Test and Measurement
Division

Release Notes

3G FDD UE

Application Firmware R&S FS-K73

Release 4.17

for R&S FSUP Analyzer Firmware 4.17

New Features:

- Automatic determination of measurement interval for EVM (RMS) versus slot measurement according to 3GPP specification 34.121

Release Note Revision: **1**

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Contents

History

Date	Rel Note Rev	Changes
4. August 2007	1	First revision for R&S FS-K73 version 4.17

General Topics

Hardware Requirements

Please note that R&S FS-K73 requires option R&S FSP-B15 in order to run on an R&S FSP.
If the required hardware option is not installed the unit will not accept the license key for the corresponding application firmware.

Additionally please note that FRAME based analysis with R&S FS-K73 on an R&S FSP is only possible if R&S FSP-B70 is installed; otherwise only SLOT based analysis will be available on the R&S FSP.

Compatibility of the R&S FS-K73 3G FDD UE Application Firmware

The following table shows the compatible versions of the basic analyzer firmware and the 3G FDD UE Application Firmware:

Table of compatible versions:

R&S FS-K73 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
4.17	-	-	-	-	4.17
4.10	4.10	4.11	4.15	-	-
4.01	-	-	-	-	-
4.00	4.00	4.01	4.05	-	-
3.90 SP1	3.90	3.91	3.95	3.96	3.99
3.90	3.90	3.91	3.95	3.96	-
3.80	3.80	3.81	3.85	3.86	-
3.70	3.70	3.71	3.75	-	-
3.60 SP1	3.60	3.61	3.65	3.66 SP1	-
3.60	3.60	3.61	3.65	-	-
3.50	3.50	3.51	3.55	-	-
3.40	3.40	3.41	3.45	-	-
3.35	-	-	3.35	-	-
3.30	3.30	3.31	-	-	-
3.28	3.20	3.21	3.25	-	-
3.24	3.10	3.11	3.15	-	-
3.20	3.00	-	3.05	-	-
2.80	2.80	2.81	-	-	-
2.60	2.60	2.61	-	-	-
2.40	2.40	2.41	2.45	-	-
2.35	-	-	2.35	-	-
2.30	2.30	2.31	-	-	-
2.28	2.20	2.21	2.25	-	-
2.24	2.10	2.11	2.15	-	-
1.21	-	-	2.05	-	-
1.20	1.80	1.81	1.85	-	-

Application firmware versions 3.xx running on FSPs with order # 1164.4391.xx or FSU with order # 1166.1660.xx are adequate to version 2.xx for FSPs with order # 1093.4495.xx or FSU with order # 1129.9003.xx. (Version 3.20 is adequate to 1.20)

On the FSQ application firmware versions 3.xx requires the Windows-XP upgrade kit FSQ-U2, order # 1162.9696.02.

Note:

Applications with version number 3.xx are only compatible with basic firmware 3.yy (see table above). Do not install them on basic firmware versions below 3.00!

Firmware Update of the R&S FS-K73 3G FDD UE Application Firmware

The R&S FS-K73 3G FDD UE Application Firmware package is available with its own version number. This application firmware package requires an appropriate basic instrument firmware version. Compatible revisions are shown in the table above.

Please make sure to have the correct basic firmware version installed prior to installing the R&S FS-K73 3G FDD UE Application Firmware. Please refer to the basic firmware version release notes for firmware update information of the basic firmware.

Note: *R&S FS-K72/74 and R&S FS-K73 are using the same update set. It is therefore required to only update one of these applications.*

Generation of the update disk set for R&S FS-K73 Application Firmware

If you already have the update disk set you can skip this paragraph.

The files needed for the R&S FS-K73 3G FDD UE Application Firmware update are grouped according to the disk contents:

Disk 1: disk1.bin (self-extracting ZIP file)

For Version 3.xx only:

Disk 2: data3.cab (packed contents of disk 2, will be automatically unpacked by FW update)

The contents of disk 1 are packed in a self-extracting ZIP file and need to be unzipped. For this purpose the following steps are necessary:

1. Create a temporary directory on your local PC (e.g. MyTemp\Extensions\K73 on drive C:)
2. Copy disk1.bin into that directory and rename it to disk1.exe
3. Execute disk1.exe. Under Windows 95/98/NT this is done best using the following sequence:
   <CTRL><ESC> - RUN – C:\MyTemp\Extensions\K73\DISK1 - <ENTER> or
   <CTRL><ESC> - AUSFÜHREN – C:\MyTemp\Extensions\K73\DISK1 - <ENTER> for a German Windows version.
   The files will be unzipped.
4. **For Version 2.xx only:**
   Delete disk1.exe from the temporary directory.
   The temporary directory will now contain the following files:

inst32i.ex	_isdel.exe	_setup.dll	_sys1.cab	_user1.cab
Data.tag	data1.cab	id.txt	lang.dat	layout.bin
os.dat	Setup.exe	Setup.ini	setup.ins	setup.lid

   For Version 3.xx only:
   Delete disk1.exe from the temporary directory.
   The temporary directory will now contain the following files:

data1.cab	data1.hdr	data2.cab	ExecCtrl.exe	id.txt	ikernel.ex_
ISSetup.exe	layout.bin	RestInst.exe	Setup.exe	Setup.ini	setup.inx

Please make sure that all filenames exactly match with these printed above before you try to use them for the firmware update. Especially the trailing underscore ('_') as used in ikernel.ex_ **or** _inst32i.ex_ **is essential for correct operation of the update program.**

5. Copy the contents of the temporary directory onto update disk #1.

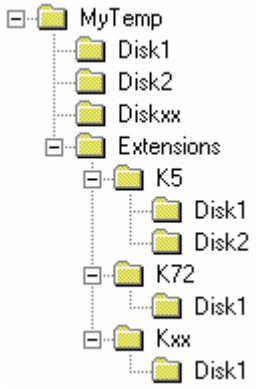
For Version 3.xx only:

The content of the other disk is already packed in the format required by the firmware update program and need no further processing. The files only need to be copied onto disks #2, the number in the filename (minus 1) indicating the corresponding disk number (data3.cab => disk #2).

