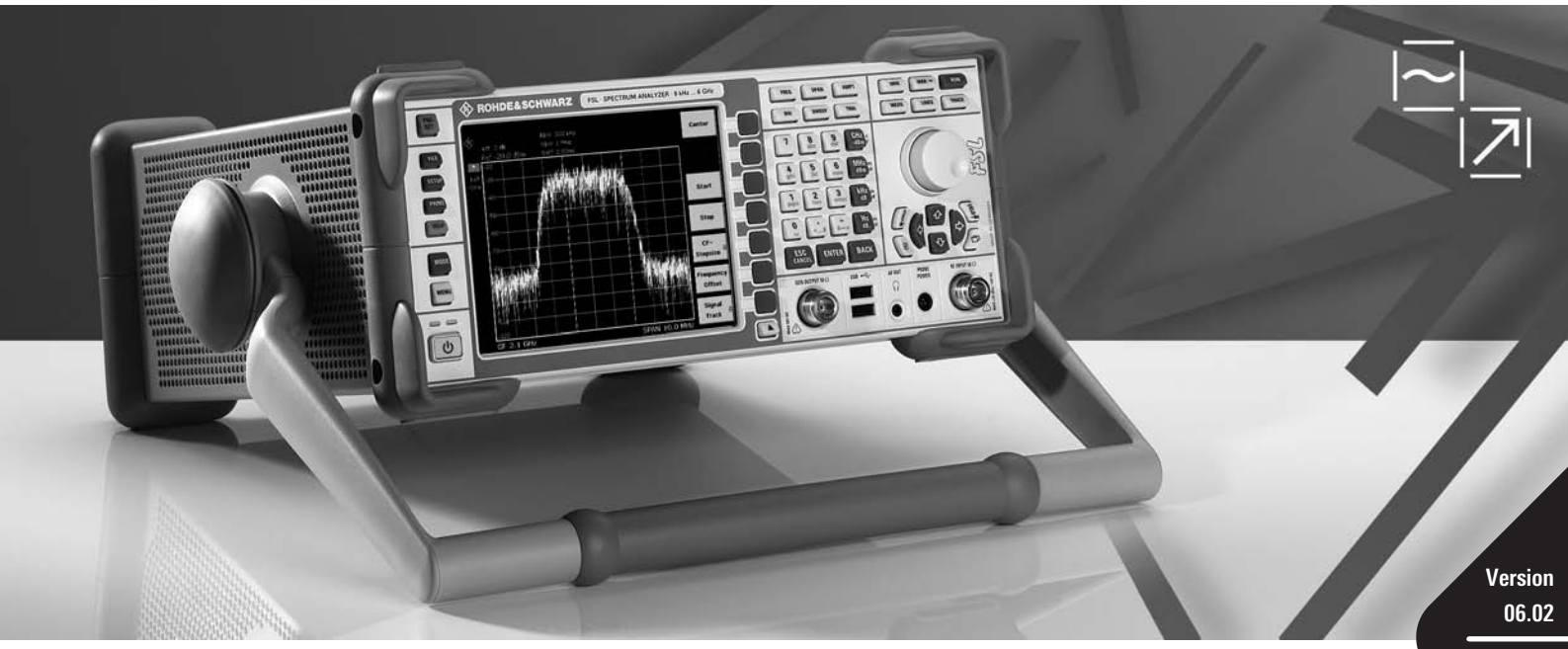

Version
06.02

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R&S®FSL Spectrum Analyzer

Data Sheet

ROHDE&SCHWARZ

CONTENTS

Specifications apply under the following conditions:
15 minutes warm-up time at ambient temperature, specified environmental conditions met, calibration cycle adhered to.
Data without tolerances: typical values only. Data designated 'nominal' applies to design parameters and is not tested.

Frequency

Frequency range	R&S®FSL3	9 kHz to 3 GHz
	R&S®FSL6	9 kHz to 6 GHz
	R&S®FSL18	9 kHz to 18 GHz (overrange 20 GHz)
Frequency resolution		1 Hz

Reference frequency, internal, nominal		
Aging per year		1×10^{-6}
Temperature drift	0 °C to +50 °C	1×10^{-6}

Reference frequency, internal, nominal	R&S®FSL-B4 OCXO reference frequency option, standard in R&S®FSL18	
Aging per year		1×10^{-7}
Temperature drift	0 °C to +50 °C	1×10^{-7}

Frequency readout		
Marker resolution		1 Hz
Uncertainty		±(marker frequency × reference uncertainty + 10 % × resolution bandwidth + ½ (span / (sweep points -1)) + 1Hz)
Marker tuning frequency stepsize	default marker stepsize = sweep points	span / 500 span / (sweep points – 1)
Frequency counter resolution		1 Hz
Count uncertainty	S/N > 25 dB	±(frequency × reference uncertainty + ½ (last digit))
Frequency span		0 Hz, 10 Hz to 3/6/20 GHz
Span uncertainty		3 %

Spectral purity SSB phase noise		f = 500 MHz
Carrier offset	1 kHz	typ. –95 dBc (1 Hz)
	10 kHz	<–98 dBc (1 Hz), typ. –103 dBc (1 Hz)
	100 kHz	<–98 dBc (1 Hz), typ. –105 dBc (1 Hz)
	1 MHz	<–115 dBc (1 Hz), typ. –120 dBc (1 Hz)

Sweep time

Sweep time	span = 0 Hz	1 µs to 5 µs in 125 ns steps 5 µs to 16000 s in 5 % steps
	10 Hz ≤ span ≤ 3.2 kHz	2.5 ms to 5 s/Hz × span
	3.2 kHz < span ≤ 1.5 GHz	2.5 ms to 16000 s
	1.5 GHz < span ≤ 3 GHz	5 ms to 16000 s
	span > 3 GHz	10 ms to 16000 s
Uncertainty	span = 0 Hz	nominal 0.1 %
	span ≥ 10 Hz	nominal 3 %

Resolution bandwidths

Sweep filters		
Resolution bandwidths		300 Hz to 10 MHz (–3 dB) in 1/3 sequence
	with R&S®FSL-B7 option	10 Hz to 10 MHz (–3 dB) in 1/3 sequence
	zero span	20 MHz (–3 dB) additionally
Resolution bandwidth uncertainty		nominal <3 %
Resolution filter shape factor 60 dB : 3 dB		nominal <5 (Gaussian type filters)

EMI filters		
6 dB bandwidths		9 kHz, 120 kHz, 1MHz
	with R&S®FSL-B7 option	200 Hz, 9 kHz, 120 kHz, 1MHz
Bandwidth uncertainty		nominal <3 %
Shape factor 60 dB : 3 dB		nominal <6

FFT filters		
3 dB bandwidths		300 Hz to 30 kHz in 1/3 sequence
	with R&S®FSL-B7 option	1 Hz to 30 kHz in 1/3 sequence
Bandwidth uncertainty		nominal 5 %
Shape factor 60 dB : 3 dB		nominal 2.5

