ROHDE&SCHWARZ

Test and Measurement
Division

Release Notes

Firmware Release 4.12 (XP)

for R&S ESCI EMI Test Receivers
with order number: **1166.5950.03**

and R&S ESPI Test Receivers
with order number: **1164.6407.xx**

Release Note Revision: 2

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Contents

History

Date	Rel Note Rev	Changes
7 Nov 2007	1	First Revision for 4.12
28 Nov 2007	2	Headline changed

General Topics

Firmware Update

Generation of the update disk set

The files needed for the firmware update are grouped according to the disk contents:

Disk 1:	disk1.bin	(self-extracting ZIP file; needs to be renamed to disk1.exe before unpacking)
Disk 2:	data3.cab	(packed contents of disk 2, will be automatically unpacked by FW update)
Disk 3:	data4.cab	(packed contents of disk 3, will be automatically unpacked by FW update)
…	…	…
Disk 13:	data14.cab	(packed contents of disk 13, will be automatically unpacked by FW update)
Disk 14:	data15.cab	(packed contents of disk 14, will be automatically unpacked by FW update)

Please note that the difference in disk number and filename of the corresponding archive file is by intention, not by chance!

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 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/2000 this is done best using the following sequence:

    <CTRL><ESC> - RUN – C:\MyTemp\Disk1 - <ENTER>

    or

    <CTRL><ESC> - AUSFÜHREN – C:\MyTemp\Disk1 - <ENTER> for a German Windows version.

    The files will be unzipped

4. Delete disk1.exe from the temporary directory.
    The temporary directory will now contain the following files:

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

    Please make sure that all the filenames are spelt correctly on your disks before you try to use them for the firmware update. Especially the trailing underscore'('_') as used in ikernel.ex_ **is essential for correct operation of the update program.**

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

The contents of the other disks are 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 to #14, the number in the filename (minus 1) indicating the corresponding disk number (data3.cab => disk #2, data4.cab => disk#3, etc.).

Preparing an installation via LAN or USB stick:

If the installation is performed via LAN or USB stick please set up a directory structure as shown on the right.

Copy all files as mentioned in the previous section in the directories Disk1 – Diskxx.

The directory path shall not contain more the 64 characters.
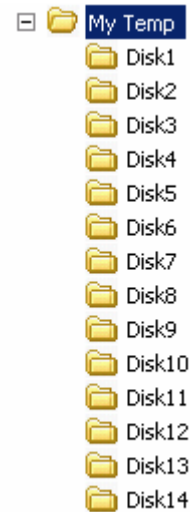
Performing the firmware update on the instrument

A new method to install the base system is available, if the installed base system firmware is V4.12 or newer. The sub directories for all update sets have to be aranged as described in the section "*Preparing installation via LAN or USB stick*". The new update manager will search for available update sets.
For updating to version 4.12 first update the bases system only to get the new update manager. Then update base system using the new update manager.

Skip the part *Base System Update*, if base system firmware V4.12 or newer is already installed and the directories are arranged as described above (with LAN or USB stick).

Base System Update:
The 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 use the SETUP | NEXT | FIRMWARE UPDATE | UPDATE PATH softkey to specify any path for the location of the disk directory (e.g. F:\MyTemp). 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 to #14 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.**

Complete Update with update manager:
➢ Use the SETUP | NEXT | FIRMWARE UPDATE | UPDATE PATH softkey to specify any path for the location of the disk directory (e.g. F:\MyTemp).
➢ Press SETUP → NEXT → FIRMWARE UPDATE

The *Installation Manager* will terminate the analyzer application, search for available application update set and will show a selection list.
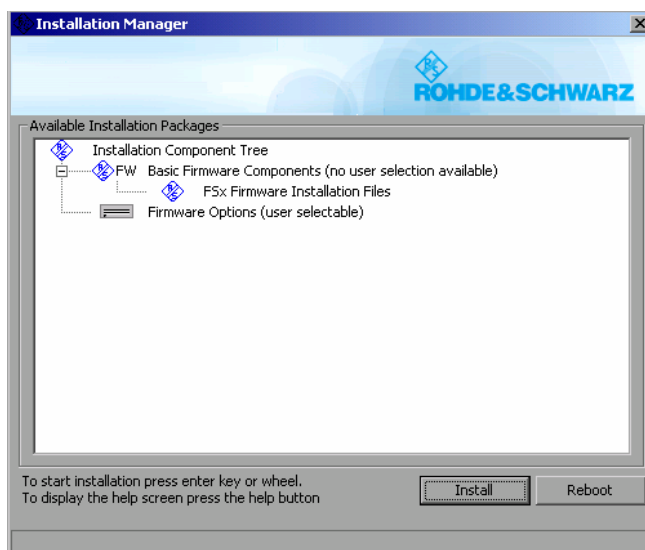
➢ Start the installation process with INSTALL.
  REBOOT will abort the update and restart the analyzer application without any changes.
➢ The instrument will perform several automatic shutdowns, until the new firmware and all applications are installed properly.

Do not switch the instrument off until the update process has been finished completely.

After a successful firmware update it is necessary to execute the instument's self alignment process by pressing CAL and softkey CAL TOTAL.

Known problems during firmware update

After switching on the instrument for the first time after a successful firmware update, the following system message might occur once: System Message
                                                    CDS: Error...

In this case the unit needs to be switched off and on again. This system message does not appear again during further power-on cycles.

Note: *If the unit is not restarted as described, system error correction data (CAL TOTAL) of a later date will be lost when switching the unit on again.*

Firmware update with ESPI-B20 and ESCI-B20 (flash disk):
At the final step of the setup, backup files are stored for the 'Analyzer Firmware Backup' (option during the start-up of the instrument). This backup is only available for analyzers equipped with hard discs. Therefore an error message "Add folder icon failed" occurs twice if the ESxI-B20 is installed.
Workaround: Accept that message via the 'OK' button twice. The firmware update will continue without any problem! This problem is solved with version 3.50 or later.

Message box: Can't open front panel driver, error code=0x2
For some constellations this message box occurs after the last reboot of the device. Please start the WDMutility with START | PROGRAMS | WDM Utility and click the START button. The device will boot twice (the message box will be still shown after the first boot) and after the second boot the measurement application comes up and the problem is solved.

Firmware installation of the R&S FS-K7 FM demodulator software

The R&S FS-K7 FM demodulator software package is included in the basic instrument firmware. It therefore needs no separate firmware update procedure.

Enabling the option via option key code entry

For activation of the R&S FS-K7 a license key for validation must be entered. The license key is printed either on a label on the rear panel of the R&S ESPI or delivered as a part of the R&S FS-K7 option package. The key sequence for entering the license key is:

SETUP - GENERAL SETUP – OPTIONS - INSTALL OPTION

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

➢ On a successful validation the message 'option key valid' will appear.

➢ If the validation failed, the option software is not installed.

Modified Functions

1. (V3.32SP3) Receiver: Number of stored results per trace increased to 1 Mio.

The maximal number of measured frequencies is limited to 1.000.000. A maximum of 3 x 1.000.000 values (1.000.000 per detector) can be stored for postprocessing (was 100.000 before).

2. (V3.32SP3) Receiver: Downrange limit for Quasipeak Detector

The level limit for the autoranging function has been increased. Attenuation is now decreased earlier to get a better signal to noise ratio.

3. (V3.32SP3) Receiver: Audio not longer disabled with Quasipeak settling time

4. (V3.82) Receiver: Improved frequency tuning with Quasipeak Detector.

The level bargraph will not longer be blanked when the frequency is tuned manually.

5. (V3.82) Analyzer: Active transducer and adjust reference level procedure:

If transducers are active and the adjust reference level procedure (in measurements like ACP, occupied bandwidth, signal statistics, etc.) is invoked, the REFLVL ADJ AUTO/MANUAL of the SETUP|TRANSDUCER menu is set to AUTO thus the best dynamic performance is obtained.

6. (V3.82) Analyzer: Marker peak list in continuous sweep mode

In continuous sweep mode the marker peak list is not any longer executing a single sweep and then peak list search, but the peak list will immediately work on the current trace. This allows peak list functionality on averaged or max holded traces in continuous sweep mode. The single sweep mode is unchanged.

7. (V3.82) Analyzer: Harmonic measurement

The mixer level within the harmonic measurement is changed to -10 dBm. The value update in the lower screen happens during the sweep and not only at sweep end.

8. (V3.82) Display of RBW type

The selected type of the resolution bandwidth is displayed as label on the right side of the diagram.

```
3DB        NORMAL (3dB)
6DB        NORMAL (3dB)
FFT        FFT
CHN        CHANNEL
RRC        RRC
```

9. (V3.82) 1 MHz 6 dB Resolution Bandwidth

The 1 MHz 6 dB resolution bandwidth has been adjusted to better match the impulse bandwidth.

10. (V4.12) CCDF measurement result table extended by 0.01% value.

11. (V4.12) New marker functions AUTO MAX PEAK and AUTO MIN PEAK.

12. (V4.12) HP emulation: HP Models 71100C, 71200C and 71209A are using 800 sweep points.

13. (V4.12) Additional number of sweep points 201, 401, 801 and 1601.

14. (V4.12) HP emulation: Additional models 8568A_DC and 8568B_DC using DC coupling.

15. (V4.12) HP emulation: GENERAL SETTINGS - GPIB menu extended by IF GAIN NORM / PULS.

16. (V4.12) New spurious emissions measurement LIST EVALUATION.

17. (V4.12) FS-K7: The THD Unit is selectable (dB / %) in the AM signal / AF spectrum result.

18. (V4.12) New function MARKER FILE EXPORT.

19. (V4.12) Signal Track: Enhanced sensitivity in marker tracking function.
The marker is now set to the signal peak after very single sweep. In previous versions, this only happened if the difference between signal peak and center frequency exceeded 20 % of the Resolution Bandwidth.

20. (V4.12) Improved Firmware Update.

21. (V4.12) Gated statistics measurements APD, CCDF.

22. (V4.12) GPIB: Basic remote control of the signal generator which is connected to the additional FSP-B10 GPIB Interface.

23. (V4.12) GPIB: New commands available
      :[SENSe<1|2>:]CORRection:TRANsducer:ACTive?   returns active transducer
      :CALCulate<1|2>:LIMit<1...8>:ACTive?   returns active limit line(s)

24. (V4.12) Trigger Line for video trigger now also visible outside of the trigger menu.

25. (V4.12) HP emulation: The OL command returns the mixer level in byte 23

26. (V4.12) HP emulation: The commands MKPK NH | NL | NR and KSK do not perform a sweep start when marker is already switched on.

27. (V4.12) HP emulation: The commands SNGLS and CONTS are setting the command complete bit (bit 4) in STB

28. (V4.12) HP emulation: New softkey SETUP - GENERAL SETUP - GPIB - SWEEP REP ON/OFF"

29. (V4.12) HP emulation: New commands: VARDEF, CTA, ADD, SUB, MPY, DIV

30. (V4.12) HP emulation: New command NORMLIZE for tracking generator

31. (V4.12) HP emulation: The command LF performs a reset

32. (V4.12) Scan needs to be interrupted for a hardcopy but it may be resumed after having done the hardcopy.

Problems Eliminated

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

Problem solved in version 3.82:

1. (V3.32)   **Measurement in Receiver scan mode too fast**
The measurement time in scans started from below 150 kHz could be faster than defined in the scan table.

2. (V3.32)   **Level of Display line could not be changed (Receiver mode)**
The Level value of a display line was fixed.

3. (V3.32)   **Changing from a Setup, Hardcopy or File Menu to another menu needed two keystrokes**

4. (V3.32)   **Video trigger in conjunction with transducer factors corrected.**

5. (V3.32)   **FS-K7: all marker info disappears when markers are switched off.**

Problem solved in version 3.82 SP1:

6. (V3.82)   **Instrument Firmware did not start.**
When the instrument has been switched off with full screen in receiver mode, the firmware did not start when the instrument was switched on again.

7. (V3.32)   **Video Trigger and Transducer**
The Video Trigger level does now take active transducer factors into account.

Problem solved in version 3.92:

8. (V3.82)   **Error Message: Your trial period will expire**
This error message now is only displayed when the option for a trial period is installed.

9. (V3.32)   **Reception of a spurious signal with 100 Hz and 200 Hz RBW**
A spurious signal 1.8666 MHz away from the real signal has been removed.

10. (V3.32)   **Display of RBW filter type with active OBW function**
Switching on the OBW function with RBW filter type FFT, the displayed filter type remained FFT instead of 3DB. .

11. (V3.32)   **Remote Control: Block ready bit after Scan continue**
The block ready bit in the status reporting system is now correcly set after continuing a scan.

12. (V3.32)   **Transducer factor with unit dBpW**
Transducer factors with unit dBpW are not longer based on the unit dBµV.

