Supplement A
to Operating Manual
EMI Test Receiver ESPI3 and ESPI7
(Firmware Version 1.72)

Dear Customer,

As far as the functionality of ESPI is concerned, the following new and modified functions are not yet described in the operating manual.

- Automatic final measurement with *THRESHOLD SCAN* (page A)
- New status messages (page *E*)
- Number of sweep points selectable (page *F*)
- Linear dB scaling (page *G*)
- Support for Multi Carrier Channel Power measurements (page *I*)
- Trigger line remains on screen after leaving the TRIG menu (page *Z*)
- Extended IEC/IEEE bus command (page *AA*)
- Extended # of frequency points (200 now!) with function SENSe:LIST (page *EE*)

Automatic Final Measurement with *THRESHOLD SCAN*

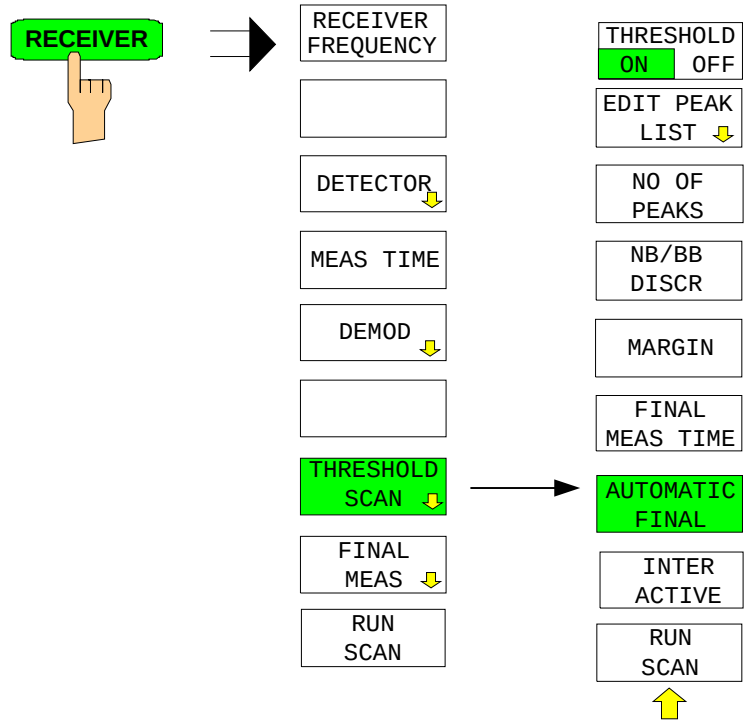
The interference spectrum is first pre-analyzed in a fast prescan to optimize the duration of the measurement. If the measured level exceeds a limit line, or violates a margin defined for this line, the time-consuming final measurement is performed. The final measurement is, therefore, carried out only for a reduced number of frequencies of interest. For this measurement, each scan trace to be taken into account has to be assigned a limit line, and the limit line and the limit check function have to be activated in the *LIMIT LINE* menu.

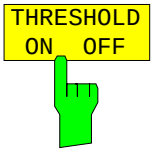
The prescan is interrupted immediately for each final measurement to be performed, i.e. the final measurement immediately follows the prescan measurement. In the case of drifting or fluctuating interferers, this increases the probability that the signal of interest will be reliably detected in the final measurement.

If the narrowband/broadband discrimination function is activated (NB/BB DISCR softkey), the receiver automatically selects the detector to use in the final measurement. To this end, the receiver compares the positive and the negative peak value obtained in the prescan. If the difference between the two values exceeds a user-selected threshold, a broadband interferer is assumed, and the quasi-peak detector is used in the final measurement. If the difference falls below this threshold, a narrowband interferer is assumed, and the average detector is used in the final measurement. (The receiver automatically determines the positive and the negative peak value during the prescan.)

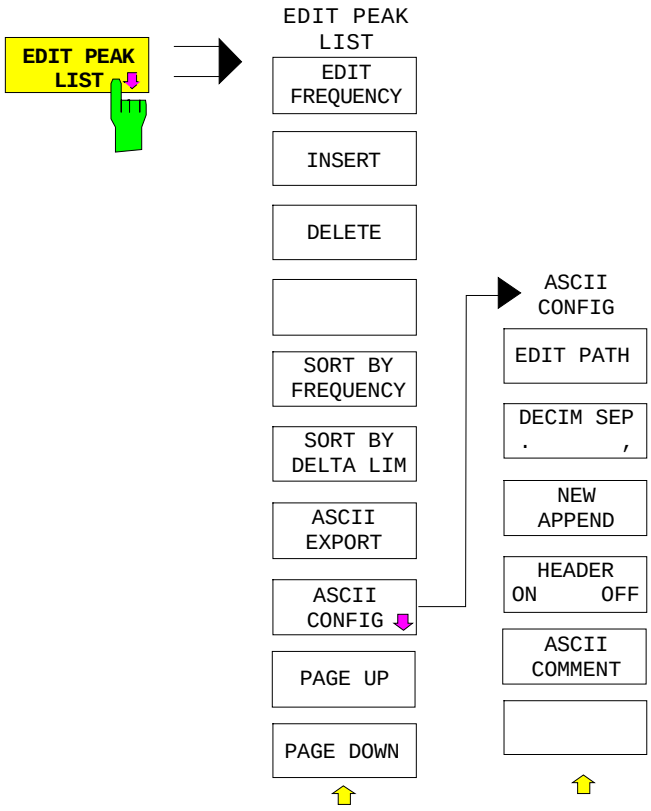
The value obtained in the final measurement is added to the peak list, where it replaces the result of the prescan. With *NO OF PEAKS*, the maximum number of peak values to be included in the list can be defined. If this number is attained, the prescan will be continued, but no further final measurements will be performed.

The *THRESHOLD SCAN* submenu is called from the *RECEIVER* main menu:





The *THRESHOLD ON OFF* softkey activates or deactivates the *THRESHOLD SCAN* measurement function. This function will also be activated on opening the submenu with the *THRESHOLD SCAN* softkey from the *RECEIVER* main menu.

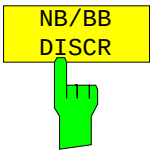


The *EDIT PEAK LIST* softkey calls the *EDIT PEAK LIST* submenu used for editing the peak list.

Further functions relating to the peak list are described in the operating manual, section "*Data Reduction by Generating Subrange Maxima*".

With the *NO OF PEAKS* softkey, you can enter the number of final measurement peaks to be stored. Numbers between 1 and 500 can be entered. If the selected number is attained, no further final measurements will be performed.

IEC/IEEE-bus command `:CALC:PEAK:SUBR 1...500`



With the *NB/BB DISCR* softkey, you can enter the decision threshold to be used by the analyzer to discriminate between broadband and narrowband interference. Values between 0 dB and 200 dB can be entered.

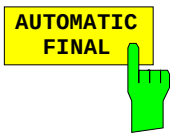
IEC/IEEE-bus command --

The *MARGIN* softkey activates the entry field of the margin, i.e. of an additional acceptance threshold for the determination of the peak list. The limit line currently used is shifted by this amount for defining the maxima. The range of values is -200 dB to 200 dB.

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

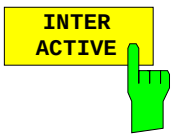
The *FINAL MEAS TIME* softkey activates the entry field of the time of final measurement.

IEC/IEEE-bus command `:SWE:TIME:FME <num_value>`



The *AUTOMATIC FINAL* softkey activates the automatic mode for the final measurement, i.e. a final measurement will be performed automatically and immediately each time a value out of limit is detected.

IEC/IEEE-bus command - -



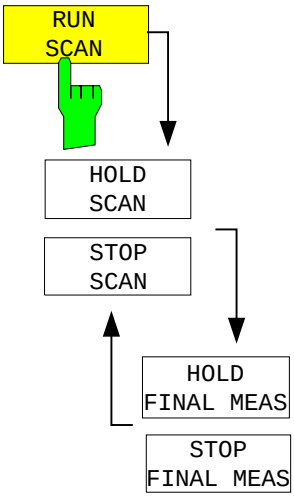
The *INTERACTIVE* softkey selects the following sequence for the final measurement:

- The prescan is interrupted – *HOLD SCAN* state.
- The bar graph measurement is started in the free running mode.
- The signal can be exactly analyzed by modifying the receiver settings.
- The actual final measurement is started, the receiver settings being restored except the frequency.
- The current frequency replaces the original one in the frequency list (drifting interference sources).
- The prescan is continued at the frequency at which it was interrupted....

Note: *With the AUTOMATIC FINAL softkey in the CONTINUE FINAL MEAS submenu a switchover can be made to the automatic mode before the measurement is started anew.*

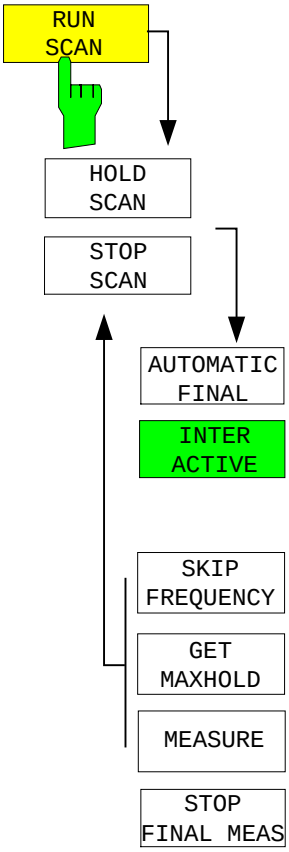
IEC/IEEE-bus command - -

Sequence for *AUTOMATIC FINAL:*



The *RUN SCAN* softkey starts the prescan. The *HOLD SCAN* submenu is called.
If an out-of-limit value is detected, the receiver automatically goes to the HOLD SCAN state and starts the final measurement. The *HOLD FINAL MEAS* submenu comes up. On completion of the final measurement, the receiver continues the prescan, and the *HOLD SCAN* submenu is displayed again.

Sequence for *INTERACTIVE:*



The *RUN SCAN* softkey starts the prescan. The *HOLD SCAN* submenu is called.

