



ROHDE & SCHWARZ

Test and Measurement
Division

Release Notes

WiMAX/WIBRO 802.16 OFDM/OFDMA, WiMAX 802.16e MIMO

Application Firmware R&S FSQ-K92/K93/K94 Release 4.60

for R&S FSQ, FSG, FMU Analyzer Firmware V4.6x

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History

<u>Date</u>	<u>Rel Note Rev</u>	<u>Changes</u>
28 July 2010	1	First revision of K94 Application Firmware for V4.60

General Topics

Compatibility of the R&S FSQ-K92/K93/K94 WIMAX Application Firmware with other Firmware Releases

The following table shows the compatible versions of the basic analyzer firmware and the WIMAX Application Firmware.

Note: *V3.90SP2 was the last release of the K92-only firmware. All releases from V3.91 to V4.2x are of the combined K92/K93 firmware. All releases from V4.30 onwards are of the combined K92/K93/K94 firmware.*

Table of compatible versions:

R&S FSQ-K92 Application Firmware	R&S FSQ-K92/K93 Application Firmware	R&S FSQ-K92/K93/K94 Application Firmware	R&S FSQ Basic Firmware	R&S FMU Basic Firmware	R&S FSG Basic Firmware
-	-	4.60	4.65	-	4.69
-	-	4.51	4.55 SP2	-	4.59 SP1
-	-	4.50	4.55 SP1	-	4.59
-	-	4.41	4.45 SP1	-	4.49 SP1
-	-	4.40	4.45 SP1	-	4.49 SP1
-	-	4.40	4.45	-	4.49
-	-	4.30SP1	4.35	4.38	4.39
-	-	4.30	4.35	-	4.39
-	4.21	-	4.25	-	4.29
-	4.20	-	-	-	4.29
-	4.10	-	4.15	-	-
-	4.00	-	4.05	-	-
-	3.91	-	3.95SP2	-	-
3.90SP2	-	-	3.95SP2	-	-
3.90SP1	-	-	3.95SP1	-	-
3.90	-	-	3.95	-	-
3.80	-	-	3.85	-	-
3.72	-	-	3.75	-	-
3.70	-	-	3.75	-	-
3.61	-	-	3.65	-	-
3.60	-	-	3.65	-	-
3.55	-	-	3.55	-	-

Firmware Update of the R&S FSQ-K92/K93/K94 WIMAX Application Firmware

Since basic firmware version 4.2x a ZIP file with the update sets of the basic system firmware and all available applications is provided. This ZIP file is available in the instruments FIRMWARE section, e.g. R&S FSQ of the Service Board on GLORIS.

Please follow the steps described in the instrument's basic firmware release note to perform a complete firmware update.

Enabling the Application Firmware via License Key Code Entry

This section can be skipped if the option key was entered once.

After installing the application firmware package a license key for validation must be entered. The license key is printed either on a label on the rear panel of the instrument or delivered as a part of the R&S FSQ-K92/K93/K94 WIMAX application firmware package.

Note the K94 WiMAX 802.16e MIMO application firmware requires a R&S FSQ-K92/K93 and a R&S FSQ-K94 option key.

The key sequence for entering the license key is:

SETUP - GENERAL SETUP – OPTIONS - INSTALL OPTION

Use the numeric keypad to input the license key number and press ENTER.

- On a successful validation the message 'option key valid' will appear. The instrument will perform an automatic reboot.
- If the validation failed, the application firmware is not installed.
The most probable reason will be that the instrument is not equipped with the correct basic firmware version. Therefore a messagebox will appear asking for installation of the correct basic firmware version.

If the application firmware package was not installed prior to entering the license key code, a message will appear asking for installation of the application firmware package.

In any case please make sure that the correct basic firmware version and the application firmware package is installed prior to entering the license key code..

In case of upgrading to FSQ-K93 from FSQ-K92 the upgrade key is supplied. This key needs to be entered (as described above) in addition to the existing FSQ-K92 key-code.

In order to enable the FSQ-K94 enter the provided K94 key according to the description above. As mentioned above a R&S FSQ-K92/K93 and a R&S FSQ-K94 option key is required.

System Memory Requirements

For FSQ-K92/K93/K94 WIMAX Application Firmware, an installed system memory of 512MByte is essential. The FSQ-K92/K93/K94 firmware will generate an error message during activation, if available system memory does not meet the requirements. This may happen for FSQ-K92/K93/K94, if FS-K30, FSQ-K70 or FSQ-K90/91 was active before starting WIMAX.



