



up to 50 GHz  
up to 50 GHz

Version  
09.00

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2007

## R&S®FSU Spectrum Analyzer

The high-end spectrum analyzer with unrivaled performance

### Features

#### Versatile resolution filters

- ◆ Gaussian, FFT, channel, RRC
- ◆ Comprehensive test routines
- ◆ TOI, OBW, CCDF
- ◆ Channel power, ACPR, multicarrier ACPR

#### Full choice of detectors

#### Optional electronic attenuator

#### Preamplifier up to 26 GHz

#### Measurement functions for

- ◆ GSM/EDGE
- ◆ Bluetooth® wireless technology
- ◆ TD-SCDMA (BTS/MS)
- ◆ WCDMA node B and UE, HSDPA
- ◆ CDMA2000®, CDMA2000®1xEV-DO (BTS/MS)

### Speed

- ◆ Fast ACP test routine in time domain
- ◆ User-configurable list for fast measurements at frequencies of interest
- ◆ Up to 70 measurements/s in time domain via IEC/IEEE bus (including trace data transfer)
- ◆ Fast frequency counter with 0.1 Hz resolution in 30 ms

### Unrivaled performance

#### Unmatched dynamic range

- ◆ 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



**ROHDE & SCHWARZ**

# Performance surpassing all expectations ...

## Milestones in spectrum analysis

The name Rohde & Schwarz has been synonymous with innovative spectrum analyzers since 1986, the unique features of which have repeatedly set standards in this technology. Examples are the analyzers of the R&S®FSE and R&S®FSIQ families.

The R&S®FSU spectrum analyzer is another milestone. New circuit concepts, advanced RF components, A/D converters, ASIC technology, plus extensive experience gained from a variety of applications and customer requirements – all these combine to form a solid basis on which the R&S®FSU was developed. Its unparalleled features enable the use of new test methods – to your advantage. The future-oriented concept fuses unprecedented performance with continuity. The R&S®FSU is compatible with the R&S®FSE and R&S®FSIQ, the industry standards to date. Test routines and sequences generated for the R&S®FSE or R&S®FSIQ can be used on the R&S®FSU too. The R&S®FSU family thus safeguards your investment.

The operating concept of the high-end R&S®FSU spectrum analyzer is the same as that of the R&S®FSP general-purpose analyzer, so these instruments offer a uniform platform for a variety of applications. The R&S®FSU even surpasses the proven excellent RF data of the R&S®FSE and R&S®FSIQ families. Measurements calling for an extremely wide dynamic range become even simpler, faster and more reliable – in development, quality management and production.

The R&S®FSU is the reference spectrum analyzer with the widest dynamic range to date.

## Rohde & Schwarz innovation in spectrum analyzers

- 1986 **R&S®FSA** – first color display, first spectrum analyzer to feature –154 dBm (6 Hz) displayed average noise level without the use of preamplifiers, quasi-continuously variable resolution bandwidths, phase noise optimization
- 1995 **R&S®FSE** – fastest analyzer
- 1996 **R&S®FSE** – first spectrum analyzer with RMS detector
- 1997 **R&S®FSE-B7** – universal vector signal analysis and spectrum analyzer capability combined for the first time
- 1998 **R&S®FSIQ** – first analyzer offering 75 dB dynamic range for UMTS/WCDMA ACLR measurements

## Wealth of functions

Highly selective digital filters from 10 Hz to 100 kHz	Up to 80 measurements/s in manual mode
Fast FFT filters from 1 Hz to 30 kHz	Up to 70 measurements/s on GPIB interface
Channel filters from 100 Hz to 5 MHz	SCPI-compatible GPIB command set
RRC filters	R&S®FSE/R&S®FSIQ-compatible GPIB command set
Resolution bandwidth from 1 Hz to 50 MHz	8566A/B/859x-compatible GPIB command set
QP, CISPR-AV and CISPR-RMS detectors with EMI bandwidths 200 Hz, 9 kHz, 120 Hz, 1 MHz	Time-selective spectrum analysis with gating function
2.5 ms sweep time in frequency domain	Statistical signal analysis with CCDF function
1 μs sweep time in time domain	RMS detector of 100 dB dynamic range
Number of measurement points/trace selectable between 155 and 10001	Transducer factor for correcting antenna or cable frequency responses
Fast ACP measurement in time domain	Limit lines with PASS/FAIL evaluation
GPIB interface, IEEE 488.2	Peak list function for fast spurious measurement
RS-232-C serial interface, 9-pin D-Sub	Two-year calibration cycle
VGA output, 15-pin D-Sub	External reference from 1 MHz to 20 MHz in 1 Hz steps
PC-compatible screenshots on floppy disc, hard disk or USB flash memory stick	Spurious emissions measurement
Harmonic distortion measurement	

- 1999 **R&S®FSP** – 0.5 dB total measurement uncertainty as standard, fast ACP test routines in time domain, digital channel filters, CCDF
- 2000 **R&S®FSP-B25** – first electronic attenuator for wear-free use in production
- 2001 **R&S®FSU** – 0.3 dB total measurement uncertainty, 50 MHz resolution bandwidth, +25 dBm TOI

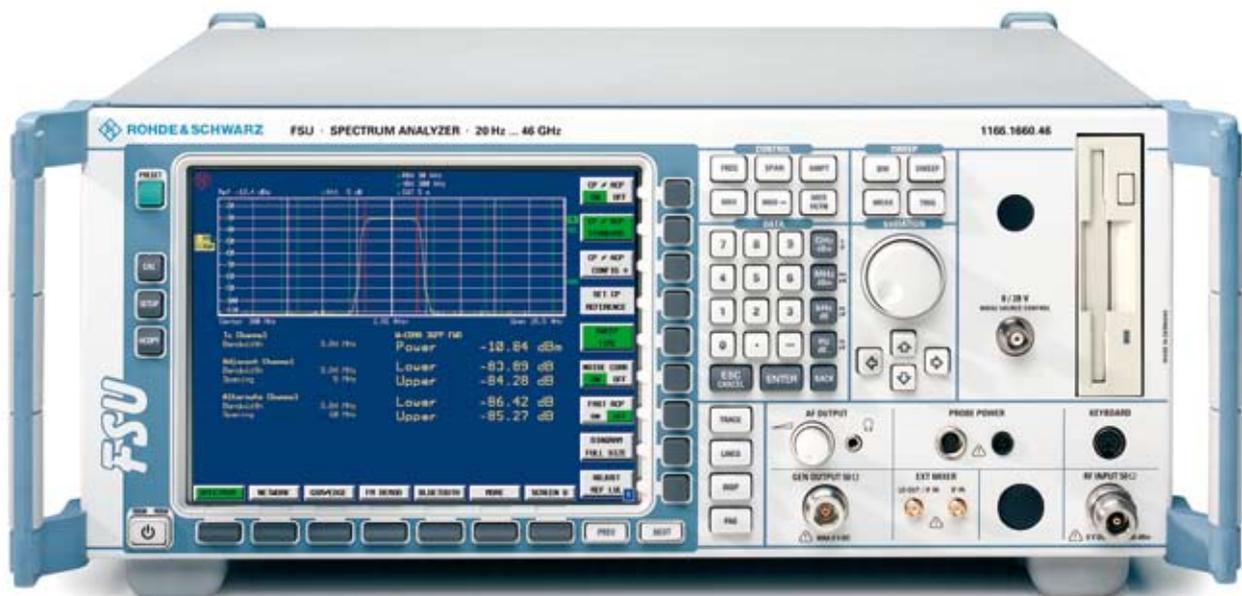
## R&S®FSU – ideal for signals requiring wide dynamic range

