

Тестовые ЭМИ приемники ESR3/7/26



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R&S®ESR

EMI Test Receiver

At a glance

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 standard. It measures electromagnetic disturbances with the conventional stepped frequency scan or – at an extremely high speed – with an FFT-based time domain scan. 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 clearly structured menus and an intuitive touchscreen, making it very easy to operate in any mode.

The R&S®ESR measures up to 6000 times faster than conventional EMI test receivers. Disturbance measurements that 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 combined with the intuitive touchscreen make the test receiver very easy to operate in any mode. It displays up to six different traces on the large, 21 cm (8.4") touchscreen for fast, effective result analysis. Compact dimensions, low weight, optional ruggedized housing and optional DC power supply make the R&S®ESR an ideal choice also for mobile applications.

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 optionally in decade steps from 10 Hz to 1 MHz (MIL STD-461, DO-160)
- Ultrafast time domain scan (option) or conventional stepped frequency scan
- Realtime spectrum analysis with up to 40 MHz span for detailed investigation of disturbances (option)
- Time domain display with high resolution (50 μ s)
- Automatic test routines
- IF analysis (option)



R&S®ESR

EMI Test Receiver

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 ultrafast measurements (option)

- Extremely fast measurements due to hardware-based FFT calculation
- Realtime measurement of the levels of conducted disturbances with simultaneous quasi-peak and average weighting

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Realtime spectrum analysis for detailed investigation of disturbances (option)

- 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 (option)
- 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 measurement software and R&S®ES-SCAN EMI software
- Extensive analysis capabilities for general laboratory applications
- Tracking generator for scalar network analysis (option)

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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 and ruggedized housing
- Solid state drive (SSD) for optimum vibration and shock resistance
- 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.

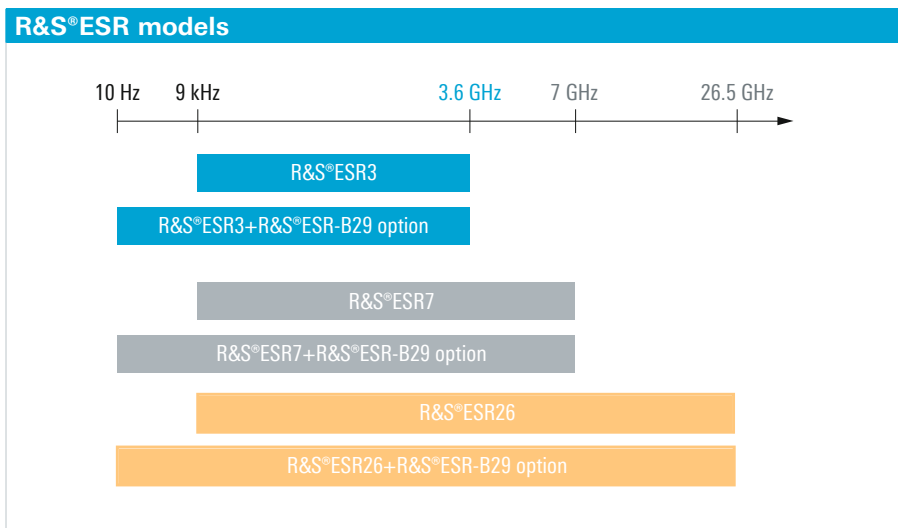
With its integrated preselection with 16 fixed filters up to 7 GHz, a 20 dB preamplifier and a highly linear frontend, the R&S®ESR meets the requirements of commercial and military standards such as CISPR, EN, ETS, ANSI, FCC, VCCI, MIL-STD-461 and DO-160 up to 26.5 GHz. The R&S®ESR has a standard frequency range from 9 kHz to 3.6/7/26.5 GHz, which can optionally be extended down to 10 Hz.

Featuring a low displayed average noise level (–168 dBm typ. 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 EMI test receivers, the R&S®ESR is based on the powerful signal and spectrum analyzer platform of the 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 on 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 and are used for fast, standard-compliant comparison of EMI signals with limit lines.



FFT-based time domain scan for ultrafast measurements (option)

Extremely fast measurements 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 the conventional, stepped frequency scan mode, making the R&S®ESR one of the fastest EMI test receivers on the market.