For instruments, shipped with 256MByte system memory, a memory extension FSQ-B512, order number 1157.1590.02, is available.

The system memory size can be easily checked by pressing SETUP – SYSTEM INFO – STATISTICS, item "Memory size". This item is available since version 3.25 of the base system firmware.

Application Firmware WiMAX IEEE 802.16-2004 OFDM, IEEE 802.16e-2005 OFDMA, WiBro and WiMAX 802.16e MIMO

Literature:

- [1] IEEE Std 802.16-2004, 1 October 2004. Part 16: Air Interface for Fixed Broadband Wireless Access Systems.
- [2] 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.
- [3] IEEE P802.16-2004/Cor1/D5; 2005-09-12.
- [4] IEEE Std 802.16e-2005 and IEEE Std 802.16-2004/Cor1-2005, IEEE Standard for Local and metropolitan area networks Part 16: Air Interface for Fixed and Mobile Broadband Wireless Access Systems Amendment 2: Physical and Medium Access Control Layers for Combined Fixed and Mobile Operation in Licensed Bands.
- [5] P802.16Rev2/D8 December 2008 (Revision of IEEE Std 802.16-2004 and consolidates material from IEEE Std 802.16e-2005, IEEE Std 802.16-2004/Cor1-2005, IEEE Std 802.16f-2005 and IEEE Std802.16g-2007).

See also section 'IEEE 802.16e-2005 SISO- and MIMO-OFDMA/WiBro Measurements' in the FSQ-K92/K93/K94 manual.

General comments regarding the Application Firmware WiMAX IEEE 802.16 OFDM IEEE 802.16e-2005 OFDMA, WiBro FSQ-K92/K93

Supported features of the IEEE802.16-2004 OFDM standard

Standard	IEEE 802.16-2004 OFDM
Duplexing Mode	TDD, FDD, H-FDD
Frame Structure	TDD mode according to [1] "Figure 207 Example of OFDM frame structure with TDD". FDD mode according to [1] "Figure 208 Example of OFDM frame structure with FDD".
Preambles	$(P_{4 \times 64}, P_{EVEN})$ Long Preamble (LP), (P_{EVEN}) Short Preamble (SP), P_{SUB}
TTG, RTG	The power off periods TTG, RTG between the subframes must be ≥ 0 s
*Modulation ¹	BPSK, QPSK, 16QAM, 64QAM
Miscellaneous	a. In DL Subframe the FCH BPSK 1/2 Symbol is taken into account.

The restrictions related to features marked with a * will be removed in a future version of the FSQ-K92/K93.

Currently NOT supported features of the IEEE802.16-2004 OFDM standard

Standard	IEEE 802.16a OFDM
Frame Structure	PMP-AAS Zones, Mesh frame structure
Preambles	P_{AAS}, P_{ODD} ,
Miscellaneous	a. Transmit diversity: Space-Time Coding (STC).

General comments regarding the Application Firmware WiMAX IEEE 802.16e MIMO FSQ – K94

1. It is not possible to abort a measurement once the DSP has started to process the captured data (if the measurement is a triggered measurement that has not yet triggered this can still be aborted).
2. A DL-MIMO zone has – as second or higher zone – no prefixed preamble. Therefore set *Demod Settings / Channel Estimation Range = Payload Only*.
3. MIMO systems with maximal 2 DUT Tx antennas are supported.
4. Supported MIMO scenarios
Matrix A: Antenna 0, Antenna 1, Antenna 0 + Antenna 1
Matrix B: Antenna 0, Antenna 1, Antenna 0 + Antenna 1

¹ At the moment the FSQ-K92 measurement application can't distinguish between different coding rates for the same modulation format. I.e. in case auto demod functionality is used, the measurement application can detect the different modulation formats {BPSK, QPSK, 16QAM, 64QAM} but it can't distinguish the different coding rates applied with a modulation format. As a consequence, the user is at the moment responsible,

1. that the signal to be analyzed uses only one profile (modulation format, coding rate) at all and
2. the Demodulator is set according to this value.

In example the signal to be analyzed contains the profiles (modulation format A, coding rate B) and (modulation format C, coding rate D).

