R&S®EPL
EMI TEST RECEIVER

Mix, match and upgrade for your EMI testing

R&S®EPL1000
R&S®EPL1001
R&S®EPL1007

Product Brochure
Version 04.00

ROHDE&SCHWARZ
Make ideas real

AT A GLANCE

The R&S®EPL is the perfect instrument for quick and precise EMI measurements from 5 kHz up to 7.125 GHz. The flexible option concept, including CISPR 16-1-1 compliance, makes it ideal for both precompliance and compliance applications such as measurements during development, for preparing certification and for final testing to confirm compliance with the latest EMI standards.

The R&S®EPL1000 is specially designed for conducted measurements up to 30 MHz. Even the base unit offers time domain scan and preselection with preamplifier and fully complies with CISPR 16-1-1. The R&S®EPL1001 and R&S®EPL1007 can also measure higher frequencies, from 5 kHz to 1 GHz (R&S®EPL1001) and from 5 kHz to 7.125 GHz (R&S®EPL1007). This also enables higher-frequency conducted and radiated emission measurements. The R&S®EPL1001 can be extended to 7.125 GHz via a software option. For flexible pricing, time domain scan, preselection with preamplifier and CISPR 16-1-1 compliance are optionally available for the R&S®EPL1001 and R&S®EPL1007.

The R&S®EPL automatically performs EMI measurements over several frequency ranges, even with different parameterizations (scan table). Comparing results to configured limit values is also automatic, and the R&S®EPL displays the result of the entire measurement as PASS/FAIL. Using the integrated report generator, the result and the measurement details can easily be saved and printed.

For detailed signal analysis, the R&S®EPL offers several functions including a real-time spectrogram, IF analysis, four-channel click rate analysis and standard spectrum analysis. The integrated signal generator, including a tracking generator function, can quickly and easily determine the transfer functions of components used for measurements without an additional device. Battery operation, 12 V to 24 V DC input, a carrying bag and other extras enable very flexible deployment of the R&S®EPL. The R&S®EPL offers the same user interface and operating concept as the other EMI test receivers from Rohde&Schwarz . Both new and experienced users will quickly familiarize themselves with the instrument.

KEY FACTS

- Testing from 5 kHz up to 7.125 GHz
- Precompliance and compliance testing
- Flexible option concept – buy what you need, upgrade at any time
- Fast time domain scan
- Battery operation for mains independent use
- Compact instrument with large touchscreen

