R&S®FPL1000 SIGNAL AND SPECTRUM ANALYZER

3 year warranty

Experience high performance wherever you take it

Data Sheet
Version 06.00

ROHDE&SCHWARZ
Make ideas real

AT A GLANCE

The R&S®FPL1000 signal and spectrum analyzer makes measuring fast and simple. The intuitive touchscreen is straightforward and easy to use. With its solid RF performance, light weight and small footprint, the R&S®FPL1000 combines the functionality of a benchtop instrument with the portability of a handheld instrument.

Text 1 Zeile Abstand zum Teaser

In an RF lab, the R&S®FPL1000 is as indispensable as an oscilloscope or multimeter. It is a single measuring instrument for a variety of measurement tasks. It supports not only spectrum analysis, but also highly accurate power measurement with power sensors and analysis of analog and digitally modulated signals.

The R&S®FPL1000 is the only instrument in its class that features an internal generator (R&S®FPL1-B9 option) and can analyze signals with a bandwidth of 40 MHz (R&S®FPL1-B40 option).

The solid RF performance makes the R&S®FPL1000 the ideal instrument for use in the lab, production and service. The 1 dB attenuator step size (R&S®FPL1-B25 option) allows you to perform measurements at the instrument's maximum dynamic range. The preamplifier (R&S®FPL1-B22 option) extends the sensitivity level. Thanks to its high sensitivity and low phase noise performance, even small interfering signals next to the carrier can be analyzed.

Using the R&S®FPL1000 is as intuitive as using a smartphone. Simple swiping gestures adjust the center frequency or the reference level. Two-finger gestures change the span or the displayed power level, while the 10.1" screen with 1280 × 800 pixel resolution provides a clear display of the signal. Furthermore, the user can freely arrange the layout of the measurement results on the display. Using the MultiView display mode, even different measurement modes can be combined and all the results can be displayed on one screen.

The R&S®FPL1000 has a depth of only one hand length. It fits into any workplace and leaves enough space for DUTs and other measurement instruments.

Its light weight and battery operation capability lets you take it anywhere to perform measurements. The optional battery pack provides three hours of operation. Thanks to its rich set of accessories, the R&S®FPL1000 is suitable for field measurements. For transport, a protective hard cover is available as well as a padded carrying bag that allows the instrument to be operated while in the bag. A shoulder harness simplifies portable operation.

BENEFITS

Key facts

- Frequency range: 5 kHz to 7.5 GHz
- SSB phase noise: –108 dBc (1 Hz) at 10 kHz offset (1 GHz carrier)
- DANL with preamplifier: –166 dBm from 10 MHz to 2 GHz
- Lightweight with small footprint
- Battery pack and 12 V/24 V power supply (option)
- Use with power sensors (option)
- 40 MHz analysis bandwidth (option)
- Analog and digital signal analysis (option)
- Internal generator (option)
- Gated sweep, narrowband resolution filters and spectrogram measurements as standard

One instrument for multiple applications

- Spectrum analysis
- Scalar network analysis
- Signal analysis of analog and digitally modulated signals
- Power measurements with power sensors
- Noise figure and gain measurements
- Phase noise measurements
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Solid RF performance

- Low spurious response
- Low displayed average noise level (DANL)
- 40 MHz signal analysis bandwidth
- Low level measurement uncertainty
- Precise spectral measurements due to low phase noise
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Intuitive user interface

- High-resolution display
- Multipoint touchscreen
- Flexible arrangement of results and MultiView
- Toolbar
- Quiet operation
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Fully portable

- Battery pack and 12 V/24 V power supply (option)
- Carrying bag and shoulder harness
- Low power consumption
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ONE INSTRUMENT FOR MULTIPLE APPLICATIONS

The R&S®FPL1000 is a single measuring instrument for many types of measurements. You can use it for spectral measurements, for highly accurate power measurements with power sensors and for analyzing analog and digitally modulated signals.

Spectrum analysis

Even in its basic configuration, the R&S®FPL1000 is a true allrounder. The basic configuration for spectral measurements includes:

- Spectrum analysis
- Wide range of spectral measurement functions such as channel power, ACLR, signal-to-noise ratio, spurious, harmonic distortions, third-order intercept point, AM modulation depth
- Statistical ADP and CCDF analysis
- Versatile marker functions

Signal analysis of analog and digitally modulated signals

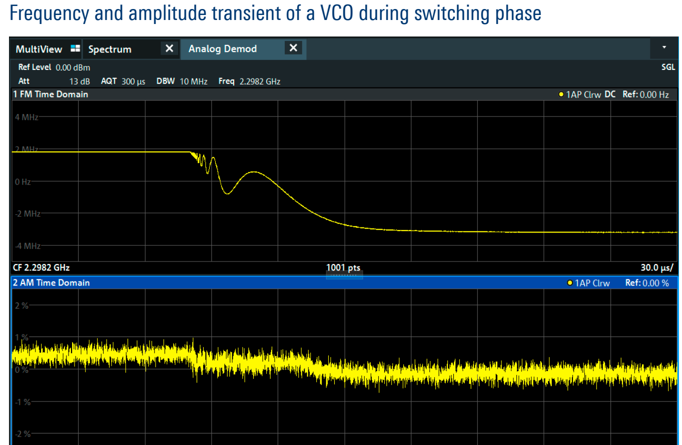
Suitable measurement applications are available for analyzing analog and digitally modulated signals. The R&S®FPL1-K7 option turns the R&S®FPL1000 into an analog modulation analyzer for amplitude, frequency and phase modulated signals. The base unit's I/Q analyzer supports the magnitude and phase presentation of I and Q within the analysis bandwidth. The I/Q data can be exported for further analysis with third-party software products. The R&S®FPL1-K70 vector signal analysis option also analyzes digitally modulated single-carrier signals. The R&S®FPL1-K70M and R&S®FPL1-K70P options are extensions of the R&S®FPL1-K70 option for multi-modulation analysis and measurement of BER on PRBS data.

Other features that typically require costly options are already included in the base unit, e.g.:

- Spectrogram measurements to display the spectrum versus time
- Trace zoom function
- Gated sweep for accurate display of pulsed signals
- Narrowband resolution bandwidth down to 1 Hz

The R&S®FPL1000 base unit supports various advanced spectrum measurement modes as standard

Frequency and amplitude transient of a VCO during switching phase



Scalar network analysis

Equipped with the R&S®FPL1-B9 option, the R&S®FPL1000 offers an internal CW source and a tracking generator for quick and easy measurement of frequency response, filters and attenuation. The n-dB down marker determines the 3 dB bandwidth of a bandpass filter at the press of a button. Precision is enhanced by through, short and open normalization methods. In addition, the R&S®FPL1-B9 option allows characterization of two-port devices such as power amplifiers or limiters. The internal generator is in this case switched to power sweep mode (–50 dBm to 0 dBm), e.g. to perform measurements on amplifiers and determine their gain and 1 dB compression point.

Power measurements with power sensors

For applications requiring high level accuracy, the R&S®FPL1-K9 option allows the R&S®FPL1000 to be used with R&S®NRP power sensors in a range from –67 dBm to +45 dBm and frequencies up to 110 GHz. The spectrum analyzer and the power meter modes run fully in parallel, effectively improving the measurement efficiency with a single instrument.

Noise figure and gain measurements

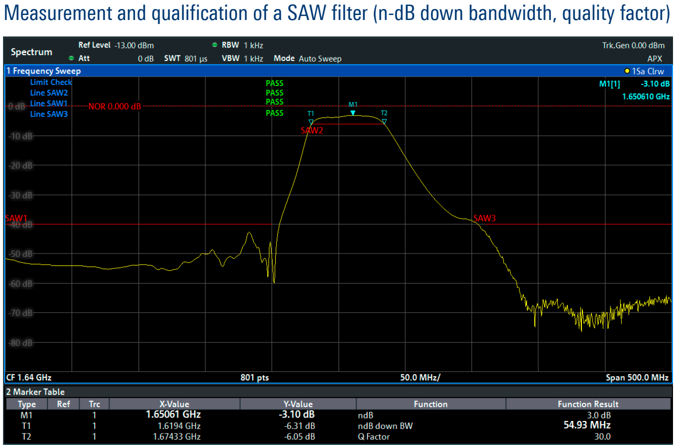
For amplifier characterization, noise figure and gain measurements can easily be performed with the R&S®FPL1-K30 option. This requires the R&S®FPL1-B5 additional interfaces option and an external noise source with a 28 V DC power input. Using the Y-factor method, noise figure and gain are measured independent of the instrument's own noise figure.

Phase noise measurements

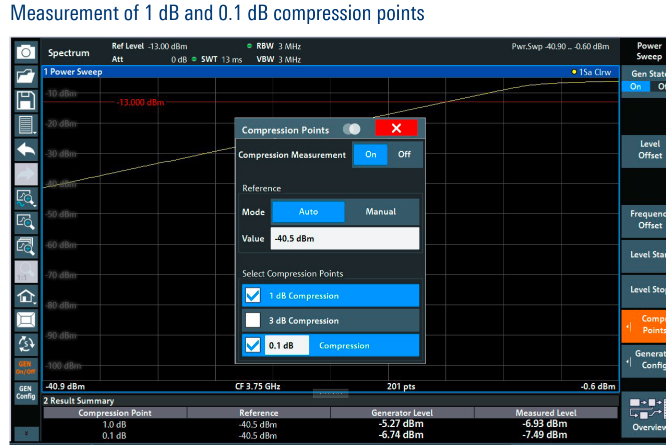
Signals that are, for example, used for data transmissions (such as communications and Wi-Fi) often make use of the signal phase as part of the modulation technique. Phase noise will therefore result in increased bit error rates.

