

# Perfectly positioned: the new, compact R&S®EB500 monitoring receiver

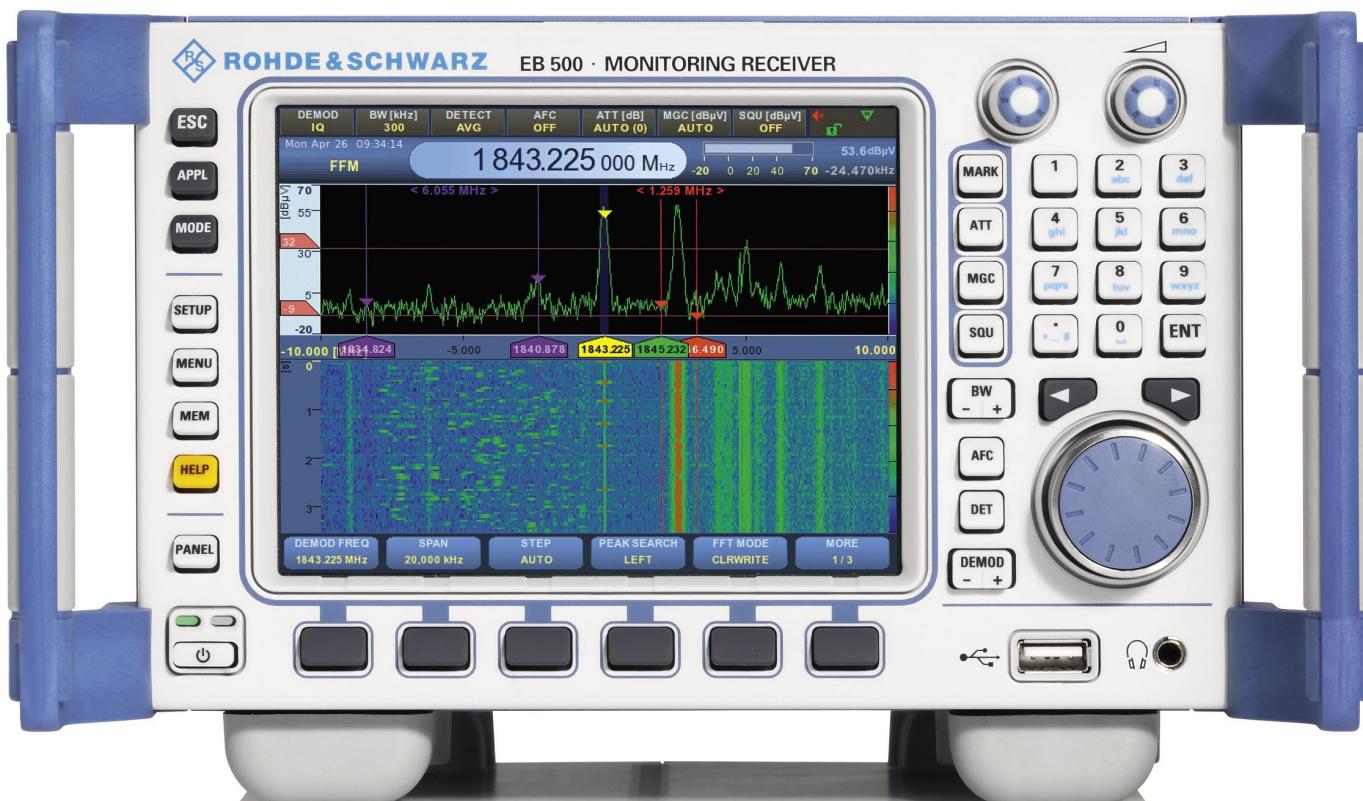
With its fine balance of technical specifications, dimensions, power consumption and price, the new R&S®EB500 monitoring receiver is well positioned between the R&S®PR100 portable receiver and the high-end R&S®ESMD wideband monitoring receiver. From this trio of receivers, users can choose the right receiver to handle any radiomonitoring task.

## R&S®EB500 – the perfect blend of form and functionality

The new R&S®EB500 monitoring receiver (FIG 1) which covers the frequency range from 9 kHz to 6 GHz has now closed the gap between the R&S®PR100 portable receiver and the high-end R&S®ESMD wideband monitoring receiver (see box on page 64). The new receiver inherits the intuitive operation of the R&S®ESMD along with the bulk of its rich set of features. The new R&S®EB500 replaces the tried-and-tested, ITU-compliant R&S®ESMB wideband monitoring receiver. The R&S®EB500 has identical dimensions so it can easily take the place of the former instrument in current rack installations

or vehicular installations. The R&S®EB500 addresses more applications than its predecessor and offers enhanced performance, e.g. polychrome and waterfall diagram, 20 MHz realtime bandwidth, 5 MHz demodulation bandwidth and fast panorama scan up to 12 GHz/s (R&S®ESMB: 1 MHz realtime bandwidth, 300 kHz demodulation bandwidth, scan speed up to 3 GHz/s). The receiver has a special frontend that simultaneously delivers high sensitivity with a good third order intercept point (IP3), making a separate low noise mode unnecessary. Accordingly, the R&S®EB500's quality coefficient (IP3 minus noise figure) is comparable to the performance of the R&S®ESMD in the corresponding frequency ranges.

