



up to 40 GHz

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Version
01.00

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R&S® FSP-K93 Application firmware WiMAX IEEE 802.16 OFDMA measurements

Data sheet



ROHDE & SCHWARZ

The specifications of the R&S®FSP-K93 are based on the data sheet specifications of the R&S®FSP spectrum analyzer and are not tested separately. Specifications apply under the following conditions: 30 minutes warm-up time at ambient temperature, specified environmental conditions met, calibration cycle adhered to, and internal calibration performed.

Nominal values indicate design-based expected performance or describe product performance, but are not warranted.

Frequency

Frequency range	RF input	
	R&S®FSP3	10 MHz to 3 GHz
	R&S®FSP7	10 MHz to 7 GHz
	R&S®FSP13	10 MHz to 13.6 GHz
	R&S®FSP30	10 MHz to 30 GHz
	R&S®FSP40	10 MHz to 40 GHz
Maximum channel bandwidth		8.75 MHz

Level

Level range	RF input	-50 dBm to +30 dBm
Level setting		auto, manual

Signal acquisition

Supported standards		IEEE 802.16e-2005 based WiBro
Capture length		24 µs to 16.36 ms
Gate length		24 µs to capture length
Number of analyzed subframes		1 to 10922 subframes
Result length	EVM versus symbol, burst summary list, constellation versus symbol, bit stream	capture length
	FFT spectrum, CCDF	capture length or gate length
	result summary, power versus time, EVM versus carrier, spectrum flatness, spectrum flatness difference	capture length or 1 to 10922 subframes
Frame length		2 ms to 15 ms
Sweep time	spectrum mask	10 ms to 16000 s, auto
	ACPR (adjacent channel power ratio)	10 ms to 16000 s
Triggering	RF input	free run, IF power, external

Measurement parameters

Sampling rate (F_{sampl})		10 MHz
Channel bandwidth (BW)		8.75 MHz
Guard period ratio $G = T_g/T_b$		1/8
N_{FFT}		1024
Zones		DL-PUSC, DL-FUSC, UL-PUSC
Signal analysis	downlink (DL)	in line with signal DL map (auto demod)
	downlink (DL),uplink (UL)	in line with user-defined frame configuration
IDcell		0 to 31
Segments	DL-PUSC	0, 1, 2
Preamble	preamble mode, auto	derived from IDcell and segment setting in line with the standard
	preamble mode, user	defined by the preamble index in line with the standard
Subchannel bitmap used	DL-PUSC	6-bit mask allocating subchannel groups to a segment
Burst modulation format		BPSK (pilots only), QPSK, 16QAM, 64QAM
Pilot tracking	downlink, uplink	phase ON/OFF, timing ON/OFF, level ON/OFF
	downlink, uplink	use of pilots in line with the standard ¹ use of detected pilots ²
Channel estimation range	downlink	preamble only
		preamble and payload
	uplink	payload only
Zone editor		
Zone/segment list	downlink, uplink	zone type, segment, length in symbols, offset in symbols, PermBase
	downlink	PRBS_ID
Zone/segment map		graphical display of frame content defined by zone/segment list
Maximum number of zones/segments per subframe/frame		26
Burst editor		
Burst list	downlink	modulation, no. of subchannels, no. of symbols, offset in subchannels, offset in symbols, boosting, burst type
	uplink	modulation, duration in slots, offset in subchannels, offset in symbols
Burst map		graphical display of zone/segment content defined by burst list
Maximum number of bursts per zone/segment		32
Spectrum emission mask	standard	TTA
	user-definable	spectrum emission mask in line with a user setting file

¹ The application computes the pilot modulation sequence – used for tracking – in line with the standard.

² The application detects the pilot modulation sequence – used for tracking – from the signal to be analyzed.

Result display

Result summary	analyzed subframes min./mean/max. values	center frequency error, clock error, TD power DL preamble, TD power subframe, TD power zone, crest factor, RSSI, RSSI standard deviation, CINR, CINR standard deviation
	analyzed zones/segments min./mean/max. values	BER pilots, EVM data and pilots, EVM data, EVM pilots, unmodulated subcarrier error, I/Q offset, gain imbalance, quadrature error, power DL preamble, power data and pilots, power data, power pilots
Power versus time	min./mean/max. values	full subframe, rising/falling
EVM	min./mean/max. values	EVM versus symbol, EVM versus carrier
Error versus sample	min./mean/max. values	frequency error versus sample, phase error versus sample
Spectrum	min./mean/max. values	spectrum flatness, spectrum flatness difference
	min./mean/max. values	group delay
	clear write, max. hold	TTA, user
	clear write	spectrum FFT
Constellation		constellation diagram versus symbol
Statistics		CCDF
		bit stream
	downlink, uplink	erroneous pilots are highlighted ³
		burst summary list: modulation format, burst area in slots, power, EVM
Limit check	values in line with standard	result list: center frequency error, clock error, EVM data and pilots, EVM data, I/Q offset, spectrum flatness, spectrum flatness difference, spectrum mask, TTA, user-definable

³ The detected pilot sequence is compared with the pilot sequence specified in the standard. The standard-conforming pilot sequence depends on the IDcell, Frame Number [UL], PRBS_ID [DL], PermBase [DL] user settings.