For these signals, it is important to ensure good phase noise performance (e.g. of the local oscillators). Phase noise measurements help to characterize the quality of these signals. The R&S®FPL1-K40 phase noise measurement application offers everything needed for this.

Measurement and qualification of a SAW filter (n-dB down bandwidth, quality factor)



Measurement of 1 dB and 0.1 dB compression points



SOLID RF PERFORMANCE

Featuring a phase noise of –108 dBc (1 Hz) at 10 kHz offset (1 GHz carrier), a third-order intercept point of +20 dBm, 1 Hz to 10 MHz resolution bandwidth and –166 dBm displayed average noise level, the R&S®FPL1000 is comparable to higher class analyzers. This makes it the ideal tool for use in the lab, in production and for service tasks. The 1 dB attenuator step size (R&S®FPL1-B25 option) and the preamplifier (R&S®FPL1-B22 option) extend the usable dynamic range and sensitivity.

Low spurious response

In order to distinguish spurs in the signal from spurs of the measuring instrument, a low spurious response is required. Within 10 MHz offset from the carrier signal, the specified spurious response of the R&S®FPL1000 is –70 dB lower than the signal level. This is over 10 dB better than comparable analyzers in this class. At higher offset, the specified value is even –80 dB, which is 20 dB better than comparable analyzers. This makes the R&S®FPL1000 the perfect tool for identifying interferers even when they are significantly below the carrier level.

Low displayed average noise level (DANL)

A low displayed average noise level (DANL) is required to detect signals with low levels. In addition, when you search for interferers above a certain level, a low DANL allows you to use a higher resolution bandwidth and to increase the measurement speed. With a typical DANL of –152 dBm, which can be improved to –166 dBm with a preamplifier, the R&S®FPL1000 can identify even small spurious emissions.

40 MHz signal analysis bandwidth

The signal analysis bandwidth defines the frequency range in which all level and phase information over a given time is captured. The R&S®FPL1-B40 option extends the analysis bandwidth from 12.8 MHz to 40 MHz, making the R&S®FPL1000 the only instrument in its class that can demodulate analog and digitally modulated signals with up to 40 MHz bandwidth.

The R&S®FPL1-K7 option lets you analyze the amplitude, frequency and phase of analog modulated signals. And the R&S®FPL1-K70 vector signal analysis option makes it possible to demodulate modulated single-carrier signals and analyze them in detail.

The I/Q analyzer is the standard function for digital signal analysis. It displays the magnitude and phase parameters and the FFT spectrum. The captured I/Q data can be transferred to third-party software tools (e.g. Matlab® or Python) for further analysis.

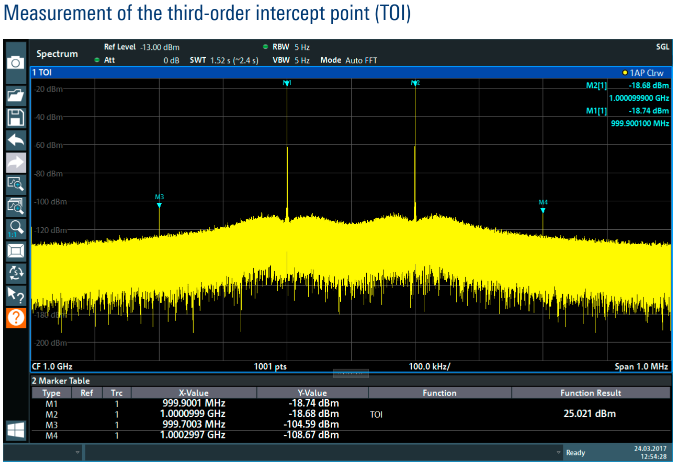
Low level measurement uncertainty

Another unique feature in this class is the low level measurement uncertainty of 0.5 dB. The instrument's high measuring accuracy ensures precise and reliable test results, which often makes it possible to dispense with a separate power sensor.

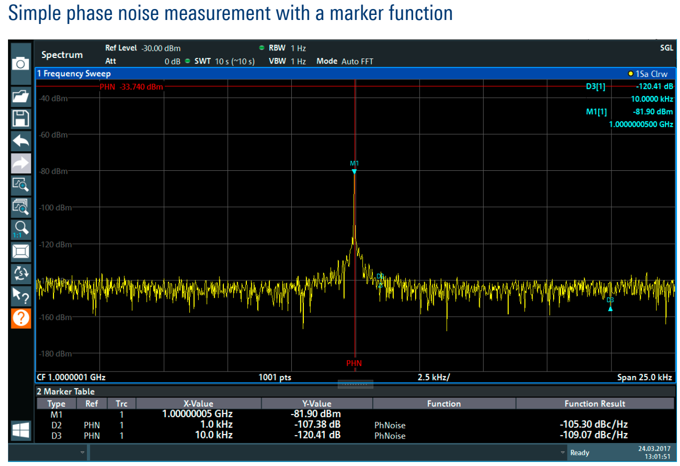
Precise spectral measurements due to low phase noise

The low phase noise of –108 dBc (1 Hz) at 10 kHz offset to the carrier (1 GHz carrier) yields significant advantages for spectral measurements as well. It enables accurate adjacent channel power measurements of narrowband carriers. Unwanted spurs close to the carrier can be detected.

Measurement of the third-order intercept point (TOI)



Simple phase noise measurement with a marker function



INTUITIVE USER INTERFACE

Operating the R&S®FPL1000 is as intuitive as using a smartphone. You can configure the instrument and perform measurements with the touchscreen. A one-finger swipe across the screen adjusts the center frequency or the reference level. Two-finger gestures adjust the displayed span or level range.

High-resolution display

The 10.1" screen with 1280 × 800 pixel resolution provides a precise representation of the signal. The soft menu keys and the information fields are arranged in such a way that the signal appears true to detail with the highest possible resolution.

Innovative user interface

Within a measurement application, different measurement items can be easily added using drag and drop. The combined results can be arranged as desired on the display.

Flexible arrangement of results and MultiView

Different measurements, for example spectrum measurements and an analog demodulation measurement, can be opened on different tabs in parallel. A simple click activates the measurement of interest, maximizing relevant windows and fading out the others. The MultiView function displays all tabs on one screen. With the sequencer, all measuring channels are measured consecutively, one after the other. The user is provided with constantly updated results and no annoying, time-consuming parameter adjustments are necessary.

Toolbar

Overlapping and frequently used functions – such as loading and saving configurations, taking screenshots, the help menu or the zoom function – can easily be accessed at any time via the toolbar menu.

Screenshot of the R&S®FPL1000 with MultiView. The sequencer consecutively performs a spectrum measurement, an adjacent channel power measurement, a time domain measurement (zero span) and a spectrogram measurement. The results are displayed clearly and simultaneously. The toolbar on the left allows fast access to the most common menu functions. Different measurements can be activated with the tabs at the top.

10.1" HIGH-RESOLUTION DISPLAY

10.1" high-resolution display
1280 × 800 pixel resolution

Hardkeys
For setup, presets, etc.

Two USB 2.0 ports
- For storage media
- For connecting accessories

Soft menu selection
- Quick access to key tools
- Hardware settings at a glance

Measurement setup buttons

Control knob

Numerical keypad
With unit keys for frequency and level

Generator output
Internal generator output

RF input

FULLY PORTABLE

The R&S®FPL1000 signal and spectrum analyzer can be used almost everywhere. With a depth of only 23 cm, it fits into any workplace and leaves enough space for DUTs and other measuring instruments. Due to its low weight of 6 kg and the carrying handle, you can take it wherever you need it.

Battery pack and 12 V/24 V power supply (option)

The optional battery pack provides three hours of operation. With additional batteries and an additional charger, the operating time can be extended without interruption.

When the R&S®FPL1000 is used in vehicles, the optional 12 V/24 V DC power supply conveniently supplies power via the car socket.

Carrying bag and shoulder harness

A padded carrying bag is available for keeping the R&S®FPL1000 well protected during transport. Ventilation slits and a transparent cover allow the instrument to be operated while inside the bag. This lets you use the R&S®FPL1000 at any location and under adverse environmental conditions.

Users who need the functionality of a benchtop instrument and the flexibility of a handheld instrument can use the shoulder harness. Measurements where the instrument needs to be carried, such as interference hunting, are almost as convenient as with pure handheld instruments.

Fully portable configuration with optional transport bag, shoulder harness and UWB antenna module

An optional carrying bag is available for transporting the R&S®FPL1000. With the R&S®FPL1-B31 battery option, the instrument can be operated while inside the bag.