If an out-of-limit value is detected, the receiver automatically goes to the HOLD SCAN state. A submenu with several options for the final measurement comes up:

- *AUTOMATIC FINAL* activates the automatic final measurement mode for the rest of the test run.
- *SKIP FREQUENCY* skips the final measurement and continues with the prescan.
- *GET MAXHOLD* accepts the highest level measured during the HOLD SCAN state as the result of the final measurement and continues the prescan. (The level value in question is displayed as a small bar in the bar graph.)
- *MEASURE* starts the final measurement, the receiver settings being restored except the frequency.
- *STOP FINAL MEAS* aborts the final measurement and the prescan.

The table shows a peak list:

EDIT PEAK LIST (Final Measurement Results)

Trace1: 014QP
Trace2: 014AV
TRACE3: ---

TRACE	FREQUENCY	LEVEL dBpT	DELTA LIMIT dB
1 Average	80.0000 MHz	29.99	-9.25
2 Average	89.4800 MHz	35.64	-4.09
1 Quasi Peak	98.5200 MHz	49.94	-0.22
2 Average	98.5200 MHz	48.32	8.15
1 Quasi Peak	100.7200 MHz	55.33	5.07
2 Average	102.3200 MHz	50.86	10.53
1 Quasi Peak	113.2400 MHz	42.50	-8.26
2 Average	116.9200 MHz	44.44	3.53
1 Quasi Peak	125.8800 MHz	54.91	3.68
2 Average	125.8800 MHz	53.86	12.64
1 Quasi Peak	138.4800 MHz	41.83	-9.81
2 Average	138.4800 MHz	39.38	-2.25
2 Average	144.0400 MHz	40.77	-1.04
2 Average	167.0400 MHz	44.82	2.37
2 Average	176.2400 MHz	46.56	3.87
1 Quasi Peak	200.4800 MHz	50.93	-2.31
2 Average	200.4800 MHz	48.27	5.02
1 Quasi Peak	210.2800 MHz	58.71	5.25
2 Average	226.5600 MHz	59.07	15.29
2 Average	230.0000 MHz	46.90	3.05

In the *THRESHOLD SCAN* mode, with the *NB/BB DISCR* function active, the receiver automatically selects the detector to be used in the final measurement on the basis of the results obtained in the prescan.

New Status Messages/Trace Info

Note: *Status message MSG is omitted*

#SMPL

"#SMPL" indicates that the relation Span / RBW is higher than 125 while the RMS detector is activated. In this case a stable signal evaluation is no longer possible due to an insufficient number of A/D converter samples.

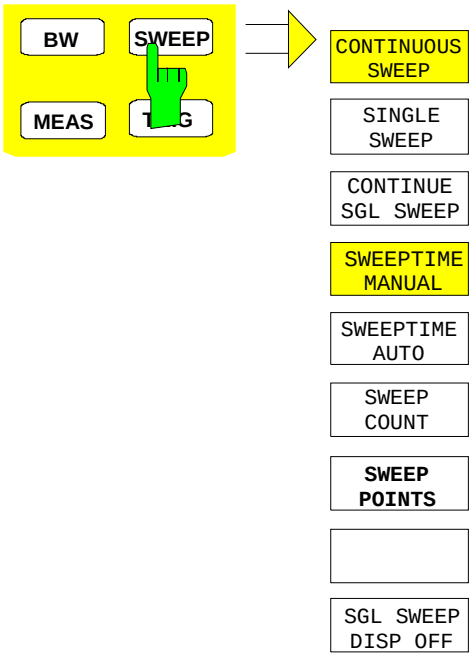
⇒ reduce span or increase RBW

Trace-Info:

Every active measurement curve (trace ≠ BLANK) is allocated trace information of two or three lines at the left of the diagram. The trace information has the same color as the measurement curve.
The information on the currently selected trace is displayed in inverse video (see *TRACE - SELECT TRACE softkey*).

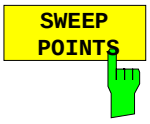
Number of Sweep Points Selectable

The *SWEEP* menu was extended by the *SWEEP POINTS* softkey.



The *SWEEP* key calls a menu in which the sweep mode is defined. In split-screen mode, the entries made are valid for the active window only.

The *CONTINUOUS SWEEP, SINGLE SWEEP* and *SGL SWEEP DISP OFF* softkeys are mutually exclusive selection keys.



The *SWEEP POINTS* softkey selects the number of measurement samples acquired during a sweep.

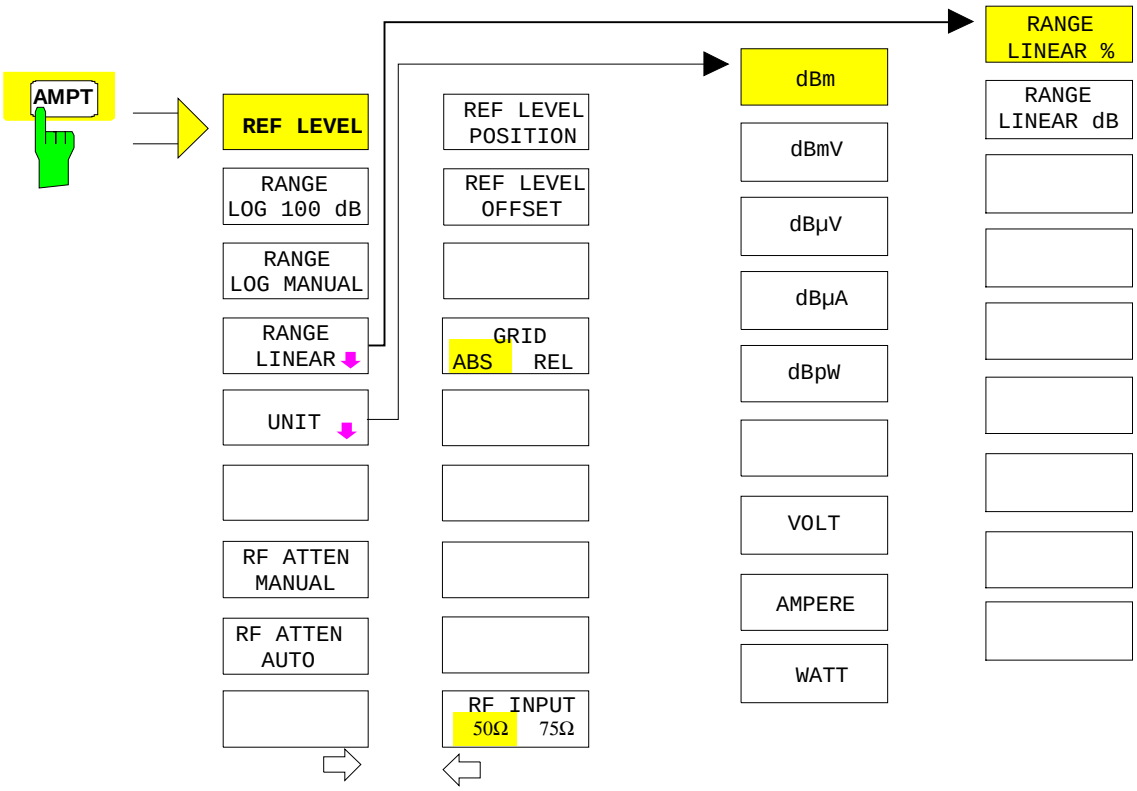
The following numbers of points per sweep are available: 125, 251, 501 (default), 1001, 2001, 4001, 8001

Note:
The autopeak detector will be disabled while the number of points per sweep is ≠ 501.

IEC/IEEE-bus command: `SWE:POIN 501`

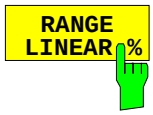
Linear dB scaling

The *AMPT* menu was extended by the *RANGE LINEAR* submenu.



The *RANGE LINEAR* softkey selects linear scaling for the level display range of the analyzer. In addition, it opens a submenu for selecting % or dB for the scaling.
When linear scaling is selected, the % scaling is first activated (see also *RANGE LINEAR dB* softkey).

IEC/IEEE-bus command: `DISP:WIND:TRAC:Y:SPAC LIN`



The *RANGE LINEAR %* softkey selects linear scaling in % for the level display range, i.e. the horizontal lines are labelled in %. The grid is divided into decades. Markers are displayed in the selected unit; delta markers are displayed in % referenced to the voltage value at the position of marker 1.

IEC/IEEE-bus command:
`DISP:WIND:TRAC:Y:SPAC LIN`

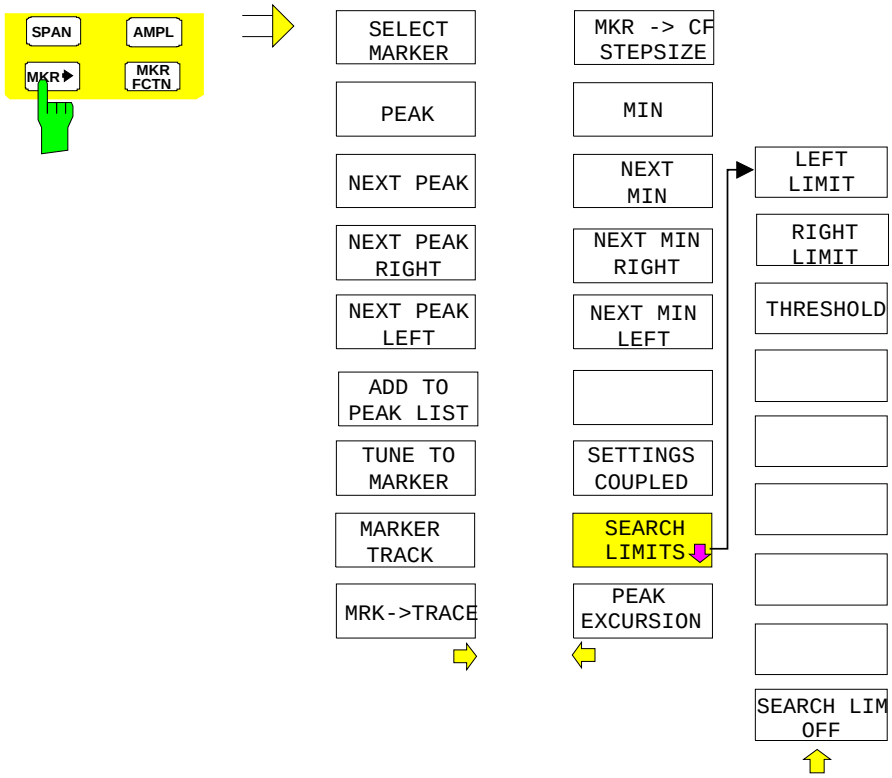
The *RANGE LINEAR dB* softkey selects linear scaling in dB for the level display range, i.e. the horizontal lines are labelled in dB.
Markers are displayed in the selected unit; delta markers are displayed in dB referenced to the power value at the position of marker 1.

