EUTRA/LTE Uplink
Specifications

R&S®FS-K101PC/-K103PC/-K105PC
R&S®FSV-K101/-K103/-K105
R&S®FSQ-K101/-K103/-K105
R&S®FSW-K103/-K105

ROHDE & SCHWARZ

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The specifications of the R&S®FS-K101/103/105PC, R&S®FSW-K101/105, R&S®FSV-K101/103/105 and R&S®FSQ-K101/103/105 EUTRA/LTE uplink are based on the data sheet specifications of the R&S®FSW, R&S®FSV, R&S®FSQ, R&S®FSG and R&S®RTO1044 signal and spectrum analyzers and oscilloscope, have not been checked separately and are not verified during instrument calibration. Measurement uncertainties are given as 95 % confidence intervals. The specified level measurement errors do not take into account systematic errors due to reduced signal to noise ratio (S/N).

In line with the 3GPP standard, chip rates are specified in Mcps (million chips per second), whereas bit rates and symbol rates are specified in kbps (thousand bits per second) or ksps (thousand symbols per second). Mcps, kbps and ksps are not SI units.

Definitions

General

Product data applies under the following conditions:

- Three hours storage at ambient temperature followed by 30 minutes warm-up operation
- Specified environmental conditions met
- Recommended calibration interval adhered to
- All internal automatic adjustments performed, if applicable

Specifications with limits

Represent warranted product performance by means of a range of values for the specified parameter. These specifications are marked with limiting symbols such as <, ≤, >, ≥, ±, or descriptions such as maximum, limit of, minimum. Compliance is ensured by testing or is derived from the design. Test limits are narrowed by guard bands to take into account measurement uncertainties, drift and aging, if applicable.
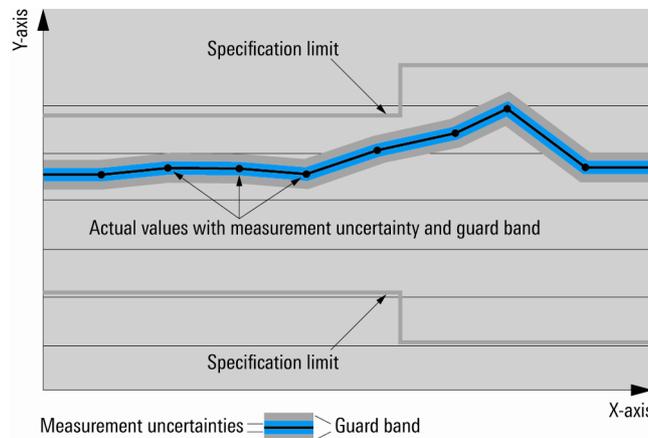
Specifications without limits

Represent warranted product performance for the specified parameter. These specifications are not specially marked and represent values with no or negligible deviations from the given value (e.g. dimensions or resolution of a setting parameter). Compliance is ensured by design.

Typical data (typ.)

Characterizes product performance by means of representative information for the given parameter. When marked with <, > or as a range, it represents the performance met by approximately 80 % of the instruments at production time. Otherwise, it represents the mean value.

Nominal values (nom.)

Characterize product performance by means of a representative value for the given parameter (e.g. nominal impedance). In contrast to typical data, a statistical evaluation does not take place and the parameter is not tested during production.

Measured values (meas.)

Characterize expected product performance by means of measurement results gained from individual samples.

Uncertainties

Represent limits of measurement uncertainty for a given measurand. Uncertainty is defined with a coverage factor of 2 and has been calculated in line with the rules of the Guide to the Expression of Uncertainty in Measurement (GUM), taking into account environmental conditions, aging, wear and tear.

Device settings and GUI parameters are designated with the format "parameter: value".

Typical data as well as nominal and measured values are not warranted by Rohde & Schwarz.