R&S®FPL1-K7 AM/FM/ΦM ANALOG DEMODULATION

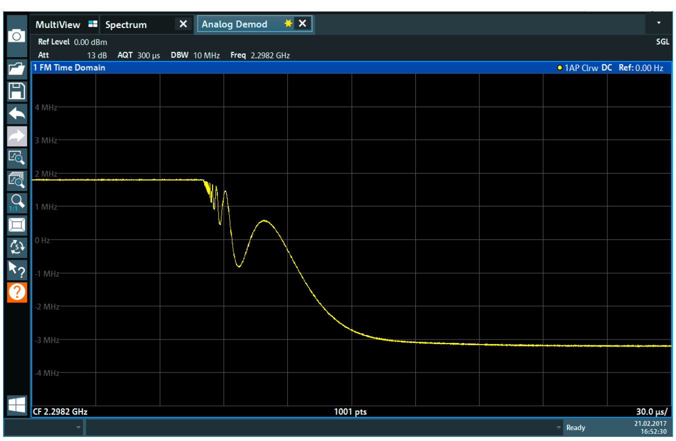
The R&S®FPL1-K7 option converts the R&S®FPL1000 into an analog modulation analyzer for amplitude, frequency and phase modulated signals. It measures the characteristics of the useful modulation and other items such as residual FM or synchronous modulation. Typical applications of the R&S®FPL1-K7 include:

- ▶ Transient and settling measurements on oscillators such as VCOs and PLLs
- ▶ Troubleshooting AM/FM transmitters
- ▶ Simple chirp analysis of pulsed or continuous wave signals

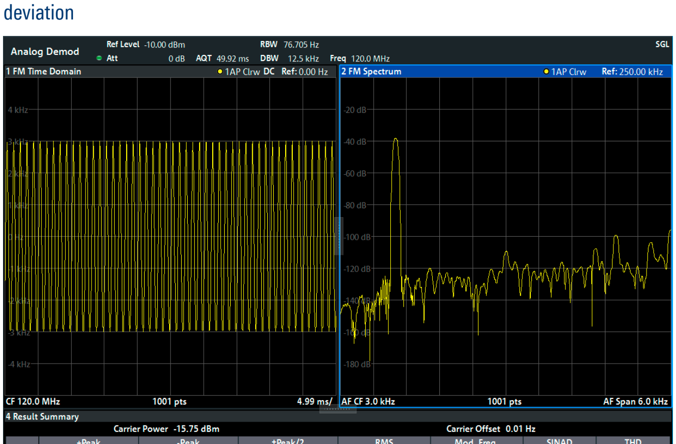
Display and measurement capabilities

- ▶ Modulation signal versus time
- ▶ FFT spectrum of modulation signal
- ▶ RF signal power versus time
- ▶ FFT spectrum of RF signal
- ▶ Table with numeric display of:
  - – Deviation or modulation depth, +peak, –peak, ±peak/2 and RMS weighted
  - – Modulation frequency
  - – Carrier frequency offset
  - – Carrier power
  - – Total harmonic distortion (THD) and SINAD

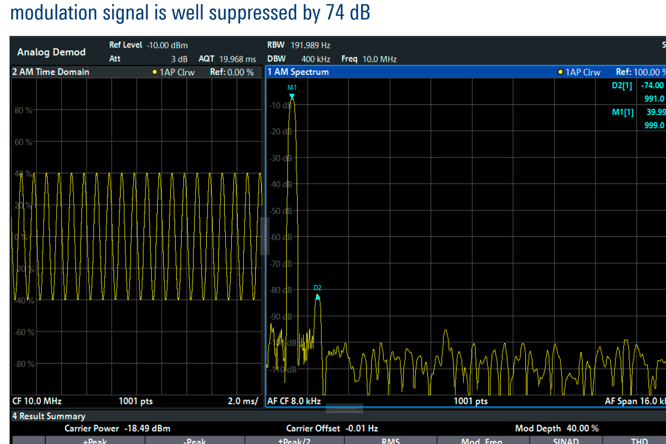
Frequency settling behavior of an oscillator



Display of the modulating signal and its spectrum together with peak and RMS deviation



THD measurement on an amplitude modulated signal: the first harmonic of the modulation signal is well suppressed by 74 dB



R&S®FPL1-K30 NOISE FIGURE AND GAIN MEASUREMENTS

The R&S®FPL1-K30 noise figure and gain measurement option [1] allows you to characterize the most important amplifiers specifications. Using the Y-factor method, the noise figure and gain are measured with high accuracy independent of the instruments own noise figure.

Typical applications for the R&S®FPL1-K30 include the characterization of amplifiers.

The following parameters can be measured at a specified frequency or in a selectable frequency range:
- Noise figure in dB
- Gain in dB
- Y factor in dB

The noise source is controlled by the 28 V output on the R&S®FPL1-B5 additional interfaces option on the back of the instrument. With an optional R&S®FPL1-B22 RF preamplifier, the sensitivity of the measurement can be improved for measuring devices with a low noise figure, e.g. LNAs.

The advantage of the R&S®FPL1-K30 compared to conventional noise measurement systems is that a wide variety of other RF measurements can also be performed with one instrument, for example measurement of harmonics, intermodulation, spurious responses.

[1] The R&S®FPL1-K30 requires the R&S®FPL1-B5 additional interfaces option and a noise source, for instance the smart noise source R&S®FS-SNS26.

Simultaneous view of graphs for noise figure, gain and Y factor versus frequency and a table of the results in numerical format

R&S®FPL1-K40 PHASE NOISE MEASUREMENT APPLICATION

Phase noise is an important parameter in wireless communications systems. The R&S®FPL1-K40 option enables the R&S®FPL1000 to perform fast and easy phase noise measurements in development and production.

Equipped with the R&S®FPL1-K40 option, the R&S®FPL1000 can measure single sideband phase noise across a selectable carrier offset frequency range displayed on a logarithmic axis. Based on the measured phase noise, the user can determine the residual FM/φM and the jitter.

Phase noise measurement

- Carrier offset frequency range selectable from 1 Hz to 1 GHz in 1/3/10 sequence (1 Hz, 3 Hz, 10 Hz, 30 Hz, etc.)
- Number of averages, sweep mode and filter bandwidth can be individually selected for every measurement subrange to optimize the measurement speed
- Fast results for the subranges are obtained by starting the measurement at the maximum carrier offset
- Verification of carrier frequency and power prior to each measurement to prevent incorrect measurements
- Improvement of dynamic range by measuring the inherent thermal noise and performing noise correction

Measurement of residual FM/φM and jitter

- Integration across the entire selected carrier offset frequency range or across a selectable subrange
- Tabular display of residual FM, residual φM and RMS jitter in addition to measurement trace

Evaluation support

- Limit lines with pass/fail indication
- Display of phase noise at up to four selectable frequency offsets
- Additional markers

Phase noise measurement plus automatic limit checking, spot noise and residual noise indication

R&S®FPL1-K54 EMI MEASUREMENT APPLICATION

The R&S®FPL1-K54 EMI measurement application adds EMI diagnostic functionality to the R&S®FPL signal and spectrum analyzer. The R&S®FPL1-K54 offers EMI bandwidths for commercial and military applications, detectors such as quasi-peak, CISPR-average and RMS-average, limit lines and correction factors.

EMI detectors in line with CISPR 16-1-1

- Flexible application of EMI detectors such as peak, quasi-peak, CISPR-average and RMS-average
- Fast, easy-to-read diagnostic measurements with high result reproducibility

Measurement bandwidths in line with CISPR and MIL-STD

Diagnostic measurements during development deliver the correct amplitude of the disturbance signal thanks to the 6 dB bandwidths (CISPR from 200 Hz to 1 MHz, MIL-STD from 10 Hz to 1 MHz)

Measurement markers for evaluating EMI

- The ability to link markers to up to six traces and an associated EMI detector provides users with a direct reference to limits
- Automatic searching for disturbance maxima for reliable detection of time-varying interferers
- Critical frequencies are entered in a peak list for fast evaluation of a frequency spectrum with respect to official EMI emission limits

Marker demodulation

Fast and reliable identification of AM and FM signals.

EMI limit lines

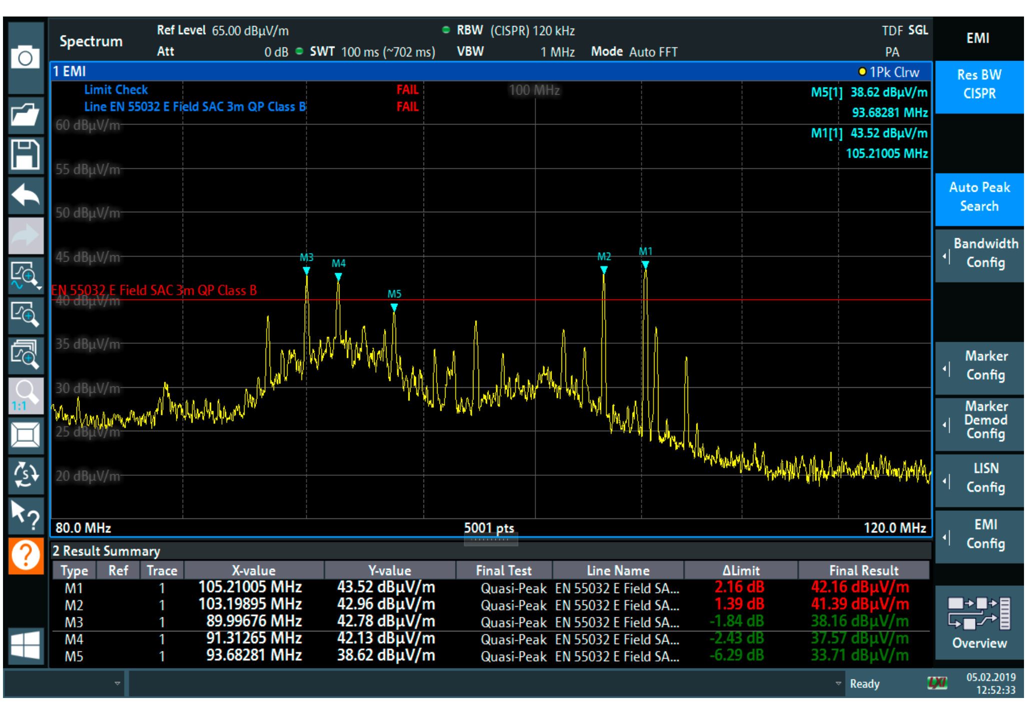
- Selection of limit lines that meet international standards
- Easy generation, editing and use of customer-specific limit lines
- Fast pass/fail test using activated limit lines

Frequency-dependent correction value tables

- Database with correction value tables for EMI accessories such as antennas, clamps, line impedance stabilization networks (LISN), pulse limiters, preamplifiers, cables and attenuators
- Easy generation, editing and storage of new correction tables
- Several correction tables can be combined to compensate for the entire test setup, e.g. including an antenna, a cable and a preamplifier

Logarithmic spectrum display

The spectrum display with logarithmic frequency axis makes it easy to analyze measurement results over a wide frequency range. Limit lines are displayed in accordance with the standards.



