Annex G (Coverage Measurement)

If fitted with SW option EB200CM (Coverage Measurement) (R&S part no. 4052.9804.02), the EB200 is suitable for coverage measurements.

Note:
A RAM-expansion is prerequisite for this software option for the EB200 (see also TEST on page 3.43, List of modules on page 5.4 and RAM expansion / Li-battery on page 5.7).
Furthermore the DDC2 must be part of the IF-section of the EB200 (see SYSTEM menu on page 40).

Thanks to this option, in the single-channel measurement mode up to 2000 triggered level measurements per second can be carried out on a single frequency. In the multi-channel measurement mode up to 200 measurements per second can be carried out on the frequencies contained in a list, the frequency hops being random. The trigger can be configured to be external, internal or to come from a timer. Addressing this option is only possible via remote control. In this mode manual operation is disabled and only the current operating mode will be displayed.

Operating modes

Single-channel measurement

For measurements on a single frequency the **FASTlevcw** mode has to be selected.

Before measuring the parameters bandwidth, demodulation mode, AGC, detector type and the measuring time must be set.

When DEFAULT measuring time is selected (command `MEAS:TIME DEF`) the measurement is carried out in a time which depends on the bandwidth and the type of detector. Also see Table Measuring times on page 3, column Default Measuring Times.

When the measuring time is set explicitly (command `MEAS:TIME <value>`) the measurement is carried out always within this time. The minimum adjustable measuring time is 500 µs (command `MEAS:TIME 0.5 mS`).

If triggering is faster (external or timer triggering) than permitted by the measuring time, the measurement in progress is aborted and the currently valid value is output. This allows the measuring time to be adapted implicitly to the measuring rate.

Before starting the measurement the attenuation must be explicitly set to ON or OFF.

Then the mode is to be set to FASTlevcw by using command `FREQ:MODE FASTlevcw`.

Caution:
For bandwidths ≤ 1 kHz, the maximum trigger rate with external triggering and timer triggering is approx. 400 trigger pulses per second.

Multi-channel measurement (triggered scan)

In order to be able to measure several channels the **LIST** mode (command `FREQ:MODE LIST`) was introduced. By using command `LIST:FREQ <freq1>,<freq2>,...` up to 50 frequencies can be defined. All other parameters (bandwidth, detector type, etc.) are set in the same way as for single-channel measurement.

Autoranging operation is deactivated. Before starting the measurement the attenuation must be explicitly set to ON or OFF.

With each trigger one run is covered. The overall time per channel is calculated based on the following formula:

$t_{channel} = t_{syn} + t_{IF} + t_{MEAS} + t_{cpu}$

With:

t_{syn} :   synthesizer settling time for any hop = 3 ms

t_{IF} :   IF section settling time (see Table "Measuring times" on page 3, column Settling times t_{IF})

t_{MEAS} :   measuring time (see Table "Measuring times" on page 3, column Default measuring times t_{MEAS})

t_{cpu} :   other processing time = 1.25 ms

Examples:

BW = 6 kHz, FM, FAST, MEAS:TIME DEF

$t_{channel}$ = 3 ms + 3.75 ms + 0.56 ms + 1.25 ms = 8.56 ms

With 5 frequencies this means that the trigger period must be < 42.8 ms (5*8.56 ms).

BW = 30 kHz, AM, AVG, MEAS:TIME DEF

$t_{channel}$ = 3 ms + 0.968 ms + 3 ms + 1.25 ms = 8.22 ms

With 5 frequencies this means that the trigger period must be < 41.1 ms (5*8.22 ms).

BW = 150 kHz, AM, PEAK, MEAS:TIME 1 ms

$t_{channel}$ = 3 ms + 0.468 ms + 1 ms + 1.25 ms = 5.72 ms

With 5 frequencies this means that the trigger period must be < 28.59 ms (5*5.72 ms).

