



**ROHDE & SCHWARZ**

Test and Measurement  
Division

## **Release Notes**

# **TD-SCDMA Mobile Station Test Application Firmware R&S FS-K77**

## **Release 4.50**

for R&S FSP, FSU, FSQ, FSG, FSMR, FSUP  
Analyzer Firmware 4.5x

### **New Features:**

- Relative Code Domain Error (RCDE) in result summary
- Support for 64QAM modulation
- New midamble based synchronization mode

**Release Note Revision: 1**

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## History

<b>Date</b>	<b>Rel Note Rev</b>	<b>Changes</b>
16 August 2009	1	First revision for R&S FS-K77 Firmware 4.50.

## General Topics

### Compatibility of R&S FS-K77 TD-SCDMA MS Application Firmware

The following table shows the compatible versions of the basic analyzer firmware version and the TD-SCDMA MS application firmware:

**Table of compatible versions:**

R&S FS-K77 Application Firmware	R&S FSP Basic Firmware	R&S FSU Basic Firmware	R&S FSQ Basic Firmware	R&S FSMR Basic Firmware	R&S FSUP Basic Firmware	R&S FSG Basic Firmware
4.50	4.50	4.51	4.55	-	-	4.59
4.40	4.40	4.41	4.45	-	-	4.49
4.30	4.30	4.31	4.35	-	-	4.39
4.20	4.20	4.21	4.25	-	4.27	4.29
4.10	4.10	4.11	4.15	-	4.17	-
4.00	4.00	4.01	4.05	-	-	-
3.90	3.90	3.91	3.95	3.96	3.99	-
3.80	3.80	3.81	3.85	3.86	-	-
3.70	3.70	3.71	3.75	-	-	-
3.60	3.60	3.61	3.65	3.66 SP1	-	-
3.50	3.50	3.51	3.55	-	-	-
3.40	3.40	3.41	3.45	-	-	-
3.30	3.30	3.31	3.35	-	-	-
2.80	2.80	2.81	-	-	-	-
2.60	2.60	2.61	-	-	-	-
2.40	2.40	2.41	2.45	-	-	-
2.30	2.30	2.31	2.35	-	-	-

Application firmware versions 3.xx are running on R&S FSPs with order # 1164.4391.xx or R&S FSU with order # 1166.1660.xx or R&S FSQ with operating system XP.

Application firmware version 2.xx are running on R&S FSPs with order # 1093.4495.xx or R&S FSU with order # 1129.9003.xx or R&S FSQ with operating system NT.

## Firmware Update of R&S FS-K77 TD-SCDMA MS 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 FSU 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 analyzer or delivered as a part of the R&S FS-K77 TD-SCDMA MS 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.
- If the validation failed, the application firmware is not installed.  
The most likely reason will be that the instrument is not equipped with the correct basic firmware version. In this case a message box 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.**

## New Functions in Version 4.50

- **Relative Code Domain Error (RCDE) in result summary.**  
The average relative code domain error in dB for all active channels in the selected slot is calculated according to release 8 of the standard. This value is displayed in the result summary.
- **Support for 64QAM modulation.**  
64QAM constellations are fully supported as code channel modulation. An improved robust channel search algorithm classifies the modulation automatically from QPSK up to 64QAM. For bad SNR environments the automatic search can optionally be limited to lower constellations.
- **New midamble based synchronization mode.**  
By default the R&S FS-K77 determines the phase reference by a multi-step algorithm using both code channels and midambles. At least one of the code channels had to be QPSK or 8PSK modulated. The new midamble based synchronization is independent of the code channel modulation and thus allows synchronization on slots with arbitrary code channel modulation.

## Improvements

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

### 1. [V4.40] No independent sweeptime settings supported for ACLR and SEM measurement.

Changing the sweeptime for ACLR measurement also changes the sweeptime for SEM measurement and vice versa.

## Known Issues

None

## Modified Functions

### 1. [V3.50] Change of default node for CALC2:FEED 'XTIM:CDP:PVSL'.

For compatibility reason with other 3G applications the default node for the IEC/IEEE bus command

CALC2:FEED 'XTIM:CDP:PVSL[:ABS]' is changed to

CALC2:FEED 'XTIM:CDP:PVSL[:RAT]'.

