Phase Noise Measurement Software FS-K4

Phase noise measurements with Spectrum Analyzers FSE/FSIQ/FSP/FSU and EMI Test Receivers ESIB/ESPI

- User-editable sweep settings
- Fast residual FM/φM measurements
- Comprehensive marker functions
- Storage of results and settings
- Detailed screen printouts

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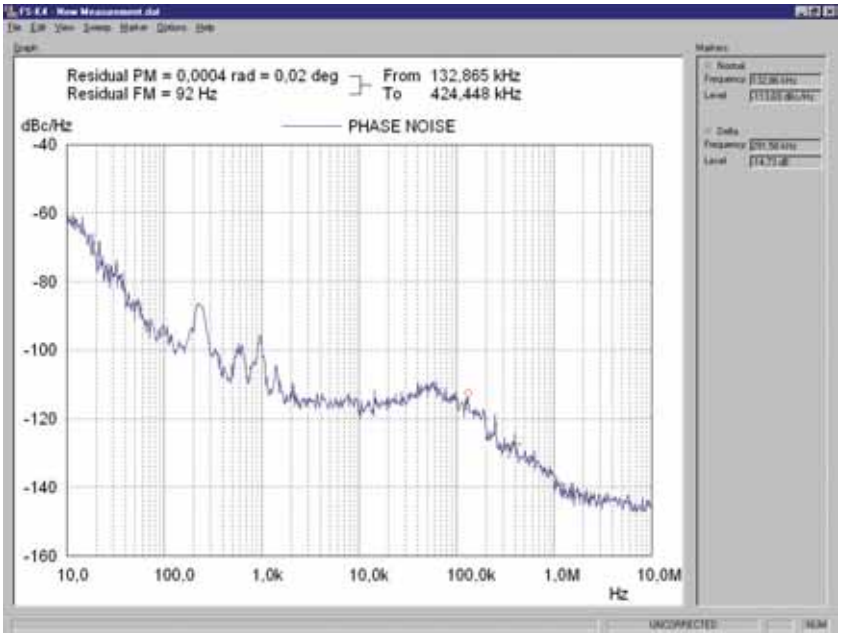


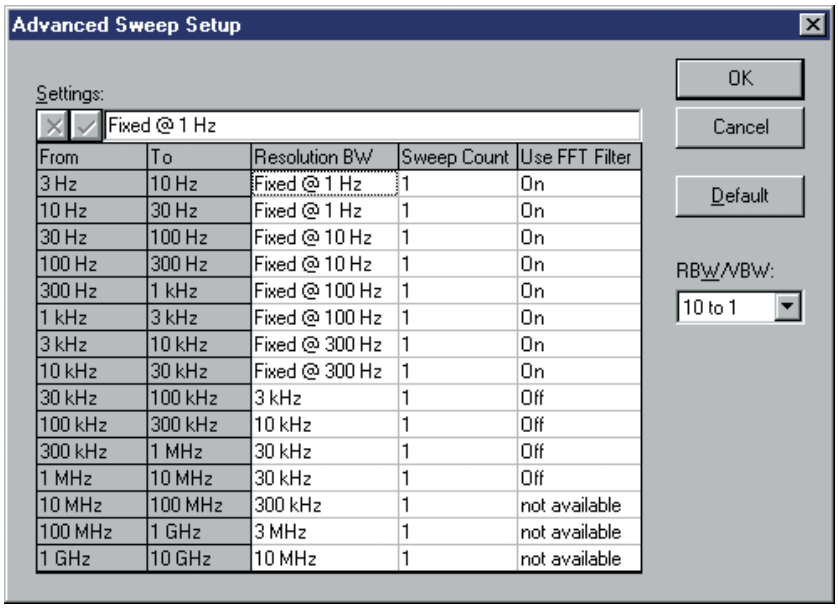
The Phase Noise Measurement Software FS-K4 extends the measurement capabilities of Rohde&Schwarz Spectrum Analyzers and EMI Test Receivers to give a phase noise tester. The FSE and the FSU are ideal for this purpose because of their low inherent phase noise and noise figure.