BW = 150 kHz, AM, FAST, MEAS:TIME DEF

$t_{channel}$ = 3 ms + 0.468 ms + 0.281 ms + 1.25 ms = 5 ms

With 5 frequencies this means that the trigger period must be < 25 ms (5*5 ms).

To be on the safe side another 5 % should be added.

In LIST mode, with external and timer triggering the error message "Trigger ignored" will be generated if triggering was too fast.

Measuring times

Depending on the bandwidth and demodulation mode selected the following settling times t_{IF} are obtained.

Depending on the type of detector used the following default measuring times t_{MEAS} are obtained.

	Overall settling times t_{IF}		Default measuring times t_{MEAS}		
Bandwidth [kHz]	AM, FM [us]	IQ, CW, SSB [us]	Peak [us]	Average [us]	Fast [us]
150	468.75	406.25	2000	3000	281.25
120	468.75	406.25	2000	3000	281.25
50	625	531.25	4000	3000	281.25
30	968.75	750	5000	3000	281.25
15	1656.25	1312.5	10000	3000	281.25
9	3187.5	2437.5	20000	6000	562.5
6	3750	3000	30000	12000	562.5
2,4	10500	7750	60000	25000	2250
1.5	14000	11000	100000	50000	2250
0.6	37000	28000	200000	100000	9000
0.3	136000	100000	400000	100000	18000
0.15	82000	60000	500000	200000	18000

Triggering

There are three triggering possibilities.

External: `TRIG:SOUR EXT`   -> trigger by external pulse
Internal: `TRIG:SOUR INT`   -> measurement "as fast as possible"
Timer: `TRIG:SOUR TIM`   -> trigger by timer

Externally triggered measurement

The trigger source has to be set to external by using command `TRIG:SOUR EXT`.

The trigger input is !INTRPT is located at the rear of EB200 at connector X8, pin 12. This input is TTL-compatible. The slope which is to trigger the measurement can be selected by using command `TRIG:SLO POS` or `TRIG:SLOP NEG`, respectively.

After the `INIT` command the external trigger is enabled.

The maximum trigger rate of 2000 pulses per second must no be exceeded!

The measurement is aborted using the `ABORT` command. The external trigger input will then be inhibited again.

Internally triggered measurement

The trigger source has to be set to internal by using command `TRIG:SOUR INT`.

The `INIT` command starts the measurement which is carried out at a rate of either the default measuring time or the set measuring time. Thus the measurement is carried out "as fast as possible".

The `ABORT` command aborts the measurement.

Timer-triggered measurement

The trigger source has to be set to timer by using command `TRIG:SOUR TIM`.

The trigger period is set by using command `TRIG:TIM <value>` (eg `TRIG:TIM 20 mS`). The minimum value is 500 µs. The `INIT` command starts the measurement. The measurement is triggered by each timer pulse. Everything else is the same as with the externally triggered measurement.

The `ABORT` command aborts the measurement.

Data output

All measured values are transmitted as UDP packets via LAN or RS232 PPP.

The UDP path must be configured accordingly with the FASTlevcw attribute. See Annex F.

Simultaneous AF transmission via the remote-control interface is not possible.

Single-channel measurement

Only level values are transmitted. Transmission is binary in 1/10 dBµV.

Multi-channel measurement (triggered scan)

The measured values are output in the same way as in single-channel measurement. Only levels are transmitted. The individual runs are separated by wrap-around markers.

Example:

3 frequencies are to be measured. The UDP packet covers 3 runs with 3 frequencies each.
Level of 1st channel
Level of 2nd channel
Level of 3rd channel
Wrap-around marker (= 200 dBµV = 2000 binary)
Level of 1st channel
Level of 2nd channel
Level of 3rd channel
Wrap-around marker (= 200 dBµV = 2000 binary)
Level of 1st channel
Level of 2nd channel
Level of 3rd channel
Wrap-around marker (= 200 dBµV = 2000 binary)