

ROHDE & SCHWARZ

Make ideas real



EMC SYSTEM SOLUTIONS FROM ROHDE & SCHWARZ

Customized EMC test system solutions

Brochure | Version 03.00



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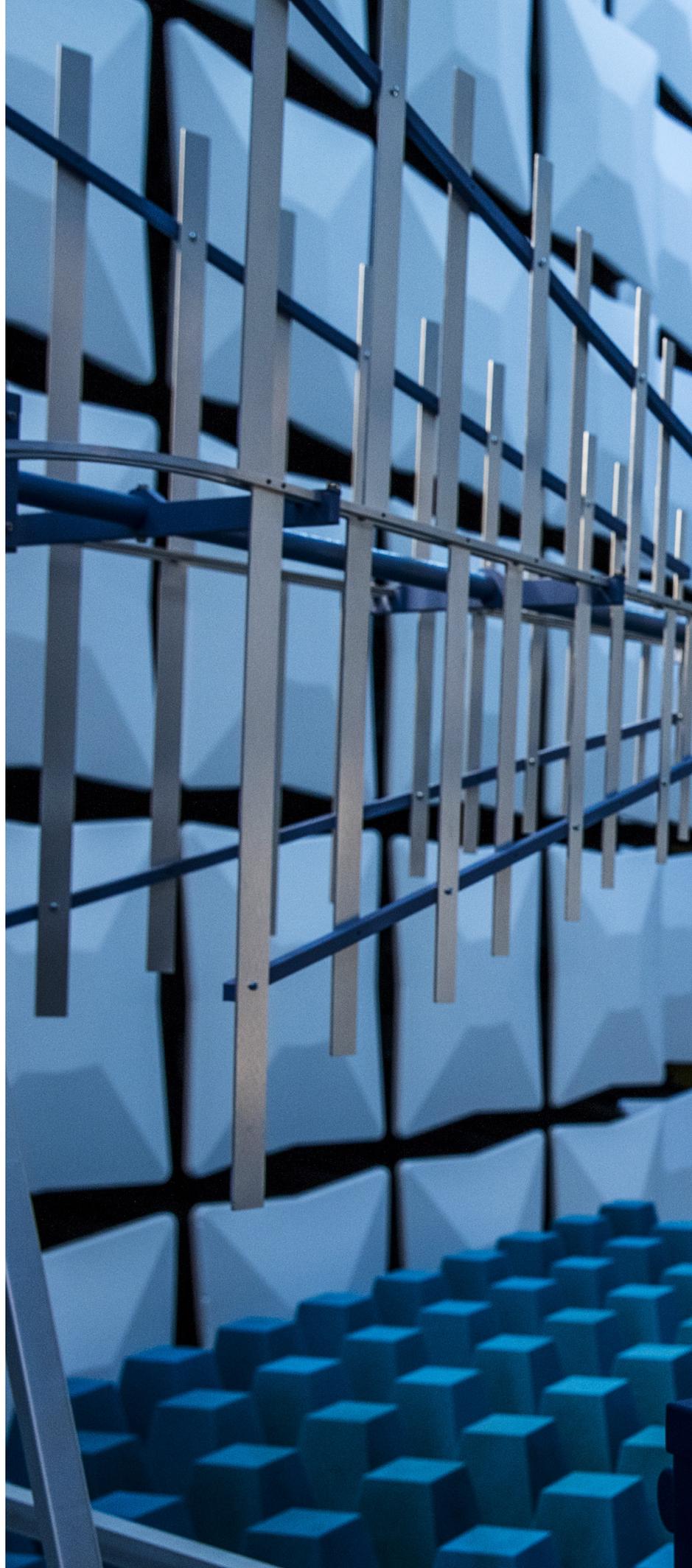
R&S®AdVISE visual inspection software

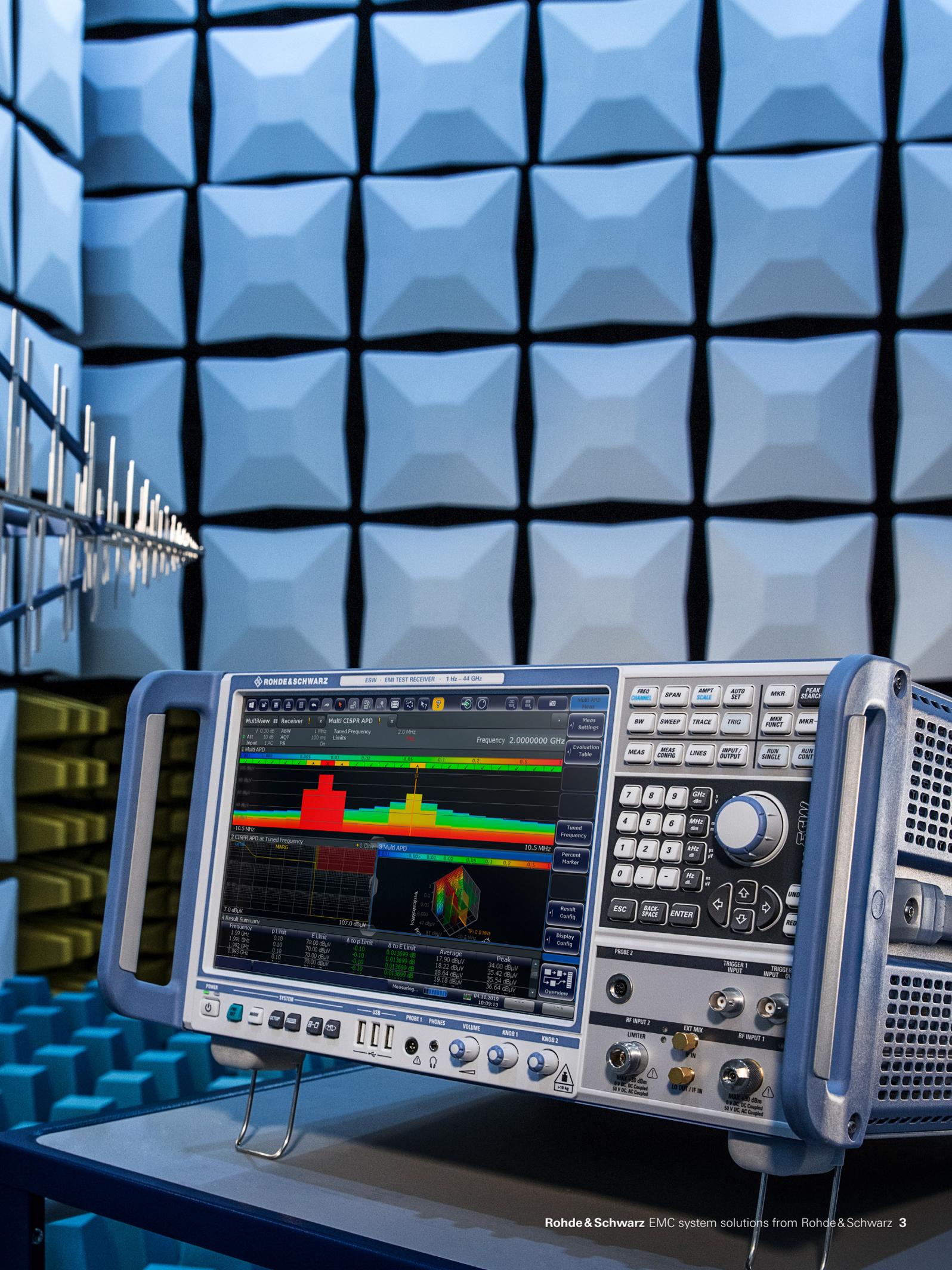
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System components

