CellAdvisor™ 5G

User's Guide

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About CellAdvisor 5G

CellAdvisor 5G

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Notice

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Safety and compliance information

Product Regulatory compliance

Federal Communications Commission (FCC) notice

This product was tested and found to comply with the limits for a Class A digital device, pursuant to Part 15 of the FCC Rules. These limits are designed to provide reasonable protection against harmful interference when the equipment is operated in a commercial environment. This product generates, uses, and can radiate radio frequency energy and, if not installed and used in accordance with the instruction manual, may cause harmful interference to radio communications. Operation of this product in a residential area is likely to cause harmful interference, in which case you will be required to correct the interference at your own expense.

The authority to operate this product is conditioned by the requirements that no modifications be made to the equipment unless the changes or modifications are expressly approved by VIAVI.

Caution:

– To comply with FCC RF exposure compliance requirements, a separation distance of at least 20 cm must be maintained between the antenna of this device and all person.

– This transmitter must not be co-located or operating in conjunction with any other antenna or transmitter.

Industry Canada requirements

This device complies with Industry Canada license-exempt RSS standard(s). Operation is subject to the following two conditions: (1) this device may not cause interference, and (2) this device must accept any interference, including interference that may cause undesired operation of the device.

This Class A digital apparatus complies with Canadian standard ICES-003.

Le présent appareil numérique de classe A est conforme à la norme ICES-003 du Canada.

This device complies with Industry Canada license-exempt RSS standard(s). Operation is subject to the following two conditions: (1) this device may not cause interference, and (2) this device must accept any interference, including interference that may cause undesired operation of the device.

Device operation in the band 5150–5250 MHz is for indoor use only.

Le présent appareil est conforme aux CNR d'Industrie Canada applicables aux appareils radio exempts de licence. L'exploitation est autorisée aux deux conditions suivantes: 1) l'appareil ne doit pas produire de brouillage; et, 2) l'utilisateur de l'appareil doit accepter tout brouillage radioélectrique subi, même si le brouillage est susceptible d'en compromettre le fonctionnement.

Dans la bande de fréquence 5150-5250 Mhz, l'utilisation du produit doit être uniquement en intérieur.

Japan Ministry of Internal Affairs and Communications (MIC) Requirements

This device is compliant with Japan's Radio Law and the Technical Conformity (Giteki) Mark can be viewed on the instrument's display screen. The telec.pdf file containing the conformity mark is located in the files/disk/licenses folder under the System menu.

EU WEEE and battery directives

This product, and the batteries used to power the product, should not be disposed of as unsorted municipal waste and should be collected separately and disposed of according to your national regulations.

VIAVI has established a take-back processes in compliance with the EU Waste Electrical and Electronic Equipment (WEEE) Directive, 2012/19/EU, and the EU Battery Directive, 2006/66/EC.

Instructions for returning waste equipment and batteries to VIAVI can be found in the WEEE section of VIAVI Standards and Policies web page.

If you have questions concerning disposal of your equipment or batteries, contact VIAVI WEEE Program Management team at WEEE.EMEA@ViaviSolutions.com.

EU REACH

Article 33 of EU REACH regulation (EC) No 1907/2006 requires article suppliers to provide information if a listed Substances of Very High Concern (SVHC) is present in an article above a certain threshold.

For information on the presence of REACH SVHCs in VIAVI products, see the Hazardous Substance Control section of VIAVI Standards and Policies web page.

EU CE marketing directives (LV, EMC, RoHS, RE)

This product conforms with all applicable CE marking directives. Please see EU Declaration of Conformity for details.

EU Radio Equipment Directive

In accordance with Article 10.8 of the EU Radio Equipment Directive 2014/53/EU, the following table provides information on the frequency bands and the maximum RF transmit power of this product for sale in the EU:

Frequency range (MHz)	Channels Used	Max. Transmit Power (dBm/mW)
5470-5725	100-140	29.9 dBm (977 mW) with TPC 26.9 dBm (490 mW) non-TPC
5250-5350	52-64	22.9 dBm (195 mW) with TPC 19.9 dBm (97.7 mW) with TPC
5150-5250	36-48	22.9 dBm (195 mW)
2400-2483.5	1-13	ODFM: 19.9 dBm (97.7 mW) CCK: 17.9 dBm (61.7 mW)

TPC: Transmit Power Control

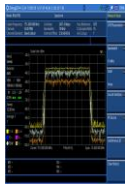
Guide conventions

This guide uses the following conventions:

Typographical conventions

Description	Example
Buttons that the user presses or tap on a physical device	Press the **ON** button.
Screen buttons, menus, icons, and options that you tab/select on the touch-screen in **this typeface**	Tap the **Apply** button. Tap **Limit line** to turn on. Go to **Settings**. Select **Channel standard**.
A single slanted bracket (>) indicates choosing a submenu from a menu.	On the menu bar, click **File** > **Save.**
A file type in `this typeface`.	In `.trav` file type

Symbol conventions

Items	Descriptions
	This symbol indicates a note that includes important supplemental information or tips related to the main text.
	This symbol represents a general hazard. It may be associated with either a DANGER, WARNING, CAUTION, or ALERT message.
	This symbol represents an alert. It indicates that there is an action that must be performed in order to protect equipment and data or to avoid software damage and service interruption.
	This symbol represents hazardous voltages. It may be associated with either a DANGER, WARNING, CAUTION, or ALERT message.
	This symbol represents a risk of explosion. It may be associated with either a DANGER, WARNING, CAUTION or ALERT message.
	This symbol represents a risk of a hot surface. It may be associated with either a DANGER, WARNING, CAUTION, or ALERT message.
	This symbol represents a risk associated with fiber optic lasers. It may be associated with either a DANGER, WARNING, CAUTION or ALERT message
	This symbol, located on the equipment, battery, or the packaging indicates that the equipment or battery must not be disposed of in a land-fill site or as municipal waste, and should be disposed of according to your national regulations.

Safety definitions

Term	Definition
NOTE	Indicates important supplemental information or tips related to the main text.
DANGER	Indicates a potentially hazardous situation that, if not avoided, will result in death or serious injury. It may be associated with either a general hazard, high voltage, or other symbol.
WARNING	Indicates a potentially hazardous situation that, if not avoided, could result in death or serious injury. It may be associated with either a general hazard, high voltage, or other symbol.
CAUTION	Indicates a potentially hazardous situation that, if not avoided, could result in minor or moderate injury and/or damage to equipment. It may be associated with either a general hazard, high voltage, or risk of explosion symbol.

	When applied to software actions, indicates a situation that, if not avoided, could result in loss of data or a disruption of software operation.
ALERT	Indicates that there is an action that must be performed in order to protect equipment and data or to avoid software damage and service interruption.

Technical assistance

If you require technical assistance, call 1-844-GO-VIAVI or send an email to TAC@viavisolutions.com. For the latest TAC information, go to http://www.viavisolutions.com/en/services-and-support/support/technical-assistance.

Introduction to CellAdvisor 5G

What is CellAdvisor 5G?

VIAVI RF and fiber test solutions for the field include spectrum analyzers, cable and antenna analyzers, and signaling analyzers for the installation and maintenance of modern wireless communication systems. RF and fiber test is critical for wireless operators facing challenges of signal quality and signaling interference, and maintaining quality high-bandwidth services. The CellAdvisor 5G is designed to be rugged, portable, touch-based, and battery-operated test solutions that facilitate the quick turn-up and validating 5G radio access.

The CellAdvisor 5G addresses spectrum analysis, interference analysis, and signal analysis, using the 5G technology with FR1 and FR2 bands.

Main features of the CellAdvisor 5G CA5000 are as below:

- Full flexibility to test multi-radio access technologies from 3G to 5G for macro-cell and small-cell site, DAS, and C-RAN
- Small cell signal modulation quality assessment in FR1 and FR2 bands with channels up to 100 MHz
- Real-time spectrum with persistence for effective interference analysis

CellAdvisor 5G

Features and capabilities

The CellAdvisor 5G is the optimal portable test solution for installation and maintenance of cellular base stations and cell sites, running with external AC power or battery for the field. Its touch-based user interface has been specifically designed with customized menus and simple calibration procedures, providing service providers with accurate and reliable measurement results.

- Intuitive user interface that facilitates quick test configuration and execution, and easy interpretation of test results.
- Detailed test results that displays the entire screen to observe test results.
- Real-time spectrum with persistence display for 5G FR1 band (Sub-6 GHz) and FR2 band (24 GHz to 40 GHz).
- 5G Carrier scanner measuring up to eight single component carriers' power as well as strongest beam power level and its corresponding ID.

- 5G beam analyzer assessing individual beam’s ID, its power level and corresponding signal to noise ratios.
- 5G route map for coverage verification mapping the beam strength in real-time as well as making data available for postprocessing.

Specifications

The physical, power supply, battery and environmental characteristics for the CellAdvisor 5G are listed in the tables below.

Physical specifications

Product	Dimension (H x W x D)
CellAdvisor 5G	309 mm x 241 mm x 113 mm with a top bumper 309 mm x 225 mm x 113 mm without a top bumper

Power supply specifications

Power	Descriptions
External DC Input	19V DC
Power consumption	Option F001 54 W Option F002 64 W

Battery specifications

Although battery life varies depending on the type of test, the following table provides specifications for the battery life and the specifications for the AC adapter.

Battery	Descriptions
Battery	14.4 V, 6800 mA-h, Lithium Ion
Operating Time	Option F001 standard (one battery) > 2 hours/ Option F001 option (two batteries) > 4.10 hours (Typical) Option F002 standard (one battery) > 1.40 hours/ Option F002 option (two batteries) > 3.30 hours (Typical)

Charge Time	In case of a fully charged battery with only one battery installed, > 2.30 hours and with two batteries, > 4.30 hours (100%) In case of battery charging up to 80% with only one battery installed, > 1.40 hours and with two batteries, > 3.20 hours (80%)
Charging Temperature	0 to 60°C, ≤ 85% RH
Discharging Temperature	-20 to 55°C ≤ 85% RH
Storage Temperature	-20 to 60°C, the battery pack should be stored in an environment with low humidity.

Environmental specifications

You can check the environment specifications in the following table.

Item	Descriptions
Maximum Humidity	95% RH non-condensing
Shock and Vibration	MIL-PRF-28800F Class 2
Drop	MIL-PRF-28800F Class 2
Storage Temperature	-20 to 60℃

Data storage

You can check the data storage specifications in the following table.

Item	Descriptions
Internal	Maximum 4 GB
External	Maximum 32 GB (FAT32), supports USB 2.0 compatible memory devices

Options

This instrument is provided with various options/features that are available to be ordered. See “Appendix A. Ordering information” for more information.

Getting Started

Unpacking and inspecting the CellAdvisor 5G

VIAVI ships our instruments using anti-static packing material to stabilize the components inside the box. When unpacking the components, verify that all the items you ordered are included in the package. Accessories may be shipped in a separate box. After you unpack the components, you should inspect them for damage. If undamaged, consider saving the box and packing materials in case you need to repackage the components for shipment.

After you unpack the components, examine the connectors, ports, LEDs, and screen for damage. Be sure to check the top, bottom, and front panels. If you find damage, contact VIAVI Customer Care at 1-844-GO-VIAVI. For the latest TAC information, go to https://www.viavisolutions.com/en-us/services-and-support/support/technical-assistance.

Make sure that the LCD protector is undamaged. For more details to how to use the LCD protector, see the *Quick Start Guide* provided with the instrument.

Accessories

The following standard accessories are shipped with the instrument. Optional accessories can be also purchased when needed.

Standard accessories

Item	Description
CA5000 CellAdvisor 5G	A base unit. Software and Hardware options are also available which enable you to expand your testing capabilities.
AC/DC adapter	A power adapter designed specifically for use with your instrument is included. *Use only the VIAVI AC Power Adapter that shipped with your particular instrument.* For details, refer to "Powering the instrument".
Lithium Ion battery	A rechargeable Lithium Ion battery
Stylus pen	A small pen-shaped instrument

Cross LAN cable	A 1.5 meter cross LAN cable that enables network connection
LCD Protector	A LCD protector that protects the main unit's front side
USB memory stick	A USB memory stick with 1 GB memory which includes the CellAdvisor 5G User's Guide
Side strap	A 208 mm handle with D-ring attached to the CellAdvisor 5G
Power cord	A power cord that is equipped with AC/DC power adapter
CellAdvisor 5G User's Guide	A manual that is stored in the USB memory stick

Optional accessories

Item	Description
Soft carrying case (G700050431)	Light weight cases allow you to store your test instrument when it is not being used. The size is 420 (H) x 270 (W) x 285 (D) mm. The CellAdvisor 5G soft carrying cases are designed to have a main base unit and modules.
Horn Antenna (G700050370)	It is a Ka-band pyramidal horn antenna that operates from 26.5 to 40 GHz. The antenna offers 20 dBi nominal gain and a typical half power beam width of 14 degrees on the E-plane and 16 degrees on the H-plane. The antenna suppports linear polarized waveforms. The input of this antenna is a WR-28 waveguide with UG-599/U flange. The Horn Antenna Kit consists of Horn Antenna and WR-28 Waveguide Adaptor.
Omni-directional Antenna K(f), 26 GHz to 40 GHz (G700050340)	It is a full band, Ka band omnidirectional antenna that covers the frequency range of 26.5 and 40 GHz. This vertically polarized antenna offers 360 degrees azimuth coverage with a 3 dBi typical gain and ±1 dB nominal gain flatness. The antenna features a half power beam width of 45 degrees in its vertical direction. The RF port of the antenna is equipped with WR-28 waveguide with UG-599/U flange.
GPS SMA Mount Antenna	It is GPS L1(1575.42 MHz) Passive Antenna with -5 dBi gain. It is easy to connect to the CellAdvisor 5G GPS port because of SMA plug.

Exploring the CellAdvisor 5G

Top panel

The CellAdvisor 5G product has the following top view.

Top panel view with optical hardware options

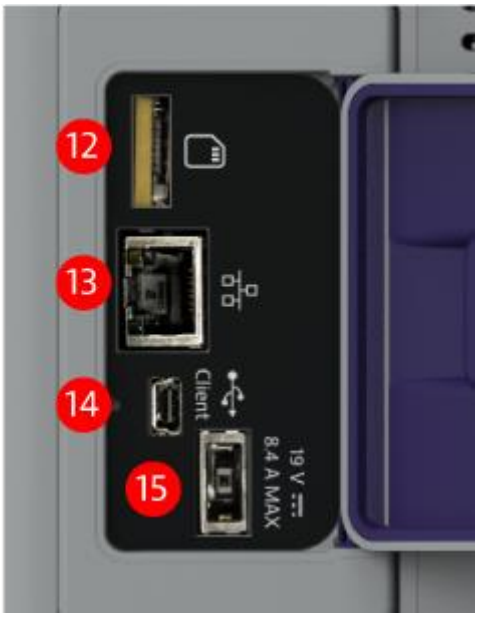
No.	Description
1	**Trigger In** port: You can use this SMA type female connector to receive 1 PPS clock or 10 ms synchronization signals from an external timing reference. Digital CMOS Input DC Coupled Input signal requirements: Minimum logic high ≥ 2.4V, Maximum logic high ≤ 3.3V
2	**Trigger Out** port: You can use this SMA type female connector to send 1 PPS clock or 10 ms synchronization signals from an internal timing reference. Digital Ouput DC Coupled 5V logic Do not terminate with 50-Ohm. Minimum termination value is 220-Ohm.
3	**Ref Out** port: CellAdvisor 5G provides a 10 MHz sine-wave reference signal at approximately 0 dBm into 50-Ohms.
4	**Ref In** port: You can use this SMA type female connector to receive 10 MHz, 13 MHz, or 15 MHz reference clock signals from an external frequency source. Input is AC-coupled 50-Ohm terminated. Input signal requirements: AC or DC coupled signal, Frequency 10 MHz, 13 MHz or 15 MHz, Maximum Amplitude 500 mV peak to peak, Minimum Amplitude 50 mV peak to peak.

5	**USB** port: CellAdvisor 5G has two **Host** ports on the top panel. You can use this port to plug in an external USB memory to extend storage capacity or to upgrade the instrument's firmware. It supports most USB memory devices with 32-bit file system. You can also use this port to connect an external power sensor, Bluetooth USB adapter, or P5000i.
6	**GPS** port: You can plug in a GPS antenna to this SMA type female connector in order to get location information and highly accurate reference.
7	**Audio jack:** The audio jack is labeled with a headphones icon. It is a 3.5 mm size mono jack. Plugging in specified headset with integrated microphone turns unit internal speaker off..
8	**POWER** button: Use the power button to turn your CellAdvisor 5G on or off. When external power is supplied via the AC/DC adapter, the LED is illuminated based on the battery status.
9	**SFP/SFP+** ports: The optical hardware option board (Option O001) for RFoCPRI supports all types of MSA (Multi-Source Agreement) compliant SFP transceivers. You can use these SFP/SFP+ ports to connect SFP modules to test CPRI protocols, detect an error or alarm, perform interference analysis, and transmit test pattern over fiber link.
10	**RJ-45 Ethernet test** port: This port is available on the hardware option board (Option 001) for RFoCPRI and provides testing of Cooper Ethernet connections up to 1Gbps-Ethernet.
11	**RF Input** port for Option F001: This port is a precise 50 Ω N-type female connector that is used as the input signal port for spectrum analysis, signal analysis, and RF power measurement. **RF Input** port for Option F002: This port is a precise 50 Ω K male connector that is used as the input signal port for spectrum analysis, signal analysis, and RF power measurement.

Side panel

The CellAdvisor 5G product has the following side view on the right.

Side panel view (right)



No.	Description
12	**MicroSD** port: You can use this port to insert your Micro SD card to save measurement data of the instrument.
13	**LAN** port: You can use this Ethernet communication port to connect your instrument.
14	**Mini USB** port: You can use this USB client port to connect and control your instrument. It supports USB TMC and controls via SCPI communication.
15	**AC/DC Adapter** port: This port is to supply power via AC/DC power adapter provided with your instrument.

NOTE:

You need to open the led located between the cooling fans on the right side panel to use ports.

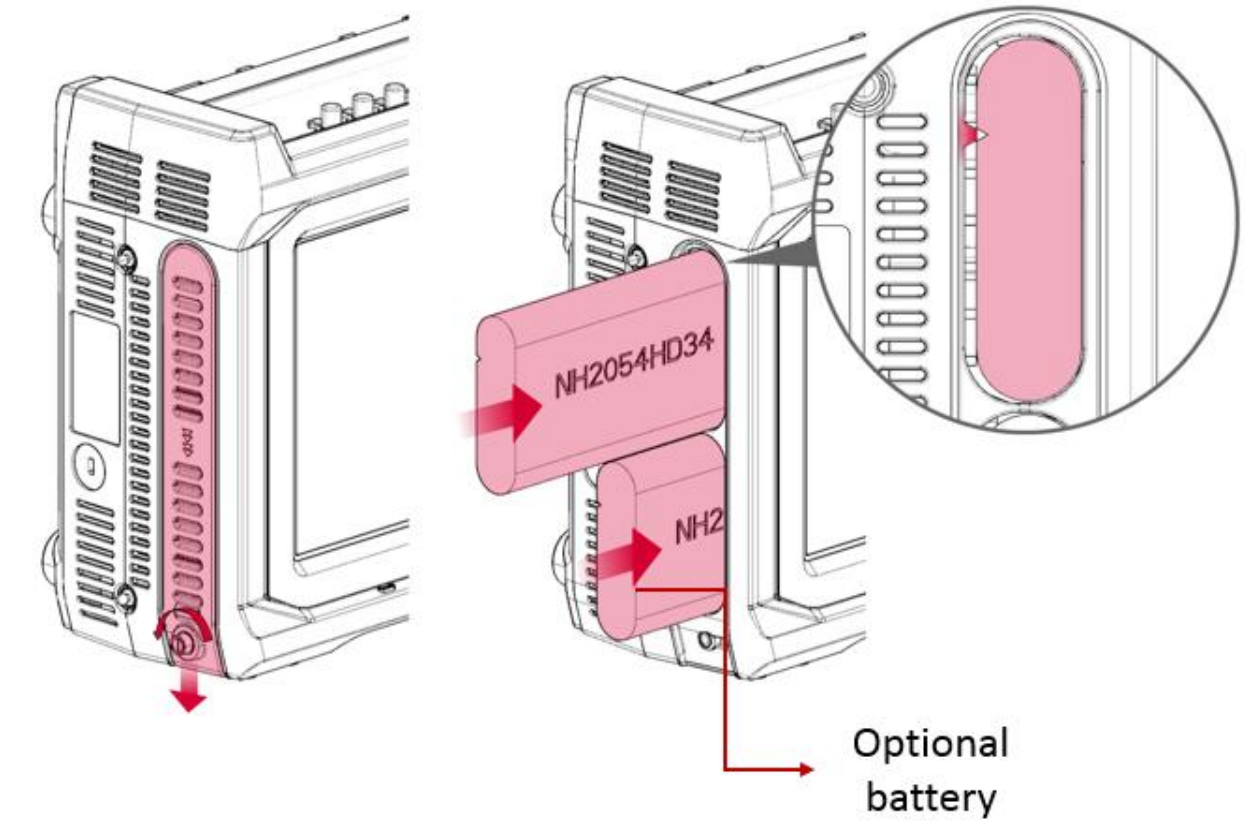
Installing battery

You need to install the Lithium Ion battery pack provided with your instrument. Follow the instruction to install batteries.