Specifications

Minimum system requirements for PC software R&S®FS-K101/103/105PC

The R&S®FS-K101/103/105PC EUTRA/LTE uplink PC software is compatible with the R&S®FSW, R&S®FSQ, R&S®FSG and R&S®FSV signal and spectrum analyzers.

Running on a PC

Operating system	Windows XP Professional + Service Pack 2, Windows 7
Free hard disk space	1 Gbyte
Free RAM	≥ 512 Mbyte
Graphics resolution	≥ 800 × 600 pixel
Measuring instrument connection	IEC/IEEE bus or LAN connection, VISA driver

Running on an R&S®FSQ

Some options and features require a minimum memory size of at least 1024 Mbyte and are marked accordingly in the following.

R&S®FSQs that do not have a CPU-board order number 1091.3104 (see **SETUP → SYSTEM INFO → HARDWARE INFO**) cannot be upgraded to ≥ 1024 Mbyte memory size.

EUTRA/LTE uplink analysis

Frequency

Frequency range	RF input	same as R&S®FSW/FSQ/FSG/FSV/RTO [1]
	I/Q baseband inputs (R&S®FSQ-B71)	DC to 36 MHz

Level

Level range	RF input	−50 dBm to +30 dBm [1]
	I/Q baseband inputs (R&S®FSQ-B71)	31.6 mV to 5.62 V

Signal acquisition

Supported standards		EUTRA/LTE uplink in line with [1]
Capture length		20.1 ms to 50.1 ms [2]
Sweep time	spectrum mask	auto
	adjacent channel leakage ratio (ACLR)	500 ms
Trigger modes	RF input	free run, external, IF power [1]
	I/Q baseband inputs (R&S®FSQ-B71)	free run, external

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[1] For signal and spectrum analyzers, restricted IF overload, IF power trigger and auto level functionality depending on carrier frequency and bandwidth at carrier frequencies < 50 MHz. For R&S®RTO, the R&S®RTO-K11 I/Q software interface and the R&S®RTO-B4 OCXO 10 MHz are required.

[2] Running R&S®FS-K101/103/105PC on an R&S®FSQ with a memory size of less than 1024 Mbyte, the maximum capture length is restricted to 20.1 ms.

Measurement parameters

Input		RF
	R&S®FSQ-B71 option required	I/Q baseband, balanced-to-unbalanced switchover
	R&S®FSW/FSQ/FSV-B17 option required	digital baseband interface
Duplexing		FDD [3], TDD [4]
Channel bandwidth		1.4/3/5/10/15/20 MHz [5]
MIMO [6]	PUSCH/PUCCH/SRS configuration	1, 2 TX antennas
Resource allocation		one frame can be allocated
	modulation	QPSK, 16QAM, 64QAM
	allocation settings [7]	enable PUSCH [8], enable PUCCH, resource allocation type1 [8]
Analysis mode		PUSCH/PUCCH or PRACH
Spectrum emission mask/adjacent channel leakage power ratio (ACLR) [9]	requirement [10] [11]	General, NS_03, NS_04, NS_06_07
	assumed adjacent channel carrier [10]	EUTRA of same bandwidth, 1.28 Mcps UTRA, 3.84 Mcps UTRA, 7.68 Mcps UTRA
	ACLR noise correction	on/off
	auto gating	on/off

Result display

	R&S®FS-K101/103/105PC	R&S®FSW-K101/105	R&S®FSQ-K101/103/105 R&S®FSV-K101/103/105
Result summary			
EVM PUSCH QPSK	●	●	●
EVM PUSCH 16QAM	●	●	●
EVM DMRS PUSCH QPSK	●	●	●
EVM DMRS PUSCH 16QAM	●	●	●
EVM PUCCH	●	●	●
EVM DMRS PUCCH	●	●	●
EVM PRACH	●	●	
EVM physical channel	●	●	●
EVM physical signal	●	●	●
EVM all	●	●	●
Center frequency error	●	●	●
Sampling error	●	●	●
I/Q offset	●	●	●
I/Q gain imbalance	●	●	●
I/Q quadrature error	●	●	●
Power	●	●	●
Crest factor	●	●	●
Power versus time			
Capture buffer	●	●	●
Power versus symbol and carrier	●		
EVM			
EVM versus carrier	●	●	●
EVM versus symbol	●	●	●
EVM versus symbol and carrier	●		
EVM versus subframe	●	●	●

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[3] R&S®FSW/FSQ/FSV/FS-K101(PC) required.