IEC/IEEE-bus command:
`DISP:WIND:TRAC:Y:SPAC LDB`

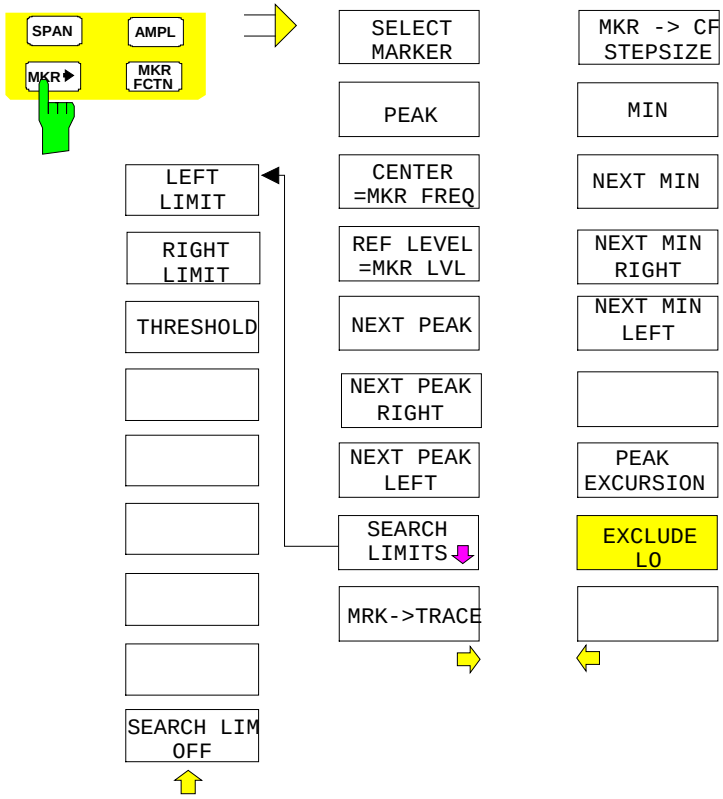
Modified softkey menu MKR->

In the MRK-> menus of Receiver and Analyzer mode, the softkeys *NEXT PEAK, NEXT PEAK LEFT, NEXT PEAK RIGHT, NEXT MIN, NEXT MIN LEFT, NEXT MIN RIGHT* were re-ordered for easier operation.

Receiver Mode:

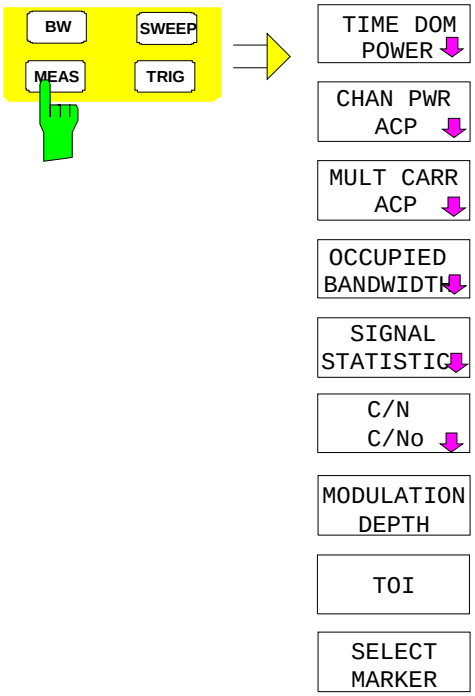


Analyzer Mode:



Support for Multi Carrier Channel Power measurements

The *MEAS* menu was extended by the ***MULT CARR ACP*** submenu. In the following, the complete submenus *CHAN PWR ACP* and *MULT CARR ACP* are described. The modifications are displayed in bold types.



The *MEAS* key opens the menu to select and set the power measurement.

The following measurements can be selected:

- Power in time domain (*TIME DOM POWER*)
  Channel power and adjacent-channel power in the frequency domain **with a single carrier** (*CHAN PWR ACP*)
- **Channel power and adjacent-channel power in the frequency domain with several carriers (*MULT CARR ACP*)**
- Occupied bandwidth (*OCCUPIED BANDWIDTH*)
- Amplitude probability distribution (*SIGNAL STATISTICS*)
- Carrier/noise ratio (*C/N, C/No*)
- Modulation depth (*MODULATION DEPTH*)
- 3rd order intercept (*TOI*)

The above measurements are carried out alternatively.

Channel and Adjacent-Channel Power Measurements

For all channel and adjacent-channel power measurements a specified channel configuration is assumed which is for instance based on a specific radio communication system.
This configuration is defined by the nominal channel frequency (= center frequency of the ESPI **if only one carrier is active**), the channel bandwidth, **the channel spacing**, the adjacent-channel bandwidth and the adjacent-channel spacing. The ESPI is able to simultaneously measure the power **in up to four transmission channels** and up to three adjacent channels (**10** channels: **4** transmission channels, 3 lower and 3 upper adjacent channels).
It offers two methods for channel and adjacent-channel power measurement:

- The integrated bandwidth method (IBW method), i.e. the integration of trace pixels within the bandwidth of the channel to be measured to the total power of the channel,
- The measurement in time domain (Fast ACP) by means of steep resolution filters simulating the channel.

The two measurements yield the same results. The measurement in time domain can be performed much faster since the complete signal is measured within a channel at the same time. With the IBW method, the channel is divided into subspectra. This is done by means of a bandwidth which is small compared to the channel bandwidth. These subspectra are then combined by integration of the trace pixels.

With the IBW method, the transmission channels or adjacent channels are marked by vertical lines at a distance of half the channel bandwidth to the left and to the right of the corresponding channel center frequency. The boundaries of the channels are marked by vertical lines. (see Fig. 1).
With the time-domain method, the power versus time is shown for each channel. (see Fig. 2).

For both methods, the results are listed in tables in the lower half of the screen.

The ESPI offers predefined standard settings which can be selected from a table for the common mobile radio standards. Thus, channel configuration is performed automatically without the need to enter the corresponding parameters manually.
For some standards, the channel power and the adjacent-channel power are to be weighted by means of a root-raised cosine filter corresponding to a receive filter. This type of filtering is switched on automatically for both methods on selecting the standard (e.g. NADC, TETRA or 3GPP W-CDMA).

