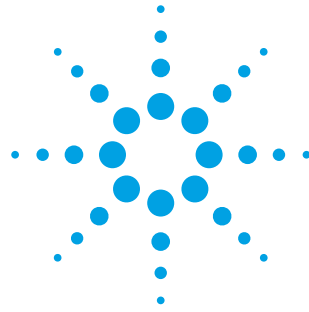


Agilent FieldFox RF Analyzer

N9912A

Technical Specifications



Agilent Technologies

Documentation Warranty

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Definitions

Specification (spec.)

Warranted performance. Specifications include guardbands to account for the expected statistical performance distribution, measurement uncertainties, and changes in performance due to environmental conditions. The following conditions must be met:

- FieldFox has been turned on at least 90 minutes
- FieldFox is within its calibration cycle
- Storage or operation at 25°C ±5 °C range (unless otherwise stated)

Typical (typ.)

Expected performance of an average unit over a 20 °C to 30 °C temperature range after being at ambient temperature for two hours, unless otherwise indicated; does not include guardbands. It is not covered by the product warranty. The FieldFox must be within its calibration cycle.

Nominal (nom.)

A general, descriptive term or design parameter. It is not tested, and not covered by the product warranty.

Calibration

The process of measuring known standards to characterize an instrument's systematic (repeatable) errors.

Corrected (residual)

Indicates performance after error correction (calibration). It is determined by the quality of calibration standards and how well "known" they are, plus system repeatability, stability, and noise.

Uncorrected (raw)

Indicates instrument performance without error correction. The uncorrected performance affects the stability of a calibration.

Cable and Antenna Analyzer

Description	Specification	Typical		Supplemental Information
		10 minute warm up	90 minute warm up	
Frequency Range				
Option 104	2 MHz to 4 GHz			
Option 106	2 MHz to 6 GHz			
Frequency Reference				
Accuracy	±2 ppm	±2 ppm		
Aging Rate	±1 ppm/yr	±1 ppm/yr		
Temperature Stability	±1 ppm over 0 to 55 °C	±1 ppm		
Frequency Resolution				
2 MHz to 1.6 GHz	2.5 kHz			
> 1.6 GHz to 3.2 GHz	5 kHz			
> 3.2 GHz to 6 GHz	10 kHz			
Data Points				
	101, 201, 401, 601, 801, 1001			
Measurement Speed				
Return Loss				
1.75 GHz – 3.85 GHz, 1001 points, Cal ON				1.5 ms/point (nominal)
DTF				
0 to 500 ft, 601 points, Cal ON				2.4 ms/point (nominal)
Output Power (RF Out Port)				
High				
2 MHz to 4 GHz				< +8 dBm, +6 dBm (nominal)
> 4 GHz to 6 GHz				< +7 dBm, +2 dBm (nominal)
Low (Typically 31 dB below high power)				
2 MHz to 4 GHz				< -23 dBm, -25 dBm (nominal)
> 4 GHz to 6 GHz				< -24 dBm, -25 dBm (nominal)
Immunity to Interfering Signals				
				+16 dBm (nominal)

Cable and Antenna Analyzer (continued)

Description	Specification	Typical	
		10 minute warm up	90 minute warm up
Directivity			
Corrected with OSL calibration ¹	>42 dB	>42 dB	
Corrected with QuickCal (Option 111) ³			≥42 dB
Raw			
2 MHz to 3.5 GHz			> 20 dB
> 3.5 GHz to 6 GHz			> 14 dB
Source Match			
Corrected with OSL calibration ¹	> 36 dB	> 36 dB	
Corrected with QuickCal (Option 111) ³			≥35 dB
Raw			
2 MHz to 3 GHz			> 25 dB
> 3 GHz to 6 GHz			> 16 dB
Reflection Tracking			
Corrected with OSL calibration ¹	±0.06 dB	±0.06 dB	
Corrected with QuickCal (Option 111) ³			±0.15 dB
Reflection Dynamic Range			
Reflection (RF Out port) (High power out)			
2 MHz to 4 GHz		60 dB	
> 4 GHz to 6 GHz		55 dB	
Maximum Measurable Cable Loss Using 1–Port CAT Measurement Model ²			
			Refl Dyn Range /2
Transmission Dynamic Range(Option 110)			
300 Hz IF Bandwidth			
2 MHz to 2 GHz		72 dB	
> 2 GHz to 3 GHz		67 dB	
> 3 GHz to 5 GHz		58 dB	
> 5 GHz to 6 GHz		49 dB	
Return Loss			
Display Range	0 to 100 dB		
Resolution	0.01 dB		
VSWR			
Display Range	1 to 100		
Resolution	0.01		
Cable Loss			
Display Range	0 to 100 dB		
Resolution	0.01 dB		

Cable and Antenna Analyzer (continued)

