



ROHDE & SCHWARZ

Test and Measurement
Division

Release Notes

Firmware Release 4.23

for R&S ESU EMI Test Receiver

with order number: **1302.6005.xx**

New Features:

- Required sweeptime reduced for video bandwidth < resolution bandwidth.
- New SAVE/RECALL menu and dialogs.
- ASCII Export function for Marker Peak List.
- Adjustable marker position knob stepsize.
- New trace average function Power.
- Easy access to Windows XP Start menu.
- HP emulation: Personality Spurious supported.
- HP emulation: Personality Phase Noise supported.
- Option FSP-B10: Frequency range of SMF100A increased to 43.5 GHz
- IF SHIFT function
- Option FSP-B10 additionally supports:
SMA100, SMB100, SMJ and SMF100a (TTL mode)
- Statusbit 4 (0x10) is set in Status Operation Register when scan is running
- New parameter coupling "Analyzer Marker Frequency -> Receiver Frequency"
- CISPR detectors (QP, CISPR-RMS, CISPR-AVERAGE) now available in Time Domain Scan

Release Note Revision: 11

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History

Date	Rel Note Rev	Changes
16. Jan 2007	5	First revision for V3.93
30. Mar 2007	6	Release for service pack 1
18. Jun 2007	7	Release for service pack 2
31. Jul 2007	8	Release for service pack 3
08. Oct 2007	9	First revision for 4.13
29. Nov 2007	10	Release for service pack 1
24. Apr 2008	11	First revision for 4.23

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:	data12.cab	(packed contents of disk 13, will be automatically unpacked by FW update)
Disk 14:	data13.cab	(packed contents of disk 14, will be automatically unpacked by FW update)
Disk 15:	data14.cab	(packed contents of disk 15, 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.

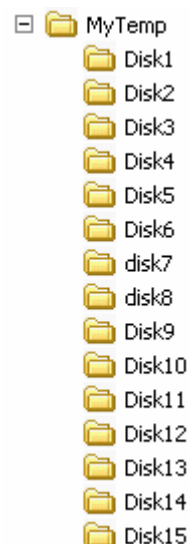
The contents of the other disks are already packed in the format required by the firmware update program and need no further processing. The files only need to be copied onto disks #2 to #12, the number in the filename (minus 1) indicating the corresponding disk number (data3.cab => disk #2, data4.cab => disk#3, etc.).

Preparing installation via LAN or USB stick:

If the installation shall be done via LAN or USB stick please set up the following directory structure.

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

Please do not copy any further files like documentation, release notes or pictures in those directories, because this may cause malfunction due to limited hard disc space on the instrument.



Performing the firmware update on the instrument

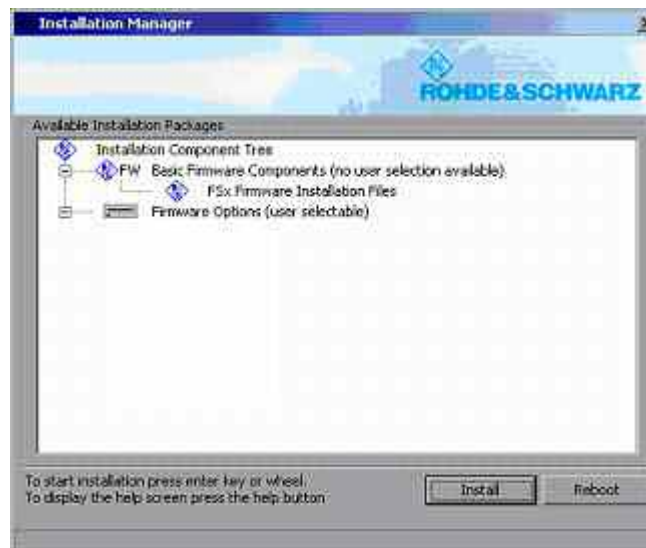
The firmware update process is performed in the following steps:

- 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 #12 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
- Confirm the query "Do you really want to update the firmware?" with OK

The *Installation Manager* will terminate the analyzer application, search for available application update set and will show a selection list.



- Deselect applications, not to be installed and 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 instrument'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.*

Messagebox: Can't open front panel driver, errorcode=0x2

For some constellations this messagebox 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 messagebox will be still shown after the first boot) and after the second boot the measurement application comes up and the problem is solved.

Modified Functions

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

1. (V3.83 SP2) The Maxhold display of the Bargraph is reset after the settling time of the used detectors
2. (V3.83 SP2) The maximum number of transducer sets has been enhanced from 10 to 100
3. (V3.83 SP2) The RBW filters used with the IF analysis are marked with IFA in the CAL results table.
4. (V3.83 SP2) A Final Measurement can be done while the instrument displays the IF analysis
5. (V3.83 SP2) The grid level borders of the IF analysis are dependent of the bargraph
6. (V3.83 SP2) The units dB*/MHz and dBpT are now available in the spectrum analyzer
7. (V3.83 SP2) A running scan will be stopped when doing a hardcopy or when saving and recalling data.
8. (V3.83 SP2) The length of a test report will be limited due to internal memory resources.
9. (V3.83 SP4) The possibility of a wrong level measurement due to an AC coupled input is displayed by a red AC enhancement label and by the AC IN label.
10. (V3.83 SP4) The level accuracy with preselector has been improved.
11. (V3.83 SP4) The option FS-K7 is now available for the ESU.
12. (V3.83 SP4) The default scan table does now start at 30 MHz.
13. (V3.83 SP5) REFLVL ADJ AUTO (SETUP TRANSDUCER menu) does now affect the Y axis scaling of the IF analysis.
14. (V3.93) Minimum Sweep time with 6 dB type RBWs has been reduced.
15. (V3.93 SP3) Modification for production internal purposes.
16. (V4.13) Additional number of sweep points: an increment of 100 is possible now for number of points ≥ 201
17. (V4.13) HP emulation: Additional HP Models 8568A_DC and 8568B_DC using DC coupling.
18. (V4.13) HP emulation: GENERAL SETTINGS - GPIB menu extended by IF GAIN NORM / PULS
19. (V4.13) New spurious emissions measurement LIST EVALUATION
20. (V4.13) New function MARKER FILE EXPORT.
21. (V4.13) Improved Firmware Update.
22. (V4.13) Gated statistics measurements APD, CCDF.
23. (V4.13) GPIB: Basic remote control of the signal generator which is connected to the additional FSP-B10 GPIB Interface.
24. (V4.13) GPIB: SCPI format for binary block data extended for byte counts $> 999.999.999$ bytes.
25. (V4.13) 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)
26. (V4.13) Trigger Line for video trigger now also visible outside of the trigger menu.
27. (V4.13) HP emulation: The OL command returns the mixer level in byte 23
28. (V4.13) HP emulation: The commands MKPK NH | NL | NR and KSK do not perform a sweep start when marker is already switched on

29. (V4.13) HP emulation: The commands SNGLS and CONTS are setting the command complete bit (bit 4) in STB
30. (V4.13) HP emulation: New softkey SETUP - GENERAL SETUP - GPIB - SWEEP REP ON/OFF"
31. (V4.13) HP emulation: New commands: VARDEF, CTA, ADD, SUB, MPY, DIV
32. (V4.13) HP emulation: New command NORMLIZE for tracking generator
33. (V4.13) HP emulation: The command LF performs a reset
35. (V4.13) Support for EMI APD function
35. (V4.13) Increased dwell time for Time Domain Scan
36. (V4.13) Scan needs to be interrupted for a hardcopy but it may be resumed after having done the hardcopy.
37. (V4.13SP1) The Aquisition Time (for FFT filter) is now readable with remote command "SENS:SWE:TIME?".
38. (V4.23) New Save/Recall menu and dialogs.
39. (V4.23) Easy access to Windows XP Start menu (setup menu described in "Modifications to the Operating Manual").
40. (V4.23) IF SHIFT function added (setup menu described in "Modifications to the Operating Manual").
41. (V4.23) Required sweeptime reduced for video bandwidth < resolution bandwidth.
42. (V4.23) ASCII Export function for Marker Peak List.
43. (V4.23) Adjustable marker position knob stepsize.
44. (V4.23) New trace average function Power.
45. (V4.23) HP emulation: Personality Spurious supported.
46. (V4.23) HP emulation: Personality Phase Noise supported.
47. (V4.23) FSP-B10: Upper frequency limit of SMF100A is now 43.5 GHz .
48. (V4.23) FSP-B10: Support for SMA100, SMB100 (1/2/3/6GHz), SMF (22/43GHz) SMJ (3/6GHz).
49. (V4.23) FSP-B10: Support for SMF100a - TTL mode.
50. (V4.23) Function TRACe:IQ:FILTer NORMAl | WIDE changed.
The extension of the filter flatness is possible for the sample rate range 10.2 MHz < sample rate ≤ 20.4 MHz.
51. (V4.23) Function "CISPR RBW UNCOUPLED (SENSE1:BANDwidth:RESolution:AUTO)" changed.
In earlier versions this command was effective only when the quasipeak detector was activated in the receiver mode. Now this command is effective if any CISPR detector (Quasipeak, CISPR-RMS, CISPR-AV) is switched on.
51. (V4.23) Statusbit 4 (0x10) is set in Status Operation Register when scan is running.
52. (V4.23) All analyzer traces that are set to "MAX HOLD", "MIN HOLD" or "AVERAGE" are set to "VIEW" after switching to receiver, IF analysis or APD and back to analyzer mode.
53. (V4.23) Compatible limit lines keep active when switching between analyzer and receiver mode.

54. (V4.23) New coupling parameter “Analyzer Marker Frequency -> Receiver Frequency”

IEEE/IEC bus command: INSTrument:COUPle:MARKer ALL|NONE

If this coupling parameter is selected, the receiver frequency is set to the stimulus of the actual selected marker in analyzer mode. This coupling becomes effective only when switching from analyzer to receiver, IF analysis or APD mode.

55. (V4.23) CISPR detectors (QP, CISPR-RMS, CISPR-AV) now available in Time Domain Scan

In Time Domain Scan the CISPR detectors can be selected in the trace menu (see below).

If a CISPR detector is selected the step mode AUTO CW is not available.

Problems Eliminated

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

1. (V3.83) Overload display

The overload indication is cleared when changing from scan display to IF analysis display.

2. (V3.83) Autorange function

The ranging limits of the autorange function have been changed.

3. (V3.83) Hardcopy in IF analysis

A hardcopy in IF analysis mode does now contain the traces.

4. (V3.83) IF Analysis.

The spurious signal 60 dB under the signal level has been removed.

5. (V3.83) Overload display

The overload indication in scan mode without any signal has been removed.

6. (V3.83) Time Domain Scan (ESU-K53)

The time domain scan does now work up to 40 GHz with a small resolution bandwidth.

7. (V3.83) AC/DC switch

Changing the AC/DC coupling of the RF input could modify the video bandwidth in spectrum analyzer mode.

8. (V3.83) IF Analysis

The selected level unit is now displayed correctly in IF analysis.

9. (V3.83) Templates for the Test Report

Templates for the Test Report are now saved correctly.

10. (V3.93) Marker Menu: Next Peak Left and NEXT PEAK RIGHT

The a.m. marker functions do now work correct.

11. (V3.83) Entering the HARDCOPY Menu

Open tables are not longer closed when entering the HARDCOPY menu.

12. (V3.83) Spurious in Time Domain Scan

Due to a numerical problem the time domain scan trace could have spurious with an RBW of 10 kHz.

13. (V3.83) Instrument indicates UNCAL after following steps:

- Firmware Update
- CAL TOTAL
- Reboot of the instrument

14. (V3.83) Statistic measurements CCDF/APD in analyzer mode does not work if a transducer is switched on.

15. (V3.83) Overload is not displayed in scan data

An overload condition has not been displayed in the scan data in Time Domain Scan (TRACe? SCAN).

16. (V3.83) MMEMory command could block instument

The instrument firmware could be blocked after several hundred MMEMory commands.

17. (V3.93) Marker not available after Hardcopy

Pressing the Hardcopy key while scanning made the marker function unavailable.

Problems solved in version 4.13 SP1:

18. (V4.13) Wrong measurement results in spectrum analyzer with option B24

In some cases wrong levels may be displayed in analyzer mode (dependant from span settings). Already delivered ESUs don't show this error.

19. (V4.13) Some old savesets could not be recalled.

Problems solved in version 4.23:

20. (V4.13) ESU hangs after changing from local to remote state or vice versa when a scan is running.

If a scan was running in remote state, the ESU hangs if the "Local" button was pressed. The same effect occurred when a scan was running in local state and the ESU was set to remote state.

Now a running scan is stopped if the remote state is to be changed.

The same error occurred if the display state was changed in remote state when a scan was running.

21. (V4.13) Preamp not selectable in scan table if Input2 was switched on in AMPT-Menu.

The preamp value was not changeable in the scan table, if the range stop frequency was greater than 1 GHz although Input1 was selected. This error only occurred if no B24 was available.

22. (V4.13) Lower limit line check did not work for a scan in receiver mode.

Now the lower limit line check is available for a scan in receiver mode.

If threshold scan is active and the lower limit line check is selected, a final measurement is performed if the signal level is lower than the limit value.

23. (V4.13) No IF-Overload was detected with analog RBW's.

24. (V4.13) Wrong limit check if a dBuA transducer was active.

If a transducer with dBuA and a compatible limit line was active, the signal level had to be 34 dB higher than the limit value to generate a limit failure.

25. (V4.13) Level error in analyzer sweep with preselector from 2MHz up to 8MHz.

If a sweep with preselector from 2 MHz up to 8 MHz was performed, the signal was about 10 dB down at 2 MHz.