The signal to be analyzed must hold the following condition

$[A=C \Rightarrow B=D]$

in order to produce correct measurement results.

WIMAX IEEE 802.16e MIMO FSQ – K94 measurement results

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 std dev., CINR, CINR std. dev.
	analyzed zones/segments min./mean/max. values	BER pilots, EVM data and pilots, EVM data, EVM pilots, EVM preamble, unmodulated subcarrier error, IQ offset, gain imbalance, quadrature error, power DL preamble, power data and pilots, power data, power pilots, power null pilots
Power vs time	min./mean/max. values	capture memory comprises also time to capture buffer, subframe length full subframe, rising/falling
EVM	min./mean/max. values	EVM versus symbol, EVM versus carrier
Spectrum	min./mean/max. values	spectrum flatness spectrum flatness difference
	min./mean/max. values	preamble channel frequency response
	min./mean/max. values	group delay
	clear write, max hold	spectrum mask IEEE ² , ETSI ³ , TTA, user
	clear write, max hold	ACP (absolute/relative)
	clear write	spectrum FFT
Constellation		constellation diagram versus symbol
Statistics		bit stream
		CCDF
		burst summary modulation format, burst area in slots, power, burst power null pilots, EVM
Limit check	values according to standard	result list center frequency error, clock error, EVM data and pilots, EVM data, IQ offset spectrum flatness spectrum flatness difference spectrum mask IEEE ⁴ , ETSI ⁵ , TTA, user definable

Abbreviations and acronyms:

$P_{4 \times 64}$, P_{EVEN} , P_{ALL} , P_{AAS} , P_{ODD} , P_{SUB}	Different Preambles.
AAS	Adaptive Antenna System
CRS	Central Radio Station

² According to [1] IEEE 802.16-2004.

³ According to [10] ETSI EN 301 021 V1.6.1 (2003-07).

⁴ According to [1] IEEE 802.16-2004.

⁵ According to [10] ETSI EN 301 021 V1.6.1 (2003-07).

DSP	Digital Signal Processing
DL	Down Link
DUT	Device Under Test
FCH	Frame Control Header
FDD	Frequency Division Duplexing
H-FDD	Half-Duplex Frequency Division Duplex
LP	Long Preamble
MIMO	Multiple Input Multiple Output
RTG	Receive/Transmit Transition Gap
SP	Short Preamble
TDD	Time Division Duplexing
TS	Terminal Station
TTG	Transmit/Receive Transition Gap
UL	Up Link

New Functions in Version 4.60

None.

Improvements with option R&S FSQ-K92/K93/K94 WIMAX Application Firmware

The version numbers in brackets indicate the version in which the issue was observed for the first time.

1. (V4.50) **Corrected problem with user auto demodulation selecting reverting back to predefined.**
2. (V4.50) **Improved error reporting when analysing none standard signals.**
3. (V4.50) **FSQ-B17: Correct LVDS status now reported:**
Previously if an error occurred with the LVDS connection a pass status was reported. The correct status is now reported correctly.

Known Issues

The version numbers in brackets indicate the version in which the issue was observed for the first time. A version specified as "K92" implies an issue affecting both FSQ-K92 and FSQ-K93. An issue specified as "K93" affects FSQ-K93 only.

Manual Operation and IEC/IEEE Bus

1. (K93 V4.21) Subchannel Renumbering in second or higher DL-PUSC zone.

In case all SC indicator is set for the second or higher DL-PUSC zone ios set, subchannel renumbering is required according to [IEEE 802.16e-2005].361 "8.4.4.4 Allocation of subchannels for FCH and DL-MAP, and logical subchannel numbering".

2. (K93 V4.21) Analyzing UL-AMC zones

The UL-AMC zone has to be the first UL zone, in order to be analyzed!

3. (K93 V4.10) Simultaneous display of frame configuration and editing via SCPI

Changes to the frame configuration made via remote control while the Frame Configuration dialog is open are not reflected on screen. In addition, closing the Frame Configuration dialog will save the displayed configuration, losing any changes made via remote control while the dialog was open.

In normal remote operation (via GPIB or RSIB) the Frame Configuration dialog is automatically closed when SCPI commands are issued, preventing this situation from arising. However, using IECWIN via NT Pipe does not force the dialog to be closed.

Workaround: Close the Frame Configuration dialog prior to using the CONF:WIM:ZONE remote control commands.

