Signal Analyzer FSIG

Analysis of GSM, IS-136, cdmaOne and W-CDMA signals

- Spectrum analysis with ultra-wide dynamic range for sophisticated ACPR measurements NF = 16 dB/TOI = +18 dBm (FSIG 3)
- Integrated vector signal analyzer for analysis of GSM, EDGE, IS-136, cdmaOne, W-CDMA/3GPP signals
- Code domain power measurements on cdmaOne signals (forward channel)
- High-speed synthesizer with 5 ms sweep time for FULL SPAN (FSIG 3)
- 75 dB ACPR for W-CDMA
- 82 dB ACPR in alternate channel for W-CDMA
- True RMS detector for precise and repeatable measurements of any signal type

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FSIG – signal analyzer for the 3rd mobile radio generation

Features in brief

- 2 models and frequency ranges
  FSIG 3: 9 kHz to 3.5 GHz
  FSIG13: 9 kHz to 13 GHz
- Resolution bandwidth 1 kHz to 10 MHz in 1/2/3/5 steps
- 5-pole resolution filters with high selectivity
- Displayed average noise floor typ. –130 dBm in 1 kHz bandwidth
- Third-order intercept +18 dBm with FSIG 3, +22 dBm with FSIG13
- Phase noise –150 dBc(1 Hz) at 5 MHz offset
- 75 dB ACPR dynamic range for W-CDMA (4.096 MHz integration BW)
- Total level uncertainty
  <1 dB up to 2.2 GHz,
  <1.5 dB up to 7 GHz
- RMS detector for high-precision power measurements irrespective of waveform
- Fast spectrum analysis with 5 ms sweep time for full span (FSIG3)
- Fast time domain analysis with 1 µs zero span sweep time
- Integrated broadband vector signal analyzer for GSM, EDGE, IS-136, cdmaOne, W-CDMA and 3GPP signals with versatile result display: I and Q signal, magnitude and phase, vector and constellation diagrams, tabular output with numerical values of modulation errors and demodulated bit sequence

FSIG – the one box solution in signal analysis

FSIG provides in a single unit comprehensive and easy-to-use measurement functions in the

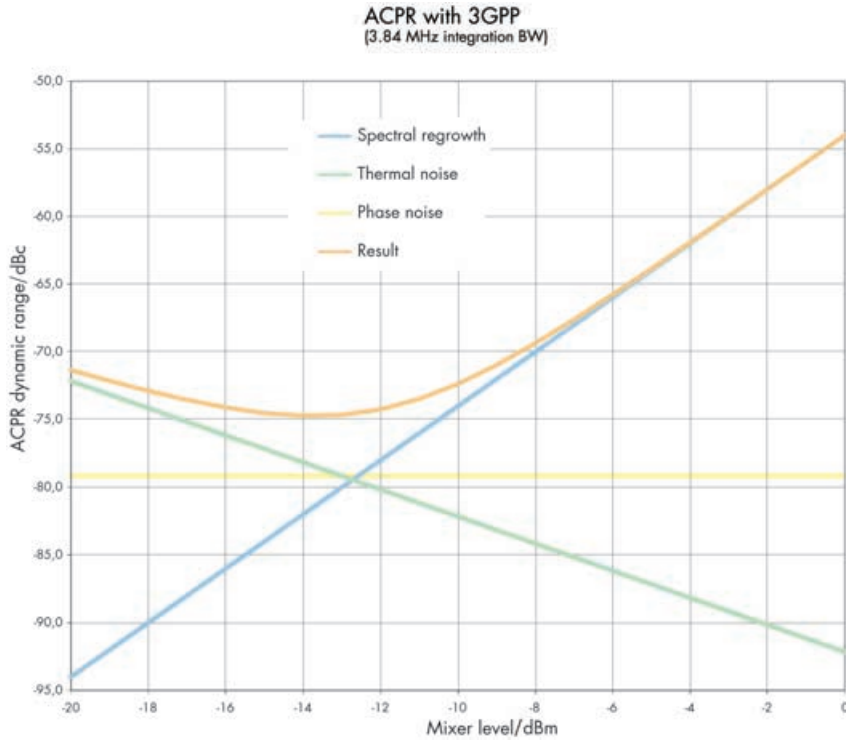
- frequency domain
- time domain
- modulation domain
- code domain
  (cdmaOne forward channel)