BENEFITS

For all use cases up to CISPR 16-1-1 compliance
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Convenient measurements
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Fast measurements thanks to time domain scan
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Comprehensive EMI analysis functions
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For stationary, portable and mains independent use
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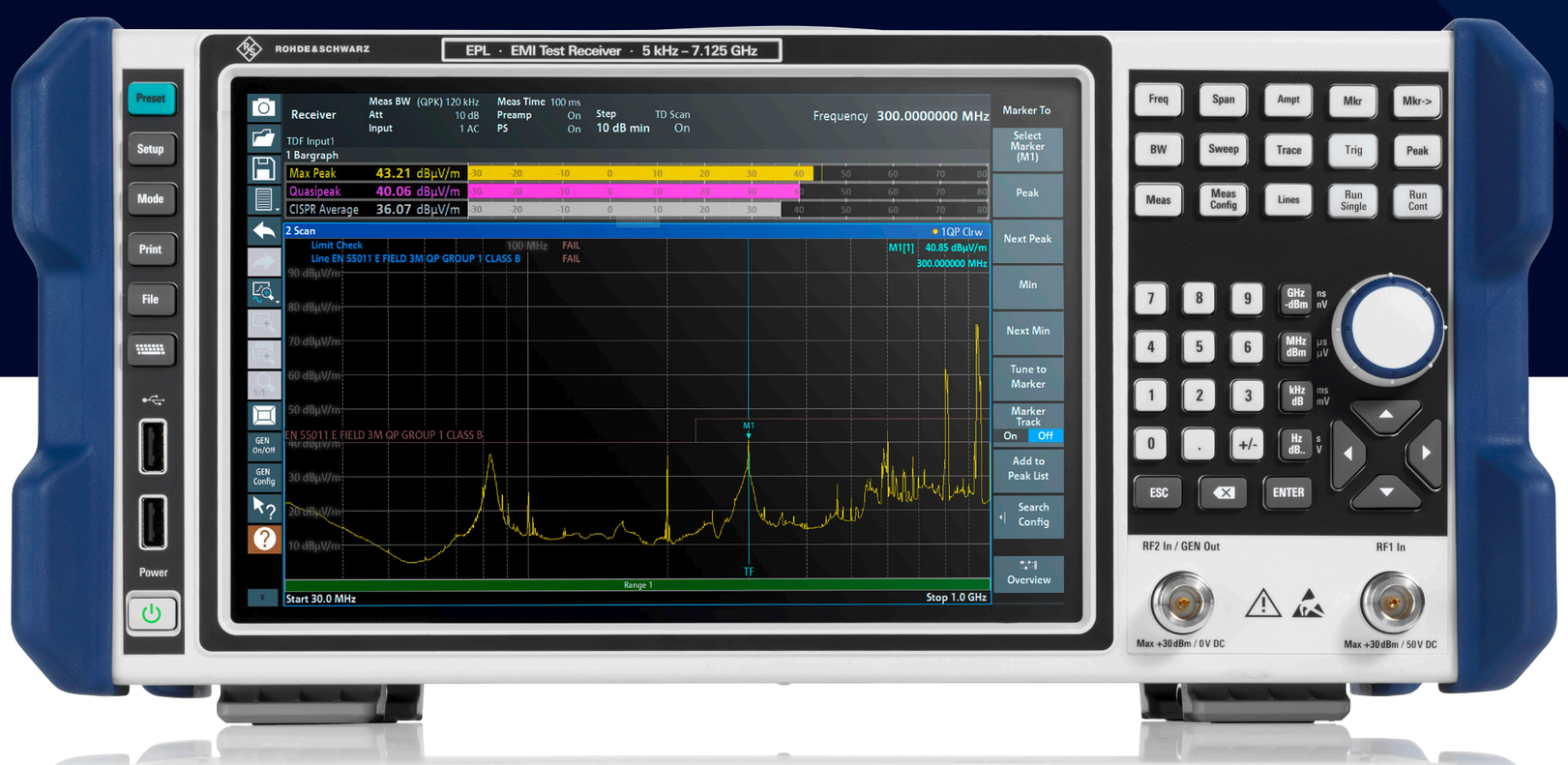
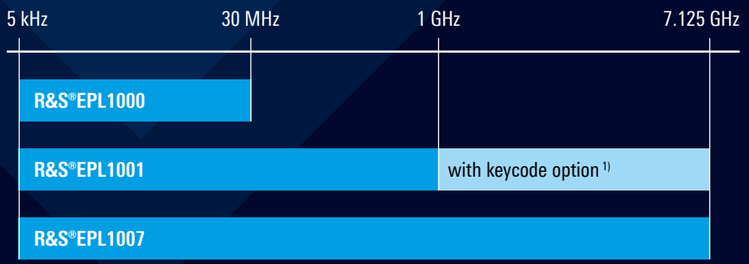
Integration into EMI test systems and remote control
▶ page 10



R&S®EPL MODEL OVERVIEW

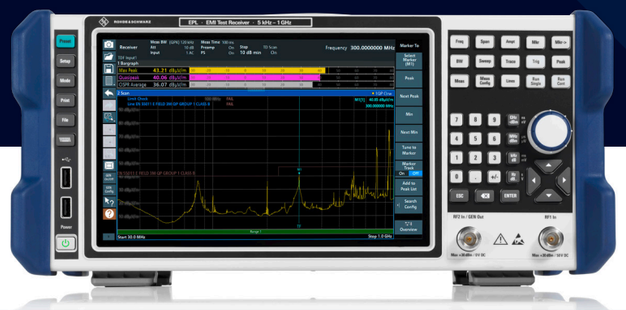


1) Upgrade possible at any time.

FOR ALL USE CASES UP TO CISPR 16-1-1 COMPLIANCE

The R&S®EPL provides strong features and options to precisely measure emissions even if the measured signals are challenging. Input signal filtering by preselection, preamplifier and CISPR 16-1-1 compliance comes with the R&S®EPL1000 base unit, and for the R&S®EPL1001 and R&S®EPL1007 they are optional. This means that the R&S®EPL can be used both during the development phase and for certification.