[4] R&S®FSW/FSQ/FSV/FS-K105(PC) required.

[5] For R&S®FSW, R&S®FSW-B28 required for channel bandwidths >10 MHz.

[6] R&S®FS-K103PC required. The R&S®FS-K103PC option requires at least 1024 Mbyte of memory.

[7] If resource allocation type1 or simultaneous PUSCH/PUCCH transmission is enabled, R&S®FS-K103PC is required.

[8] Only supported by R&S®FS-K101/103/105PC.

[9] Spectrum emission mask/adjacent channel leakage power ratio (ACLR) are not supported for R&S®RTO.

[10] As defined in section 6.6 of 3GPP TS 36.521-1 v10.0.0.

[11] Only supported by R&S®FS-K101/103/105PC and R&S®FSW-K101/105.

	R&S®FS-K101/103/105PC	R&S®FSW-K101/105	R&S®FSQ-K101/103/105 R&S®FSV-K101/103/105
Spectrum			
Power spectrum	●	●	●
Relative inband emission	●	●	●
Channel flatness	●	●	●
Channel flatness SRS	●	●	
Channel flatness difference	●	●	●
Channel group delay	●	●	●
Spectrum mask	●	●	●
ACLR	●	●	●
Constellation			
Constellation diagram	●	●	●
Statistics/miscellaneous			
CCDF	●	●	●
Allocation summary list	●	●	●
Bit stream	●	●	●

Measurement uncertainty (nominal)

UE output power

UE output power	R&S®FSW	R&S®FSQ	R&S®FSG	R&S®FSV	R&S®RTO1044	AUTS [12]
Level uncertainty	same as R&S®FSW/FSQ/FSG/FSV/RTO (see R&S®FSW/FSQ/FSG/FSV/RTO total measurement uncertainty)					0.7 dB

Transmitted signal quality

EVM		R&S®FSW	R&S®FSQ	R&S®FSG	R&S®FSV	R&S®RTO1044 [13]	AUTS [12]
Residual EVM	FDD, 10 MHz, normal cyclic prefix, no SRS, no PUCCH, one allocation with 16 QAM on all PRBs level –25 dBm to +15 dBm input = RF (0.6 GHz < f < 2.7 GHz) channel estimation: pilot and payload phase tracking: off timing tracking: off	< –48 dB	< –46 dB	< –45 dB	< –45 dB	< –41 dB	
Frequency error							
Uncertainty	1 Hz + R&S®FSW/FSQ/FSG/FSV/RTO frequency uncertainty (see R&S®FSW/FSQ/FSG/FSV/RTO reference frequency)						15 Hz

References

[1]   3GPP TS 36.211 V10.0.0 (2010-12), 3rd Generation Partnership Project; Technical Specification Group Radio Access Network; Evolved Universal Terrestrial Radio Access (E-UTRA); Physical Channels and Modulation (Release 10).

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[12] Acceptable uncertainty of test system, in line with 3GPP TS 36.521-1 V9.3.0.

[13] All measurement results obtained under the use of an external reference frequency.

