Agilent FieldFox Spectrum Analyzers

9/14/18/26.5 GHz

Technical Overview

N9935A

N9936A

N9937A

N9938A

Carry precision with you.

Anticipate ___Accelerate ___Achieve

Agilent Technologies

Get Agilent-quality microwave measurements in the field

Every piece of gear in your field kit had to prove its worth. Measuring up and earning a spot is the driving idea behind Agilent's FieldFox microwave analyzers. They're equipped to handle routine maintenance, in-depth troubleshooting and anything in between. Better yet, FieldFox delivers Agilent-quality microwave measurements—wherever you need to go.

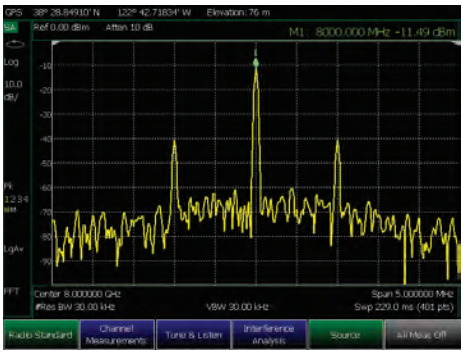
On land, sea and air, FieldFox is ready for a wide range of applications: satellite communications, microwave backhaul, military communications, radar systems, and more. In harsh conditions and hard-to-reach locations, FieldFox delivers precise results that are consistent with those you'd see on a benchtop analyzer. To get you out of the elements sooner, the task-driven user interface will help you finish the job faster.

FieldFox spectrum analyzers give you - and your budget - more flexibility: configure an instrument with just spectrum analysis today and add a full-band tracking generator and preamplifier and other capabilities in the future.

Key Measurements

Spectrum analyzer

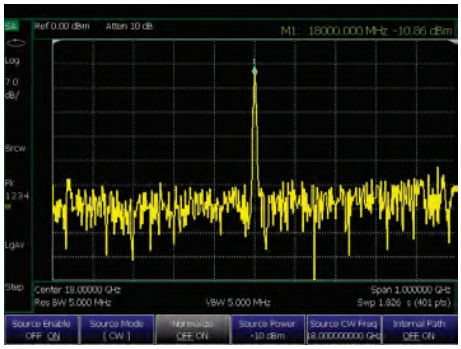
- Unprecedented amplitude accuracy (± 0.5 dB) with InstAlign[1] – no warm up required
- Interference analysis with spectrogram and record and playback
- Superior spur-free dynamic range and phase noise (-111 dBc/Hz at 10 kHz offset)
- Tracking generator, independent source, and preamplifier covering the full frequency range
- 5 kHz to 26.5 GHz



Spectrum analyzer

1. With FieldFox InstAlign, internal amplitude alignments occur automatically as environmental conditions change, without any user intervention.

Add the world's most precise handheld microwave analyzer to your kit



Tracking generator and built-in independent signal source

- CW, CW coupled, and tracking
- Flat output power across whole frequency span, in 1 dB steps
- 30 kHz to 26.5 GHz

Built-in power meter

- Easy to view analog and digital display
- ± 0.5 dB accuracy with InstAlign
- 5 kHz to 26.5 GHz

Power meter using a USB power sensor

- Measure power with USB power sensors
- -60 to +44 dBm (sensor dependent)
- 9 kHz to 24 GHz

Designed for you and the work you do everyday

Carry FieldFox wherever you need to go

- Kit friendly 3.0 kg or 6.6 lbs
- Large buttons are easy to operate, even when wearing gloves
- Field swappable battery lasts up to 3 1/2 hours
- Non-slip rubber grip securely fits in your hands and won't slide off the hood of your vehicle
- Vertical "portrait" orientation makes it easy to hold and operate at the same time