26. (V4.13) Signal drops about 40 dB at 90 MHz.

The signal drops about 40 dB at 90 MHz with following adjustments:

Center Frequency:	90 MHz
Span:	1 MHz
RBW:	100 kHz
VBW:	10 kHz
Meas Time:	2.5 ms

27. (V4.13) 1 MHz impulse bandwidth was not applied in APD mode precisely.

In APD mode the overall selectivity of the 1 MHz impulse bandwidth was not in line with CISPR 16-1-1. This has been corrected now.

28. (V4.13) Wrong return value in ESU-APD measurement and unit dBuV via IEC/IEEE bus command.

If the ESU-APD measurement with unit dBuV was active, the IEC/IEEE bus command CALC:STAT:SCAL:X:RLEV? returned the wrong value.

Known Problems

1. (V4.13) Savesets of versions 3.83 and 3.93 only can be recalled if the Report-Item is deselected in the save/recall item list.

Modifications to the Operating Manual

The order number for the current manual set is

- 1302.6163.12-01 (English).

The firmware options FS-Kxx come with their own operating manual and release notes. Please refer to the corresponding release notes for more information on changes to these packages.

Last minute changes to the Operating Manual

Mode Selection – Hotkey Bar



APD The APD Hotkey activates the CISPR weighting function for measuring the Amplitude Probability Distribution (APD) of a disturbance signal.

IEC/IEEE bus command: `INST:SEL APD`

Instrument Functions – APD Mode

Introduction

With Firmware Version 4.13 of R&S Test Receiver ESU series a new CISPR weighting function is available for measuring the Amplitude Probability Distribution (APD) of a disturbance signal.

This new measuring function was introduced by Amendment 1:2005 to CISPR 16-1-1:2003. In this standard the APD of a disturbance signal is defined as:

“The cumulative distribution of the probability of time that the amplitude of disturbance exceeds a specified level”.

In R&S Test Receiver ESU the APD is measured at the output of the envelope detector. The APD measurement method gives all amplitude probability information taken over the entire disturbance envelope within the measurement bandwidth at a certain frequency within a specified time interval, i.e., it provides a statistical characterization of the disturbance signal in question.

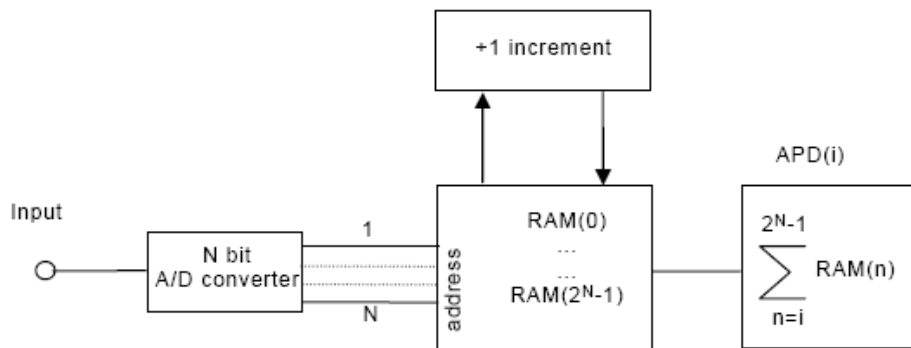


Figure 1: Block diagram of APD measurement circuit with A/D converter [2]

The amplitude of the disturbance is expressed in terms of the corresponding field strength or voltage at the receiver input. The method of measuring the probability of time p_{meas} during which the disturbance envelope exceeds a specified level E_{limit} is applied. Usually, an APD measurement is carried out at a fixed frequency.

Advantages of the APD measurement method:

- Is expected as an alternative method to present logarithmic average measurements.
- Can also be used to calculate the true average value.

As an alternative to the latter, state-of-the-art spectrum analyzers with a wide dynamic range (>70 dB) can be used to measure the true average value directly.

Background material on the application of the APD-measuring function is provided in [1].

Examples of APD

When there is no input signal at the measuring receiver, the envelope of the receiver noise is shown as in Figure 1 with zero span mode at center frequency f_c . The corresponding APD response of the receiver noise is shown in Figure 3. The ordinate axis of the APD function displays the probability that the disturbance envelope exceeds the disturbance level.

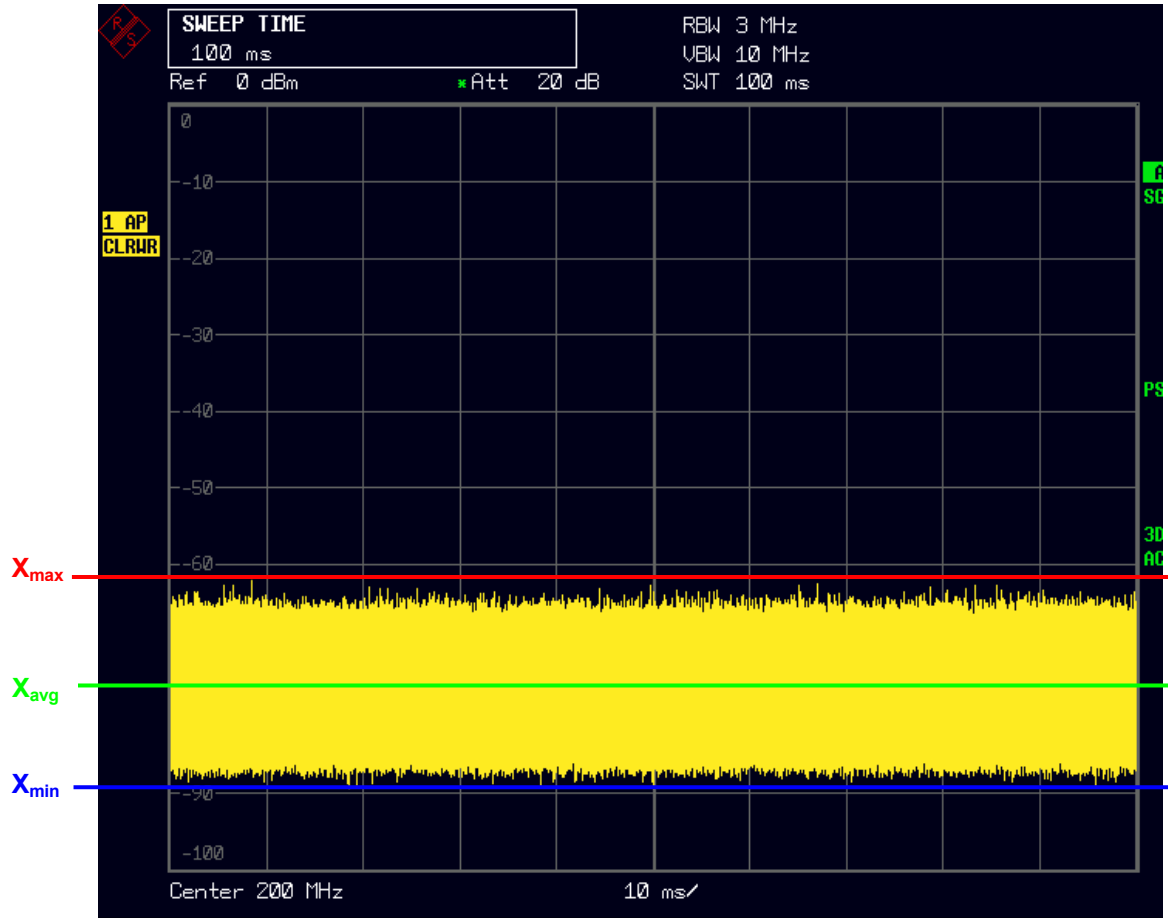


Figure 2: Zero Span of receiver noise

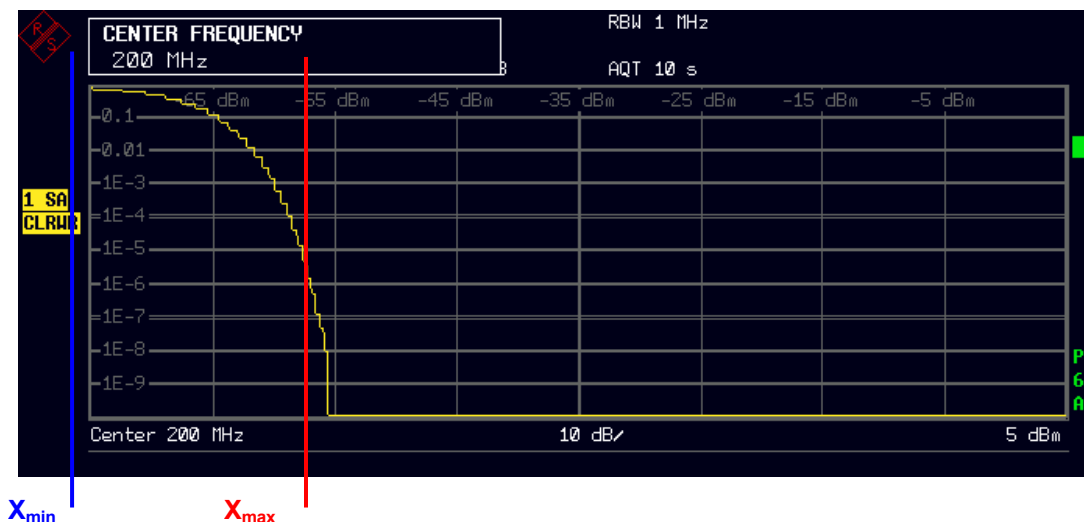


Figure 3: APD of receiver noise

If one impulse is received within 1% of time, as shown in Figure 4, the APD shows drastic extension to the right side at the bottom of Figure 5, indicating a high disturbance level but at low probability. The difference between Figure 2 and Figure 4 is their peak value (X_{max}), it appears dominantly on the abscissa of APD.

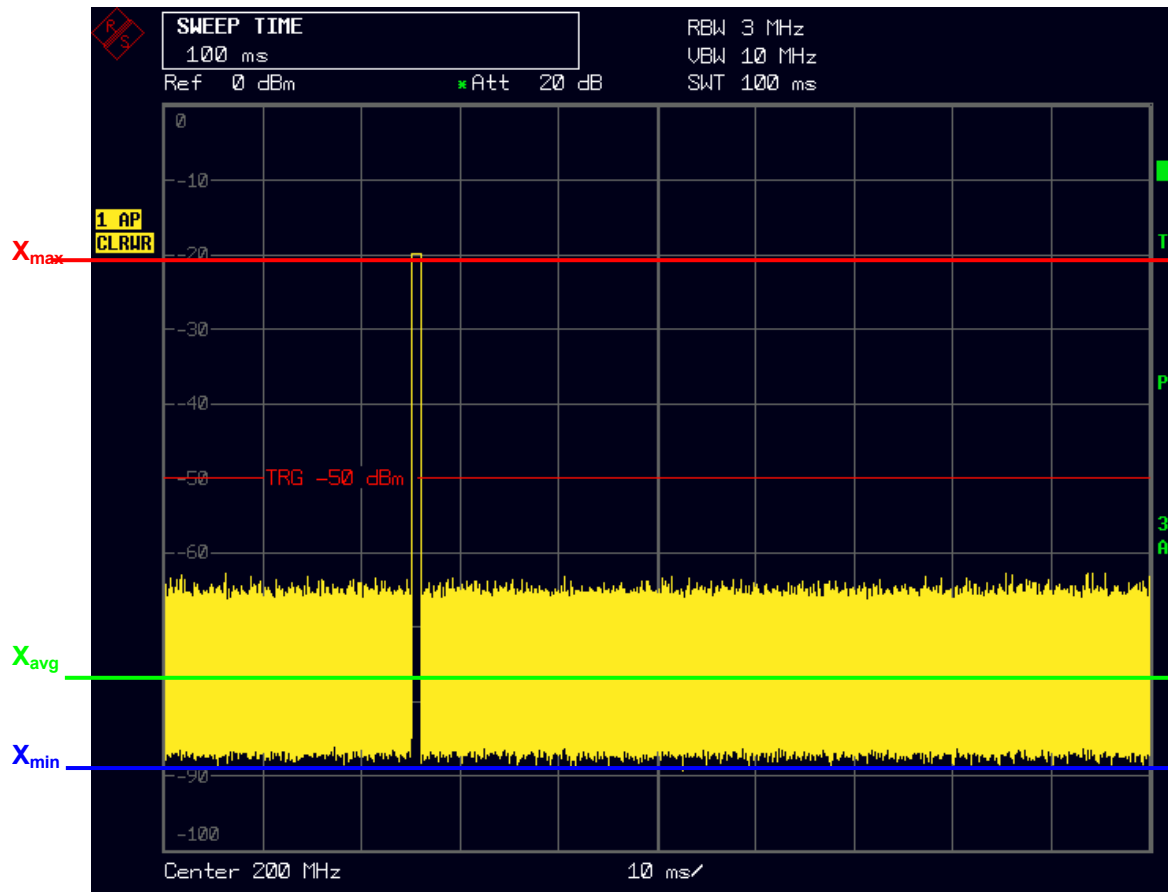


Figure 4: Zero Span of a pulsed signal (single or low PRF)

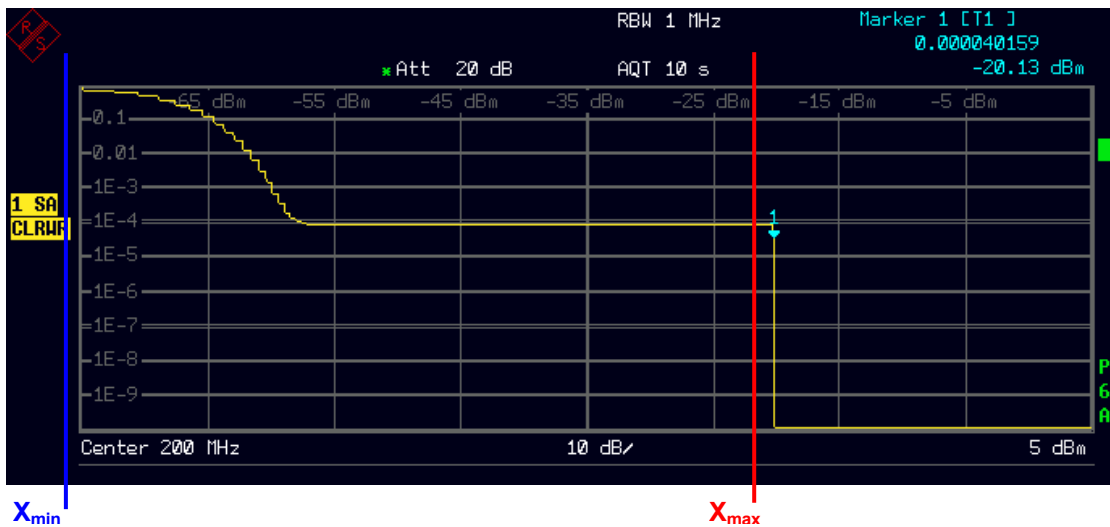


Figure 5: APD of a pulsed signal (single or low PRF)

Next, let us consider the case that the repetition frequency of the impulse increases as shown in Figure 6. The disturbance shown in Figure 6 has a higher average value than Figure 4 because of the increasing

pulse repetition frequency, but the log-average value (X_{avg}) of Figure 6 does not show any difference from that of Figure 4. This is because the log-average value mainly depends on the receiver noise and strongly suppresses impulsive noise in this case. But the APD of the disturbance, shown in Figure 7, has high sensitivity to variation in the average value. Clearly the probability presented in Figure 7 increases when compared with Figure 5.