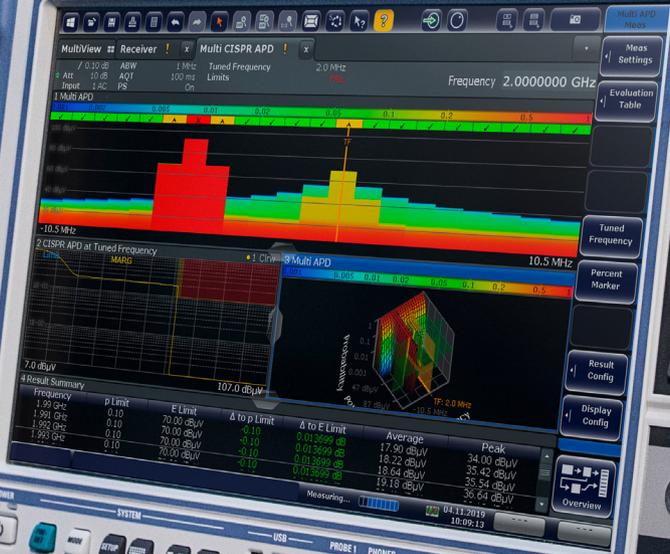
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ROHDE & SCHWARZ ESIW · EMI TEST RECEIVER · 1 Hz – 44 GHz



FREQ CHANNEL SPAN AMP SCALE AUTO SET MKR PEAK SEARCH

BW SWEEP TRACE TRIG MKR FUNCT MKR

MEAS MEAS CONFIG LINES INPUT OUTPUT RUN SINGLE RUN CONT

7 8 9 GHz -8m

4 5 6 MHz -8m

1 2 3 kHz -8m

0 . - Hz -8m

ESC BACK SPACE ENTER

PROBE 2 TRIGGER 1 INPUT TRIGGER 1 INPUT OUT

RF INPUT 2 EXT MIX RF INPUT 1

LIMITER

MAX 30 dBm
0 V DC, AC Coupled
50 V DC, AC Coupled

MAX 300 dBm
0 V DC, DC Coupled
50 V DC, AC Coupled

ROHDE & SCHWARZ HAS ...

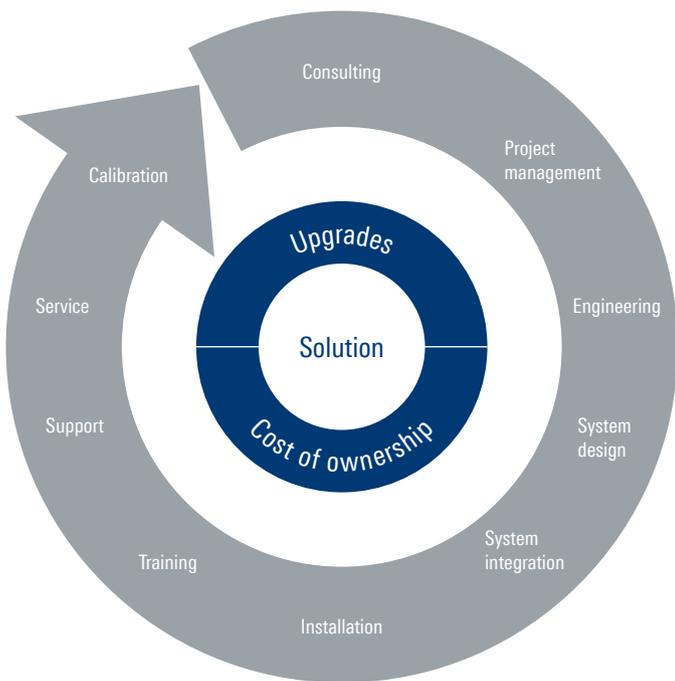
EMC test systems from Rohde & Schwarz test electrical devices and equipment for compliance with applicable EMC standards. As the industry-leading supplier of EMC T&M equipment, Rohde & Schwarz offers solutions for measuring electromagnetic interference (EMI) and electromagnetic susceptibility (EMS).

Do you need to perform standard-compliant EMC testing in line with civil, military, automotive or aerospace standards? Or are you faced with the challenge of radiated spurious emissions and audio breakthrough measurements in line with ETSI and FCC standards?

Would you like a system solution that includes consulting, planning, integration, acceptance and training – all from a single, reliable manufacturer?

Do you need a small system to perform conducted or pre-compliance tests, or a fully equipped, automated test system that can also handle radiated measurements?

Are you looking for a reliable partner who will continue to support you after system handover?



Rohde & Schwarz offers

- ▶ Professional support in determining your requirements
- ▶ Integration of existing T&M equipment into new EMC test systems; enhancement of existing test systems
- ▶ Delivery of all-in-one, turnkey solutions, including T&M equipment and anechoic chambers
- ▶ Consulting, planning, integration and training by experienced system engineers
- ▶ Uniform field area (UFA) field level setting
- ▶ Optimal on-site, after-sales expert support

Your benefits

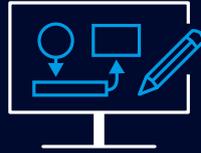
- ▶ An EMC partner who ensures that your test system complies with the latest standards and regulations
- ▶ Cost savings through integration of existing T&M equipment
- ▶ Time and cost efficiency thanks to automated solutions from a single source
- ▶ A partner for project management and integration
- ▶ Maximum availability of your EMC test system

... THE RIGHT SYSTEM FOR YOUR REQUIREMENTS



SYSTEMS OF ALL SIZES

We supply everything from small precompliance systems through standard-compliant, fully automated systems including the test chambers.



SYSTEM DEFINITION

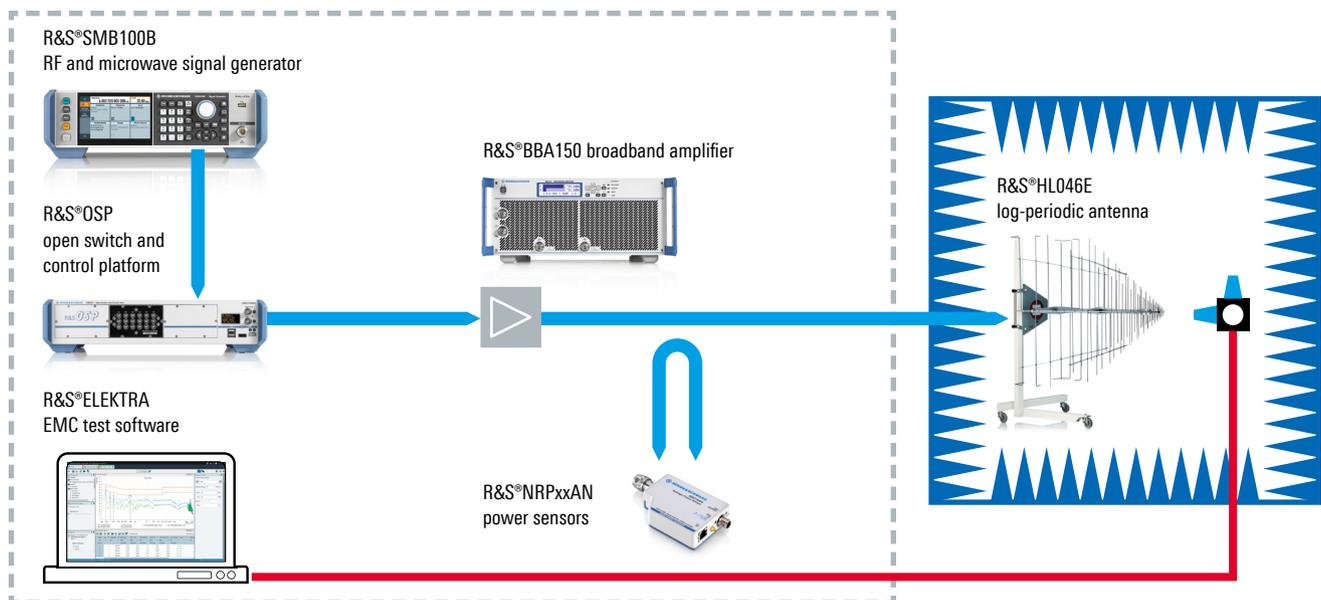
Our experts are familiar with common EMC standards. They will be pleased to offer you advice and define critical components such as amplifiers, antennas, test receivers and low-loss RF cables.



SYSTEM INTEGRATION

Our EMC system engineers ensure correct and seamless on-site integration of your EMC system and provide professional training.

