

EUTRA/LTE Downlink Specifications

R&S®FS-K100PC/-K102PC/-K104PC

R&S®FSV-K100/-K102/-K104

R&S®FSQ-K100/-K102/-K104

R&S®FSW-K100/-K102/-K104



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The specifications of the R&S®FS-K100/102/104PC, R&S®FSW-K100/102/104, R&S®FSV-K100/102/104 and R&S®FSQ-K100/102/104 EUTRA/LTE downlink 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

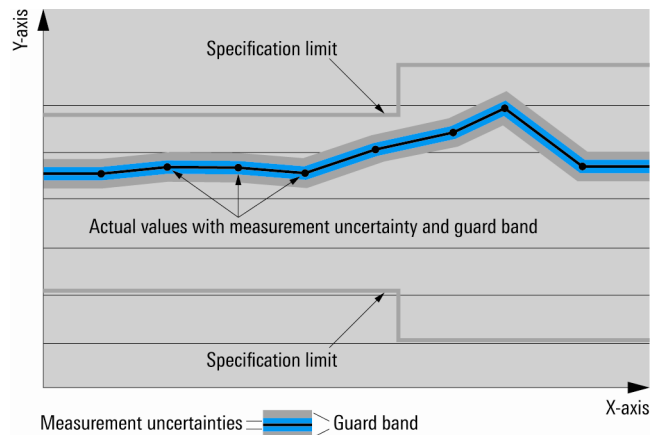
General

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 $<$, \leq , $>$, \geq , \pm , 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-K100/102/104PC

The R&S®FS-K100/102/104PC EUTRA/LTE downlink 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 downlink 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 downlink 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

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-K100/102/104PC 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	configuration	1, 2, 4 TX antennas
	antenna selection (depending on MIMO configuration)	either antenna 1, 2, 3, 4
	antenna selection (depending on MIMO configuration) ⁶	either antenna 1, 2, 3, 4 or all antennas or auto (1 antenna) or auto (2 antennas) or auto (4 antennas)
PDSCH resource allocation		four frames can be allocated
	modulation	QPSK, 16QAM, 64QAM
	MIMO precoding type ⁶	none, transmit diversity, spatial multiplexing, beamforming (UE-spec. RS)
Multicarrier filter		on/off
Spectrum emission mask/adjacent channel leakage power ratio (ACLR) ⁷	category ⁸	A, B (option 1, option 2 ⁹), local area ⁹ , home ⁹
	assumed adjacent channel carrier ⁸	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-K100/102/104PC	R&S®FSW-K100/102/104	R&S®FSQ-K100/102/104 R&S®FSV-K100/102/104
Result summary			
EVM PDSCH QPSK	•	•	•
EVM PDSCH 16QAM	•	•	•
EVM PDSCH 64QAM	•	•	•
EVM physical channel	•	•	•
EVM physical signal	•	•	•
EVM all	•	•	•
Center frequency error	•	•	•
Sampling error	•	•	•
Time alignment error $\Delta 2.1, \Delta 3.1, \Delta 4.1$ ¹⁰	•	•	•
I/Q offset	•	•	•
I/Q gain imbalance	•	•	•
I/Q quadrature error	•	•	•
RSTP (reference signal TX power)	•	•	•
OSTP (OFDM symbol TX power)	•	•	•
Power	•	•	•
Crest factor	•	•	•
Power versus time			
Capture buffer	•	•	•
On/off power	•		•
Power versus symbol and carrier	•		

³ R&S®FSW/FSQ/FSV/FS-K100(PC) option required.

⁴ R&S®FSW/FSQ/FSV/FS-K104(PC) option required.

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

⁶ R&S®FS-K102PC option required. The R&S®FS-K102PC option requires at least 1024 Mbyte of memory.

⁷ Spectrum emission mask/adjacent channel leakage power ratio (ACLR) are not supported for R&S®RTO.

⁸ As defined in section 6.6 of 3GPP TS 36.141 v10.0.0.

⁹ Only supported by R&S®FS-K100/102/104PC.

¹⁰ R&S®FSW/FSQ/FSV/FS-K102(PC) option required.