Ordering information

Designation	Type	Order No.
LTE FDD Uplink PC Software (requires R&S®FSPC)	R&S®FS-K101PC	1309.9922.06
LTE MIMO Uplink PC Software (requires either R&S®FS-K101PC or R&S®FS-K105PC)	R&S®FS-K103PC	1309.9945.06
LTE TDD Uplink PC Software (requires R&S®FSPC)	R&S®FS-K105PC	1309.9968.06
FSPC Licence Dongle	R&S®FSPC	1310.0002.02
EUTRA/LTE FDD Uplink Measurement Application	R&S®FSW-K101	1313.1551.02
EUTRA/LTE TDD Uplink Measurement Application	R&S®FSW-K105	1313.1580.02
EUTRA/LTE FDD Uplink Measurement Application	R&S®FSQ-K101	1308.9058.02
EUTRA/LTE Advance UL MIMO (requires either R&S®FSQ-K101 or R&S®FSQ-K105)	R&S®FSQ-K103	1309.9097.02
EUTRA/LTE TDD Uplink Measurement Application	R&S®FSQ-K105	1309.9516.02
EUTRA/LTE FDD Uplink Measurement Application	R&S®FSV-K101	1310.9100.02
EUTRA/LTE Advance UL MIMO (requires either R&S®FSV-K101 or R&S®FSV-K105)	R&S®FSV-K103	1310.9200.02
EUTRA/LTE TDD Uplink Measurement Application	R&S®FSV-K105	1309.9780.02
Signal Analyzer, 2 Hz to 8 GHz	R&S®FSW8	1312.8000.08
Signal Analyzer, 2 Hz to 13.6 GHz	R&S®FSW13	1312.8000.13
Signal Analyzer, 2 Hz to 26.5 GHz	R&S®FSW26	1312.8000.26
Signal Analyzer, 20 Hz to 3.6 GHz	R&S®FSQ3	1313.9100.03
Signal Analyzer, 20 Hz to 8 GHz	R&S®FSQ8	1313.9100.08
Signal Analyzer, 20 Hz to 26.5 GHz	R&S®FSQ26	1313.9100.26
Signal Analyzer, 20 Hz to 40 GHz	R&S®FSQ40	1313.9100.40
Signal Analyzer, 9 kHz to 8 GHz	R&S®FSG8	1309.0002.08
Signal Analyzer, 9 kHz to 13.6 GHz	R&S®FSG13	1309.0002.13
Signal Analyzer, 9 kHz to 3.6 GHz	R&S®FSV3	1307.9002.03
Signal Analyzer, 9 kHz to 7 GHz	R&S®FSV7	1307.9002.07
Signal Analyzer, 9 kHz to 13.6 GHz	R&S®FSV13	1307.9002.13
Signal Analyzer, 9 kHz to 30 GHz	R&S®FSV30	1307.9002.30
Signal Analyzer, 9 kHz to 40 GHz	R&S®FSV40	1307.9002.40
Digital Oscilloscope, 4 GHz, 4 channels (requires R&S®RTO-K11 and R&S®RTO-B4)	R&S®RTO1044	1316.1000.44
I/Q Software Interface	R&S®RTO-K11	1317.2975.02
OCXO 10 MHz	R&S®RTO-B4	1304.8305.02
Recommended options and extras		
28 MHz Analysis Bandwidth	R&S®FSW-B28	1313.1645.02
I/Q Baseband Inputs	R&S®FSQ-B71	1157.0113.03
Digital Baseband Interface	R&S®FSW-B17	1313.0784.02
Digital Baseband Interface	R&S®FSQ-B17	1163.0063.02
Digital Baseband Interface	R&S®FSV-B17	1310.9568.02
Trigger Unit	R&S®FS-Z11	5013.4547.02

About Rohde & Schwarz

Rohde & Schwarz is an independent group of companies specializing in electronics. It is a leading supplier of solutions in the fields of test and measurement, broadcasting, radiomonitoring and radiolocation, as well as secure communications. Established more than 75 years ago, Rohde & Schwarz has a global presence and a dedicated service network in over 70 countries. Company headquarters are in Munich, Germany.

Environmental commitment

ı Energy-efficient products
ı Continuous improvement in environmental sustainability
ı ISO 14001-certified environmental management system

Certified Quality System
ISO 9001

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