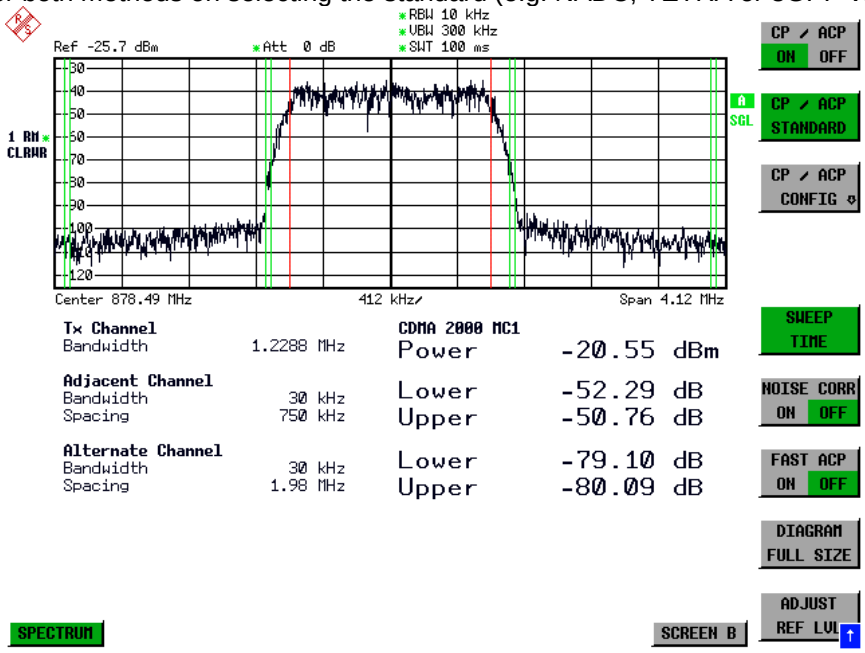


Fig. 1 Screen display of adjacent-channel power measurement using the IBW method

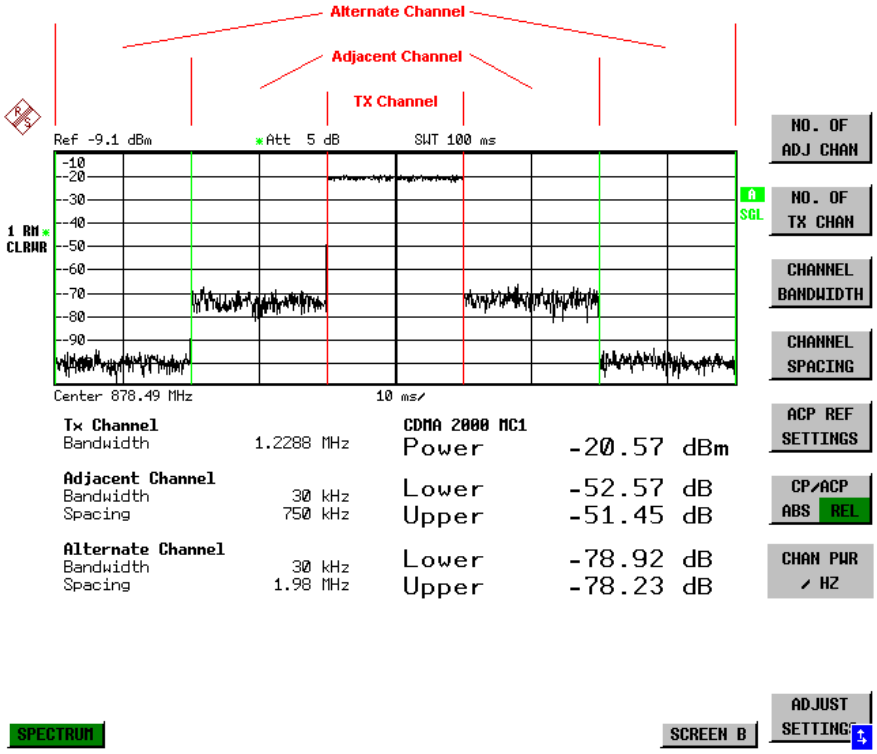
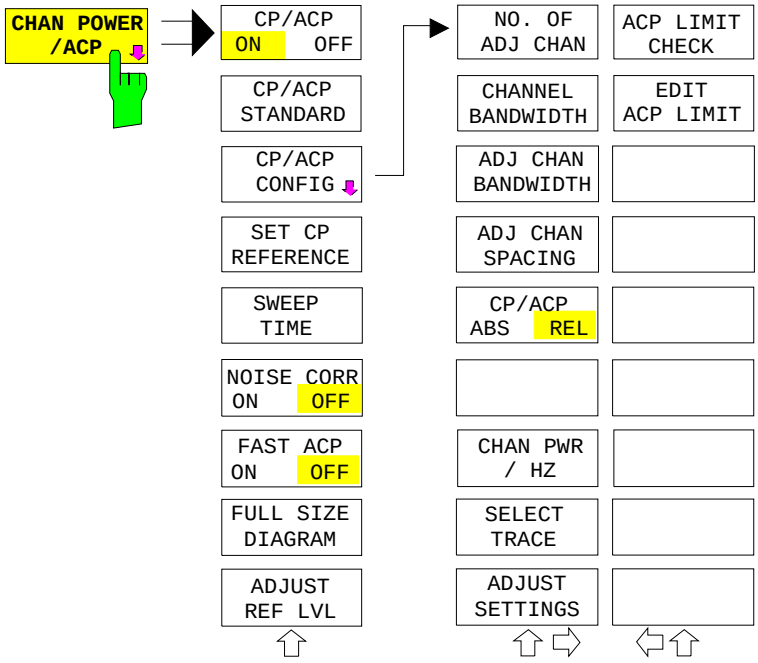


Fig. 2 Screen display of adjacent-channel power measurement using the time-domain method

Limit values for the adjacent-channel power can be defined for the measurement. If limit checking is switched on, a pass/fail information indicating that the power has been exceeded is displayed during the measurement in the table in the lower half of the screen.

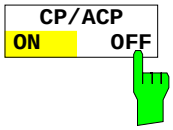
Note: *With the CP/ACP measurement switched on the functions SPLIT SCREEN and FULL SCREEN are inhibited.*

The channel configuration is defined in the *MEAS - CHAN PWR ACP or the MEAS - MULT CARR ACP* menu.



The *CHAN PWR ACP* and *MULT CARR ACP* softkeys activate channel or adjacent-channel power measurement either for a single carrier signal (*CHAN PWR ACP*) or for several carrier signals (*MULT CARR ACP*), depending on the current measurement configuration. In addition, they open a submenu for defining the parameters for channel power measurement. The softkey selected is shown in color to indicate that a channel or adjacent-channel power measurement is active.

Note: ***The softkeys are available only for measurements in the frequency domain (span > 0).***



The *CP/ACP ON/OFF* softkey switches calculation of the channel power or adjacent-channel power on and off.

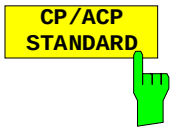
With default settings the measurement is performed by integrating the powers at the display points within the specified channels (IBW method).

The powers of the adjacent channels are measured either as absolute values or as relative values referenced to the power of a transmission channel. The default setting is relative-value measurement (see *CP/ACP ABS/REL* softkey).

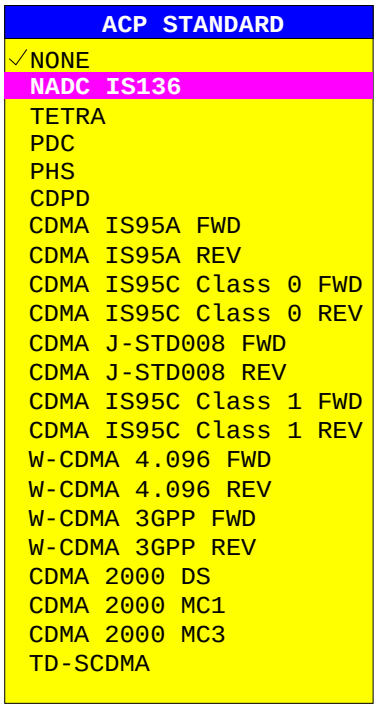
When multicarrier ACP measurement is activated, the number of test points is increased to ensure that adjacent-channel powers are measured with adequate accuracy.

IEC/IEEE-bus commands:

```
CALC:MARK:FUNC:POW:SEL CPOW|ACP|MCAC
CALC:MARK:FUNC:POW:RES? CPOW|ACP|MCAC
CALC:MARK:FUNC:POW OFF
```



The *CP/ACP STANDARD* softkey opens a table for the selection of the settings according to predefined standards. The test parameters for the channel and adjacent-channel measurements are set according to the mobile radio standard.



The standards available are listed in the table on the left.

Note: *For the ESPI, the channel spacing is defined as the distance between the center frequency of the adjacent channel and the center frequency of the transmission channel. The definition of the adjacent-channel spacing in standards IS95 B and C, IS97 B and C and IS98 B and C is different. These standards define the adjacent-channel spacing from the center of the transmission channel to the closest border of the adjacent channel. This definition is also used for the ESPI when the following standard settings are selected:*
CDMA IS95 Class 0 FWD
CDMA IS95 Class 0 REV
CDMA IS95 Class 1 FWD
CDMA IS95 Class 1 REV

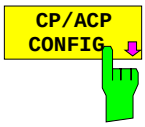
The selection of the standard influences the following parameters:

- channel spacing **and adjacent-channel spacing**
- channel bandwidth, **adjacent-channel bandwidth**, and type of filtering
- resolution bandwidth
- video bandwidth
- detector
- # of adjacent channels

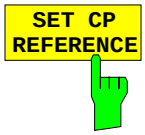
Trace mathematics and trace averaging are switched off.
The reference level is not influenced by the selection of a standard. To achieve an optimum dynamic range, the reference level has to be set in a way that places the signal maximum close to the reference level without forcing an overload message.

The default setting is CP/*ACP STANDARD NONE*.

IEC/IEEE-bus command: `CALC:MARK:FUNC:POW:PRES <standard>`



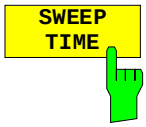
See following section "Setting the Channel Configuration"



With channel power measurement activated, the *SET CP REFERENCE* softkey defines the currently measured channel power as the reference value. The reference value is displayed in the *CH PWR REF* field; the default value is 0 dBm.

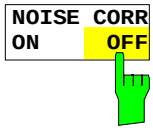
In adjacent-channel power measurement with one or several carrier signals, the power is always referenced to a transmission channel, i.e. no value is displayed for *CH PWR REF*.

IEC/IEEE-bus command: `POW:ACH:REF:AUTO ONCE`



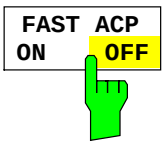
The *SWEEP TIME* softkey activates the entry of the sweep time. With the RMS detector, a longer sweep time increases the stability of the measurement results. The function of the softkey is identical to the softkey *SWEEP TIME MANUAL* in the menu *BW*.

IEC/IEEE-bus command: `SWE:TIM <value>`



If the *NOISE CORR ON/OFF* softkey is activated, the results will be corrected by the instrument's inherent noise, which increases the dynamic range.
When the function is switched on, a reference measurement of the instrument's inherent noise is carried out. The noise power measured is then subtracted from the power in the channel that is being examined.
The inherent noise of the instrument depends on the selected center frequency, resolution bandwidth and level setting. Therefore, the correction function is disabled whenever one of these parameters is changed. A disable message is displayed on the screen.
To enable the correction function in conjunction with the changed setting, press the softkey once more. A new reference measurement is carried out.

IEC/IEEE-bus command: `SENS:POW:NCOR ON`



The *FAST ACP* softkey switches between the IBW method (*FAST ACP OFF*) and the time domain method (*FAST ACP ON*).

With *FAST ACP ON* the power measurement is performed in the different channels in the time domain. The ESPI sets the center frequency consecutively to the different channel center frequencies and measures the power with the selected measurement time (= sweep time/number of channels). The RBW filters suitable for the selected standard and frequency offset are automatically used (e.g. root raised cos with IS 136). The list of available channel filters is included in section "Setting of Bandwidths and Sweep Time – *BW key*".

The RMS detector is used for obtaining correct power measurement results. Therefore this requires no software correction factors.

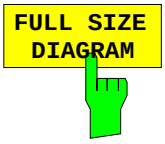
Measured values are output as a list. The powers of the transmission channels are output in dBm, the powers of the adjacent channels in dBm *(CP/ACP ABS)* or dB *(CP/ACP REL)*.

The sweep time is selected depending on the desired reproducibility of results. Reproducibility increases with sweep time since power measurement is then performed over a longer time period.

As a general approach, it can be assumed that approx. 500 non-correlated measured values are required for a reproducibility of 0.5 dB (99% of the measurements are within 0.5 dB of the true measured value). This holds true for white noise. The measured values are considered as non-correlated when their time interval corresponds to the reciprocal of the measured bandwidth.