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 FFT windows overlapping by $> 90\%$, 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 extremely fast time domain scan delivers results very quickly, making 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 the levels of conducted disturbances with simultaneous 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 not 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 (option)

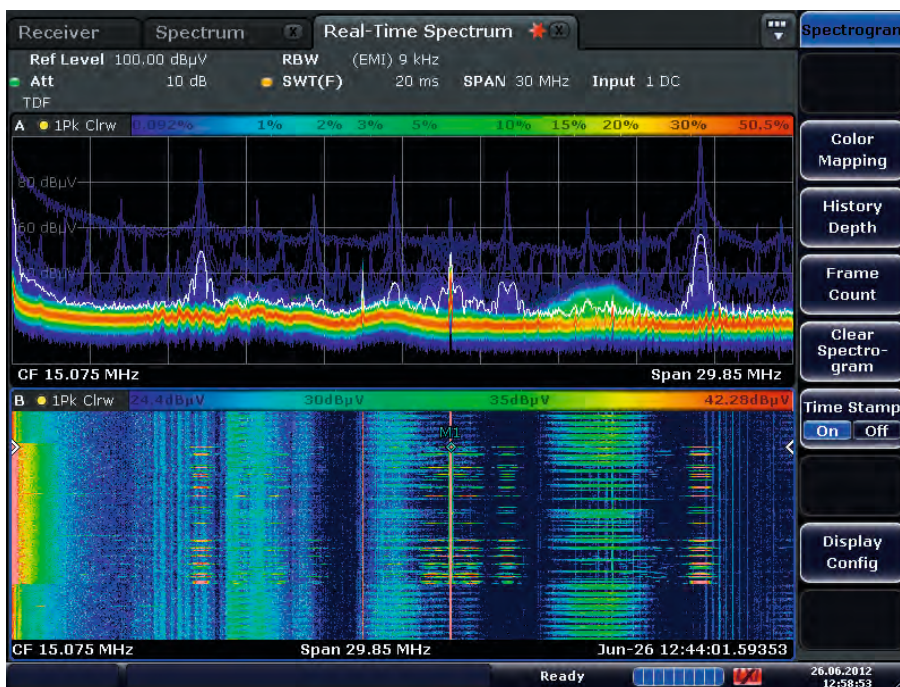
Measuring disturbances caused by sporadic and brief events in the frequency domain or determining the spectral behavior of devices under test during switching operations, for example, are difficult and time-consuming tasks. The realtime spectrum analysis function of the R&S®ESR now provides new insight 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 resolutions 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 are shown in red, for example, and sporadic ones in blue.

