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R&S® ETL TV Analyzer

Data sheet



ROHDE & SCHWARZ

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Specifications

Specifications apply under the following conditions:

30 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.

Part 1 – TV analyzer

Frequency

Frequency range		500 kHz to 3 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	
Aging per year		1×10^{-7}
Temperature drift	0 °C to +50 °C	1×10^{-7}

Spectral purity SSB phase noise		
	f = 500 MHz	
Carrier offset	1 kHz	typ. -90 dBc (1 Hz)
	10 kHz	<-98 dBc (1 Hz), typ. -103 dBc (1 Hz)
	100 kHz	<-105 dBc (1 Hz), typ. -110 dBc (1 Hz)
	1 MHz	<-125 dBc (1 Hz), typ. -130 dBc (1 Hz)

Level

Maximum rated input level		
DC voltage		80 V
CW RF power	preamplifier OFF	30 dBm (= 1 W)
CW RF power	preamplifier ON	20 dBm (= 0.1 W)
Peak RF power	preamplifier OFF	36 dBm (= 4 W), t < 3 s
Max. pulse voltage		150 V
Max. pulse energy	10 µs	10 mWs
1 dB compression of input mixer	0 dB RF attenuation, f > 200 MHz	nominal +5 dBm

Intermodulation		
Third-order intermodulation	intermodulation-free dynamic range, level 2×-20 dBm, reference level -10 dBm, preamplifier = OFF	
	f < 30 MHz	>54 dBc (TOI + 7 dBm, typ. + 12 dBm)
	f ≥ 30 MHz	>60 dBc (TOI + 10 dBm, typ. + 18 dBm)
Second harmonic intercept (SHI)	f = 20 MHz to 3 GHz	typ. 40 dBm

Immunity to interference		
Image frequency	f + 2 × 48.375 MHz	>60 dB, typ. 80 dB
	f + 2 × 838.375 MHz	>60 dB, typ. 80 dB
	f + 2 × 7158.375 MHz	typ. 60 dB
Intermediate frequency	48.375 MHz, 838.375 MHz, 7158.375 MHz	>60 dB, typ. 80 dB
Spurious response, inherent	f > 30 MHz, without input signal, RF attenuation = 0 dB, RBW < 1 MHz	<-90 dBm
Spurious response	related to local oscillators	<-60 dBc
Spurious response	related to A/D conversion	typ. <-70 dBc
Spurious response	related to sub harmonic of first LO (spur at 7158.375 MHz - $2 \times f_{in}$)	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 settings		
Setting range of signal level		–80 dBm to 20 dBm in steps of 0.1 dB
Units of level axis	logarithmic level display	dBm, dBmV, dB μ V, dB μ A, dBpW
	linear level display	μ V, mV, V, μ A, mA, A, pW, nW, μ W, 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	50 MHz < f ≤ 3 GHz	<1.0 dB
Attenuator uncertainty		<0.3 dB
Uncertainty of signal level setting		<0.1 dB nominal

Analog TV

Standards		B/G, I, D/K, K1, M, N
Sound standards	in line with TV standard, see table channel filter analog TV	IRT-A2, NICAM, BTSC, EIA-J, Korea-Stereo
Video bandwidth	in line with TV standard, see table channel filter analog TV	4.0 MHz, 4.2 MHz, 5.0 MHz, 5.2 MHz, 5.5 MHz, 5.75 MHz, and 6 MHz
Group delay correction	see table channel filter analog TV	

Measurements		
		vision carrier power
		vision carrier frequency offset
		vision/sound carrier power ratio
		vision/NICAM power ratio
		vision/sound carrier frequency offset
		video S/N, weighted in line with ITU-R Rec. 567
		audio mode (in preparation)
		NICAM bit error ratio (in preparation)
		vision modulation depth, residual picture carrier
		video scope
		hum modulation
	in-service, off-service, quiet line	carrier to noise power ratio
	off-service	composite triple beat (CTB) ratio
	off-service, quiet line	composite second order (CSO) ratio
	vision detector	synchronous PLL sample back porch medium synchronous PLL sample back porch slow synchronous PLL continuous fast synchronous PLL continuous medium synchronous PLL continuous slow envelope (ultrafast)

System performance		
Video S/N	weighted in line with ITU-R Rec. 567 (1 channel)	≥60 dB