R&S®FPL1-K54
EMI measurement application

R&S®FPL1-K70 VECTOR SIGNAL ANALYSIS

The R&S®FPL1000 analyzes and demodulates digitally modulated single-carrier signals with up to 40 MHz analysis bandwidth. Universities and research facilities will benefit from the instrument's flexibility in analyzing proprietary signals. Developers of mobile communications devices and components can easily use the predefined standard settings.

When analyzing digital modulation signals, the R&S®FPL1000 receives and digitizes the signal, which is then analyzed by the R&S®FPL1-K70 option.

The R&S®FPL1-K70 vector signal analysis option is a powerful tool for analyzing individual digitally modulated signals down to the bit level. The clear operating concept simplifies the measurement despite many analysis functions, including a digital equalizer for channel response correction, correction of common I/Q errors and the display of many measured values as a graph or in table format.

Flexible modulation analysis from MSK to 4096QAM

- Modulation formats
  - 2FSK, 4FSK, 8FSK
  - MSK, GMSK, DMSK
  - BPSK, QPSK, offset QPSK, DQPSK, 8PSK, D8PSK, π/4-DQPSK, 3π/8-8PSK, π/8-D8PSK
  - 16QAM, 32QAM, 64QAM, 128QAM, 256QAM, 512QAM, 1024QAM, 2048QAM, 4096QAM
  - 16 APSK (DVB-S2), 32 APSK (DVB-S2), 2 ASK, 4 ASK, π/4-16QAM (EDGE), –π/4-16QAM (EDGE)

Numerous standard-specific presets

- User-definable constellations and mappings
- GSM, GSM/EDGE
- 3GPP WCDMA, EUTRA/LTE, CDMA2000®
- TETRA, APCO25
- Bluetooth®, ZigBee
- DECT, DVB-S2

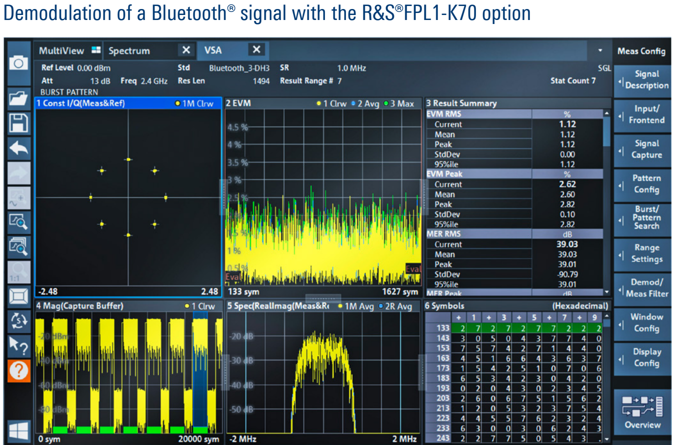
DVB-S2X modulation analysis

The R&S®FPL1-K70M multicarrier modulation analysis application (R&S®FPL1-K70 option required) allows DVB-S2X signals to be analyzed. The R&S®FPL1-K70M option detects the start of frame, demodulates both the header and payload parts of the signal and displays the constellation diagram and relevant modulation analysis parameters.

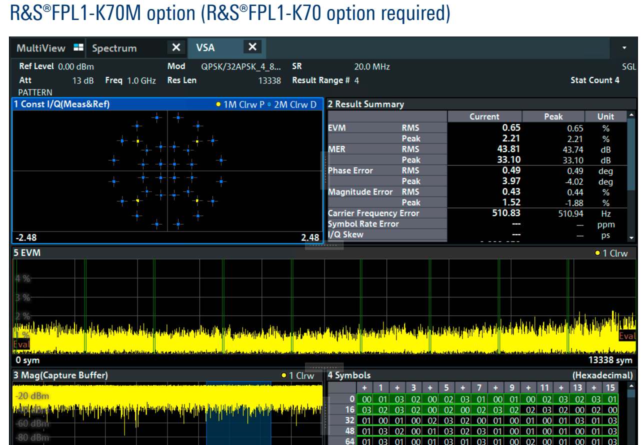
Uncoded bit error rate

The R&S®FPL1-K70P is an extension of the R&S®FPL1-K70 vector signal analysis option that allows the measurement of raw bit error rate (BER) on PRBS data up to PRBS23. The R&S®FPL1-K70P also offers the ability to measure BER based on user-defined bit sequences.

Demodulation of a Bluetooth® signal with the R&S®FPL1-K70 option



Demodulation of a DVB-SX2 multi-modulation signal with the R&S®FPL1-K70M option (R&S®FPL1-K70 option required)



R&S®VSE-K106 EUTRA/LTE NB-IOT MEASUREMENT SOFTWARE

The R&S®FPL1000 can be used to analyze cellular 3GPP NB-IoT signals. It captures the signal, which is then analyzed by the R&S®VSE-K106 EUTRA/LTE NB-IoT measurement software [1)].

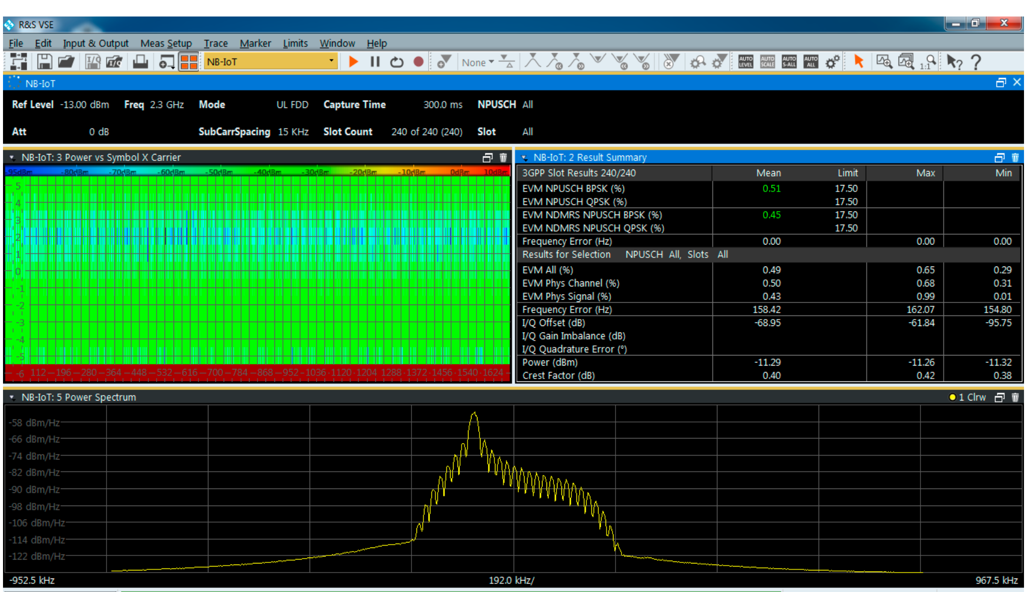
[1)] R&S®VSE base software and R&S®FSPC license dongle required.

This solution can perform all relevant measurements on 3GPP NB-IoT signals:

- UL signals from NB-IoT modules and devices
- DL signals from base stations
- Signal demodulation and EVM measurements
- Spectral measurements/ACLR in line with 3GPP
- Time alignment error (TAE) measurements

It works in all three NB-IoT operation modes:

- In-band
- Guard band
- Standalone



Demodulation and EVM measurement of an NB-IoT UL signal with the R&S®VSE-K106 measurement application