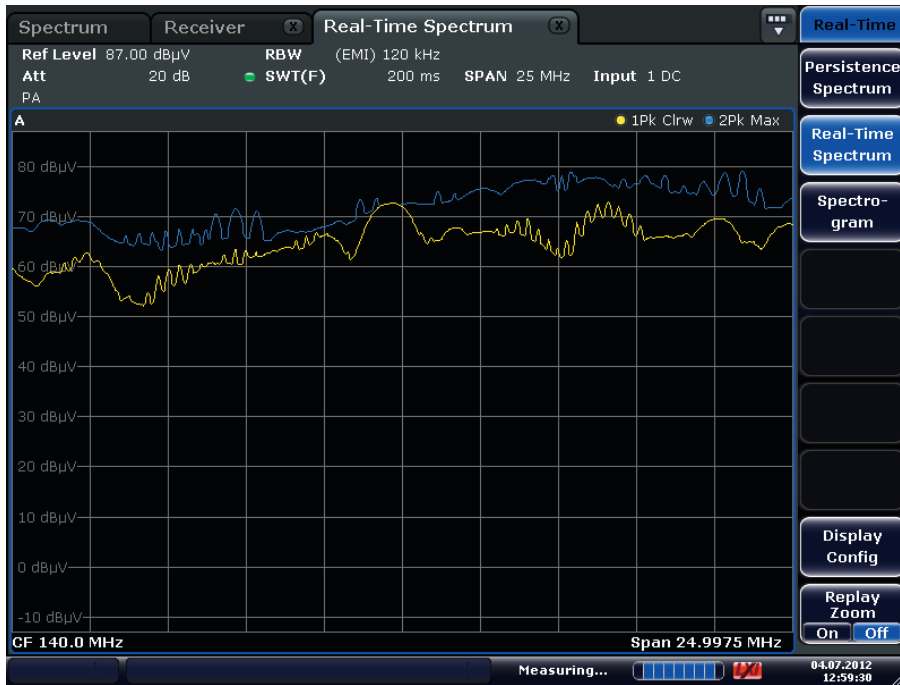


Simultaneous display of disturbance spectrum in persistence mode (top) and as a spectrogram (bottom). The spectrogram provides seamless information about the behavior over time of disturbances emitted by a DUT. In persistence mode, users can clearly distinguish between narrowband and broadband disturbances. 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.

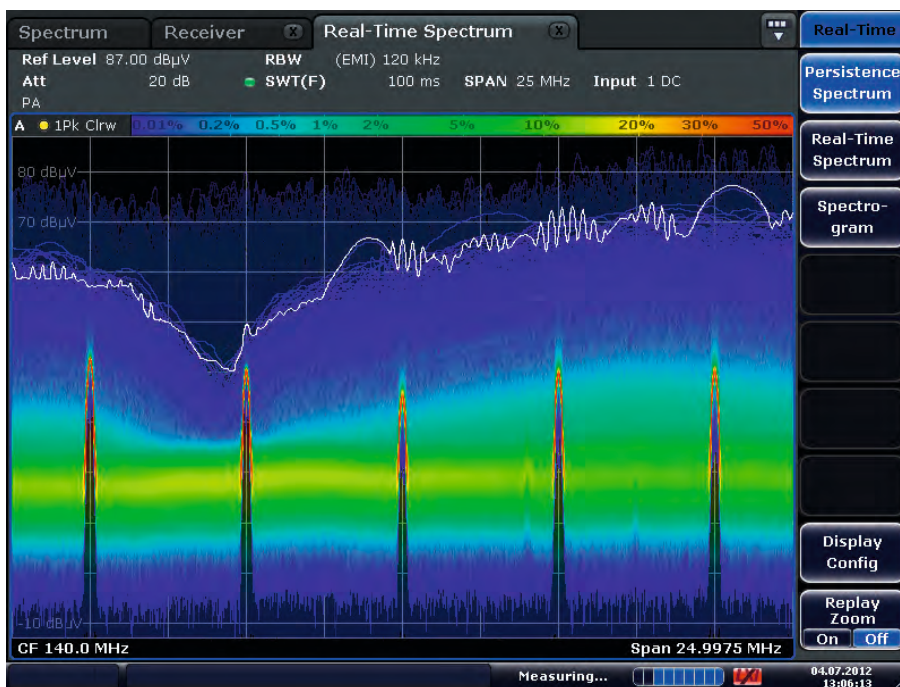
If signals no longer occur at a specific frequency with a specific amplitude, the corresponding pixel disappears after a user-definable persistence period. This allows users to clearly distinguish between pulsed disturbances, which occur only for very brief periods, and continuous disturbances. In addition, different pulsed disturbances can easily be distinguished from one another.

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 spectrum – up to 250 000 per second – and compares them 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, 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.



