Keysight Technologies

Managing Wireless Medical Applications with FieldFox Handheld RF and Microwave Analyzers (Part 2)

There are many radio frequency (RF) and wireless applications in the medical industry. They range from diagnostic imaging maintenance to shielding tests, which help prevent interference from consumer wireless products to medical implants or medical devices in healthcare facilities. Challenges range from finding unexpected interference and device co-existence to choosing suitable tools to address these issues.

This application brief explores how Keysight FieldFox handheld RF and microwave analyzer is used to detect wireless signal coverage and to find unexpected wireless interference in healthcare facilities.

Keysight FieldFox

- Rugged
- Battery-operated and does not require an AC outlet
- Portable and easy to carry around during a service call

Figure 1. Keysight FieldFox Handheld RF and Microwave Analyzer

Keysight Solutions

Wireless Signal Coverage Testing

The channel scanner capability provides channel power measurements to verify signal coverage, identify potential interference issues and optimize network performance. Each channel can be custom set with different frequencies and bandwidths for multiple signal analysis. This capability is useful for engineers and technicians performing wireless signal network coverage test and interference analysis. The FieldFox's channel scanner option transforms the instrument into a multichannel scanner for on-site survey to detect indoor signals as well as outdoor signals such as paging system or communication with emergency medical services or ambulances. The channel scanner is also used to detect intermodulation between two signals. Intermodulation is the mixing of two signals to create other new unwanted signals. This scenario frequently occurs in dense RF environments, especially in places like healthcare facilities.

With the data logging capability, users can record the signal strength data for each GPS point in either .csv or .kml format and process the data offline. Files can be exported to Google Earth.

Figure 2. This screenshot shows the wireless network channels present in an active area. FieldFox scans up to 20 channels simultaneously at any given frequency and bandwidth.

Figure 3. Targeted signal strengths and new intermodulation signals.

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Finding Unexpected Interference

With the proliferation of wireless technologies in commercial and wireless medical device applications, interference problems have become increasingly common and severe. For example, consumer products such as cellphones, PCs or tablets can cause wireless interference with medical equipment in a medical facility, such as CT machines, MRI machines and other physiological monitoring devices.

The Real Time Spectrum Analysis (RTSA) software found in the FieldFox is an effective tool for interference hunting and signal monitoring. RTSA is an FFT analyzer without dead time. The receiver is parked at the interested frequency span, which is limited by real time frequency bandwidth. There is no tuning or stepping. RTSA has sufficient signal buffer, FFT engine and display engine to process and empty memory before subsequent data frames come in. Within its capture bandwidth, it detects transient signals, dynamic signals and RF pulses. This optional high-speed, gap-free measurement capability can be added to Keysight's FieldFox, which is a must-have tool for field and facility personnel to use as a single instrument to detect, locate and fix interference problems.

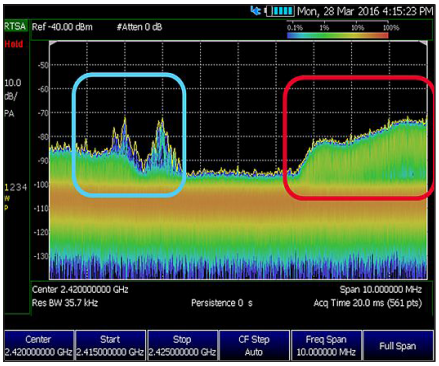

Figure 4. With RTSA features, user can identify multiple types of signals in the same frequency band. The *Bluetooth*® signal is highlighted in blue while the wireless LAN signal is in red.

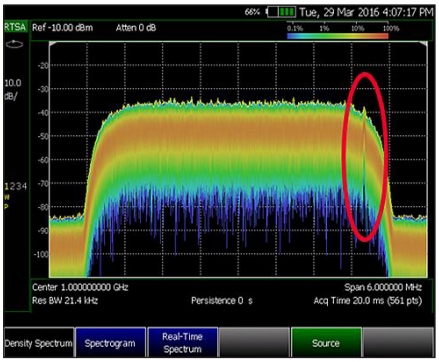

Figure 5. RTSA offers a measurement display called density display, providing signal hitting capabilities at specified frequency span. This feature makes it easier to identify two different signals that have power level fluctuations with distinct statistic natures. This screenshot illustrates how RTSA can clearly see the "threat" instantly.

Specification in A Glance

Function	Keysight N9918A FieldFox RF and Microwave Combination Analyzer
Real-time spectrum analyzer (RTSA)	
Frequency	100 kHz to 18 GHz
Maximum real-time bandwidth	10 MHz
Minimum signal duration with 100% POI at full amplitude accuracy	12.2 µsec
Channel Scanner	
Scan mode	Range or custom list
Display type	Bar chart vertical, bar chart horizontal, channel power, strip chart, chart overlay, scan & listen
Data logging mode	Time with geo tagging
Trace playback and recording	– Record channel power measurement – Store data internally or USB or SD card in .csv or .kml format – Playback recorded data using FieldFox – Data in .kml format can be exported to Google Earth

Literature

Managing Wireless Medical Application	Publication Number
FieldFox RF Vector Network Analyzer Data Sheet	5990-9783EN
Techniques for Precise Interference Measurements in the Field Using FieldFox Handheld Analyzer Application Notes	5991-0418EN
Solving Design and Test Challenges for Medical Devices Brochure	5991-2240EN

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