Installing battery

1. Lay the unit on the back side with the LCD facing up.
2. Unscrew the battery door thumb screw and slide the battery door off.
3. Slide a battery straight in keeping care to have the key feature on the back side of the battery. A user will feel the battery contacts engage the battery.
4. Push the battery an additional 1/8 to 1/4 of an inch to fully seat the battery. The battery will seem to snap into position when the connector is seated.
5. Slide the battery door back on, making sure to engage the center and end hooks of the door.
6. Tighten the thumb screw.

Installing battery



CAUTION:

The battery pack that came with your instrument is Lithium Ion and it may, if not connected

	correctly, lead to explosion. In case you need to replace the battery, you must use one of the same kinds or compatible ones. You must dispose a battery according to your local safety and environmental regulation.

	NOTE: It is recommended that you turn off the instrument to replace the battery. However, if yo do not want to interrupt the current test, you can leave the module tuned on with the AC power adapter plugged in.

Powering the instrument

Power is supplied to the instrument by the battery or the AC power adapter. For the CellAdvisor 5G, the adapter is supplied with the instrument. Use of AC power adapters or batteries other than those supplied with your CellAdvisor 5G, is not recommended as other slices/modules may be supplied with incompatible adapters or batteries. When supplying power using AC power adapter, you need to verify that you have the correct adapter.

The following figure shows the label on the adapter that ship with CellAdvisor 5G.

Adapter label

Using the AC power adapter

Supplying power using the AC power adapter

1. Verify that the AC power adapter is the one that shipped with your instrument (see the adapter label above).
2. Plug the adapter into the power supply jack.
   - The jack is located on the bottom right side of the side panel.

3 Plug the opposite end of the adapter in the power mains.

Power is supplied using the adapter.

Turning on the instrument

1 Press the **ON/OFF** button approximately1 second then release.
The On LED for the Power button, located on the top panel, displays different color based on the battery status.

The following table shows the LED indication when the unit powered on or in hibernate mode.

Battery status	LED color
Battery charging	The LED color is amber (red+green). The unit can be either On or Off.
Battery fully charged	The LED color is green.
Battery low	The LED color is red. Make sure the instrument is not powered by AC adapter.

Turning off and rebooting the instrument

1 Press the **ON/OFF** button for approximately1 second then release.

2 Check whether the **Power options** appear on the display.

3 Select **Power off** to turn your instrument off..
When the unit is off and battery is not charging, there is no illumination of LED.

4 Select **Reboot** to reboot your instrument.

To cancel the operation, simply select **Cancel** and go back to the previous screen.

NOTE:

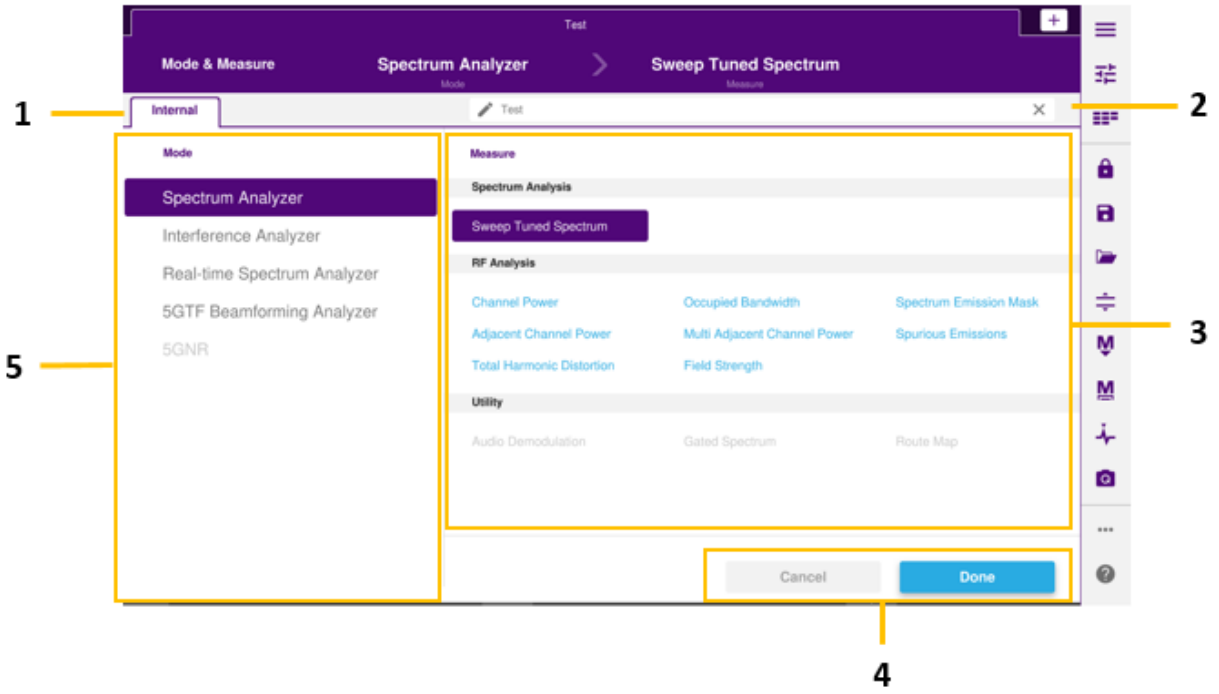
Continued holding of the POWER button more than 7 seconds will initiate a non-graceful unit shutdown.

Navigating the user interface

Starting the CellAdvisor 5G

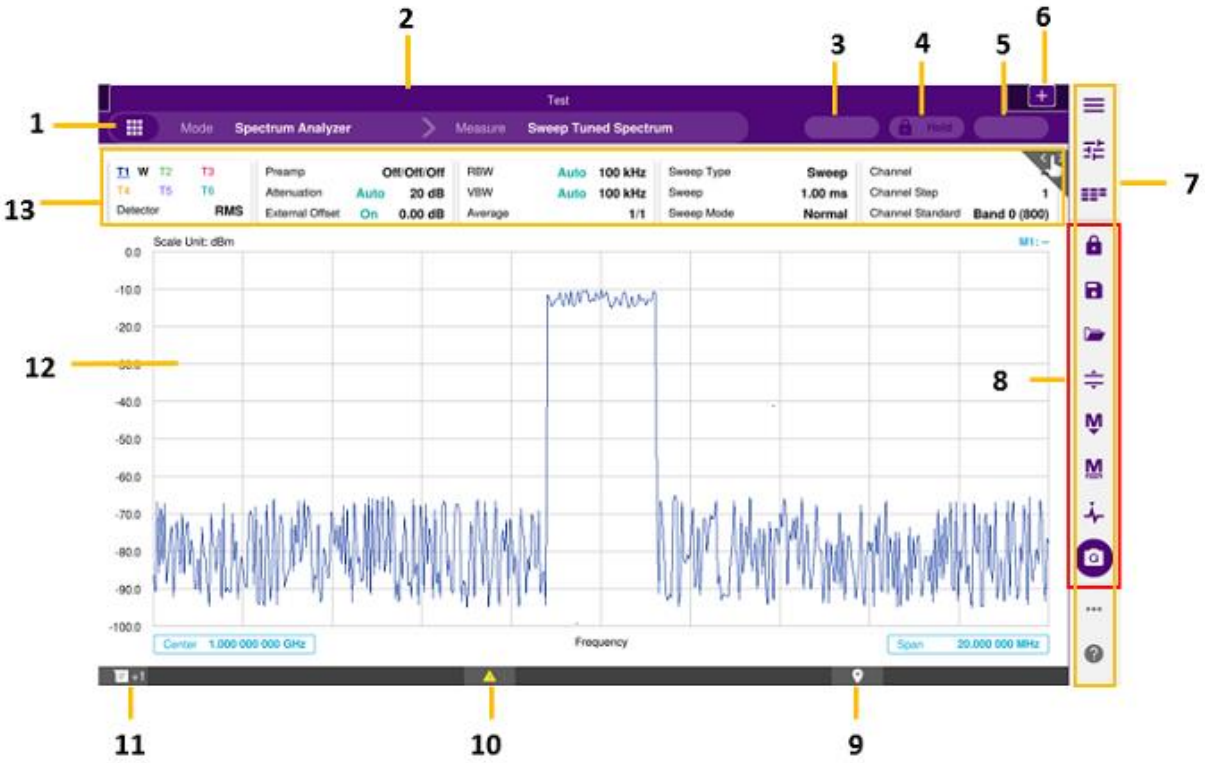
The user interface lets you set up the instrument, configure tests, and display test results. The figure below is the Home screen where you need to select mode and measure using the icon ( ) on the Main screen.

Home screen (CellAdvisor 5G)



Items	Name	Description
1	**Module**	This indicates that the current active module. It may have more tabs when the external module is attached. If there is no other modules attached, only the internal tab is displayed.
2	**Title edit box**	Tap the Edit ( ) icon to change the title name using the on-screen keypad. The default name is test #.
3	**Measurement panel**	Tap to select measurement that you want to measure.
4	**Cancel/Done button**	Tap the Cancel or Done button to cancel or apply the mode and measurement that you have selected.
5	**Mode panel**	Tap to select mode that you want to measure.

Main screen (CellAdvisor 5G)



Items	Name	Description
1	**Home screen button**	This is a Home screen button to return to the Home screen and select a new mode and measure.
2	**Title**	This is a test title that you can edit on the Home screen.
3	**Event**	This is an Event indicator. This icon is used for logging Save, image viewer, and trace overlay event.
4	**Hold**	This is a Hold indicator. When you need to hold spectrum, tap the **Hold** ( ) icon on the hot key group.
5	**Pass and Fail**	This is a pass and fail indicator for the measurement result. It is activated only when you turn the Limit on.
6	**Add button**	This is an icon that creates a new measurement tab.

7	**Side bar**	This is a menu set which includes all parameters that you can set for the selected mode and measure.
8	**Hot keys**	This is a hot key group that you can quickly access the operation.
9	**GPS info**	This indicates GPS information.
10	**Warning message**	This shows the warning message that you need to be aware of.
11	**Toast message**	This shows a toast message that indicates the user's action. Up to 10 messages are popped up.
12	**Measurement screen**	This is a measurement result screen.
13	**Quick access and display tab**	This is a quick access and display tab. You can quickly access the menus and parameters. Once you tap it, the tab that you have selected outlines purple.

Operating CellAdvisor 5G

CellAdvisor 5G provides an easy-to-use touch-based user interface that users can easily operate.

There are four ways to operate the CellAdvisor 5G as below.

Method 1: The **Quick Access and Display** tab in the upper part of the screen enables you to set each spectrum measurement for the selected measure. You can simply tap it and set the parameters.

Method 2: The first icon, **Menu** ( ) on the **Side bar** provides test parameters to set for the selected measure. You can simply tap it and set the parameters.

Method 3: The third icon, **Full Menu** ( ) on the **Side bar** provides test parameters to set for the selected measure. You can simply tap it and set the parameters.

Method 4: CellAdvisor 5G provides you with finger touch gesture operation for the Center Frequency, Span Frequency and Reference Level. For how to use gestures, see the following table.

Finger Touch Gesture

Gestures	Description	Gestures	Description

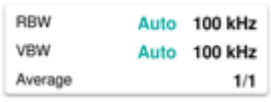
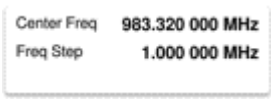
	Tap and drag left and right to change the Center Frequency.		Tap and drag up and down to change the Reference Level.
	Tap two fingers and pinch in to change the Span Frequency.		Tap two fingers and pinch out to change the Span Frequency.

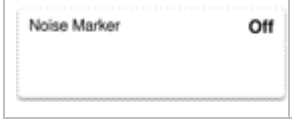
Glancing at menus and icons

There are menus and icons that you need to get familiar with to operate CellAdvisor 5G efficiently.

Quick access and display tab

The Quick access and display tab displays parameters to be set based on the Mode and Measurement that you have set. The following table shows the example of the Sweep Tuned Spectrum in SA mode.

Items	Menu	Description
	Trace	Tap to set the Trace related parameters. The Trace menu pops up on the right side.
	Amp/Scale	Tap to set the Amp/Scale related parameters. The Amp/Scale menu pops up on the right side.
	**BW/AVG**	Tap to set the BW/AVG related parameters. The BW/AVG menu pops up on the right side.
	Sweep	Tap to set the Sweep related parameters. The Sweep menu pops up on the right side.
	Channel	Tap to set the Channel related parameters. The Channel menu pops up on the right side.
	**Frequency**	Tap to set the Frequency related parameters. The Frequency menu pops up on the right side.
	Trigger	Tap to set the Trigger related parameters. The Trigger menu pops up on the right side.

	Limit	Tap to set the Limit related parameters. The Limit menu pops up on the right side.
	**Marker**	Tap to set the Marker related parameters. The Marker menu pops up on the right side.

Menus on the side bar

Items	Name	Description
	Menu	Tap to view all menus for the selected measurement and mode. Note that the Menus vary based on the selected measurement and mode.
	Setup	Tap to view measure setup menus for the selected measurement and mode. Note that the measure setup menus vary based on the selected measurement and mode.
	Full menu	Tap to view full menus for the selected measurement and mode in one screen. You can set all the parameters needed for a test at once.
	More	Tap to view more hot keys available.
	Help	Tap to view the CellAdvisor 5G Help.

Hot keys and icons on the side bar

Items	Name	Description
	Hold	Tap to hold spectrum measurement.
	Save	Tap to save the current measurement from one of the five file types: **Result**, **Result as CSV**, **Setup**, **Report**, or **Screen**.
	Load	Tap to load the saved measurement result file.
	Auto Scale	Tap to set the scale automatically.

	Marker Table	Tap to view the active marker with its information.
	Marker Setting	Tap to select the marker from 1 to 6 to set the marker position.
	Peak Search	Tap to set the active marker to peak. When makers are all off, M1 will be the active marker.
	Screen Capture	Tap to quick save the current screen.
PRE	**Preset**	Tap to reset the instrument to the factory default. It can be shown when you tap the more ( ) icon on the side bar.
	System Setting	Tap to view the system information and system settings. In the System Settings, you can set the Frequency Reference and GPS. The CellAdvisor 5G saves important logs permanently. You can tap the Click to Save button to save the log files. You can tap the Factory Reset button to reset your instrument. The Global 30 days options are also available in the System Setting screen.

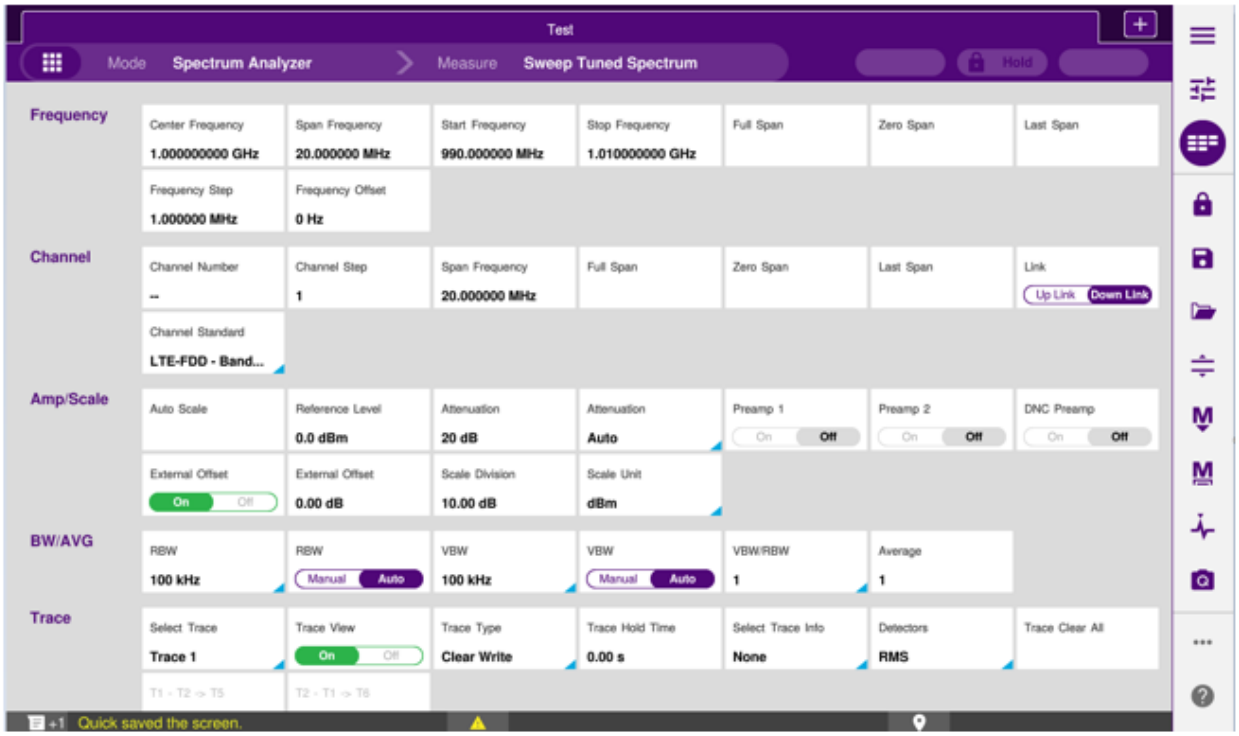
	NOTE: In the System Setting screen, there is Global 30 days options available. The option that starts with S with 3 numbers are only used. You can simply tap the Active button to activate the option you want, and you can only use it for 30 days once activated.

Glancing at full menus

You can configure test parameters, marker, trace and other settings that you want at one time in one place. The full menus displayed are different based on the Mode and Measure that you have selected. The following is the example of full menus for SA mode, Sweep Tuned Spectrum.

Access: Tap the **Full Menu** ( ) icon from the third one on the side bar.

Full menus



NOTE:

You can simply touch the screen and scroll up and down to set more parameters available.

Managing files

The CellAdvisor 5G lets you save and load screen, result, setup, logging data, or Fail events depending on your selected measurement modes and options. You can also save the limit when saving the File Type as Setup.

Using save

You can save your current screen, result, and setup into the internal memory or your external USB memory drive, **USB A** or **USB B** or **SD card.** To see the storage location, tap the **Folder** ( ) icon. Make sure to insert a USB memory drive to USB A or B port and insert the SD card to MicroSD port to enable the option. When you are using the Save feature, Hold is automatically enabled.

There are two ways that you can access **Save**.

Method 1: Tap the first **Menu** ( ) icon on the side bar and select **Save/Load** > **Save**.

The menu popped up beside the side bar is the last operation that you had set. Tap the **Back** ( ) icon.

Method 2: Tap the **Save** ( ) hot key on the side bar.

1 Tap the **File Name** input field.

2 Enter the file name you want using the on-screen keyboard.

3 To know what and how to save, see the following options:

   a Select **Screen** to save the current screen with a fie type, `.png`.

   b Select **Report** to save the measurement result in a report format with comments and captured screen images with a fie type, `.pdf`.

   c Select **Result** to save the measurement result with a file type, `.trav` and `.gomv` (Route Map).

   d Select **Result as CSV** to save the measurement result with a file type, `.csv`.

   e Select **Setup** to save the setup and test configuration with a file type, `.stav`.

   f Select **Logging** to save the logging data with a file type, `.grrv`.

   g Select **Logging as CSV** to save the logging data with a file type, `.csv`. (Beam Analyzer, Power vs Time in 5G NR Signal Analyzer).

4 *Optional.* Tap to switch the **Color Inversions** to **On** to invert the image color (only available to save as Screen or Report).

	NOTE: The file type Result and Result as CSV is inactivated (greyed-out) based on the selected measurement mode.

Creating a report

You can create a report by clicking the **Report Setup** box in the Save and Quick Save Setup mode. To create a report, do the following steps.

1 Tap the **Report Setup** box.

2 Insert the company image using the icon.

3 Enter the company name in the **Company Name Here** field.

4 Enter the name of the person who performed testing in the **Your Name Here** field.

5 Enter your company or site address in the **Address** field.

6 Enter a description about the site or place in the **Site Information** field.

7 Enter your test purpose in the **Test Purpose** field.

8 Enter a summary of your test results in the **Result** field.

9 Tap the **Image Add** ( ) button to add up to six screenshots and tap the **Apply** button.

Using save to event setup

Depending on the measurement mode, you can let the instrument automatically save measurement screen or result that falls outside the defined limit settings or the Fail indicator is on. You can also set to save the first event and hold the measurement or to save all the events continuously.

1 Tap the **Save to Event Setup** box.

2 Tap the **File Name** input field and enter the file name using the on-screen keyboard.

3 Tap to select the **File Type** from the following options: **Result**, **Result as CSV**, and **Screen**.

4 Tap to switch the **Save On Event** to **On** or **Off**. If the Save On Event is On, it is saved with the selected file type in accordances with limit(s) fail.

5 Tap to switch the **Save Then Stop** to **On** to save the first event that fails outside the limit(s) and to hold the measurement. Otherwise, leave this feature off to save events continuously.

6 Tap to switch the **Color Inversions** to **On** to invert the image color.

7 Tap the **Save** button to save the file.

Using quick save setup

You can save your configured settings by using this Quick Save Setup feature.

1 Tap the **Quick Save Setup** box.

2 Tap the **File Name** input field and enter the file name using the on-screen keyboard.

3 Tap to select the **File Type** from the following options: **Result**, **Report**, and **Screen**.
If the file type is not selected, it is saved as a Screen type.

4 Tap the **Apply** button to apply the settings.

Using load

You can load your saved screen, result, and setup from the internal memory or your external USB memory drive, **USB A** or **USB B** or **SD card.** To see the storage location, tap the **Folder** ( ) icon. Make sure to insert a USB memory drive to USB A or B port and insert the SD card to MicroSD port to enable the option.

There are two ways that you can access **Load**.

Method 1: Tap the first **Menu** ( ) icon on the side bar and select **Save/Load** > **Load**.