Specifications

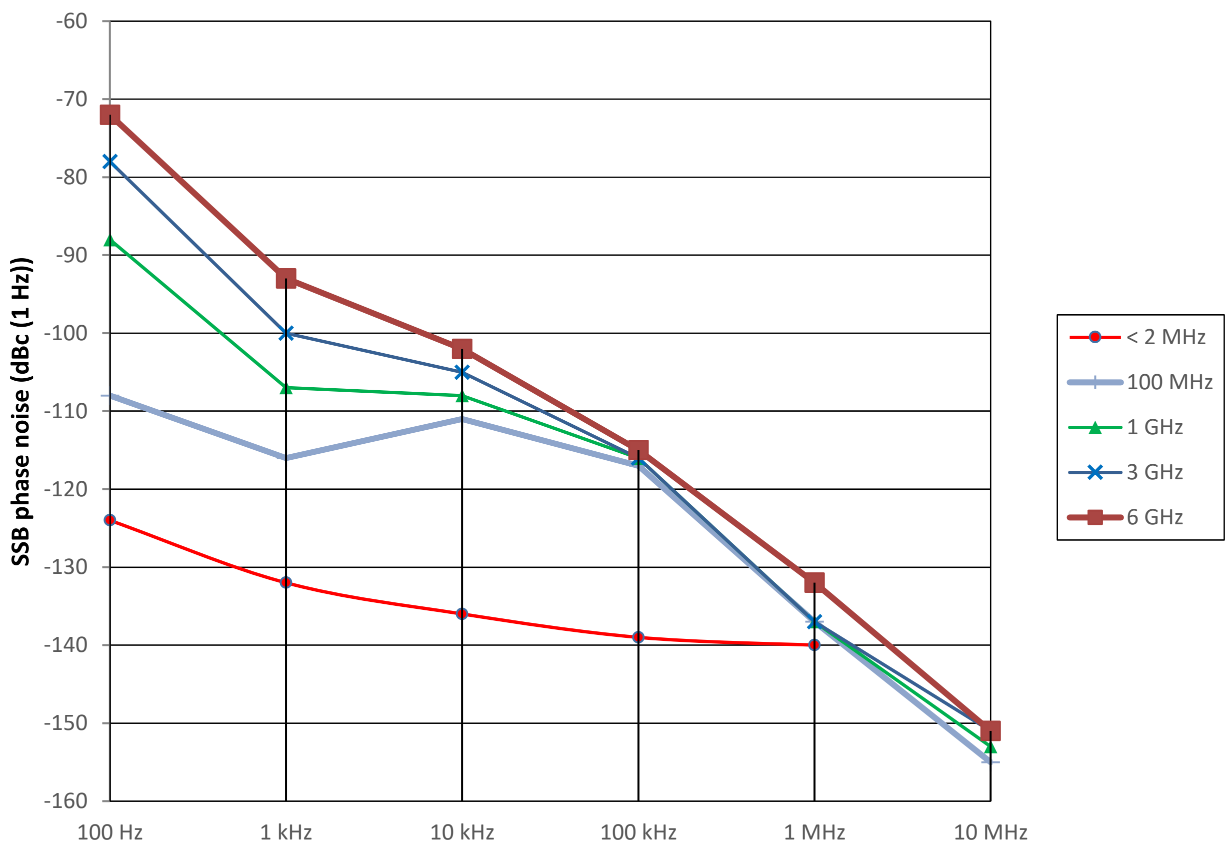
Frequency

Frequency range	R&S®FPL1003	5 kHz to 3 GHz
	R&S®FPL1007	5 kHz to 7.5 GHz
Frequency resolution		0.01 Hz
Scaling	standard	linear
	with R&S®FPL1-K54, RBW ≤ 1 MHz	linear, logarithmic

Reference frequency, internal, nominal		
Accuracy		(time since last adjustment × aging rate) + temperature drift + calibration accuracy
Aging per year	standard	1×10^{-6}
	with R&S®FPL1-B4 OCXO reference frequency option	1×10^{-7}
Temperature drift (0 °C to +50 °C)	standard	1×10^{-6}
	with R&S®FPL1-B4 OCXO reference frequency option	1×10^{-7}
Achievable initial calibration accuracy	standard	5×10^{-7}
	with R&S®FPL1-B4 OCXO reference frequency option	5×10^{-8}

Frequency readout		
Marker resolution		0.01 Hz
Uncertainty		±(marker frequency × reference uncertainty + 10 % × resolution bandwidth + ½ (span/(sweep points – 1)) + 1 Hz)
Number of sweep (trace) points	default value	1001
	range	101 to 100001
Number of measurement points	with R&S®FPL1-K54, active EMI measurement	101 to 200001
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		1 Hz
Count accuracy		±(frequency × reference uncertainty + ½ (last digit))
Display range for frequency axis		0 Hz, 10 Hz to max. frequency
Resolution		0.1 Hz
Maximum span deviation		0.1 %

Spectral purity		
SSB phase noise	frequency = 1000 MHz, carrier offset	
	100 Hz	nom. –88 dBc (1 Hz)
	1 kHz	< –99 dBc (1 Hz)
	10 kHz	< –105 dBc (1 Hz), typ. –108 dBc (1 Hz)
	100 kHz	< –110 dBc (1 Hz), typ. –115 dBc (1 Hz)
	1 MHz	< –130 dBc (1 Hz), typ. –135 dBc (1 Hz)
	10 MHz	nom. –152 dBc (1 Hz)



Measured phase noise at different center frequencies

Sweep time

Range	span = 0 Hz	1 µs to 8000 s
	span ≥ 10 Hz, RBW ≥ 100 kHz	1 ms to 8000 s [1]
	span ≥ 10 Hz, RBW < 100 kHz	75 µs to 8000 s [2]
Sweep time accuracy	span = 0 Hz	nom. 0.1 %
	span ≥ 10 Hz, RBW ≥ 100 kHz	nom. 3 %

Resolution bandwidths

Sweep filters and FFT filters		
Resolution bandwidths (–3 dB)	sweep filters	100 kHz to 10 MHz in 1/2/3/5 sequence
	FFT filters	1 Hz to 50 kHz in 1/2/3/5 sequence
Bandwidth uncertainty		nom. < 3 %
Shape factor 60 dB:3 dB		nom. < 5

1 Net sweep time without additional hardware settling time.
2 Time for data acquisition for FFT calculation.

Channel filters		
Bandwidths (–3 dB)		100/200/300/500 Hz
		1/1.5/2/2.4/2.7/3/3.4/4/4.5/5/6/7.5/8.5/9/ 10/12.5/14/15/16/20/21/25/30/50/100/150/ 192/200/300/500 kHz
		1/1.228/1.5/2/3/3.75/5/10 MHz
Bandwidth uncertainty		nom. < 2 %
Shape factor 60 dB:3 dB		nom. < 2

EMI filters (with R&S®FPL1-K54 option)		
Bandwidths (–6 dB)		10/100/200 Hz
		1/9/10/100/120 kHz
		1 MHz
Bandwidth uncertainty		nom. < 3 %
Shape factor 60 dB:6 dB		nom. < 4

Video bandwidths	standard	1 Hz to 10 MHz in 1/2/3/5 sequence

Signal analysis bandwidth (equalized)	standard	nom. 10 MHz
	with R&S®FPL1-B40 option	nom. 40 MHz

Level

Display range		displayed noise floor up to +30 dBm

Maximum input level		
DC voltage		50 V
CW RF power	RF attenuation 0 dB	
	RF preamplifier = off	20 dBm (= 0.1 W)
	with R&S®FPL1-B22 option, RF preamplifier = on	13 dBm (= 0.02 W)
	RF attenuation ≥ 10 dB	
	RF preamplifier = off	30 dBm (= 1 W)
	with R&S®FPL1-B22 option, RF preamplifier = on	23 dBm (= 0.2 W)
Pulse spectral density	RF attenuation 0 dB, RF preamplifier = off	97 dB µV/MHz
Maximum pulse voltage	RF attenuation ≥ 10 dB	150 V
Maximum pulse energy	RF attenuation ≥ 10 dB, 10 µs	1 mWs

Intermodulation		
1 dB compression of input mixer (two tone)	RF attenuation 0 dB, RF preamplifier = off	nom. +7 dBm
Third-order intercept point (TOI)	RF attenuation 0 dB, level 2 × –20 dBm, ∆f > 5 × RBW or 10 kHz, whichever is larger, RF preamplifier = off	
	10 MHz ≤ f_{in} < 300 MHz	> 13 dBm, typ. 16 dBm
	300 MHz ≤ f_{in} < 3 GHz	> 17 dBm, typ. 20 dBm
	3 GHz ≤ f_{in} ≤ 7.5 GHz	> 15 dBm, typ. 18 dBm
	with R&S®FPL1-B22 option, RF attenuation 0 dB, level 2 × –40 dBm, ∆f > 5 × RBW or 10 kHz, whichever is larger, RF preamplifier = on	
	5 MHz ≤ f_{in} < 7,5 GHz	nom. 0 dBm
Second-harmonic intercept (SHI)	RF attenuation 0 dB, level –13 dBm, RF preamplifier = off	
	1 MHz < f_{in} ≤ 900 MHz	nom. 45 dBm
	900 MHz < f_{in} ≤ 3.75 GHz	nom. 70 dBm

Displayed average noise level (DANL)	0 dB RF attenuation, termination 50 Ω, log. scaling, normalized to 1 Hz RBW, RBW = 1 kHz, VBW = 1 Hz, sample detector, +20 °C to +30 °C	
RF preamplifier off	5 kHz ≤ f < 100 kHz	typ. –143 dBm
	100 kHz ≤ f < 5 MHz	< –140 dBm, typ. –143 dBm
	5 MHz ≤ f < 3 GHz	< –149 dBm, typ. –152 dBm
	3 GHz ≤ f < 5 GHz	< –143 dBm, typ. –146 dBm
	5 GHz ≤ f ≤ 7.5 GHz	< –140 dBm, typ. –143 dBm

RF preamplifier on (gain nom. 20 dB)	3 MHz ≤ f < 10 MHz	< –155 dBm, typ. –158 dBm
	10 MHz ≤ f < 2 GHz	< –163 dBm, typ. –166 dBm
	2 GHz ≤ f < 3 GHz	< –162 dBm, typ. –165 dBm
	3 GHz ≤ f < 5 GHz	< –158 dBm, typ. –161 dBm
	5 GHz ≤ f < 7 GHz	< –156 dBm, typ. –159 dBm
	7 GHz ≤ f < 7.5 GHz	< –155 dBm, typ. –158 dBm