Channel filter analog TV				
Standard	group delay characteristic	sound system	bandwidth in MHz ($f_{\text{passband-max}}$)	residual sideband in MHz
B/G	general	FM 5.5 / FM 5.742	5.0	0.75
		FM 5.5 / NICAM 5.85	5.0	0.75
		FM 5.5 mono	5.0	0.75
	Australia	FM 5.5 / FM 5.742	5.0	0.75
		FM 5.5 / NICAM 5.85	5.0	0.75
		FM 5.5 mono	5.0	0.75
	Denmark	FM 5.5 / FM 5.742	5.0	0.75
		FM 5.5 / NICAM 5.85	5.0	0.75
		FM 5.5 mono	5.0	0.75
	general half	FM 5.5 / FM 5.742	5.0	0.75
		FM 5.5 / NICAM 5.85	5.0	0.75
		FM 5.5 mono	5.0	0.75
	New Zealand	FM 5.5 / FM 5.742	5.0	0.75
		FM 5.5 / NICAM 5.85	5.0	0.75
		FM 5.5 mono	5.0	0.75
	Norway	FM 5.5 / FM 5.742	5.0	0.75
		FM 5.5 / NICAM 5.85	5.0	0.75
		FM 5.5 mono	5.0	0.75
	Sweden	FM 5.5 / FM 5.742	5.0	0.75
		FM 5.5 / NICAM 5.85	5.0	0.75
		FM 5.5 mono	5.0	0.75
	flat	FM 5.5 / FM 5.742	5.0	0.75
		FM 5.5 / NICAM 5.85	5.0	0.75
		FM 5.5 mono	5.0	0.75
D/K	OIRT GOST 20532-75	FM 6.5 / FM 6.742	6.0	0.75
		FM 6.5 / FM 6.258	5.75	0.75
		FM 6.5 / NICAM 5.85	5.2	0.75
		FM 6.5 mono	6.0	0.75
	ITU-R Report 308	FM 6.5 / FM 6.742	6.0	0.75
		FM 6.5 / FM 6.258	5.75	0.75
		FM 6.5 / NICAM 5.85	5.2	0.75
		FM 6.5 mono	6.0	0.75
	flat	FM 6.5 / FM 6.742	6.0	0.75
		FM 6.5 / FM 6.258	5.75	0.75
		FM 6.5 / NICAM 5.85	5.2	0.75
		FM 6.5 mono	6.0	0.75
I	flat	FM 6 / NICAM 6.552	5.5	0.75
		FM 6 mono	5.5	0.75
K1	K1	FM 6.5 / FM 6.742	6.0	0.75
		FM 6.5 / FM 6.258	5.75	0.75
		FM 6.5 / NICAM 5.85	5.2	0.75
		FM 6.5 mono	6.0	0.75
	flat	FM 6.5 / FM 6.742	6.0	0.75
		FM 6.5 / FM 6.258	5.75	0.75
M/N	FCC	FM 4.5 BTSC	4.0	0.75
		FM 4.5 EIA-J	4.0	0.75
		FM 4.5 / FM 4.724	4.0	0.75
		FM 4.5 mono	4.0	0.75
	flat	FM 4.5 BTSC	4.2	0.75
		FM 4.5 EIA-J	4.2	0.75
		FM 4.5 / FM 4.724	4.2	0.75
		FM 4.5 mono	4.2	0.75

Automatic selection depending on selected TV standard and sound system

Pass band amplitude error of channel filter		
Group delay activated	$f \leq f_{\text{passband-max}}$	≤ 0.1 dB
Group delay flat	$f \leq f_{\text{passband-max}}$	≤ 0.05 dB

Group delay correction												
Standard	B/G							D/K		I	K1	M/N
Frequency in MHz	General	Australia	Denmark	General half	New Zealand	Norway	Sweden	OIRT GOST 20532-75	ITU-R Report 308			FCC
group delay in ns												
0.10	0	0	0	0	0	0	0	0	0	0	0	0
0.25	-5		-5	-2.5		0	0	-5	-5	0	0	0
0.50						0	0	-10		0	0	0
1.00	-53	-30	-53	-26.5		0	0	-40	-53	0	0	0
1.50						0	0	-70		0	0	0
2.00	-90	-60	-75	-45		0	0	-80	-87	0	0	0
2.25					-60	0	0			0	0	0
3.00	-75	-40	-75	-37.5	-60	0	0	-80	-85	0	0	0
3.50		0					0			0	0	
3.58							0			0	0	170
3.60						20	0			0	0	
3.75	0			0	0					0	0	
3.80			0							0	0	
4.00						50		-40	-50	0	0	293
4.18										0		346
4.43	170	170	170	85	170	170	175	0	0	0	15	
4.60										0		
4.80	400	260	400	200	400	350	400			0		
5.00								80	90	0	90	
5.25										0	140	
5.50										0		