Field-proof usability for better answers in less time

- Bright, low-reflection display and backlit keys enable easy viewing in direct sunlight or darkness
- Intuitive user interface is designed for your workflow, enabling measurements in fewer key presses
- One-button measurements simplify complex setups and ensure quick, accurate results with confidence
- 3-year warranty ensures field confidence - especially in harsh environments

Transflective display makes it easy to read measurements in direct sunlight

Large buttons make it easy to perform spectrum analysis measurements—even with gloves on

Rugged enough to meet MIL-specs

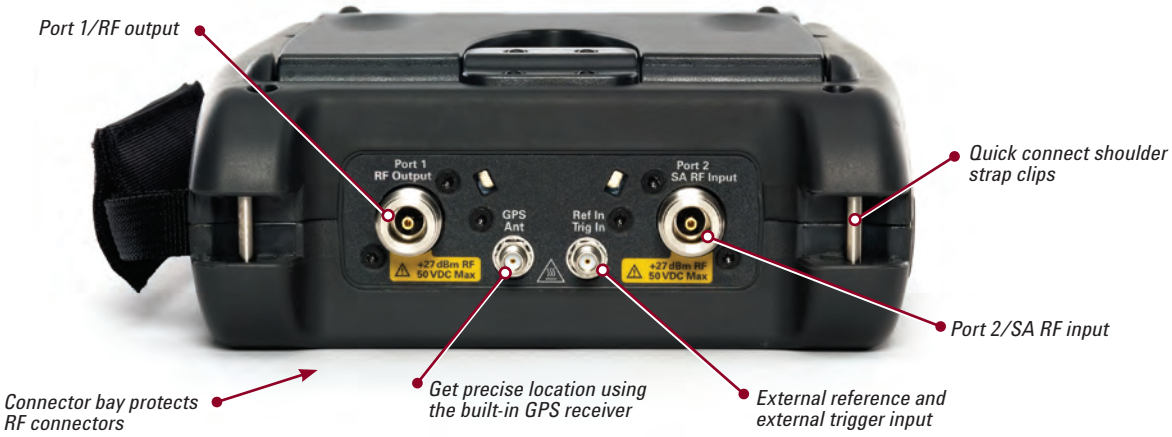
- Completely sealed instrument enclosure provides measurement stability in harsh environments
- Specially designed connector bay protects RF connectors from damage due to drops or other external impacts (designed to withstand 4' drop on concrete surface on all 6 faces)
- Water-resistant chassis, keypad and case withstand wide temperature ranges and salty, humid environments
    - Case withstands shock and vibration
    - Wide operating temperature
      -10 to +55 °C (14 to 131 °F)
    - Wide storage temperature
      -51 to +71 °C (-60 to 160 °F)
- Meets MIL-PRF-28800F Class 2 requirements
- Type tested and meets MIL-STD-810G, Method 511.5, Procedure I requirements for operation in explosive environments

