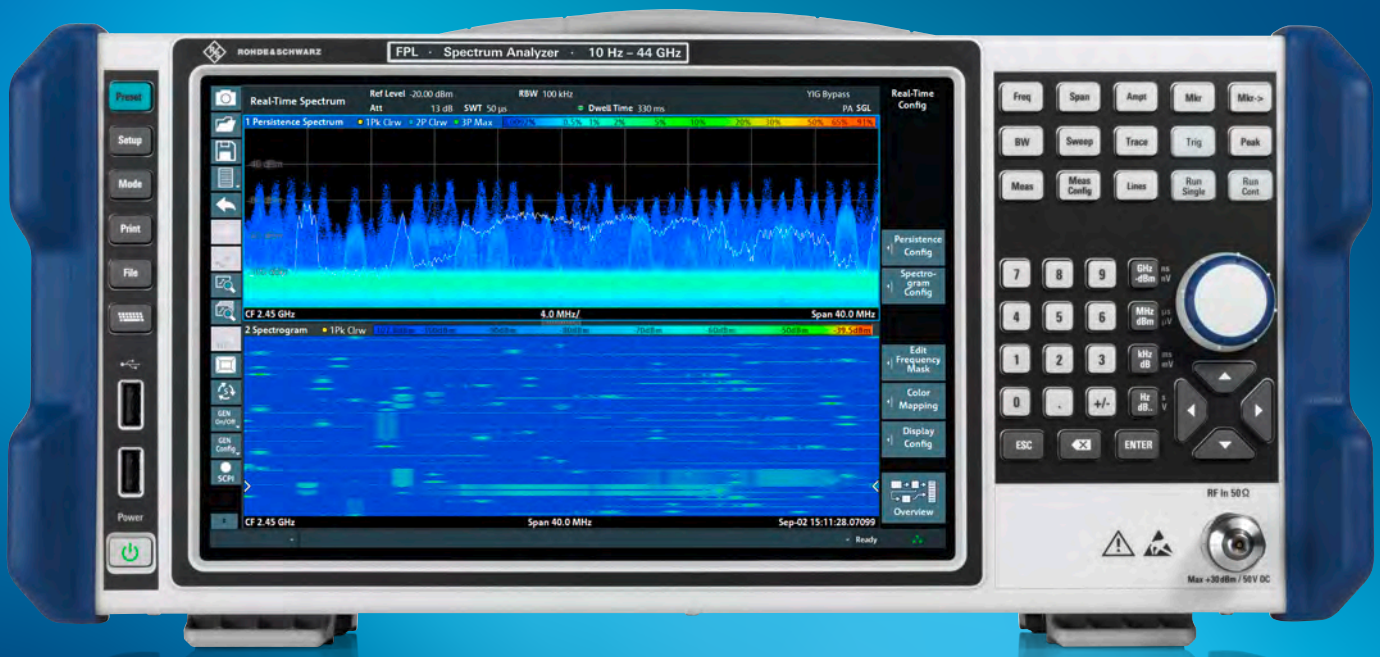
R&S®ESSENTIALS

FPL SPECTRUM ANALYZER

Experience high performance wherever you take it



Now with 40 MHz real-time analysis up to 44 GHz

Product Brochure
Version 12.00

ROHDE&SCHWARZ
Make ideas real

AT A GLANCE

The FPL spectrum analyzer makes measuring fast and simple. The intuitive touchscreen is straightforward and easy to use. With solid RF performance, light weight and small footprint, the FPL combines the functions of a benchtop instrument with the portability of a handheld instrument.

In an RF lab, the FPL 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 FPL is the only instrument in its class that features an internal generator up to 7.5 GHz (R&S®FPL1-B9 option) and can analyze signals with a bandwidth of 40 MHz (R&S®FPL1-B40 option, for frequencies above 6 GHz the R&S®FPL1-B11 option is required).