Pass band group delay error of channel filter		
	$f \leq f_{\text{passband-max}} - 0.1 \text{ MHz}$	7 ns

I/Q data

Memory length	output via LAN or GPIB (option R&S®FSL-B10)	max. 512 ksample I and Q
Sample rate		10 kHz to 65.8 MHz
Signal bandwidth	sample rate 65.833333 MHz	20 MHz

Digital TV options

R&S® ETL-B210 digital demodulator for J.83/A/C (DVB-C)

Option R&S® ETL-K210 is required.

Standard	cable TV (e.g. Europe, China, Japan)	J.83/A/C (DVB-C)
QAM order		4, 16, 32, 64, 128 and 256QAM
Bandwidth	digitally filtered, in line with symbol rate	1 MHz to 8 MHz
Symbol rate		1 MSymb/s to 6.999 MSymb/s
Measurements	see option R&S® ETL-K210 (DVB-C, J.83/A/C)	

R&S® ETL-B211 digital demodulator for DTMB

Standard	terrestrial TV, China	DTMB
QAM order		4, 16, 64QAM
Modulation		TDS-OFDM
Bandwidth		8 MHz

Measurements DTMB		level
		frequency offset (in Hz)
		bit rate offset (in ppm)
		packet error ratio
		MPEG transport stream rate
		shoulder attenuation in line with ETSI TR 101 290
		CCDF and APD with crest factor (in preparation)

Channel filter for DTMB		
Channel filter bandwidth		8.0 MHz
Pass band amplitude error		≤0.1dB
Stop band attenuation		≥90 dB
Channel filter shape factor 90 dB:0.1 dB		≤1.08

R&S® ETL-B212 digital demodulator for J.83/A/C (DVB-C) and DTMB

R&S® ETL-K210 option is required for J.83/A/C (DVB-C).

Standard	cable TV (e.g. Europe, China, Japan) terrestrial TV, China	J.83/A/C, DVB-C (QAM) DTMB (TDS-OFDM)
QAM order		4-, 16-, 32-, 64-, 128- and 256-QAM (J.83/A/C, DVB-C) 4-, 16-, 64QAM (DTMB)
Bandwidth	digitally filtered, in line with symbol rate	1 MHz to 8 MHz (J.83/A/C, DVB-C) 8 MHz (DTMB)
Symbol rate		1 MSymb/s to 6.999 MSymb/s (J.83/A/C, DVB-C)
Measurements	see R&S® ETL-B211 option (DTMB) and R&S® ETL-K210 option (DVB-C, J.83/A/C)	

R&S® ETL-K210 DVB-C firmware

Standard	cable TV (e.g. Europe, China, Japan)	J.83/A/C (DVB-C)
QAM order		4, 16, 32, 64, 128 and 256QAM
Bandwidth	digitally filtered, in line with symbol rate, see section channel filter	1 to 8 MHz
Symbol rate		1 MSymb/s to 6.999 MSymb/s
Roll-off factor		0.12, 0.13, 0.15, 0.18 (selectable)

Measurements	parameter	
	level	-55 dBm (preamplifier ON) to +10 dBm for quasi error free(qef 64QAM, f < 1 GHz, R&S® ETL-B203 preselector not installed)
	carrier frequency offset (in Hz)	
	symbol rate offset (in Hz)	
	MER (modulation error ratio) in dB or %	
	EVM (error vector magnitude) in dB or %	
	bit error ratio before RS decoder	
	packet error ratio respectively segment error ratio	
	MPEG transport stream rate	
	constellation diagram	symbol count selectable (1 symbol to 999,999,999 symbols + infinite), freeze mode
	shoulder attenuation in line with ETSI TR 101 290	
	amplitude/phase/group delay frequency response	
	CCDF and APD with crest factor (in preparation)	

