

R&S® ESR

EMI Test Receiver

More speed
More insight
More intelligence



R&S®ESR

EMI Test Receiver

At a glance

The R&S®ESR measures conducted and radiated disturbances in the frequency range from 10 Hz to 7 GHz in compliance with the CISPR 16-1-1 standard. Using an FFT-based time domain scan, the instrument measures electromagnetic disturbances at an extremely high speed. At the same time, the R&S®ESR functions as a full-featured, powerful signal and spectrum analyzer for lab applications. Featuring realtime spectrum analysis capability with a wide range of diagnostic tools, the test receiver also enables detailed analysis of disturbance signals and their history. The R&S®ESR comes with a clearly structured, intuitive touchscreen interface and is very easy to use.

The R&S®ESR measures up to 6000 times faster than conventional EMI test receivers. Disturbance measurements which took hours in the past can now be completed in just seconds. This also applies to measurements across wide frequency ranges or with small step sizes as well as to disturbance voltage measurements using quasi-peak and average weighting. This saves considerable time and cost during product development and certification.

Besides offering functionality for EMC conformance testing, the R&S®ESR features realtime spectrum analysis capability, providing new diagnostic tools such as a spectrogram, persistence mode and frequency mask trigger. With these tools, users can detect hidden or sporadic emissions and analyze their causes.

The clearly structured menus combine with the intuitive touchscreen to make the test receiver very easy to operate in any mode. Users can display up to six different traces on the large, 21 cm (8.4") touchscreen for fast, effective result analysis. Featuring compact dimensions, low weight and optional DC power supply, the R&S®ESR is an ideal choice also for mobile use.

Key facts

- EMI test receiver and signal/spectrum analyzer combined in a single instrument
- Compliant with CISPR 16-1-1 Ed. 3.1
- Preselection with integrated 20 dB preamplifier
- Resolution bandwidths in line with CISPR and in decade steps from 10 Hz to 1 MHz (MIL-STD-461, DO-160)
- Ultra-fast time domain scan in addition to conventional stepped frequency scan
- Realtime spectrum analysis with up to 40 MHz span for detailed investigation of disturbance signals
- Time domain display with high resolution (50 μ s)
- Automatic test routines



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Benefits and key features

Standard-compliant disturbance measurements

- Certification measurements
- Standard-compliant EMI measurements in spectrum analyzer mode

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FFT-based time domain scan for ultra-fast measurements

- Fastest EMI test receiver in the marketplace due to hardware-based FFT calculation
- Seamless detection of disturbance signals
- Realtime measurement of conducted disturbances with quasi-peak and average weighting

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Realtime spectrum analysis for detailed investigation of disturbances

- Spectrogram for seamless spectrum display in the time domain
- Persistence mode (spectral histogram) for clear identification of pulsed and continuous disturbances
- Frequency mask trigger for precise and reliable detection of sporadic spectral events

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Powerful measurement and analysis functions in frequency and time domain

- Automatic test sequences with preview measurement, data reduction and final measurement
- IF analysis function for displaying the spectrum around disturbance signals
- Time domain display – integrated oscilloscope function
- Simultaneous display of up to six traces and four bargraphs
- Preset antenna factors (transducers) and user-created transducer sets
- EMI limit line library for commercial standards, with convenient editor
- Remotely controlled measurements and automated EMI test routines using R&S®EMC32 and R&S®ES-SCAN application software
- Extensive analysis capabilities for general laboratory applications
- Tracking generator for scalar network analysis

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Convenient operation, straightforward display

- Touchscreen-based user interface with undo/redo functions
- Straightforward scan table
- Integrated online help
- Storage of results and instrument settings to internal or external media
- Removable hard disk drive (HDD) to keep test data confidential
- Remote control via GPIB or LAN
- Drivers for LabView, LabWindows/CVI, VXI Plug&Play
- Firmware updates – always in step with new developments

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Robust and compact – ideal also for mobile use

- DC power supply for field use, optionally with external battery pack
- Solid state drive (SSD) for high vibration and shock loading
- Compact design

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Standard-compliant disturbance measurements

Certification measurements

The R&S®ESR has been designed with the main focus on certification measurements in line with EMC standards. Standard-compliant certification measurements place very high demands on the test equipment since it must correctly detect, measure and weight all of the disturbance signals that occur. These include pulsed and sinusoidal as well as modulated and intermittent signals.

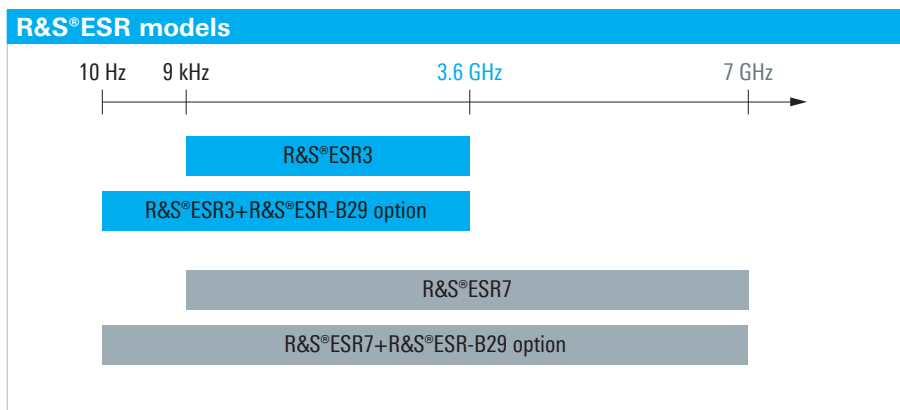
With its integrated preselection with 16 fixed filters up to 7 GHz, a 20 dB preamplifier and a highly linear frontend, the R&S®ESR meets the requirements of commercial standards such as CISPR, EN, ETS, ANSI, FCC and VCCI. The R&S®ESR has a standard frequency range from 9 kHz to 3.6 GHz or 7 GHz, which can optionally be extended down to 10 Hz.

