# R&S®FSMR3000
# MEASURING RECEIVER

## Calibration and performance check of signal generators and attenuators


Product Brochure
Version 05.00

ROHDE&SCHWARZ
Make ideas real

# AT A GLANCE

## The R&S®FSMR3000 measuring receiver is a complete solution for calibration and performance checks of signal generators and fixed or adjustable attenuators.

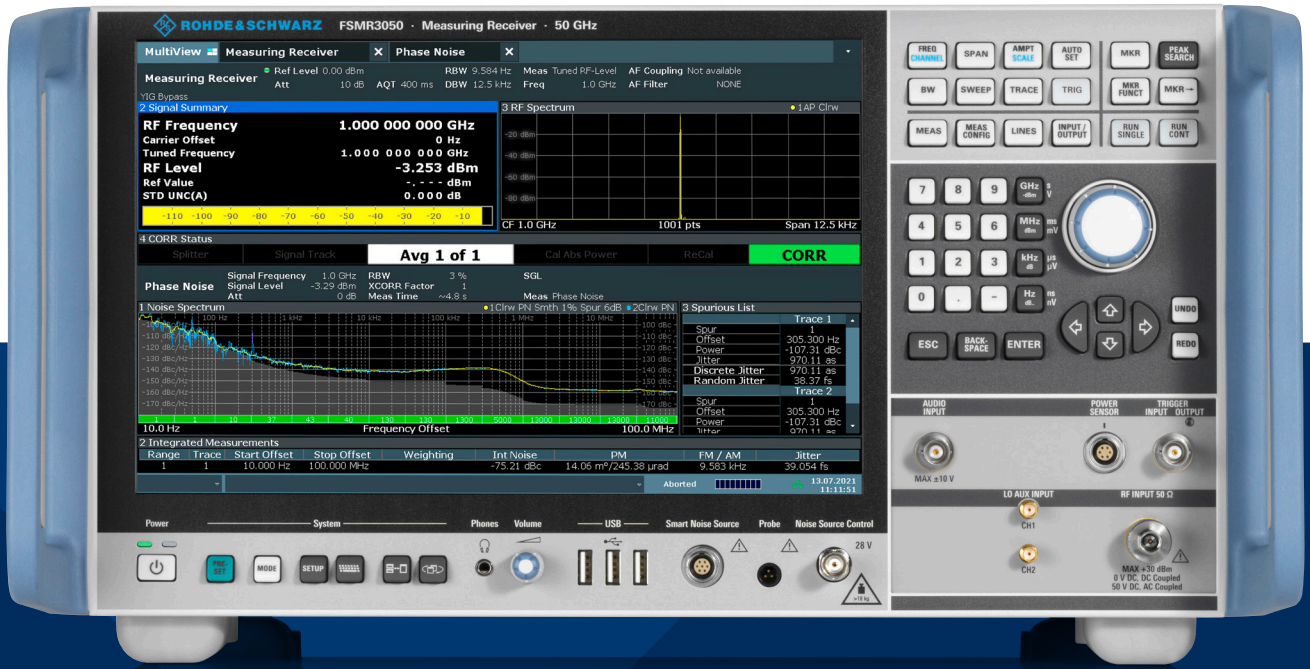
The R&S®FSMR3000 combines the functionality of multiple instruments such as a level calibrator, modulation analyzer and frequency counter in one. It is capable of calibrating all vital parameters of a signal generator.

The R&S®FSMR3000 can be optionally equipped with a full-featured spectrum analyzer for measuring harmonics, phase noise or the modulation quality of digitally modulated signals. If the spectrum analyzer's phase noise sensitivity is not sufficient, the R&S®FSMR3000 can be further upgraded to a high-end phase noise analyzer with cross-correlation that can be used for comprehensive signal generator measurement and calibration.

### Key facts

- Frequency range from 2 Hz to 8/26.5/50 GHz
- Highly accurate level calibrator with wide level measurement range from –152 dBm to +30 dBm
- Power meter for connecting power sensors from the R&S®NRP family
- R&S®NRP50T sensor for covering the entire frequency range from DC to 50 GHz
- Power sensor with power splitter for simplified measurement process
- Modulation analyzer
- Full-featured signal and spectrum analyzer
- Vector signal analyzer with up to 80 MHz analysis bandwidth
- High-end phase noise analyzer with cross-correlation, typ. –163 dBc (1 Hz) at 10 kHz offset (1 GHz)

Front view of the R&S®FSMR3000.



# BENEFITS AND KEY FEATURES

### Tuned RF level (TRFL) calibration and power measurement – precise and simple

- Excellent linearity and level stability
- High tolerance with respect to frequency drift and residual FM

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### Direct connection of power sensors for accurate power measurements

- Power sensor module with integrated power splitter
- Automatic VSWR correction
- Easy integration due to fully R&S®FSMR compatible remote control commands

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### AM/FM/PM modulation analysis

- Measurement of modulation depth, frequency deviation and phase deviation with < 0.5 % measurement uncertainty
- User-definable result presentation
- Simple selection of diverse audio filters
- Audio input for calibrating modulation generators

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### Full-featured signal and spectrum analyzer

- Measurement functions for spectral analysis, e.g. harmonics, TOI, etc.
- Wide selection of detectors and RBW settings
- Noise figure and phase noise measurements
- Up to 80 MHz signal analysis bandwidth
- Analysis of pulsed signals
- Vector signal analysis for digitally modulated signals
- Analysis of VOR/ILS signals

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### High-end phase noise analyzer

- High sensitivity through cross-correlation
- Indication of cross-correlation gain
- Parallel measurement of amplitude and phase noise

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Rear view of the R&S®FSMR3000.

# TUNED RF LEVEL (TRFL) CALIBRATION AND POWER MEASUREMENT – PRECISE AND SIMPLE

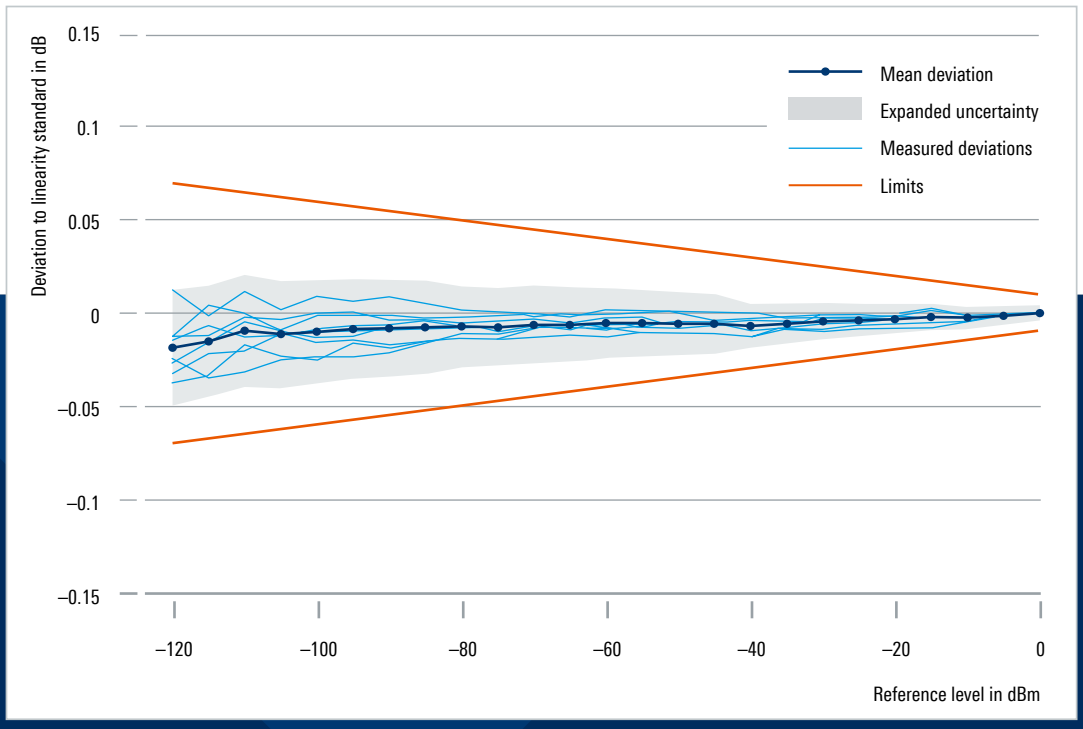
### Excellent linearity and level stability

The R&S®FSMR3000 achieves a linearity that is equal to or even better than the currently applicable industry standards. The R&S®FSMR3000 offers excellent level stability, allowing measurements to be performed with high accuracy over extended periods of time, for example during manual calibration.

To measure conventional RF generators over their full range, e.g. from –150 dBm to +20 dBm, the input attenuation of the R&S®FSMR3000, the preamplifier and the IF gain must be switched as necessary. The R&S®FSMR3000 eliminates potential level errors by using adjacent range calibration. As a result, users benefit from the instrument's high linearity of ±(0.009 dB + 0.005/10 dB) across the entire level range. Optional R&S®FSMR3-B24 preamplifiers extend the level range down to lower levels.