Measurement uncertainty (64QAM)		
Carrier frequency offset	referred to carrier frequency	<2 ppm
Symbol rate offset	referred to symbol rate	<2 ppm
Transport stream rate	referred to stream rate	<2 ppm
With R&S®FSL-B4 OCXO		
Carrier frequency offset	referred to carrier frequency	<0.2 ppm
Symbol rate offset	referred to symbol rate	<0.2 ppm
Transport stream rate	referred to stream rate	<0.2 ppm
With external 10 MHz reference		
Carrier frequency offset	referred to carrier frequency	≤1 Hz
Symbol rate offset	referred to symbol rate	≤0.5 Hz
MPEG transport stream rate	referred to MPEG transport stream rate	≤1 Hz
Modulation error ratio		
	equalizer on, 1 channel	
	MER 18 to 30 dB	typ. <0.8 dB
	MER 30 to 35 dB	typ. <1.5 dB
System performance	signal power >-30 dBm, f ≤ 1.3 GHz	MER ≥40 dB (equalizer ON) 36 dB (equalizer OFF, f ≥ 100 MHz)
Error vector magnitude	EVM >2 % to 8 %	typ. <7 % of measured value
	EVM >1.2 % to 2 %	typ. <13 % of measured value
BER before Reed-Solomon	range 1.0×10^{-3} to 0.1×10^{-15} , 0.0	$0.1 \times 10^{-\text{exponent}}$
Packet/segment error ratio	range 1.0×10^{-1} to 0.1×10^{-14} , 0.0	$0.1 \times 10^{-\text{exponent}}$

Channel filter for DVB-C firmware (R&S® ETL-K210)		
Channel filter bandwidth	1.0 MHz, 2.0 MHz, 3.0 MHz, 4.0 MHz, 5.0 MHz, 5.4 MHz, 5.6 MHz, 5.8 MHz, 6.0 MHz, 6.2 MHz, 6.4 MHz, 6.6 MHz, 6.8 MHz, 7.0 MHz, 7.2 MHz, 7.4 MHz, 7.5 MHz, 7.6 MHz, 7.65 MHz, 7.7 MHz, 7.75 MHz, 7.8 MHz, 8.0 MHz, 8.2 MHz, 8.4 MHz, 9.0 MHz	automatic selection of channel filter, in line with symbol rate selected
Pass band amplitude error		≤0.05 dB
Stop band attenuation		≥70 dB
Channel filter shape factor 60 dB:0.1 dB		≤1.05

R&S® ETL-K240 DVB-T/H firmware

Standard	terrestrial TV in line with ETSI EN 300 744	DVB-T/H
FFT Mode	automatic detection or manual selection	2K, 4K, 8K
QAM order	automatic detection or manual selection	4-, 16-, 64-QAM
QAM hierarchy	automatic detection or manual selection	none, alpha = 1, 2, 4
Guard Interval	automatic detection or manual selection	1/4, 1/8, 1/16, 1/32
Code Rate HP, LP	automatic detection or manual selection	1/2, 2/3, 3/4, 5/6, 7/8
Interleaver mode	automatic detection or manual selection	native or In-depth
Bandwidth	digitally filtered, in line with channel bandwidth, see section channel filter	5 MHz, 6 MHz, 7 MHz, 8 MHz

Measurements	parameter	
	level	-55 dBm (preamplifier ON) to +10 dBm for quasi error free (qef 64QAM, f < 1 GHz, R&S® ETL-B203 preselector not installed)
	carrier frequency offset (in Hz)	
	bit rate offset (in Hz)	
	MER (modulation error ratio) in dB or %	
	EVM (error vector magnitude) in dB or %	
	bit error ratio before Viterbi decoder	
	bit error ratio before RS decoder	
	packet error ratio respectively segment error ratio	
	MPEG transport stream rate	
	constellation diagram	symbol count selectable (1 symbol to 999,999,999 symbols + infinite), freeze mode, carrier number selectable (carrier 0 to carrier 6816 in case of 8K FFT)
	MER versus frequency	carrier number selectable (carrier 0 to carrier 6816 in case of 8K FFT)
	shoulder attenuation in line with ETSI TR 101 290	
	amplitude/phase/group delay frequency response	carrier number selectable (carrier 0 to carrier 6816 in case of 8K FFT)
	echo pattern (channel impulse response)	center and time/div selectable
	CCDF and APD with crest factor	(in preparation)
	TPS information	FFT, QAM order, hierarchy, guard interval, Code Rate HP, Code Rate LP, Interleaver mode, MPE-FEC (HP), MPE-FEC (LP), Time Slicing (HP), Time Slicing (LP), Length indicator, Cell Id, TPS reserved