Preparing installation via LAN or USB stick:

If the installation shall be done via LAN or USB stick (XP only) please set up the following directory structure:

Copy all files as mentioned in the previous section in the directory ..\MyTemp\Extensions\K73\Disk1.



Performing the Application Firmware Update on the Instrument

The Application Firmware update process is performed in the following steps:

- Switch the instrument on and wait until the Analyzer has resumed operation.
- For updates from LAN or USB (XP only) use the SETUP | NEXT | FIRMWARE UPDATE | UPDATE PATH soft key to specify any path for the location of the Disk1 directory (e.g. F:\MyTemp\Extensions\K73). For floppy usage the default A:\ must not be changed
- Press SETUP → NEXT → FIRMWARE UPDATE
- Confirm the query "Do you really want to update the firmware?" with OK
- Insert update disk #1 (and #2 for version 3.xx) as requested (for LAN or USB just confirm the copy process)
- The instrument will perform several automatic shutdowns, until the new firmware is installed properly. **Do not switch the instrument off until the update process has been finished completely.**

After switching on the instrument for the first time after a successful firmware update it is necessary to execute the instument's self alignment process by pressing CAL and softkey CAL TOTAL.

Note: *R&S FS-K72/74 and R&S FS-K73 are using the same update set. It is therefore required to only update one of these applications.*

A simplified update process is available if base system firmware 4.1x or newer is installed. More details are described in the release note of the base system firmware.

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-K73 3G FDD UE 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 probable reason will be that the instrument is not equipped with the correct basic firmware version. Therefore 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

- **Automatic determination of measurement interval for EVM (RMS) versus slot measurement according to 3GPP specification 34.121**

  According to new specification of 3GPP TS 25.101 version V7.4.0 from June 2006 chapter 6.8.2 “Error Vector Magnitude” and 3GPP TS 34.121 version V7.1.0 chapter 5.13.1A “Error Vector Magnitude (EVM) with HS-DPCCH”, the average interval for root mean square calculation of the error vector magnitude (EVM_{rms}) is not fixed to a full slot length.

  The 3GPP specification defines the EVM average interval as follows:

  > *For signals containing more than one spreading code where the slot alignment of the codes is not the same and the code power is varying, the period over which the nominal mean power remains constant can be less than one timeslot. For such time-varying signals it is not possible to define EVM across one timeslot since this interval contains an expected change in mean power, and the exact timing and trajectory of the power change is not defined. For these signals, the EVM minimum requirements apply only for intervals of at least one half timeslot (less any 25µs transient periods) during which the nominal code power of each individual code is constant.*

  Within this version this requirement is supported. The average length inside the slot depends on active channels with a varying code power coming up from zero power (code channel switched ON), or falling down to zero power (code channel switched OFF). The timing offset of these channels determines the begin and end of the average interval for root mean square calculation. According to 3GPP specification, the HS-DPCCH (**H**igh **S**peed **D**edicated **P**hysical **C**ontrol **Ch**annel) and the E-DPCCH (**E**nhanced **D**edicated **P**hysical **C**ontrol **Ch**annel) can be switched at times unaligned to DPDCH (**D**edicated **P**hysical **C**ontrol **Ch**annel) slot timing. Furthermore, an additional interval of 25µs can be subtracted from the beginning and the end of the average interval to provide an unevaluated transition period of 25µs. For a new Softkey and IEC-bus configuration refer to the following chapters.

Modified Functions

The version numbers in brackets indicate the version in which the function was modified.

1. [V1.12] New result display type Power vs. Symbol

2. [V3.24/V2.24] Code Domain Error Power measurement is now available

3. [V3.24/V2.24] Improved Resolution of Trigger to Frame measurement

4. [V3.24/V2.24] Improved absolute accuracy of Trigger to Frame measurement

5. [V3.24/V2.24] Trace statistic available on result summary parameters (MIN Hold, MAX Hold, Averaging)

6. [V3.28/V2.28] Unit circle display in constellation diagrams

7. [V3.28] Option FS-K9 power sensor support for RF measurements

8. [V3.30/V2.30] Multi-Frame Measurement supported

9. [V3.30/V2.30] Read out of spectrum emission mask worst fail position

10. [V3.35/V2.35] Detecting of incorrect pilot symbols of the DPCCH

11. [V3.40/V2.40] Detection of HS-DPCCH in HSDPA signal (TM5)

12. [V3.40/V2.40] Remote readout of frame bit-stream available

13. [V3.50/V2.60] Full Support of Uplink HSDPA signals (TM5)

14. [V3.50/V2.60] Eliminate 25us of each slot for EVM calculation:

According to 3GPP specification Release 5 the measurement interval for error vector magnitude (EVM) is one slot (4096 chips) less 25 µs at each end of the burst (3904 chips). This requirement depends on the expected power changes of the channel. The consideration of eliminating the tail of a slot can be switched ON or OFF.

