IN THE UNITED STATES DISTRICT COURT
FOR THE DISTRICT OF COLORADO

Civil Action No. 1:22-cv-1867

PRESTWICK LICENSING LLC,

Plaintiff,

v.

KEYSIGHT TECHNOLOGIES, INC.,
a Delaware Corporation

Defendant.

JURY TRIAL DEMANDED

PATENT CASE

ORIGINAL COMPLAINT FOR PATENT INFRINGEMENT

Plaintiff Prestwick Licensing LLC files this Original Complaint for Patent Infringement against Keysight Technologies, Inc. and would respectfully show the Court as follows:

I. THE PARTIES

1. Plaintiff Prestwick Licensing LLC ("Prestwick" or "Plaintiff") is a Texas limited liability company having an address at 5121 Collin McKinney Pkwy Ste 500, McKinney, Tx 75070-1524.

2. On information and belief, Defendant Keysight Technologies, Inc. ("Defendant") has a place of business at 1900 Garden of the Gods Road, Colorado Springs, CO, 80907. Defendant has a registered agent at C T Corporation 1675 Broadway, Suite 1200, Denver, CO 80202.

II. JURISDICTION AND VENUE

3. This action arises under the patent laws of the United States, Title 35 of the United States Code. This Court has subject matter jurisdiction of such action under 28 U.S.C. §§ 1331 and 1338(a).

4. On information and belief, Defendant is subject to this Court's specific and general personal jurisdiction, pursuant to due process and the Colorado Long-Arm Statute, due at least to its business in this forum, including at least a portion of the infringements alleged herein, at 1900 Garden of the Gods Road, Colorado Springs, CO, 80907.

5. Without limitation, on information and belief, within this state, Defendant has used the patented inventions thereby committing, and continuing to commit, acts of patent infringement alleged herein. In addition, on information and belief, Defendant has derived revenues from its infringing acts occurring within Colorado. Further, on information and belief, Defendant is subject to the Court's general jurisdiction, including from regularly doing or soliciting business, engaging in other persistent courses of conduct, and deriving substantial revenue from goods and services provided to persons or entities in Colorado. Further, on information and belief, Defendant is subject to the Court's personal jurisdiction at least due to its sale of products and/or services within Colorado. Defendant has committed such purposeful acts and/or transactions in Colorado such that it reasonably should know and expect that it could be haled into this Court as a consequence of such activity.

6. Venue is proper in this district under 28 U.S.C. § 1400(b). On information and belief, Defendant has businesses in this district at 1900 Garden of the Gods Road, Colorado Springs, CO, 80907. On information and belief, from and within this District Defendant has committed at least a portion of the infringements at issue in this case.

7. For these reasons, personal jurisdiction exists, and venue is proper in this Court under 28 U.S.C. § 1400(b).

III. COUNT I
(PATENT INFRINGEMENT OF UNITED STATES PATENT NO. 7,668,301)

8. Plaintiff incorporates the above paragraphs herein by reference.

9. On February 23, 2010, United States Patent No. 7,668,301 ("the '301 Patent") was duly and legally issued by the United States Patent and Trademark Office. The '301 Patent is titled "Simulated User Calling Test System and Method with Built-In Digital SPC-Exchange." A true and correct copy of the '301 Patent is attached hereto as Exhibit A and incorporated herein by reference.

10. Prestwick is the assignee of all right, title, and interest in the '301 patent, including all rights to enforce and prosecute actions for infringement and to collect damages for all relevant times against infringers of the '301 Patent. Accordingly, Prestwick possesses the exclusive right and standing to prosecute the present action for infringement of the '301 Patent by Defendant.

11. The invention in the '301 Patent relates to the field of digital stored program control (SPC) switch technique in telecommunications, particularly, to a simulated user call test system built-in digital SPC switch and method. (Ex. A at 1:13-16).

12. In the prior art, simulated user calling performance tests for digital SPC switches mainly employed large traffic call test instruments. (*Id.* at 1:20-22). The available commercial simulated user calling test instruments simulated the calling process of actual users realistically, in which the test is performed by transmitting and receiving pass detecting tone and judging the pass detecting tone while a call is initiated on a user line, a dial is simulated, and the call is communicated. (*Id.*at 1:23-28). However, these systems were expensive and therefore many network operators do not buy this type of equipment and therefore calling tests are vey complicated during pass tests of many digital SPC switches. (*Id.* at 1:31-37). It is therefore advantageous and simpler if a calling test instrument was built into the switch. (*Id.*at 1:35-37).

13. There are existing switches with a built-in large traffic calling test system characterized by designing a virtual calling process on a user element processor, simulating the

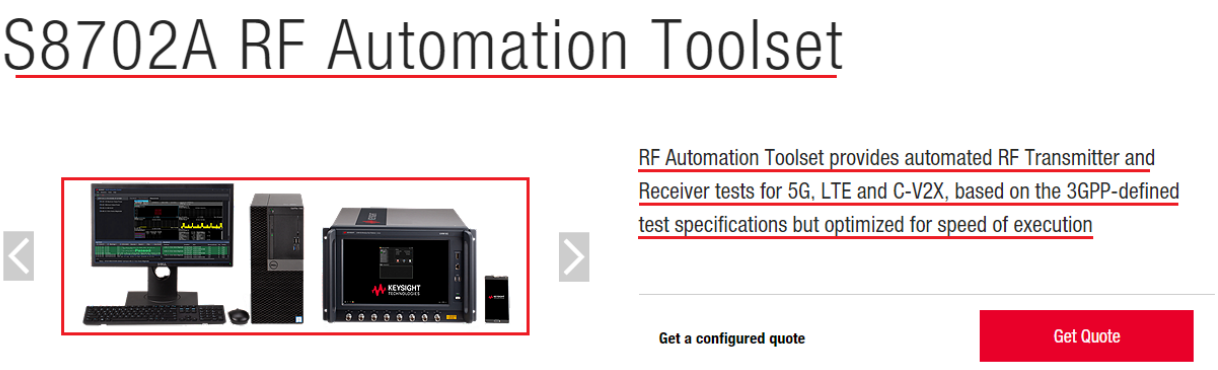
whole process including initiating a call by a user and answering the call by the called user. (Ex. A at 1:43-48). However, the main disadvantage of these kind of system was that it could only realistically test the process of call signaling by the main control system in a test switch, but not the performance such as the hardware interface performance in the switch and the performance of the switching connection path. (*Id.*at 1:48-53). Furthermore, they cannot accurately reflect the call process performance of the switch system. (*Id.*at 1:53-54).

14. The technical problem solved by the inventors is to provide a simulated user call test system located within a digital SPC switch, and to provide a test method based on built-in modules of a digital SPC switch, in which equal functions to commercial external call test systems can be realized with a lower cost by user the current hardware and software resources in a digital SPC switch. (*Id.* at 1:58-64).

15. **Direct Infringement.** Upon information and belief, Defendant has been directly infringing claim 1 of the '301 Patent in Colorado, and elsewhere in the United States, by making, using, selling, and or offering to sell the Keysight S8702A RF Automation Toolset ("Accused Instrumentality").

16. The Accused Instrumentality is a simulated user call test system (*e.g.*, GUI-based Keysight Test Application Framework software with E7515B Test platform), characterized in that the simulated user call test system is built in a digital stored program control switch (*e.g.*, the accused product), and comprises a back process module (*e.g.*, GUI-based Keysight Test Application Framework software, residing on E7515B UXM 5G Test Platform), a front call control process module (*e.g.*, user equipment (UE)) and a hardware subsystem (*e.g.*, Hardware Units in the Accused Instrumentality) for performing a call test (*e.g.*, call tests for 5G and LTE). As shown below, the Accused Instrumentality is a part of the simulated user call test system which is a GUI-

based Keysight Test Application Framework software, residing on E7515B UXM 5G Test Platform. The Accused Instrumentality comprises back process module (*e.g.*, GUI-based Keysight Test Application Framework software, residing on E7515B UXM 5G Test), a front call control process module (*e.g.*, user equipment (UE)) and a hardware subsystem (*e.g.*, Hardware) for performing a call test (*e.g.*, call tests for 5G and LTE). The back process module (GUI-based Keysight Test Application Framework software, residing on E7515B UXM 5G Test) provides an operation interface for a user to perform a call test setup (setting various parameters for call test), receives call test result data (*e.g.*, result report) transmitted by the front call control process module (*e.g.*, user equipment (UE)), and displays the result on the display of the Accused Instrumentality. The front call control process module receives call test setup parameters provided by the Keysight Test Application Framework software, controls the hardware subsystem (Hardware Units in the Accused Instrumentality) to perform a call test, and reports a result of the call test to Keysight Test Application Framework software, residing on E7515B UXM 5G Test. The hardware subsystem comprises function process units of the switch to receive instructions from the user equipment (UE), perform tests comprising picking-up phones, detecting signaling tone, and talking; and report test results (*e.g.*, report generator) to the front call control process module.



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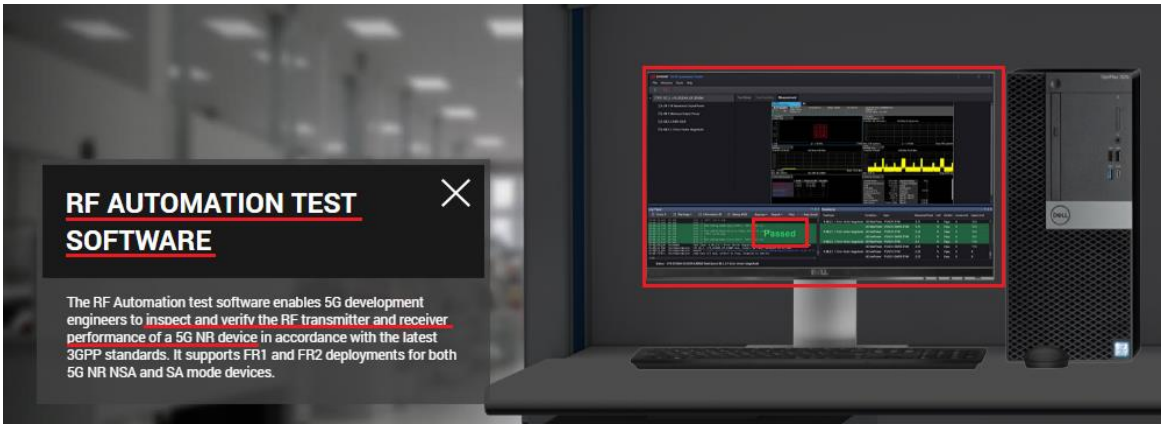

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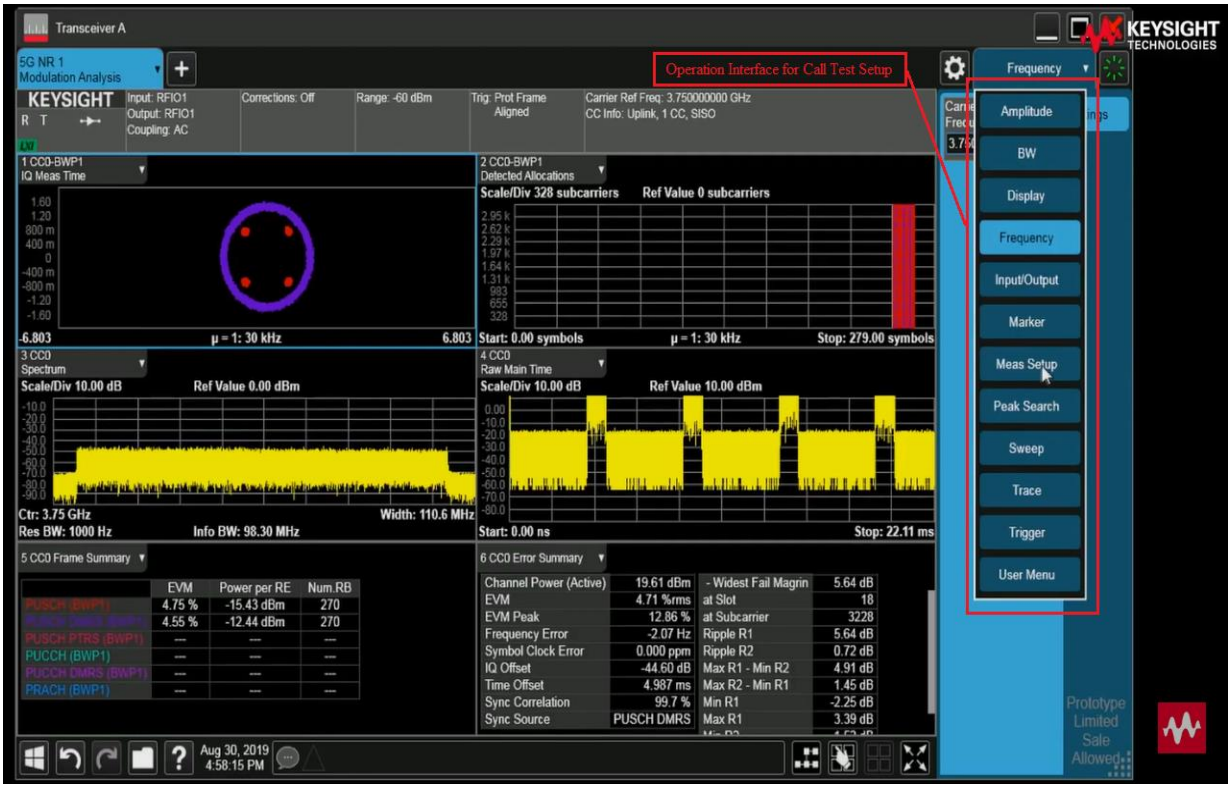

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The S8702A RF Automation Toolset is a comprehensive benchtop solution that enables 5G device development engineers to quickly inspect and verify the RF Transmitter and Receiver performance of new 5G NR devices in accordance with the 3GPP TS 38.521 and 3GPP TS 36.521 specifications; supporting FR1 and FR2 deployments for both 5G NR NSA and SA modes devices. The toolset is based on:

Keysight's Test Application Framework Software (Back Process Module) is residing on E7515B UXM 5G (Maintaining Platform).

- Keysight E7515B UXM 5G Wireless Test Platform: emulates the 5G network
- Keysight's Test Application Framework Software: provides control of the UXM 5G network emulator
- Keysight's X-Series Measurement Software: provides ready-to use measurements for signal analysis
- Keysight's E7770A Common Interface Unit, M1740A mmWave Transceiver and mmWave OTA chambers: extend testing range to the mmWave frequencies (FR2)

HIGHLIGHTS

The S8702A RF Automation Toolset extends the capabilities of the 5G Test Application by providing:

- An intuitive and easy-to-use graphical user interface for creating, configuring and running test campaigns
- A suite of fully-automated RF Transmitter and Receiver tests, based on the 3GPP TS 38.521 test specifications for 5G New Radio (NR), and on 3GPP TS 36.521 for LTE Advanced
- Optimized test execution times, enabling rapid inspection of the RF performance of 5G NR devices
- A report generator to summarize the results of test campaigns
- Support for both NSA and SA 5G modes in the same network emulator, providing a small footprint benchtop solution
- State-of-the art logging, visualization and debugging tools
- Flexible licensing options and tools

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When developing new 5G devices, RF design engineers require access to tools that enable them to rapidly inspect and verify the transmitter and receiver performance of their devices. This allows them to identify and focus on areas where performance is sub-optimal and quickly retest when the issue has been rectified.

Keysight's RF Automation Toolset addresses this need by providing a suite of RF transmitter and receiver tests based on the relevant 3GPP test specifications. These tests are optimized for speed and designed to run on a benchtop platform, allowing each engineer to have a dedicated test system on their own desk. Combined with Keysight's sophisticated logging and debugging tools, the toolset enables design verification engineers to accelerate the transformation of new 5G devices from prototypes to commercial products.

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Based on the Test Application Framework

Keysight's 5G Test Application (TA) Framework allows both touch-based and remote control of the UXM 5G network emulator. Its different operation modes support a wide range of tests, from non-signaling for UE Calibration to full signaling tests, providing a comprehensive set of features for engineers designing RF components and devices. The framework supports 4G LTE as well as both 5G deployment modes, Non-Standalone (NSA) and Standalone (SA), and its full signaling test mode enables users to perform RF measurements while a call is in progress.

The RF Automation Toolset uses this underlying Test Application Framework to control the UXM 5G network emulator and provide a suite of fully-automated Transmitter and Receiver tests that are based on the 3GPP TS 38.521 (5G NR) / 36.521 (4G LTE) test specifications.

(*E.g.*, https://www.keysight.com/us/en/assets/7018-06924/technical-overviews/5992-4178.pdf).

Figure 1. Screen capture illustrating a completed 5G NR NSA Random Access procedure using Keysight's 5G Test Application Framework

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Campaign Creation

The RF Automation Toolset user interface allows users to easily create test campaigns by simply adding one or more test modes (e.g. NSA FR1, NSA FR2, SA FR1). This is followed by selecting the target tests and specifying the key network parameters for each test mode, e.g. duplex mode, frequency band, channel bandwidth, high/mid/low band channels, and sub-carrier spacing (SCS).

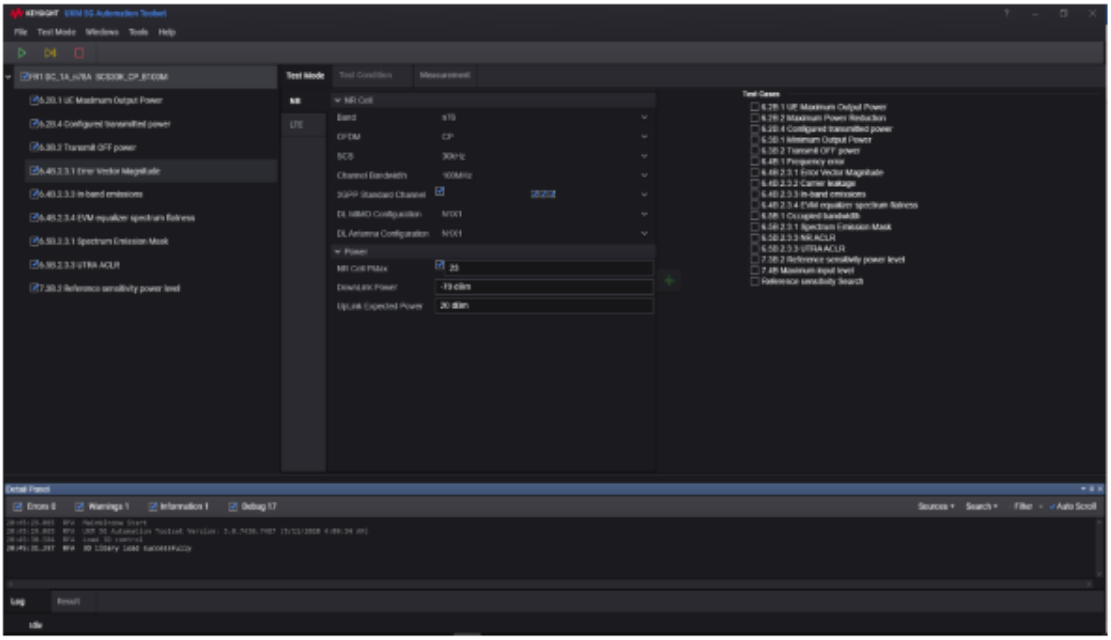

Figure 2. Campaign created by selecting available tests and configuring the Test Mode

Test Configuration

Each test in the campaign may be executed over a range of test conditions specified by the user, resulting in a test generated for each individual test condition. Test conditions provide access to a range of test-specific parameters, including bandwidth, modulation scheme, power levels, and the limits/measurement values against which the pass/fail verdict is assessed. This provides users with the flexibility to focus campaigns on specific conditions requiring further debugging, in order to quickly complete the verification of a device's RF performance.

