

Portable Testers Add Real-Time Spectrum Analysis to 50 GHz

Covering a total frequency range from 9 kHz to 50 GHz, these portable, handheld test instruments now offer a 10-MHz real-time bandwidth to capture short-duration signals.

On-site spectrum analysis once implied the use of a “portable” instrument with a battery almost large enough to start an automobile. But portable RF/microwave test instruments have come a long way, and lightweight units such as the FieldFox analyzers from Keysight Technologies (www.keysight.com) provide a number of measurement functions from a battery-powered package weighing just 7.1 lb. (3.2 kg).

Just added as an option to 16 models in the FieldFox line is real-time spectrum-analysis (RTSA) capability. Available over a total frequency range of 9 kHz to 50 GHz, it captures the most elusive signals—including multiple pulses, interference, and other signals occupying a band of interest. With outstanding efficiency, these portable analyzers can run for nearly four hours on a single battery charge for thorough, on-site RTSA measurements.

The FieldFox analyzers (*Fig. 1*) are compact and light in weight, yet quite rugged and lacking none of the power and accuracy of much larger, laboratory benchtop analyzers. They show captured signals on a bright 6.5-in. diagonal thin-film-transistor (TFT) display and are available with a variety of measurement functions, including as combination instruments with cable and antenna tester (CAT), spectrum analyzer, and vector network analyzer (VNA).

The 16 models available with RTSA option 350 (*see table*)

include spectrum analyzers and combination analyzers with built-in power meters, frequency counters (with 1-Hz resolution), and a Global Positioning System (GPS) receiver for precise location of detected signals. The internal GPS receiver, which has a female SMA connector for attachment of a GPS antenna, can also be used as a frequency reference.

Although battery powered, these analyzers perform very much like larger benchtop instruments, with frequency resolution of 1 Hz for signals to 5 GHz, 1.34 Hz for signals to 10 GHz, 2.68 Hz for signals to 20 GHz, 5.36 Hz for signals to 40 GHz, and 8.04 Hz for signals to 50 GHz. The dedicated reference oscillator is accurate to ± 0.7 ppm plus the aging rate, which is ± 1 ppm/year for 20 years.

When locked to a GPS signal, the frequency accuracy improves to ± 0.010 ppm. The nominal zero-span sweep time can be set from 1 μ s to 1000 s, with 100-ns resolution. The zero-span 3-dB RBW is settable from 10 Hz to 5 MHz in a 1-3-10 sequence. Video bandwidth range is 1 Hz to 5 MHz. The amplitude accuracy at center frequency ranges from ± 0.8 to ± 1.4 dB

depending on frequency.

AN RTSA EXAMPLE

One of the widest-frequency analyzers, model N9952A, has a real-time bandwidth of 10 MHz that can be swept across a total frequency range of 9 kHz to 50 GHz. It features a wide dynamic range of 105 dB and spurious-free dynamic



1. The FieldFox portable, battery-powered RF/microwave signal and spectrum analyzers are now available with optional real-time-spectrum-analyzer (RTSA) capability across bandwidths as wide as 9 kHz to 50 GHz.

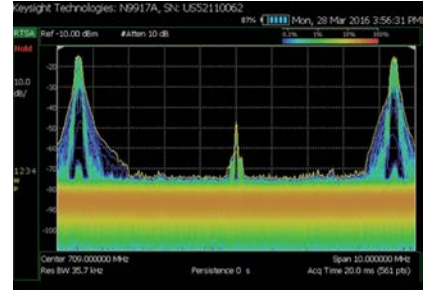
range (SFDR) of 63 dB. It can capture and display as many as four separate signal traces with a total of 561 points, using density spectrum, spectrogram, and real-time-spectrum displays. The N9952A FieldFox with RTSA capability can detect pulses as narrow as 22 ns even amidst surrounding signals and noise.

The analyzer achieves 100% probability of intercept (POI) with full amplitude accuracy for pulses as narrow as 12 μ s. As with the other analyzers featuring the RTSA option, the N9952A provides flexible triggering, with free-run, external, video, and RF burst triggers using positive- or negative-edge trigger slopes. Trigger delay times can be set from 150 ms to 10 s with 100-ns resolution. The built-in power meter in the N9952A covers a frequency range of 300 kHz to 50 GHz.