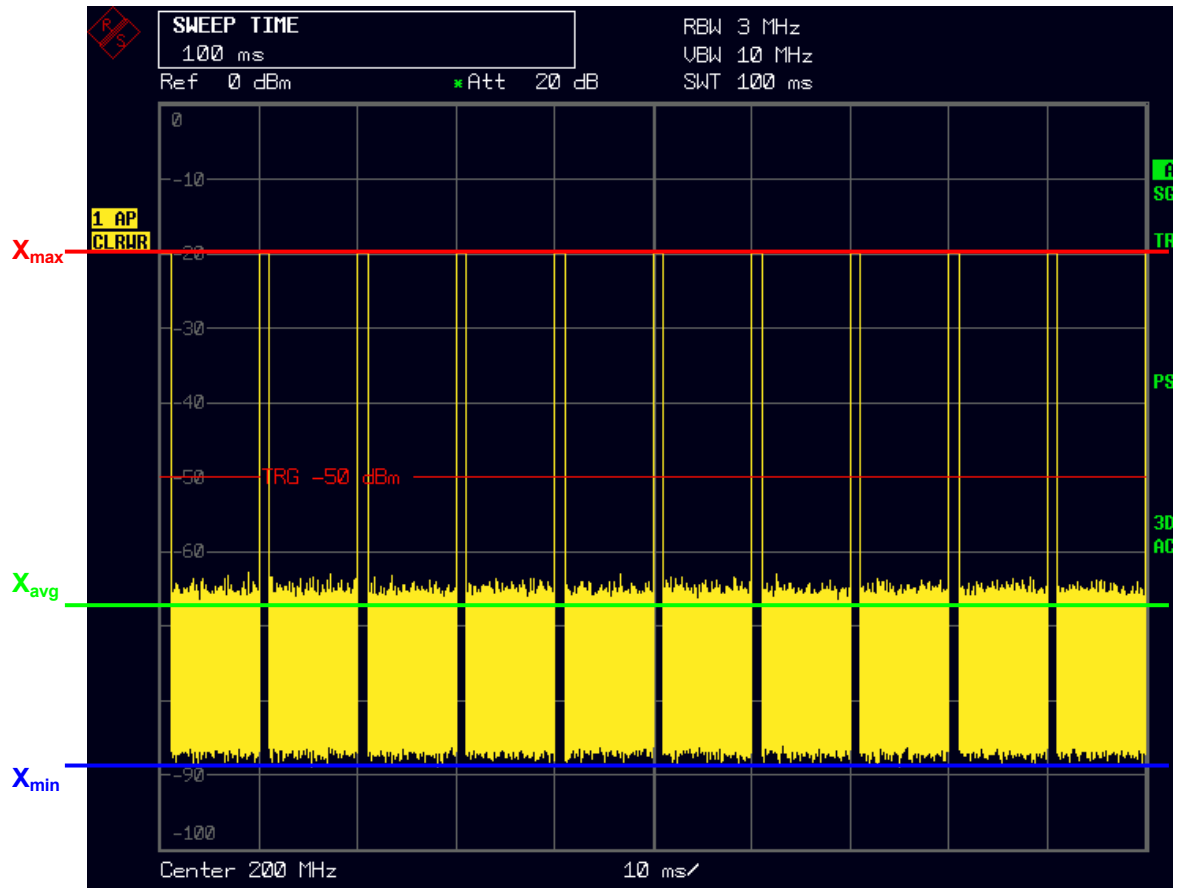


Figure 6: Zero Span of of a pulsed signal (high PRF)

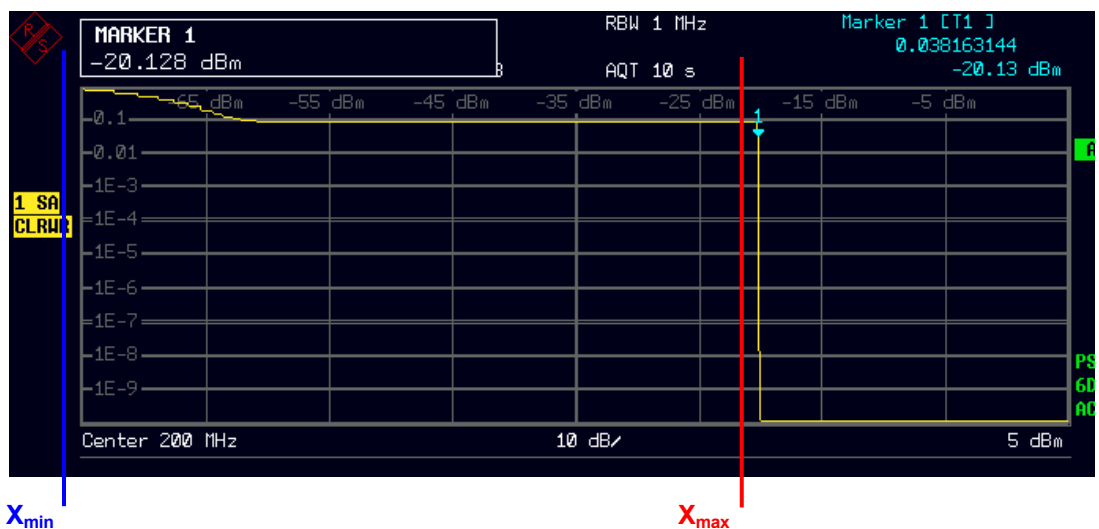


Figure 7: APD of a pulsed signal (high PRF)

For the disturbance which has high peak and average value, such as in Figure 8, the APD curve shows high probability at high level as shown in Figure 9.

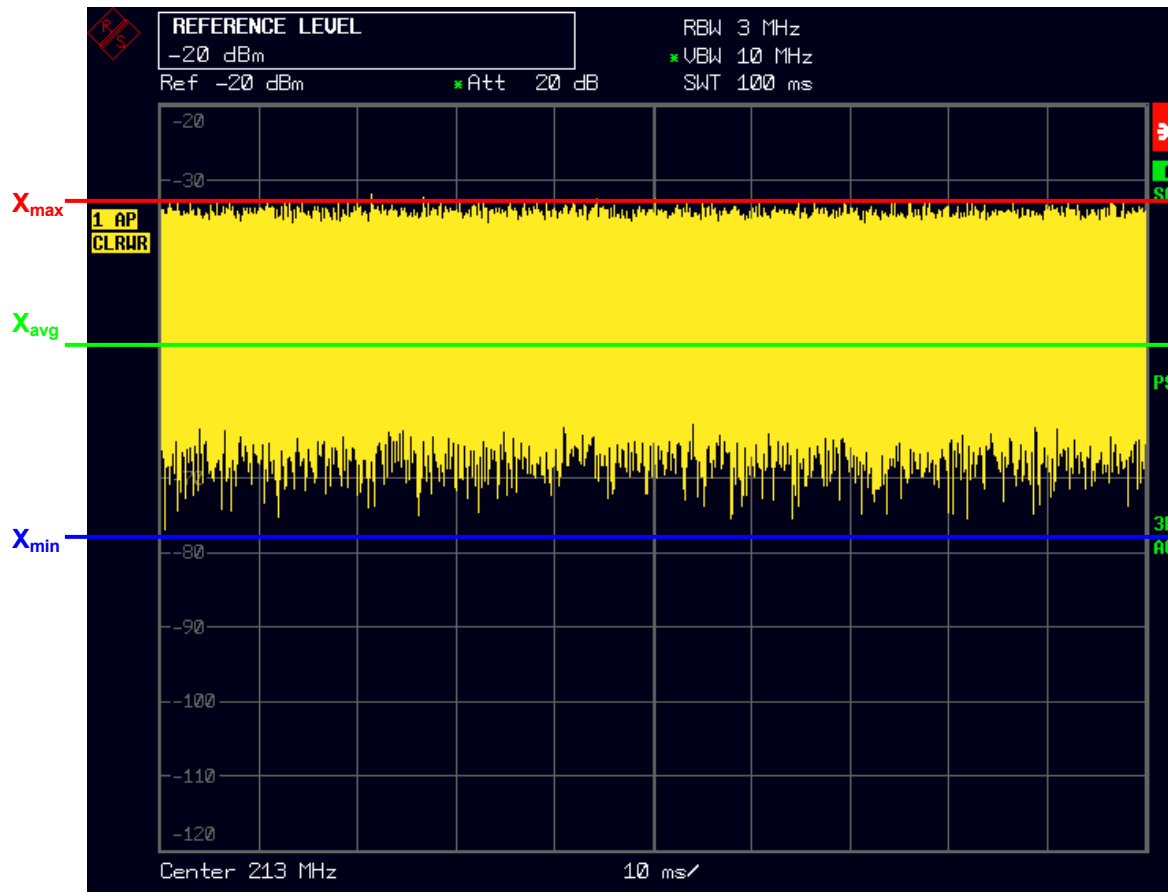


Figure 8: Zero Span of a broadband signal (high level)

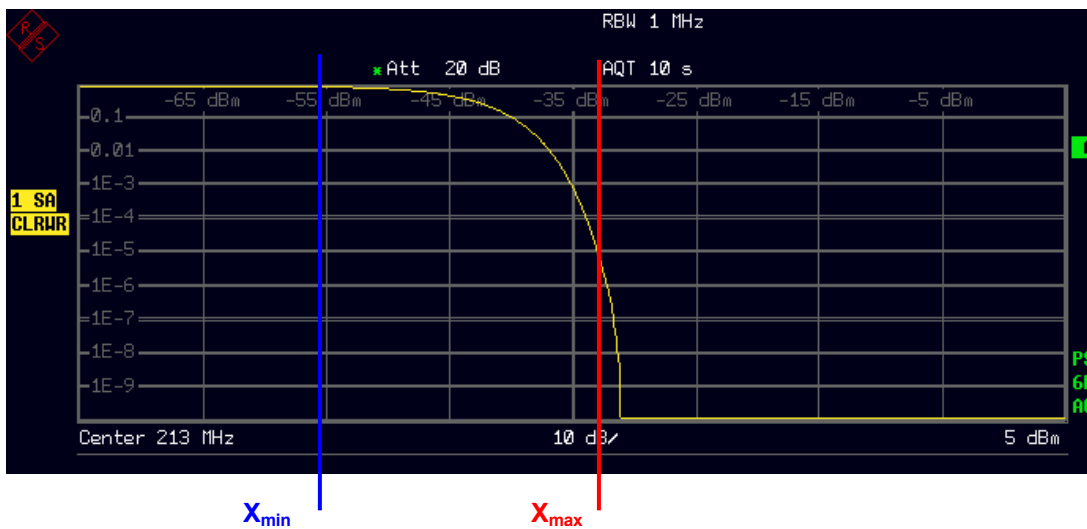


Figure 9: APD of a broadband signal (high level)

Measurement Method

In R&S Test Receiver ESU, the method of measuring the probability of time p_{meas} during which the disturbance envelope exceeds a specified level E_{limit} is applied.

The measurement shall be carried out using the following procedure [3]:

- 1) Set the resolution bandwidth (RBW) and the video bandwidth (VBW) of the spectrum analyzer according to CISPR 16-1-1 (for measurements above 1 GHz).
- 2) Find the frequencies at which high disturbances are observed. This can be accomplished by using the maximum hold function during a specified amount of time (e.g. 2 min) in the frequency span of interest. Peak detection shall be used when applying this procedure.
- 3) Determine the frequencies for the APD measurement.
- 4) Set the center frequency of the measuring receiver to the frequency at which the highest level is observed during the application of step 2) of this procedure.
- 5) Set the reference level of the measuring receiver to minimum 5 dB above the maximum level of disturbance that is obtained in step 2).
- 6) Set the measuring receiver to the APD mode and measure the APD of the disturbance during the measurement time that is specified by the product family standard. The measurement time shall be longer than the period of the disturbance.
- 7) Change the center frequency of measuring receiver to the next frequency determined in step 2), then repeat the procedures of steps 4) - 6) until the APD measurements for all frequencies are carried out.
- 8) Read the probabilities p_{meas} during which the disturbance envelope exceeds a specified level E_{limit} from the results of step 6).
- 9) Compare p_{meas} against the limit p_{limit} . The EUT complies if p_{meas} is less than or equal to p_{limit} at all frequencies.
- 10) Or, read the levels E_{meas} for a given probability p_{limit}
- 11) Compare E_{meas} against the limit E_{limit} . The EUT complies if E_{meas} is less than or equal to E_{limit} .

