurement	Miscellaneous	Special features
R&S®FS-K8 ▪ Bluetooth®/EDR	▪ Output power ▪ Average and peak power ▪ EDR relative TX power	▪ Deviation ▪ Initial carrier frequency tolerance (ICFT) ▪ Carrier frequency drift ▪ EDR frequency stability ▪ EDR modulation accuracy	▪ ACP ▪ EDR in-band spurious emissions	▪ Trigger: IF power, external, free run ▪ Support for packet types DH1, DH3 and DH5 and power classes 1 to 3	▪ In line with Bluetooth® RF test specification 2.0
R&S®FS-K10 ▪ GSM/EDGE/EDGE Evolution	▪ Power measurement in time domain, including carrier power	▪ EVM ▪ Phase/frequency error ▪ Origin offset suppression	▪ Modulation spectrum ▪ Transient spectrum	–	▪ Single burst and multiburst
R&S®FS-K72/-K73/ -K73+/-K74+ ▪ WCDMA	▪ Code domain power ▪ Code domain power versus time ▪ CCDF	▪ EVM ▪ Peak code domain error ▪ Constellation diagram ▪ Residual code domain error ▪ I/Q offset ▪ Gain imbalance ▪ Center frequency error (chip rate error)	▪ Spectrum mask ▪ ACLR ▪ Power measurement	▪ Channel table with summary of channels used on base station ▪ Timing offset	▪ Automatic detection of active channels and decoding of signal information ▪ Automatic detection of encryption code ▪ Automatic detection of HSDPA modulation format ▪ Support for signals with compressed mode ▪ Support for HSPA (HSDPA and HSUPA) ▪ Support for HSPA+ (HSDPA+ and HSUPA+)
R&S®FS-K76/-K77 ▪ TD-SCDMA	▪ Code domain power ▪ Code domain power versus time ▪ CCDF	▪ EVM ▪ Peak code domain error ▪ Constellation diagram ▪ Residual code domain error ▪ I/Q offset ▪ Gain imbalance ▪ Center frequency error (chip rate error)	▪ Spectrum mask ▪ ACLR ▪ Power measurement	▪ Channel table with summary of channels used on base station ▪ Timing offset ▪ Power versus time	▪ Automatic detection of active channels and decoding of signal information ▪ Automatic detection of HSDPA modulation format ▪ Support for HSPA (HSDPA and HSUPA) ▪ Support for HSPA+ (HSDPA+ and HSUPA+)
R&S®FS-K82/-K83 ▪ CDMA2000®	▪ Carrier power ▪ Code domain power ▪ Code domain power versus time ▪ CCDF	▪ RHO ▪ EVM ▪ Peak code domain error ▪ Constellation diagram ▪ Residual code domain error ▪ I/Q offset ▪ Gain imbalance ▪ Center frequency error (chip rate error)	▪ Spectrum mask ▪ ACLR ▪ Power measurement	▪ Channel table with summary of channels used on base station ▪ Timing offset	▪ Automatic detection of active channels and decoding of signal information ▪ Robust demodulation algorithms for reliable measurement of multicarrier signals
R&S®FS-K84/-K85 ▪ 1xEV-DO	▪ Carrier power ▪ Code domain power ▪ Code domain power versus time ▪ CCDF	▪ RHO_{Pilot}/RHO_{Data}/RHO_{MAC} (R&S®FSV-K84) ▪ $RHO_{Overall}$ ▪ EVM ▪ Peak code domain error ▪ Constellation diagram ▪ Residual code domain error ▪ I/Q offset ▪ Gain imbalance ▪ Center frequency error (chip rate error)	▪ Spectrum mask ▪ ACLR ▪ Power measurement	▪ Channel table with summary of channels used on base station ▪ Timing offset	▪ Automatic detection of active channels and decoding of signal information ▪ Robust demodulation algorithms for reliable measurement of multicarrier signals
R&S®FS-K110 ▪ TETRA/TEDS	▪ Power measurement in time domain, including carrier power	▪ Error vector magnitude (EVM) ▪ Constellation diagram, selectable per carrier and per symbol type ▪ Phase and magnitude error	▪ Adjacent-channel power (ACP) due to modulation and transients	▪ Bit stream	▪ No trigger required ▪ Supports 25 kHz, 50 kHz, 100 kHz, 150 kHz channels ▪ Supports 4QAM,16QAM and 64QAM data symbols