15. [V3.50/V2.60] Absolute and relative slot power display for Power vs Slot

16. [V3.50/V2.60] Disable/Enable root raised cosine (RRC) receiver filter

17. [V3.50/V2.60] Extended trigger range:

In external trigger mode, the trigger event is expected in a time range of a half slot (333us) before and a half slot (-333us) after the start of the frame

18. [V3.60/V2.60] Display of frequency error versus slot, phase discontinuity versus slot, symbol magnitude error, symbol phase error

22. [V3.60/V2.60] Result Summary: added value RHO and timing offset

23. [V3.60/V2.60] Scrambling code input in hexadecimal and in decimal format

24**. [V3.60/V2.60] HSDPA mode channel detection can be switched ON or OFF**

25. [V3.60/V2.60] SEM: Adjustable transition frequency (30 kHz/1 MHz RBW)

26. [V3.60/V2.60] External trigger level adjustable from 0.5 to 3.5

27. [V3.60/V2.60] Carrier frequency step size softkey available

28. [V3.70] Remote command to read out total power versus slot

29. [V3.70] ACP/MCACP: number of adjacent channels increased to 12

30. [V3.70] ACP/MCACP: power mode to max hold the power results

31. [V3.80/V2.80] Support of enhanced channels (HSUPA)

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

33. [V4.00] Vector error of Error Vector Magnitude (EVM) versus chip, Magnitude error of Error Vector Magnitude (EVM) versus chip, Phase error of Error Vector Magnitude (EVM) versus chip, Composite constellation diagram of scrambled chip buffer available

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

34. [V4.00SP1] Error Vector Magnitude (EVM) versus chip for composite signal

In the vector error, magnitude error and phase error display the averaging interval for RMS values is shown.

34. [V4.10] New remote command CALC:MARK:FUNC:WCDP:RES? MTYPe | ACHannels.

Problems Eliminated with 4.10

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

1. [V3.80/ V2.80] Code domain error power display corrected.

According to 3GPP specification the code domain error (CDE) measurement displays the chip error of the signal spread to the channels spreading factor 256. In previous versions the spreading factor of the CDE measurement has been varied by adjusting the spreading factor of the Peak Code Domain Error Power (PCDEP) measurement. According to 3GPP the spreading factor of CDE is fixed to 256 and only the spreading factor of PCDEP may be varied. The unwanted dependency of CDE spreading factor on PCDEP spreading factor has been eliminated within this version.

2. [V4.00] Frame synchronisation adapted to new specifications.

Due to extended specification changes within 3GPP the frame synchronisation of K73 had to be adapted. Some of the new signals are now specified, e.g. signals with channels of high data rates, caused a loss of synchronisation when influenced by an IQ offset or IQ imbalance. The new synchronisation algorithm takes care of the conditions rising by analyzing those signals.

3. [V4.00] Wrong modulation type returned by command TRACE:DATA? CWCDP.

4. [V4.00] Wrong modulation type indicated in the result summary table for channels DPCCH and DPDCH.

Modifications to the Operating Manual

The R&S FS-K73 3G FDD UE analyzer functions are included in a separate manual set. Please refer to the following order numbers:

- 1154.7275.44-01 (German and English)