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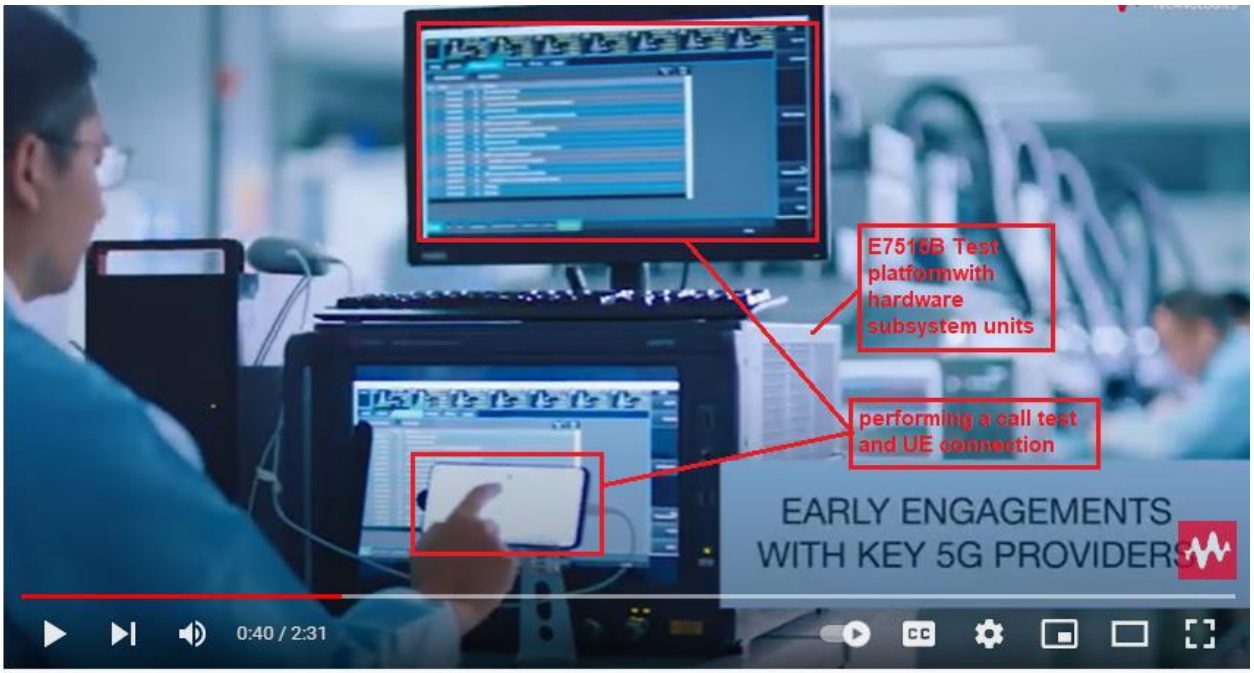

Keysight 5G Test Solutions for the Device Workflow

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Result Analysis

The Result List area provides real-time information about the test campaign execution progress with relevant information about each individual test result, including a pass/fail verdict for each test based on the user-defined verdict conditions.

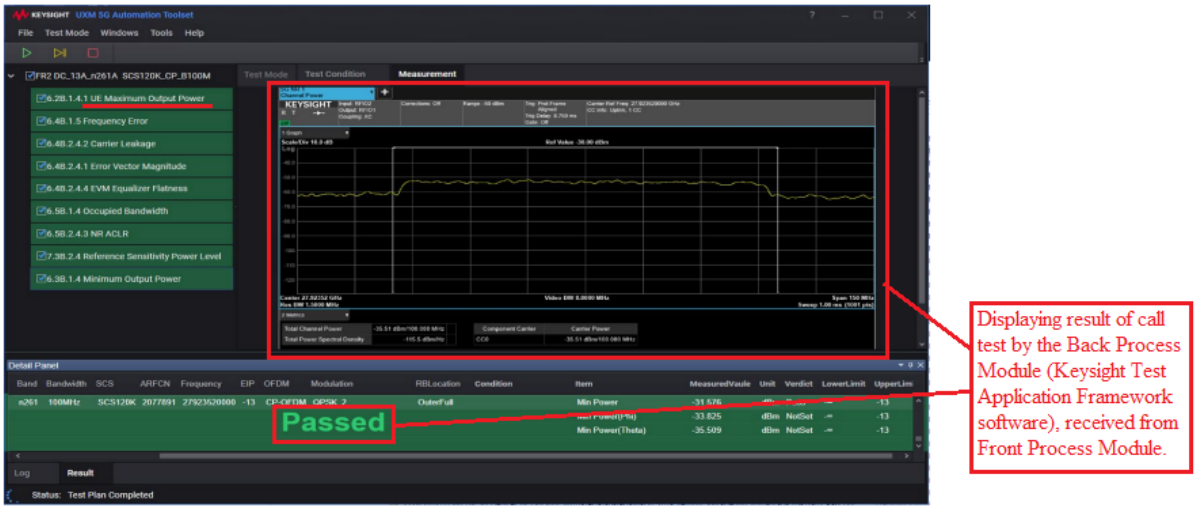

Figure 5. Real-time results information available in RF Automation user interface

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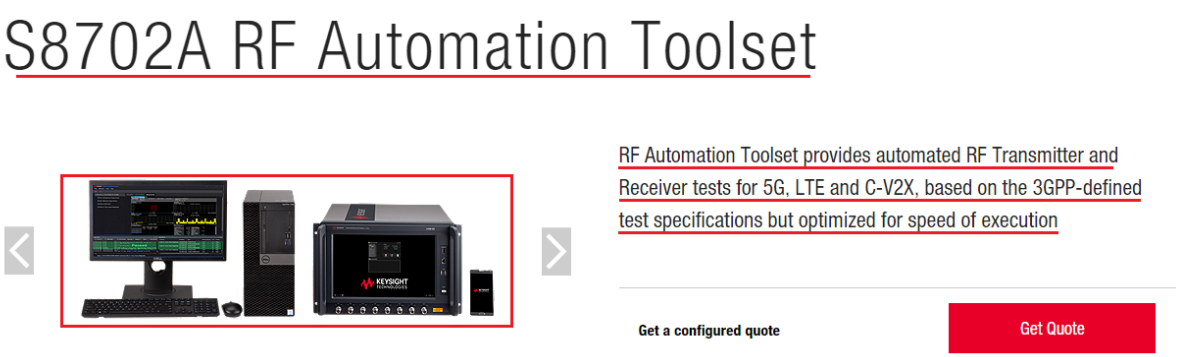

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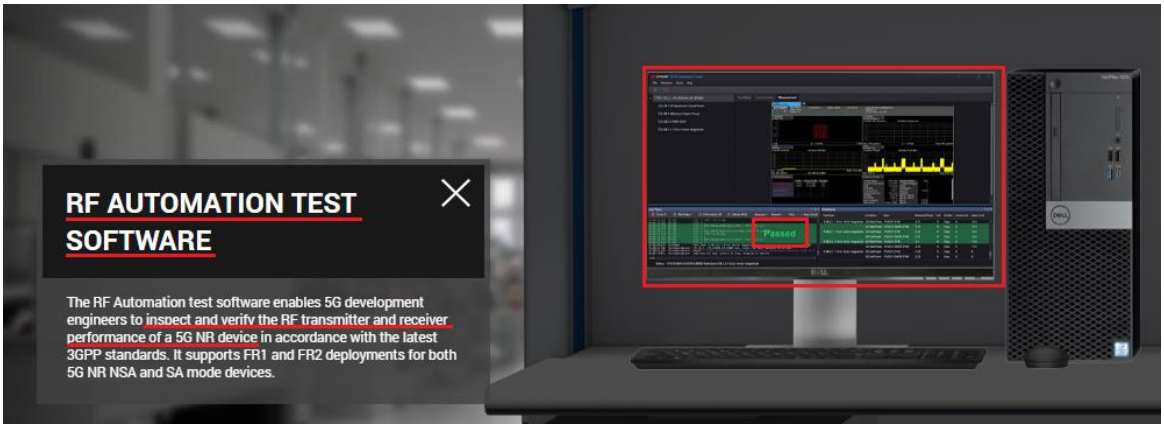

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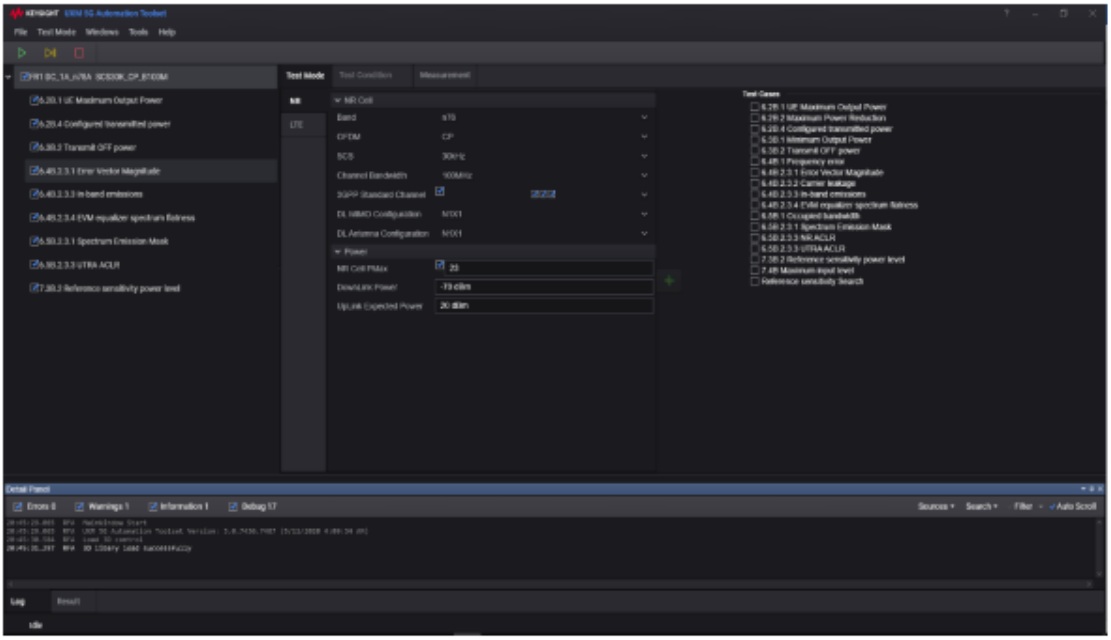

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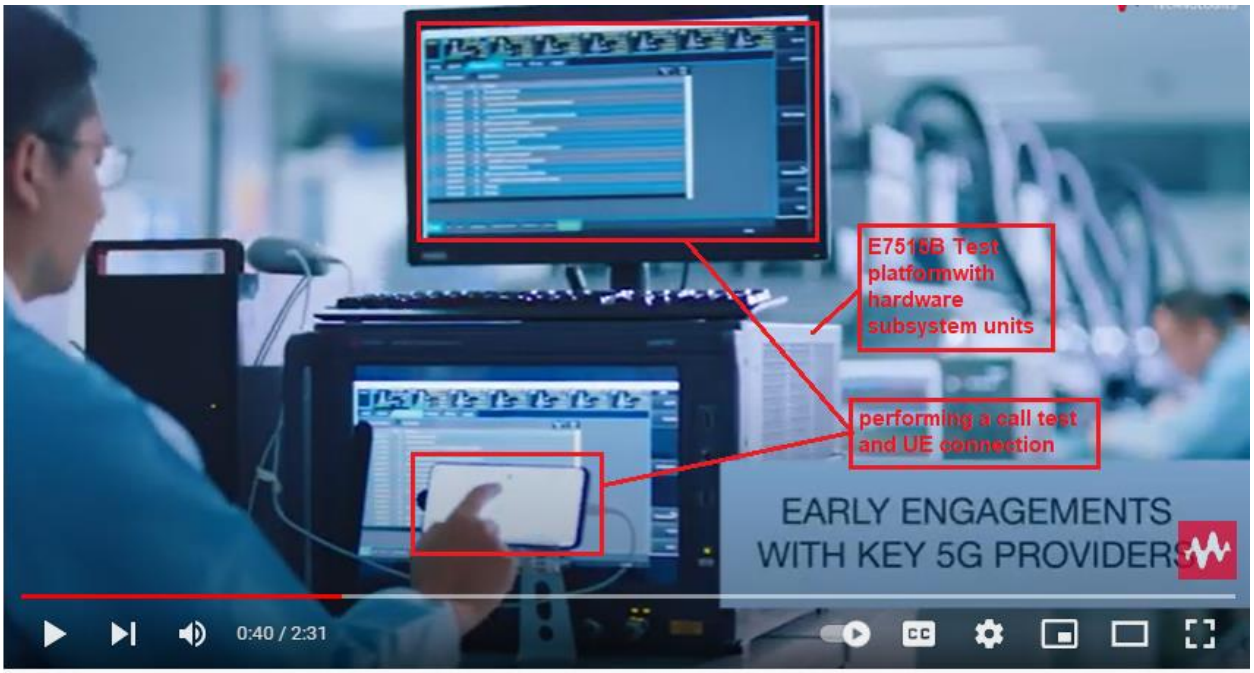

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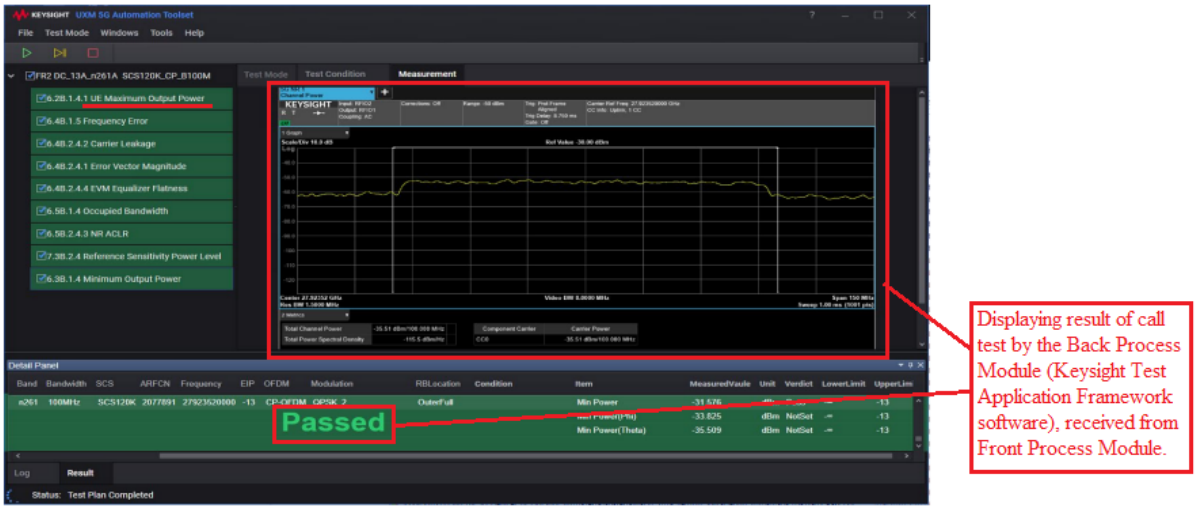

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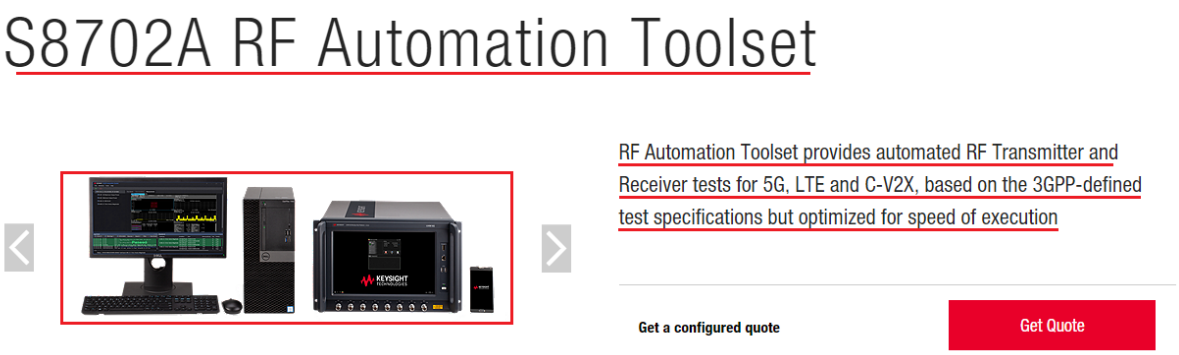

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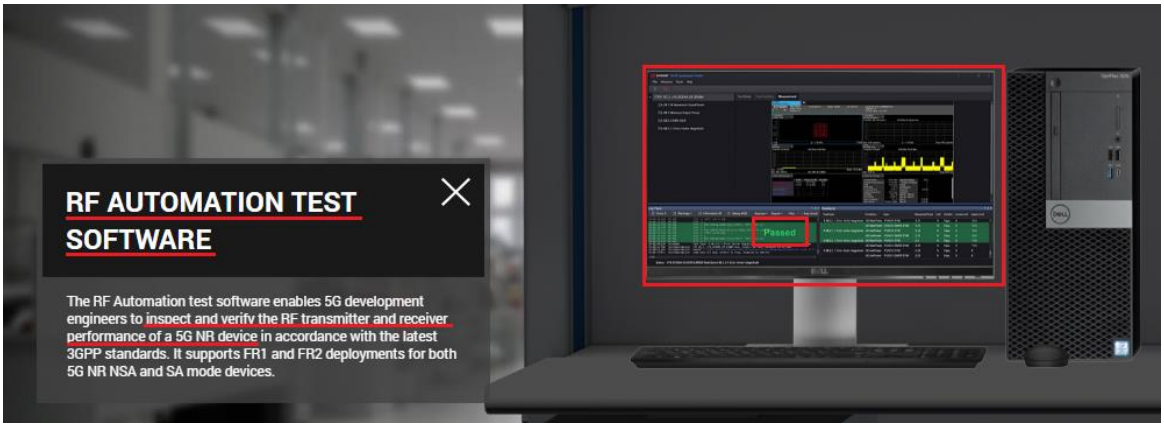

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The S8702A RF Automation Toolset is a comprehensive benchtop solution that enables 5G device development engineers to quickly inspect and verify the RF Transmitter and Receiver performance of new 5G NR devices in accordance with the 3GPP TS 38.521 and 3GPP TS 36.521 specifications; supporting FR1 and FR2 deployments for both 5G NR NSA and SA modes devices. The toolset is based on:

Keysight's Test Application Framework Software (Back Process Module) is residing on E7515B UXM 5G (Maintaining Platform).

- Keysight E7515B UXM 5G Wireless Test Platform: emulates the 5G network
- Keysight's Test Application Framework Software: provides control of the UXM 5G network emulator
- Keysight's X-Series Measurement Software: provides ready-to use measurements for signal analysis
- Keysight's E7770A Common Interface Unit, M1740A mmWave Transceiver and mmWave OTA chambers: extend testing range to the mmWave frequencies (FR2)

HIGHLIGHTS

The S8702A RF Automation Toolset extends the capabilities of the 5G Test Application by providing:

- An intuitive and easy-to-use graphical user interface for creating, configuring and running test campaigns
- A suite of fully-automated RF Transmitter and Receiver tests, based on the 3GPP TS 38.521 test specifications for 5G New Radio (NR), and on 3GPP TS 36.521 for LTE Advanced
- Optimized test execution times, enabling rapid inspection of the RF performance of 5G NR devices
- A report generator to summarize the results of test campaigns
- Support for both NSA and SA 5G modes in the same network emulator, providing a small footprint benchtop solution
- State-of-the art logging, visualization and debugging tools
- Flexible licensing options and tools

(*E.g.*, https://www.keysight.com/us/en/product/S8702A/s8702a-rf-automation-toolset.html).

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When developing new 5G devices, RF design engineers require access to tools that enable them to rapidly inspect and verify the transmitter and receiver performance of their devices. This allows them to identify and focus on areas where performance is sub-optimal and quickly retest when the issue has been rectified.

Keysight's RF Automation Toolset addresses this need by providing a suite of RF transmitter and receiver tests based on the relevant 3GPP test specifications. These tests are optimized for speed and designed to run on a benchtop platform, allowing each engineer to have a dedicated test system on their own desk. Combined with Keysight's sophisticated logging and debugging tools, the toolset enables design verification engineers to accelerate the transformation of new 5G devices from prototypes to commercial products.

(*E.g.*, https://www.keysight.com/us/en/product/S8702A/s8702a-rf-automation-toolset.html).

Based on the Test Application Framework

Keysight's 5G Test Application (TA) Framework allows both touch-based and remote control of the UXM 5G network emulator. Its different operation modes support a wide range of tests, from non-signaling for UE Calibration to full signaling tests, providing a comprehensive set of features for engineers designing RF components and devices. The framework supports 4G LTE as well as both 5G deployment modes, Non-Standalone (NSA) and Standalone (SA), and its full signaling test mode enables users to perform RF measurements while a call is in progress.

The RF Automation Toolset uses this underlying Test Application Framework to control the UXM 5G network emulator and provide a suite of fully-automated Transmitter and Receiver tests that are based on the 3GPP TS 38.521 (5G NR) / 36.521 (4G LTE) test specifications.

(*E.g.*, https://www.keysight.com/us/en/assets/7018-06924/technical-overviews/5992-4178.pdf).

Figure 1. Screen capture illustrating a completed 5G NR NSA Random Access procedure using Keysight's 5G Test Application Framework

(*E.g.*, https://www.keysight.com/us/en/assets/7018-06924/technical-overviews/5992-4178.pdf).

Campaign Creation

The RF Automation Toolset user interface allows users to easily create test campaigns by simply adding one or more test modes (e.g. NSA FR1, NSA FR2, SA FR1). This is followed by selecting the target tests and specifying the key network parameters for each test mode, e.g. duplex mode, frequency band, channel bandwidth, high/mid/low band channels, and sub-carrier spacing (SCS).