### 2. [V3.50] CDP measurement over 11970 consecutive PCGs for R&S FSQ possible (8 seconds of IQ data).

### 3. [V3.60/V2.60] External trigger level adjustable from 0.5 to 3.5V.

### 4. [V3.60/V2.60] Center Frequency Stepsize softkey available.

### 5. [V3.60/V2.60] Changed SCPI commands.

In order to limit to 12 chars the :CALCulate2:FEED 'XTIME:CDPower:SYMBOL:CONStellation'

and :CALCulate2:FEED 'XTIME:CDPower:COMPOSITE:CONStellation' are changed to

:CALCulate2:FEED 'XTIME:CDPower:SYMBOL:CONSt' and

:CALCulate2:FEED 'XTIME:CDPower:COMPOSITE:CONSt'.

### 6. [V3.70/V2.80] ACP: number of adjacent channels increased to 12.

### 7. [V3.70/V2.80] ACP: power mode to max holds the power results.

### 8. [V3.80/V2.80] Trace view available within code domain analyzer.

### 9. [V3.90] Support for noise correction in ACLR measurement with power trigger.

### 10. [V4.00] Spectrum emission mask: List evaluation in lower screen now supported.

### 11. [V4.10] High Dynamic Mode for Power vs. Time Measurement.

### 12. [V4.20] Support for instrument R&S FSG.

### 13. [V4.20] Softkey REF VALUE Y AXIS available for CDP measurements.

### 14. [V4.20] Power vs Time: Sweep Mode SINGLE/CONTINUOUS is now restored to it's previous state, when HIGH DYNAMIC is switched off.

### 15. [V4.30] Synchronization to Midamble of Selected Slot (softkey SYNC to SLOT).

### 16. [V4.30] Measurements in presence of the DwPCH supported if K76 is enabled.

### 17. [V4.30] Softkey AC / DC Coupling available.

**18. [V4.30] New Ref Value Y Axis / Reference Level coupling simplifies grid scaling configuration for Code Domain measurements.**

Since version 4.20 the Reference Level and the grid scaling (REF VALUE Y AXIS) with unit dBm can be independently set for Code Domain measurements. In previous versions changing the Reference Level and changing the Ref Value Y Axis were independent. If the Reference Level value is changed the Ref Value Y Axis is now automatically adjusted to keep the difference between Reference Level and Ref Value Y axis constant.

Example:

Ref Level set to 0 dBm

Ref Value Y axis set to -10 dBm (at Y Axis Position 100%)

► The upper Y limit of the grid scaling is now at 10 dB below reference level.

Change Reference Level to -10dBm

The Ref Value Y Axis is now adjusted to -20 dB

► The upper Y limit of the grid scaling is at 10 dB below reference level as before.

**Note:** The internal reference level change with function ADJUST REF LEVEL is treated in the same way.

**19. [V4.50] The Relative Code Domain Error (RCDE) is displayed in the result summary.****20. [V4.50] Support for 64QAM modulation.**

64QAM constellations are fully supported as code channel modulation. An improved robust channel search algorithm classifies the modulation automatically from QPSK up to 64QAM. For bad SNR environments the automatic search can optionally be limited to lower constellations.

**21. [V4.50] New midamble based synchronization mode.**

By default the R&S FS-K77 determines the phase reference by a multi-step algorithm using both code channels and midambles. At least one of the code channels had to be QPSK or 8PSK modulated. The new midamble based synchronization is independent of the code channel modulation and thus allows synchronization on slots with arbitrary code channel modulation.