Featuring low displayed average noise level (typ. –168 dBm at 1 Hz bandwidth, with preamplifier switched on), the R&S®ESR also measures very weak signals precisely and with a good signal-to-noise ratio. The R&S®ESR weighting detectors, including CISPR average (average detector with meter time constant) and RMS-Average, meet the requirements of the CISPR 16-1-1 standard, as do the EMI resolution bandwidths (200 Hz, 9 kHz, 120 kHz as 6 dB bandwidths, 1 MHz as impulse bandwidth). 6 dB resolution bandwidths in decade steps from 10 Hz to 1 MHz are optionally available, for example to enable measurements in line with MIL-STD-461, DO-160 and ICNIRP guidelines on exposure limits.

Standard-compliant EMI measurements in spectrum analyzer mode

Like all Rohde&Schwarz EMI test receivers, the R&S®ESR is based on a powerful signal/spectrum analyzer platform (R&S®FSV). With preselection activated, the R&S®ESR can perform standard-compliant EMI measurements – in addition to EMI analysis during development.

Up to 16 configurable markers can be placed on the frequencies of EMI signals to carry out targeted analysis. Markers can be coupled with a CISPR weighting detector to enable direct comparison with limit values. The spectrum can also be displayed along a logarithmic frequency axis, which simplifies result analysis across a wide frequency range and displays limit lines in compliance with relevant standards. Critical frequencies are presented in a peak list, enabling fast, standard-compliant comparison of EMI signals with limit lines.



FFT-based time domain scan for ultra-fast measurements

Fastest EMI test receiver in the marketplace due to hardware-based FFT calculation

The R&S®ESR-B50 and R&S®ESR-K53 options enhance the R&S®ESR by adding an FFT-based time domain scan. This scan mode delivers measurement speed up to 6000 times higher than can be achieved in conventional, stepped frequency scan mode, making the R&S®ESR the fastest EMI test receiver in the marketplace.

Seamless detection of disturbance signals

The R&S®ESR performs frequency scans in the CISPR bands in just a few milliseconds, and measures conducted disturbances in realtime. Spectral signal components with a bandwidth of up to 30 MHz are covered without any time gaps. With a virtual step size of $\frac{1}{4}$ of the resolution bandwidth and Gaussian FFT windows overlapping by more than 90%, the test receiver achieves level measurement accuracy in line with CISPR 16-1-1.

Speed is a crucial factor when testing devices that can be operated, or measured, only during a short period of time – either because they change their behavior (fluctuating or drifting disturbances), or because extended operation might be destructive, or because their operating cycle calls for high speed (as in the case of electric window regulators in motor vehicles). The test receiver's extremely fast time domain scan makes it easy to handle such scenarios.

Users can also increase the measurement time in order to reliably detect narrowband, intermittent interferers or isolated pulses. The R&S®ESR allows seamless measurement of a disturbance signal for a period of up to 100 s for each frequency segment.

Realtime measurement of conducted disturbances with quasi-peak and average weighting

The time domain scan function is particularly useful when carrying out weighted measurements of conducted disturbances, for example when measuring disturbance voltage in the frequency range from 150 kHz to 30 MHz in line with CISPR/EN product emission standards. The R&S®ESR measures this range in realtime and immediately performs the required quasi-peak and average weighting. A preview scan is no longer needed.



The R&S®ESR performs disturbance voltage measurements with quasi-peak and average weighting in just a few seconds.