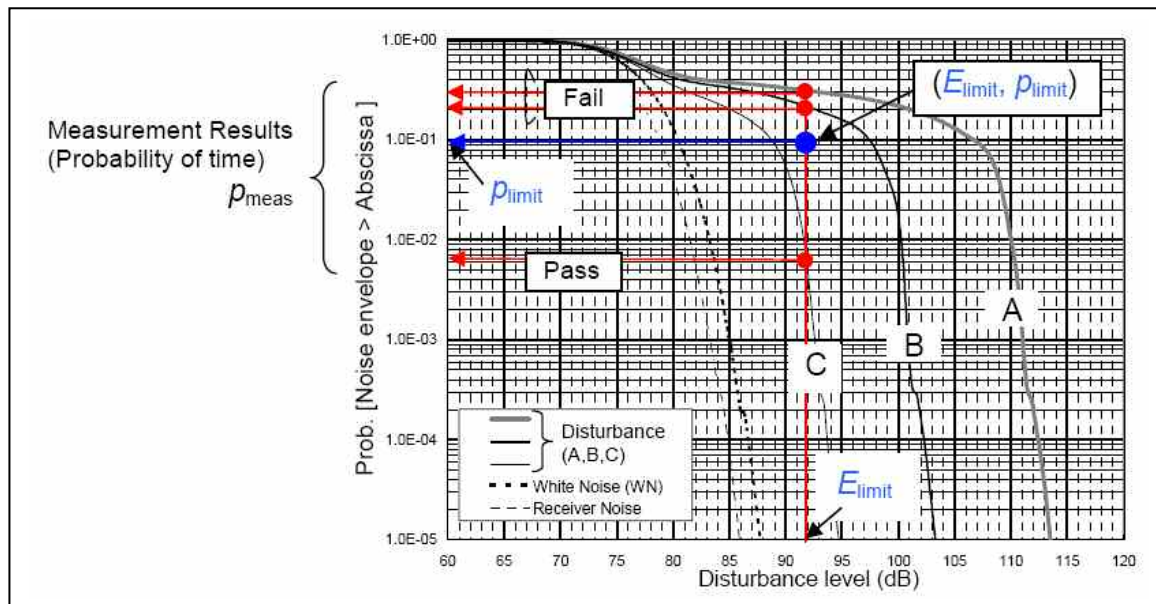


Figure 10: Compliance test using the APD method (Cases A and B are failing, C is passing.)

Specification

The following specifications described in [2] shall be applied to the APD measuring function. A rationale for these specifications is provided in Annex G of CISPR 16-1-1 [2].

	CISPR 16-1-1	R&S Test Receiver ESU
Dynamic range of the amplitude	>60 dB	>70 dB
Amplitude accuracy	better than $\pm 2,7$ dB	<2,5 dB for $f < 18$ GHz
Maximum measurable time	longer than or equal to 2 min ¹⁾	2 min (no dead time)
Minimum measurable probability	10^{-7}	10^{-7}
Assignment of amplitude levels	at least two amplitude levels with a resolution of 0,25 dB or better ²⁾	no limitation by using external software ³⁾
Sampling rate	≥ 10 MSamples, when using an RBW of 1 MHz	10,2 MSamples for RBW = 1 MHz 4,0 MS for RBW = 200 Hz, 9 kHz, 120 kHz
Display resolution of APD measurement data	less than 0,25 dB	0,128 dB

- 1) The intermittent measurement can be used if the dead time is less than 1 % of the total measurement time.
- 2) The probabilities corresponding to all pre-assigned levels shall be measured simultaneously.
- 3) In R&S Test Receiver ESU for each of the 625 disturbance levels the probability of time p_{meas} is recorded.

Application of the APD method for compliance testing of microwave ovens

CISPR 11, the current standard for microwave ovens, specifies peak and average limits for the radiated emission test of microwave ovens. The average (weighted) value is measured by reducing the VBW (10 Hz) in logarithmic mode. Therefore, the result does not give a true average value. The linear mode shall be used to obtain the true average. However, in linear mode, the conventional spectrum analyzer offers a dynamic range of less than 40 dB. This makes it difficult to make true average measurements of disturbances from microwave ovens.

The APD measurement is expected as an alternative method to the present weighted measurement in CISPR 11 with the benefit that the true average value can be evaluated.

By using the ESU, compliance with the APD limit is determined by measuring the probability of time p_{limit} corresponding to a specified limit level E_{limit} . As peak and average (weighted) limits are already specified in CISPR 11, it is recommended to use the existing peak limit together with an APD limit point. The EUT is deemed to be compliant if the measured values are less than both limits.

The problem is how to determine the APD limit point (E_{limit} , p_{limit}). This can be done in accordance with [4] as follows:

- The limit of disturbance level E_{limit} is set to the same value as the present average (weighted) limit.
- Measure the APD of the typical disturbance from a microwave oven which is almost compliant to the present limit.
- The average value is calculated from APD measurement results and the probability of time corresponding to the average value is taken from the APD plot. This value, the probability of time, is set to the limit, p_{limit} .
- Repeat 2)-3) for various types of microwave ovens to determine the final p_{limit} .

If the preliminary measurement results, obtained by using the maximum hold mode and peak detection, exceeds the specified APD limit at certain frequencies, then the APD measurement should be performed at these identified frequencies.

References

[1] Amendment 1:2005 to TR CISPR 16-3:2003 (2nd Ed.): *Correlation between amplitude probability distribution (APD) characteristics of disturbance and performance of digital communication systems*

[2] Amendment 1:2005 to CISPR 16-1-1:2003 (1st Ed.): *Radio disturbance and immunity measuring apparatus – Measuring apparatus*

[3] CISPR 16-2-3:2006 (2nd Ed.): *Methods of measurement of disturbances and immunity – Radiated disturbance measurements*

[4] CISPR/A/675/DC: *Guidance for applying the APD method to the compliance testing and for developing APD emission limits*

Frequency Scan and Time Domain Scan - SWEEP Key - Entry of Scan Data

Meas Time - Entry of measurement time

The measurement time can be set between 100 μ s and 100 s separately for each subrange. In the case of quasi-peak weighting, the minimum is 1 ms. The measurement time can be set independently for each scan range.

With option ESU-K53 (Time Domain Scan) is the measurement time range dependent on the selected resolution bandwidth.

Resolution Bandwidth	Minimum Measurement Time	Maximum Measurement Time
10 Hz ... 50 Hz	10 ms	100 s
100 Hz ... 500 Hz	1 ms	100 s
1 kHz ... 30 kHz	100 μ s	100 s
50 kHz	100 μ s	50 s
100 kHz ... 120 kHz	10 μ s	30 s
200 kHz	10 μ s	16 s
300 kHz	10 μ s	10 s
500 kHz	10 μ s	6 s
1 MHz	10 μ s	3 s

IEC/IEEE bus command: SCAN1:TIME 1ms

Instrument Functions – Receiver Mode – Level Display and RF Input Configuration

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 ESU8	
	DC coupled	20 Hz to 8 GHz
	AC coupled	1 MHz to 8 GHz
	R&S ESU26	
	DC coupled	20 Hz to 26.5 GHz
	AC coupled	10 MHz to 26.5 GHz
	R&S ESU40	
	DC coupled	20 Hz to 40 GHz
	AC coupled	10 MHz to 40 GHz
	R&S ESU8/26/40	
	DC coupled, input 2	20 Hz to 1 GHz
	AC coupled, input 2	9 kHz to 1 GHz

Measurements outside the valid frequency range are marked with the AC label in red and the AC IN label



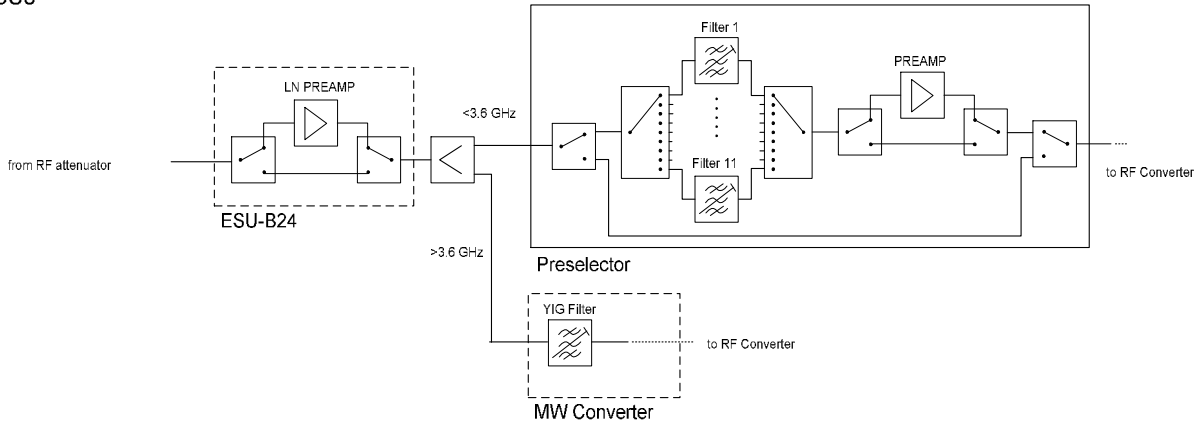
IEC/IEEE bus command: INP:COUP AC|DC

Receiver Mode - Level Display and RF Input Configuration - AMPT Key

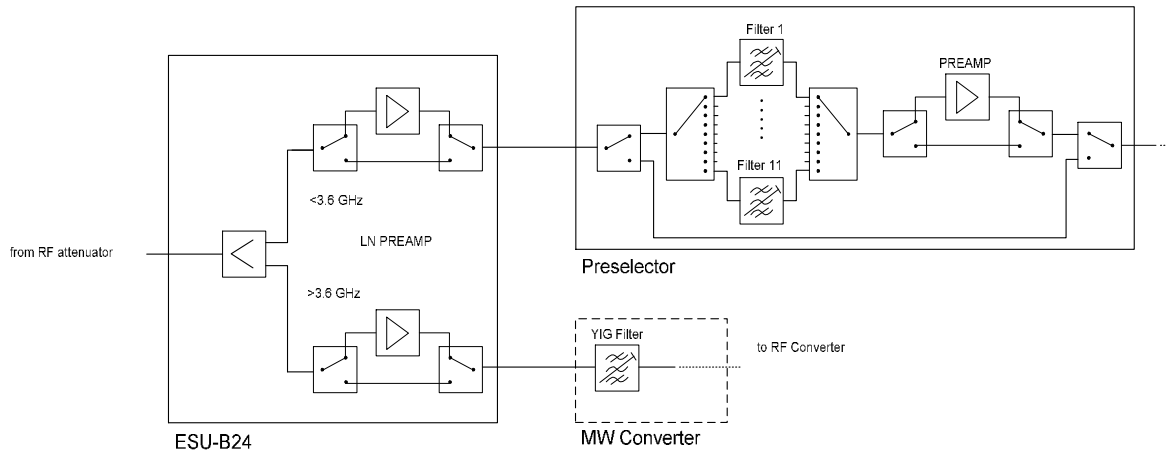
Spectrum Analyzer – SETUP Key – Pre amplification and Preselection

The R&S ESU is provided with a switchable preamplifier of 20 dB gain in the frequency range up to 3.6 GHz as standard. An additional low noise preamplifier which covers the whole frequency range is available as option R&S ESU-B24. Switching on the preamplifier reduces the total noise figure of R&S ESU and thus improves the sensitivity. In case of the standard preamplifier, the disadvantage of a poorer large-signal immunity (intermodulation) is reduced by the connected preselector: the preamplifier follows the preselection filters so that the risk of overdriving by strong out-of-band signals is reduced to a minimum.

ESU8



ESU26/40



The low noise preamplifier R&S ESU-B24 is located between RF attenuator and the preselection.

The signal level of the subsequent mixer is 20 dB higher so that the maximum input level is reduced by the gain of the preamplifier. The use of the preamplifier is recommended when measurements with a maximum sensitivity are to be performed. On the other hand, if the measurement should be performed at maximum dynamic range, the preamplifier should be switched off.

The gain of the preamplifier is automatically considered in the level display.

PREAMP ON/OFF

The *PREAMP ON/OFF* softkey switches the preamplifier (1 kHz to 3.6 GHz) on and off. With option R&S ESU-B24 the frequency range of the preamplifier is extended to the upper frequency limit of the instrument. The frequency range up to 3.6 GHz is covered by the preamplifier in the preselector, the range above by the low noise preamplifier R&S ESU-B24.

The softkey is available only in the analyzer mode when the measurement with preselection is activated.

Default value is OFF.