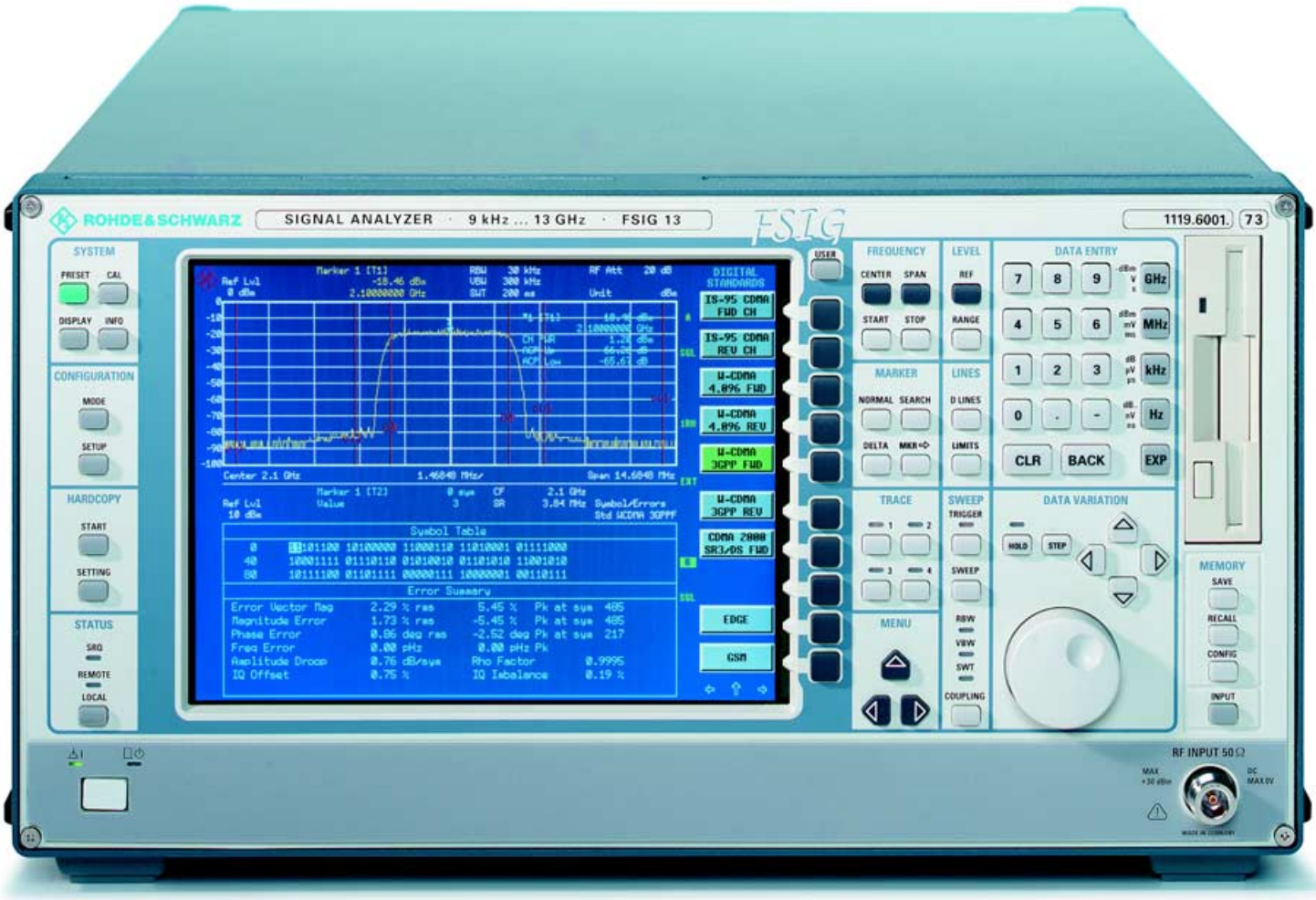
Frequency domain

In the frequency domain, FSIG measures intermodulation and harmonics with great accuracy. The high 3rd-order intercept point in conjunction with the extremely low noise floor yields a wide intermodulation-free dynamic range and ensures reliable performance of even sophisticated measurements like spurious measurements. The maximum input frequency of 13 GHz (FSIG 13) allows even out-of-band spurious measurements.

The excellent dynamic range and low phase noise make the FSIG an ideal tool for ACPR (Adjacent Channel Power Ratio) measurements on cdmaOne, W-CDMA and IS-136.

The maximum ACPR value for 3GPP in 3.84 MHz bandwidth is 75 dB and is already attained at
–14 dBm input level.





The RMS detector available for all bandwidths up to 10 MHz is the ideal tool for precise power measurements whatever the waveform. Channel power and adjacent-channel power can accurately be measured and displayed irrespective of any signal statistics. Measurement challenges like repeatability of power measurement of modulated signals (eg CDMA) can thus be eliminated.

Time domain

In the time domain, FSIG features all modern capabilities of burst analysis in TDMA systems; gate functions, trigger delay and integrated RF trigger in conjunction with a short sweep time of 1 µs ensure precise measurement of the timing characteristics of mobile radio systems.

Thanks to the wide range of bandwidths available up to 10 MHz the effect of the measuring instrument becomes negligible, in particular in the case of measurements on broadband systems.

Various marker functions in conjunction with editable gated sweeps allow RMS, average and peak power measurements to be carried out over any selectable time slot.

Modulation domain

In the modulation domain, the integrated vector signal analyzer provides diverse measurements on GSM, EDGE, IS-136, cdmaOne, W-CDMA/3GPP signals. These convenient presettings make it superfluous for the user to spend valuable time in looking up specifications and go towards enhancing the measurement reliability.

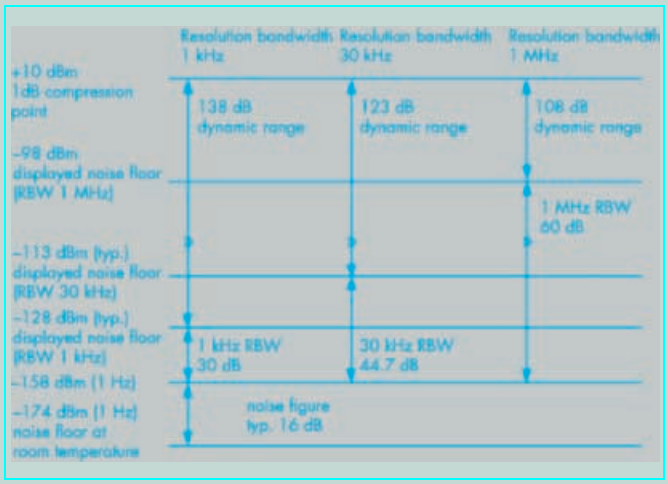
Display of the results caters to practically each and every need: in addition to vector and constellation diagrams, I/Q signal and eye/trellis diagrams, tables with modulation errors including the demodulated bit sequence are particularly useful. EVM (error vector magnitude), phase and frequency error, waveform factor and I/Q offset are output as numeric values, with RMS and peak value being shown separately.

