



**ROHDE & SCHWARZ**

Test and Measurement  
Division

## **Release Notes**

# **TETRA II Analysis**

## **Application Firmware R&S FS-K110**

### **Release 4.61**

for R&S FSQ, FSU, Analyzer Firmware V4.6x SP1

#### **New Features:**

- **Flatness Subcarrier Reference Power Deviation**
- **Flatness Pilot Symbol Powers Deviation**
- **ACP measurements can display averaged results**

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## History

Date	Rel Note Rev	Changes
13 October 2010	1	First revision of K110 Application Firmware for V4.61
07 March 2011	2	New chapter "Customer Support".

## General Topics

### Compatibility of the R&S FS-K110 TETRA II Analysis Application Firmware with other Firmware Releases

The following table shows the compatible versions of the basic analyzer firmware and the TETRA II Analysis Application Firmware.

Table of compatible versions:

R&S FS-K110 Application Firmware	R&S FSQ Basic Firmware	R&S FSU Basic Firmware
4.61	4.65 SP1	4.61 SP1
4.60	4.65	4.61
4.50 SP1	4.55 SP2	4.51 SP1
4.50	4.55 SP1	4.51
4.40	4.45 SP 2	4.41 SP2

### Firmware Update of the R&S FS-K110 TETRA II Analysis 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 FS-K110 TETRA II Analysis application firmware package.

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 is installed prior to entering the license key code..**

## **System Memory Requirements**

For FS-K110 TETRA II Analysis Application Firmware, an installed system memory of 512MByte is essential.

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.

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

For FSU instruments, shipped with 256MByte system memory, a memory extension FSP-B512, order number 1157.1590.03 (for CPU boards with order no. 1091.2520.00) respectively 1157.1590.04 (for CPU board with order no. 1091.2808.00 or 1091.2814.00), is available.

Please refer to the Software Release Notes of the basic system firmware for further system memory requirements which may apply.

## New Functions in Version 4.61

- Measurement *Flatness Subcarrier Reference Powers* measures the deviation of each subcarrier's Reference Power from the average subcarrier Reference Power.
- Measurement *Flatness Pilot Symbol Powers* measures the deviation of each pilot symbol's power from the Reference Power of the subcarrier it resides on.
- Measurements *ACP due to Modulation* and *ACP due to Transients* can be configured to either show the maximum and the current results (as in earlier versions) or the maximum and the averaged results. Dialog *Demod Settings* offers a new switch *ACP Display* for that.

## Improvements

- SCPI commands `:INPut:SElect BB` and `:INPut:SElect AIQ` are equivalent. They both switch to the analog baseband input (if the HW option FSQ-B71 is installed). When reading back the setting, SCPI returns „BB“.

## Known Issues with option R&S FS-K110 TETRA II Analysis Application Firmware

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

### Manual Operation and IEC/IEEE Bus

#### 1. (K110 V4.40) Y-Auto scaling is not always optimum

The automatic scaling of the y-axis of some measurements needs improvement.

**Workaround:** Switch to manual y-axis scaling for measurements located in the EVM-submenu.

#### 2. (K110 V4.40) RBW of FFTs blinks

In the measurements Spectrum FFT and ACP due to Modulation the application delivers FFT traces and the resolution bandwidth of them. These RBW figures blink and disappear after a RUN SGL is finished.

**Workaround:** In all releases the RBW was always 300 Hz.

#### 3. (K110 V4.50) FSQ-B17: The message "PRBS Test passed" is indicated, but the test ist failed.

The remote status register bit is not affected.

**Workaround:** Check the status in Spectrum Analyzer mode (menu SETUP –SIGNAL SOURCE, Softkey DIGITAL BB INFO).

## IEC/IEEE Bus only

### 1. (K110 V4.40) Setting limits for ACP due to Transients does not update GUI

Commands that set limits of the measurement ACP due to Transients like

*CALCulate1:LIMit:BURSt:ACPTrans:CHAN2:RELPower:BANDwidth0*

change the limits but the GUI does not reflect these changes.