The solid RF performance makes the FPL the ideal instrument for labs, test houses, production and service. The 1 dB attenuator step size (R&S®FPL1-B25 option) allows 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.

The FPL is as intuitive as 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 image of the signal. The user can freely arrange the layout of the measurement results on the display. In the MultiView display mode, different measurement modes can be combined and all the results displayed on one screen.

The FPL 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 let you take the instrument anywhere for measurements. The optional battery pack provides three hours of operation and the rich set of accessories make the FPL suitable for field measurements. A protective hard cover is available for transport and a padded carrying bag that allows the instrument to be operated in it. A shoulder harness simplifies portable operation.

KEY FACTS

- Frequency range: 10 Hz to 44 GHz
- SSB phase noise: –108 dBc (1 Hz) at 10 kHz offset to the 1 GHz carrier
- DANL with preamplifier: –160 dBm from 10 MHz to 2 GHz
- Lightweight with small footprint
- Battery pack and 12 V/24 V DC power supply (option)
- Use with power sensors (option)
- YIG preselector bypass for full 40 MHz bandwidth analysis over 6 GHz (option)
- 40 MHz analysis bandwidth (option)
- Real-time spectrum analysis with up to 40 MHz bandwidth
- Analog and digital signal analysis (option)
- Internal generator up to 7.5 GHz (option)
- Gated sweep, narrowband resolution filters and spectrogram measurements as standard

BENEFITS

One instrument for multiple applications

- Spectrum analysis
- Real-time spectrum analysis
- Signal analysis of analog and digitally modulated signals
- Scalar frequency response measurement
- 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
- Innovative user interface
- Flexible arrangement of results and MultiView
- Toolbar

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Fully portable

- Battery pack and 12 V/24 V DC power supply (option)
- Carrying bag and shoulder harness

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ONE INSTRUMENT FOR MULTIPLE APPLICATIONS

The FPL is a single 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

The FPL is a true allrounder, even in its basic configuration for spectral measurements that 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

Real-time spectrum analysis

The R&S®FPL1-K41R 40 MHz real-time spectrum measurement option transforms the FPL into a true real-time spectrum analyzer with up to 40 MHz of real-time bandwidth and a seamless, continuous spectrum display that eliminates swept analyzer blind times. Even very short, frequency-agile events (4.2 µs) can be captured with 100 % probability and full level accuracy. The option reliably detects and analyzes sporadic or transient signals in crowded environments with selectable display modes (real-time spectrum, persistence and spectrogram), coupled markers for inspecting past events and user-definable frequency-dependent masks and triggers. The FPL spectrum analyzer with the R&S®FPL1-K41R real-time option is ideal for demanding applications such as aerospace and defense validation, regulatory monitoring of frequency bands and EMC precompliance testing.

Signal analysis of analog and digitally modulated signals

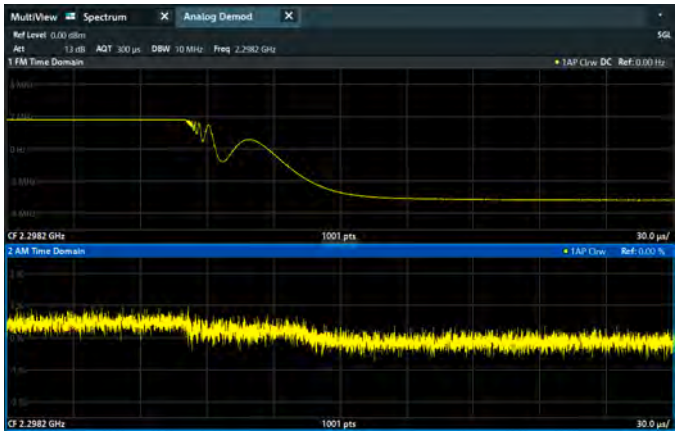
Suitable measurement applications are available for analyzing analog and digitally modulated signals. The R&S®FPL1-K7 option turns the FPL into an analog modulation analyzer for amplitude, frequency and phase modulated signals. The base unit's I/Q analyzer supports the magnitude and phase presentation of I and Q within the analysis bandwidth. The I/Q data can be exported for further analysis with third-party software. 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 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 FPL base unit supports various advanced spectrum measurement modes as standard