FIG 1 Something new in such a small receiver: large color display with softkeys for intuitive operation and a detailed signal overview.



## R&S®EB500 stationary applications – versatile and cost-effective

With a densely populated network of stations, the level of confidence in the monitoring results during interception and detection of interfering signals increases drastically. Due to its excellent price/performance ratio, the R&S®EB500 can be used cost-effectively to create a large nationwide network of stationary monitoring stations. In difficult terrain such as mountain areas and in urban environments, a large network of monitoring stations is an absolute must. This is true especially in the VHF and UHF frequency ranges and above. To reduce costs, the R&S®EB500 can be offered with or without front panel and can be operated locally via the front panel or remotely via a PC and a control software. This flexible approach makes it possible for just a few operators to monitor nationwide networks, leading to lower overall operating costs.

Different receivers are sometimes used in a network as a result of varying local requirements. However, the actual implementation is transparent to the users since all of the Rohde & Schwarz monitoring receivers have similar operating concepts and user interfaces that are designed for remote or manual operation.

## R&S®EB500 mobility – convenience by vehicle-based stations

Monitoring tasks are handled primarily by fixed stations. However, it is not possible to detect all interfering signals even with a dense network of fixed stations, especially in the VHF / UHF range. In these cases, additional vehicle-based monitoring stations are used to get closer to the signal source. Nevertheless, vehicular radiomonitoring should not entail

### The trio in comparison

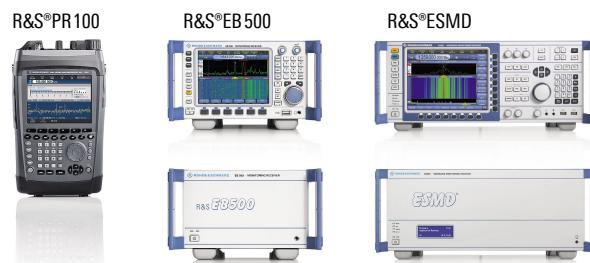
These three receivers from Rohde & Schwarz have the performance and design needed in different application areas (FIG 2). For monitoring tasks in a harsh outdoor environment, the compact R&S®PR100 is the best choice due to its low weight, display with adjustable brightness control, good RF characteristics and a built-in mapping feature.

The new R&S®EB500 with its high scan speed and excellent RF characteristics is the ideal receiver for monitoring tasks in a signal environment up to 6 GHz and for different scenarios, including stationary, vehicular as well as transportable applications. It can be used as a desktop receiver or in a network via remote control. Using its remote control interface, the R&S®EB500 is ideal for use as a handoff receiver in conjunction with a powerful search and monitoring receiver such as the R&S®ESMD. Whereas receivers with less dynamic range would be quickly overwhelmed in such an application, the R&S®EB500 has adequate performance to ensure optimum reception of the signals of interest.

The R&S®ESMD wideband monitoring receiver is the ideal choice for extremely demanding monitoring tasks in difficult signal scenarios, e.g. in urban environments. Strong signals can be very challenging for the receiver's frontend, especially when powerful transmitters are situated in the vicinity of the monitoring station. Despite the presence

of strong signals, the stationary receivers, which are typically connected to large antennas with high gain, must still be capable of detecting very weak emissions. In this application, the R&S®ESMD stands out with its excellent RF characteristics. In addition, there are numerous options available for this receiver, e.g. an SHF frequency range extension up to 26.5 GHz, an option for the very highest scan speed in its class, an 80 MHz realtime bandwidth and a module to speed up signal analysis.

### Radiomonitoring receivers



Performance

FIG 2 Overview of the radiomonitoring receivers.

compromises in the monitoring capabilities. The recommended procedure is to install the same receiver type in the vehicle that is used in the fixed stations. The R&S®EB500 represents an ideal choice due to its compact dimensions (1½ 19" width, 3 height units), integrated wide-range power supply (+10 V DC to +32 V DC) and low power consumption (starting at approx. 50 W).