Dust-free design with no vents or fans helps extend instrument reliability

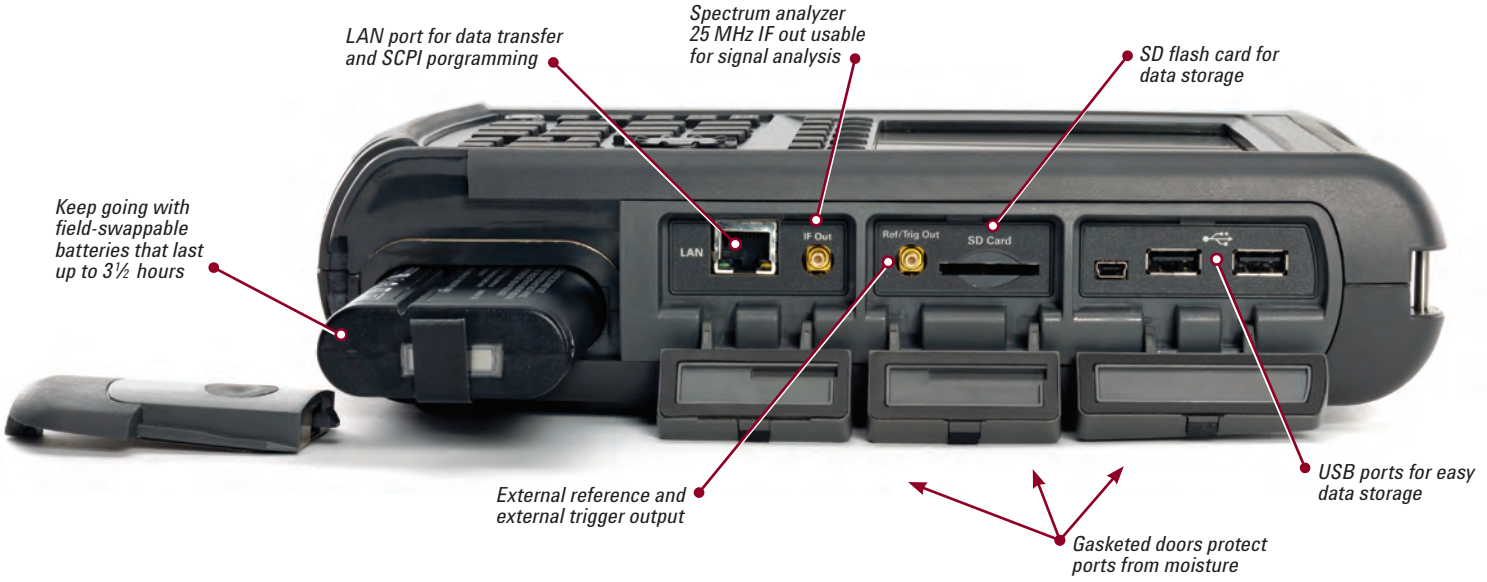
Pick up FieldFox for its ergonomics

...and depend on its durability and convenience

TOP



RIGHT SIDE



LEFT SIDE

Spectrum analyzer

Spectrum analyzer

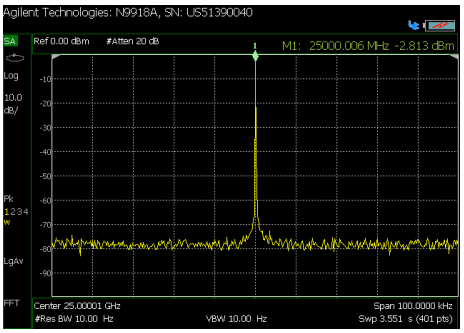
In microwave, radar, and satellite communications, and commercial microwave backhaul, engineers are responsible not only for hardware installation and maintenance, but also over-the-air signal quality. They need to regularly monitor for rogue signals and perform signal surveillance.

FieldFox's spectrum analyzer is optimized to excel in the dynamic spectral environment seen commonly in the field. In the field, users face measurement challenges such as the need to detect a low-level signal under strong signal conditions (requiring high dynamic range), or close-in small interference signals (requiring excellent phase noise). FieldFox's superior dynamic range (TOI > +15 dBm), close in phase noise (-111 dBc/Hz at 10 kHz), and fast sweep time make these challenging tasks easier.

FieldFox's spectrum analyzer also provides a full power measurement suite and complete trace and state control.

Unprecedented amplitude accuracy without instrument warm up – InstAlign

With FieldFox InstAlign, internal amplitude alignments occur automatically as the environmental conditions change, without any user intervention. This provides unprecedented amplitude accuracy up to ± 0.5 dB for spectrum analysis and power measurements. Better yet, FieldFox provides this accuracy immediately upon instrument turn on—no warm up required.



Monitor the spectrum using the FieldFox analyzers

Spectrum analyzer

Field strength measurements

To characterize the electric and magnetic fields, the gain and loss of the antenna and cables need to be accounted for. With FieldFox, antenna factors and cable loss data can be loaded using either the front panel or the complimentary Data Link software.