Code Domain Power

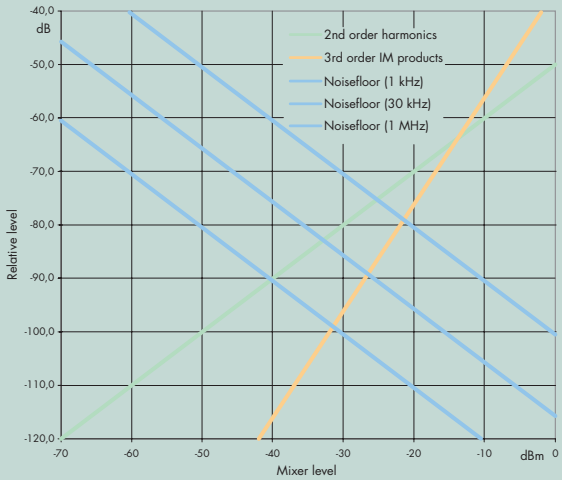
An optional application firmware FSIQ-K71allows power measurement in the 64 Walsh code channels of a cdmaOne signal (forward channel). The results can be output numerically or displayed as a bargraph.

In the graphic display, transmission interference such as crosstalk between the code channels can be easily identified.

FSIG – signal analyzer for the 3rd mobile radio generation



Dynamic range, noise, and 1 dB compression point of Signal Analyzer FSIG3



Typ. dynamic range, noise, 3rd-order intercept point of Signal Analyzer FSIG 3

High measurement speed for use in production

- The minimum sweep time for FULL SPAN is 5 ms (FSIG 3)
  The sweep is synthesizer-controlled for all frequency settings, thus providing high frequency accuracy of the displayed spectra
- The shortest sweep time in ZERO SPAN mode is 100 ns/div and ideal for high-resolution time measurements on burst edges
- High throughput on GPIB interface saves time and costs in production

Versatile test routines – convenient measurements

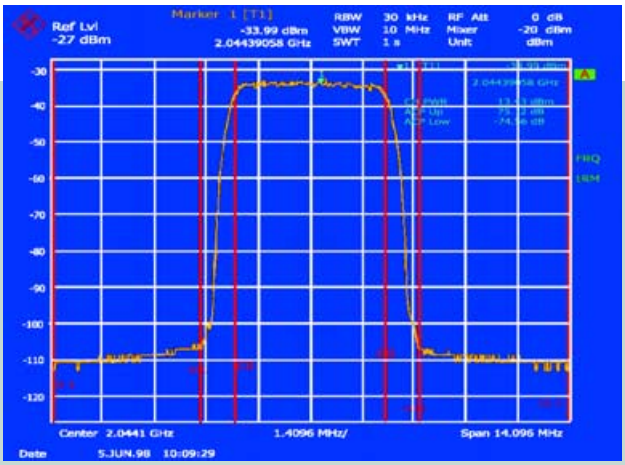
FSIG excels in its wide variety of sophisticated test routines and evaluation tools which considerably enhance measurement reliability and speed:

- Automatic measurement of channel power, adjacent-channel power ratio (ACPR) and occupied bandwidth with free choice of channel bandwidths and detector to be used. For the ACPR measurement the availability of an RMS detector is of vital importance especially with modern W-CDMA systems
- Marker functions for direct measurement of:
  – phase noise
  – C/N, C/N_0
  – PEAK/NEXT PEAK (LEFT/RIGHT)/MIN/NEXT MIN, etc
  – bandwidth and shape factor
- Frequency counter with selectable resolution
- Up to four simultaneously active traces
- Split screen with independent measurement windows: time domain analysis/frequency analysis, frequency analysis/modulation analysis, etc
- Level, frequency and threshold lines as well as user-definable limit lines with pass/fail check
- Comprehensive documentation of results with hardcopy output on a wide variety of printers or as WMF or BMP files
- Remote control and data transfer via GPIB and Ethernet interface (optional)

Applications

Analysis of cdmaOne and W-CDMA signals

1



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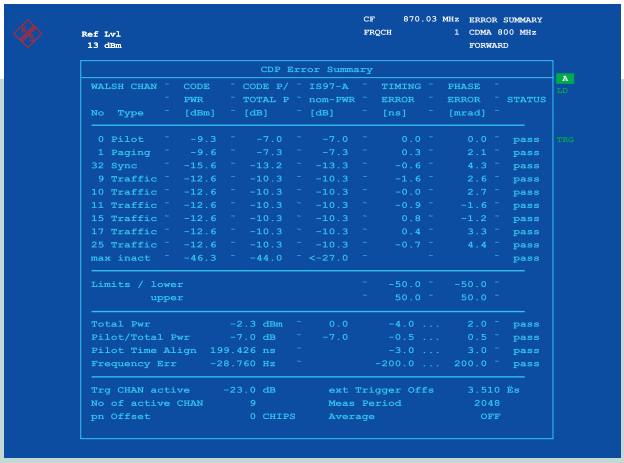

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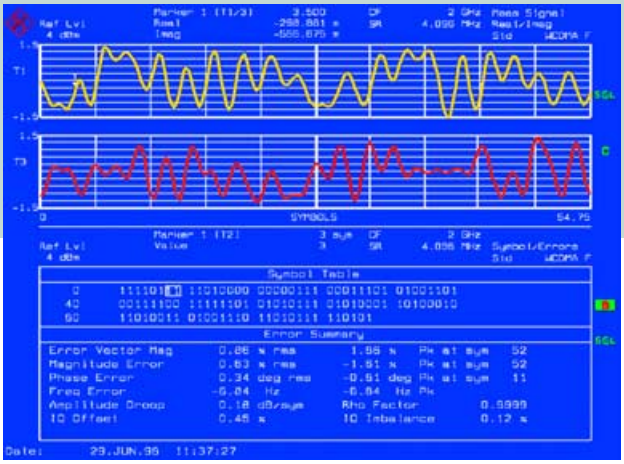