Commands that query failed / passed limits like

*CALCulate1:LIMit:BURSt:ACPTrans:CHAN2:RELPower:MAXimum:RESult?*

use the correct (i.e. changed) limits.

## Modified Functions

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. (K110 V4.61) Softkey *Support* stores files in a separate folder

If the the softkey *Support* is pressed, the FS-K110 stores various files on the instrument's hard disk. The user can send these files to the R&S support center.

Firmware version V4.61 the FS-K110 uses its own folder "D:\USER\SUPPORT\TETRA2\".

In earlier firmware versions various firmware applications share the same folder "D:\USER\SUPPORT\".

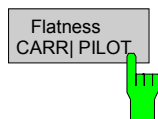
## Modifications to the Operating Manual

The R&S FS-K110 TETRA II Analysis Application Firmware functions are included in a separate manual set. Please refer to the following order numbers:

- 1309.9680.42-02- (English)

## Modified Chapters for manual operation

### Flatness



The "Flatness Carrier" respectively "Flatness Pilot" result display is selected by pressing the SPECTRUM softkey in the main measurement softkey menu followed by the FLATNESS CARR|PILOT softkey. Pressing this softkey again toggles between these two measurements.

Remote: CONF:BURS:SPEC:FLAT:SEL CARR  
CONF:BURS:SPEC:FLAT:SEL PIL



Fig. 23 Flatness measurement (example): Subcarrier Power Deviation



Fig. 24 Flatness measurement (example): Pilot Symbol Power Deviation

This measurement checks the power deviation of the subcarriers and the pilot symbols.

- For "Flatness Carriers" this is in detail:  
Deviation of the measured "Reference Power" of each subcarrier from the slot's "Average Subcarrier Reference Power".  
The "Reference Power" of each subcarrier is the average power of all its pilot and sync symbols (please refer to Formula 45).  
And the slot's "Average Subcarrier Reference Power" is the measured total "Reference Power" of the whole slot (mean power of ALL sync and pilot symbols, please refer to Formula 49), divided by the number of subcarriers.  
The final result is a vector, one value per subcarrier. It is displayed (trace results) or condensed to scalar results (result table) by mathematical operations.
- For "Flatness Pilots" this is in detail:  
Deviation of the measured power of any pilot symbol in each subcarrier from the corresponding subcarrier's "Reference Power" (please refer to Formula 45).  
The final result is a kind of matrix with the size: number of subcarriers times number of symbol positions in the slot. But because not all subcarriers and not all symbol positions contain a pilot symbol the result matrix is a sparse matrix. It is condensed to a vector (trace results) or even more to scalar results (result table) by mathematical operations.

The table in the upper part of the result display shows numeric results (for details please refer to page 110):

- As first result the Total Reference Power of the whole slot, i.e. the mean power of all pilot and sync symbols in the whole slot.
- As second result the Average Subcarrier Reference Power, i.e. the first result divided by the number of carriers.
- As third result the deviation of the Average Subcarrier Reference Power (second result) from the Reference Powers measured separately for each

subcarrier (mean power of pilot and sync symbols in that subcarrier). Additionally it shows in which subcarrier the maximum and minimum (unit "dB") deviation occurred.

- As fourth result the deviation of the power of any pilot symbol in a subcarrier from that subcarrier's measured Reference Power. Additionally it shows in which subcarrier and at which symbol position the maximum and minimum (unit "dB") deviation occurred.

The lower part of the result display shows the result traces versus subcarrier index.

Note:

- Pilot Symbol Flatness can only be measured and displayed for subcarriers that contain at least one pilot symbol.
- Subcarrier Reference Power Flatness is measured for all subcarriers.

Activating a marker (please refer to page 94) delivers more information.

- For "Flatness Carrier" measurement:  
Maximum, minimum, average and standard deviation (== RMS) results for the subcarrier the marker resides on.
- For "Flatness Pilot" measurement:  
Maximum, minimum, average and "dB"-standard deviation (== linear-scale RMS) results for all the pilot symbols in the subcarrier the marker resides on.