Operation is very straightforward. Only a few steps are required to perform the calibration for this wide dynamic range. The user begins with a reference measurement based on the power meter. This requires just one press of a key and prepares the R&S®FSMR3000 for the level calibration. The level of the device to be calibrated can now be reduced in the desired steps and verified. If the test signal is outside the usable measurement range and the input attenuation and IF gain of the R&S®FSMR3000 need to be changed, the user is prompted to calibrate the adjacent range. The RECAL key initiates the adjacent range calibration and automatically switches the R&S®FSMR3000 measurement range.

### Deviation of linearity at 1 GHz



## High tolerance with respect to frequency drift and residual FM

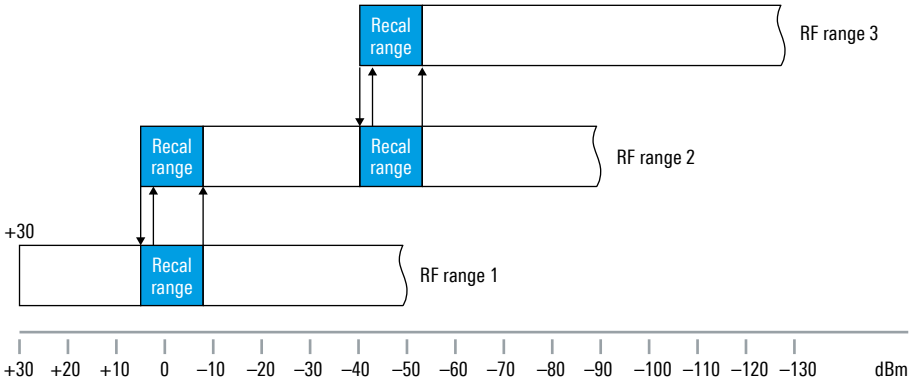
The R&S®FSMR3000 measures the signal level within the selectable measurement bandwidth. Level measurement is not affected by frequency drift, frequency deviation or residual FM. With its selectable measurement bandwidth in a wide range from 100 Hz to 10 MHz, the R&S®FSMR3000 is insensitive to frequency offset or residual FM of the generator to be calibrated. Very small levels are measured using the detector "narrow", which determines the signal power within the measurement bandwidth with FFT at a reduced noise bandwidth. This yields an improved signal-to-noise ratio without increasing the effect of frequency offset or residual FM.

Once the signal source is connected, the R&S®FSMR3000 calibrates the absolute power in an initial step using a power sensor. Recalibration is triggered when the power is further reduced if the input attenuation or IF gain changes.

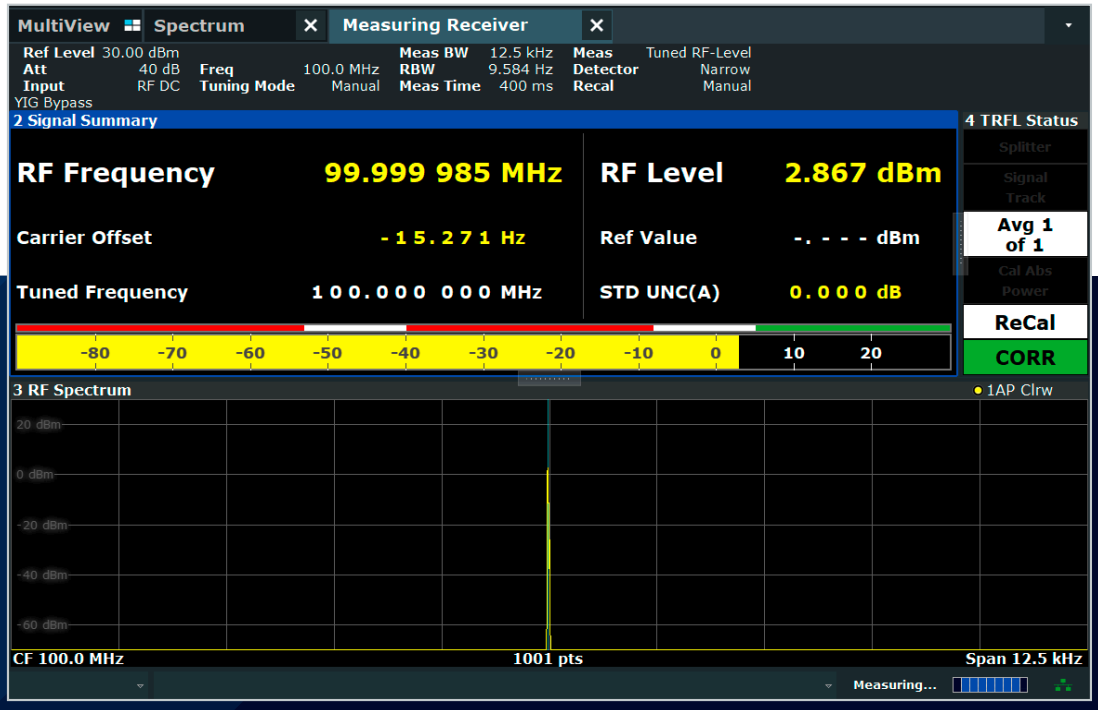
### Easy integration due to fully R&S®FSMR compatible remote control commands

The R&S®FSMR3000 uses remote control commands that are fully compatible with the predecessor model R&S®FSMR in terms of the measuring receiver functionality, modulation analysis and spectral measurements. The new instrument is thus very easy to integrate into systems that are still using the previous model. Once the instruments are swapped, the current platform immediately becomes part of the system. This means that no additional programming is needed to prepare the system for future requirements.

## Procedure for the TRFL measurement




Tuned RF level measurement (TRFL) at 2.4 GHz.



# DIRECT CONNECTION OF POWER SENSORS FOR ACCURATE POWER MEASUREMENTS

Absolute power and reference power are measured with high accuracy using a power sensor. It is connected directly to the R&S®FSMR3000. The sensor input is either connected directly to the DUT (i.e. the generator output) or via a power splitter in parallel with the input of the R&S®FSMR3000. The R&S®FSMR3000 automatically corrects the power splitter's frequency response and insertion loss.

The R&S®FSMR3000 can also control power meters via its second IEEE-488 (GPIB) bus connector. This allows simple operation in scenarios involving power meters from other manufacturers. Remote control via the IEEE-488 bus is handled only via the R&S®FSMR3000. Calibration labs can therefore continue to use their existing power meters.

### Power sensor module with integrated power splitter

Power sensors with a built-in power splitter simplify setup and testing since the DUT does not have to be repeatedly connected to the power sensor and the RF input of the R&S®FSMR3000. The R&S®NRP-Z27/-Z37 power sensor modules are available with a built-in power splitter for the R&S®FSMR3000.

### Automatic VSWR correction

If a power sensor with a power splitter is used, the analyzer's input VSWR affects the display and the measurement uncertainty of the power sensor. For this reason, the R&S®NRP-Z27/-Z37 power sensor modules provide automatic VSWR correction as well as an attenuator in the signal path to the analyzer input for improved matching. The automatic VSWR correction in the R&S®FSMR3000 and the R&S®NRP-Z27/-Z37 considerably reduces loading, allowing users to profit from the overall measurement accuracy of the thermal power sensors in the power sensor modules.

R&S®NRP-Z27/-Z37 power sensor modules with automatic VSWR correction.

# AM/FM/PM MODULATION ANALYSIS

## Measurement of modulation depth, frequency deviation and phase deviation with < 0.5 % measurement uncertainty

The R&S®FSMR3000 features a complete, integrated modulation analyzer for the AM, FM and PM analog modulation modes. Audio parameters are measured on the demodulated signal. This means that no extra instrument is required for calibrating modulation settings and the modulation generator.

Various audio filters, deemphasis functions and detectors are available for audio analysis. This makes it easy to perform residual FM measurements, for example.

Across the entire audio input frequency range the uncertainty applies as follows:

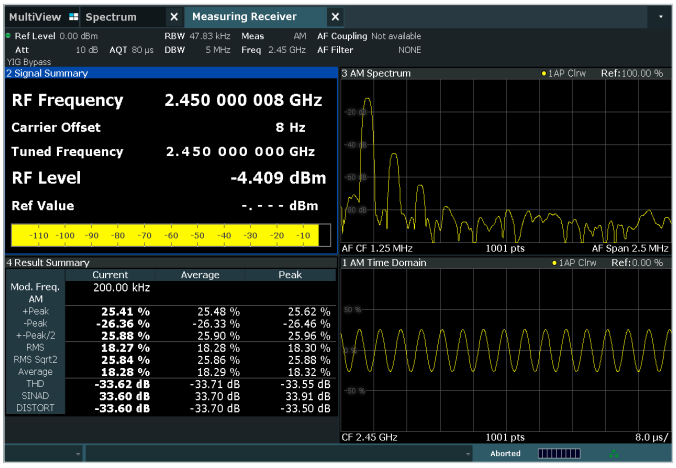
- Measurement of modulation depth for AM: 0.25 % (audio frequency < 100 kHz)
- Measurement of FM and PM deviation: 0.5 % (audio frequency < 200 kHz)

THD and SINAD are automatically calculated and displayed.