Interference analyzer

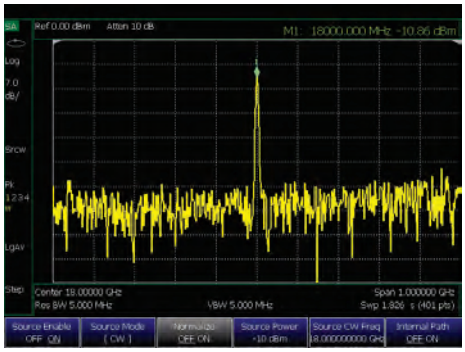
Interference can be internal or external, uplink or downlink, and has a direct impact on the Quality of Service of a communication network. FieldFox's interference analyzer is designed to identify interfering signals quickly. Spectrogram and waterfall displays detect intermittent signals or monitor signals over a period of time. Signal traces can be recorded into internal memory or external flash memory devices, and the saved traces can be played back for offline processing. It has excellent dynamic range with very fast sweep times under narrow resolution bandwidths (RBWs).

Independent signal source

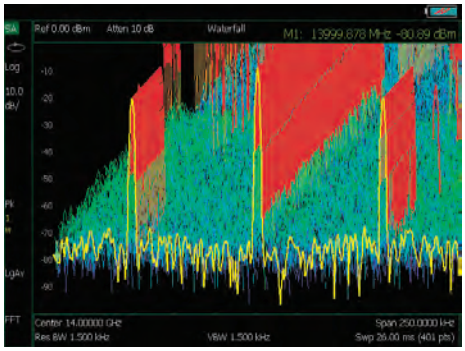
FieldFox has a built-in independent signal source, with a frequency range of 30 kHz to 26.5 GHz. The signal source can be tuned to any frequency, independent of the spectrum analyzer frequency. The signal source can be used to create a test signal to measure coverage, antenna isolation, antenna direction alignment, shielding effectiveness or attenuation, transponder and frequency offset device verification, and long cable loss measurement.

IF signal output

FieldFox provides a spectrum analyzer IF output with 25 MHz bandwidth for use as a frequency down-converter, and to perform wideband signal analysis.



Use the internal microwave signal source for transponder testing



Waterfall display makes interference hunting easier

Power measurements and more

Built-in power meter

By leveraging InstAlign technology, FieldFox is able to make very accurate channel power measurements. The channel bandwidth can be set wide to simulate average power meter measurements. This measurement function provides the flexibility to make user definable channel power measurements with accuracy up to ± 0.5 dB.

USB Power sensor support

FieldFox can connect with the Agilent U2000 Series USB power sensors to make RF/microwave power measurements up to 24 GHz. FieldFox provides true average power measurements with a wide dynamic range from -60 dBm to +44 dBm.

Built-in GPS

A built-in GPS receiver provides geo-location tags to measurements. The geo data—time, latitude, longitude, and elevation—can be displayed and saved in data files. In addition to location information, the GPS provides an accurate frequency reference to improve accuracy.

Built-in variable voltage DC bias

FieldFox has a built-in variable voltage DC bias source. The source provides 1 to 32 VDC with maximum current of 650 mA and 8 W maximum power.

The DC bias source can provide DC power to amplifiers under test and bias tower mounted amplifiers (TMA) when engineers need to sweep through the TMA to reach the antenna (bias-tees available separately).

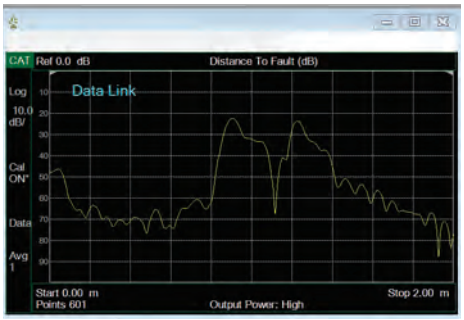
FieldFox's Data Link software makes report generation and documentation easier

FieldFox's complimentary Data Link software provides data transfer, data definition and report generation. Markers and limit lines can be added to the traces. Cable files and antenna factors can also be loaded using Data Link.