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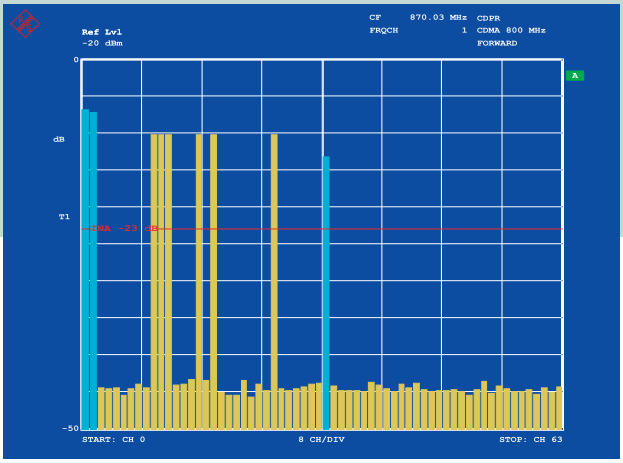


W-CDMA

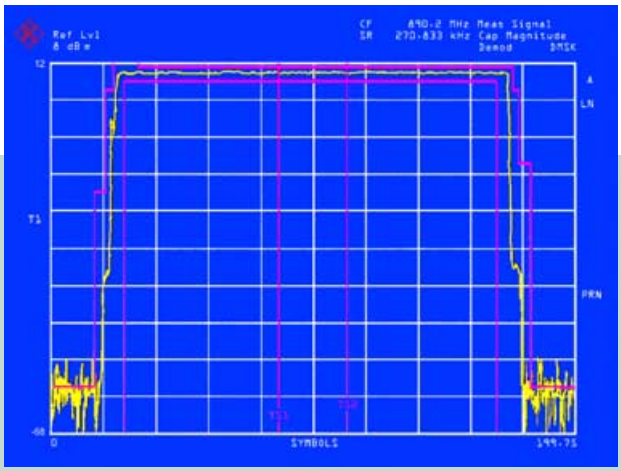
Modern broadband communication systems like the UMTS systems place extremely stringent requirements on the spectral purity of all components. Phase noise, intermodulation and spurious suppression all play a role in the measurement of ACPR (adjacent-channel power ratio). The most stringent requirements are normally placed on the component characteristics. FSIG is the ideal choice for this measurement; without any additional facility such as preselection it is able to attain an ACPR value of 75 dB at the optimum mixer level and power integration over eg 3.84 MHz (1). This excellent value is already attained at a mixer level of –14 dBm which means an additional benefit in component testing.

The integrated vector signal analyzer provides high-accuracy offline demodulation of eg 3GPP signals so that signal distortion caused by the device under test can quickly and reliably be measured. The I and Q signal characteristics can precisely be measured with the aid of the marker functions (2 above). The numeric error table (2 below) shows all main modulation errors such as EVM or I/Q offset, with the demodulated bit sequence being displayed in addition. Coupled marker functions allow the I/Q signals to be allocated to the demodulated dibits (2).

cdmaOne (IS-95)

In addition to spectral measurements such as ACPR or detection of spurious emissions, FSIG with built-in vector signal analyzer also provides demodulation of cdmaOne signals of base and mobile stations. Parameters such as waveform quality, EVM or I/Q offset can thus be determined simply.

Application Firmware FSIQ-K71 allows Walsh code channels of cdmaOne signals in the forward channel (base station) to be characterized in line with TIA IS-95/97 standard. In addition to measurement of time offset and phase errors relative to the pilot signal as well as synchronization, this firmware provides simultaneous measurement of the code domain power of 64 code channels. Results are displayed in tabular form (9 code channels, see Fig. 3) or as a bargraph (64 code channels, see Fig. 4).



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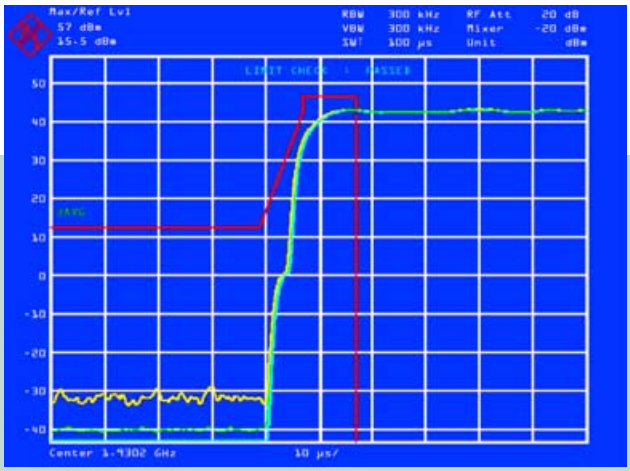

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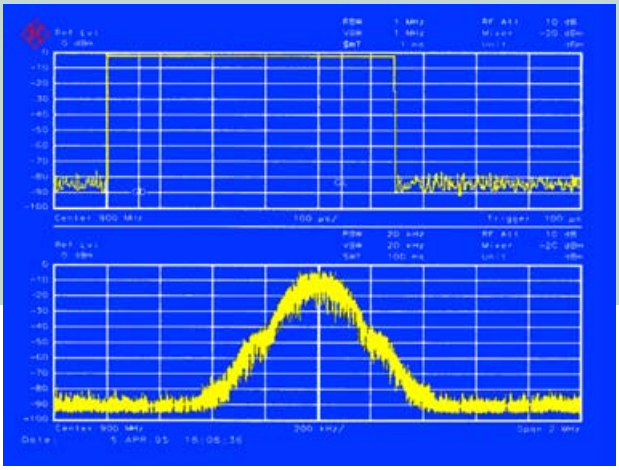