Realtime spectrum analysis for detailed investigation of disturbances

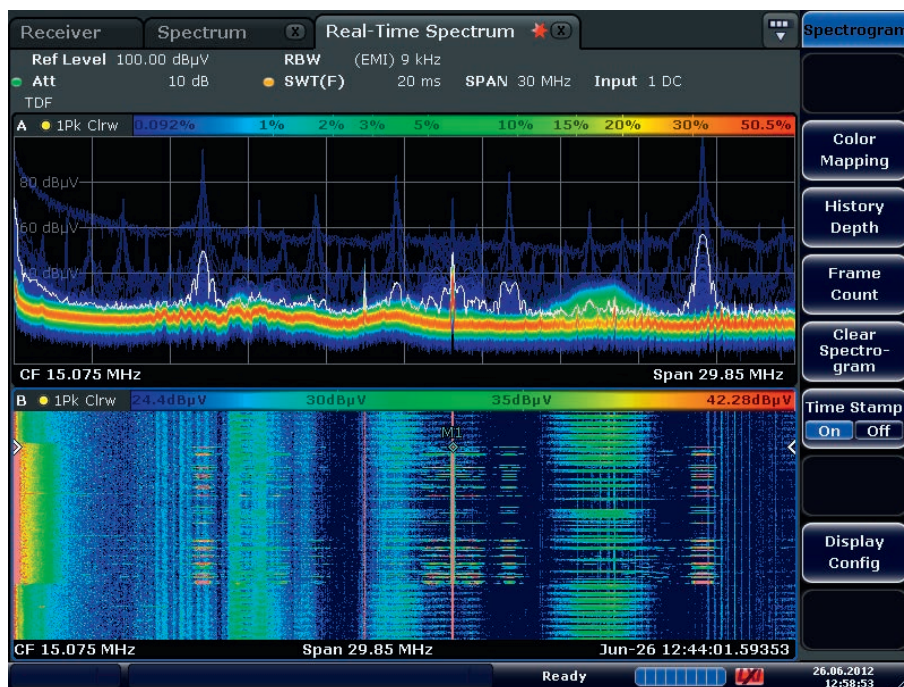
Measuring disturbances caused by sporadic and brief events in the frequency domain or determining the spectral behavior of devices under test during switching operations, for example, are difficult and time-consuming tasks. The realtime spectrum analysis function of the R&S®ESR now provides new insight into this type of disturbance. The R&S®ESR seamlessly measures a spectrum of up to 40 MHz for any length of time, and therefore reliably captures even sporadic signals. Realtime spectrum analysis speeds up final product certification, as it shortens test times.

Spectrogram for seamless spectrum display in the time domain

The R&S®ESR offers a spectrogram function that allows users to analyze the behavior of disturbance signals in the time domain. Each spectrum is presented as a horizontal line with different levels assigned different colors, and the individual spectral lines are joined continuously. Recording is seamless at a rate of up to 10000 lines per second, which corresponds to a time resolution of 100 μ s. For an even more detailed representation, the R&S®ESR reprocesses the recorded data to achieve resolution of up to 60 ns.

Persistence mode (spectral histogram) for clear identification of pulsed and continuous disturbances

In persistence mode, the R&S®ESR writes the seamless spectra into a single diagram. The color of each pixel indicates how often a specific amplitude occurs at a specific frequency. Frequently occurring signals can be shown in red, for example, and sporadic ones in blue. If signals no longer occur at a specific frequency with a specific amplitude, the corresponding pixel disappears after a user-definable persistence period. This allows users to clearly distinguish between pulsed disturbances, which are present only for very brief periods, and continuous disturbances. In addition, different pulsed disturbances can easily be distinguished from one another.

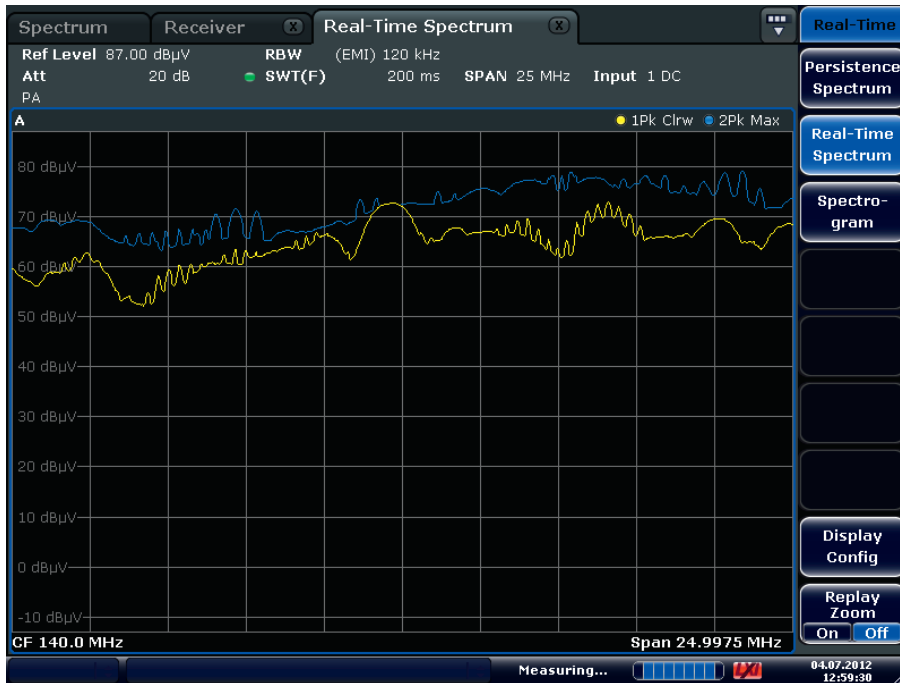


Simultaneous display of disturbance spectrum in persistence mode (top) and as a spectrogram (bottom). The spectrogram provides seamless information about the timing behavior of disturbances emitted by a DUT; the persistence display allows a clear distinction between narrow-band and broadband disturbances. The position in time of a user-selected, individual spectrum (shown as a white trace in persistence mode) is indicated in the spectrogram by marker M1, which can be positioned as required.