Spurious responses	mixer level ≤ –13 dBm, sweep optimization: auto or dynamic, scaling linear	
Image response	10 MHz ≤ f ≤ 3 GHz	
	f_{in} – 2 × 4020.4 MHz (1st IF)	typ. < –90 dBc
	f_{in} – 2 × 820.4 MHz (2nd IF)	< –80 dBc
	f_{in} – 2 × 20.4 MHz (3rd IF), RBW ≤ 3 MHz	< –80 dBc
	3 GHz < f ≤ 7.5 GHz, RBW ≤ 3 MHz	typ. < –70 dBc
Intermediate frequency response	2 MHz ≤ f ≤ 3 GHz	
	1st IF (4020.4 MHz)	typ. < –80 dBc
	2nd IF (820.4 MHz)	< –80 dBc
	3rd IF (20.4 MHz)	< –80 dBc
	3 GHz < f ≤ 7.5 GHz	< –70 dBc
Residual spurious response	0 dB RF attenuation	
	f ≤ 1 MHz	nom. < –90 dBm
	f > 1 MHz	< –90 dBm
Local oscillator related spurious	f < 3 GHz	
	1 kHz ≤ carrier offset ≤ 10 MHz	< –70 dBc
	carrier offset > 10 MHz	< –80 dBc
	3 GHz ≤ f < 7.5 GHz	typ. < –70 dBc
Other interfering signals		
Subharmonic of 1st LO	20 MHz ≤ f < 3 GHz, spurious at 4020.4 MHz – 2 × f_{in}	nom. < –80 dBc
Harmonic of 1st LO	20 MHz ≤ f < 3 GHz, mixer level < –25 dBm, spurious at f_{in} –2010.2 MHz	nom. < –80 dBc

Level display		
Logarithmic level axis		1 dB to 200 dB, in 1 dB steps
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
Trace functions		clear/write, max. hold, min. hold, average, view
EMI detectors (with R&S®FPL1-K54)		quasi-peak, RMS-average, CISPR-average
Measurement marker detector (with R&S®FPL1-K54)		max. peak, average, quasi-peak, RMS-average, CISPR-average
Setting range of reference level		–130 dBm to (–13 dBm + RF attenuation – RF preamplifier gain), in steps of 0.01 dB
Units of level axis		dBm, dBμV, dBmV, dBμA, dBpW, V, A, W

Level measurement uncertainty		
Absolute level uncertainty at 50 MHz	RBW = 10 kHz, level –10 dBm, reference level –10 dBm, RF attenuation 10 dB	
	+20 °C to +30 °C	< 0.3 dB (σ = 0.1 dB)
	0 °C to +50 °C	< 0.5 dB (σ = 0.17 dB)
Frequency response referenced to 50 MHz	RF attenuation 10/20/30/40 dB, RF preamplifier = off, +20 °C to +30 °C	
	5 kHz ≤ f < 3 MHz	nom. < 1 dB
	3 MHz ≤ f < 3 GHz	< 0.3 dB (σ = 0.1 dB)
	3 GHz ≤ f < 7.5 GHz	< 0.6 dB (σ = 0.2 dB)
	any setting of RF attenuation, RF preamplifier = off, 0 °C to +50 °C	
	5 kHz ≤ f < 3 GHz	nom. < 1 dB
	3 GHz ≤ f < 7.5 GHz	nom. < 1.5 dB
	RF attenuation ≤ 20 dB,RF preamplifier = on, +20 °C to +30 °C	
	3 MHz ≤ f < 3 GHz	nom. < 0.6 dB
	3 GHz ≤ f < 7.5 GHz	nom. < 1 dB

Attenuator switching uncertainty	f = 50 MHz, 0 dB to 45 dB, referenced to 10 dB attenuation	< 0.2 dB (σ = 0.07 dB)
Uncertainty of reference level setting		0 dB [3]
Bandwidth switching uncertainty	referenced to RBW = 10 kHz and sweep type FFT	
	sweep type = FFT (RBW < 100 kHz)	nom. < 0.1 dB
	sweep type = sweep (RBW ≥ 100 kHz)	nom. < 0.2 dB

Nonlinearity of displayed level		
Logarithmic level display	S/N > 16 dB, 0 dB to –50 dB	< 0.1 dB (σ = 0.07 dB)
Linear level display	S/N > 16 dB, 0 dB to –70 dB	nom. 5 % of reference level

Total measurement uncertainty	signal level 0 dB to –50 dB below reference level, S/N > 20 dB, sweep time auto, sweep type = FFT, RF attenuation 10 dB, 20 dB, 30 dB, 40 dB, RF preamplifier = off, span/RBW < 100, confidence level 95 %, +20 °C to +30 °C	
	1 MHz ≤ f < 3 GHz	0.5 dB
	3 GHz ≤ f < 7.5 GHz	0.8 dB

Measurement speed

Local measurement and display update rate	1001 sweep points, sweep optimization set to “speed”	nom. 1 ms (1000/s)
Maximum sweep rate, remote operation [4, 5]	trace average = on	nom. 0.9 ms (1100/s)
Remote measurement and LAN transfer [4]		nom. 3.2 ms (357/s)
Marker peak search [4]		nom. 1.9 ms
Center frequency tune + sweep + sweep data transfer [4]		nom. 16 ms

Trigger functions

Trigger		
Trigger source		free run, video, external, IF power, I/Q power
Trigger offset	span ≥ 10 Hz	0 s to 20 s
	span = 0 Hz	(–sweep time) to 20 s
Maximum deviation of trigger offset		±10 ns
IF power trigger		
Sensitivity	min. signal power	–60 dBm + RF attenuation – RF preamplifier gain
	max. signal power	–15 dBm + RF attenuation – RF preamplifier gain
IF power trigger bandwidth	RBW > 5 MHz	nom. 40 MHz
	RBW ≤ 5 MHz	nom. 6 MHz
Gated sweep		
Gate source		video, external, IF power, I/Q power
Gate delay		0 s to 20 s, min. resolution 10 ns
Gate length		10 ns to 20 s, min. resolution 10 ns
Maximum deviation of gate length		±10 ns

I/Q data

Interface		GPIB or LAN interface
Memory length		max. 25 Msample I and Q
Word length of I/Q samples		14 bit
Sampling rate	standard	100 Hz to 16 MHz
	with R&S®FPL1-B40 option	100 Hz to 100 MHz
Max. signal analysis bandwidth (equalized)	standard	12.8 MHz
	with R&S®FPL1-B40 option	40 MHz

3 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.
4 Measured with a PC equipped with Intel® Core™ i7 2.8 GHz and Gbit LAN interface.
5 Measurement is performed with a sweep count of 1000. The indicated speed is the average speed of 1 sweep.

Signal analysis bandwidth ≤ 10 MHz		
Amplitude flatness	f_{center} ≥ 12 MHz and (1.25 × signal analysis bandwidth)	nom. ±0.3 dB
Deviation from linear phase	f_{center} ≥ 12 MHz and (1.25 × signal analysis bandwidth)	nom. ±1°
Signal analysis bandwidth ≤ 40 MHz		
Amplitude flatness	f_{center} ≥ 12 MHz and (1.25 × signal analysis bandwidth)	nom. ±0.5 dB
Deviation from linear phase	f_{center} ≥ 12 MHz and (1.25 × signal analysis bandwidth)	nom. ±1.5°

Inputs and outputs

RF input		
Impedance		50 Ω
Connector		N female
VSWR	RF attenuation ≥ 10 dB	
	10 MHz ≤ f < 3 GHz	nom. < 1.5
	3 GHz ≤ f < 7.5 GHz	nom. < 2
Setting range of attenuator	standard	0 dB to 45 dB, in 5 dB steps
	with R&S®FPL1-B25 option	0 dB to 45 dB, in 1 dB steps
RF preamplifier gain	with R&S®FPL1-B22 option	nom. 20 dB

USB interface		4 ports, type A plug, version 2.0

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

Reference input		
Connector		BNC female
Impedance		50 Ω
Input frequency range		10 MHz ± 5 ppm
Required level		> 0 dBm into 50 Ω

External trigger/gate input		
Connector		BNC female
Trigger voltage		0.5 V to 3.5 V
Input impedance		10 kΩ

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		DVI-D

General data

Display		21 cm LC TFT color display (10.1")
Resolution		1280 × 800 pixel (WXGA resolution)
Pixel failure rate		$< 1 \times 10^{-5}$

Data storage		
Internal	standard	solid-state drive (SSD) 32 Gbyte
External		supports USB 2.0 compatible memory devices

Environmental conditions		
Temperature	operating temperature range	0 °C to +50 °C
	storage temperature range	–20 °C to +70 °C
Climatic loading	without condensation	+40 °C at 85 % rel. humidity, in line with EN 60068-2-30,

Mechanical resistance		
Vibration	sinusoidal	5 Hz to 55 Hz 0.15 mm constant amplitude (1.8 g at 55 Hz); 55 Hz to 150 Hz acceleration: 0.5 g constant; in line with EN 60068-2-6
	random	10 Hz to 300 Hz, acceleration 1.2 g (RMS), in line with EN 60068-2-64
Shock		40 g shock spectrum, in line with MIL-STD-810E method no. 516.4 procedure I, MIL-PRF-28800F

EMC		in line with EMC Directive 2014/30/EU including IEC/EN 61326-1 [6, 7], IEC/EN 61326-2-1, CISPR 11/EN 55011 [6], IEC/EN 61000-3-2, IEC/EN 61000-3-3

Recommended calibration interval		2 years

Power supply		
AC supply	without battery option	100 V to 240 V ± 10 %, 50 Hz to 60 Hz ± 5 %, 400 Hz ± 5 % class of protection I, in line with VDE 411
	with battery option	100 V to 240 V ± 10%, 50 Hz to 60 Hz ± 5%
Current consumption	without options	nom. 1.7 A to 0.8 A
	with internal battery (option R&S®FPL1-B31) in charge mode	nom. 3 A to 1.5 A
Safety		in line with EN 61010-1, IEC 61010-1, UL 61010-1, CAN/CSA-C22.2 No. 61010-1
Test mark		CSA, CSA-NRTL

Dimensions and weight		
Dimensions	W × H × D	408 mm × 186 mm × 235 mm (16.06 in × 7.32 in × 9.25 in)
Net weight, nominal	without options	6 kg (13.22 lb)
	with internal battery	7.3 kg (16 lb)

6 Emission limits for class A equipment.

7 Immunity test requirement for industrial environment (EN 61326 table 2).

Options

R&S®FPL1-B5 additional interfaces

User port		
Connector		25-pin D-Sub female
Output		TTL-compatible, 0 V/5 V, max. 15 mA
Input		TTL-compatible, max. 5 V

Noise source control and power sensor		
Connectors	for R&S®FS-SNSxx smart noise sources and R&S®NRP-Zxx power sensors	7-pin LEMOSA female
	for noise source control	BNC female
Noise source control output voltage		0 V/28 V, switchable, max. 100 mA (nom.)