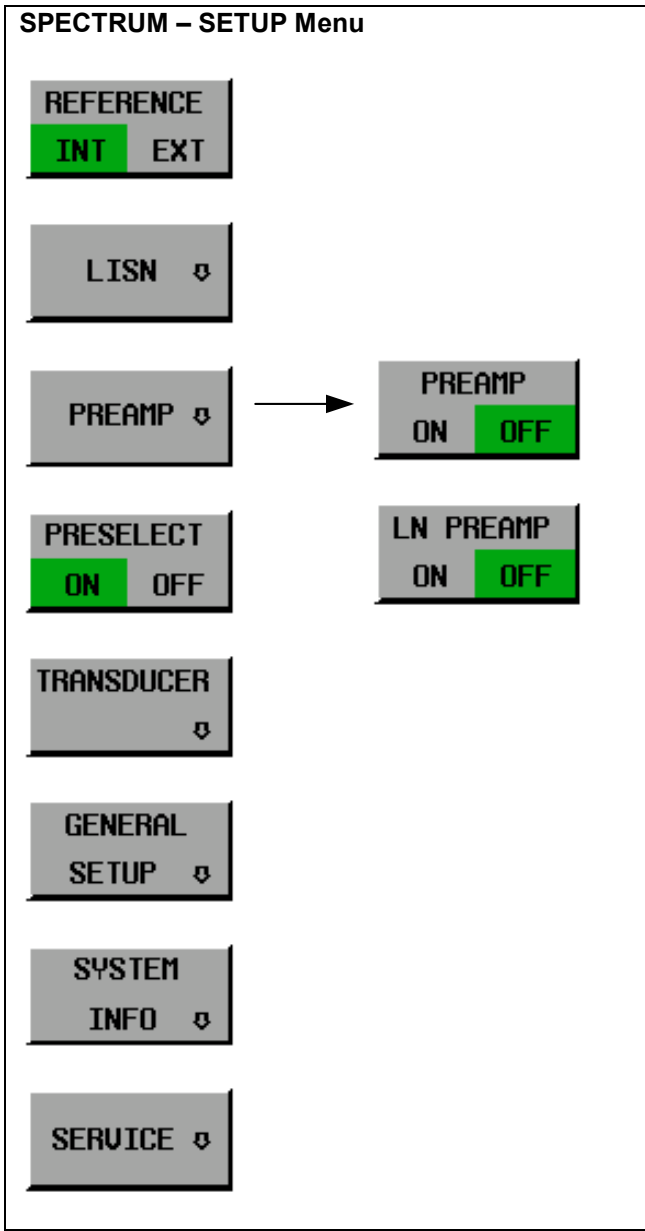
IEC/IEEE bus command: `:INP:GAIN:STAT ON | OFF`

LN PREAMP ON/OFF

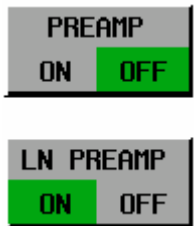



The *LN PREAMP ON/OFF* softkey switches the low noise preamplifier (100 kHz to upper frequency limit of the instrument) on and off. The softkey is only available with option R&S ESU-B24. The low noise preamplifier cannot be switched on with the preselector set to ON.

Default value is OFF.

IEC/IEEE bus command: `:INP:GAIN:LNA:STAT ON | OFF`



Display of the different preamplifier settings

Preamplifier setting	Spectrum analyzer
	
	

LN Preamp - Switching the low noise preamplifier on and off

The low noise preamplifier can be switched on/off separately for each subrange (requires option R&S ESU-B24)

IEC/IEEE bus command: `SCAN1:INP:GAIN:LNA:STAT OFF`

Instrument Functions – Receiver Mode – Running a Scan

CONT AT REC FREQ With the *CONT AT REC FREQ* softkey the scan is continued at the current receiver frequency when the receiver frequency is lower than the frequency at which the scan was interrupted. Otherwise the scan continues at the frequency at which it was interrupted.

The scan is always continued with the settings in the scan table.

IEC/IEEE bus command: `INITiate2`

Instrument Functions – IF Spectrum Analysis Mode

The displayed level values do have the full accuracy of the instrument only at the center frequency. At all other frequencies the displayed level is typically lower due to the frequency response of the IF filter and of the preselector.

Instrument Functions – Spectrum Analysis – Sweep Key

SWEEP POINTS The *SWEEP POINTS* softkey selects the number of measurement samples acquired during a sweep. The following numbers of points per sweep are available: 155, 313, 625 (default), 1251, 1999 and 201 up to 30001 in steps of 100.

IEC/IEEE bus command: `SWEEP:POIN 625`

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.

Instrument Functions – Spectrum Analysis – BW Key

VBW MODE The VBW MODE LIN/LOG softkey determines the position of the video filter
LIN /LOG in the signal path for resolution bandwidths ≤ 120 kHz:

- If LINear is selected, the video filter will be in front of the logarithmic amplifier (default).
- If LOGarithmic is selected, the video filter will be behind the logarithmic amplifier.

The essential difference between the two operating modes relates to the settling in the case of falling signal edges:

With LINear, the falling signal edge will be "flatter" than with LOGarithmic.

This is due to the conversion from linear power to logarithmic level units: a reduction of the linear power by 50% reduces the logarithmic signal level by only 3 dB.

This is important for **EMI measurements above 1 GHz**. Below 1 GHz, CISPR 16-1-1 defines the linear average detector only. Above 1 GHz both, the linear and the logarithmic average detector may be specified in product standards. Some standards (e.g. ANSI C63.4:2000) require the linear average detector, whereas microwave oven measurements may be made with the log average detector. CISPR 11 specifies weighted measurements with a VBW of 10 Hz.

The figure below shows the response of the linear and the logarithmic average detector for pulse-modulated signals.

Comparison of linear and log. Average Detectors

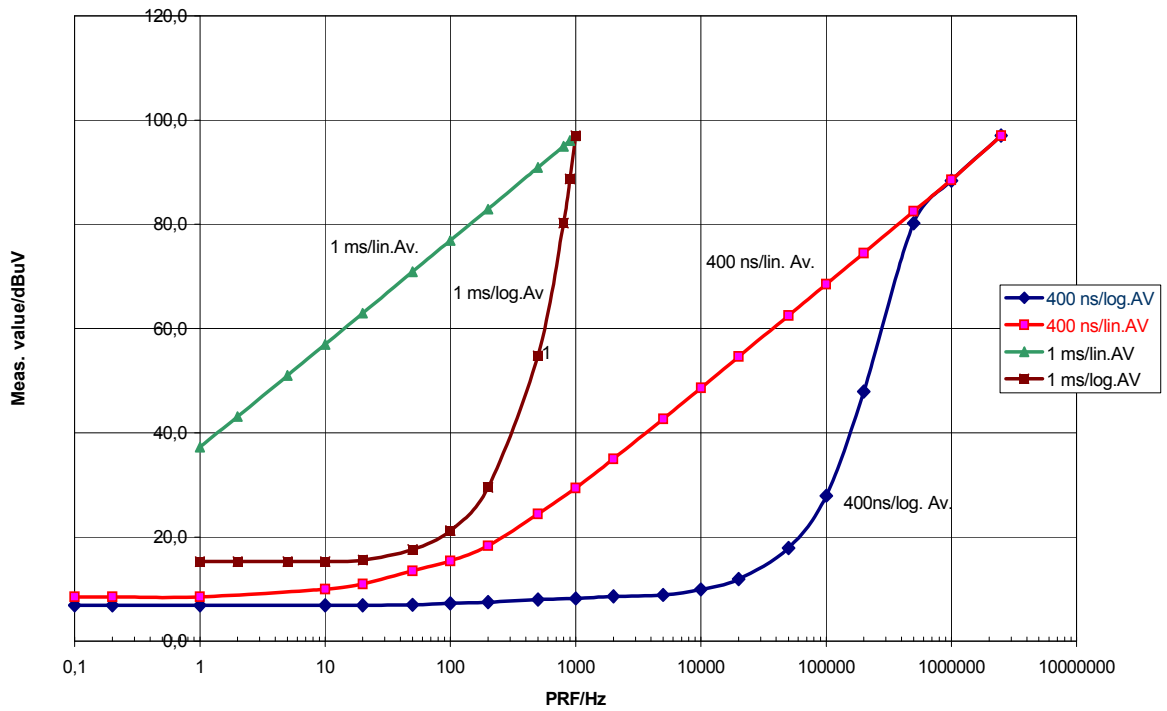


Figure: Responses of the linear and the logarithmic average detectors as a function of pulse repetition frequency (PRF) for pulse-modulated signals with pulse durations of 400 ns and 1 ms. Resolution bandwidth is 1 MHz.

IEC/IEEE bus command: BAND:VID:TYPE LIN

Menu MKR – NEXT – NEXT (Analyzer)

STEPSIZE
STANDARD

STEPSIZE
SPW POINTS

These softkeys control the knob increment/decrement of the marker position. STEPSIZE STANDARD uses the grid resolution (span/625), STEPSIZE SWP POINTS uses the available sweep points configured in the SWEEP menu.

IEC/IEEE-bus command:
CALC:MARK:X:SSIZE STANDARD | POINTS

MKR FILE
EXPORT

DECIM SEP
.

The MKR FILE EXPORT softkey stores the content of the active markers in ASCII format to the specified file.

IEC/IEEE-bus command: MMEM:STOR:MARK "ilename'
"DECIM SEP" selects '.' or ',' as the decimal point.

Menu MKR → – NEXT – NEXT (Analyzer and IF Analysis)

AUTO MAX
PEAK

AUTO MIN
PEAK



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 FCTNT – 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>:FUNctio:n:PNOise:
AUTO ON | OFF

The suffix at DELTmarker is ignored.

Menu MKR FCTNT – PEAK LIST (Analyzer)

PEAK LIST
EXPORT

The PEAK LIST EXPORT softkey stores the content of the marker peak list in ASCII format to the specified file.

DECIM SEP
.

IEC/IEEE-bus command: MMEM:STOR:PEAK 'ilename'

“DECIM SEP” selects '.' or ',' as the decimal point.

Menu MEAS – CHAN PWR ACP / MULT PWR ACP – CP/ACP CONFIG (Analyzer)



ACP STANDARD
√NONE
NADC IS136
TETRA
PDC
PHS
CDPD
CDMA IS95A FWD
CDMA IS95A REV
CDMA IS95C Class 0 FWD
CDMA IS95C Class 0 REV
CDMA J-STD008 FWD
CDMA J-STD008 REV
CDMA IS95C Class 1 FWD
CDMA IS95C Class 1 REV
W-CDMA 4.096 FWD
W-CDMA 4.096 REV
W-CDMA 3GPP FWD
W-CDMA 3GPP REV
CDMA 2000 DS
CDMA 2000 MC1
CDMA 2000 MC3
TD-SCDMA
WLAN 802.11A
WLAN 802.11B
WIMAX
WIBRO

The CP/ACP STANDARD softkey opens a list of selectable standards. WiMAX and WiBro are appended to that list.

Notes:
FAST ACP is not available if a WiMax or WiBro standard is selected.

IEC/IEEE-bus command:

CALC:MARK:FUNC:POW:PRES WiMax | WiBro

Menu MEAS – SIGNAL STATISTIC – CCDF ON / APD ON – SCALING (Analyzer)



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:

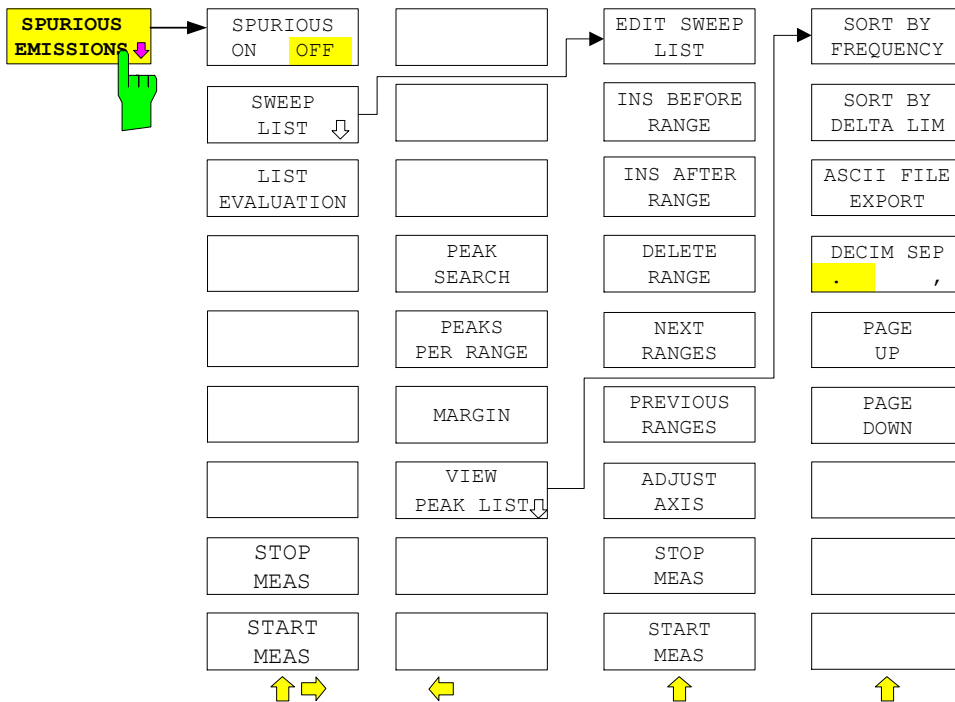
:CALC:STAT:SCAL:Y:UNIT PCT | ABS

The 0.01%, 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:

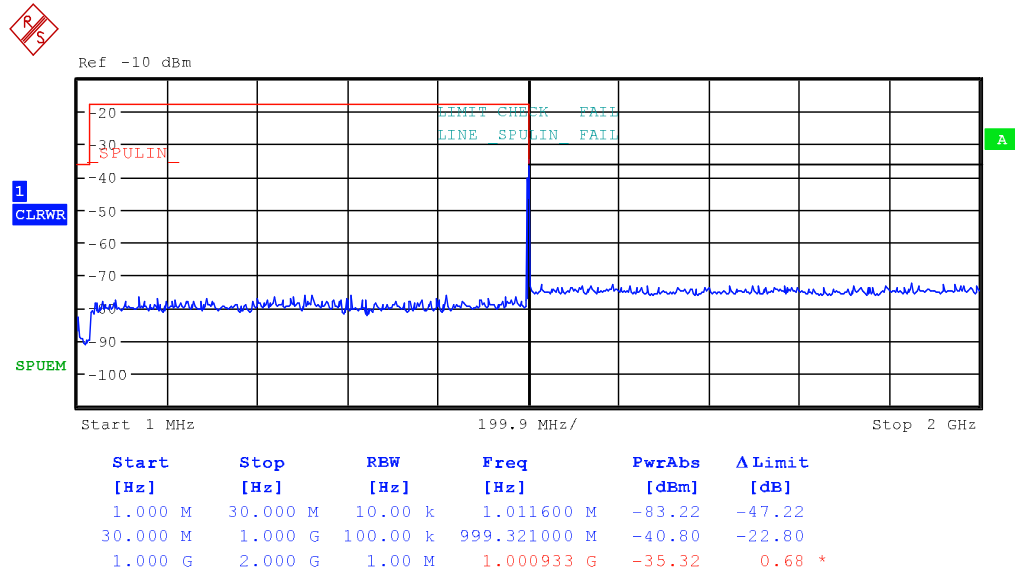
:CALCulate<1|2>:STATistics:CCDF:X<1..4>? P0_01 |P0_1 | P1 | P10

Menu MEAS – SPURIOUS EMISSION (Analyzer)



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).