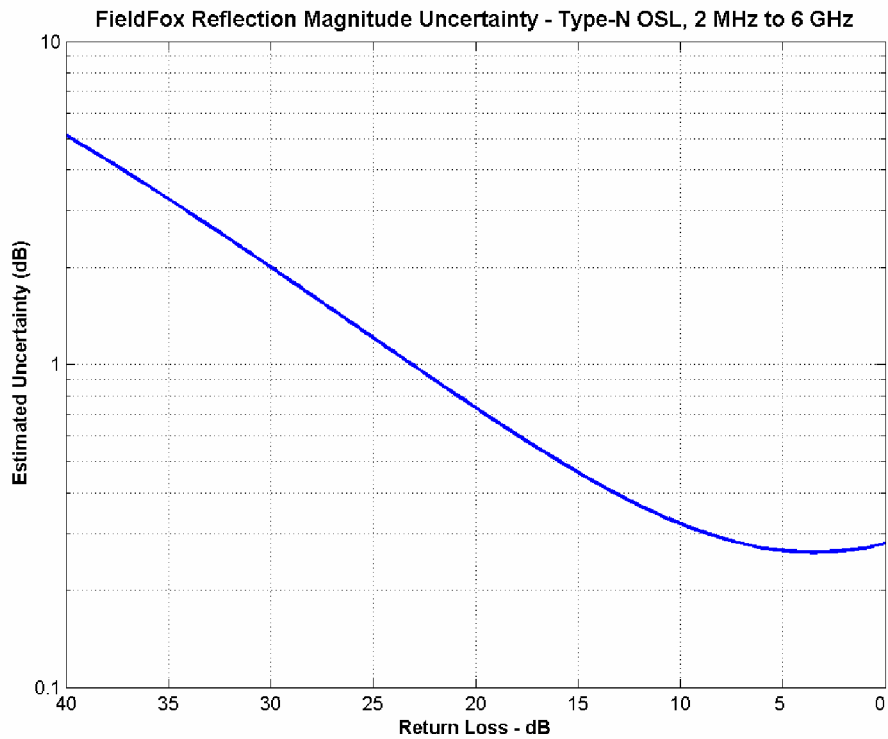
Description	Specification	Supplemental Information
Distance-to-Fault		
Horizontal Range	Range = [(number of points – 1) / frequency span * 2] * velocity factor * speed of light	Number of points auto coupled according to start and stop distance entered
Horizontal Resolution	Resolution = Range / (number of points – 1)	Number of points settable by user
Bandpass Mode Window Types		Maximum, medium, and minimum windows

¹ Using recommended calibration kits.

² Higher cable losses can be measured using transmission or S21 measurements. Cable losses measured in transmission mode limited by transmission dynamic range.

³ QuickCal is performed with the connect LOAD step.

Figure 1: CAT Mode, Type-N Calibration Kit – Magnitude (Specification)



Cable and Antenna Analyzer (continued)

Figure 2: CAT Mode, QuickCal – Magnitude (Typical)

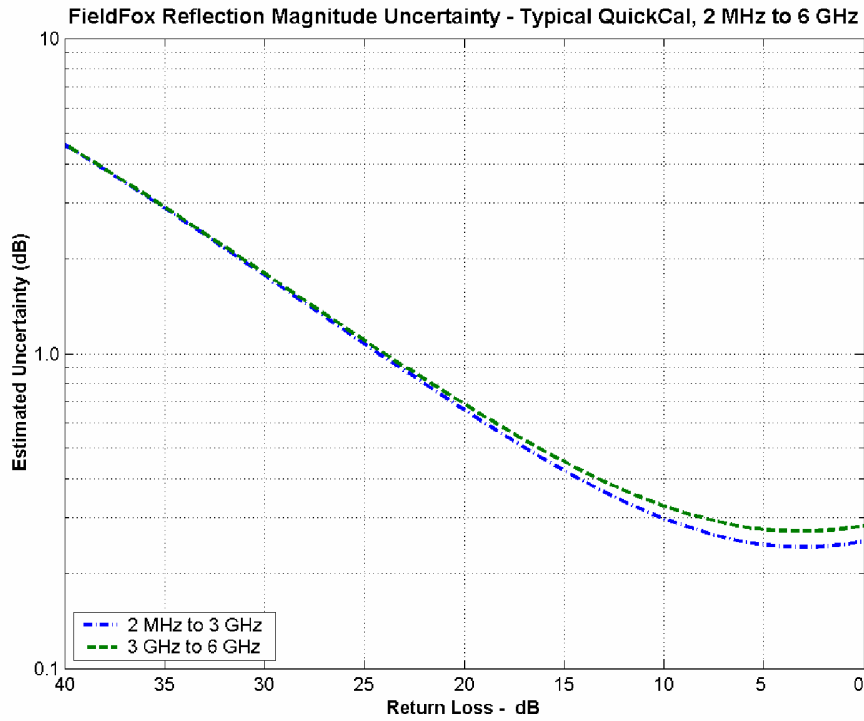
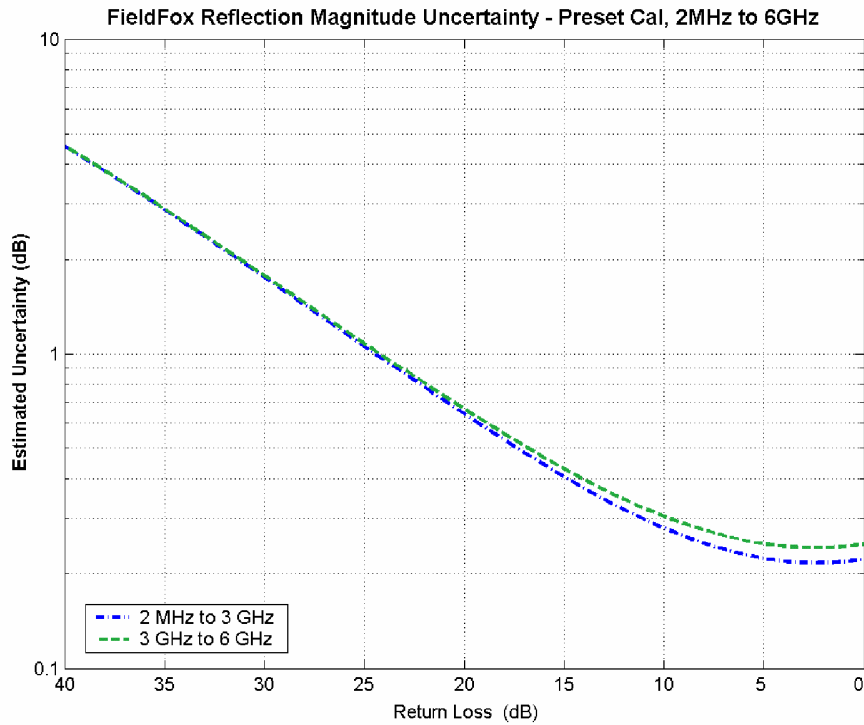