The identical user interfaces in the fixed and mobile stations are another benefit since the need for additional operator training to master different receivers is eliminated. Due to its versatility, the R&S®EB500 can be deployed in large quantities to handle diverse tasks and scenarios, thereby simplifying service and spare part handling in the context of repairs and maintenance.

## R&S®EB500 transportability – autonomous and remote-controllable

In cases where the place of origin of an emission of interest is not accessible by vehicle and monitoring is required over several hours, the R&S®EB500 is also a good choice. The receiver's good balance between performance, size, weight and power consumption makes it easy to integrate into a transport case with its own power supply. An integrated PC can be included to store the monitoring results. No separate antenna selector is needed to select different antennas since the R&S®EB500 already has a space-saving, built-in antenna selector (1 × HF, 1 × HF / VHF / UHF).

An all-in-one system of this type could be installed, for example, on the flat rooftop of a building and configured for monitoring using the convenient R&S®EB500-Control remote

In applications where such high-end features are not required, the R&S®EB500 is recommended as a comparable yet more economical alternative. FIG 3 summarizes and compares

the key parameters and features of these three outstanding radiomonitoring receivers, helping to select the right receiver for a particular task.

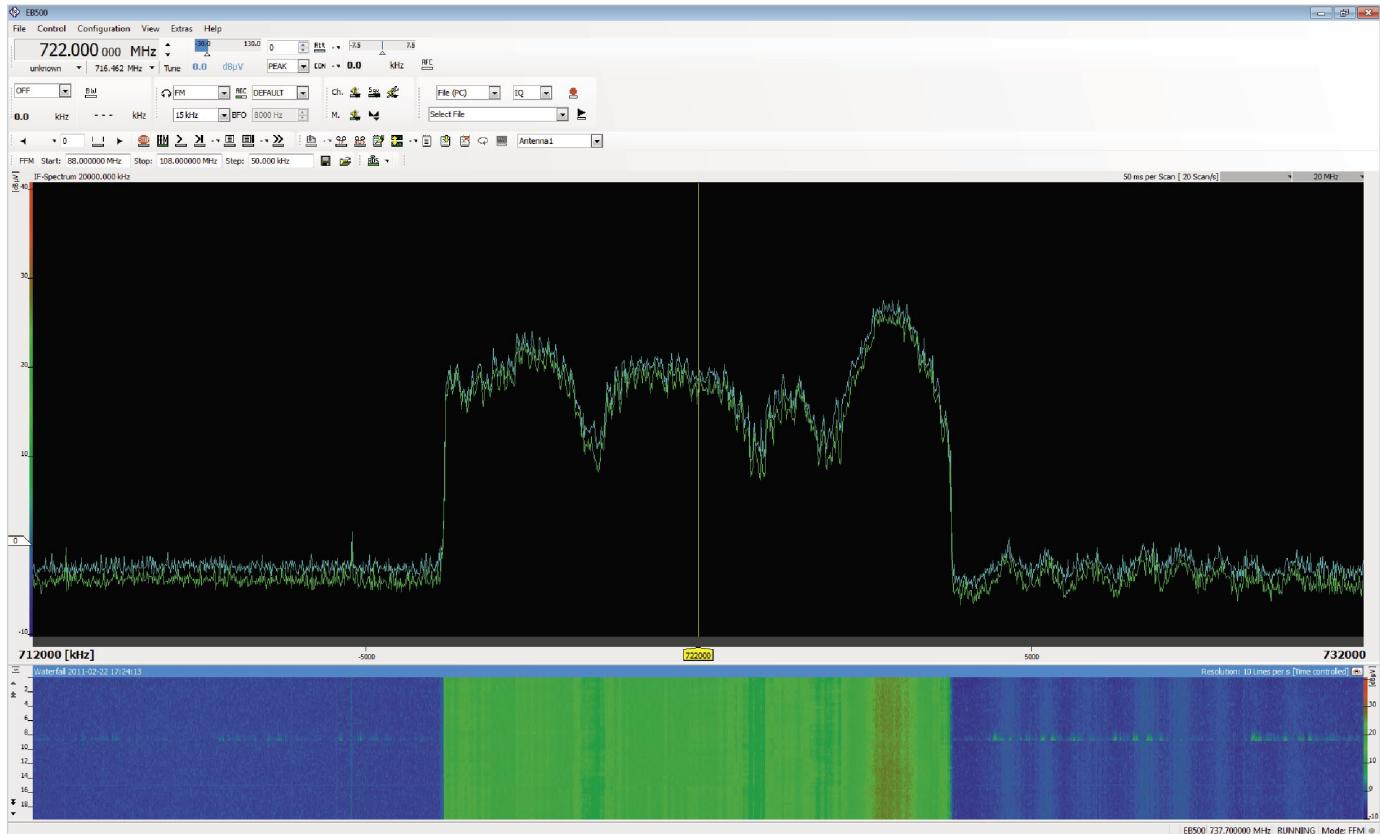
FIG 3 Comparison of the key specifications for the three receivers.