13. (V3.32)   **Squelch setting after power on**
The squelch setting is now properly restored after power on.

14. (V3.32)   **Coupled Reference Level in Split Screen**
Switching on REF LEVEL COUPLED in the DISP menu could give an offset in the displayed level values.

Problem solved in version 3.92 SP1:

15. (V3.82)   **FSP-B9: Amplitude droop of tracking generator output signal at 9kHz fixed**
This problem was reported for B9 board revisions with HWC 01 (see table SETUP - SYSTEM INFO - HARDWARE INFO, column HWC).

Problems solved in version 3.92 SP2:

16. (V3.92) Pressing the HCOPY key does not longer close open tables on the screen
It is now again possible to make hardcopies from tables.

17. (V3.92) Marker Next Peak in Receiver Scan
The MKR→ NEXT PEAK softkey didn't work.

18. (V3.92) Autorange function in Receiver Mode
The bargraph measurement function could display results before the final attenuator setting had been reached.

Problems solved in version 4.12:

19. (V3.92) Marker not available after Hardcopy
Pressing the Hardcopy key while scaning made the marker function unavailable.

20. (V3.92) MMEMory command could block instument
The instrument firmware could be blocked after several hundred MMEMory commands.

21. (V3.92) Wrong frequencies in trace export file with logarithmic x axis scaling in analyzer sweep

Known Problems

none

Modifications to the Operating Manual

The order numbers for the current manual sets for R&S ESCI are

- 1166.6004.11-01
  1166.6004.81-01 (German)

- 1166.6004.12- 01
  1166.6004.82-02 (English).

- 1166.6004.19-01
  1166.6004.89-02 (English, letter format).

The order numbers for the current manual sets for R&S ESPI (XP) are

- 1164.6459.11-01
  1164.6459.81-01 (German)

- 1164.6459.12-01
  1164.6459.82-01 (English).

- 1164.6459.19-01
  1164.6459.89-01 (English, letter format).

The corresponding PDF-Files for the operating manuals are separately available on our web page.

Last minute changes to the operating manual

Menu MEAS (Receiver)
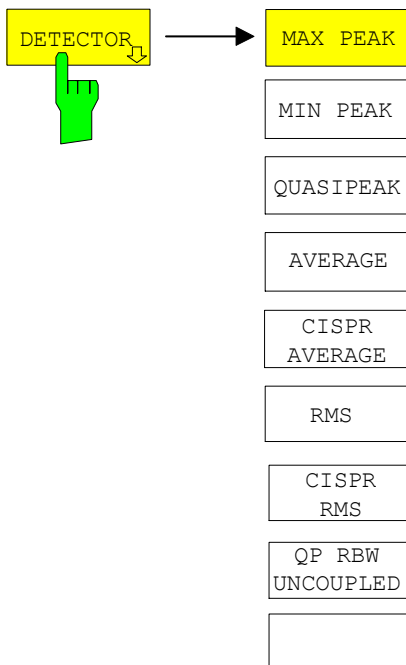
The *DETECTOR* softkey opens a submenu to select the detector and combinations of detectors.

A maximum of three detectors can be switched on simultaneously.

Note: *This softkey is also available in the Receiver-menu.*

CISPR RMS

The *CISPR RMS* softkey activates the weighting average detector according to to a proposed amendment of CISPR 16-1-1 (CISPR/A/628/CD). The IF bandwidth is automatically set to the required value according to the receiving frequency. This coupling can be cancelled by the *QP RBW UNCOUPLED* softkey.

IEC/IEEE-bus command: DET:REC CRMS

- The CISPR rms detector supplies a weighted average. When measuring the average according to CISPR 16-1, the maximum value of the linear average during the measurement time is displayed. The detector is used, for example, to measure pulsed si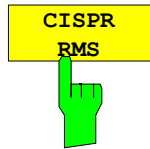nusoidal signals with a low pulse frequency. It is calibrated with the rms value of an unmodulated sinusoidal signal. Averaging is with lowpass filters of the 2nd order (simulation of a mechanical instrument). The lowpass time constants and the IF bandwidths are fixed depending on the frequency. The main parameters are listed in the following table:

	CISPR Band A	CISPR Band B	CISPR Band C/D	CISPR Band E
Frequency range	9 kHz to 150 kHz	150 kHz to 30 MHz	30 MHz to 1000 MHz	> 1000 MHz
IF bandwidth	200 Hz	9 kHz	120 kHz	1 MHz
Lowpass time constant	160 ms	160 ms	100 ms	100 ms
Corner frequency	10 Hz	100 Hz	100 Hz	1 kHz

Effect of measurement time:

CISPR average and CISPR rms measurement:

With a CISPR average or a CISPR rms measurement, the maximum value of the weighted signal during the measurement time is displayed. The relatively long time constants used with CISPR average and CISPR rms detectors result in long measurement times in order to obtain a correct measurement result. If unknown signals are measured, the measurement time should be at least one second so that pulses down to a frequency of 5 Hz are correctly weighted.

After a frequency change or a modification of the attenuation, the receiver waits until the lowpass has settled before the measurement time starts. The measurement time is selected depending on the IF bandwidth and the characteristics of the signal to be measured. Unmodulated sinusoidal signals as well as signals with high modulation frequency can be measured within a short time. Slowly fluctuating signals or pulse signals require longer measurement times.

Menu TRACE (Receiver)
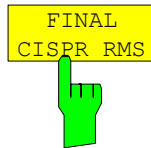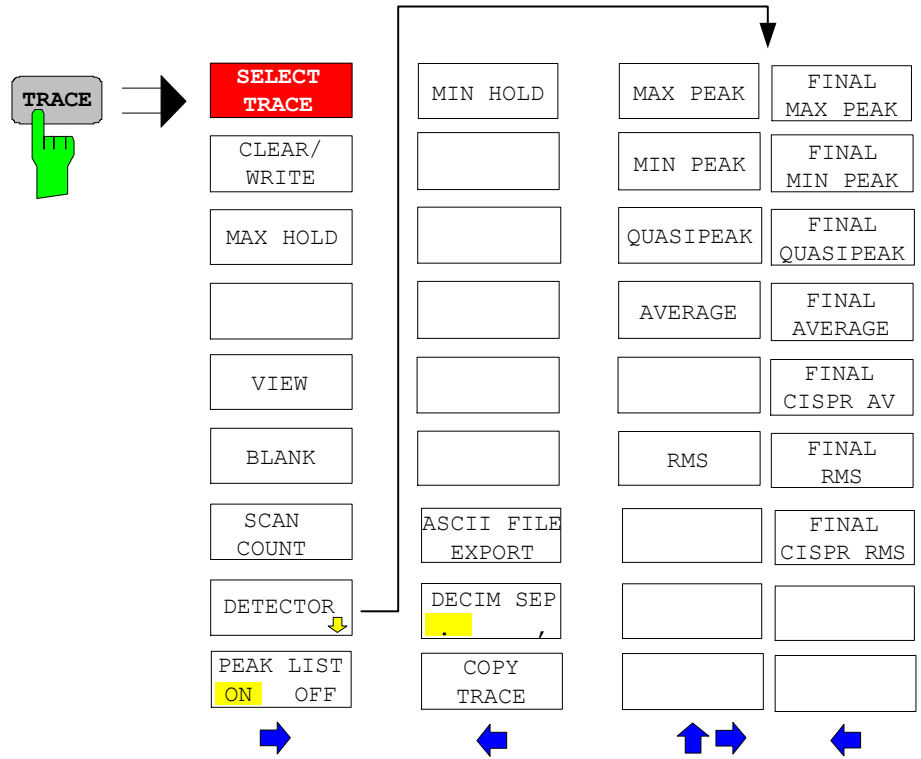
The *FINAL CISPR RMS* selects the weighting rms detector according to CISPR 16-1 for the final measurement.

IEC\IEEE bus command   `:DET:FME CRMS`

Menu TRACE – DETECTOR – NEXT (Analyzer)

DETECTOR
CISPR RMS

DETECTOR
CISPR AV

The *DETECTOR CISPR RMS* softkey activates the weighting detector according to a proposed amendment of CISPR 16-1-1 (CISPR/A/628/CD).The CISPR RMS average detector supplies a weighted readin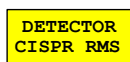g of the input signal. When measuring the RMS-average according to the proposed amendment of CISPR 16-1-1, the maximum value of the RMS-average during the measurement time is displayed. The detector is used, for example, to measure pulsed sinusoidal signals with a low pulse repetition frequency. It is calibrated with the RMS value of an unmodulated sinusoidal signal. Averaging is with lowpass filters of the 2nd order (simulation of a mechanical instrument).

The DETECTOR CISPR AVERAGE softkey activates the weighting average detector according to CISPR 16-1-1.The CISPR average detector supplies a weighted average. When measuring the average according to CISPR 16-1-1, the maximum value of the linear average during the measurement time is displayed. The detector is used, for example, to measure pulsed sinusoidal signals with a low pulse repetition frequency. It is calibrated with the rms value of an unmodulated sinusoidal signal. Averaging is with lowpass filters of the 2nd order (simulation of a mechanical instrument).

Both softkeys are only available in zero span mode. The bandwidth is limited to the values 200Hz, 9kHz, 120kHz and 1 MHz. In order to use the normal bandwidths again, the detector must be changed e.g. AUTO SELECT.

IEC/IEEE-bus command:
DETector<1|2> CRMS
DETector<1|2> CAVerage

Menu MEAS – CHAN PWR ACP / MULT PWR ACP – CP/ACP CONFIG (Analyzer)
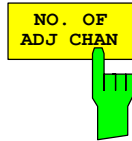
**NO. OF
ADJ CHAN**

The *NO. OF ADJ CHAN* softkey enables input of the number ±n of adjacent channels which are taken into account for the adjacent channel power measurement.

Numbers between 0 and 12 can be entered.

IEC/IEEE bus command:
```
:SENS:POW:ACH:ACP 0..12
```

This increased number of adjacent channels is realized through all the relevant settings like:
ACLR LIMIT CHECK
```
:CALC:LIM:ACP:ACH:RES?
:CALC:LIM:ACP:ALT1..11:RES?
```
The following summary bits are introduced to `STAT:QUES:ACPL`:
    Bit 14 : ALT3..11 LOWER or UPPER FAIL (screen B)
    Bit 6   : ALT3..11 LOWER or UPPER FAIL (screen A)
EDIT ACLR LIMITS
```
:CALC:LIM:ACP:ACH:STAT ON
:CALC:LIM:ACP:ACH:ABS -10dBm,-10dBm
:CALC:LIM:ACP:ACH:ABS:STAT ON
:CALC:LIM:ACP:ALT1..11 0dB,0dB
:CALC:LIM:ACP:ALT1..11:STAT ON
:CALC:LIM:ACP:ALT1..11:ABS -10dBm,-10dBm
:CALC:LIM:ACP:ALT1..11:ABS:STAT ON
```
ADJ CHAN BANDWIDTH
```
:SENS:POW:ACH:BWID:ALT1..11 30kHz
```
ADJ CHAN SPACING
```
:SENS:POW:ACH:SPAC:ALT1..11 4MHz
```

**POWER
MODE**

**CLEAR/
WRITE**
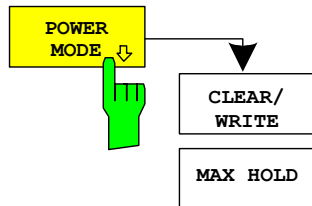
MAX HOLD

The *POWER MODE* sub menu allows to change between the normal (*CLEAR/WRITE*) and the max hold power mode. In the *CLEAR/WRITE* mode the channel power and the adjacent channel powers are calculated directly from the current trace. In *MAX HOLD* mode the power values are still derived from the current trace, but they are compared with a maximum algorithm to the previous power value. The greater value is remained.

IEC/IEEE bus command:
```
:CALC:MARK:FUNC:POW:MODE WRIT|MAXH
```

Menu MKR→ – NEXT – NEXT (Analyzer)

AUTO MAX PEAK / AUTO MIN PEAK adds an automatic peak search action for marker 1 at the end of each particular sweep. This function may be used during adjustments of a device under test to keep track of the actual peak marker position and level.
The actual marker search limit settings (*LEFT LIMIT*, *RIGHT LIMIT*, *THRESHOLD,* EXCLUDE LO) are taken into account.

IEC/IEEE-bus command:
```
CALCulate<1|2>:MARKer<1...4>:MAXimum:AUTO ON | OFF
CALCulate<1|2>:MARKer<1...4>:MINimum:AUTO ON | OFF
```
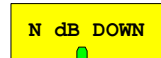
The suffix at MARKer is ignored.

