More effective than ever: R&S®EMC32 EMC measurement software with new enhancements

New options for increasing the automation and flexibility of test sequences, for measuring antenna radiation patterns and for integrating the software into laboratory management systems make the R&S®EMC32 EMC measurement software even more versatile. It is therefore no surprise that this powerful tool for electromagnetic interference (EMI) and susceptibility (EMS) measurements, with more than 2000 licenses sold worldwide, is the market leader for automatic EMC testing in all relevant sectors and standardization fields.

Greater efficiency in the EMC test lab
EMC test labs have to face major challenges if they are to prevail against their competitors now and in the future. It is not enough to merely reduce costs, for this may result in a deterioration of the service provided. It makes much more sense to free up unused resources through higher measurement automation and by integrating the tests into the overall laboratory workflows. This is the only way to fully utilize test stations, improve the quality of work and respond flexibly to customers’ wishes.

The new options for the R&S®EMC32 software make users ideally prepared to meet these requirements:

- **R&S®EMC32-K11**
  Test plan generation and automatic test sequence control with test sequencer

- **R&S®EMC32-K21**
  Automation of additional measurement tasks using macro language

- **R&S®EMC32-K22**
  Measurement of RF radiation patterns of antennas and EUTs

- **R&S®EMC32-K8**
  Interface to laboratory management systems

Automated testing with the R&S®EMC32-K11 EMC test sequencer

The R&S®EMC32-K11 option increases efficiency and measurement throughput. It adds a test sequencer to the R&S®EMC32-S (EMS) and R&S®EMC32-EB (EMI) basic packages and offers the following functions:

Improved automation through sequential execution of measurements

The test sequencer (FIG 1) increases the productivity of a test system by combining individual EMC measurements into a test sequence, which yields an automated flow of measurements. It covers all types of tests ranging from EMI to EMS and also includes the new test methods, i.e. measurement of RF radiation patterns and automation of additional measurement tasks using macro language. The EUT can automatically be switched to the desired operating status by actions at the beginning and end of a test, e.g. starting the call setup in the respective communications band (GSM900, GSM1800, WCDMA, etc.).
**Test plans for different EUT categories**
The test sequencer allows individual tests in a sequence to be repeated or skipped, providing the necessary flexibility to save test plans for different EUT categories in R&S®EMC32. This results in a higher standardization of test sequences in the lab and improves throughput. The test sequencer is integrated into the operating concept of R&S®EMC32’s virtual instrument, giving the user an overview of the current measurement, of test results (PASS/FAIL) already obtained, and of the tests in the sequence still to be completed.

**Individual test reports and test reports covering multiple measurements**
The software is also versatile when it comes to generating test reports: For a test sequence, it automatically creates test reports for individual measurements as well as a comprehensive test report covering all or selected measurements. The content of the reports can be visualized as desired by including graphics and tables.

**Automation of additional measurement tasks with the R&S®EMC32-K21 option**
Development labs often have to carry out measurement tasks in addition to the actual EMC measurements. In most cases, the T&M equipment required for these measurements is already integrated in the EMC test system. The R&S®EMC32-K21 software option makes it possible to automate these measurements with little effort, increasing the speed and reproducibility of the test sequence.

**Seamless integration of additional measurement tasks into the R&S®EMC32 operating concept**
The test sequences created with the integrated macro language are available as test templates and fit seamlessly into the general R&S®EMC32 operating concept for test execution and test report generation. Measurement results are stored in the EUT-specific R&S®EMC32 data structure. As a result, the execution and documentation of these additional test sequences can also be standardized. The R&S®EMC32-K11 option makes it possible to combine these test sequences into an overall test program sequence.

**Intuitive macro language for test sequence control**
For the creation of program sequences, the integrated macro language (FIG 2) provides the basic functions of a programming language as well as high-level functions to perform the following tasks:
- Branching and looping
- Use of variables
- Mathematical operations
- Generation and editing of result tables
- Generation of graphics and representation of results
- Call of subroutines

**Wide range of actions during EMC measurements**
The created macros can not only be used for performing independent tests, they can also be executed as actions during an EMC test, for example at the start or end of a measurement or when EUT errors occur. The transfer of parameters to the macro makes it possible, for example, to switch EUTs to a specific operating status or reset them to a defined status after an error has occurred. Of course, these actions can also be used for a variety of other tasks, such as processing of measured data in order to generate additional result graphics.
Versatile use

The macro language opens the door to a wide range of T&M applications. Typical applications include:

- Setup of communications link with the EUT
- Monitoring of transmission signal with a spectrum analyzer in Max Hold mode
- Analysis of occupied band on spectrum analyzer
- Measurement of total harmonic distortion (THD) on FM receivers of mobile phones while GSM and UMTS transmitters are active at the same time
- Measurement of additional EUT and environmental parameters

Measurement of RF radiation patterns with the R&S®EMC32-K22 option

In combination with the R&S®EMC32-EB basic package for EMI measurements, the R&S®EMC32-K22 software option makes it possible to measure the RF radiation patterns of antennas and EUTs (FIG 3). The EMC measurement system can therefore also be used for antenna measurements. The following types of measurements are available:

Measurement of passive and integrated antennas

When measuring the RF radiation pattern of passive antennas, the transmit antenna is fed by a generator controlled by...
Example: structure of a test lab

- **Laboratory management system**
  - Recording orders
  - Defining test plans

- **Reporting system**
  - Generating test reports

- **Database**
  - Test plan definitions, test plans, test results, test reports

- **Test stations equipped with the R&S®EMC32 EMC measurement software**
  - Reading test plans, executing tests, saving results

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R&S®EMC32. To measure the RF radiation pattern of an EUT in a specific plane, the EUT is rotated and the emission values are determined. The user can individually define the test sequence order (frequency loop, turntable position, polarization). Measured values are displayed for each polarization in a separate polar diagram; a result trace is generated for each test frequency across the turntable’s range of rotation. The EUT can be set to the desired azimuth position either in steps or continuously.