Measurement uncertainty (64QAM)		
Carrier frequency offset	referred to carrier frequency	<2 ppm
Bit rate offset	referred to symbol rate	<2 ppm
Transport stream rate	referred to stream rate	<2 ppm
With R&S® FSL-B4 OCXO		
Carrier frequency offset	referred to carrier frequency	<0.2 ppm
Bit rate offset	referred to symbol rate	<0.2 ppm
Transport stream rate	referred to stream rate	<0.2 ppm
With external 10 MHz reference		
Carrier frequency offset	referred to carrier frequency	≤1 Hz
Bit rate offset	referred to MPEG TS rate	≤0.5 ppm
MPEG transport stream rate	referred to MPEG transport stream rate	≤1 Hz
Modulation error ratio		
	MER 18 to 30 dB	typ. <0.8 dB
	MER 30 to 35 dB	typ. <1.5 dB
System performance	signal power >-30 dBm, f ≤ 1.3 GHz	MER ≥40 dB (system optimization stationary fast or stationary slow)
Error vector magnitude	EVM >2 % to 8 %	typ. <7 % of measured value
	EVM >1.2 % to 2 %	typ. <13 % of measured value
BER before Reed-Solomon	range 1.0×10^{-3} to 0.1×10^{-15} , 0.0	$0.1 \times 10^{-\text{exponent}}$
Packet/segment error ratio	range 1.0×10^{-1} to 0.1×10^{-14} , 0.0	$0.1 \times 10^{-\text{exponent}}$

Channel filter for DVB-T/H firmware (R&S® ETL-K240)		
Channel filter bandwidth	5.0 MHz, 6.0 MHz, 7.0 MHz, 8.0 MHz	automatic selection of channel filter, in line with channel bandwidth selected
Pass band amplitude error		≤0.03 dB
Stop band attenuation		≥90 dB
Channel filter shape factor 90 dB:0.03 dB		≤1.09

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. $0.5 \times$ 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 ≤ $0.5 \times$ demodulation bandwidth	typ. 1 % + residual AM

FM demodulation		
Measurement range	frequency deviation	≤9 MHz
Deviation uncertainty	AF ≤ 1 MHz and AF + deviation ≤ $0.5 \times$ 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
Max. 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

Part 2 – Spectrum analyzer

Frequency

Frequency range		500 kHz to 3 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	
Aging per year		1×10^{-7}
Temperature drift	0 °C to +50 °C	1×10^{-7}

Frequency readout		with marker or frequency counter
Marker resolution		span/500
Uncertainty		$\pm(\text{marker frequency} \times \text{reference uncertainty} + 2 \% \times \text{span} + 10 \% \times \text{resolution bandwidth} + \frac{1}{2} \text{ (last digit)})$
Frequency counter resolution		1 Hz
Count uncertainty	S/N >25 dB	$\pm(\text{frequency} \times \text{reference uncertainty} + \frac{1}{2} \text{ (last digit)})$
Frequency span		0 Hz, 10 Hz to 3 GHz
Span uncertainty		3 %

Spectral purity SSB phase noise		f = 500 MHz
Carrier offset	1 kHz	typ. -90 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	10 Hz ≤ span ≤ 3.2 kHz 3.2 kHz <span ≤ 1.5 GHz 1.5 GHz <span ≤ 3 GHz	2.5 ms to 5 × span 2.5 ms to 16000 s 5 ms to 16000 s
Uncertainty		nom. 3 %
	span 0 Hz	1 μs to 5 μs in 125 ns steps 5 μs to 16000 s in 5 % steps

Resolution bandwidths

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

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

FFT filters (in preparation)		
3 dB bandwidths	analyzer mode	300 Hz to 30 kHz in 1/3 sequence
	with R&S®FSL-B7	1 Hz to 30 kHz in 1/3 sequence
Bandwidth uncertainty		nom. 5 %
Shape factor 60 dB:3 dB		nom. 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; 3.75; 3.84 (RRC); 4.096 (RRC); 5 MHz (RRC = root raised cosine)	
	with R&S®FSL-B7	100 Hz, 200 Hz additionally