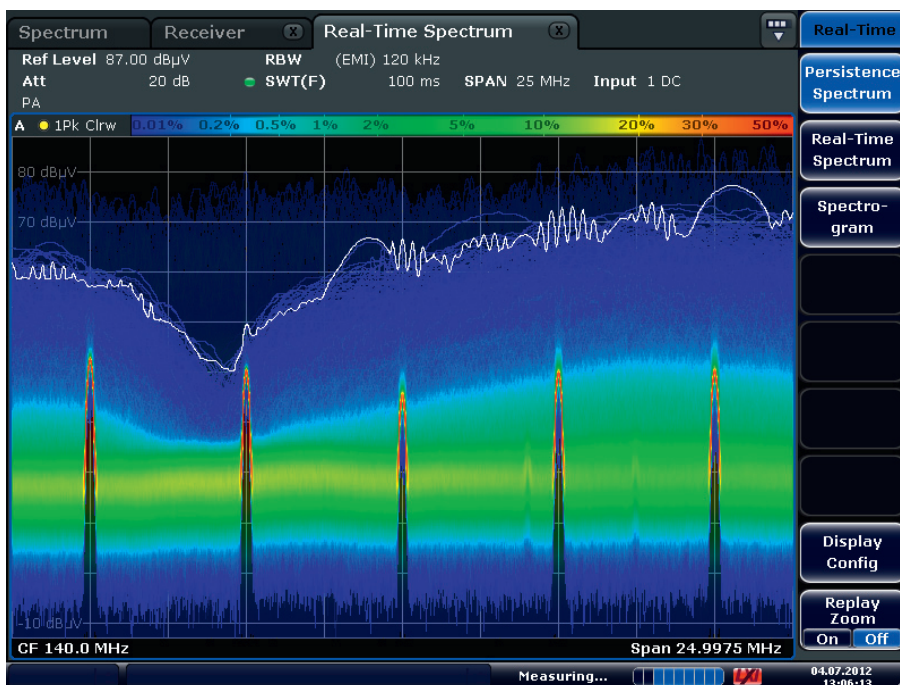
Frequency mask trigger for precise and reliable detection of sporadic spectral events

Sporadic events are often difficult to detect and measure. The test receiver's frequency mask trigger (FMT), which operates in the frequency domain, provides a solution to this problem. The R&S®ESR measures every single spec-

trum – up to 250 000 per second – and compares it with a frequency-dependent mask. If a spectrum violates the mask, the R&S®ESR activates a trigger and either displays that spectrum and then freezes the display or, in continuous mode, it updates the display whenever a spectrum violates the mask.



Display of a broadband disturbance in conventional analyzer mode – in this example caused by an electric motor with poor EMI suppression. The yellow trace represents the current spectrum, the blue trace Max Hold.



Disturbance spectrum for the same motor in persistence mode. A second pulsed disturbance is clearly visible, while it cannot be identified in conventional analyzer mode (upper diagram) as it is hidden by the broadband disturbance.

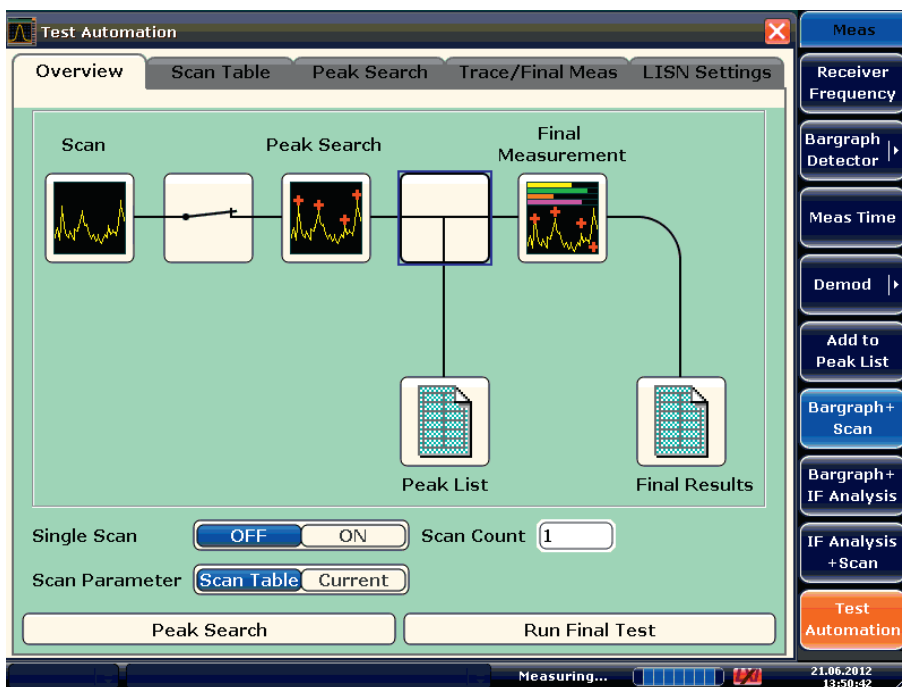
Powerful measurement and analysis functions in frequency and time domain

Automatic test sequences with preview measurement, data reduction and final measurement

A fast preview measurement with peak and average weighting combined with a final measurement on the critical frequencies with the required CISPR weighting – this is the standard approach when performing disturbance measurements.