## Modifications to the Operating Manual and Supplements

For the R&S FS-K77 TD-SCDMA Mobile Station Test Application Firmware manuals please refer to the following order numbers:

- 1300.7304.44-02 (German/English)

They can be downloaded from R&S internet – search: FS-K77:

<http://www.rohde-schwarz.com>

## Modified Chapters

### Menu CHAN CONF

HEADER  
VALUES

#### MODULATION TYPE:

Modulation type of the channel. You can choose between QPSK, 8PSK, 16QAM and 64 QAM

#### IEC-Bus-command:

```
:CONFigure:CDPower[:BTS]:CTABLE:DATA 1..6, 0..4,
1..16, 0..3, 1..16, 0 | 1, 0, 0...
```

< Channel type >, <Code class>, <Code number>, <Modulation type>,  
<Midamble shift>, <Status>, <Reserved 1>, <Reserved 2>, ....

Modulation type: 0 = invalid (for midamble)

1 = QPSK

2 = 8PSK

3 = 16QAM

4 = 64QAM

MAX MOD  
<64QAM>

The MAX MOD setting defines the highest modulation to be considered in the automatic channel search. In low SNR environments it may be necessary to limit the channel search to lower modulations than 64QAM.

#### IEC/IEEE-bus command:

```
SENSe:CDPower:MMAx QPSK | PSK8 | QAM16 | QAM64
```

### Menu RESULTS

RESULT  
SUMMARY



The RESULT SUMMARY softkey selects numeric evaluation of all measured results. Evaluation is subdivided as follows:

RESULT SUMMARY TABLE				DR	52.8 kbps
				Chan	1.16
				Slot	4
CF 1 GHz					
Ref -6.00 dBm Att 20 dB  1 CLRWR	GLOBAL RESULTS FOR SET 0:			Chip Rate Error	0.05 ppm
				Trg to Frame	59 ns
	SLOT RESULTS			Carr Freq Err	-38.40 Hz
	P Data	-10.75 dBm		IQ Imbal/Offs	0.03/0.05 %
	P D1	-11.30 dBm		RHO	1.0000
	P D2	-10.27 dBm		Composite EVM	0.18 %
	P Midamble	-10.19 dBm		Pk CDE(SF 16)	-62.68 dB
	Active Channels	2		Average RCDE	-59.75 dB
	CHANNEL RESULTS			Channel.SF	1.16
	ChannelPwr Rel	-3.01 dB		Data Rate	52.8 kbps
				ChannelPwr Abs	-13.76 dBm
				Symbol EVM	0.31 %Pk

Fig. 1 Result summary

The second part shows measured results relating to all channels for the slot selected with the SELECT SLOT softkey:

Average RCDE:                      Average relative code domain error of the active channels

IEC/IEEE bus command:                      :CALC2:FEED "XTIM:CDP:ERR:SUMM"  
    :CALC2:MARK1:FUNC:CDP:BTS:RES?  
    SLOT | PDAT | PD1 | PD2 | PMID |  
    RHO | MACC | PCD | FERR | CERR | TFR |  
    IQIMB | IQOF | ACT | SRAT | CHAN  
    | SFAC | CDPR | CDP | EVMR | EVMP | ARCD

## Menu SETTINGS – NEXT

SYNC  
TO SLOT

By default the R&S FS-K77 determines the phase reference for all data slots from the midamble of slot 1. For e.g. beamforming or repeater measurements it might be necessary to apply different phase offsets to each time slot. Using slot 1 as phase reference leads to rotated constellation diagrams and bad EVM values in the other time slots.

By activating the new setting 'SYNC TO SLOT' the R&S FS-K77 determines the phase reference from the midamble of the selected slot. Thus the data slots can be phase rotated to each other without degrading the EVM results. The selected slot must contain at least one data channel with sufficient power for successful synchronization.

The softkey *SYNC TO SLOT* changes the phase reference from the midamble of slot 1 to the midamble of the selected slot.

IEC/IEEE-bus command:  
    :SENSe:CDPower:STSlot ON | OFF

SYNC TO  
CODE MA

This softkey selects the synchronization mode.

If CODE is selected, the phase reference is determined by a multi-stage algorithm involving code channels and midambles. At least one code channel within the selected slot must be QPSK or 8PSK modulated.

If MA is selected, the phase reference is determined by the midamble area. Hence there is no requirement about the code channel modulation.

IEC/IEEE-bus command:  
    :SENSe:CDPower:STSlot:MODE CODE | MA

## Menu MEAS - ACLR

NOISE CORR  
ON OFF

The softkey *NOISE CORR* is since firmware version 3.90 also available in IF or RF power trigger mode.