The table provides an overview of the most important RF and CISPR 16-1-1 relevant features.
The flexible option concept lets you buy just what you need to perfectly address precompliance and compliance applications.



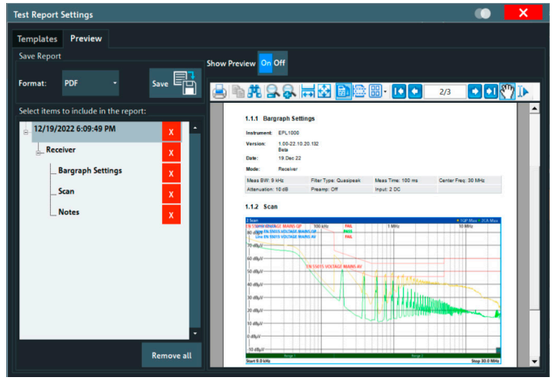
	R&S®EPL1001 | R&S®EPL1007	R&S®EPL1001 | R&S®EPL1007 with R&S®EPL1-B2	R&S®EPL1001 | R&S®EPL1007 with R&S®EPL1-B2 and R&S®EPL1-B1611	R&S®EPL1000
	Base unit	**Base unit with preselection option**	**Base unit with preselection option and CISPR 16-1-1 compliance option**	**Base unit**
Hardware protection Pulse limiter, pulse-resistant 10 dB attenuator	●	●	●	●
Attenuation of strong signals Up to 55 dB attenuation in 1 dB steps	●	●	●	●
Maximum use of dynamic range and overload handling to prevent distorted measurement results Automatic attenuator ranging	●	●	●	●
EMI detectors Peak, quasi-peak, CISPR-average, RMS-average (CISPR 16-1-1)	●	●	●	●
EMI bandwidths (6 dB) 200 Hz, 9 kHz, 120 kHz and 1 MHz (CISPR 16-1-1); 10 Hz, 100 Hz, 1 kHz, 10 kHz, 100 kHz, 1 MHz (MIL-STD-461 and DO-160)	●	●	●	●
Improved measurement of broadband interferers and short pulses Input signal filtering by preselection increasing dynamic range	—	●	●	●
Measurement of small signals Preamplifier with 20 dB gain directly attached to the preselection filters	—	●	●	●
Full CISPR 16-1-1 compliant EMI test receiver for product certification	—	—	●	●

CONVENIENT MEASUREMENTS

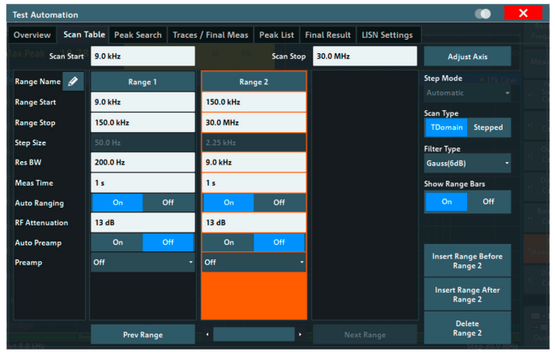
The R&S®EPL comes with many features that make it easy for the user to perform and document EMI measurements.

Features include:

- Automatic measurement of multiple frequency segments with individual settings (scan table) for resolution bandwidth (RBW), measurement time, attenuation and preamplifier use
- Remote control of connected Rohde&Schwarz line impedance stabilization networks (LISN) via R&S®EZ-21 control cable
  - Selection of the line to measure via the R&S®EPL GUI
- Preview and final measurement
  - Alternative time saving procedure when time domain scan is not used with the final detector
  - Completely automated sequence of preview measurement, peak search and final measurement
- Limit line display and checking to easily evaluate measurement results
  - Easy definition of limit lines
  - Library with about 170 EMI limit lines based on the latest versions of common EMI standards (CISPR/EN, FCC, MIL-STD-461 and DO-160) for fast and accurate configuration of measurements
- Report generation to easily record, document and exchange results
  - User-defined layout and content definition through templates
  - On-screen report display and saving (pdf and docx file formats)
  - Layout definition and preview of test reports
- Transducer factors to include characteristics of additional components used (e.g. cable attenuation, LISN or antenna factors)
  - Simple definition and quick import
  - Library covering most of the Rohde&Schwarz EMI accessories
  - Record of new transducer factors with integrated tracking generator function (part of R&S®EPL1-B91/ R&S®EPL1-B9 internal generator option)
  - Simultaneous activation of one or more transducers



Layout definition and preview of test reports



Scan table with two segments for CISPR bands A and B

Checking a laptop power supply in CISPR band B. The measurement takes about 3 s for one mains line with a measurement time of 1 s. All signal components are captured seamlessly in the same timeframe.

