Moving Wireless Research From the Lab to the Field

Testing Propagation and Path Loss Models Under Real-World Conditions

We have seen a proliferation of wireless devices in the past decade. Today, 95 percent of US adults\(^1\) own a mobile phone, and the combination of faster speeds and lower data costs has led to an explosion in mobile data usage around the world.

This increasing demand for wireless signals has led to the development of new signal standards, such as 5G. These new standards rely on high frequency, wideband signals well above what is typically used for Wi-Fi or 3G/4G/LTE.

Higher frequency signals, such as those being studied, evaluated, and deployed for 5G wireless, are more prone to path loss and have difficulty passing through various obstructions, such as walls, buildings, densely covered treed areas, or even people. It is generally expected, therefore, that various signal types at different frequencies will be needed to enable widespread 5G coverage that offers the performance and reliability needed for critical use cases.

Wireless researchers at research labs and universities, therefore, need to understand how these signals respond under real-world conditions for communications and defense applications. They must be able to move their research from the lab to the field to test models, evaluate results, and determine the accuracy of path loss and propagation models in a variety of different environments.

\(^1\) [https://www.pewinternet.org/fact-sheet/mobile/](https://www.pewinternet.org/fact-sheet/mobile/)
The Challenge

Traditional lab signal analysis equipment has been used by wireless researchers for decades. These analyzers are typically large, heavy, and expensive, and most lack the networking capabilities needed to be deployed remotely. They limit researchers to the lab while also making it difficult to adapt to new signal standards or modulation types.

Today, however, the lab is no longer the place to predict real-world performance through ideal or theoretical models of propagation. For users, it is becoming increasingly clear that this traditional equipment is unable to keep up with the more complex, distributed, and varied research being completed today.

To conduct propagation and path loss studies in real-world environments, researchers require signal analysis equipment that is networked, portable, and designed for distributed deployment. They must be versatile and able to quickly switch between different frequencies, modulation types, and deployment scenarios while maintaining test setups and measurement consistency. And they need the performance and software capabilities required to get an in-depth look at properties such as signal strength, degradation, as well as the quality of the signal based on demodulation and looking at a constellation diagram.

QUICK FACTS

Wireless researchers are conducting more complex and varied research that goes beyond just the lab environment

Traditional lab-based signal analysis equipment is no longer suited to these requirements

ThinkRF is the first third-party vendor to integrate with leading Keysight 89600 VSA software for demodulation and in-depth signal analysis
ThinkRF Real-Time Spectrum Analyzers are versatile, portable, and networkable for remote deployment in a variety of environments. Powered by innovative software-defined radio (SDR) technologies, these lightweight, cost-effective, and high performance signal analyzers give wireless researchers the ability to move out of the lab and into the field to conduct experiments and tests under real-world conditions, either using a signal generator or over the air signals.

ThinkRF is the first, third-party vendor to fully integrate with the leading Keysight 89600 VSA software through the ThinkRF E300 Enabler. The combined solution provides users with advanced capabilities and in-depth measurement performance so that wireless researchers can validate models and theories, demodulate signals to view signal properties, conduct frequency and time domain analysis, and easily switch between more than 75 signal and modulation types.

**Benefits of ThinkRF Real-Time Spectrum Analyzers with Keysight 89600 VSA**

- Compact, lightweight, and networkable for distributed deployment across a variety of environments
- High frequency performance from 9 kHz to 27 GHz, which can be extended up to 30 GHz using the ThinkRF D2030 RF Downconverter
- Demodulate signals to view signal properties and conduct deeper analysis
- Save and forward data for further analysis
- Best price-performance ratio available on the market
The Results

ThinkRF Real-Time Spectrum Analyzers, when combined with leading Keysight 89600 VSA software, gives wireless researchers the ability to shift from the lab to the field to evaluate theoretical models, improve the accuracy of results, and conduct propagation and path loss studies under a variety of conditions. By using the same equipment across deployment scenarios, researchers gain measurement consistency and retain test setups, while also reducing the need for costly, bulky, lab-based equipment.

The combined solution empowers wireless researchers in labs or universities to conduct more complex, distributed, and varied research applications. They are ideal for users who need to be able to quickly shift between signal types, demodulate signals for further analysis, and collect data in real-world environments.

ThinkRF is the leader in software-defined spectrum analysis solutions that monitor, detect and analyze complex waveforms in today’s rapidly evolving wireless landscape. Built on patented technology and quality by design principles, the ThinkRF platform offers greater versatility, better performance and additional capabilities for 5G, monitoring, signals intelligence (SIGINT), technical surveillance countermeasures (TSCM), and test and measurement applications. Aerospace and defense companies, spectrum regulators and wireless communications providers use the remotely deployable, PC-driven and easily-upgraded platform to replace traditional lab equipment for wireless spectrum analysis.

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