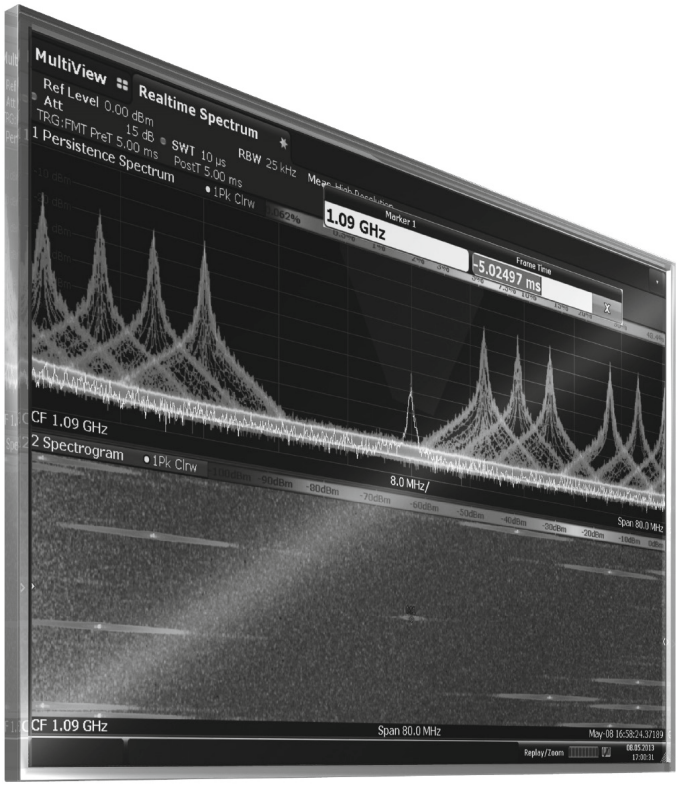
R&S®FSW-K160RE
160 MHz Real-Time Measurement Application
Specifications



Test & Measurement
Data Sheet | 02.00

ROHDE&SCHWARZ

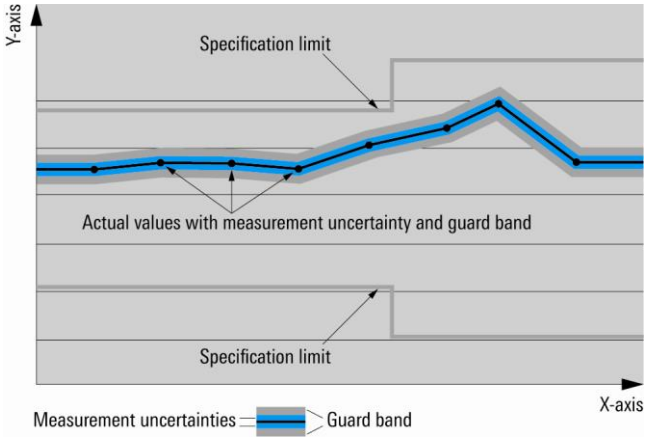
CONTENTS

Definitions

General
Product data applies under the following conditions:

- Three hours storage at ambient temperature followed by 30 minutes warm-up operation
- Specified environmental conditions met
- Recommended calibration interval adhered to
- All internal automatic adjustments performed, if applicable

Specifications with limits
Represent warranted product performance by means of a range of values for the specified parameter. These specifications are marked with limiting symbols such as <, ≤, >, ≥, ±, or descriptions such as maximum, limit of, minimum. Compliance is ensured by testing or is derived from the design. Test limits are narrowed by guard bands to take into account measurement uncertainties, drift and aging, if applicable.



Specifications without limits
Represent warranted product performance for the specified parameter. These specifications are not specially marked and represent values with no or negligible deviations from the given value (e.g. dimensions or resolution of a setting parameter). Compliance is ensured by design.

Typical data (typ.)
Characterizes product performance by means of representative information for the given parameter. When marked with <, > or as a range, it represents the performance met by approximately 80 % of the instruments at production time. Otherwise, it represents the mean value.

Nominal values (nom.)
Characterize product performance by means of a representative value for the given parameter (e.g. nominal impedance). In contrast to typical data, a statistical evaluation does not take place and the parameter is not tested during production.