The menu popped-up beside the side bar is the last operation that you had set. Tap the **Back** ( ) icon.

Method 2: Tap the **Load** ( ) hot key on the side bar.

1 Select the file to be loaded from the internal memory or from your USB drive. Information of your selected file appears in the File Information pane.

2 Check the file information on the right pane.

3 Tap the **Load** button to load the file.

Using file manager

The CellAdvisor 5G lets you create a user-defined folder, select, copy, cut, paste, and delete data files saved in the internal memory or in your USB memory drive. You can manage your data files using the icons below.

Items	Name	Description
	Select	Tap the **Folder** ( ) icon to open the files or folders you want to select. Tap to select files or folders.
	New	Tap to create a new folder. Once tapped, the on-screen keyboard pops up and enter any folder name that you want to create.
	Copy	Tap to copy a selected file or folder.
	Paste	Tap to paste the copied or cut file or folder to the location where the file or folder to be pasted. You can tap the **Folder** ( ) icon to select the location. The default setting is greyed out and it is only activated when copy and cut is performed.
	Cut	Tap to cut a selected file or folder.
	Undo	Tap to undo copy, cut or select. The default setting is greyed out and it is only activated when copy and cut is performed.
	Delete	Tap to delete a selected file or folder. The confirmation dialog box appears. Once the file or folder is deleted, you cannot recover it.

NOTE:

You can simply select the file or folder by tapping it on the File Information pane on the left. Once tapped, it will be highlighted as purple.

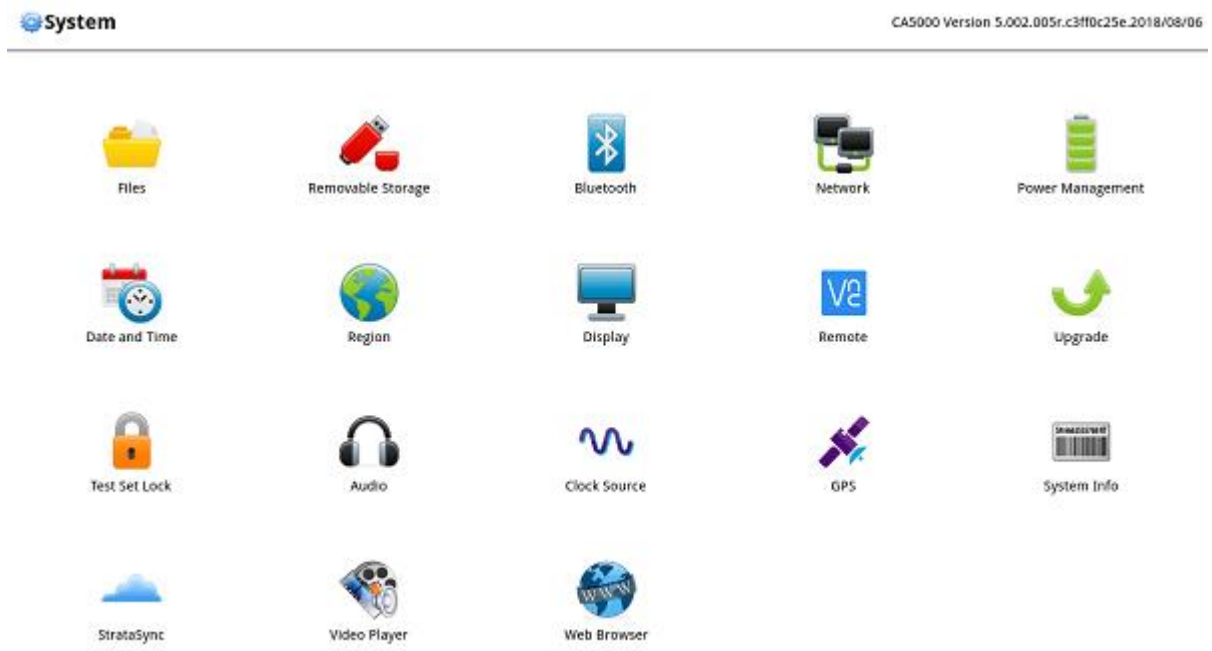
Setting up the instrument

Setting up the system

Setting up the system involves loading new software upgrades or options, setting up the screen saver, and indicating whether you want your LEDs displayed. You can also change the instrument's default VNC password.

The System menu provides access to regional settings, the date and time, and display settings. The CellAdvisor 5G system menu shown in the following figure.

CellAdvisor 5G System Menu



Specifying international settings

Before testing, you can specify the language and the date and time format for the user interface.

1 Select the **SYSTEM** icon.
The System Menu appears.

2 Select **Region**.

3 The System Setup screen appears, listing settings that control the appearance and behavior of your instrument.

4 In the **Language** box, select the language for the user interface.
The formatting standard changes automatically.

5 In the **Samples for selected formatting** box, the date, time, and number formatting appear.

6 To change the formatting standard, click the **Change formatting standard** box and select a country.

7 In the **Customize** box, click the check box next to **Use 24-hour time**.

8 Turn the instrument off then back on.
The user interface changes to the language you specified.

Setting the date and time

You can change the date and time on your instrument by editing the system settings, and then rebooting your instrument. You can set the date and time in two ways:

Method 1: The date and time in the upper right corner of the screen provides current date and time set by user. You can simply tap it to change the date and time.

Method 2: Tap the **System Menu** > **Date and Time**.

1 Select the **System** icon.
The System screen appears.

2 Select **Date and Time**.

3 Specify the **Region**, **Country**, and **Area**, and if you wish to do so, click the check box for **Automatically adjust for daylight savings time**.

4 Under the current Date & Time, do the following:

   a Use the up and down arrows to specify the current local time. If you wish to do so, click the check box next to **Use 24-hour time**.

   b Use the calendar to select the current date.

Setting the remote access password

To change the default password, do the following steps.

1 Select the **System** icon.
The System screen appears.

2 Select the **Remote (VNC)** icon.

3 Tap the **Remote access password** filed, then specify a new password using the on-screen keyboard.

4 *Optional.* Tap the check box for **Enable Firewall** if you wish to do so.

5 *Optional.* Tap the check box for **Enable VNC access** if you wish to do so.

6 *Optional.* Tap the check box for **Require password for VNC access** if you wish to do so.

Setting the Wi-Fi connection

To connect to the Wi-Fi, do the following steps.

1 Select the **System** icon.
The System screen appears.

2 Select the **Network** icon.

3 Tap **Wi-Fi** at the upper left of the screen, then click **Enable Wireless Adapter** as shown below.

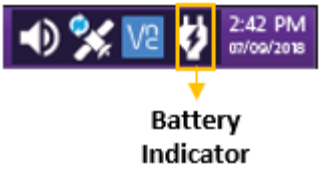
4 You can find AP information, then select your desired AP.

5 Enter the password and you can find the IP information.

Checking the battery

You can check the status of the battery in two ways:

Method 1: The battery status indicator in the upper right corner of the screen provides a graphic indication of the approximate battery charge.



Method 2: The Battery Level percentage on the Battery status page.

1 Select the **System** icon.
The System screen appears.

2 Select the **Power Management**.
The battery status appears.

3 View the **Battery Level**.
The Battery Status page indicates the charge level (both in percentage under the battery and the color of the battery), whether the adapter is plugged in, and indicates the battery temperature range.

4 Tap the check box for **Enable auto-off while on battery** if you wish to do so.

5 Tap **Inactive time (minutes)** and set it using the on-screen keyboard.

6 Tap **OK** to apply the inactive time you have set or **Cancel** to cancel the inactive time that you have set.
The default inactive time is set to 30 minutes.

Setting up the display

Setting up the display includes setting the screen brightness and setting up the screen saver.

Adjusting screen brightness

The following procedure describes how to adjust the screen brightness.

1 Select the **System** icon, then select **Display**.

2 Change the brightness level by moving the slider left or right.

Setting up the screen saver

If you are operating the instrument using the battery, you should set up the screen saver to switch off the screen automatically after the instrument has not been used for a specific interval of time.

1 Select the **System** icon, then select **Display**.

2 To enable the screen saver, tap the check box next to **Enable automatic screen saver**.

3 To change the message displayed as a screen saver, tap in the **Message** field, and then enter the message.

4 To specify the time to wait until the screen saver begins, do the following:

   a Tap on the drop down next to the Delay field, and then specify the time unit, for example, seconds, minutes or hours.

   b Tap in the Delay field. A keyboard appears. Enter the amount of time, and then click OK. For example, if you selected minutes in the previous step, enter the number of minutes of delay.

5 Tap the check box next to **Screen saver password** if you wish to enable a screen saver password (a password is required to close the screen saver and resume using the instrument). Make a note of the password and put it somewhere safe.

The screen saver is setup.

Using the clock source

The Clock Source is used as a reference frequency and timing source for the CellAdvisor 5G application. You can configure the clock source to be used.

Setting up the clock source

The following procedure describes how to use the clock source.

1 Select the **System** icon, then select **Clock Source**.

2 Tap the drop down menu and select the options from the following choices:

- **Internal**:Uses a 10 MHz internal clock
- **External - 10 MHz**: Uses an external 10 MHz clock which must be accurate within +/500ppb which is connected using the top panel.
- **External - 13 MHz**: Uses an external 13 MHz clock which must be accurate within +/500ppb which is connected using the top panel.
- **External - 15 MHz**: Uses an external 15 MHz clock which must be accurate within +/500ppb which is connected using the top panel.
- **GPS**: Uses a built-in GPS as a frequency and timing source.

Icon indication

The following shows the icon indication based on each setting.

- **Internal**:

- **External - 10 MHz**:

- **External - 13 MHz**:

- **External - 15 MHz**:

Setting up the GPS

You can configure the GPS setting by clicking the GPS icon on the System screen. You are required to configure GPS settings if you need the GPS location or need to use it as a frequency and clock source.

1 Select the **System** icon, then select **GPS**.

Specifying GPS settings

You can configure the settings depending on what you need, but turning GNSS on and Antenna Power on should make it work for most cases.

1. In GPS, turn on **Antenna Power** if required. The antenna power setting enables the external antenna power so it depends on what you plugs into the instrument. If you have an externally powered antenna, you will not need to turn on antenna power.
2. Select the required Fix Type from the following choices:
   - **2D Mode**: A 2D (two dimensional) position fix that includes only horizontal coordinates. It requires a minimum of three visible satellites.
   - **3D Mode**: A 3D (three dimensional) position fix that includes horizontal coordinates plus altitude. It requires a minimum of four visible satellite.
   - **Any**: Calculates a 3D position fix if possible but reverts to 2D position if necessary.
3. Turn the **GNSS** value on if using GPS.
4. Select the value representing the **GNSS System** supported in the region where you intend to conduct testing. If you want to use Satellite Based Augmentation Systems (SBAS) to augment the GNSS System, select the option that provides SBAS (indicated with + SBAS).
5. Select the desired Survey Mode from the following choices:
   - **Dynamic**: Continuously calculates positioning for continuous location information
   - **Auto**: Calculates positioning until accurate location information is determined and switches to fixed position using accurate location information and switches to determine timing accuracy
6. In **Elevation Limit (deg)**, specify the elevation limit in degrees. This value represents the lowest point on the horizon on which the receiver will try to locate and obtain information from GNSS satellites. The default elevation is set to 10 degrees. Using satellites near the horizon may degrade performance.
7. In **Minimum C/No (dBHz)**, specify the minimum Carrier to Noise Ratio (C/ No) for the satellite signals that will be used by the module's GNSS receiver. The C/No is an indication of signal strength ranging from 0 to 50 dBHz. The default value is 9 dBHz. Using satellites with a weak C/No may degrade performance.
8. Specify the **Antenna Time Bias** value. The default Antenna Time Bias value is 28 (the optimal value for the VIAVI qualified antenna). If you are using a different antenna, determine the optimal bias value by referring to the vendor specifications for the antenna (and, if applicable, splitter or amplifier), then specify the bias value in nanoseconds. This value represents the bias that is used to compensate for the delay introduced by your antenna, the antenna's cable, and if applicable, an inline splitter or amplifier where absolute accuracy of PPS is important.

Checking GPS results

In the GPS result screen, the items indicate as below:

- **Latitude (deg)**: Distance north or south of the equator measured by degrees (°) from 90° to +90°.

- **Longitude (deg)**: Distance east or west of the prime meridian, usually measured in degrees (°) which runs from the North to South Pole through Greenwich, England. Longitude is expressed from 180° to +180°.
- **Altitude (m)**: Height above Ellipsoid (HAE) - The height coordinate determined from GPS observations is related to the surface of a Reference Ellipsoid (WGS84). The coordinates are derived initially in the 3D Cartesian system (as XYZ values), and then for display/output purposes they are transformed to Latitude, Longitude and (Ellipsoidal) Height using well known formulae to an ellipsoid such as that associated with the WGS84 Datum (semimajor axis: 6378137m; inverse flattening: 298.257223563). The surface of the ellipsoid is the zero ellipsoidal height datum. In Relative Positioning, the height component of the receiver whose coordinates are being determined relative to the Base Station can also be related to an ellipsoid by transforming the baseline vector from the 3D form (DXDYDZ) to a change in Latitude, change in Longitude, and change in Ellipsoidal Height.
- **Lock Status**

  i) Searching: The GPS system has not achieved lock and is searching for satellites.

  ii) Locked: A signal has been established with enough satellites to provide location information as specified by Fix Type.

Icon indication

Icon indication is available only if GNSS is On.

- **Lock Status: Searching**
- **Lock Status: Locked**

Viewing the System Info

To view the revisions of internal components and to see which options are enabled, use the System Info menu. This menu also provides the serial number of the instrument and serial numbers of internal components. The Copy System Info to File button is used to save a file that includes all of the system information for the instrument.

1 Select the **System** icon, then select **System Info**.

2 The instrument Info appears on the left box of the screen.

- **Reset Instrument to defaults** button: Tap to reset the System and Test settings to defaults. Instrument reboot is required.

- **Export logs to usb stick** button: Tap to export logs to your USB memory stick. Make sure to insert a USB memory stick to **USB A** or **USB B** port.
- **Secure erase instrument** button: Tap to securely erase all data from this instrument. The instrument is inoperable until software is reloaded.

Enabling software options

You can enable purchased software options by using the Import Options from USB button. Please call the regional VIAVI Solutions Sales Office for more details about enabling options. They will ask you the serial number of the test instrument for which the upgrade or software option was ordered.

Viewing options

Your instrument may come with software options installed or you may order them later and install yourself.

1 Select the **System** icon, then select **System Info**.

2 The options installed appears in the **Base Options** pane on the right.

The icon indicates whether the option is enabled.

Icon	Indicates
	Option is enabled.
	An expiring option. An “expiring option” is an option that is installed for free for a trial period. The time left in the trial is indicated to the right. When the trial period ends, a warning message appears. If you are running a test when the option expires, you can continue testing, but the expiration warning will reappear every minute until you either enter a permanent option code or reset the module (changing applications will reset the module).
	Option has not been enabled. If you need this option, contact regional Sales Office to place an order.

Installing software options

You can enable purchased software options by using the Import Options from USB button. Before installing the options, you need to have a USB memory stick including option files provided by VIAVI.

1 Select the **System** icon, then select **System Info**.

2 Connect the USB memory stick with option files to the **USB A** or **USB B** port of the instrument.

3 In the lower part of the **Base Options** pane, tap the **Import Options from USB** button.
A message alerting the option file is imported appears.

4 Reboot the instrument and check the option is installed.

Updating the software

System Software and Solution Firmware upgrades can be loaded from storage media such as a USB memory stick and over the network. To obtain the latest software release for your unit, visit VIAVI Software Updates website and check if your installed software and firmware are the latest ones.

The CellAdvisor 5G software can be updated in the field two ways:

- Using a USB memory drive.
  - Software and/or firmware can be downloaded for the CellAdvisor 5G from CellAdvisor.updatemyunit.net.
- Over a network.

The process for updating varies depending on the way the update is performed.

Downloading the software to a USB

A USB memory stick with at least 1GB of space is required to store the latest CellAdvisor 5G software. It is recommended that you have nothing stored in your USB memory stick when downloading a software.

1 Using a browser, go to CellAdvisor.updatemyunit.net.
This will bring you to a landing page where you can download the latest self extracting software/firmware upgrade file.

2 Click the software/firmware link for the software release you want to download.

3 Save the file to the desktop of your personal computer (PC).

The software is downloaded.

Extracting the software to a USB stick

After downloading the firmware to your PC, it must be extracted to a USB stick.

1 Insert the USB memory stick into your PC.

2 Double-click the downloaded self-extracting file you saved to your desktop, then click **Run** as prompted.
A dialogue box appears asking for the location to extract the files.

3 Click **Browse** to navigate to and select the drive with the USB stick.

4 Click **Extract**.
The files are extracted to the USB stick. Do not remove the USB stick.

5 Using Windows Explorer, navigate to the drive with the USB stick, right-click on the drive, and then select **Eject**.

6 Remove the USB stick from the PC.

The software is ready to be installed on your instrument using the USB stick.

Installing the software using a USB stick

1 To ensure an uninterrupted supply of power during the installation, connect the AC power adapter to the CellAdvisor 5G.

WARNING:

Electrical shock may result in serious injury or death. Be sure the AC power adapter is connected to the correct voltage mains. Do not use the adapter outdoors or in wet locations. Use only the AC power adapter supplied with the instrument.

2 Connect the USB flash drive with the extracted firmware/software into the USB connector on the top panel of the instrument.

3 Select the **SYSTEM** icon.

4 Select **Upgrade**.

5 Select **USB**.
The release number of the software on the USB is displayed.
If the release is equal to the current software release installed on your instrument, an equals symbol will be displayed next to the USB software release number.
If the release is a retrograde (an earlier software release than that installed on your instrument), a down arrow will be displayed next to the USB software release number. If the release is an upgrade (a later software release than that installed on your instrument) an up arrow will be displayed next to the USB software release number.

6 Select **Start Upgrade**.
A dialog box appears instructing you to exit any existing tests. You have the option to cancel the upgrade at this point (for example, if you need to complete a test that you are currently running).

7 Select **OK**.

The software is installed. The instrument automatically reboots when the installation is complete. After the instrument reboots, remove the USB stick from the instrument.

Reimage software using a USB stick

Reimage is deleting the internal flash of the instrument and reinstalling the software. Users can perform reimage when the instrument is inoperable and the instrument can be only recovered by performing reimage in cases where the instrument is not rebooting.

1 To ensure an uninterrupted supply of power during the installation, connect the AC power adapter to the CellAdvisor 5G.

WARNING:

	Electrical shock may result in serious injury or death. Be sure the AC power adapter is connected to the correct voltage gains. Do not use the adapter outdoors or in wet locations. Use only the AC power adapter supplied with the instrument.

2 Connect the USB flash drive with the extracted firmware into the USB connector on the top panel of the instrument.

3 Use the **POWER** button to turn off the instrument.

4 Use the **POWER** button to turn on the instrument.

5 Remove the USB memory stick once the USB removal message appears.

The software is installed. The instrument automatically reboots when the installation is complete.

	NOTE: If you run reimage, you must update your software/firmware with the latest one.

Upgrading over a network connection

Before updating your instrument using a network connection, review the following recommendations:

- A wired network connection is recommended for software/firmware upgrades.
  - Software and/or firmware can be downloaded for the CellAdvisor 5G from CellAdvisor.updatemyunit.net.
- You may experience problems accessing the CellAdvisor.updatemyunit.net site from behind a firewall. If this is the case, please connect the instrument or your PC to a public network for the purpose of performing the upgrade.

1 Connect the CellAdvisor 5G to AC power to ensure an uninterrupted supply of power during the update.

	WARNING: Electrical shock may result in serious injury or death. Be sure the AC power adapter is connected to the correct voltage mains. Do not use the adapter outdoors or in wet locations. Use only the AC power adapter supplied with the instrument.

2 Select the **SYSTEM** icon.

3 Select **Upgrade**.

4 Select **Network**.

5 Do one of the following:

a Enter the address where the software file is located. This could include the FTP address, server IP address or hostname, and the proxy server address (if necessary), as well as a User Name and Password.

b Use the provided CellAdvisor.updatemyunit.net server address.

6 Select **Connect**.
This will bring you to a landing page where you can select the firmware release that you want to use to update your instrument.
Click the firmware link for the firmware release that you want to install.
The release number of the software on the USB is displayed.
If the release is equal to the current software release installed on your instrument, an equals symbol will be displayed next to the USB software release number.
If the release is a retrograde (an earlier software release than that installed on your instrument), a down arrow will be displayed next to the USB software release number.
If the release is an upgrade (a later software release than that installed on your instrument) an up arrow will be displayed next to the USB software release number.

7 Select **Start Upgrade**.
A dialog box appears instructing you to exit any existing tests. You have the option to cancel the upgrade at this point (for example, if you need to complete a test that you are currently running).

8 Select **OK**.

The instrument will communicate with the upgrade server, download the software, and then install it. In some cases, the instrument automatically reboots even before you turn off the instrument, you need to reboot again to restart the update, and if the USB removal message appears, remove it and the instrument will automatically reboots and the software is updated.

NOTE:

You will be downloading a file in excess of 700MB; therefore, the update will typically take 15 to 30 minutes, depending on the speed and reliability of the network.

Synchronizing to the StrataSync server

To automatically obtain the latest configuration settings, software options, updates and ownership registration information, the instrument should be synchronized with a VIAVI server via the Internet with an optional subscription-based service called StrataSync. In addition to the latest operating software, the synchronization also stores any user files saved to the unit's hard drive on the StrataSync server. A connection to the internet would be provided upon receipt of the unit and on a regular (daily) basis thereafter to ensure that it has the most currently issued options and updates and to allow all user information to be backed up. If an internet connection is available and contact has been made with the StrataSync server, a message appears asking you to initiate the syncing process.