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 LIST 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		

Menu MEAS – NEXT – HARMONIC DIST (Analyzer)

HARMONIC ON OFF
NO. OF HARMONICS
HARMONIC SWEPTIME
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 SWEPTIME* 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.

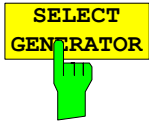
THD value comma separated in % and dB:

```
:CALCulate:MARKer:FUNCTion:HARMonics:DISToRtion? TOTal
```

Comma separated list of harmonic levels, for each harmonic one value:

```
:CALCulate:MARKer:FUNCTion:HARMonics:LIST?
```

Menu NETWORK – EXT SOURCE



Within the list of types of external generators the R&S SMA100A is supported with the item SMA01A.

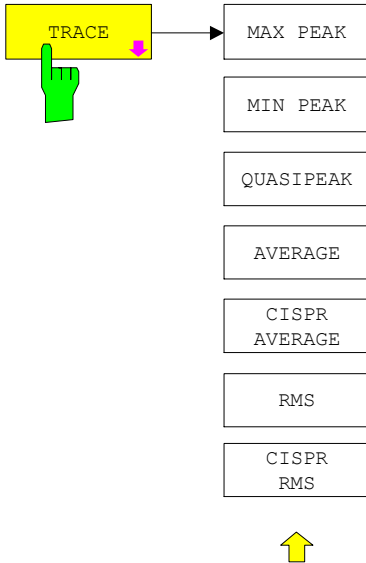
Note:

The TTL mode will only work correctly if a minimum firmware version 2.10.x is installed on the R&S SMA.

IEC/IEEE-bus command:

SYST:COMM:RDEV:GEN2:TYPE 'SMA01A'

Menu TRACE (Receiver Time Domain Scan)



In Receiver Time Domain Scan the CISPR detectors QUASIPEAK, CISPR RMS and CISPR AVERAGE are available.

CISPR RMS activates the weighting rms detector according to CISPR 16-1.

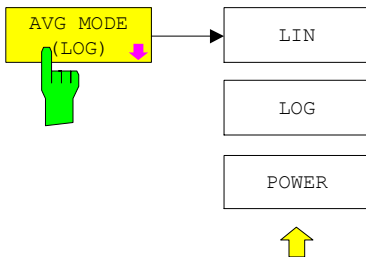
CISPR AVERAGE activates the weighting average detector according to CISPR 16-1.

IEC/IEEE bus commands:

:SENSe1:DETECTOR1 QPEak
 :SENSe1:DETECTOR1 CRMS
 :SENSe1:DETECTOR1 CAVERage

If a CISPR detector is selected, the step mode AUTO CW is not available.

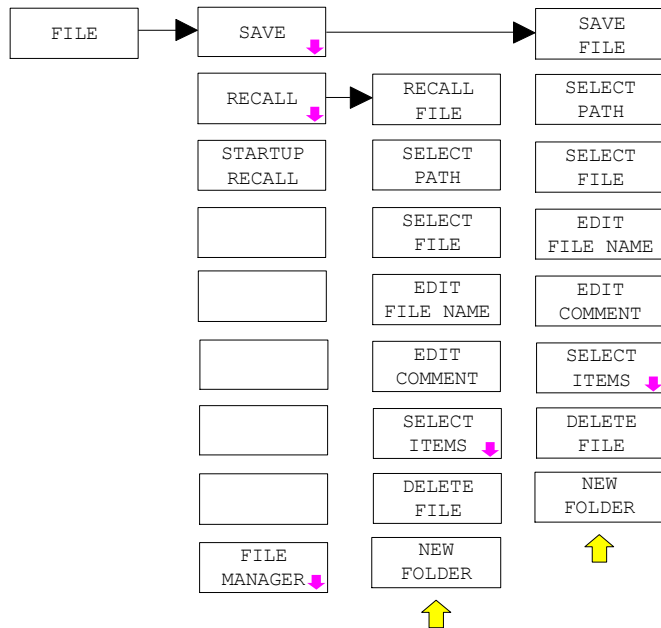
Menu TRACE – NEXT (Analyzer)



The *AVG MODE* softkey selects logarithmic or linear averaging for the logarithmic level display mode.

At the same time the difference calculation is switched between linear and logarithmic in submenu *TRACE MATH*.

Menu FILE



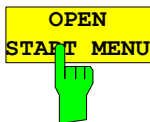
SAVE -
Edit File Name

Sets the focus on the File Name field.

In the Save dialog box, the field already contains a suggestion for a new name: the file name used in the last saving process is counted up to the next unused name. For example, if the name last used was "test_004", the new name "test_005" is suggested, but only if this name is not in use. If the name "test_005" is already in use, the next free name is suggested, e.g. "test_006". You can change the suggested name to any name conform to the following naming conventions.

The name of a settings file consists of a base name followed by an underscore and three numbers, e.g. "limit_lines_005". In the example, the base name is "limit_lines". The base name can contain characters, numbers and underscores. The file extension is added automatically and can not be changed.

Menu SETUP – NEXT



Softkey OPEN START MENU opens the windows XP start menu. and provides an easy access to standard windows functions if a mouse is connect.

IEC/IEEE-bus command: -

Menu SETUP – NEXT



Input signals at a frequency of half the 1st IF (in the frequency range of 2270 MHz to 2350 MHz) will reduce the dynamic range of the analyzer. This problem only occurs for low RF attenuation values. It can be overcome by shifting the 1st IF.

For signals from 2270MHz to 2310 MHz *IF SHIFT A* is appropriate, for 2310 MHz to 2350 MHz *IF SHIFT B* must be used.

IF SHIFT AUTO automatically selects the suitable 1st IF shifting. The Signal Frequency has to be specified for that purpose in the Signal Frequency dialog.

Note:
The 1st IF shifting is automatically done for ACP measurements if center frequency (= signal frequency) is in the range of 2270 MHz ... 2350 MHz. The IF SHIFT setting is therefore ignored for ACP measurements.

IEC/IEEE-bus command:
 [SENS<1|2>:]SWEp:IF:SHIFt[:MODE] OFF | A | B | AUTO
 [SENS<1|2>:]SWEp:IF:SHIFt:FREQuency <numeric value>

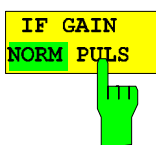
Menu SETUP - GENERAL SETUP - GPIB



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

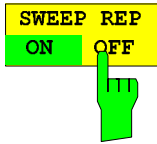
Notes:
Selecting a language different from "SCPI" will set the GPIB address to 18 if it was 20 before.
Start / stop frequency, reference level and # of sweep points will be adapted to the selected instrument model.
8568A_DC and 8568B_DC are using DC input coupling as default. if it is supported by the instrument.

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



Softkey IF GAIN PULS configures the internal IF gain settings in HP emulation mode due to the application needs. This setting is only taken into account for resolution bandwidth < 300 kHz.
 NORMAL Optimized for high dynamic range, overload limit is close to reference level
 PULS Optimized for pulsed signals, Overload limit up to 10 dB above reference level

IEC/IEEE bus command: SYSTem:IFGain:MODE NORM | PULSe



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: -

Remote Control – Description of Commands – CALCulate:DELTamarker Subsystem

CALCulate<1|2>:DELTamarker<1 to 4>:LINK ON | OFF

This command switches on and off a link of delta marker 1 to marker 1. If the link is switched on and the x-axis value of the marker1 is changed the delta marker 1 will follow on the same x-position.

Example: "CALC:DELT1:LIN ON" 'Switches the link of marker1/delta marker 1 on

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

Mode: A

Remote Control – Description of Commands – CALCulate:LIMit Subsystem

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 – CALCulate:MARKer Subsystem

CALCulate<1|2>:MARKer<1 to 4>:FUNCtion:HARMonics:BANDwidth:AUTO ON | OFF

This command specifies whether the resolution bandwidth of the 2nd to the nth harmonic should be identical to the bandwidth of the first harmonic (OFF) or to the next largest bandwidth (corresponding to the harmonic) of the multiple of the bandwidth of the first harmonic (ON).

Example: "CALC:MARK:FUNC:HARM:BAND:AUTO OFF"
'Switches automatic bandwidth expansion off

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

CALCulate<1|2>:MARKer<1 to 4>:FUNCtion:HARMonics:PRESet

This command optimizes the device settings depending on the mode in which the harmonic measurement was started:

If the harmonic measurement was started in the frequency domain (span > 0), the frequency and the level of the first harmonic are calculated, from which the measurement list is set up.

If the measurement was started in the time domain (span = 0), the frequency of the first harmonic is not changed. The level, however, is not calculated.

The function is independent of the marker selection, i.e. the suffix <1|2> or <1 to 4> of CALCulate or MARKer is irrelevant.

Example: "CALC:MARK:FUNC:HARM:PRES" Optimizes the device setting for the measurement of harmonics.

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

This command is an event and therefore has no *RST value and no query.

CALCulate<1|2>:MARKer<1 to 4>:FUNCtion:HARMonics:DISToRTion? TOTal

This command queries the results of the total harmonic distortion (THD).

A complete sweep with synchronization to sweep end should be performed between switching on the function and querying the measured value to obtain a valid query result. This is only possible in the single-sweep mode.

The function is independent of the marker selection, i.e. the suffix <1|2> or <1 to 4> of CALCulate or MARKer is irrelevant.

Example:

"INIT:CONT OFF"	'Switches to single-sweep mode.
"CALC:MARK:FUNC:HARM:NHARM 3"	'Sets the number of harmonics to 3.
"CALC:MARK:FUNC:HARM ON"	'Switches on the measurement of harmonics.
"INIT;*WAI"	'Starts a sweep and waits for the end.
"CALC:MARK:FUNC:HARM:DIS? TOT"	'Outputs the total harmonic distortion in % and dB.

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

CALCulate<1|2>:MARKer<1 to 4>:FUNCtion:HARMonics:LIST?

This command reads out the list of harmonics. The first value is the absolute power of the first harmonic in the unit set via UNIT. The other values are relative to the carrier signal and are output in dB.

The numeric values are output, separated by commas. The number corresponds to that of the harmonics to be measured, which are defined with `CALC:MARK:FUNC:HARM:NHARM`.

A complete sweep with synchronization to sweep end should be performed between switching on the function and querying the measured value to obtain a valid query result. This is only possible in the single-sweep mode.

The function is independent of the marker selection, i.e. the suffix `<1|2>` or `<1 to 4>` of `CALCulate` or `MARKer` is irrelevant.

Example:	"INIT:CONT OFF"	'Switches to single-sweep mode.
	"CALC:MARK:FUNC:HARM:NHARM 3"	'Sets the number of harmonics to 3.
	"CALC:MARK:FUNC:HARM ON"	'Switches on the measurement of harmonics.
	"INIT;*WAI"	'Starts a sweep and waits for the end.
	"CALC:MARK:FUNC:HARM:LIST?"	'Outputs the three measured harmonics, separated by commas.

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

CALCulate<1|2>:MARKer<1..4>:MAXimum:AUTO ON | OFF

This command switches an automatic maximum peak search for marker 1 at the end of each particular sweep on and off. The actual marker search limit settings (*LEFT LIMIT*, *RIGHT LIMIT*, *THRESHOLD*, *EXCLUDE LO*) are taken into account.

The numeric suffix at `MARKer<1..4>` is irrelevant.

Example:	"CALC:MARK:MAX:AUTO ON"	'activates the auto search function for marker 1
-----------------	-------------------------	--

Characteristics:	*RST value	OFF
	SCPI:	device-specific

Mode: A

CALCulate<1|2>:MARKer<1..4>:MINimum:AUTO ON | OFF

This command switches an automatic minimum peak search for marker 1 at the end of each particular sweep on and off. The actual marker search limit settings (*LEFT LIMIT*, *RIGHT LIMIT*, *THRESHOLD*, *EXCLUDE LO*) are taken into account.

The numeric suffix at `MARKer<1..4>` is irrelevant.

Example:	"CALC:MARK:MIN:AUTO ON"	'activates the auto search function for marker 1
-----------------	-------------------------	--

Characteristics:	*RST value	OFF
	SCPI:	device-specific

Mode: A

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 – DISPlay Subsystem

DISPlay[:WINDow<1|2>]:ACTive?