Frequency and amplitude transient of a VCO during switching phase



Scalar frequency response measurement

Equipped with the R&S®FPL1-B9 option, the FPL offers an internal CW source and a tracking generator for quick and easy measurement of frequency response, e.g. of filters and attenuators. 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 here is switched to power sweep mode (–50 dBm to 0 dBm), 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 FPL 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 interface 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.

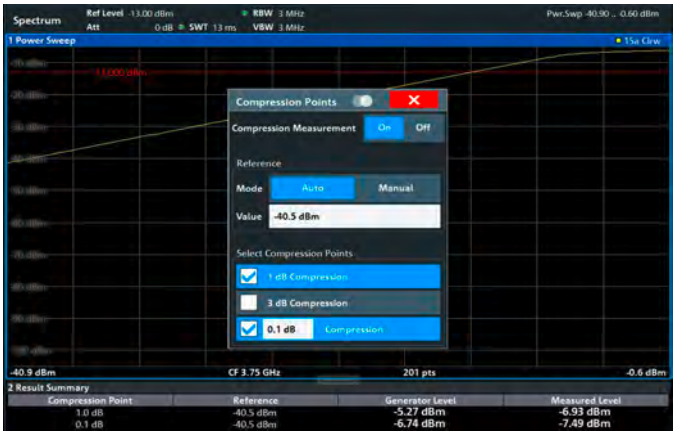
Phase noise measurements

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

For these signals, it is important to ensure good phase noise performance (e.g. for local oscillators). Phase noise measurements help 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 FPL is comparable to higher class analyzers. This makes it ideal for labs, production and servicing. 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

To distinguish spurs in the signal from those of the measuring instrument, a low spurious response is required. Within 10 MHz offset from the carrier signal, the specified spurious response of the FPL is –70 dB lower than the signal level. This is over 10 dB better than comparable analyzers in this class. At higher offsets, the specified value is –80 dB, which is 20 dB better than comparable analyzers. This makes the FPL ideal for identifying interferers even when they are significantly below the carrier level.

Low displayed average noise level (DANL)

A low DANL is required to detect low level signals. In addition, when you search for interferers above a certain level, a low DANL allows you to use a higher resolution bandwidth and increase measurement speed. With a typical DANL of –152 dBm, which can be improved to –166 dBm with a preamplifier, the FPL 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 FPL the only instrument in its class that can demodulate analog and digitally modulated signals with up to 40 MHz bandwidth. A YIG preselector bypass (R&S®FPL1-B11 option) can be used for frequencies over 6 GHz.

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 can 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.

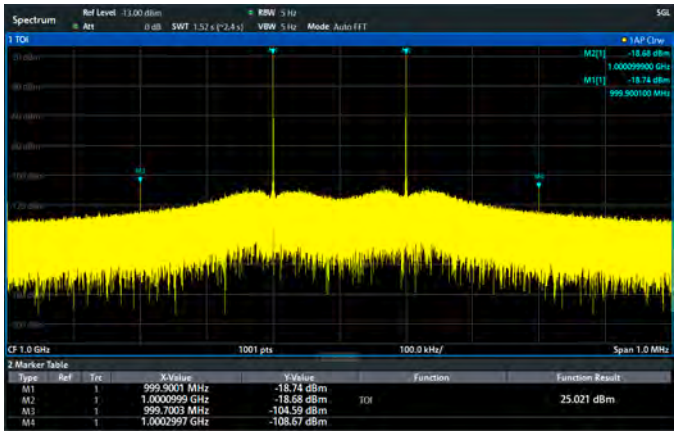
Low level measurement uncertainty

Another feature unique in this class is the low level measurement uncertainty of 0.5 dB. The high measuring accuracy of the instrument ensures precise and reliable test results, often making a separate power sensor unnecessary.