Video bandwidths	(1-pole low pass RC filters)	1 Hz to 10 MHz in 1/3 sequence
Demodulation bandwidth		nom. 20 MHz

Level

Display range		displayed noise floor to +20 dBm
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Maximum rated input level		
DC voltage		80 V
CW RF power	preamplifier off	30 dBm (= 1 W)
CW RF power	preamplifier on	20 dBm (= 0.1 W)
Peak RF power	preamplifier off	36 dBm (= 4 W), t < 3 s
Max. pulse voltage		150 V
Max. pulse energy	10 µs	10 mWs
1 dB compression of input mixer	0 dB RF attenuation, f > 200 MHz	nominal +5 dBm

Intermodulation		
Third-order intermodulation	intermodulation-free dynamic range, level 2 × -20 dBm, reference level -10 dBm	
	f < 30 MHz	>54 dBc (TOI + 7 dBm, typ. + 12 dBm)
	f ≥ 30 MHz	>60 dBc (TOI + 10 dBm, typ + 18 dBm)
Second harmonic intercept (SHI)	f = 20 MHz to 3 GHz	typ. 40 dBm

Displayed average noise level		
	0 dB RF attenuation, RBW = 1 kHz, VBW = 10 Hz, normalized to 1 Hz	
R&S®ETL-B203 not installed	frequency	preamplifier = OFF
	500 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)
	frequency	preamplifier = ON
	500 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)	
	frequency	preamplifier = ON, typical values
	500 MHz	-162 dBm (1 Hz)
	1 GHz	-160 dBm (1 Hz)
	3 GHz	-158 dBm (1 Hz)
with R&S®ETL-B203 preselector (bypass)	frequency	preamplifier = OFF
	500 kHz to 1 MHz	<-92 dBm (1 Hz)
	1 MHz to 10 MHz	<-107 dBm (1 Hz)
	10 MHz to 50 MHz	<-122 dBm (1 Hz)
	50 MHz to 3 GHz	<-128 dBm (1 Hz)
	frequency	preamplifier = ON
	500 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)	
with R&S®ETL-B203 preselector (filter path, TV mode)	frequency	preamplifier = OFF
	500 kHz to 1 MHz	<-110 dBm (1 Hz)
	1 MHz to 10 MHz	<-125 dBm (1 Hz)
	10 MHz to 50 MHz	<-140 dBm (1 Hz)
	50 MHz to 3 GHz	<-150 dBm (1 Hz)
	frequency	preamplifier = ON
	500 kHz to 1 MHz	<-120 dBm (1 Hz)
1 MHz to 10 MHz	<-135 dBm (1 Hz)	
10 MHz to 50 MHz	<-150 dBm (1 Hz)	
50 MHz to 3 GHz	<-157 dBm (1 Hz)	

Immunity to interference		
Image frequency	f + 2 × 48.375 MHz f + 2 × 838.375 MHz f + 2 × 7158.375 MHz	>60 dB, typ. 80 dB >60 dB, typ. 80 dB typ. 60 dB
Intermediate frequency	48.375 MHz, 838.375 MHz, 7158.375 MHz	>60 dB, typ. 80 dB
Spurious response, inherent	f > 30 MHz, without input signal, RF attenuation = 0 dB, RBW <1 MHz	<-90 dBm
Spurious response	related to local oscillators	<-60 dBc
Spurious response	related to A/D conversion	typ. <-70 dBc
Spurious response	related to sub harmonic 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 range	501 125 to 16001 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
Absolute uncertainty at reference frequency		<0.3 dB
Frequency response (+20 °C to +30 °C)		<0.5 dB, typ. 0.3 dB
Attenuator uncertainty		<0.3 dB
Uncertainty of reference level setting		nom. <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	nom. <0.1 dB

Trigger functions

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

Part 3 – Common specifications

Inputs and outputs

RF input		
Impedance		50 Ω
Connector		N female
VSWR	RF attenuation ≥ 10 dB	typ. 1.5
Input attenuator		0 dB to 30 dB in 5 dB steps

Additional RF input, 75 Ω (see option R&S®ETL-B203)