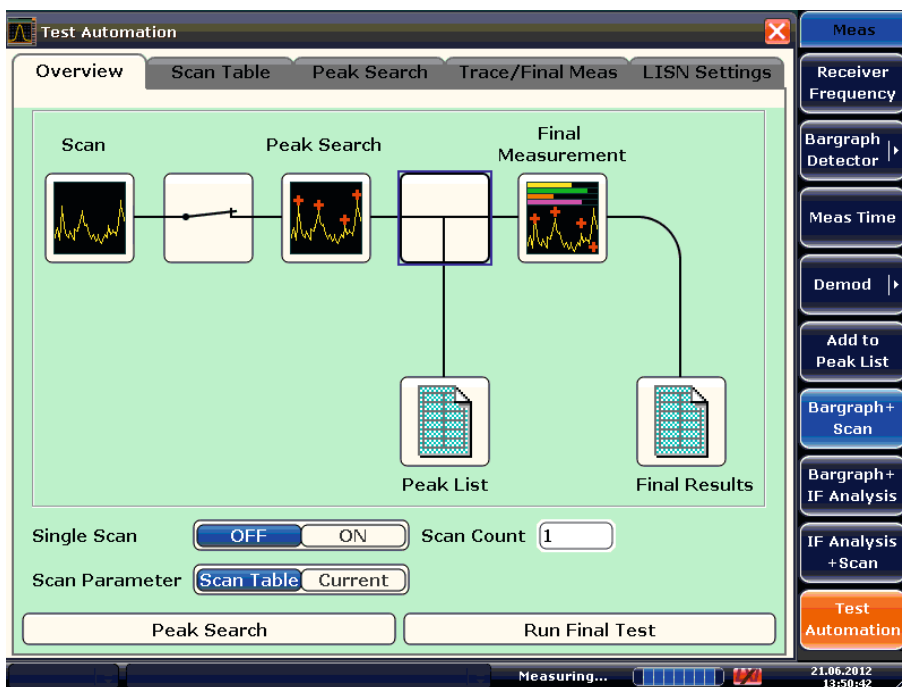
Disturbance spectrum for the same motor in persistence mode.: A second pulsed disturbance is clearly visible. It cannot be identified in conventional analyzer mode (upper diagram) as it is hidden by the broadband disturbance.

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). This table can be manually edited prior to the final measurement with standard-compliant measurement time and CISPR detector(s). Users can add or delete frequencies in an interactive way. The results of the final measurement can be exported as an ASCII file for further processing.

The R&S®ESR can remotely control 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 quickly and easily configure automatic test sequences (preview measurement, data reduction, final measurement) 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 (option)

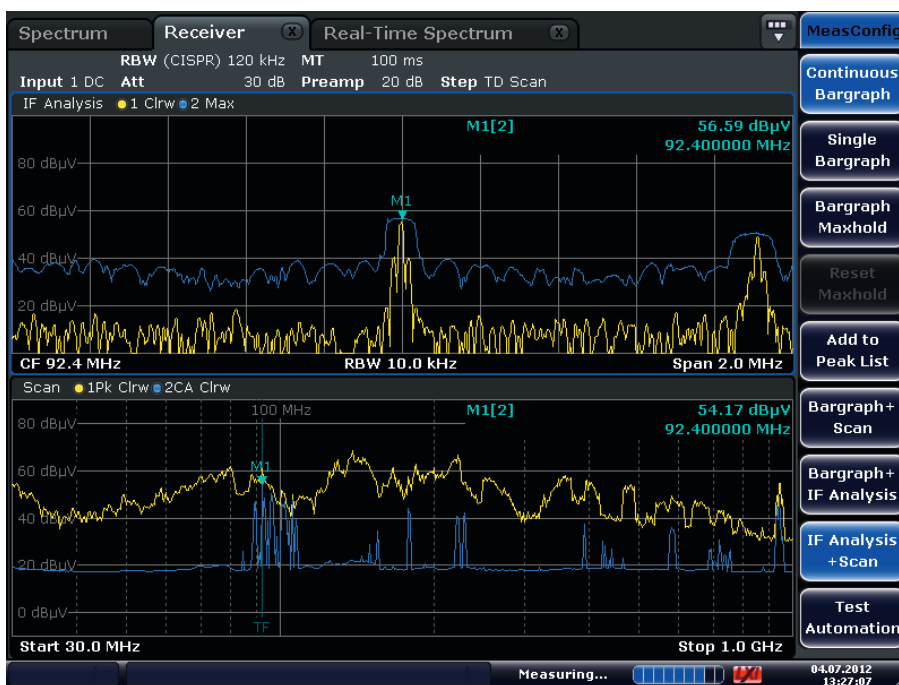
The optional IF analysis function of the R&S®ESR provides a spectral display of the RF input signal in a selectable range around the EMI receive frequency. The IF spectrum display can be coupled to the bargraph display for the current receive frequency. Alternatively, the IF spectrum can be displayed together with the stored results of the preview measurement. The marker in the preview diagram can be used to control the center frequency of the IF spectrum (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 accurately and 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. 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 behavior over time of a disturbance signal at a fixed frequency – comparable to using an oscilloscope. The receiver measures the level versus time at 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 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-like 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 measure the pulse amplitude and duration at each frequency required by the CISPR standard, thus reproducing the functionality of a click rate analyzer.



