

# All-purpose software for any EMS measurement task

R&S®EMC32-S is a powerful measurement tool to handle EMS measurement tasks in all relevant business sectors and standards. It covers commercial measurements, specific test methods conforming to the ETSI standards for radiocommunications equipment and all other important standards in the automotive and aerospace & defense sector. Moreover, it also takes into consideration a variety of manufacturer-specific standards and national adaptations of international standards. More than 1500 licenses sold worldwide make the R&S®EMC32 software platform a market leader in EMC testing.

## EMS measurements — more sophisticated and versatile than ever

Manufacturers and test houses have long been confronted with changing requirements in electromagnetic susceptibility (EMS) testing. Many EMC standards were not up-to-date and needed to be revised or adapted to meet the latest requirements: For example, the frequency ranges to be measured have been extended as a result of new wireless communications services. Moreover, products often have to comply with multiple EMC standards because many of today's instruments have been equipped with Bluetooth® or WLAN modules, for example. In vehicles, mobile communications are now part of everyday life.

Owing to its modular design, the R&S®EMC32-S EMC measurement software is specifically tailored to meet such

complex requirements. It can be customized by including additional measurement functions and support other measuring instruments. This means that EMC test systems can be expanded at minimum cost at any time and modified to meet the latest requirements. FIG 1 lists the typical applications and EMC standards and provides an overview of the corresponding R&S®EMC32-S options.

The R&S®EMC32 software platform can also be expanded to include EMI measurement tools and a test sequencer for performing individual measurements sequentially\*. It thus covers the entire range of EMC measurements — from simple lab applications through to complex test sequences in EMC test chambers.

\* All modules for the R&S®EMC32 software platform are listed in FIG 7 on page 61.

FIG 1 Applications, relevant standards and the expansion modules available for the R&S®EMC32-S EMC measurement software.

Application	Standards (Examples)	Required software options*
Industrial and domestic appliances	IEC / EN 61000-4-3, EN 61000-4-6	R&S®EMC32-S
Information technology	CISPR24 / EN 55024 IEC / EN 61000-4-3, EN 61000-4-6	R&S®EMC32-S
Medical appliances	EN 60601-1-2 / EN 60601-2-x	R&S®EMC32-S
Mobile communications	ETSI EN 301489-x / ETSI EN 300826	R&S®EMC32-S and R&S®EMC32-K2 (R&S®EMC32-K4 recommended)
Automotive	ISO 11451, ISO 11452 SAEJ 1113, SAEJ 551 2004/104/EC GMW3097 Feb 2004 Ford ES-XW7T-1A278-AC	R&S®EMC32-S and R&S®EMC32-K1 (R&S®EMC32-K4 recommended)
	Reverberation chamber EN 61000-4-21 GMW3097 Feb 2004 Ford ES-XW7T-1A278-AC	R&S®EMC32-S, R&S®EMC32-K1, -K3 and -K4
Aerospace & defense	MIL-STD-461E/F CS101, CS114, RS101 and RS103	R&S®EMC32-S and R&S®EMC32-K1 (R&S®EMC32-K4 recommended)
	MIL-STD-461E/F CS103, CS104, CS105	R&S®EMC32-S, -K1 and -K6 (R&S®EMC32-K4 recommended)
	RTCA / DO-160	R&S®EMC32-S and R&S®EMC32-K1 (R&S®EMC32-K4 recommended)

