

R&S®FS-K96/ R&S®FS-K96PC OFDM Vector Signal Analysis Software Specifications



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The specifications of the R&S®FS-K96/R&S®FS-K96PC OFDM vector signal analysis software are based on the data sheet specifications of the R&S®FSQ/FSG/FSUP/FSV/FSVR/FSW signal and spectrum analyzers and the R&S®RTO digital oscilloscope. They 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). Specifications apply under the following conditions: 30 minutes warm-up time at ambient temperature, specified environmental conditions met, calibration cycle adhered to, and all internal automatic adjustments performed.

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. EVM). In contrast to typical data, a statistical evaluation does not take place and the parameter is not tested during production.

Specifications

Minimum system configuration

| | | |
|---------------------------------|----------|---|
| Operating system | | Windows XP Professional with Service Pack 2 |
| Free hard disk space | | 1 Gbyte |
| Free RAM | | ≥ 1 Gbyte |
| Graphics resolution | | ≥ XGA (800 × 600 pixel) |
| USB | | 1 free USB port for connecting the Smart Card reader (if no PC built-in Smart Card reader is used) |
| Measuring instrument connection | hardware | IEC/IEEE bus or LAN connection |
| | software | VISA driver: National Instruments VISA Version ≥ 4.2 (included) |

Inputs

| | | |
|------------------------|--|-------------------------------------|
| RF input | R&S®FSQ | frequency range same as base system |
| | R&S®FSG | |
| | R&S®FSUP | |
| | R&S®FSV | |
| | R&S®FSVR | |
| | R&S®FSW | |
| | R&S®RTO ¹ | |
| Digital baseband input | only with R&S®FSQ-B17/FSV-B17 option | |
| Analog baseband input | only with R&S®FSQ-B71 option or R&S®RTO ¹ | |
| File | *.iqw (IIIQQQ or IQIQIQ), *.dat (ASCII), *.vv (encrypted), *.iq.tar (iq-tar) | up to 10 Msample |

¹ Requires R&S®RTO-K11 I/Q software interface.

Signal acquisition

| | | |
|-----------------------|---|-----------------------|
| Instrument connection | | LAN, IEC/IEEE bus |
| Record length | | up to 10 Msample |
| | The usable record length depends on the OFDM system configuration, the PC memory available for the application and the Rohde & Schwarz instrument. ² The record length is reduced if the adjustable channel filter is selected. | |
| Triggering | RF input | free run |
| | | external |
| | | IF power ³ |
| | digital baseband input | free run |
| | | external ⁴ |
| | analog baseband input | free run |
| external | | |

Bandwidth

| | | | |
|--|--------------------------|--------------------|---|
| Usable I/Q bandwidth | R&S [®] FSQ | standard | 28 MHz |
| | | up to ⁵ | 120 MHz |
| | R&S [®] FSG | standard | 28 MHz |
| | R&S [®] FSUP | standard | 28 MHz |
| | R&S [®] FSV | standard | 28 MHz |
| | | up to ⁵ | 40 MHz |
| | R&S [®] FSVR | standard | 40 MHz |
| | R&S [®] FSW | standard | 10 MHz |
| | | up to ⁵ | 160 MHz |
| R&S [®] RTO | up to ⁵ | 4 GHz (–3 dB) | |
| Channel filter | | | built-in decimation filter, adjustable software filter |
| Sample rate | R&S [®] FSQ | standard | 400 Hz to 81.6 MHz |
| | R&S [®] FSQ-B72 | | 400 Hz to 326.4 MHz |
| | R&S [®] FSG | standard | 400 Hz to 81.6 MHz |
| | R&S [®] FSUP | standard | 400 Hz to 81.6 MHz |
| | R&S [®] FSV | standard | 100 Hz to 45 MHz |
| | R&S [®] FSV-B70 | | 100 Hz to 128 MHz |
| | R&S [®] FSVR | standard | 100 Hz to 128 MHz |
| | R&S [®] FSW | standard | 100 Hz to 200 MHz |
| | R&S [®] RTO | standard | 1 kHz to 10 GHz |
| The maximum sample rate is reduced if the adjustable channel filter is selected. | | | |