Video output (CCVS)		
I out (option R&S®ETL-B201 required)		
Connector		BNC female, 75 Ω
Output level, peak–peak	CCVS	1 V
DC position back porch		0 V
Frequency response error	within video bandwidth	≤ 0.4 dB
Group delay response error	within video bandwidth, group delay flat	≤ 12 ns
	within video bandwidth, group delay in line with standard	≤ 20 ns
2T pulse k-factor		≤ 1 %
2T pulse amplitude error		≤ 2 %
Tilt	bar	≤ 1 %
Luminance nonlinearity		≤ 2 %
Differential gain		≤ 2 %
Differential phase		$\leq 1^\circ$

TS-ASI output (digital TV receiver mode)

Connector		BNC female, 75 Ω
Output level, peak–peak		0.8 V
Data rate		270 Mbit/s

AF signal output

Connector		2 \times Lemo Triax, female, balanced, non-floating
Output impedance		$Z < 35 \Omega$
Output level	load 600 Ω	6 dBm
Signals		left/right, sound 1/sound 2, mono
S/N	signal: test pattern, weighted (ITU-R468-3) intercarrier method	≥ 50 dB
Frequency response	deemphasis 50 μ s, 0.03 to 15 kHz	≤ 0.5 dB
Total harmonic distortion (THD)	1 kHz	≤ 0.1 %

AF output (headphone)

Connector		3.5 mm mini jack
Output impedance		$< 100 \Omega$
Open-circuit voltage	adjustable in spectrum analyzer mode	up to 1.5 V

Tracking generator (spectrum analyzer mode)

Tracking generator		N female, 50 Ω
Output level		-20 dBm to 0 dBm in 1 dB steps
Frequency range		1 MHz to 3 GHz
Reverse power		
	DC voltage	50 V
	CW RF power	30 dBm (= 1 W)
	max. pulse voltage	150 V
	max. pulse energy (10 μ s)	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 (spectrum analyzer mode)		
Connector		BNC female, 50 Ω
Input level		TTL compatible

USB and Remote		
USB interface		2 × USB 1.1, host for memory stick, mouse, keyboard
Remote interface		LAN
	R&S®FSL-B10	LAN or GPIB

General data

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 × 10 ⁻⁵

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

Temperature		
Temperature	operating temperature range permissible temperature range storage temperature range	+0 °C to +45 °C +0 °C to +50 °C -40 °C to +70 °C
Climatic loading		+25 °C/+40 °C at 85 % relative humidity (tested in line with 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 60 Hz
Input current, AC		1.8 A to 0.4 A
Power consumption		typ. 95 VA, max. 140 VA with all options
Safety		IEC 61010-1, EN 61010-1, UL 61010-1, CSA C22.2 No. 61010-1
EMC	in line with CISPR 11/EN 55011 Group 1 Class A (for a shielded test set-up). The instrument complies with the emission requirements stipulated by EN 55011 class A. This means that the instrument is suitable for use in industrial environments. According to EN 61000-6-4 operation neither in residential, commercial, business areas nor in small-size companies is covered. The instrument must not be operated in residential, commercial, business areas or in small-size companies, except that additional measures are taken, so that EN 61000-6-3 is met.	
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	<9 kg (<19.84 lb)

Recommended calibration interval		
		12 month
	operation with external reference	24 month

Hardware options

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

IF/video out		
Connector		BNC female, 50 Ω
Bandwidth	IF and video out	typ. 20 MHz
Output level	video out	typ. 200 mV full scale (open circuit), linear scaling
IF frequency	IF out, TV mode IF out, spectrum analyzer mode	17.458333 MHz typ. 18 MHz

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

R&S® ETL-B201 additional interface DTV

Serial data output (DVB-T/H)		
Connector		BNC female, 50 Ω
Output		TTL, $R_i = 50 \Omega$

Serial clock output (DVB-T/H)		
Connector		BNC female, 50 Ω
Output		TTL, $R_i = 50 \Omega$

I signal input		
Connector		BNC female, 50 Ω
Input level		±0.5 V MAX

Q signal input		
Connector		BNC female, 50 Ω
Input level		±0.5 V MAX

IF output		
Connector		BNC female, 75 Ω
Output level		±1.0 V max
IF	output only available in DVB-C and DTMB mode	4.571428 MHz (DVB-C) 5.000 MHz (DTMB, 8 MHz channel bandwidth)