Typical system from Rohde & Schwarz for commercial EMS tests



BENEFITS IN DETAIL

Professional support in determining your requirements

The Rohde&Schwarz EMC specialists and sales engineers will provide a turnkey EMC test system tailored to your needs while ensuring compliance with current standards and compatibility with your existing test equipment. All system components are harmonized. You will receive a future-proof EMC test system.

All-in-one solution including T&M equipment and anechoic chambers

We provide an all-in-one solution, including T&M equipment and anechoic chambers. The Rohde&Schwarz product portfolio encompasses all T&M key components. Since we work very effectively with other major suppliers in the EMC industry, we can procure any additional components that may be required, such as anechoic chambers in line with your specifications.

Consulting, planning, integration and system training by experienced engineers

When you decide on an EMC system solution from Rohde&Schwarz, our experts will work with you to clarify any technical issues that may arise and create a project schedule through to system handover. Our experienced EMC system engineers will provide project management support during the implementation phase.

Our engineers will integrate and commission your system on site and will be on hand to assist you during your first measurements. Following system installation, our engineers will provide comprehensive training on your new system.

Uniform field area (UFA) field level setting

On request, we will carry out UFA field level setting for you. This is a complex process that may take up to two days. Alternatively, Rohde&Schwarz can provide you with the T&M equipment required for this process in order to lower your costs.

Optimal on-site, after-sales expert support

You will receive documentation for your system when it is handed over, and our experts will be available to answer any further questions you may have. Rohde&Schwarz offers various service level agreements, including on-site service by specially trained technicians to maximize the availability of your EMC test system. Our sales engineers will be happy to go over the available options with you and provide you with an individual quote.







RADIATED IMMUNITY TESTS IN LINE WITH EN 61000-4-3

Test systems in line with EN61000-4-3 determine the immunity of electrical and electronic equipment (EUT) against high-frequency electromagnetic fields so that a CE mark can be obtained. Rohde&Schwarz supplies systems for all EUT sizes and field strengths up to 30 V/m + 80% amplitude modulation. Multiple configurations enable tests from 80 MHz to 1 GHz, 3 GHz or 6 GHz without changing antennas. The system's frequency range and field strength can be extended at any time. Immunity tests in line with EN61000-4-3 can be performed even in the most compact anechoic chambers.

On request, our EMC system engineers will carry out UFA field level setting for you. You can start certifying your EUTs as soon as we have commissioned your system. Rohde&Schwarz delivers a turnkey test system and will be happy to perform annual UFA field level setting for you.

CONDUCTED IMMUNITY TESTS IN LINE WITH EN 61000-4-6

Equipment connected to the mains supply voltage or other networks (signal or control lines) and exposed to high-frequency fields usually needs to be tested for immunity against conducted disturbances induced by these fields.

Rohde&Schwarz can also supply appropriate coupling/decoupling networks and/or current probes as needed to feed the required disturbances to the EUT in line with the standard test specifications.

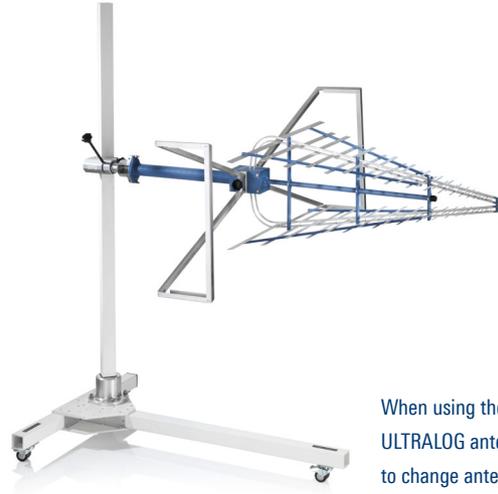
We would be happy to expand your system to include conducted immunity tests. This upgrade will encompass an additional power amplifier that you can integrate into your switch matrix. Even these tests can be run fully automatically.

EMI AND EMS MEASUREMENTS WITHOUT CHANGING ANTENNAS

Rohde & Schwarz offers a cost-effective, single-antenna solution for measuring EMI and EMS.

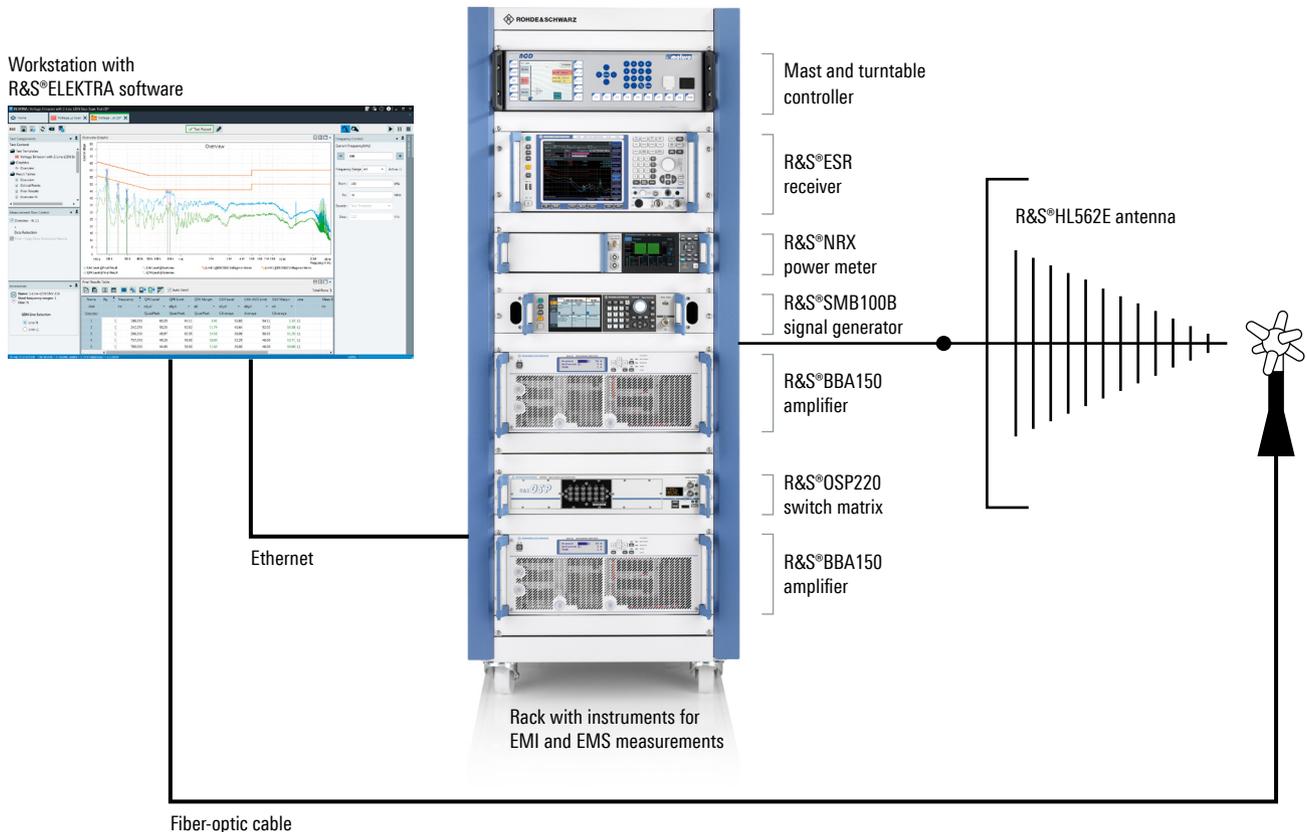
Depending on the size of your EUT and anechoic chamber, you can perform time-saving, fully automated EMI and EMS tests between 30 MHz and 6 GHz without changing antennas.

The R&S®ELEKTRA test software controls the antenna stand, turntable, RF switches and test equipment while monitoring the EUT. A configurable report generator creates a test report.



When using the R&S®HL562E ULTRALOG antenna, there is no need to change antennas.

