# R&S®ESR
# EMI Test Receiver
# Specifications


ROHDE&SCHWARZ

Data Sheet | Version 06.00

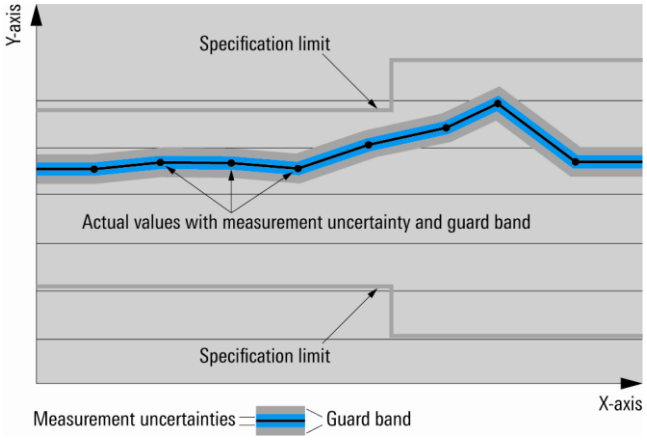
# CONTENTS

# Definitions

**General**
Product data applies under the following conditions:

- Three hours storage at ambient temperature followed by 30 minutes warm-up operation
- Specified environmental conditions met
- Recommended calibration interval adhered to
- All internal automatic adjustments performed, if applicable

**Specifications with limits**
Represent warranted product performance by means of a range of values for the specified parameter. These specifications are marked with limiting symbols such as <, ≤, >, ≥, ±, or descriptions such as maximum, limit of, minimum. Compliance is ensured by testing or is derived from the design. Test limits are narrowed by guard bands to take into account measurement uncertainties, drift and aging, if applicable.




**Specifications without limits**
Represent warranted product performance for the specified parameter. These specifications are not specially marked and represent values with no or negligible deviations from the given value (e.g. dimensions or resolution of a setting parameter). Compliance is ensured by design.

**Typical data (typ.)**
Characterizes product performance by means of representative information for the given parameter. When marked with <, > or as a range, it represents the performance met by approximately 80 % of the instruments at production time. Otherwise, it represents the mean value.

**Nominal values (nom.)**
Characterize product performance by means of a representative value for the given parameter (e.g. nominal impedance). In contrast to typical data, a statistical evaluation does not take place and the parameter is not tested during production.

**Measured values (meas.)**
Characterize expected product performance by means of measurement results gained from individual samples.

**Uncertainties**
Represent limits of measurement uncertainty for a given measurand. Uncertainty is defined with a coverage factor of 2 and has been calculated in line with the rules of the Guide to the Expression of Uncertainty in Measurement (GUM), taking into account environmental conditions, aging, wear and tear.

Device settings and GUI parameters are designated with the format “parameter: value”.

Typical data as well as nominal and measured values are not warranted by Rohde & Schwarz.

# Specifications

| | | |
|---|---|---|
| Operating modes | | EMI test receiver |
| | | spectrum analyzer |
| | with R&S®ESR-K55 option | real-time spectrum analyzer |

## Frequency

| | | |
|---|---|---|
| **Frequency range** | R&S®ESR3 | |
| | input 1, AC coupled | 10 MHz to 3.6 GHz |
| | input 1, DC coupled | 9 kHz to 3.6 GHz |
| | input 2, DC coupled | 9 kHz to 1 GHz |
| | R&S®ESR7 | |
| | input 1, AC coupled | 10 MHz to 7 GHz |
| | input 1, DC coupled | 9 kHz to 7 GHz |
| | input 2, DC coupled | 9 kHz to 1 GHz |
| | R&S®ESR26 | |
| | input 1, AC coupled | 10 MHz to 26.5 GHz |
| | input 1, DC coupled | 9 kHz to 26.5 GHz |
| | input 2, DC coupled | 9 kHz to 1 GHz |
| | with R&S®ESR-B29 option, DC coupled | 10 Hz to max. frequency |
| **Frequency resolution** | receiver mode | 0.1 Hz |
| | analyzer mode | 0.01 Hz |

| **Reference frequency, internal** | | |
|---|---|---|
| Accuracy | | ±((time since last adjustment × aging rate) + temperature drift + calibration accuracy) |
| Aging per year | standard | $\pm 1 \times 10^{-6}$ |
| | with R&S®FSV-B4 option | $\pm 1 \times 10^{-7}$ |
| Temperature drift (+5 °C to +45 °C) | standard | $\pm 1 \times 10^{-6}$ |
| | with R&S®FSV-B4 option, model .02 | $\pm 1 \times 10^{-7}$ |
| | with R&S®FSV-B4 option, model .03 | $\pm 1 \times 10^{-8}$ |
| Max. initial calibration accuracy | standard | $\pm 5 \times 10^{-7}$ |
| | with R&S®FSV-B4 option | $\pm 5 \times 10^{-8}$ |

| **Frequency readout (analyzer mode)** | | |
|---|---|---|
| Marker resolution | | 1 Hz |
| Uncertainty | | ±(marker frequency × reference accuracy + 10 % × resolution bandwidth + ½ (span/(sweep points – 1)) + 1 Hz) |
| Number of sweep (trace) points | default value | 691 |
| | range | |
| | spectrum analyzer | 101 to 32 001 |
| | EMI measurement | 101 to 200 001 |
| Marker tuning frequency step size | marker step size = sweep points | span/(sweep points – 1) |
| | marker step size = standard | span/(default sweep points – 1) |
| Frequency counter resolution | | 0.001 Hz |
| Count accuracy | | ±(frequency × reference accuracy + ½ (last digit)) |
| Display range for frequency axis | | 0 Hz, 10 Hz to max. frequency |
| Resolution | | 0.1 Hz |
| Max. span deviation | | ±0.1 % |

| **Receiver scan** | | |
|---|---|---|
| Scan | | max. 10 subranges with different settings |
| Scan modes | | normal, time domain [1] |
| Measurement time | normal scan, per frequency | 50 µs to 100 s |
| | time domain scan, per subrange [1] | 50 µs to 100 s |
| Number of trace points | | up to 4 000 000 |
| Frequency step size | normal scan | min. 1 Hz |
| | time domain scan [1] | 0.25 × resolution bandwidth |
| **Time domain scan** [1] | | |
| Frequency segment processed in parallel | f < 7 GHz | |
| | RBW = 200 Hz | 0.66 MHz |
| | RBW = 9 kHz | 30 MHz |
| | RBW = 120 kHz | 24.6 MHz |
| | RBW = 1 MHz | 25.6 MHz |
| | f ≥ 7 GHz | |
| | RBW = 200 Hz | 0.66 MHz |
| | RBW ≥ 9 kHz | 10 MHz |
| FFT overlap factor | | ≥ 93 % |

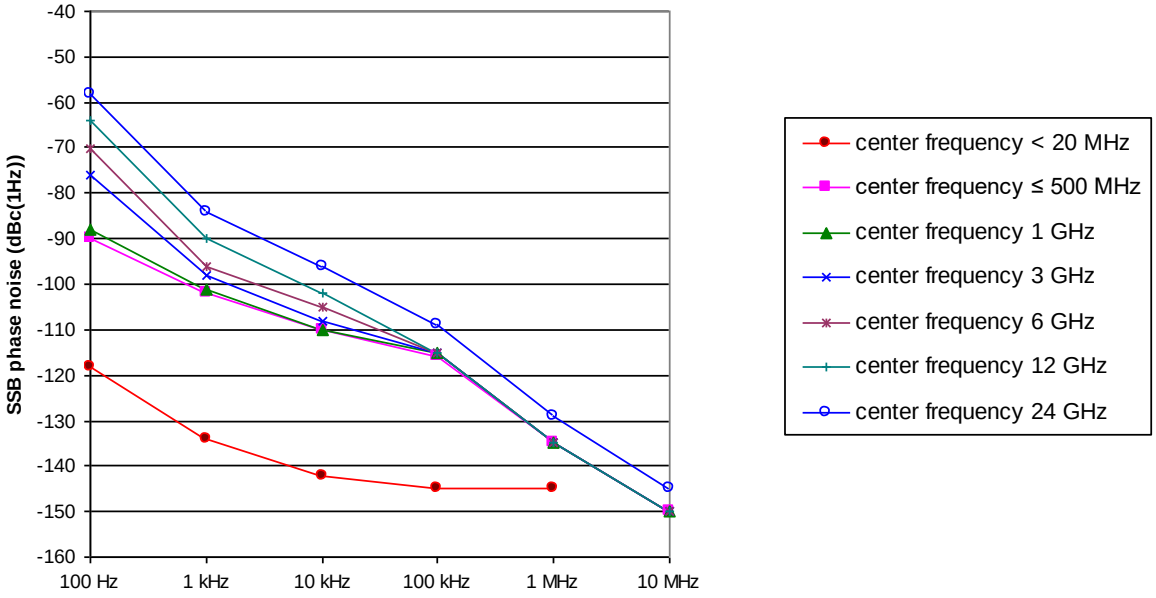
| **Spectrum analyzer** | | |
|---|---|---|
| Sweep time range | span = 0 Hz | 1 µs to 16 000 s |
| | span ≥ 10 Hz, swept | 1 ms to 16 000 s [2] |
| | span ≥ 10 Hz, FFT | 7 µs to 16 000 s [3] |
| Sweep time accuracy | span = 0 Hz | ±0.1 % (nom.) |
| | span ≥ 10 Hz, swept | ±3 % (nom.) |

| **Spectral purity** | | |
|---|---|---|
| SSB phase noise | frequency = 500 MHz, carrier offset | |
| | 100 Hz | < –84 dBc (1 Hz) |
| | 1 kHz | < –101 dBc (1 Hz) |
| | 10 kHz | < –106 dBc (1 Hz) |
| | 100 kHz | < –115 dBc (1 Hz) |
| | 1 MHz | < –134 dBc (1 Hz) |
| | 10 MHz | < –150 dBc (1 Hz) (nom.) |
| Residual FM | frequency = 500 MHz, RBW = 1 kHz, sweep time = 100 ms | < 3 Hz (nom.) |

[1] Requires R&S®ESR-K53 option.