Menu MKR FCT (Analyzer)
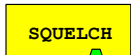
The *N dB DOWN* softkey activates the temporary markers T1 and T2 which are n dB below the active reference marker. Marker T1 is placed to the left and marker T2 at the right of the reference marker. The value n can be input in a window.
If a negative value is entered than the markers are placed n dB above the active reference marker. This is then a n dB up function which can be used for notch filter measurements,

The default setting is 3 dB.

IEC/IEEE-bus command:
```
:CALC:MARK1:FUNC:NDBD:STAT ON
:CALC:MARK1:FUNC:NDBD -3dB      'n dB up function with negative values
```

Menu MKR FCT - MARKER DEMOD - SQUELCH (Analyzer)

The *SQUELCH* softkey enables the input of a level threshold below which the audible AF is cut off. The squelch function is associated with the internal trigger function (TRIGGER menu), which will be switched on automatically with the squelch. Squelch level and trigger level do have the same value.

The default setting for the squelch is off.

IEC/IEEE-bus command:
```
:CALC:MARK1:FUNC:DEM:SQU ON | OFF
:CALC:MARK1:FUNC:DEM:SQU:LEV 80 PCT
```

Menu MKR FKT – PHASE NOISE (Analyzer)

AUTO PEAK SEARCH

The phase noise *AUTO PEAK SEARCH* adds an automatic peak search action for the reference fixed marker 1 at the end of each particular sweep. This function may be used for tracking of a drifting source whilst phase noise measurement. The delta marker 2 which shows the phase noise measurement result keeps the delta frequency value. Therefore the phase noise measurement in a certain offset is valid although the source is drifting. Only when the marker 2 is reaching the border of the span the delta marker value is adjusted to be within the span. Choose a larger span in such situations.
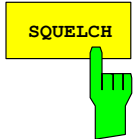
IEC/IEEE-bus command:
```
CALCulate<1|2>:DELTamarker<1...4>:FUNCtion:PNOise:
AUTO ON | OFF
```

The suffix at DELTamarker is ignored.

Menu MEAS - DEMOD - SQUELCH (Receiver)

SQUELCH

The *SQUELCH* softkey enables the input of a level threshold below which the audible AF is cut off. The squelch function is associated with the internal trigger function (TRIGGER menu), which will be switched on automatically with the squelch. Squelch level and trigger level do have the same value.

The default setting for the squelch is off.

IEC/IEEE-bus command:
```
:SENS:DEM:SQU ON | OFF
:SENS:DEM:SQU:LEV 80 PCT
```

Menu SETUP – SYSTEM INFO MEAS – STATISTICS

For new delivered devices the specifications version (document of the hardware properties) is shown. For already delivered device dashes (--.--) are displayed.

Menu MEAS – STATISTICS – CCDF ON / APD ON – SCALING (Analyzer)
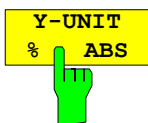
Y-UNIT % ABS

The softkey *Y-UNIT %/ABS* defines the scaling type on the y-axis. The default case are the absolute probability. This can be changed to percent values. The softkeys *Y-AXIS MIN* and *Y-AXIS MAX* are using values based on the *Y-UNIT* setting.

IEC/IEEE-bus command:
```
:CALC:STAT:SCAL:Y:UNIT PCT | ABS
```

The 0.1%, 1% and 10% value from the CCDF measurement are shown in the bottom screen half. Those values can also queried via remote:

IEC/IEEE-bus command:
```
:CALCulate<1|2>:STATistics:CCDF:X<1..4>? P0_1 | P1 | P10
```

Menu NETWORK with option R&S FSP-B9
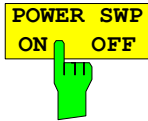
The softkey *POWER SWP ON/OFF* activates or deactivates the power sweep. If the power sweep is ON the enhancement label TGPWR is shown and the analyzer is set in zero span mode (span = 0Hz). During the sweep time of the zero span the power at the internal tracking generator is changed linear from start power to stop power. The start and stop power values are shown on the right side below the diagram.

IEC/IEEE-bus command:
```
:SOUR:POW:MODE SWE
:SOUR:POW:MODE FIX
```
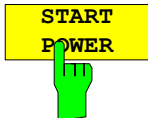
The softkey *START POWER* defines the start power of the power sweep.

The start power can be set between -30 and +0 dBm for the R&S FSP and between -30 dBm and +5 dBm for the R&S FSU. With the option FSU-B12 the power can be set between -100 and + 5 dBm.

IEC/IEEE-bus command:
```
:SOUR:POW:STAR –20dBm
```
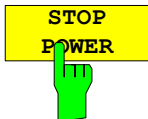
The softkey *STOP POWER* defines the stop power of the power sweep.

The stop power can be set between -30 and +0 dBm for the R&S FSP and between -30 dBm and +5 dBm for the R&S FSU. With the option FSU-B12 the power can be set between -100 and + 5 dBm.
The stop value can be smaller than the start value.

IEC/IEEE-bus command:
```
:SOUR:POW:STOP –10dBm
```

Menu NETWORK with option R&S FSP-B10 – EXT SOURCE

FREQUENCY SWEEP

The *FREQUENCY SWEEP* softkey opens a table for setting the generator level as well as the multiplier and the offset used to derive the generator frequency from the analyzer frequency.

Since version 3.7x the external generator can also be used to sweep in the reverse direction. This can be achieved by setting a **negative** offset in the following formula:

$$F_{Generator} = \left| F_{Analyzer} * \frac{Numerator}{Denominator} + F_{Offset} \right|$$

Example for reverse sweep:

$F_{AnalyzerStart}$	= 100 MHz
$F_{AnalyzerStop}$	= 200 MHz
F_{Offset}	= -300 MHz
Numerator = Denominator	= 1
-> $F_{GeneratorStart}$	= 200 MHz
-> $F_{GeneratorStop}$	= 100 MHz

If the offset is adjusted in a way that the sweep of the generator crosses the 0 Hz Frequency, it is indicated by the additional statement "via 0 Hz".

Example for reverse sweep via 0 Hz

$F_{AnalyzerStart}$	= 100 MHz
$F_{AnalyzerStop}$	= 200 MHz
F_{Offset}	= -150 MHz
Numerator = Denominator	= 1
-> $F_{GeneratorStart}$	= 50 MHz
-> $F_{GeneratorStop}$	= 50 MHz via 0 Hz

IEC/IEEE-bus command:
```
SOUR:EXT:FREQ:NUM 1
SOUR:EXT:FREQ:DEN 1
SOUR:EXT:FREQ:OFFS -300MHZ
```

External Generator Control – Option R&S FSP-B10

Note: The external generator control is only available in the spectrum analyzer mode and not in the receiver mode.

Menu MEAS – NEXT – HARMONIC DIST (Analyzer)

HARMONIC ON OFF
NO. OF HARMONICS
HARMONIC SWEEPTIME
HARMONIC RBW AUTO
ADJUST SETTINGS

The softkey *HARMONIC DISTORTION* opens this menu and activates the harmonic distortion measurement. With this measurement it is possible to measure easily the harmonics e.g. from a VCO. In addition the THD (total harmonic distortion) is calculated in % and dB.

There are 2 possible modes within the harmonic measurement. When entering the harmonic measurement from a frequency sweep (span > 0 Hz) an automatic search for the first harmonic is carried out within that given frequency range. Also a level adjust will be carried out. Is the zero span mode active before entering the harmonic measurement, the center frequency is unchanged.

IEC/IEEE-bus command:
`:CALCulate:MARKer:FUNCtion:HARMonics:STATe ON | OFF`

With the softkey *NO. OF HARMONICS* the number of harmonics which shall be measured can be adjusted. The range is from 1 to 26.
IEC/IEEE-bus command:
`:CALCulate:MARKer:FUNCtion:HARMonics:NHARmonics`
`<numerical value>`

The *HARMONIC SWEEPTIME* softkey allows to set the value how long the zero span measurement on each harmonic frequency shall take place. This is an alias softkey to the normal sweep time of the zero span, therefore the same parser command is to be used.

In the upper screen the zero span sweeps on all harmonics are shown, separated by a grid line. This allows a very good overview about the measurement. In the lower screen the mean RMS results are displayed in numerical values and the THD values can be seen in the marker info field.

The resolution bandwidth will be automatically adjusted: $RBW_n = RBW_1 * n$, if that RBW is not available the next higher value is used. This feature can be disabled with the softkey *HARMONIC RBW AUTO*.
IEC/IEEE-bus command:
`:CALCulate:MARKer:FUNCtion:HARMonics:BANDwidth:AUTO`
`ON | OFF`

With the adjust setting function the frequency search in the frequency range from before starting the harmonic measurement (if harmonic measurement was started from frequency sweep) and the level adjust can be activated.
IEC/IEEE-bus command:
`:CALCulate:MARKer:FUNCtion:HARMonics:PRESet`

The results can be obtained via IEC/IEEE-bus via the following commands:
Trace read out via the normal trace subsystem. The first harmonic frequency can be read out via the center frequency command.

THD value comma separated in % and dB:
`:CALCulate:MARKer:FUNCtion:HARMonics:DISTortion? TOTal`

Comma separated list of harmonic levels, for each harmonic one value:
`:CALCulate:MARKer:FUNCtion:HARMonics:LIST?`

Menu MEAS – MULT CARR ACP – CP/ACP CONFIG (Analyzer)

CHANNEL SPACING

The softkey CHANNEL SPACING opens a table which allows to set the spacings for the TX channels as well as for the adjacent channels. Up to now the TX spacing was a single parameter valid for all TX channels. Now the spacing between every TX channels can be defined separately. Therefore a TX spacing 1-2 for the spacing between the first and the second carrier, a TX spacing 2-3 for the spacing between the second and the third carrier and so on can be defined. In order to allow a convenient setup for the system with equal TX channel spacing, the value of TX spacing 1-2 will be copied in all the spacing below after entry, the TX spacing 2-3 will be copied in all the spacing below after entry and so forth. For different spacings a setup from top to bottom is necessary.

If the spacings are not equal the channel distribution according to the center frequency is as follows:

<u>Odd number of TX channels:</u>
The middle TX channel is centered to center frequency.

<u>Even number of TX channels:</u>
The two TX channels in the middle are used to calculate the frequency between those two channels. This frequency is aligned to the center frequency.

IEC/IEEE-bus command:
```
[SENSe<1|2>:]POWer:ACHannel:SPACing:CHANnel<1..11>
100 Hz ... 2000 MHz
```

This command defines the channel spacing of the carriers. At the same time the spacing of carriers with higher channel number are set to the same value. If the spacing is equal between all carriers it is sufficient to set the spacing between carrier 1 and 2 with the command `SENS:POW:ACP:SPAC:CHAN1` or `SENS:POW:ACP:SPAC:CHAN`. If the spacing are set in ascending order individual spacing of the carriers can be set.

Example: `"POW:ACH:SPAC:CHAN2 4.8MHz"`
            'sets the spacing between TX carrier 2 and 3 to 4.8 MHz.

Note:
If the ACP or MCACP measurement is started all settings according to the standard including the channel bandwidths and channel spacings are set and can be adjusted afterwards.

Menu TRIG

EXTERN

With the softkey *EXTERN* the external trigger source can be selected. From firmware V2.60/3.60 on also the external trigger level can be adjusted in the range from 0.5V to 3.5V. The default value is 1.4V.

IEC/IEEE-bus command:
```
:TRIGger[:SEQuence]:LEVel[:EXTernal] <numeric_value>
```

Menu MEAS – CHAN PWR ACP or MULTI CHAN ACP (Analyzer)

CP / ACP
STANDARD

The *CP/ACP STANDARD* softkey opens a list of selectable standards. WLAN 802.11A and WLAN 802.11B is appended to that list.

Notes:
FAST ACP is not available if a WLAN standard is selected.

IEC/IEEE-bus command:
CALC:MARK:FUNC:POW:PRES AWLan | BWLan

Menu MEAS – MULTI CARR ACP – CP/ACP CONFIG (Analyzer)

NO. OF
TX CHAN

With the softkey *NO. OF TX CHAN* now up to 12 carriers can be measured.

IEC/IEEE-bus command:
[:SENSe<1|2>]:POWer:ACHannel:TXCHannel:COUNt 1..12

Menu TRIG - NEXT (Analyzer)

DELAY COMP
ON OFF

The *DELAY COMP ON/OFF* softkey enables the filter group delay compensation for the external trigger. If a bursted signal is analyzed in zero span and the delay compensation is on, a change of the RBW will not change the rising slope of the signal.
Default is OFF.