- ◆ TOI >20 dBm, typ. +25 dBm
- ◆ 1 dB compression: +13 dBm (0 dB RF attenuation)
- ◆ Displayed average noise level: –158 dBm (1 Hz bandwidth)
- ◆ typ. 77 dB ACLR for 3GPP, typ. 84 dB with noise correction
- ◆ HSO1 typ. 55 dBm
- ◆ Phase noise: typ. –160 dBc (1 Hz) at 10 MHz carrier offset

# ... the R&S®FSU

## Condensed specifications

	R&S®FSU3	R&S®FSU8	R&S®FSU26	R&S®FSU 43	R&S®FSU46	R&S®FSU 50
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
Reference frequency	aging: $1 \times 10^{-7}$ /year; with R&S®FSU-B4 option: $3 \times 10^{-8}$ /year					
Spectral purity						
Phase noise	typ. -133 dBc (1 Hz) at 640 MHz from carrier					
Residual FM	1 Hz					
Sweep time						
Span $\geq 10$ Hz	2.5 ms to 16000 s					
Span 0 Hz (zero span)	1 $\mu$ s 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 (10 Hz RBW)						
1 GHz	typ. -148 dBm	typ. -148 dBm	typ. -146 dBm	typ. -146 dBm	typ. -146 dBm	typ. -146 dBm
7 GHz	-	typ. -144 dBm	typ. -146 dBm	typ. -143 dBm	typ. -143 dBm	typ. -143 dBm
13 GHz	-	-	typ. -143 dBm	typ. -143 dBm	typ. -143 dBm	typ. -143 dBm
26 GHz	-	-	-	typ. -138 dBm	typ. -138 dBm	typ. -138 dBm
40 GHz	-	-	-	typ. -133 dBm	typ. -133 dBm	typ. -126 dBm
50 GHz	-	-	-	-	-	typ. -121 dBm
Displayed average noise level with pre-amplifier ON (R&S®FSU-B25), 1 GHz, 10 Hz RBW	<-152 dBm	<-152 dBm	<-152 dBm	<-152 dBm	<-152 dBm	<-152 dBm
Displayed average noise level with pre-amplifier ON (R&S®FSU-B23), 26 GHz, 10 Hz RBW	-	-	<-140 dBm, typ. -150 dBm	-	-	-
Trace detectors	max peak, min peak, auto peak, sample, RMS, average, quasi-peak, CSIPR-AV, CSIPR-RMS					
Total measurement error, $f < 3.6$ GHz	0.3 dB					
Display linearity	0.1 dB (0 dB to -70 dB)					



# Shorter development cycles through versatile functions ...

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.

Full choice of detectors for adaptation to a wide range of signal types (Fig. 1):

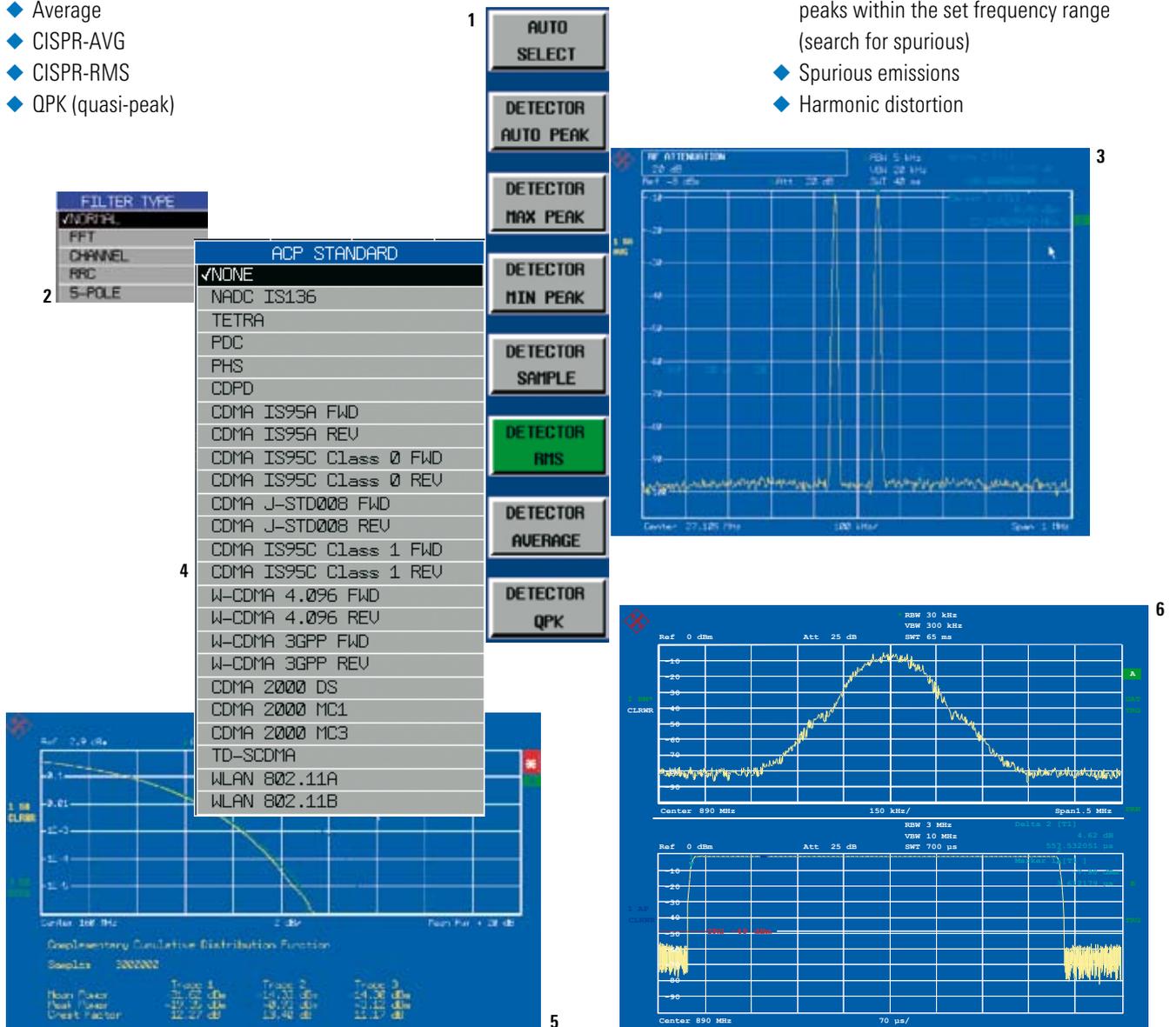
- ◆ RMS
- ◆ Auto peak
- ◆ Max peak
- ◆ Min peak
- ◆ Sample
- ◆ Average
- ◆ CISPR-AVG
- ◆ CISPR-RMS
- ◆ QPK (quasi-peak)

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 bandwidth from 100 Hz to 5 MHz (Fig. 2)
- ◆ RRC filters for NADC and TETRA
- ◆ EMI filters: 200 Hz, 9 kHz, 120 kHz, 1 MHz

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 (Fig. 3)
- ◆ Noise/phase-noise marker
- ◆ Versatile channel/adjacent-channel power measurement functions with wide selection of standards, user-configurable (Fig. 4)
- ◆ CCDF measurement function (Fig. 5)
- ◆ Split-screen mode with selectable settings (Fig. 6)
- ◆ Peak list marker for fast search of all peaks within the set frequency range (search for spurious)
- ◆ Spurious emissions
- ◆ Harmonic distortion