	R&S®FS-K100/102/104PC	R&S®FSW-K100/102/104	R&S®FSQ-K100/102/104 R&S®FSV-K100/102/104
EVM			
EVM versus carrier	•	•	•
EVM versus symbol	•	•	•
EVM versus symbol and carrier	•		
EVM versus resource block	•	•	
frequency error versus symbol	•	•	•
EVM versus subframe	•	•	•
Spectrum			
Power spectrum	•	•	•
Power versus resource block	•	•	•
Channel flatness	•	•	•
Channel flatness difference	•	•	•
Channel group delay	•	•	•
Spectrum mask	•	•	•
ACLR	•	•	•
Constellation			
Constellation diagram	•	•	•
Statistics/miscellaneous			
CCDF	•	•	•
Signal flow	•		
Allocation summary list	•	•	•
Bit stream	•	•	•
Allocation ID versus symbol and carrier	•		
Channel decoder results	•	•	
Beamforming			
UE RS weights (magnitude/phase)	•		

Measurement uncertainty (nominal)

Base station output power

Base station output power	R&S®FSW	R&S®FSQ	R&S®FSG	R&S®FSV	R&S®RTO1044	AUTS ¹¹
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 ¹²	AUTS ¹¹
Residual EVM test model 3.1, 10 MHz ¹³ level -25 dBm to +15 dBm input = RF (0.6 GHz < f < 2.7 GHz) channel estimation: "3GPP EVM definition" EVM calculation method: "3GPP EVM definition" phase tracking: off timing tracking: off	< -49 dB	< -47 dB	< -46 dB	< -46 dB	< -42 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)					12 Hz
Time alignment between transmitter branches						
Uncertainty	test model 1.1, 10 MHz ¹³	< 2.5 ns	< 2.5 ns	< 2.5 ns	< 2.5 ns	25 ns

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).

¹¹ Acceptable uncertainty of test system, in line with 3GPP TS 36.141 v10.0.0.

¹² All measurement results obtained under the use of an external reference frequency.

¹³ Test model as defined in section 6.1 of 3GPP TS 36.141 v10.0.0.

Ordering information

Designation	Type	Order No.
LTE FDD Downlink PC Software (requires R&S®FSPC)	R&S®FS-K100PC	1309.9916.06
LTE MIMO Downlink PC Software (requires either R&S®FS-K100PC or R&S®FS-K104PC)	R&S®FS-K102PC	1309.9939.06
LTE TDD Downlink PC Software (requires R&S®FSPC)	R&S®FS-K104PC	1309.9951.06
FSPC Licence Dongle	R&S®FSPC	1310.0002.02
EUTRA/LTE FDD Downlink Measurement Application	R&S®FSW-K100	1313.1545.02
EUTRA/LTE Downlink MIMO (requires either R&S®FSW-K100 or R&S®FSW-K104)	R&S®FSW-K102	1313.1568.02
EUTRA/LTE TDD Downlink Measurement Application	R&S®FSW-K104	1313.1574.02
EUTRA/LTE FDD Downlink Measurement Application	R&S®FSQ-K100	1308.9006.02
EUTRA/LTE Downlink MIMO (requires either R&S®FSQ-K100 or R&S®FSQ-K104)	R&S®FSQ-K102	1309.9000.02
EUTRA/LTE TDD Downlink Measurement Application	R&S®FSQ-K104	1309.9422.02
EUTRA/LTE FDD Downlink Measurement Application	R&S®FSV-K100	1310.9051.02
EUTRA/LTE Downlink MIMO (requires either R&S®FSV-K100 or R&S®FSV-K104)	R&S®FSV-K102	1310.9151.02
EUTRA/LTE TDD Downlink Measurement Application	R&S®FSV-K104	1309.9774.02
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 4 GHz	R&S®FSV4	1321.3008.04
Signal Analyzer, 9 kHz to 7 GHz	R&S®FSV7	1321.3008.07
Signal Analyzer, 9 kHz to 13.6 GHz	R&S®FSV13	1321.3008.13
Signal Analyzer, 9 kHz to 30 GHz	R&S®FSV30	1321.3008.30
Signal Analyzer, 9 kHz to 40 GHz	R&S®FSV40	1321.3008.40
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
RF Preamplifier	R&S®FSW-B24	1313.0832.13/26
Electronic Attenuator, 1 dB steps	R&S®FSW-B25	1313.0990.02
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

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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

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

Certified Quality System
ISO 9001

Rohde & Schwarz GmbH & Co. KG

www.rohde-schwarz.com

Regional contact

- ▮ Europe, Africa, Middle East | +49 89 4129 12345
customersupport@rohde-schwarz.com
- ▮ North America | 1 888 TEST RSA (1 888 837 87 72)
customer.support@rsa.rohde-schwarz.com
- ▮ Latin America | +1 410 910 79 88
customersupport.la@rohde-schwarz.com
- ▮ Asia/Pacific | +65 65 13 04 88
customersupport.asia@rohde-schwarz.com
- ▮ China | +86 800 810 8228/+86 400 650 5896
customersupport.china@rohde-schwarz.com

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