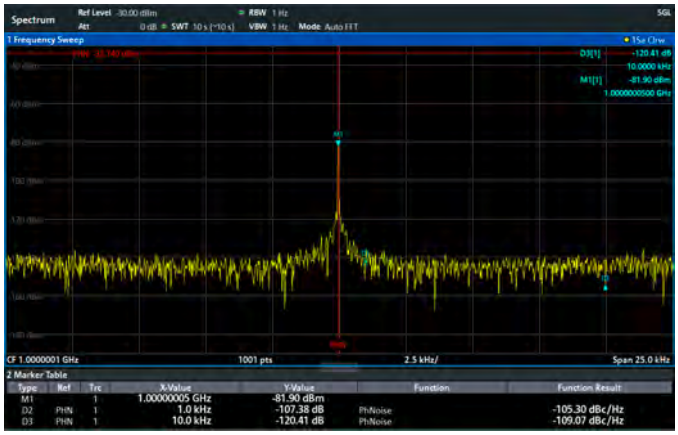
Precise spectral measurements due to low phase noise

The low phase noise of –108 dBc (1 Hz) at 10 kHz offset to the 1 GHz carrier has benefits for spectral measurements. 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

The FPL is as intuitive as 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 so 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, such as 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 has constantly updated results and no annoying, time-consuming parameter adjustments are necessary.

Toolbar

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

GUI of the FPL 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. 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 FPL 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. Its low weight of 6 kg and carrying handle mean you can take it wherever you need it.

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

The optional battery pack provides three hours of operation. The operating time can be extended without interruption with additional batteries and a charger.

When the FPL is used in vehicles, the optional 12 V/24 V DC power supply can conveniently tap power from the vehicle socket.

Carrying bag and shoulder harness

A padded carrying bag is available for protecting the FPL during transport. Ventilation slits and a transparent cover allow the instrument to be operated from inside the bag. This lets you use the FPL anywhere and under adverse environmental conditions.

Users who need the functions 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.

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

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

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

Typical R&S®FPL1-K30 applications include amplifier characterization.

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 interface 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, such as 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, including measurements 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 R&S®FS-SNS26 smart noise source.

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 FPL to perform fast and easy phase noise measurements in development and production.

With the R&S®FPL1-K40 option, the FPL 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/PM and 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 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 correcting noise

Measurement of residual FM/PM and jitter

- Integration across the entire selected carrier offset frequency range or across a selectable subrange
- Tabular display of residual FM, residual PM 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-K41R 40 MHz REAL-TIME SPECTRUM MEASUREMENTS

Equipped with the R&S®FPL1-K41R 40 MHz real-time spectrum measurements option, the FPL spectrum analyzer seamlessly displays RF spectra and in real time. Short events lasting just 4.2 µs can be captured with 100 % probability and full level accuracy.

Unlocking comprehensive analysis capabilities

The R&S®FPL1-K41R option transforms the FPL into a fully-fledged real-time spectrum analyzer, offering up to 40 MHz real-time bandwidth based on the selected analysis bandwidth option.

Seamless capture without blind times

Unlike traditional swept spectrum analyzers with blind times, the R&S®FPL1-K41R real-time option has a continuous spectrum display with a range of up to 40 MHz. The option supports various display modes, including real-time spectrum, persistence spectrum and spectrogram.