The R&S®ESR supports this approach. It offers a choice of common limit lines defined in commercial product emission standards. The results of the preview measurement – obtained with a fast time domain scan or a stepped frequency scan – are compared with the limit lines. Next, the test receiver identifies critical frequencies according to user-defined criteria and presents them in a table (peak list). In a last step, a final measurement is performed with CISPR-conformant measurement time and detector(s). Prior to the final measurement, users can manually edit the peak list by adding or deleting frequencies in an interactive way.

The R&S®ESR can remotely control Rohde&Schwarz line impedance stabilization networks via its AUX port. Disturbance voltage measurements on power lines can be performed fully automatically on all phases. This ensures reliable detection of the highest disturbance level.



The R&S®ESR allows users to configure automatic test sequences (preview measurement, data reduction, final measurement) quickly and easily and execute them at the press of a button. The final measurement can also be carried out interactively.

IF analysis function for displaying the spectrum around disturbance signals

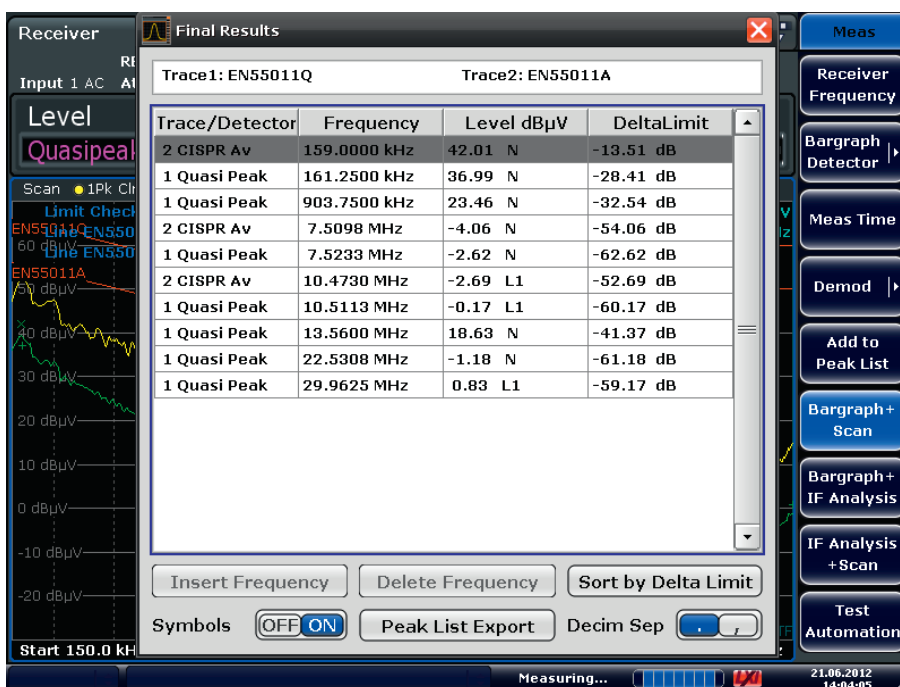
The optional IF analysis function of the R&S®ESR provides a spectral display of the RF input signal in a selectable range around the EMI receive frequency. The IF spectrum display can be coupled to the bargraph display for the current receive frequency. Alternatively, the center frequency of the IF spectrum can be controlled by the position of the marker, which is placed on the EMI signal peaks detected during the frequency scan (marker track function).

The center frequency of the IF spectrum always corresponds to the current receive frequency. The R&S®ESR can therefore be tuned to the signal of interest very accurately and very quickly. In addition, the IF spectrum provides a detailed overview of the spectrum occupancy around the measurement channel and – with sufficiently wide IF bandwidth – information about the spectral distribution of a modulated signal in the measurement channel. Any signals received can be quickly classified as disturbance signals or wanted signals. CW signals appear in the form of unmodulated carriers, whereas pulsed disturbances travel across the screen in the form of narrow lines. AM or FM audio demodulation can be activated in parallel, making it easier to identify detected signals, for example in order to identify and exclude ambient interferers in open-area measurements.

Time domain display – integrated oscilloscope function

The time domain display function of the R&S®ESR allows users to assess the timing behavior of a disturbance signal on a fixed frequency – comparable to using an oscilloscope. The user measures the level versus time on the set receive frequency with a resolution of 50 μ s to 100 s, for example to determine the pulse repetition frequency (PRF) of a broadband disturbance. To reliably measure a pulsed disturbance, the dwell time per frequency must be set at least as large as the reciprocal of the signal's pulse repetition frequency. Based on the measured pulse repetition frequency, the user can set the optimum measurement time, i.e. as short as possible and as long as necessary. The user can also determine whether and to what extent a narrowband disturbance is fluctuating, and whether it is amplitude-modulated or pulsed.