Compact test system performs EMI and EMS measurements with a single antenna

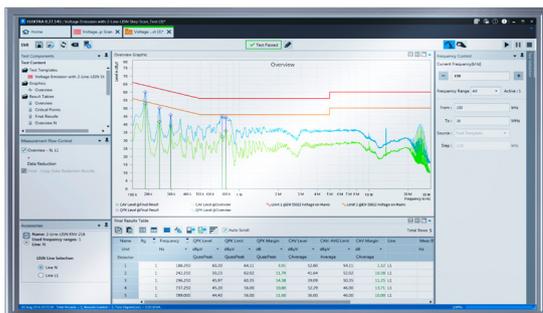


EMC TESTING OF VEHICLE COMPONENTS IN LINE WITH ISO 11452 AND CISPR 25

Rohde & Schwarz engineers are experienced in installing compact systems for testing the electromagnetic immunity of vehicle components in line with ISO 11452-2 (radiated) and ISO 11452-4 (bulk current injection, BCI). Tests in line with ISO 11452-3 (transverse electromagnetic mode (TEM) cell), ISO 11452-5 (stripline) and ISO 11452-9 (portable transmitters) can also be implemented. This modular system allows the frequency range and power classes to be extended at any time.

Using a high-speed R&S®ESR or R&S®ESW EMI test receiver, you can perform standard-compliant radiated emission measurements in line with CISPR25 in the same anechoic chamber. EMS test systems from Rohde & Schwarz can optionally generate radar pulses of up to 600 V/m as required by some vehicle manufacturers. The R&S®AdVISE visual inspection software together with a camera system monitors your EUTs.

In combination with the R&S®ELEKTRA software, you can carry out fully automated EMC tests. The Rohde & Schwarz product portfolio also includes the necessary antennas. Calibration in line with SAE ARP958 is handled by our calibration laboratory certified by Germany's National Accreditation Body (DAkkS). You will receive a calibration certificate in line with ISO 17025.



EMC test software
R&S®ELEKTRA



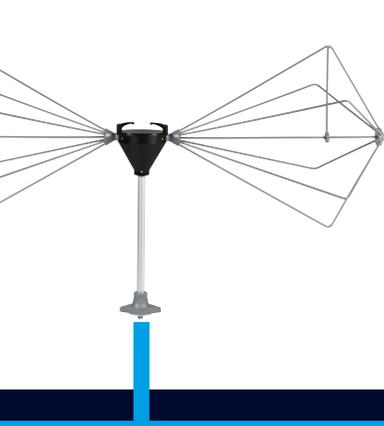
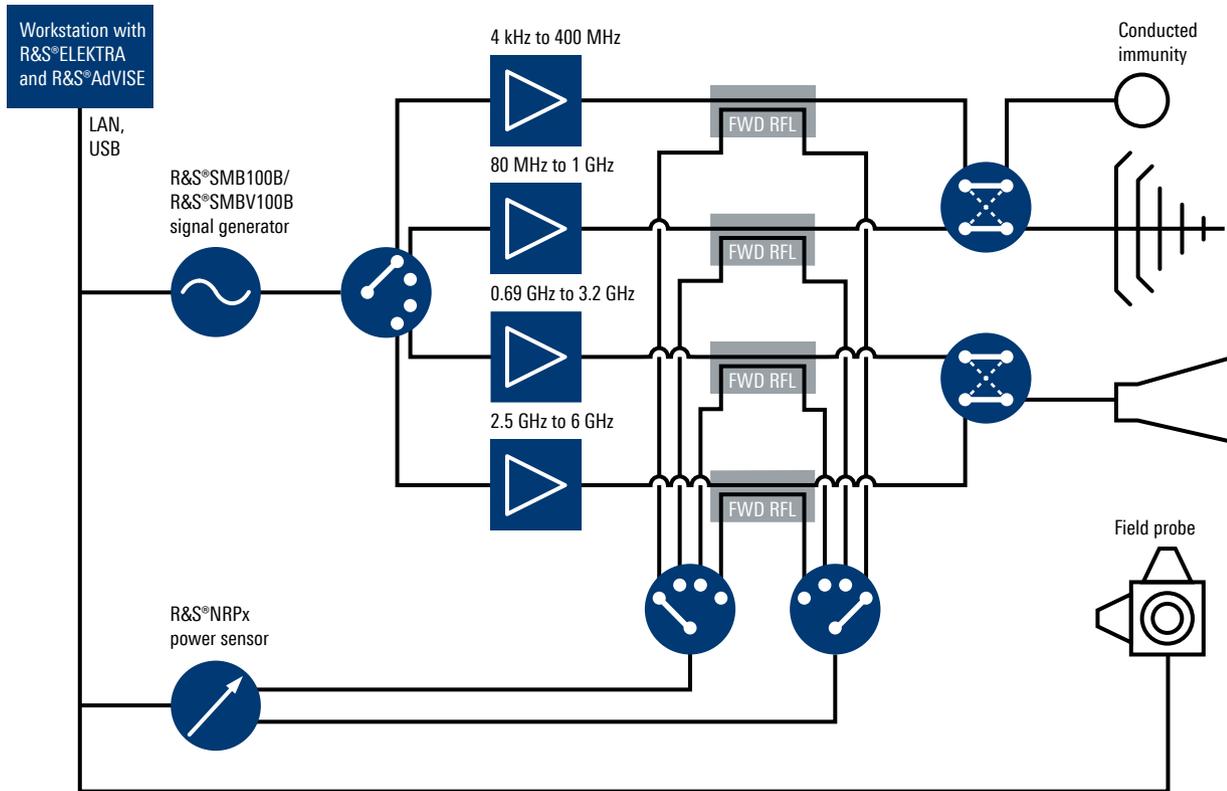
EMI test receiver
R&S®ESR7/R&S®ESW8



Active rod antenna
R&S®HFH2-Z6E
(and R&S®RAS rod antenna stand)
9 kHz to 30 MHz

ROHDE & SCHWARZ PRODUCT PORTFOLIO FOR RADIATED EMISSIONS

EMC system for testing the electromagnetic immunity of vehicle components



Biconical antenna
R&S®HK116E
30 MHz to 220 MHz



Log-periodic antenna
R&S®HL223
200 MHz to 1000 MHz



Double-ridged waveguide horn
R&S®HF907
1 GHz to 18 GHz

EMC MEASUREMENTS ON VEHICLE COMPONENTS

EMC TESTING IN LINE WITH MIL-STD-461 AND RTCA DO-160

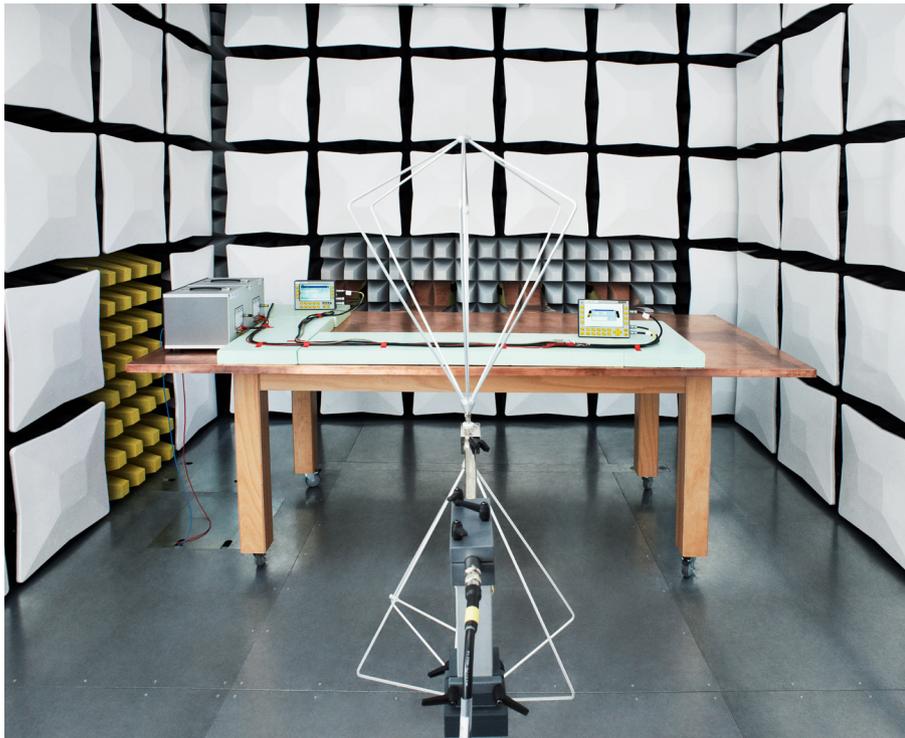
Rohde & Schwarz offers EMI and EMS test systems that meet the stringent requirements of MIL-STD-461 and RTCA DO-160 for testing military and airborne equipment.