## User-definable result presentation

The R&S®FSMR3000 displays all key results simultaneously. However, the user can choose certain results for detailed display or arrange the different windows as desired. Presentation of the results can thus be optimized for the current application by suppressing unnecessary information. Since the user can see the most important parameters at a glance, pending measurements can be completed quickly and efficiently.

The R&S®FSMR3000 simultaneously displays a variety of modulation analysis results. Of course, the user can choose exactly which results to display in order to optimize the presentation.



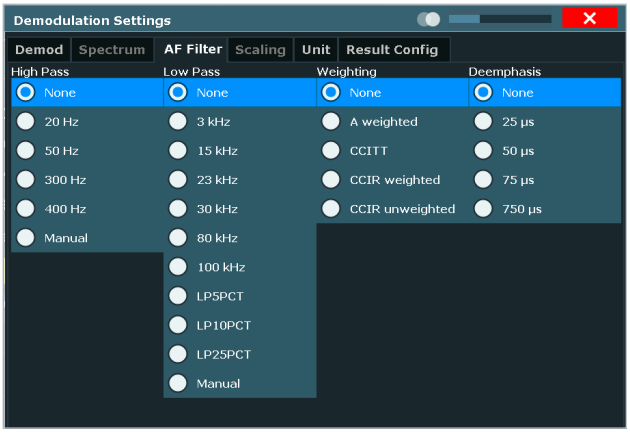

## Simple selection of diverse audio filters

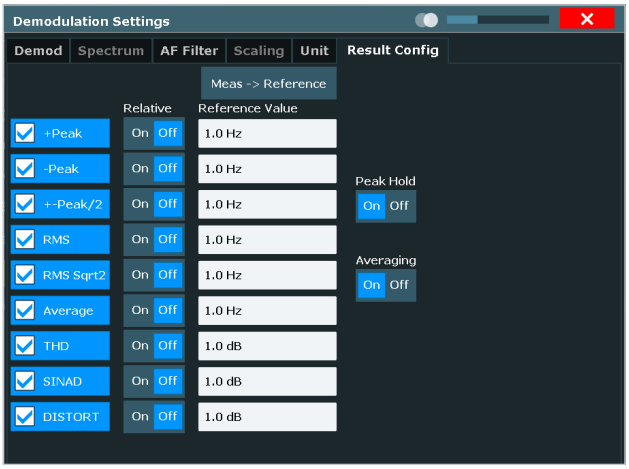
For audio analysis, the R&S®FSMR3000 provides a wide array of filters that can be easily selected by clicking within the large menus. Users can see at a glance which filters are active and can easily modify the settings with a click of the mouse or via the touchscreen.

## Audio input for calibrating modulation generators

When equipped with the R&S®FSMR3-B3 audio input and analysis option, the R&S®FSMR3000 can perform measurements directly on the audio signal to calibrate modulation generators. The audio input supports the frequency range from 10 Hz to 1 MHz. The input impedance can be set to 50 Ω or 1 MΩ.

Various filters can be selected for analysis of demodulated signals. Users can also specify which modulation parameters to show within the results in order to optimize the display for the current application.



# FULL-FEATURED SIGNAL AND SPECTRUM ANALYZER

## Measurement functions for spectral analysis, e.g. harmonics, TOI, etc.

Calibration labs handle a variety of measurement tasks. These tasks often require a spectrum analyzer featuring a wide range of functions and excellent allround performance. This is possible with the R&S®FSMR3000 thanks to the R&S®FSMR3-B1 option which transforms the measuring receiver into a full-featured signal and spectrum analyzer. The functionality and performance are then equivalent to that of the R&S®FSW signal and spectrum analyzer. Along with unrivaled performance (e.g. phase noise, wide dynamic range due to very low intrinsic noise (DANL), high input TOI of up to +30 dBm), the instrument also offers a number of functions as standard that are required for calibration and performance verification of generators. For example, the instrument can measure a generator's higher-order harmonics at the press of a key. It also provides a routine for measuring TOI or adjacent channel power along with a wide array of marker functions. A true channel power measurement in the time domain combined with channel filters or RRC filters is also possible.

### Key features

- Wide dynamic range thanks to a low noise level of typ. –153 dBm (1 Hz) (without noise cancelation and preamplifier) and high TOI of typ. +30 dBm
- Total measurement uncertainty of < 0.3 dB up to 3.6 GHz, < 0.4 dB up to 8 GHz
- Phase noise at 1 GHz (100 kHz offset): typ. –140 dBc (1 Hz)
- Signal analysis bandwidth 80 MHz

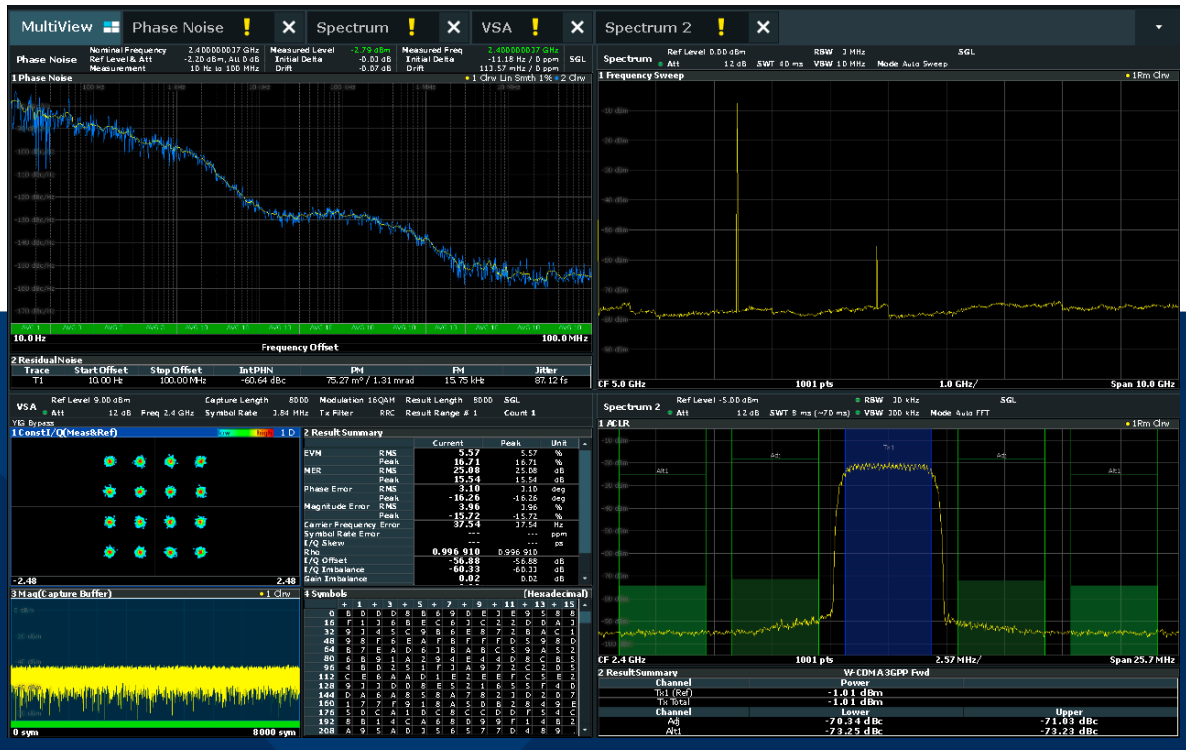
## Wide selection of detectors and RBW settings

For adaptation of the R&S®FSMR3000 to different signal types, a wide selection of detectors is included:

- RMS
- Auto peak
- Max. peak
- Min. peak
- Sample
- Average

The resolution bandwidth of the R&S®FSMR3000 can be varied from 1 Hz to 10 MHz in steps of 1/2/3/5 and various filter types are available. Using the R&S®FSMR3-B8 option, bandwidths up to 80 MHz are supported.

Signal and spectrum analysis in a single instrument. Right: typical spectral measurements such as adjacent channel power (ACP) or higher-order harmonics. Left (top): phase noise measurement. Left (bottom): vector signal analysis of a digitally modulated signal.