Channel filters		
Bandwidths	300; 500 Hz; 1; 1.5; 2; 2.4; 2.7; 3; 3.4; 4; 4.5; 5; 6; 8.5; 9 kHz 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; 1.28 (RRC); 1.5; 2; 3;3.84 (RRC); 4.096 (RRC); 5 MHz (RRC = root raised cosine)	
	R&S®FSL-B7 option	100 Hz, 200 Hz additionally

Video bandwidths	(1-pole lowpass RC filters)	1 Hz to 10 MHz in 1/3 sequence
Demodulation bandwidth	R&S®FSL3/6	nominal 20 MHz
	R&S®FSL18	nominal 28 MHz

Level

Display range		displayed noise floor to +20 dBm

Maximum rated input level R&S®FSL3 and R&S®FSL6		
DC voltage		50 V
CW RF power		30 dBm (= 1 W)
Peak RF power		36 dBm (= 4 W) <3 s
Max. pulse voltage		150 V
Max. pulse energy	pulse width 10 µs	10 mWs

Maximum rated input level R&S®FSL18 with RF attenuation ≥ 10 dB		
DC voltage		50 V
CW RF power		30 dBm (= 1 W)
Peak RF power		36 dBm (= 4 W) <3 s
Max. pulse voltage		100 V
Max. pulse energy	pulse width 10 µs	2 mWs

Maximum rated input level R&S®FSL18 with RF attenuation < 10 dB		
DC voltage		30 V
CW RF power		20 dBm (= 100 mW)
Peak RF power		26 dBm (= 400 mW)
Max. pulse voltage		30 V
Max. pulse energy	pulse width 10 µs	0.2 mWs

Intermodulation R&S®FSL3 and R&S®FSL6		
Third-order intermodulation	intermodulation-free dynamic range, level 2 × –20 dBm, reference level –10 dBm	
	f_{in} < 30 MHz	>54 dBc (TOI +7 dBm, typ. +12 dBm)
	f_{in} ≥ 30 MHz	>60 dBc (TOI +10 dBm, typ +18 dBm)
Second harmonic intercept (SHI)	f_{in} = 20 MHz to 3 GHz	nominal +35 dBm
1 dB compression of input mixer	0 dB RF attenuation, f > 200 MHz	nominal +5 dBm

Intermodulation R&S®FSL18		
Third-order intermodulation	intermodulation-free dynamic range, level 2 × –20 dBm, reference level –10 dBm	
	f_{in} < 50 MHz	>54 dBc (TOI +7 dBm, typ. +10 dBm)
	50 MHz ≤ f_{in} ≤ 6 GHz	>60 dBc (TOI +10 dBm, typ +13 dBm)
	f_{in} > 6 GHz	nominal 60 dBc (TOI +10 dBm)
Second harmonic intercept (SHI)	f_{in} = 20 MHz to 9 GHz	nominal +35 dBm
1 dB compression of input mixer	0 dB RF attenuation, f > 200 MHz	nominal +5 dBm

Displayed average noise level R&S®FSL3 and R&S®FSL6		
	0 dB RF attenuation, termination 50 Ω, RBW = 1 kHz, VBW = 1 Hz, sample detector, log scaling, tracking generator OFF, normalized to 1 Hz	
	frequency	preamplifier = OFF
	9 kHz to 1 MHz	<–100 dBm (1 Hz)
	1 MHz to 10 MHz	<–115 dBm (1 Hz)
	10 MHz to 50 MHz	<–130 dBm (1 Hz)
	50 MHz to 3 GHz	<–140 dBm (1 Hz)
	3 GHz to 5 GHz	<–136 dBm (1 Hz)
	5 GHz to 6 GHz	<–130 dBm (1 Hz)
	frequency	preamplifier = ON
	9 kHz to 1 MHz	<–115 dBm (1 Hz)
	1 MHz to 10 MHz	<–130 dBm (1 Hz)
	10 MHz to 50 MHz	<–145 dBm (1 Hz)
	50 MHz to 3 GHz	<–152 dBm (1 Hz)
	3 GHz to 5 GHz	<–146 dBm (1 Hz)
	5 GHz to 6 GHz	<–140 dBm (1 Hz)
	frequency	preamplifier = ON, typical values
	500 MHz	–162 dBm (1 Hz)
	1 GHz	–160 dBm (1 Hz)
	3 GHz	–158 dBm (1 Hz)
	6 GHz	–147 dBm (1 Hz)

Displayed average noise level R&S®FSL18		
	0 dB RF attenuation, termination 50 Ω, RBW = 1 kHz, VBW = 1 Hz, sample detector, log scaling, tracking generator OFF, normalized to 1 Hz	
	frequency	preamplifier = OFF
	9 kHz to 1 MHz	<–100 dBm (1 Hz)
	1 MHz to 10 MHz	<–115 dBm (1 Hz)
	10 MHz to 50 MHz	<–130 dBm (1 Hz)
	50 MHz to 3 GHz	<–140 dBm (1 Hz)
	3 GHz to 12 GHz	<–136 dBm (1 Hz)
	12 GHz to 18 GHz	<–130 dBm (1 Hz)
	18 GHz to 20 GHz	<–123 dBm (1 Hz)
	frequency	preamplifier = ON
	9 kHz to 1 MHz	<–115 dBm (1 Hz)
	1 MHz to 10 MHz	<–130 dBm (1 Hz)
	10 MHz to 50 MHz	<–145 dBm (1 Hz)
	50 MHz to 3 GHz	<–152 dBm (1 Hz)
	3 GHz to 5 GHz	<–149 dBm (1 Hz)
	5 GHz to 6 GHz	<–145 dBm (1 Hz)
	frequency	preamplifier = ON, typical values
	500 MHz	<–162 dBm (1 Hz)
	1 GHz	<–161 dBm (1 Hz)
	3 GHz	<–158 dBm (1 Hz)
	6 GHz	<–152 dBm (1 Hz)

Immunity to interference		
Image frequency	f_{in} – 2 × 48.375 MHz	<–80 dBc, typ. –90 dBc
	f_{in} – 2 × 838.375 MHz	<–80 dBc, typ. –90 dBc
	f_{in} – 2 × 7158.375 MHz	typ. –60 dBc
Intermediate frequency	48.375 MHz, 838.375 MHz, 7158.375 MHz	<–60 dBc, typ. –80 dBc
Spurious response, inherent	f > 30 MHz, without input signal, RF attenuation = 0 dB, RBW ≤ 10 kHz	<–90 dBm
Spurious response	related to local oscillators	
	f ≤ 6 GHz	
	Δf <100 kHz	typ. –60 dBc
	Δf ≥100 kHz	<–60 dBc
	f > 6 GHz	
	Δf <100 kHz	typ. –48 dBc
	Δf ≥100 kHz	<–48 dBc
	f = receive frequency	
Spurious response	related to A/D conversion	typ. <–70 dBc
Spurious response	related to subharmonic of first LO (spur at 7158.375 MHz – 2 × f_{in})	typ. –60 dBc
Spurious response at mixer level <–10 dBm	related to harmonic of first LO (spur at f_{in} – 3579.1875 MHz)	typ. –60 dBc