Remote control via LAN and FieldFox programming

FieldFox analyzers are fully SCPI compliant and can be controlled over the LAN.

Easily measure power levels using the built-in channel power meter



Use the complimentary Data Link software to generate reports

Use the built-in GPS to obtain geo-location data

Specifications in brief

See the FieldFox Handheld Analyzer Data Sheet for a complete listing of the specifications:
http://cp.literature.agilent.com/litweb/pdf/5990-9783EN.pdf

Spectrum analyzer

The specifications in this section apply to the spectrum analyzer capabilities available in the following models:
FieldFox microwave combination analyzers: N9913A, N9914A, N9915A, N9916A, N9917A, N9918A
FieldFox microwave spectrum analyzers: N9935A, N9936A, N9937A, N9938A

Models	Frequency range	
N9913A	100 kHz to 4 GHz	Usable to 5 kHz
N9914A	100 kHz to 6.5 GHz	Usable to 5 kHz
N9915A, N9935A	100 kHz to 9 GHz	Usable to 5 kHz
N9916A, N9936A	100 kHz to 14 GHz	Usable to 5 kHz
N9917A, N9937A	100 kHz to 18 GHz	Usable to 5 kHz
N9918A, N9938A	100 kHz to 26.5 GHz	Usable to 5 kHz

The spectrum analyzer is tunable to 0 Hz or DC.
The preamplifier covers the full band with nominal gain of 20 dB.

Frequency reference: -10 to 55 °C

Accuracy	± 0.7 ppm (spec) + aging ± 0.4 ppm (typical) + aging
Accuracy, when locked to GPS	± 0.025 ppm (spec)
Aging rate	± 1 ppm/yr for 20 years (spec), will not exceed ± 3.5 ppm
Frequency span	**Spec**
Resolution	1 Hz
	Spec
Resolution bandwidth (RBW) Range (-3 dB bandwidth)	10 Hz to 5 MHz Non-zero span: 1, 1.5, 2, 3, 5, 7.5, 10 sequence < 300 kHz, 300 kHz, 1 MHz, 3 MHz, 5 MHz Zero span: 1, 3, 10 sequence
Video bandwidth (VBW)	1 Hz to ≥ 3 MHz Non-zero span: 1, 1.5 ,2, 3, 5, 7.5, 10 sequence Zero span: RBW/VBW ≤ 100

Phase noise: Stability, SSB phase noise at 1 GHz, normalized to 1 Hz RBW

Offset	Spec (23 ± 5 °C)	Spec (-10 to 55 °C)	Typical (23 ± 5 °C)	Typical (-10 to 55 °C)
10 kHz	-108 dBc	-108 dBc	-111 dBc	-111 dBc
30 kHz	-107 dBc	-105 dBc	-108 dBc	-110 dBc
100 kHz	-100 dBc	-99 dBc	-104 dBc	-105 dBc
1 MHz	-110 dBc	-110 dBc	-113 dBc	-113 dBc
3 MHz	-119 dBc	-118 dBc	-122 dBc	-122 dBc
5 MHz	-120 dBc	-120 dBc	-123 dBc	-123 dBc

Displayed average noise level (DANL): RMS detection, log averaging, reference level of -20 dBm, normalized to 1 Hz RBW

Preamp on	Spec (23 ± 5 °C)	Spec (-10 to 55 °C)	Typical (23 ± 5 °C)	Typical (-10 to 55 °C)
2 MHz to 4.5 GHz[1]	-153 dBm	-151 dBm	-155 dBm	-154 dBm
> 4.5 to 7 GHz	-149 dBm	-147 dBm	-151 dBm	-150 dBm
> 7 to 13 GHz	-147 dBm	-145 dBm	-149 dBm	-148 dBm
> 13 to 17 GHz	-143 dBm	-141 dBm	-145 dBm	-144 dBm
> 17 to 22 GHz	-140 dBm	-139 dBm	-143 dBm	-142 dBm
> 22 to 25 GHz	-134 dBm	-132 dBm	-137 dBm	-134 dBm
> 25 to 26.5 GHz	-128 dBm	-126 dBm	-131 dBm	-129 dBm