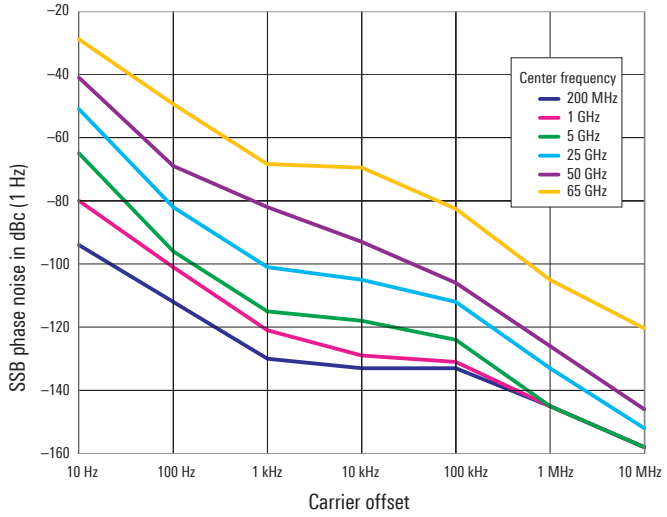
General purpose measurements

Measurement applications/ technology	Power	Modulation quality	Spectrum measurement	Miscellaneous	Special features
R&S®FS-K7 ▮ AM/FM/φM Modulation analysis	▮ Carrier power ▮ Carrier power versus time	▮ Frequency modulation (FM) ▮ Amplitude modulation (AM) ▮ Phase modulation (φM) ▮ Peak and RMS deviation ▮ Modulation frequency	▮ THD, SINAD ▮ RF spectrum (FFT) of the demodulated signal	▮ Analysis bandwidth from 100 Hz to 10 MHz ▮ AF filters (highpass, lowpass, deemphasis) ▮ Large memory depth for long measurement sequences (I/Q memory 2 × 128 ksample)	
R&S®FS-K15 ▮ VOR/ILS measurements		ILS measurement functions: ▮ DDM ▮ SDM ▮ Modulation depth and frequency VOR measurement functions: ▮ VOR phase ▮ Modulation depth and frequency for 30 Hz subcarrier identifier ▮ 9.96 kHz subcarrier deviation ▮ Modulation depth and frequency of subcarrier	▮ ILS: THD ▮ VOR: THD – phase between 90 Hz and 150 Hz signal	▮ VOR phase measurement range: 0° to 360°, 0.1° resolution ▮ VOR phase measurement uncertainty: 0.003°	
R&S®FSU-B73 Vector signal analysis for: ▮ BPSK, QPSK, OQPSK ▮ π/4 DQPSK ▮ 8PSK, D8PSK, 3π/8 8PSK ▮ (G)MSK ▮ 2, 4, (G)FSK ▮ 16/32/64/128/256 (D)QAM ▮ 2FSK, 4FSK ▮ 8VSB		▮ In-phase and quadrature signals versus time ▮ Magnitude and phase versus time ▮ Eye diagram ▮ Vector diagram ▮ Constellation diagram ▮ Demodulated bit stream ▮ Statistical evaluation of modulation parameters	▮ Spectral evaluation ▮ Amplifier distortion measurements	▮ Trigger modes: external, burst, IF power	▮ 6.4 MHz symbol rate ▮ 7 MHz I/Q demodulation bandwidth