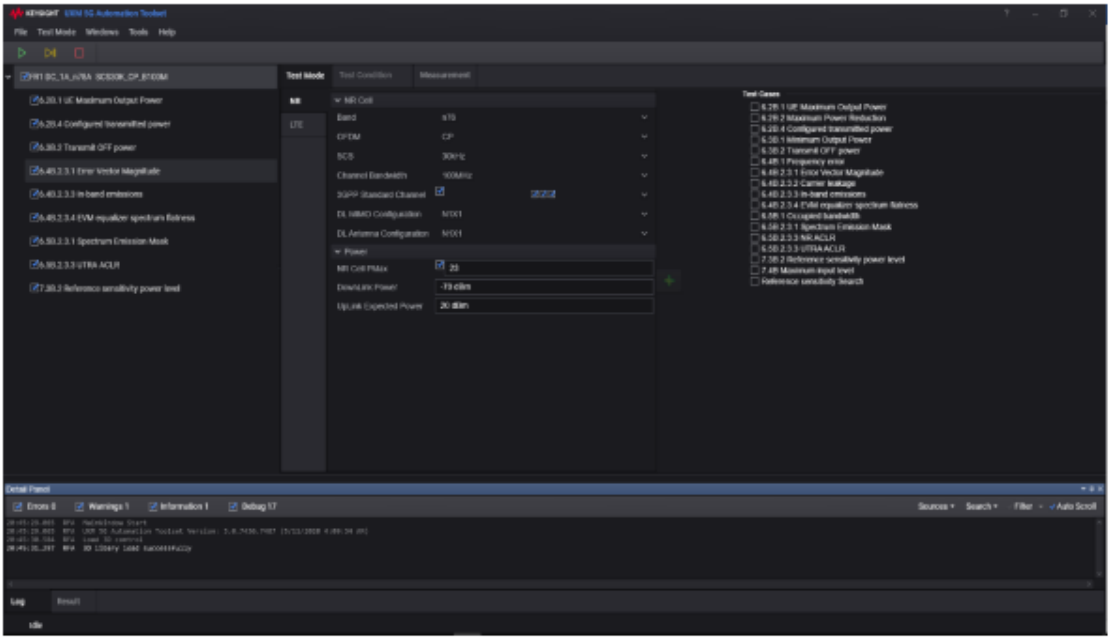
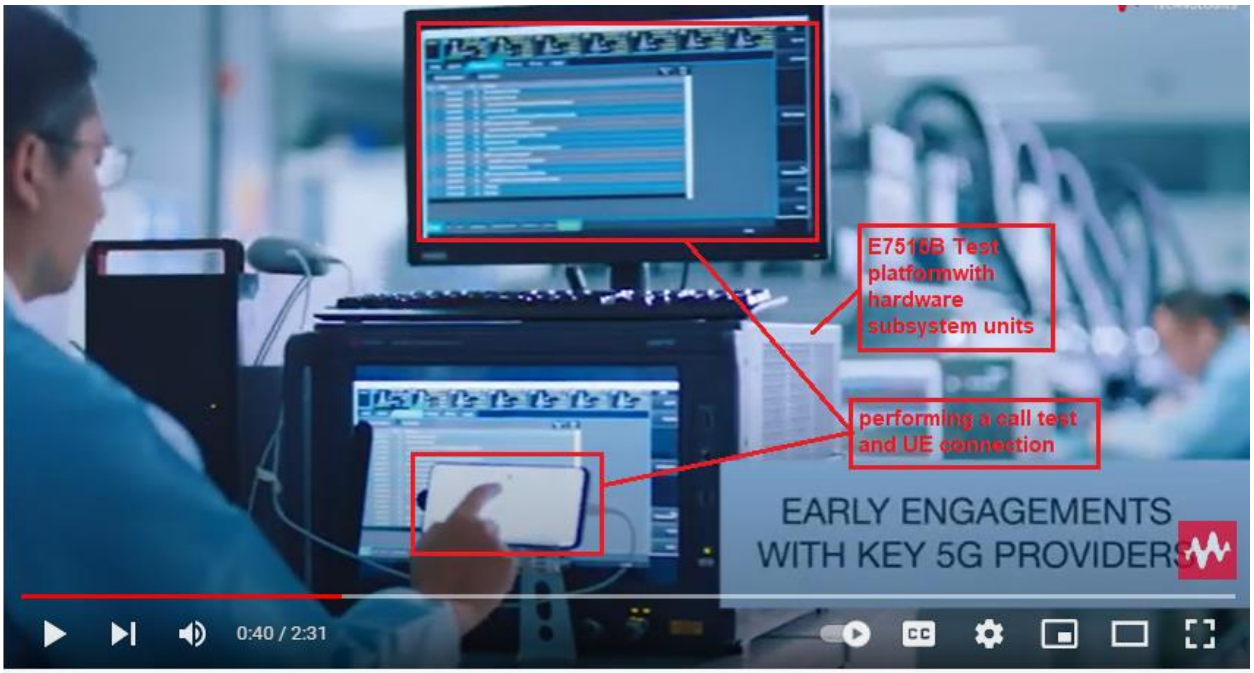


Figure 2. Campaign created by selecting available tests and configuring the Test Mode

Test Configuration

Each test in the campaign may be executed over a range of test conditions specified by the user, resulting in a test generated for each individual test condition. Test conditions provide access to a range of test-specific parameters, including bandwidth, modulation scheme, power levels, and the limits/measurement values against which the pass/fail verdict is assessed. This provides users with the flexibility to focus campaigns on specific conditions requiring further debugging, in order to quickly complete the verification of a device's RF performance.

(*E.g.*, https://www.keysight.com/us/en/assets/7018-06924/technical-overviews/5992-4178.pdf).



Keysight 5G Test Solutions for the Device Workflow

(*E.g.*, https://www.youtube.com/watch?v=mpfiQi6w8is).

Result Analysis

The Result List area provides real-time information about the test campaign execution progress with relevant information about each individual test result, including a pass/fail verdict for each test based on the user-defined verdict conditions.

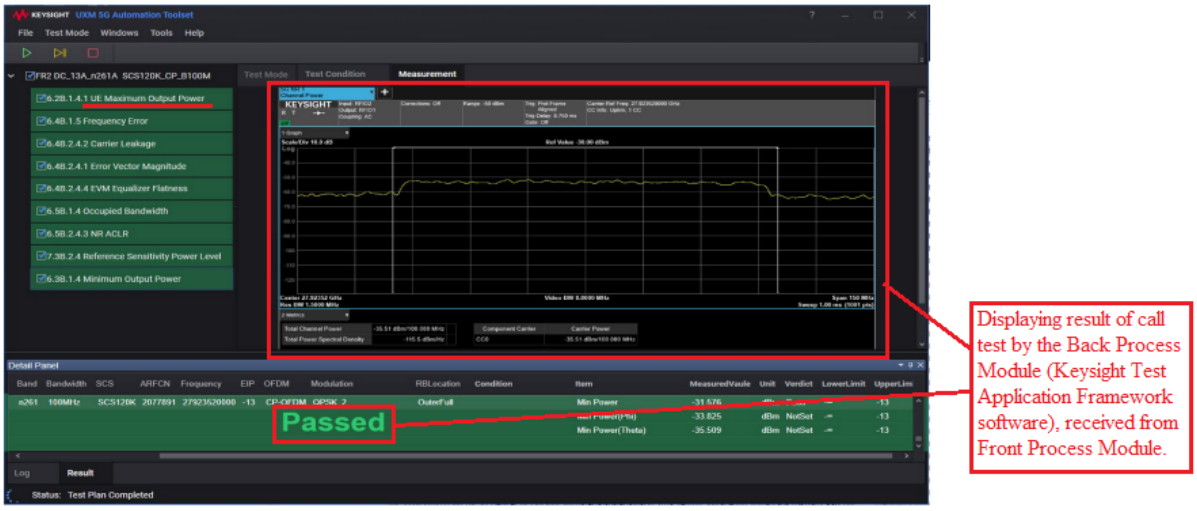
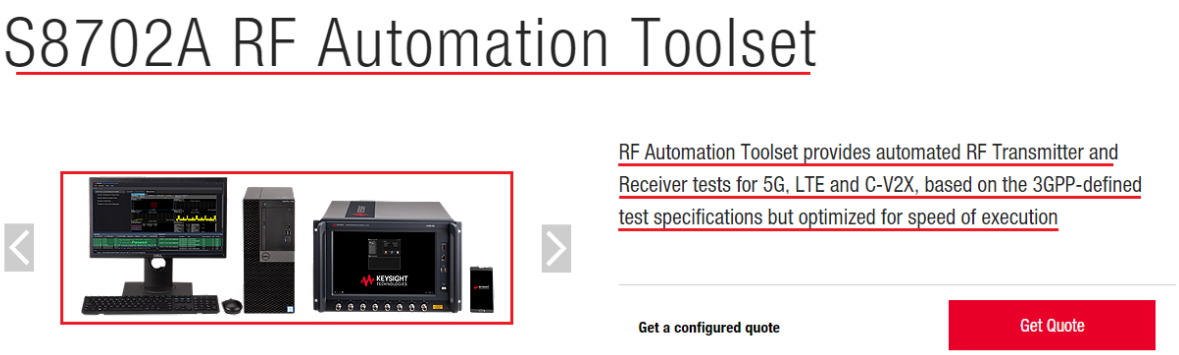


Figure 5. Real-time results information available in RF Automation user interface

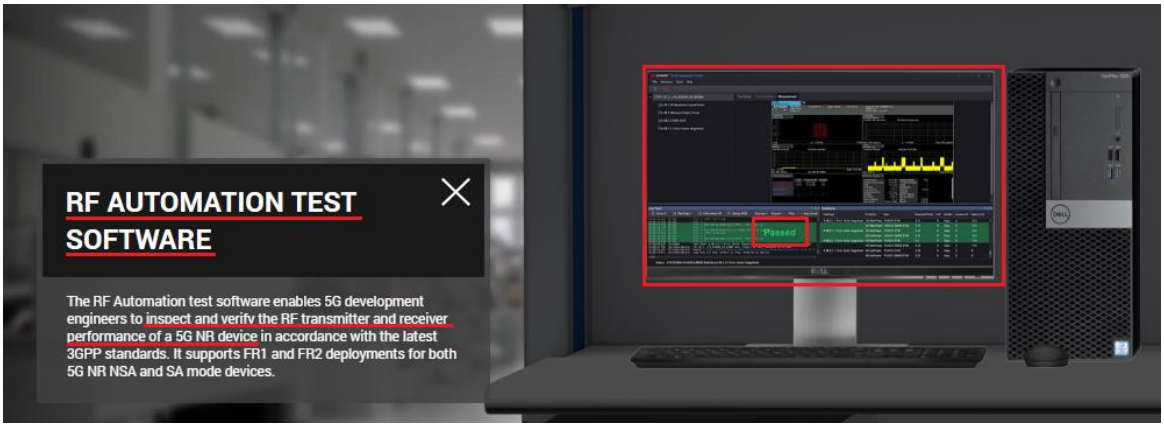
(*E.g.*, https://www.keysight.com/us/en/assets/7018-06924/technical-overviews/5992-4178.pdf).

19. The Accused Instrumentality is a simulated user call test system that comprises a hardware subsystem (*e.g.,* Hardware) that comprises function process units of the digital stored program control switch (*e.g.,* the Accused Instrumentality) to receive instructions from the front call control process module (*e.g.,* user equipment (UE)), perform tests comprising at least one of the following: picking-up or hanging-up phones, detecting signaling tone, dialing, sending a test tone, or talking (see the below evidence showing measurements while the call is in progress, etc.); and report test results to the front call control process module (*e.g.,* user equipment (UE)), and wherein the hardware subsystem further comprises a loop relay panel (*e.g.,* display of the E7515B Test Platform) used for simulating picking-up or hanging-on a phone in a calling (*e.g.,* call in progress) or called user terminal and dial function of dial pulse form by the calling user. As shown below, the Accused Instrumentality is a part of the simulated user call test system which is a GUI-based Keysight Test Application Framework software, residing on E7515B UXM 5G Test Platform. The Accused Instrumentality comprises back process module (*e.g.,* GUI-based Keysight Test Application Framework software, residing on E7515B UXM 5G Test Platform), a front call control process module (*e.g.,* user equipment (UE)) and a hardware subsystem (*e.g.,* Hardware) for performing a call test (*e.g.,* call tests for 5G and LTE). The back process module (*e.g.,* GUI-based Keysight Test Application Framework software, residing on E7515B UXM 5G Test) provides an operation interface for a user to perform a call test setup (setting various parameters for call test), receives call test result data (*e.g.,* result analysis) transmitted by the front call control process module (*e.g.,* user equipment (UE)), and displays the result on the display of the Accused Instrumentality. The front call control process module receives call test setup parameters provided by the Keysight Test Application Framework software, controls the hardware subsystem (Hardware Units in the Accused Instrumentality) to perform a call test, and reports a result of the

call test to Keysight Test Application Framework software, residing on E7515B UXM 5G Test Platform. The hardware subsystem comprises function process units of the switch to receive instructions from the user equipment (UE), perform tests comprising picking-up phones, detecting signaling tone, and talking; and report test results (*e.g.*, report generator) to the front call control process module.



(*E.g.*, https://www.keysight.com/us/en/product/S8702A/s8702a-rf-automation-toolset.html).



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HIGHLIGHTS

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Figure 1. Screen capture illustrating a completed 5G NR NSA Random Access procedure using Keysight's 5G Test Application Framework

(*E.g.*, https://www.keysight.com/us/en/assets/7018-06924/technical-overviews/5992-4178.pdf).

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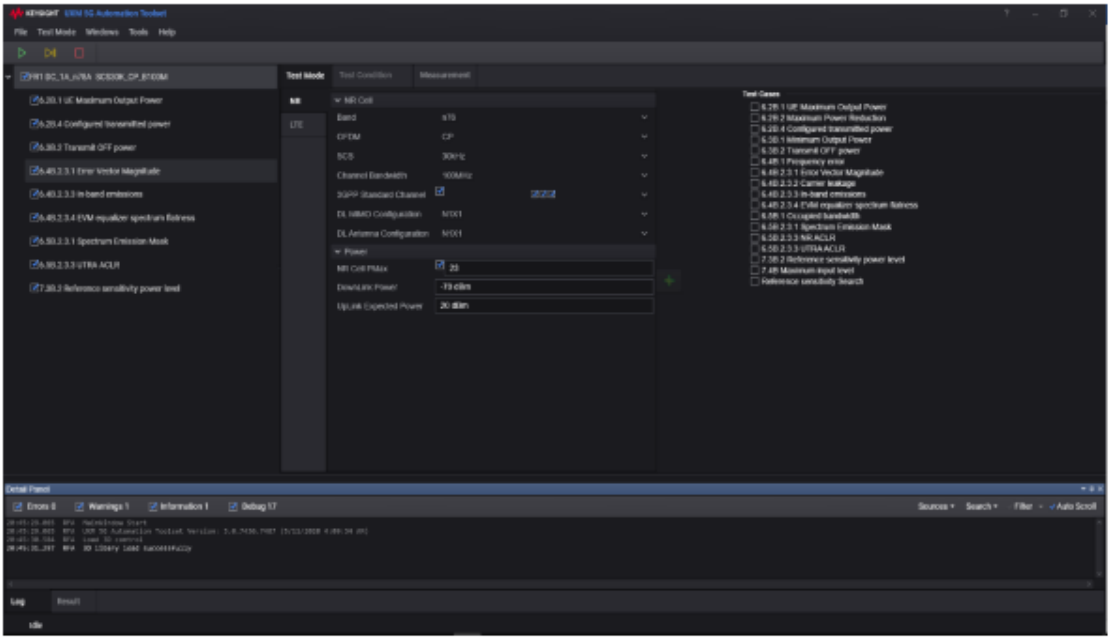

Figure 2. Campaign created by selecting available tests and configuring the Test Mode

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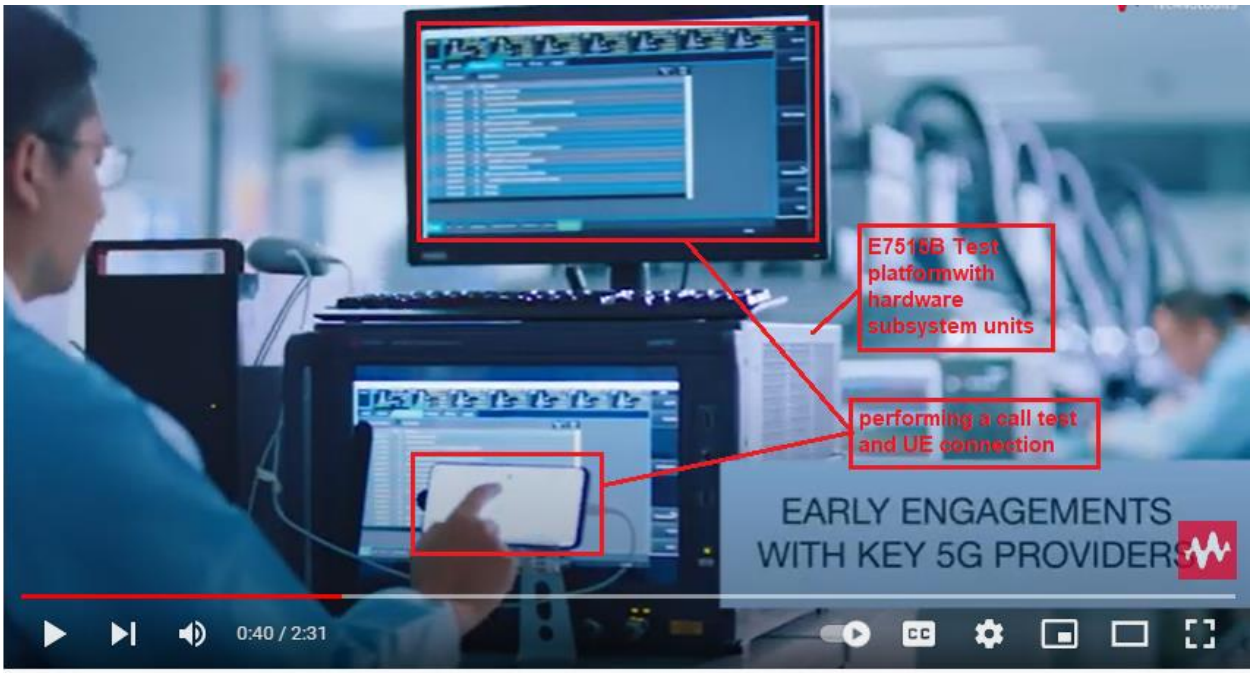


Keysight 5G Test Solutions for the Device Workflow

(*E.g.*, https://www.youtube.com/watch?v=mpfiQi6w8is).

The Keysight E7515B UXM 5G wireless test platform provides the foundation for Keysight's 5G network emulation solutions used during device development and acceptance testing. It is a highly integrated signaling test platform with multiformat stack support, rich processing power, and abundant RF resources. The E7515B UXM 5G wireless test platform supports the latest 3rd Generation Partnership Project (3GPP) releases.

- Initiate a 5G call with a device under test (DUT) in different 5G NR deployment modes (NSA and SA) and frequency bands (FR1 and FR2).

E7515B UXM 5G is a part of S8702A RF Automation Toolset, which is responsible to initiate **(Dial or send test tone)** a 5G call to the DUT/UE.

(*E.g.*, https://www.keysight.com/us/en/assets/7120-1262/catalogs/5G-Network-Emulation-Solutions-Catalog.pdf).

Result Analysis

The Result List area provides real-time information about the test campaign execution progress with relevant information about each individual test result, including a pass/fail verdict for each test based on the user-defined verdict conditions.