OFDM system configuration

| | | |
|-----------------------------|----------------------|---|
| Manual settings | FFT length | 8 to 32768 (all integer numbers allowed) |
| | cyclic prefix length | 4 to FFT length |
| Configuration file settings | cell types | zero, pilot, data, don't care |
| | pilot modulation | arbitrary complex numbers |
| | data modulation | each data cell individually assigned to a constellation |
| | constellations | arbitrary complex numbers, e.g. PSK or QAM |

² Example: approx. 600 Mbyte memory required for 4 Msample (FFT length 2048, CP length 64, 68 symbols per frame, 27 frames analyzed).

³ Restricted IF power trigger functionality for carrier frequencies < 50 MHz. IF power trigger not available for R&S[®]RTO.

⁴ Available only for R&S[®]FSV-B17.

⁵ Depends on the hardware configuration. For details, see R&S[®]FSV/FSQ/FSW and R&S[®]RTO data sheets.

Result display

| | | |
|------------------------------|----------------|--|
| Result summary | min./mean/max. | EVM all |
| | | EVM data |
| | | EVM pilot |
| | | frequency error |
| | | sample clock error |
| | | I/Q offset |
| | | gain imbalance |
| | | quadrature error |
| | | frame power |
| | | crest factor |
| | | Power |
| power versus carrier | | |
| power versus symbol | | |
| capture buffer | | |
| power spectrum | | |
| EVM | | EVM versus symbol × carrier |
| | | EVM versus carrier |
| | | EVM versus symbol |
| | | error frequency/phase |
| Channel | | flatness |
| | | group delay |
| | | impulse response |
| Constellation | | constellation diagram |
| | | constellation versus carrier |
| | | constellation versus symbol |
| Miscellaneous and statistics | | CCDF |
| | | signal flow |
| | | demodulation report |
| | | allocation matrix as defined in configuration file |

Measurement parameters

| | | |
|----------------------|---|--|
| Burst search | | on/off |
| Synchronization | time synchronization | cyclic prefix/repetitive preamble |
| | parameter estimation and channel estimation | pilot aided/pilot and data aided |
| Modulation detection | | defined by configuration file/ per symbol/per carrier |
| Compensation | phase tracking | on/off |
| | timing tracking | on/off |
| | level tracking | on/off |
| | channel compensation | on/off |

EVM measurement specification (nominal)

Averaged EVM of pilots and data measured using the following signals:

- WLAN IEEE 802.11g OFDM, 64QAM, 100 symbols per frame
- WiMAX™ IEEE 802.16 OFDM, 16QAM, 14 MHz bandwidth, 100 symbols per frame
- DVB-T 2k mode, QPSK, 6 MHz bandwidth, 68 symbols per frame

EVM normalization is set to "RMS Pilots & Data"

| EVM | | |
|---|--|----------|
| Residual EVM WLAN IEEE 802.11g OFDM | level -25 dBm to +10 dBm, properly adjusted reference level, center frequency 2.4 GHz, parameter estimation: pilot and data aided | |
| | R&S®FSQ | < -45 dB |
| | R&S®FSG | < -44 dB |
| | R&S®FSUP | < -44 dB |
| | R&S®FSV | < -44 dB |
| | R&S®FSVR | < -44 dB |
| | R&S®FSW | < -47 dB |
| | R&S®RTO | < -42 dB |
| Residual EVM WiMAX™ IEEE 802.16 OFDM | level -25 dBm to +10 dBm, properly adjusted reference level, center frequency 3.417 GHz, parameter estimation: pilot and data aided | |
| | R&S®FSQ | < -48 dB |
| | R&S®FSG | < -47 dB |
| | R&S®FSUP | < -47 dB |
| | R&S®FSV | < -45 dB |
| | R&S®FSVR | < -45 dB |
| | R&S®FSW | < -49 dB |
| | R&S®RTO | < -42 dB |
| Residual EVM DVB-T 2k mode | level -25 dBm to +10 dBm, properly adjusted reference level, center frequency 800 MHz, parameter estimation: pilot and data aided | |
| | R&S®FSQ | < -51 dB |
| | R&S®FSG | < -50 dB |
| | R&S®FSUP | < -50 dB |
| | R&S®FSV | < -49 dB |
| | R&S®FSVR | < -49 dB |
| | R&S®FSW | < -54 dB |
| | R&S®RTO | < -43 dB |