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: display of saved 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.

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 of up to four million values per trace, the R&S®ESR is ideally suited to this task. Application software for measurements in line with CISPR 14-1/EN55014-1 is installed in the R&S®ESR.

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 displays up to six different traces (including limit lines) simultaneously in a single diagram. The R&S®ESR offers the following benefits:

- ▀ Time-saving operation through simultaneous measurements using different weighting detectors
- ▀ Direct comparison of different traces
- ▀ With up to four million values per trace, the R&S®ESR can perform seamless frequency scans with narrow IF bandwidths even 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

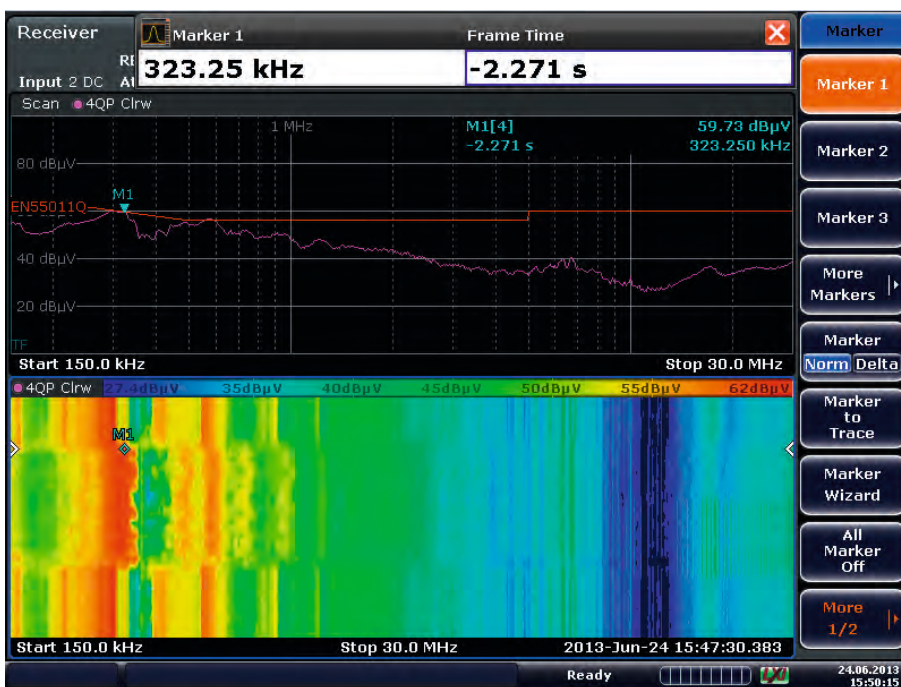
The R&S®ESR provides a combined numeric and analog bargraph display of results for up to four detectors, including the Max Hold function. This allows users to rapidly recognize the effect of changes made to the device under test.

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 their own correction tables 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 activated transducers and correction factors and displays them in the correct 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 table editor.



Upper part of screen: realtime disturbance voltage measurement with time domain scan and quasi-peak weighting.

Lower part of screen: disturbance spectra as a seamless spectrogram with marker analysis. The device under test is a computer power supply; the spectrum changes over time due to varying load states.