50 MHz absolute amplitude accuracy:	50 MHz, verified with input level of 0 to -35 dBm, peak detector, 10 dB attenuation, preamplifier off, 30 kHz RBW, all settings auto-coupled, no warm-up required, -10 to 55 °C
	± 0.3 dB (spec)
	± 0.10 dB (typical)

Total absolute amplitude accuracy

Verified with input level of -10 dBm. Peak detector, 10 dB attenuation, preamplifier off, 30 kHz RBW, all settings auto-coupled, no warm-up required. Includes frequency response uncertainties.

	Spec (23 ± 5 °C)	Spec (-10 to 55 °C)	Typical (23 ± 5 °C)	Typical (-10 to 55 °C)
100 kHz to 18 GHz	± 0.8 dB	± 1.0 dB	± 0.35 dB	± 0.50 dB
> 18 GHz to 26.5 GHz	± 1.0 dB	± 1.2 dB	± 0.50 dB	± 0.60 dB

Third order intermodulation distortion (TOI)

Two -20 dBm signals, 100 kHz spacing at input mixer, -10 to 55 °C	Spec	Typical
	at 2.4 GHz, +15 dBm	< 1 GHz, +10 dBm 1 to 7.5 GHz, +15 dBm > 7.5 GHz, +21 dBm

1. Increase the noise floor 4 dB for frequencies between 2.1 and 2.8 GHz.

Tracking generator or independent source

The specifications in this section apply to the tracking generator or independent source capabilities available in the following models:
FieldFox microwave combination analyzers: N9913A, N9914A, N9915A, N9916A, N9917A, N9918A.
FieldFox microwave spectrum analyzers: N9935A, N9936A, N9937A, N9938A.

Model	Tracking generator or independent source frequency range
N9913A	30 kHz to 4 GHz
N9914A	30 kHz to 6.5 GHz
N9915A, N9935A	30 kHz to 9 GHz
N9916A, N9936A	30 kHz to 14 GHz
N9917A, N9937A	30 kHz to 18 GHz
N9918A, N9938A	30 kHz to 26.5 GHz

Dynamic range: Typical, -10 to 55 °C

Frequency	Preamp off	Preamp on
2 MHz to 2 GHz	97 dB	112 dB
> 2 to 7 GHz	93 dB	108 dB
> 7 to 11 GHz	88 dB	103 dB
> 11 to 18 GHz	79 dB	94 dB
> 18 to 21 GHz	71 dB	86 dB
> 21 to 26.5 GHz	55 dB	70 dB

Built-in power meter, Option 310

The specifications in the sections that follow apply to these FieldFox analyzers:
FieldFox microwave combination analyzers: N9913A, N9914A, N9915A, N9916A, N9917A, N9918A
FieldFox microwave spectrum analyzers: N9935A, N9936A, N9937A, N9938A

Models	Frequency range	
N9913A	100 kHz to 4 GHz	Usable to 5 kHz
N9914A	100 kHz to 6.5 GHz	Usable to 5 kHz
N9915A, N9935A	100 kHz to 9 GHz	Usable to 5 kHz
N9916A, N9936A	100 kHz to 14 GHz	Usable to 5 kHz
N9917A, N9937A	100 kHz to 18 GHz	Usable to 5 kHz
N9918A, N9938A	100 kHz to 26.5 GHz	Usable to 5 kHz