This command returns the active measurement window. The numeric response has following meaning:

- 1 Screen A
- 2 Screen B
- 3 Screen C
- 4 Screen D

The numeric suffix at WINDow<1|2> is irrelevant.

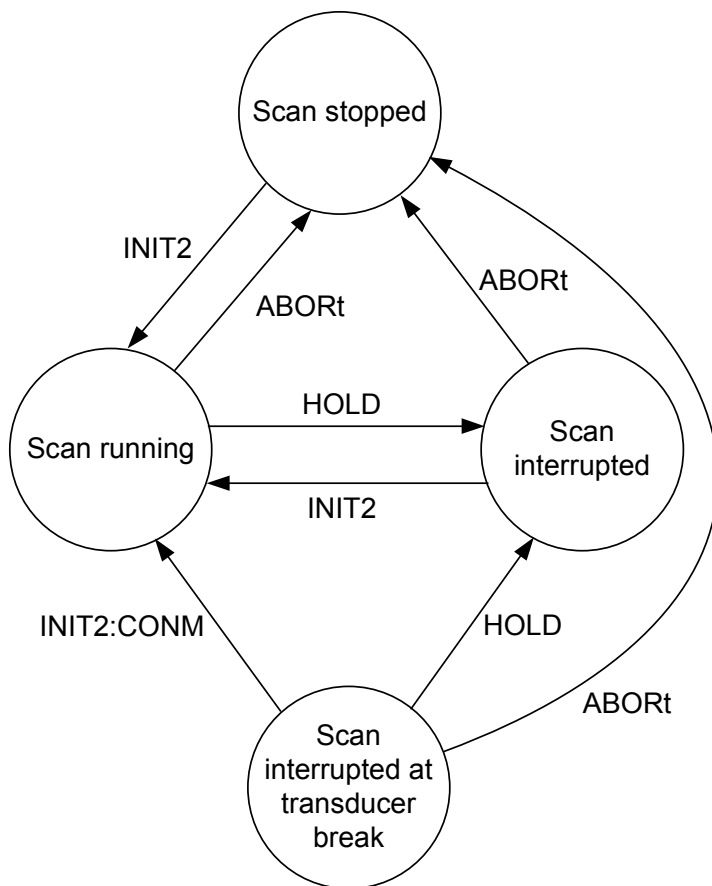
Example: "DISP:WIND:ACT?" 'returns the active window

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

Mode: all

Remote Control – Description of Commands – INITiate Subsystem

Controlling a scan in Receiver Mode.



Remote Control – Description of Commands – INSTRument:COUPlE Subsystem

INSTRument:COUPlE:MARKer ALL | NONE

This command defines the parameter coupling "Analyzer Marker Frequency -> receiver Frequency".

Example: "INST:COUP:MARK ALL"
Activates marker frequency coupling

Characteristics: *RST value: NONE
SCPI: device-specific

Mode: R|A

Remote Control – Description of Commands – MMEMory Subsystem

MMEMory:STORe<1|2>:MARKer <file_name>

This command saves the data of active markers to a file < file_name >.

Example: File content with 2 active marker in screen A:

```
Marker;1;T1
-25.87;dBm
19.920000000;GHz
Delta;2;T1
-21.90;dB
-5.920000000;GHz
```

Example: "MMEM:STOR:MARK 'C:\marker.txt'" 'Creates the file
'marker.txt, with all marker data of screen A.

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

Mode: A

This command is an event and therefore has no *RST value and no query.

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

Remote Control – Description of Commands – SENSE:LIST Subsystem

[SENSe<1|2>:]LIST:RANGe<1...20>:BANDwidth[:RESolution] <numeric_value>

This command selects the resolution bandwidth (RBW) of a range in the spurious measurement.

Example: `" :LIST:RANG2:BAND 10E3"` 'sets the RBW to 10 KHz

Features: *RST value: 10 kHz
 SCPI: device-specific

Mode: A

[SENSe<1|2>:]LIST:RANGe<1...20>:BANDwidth:VIDeo <numeric_value>

This command selects the video bandwidth (VBW) of a range in the spurious measurement.

Example: `" :LIST:RANG2:BAND:VIDeo 40E3"` 'sets the VBW to 40 KHz

Features: *RST value: 30 kHz
 SCPI: device-specific

Mode: A

[SENSe<1|2>:]LIST:RANGe<1...20>:BREak ON | OFF

This command determines whether a sweep is stopped in the spurious measurement when a range is changed.

Example: `" :LIST:RANG2:BRE ON"` 'sweep stops if the range is changed from 'range 2 to 3

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

Mode: A

[SENSe<1|2>:]LIST:RANGe<1...20>:COUNT?

This command indicates the number of defined ranges of the spurious measurement.

The numeric suffix <1 to 4> with RANGe is not relevant for this command.

Example: `" :LIST:RANG:COUN?"` 'Indicates the number of ranges

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

Mode: A

[SENSe<1|2>:]LIST:RANGe<1...20>:DELeTe

This command deletes a range.

Example: ":LIST:RANG2:DEL" 'deletes range 2
Features: *RST value: --
 SCPI: device-specific
Mode: A

[SENSe<1|2>:]LIST:RANGe<1...20>:DETector APEak | NEGative | POSitive | SAMPlE | RMS | AVERAge

This command sets the detector in the spurious measurement.

Example: ":LIST:RANG2:DET APE" 'autopeak detector
Features: *RST value: POS
 SCPI: device-specific
Mode: A

[SENSe<1|2>:]LIST:RANGe<1...20>:FILTer:TYPE NORMAl | CHANnel | RRC | P5

This command sets the filter in the spurious measurement.

Example: ":LIST:RANG2:FILT:TYPE RRC" 'RRC filter
Features: *RST value: NORMAL
 SCPI: device-specific
Mode: A

[SENSe<1|2>:]LIST:RANGe<1...20>[:FREQuency]:STARt <numeric_value>

This command sets the start frequency of a range in the spurious measurement.

Example: ":LIST:RANG2:STAR 1GHZ" 'start frequency of range 2 to 1 GHz
Features: *RST value: --
 SCPI: device-specific
Mode: A

[SENSe<1|2>:]LIST:RANGe<1...20>[:FREQuency]:STOP <numeric_value>

This command sets the stop frequency of a range in the spurious measurement.

Example: ":LIST:RANG2:STOP 2GHZ" 'stop frequency of range 2 to 2 GHz
Features: *RST value: --
 SCPI: device-specific
Mode: A

[SENSe<1|2>:]LIST:RANGe<1...20>:INPut:ATTenuation <numeric_value>

This command defines the RF attenuation of a range in the spurious measurement.

Example: ":LIST:RANG2:INP:ATT 30db" 'RF attenuation of range 2 to 30 dB
Features: *RST value: -
 SCPI: device-specific

Mode: A

[SENSe<1|2>:]LIST:RANGe<1...20>:INPut:ATTenuation:AUTO ON | OFF

This command switches the autoranging of a range in the spurious measurement on or off.

Example: " :LIST:RANG2:INP:ATT:AUTO ON" 'activates autorange for range 2

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

Mode: A

[SENSe<1|2>:]LIST:RANGe<1...20>:INPut:GAIN:STATe ON | OFF

This command switches the preamplifier of a range in the spurious measurement on or off.

Example: " :LIST:RANG2:INP:GAIN:STAT ON" 'activates the preamplifier for 'range 2

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

Mode: A

[SENSe<1|2>:]LIST:RANGe<1..20>:LIMit <numeric_value>

This command defines the limit of spurious emission measurement LIST EVALUATION.

The numeric suffix at SENSe<1|2> is irrelevant.

Example: "LIST:RANG5:LIM -40" 'Limit Line in Range 5 is -40dB

Characteristics: *RST value: -13dBm
SCPI: device-specific

Mode: A

[SENSe<1|2>:]LIST:RANGe<1..20>:LiMit:STATe ON | OFF

This command activates/deactivates limit checking of spurious emission measurement LIST EVALUATION.

The numeric suffix at SENSe<1|2> and the numeric suffix at RANGe1..20> are irrelevant.

Example: "LIST:RANG5:LIM -40" 'limit in range 5 is -40dBm
 "LIST:RANG7:LIM -20" 'limit in range 7 is -20dBm
 "LIST:RANG:LIM:STAT ON" 'activates limit checking

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

Mode: A

[SENSe<1|2>:]LIST:RANGe<1...20>:POINts <numeric_value>

This command defines the number of sweep points of a range in the spurious measurement.

Example: ":LIST:RANG2:POIN 300" 'sets 300 sweep points in range 2

Features: *RST value: 625
 SCPI: device-specific

Mode: A

[SENSe<1|2>:]LIST:RANGe<1...20>:RLEVEl <numeric_value>

This command defines the reference level of a range in the spurious measurement.

Example: ":LIST:RANG2:RLEV -30" 'sets the reference level in range 2 to -30 dBm

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

Mode: A

[SENSe<1|2>:]LIST:RANGe<1...20>:SWEep:TIME <numeric_value>

This command defines the sweep duration of a range in the spurious measurement.

Example: ":LIST:RANG2:SWE:TIME 1MS" 'sets the sweep time in range 2 to 1 ms

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

Mode: A

[SENSe<1|2>:]LIST:RANGe<1...20>:SWEep:TIME:AUTO ON | OFF

This command controls the automatic coupling of the sweep duration on the frequency span and the bandwidth settings in a spurious measurement range.

Example: ":LIST:RANG2:SWE:TIME:AUTO ON" 'activates the coupling of frequency range and bandwidths in range 2

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

Mode: A

[SENSe<1|2>:]LIST:RANGe<1...20>:TRANsducer <string>

This command sets the transducer factor for a range in the spurious measurement.

Example: ":LIST:RANG2:TRAN ON 'fac_1'" 'sets the transducer factor fac_1 in 'range 2

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

Mode:

Remote Control – Description of Commands – SENSE:SCAN Subsystem**[SENSe<1|2>:]SCAN<1 to 10>:INPut:TYPE INPUT1 | INPUT2**

This command defines the input for a receiver subscan.

Example: "SCAN1:INP:TYPE INPUT2"
 'Activates RF input 2 for scan range 1

Characteristics: *RST value: INPUT1
 SCPI: device-specific

Mode: R

[SENSe<1|2>:]SCAN<1 to 10>:INPut:GAIN:LNA[:STATe] ON | OFF

This command switches the low noise preamplifier on or off for a receiver subscan. (Only with option R&S ESU-B24).

Example: "SCAN1:INP:GAIN:LNA ON"
 'Switches the low noise amplifier on for scan range 1

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

Mode: R

Remote Control – Description of Commands – SENSE:SWEep:IF:SHIFt Subsystem

[SENSe<1|2>:]SWEep:IF:SHIFt[:MODE] OFF | A | B | AUTO

Input signals at a frequency of half the 1st IF (in the frequency range of 2270 MHz to 2350 MHz) will reduce the dynamic range of the analyzer. This problem only occurs for low RF attenuation values. It can be overcome by shifting the 1st IF.

OFF: Normal operation.

A: For signals from 2270MHz to 2310 MHz.

B: For signals from 2310 MHz to 2350 MHz.

AUTO: Automatically selects the suitable 1st IF shifting.

The signal frequency has to be specified with SWE:IF:SHIFT:FREQ.

Note:

The 1st IF shifting is automatically done for ACP measurements if center frequency (= signal frequency) is in the range of 2270 MHz ... 2350 MHz. The IF SHIFT setting is therefore ignored for ACP measurements.

Example: "SENS:SWE:IF:SHIFT A" ' activates IF SHIFT A

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

[SENSe<1|2>:]SWEep:IF:SHIFt:FREQuency <numeric value>

This command defines the signal frequency to automatically select the suitable 1st IF shifting for mode IF SHIFT AUTO (SENS:SWE:IF:SHIFT:MODE AUTO).

Example: "SENS:SWE:IF:MODE AUTO" ' activates IF SHIFT AUTO
"SENS:SWE:IF:SHIFT:FREQ 2GHz" ' carrier signal at 2 GHz"

Characteristics: *RST value: 1 GHz
SCPI: device-specific

Remote Control – Description of Commands – SENSE:SWEep:MODE Subsystem

[SENSe<1|2>:]SWEep:MODE AUTO | LIST

This command controls the sweep continuation.

Example: "SWE:MODE LIST" Activates the spurious emissions measurement.

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

Mode: A

Remote Control – Description of Commands – STATus Subsystem

STATus:QUESTionable:ACPLimit Register

This register comprises information about the observance of limits during adjacent power measurements. It can be queried with commands 'STATus:QUESTionable:ACPLimit :CONDition?' and 'STATus:QUESTionable:ACPLimit[:EVENT]?'