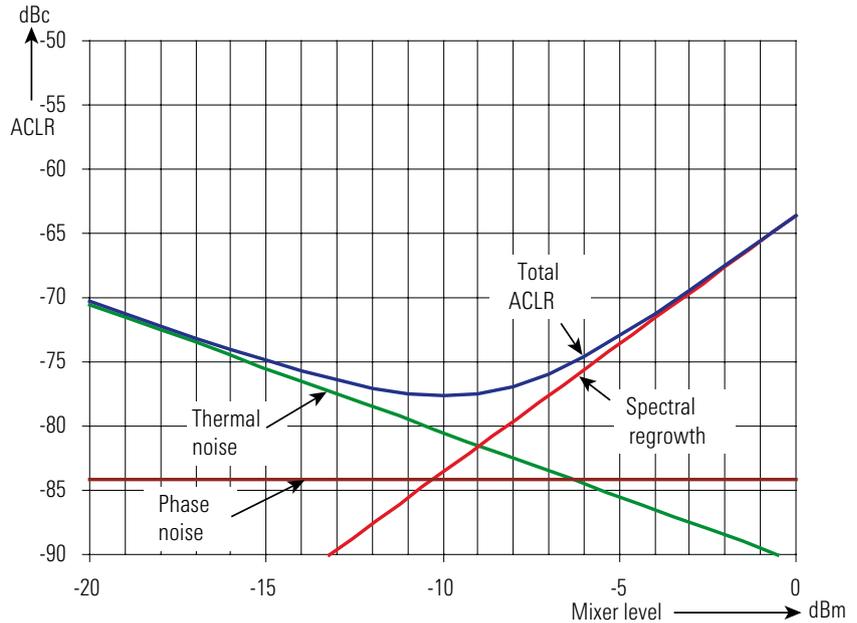
# ... wide dynamic range and future-proof performance

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 verified and demonstrated very simply and with high accuracy.

A higher-performance node B can thus be built, proving the fact.

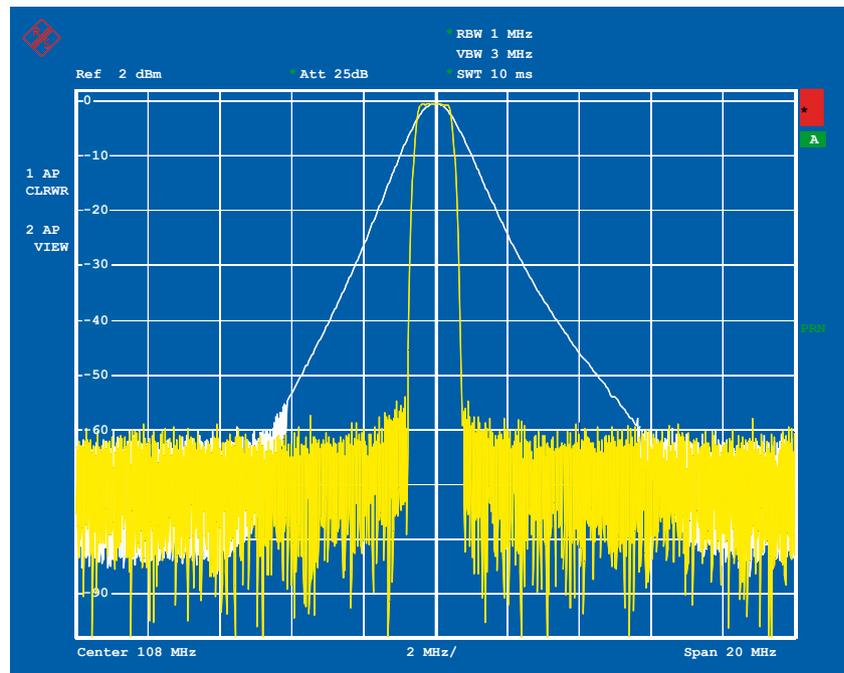
The high harmonic second-order intercept point means optimum dynamic range for multichannel cable TV measurements.



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

Some mobile radio standards such as TETRA and IS-136 require RRC filters for power measurement such as available in the R&S® FSU. In addition, channel filters are available that support other analog and digital methods such as cdmaOne, AM/FM radio and ETS 300 113.

Adjacent-channel power resulting from switching operations can also be measured using the channel filters. For conventional mobile radio standards, the R&S® FSU includes measurement routines (fast ACP) for determining the adjacent-channel power in the time domain, yielding shorter measurement times and higher reproducibility.



**1 MHz channel filter versus normal 1 MHz resolution filter.**

# Shorter development cycles through versatile functions ...

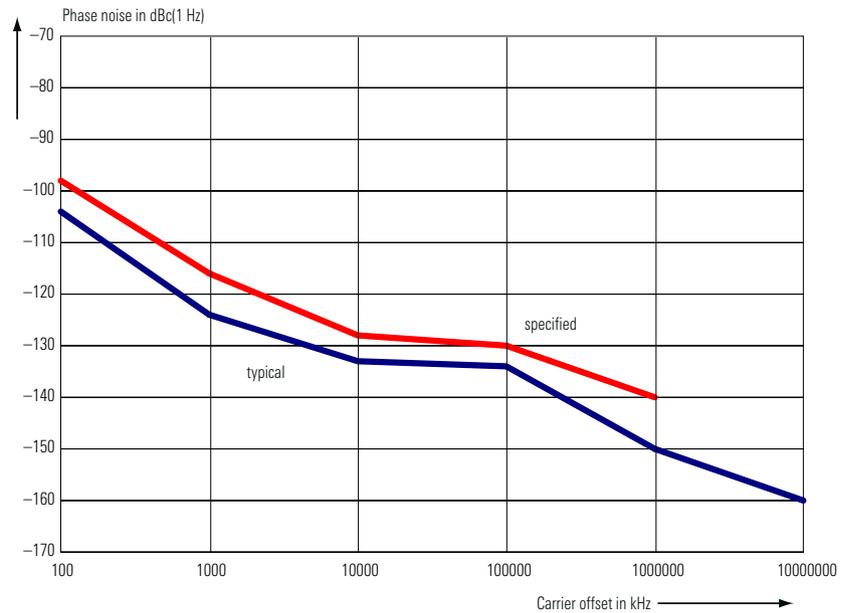
Whether in synthesizer development or frontend design, additional applications add to the R&S®FSU functionality while user-friendliness is maintained.

The R&S®FS-K40 phase noise measurement firmware automates measurement over a complete offset frequency range and determines residual FM from the phase noise characteristic. This in conjunction with the R&S®FSU's extremely low phase noise generally does away with the need for an extra phase noise measurement system, which can be difficult to operate anyway.

The extremely low phase noise, particularly far away from the carrier, makes it possible to measure nonharmonics (spurious) without an additional filter even on base station signals.



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



**SSB phase noise of the R&S®FSU at 640 MHz.**

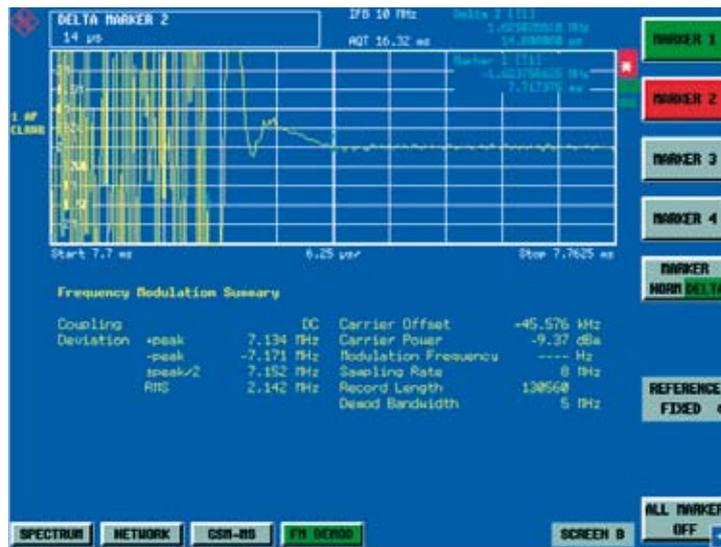
## Software options and function expansions for general applications

Type	Designation and/or application
R&S®FS-K7	AM/FM/φM measurement demodulator for general applications
R&S®FS-K9	Power sensor measurements
R&S®FS-K30	Noise figure measurements (application firmware), remote-controllable
R&S®FS-K40	Phase noise measurements (application firmware), remote-controllable

# ... wide dynamic range and future-proof performance ...

## 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, for example, also the frequency settling of oscillators (AM/φM, audio distortion, THD/SINAD).



