Test Equipment Solutions Datasheet

Test Equipment Solutions Ltd specialise in the second user sale, rental and distribution of quality test & measurement (T&M) equipment. We stock all major equipment types such as spectrum analyzers, signal generators, oscilloscopes, power meters, logic analysers etc from all the major suppliers such as Agilent, Tektronix, Anritsu and Rohde & Schwarz.

We are focused at the professional end of the marketplace, primarily working with customers for whom high performance, quality and service are key, whilst realising the cost savings that second user equipment offers. As such, we fully test & refurbish equipment in our in-house, traceable Lab. Items are supplied with manuals, accessories and typically a full no-quibble 2 year warranty. Our staff have extensive backgrounds in T&M, totalling over 150 years of combined experience, which enables us to deliver industry-leading service and support. We endeavour to be customer focused in every way right down to the detail, such as offering free delivery on sales, covering the cost of warranty returns BOTH ways (plus supplying a loan unit, if available) and supplying a free business tool with every order.

As well as the headline benefit of cost saving, second user offers shorter lead times, higher reliability and multivendor solutions. Rental, of course, is ideal for shorter term needs and offers fast delivery, flexibility, try-before-you-buy, zero capital expenditure, lower risk and off balance sheet accounting. Both second user and rental improve the key business measure of Return On Capital Employed.

We are based near Heathrow Airport in the UK from where we supply test equipment worldwide. Our facility incorporates Sales, Support, Admin, Logistics and our own in-house Lab.

All products supplied by Test Equipment Solutions include:

- No-quibble parts & labour warranty (we provide transport for UK mainland addresses).
- Free loan equipment during warranty repair, if available.
- Full electrical, mechanical and safety refurbishment in our in-house Lab.
- Certificate of Conformance (calibration available on request).
- Manuals and accessories required for normal operation.
- Free insured delivery to your UK mainland address (sales).
- Support from our team of seasoned Test & Measurement engineers.
- ISO9001 quality assurance.

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Product brochure

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Spectrum Analyzer R&S®FSP

The medium-class standard

Features

- 21 cm TFT colour display
- 1 Hz to 10 MHz RBW
- RMS detector for fast and reproducible measurements on digitally modulated signals
- Measurement routines for TOI, ACPR, OBW, amplitude statistics, multicarrier ACP
- EMI bandwidths and quasi-peak detector

Speed

- 2.5 ms minimum sweep time in frequency domain
- 1 µs sweep time in time domain
- Up to 55 GPIB measurements/s in frequency domain (including trace transfer)
- Up to 80 GPIB measurements/s in time domain (including trace transfer)
- Fast ACP measurement routine in time domain

Performance

- Total measurement uncertainty: 0.5 dB
- Displayed average noise level: –155 dBm (1 Hz)
- Phase noise: –113 dBc (1 Hz) at 10 kHz
- Dynamic range of RMS detector: 100 dB
- Synthesized frequency setting

ROHDE&SCHWARZ

The standard in the medium class …

Features

The Spectrum Analyzers R&S®FSP are outstanding for their innovative measurements and a host of standard functions.

Instead of a wide choice of options, the R&S®FSP offers as standard all the functions and interfaces expected from a state-of-the-art spectrum analyzer:

- Largest colour display in its class
- Resolution bandwidths from 1 Hz to 10 MHz
- Highly selective digital filters and FFT
- Quasi-peak detector and EMI bandwidths
- ACP and multicarrier ACP measurements
- Convenient documentation of results as a hardcopy or file in PC-compatible formats
- Interfaces: GPIB, Centronics, RS-232-C, LAN (option), USB
- Automatic test routines for measuring TOI, OBW, phase noise and ACP(R)
- Split screen with separate settings and up to 3 traces per screen
- Editable limit lines including PASS/FAIL indication
- Fast measurements in the time domain: minimum sweep time 1 µs
- Gated sweep for measurements on TDMA signals

In addition, the R&S®FSP features the following unique attributes as standard:

- RMS detector for fast and reproducible power measurements on digitally modulated signals in frequency and time domain
- Statistical measurement functions for determining crest factor and CCDF (complementary cumulative distribution function)

Featuring such a wealth of functions, the R&S®FSP offers state-of-the-art spectrum analysis at an extremely attractive price/performance ratio.

Speed

Time is a finite resource – so high measurement speed is indispensable for competitiveness and cost-effective testing.

Here, too, the new R&S®FSP offers characteristics that make it top of the class:

- Up to 55 measurements/s on GPIB interface including trace transfer of 501 binary data
- 80 measurements/s on GPIB interface in zero span mode including trace transfer of 501 binary data
- Minimum sweep time of 2.5 ms

Performance

- 1 µs time domain measurements
- Unique fast ACP mode for high-speed ACPR measurements in time domain using the standard-compliant test filters
- List mode for fast, selective power measurements

With 100 measurements/s in manual operation and digital filters with a sweep time 2.5 times faster than comparable analog filters, the R&S®FSP will also prove beneficial in the day-to-day tasks of product development.

Modern communication systems should provide optimum spectral efficiency at high data rates. For the 3rd generation of CDMA mobile radio systems currently under development, this is achieved through functions such as among other things, by high-precision power control.

The R&S®FSP is the ideal partner in development and production, featuring low uncertainty in level measurement, as well as excellent RF characteristics:

- 0.5 dB total measurement uncertainty allows higher tolerances for the DUT, thus increasing production yield
- 0.07 dB linearity uncertainty (1 σ) is ideal for precise measurements, for example of gain control and ACPR
- RMS detector with >100 dB dynamic range measures power fast and accurately irrespective of the signal shape – almost like a thermal power sensor
- The displayed average noise level of typ. –155 dBm (1 Hz) is attained without the use of preamplifiers and thus without any reduction in dynamic range
- Typ. –145 dBc (1 Hz) phase noise at 10 MHz offset offers optimum conditions for ACPR measurements on WCDMA systems

Resolution bandwidths of up to 100 kHz are fully digital and provide – in addition to high selectivity – an ideal basis for accurate (adjacent-) channel power measurements owing to a maximum bandwidth deviation of 3%.

… now even faster

High-end characteristics …

Rohde&Schwarz ASICs

Top-class performance as offered by the R&S®FSP essentially depends on the extensive use of digital signal processing and large-scale integration of components.

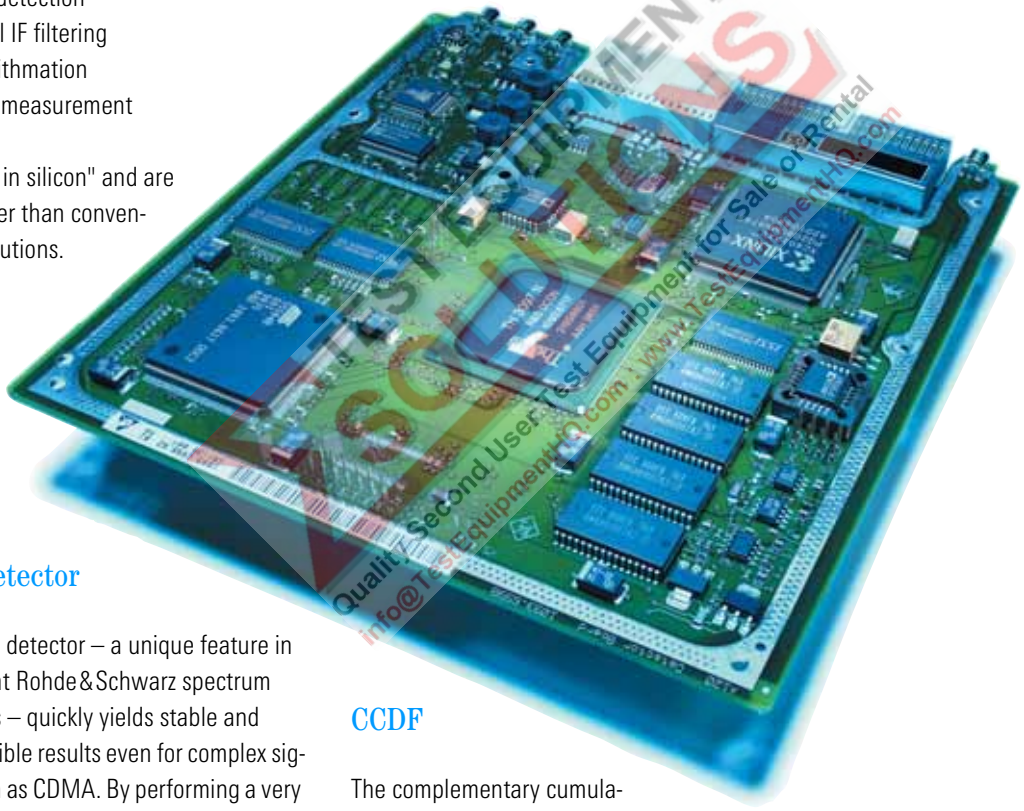
For these demanding tasks, Rohde&Schwarz has developed ASICs tailored to the requirements of signal analysis. Key functions such as

- RMS detection
- Digital IF filtering
- Logarithmation
- CCDF measurement

are "cast in silicon" and are thus faster than conventional solutions.

Logarithmic amplifier

The R&S®FSP comes equipped with digital resolution filters between 10 Hz and 100 kHz featuring high selectivity and very low bandwidth deviation. The filters have an extremely low logarithmic level deviation of <0.2 dB in the range 0 dB to –70 dB. As they are implemented as ASIC functions, their great precision is attained without any reduction in measurement speed.



RMS detector

The RMS detector – a unique feature in all current Rohde&Schwarz spectrum analyzers – quickly yields stable and reproducible results even for complex signals such as CDMA. By performing a very large number of linear single measurements, followed by power integration, the detector avoids the measurement error inherent in conventional analyzers that arises from the averaging of the log video signal. The RMS detector of the R&S®FSP measures all modern communication signals with unparalleled accuracy and speed.

CCDF

The complementary cumulative distribution function (CCDF) describes the probability of a signal power exceeding a specific (usually the average) power. CCDF analysis is indispensable for determining the optimal transmitting power for CDMA signals, assuming that clipping over known, short intervals is tolerable. The R&S®FSP with its dedicated CCDF measurement routine furnishes 10^6 single values in only 250 ms, thus enabling extremely accurate statistical analysis even of rarely occurring signal peaks.

This analysis function, which is becoming more and more important, has been implemented for the first time in the Spectrum Analyzer R&S®FSP as a fast and cost-effective solution based on ASICs.

The platform

Excellent specifications such as those of the R&S®FSP require a high-grade and service-friendly platform. All the modules are optimally shielded and easy to exchange, and are accommodated in a lightweight but stable frame. A powerful low-noise fan in conjunction with low power consumption of 70 VA to 150 VA (depending on model) makes for high reliability.

A 2-year calibration interval (excluding the reference frequency) is offered with the R&S®FSP.

Fit for the future

Owing to its modular design, the R&S®FSP is optimally equipped to handle all present and future tasks. The design takes into account both hardware and firmware extensions to safeguard your investment far into the future. Thus, you can also rely on your R&S®FSP to meet all requirements that will arise in the years to come.

Ergonomics and design

The R&S®FSP sets the ergonomic standard in this class of analyzers. The 21 cm (8.4") colour display is the largest and most brilliant in its category. Vertical and horizontal rows of softkeys allow even complex measurement tasks to be performed easily. Parameters such as frequency and amplitude are entered by means of dedicated hardkeys and unit keys.

… through innovative solutions

Innovative solutions …

Optimum dynamic range

Featuring the lowest displayed average noise level in its class (DANL <–145 dBm at 10 Hz RBW), the R&S®FSP measures even small signals accurately without using preamplifiers that reduce dynamic range. Together with the high intercept point, this yields an intermodulation-free range of typ. 100 dB – yet another record among medium-class analyzers.