FAST MEASUREMENTS THANKS TO TIME DOMAIN SCAN

The R&S®EPL supports conventional level determination measuring one frequency at a time (stepped scan). CISPR 16-1-1 compliant time domain scan (TDS) increases measurement speed significantly. TDS comes standard with the R&S®EPL1000 and optionally with the R&S®EPL1001/R&S®EPL1007 (R&S®EPL1-K53).

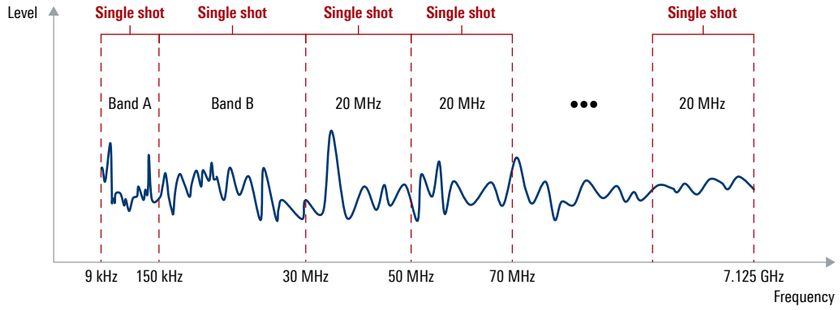
Fast measurements

Using RBWs as defined by CISPR, the R&S®EPL can measure an entire CISPR band A or B in a single measurement. Frequency ranges above 30 MHz are measured automatically in multiple steps of 20 MHz using CISPR band associated RBWs. Up to three traces can be activated with different detectors, including CISPR detectors. This enables fast standard-compliant EMI measurements directly with the detector required by the standard.

Fast and reliable detection of sporadic emissions

Hardware accelerated FFT algorithm enables long and gapless measurements of relatively large frequency segments. Every emission in the measured frequency segment is detected, no matter how short. For measuring intermittent disturbances, the measurement time can be as long as 100 s. Because all detected emissions of a measurement belong to the same time segment, any dependencies in the emissions can easily be recognized.

Time domain scan step sizes using CISPR band associated RBWs



Measurement times for the different CISPR bands with associated RBW

	Measurement time per shot	Total time [1]
CISPR band A or B, RBW = 0.2 kHz (band A), RBW = 9 kHz (band B)		
Detector: peak	0.1 s	0.5 s
	1 s	1.4 s
	15 s	15.4 s
Detector: peak, quasi-peak, CISPR-average	1 s	3 s
	15 s	17 s
CISPR band C, RBW = 120 kHz		
Detector: peak	0.1 s	1.8 s
Detector: peak, quasi-peak, CISPR-average	1 s	29 s
CISPR band C and D, RBW = 120 kHz		
Detector: peak	0.01 s	1.4 s
	0.1 s	5.8 s
Detector: peak, quasi-peak, CISPR-average	1 s	100 s
1 GHz to 6 GHz, RBW = 1 MHz		
Detector: peak	0.01 s	4.8 s
	0.1 s	28 s

[1] Necessary settling times for a valid measurement are included and automatically accounted for by the R&S®EPL. Total times may vary slightly and may change due to firmware updates.

COMPREHENSIVE EMI ANALYSIS FUNCTIONS

Level versus frequency and time: spectrogram function

The spectrogram function of the receiver mode in combination with the time domain scan (included in the R&S®EPL1000 base unit, R&S®EPL1-K53 option for R&S®EPL1001 and R&S®EPL1007) is ideal for capturing and analyzing signal properties over both time and frequency. The display in the upper part of the real-time spectrogram screen shows the measured level versus frequency (trace) at the current time. The lower part of the real-time spectrogram screen consists of colored horizontal pixel lines in which the color of each pixel line represents the measured level. The level values within one line can come from consecutive periods. Time gaps may exist between these periods within one line and between lines. The R&S®EPL1-K55E option gives the instrument an additional real-time spectrogram mode. This mode ensures that users can only use settings that enable gapless measurement of the entire measured frequency range (complete trace is measured in one shot with no gaps between the shots). The entire CISPR band A or B can thus be measured without any gaps. Above 30 MHz, 20 MHz wide frequency sections can be measured without gaps if RBWs according to CISPR are used.

