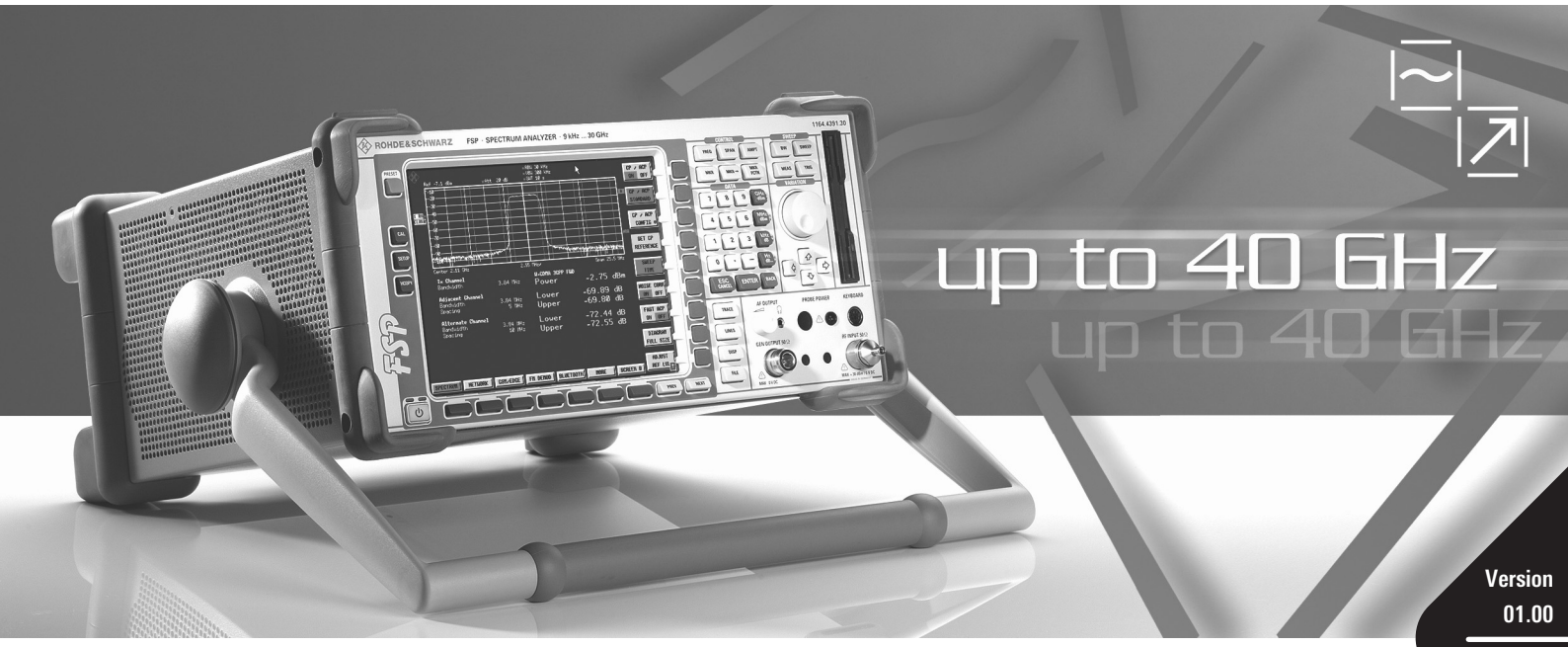


Version 01.00

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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<br>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]<br>use of detected pilots[2] |
| Channel estimation range | downlink | preamble only<br>preamble and payload<br>payload only |
| | 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<br>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<br>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,<br>phase error versus sample |
| Spectrum | min./mean/max. values | spectrum flatness,<br>spectrum flatness difference |
| | min./mean/max. values | group delay |
| | clear write, max. hold | TTA, user |
| | clear write, max. hold | ACP (absolute/relative) |
| | 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<br>spectral lines from $-N_{used}$ /4 to –1<br>spectral lines from 1 to $N_{used}$ /4 | 0.6 dB |
| | outer carriers<br>spectral lines from $-N_{used}$ /2 to $-N_{used}$ /4<br>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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