# IF panorama option – nothing hidden in the spectrum

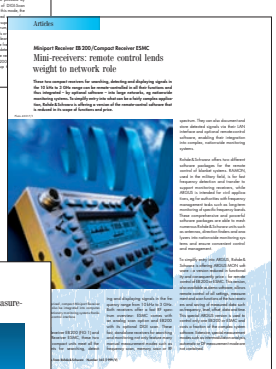
**Even in its basic version, the EB 200 (FIG 1) offers a range of functions in the frequency range from 10 kHz to 3 GHz that previously was hardly imaginable for such a compact unit. With the IF panorama option, it turns into a radiomonitoring specialist.**


**FIG 1 With the IF Panorama Option EB 200-SU, the EB 200 turns into a radiomonitoring specialist**

**News from Rohde&Schwarz has often reported that the "little one" is most versatile (see also [1])**


Application notes
Miniport Receiver EB 200
Hard times for eavesdroppers

**Detection and localization of spy transmitters (No. 164, pp 24–25)**


Articles
Miniport Receiver EB 200/Compact Receiver ESMC
Mini-receivers: remote control lends weight to network role

**The EB 200 in computer-controlled monitoring systems (No. 165, pp 16–17)**


MOBILE RADIO Coverage measurement systems
Coverage and field-strength measurements with the mini-receiver

**Field-strength and coverage measurements (No. 170, pp 12–14)**

## IF panorama: Indispensable for efficient radiomonitoring

With conventional receivers, the panorama display unit usually shows only the set receiver frequencies. The signal at the receiver IF output is analogously displayed by means of a simple spectrum analyzer. In many cases, this panorama display is implemented as an external add-on unit, which is relatively large and heavy and consumes a correspondingly high amount of power.

Not with the EB 200: During the development of the IF Panorama Option EB 200-SU, it was possible to avoid all these disadvantages by a consequent utilization of **digital signal processing**. This option uses FFT to calculate a spectrum of the scenario around the receiver frequency up to 250 times per second. These spectra are combined to form an image and are shown on the instrument display so that all details are revealed.

In the **MIN mode**, for example, the new option stores all spectral lines with their minimum level. It is thus possible to determine spectral lines with constant level from very noisy signals. These lines are permanently available and their amplitudes vary just slightly. FIG 2 shows the spectrum of a signal which is applied to the antenna input of the EB 200 with a level of –10 dBµV. The panorama unit is placed in the CLRWRITE mode, in which the spectrum is not further processed for display. FIG 3 shows the same signal in the MIN mode for a measurement lasting one second. A single spectral line is clearly visible, but the noise display is suppressed.

A similar result is obtained in the **AVG mode** (FIG 4). The noise floor, however, is not suppressed but smoothed. This method has the advantage that the magnitude of the spectral lines is maintained and their level can be exactly measured directly with the level ruler.

In the **MAX mode**, all spectral lines are stored with their maximum level. When a long measurement time is selected, e. g. five minutes, it appears that the spectrum is building up. FIG 5 shows the spectrum of a radiotelephony band after such a measurement time. The occupied radiotelephony channels are clearly visible. The MAX mode is also well suited for burst signals (single emissions of short duration) and frequency hop signals.

The IF panorama can be directly used for tuning by activating the **step function** via softkeys ⊥ TO ▲ (move to next peak left) and ⊥ TO ▲ (move to next peak right). This is best done with the MAX mode and a measurement time of 100 ms to 1 s. In the radiotelephony band, for example, signals appear and disappear at irregular intervals. Selecting an appropriate measurement time can, however, artificially slow down the disappearance such that even short emissions can easily be detected. The two softkeys help the user to move rapidly from an occupied channel to the next one (e. g. to store the new frequency in a memory location). Unoccupied channels are skipped. The threshold predefined by the squelch setting determines which signals are relevant.

One of the great advantages of this interactive step method is that no channel spacing has to be entered as step width (e. g. 25 kHz) due to the high resolution of <1 kHz per spectral line. As a result, signals that often change their frequency and use frequencies which are not in the channel spacing can easily be detected and traced (direction finding is ▶

