# Indoor Mapping Solution with Tektronix Real–Time Spectrum Analyzers and TRX NEON® Signal Mapper

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**Tektronix**®

## Introduction

Ensuring coverage of your wireless system is key. Not only when customer satisfaction and revenue is at risk, but more importantly when safety is at risk. In large, high-density public spaces such as sports arenas, hospitals, malls, airports, parking garages, and ships emergency first responders need to communicate reliably, and life-saving equipment needs to connect to the cloud. A large building complex could have thousands of Wi-Fi access points and cellular antennas providing service, but is it enough and is there enough coverage to support an emergency? What is coverage like in evacuation routes, stairwells, and first responder access

passageways? Can firefighters, medical staff and police effectively control an emergency if wireless coverage is limited or strained?

In this application note, portable Tektronix Real-Time Spectrum Analyzers (RSAs) are used in combination with TRX NEON® 3D Signal Mapper to create a complete indoor RF signal mapping solution. With this new integrated TRX-Tektronix solution, engineers and technicians can easily collect wireless network site survey measurements for performance verification of commercial and public safety networks.



**Tektronix RSA300/500**

**RF Data**

**Location**

**NEON Command**

**NEON Tracking Unit**

Configuring the Tektronix Real-Time Spectrum Analyzer with the NEON Command Software and Tracking Unit.

# Field Measurements with Real–Time Spectrum Analyzers

Coverage mapping and RF survey measurements have traditionally employed the use of a spectrum analyzer, directional antenna, global-positioning system (GPS) and mapping software. But GPS is often highly attenuated inside of buildings, making indoor mapping a tedious manual task.

What's unique about this solution is that indoor mapping with the TRX-Tektronix solution utilizes a suite of sensors combined with ranging and dynamic mapping algorithms that allow for relatively precise and visually stunning geolocated measurements, without having to rely on satellite-based positioning systems or distance measurements.

Using the real-time spectrum analyzer as the measurement device, the received signal strength is plotted and visualized on a 3D heat map using the TRX NEON® 3D Signal Mapper system. The heat map shows where signals are strong using one color, and where signals are weak using another color.