Level display		
Logarithmic level axis		10 dB to 100 dB
Linear level axis		0 % to 100 %/10 divisions
Number of traces		4
Trace detectors		max peak, min peak, auto peak, sample, RMS, quasi peak, average
Number of measurement points	default value	501
	range	125 to 32001 in steps of about a factor of 2
Trace functions		clear/write, max hold, average, min hold, view
Setting range of reference level	logarithmic level display	–80 dBm to 20 dBm in steps of 2 dB, 5 dB or 10 dB
	linear level display	–80 dBm to 20 dBm, 0 % to 100 %
Units of level axis	logarithmic level display	dBm, dBmV, dBµV, dBµA, dBpW
	linear level display	µV, mV, V, µA, mA, A, pW, nW, µW, mW, W

Level measurement uncertainty		
	95 % confidence level, +20 °C to +30 °C, S/N > 16 dB, 0 dB to –50 dB from reference level	
	10 MHz < f ≤ 3 GHz	<0.5 dB
	3 GHz < f ≤ 6 GHz	<0.8 dB
	6 GHz < f ≤ 18 GHz	<1.2 dB
Absolute uncertainty at 65.83 MHz		<0.3 dB
Frequency response (+20 °C to +30 °C)	9 kHz ≤ f = 30 kHz	nominal 1.5 dB
	30 kHz ≤ f ≤ 3 GHz	<0.5 dB, typ. 0.3 dB
	3 GHz < f ≤ 6 GHz	<0.8 dB, typ. 0.3 dB
	6 GHz < f ≤ 18 GHz	<1.2 dB, typ. 0.6 dB
	f >18 GHz	nominal 2 dB
Attenuator uncertainty		<0.3 dB
Uncertainty of reference level setting		nominal <0.1 dB

Display nonlinearity		
Logarithmic level display	S/N > 16 dB 0 dB to –50 dB	<0.2 dB
Bandwidth switching uncertainty	reference: RBW = 10 kHz	nominal <0.1 dB

Trigger functions

Trigger		
Trigger source		free run, video, external, IF power
External trigger level		TTL level

I/Q data

Interface		LAN
	R&S®FSL-B10	LAN or GPIB
Memory length		max. 512 ksample I and Q
Sample rate		10 kHz to 65.8 MHz
Signal bandwidth R&S®FSL3/6	sample rate 65.8 MHz	nominal 20 MHz
Signal bandwidth R&S®FSL18	sample rate 65.8 MHz	nominal 28 MHz

Inputs and outputs

RF input R&S®FSL3 and R&S®FSL6		
Impedance		50 Ω
Connector		N female
VSWR	RF attenuation ≥ 10 dB	
	10 MHz ≤ f ≤ 1 GHz	nominal 1.2
	1 GHz < f ≤ 6 GHz	nominal 1.5
Input attenuator		0 dB to 30 dB in 5 dB steps

RF input R&S®FSL18		
Impedance		50 Ω
Connector		N female
VSWR	RF attenuation ≥ 10 dB	
	10 MHz ≤ f ≤ 8 GHz	nominal 1.2
	8 GHz < f ≤ 16 GHz	nominal 1.5
	f > 16 GHz	nominal 2
Input attenuator		0 dB to 40 dB in 5 dB steps

AF output		
Connector		3.5 mm mini jack
Output impedance		<100 Ω
Open-circuit voltage		up to 1.5 V, adjustable

Tracking generator only R&S®FSL3 and R&S®FSL6		
Tracking generator	models .13 and .16 only	N female, 50 Ω
Output level		–20 dBm to 0 dBm in 1 dB steps
Frequency range		1 MHz to 3 GHz/6 GHz
Dynamic range	RF attenuation = 0 dB, source power 0 dBm	
	10 MHz to 2 GHz	nominal 80 dB
	2 GHz to f_{max}	nominal 60 dB
Reverse power		
DC voltage		50 V
CW RF power		30 dBm (= 1 W)
Max. pulse voltage		150 V
Max. pulse energy (10 µs)		10 mWs

External reference		
Connector		BNC female, 50 Ω
Input level		0 dBm to +10 dBm
Output level	with R&S®FSL-B4	typ. 0 dBm
Frequency		10 MHz ±5 ppm

External trigger/gate input		
Connector		BNC female, 50 Ω
Input level		TTL compatible

Probe power		
		+15 V DC, –12.6 V DC and ground, max. 150 mA, nominal

External monitor		
Connector	R&S®FSL18 only	DVI-D

General specifications

Remote control		
LAN interface		10/100BaseT, RJ-45
IEC/IEEE bus (GPIB)	R&S®FSL-B10	SCPI 1997.0

Display		
Resolution		640 × 480 pixels
Pixel failure rate		$<2 \times 10^{-5}$

Mass memory		
Mass memory		flash disk (internal), USB memory stick (not supplied)
Data storage		>500 instrument settings and traces

Temperature		
	Operating temperature range	+0 °C to +50 °C
	Permissible temperature range	+0 °C to +55 °C
	Storage temperature range	–40 °C to +70 °C
Climatic loading		+25 °C/+40 °C at 85 % relative humidity (IEC 60068-2-30)

Mechanical resistance		
Vibration	sinusoidal	IEC 60068-2-6
	random	IEC 60068-2-64
Shock		40 g shock spectrum, in line with MIL-STD-810E, method 516.4 procedure 1, IEC 60068-2-27

Power supply		
Input voltage range, AC, nominal		100 V to 240 V
AC supply frequency		50 Hz to 400 Hz
Input current, AC		0.9 A to 0.3 A
Input voltage range, DC, nominal	R&S®FSL-B30	10 V to 28 V
Input current, DC	R&S®FSL-B30	8.0 A to 2.2 A
Power consumption		typ. 45 W, max. 65 W with all options
Safety		IEC 61010-1, EN 61010-1, UL 61010B-1, CSA C22.2 No. 1010-1
Test mark		VDE, GS, CSA, CSA-NRTL
EMC		in line with European EMC Directive 89/336/EEC and the new EMC Directive 2004/108/EC including: - IEC/EN 61326 class B (emission) - CISPR 11/EN 55011/group 1 Class B (emission) - IEC/EN 61326 Table A.1 (immunity, industrial)
Dimensions (W × H × D)	with handle	408.8 mm × 158.1 mm × 465.3 mm (16.09 in × 6.22 in × 18.32 in)
	without handle	342.3 mm × 158.1 mm × 367.0 mm (13.48 in × 6.22 in × 14.45 in)
Weight	without options	<7 kg (<15.43 lb)
	with battery pack	<8 kg (<17.64 lb)

Recommended calibration interval		1 year
	operation with external reference	2 years

R&S®FSL-B5 additional interfaces

User port		
Connector		9-pin D-Sub male
Output		TTL compatible, 0 V/5 V max. 15 mA
Input		TTL compatible, max. 5 V

Noise source control		
Connector		BNC female
Output		0 V/28 V, max. 100 mA, switchable, supply for noise source