Figure 3: CAT Mode, Preset Cal – Magnitude (Typical)



Network Analyzer (Option 303)

The following CAT mode performance parameters apply to NA mode: frequency accuracy, frequency resolution, output power, directivity, source match, reflection tracking, and reflection and transmission dynamic range. NA mode performance that is in addition to CAT mode is listed in the table below.

Description	Specification	Supplemental Information
Frequency Range		
	2 MHz to 4 GHz	Option 104
	2 MHz to 6 GHz	Option 106
Measurements		
		S11 magnitude and phase S21 magnitude (option 110) A receiver magnitude R receiver magnitude
Formats		
		Log magnitude, Linear magnitude, VSWR, Phase, Smith Chart, Polar
Measurement Speed		
S11: 1.75 GHz – 3.85 GHz, 1001 Points, Cal ON		1.5 ms/point (nominal)
S21: 1.78 GHz – 2.06 GHz, 201 Points, Cal ON		1.9 ms/point (nominal)
S11 Phase Uncertainty¹		
	See Figure 5 on following page	
Display Range	–180° to +180°	
System Impedance		
	50Ω (nominal)	75Ω with appropriate adapter and Cal Kit

¹ Using recommended calibration kits.

Network Analyzer (continued)

Figure 4: NA Mode, Type-N Calibration Kit – Magnitude (Specification)

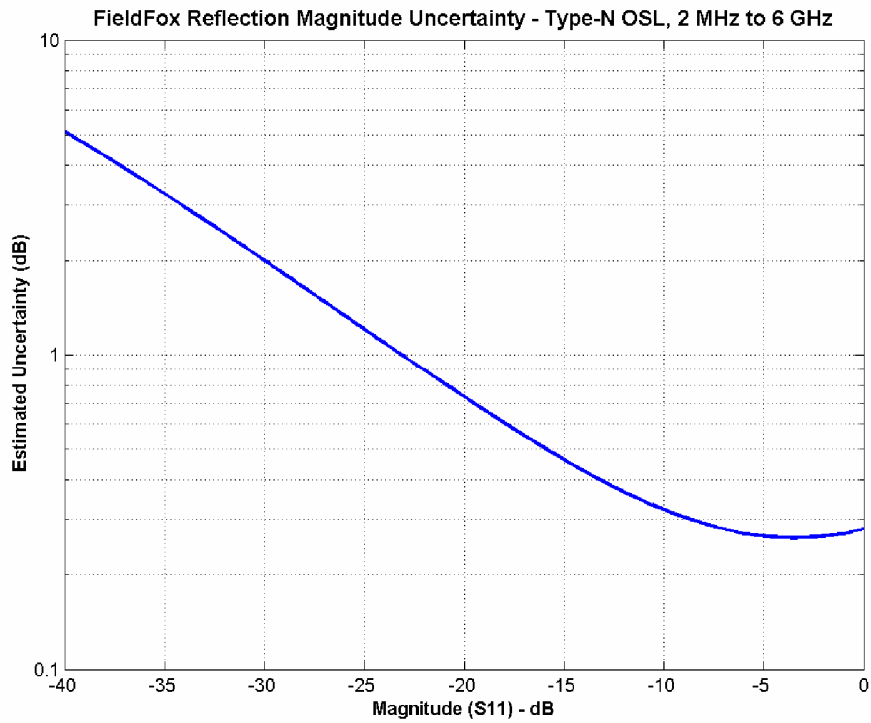
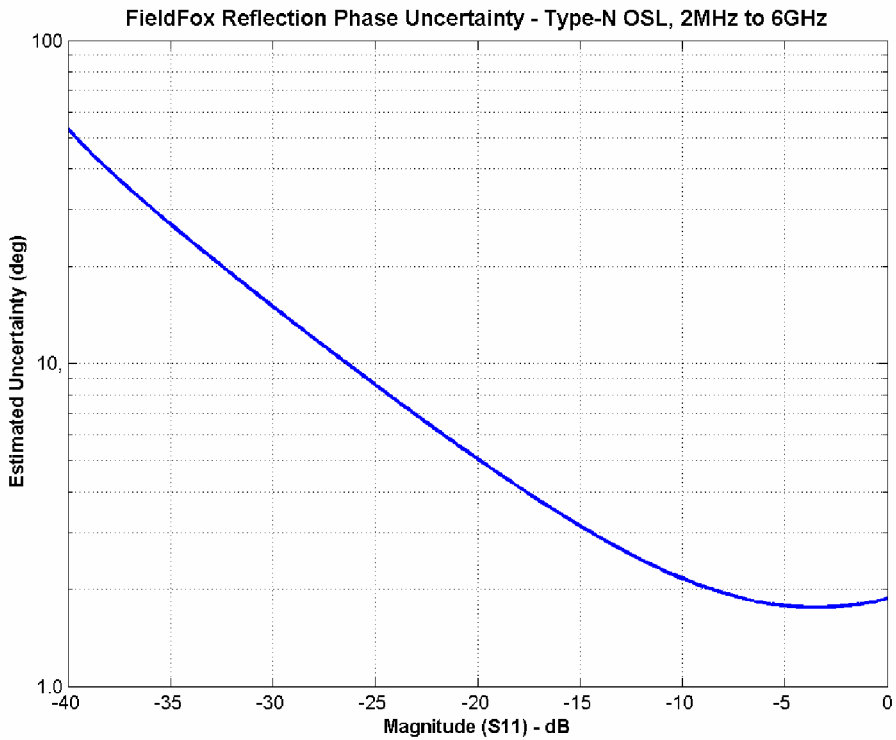
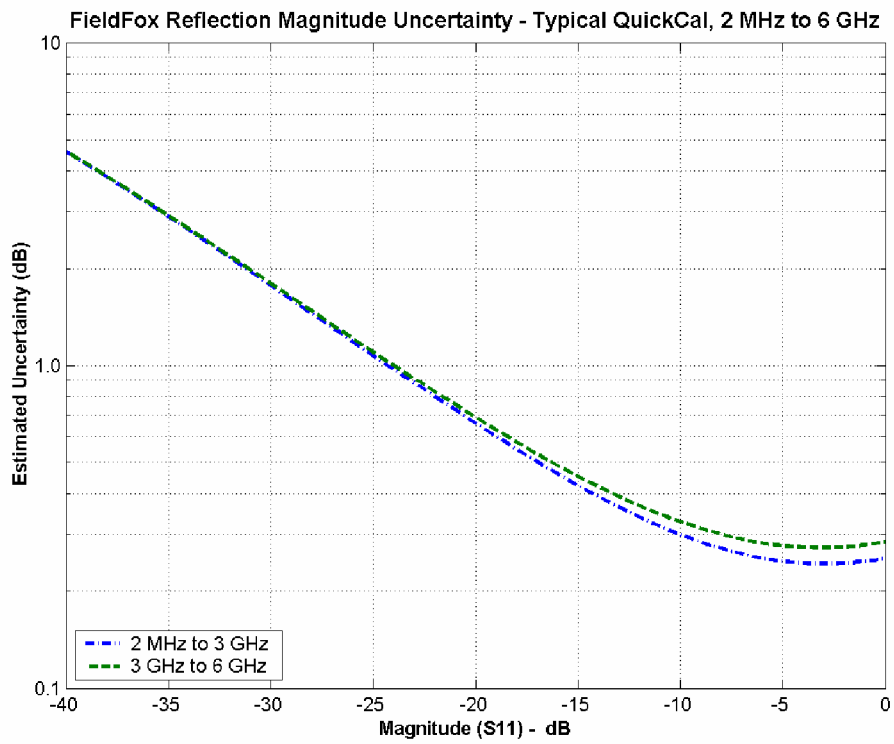