## Noise figure and phase noise measurements

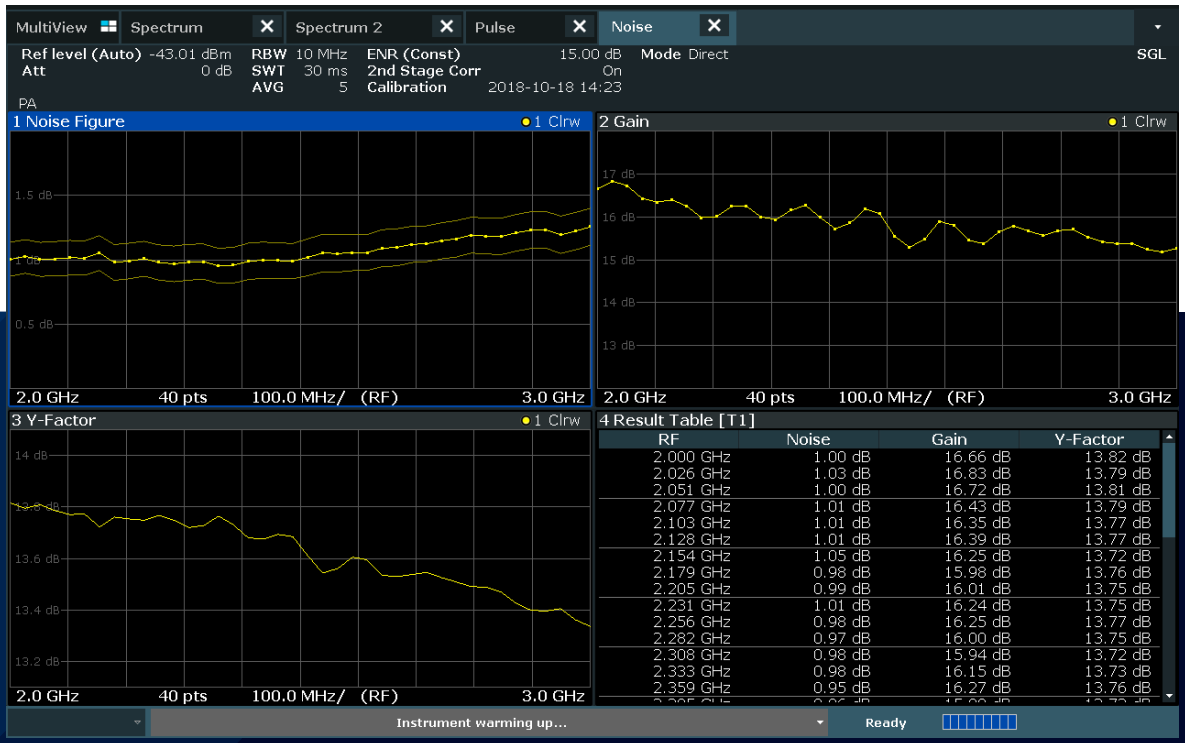
Due to the extremely low inherent noise of the R&S®FSMR3000 of typ. –153 dBm (1 Hz) at 2 GHz or –145 dBm (1 Hz) at 25 GHz without preamplifier (further improved by 12 dB to 20 dB with internal preamplifier), it is the ideal instrument for measuring the noise figure of components. The R&S®FSMR3-K30 option allows users to easily perform noise figure and gain measurements. An excess noise ratio (ENR) source is needed which is switched back and forth at the DUT input between normal (room temperature) and increased noise. Based on the noise measurements, the R&S®FSMR3-K30 option automatically calculates the gain or noise figure of the DUT vs. frequency.

Any available noise diodes can be used as an ENR source. However, the relevant correction data must be taken into account for the frequency response of the ENR values as well as the temperature and matching.

The R&S®FS-SNS18/26/40/55/67 smart noise sources make this time-consuming and error-prone task unnecessary by providing all of the correction tables as well as the ambient temperature of the R&S®FSMR3-K30 in electronic form. Using the combination of R&S®FSMR3-K30 and R&S®FS-SNSxx, it is possible to measure the gain and noise figure of components at the press of a key. The results are displayed along with the calculated measurement errors.

Phase noise is a key parameter for signal generators. The lower the phase noise, the better the quality of signal and modulation. Measuring this parameter requires an analyzer with even lower intrinsic phase noise. The R&S®FSMR3000 convinces with its outstanding dynamic range for phase noise measurements. At 10 kHz offset from the carrier, the analyzer achieves a phase noise of –140 dBc (1 Hz) for a 1 GHz carrier and –133 dBc (1 Hz) for a 10 GHz carrier. The R&S®FSMR3-K40 option enables phase noise measurement at the press of a key.

Noise figure and gain measurement for a preamplifier. In the top left display, the thin lines above and below the trace represent the measurement error.



## Up to 80 MHz signal analysis bandwidth

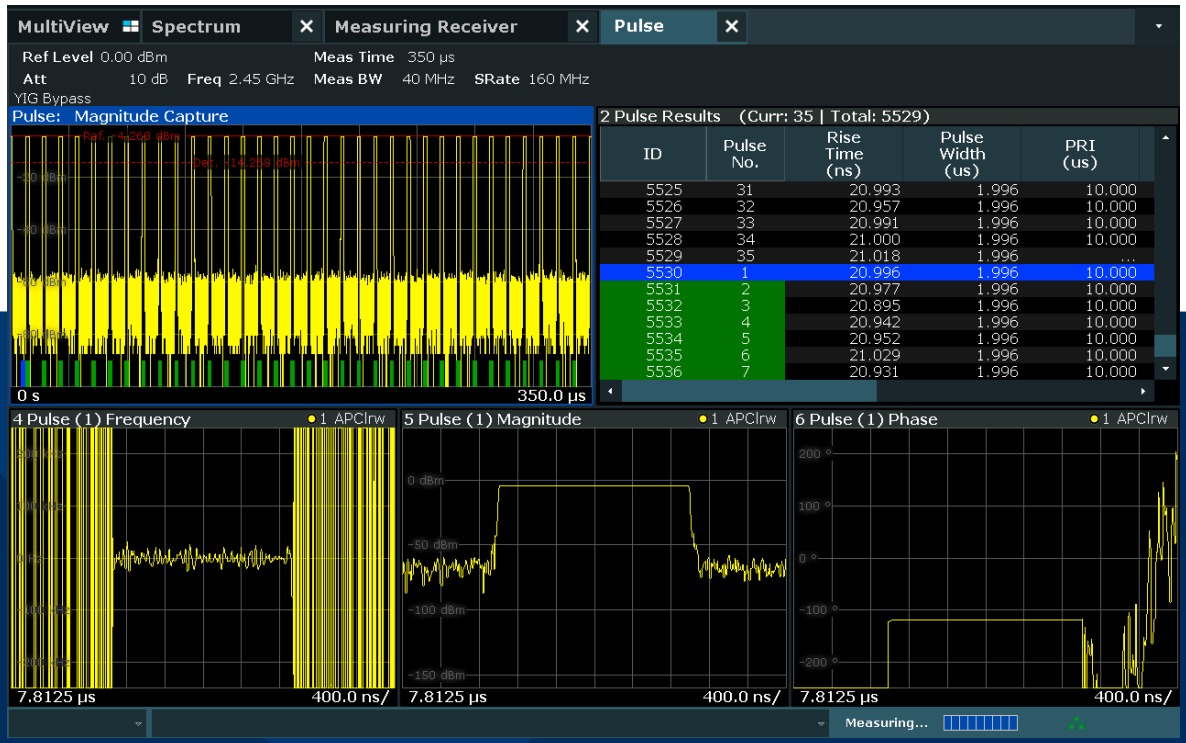
In addition to spectral measurements, the R&S®FSMR3000 can also digitize and analyze signals. It can be equipped with a bandwidth of up to 80 MHz to handle signals with broadband modulation that are typical in advanced communications technology, or it can be used to digitize, store and analyze signals with very short pulses. Although the analysis can be performed externally, the R&S®FSMR3000 also includes internal analysis tools for vector signal or pulse analysis.

## Analysis of pulsed signals

Characterizing pulse generators requires the measurement of numerous pulse parameters. The R&S®FSMR3-K6 option measures – at the press of a key – all relevant parameters such as pulse duration, pulse period, pulse rise and fall times, power drop across a pulse and intrapulse phase modulation, and produces a trend analysis over many pulses. The user selects the results to be displayed simultaneously on the screen. A complete picture is available within seconds.

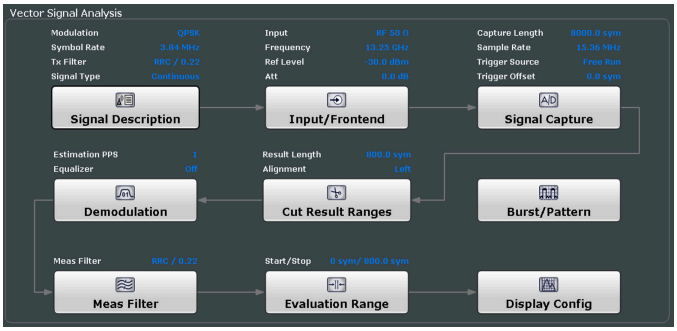
To allow the analysis of trends over very long periods, the R&S®FSMR3-K6 option has especially efficient memory management. The segmented I/Q capture function ensures that I/Q data is only timestamped and stored in the memory when a pulse is detected. This feature significantly increases the analysis period – by nearly a factor of 1000 for pulse lengths less than 1 µs and a pulse repetition rate of 1 kHz.