Measured values (meas.)
Characterize expected product performance by means of measurement results gained from individual samples.

Uncertainties
Represent limits of measurement uncertainty for a given measurand. Uncertainty is defined with a coverage factor of 2 and has been calculated in line with the rules of the Guide to the Expression of Uncertainty in Measurement (GUM), taking into account environmental conditions, aging, wear and tear.

Device settings and GUI parameters are indicated as follows: “parameter: value”.

Typical data as well as nominal and measured values are not warranted by Rohde & Schwarz.

Specifications

The specifications of the R&S®FSW-K160RE measurement application are based on the specifications in the data sheet for the R&S®FSW signal and spectrum analyzer. For frequencies > 8 GHz, the specifications for YIG preselector = off apply.

The R&S®FSW-K160RE 160 MHz real-time measurement application requires:

- R&S®FSW-B160 160 MHz analysis bandwidth option or
- R&S®FSW-B320 320 MHz analysis bandwidth option

Span		
Range		1 kHz to 160 MHz
Resolution		1 Hz

Frequency readout		
Number of sweep (trace) points		1001
Marker resolution		0.01 Hz
Uncertainty		±(marker frequency × reference uncertainty + 10 % × resolution bandwidth + ½ (span/(sweep points –1)) + 1 Hz)
Marker tuning frequency step size		span/1000

Sweep time		
	span/RBW ratio ≤ 200	
Range	real-time spectrum, real-time spectrogram, 160 MHz span	96 µs to 1 s [1]
Resolution		48 µs

Data acquisition		
Input	standard	RF
	with R&S®FSW-B21 option	external mixer
Output	with R&S®FSW-B17 option	digital baseband
FFT length		32/64/128/256/512/1024/2048/4096/8192/16384
FFT window		Blackman Harris, Flattop, Gaussian, Rectangular, Hanning, Hamming, Kaiser
Max. spectrum (FFT) processing rate		58 824/s
Minimum detectable signal duration	span = 160 MHz, SNR > 60 dB	17 µs (nom.)

Resolution bandwidths		
Range	Blackman Harris FFT window	0.3 Hz to 10 MHz, with respect to the supported span/RBW ratios
	Blackman Harris FFT window, with R&S®FSW-B8 option	10 MHz to 25.6 MHz, with respect to the supported span/RBW ratios
Span/RBW ratio with Blackman Harris FFT window		6.25 to 3200
Bandwidth uncertainty		< 3 % (nom.)

[1] Time period during which individual FFTs contribute to the results of the selected trace detector.

Level

Span ≤ 80 MHz	
Amplitude flatness	see R&S®FSW data sheet, section I/Q data – Amplitude flatness [2]
Nonlinearity of displayed level	see R&S®FSW data sheet, section I/Q data – Nonlinearity of displayed level [2]
Level measurement uncertainty	see R&S®FSW data sheet, section I/Q data – Level measurement uncertainty [2]
Third-order intermodulation distortion	see R&S®FSW data sheet, section I/Q data – Third-order intermodulation distortion [2]
ADC related spurious response	see R&S®FSW data sheet, section I/Q data – ADC related spurious response [2]
Other spurious responses	see R&S®FSW data sheet, section I/Q data – Other spurious responses [2]

Span > 80 MHz	
Amplitude flatness	see R&S®FSW data sheet, section I/Q data – Signal analysis bandwidth 80 MHz to 160 MHz – Amplitude flatness [3]
Nonlinearity of displayed level	see R&S®FSW data sheet, section I/Q data – Signal analysis bandwidth 80 MHz to 160 MHz – Nonlinearity of displayed level [3]
Level measurement uncertainty at center frequency	see R&S®FSW data sheet, section I/Q data – Signal analysis bandwidth 80 MHz to 160 MHz – Level measurement uncertainty at center frequency [3]
Third-order intermodulation distortion	see R&S®FSW data sheet, section I/Q data – Signal analysis bandwidth 80 MHz to 160 MHz – Third-order intermodulation distortion [3]
Residual spurious response	see R&S®FSW data sheet, section I/Q data – Signal analysis bandwidth 80 MHz to 160 MHz – Residual spurious response [3]
ADC related spurious response	see R&S®FSW data sheet, section I/Q data – Signal analysis bandwidth 80 MHz to 160 MHz – ADC related spurious response [3]
Other spurious responses	see R&S®FSW data sheet, section I/Q data – Signal analysis bandwidth 80 MHz to 160 MHz – Other spurious responses [3]