Figure 5: NA Mode, Type-N Calibration Kit – Phase (Specification)



Network Analyzer (continued)

Figure 6: NA Mode, QuickCal – Magnitude (Typical)



Network Analyzer (continued)

Figure 7: NA Mode, Preset Cal – Magnitude (Typical)

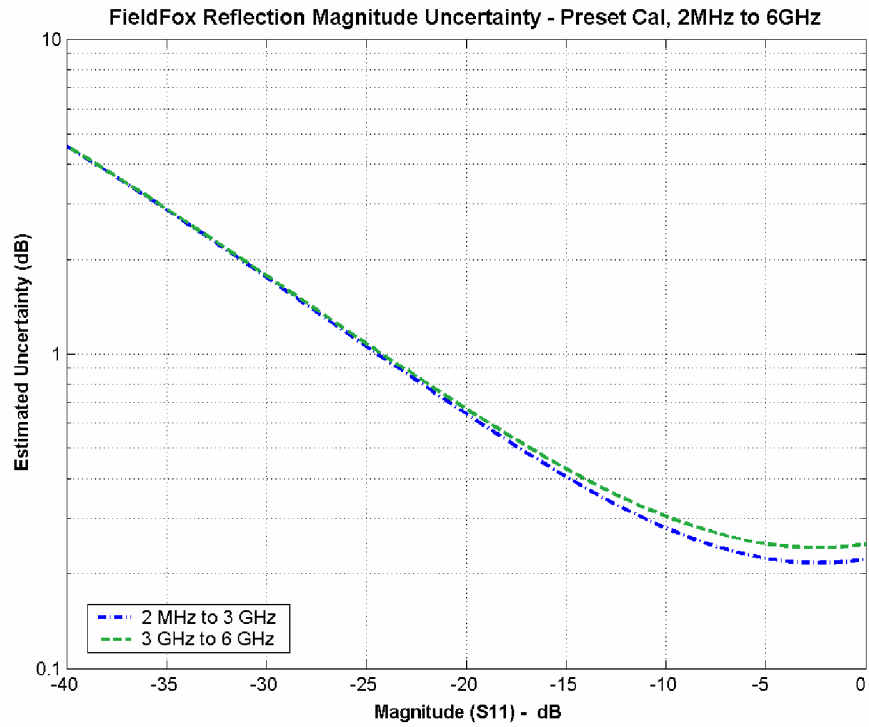
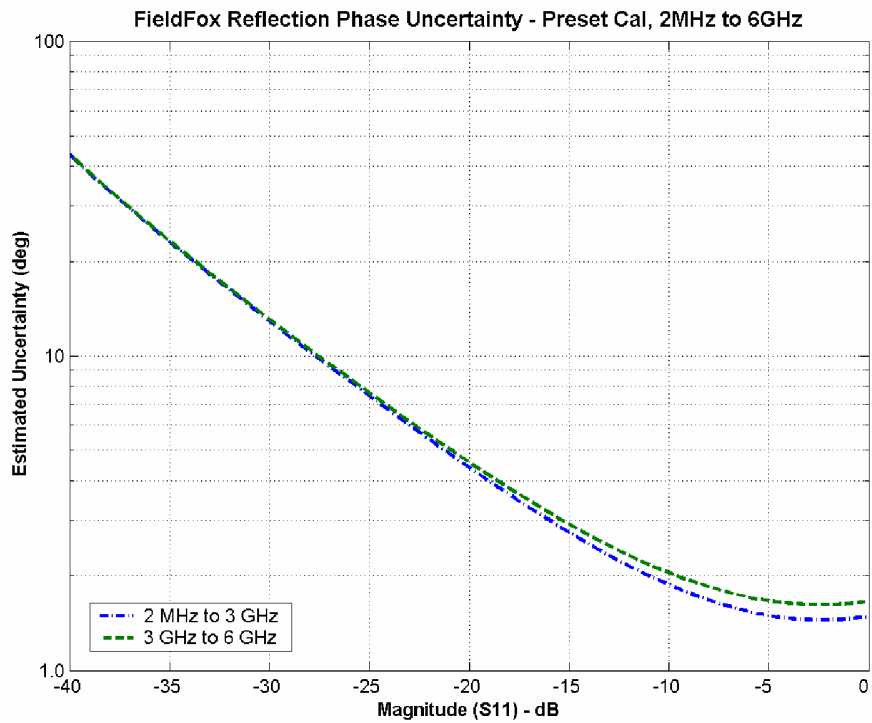