Modified Chapters for manual operation

Code Domain Power Menu – Overview

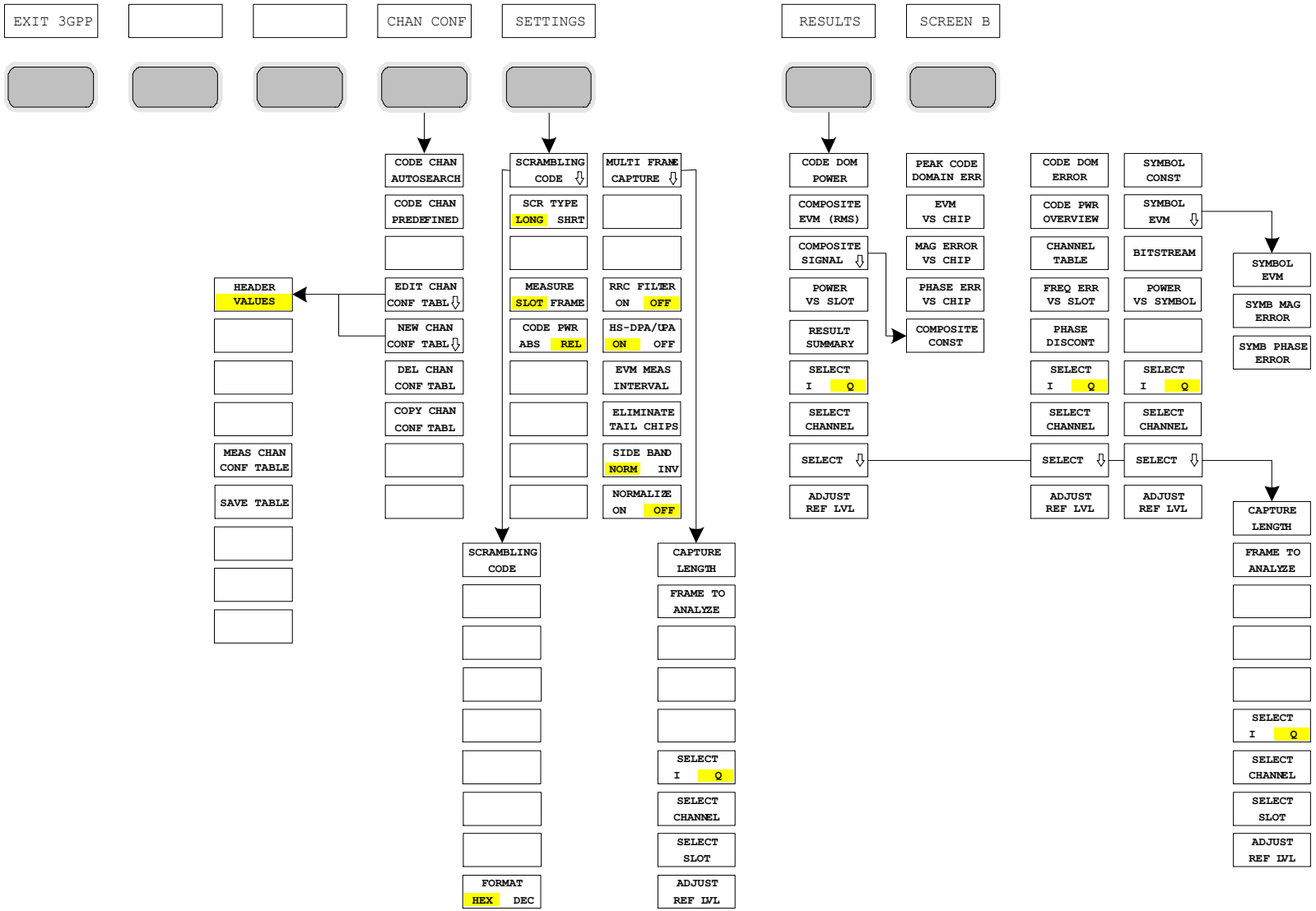
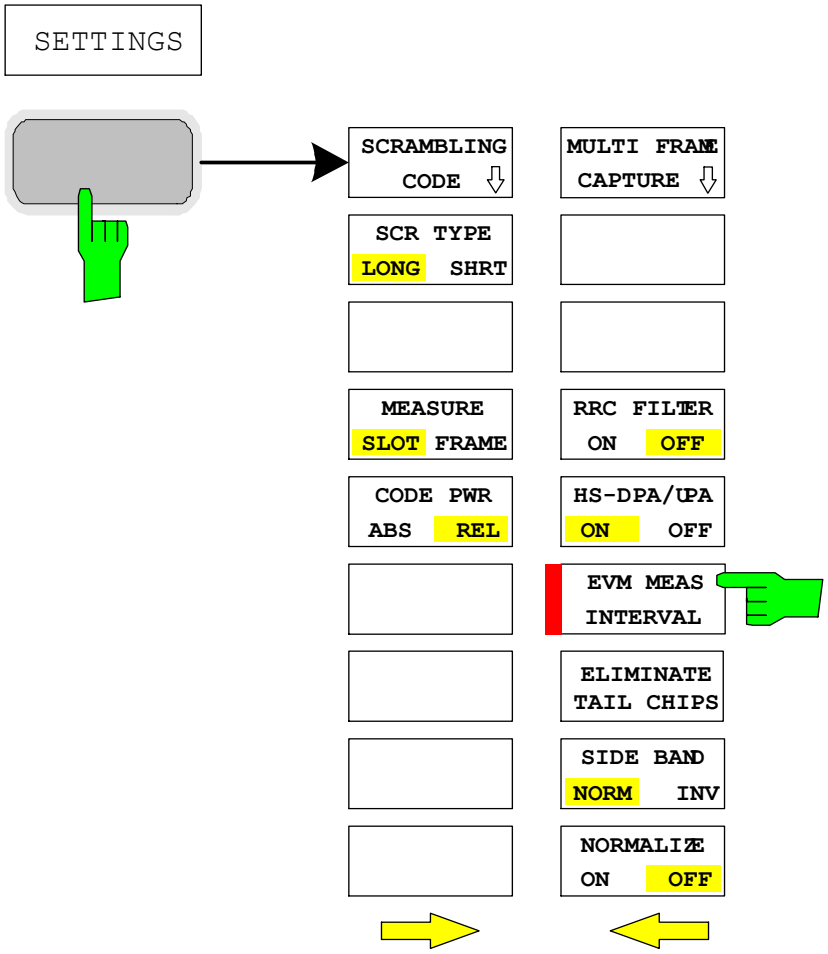
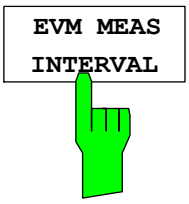


Figure 1: Code Domain Power Menu – Overview

Configuration of CDP Measurement – SETTINGS hotkey



Settings for automatic determination of measurement interval for EVM_{RMS}



The softkey *EVM MEAS INTERVAL* sets the mode of determining the average interval of the root mean square (RMS) calculation for error vector magnitude (EVM_{rms}) versus slot. The softkey influences the display of *COMPOSITE EVM* (RMS)

According to 3GPP TS 34.121 version V7.1.0 chapter 5.13.1A “Error Vector Magnitude (EVM) with HS-DPCCH”, the average interval for root mean square calculation of EVM_{rms} is not fixed to a full slot length. For signals containing power controlled channels that are not aligned to DPCCH slot timing, the interval is reduced to the period of constant power of each individual channel

By the means of the softkey the user is able to decide the way unaligned power controlled channels should influence the average interval:

CHIP 0 TO 2559:

The measurement interval of EVM_{rms} is set to a complete slot.