Synchronizing with the StrataSync server

Your CellAdvisor 5G must have Internet access to be able to connect to the StrataSync. You can set up for wireline or wireless Ethernet network connection. it is recommended that you set your network IP mode to DHCP.

1 Select the **System** icon, then select **Stratasync**.

2 Verify that the server address is displayed in the Server Address field (default= *stratasync.viavisolutions.com).*

3 Enter the Account ID for this test instrument. No synchronization can occur without the entry of a pre-approved, unique ID number. This ID must be obtained from VIAVI before attempting to sync to the server.

4 Enter an optional Tech ID. This will be populated by a default value representing your test instrument, but can be changed to identify the user who is initiating the synchronization.

5 Tap the **Start Sync** button.

6 Go to the *stratasync.viavisolutions.com* via internet connection.

NOTE:

During Synchronization, a cloud icon will be displayed at the top of the screen and the state of the synchronization activities will be displayed below the Start Sync button. The cloud icon will also be modified to indicate the following actions:

Up/Downloading: Cloud with arrows

Failed to Sync: Cloud with X overlay

Sync Success: Green cloud with check mark

If an error or failure occurs, a message detailing the possible reason for the problem will be displayed in the status message next to the Start Sync button.

Using Spectrum Analyzer

Introduction

The advantage of using the Spectrum Analyzer is easy to verify the presence of unwanted signals such as spurious and harmonics, which are normally very hard to identify in time domain analysis.

Performance assurance in wireless communication systems includes the observation of the out-of-band signal characteristics in order to identify the presence of harmonic signals. Harmonic signals of a carrier may interfere with other signals far out of the transmission band, or harmonic signals from other transmitter may interfere with in band signals affecting the spectral integrity.

In these days when wide variety of wireless communication services are provided in frequency bands assigned very closely to each other, it is critical to ensure that each communication service is carried out within their assigned frequency band minimizing interference with adjacent frequency bands. The Adjacent Channel Power Ratio (ACPR) characteristic of a power amplifier or other RF components is an important factor in evaluating the system performance.

Spectrum analyzer in CellAdvisor 5G has three measure categories as the following with frequency extension up to 18.5 GHz in addition to existing 24 GHz to 40 GHz:

- Spectrum Analysis
  - Sweep Tuned spectrum
- RF Analysis
  - Channel Power
  - Occupied Bandwidth
  - Spectrum Emission Mask
  - Adjacent Channel Power (ACP)
  - Multi Adjacent Channel Power (Multi-ACP)
  - Spurious Emissions
  - Total Harmonic Distortion (THD)
  - Field Strength
- Utility
  - AM/FM Audio Demodulation
  - Gate Sweep Spectrum (Optional)
  - Route Map (Optional)

Selecting mode and measure

To start measurement, do the following steps:

1 Tap **Spectrum Analyzer** on the **MODE** panel.

2 Tap any measurement mode from the following choices:

Spectrum Analysis > **Sweep Tuned Spectrum**

RF Analysis > **Channel Power Occupied Bandwidth**, **Spectrum Emission Mask**, **Adjacent Channel Power**, **Multi- Adjacent Channel Power**, **Spurious Emissions**, **Total Harmornic Distortion**, or **Field Strength**

Utility > **AM/FM Audio Demodulation**, **Gate Sweep Spectrum**, or **Route Map**

NOTE:

You can choose **RF Source On** or **Off** in setup menu after tap to **CAA RF Power On** if you have **RF Source** option in your CAA(Cable and Antenna Analyzer).

Configuring spectrum measurements

Configuring spectrum measurements

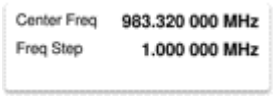
The Quick Access and Display tab contains all necessary functions to configure the horizontal axis, vertical axis and to configure and trigger the sweep for spectrum measurements. The Quick Access and Display tab also allows you to set traces, markers, and display lines and limit lines. The contents of the menu vary by the currently selected measurement.

In general, the horizontal axis contains frequency information in spectrum mode. You can specify the frequency in terms of the center frequency or by defining a start and stop frequency for a particular span. The settings related to the vertical axis can be access via Amp/Scale menu.

Setting frequency

You need to set the frequency range to be measured with either the center frequency/span or the start/stop frequencies. You can also set the frequency with the channel number and span. The center frequency, or start and stop frequency values appear below the graticule on the display.

If you are aware of the frequency of the signal you are going to measure, the best option is to match the center frequency to the signal's frequency. If you are investigating signals, for example harmonics distortion, that are within a particular frequency range, it is best to enter a start and stop frequency to define the span.

Access: 

on the Quick access and display tab or **Menu** > **Frequency**.

Frequency and span

The following is the definition of each key function:

Parameter	Definition
Center Frequency	Sets the horizontal center of the display to a specific frequency using the on-screen keyboard. The left and right sides of the graticule correspond to the start and stop frequencies using the on-screen keyboard.. **Access**: **Menu** > **Frequency** > **Center Frequency**
Start Frequency	Sets the frequency starting at the left side of the graticule. **Access**: **Menu** > **Frequency** > **Start Frequency**
Stop Frequency	Sets the frequency starting at the right side of the graticule. The right sides of the graticule correspond to the stop frequency using the on-screen keyboard. **Access**: **Menu** > **Frequency** > **Stop Frequency**
Frequency Step	Sets the step size for the frequency setting. The step size function is useful for finding harmonics and sidebands beyond the current frequency span of the instrument using the on-screen keyboard. **Access**: **Menu** > **Frequency** > **Frequency Step**
Frequency Offset	Allows you to set a frequency offset value that is added to the frequency readout of the marker, to account for frequency conversions external to the instrument using the on-screen keyboard. Offset entries are added to all frequency readouts including marker, start frequency, and stop frequency. Offsets are not added to the span or frequency count readouts. Setting an offset does not affect the trace display. **Access**: **Menu** > **Frequency** > **Frequency Offset**
Span Frequency	Sets frequency range symmetrically about the center frequency using the on-screen keyboard. The span frequency readout describes the total displayed frequency range. To determine span frequency per horizontal graticule division, divide the frequency span by 10. **Access**: **Menu** > **Frequency** > **Span Frequency**

Full Span	Sets the span to full span showing the full frequency range of the instrument. For the F002 option (24 GHz to 40 GHz). you need to change the center frequency to the 24 GHz to 40 GHz frequency range. **Access**: **Menu** > **Frequency** > **Full Span**
Zero Span	Sets the frequency span to zero. In this mode, the current center frequency is displayed in the time domain. It is only available in the Spectrum mode. If you have selected **Zero Span**, select **Trigger** > **Free**, **External**, **GPS**, or **Video**. **Access**: **Menu** > **Frequency** > **Zero Span**
Last Span	Sets the span to the previous span setting. **Access**: **Menu** > **Frequency** > **Last Span**

Setting channel

Almost all transmission systems divide their assigned frequency ranges into channels. Each channel corresponds to a specific frequency. To easily operate such systems, you can use channel standard table instead of setting frequencies manually. You can set the frequency with either frequency or channel number.

The channel standard table is already implemented in the CellAdvisor 5G, and it enables you to use it easily without doing anything.

Access:

on the Quick access and display tab or **Menu** > **Frequency**.

Channel number, channel step, and channel standard

The following is the definition of each key function:

Parameter	Definition
Channel Number	Sets the channel number using the on-screen keyboard. You can set the center frequency as channel number instead of setting frequency. In order to set the accurate frequency, you need to set channel standard and link first. **Access: Menu** > **Channel** > **Channel Number**
Channel Step	Sets the channel step using the on-screen keyboard. **Access**: **Menu** > **Channel** > **Channel Step**

Link	You can toggle between **Uplink** and **Downlink**. **Access**: **Menu** > **Channel** > **Link Uplink/Downlink**
Channel Standard	Shows you list of technology, Band Class, Channel Range, and Frequency Range (MHz). Tap to set the channel standard. **Access**: **Menu** > **Channel** > **Channel Standard**

Setting amplitude

You can set the reference and attenuation levels automatically or manually to optimize the display of the traces measured.

Access:

on the Quick access and display tab or **Menu** > **Amp/Scale**.

Amplitude

The following is the definition of each key function:

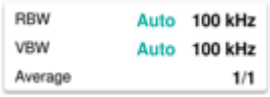
Parameter	Definition
Reference Level	Sets the horizontal bar that can be placed at any graticule. Enter a value using the on-screen keyboard. **Access**: **Menu** > **Amp/Scale** > **Reference Level**
Attenuation	Tap to set the attenuation value using the on-screen keyboard. **Access**: **Menu** > **Amp/Scale** > **Attenuation**
Attenuation Auto/Couple/Manual	Tap to select the attenuation option from **Auto**, **Couple**, or **Manual**. **Auto** to set the input attenuator's level automatically. **Manual** to set the input attenuation manually up to 55 dB for the CellAdvisor 5G to optimize S/N. **Couple** to couple the input attenuator's level with your reference level setting. **Access**: **Menu** > **Amp/Scale** > **Attenuation/Manual**
Scale Division	Allows you to use the Scale/Div feature available for the total harmonic distortion screen. It represents the value of one division on the horizontal scale. The default setting is 10 dB per division and the maximum value can

	be set up to 20 dB. Set the value using the on-screen keyboard. **Access**: **Menu** > **Amp/Scale** > **Scale Division**
Scale Unit	Tap to change the scale unit of the display scale: **dBm**, **dBV**, **dBmV**, **dBµV**, **V**, or **W**. **Access**: **Menu** > **Amp/Scale** > **Scale Unit**
Preamp 1 On/Off	Allows you to turn the internal pre-amplifier on to correct and compensate for the gain of the preamp so that amplitude readings show the value at the input connector. It is the first Preamp for the CellAdvisor 5G FR1 Band and operated when the input level is -50 dBm or below. **Access**: **Menu** > **Amp/Scale** > **Premap 1** On/Off
Preamp 2 On/Off	Allows you to turn the external pre-amplifier on to correct and compensate for the gain of the preamp so that amplitude readings show the value at the input connector. It is the second Preamp for the CellAdvisor 5G FR1 Band and operated when the input level is -70 dBm or below. **Access**: **Menu** > **Amp/Scale** > **Premap 2** On/Off
DNC Preamp On/Off	Allows you to turn the external DNC pre-amplifier on to correct and compensate for the gain of the preamp so that amplitude readings show the value at the input connector. It is a Preamp for the CellAdvisor 5G FR2 Band and operated when the input level is -50 dBm or below. **Access**: **Menu** > **Amp/Scale** > **DNC Premap** On/Off
External Offset Mode On/Off	Tap to turn the external offset mode on or off. **Access**: **Menu** > **Amp/Scale** > **External Offset** On/Off
External Offset	Tap to manually set the external offset value from - 120 to 120 using the on- screen keyboard. When you compensate for the external loss, input the negative values, and when you compensate for the external gain, input the positive values. **Access**: **Menu** > **Amp/Scale** > **External Offset**
Auto Scale	Tap to automatically set the reference and attenuation level. Each time you tap this, both of the Y-axis scale and input attenuation level change to be optimized with some margin. **Access**: **Menu** > **Amp/Scale** > **Auto Scale**

	NOTE: It is recommended that you set the **Attenuation** to **Auto** in most situations so that the level of the input attenuator can be set automatically according to your input signal level.

Setting BW/AVG

You can manually set the Resolution Bandwidth (RBW), Video Bandwidth (VBW), and the proportional VBW based on the designated RBW. Selecting **Auto** changes the value to correspond to your frequency span setting for RBW and to the current RBW and VBW/RBW settings for VBW.

Access: 

on the Quick access and display tab or **Menu** > **BW/AVG**

BW/AVG

The following is the definition of each key function:

Parameter	Definition
RBW	Tap **RBW** to set it manually. Tap a value between 1 Hz to 3 MHz. The RBW setting automatically changes to **Manual**. **Access**: **Menu** > **BW/AVG** > **RBW**
RBW Mode Manual/Auto	Toggle the **RBW Mode** to **Manual** or **Auto**. When you select Auto, it will be automatically set to an approximate value for Span/100. **Access**: **Menu** > **BW/AVG** > **RBW** (Manual/Auto)
VBW	Tap **VBW** to set it manually. Tap a value between 1 Hz to 3 MHz. The VBW setting automatically changes to **Manual**. **Access**: **Menu** > **BW/AVG** > **VBW**
VBW Mode Manual/Auto	Toggle the **RBW Mode** to Manual or Auto. **Access**: **Menu** > **BW/AVG** > **VBW** (Manual/Auto)
VBW/RBW	Sets the proportional VBW based on the designated RBW. Select the ratio: 1, 0.3, 0.1, 0.03, 0.01, or 0.003. Toggle the **VBW** and **RBW** to **Auto**. **Access**: **Menu** > **BW/AVG** > **VBW/RBW**
Average	Sets the number of measurements to be averaged for the trace presentation. A maximum of 100 times of averaging can be set. **Access**: **Menu** > **BW/AVG** > **Average**

VBW/RBW ratio example

RBW	Ratio (VBW/RBW)	VBW
30 kHz	1:1	30 kHz
	1:0.3	10 kHz
	1:0.1	3 kHz
	1:0.03	1 kHz
	1:0.01	300 Hz
	1:0.003	100 Hz

Setting sweep

You can set the length of time that the instrument takes to tune across the displayed frequency span (or, in zero span, the time that the instrument takes to sweep the full screen). Reducing the sweep time increases the sweep rate. The default settings of the sweep mode are **Continue** and **Normal** to sweep continuously at a normal speed for most on-going measurements. If you want to hold the measurement or get a single sweep, you can change the sweep mode.

Access:

on the Quick access and display tab or **Menu** > **Sweep**.

Sweep

The following is the definition of each key function:

Parameter	Definition
Sweep Time	Shows the sweep time when the sweep time is set to **Auto**. If the sweep time is set to **Manual**, you can manually input the sweep time using the on-screen keyboard. **Menu** > **Sweep** > **Sweep Time**
Sweep Time Mode	Select the sweep time mode to **Manual** to set it manually or to **Auto** to set it automatically.

Manual/Auto	**Menu** > **Sweep** > **Sweep Time** Manual/Auto
Sweep Mode Single/Continue	Tap to switch the sweep mode to **Single** or **Continue**. **Menu** > **Sweep** > **Sweep Mode** Single/Continue
Sweep Once	Tap to get a new measurement in Single mode. If Continue is set in sweep mode, the sweep mode will be changed to Single after tapping it. **Menu** > **Sweep** > **Sweep Once**
Sweep Speed Fast/Normal	Tap the sweep speed to **Fast** to speed up sweeping. You can set it to Fast when the RBW range is from 1 Hz to 30 kHz. You can set it to Normal when the RBW range is from 1 kHz to 3 MHz. **Menu** > **Sweep** > **Sweep Mode** Fast/Normal
Zero Span Time	Enabled when you select **Zero Span**. Adjusts sweep time to allow enough time for a cycle. **Menu** > **Sweep** > **Zero Span Time**
Period Time	Enabled when you select **Zero Span**. Tap to set **Period Time** using the on-screen keyboard. **Menu** > **Sweep** > **Period Time**
Period Type Manual/Standard	Enabled when you select **Zero Span**. Tap to switch **Period Type** to **Manual** or **Standard**. **Menu** > **Sweep** > **Period Type** Manual/Standard
Standard Signal	Enabled when you select **Zero Span**. Tap to select Standard Signal from: **GSM**, **WCDMA**, **LTE**, **EV-DO**, **TD-SCDMA**, or **WiMAX**. **Menu** > **Sweep** > **Standard Signal**

Setting trigger

Trigger

If you have to perform measurements according to certain signal conditions, you can use a trigger. A trigger responds to certain events. When using a trigger source other than Free, the CellAdvisor 5G starts to sweep only with the selected trigger conditions are met. The trigger can be generated either externally or internally.

Access:

on the Quick access and display tab or **Menu** > **Trigger**.

The following is the definition of each key function:

Parameter/Definition
Trigger ▪ **Trigger - Free** Select **Free** to start a new sweep right after the current sweep ends. This is the default state of the CellAdvisor 5G. **Menu** > **Trigger** > **Free** ▪ **Trigger - Internal** Select **Internal** to start a sweep using the internal reference clock and creating a trigger. **Menu** > **Trigger** > **Internal** ▪ **Trigger - External** Select **External** to start a sweep based on the external input trigger. **Menu** > **Trigger** > **External** ▪ **Trigger - GPS** If you use a GPS receiver while performing measurements on a base station, you can synchronize the sweep via the GPS receiver. **Menu** > **Trigger** > **GPS** ▪ **Trigger - Video** A sweep starts when the video voltage exceeds a particular level. The video trigger is available only in the time domain (when it is Zero Span = 0). **Menu** > **Trigger** > **Video**

Setting trace

The CellAdvisor 5G provides display of up to 6 traces. Each trace consists of a series of points where amplitude data is stored. The CellAdvisor 5G updates the information for any active trace with each sweep.

Access:

on the Quick access and display tab or **Menu** > **Trace**.

Trace

The following is the definition of each key function:

Parameter	Definition
Select Trace	Tap to select trace from the following options: **Trace 1**, **Trace 2**, **Trace 3**, **Trace 4**, **Trace 5**, or **Trace 6**. **Access**: **Menu** > **Trace** > **Select Trace**
Trace View On/Off	Select the **Trace View** to **On** of **Off**. Once you select On, you can see the selected trace with its dedicated color on the chart, or select Off, the Trace Legend, F is indicated on the Quick access and display tab for Trace. **Access**: **Menu** > **Trace** > **Trace View** On/Off
Trace Type	Tap to select the **Trace Type** from the following options: **Clear Write**, **Capture**, **Max**. **Min**, or **Load**. For details, refer to "Trace type" below. **Access**: **Menu** > **Trace** > **Trace Type**
Trace Hold Time	Tap to set the **Trace Hold Time** using the on-screen keyboard. **Access**: **Menu** > **Trace** > **Trace Hold Time**
Select Trace Info	Tap to select the trace information from the following options: **None**, **Trace 1**, **Trace 2**, **Trace 3**, **Trace 4**, **Trace 5**, or **Trace 6**. Based on your choice, the selected trace's parameter setting information stored at the time of the measurement is displayed on the left top of the screen. You can select **None** to hide the information display. **Access**: **Menu** > **Trace** > **Select Trace Info**
Detectors	Tap to select the detection mode from the following options: **Normal**, **Peak**, **RMS**, **Negative Peak**, or **Sample**. For details, refer to "Trace detection" below. **Access**: **Menu** > **Trace** > **Detectors**
Trace Clear All	Tap to remove all the traces and initialize the trace settings. **Access**: **Menu** > **Trace** > **Detectors** > **Trace Clear All**
T1 - T2 -> T5	If Trace 1 and Trace 2 are active, this menu is activated.
T2 - T1 -> T6	If Trace 1 and Trace 2 are active, this menu is activated.

Trace Type

- **Clear Write**: Clears current data and display with new measurements, and once selected, the Trace Legend, W is indicated on the Quick access and display tab for Trace.

- **Capture**: Captures the selected trace and compare traces, and once selected, the Trace Legend, C is indicated on the Quick access and display tab for Trace.
- **Max Hold**: Displays the input signal's maximum response only (unlimited or for a certain amount of time), and once selected, the Trace Legend, M is indicated on the Quick access and display tab for Trace.
- **Min Hold**: Display the input signal's minimum response only (unlimited or for a certain amount of time), and once selected, the Trace Legend, m is indicated on the Quick access and display tab for Trace.
- **Load**: Loads a saved trace, and once selected, the Trace Legend, L is indicated on the Quick access and display tab for Trace.

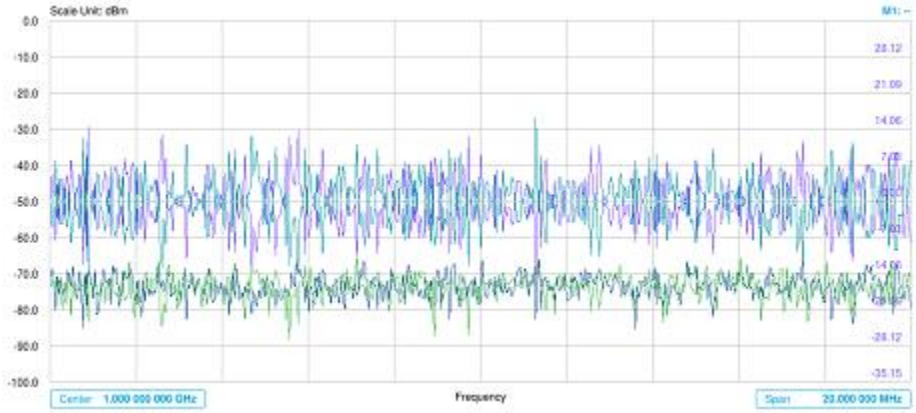
	NOTE: For the Max Hold and Min Hold, your instrument compares newly acquired data with the active trace and displays larger maximum values or smaller minimum values on the screen.

Trace detection

- **Normal**: Displays random noise better than the peak without missing signals.
- **Peak**: Displays the highest value in each data point.
- **RMS**: Displays root mean squared average power across the spectrum.
- **Negative Peak**: Displays lowest value in each data point.
- **Sample**: Displays the center value in each data point.

Trace math

The trace math shows the difference of Trace 1 and Trace 2 measurement results. If Trace 1 and Trace 2 are active, the menu, **T1 – T2 -> T5** or **T2 – T1 -> T6** become available and you can perform trace math. When performing the trace math, the scale is automatically set and the display of scale for the trace math is on the right side of the screen as below.