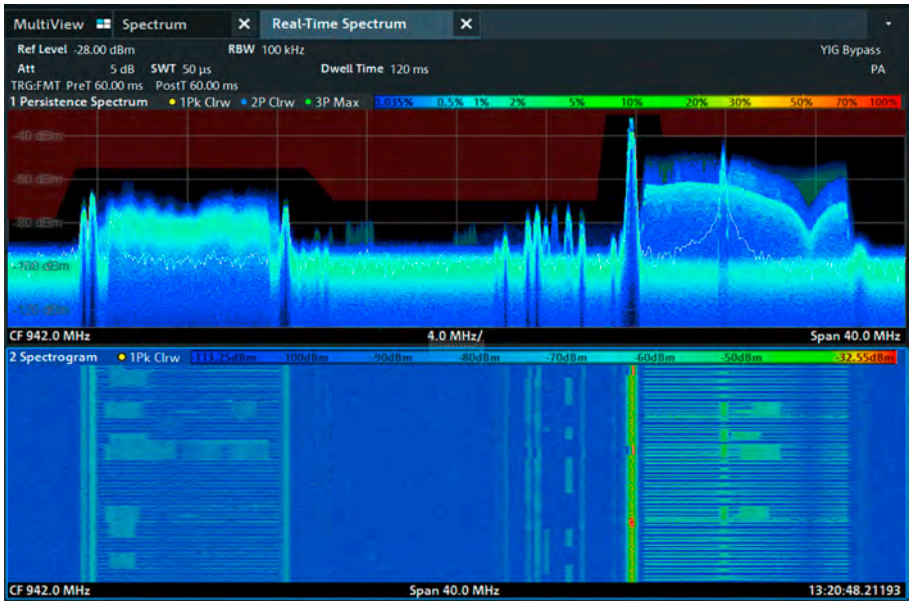
The spectrogram visualizes multiple consecutive spectra over time, with time represented on the vertical axis and frequency on the horizontal axis. The power level for each frequency/time value is indicated by a specific color. This seamless spectrum display enables users to analyze existing frequencies even in the presence of strong signals nearby, ensuring optimal system operation on the correct frequency in high-end radar and other aerospace and defense applications.

In the persistence spectrum, the color depends on how often a level occurs at a specific frequency in a certain period. Events further in the past are slowly grayed out with an afterglow effect.

By coupling the markers between the spectrogram and real-time spectrum, the spectra of past events can be displayed.

Key use cases

- Aerospace and defense (A&D)
  - Detection of unwanted spurious emissions
  - Validation of frequency agile tactical communications systems
- Regulatory authorities
  - Continuous monitoring of frequency bands
  - Reliable detection of unwanted or unlicensed signals
- EMC precompliance
  - Instantaneous identification of emission sources
  - Spectral mask triggering on transmission events
  - Detection of spurious emissions in real time



Real-time spectrum with frequency mask trigger in cellular band

R&S®FPL1-K54 EMI MEASUREMENT APPLICATION

The R&S®FPL1-K54 EMI measurement application adds EMI diagnostic functions to the FPL spectrum analyzer. The R&S®FPL1-K54 offers EMI bandwidths for commercial and military applications, detectors including quasi-peak, CISPR-average and RMS-average, limit lines and correction factors. Up to 200001 user-defined sweep points enable higher frequency resolution regardless of large or small span and bandwidths settings.

EMI detectors in line with CISPR 16-1-1

- Flexible application of EMI detectors such as peak, quasi-peak, CISPR-average, RMS-average and frequency sweep
- 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 disturbance signal amplitude thanks to 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 search for disturbance maxima to reliably detect time-varying interferers
- Critical frequencies are entered in a peak list for fast evaluation of a frequency spectrum for 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 user-specific limit lines
- Fast pass/fail test using activated limit lines