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

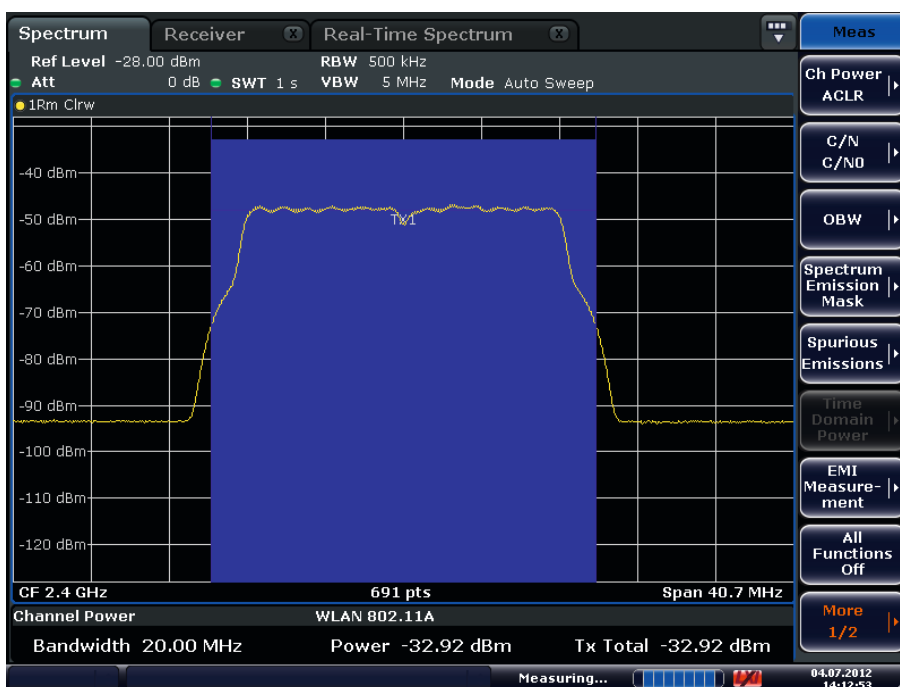
The R&S®ES-SCAN EMI software is cost-effective, user-friendly Windows software created especially for disturbance measurements during development.

Extensive analysis capabilities for general laboratory applications

The R&S®ESR is based on the powerful signal and spectrum analyzer platform of the R&S®FSV and therefore features the extensive measurement capabilities of this platform. In spectrum analyzer mode, the R&S®ESR provides measurement functions for many typical laboratory measurements (see R&S®FSV product brochure, PD 5214.0499.12)

Tracking generator for scalar network analysis (option)

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 9 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 makes it easier to learn how to use the R&S®ESR. All functions and measurement parameters can be configured using the instrument's keys and rotary knob, or a mouse and keyboard. The large, high-resolution display (800 × 600 pixel) 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 experienced 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 hard disk drive or an external storage medium. The R&S®ESR accesses external media via USB or LAN. To further process results, users can store them as ASCII files. These files contain the trace data and the most important instrument settings.



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 (range start/stop, step size, measurement time, resolution bandwidth, input attenuation, etc.).

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).

Robust and compact – ideal also for mobile use

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.

DC power supply for field use, optionally with external battery pack and ruggedized housing 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 records measurements for up to two hours on a single charge. In addition, ruggedized housing (R&S®ESR-B1 option) is available for mobile applications.

Solid state drive (SSD) for optimum vibration and shock resistance

The R&S®ESR comes 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 shocks and vibration, for example in vehicles.

Compact design

Its compact, rugged design and low weight of approx. 13 kg (R&S®ESR7 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
	with R&S®ESR-B29 option	10 Hz to 3.6 GHz
	R&S®ESR7	9 kHz to 7 GHz
	with R&S®ESR-B29 option	10 Hz to 7 GHz
	R&S®ESR26	9 kHz to 26.5 GHz
	with R&S®ESR-B29 option	10 Hz to 26.5 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 μ s 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 μ s to 16000 s span ≥ 10 Hz (swept): 1 ms to 16000 s span ≥ 10 Hz (FFT): 7 μ s to 16000 s
	receiver mode (stepped frequency scan) receiver mode (time domain scan)	50 μ s to 100 s (per frequency) 50 μ s to 100 s (per frequency subrange)
Frequency step size	receiver mode (stepped frequency scan) receiver mode (time domain scan)	min. 1 Hz 0.25 \times 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	
	30 MHz $< f < 1$ GHz, bandwidth 120 kHz	< 8 dB μ V
	1 GHz $< f < 3.6$ GHz, bandwidth 1 MHz	< 20 dB μ V
	3.6 GHz $< f < 26.5$ GHz, bandwidth 1 MHz	< 26 dB μ V
	preamplifier on	
	30 MHz $< f < 1$ GHz, bandwidth 120 kHz	< -3 dB μ V
	1 GHz $< f < 3.6$ GHz, bandwidth 1 MHz	< 9 dB μ V
	3.6 GHz $< f < 26.5$ GHz, bandwidth 1 MHz	< 13 dB μ V
Number of sweep (trace) points		
	analyzer mode (standard)	101 to 32001
	analyzer mode (EMI)	101 to 200001
	receiver mode	max. 4000000
	realtime analysis (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, $+20$ $^{\circ}$ C to $+30$ $^{\circ}$ C	
	9 kHz $\leq f < 3.6$ GHz	0.47 dB
	3.6 GHz $\leq f \leq 7$ GHz	0.59 dB
	7 GHz $\leq f \leq 13.6$ GHz	1.01 dB
	13.6 GHz $\leq f \leq 26.5$ GHz	1.34 dB