IEC/IEEE-bus command:
TRIG:HOLD:ADJ:AUTO <boolean>

Menu TRACE - NEXT (Analyzer)

HOLT CONT
ON OFF
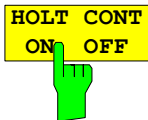
The *HOLD CONT* softkey defines whether the traces in min hold and max hold mode are reset after some definite parameter changes.
OFF   The traces are reset after some definite parameter changes (default)
ON   This mechanism is switched off.
In general, parameter changes require a restart of the measurement before results are evaluated (e. g. with markers). For those changes that are known to require a new measurement (e. g. modification of the span), the trace is automatically reset so that erroneous evaluations of previous results are avoided.
This mechanism can be switched off for those exceptional cases where the described behavior is unwelcome.

IEC/IEEE-bus command
:DISPlay[:WINDow<1|2>]:TRACe<1..4>:MODE:HCON ON|OFF

Menu SETUP - TRANSDUCER

REFLVL ADJ
AUTO   MAN

When a transducer factor is used, the trace is moved by a calculated shift. However, an upward shift reduces the dynamic range for the displayed values. With the softkey REFLVL ADJ an automatic reference level offset adaptation allows to restore the original dynamic range by also shifting the reference level by the maximum value of the transducer factor.

IEC/IEEE-bus command:
```
[:SENSe<1|2>:]CORRection:TRANsducer:ADJust:
RLEVel[:STATe] ON | OFF
```

> *Note: Command* `SENS:CORR:TRAN:SEL` *or* `SENS:CORR:TSET:SEL`
> *has to be sent prior to this command*

Menu MKR - NEXT (Analyzer)

LINK MKR1
AND DELTA1

With the softkey *LINK MKR1 AND DELTA1* the delta marker1 can be linked to marker1, so if the x-axis value of the marker1 is changed the delta marker1 will follow on the same x-position. The link is default off, and can be switched on.

Example for setup:
- PRESET
- TRACE | MAX HOLD
- TRACE | SELECT TRACE | 2 | AVERAGE
- MKR (Switches marker1 on)
- MARKER NORM DELTA | DELTA (Delta Marker 1 ON)
- MKR-> | MKR->TRACE | 2
- LINK MKR1 AND DELTA1

Now select the Marker1 (by switching MARKER1 from DELTA back to NORM) and when changing the x-axis value (by knob wheel or UP/DOWN keys) the delta marker1 will follow automatically.

The delta marker1 x-value can not be changed away from 0 as long as the link functionality is active.

IEC/IEEE-bus command:
```
CALCulate<1|2>:DELTamarker<1...4>:LINK ON | OFF
```
The suffix at `DELTamarker` can only be 1 or not present, because the functionality is only available for marker1.

Menu MKR FCTN (Analyzer)
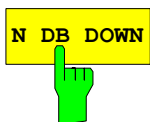
N DB DOWN

The softkey *N DB DOWN* is now also available in zero span mode. The pulse width result (PWIDTH) is shown at the display.

IEC/IEEE-bus command:
```
:CALCulate<1|2>:MARKer<1..4>:FUNCtion:NDBDown:
STATe ON|OFF
        //switches ndb down on or off
:CALCulate<1|2>:MARKer<1..4>:FUNCtion:NDBDown:RESult?
        //queries the result pulse width
:CALCulate<1|2>:MARKer<1..4>:FUNCtion:NDBDown:TIME?
        //queries the two marker x-values in seconds
          separated by a comma
```

Menu SETUP - GENERAL SETUP - GPIB

GPIB LANGUAGE

The *GPIB LANGUAGE* softkey opens a list of selectable remote-control languages:
SCPI, 8560E, 8561E, 8562E, 8563E, 8564E, 8565E, 8566A, 8566B, 8568A, 8568B, 8591E, 8594E, 71100C, 71200C, 71209A

Notes:
Selecting a language different from "SCPI" will set the GPIB address to 18 if it was 20 before.
Start / stop frequency, reference level and # of sweep points will be adapted to the selected instrument model.

IEC/IEEE-bus command:
```
SYST:LANG  "SCPI"  |  "8560E"  |  "8561E"  |  "8562E"  |
"8564E"  |  "8565E"  |  "8566A"  |  "8566B"  |  "8568A"  |
"8568B"  |  "8591E"  |  "8594E"  |  "71100C"  |  "71200C"  |
"71209A"
```

Menu SETUP - GENERAL SETUP - GPIB

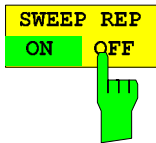**SWEEP REP ON OFF**

Softkey SWEEP REP ON/OFF controls a repeated sweep of the commands E1 and MKPK HI. If the repeated sweep is OFF, the marker is set without sweeping before.

IEC/IEEE bus command: -

Menu NETWORK with option R&S FSP-B10 – EXT SOURCE
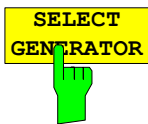
SELECT GENERATOR

Within the list of types of external generators the following R&S SMU models can be selected in addition: SMU02, SMU02B31, SMU03, SMU03B31, SMU04, SMU04B31, SMU06, SMU06B31.

Note:
There is a minimum version requirement of the R&S SMU firmware. Please install V1.10 or higher on the R&S SMU!

IEC/IEEE-bus command:
```
SYST:COMM:RDEV:GEN2:TYPE 'SMU03'
```

Menu NETWORK with option R&S FSP-B10
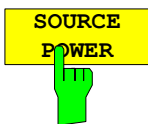
SOURCE POWER

The *SOURCE POWER* softkey activates the input of the generator output level. The value range depends on the selected generator (See table of chapter "Configuration of the External Generator").

If both option External Generator Control FSP-B10 and option Tracking Generator B9 are installed, the softkey will modify the output power of the generator currently in use.

The default output power is -20 dBm.

IEC/IEEE-bus command: `SOUR:EXT:POW -20dBm`
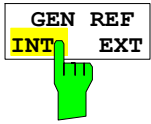
GEN REF
INT   EXT

The *GEN REF INT/EXT* softkey selects the reference signal for the external generator. Selection EXT allows connecting the external generator to an external reference frequency source. By default the external generator will use its internal frequency reference.

IEC/IEEE-bus command: `SOUR:EXT1:ROSC INT | EXT`

Menu MEAS – SIGNAL STATISTICS - NEXT

Statistic measurements on pulsed signals can be done using GATED TRIGGER. An external frame trigger is required as a time (frame) reference.
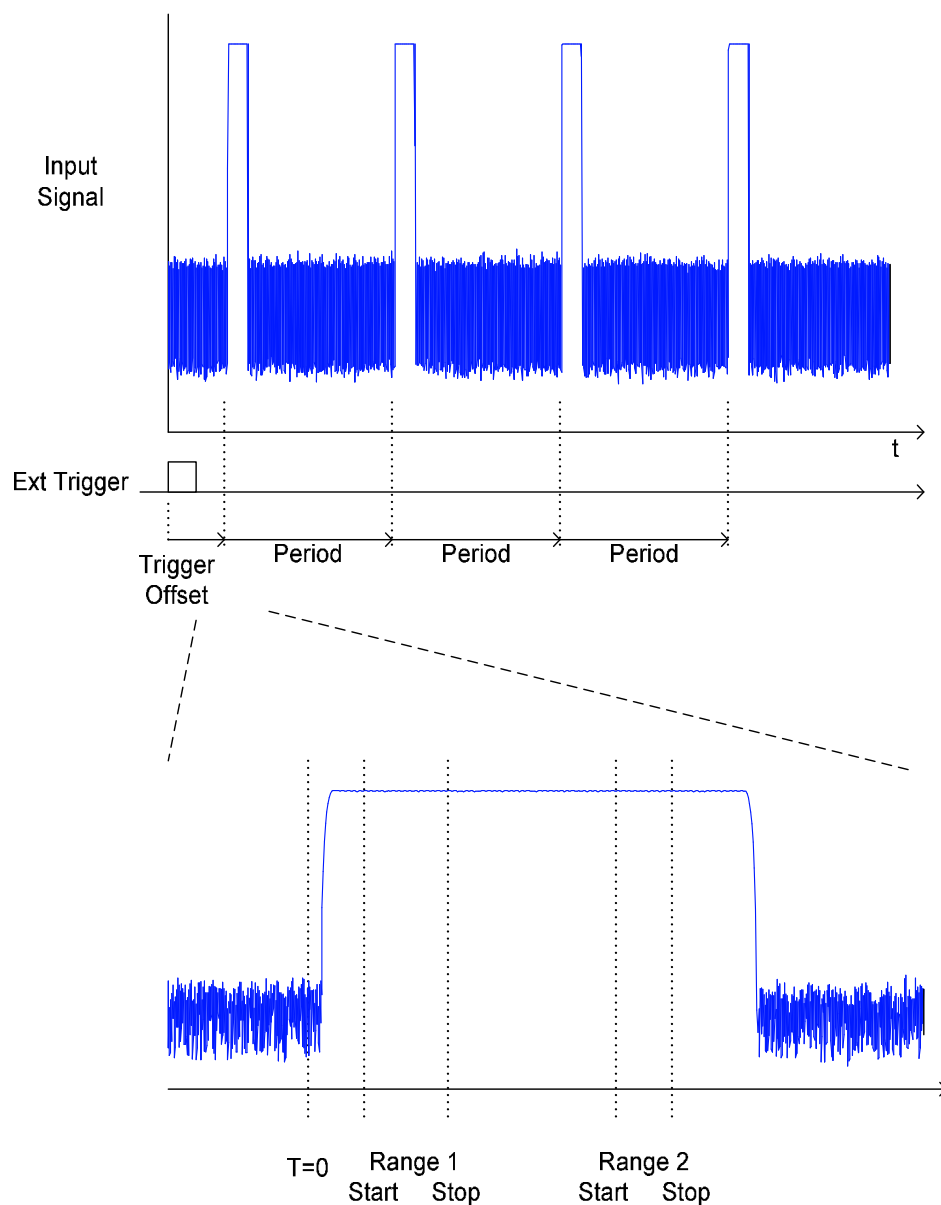
The gate ranges define the part of the I/Q capture data taken into account for the statistics calculation. These ranges are defined relative to a reference point T=0. The gate interval is repeated every period time until the end of the I/Q capture buffer.

The reference point T=0 is defined by the external trigger event and the instrument's trigger offset.
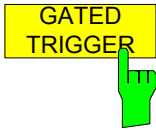
<div style="border:1px solid #000; background:#ff0; color:#000; display:inline-block;">GATED
TRIGGER</div>

GATED TRIGGER activates the gating for statistics functions. The trigger source is changed to EXTERN if this function is switched on.

Note:
The I/Q data capturing is repeated until the configured number of valid samples is reached. If the active gate period is outside the I/Q capture buffer or the resulting gate time is zero the measurement will not reach its end. In this case, the range start and stop values have to be checked.

IEC/IEEE-bus command:
```
[SENSe<1|2>:]SWEep:EGATe ON | OFF
```
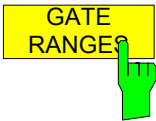
<div style="border:1px solid #000; background:#ff0; color:#000; display:inline-block;">GATE
RANGES</div>

GATED RANGE opens a table to configure up to 3 gate ranges for each trace.

GATE RANGES			
	Trace 1	Trace 2	Trace 3
Comment			
Period	4.615 ms		
Range 1 Start	0 us		
Stop	200 us		
Use Range	YES		
Range 2 Start			
Stop			
Use Range			
Range 3 Start			
Stop			
Use Range			

Comment: Comment string
Period: Period of the signal to be measured.
                  The signal period is common for all ranges.
Range x Start   Begin of time period to be taken into account.
Range x Stop   End of time period to be taken into account.
Use Range   YES / NO: Allows to temporarily disable a range.

Note: The timing values have full numerical resolution and are only rounded for display.