Frequency-dependent correction value tables

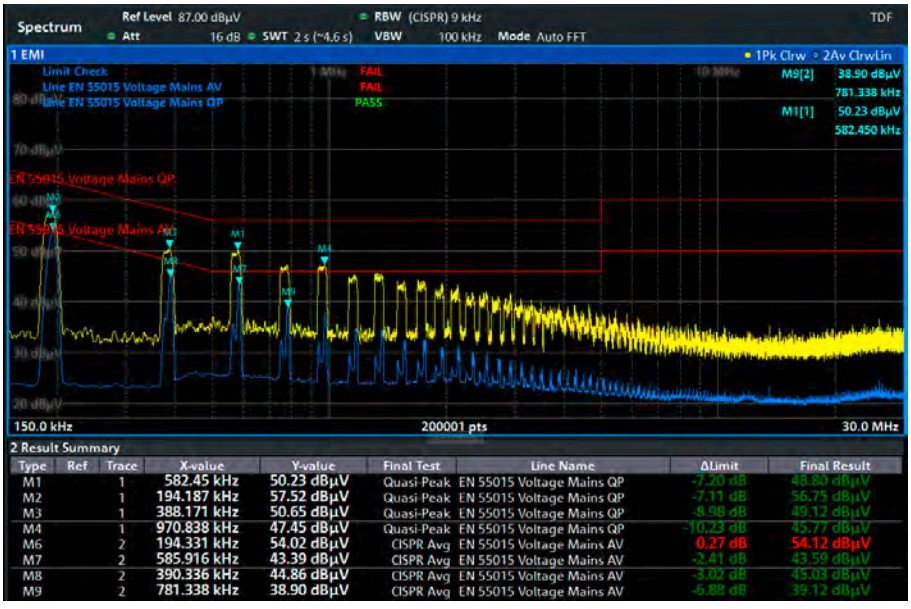
- Database with correction value tables for EMI accessories such as antennas, clamps, line impedance stabilization networks (LISN), pulse limiters, preamplifiers, cables and attenuators
- Easy generation, editing and storage of new correction tables
- Several correction tables can be combined to compensate 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 line with standards.

See also

"EMI Measurement Application for Signal and Spectrum Analyzers" product brochure (PD 3608.3949.12).



Type	Ref	Trace	X-value	Y-value	Final Test	Line Name	ΔLimit	Final Result
M1		1	582.45 kHz	50.23 dBµV	Quasi-Peak	EN 55015 Voltage Mains QP	-7.20 dB	48.80 dBµV
M2		1	194.187 kHz	57.52 dBµV	Quasi-Peak	EN 55015 Voltage Mains QP	-7.11 dB	56.75 dBµV
M3		1	388.171 kHz	50.65 dBµV	Quasi-Peak	EN 55015 Voltage Mains QP	-8.98 dB	49.12 dBµV
M4		1	970.838 kHz	47.45 dBµV	Quasi-Peak	EN 55015 Voltage Mains QP	-10.23 dB	45.77 dBµV
M6		2	194.331 kHz	54.02 dBµV	CISPR Avg	EN 55015 Voltage Mains AV	0.27 dB	54.12 dBµV
M7		2	585.916 kHz	43.39 dBµV	CISPR Avg	EN 55015 Voltage Mains AV	-2.41 dB	43.59 dBµV
M8		2	390.336 kHz	44.86 dBµV	CISPR Avg	EN 55015 Voltage Mains AV	-3.02 dB	45.03 dBµV
M9		2	781.338 kHz	38.90 dBµV	CISPR Avg	EN 55015 Voltage Mains AV	-6.88 dB	39.12 dBµV

R&S®FPL1-K54
EMI measurement application

R&S®FPL1-K70 VECTOR SIGNAL ANALYSIS

The FPL analyzes and demodulates digitally modulated single-carrier signals with up to 40 MHz analysis bandwidth. Universities and research facilities benefit from the instrument's flexible proprietary signal analysis. Developers of mobile communications devices and components can easily use the predefined standard settings.

When analyzing digital modulation signals, the FPL receives and digitizes the signal, which the R&S®FPL1-K70 option then analyzes.