Component tests in line with MIL-STD-461 and RTCA DO-160 can be performed in compact anechoic chambers since these tests require only minimal spacing between the EUT and the chamber walls. Anechoic chambers come equipped with a test bench and ground plane.

Rohde & Schwarz test systems can also be used to perform tests with high field strengths of 2500 V/m and higher as stipulated by the standards.

In combination with the R&S®ELEKTRA test software, Rohde & Schwarz T&M equipment can carry out fully automated, standard-compliant tests. Our experts will train you to use your test system and will provide consultation on how to configure and set up your EUTs and execute the tests optimally.

Test setup for component testing in line with MIL-STD-461 and RTCA DO-160 in a compact anechoic chamber.



R&S® BBL/BBA AMPLIFIER SYSTEMS

The R&S® BBL/BBA broadband amplifiers are ideal for applications in EMC environments. They feature a modular design combined with optimal scalability and configurability.

R&S® BBL200 – for high field strengths

- ▶ 9 kHz to 250 MHz, RF power up to 10000 W
- ▶ Liquid-cooled class A amplifiers

R&S® BBA130 – the tunable amplifier

- ▶ 80 MHz to 6 GHz, RF power up to 13 kW (P_{sat})
- ▶ Power optimization between high output power and high mismatch tolerance up to VSWR 6:1
- ▶ Bias point adjustable between class A for highly linear signals and class AB for signal shaping and improved efficiency
- ▶ Air-cooled

R&S® BBA150 – the EMC specialist

- ▶ 4 kHz to 6 GHz, RF power up to 3 kW (P_{1dB})
- ▶ Nominal output power at VSWR 6:1
- ▶ Highly linear class A amplifiers
- ▶ Air-cooled

Key facts

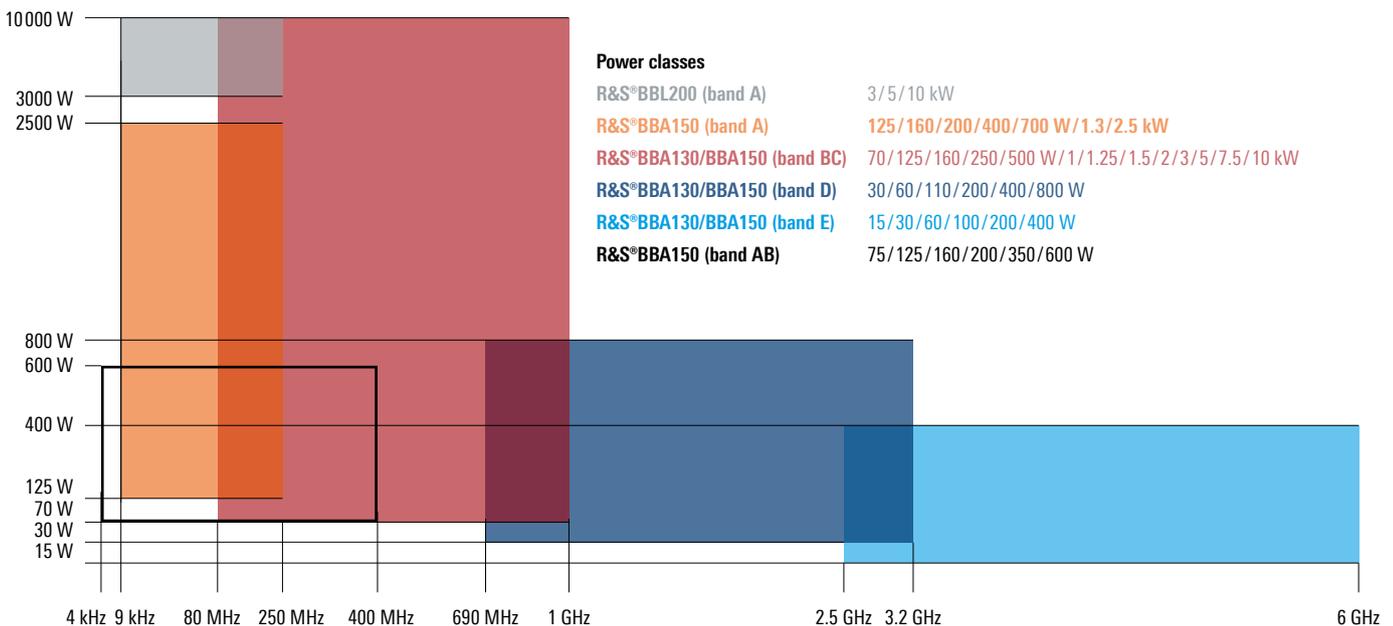
- ▶ Customizable amplifier systems ranging from small precompliance systems through test systems accredited in line with all major EMC standards
- ▶ Amplitude-modulated signal for classic EMC test requirements and pulsed signals for radar tests
- ▶ OFDM or multitone signals for application-specific robustness tests
- ▶ Highest flexibility on the market since all frequency bands and power classes can be combined as required, including band switching
- ▶ Frequency range and power class can be upgraded at any time thanks to the future-proof design concept – this protects your investment
- ▶ Fast, on-site support and service by experts



Amplifier system with antenna mast mounted in rack.

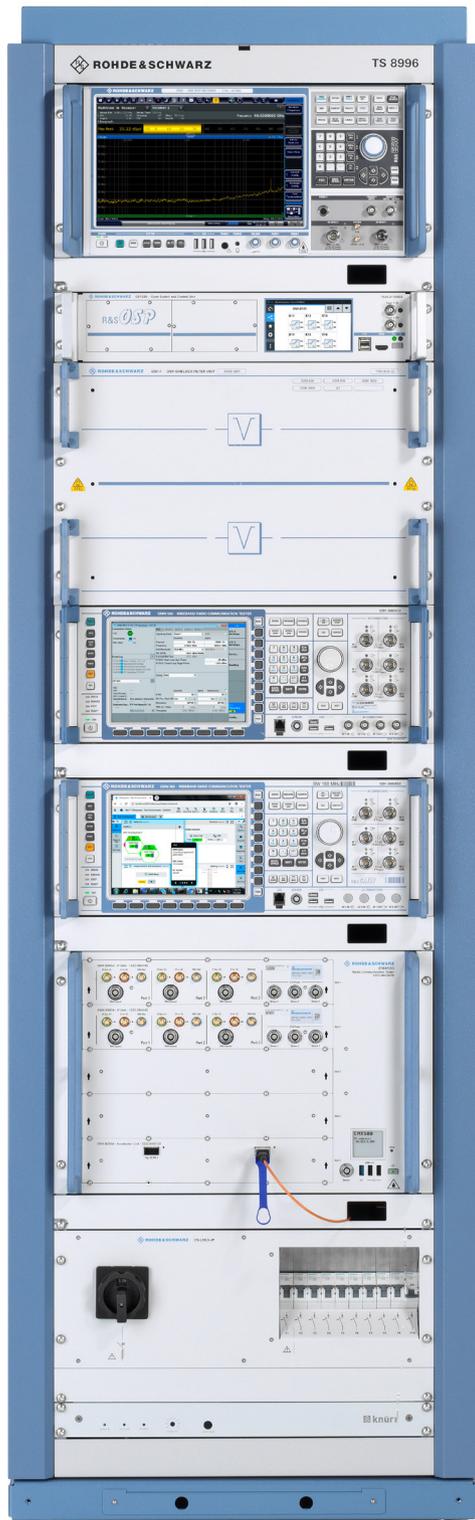
Model overview

1 dB compression point (P_{1dB})



R&S®TS8996 RSE TEST SYSTEM UP TO 200 GHz

The R&S®TS8996 is used to perform fully automated emissions measurements on mobile communications devices as required in research and development as well as in quality assurance. For 5G devices, measurements up to 200 GHz are supported.