4. (K93 V4.10) OFDMA/WiBro DEMOD settings

Subchannel Bitmap bits that are not available in FFT sizes 512/128 are disabled but may remain ticked. This has no effect on measurement behaviour.

Workaround: None.

5. (K93 V4.10) SEM Settings File Name

When switching from SEM According To: User to one of the build-in types (ETSI/IEEE/TTA), the File Name box does not correctly refresh.

Workaround: Close and reopen the dialog by using the SEM SETTINGS softkey.

6. (K92 V3.60) Result Summary RSSI results

The RSSI results in List Mode correspond to the preamble power. The ADC resolution is not taken into account.

Workaround: None.

7. (K92 V3.60) IF Power Trigger

IF Power Trigger does not work reliably, for signals with a 28MHz channel bandwidth.

Workaround: None.

8. (K92 V3.60) Spectrum ETSI Mask [2]

The ETSI Spectrum Mask settings in the UL [TS] – Table 6: Spectrum analyzer settings for RF power spectrum measurement – case leads to a non practicable measurements. Unless this situation is improved, the UL [TS] is treated in the same way as the DL [CRS].

Workaround: None.

9. (K92 V3.60) Possible overload condition when measuring below 200MHz

In certain circumstances an overload condition can occur when using autolevel below 200MHz

Workaround: Switch off autolevel and use manual settings to configure the individual measurement parameters prior to performing a measurement.

10. (K92 V3.90) HCOPI "PRINT SCREEN" in MSPaint

The WMF generated by "PRINT SCREEN" does not correctly display in Microsoft Paint. In particular, the screen shot is displayed with a partially black background.

Workaround: Use a more fully featured WMF viewer. For example, preview using the Microsoft Windows Picture and Fax Viewer, or insert into a Microsoft Word document.

11. (K92 V3.91) Split screen state after remote control

After using remote commands (e.g. via IECWin), the SPLIT / FULL SCREEN softkey state may not match that actually in use.

Workaround: Switch between full screen and split screen to correct the softkey states.

12. (K92 V3.90) Noise Correction enhancement label

The NOR label should be displayed when running a Spectrum ACPR measurement with Noise Correction enabled. Occasionally the label is not displayed.

Workaround: None.

13. (K92 V3.90) Auto demod does not work for already captured data

Auto Demod [Use Signal MAP for analysis] currently doesn't work with IMPORTed *.iqw files or when re-analyzing data using the REFRESH hot key.

Workaround: None.

14. (K93 V4.30) Fast Feedback Bursts

Currently fast feedback bursts have to be defined inside the UL-control region. Therefore the UL-control region must be defined first!

Workaround: Set the Frame Global | UL Control Region Length first according to the signal requirements. Afterwards define the fast feedback bursts in the Frame Config dialog inside the specified control region.

15. (K94 V4.30) Matrix A, B Antenna 1 Result Summary of Analyzed Zone/Segment measurements

Changing for Screen A 'A: Result Overview of Analyzed Zone/Segment Tx0 A: Result Overview of Analyzed Zone/Segment Rx0 ' from [DISP] split screen

IEEE 802.16e-2005 MIMO					
Frequency/Fs:	1 GHz / 11.2 MHz	Signal Level Setting/Ext. Att:	-15.2 dB / 0 dB	Capture Time/No. Samples:	3 ms / 33601
Zone/Seg:	DL-PUSC, ID=5, Seg=0	MIMO Meas Setup:	2 Tx X 1 Rx	Zone Offset / Len:	3 / 16 Symbols

A: Result Overview of Analyzed Zone/Segment			Tx:0
BER Pilots	0.00	0.00	%
IQ Offset	...	-15.00	dB
Gain Imbalance	-0.89		dB
Quadrature Error	24.063		°

A: Result Overview of Analyzed Zone/Segment			Rx:0
EVM Data and Pilots	-56.15	-15.00	dB
Power Data and Pilots	-16.15		dBm
Power Pilots	-11.43		dBm
Power Null Pilots	-72.34		dBm

B: Result Overview of Analyzed Zone/Segment			Tx:1
BER Pilots	0.00	0.00	%
IQ Offset	...	-15.00	dB
Gain Imbalance	-0.01		dB
Quadrature Error	-0.011		°