INT OF CONST POW:

The measurement interval of EVM_{rms} is determined by the measurement software. If the signal contains channels with a slot timing not aligned to DPCCH slot timing the measurement interval is reduced to the period during which the power of each individual code remains constant. No channel should change ist power within this interval. The length of the measurement interval should be at least one half slot. The determination of measurement interval is done for each slot individually for the period of constant power can change according to channels being switched off for some slots.

CHIP 0 TO 1279:

If the channel configuration is that way that the interval of constant power is exactly one half slot the user should be able to determine which half of the slot he likes to be used. *CHIP 0 To 1279* sets the measurement interval of of EVM_{rms} to the first half of the slot.

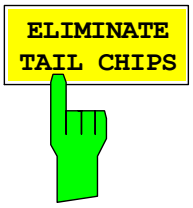
CHIP 1280 TO 2559:

The measurement interval of of EVM_{rms} is set to the second half of the slot.

The measurement interval is also influenced by the softkey *ELIMINATE TAIL CHIPS* for details please refer to the related description.

IEC/IEEE bus command: `SENSe1:CDPower:EINTerval SLOT | MEAS | FHALf | SHALf`

Default Setting: `SLOT`



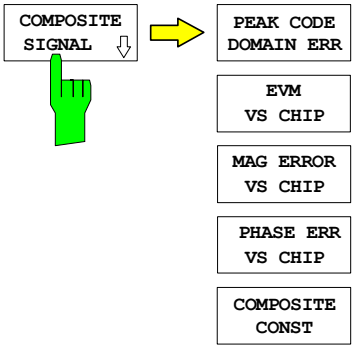
By the means of the *ELIMINATE TAIL CHIPS* the user is able to influence the measurement interval for calculation of error vector magnitude (EVM). In accordance with 3GPP specification, the EVM measurement interval is reduced by 25 µs at each end of the period of constant power of each individual code if power changes are expected. If no power changes are expected, the evaluation length is one slot. *ELIMINATE TAIL CHIPS* always reduces the measurement interval – whatever it is like – by 25 µs at both ends. However, the resulting measurement interval after reduction should be at least one half slot according to 3GPP. The measurement interval of error vector magnitude is determined by means of the softkey *EVM MEAS INTERVAL*. Please refer to that softkey for detailed description.

ON: Changes of power are expected. Therefore the EVM measurement interval is reduced by 25 µs at each end.

OFF: Changes of power are not expected. No reduction is done. (Default setting)

IEC/IEEE bus command: `:SENS:CDP:ETCH ON|OFF`

Error Vector Magnitude (EVM_{chip}) versus chip



The *COMPOSITE SIGNAL* softkey opens a submenu for evaluation dispays of the compsite WCDMA signal versus time. Different measurements are supported:

PEAK CODE DOMAIN ERR:

Peak Code Domain Error

Projection of the error between the received signal and the ideal reference signal onto the spreading factor of code class 8 and subsequent averaging using the symbols of each slot of the difference signal. The maximum value of all codes is displayed versus the CPICH slot number [screen B].

EVM VS CHIP:

Error Vector Magnitude versus chip

Square root of square difference between received signal and reference signal at chip level, displayed for each chip.

MAG ERROR VS CHIP:

Magnitude Error versus chip

Difference between the amplitude of the received signal and the reference signal at chip level, displayed for each chip.

PHASE ERROR VS CHIP:

Phase Error versus chip

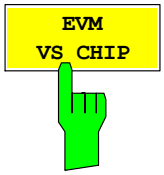
Phase difference between the received signal vector and the reference signal vector at chip level, displayed for each chip.

COMPOSITE CONST

Composite Constellation diagram

Constellation diagram of received signal (scrambled chips) [screen B].

Vector error versus chip of chip error vector magnitude



The EVM VS CHIP softkey activates the Error Vector Magnitude (EVM) versus chip display. The EVM is displayed for all chips of the slected slot. . The selected slot can be varied by the SELECT CPICH SLOT softkey. The EVM is calculated by the root of the square difference of received signal and reference signal. The reference signal is estimated from the channel configuration of .all active channels. The EVM is related to the square root of the mean power of reference signal and given in percent.

$$EVM_k = \sqrt{\frac{|s_k - x_k|^2}{\frac{1}{N}\sum_{n=0}^{N-1}|x_n|^2}} \cdot 100\% \quad | \quad N = 2560 \quad | \quad k \in [0\ldots(N-1)]$$

where: EVM_k - vector error of the chip EVM of chip number k

s_k - complex chip value of received signal

x_k - complex chip value of reference signal

k - index number of the evaluated chip

n - index number for mean power calculation of reference signal.

N - number of chips at each CPICH slot

The value are displayed as trace in screen B (Figure 2) and can be read by IEC bus command.