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 measurements 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
  - 16APSK (DVB-S2), 32APSK (DVB-S2), 2ASK, 4ASK
  - 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 frames, demodulates both the header and payload signal components 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 measurements of raw bit error rate (BER) on PRBS data up to PRBS23. The R&S®FPL1-K70P can also 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 APPLICATION

The FPL can analyze cellular 3GPP NB-IoT signals. It captures the signals, which are then analyzed by the R&S®VSE-K106 EUTRA/LTE NB-IoT measurement application [1].

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

This solution can perform all relevant measurements of 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

The following NB-IoT operation modes are applicable:

- In-band
- Guard band
- Standalone

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

SPECIFICATIONS IN BRIEF

Specifications in brief		
Frequency		
Frequency range	R&S®FPL1003	5 kHz to 3 GHz
	R&S®FPL1007	5 kHz to 7.5 GHz
	R&S®FPL1014	5 kHz to 14 GHz
	R&S®FPL1026	5 kHz to 26.5 GHz
	R&S®FPL1044	10 Hz to 44 GHz
Aging per year		1×10^{-6}
	with R&S®FPL1-B4 and R&S®FPL1-B11 options	1×10^{-7}
Frequency resolution		0.01 Hz
Bandwidth		
Resolution bandwidth (–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
I/Q demodulation bandwidth		12.8 MHz
	with R&S®FPL1-B40 option	40 MHz
Real-time bandwidth (with R&S®FPL1-K41R option)		
Bandwidth (span)	standard	1 MHz to 12.8 MHz
	with R&S®FPL1-B40 option	1 MHz to 40 MHz
Probability of intercept (POI)	minimum signal duration for 100% probability of intercept with full amplitude accuracy, with R&S®FPL1-B40 option	4.2 µs (nom.)
Displayed average noise level (DANL)		
	RF preamplifier off	
	5 MHz ≤ f < 3 GHz	–152 dBm (typ.)
	3 GHz ≤ f < 6 GHz	–146 dBm (typ.)
	6 GHz ≤ f < 14 GHz	–144 dBm (typ.)
	14 GHz ≤ f < 20 GHz	–140 dBm (typ.)
	20 GHz ≤ f < 26.5 GHz	–135 dBm (typ.)
	26.5 GHz ≤ f ≤ 44 GHz	–135 dBm (typ.)
	RF preamplifier on (option R&S®FPL1-B22)	
	10 MHz ≤ f < 2 GHz	–166 dBm (typ.)
	2 GHz ≤ f < 6 GHz	–161 dBm (typ.)
	6 GHz ≤ f < 14 GHz	–163 dBm (typ.)
	14 GHz ≤ f < 18 GHz	–161 dBm (typ.)
	18 GHz ≤ f ≤ 26.5 GHz	–158 dBm (typ.)
	26.5 GHz ≤ f ≤ 44 GHz	–157 dBm (typ.)
Intermodulation		
1 dB compression of input mixer		+7 dBm (nom.)
Third order intercept point (TOI)	300 MHz ≤ f_{in} < 3 GHz	+20 dBm (typ.)
	3 GHz ≤ f_{in} < 6 GHz	+18 dBm (typ.)
	6 GHz ≤ f_{in} < 14 GHz	+16 dBm (typ.)
	14 GHz ≤ f_{in} < 20 GHz	+15 dBm (typ.)
Phase noise	f = 1 GHz, 10 kHz frequency offset	–108 dBc (1 Hz) (typ.)
Total measurement uncertainty	1 MHz ≤ f < 3 GHz	0.5 dB
	3 GHz ≤ f < 7.5 GHz	0.8 dB
	7.5 GHz ≤ f ≤ 14 GHz	1.2 dB
	14 GHz ≤ f ≤ 26.5 GHz	1.8 dB
	26.5 GHz ≤ f < 36 GHz	1.8 dB
	36 GHz ≤ f ≤ 44 GHz	2.0 dB

More information

For detailed specifications and ordering information, see FPL specifications (PD 5214.6974.22).

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

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