Ultra-low measurement uncertainty

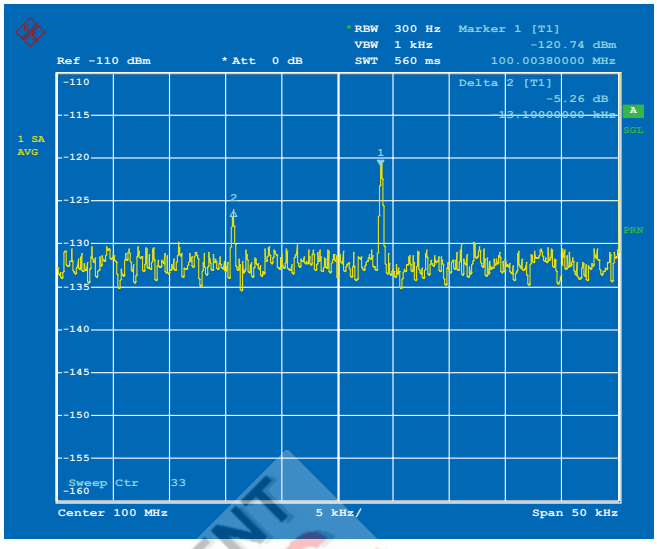
In the vital frequency range below 3 GHz, the R&S®FSP is outstanding for its ultra-low measurement uncertainty. The total measurement uncertainty is less than 0.5 dB. Due to this excellent value, the use of power meters in routine lab applications very often becomes superfluous and may greater tolerances are possible for DUTs.

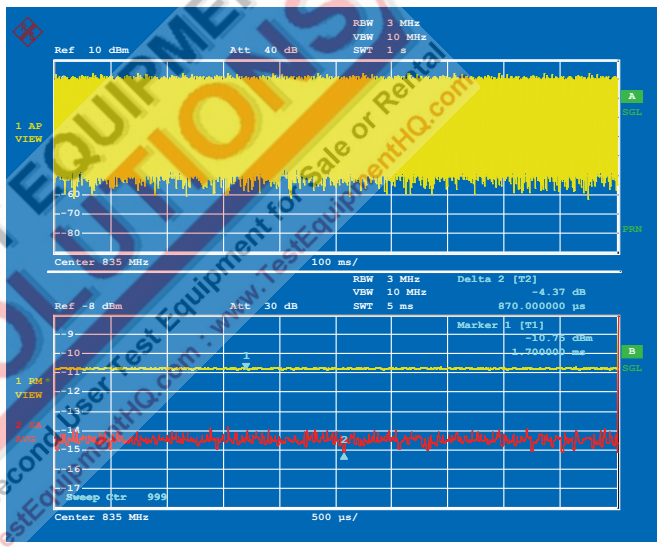
RMS detector

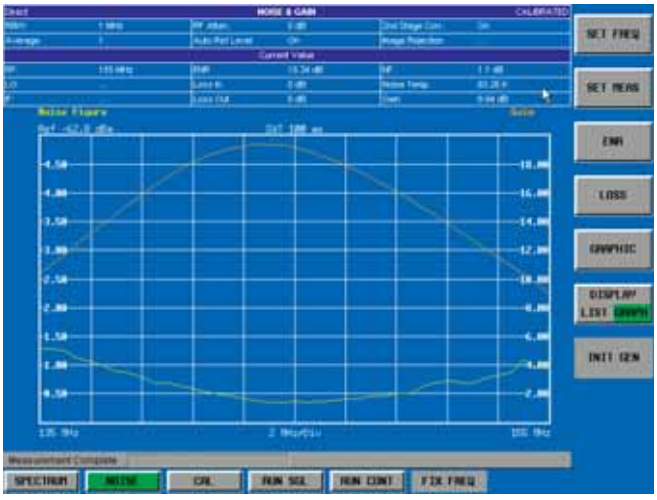
The unique RMS detector measures modern, noise-like communication signals with optimal repeatability and stability. As there are neither correction factors nor the typical errors caused by averaging of logarithmic trace data, the correct average power is displayed with high stability for all signal types – almost like in measurements with a thermal power meter.

Noise figure measurements

Owing to its excellent display linearity, the R&S®FSP is also ideal for noise figure measurements. The optional Noise Measurement Software R&S®FS-K30 enhances the R&S®FSP to form a noise measurement system offering analyzer-specific advantages (see data sheet PD 0758.0839.32).



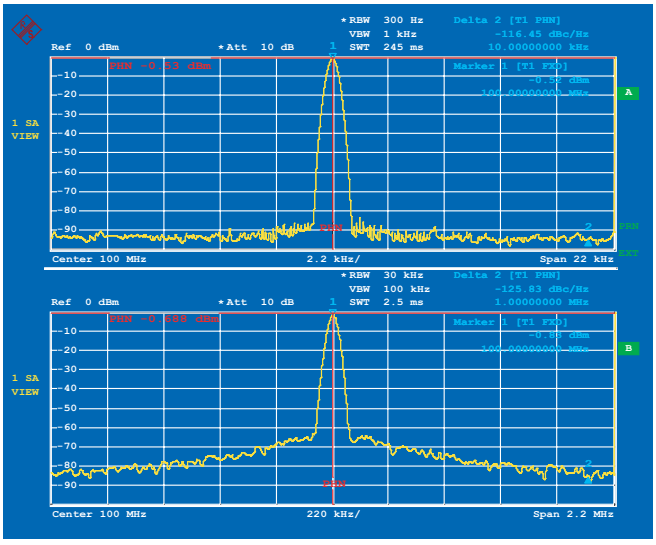




Noise figure measurement with Noise Measurement Software R&S®FS-K30.

Phase noise

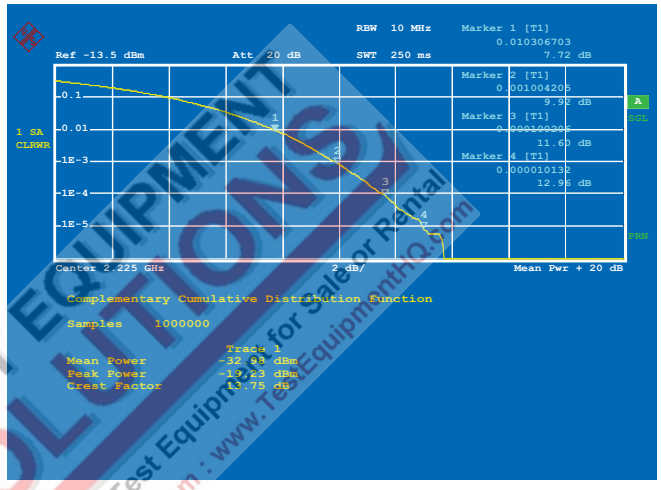
The low phase noise of the R&S®FSP makes it suitable for demanding measurement tasks both in the vicinity of the carrier (typ. –113 dBc (1 Hz) at 10 kHz) and far from the carrier (typ. –125 dBc (1 Hz) at 1 MHz). The R&S®FSP is thus optimally equipped for performing spectral analysis and ACPR measurements on narrowband systems such as IS136 or PDC as well as on wideband systems such as IS95 or WCDMA. Phase Noise Measurement Software R&S®FS-K4 enhances the Spectrum Analyzer R&S®FSP to form a phase noise tester.



Phase noise measurement with the R&S®FSP.

CCDF analysis

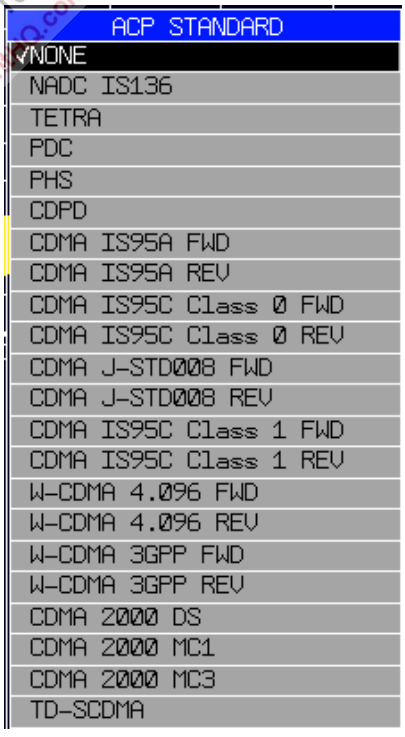
The R&S®FSP is the first spectrum analyzer to offer statistical analysis of signals by means of the complementary cumulative distribution function (CCDF) as standard and at an impressively high speed. The R&S®FSP furnishes in only 250 ms the exact CCDF characteristic, average and peak power as well as the crest factor covering 1 million measured values.



CCDF of a WCDMA signal.

ACPR measurements

Adjacent-channel power ratio (ACPR) measurements, which many mobile radio standards stipulate for components and devices, are implemented in the R&S®FSP by means of automatic test routines. All settings, measurements and filters required for a selected standard are activated at a keystroke. In addition to a large number of preprogrammed standards, the channel width and channel spacing can be individually selected. Owing to the excellent dynamic range, lowest phase noise in its class and the RMS detector, the R&S®FSP sets the standard in the medium class also for ACPR measurements.



Preprogrammed standards for ACP measurements.

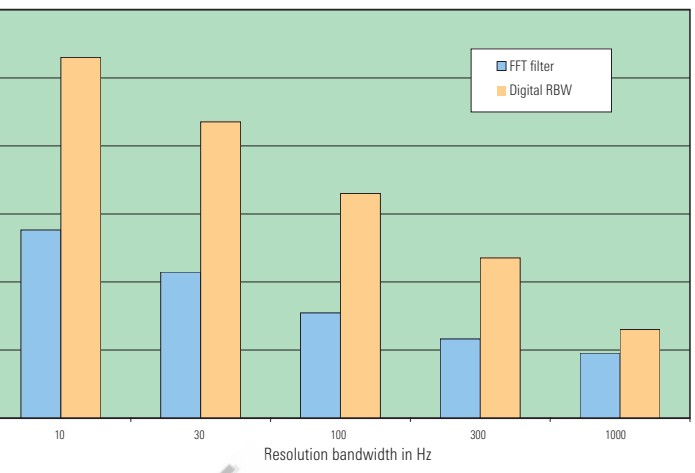
… for research & development

Innovative solutions …

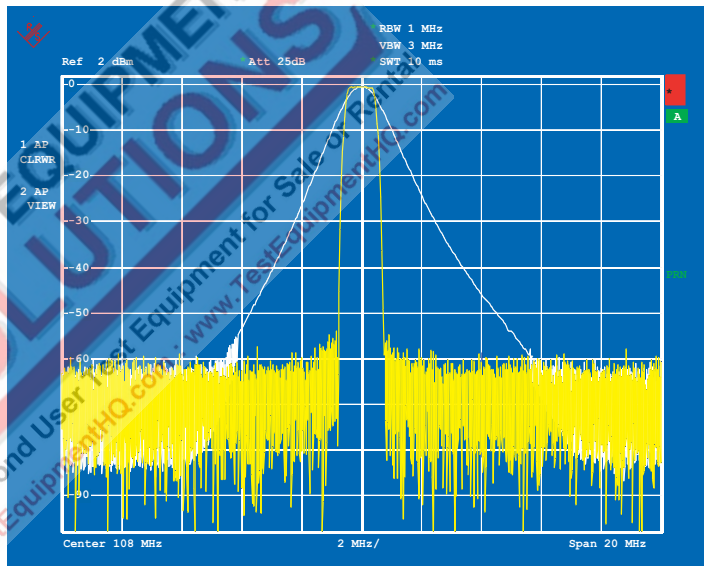
High measurement speed

With 100 measurements/s in manual operation, a minimum sweep time of 2.5 ms and 1 µs zero span as standard, the R&S®FSP is ideal for time-critical applications. The highly selective, fast-sweep digital filters featuring "analog" response allow measurements on pulsed signals as well as the use of the built-in frequency counter.