Settling of a synthesizer.

## Power measurement

The R&S®FS-K9 option transforms the R&S®FSU into a highly accurate power meter. Together with the R&S®NRP-Z4 and R&S®NRP-Z3 USB adapters, the R&S®NRP-Z11 and R&S®NRP-Z21 power sensors are supported.

The measurement result is displayed during current 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.

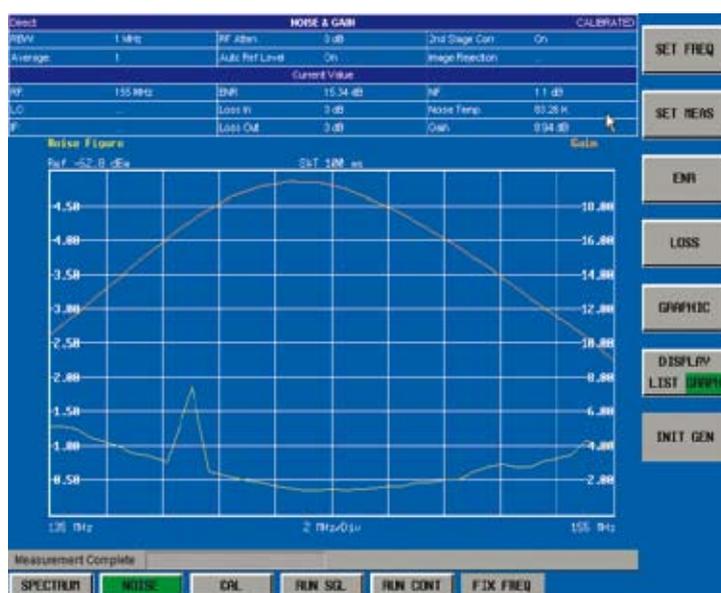


Power measurement of a 3GPP HSDPA signal.

## Noise figure measurement

The R&S®FS-K30 option is a convenient way to determine the noise figure of amplifiers and frequency-converting DUTs throughout the R&S®FSU's frequency range, thus enabling complete documentation. The high linearity and extremely accurate power measurement routines of the R&S®FSU deliver precise and reproducible results, eliminating the need for a noise figure meter.

If the R&S®FSU3/8/43/46/50 is equipped with the option R&S®FSU-B25 and the R&S®FSU 26 with the R&S®FSU-B25 and -B23 options, a separate preamplifier is not required for measuring very low noise figures.



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

# ... and general vector signal analysis

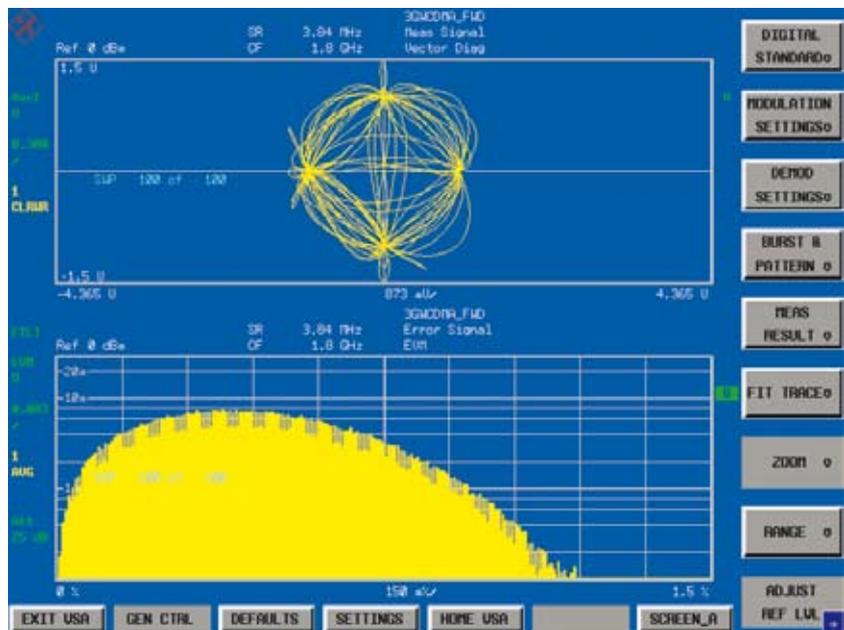
The general vector signal analysis function is available now for the R&S®FSU spectrum analyzer. The R&S®FSU-B73 option provides a narrowband, cost-effective vector signal analyzer solution. It contains the necessary hardware and the R&S®FSQ-K70 well known from the R&S®FSQ signal analyzer. The detailed specifications are covered in a combined specification document for R&S®FSQ-K70, R&S®FSU-B73 and R&S®FSMR-B73 (PD 0758.1706.22).

## Specifications and functions in brief

Specified frequency range	20 MHz to max. frequency of analyzer
Max. symbol rate	6.4 MHz
I/Q bandwidth	7 MHz
Modulation formats	BPSK, QPSK, OQPSK, DQPSK, $\pi/4$ DQPSK, 8PSK, DBPSK, $3\pi/8$ 8PSK (EDGE), QAM (16, 32, 64, 128, 256), DVB mapping, DQAM, VSB, FSK (2, 4), MSK
<b>User-definable mapping and constellation</b>	
Predefined standards	3GPP WCDMA, CDMA2000®, GSM/EDGE, NADC, PDC, PHS, TETRA, Bluetooth®, DECT ZIGBEE: see AN, APCO 25 phase 1, 2
<b>User-definable standards</b>	
Residual EVM, QPSK, symbol rate 6 MHz	1%
I/Q memory	16 Msample
<b>User-designable baseband filters</b>	
	equalizer, AM/AM and AM/φM measurements, histogram function (PDF)

The table below shows the important parameters for characterizing a digital modulated signal. The demodulated bits are listed as well.

MODULATION		ACCURACY			SYMBOL TABLE (Hexadecimal)																		
	Result	Peak	atSym	Unit																			
EVM	1.026	1.946	61	%	00000	0	1	0	1	2	2	3	3	0	0	1	1	0	0	0	0	0	2
Magnitude Err	0.724	1.659	88	%	00018	2	3	3	2	0	0	1	1	2	0	1	0	1	0	2	2	3	1
Phase Error	0.42	0.98	82	deg	00036	2	1	0	0	3	2	1	1	3	3	1	3	3	2	3	2	0	2
CarrierFreq Err	99.75			Hz	00054	3	0	3	1	2	2	0	1	1	3	0	1	2	1	3	2	2	1
Ampt Droop	-0.03			dB	00072	0	1	1	2	2	1	1	1	1	0	2	2	1	1	3	1	1	2
Origin Offset	-63.47			dB	00090	3	3	1	2	1	2	0	2	2	0								
Gain Imbalance	0.00			dB																			
Quadrature Err	-0.03			deg																			
RHO	0.999895																						
Mean Power	-5.96	-0.95	97	dBm																			
SWR (MER)	39.77			dB																			



