The new VHF/UHF Receiver R&S EM050 (FIGs 1 and 2) is another vital component in the state-of-the-art VXI receiver and analyzer family from Rohde & Schwarz, opening up the 20 MHz to 3600 MHz frequency range. It combines outstanding RF characteristics with the powerful signal processing of state-of-the-art technology.

New addition to tried-and-tested technology

For well over two years now, the VXI HF Receiver R&S EM010 [*] has proven a success on the market for the 300 Hz to 30 MHz frequency range. Its attractive characteristics coupled with easy system integration quickly sparked user interest in receivers designed for higher frequency ranges. Building on this success, the VHF/UHF Receiver R&S EM050 was developed to VXI standard (VXI: VME bus extension for instrumentation; VME: versa modular eurocard IEEE 1014); it is based on years of Rohde & Schwarz production expertise in the area of professional radio-monitoring receivers.

Wide dynamic range – high sensitivity

With the R&S EM050, great importance was placed on excellent large-signal characteristics and high sensitivity – two features that are crucial if numerous powerful transmitters “challenge” the receiver, or if weak signals in critical scenarios require unambiguous identification. The user quickly finds the correct settings for successful radio-monitoring even in a signal environment prone to interference. Furthermore, optimum receive conditions are ensured by matching preselection ranges with tracking or fixed bandpass filters.
**Powerful digital signal processing**

All intermediate frequencies are processed in powerful signal processors and field programmable gate arrays (FPGA). This technology allows the implementation of functions that are indispensable in modern radiomonitoring. The new receiver includes numerous filters, different evaluation methods for level measurements, matching time constants and a multitude of standard demodulators, to name just the most important features. Another advantage of this technology is the availability of signals or signal contents in digital form on different interfaces, which is a crucial aspect in system integration. One of the receiver’s special features is its front panel data port (FPDP) interface which has been designed for maximum data rates. Moreover, signal processing provides sufficient leeway for future expansions.

**Narrowband – wideband**

Up to now, different applications required different receivers. The R&S EM050, however, is capable of processing both narrowband and wideband transmissions without any performance loss. Its digital IF filters with bandwidths between 150 Hz and 2 MHz plus numerous internal demodulators allow the receiver to handle a multitude of signals; if it is connected to external DSP boards via the appropriate interfaces, it can also process complex signals. This combination opens up the full scope of analysis and demodulation of digital signals.

Yet this is by no means all that the R&S EM050 can do. Transmission methods such as used with bandspread signals (DSSS: direct sequence spread spectrum), frequency-varying emissions (FH: frequency hopping) or pulsed signals require even wider bandwidths.

Together with a wideband DSP board that is connected to the wideband IF output of the receiver, the latter can reliably detect such signals and make them accessible for further processing. But optimum signal analysis is not much use if the signals are not detected. Such tasks require high scan rates, which are no problem with the wideband combination of receiver and DSP board since scan rates in the two-digit GHz range can be easily achieved, depending on the settings made.

**Large systems – small systems**

The R&S EM050 is designed for multi-channel receive and analysis systems that are used in state-of-the-art radiomonitoring, for example in the powerful R&S AMMOS® monitoring system from Rohde & Schwarz (page 56). Its automatic, parameterized processes allow users to handle the enormous data flow and to detect and analyze signals of interest without incurring any loss. R&S AMMOS® of course fully controls the R&S EM050. The modular design of the system enables the user to start on a small scale and expand the system step by step; there are no limits to performance.

The new receiver offers decisive advantages, and not only in larger systems, but also in smaller-sized units, because the diverse hardware and software combinations that are feasible allow optimum adaptation to the tasks at hand. Simply combining a receiver with different DSP boards from Rohde & Schwarz and the associated software opens up an unprecedented variety of functions in radiomonitoring. This flexibility yields even more advantages because the user gets everything from a single source plus the guarantee that everything fits together.

![FIG 2 State-of-the art DSPs and FPGAs on a multilayer with 10 layers ensure extremely powerful signal processing in the R&S EM050. The rear is for the VXI bus only; everything else can be accessed from the front panel.](image)
The user can, of course, personally integrate the R&S EM050 into a monitoring system. The necessary interfaces and commands are detailed in the manual.

**Versatile applications**

Whether the R&S EM050 is integrated into large or small systems, it can handle a multitude of further applications in addition to the ones already mentioned, for example:

- Buffer memory for wideband signals
- Signal-specific detection
- Visualization of wideband spectra
- Monitoring of wideband frequency occupancy
- Statistics on frequency / level / time
- Replaying and reprocessing of recorded wideband signals

**Summary**

The R&S EM050 is a powerful receiver that will superbly accomplish the tasks at hand for many years to come. Since internal signal processing can be adjusted via software, the R&S EM050 is also ideal for handling future signal scenarios.

Christian Gottlob

---

**Main characteristics of the R&S EM050**

**Operating modes**

- Fixed frequency
- Memory scan
- Frequency scan
- Fast RF spectrum
- Replay (IF)
- Wideband
- Test

**Data output**

- Baseband signals (I and Q) in digital form; 10 MHz maximum bandwidth
- IF analog
  - f = 405.4 MHz, B_max = 50 MHz
  - f = 21.4 MHz, B = 10 MHz
- Video digital
- Video analog, B = DC to ½ IF bandwidth
- DAT recorder, AES3 format
- Audio digital
- Audio analog (600 Ω and headphones)

**Demodulation modes in fixed frequency operating mode**

AM, FM, CW, LSB, USB, ISB, PULSE, IQ

**IF bandwidth** is settable between 150 Hz and 2 MHz in 21 steps.

**Squelch** is settable from −30 dBµV to 130 dBµV in 1 dB steps.

**Gain control** is selectable: either automatic (AGC) or manual (MGC) gain control.

In **memory scan** mode, all relevant parameters can be set for each channel:

- Memory
- Frequency
- Demodulation mode
- Bandwidth
- Preamplifier / attenuator
- Squelch

In **replay mode**, recorded IF data can be fed via the data interface for post-processing.

In **test mode**, a comprehensive selftest is performed, either as a short or as a long test.

---

**Condensed data of the R&S EM050**

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Specification</th>
</tr>
</thead>
<tbody>
<tr>
<td>Frequency range</td>
<td>20 MHz to 3600 MHz</td>
</tr>
<tr>
<td>Second-order intercept point</td>
<td>typ: 55 dBm</td>
</tr>
<tr>
<td>Third-order intercept point</td>
<td>≥17 dBm (20 MHz to 300 MHz)</td>
</tr>
<tr>
<td></td>
<td>≥20 dBm (300 MHz to 3600 MHz)</td>
</tr>
<tr>
<td></td>
<td>≤12 dB (f &lt;2000 MHz)</td>
</tr>
<tr>
<td></td>
<td>≤15 dB (2000 MHz to 3000 MHz)</td>
</tr>
<tr>
<td>Noise figure</td>
<td>21 filters, 150 Hz to 2 MHz</td>
</tr>
</tbody>
</table>

**Digital IF filters**

21 filters, 150 Hz to 2 MHz

---

**More information at**

[www.rohde-schwarz.com](http://www.rohde-schwarz.com) (search term: AMMOS)

**REFERENCES**