АНАЛИЗАТОР СПЕКТРА и СИГНАЛОВ FSQ

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Астрахань (8512)99-46-04
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Омск (3812)21-46-40
Орел (4862)44-53-42
Оренбург (3532)37-68-04
Пенза (8412)22-31-16
Пермь (342)205-81-47
Ростов-на-Дону (863)308-18-15
Рязань (4912)46-61-64
Самара (846)206-03-16
Санкт-Петербург (812)309-46-40
Саратов (845)249-38-78
Севастополь (8692)22-31-93
Симферополь (3652)67-13-56
Смоленск (4812)29-41-54
Сочи (862)225-72-31
Ставрополь (8652)20-65-13
Сургут (3462)77-98-35
Тверь (4822)63-31-35
Томск (3822)98-41-53
Тула (4872)74-02-29
Тюмень (3452)66-21-18
Ульяновск (8422)24-23-59
Уфа (347)229-48-12
Хабаровск (4212)92-98-04
Челябинск (351)202-03-61
Череповец (8202)49-02-64
Ярославль (4852)69-52-93

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R&S®FSQ Signal Analyzer

At a glance

The R&S®FSQ is the solution for all development and production measurement tasks. It offers very low phase noise, unsurpassed low residual EVM, a wide dynamic range and above-average accuracy, making it the ideal high-end measuring instrument for development applications, where tolerances and limit values must often be lower than defined in a standard.

The R&S®FSQ combines the outstanding spectrum analyzer features and functions of the R&S®FSU with those of a wideband signal analyzer. Due to its large analysis bandwidth of up to 120 MHz (R&S®FSQ-B72), the R&S®FSQ is the right instrument for measuring broadband signals (e.g. WLAN, IEEE 802.11n/ac, 3GPP LTE or 3GPP WCDMA multicarrier signals), for determining amplitude statistics with the CCDF measurement and for measuring modulation accuracy or code domain power. Equipped with the R&S®FSQ-B71 option, the R&S®FSQ can analyze signals in the analog baseband, and even in the digital baseband if the R&S®FSQ-B17 option is used.

Model overview	
R&S®FSQ3	20 Hz to 3.6 GHz
R&S®FSQ8	20 Hz to 8 GHz
R&S®FSQ26	20 Hz to 26.5 GHz
R&S®FSQ40	20 Hz to 40 GHz

Key facts

- Frequency range from 20 Hz to 3.6/8/26.5/40 GHz
- 28 MHz signal analysis bandwidth, optionally 120 MHz
- Outstanding RF characteristics
  - TOI typ. +25 dBm
  - 1 dB compression point +13 dBm
  - 84 dBc ACLR/3GPP with noise correction
  - –173 dBm (1 Hz) displayed average noise level (DANL) with noise correction and R&S®FSU-B24 preamplifier
- Analysis of signals in the analog and digital baseband
- Numerous firmware applications extending the signal analysis capabilities
- 16 Msample I/Q memory, expandable up to 705 Msample

R&S®FSQ Signal Analyzer Benefits and key features

Excellent RF performance for demanding applications

- Outstanding RF features
  - 84 dB ACLR for 3GPP with noise correction
  - 77 dB ACLR for 3GPP multicarrier signals (four adjacent carriers)
  - TOI > +20 dBm, typ. +25 dBm
  - 1 dB compression +13 dBm
  - Displayed average noise level (DANL) typ. –173 dBm using noise correction (1 Hz bandwidth) and R&S®FSU-B24 preamplifier
  - Phase noise –160 dBc (1 Hz) at 10 MHz carrier offset
  - Phase noise –133 dBc (1 Hz) at 10 kHz carrier offset

▷ page 4

Signal and spectrum analysis in a single instrument

- Signal analysis with up to 120 MHz bandwidth
  - Signals from RF, analog or digital baseband
  - Up to 705 Msample (I and Q)
  - Low phase/frequency response
  - User-definable sample rate
- Best signal fidelity for modulation analysis
- Ready for analysis of multistandard, multicarrier transmitters