R&S® ETL-B203 RF preselector

Additional RF input		
Impedance		75 Ω
Connector		F male F female (with F adapter, supplied)
VSWR	RF attenuation ≥5 dB	1.5
Input attenuator		0 dB to 55 dB in 5 dB steps

Common data for RF input, 50 Ω and additional RF input, 75 Ω		
Frequency range		500 kHz to 3 GHz
Noise figure	0 dB attenuation, including spectrum analyzer frontend	15 dB (50 MHz to 1.3 GHz, preamplifier OFF) 9 dB (50 MHz to 1.3 GHz, preamplifier ON) 11 dB (1.3 GHz to 2.3 GHz, preamplifier ON) 13 dB (2.3 GHz to 3.0 GHz, preamplifier ON)
TOI	0 dB attenuation, including spectrum analyzer frontend	>-5 dBm
Maximum safe input level	DC voltage CW RF power (preamplifier on) CW RF power (preamplifier on)	80 V 20 dBm 30 dBm

Ordering information

Designation	Type	Order No.
TV Analyzer 500 kHz to 3 GHz, with tracking generator	R&S®ETL	2112.0004.13
Accessories supplied		
Power cable, quick start guide and CD-ROM (with operating manual)		

Options

Designation	Type	Order No.	Retrofittable	Remarks
Additional Interface DTV	R&S®ETL-B201	2112.0304.02	yes (customer)	SER-DAT out, SER-CLK out, I in, Q in, IF out (4.571428 MHz) (same slot as R&S®FSL-B5)
RF Preselector	R&S®ETL-B203	2112.0327.02	yes (service)	
Digital Demodulator for Single Carrier	R&S®ETL-B210	2112.0104.02	yes (service)	
Digital Demodulator for DTMB	R&S®ETL-B211	2112.0110.02	yes (service)	
Digital Demodulator for Single Carrier and DTMB	R&S®ETL-B212	2112.0127.02	yes (service)	
OCXO Reference Frequency	R&S®FSL-B4	1300.6008.02	yes (customer)	
Additional Interfaces	R&S®FSL-B5	1300.6108.02	yes (customer)	video out, IF out, noise source control, AUX port, R&S®NRP power sensor (same slot as R&S®ETL-B201)
Narrow Resolution Filters	R&S®FSL-B7	1300.5601.02	yes (service)	
GPIB Interface	R&S®FSL-B10	1300.6208.02	yes (customer)	
Firmware/Software				
DVB-C Firmware	R&S®ETL-K210	2112.0404.02		requires R&S®ETL-B210 or R&S®ETL-B212
DVB-T/H Firmware	R&S®ETL-K240	2112.0556.02		
Analog demodulation AM/FM/φM	R&S®FSL-K7	1301.9246.02		
Power Sensor Support	R&S®FSL-K9	1301.9530.02		requires R&S®FSL-B5 or R&S®NRP-Z3/4

Recommended extras

Designation	Type	Order No.
Documentation of R&S [®] ETL calibration values	R&S [®] ETL-DCV	2082.0490.31
19" Rackmount Adapter	R&S [®] ZZA-S334	1109.4487.00
Soft Carrying Bag	R&S [®] FSL-Z3	1300.5401.00
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, 50 Ω	R&S [®] ZRC	1039.9492.52
SWR Bridge 40 kHz to 2.5 GHz, 75 Ω	R&S [®] ZRC	1039.9492.72
Mouse with USB interface, optical	R&S [®] PSL-Z10	1157.7060.02
Keyboard with USB interface (US assignment)	R&S [®] PSL-Z2	1157.6870.03
Spare F adapter, female/female	R&S [®] FSHTV-Z61	2111.7111.02

Power sensors supported by R&S[®]FSL-K9

Designation	Type	Order No.
USB Adapter (active) (required for use of power sensors with R&S [®] ETL, when R&S [®] FSL-B5 is not installed)	R&S [®] NRP-Z3	1146.7005.02
USB Adapter (passive) (required for use of power sensors with R&S [®] ETL, when R&S [®] FSL-B5 is not installed)	R&S [®] NRP-Z4	1146.8001.02
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
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



For product brochure, see PD 5213.7748.32
and www.rohde-schwarz.com
(search term: ETL)



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