Power sensor		
Connector		6-pin LEMOSA female for supported power sensors R&S®NRP-Zxx

IF/video out		
Connector		BNC female, 50 Ω
IF out		
Bandwidth	R&S®FSL3/6	nominal 10 MHz (–3 dB) nominal 20 MHz (10 dB)
	R&S®FSL18	nominal 28 MHz (–3 dB)
IF frequency	RBW 20 MHz, center frequency >20 MHz, span 0 Hz	17.45833 MHz (nominal) ±2 MHz, dependent on center frequency
Output level (gain versus RF input)	RF attenuation 0 dB, RF preamplifier = OFF, span 0 Hz, RBW 20 MHz	
	center frequency	
	100 MHz	approx. +3 dB
	3 GHz	approx. –1 dB
	6 GHz	approx. –7 dB
Video out		
Bandwidth		equal to VBW setting, max RBW/2
Firmware version ≥1.50		
Output scaling		log scaling with display scale set to log, lin scaling with display scale set to lin
Output level	center frequency >10 MHz, span 0 Hz, signal at reference level and center frequency	
	video 1 V	1 V ±10 % (open circuit) (nominal)
	video 200 mV	200 mV ±10 % (open circuit) (nominal)
Firmware version <1.50		
Output scaling		linear
Output level	center frequency 65.8333 MHz, span 0 Hz, resolution bandwidth 300 kHz, reference level –10 dBm, RF attenuation 0 dB, RF preamplifier = OFF	approx. 170 mV (open circuit),

R&S®FSL-K7 AM/FM/φM measurement demodulator

Measurement of analog modulation signals		
Demodulation bandwidth		100 Hz to 6.4 kHz, binary steps 12.5 kHz to 1.6 MHz, binary steps 3 MHz, 5 MHz, 8 MHz, 10 MHz, 18 MHz
Recording length	maximum	512 ksample
Recording time	demodulation bandwidth	
	100 Hz	3276.8 s
	6.4 kHz	51.2 s
	12.5 kHz	26.6 s
	1.6 MHz	200 ms
	3 MHz	100 ms
	5 MHz	50 ms
	8 MHz	25 ms
	10 MHz	12.5 ms
	18 MHz	12.5 ms
Display	frequency versus time (FM), amplitude versus time (AM), phase versus time (φM), RF power versus time, RF spectrum (FFT), AF spectrum (FFT), table with numeric values for: modulation deviation (peak, RMS), modulation frequency, carrier offset, carrier power (power of unmodulated carrier), THD, SINAD	

AF (modulation frequency)		
Range		≤9 MHz max. 0.5 × demodulation bandwidth
Resolution		5 digits
Measurement uncertainty		0.1 %
AF filters		
Lowpass		3 kHz, 15 kHz, 150 kHz, 5 %, 10 %, 25 % of demodulation bandwidth
Highpass		50 Hz, 300 Hz
Deemphasis		25 µs, 50 µs, 75 µs, 750 µs

AM demodulation		
Measurement range	modulation depth	0 % to 100 %
Modulation depth uncertainty	AF ≤ 1 MHz	<3 % of reading + residual AM
Residual AM	demodulation bandwidth ≤ 200 kHz, RMS, RF ≤ 3 GHz, RF input level ≥ (RF attenuation/dB – 30) dBm	0.2 %
Distortion	10 Hz ≤ AF ≤ 100 kHz	0.3 %
FM rejection	AF ≤ 1 MHz and AF + deviation ≤ 0.5 × demodulation bandwidth	typ. 1 % + residual AM

FM demodulation		
Measurement range	frequency deviation	≤9 MHz
Deviation uncertainty	AF ≤ 1 MHz and AF + deviation ≤ 0.5 × demodulation bandwidth	<3 % of reading + residual FM
Residual FM	demodulation bandwidth ≤ 100 kHz, RMS, RF input level ≥ (RF attenuation/dB –30) dBm	
	RF ≤ 1 GHz	150 Hz
	RF = 3 GHz	200 Hz
Distortion	10 Hz ≤ AF ≤ 100 kHz, deviation < 400 kHz	0.3 %
AM rejection	100 Hz ≤ AF ≤ 1 kHz, modulation depth 50 %	30 Hz

φM demodulation		
AF		≤5 MHz, max. 0.5 × demodulation bandwidth
Measurement range	phase deviation	<1000 rad
Residual φM	demodulation bandwidth ≤ 100 kHz, RMS, RF = 1 GHz, highpass 300 Hz, RF input level ≥ (RF attenuation/dB – 30 dBm)	5 mrad

Carrier power versus time		
Display range		noise floor to +20 dBm
Measurement uncertainty	unmodulated carrier, S/N > 16 dB, RF: 50 kHz to 3 GHz	typ. 1 dB
Maximum dynamic range	demodulation bandwidth 200 kHz	typ. 75 dB
Display linearity	S/N > 16 dB	typ. 0.2 dB

AF spectrum		
Span		≤9 MHz
Resolution bandwidth		1 Hz to 10 MHz

RF spectrum		
Span		≤18 MHz
Resolution bandwidth		1 Hz to 10 MHz
Shape factor	60 dB/3 dB	2.5, nominal

Modulation distortion		
Measurement functions		THD, SINAD
Measurement range		–100 dB to 0 dB
Resolution		0.01 dB
Measurement uncertainty		typ. 0.5 dB
AF frequency range		10 Hz to 5 MHz

Trigger		
Trigger functions		RF level, AM, FM, φM demodulation

R&S®FSL-K8 Bluetooth® TX measurements

The specifications below are based on the data sheet specifications of the R&S®FSL spectrum analyzer and have not been checked separately. Specifications apply under the following conditions: Unless otherwise stated, these specifications are with RF input level +20 dBm to –40 dBm within the Bluetooth® band (ISM) 2400 MHz to 2483.5 MHz and default settings.

Output power		
Measurements		average and peak power in line with Bluetooth® RF test specification 2.0.E.3, 5.1.3
Level range		–40 dBm to + 20 dBm
Level uncertainty		<0.7 dB
Packet type		longest supported (DH1, DH3, DH5)
Payload		PRBS9
Synchronization		RF burst, access code
Trigger		IF power, external, free run

Modulation characteristics		
Measurements		FM deviation in line with Bluetooth® RF test specification 2.0.E.3, 5.1.9 Δf_{1max}, Δf_{2max}, Δf_{1avg}, Δf_{2avg} and $\Delta f_{2avg}/\Delta f_{1avg}$
Deviation range		±250 kHz
Deviation uncertainty	signal level >–25 dBm, 10 averages	<6 kHz
Packet type		all supported (DH1, DH3, DH5)
Payload		10101010 and 11110000, auto detect
Synchronization		access code
Trigger		IF power, external, free run