Equipped with the R&S®FSMR3-K6 option, the R&S®FSMR3000 delivers all relevant pulse parameters at the press of a key.



## Vector signal analysis for digitally modulated signals

The R&S®FSMR3-K70 option enables users to flexibly analyze digitally modulated single carriers down to the bit level. Measurements are simplified by the straightforward operating concept. For example, the different demodulation steps are visualized in a clear block diagram so that even inexperienced users can quickly find the optimum settings.

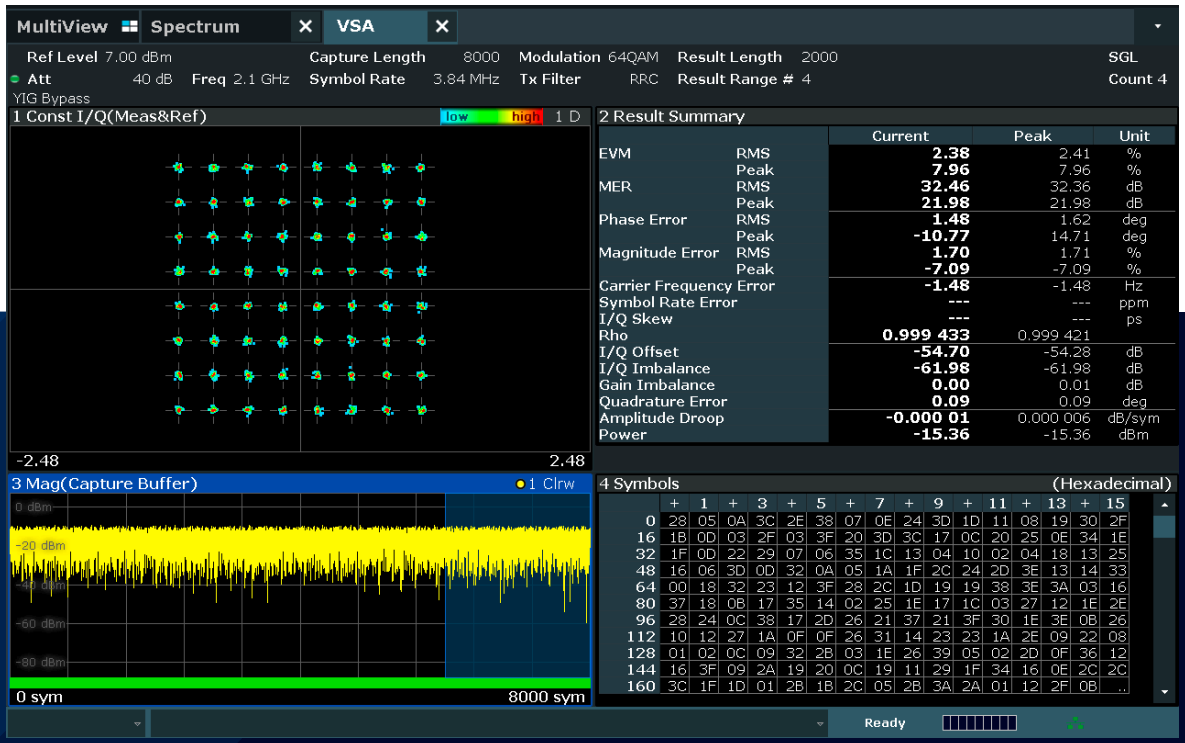



Clear operation concept visualized in a block diagram.

Troubleshooting is simplified by a variety of flexible analysis tools:

- Various display options for amplitude, frequency and phase
  - I/Q display, eye diagrams, amplitude, phase and frequency error
  - Constellation or vector diagram
- Statistical analysis (e.g. histogram) or standard deviation with 95th percentile
- Tabular results for EVM, I/Q offset, I/Q imbalance, etc.
- Spectrum of measurement and error signal
- Flexible definition of burst search for easier analysis of complex signals
- Internal equalizer for optimal filter design
- Flexible modulation analysis from MSK to 16384QAM
  - 2FSK, 4FSK to 64FSK
  - MSK, GMSK, DMSK
  - BPSK, π/2-BPSK, π/2-DBPSK, QPSK, offset QPSK, DQPSK, π/4-DQPSK, 3π/4-QPSK, 8PSK, D8PSK,
  - 3π/8-8PSK, π/8-D8PSK
  - 16QAM, 32QAM, 64QAM, 128QAM, 256QAM, 512QAM, 1024QAM, 2048QAM, 4096QAM, 8192QAM, 16384QAM
  - 16APSK (DVB-S2), 32APSK (DVB-S2), 2ASK, 4ASK
  - π/4-16QAM (EDGE), –π/4-32QAM (EDGE), SOQPSK
- Analysis length up to 128000 symbols
- Up to 80 MHz analysis bandwidth

Analysis of a 64QAM signal with a bandwidth of 3.84 MHz.

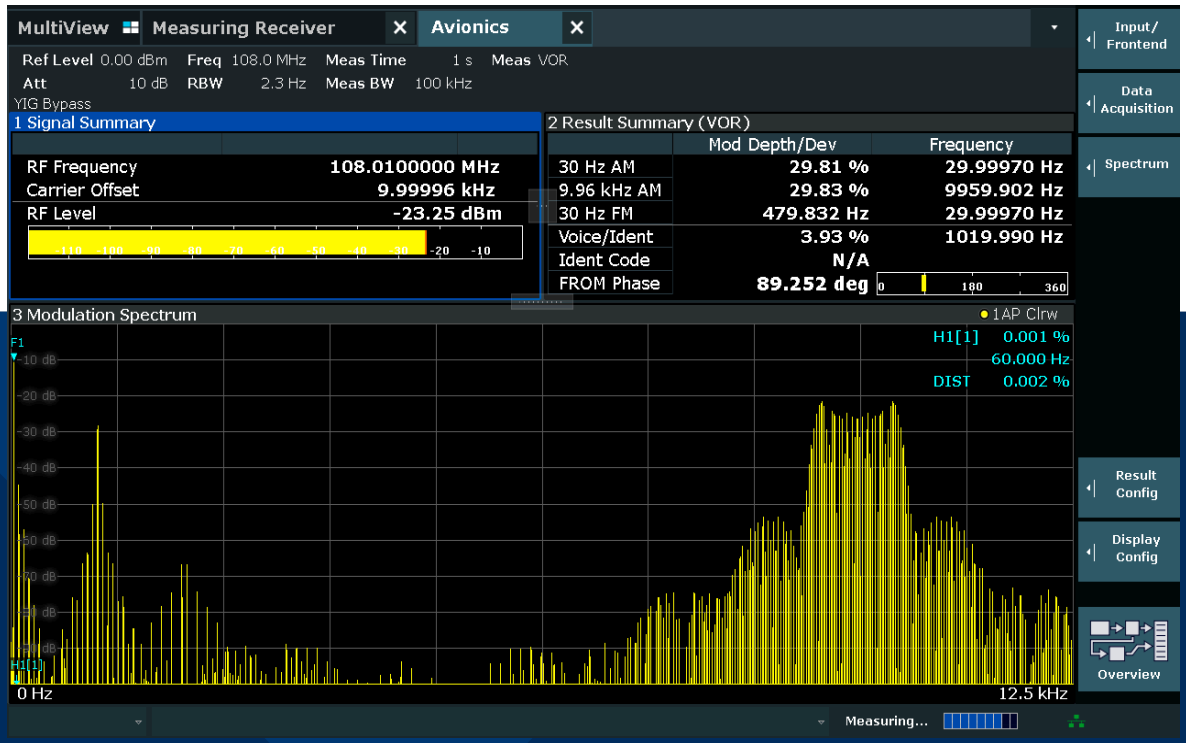


## Analysis of VOR/ILS signals

VHF omnidirectional range (VOR; an on-course radio beacon) and the instrument landing system (ILS; used for guidance during approach and landing) are air traffic navigation aids based on amplitude-modulated signals. They both require very accurate and reliable modulation measurements.

The R&S®FSMR3-K15 option extends the calibration capabilities of the R&S®FSMR3000 to cover VOR/ILS signal generators and navigation/ramp testers. With the R&S®FSMR3-K15 option, the generators can be calibrated without requiring an additional VOR/ILS tester.

Analysis of a VOR signal: The spectrum, power and modulation parameters are displayed.