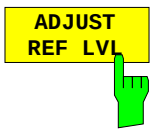
With IS 136 the measurement bandwidth is approx. 25 kHz, i.e. measured values at an interval of 40 µs are considered as noncorrelated. A measurement time of 20 ms is thus required per channel for 1000 measured values. This is the default sweep time which the ESPI sets in coupled mode. Approx. 5000 measured values are required for a reproducibility of 0.1 dB (99%), i.e. the measurement time is to be increased to 200 ms.

IEC/IEEE-bus command `SENS:POW:HSP ON`



The *FULL SIZE DIAGRAM* softkey switches the diagram to full screen size.

IEC/IEEE-bus command: **`DISP:WIND1:SIZE LARG|SMAL`**



The *ADJUST REF LVL* softkey adjusts the reference level of the ESPI to the measured channel power. This ensures that the settings of the RF attenuation and the reference level are optimally adjusted to the signal level without overloading the ESPI or limiting the dynamic range by a too small S/N ratio.
Since the measurement bandwidth for channel power measurements is significantly lower than the signal bandwidth, the signal path may be overloaded although the trace is still significantly below the reference level.

IEC/IEEE-bus command: `SENS:POW:ACH:PRES:RLEV`

For manual setting of the test parameters different from the settings made with *ADJUST SETTINGS* the following should be observed:

Frequency span

The frequency span must at least cover the channels to be measured plus a measurement margin of 10%.
For channel power measurement, the span is 1.1 x channel bandwidth.

Note: *If the frequency span is large in comparison with the channel bandwidth (or the adjacent-channel bandwidths) being examined, only a few points on the trace are available per channel. This reduces the accuracy of the waveform calculation for the channel filter used, which has a negative effect on the measurement accuracy.*
We therefore strongly recommend that the formulas mentioned be taken into consideration when selecting the frequency span.

Resolution bandwidth (RBW)

To ensure both an acceptable measurement speed and the required selection (to suppress spectral components outside the channel to be measured, especially of the adjacent channels), the resolution bandwidth must not be selected too small or too large. As a general approach, the resolution bandwidth is to be set to values between 1% and 4% of the channel bandwidth.
A larger resolution bandwidth can be selected if the spectrum within the channel to be measured and around it has a flat characteristic. In the standard setting, e.g. for standard IS95A REV at an adjacent channel bandwidth of 30 kHz, a resolution bandwidth of 30 kHz is used. This yields correct results since the spectrum in the neighborhood of the adjacent channels normally has a constant level. For standard NADC/IS136 this is not possible for example, since the spectrum of the transmit signal penetrates into the adjacent channels and a too large resolution bandwidth causes a too low selection of the channel filter. The adjacent-channel power would thus be measured too high.
With the exception of the IS95 CDMA standards, the *ADJUST SETTINGS* softkey sets the resolution bandwidth (RBW) as a function of the channel bandwidth:

RBW $\leq$ 1/40 of channel bandwidth.

The maximum possible resolution bandwidth (with respect to the requirement RBW $\leq$ 1/40) resulting from the available RBW steps (1, 3) is selected .

Video bandwidth (VBW)

For a correct power measurement, the video signal must not be limited in bandwidth. A restricted bandwidth of the logarithmic video signal would cause signal averaging and thus result in a too low indication of the power (-2.51 dB at very low video bandwidths). The video bandwidth should therefore be selected at least three times the resolution bandwidth.
The *ADJUST SETTINGS* softkey sets the video bandwidth (VBW) as a function of the channel bandwidth as follows:

VBW $\geq 3 \times$ RBW.

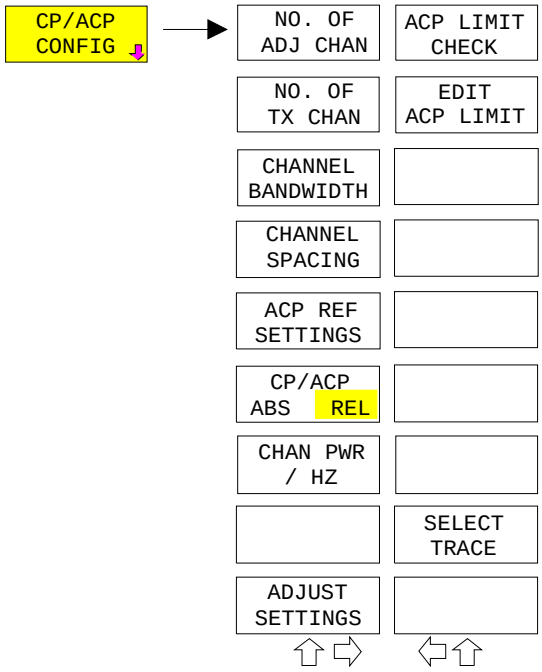
The smallest possible VBW with regard to the available step size will be selected.

Detector

The *ADJUST SETTINGS* softkey selects the RMS detector.
The RMS detector is selected since it correctly indicates the power irrespective of the characteristics of the signal to be measured. In principle, the sample detector would be possible as well. Due to the limited number of trace pixels used to calculate the power in the channel, the sample detector would yield less stable results. Averaging, which is often performed to stabilize the measurement results, leads to a too low level indication and should therefore be avoided. The reduction in the displayed power depends on the number of averages and the signal characteristics in the channel to be measured.

Setting the Channel Configuration

MEAS - CP/ACP CONFIG submenu:



The *CP/ACP CONFIG* softkey opens a submenu for configuration of the channel power and adjacent channel power measurement independently of the offered standards.

The channel configuration includes the number of channels to be measured, the channel bandwidths (*CHANNEL BANDWIDTH*), and the channel spacings (*CHANNEL SPACING*).

Limit values can additionally be specified for the adjacent-channel power (*ACP LIMIT CHECK* and *EDIT ACP LIMITS*) which are checked for compliance during the measurement.

The *NO. OF ADJ CHAN* softkey activates the entry of the number ±n of adjacent channels to be considered in the adjacent-channel power measurement.
Numbers from 0 to 3 can be entered.

The following measurements are performed depending on the number of the channels.

0 Only the channel powers are measured.

1 The channel powers and the power of the upper and lower adjacent channel are measured.

2 The channel powers, the power of the upper and lower adjacent channel and of the next higher and lower channel (alternate channel 1) are measured.

3 The channel power, the power of the upper and lower adjacent channel, the power of the next higher and lower channel (alternate channel 1) and of the next but one higher and lower adjacent channel (alternate channel 2) are measured.

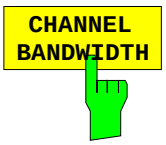
IEC/IEEE-bus command: `POW:ACH:ACP 1`

The *NO. OF TX CHAN* softkey enables the entry of the number of carrier signals to be considered in channel and adjacent-channel power measurements.

Numbers from 1 to 4 can be entered.

The softkey is available only for multicarrier ACP measurements.

IEC/IEEE-bus command: `SENS:POW:ACH:TXCH:COUN 4`



The *CHANNEL BANDWIDTH* softkey opens a table for defining the channel bandwidths for the transmission channels and the adjacent channels.

ACP CHANNEL BW	
CHAN	BANDWIDTH
ADJ	14 kHz
ALT1	14 kHz
ALT2	14 kHz

The transmission-channel bandwidth is normally defined by the transmission standard. The correct bandwidth is set automatically for the selected standard (see *CP/ACP STANDARD* softkey).

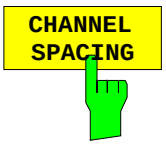
With the IBW method (*FAST ACP OFF),* the channel bandwidth limits are marked by two vertical lines right and left of the channel center frequency. It can in this way be visually checked whether the entire power of the signal under test is within the selected channel bandwidth.

Measurements in the time domain (*FAST ACP ON)* are performed in the zero span mode. The channel limits are indicated by vertical lines. For measurements requiring channel bandwidths deviating from those defined in the selected standard the IBW method is to be used.
Refer to section "Setting of Bandwidths and Sweep Time – *BW* key" for a list of available channel filters.

When measuring according to the IBW method (FAST ACP OFF) the bandwidths of the different adjacent channels are to be entered numerically. Since all adjacent channels often have the same bandwidth, the other channels Alt1 and Alt2 are set to the bandwidth of the adjacent channel on entering the adjacent-channel bandwidth (ADJ). Thus only one value needs to be entered in case of equal adjacent channel bandwidths. The same holds true for the ALT2 channels (alternate channels 2) when the bandwidth of the ALT1 channel (alternate channel 1) is entered.

Note: *The bandwidths can be set separately by overwriting the table from top to bottom.*

IEC/IEEE-bus command: **`SENS:POW:ACH:BWID:CHAN 14kHz`**
`SENS:POW:ACH:BWID:ACH 1kHz`
`SENS:POW:ACH:BWID:ALT1 14kHz`
`SENS:POW:ACH:BWID:ALT2 14kHz`



The *CHANNEL SPACING* softkey opens a table for defining the channel spacings.

ACP CHANNEL SPACING	
CHAN	SPACING
ADJ	20 kHz
ALT1	40 kHz
ALT2	60 kHz

Since all the adjacent channels often have the same distance to each other, the entry of the adjacent-channel spacing (ADJ) causes channel spacing ALT1 to be set to twice and channel spacing ALT2 to three times the adjacent-channel spacing. Thus only one value needs to be entered in case of equal channel spacing. The same holds true for the ALT2 channels when the bandwidth of the ALT1 channel is entered.

Note: *The channel spacings can be set separately by overwriting the table from top to bottom.*

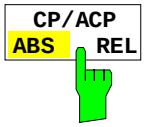
IEC/IEEE-bus command: **SENS:POW:ACH:SPAC:CHAN 20kHz**
SENS:POW:ACH:SPAC:ACH 20kHz
SENS:POW:ACH:SPAC:ALT1 40kHz
SENS:POW:ACH:SPAC:ALT2 60kHz

The *ACP REF SETTINGS* softkey opens a table for selecting the transmission channel to which the adjacent-channel relative power values should be referenced.