▷ page 5

Wide range of functions

With its wide range of functions, the R&S®FSQ is practically unparalleled on the spectrum analyzer market. Even the base unit includes all important functions:

- Channel filters from 100 Hz to 5 MHz
- RRC filters
- 1 Hz to 50 MHz resolution bandwidth (RBW)
- Number of measurement points/trace selectable between 155 and 30 001
- Time-selective spectrum analysis with gating function
- Up to 80 measurements/s in manual mode
- SCPI-compatible GPIB command set
- GPIB command set compatible with the R&S®FSE/R&S®FSIQ and legacy HP spectrum analyzer
- Fast ACP measurement in time domain
- Statistical signal analysis with CCDF function
- RMS detector
- Transducer factor for correcting antenna or cable frequency responses
- Harmonic distortion measurement function
- Spurious emission measurements with up to 100 001 points, in up to 20 segments
- External reference from 1 MHz to 20 MHz in 1 Hz steps
- LAN interface 100BaseT (1 Gbit)
- 16 Msample I and Q memory

Excellent RF performance for demanding applications

Outstanding RF features

The dynamic range performance of a spectrum analyzer is mainly defined by three parameters:

- Noise level
- Intermodulation performance (TOI)
- Phase noise

The R&S®FSQ excels in all of these three categories. Its wide dynamic range comes in handy when solving difficult measurement problems.

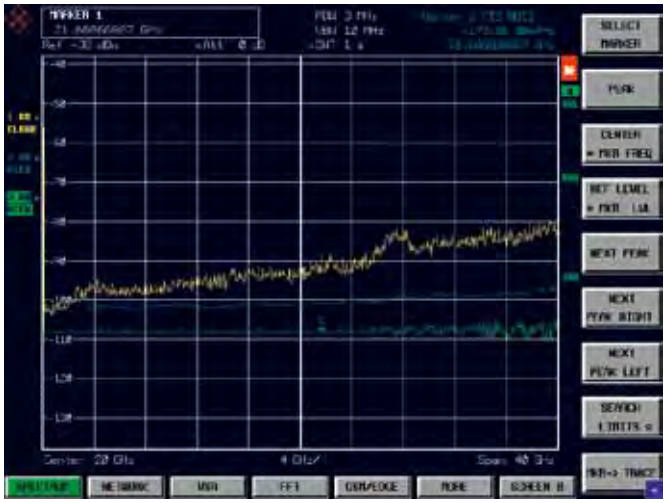
The inherent noise level of the R&S®FSQ can be reduced by using noise correction. The instrument measures its own noise in the active operating mode, and then uses signal processing to remove the noise from the trace, enabling measurement of weak signals close to the thermal noise.

Measurement of nonharmonics (spurious) on base station signals without an additional filter is made possible by the extremely low phase noise, particularly far away from the carrier.

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

For 3GPP adjacent-channel power measurements, a figure of 84 dB ACLR with noise correction allows very good adjacent-channel power ratios to be verified and demonstrated very simply and with high accuracy. A higher-performance NodeB can therefore be built and tested.

Yellow trace: noise correction activated.
Blue trace: R&S®FSU-B24 preamplifier.
Green trace: R&S®FSU-B24 preamplifier and noise correction.



Signal and spectrum analysis in a single instrument

Signal analysis with up to 120 MHz bandwidth

The R&S®FSQ combines dedicated processing hardware and the outstanding spectrum analyzer features and function of the R&S®FSU with a demodulation and analysis bandwidth that has been enhanced to 120 MHz.

Best signal fidelity for modulation analysis

The R&S®FSQ determines the linear distortion in the RF and IF paths with the aid of the built-in calibration source and corrects such distortion online using a compensation filter. Moreover, the bandwidth-limiting YIG filter can be switched off in the microwave range at carrier frequencies greater than 3.6 GHz to ensure that even the smallest modulation errors can be measured with high accuracy.