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

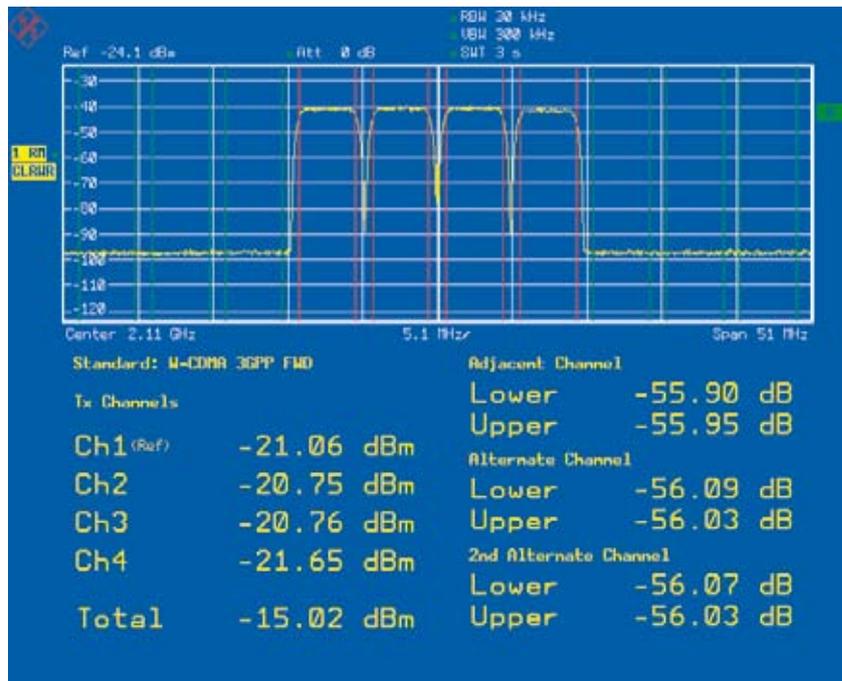
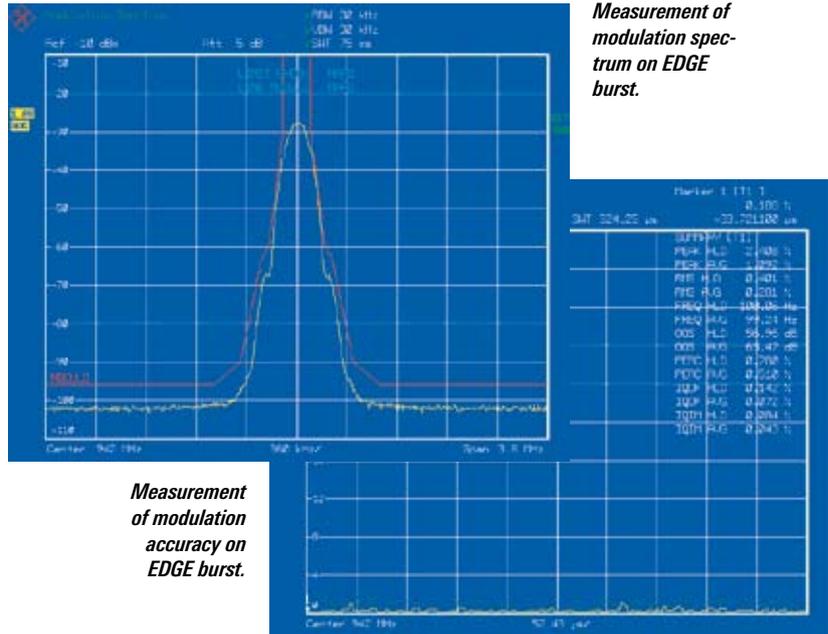
# From GSM to UMTS ...

## From GSM to UMTS – ready for 3G mobile radio

The above features plus its wide dynamic range make the R&S®FSU an ideal tool in base station development and testing. This is enhanced by excellent characteristics already incorporated in the standard unit, e.g. <0.3 dB total measurement uncertainty, gated sweep and IF power trigger.

Even in its basic version, the R&S®FSU offers the functionality and characteristics needed to develop, verify and produce 3G mobile radio systems:

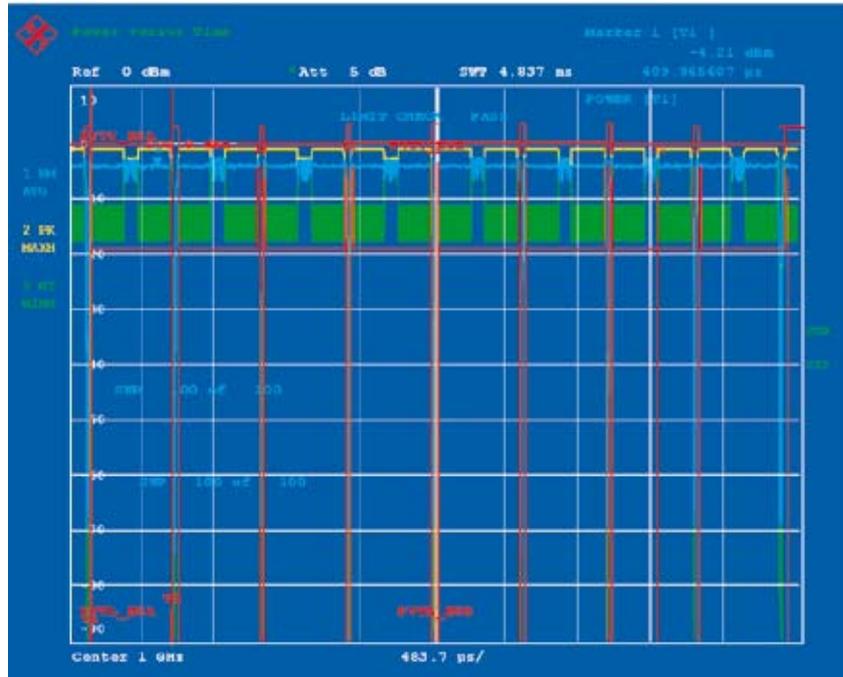
- ◆ RMS detector, provided as standard in Rohde & Schwarz analyzers for many years and allowing accurate power measurements independently of signal form; 3GPP specifications stipulate RMS power measurements for most tests
- ◆ ACP measurement function for 3GPP with 3.84 MHz bandwidth RRC filter for standard-conforming adjacent-channel power measurements with a dynamic range limit of 77 dB or 84 dB
- ◆ Dedicated CCDF measurement function that determines the probability of instantaneous signal power exceeding average power; CCDF measurement is indispensable in determining optimum transmit power for CDMA signals, assuming that clipping at known, short intervals is tolerable



ACP measurement on a WCDMA signal with 4 channels.

In conjunction with the R&S®FS-K5 GSM/EDGE application firmware, the R&S®FSU offers complete functionality for RF and modulation measurements in GSM systems. EDGE (generation 2.5) is already included in the R&S®FS-K5 option.

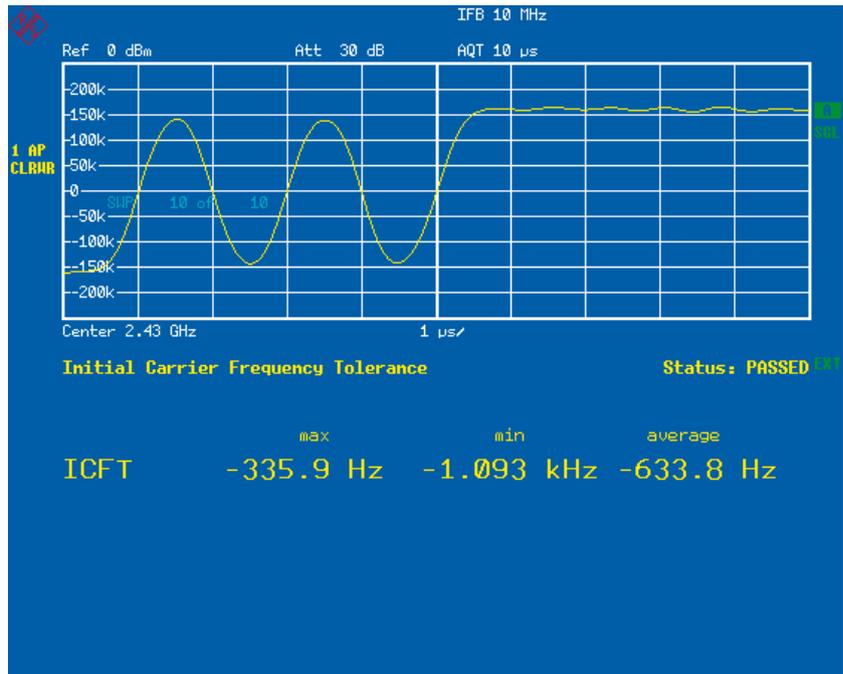
- ◆ Phase/frequency error for GSM
- ◆ Modulation accuracy for EDGE with:
  - EVM and ETSI-conforming weighting filters
  - OOS
  - 95:th percentile
  - Power versus time with synchronization to midamble
  - Spectrum due to modulation
  - Spectrum due to transients