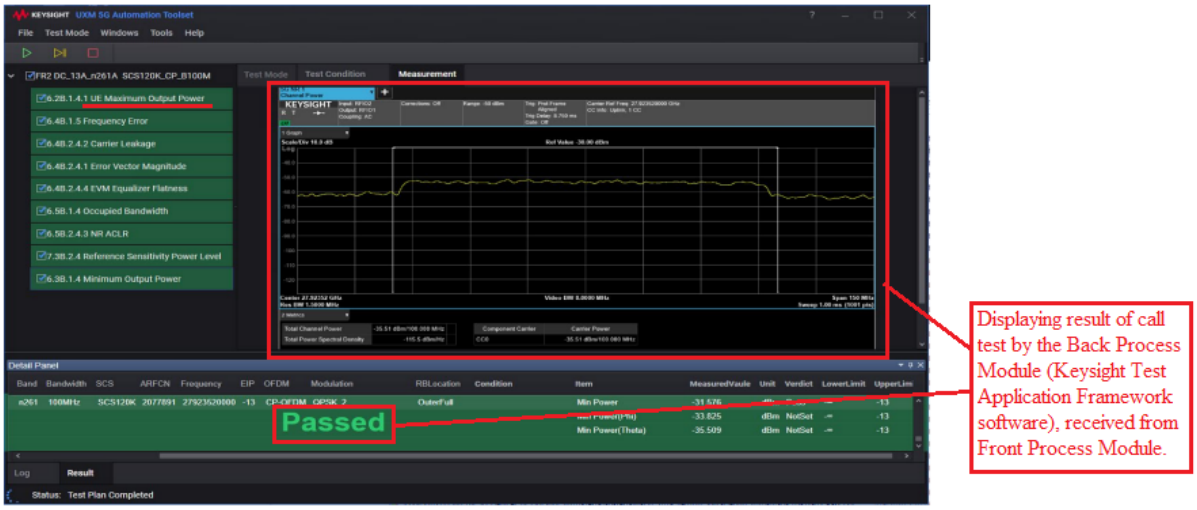
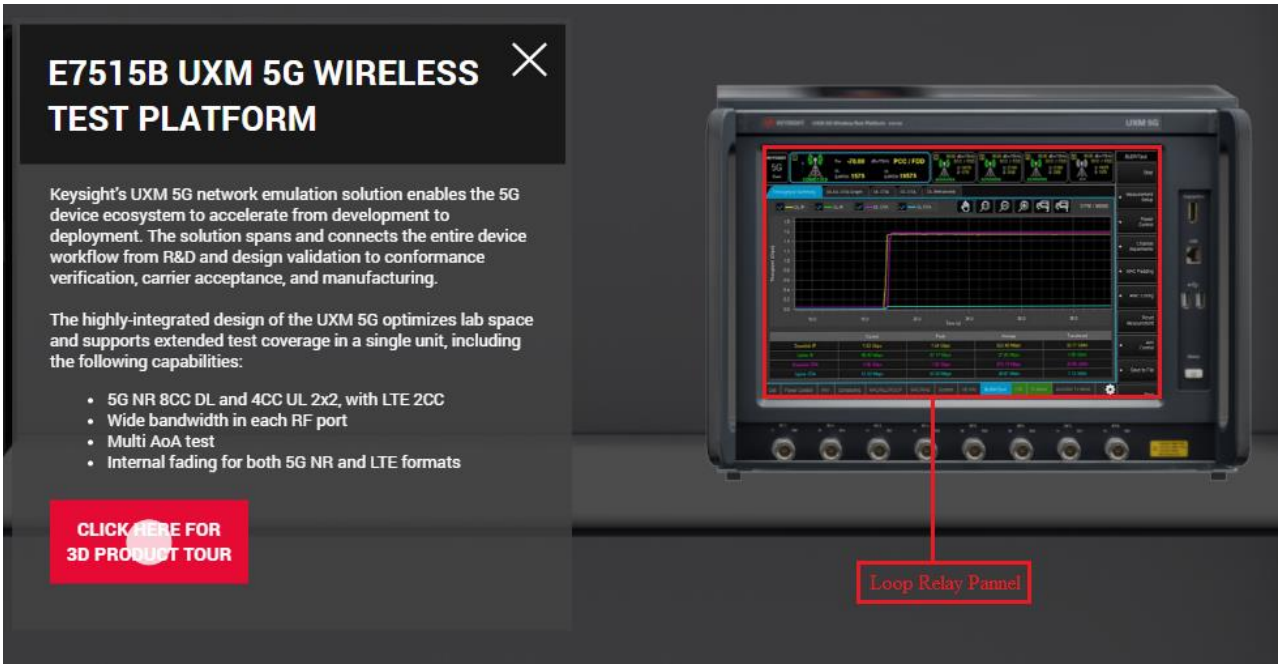


Figure 5. Real-time results information available in RF Automation user interface

(*E.g.*, https://www.keysight.com/us/en/assets/7018-06924/technical-overviews/5992-4178.pdf).



(*E.g.*, https://www.keysight.com/demos/solutions_individual/5g-rf-verification/).

IV. COUNT II
(PATENT INFRINGEMENT OF UNITED STATES PATENT NO. 9,179,339)

20. Plaintiff incorporates the above paragraphs herein by reference.

21. On November 3, 2015, United States Patent No. 9,179,339 ("the '339 Patent") was duly and legally issued by the United States Patent and Trademark Office. The '339 Patent is titled "Method and System for Testing the Wireless Signal Propagation Model of the Cellular Network." A true and correct copy of the '339 Patent is attached hereto as Exhibit B and incorporated herein by reference.

22. Prestwick is the assignee of all right, title, and interest in the '339 patent, including all rights to enforce and prosecute actions for infringement and to collect damages for all relevant times against infringers of the '339 Patent. Accordingly, Prestwick possesses the exclusive right and standing to prosecute the present action for infringement of the '339 Patent by Defendant.

23. The invention in the '339 Patent relates to the field of communication and more particularly to a method and system for testing the wireless signal propagation of the cellular network. (Ex. B at 1:17-19).

24. Cellular networking is one of the most common networking mode in the wireless communication. (*Id.* at 1:23-24). A cellular network is constructed of base stations in which the coverage area of a base station is called a cell. (*Id.* at 1:24-32). In the coverage area of the cell, a terminal can establish a wireless communication link with the base station. (*Id.* at 1:32-34). Multiple base station transceivers form a network to continually cover an area so to provide a user terminal with seamless wireless communication service within the network. (*Id.* at 1:34-36). When planning a network, the provider looks at the user requirements, including designed capacity, coverage range and rate, and network performance. (*Id.* at 1:37-41). When the designed requirement is clear, it comes to the requirement analysis of the wireless network design, including

the prediction of the coverage radius of the coverage area and the analysis of the distribution of the user capacity. (*Id.* at 1:41-45). The capacity distribution of the coverage area means to determine the equipment configuration and the size of the coverage radius of the cell according to the potential of the user development in the network coverage area. (*Id.* at 1:45-48). The original design 206 of the network topology structure is completed on the map by combining the two factors, *i.e.*, the network coverage and the user distribution. (*Id.* at 1:48-51).

25. A site survey is then performed to help select the appropriate base station sites in the actual coverage environment. (*Id.* at 1:52-54). After the site survey, the provider has basically ascertained which sites possess the essential conditions for establishing the base stations. (*Id.*at 1:57-61).

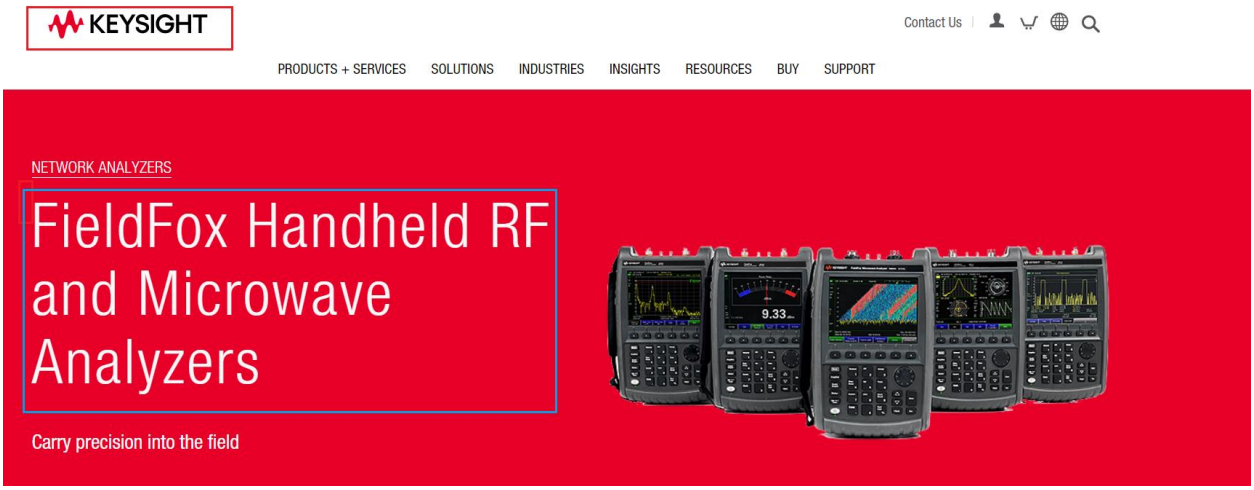
26. After the sites are selected, it is necessary to use a network simulation to verify whether the network design requirement is satisfied and adjust the site parameters on the simulation platform to find the appropriate site places. (*Id.* at 1:61-67). A signal propagation model is used for the traditional cell coverage prediction and is usually needed to correct for typical topographic and geomorphologic environments. (*Id.* at 2:2-11). A propagation model correction is also used, which corrects the wireless propagation model by collecting sufficient field strength testing data through selecting the typical sites with respect to the typical topography and geomorphology (multiple testing sites are usually needed to be selected such that the testing data covers various topography, geomorphology, and site heights). (*Id.* at 2:2-5, 12-14, 38-44). The more testing sites in an area, the better the model correction effect is (multiple parameters in the model are corrected and the parameters corresponding to various geomorphology are corrected). (*Id.* at 2:45-49). When testing the wireless signal field strength, transmission apparatus need to be installed in sequence at each testing site in the testing area, and the receiving field strength of the

wireless signal is tested for the coverage area of each site in sequence. (*Id.* at 2:50-54). If n sites are to be tested, the apparatus installation and the testing need to be performed n times, which results in quite large workload. (*Id.* at 2:54-56).

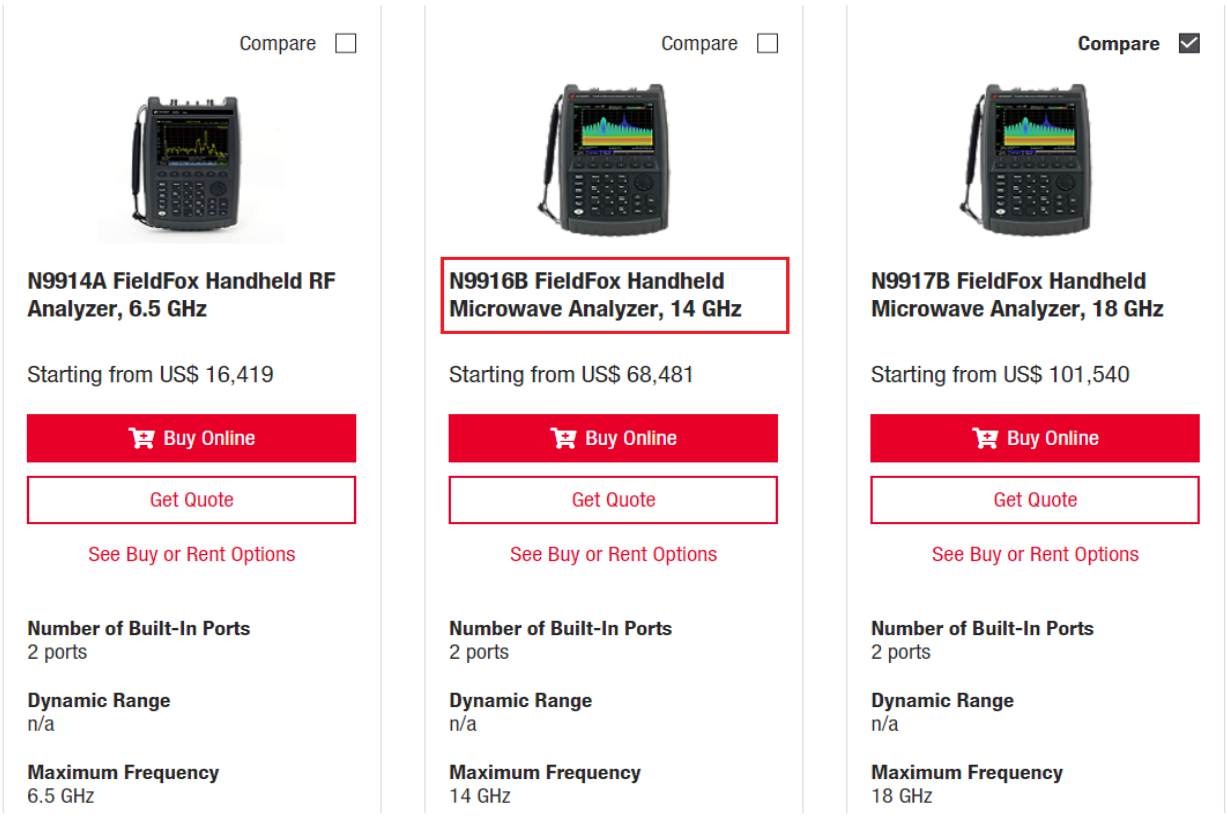
27. In view of this problem, the inventors therefore invented a system for testing the wireless propagation model to address the problem of the heavy workload caused by repeated installing of the transmission apparatus and testing the receiving field strength at each testing site in the testing area in the prior art. (*Id.* at 2:60-65).

28. **Direct Infringement.** Upon information and belief, Defendant has been directly infringing claim 4 of the '339 Patent in Colorado, and elsewhere in the United States, by making, using, selling, and or offering to sell the Keysight Technologies-N9916B - FieldFox Handheld Analyzer ("Accused System").

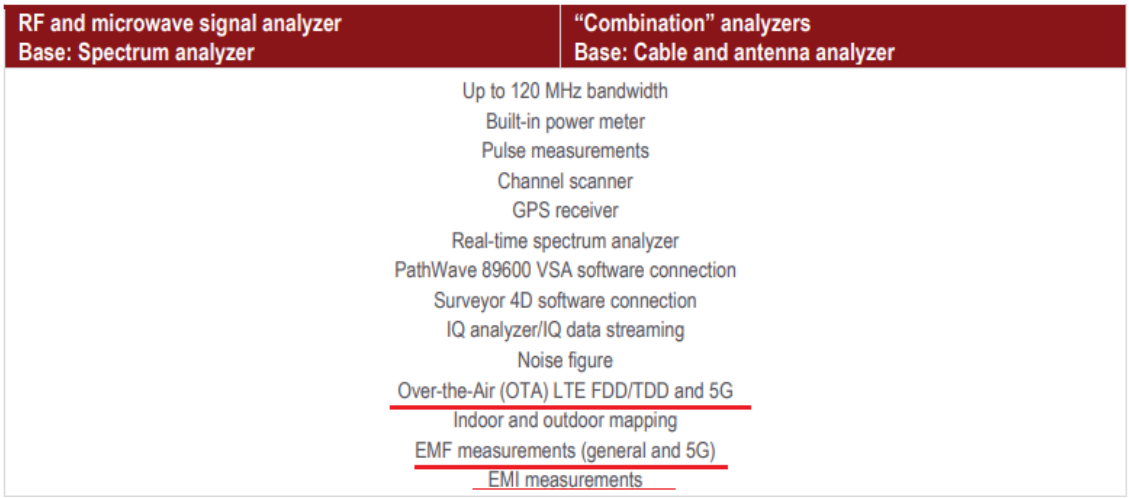
29. The Accused System is a system for testing wireless signal field strength of a cellular network (*e.g.*, LTE TDD/FDD, 5G, etc.).



(*E.g.*, https://www.keysight.com/us/en/products/network-analyzers/fieldfox-handheld-rf-microwave-analyzers.html).



(*E.g.*, https://www.keysight.com/us/en/catalog/key-34752/fieldfox-handheld-rf-microwave-analyzers.html).



(*E.g.*, https://www.keysight.com/us/en/assets/7018-06517/technical-overviews/5992-3703.pdf).

FieldFox Handheld Analyzers

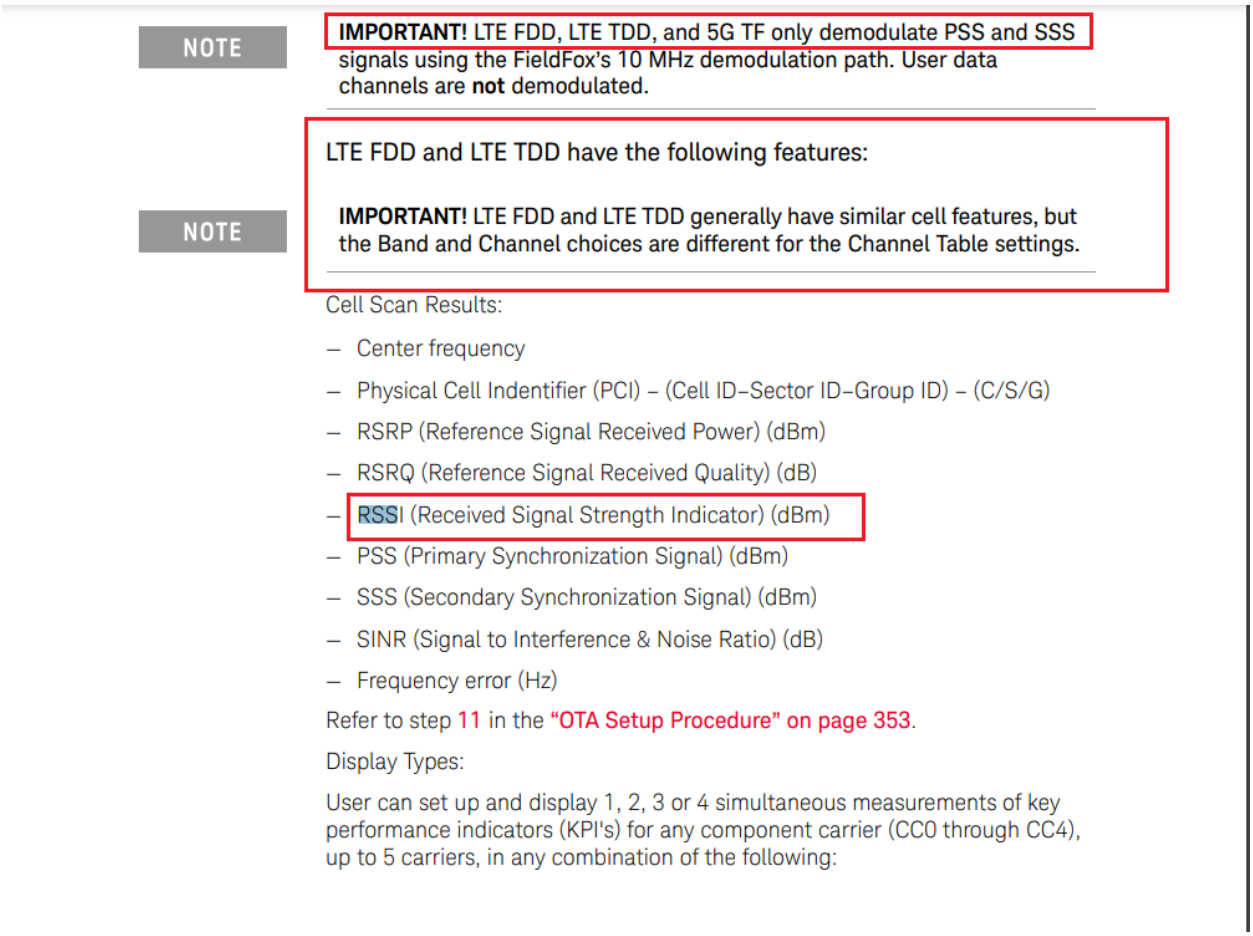
The Keysight FieldFox handheld analyzers can withstand your toughest working conditions with a ruggedized yet light weight and portable battery powered design for making measurements for RF devices like cables, antennas, filters, amplifiers, and signal/spectrum analysis. Create your specialized handheld analyzer solution by selecting FieldFox options and features to address cable and antenna test (CAT) spectrum analysis (SA) or vector network analysis (VNA) real time spectrum analyzer and over the air digital demodulation analysis required for your application. The FieldFox analyzers are always ready to make RF measurements, ensuring every operating mode is flexible enough to meet the needs of novices and experts alike.

This technical overview provides details of the standard FieldFox handheld analyzer features as well as selectable options for addressing your specific application needs.

Why choose FieldFox?

- Ideal 5G deployment and field-testing tool with 100 MHz real-time bandwidth and over-the-air (OTA) measurements
- Ability for 5G, satellite and radar operators to make true RF coverage measurements, up to 54 GHz and beyond, and beamforming verification with phased array antenna support
- Simplified field signal monitoring with wideband capture and recording of fully corrected IQ data
- Highly efficient radar and EW systems diagnostics with spectrum analysis, full 2-port VNA, power meter, pulse and noise figure measurements and results that correlate with high-performance bench top instruments
- Durable handheld analyzers that can withstand your toughest working conditions

(*E.g.*, https://www.keysight.com/us/en/assets/7018-06517/technical-overviews/5992-3703.pdf).



NOTE

IMPORTANT! LTE FDD, LTE TDD, and 5G TF only demodulate PSS and SSS signals using the FieldFox's 10 MHz demodulation path. User data channels are **not** demodulated.