[2] Net sweep time without additional hardware settling time.

[3] Data acquisition time for FFT calculation.




*Typical phase noise at different center frequencies.*

## Preselection and preamplifier

| | | |
|---|---|---|
| **Preselection** | | |
| State | receiver mode | always on |
| | analyzer mode | on/off (selectable) |
| Number of preselection filters | | 16 |
| Bandwidths (–6 dB), nominal | 10 Hz to 150 kHz | fixed lowpass filter |
| | 150 kHz to 30 MHz | 35 MHz, fixed bandpass filter |
| | 30 MHz to 80 MHz | 94 MHz, fixed bandpass filter |
| | 80 MHz to 130 MHz | 94 MHz, fixed bandpass filter |
| | 130 MHz to 180 MHz | 91 MHz, fixed bandpass filter |
| | 180 MHz to 230 MHz | 105 MHz, fixed bandpass filter |
| | 230 MHz to 300 MHz | 110 MHz, fixed bandpass filter |
| | 300 MHz to 425 MHz | 195 MHz, fixed bandpass filter |
| | 425 MHz to 570 MHz | 200 MHz, fixed bandpass filter |
| | 570 MHz to 715 MHz | 210 MHz, fixed bandpass filter |
| | 715 MHz to 860 MHz | 200 MHz, fixed bandpass filter |
| | 860 MHz to 1005 MHz | 200 MHz, fixed bandpass filter |
| | 1005 MHz to 1750 MHz | fixed highpass filter |
| | 1750 MHz to 2850 MHz | fixed highpass filter |
| | 2850 MHz to 4850 MHz | fixed highpass filter |
| | 4850 MHz to 7000 MHz | fixed highpass filter |
| | 7 GHz to 26.5 GHz | YIG filter |
| **Preamplifier** | switchable | |
| Location | 1 kHz to 7 GHz | in the signal path between preselection and 1st mixer |
| | 7 GHz to 26.5 GHz | in the signal path between diplexer and preselection |
| Range | | 1 kHz to 26.5 GHz |
| Gain | 1 kHz to 7 GHz | 20 dB (nom.) |
| | 7 GHz to 26.5 GHz | 30 dB (nom.) |

# IF and resolution bandwidths

| **IF and sweep filters** | | |
|---|---|---|
| Resolution bandwidths (–3 dB) | receiver mode or<br>analyzer mode, span ≥ 10 Hz | 10 Hz to 10 MHz in 1/2/3/5 sequence |
| | analyzer mode, span = 0 Hz | 20 MHz, 28 MHz additionally |
| | analyzer mode, span = 0 Hz, f ≤ 7 GHz | 40 MHz additionally |
| Bandwidth uncertainty | | < 3 % |
| Shape factor 60 dB:3 dB | | < 5 |
| EMI bandwidths (–6 dB) | standard | 200 Hz, 9 kHz, 120 kHz, 1 MHz |
| | with R&S®ESR-B29 option | 10 Hz, 100 Hz, 1 kHz, 10 kHz, 100 kHz additionally |
| Bandwidth uncertainty | | < 3 % |
| Shape factor 60 dB:6 dB | | < 4 |

| **FFT filters (analyzer mode)** | | |
|---|---|---|
| Resolution bandwidths (–3 dB) | span ≥ 10 Hz | 10 Hz to 300 kHz in 1/2/3/5 sequence |
| Bandwidth uncertainty | | < 3 % (nom.) |
| Shape factor 60 dB:3 dB | | < 5 (nom.) |

| **Channel filters (analyzer mode)** | | |
|---|---|---|
| Bandwidths (–3 dB) | standard<br>(RRC = root raised cosine) | 100/200/300/500 Hz |
| | | 1/1.5/2/2.4/2.7/3/3.4/4/4.5/5/6/8.5/9/10/<br>12.5/14/15/16/18 (RRC)/20/21/24.3 (RRC)<br>/25/30/50/100/150/192/200/300/500 kHz |
| | | 1/1.228/1.28 (RRC)/1.5/2/3/3.84 (RRC)/<br>4.096 (RRC)/5/5.6/8/10 MHz |
| | f ≤ 7 GHz | 20/28/40 MHz additionally |
| Bandwidth accuracy | | < 2 % (nom.) |
| Shape factor 60 dB:3 dB | | < 2 (nom.) |

| **Video bandwidths (analyzer mode)** | | |
|---|---|---|
| | | 1 Hz to 10 MHz in 1/2/3/5 sequence,<br>20 MHz, 28 MHz |
| | f ≤ 7 GHz | 40 MHz additionally |

# Level

| | | |
|---|---|---|
| Display range | | displayed noise floor up to +30 dBm |

| **Max. input level** | | |
|---|---|---|
| DC voltage | input 1 | |
| | AC coupled | 50 V |
| | DC coupled | 0 V |
| | input 2 | 0 V |
| CW RF power | RF attenuation = 0 dB | |
| | RF preamplifier = off | 20 dBm (= 0.1 W) |
| | RF preamplifier = on | 13 dBm (= 0.02 W) |
| | RF attenuation ≥ 10 dB | |
| | RF preamplifier = off | 30 dBm (= 1 W) |
| | RF preamplifier = on | 23 dBm (= 0.2 W) |
| Pulse spectral density | RF attenuation = 0 dB, preselection = on [4],<br>RF preamplifier = off | 97 dB µV/MHz |
| Max. pulse voltage | RF attenuation ≥ 10 dB | |
| | input 1 | 150 V |
| | input 2 | 450 V |
| Max. pulse energy | RF attenuation ≥ 10 dB, 10 µs | |
| | input 1 | 1 mWs |
| | input 2 | 20 mWs |

[4] Default setting in receiver mode.

| **Intermodulation** | | |
|---|---|---|
| 1 dB compression of input mixer | RF attenuation = 0 dB, preselection and preamplifier = off [5] | |
| | f ≤ 7 GHz | +10 dBm (nom.) |
| | f > 7 GHz | +5 dBm (nom.) |
| Third-order intercept point (TOI) | RF attenuation = 0 dB, level = 2 × –15 dBm, Δf > 5 × RBW or 10 kHz, whichever is larger, preselection = off [5], with R&S®FSV-B22 option: RF preamplifier = off | |
| | 10 MHz ≤ $f_{in}$ < 100 MHz | > 12 dBm, 15 dBm (typ.) |
| | 100 MHz ≤ $f_{in}$ < 3.6 GHz | > 13 dBm, 16 dBm (typ.) |
| | 3.6 GHz ≤ $f_{in}$ ≤ 26.5 GHz | > 15 dBm, 18 dBm (typ.) |
| | preselection = on [6], preamplifier = off,<br>RF attenuation = 0 dB, level = 2 × –20 dBm, Δf > 5 × RBW or 10 kHz, whichever is larger | |
| | 10 MHz ≤ $f_{in}$ < 100 MHz | > 5 dBm, 8 dBm (typ.) |
| | 100 MHz ≤ $f_{in}$ < 4.5 GHz | > 8 dBm, 11 dBm (typ.) |
| | 4.5 GHz ≤ $f_{in}$ ≤ 7 GHz | > 5 dBm, 8 dBm (typ.) |
| | 7 GHz ≤ $f_{in}$ ≤ 26.5 GHz | > 15 dBm, 18 dBm (typ.) |
| | preselection = on [6], preamplifier = on,<br>RF attenuation = 0 dB, level = 2 × –45 dBm, Δf > 5 × RBW or 10 kHz, whichever is larger | |
| | 10 MHz ≤ $f_{in}$ < 100 MHz | > –16 dBm, –13 dBm (typ.) |
| | 100 MHz ≤ $f_{in}$ < 3.6 GHz | > –14 dBm, –11 dBm (typ.) |
| | 3.6 GHz ≤ $f_{in}$ ≤ 7 GHz | > –10 dBm, –7 dBm (typ.) |
| | 7 GHz ≤ $f_{in}$ ≤ 26.5 GHz | –10 dBm (nom.) |
| | with R&S®FSV-B22 option, preselection = off [5], RF preamplifier = on,<br>RF attenuation = 0 dB, level = 2 × –45 dBm, Δf > 5 × RBW or 10 kHz, whichever is larger | |
| | 10 MHz ≤ $f_{in}$ < 100 MHz | –3 dBm (nom.) |
| | 100 MHz ≤ $f_{in}$ < 3.6 GHz | –2 dBm (nom.) |
| | 3.6 GHz ≤ $f_{in}$ ≤ 7 GHz | 0 dBm (nom.) |
| | 7 GHz ≤ $f_{in}$ ≤ 26.5 GHz | –10 dBm (nom.) |
| Second-harmonic intercept (SHI) | RF attenuation = 0 dB, level = –10 dBm, preselection = off [5],<br>with R&S®FSV-B22 option: RF preamplifier = off | |
| | 100 MHz < $f_{in}$ ≤ 3.5 GHz | 45 dBm (nom.) |
| | 3.5 GHz < $f_{in}$ ≤ 13.25 GHz | 75 dBm (nom.) |
| | RF attenuation = 0 dB, level = –15 dBm, preselection = on [6], preamplifier = off | |
| | 100 MHz < $f_{in}$ ≤ 3.5 GHz | 50 dBm (nom.) |
| | 3.5 GHz < $f_{in}$ ≤ 13.25 GHz | 75 dBm (nom.) |
| | RF attenuation = 0 dB, level = –10 dBm, preselection = on [6], preamplifier = on | |
| | 100 MHz < $f_{in}$ ≤ 3.5 GHz | 35 dBm (nom.) |
| | 3.5 GHz < $f_{in}$ ≤ 13.25 GHz | 10 dBm (nom.) |
| | with R&S®FSV-B22 option, preselection = off [5], RF preamplifier = on,<br>RF attenuation = 0 dB, level = –40 dBm | |
| | 100 MHz < $f_{in}$ ≤ 3.5 GHz | 25 dBm (nom.) |
| | 3.5 GHz < $f_{in}$ ≤ 13.25 GHz | 10 dBm (nom.) |