The measurement can run for any length of time and the last 100 000 traces are stored in a ring buffer. For example, when using the real-time spectrogram and a measurement time of 50 ms, the buffer contains the measured values of the last 5000 s. Users can select either a 2D or 3D display and quickly measure results with markers. Receiver mode and real-time spectrogram mode support the use of transducers, EMI bandwidths, CISPR detectors and limit lines. For example, in real-time spectrogram mode the entire CISPR band B can be gaplessly measured over time and frequency using a quasi-peak detector. The results for the entire ring buffer time period can be visualized and measured with markers. The spectrogram function is especially helpful when measuring signals that vary over time. Sporadic signal components are easy to identify and analyze.

Level at a frequency versus time: zero span

The level over time at a selected frequency is displayed as a trace. Level and time values can be determined quickly and precisely using markers. This can be helpful in determining the period of periodic interferers to specify an appropriate measurement time, for instance.

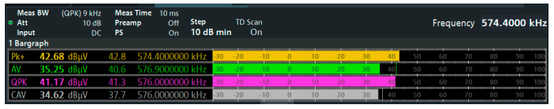
Level at a frequency: bar graph display

The bar graph display visualizes the level at a selected frequency. Instantaneous and maximum values are also displayed. Up to four graphs, each corresponding to its own detector can be displayed at the same time. This function enables quick and easy analysis of the level at a given frequency.

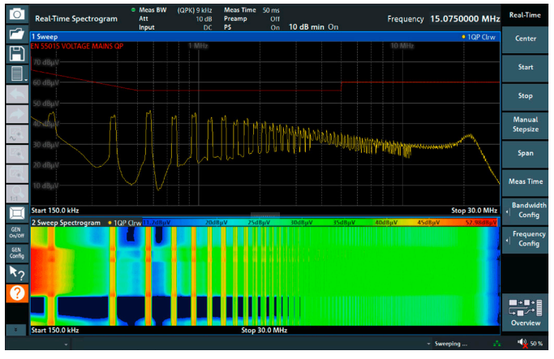
IF analysis (R&S®EPL1-K56 option)

The R&S®EPL offers IF analysis as an option. Its display can be combined with the bar graph and a spectrogram function. Marker functions enable precise measurements.

Bar graph display with four detectors



Real-time spectrogram: analysis of the emissions of an LED lamp while changing the brightness level. The measurement was made with a quasi-peak detector.



Analysis of the emissions of an LED lamp at 576 kHz using bar graph display in combination with IF spectrum and spectrogram function. The dynamic behavior of the signal, especially in the 560 kHz to 585 kHz range, is clearly visible.

AM/FM audio output

AM and FM audio output helps the user to understand the characteristic of an interferer or easily identify ambient interferers – during open area testing, for instance. For audio output, there is an integrated loudspeaker and a headphone port. Comprehensive analysis functions for the modulation parameters of AM, FM and PM signals can be activated with the R&S®FPL1-K7 keycode option.

Spectrum analysis

In addition to the various EMI-specific measurement functions, the R&S®EPL includes spectrum analysis functions, equivalent to those offered by a state-of-the-art spectrum analyzer.

Four-channel click rate analyzer (R&S®EPL1-K59 option)

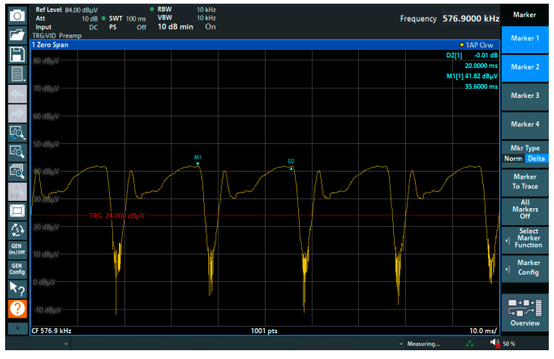
Thermostat or software-controlled devices such as ovens, rice cookers, irons, refrigerators, air conditioners and washing machines can generate discontinuous disturbances (clicks). Higher limits than those for continuous disturbances can be used to evaluate discontinuous disturbances as long as the clicks are not too long or too frequent.