Figure 8: NA Mode, Preset Cal – Phase (Typical)



Spectrum Analyzer (Option 230 and 231)

Description	Specification	Supplemental Information
FREQUENCY		
Frequency Range		
Option 230	100 kHz to 4 GHz	Usable to 5 kHz ¹
Option 231	100 kHz to 6 GHz	Usable to 5 kHz ¹ Tunable to 6.1 GHz
Frequency Reference		
Accuracy	±2 ppm	
Aging Rate	± 1 ppm/yr	
Temperature Stability	± 1 ppm over –10 to 55 °C	
Frequency Readout Accuracy (start, stop, center, marker)		
	± (readout frequency x frequency reference accuracy + RBW centering + 0.5 x horizontal resolution)	Horizontal resolution = span/(trace points – 1) RBW centering : 5% x RBW, FFT mode (nominal) 16% x RBW, Step mode (nominal)
Frequency Span		
Range	0 Hz (zero span), 10 Hz to max freq	
Accuracy	±(2 x RBW centering + horizontal resolution)	±(2 x RBW centering + 2 x horizontal resolution) for detector = Normal
Resolution	1 Hz	
Sweep Time, Span = 0 Hz		
Range		
Minimum	1.0 us	
Maximum		
RBW = 2 MHz	2.18 ms	
RBW = 1 MHz	3.28 ms	
RBW = 300 kHz	5.46 ms	
RBW = 100 kHz	16.38 ms	
RBW = 30 kHz	54.60 ms	
RBW = 10 kHz	163.84 ms	
RBW = 3 kHz	546.00 ms	
RBW = 1 kHz	1.64 s	
RBW = 300 Hz	2.54 s	
Resolution	100.0 ns	
Readout	Entered value representing trace horizontal scale range.	

¹With signal at center frequency.

Spectrum Analyzer (continued)

Description	Specification	Supplemental Information
Sweep Acquisition, Span > 0 Hz		
Range	1 to 5000. Number of data acquisitions per trace point. Value is normalized to the minimum required to achieve amplitude accuracy with CW signals.	Auto coupled. For pulsed RF signals, manually increase the sweep acquisition value to maximize the pulse spectrum envelope.
Resolution	1	
Readout	Measured value representing time required to tune receiver, acquire data, and process trace.	
Trigger		
Trigger Type	Free Run, Video, External	
Trigger Slope	Positive, Negative edge	
Trigger Delay		
Range	0 to 10 sec	
Resolution	100 nsec	
Auto Trigger	Forces a periodic acquisition in the absence of a trigger event	
Auto Trigger Range	0 sec (OFF) to 10 sec	
Time Gating		
Gate Method	Triggered FFT	
Gate Delay Range	Same as Trigger Delay	
Trace Update		
Span = 20 MHz, RBW = 3 kHz		1.5 updates/s (nominal)
Span = 100 MHz, RBW auto coupled		7 updates/s (nominal)
Span = 6 GHz, RBW auto coupled		1 update/s (nominal)
Trace Points		
	101, 201, 401, 601, 801, 1001 (Defaults to 401)	

Spectrum Analyzer (continued)

Description	Specification	Supplemental Information
Resolution Bandwidth (RBW)		
Range (–3 dB bandwidth)		
Zero Span	300 Hz to 1 MHz in 1–3–10 sequence; 2 MHz	
Non–Zero Span	10 Hz to 300 kHz in 1/1.5/2/3/5/7.5/10 sequence; 1 MHz, 2 MHz	Step keys change RBW in 1–3–10 sequence
Accuracy		
1 kHz to 1 MHz		± 5% (nominal)
10 Hz to 100 kHz non–zero span		± 1% (nominal)
2 MHz		± 10% (nominal)
300 Hz zero span		± 10% (nominal)
Selectivity (–60 dB/ –3 dB)		4:1 (nominal)
Video Bandwidth (VBW)		
Range	1 Hz to 2 MHz in 1/1.5/2/3/5/7/10 sequence	VBW ≥ RBW in zero span