Note: Both the result table in the upper half and the traces in the lower half distinguish two kinds of averaged results:

- "AVG":  
For all absolute powers (shown in unit "dBm"): Arithmetic averaging of powers (unit Watt) is done.  
For power deviation results (shown in "dB"): Arithmetic averaging of the deviations in linear scale is done.  
If the power deviations vary around 0 dB, their average will tend towards 0 dB, they compensate each other.
- "StdDev":  
For all absolute powers "Total Reference Power (Slot)" and "Average SubCarrier Reference Power":  
This column displays the straight-forward standard deviation of the powers, calculated in unit "Watt".  
For the power deviations (unit "dB"):  
This column displays the standard deviations of the "dB" values. But they are calculated internally by averaging the squares of the deviations in linear scale (RMS averaging). This prevents that deviations in different directions compensate each other. After converting them to unit "dB" the results are always positive. Because of the RMS averaging done internally the corresponding trace in the lower half is labelled "RMS", which is shorter than "StdDev".

The measurements "Flatness Carrier" and "Flatness Pilot" are useful

- for checking if "Transmitter output power" requirements of [2] and [1] are met
- for checking if there is a remarkable channel amplitude response
- for checking if the transmitter adjusts all subcarrier powers equally.
- for checking if the transmitter adjusts all pilot symbol powers equally.

## ACP Display

<b>ACP (Modulation+Transients)</b>				
ACP Auto	<input checked="" type="checkbox"/>			
+/- Offset Freq [kHz]	0	25	50	75
Bandwidth [kHz]	25	18	18	18
ACP RRC Roll-off	0	0.35	0.35	0.35
Measure ACP Transients	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
ACP Display	ACP Avg			

Drop-down menu “ACP Display” selects which numeric ACP results are shown simultaneously in the two ACP measurements:

- “Current” & “Max” or
- “Average” & “Max”

This switch has no influence on

- which results are calculated internally. I.e. you can toggle this switch after a measurement of 1000 slots has stopped and you will immediately see the desired result. You do not have to restart the measurement with the changed settings.
- which traces are calculated internally or shown. I.e. the number of traces shown in the *ACP due to Transients* measurement is independent of this switch.

## Modified Chapters for remote operation

### **CALCulate:LIMit:BURSt:SPECTrum:FLATness:DEVCarrier**

### **CALCulate:LIMit:BURSt:SPECTrum:FLATness:DEVCarrier?**

These commands set or return the limits used in the Spectrum Flatness measurements to compare the subcarrier Reference Power deviation results against. There is one limit for all kinds of results, i.e. maximum, average, standard deviation (=“RMS”) and minimum result. The limit value must be a positive number. A value of +1 dB means that a measured deviation of larger than +1 dB or smaller than -1 dB causes the limit check to fail. Unit is always “dB”.

**Examples:** "CALC:LIM:BURS:SPEC:FLAT:DEVC?"

Returns the set limit for the subcarrier Reference Power deviation results.

**Characteristics:** \*RST value: +1 dB-  
SCPI: device-specific

### **CALCulate:LIMit:BURSt:SPECTrum:FLATness:DEVCarrier[:AVERage]:RESult?**

### **CALCulate:LIMit:BURSt:SPECTrum:FLATness:DEVCarrier:RMS:RESult?**

### **CALCulate:LIMit:BURSt:SPECTrum:FLATness:DEVCarrier:MAXimum:RESult?**

### **CALCulate:LIMit:BURSt:SPECTrum:FLATness:DEVCarrier:MINimum:RESult?**

These commands return the limit check results for the measured subcarrier Reference Power deviation results (Spectrum Flatness measurement). The results are returned as a boolean value where 0 = Passed and 1 = Failed (limit exceeded).

Different statistics of the result can be compared against the same limit value (please refer to CALC:LIM:BURS:SPEC:FLAT:DEVC):

Standard deviation (=“RMS”), maximum, average, minimum.