Specifications in brief

	R&S®FSU3	R&S®FSU8	R&S®FSU26	R&S®FSU43	R&S®FSU46	R&S®FSU50	R&S®FSU67
Frequency range	20 Hz to 3.6 GHz	20 Hz to 8 GHz	20 Hz to 26.5 GHz	20 Hz to 43 GHz	20 Hz to 46 GHz	20 Hz to 50 GHz	20 Hz to 67 GHz
Reference frequency	aging: 1 × 10^{-7}/year; with R&S®FSU-B4 option: 3 × 10^{-8}/year						
Spectral purity							
Phase noise	typ. –133 dBc (1 Hz) at 640 MHz in 10 kHz from carrier						
Sweep time							
Span ≥ 10 Hz	2.5 ms to 16000 s						
Span 0 Hz (zero span)	1 µs to 16000 s						
Resolution bandwidth	10 Hz to 50 MHz (R&S®FSU43: 10 Hz to 10 MHz), FFT filter: 1 Hz to 30 kHz, channel filter, EMI bandwidth						
Video bandwidth	1 Hz to 10 MHz						
Display range	displayed average noise level to +30 dBm						
Displayed average noise level (1 Hz RBW)							
1 GHz	typ. –158 dBm	typ. –158 dBm	typ. –156 dBm	typ. –156 dBm	typ. –156 dBm	typ. –156 dBm	typ. –152 dBm
7 GHz	–	typ. –154 dBm	typ. –156 dBm	typ. –153 dBm	typ. –153 dBm	typ. –153 dBm	typ. –148 dBm
13 GHz	–	–	typ. –153 dBm	typ. –153 dBm	typ. –153 dBm	typ. –153 dBm	typ. –148 dBm
26 GHz	–	–	–	typ. –148 dBm	typ. –148 dBm	typ. –148 dBm	typ. –142 dBm
40 GHz	–	–	–	typ. –143 dBm	typ. –143 dBm	typ. –136 dBm	typ. –142 dBm
50 GHz	–	–	–	–	–	typ. –131 dBm	typ. –140 dBm
65 GHz	–	–	–	–	–	–	typ. –132 dBm
Displayed average noise level with preamplifier ON (R&S®FSU-B25), 1 GHz, 1 Hz RBW	< –162 dBm	< –162 dBm	< –162 dBm	< –162 dBm	< –162 dBm	< –162 dBm	–
Displayed average noise level with preamplifier ON (R&S®FSU-B24), 26 GHz, 10 Hz RBW	–	–	typ. –166 dBm	typ. –166 dBm	typ. –166 dBm	typ. –166 dBm	–
Trace detectors	max. peak, min. peak, auto peak, sample, RMS, average, quasi-peak, CISPR-AV, CISPR-RMS						
Total measurement error, f < 3.6 GHz	0.3 dB						
Display linearity	0.1 dB (0 dB to –70 dB)						

Phase noise of the R&S®FSU at various center frequencies



Ordering information

Designation	Type	Order No.
Spectrum Analyzer, 20 Hz to 3.6 GHz	R&S®FSU3	1313.9000.03
Spectrum Analyzer, 20 Hz to 8 GHz	R&S®FSU8	1313.9000.08
Spectrum Analyzer, 20 Hz to 26.5 GHz	R&S®FSU26	1313.9000.26
Spectrum Analyzer, 20 Hz to 43 GHz	R&S®FSU43[1)]	1313.9000.43
Spectrum Analyzer, 20 Hz to 46 GHz	R&S®FSU46	1313.9000.46
Spectrum Analyzer, 20 Hz to 50 GHz	R&S®FSU50[1)]	1313.9000.49
Spectrum Analyzer, 20 Hz to 50 GHz	R&S®FSU50	1313.9000.50
Spectrum Analyzer, 20 Hz to 67 GHz	R&S®FSU67[1)]	1313.9000.49
Spectrum Analyzer, 20 Hz to 67 GHz	R&S®FSU67	1313.9000.67

[1)] Max. RBW 10 MHz.