Minimum signal duration for 100 % probability of intercept with full amplitude accuracy [4]	Blackman Harris FFT window, trace detector = max. peak					
	Span	Span/RBW ratio = 6.25	Span/RBW ratio = 50	Span/RBW ratio = 200	Span/RBW ratio = 800	Span/RBW ratio = 3200
	160 MHz	17 µs	17 µs	17 µs	27.3 µs	109 µs
	100 MHz	17 µs	17 µs	17 µs	39.6 µs	158 µs
	80 MHz	17 µs	17 µs	17 µs	47.8 µs	191 µs
	40 MHz	17 µs	17 µs	22.2 µs	88.8 µs	355 µs
	20 MHz	17 µs	17 µs	42.7 µs	171 µs	683 µs
	10 MHz	17 µs	22.2 µs	83.6 µs	335 µs	1.34 ms
	1 MHz	27.3 µs	206 µs	820 µs	3.28 ms	13.1 ms

[2] Span in the R&S®FSW-K160RE is referred to as “signal analysis bandwidth” in the R&S®FSW data sheet, here for analysis bandwidth ≤ 80 MHz.

[3] Span in the R&S®FSW-K160RE is referred to as “signal analysis bandwidth” in the R&S®FSW data sheet, here for analysis bandwidth > 80 MHz.

[4] Events lasting shorter than the minimum signal duration specification will result in degraded level accuracy.

Result display

Result display types with or without active frequency mask trigger, or in any combination		real-time spectrum, persistence spectrum, real-time spectrogram

Real-time spectrum		
Number of traces		4
Trace detector		max. peak, min. peak, average, sample
Trace functions		clear/write, max. hold, min. hold, view
Number of markers		16
Marker readout		frequency, level
Maximum sweep update rate [5]		10 000/s

Persistence spectrum		
Persistence bitmap resolution		1001 × 600 points
Persistence bitmap color depth		256 colors
Probability range covered by bitmap colors		selectable, 0 % to 100 %
Persistence duration		0 s to 8 s
Number of markers		16
Marker readout		frequency, level, hit probability
Number of real-time traces	in addition to persistence spectrum display	1
Real-time trace detector		max. peak, min. peak, sample, average
Real-time trace functions		clear/write, max. hold, min. hold

Spectrogram		
Result display		color-graded bitmap
Spectrogram bitmap color depth		240 colors
Dynamic range covered by bitmap colors		selectable, up to 200 dB (nom.)
History depth		max. 100 000 frames [6]
Recording mode		single trace, continuous, frame count
Trace detector		max. peak, min. peak, sample
Number of markers		16
Marker readout		frequency, time/frame number, level
Maximum sweep update rate [5]		10 000/s

Trigger

Trigger source		free run, frequency mask, external

Frequency mask trigger		
Trigger level resolution		0.5 dB
Minimum required mask distance to noise floor		30 dB (nom.)
Dynamic range	frequency mask – reference level	0 dB to –80 dB (nom.)
Trigger level accuracy	frequency mask > reference level – 50 dB	±(frequency response + 1.0 dB) (nom.)
	frequency mask > reference level – 70 dB	±(frequency response + 2.5 dB) (nom.)
Trigger uncertainty	span = 160 MHz, span/RBW ratio = 6.25	±25 µs (nom.)
Trigger conditions		enter mask area, leave mask area
Trigger modes		auto rearm trigger, stop on trigger
Trigger mask		
Mask length		3 to 1001 frequency points
Mask frequency resolution		span/1001
Mask shape generation		manual, auto set (mask derived from the measured spectrum)

Trigger out		
Connector		BNC female
Output		TTL-compatible, 0 V/5 V (nom.)

[5] Sweep update rate includes FFT overlap and trace detector processing.

[6] A frame is the measurement result displayed in one row of the spectrogram. It may consist of one or more traces, depending on the set sweep count. For example, a sweep count of 2 means that two traces will be combined to one row in the spectrogram using the set trace detector.