One special application is click-rate analysis. Thermostatic or program-controlled electrical appliances such as washing machines and air conditioners generate discontinuous disturbances. Due to the aperiodic nature of click-type disturbances, the limit values they need to comply with are higher than those for continuous disturbances. In order to apply these less stringent limit values, users need to measure the duration of the clicks, their repetition rate (click rate) and their amplitudes. The time domain analysis function of the R&S®ESR can consecutively measure the pulse amplitude and duration on each frequency required by the CISPR standard, thus reproducing the functionality of a click-rate analyzer. To carry out standard-compliant analysis, sufficient memory space must be available in order to seamlessly record peak values and quasi-peak values for a period of at least two hours. With a memory depth



Results of standard-compliant final measurement presented in tabular format, stating the offset values (deltas) with respect to the applicable limit values. Results can be exported as an ASCII file for further processing.

of up to four million values per trace, the R&S®ESR is ideally suited to this task. Free-of-charge application software is available for measurements in line with CISPR 14-1/ EN 55014-1.

Simultaneous display of up to six traces and four bargraphs

The R&S®ESR has a 21 cm (8.4") touchscreen with 800 × 600 pixel resolution. It can simultaneously display up to six different traces (including limit lines) in a single diagram. This affords the following benefits:

- Time-saving operation through simultaneous measurements using different weighting detectors
- Clear identification of traces in a diagram, direct comparison of traces
- With up to four million values per trace, the R&S®ESR can perform seamless frequency scans with narrow IF bandwidths across very wide frequency ranges. The R&S®ESR provides high frequency resolution and, consequently, measures the disturbance frequency with high accuracy. This is a major advantage over spectrum analyzers or test receivers that use a lower number of test points
- The displayed frequency range can be traced back to real measured values even when zooming in closely, for example during subsequent detailed analysis

The R&S®ESR provides a combined numeric and analog bargraph display of results for up to four detectors, including Max Hold function. This allows users to rapidly recognize the effect of changes made to the device under test.

Preset antenna factors (transducers) and user-created transducer sets

The R&S®ESR comes with a set of typical transducers for test antennas employed in radiated disturbance measurements. Users can also create and save correction tables of their own for antennas, cables, line impedance stabilization networks, external preamplifiers, etc. Multiple correction factors (for different antennas covering different frequency ranges, different cables, external preamplifiers, etc.) can be combined in transducer sets. The R&S®ESR automatically takes into account all activated transducers and correction factors and selects the appropriate measurement unit.

EMI limit line library for commercial standards, with convenient editor

The R&S®ESR also includes a selection of important limit lines in line with commercial product emission standards. Users can edit, add and save limit lines in the corresponding tables.



Upper part of screen: continuous spectral display of RF input signal around the current EMI receive frequency using the IF analysis function. Lower part of screen: stored results of preview measurement. The center frequency in the upper diagram is controlled by the marker position in the lower diagram (marker track function). Alternatively, the IF spectrum display can be coupled with the combined numeric and bargraph display.

Remotely controlled measurements and automated EMI test routines using R&S®EMC32 and R&S®ES-SCAN application software

The R&S®EMC32 EMC measurement software ideally complements the R&S®ESR. R&S®EMC32 is modular test software that supports manual as well as partially or fully automated electromagnetic interference and immunity measurements in line with commercial and military standards. The software provides reliable recording, analysis, documentation and traceability of measurement results and offers remote-control capability for a wide variety of accessory components such as mast and turntable systems.

The R&S®ES-SCAN application software is cost-effective, user-friendly Windows software created especially for disturbance measurements during development.

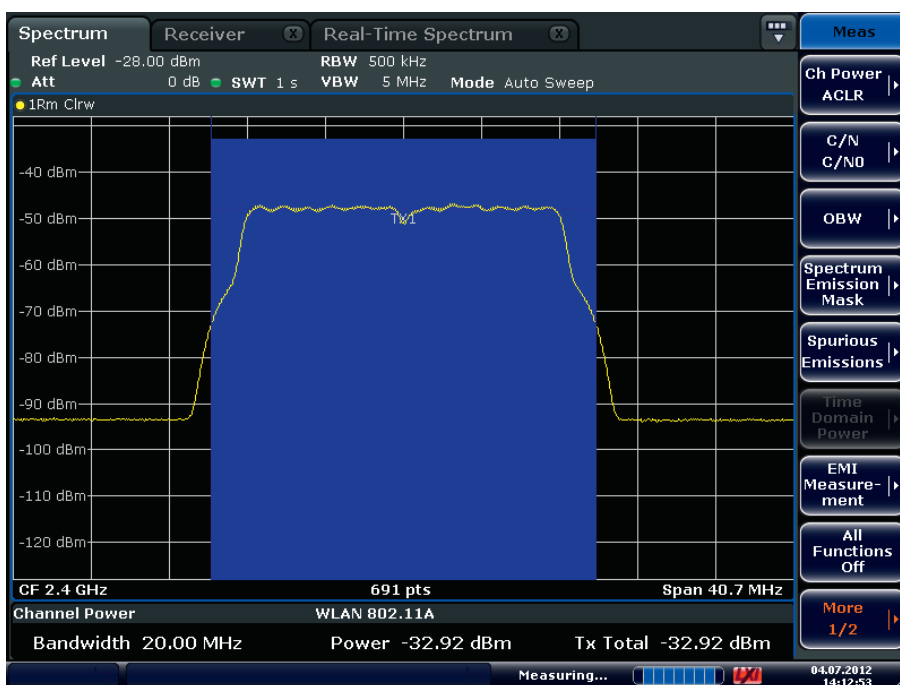
Extensive analysis capabilities for general laboratory applications

Like all Rohde & Schwarz EMI test receivers, the R&S®ESR is based on a powerful signal and spectrum analyzer – the R&S®FSV. This means that the extensive measurement capabilities of this state-of-the-art instrument are also available for the R&S®ESR. For disturbance measurements during development, users can activate or deactivate the preselection and preamplifier as required.