[5] Preselection = off is only available in analyzer mode. In receiver mode the preselection is permanently on.

[6] Default setting in receiver mode.

| **Displayed average noise level (analyzer mode)** | | |
|---|---|---|
| | RF attenuation = 0 dB, preselection = off/on, preamplifier = off, termination = 50 Ω, log. scaling, normalized to 1 Hz RBW, RBW = 1 kHz, VBW = 3 kHz, zero span, sweep time = 50 ms, sample detector, trace average, sweep count = 20, mean marker | |
| | R&S®ESR3, R&S®ESR7 | |
| | 9 kHz ≤ f < 100 kHz | < –130 dBm, –140 dBm (typ.) |
| | 100 kHz ≤ f < 1 MHz | < –145 dBm, –150 dBm (typ.) |
| | 1 MHz ≤ f < 1 GHz | < –152 dBm. –155 dBm (typ.) |
| | 1 GHz ≤ f < 3.6 GHz | < –150 dBm, –151 dBm (typ.) |
| | 3.6 GHz ≤ f < 6 GHz | < –148 dBm, –151 dBm (typ.) |
| | 6 GHz ≤ f ≤ 7 GHz | < –146 dBm, –149 dBm (typ.) |
| | R&S®ESR26 | |
| | 9 kHz ≤ f < 100 kHz | < –130 dBm, –140 dBm (typ.) |
| | 100 kHz ≤ f < 1 MHz | < –145 dBm, –150 dBm (typ.) |
| | 1 MHz ≤ f < 1 GHz | < –150 dBm, –153 dBm (typ.) |
| | 1 GHz ≤ f < 3.6 GHz | < –147 dBm, –150 dBm (typ.) |
| | 3.6 GHz ≤ f < 6 GHz | < –144 dBm, –147 dBm (typ.) |
| | 6 GHz ≤ f < 7.4 GHz | < –141 dBm, –144 dBm (typ.) |
| | 7.4 GHz ≤ f < 13.6 GHz | < –145 dBm, –148 dBm (typ.) |
| | 13.6 GHz ≤ f < 15 GHz | < –143 dBm, –146 dBm (typ.) |
| | 15 GHz ≤ f ≤ 26.5 GHz | < –141 dBm, –144 dBm (typ.) |
| | with R&S®ESR-B29 option, RF attenuation = 0 dB, preselection = off/on, preamplifier = off, termination = 50 Ω, log. scaling, normalized to 1 Hz RBW, RBW = 10 Hz, VBW = 10 Hz, zero span, sweep time = 500 ms, sample detector, trace average, sweep count = 20, mean marker | |
| | R&S®ESR3, R&S®ESR7, R&S®ESR26 | |
| | 10 Hz | < –90 dBm, –100 dBm (typ.) |
| | 20 Hz | < –100 dBm, –110 dBm (typ.) |
| | 100 Hz | < –110 dBm, –120 dBm (typ.) |
| | 1 kHz | < –120 dBm, –130 dBm (typ.) |
| | RF attenuation = 0 dB, preselection = on, preamplifier = on, termination = 50 Ω, log. scaling, normalized to 1 Hz RBW, RBW = 1 kHz, VBW = 3 kHz, zero span, sweep time = 50 ms, sample detector, trace average, sweep count = 20, mean marker | |
| | R&S®ESR3, R&S®ESR7 | |
| | 9 kHz ≤ f < 100 kHz | < –150 dBm, –155 dBm (typ.) |
| | 100 kHz ≤ f < 1 MHz | < –155 dBm, –160 dBm (typ.) |
| | 1 MHz ≤ f < 1 GHz | < –165 dBm, –168 dBm (typ.) |
| | 1 GHz ≤ f < 3.6 GHz | < –162 dBm, –165 dBm (typ.) |
| | 3.6 GHz ≤ f < 6 GHz | < –160 dBm, –163 dBm (typ.) |
| | 6 GHz ≤ f ≤ 7 GHz | < –158 dBm, –161 dBm (typ.) |
| | R&S®ESR26 | |
| | 9 kHz ≤ f < 150 kHz | < –150 dBm, –155 dBm (typ.) |
| | 150 kHz ≤ f < 2 MHz | < –155 dBm, –160 dBm (typ.) |
| | 2 MHz ≤ f < 1 GHz | < –161 dBm, –164 dBm (typ.) |
| | 1 GHz ≤ f < 3.6 GHz | < –158 dBm, –161 dBm (typ.) |
| | 3.6 GHz ≤ f < 6 GHz | < –156 dBm, –159 dBm (typ.) |
| | 6 GHz ≤ f < 7.4 GHz | < –154 dBm, –157 dBm (typ.) |
| | 7.4 GHz ≤ f < 13.6 GHz | < –164 dBm, –167 dBm (typ.) |
| | 13.6 GHz ≤ f < ≤ 26.5 GHz | < –157 dBm, –160 dBm (typ.) |
| | with R&S®ESR-B29 option, RF attenuation = 0 dB, preselection = on, preamplifier = on, termination = 50 Ω, log. scaling, normalized to 1 Hz RBW, RBW = 10 Hz, VBW = 5 Hz, zero span, sweep time = 500 ms, sample detector, trace average, sweep count = 20, mean marker | |
| | R&S®ESR3, R&S®ESR7 | |
| | 1 kHz | < –140 dBm, –150 dBm (typ.) |
| | R&S®ESR26 | |
| | 1 kHz | < –130 dBm, –140 dBm (typ.) |

| | | |
|---|---|---|
| | with R&S®FSV-B22 option,<br>RF attenuation = 0 dB, preselection = off, RF preamplifier = on, termination = 50 Ω,<br>log. scaling, normalized to 1 Hz RBW, RBW = 1 kHz, VBW = 3 kHz, zero span,<br>sweep time = 50 ms, sample detector, trace average, sweep count = 20, mean marker | |
| | R&S®ESR3, R&S®ESR7 | |
| | 100 kHz ≤ f < 1 MHz | < –150 dBm, –155 dBm (typ.) |
| | 1 MHz ≤ f < 1 GHz | < –162 dBm, –165 dBm (typ.) |
| | 1 GHz ≤ f < 3.6 GHz | < –160 dBm, –163 dBm (typ.) |
| | 3.6 GHz ≤ f < 6 GHz | < –158 dBm, –161 dBm (typ.) |
| | 6 GHz ≤ f ≤ 7 GHz | < –156 dBm, –159 dBm (typ.) |
| | R&S®ESR26 | |
| | 100 kHz ≤ f < 1 MHz | < –145 dBm, –148 dBm (typ.) |
| | 1 MHz ≤ f < 20 MHz | < –155 dBm, –158 dBm (typ.) |
| | 20 MHz ≤ f < 1 GHz | < –160 dBm, –163 dBm (typ.) |
| | 1 GHz ≤ f < 3.6 GHz | < –157 dBm, –160 dBm (typ.) |
| | 3.6 GHz ≤ f < 6 GHz | < –153 dBm, –156 dBm (typ.) |
| | 6 GHz ≤ f < 7.4 GHz | < –150 dBm, –153 dBm (typ.) |
| | 7.4 GHz ≤ f < 13.6 GHz | < –164 dBm, –167 dBm (typ.) |
| | 13.6 GHz ≤ f ≤ 26.5 GHz | < –157 dBm, –160 dBm (typ.) |