The R&S®TS8996 RSE test system is designed for EMC and factory acceptance testing involving EMI and radiated spurious emissions. For certain radiocommunications systems, higher frequency limits are specified for measurements of radiated spurious emissions. The R&S®TS8996 can be easily adapted to such requirements.

A unique feature allows the signal to be shifted to the analyzer's ideal dynamic range using the R&S®OSP-B155G signal conditioning unit. This enables measurement of spurious signals for many standards, including 3G, 4G and 5G FR1, without notch filters for carrier suppression. 5G FR2 with carriers in the microwave range from 24 GHz to 40 GHz is covered by a similar signal conditioning unit (the R&S®TS-PRE1840).

The frequency range is also extended from 40 GHz to 200 GHz in order to cover the RSE requirements for 5G FR2 (e.g. FCC). This includes:

- ▶ Converter units with integrated antennas and filters for very high sensitivity of -40 dBm EIRP at test distance of 1 m
- ▶ Positioner for automated test sequences
- ▶ Multiplier units for system testing and calibration
- ▶ Full integration into R&S®ELEKTRA EMC test software

The R&S®ELEKTRA software allows simple and fully automated testing. Its special functions include:

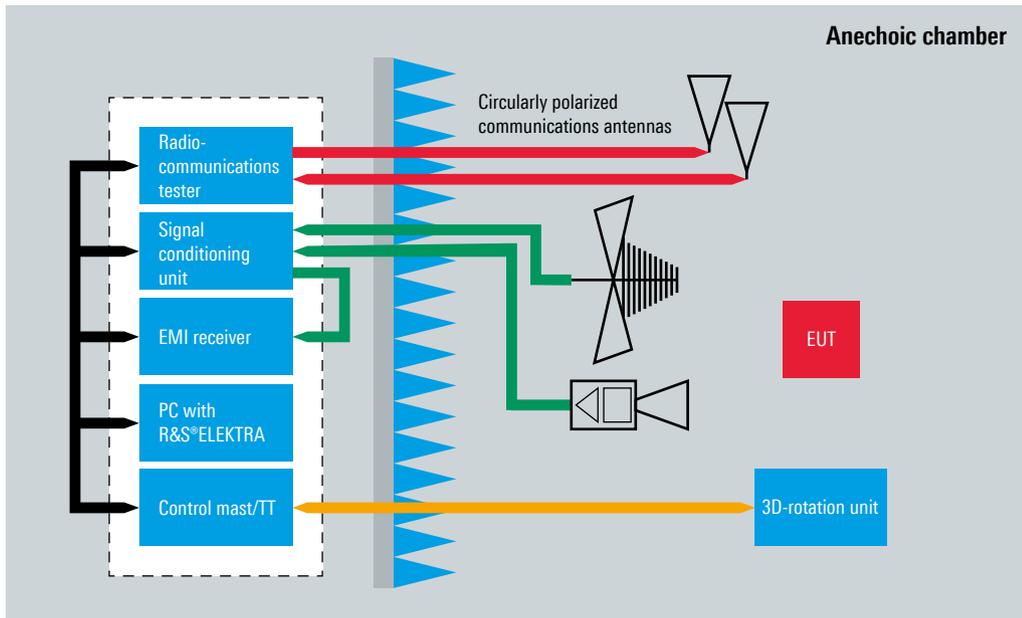
- ▶ Automatic setup and control of wireless connections
- ▶ Control of various 3D turning devices for EUTs
- ▶ ERP/EIRP measurement
- ▶ Special measurement procedures for 5G FR2 including TRP

R&S®TS8996 RSE
test system

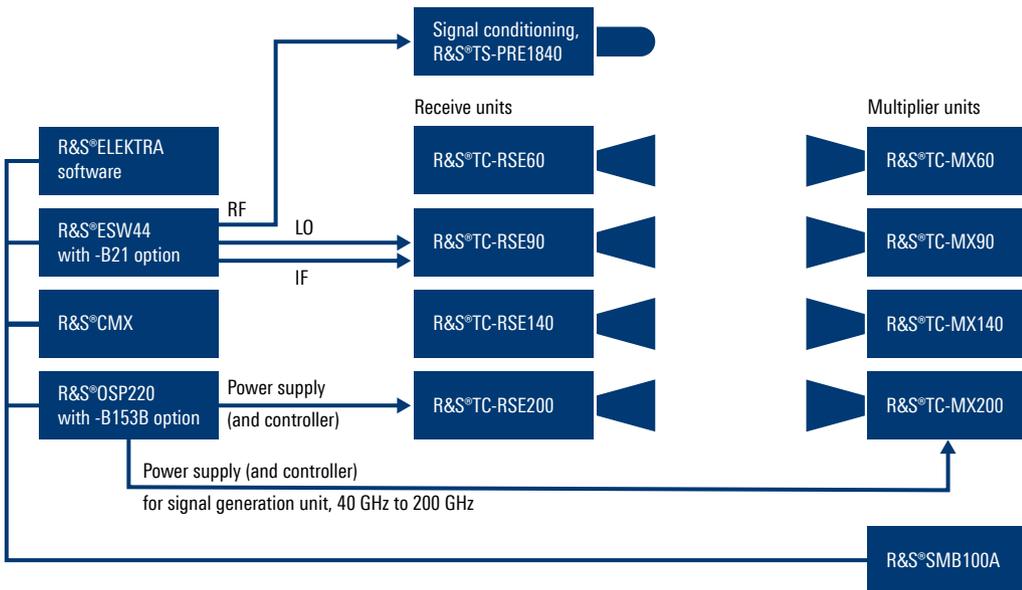
Key facts

- ▶ Measurement of EMI emissions from radiocommunications devices
- ▶ Frequency range from 30 MHz to 18 GHz (40 GHz) and up to 200 GHz for 5G
- ▶ Radiated measurements in line with ETSI EN301489, FCC Part 15; ANSI C63.10 and C63.26 as well as 3GPP for mobile and wireless standards from GSM to 5G

Typical configuration of an R&S®TS8996 test system for measuring radiated spurious emissions



RSE system extension for 5G FR2 up to 200 GHz



R&S®ELEKTRA EMC TEST SOFTWARE

R&S®ELEKTRA EMC test software is a complete solution for controlling EMC systems and automating measurements on commercial equipment under test (EUT) during conformance verification of the emissions (EMI) and electromagnetic susceptibility (EMS).

R&S®ELEKTRA supports automatic and interactive measurement procedures, including overview measurements, data reduction, maximization, zooming, adaptation and final measurement for EMI. The procedures deliver accurate results and enable in-depth analysis of EMI and EMS measurements during development and certification. Developers and testers can validate the results in a very short time. R&S®ELEKTRA includes a predefined software library for the common standards, including the relevant limit lines, test setups and transducer factors. This simplifies configuration and allows tests to be quickly launched.