Designation	Type	Order No.	Retrofittable	Remarks
Hardware options				
OCXO, low aging/improved phase noise at 10 Hz carrier offset	R&S®FSU-B4	1144.9000.02	yes	
Tracking Generator, 100 kHz to 3.6 GHz	R&S®FSU-B9	1142.8994.02	yes	not available for R&S®FSU67
External Generator Control	R&S®FSP-B10	1129.7246.03	yes	
Output Attenuator, 0 dB to 70 dB	R&S®FSU-B12	1142.9349.02	yes	requires R&S®FSU-B9, not available for R&S®FSU67
Removable Hard Disk	R&S®FSU-B18	1303.0400.12	no	not with R&S®FSU-B20
Second Hard Disk	R&S®FSU-B19	1303.0600.02		requires R&S®FSU-B18
Extended Environmental Specifications	R&S®FSU-B20	1155.1606.11	no	
LO/IF Ports for External Mixers	R&S®FSU-B21	1157.1090.03	yes	only for R&S®FSU26/43/46/50/67
20 dB Preamplifier, 3.6 GHz to 26.5 GHz	R&S®FSU-B23	1157.0907.02	no	only for R&S®FSU26, requires R&S®FSU-B25
30 dB Preamplifier, 100 kHz to 50 GHz	R&S®FSU-B24	1157.2100.50	yes	only for R&S®FSU26/43/46/50, not available for R&S®FSU50, model .49, excludes R&S®FSU-B23, R&S®FSU-B25
Electronic Attenuator, 0 dB to 30 dB and 20 dB Preamplifier (3.6 GHz)	R&S®FSU-B25	1144.9298.02	yes	not available for R&S®FSU50, model .49 and R&S®FSU67
Broadband FM Demodulator Output, max. dev. 5 MHz	R&S®FSU-B27	1157.2000.02	yes	
Vector Signal Analyzer	R&S®FSU-B73	1169.5696.03	no	not available for R&S®FSU67
Vector Signal Analyzer Upgrade for XP instruments	R&S®FSU-U73	1169.5696.04	yes	not available for R&S®FSU67
Extended Specifications for Low-Noise Preamplifier	R&S®FSU-B85	1303.3000.02	no	only for R&S®FSU3 and R&S®FSU8, requires R&S®FSU-B25
N-type Adapter for R&S®RT-Zxx Oscilloscope Probes	R&S®RT-ZA9	1417.0909.02	yes	
Measurement applications				
GSM/EDGE Application Firmware	R&S®FS-K5	1141.1496.02		
Upgrade from R&S®FS-K5 to R&S®FS-K10	R&S®FS-K5U	1309.9745.02		
AM/FM/φM Measurement Demodulator	R&S®FS-K7	1141.1796.02		
Bluetooth® Application Firmware	R&S®FS-K8	1157.2568.02		
Power Sensor Measurements	R&S®FS-K9	1157.3006.02		
GSM/EDGE/EDGE Evolution Measurements	R&S®FS-K10	1309.9700.02		
VOR/ILS Measurement Demodulator	R&S®FS-K15	1302.0936.02		
Application Firmware for Noise Figure and Gain Measurements	R&S®FS-K30	1300.6508.02		preamplifier (e.g. R&S®FSU-B25) recommended
Application Firmware for Phase Noise Measurement	R&S®FS-K40	1161.8138.02		
3GPP BTS/NodeB FDD Application Firmware	R&S®FS-K72	1154.7000.02		
3GPP UE FDD Application Firmware	R&S®FS-K73	1154.7252.02		
3GPP HSPA+ UE Application Firmware	R&S®FS-K73+	1309.9274.02		requires R&S®FS-K73

Designation	Type	Order No.	Retrofittable	Remarks
3GPP HSDPA BTS Application Firmware	R&S®FS-K74	1300.7156.02		requires R&S®FS-K72
3GPP HSPA+ BTS Application Firmware	R&S®FS-K74+	1309.9180.02		requires R&S®FS-K74
3GPP TD-SCDMA BTS Application Firmware	R&S®FS-K76	1300.7291.02		
3GPP TD-SCDMA UE Application Firmware	R&S®FS-K77	1300.8100.02		
CDMA2000®/IS-95 (cdmaOne)/1xEV-DV BTS Application Firmware	R&S®FS-K82	1157.2316.02		
CDMA2000® 1xEV-DV MS Application Firmware	R&S®FS-K83	1157.2416.02		
CDMA2000® 1xEV-DO BTS Application Firmware (incl. Rev A)	R&S®FS-K84	1157.2851.02		
CDMA2000® 1xEV-DO MS Application Firmware	R&S®FS-K85	1300.6689.02		
TETRA Release 2 Analysis	R&S®FS-K110	1309.9668.02		requires R&S®FSU-B73/-K73

Service options		
Extended Warranty, one year	R&S®WE1FSU	Please contact your local Rohde&Schwarz sales office.
Extended Warranty, two years	R&S®WE2FSU	
Extended Warranty, three years	R&S®WE3FSU	
Extended Warranty, four years	R&S®WE4FSU	
Extended Warranty with Calibration Coverage, one year	R&S®CW1FSU	
Extended Warranty with Calibration Coverage, two years	R&S®CW2FSU	
Extended Warranty with Calibration Coverage, three years	R&S®CW3FSU	
Extended Warranty with Calibration Coverage, four years	R&S®CW4FSU	

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