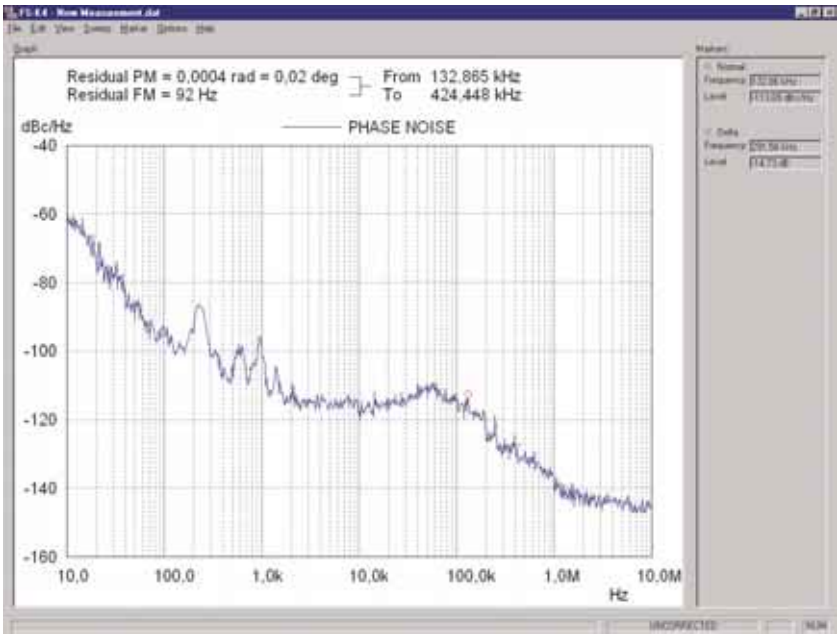




## Phase Noise Measurement Software R&S FS-K4

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

- ◆ User-editable sweep settings
- ◆ Fast residual FM/ $\phi$ M measurements
- ◆ Comprehensive marker functions
- ◆ Storage of results and settings
- ◆ Detailed screen printouts



Phase Noise Measurement Software R&S FS-K4 extends the measurement capabilities of Rohde&Schwarz spectrum analyzers and EMI test receivers to give a phase noise tester. The R&S FSE, the R&S FSU and the R&S FSQ 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 ( $\leq 1$  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.

Software R&S FS-K4 runs on the R&S FSE with the Controller Function R&S FSE-B15 fitted (Windows NT), or on an external PC (Windows 9x or later) with GBIP controller. The R&S FS1Q/FSQ/FSP/FSU/ESIB/ESPI provide the controller function as standard.

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

**Advanced Sweep Setup**

Settings:

From	To	Resolution BW	Sweep Count	Use FFT Filter
<input checked="" type="checkbox"/> Fixed @ 1 Hz				
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

Buttons: OK, Cancel, Default

RBW/VBW: 10 to 1

- ◆ **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/ $\phi$ M measurements**  
After positioning of marker and delta marker in the phase noise diagram, the residual FM/ $\phi$ M is calculated by Software R&S FS-K4 for the selected offset range; the residual  $\phi$ M is displayed in degrees and radians
- ◆ **Limit line**  
An editable limit line allows fast comparison of measurement results and specified limits

# Specifications

## Frequency range

R&S FSEA30 20 Hz to 3.5 GHz  
 R&S FSEB30 20 Hz to 7 GHz  
 R&S FSEM30 20 Hz to 26.5 GHz  
 R&S FSEK30 20 Hz to 40 GHz

R&S FSIO3 20 Hz to 3.5 GHz  
 R&S FSIO7 20 Hz to 7 GHz  
 R&S FSIO26 20 Hz to 26.5 GHz

R&S ESIB7 20 Hz to 7 GHz  
 R&S ESIB26 20 Hz to 26.5 GHz  
 R&S ESIB40 20 Hz to 40 GHz

R&S FSP3 9 kHz to 3 GHz  
 R&S FSP7 9 kHz to 7 GHz  
 R&S FSP13 9 kHz to 13 GHz  
 R&S FSP30 9 kHz to 30 GHz  
 R&S FSP40 9 kHz to 40 GHz

R&S ESPI3 9 kHz to 3 GHz  
 R&S ESPI7 9 kHz to 7 GHz

R&S FSU3/R&S FSQ3 20 Hz to 3 GHz  
 R&S FSU8/R&S FSQ8 20 Hz to 8 GHz  
 R&S FSU26/R&S FSQ26 20 Hz to 26.5 GHz

## Averaging

RBW:VBW ratio in video averaging 1:10, 1:1, 10:1 implemented  
 Trace averaging

Smoothing window 1 to 199 points

## Carrier offset frequency range

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

Lower offset limit	
All R&S FSE, R&S FSIO, R&S ESIB, R&S FSP R&S ESPI models	10 Hz
All R&S FSU and R&S FSQ models	1 Hz
Upper offset limit	
Analyzer frequency range < 10 GHz	1 GHz
Analyzer frequency range > 10 GHz	10 GHz