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

## 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 (ICFT)
  - Carrier frequency drift
- ◆ Simultaneous display of traces and all numeric measurement results
- ◆ Automatic limit value monitoring
- ◆ Ideal for use in development and production of Bluetooth® modules



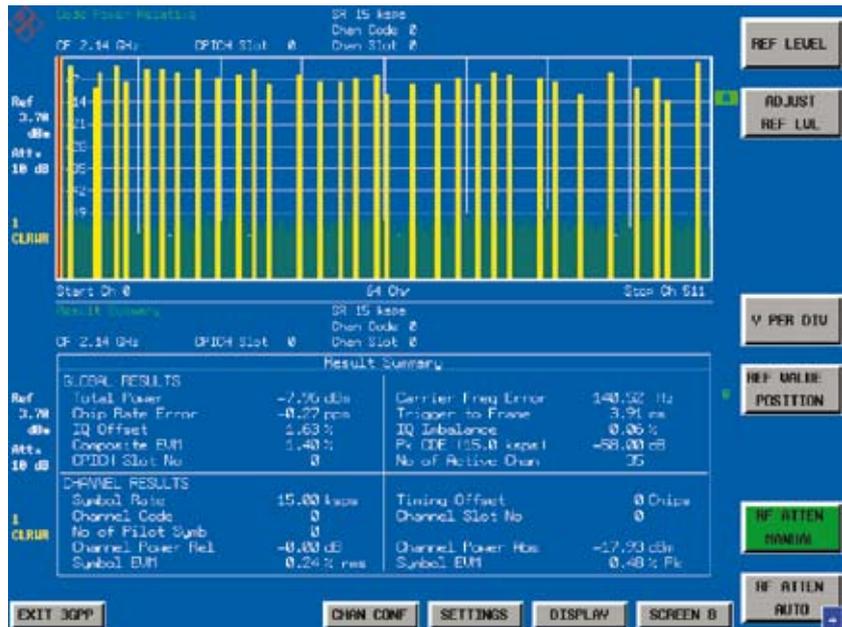
*Measurement of initial carrier frequency tolerance on a Bluetooth® signal with R&S®FS-K8.*

The Bluetooth word mark and logos are owned by the Bluetooth SIG, Inc. and any use of such marks by Rohde & Schwarz is under license.

# ... ready for 3G mobile radio

## Standard 3GPP modulation and code domain power measurements

- ◆ Additional measurement functions in line with 3GPP specifications for FDD mode
- ◆ High measurement speed of 1.5 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



WCDMA code domain power measurement with the R&S® FSU and R&S® FS-K72.

CDMA2000® is a registered trademark of the Telecommunications Industry Association (TIA -USA).

## Firmware options for mobile radio applications

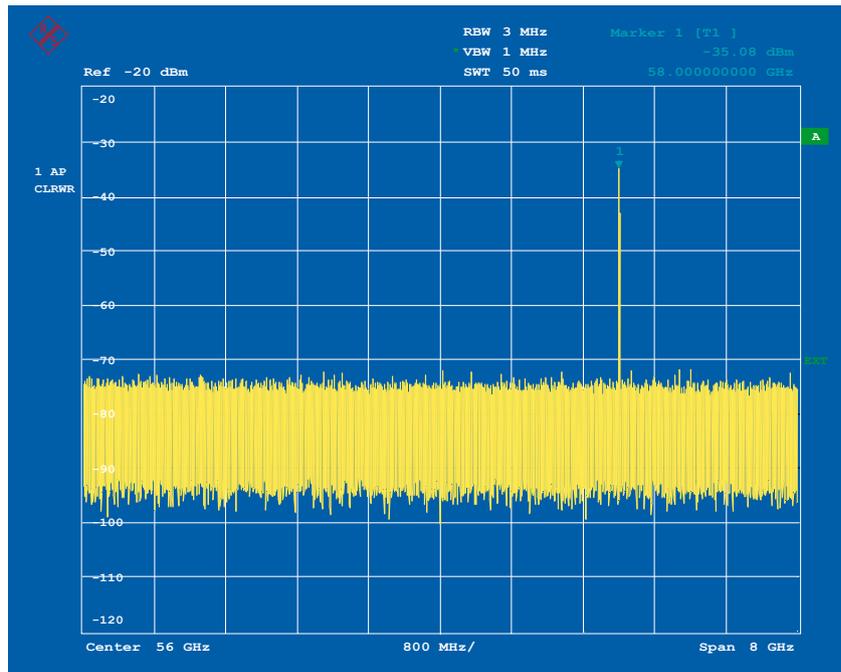
Type	Designation and/or application
R&S®FS-K5	Modulation and spectrum measurements on GSM/EDGE base station and mobile signals
R&S®FS-K8	Bluetooth® transmitter measurements
R&S®FS-K72	Modulation and code domain power measurements in line with 3GPP TS 24.141 on base station signals (node B)
R&S®FS-K73	Modulation and code domain power measurements in line with 3GPP TS 25.121 on mobile station signals (UE), including HSUPA
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 line with CDMA2000®/3GPP2/1xEV-DV on base station signals (also for measurements on IS-95/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 in line with 1xEV-DO on base station signals, including Rev. A
R&S®FS-K85	Modulation and code domain power measurements in line with CDMA2000®/1xEV-DO on mobile station signals (UE)

# Innovative solutions ...

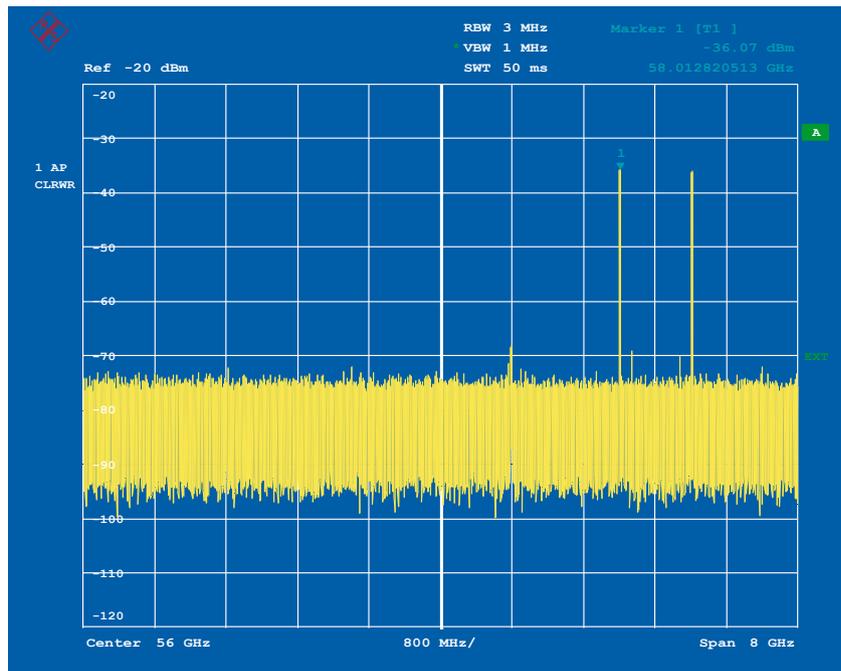
## Expansion of the frequency range to 110 GHz and above

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.