Setting limit

A limit value can be set to alert you that the measured value exceeds the value that is specified. If the span is selected as Zero Span, the line is not displayed.

Access:

on the Quick access and display tab or **Menu** > **Limit**.

Limit

The following is the definition of each key function:

Parameter	Definition
Display Line	Tap to set values for the reference line using the on-screen keyboard. **Access**: **Menu** > **Limit** > **Display Line**
Display Line Mode On/Off	Tap to set the **Display Line Mode** to **On** or **Off** to display or dismiss the reference line. The inactive vertical move bar on the left edge with straight line appears across the screen to be used as a visual reference only. To adjust the display line, tap and drag the move bar up or down, then the vertical move bar becomes purple and activated. If there is no touch operation for 2 seconds, the move bar becomes inactive again. This display line does not indicate Pass/Fail. **Access**: **Menu** > **Limit** > **Display Line Mode** On/Off
Multi Segment Line	Tap **Multi Segment Line** for Pass/Fail indication. **Access**: **Menu** > **Limit** > **Multi Segment Line**

Multi segment line

1. Tap **Menu** > **Limit**.
2. Tap **Multi Segment Line**.
3. Tap to switch the select side to **Upper** or **Lower**.
4. Tap the **# of Line** to set the number of segments for the selected side for upper of lower up to 50 segments using the on-screen keyboard.
5. Tap **Autoset** soft key to automatically set the limit for each segment and display the line.
6. Tap **Offset Up/Down** or **Offset Left/Right** to move the limit line using the on-screen keyboard.

The following table shows the parameters displayed for the multi-segment line.

Parameter	Definition

Autoset	Tap to autoset the limit for each segment and display line. **Access**: **Menu** > **Limit** > **Multi Segment Line** > **Autoset**
Select Side	Tap to set the **Select Side** to **Lower** or **Upper** to select the one to be displayed. **Access**: **Menu** > **Limit** > **Multi Segment Line** > **Select Side Lower/Upper**
Limit	Tap to select the Limit to **On** of **Off**. Once the **Autoset** is selected, the Limit changes to On. **Access**: **Menu** > **Limit** > **Multi Segment Line** > **Limit On/Off**
# of Line	Tap to set the **# of Line** up to 50 segments for the selected upper or lower limit line using the on-screen keyboard. **Access**: **Menu** > **Limit** > **Multi Segment Line** > **# of Line**
Offset Up/Down (dB)	Tap to set the **Offset Up/Down** to move the limit line up or down when the Display Line Mode is set to on using the on-screen keyboard. **Access**: **Menu** > **Limit** > **Multi Segment Line** > **Offset Up/Down**
Offset Left/Right	Tap to set the **Offset Left/Right** to move the limit line left or right when the Display Line Mode is set to on using the on-screen keyboard. **Access**: **Menu** > **Limit** > **Multi Segment Line** > **Offset Left/Right**
Edit Limit Table	Tap to edit the Limit Table. The limit table appears on the bottom of the chart screen. **Access**: **Menu** > **Limit** > **Multi Segment Line** > **Edit Limit Table**

Editing limit table

1. Tap to switch the select side to **Upper** or **Lower**.
2. Tap **Select Display Plot** to select the segment that you want to edit.
3. Tap the switch to switch the selected segment line to **On** or **Off**.
   To remove the selected segment line, select **Off**.
4. Tap **Add Point** to add a new segment line.
5. Tap **Delete Point** to delete the selected point.
6. Tap **Frequency** or **Amplitude** to change the position and input the value using the on-screen keyboard.

NOTE:

If the Upper and Lower are set to Off in the Select Side menu, the Edit Limit Table mode is

	not available.

Using marker

Marker is used to get the information about a specific trace. Six markers can be set on the display and each marker can be used independently. The X and Y coordinates of the trace are displayed when the marker is placed on any position of the trace. The position displaying the marker's X and Y coordinates may be slightly different for each measurement mode and refer to the description of each measurement. There are three different marker types available: Normal, Delta, and Delta pair. Marker position can be set manually by entering numeric values (frequency) or using the purple move bar when one of the marker types is selected.

Access:

on the Quick access and display tab, go to **Menu** > **Marker**, or tap the hot key icon ( ).

Marker

The following is the definition of each key function:

Parameter	Definition
Frequency Count On/Off	This Frequency Count is used when a highly accurate reading of the frequency is needed for the active marker on the signal. The measurement sweeps get significantly slower because the instrument runs the measurement of the signal peak with 1 Hz resolution in background. Select to switch the **Frequency Count** between **On** and **Off** to enable or disable the frequency count function for the selected marker. **Access**: **Menu** > **Marker** > **Frequency Count** On/Off
Noise Marker On/Off	This Noise Marker is used to measure a noise adjacent to a signal by averagin several data points to calculate the readout for the Noise Marker as if making a measurement using a 1 Hz bandwidth. Select to switch the **Noise Marker** between **On** and **Off** to enable or disable the noise marker function for the selected active marker. **Access**: **Menu** > **Marker** > **Noise Marker** On/Off

	NOTE: Frequency Count and Noise Marker functions are used only in the Spectrum Analyzer mode.

Using marker table

- **Select Marker**: Selects an active marker whose position can be changed by tapping and switching marker from M1 to M6 (each marker has a different color). The assigned number of the active marker is displayed in the Marker Table box and the active marker number is also displayed right next to the active marker on the trace. When tapping the Active Marker Off ( ) icon, the selected marker disappears.
- **Normal**: This Normal marker type provides the reading of a marker position on the trace along with the marker number between one and six.
- **Delta**: This Delta marker type is associated with a Normal marker. A Normal marker must be set before a Delta marker is set. When the Delta marker is set, the position set by the Delta marker becomes the reference position of the Normal marker and the marker's X and Y values displays the difference compared with the Delta marker.
- **Delta Pair**: This Delta Pair marker type is associated with a Normal marker. A Normal marker must be set before a Delta Pair marker is set. When the Delta Pair marker is set, the position set by the Delta Pair marker becomes the reference position of the Normal marker and the marker's X and Y values displays the difference compared with the Delta Pair marker. The reference position will be varied in accordance with trace change.
- **Marker All Off (** **)**: Turns all the markers the screen off. When the Marker View is selected for those markers, the instrument displays those markers back at the previous position. If a measurement mode is changed, current settings are not restored.
- **Start**: Sets the frequency of the active marker to the start frequency of spectrum analyzer.
- **Center**: Sets the frequency of the active marker to the center frequency of spectrum analyzer.
- **Stop**: Sets the frequency of the active marker to the stop frequency of spectrum analyzer.
- **Peak Search**: Moves the active marker to the highest peak of the trace. You can also tap the hot key icon ( ) to use this function.
- **Min Search**: Moves the active marker to the lowest peak of the trace.
- **Next Peak**: Moves the active marker to the second highest peak of the trace.
- **Left Peak**: Moves the active marker to the highest peak to the left of its current position.
- **Right Peak**: Moves the active marker to the highest peak to the right of its current position.
- **Always Peak**: When the Always Peak is set to On, the instrument moves the active marker automatically to the highest peak of the trace every time the trace is refreshed.

Moving a marker to a selected trace

If you have selected marker using the marker table, you can move the marker position to the other trace by following the procedure.

1 Tap **Menu** > **Trace**.

2 Tap **Select Trace** and select the trace from **Trace 1** to **Trace 6.**.

3 Tap **Trace View** to **On**.
The selected marker moves to the selected trace.

	NOTE: If the marker is beyond the frequency range, the purple horizontal move bar appears on the right and left edge of the chart screen. You can move the marker by moving the bar right and left.

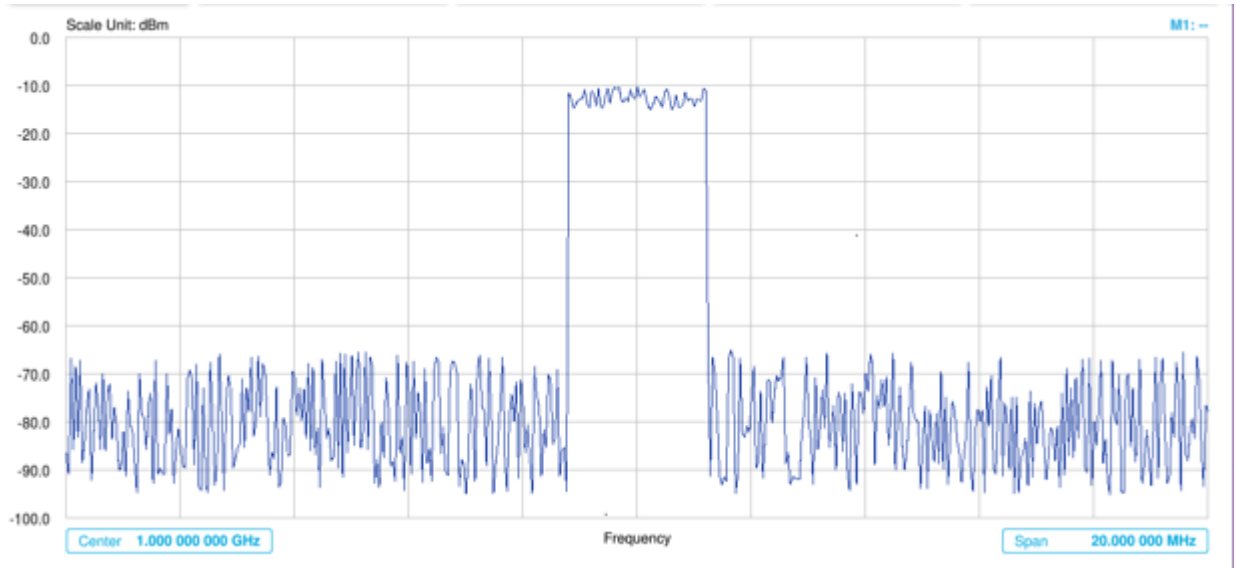
Conducting spectrum measurements

Sweep tuned spectrum

If you have configured test parameters as described in the "Configuring Spectrum Measurements", your measurement is displayed on the screen as like the following example. You can simply change Center Frequency and Span by tapping the icons right below the result chart screen.

Tap **Menu** > **Sweep** > **Gated Sweep** to set the Gated Sweep **On** or **Off**. This function needs License S015.

Sweep tuned spectrummeasurement with spectrum analyzer



NOTE:

If the Sweep Mode is set to Normal and RBW is 300 Hz or below, the Sweep Type changes to FFT. If the Sweep Mode is set to Fast and RBW is 30 kHz or below, the Sweep Type changes to FFT.

Conducting RF measurements

Channel power

The Channel Power measurement is a common test used in the wireless industry to measure the total transmitted power of a radio within a defined frequency channel. It acquires a number of points representing the input signal in the time domain, transforms this information into the frequency domain using Fast Fourier Transform (FFT), and then calculates the channel power. The effective resolution bandwidth of the frequency domain trace is proportional to the number of points acquired for the FFT.

The channel power measurement identifies the total RF power, power spectral density, and Peak to Average Ratio (PAR) of the signal within the channel bandwidth.

Setting measure setup

After configuring spectrum measurement in "Configuring Spectrum Measurements", you can set the measure setup to continue your measurement. The measurement settings can be saved and recalled as

a file by selecting File Type as Setup and load the file onto the instrument using the **Save/Load** icons on the side bar.

1 Tap the **Setup** ( )icon on the side bar.

2 Tap **Integrated BW** and input the value using the on-screen keyboard.

You can also tap the rectangle with value,

under the chart screen and input the value using the on-screen keyboard.

3 Tap to set the frequency range over which the instrument will sweep using the on-screen keyboard.

4 Tap **Menu** > **Sweep** > **Gated Sweep** to set the Gated Sweep **On** or **Off**. This function needs License S015.

5 Tap **Menu** > **BW/AVG** > **Average** to set the number of measurements to be averaged using the on-screen keyboard.
The input value range is from 1 to 100.

NOTE:

Make sure the Detector is selected to RMS when you perform the channel power measurement.

Setting limit

1 Tap **Menu** > **Limit**.

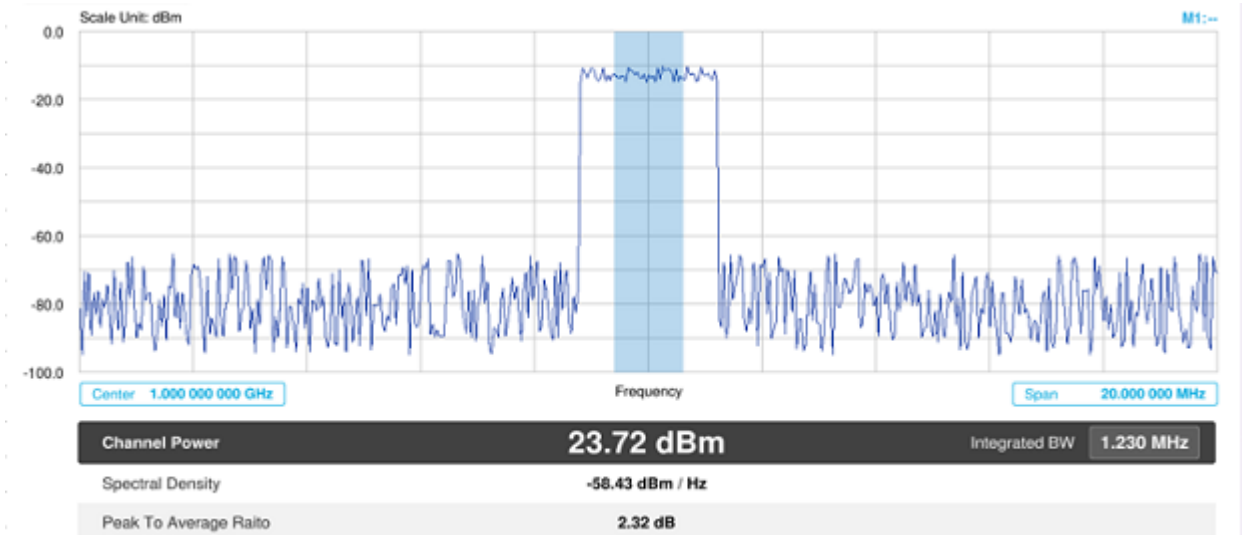
2 Tap to switch the **Test Limits** to **On** or **Off** to enable or disable Pass/Fail indication.
The result table color for Pass is green, and the result table color for Fail is red.

3 Tap **High Limit** to set the upper threshold using the on-screen keyboard.

4 Tap **Low Limit** to set the lower threshold using the on-screen keyboard.

5 *Optional.* Tap the Save hot key on the side bar and select the save option form the choices available for your measurement mode.

Channel power measurement with spectrum analyzer



Channel power measurement result shows channel power and spectrum density in a user specified channel bandwidth. The peak to average ratio (PAR) is shown at the bottom of the screen as well. The shaded area on the display indicates the channel bandwidth.

NOTE:

If the Trace View is set to Off, the Channel Power, Spectral Density, and Peak to Average Ratio is not shown. If the Trace View is set to On and the Trace Type is selected other than Clear Write, the Channel Power, Spectral Density, and Peak to Average Ratio is shown with value and "*" at the end of the value.

Occupied bandwidth

The Occupied Bandwidth measures the percentage of the transmitted power within a specified bandwidth. The percentage is typically 99%.

Setting measure setup

After configuring spectrum measurement in "Configuring Spectrum Measurements", you can set the measure setup to continue your measurement. The measurement settings can be saved and recalled as a file by selecting File Type as Setup and load the file onto the instrument using the **Save/Load** icons on the side bar.

1 Tap the **Setup** ( )icon on the side bar.

2 Tap **Occupied BW % Power** and input the value using the on-screen keyboard.

You can also tap the rectangle with value,

under the chart screen and input the value using the on-screen keyboard.

3 Tap **x dB** to input a value using the on-screen keyboard.
The input value range is from -50 to 0 dB.

4 Tap to set the frequency range over which the instrument will sweep using the on-screen keyboard.

5 Tap **Menu** > **BW/AVG** > **Average** to set the number of measurements to be averaged using the on-screen keyboard.
The input value range is from 1 to 100.

6 Tap **Menu** > **Sweep** > **Gated Sweep** to set the Gated Sweep **On** or **Off**. This function needs License S015.

Setting Limit

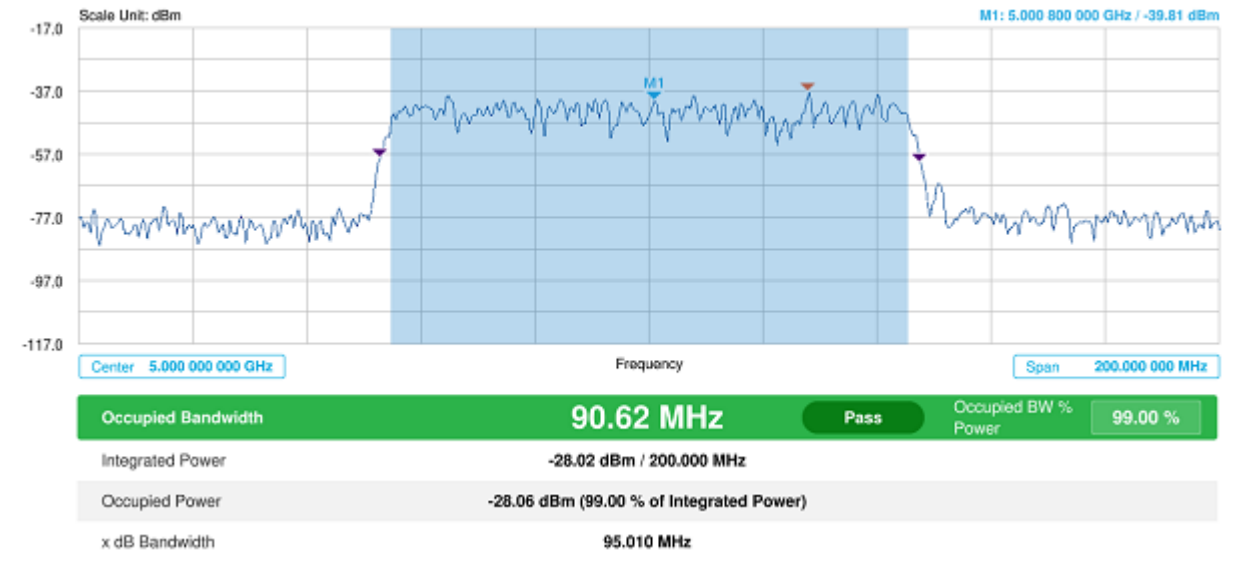
1 Tap **Menu** > **Limit**.

2 Tap to switch the **Test Limits** to **On** or **Off** to enable or disable Pass/Fail indication.
The result table color for Pass is green, and the result table color for Fail is red.

3 Tap **High Limit** to set the upper threshold using the on-screen keyboard.

4 *Optional.* Tap the **Save** icon on the side bar and select the save option form the choices available for your measurement mode.

Occupied bandwidth with spectrum analyzer



The Occupied Bandwidth measurement shows both of power across the band and power bandwidth in a user specified percentage to determine the amount of spectrum used by a modulated signal. Occupied bandwidth is typically calculated as the bandwidth containing 99% of the transmitted power.

NOTE:

If the Trace View is set to Off, the Occupied Bandwidth, Integrated Power, Occupied Power, and x dB bandwidth is not shown. If the Trace View is set to On and the Trace Type is selected other than Clear Write, the Occupied Bandwidth, Integrated Power, Occupied Power, and x dB bandwidth is shown with value and "*" at the end of the value.

Spectrum emission mask (SEM)

The Spectrum Emission Mask (SEM) measurement is to identify and determine the power level of out-of band spurious emission outside the necessary channel bandwidth and modulated signal. It measures the power ratio between in-band and adjacent channels. The CellAdvisor 5G indicates either Pass or Fail based on the specified limit of the signal.

Setting measure setup

After configuring spectrum measurement in "Configuring Spectrum Measurements", you can set the measure setup to continue your measurement. The measurement settings can be saved and recalled as a file by selecting File Type as Setup and load the file onto the instrument using the **Save/Load** icons on the side bar.

1 Tap the **Setup** ( )icon on the side bar.

2 Tap **Main Channel BW** to set the main channel bandwidth and input the value using the on-screen keyboard.

You can also tap the rectangle with value,

under the chart screen and input the value using the on-screen keyboard.

3 Tap **Configuration** to configure an offset, up to five. The below table appears.

You can also tap the Configuration ( ) under the chart screen.

a Select **Offset** from 1 to 5 and switch each to **On** to display or **Off** to hide the active offset.

b Select **Offset Frequency** to set the start frequency of SEM using the on-screen keyboard.

c Select **Measurement Bandwidth** to set the bandwidth for the selected offset using the on-screen keyboard.

d Switch the **Reference** to **Relative** or **Absolute** depending on how to use the reference.

e Select **Start Limit** to set the start point of the mask.

f Select **Stop Limit** to set the stop point of the mask.