IEC/IEEE bus command: `:CALCulate1:FEED 'XTIMe:CDPower:CHIP:EVM'`

Query of result: `:TRACe1:DATA? TRACe2`

UNIT: [%]

Range: [0% … 100%]

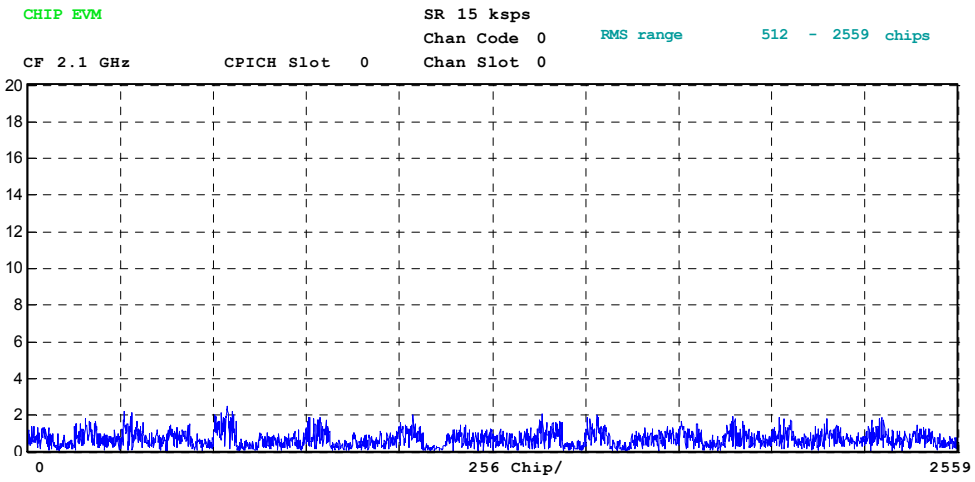


Figure 2: Display of vector error of the EVM versus chip measurement

Result Summary display

The *RESULT SUMMARY* softkey selects the numerical display of all results. The display is subdivided as follows:

Result Summary — SR 15 ksps — Chan Code 0 — CF 20 GHz — Slot # 0 — Mapping Q

GLOBAL RESULTS FOR FRAME 0:		Slot No	0
Total Power	-0.06 dBm	Carrier Freq Error	-58.06 Hz
Chip Rate Error	0.24 ppm	Trigger to Frame	640.017549 µs
IQ Offset	1.03 %	IQ Imbalance	0.13 %
Composite EVM	2.68 %	Pk CDE (480 ksps)	-42.71 dB
RMS range	512 - 2559 chips	No of Active Chan	7
CHANNEL RESULTS		RHO	0.99928
Symbol Rate	15.00 ksps	Timing Offset	0 Chips
Channel Code	0	Channel Mapping	Q
No of Pilot Bits	8	Modulation Type	BPSK-Q
Channel Power Rel	-8.46 dB	Channel Power Abs	-8.52 dBm
Symbol EVM	0.38 % rms	Symbol EVM	0.61 % Pk

Figure 3: Display of Result Summary

The upper part contains the results relating to the total signal:

Composite EVM: The composite EVM is the difference between the test signal and the ideal reference signal (see *COMPOSITE EVM* softkey). The composite EVM value for the selected slot is given in the *RESULT SUMMARY*. The measurement interval inside the selected slot is within the chips of the displayed “RMS range”. It is determined by the value of the SETTING softkeys “*EVM INTERV SLOT / MEAS”* and “*ELIMINATE TAIL CHIPS”.* (Please refer to the description of the mentioned softkeys)

RMS range: The RMS range gives the measurement interval of rot mean square averaged error vector magnitude inside the selected slot. It is determined by the value of the SETTING softkeys “*EVM INTERV SLOT / MEAS”* and “*ELIMINATE TAIL CHIPS”.* (Please refer to the description of the mentioned softkeys)

Modulation type: This parameter shows the modulation type of the selected channel. Possible values are:

- BPSK -I: The selected channel has BPSK modulation and is mapped to branch I
- BPSK -Q: The selected channel has BPSK modulation and is mapped to branch Q
- NONE: This value occurs if the selected channel is

switched off and therefore no modulation type could be detected.

Modified Chapters for remote operation

Control of root mean square average range of EVM_{rms} value

:[SENSe:]CDPower:EINTerval SLOT | MEAS

This command switches sets the mode of determining the average interval of the root mean square (RMS) calculation for error vector magnitude (EVM_{rms}) versus slot. The command influences the calculation of the composiet EVM (rms) values. [*COMPOSITE EVM* (RMS)]. According to 3GPP TS 34.121 version V7.1.0 chapter 5.13.1A “Error Vector Magnitude (EVM) with HS-DPCCH”, the average interval for root mean square calculation of EVM_{rms} is not fixed to a full slot length. In signals containing power controlled channel unaligned to DPCCH slot timing, only an interval of constant channel power should be considered to calculate EVM_{rms}. The command decides wether unaliigned power controlled channels should influence the average interval or not. The measurement interval is also influenced by the setting *ELIMINATE TAIL CHIPS* for details please refer to the command description of

MEAS: The measurement interval of EVM_{rms} is determined automatically considering the timing offset of HS-DPCCH and E-DPCCH channel of the received signal.

SLOT: The measurement interval of EVM_{rms} is set to a complete slot.