Measurement Complete

SPECTRUM
WIMAX
AUTO LVL
RUN SGL
RUN CONT
REFRESH
SCREEN B

GENERAL
SETTINGS

DEMOD
SETTINGS

DISPLAY
GRAPH

FLATNESS
FLAT GRDEL

FLATNESS
DIFFERENCE

SPECTRUM
MASK

SPECTRUM
FFT

ACP
ABS REL

FILE
MANAGER

to [DISP] full screen

IEEE 802.16e-2005 MIMO							
Frequency/Fs:	1 GHz / 11.2 MHz	Signal Level Setting/Ext. Att:	-15.2 dB / 0 dB	Capture Time/No.Samples	3 ms / 33601	FULL SCREEN	
Zone/Seg:	DL-PUSC, F=6, Seg=0	MIMO Meas Setup:	2 Tx X 1 Rx	Zone Offset / Len:	3 / 16 Symbols		
Result Summary of Analyzed Zone/Segment							SPLIT SCREEN
No. of Zones/Segments	1						
	Min	Mean	Limit	Max	Limit	Unit	
BER Pilots	0.00	0.00	0.00	0.00	0.00	%	
EVM Data and Pilots	-56.15	-56.15	-15.00	-56.15	-15.00	dB	
EVM Data	-55.89	-55.89	-15.00	-55.89	-15.00	dB	
EVM Pilots	-62.00	-62.00		-62.00		dB	
Unmod. Subcarrier Error	...	...		...		dB
IQ Offset	...	...	-15.00	...	-15.00	dB
Gain Imbalance	-0.89	-0.89		-0.89		dB	
Quadrature Error	24.063	24.063		24.063		°	
Power DL Preamble	...	...		...		dBm
Power Data and Pilots	-16.15	-16.15		-16.15		dBm	
Power Data	-16.93	-16.93		-16.93		dBm	
Power Pilots	-11.43	-11.43		-11.43		dBm	
Power Null Pilots	-72.34	-72.34		-72.34		dBm	
Measurement Complete							
SPECTRUM	WIMAX	AUTO LUL	RUN SGL	RUN CONT	REFRESH	SCREEN B	

will display the

Result Summary of Analyzed Zone/Segment Tx0
 BER Pilots, Gain Imbalance, Quadrature Error

and Result Summary of Analyzed Zone/Segment Rx0
 EVM Data and Pilots, EVM Data, EVM Pilots,
 Power DL Preamble, Power Data and Pilots, Power Data, Power Pilots, Power Null Pilots

results simultaneously!

16. (K94 V4.41) Master and slave equipped with different hard ware options.

In case master and slave are equipped with different hardware options, the message ‘Slave has different Hw Options. IP *.*.*’ may occur. In example the master is equipped with electronic attenuators and the slave isn’t. Also the preamplifier Hw option might cause this message.

Workaround: Switch off the Hw for the master instrument, that is not available for the slave. For the electronic attenuator example, switch off the electronic attenuator in General Settings Advanced for the master.

IEC/IEEE Bus only

1. (K92 V3.60) Selecting screen A/B

For selecting screen A or B, DISPLAY:<WINDow[1|2]>:SElect command does not work correctly.

Workaround: Instead of this command, an alias command is provided, which is:
DISPlay:<WINDow[1|2]>:SSElect.

2. (K93 V3.91) SENSE:DEMod:CESTimation arguments

For the OFDMA standard, remote command SENSE:DEMod:CESTimation has conflicting short forms for the parameters PREamonly/PREampayl. Using the argument "PRE" will select PREamonly. Long forms are returned. This behaviour is consistent with the External PC Software.

Workaround: Use long form of the arguments.

3. (K92 V3.90) [SENSE:]TRACking:LEVel

[SENSE] is not optional for this command when using the short form: "TRAC" as it conflicts with the "TRACe" command.

Workaround: Do not omit SENSE for this command.