For a given frequency range, these FieldFox portable analyzers with RTSA option can capture multiple simultaneous pulses or short-duration signal events within a channel of interest. The two pulses shown in Fig. 2 were acquired within a 20-ms acquisition time for a center frequency of 1 GHz, using



2. The portable FieldFox analyzers with optional RTSA capability can capture two simultaneous pulses and show traces on a bright, 6.5-in. diagonal TFT display screen.



3. When using available software, the portable FieldFox analyzers with optional RTSA capability can measure and display LTE commercial communications control signals.

a spectrum-analyzer resolution bandwidth (RBW) of 35.7 kHz and real-time bandwidth of 10 MHz. The pulse traces are formed from 561 points with display persistence set at 1 s.

When working with the firm's new RTSA software, one of these FieldFox analyzers can capture and identify multiple simultaneous pulses within the capture bandwidth; work with a directional antenna to identify interference signals; and even verify wireless communications network operations, such as Long Term Evolution (LTE) uplink control and traffic signals (Fig. 3).

These portable analyzers with optional RTSA capability are compliant to MIL Class 2 requirements and are as home in commercial and industrial applications as they are in military test situations. They are well-suited for monitoring interference on two-way radio links, checking signals at satellite-communications (satcom) ground stations, capturing frequency-hopped signals, and verifying pulse sequences in military radar systems.

With their multiple display modes, such as spectrogram and real-time-spectrum displays, these FieldFox analyzers with optional RTSA capability can show small signals "hiding" within or in the presence of larger signals. They can serve as effective tools for checking on wireless communications signal carrier quality or for detecting the small signals emitted by improvised explosive devices (IEDs), even in the presence of much larger signals at airports.

The FieldFox microwave and spectrum analyzers with optional RTSA capability measure just 11.5 \times 7.4 \times 2.8

THE FIELDFOX ANALYZERS WITH OPTION 350 RTSA, AT A GLANCE			
Model	Instrument type	Frequency range	RTSA range
N9913A	Combination	30 kHz to 4 GHz	100 kHz to 4 GHz
N9914A	Combination	30 kHz to 6.5 GHz	100 kHz to 6.5 GHz
N9915A	Combination	30 kHz to 9 GHz	100 kHz to 9 GHz
N9916A	Combination	30 kHz to 14 GHz	100 kHz to 14 GHz
N9917A	Combination	30 kHz to 18 GHz	100 kHz to 18 GHz
N9918A	Combination	30 kHz to 26.5 GHz	100 kHz to 26.5 GHz
N9935A	Spectrum analyzer	30 kHz to 9 GHz	100 kHz to 9 GHz
N9936A	Spectrum analyzer	30 kHz to 14 GHz	100 kHz to 14 GHz
N9937A	Spectrum analyzer	30 kHz to 18 GHz	100 kHz to 18 GHz
N9938A	Spectrum analyzer	30 kHz to 26.5 GHz	100 kHz to 26.5 GHz
N9950A	Combination	300 kHz to 32 GHz	9 kHz to 32 GHz
N9951A	Combination	300 kHz to 44 GHz	9 kHz to 44 GHz
N9952A	Combination	300 kHz to 50 GHz	9 kHz to 50 GHz
N9960A	Spectrum analyzer	300 kHz to 32 GHz	9 kHz to 32 GHz
N9961A	Spectrum analyzer	300 kHz to 44 GHz	9 kHz to 44 GHz
N9962A	Spectrum analyzer	300 kHz to 50 GHz	9 kHz to 50 GHz

Note: Combination analyzers include cable and antenna tester (CAT), vector network analyzer (VNA), and spectrum analyzer.

in. (292 × 188 × 72 mm). They are software-enabled and field-upgradable for keeping pace with changing measurement requirements. In addition to the many integral measurement functions already mentioned, these portable instruments also feature a built-in interference analyzer for the frequency range of the instrument, with included record and playback capability for analyzing captured interference.

Finally, the analyzers offer a number of different options, including for characterizing pulses found in radar and electronic-warfare (EW) systems, use of an external Universal Serial Bus (USB) power sensor, and remote control of the analyzer using smartphones or other wireless devices.

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