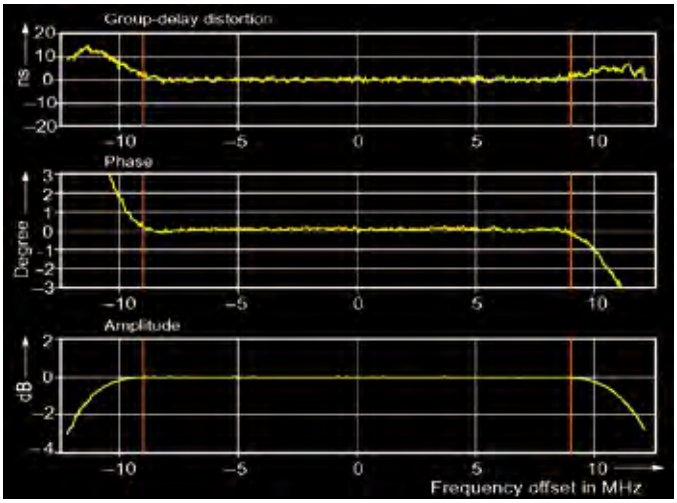
The I/Q data can be transferred to a process controller via either the IEC/IEEE bus interface or the factory-installed LAN interface and then imported into programs such as MATLAB® for further analysis.

Ready for analysis of multistandard, multicarrier transmitters

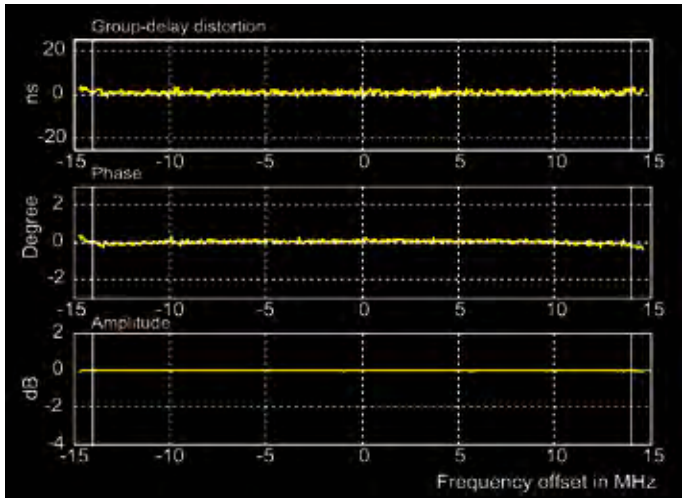
Future transmission methods in mobile radio and related fields call for wider transmission bandwidths to handle increasing data throughput. Even today multiple carriers of a GSM or 3GPP base station are often transmitted in common power output stages. This reduces the technical effort and costs on the one hand, but increases the bandwidth to be transmitted on the other.

	Standard	With R&S®FSQ-B72
Demodulation bandwidth	28 MHz	120 MHz
Sampling rate, selectable	10 kHz to 81.6 MHz	81.6 MHz to 326.4 MHz
Third-order intermodulation	80 dB	typ. 68 dB

Frequency response and group-delay distortion of 20 MHz resolution filter (example).



Frequency response and group-delay distortion of 50 MHz resolution filter (example).



Application

Transmitter and modulation measurements in mobile communications systems

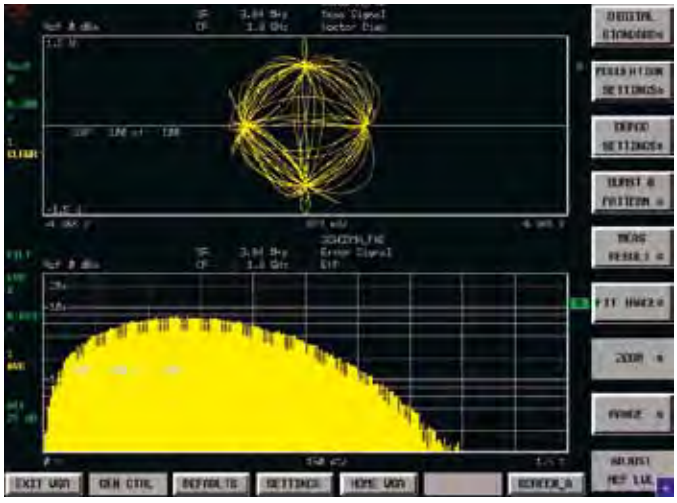
Measurement application/ technology	Power	Modulation quality	Spectrum measurement	Miscellaneous	Special features
R&S®FS-K10 ▪ GSM/EDGE/ EDGE Evolution/ VAMOS	▪ Power measure-ment in time domain including carrier power	▪ EVM ▪ Phase/frequency error ▪ Origin offset suppression	▪ Modulation spectrum ▪ Transient spectrum	–	▪ Single burst and multiburst ▪ Automatic detection of modulation formats and powers
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