# HIGH-END PHASE NOISE ANALYZER

## High sensitivity through cross-correlation

The R&S®FSMR3-B60 option turns the R&S®FSMR3000 measuring receiver into a full-featured phase noise analyzer. The R&S®FSMR3000 uses an I/Q mixer to mix the measurement signal down to zero or a very low intermediate frequency and demodulates the signal. The combination of a fast processor and FPGAs enables immediate data processing. Measurement time is determined solely by the physically required time (data recording). Signal demodulation and correlation of the various measurement sequences take no additional time.

Due to its excellent internal sources and largely digital architecture, the R&S®FSMR3000 equipped with the R&S®FSMR3-B60 option is faster than test systems that digitize the signal after the phase detector.

The R&S®FSMR3000-B60 option equips the measuring receiver with a second RX path, thus allowing cross-correlation and increasing the sensitivity depending on the number of correlations.

## Indication of cross-correlation gain

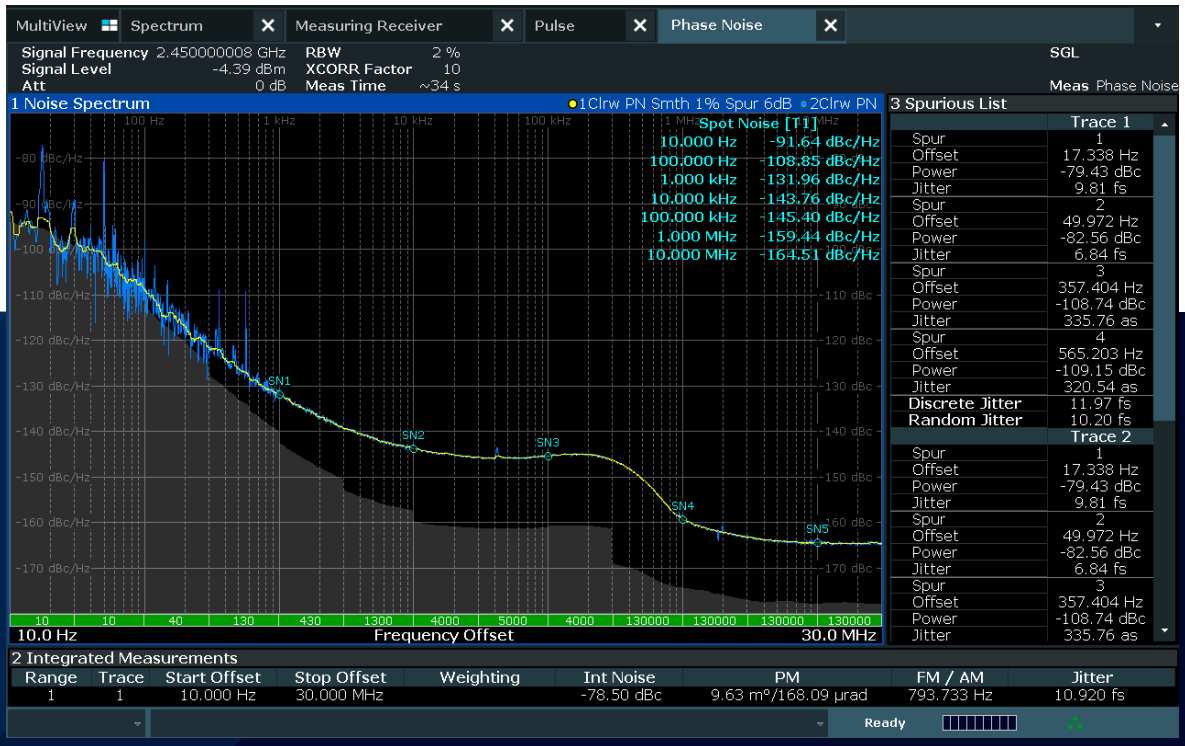
Equipping the measuring receiver with a second local oscillator improves the sensitivity by as much as 25 dB, depending on the number of correlations used. The improvement that can be expected is as follows:

$$\Delta L = 5 \cdot log(n)$$

- $\Delta L$: improvement in phase noise sensitivity through cross-correlation (in dB)
- $n$: number of correlations/averages

Increasing the number of correlations by a factor of 10 lowers the intrinsic phase noise of the R&S®FSMR3000 by 5 dB. Thanks to the analyzer's low noise internal sources, often only a few correlations are needed to measure a high-quality generator. A gray area below the trace shows the expected sensitivity gain due to cross-correlation. This allows the user to accurately assess the measurement that is performed. If the gray area is well below the trace, the DUT can be precisely analyzed and errors due to insufficient sensitivity can be excluded.

Measurement of amplitude and phase noise with the R&S®FSMR3-B60 option.

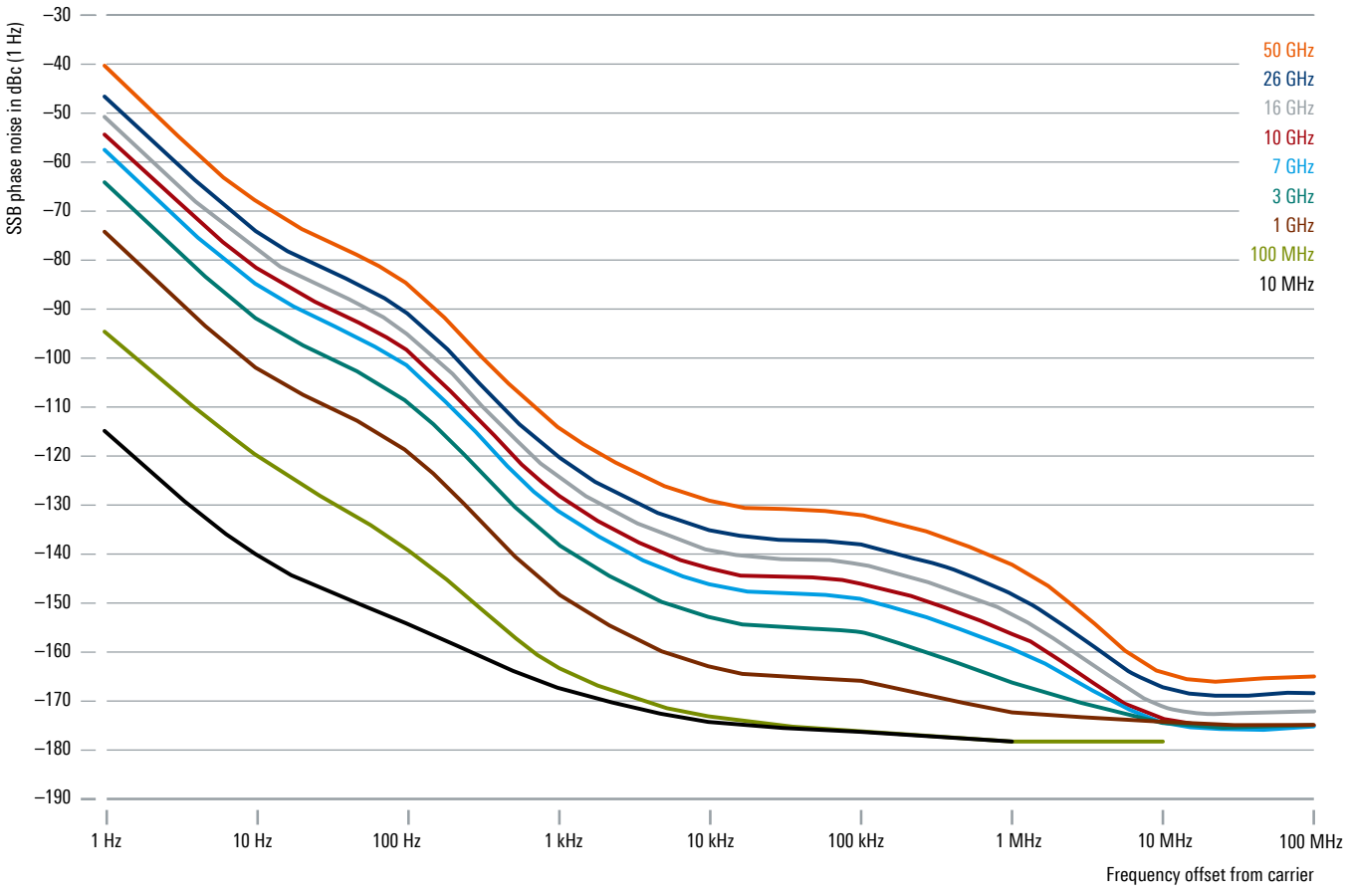


## Parallel measurement of amplitude and phase noise

If the R&S®FSMR3000 is equipped with the R&S®FSMR3-B60 option, amplitude noise can be measured in addition to phase noise. Since the R&S®FSMR3000 directly demodulates the signal using the CORDIC algorithm, both results can be displayed simultaneously in a single diagram or in separate windows. The R&S®FSMR3000 high precision sources, in combination with cross-correlation, surpass the accuracy of diode detector based measurements for AM noise, with an increase in sensitivity of up to 20 dB.