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

The Software FS-K4 runs on the FSE with the Controller Function FSE-B15 fitted (WindowsNT), or on an external PC (Windows 9x or later) with GBIP controller. The FSIQ/FSP/FSU/ESIB and ESPI provide the controller function as standard.

- **Marker functions**
  The marker functions allow easy display of numeric phase noise values for a given carrier offset; for continuous phase noise measurement at a given frequency, the analyzers are tuned to the marker frequency
- **Sweep settings**
  Resolution bandwidth and sweep count can be set separately for each frequency range

- **Detailed screen printouts**
  Screen printouts with editable comments allow fast and detailed documentation of measurement results
- **Storage of results**
  Storage of all measurement results together with relevant analyzer settings for each result on hard disk or floppy disk
- **Fast residual FM/φM measurements**
  After positioning of marker and delta marker in the phase noise diagram, the residual FM/φM is calculated by the Software FS-K4 for the selected offset range; the residual φM is displayed in degrees and radians
- **Limit line**
  An editable limit line allows fast comparison of measurement results and given limits



From	To	Resolution BW	Sweep Count	Use FFT Filter
3 Hz	10 Hz	Fixed @ 1 Hz	1	On
10 Hz	30 Hz	Fixed @ 1 Hz	1	On
30 Hz	100 Hz	Fixed @ 10 Hz	1	On
100 Hz	300 Hz	Fixed @ 10 Hz	1	On
300 Hz	1 kHz	Fixed @ 100 Hz	1	On
1 kHz	3 kHz	Fixed @ 100 Hz	1	On
3 kHz	10 kHz	Fixed @ 300 Hz	1	On
10 kHz	30 kHz	Fixed @ 300 Hz	1	On
30 kHz	100 kHz	3 kHz	1	Off
100 kHz	300 kHz	10 kHz	1	Off
300 kHz	1 MHz	30 kHz	1	Off
1 MHz	10 MHz	30 kHz	1	Off
10 MHz	100 MHz	300 kHz	1	not available
100 MHz	1 GHz	3 MHz	1	not available
1 GHz	10 GHz	10 MHz	1	not available

Specifications

Frequency range

FSEA30	20 Hz to 3.5 GHz
FSEB30	20 Hz to 7 GHz
FSEM30	20 Hz to 26.5 GHz
FSEK30	20 Hz to 40 GHz
FSIQ3	20 Hz to 3.5 GHz
FSIQ7	20 Hz to 7 GHz
FSIQ26	20 Hz to 26.5 GHz
ESIB7	20 Hz to 7 GHz
ESIB26	20 Hz to 26.5 GHz
ESIB40	20 Hz to 40 GHz
FSP3	9 kHz to 3 GHz
FSP7	9 kHz to 7 GHz
FSP13	9 kHz to 13 GHz
FSP30	9 kHz to 30 GHz
ESPI3	9 kHz to 3 GHz
ESPI7	9 kHz to 7 GHz
FSU3	20 Hz to 3 GHz
FSU8	20 Hz to 8 GHz

Averaging

RBW:VBW ratio in video averaging	1:10, 1:1, 10:1
Trace averaging	implemented
Smoothing window	1 to 199 points

Carrier offset frequency range/number of decades

The maximum number of decades that can be represented in a phase noise diagram is defined by the carrier offset frequency range.

Analyzer and test receiver models	FSEA30, FSEB30 FSIQ3/7, ESIB7 FSP3/7, ESPI3/7	FSEM30, FSEK30 FSIQ26, ESIB26/40 FSP13/30	FSU3/8
Lower offset limit	10 Hz	10 Hz	3 Hz
Upper offset limit	1 GHz	10 GHz	1 GHz
Max. number of decades	8	9	9

Nominal measurement accuracy (RSS error, 95% confidence level)

Minimum phase noise level 95 dB below reference level, FFT deactivated, return loss of source >14 dB (VSWR <1.5: 1), signal-to-noise ratio ≥10 dB

Center frequency	≤3.5 GHz	≤7 GHz	≤18 GHz	≤26.5 GHz	≤40 GHz
Offset ≤10 MHz	1.5 dB	1.6 dB	1.9 dB		
Offset >10 MHz	1.8 dB	2 dB	2.9 dB	3.4 dB	3.9 dB

Repeatability
(95% confidence level) ±0.8 dB
RBW:VBW 10:1, trace averaging <15, smoothing window ≥9

System phase noise

A systematic measurement uncertainty is introduced by the inherent phase noise of the measuring instrument. Figures below show typical phase noise curves of the analyzer models for different center frequencies.