The R&S®EPL1-K59 four-channel click rate analyzer has everything you need for CISPR 14-1 compliant discontinuous disturbance measurements (click measurements). These measurements can be easily configured and run for a defined period of time or until a specific number of clicks is detected. The measured values are automatically evaluated in line with CISPR 14-1 edition 6 or 7 and a PASS/FAIL message is displayed. Details of the evaluation are also provided. When ordered with the instrument, this function is verified with CISPR 16-1-1 defined pulses. The R&S®DCV-2 option or the R&S®ACAEPL accredited calibration option provides documentation of the results.

The R&S®EPL1-K59 click rate analyzer option also features extensive analysis of measured values to help the user understand and improve emission characteristics. It is ideal for certification and EMI debugging and analysis.

- Compliant with CISPR 14-1 editions 6 and 7
- Simultaneous and gapless measurement of all four frequencies defined by CISPR 14-1
- Optional frequency setting in line with DENAN law (Japan)
- Up to four hours of measurement time
- Save and recall settings and measured values for later analysis
- Analyze four hours of measurement values within a few seconds
- Reanalyze measured values with modified settings
- Result summary window with details for each channel
- Flow chart diagram to visualize results (PASS/FAIL)
- User-defined report generation with graphics and analysis results for each click (configurable)
- Measurement value export for external processing
- Special operating mode to measure repetitive igniters
- Display of all or selected channels and detectors
- Overview of complete timeline with free time selection for detail window
- Detail window with extensive analysis functions
  - Zoom function
  - Duration information with each click
  - Marker and delta marker measurements
  - Fast browsing through click sequence
- Click info window with detailed measurement results for the selected click

Analysis of the emissions of an LED lamp at 576 kHz versus time. The trigger function ensures a stable display. A period of 20 ms was measured using the marker functions.

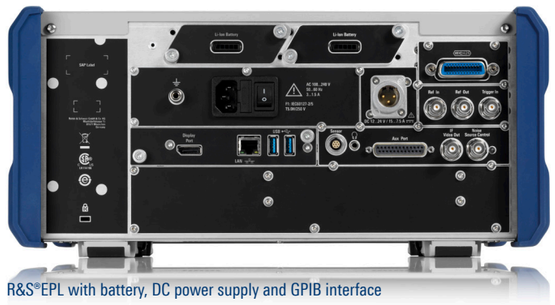


Analysis of the emissions of an oven using the R&S®EPL1-K59 click rate analyzer option. Clicks are identified on CH1. The complete timeline at the top shows a nearly regular distribution of the pulses. The detail window shows that the quasi-peak detector exceeds the limit. Although several clicks are detected, the oven has passed the test.

FOR STATIONARY, PORTABLE AND MAINS INDEPENDENT USE

Flexible power supply, including an integrated rechargeable battery

With an input voltage range of 110 V to 240 V, the R&S®EPL can be connected to all customary AC power sources. If an AC power source is not available, the integrable 12 V to 24 V DC input (R&S®FPL1-B30) can be used as an alternative. If no external power source is available, the R&S®EPL is still usable thanks to the integrated rechargeable battery (R&S®FPL1-B31). For an especially long operating time, the batteries can be exchanged (R&S®FPL1-Z4/R&S®FSV-B34). This makes it easy to perform measurements far from AC power sources (such as in-situ measurements).



R&S®EPL with battery, DC power supply and GPIB interface

Operation in a rack, in the lab or on the go

Fold-out feet on the bottom and a carrying handle on the top of the R&S®EPL enable flexible deployment in the lab. Professional installation in a 19" rack is easy using the R&S®EPL1-Z6 rackmount kit. The R&S®EPL1-Z1 protective hard cover for the front of the instrument and the R&S®EPL1-Z2 carrying bag make transport easy and safe. A Kensington lock can be used to secure the instrument.