Measurement application/ technology	Power	Modulation quality	Spectrum measurement	Miscellaneous	Special features
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®FSQ-K100/ -K101/-K102/-K103/ -K104/-K105 ▪ EUTRA/LTE and LTE-Advanced ▪ TDD and FDD ▪ Uplink and downlink ▪ MIMO	▪ Power measurement in time and frequency domains ▪ CCDF	▪ EVM ▪ Constellation diagram ▪ I/Q offset ▪ Gain imbalance ▪ Quadrature error ▪ Center frequency error (symbol clock error)	▪ Spectrum flatness ▪ Spectrum emission mask ▪ ACLR	▪ Bit stream ▪ Allocation summary list ▪ Averaging over multiple measurements	▪ Automatic detection of modulation, cyclic prefix length and cell ID ▪ MIMO measurements
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

Application

Transmitter and modulation measurements in wireless communications systems

Measurement application/ 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-K91/-K91n/ -K91ac ▮ WLAN ▮ IEEE 802.11a/b/g/j/ n/ac	▮ Power measurement in time and frequency domains ▮ Rising/falling edge ▮ CCDF	▮ EVM ▮ Constellation diagram ▮ I/Q offset ▮ Gain imbalance ▮ Quadrature error ▮ Center frequency error (symbol clock error)	▮ Spectrum mask ▮ ACP ▮ Spectrum flatness	▮ Bit stream ▮ Signal field ▮ Averaging over multiple measurements	▮ 40 MHz bandwidth for WLAN IEEE 802.11n ▮ 80 MHz bandwidth for WLAN IEEE 802.11ac
R&S®FS-K93 ▮ WiMAX™ ▮ IEEE 802.16e ▮ OFDM ▮ OFDMA	▮ Power measurement in time and frequency domains ▮ Rising/falling edge ▮ CCDF	▮ EVM ▮ Constellation diagram ▮ I/Q offset ▮ Gain imbalance ▮ Quadrature error ▮ Center frequency error (symbol clock error)	▮ Spectrum mask ▮ ACP ▮ Spectrum flatness	▮ Bit stream ▮ Signal field ▮ Averaging over multiple measurements ▮ Burst summary list ▮ Graphical display of DL map	▮ Automatic demodulation in line with DL map ▮ User-editable spectrum mask
R&S®FS-K94 ▮ WiMAX™ ▮ MIMO ▮ IEEE 802.16e	▮ Power measurement in time and frequency domains ▮ Rising/falling edge ▮ CCDF	▮ EVM ▮ Constellation diagram ▮ I/Q offset ▮ Gain imbalance ▮ Quadrature error ▮ Center frequency error (symbol clock error)	▮ Spectrum mask ▮ ACP ▮ Spectrum flatness	▮ Bit stream ▮ Signal field ▮ Averaging over multiple measurements ▮ Burst summary list ▮ Graphical display of DL map	▮ Different channels can be displayed ▮ Power of unmodulated pilots is listed



Convenient analysis with vector diagram.
The upper screen shows the complete constellation diagram, the lower screen the probability distribution of the error vector magnitude (EVM).