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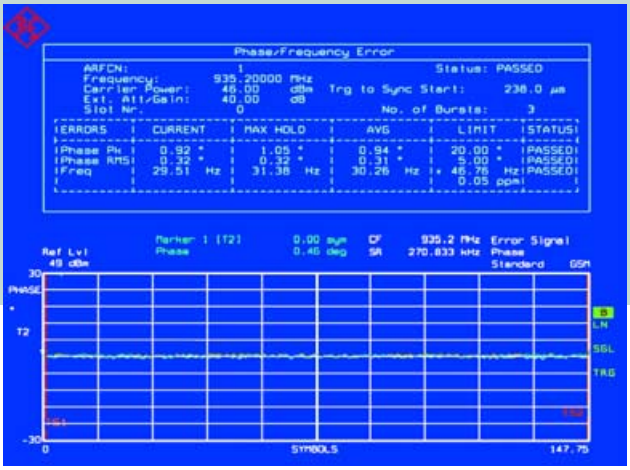

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Power ramp measurement (3)
To perform power ramp measurements (power time template) on TDMA systems such as GSM, EDGE or IS-136 in line with standards, reference must be made to synchronization sequences in order to establish a precise time reference (5). FSIG supports this task with a wide variety of already programmed as well as user-editable bit sequences.

GATED SWEEP (4)
The GATED SWEEP function in the frequency range is indispensable for the analysis of TDMA systems. The modulation spectrum (6) of burst signals can be measured without any interference being caused by switching the RF carrier on and off. Imbalance of the modulator under test or spurious emissions can quickly and reliably be determined.

Fast and simple measurement in line with GSM specifications
The optional application firmware packages FSE-K10 and FSE-K11 serve for complex transmitter measurements on GSM mobile phones and base stations fully compliant with standard specifications at the push of a button. They satisfy all requirements and settings for GSM900, GSM1800 (Phase I or Phase II), GSM1900, E-GSM or R-GSM.

The built-in vector signal analyzer allows correct synchronization in power vs time measurements (7) as well as measurement of phase and frequency errors (8).

In the frequency domain, the spectrum due to modulation or spectrum due to switching as well as spurious emissions can be measured using the gating sweep function – with FSIG13 in the complete frequency range up to 12.75 GHz.

Designation	Type	Use	Functions
Application Firmware	FSE-K10[1], Mobile, FSE-K11, BTS	Mobile radio, transmitter measurements to GSM standards 11.10 and 11.20	•Power versus Time measurement •Spectrum due to modulation and due to switching •Spurious emissions radiated and conducted •Carrier power measurement •Phase/frequency error
Application Firmware	FSIQ-K71[1]	Characterization of Walsh code channels to TIA IS-95/97 (forward channel)	•Code domain power measurements •Measurement of time and phase offsets relative to pilot signal •Measurement of pilot time alignment error •Dedicated menue for measurements on cdmaOne (IS-95) signals providing easy access to all measurement functions

[1] see separately available datasheets FSIQ-K71 PD 757.5572, FSE-K10 PD 757.3592

Quality and environment management at Rohde&Schwarz

Lasting customer satisfaction is our primary objective. The quality management system of Rohde&Schwarz meets the requirements of ISO 9001 and encompasses virtually all fields of activity of the company.

Certified Quality System
ISO 9001
DQS REG. NO 1954-04

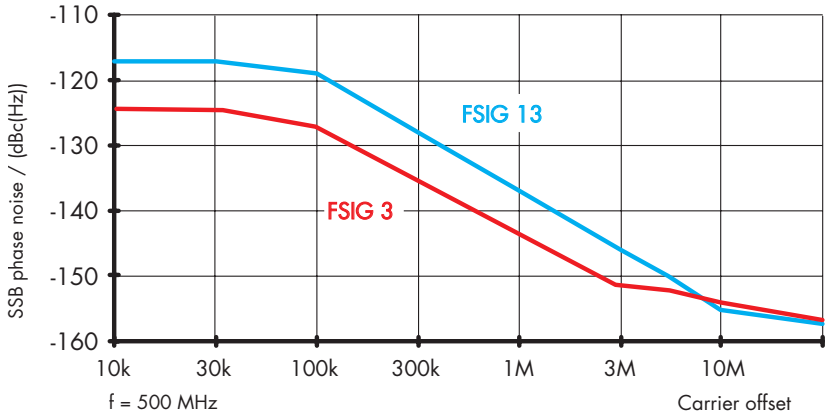
Certified Environmental System
ISO 14001
REG. NO 1954-03

Rear view of FSIG

Specifications

	FSIG 3	FSIG 13
Specifications are guaranteed under the following conditions: 30 minutes warmup 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" apply to design parameters and are not tested.		
Frequency		
Frequency range	9 kHz to 3.5 GHz	9 kHz to 13 GHz
Frequency resolution	0.01 Hz	
Reference frequency, internal nominal		
Aging per year[1)]	$1x10^{-6}$	
Temperature drift (0°C to 50°C)	$1x10^{-6}$	
Total error limit (per year)	$2.5x10^{-6}$	
External reference frequency	10 MHz or n x 1 MHz, n = 1 to 16	
Frequency display	with marker or frequency counter	
Marker resolution	0.1 Hz to 10 kHz (dependent on span)	
Error limit (sweep time >3 x auto sweep time)	±(marker frequency x reference error + 0.5% x span + 10% x resolution bandwidth + ½ (last digit))	
Frequency counter resolution	0.1 Hz to 10 kHz (selectable)	
Count accuracy (S/N >25 dB)	±(frequency x reference error + ½ (last digit))	
Display range for frequency axis	0 Hz, 10 Hz to 3.5 GHz	0 Hz, 10 Hz to 13 GHz
Resolution/error limit of display range	0.1 Hz/1%	
Spectral purity (dBc(1Hz)) SSB phase noise, f ≤500 MHz, for carrier offset >1 MHz see diagram below		
Carrier offset 100 Hz (nominal)	–87	–81
1 kHz (nominal)	–107	–100
10 kHz (nominal)	–120	–114
100 kHz [2)]	<–119	<–113
1 MHz [2)]	<–138	<–132
Sweep		
Display range 0 Hz	1 µs to 2500 s in 5% steps	
Display range ≥10 Hz	5 ms to 16000 s in steps ≤10 %	
Error	<1%	
Sampling rate	50 ns (20 MHz A/D converter)	
Number of pixels (x axis)	500	
Time measurement	with marker and cursor lines (resolution 50 ns)	
Resolution bandwidths with spectrum display **Analog filter**		
3 dB bandwidths	1 kHz to 10 MHz in 1/2/3/5 steps	
Bandwidth error limits		
≤3 MHz	<10%	
5 MHz	<15%	
10 MHz	+25%, –10%	
Shape factor 60:3 dB		
1 kHz to 2 MHz	<12	
>2 MHz	<7	
Video bandwidths	1 Hz to 10 MHz in 1/2/3/5 steps	