ACP REFERENCE CHANNEL
✓TX CHANNEL 1
TX CHANNEL 2
TX CHANNEL 3
TX CHANNEL 4
MIN POWER TX CHANNEL
MAX POWER TX CHANNEL
LOWEST & HIGHEST CHANNEL

TX CHANNEL 1 - 4	**Selection of one of channels 1 to 4.**
MIN POWER TX CHANNEL	**The transmission channel with the lowest power is used as a reference channel.**
MAX POWER TX CHANNEL	**The transmission channel with the highest power is used as a reference channel.**
LOWEST & HIGHEST CHANNEL	**The outer lefthand transmission channel is the reference channel for the lower adjacent channels, the outer righthand transmission channel that for the upper adjacent channels.**

IEC/IEEE-bus command:
SENS:POW:ACH:REF:TXCH:MAN 1
SENS:POW:ACH:REF:TXCH:AUTO MIN



The *CP/ACP ABS/REL* softkey (channel power absolute/relative) switches between absolute and relative power measurement in the channel.

CP/ACP ABS The absolute power in the transmission channel and in the adjacent channels is displayed in the unit of the Y axis, e.g. in dBm, dBµV.

CP/ACP REL For adjacent-channel power measurements (*NO. OF ADJ CHAN* > 0), the level of the adjacent channels is displayed relative to the level of the transmission channel in dBc.

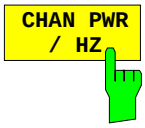
For channel power measurements (*NO. OF ADJ CHAN* = 0) **with a single carrier**, the power of the transmission channel is displayed relative to the power of a reference channel defined by *SET CP REFERENCE*. This means:

1. Declare the power of the currently measured channel as the reference value, using the *SET CP REFERENCE* softkey.
2. Select the channel of interest by varying the channel frequency (ESPI center frequency).

With linear scaling of the Y axis, the power of the new channel relative to the reference channel (CP/CP_{ref}) is displayed. With dB scaling, the logarithmic ratio $10lg\ (CP/CP_{ref})$ is displayed.

The relative channel power measurement can thus also be used for universal adjacent-channel power measurements. Each channel can be measured individually.

IEC/IEEE-bus command: `SENS:POW:ACH:MODE ABS`



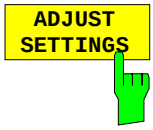
The *CHAN PWR / HZ* softkey toggles between the measurement of the total channel power and the measurement of the channel power referenced to a 1-Hz bandwidth.

The conversion factor is $10 \cdot \lg \frac{1}{\text{Channel} \cdot \text{Bandwidth}}$.

By means of this function it is possible e.g. to measure the signal/noise power density or use the additional functions *CP/ACP REL* and *SET CP REFERENCE* to obtain the signal to noise ratio.

IEC/IEEE-bus command:

`CALC:MARK:FUNC:POW:RES:PHZ ON|OFF`



The *ADJUST SETTINGS* softkey automatically optimizes the instrument settings for the selected power measurement (see below).
All instrument settings relevant for a power measurement within a specific frequency range (channel bandwidth) are optimized for the selected channel configuration (channel bandwidth, channel spacing):

- Frequency span:

  The frequency span should cover at least all channels to be considered in a measurement.

  For channel power measurements, the frequency span is set as follows:
  (No. of transmission channels - 1) × transmission channel spacing + 2 x transmission channel bandwidth + measurement margin

  For adjacent-channel power measurements, the frequency span is set as a function of the number of transmission channels, the transmission channel spacing, the adjacent-channel spacing, and the bandwidth of one of adjacent-channels ADJ, ALT1 or ALT2, whichever is furthest away from the transmission channels:

  (No. of transmission channels - 1) × transmission channel spacing + 2 × (adjacent-channel spacing + adjacent-channel bandwidth) + measurement margin

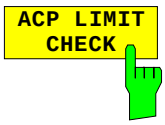
  The measurement margin is approx. 10% of the value obtained by adding the channel spacing and the channel bandwidth.
- Resolution bandwidth RBW ≤ 1/40 of channel bandwidth
- Video bandwidth VBW ≥ 3 × RBW
- Detector RMS detector

Trace math and trace averaging functions are switched off.
The reference level is not influenced by *ADJUST SETTINGS*. It can be separately adjusted with *ADJUST REF LVL.*

The adjustment is carried out only once; if necessary, the instrument settings can be changed later.

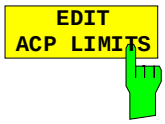
IEC/IEEE-bus command:

```
SENS:POW:ACH:PRES ACP|CPOW|MCAC|OBW
```



The *ACP LIMIT CHECK* softkey switches the limit check for the ACP measurement on and off.

IEC/IEEE-bus command:
```
CALC:LIM:ACP ON
CALC:LIM:ACP:ACH:RES?
CALC:LIM:ACP:ALT:RES?
```



The *EDIT ACP LIMITS* softkey opens a table for defining the limits for the ACP measurement.

ACP LIMITS

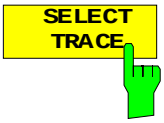
CHAN	RELATIVE LIMIT CHECK		ABSOLUTE LIMIT CHECK	
	VALUE	ON	VALUE	ON
ADJ	-45 dB	√		
ALT1	-60 dB	√		
ALT2				

The following rules apply for the limits:

- A separate limit can be defined for each adjacent channel. The limit applies to both the upper and the lower adjacent channel.
- A relative and/or absolute limit can be defined. The check of both limit values can be activated independently.
- The ESPI checks adherence to the limits irrespective of whether the limits are absolute or relative or whether the measurement is carried out with absolute or relative levels. If both limits are active and if the higher of both limit values is exceeded, the measured value is marked accordingly.

Note: *Measured values exceeding the limit are marked by a preceding asterisk.*

IEC/IEEE-bus command:
```
CALC:LIM:ACP ON
CALC:LIM:ACP:ACH 0dB,0dB
CALC:LIM:ACP:ACH:STAT ON
CALC:LIM:ACP:ACH:ABS –10dBm,-10dBm
CALC:LIM:ACP:ACH:ABS:STAT ON
CALC:LIM:ACP:ALT1 0dB,0dB
CALC:LIM:ACP:ALT1:STAT ON
CALC:LIM:ACP:ALT1:ABS –10dBm,-10dBm
CALC:LIM:ACP:ALT1:ABS:STAT ON
CALC:LIM:ACP:ALT2 0dB,0dB
CALC:LIM:ACP:ALT2:STAT ON
CALC:LIM:ACP:ALT2:ABS –10dBm,-10dBm
CALC:LIM:ACP:ALT2:ABS:STAT ON
```



The *SELECT TRACE* softkey selects the trace on which the CP/ACP measurement is to be performed. Only activated traces can be selected, i.e. traces not set to BLANK.

IEC/IEEE-bus command:
```
SENS:POW:TRAC 1
```

Examples:

1. Measurement of adjacent-channel power for a specific standard:

The adjacent-channel power is to be measured for a signal at 800 MHz with 0 dBm level in line with IS136.

[**PRESET**]	Set the ESPI to the default setting.
[**FREQ**: *CENTER*: 800 **MHz**]	Set the center frequency to 800 MHz.
[**AMPT**: 0 **dBm**]	Set the reference level to 0 dBm.
[**MEAS**]	Call the menu for the measurement functions.
[*CHAN PWR / ACP*]	Select the channel and adjacent-channel power measurement function. The measurement is performed with the default settings or a previously defined setting. The submenu for setting the desired new configuration is opened.
[*CP/ACP STANDARD*: select IS136: **ENTER**]	Select the NADC (IS136) standard.
[*CP/ACP CONFIG*]	Call the submenu for configuration of the adjacent-channel power measurement.
[*NO. OF ADJ CHAN*: 2 **ENTER**]	Select two adjacent channels for the measurement, i.e. the adjacent channel and the alternate channel are measured.
[*ADJUST SETTINGS*]	Set the optimum span, resolution bandwidth (RBW), video bandwidth (VBW) and detector automatically for the measurement. The absolute channel power and the relative power of the adjacent channels are displayed on the screen.
PREV	Change to the main menu for channel power measurement.
[*ADJUST REF LVL*]	Set the reference level equal to the channel power measured.

2. Measurement with user-specific channel configuration:

Measurement of the adjacent-channel power ratio (ACPR) of an IS95 CDMA signal at 800 MHz, level 0 dBm. Similar to example 1, the setting can be simplified by using *CP/ACP STANDARD*.

[**PRESET**]	Set the ESPI to the default setting.
[**FREQ:** *CENTER*: 800 **MHz**]	Set the center frequency to 800 MHz.
[**AMPT**: 0 **dBm**]	Set the reference level to 0 dBm.
[**MEAS**]	Call the menu for the measurement functions.
[*CHAN PWR / ACP*]	Select the channel and adjacent-channel power measurement function. The measurement is carried out with the default settings or a previously defined setting. The submenu for setting the desired new configuration is opened.
[*CP/ACP CONFIG*]	Call the submenu for defining the channel configuration.
[*NO. OF ADJ CHAN*: 2 **ENTER**]	Select two adjacent channels for the measurement, i.e. the adjacent channel and the alternate channel are measured.

[*CHANNEL BANDWIDTH*:
1.23 **MHz**: : 30 **kHz**]

Set the channel bandwidth to 1.23 MHz in accordance with IS 95. Set the adjacent-channel bandwidth to 30 kHz.

TX/ACP CHANNEL BW	
CHAN	BANDWIDTH
TX	1.23 MHz
ADJ	30 kHz
ALT1	30 kHz
ALT2	30 kHz

Upon entry of 30 kHz for the adjacent channel the alternate channels are also set to 30 kHz.

[*CHAN SPACING*:
1.25 **MHz**:
885 **kHz:** :
-1.98 **MHz**] :
2.97 **MHz**]

Open the list for entering the channel spacings.

TX/ACP CHAN SPACING	
CHAN	SPACING
TX	1.25 MHz
ADJ	885 kHz
ALT1	1.98 MHz
ALT2	2.97 MHz

Upon entry of 885 kHz for the adjacent channel the channels ALT1 and ALT2 are set to 1770 kHz and 2655 kHz. Upon entry of 1.98 MHz for the alternate channel 1 the alternate channel 2 is set to 2.97 MHz.