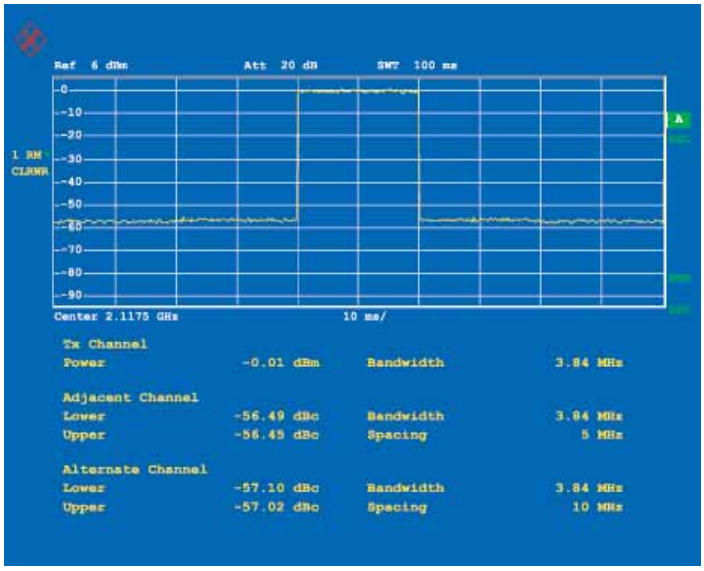
The R&S®FSP comes standard with different filter types for digital resolution bandwidths up to 100 kHz such as Gaussian filter, raised root cosine (RRC) filter and steep-sided channel filters. Up to a resolution bandwidth of 30 kHz, fast Fourier transform (FFT) is available in addition. In the analyzer mode, the Gaussian filters have the advantage of high sweep speed plus excellent resolution. At high span/RBW ratios, measurements using FFT can be as much as 300 times faster than measurements with digital filters.



Comparison of sweep times for 200 kHz span using digital filters or FFT.



Comparison of 1 MHz channel filter and normal 1 MHz resolution filter.



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

Some mobile radio standards such as TETRA and IS136 require RRC filters for power measurement, a type of filter already included in the R&S®FSP. In addition, the R&S®FSP provides channel filters for other analog and digital methods, e.g. cdmaOne, AM/FM radio and ETS 300 113. Adjacent-channel power due to switching can also be measured using the channel filters. For the common mobile radio standards, the R&S®FSP is equipped with test routines (fast ACP) that allow the adjacent-channel power in the time domain to be determined, which reduces measurement time and increases reproducibility.

55 measurements per second on GPIB interface

The high-speed GPIB interface enables up to 55 measurements/s including trace data transfer of 501 test points with the display switched off. In the zero span mode, 80 measurements/s are possible. This characteristic makes the R&S®FSP by far the fastest spectrum analyzer on the GPIB interface. Valuable time can be saved in production, boosting throughput enormously. The R&S®FSP thus supports you in getting your products more cost-effective on the market.

0.2 dB maximum linearity uncertainty

All modern mobile radio systems achieve high spectral efficiency through precise control of transmitter output power or other means. The correct functioning of gain control, which may be as much as –70 dB depending on the system, is checked against the nominal value in a large number of individual measurements.

Featuring a maximum linearity uncertainty of only 0.2 dB and fast power measurement routines especially for digitally modulated signals, the R&S®FSP is the ideal choice wherever the reduction of the test time and the number of rejects is of primary importance.

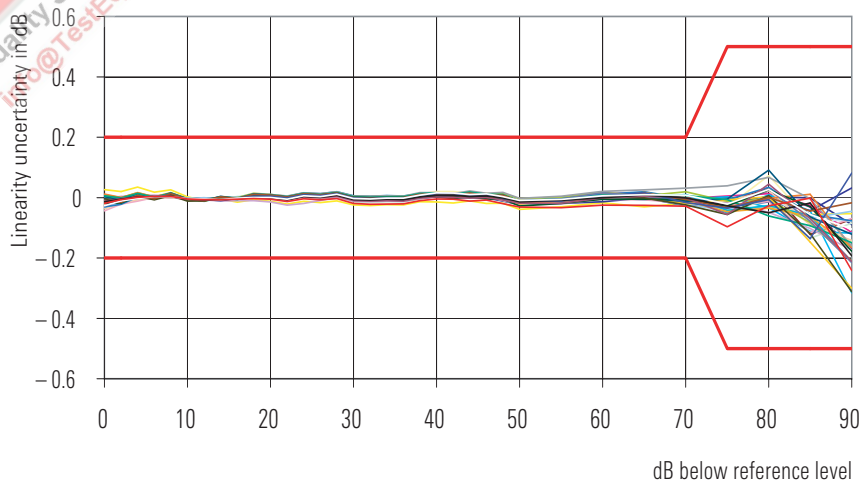
0.5 dB total measurement uncertainty

Measurement uncertainty can be split into the part from the instrument and that introduced by the test setup. With lower uncertainty of the spectrum analyzer, greater tolerances can be allowed for the test setup. If the lower uncertainty of the analyzer is utilized to allow for higher DUT tolerances, the result will be a marked reduction of manufacturing rejects – an advantage that pays off immediately. With a total measurement uncertainty of 0.5 dB, the R&S®FSP undisputedly ranks at the top, way ahead of other medium-class analyzers.

	Sweeps/s Span 10 MHz, sweep time 2.5 ms	**Sweeps/s** Span 0 Hz, sweep time 100 µs
Binary IEEE 754 format	55	80

Measurement speed on GPIB interface, with transfer of trace data.

Settings: DISPLAY OFF, DEFAULT COUPLING, SINGLE TRACE, 501 POINTS.



Display linearity with ≤ 100 kHz resolution bandwidth (measurement on 30 devices).

… for production

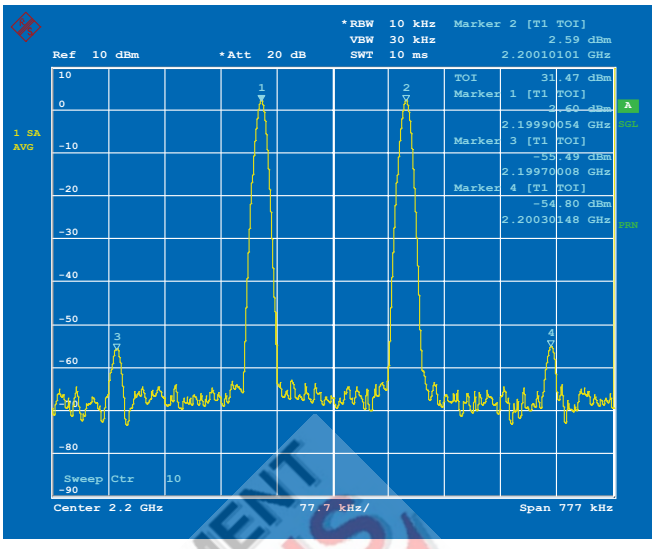
Innovative solutions …

Measurement routines TOI, OBW …

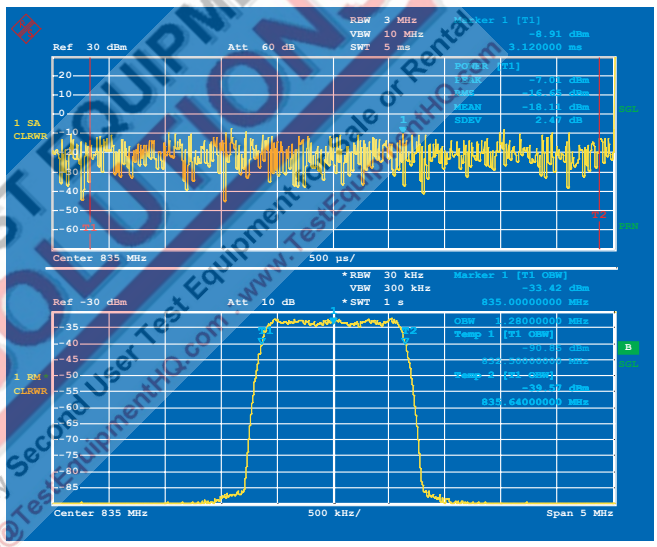
The R&S®FSP offers fast routines for a multitude of typical measurement tasks, which make result postprocessing superfluous by supplying the desired data directly:

- Determination of TOI
- Occupied bandwidth (OBW)
- Burst power with peak, average and RMS indication as well as standard deviation
- Modulation depth of AM signals
- Phase noise
- Bandwidth marker

Of course these functions can also be used via the fast GPIB interface.

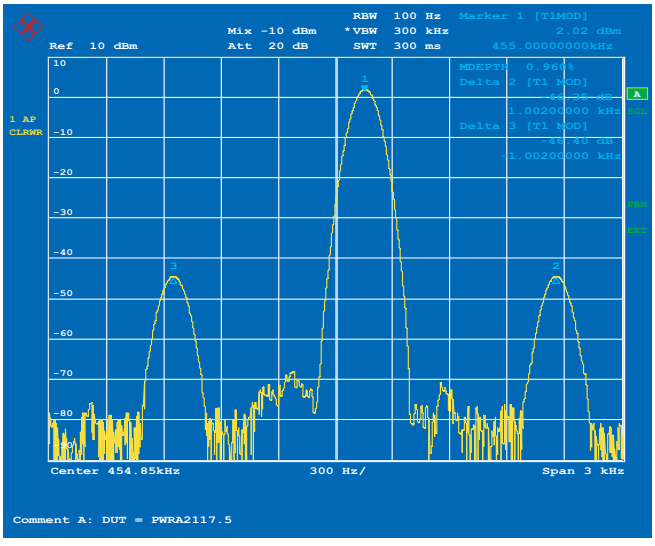


Measurement of TOI.



Measurement of burst power (top).

Determination of OBW (bottom).



Measurement of modulation depth of AM signal.

Remote control of the R&S® FSP via IEC/IEEE bus in list mode cuts down on measurement time.

List mode

In the List mode, the user only has to enter a few IEC/IEEE bus commands to perform measurements on up to 100 frequencies with different instrument setups in each case. A single command configures the list, and frequency, bandwidths, measurement time, reference level and RF attenuation can be set independently of each other. The SENSE:LIST:POWER:RESULT? query, for example, simultaneously transfers all measurement results to the process controller after the list has been processed. This feature reduces the time required for transfer via the IEC/IEEE bus. In conjunction with the very high measurement speed of the R&S® FSP, it also allows the generation of time-saving test routines in production applications.

The optional Trigger Port R&S® FSP-B28 allows idle times between the different settings to be minimized.

Electronic attenuator for high production throughput

The optional Electronic Attenuator R&S® FSP-B25 supplements the standard mechanical attenuator and provides a wear-and-tear-free setting range of 30 dB in 5 dB steps. The option does away with frequent switching of the mechanical attenuator as required for high throughput in production and so increases the availability and reliability of the measurement equipment. For example, the limit of 10^7 switching operations, which is typical of mechanical attenuators, already means a breakdown after approx. 6 months at 1.5 switching operations/s whereas the Electronic Attenuator R&S® FSP-B25 can be switched any number of times without impairing the specifications.

The integrated switchable 20 dB preamplifier allows high-sensitivity measurements in the useful frequency range from 10 MHz to 7000 MHz.

LAN interface

With the aid of the optional LAN Interface R&S® FSP-B16, the R&S® FSP can be connected to common networks such as 100Base-T so that functions such as file logging on network drives or documentation of measurement results via a network printer are available. In addition, the R&S® FSP can be remote-controlled via LAN), which is especially easy with the Windows XP Remote Desktop function. This yields a clear speed advantage over the IEC/IEEE bus, in particular for the transmission of large data blocks.

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

In many applications, existing test software is to be used in automatic test systems alongside new devices. For this reason, the R&S® FSP comes standard with an IEC/IEEE bus command set that is compatible not only with the R&S® FSEx/FSIQ family but also with the spectrum analyzers of the 859x/8566 series.