Ordering information

Options

Designation	Type	Order No.	Retrofittable	Remarks
160 MHz Real-Time Measurement Application, POI > 15 µs	R&S®FSW-K160RE	1313.7766.02		one of the R&S®FSW-B160/320 options is required, not available for R&S®FSW-B512, no export license required
Resolution Bandwidth > 10 MHz	R&S®FSW-B8	1313.2464.26	no	for R&S®FSW8/13/26, with span = 0 Hz; the signal analysis bandwidth is defined by the R&S®FSW-B28/40/80/160/ 160R/320/512/512R/2000 options, not by the R&S®FSW-B8 option
Resolution Bandwidth > 10 MHz	R&S®FSW-B8	1313.2464.02	no	for R&S®FSW43/50/67, with span = 0 Hz; the signal analysis bandwidth is defined by the R&S®FSW-B28/40/80/160/ 160R/320/512/512R/2000 options, not by the R&S®FSW-B8 option; export license required
160 MHz Analysis Bandwidth	R&S®FSW-B160	1325.4850.04	yes	contact service center
320 MHz Analysis Bandwidth	R&S®FSW-B320	1325.4867.04	yes	contact service center
Digital Baseband Interface	R&S®FSW-B17	1313.0784.02	yes	user-retrofittable
Highpass Filter for Harmonic Measurements	R&S®FSW-B13	1313.0761.02	yes	user-retrofittable
LO/IF Connections for external mixers	R&S®FSW-B21	1313.1100.26	yes	for R&S®FSW26; contact service center
LO/IF Connections for external mixers	R&S®FSW-B21	1313.1100.43	yes	for R&S®FSW43/50/67; contact service center

Upgrades

Designation	Type	Order No.	Retrofittable	Remarks
Analysis Bandwidth Upgrade from 28 MHz to 40 MHz	R&S®FSW-U40	1313.5205.02	yes	user-retrofittable, R&S®FSW-B28 required
Analysis Bandwidth Upgrade from 40 MHz to 80 MHz	R&S®FSW-U80	1313.5211.02	yes	user-retrofittable, R&S®FSW-B40 or R&S®FSW-U40 required
Analysis Bandwidth Upgrade from 80 MHz to 160 MHz	R&S®FSW-U160	1325.5357.04	yes	contact service center, R&S®FSW-B80 or R&S®FSW-U80 required
Analysis Bandwidth Upgrade from 160 MHz to 320 MHz	R&S®FSW-U320	1313.7189.02	yes	user-retrofittable, R&S®FSW-B160 or R&S®FSW-U160 required
Real-Time Spectrum Analyzer 160 MHz, POI ≤ 15 µs	R&S®FSW-U160R	1325.5357.06	yes	contact service center, R&S®FSW-B80 or R&S®FSW-U80 required; includes analysis bandwidth upgrade from 80 MHz to 160 MHz, export license required

Recommended extras

External harmonic mixers (for R&S®FSW26, R&S®FSW43, R&S®FSW50 and R&S®FSW67 with R&S®FSW-B21 option)		
Harmonic Mixer, 40 GHz to 60 GHz	R&S®FS-Z60	1089.0799.02
Harmonic Mixer, 50 GHz to 75 GHz	R&S®FS-Z75	1048.0271.02
Harmonic Mixer, 60 GHz to 90 GHz	R&S®FS-Z90	1048.0371.02
Harmonic Mixer, 75 GHz to 110 GHz	R&S®FS-Z110	1048.0471.02

See also R&S®FSW signal and spectrum analyzer data sheet (PD 5214.5984.22).

For R&S®FSW product brochure, see PD 5214.5984.12 and www.rohde-schwarz.com.

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- Environmental compatibility and eco-footprint
- Energy efficiency and low emissions
- Longevity and optimized total cost of ownership

Certified Quality Management
ISO 9001

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PD 3607.1759.22 | Version 02.00 | April 2016 (as)
R&S®FSW-K160RE 160 MHz Real-Time Measurement Application
Data without tolerance limits is not binding | Subject to change

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3607.1759.22 02.00 PDP 1 en