## LOW–COST, HIGHLY PORTABLE PACKAGE

Both the Tektronix RSA300 and RSA500 Series Portable Real-Time Spectrum Analyzers can be used for this application and provide other measurement capabilities such as signal quality metrics, signal survey and classification tools, and GPS-based mapping capabilities. The analyzers connect to the recommended Android device via WLAN. The Android device is also connected to the cloud via WLAN, while the TRX tracking unit utilizes a bluetooth connection.
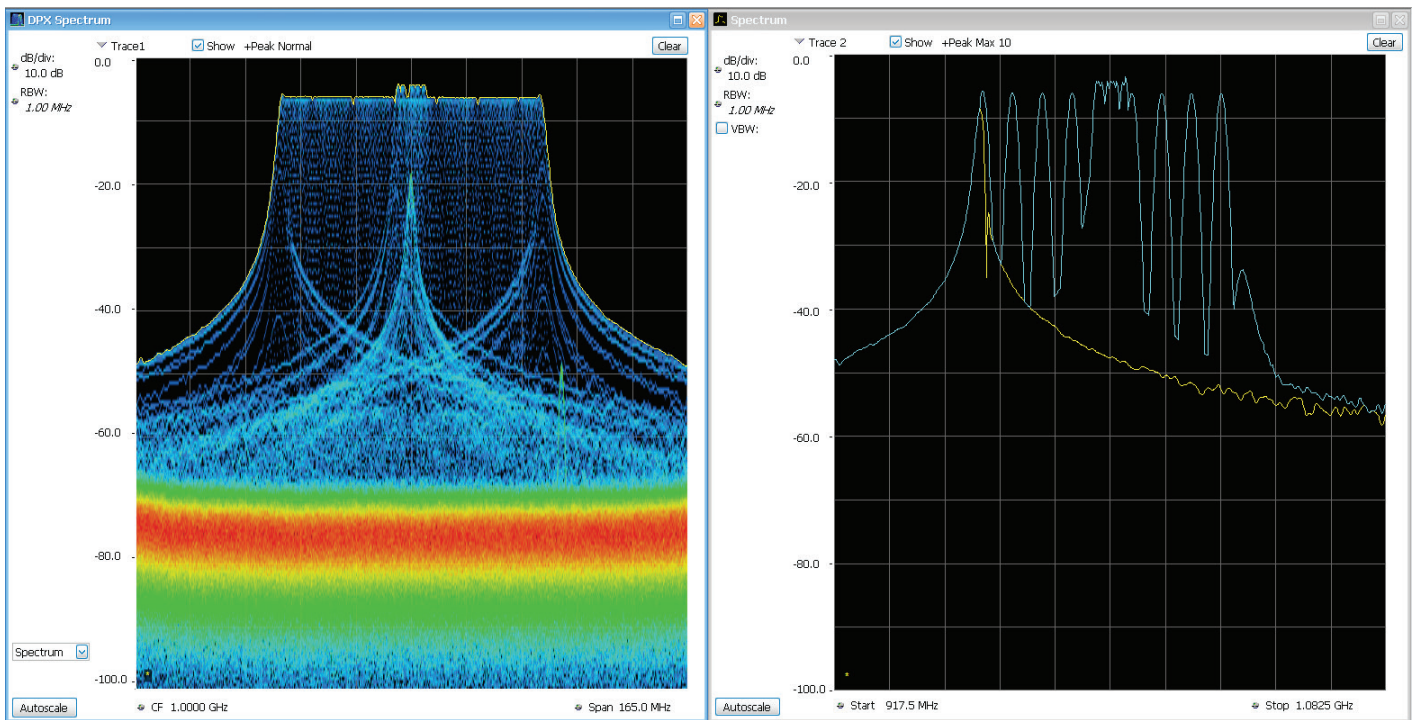


**Real-Time DPX® Spectrum**

Instrument sweeps up to 40 MHz bandwidths instantaneously (guaranteeing 100% probability of intercept of signals as low as 15 us in duration), allowing for the detection of short duration, hopping, low duty-cycle, or intermittent signals such as the RF pulse from a local WIFI router pictured here. The DPX® color-graded bitmap display can also be swept, allowing the instrument, in a single sweep, to detect and display intermittent emitters or signals under signals over the full frequency range.

**Traditional Swept Spectrum**

Instrument sweeps from left to right, at speeds up to 70 GHz/sec (RSA518A). The fact that the instrument is sweeping is a potential problem since short duration signals could be missed due to them being on and off in between sweeps. A Max Hold trace can be used to build up an RF profile, but this only becomes useful after multiple sweeps.

# Performing the Measurements

## SET UP RSA300/500 FOR CHANNEL POWER MEASUREMENT

1. Run SignalVu-PC and wait for the auto connection with the RSA.

2. Select Chan Power and ACPR as the measurement.
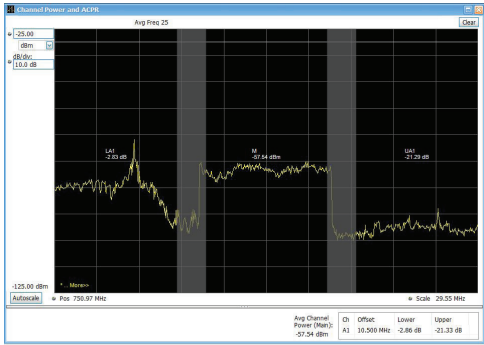


3. Set the center frequency, ref level, and the channel bandwidth.

4. Optimize the measurements with other settings (trace detector, measurement filter, trace point, averaging, …)

5. Start the socket/VXI-11 server and record the IP address in TekVISA LAN service control tool.

## SET UP NEON SIGNAL MAPPER

1. Download and install NEON Signal Mapper on an Android device.

2. Turn on the tracking unit.

3. Turn on the Bluetooth of the Android device, pair and select the tracking unit
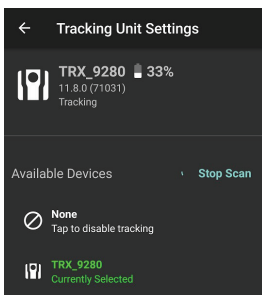