**FIG 2**
**CLRWRITE mode: spectrum without electronic processing**

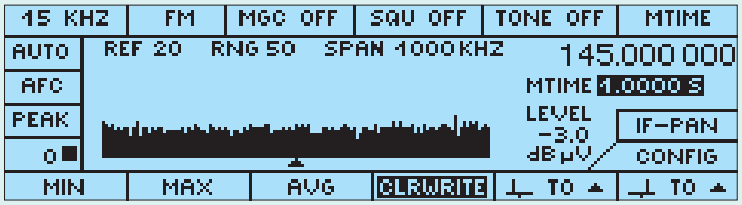



**FIG 3**
**MIN mode: same input signal but with suppressed noise**

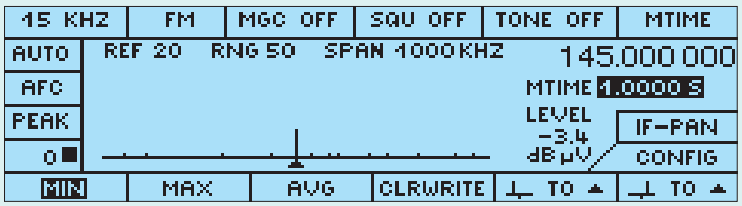



**FIG 4**
**AVG mode: same input signal, the exact level of the spectral line, however, being maintained by smoothing**

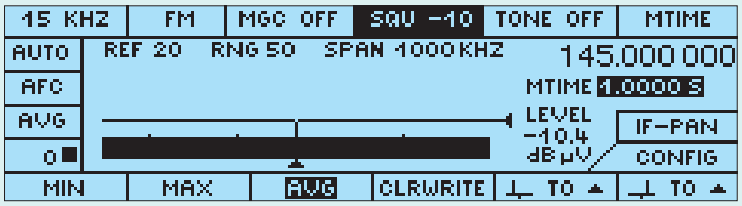



**FIG 5**
**MAX mode: spectrum of a radiotelephony band after a measurement time of five minutes**

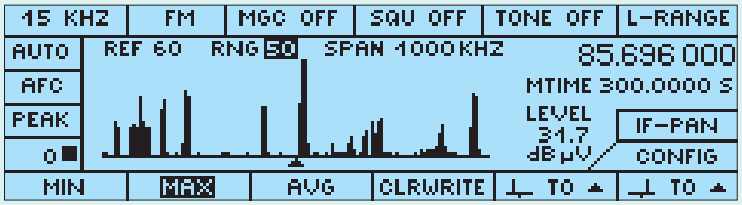



**FIG 6**
**spectrum in the 20 m band, ±25 kHz near the receive frequency**

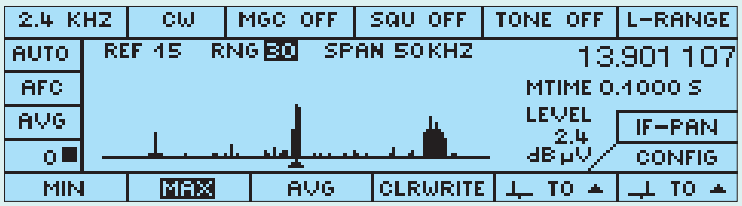
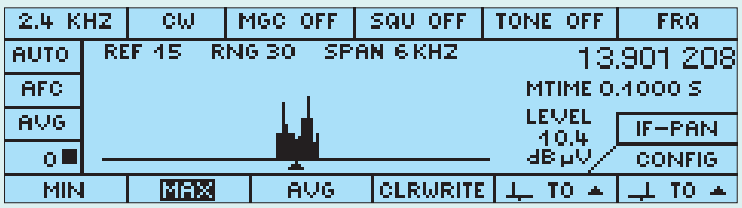



**FIG 7**
**Approximate resolution 8 Hz: marker and space frequency of FSK signal clearly visible**



possible with the EB 200 and the Digital Direction Finder DDF 190 [2]).

For combining broadband signals comprising more than one spectral line, the EB 200 employs a **special search algorithm**, which searches to the right or left of the center for the next local level maximum that does not belong to the current center signal. With squelch switched off, the EB 200 automatically determines the level of the noise floor via spectral estimation and then uses it as a search threshold.

The IF panorama also performs well in the **shortwave range**. A high spectral resolution is required in this case. The display range on the EB 200 can be varied to nearly any value between 150 Hz and 1 MHz, which corresponds to a frequency resolution of 120 mHz to 1 kHz. FIG 6 shows a spectrum of ±25 kHz near the receive frequency in the 20 m band.

As shown in FIG 7, the up-to-date FFT panorama display can also be used on the EB 200 for **signal analysis**. The receive signal is displayed with a resolution of approx. 8 Hz. The mark and space frequency of an FSK (frequency shift keying) signal is clearly visible.

Of course, the data can be transferred to a PC via the EB 200 remote-control interface so that a detailed spectrum analysis can be performed. All image details can be output on a large display, e. g. by means of the Spectrum Monitoring Software ARGUS [3] with up to 1200 spectral lines at repetition rates of up to 20 images per second.

Theodor Fokken; Martin Hisch

**More information and data sheet at www.rohde-schwarz.com (search for EB 200)**


Data sheet EB 200


CD-ROM on EB 200 available free of charge from any Rohde & Schwarz representative

REFERENCES

[1] Miniport Receiver EB 200 and Handheld Directional Antenna HE 200 – Radiolocation from 10 kHz to 3 GHz now with portable equipment. News from Rohde & Schwarz (1997) No. 156, pp 4–6

[2] DDF190 – Now from 0.5 MHz through 3000 MHz. News from Rohde & Schwarz (2000) No. 166. pp 16–17

[3] ARGUS 4.0 – New software generation for spectrum monitoring systems. News from Rohde & Schwarz (2000) No. 167, pp 18–20