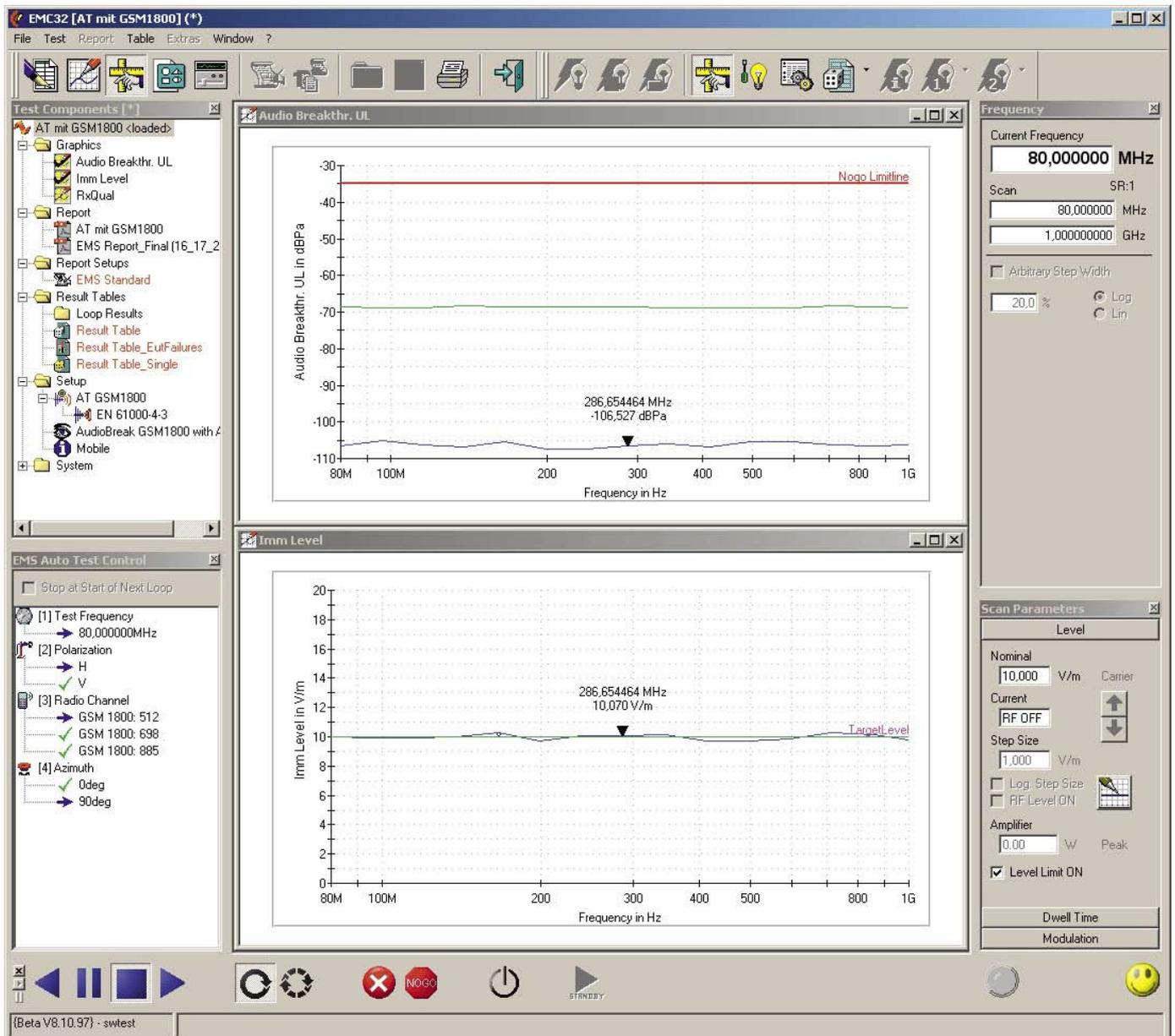


FIG 2 Clear and convenient: the R&S®EMC32-S EMC measurement software during an audio breakthrough measurement.

### R&S®EMC32-S EMC measurement software: versatile tool offering a variety of functions

R&S®EMC32-S is a leading software tool for determining immunity to conducted and radiated electromagnetic disturbance signals. Its intuitive GUI makes learning and operating the instrument quick and easy (FIG 2). The software is the ideal tool for both compliance and batch testing in scenarios with high EUT throughput. Likewise, it is used for measurements accompanying development where its versatility makes it irreplaceable. It comes in handy in applications that range from development and conformance testing through to production and quality assurance. Its key functions are as follows:

#### Structured test sequence owing to test templates

The test parameters for disturbance signal generation and EUT monitoring — like test report templates and EUT information (type, serial number, measurement conditions) — are centrally stored in a template library customized for the individual test setup. This makes tests reproducible and efficient. When starting the test, users simply need to select and combine the required templates. Even less experienced users quickly become familiar with the clear and easy operation.