General purpose measurements

Measurement application	Power	Modulation quality	Spectrum measurement	Miscellaneous	Special features
R&S®FS-K7 ▪ AM/FM/φM	▪ 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	▪ Large bandwidth range from 100 Hz to 28 MHz ▪ Up to 120 MHz demodulation bandwidth with R&S®FSQ-B72 option ▪ AF filters (highpass, lowpass, deemphasis) ▪ Large memory depth for long measurement sequences	
R&S®FS-K15 ▪ VOR/ILS		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®FSQ-K70 ▪ 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	▪ 25 MHz symbol rate expandable up to 81.6 MHz ▪ 28 MHz I/Q demodulation bandwidth expandable up to 120 MHz

Analysis software	Power	Modulation quality	Spectrum measurement	Miscellaneous	Special features
R&S®FS-K96 ▪ OFDM ▪ OFDMA	▪ Power versus symbol and carrier ▪ Power versus carrier ▪ Power versus symbol ▪ Capture buffer ▪ Power spectrum ▪ Frame power ▪ Crest factor ▪ CCDF	▪ EVM I/Q constellation ▪ Frequency error ▪ Symbol clock error ▪ I/Q offset ▪ Gain imbalance ▪ Quadrature offset	▪ Spectrum flatness ▪ Group delay impulse response	▪ Signal flow diagram (detailed description of the current measurement status) ▪ Report (detailed list of demodulation steps)	▪ Wizard with a step-by-step guide for easy setup of the configuration file from a captured signal ▪ Very low residual EVM < –51 dB for DVB-T, 2k mode
R&S®FS-K130 ▪ Distortion analysis	▪ Power level dependence of gain and phase response ▪ CCDF ▪ PDF	▪ Constellation diagram ▪ EVM	▪ Spectrum with spectral regrowth	▪ Export of measurement results ▪ Export of calculated distortion model	▪ Measurement bandwidths up to 120 MHz ▪ AM/AM and AM/φM conversion curves ▪ Simulation of the influence of characteristics

Application

Phase noise and noise figure measurement

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®FSQ, this eliminates in many cases the need for an extra phase noise measurement system that may be difficult to operate.

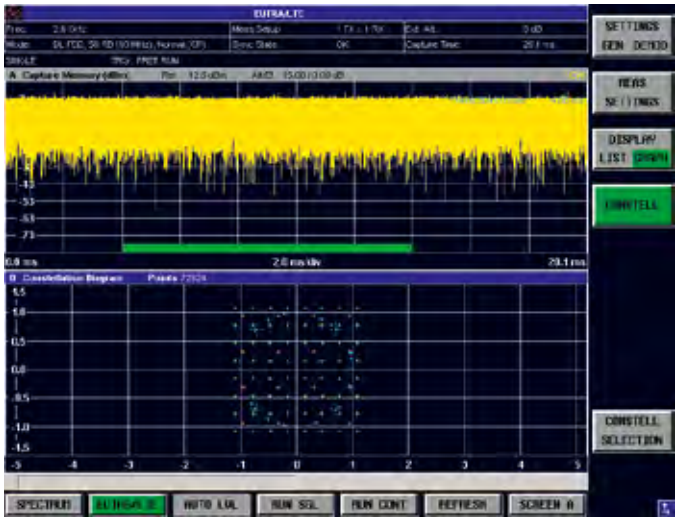
The R&S®FS-K30 application firmware for noise figure and gain measurements is a convenient tool for determining the noise figure of amplifiers and frequency-converting DUTs throughout the frequency range of the R&S®FSQ. This tool provides the measurements needed for complete documentation.

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

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

Noise figure measurement using the R&S®FS-K30 application firmware.

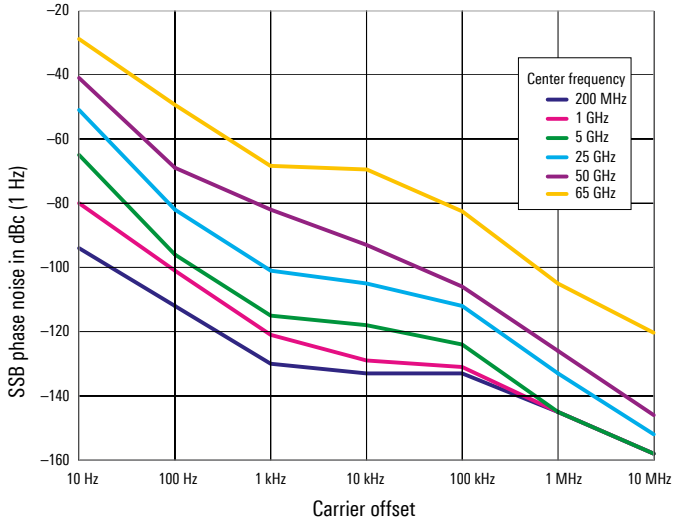
Constellation of a complete frame of a 10 MHz LTE downlink signal.