Thus importance was placed on maximum compatibility in order to minimize the necessity for changes.

- 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

8560E to 8565E, 8566A/B, 8568A/B and 8594E are supported. The IEC/IEEE bus commands in IEEE 488-2 format can be used together with the R&S® FSP command set, making it possible to enhance and complete available software by using the innovative instrument functions of the R&S® FSP (such as list mode, channel filters) without having to redesign the test software.

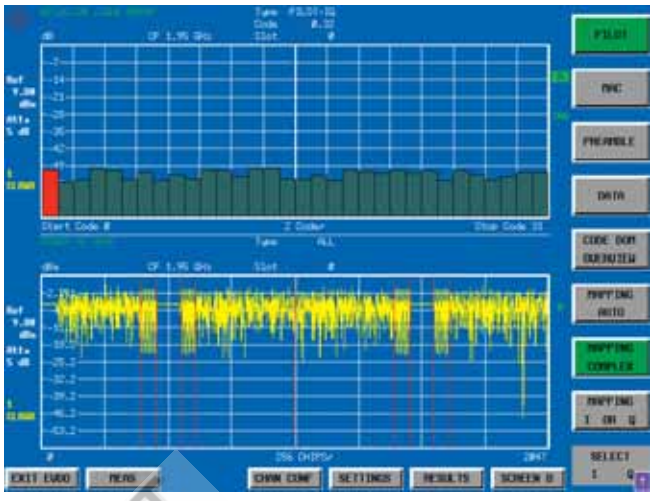
… for production

Innovative solutions …

GSM/EDGE measurements

Application Firmware R&S®FS-K5 allows the user to perform the most important GSM and EDGE transmitter measurements at a keystroke:

- Phase/frequency error (GSM)
- Modulation accuracy (EDGE) including 95:th percentile and origin offset suppression
- Power versus time
- Carrier power
- Modulation spectrum
- Transient spectrum
- Spurious emissions

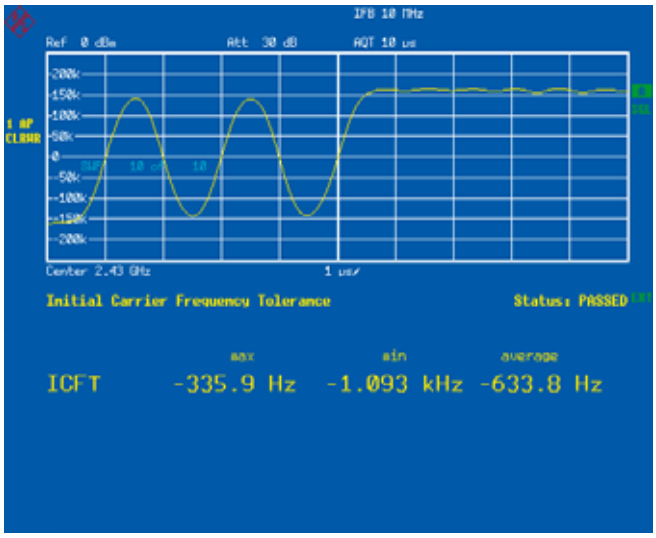


Error power and power versus chip for 1×EV-DO signal, measured with R&S®FS-K84

Type	Designation and/or application	Additionally required options in the R&S®FSP
R&S®FS-K4	Phase noise measurements (Windows software)	
R&S®FS-K5	Modulation and spectrum measurements on GSM/EDGE base station and mobile signals	
R&S®FS-K7	AM/FM/φM measurement demodulator for general applications	
R&S®FS-K8	*Bluetooth* transmitter measurements	
R&S®FS-K9	Power sensor measurements	supports R&S®NRP-Z11/-Z21/-Z22/-Z23/-Z24/-Z51/-Z55/-Z91 with R&S®NRP-Z4 USB adapter
R&S®FS-K72	Modulation and code domain power measurements in accordance with 3GPP TS 24.141 on base station signals (Node B)	R&S®FSP-B15 and R&S®FSP-B70
R&S®FS-K73	Modulation and code domain power measurements in accordance with 3GPP TS 25.121 on mobile station signals (UE)	R&S®FSP-B15: slot-based measurements R&S®FSP-B70: additionally required for frame-based measurements
R&S®FS-K74	HSDPA extension for R&S®FS-K72	
R&S®FS-K76	Modulation and code domain power measurements on TD-SCDMA base station signals	
R&S®FS-K77	Modulation and code domain power measurements on TD-SCDMA mobile station signals (UE)	
R&S®FS-K82	Modulation and code domain power measurements in accordance with CDMA2000®/1xEV-DV on base station signals (also for measurements on IS95/cdmaOne signals)	
R&S®FS-K83	Modulation and code domain power measurements on CDMA2000®/1xEV-DV mobile station signals (UE)	
R&S®FS-K84	Modulation and code domain power measurements on 1xEV-DO base station signals	
R&S®FS-K85	Modulation and code domain power measurements on 1xEV-DO mobile station signals (UE)	
R&S®FSP-K90	WLAN 802.11a Application Firmware	
R&S®FS-K30	Noise figure measurements (application firmware), functions similar to R&S®FS-K3, but remote-controllable	Preamplifier recommended, e.g. R&S®FSP-B25 for R&S®FSP3/7

Bluetooth® signal measurements

- Enhanced measurement functionality in line with *Bluetooth* RF Test Specification (*Bluetooth* SIG) Rev. 0.91
- Measurement functions
  - Output power
  - Adjacent channel power (ACP)
  - Modulation characteristics
  - Initial carrier frequency tolerance (ICTF)
  - Carrier frequency drift
- Simultaneous display of traces and all numerical measurement results
- Automatic limit value monitoring
- Ideal for use in development and production of *Bluetooth* modules

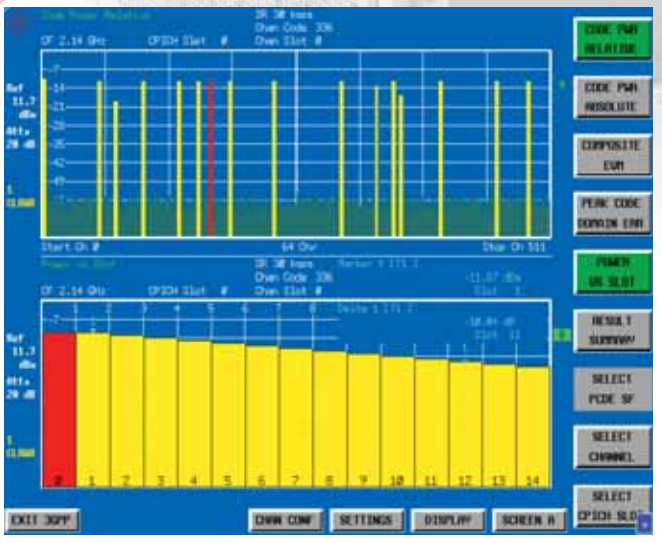


Measurement of initial carrier frequency tolerance of Bluetooth signal with R&S®FS-K8.

Standard 3GPP modulation and code domain power measurements

- Adds measurement functions in line with the 3GPP specifications for the FDD mode
- For BTS/Node B signals: Application Firmware R&S®FS-K72
- For CDMA2000®/3GPP3 base station signals: Application Firmware R&S®FS-K82/-K84
- For UE signals: Application Firmware R&S®FS-K73
- High measurement speed of 4 s/measurement
- Code domain power and CPICH power
- Code domain power and rho (CDMA2000®/3GPP2)
- EVM and PCDE
- Code domain power versus slot
- EVM/code channel
- Spectrum emission mask

Simultaneous power versus time measurement on eight slots of EDGE signal.



Code domain power measurement versus slot.

Innovative solutions …

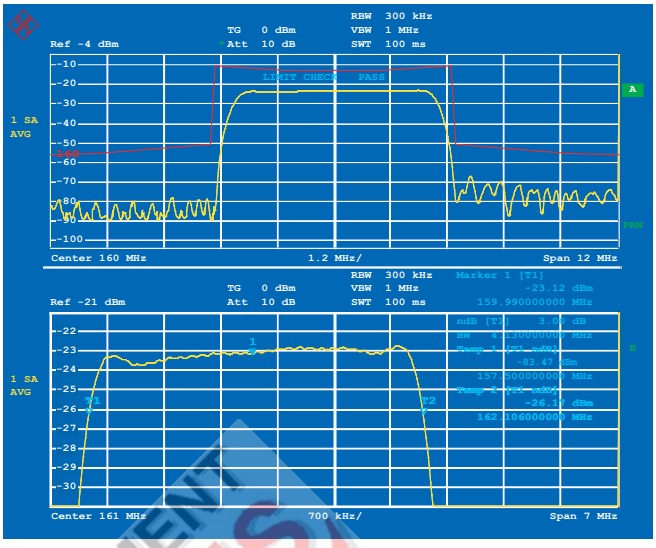
Scalar network analysis in wide dynamic range and at any frequency offset

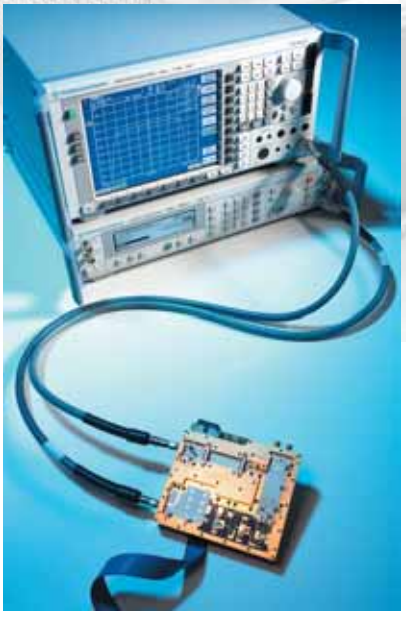
The optional Internal Tracking Generator R&S®FSP-B9 up to 3 GHz and External Generator Control R&S®FSP-B10 extend the R&S®FSP spectrum analyzers to scalar network analyzer functionality. The gain, frequency response, insertion and return loss are measured using a selective method in a wide dynamic range without any influence from the harmonics or spurious of the generator. The Internal Tracking Generator R&S®FSP-B9 can be used in all R&S®FSP models and covers the frequency range from 9 kHz to 3 GHz. A frequency offset of ±150 MHz can be set for measurements on frequency-converting modules. The tracking generator can be broadband-modulated by an external I/Q baseband signal.

The R&S®FSP-B10 option uses commercial RF signal generators as its external tracking source that can be controlled via the GPIB or a TTL bus. With this option the functionality of the internal tracking generator can be utilized:

- Normalization with interpolation also for reflection measurements with open and short
- Automatic bandwidth measurement with "n dB down" function
- Tolerance lines with PASS/FAIL assessment

The R&S®FSP-B6 option makes the Spectrum Analyzers R&S®FSP suitable for analog TV measurement applications and provides a settable RF level trigger for measurements on pulsed RF signals that are used in TDMA transmission systems.