Example: `" SENS:CDP:EINT MEAS"`

Characteristics: *RST value: `SLOT`
SCPI: device-specific

Query of results: `:SENS:CDP:EINT?`

Result: `<SLOT | MEAS>`

:[SENSe:]CDPower:ETCHips ON|OFF

This command selects length of the measurement interval for calculation of error vector magnitude (EVM). In accordance with 3GPP specification Release 5, the EVM measurement interval is one slot (4096 chips) minus 25 µs at each end of the burst (3904 chips) if power changes are expected. If no power changes are expected, the evaluation length is one slot (4096 chips). In case of a reduced measurement length due to activated EVM interval reduction (refer to EVM INTERV SLOT/MEAS), the EVM measurement interval is also reduced by 25 µs. That results in an interval of less than one slot minus 25 µs (less than 3904 chips).

ON: Changes of power are expected. Therefore an EVM measurement interval of one slot minus 25 µs (3904 chips) is considered.

OFF: Changes of power are not expected. Therefore an EVM measurement interval of one slot (4096 chips) is considered

Example: `:SENS:CDP:ETCH ON`

Features: *RST value: OFF
SCPI: device-specific

Query of results: `:SENS:CDP:ETCH?`

Result: `<1|0>`

Query result of root mean square value of error vector magnitude with included measurement interval information.

:TRACe:DATA? CEVM

This command reads the root mean square (RMS) value of the error vector magnitude (EVM_{rms}). The measurement interval of the RMS value depends on analyzer settings and the channel configuration of the applied signal (refer to ":[SENSe:]CDPower:EINTerval" and ":[SENSe:]CDPower:ETCHips"). The information of the chip limits of the used measurement interval are given for each slot. Fifteen (15) groups of 6 values are always transferred.

Example: `:TRAC:DATA? CEVM`

Result: 15 groups with 6 values per group are returned:

<slot$_0$>,<EVM$_0$>, <BeginMeas$_0$>,<EndMeas$_0$>,<Reserved_A$_0$>,<Reserved_B$_0$>
<slot$_1$>,<EVM$_1$>, <BeginMeas$_1$>,<EndMeas$_1$>,<Reserved_A$_1$>,<Reserved_B$_1$>
| | | | | |
<slot$_{14}$>,<EVM$_{14}$>, <BeginMeas$_{14}$>,<EndMeas$_{14}$>,<Reserved_A$_{14}$>,<Reserved_B$_{14}$>

Where:	<field>	[unitf]	{range}	-	explanation
	<slot$_n$>	[1]	{0 … 14}	-	slot number
	<EVM$_n$>	[%]	{0 … 100}	-	RMS value of error vector magnitude
	<BeginMeas$_n$>	[chip]	{0 … 1278}	-	Begin of the measurement interval for EVM_{rms} value
	<EndMeas$_n$>	[chip]	{0 … 2559}	-	End of the measurement interval for EVM_{rms} value
	< Reserved_A$_n$>	[]	{0}	-	Reserved for possible additional information in future FW versions
	< Reserved_B$_n$>	[]	{0}	-	Reserved for possible additional information in future FW versions

Query result of root mean square average interval

:CALCulate<1|2>:MARKer<1>:FUNCtion:WCDPower:MS:RESult?
PTOTal | FERRor | TFRame | MACCuracy | PCDerror | EVMRms | EVMPeak | CERRor | CSLot | SRATe | CHANnel | CDPabsolute | CDPRelative | IQOFfset | IQIMbalance | CMAPping | PSYMbol | RHO | TOFFset | EVMBegin | EVMend

This command queries the measured and calculated results of the 3GPP FDD code domain power measurement.

PTOTal	total power	[dBm]
FERRor	frequency error	[Hz]
TFRame	trigger to frame	[s]
MACCuracy	composite EVM (RMS)	[%]
PCDerror	peak code domain error	[dB]
EVMRms	symbol error vector magnitude RMS	[%]
EVMPeak	symbol error vector magnitude peak	[%]
CERRor	chip rate error	[ppm]
CSLot	channel slot number	[]
SRATe	symbol rate	[ksps]
CHANnel	channel number	[]
CDPabsolute	channel power absolute	[dBm]
CDPRelative	channel power relative	[dB]
IQOFfset	IQ offset	[%]
IQIMbalance	IQ imbalance	[%]
CMAPping	Channel component	[I | Q]

PSYMbol	Number of pilot bits	[]
RHO	Quality paramter rho for every slot	[]
TOFFset	Offset between the start of the first slot in the channel and the start of the analyzed 3GPP FDD frame.	[chip]
EVMBegin	Begin of the measurement interval to calculate EVM (RMS) value	[chip]
EVMend	End of the measurement interval to calculate EVM (RMS) value	[chip]

Example: ":CALC:MARK:FUNC:WCDP:RES? EVMBegin"

Features: *RST value: -
SCPI: device-specific

Query result of result summary parameters

:CALCulate<1|2>:MARKer<1>:FUNCtion:WCDPower:MS:RESult?
PTOTal | FERRor | TFRame | MACCuracy | PCDerror | EVMRms | EVMPeak | CERRor | CSLot | SRATe | CHANnel | CDPabsolute | CDPRelative | IQOFfset | IQIMbalance | CMAPping | PSYMbol | RHO | TOFFset **| MTYPe | ACHannels**

This command queries the measured and calculated results of the 3GPP FDD code domain power measurement.

