EMI Measurement Software R&S® EMC32-E+

All-purpose software for complete EMI measurements

Electromagnetic interference fully under control

The new EMI Measurement Software R&S® EMC32-E+ – the successor to the tried-and-tested EMI Software R&S® ES-K1 – is the latest addition to the advanced 32-bit R&S® EMC32 software platform from Rohde & Schwarz and runs on the current Windows® 2000/XP operating systems. The R&S® EMC32-E+ is used to precisely and completely collect, evaluate and document RFI voltage, power and field strength. You can perform purely manual and partially or fully automatic measurements in accordance with either commercial or military standards. In addition to current EMI test receivers and spectrum analyzers from Rohde & Schwarz, the software also supports many earlier-model test receivers. You can also control a variety of EMI measurement equipment such as masts and turntables, MDS absorbing clamps, artificial mains networks and switch units for switching transducers and antennas.

Versatile with numerous features

The R&S® EMC32-E concept takes different operational requirements into account: Expert users can personally define all test templates and test parameters, while users who are less familiar with all standards and regulations can quickly obtain reliable and reproducible results by means of predefined test templates, limit lines and fully automatic measurements.

The upgraded EMI Measurement Software R&S® EMC32-E+ now offers a wider range of integrated templates and
covers the fields MIL-STD, automotive applications and RFI power measurement. In addition, capabilities for selecting parameters and adapting automated test sequences to the measurement task and environment at hand have been expanded. The number of links performing operations during a scan or sweep has been increased as well so that even the highest demands with respect to flexibility, measurement speed and interactivity can be met (FIG 1). Moreover, a backup/restore function was added to quickly and easily store measurement data and device configuration in cyclic intervals. Also new is the System Check function stipulated by military standards in conjunction with a signal generator for verifying the signal path, for example (FIG 2).

The software offers the following predefined measurement types, including the corresponding limit lines and analysis methods for automatic EMI measurements:

**Conducted EMI**
- RFI voltage with probe (individual measurement point)
- RFI voltage with artificial mains network (single-phase, two-line and four-line systems)
- RFI current with current probe (individual line)
- RFI power with absorbing clamp and slideway
- RFI current with current probe in compliance with MIL-STD-461C/D/E
- RFI voltage/RFI current in compliance with EN55025 (automotive)
- System check with direct or coupled signal supply

**Radiated EMI**
- Electric field strength with antenna mast and turntable
- Electric field strength with the Shielded TEM Cell R&S S-LINE including open-area correlation
- Electric field strength with GTEM cells (GHz transverse electromagnetic cells) including open-area correlation
- Magnetic/electric field strength in compliance with MIL-STD-461C/D/E
- Radiated emission with antenna in compliance with EN 55025 (automotive)
- System check with direct or radiated signal supply

**Normalized site attenuation (NSA)**
- Determination of normalized site attenuation using broadband antennas or
- Tuned half-wave dipoles

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**FIG 1** Any phase of a scan or sweep can be linked with specific actions. These actions include the display of messages during the test sequence, adjustable delays, and the programming or remote control of other instruments, e.g. via USB or IEC/IEEE bus interface.

**FIG 2** Configuration settings for performing measurements in compliance with MIL-STD-461E RE102 (radiated emission) in the System Check view, and entry window for the System Check parameters.
Optimum adaptation of automatic EMI measurements

An automatic test sequence contains the following phases regardless whether RFI voltage, RFI power or RFI field strength is being measured: prescan measurement, data reduction, maximization measurements, final measurement and report generation. R&S®EMC32-E+ offers very flexible test phases and can be adapted to widely different test conditions and specifications: Instead of performing a new, time-consuming prescan measurement, you can use an existing prescan result. This allows you, for example, to evaluate data whose limit line has changed compared to the previous measurement or to perform an evaluation using other settings for data reduction, frequency optimization and/or mast and turntable positions (FIG 3).

Instead of using the data reduction result, you can also apply an existing final measurement result obtained from a previous measurement. This is useful, for example, if you merely want to repeat the final measurement. The subsequent test phases for making the level or frequency more precise are then optional.

Another way to adapt the automatic test sequence to special specifications is to replace the data-reduced and frequency-optimized prescan measurement points with an existing frequency list, which enables you to analyze specific frequencies, for example. You can also add a frequency list to the frequency points that have already been determined (FIG 3).

Except for certain tests specified by MIL-STD-461C and with S-LINE and GTEM cells, data reduction itself consists of searching for the local frequency maxima within the specified subranges and, if additionally required, performing peak reduction based on a definable number of maximum levels, e.g. to detect conspicuous narrowband interferers. The subsequent acceptance analysis excludes irrelevant points. Finally, it is also possible to perform maxima reduction in order to limit the total number of final test points (FIG 4).

By selecting “Interactive data reduction”, you can again edit the data reduction result table and change the list of frequencies to be analyzed.

If you activate “Flexible test flow”, a dialog allows you to skip the rest of the test sequence for the current frequency subrange after data reduction has been completed and then immediately continue with the next subrange.

For certain tests specified by MIL-STD-461C, data reduction starts by differentiating between narrowband and broadband interferers in accordance with the tuning method or by performing a peak/average comparison. The remaining steps and the final evaluation with the narrowband/broadband limits are then performed separately for the two result tables (FIG 5).

Future-proof for many years to come

The modular design of the 32-bit R&S®EMC32 software platform and the flexible device driver concept have proven to be successful with all existing modifications and expansions as well as in the development of new application-specific modules. Likewise, EMI Measurement Software R&S®EMC32-E+ can be quickly and reliably adapted to future measurement tasks, amendments to standards or new hardware requirements.

Summary

Anyone who performs computer-controlled EMI measurements using state-of-the-art software expects the software to be a universal and convenient tool that can reliably collect, evaluate and document measurement results. In addition to being a time-saving tool, the software must also offer optimum reproducibility and accuracy of results. Further requirements include a clear operating concept, high stability and future-proofness. Moreover, automatic EMI measurements require the software to be easily adaptable to a variety of measurement tasks and individual measurement environments. This means that the software manufacturer must be highly experienced in the area of software design and development. The clear solution to all these requirements is the EMI Measurement Software R&S®EMC32-E+.

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REFERENCES
FIG 3  Test template editor for an automatic RFI field strength measurement. The editor shows setting elements for the parameters required for data reduction, frequency and level optimization including mast/turntable positioning, final measurement and report generation. Instead of the prescan measurement, an existing measurement result is used. In addition to the frequencies determined from data reduction and frequency zoom, the values from a separate frequency list are added for further analysis.

FIG 4  General data reduction editor: The subrange maxima reduction (lower path) and/or peak reduction with optional limitation to a predefined number of results (upper path) are followed by an acceptance analysis with reference to user-selectable limit line(s) and a further optional maxima limitation. Moreover, the result can be edited during the measurement (“Interactive data reduction”). By activating “Flexible test flow”, you can skip subsequent steps in the test sequence, if required.

FIG 5  Data reduction editor for MIL-STD-461C with narrowband/broadband determination using the tuning or Pk-AV method: The narrowband points are evaluated with the narrowband limit value after being limited to a fixed number. By means of subrange minima reduction, supplementary noise points are added to the number of broadband points defined per octave wherever broadband interference was not found. The broadband correction referenced to 1 MHz or the resolution bandwidth is followed by the evaluation using the broadband limit.