Version
01.00June
2005

Application Firmware for Phase Noise Measurements R&S®FS-K40

Phase noise measurements with Analyzers R&S®FSP/FSU/FSQ/FSMR

- ◆ Editable sweep settings:
 - Measurement range
 - Resolution bandwidths
 - Filter types (analog, digital, FFT)
 - Averaging
 - Smoothing factors
- ◆ Editable limit lines with pass/fail indication
- ◆ Fast residual FM/ ϕ M measurements over settable frequency range
- ◆ Comprehensive marker functions
- ◆ Simultaneous display of up to three traces
- ◆ Storage of results and settings
- ◆ Remote control via GPIB or LAN


ROHDE & SCHWARZ

Application Firmware R&S®FS-K40 adds phase noise measurement capability to the Analyzers R&S®FSP/R&S®FSU/R&S®FSQ/R&S®FSMR.

Due to their very low inherent phase noise and low noise factor, the R&S®FSU, R&S®FSQ and the R&S®FSMR are ideal for applications that call for very high spectral purity, for example analyzing signal sources such as radio frequency chips used in the modern 3GPP communications standards.

The high phase noise measurement speed is achieved through the high sweep rates of the Rohde & Schwarz analyzers. It is possible to trade off speed against accuracy at small resolution bandwidths (≤ 10 kHz) by using either FFT or digital/analog filters. The application firmware allows several, different settings within a phase noise diagram, e.g. FFT close to the carrier and analog/digital filters far from the carrier (see Fig. 1).

The large variety of setting options offered by the R&S®FS-K40 allows optimal sweep configuration for your specific measurement task:

- ◆ Three predefined settings (Fast, Normal, Averaged) in the Sweep Mode menu make settings easy and produce results quickly. You can of course also configure the measurement yourself and thus adapt the settings optimally to your specific task.
- ◆ User-definable carrier offset frequency range from 1 Hz to 1 GHz.
- ◆ User-selectable filter type, filter bandwidth and number of averaged sweeps for each carrier offset subrange (1 Hz to 3 Hz/3 Hz to 10 Hz/10 Hz to 30 Hz, and so forth).
- ◆ Global definition of basic parameters, eliminating the need for tedious pre-settings (see Fig. 2).
- ◆ You can define whether measurements should be started at maximum carrier offset and continued toward smaller offsets or vice versa, so that results are obtained quickly for the subrange of interest.
- ◆ Verification of carrier frequency and level prior to each measurement to prevent measurement errors due to frequency drift.
- ◆ Autoscaling or user-defined setting of x- and y-axis ranges.
- ◆ You can select a trace smoothing factor as required for your application. The original trace and the smoothed trace can be displayed together. It is also possible to apply different smoothing factors to a single trace. The smoothed traces can be displayed together.
- ◆ Evaluation lines for residual FM/ ϕ M measurements to limit the measurement range.
- ◆ User-definable, storable limit lines for fast pass/fail indication.
- ◆ Results and settings can be stored and recalled at any time.
- ◆ Traces can be stored as ASCII files for subsequent evaluation by means of external tools.
- ◆ Application Firmware R&S®FS-K40 is fully remote-controllable via GPIB or LAN.

Fig. 1: Setting of sweep parameters:
The area with a green background on the left shows the currently selected offset frequency measurement range. The fields with a white background can be edited.