| | | |
|---|---|---|
| **Noise indication (receiver mode),** nominal, calculated from DANL data | | |
| | RF attenuation = 0 dB, preamplifier = off, termination = 50 Ω, average detector (AV) | |
| | R&S®ESR3, R&S®ESR7 | |
| | 9 kHz ≤ f < 100 kHz, BW = 200 Hz | < 0 dBµV |
| | 100 kHz ≤ f < 150 kHz, BW = 200 Hz | < –15 dBµV |
| | 150 kHz ≤ f < 1 MHz, BW = 9 kHz | < 2 dBµV |
| | 1 MHz ≤ f < 30 MHz, BW = 9 kHz | < –5 dBµV |
| | 30 MHz ≤ f < 1 GHz, BW = 120 kHz | < 6 dBµV |
| | 1 GHz ≤ f < 3.6 GHz, BW = 1 MHz | < 17 dBµV |
| | 3.6 GHz ≤ f < 6 GHz, BW = 1 MHz | < 19 dBµV |
| | 6 GHz ≤ f ≤ 7 GHz, BW = 1 MHz | < 21 dBµV |
| | R&S®ESR26 | |
| | 9 kHz ≤ f < 100 kHz, BW = 200 Hz | < 0 dBµV |
| | 100 kHz ≤ f < 150 kHz, BW = 200 Hz | < –15 dBµV |
| | 150 kHz ≤ f < 1 MHz, BW = 9 kHz | < 2 dBµV |
| | 1 MHz ≤ f < 30 MHz, BW = 9 kHz | < –3 dBµV |
| | 30 MHz ≤ f < 1 GHz, BW = 120 kHz | < 8 dBµV |
| | 1 GHz ≤ f < 3.6 GHz, BW = 1 MHz | < 20 dBµV |
| | 3.6 GHz ≤ f < 6 GHz, BW = 1 MHz | < 23 dBµV |
| | 6 GHz ≤ f < 7.4 GHz, BW = 1 MHz | < 26 dBµV |
| | 7.4 GHz ≤ f < 13.6 GHz, BW = 1 MHz | < 22 dBµV |
| | 13.6 GHz ≤ f < 15 GHz, BW = 1 MHz | < 24 dBµV |
| | 15 GHz ≤ f ≤ 26.5 GHz, BW = 1 MHz | < 26 dBµV |
| | with R&S®ESR-B29 option,<br>RF attenuation = 0 dB, preamplifier = off, termination = 50 Ω, average detector (AV) | |
| | R&S®ESR3, R&S®ESR7, R&S®ESR26 | |
| | 10 Hz, BW = 10 Hz | < 27 dBµV |
| | 20 Hz, BW = 10 Hz | < 17 dBµV |
| | 100 Hz, BW = 10 Hz | < 7 dBµV |
| | 1 kHz, BW = 100 Hz | < 7 dBµV |
| | RF attenuation = 0 dB, preamplifier = on, termination = 50 Ω, average detector (AV) | |
| | R&S®ESR3, R&S®ESR7 | |
| | 9 kHz ≤ f < 100 kHz, BW = 200 Hz | < –20 dBµV |
| | 100 kHz ≤ f < 150 kHz, BW = 200 Hz | < –25 dBµV |
| | 150 kHz ≤ f < 1 MHz, BW = 9 kHz | < –8 dBµV |
| | 1 MHz ≤ f < 30 MHz, BW = 9 kHz | < –18 dBµV |
| | 30 MHz ≤ f < 1 GHz, BW = 120 kHz | < –7 dBµV |
| | 1 GHz ≤ f < 3.6 GHz, BW = 1 MHz | < 5 dBµV |
| | 3.6 GHz ≤ f < 6 GHz, BW = 1 MHz | < 7 dBµV |
| | 6 GHz ≤ f ≤ 7 GHz, BW = 1 MHz | < 9 dBµV |
| | R&S®ESR26 | |
| | 9 kHz ≤ f < 150 kHz, BW = 200 Hz | < –20 dBµV |
| | 150 kHz ≤ f < 2 MHz, BW = 9 kHz | < –8 dBµV |
| | 2 MHz ≤ f < 30 MHz, BW = 9 kHz | < –14 dBµV |
| | 30 MHz ≤ f < 1 GHz, BW = 120 kHz | < –3 dBµV |
| | 1 GHz ≤ f < 3.6 GHz, BW = 1 MHz | < 9 dBµV |
| | 3.6 GHz ≤ f < 6 GHz, BW = 1 MHz | < 11 dBµV |
| | 6 GHz ≤ f < 7.4 GHz, BW = 1 MHz | < 13 dBµV |
| | 7.4 GHz ≤ f < 13.6 GHz, BW = 1 MHz | < 3 dBµV |
| | 13.6 GHz ≤ f ≤ 26.5 GHz, BW = 1 MHz | < 10 dBµV |
| | with R&S®ESR-B29 option,<br>RF attenuation = 0 dB, preamplifier = on, termination = 50 Ω, average detector (AV) | |
| | R&S®ESR3, R&S®ESR7 | |
| | 1 kHz, BW = 100 Hz | < –13 dBµV |
| | R&S®ESR26 | |
| | 1 kHz, BW = 100 Hz | < –3 dBµV |

| **Spurious responses** | | |
|---|---|---|
| Image response | 30 MHz ≤ f ≤ 7 GHz | |
| | $f_{in}$ – 2 × 8409.9 MHz (1st IF) | < –80 dBc (nom.) |
| | $f_{in}$ – 2 × 729.9 MHz (2nd IF) | < –80 dBc |
| | $f_{in}$ – 2 × 89.9 MHz (3rd IF) | < –80 dBc |
| | 7 GHz < f ≤ 26.5 GHz | |
| | $f_{in}$ ± 2 × 729.9 MHz (1st IF) | < –80 dBc |
| | $f_{in}$ – 2 × 89.9 MHz (2nd IF) | < –80 dBc |
| Intermediate frequency response | 30 MHz ≤ f ≤ 7 GHz | |
| | 1st IF (8409.9 MHz) | < –70 dBc (nom.) |
| | 2nd IF (729.9 MHz) | < –80 dBc |
| | 3rd IF (89.9 MHz) | < –80 dBc |
| | 7 GHz < f ≤ 26.5 GHz | |
| | 1st IF (729.9 MHz) | < –80 dBc |
| | 2nd IF (89.9 MHz) | < –80 dBc |
| Residual spurious response | RF attenuation = 0 dB | |
| | f ≤ 1 MHz | < –90 dBm |
| | f > 1 MHz | < –103 dBm |
| Local oscillator related spurious | 30 MHz ≤ f ≤ 15 GHz | |
| | 1 kHz ≤ offset from carrier ≤ 10 MHz | < –70 dBc |
| | offset from carrier > 10 MHz | < –80 dBc |
| | 15 GHz ≤ f < 26.5 GHz | |
| | 1 kHz ≤ offset from carrier ≤ 10 MHz | < –64 dBc |
| | offset from carrier > 10 MHz | < –74 dBc |
| Other interfering signals | | |
| Subharmonic of 1st LO | 20 MHz ≤ f < 7 GHz,<br>spurious at 8410 MHz – 2 × $f_{in}$ | < –70 dBc |
| Harmonic of 1st LO | mixer level < –25 dBm,<br>spurious at $f_{in}$ –4205 MHz | < –70 dBc |

| **Level display (analyzer mode)** | | |
|---|---|---|
| Logarithmic level axis | | 1 dB to 200 dB, in steps of 1/2/5 |
| Linear level axis | | 10 % of reference level per level division, 10 divisions or logarithmic scaling |
| Number of traces | | 6 |
| Trace detector | | max. peak, min. peak, auto peak (normal), sample, RMS, average, quasi-peak, CISPR-average, RMS-average |
| Trace functions | | clear/write, max. hold, min. hold, average, view |
| Setting range of reference level | | –130 dBm to (–10 dBm + RF attenuation – RF preamplifier gain), in steps of 0.01 dB |
| Units of level axis | logarithmic level display | dBm, dBµV, dBmV, dBµA, dBpW |
| | linear level display | µV, mV, µA, mA, pW, nW |

| **Level display (receiver mode)** | | |
|---|---|---|
| Level display | analog | bargraph display, separately for each detector |
| | digital | numeric; 0.01 dB resolution |
| Detectors | max. 4 selectable | max. peak, min. peak, RMS, average, quasi-peak, CISPR-average, RMS-average |
| Units of level axis | | dBm, dBµV, dBmV, dBµA, dBpW, dBpT |
| RF spectrum | | |
| Logarithmic level axis | | 10 dB to 200 dB, in steps of 10 |
| Frequency axis | | linear or logarithmic |
| Number of traces | | 6 |
| Detectors | normal scan | max. peak, min. peak, RMS, average, quasi-peak, CISPR-average, RMS-average |
| | time domain scan [7] | max. peak, min. peak, average, quasi-peak, CISPR-average, RMS-average |

| **Spectrogram display (analyzer mode)** | | |
|---|---|---|
| Result display | | color-graded bitmap |
| Spectrogram bitmap color depth | | 240 colors |
| Dynamic range covered by bitmap colors | | selectable, up to 200 dB (nom.) |
| History depth | | max. 100 000 frames |
| Recording mode | | single trace, continuous, frame count |
| Trace detector | | max. peak, min. peak, sample, RMS, average |
| Number of markers | | 16 |
| Marker readout | | frequency, time/frame number, level |

[7] Requires R&S®ESR-K53 option.