Ordering information

| Designation | Type | Order No. |
|--|--------------|--------------|
| OFDM Vector Signal Analysis Software, PC and analyzer required (requires R&S®FSPC) | R&S®FS-K96 | 1310.0202.06 |
| OFDM Vector Signal Analysis Software, usable with and without analyzer (requires R&S®FSPC) | R&S®FS-K96PC | 1310.0219.06 |
| Upgrade from R&S®FS-K96 to R&S®FS-K96PC (requires R&S®FSPC) | R&S®FS-K96U | 1310.0225.06 |
| License Dongle | R&S®FSPC | 1310.0002.03 |
| 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, 20 Hz to 8 GHz | R&S®FSUP8 | 1166.3505.09 |
| Signal Analyzer, 20 Hz to 26.5 GHz | R&S®FSUP26 | 1166.3505.27 |
| Signal Analyzer, 20 Hz to 50 GHz | R&S®FSUP50 | 1166.3505.51 |
| 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 |
| Real-Time Spectrum Analyzer, 10 Hz to 7 GHz | R&S®FSVR7 | 1311.0006.07 |
| Real-Time Spectrum Analyzer, 10 Hz to 13.6 GHz | R&S®FSVR13 | 1311.0006.13 |
| Real-Time Spectrum Analyzer, 10 Hz to 30 GHz | R&S®FSVR30 | 1311.0006.30 |
| Real-Time Spectrum Analyzer, 10 Hz to 40 GHz | R&S®FSVR40 | 1311.0006.40 |
| 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 |
| Digital Oscilloscope, 600 MHz, 10 Gsample/s, 20/40 Msample, 2 channels | R&S®RTO1002 | 1316.1000.02 |
| Digital Oscilloscope, 600 MHz, 10 Gsample/s, 20/80 Msample, 4 channels | R&S®RTO1004 | 1316.1000.04 |
| Digital Oscilloscope, 1 GHz, 10 Gsample/s, 20/40 Msample, 2 channels | R&S®RTO1012 | 1316.1000.12 |
| Digital Oscilloscope, 1 GHz, 10 Gsample/s, 20/80 Msample, 4 channels | R&S®RTO1014 | 1316.1000.14 |
| Digital Oscilloscope, 2 GHz, 10 Gsample/s, 20/40 Msample, 2 channels | R&S®RTO1022 | 1316.1000.22 |
| Digital Oscilloscope, 2 GHz, 10 Gsample/s, 20/80 Msample, 4 channels | R&S®RTO1024 | 1316.1000.24 |
| Digital Oscilloscope, 4 GHz, 20 Gsample/s, 20/80 Msample, 4 channels | R&S®RTO1044 | 1316.1000.44 |
| I/Q Software Interface | R&S®RTO-K11 | 1317.2975.02 |
| Recommended options and extras | | |
| Analog Baseband Inputs | R&S®FSQ-B71 | 1157.0113.03 |
| Digital Baseband Interface | R&S®FSQ-B17 | 1163.0063.02 |
| | R&S®FSV-B17 | 1310.9568.02 |
| I/Q Bandwidth Extension | R&S®FSQ-B72 | 1157.0336.12 |
| | R&S®FSV-B70 | 1310.9645.02 |
| | R&S®FSW-B28 | 1313.1645.02 |
| | R&S®FSW-B40 | 1313.0861.02 |
| | R&S®FSW-B80 | 1313.0878.02 |
| | R&S®FSW-B160 | 1313.1668.02 |
| OCXO 10 MHz | R&S®RTO-B4 | 1304.8305.02 |
| Accessories supplied | | |
| Software and operating manual (on CD-ROM), National Instruments VISA Version (on CD-ROM) | | |

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