Typ. phase noise for FSIG 3 and FSIG 13



Specifications

	FSIG3	FSIG13
Level		
Display range	noise floor displayed to 30 dBm	
Maximum input level		
RF attenuation 0 dB		
DC voltage	0 V	
CW RF power	20 dBm (= 100 mW)	
Pulse spectral density	97 dBµV/MHz	
RF attenuation ≥10 dB		
DC voltage	0 V	
CW RF power	30 dBm (= 1 W)	
Max. pulse voltage	150 V	
Max. pulse energy (10 µs)	1 mWs	0.5 mWs
1 dB compression of input mixer (0 dB RF attenuation)	+10 dBm nominal	
Intermodulation		
3rd-order intermodulation Intermodulation-free dynamic range, level 2 x −30 dBm, Δf >5 x RBW or 10 kHz, whichever is the greater value	>84 dBc for f >100 MHz (TOI >12 dBm, typ. 18 dBm)	>94 dBc for f >150 MHz (TOI >17 dBm, typ. 22 dBm) >80 dBc for f >7 GHz (TOI >10 dBm)
Second harmonic intercept point (SHI)	>25 dBm, typ. >40 dBm for f <50 MHz >45 dBm, typ. >50 dBm for f >50 MHz	>25 dBm, typ. >35 dBm for f <50 MHz >40 dBm, typ. >45 dBm for f >50 MHz
Displayed average noise level (DANL) (0 dB RF attenuation, RBW 1 kHz, VBW 1 Hz, 20 averages, trace average, span 0 Hz, termination 50 Ω)		
Frequency		
10 kHz	<−70 dBm	<−64 dBm
100 kHz	<−90 dBm	<−84 dBm
1 MHz	<−110 dBm	<−104 dBm
10 MHz to 6 GHz	<−125 dBm, typ. −130 dBm	<−118 dBm, typ. −120 dBm
6 GHz to 7 GHz	–	<−115 dBm, typ. −118 dBm
7 GHz to 13 GHz	–	<−118 dBm, typ. −120 dBm
Maximum dynamic range 1 dB compression to DANL (RBW 1 kHz)	135 dB	130 dB
Immunity to interference		
Image frequency	>80 dB, typ. >90 dB	
Intermediate frequency	>100 dB	>75 dB
Spurious response (f >1 MHz, without input signal, 0 dB attenuation)		
Span <30 MHz	<−110 dBm	
Span ≥30 MHz	<−100 dBm	
f_{in} = 25.175 MHz, 25.060 MHz	<−100 dBm	
f_{in} = 60 MHz, 5.7172 GHz	–	<−100 dBm
Other interfering signals (mixer level <10 dBm)	<−80 dB	<−75 dB
Level display (spectrum mode)		
Screen	500 x 400 pixel (one diagram), max. 2 diagrams with independent settings	
Log level axis	10 dB to 200 dB, in steps of 10 dB	
Linear level axis	10% of reference level per level division, 10 divisions or logarithmic scaling	
Trace	max. 4, with two diagrams on screen, max. 2 per diagram	
Trace detector	Max Peak, Min Peak, Auto Peak (Normal), Sample, RMS, Average	
Trace functions	Clear/Write, Max Hold, Min Hold, Average	
Setting range of reference level		
Logarithmic level display	–130 dBm to +30 dBm, in steps of 0.1 dB	
Linear level display	7.0 nV to 7.07 V, in steps of 1%	
Units of level axis	dBm, dBµV, dBmV, dBpW (log level display); V, A, W dBµA (linear level display)	
Level measurement error limits level –40 dBm, RF attenuation 20 dB, ref. level –15 dB, RBW 5 kHz	**The values are guaranteed for bandwidths from 1 kHz to 30 kHz and 100 kHz to 10 MHz**	
Absolute error limit at 120 MHz	<0.3 dB	
Freqency response (10 dB RF attenuator)		
<2.2 GHz	<0.5 dB	
2.2 GHz to 3.5/7 GHz	<1 dB	
7 GHz to 13 GHz	–	<2 dB [3)]
Attenuator switching error limit	<0.3 dB	
Error limit of reference level setting	<0.2 dB, typ. 0.1 dB	