Measurement specification (nominal)

Residual EVM	level –10 dBm, average of 30 subframes, f = 2.4 GHz	
	downlink ^{S1} channel estimation = preamble and payload	–47 dB
Residual EVM	level –25 dBm to +10 dBm, f = 2.4 GHz or 5 GHz	
	downlink ^{S1} : channel estimation = preamble and payload	–43 dB
	uplink ^{S2} : channel estimation = payload	–43 dB
Frequency error measurement	lock range	±30 ppm
	measurement uncertainty	1 Hz + reference frequency uncertainty
Symbol clock error measurement	measurement uncertainty	0.05 ppm
Residual I/Q offset	level –25 dBm to +10 dBm, f = 2.4 GHz or 5 GHz signal ^{S1, S2}	–47 dB
Level uncertainty	spectrum flatness level –25 dBm to +10 dBm, f = 2.4 GHz or 5 GHz signal ^{S1, S2}	
	inner carriers spectral lines from $-N_{used}/4$ to -1 spectral lines from 1 to $N_{used}/4$	0.6 dB
	outer carriers spectral lines from $-N_{used}/2$ to $-N_{used}/4$ spectral lines from $N_{used}/4$ to $N_{used}/2$	1 dB
	test of spectrum mask	0.2 dB
	output power	
	f < 3.6 GHz	0.5 dB
	3 GHz ≤ f ≤ 7 GHz	1 dB
	ACPR (adjacent channel power ratio)	0.5 dB

^{S1} This result is based on the following WiBro DL signal: BW = 8.75 MHz, $N_{FFT} = 1024$, all 30 subchannels assigned to segment 0. The segment contains one QPSK burst using all 30 subchannels over 30 OFDMA symbols.

^{S2} This result is based on the following WiBro UL signal: BW = 8.75 MHz, $N_{FFT} = 1024$. The signal contains one QPSK burst using all 35 subchannels over 30 OFDMA symbols.

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

Ordering information

Designation	Type	Order No.
WiMAX/WiBro Application Firmware (Name hier, auf 1. Seite und in Fußzeile jeweils anders – wie heißt die Firmware richtig?)	R&S®FSP-K93	1308.5500.02
Spectrum Analyzer, 9 kHz to 3 GHz	R&S®FSP3	1164.4391.03
Spectrum Analyzer, 9 kHz to 7 GHz	R&S®FSP7	1164.4391.07
Spectrum Analyzer, 9 kHz to 13.6 GHz	R&S®FSP13	1164.4391.13
Spectrum Analyzer, 9 kHz to 30 GHz	R&S®FSP30	1164.4391.30
Spectrum Analyzer, 9 kHz to 40 GHz	R&S®FSP40	1164.4391.40
Recommended options and extras	see also data sheet for R&S®FSP spectrum analyzer	

Hardware and software requirements for the R&S®FSP-K93 option

Designation	Type	Order No.
R&S®FSP spectrum analyzers with WindowsXP operating system		
512 Mbyte Memory for CPU board with order no. 1091.2520.00	R&S®FSQ-B512	1157.1590.02
512 Mbyte Memory for CPU board with order no. 1091.2808.00	R&S®FSP-B512	1157.1590.04
512 Mbyte Memory for CPU board with order no. 1091.2814.00	R&S®FSP-B512	1157.1590.04
1 Gbyte Memory for CPU board with order no. 1091.2895.00 and 512 Mbyte current memory size.	R&S®FSP-B1G	1164.5575.02
Demodulation Hardware Memory Extension	R&S®FSP-B70	1157.0559.02
Pulse Calibrator	R&S®FSP-B15	1155.1006.02

In order to determine the order no. of the CPU board, press the following hardkeys and softkeys to call up the HARDWARE INFO dialog:

SETUP | SYSTEM INFO | HARDWARE INFO

The CPU board order no. is indicated in the 'CPU Board' row in the ORDER #, MODEL columns.

In order to check the current size of the R&S®FSP memory [**it must be at least 512 Mbyte**], press the following hardkeys and softkeys to call up the FIRMWARE VERSIONS – STATISTICS dialog:

SETUP | SYSTEM INFO | STATISTICS

The 'Memory Size' field shows the currently available memory capacity of the R&S®FSP.



For product brochure, see PD 5213.8815.22
and www.rohde-schwarz.com
(search term: FSP-K93)



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