LTE FDD and LTE TDD have the following features:

NOTE

IMPORTANT! LTE FDD and LTE TDD generally have similar cell features, but the Band and Channel choices are different for the Channel Table settings.

Cell Scan Results:

- Center frequency
- Physical Cell Indentifier (PCI) – (Cell ID–Sector ID–Group ID) – (C/S/G)
- RSRP (Reference Signal Received Power) (dBm)
- RSRQ (Reference Signal Received Quality) (dB)
- RSSI (Received Signal Strength Indicator) (dBm)
- PSS (Primary Synchronization Signal) (dBm)
- SSS (Secondary Synchronization Signal) (dBm)
- SINR (Signal to Interference & Noise Ratio) (dB)
- Frequency error (Hz)

Refer to step 11 in the "OTA Setup Procedure" on page 353.

Display Types:

User can set up and display 1, 2, 3 or 4 simultaneous measurements of key performance indicators (KPI's) for any component carrier (CC0 through CC4), up to 5 carriers, in any combination of the following:

(*E.g.*, https://www.keysight.com/us/en/assets/9921-01763/user-manuals/Users-Guide-B-Series-N991xB-3xB-5xB-6xB-Unabridged.pdf?success=true).

30. The Accused System is a system comprising a transmitting apparatus (*e.g.*, a base station transmitter for testing), configured to transmit a testing signal upon moving along a testing route (*e.g.*, indoor/outdoor network coverage, measures OTA, interference in an area, etc.).

RF and microwave signal analyzer Base: Spectrum analyzer	"Combination" analyzers Base: Cable and antenna analyzer
Up to 120 MHz bandwidth	
Built-in power meter	
Pulse measurements	
Channel scanner	
GPS receiver	
Real-time spectrum analyzer	
PathWave 89600 VSA software connection	
Surveyor 4D software connection	
IQ analyzer/IQ data streaming	
Noise figure	
Over-the-Air (OTA) LTE FDD/TDD and 5G	
Indoor and outdoor mapping	
EMF measurements (general and 5G)	
EMI measurements	

(*E.g.*, https://www.keysight.com/us/en/assets/7018-06517/technical-overviews/5992-3703.pdf).

Indoor and Outdoor Mapping – Option 352 (Requires Spectrum Analyzer Mode (Option 233), and GPS Receiver (Option 307))

Figure 16-2 Maps With Current Position Marker Displayed - (OpenStreetMaps)

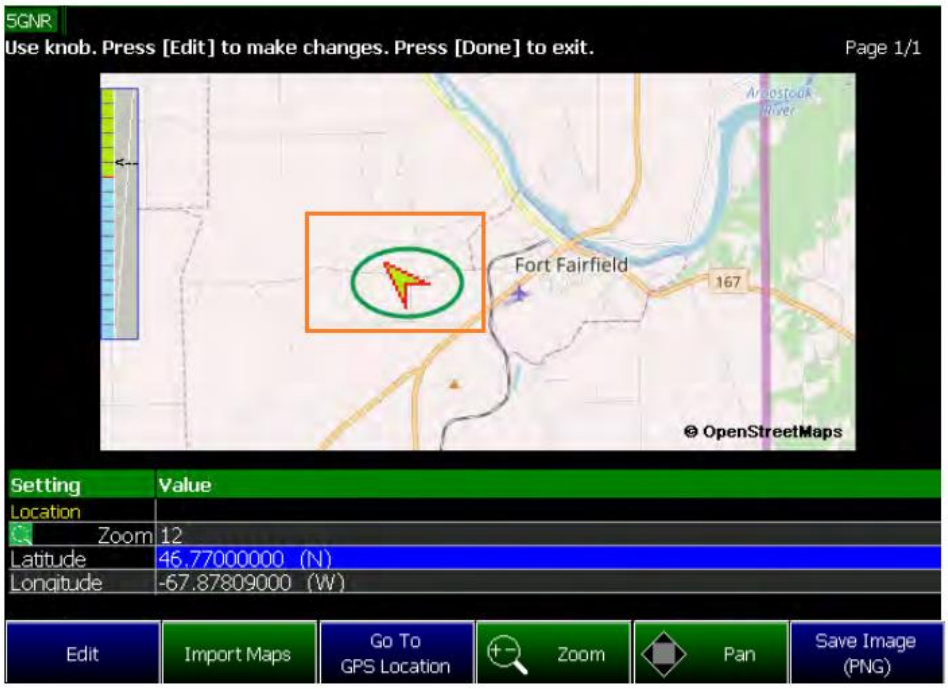


Figure 16-3 Using Mapping (Option 352) - Satellite View for Indoor Mapping

Indoor Maps: RPG Functions with [Navigate] ON OFF

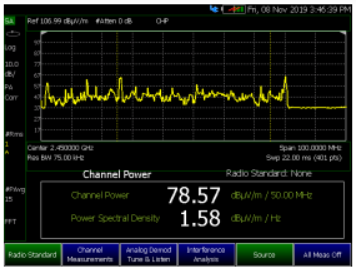
(*E.g.*, https://www.keysight.com/us/en/assets/9921-01763/user-manuals/Users-Guide-B-Series-N991xB-3xB-5xB-6xB-Unabridged.pdf?success=true).

Electromagnetic field (EMF) measurements

Radio frequency electromagnetic fields (EMF) tests evaluate total RF exposure in any given area due to deployment of various RF/MW networks, such as mobile phones, base stations, Wi-Fi, smart meters, IoT devices, as well as satellite and radar systems.

Exposure limits for electromagnetic field (EMF) radiation differ by country. Many countries base their regulations on findings from research organizations like the International Commission on Non-Ionizing Radiation Protection (ICNIRP), the Institute of Electrical and Electronics Engineers (IEEE), and the Federal Communication Commission (FCC).

Field verification is required for compliance to exposure levels set by these government and regulatory agencies. FieldFox with EMF measurements supports connectivity to AGOS Advanced Technologies Triaxial Isotropic Antenna (or Keysight 85572A-006). The spectrum analyzer and over-the-air (OTA) 5G NR modes support EMF measurements that measure the total field strength across the frequency band of interest.



EMF measurement using spectrum analyzer channel power mode

Imported indoor site map PNG file

Indoor and outdoor mapping

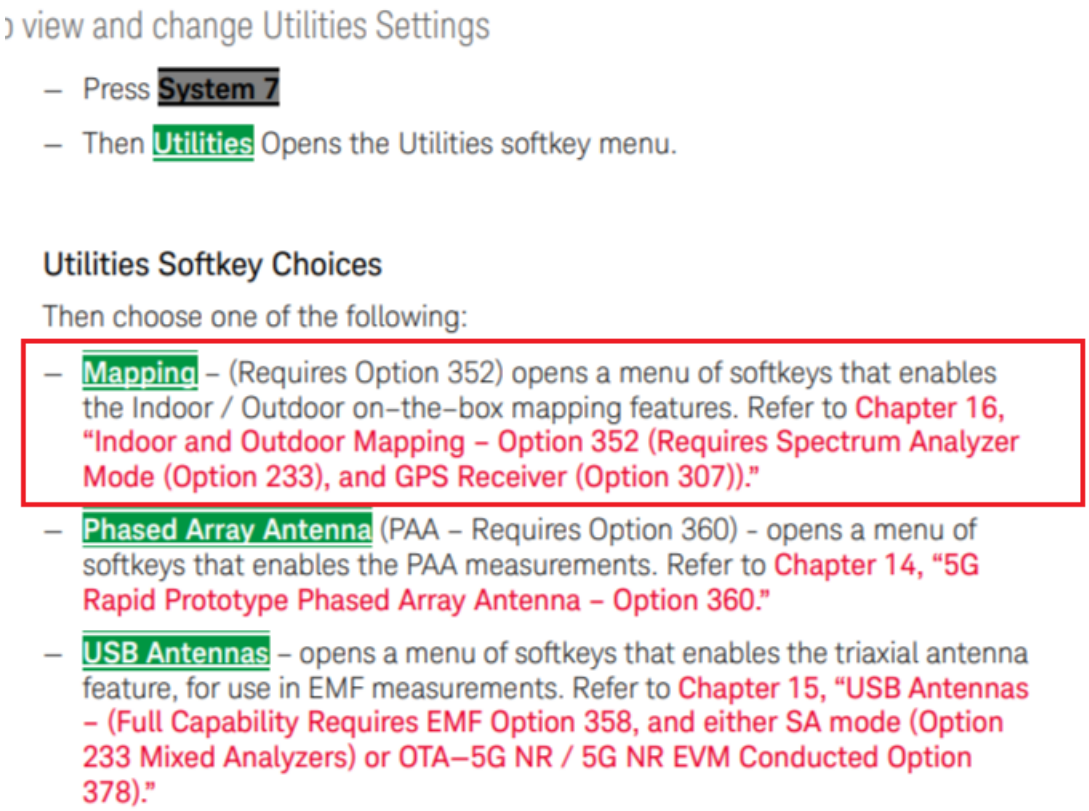
To verify network coverage or identify interference in any area, it is essential to combine receiver measurements with GPS location tags or from indoor markers. FieldFox imports and displays maps from OpenStreetMap (OSM) for data collection and mapping. The FieldFox system level indoor and outdoor mapping feature can be enabled within the following modes:

- Channel Scanner
- Phased Array Antenna Support
- Over-the-Air (OTA) LTE FDD or TDD
- Over-the-Air (OTA) 5G TF
- Over-the-Air (OTA) 5G NR

Save maps to the FieldFox internal memory, SD card or USB drive. Use the FieldFox Map Support Tool download OSM maps or use a direct wired LAN connection.

Outdoor map of OTA LTE synched with GPS

(*E.g.*, https://www.keysight.com/us/en/assets/7018-06517/technical-overviews/5992-3703.pdf).



) view and change Utilities Settings

– Press System 7

– Then Utilities Opens the Utilities softkey menu.

Utilities Softkey Choices

Then choose one of the following:

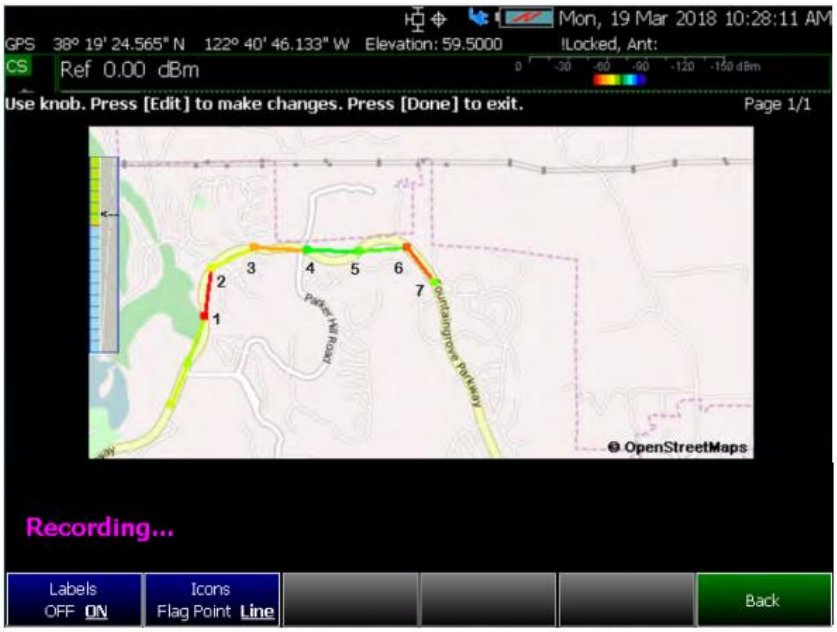
– Mapping – (Requires Option 352) opens a menu of softkeys that enables the Indoor / Outdoor on–the–box mapping features. Refer to Chapter 16, "Indoor and Outdoor Mapping – Option 352 (Requires Spectrum Analyzer Mode (Option 233), and GPS Receiver (Option 307))."

– Phased Array Antenna (PAA – Requires Option 360) - opens a menu of softkeys that enables the PAA measurements. Refer to Chapter 14, "5G Rapid Prototype Phased Array Antenna – Option 360."

– USB Antennas – opens a menu of softkeys that enables the triaxial antenna feature, for use in EMF measurements. Refer to Chapter 15, "USB Antennas – (Full Capability Requires EMF Option 358, and either SA mode (Option 233 Mixed Analyzers) or OTA–5G NR / 5G NR EVM Conducted Option 378)."

(*E.g.*, https://www.keysight.com/us/en/assets/9921-01763/user-manuals/Users-Guide-B-Series-N991xB-3xB-5xB-6xB-Unabridged.pdf?success=true).

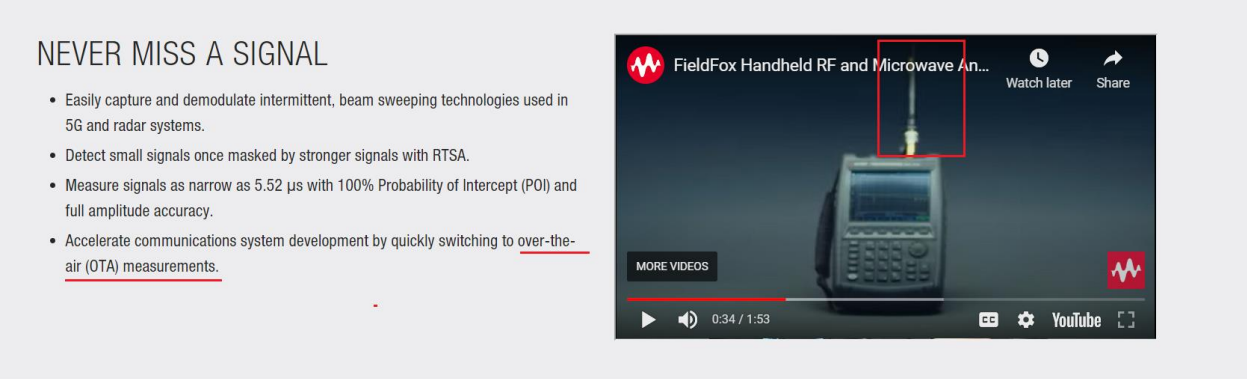
Figure 16-1 Maps (Outdoor) With Line Feature Enabled



(*E.g.*, https://www.keysight.com/us/en/assets/9921-01763/user-manuals/Users-Guide-B-Series-N991xB-3xB-5xB-6xB-Unabridged.pdf?success=true).

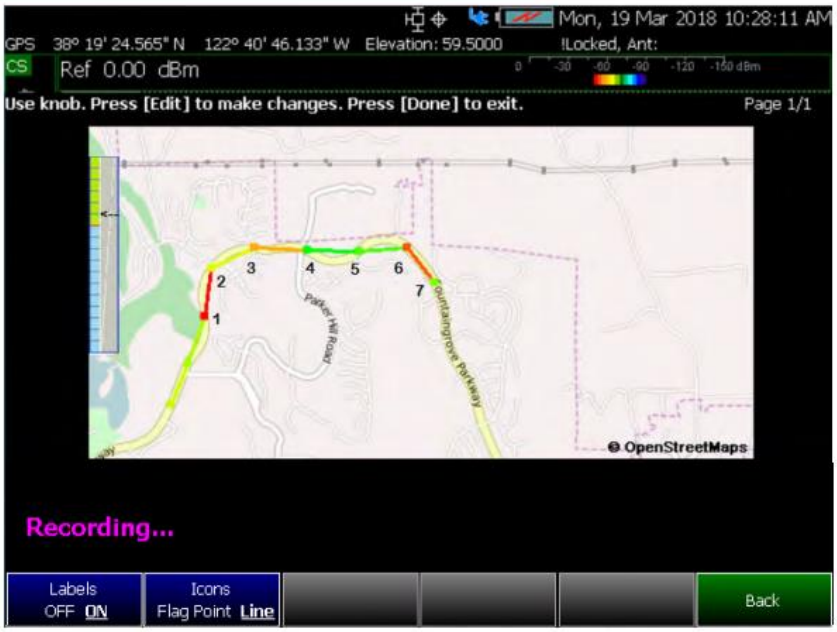
31. The Accused System is a system comprises a receiving testing apparatus (*e.g.*, a receiver, RF IN, etc.), installed at more than one selected testing sites (*e.g.*, multiple locations), configured to receive the testing signal and to detect the strength (RSSI, field strength, etc.) of the received signal.

(*E.g.*, https://www.keysight.com/us/en/assets/9921-01763/user-manuals/Users-Guide-B-Series-N991xB-3xB-5xB-6xB-Unabridged.pdf?success=true).



(*E.g.*, https://www.keysight.com/us/en/products/network-analyzers/fieldfox-handheld-rf-microwave-analyzers.html).

Figure 16-1 Maps (Outdoor) With Line Feature Enabled



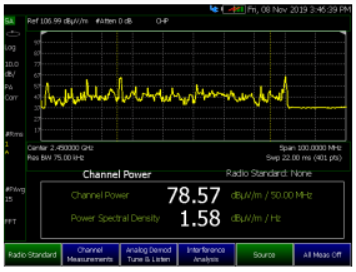
(*E.g.*, https://www.keysight.com/us/en/assets/9921-01763/user-manuals/Users-Guide-B-Series-N991xB-3xB-5xB-6xB-Unabridged.pdf?success=true).

Electromagnetic field (EMF) measurements

Radio frequency electromagnetic fields (EMF) tests evaluate total RF exposure in any given area due to deployment of various RF/MW networks, such as mobile phones, base stations, Wi-Fi, smart meters, IoT devices, as well as satellite and radar systems.

Exposure limits for electromagnetic field (EMF) radiation differ by country. Many countries base their regulations on findings from research organizations like the International Commission on Non-Ionizing Radiation Protection (ICNIRP), the Institute of Electrical and Electronics Engineers (IEEE), and the Federal Communication Commission (FCC).

Field verification is required for compliance to exposure levels set by these government and regulatory agencies. FieldFox with EMF measurements supports connectivity to AGOS Advanced Technologies Triaxial Isotropic Antenna (or Keysight 85572A-006). The spectrum analyzer and over-the-air (OTA) 5G NR modes support EMF measurements that measure the total field strength across the frequency band of interest.



EMF measurement using spectrum analyzer channel power mode

Imported indoor site map PNG file

Indoor and outdoor mapping

To verify network coverage or identify interference in any area, it is essential to combine receiver measurements with GPS location tags or from indoor markers. FieldFox imports and displays maps from OpenStreetMap (OSM) for data collection and mapping. The FieldFox system level indoor and outdoor mapping feature can be enabled within the following modes:

- Channel Scanner
- Phased Array Antenna Support
- Over-the-Air (OTA) LTE FDD or TDD
- Over-the-Air (OTA) 5G TF
- Over-the-Air (OTA) 5G NR

Save maps to the FieldFox internal memory, SD card or USB drive. Use the FieldFox Map Support Tool download OSM maps or use a direct wired LAN connection.

Outdoor map of OTA LTE synched with GPS

(*E.g.*, https://www.keysight.com/us/en/assets/7018-06517/technical-overviews/5992-3703.pdf).

Electromagnetic field (EMF) measurements

Radio frequency electromagnetic fields (EMF) tests evaluate total RF exposure in any given area due to deployment of various RF/MW networks, such as mobile phones, base stations, Wi-Fi, smart meters, IoT devices, as well as satellite and radar systems.