Amplitude accuracy

	Spec (23 ± 5 °C)	Typical (23 ± 5 °C)	Spec (-10 to 55 °C)	Typical (-10 to 55 °C)
100 kHz to 18 GHz	± 0.8 dB	± 0.35 dB	± 1.0 dB	± 0.50 dB
> 18 GHz to 26.5 GHz	± 1.0 dB	± 0.50 dB	± 1.2 dB	± 0.60 dB

General information

Calibration cycle	1 year
Weight	3.0 kg or 6.6 lbs including battery
Dimensions: H x W x D	292 x 188 x 72 mm 11.5" x 7.4" x 2.8"

Environmental

MIL-PRF-28800F Class 2	Operating temperature Storage temperature Operating humidity Random vibration Functional shock Bench drop
MIL-STD-810G, Method 511.5	Type tested and meets Procedure I requirements for operation in explosive environments
Altitude – operating	9144 m or 30,000 ft (using battery)
Altitude – non-operating	15,240 m or 50,000 ft
Complies with European EMC directive 2004/108/EC	IEC/EN 61326–1 CISPR Pub 11 Group 1, class B, Group 1 limit of CISPR 11:203/EN 55011:2007 AS/NZS CISPR 11 ICES/NMB–001
Battery	Lithium ion, 10.8 V, 4.6 A-h, 3.5 hours (typical)
Warranty	3-year warranty standard on all FieldFox instruments

Configuration information in brief

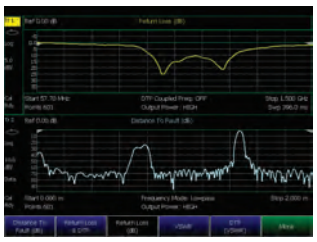
See the FieldFox Configuration Guide for complete information on all FieldFox products and accessories. http://cp.literature.agilent.com/litweb/pdf/5990-9836EN.pdf

These configuration details also apply to the FieldFox combination analyzers N9913/4/5/6/7/8A with Option 233 (spectrum analyzer).

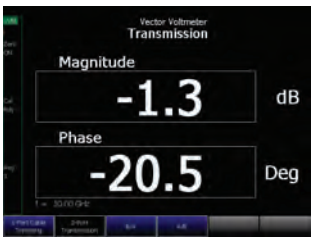
Model	Description	Test port connector
N9935A	FieldFox microwave spectrum analyzer, 9 GHz	Type-N (f) test ports, 50 ohm
N9936A	FieldFox microwave spectrum analyzer, 14 GHz	Type-N (f) test ports, 50 ohm
N9937A	FieldFox microwave spectrum analyzer, 18 GHz	Type-N (f) test ports, 50 ohm
N9938A	FieldFox microwave spectrum analyzer, 26.5 GHz	Type-N (f) test ports, 50 ohm, 3.5 mm (m) test ports, 50 ohm (Option 100)

Options	Descriptions	Measurements /functions
Base unit for N9935/6/7/8A analyzers	Spectrum analyzer	Spectrum analysis Channel power (CHP), adjacent channel power (ACP), occupied bandwidth (OBW) AM/FM tune and listen Field strength measurements Frequency marker counter, band power marker Independent source
Option 220	Full-band tracking generator	Stimulus response/response measurements
Option 235	Preamplifier	20 dB gain nominal
Option 236	Interference analyzer and spectrogram	Spectrogram and waterfall display Record / playback
Option 302	External USB power sensor support	Supports Agilent U2000 series power sensor
Option 307	GPS receiver (receiver built-in, external antenna required)	Geo location information Lock internal reference to GPS
Option 309	DC bias variable-voltage source	+1 to 32 VDC for external bias-tee and other devices
Option 310	Built-in power meter	Built-in power measurement, using the built-in receiver, without a power sensor
Option 320	Reflection measurements (return loss, VSWR)	Cable and antenna analysis