| **Level measurement uncertainty** | | |
|---|---|---|
| Absolute level uncertainty at 64 MHz | RBW = 10 kHz, CW signal, level = –10 dBm, reference level = –10 dBm, RF attenuation = 10 dB | |
| | +20 °C to +30 °C | |
| | preselection = off [8] | < 0.2 dB (σ = 0.07 dB) |
| | preselection = on [9] | < 0.3 dB (σ = 0.1 dB) |
| | +5 °C to +40 °C | |
| | preselection = off [8] | < 0.35 dB (σ = 0.12 dB) |
| | preselection = on [9] | < 0.45 dB (σ = 0.15 dB) |
| Frequency response referenced to 64 MHz | DC coupling, RF attenuation = 10 dB, 20 dB, 30 dB, 40 dB, preselection = off [8], with R&S®FSV-B22 option: RF preamplifier = off , +20 °C to +30 °C | |
| | 9 kHz ≤ f < 10 MHz | < 0.5 dB (σ = 0.17 dB) |
| | 10 MHz ≤ f < 3.6 GHz | < 0.3 dB (σ = 0.1 dB) |
| | 3.6 GHz ≤ f ≤ 7 GHz | < 0.5 dB (σ = 0.17 dB) |
| | 7 GHz ≤ f < 13.6 GHz, span < 1 GHz | < 1.5 dB (σ = 0.5 dB) |
| | 13.6 GHz ≤ f ≤ 26.5 GHz, span < 1 GHz | < 2 dB (σ = 0.67 dB) |
| | DC coupling, RF attenuation = 10 dB, 20 dB, 30 dB, 40 dB, preselection = on [9], preamplifier = on/off, +20 °C to +30 °C | |
| | 9 kHz ≤ f < 3.6 GHz | < 0.6 dB (σ = 0.2 dB) |
| | 3.6 GHz ≤ f ≤ 7 GHz | < 0.8 dB (σ = 0.27 dB) |
| | 7 GHz ≤ f < 13.6 GHz, span < 1 GHz | < 1.5 dB (σ = 0.5 dB) |
| | 13.6 GHz ≤ f ≤ 26.5 GHz, span < 1 GHz | < 2 dB (σ = 0.67 dB) |
| | any setting for RF attenuation and preselection, preamplifier = off, +5 °C to +40 °C | |
| | 9 kHz ≤ f < 3.6 GHz | < 1 dB (σ = 0.33 dB) |
| | 3.6 GHz ≤ f ≤ 7 GHz | < 1.5 dB (σ = 0.5 dB) |
| | 7 GHz ≤ f < 13.6 GHz | < 2.5 dB (σ = 0.83 dB) |
| | 13.6 GHz ≤ f ≤ 26.5 GHz | < 3 dB (σ = 1 dB) |
| | any setting for RF attenuation and preselection, preamplifier = on, +5 °C to +40 °C | |
| | 9 kHz ≤ f < 3.6 GHz | < 1 dB (σ = 0.33 dB) |
| | 3.6 GHz ≤ f ≤ 7 GHz | < 1.5 dB (σ = 0.5 dB) |
| | 7 GHz ≤ f < 13.6 GHz | < 3 dB (σ = 1 dB) |
| | 13.6 GHz ≤ f ≤ 26.5 GHz | < 3.5 dB (σ = 1.17 dB) |
| | with R&S®ESR-B29 option, DC coupling, preamplifier = off, +5 °C to +40 °C | |
| | 10 Hz ≤ f < 9 kHz | < 1 dB (σ = 0.33 dB) |
| Attenuator switching uncertainty | f = 64 MHz, 0 dB to 70 dB, referenced to 10 dB attenuation | < 0.2 dB (σ = 0.07 dB) |
| Uncertainty of reference level setting | | 0 dB [10] (nom.) |
| Bandwidth switching uncertainty | referenced to RBW = 10 kHz | |
| | sweep filters | < 0.1 dB (σ = 0.03 dB) |
| | FFT filters | < 0.2 dB (σ = 0.07 dB) |
| Quasi-peak display | | in line with CISPR 16-1-1 |

| **Nonlinearity of displayed level** | | |
|---|---|---|
| Logarithmic level display | S/N > 16 dB | |
| | 0 dB to –50 dB | < 0.1 dB (σ = 0.03 dB) |
| | –50 dB to –60 dB | < 0.15 dB (σ = 0.05 dB) |
| | –60 dB to –70 dB | < 0.2 dB (σ = 0.07 dB) |
| Linear level display | S/N > 16 dB, 0 dB to –70 dB | < 5 % of reference level (nom.) |

[8] Preselection = off is only available in analyzer mode. In receiver mode the preselection is permanently on.

[9] Default setting in receiver mode.

[10] The setting of the reference level affects only the graphical representation of the measurement result on the display, not the measurement itself. Therefore, the reference level setting causes no additional uncertainty in measurement results.

| **Total measurement uncertainty** | | |
|---|---|---|
| | CW signal, level = 0 dB to –70 dB below reference level, S/N > 20 dB,<br>sweep time = auto, sweep type = sweep, RF attenuation = 10 dB, 20 dB, 30 dB, 40 dB,<br>preselection = off [8], with R&S®FSV-B22 option: RF preamplifier = off, span/RBW < 100,<br>95 % confidence level, +20 °C to +30 °C | |
| | 9 kHz ≤ f < 10 MHz | 0.39 dB |
| | 10 MHz ≤ f < 3.6 GHz | 0.29 dB |
| | 3.6 GHz ≤ f ≤ 7 GHz | 0.39 dB |
| | 7 GHz ≤ f < 13.6 GHz | 1 dB |
| | 13.6 GHz ≤ f ≤ 26.5 GHz | 1.33 dB |
| | CW signal, level = 0 dB to –70 dB below reference level, S/N > 20 dB,<br>sweep time = auto, sweep type = sweep, RF attenuation = 10 dB, 20 dB, 30 dB, 40 dB,<br>preselection = on [9], preamplifier = off /on, span/RBW < 100, 95 % confidence level,<br>+20 °C to +30 °C | |
| | 9 kHz ≤ f < 3.6 GHz | 0.47 dB |
| | 3.6 GHz ≤ f ≤ 7 GHz | 0.59 dB |
| | 7 GHz ≤ f < 13.6 GHz | 1.01 dB |
| | 13.6 GHz ≤ f ≤ 26.5 GHz | 1.34 dB |

# Measurement speed

| | | |
|---|---|---|
| **Receiver mode** | | |
| Time domain scan [11] | CISPR band B, 150 kHz to 30 MHz, RBW = 9 kHz, measurement time = 100 ms, peak detector | 120 ms (meas.) |
| | CISPR band B, 150 kHz to 30 MHz, RBW = 9 kHz, measurement time = 1 s, quasi-peak detector | 2 s (meas.) |
| | CISPR band C/D, 30 MHz to 1000 MHz, RBW = 120 kHz, measurement time = 10 ms, peak detector | 750 ms (meas.) |
| | CISPR band C/D, 30 MHz to 1000 MHz, RBW = 9 kHz, measurement time = 10 ms, peak detector | 1.2 s (meas.) |
| | CISPR band C/D, 30 MHz to 1000 MHz, RBW = 120 kHz, measurement time = 1 s, quasi-peak detector | 80 s (meas.) |
| **Analyzer mode** | | |
| Local measurement and display update rate | | 1.1 ms (900/s) (meas.) |
| Remote measurement, 1000 sweep averages [12] | | 1 ms (1000/s) (meas.) |
| Remote measurement and LAN transfer [12] | | 3 ms (333/s) (meas.) |
| Marker peak search | | 1.5 ms (meas.) |
| Center frequency tune and transfer [12] | | 15 ms (meas.) |

# Trigger functions

| | | |
|---|---|---|
| **Trigger** | | |
| Trigger source | analyzer mode | free run, video, external, IF power |
| | receiver mode | free run, video, external |
| Trigger offset | analyzer mode, span ≥ 10 Hz | 31.25 ns to 30 s, min. resolution = 31.25 ns (or 1 % of offset) |
| | analyzer mode, span = 0 Hz | (–sweep time) to 30 s, min. resolution = 31.25 ns (or 1 % of offset) |
| Max. deviation of trigger offset | analyzer mode | ±(7.8125 ns + (0.1 % × trigger offset)) |
| **IF power trigger (analyzer mode)** | | |
| Sensitivity | min. signal power | –60 dBm + RF attenuation – RF pre-amplifier gain (nom.) |
| | max. signal power | –10 dBm + RF attenuation – RF pre-amplifier gain (nom.) |
| IF power trigger bandwidth | RBW > 500 kHz, swept | 40 MHz (nom.) |
| | RBW > 20 kHz, FFT | |
| | RBW ≤ 500 kHz, swept | 6 MHz (nom.) |
| | RBW ≤ 20 kHz, FFT | |
| **Gated sweep (analyzer mode)** | | |
| Gate source | | video, external, IF power |
| Gate delay | | 31.25 ns to 30 s, min. resolution = 31.25 ns (or 1 % of delay) |
| Gate length | | 31.25 ns to 30 s, min. resolution = 31.25 ns (or 1 % of gate length) |
| Max. deviation of gate length | | ±(7.8125 ns + (0.1 % × gate length)) |

[11] Requires R&S®ESR-K53 option.

[12] Measured with personal computer equipped with Intel Core2 Duo 2.13 GHz and Gbit LAN interface.