Specifications in brief

	R&S®FSQ3	R&S®FSQ8	R&S®FSQ26	R&S®FSQ40
Frequency range	20 Hz to 3.6 GHz	20 Hz to 8 GHz	20 Hz to 26.5 GHz	20 Hz to 40 GHz
Reference frequency	aging: 1 × 10^{-7}/year, with R&S®FSU-B4 option: 2 × 10^{-8}			
Spectral purity				
Phase noise	typ. –133 dBc (1 Hz) at 10 kHz carrier offset, carrier frequency 500 MHz			
Distortion	1 Hz			
Sweep time				
Span > 10 Hz	2.5 ms to 16000 s			
Span 0 Hz (zero span)	1 µs to 16000 s			
RBW	10 Hz to 50 MHz, FFT filter: 1 Hz to 30 kHz, channel filter, EMI bandwidth			
VBW	1 Hz to 30 MHz			
Display range	DANL to +30 dBm			
DANL (1 Hz RBW)				
1 GHz	typ. –158 dBm	typ. –155 dBm	typ. –156 dBm	typ. –155 dBm
7 GHz	–	typ. –154 dBm	typ. –155 dBm	typ. –153 dBm
13 GHz	–	–	typ. –151 dBm	typ. –151 dBm
26 GHz	–	–	typ. –146 dBm	typ. –147 dBm
40 GHz	–	–	–	typ. –141 dBm
DANL with preamplifier ON (R&S®FSU-B25), 1 GHz, 1 Hz RBW	–162 dBm	–162 dBm	–162 dBm	–162 dBm
DANL with preamplifier ON (R&S®FSU-B23), 26 GHz, 1 Hz RBW	–	–	–150 dBm	–
Trace detectors	Max Peak, Min Peak, Auto Peak, Sample, RMS, Average, Quasi Peak			
Total measurement uncertainty, f < 3.6 GHz	0.3 dB			
Display linearity	0.1 dB (0 dB to –70 dB)			

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



Ordering information

Designation	Type	Order No.
Signal Analyzer, 20 Hz to 3.6 GHz	R&S®FSQ3	1313.9100.03
Signal Analyzer, 20 Hz to 8 GHz	R&S®FSQ8	1313.9100.08
Signal Analyzer, 20 Hz to 26.5 GHz	R&S®FSQ26	1313.9100.26
Signal Analyzer, 20 Hz to 40 GHz	R&S®FSQ40	1313.9100.40
Accessories supplied Power cable, printed quick start guide, CD-ROM (with operating manual and service manual) R&S®FSQ26: test port adapter with 3.5 mm female (1021.0512.00) and N female (1021.0535.00) connector R&S®FSQ40: test port adapter with K female (10366.4790.00) and N female (1036.4777.00) connector		