- ◆ Easy-to-use software preselector that identifies and suppresses unwanted signals arising from image frequency response or reception with a harmonic number other than the one set
- ◆ Supports two- 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
- ◆ Maximum harmonic number that can be selected:  $n = 66$  (or 1.022 THz)
- ◆ High LO frequency range, allowing low harmonic numbers to be used; fewer unwanted products are created and the phase noise remains lower



*The software preselector suppresses image frequency response and unwanted spurious reception as can be seen by comparing the two figures.*

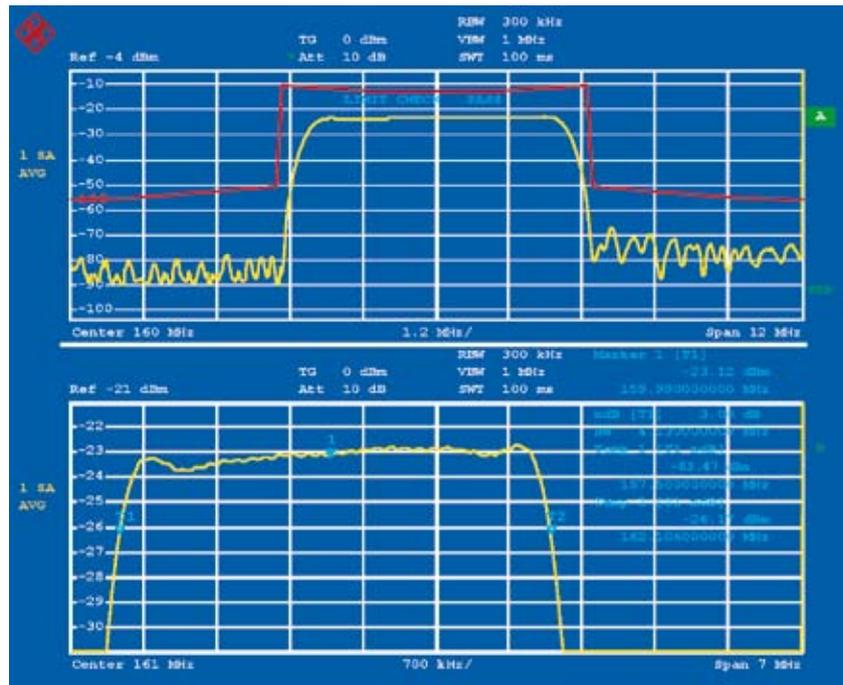


## ... through customized options

### 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 analyzers 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  $\pm 150$  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.



This solution covers the functions of the internal tracking generator:

- ◆ Normalization with interpolation including for reflection measurements with open and short
- ◆ Automatic bandwidth measurement via the "n dB down" function
- ◆ Tolerance characteristics with PASS/FAIL evaluation

# We make your production more profitable

## 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 at 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

## Downtime and repair time cut to a minimum

### No limited lifetime of mechanical attenuators due to high throughput

The optional R&S®FSU-B25 electronic attenuator with 25 dB setting range does away with any mechanical switching – so the R&S®FSU's high accuracy is maintained without any early failure. A two-year calibration cycle minimizes downtime for instrument calibration.

### Spurious emission measurements without notch filter

The R&S®FSU is the ideal choice for this type of measurement, even for tests on GSM base stations. The extremely low phase noise and high 1 dB compression point of the R&S®FSU enable direct measurements without the use of extra automatic or manually tuned notch filters. This eliminates possible sources of error and makes measurements simpler and more reliable. It also enhances the reliability of your test system.

### Existing programs for the R&S®FSE, R&S®FSIQ or R&S®FSP can be used on the R&S®FSU

The R&S®FSU complies with SCPI conventions and is IEC/IEEE-bus-compatible with respect to the R&S®FSE and R&S®FSIQ. These instruments can in most cases be directly replaced with only minor, if any, changes to the software. If changes have to be made, they affect only those program parts that concern the speed-optimized measurement routines of the R&S®FSU.

### External frequency standards

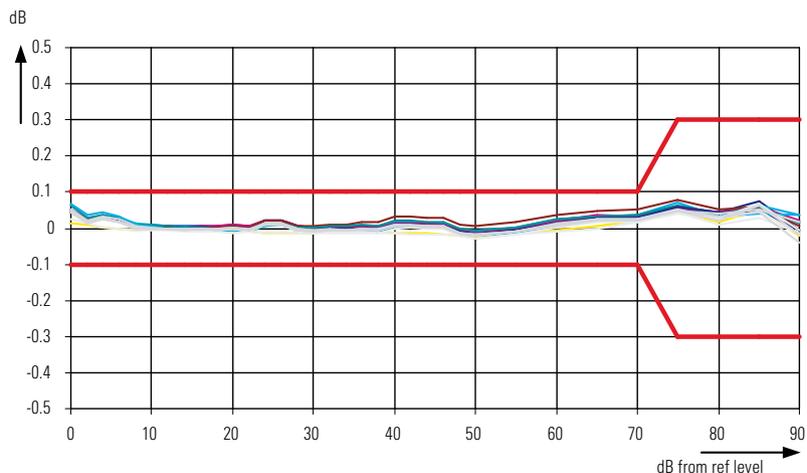
The R&S®FSU accepts signals between 1 MHz and 20 MHz in steps of 1 Hz.

### Higher production yield

Enhanced measurement accuracy makes for higher production yield. The safety margins that usually compensate for the measurement uncertainty of test systems can be reduced, thus increasing the accept (passed) region. Given the same spread of results, more products will pass the test. The R&S®FSU helps you to boost your production yield due to a total measurement uncertainty of <0.3 dB ( $2\sigma$ ).

## LAN interface

With the aid of a LAN interface, the R&S®FSU can be connected to common networks such as 100BaseT 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®FSU can be remote-controlled via a LAN. This yields a clear speed advantage over the IEC/IEEE bus in particular for the transmission of large data blocks.



Display linearity at  $\leq 100$  kHz resolution bandwidth (measured on 30 instruments).

# We make your production more profitable

## 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 is provided as standard with an IEC/IEEE bus command set that is compatible not only with the R&S®FSEx/R&S®FSIQ family but also with the spectrum analyzers of the 859x/8566 series.

It was of utmost importance to achieve maximum compatibility in order to minimize the effort required to change from one to the other:

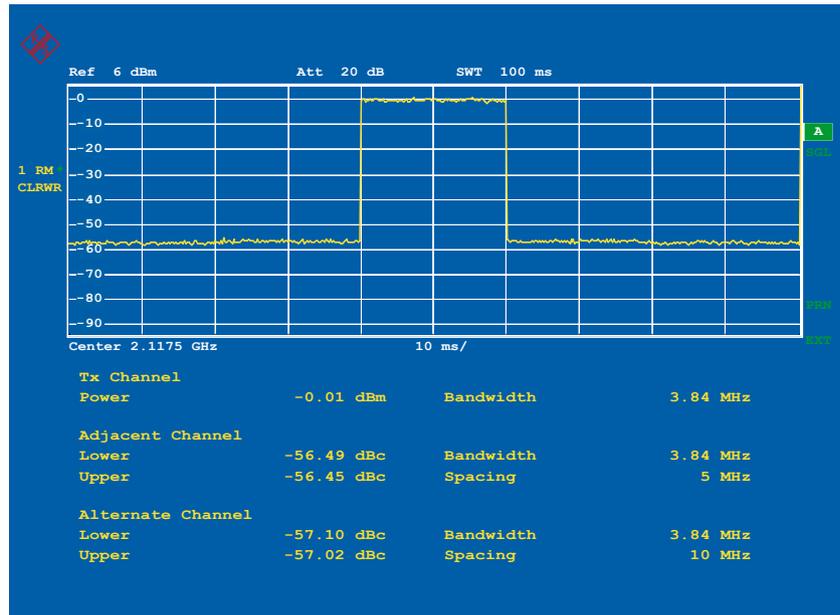
- ◆ Approx. 175 commands in IEEE 488.2 format (incl. CF, AT, ST)
- ◆ The most important commands in IEEE 488.1 format (8566A, for exclusive use only)
- ◆ Selectable presets
- ◆ Selectable trace format

The IEC/IEEE bus commands in IEEE 488.2 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.