PTOTal	total power
FERRor	frequency error in Hz
TFRame	trigger to frame
MACCuracy	composite EVM
PCDerror	peak code domain error
EVMRms	error vector magnitude RMS
EVMPeak	error vector magnitude peak
CERRor	chip rate error
CSLot	channel slot number
SRATe	symbol rate
CHANnel	channel number
CDPabsolute	channel power absolute
CDPRelative	channel power relative
IQOFfset	IQ offset
IQIMbalance	IQ imbalance
CMAPping	Channel component
PSYMbol	Number of pilot bits
RHO	Quality paramter rho for every slot
TOFFset	Offset between the start of the first slot in the channel and the start of the analyzed 3GPP FDD frame.
MTYPe	**modulation type**
ACHannels	**Number of active channels**

Example: ":CALC:MARK:FUNC:WCDP:RES? PTOT"

Features: *RST value: -
SCPI: device-specific

Query results of channel table

:TRACe[:DATA]? TRACE1 | TRACE2 | ABITstream | CTABle | CWCDp | TPVSlot

This command transfers trace data from the controller to the instrument, the query reads trace data out of the instrument.

ABITstream can be set only if `CALC2:FEED "XTIM:CDP:BSTReam"` is selected (in the lower bitstream window). This command returns the bitstreams of all 15 slots one after the other, the output format may be REAL, UINT or ASCII.

The output format is equal to that of the ":TRACe1:DATa? TRACE2" command in case of an activated bitstream display. The only difference is the number of symbols which are evaluated. The ABITSTREAM command evaluates all symbols of one frame. One value is transferred per bit (range 0,1,). Each symbol contains of two (QPSK) consecutive bits. The number of symbols is not constant and may vary depending on the spreading factor of the selected channel. The bit stream may contain invalid (symbols without power). In this case the character '9' is read.

Unit: []

Range: {0, 1, 7, 9}

Bits per symbol: $N_{BitPerSymb} = 2$

Number of symbols: $N_{Symb} = 150*2^{(8\text{-Code Class})}$

Number of bits: $N_{Bit} = N_{Symb} * N_{BitPerSymb}$

Format: $Bit_{00}, Bit_{01}, Bit_{10}, Bit_{11}, Bit_{20}, Bit_{21}, \ldots.$,
$Bit_{NSymb\ 0}, Bit_{NSymb\ 1}$

Explanation: 0 – Low state of a transmitted bit
1 – High state of a transmitted bit
7 – Suppressed symbol of a HS-DPCCH slot
9 – Bit of an inactive channel

CTABle reads out the channel table: Seven values are transmitted for each channel, the sixth value (reserved for pilot length) being constantly 0:
< class>,<cannel number>,<absolute level>,<relative level>, <I/Q component>,0,<state>...

CWCDp can be set if CODE PWR ABSOLUTE / RELATIVE, CHANNEL TABLE is selected for trace 1. The pilot length, channel state, channel type, modulation type and a reserved value are transmitted in addition to the values transmitted for trace 1. For each channel, 11 values are transmitted

<code class>, <channel number>, <IQ component>, <absolute level>, <relative level>,
<timing offset>, <pilot length>, <active flag>, <channel type>, <modulation type>, <reserved>...

No.	Parameter	Range	Unit	Explanation
1)	<code class>	{2 to 8}	[1]	Code class of the channel.
2)	<channel number>	{0 to 255}	[1]	Code number of the channel.
3)	<IQ component>	{0, 1}	[1]	IQ component of the channel.
		0 - Q component	Channel symbols (S_n) sent from **q**uadrate component; only imaginary part of S_n is used. [Re {S_n} = 0 Im {S_n} ≠ 0]	
		1 - I component	Channel symbols (S_n) sent from **I**n phase component; only real part of S_n is used. [Re {S_n} ≠ 0 Im {S_n} = 0]	
4)	<absolute level>	{-∞ to ∞}	[dBm]	Absolute level of the code channel at the selected channel slot. (The channel slot can be marked by the SELECTED CPICH slot.)
5)	< relative level >	{-∞to ∞}	[dB]	Relative level of the code channel at the selected channel slot referenced to CPICH or total power. (The channel slot can be marked by the SELECTED CPICH slot.)

6)	<timing offset>	{0 to 2560}	[chips]	Timing offset of the HS-DPCCH to the frame start. The value is measured in chips. The step width is 256 chips. For all other data channels, the timing offset is zero.
7)	<pilot length>	{0 to 8}	[symbols]	Pilot length of the DPCCH.
8)	<active flag>	{0,1}	[1]	Flag to indicate whether a channel is active 0 - channel not active 1 - channel active
9)	<channel type>	{0 ... 2}	[1]	Channel type indication
		0 - DPDCH	**D**edicated **P**hysical **D**ata **Ch**annel	
		1 - DPCCH	**D**edicated **P**hysical **C**ontrol **Ch**annel	
		2 – HS-DPCCH	**H**igh-**S**peed **D**edicated **P**hysical **C**ontrol **Ch**annel	
		3 – E-DPCCH	***E**nhanced **D**edicated **P**hysical **C**ontrol **Ch**annel*	
		4 - E-DPDCH	***E**nhanced **D**edicated **P**hysical **D**ata **Ch**annel*	
10)	**<modulation type>**	**{0,1,15}**	**[1]**	**Modulation type of the code channel**
		0 - BPSK-I		**Modulation type BPSK I - Branch**
		1 – BPSK-Q		**Modulation type BPSK Q - Branch**
		15 – None		**no power within the channel slot**
11)	<reserved>	{0}	[1]	Reserved for future functionality.

For TRACE1 or TRACE2 the following measured values are transferred depending on the display mode:

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

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