4 Tap **Menu** > **Sweep** > **Gated Sweep** to set the Gated Sweep **On** or **Off**. This function needs License S015.

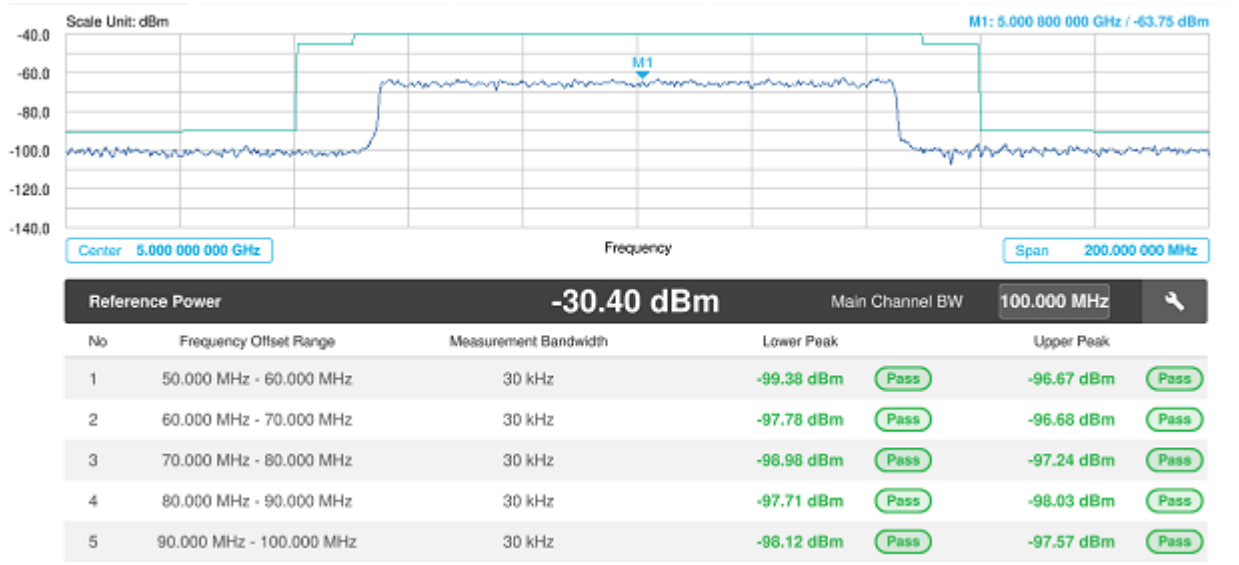
Setting limit

1 Tap **Menu** > **Limit**.

2 Tap to switch the **Test Limits** to **On** or **Off** to enable or disable Pass/Fail indication.
The result table color for Pass is green, and the result table color for Fail is red.

3 *Optional.* Tap the **Save** hot key on the side bar and select the save option form the choices available for your measurement mode.

Spectrum emission mask measurement with spectrum analyzer



No	Frequency Offset Range	Measurement Bandwidth	Lower Peak		Upper Peak	
1	50.000 MHz - 60.000 MHz	30 kHz	-99.38 dBm	Pass	-96.67 dBm	Pass
2	60.000 MHz - 70.000 MHz	30 kHz	-97.78 dBm	Pass	-96.68 dBm	Pass
3	70.000 MHz - 80.000 MHz	30 kHz	-98.98 dBm	Pass	-97.24 dBm	Pass
4	80.000 MHz - 90.000 MHz	30 kHz	-97.71 dBm	Pass	-98.03 dBm	Pass
5	90.000 MHz - 100.000 MHz	30 kHz	-98.12 dBm	Pass	-97.57 dBm	Pass

If Lower Peak or Upper Peak indicates Fail, the mask line becomes red.

NOTE:

If the Trace View is set to Off, the Reference Power, Lower Peak, and Upper Peak is not shown. If the Trace View is set to On and the Trace Type is selected other than Clear Write, the Reference Power, Lower Peak, and Upper Peak is shown with value and "*" at the end of the value.

Adjacent channel power (ACP)

The Adjacent Channel Power (ACP) is the power contained in a specified frequency channel bandwidth relative to the total carrier power. It may also be expressed as a ratio of power spectral densities between the carrier and the specified offset frequency band.

The ACP measures the power of a carrier channel and the power in its adjacent (offset) channels. The measurement results allows you to determine whether the carrier power is set correctly and whether the transmitter filter is working properly. You can measure the channel power in from one to five adjacent (offset) channels on the lower frequency and upper frequency side of the carrier channel. Limits can be used to quickly see if too much power is measured in the adjacent channels.

Setting measure setup

After configuring spectrum measurement in "Configuring Spectrum Measurements", you can set the measure setup to continue your measurement. The measurement settings can be saved and recalled as a file by selecting File Type as Setup and load the file onto the instrument using the **Save/Load** icons on the side bar.

1 Tap the **Setup** ( )icon on the side bar.

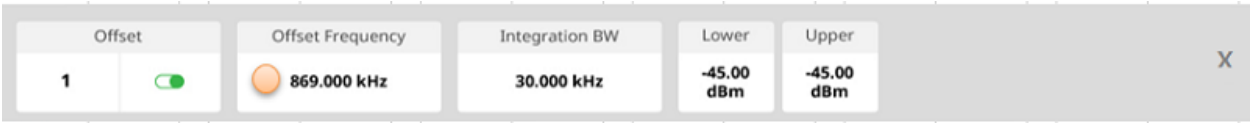
2 Tap **Main Channel BW** to set the main channel bandwidth and input the value using the on-screen keyboard.

You can also tap the rectangle with value,

under the chart screen and input the value using the on-screen keyboard.

3 Tap **Configuration** to configure an offset, up to five. The below table appears.

You can also tap the Configuration ( ) under the chart screen.



a Select **Offset** from 1 to 5 and switch each to **On** to display or **Off** to hide the active offset.

b Select **Offset Frequency** to set the center frequency of the offset using the on-screen keyboard.

c Select **Integration BW** to set the channel power bandwidth for the selected offset using the on-screen keyboard.

d Select **Lower** to set the threshold for the power difference between the main channel bandwidth and the selected offset bandwidth on the left using the on-screen keyboard.

e Select **Upper** to set the threshold for the power difference between the main channel bandwidth and the selected offset bandwidth on the right using the on-screen keyboard.

4 Tap **Menu** > **Sweep** > **Gated Sweep** to set the Gated Sweep **On** or **Off**. This function needs License S015.

5 Tap **Menu** > **Trace** > **Threshold RMS** to switch **On** or **Off**. Threshold RMS function detects RMS above a certain level of power and make sample detecting for the power below that level. When switched **On**, Average is automatically set to 100 while switched **Off**, Average is automatically set to 1.

Threshold can also be adjusted by the menu under **Trace**, **Threshold Auto** and **Threshold RMS Level**.

An offset represents a difference in center frequencies of the carrier channel and its adjacent channel to be measured. The frequency range for each offset is specified with an Offset Frequency and Integration BW. Each offset that is created has a Lower and Upper set of frequencies.

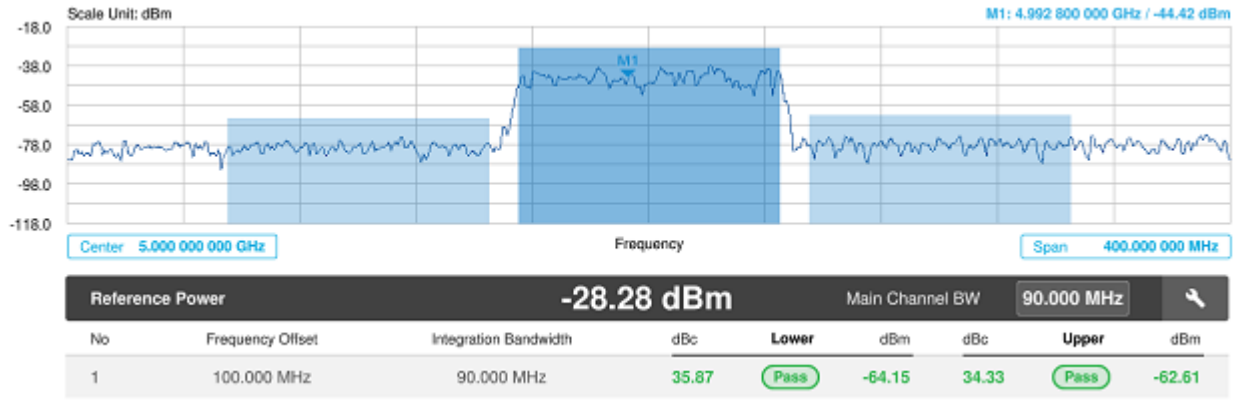
NOTE:

Make sure the Detector is selected to RMS when you perform the adjacent channel power measurement.

Setting limit

1. Tap **Menu** > **Limit**.
2. Tap to switch the **Test Limits** to **On** or **Off** to enable or disable Pass/Fail indication.
   The result table color for Pass is green, and the result table color for Fail is red.
3. *Optional.* Tap the Save hot key on the side bar and select the save option form the choices available for your measurement mode.

Adjacent channel power measurement with spectrum analyzer



Multi adjacent channel power

The Multi-ACP measurement is used to do multi-channel ACP testing. It helps you to measure ACP in multichannel transmitting base station environment.

Setting measure setup

After configuring spectrum measurement in "Configuring Spectrum Measurements", you can set the measure setup to continue your measurement. The measurement settings can be saved and recalled as a file by selecting File Type as Setup and load the file onto the instrument using the **Save/Load** icons on the side bar.

1 Tap the **Setup** ( )icon on the side bar.

2 Tap **Main Channel BW** to set the main channel bandwidth and input the value using the on-screen keyboard.

You can also tap the rectangle with value,

under the chart screen and input the value using the on-screen keyboard.

3 For channel setting, tap **Lowest Channel Number** and input the value using the on-screen keyboard. You can also tap the rectangle with value, under the chart screen and input the value using the on-screen keyboard.

4 For channel setting, tap **Highest Channel Number** and input the value using the on-screen keyboard.

5 For frequency setting, tap **Lowest Frequency** and input the value using the on-screen keyboard.

You can also tap the rectangle with value,

under the chart screen and input the value using the on-screen keyboard.

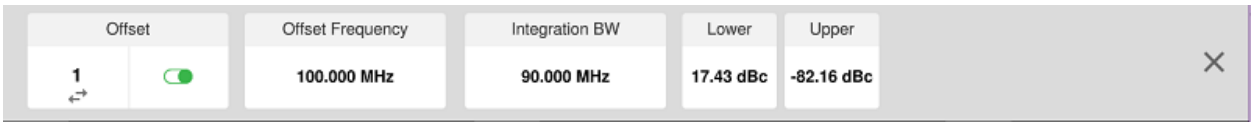
6 For frequency setting, tap **Highest Frequency** and input the value using the on-screen keyboard.

You can also tap the rectangle with value,

under the chart screen and input the value using the on-screen keyboard.

7 Tap **Configuration** to configure an offset, up to five. The below table appears.

You can also tap the **Configuration** ( ) under the chart screen.



a Select **Offset** from 1 to 5 and switch each to **On** to display or **Off** to hide the active offset.

b Select **Offset Frequency** to set the offset frequency using the on-screen keyboard.

c Select **Integration BW** to set the bandwidth for the selected offset using the on-screen keyboard.

d Select **Lower** to set the threshold for the power difference between the main channel bandwidth and the selected offset bandwidth on the left using the on-screen keyboard.

e Select **Upper** to set the threshold for the power difference between the main channel bandwidth and the selected offset bandwidth on the right using the on-screen keyboard.

8 Tap to set the frequency range over which the instrument will sweep using the on-screen keyboard.

9 Tap **Menu** > **Sweep** > **Gated Sweep** to set the Gated Sweep **On** or **Off**. This function needs License S015.

NOTE:

Make sure the Detector is selected to RMS when you perform the multi adjacent channel

	power measurement.

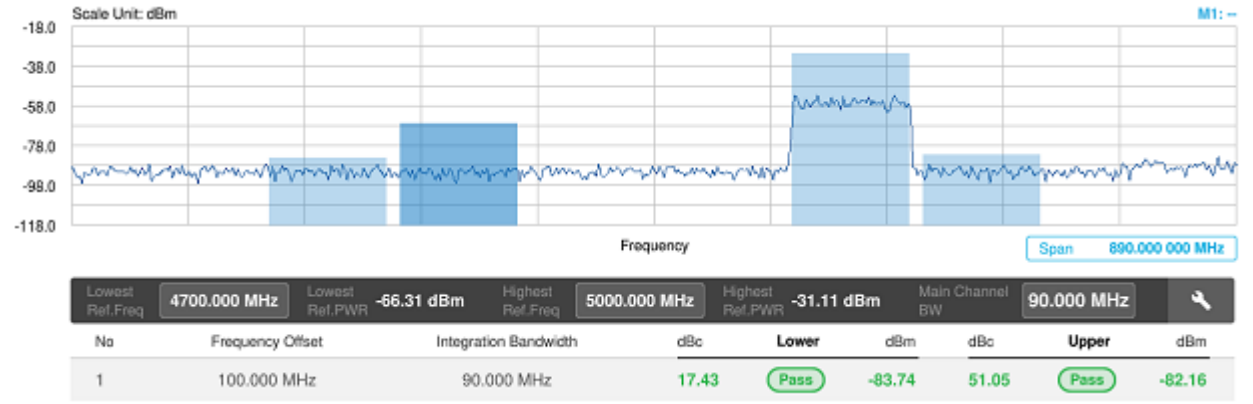
Setting limit

1 Tap **Menu** > **Limit**.

2 Tap to switch the **Test Limits** to **On** or **Off** to enable or disable Pass/Fail indication.
The result table color for Pass is green, and the result table color for Fail is red.

3 *Optional.* Tap the **Save** icon on the side bar and select the save option form the choices available for your measurement mode.

Multi-adjacent channel power measurement with spectrum analyzer



Spurious emissions

The Spurious Emissions measurement is to identify or determine the power level of in-band or out-of-band spurious emissions within the necessary channel bandwidth and modulated signal. The CellAdvisor 5G indicates either Pass or Fail based on the specified limit of the signal.

Setting measure setup

After configuring spectrum measurement in "Configuring Spectrum Measurements", you can set the measure setup to continue your measurement. The frequency setting is not used in the Spurious Emissions mode. The measurement settings can be saved and recalled as a file by selecting File Type as Setup and load the file onto the instrument using the **Save/Load** icons on the side bar.

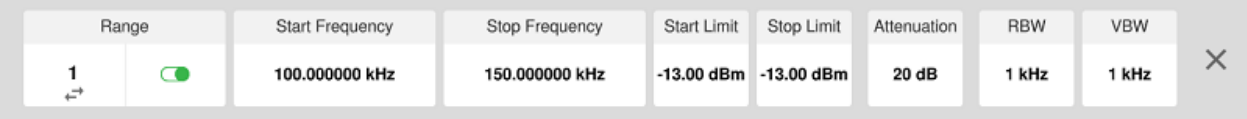
1 Tap the **Setup** ( ) icon on the side bar.

2 Tap to switch the **Measure Type** to **Full** or **Examine**.

NOTE:

The Examine mode displays only the selected range while the Full mode lets the instrument automatically changes the selected range from one another.

3 Tap **Configuration** to set up the range table and parameters as below.



a Select **Range** from 1 to 20 and switch each to **On** to display the selected range in the result table or **Off** to hide it from the table.

b Select **Start Frequency** to specify the start frequency for the selected range using the on-screen keyboard.

c Select **Stop Frequency** to specify the stop frequency for the selected range using the on-screen keyboard.

d Select **Start Limit** and **Stop Limit** to specify the upper limit for Pass/Fail indication using the on-screen keyboard.
You can set the threshold line by setting the start/stop limit.

e Select **Attenuation** and specify a value in the multiple of five using the on-screen keyboard.

f Select **RBW** to specify a RBW value using the on-screen keyboard.

g Select **VBW** to specify a VBW value using the on-screen keyboard.

4 Tap **Menu** > **BW/AVG** > **Average** to set the number of measurements to be averaged using the on-screen keyboard.
The input value range is from 1 to 100.

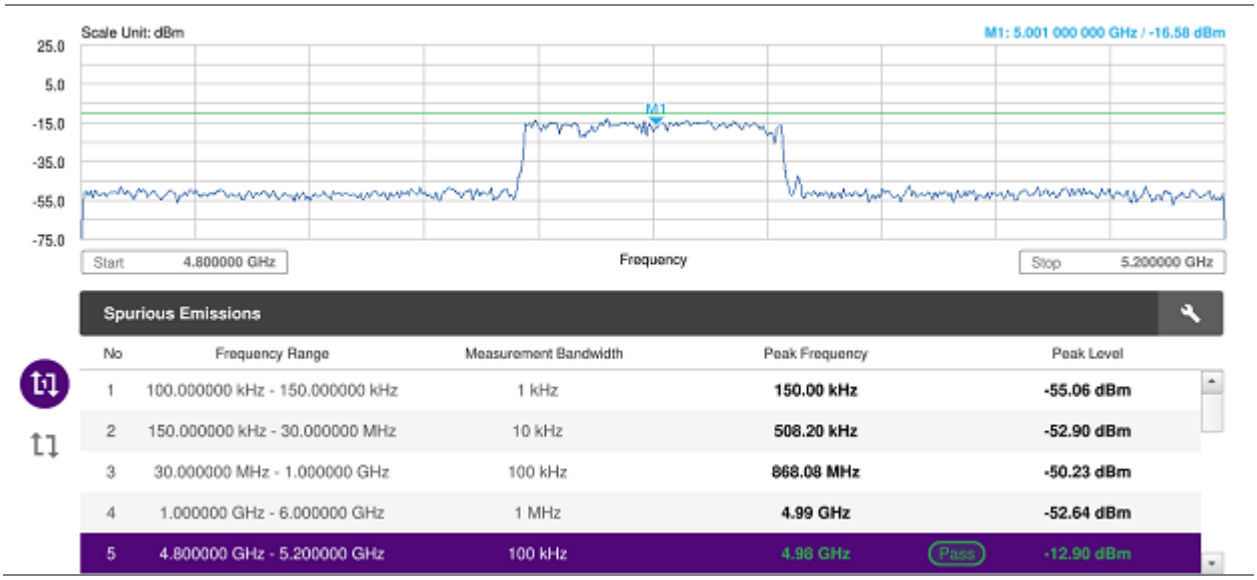
Setting limit

1 Tap **Menu** > **Limit**.

2 Tap to switch the **Test Limits** to **On** or **Off** to enable or disable Pass/Fail indication.

3 *Optional.* Tap the **Save** icon on the side bar and select the save option form the choices available for your measurement mode.

Spurious emissions measurement with spectrum analyzer



NOTE:

If you select the first icon next to the Range table above, it only shows the selected range and if you select the second icon next to the Range table, it keeps moving from the first selected range to the final selected range.

Total harmonic distortion (THD)

The CellAdvisor 5G can measure the Total Harmonic Distortion using spectrum analyzer. The Total Harmonic Distortion is defined as the ratio of RMS voltage of the harmonics to that of the fundamental component. This is accomplished by using a spectrum analyzer to obtain the level of each harmonic with peak detector.

Setting measure setup

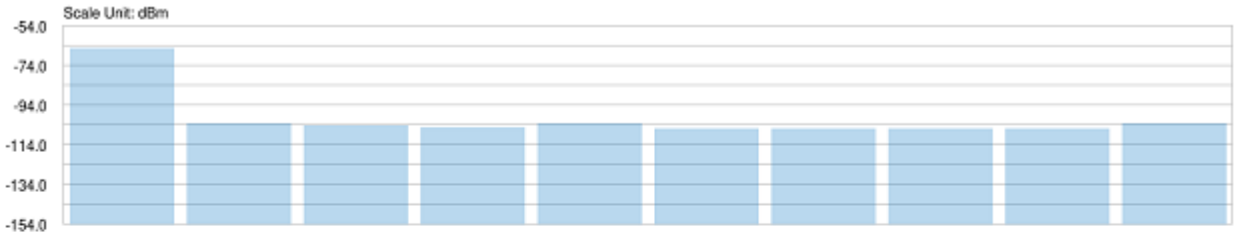
You need to set the fundamental frequency to measure the total harmonic distortion. Once you set up, it will automatically collect the harmonic outputs up to the tenth harmonics from the spectrum analyzer and calculate the corresponding THD value (%) and the distortion attenuation (dB).

1 Tap the **Setup** ( ) icon on the side bar.

2 Tap **Fundamental Frequency** and input the value using the on-screen keyboard.
The total harmonic distortion screen changes accordingly.

3 Tap **Menu** > **Amp/Scale** to set the related parameters such as Reference level, Attenuation, Preamp, External Offset, and Scale Division. For details, see "Setting amplitude".

Total harmonic distortion measurement with spectrum analyzer



THD: 3.0 % / -30.50 dBc

Frequency Table

Index	Frequency (MHz)	Level	Index	Frequency (MHz)	Level
Fund	100.00	**-65.06 dBm**	5	600.00	**-40.32 dBc**
1	200.00	**-37.72 dBc**	6	700.00	**-40.69 dBc**
2	300.00	**-39.15 dBc**	7	800.00	**-40.35 dBc**
3	400.00	**-39.86 dBc**	8	900.00	**-40.54 dBc**
4	500.00	**-37.79 dBc**	9	1000.00	**-38.07 dBc**

Field strength meter

The Field Strength Meter measures the field strength over the frequency range of a connected antenna, which is known with its specific bandwidth and gain characteristics. A standard or user-defined antenna can be selected from the antenna list in the CellAdvisor 5G. After configuring spectrum measurement in "Configuring Spectrum Measurements", you can set the measure setup to continue your measurement.

Setting measure setup

1. Connect an antenna to be used with your instrument.
2. Tap the **Setup** ( ) icon on the side bar.
3. Tap **Antenna List** to select antennas to be used for field strength measurement from the list stored in the instrument.
   The antenna list window appears.
4. Tap the **Apply** button to apply the selection.
5. Tap **Antenna Start Frequency** to edit the start frequency of the connected antenna using the on-screen keyboard.
6. Tap **Antenna Stop Frequency** to edit the stop frequency of the connected antenna using the on-screen keyboard.
7. Tap **Gain** to input the gain information of the antenna using the on-screen keyboard.