Specifications

	FSIG3	FSIG13
Display non linearity		
Log level display		
0 dB to –50 dB	<0.3 dB	
–50 dB to –70 dB	<0.5 dB	
–70 dB to –95 dB	<1 dB	
Linear level display	5% of reference level	
Bandwidth switching error limit		
1 kHz to 30 kHz/ 100 kHz to 500 kHz	<0.2 dB	
1 MHz to 10 MHz	<0.3 dB	
Total measurement uncertainty		
(0 dB to –50 dB, span/RBW <100) 95 % confidence level		
<2.2 GHz	<1 dB	
2.2 GHz to 3.5/7 GHz	< 1.5 dB	
7 GHz to 13 GHz	–	< 2.5 dB [3]
Measurement of digital modulation signals		
Selectable standards	W-CDMA, 3GPP, cdmaOne (IS-95) Forward/Reverse, GSM, EDGE, IS-136 (NADC)	
Filtering		
W-CDMA, 3GPP	root raised cosine, $\alpha = 0.22$	
cdmaOne (IS-95)	specific to IS-95 forward and reverse channel	
GSM	–	
EDGE	90 kHz root raised cosine (specific to EDGE standard)	
IS-136 (NADC)	root raised cosine, $\alpha = 0.35$	
Measurements		
	I and Q signals (filtered, synchronized to frequency and symbol clock) I and Q reference signals (calculated from demodulated bits) I and Q error (magnitude and phase), error vector bit stream/modulation error (symbols demodulated at ideal decision points and table of modulation errors)	
Display modes		
	constellation diagram, vector diagram in-phase and/or quadrature signal phase and magnitude (level) eye diagram, trellis diagram error vector magnitude (EVM) in %, magnitude error, phase/frequency error, in-phase and quadrature error signals	
Numerical modulation error readout (*rms and peak value)	error vector magnitude*, magnitude error*, phase error*, frequency error, I/Q offset, I/Q imbalance, amplitude droop, ρ factor	
Samples/symbol		
W-CDMA, 3GPP, cdmaOne (IS-95)	1, 2, 4	
GSM, EDGE, IS-136 (NADC)	1, 2, 4, 8, 16	
Memory depth		
cdmaOne (IS-95) Forward /Reverse	600 symbols	
W-CDMA, 3GPP, GSM, EDGE, IS-136 (NADC)	1600 symbols	
Level measurements with digital demodulation		
Peak power range	–60 dBm to +30 dBm	
Absolute level error limit		
Mean power (0 dB to 10 dB below reference level)		
f ≤2.2 GHz	<1 dB	
2.2 GHz to 3.5/7 GHz	<1.5 dB	
7 GHz to 13 GHz	–	<2.5 dB [3]
Relative level error limit		
Mean power, level 0 dB to 10 dB below reference level	0.2 dB	
10 dB to 50 dB below reference level	(0.0325/dB – 0.125) dB	
Dynamic range for burst measurement		
(mean power, ref. level ≥10 dBm, peak power = ref. level +1 dB, low noise mode, points/ symbol ≤4, nominal values)	W-CDMA/3GPP 60 dB GSM 74 dB NADC 78 dB	
Time reference (nominal)		
without clock synchronization		
GSM	<1/(2 x symbol rate x points/symbol)	
EDGE, IS-136 (NADC), W-CDMA, 3GPP, cdmaOne (IS-95)	<1/(2 x symbol rate)	
with clock synchronization	<0.001 x 1/(symbol rate)	

Specifications

	FSIG3	FSIG13
Residual error in modulation measurements	(data valid for level from reference level to reference level – 6 dB, S/N >60 dB, number of demodulated symbols >100, averaging ≥10, analog bandwidth >10 x symbol rate, input frequency >15 x symbol rate, local suppression at 0 Hz input frequecy adjusted), symbol rate (1+α) ≤ 8 MHz	
Errors with modulation standards		
GSM, DCS1800, PCS1900	phase error ≤ 0.5° rms, typ. <1.5° peak	
NADC	EVM ≤ 0.5% rms, typ. <1.5% peak	
cdmaOne (IS-95), forward/reverse channel	ρ factor ≥ 0.9995	
W-CDMA/3GPP	EVM ≤ 1.8% rms, typ. < 5% peak	
Trigger functions		
Trigger		
Span ≥10 Hz	free run, line, video, RF level, external	
Span = 0 Hz	plus pretrigger, posttrigger, trigger delay	
with digital demodulation	plus burst trigger and synchronization to bit sequence (max. 32 symbols)	
with analog demodulation	plus trigger to demodulated AF	
Delayed sweep		
Trigger source	free run, line, video, external	
Delay time	100 ns to 10 s, resolution min. 1 µs or 1% of delay time	
Error of delay time	±(1 µs + (0.05% x delay time))	
Delayed sweep time	2 µs to 1000 s	
Gated sweep		
Trigger source	external, RF level	
Gate delay	1 µs to 100 s	
Gate length	1 µs to 100 s, reolution min. 1 µs or 1% of gate length	
Error of gate length	±(1 µs + (0.05% x gate length))	
Gap sweep (span = 0 Hz)		
Trigger source	free run, line, video, RF level, external	
Pretrigger	1 µs to 100 s, resolution 50 ns, dependent on sweep time	
Trigger to gap time	1 µs to 100 s, resolution 50 ns, dependent on sweep time	
Gap length	1 µs to 100 s, resolution 50 ns	
Inputs & outputs (front panel)		
RF input	N female, 50 Ω	N female, 50 Ω
VSWR (RF attenuation ≥10 dB)		
f <3.5 GHz	<1.5	
f <7 GHz	–	<2.0
f <13 GHz	–	<3
Attenuator	0 dB to 70 dB, selectable in 10 dB steps	
Inputs & outputs (rear panel)		
IF 21.4 MHz	Z_{out} = 50 Ω, BNC female, bandwidth >1 kHz or resolution bandwidth	
Level	0 dBm at reference level, mixer level >–60 dBm	
Video output	Z_{out} = 50 Ω, BNC female	
Voltage (RBW ≥1 kHz)	0 to 1 V, full scale (open-circuit voltage); log scaling	
Reference frequency		
Output, usable as input	BNC female	
Output frequency	10 MHz	
Level	10 dBm nominal	
Input	1 MHz to 16 MHz, integer MHz	
Required level	>0 dBm from 50 Ω	
Other data		
Sweep output	BNC female, 0 V to +10 V, proportional to displayed frequency	
Power supply connector for noise source	BNC female, 0 V and 28 V, switched	
External trigger/gate input	BNC female, >10 kΩ	
Voltage	–5 V to +5 V, adjustable	
IEC/IEEE bus remote control	interface to IEC 625-2 (IEEE 488.2)	
Command set	SCPI 1994.0	
Connector	24-pin Amphenol female	
Interface functions	SH1, AH1, T6, L4, SR1, RL1, PP1, DC1, DT1, C11	
Serial interface	RS-232-C (COM1 and COM2), 9-pin female connectors	
Mouse interface	PS/2 compatible	
Printer interface	parallel (Centronics compatible) or serial (RS-232-C)	
Keyboard connector	5-pin DIN female for MF2 keyboard	
User interface	25-pin Canon female	