# Audio demodulation

| | | |
|---|---|---|
| AF demodulation types | | AM and FM |
| Audio output | | loudspeaker and phone jack |
| Marker stop time in spectrum mode | | 100 ms to 60 s |

# Inputs and outputs

| **RF input** | | |
|---|---|---|
| Impedance | | 50 Ω |
| Connector | R&S®ESR3, R&S®ESR7 | N female |
| | R&S®ESR26 | test port adapter APC 3.5 mm/N female |
| VSWR | RF attenuation ≥ 10 dB, DC coupled | |
| | 10 Hz ≤ f ≤ 1 GHz | < 1.2 |
| | 1 GHz < f < 3.6 GHz | < 1.5, 1.3 (typ.) |
| | 3.6 GHz ≤ f < 20 GHz | < 2, 1.8 (typ.) |
| | 20 GHz ≤ f ≤ 26.5 GHz | < 2.2, 2 (typ.) |
| | RF attenuation < 10 dB, DC coupled | |
| | 10 Hz ≤ f ≤ 1 GHz | < 2 |
| | 1 GHz < f ≤ 26.5 GHz | < 3 |
| | RF attenuation ≥ 10 dB, AC coupled | |
| | 10 MHz ≤ f ≤ 1 GHz | < 1.2 |
| | 1 GHz < f < 3.6 GHz | < 1.5, 1.3 (typ.) |
| | 3.6 GHz ≤ f < 20 GHz | < 2, 1.8 (typ.) |
| | 20 GHz ≤ f ≤ 26.5 GHz | < 2.2, 2 (typ.) |
| Setting range of attenuator | RF input 1 | 0 dB to 75 dB, in 5 dB steps |
| | RF input 2 | 10 dB to 75 dB, in 5 dB steps |

| **Probe power supply** | | |
|---|---|---|
| Supply voltages | 3-pin connector | +15 V DC, –12.6 V DC and ground, max. 150 mA (nom.) |
| | 5-pin connector | ±10 V DC and ground, max. 100 mA, (nom.) |

| **Noise source drive** | | |
|---|---|---|
| Connector | | BNC female |
| Output voltage | | 0 V/28 V, max. 100 mA, switchable (nom.) |

| **AF output** | | |
|---|---|---|
| Connector | | 3.5 mm mini jack |
| Output impedance | | 10 Ω (nom.) |
| Open-circuit voltage | | up to 1.5 V, adjustable |

| **USB interface** | front panel | 2 ports, type A plug, version 2.0 |
|---|---|---|
| | rear panel | 2 ports, type A plug, version 2.0 |

| **Reference output** | | |
|---|---|---|
| Connector | | BNC female |
| Impedance | | 50 Ω (nom.) |
| Output frequency | internal reference | 10 MHz |
| | external reference | same as reference input signal |
| Level | | > 0 dBm (nom.) |

| **Reference input** | | |
|---|---|---|
| Connector | | BNC female |
| Impedance | | 50 Ω (nom.) |
| Input frequency range | | 1 MHz ≤ $f_{in}$ ≤ 20 MHz, in 100 kHz steps |
| Required level | | > 0 dBm into 50 Ω (nom.) |

| **External trigger/gate input** | | |
|---|---|---|
| Connector | | BNC female |
| Trigger voltage | | 0.5 V to 3.5 V (nom.) |
| Input impedance | | 10 kΩ (nom.) |

| **IEC/IEEE bus control** | | interface in line with IEC 625-2 (IEEE 488.2) |
|---|---|---|
| Command set | | SCPI 1997.0 |
| Connector | | 24-pin Amphenol female |
| Interface functions | | SH1, AH1, T6, L4, SR1, RL1, PP1, DC1, DT1, C0 |

| **LAN interface** | | 10/100/1000BASE-T |
|---|---|---|
| Connector | | RJ-45 |

| **External monitor** | | |
|---|---|---|
| Connector | | VGA-compatible, 15-pin mini D-Sub |

| **User port** | | |
|---|---|---|
| Connector | | 9-pin D-Sub male |
| Output | | TTL-compatible, 0 V/5 V (nom.), max. 15 mA (nom.) |
| Input | | TTL-compatible, max. 5 V (nom.) |

| **IF/video out (analyzer mode)** | | |
|---|---|---|
| Connector | | BNC female, 50 Ω (nom.) |
| **IF out** | | |
| Bandwidth | | RBW setting |
| IF frequency | | 32 MHz (nom.) |
| Output level (gain versus RF input) | RF attenuation = 0 dB, RF preamplifier = off, span = 0 Hz | 0 dB (nom.) |
| **Video out** | | |
| Bandwidth | | VBW setting |
| Output scaling | log. display scale | logarithmic |
| | lin. display scale | linear |
| Output level | center frequency > 10 MHz, span = 0 Hz, signal at reference level and center frequency | 1 V, open circuit (nom.) |

| **Trigger out** | | |
|---|---|---|
| Connector | | BNC female |
| Output | | TTL-compatible, 0 V/5 V (nom.) |

# General data

| | | |
|---|---|---|
| **Display** | | 21 cm LC TFT color display (8.4") |
| Resolution | | 800 × 600 pixel (SVGA resolution) |
| Pixel failure rate | | < 1 × $10^{-5}$ |

| **Data storage** | | |
|---|---|---|
| Internal | standard | hard disk ≥ 40 Gbyte |
| | with R&S®ESR-B18 option | solid state disk ≥ 8 Gbyte |
| External | | supports USB 2.0 compatible memory devices |

| **Temperature** | | |
|---|---|---|
| Temperature | operating temperature range | +5 °C to +40 °C |
| | permissible temperature range | 0 °C to +50 °C |
| | storage temperature range | –40 °C to +70 °C |
| Climatic loading | | +40 °C at 90 % rel. humidity, in line with EN 60068-2-30 |

| **Mechanical resistance** | | |
|---|---|---|
| Vibration | sinusoidal | 5 Hz to 150 Hz, max. 2 g at 55 Hz; 0.5 g from 55 Hz to 150 Hz; in line with EN 60068-2-6 |
| | random | 10 Hz to 130 Hz, acceleration 1.2 g (RMS), in line with EN 60068-2-64 |
| Shock | | 40 g shock spectrum, in line with MIL-T-28800F, class 3, MIL-STD-810E, method 516.4, procedure I |

| | | |
|---|---|---|
| **EMC** | | in line with EMC Directive 2004/108/EC including:<br>IEC/EN 61326-1 [13, 14]<br>IEC/EN 61326-2-1<br>CISPR 11/EN 55011 [13]<br>IEC/EN 61000-3-2<br>IEC/EN 61000-3-3 |

| | | |
|---|---|---|
| **Recommended calibration interval** | | 1 year |

| **Power supply** | | |
|---|---|---|
| AC input voltage range | | 100 V to 240 V, ±10 % (nom.) |
| AC supply frequency | | 50 Hz to 400 Hz, +10 %/–6 % (nom.) |
| Max. input current | | 5.2 A (100 V) to 2.2 A (240 V) (nom.) |
| Power consumption | R&S®ESR3, R&S®ESR7 | 150 W, max. 250 W with all options (meas.) |
| | R&S®ESR26 | 175 W, max. 250 W with all options (meas.) |
| Safety | | in line with IEC 61010-1, EN 61010-1, CAN/CSA-C22.2 No. 61010-1, UL 61010-1 |
| Test mark | | VDE-GS, $_{C}$CSA$_{US}$ |

| **Weight and dimensions** | | |
|---|---|---|
| Dimensions | W × H × D | 412 mm × 197 mm × 517 mm (16.22 in × 7.76 in × 20.35 in) |
| Net weight without options | R&S®ESR3, R&S®ESR7 | 12.8 kg (28.22 lb) |
| | R&S®ESR26 | 14.6 kg (32.19 lb) |

[13] Emission limits for class B equipment.

[14] Immunity test requirement for industrial environment (EN 61326 table 2).

# Options

## R&S®FSV-B9 tracking generator (spectrum analyzer mode)

| | | |
|---|---|---|
| **Frequency** | | |
| Frequency range | R&S®ESR3 | 9 kHz to 3.6 GHz |
| | R&S®ESR7, R&S®ESR26 | 9 kHz to 7 GHz |

| | | |
|---|---|---|
| **Frequency offset** | | |
| Setting range | | ±1 GHz |
| Setting resolution | | 1 Hz |

| | | |
|---|---|---|
| **Spectral purity** | | |
| SSB phase noise | frequency = 1000 MHz,<br>carrier offset = 100 kHz | –90 dBc (1 Hz) (typ.) |

| | | |
|---|---|---|
| **Level** | | |
| Setting range | normal mode, 9 kHz ≤ f < 100 kHz | –60 dBm to –10 dBm, in 0.1 dB steps |
| | normal mode, f ≥ 100 kHz | –60 dBm to 0 dBm, in 0.1 dB steps |
| | with AM, I/Q, 9 kHz ≤ f < 100 kHz | –60 dBm to –20 dBm, in 0.1 dB steps |
| | with AM, I/Q, f ≥ 100 kHz | –60 dBm to –10 dBm, in 0.1 dB steps |
| Max. deviation of output level | frequency = 64 MHz, +20 °C to +30 °C,<br>output level = –10 dBm,<br>frequency offset = 0 Hz, modulation = off | < 1 dB |
| Frequency response | output level = –10 dBm, referenced to level at 64 MHz, frequency offset = 0 Hz, modulation = off | |
| | 9 kHz ≤ f < 100 kHz | < 4 dB |
| | 100 kHz ≤ f ≤ 7 GHz | < 3 dB |

| | | |
|---|---|---|
| **Dynamic range** | RBW = 1 kHz, f > 10 MHz | 110 dB |

| | | |
|---|---|---|
| **Harmonics, non-harmonic spurious** | output level = –10 dBm | –30 dBc |

| | | |
|---|---|---|
| **Modulation** | | |
| Modulation format | external | I/Q, AM, FM |
| **AM** | f > 10 MHz | |
| Modulation depth | | 0 % to 100 % |
| Modulation frequency range | | 0 Hz to 1 MHz |
| **FM** | f > 10 MHz | |
| Frequency deviation | | 0 Hz to 10 MHz |
| Modulation frequency range | | 0 Hz to 10 kHz |

| | | |
|---|---|---|
| **RF output** | | |
| Connector | | N female, 50 Ω |
| VSWR | | 1.3, (nom.) |

| | | |
|---|---|---|
| **TG I/AM IN** | | |
| Connector | | BNC female, 50 Ω |
| Input voltage | | 1 V ($V_{pp}$) |

| | | |
|---|---|---|
| **TG Q/FM IN** | | |
| Connector | | BNC female, 50 Ω |
| Input voltage | | 1 V ($V_{pp}$) |