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Indoor and outdoor mapping

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Over-the-Air (OTA) 5G NR

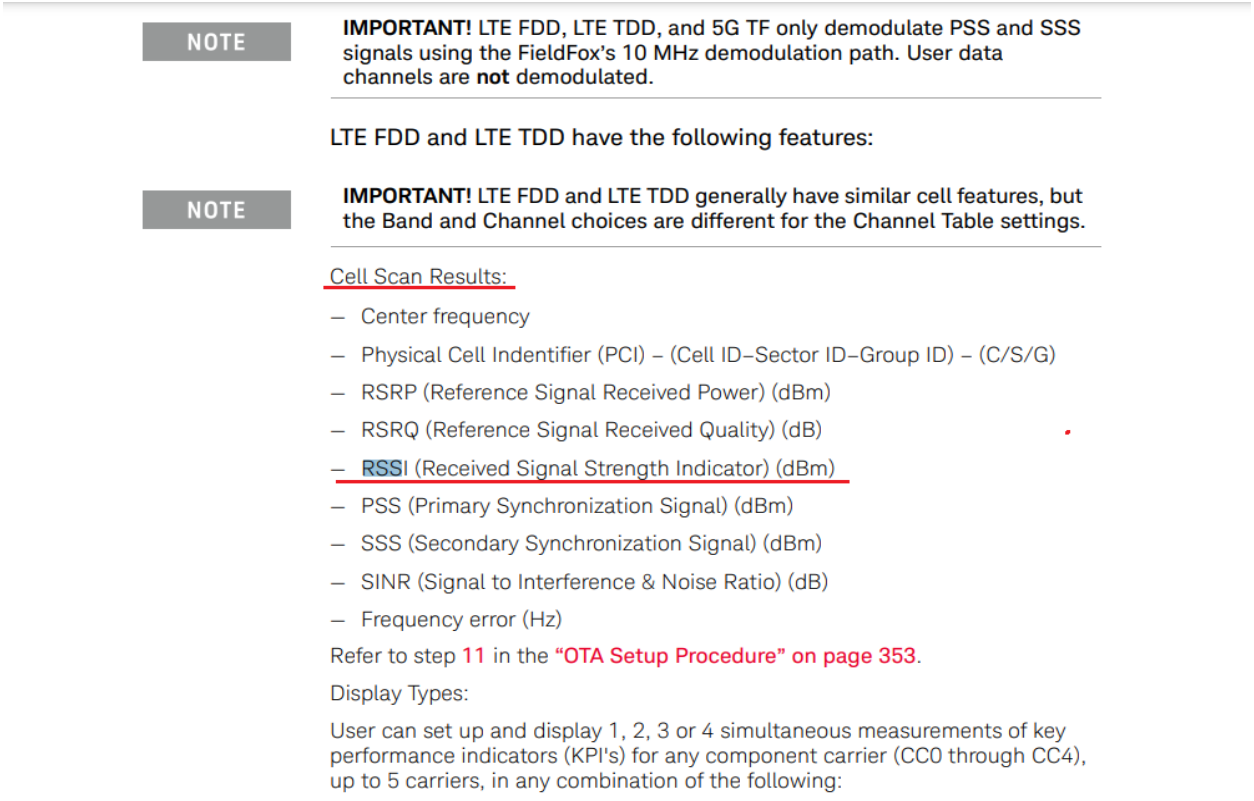
Save maps to the FieldFox internal memory, SD card or USB drive. Use the FieldFox Map Support Tool download OSM maps or use a direct wired LAN connection.

EMF measurement using spectrum analyzer channel power mode

Imported indoor site map PNG file

Outdoor map of OTA LTE synched with GPS

(*E.g.*, https://www.keysight.com/us/en/assets/7018-06517/technical-overviews/5992-3703.pdf).



NOTE

IMPORTANT! LTE FDD, LTE TDD, and 5G TF only demodulate PSS and SSS signals using the FieldFox's 10 MHz demodulation path. User data channels are **not** demodulated.

LTE FDD and LTE TDD have the following features:

NOTE

IMPORTANT! LTE FDD and LTE TDD generally have similar cell features, but the Band and Channel choices are different for the Channel Table settings.

Cell Scan Results:

- Center frequency
- Physical Cell Indentifier (PCI) – (Cell ID–Sector ID–Group ID) – (C/S/G)
- RSRP (Reference Signal Received Power) (dBm)
- RSRQ (Reference Signal Received Quality) (dB)
- RSSI (Received Signal Strength Indicator) (dBm)
- PSS (Primary Synchronization Signal) (dBm)
- SSS (Secondary Synchronization Signal) (dBm)
- SINR (Signal to Interference & Noise Ratio) (dB)
- Frequency error (Hz)

Refer to step 11 in the "OTA Setup Procedure" on page 353.

Display Types:

User can set up and display 1, 2, 3 or 4 simultaneous measurements of key performance indicators (KPI's) for any component carrier (CC0 through CC4), up to 5 carriers, in any combination of the following:

(*E.g.*, https://www.keysight.com/us/en/assets/9921-01763/user-manuals/Users-Guide-B-Series-N991xB-3xB-5xB-6xB-Unabridged.pdf?success=true).

Electromagnetic field (EMF) measurements

Radio frequency electromagnetic fields (EMF) tests evaluate total RF exposure in any given area due to deployment of various RF/MW networks, such as mobile phones, base stations, Wi-Fi, smart meters, IoT devices, as well as satellite and radar systems.

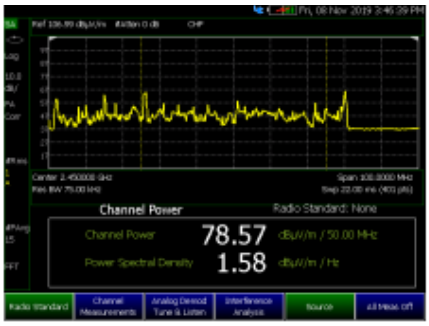
Exposure limits for electromagnetic field (EMF) radiation differ by country. Many countries base their regulations on findings from research organizations like the International Commission on Non-Ionizing Radiation Protection (ICNIRP), the Institute of Electrical and Electronics Engineers (IEEE), and the Federal Communication Commission (FCC).

Field verification is required for compliance to exposure levels set by these government and regulatory agencies. FieldFox with EMF measurements supports connectivity to AGOS Advanced Technologies Triaxial Isotropic Antenna (or Keysight 85572A-006). The spectrum analyzer and over-the-air (OTA) 5G NR modes support EMF measurements that measure the total field strength across the frequency band of interest.

Indoor and outdoor mapping

To verify network coverage or identify interference in any area, it is essential to combine receiver measurements with GPS location tags or from indoor markers. FieldFox imports and displays maps from OpenStreetMap (OSM) for data collection and mapping. The FieldFox system level indoor and outdoor mapping feature can be enabled within the following modes:

Channel Scanner



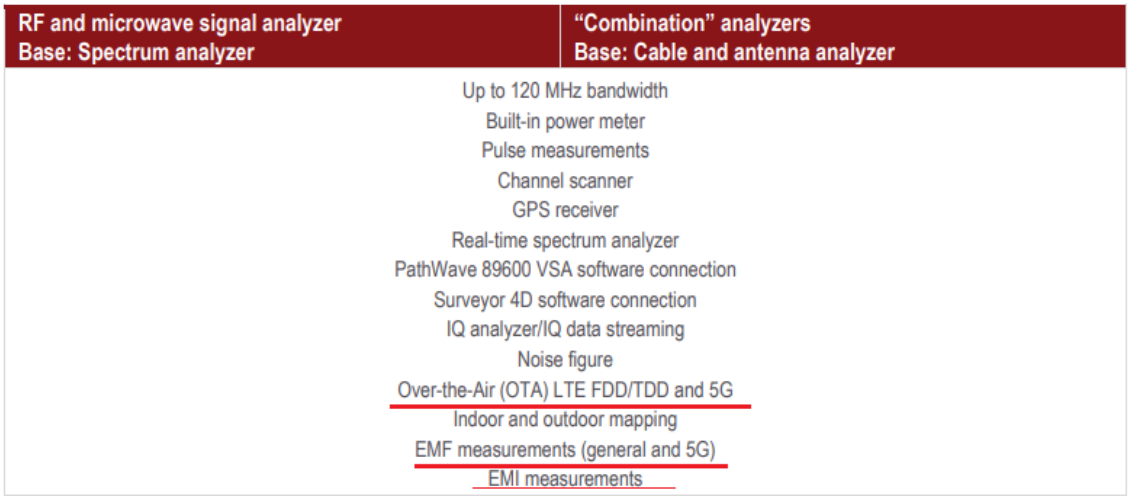
EMF measurement using spectrum analyzer channel power mode

Imported indoor site map PNG file

(*E.g.*, https://www.keysight.com/us/en/assets/9921-01763/user-manuals/Users-Guide-B-Series-N991xB-3xB-5xB-6xB-Unabridged.pdf?success=true).

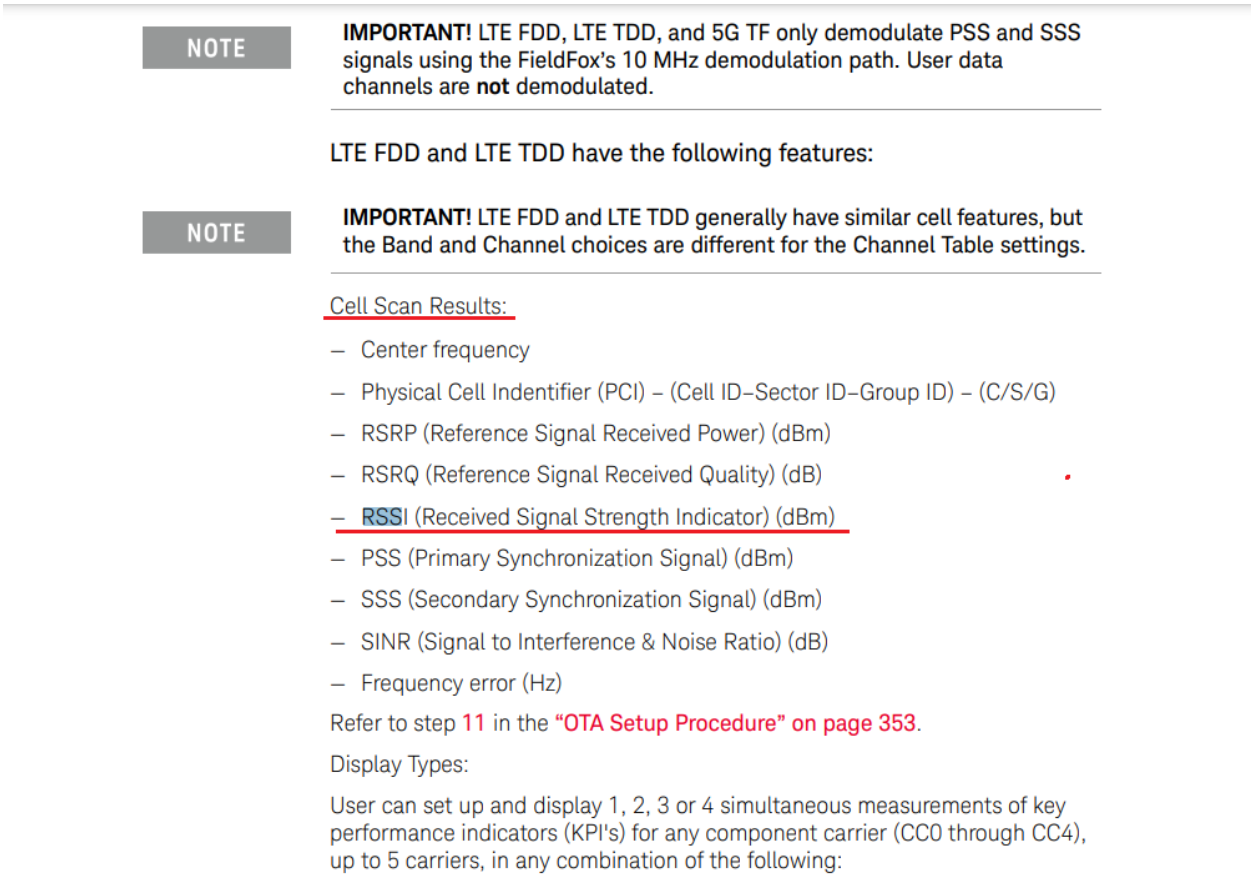
32. The Accused System is a system that obtains field strength testing data (*e.g.*, RSSI, field strengths, interference strengths, etc.) along the testing route (*e.g.*, a test route for indoor/outdoor mapping, etc.) according to a synchronization established between the transmission apparatus and the receiving testing apparatus (*e.g.*, for different types of spectrum like LTE FDD/TDD , 5G receiver is synchronized with base station), wherein the more than one selected testing sites (*e.g.*, interference, RSSI values, etc. are collected from multiple locations) to install the receiving testing apparatus comprise at least one height (*e.g.*, altitude) selected in each of the testing sites to mount at least one said receiving testing apparatus, the at least one receiving testing

apparatus being respectively oriented in at least one direction (*e.g.*, isotropic antenna, or triaxial antenna).



RF and microwave signal analyzer Base: Spectrum analyzer	"Combination" analyzers Base: Cable and antenna analyzer
Up to 120 MHz bandwidth	
Built-in power meter	
Pulse measurements	
Channel scanner	
GPS receiver	
Real-time spectrum analyzer	
PathWave 89600 VSA software connection	
Surveyor 4D software connection	
IQ analyzer/IQ data streaming	
Noise figure	
Over-the-Air (OTA) LTE FDD/TDD and 5G	
Indoor and outdoor mapping	
EMF measurements (general and 5G)	
EMI measurements	

(*E.g.*, https://www.keysight.com/us/en/assets/7018-06517/technical-overviews/5992-3703.pdf).



NOTE

IMPORTANT! LTE FDD, LTE TDD, and 5G TF only demodulate PSS and SSS signals using the FieldFox's 10 MHz demodulation path. User data channels are **not** demodulated.

LTE FDD and LTE TDD have the following features:

NOTE

IMPORTANT! LTE FDD and LTE TDD generally have similar cell features, but the Band and Channel choices are different for the Channel Table settings.

Cell Scan Results:

- Center frequency
- Physical Cell Indentifier (PCI) – (Cell ID–Sector ID–Group ID) – (C/S/G)
- RSRP (Reference Signal Received Power) (dBm)
- RSRQ (Reference Signal Received Quality) (dB)
- RSSI (Received Signal Strength Indicator) (dBm)
- PSS (Primary Synchronization Signal) (dBm)
- SSS (Secondary Synchronization Signal) (dBm)
- SINR (Signal to Interference & Noise Ratio) (dB)
- Frequency error (Hz)

Refer to step 11 in the "OTA Setup Procedure" on page 353.

Display Types:

User can set up and display 1, 2, 3 or 4 simultaneous measurements of key performance indicators (KPI's) for any component carrier (CC0 through CC4), up to 5 carriers, in any combination of the following:

(*E.g.*, https://www.keysight.com/us/en/assets/9921-01763/user-manuals/Users-Guide-B-Series-N991xB-3xB-5xB-6xB-Unabridged.pdf?success=true).

Electromagnetic field (EMF) measurements

Radio frequency electromagnetic fields (EMF) tests evaluate total RF exposure in any given area due to deployment of various RF/MW networks, such as mobile phones, base stations, Wi-Fi, smart meters, IoT devices, as well as satellite and radar systems.

Exposure limits for electromagnetic field (EMF) radiation differ by country. Many countries base their regulations on findings from research organizations like the International Commission on Non-Ionizing Radiation Protection (ICNIRP), the Institute of Electrical and Electronics Engineers (IEEE), and the Federal Communication Commission (FCC).

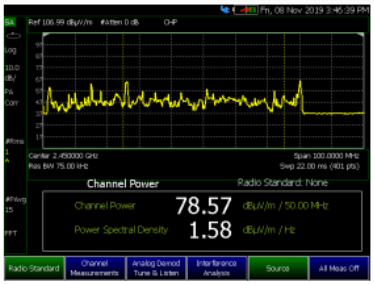
Field verification is required for compliance to exposure levels set by these government and regulatory agencies. FieldFox with EMF measurements supports connectivity to AGOS Advanced Technologies Triaxial Isotropic Antenna (or Keysight 85572A-006). The spectrum analyzer and over-the-air (OTA) 5G NR modes support EMF measurements that measure the total field strength across the frequency band of interest.

Indoor and outdoor mapping

To verify network coverage or identify interference in any area, it is essential to combine receiver measurements with GPS location tags or from indoor markers. FieldFox imports and displays maps from OpenStreetMap (OSM) for data collection and mapping. The FieldFox system level indoor and outdoor mapping feature can be enabled within the following modes:

Channel Scanner
Phased Array Antenna Support
Over-the-Air (OTA) LTE FDD or TDD
Over-the-Air (OTA) 5G TF
Over-the-Air (OTA) 5G NR

Save maps to the FieldFox internal memory, SD card or USB drive. Use the FieldFox Map Support Tool download OSM maps or use a direct wired LAN connection.



EMF measurement using spectrum analyzer channel power mode

Imported indoor site map PNG file

Outdoor map of OTA LTE synched with GPS

(*E.g.*, https://www.keysight.com/us/en/assets/7018-06517/technical-overviews/5992-3703.pdf).

Indoor and Outdoor Mapping – Option 352 (Requires Spectrum Analyzer Mode (Option 233), and GPS Receiver (Option 307))

Figure 16-2 Maps With Current Position Marker Displayed - (OpenStreetMaps)

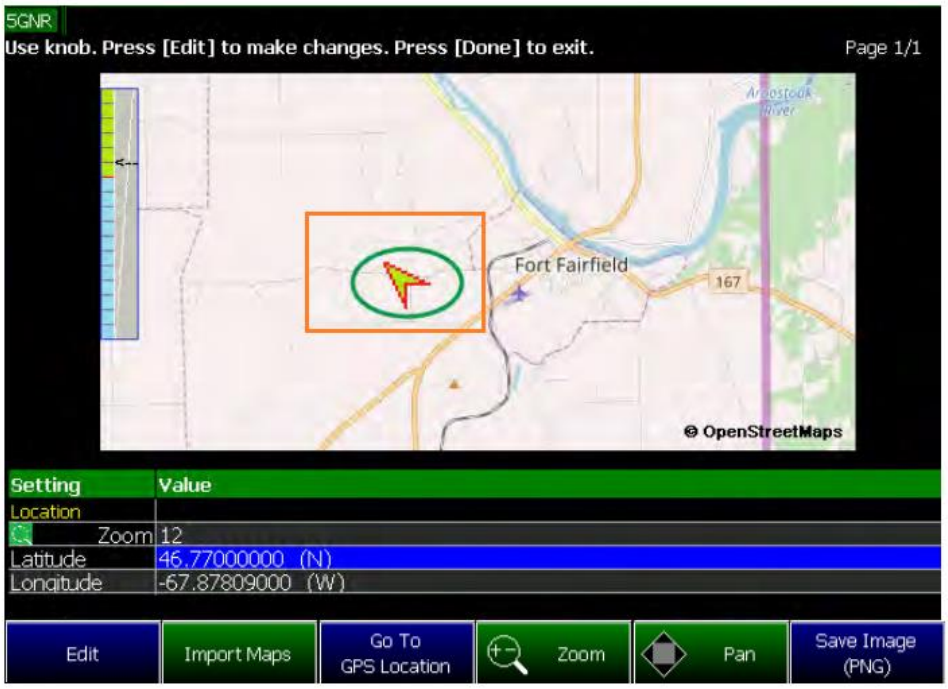
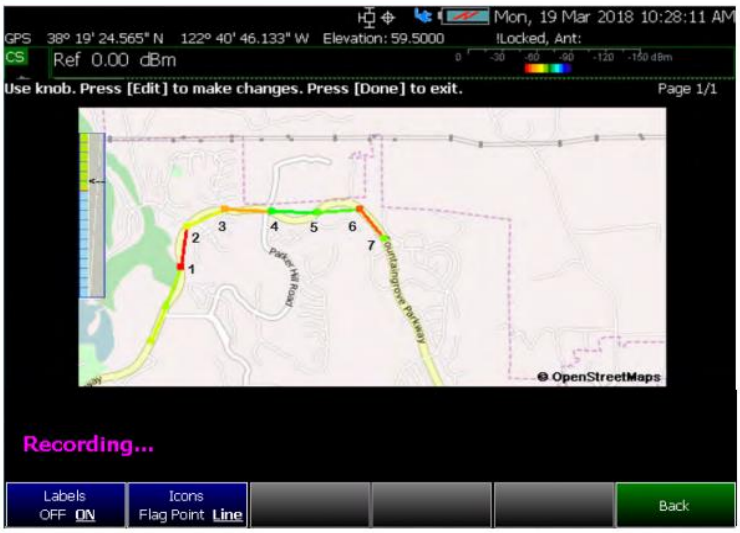


Figure 16-3 Using Mapping (Option 352) - Satellite View for Indoor Mapping

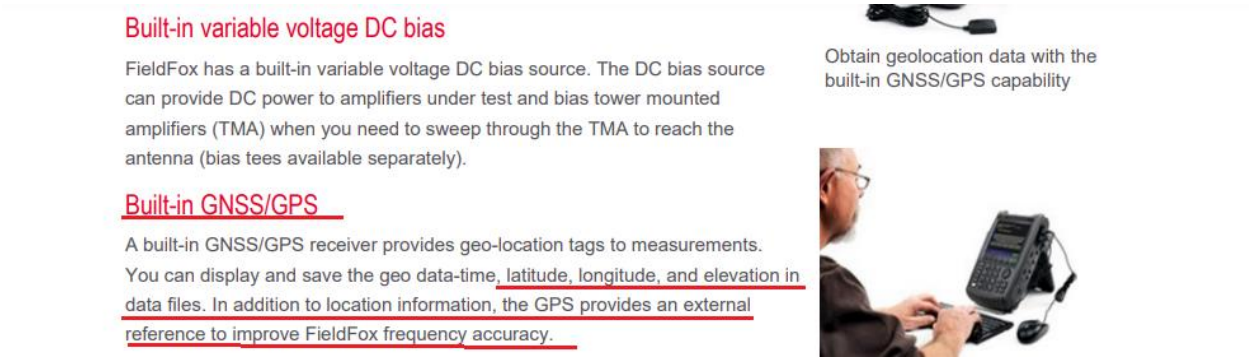
Indoor Maps: RPG Functions with [Navigate] ON OFF

(*E.g.*, https://www.keysight.com/us/en/assets/9018-04841/user-manuals/9018-04841.pdf?success=true).