IF/video/demod out		
Connector		BNC female, 50 Ω
IF out		
Bandwidth		equal to RBW setting
IF frequency		25 MHz
Output level	center frequency > 10 MHz, span = 0 Hz, signal at reference level and center frequency	nom. 0 dBm
Video out		
Bandwidth		equal to 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	nom. 1 V, open circuit

Audio output		
Loudspeaker		built-in, adjustable
AF out		
Connector		3.5 mm mini jack
Output impedance		10 Ω
Open-circuit voltage		up to 1.5 V, adjustable

R&S®FPL1-B9 internal generator

Frequency		
Frequency range	R&S®FPL1003	5 kHz to 3 GHz
	R&S®FPL1007	5 kHz to 7.5 GHz
Setting resolution	independent CW source	0.01 Hz

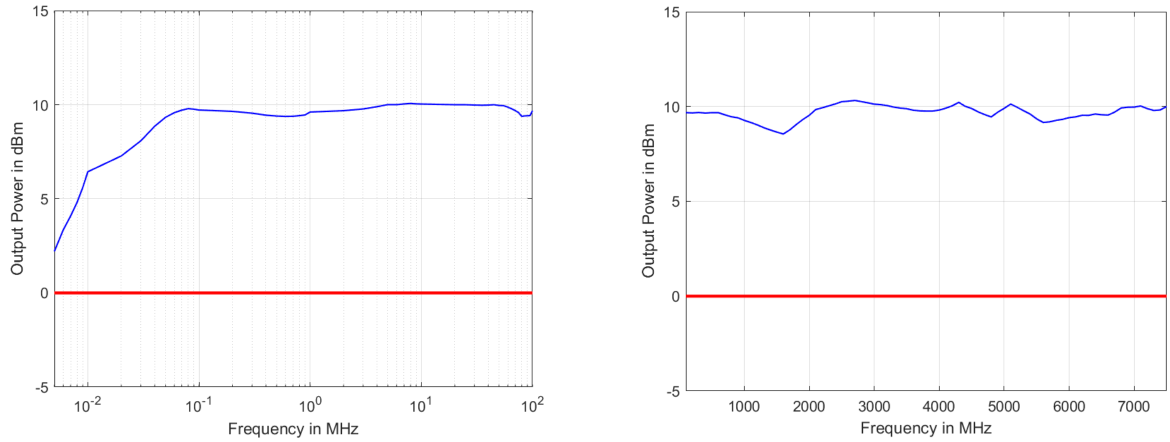
Frequency offset		
Setting range		0 Hz to f_{max} [8]
Setting resolution		0.01 Hz

Spectral purity		
SSB phase noise	frequency = 1 GHz, output level = 0 dBm	
	carrier offset = 10 kHz	< –102 dBc (1 Hz), typ. –108 dBc (1 Hz)
	carrier offset = 100 kHz	< –105 dBc (1 Hz), typ. –111 dBc (1 Hz)
	carrier offset = 1 MHz	< –117 dB (1 Hz), typ. –130 dBc (1 Hz)
Harmonics	output level = 0 dBm	
	5 kHz ≤ f < 100 kHz	nom. < –30 dBc
	100 kHz ≤ f ≤ 7.5 GHz [9]	< –30 dBc
Non-harmonic spurious	output level = 0 dBm	
	1 kHz < offset from carrier ≤ 4 MHz	nom. –35 dBc
	offset from carrier > 4 MHz	< –35 dBc, typ. –45 dBc

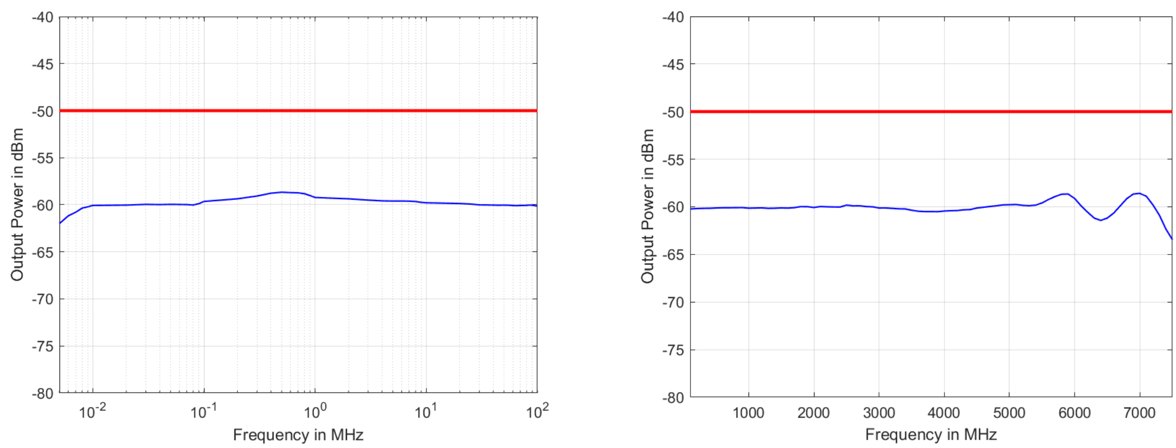
Level		
Specified level range		–50 dBm to 0 dBm
Setting resolution		0.1 dB
Setting range		–60 dBm to +10 dBm
Absolute level uncertainty	frequency = 50 MHz, +20 °C to +30 °C, output level = –10 dBm, frequency offset = 0 Hz	< 0.5 dB
Frequency response	output level = –10 dBm, referenced to level at 50 MHz, +20 °C to +30 °C, frequency offset = 0 Hz	
	100 kHz ≤ f ≤ 3 GHz	< 1 dB,
	3 GHz < f ≤ 7.5 GHz	< 1.5 dB, typ. < 1 dB
Level nonlinearity	for specified level range, referenced to –10 dBm output level, +20 °C to +30 °C, f ≥ 100 kHz	≤ 2 dB, typ. < 0.5 dB

8 f_{max} depends on frequency range.

9 Limit is nominal for harmonics at frequencies > 20 GHz.



Maximum output power versus frequency, level in dBm (meas.).



Minimum output power versus frequency, level in dBm (meas.).

Dynamic range	RBW = 1 kHz, f = 1 GHz	nom. 115 dB

Power sweep		
Specified level range		–50 dBm to 0 dBm
Setting resolution		0.1 dB
Setting range		–60 dBm to +10 dBm

GEN output		
Connector		N female, 50 Ω
VSWR		nom. 1.5

Reverse power		
DC voltage		50 V
CW RF power		30 dBm (= 1 W)
Max. pulse voltage		150 V
Maximum pulse energy (10 µs)		1 mWs

R&S®FPL1-B30 DC power input 12 V/24 V

Input voltage range	DC	12 V to 24 V (nom.), 10.4 V to 28 V, switch-on voltage > 11 V (meas.)
Input current	V_{in} = 12 V/24 V	13 A/6.5 A (nom.)
	V_{in} = 12 V/24 V, operating mode, without internal batteries (R&S®FPL1-B31)	5.5 A/2.7 A (meas.)
	V_{in} = 12 V/24 V, operating mode, internal batteries in charge mode	11 A/5 A (meas.)
	V_{in} = 12 V/24 V, instrument standby mode, internal batteries in charge mode	6.5 A/3 A (meas.)
Temperature	operating temperature range	0 °C to +40 °C
	storage temperature range	–20 °C to +70 °C

R&S®FPL1-B31 internal lithium-ion battery

Operating time		nom. 3.5 h
Charge time	standby mode, AC supply	nom. < 2 h
	standby mode, external DC supply (R&S®FPL1-B30)	nom. < 2 h
	operating mode	nom. < 4 h
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 [10]

R&S®FSV-B34 charger (only needed for charging spare batteries)

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.)
Number of charger bays		4
Dimensions	W × H × D	400 mm × 127 mm × 203 mm (15.75 in × 5 in × 8 in)
Net weight		3.1 kg (6.9 lb)

[10] 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.