## EUT-oriented measurement data storage with open data structure

R&S®EMC32-S makes the task of archiving and further processing measurement data particularly convenient: The measurement software stores all results (tables, graphics, log files) as well as the associated test templates for testing an EUT

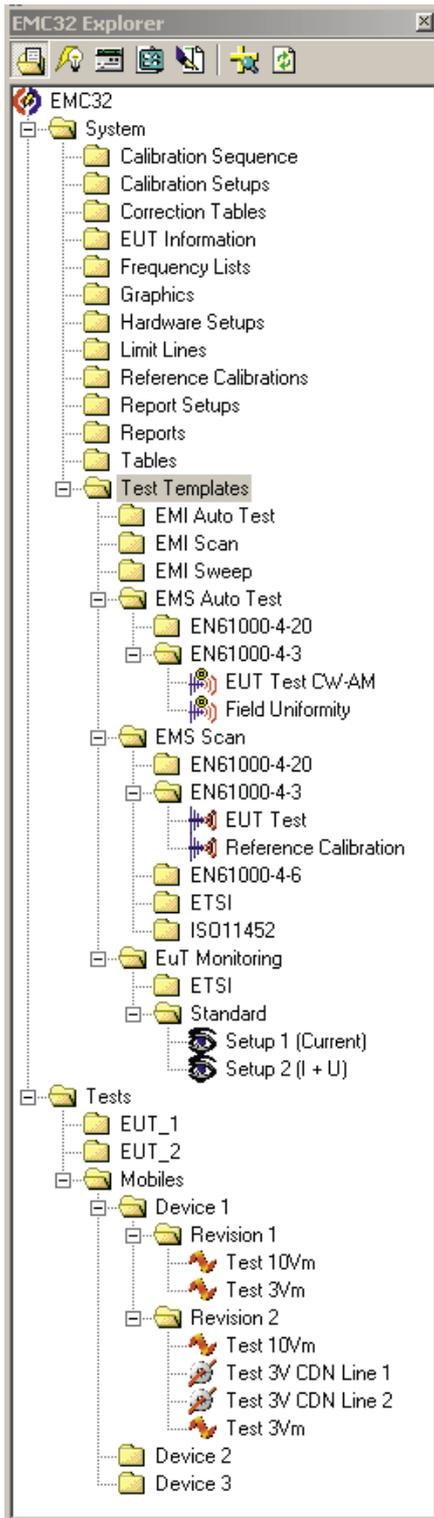


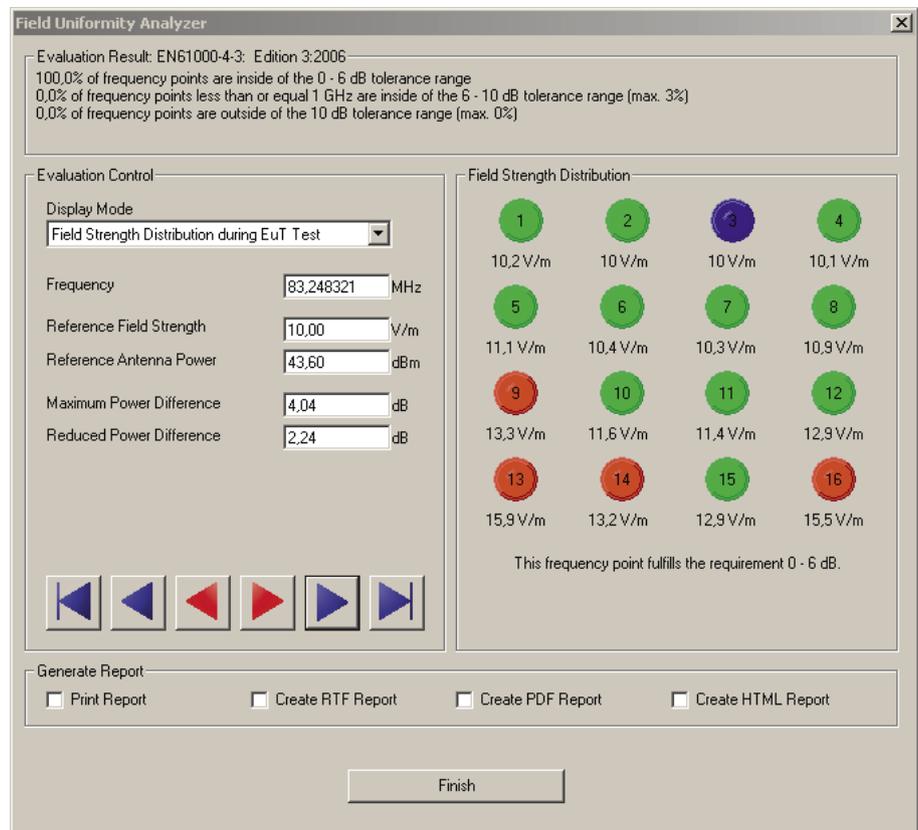
FIG 3 The software stores all the results in an EUT-oriented directory structure.

in an EUT-oriented directory in the Windows™ file system (FIG 3). Since all necessary settings are automatically documented, tests can be reproduced and repeated at any time.