The R&S®ESR provides test routines for many typical laboratory measurements (see R&S®FSV product brochure, PD 5214.0499.12).

Tracking generator for scalar network analysis

The optional, internal R&S®FSV-B9 tracking generator enhances the R&S®ESR to operate as a scalar network analyzer in the frequency range from 100 kHz to 7 GHz. With this option, users can quickly and easily determine the frequency-dependent insertion loss of test cables or filters, for example, and store the results as correction tables (transducers) in the R&S®ESR.



In analyzer mode, the R&S®ESR provides test routines for many typical laboratory measurements. The diagram shows a WLAN channel power measurement.

Convenient operation, straightforward display

Touchscreen-based user interface with undo/redo functions

The R&S®ESR features a touchscreen GUI for convenient, intuitive operation. The straightforward, menu-driven design reduces learning time. All functions and measurement parameters can be configured in the conventional manner using the instrument's keys and rotary knob, or a mouse and keyboard. The large, high-resolution SVGA display provides good readability.

Up to six prior operating steps can be canceled and re-stored using the undo/redo softkeys. This enables users to quickly toggle between two different states or to correct erroneous entries.

Straightforward scan table

In receiver mode, disturbance measurements in the frequency domain are controlled by the settings in the scan table. The scan parameters are presented in a clear manner and can be configured as required for a given task or device under test.

Integrated online help

Context-sensitive help provides detailed information about the current function and lists the associated remote control commands. Even less trained users come up to speed quickly, and programming becomes an easier task.

Storage of results and instrument settings to internal or external media

Measurement data and instrument setups can be saved to, and recalled from, the instrument's internal memory or an external storage medium. The R&S®ESR accesses external media via USB or LAN, and stores results as ASCII files for further processing. These files contain the trace data together with the most important instrument settings and are exported via USB or LAN.



In receiver mode, the R&S®ESR is tuned across a user-defined frequency range in line with the settings made in the scan table. Users can define up to ten frequency subranges and configure the parameters independently for each subrange (for example range start/stop, step size, measurement time, resolution bandwidth, input attenuation).

Removable hard disk drive (HDD) to keep test data confidential

To keep their test data confidential, users can exchange the R&S®ESR standard hard disk drive for another, neutral hard disk drive (R&S®ESR-B19 option). The test receiver can then be sent in for calibration, repair or any other purpose without any confidential test data leaving the lab. Device-specific alignment data remains in the test receiver, where it is stored separately and independently of user data.

Remote control via GPIB or LAN

The R&S®ESR can be remotely controlled via its standard IEC 625-2 (IEEE 488.2) interface or a LAN interface (10/100/1000BaseT).

Drivers for LabView, LabWindows/CVI, VXI Plug & Play

For software integration, drivers for LabView, LabWindows/CVI and VXI Plug & Play are available free of charge.

Firmware updates – always in step with new developments

R&S®ESR firmware updates can be downloaded from a USB stick or via GPIB or LAN. They are available free of charge at www.rohde-schwarz.com.

Robust and compact – ideal also for mobile use

DC power supply for field use, optionally with external battery pack

The optional R&S®FSV-B30 DC power supply makes it possible to operate the R&S®ESR from 12 V to 15 V DC sources. Using the optional, rechargeable R&S®FSV-B32 battery pack, the R&S®ESR can record measurements for up to two hours on a single charge.

Solid state drive (SSD) for high vibration and shock loading

The R&S®ESR is equipped as standard with a removable hard disk drive. The hard disk drive can be replaced with a solid state drive (R&S®ESR-B18 option) to handle scenarios with above-average fluctuations of the operating temperature (permissible range +5°C to +40°C), or when the instrument is exposed to strong shock and vibration loads, for example in vehicles.

Compact design

Its compact and robust design and low weight of approx. 13 kg (without hardware options) make the R&S®ESR an ideal choice also for mobile applications.