Specifications

	FSIG 3	FSIG 13
Connector for external monitor (VGA)	15-pin female	
General data		
Display	24 cm colour diplay TFT (9.5")	
Resolution	640 x 480 pixels (VGA resolution)	
Mass memory	1.44 Mbyte 3½" floppy disk drive, hard disk	
Operating temperature range		
Nominal temperature range	+5°C to +40°C	
Limit temperature range	0°C to +50°C	
Storge temperature range	–40°C to +70°C	
Humidity	+40°C at 95% relative humidity (IEC 68-2-3)	
Mechanical stress		
Sinusoidal vibration	5 Hz to 150 Hz, max. 2 g at 55 Hz; 0.5 g from 55 Hz to 150 Hz; to IEC 68-2-6, IEC 68-2-3, IEC 1010-1, MIL-T-28800D, class 5	
Random vibration	10 Hz to 300 Hz, acceleration 1.2 g_{rms}	
Shock	40 g shock spectrum, to MIL-STD-810D and MIL-T-28800D, classes 3 and 5	
Recommended calibration interval	1 year (2 years for operation with external reference)	
RFI suppression	to EMC directive of EU (89/336/EEC) and German EMC legislation	
Power supply		
AC supply	200 V to 240 V: 50 Hz to 60 Hz, 100 V to 120 V: 50 Hz to 400 Hz, protection class I to VDE 411	
Power consumption	195 VA	245 VA
Safety	to EN 61010-1, UL 3111-1, CDA C22.2 No. 1010-1, IEC 1010-1	
Test mark	VDE, GS, UL, cUL	
Dimensions in mm (W x H x D)	435 x 236 x 460	435 x 236 x 570
Weight	24 kg	26.5 kg

1) After 30 days of operation
2) Valid for span >100 kHz
3) For frequencies >7 GHz: error after calling peaking function. For sweep times <10 ms/GHz: additional error 1.5 dB

Specifications of options

Option	
1 dB input attenuator FSE-B13	
Frequency range	0 to 7 GHz (stop frequency ≤7 GHz)
Setting range RF attenuation	0 dB to 70 dB
Step width	1 dB
Additional attenuation error limit	<0.1 dB
Increased level accuracy FSE-B22	
Total level error limit	≤0.5 dB with 10 dB RF attenuation ≤0.6 dB with 20/30/40 dB RF attenuation
Specifications are valid for:	
Temperature range	20 °C to 30 °C
Frequency range	10 MHz to 2 GHz
Resolution bandwidths	5 kHz to 30 kHz/300kHz/1MHz
Signal level	10 dB to 50 dB below reference level
Stop frequency	≤2 GHz
Sweep time	≥3 x auto sweep time

Ordering information

Order designation	**Type**	**Order No.**
Signal Analyzer 9 kHz to 3.5 GHz	FSIG 3	1119.5005.63
Signal Analyzer 9 kHz to 13 GHz	FSIG 13	1119.6001.73
Accessories supplied		
Keyboard, mouse, power cable, operating manual, spare fuses		

Options

Hardware		
1-dB attenuator	FSE-B13	1119.6499.02
Ethernet Interface 15-contact AUI connector	FSE-B16	1073.5973.02
Thin-wire BNC connector	FSE-B16	1073.5973.03
RJ45 twisted pair	FSE-B16	1073.5973.04
2nd IEC/IEEE Bus Interface	FSE-B17	1066.4017.02
Increased level accuracy up to 2 GHz	FSE-B22 [3]	1106.3480.02
DSP and IQ memory extension 2x 512 k	FSIQ-B70	1119.6747.02
Software		
GSM Application Firmware, Mobile [1]	FSE-K10	1057.3092.02
GSM Application Firmware, BTS [1]	FSE-K11	1057.3392.02
IS-95 Application Firmware, BTS [1] [2]	FSIQ-K71	1126.4498.02

[1] extra data sheet available
[2] FSIQ-K71 requires FSIQ-B70
[3] cannot be retrofitted, factory fitted only

Recommended extras

Description	Type	Order number
Service Kit	FSE-Z1	1066.3862.02
DC Block, 5 MHz to 7 GHz, N-connector	FSE-Z3	4010.3895.00
DC Block 10 kHz to 18 GHz, N-connector	FSE-Z4	1084.7443.02
IEC/IEEE Bus Cable, 1 m	PCK	0292.2013.10
IEC/IEEE Bus Cable, 2 m	PCK	0292.2013.20
19" Rack Adapter with front handles	ZZA-95	0396.4911.00
High-Power Attenuators, 100 W		
3/6/10/20/30 dB	RBU 100	1073.8820.XX (XX = 03/06/10/20/ 30)
High-Power Attenuators, 50 W		
3/6/10/20/30 dB	RBU 50	1073.8895.XX (XX = 03/06/10/20/ 30)

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ROHDE&SCHWARZ

ROHDE&SCHWARZ GmbH & Co. KG · Muehldorfstraße 15 · 81671 Munich Germany · P.O.B. 801469 · 81614 Munich Germany ·
Telephone +4989 4129-0 www.rohde-schwarz.com · CustomerSupport: Tel. +491805124242 · Fax +4989 4129-3777 ·
E-mail: CustomerSupport@rohde-schwarz.com