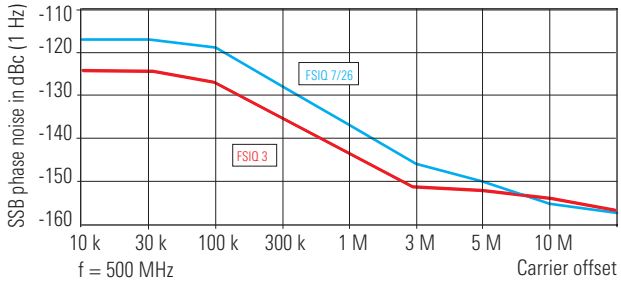


Fig. 1: SSB phase noise of the FSIQ models

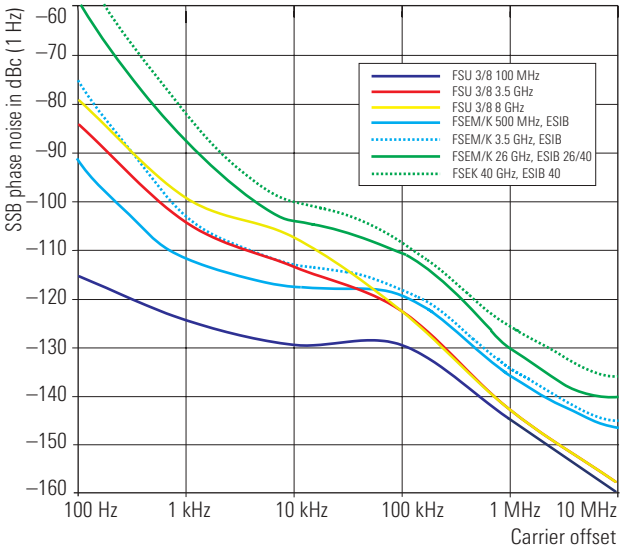


Fig. 2: SSB phase noise of FSEx/FSU/ESIB

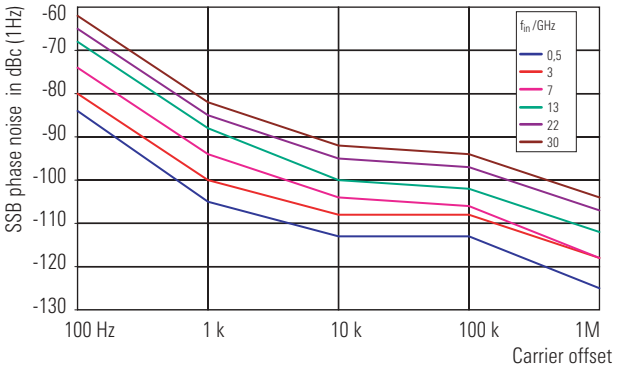


Fig. 3: SSB phase noise of FSP/ESPI vs offset

System requirements

Control via external PC/IEEE bus
Windows 9x/NT4.0/2000 (English version)
IEEE 488 interface
AT/TNT/PCMCIA IEEE card

Control via FSE
Controller FSE-B15 for FSE

Control via FSIQ, FSP, FSU, ESIB, ESPI

Ordering information

Phase Noise Measurement Software	FS-K4	1108.0088.02

Recommended options for FSE

Controller for FSE (Windows NT, English)	FSE-B15	1073.5696.06
Increased Level Accuracy up to 2 GHz	FSE-B22	1106.3480.02

Related data sheets

Spectrum Analyzers FSEx	PD 0757.1519
Spectrum Analyzer FSP	PD 0757.5137
Spectrum Analyzer FSU	PD 0757.6504
Signal Analyzer FSIQ	PD 0757.4160
EMI Test Receiver ESIB	PD 0757.4576
Test Receiver ESPI	PD 0757.6540

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