## R&S®ESR-B10 external generator control

| | | |
|---|---|---|
| **Interface** | | |
| IEC/IEEE bus control | | 24-pin Amphenol female |
| Aux control | | 9-pin D-Sub female |

| | | |
|---|---|---|
| **Supported signal generators** | | R&S®SGS100A, R&S®SMA100A, R&S®SMB100A, R&S®SMBV100A, R&S®SMC100A, R&S®SME, R&S®SMF100A, R&S®SMG, R&S®SMGL, R&S®SMGU, R&S®SMH, R&S®SMHU, R&S®SMIQ, R&S®SMJ100A, R&S®SML, R&S®SMP, R&S®SMR, R&S®SMT, R&S®SMU200A, R&S®SMV03, R&S®SMX, R&S®SMY |

## R&S®FSV-B30 DC power supply for 12 V/24 V supply voltage

| | | |
|---|---|---|
| Input voltage range | | 10 V to 28 V |
| Output voltage | | 120 V to 360 V DC |
| Input current | $V_{in}$ = 12 V, instrument without options, preset settings | |
| | R&S®ESR3, R&S®ESR7 | 11 A (typ.) |
| | R&S®ESR26 | 14 A (typ.) |
| Temperature | operating temperature range | 0 °C to +50 °C |
| | storage temperature range | –40 °C to +70 °C |
| Dimensions | W × H × D | 201 mm × 125 mm × 56 mm<br>(7.91 in × 4.92 in × 2.20 in) |
| Net weight | | 1 kg (2.2 lb) |

## R&S®FSV-B32 Lithium-ion battery pack

| | | |
|---|---|---|
| **Battery pack** | | |
| Output voltage | | 12 V (nom.) |
| Operating time | instrument without options, preset settings | |
| | R&S®ESR3, R&S®ESR7 | 2 h (nom.) |
| | R&S®ESR26 | 1.5 h (nom.) |
| Charge time | with R&S®FSV-B34 charger, T = +25 °C | 3.5 h (nom.) |
| Temperature | operating temperature range, discharge | 0 °C to +50 °C |
| | operating temperature range, charge | 0 °C to + 45 °C |
| | storage temperature range | –20 °C to +60 °C [15] |
| Dimensions | W × H × D | 406 mm × 71 mm × 241 mm<br>(16 in × 2.76 in × 9.49 in) |
| Net weight | | 3.4 kg (7.5 lb) |

## R&S®FSV-B34 charger for R&S®FSV-B32 Lithium-ion battery pack

| | | |
|---|---|---|
| AC input voltage range | | 100 V to 240 V, ±10 % (nom.) |
| AC supply frequency | | 50 Hz to 60 Hz (nom.) |
| Power consumption | | max. 300 W (nom.) |
| Dimensions | W × H × D | 400 mm × 127 mm × 203 mm<br>(15.75 in × 5 in × 8 in) |
| Net weight | | 3.1 kg (6.9 lb) |

[15] The battery packs should be stored in an environment with low humidity, free from corrosive gas at a recommended temperature range < +21 °C. Extended exposure to temperatures above +45 °C could degrade battery performance and life.

# R&S®ESR-K55 real-time spectrum analyzer mode

The specifications are based on the specifications of the spectrum analyzer mode.
Therefore, these specifications also apply for the real-time spectrum analyzer mode unless otherwise stated.

| **Span** | | |
|---|---|---|
| Range | f ≤ 7 GHz, preselection = off | 10 kHz to 40 MHz |
| | f > 7 GHz, overview mode = off | 10 kHz to 10 MHz |
| | f > 7 GHz, overview mode = on | 10 kHz to 30 MHz |
| Resolution | | 1 Hz |

| **Frequency readout** | | |
|---|---|---|
| Number of sweep (trace) points | | 801 |
| Marker resolution | | 0.01 Hz |
| Uncertainty | | ±(marker frequency × reference uncertainty + 10 % × resolution bandwidth + ½ (span/(sweep points –1)) + 1 Hz) |
| Marker tuning frequency step size | | span/800 |

| **Sweep time** | | |
|---|---|---|
| Range | real-time spectrum, real-time spectrogram, free run or stop on trigger | 52 µs to 1 s [16] |
| | auto rearm trigger | 5.2 µs to 1 s |
| Resolution | | 5.2 µs |

| **Data acquisition** | | |
|---|---|---|
| A/D converter | | |
| Sampling rate | | 128 Msample/s |
| Resolution | | 16 bit |
| FFT length | | 1024/2048/4096/8192/16 384 |
| FFT window | | Gaussian |
| FFT overlap factor | | ≥ 80 % |
| Spectrum (FFT) processing rate | span = 40 MHz | 250 000/s |
| Minimum detectable signal duration | span = 40 MHz, SNR > 60 dB | 25 ns (nom.) |

| **Resolution bandwidths** | | |
|---|---|---|
| Range | RBW 6 dB = off | 2 Hz to 128 kHz, fixed span/RBW ratio |
| | RBW 6 dB = on | 3 Hz to 192 kHz, fixed span/RBW ratio |
| Span/RBW ratio | RBW 6 dB = off | 312/625/1250/2500/5000 |
| | RBW 6 dB = on | 208/416/833/1666/3333 |
| Bandwidth uncertainty | | < 3 % (nom.) |

| **Video bandwidths** | | none |
|---|---|---|

| **Channel bandwidths** | | none |
|---|---|---|

[16] Time period during which individual FFTs contribute to the results of the selected trace detector.

## Level

| | | |
|---|---|---|
| **Amplitude flatness** | (1.25 × signal analysis bandwidth) ≤ $f_{center}$ ≤ 7 GHz | ±0.8 dB (nom.) |
| | f > 7 GHz, span ≤ 10 MHz | ±1 dB (nom.) |

| | | |
|---|---|---|
| **Spurious-free dynamic range** | span = 40 MHz | < –70 dBc (nom.) |

| | | |
|---|---|---|
| **Minimum signal duration necessary for specified level measurement uncertainty** [17] | RBW 6 dB = off, span/RBW ratio = 312, trace detector = max. peak, span = | |
| | 40 MHz | 24 µs (nom.) |
| | 20 MHz | 45 µs (nom.) |
| | 10 MHz | 86 µs (nom.) |
| | 5 MHz | 168 µs (nom.) |
| | 2 MHz | 414 µs (nom.) |
| | 1 MHz | 824 µs (nom.) |
| | 500 kHz | 1.7 ms (nom.) |
| | 200 kHz | 4.1 ms (nom.) |
| | 100 kHz | 8.2 ms (nom.) |
| | 50 kHz | 16.4 ms (nom.) |
| | 20 kHz | 41 ms (nom.) |
| | 10 kHz | 82 ms (nom.) |

## Result display

| | | |
|---|---|---|
| Display modes | | full screen, split screen |
| Max. number of screens | display mode = split screen | 4 |
| Result display types | with or without active frequency mask trigger, or any combination if display mode = split screen | real-time spectrum, persistence spectrum, real-time spectrogram |

| **Real-time spectrum** | | |
|---|---|---|
| Number of traces | | 4 |
| Trace detector | | max. peak, min. peak, average |
| Trace functions | | clear/write, max. hold, min. hold, view |
| Number of markers | | 16 |
| Marker readout | | frequency, level |
| Maximum sweep update rate [18] | | 10 000/s |

| **Persistence spectrum** | | |
|---|---|---|
| Persistence bitmap resolution | | 801 × 600 points |
| Persistence bitmap color depth | | 256 colors |
| Probability range covered by bitmap colors | | selectable, 0 % to 100 % |
| Persistence duration | | 0 s to 8 s |
| Number of markers | | 16 |
| Marker readout | | frequency, level, hit probability |
| Number of real-time traces | in addition to persistence spectrum display | 1 |
| Real-time trace detector | | max. peak, min. peak, sample, average |
| Real-time trace functions | | clear/write, max. hold, min. hold, view |

[17] Events lasting shorter than the minimum event duration specification will result in degraded level accuracy.