Modified Functionality

The behaviour of the following functions changed compared to earlier versions [the number in brackets indicates the firmware version that introduced the individual change]:

1. [V3.70] Import and export of captured IQ data.
2. [V3.70] Number of analyzed bursts available via GPIB (FETCh:BURSt:COUNt?).
3. [V3.70] Number of symbols in each analyzed burst available via SCPI (FETCh:SYMBol:COUNt?).
4. [V3.70] Sweep time for auto-level can now be configured.
5. [V3.70] Format of parameters to INPut:IQ:IMPediance command changed to to LOW | HIGH.
6. [V3.72] Subchannelization extension
7. [V3.72] In the Downlink Bursts with optional Preambles are supported.
8. [V3.72] In the Uplink Bursts with optional Midambles are supported.
9. [V3.72] New statistical measurement, Burst Summary.
10. [V3.72] Import and export of IQ data via GPIB (MMEMory:LOAD:IQ:STATe, MMEMory:STORe:IQ:STATe)
11. [V3.72] Bitstream: Results display shows the demodulated data stream for all analysed modulation schemes with modulation detection mode ALL.
12. [V3.72] Constellation vs Symbol: ALL the Constellation display shows the Inphase and Quadrature phase results for all analysed modulation schemes over the full range of the measured input data with modulation detection mode ALL.
13. [V3.72] PVT: With the modulation detection mode ALL , a burst is an area with constant modulation format. PVT burst statistics are no longer available.
14. [V3.80] Digital Down Converter available for low carrier frequency with Baseband input.
15. [V3.80] External trigger level can now be specified.

16. [V3.80] SUPPORT softkey has been provided to allow detailed information about the FS-K92 option to be saved to file.
17. [V3.90] Transitions from WIMAX to Spectrum Analyzer has been optimised to ensure the Spectrum Analyzer has a defined state
18. [V3.90] Spectrum ACP mode now allows 5 adjacent channel offsets, and provides the option to enable Noise Correction. The command [SENSe:]POWer:NCORrection ON|OFF has been added.
19. [V3.90] Colouring of Burst Summary, Bitstream and Constellation displays according to the modulation type
20. [V3.90] The Modulation Detection Mode in the Demod Settings dialog now defaults to "All".
21. [V3.91] The YIG filter (where fitted) is no longer set ON when exiting to the Spectrum Analyzer.
22. [V3.91] OFDM WCS licensed bands: 3.5 MHz has been added as a predefined Channel Bandwidth.
23. [V3.91] The [SUPPORT] softkey has been disabled in RUN CONT mode.
24. [V3.91] GPIB: The remote command [SENSe]:DEMod:FORMat:BANalyze:BTYPe is obsolete and has no effect.
25. [V4.00] SMU Setting transfer for zone and burst configuration information option using a TCP-IP connection.
26. [V4.00] Frequency Error Vs Sample and Phase Error Vs Sample measurement graphs available.
27. [V4.00] Time to Capture Buffer start Measurement available.
28. [V4.00] Spectrum Emission Mask for WiBro available.
29. [V4.00] Preamble indices can be specified manually as well as according to the standard.
30. [V4.00] For a PUSC signal using up to 3 segments, each of the segments can be analysed.
31. [V4.00] For a DL-Subframe utilizing several zones, each zone may be analyzed.
32. [V4.00] The table of results is now fully supported with all measurement results.
33. [V4.00] Incorrect Pilot values highlighted in bitstream
34. [V4.00] Power results are now displayed in the burst summary display.
35. [V4.10] OFDMA/WiBro Analysis:
 - Wrapping DL-MAP bursts are now supported in the burst configuration.
 - "Pilots For Tracking" is now a combined setting for UL and DL.
 - Support for UL Control regions, new entry for setting the UL Control region length.
 - The zone map now highlights zones with a blue border.
36. [V4.10] New Result Summary value/limit
The OFDMA/WiBro Summary table now includes the Unmodified Subcarrier Error, along with corresponding changes to SCPI commands.
37. [V4.10] Maximum capture time
A maximum of 1 MSamples can be captured for an IQ measurement, allowing up to 500 ms capture time for a 2MHz Sample Rate (Fs). A previous fixed limit of 50 ms has been removed.
38. [V4.10] Sample Rate and Channel Bandwidth relation
The ratio between these two values can now be user-defined, or left as "Auto".
39. [V4.10] ACP measurement
A user configurable number of channels may be specified, up to a maximum of 12.

40. [V4.10] OFDMA/WiBro SYNC condition bits

Synchronisation (signal decoding) error messages reported to the user for OFDMA/WiBro measurements now set corresponding bits (bits 7-8) in the SCPI/IEC register.

41. [V4.10] Transfer of ".WIMAX" files between FSQ and signal generator

- It is now possible to load files from other generators related to the SMU (e.g. SMJ, AMU).
- Support for files produced by v2.0.x of the SMU firmware.
- Loading a .WIMAX file sets "Predefined MAP" mode (DEMOM SETTINGS / Frame Global)
- If a file is loaded while in WiBro standard, then it is possible that the FFT size, sample rate and channel bandwidth may be out of range. In this eventuality the invalid values are ignored and a warning message is displayed in the status bar while loading.

