VIAVI
Over the Air Uplink Interference Testing
with OneAdvisor 800 Wireless

As a mobile service provider, signal interference is an unavoidable reality but one that must be addressed quickly to keep subscribers happy.

Interference can be defined simply as the presence of signals that impacts radio communications either in the downlink (DL) or the uplink (UL) path, producing network impairments. The interfering radio activity can have an internal origin when produced by the network itself, or an external origin when produced by other transmission systems nearby. Cell phones are more prone to interference impairments since their transmission power (UL) is much lower than the base station (DL). This means that any interfering signal in the uplink (UL), even if it transmits at a low power level, can cause retransmissions, or loss of capacity and service. This leads to service problems, which lead to dissatisfied customers and a higher customer churn.

There are three main types of UL interference:

- Passive intermodulation (PIM) usually on the feedline, antenna or nearby metal elements

- Interference in time division duplex signals (LTE and 5G) due to radio synchronization and timing issues

- Interference from external sources, which are increasingly appearing in the radio access network

Historically, a mobile service provider needed to use multiple devices to test for different types of interference, which was not only impractical, but also expensive. For PIM alone, engineers typically had to use a different test device per band, and had to make dangerous tower climbs to find and fix problems. To find external interference, one had to be a true expert to tackle a spectrum analyzer.

But RF interference hunting can be far easier with today's technology. With a single, compact device, service providers can now address all three categories of interference. The OneAdvisor 800 Wireless is a complete solution that enables the consolidation of multiple test tools, but it also packs value-added features into each test category, thus making the user's job much simpler.

The OneAdvisor 800 can make your job easier by:

- Testing for multiple types of interference with one device

- Scaling test capabilities as MOPs expand

- Simplifying interference testing

Here are some examples of how it works in real-life:

PIM Detection

⊘ Test Challenge:

Traditional passive intermodulation (PIM) isolation methods involve climbing a tower, disconnecting a radio from its feedline, and setting a dedicated tone generator to perform PIM analysis through the operating frequency band of the radio. The frustrating thing is that opening a coaxial connection to test for PIM can introduce a new VSWR or PIM issue. In addition, dedicated tone generators have several disadvantages such as their large size, high cost, and their limitation of only being able to test one frequency band per device.

⚙ Solution:

The OneAdvisor 800 Wireless addresses multiple PIM challenges. It performs PIM detection via RFoCPRI on all frequency bands, non-intrusively, without a tower climb, with minimal service impact, and by setting the radio to transmit at full power in test mode. If desired, the RRH power can be increased to trigger more PIM, making it easier to detect. Further, this "real" PIM seen in real-time is often a result of many more sources than any single or dual port PIM tone generator can simulate.

> It's important to note that not all PIM sources are on the feedline.

It's important to note that not all PIM sources are on the feedline. OneAdvisor 800 Wireless allows you to inspect in front and behind the impacted antenna for potential external PIM sources. The user should then shake, tap, tighten, or cover potential PIM sources and see the instantaneous effect on the PIM signature on the screen. For PIM, the OneAdvisor 800 is a real time and cost saver.