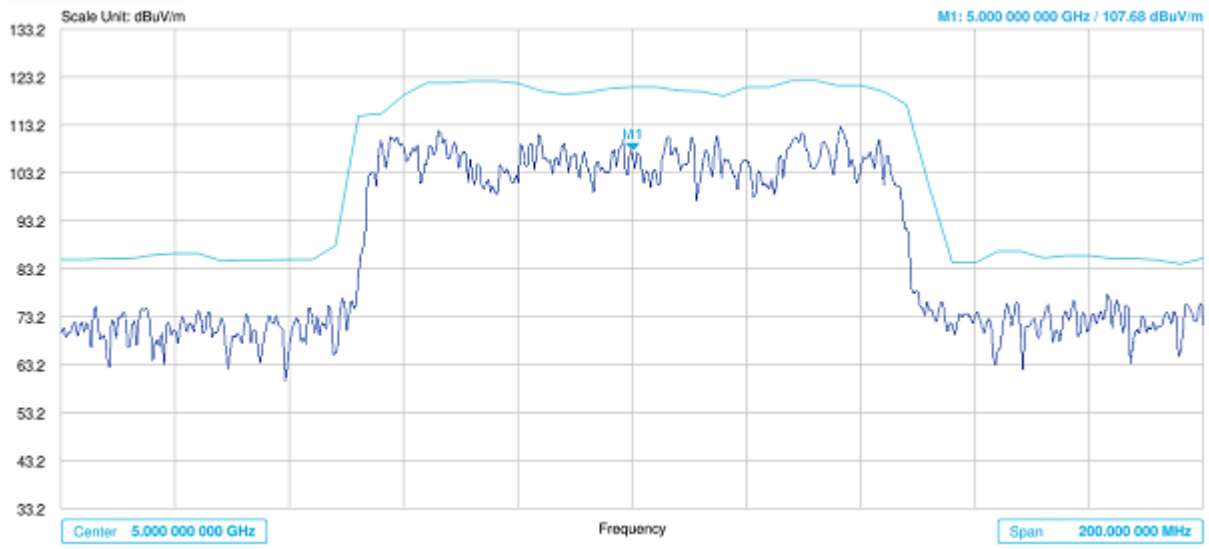
Setting limit

You can show or hide the display line on the screen that is used as a visual reference only. You can also use the multiple segment limit line to set up different limits for different frequency ranges for Pass/Fail indication.

1 Tap **Menu** > **Limit**.

2 For details, see "Setting limit".

Field strength measurement with spectrum analyzer



Utility

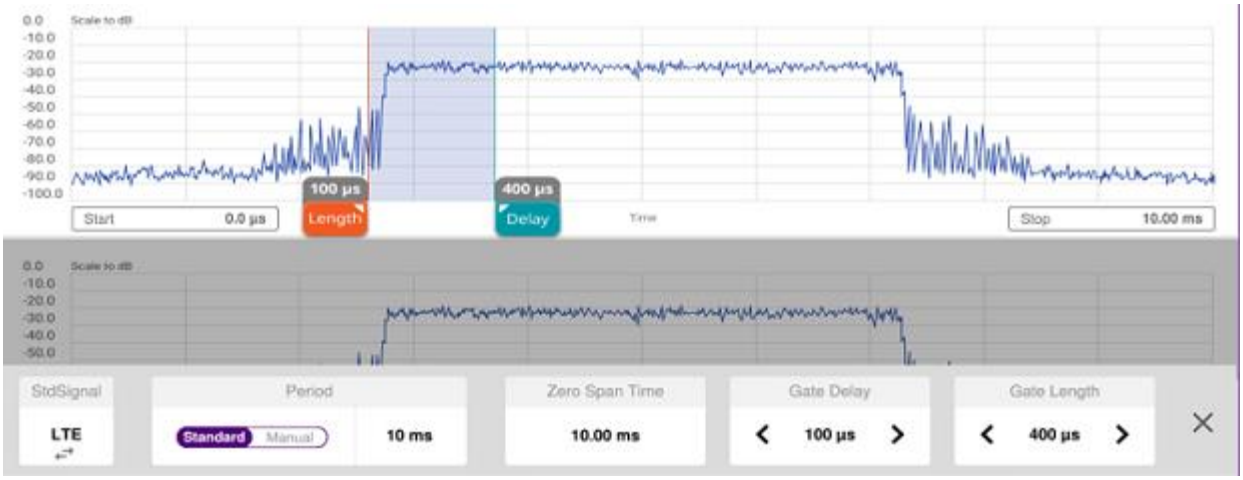
Gate Sweep Spectrum

To get appropriate gate sweep spectrum, you have to set the gate delay and gate length in a way that the measurement is active during the interesting part of the signal. You can also modify the sweep time in order to match the horizontal axis to the length of the signal and thus set the gate delay and gate length parameters more accurately.

The gate delay parameter means the time between the trigger event and the beginning of the actual measurement. The gate length means the duration of the measurement, before it is interrupted and the next gate signal is expected to resume the measurement.

The measurement settings can be saved and recalled as a file by selecting File Type as Setup and load the file onto the instrument using the **Save/Load** icons on the side bar.

Gate sweep spectrum setup screen



Setting Gate Sweep Spectrum

The above figure is the first screen you will see when entering the gate sweep measurement mode.

1 Tap **Gate Delay** on the setup table and input a value using the on-screen keyboard.
When the gate delay changes, the gate length line also changes accordingly with the same interval.

2 Tap **Gate Length** on the setup table and input a value using the on-screen keyboard.
The gate length cannot be moved on the left side of the gate delay.

3 Tap **Zero Span Time** on the setup table and input a value using the on-screen keyboard.

4 Tap **StdSingal** to select a Standard Signal from the pop-up list

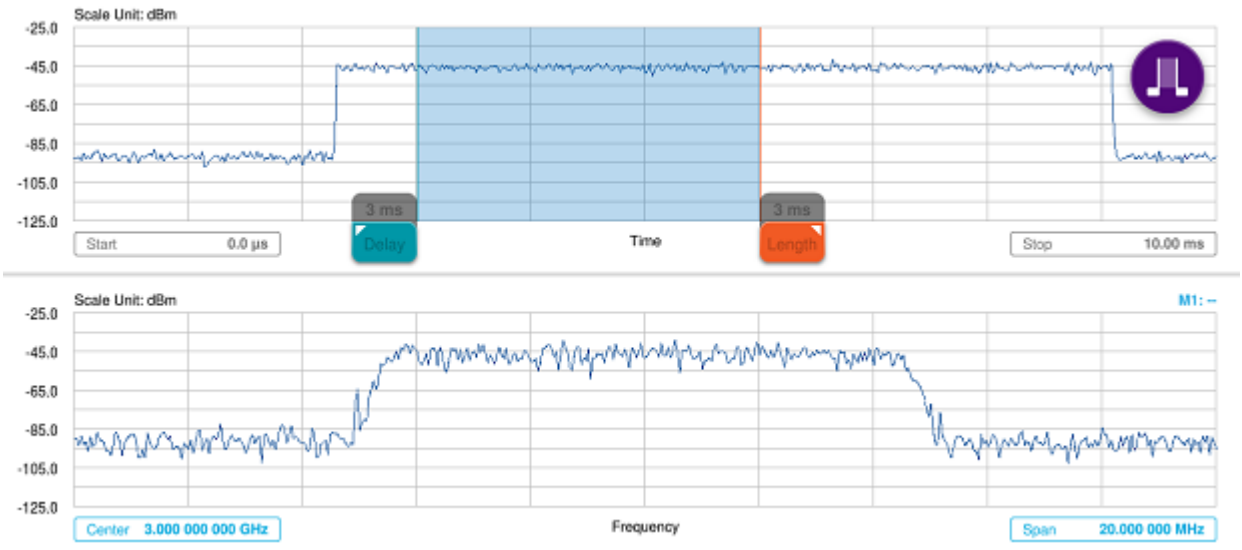
5 Tap **Period** and switch it to **Standard** or **Manual** and input a value using the on-screen keyboard.

6 Tap **x** button on the setup table then Gate Sweep becomes On.

The setup table disappears and the edit mode ( ) icon appears on the right edge of the chart screen as below figure.

7 When judged Triggering is not valid, for example, Delay set bigger than Trigger Period, **Trigger not Detected** message appears on the screen.

Gate Sweep Spectrum with spectrum analyzer



AM/FM Audio Demodulation

The AM/FM Audio Demodulator operates using the power received from radio waves and it serves as an alternative to identify interfering signals easily. The instrument sounds demodulated signals that can be heard through the built-in speaker or plugged-in headphones. You can hear the sound and identify interfering signals easily.

Setting measure setup

After configuring spectrum measurement in "Configuring Spectrum Measurements", you can set the measure setup to continue your measurement. The measurement settings can be saved and recalled as a file by selecting File Type as Setup and load the file onto the instrument using the **Save/Load** icons on the side bar.

1 Tap the **Setup** ( ) icon on the side bar.

2 Tap to switch the **Audio Demod** to **On** or **Off** to turn the AM/FM audio demodulation on or off.

3 Tap **Demod At** to select the marker number for the frequency to be demodulated.

NOTE:

You must set the marker(s) first as the AM/FM demodulator uses the marker position to demodulate. See “Using marker” for more details.

4 Tap **Demod Mode** to select the demodulation mode: **CW**, **AM**, or **FM**.

5 Tap **Dwell Time** and set the demodulation interval between 1 and 20 using the on-screen keyboard.

6 Tap Volume to set the speaker volume using the on-screen keyboard.

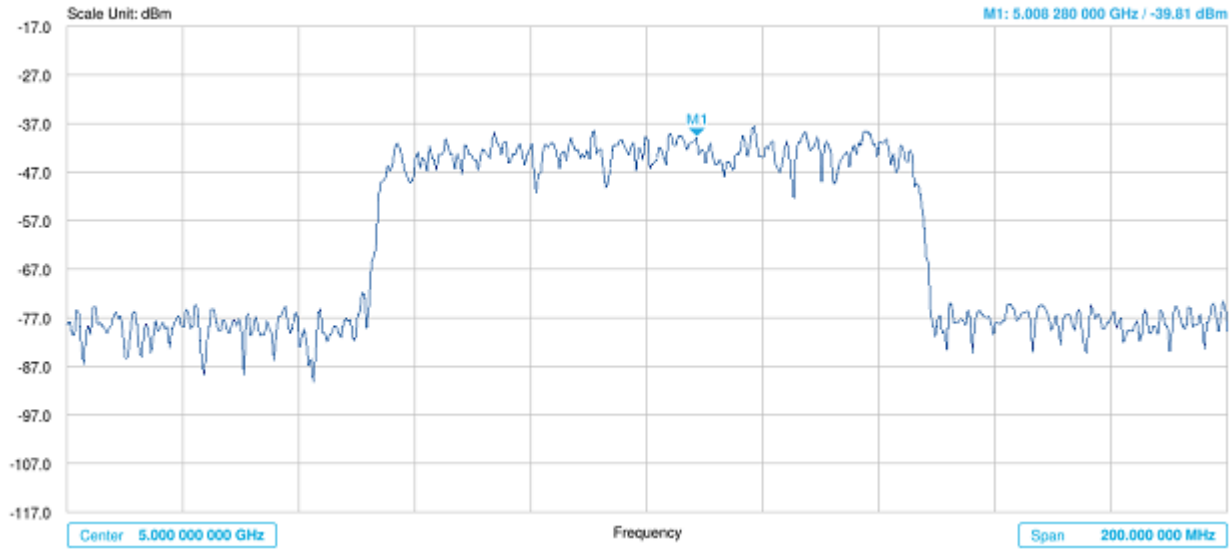
7 *Optional.* You can use the **Save** icon and select **Save to Event Setup** to let the instrument automatically save measurement screen or result that falls outside the defined limit settings or the Fail indicator is on. You can also set to save the first event and hold the measurement or to save all the events continuously.

Setting limit

1 Tap **Menu** > **Limit**.

2 For details, see "Setting limit".

AM/FM audio demodulation with spectrum analyzer



Route map

The CellAdvisor 5G provides the Route Map function that allows you to collect data of points in an indoor or outdoor environment and track the received signals and coverage of RF transmitters by plotting data real time directly on top of a loaded floor plan or a map.

Loading a map

To use any features related to maps, you need to download and install the maps on the CellAdvisor 5G. The VIAVI JDMapCreator will help you download maps. Make sure the JDMapCreator application on your computer is connected to the instrument via LAN. You can send a map file with a single layer to the

instrument directly by using the **Send to EQP** menu in JDMapCreator. For more information on how to use the JDMapCreator, see the *JDMapCreator 2.0 User Guide*.

1 Plug in your USB flash drive that has a map file in `.mcf` file type created in JDMapCreator.

2 Tap the **Load** icon( ) on the side bar.

3 Navigate the map file you want to open.
The File Information pane displays the file properties including its name, size, type and date modified.

4 Tap the **Load** button on the screen.

Once you loaded the map, you can also control the map using the following icons on the map.

Icon	Description
	Tap to go to your current location on the map. Once tapped, the purple icon appears on the map indicating your current location.
	Tap to switch to the full screen map view.
	Tap to zoom in the map.
	Tap to zoom out the map.
	Tap and select the area where you want to expand.

Setting measure setup

Before starting the Route Map measurement, you need to set Spectrum measurements displayed on the quick access and display tab. See "Configuring Spectrum Measurements" for more details.

1 If required, connect a GPS receiver to your CellAdvisor 5G for outdoor mapping. Indoor mapping does not necessarily need a GPS antenna.

2 Tap the **Setup** ( ) icon on the side bar.

3 Tap to switch the **Plot Point** to **GPS**, **Position** or **Time**.

   a To collect data/plot points automatically as you move around in a vehicle or outside (outdoor), select **GPS** and then tap to switch to the **Screen Mode** between **Map** and **Full**.
   With the **Map** setting, you can view only the collected points that can be seen within the boundary of the loaded map. With the **Full** setting, you can view all the collected points of the route without the loaded map.

   b To collect data/plot points manually in indoor layout without a GPS antenna, select **Position**.

   c To collect data/plot points based on time, select **Time**.

3 Tap to switch **Plot Item** to **RSSI** or **ACP**.

4 *Optional.* If **ACP** is selected, set the **Main Channel BW** and **Offset Limit**.

   a Tap **Main Channel BW** and input a value using the on-screen keyboard.

   b Tap **Offset Limit** and tap to switch the Offset to **On** to display or **Off** to hide the offset.

   c Tap **Integration Bandwidth** and input a value using the on-screen keyboard.

   d Tap **Offset Frequency** and input a value using the on-screen keyboard.

   e Tap **Offset Limit** and input a value using the on-screen keyboard.

5 Tap the **Start** button ( ) on the right panel of the map to start plotting for the Position or Time setting.
Touch directly on the screen and tap to collect data and plot points on the loaded map. For the Position setting, you can change the direction of the route with screen touch. For the Time setting, when you first touch screen a purple triangle appears on the point and the "Number of n" appears in the bottom left of the map. The instrument interpolates points in between two enters on a straight dotted line. The max count is 2560, and the time interval is 0.5 s.

6 Tap the **Pause** button ( ) to pause plotting, then the **Pause** button changes to ( ) and GPS cannot be plotted.

7 Tap to switch **Plot** to **Stop** to stop plotting.

8 Tap **Menu** > **Sweep** > **Gated Sweep** to set the Gated Sweep **On** or **Off**. This function needs License S015.

9 If you start test and select **Setup** > **Plot Point** > **position**, you can undo by tapping the **Start** button.

10 If you select **Stop** button, **Plot Stop** popup window appears.

	NOTE: The number of Cell site Count has been increased to max.1000. The instrument does not automatically save the collected data. It is recommended that you save the result. Otherwise, you will lose all the collected data.

Setting limit

You can set the thresholds for the four different color indicators.

1 Tap **Menu** > **Limit**.

2 Tap **Excellent** and set a value using the on-screen keyboard.

3 Tap **Very Good** and set a value using the on-screen keyboard.

4 Tap **Good** and set a value using the on-screen keyboard.

5 Tap **Poor** and set a value using the on-screen keyboard.

Route map with spectrum analyzer

Using Interference Analyzer

Introduction

Interference is becoming more prevalent in the wireless community with the increasing number of transmitters coming on the air. Wireless service providers have traditionally used spectrum analyzers to monitor service channels, frequencies, and adjacent spectrum and to locate sources of interference. A spectrum analyzer can only show you an interfering signal and you require determining the source of the interference. To solve interference problems, you must understand the RF environment, know adjacent operating transmitters, and identify any new or unlicensed emitters.

Once a potential interfering signal is identified in the Spectrum Analyzer mode, you can monitor the signal further in the Interference Analyzer mode. CellAdvisor 5G provides two different methodologies to identify and determine interference signals: Spectrogram and Received Signal Strength Indicator (RSSI). Locating the source of interference signal can be done with geographical information received from the built-in GPS receiver.

The CellAdvisor 5G is extremely effective for locating and identifying periodic or intermittent RF interference. Interference signals derive from several kinds of licensed or unlicensed transmitters that cause dropped calls and poor service quality.

The CellAdvisor 5G provides following measurements for interference analysis with frequency extension up to 18.5 GHz in addition to existing 24 GHz to 40 GHz:

- Spectrum Analysis
  - Spectrum
  - Spectrogram
- Interference Analysis
  - RSSI (Received Signal Strength Indicator)
  - Interference Finder
  - Radar Chart
- Utility
  - Spectrum Replayer
  - PIM Detection Single Carrier
  - PIM Detection Multi Carrier

Using a set of the AntennaAdvisor Handle that holds a broadband directional antenna is mandatory in the Rader Chart mode and its built-in compass, GPS antenna, gyro sensor, and low-noise amplifier (LNA) benefits you to determine the direction of the interference.

Selecting mode and measure

To start measurement, do the following steps:

1 Tap **Interference Analyzer** on the **MODE** panel.

2 Tap any measurement mode from the following choices:

Spectrum Analysis > **Spectrum** or **Spectrogram**

Interference Analysis > **RSSI**, **Interference Finder** or **Radar Chart**

Utility > **Spectrum Replayer**, **PIM Detection Single Carrier** or **PIM Detection Multi Carrier**

NOTE:

You can choose **RF Source On** or **Off** in setup menu after tap to **CAA RF Power On** if you have **RF Source** option in your CAA(Cable and Antenna Analyzer).

Conducting spectrum measurements

Spectrum

Most spectrum measurements of the interference analyzer are also available in Spectrum mode. Using these measurements allow you to locate interferences in the frequency spectrum. You can configure the measurements just as in Spectrum mode. For more information see "Configuring spectrum measurements".

The spectrum measurement with an audible indicator is especially useful for locating interferer sources with a directional antenna.

Setting measure setup for sound indicator

1 Tap the **Setup** ( ) icon on the side bar.

2 Tap **Sound Indicator**.

a Tap to switch the **Sound** between **On** and **Off** to enable and disable the alarm sound.

b Tap to switch the **Alarm Reference** to **Marker** to set the active marker position as the alarm reference.

c Tap to switch the **Alarm Reference** to **Line** to set the limit as the alarm reference. The Reference Line Mode menu becomes activated to be set.

d Select **Reference Line** to specify a threshold for the reference line using the on-screen keyboard.

e *Optional.* To adjust the volume for alarm sound, tap **Volume** and input from 1 to 10 using the on-screen keyboard.

Setting measure setup for Interference ID

The Interference ID automatically classifies interfering signals over a designated spectrum and displays the list of possible signal types corresponding to the selected signal.

1 Tap the **Setup** ( ) icon on the side bar.

2 Tap **Interference ID**.

a Tap to switch the **Interference ID** between **On** and **Off** to turn the Interference ID on and off.

b Tap **Threshold** and input a value using the on-screen keyboard.

NOTE:

You can go to **Menu** > **Limit** to analyze your measurements with the display line, multi-segment line, and channel limit table. See “Setting limit" for details.

Spectrogram

The Spectrogram is particularly useful when attempting to identify periodic or intermittent signals as it captures spectrum activity over time and uses various colors to differentiate spectrum power levels. When the directional antenna is used to receive the signal, you will see a change in the amplitude of the tracked signal as you change the direction of the antenna and see a change in the Spectrogram colors. The source of the signal is located in the direction that results in the highest signal strength.

Setting measure setup

After configuring spectrum measurement in "Configuring Spectrum Measurements", you can set the measure setup to continue your measurement.

1 Tap the **Setup** ( ) icon on the side bar.

2 Tap **Time Interval** to set the amount of time between each trace measurement using the on-screen keyboard.

3 Tap **Time Cursor** to **On** to set the time cursor on a specific trace position.
The Position menu becomes activated to be set. You can also move the time cursor up and down using the move bar on the left edge.