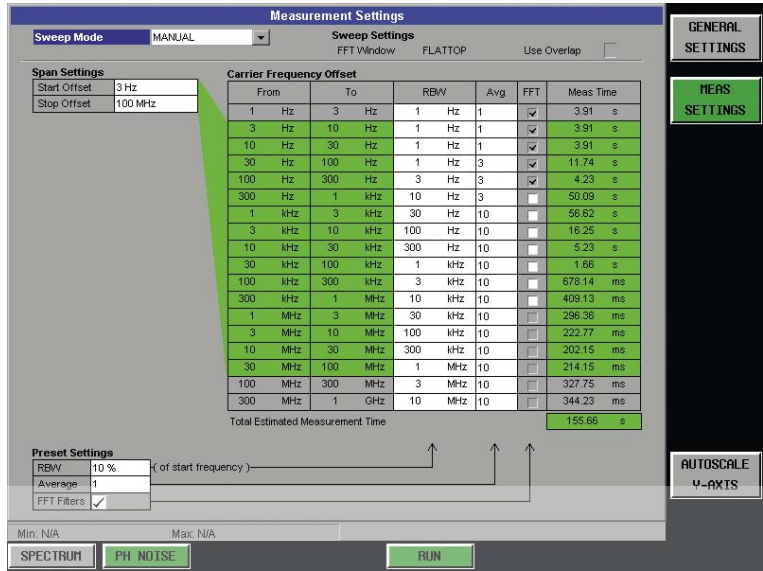
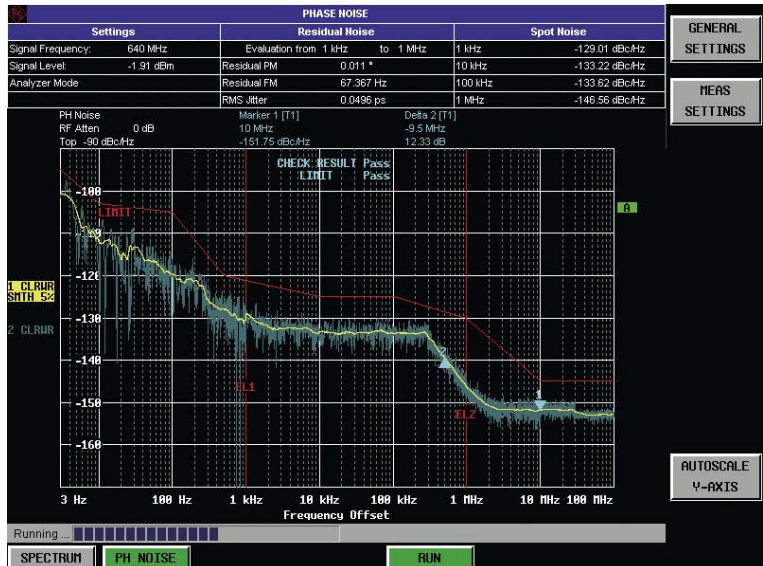


Fig. 2: Setting of global parameters for phase noise measurements:
The basic measurement parameters (carrier level and frequency, display ranges, etc), the residual FM/φM measurement range, as well as discrete offset frequencies of interest are entered here.



Fig. 3: Phase noise measurement of a signal source: blue trace: original trace; yellow trace: trace with a smoothing factor of 5%. The red trace is a LIMIT. The measurement result (pass in this example) is displayed directly in the diagram. The vertical red lines mark the range limits for residual FM/φM measurements. Results are displayed in the top center of the screen under Residual Noise.



Specifications

Frequency range	
R&S®FSP 3	20 Hz ¹⁾ /9 kHz to 3 GHz
R&S®FSP 7	20 Hz ¹⁾ /9 kHz to 7 GHz
R&S®FSP 13	20 Hz ¹⁾ /9 kHz to 13.6 GHz
R&S®FSP 30	20 Hz ¹⁾ /9 kHz to 30 GHz
R&S®FSP 40	20 Hz ¹⁾ / 9 kHz to 40 GHz
R&S®FSU 3	20 Hz to 3.6 GHz
R&S®FSU 8	20 Hz to 8 GHz
R&S®FSU 26	20 Hz to 26.5 GHz
R&S®FSU 46	20 Hz to 46 GHz
R&S®FSU 50	20 Hz to 50 GHz
R&S®FSQ 3	20 Hz to 3.6 GHz
R&S®FSQ 8	20 Hz to 8 GHz
R&S®FSQ 26	20 Hz to 26.5 GHz
R&S®FSQ 40	20 Hz to 40 GHz
R&S®FSMR 3	20 Hz to 3.6 GHz
R&S®FSMR 26	20 Hz to 26.5 GHz
R&S®FSMR 50	20 Hz to 50 GHz
The maximum number of decades that can be represented in a phase noise diagram is determined by the user-definable carrier offset frequency range.	
Lower offset limit (inherent residual FM)	
All R&S®FSU/FSQ/FSMR models	1 Hz
All R&S®FSP models	10 Hz
Upper offset limit	
All analyzer models	1 GHz

Measurement accuracy

The level measurement accuracy is mainly determined by the characteristics of the analyzer used. For relevant specifications refer to the corresponding data sheet (see "Related data sheets").