Ordering information

Designation	Type	Order No.
Signal and spectrum analyzer	R&S®FPL1003	1304.0004.03
Signal and spectrum analyzer	R&S®FPL1007	1304.0004.07
Accessories supplied		
Power cable and quick start guide		

Options

Designation	Type	Order No.	Retrofittable	Remarks
OCXO reference frequency	R&S®FPL1-B4	1323.1902.02	yes	retrofit in service center
Additional interfaces	R&S®FPL1-B5	1323.1883.02	yes	user-retrofittable IF/video/demod out, user port, noise source control, power sensor, AF output, loudspeaker
Internal generator	R&S®FPL1-B9	1323.1925.03	no	for R&S®FPL1003
Internal generator	R&S®FPL1-B9	1323.1925.07	no	for R&S®FPL1007
GPIB interface	R&S®FPL1-B10	1323.1890.02	yes	user-retrofittable
Second hard disk (SSD)	R&S®FPL1-B19	1304.0427.02	yes	user-retrofittable mounted on PC board, including analyzer firmware
RF preamplifier (3 GHz/7.5 GHz)	R&S®FPL1-B22	1323.1719.02	yes	user-retrofittable
1 dB steps for electronic attenuator	R&S®FPL1-B25	1323.1990.02	yes	user-retrofittable
DC power supply 12 V/24 V	R&S®FPL1-B30	1323.1877.02	yes	user-retrofittable
Internal lithium-ion battery	R&S®FPL1-B31	1323.1725.02	yes	retrofit in service center; including 2 battery packs and internal charging unit
40 MHz analysis bandwidth	R&S®FPL1-B40	1323.1931.02	yes	user-retrofittable
Firmware				
AM/FM/φM measurement demodulator	R&S®FPL1-K7	1323.1731.02		
Power sensor measurement with R&S®NRPxx power sensors	R&S®FPL1-K9	1323.1754.02		supports R&S®NRPxx power sensors
Noise figure and gain measurements	R&S®FPL1-K30	1323.1760.02		requires R&S®FPL1-B5
EMI measurement application	R&S®FPL1-K54	1323.1783.02		
Vector signal analysis	R&S®FPL1-K70	1323.1748.02		
Multi-modulation analysis	R&S®FPL1-K70M	1323.1625.02		requires R&S®FPL1-K70
BER measurements with PRBS data	R&S®FPL1-K70P	1323.1631.02		requires R&S®FPL1-K70
Software				
License dongle	R&S®FSPC	1310.0002.03		
Vector signal explorer base software	R&S®VSE	1320.7500.06		
Vector signal analysis	R&S®VSE-K70	1320.7522.06		
EUTRA/LTE NB-IoT	R&S®VSE-K106	1320.7900.06		

Recommended extras

Designation	Type	Order No.
Protective hard cover	R&S®FPL1-Z1	1323.1960.02
Soft carrying bag for transport and outdoor operation	R&S®FPL1-Z2	1323.1977.02
H-style shoulder harness (requires R&S®FPL1-Z2 option)	R&S®FPL1-Z3	1323.1683.02
Spare lithium-ion battery pack	R&S®FPL1-Z4	1323.1677.02
Anti-glare display film for outdoor operation	R&S®FPL1-Z5	1323.1690.02
Lithium-ion battery charger for charging spare batteries	R&S®FSV-B34	1321.3950.02
19" rackmount kit	R&S®FPL1-Z6	1323.1954.02
Headphones		0708.9010.00
UWB antenna module (30 MHz to 6 GHz)	R&S®HE400UWB	4104.6900.02
Matching pads, 50 Ω/75 Ω		
L section, matching at both ends	R&S®RAM	0358.5414.02
Series resistor, 25 Ω, matching at one end (taken into account in instrument function RF INPUT 75 Ω)	R&S®RAZ	0358.5714.02
Smart noise source		
Smart noise source for noise figure and gain measurements (requires R&S®FPL1-K30)	R&S®FS-SNS26	1338.8008.26
High-power attenuators		
Attenuator 100 W, 3/6/10/20/30 dB, 1 GHz	R&S®RBU100	1073.8495.xx (xx = 03/06/10/20/30)

Designation	Type	Order No.
Attenuator 50 W, 3/6/10/20/30 dB, 2 GHz	R&S®RBU50	1073.8695.xx (xx = 03/06/10/20/30)
Attenuator 50 W, 20 dB, 6 GHz	R&S®RDL50	1035.1700.52
Connectors and cables		
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
DC block		
DC block, 10 kHz to 18 GHz (type N)	R&S®FSE-Z4	1084.7443.02

Power sensors supported by the R&S®FPL1-K9 option [11]

Designation	Type	Order No.
Universal power sensors		
10 MHz to 8 GHz, 100 mW, two-path	R&S®NRP-Z211	1417.0409.02
10 MHz to 8 GHz, 200 mW [12]	R&S®NRP-Z11	1138.3004.02
10 MHz to 18 GHz, 100 mW, two-path	R&S®NRP-Z221	1417.0309.02
10 MHz to 18 GHz, 200 mW [12]	R&S®NRP-Z21	1137.6000.02
10 MHz to 18 GHz, 2 W [12]	R&S®NRP-Z22	1137.7506.02
10 MHz to 18 GHz, 15 W [12]	R&S®NRP-Z23	1137.8002.02
10 MHz to 18 GHz, 30 W [12]	R&S®NRP-Z24	1137.8502.02
Power sensor modules with power splitter		
DC to 18 GHz, 500 mW	R&S®NRP-Z27	1169.4102.02
DC to 26.5 GHz, 500 mW	R&S®NRP-Z37	1169.3206.02
Thermal power sensors		
0 Hz to 18 GHz, 100 mW	R&S®NRP18T	1424.6115.02
0 Hz to 18 GHz, 100 mW	R&S®NRP18TN	1424.6121.02
0 Hz to 33 GHz, 100 mW	R&S®NRP33T	1424.6138.02
0 Hz to 33 GHz, 100 mW	R&S®NRP33TN	1424.6144.02
0 Hz to 40 GHz, 100 mW	R&S®NRP40T	1424.6150.02
0 Hz to 40 GHz, 100 mW	R&S®NRP40TN	1424.6167.02
0 Hz to 50 GHz, 100 mW	R&S®NRP50T	1424.6173.02
0 Hz to 50 GHz, 100 mW	R&S®NRP50TN	1424.6180.02
0 Hz to 67 GHz, 100 mW	R&S®NRP67T	1424.6196.02
0 Hz to 67 GHz, 100 mW	R&S®NRP67TN	1424.6209.02
0 Hz to 110 GHz, 100 mW	R&S®NRP110T	1424.6215.02
Average power sensors		
8 kHz to 6 GHz, 200 mW	R&S®NRP6A	1424.6796.02
8 kHz to 6 GHz, 200 mW	R&S®NRP6AN	1424.6809.02
9 kHz to 6 GHz, 200 mW [12]	R&S®NRP-Z91	1168.8004.02
8 kHz to 18 GHz, 200 mW	R&S®NRP18A	1424.6815.02
8 kHz to 18 GHz, 200 mW	R&S®NRP18AN	1424.6821.02
Three-path diode power sensors		
100 pW to 200 mW, 10 MHz to 8 GHz	R&S®NRP8S	1419.0006.02
100 pW to 200 mW, 10 MHz to 8 GHz, LAN version	R&S®NRP8SN	1419.0012.02
100 pW to 200 mW, 10 MHz to 18 GHz	R&S®NRP18S	1419.0029.02
100 pW to 200 mW, 10 MHz to 18 GHz, LAN version	R&S®NRP18SN	1419.0035.02
1 nW to 2 W, 10 MHz to 18 GHz	R&S®NRP18S-10	1424.6721.02
10 nW to 15 W, 10 MHz to 18 GHz	R&S®NRP18S-20	1424.6738.02
30 nW to 30 W, 10 MHz to 18 GHz	R&S®NRP18S-25	1424.6744.02
100 pW to 200 mW, 10 MHz to 33 GHz	R&S®NRP33S	1419.0064.02
100 pW to 200 mW, 10 MHz to 33 GHz, LAN version	R&S®NRP33SN	1419.0070.02
100 pW to 200 mW, 10 MHz to 33 GHz, LAN version, TVAC-compliant	R&S®NRP33SN-V	1419.0129.02
100 pW to 100 mW, 50 MHz to 40 GHz	R&S®NRP40S	1419.0041.02
100 pW to 100 mW, 50 MHz to 40 GHz, LAN version	R&S®NRP40SN	1419.0058.02
100 pW to 100 mW, 50 MHz to 50 GHz	R&S®NRP50S	1419.0087.02
100 pW to 100 mW, 50 MHz to 50 GHz, LAN version	R&S®NRP50SN	1419.0093.02

[11] For average power measurement only. LAN connection not supported.
[12] Product discontinued.

Wideband power sensors		
50 MHz to 18 GHz, 100 mW	R&S®NRP-Z81	1137.9009.02
50 MHz to 40 GHz, 100 mW (2.92 mm)	R&S®NRP-Z85	1411.7501.02
50 MHz to 40 GHz, 100 mW (2.40 mm)	R&S®NRP-Z86	1417.0109.40
50 MHz to 44 GHz, 100 mW (2.40 mm)	R&S®NRP-Z86	1417.0109.44

Warranty		
Base unit		3 years
All other items [13]		1 year
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 accredited calibration coverage, one year	R&S®AW1	
Extended warranty with accredited calibration coverage, two years	R&S®AW2	

Extended warranty with a term of one to two years (WE1 and WE2)
Repairs carried out during the contract term are free of charge [14]. 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 and 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 [14] and calibration at the recommended intervals as well as any calibration carried out during repairs or option upgrades.

Extended warranty with accredited calibration (AW1 and AW2)
Enhance your extended warranty by adding accredited calibration coverage at a package price. This package ensures that your Rohde & Schwarz product is regularly calibrated under accreditation, inspected and maintained during the term of the contract. It includes all repairs [14] and accredited calibration at the recommended intervals as well as any accredited calibration carried out during repairs or option upgrades.

[13] For options that are installed, the remaining base unit warranty applies if longer than 1 year. Exception: all batteries have a 1 year warranty.
[14] Excluding defects caused by incorrect operation or handling and force majeure. Wear-and-tear parts are not included.

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- ▶ Long-term dependability

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