4. Enter the IP address of the Tektronix RSA.
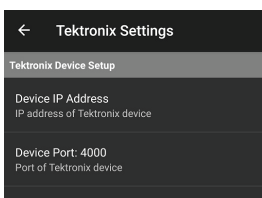


## PREPARE A MAP WITH NEON COMMAND SOFTWARE

1. Download and install NEON Command software on a PC.

2. Follow the instruction to create an indoor map from your floor plans.

3. The created map will be downloaded to the NEON Signal Mapper App on the android device automatically.

## PERFORM MEASUREMENTS

1. In Signal Mapper, calibrate the Tracking Unit by setting your location using the check-in icon. Navigation lock will be indicated on device UI by green bars.

2. Walk and start recording the measured data.
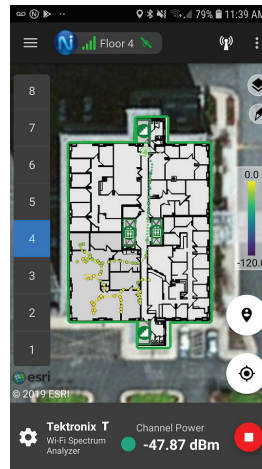


3. Once the tests are done, upload the results to a cloud server.

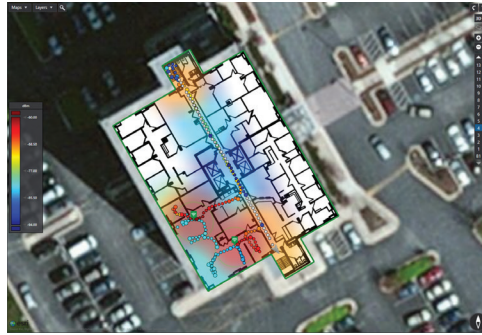4. In NEON Command software on the PC, select the measured result, and generate the heat map.

# Summary

Indoor wireless coverage mapping tests are critical in today's modern radio and public safety environments but are challenging due to the limited availability of GPS coverage. Tektronix has partnered with TRX to provide a complete solution for indoor or outdoor coverage mapping, without the need of GPS. Tektronix RSA300/500 Series Real-Time Spectrum Analyzers are used to collect the RF data. TRX NEON software and tracking units are used to record the geolocation of each measurement and plot the 3D heat map to display the wireless signal coverage in buildings, arenas, hospitals, or ships.
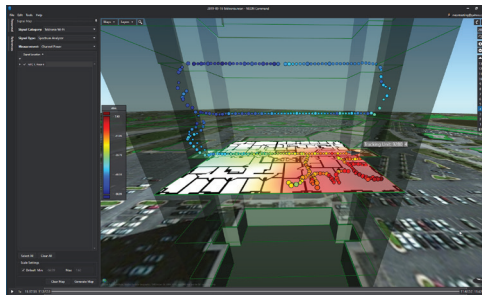


Indoor wireless network coverage heat map

KEY BENEFITS :

- Automated Indoor location speeds in-building testing.

- Eliminates the need to manually add markers (waypoints).

- Fast delivery of coverage reporting including 3D images and Grid Report formats.

- Removes data recording errors caused by incorrect location estimates.



3D visualization of signal data

- Provides continuous logging of data with a high density of data points, including map stairwells, elevators, and tunnels.

- Provides actionable data for rapid analysis of signal coverage with 3D visualization and time-stamped data.

- Allows for combination of multiple survey files into a single report.

For more information on Tektronix Real-Time Spectrum Analyzers with the TRX NEON® Mapper, contact a Tektronix representative or visit **www.Tek.com/spectrum-analyzer**.

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