Description	Specification	Typical	
		10 minute warm up	90 minute warm up
Stability			
Noise Sidebands, CF = 1 GHz			
10 kHz offset	< –85 dBc/Hz	–88 dBc/Hz	–88 dBc/Hz
30 kHz offset		–89 dBc/Hz	–89 dBc/Hz
100 kHz offset		–95 dBc/Hz	–95 dBc/Hz
1 MHz offset		–115 dBc/Hz	–115 dBc/Hz
Measurement Range			
	Displayed average noise level (DANL) to +20 dBm		
Input Attenuator Range	0 to 31 dB		
Resolution	1 dB steps		
Maximum Safe Input Level			
Average Continuous Power	+27 dBm (0.5 W)		
DC	±50 VDC		

Spectrum Analyzer (continued)

Description	Specification	Typical	
		10 minute warm up	90 minute warm up
Displayed Average Noise Level (DANL)			
Preamplifier OFF			
20 to 30 °C:			
10 MHz to 2.4 GHz			-130 dBm
> 2.4 GHz to 5.0 GHz			-125 dBm
> 5.0 GHz to 6.0 GHz			-119 dBm
Preamplifier ON (Option 235)			
20 to 30 °C:			
10 MHz to 2.4 GHz	< -143 dBm		-148 dBm
> 2.4 GHz to 5.0 GHz	< -140 dBm		-145 dBm
> 5.0 GHz to 6.0 GHz	< -132 dBm		-138 dBm
-10 to 55 °C:			
10 MHz to 2.4 GHz	< -141 dBm		
> 2.4 GHz to 5.0 GHz	< -138 dBm		
> 5.0 GHz to 6.0 GHz	< -130 dBm		
Display Range			
Log Scale	Ten divisions displayed; 0.1 to 1.0 dB/division in 0.1 dB steps, and 1 to 20 dB/division in 1 dB steps		
Trace Detectors			
	Normal, Positive Peak, Negative Peak, Sample, Average		
Trace States			
	Clear/Write, Max Hold, Min Hold, Average, View, Blank		
Number of Traces			
	4		
Number of Averages			
	1 to 10,000		
Reference Level			
Range	-170 dBm to +30 dBm		
Resolution	0.1 dB		
Accuracy	0 dB		

Spectrum Analyzer (continued)

Description	Specification	Typical	
		10 minute warm up	90 minute warm up
Absolute Amplitude Accuracy at 50 MHz			
Peak detector, 10 dB attenuation, preamplifier off, RBW < 2 MHz, input signal –5 dBm to –50 dBm, all settings auto-coupled			
20 to 30 °C	±0.8 dB	±0.8 dB	±0.4 dB
–10 to 55 °C	±1.1 dB		±0.8 dB
Frequency Response			
Relative to 50 MHz, Peak detector, 10 dB attenuation, preamplifier off, RBW = 30 kHz, input signal 0 dBm to –50 dBm, all settings auto-coupled			
20 to 30 °C:			
2 MHz to 10 MHz	±1.1 dB	±1.0 dB	±0.5 dB
> 10 MHz to 3.0 GHz	±0.9 dB	±0.6 dB	±0.3 dB
> 3.0 GHz to 5.0 GHz	±1.3 dB	±1.1 dB	±0.5 dB
> 5.0 GHz to 6.0 GHz	±1.5 dB	±1.5 dB	±0.5 dB
–10 to 55 °C:			
2 MHz to 10 MHz	±2.0 dB		±1.0 dB
> 10 MHz to 3.0 GHz	±1.5 dB		±0.6 dB
> 3.0 GHz to 5.0 GHz	±2.0 dB		±1.1 dB
> 5.0 GHz to 6.0 GHz	±2.6 dB		±1.5 dB
Preamplifier ON (Option 235)			
20 to 30 °C:			
2 MHz to 10 MHz			±0.7 dB
> 10 MHz to 3.0 GHz			±0.5 dB
> 3.0 GHz to 5.0 GHz			±0.7 dB
> 5.0 GHz to 6.0 GHz			±0.7 dB
–10 to 55 °C:			
2 MHz to 10 MHz			±1.2 dB
> 10 MHz to 3.0 GHz			±0.8 dB
> 3.0 GHz to 5.0 GHz			±1.3 dB
> 5.0 GHz to 6.0 GHz			±1.7 dB

Spectrum Analyzer (continued)

Description	Specification	Typical		Supplemental Information
		10 minute warm up	90 minute warm up	
Resolution Bandwidth Switching Uncertainty				
	RBW < 2 MHz			0.0 dB 0.7 dB peak-to-peak ³
Total Absolute Amplitude Accuracy ¹				
	Peak detector, 10 dB attenuation, preamplifier off, RBW < 2 MHz, input signal 0 dBm to -50 dBm, all settings auto coupled	Absolute Amplitude at 50 MHz + Frequency Response ⁴		
	20 to 30 °C:			
	2 MHz to 10 MHz	±1.8 dB	±1.28 dB	±0.60 dB
	> 10 MHz to 3.0 GHz	±1.5 dB	±1.0 dB	±0.50 dB
	> 3.0 GHz to 5.0 GHz	±1.9 dB	±1.36 dB	±0.60 dB
	> 5.0 GHz to 6.0 GHz	±2.1 dB	±1.7 dB	±0.60 dB
RF Input VSWR				
	At all attenuation settings			1.5:1 (nominal)
Second harmonic distortion (SHI)				
	-30 dBm signal at input mixer ²			
	2 MHz to 1.35 GHz			< -70 dBc +40 dBm SHI (nominal)
	1.35 GHz to 3.0 GHz			< -80 dBc +50 dBm SHI (nominal)
Third Order Intermodulation Distortion (TOI)				
	Two -30 dBm tones at input mixer			< -96 dBc +18 dBm TOI (nominal)

¹ With signal at center frequency.