Figure 16-1 Maps (Outdoor) With Line Feature Enabled



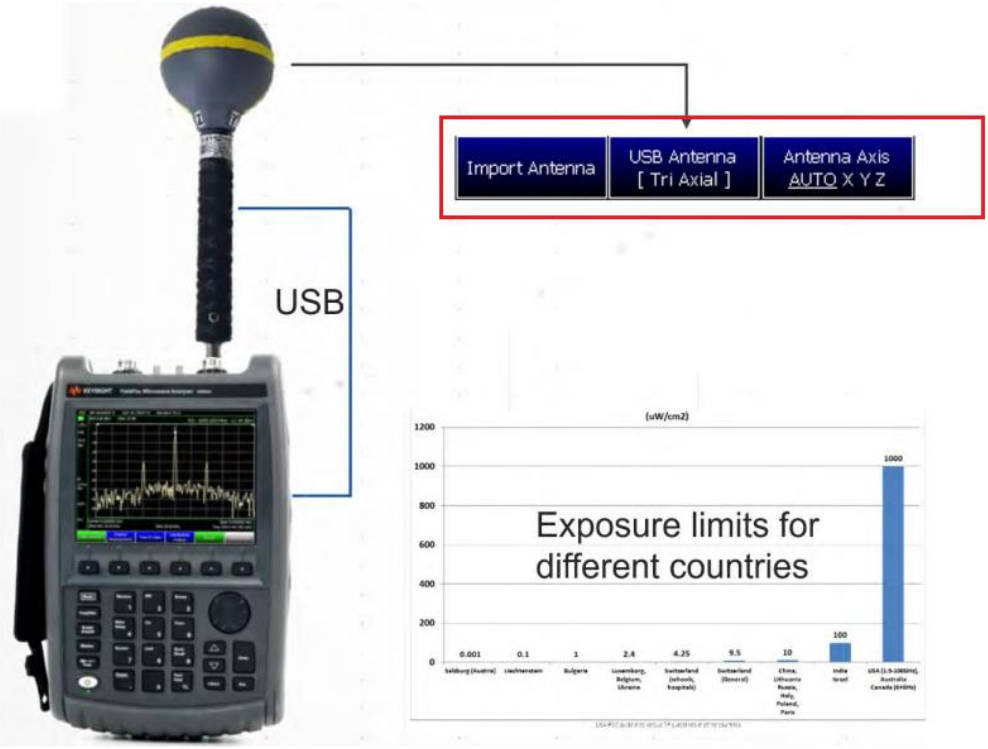
(*E.g.*, https://www.keysight.com/us/en/assets/9018-04841/user-manuals/9018-04841.pdf?success=true).



(*E.g.*, https://www.keysight.com/us/en/assets/9018-04841/user-manuals/9018-04841.pdf?success=true).

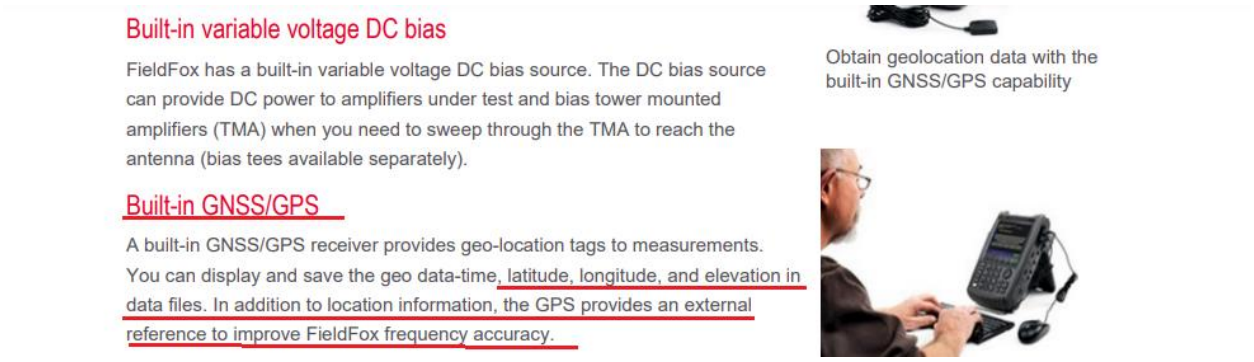
SA (Spectrum Analyzer) Mode (Option 233–Mixed Analyzers)
How to Set Up EMF Settings (Requires EMF (Option 358), GPS (Option 307), and SA Mode (Option 233–Mixed Analyzers))

Figure 9-20 Example of EMF with Triaxial Antenna

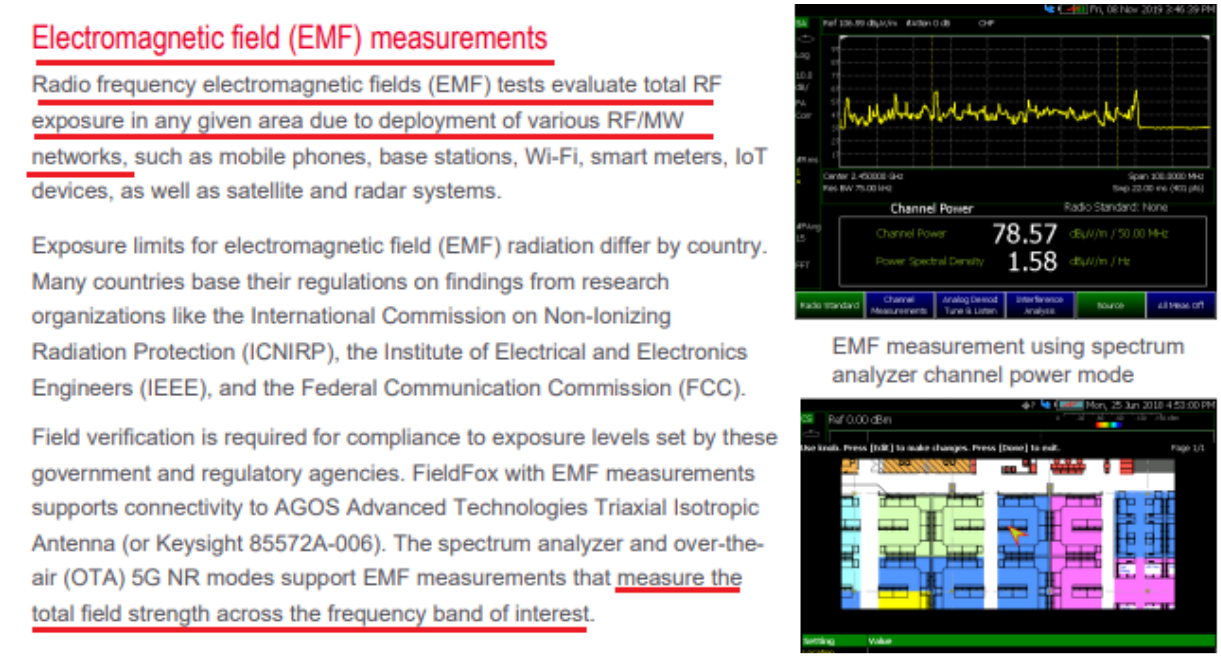


(*E.g.*, https://www.keysight.com/us/en/assets/9921-01763/user-manuals/Users-Guide-B-Series-N991xB-3xB-5xB-6xB-Unabridged.pdf?success=true).

33. The Accused System is a system that comprises a model analyzing apparatus (*e.g.*, Mapping apparatus comprising antennas, GPS receivers, maps, etc.), configured to analyze the field strength testing data (*e.g.*, RSSI, interference, etc.) to obtain a wireless propagation model about an area of the testing route (*e.g.*, coverage mapping, interference mapping, etc.).



(*E.g.*, https://www.keysight.com/us/en/assets/9018-04841/user-manuals/9018-04841.pdf?success=true).



(*E.g.*, https://www.keysight.com/us/en/assets/9921-01763/user-manuals/Users-Guide-B-Series-N991xB-3xB-5xB-6xB-Unabridged.pdf?success=true).

Indoor and outdoor mapping

To verify network coverage or identify interference in any area, it is essential to combine receiver measurements with GPS location tags or from indoor markers. FieldFox imports and displays maps from OpenStreetMap (OSM) for data collection and mapping. The FieldFox system level indoor and outdoor mapping feature can be enabled within the following modes:

- Channel Scanner
- Phased Array Antenna Support
- Over-the-Air (OTA) LTE FDD or TDD
- Over-the-Air (OTA) 5G TF
- Over-the-Air (OTA) 5G NR

Save maps to the FieldFox internal memory, SD card or USB drive. Use the FieldFox Map Support Tool download OSM maps or use a direct wired LAN connection.

Imported indoor site map PNG file

Outdoor map of OTA LTE synched with GPS

(*E.g.*, https://www.keysight.com/us/en/assets/9921-01763/user-manuals/Users-Guide-B-Series-N991xB-3xB-5xB-6xB-Unabridged.pdf?success=true).

NOTE

IMPORTANT! LTE FDD, LTE TDD, and 5G TF only demodulate PSS and SSS signals using the FieldFox's 10 MHz demodulation path. User data channels are **not** demodulated.

LTE FDD and LTE TDD have the following features:

NOTE

IMPORTANT! LTE FDD and LTE TDD generally have similar cell features, but the Band and Channel choices are different for the Channel Table settings.

Cell Scan Results:

- Center frequency
- Physical Cell Indentifier (PCI) – (Cell ID–Sector ID–Group ID) – (C/S/G)
- RSRP (Reference Signal Received Power) (dBm)
- RSRQ (Reference Signal Received Quality) (dB)
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- SSS (Secondary Synchronization Signal) (dBm)
- SINR (Signal to Interference & Noise Ratio) (dB)
- Frequency error (Hz)

Refer to step 11 in the "OTA Setup Procedure" on page 353.

Display Types:

User can set up and display 1, 2, 3 or 4 simultaneous measurements of key performance indicators (KPI's) for any component carrier (CC0 through CC4), up to 5 carriers, in any combination of the following:

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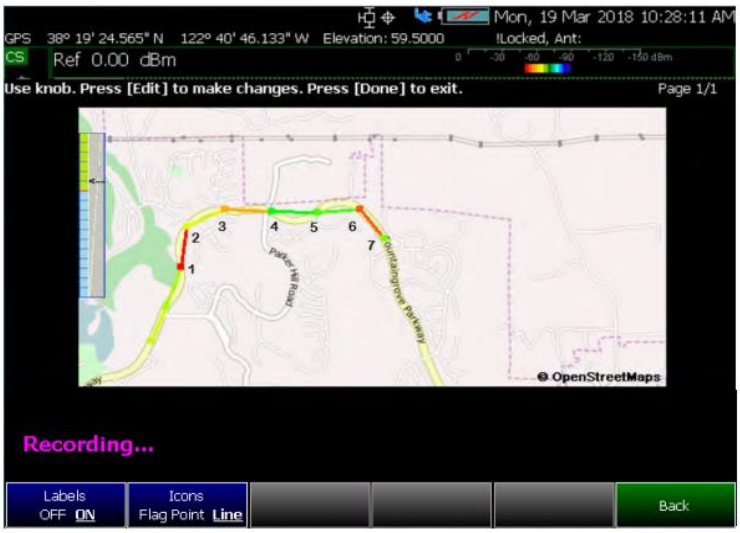
Figure 16-1 Maps (Outdoor) With Line Feature Enabled



(*E.g.*, https://www.keysight.com/us/en/assets/9018-04841/user-manuals/9018-04841.pdf?success=true).

34. The Accused System comprises a merging module (*e.g.*, FieldFox Map Support Tool, OpenStreeTMaps (OSM), etc.,), configured to selectively merge the field strength testing data (*e.g.*, RSSI, interference strength, etc.) according to a topographic and geomorphologic feature along the testing route. As shown, the Accused System saves the latitude, longitude and altitude data for each location (according to a topographic and geomorphologic feature along the testing route) and merges the field strength data with the location data. These files can be saved as KML and can be opened using Google Earth.

Indoor and outdoor mapping

To verify network coverage or identify interference in any area, it is essential to combine receiver measurements with GPS location tags or from indoor markers. FieldFox imports and displays maps from OpenStreetMap (OSM) for data collection and mapping. The FieldFox system level indoor and outdoor mapping feature can be enabled within the following modes:

Channel Scanner
Phased Array Antenna Support
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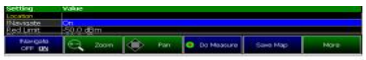
Over-the-Air (OTA) 5G TF
Over-the-Air (OTA) 5G NR

Save maps to the FieldFox internal memory, SD card or USB drive. Use the FieldFox Map Support Tool download OSM maps or use a direct wired LAN connection.



Imported indoor site map PNG file

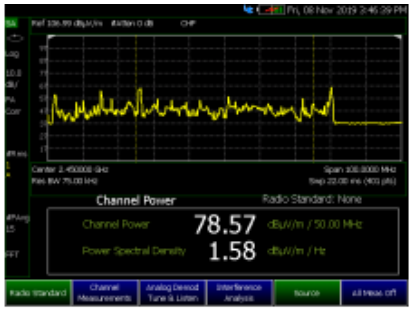
Outdoor map of OTA LTE synched with GPS

Electromagnetic field (EMF) measurements

Radio frequency electromagnetic fields (EMF) tests evaluate total RF exposure in any given area due to deployment of various RF/MW networks, such as mobile phones, base stations, Wi-Fi, smart meters, IoT devices, as well as satellite and radar systems.

Exposure limits for electromagnetic field (EMF) radiation differ by country. Many countries base their regulations on findings from research organizations like the International Commission on Non-Ionizing Radiation Protection (ICNIRP), the Institute of Electrical and Electronics Engineers (IEEE), and the Federal Communication Commission (FCC).

Field verification is required for compliance to exposure levels set by these government and regulatory agencies. FieldFox with EMF measurements supports connectivity to AGOS Advanced Technologies Triaxial Isotropic Antenna (or Keysight 85572A-006). The spectrum analyzer and over-the-air (OTA) 5G NR modes support EMF measurements that measure the total field strength across the frequency band of interest.



EMF measurement using spectrum analyzer channel power mode

(*E.g.*, https://www.keysight.com/us/en/assets/7018-06517/technical-overviews/5992-3703.pdf).

NOTE

IMPORTANT! LTE FDD, LTE TDD, and 5G TF only demodulate PSS and SSS signals using the FieldFox's 10 MHz demodulation path. User data channels are **not** demodulated.

LTE FDD and LTE TDD have the following features:

NOTE

IMPORTANT! LTE FDD and LTE TDD generally have similar cell features, but the Band and Channel choices are different for the Channel Table settings.

Cell Scan Results:

- Center frequency
- Physical Cell Indentifier (PCI) – (Cell ID–Sector ID–Group ID) – (C/S/G)
- RSRP (Reference Signal Received Power) (dBm)
- RSRQ (Reference Signal Received Quality) (dB)
- RSSI (Received Signal Strength Indicator) (dBm)
- PSS (Primary Synchronization Signal) (dBm)
- SSS (Secondary Synchronization Signal) (dBm)
- SINR (Signal to Interference & Noise Ratio) (dB)
- Frequency error (Hz)

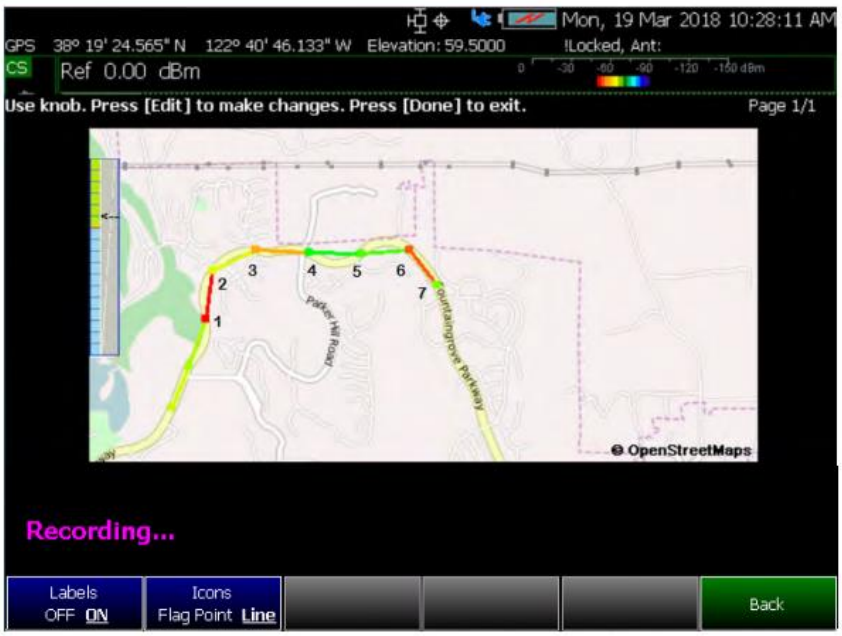
Refer to step 11 in the "OTA Setup Procedure" on page 353.

Display Types:

User can set up and display 1, 2, 3 or 4 simultaneous measurements of key performance indicators (KPI's) for any component carrier (CC0 through CC4), up to 5 carriers, in any combination of the following:

(*E.g.*, https://www.keysight.com/us/en/assets/7018-06517/technical-overviews/5992-3703.pdf).

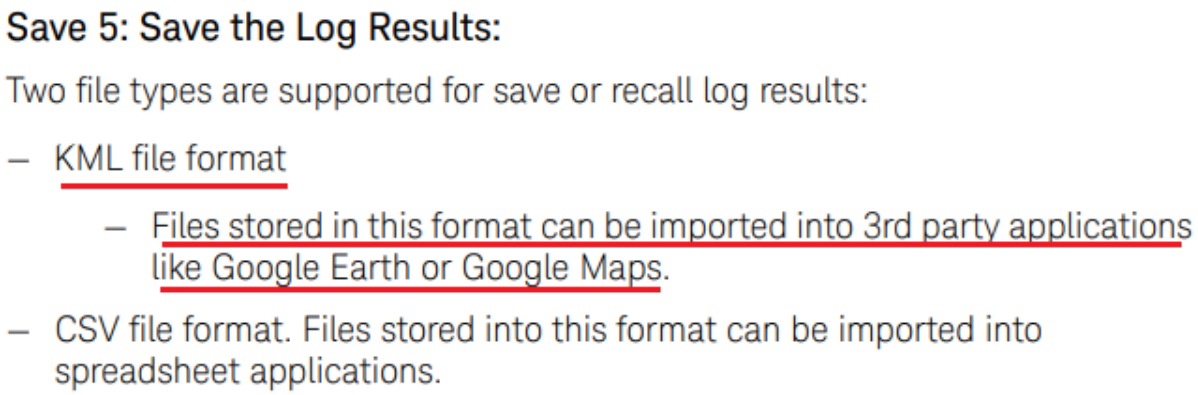
Figure 16-1 Maps (Outdoor) With Line Feature Enabled



(*E.g.*, https://www.keysight.com/us/en/assets/9921-01763/user-manuals/Users-Guide-B-Series-N991xB-3xB-5xB-6xB-Unabridged.pdf?success=true).

Using a direct wired LAN connection with access to a network and the internet, FieldFox will automatically access OSM once location coordinates (latitude and longitude) and zoom levels are entered the Map Explorer menu. If using the FieldFox Map Support Tool, OSM map files can be downloaded to a *.zip file and imported to FieldFox internal memory. If the FieldFox GPS receiver is enabled and OSM maps have been previously saved to FieldFox with those GPS coordinates, FieldFox will automatically load the corresponding map to match the GPS coordinates.

(*E.g.*, https://www.keysight.com/us/en/assets/9921-01763/user-manuals/Users-Guide-B-Series-N991xB-3xB-5xB-6xB-Unabridged.pdf?success=true).



Save 5: Save the Log Results:

Two file types are supported for save or recall log results:

- KML file format
  - Files stored in this format can be imported into 3rd party applications like Google Earth or Google Maps.
- CSV file format. Files stored into this format can be imported into spreadsheet applications.

(*E.g.*, https://www.keysight.com/us/en/assets/9921-01763/user-manuals/Users-Guide-B-Series-N991xB-3xB-5xB-6xB-Unabridged.pdf?success=true).