## Convenient compilation of test reports and versatile post-processing of measurement data

The report editor in R&S®EMC32-S supports the user in compiling comprehensive test reports in RTF, HTML and PDF format. Moreover, measurement data and measurement settings (test templates) are stored in Unicode (ASCII) format and measurement graphics in WMF format. They can thus be imported into applications such as Microsoft™ Word. The software also provides important information such as path and file names in an information file for synchronizing the data transfer using a Microsoft™ Word macro. In order not to block the measurement system controller during test report compilation, a free-of-charge installation of R&S®EMC32 may be used.

FIG 4 Graphical field uniformity analyzer.



## Monitoring options

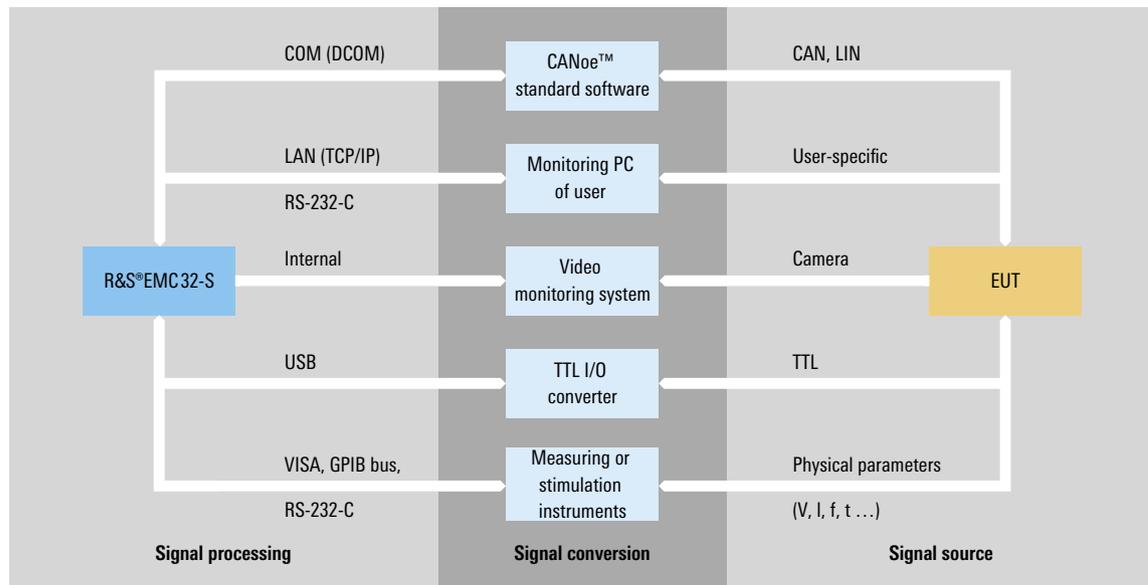


FIG 5 Overview of monitoring options using the R&S®EMC32-S EMC measurement software.

### Efficient measurement, calibration and monitoring functions

An efficient algorithm allows the fast generation of disturbance signals in accordance with the common substitution and closed-loop methods. The test run can be performed either automatically or in the single-step mode. Automatic runs are ideal for overview measurements and acceptance tests. In contrast, the single-step mode supports analysis by enabling the user to interactively change the frequency, level or modulation of the disturbance signal.

The straightforward calibration concept covers complete signal path calibration with a calibration sequencer as well as transducer and reference calibration. This helps ensure the easy replacement of system components, if required. The integrated device test, an amplifier test (max. power and amplifier saturation) and the system monitoring function activated during a test run round out the monitoring functions.

### Intensive backup through worldwide support

The R&S®EMC32-S EMC measurement software supports the user with a comprehensive, context-sensitive online help facility. It also includes application notes for performing the tests in accordance with the most important EMS standards. Further backup is provided 24 hours a day worldwide by the Rohde&Schwarz support centers.

### Measurements in line with IEC / EN standards (commercial)

The basic configuration of the R&S®EMC32-S software fully supports EMS measurements in line with the generic EN 61000-4-3 standard (electrical field in absorber chamber) and EN 61000-4-6 (disturbance voltage/current with coupling / decoupling network (CDN) and bulk injection current clamp) and offers the following key functions:

#### Comprehensive evaluation of field uniformity

The software allows a standard-compliant graphical evaluation of field uniformity (FIG 4). It also provides important auxiliary information (e.g. reference point and field-strength distribution) that is essential for weighting the performance of the test chamber. The R&S®EMC32-K4 option enables the user to automate the reference calibration across all measurement points. In this case, the field probes are either automatically put into place by using a positioning device or interactively by the user.