## Menu MEAS – SPECTRUM EM MASK



The softkey *LIST EVALUATION* reconfigures the SEM output to a split screen. In the upper half the trace with the limit line is shown. In the lower half the peak value list is shown. For every range of the spectrum emission defined by the standard the peak value is listed. For every peak value the frequency, the absolute power, the relative power to the channel power and the delta limit to the limit line is shown. As long as the delta limit is negative, the peak value is below the limit line. A positive delta indicates a failed value. The results are then colored in red, and a star is indicated at the end of the row, for indicating the fail on a black and white printout.

If the list evaluation is active, the peak list function is not available.

IEC/IEEE-bus command:

```
:CALCulatel:PEAKsearch:AUTO ON | OFF
```

With this command the list evaluation which is by default for backwards compatibility reasons off can be turned on.

```
TRACel:DATA? LIST
```

With this command the list evaluation results are queried in the following order: <no>, <start>, <stop>, <rbw>, <freq>, <power abs>, <power rel>, <delta>, <limit check>, <unused1>, <unused2>

All results are float values.

no	: range number	
start	: start frequency	
stop	: stop frequency	
rbw	: resolution bandwidth of range	
freq	: frequency of peak	
power abs	: absolute power in dBm of peak	
power rel	: relative power in dBc (related to the channel power) of peak	
delta	: distance to the limit line in dB (positive indicates	value
	above the limit, fail)	
limit check	: limit fail (pass = 0, fail =1)	
unused1	: reserved (0.0)	
unused2	: reserved (0.0)	

## Menu MEAS – POWER VS TIME

START  
MEAS

The softkey *START MEAS* starts a single sweep measurement.

IEC/IEEE-bus command:

INIT:CONT OFF;:INIT

HIGH  
DYNAMIC

The softkey *HIGH DYNAMIC* selects the high dynamic mode. The sweep mode is automatically set to single sweep.

The High Dynamic mode uses a digital 2 MHz RBW filter with an outstanding low settling time of about 1 chip duration. The Power vs. Time sweep is divided into a TX on power and a TX off power section. The TX on power section uses reference level and attenuator settings according to the maximum input level, whereas the TX off power section is optimized for a noise power of less than -80 dBm. Each section is averaged over the selected number of subframes. The measurement can be performed in single sweep mode only.

Due to the low reference level, power values above -50dBm are not displayed with the correct magnitude, if they fall into the TX off power section. However, these power values will clearly fail the time mask.

**For all Power vs. Time measurements it is mandatory to keep the input power within the instruments specifications. The internal attenuator is set to 0 dB for reference levels below 20 dBm.**

**If the input power is increased above 20 dBm, the Auto Level & Time routine must be called before starting the measurement. Alternatively an RF attenuation of at least 10 dB can be set manually.**

IEC/IEEE-bus command:

:CONFigure:CDPower:PVTime:HDYNamic ON|OFF

## Menu TRACE

VIEW

The softkey *VIEW* freezes the trace.

IEC/IEEE-bus command:

:DISP:WIND:TRAC:MODE VIEW

## Remote Control Commands

**:[SENSe<1|2>:]CDPower:STSLot ON | OFF**

This command selects the phase reference to be used.

By default the R&S FS-K77 determines the phase reference for all data slots from the midamble of slot 1. For e.g. beamforming or repeater measurements it might be necessary to apply different phase offsets to each time slot. Using slot 1 as phase reference leads to rotated constellation diagrams and bad EVM values in the other time slots.

By activating the new setting 'SYNC TO SLOT' the R&S FS-K77 determines the phase reference from the midamble of the selected slot. Thus the data slots can be phase rotated to each other without degrading the EVM results. The selected slot must contain at least one data channel with sufficient power for successful synchronization.

**Parameter:** ON: Selects the midamble of the selected slot as phase reference.  
OFF: Selects the midamble of slot 1 as phase reference.