Indoor and Outdoor Mapping – Option 352 (Requires Spectrum Analyzer Mode (Option 233), and GPS Receiver (Option 307))

Figure 16-2 Maps With Current Position Marker Displayed - (OpenStreetMaps)

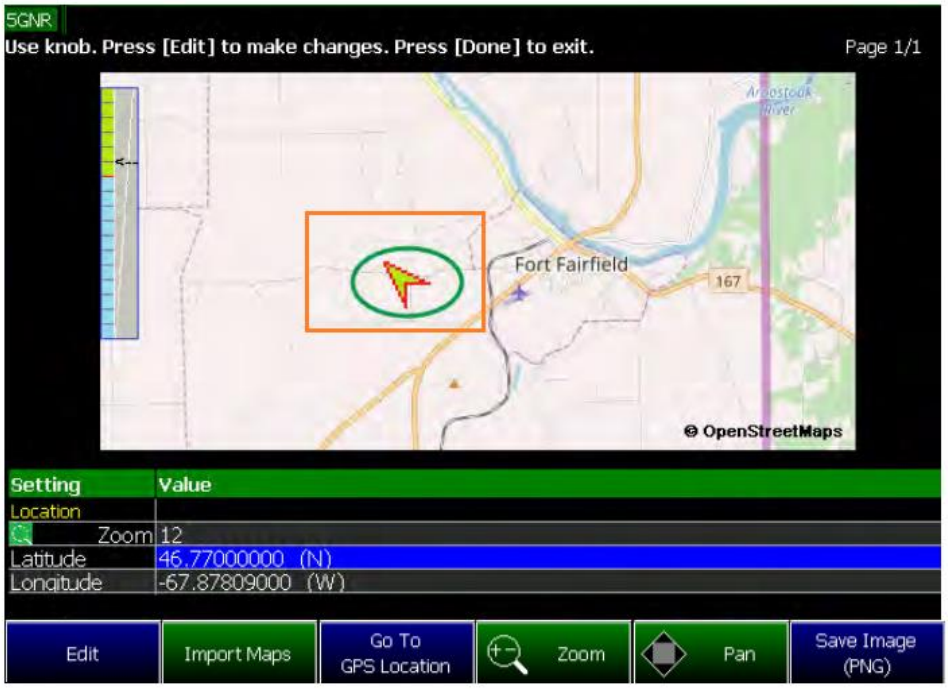
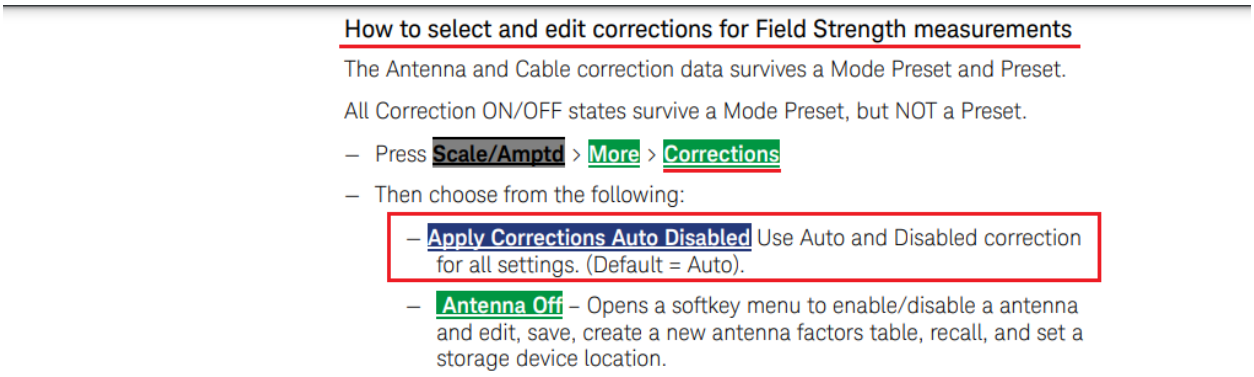


Figure 16-3 Using Mapping (Option 352) - Satellite View for Indoor Mapping

Indoor Maps: RPG Functions with [Navigate] ON OFF

(*E.g.*, https://www.keysight.com/us/en/assets/9921-01763/user-manuals/Users-Guide-B-Series-N991xB-3xB-5xB-6xB-Unabridged.pdf?success=true).

35. The Accused System comprises a correcting module (*e.g.*, edit corrections for field strengths), configured to perform a wireless propagation model correction (*e.g.*, user define parameters for field strengths, antenna) using the field strength testing data (*e.g.*, RSSI, interference, etc.) to form the wireless propagation model under at least one type of environment (*e.g.*, current testing environment, etc.).



How to select and edit corrections for Field Strength measurements

The Antenna and Cable correction data survives a Mode Preset and Preset.

All Correction ON/OFF states survive a Mode Preset, but NOT a Preset.

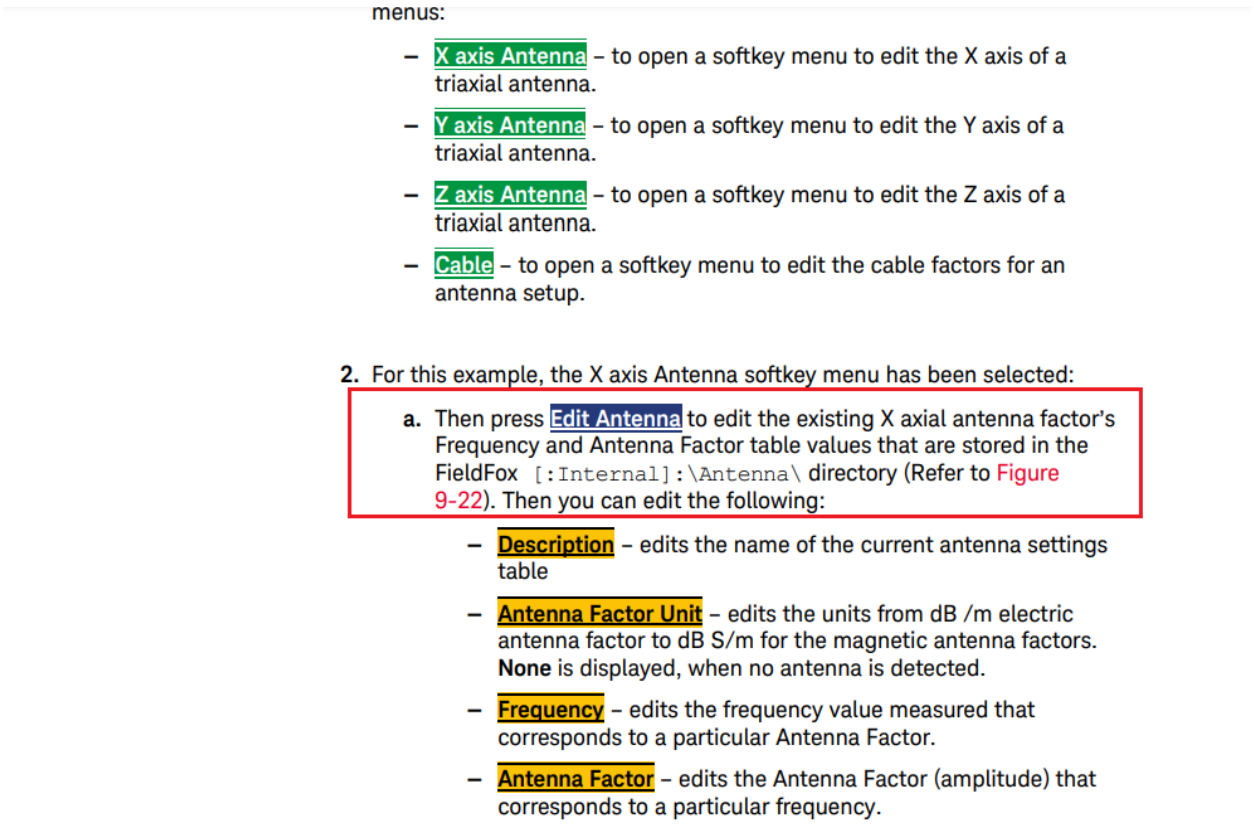
– Press Scale/Amptd > More > Corrections

– Then choose from the following:

– Apply Corrections Auto Disabled Use Auto and Disabled correction for all settings. (Default = Auto).

– Antenna Off – Opens a softkey menu to enable/disable a antenna and edit, save, create a new antenna factors table, recall, and set a storage device location.

(*E.g.*, https://www.keysight.com/us/en/assets/9921-01763/user-manuals/Users-Guide-B-Series-N991xB-3xB-5xB-6xB-Unabridged.pdf?success=true).



menus:

– X axis Antenna – to open a softkey menu to edit the X axis of a triaxial antenna.

– Y axis Antenna – to open a softkey menu to edit the Y axis of a triaxial antenna.

– Z axis Antenna – to open a softkey menu to edit the Z axis of a triaxial antenna.

– Cable – to open a softkey menu to edit the cable factors for an antenna setup.

2. For this example, the X axis Antenna softkey menu has been selected:

a. Then press Edit Antenna to edit the existing X axial antenna factor's Frequency and Antenna Factor table values that are stored in the FieldFox `[:Internal]:\Antenna\` directory (Refer to Figure 9-22). Then you can edit the following:

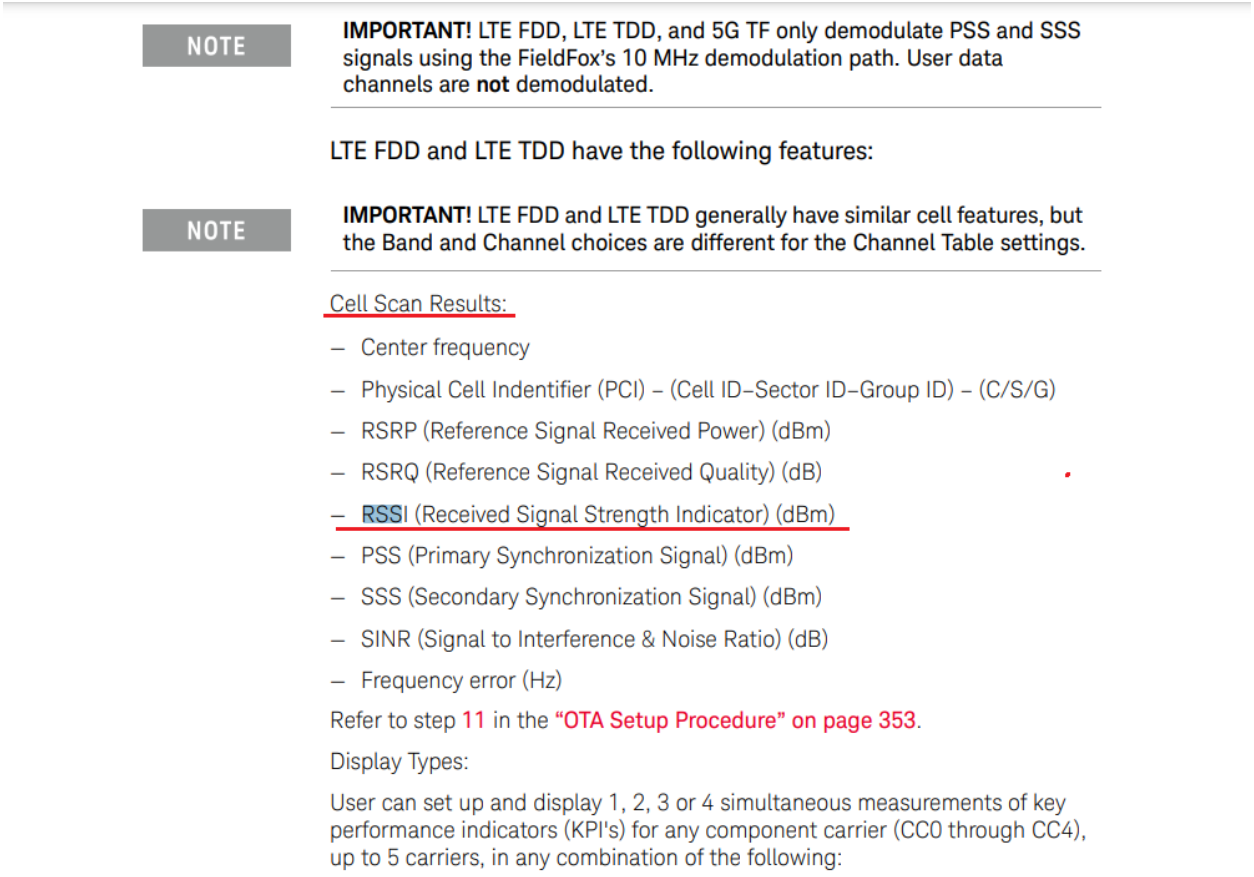
– Description – edits the name of the current antenna settings table

– Antenna Factor Unit – edits the units from dB /m electric antenna factor to dB S/m for the magnetic antenna factors. **None** is displayed, when no antenna is detected.

– Frequency – edits the frequency value measured that corresponds to a particular Antenna Factor.

– Antenna Factor – edits the Antenna Factor (amplitude) that corresponds to a particular frequency.

(*E.g.*, https://www.keysight.com/us/en/assets/9921-01763/user-manuals/Users-Guide-B-Series-N991xB-3xB-5xB-6xB-Unabridged.pdf?success=true).



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Electromagnetic interference (EMI) measurements

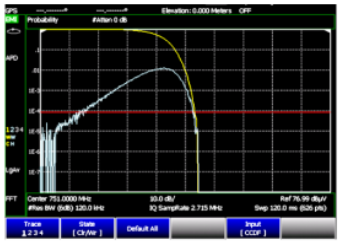
Base stations and mobile devices generate unwanted signals that create noise and interference. One of the key challenges in the wireless industry is to minimize this noise and interference with EMI testing.

EMI diagnostic and performance verification are common tests for the lab, the manufacturing floor, field equipment, and regulatory inspections. EMI measurements help to:

1. Evaluate pre-compliance limits before formal compliance tests
2. Identify issues like noise floor rise and interference generated by other equipment
3. Perform equipment or network regulatory audits against various limits, such as CISPR 16-1-1.
4. Troubleshoot circuit boards
5. Test potential system level performance impact due to EMI degradation

Keysight's FieldFox handheld analyzer provides a comprehensive solution to measure EMI, Amplitude Probability Distribution (APD), FFT spectrum analysis, and real-time spectrum analysis with density and spectrogram displays. It also performs vector network analysis for full 2 port S-parameter measurements. It is an ideal tool to address all EMI troubleshooting issues.

EMI measurements with built-in CISPR compliant detectors, RBW's and band presets in addition to a logarithmic scan and user-defined limit lines provide an ideal pre-compliance EMI testing tool regardless of being in the field or in a lab.



A Complementary Cumulative Distribution Function (CCDF) curve under APD and within EMI measurements reveals the statistical behavior of interference signals

(*E.g.*, https://www.keysight.com/us/en/assets/7018-06517/technical-overviews/5992-3703.pdf).

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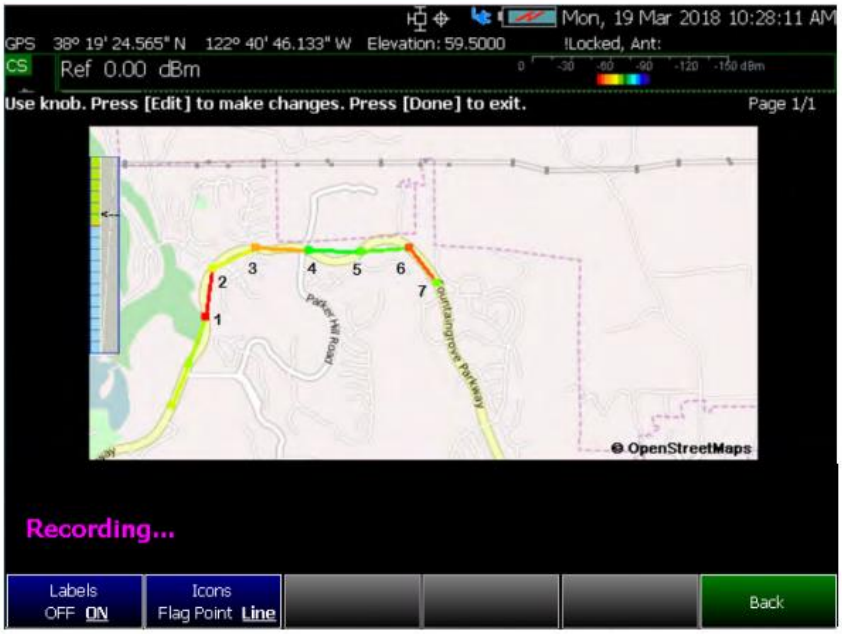

(*E.g.*, https://www.keysight.com/us/en/assets/9921-01763/user-manuals/Users-Guide-B-Series-N991xB-3xB-5xB-6xB-Unabridged.pdf?success=true).

Indoor and Outdoor Mapping – Option 352 (Requires Spectrum Analyzer Mode (Option 233), and GPS Receiver (Option 307))

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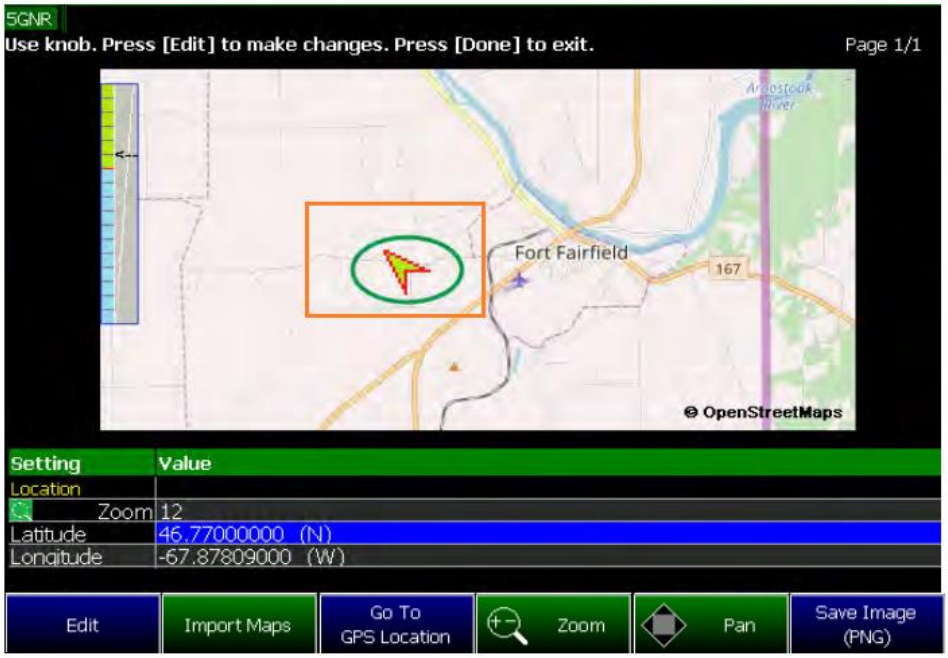

Figure 16-3 Using Mapping (Option 352) - Satellite View for Indoor Mapping

Indoor Maps: RPG Functions with [Navigate] ON OFF

(*E.g.*, https://www.keysight.com/us/en/assets/9921-01763/user-manuals/Users-Guide-B-Series-N991xB-3xB-5xB-6xB-Unabridged.pdf?success=true).

36. Plaintiff has been damaged as a result of Defendant's infringing conduct with respect to United States Patent Nos. 7,668,301 and 9,179,339. Defendant is thus liable to Plaintiff for damages in an amount that adequately compensates Plaintiff for such Defendant's infringement of the '301 patent and the '339 patent, *i.e.*, in an amount that by law cannot be less than would constitute a reasonable royalty for the use of the patented technology, together with interest and costs as fixed by this Court under 35 U.S.C. § 284.

37. On information and belief, and to the extent required, all marking requirements have been complied with.

V. JURY DEMAND

Plaintiff, under Rule 38 of the Federal Rules of Civil Procedure, requests a trial by jury of any issues so triable by right.

VI. PRAYER FOR RELIEF

WHEREFORE, Plaintiff respectfully requests that the Court find in its favor and against Defendant, and that the Court grant Plaintiff the following relief:

a. Judgment that one or more claims of United States Patent Nos. 7,668,301 and 9,179,339 have been infringed, either literally and/or under the doctrine of equivalents, by Defendant;

b. Judgment that Defendant account for and pay to Plaintiff all damages to and costs incurred by Plaintiff because of Defendant's infringing activities and other conduct complained of herein, and an accounting of all infringements and damages not presented at trial;

c. That Plaintiff be granted pre-judgment and post-judgment interest on the damages caused by Defendant's infringing activities and other conduct complained of herein; and

d. That Plaintiff be granted such other and further relief as the Court may deem just and proper under the circumstances.

July 28, 2022

Respectfully Submitted,

/s/ David R. Bennett

David R. Bennett
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(312) 291-1667
dbennett@directionip.com

Attorneys for Plaintiff Prestwick Licensing LLC