… through custom-made options

Complete measurement solutions …

Environmental compatibility

- Fast and easy disassembly
- Small number of materials
- Compatibility of materials
- Easy identification of substances through appropriate marking (plastics)
- Recycling of enclosure

DESIGN AWARD WINNER 1998

Open for the PC world …

- PC-compatible screenshots, no conversion software needed
- Windows printer support
- USB interface for connecting PC peripherals
- LabWindows driver
- LabView driver
- SCPI-compatible
- R&S®FSE/FSIQ-compatible GPIB command set
- Customized training
- Solution-oriented consulting
- Application notes
- 2-year calibration cycle

… and much more

… no guessing games

Specifications in brief of the R&S®FSP family

	R&S®FSP3	R&S®FSP7	R&S®FSP13	R&S®FSP30	R&S®FSP40
Frequency range	9 kHz to 3 GHz	9 kHz to 7 GHz	9 kHz to 13 GHz	9 kHz to 30 GHz	9 kHz to 40 GHz
Frequency resolution	aging 1×10^{-6}/year, with option R&S®FSP-B4: 1×10^{-7}				
Spectral purity					
Phase noise	typ. –113 dBc (1 Hz) in 10 Hz carrier offset				
Residual FM	typ. 3 Hz				
Sweep time					
Span >10 Hz	2.5 ms to 16000 s				
Span 0 Hz (zero span)	1 µs to 16000 s				
Resolution bandwidths	10 Hz to 10 MHz, FFT filter: 1 Hz to 30 kHz, channel filter, EMI bandwidths				
Video bandwidths	1 Hz to 10 MHz				
Display range	DANL up to +30 dBm				
Displayed average noise level					
1 GHz	typ. –145 dBm	typ. –145 dBm	typ. –145 dBm	typ. –145 dBm	typ. –145 dBm
7 GHz	–	typ. –143 dBm	typ. –145 dBm	typ. –145 dBm	typ. –145 dBm
13 GHz	–	–	typ. –138 dBm	typ. –138 dBm	typ. –138 dBm
30 GHz	–	–	–	typ. –123 dBm	typ. –128 dBm
40 GHz	–	–	–	–	typ. –120 dBm
Displayed average noise level with optional on (option R&S®FSP-B25 electronic attenuator on)	–152 dBm	–152 dBm	–	–	–
Total measurement uncertainty, f < 3 GHz	0.5 dB				
Linear level display	0.2 dB (0 dB to –70 dB)				

Certified Quality System ISO 9001 DQS REG. NO 1954 QM

Certified Environmental System ISO 14001 DQS REG. NO 1954 UM

Ordering information

Order designation	Type	Order No.
Spectrum Analyzer 9 kHz to 3 GHz	R&S®FSP3	1164.4391.03
Spectrum Analyzer 9 kHz to 7 GHz	R&S®FSP7	1164.4391.07
Spectrum Analyzer 9 kHz to 13.6 GHz	R&S®FSP13	1164.4391.13
Spectrum Analyzer 9 kHz to 30 GHz	R&S®FSP30	1164.4391.30
Spectrum Analyzer 9 kHz to 40 GHz	R&S®FSP40	1164.4391.40
Accessories supplied		
Power cable, compact manual, CD-ROM with operating manual and service manual. R&S®FSP30: test port adapter 3.5 mm female (1021.0512.00) and N female (1021.0535.00) R&S®FSP40: test port adapter K female (1036.4770.00) and N female (1036.4777.00)		

Related data sheets

Title	Order No.
TV Trigger/RF Power Trigger R&S®FSP-B6	PD 0757.6433
Phase Noise Measurement Software R&S®FSE-K4	PD 0757.4201
GSM/EDGE Application Firmware R&S®FS-K5 for R&S®FSP	PD 0757.6185
FM Measurement Demodulator R&S®FS-K7	PD 0757.6685
Bluetooth Application Firmware R&S®FS-K8	PD 0757.7730
Application Firmware for Noise Figure and Gain Measurements R&S®FS-K30 for R&S®FSP/FSU/FSQ	PD 0758.0839.32
WCDMA 3GPP Application Firmware R&S®FS-K72/-K73	PD 0757.7246
CDMA2000® Base Station Test Application Firmware 1xEV-DO Base Station Test Application Firmware R&S®FS-K82/-K84	PD 0757.7675
WLAN 802.11a Application Firmware R&S®FSP-K90	PD 0758.0916.22
R&S®FSP Specifications	PD 0757.8565

ROHDE&SCHWARZ

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PD 0758.1206.12 · Spectrum Analyzer R&S®FSP · Version 09.01 · February 2005 · Data without tolerance limits is not binding · Subject to change

The Spectrum Analyzers R&S®FSP …

- Unparalleled range of functions
- Highest measurement speed
- Maximum precision

With the R&S®FSP family, the well-known advantages of the Rohde&Schwarz high-end analyzers have been systematically integrated into the medium-class analyzers. The R&S®FSP sets the standard for the medium-class regarding the vital criteria of functionality, measurement speed and accuracy. The use of innovative techniques such as a highly integrated front-end and fully digital signal processing in the back-end, together with ASICs developed by Rohde & Schwarz, has resulted in a product that features top-class specifications and high reliability.

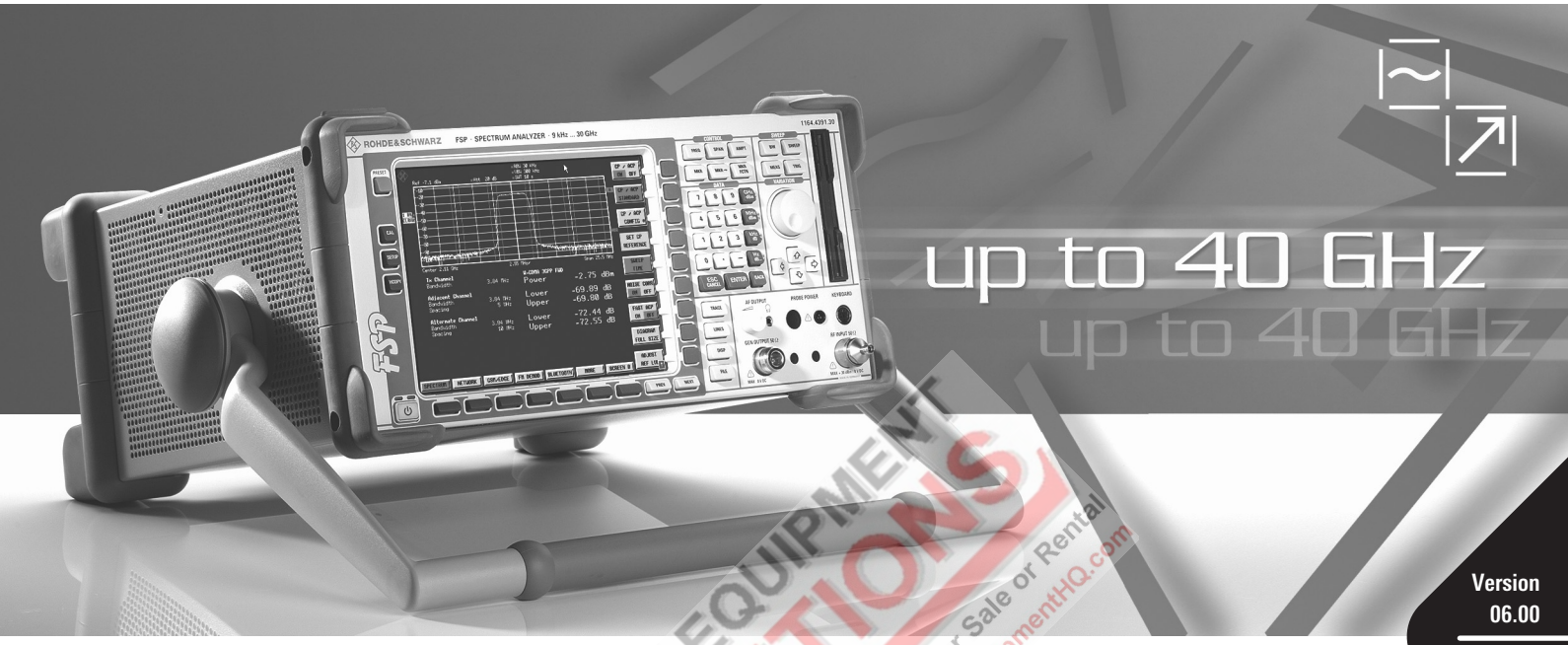
… the medium-class standard

A wealth of functions …

Function/Option	Standard	Option
Highly selective digital filters from 10 Hz to 100 kHz	●	
Fast FFT filters from 1 Hz to 30 kHz	●	
Channel filter 100 Hz to 5 MHz	●	
QP detector & EMI bandwidths 200 Hz, 9 kHz, 120 kHz	●	
2.5 ms sweep time in frequency domain	●	
1 µs sweep time in time domain	●	
Time-selective spectrum analysis with gating	●	
GPIB interface, IEEE 488.2	●	
USB interface	●	
RS-232-C serial interface, 9-pin D-sub	●	
VGA output, 15-pin D-sub	●	
PC-compatible screenshots on floppy disk or hard disk	●	
Measurement speed manually up to 100 measurements/s	●	
Measurement speed GPIB up to 80 measurements/s	●	
SCPI-compatible GPIB command set	●	
R&S®FSE/FSIQ-compatible GPIB command set	●	
856XA/B-compatible command set	●	
Fast ACP measurements in time domain	●	
CCDF measurement functions	●	
RMS detector with 100 dB dynamic range	●	
2-year calibration interval[1]	●	
Cabinet for portable use	–	B1
AM/FM audio demodulator	–	B3
OCXO reference frequency	–	B4
TV trigger/RF power trigger	–	B6
Tracking generator	–	B9
External generator control	–	B10
Pulse calibrator	–	B15
LAN interface	–	B16
Extended environmental specification	–	B20
LO/IF ports for external mixers	–	B21
Electronic attenuator	–	B25
Trigger port	–	B28
Frequency range extension 20 Hz	–	B29
DC power supply	–	B30
Battery pack/spare battery pack	–	B31/B32
Demodulation hardware memory extension	–	B70

1) Except reference frequency.

… the medium-class standard



Version 06.00
May 2008

R&S®FSP Spectrum Analyzer

Data Sheet

ROHDE&SCHWARZ

Specifications

Specifications are valid under the following conditions:
15 minutes warm-up time at ambient temperature, specified environmental conditions met, calibration cycle adhered to, and total calibration performed.
Data without tolerances: typical values only.
Data designated "nominal" applies to design parameters and is not tested.
Data designated "σ = xx dB" is shown as standard deviation.

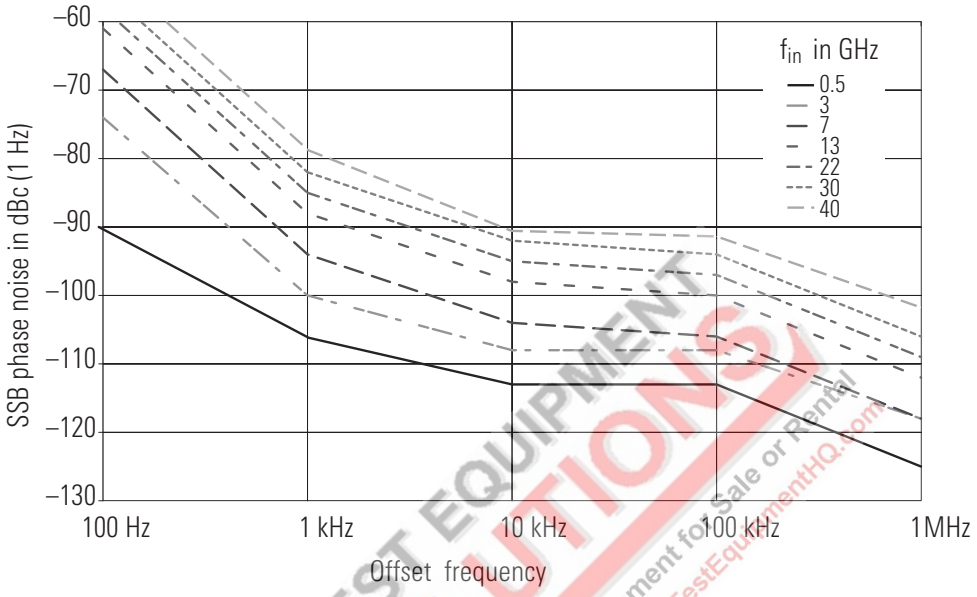
	R&S®FSP3	R&S®FSP7	R&S®FSP13	R&S®FSP30	R&S®FSP40
Frequency					
Frequency range	9 kHz to 3 GHz	9 kHz to 7 GHz	9 kHz to 13.6 GHz	9 kHz to 30 GHz	9 kHz to 40 GHz
Frequency resolution	0.01 Hz				
Internal reference frequency (nominal)					
Aging per year[1]	1×10^{-6}				
Temperature drift	1×10^{-6}				
With option R&S®FSP-B4 (OCXO)					
Aging per year[1]	1×10^{-7}				
Temperature drift	1×10^{-8}				
External reference frequency	10 MHz				
Frequency display	with marker or frequency counter				
Marker resolution	span/500				
Max. deviation (sweep time >3 × auto sweep time)	±(frequency × reference frequency + 0.5% × span + 10% × resolution bandwidth + ½ (last digit))				
Frequency counter resolution	0.1 Hz to 10 kHz (selectable)				
Count accuracy (S/N >25 dB)	±(frequency × reference frequency + ½ (last digit))				
Frequency span	0 Hz, 10 Hz to 3 GHz	0 Hz, 10 Hz to 7 GHz	0 Hz, 10 Hz to 13.6 GHz	0 Hz, 10 Hz to 30 GHz	0 Hz, 10 Hz to 40 GHz
Max. span deviation	0.1%				
Spectral purity (dBc (1 Hz)) SSB phase noise, f = 500 MHz, for f > 500 MHz see diagrams below					
Carrier offset					
100 Hz	<–84, typ.–90				
1 kHz	<–100, typ.–108				
10 kHz	<–106, typ. –113				
100 kHz[2]	<–110, typ. –113				
1 MHz[2]	<–120, typ.–125				
10 MHz	typ.–145				
Residual FM					
f = 500 MHz, RBW 1 kHz, sweep time 100 ms	typ. 3 Hz				