Note: Loading is not possible in OFDM mode

42. [V4.10] Transitions from WiMAX to SAN

Additional measurement settings are preserved when transitioning from OFDMA/WiBro to the Spectrum Analyzer, in particular the RBW/VBW settings for a SEM measurement.

43. [V4.10] Limit lines

Spectrum Flatness limits are now +/- 0.4 for all standards.

44. [V4.10] Graph/summary tables

- Reference Level / External Attenuation are now displayed as a combined cell at the top-right of the main page header.
- The Time to Capture Buffer Start label now has increased precision.

45. [V4.20] Support for new instrument model R&S FSG.**46. [V4.20] Trace data now available via remote control in binary format for all traces.****47. [V4.20] Results display pages selectable via SCPI command.****48. [V4.20] Channel Estimation selection configurable by the user.**

Selections are either:

- user selected tracked signal
- fully tracked signal

49. [V4.20] Implemented alternative SCPI commands for [SENSE]:ZONE:COUNT and [SENSE]:ZONE:COUNT:STATE.

New command are [SENSE]:SUBFrame:COUNT and [SENSE]: SUBFrame:COUNT:STATE.

50. [V4.20] Modified parsing of SCPI command ":CONF:WIM:ZONE1:BURS1:CONT" to ignore Symbol count for UL Zones.**51. [V4.21] AMC Zone supported in OFDMA.****52. [V4.30] Support of IEEE Std P802.16-2004/Cor2/D4 Draft Corrigendum to IEEE Std 802.16-2004 from 2007-05-22.****53. [V4.30] Support for Application Recovery.****54. [V4.30] Option B17 is now supported.****55. [V4.30] Option FSU-B24 supported.****56. [V4.30] Option FSU-B25 supported.****57. [V4.30] Increased max analysed bursts for OFDM from 100 to 200 per sweep.****58. [V4.30] Added support for SEM filters - GAUSSIAN, EMI, 5POLE, FFT, CHANNEL and RRC.****59. [V4.30] The General Settings and Advanced Settings dialog changed to a Tabbed Dialog.****60. [V4.30] Support added for HARQ and Fast Feedback control bursts.****61. [V4.30] K94 WiMAX 802.16e MIMO application firmware option available.**

62. [V4.30] With this release the 'Frame Global | UL Control Region Length' setting will be taken into account for the following measurement settings respective measurement results.

Measurement settings:

Frame Config | Burst Offset.

In example for a 3 symbol control region length, an UL-burst would have to be specified according to

:CONFigure:WIMax:ZONE1:BURSt1:CONTRol:DATA QPSK_1_2,0,0,45,0,3,0,DATA

The green highlighted three specifies the offset of the burst from the zone start.

Being three because of the control region.

Measurement Results:

Time to Capture Buffer Start, EVM vs Symbol, Constellation Diagram, Bit Stream.

63. [V4.30 SP1] R&S FMU supported.

64. [V4.40]. EVM Preamble results added to OFMDA and WiBro statistical results.

65. [V4.40]. Ability to display Time to Capture Buffer marker at frame or FFT start.

66. [V4.40]. New Preamble Channel Frequency Response measurement for OFDMA standard.

67. [V4.41]. Measurement speed improved for K94.

68. [V4.41]. Constellation Diagram measurement available for K94.

69. [V4.41]. Bitstream measurement results available for K94.

70. [V4.41]. FFT Spectrum measurement for up to two Rx Path signals available.

71. [V4.41]. CCDF measurement for up to two Rx Path signals available.

72. [V4.50]. Improvements made to the control of the slave analyser in MIMO.

73. [V4.50]. Improved DL Auto Demodulation functionality.

74. [V4.50]. Modified layout of Advanced Settings dialog.

75. [V4.50]. Physical Layer auto demodulation for a single UL burst

76. [V4.50]. Support of MIMO UL-PUSC zones for K94

77. [V4.50]. Support of MIMO DL-FUSC zones for K94

78. [V4.50]. Preamble Channel Frequency Response measurement results also available for K94
MIMO and K93 WiBro

79. [V4.50]. Frame Length measurement available in the Capture Memory measurement window

80. [V4.50]. Support of estimated and predefined burst boosting

81. [V4.51]. Added MIMO slave support for baseband.