Ordering information

Designation	Type	Order number
EMI Test Receiver, 9 kHz to 3.6 GHz	R&S®ESR3	1316.3003.03
EMI Test Receiver, 9 kHz to 7 GHz	R&S®ESR7	1316.3003.07
EMI Test Receiver, 9 kHz to 26.5 GHz	R&S®ESR26	1316.3003.26
Accessories supplied		
Power cable, probe power cable, quick start guide and CD-ROM (with operating manual and service manual)		
R&S®ESR26: test port adapter with 3.5 mm female connector (1021.0512.00) and N female connector (1021.0535.00)		
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		
Ruggedized Housing (corner guards and front panel cover) for R&S®ESR	R&S®ESR-B1	1316.4100.02
OCXO, Precision Reference Frequency	R&S®FSV-B4	1310.9522.02
OCXO, Enhanced Frequency Stability	R&S®FSV-B4	1310.9522.03
Tracking Generator, 9 kHz to 7 GHz	R&S®FSV-B9	1310.9545.02
Solid State Drive (SSD, removable)	R&S®ESR-B18	1316.3555.14
Spare Hard Disk Drive (HDD, removable)	R&S®ESR-B19	1316.3561.14
RF Preamp, 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, 12 V to 15 V	R&S®FSV-B30	1310.9897.02
Lithium-Ion Battery Pack	R&S®FSV-B32	1321.3750.03
Charger for R&S®FSV-B32 lithium-ion battery pack	R&S®FSV-B34	1321.3950.02
Hardware for Time Domain Scan and Realtime Analysis	R&S®ESR-B50	1316.3584.02
Upgrade Kits ¹⁾		
Windows 7 Upgrade for R&S®ESR with hard drive	R&S®ESR-U1	1321.3608.02
Windows 7 Upgrade for R&S®ESR with solid state drive	R&S®ESR-U1	1321.3608.03
Solid State Drive (SSD, removable hard drive)	R&S®ESR-B18	1316.3555.12
Spare Hard Drive (removable hard drive)	R&S®ESR-B19	1316.3561.12

¹⁾ For R&S®ESR with the following serial numbers: R&S®ESR3: ≤ 101830, R&S®ESR7: ≤ 101393, R&S®ESR26: ≤ 101295.

Service options		
Extended Warranty, one year	R&S®WE1	Please contact your local sales office.
Extended Warranty, two years	R&S®WE2	
Extended Warranty, three years	R&S®WE3	
Extended Warranty, four years	R&S®WE4	
Extended Warranty with Calibration Coverage, one year	R&S®CW1	
Extended Warranty with Calibration Coverage, two years	R&S®CW2	
Extended Warranty with Calibration Coverage, three years	R&S®CW3	
Extended Warranty with Calibration Coverage, four years	R&S®CW4	

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Астрахань (8512)99-46-04
Барнаул (3852)73-04-60
Белгород (4722)40-23-64
Брянск (4832)59-03-52
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Волгоград (844)278-03-48
Вологда (8172)26-41-59
Воронеж (473)204-51-73
Екатеринбург (343)384-55-89
Иваново (4932)77-34-06

Ижевск (3412)26-03-58
Иркутск (395)279-98-46
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Сочи (862)225-72-31
Ставрополь (8652)20-65-13

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Томск (3822)98-41-53
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Тюмень (3452)66-21-18
Ульяновск (8422)24-23-59
Уфа (347)229-48-12
Хабаровск (4212)92-98-04
Челябинск (351)202-03-61
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