IEC/IEEE-bus command:
[:SENSe<1|2>]:SWEep:EGATe:TRACe<1...3>:COMMent
[:SENSe<1|2>]:SWEep:EGATe:TRACe<1...3>:STATe<1...3> ON | OFF
[:SENSe<1|2>]:SWEep:EGATe:TRACe<1...3>: STARt<1...3> value
[:SENSe<1|2>]:SWEep:EGATe:TRACe<1...3>: STOP<1...3> value
[:SENSe<1|2>]:SWEep:EGATe:TRACe<1...3>: PERiod value

Gated statistics configuration example:

A statistics evaluation has to be done over the useful part of the signal between t3 and t4.
The period of the GSM signal is 4.61536 ms
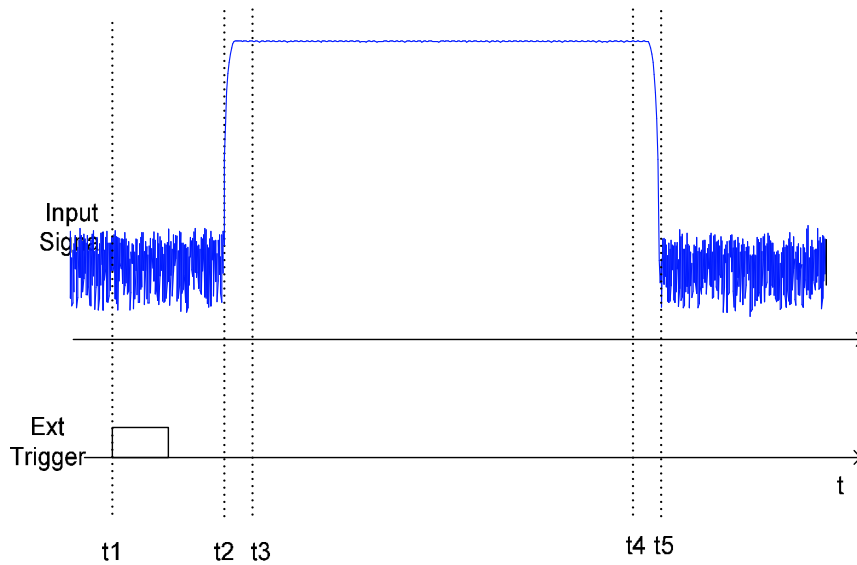
t1: External positive trigger slope
t2: Begin of burst (after 25 µs)
t3: Begin of useful part, to be used for statistics (after 40 µs)
t4: End of useful part, to be used for statistics (after 578 µs)
t5: End of burst (after 602 µs)

The instrument has to be configured as follows:

Trigger Offset	t2 - t1 = 25 µs	now the gate ranges are relative to t2
Range1 Start	t3 - t2 = 15 µs	start of range 1 relative to t2
Range1 End	t4 - t2 = 553 µs	end of range 1 relative to t2

Menu MEAS – SPURIOUS EMISSION

All real amplifiers also generate unwanted RF products outside the assigned frequency band. These spurious emissions are usually measured across a wide frequency range, for example from 9 kHz to 12.75 GHz (ETSI). The spectrum analyzer settings are specified for each frequency range.
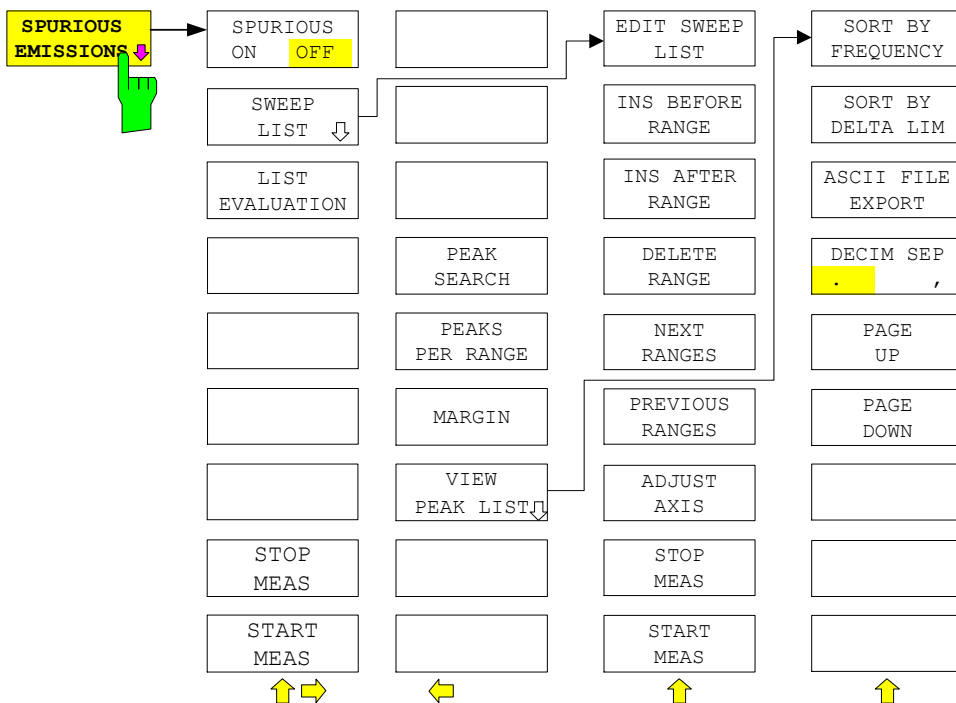
In the Spurious Emissions mode, the analyzer performs measurements in predefined frequency ranges with settings that can be specified individually for each of these ranges.

For this purpose, the SWEEP TABLE settings or the current device settings are used. Up to 20 subranges can be defined (they need not directly follow one another) across which the analyzer sweeps in subsequent order. However, the measurement ranges must not overlap. The measurement parameters can be selected independently from each other in every subrange (*SWEEP LIST* menu, EDIT SWEEP LIST).

Limit lines are defined and displayed irrespective of the sweep ranges, i.e. they are not part of the sweep ranges. The unit of the limit lines is restricted to dB or dBm.

The frequency range where measurements are actually performed is set by the start and stop frequency parameters of the analyzer; these parameters are independent of the sweep ranges. It is thus possible to define sweep ranges for a measurement task that can be stored and reloaded and to quickly and easily set the frequency range to be actually measured by means of two parameters; complex editing in the sweep table is not necessary.

Note: *When a limit line is defined in steps, the weaker limit is used at the frequency point with the straight vertical section.*
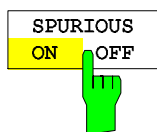
The *SPURIOUS ON OFF* softkey switches the spurious emissions measurement on or off according to the current configuration.

IEC/IEEE bus command: `SWEEP:MODE LIST` switches the spurious list on
                        `SWEEP:MODE AUTO` switches the spurious list off

The SWEEP LIS" softkey opens a submenu where predefined sweep ranges can be edited, or new ranges generated or deleted. A table listing the current sweep ranges is displayed.

IEC/IEEE bus command: `--`

LIST EVALUATION

The softkey LIST EVALUATION activates or deactivates spurious emission measurement LIST EVALUATION. The peak search evaluation is automatically done during measurement and the results are displayed in a table in the lower part of the screen.
Following results are listed:
- Frequency range
- Frequency of the absolute peak power in this range in dBm
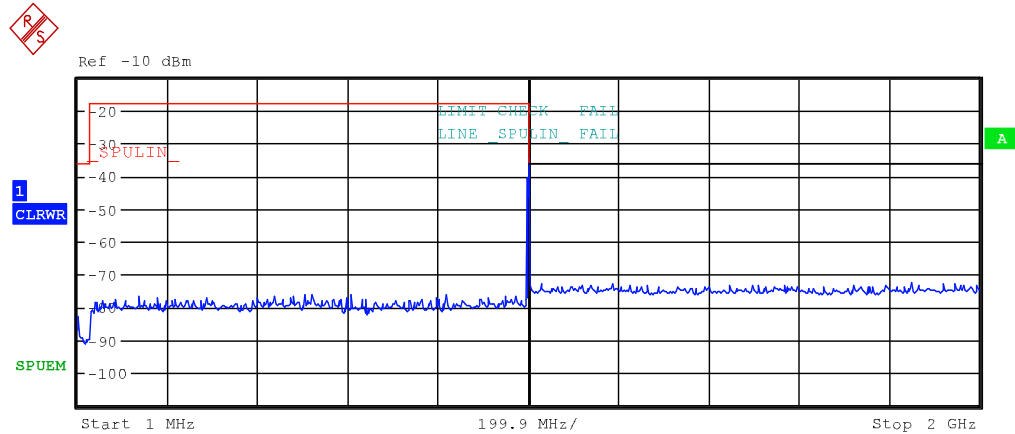- Level delta to the limit with margin in dB
- Limit check state (by color change and an asterisk at the end of the line if failed).

Start [Hz]	Stop [Hz]	RBW [Hz]	Freq [Hz]	PwrAbs [dBm]	Δ Limit [dB]
1.000 M	30.000 M	10.00 k	1.011600 M	-83.22	-47.22
30.000 M	1.000 G	100.00 k	999.321000 M	-40.80	-22.80
1.000 G	2.000 G	1.00 M	1.000933 G	-35.32	0.68 *

If LIST EVALUATION is switched on, the functions PEAKS PER RANGE, MARGIN, PEAK SEARCH and VIEW PEAK LIST are not available.

IEC/IEEE bus command: :CALCulate1:PEAKsearch:AUTO ON | OFF

EDIT SWEEP LIST

The EDIT *SWEEP LIS"* softkey opens the table for editing the sweep range".

In the *SWEEP LIST* table, the individual sweep ranges are set.

Range Start:	Start frequency of the range
Range Stop:	Stop frequency of the range
Filter Type:	Filter type: NORMAL, CHANNEL, RRC
RBW:	Resolution filter bandwidth
VBW:	Video filter bandwidth; not applicable for CHANNEL and RRC filters
Sweep Time Mode:	AUTO / MANUAL
Sweep Time:	Sweep time; if *AUTO* is indicated for the sweep time mode, the automatically calculated sweep time is displayed. If the cell is edited, the associated sweep time mode is automatically set to MANUAL.
Detector:	Specifies the range detector: Sample, Average, Max Peak, RMS, Min Peak and Auto Peak
REF-Level	Reference level in dBm
	The upper edge of the displayed screen area is the value of the maximum reference level, corrected by the associated transducer factor.
RF-Attenuator-Mode	AUTO / MANUAL
RF-Attenuator	Number; as with Sweep Time
PRE-AMP	ON / OFF; preamplifier selection (options B23, B25, if available)

Sweep Points	Number of sweep points per range (sweep segment). The number of sweep points must not exceed **100001**.		
Stop after Sweep	ON / OFF; if *ON*, the sweep is stopped after the range and continued only if confirmed by you via a message box.		
Transd. factor	NONE or factor (enter via selection list)		
Limit check	ON / OFF (common for all ranges).		
Limit	Limit in dBm (enter via selection list)		
	A temporary limit line '_SPUL_IN_' is used, based on the range limits. This temporary limit line is created at measurement start and may be copied for other purposes.		

IEC/IEEE bus commands: `SENS:LIST:RANGE<1…20>:...`

SWEEP LIST					
	RANGE 1	RANGE 2	RANGE 3	RANGE 4	RANGE 5
Range Start	9 kHz	50 MHz	500 MHz		
Range Stop	50 MHz	500 MHz	1 GHz		
Filter Type	NORMAL	CHANNEL	RRC		
RBW	10 kHz	100 kHz	1.28 MHz		
VBW	30 kHz	300 kHz	10 MHz		
Sweep time mode	AUTO	MANUAL	AUTO		
Sweep time	500 ms	10 s	65 ms		
Detector	Peak	RMS	Peak		
REF-Level	-20 dBm	-20 dBm	-20 dBm		
RF-Att. mode	AUTO	MANUAL	AUTO		
RF-Attenuator	10 dB	5 dB	10 dB		
PRE-AMP	OFF	OFF	OFF		
Sweep Points	501	501	501		
Stop after sweep	ON	OFF	OFF		
Transd. factor	LOWFREQ	MIDFREQ	MIDFREQ		
Limit check	ON	ON	ON		
Limit	-13 dBm	-13 dBm	-13 dBm		
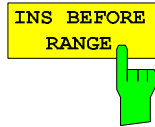
INS BEFORE RANGE

The INS BEFORE RANGE softkey inserts a range in front of the marked line.

IEC/IEEE bus command `--`
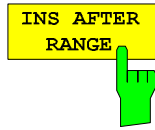
INS AFTER RANGE

The INS AFTER RANGE softkey inserts a range following the marked line.

IEC/IEEE bus command `--`
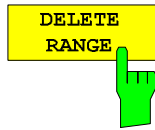
DELETE RANGE

The *DELETE RANG"* softkey deletes the current range. All higher ranges are set back by one.

IEC/IEEE bus command `LIST:RANGe<1…20>:DELete`
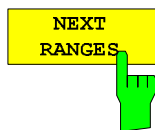
NEXT RANGES

The *NEXT RANGE"* softkey activates the displays of the next higher subranges, i.e. 6 to 10, 11 to 15 or 16 to 20.

IEC/IEEE bus command `--`
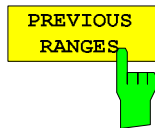
PREVIOUS RANGES

The *PREVIOUS RANGE* softkey activates the displays of the next lower subranges, i.e. 1 to 5, 6 to 10 or 11 to 15.

IEC/IEEE bus command: `--`
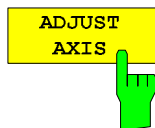
ADJUST AXIS

The *ADJUST AXIS* softkey automatically adjusts the frequency axis of measurement diagram so that the start frequency matches the start frequency of the first sweep range, and the stop frequency of the last sweep range.

IEC/IEEE bus command: `--` (via `FREQuency:STARt <num_value>` / `FREQuency:STOP <num_value>`)
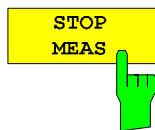
STOP MEAS

The *STOP MEAS* softkey stops the measurement. The measurement data can be analyzed.