**Example:** "SENS:CDP:STSL ON" 'use selected slot as phase reference

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

**:[SENSe<1|2>:]CDPower:STSLot:MODE CODE | MA**

This command selects the slot synchronization mode. It is effective only if SYNC TO SLOT is activated.

If CODE is selected, the phase reference is determined by a multi-stage algorithm involving code channels and midambles. At least one code channel within the synchronization slot must be QPSK or 8PSK modulated.

If MA is selected, the phase reference is determined by the midamble area. Hence there is no requirement about the code channel modulation.

**Parameter:** CODE: Uses code channels and midamble of the selected slot as phase reference  
MA: Uses the midamble of the selected slot as phase reference.

**Example:** "SENS:CDP:STSL:MODE MA" 'use midamble in selected slot as phase reference

**Characteristics:** \*RST value: CODE  
SCPI: instrument-specific

**:[SENSe<1|2>:]CDPower:MMAQ QPSK | PSK8 | QAM16 | QAM64**

This command defines the highest modulation to be considered in the automatic channel search. In low SNR environments it may be necessary to limit the channel search to lower modulations than 64QAM.

**Parameter:** QPSK: Consider QPSK modulation only  
PSK8: Consider QPSK and 8PSK modulation.  
QAM16: Consider QPSK, 8PSK and 16QAM modulation  
QAM64: Consider QPSK, 8PSK, 16QAM and 64QAM modulation

**Example:** "SENS:CDP:MMAQ PSK8" 'assume QPSK and 8PSK modulations only for the automatic channel search

**Characteristics:** \*RST value: QAM64  
SCPI: instrument-specific

**:CALCulate<1|2>:MARKer<1>:FUNCTION:CDPower[:BTS]:RESult?**

SLOT | PDATa | PD1 | PD2 | PMIDamble | RHO | MACCuracy | PCDerror |  
 FERRor | CERRor | TFRame | IQOffset | IQIMbalance | ACTive | SRATe |  
 CHANnel | SFACtor | CDPabsolute | CDPRelative | EVMRms | EVMPeak |  
 ARCDerror

This command polls the measured and calculated values of code domain power analysis. The results are provided for the channel to which the code selected by the `CDPower:CODE` command belongs.

**Parameters:**

Global results of selected slot:

SLOT	Slot number		
PDATa	Power data fields in dBm	FERRor	Frequency error in Hz
PD1	Power data field 1 in dBm	CERRor	Chip rate error in ppm
PD2	Power data field 2 in dBm	TFRame	Trigger to frame
PMIDamble	Power midamble in dBm	IQIMbalance	IQ imbalance in %
RHO	RHO	IQOffset	IQ offset in %
MACCuracy	Composite EVM in %	ACTive	Number of active channels
PCDerror	Peak code domain error in dB	ARCDerror	Average RCDE of active channels

Channel results:

SRATe	Data rate in kbps
CHANnel	Channel number
SFACtor	Spreading factor of channel
CDPRelative	Channel power relative in dB
CDPabsolute	Channel power absolute in dBm
EVMRms	Error vector magnitude RMS in %
EVMPeak	Error vector magnitude Peak in %

**Note:** The trigger to frame (*TFRame*) value produces a "9" if the trigger is set to *FREE RUN*.

**Example:**

"INST:SEL BTDS"	' Activate TD-SCDMA BTS meaning
	' CDP relative on screen A and
	' Result Summary active on screen B
"INIT:CONT OFF"	' Select single sweep
"INIT;*WAI"	' Start measurement with
	' synchronization
"CALC:MARK:FUNC:CDP:RES? PDAT"	' Read out power of data fields
"CDP:SLOT 5"	' Selects slot 5
"CDP:CODE 11"	' Select code number 11
"CALC:MARK:FUNC:CDP:RES? EVMR"	' Read out EVM RMS of code with
	' number 11 in slot 5

**Characteristics:**

*RST value:	-
SCPI:	instrument-specific

## Appendix: Contact to our hotline

Any questions or ideas concerning the instrument are welcome 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](mailto: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](mailto: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

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E-mail [CustomerSupport@rohde-schwarz.com](mailto:CustomerSupport@rohde-schwarz.com)