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	
External Generator Control	R&S®FSP-B10	1129.7246.03	yes	not with R&S®FSQ-B100
Output Attenuator, 0 dB to 70 dB	R&S®FSU-B12	1142.9349.02	yes	requires R&S®FSU-B9
Digital Baseband Interface	R&S®FSQ-B17	1163.0063.02	no	
Removable Hard Disk	R&S®FSQ-B18	1303.0400.03	no	
Second Hard Disk	R&S®FSQ-B19	1303.0600.03		requires R&S®FSU-B18
LO/IF Ports for External Mixers	R&S®FSU-B21	1157.1090.03	yes	only for R&S®FSQ26 and R&S®FSQ40
20 dB Preamplifier, 3.6 GHz to 26.5 GHz	R&S®FSQ-B23	1157.0907.03	no	only for R&S®FSQ26, 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®FSQ26 and R&S®FSQ40 not with R&S®FSQ-B25
Electronic Attenuator, 0 dB to 30 dB, and 20 dB Preamplifier (3.6 GHz)	R&S®FSU-B25	1144.9298.02	yes	not with R&S®FSQ-B24
Analog Baseband Inputs	R&S®FSQ-B71	1157.0113.03	yes	
I/Q Bandwidth Extension	R&S®FSQ-B72	1157.0336.12	no	
I/Q Memory Extension to 235 Msample	R&S®FSQ-B100	1169.5244.02	no	not with R&S®FSP-B10
I/Q Memory Extension from 235 Msample to 705 Msample	R&S®FSQ-B102	1169.5444.04	no	requires R&S®FSQ-B100
N-type Adapter for R&S®RT-Zxx Probes	R&S®RT-ZA9	1417.0909.02		
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		
FM 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/VAMOS 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 recommended (e.g. R&S®FSU-B25)
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
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		

Designation	Type	Order No.	Retrofittable	Remarks
CDMA2000®/IS-95 (cdmaOne)/1xEV-DV BTS	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	R&S®FS-K84	1157.2851.02		
CDMA2000®/1xEV-DO MS Application Firmware	R&S®FS-K85	1300.6689.02		
Vector Signal Analysis	R&S®FSQ-K70	1161.8038.02		
WLAN IEEE 802.11a/b/g/j Application Firmware	R&S®FSQ-K91	1157.3129.02		
Upgrade from R&S®FSQ-K91 to WLAN IEEE 802.11n	R&S®FSQ-K91n	1308.9387.02		
Upgrade from R&S®FSQ-K91 to WLAN IEEE 802.11ac	R&S®FSQ-K91ac	1308.9170.02		requires R&S®FSQ-K91n
WiMAX™ 802.16-2004 OFDM Application Firmware	R&S®FSQ-K92	1300.7410.02		
WiMAX™ 802.16e, WiBro Application Firmware	R&S®FSQ-K93	1300.8600.02		
Upgrade from R&S®FSQ-K92 to R&S®FSQ-K93	R&S®FSQ-K92U	1300.8500.02		
WiMAX™ 802.16e MIMO Application Firmware	R&S®FSQ-K94	1308.9770.02		
Analysis of EUTRA/LTE FDD Downlink Signals	R&S®FSQ-K100	1308.9006.02		
Analysis of EUTRA/LTE FDD Uplink Signals	R&S®FSQ-K101	1308.9058.02		
Analysis of EUTRA/LTE Downlink MIMO Signals	R&S®FSQ-K102	1309.9000.02		
Analysis of EUTRA LTE-Advanced and MIMO Uplink Signals	R&S®FSQ-K103	1309.9097.02		
Analysis of EUTRA/LTE TDD Downlink Signals	R&S®FSQ-K104	1309.9422.02		
Analysis of EUTRA/LTE TDD Uplink Signals	R&S®FSQ-K105	1309.9516.02		
TETRA Release 2 Analysis	R&S®FSQ-K110	1309.9668.02		
Signal analysis software				
OFDM Vector Signal Analysis Software	R&S®FS-K96	1310.0202.06		
OFDM Vector Signal Analysis Software, usable with and without analyzer	R&S®FS-K96PC	1310.0219.06		
Distortion Analysis Software	R&S®FS-K130	1310.0090.06		

Service options		
Extended warranty, one year	R&S®WE1FSQ	Please contact your local sales office.
Extended warranty, two years	R&S®WE2FSQ	
Extended warranty, three years	R&S®WE3FSQ	
Extended warranty, four years	R&S®WE4FSQ	
Extended warranty with calibration coverage, one year	R&S®CW1FSQ	
Extended warranty with calibration coverage, two years	R&S®CW2FSQ	
Extended warranty with calibration coverage, three years	R&S®CW3FSQ	
Extended warranty with calibration coverage, four years	R&S®CW4FSQ	