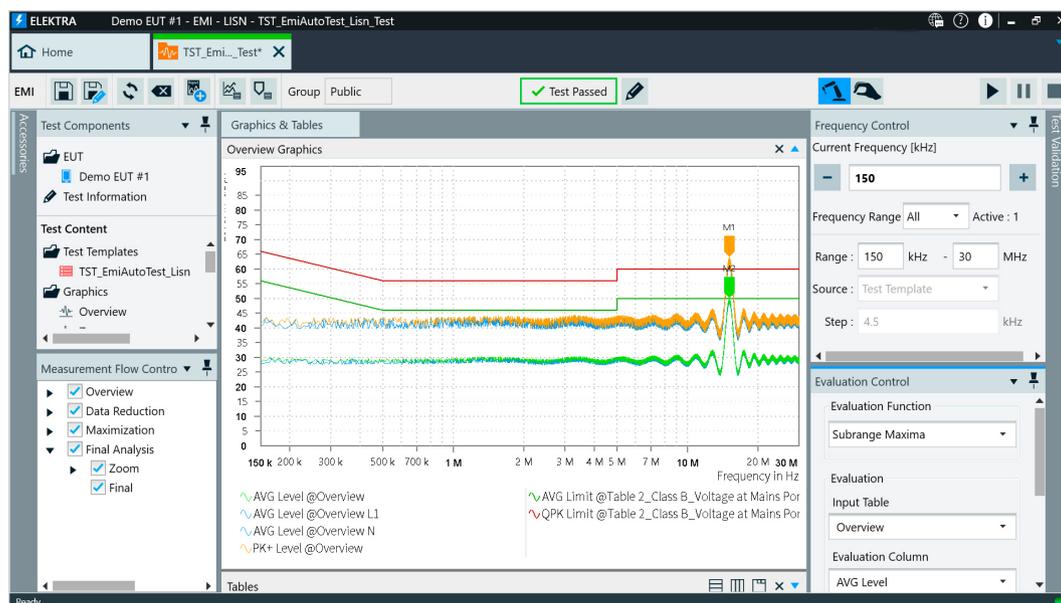
To assist users in navigating through the huge quantities of data that are generated by EMC tests, R&S®ELEKTRA has a dashboard with favorites for frequently used elements as well as tagging and search functions and an all-in-one page. Thanks to the extensive planning, execution and reporting functions, users can maintain a clear overview of testing at all times.

Tests that deviate from the standards are also possible. The test setups, measurement procedures and reports can be adapted as required. R&S®ELEKTRA has an open interface that supports a wide range of devices and system components.

Key facts

- ▶ Creation of test plans with multiple tests for easy management of EUTs
- ▶ Intuitive, interactive and automatic EMC measurements
- ▶ Coverage of the most common EMC standards with predefined settings/templates
- ▶ Efficient result analysis and reports
- ▶ Scalable and flexible platform – from small systems for R&D debugging through EMC certification labs with multiple locations as well as numerous users and projects

Automated EMI measurement with R&S®ELEKTRA.



R&S® AdVISE VISUAL INSPECTION SOFTWARE

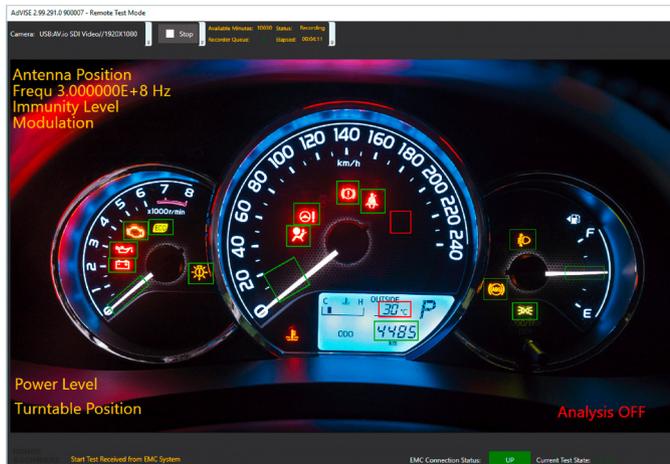
R&S® AdVISE visual inspection software automates the process of visually monitoring equipment under test (EUTs) during EMS testing. It eliminates human inattentiveness from the test process, ensures reproducible test results and simplifies documentation.

Visually monitoring an EUT during a complex test sequence is time-consuming and requires utmost concentration. Errors can be missed during a brief moment of inattentiveness. Many events cannot be reliably monitored with the naked eye, such as slight changes in color or brightness or deviation from a predefined flashing frequency. This is where R&S® AdVISE software provides assistance.

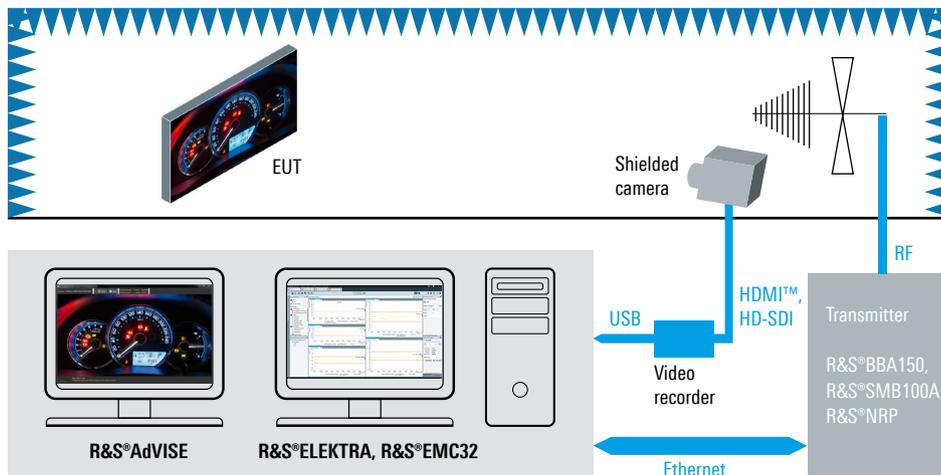
Key facts

- ▶ Automatic error detection for EUTs on the basis of camera signal evaluation
- ▶ Continuous monitoring of up to 32 regions at 30 frames per second
- ▶ High-performance image processing thanks to object based evaluation with optimized test methods
- ▶ Generation of event-controlled video protocols and test reports
- ▶ Standalone operation or under the control of system software such as R&S® EMC32 and R&S® ELEKTRA
- ▶ Monitoring of diverse operating conditions with a wide range of test procedures

R&S® AdVISE measurement view with overlaid EMS test conditions.