IEC/IEEE bus command: `ABORt`
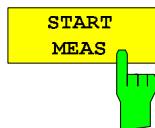
START MEAS

Using the *START MEAS* softkey, you can start the measurement while the submenu is simultaneously exited.
When the measurement is started, the analyzer sets up the measurement diagram in the selected measurement window and starts the measurement in the selected mode.
With *SINGLE*, a single frequency sweep occurs; afterwards the analyzer remains on the stop frequency.
With *CONTINUOUS*, the measurement continues until it is stopped.
You can stop the measurement with *STOP SWEEP*.
If a *STOP AFTER SWEEP* point has been defined in the range, the sweep stops automatically at the end of the respective range to allow you to change the external circuitry, for example. This is indicated in a message box:
SWEEP Range# reached CONTINUE/BREAK
If *CONTINUE* is selected, the sweep is continued in the next range. If *BREAK* is selected, the sweep is stopped.

IEC/IEEE bus command: `INIT:SPUR` starts the measurement
                      `INIT:CONM` starts the measurement after a BREAK has been reached
                      `ABORt` stops the measurement after a range has

been reached
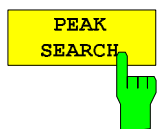
PEAK SEARCH

The *PEAK SEARCH* softkey starts the process of determining the list of the subrange maximums from the existing sweep results. This procedure can be repeated as often as desired, e.g. to experiment with the various threshold settings.

It is activated only after a measurement has been performed with *START MEAS.*

IEC/IEEE bus command   `CALC:PEAK`
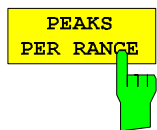
PEAKS PER RANGE

The *PEAKS PER RANGE* softkey activates entry of the number of peaks per range that are stored in the list. The value range extends from 1 to 50. Once the selected number of peaks has been reached, the peak search is stopped in the current range and continued in the next range.

IEC/IEEE bus command: `CALC:PEAK:SUBR 1...50`

Default: 25;
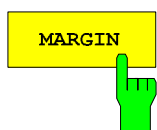
MARGIN

The *MARGIN* softkey activates entry of the margin, i.e. the acceptance threshold for determining the peak list. The limit line is shifted by this value when the maximums are determined. The value range extends from -200 dB to 200 dB.

IEC/IEEE bus command: `CALC:PEAK:MARG –200dB...200dB`
Default: 6 dB

VIEW PEAK LIST

The *VIEW PEAK LIST* softkey opens the submenu for viewing the peak list.

It is activated for display only after a PEAK search has been performed with *PEAK SEARCH.*

A delta limit of +200dB is listed if no limit check is active.

IEC/IEEE bus command: `TRACe? SPURious`

The table below shows a peak list after a *PEAK SEARCH*:

VIEW PEAK LIST			
TRACE / Detector	FREQUENCY	LEVEL dBm	DELTA LIMIT dB
1 RMS	80.0000 MHz	-36.02	-5.02
1 RMS	80.0001 MHz	-30.07	+0.24
1 RMS	85.1234 MHz	-30.02	-0.02
1 AVERAGE	130.234 MHz	-29.12	-5.12
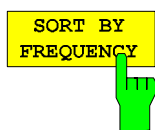
SORT BY FREQUENCY

The *SORT BY FREQUENCY* softkey sorts the table according to the entries in the *FREQUENCY* column in descending order.

IEC/IEEE bus command   `--`
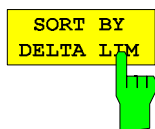
SORT BY DELTA LIM

The *SORT BY DELTA LIM* softkey sorts the table according to the entries in the *DELTA LIM* column (default) in descending order. If no limit line has been specified, an offset of 200 dB is assumed for all peaks.

IEC/IEEE bus command: `--`

ASCII FILE EXPORT

The *ASCII FILE EXPORT* softkey stores the peak list in ASCII format to a file on a diskette.

IEC/IEEE bus command: `MMEM:STOR:SPUR,'A:\TEST.ASC'`
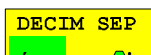
The file has a header containing important parameters for scaling, several data sections containing the sweep settings per range and a data section containing the peak list.

The header data is made up of three columns, separated by ';':
parameter name; numeric value; basic unit

The data section for the measurement values starts with the keyword "TRACE <n>:", where <n> includes the number of the used trace. Next comes the peak list with several columns also separated by ';'.

Spreadsheet programs such as MS Excel can read this format. Use ';' as the delimiter for the table cells.

Note: *Different language versions of evaluation programs may require different handling of the decimal point. Using the DECIM SEP softkey, you can thus choose between the delimiters '.' (decimal point) and ',' (comma).*

DECIM SEP

In the case of floating-point numbers, use the *DECIM SEP* softkey to select between '.' (decimal point) and ',' (comma) as the decimal delimiter for the ASCII FILE EXPORT function.
By selecting the decimal delimiter, various language versions of evaluation programs (e.g. MS Excel) are supported.

IEC/IEEE bus command: `FORM:DEXP:DSEP POIN`

The ASCII export table is structured as shown below:

	File contents	Explanation
File header	Type;FSP; Version;3.90; Date;02.Aug 2004; Mode;ANALYZER; SPURIOUS; Start;9000.000000;Hz Stop;8000000000.000000;Hz	Model Firmware version Storage date of data set Operating mode of the device Start/stop of the span Unit: Hz
	x-Axis;LIN;	Linear (LIN) or logarithmic (LOG) (future feature) scaling of the x-axis
	Sweep Count;1;	Selected number of sweeps
File data section	TRACE 1:	Selected trace
	Trace Mode;CLR/WRITE;	Display mode of trace: CLR/WRITE,AVERAGE,MAX HOLD,MIN HOLD, VIEW, BLANK
	x-Unit;Hz; y-Unit;dBm;	Unit of x values: Unit of y values:
	Margin;6.000000:s Values;8; 1;1548807257.5999999000;-65.602280;-5.602280 1;1587207214.4000001000;-65.327530;-5.327530 1;2112006624.0000000000;-4.388008;55.611992	Peak List margin Number of measurement points Measurement values: <Trace>;<x value>; <y value>;<delta limit>
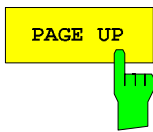
PAGE UP

Using PAGE UP and PAGE DOWN, you can scroll forward and backward through the peak list pages.

They are active only as long as a peak list is displayed.

STOP MEAS

See above.

START MEAS
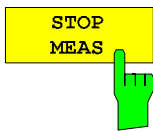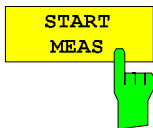
See above.

Hotkey RECEIVER, Menu MEAS (Receiver)

Fehler! Es ist nicht möglich, durch die Bearbeitung von Feldfunktionen Objekte zu erstellen.

| RUN PRE-SCAN+FINAL | The softkey *RUN PRESCAN+FINAL* is starting a sequence, consisting of a prescan, the peak search-function and the final measurement. |

IEC/IEEE-bus command: `INITiate:EMITest`

The *CONTINUOUS BARGRAPH* softkey selects the continuous measurement mode.

IEC/IEEE-bus command: `INITiate:CONTinuous ON`

Pressing the *SINGLE BARGRAPH* softkey triggers a single level measurement.
The enhancement label SGL displayed at the screen edge indicates that the single-measurement mode is set.

IEC/IEEE-bus command: `INITiate:CONTinuous OFF`

The *ADD TO PEAK LIST* softkey adds the current receiver frequency to the peak list (see also Section "Data Reduction and Peak List").

IEC/IEEE-bus command: --

Menu AMPT (only ESCI Receiver)

RF INPUT AC/DC   The RF INPUT AC/DC softkey switches between AC and DC coupling of the instrument input. The state of the input coupling is displayed with an enhancement label on the right side of the diagram.

Frequency range	R&S ESCI	
	DC coupled	9 kHz to 3 GHz
	AC coupled	1 MHz to 3 GHz

Measurements outside the valid frequency range are marked with the AC label in red
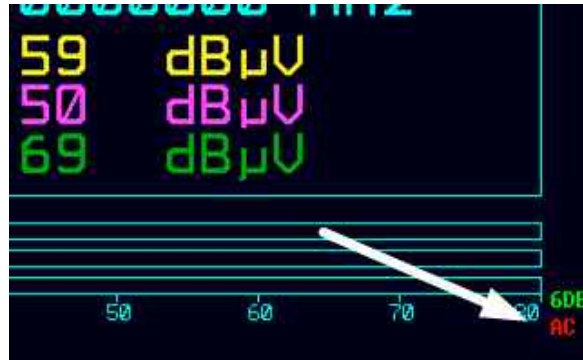
IEC/IEEE bus command: INP:COUP AC|DC

Remote Control – VXI11 support

The VXI-11 channel is now also supported. To remote control the instrument via LAN beside RSIB also the TCPIP connection is possible.

Remote Control – Description of Commands – INITiate Subsystem

Controlling a scan in Receiver Mode.
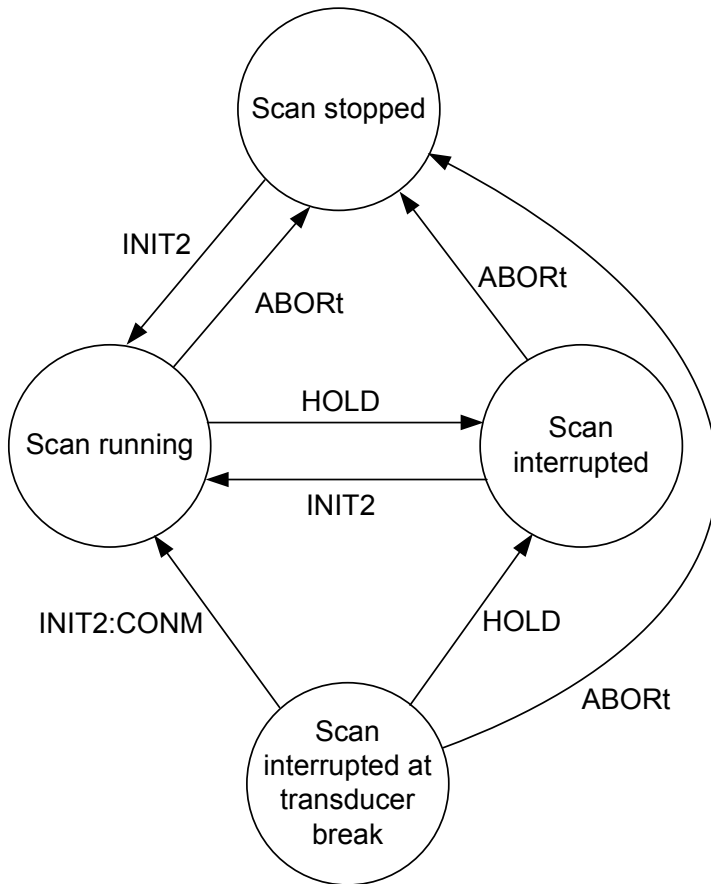
Remote Control – Description of Commands – CALCulate:LIMit Subsystem

CALCulate<1|2>:LIMit<1...8>:CATalog?

   This command queries all the names of the limit lines saved on the hard disc.
   The syntax of the output is:
   <sum of file length of all following files>,<free spaces on hard disc>,<1st file name,,<1st file length>,
   <2nd file name>,<2nd file length>,....,<nth file name>,<nth file . length>

   Example: `":CALC:LIM:CAT?"`

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

   Mode: R, A

CALCulate<1|2>:LIMit<1...8>:ACTive?

   This commands queries the names of all active limit lines. The numeric suffixes at CALCulate and LIMit are ignored. The list is sorted in alphabetic order. Any empty string is returned, if no limit line is active.

   Example: `":CALC:LIM:ACT?"`

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

Remote Control – Description of Commands – SENSe:CORRection Subsystem

[SENSe<1|2>:]CORRection:TRANsducer:CATalog?

This command reads out the names of all transducer factors stored on the internal drive.
Syntax of output format:
<Sum of file lengths of all subsequent files>,<free memory on hard disk>,
<1st file name>,<1st file length>,<2nd file name>,<2nd file length>,....,<nth file name>,
<nth file length>

Example: "CORR:TRAN:CAT?"

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

Mode: R, A

[SENSe<1|2>:]CORRection:TSET:CATalog?

This command reads out the names of all transducer sets stored on the internal drive.
Syntax of output format:
<Sum of file lengths of all subsequent files>,<free memory on hard disk>,
<1st file name>,<1st file length>,<2nd file name>,<2nd file length>,....,<nth file name>,
<nth file length>

Example: "CORR:TSET:CAT?"

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

Mode: R, A

[SENSe<1|2>:]CORRection:TRANsducer:ACTive?