Initial carrier frequency tolerance (ICFT)		
Measurements		ICFT in line with Bluetooth® RF test specification 2.0.E.3, 5.1.10
Measurement range		±250 kHz
Measurement uncertainty	signal level >–30 dBm	<3 kHz + carrier frequency × reference error
Packet type		DH1 and all supported (DH1, DH3, DH5)
Payload		PRBS9
Synchronization		access code
Trigger		IF power, external, free run

Carrier frequency drift		
Measurements		carrier frequency drift in line with Bluetooth® RF test specification 2.0.E.3, 5.1.11 drift/packet and drift/50 µs
Measurement range		±250 kHz
Uncertainty	signal level >–30 dBm	<5 kHz
Packet type		all supported (DH1, DH3, DH5)
Payload		10101010
Synchronization		access code
Trigger		IF power, external, free run

Adjacent channel power (ACP)		
Measurements		adjacent channel power in line with Bluetooth® RF test specification 2.0.E.3, 5.1.8
Level range		max. +20 dBm
Packet type		DH1
Payload		PRBS9
Synchronization		none
Trigger		external, free run

EDR relative TX power		
Measurements		GFSK and DPSK power in line with Bluetooth® RF test specification 2.0.E.3, 5.1.12
Measurement range		–40 dBm to +20 dBm
Level uncertainty		<0.7 dB
Packet type		2-DHx, 3-DHx, 2-EVx, 3-EVx
Payload		PRBS9
Synchronization		GFSK access code and DPSK synchronization sequence
Trigger		IF power, external, free run

EDR frequency stability		
Measurements		frequency error initial (ω_i), per block (ω_0) and total ($\omega_i + \omega_0$) in line with Bluetooth® RF test specification 2.0.E.3, 5.1.13
Measurement range		±250 kHz
Uncertainty	frequency error initial, signal level >–25 dBm	<1 kHz + carrier frequency × reference error
	frequency error per block, signal level >–25 dBm	<1 kHz
Packet type		2-DHx, 3-DHx, 2-EVx, 3-EVx
Payload		PRBS9
Synchronization		
Trigger		IF power, external, free run

EDR modulation accuracy		
Measurements		RMS, peak and 99 % DEVM in line with Bluetooth® RF test specification 2.0.E.3, 5.1.13
Uncertainty	RMS, signal level >–25 dBm	<3 %
	peak, signal level >–25 dBm	<8 %
Packet type		2-DHx, 3-DHx, 2-EVx, 3-EVx
Payload		PRBS9
Synchronization		GFSK access code and DPSK synchronization sequence
Trigger		IF power, external, free run

EDR differential phase encoding		
Measurements		bit error detection in line with Bluetooth® RF test specification 2.0.E.3, 5.1.14
Packet type		2-DHx, 3-DHx, 2-EVx, 3-EVx
Payload		PRBS9
Synchronization		GFSK access code and DPSK synchronization sequence
Trigger		IF power, external, free run

EDR in-band spurious emissions		
Measurements		adjacent channel power and power between 1 MHz and 1.5 MHz from carrier in line with Bluetooth® RF test specification 2.0.E.3, 5.1.15
Level range		max. +10 dBm
Packet type		2-DHx, 3-DHx, 2-EVx, 3-EVx
Payload		PRBS9
Synchronization		gated measurement
Trigger		IF power, external, free run

R&S®FSL-K20 cable TV measurements

The R&S®FSL-K20 option for the R&S®FSL spectrum analyzer makes it possible to perform measurements on analog and digital modulated TV signals in cable networks and also simplifies such measurements.

The option includes a software demodulator for analyzing digital TV signals and an internal TV trigger for analyzing analog TV signals.

General

Frequency		
Range	vision carrier frequency with analog modulation or carrier frequency with digital modulation	5 MHz to 1.5 GHz
Selection of measurement frequency	a channel table is used	selection of a channel and/or direct input of frequency
	no channel table is used	direct input of frequency
Channel tables		
Characteristics	The number of channel tables that can be saved is limited only by the memory capacity of the instrument. Max. 400 channels in each channel table. Channel bandwidths from 0.1 MHz to 10 MHz. Max. 50 modulation standards, i.e. signal characteristic sets, can be present in each channel table. The modulation standard assigned to the active channel automatically configures each measurement. Channel tables can be generated and edited on the instrument at any time. The most important standard channel tables and modulation standards are included.	
Manual measurements	Operation is also possible without channel tables, in which case the user must select the measurement parameters.	

Analog TV

TV standards	B/G, D/K, I, K1, L, M, N	
Color system	PAL / SECAM / NTSC	
Sound systems	B/G	FM 5.5 MONO FM 5.5 / FM 5.742 FM 5.5 / NICAM 5.85
	D/K/K1	FM 6.5 MONO FM 6.5 / FM 6.742 FM 6.5 / FM 6.258 FM 6.5 / NICAM 5.85
	I	FM 6.0 MONO FM 6.0 / NICAM 6.552
	L	AM 6.5 MONO AM 6.5 / NICAM 5.85
	M, N	FM 4.5 MONO FM 4.5 / FM 4.724 FM 4.5 BTSC FM 4.5 EIA-J

Measurements		
Spectrum	active channel/signal spectrum	
Carriers	vision carrier	frequency and level absolute; display of deviation from nominal values
	one or two sound carriers	frequency and level relative to vision carrier; display of deviation from nominal values
C/N	carrier to noise; peak level of vision carrier relative to noise in selectable bandwidth; noise floor correction can be activated	
	channel switched ON	in-service mode, measurement next to signal
	channel switched OFF	off-service mode
	channel switched ON, no scrambling	quiet-line mode, measurement during unmodulated line
CSO	composite second order (beat); peak level of vision carrier relative to second-order intermodulation product; noise floor correction can be activated	
	channel switched OFF	off-service mode
	channel switched ON, no scrambling, unmodulated video line present	quiet-line mode, measurement during unmodulated line
CTB	composite triple beat; channel switched OFF; peak level of vision carrier relative to third-order intermodulation product; noise floor correction can be activated	
Video scope	no scrambling, SWT = 25 µs to 100 µs, offset = –50 µs to +50 µs	luminance signal of a selectable video line versus time
Vision modulation	white-reference test line, no scrambling	modulation depth and residual carrier of vision carrier
Hum	no scrambling	modulation depth of unwanted AM, modulation frequency <1 kHz

Analog TV measurement ranges and measurement uncertainty

Standards	All specified tolerances refer to a modulated TV signal in line with the PAL B/G standard. FM carriers are at 5.5 MHz and 5.742 MHz relative to the vision carrier, each modulated with 3 kHz. Vision carrier frequency range: 10 MHz < f ≤ 1.5 GHz.	
Measurements		
Carriers		
Vision carrier power, absolute	S/N (vision carrier) > 16 dB	typ. <0.5 dB
Vision carrier frequency offset	|frequency offset| < 10 kHz	±(vision carrier frequency × reference uncertainty + 0.5 Hz)
Sound carrier 1 power, relative	S/N (sound carrier 1) > 16 dB	typ. <0.7 dB
Intercarrier 1 frequency offset	|intercarrier 1 frequency offset| < 100 Hz S/N (sound carrier 1) > 25 dB	±(intercarrier 1 frequency offset × reference uncertainty + 0.5 Hz)
Sound carrier 2 power, relative	S/N (sound carrier 2) > 16 dB	typ. <0.7 dB
Intercarrier 2 frequency offset	|intercarrier 2 frequency offset| < 100 Hz S/N (sound carrier 2) > 25 dB	±(intercarrier 2 frequency offset × reference uncertainty + 0.5 Hz)
C/N	channel with vision carrier peak power –2 dBm; noise-reference bandwidth = 4 MHz; carrier and noise with 0 dB attenuation	
C/N (off-service)	preamp = OFF	C/N < 54 dB, typ. <1 dB
		C/N < 59 dB, typ. <3 dB
	preamp = ON for noise measurement	C/N < 69 dB, typ. <1 dB
		C/N < 74 dB, typ. <3 dB