Data is protected when the instrument is used at different locations or by different users

The R&S®EPL features a unit containing an SSD and CPU, which can easily be swapped for a replacement unit (R&S®EPL1-B19). This allows for easy and highly reliable removal of sensitive measurement data from the instrument. If the R&S®EPL is transferred without this removable unit, no data is handed over with the instrument. Once the recipient inserts a replacement SSD-CPU unit, the R&S®EPL is again fully ready to use.

INTEGRATION INTO EMI TEST SYSTEMS AND REMOTE CONTROL

The R&S®EPL can be integrated into TCP/IP networks via its integrated Ethernet interface. A GPIB interface (R&S®FPL1-B10) can optionally be added. Using SCPI commands, the functions of the R&S®EPL can be controlled and measurement results can be retrieved. This enables integration into EMC test system software (like R&S®ELEKTRA) or any other software application. The remote control command set is as compatible as possible with that of other Rohde&Schwarz test receivers.

Remote operation of the R&S®EPL is easy with a Windows remote desktop connection or via the integrated web server of the R&S®EPL. In both cases the R&S®EPL screen, along with an interactive visual simulation of the R&S®EPL controls, is displayed on the client computer. This allows remote operation as if the user were sitting directly at the device. Multiple users can access the instrument at the same time from different computers via the web server and see the same user interface. The web server also supports simple data exchange with the R&S®EPL.

Use of R&S®EPL with R&S®ELEKTRA EMC test software

DEVICE COMPARISON

	R&S®EPL1000	R&S®EPL1001 | R&S®EPL1007
Upper frequency	30 MHz	1 GHz (R&S®EPL1001), 7.125 GHz (R&S®EPL1007)
Frequency upgrade option	–	R&S®EPL1001 upgradeable to 7.125 GHz (R&S®EPL1-B7125)
Time domain scan, preselection with preamplifier and CISPR 16-1-1 compliance	included	option (R&S®EPL1-K53, R&S®EPL1-B2, R&S®EPL1-B1611)
Tracking generator	hardware option (R&S®EPL1-B91)	keycode option (R&S®EPL1-B9), requires preselection hardware option (R&S®EPL1-B2)
RF input(s), generator output	1 input, 1 optional output	2 inputs (1 of the 2 inputs optionally configurable as output)
Preamplifier for spectrum mode	not necessary	option (R&S®R&S®EPL1-B22)
Real-time spectrogram	option (R&S®EPL1-K55E)	option (R&S®EPL1-K55E), requires time domain scan option (R&S®EPL1-K53)
Depth	23.5 cm (9.25 in)	30.5 cm (12.0 in)
Model-specific versions of options		
Transport bag	R&S®EPL1-Z2 (order no.: 1350.4309.02)	R&S®EPL1-Z2 (order no.: 1353.6431.02)
Rackmount kit	R&S®EPL1-Z6 (order no.: 1350.4321.02)	R&S®EPL1-Z6 (order no.: 1353.6377.02)
Lithium-ion battery pack for internal battery slot	R&S®FPL1-B31 (var. 02, order no.: 1323.1725.02)	R&S®FPL1-B31 (var. 03, order no.: 1323.1725.03)
Tracking generator	R&S®EPL1-B91 (order no.: 1350.4073.02)	R&S®EPL1-B9 ▶ for R&S®EPL1001 (order no.: 1350.4467.02) ▶ for R&S®EPL1007 (order no.: 1350.4044.02)

Service at Rohde&Schwarz

YOU'RE IN GREAT HANDS

	SERVICE PLANS	ON DEMAND
Calibration	Up to five years [1]	Pay per calibration
Warranty and repair	Up to five years [1]	Standard price repair

[1] For extended periods, contact your Rohde&Schwarz sales office.

Instrument management made easy

The R&S®InstrumentManager makes it easy to register and manage your instruments. It lets you schedule calibration dates and book services.

Find out more about our service portfolio under:

Service at Rohde&Schwarz
You're in great hands

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

Rohde&Schwarz

The Rohde&Schwarz technology group is among the trailblazers when it comes to paving the way for a safer and connected world with its leading solutions in test&measurement, technology systems and networks&cybersecurity. Founded more than 90 years ago, the group is a reliable partner for industry and government customers around the globe. The independent company is headquartered in Munich, Germany and has an extensive sales and service network with locations in more than 70 countries.

www.rohde-schwarz.com

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

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