Spectrum analysis

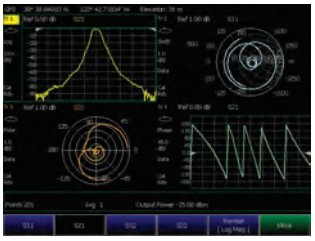


Cable and antenna analysis

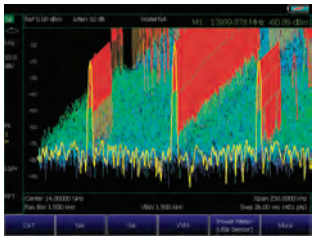


Vector voltmeter measurements

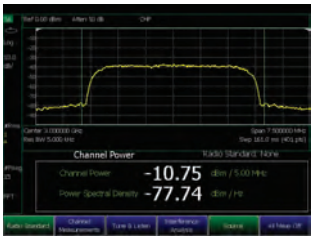
Built-in power meter



Vector network analysis



Interference analysis



Channel power measurement

Tracking generator

FieldFox analyzers

FieldFox	RF & microwave combination analyzers	Microwave vector network analyzers	Microwave spectrum analyzers
Model number	N9913/4/5/6/7/8A	N9925/6/7/8A	N9935/6/7/8A
Maximum frequency range	4, 6.5, 9, 14, 18, 26.5 GHz	9, 14, 18, 26.5 GHz	9, 14, 18, 26.5 GHz
Cable and antenna analyzer	✓	✓	VSWR and reflection
Vector network analyzer	✓	✓	
Spectrum analyzer, Interference analyzer	✓		✓
Tracking generator, Independent source	✓		✓
Vector voltmeter	✓	✓	
Built-in power meter	✓	✓	✓
Power meter with USB sensor	✓	✓	✓

Accessories

The accessories shown here are a subset of the available accessories.
For a complete list, visit www.agilent.com/find/n9910x

N9910X-704 Phase stable cable

- Type-N(m) to TNC(f)
- 13 GHz

N9910X-709 Phase stable cable

- 3.5 mm(f) to 3.5 mm(f)
- 26.5 GHz

N9910X-810 Phase stable cable

- Type-N(m) to Type-N(m)
- 6 GHz

N9910X-845 Adaptor kit

N9910X-872 External battery charger

N990X-873 AC/DC adaptor

N9910X-874 Bias-tee

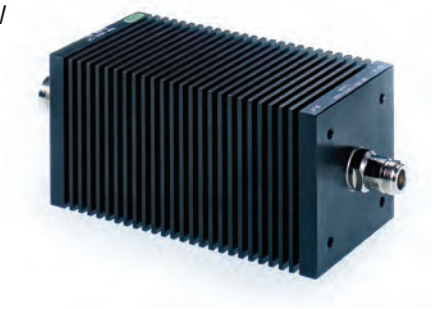
N9910X-875 DC car charger and adapter

Accessories

The accessories shown here are a subset of the available accessories.
For a complete list, visit www.agilent.com/find/n9910x

N9910X-860 Fixed attenuator

- 40 dB
- 100 W



N9910X-870 Extra battery

N9910X-880 Soft transit case

- Comes standard with each FieldFox
- Includes backpack and shoulder straps

N9910X-881 Hard transit case

- FieldFox fits inside hard transit case

N9910X-820 Directional antenna

N9910X-821 Telescopic whip antenna

Carry precision with you.

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Related literature	Number
FieldFox Handheld Analyzers, Brochure	5990-9779EN
FieldFox Combination Analyzers, Technical Overview	5990-9780EN
FieldFox Vector Network Analyzers, Technical Overview	5990-9781EN
FieldFox Handheld Analyzers, Data Sheet	5990-9783EN
FieldFox Handheld Analyzer, Configuration Guide	5990-9836EN
FieldFox N9912A RF Analyzer, Technical Overview	5989-8618EN
FieldFox N9912A RF Analyzer, Data Sheet	N9912-90006
FieldFox N9923A RF Vector Network Analyzer, Technical Overview	5990-5087EN
FieldFox N9923A RF Vector Network Analyzer, Data Sheet	5990-5363EN

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