#### Synchronization with external monitoring software

Apart from EUT monitoring with measuring instruments (FIG 5), the software also supports communications with external EUT monitoring software. R&S®EMC32-S sends current disturbance signal data (frequency, level, polarization,

etc.) to the external monitoring software via a command-based interface (TCP/IP, RS-232-C) and, in return, receives the EUT status. In the simplest case, this is a Go/NoGo message but can also involve comprehensive information. If required, the external monitoring software can deactivate the disturbance signal via the interface and then set the EUT to a defined state. Another application of this function is to insert disturbance signal parameters into a video signal, for example, by using appropriate hardware.

### User-definable actions during the test run

By user-definable actions, the test run can be adapted to the requirements of the EUT or test (e.g. at the start / stop of a test or at each test frequency). Such actions may, for example, include controlling or resetting the EUT, outputting comments or operating instructions, starting other applications and sending network messages.

### Measurements in the automotive sector

The R&S®EMC32-K1 option expands R&S®EMC32-S by EMS measurements on automotive components and vehicles in line with ISO 11451 / ISO 11452, SAE and relevant manufacturer-specific standards. Both for disturbance signal generation and EUT monitoring, this includes the following specific functions:

#### Integrated method for disturbance level control

The test specifications for conducted susceptibility BCI (bulk current injection) provide for the measurement of amplifier harmonics and the limiting of the current disturbance level. R&S®EMC32-S controls the monitoring of the harmonics by means of a spectrum analyzer or measuring receiver.

The R&S®EMC32-K1 option can generate special radar pulse signals and measure their power as stipulated by some test specifications (e.g. GM and Ford standards, see FIG 1).

#### Automatic determination of immunity thresholds

Even in the development phase, it is important to determine the maximum susceptibility versus frequency. The R&S®EMC32-K1 option offers extensive monitoring capabilities to automate this measurement task. It separately detects EUT errors during a measurement and determines the immunity threshold.

#### Automation by means of sequential measurements for different modulation modes

By means of sequential measurements, the R&S®EMC32-K4 option supports the automation for multiple modulation modes (e.g. CW / AM / FM), different antenna polarizations, turntable positions and EUT states. The software performs a worst-case analysis of all EUT errors.

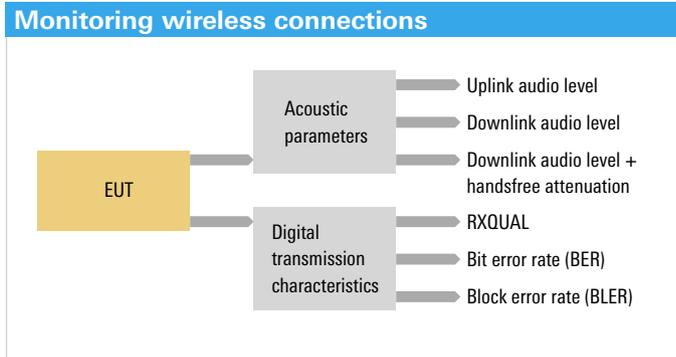


FIG 6 The R&S®EMC32-S EMC measurement software offers a variety of alternatives for monitoring the wireless connections of an EUT.

### Flexible CAN and LIN bus monitoring

In state-of-the-art vehicles, electronic subassemblies communicate primarily via CAN or LIN bus systems. These buses are used to monitor the functions of the individual components and those of the overall system. The R&S®EMC32-K1 option provides an interface to the CANoe™ standard software (FIG 5) via which data can be sent to a specific subassembly on the bus and parameters such as wheel / engine rpm or indicator light frequency can be queried.

### Measurements on wireless terminals

EMS measurements on wireless terminals are carried out in accordance with the ETSI EN 301489 family of standards (FIG 1). To do so, the disturbance signal is generated in line with the generic standards EN 61000-4-3 and EN 61000-4-6. Depending on the relevant wireless communications standard (e.g. 2G, 3G, WLAN, WiMAX™, Bluetooth®), the R&S®EMC32-K2 software extension allows the measurement to be performed using the following functions:

#### Automatic setup and monitoring of communications

The device drivers integrated in the R&S®EMC32-K2 option for the R&S®CMU200, R&S®CMW270, R&S®PTW70 and R&S®CBT communications testers from Rohde&Schwarz help ensure the defined setup of communications (voice and data) when the testers are started and help monitor active communications during the measurement.