[1] After 30 days of operation.
[2] Valid for span >100 kHz.

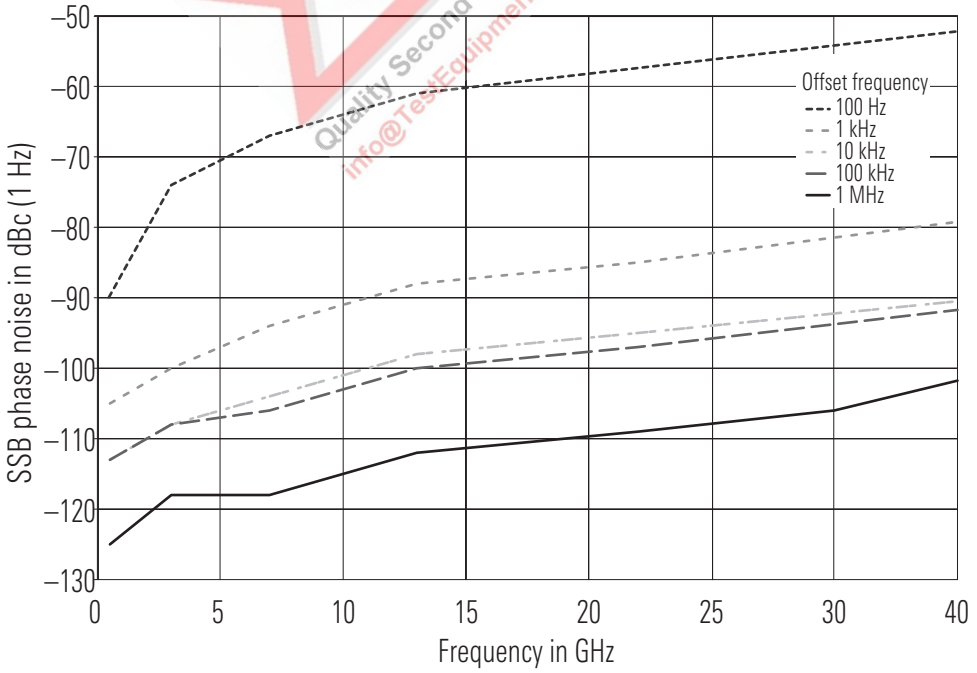
Typical values for SSB phase noise (reference to 1 Hz bandwidth):

Offset	f_{in} = 3 GHz	f_{in} = 7 GHz	f_{in} = 13 GHz	f_{in} = 22 GHz	f_{in} = 26 GHz	f_{in} = 40 GHz
100 Hz	–74 dBc	–67 dBc	–61 dBc	–57 dBc	–55 dBc	–52 dBc
1 kHz	–100 dBc	–94 dBc	–88 dBc	–84 dBc	–82 dBc	–79 dBc
10 kHz	–108 dBc	–104 dBc	–98 dBc	–94 dBc	–92 dBc	–91 dBc
100 kHz	–108 dBc	–106 dBc	–100 dBc	–96 dBc	–94 dBc	–92 dBc
1 MHz	–118 dBc	–118 dBc	–112 dBc	–108 dBc	–106 dBc	–102 dBc

Typ. SSB phase noise vs offset



Typ. SSB phase noise vs frequency



	R&S®FSP3	R&S®FSP7	R&S®FSP13	R&S®FSP30	R&S®FSP40
Sweep time					
Span ≥10 Hz	2.5 ms to 16000 s				
Max. deviation	1%				
Span 0 Hz	1 µs to 16000 s				
Resolution	125 ns				
Resolution bandwidths					
Bandwidths	10 Hz to 10 MHz (–3 dB) in 1, 3 sequence				
EMI bandwidths	200 Hz, 9 kHz, 120 kHz (–6 dB)				
Bandwidth accuracy					
≤100 kHz	<3%				
300 kHz to 3 MHz	<10%				
10 MHz	+10%, –30%				
Shape factor –60 dB: –3 dB					
≤100 kHz	<5:1 (Gaussian filters)				
300 kHz to 3 MHz	<15:1 (4-pole synchronously tuned filters)				
10 MHz	<7:1				
Shape factor –60 dB: –6 dB					
EMI bandwidths	<5:1				
Video bandwidths	1 Hz to 10 MHz in 1, 3 sequence				
FFT filter					
Bandwidths	1 Hz to 30 kHz (–3 dB) in 1, 3 sequence				
Bandwidth accuracy	5%, nominal				
Shape factor –60 dB:–3 dB	2.5:1 nominal				
Channel filter					
Bandwidths	100; 200; 300; 500 Hz; 1; 1.5; 2; 2.4; 2.7; 3; 3.4; 4; 4.5; 5; 6; 8.5; 9; 10; 12.5; 14; 15; 16; 18 (RRC); 20; 21; 24.3 (RRC); 25; 30; 50; 100; 150; 192; 200; 300; 500 kHz; 1; 1.228; 1.5; 2; 3; 5 MHz 1.28 (RRC); 3.84 (RRC); 4.096 (RRC)				
Level					
Display range	displayed average noise level to 30 dBm				
Maximum input level					
DC voltage	50 V		0 V		
DC voltage with R&S®FSP-B29	0V				
RF attenuation 0 dB					
CW RF power	20 dBm				
Pulse spectral density	97 dBµV (1 MHz)				
RF attenuation ≥10 dB					
CW RF power	30 dBm				
Max. pulse voltage	150 V		50 V		
Max. pulse energy (10 µs)	1 mWs		0.5 mWs		
1 dB compression of input mixer					
0 dB RF attenuation, f > 200 MHz	0 dBm nominal				
Intermodulation					
3rd-order intermodulation					
Intermodulation-free dynamic range, level 2 × –30 dBm, Δf > 5 × RBW or 10 kHz, whichever is larger					
20 MHz to 200 MHz	>70 dBc, TOI >5 dBm				
200 MHz to 3 GHz	>74 dBc, TOI >7 dBm (typ. 10 dBm)				
3 GHz to 7 GHz	–	>80 dBc, TOI >10 dBm (typ. 15 dBm)			
7 GHz to 13.6 GHz	–	–	>80 dBc, TOI >10 dBm		
13.6 GHz to 30 GHz	–	–	–	>76 dBc, TOI >8 dBm	>80 dBc, TOI >10 dBm
30 GHz to 40 GHz	–	–	–	–	>80 dBc, TOI >10 dBm
With optional Electronic Attenuator R&S®FSP-B25 switched on					
20 MHz to 200 MHz	>74 dBc, TOI > 7 dBm		–		
200 MHz to 3 GHz	>80 dBc, TOI > 10 dBm		–		
3 GHz to 7 GHz	>84 dBc, TOI > 12 dBm		–		

	R&S®FSP3	R&S®FSP7	R&S®FSP13	R&S®FSP30	R&S®FSP40
Second harmonic intercept point (SHI)					
<100 MHz	typ. 25 dBm				
100 MHz to 1.5 GHz	typ. 35 dBm				
1.5 GHz to 7 GHz	–	typ. 80 dBm			
7 GHz to 13.6 GHz	–	–	typ. 80 dBm		
13.6 GHz to 30 GHz	–	–	–	typ. 80 dBm	
30 GHz to 40 GHz	–	–	–	–	typ. 80 dBm
Displayed average noise level					
(0 dB RF attenuation, RBW 10 Hz, VBW 1 Hz, 20 averages, trace average, span 0 Hz, termination 50 Ω)					
Frequency					
9 kHz	<–95 dBm				
100 kHz	<–100 dBm				
1 MHz	<–120 dBm, typ. –125 dBm				
10 MHz to 1 GHz	<–142 dBm, typ. –145 dBm	<–140 dBm, typ. –145 dBm			
1 GHz to 3 GHz	<–140 dBm, typ. –145 dBm	<–138 dBm, typ. –143 dBm			
3 GHz to 7 GHz	–	<–138 dBm, typ. –143 dBm	<–135 dBm, typ. –140 dBm		
7 GHz to 13.6 GHz	–	–	<–132 dBm, typ. –138 dBm		
13.6 GHz to 22 GHz	–	–	–	<–120 dBm, typ. –128 dBm	–
22 GHz to 30 GHz	–	–	–	<–115 dBm, typ. –123 dBm	–
13.6 GHz to 20 GHz	–	–	–	–	<–120 dBm, typ. –128 dBm
20 GHz to 30 GHz	–	–	–	–	<–120 dBm, typ. –128 dBm
30 GHz to 40 GHz	–	–	–	–	<–112 dBm, typ. –120 dBm
Displayed average noise level with preamplifier on (option R&S®FSP-B25)					
10 MHz to 2 GHz	<–152 dBm	–			
2 GHz to 7 GHz	<–150 dBm	–			
Immunity to interference					
Image frequency	>70 dB				
Intermediate frequency (f <3 GHz)	>70 dB				
Spurious responses (f >1 MHz, without input signal, 0 dB attenuation)	<–103 dBm				
Other spurious (with input signal, mixer level <–10 dBm, Δf >100 kHz)	f <7 GHz: <–70 dBc f <13.6 GHz: <–64 dBc f <30 GHz: <–56 dBc				
Level display					
Screen	501 × 400 pixels (one diagram), max. two diagrams with independent settings				
Logarithmic level scale	10 dB to 200 dB, in steps of 10 dB				
Linear level scale	10% of reference level per level division (10 divisions)				
Traces	max. 3, with two diagrams on screen max. 3 per diagram				
Trace detector	max peak, min peak, auto peak, sample, quasi-peak, average, RMS				
Trace functions	clear/write, max. hold, min hold, average				
Number of test points	501, selectable in steps of approx. factor 2, 125 to 8001				
Setting range of reference level					
Logarithmic level display	–130 dBm to 30 dBm, in steps of 0.1 dB				
Linear level display	70.71 nV to 7.07 V in steps of 1%				
Units of level scale	dBm, dBmV, dBµV, dBµA, dBpW (log level display), mV, µV, mA, µA, pW, nW (linear level display)				
Max. uncertainty of level measurement					
At 128 MHz, –30 dBm (RF attenuation 10 dB, RBW 10 kHz, ref. level –20 dBm)	<0.2 dB (σ = 0.07 dB)				