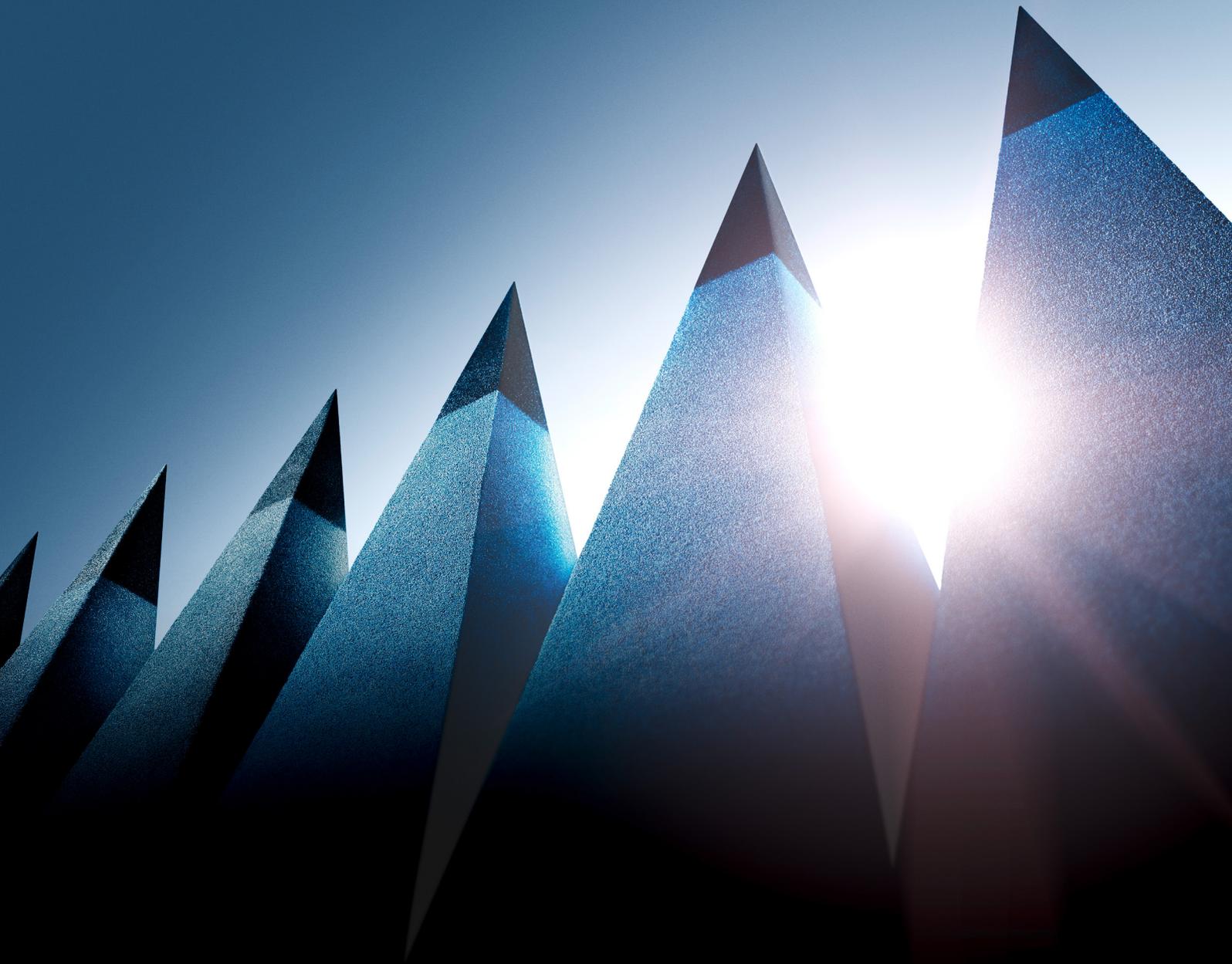


R&S® AdVISE in a network system with EMC control software



SYSTEM COMPONENTS

Rohde & Schwarz develops and manufactures the key components for its EMC and field strength measurement systems in-house. The following pages provide an overview of the most important components. Our sales engineers will be happy to provide you with details and answer your questions.



R&S®BBA150, R&S®BBA130, R&S®BBL200 broadband amplifiers

The R&S®BBA150 broadband amplifiers generate P1dB power levels up to 3 kW in the frequency range from 4 kHz to 6 GHz. The R&S®BBA130 broadband amplifiers offer P_{sat} power levels up to 13 kW and various setting options for optimally adapting the output signal to the application on the basis of the parameters for linearity or mismatch tolerance. For applications requiring very high RF power up to 10 kW between 9 kHz and 250 MHz, the liquid-cooled R&S®BBL200 broadband amplifiers are ideal. All of the broadband amplifiers are rugged and feature high availability. They are perfectly suited for amplitude, frequency, phase, pulse, multitone and OFDM modulation. Extensive and flexible switching options for the input, output and sample ports are available for different applications.



R&S®SMB100B RF and microwave signal generator

The R&S®SMB100B RF and microwave signal generator is compact and versatile. It has a frequency range of up to 40 GHz and provides outstanding spectral purity and high output power. It features easy operation, comprehensive functionality and low cost of ownership.



R&S®SMBV100B vector signal generator

The state-of-the-art R&S®SMBV100B vector signal generator is setting new standards in its class. The ultra high output power, fully calibrated broadband signal generation and intuitive touchscreen operation make the R&S®SMBV100B the ideal instrument for a wide range of applications.



R&S®NRX power meter

The compact, robust R&S®NRX base unit with color display supports up to four R&S®NRP-Zxx and/or R&S®NRPxxS/SN power sensors and all sensor-dependent measurement functions. Measured values are displayed numerically or graphically, depending on the measurement function.



R&S®NRPxxA/AN average power sensors

In EMC T&M applications, usually only the average power is of interest. This is where the R&S®NRPxxA/AN average power sensors come into their own. They cover measurement ranges used in radio telecommunications as well as the important lower frequency bands down to 8 kHz. The R&S®NRPxxAN LAN-enabled models can be controlled and monitored over large distances.



R&S®ESW EMI test receiver (compliance)

The R&S®ESW is an EMI test receiver with outstanding RF characteristics for the frequency range from 2 Hz to 44 GHz. Its wide dynamic range and high accuracy make it ideal for demanding EMC certification measurements. The R&S®ESW meets the most stringent requirements in line with CISPR, EN, MIL-STD-461, DO-160 and FCC. Its frequency range can be extended up to 500 GHz using external mixers (options).



R&S®ESR EMI test receiver (compliance)

The R&S®ESR is an EMI test receiver for the frequency range from 10 Hz to 26.5 GHz and complies with the CISPR 16-1-1 basic standard. It measures electromagnetic emissions with the conventional stepped frequency scan or – at very high speed – with an FFT-based time domain scan.



R&S®ESRP EMI test receiver (precompliance)

The R&S®ESRP is an EMI test receiver for the frequency range from 10 Hz to 7 GHz. It is designed for precompliance measurements in order to prepare products for final certification testing.



R&S®OSP open switch and control platform

The R&S®OSP open switch and control platform is designed to handle RF switching and control tasks. It provides comprehensive functionality, ranging from simple RF switching functions to automatic path switching in complex RF test systems. Special modules are available for implementation of EMS test systems. In addition to the R&S®OSP devices, the compact R&S®OSP-B200S2 satellite box can be used to perform switching and control functions in an RF chamber in the vicinity of the EUT or the antennas. The R&S®OSP can be controlled via a fiber-optic link in order to avoid RF emissions associated with electrical control lines.



R&S®ENV216 two-line and R&S®ENV432 four-line V-networks

The R&S®ENV216 two-line and R&S®ENV432 four-line V-networks meet the requirements of CISPR 16-1-2, EN 55016-1-2 and ANSIC63.4 for V-networks with a simulated impedance of $(50 \mu\text{H} + 5 \Omega) \parallel 50 \Omega$ in the frequency range from 9 kHz to 30 MHz.



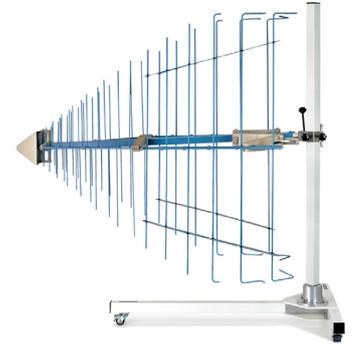
R&S®ENV4200 200 A four-line V-network

The R&S®ENV4200 200 A four-line V-network meets the requirements of CISPR 16-1-2, EN 55016-1-2, ANSIC63.4 and FCC Part 15 for V-networks with a simulated impedance of $50 \mu\text{H} \parallel 50 \Omega$ in the frequency range from 150 kHz to 30 MHz.



R&S®HL046E EMS antenna

The R&S®HL046E log-periodic antenna for the frequency range from 80 MHz to 3 GHz offers excellent broadband characteristics, high gain, and a radiation pattern that is approximately rotationally symmetric. These characteristics make the R&S®HL046E ideal for EMS measurements.



R&S®HL562E EMI and EMS antenna

The R&S®HL562E ultrawideband antenna is used for EMI and EMS measurements across an extremely wide frequency range from 30 MHz to 6 GHz. The antenna significantly reduces measurement time since there is no need to change antennas.



R&S®HF907 double-ridged waveguide horn antenna

The linearly polarized R&S®HF907 double-ridged waveguide horn antenna is a compact, broadband transmit and receive antenna for the frequency range from 800 MHz to 18 GHz.



R&S®HL050E log-periodic antenna

The R&S®HL050E log-periodic antenna is a compact, broadband transmit and receive antenna for the frequency range from 750 MHz to 6 GHz. Its high-precision design makes it suitable for field strength and EMI measurements. The outstanding power rating and matching (VSWR) allow its use in EMS applications requiring field strengths of 10 V/m or higher.



Rohde & Schwarz

The Rohde & Schwarz electronics group offers innovative solutions in the following business fields: test and measurement, broadcast and media, secure communications, cybersecurity, monitoring and network testing. Founded more than 80 years ago, the independent company which is headquartered in Munich, Germany, has an extensive sales and service network with locations in more than 70 countries.

www.rohde-schwarz.com

Service that adds value

- ▶ Worldwide
- ▶ Local and personalized
- ▶ Customized and flexible
- ▶ Uncompromising quality
- ▶ Long-term dependability

Sustainable product design

- ▶ Environmental compatibility and eco-footprint
- ▶ Energy efficiency and low emissions
- ▶ Longevity and optimized total cost of ownership

Certified Quality Management

ISO 9001

Certified Environmental Management

ISO 14001

Rohde & Schwarz training

www.training.rohde-schwarz.com

Rohde & Schwarz customer support

www.rohde-schwarz.com/support