Modifications to the Operating Manual

The R&S FSQ-K92/K93/K94 analyzer functions are included in a separate manual set. Please refer to the following order numbers:

- 1300.7462.42-08- (English)

Regarding restrictions of OFDMA/WiBro signals that can be measured, see section 'IEEE 802.16e-2005 SISO- and MIMO-OFDMA/WiBro Measurements'.

Modified Chapters for remote operation

CONFigure:BURSt:SPECtrum:MASK:SELEct

This remote control configures how R&S FSQ-K92/K93 will interpret the Spectrum MASK measurement results. This is either performed using the IEEE or ETSI standard.

The ETSI standards are selected as follows:

- ETSI** or **ETSI301021** = ETSI EN 301021 SEM standard (this is the default standard)
ETSI30254401 or **ETSI30254401,BW5M** = ETSI EN 30254401 SEM standard for 5MHz BW
ETSI30254401,BW10M = ETSI EN 30254401 SEM standard for 10MHz BW

Note: This command is maintained for backward compatibility only. It has been replaced by SENSE:]POWER:SEM.

Example: "CONF:BURS:SPECT:MASK:SEL ETSI"
 R&S FSQ-K92/93 option is will interpret the measurement results using the ETSI standard

Characteristics: *RST value: –
 SCPI: device-specific
Mode: OFDM, OFDMA

[SENSe:]POWER:SEM

This command sets the behaviour of the Spectrum Emission Mask (SEM) analysis to use a specific configuration:

- User** - Analysis according to a user-defined configuration
Standard - Analysis according to the TTA standard (WiBro only)
IEEE - Analysis according to the IEEE standard (OFDM/OFDMA only)
ETSI or **ETSI301021** - Analysis according to the EN 301021 standard (default standard)
ETSI30254401 or **ETSI30254401,BW5M** - ETSI EN 30254401 standard for 5MHz BW
ETSI30254401,BW10M - ETSI EN 30254401 standard for 10MHz BW

Example: "POW:SEM USER" set SEM analysis according to a user defined configuration.

Characteristics: *RST value: IEEE (OFDM/OFDMA), STANDARD (WiBro)
 SCPI: device-specific
Mode: OFDM, OFDMA, MIMO

CONFigure:WIMax:FRAME:PREDefmap

This remote control command can be used to configure the predefined map mode for auto demod.

- CONFig, i.e. the use of frame config
- IQDL, downlink determined by a loaded IQW file
- IQUL, uplink, determined by an IQW file
- SMU, the current SMU or equivalent generator settings are used

Example: "CONF:WIM:FRAME:PREDefmap CONFig 0"

Characteristics: *RST value: 0
 SCPI: device-specific
Mode: OFDMA, MIMO

CONFigure:WIMax:ZONE<1...26>:CONTrol:STCConfig

This remote control specifies the space time coding.

NOSTC No space time coding
 TX1 One antenna (uplink MIMO only).
 TX2 Two antennas

Example: "CONF:WIM:ZONE1:CONT:STCC TX2"
Characteristics: *RST value: 0
 SCPI: device-specific
Mode: OFDMA, MIMO

Appendix: Contacting our hotline

Any questions or ideas concerning the instrument are welcomed by our hotline:

USA & Canada

Monday to Friday (except US public holidays)
 8:00 AM – 8:00 PM Eastern Standard Time (EST)
 Tel. from USA 888-test-rsa (888-837-8772) (opt 2)
 From outside USA +1 410 910 7800 (opt 2)
 Fax +1 410 910 7801
 E-mail Customer.Support@rsa.rohde-schwarz.com

East Asia

Monday to Friday (except Singaporean public holidays)
 8:30 AM – 6:00 PM Singapore Time (SGT)
 Tel. +65 6 513 0488
 Fax + 65 6 846 1090
 E-mail Customersupport.asia@rohde-schwarz.com

Rest of the World

Monday to Friday (except German public holidays)
 08:00 – 17:00 Central European Time (CET)
 Tel. from Europe +49 (0) 180 512 42 42
 From outside Europe +49 89 4129 13776
 Fax +49 (0) 89 41 29 637 78
 E-mail CustomerSupport@rohde-schwarz.com