	R&S®FSP3	R&S®FSP7	R&S®FSP13	R&S®FSP30	R&S®FSP40
Frequency response					
<50 kHz	<+0.5/– 1.0 dB				
50 kHz to 3 GHz	<0.5 dB (σ = 0.17 dB)				
3 GHz to 7 GHz	–	<2 dB (σ = 0.7 dB)			
7 GHz to 13.6 GHz	–	–	<2.5 dB[1)]		
13.6 GHz to 30 GHz	–	–	–	<3 dB[1)]	
30 GHz to 40 GHz	–	–	–	–	<4 dB[1)]
Frequency response with option R&S®FSP-B25 switched on (preamplifier, electronic attenuator)					
10 MHz to 3 GHz	<1 dB (σ = 0.33 dB)		–		
3 GHz to 7 GHz	–	<2 dB (σ = 0.7 dB)	–		
Attenuator	<0.2 dB (σ = 0.07 dB)				
Reference level switching	<0.2 dB (σ = 0.07 dB)				
Display nonlinearity LOG/LIN (S/N >16 dB)					
RBW ≤100 kHz					
0 dB to –70 dB	<0.2 dB (σ = 0.07 dB)				
–70 dB to –90 dB	<0.5 dB (σ = 0.17 dB)				
RBW ≥300 kHz					
0 dB to –50 dB	<0.2 dB (σ = 0.07 dB)				
–50 dB to –70 dB	<0.5 dB (σ = 0.17 dB)				
Bandwidth switching uncertainty (ref. to RBW = 10 kHz)					
10 Hz to 100 kHz	<0.1 dB (σ = 0.03 dB)				
300 kHz to 10 MHz	<0.2 dB (σ = 0.07 dB)				
1 Hz to 3 kHz, FFT	<0.2 dB (σ = 0.03 dB)				
Total measurement uncertainty					
50 kHz to 3 GHz, signal level 0 dB to 70 dB below reference level, S/N >16 dB, RBW ≤ 100 kHz, 95 % confidence level	0.5 dB				
Trigger functions					
Trigger					
Span ≥10 Hz					
Trigger source	free run, video, external, IF level				
Trigger offset	125 ns to 100 s, resolution 125 ns min. (or 1% of offset)				
Span = 0 Hz					
Trigger source	free run, video, external, IF level				
Trigger offset	±125 ns to 100 s, min. resolution 125 ns, dependent on sweep time				
Max. deviation of trigger offset	±(125 ns + (0.1% × delay time))				
Gated sweep					
Trigger source	external, IF level, video				
Gate delay	1 µs to 100 s				
Gate length	125 ns to 100 s, min. resolution 125 ns or 1% of gate length				
Max. deviation of gate length	±(125 ns + (0.05% × gate length))				
Inputs and outputs (front panel)					
RF input	N female, 50 Ω			test port system 50 Ω, N female, 3.5 mm female[2)]	test port system 50 Ω, N female, K female[2)]
VSWR (RF attenuation >0 dB)					
f <3 GHz	1.5:1				
f <7 GHz	–	2.0:1			
f <13 GHz	–	–	2.5:1		
f <30 GHz	–	–	–	3.0:1	
f <40 GHz	–	–	–	–	3.0:1
Input attenuator	0 dB to 70 dB in 10 dB steps				
With option R&S®FSP-B25	0 dB to 75 dB in 5 dB steps		not available		
Probe power supply	+15 V DC, –12.6 V DC and ground, max. 150 mA				
Keyboard connector	PS/2 female for MF2 keyboard				
AF output (only with option R&S®FSP-B3)	3.5 mm mini-jack				

	R&S®FSP3	R&S®FSP7	R&S®FSP13	R&S®FSP30	R&S®FSP40
Output impedance	10 Ω				
Open-circuit voltage	up to 1.5 V, adjustable				
Inputs and outputs (rear panel)					
IF 20.4 MHz	Z_{out} = 50 Ω, BNC female				
Level					
RBW ≤30 kHz, FFT	–10 dBm at reference level, mixer level >–60 dBm				
RBW ≥100 kHz	0 dBm at reference level, mixer level >–60 dBm				
Reference frequency					
Output	BNC female				
Output frequency	10 MHz				
Level	0 dBm, nominal				
Input	10 MHz				
Required level	0 dBm into 50 Ω				
Others					
Power supply for noise source	BNC female, 0 V and 28 V, switchable, max. 100 mA				
External trigger/gate input	BNC female, >10 kΩ				
Trigger voltage	1.4 V (TTL)				
IEC/IEEE bus remote control interface to IEC 625-2 (IEEE 488.2)					
Command set	SCPI 1997.0				
Connector	24-pin Amphenol female				
Interface functions	SH1, AH1, T6, L4, SR1, RL1, PP1, DC1, DT1, C0				
Serial interface	RS-232-C (COM), 9-pin sub-D connector				
Printer interface	parallel (Centronics-compatible)				
Mouse connector	PS/2 female				
Connector for ext. monitor (VGA)	15-pin sub-D connector				
General data					
Display	21 cm TFT colour display (8.4")				
Resolution	640 × 480 pixels (VGA resolution)				
Pixel failure rate	$<2 \times 10^{-5}$				
Mass memory	1.44 MByte 3½" disk drive (built-in), hard disk				
Data storage	>500 instrument settings and traces				
Temperatures					
Operating temperature range	+5 °C to +40 °C				
Permissible temperature range	+5 °C to +45 °C				
Storage temperature range	–40 °C to +70 °C				
Damp heat	+40 °C at 95% relative humidity (EN 60068-2-30)				
Mechanical resistance					
Vibration, sinusoidal	5 Hz to 150 Hz, max. 2 g at 55 Hz; 0.5 g from 55 Hz to 150 Hz; meets EN 60068-2-6, EN 60068-2-30, EN 61010-1, MIL-T-28800D, class 5				
Vibration, random	10 Hz to 100 Hz, acceleration 1 g (rms)				
Shock test	40 g shock spectrum, meets MIL-STD-810C and MIL-T-28800D, classes 3 and 5				
Recommended calibration interval	2 years for operation with external reference,1 year with internal reference				
Power supply					
AC supply	100 V AC to 240 V AC, 50 Hz to 400 Hz, 3.1 A to 1.3 A, class of protection I to VDE411				
Typical power consumption	70 VA	120 VA	150 VA		
Safety	meets EN 61010-1, UL 3111-1, CSA C22.2 No. 1010-1,				
RFI suppression	meets EMC Directive of EU (89/336/EEC) and German EMC law				
Test mark	VDE, GS, CSA, CSA-NRTL/C				
Dimensions in mm (W × H × D)	412 × 197 × 417				
Weight	10.5 kg	11.3 kg	12 kg		

1) RF attenuation 10 dB, sweep time >1s/1 GHz.

2) See recommended extras for alternate connectors.

Specifications of options

Tracking Generator R&S®FSP-B9

Unless specified otherwise, specifications not valid for frequency range from –3 × RBW to +3 × RBW; however, at least not valid from –9 kHz to +9 kHz.
The specified level accuracy of the tracking generator is valid under the following conditions: RF attenuation ≥ 20 dB and sweep time ≥2000 ms.

Frequency	
Frequency range	9 kHz to 3 GHz
Frequency offset	
Setting range	±150 MHz
Resolution	1 Hz
Spectral purity (dBc (1 Hz)) SSB phase noise, f = 500 MHz, carrier offset 100 kHz	
Normal mode	typ. –90
With FM modulation on	typ. –70
Level	
Level setting range	–30 dBm to 0 dBm in steps of 0.1 dB
Level setting range with AM	–30 dBm to –6 dBm in steps of 0.1 dB
Max. deviation of output level, 128 MHz, 0 dBm	<1 dB
Frequency response	
Output level 0 dBm, 100 kHz to 2 GHz	<1 dB
Output level 0 dBm to –25 dBm, 9 kHz to 3 GHz	<3 dB
Dynamic range	
Attenuation, RBW = 1 kHz, f > 10 MHz	typ. 110 dB
Spurious	
Harmonics, output level –10 dBm	typ. –30 dBc
Nonharmonics, output level 0 dBm	typ. –30 dBc
Modulation	
Modulation format (external)	I/Q, AM, FM, FM-DC, PM, ASK, FSK
AM, f > 10 MHz	
Modulation depth	0% to 99%
Modulation frequency range	0 Hz to 1 MHz
FM, f > 10 MHz	
Frequency deviation	0 Hz to 20 MHz
Modulation frequency range	0 Hz to 100 kHz
I/Q modulation, f > 10 MHz	
0 Hz to 30 MHz	typ. 1 dB
Inputs and outputs (front panel)	
RF output	N female, 50 Ω
VSWR	typ. 2:1
Inputs and outputs (rear panel)	
TG/AM IN	$V_{max(pp)}$ = 1 V; Z_{in} = 50 Ω, BNC female
TG Q/FM IN	$V_{max(pp)}$ = 1 V; Z_{in} = 50 Ω, BNC female

External Generator Control R&S®FSP-B10

Supported signal generators	R&S®SME02/03/06, R&S®SMG, R&S®SMGL, R&S®SMGU, R&S®SMH, R&S®SMHU, R&S®SMIQ02B/02E/03B/03E/04B/06B R&S®SML, R&S®SMR20/27/30/40/60 R&S®SMP02/22/03/04,R&S®SMX, R&S®SMY R&S®SMT02/03/06

LAN Interface R&S®FSP-B16

Connector (rear panel)	RJ-45
Supported protocols	10Base-T (IEEE standard 10 Mbit/s 802.3) 100Base-TX (IEEE standard 100 Mbit/s 802.3u)

Extended Environmental Specification R&S®FSP-B20

Temperature range (noncondensing)	
Operating temperature range	0°C to +50°C
Permissible temperature range	0°C to +55°C
Mechanical resistance	
Vibration, random	10 Hz to 300 Hz, acceleration 1.9 g (rms)

LO/IF ports for external Mixers R&S®FSP-B21 (R&S®FSP40 only)

LO level	
Frequency range	7 GHz to 13.2 GHz
Level	+15.5 dBm ±3 dB
IF input	
IF frequency	404.4 MHz
Full scale level	
2 port mixer, LO output/IF input (front)	–20 dBm
Level deviation	
IF level –30 dBm, reference level –20 dBm, RBW 30 kHz, LO output/IF input (front)	<1dB
Full scale level	
3 port mixer, IF input (front)	–20 dBm
Level deviation	
IF level –30 dBm, reference level –20 dBm, RBW 30 kHz, IF input (front)	<1dB
Inputs and outputs (front)	
LO output/IF input	SMA female, 50 Ω
IF input	SMA female, 50 Ω

Electronic Attenuator R&S®FSP-B25 (only for R&S®FSP3 and R&S®FSP7)

Frequency	
Frequency range	10 MHz to 7 GHz
Input attenuator range (mechanical)	0 dB to 75 dB in 5 dB steps
Electronic attenuation range	0 dB to 30 dB in 5 dB steps
Preamplifier	20 dB, switchable
Displayed average noise level with preamplifier on (0 dB RF attenuation, RBW 10 Hz, VBW 1 Hz, 20 averages, trace average, span 0 Hz, termination 50 Ω)	
10 MHz to 2 GHz	<–152 dBm
2 GHz to 7 GHz	<–150 dBm
Intermodulation with electronic attenuator on	
3rd-order intermodulation, intermodulation-free dynamic range, level 2 × –30 dBm, Δf >5 × RBW or 10 kHz, whichever is larger	
20 MHz to 200 MHz	>74 dBc, TOI >7 dBm
200 MHz to 3 GHz	>80 dBc, TOI >10 dBm
3 GHz to 7 GHz	>84 dBc, TOI >12 dBm
Max. deviation of level measurement	
128 MHz, –30 dBm (RF attenuation 10 dB, RBW 10 kHz, ref. level –20 dBm), preamplifier on	<0.2 dB (σ = 0.07 dB)
Electronic attenuator	<0.2 dB (σ = 0.07 dB)
Frequency response with preamplifier, electronic attenuator	
10 MHz to 3 GHz	<1.0 dB (σ = 0.33 dB)
3 GHz to 7 GHz	<2 dB (σ = 0.7 dB)