[*ADJUST SETTINGS*] Automatically set the optimum span (= 5 MHz), resolution bandwidth (RBW = 30 kHz), video bandwidth (VBW = 300 kHz) and detector (RMS) for the measurement. The absolute channel power and the relative power of the adjacent channels and alternate channels are displayed on the screen.

PREV Go to the main menu for channel power measurement.

[*ADJUST REF LVL*] Set the reference level equal to the channel power measured.

3. Measurement of signal/noise power density (C/No) of an IS95 CDMA signal (frequency 800 MHz, level 0 dBm)

[**PRESET**] Set the ESPI to the default setting.

[**FREQ:** *CENTER*: 800 **MHz**] Set the center frequency to 800 MHz.

[**AMPT**: 0 **dBm**] Set the reference level to 0 dBm.

MEAS] Call the menu for the measurement functions.

[*CHAN PWR / ACP*] Select the channel and adjacent-channel power measurement. The measurement is performed with the default setting or a previously defined setting. The submenu for setting the desired new configuration is opened.

[*CP/ACP CONFIG*] Call the submenu for defining the channel configuration.

[*NO. OF ADJ CHAN*:
0 **ENTER**] Do not select an adjacent channel for the measurement, i.e. the measurement is carried out in one channel only.

[*CHANNEL BANDWIDTH*: 1.23 **MHz**] Set the channel bandwidth to 1.23 MHz in line with IS95.

[*ADJUST SETTINGS*] Set the optimum span (= 5 MHz), resolution bandwidth (RBW = 30 kHz), video bandwidth (VBW = 300 kHz) and detector (RMS) for the measurement automatically. The absolute channel power and the relative power of the adjacent channels and alternate channels are displayed on the screen.

PREV Go to the main menu for channel power measurement

[*ADJUST REF LVL*] Set the reference level equal to the channel power measured.

[*SET CP REFERENCE*] Set the measured channel power as a reference for the subsequent measurements.

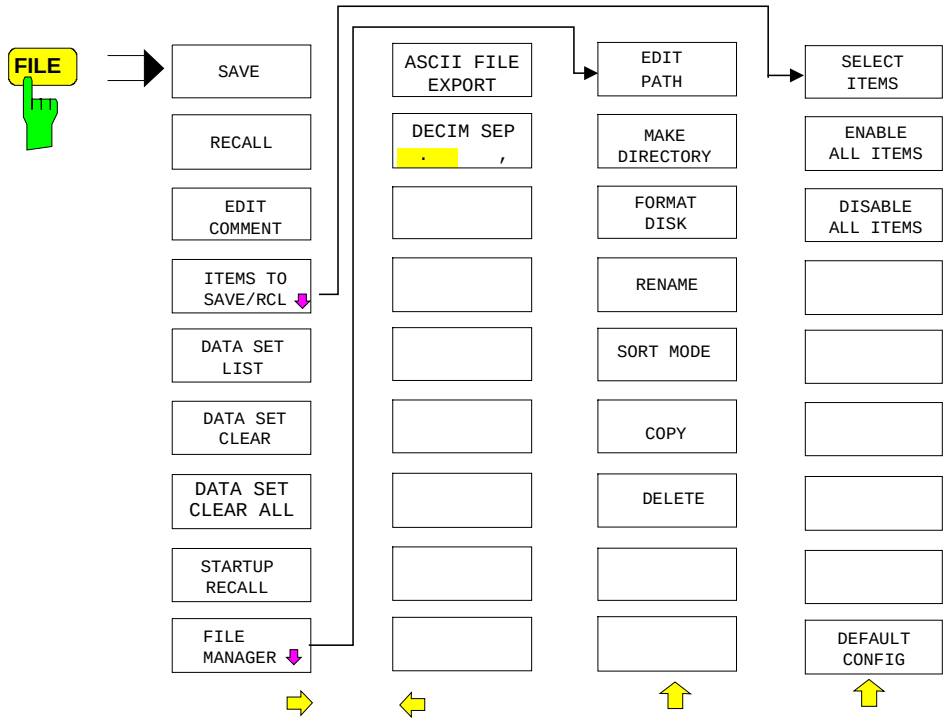
[*CP/ACP ABS / REL*] Select relative measurement related to the reference power set with *SET REFERENCE* (result 0 dB).

[*CHAN PWR / HZ*] Select power measurement related to 1 Hz bandwidth (result -60.9 dB).

[**FREQ:** *CENTER*: 805 **MHz**] Set the center frequency to 805 MHz. The ESPI measures the channel power at 1.23 MHz bandwidth and outputs the result in dB relative to the reference power and 1 Hz bandwidth.

Additional softkeys for menu FILE

For easier operation, the *FILE* menu was extended by softkeys *ASCII FILE EXPORT* and *DECIMAL SEP* in the FILE - NEXT submenu . The softkeys are also available in the TRACE menu.



FILE - NEXT menu:

The *ASCII FILE EXPORT* softkey stores the active trace in ASCII format to a diskette.

IEC/IEEE-bus command:
```
FORM ASC;
MMEM:STOR:TRAC 1,'TRACE.DAT'
```

The file consists of a header, which contains important scaling parameters, and a data section, which contains the trace data.

The file header data comes in three columns separated by semicolons (;).
It has the following contents:

parameter name; numerical value; default unit

The data section starts with the keyword "Trace <n>", where <n> designates the number of the trace to be stored. This is followed by the measured data in columns separated by semicolons (;).

This format can be read by spreadsheet programs such as MS Excel. A semicolon (;) is to be defined as a separator between the cells of a table.

***Note**:* *Analysis programs may come in different language versions that require different notations of the decimal point. By means of the DECIM SEP softkey, a decimal point (.) or a comma (,) can be selected as decimal-point notation.*

For a detailed description of the ASCII file format refer to section "Selection and Setting of Traces – TRACE Key", ASCII FILE EXPORT softkey.

By means of the *DECIM SEP* softkey, one can select between a decimal point (.) and a comma (,) as decimal-point notation for the ASCII FILE EXPORT function.
Due to the possibility of selecting between different decimal-point notations, different language versions of analysis programs (such as MS Excel) can be supported.

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

Trigger line remains on screen after leaving the TRIG menu

The line indicating the trigger level for active video trigger is preserved on the screen even if the trigger menu is abandoned.

New and Modified Remote Control Commands

CALCulate<1|2>:LIMit<1 ... 8>:CONTrol:SPACing LINear | LOGarithmic

This command selects linear or logarithmic interpolation for the calculation of limit lines from frequency points.

Example: "CALC:LIM:CONT:SPAC LIN"

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

Mode: A

CALCulate<1|2>:LIMit<1 to 8>:LOWer:SPACing LINear | LOGarithmic

This command selects linear or logarithmic interpolation for the lower limit line.

Example: "CALC:LIM:LOW:SPAC LIN"

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

Mode: A

CALCulate<1|2>:LIMit<1 to 8>:UPPer:SPACing LINear | LOGarithmic

This command selects linear or logarithmic interpolation for the upper limit line.

Example: "CALC:LIM:UPP:SPAC LIN"

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

Mode: A

CALCulate<1|2>:MARKer<1...4>:FUNCtion:POWer:SELect ACPower | CPOWer | MCACpower | OBANdwidth | OBWidth | CN | CN0

This command selects – and switches on – one of the above types of power measurement in the selected measurement window. This function is independent of the selected marker, i.e. the numerical suffix <1...4> appended to MARKer has no effect.
The channel spacings and channel bandwidths are configured in the SENSe:POWer:ACHannel subsystem.
Please note the following:
If CPOWer is selected, the number of adjacent channels (command: [SENSe:]POWer:ACHannel:ACPairs) is set to 0. If ACPower is selected, the number of adjacent channels is set to 1, unless adjacent-channel power measurement is switched on already.
With respect to the above two settings, the behaviour of the ESPI differs from that of the ESIB family.

Note: *The channel/adjacent-channel power measurement is performed for the trace selected with SENSe:POWer:TRACe 1|2|3.*
The occupied bandwidth measurement is performed for the trace on which marker 1 is positioned. To select another trace for the measurement, marker 1 is to be positioned on the desired trace by means of CALC:MARK:TRAC 1|2|3.

Parameters:

ACPower	Adjacent-channel power measurement with a single carrier signal
CPOWer	Channel power measurement with a single carrier signal (equivalent to adjacent-channel power measurement with *NO. OF ADJ CHAN* = 0)
MCACpower	Channel/adjacent-channel power measurement with several carrier signals
OBANdwidth | OBWidth	Measurement of occupied bandwidth
CN	Measurement of carrier-to-noise ratio
CN0	Measurement of carrier-to-noise ratio referenced to 1 Hz bandwidth

Example: `"CALC:MARK:FUNC:POW:SEL ACP"` 'Switches on adjacent-channel power measurement in window A.

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

Mode: A-F

CALCulate<1|2>:MARKer<1...4>:FUNCtion:POWer:RESult? ACPower | CPOWer | MCACpower | OBANdwidth | OBWidth | CN | CN0

This command queries the result of the power measurement performed in the selected window. If necessary, the measurement is switched on prior to the query.

The channel spacings and channel bandwidths are configured in the `SENSe:POWer:ACHannel` subsystem.

To obtain a valid result, a complete sweep with synchronization to the end of the sweep must be performed before a query is output. Synchronization is possible only in the single-sweep mode.

Parameters:

ACPower: Adjacent-channel power measurement

Results are output in the following sequence, separated by commas:

Power of transmission channel

Power of lower adjacent channel

Power of upper adjacent channel

Power of lower alternate channel 1

Power of upper alternate channel 1

Power of lower alternate channel 2

Power of upper alternate channel 2

The number of measured values returned depends on the number of adjacent/alternate channels selected with `SENSe:POWer:ACHannel:ACPairs`.

With logarithmic scaling (RANGE LOG), the power is output in the currently selected level unit; with linear scaling (RANGE LIN dB or LIN %), the power is output in W. If `SENSe:POWer:ACHannel:MODE REL` is selected, the adjacent/alternate-channel power is output in dB.

CPOWer Channel power measurement

With logarithmic scaling (RANGE LOG), the channel power is output in the currently selected level unit; with linear scaling (RANGE LIN dB or LIN %), the channel power is output in W.