Parameter	R&S®PR100 / R&S®EM100	R&S®EB500	R&S®ESMD
Frequency range	9 kHz to 7.5 GHz	(9 kHz) 20 MHz to 3.6 GHz (6 GHz)	(9 kHz) 20 MHz to 3.6 GHz (26.5 GHz)
Realtime bandwidth	10 MHz	20 MHz	20 MHz (80 MHz)
Demodulation bandwidth	500 kHz	5 MHz	20 MHz (80 MHz)
Panorama scan speed	up to 2 GHz/s	up to 12 GHz/s	up to 43 GHz/s
Noise figure (VHF / UHF range)	< 12 dB, typ. 10 dB (ATT off, equivalent to normal mode)	< 14 dB, typ. 10 dB (normal mode)	< 12 dB, typ. 9 dB (low noise mode) < 16 dB, typ. 12 dB (normal mode)
IP3 (VHF / UHF range)	> -6 dBm, typ. -3 dBm (ATT off, equivalent to normal mode)	> 7 dBm, typ. 10 dBm (normal mode)	> 8 dBm, typ. 13 dBm (normal mode)
LAN interface	100 Mbit Ethernet	1 Gbit Ethernet	1 Gbit Ethernet (10 Gbit Ethernet)
Digital downconverter	–	yes (end of 2011)	yes
Direction finder upgrade kit	yes (middle of 2011)	yes (middle of 2011)	yes
ITU-compliant specifications	–	yes	yes
Portable	yes	low	
Space required for rackmounting			
Recommended as handoff receiver		yes	



FIG 4 Determination of the bandwidth occupancy of an FM broadcast transmitter using the R&S®EB500-IM option for measurements in line with ITU standards.

FIG 5 The R&S®EB500-Control remote control software supports all of the receiver's features during remote control operation. A single-user license is included with each receiver.



control software. After the system has been left on the rooftop for a few hours to capture data, it can be removed. The collected monitoring results are then available for subsequent analysis. If the system includes components for setting up a radio link (e.g. via GSM), its monitoring parameters can even be modified remotely.

### R&S®EB500 standard-compliance – all important ITU measurements

Frequency regulatory authorities require ITU-compliant receivers with predefined automatic measurement functions. When equipped with the R&S®EB500-IM ITU measurement option, the R&S®EB500 is able to measure the following:

- AM modulation index
- FM frequency deviation
- PM phase deviation
- Occupied bandwidth

These measurements help regulatory authorities to decide whether a given emission is in compliance and simplify the job of identifying unusual emissions. For example, in FM broadcasting the maximum frequency deviation must not exceed 75 kHz according to ITU recommendations (including the radio data system (RDS)). The deviation is easy to measure automatically using the R&S®EB500-IM option (FIG 4).

## Comprehensive computer-based training for the R&S®EB500

This computer-based training (CBT) program provides step-by-step instructions on using the receiver's functions. The program demonstrates the effects of different receiver settings in a clear and detailed manner and recommends

relevant settings to allow optimum detection of different signals. The CBT on DVD is available free-of-charge from any Rohde&Schwarz office (Order No.: 5214.3800.52).



The CBT for the R&S®EB500 monitoring receiver provides a step-by-step introduction into the receiver's functions and operation. A screenshot of the start page is shown here.



Example from the CBT: Effects of the modulation bandwidth setting when AFC is switched on.

## R&S®EB500 compatibility – good integration with Rohde & Schwarz software

The R&S®EB500 is fully compatible with the relevant software packages from Rohde&Schwarz:

- [R&S®GX430 analysis software](#) for automatic signal search and classification
- [R&S®ARGUS spectrum monitoring software](#) for systems all the way up to nationwide installations in line with ITU recommendations
- [R&S®RAMON operating software](#) for radiomonitoring including convenient master/slave capabilities

Existing receivers such as the R&S®ESMB can be easily replaced by the R&S®EB500 due to the compatible remote control interface. In addition, each R&S®EB500 comes with a

single-user license for the R&S®EB500-Control remote control software which is based on R&S®RAMON. This software enables complete remote control of the receiver and storage of the monitoring results on the control PC (FIG 5).

## Additional information

Although it is already packed with features and functions, the R&S®EB500 is continuously being enhanced. Additional information is available on the Internet (search term: EB500). A comprehensive computer-based training program is available on DVD (see box above).

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