## SSB phase noise versus frequency offset

Typical values for phase noise sensitivity of the R&S®FSMR3-B60 option for correlation at the start offset of 1 Hz.



# SPECIFICATIONS IN BRIEF

| | R&S®FSMR3008 | R&S®FSMR3026 | R&S®FSMR3050 |
|---|---|---|---|
| Frequency range | 2 Hz to 8 GHz | 2 Hz to 26.5 GHz | 2 Hz to 50 GHz |
| Reference frequency aging | 1 × $10^{-7}$/year, optionally: 3 × $10^{-8}$/year | | |
| Absolute power measurement | using R&S®NRP-Zxx power sensor or external power meters | | |
| Uncertainty | with R&S®NRP-Z27/-Z37: 0.083 dB (up to 4.2 GHz, +15 °C to +35 °C) | | |
| **Relative level measurement** | | | |
| Measurement range | +30 dBm to –152 dBm, depending on frequency | | |
| Linearity uncertainty | ±(0.009 dB + 0.005 dB per 10 dB step) | | |
| **AM modulation measurements** | | | |
| Modulation depth | 0 % to 100 % | | |
| Measurement uncertainty | < 0.0025 % + 0.0035 of reading | | |
| Modulation frequency | 10 Hz to 1 MHz | | |
| Inherent distortion | 0.1 % | | |
| **FM modulation measurements** | | | |
| Frequency deviation | max. 16 MHz | | |
| Measurement uncertainty | < 0.5 % × (AF + FM deviation) + 5 Hz, for AF < 1 MHz | | |
| Modulation frequency | 10 Hz to 5 MHz | | |
| Inherent distortion | 0.1 % | | |
| **PM modulation measurements** | | | |
| Phase deviation | max. 10 000 rad and < 16 MHz / AF, whichever is smaller | | |
| Measurement uncertainty | < 0.5 % of reading + 0.002 rad, for AF < 1 MHz | | |
| Modulation frequency | 10 Hz to 5 MHz | | |
| Inherent distortion | 0.1 % | | |
| **Audio input and analysis** | | | |
| Input impedance | 50 Ω/1 MΩ (nom.), selectable | | |
| Frequency range | 10 Hz to 1 MHz | | |
| Level ranges | 0.2 V, 2 V, 4 V, selectable | | |
| Measurement uncertainty | < 1 % of reading, 50 Hz to 100 kHz | | |
| **Spectrum analyzer** | | | |
| Frequency range | 2 Hz to 8 GHz | 2 Hz to 26.5 GHz | 2 Hz to 50 GHz |
| **Displayed average noise level (RBW 1 Hz)** | | | |
| 1 GHz | –153 dBm | –153 dBm | –153 dBm |
| 25 GHz | – | –145 dB | –145 dBm |
| 50 GHz | – | – | –129 dBm |
| Trace detectors | max. peak, min. peak, auto peak, sample, RMS, average, quasi-peak | | |
| Phase noise | typ. –140 dBc (1 Hz) at 10 kHz from carrier, 1 GHz carrier frequency | | |
| **Sweep time** | | | |
| Span > 10 Hz | 2.5 ms to 16 000 s | | |
| Span 0 Hz (zero span) | 1 µs to 16 000 s | | |

## Phase noise sensitivity in dBc (1 Hz) with R&S®FSMR3-B60 option (low phase noise) [1)]

| RF input frequency | Offset frequency from the carrier | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| | 1 Hz | 10 Hz | 100 Hz | 1 kHz | 10 kHz | 100 kHz | 1 MHz | 10 MHz | 30 MHz |
| 1 MHz | (–115) | (–140) | –140 (–146) | –158 (–164) | –170 (–176) | –170 (–176) | | | |
| 10 MHz | (–115) | (–140) | –140 (–146) | –158 (–164) | –170 (–176) | –170 (–176) | –170 (–176) | | |
| 100 MHz | (–95) | (–120) | –133 (–139) | –157 (–163) | –167 (–173) | –170 (–176) | –172 (–178) | –172 (–178) | –172 (–178) |
| 1 GHz | (–75) | (–102) | –113 (–119) | –142 (–148) | –157 (–163) | –160 (–166) | –167 (–173) | –168 (–174) | –168 (–174) |
| 3 GHz | (–65) | (–92) | –103 (–109) | –132 (–138) | –147 (–153) | –150 (–156) | –160 (–166) | –168 (–174) | –168 (–174) |
| 7 GHz | (–58) | (–85) | –96 (–102) | –125 (–131) | –140 (–146) | –143 (–149) | –153 (–159) | –168 (–174) | –168 (–174) |
| 10 GHz | (–55) | (–82) | –93 (–99) | –122 (–128) | –137 (–143) | –140 (–146) | –150 (–156) | –168 (–174) | –168 (–174) |
| 16 GHz | (–51) | (–78) | –89 (–95) | –118 (–124) | –133 (–139) | –136 (–142) | –146 (–152) | –165 (–171) | –165 (–171) |
| 26 GHz | (–47) | (–74) | –85 (–91) | –114 (–120) | –129 (–135) | –132 (–138) | –142 (–148) | –161 (–167) | –161 (–167) |
| 50 GHz | (–41) | (–68) | –79 (–85) | –108 (–114) | –123 (–129) | –126 (–132) | –136 (–142) | –158 (–164) | –158 (–164) |

[1)] Start offset = 1 Hz, correlation factor = 1, frequency reference: internal, internal reference loop bandwidth = 30 Hz, signal level ≥ 10 dBm, +20 °C to +30 °C, specified values in dBc (1 Hz), numbers in brackets are typical values in dBc (1 Hz).

# ORDERING INFORMATION

| Designation | Type | Order No. | Retrofittable | Remarks |
|---|---|---|---|---|
| Measuring receiver, 100 kHz to 8 GHz | R&S®FSMR3008 | 1345.4004.08 | | |
| Measuring receiver, 100 kHz to 26.5 GHz | R&S®FSMR3026 | 1345.4004.26 | | |
| Measuring receiver, 100 kHz to 50 GHz | R&S®FSMR3050 | 1345.4004.50 | | |
| **Hardware options** | | | | |
| Spectrum analyzer, 2 Hz to 8 GHz | R&S®FSMR3-B1 | 1345.3050.08 | no | for R&S®FSMR3008, ex factory |
| Spectrum analyzer, 2 Hz to 26 GHz | R&S®FSMR3-B1 | 1345.3050.26 | no | for R&S®FSMR3026, ex factory |
| Spectrum analyzer, 2 Hz to 50 GHz | R&S®FSMR3-B1 | 1345.3050.50 | no | for R&S®FSMR3050, ex factory |
| Audio input and analysis | R&S®FSMR3-B3 | 1345.3066.02 | yes | |
| OCXO, precision frequency reference | R&S®FSMR3-B4 | 1345.3072.02 | yes | contact service center |
| Resolution bandwidth up to 80 MHz | R&S®FSMR3-B8 | 1345.3166.26 | no | for R&S®FSMR3008 and R&S®FSMR3026, R&S®FSMR3-B1 option required |
| Resolution bandwidth up to 80 MHz | R&S®FSMR3-B8 | 1345.3166.50 | no | for R&S®FSMR3050, R&S®FSMR3-B1 option required; contact service center |
| Resolution bandwidth up to 40 MHz | R&S®FSMR3-B8E | 1345.3372.02 | yes | R&S®FSMR3-B1 option required, user-retrofittable |
| External generator control | R&S®FSMR3-B10 | 1345.3089.02 | yes | contact service center |
| Highpass filter | R&S®FSMR3-B13 | 1345.3395.02 | yes | user-retrofittable |
| Spare solid-state drive (removable hard disk drive) | R&S®FSMR3-B18 | 1345.3095.21 | yes | user-retrofittable |
| RF preamplifier, 100 kHz to 8 GHz | R&S®FSMR3-B24 | 1345.3108.08 | yes | |
| RF preamplifier, 100 kHz to 26.5 GHz | R&S®FSMR3-B24 | 1345.3108.26 | yes | |
| RF preamplifier, 100 kHz to 50 GHz | R&S®FSMR3-B24 | 1345.3108.49 | yes | |
| RF preamplifier, 100 kHz to 50 GHz | R&S®FSMR3-B24 | 1345.3108.50 | yes | export license required |
| 80 MHz analysis bandwidth | R&S®FSMR3-B80 | 1345.3608.02 | yes | user-retrofittable |
| Phase noise analyzer with cross-correlation, 1 MHz to 8 GHz | R&S®FSMR3-B60 | 1345.3114.08 | yes | for R&S®FSMR3008, ex factory; includes R&S®FSMR3-B4, excludes R&S®FSMR3-K40 |
| Phase noise analyzer with cross-correlation, 1 MHz to 26 GHz | R&S®FSMR3-B60 | 1345.3114.26 | yes | for R&S®FSMR3026, ex factory; includes R&S®FSMR3-B4, excludes R&S®FSMR3-K40 |
| Phase noise analyzer with cross-correlation, 1 MHz to 50 GHz | R&S®FSMR3-B60 | 1345.3114.50 | yes | for R&S®FSMR3050, ex factory; includes R&S®FSMR3-B4, excludes R&S®FSMR3-K40 |
| LO inputs for residual phase noise measurements | R&S®FSMR3-B65 | 1345.3120.02 | yes | R&S®FSMR3-B60 option required |
| **Firmware options** | | | | |
| Pulse measurement application | R&S®FSMR3-K6 | 1345.3137.02 | | R&S®FSMR3-B1 option required |
| AM/FM/PM modulation analysis | R&S®FSMR3-K7 | 1345.3389.02 | | R&S®FSMR3-B1 option required |
| VOR/ILS measurements | R&S®FSMR3-K15 | 1345.3143.02 | | R&S®FSMR3-B1 option required |
| Noise figure measurements | R&S®FSMR3-K30 | 1345.3637.02 | | R&S®FSMR3-B1 option required, R&S®FSMR3-B24 option recommended |
| Phase noise measurements | R&S®FSMR3-K40 | 1345.3620.02 | | R&S®FSMR3-B1 option required; excludes R&S®FSMR3-B60 option |
| Spurious measurements | R&S®FSMR3-K50 | 1345.3966.02 | | R&S®FSMR3-B1 option required |
| Vector signal analysis application | R&S®FSMR3-K70 | 1345.3150.02 | | R&S®FSMR3-B1 option required |
| Multi-modulation analysis | R&S®FSMR3-K70M | 1345.1211.02 | | R&S®FSMR3-B1 and R&S®FSMR3-K70 options required |
| BER PRBS measurements | R&S®FSMR3-K70P | 1345.1228.02 | | R&S®FSMR3-B1 and R&S®FSMR3-K70 options required |
| Health and utilization monitoring service (HUMS) | R&S®FSMR3-K980 | 1345.3808.02 | | |