**Measurement at critical frequencies in an EMI test**

R&S®EMC32-K22 enables users to measure frequencies at a defined spacing, or process user-defined frequency lists. In EMI measurements, therefore, it helps users make a detailed spatial analysis of the RF radiation patterns of an EUT at predetermined interference frequencies.

**Optimized test methods for measurements on mobile phones**

In combination with the R&S®EMC32-K2 option, the following additional functionality is available for RF radiation pattern measurements:

- Automatic setup of a communications link by a network simulator (e.g. the R&S®CMU200 universal radio communication tester)
- Monitoring of communications during the measurement and call clearance at the end of the measurement
- Additional measurement loop for the mobile phone’s elevation positioning
- Measurement loop either across all harmonics of the carrier or across selected communications channels

**Automatic analysis of measured data**

The integrated analysis functions provide the following result tables at the end of a measurement:

- The minimum / maximum / average level over a rotation is calculated for each polar diagram and each test frequency
- The position of the radiation minimum and maximum is determined for each test frequency of the entire measurement

These tables can be automatically included in the test report.
Seamless integration into the test lab workflow with the R&S®EMC32-K8 option

Test houses often use laboratory management systems (LMS). These include software packages for mapping, structuring and standardizing all workflows in the lab. The R&S®EMC32-K8 option developed by Rohde & Schwarz for the R&S®EMC32 measurement software is an interface to the most important LMS software packages. It allows EMC measurements to be seamlessly integrated into the overall test plan of an EUT and simplifies the acquisition, analysis and transfer of measured data.

Integration of test plan and test result structure into R&S®EMC32

The interface makes it possible to transfer all relevant test plan and EUT data from the LMS to the R&S®EMC32 measurement software, to display the test result structure of the LMS software in the R&S®EMC32 Explorer and to save the R&S®EMC32 test data in the LMS software. As a result, all LMS data relevant to EMC testing is available on the appropriate test station. R&S®EMC32 users can work in the local test structure with subdirectories and tests as well as in the LMS test structure. From both environments, tests can be called up, redefined and saved.

Transfer of test results for report generation in the LMS

By providing test result components such as graphics and tables for report generation in the LMS, lab management and test tasks can be ideally combined. Users benefit from the reliable, error-free transfer of measured data to the LMS test report, the acceleration of processes, and easier comparison of measured data.

Test plan and data flow in an EMC lab

FIG 4 shows the typical network structure of a test lab in which R&S®EMC32 and an LMS are used. The information and data flow between the LMS and R&S®EMC32 is shown in FIG 5.
FIG 7 The R&S®EMC32 Explorer can display a test directory with the LMS data structure in addition to the local test directory.

R&S®EMC32 Explorer with display of the LMS data structure

If the R&S®EMC32-K8 option has been installed and there is a network connection to the LMS database, the R&S®EMC32 Explorer displays, in addition to the local test directory, a test directory with the LMS data structure (FIG 7).

Summary

Owing to its intuitive operating concept, the R&S®EMC32 EMC measurement software makes it easy to perform EMC measurements in all relevant sectors. This applies to measurements during development as well as to acceptance tests and certification measurements – from simple lab applications to complex test sequences in EMC test chambers.

The tried-and-tested modular concept implemented by the R&S®EMC32 options provides extensive capabilities for tailoring the software to various requirements, reducing costs and allowing future-oriented expansion (FIG 6).

Special options make it possible to maximize automation while integrating the measured data into a test house’s overall workflow. The resulting increase in throughput contributes to cost efficiency in the lab and the test house.

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<table>
<thead>
<tr>
<th>Type</th>
<th>Application</th>
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<tbody>
<tr>
<td>R&amp;S®EMC32-S</td>
<td>Basic package for EMS measurements</td>
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<tr>
<td>R&amp;S®EMC32-K1</td>
<td>Enhanced EMS functionality for automotive / MIL measurements</td>
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<tr>
<td>R&amp;S®EMC32-K2</td>
<td>Measurement of audio breakthrough and spurious emissions in wireless</td>
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<td></td>
<td>communications sector</td>
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<tr>
<td>R&amp;S®EMC32-K3</td>
<td>EMS measurements in reverberation chambers in line with EN 61000-4-21</td>
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<td></td>
<td>(requires R&amp;S®EMC32-K4)</td>
</tr>
<tr>
<td>R&amp;S®EMC32-K4</td>
<td>EMS auto test functionality</td>
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<tr>
<td>R&amp;S®EMC32-K6</td>
<td>Measurements in line with MIL-STD-461E CS103 / 4 / 5</td>
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<tr>
<td>R&amp;S®EMC32-K7</td>
<td>Generic drivers for RF generators, power meters and oscilloscopes</td>
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<tr>
<td>R&amp;S®EMC32-K8</td>
<td>Database interface to lab management systems</td>
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<tr>
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FIG 6 The R&S®EMC32 software has a modular structure, providing a wide range of capabilities to individually tailor the software to the tasks at hand.