This command queries the active transducer factor. Any empty string is returned, if no transducer
factor is active.

Example: ":CORR:TRAN:ACT?"

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

Mode: R, A

Remote Control – Description of Commands – TRACe Subsystem

TRACe:POINts LIMit, 1 to 10000

This command defines the maximum number of measurement points which are transferred in one block after the query command `TRACE? SCAN`. The total amount of bytes which is transferred depends on the number of active traces.

Example: `"TRAC:POIN LIM, 8000"`
'A maximum of 8000 measurement values per trace will be transferred with a single 'query

Characteristics: *RST value: 1000
SCPI: device-specific
Mode: R

Remote Control – Description of Commands – CALCulate:PEAKsearch Subsystem

CALCulate:PEAKsearch:ADD <numeric_value>

This command adds a frequency value to the peaklist in receiver mode. (RECEIVER – FINAL MEAS – EDIT PEAK LIST). Only frequencies in the currently displayed frequency range of the receiver scan are allowed.

Example: `"CALC:PEAK:ADD 93 MHZ"`
'The frequency 93 MHz as added to the peak list

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

Mode: R

CALCulate:PEAKsearch:CLEar[:IMMediate]

The peaklist in receiver mode (RECEIVER – FINAL MEAS – EDIT PEAK LIST) is cleared.

Example: `"CALC:PEAK:CLE"`
'The peak list is cleared

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

Mode: R

Remote Control – Description of Commands – SYSTem Subsystem

SYSTem:IDENtify:FACTory
With this command it is possible to reset the *IDN string to the factory default (Softkey: ID STRING FACTORY).
Example: `":SYST:IDEN:FACT?"`

Remote Control – Description of Commands – SYSTem:COMMunicate Subsystem

SYSTem:COMMunicate:GPIB:RDEVice:COMMand 0..30,<command string>

This command sends a command or query string to the device using the GPIB interface FSP-B10. Usually an external generator is connected to this interface.

Note: Only basic I/O is possible with this device. The first parameter is the GPIB address of the device connected with GPIB interface of option FSP-B10.

Example: ":SYST:COMM:GPIB:RDEF:COMM 18, '*RST'"   ' generator reset

                                                                              ' gen. frequency 2 GHz

                  ":SYST:COMM:GPIB:RDEF:COMM 18, 'SOURCE:FREQ:CW 2E9' "

                                                                              ' gen. power 0dBm

                  ":SYST:COMM:GPIB:RDEF:COMM 18, 'SOUR:POW 0'"

                  ":SYST:COMM:GPIB:RDEF:COMM? 18, 'SENS:POW?' "

                                                                      'queries the generator power

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

Remote Control – Description of Commands – SENSe:LIST Subsystem

[SENSe<1|2>:]LIST:POWer:SET:AVERage:TYPE LINear | LOGarithmic
With this command the average type of the sense list measurement can be set either to linear (default) or logarithmic. In linear mode voltages are averaged in logarithmic mode levels.

Example: "LIST:POW:SET:AVER LOG´"   'sets log averaging for list measurement.

[SENSe<1|2>:]LIST:POWer[:SEQuence] <analyzer freq>,<ref level>,<rf att>,<el att>,
                                        <filter type>,<rbw>,<vbw>, <meas time>,<trigger level>,...
The LIST:POW command supports now the following filter types:

<filter type>:	NORMal:	normal resolution filter
	CFILter:	channel filter. These are especially steep-edged filters, which are used for example in Fast ACP measurement to ensure the band-limiting of a transmission channel in the time domain.
	RRC:	Root Raised Cosine filter. This special filter form is used to determine the channel power for some mobile radio standards.

For allowed <rbw> setting for <filter type> = CFILter and <filter type> = RRC see table "List of available channel filters" in section "Setting Bandwidths and Sweep Time – Key *BW*".

Remote Control – Description of Commands – TRACe Subsystem

TRACe<trace #>:IMMediate:LEVel? and TRACe<trace #>:IMMediate:RESult?
These query command returns instantaneous measurement results. During a sweep which shall not have a synchronization on the sweep end last measured value can be read out. This makes sense if measurement values shall be obeyed during long sweep times. The `LEVel?` command only returns the level, where the `RESult?` command returns comma separated the x and y value. For a better time resolution the number of sweep points can be increased.

Example:	`"INIT:CONT OFF"`	'switches to single sweep mode
	`"INIT"`	'starts a sweep (without waiting for the sweep end!)
	`"TRAC1:IMM:LEV?"`	'queries the level of the last measured measurement point

Remote Control – Description of Commands – SENSe:MPOWer Subsystem

[SENSe<1|2>:]MPOWer[:SEQuence]   <analyzer freq>,<rbw>,<meas time>,<trigger source>, <trigger level>,<trigger offset>,<type of meas>,<# of meas>
For MPOW also the RRC and CFILer can be used by defining the filter type with the command:
[SENSe<1|2>:]BANDwidth|BWIDth[:RESolution]:TYPE NORMal | FFT | CFILter | RRC
before using the MPOW command.

Remote Control – Description of Commands – MMEMory Subsystem

MMEMory:CATalog:LONG? <path>
This command queries the directories and files in the given path.

Parameter:	<path>::= DOS path
Example:	`"MMEM:CAT:LONG? 'D:\USER\DATA'` 'queries the contents of directory D:\USER\DATA
Return value:	<used_bytes_in_this_directory>,<free_bytes_on_this_disk>, ”<file_name>,<file_type>,<filesize_in_bytes>”, ”<file_name>,<file_type>,<filesize_in_bytes>”, …

with

<file_name>	name of file or directory
<file_type>	file type: DIR (directory), ASCii (ASCII file), BINary (binary file) and STATe (file with device settings)
<filesize_in_bytes>	size of file, 0 for directories

Remote Control – Description of Commands – SENSe:SWEep Subsystem

[SENSe<1|2>:]SWEep:COUNt:CURRent?

This query command returns the current number of started sweeps. A sweep count value should be set and the device should be in single sweep mode.

Example: `"SWE:COUNt 64"`   'sets sweep count to 64
              `"INIT:CONT OFF"`   'switches to single sweep mode
              `"INIT"`   'starts a sweep (without waiting for the sweep end!)
              `"SWE:COUN:CURR?"`   'queries the number of started sweeps

Supported 85xx-commands

85xx - command	Modification	Description
AMB ON|OFF		Trace A minus B
ADJALL		Adjust all
ADJCRT	1)	Adjust CRT
ADJIF	1)	Auto adjust IF
APB		Trace A plus B
AUTOCPL		Coupling default
AXB		Exchange trace A and B
BL, BML		B - display line --> B
BTC		Transfer B to C
BXC		Exchange B and C
CHNPWR		Channel power
CHPWRBW		Channel power bandwidth
COUPLE AC|DC		Select input coupling
D1	1)	Display size normal
DA	1)	Display address
DEMODAGC	1)	Demodulation AGC
DEMODT		Demodulation time
DLE		Display line enable
DW	1)	Write to display and increment address
ERR	Now some errors are mapped to HP errors: ERR 250 cal level error ERR 300 LO unlock ERR 472 cal error digital filter ERR 473 cal error analog filter ERR 552 cal error log amp ERR 902 unscale tracking generator ERR 906 oven cold ERR117 numeric unit error ERR112 Unrecognized Command	Error
ERR?		Erases the error bit in the status register but always returns 0.
EX		Exchange trace A and B
FREF		Reference frequency internal/external
FUNCDEF		Define Function Function must be in one line between delimiters @
GRAT ON|OFF	1)	Grid on/off
KEYDEF		Key definition
KEYEXEC		Key execute
KS(		Lock registers
KS)		Unlock registers
KS91		Read amplitude error
KS/	1)	Manual peaking
KSK		Marker to next peak

[1]) Command accepted, but ignored

85xx - command	Modification	Description
KSO		Delta marker to span
KSQ		Band lock off
KSg		CRT beam off
KSh		CRT beam on
KSn	1)	Grid on
KSo		Character display off
KSp		Character display on
KSr		Create service request
KSt		Band lock on
KSv		Signal ident on
L0		Display line off
LB		Label
LF		Preset with low frequency band selection
LL	1)	Cursor to lower left corner
M3	M3 M3 <numeric_value> HZ|KHZ|MHZ|GHZ M3 DN M3 UP M3?	Default value value range step size. Noise measurement activated with KSM is automatically switched off with any M3-command..
MDS		Measurement data size
MKA		Marker amplitude
MKDR		Delta Marker reverse
MKDR?		Delta marker reverse query
MKFC ON|OFF		Marker frequency count
MKP		Marker position
MKPT	MKPT MKPT HI MKPT NH MKPT NR MKPT NL	
MKSP		Deltamarker to span
MKT		Marker to time point
MKTYPE AMP		Marker type
NORMALIZE		Normalize trace
NRPOS		Normalize trace position
O2		Trace readout
OT	OT after CF or SP now returns Center/Span values rather than Start/Stop string 27 now indicates the current sweep status	Output annotations
PA	1)	Plot absolute
PD	1)	Pen down
PLOTORG	1)	Plot origin
PLOTSRC	1)	Plot source
PWRBW		Power Bandwidth
PRINT	accept numeric parameter	Print
PSDAC	1)	Preselector DAC
PSTATE	1)	Protect state
PU	1)	Pen up
RBR		Resolution bandwidth/span ratio
RLCAL	1)	Reference level cal
RCLOSCAL		Recall open/short reference trace into trace B, set instrument to the stored open/short reference state.

[1] Command accepted, but ignored

85xx - command	Modification	Description
RCLT TRA|TRB, <number>		Recall Trace Data
RCLTHRU		Recall the thru-reference trace into trace B, set instrument to stored thru-reference state.
SAVET TRA|TRB, <number>		Save Trace Data
SMOOTH		Smooth trace
SQUELCH	1)	Squelch
STOREOPEN		Set open/short reference
STORESHORT		Set open/short reference
STORETHRU		Set thru reference
SWPCPL SA|SR	1)	
SWPOUT	1)	Sweep Output
T2	1)	Line trigger
TACL?, TBCL?, TCCL?		Returns instantaneous measurement results. See TRACe<trace #>:IMMediate:LEVel? for full description.
TACR?, TBCR?, TCCR?		Returns instantaneous measurement results. See TRACe<trace #>:IMMediate:RESult? for full description.
TDF	Parameters: P Meas Unit, like dBm, V etc. (already supported) M Display Unit B Binary A Binary with length I Binary without length	Trace data format
THE		Threshold enable
TM LINE	1)	Trigger Line
TRSTAT		The TRSTAT command returns trace states to the controller: clear-write, off, view, or blank.
UR	1)	Cursor to upper right corner
OA		
OT		
RESET		
REV?		
TRA/TRB	Trace input in the following format: B Binary data without header A Binary data with length I Binary data without length	
TRA?		
TRB?		
TDF	TDF P	
VARDEF		Variable definition, Command ignored
VTL		Video trigger level

[1] Command accepted, but ignored

Model dependent default settings

When selecting a 85xx model language the GPIB address will be automatically set to 18, if the FSP default address (20) is active. Other values than 20 will be left unchanged. On return to GPIB language SCPI the current GPIB address will be preserved.

The following table shows the default settings which will be set when selecting the GPIB language or when using the commands IP, KST and RESET.

Model	# of Trace Points	Start Freq.	Stop Freq.	Ref Level	Input Coupling
8566A/B	1001	2 GHz	22 GHz	0 dBm	DC (FSU) AC (FSP)
8568A/B	1001	0 Hz	1.5 GHz	0 dBm	AC
8560E	601	0 Hz	2.9 GHz	0 dBm	AC
8561E	601	0 Hz	6.5 GHz	0 dBm	AC
8562E	601	0 Hz	13.2 GHz	0 dBm	AC
8563E	601	0 Hz	26.5 GHz	0 dBm	AC
8564E	601	0 Hz	40 GHz	0 dBm	AC
8565E	601	0 Hz	50 GHz	0 dBm	AC
8594E	401	0 Hz	3 GHz	0 dBm	AC

Note on selected stop frequency:
The stop frequency indicated in the table will be limited by the maximum stop frequency of the analyzer.

Note on the selected number of trace points:
The adaptation of the number of trace points will only be performed on the LOCAL -> REMOTE transition.

Trace data output formats

Two formats are supported for trace data output: display units (command O1) and physical values (commands O3 or TDF P). With format "display units" the level data will be converted into value range and resolution of the 8566/8568 models. On transition to REMOTE state the number of trace points will be reconfigured in order to be conforming to the selected instrument model (1001 for 8566A/B and 8568 A/B, 601 for 8560E to 8565E, 401 for 8594E).