Digital TV

QAM demodulator	user-configurable, block-based, open-loop software demodulator	
Standards	J.83/A (DVB-C Europe)	
	J.83/B (US cable)	
	J.83/C (Japanese cable)	
Measurements		
Spectrum	active channel/signal spectrum	
Overview	result table, zoom of individual parameters possible	
	modulation error rate (peak and RMS value)	
	error vector magnitude (peak and RMS value)	
	frequency offset	
	symbol rate offset	
Constellation	color constellation diagram with zoom capability	
Modulation errors	result table, zoom of individual parameters possible	
	amplitude imbalance	
	quadrature error	
	carrier suppression	
	phase jitter	
	modulation error rate (peak and RMS value)	
	error vector magnitude (peak and RMS value)	
Channel analysis	–20 × symbol duration to +100 × symbol duration	magnitude of channel impulse response, zoom
Channel power	measurement of channel power	
APD	amplitude probability distribution, special channel filters (5 MHz, 6 MHz, 7 MHz, 8 MHz, 10 MHz)	
CCDF	complementary cumulative distribution function, special channel filters (5 MHz, 6 MHz, 7 MHz, 8 MHz, 10 MHz)	

Digital TV measurement ranges and measurement uncertainty

Demodulator		
Adjustable symbol rate	0.1 Hz steps	0.1 MHz to 7.15 MHz
Permissible symbol rate error	referenced to symbol rate	typ. ±0.1 %
Permissible frequency error		typ. ±30 kHz
Modulation formats	QAM	4/16/32/64/128/256/512/1024
Equalizer	ON/OFF/freeze/reset; fractionally spaced; taps from –5 symbols to +25 symbols	
Receive filter	root raised cosine	roll-off factor = 0.12/0.13/0.15/0.18
Measurements		
Overview		
MER	64QAM, roll-off factor = 0.15, symbol rate = 6.9 MHz, equalizer OFF, R&S®FSL-B4 OCXO option	typ. residual MER rms greater (95 %) than
	at 200 MHz, 400 MHz, 600 MHz, 800 MHz	42.0 dB, 39.2 dB, 38.6 dB, 41.6 dB
	256QAM, roll-off factor = 0.12, symbol rate = 5.3605369 MHz, equalizer OFF, R&S®FSL-B4 OCXO option	typ. residual MER rms greater (95 %) than
	at 200 MHz, 400 MHz, 600 MHz, 800 MHz	42.3 dB, 40.8 dB, 39.3 dB, 41.9 dB

TV analyzer

Standards	see “Analog TV” and “Digital TV”
Measurements	
Tilt	Display of the power of many channels versus frequency allows level differences/tilt to be detected. Channels are selected by specifying the frequency range and/or modulation characteristics.

R&S®FSL-K30 application firmware for noise figure and gain measurements

Frequency

Frequency range	R&S®FSL3	100 kHz to 3 GHz
	R&S®FSL6	100 kHz to 6 GHz
	R&S®FSL18	100 kHz to 18 GHz (overrange 20 GHz)

Measurement bandwidth	R&S®FSL3/6	300 Hz to 10 MHz (–3 dB) in 1/3 sequence
	R&S®FSL3/6 with R&S®FSL-B7 option	10 Hz to 10 MHz (–3 dB) in 1/3 sequence

Noise figure and gain measurement

Noise figure		
Measurement range		0 dB to 35 dB
Resolution		0.01 dB
Accuracy	instrument uncertainty (95 % confidence level)	
	frequency range 100 kHz to 10 MHz	
	measurement with external preamplifier (gain 50 dB, noise figure <5 dB), RBW <10 kHz, DUT noise figure 1 dB to 10 dB and gain >10 dB	0.3 dB
	frequency range >10 MHz to 6 GHz	
	measurement with external preamplifier (gain 30 dB, noise figure <5 dB), RBW 1 MHz, DUT noise figure 1 dB to 10 dB and gain >10 dB	0.3 dB
	R&S®FSL-B22 (internal preamplifier) active, measurement with external preamplifier (gain 20 dB, noise figure <5 dB), RBW 1 MHz, DUT noise figure 1 dB to 10 dB and gain >10 dB	0.3 dB
	frequency range >6 GHz to 18 GHz	
	measurement with external preamplifier (gain 30 dB, noise figure <5 dB), RBW 1 MHz, DUT noise figure 1 dB to 10 dB and gain >10 dB	0.3 dB

Gain		
Measurement range		0 dB to 60 dB
Resolution		0.01 dB
Accuracy	frequency range 100 kHz to 10 MHz	
	measurement with external preamplifier (gain 50 dB, noise figure <5 dB), RBW <10 kHz	0.2 dB
	frequency range >10 MHz to 18 GHz	
	measurement with external preamplifier (gain 30 dB, noise figure <5 dB), RBW 1 MHz	0.2 dB

Required hardware

Spectrum analyzer		
Noise source supply	via 28 V connector on rear panel of R&S®FSL	R&S®FSL-B5
Noise source	recommendation	NoiseCom NC346
Preamplifier, external	frequency range 100 kHz to 3/6/18 GHz	gain approx. 30 dB, noise figure max. 5 dB

R&S®FSL-K91 WLAN 802.11a/b/g/j OFDM analysis (IEEE 802.11a, IEEE 802.11g OFDM, IEEE 802.11j)

Frequency

Frequency range		
RF input	R&S®FSL3	10 MHz to 3 GHz
	R&S®FSL6	10 MHz to 6 GHz
	R&S®FSL18	10 MHz to 18 GHz (overrange 20 GHz)
Frequency setting		frequency channel number

Level

Level range	RF input	–60 dBm to +30 dBm
Level setting		autorange manual

Signal acquisition

Supported standards		IEEE 802.11a, IEEE 802.11g (OFDM), IEEE 802.11j (10 MHz), IEEE 802.11j (20 MHz)
Modulation format		BPSK, QPSK, 16QAM, 64QAM
Demodulator setting		auto, manual with/without test of signal field
Capture length	continuous	
	IEEE 802.11a, j	24 µs to 15 ms
	IEEE 802.11g	24 µs to 11.9 ms
Number of bursts that can be analyzed	manual	1 to 10922
Result length	PVT, spectrum FFT, CCDF	capture length, 1 to 10922 bursts or gate length
	EVM versus symbol and versus carrier, constellation versus symbol/versus carrier spectrum flatness, bit stream, signal field	capture length, 1 to 10922 bursts
Burst length	automatic detection of number of data symbols manual	1 to 1366 data symbols
Triggering		free run, IF power, external