Trigger Port R&S®FSP-B28

Output voltage	high ≤1.4 V low ≥0.7 V
Trigger port connector	25-pin sub-D female

Frequency range extension 20 Hz R&S®FSP-B29

Frequency range	20 Hz to f_{max}
Frequency response <9 kHz	<1 dB
Displayed average noise level	
0 dB RF attenuation, RBW 10 Hz, VBW 1 Hz, 20 averages, trace average, span 0 Hz, termination 50 Ω	
20 Hz	<–58 dBm
100 Hz	<–75 dBm
1 kHz	<–85 dBm

DC Power Supply R&S®FSP-B30

Input voltage range	10 V to 28 V DC 25 A to 12.5 A
Output voltage	120 V to 360 V DC/300 W
Current consumption (V_{DC} = 12 V, R&S®FSP without options, default settings)	
R&S®FSP3	typ. 6 A
R&S®FSP30	typ. 8 A
Operating temperature range	0°C to +50°C
Storage temperature range	–40°C to +70°C
Dimensions in mm (W × H × D)	145 × 154 × 65
Weight	0.6 kg

Battery Pack R&S®FSP-B31/-B32	
NiMH battery pack with built-in load control for all R&S®FSP and R&S®ESPI models with options R&S®FSP-B1 and R&S®FSP-B30	
Input voltage of battery pack	10 V to 28 V DC
Input voltage power supply (battery charge)	24 V DC/max. 3 A
Output voltage	
Battery operation	13.2 V DC/200 Wh
Bypass operation	10 V to 28 V DC/10 A
Typical operating times (R&S®FSP without options)	
R&S®FSP3	2 h
R&S®FSP30	1.5 h
Charging time	5 h at +25 °C
Operating temperature range (discharging)	0 °C to +50 °C
Operating temperature range (charging)	+10 °C to +40 °C
Storage temperature range (<1 year)	–20 °C to +35 °C
Storage temperature range (<1 month)	–20 °C to +55 °C
Dimensions (W × H × D)	400 mm × 134 mm × 42 mm
Weight	3.7 kg
AC adapter (R&S®FSP-B31 only)	
Input voltage range	100 V to 240 V AC ±10%
Input frequency range	50 Hz to 60 Hz ±5%
Input power	140 VA
Output voltage	24 V
Output current	3 A
Operating temperature range	0 °C to +50 °C
Storage temperature range	–20 °C to +70 °C
Dimensions (W × H × D)	132 mm × 58 mm × 30 mm
Weight	0.3 kg

Ordering information

Order designation	Type	Order No.
Spectrum Analyzer, 9 kHz to 3 GHz	R&S®FSP3	1164.4391.03
Spectrum Analyzer, 9 kHz to 7 GHz	R&S®FSP7	1164.4391.07
Spectrum Analyzer, 9 kHz to 13.6 GHz	R&S®FSP13	1164.4391.13
Spectrum Analyzer, 9 kHz to 30 GHz	R&S®FSP30	1164.4391.30
Spectrum Analyzer, 9 kHz to 40 GHz	R&S®FSP40	1164.4391.40
Accessories supplied		
Power cable, compact manual, CD-ROM with operating manual and service manual. R&S®FSP30: test port adapter with 3.5 mm female (1021.0512.00) and N female (1021.0535.00) connector. R&S®FSP40: test port adapter with K female (1036.4790.00) and N female (1036.4777.00) connector.		

Options

Order designation	Type	Order No.	Retrofittable	Remarks
Options				
Delete Manuals	R&S®FSP-B0	1129.8394.02		
Rugged Case, carrying handle (factory-fitted)	R&S®FSP-B1	1129.7998.02	no	
AM/FM Audio Demodulator	R&S®FSP-B3	1129.6491.02	yes	not with R&S®FSP-B15.
OCXO Reference Frequency	R&S®FSP-B4	1129.6740.02	yes	
TV Trigger/RF Power Trigger	R&S®FSP-B6	1129.859.4.02	yes	not with R&S®FSP-B21.
Internal Tracking Generator 9 kHz to 3 GHz, I/Q modulator, for all R&S®FSP models	R&S®FSP-B9	1129.6991.02	yes	
External Generator Control for all R&S®FSP models	R&S®FSP-B10	1129.7246.03	yes	
Pulse Calibrator for R&S®FSP	R&S®FSP-B15	1155.1006.02	yes	not with R&S®FSP-B3; required for R&S®FS-K72/-K73
LAN Interface 100BT for all R&S®FSP models with Windows XP (1164.4391.xx)	R&S®FSP-B16	1129.8042.03	yes	

Order designation	Type	Order No.	Retrofittable	Remarks
Removable Flash Disk	R&S®FSP-B18	1163.0892.03	no	
Second Flash Disk for R&S®FSP-B18	R&S®FSP-B19	1163.1124.03		R&S®FSP-B18 required
Extended Environmental Specification	R&S®FSP-B20	1155.1606.06	no	
LO/IF Ports for External Mixers	R&S®FSP-B21	1155.1758.03	yes	not with R&S®FSP-B6; only for R&S®FSP40
Electronic Attenuator, 0 dB to 30 dB, 5 dB steps, integrated preamplifier for R&S®FSP3 and R&S®FSP7	R&S®FSP-B25	1129.7746.03	yes	
Trigger Port for R&S®FSP for indication of trigger conditions	R&S®FSP-B28	1162.9915.02	yes	
Frequency Range Extension 20 Hz for R&S®FSP3/7	R&S®FSP-B29	1163.0663.07	no	
Frequency Range Extension 20 Hz for R&S®FSP13/30	R&S®FSP-B29	1163.0663.30	no	
Frequency Range Extension 20 Hz for R&S®FSP40	R&S®FSP-B29	1163.0663.40	no	
DC Power Supply for Spectrum Analyzers R&S®FSP	R&S®FSP-B30	1155.1158.02	yes	
Battery Pack for Spectrum Analyzers R&S®FSP	R&S®FSP-B31	1155.1258.02	yes	R&S®FSP-B1 and R&S®FSP-B30 required
Spare Battery Pack for Spectrum Analyzers R&S®FSP	R&S®FSP-B32	1155.1506.02	yes	R&S®FSP-B31 required
Demodulation Hardware and Memory Extension	R&S®FSP-B70	1157.0559.02	yes	required for R&S®FS-K72/ -K73; R&S®FSP-B15 required
Software				
GSM/EDGE Application Firmware, Mobile	R&S®FS-K5	1141.1496.02		
AM/FM/φM Measurement Demodulator	R&S®FS-K7	1141.1796.02		
Application Firmware for Bluetooth® Measurements	R&S®FS-K8	1157.2568.02		
Power Sensor Measurements	R&S®FS-K9	1157.3006.02		supports R&S®NRP-Z11/-Z21 with R&S®NRP-Z4 USB connector
Application Firmware for Noise Figure and Gain Measurements	R&S®FS-K30	1300.6508.02		Preamplifier R&S®FSP-B25 recommended
Application Firmware for Phase Noise Measurements	R&S®FS-K40	1161.8138.02		
3GPP BTS/Node B FDD Application Firmware	R&S®FS-K72	1154.7000.02		R&S®FSP-B15 and -B70 required
3GPP UE FDD Application Firmware	R&S®FS-K73	1154.7252.02		R&S®FSP-B15 required, R&S®FSP-B70 recommended
3GPP HSDPA BTS Application Firmware	R&S®FS-K74	1300.7156.02		R&S®FS-K72 required
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) 1xEV-DV BTS FDD 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	R&S®FS-K84	1157.2851.02		
CDMA2000®-1xEV-DO MS Application Firmware	R&S®FS-K85	1300.6689.02		
WLAN 802.11a TX Measurements Application Firmware	R&S®FSP-K90	1300.6650.02		
WiBro IEEE 802.16 OFDMA Measurements Application Firmware	R&S®FSP-K93	1308.5500.02		

Recommended extras

Designation	Type	Order No.
Headphones		0708.9010.00
DC Block,10 kHz to 18 GHz (type N)	R&S®FSE-Z4	1084.7443.02
IEC/IEEE Bus Cable, 1 m	R&S®PCK	0292.2013.10
IEC/IEEE Bus Cable, 2 m	R&S®PCK	0292.2013.20
19" Rack Adapter (not for R&S®FSP-B1)	R&S®ZZA478	1096.3248.00
Soft Carrying Case, grey	R&S®ZZT473	1109.5048.00
Printed operating manual (German)	–	1093.4820.11
Printed operating manual (English)	–	1093.4820.12
Printed service manual (German)	–	1093.4820.81
Printed service manual (English)	–	1093.4820.82
Matching Pads, 75 Ω		
L Section	R&S®RAM	0358.5414.02
Series Resistor, 25 Ω[1)]	R&S®RAZ	0358.5714.02
SWR Bridge, 5 MHz to 3 GHz	R&S®ZRB2	0373.9017.52
SWR Bridge, 40 kHz to 4 GHz	R&S®ZRC	1039.9492.52
High-Power Attenuators, 100 W		
3/6/10/20/30 dB	R&S®RBU100	1073.8495.XX (XX=03/06/10/20/30)
High-Power Attenuators, 50 W		
3/6/10/20/30 dB	R&S®RBU50	1073.8695.XX (XX=03/06/10/20/30)
For R&S®FSP30		
Test Port Adapter, 3.5 mm male	–	1021.0529.00
Test Port Adapter, N male	–	1021.0541.00
Microwave Measurement Cable and Adapter Set	R&S®FS-Z15	1046.2002.02
For R&S®FSP40		
Test Port Adapter K male	–	1036.4802.00
Test Port Adapter N male	–	1036.4783.00
Test Port Adapter 2.4 mm female	R&S®FSE-Z5	1088.1627.02
Connectors		
Probe power connector , 3-pin		1065.9480.00

1) Taken into account in device function RF INPUT 75 Ω.

Related data sheets

Title	Order No.
TV Trigger/RF Power Trigger R&S®FSP-B6	PD 0757.6433
GSM/EDGE Application Firmware R&S®FS-K5	PD 0757.6185
AM/FM/φM Measurement Demodulator R&S®FS-K7	PD 0757.6685
Bluetooth Application Firmware R&S®FS-K8	PD 0757.7730
Application Firmware for Noise Figure and Amplifier Measurements R&S®FS-K30	PD 0758.0839.32
Application Firmware for Phase Noise Measurements R&S®FS-K40	PD 0758.2631.32
WCDMA 3GPP Application Firmware R&S®FS-K72/-K73/-K74	PD 0757.7246
TD-SCDMA Test Application Firmware R&S®FS-K76/-K77	PD 0758.0880.32
CDMA2000® Base Station Test Application Firmware 1xEV-DO Base Station Test Application Firmware R&S®FS-K82/-K84	PD 0758.1712.32
Mobile Station Test Application Firmware R&S®FS-K83/R&S®FS-K85	PD 0758.1729.32
WLAN Application Firmware R&S®FSQ-K91/ R&S®FSP-K90	PD 0758.1435.12
R&S®FSx-K92/-K93 WiMAX Application Firmware	PD 5213.8550.32

Product brochure see PD 0758.1206.12
and at www.rohde-schwarz.com
(search term: FSP)

Certified Quality System ISO 9001 DQS REG. NO 1954 QM

Certified Environmental System ISO 14001 DQS REG. NO 1954 UM

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