## 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.

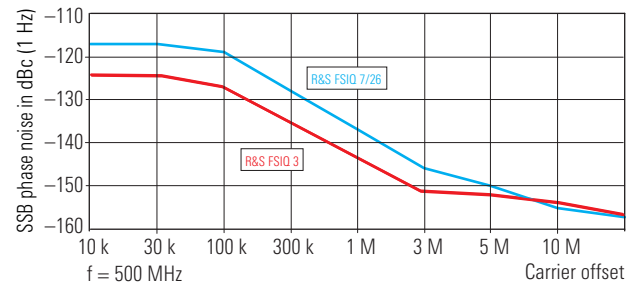


Fig. 1: SSB phase noise of R&S FSIO

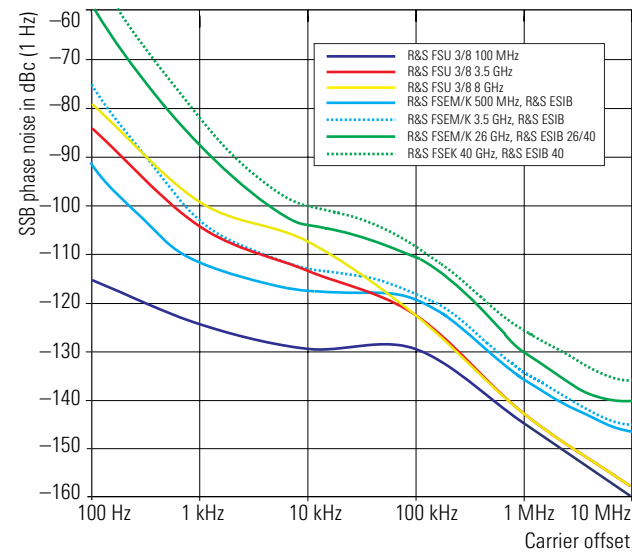


Fig. 2: SSB phase noise of R&S FSE/FSU/ESIB

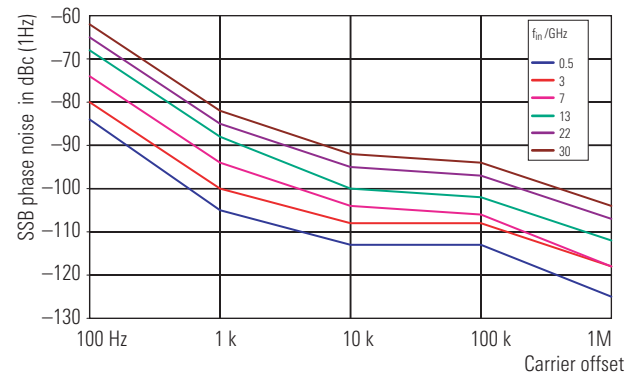


Fig. 3: SSB phase noise of R&S FSP/ESPI versus offset

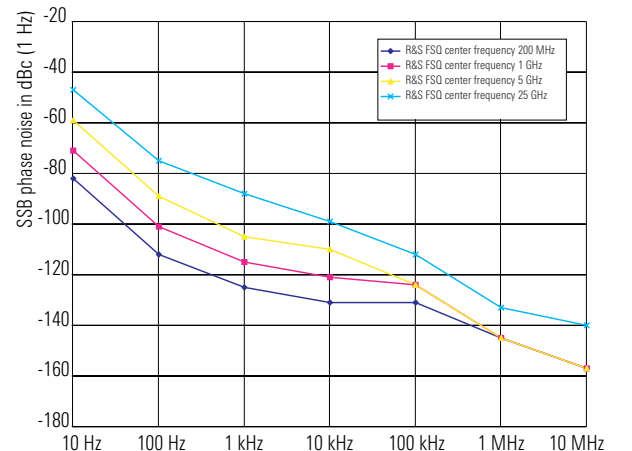


Fig. 4: Phase noise of R&S FSQ at various center frequencies versus offset

## System requirements

### Control via external PC/IEEE bus

Windows 9x/NT4.0/2000/XP (English version)  
IEEE488 interface  
AT/TNT/PCMCIA IEEE card

### Control via R&S FSE

Controller R&S FSE-B15 for R&S FSE

### Control via R&S FSIO/ESIB

### Control via R&S FSP/FSU/FSQ/ESPI

External keyboard and mouse (i.e. R&S PSP-Z2 and R&S FSE-Z2)

## Ordering information

Phase Noise Measurement Software	R&S FS-K4	1108.0088.02
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### Recommended options for R&S FSE

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

### Related data sheets

Spectrum Analyzers R&S FSEx	PD 0757.1519
Spectrum Analyzer R&S FSP	PD 0757.5137
Spectrum Analyzer R&S FSU	PD 0757.6504
Signal Analyzer R&S FSIO	PD 0757.4160
EMI Test Receiver R&S ESIB	PD 0757.4576
Test Receiver R&S ESPI	PD 0757.6540
Signal Analyzer R&S FSQ	PD 0757.7652



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