Example: To check if no subcarrier Reference Power differed more than 2 dB from the average subcarrier Reference Power, first set the corresponding limit value to 2 dB (CALC:LIM:BURS:SPEC:FLAT:DEVC 2]. Then after measuring the signal query if no power was too large (CALCulate:LIMit:BURSt:SPECTrum:FLATness:DEVCarrier:MAXimum:RESult?) AND if no power was too small

(CALCulate:LIMit:BURSt:SPECTrum:FLATness:DEVCarrier:MINimum:RESult?)

**Examples:** "CALC:LIM:BURS:SPEC:FLAT:DEVC:MAX:RES?"

The limit check result for the maximum measured subcarrier Reference Power deviation is returned as a Boolean value (0 = Passed, 1 = Failed).

**Characteristics:** \*RST value: -  
SCPI: device-specific

### **CALCulate:LIMit:BURSt:SPECTrum:FLATness:DEVPilot**

### **CALCulate:LIMit:BURSt:SPECTrum:FLATness:DEVPilot?**

These commands set or return the limits used in the Spectrum Flatness measurements to compare the pilot symbol power deviation results against. There is one limit for all kinds of results, i.e. maximum, average, standard deviation (=“RMS”) and minimum result. The limit value must be a positive number. A value of +1 dB means that a measured deviation of larger than +1 dB or smaller than -1 dB causes the limit check to fail. Unit is always “dB”.

**Examples:** "CALC:LIM:BURS:SPEC:FLAT:DEVP?"

Returns the set limit for the pilot symbol power deviation

results.

**Characteristics:** \*RST value: +1 dB-  
SCPI: device-specific

**CALCulate:LIMit:BURSt:SPECTrum:FLATness:DEVPilot[:AVERage]:RESult?**

**CALCulate:LIMit:BURSt:SPECTrum:FLATness:DEVPilot:RMS:RESult?**

**CALCulate:LIMit:BURSt:SPECTrum:FLATness:DEVPilot:MAXimum:RESult?**

**CALCulate:LIMit:BURSt:SPECTrum:FLATness:DEVPilot:MINimum:RESult?**

These commands return the limit check results for the measured pilot symbol power deviation results (Spectrum Flatness measurement). The results are returned as a boolean value where 0 = Passed and 1 = Failed (limit exceeded).

Different statistics of the result can be compared against the same limit value (please refer to `CALCulate:LIMit:BURSt:SPECTrum:FLATness:DEVPilot`):  
Standard deviation (=“RMS”), maximum, average, minimum.

Example: To check if no subcarrier pilot symbol power differed more than 2 dB from the subcarrier Reference Power, first set the corresponding limit value to 2 dB (`CALC:LIM:BURS:SPEC:FLAT:DEVP 2`). Then after measuring the signal query if no power was too large (`CALCulate:LIMit:BURSt:SPECTrum:FLATness:DEVPilot:MAXimum:RESult?`) AND if no power was too small (`CALCulate:LIMit:BURSt:SPECTrum:FLATness:DEVPilot:MINimum:RESult?`)

**Examples:** "CALC:LIM:BURS:SPEC:FLAT:DEVP:MAX:RES?"

The limit check result for the maximum measured pilot symbol power deviation is returned as a Boolean value (0 = Passed, 1 = Failed).

**Characteristics:** \*RST value: -  
SCPI: device-specific

## **Customer Support**

### **Technical support – where and when you need it**

For quick, expert help with any Rohde & Schwarz equipment, contact one of our Customer Support Centers. A team of highly qualified engineers provides telephone support and will work with you to find a solution to your query on any aspect of the operation, programming or applications of Rohde & Schwarz equipment.

### **Up-to-date information and upgrades**

To keep your instrument up-to-date and to be informed about new application notes related to your instrument, please send an e-mail to the Customer Support Center stating your instrument and your wish.

We will take care that you will get the right information.

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