Specifications in brief

Base unit		
Frequency		
Frequency range	R&S®ESR3	9 kHz to 3.6 GHz
	R&S®ESR3 with R&S®ESR-B29 option	10 Hz to 3.6 GHz
	R&S®ESR7	9 kHz to 7 GHz
	R&S®ESR7 with R&S®ESR-B29 option	10 Hz to 7 GHz
Level		
Max. RF level (CW))	RF attenuation ≥ 10 dB; RF preamplifier off RF attenuation ≥ 10 dB; RF preamplifier on	30 dBm (= 1 W) 23 dBm (= 0.2 W)
Max. pulse voltage	RF attenuation ≥ 10 dB input 1 input 2	150 V 450 V
Max. pulse energy	RF attenuation ≥ 10 dB; 10 µs input 1 input 2	1 mWs 20 mWs
1 dB compression	RF attenuation 0 dB; RF preamplifier and preselection off	+3 dBm, nominal
IF and resolution bandwidths		
	analyzer mode (span ≥ 10 Hz) and receiver mode	10 Hz to 10 MHz (–3 dB) in 1/2/3/5/10 steps
	analyzer and receiver mode	200 Hz, 9 kHz, 120 kHz (–6 dB), 1 MHz (impulse bandwidth)
	with R&S®ESR-B29 option in analyzer and receiver mode	additionally 10 Hz to 100 kHz (–6 dB) in decade steps
Preselection	can be switched off in analyzer mode	16 fixed filters
Preamplifier	can be switched on/off	1 kHz to 7 GHz, 20 dB gain, nominal
Measurement time	analyzer mode (sweep time)	span = 0 Hz: 1 µs to 16000 s span ≥ 10 Hz (swept): 1 ms to 16000 s span ≥ 10 Hz (FFT): 7 µs to 16000 s
	receiver mode (stepped frequency scan) receiver mode (time domain scan)	50 µs to 100 s (per frequency) 50 µs to 100 s (per frequency subrange)
Frequency step size	receiver mode (stepped frequency scan) receiver mode (time domain scan)	min. 1 Hz 0.25 × IF bandwidth
Detectors		
	receiver mode	max. peak, min. peak, quasi-peak, RMS, average, average with meter time constant (CISPR average), RMS average (CISPR-RMS)
Displayed average noise level (DANL)		
	receiver mode, nominal, average detector (AV), RF attenuation 0 dB, termination 50 Ω	
	preamplifier off	
	500 MHz, bandwidth 120 kHz	< 6 dBµV
	3 GHz, bandwidth 1 MHz	< 17 dBµV
	preamplifier on	
	500 MHz, bandwidth 120 kHz	< –7 dBµV
	3 GHz, bandwidth 1 MHz	< 5 dBµV
Number of sweep (trace) points		
	analyzer mode (standard)	101 to 32001
	analyzer mode (EMI)	101 to 200001
	receiver mode	max. 4000000
	realtime analyzer (option)	801
Total measurement uncertainty		
	CW signal, level 0 dB to –70 dB below reference level, S/N > 20 dB, auto sweep time, RF attenuation 10 dB, 20 dB, 30 dB, 40 dB, preselection on, span/RBW < 100, 95% confidence level, +20°C to +30°C	
	9 kHz ≤ f < 3.6 GHz	0.46 dB
	3.6 GHz ≤ f ≤ 7 GHz	0.57 dB

For data sheet see PD 3606.7201.22 and www.rohde-schwarz.com

Ordering information

Designation	Type	Order number
EMI Test Receiver	R&S®ESR3	1316.3003.03
EMI Test Receiver	R&S®ESR7	1316.3003.07
Accessories supplied		
Power cable, probe power cable, quick start guide and CD-ROM (with operating and service manual)		
Software options		
Time Domain Scan (requires R&S®ESR-B50)	R&S®ESR-K53	1316.3590.02
Realtime Analysis (requires R&S®ESR-B50)	R&S®ESR-K55	1316.3603.02
IF Analysis	R&S®ESR-K56	1316.3610.02
Hardware options		
OCXO, Precision Reference Frequency	R&S®FSV-B4	1310.9522.02
OCXO, Enhanced Frequency Stability	R&S®FSV-B4	1310.9522.03
Tracking Generator (100 kHz to 7 GHz)	R&S®FSV-B9	1310.9545.02
Solid State Drive (SSD, removable)	R&S®ESR-B18	1316.3555.02
Spare Hard Disk Drive (HDD, removable)	R&S®ESR-B19	1316.3561.02
RF Preamplifier (100 kHz to 7 GHz)	R&S®FSV-B22	1310.9600.02
Frequency Extension 10 Hz, including EMI bandwidths in decade steps	R&S®ESR-B29	1316.3578.02
DC Power Supply for 12 V supply voltage	R&S®FSV-B30	1310.9897.02
Hardware for Time Domain Scan and Realtime Analysis	R&S®ESR-B50	1316.3584.02

Service options		
Extended Warranty, one year	R&S®WE1ESR	Please contact your local Rohde & Schwarz sales office.
Extended Warranty, two years	R&S®WE2ESR	
Extended Warranty, three years	R&S®WE3ESR	
Extended Warranty, four years	R&S®WE4ESR	
Extended Warranty with Calibration Coverage, one year	R&S®CW1ESR	
Extended Warranty with Calibration Coverage, two years	R&S®CW2ESR	
Extended Warranty with Calibration Coverage, three years	R&S®CW3ESR	
Extended Warranty with Calibration Coverage, four years	R&S®CW4ESR	

Service you can rely on

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

About Rohde & Schwarz

Rohde & Schwarz is an independent group of companies specializing in electronics. It is a leading supplier of solutions in the fields of test and measurement, broadcasting, radiomonitoring and radiolocation, as well as secure communications. Established more than 75 years ago, Rohde & Schwarz has a global presence and a dedicated service network in over 70 countries. Company headquarters are in Munich, Germany.

Environmental commitment

- Energy-efficient products
- Continuous improvement in environmental sustainability
- ISO 14001-certified environmental management system

Certified Quality System
ISO 9001

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