² Mixer level = RF input level – input attenuation

³ For signals not at center frequency.

⁴ The specification for Total Absolute Amplitude Accuracy is less than the sum of the Absolute Amplitude Accuracy and Frequency Response specifications because redundant uncertainty is removed.

Spectrum Analyzer (continued)

Description	Supplemental Information
Residual Responses	
Input terminated, 0 dB attenuation, preamplifier off, RBW \leq 1 kHz, VBW auto coupled	
20 MHz to 3 GHz	-90 dBm (nominal)
> 3 GHz to 6 GHz	-85 dBm (nominal)
Spurious Responses	
Input Mixer level -30 dBm	
RFsig = Rftune + 417 MHz	-70 dBc (nominal)
RFsig = Rftune + 1.716 GHz	-80 dBc (nominal)
Input Mixer level -10 dBm; First IF Image Response	
RFsig = Rftune - 2 x 0.8346 GHz for Rftune 5.7 to 6.0 GHz	-50 dBc (nominal)
Sidebands	-80 dBc (nominal)
	-60 dBc (nominal) when battery charging, 260 kHz offset

Spectrum Analyzer (continued)

Figure 10

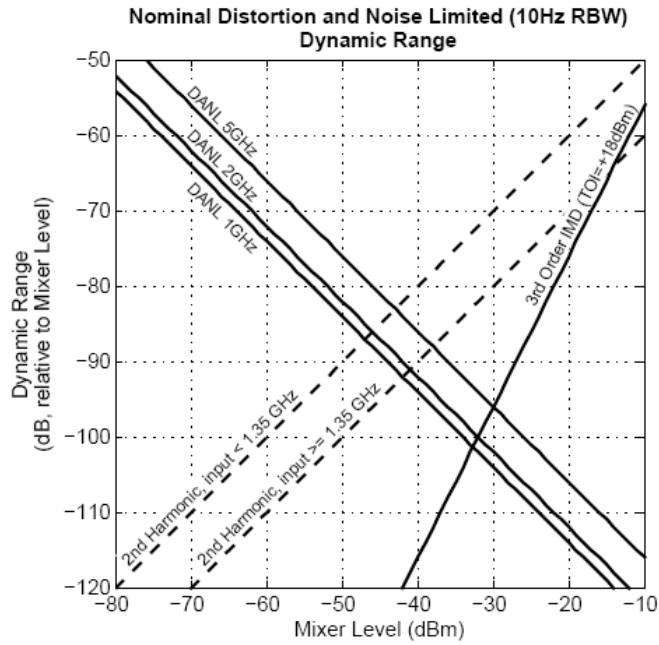
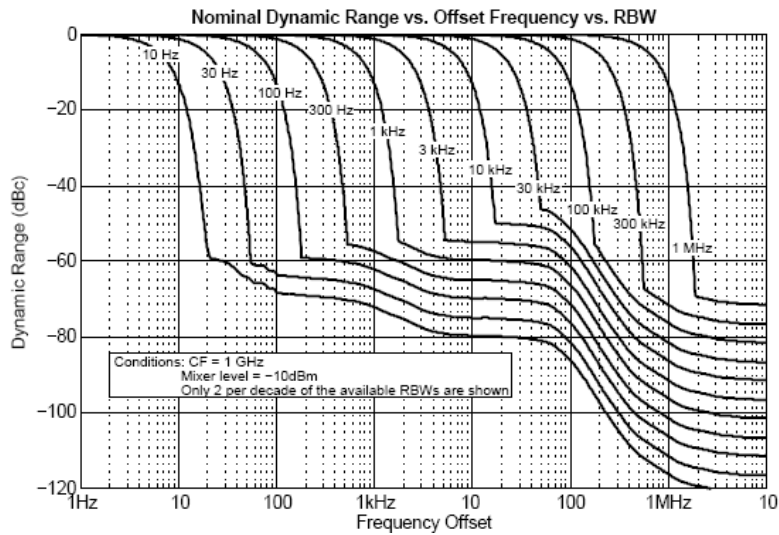


Figure 11



Spectrum Analyzer (continued)

Description	Specification	Supplemental Information
AM/FM Tune and Listen		
Audio demodulation types	AM, FM Narrow, FM Wide	
Audio Bandwidth	16 kHz	
Receiver IF Bandwidth		
AM	35 kHz	
FM Narrow	12 kHz	
FM Wide	150 kHz	
Listen Time Range	0 to 100 sec.	
Radio Standards		
With a Radio Standard applied, pre-defined frequency bands, channel numbers or Uplink / Downlink selections can be used instead of manual frequency entry. The pre-defined FieldFox Radio Standards include bands such as W-CDMA, LTE, and GSM.		
FieldFox Power Suite Measurement types		
Channel Power Occupied Bandwidth Adjacent Channel Power Ratio		

Preamplifier (Option 235)

Description	Specification	Typical 10 minute warm up
Frequency Range		
Option 230	100 kHz to 4 GHz	
Option 231	100 kHz to 6 GHz	
Gain		22 dB

Interference Analyzer (Option 236)

Description	Specification	Supplemental Information
Display Types		
Spectrogram	Overlay, full screen, top, or bottom with active trace	
Waterfall		
Markers		
Time, delta time		

Power Meter (Option 302)

Power Meter (Option 302) supports the Agilent Technologies U2000 Series USB Average Power Sensors. For specifications, refer to the U2000 Series USB Sensor's Data Sheet at <http://www.agilent.com/find/usbsensor>.