#### Easy audio calibration for audio breakthrough measurements

As the first step, EMS measurements of voice connections require an audio calibration during which the reference AF levels are measured at a defined useful audio level. The integrated audio calibration wizard supports the user when measuring the uplink and downlink reference level as well as the headset offset. The measurement results are stored in the EUT information file together with the EUT information.

### Comprehensive monitoring of EUT functions

Depending on the type of connection (data or voice connection), the monitoring function of the R&S®EMC32-S EMC measurement software supports the measurement of the corresponding parameters by using the relevant communications tester or audio analyzer (FIG 6). As for voice connections, the audio reference values for the specific wireless communications standard are automatically taken from the EUT information file. If a measured value exceeds the permissible limit, the standard describes a method used to assess whether this failure only occurs in a narrowband frequency range or if it is broadband. For this purpose, the disturbance frequency is reduced and increased by defined offsets and the measurement is repeated. The software automatically varies the frequency and enters a note in the result table indicating whether the effect is narrowband or broadband, since narrowband interferers may be neglected.

### Automatic tests covering multiple wireless communications frequency bands

The R&S®EMC32-K4 option further automates wireless communications measurements by defining additional loops for wireless communications band, polarization and turntable position to be included together with the measurement loop for test frequencies. An automatic handover is performed when the wireless communications frequency band is changed.

### Measurements on components from the aerospace & defense sector

EMS measurements on military equipment and aircraft components in line with the major EMC standards MIL-STD-461E/F and DO-160E place exacting demands on the measurement software since, during these measurements, various disturbance signals have to be generated over a wide frequency range using different methods. The R&S®EMC32-K1 option smooths out these measurements so that they are no problem at all.

### Easy intermodulation measurements on transmitting and receiving equipment

The R&S®EMC32-S software together with the R&S®EMC32-K6 option supports the measurement method for intermodulation measurements in line with sections CS103 / 104 / 105 of MIL-STD-461E/F. It controls up to three signal generators in parallel that generate the required useful signal for the EUT as well as a simulated external disturbance signal.

### Alternative EMS measurement in reverberation chambers

Reverberation chambers are an alternative to anechoic chambers as they allow high field strengths to be generated

at a favorable price. A reverberation chamber is basically a cavity resonator in which a statistically homogeneous and isotropic electrical field is generated by a stirrer. If the R&S®EMC32-K3/-K4 options have been installed, the R&S®EMC32-S software supports these measurements in line with MIL-STD-461E/F and the commercial generic EN 61000-4-21 standard. Chamber calibration (unloaded / loaded), loading the chamber by the EUT (for each new EUT setup) and the actual EUT test are included.

### Summary

Owing to its intuitive operating concept, the R&S®EMC32-S EMC measurement software allows users to easily perform EMS measurements in any EMC-relevant sector. This applies to measurements accompanying development and also to acceptance tests and certification measurements. The wide range of options enables users to modify an EMC test system to meet the latest requirements. Various alternatives for monitoring the EUT allow largely automated immunity testing, thus reducing costs and increasing throughput in the EMC lab or test house. Since the tried-and-tested option concept (FIG 7) also includes expansions to handle emission measurements, investing in R&S®EMC32-S is definitely worthwhile and future-oriented.

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Further information at [www.emc32.rohde-schwarz.com](http://www.emc32.rohde-schwarz.com)

Type	Application
R&S®EMC32-S	Basic package for EMS measurements
R&S®EMC32-K1	Enhanced EMS functionality for automotive / aerospace / MIL measurements
R&S®EMC32-K2	Measurement of audio breakthrough and spurious emissions in the wireless communications sector
R&S®EMC32-K3	Expansion modules for performing measurements in reverberation chambers in line with EN 61000-4-21 (R&S®EMC32-K4 also required)
R&S®EMC32-K4	EMS automatic test functionality
R&S®EMC32-K6	Measurements in line with MIL-STD-461E CS103 / 4 / 5
R&S®EMC32-K7	Generic driver for RF generators, power meters and oscilloscopes
R&S®EMC32-EB	Basic package for emission measurements
R&S®EMC32-K10	EMI automatic test functionality
R&S®EMC32-K11	Sequencer for EMC measurements
R&S®EMC32-K21	Application interface

FIG 7 Modules for the R&S®EMC32 software platform.