Inherent phase noise

The measurement sensitivity is mainly determined by the analyzer's inherent phase noise.

The diagrams opposite show the typical phase noise characteristics of the analyzers, which can be considered to be the minimum phase noise measurement sensitivity.

¹⁾ With option R&S®FSP-B29

Fig. 4: Typical SSB phase noise versus carrier offset frequency of Analyzers R&S®FSU, R&S®FSQ (from serial No. 2xx xxx) and R&S®FSMR

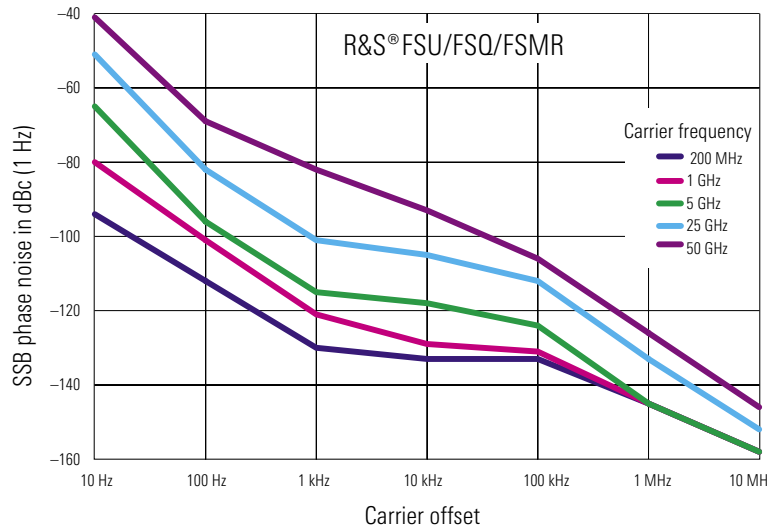
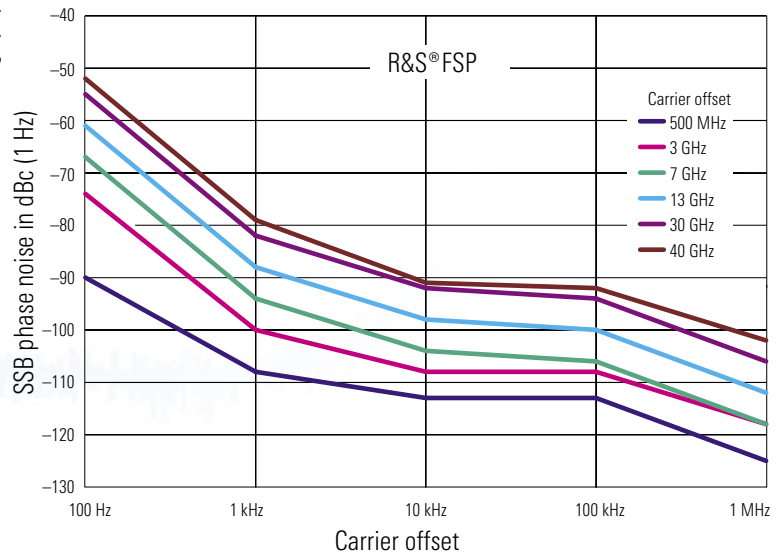


Fig. 5: Typical SSB phase noise versus carrier offset frequency of Spectrum Analyzer R&S®FSP



Ordering information

Application Firmware for Phase Noise Measurements	R&S®FS-K40	1161.8138.02
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Related data sheets

Spectrum Analyzers R&S®FSP	PD 0758.1206.21
Spectrum Analyzers R&S®FSU	PD 0758.0016.22
Signal Analyzers R&S®FSQ	PD 0758.0945.21
Measuring Receiver R&S®FSMR	PD 0758.2319.12



More information at
www.rohde-schwarz.com
(search term: FSP/FSU/FSQ/FSMR/FS-K40)



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