Table 5-7 Meaning of bits in STATus:QUESTionable:ACPLimit register

Bit No.	Meaning
0	ADJ UPPer FAIL(Screen A) This bit is set if in screen A. the limit is exceeded in the upper adjacent channel
1	ADJ LOWEr FAIL (Screen A) This bit is set if in screen A the limit is exceeded in the lower adjacent channel.
2	ALT1 UPPer FAIL (Screen A) This bit is set if in screen A the limit is exceeded in the upper 1st alternate channel.
3	ALT1 LOWEr FAIL (Screen A) This bit is set if in screen A the limit is exceeded in the lower 1st alternate channel.
4	ALT2 UPPer FAIL (Screen A) This bit is set if in screen A the limit is exceeded in the upper 2nd alternate channel.
5	ALT2 LOWEr FAIL (Screen A) This bit is set if in screen A the limit is exceeded in the lower 2nd alternate channel.
6	ALT3 ... 11 LOWEr/UPPer FAIL (Screen A) This bit is set if in screen A the limit is exceeded in one off the lower or upper alternate channel 3 ... 11
7	not used
8	ADJ UPPer FAIL (Screen B) This bit is set if in screen B the limit is exceeded in the upper adjacent channel.
9	ADJ LOWEr FAIL (Screen B) This bit is set if in screen B the limit is exceeded in the lower adjacent channel.
10	ALT1 UPPer FAIL (Screen B) This bit is set if in screen B the limit is exceeded in the upper 1st alternate channel.
11	ALT1 LOWEr FAIL (Screen B) This bit is set if in screen B the limit is exceeded in the lower 1st alternate channel.
12	ALT2 UPPer FAIL (Screen B) This bit is set if in screen B the limit is exceeded in the upper 2nd alternate channel.
13	ALT2 LOWEr FAIL (Screen B) This bit is set if in screen B the limit is exceeded in the lower 2nd alternate channel.
14	ALT3 ... 11 LOWEr/UPPer FAIL (Screen B) This bit is set if in screen A the limit is exceeded in one off the lower or upper alternate channel 3 ... 11

15	This bit is always set to 0.
----	------------------------------

STATus:OPERation Register

In the CONDition part, this register contains information on which actions the instrument is being executing or, in the EVENT part, information on which actions the instrument has executed since the last reading. It can be read using commands "STATus:OPERation:CONDition?" or "STATus:OPERation[:EVENT]?".

Table 5-4 Meaning of the bits in the STATus.OPERation register

Bit No.	Meaning
0	CALibrating This bit is set as long as the instrument is performing a calibration.
1 to 7	These bits are not used
8	HardCOPy in progress This bit is set while the instrument is printing a hardcopy.
9	This bit is not used
10	Sweep Break This bit is set when end of sweep range is reached (spurious measurement, mode analyzer). Command "INIT:CONM" has to be used to proceed.
11 to 14	These bits are not used
15	This bit is always 0

Remote Control – Description of Commands – SYSTEM 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

SYSTem:IDENtify:FACTory

With this command it is possible to reset the *IDN string to the factory default (Softkey: ID STRING FACTORY). The command in the form of a query returns "1" for the factory default state and "0" if the ID string is changed.

Example: " :SYST:IDEN:FACT" 'sets the ID string to the factory default

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

Remote Control – Description of Commands – TRACe:DATA Subsystem**TRACe<1|2>:DATA? LIST**

This command reads the resulting peak list of the spurious emission measurement LIST EVALUATION (CALC:PEAK:AUTO ON).

The output format of the result is:

<result of range 1>,< result of range 2>,...< result of range n>

Every single range has following format:

<No>,<Start>,<Stop>,<rbw>,<freq>,<Levelabs>,<Levelrel>,<Delta>,<Limitcheck>,<unused1>,<unused2>

No	: Range number
Start	: Range start frequency
Stop	: Range stop frequency
Rbw	: Resolution bandwidth
Freq	: Frequency of the peak in the range
Levelabs	: Absolute peak power of the range in dBm
Levelrel	: reserved (0.0)
Delta	: Delta of the peak power to the limit line in dB
Limitcheck	: Limit check state (0 = PASSED, 1 = FAILED)
Unused1	: reserved (0.0)
Unused2	: reserved (0.0)

The number of ranges correspond to the number of ranges define in the spurious sweep list.

The numeric suffix at TRACe<1|2> is irrelevant.

Example: "TRAC:DATA? LIST" 'Read LIST EVALUATION result

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

Mode: A

TRACe[:DATA] TRACE1 | TRACE2 | TRACE3 | SINGLE | PHOLD | SCAN | STATus | FINAL1 | FINAL2 | FINAL3 | SPURious, <block> | <numeric_value>

This command transfers trace data from the control computer to the instrument, the query reads trace data or receiver results out of the instrument. Programming trace data to the instrument is only available in spectrum analyzer mode. The associated measurement window in spectrum analyzer mode is selected with the numeric suffix of TRACe<1|2>.

Note

If the FM demodulator (option FS-K7) is active, only the displayed trace data is read out and recalled. A portion of the measurement data that can be called by means of a marker, however, is

calculated from the raw measurement data. These results are no longer available after recalling a trace; the associated queries generate a query error.

SPURious reads the peak list in the spurious measurement. As results a list of frequency, level and delta to limit line values is returned. A delta limit of +200dB indicates no limit check is active

Example: "TRAC TRACE1,"+A\$ (A\$: data list in the current format)
"TRAC? TRACE1"

Characteristics: *RST value: -
SCPI: conforming

Mode: all

Return value: The returned values are scaled in the current level unit. Returned FM-modulated measurement values (activated option FS-K7) are scaled in Hz.

ASCII format (FORMat ASCII):

In ASCII format, a list of values separated by commas is returned (Comma Separated Values = CSV).

Binary format (FORMat REAL,32):

If the transmission takes place using the binary format (REAL,32), the data are transferred in block format (Definite Length Block Data according to IEEE 488.2). They are arranged in succeeding lists of I and Q data of 32 Bit IEEE 754 floating point numbers. General structure of return string for a sweep with 625 points: #42500<meas value 1><meas value value2>...<meas value 625>

with

- #4: digits of the subsequent number of data bytes (4 in the example)
- 2500: Number of subsequent data bytes (2500 in the example)
- <meas value x>: 4 byte floating point measurement values

Saving and recalling:

Saving and recalling trace data together with the device settings to/from the device-internal hard disk or to/from a memory stick is controlled via the commands `MMEMoRY:STORe:STATe` and `MMEMoRY:LOAD:STATe` respectively.

Trace data are selected with `"MMEMoRY:SELeCt[:ITEM]:ALL"` or `"MMEMoRY:SELeCt[:ITEM]:TRACe"`. Trace data in ASCII format (ASCII FILE EXPORT) are exported with the command `"MMEMoRY:STORe:TRACe"`.

The commands for final measurement data are `"MMEMoRY:SELeCt[:ITEM]:FINAl"` and `"MMEMoRY:STORe:FINAl"`.

Number and Format of the Measurement Values for the different Operating Modes

The number of measurement values depends on the instrument setting:

SPECTRUM mode (span > 0 and zero span):

155 up to 30001 (default 625) results are output in the unit selected for display.

Note

With AUTO PEAK detector, only positive peak values can be read out.

Trace data can be written into the instrument with logarithmic display only in dBm, with linear display only in volts.

FORMat REAL,32 is to be used as format for binary transmission, and FORMat ASCii for ASCII transmission.

Receiver

Note

For reasons of compatibility with the ESIB test receiver, the data structure of the status information is designed for 4 traces. However, only 3 traces can be activated and transferred.

SINGLE is possible only as a query for single measurements in the receiver mode (bargraph). The values of all activated detectors are transferred separated by commas in the following order: POS, NEG, QPE, AVER, CAV, RMS, CRMS. For inactive detectors, the value and the comma are omitted at the position(s) in question.

PHOLD returns the peakhold value or values of the bargraph measurements with the associated frequencies. (DISP:BARG:PHOLD ON)

SCAN is only possible in form of a query during scan measurements. The number of transmitted measurement results depends on the scan settings.

FORMAT REAL,32 is to be used as format setting for binary transmission.

Structure of transmitted data:

- 4 byte: trace status: bit 0 to 9 subscan; bit 10: last block of subscan; Bit 11: last block of last subscan of scan; Bit 12: last of all blocks (for multiple scans after the last scan)
- 4 bytes: number n of the transmitted measurement results of a trace
- 4 byte: trace1 active (0/1)
- 4 byte: trace2 active (0/1)
- 4 byte: trace3 active (0/1)
- 4 byte reserved
- n*4 bytes: measurement results of trace 1 if trace 1 is active
- n*4 bytes: measurement results of trace 2 if trace 2 is active
- n*4 bytes: measurement results of trace 3 if trace 3 is active
- n*1 byte: status information per measurement result:
bit 2: overrange trace1 to trace3

STATUS is only possible in form of a query during scan measurements. 1 byte status information per measurement result is transmitted:
bit 2: overrange trace1 to trace3

FINAL1, FINAL2 and FINAL3 are only possible in form of a query. The final measurement values are transmitted.

Remote Control – Description of Commands – TRACe:FEED Subsystem

TRACe:FEED:CONTRol ALWays | NEVer

This command switches block data transmission during a scan on and off. The availability of data is reported in the STATus:OPERation-Register.
The block size depends on scan time and the upper limit defined by TRACe:POINts:LIMit.

Example: "TRAC:FEED:CONT ALW"

Characteristics: *RST Value: NEVer
SCPI: conforming

Mode: R

Remote Control – Description of Commands – TRACe:IMMediate Subsystem

TRACe<1|2>:IMMediate:LEVel?

This query returns the current Y results of the sweep. During a sweep the last measured value is read out.

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

Characteristics: *RST value:
SCPI: conforming

Mode: A

TRACe<1|2>:IMMediate:RESult?

This query returns the current X and Y results of the sweep. During a sweep the last measured values are read out.

Example: "INIT:CONT OFF"
'switches to single sweep mode
"INIT"
'starts a sweep (without waiting for the sweep end!)
"TRAC:IMM:RES?"
'queries the X and Y values of the last measured measurement point

Characteristics: *RST value:
SCPI: conforming

Mode: A

Remote Control – Description of Commands – TRACe:IQ Subsystem

It is possible to combine I/Q data measurement with gated trigger function for following settings:

- Sample Rate 81.6 MHz
- Gate Source EXTERN

The gate parameter (gate mode, gate polarity, gate delay and gate length) are configured by the sub-system SENSE:SWEep:EGATE, when TRACE:IQ:STATE is set to ON.

TRACe<1|2>:IQ:FILTer:FLATness NORMal | WIDE

This command allows measurement with extended usable signal bandwidth for sample rates in the range of 20.4 MHz to 40.8 MHz.

NORMal Normal operation

WIDE Extended usable signal bandwidth, reduced selectivity

Sample Rate Range	Usable Bandwidth	
	NORMal	WIDE
10.2 MHz < Sample Rate <= 20.4 MHz	0.8 * Sample Rate	0.9 * Sample Rate
20.4 MHz < Sample Rate <= 40.8 MHz	0.68 * Sample Rate	0.8 * Sample Rate

Example: "TRAC:IQ:FILT:FLAT WIDE"

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

Remote Control – Description of Commands – TRACe:POINts 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 – TRIGger Subsystem

TRIGger<1|2>[:SEQuence]:LEVel:IFPower +30 to -70DBM

This command sets the level of the IF power trigger source.

Example: "TRIG:LEV:IFP -20DBM"

Characteristics: *RST value: -20 DBM

Last minute changes to the Quick Start Guide

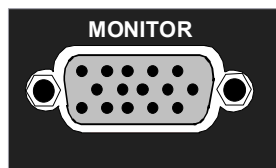
Connecting an External Monitor



Caution:

Do not connect a monitor unless the instrument is switched off (STANDBY). Otherwise, you run the risk of damaging the monitor.

You can connect an external monitor at the MONITOR connector on the instrument's rear panel.

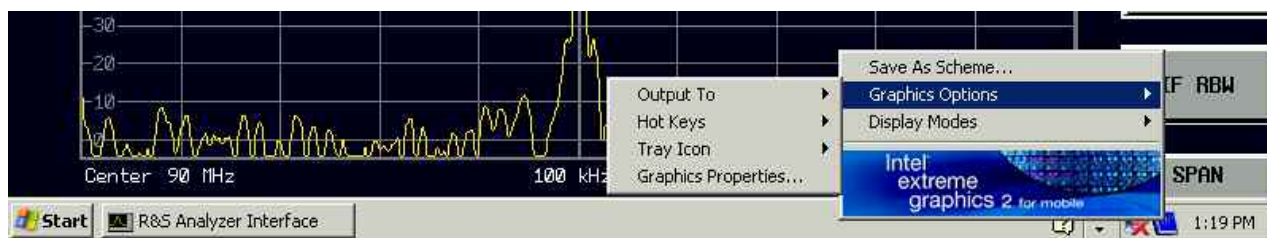


After you connect an external monitor, you must restart the instrument so that it will detect the monitor. The measurement display will then appear on both the external screen and on the instrument. No further settings are necessary.

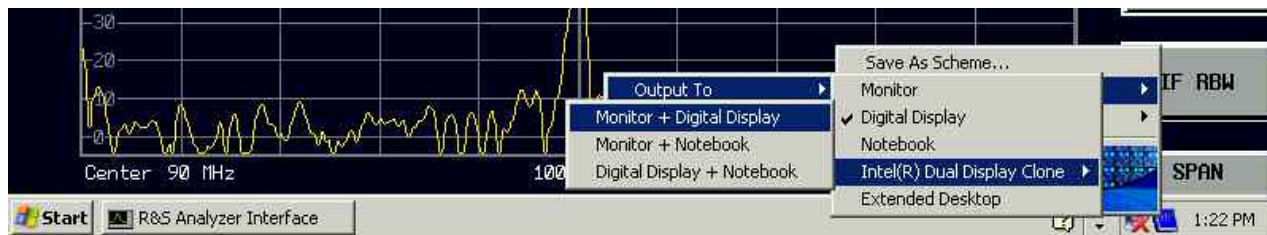
If the external monitor should not be recognized by the instrument, you need to activate it.

USB keyboard/mouse must be connected.
The external monitor must also be connected.

Press <Ctrl> <Esc>, then click on monitor icon (right bottom of the screen) and select *Graphics Options*.



Then select *Output To* ► *Intel(R) Dual Display Clone* ► *Monitor + Digital Display* and click on it.



The activation of the external monitor will be reset when the instrument is switched on later without a monitor connected.

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