General Information

Description	Specification	Typical	Supplemental Information
Calibration Cycle			
	1 Year		
Environmental			
	<ul style="list-style-type: none"> ▪ Agilent Technologies Environmental Test manual (ETM) for Outdoor Equipment¹ ▪ MIL-PRF-28800F class 2 		
Altitude – Operating	9,144 m (30,000 ft)		Under battery operation AC to DC adapter rated at 3000m
Altitude – Non-Operating	15,240 m (50,000 ft)		
IP Class	30		
Temperature Range			
Operating			
AC Power	-10 to 55 °C		
Battery	-10 to 50 °C	-10 to 55 °C	
Storage	-51 to 71 °C		With the battery pack removed. The battery packs should be stored in an environment with low humidity. Extended exposure to temperature above 45 °C could degrade battery performance and life.
EMC			
Complies with European EMC Directive 2004/108/EC	<ul style="list-style-type: none"> ▪ IEC/EN 61326-2-1 ▪ CISPR Pub 11 Group 1, class A ▪ AS/NZS CISPR 11 ▪ ICES/NMB-001 		When subjected to continuously present radiated electromagnetic phenomena, some degradation of performance may occur
ESD			
	<ul style="list-style-type: none"> ▪ IEC/EN 61000-4-2 		Functional up to 20 kV test ¹
Safety			
Complies with European Low Voltage Directive 2006/95/EC	<ul style="list-style-type: none"> ▪ IEC/EN 61010-1 2nd Edition ▪ Canada: CSA C22.2 No. 61010-1-04 ▪ USA: UL 61010-1 2nd Edition 		

General Information (continued)

Description	Specification	Typical	Supplemental Information
Power			
Power Supply			
External DC Input	15 to 19 VDC		40 W maximum when battery charging
External AC Power Adapter			Efficiency Level IV, 115 VAC
Input	100 to 250 VAC, 50 to 60 Hz 1.25 – 0.56 A		
Output	15 VDC, 4 A		
Power Consumption			
On		12 W	
Battery			
	10.8 V, 4.6 A-h		Lithium ion
Operating Time		4 hours	
Charge Time	A fully discharged battery takes about 1.5 hours to recharge to 80%, 4 hours to 100%		
Discharge Temperature Limits	-10 to 60 °C ² , ≤ 85% RH		
Charge Temperature Limits	0 to 45 °C ² , ≤ 85% RH		
Storage Temperature Limits	-20 to 50 °C ² , ≤ 85% RH		
			The battery packs should be stored in an environment with low humidity. Extended exposure to temperature above 45 °C could degrade battery performance and life
Data Storage			
Internal	Minimum 16 MB		Up to 1000 instrument states and trace
External			Supports USB 2.0 compatible memory devices; Supports miniSD and miniSDHC memory cards
Display			
	6.5" transfective color VGA LED-backlit 640 x 480 with anti-glare coating		
Weight			
	2.8 kg (6.2 lbs) including battery		
Dimensions (H x W x D)			
	292 x 188 x 72 mm (11.5" x 7.4" x 2.8")		

General Information (continued)

Description	Specification	Typical	Supplemental Information
Inputs & Outputs			
RF Out Port			
Connector	Type-N, female		
Impedance	50 Ω (nominal)		
Damage Level	> +23 dBm, > \pm 50 VDC		
RF In Port			
Connector	Type-N, female		
Impedance	50 Ω (nominal)		
Damage Level	> +27 dBm, > \pm 50 VDC		
LO Emissions			
0 dB attenuation, preamplifier off			-65 dBm (nominal)
Headphone Jack Connector	3.5 mm (1/8 inch) miniature audio jack		
USB			
USB-A (2 ports)	Hi-speed USB 2.0		
Mini USB (1 port)	Hi-speed USB 2.0		Provided for future use.
LAN	100Base-T ONLY RJ-45 connector		10Base-T is NOT supported
External Reference /Trigger Input			
Connector	BNC female		
External Reference			
Input Frequency	10 MHz		
Input Amplitude Range			-5 dBm to +10 dBm (nominal)
Impedance			50 Ω (nominal)
Lock Range			\pm 10 ppm of external reference frequency (nominal)
Trigger Input			
Impedance			10 K Ω (nominal)
Level Range			
Rising Edge			1.7 V (nominal)
Falling Edge			1 V (nominal)

1 Samples of this product have been type tested in accordance with the Agilent Environmental Test Manual (ETM) for outdoor equipment (OE) and verified to be robust against the environmental stresses of storage, transportation and end use ; those stresses include but are not limited to temperature, humidity, shock, vibration, altitude and power line conditions.

2 Charge and discharge temperatures are internal temperatures of the battery as measured by a sensor embedded in the battery. The Battery screen displays temperature information. To access the screen, select **System**, **Service Diagnostics**, and **Battery**

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Manufacturing Part Number: N9912-90006

Printed in USA, July 24, 2009

Supersedes: None

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