GPIB status reporting system

The assignment of the status bits performed by commands R1, R2, R3, R4, RQS is supported since firmware V1.80. Commands STB and a serial poll on the GPIB will return an 8 bit value with the following bit assignment:

Bit enabled by RQS
1 (Units key pressed)
2 (End of Sweep)
3 (Device Error)
4 (Command Complete)
5 (Illegal Command)
6 (Service Request)

Bits 0 and 7 are unused and always set to 0.

Please note that the FSP reports any key pressed on the front panel rather than only the unit keys if bit 1 was enabled.

Another difference is the behavior of bit 6 when using the STB? query. On the HP analyzers this bit monitors the state of the SRQ line on the bus. On the FSP this is not possible. Therefore this bit is set, as soon as one of the bits 1 to 5 is set. It won't be reset by performing a serial poll.
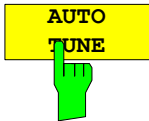
R&S FS-K7 Extensions

Operating Manual "FM Measurement Demodulator R&S FS-K7":

- 1141.1821.41-02 (English).   and
- 1141.1821.42-02 (German)

The corresponding PDF-Files are separately available on the service board.
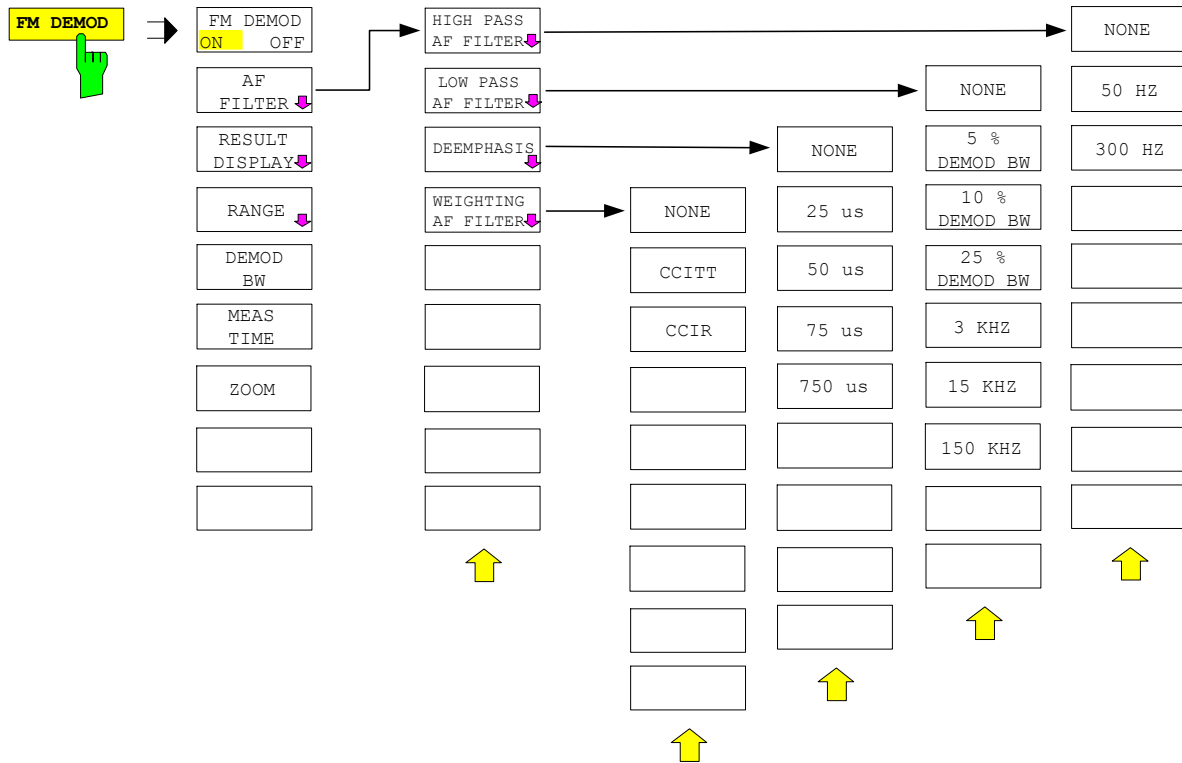
Menu FREQUENCY

AUTO TUNE   This softkey activates an automatic signal search.
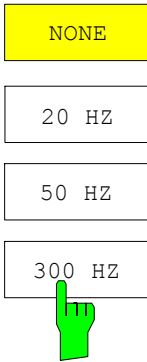
             IEC/IEEE-bus command: SENS:FREQ:CW:AFC   ONCe

Menu FM DEMOD

The FS-K7 has been extended with AF filters. The bandwidth of the demodulated signal can be reduced by high pass or low pass filters and also a de-emphasis can be switched on.

HIGH PASS AF FILTER

NONE

20 HZ

50 HZ

300 HZ

The *25 HZ, 50 HZ* and *300 HZ* softkeys switch on a high pass filter with the given limit to separate the DC component. The filters are indicated by the 3 dB cutoff frequency. The 50 Hz and 300 Hz filters are designed as 2nd-order Butterworth filter (12 dB/octave). The 20 Hz filter is designed as 3nd-order Butterworth filter (18 dB/octave).

The *NONE* softkey deactivates the AF high pass filter. Default is NONE.

The high pass filter are active in the following demodulation bandwidth range:
20 Hz   100 Hz ≤ demodulation bandwidth ≤ 1.6 MHz
50 Hz   200 Hz ≤ demodulation bandwidth ≤ 3 MHz
300 Hz   800 Hz ≤ demodulation bandwidth ≤ 8 MHz

IEC/IEEE-bus command:
```
[SENSe:]FILTer:HPASs[:STATe] ON | OFF
[SENSe:]FILTer:HPASs:FREQuency 20 Hz | 50 Hz | 300 Hz
```

LOW PASS AF FILTER

NONE

5 %

10 %

25 %

3 KHZ

15 KHZ

23 KHZ

150 KHZ

The *5 %, 10%* and *25% HZ* softkeys switch on a relative low pass filter. The filter (3 dB) can be selected in % of the demodulation bandwidth. The filters are designed as 5th-order Butterworth filter (30 dB/octave).

The *3 KHZ, 15 KHZ, 23 KHZ* and *150 KHZ* softkeys switch on a absolute low pass filter. The filter are indicated by the 3 dB cutoff frequency. The 3 kHz, 15 kHz and 23 kHz filters are designed as 5th-order Butterworth filter (30 dB/octave). The 150 kHz filter is designed as 8th-order Butterworth filter (48 dB/octave).

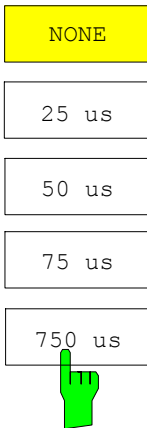The *NONE* softkey deactivates the AF low pass filter. Default is NONE.

The relative low pass filters are active for all demodulation bandwidth's. The absolute low pass filters are active in the following demodulation bandwidth range:
3 kHz   6.4 kHz ≤ demodulation bandwidth ≤ 3 MHz
15 kHz   50 kHz ≤ demodulation bandwidth ≤ 8 MHz
23 kHz   50 kHz ≤ demodulation bandwidth ≤ 8 MHz
150 kHz   400 kHz ≤ demodulation bandwidth ≤ 8 MHz

IEC/IEEE-bus command:
```
[SENSe:]FILTer:LPASs[:STATe] ON | OFF
[SENSe:]FILTer:LPASs:FREQuency:RELative 5 | 10 | 25
[SENSe:]FILTer:LPASs:FREQuency 3 kHz | 15 kHz |
                                23 kHz | 150 kHz
```

DEEMPHASIS

NONE

25 us

50 us

75 us

750 us

The *25 us, 50 us, 75 us* and *750 us* softkeys switch on a de-emphasis with the given time constant.
The *NONE* softkey deactivates the de-emphasis. Default is NONE.

The de-emphasis is active in the following demodulation bandwidth range:

25 µs   25 kHz ≤ demodulation bandwidth ≤ 30 MHz
50 µs   6.4 kHz ≤ demodulation bandwidth ≤ 18 MHz
75 µs   6.4 kHz ≤ demodulation bandwidth ≤ 18 MHz
750µs   800 Hz ≤ demodulation bandwidth ≤ 3 MHz

The following table shows the required demodulation bandwidth for an error less than 0.5 dB up to a maximum AF frequency.
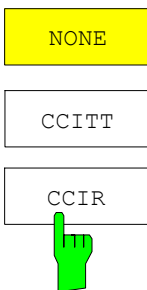
Deemphasis	25 µs	50 µs	75 µs	750 µs
Maximum AF Frequency	25 kHz	12 kHz	8 kHz	800 Hz
Required demodulation bandwidth	>= 200 kHz	>= 100 kHz	>= 50 kHz	>= 6.4 kHz

For higher AF frequencies the demodulation bandwidth must be increased.

IEC/IEEE-bus command:
```
[SENSe:]FILTer:DEMPhasis[:STATe] ON | OFF
[SENSe:]FILTer:DEMPhasis:TCONstant 25 us | 50 us |
                                    75 us | 750 us
```

WEIGHTING AF FILTER

NONE

CCITT

CCIR

The *CCITT* (CCITT P.53) and *CCIR* (CCIR unweighted) softkeys switch on a weighting filter. The CCIR unweighted filter is the combination of the 20 Hz highpass and 23 kHz lowpass filter.

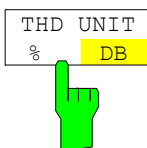The *NONE* softkey deactivates the weighting filter. Default is NONE.

The weighting filter are active in the following demodulation bandwidth range:
CCITT   25 kHz ≤ demodulation bandwidth ≤ 3 MHz
CCIR   50 kHz ≤ demodulation bandwidth ≤ 1.6 MHz

IEC/IEEE-bus command:
```
[SENSe:]FILTer:CCITt[:STATe] ON | OFF
[SENSe:]FILTer:CCIR[:STATe] ON | OFF
```

Menu FM DEMOD - RANGE - UNIT

THD UNIT
% DB

The *THD UNIT %/DB* softkey selects between % and dB for displaying the THD measurement result.

IEC/IEEE bus command: `UNIT:THD PCT | DB`

The FS-K7 has been extended about the AM result display. With active FM demodulator (ADEM ON or INST:SEL ADEM) the AM evaluation can be activated with the command CALC:FEED 'XTIM:AM:REL'. The settings and measurement result queries are similar as in the FM evaluation. The diagram scaling is in the unit % instead of Hz.

| command for FM	command for AM
`CALC:FEED 'XTIM:FM'`	`CALC:FEED 'XTIM:AM:REL'`
`CALC:FEED 'XTIM:FMS'`	`CALC:FEED 'XTIM:AMS:REL'`
`CALC:FEED 'XTIM:FM:AFSP'`	`CALC:FEED 'XTIM:AM:REL:AFSP'`
`CALC:MARK:FUNC:ADEM:FM:RES`	`CALC:MARK:FUNC:ADEM:AM:RES`
`ADEM:FM:TYPE`	`ADEM:AM:REL:TYPE`
`ADEM:FM:RES`	`ADEM:AM:REL:RES`
`TRIG:SOUR FM`	`TRIG:SOUR AMR`
`TRIG:LEV:FM`	`TRIG:LEV:AM:REL`

The other commands of the AM evaluation are identical to the FM evaluation. In addition to the FM evaluation the modulation depth of AM modulated signals can be queried with `CALC:MARK:FUNC:MDEP:RES?`.

The PM demodulation has been extended about the following new functions:
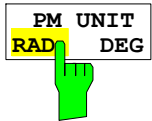
ZERO PHASE REF POINT

The *ZERO PHASE REF POINT* softkey activates the input of the reference point, where the phase is set to 0 rad.

IEC/IEEE-bus command: `SENS:ADEM:PM:RPO:X 10us`
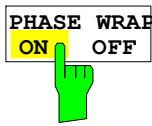
PHASE WRAP ON OFF

The *PHASE WRAP ON/OFF* softkey activates the phase wrapping to $-\pi...+\pi$ (-180°...+180°).

IEC/IEEE-bus command: `CALC:FORM PHAS | UPH`

PM UNIT RAD DEG

The *PM UNIT RAD/DEG* softkey selects the unit for PM traces.

IEC/IEEE-bus command: `UNIT:ANGL RAD | DEG`

The range of the demodulation bandwidth has been extended down to 100 Hz.

new demodulation bandwidth	sampling rate
6.4 kHz	7.8125 kHz
3.2 kHz	3.90625 kHz
1.6 kHz	1.953125 kHz
800 Hz	976.5625 Hz
400 Hz	488.28125 Hz
200 Hz	244.140625 Hz
100 Hz	122.0703125 Hz

Information to Demod BW 8 MHz:
This filter is only flat for about 6 MHz, it has a 3dB decay at 7 MHz.

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