[18] Sweep update rate includes FFT overlap and trace detector processing.

| **Spectrogram** | | |
|---|---|---|
| Result display | | color-graded bitmap |
| Spectrogram bitmap color depth | | 240 colors |
| Dynamic range covered by bitmap colors | | selectable, up to 200 dB (nom.) |
| History depth | | max. 100 000 frames [19] |
| Recording mode | | single trace, continuous, frame count |
| Trace detector | | max. peak, min. peak, sample |
| Number of markers | | 16 |
| Marker readout | | frequency, time/frame number, level |
| Maximum sweep update rate [20] | | 10 000/s |

## Trigger

| **Trigger source** | | free run, frequency mask, external |
|---|---|---|

| **Frequency mask trigger** | | |
|---|---|---|
| Trigger level resolution | | 0.5 dB |
| Minimum required mask distance to noise floor | | 30 dB (nom.) |
| Dynamic range | frequency mask – reference level | 0 dB to –80 dB (nom.) |
| Trigger level accuracy | frequency mask > reference level – 50 dB | ±(frequency response + 1.0 dB) (nom.) |
| | frequency mask > reference level – 70 dB | ±(frequency response + 2.5 dB) (nom.) |
| Trigger uncertainty | span = 40 MHz | ±12 µs (nom.) |
| Trigger conditions | | enter mask area, leave mask area |
| Trigger modes | | auto rearm trigger, stop on trigger |
| Trigger mask | | |
| Mask length | | 3 to 801 frequency points |
| Mask frequency resolution | | span/800 |
| Mask shape generation | | manual, auto set (mask derived from the measured spectrum) |
| Minimum signal duration for 100 % probability of trigger (nominal values) [21] | | see minimum signal duration required for specified level measurement uncertainty |

| Trigger out | | |
|---|---|---|
| Connector | | BNC female |
| Output | | TTL-compatible, 0 V/5 V (nom.) |

[19] A frame is the measurement result displayed in one row of the spectrogram. It may consist of one or more traces, depending on the set sweep count. For example, a sweep count of 2 means that two traces will be combined to one row in the spectrogram using the set trace detector.

[20] Sweep update rate includes FFT overlap and trace detector processing.

[21] Events lasting shorter than the minimum event duration specification will result in degraded frequency mask trigger accuracy.

# R&S®ESR-K56 IF analysis

| | | |
|---|---|---|
| **Level display (receiver mode)** | | |
| IF spectrum | | |
| Span | | max. 10 MHz |
| Resolution bandwidths | | 10 Hz to 100 kHz in 1/2/3/5 sequence |
| Detector | | sample |
| Logarithmic level axis | | 10 dB to 200 dB in steps of 10 dB |
| Frequency axis | | linear |
| Number of traces | | 3 |

# Ordering information

| Designation | Type | Order No. |
|---|---|---|
| EMI Test Receiver | R&S®ESR3 | 1316.3003.03 |
| EMI Test Receiver | R&S®ESR7 | 1316.3003.07 |
| EMI Test Receiver | R&S®ESR26 | 1316.3003.26 |
| **Accessories supplied** | | |
| Power cable, probe power cable and quick start guide<br>R&S®ESR26: test port adapter with 3.5 mm female (1021.0512.00) and N female (1021.0535.00) connectors | | |

## Options

| Designation | Type | Order No. | Retrofittable | Remarks |
|---|---|---|---|---|
| Impact Protection | R&S®ESR-B1 | 1316.4100.02 | yes | user-retrofittable |
| OCXO Reference Frequency | R&S®FSV-B4 | 1310.9522.02 | yes | user-retrofittable |
| OCXO Extended Frequency Stability | R&S®FSV-B4 | 1310.9522.03 | yes | user-retrofittable |
| Tracking Generator (9 kHz to 7 GHz) | R&S®FSV-B9 | 1310.9545.02 | yes | retrofit in service center |
| External Generator Control | R&S®ESR-B10 | 1310.9551.03 | yes | retrofit in service center |
| Solid State Drive (SSD, removable hard drive) [22] | R&S®ESR-B18 | 1316.3555.18 | yes | user-retrofittable |
| Spare Hard Drive (removable hard drive) [22] | R&S®ESR-B19 | 1316.3561.18 | yes | user-retrofittable |
| RF Preamplifier (100 kHz to 7 GHz) | R&S®FSV-B22 | 1310.9600.02 | yes | user-retrofittable, for R&S®ESR3 and R&S®ESR7 only |
| Frequency Extension 10 Hz and MIL bandwidths | R&S®ESR-B29 | 1316.3578.02 | yes | user-retrofittable |
| DC Power Supply for 12 V/24 V supply voltage | R&S®FSV-B30 | 1329.0243.02 | yes | user-retrofittable |
| Lithium-Ion Battery Pack | R&S®FSV-B32 | 1321.3750.04 | yes | user-retrofittable, requires R&S®FSV-B30 and R&S®FSV-B34 |
| Lithium-Ion Battery Charger | R&S®FSV-B34 | 1321.3950.02 | | |
| Hardware for Time Domain and Real-Time Analysis | R&S®ESR-B50 | 1316.3584.02 | yes | retrofit in service center |
| **Firmware/software** | | | | |
| Time Domain Scan | R&S®ESR-K53 | 1316.3590.02 | | requires R&S®ESR-B50 |
| Real-Time Analysis | R&S®ESR-K55 | 1316.3603.02 | | requires R&S®ESR-B50 |
| IF Analysis | R&S®ESR-K56 | 1316.3610.02 | | |

## Upgrades

| Designation | Type | Order No. | Retrofittable | Remarks |
|---|---|---|---|---|
| Windows 10 Upgrade for R&S®ESR with FMR11 CPU board with hard drive [23] | R&S®ESR-U2 | 1338.2300.10 | yes | contact service center |
| Windows 10 Upgrade for R&S®ESR with FMR11 CPU board with solid state drive [23] | R&S®ESR-U2 | 1338.2300.11 | yes | contact service center |

[22] For instruments delivered with Windows 10 ex factory or instruments with upgrade R&S®ESR-U2 only. For other models and spare parts contact your local Rohde & Schwarz service center.

[23] For R&S®ESR with the following serial numbers: R&S®ESR3: > 101830, R&S®ESR7: > 101393, R&S®ESR26: > 101295. For instruments with lower serial numbers contact your local Rohde & Schwarz service center.

# Recommended extras

| Designation | Type | Order No. |
|---|---|---|
| Headphones | | 0708.9010.00 |
| IEC/IEEE Bus Cable, length: 1 m | R&S®PCK | 0292.2013.10 |
| IEC/IEEE Bus Cable, length: 2 m | R&S®PCK | 0292.2013.20 |
| 19" Rack Adapter | R&S®ZZA-478 | 1096.3248.00 |
| **Matching pads, 50/75 Ω** | | |
| Matching Pad, 50/75 Ω, L Section, matching at both ends | R&S®RAM | 0358.5414.02 |
| Matching Pad, 50/75 Ω, series resistor, 25 Ω, matching at one end (taken into account in instrument function RF INPUT 75 Ω) | R&S®RAZ | 0358.5714.02 |
| **SWR bridges, 50 Ω** | | |
| SWR Bridge, 50 Ω, 5 MHz to 3 GHz | R&S®ZRB2 | 0373.9017.5X |
| SWR Bridge, 50 Ω, 40 kHz to 4 GHz | R&S®ZRC | 1039.9492.5X |
| **High-power attenuators** | | |
| High-Power Attenuator, 100 W, 3/6/10/20/30 dB, 1 GHz | R&S®RBU100 | 1073.8495.xx<br>(xx = 03/06/10/20/30) |
| High-Power Attenuator, 50 W, 3/6/10/20/30 dB, 2 GHz | R&S®RBU50 | 1073.8695.xx<br>(xx = 03/06/10/20/30) |
| High-Power Attenuator, 50 W, 20 dB, 6 GHz | R&S®RDL50 | 1035.1700.52 |
| **Connectors and cables** | | |
| Probe Power Connector, 3-pin | | 1065.9480.00 |
| **DC block** | | |
| DC Block, 10 kHz to 18 GHz (type N) | R&S®FSE-Z4 | 1084.7443.02 |
| **For R&S®ESR26 only** | | |
| Test Port Adapter, N male | | 1021.0541.00 |
| Test Port Adapter, 3.5 mm male | | 1021.0529.00 |

| Service options | | |
|---|---|---|
| Extended Warranty, one year | R&S®WE1 | Please contact your local Rohde & Schwarz sales office. |
| Extended Warranty, two years | R&S®WE2 | |
| Extended Warranty with Calibration Coverage, one year | R&S®CW1 | |
| Extended Warranty with Calibration Coverage, two years | R&S®CW2 | |

**Extended warranty with a term of one to two years (WE1 to WE2)**
Repairs carried out during the contract term are free of charge [24]. Necessary calibration and adjustments carried out during repairs are also covered. Simply contact the forwarding agent we name; your product will be picked up free of charge and returned to you in top condition a couple of days later.

**Extended warranty with calibration (CW1 to CW2)**
Enhance your extended warranty by adding calibration coverage at a package price. This package ensures that your Rohde & Schwarz product is regularly calibrated, inspected and maintained during the term of the contract. It includes all repairs [24] and calibration at the recommended intervals as well as any calibration carried out during repairs or option upgrades.

**For product brochure, see PD 3606.7201.12 and www.rohde-schwarz.com**

[24] Excluding defects caused by incorrect operation or handling and force majeure. Wear-and-tear parts are not included.

## Service that adds value

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

**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.

**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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