Result display

Result list	min/mean/max	EVM all carriers
	min/mean/max	EVM pilots
	min/mean/max	EVM payload I/Q offset GAIN imbalance quadrature error center frequency error symbol clock error mean burst power crest factor
Power versus time		full burst rising/falling edge
EVM		EVM versus symbol EVM versus carrier
Error versus preamble		frequency error versus preamble phase error versus preamble
Spectrum		spectrum mask (IEEE & ETSI), ACP (IEEE 802.11j: abs/rel), spectrum FFT spectrum flatness

Constellation		constellation diagram constellation versus carrier
Statistics		bit stream signal field CCDF
Limit check	values in line with standard	result list EVM spectrum mask ACP

Adjustable parameters

Pilot tracking		phase ON/OFF timing ON/OFF level ON/OFF
Channel estimation		data preamble

Measurement uncertainty

Residual EVM	level –23 dBm to +30 dBm, average of 20 bursts, f = 2.4 GHz or 5 GHz	
	channel estimation = data	–35 dB
	channel estimation = preamble	–38 dB
Frequency error		
Lock range		40 ppm
Uncertainty		1 Hz + reference frequency uncertainty
Level uncertainty	test of spectrum mask	0.2 dB
	output power	
	f < 3 GHz	0.5 dB
	3 GHz ≤ f ≤ 6 GHz	0.8 dB
	ACPR	0.5 dB
Spectrum flatness		0.5 dB

DSSS/CCK/PBCC analysis (IEEE 802.11b, IEEE 802.11g CCK)

Frequency

Frequency range		
RF input	R&S®FSL3	20 MHz to 3 GHz
	R&S®FSL6	20 MHz to 6 GHz
	R&S®FSL18	10 MHz to 18 GHz (overrange 20 GHz)
Frequency setting		frequency channel number

Level

Level range	RF input	–60 dBm to +30 dBm
Level setting		autorange manual

Signal acquisition

Supported standards		IEEE 802.11b, IEEE 802.11g (CCK)
Modulation format		DBPSK, DQPSK, CCK, short PLCP, long PLCP 5.5 Mbps, 11 Mbps PBCC
Demodulator setting		auto manual with/without test of signal field
Capture length	continuous	24 µs to 11.9 ms
Number of bursts that can be analyzed	manual	1 to 10922
Result length	PVT, spectrum FFT, CCDF	capture length, 1 to 10922 bursts or gate length
	EVM versus symbol and versus carrier, constellation versus symbol bit stream PLCP header	capture length, 1 to 10922 bursts
Burst length	automatic detection of number of data symbols manual	1 to 4095 bytes
Triggering		free run, IF power, external

Result display

Result list	min/mean/max	peak vector error
	min/mean/max	burst EVM I/Q offset gain imbalance quadrature error center frequency error chip clock error rise time fall time mean burst power peak burst power crest factor
Power versus time		up ramp/down ramp
EVM		EVM versus symbol
Error versus preamble		frequency error versus preamble phase error versus preamble
Spectrum		spectrum mask, ACPR, spectrum FFT
Constellation		constellation diagram
Statistics		bit stream PLCP header CCDF
Limit check	values in line with standard	result list, power versus time, EVM, spectrum mask, ACP

Adjustable parameters

Tracking		phase ON/OFF timing ON/OFF level ON/OFF

Measurement uncertainty

Residual EVM	level –23 dBm to +30 dBm average of 20 bursts, 11 Mbps CCK with short PLCP, burst EVM	
	f = 2.442 GHz	1.8 %
Frequency error		
Lock range		±0.6 MHz
Uncertainty		1 Hz + reference frequency uncertainty
Level uncertainty	test of spectrum mask	0.2 dB
	output power	
	f < 3 GHz	0.5 dB
	3 GHz ≤ f ≤ 6 GHz	0.8 dB
	ACPR	0.5 dB

R&S®FSL-K92 WiMAX IEEE 802.16 OFDM analysis (IEEE 802.16-2004, 802.16-2004/Cor1-2005)

Frequency

Frequency range	RF input	
	R&S®FSL3	15 MHz to 3 GHz
	R&S®FSL6	15 MHz to 6 GHz
	R&S®FSL18	10 MHz to 18 GHz (overrange 20 GHz)
Frequency setting		frequency, channel number
Sampling rate f_s		1.44 MHz to 20 MHz

Level

Level range	RF input	–60 dBm to +30 dBm
Level setting		auto, manual

Signal acquisition

Supported standards		IEEE 802.16-2004/Cor1-2005, OFDM physical layer
Capture length		24 µs to 15.6 ms, continuously adjustable
Number of bursts that can be analyzed	manual	1 to 10922
Result length	result summary	capture length, 1 to 10922 bursts
	PVT, spectrum FFT, CCDF	capture length or gate length
	EVM versus symbol, EVM versus carrier, constellation versus symbol/versus carrier, spectrum flatness, spectrum flatness difference, group delay, bit stream	capture length
Burst length	automatic detection of number of data symbols, manual	1 to 2425 data symbols
Trigger modes		free run, IF power, external

Result display

Result list	min/mean/max	EVM all carriers
	min/mean/max	EVM data carrier
	min/mean/max	EVM pilot carrier, I/Q offset, gain imbalance, quadrature error, frequency error, clock error, mean burst power, crest factor, RSSI, RSSI standard deviation, CINR, CINR standard deviation
Power versus time		full burst, start/end, burst view depending on burst selection
EVM		EVM versus symbol, EVM versus carrier
Error versus preamble		frequency error versus preamble phase error versus preamble
Spectrum		spectrum mask (IEEE[1] and ETSI[2]), ACP (abs./rel.), spectrum FFT, spectrum flatness, spectrum flatness difference, group delay
Constellation		constellation versus symbol, constellation versus carrier
Statistics		CCDF, bit stream burst summary modulation format, burst length [symbols], power, EVM

[1] In line with [1] IEEE 802.16-2004.

[2] In line with [10] ETSI EN 301 021 V1.6.1 (2003-07).