	Sweeps/s Span 10 MHz, sweep time 2.5 ms	Sweeps/s Span 0 Hz, sweep time 100 µs
Binary IEEE 754 format	50	70

### Measurement speed on GPIB interface.

Settings: display off, default coupling, single trace, 625 points.



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

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.

**Input command**

```
SENSE:LIST:POW
100MHz,-0dBm,10dB,10dB,NORM,1MHz,3MHz,434us,0,
200MHz,-20dBm,10dB,0dB,NORM,30kHz,100kHz,1ms,0,
300MHz,-20dBm,10dB,0dB,NORM,30kHz,100kHz,1ms,0;
```



**Output R&S®FSU**

```
-28.3,
-30.6,
-38.1
```

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

# Profit from the advantages of networking

## Versatile documentation and networking capabilities

The Windows XP operating system coupled with a wide variety of interfaces makes it easy to insert measurement results into documentation. Simply save the screen contents as a BMP or WMF file and import the file into your word processing system. To process trace data, save it as an ASCII file (CSV format), which not only documents trace data but also the main instrument settings.

## Make use of the advantages offered by networking

The standard LAN interface opens up versatile networking capabilities:

- ◆ Link to standard network (Ethernet 10/100BaseT)
- ◆ Running under Windows XP, the R&S®FSU can be configured for network operation. Applications such as data output to a central network printer or saving results on a central server can easily be implemented. The R&S®FSU can thus be optimally matched to any work environment
- ◆ You can import screen contents directly into Microsoft Word or, by using a Microsoft Excel macro, into your documentation programs and thus immediately create data sheets for your products or documents for quality assurance

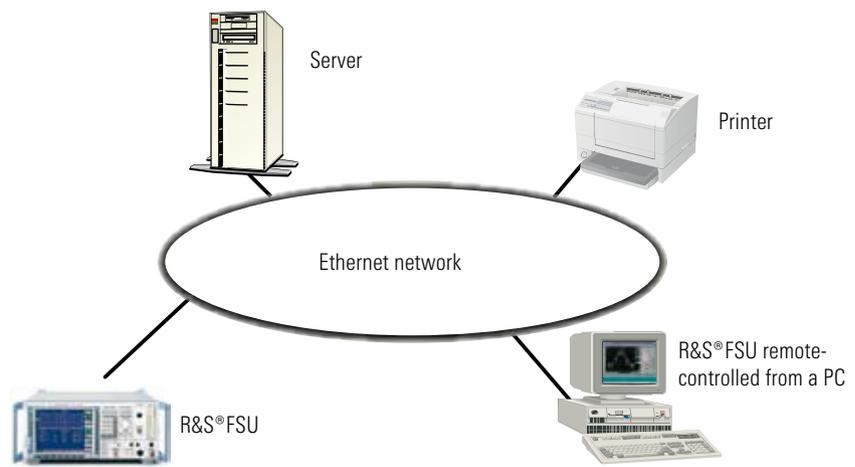
The standard USB host interface allows functions such as the following:

- ◆ Quick firmware update from a USB memory stick or a USB CD-ROM drive
- ◆ Connection of PC peripheral devices (mouse, keyboard)
- ◆ Simple file transfer, including large volumes of data via a USB memory stick

Remote control by Ethernet is even simpler:

- ◆ Allows mouse operation of the R&S®FSU after assigning it a TCP/IP address. All elements of the R&S®FSU screen are represented by a soft front panel function; the Windows XP remote desktop function is used to transmit the complete R&S®FSU screen to the remote PC

- ◆ The R&S®FSL, R&S®FSP, R&S®FSU and R&S®FSQ families from Rohde & Schwarz were the world's first spectrum analyzers to be officially certified as compliant with LXI class C. LXI (LAN eXtension for Instrumentation) is the successor of GPIB. The LXI test system architecture based on tried-and-tested standards such as Ethernet and Web technologies enables fast and cost-effective development of test systems



**Networked operation of the R&S®FSU.**



**Remote control of the R&S®FSU.**

## Ordering information

Designation	Type	Order No.
Spectrum Analyzer, 20 Hz to 3.6 GHz	R&S®FSU3	1166.1660.03
Spectrum Analyzer, 20 Hz to 8 GHz	R&S®FSU8	1166.1660.08
Spectrum Analyzer, 20 Hz to 26.5 GHz	R&S®FSU26	1166.1660.26
Spectrum Analyzer, 20 Hz to 43 GHz	R&S®FSU43	1166.1660.43
Spectrum Analyzer, 20 Hz to 46 GHz	R&S®FSU46	1166.1660.46
Spectrum Analyzer, 20 Hz to 50 GHz	R&S®FSU50	1166.1660.50

## Options

Designation	Type	Order No.
<b>Options</b>		
Low-Aging OXCO	R&S®FSU-B4	1144.9000.02
Tracking Generator, 100 kHz to 3.6 GHz	R&S®FSU-B9	1142.8994.02
External Generator Control	R&S®FSP-B10	1129.7246.02
Attenuator for Tracking Generator	R&S®FSU-B12	1142.9349.02
Removable Hard Disk	R&S®FSU-B18 <sup>1)2)</sup>	1145.0242.04
Second Hard Disk for R&S®FSU-B18	R&S®FSU-B19 <sup>2)</sup>	1145.0394.04
Extended Environmental Specification	R&S®FSU-B20 <sup>1)3)</sup>	1155.1606.08
LO/IF Ports for External Mixers	R&S®FSU-B21	1157.1090.02
RF Preamp, 3.6 GHz to 26 GHz, for R&S®FSU26	R&S®FSU-B23 <sup>1)4)5)</sup>	1157.0907.02
Electronic Attenuator, 0 dB to 30 dB, and 20 dB preamplifier	R&S®FSU-B25	1144.9298.02
Broadband FM Demodulator Output	R&S®FSU-B27	1157.2000.02
Vector Signal Analyzer	R&S®FSU-B73 <sup>1)</sup>	1169.5696.03
Vector Signal Analyzer for retrofitting XP units	R&S®FSU-U73	1169.5696.04
<b>Software</b>		
GSM/EDGE Application Firmware	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
Application Firmware for Noise Figure and Gain Measurements	R&S®FS-K30	1300.6508.02
Application Firmware for Phase Noise Measurement	R&S®FS-K40	1161.8138.02
3GPP BTS/Node B FDD Application Firmware	R&S®FS-K72	1154.7000.02
3GPP UE FDD Application Firmware	R&S®FS-K73	1154.7252.02
3GPP HSDPA BTS Application Firmware	R&S®FS-K74	1300.7156.02
3GPP TD-SCDMA BTS Application Firmware	R&S®FS-K76	1300.7291.02
3GPP TD-SCDMA MS Application Firmware	R&S®FS-K77	1300.8100.02
CDMA2000®/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	R&S®FS-K84	1157.2851.02
CDMA2000®/1xEV-DO UE-FDD Application Firmware	R&S®FS-K85	1300.6689.02
Service Kit	R&S®FSU-Z1	1145.0042.02

<sup>1)</sup> Factory installation only.

<sup>2)</sup> Not with R&S®FSU-B20.

<sup>3)</sup> Not with R&S®FSU-B18/-B19.

<sup>4)</sup> Not for retrofit.

<sup>5)</sup> R&S®FSU-B25 required.



For specifications, see PD 0758.0016.22  
and [www.rohde-schwarz.com](http://www.rohde-schwarz.com)  
(search term: FSU)



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