MCACpower: Channel/adjacent-channel power measurement with several carrier signals

Results are output in the following sequence, separated by commas:

1. Power of carrier signal 1
2. Power of carrier signal 2
3. Power of carrier signal 3
4. Power of carrier signal 4
5. Total power of all carrier signals
6. Power of lower adjacent channel
7. Power of upper adjacent channel
8. Power of lower alternate channel 1
9. Power of upper alternate channel 1
10. Power of lower alternate channel 2
11. Power of upper alternate channel 2

The number of measured values returned depends on the number of carrier signals and adjacent/alternate channels selected with `SENSe:POWer:ACHannel:TXCHannel:COUNt` and `SENSe:POWer:ACHannel:ACPairs`.

If only one carrier signal is measured, the total value of all carrier signals will not be output.

With logarithmic scaling (RANGE LOG), the power is output in dBm; with linear scaling (RANGE LIN dB or LIN %), the power is output in W. If `SENSe:POWer:ACHannel:MODE REL` is selected, the adjacent/ alternate-channel power is output in dB.

OBANdwidth
OBWidth Measurement of occupied bandwidth

The occupied bandwidth in Hz is returned.

CN Measurement of carrier-to-noise ratio

The carrier-to-noise ratio in dB is returned.

CN0 Measurement of carrier-to-noise ratio referenced to 1 Hz bandwidth.

The carrier-to-noise ratio in dB/Hz is returned.

Example of channel/adjacent-channel power measurement:

"SENS2:POW:ACH:ACP 3"	'Sets the number of adjacent/alternate channels in screen B to 3.
"SENS2:POW:ACH:BAND 30KHZ"	'Sets the bandwidth of the transmission channel to 30 kHz.
"SENS2:POW:ACH:BAND:ACH 40KHZ"	'Sets the bandwidth of each adjacent channel to 40 kHz.
"SENS2:POW:ACH:BAND:ALT1 50KHZ"	'Sets the bandwidth of each alternate channel to 50 kHz.
"SENS2:POW:ACH:BAND:ALT2 60KHZ"	'Sets the bandwidth of alternate channel 2 to 60 kHz.
"SENS2:POW:ACH:SPAC 30KHZ"	'Sets the spacing between the transmission channel and the adjacent channel to 30 kHz, the spacing between the transmission channel and alternate channel 1 to 60 kHz, and the spacing between the transmission channel and alternate channel 2 to 90 kHz.
"SENS2:POW:ACH:SPAC:ALT1 100KHZ"	'Sets the spacing between the transmission channel and alternate channel 1 to 100 kHz, and the spacing between the transmission channel and alternate channel 2 to 150 kHz.
"SENS2:POW:ACH:SPAC:ALT2 140KHZ"	'Sets the spacing between the transmission channel and alternate channel 2 to 140 kHz.
"SENS2:POW:ACH:MODE ABS"	'Switches on absolute power measurement.
"CALC2:MARK:FUNC:POW:SEL ACP"	'Switches on the adjacent-channel power measurement in screen B.
"INIT:CONT OFF"	'Switches over to single-sweep mode.
"INIT;*WAI"	'Starts a sweep and waits for the end of the sweep.
"CALC2:MARK:FUNC:POW:RES? ACP"	'Queries the result of adjacent-channel power measurement in screen B.
"SENS2:POW:ACH:REF:AUTO ONCE"	'Defines the measured channel power as the reference value for relative power measurements.

If the **channel power only** is to be measured, all commands relating to adjacent/alternate channel bandwidth and channel spacings are omitted. The number of adjacent/alternate channels is set to 0 with SENS2:POW:ACH:ACP 0.

Example of occupied bandwidth measurement:

"SENS2:POW:BAND 90PCT"	'Defines 90% as the percentage of the power to be contained in the bandwidth range to be measured.
"INIT:CONT OFF"	'Switches over to single-sweep mode.
"INIT;*WAI"	'Starts a sweep and waits for the end of the sweep.
"CALC2:MARK:FUNC:POW:RES? OBW"	'Queries the occupied bandwidth measured in screen B.

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

Mode: A-F

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

DISPlay[:WINDow<1|2>]:SIZE LARGe | SMALl

This command switches the measurement window for channel and adjacent-channel power measurements to full screen or half screen. Only "1" is allowed as a numerical suffix.

Example: `"DISP:WIND1:SIZE LARG"` 'Switches the measurement window to full screen.

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

Mode: A, 3G FDD

DISPlay[:WINDow<1|2>]:TRACe<1...3>:Y:SPACing LINear | LOGarithmic | LDB

This command defines linear or logarithmic scaling for the selected measurement window. For linear scaling, the unit % (command `DISP:WIND:TRAC:Y:SPAC LIN`) or dB (command `DISP:WIND:TRAC:Y:SPAC LDB`) can be selected.

The numerical suffix <1...3> appended to TRACe has no effect.

Example: `"DISP:WIND1:TRAC:Y:SPAC LIN"`

Characteristics: *RST value: LOGarithmic
SCPI: conforming

Mode: A

:[SENSe<1|2>:]CORRection:YIG:TEMPerature:AUTO ON | OFF

This command switches on or off the automatic correction of the YIG filter frequency drift.

When correction is switched on, it is checked once per minute whether the temperature on the YIG filter has changed by more than 5K relative to the last instance of correction. If this is the case, the frequency of the YIG filter is – at the end of the next measurement – adjusted as required for the new temperature. For time-critical applications, the correction function can be switched off after an operating period of ≥ 30 minutes.

Example: `"CORR:YIG:TEMP OFF"` 'Switches off automatic correction of the YIG filter frequency drift.

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

Mode: all

This command is available only from firmware version 1.72.
The ON parameter is available only if the MW CONV UNIT module has one of the following modification states:

Order No.	Rev	SubRev
1130.2396	≥ 02	≥ 01
1130.2544	≥ 02	≥ 01

SENSe:LIST Subsystem

The commands of this subsystem are used for measuring the power at a list of frequency points with different device settings. The measurement is always performed in the time domain (span = 0 Hz).

The number of frequencies is now extended to 200 entries.

[SENSe<1|2>:]POWer:ACHannel:SPACing:CHANnel 100 Hz to 2000 MHz

This command defines the channel spacing for the carrier signals.

The command is available only for measurements in the frequency domain (span > 0).

Example: `"POW:ACH:SPAC:CHAN 25kHz"`

Characteristics: *RST value: 20 kHz
SCPI: device-specific

Mode: A-F

[SENSe<1|2>:]POWer:ACHannel:TXCHannel:COUNt 1 | 2 | 3 | 4

This command selects the number of carrier signals.

The command is available only for multicarrier channel and adjacent-channel power measurements (`CALC:MARK:FUNC:POW:SEL MCAC`) in the frequency domain (span > 0).

Example: `"POW:ACH:TXCH:COUN 3"`

Characteristics: *RST value: 4
SCPI: device-specific

Mode: A-F

[SENSe<1|2>:]POWer:ACHannel:REFerence:TXCHannel:AUTO MINimum | MAXimum | LHIGhest

This command activates the automatic selection of a transmission channel to be used as a reference channel in relative adjacent-channel power measurements.

The transmission channel with the highest power, the transmission channel with the lowest power, or the transmission channel nearest to the adjacent channels can be defined as a reference channel.

The command is available only for multicarrier channel and adjacent-channel power measurements (`CALC:MARK:FUNC:POW:SEL MCAC`) in the frequency domain (span > 0).

Parameters:

MINimum	Transmission channel with the lowest power
MAXimum	Transmission channel with the highest power
LHIGhest	Lowermost transmission channel for the lower adjacent channels, uppermost transmission channel for the upper adjacent channels

Example: `"POW:ACH:REF:TXCH:AUTO MAX"` 'The transmission channel with the highest power is used as a reference channel.

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

Mode: A-F

[SENSe<1|2>:]POWer:ACHannel:REFerence:TXCHannel:MANual 1 | 2 | 3 | 4

This command selects a transmission channel to be used as a reference channel in relative adjacent-channel power measurements.

The command is available only for multicarrier channel and adjacent-channel power measurements (`CALC:MARK:FUNC:POW:SEL MCAC`) in the frequency domain (span > 0).

Example: `"POW:ACH:REF:TXCH:MAN 3"` 'Transmission channel 3 is used as a referencechannel.

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

Mode: A-F

[SENSe<1|2>:]POWer:ACHannel:PRESet ACPower | CPOWer | MCACpower | OBANdwidth | OBWidth | CN | CN0

This command adjusts the frequency span, the measurement bandwidths and the detector as required for the number of channels, the channel bandwidths and the channel spacings selected in the active power measurement. If necessary, adjacent-channel power measurement is switched on prior to the adjustment.

To obtain valid results, a complete sweep with synchronization to the end of the sweep must be performed after the adjustment. Synchronization is possible only in the single-sweep mode.

The result is queried with the command `CALCulate:MARKer:FUNCtion:POWer:RESult?`.

The command is available only for measurements in the frequency domain (span > 0).

Example:
```
"POW:ACH:PRES ACP"          'Sets the frequency span, the measurement bandwidths and the detector as required for the ACP measurement in screen A.
"INIT:CONT OFF"             'Switches over to single-sweep mode.
"INIT;*WAI"                 'Starts a sweep and waits for the end of the sweep.
"CALC:MARK:FUNC:POW:RES? ACP" 'Queries the result of the adjacent-channel power measurement.
```

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

Mode: A-F

[:SENSe<1|2>:]SWEep:POINts <numeric_value>

This command defines the number of measurement points for one sweep run.

Parameter: <numeric_value>::= 125, 251, 501, 1001, 2001, 4001, 8001

Example: `"SWE:POIN 251"`

Characteristics: *RST value: 501
SCPI: conforming

Modes: A

:TRACe:FEED:CONTrol<1 to 4> ALWays | NEVer

This command switches block data transmission during a scan on and off.

Example: `"TRAC:FEED:CONT ALW"`

Features: *RST Value: NEVer
SCPI: conforming

Mode: R

The block size depends on the scan time, the trace number is not evaluated.