Limit check	values in line with standard	result list EVM, I/Q offset, frequency error, clock error spectrum mask IEEE[3], ETSI[4]

Adjustable parameters

Frequency band		predefined bands: offer preset combinations of sampling rate (f_s) and nominal channel bandwidth (BW) in line with the standard unspecified: enable f_s/BW ratios in line with the standard
Sampling rate (F_s), Channel bandwidth (BW)		If one of the parameters is set, the other one is automatically set in line with the standard. The frequency band setting is taken into account.
Guard period ratio G = T_g / T_b		1/4, 1/8, 1/16, 1/32
Link mode		downlink, uplink
Modulation detection		none, first symbol, user, all
Modulation format		BPSK, QPSK, 16QAM, 64QAM
Subchannelization	UL	ON/OFF
Subchannel index		1 to 31
UL physical modifier	UL	0 to 255
Pilot tracking		phase ON/OFF, timing ON/OFF, level ON/OFF
Channel estimation		preamble, payload

Measurement uncertainty

Residual EVM	level –23 dBm to +12 dBm, average of 20 bursts, f = 2.4 GHz or 5 GHz	
	channel estimation = preamble	–34 dB
	channel estimation = payload	–35 dB
Frequency error		
Lock range		30 ppm
Uncertainty		1 Hz + reference frequency uncertainty
Level uncertainty	test of spectrum mask	0.2 dB
	output power	
	f < 3 GHz	0.5 dB
	3 GHz ≤ f ≤ 6 GHz	0.8 dB
	ACPR	0.5 dB
Spectrum flatness		0.5 dB

References

[1] IEEE 802.16-2004, IEEE Standard for Local and Metropolitan Area Networks. 1 October 2004.

[2] IEEE 802.16e-2005 and IEEE 802.16-2004/Cor1-2005. 28 February 2006.
Amendment 2: Physical and Medium Access Control Layers for Combined Fixed and Mobile Operation in Licensed Bands and Corrigendum 1.

[10] ETSI EN 301 021 V1.6.1 (2003-07). Fixed radio systems; point-to-multipoint equipment; time division multiple access (TDMA); Point-to-multipoint digital radio systems in frequency bands in the range 3 GHz to 11 GHz.

[3] In line with [1] IEEE 802.16-2004.

[4] In line with [10] ETSI EN 301 021 V1.6.1 (2003-07).

Ordering information

Designation	Type	Order No.
Spectrum Analyzer, 9 kHz to 3 GHz	R&S®FSL3	1300.2502.03
Spectrum Analyzer, 9 kHz to 3 GHz, with tracking generator	R&S®FSL3	1300.2502.13
Spectrum Analyzer, 9 kHz to 6 GHz	R&S®FSL6	1300.2502.06
Spectrum Analyzer, 9 kHz to 6 GHz, with tracking generator	R&S®FSL6	1300.2502.16
Spectrum Analyzer, 9 kHz to 18 GHz	R&S®FSL18	1300.2502.18
Accessories supplied		
Power cable, quick start guide and CD-ROM (with operating manual and service manual)		
Recommended extras		
Printed manual (includes operating manual and service manual)		1300.3338.32

Options

Designation	Type	Order No.	Retrofittable	Remarks
Options				
OCXO Reference Frequency	R&S®FSL-B4	1300.6008.02	yes	standard in R&S®FSL18
Additional Interfaces	R&S®FSL-B5	1300.6108.02	yes	video out, IF out, noise source control, AUX port, R&S®NRP power sensor
TV Trigger	R&S®FSL-B6	1300.5901.02	yes	
Narrow Resolution Filters	R&S®FSL-B7	1300.5601.02	yes	
Gated Sweep	R&S®FSL-B8	1300.5701.02	yes	
GPIB Interface	R&S®FSL-B10	1300.6208.02	yes	
RF Preamplifier (3/6 GHz)	R&S®FSL-B22	1300.5953.02	yes	
DC Power Supply	R&S®FSL-B30	1300.6308.02	yes	
NiMH Battery Pack	R&S®FSL-B31	1300.6408.02	yes	requires R&S®FSL-B30
Firmware/Software				
AM/FM/φM Measurement Demodulator	R&S®FSL-K7	1301.9246.02		
Bluetooth® TX Measurements (1.1 and 2.0+EDR)	R&S®FSL-K8	1301.9398.02		
Power Sensor Support	R&S®FSL-K9	1301.9530.02		requires R&S®FSL-B5 or R&S®NRP-Z3/4
Spectrogram Measurements	R&S®FSL-K14	1302.0913.02		
Cable TV and TV Measurements	R&S®FSL-K20	1301.9675.02		
Application Firmware for Noise Figure and Gain Measurements	R&S®FSL-K30	1301.9817.02		requires R&S®FSL-B5 and preamplifier
3GPP FDD BTS Application Firmware	R&S®FSL-K72	1302.0620.02		see separate specifications
WLAN IEEE 802.11a/b/g/j Application Firmware	R&S®FSL-K91	1302.0094.02		
WiMAX IEEE 802.16 OFDM Application Firmware	R&S®FSL-K92	1302.0236.02		
WiMAX IEEE 802.16 OFDM/OFDMA Application Firmware	R&S®FSL-K93	1302.0736.02		see separate specifications
Upgrade from R&S®FSL-K92 to R&S®FSL-K93	R&S®FSL-K92U	1302.0307.02		

Recommended extras

Order designation	Type	Order No.
19'' Rackmount Adapter	R&S®ZZA-S334	1109.4487.00
Soft Carrying Bag	R&S®FSL-Z3	1300.5401.00
Protective Hard Cover	R&S®EVS-Z6	5201.7760.00
Additional Charger Unit	R&S®FSL-Z4	1300.5430.02
Matching Pad 75 Ω, L section	R&S®RAM	0358.5414.02
Matching Pad 75 Ω, series resistor 25 Ω	R&S®RAZ	0358.5714.02
Matching Pad 75 Ω, L section, N to BNC	R&S®FSH-Z38	1300.7740.02
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
SWR Bridge 10 MHz to 3 GHz (incl. open, short, load calibration standards)	R&S®FSH-Z2	1145.5767.02

Power sensors supported by the R&S®FSL-K9

Order designation	Type	Order No.
Average Power Sensor 10 MHz to 8 GHz, 200 mW	R&S®NRP-Z11	1138.3004.02
Average Power Sensor 10 MHz to 18 GHz, 200 mW	R&S®NRP-Z21	1137.6000.02
Average Power Sensor 10 MHz to 18 GHz, 2 W	R&S®NRP-Z22	1137.7506.02
Average Power Sensor 10 MHz to 18 GHz, 15 W	R&S®NRP-Z23	1137.8002.02
Average Power Sensor 10 MHz to 18 GHz, 30 W	R&S®NRP-Z24	1137.8502.02
Power Sensor Module with Power Splitter DC to 18 GHz, 500 mW	R&S®NRP-Z27	1169.4102.02
Power Sensor Module with Power Splitter DC to 26.5 GHz, 500 mW	R&S®NRP-Z37	1169.3206.02
Average Power Sensor 9 kHz to 6 GHz, 200 mW	R&S®NRP-Z91	1168.8004.02
Thermal Power Sensor 0 Hz to 18 GHz, 100 mW	R&S®NRP-Z51	1138.0005.02
Thermal Power Sensor 0 Hz to 40 GHz, 100 mW	R&S®NRP-Z55	1138.2008.02
Wideband Power Sensor 50 MHz to 18 GHz, 100 mW	R&S®NRP-Z81	1137.9009.02

For product brochure, see PD 0758.2790.12
and www.rohde-schwarz.com
(search term: FSL)

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