| Designation | Type | Order No. |
|---|---|---|
| **Recommended extras** | | |
| 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-KN5 | 1175.3040.00 |
| Front cover | R&S®ZZF-511 | 1174.8825.00 |
| Noise sources [1] | | |
| Smart noise source, 10 MHz to 18 GHz | R&S®FS-SNS18 | 1338.8008.18 |
| Smart noise source, 10 MHz to 26.5 GHz | R&S®FS-SNS26 | 1338.8008.26 |
| Smart noise source, 100 MHz to 40 GHz | R&S®FS-SNS40 | 1338.8008.40 |
| Smart noise source, 100 MHz to 55 GHz | R&S®FS-SNS55 | 1338.8008.55 |
| Smart noise source, 100 MHz to 67 GHz | R&S®FS-SNS67 | 1338.8008.67 |
| 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 (considered in RF INPUT 75 Ω instrument setting) | R&S®RAZ | 0358.5714.02 |
| High-power attenuators | | |
| 100 W, 3/6/10/20/30 dB, 1 GHz | R&S®RBU100 | 1073.8495.xx (xx = 03/06/10/20/30) |
| 50 W, 3/6/10/20/30 dB, 2 GHz | R&S®RBU50 | 1073.8695.xx (xx = 03/06/10/20/30) |
| 50 W, 20 dB, 6 GHz | R&S®RDL50 | 1035.1700.52 |
| Connectors and cables | | |
| Coaxial adapter, 2.4 mm (f) to 2.4 mm (f) | | 3636.9290.00 |
| Coaxial semi-rigid cable, 1.85 mm (m) to 1.85 mm (m), length: 90 mm, U shape | | 1325.1251.00 |
| Coaxial adapter, 1.85 mm (f) to 2.92 mm (f) | | 3628.4728.02 |
| Coaxial adapter, 2.92 mm (f) to 2.92 mm (f) | | 3588.8664.00 |
| Coaxial adapter, 3.5 mm (f) to 3.5 mm (f), APC3.5-compatible | | 3689.9442.00 |
| Coaxial adapter, 3.5 mm (m) to 3.5 mm (m), APC3.5-compatible | | 3587.7770.00 |
| Coaxial adapter, N (f) to 3.5 mm (m), APC3.5-compatible | | 3587.7806.00 |
| Coaxial adapter, N (f) to 3.5 mm (f), APC3.5-compatible | | 3587.7829.00 |
| Coaxial adapter, N (m) to 3.5 mm (f), APC3.5-compatible | | 3587.7835.00 |
| Coaxial cable, SMA (m) to SMA (m), length: 1 m | | 3586.9970.00 |
| Probe power connector, 3-pin | | 1065.9480.00 |
| N-type adapter for R&S®RT-Zxx oscilloscope probes | R&S®RT-ZA9 | 1417.0909.02 |
| Adapter, 2.92 mm/3.5 mm/SMA to Rohde&Schwarz probe interface, including USB-C port | R&S®RT-ZA51 | 1803.5365.02 |
| DC block | | |
| DC block, 10 kHz to 18 GHz (N-type) | R&S®FSE-Z4 | 1084.7443.03 |
| Tools | | |
| Torque wrench for N-type connectors, 1.5 Nm coupling torque (for R&S®FSW8/13) | R&S®ZN-ZTW | 1328.8534.71 |
| Torque wrench for 3.5/2.92/2.4/1.85 mm connectors, 0.9 Nm coupling torque (for R&S®FSW26/43/50/67) | R&S®ZN-ZTW | 1328.8534.35 |
| Torque wrench for 1.0 mm connectors, 0.23 Nm coupling torque (for R&S®FSW85) | R&S®ZN-ZTW | 1328.8534.11 |
| Calibration kit | | |
| Attenuation calibration kit, for calibrating RF level linearity | R&S®FSMR-Z2 | 1169.4954.02 |
| **Supported power sensors [2]** | | |
| Universal power sensors | | |
| 10 MHz to 8 GHz, 100 mW, 2-path | R&S®NRP-Z211 | 1417.0409.02 |
| 10 MHz to 8 GHz, 200 mW | R&S®NRP-Z11 | 1138.3004.02 |
| 10 MHz to 18 GHz, 100 mW, 2-path | R&S®NRP-Z221 | 1417.0309.02 |
| 10 MHz to 18 GHz, 200 mW | R&S®NRP-Z21 | 1137.6000.02 |
| 10 MHz to 18 GHz, 2 W | R&S®NRP-Z22 | 1137.7506.02 |
| 10 MHz to 18 GHz, 15 W | R&S®NRP-Z23 | 1137.8002.02 |
| 10 MHz to 18 GHz, 30 W | R&S®NRP-Z24 | 1137.8502.02 |

[1] Requires R&S®FSMR3-K30 option.
[2] For average power measurements only.

| Designation | Type | Order No. |
|---|---|---|
| Power sensor modules with power splitter [3] | | |
| 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 | | |
| DC to 18 GHz, 100 mW | R&S®NRP18T | 1424.6115.02 |
| DC to 18 GHz, 100 mW, LAN version | R&S®NRP18TN | 1424.6121.02 |
| DC to 33 GHz, 100 mW | R&S®NRP33T | 1424.6138.02 |
| DC to 33 GHz, 100 mW, LAN version | R&S®NRP33TN | 1424.6144.02 |
| DC to 40 GHz, 100 mW | R&S®NRP40T | 1424.6150.02 |
| DC to 40 GHz, 100 mW, LAN version | R&S®NRP40TN | 1424.6167.02 |
| DC to 50 GHz, 100 mW | R&S®NRP50T | 1424.6173.02 |
| DC to 50 GHz, 100 mW, LAN version | R&S®NRP50TN | 1424.6180.02 |
| DC to 67 GHz, 100 mW | R&S®NRP67T | 1424.6196.02 |
| DC to 67 GHz, 100 mW, LAN version | R&S®NRP67TN | 1424.6209.02 |
| DC 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, LAN version | R&S®NRP6AN | 1424.6809.02 |
| 9 kHz to 6 GHz, 2 W | R&S®NRP-Z92 | 1171.7005.02 |
| 8 kHz to 18 GHz, 200 mW | R&S®NRP18A | 1424.6815.02 |
| 8 kHz to 18 GHz, 200 mW, LAN version | 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 |
| 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 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 |
| Wideband power sensor | | |
| 50 MHz to 18 GHz, 100 mW | R&S®NRP-Z81 | 1137.9009.02 |

[3] N (m) to 3.5 mm (f) coaxial adapter needed for R&S®FSMR3008; 3.5 mm (f) to 3.5 mm (f) coaxial adapter needed for R&S®FSMR3026; 2.4 mm (f) to 2.92 mm (f) coaxial adapter needed for R&S®FSMR3050.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