BBU: Baseband Unit
FPP: Fiber Patch Panel
RRU: Remote Radio Unit
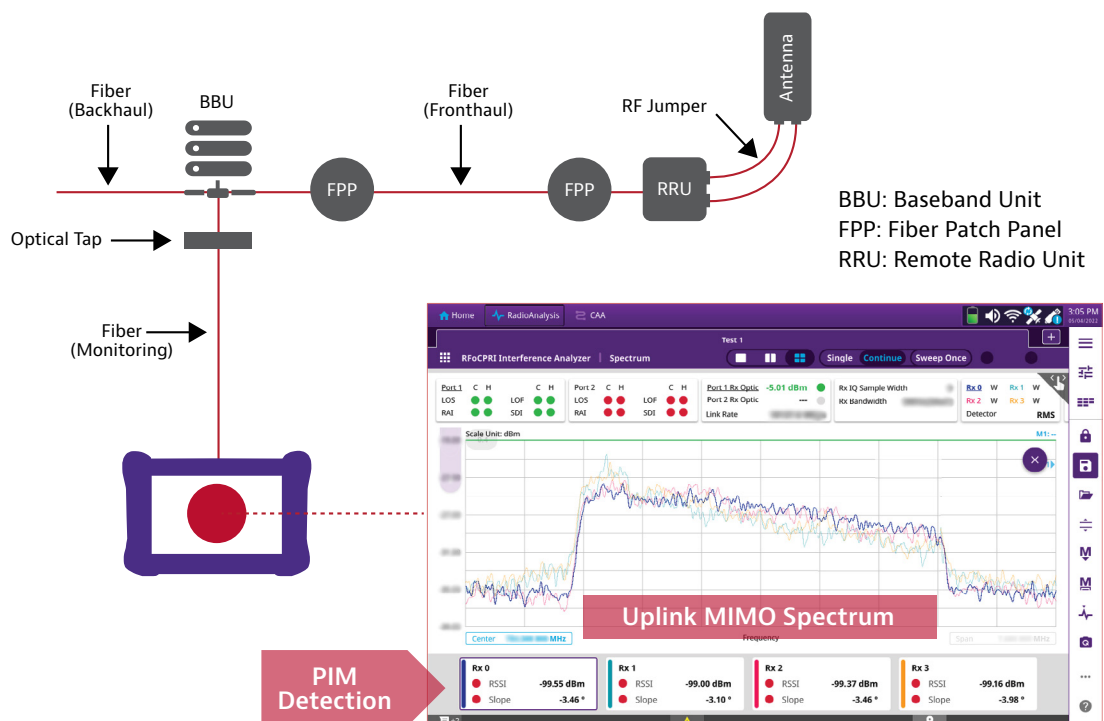
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# Synchronization and Timing

Test Challenge:

The wireless industry had fewer problems with synchronization when using Frequency Division Duplexing (FDD) radio access network (RAN) technology. FDD technology had less stringent synchronization requirements and could operate for hours after sync loss with no degradation. The arrival of 5G disrupted that complacency because FDD is no longer sufficient and mobile operators are now deploying Time Division Duplex (TDD) RAN technology in the mid-band.

TDD is superior to FDD because it uses the RF spectrum more efficiently, which is required with 5G's high data rates. TDD achieves spectral efficiency by allocating different time slots for uplink and downlink signals over the same frequency. Unfortunately, the advantages of TDD are offset by the precise timing and synchronization needed to prevent intra-cell or inter-cell interference. TDD requires both the frequency and phase to be synchronized. To make matters more complex, there are over 56 slot format configurations defined by 3GPP standards to address different 5G use cases and traffic patterns.

Solution:

OneAdvisor 800 Wireless is the first field device that can take over-the-air timing and sync measurements: timing verification of 5G signals, including frequency and time variation of a cell-site against GPS; as well as cell phase synchronization conformance test of a cluster of cell sites according to 3GPP standard with a clear PASS/FAIL indicator. The easy-to-use features of OneAdvisor 800 Wireless makes addressing the challenges of TDD timing and sync far less daunting.
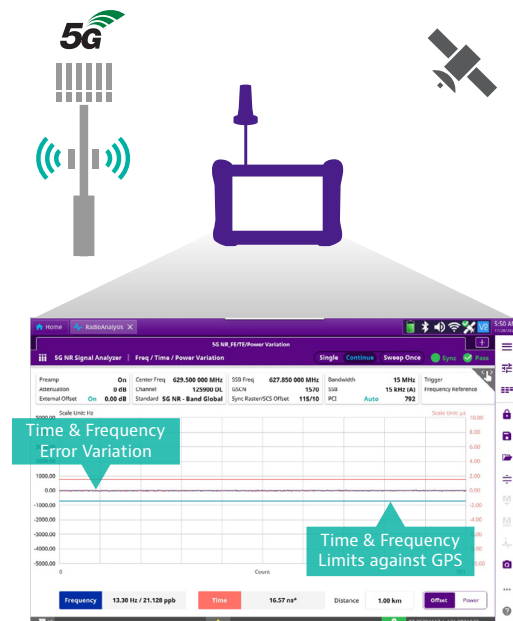
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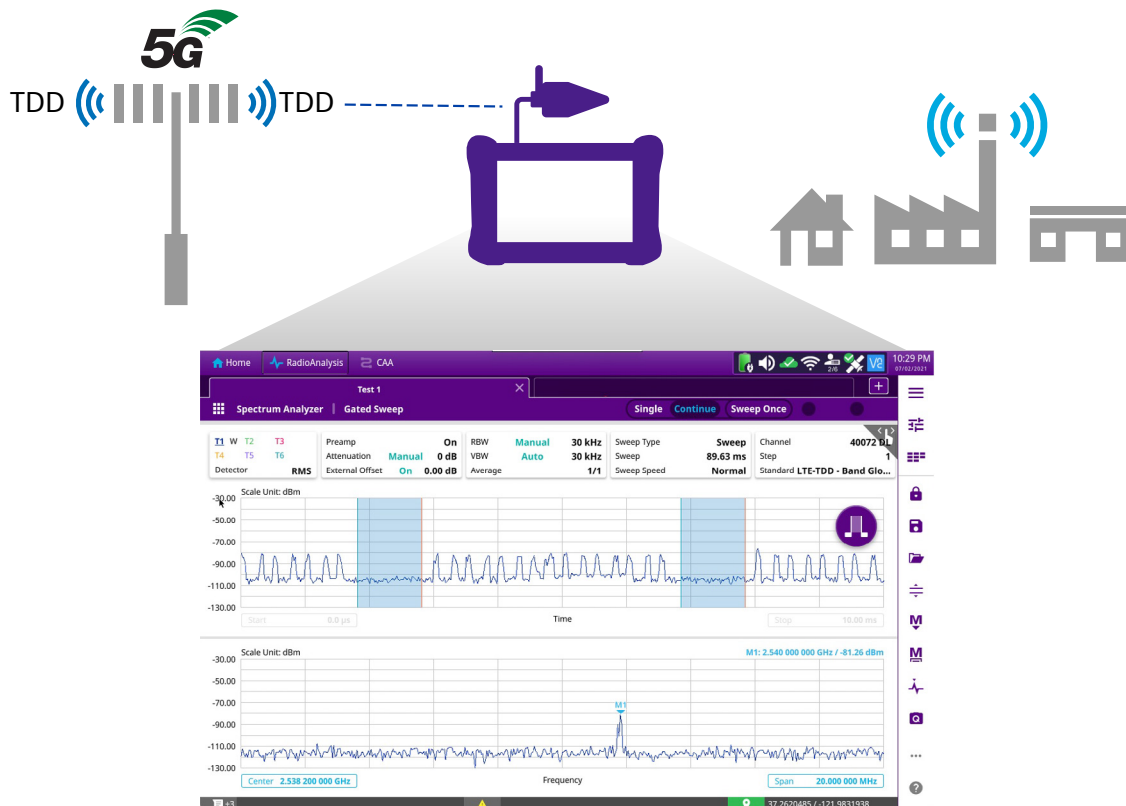
External RF Interference

Field Challenge:

Identifying and correcting interference issues in a mobile environment is a challenging but critical task. Mobile users near the interference source will experience degraded call setup success rates, increased dropped calls, decreased battery life, poor voice quality, and reduced data throughput. Detecting, locating, and ultimately eliminating sources of RF interference is an essential strategy for service providers to ensure customer satisfaction. The challenge is that there are many devices that can be a potential source of external interference; video cameras, cable TV infrastructure, cell boosters, industrial machinery, smart-grid units, etc. The possibilities are endless.
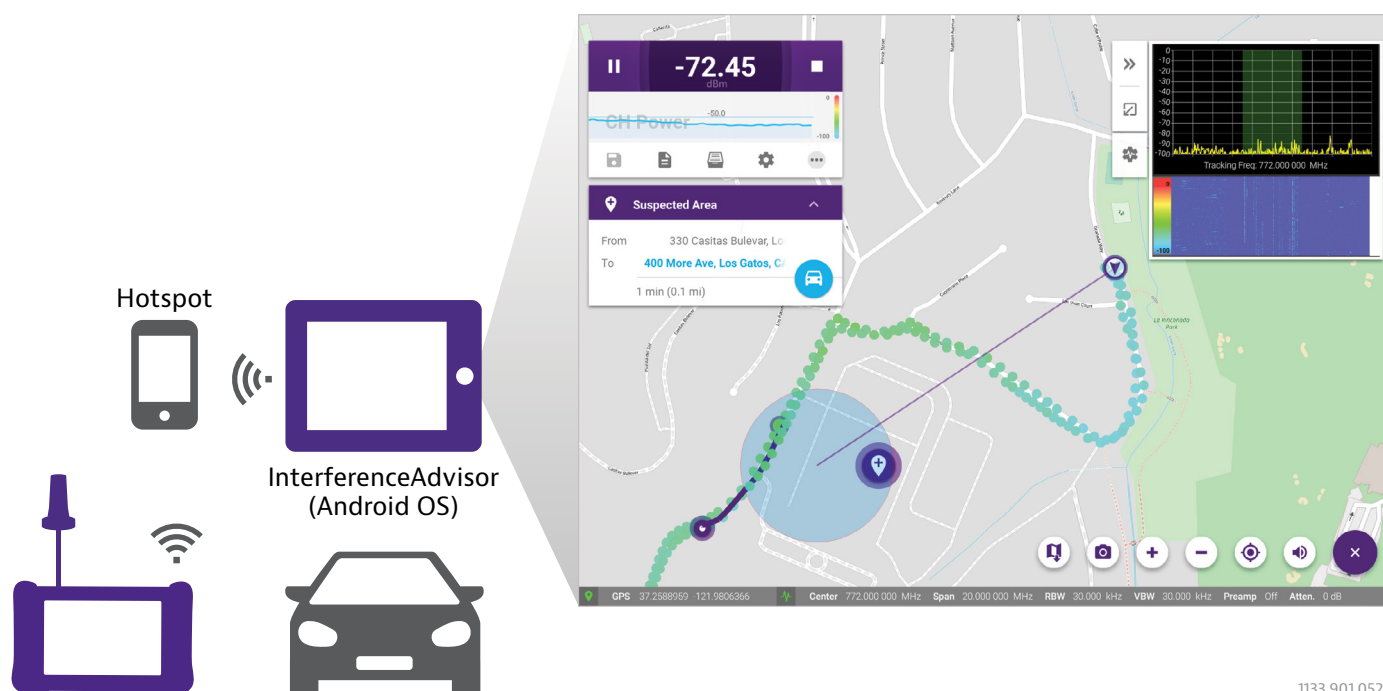
Solution:

The most effective methodology to detect interference in LTE-TDD radio access is with gated spectrum, which conducts spectrum measurements only in the transmission time of the uplink. The proprietary "TDD Automated Gated Sweep" (TAGS) feature on the OneAdvisor 800 Wireless not only performs gated spectrum, but it also automatically identifies the uplink timeslot format for the user, which is itself a challenge.

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InterferenceAdvisor™ is a fully automated RF interference hunting solution by VIAVI that removes the guesswork in finding external interference. Easy to set up and simple to use, it allows to identify and locate an interference source in just hours, simply by following voice prompts on a familiar map-style application on an Android tablet. The InterferenceAdvisor software communicates with OneAdvisor 800 Wireless to retrieve RF power measurements (Peak, RSSI, Channel) and creates a power heat-map during a drive test. InterferenceAdvisor automatically detects the area of incidence with the highest presence of interference and then gives driving directions right to its location. Detecting and finding external interference that took days now takes hours with InterferenceAdvisor and OneAdvisor 800 Wireless.

InterferenceAdvisor™ is a fully automated RF interference hunting solution that removes the guesswork in finding external interference.

Hotspot

InterferenceAdvisor
(Android OS)

1133.901.0522

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