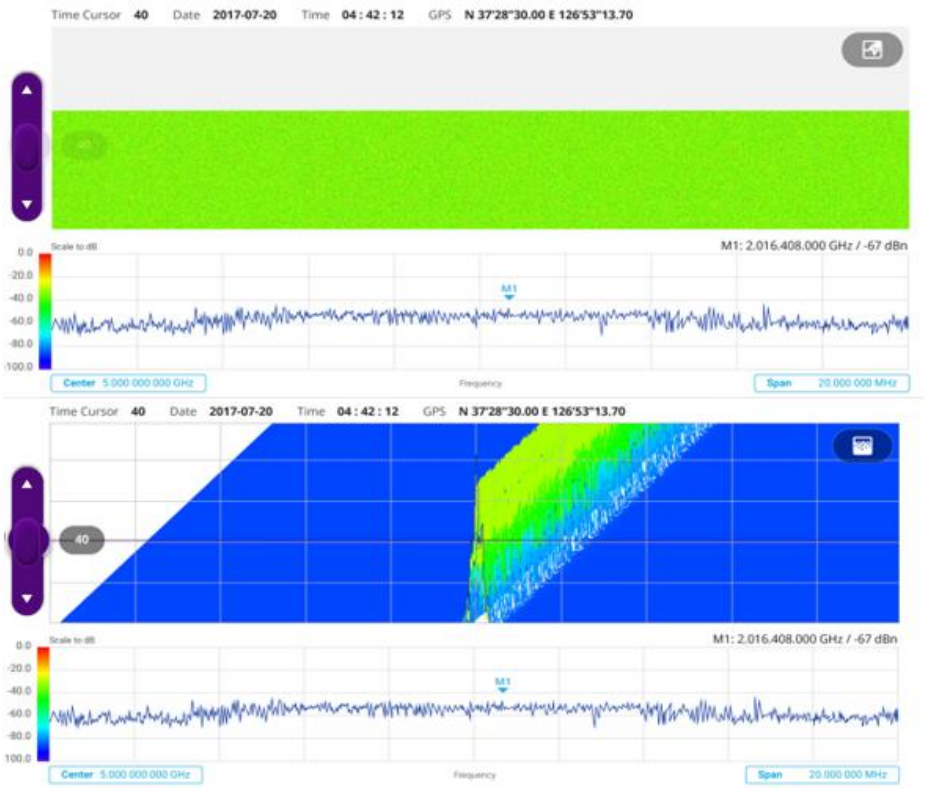
4 Tap **Position** to move the time cursor by inputting a value using the on-screen keyboard.

5 Tap **Type** to switch the chart view type **3D Display** or **Normal**.
You can also change the cart view type using the icon on the chart screen.

6 Tap **Reset/Restart** to start a new measurement.

	NOTE: Enabling the time cursor puts the measurement on hold and you can make postprocessing analysis for each measurement over time using the time cursor.

Interference measurement in spectrogram



The Spectrogram shows a vertical line on the chart when the marker is enabled on the screen. The first figure shows Normal chart view, and the second figure below shows Waterfall (3D display) chart view.

- The horizontal line or X-axis of the spectrogram indicates frequency.
- The vertical line or Y-axis indicates time.
- The color identification (Spectrogram) indicates power level of the tracked signal. As the signal strength increases, the color on the spectrogram changes accordingly.

- Once you set the reference line to On, the purple move bar becomes activated and the green line appears. You can set the reference line moving it up or down in the spectrum chart below spectrogram chart.

- You can set the GPS by selecting Frequency Reference as GPS in System Settings ( ) page.

Conducting interference measurements

RSSI

The Received Signal Strength Indicator (RSSI) is a multi-signal tracking metric that is particularly useful for measuring power-level variations over time. The RSSI measurement lets you assign power limit line for audible alarms and increase alarm counters every time a signal exceeds a defined limit line. For long-term analysis, the spectrogram and RSSI measurements can be automatically saved into an external USB memory.

Setting measure setup

After configuring spectrum measurement in "Configuring Spectrum Measurements", you can set the measure setup to continue your measurement.

1 Tap the **Setup** ( ) icon on the side bar.

2 Tap **Alarm** to set the alarm parameters.

3 Tap **Alarm at** and select the marker number from Marker 1 to Marker 6.

4 Tap **Reference Line** to set a threshold for the alarm and input a value using the on-screen keyboard.

5 Tap to switch **Alarm** to **On** or **Off** to turn the alarm feature on or off.

6 *Optional.* Tap **Volume** to adjust the volume from 1 to 10 using the on-screen keyboard.

	NOTE: You must set the marker(s) for the alarm as this feature use the marker position to sound alarm. See “Using marker” for more details.

Interference measurement in RSSI

You can go to Menu > Limit to analyze your measurements with the display line, multi-segment line, and channel limit. See "Setting limit" for more details. Once you tap the vertical move bar and move it up and down, the reference line value changes.

Interference finder

The Interference Finder is an automatic triangulation algorithm that uses GPS coordinates to locate possible interference sources based on three measurements. The interference finder calculates possible interference locations using its inscribed circle or circumscribed circle based on measured intersection points. You can plot up to seven measurement points and select three that are more representative for triangulation. CellAdvisor 5G automatically logs measurement positions not to lose them while changing measurement modes. You can switch the main screen from spectrum view to map view and vice versa using the icon, ( ) on the spectrum view screen. Before starting the Interference Finder, you need to set Spectrum measurements. See "Configuring Spectrum Measurements" for more details.

To make full use of the functions available in the map mode, you will need a GPS receiver and an antenna. For more details, see the Antenna connection below.

Antenna connection

Before starting the measurement, you need to connect the Omni or Log periodic antenna to your instrument. In the Interference Finder mode and the Radar Chart mode, you can perform interference hunting using the optional Antenna Advisor Handle after attaching a broadband directional antenna to it. The handle is a device that has a built-in GPS antenna and LNA. The following are examples of the antenna connection.

1 Mount a broadband antenna to your AntennaAdvisor Handle.

2 Connect the **RF Type-N jack** of the handle to the **RF In port** of the instrument.

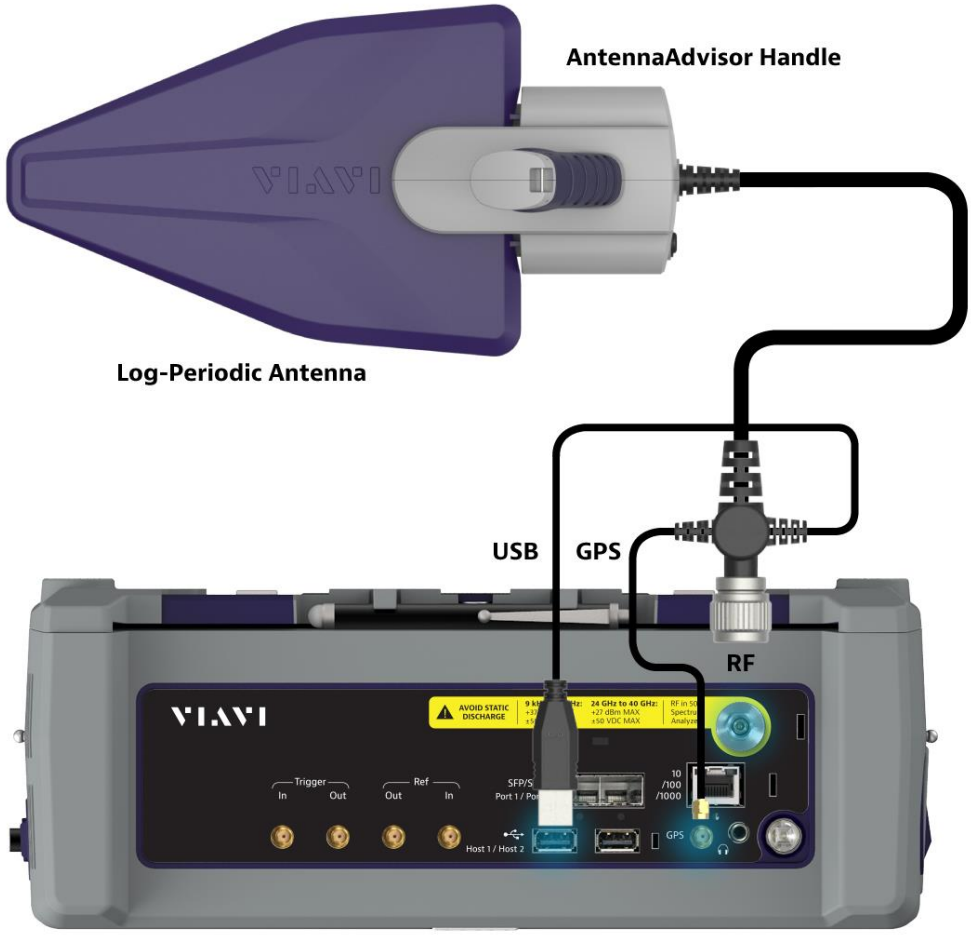
3 Connect the **GPS SMA jack** of the handle to the **GPS port** of the instrument.
The GPS status indicator appears on the instrument screen.

4 Connect the **USB plug** of the handle to the **USB Host port** of the instrument.
The device icon appears in the system status bar on the screen.

NOTE:

The AntennaAdvisor Handle is an optional item. It is recommended that you use a log periodic antenna with AntennaAdivsor handle to search more exact directional information. You can use a log periodic antenna or Omni antenna alone as well.

Antenna connection example



Loading a map

To use any features related to maps, you need to download and install the maps on the CellAdvisor 5G. The VIAVI JDMapCreator will help you download maps. Make sure the JDMapCreator application on your computer is connected to the instrument via LAN. You can send a map file with a single layer to the instrument directly by using the **Send to EQP** menu in JDMapCreator. For more information on how to use the JDMapCreator, see the *JDMapCreator 2.0 User Guide*.

1 Plug in your USB flash drive that has a map file in `.mcf` file type created in JDMapCreator.

2 Tap the **Load** icon( ) on the side bar.

3 Navigate the map file you want to open.
The File Information pane displays the file properties including its name, size, type and date modified.

4 Tap the **Load** button on the screen.

Once you loaded the map, you can also control the map using the following icons on the map.

Icon	Description
	Tap to go to your current location on the map. Once tapped, the purple icon appears on the map indicating your current location.
	Tap to switch to the full screen map view.
	Tap to zoom in the map.
	Tap to zoom out the map.
	Tap and select the area where you want to expand.

Initializing AntennaAdvisor

Once you have connected the AntennaAdvisor Handle to your instrument, antenna initialization is required to get the right azimuth data. You need to initialize the antenna handle to calibrate the built-in compass by completing the following steps. Note that the you can adjust Bandwidth based on the center frequency of the interfering signal that you have identified in the Spectrum view by tapping the **Setup** > **Bandwidth**. A message appears at the bottom of the screen to alert you if you have not performed initialization of your connected the antenna handle set.

1 Hold your antenna handle horizontally in its upright position.
To avoid unnecessary impact of external magnetic field, position yourself at the location where the value of magnetic field strength displayed on the instrument is green.

2 Point the antenna to the north and tap the **Setup** > **Initialize AntennaAdvisor**.
The message disappears and the red line for the current antenna direction moves to the 0-degree line and overlaps to let you know that the initialization is done successfully.

Setting geographic location

A point is a particular location that contains information about that location. This information includes, for example, GPS coordinates, the time of the measurement or level that has been measured. You can evaluate the Point information directly onsite or save the information for later evaluation.

With this functionality, you can mark locations where you have performed a measurement. Thus, you can analyze the geographical distribution of the received signal strength. This allows you to analyze, for example, the coverage conditions around a base station's coverage area.

In the map view, a point is displayed as a dot with a number. The straight line represents the direction you are facing.

1 Tap the **Point 1**, **Point 2** and **Point 3** on the map.
Make sure to set three location points so that the straight lines started from the point and can create three intersections.

2 Tap each point and use the **Degree** bar or button to change degrees.
Make sure to set three location points so that the straight lines started from the point and can create three intersections.

3 Tap the **GPS** icon on the side panel to automatically get the selected point's location information.
The instrument displays the latitude and longitude information of the signal received by either the GPS antenna or AntennaAdvisor Handle. This function is only available when the GPS antenna is connected.

4 Tap the **Latitude** and **Longitude** icon and enter the value using the on-screen keyboard to manually define a position.
The values should be input based on the Decimal Degrees.

5 Tap the **Apply** button.

Setting azimuth

Method 1: You can use the AntennaAdvisor Handle. Make sure to initialize AntennaAdvisor first to get more accurate directional information.

1 Press and hold the **TRIGGER** button on the handle and pan the antenna handle to scan through until you find the strongest RSSI value.
RSSI, polarization, elevation and azimuth readings are continuously updated on the screen while pressing the physical button.

2 Release the **TRIGGER** button to stop scanning.

Method 2: You can use the **Degree bar** (functions as a compass) by moving it right and left.

1 Tap the circle on the Degree bar and move it gently until you get the right azimuth.

M**ethod 3**: You can use the log-periodic antenna.

1 Pan your log-periodic antenna to find a signal with the highest RSSI value and measure an azimuth of the interfering signal.

NOTE:

The AntennaAdvisor Handle has a built-in low-noise amplifier (LNA) and you can turn it on and off using the physical On/Off button located on the rear side of the handle unit. For example, if the received signal is weak, you can turn on the switch to improve S/N.

Save position

1 To save the defined position, tap any point on the map where you want to save the position information.

2 Tap the **Save Position** icon on the side panel.
The instrument stores the saved location points in the internal memory so that you can load them by using the **Load Position** icon on the side panel. You can save and load up to 10 positions.

Setting display mode

When the triangulation is done with three location points and azimuth for each point, you can view a circumscribed circle by default. You can change the display mode to inscribed circle or double circles to view a narrower area. The center of the green-shaded circle is determined to be where the source of the interfering signal resides.

1 Tap **Measure Setup** > **Display**.

2 Select the option from the following choices.

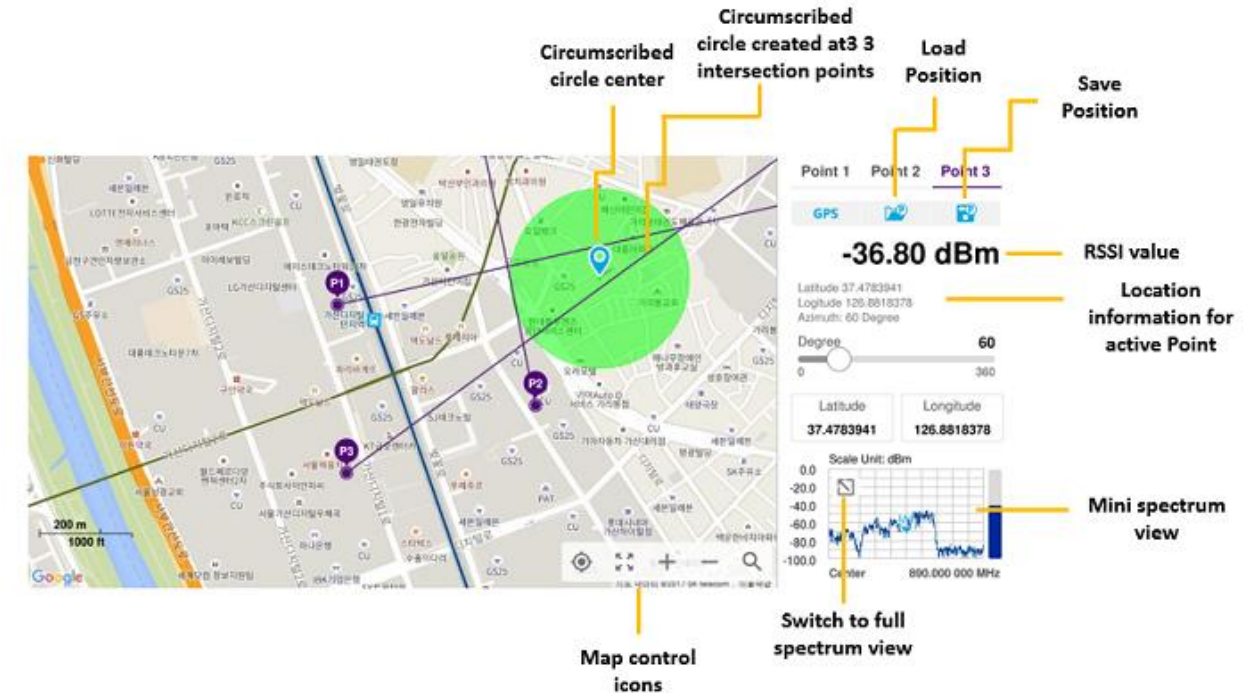
- **a** **Circum**: displays a circumscribed circle that meets three vertices of the triangle.
- **b** **Inscribed**: displays an inscribed circle that meets the three sides of the triangle.
- **c** **Double**: displays both circumscribed and inscribed circles.

3 Tap **Measure Setup** > **Screen Mode**.

4 Tap the **Screen Mode** to select **Map** or **Full**.

- **a** **Map**: This option displays what are inside the base map with the map image.
- **b** **Full**: This option displays three location points and defined circle without the map image.

Interference finder measurement in map view



Radar chart

If you have identified an interfering signal on your spectrum view, you can move to the Radar Chart mode and measure RSSI power level through 360 degrees at a location received by the connected broadband directional antenna so that you can determine the direction of the source of the interference. Using a set of the AntennaAdvisor Handle that holds a broadband directional antenna is mandatory in the Radar Chart mode and its built-in compass, GPS antenna, and a built-in low-noise amplifier (LNA) benefits you to determine the direction of the interference. You can switch the main screen from spectrum view to map view and vice versa using the icon, ( ) on the spectrum view screen.Before starting the Interference Finder, you need to set Spectrum measurements. See "Configuring Spectrum Measurements" for more details.

For antenna connection, see antenna connection in "Interference finder"

Loading a map

To use any features related to maps, you need to download and install the maps on the CellAdvisor 5G. The VIAVI JDMapCreator will help you download maps. Make sure the JDMapCreator application on your computer is connected to the instrument via LAN. You can send a map file with a single layer to the instrument directly by using the **Send to EQP** menu in JDMapCreator. For more information on how to use the JDMapCreator, see the *JDMapCreator 2.0 User Guide*.

1 Plug in your USB flash drive that has a map file in `.mcf` file type created in JDMapCreator.

2 Tap the **Load** icon( ) on the side bar.

3 Navigate the map file you want to open.
The File Information pane displays the file properties including its name, size, type and date modified.

4 Tap the **Load** button on the screen.

Once you loaded the map, you can also control the map using the following icons on the map.

Icon	Description
	Tap to go to your current location on the map. Once tapped, the purple icon appears on the map indicating your current location.
	Tap to switch to the full screen map view.
	Tap to zoom in the map.
	Tap to zoom out the map.
	Tap and select the area where you want to expand.

Initializing AntennaAdvisor

Once you have connected the AntennaAdvisor Handle to your instrument, antenna initialization is required to get the right azimuth data. You need to initialize the antenna handle to calibrate the built-in compass by completing the following steps. Note that the you can adjust Bandwidth based on the center frequency of the interfering signal that you have identified in the Spectrum view by tapping the **Setup** > **Bandwidth**. A message appears at the bottom of the screen to alert you if you have not performed initialization of your connected the antenna handle set.

1 Hold your antenna handle horizontally in its upright position.
To avoid unnecessary impact of external magnetic field, position yourself at the location where the value of magnetic field strength displayed on the instrument is green.

2 Point the antenna to the north and tap the **Setup** > **Initialize AntennaAdvisor**.
The message disappears and the red line for the current antenna direction moves to the 0-degree line and overlaps to let you know that the initialization is done successfully.

	NOTE: It is recommended that you re-initialize the AntennaAdvisor Handle after measurements to

	re-calibrate the compass when you notice that the red line on the radar chart is not aligned with the north on the map even though you are pointing the antenna to the north.

Obtaining RSSI data

Once you have connected your antenna handle set and done necessary setups, you can monitor the power level of the received signal, the amount of polarization, and elevation level real time. Using the Trigger button on the antenna handle set, you can plot the RSSI level through 360 degrees at your location.

1 When you have the green GPS indicator, Tap the **GPS** icon on the side panel to set your current location to the center of the radar chart. The latitude and longitude information at the side of the display changes from 'Unknown Position' to the obtained position information.

2 Tap the **Save Position** icon on the side panel to save a position to recall for triangulation in the **Interference Finder** mode and select one that you want to save.

3 Monitor the RSSI reading of the received signal. If the signal is weak, turn on the LNA switch on the antenna handle set to improve S/N.

4 The message disappears and the red line for the current antenna direction moves to the 0-degree line and overlaps to let you know that the initialization is done successfully.

	NOTE: The AntennaAdvisor Handle has a built-in low-noise amplifier (LNA) and you can turn it on and off by toggling the physical On/Off switch located on the rear side of the handle unit.

5 Hold the antenna handle set horizontally and then make the following measurement

6 The message disappears and the red line for the current antenna direction moves to the 0-degree line and overlaps to let you know that the initialization is done successfully.

To obtain a RSSI value, complete the following steps:

a Press the **TRIGGER** button located on the antenna handle.
Every time you press the physical button on the handle, a beep is sounded and a power level of the received signal is plotted as a blue dot on the radar chart. Depending on the strength of the measured value, you may hear different tones of beeping.

b With panning the antenna horizontally to vary the angle of the direction, repeat pressing the **TRIGGER** button to obtain at least five points if you want to do the localization.

To obtain RSSI values continuously, complete the following steps:

a Press and hold the **TRIGGER** button located on the antenna handle to start a continuous measurement.

b Pan the antenna handle horizontally through the angle of 360 degrees you desire. A beep is sounded repeatedly to let you know that the measurement is continuing and measured values are plotted on the radar chart.

c Release the **TRIGGER** button to stop the continuous measurement.

	NOTE: The maximum number you can plot on the radar chart is 2500 points both in the single and continuous measurements. If your measurement reached to 500 points, you need to reset the measurement by pressing the Localization soft key twice or performing the initialization of the AntennaAdvisor Handle. Concentric circles indicate different levels of RSSI. You can use the AMP/SCALE hard to adjust the amplitude scale of the chart.

7 Tap **Setup** > **Screen Mode Full/Map** to change the display mode.

a **Map**: It displays measured points inside the base map image. If you are in the area outside the base map and continue your measurement with the Trigger button, the instrument continue obtaining data even though the radar chart disappears from the screen. You can view obtained data when you change this display option to Full.

b **Full**: It displays measured points without the base map image. In case that you made measurements in the area outside the map image, selecting this option moves your measured data to the center of the display so that you can view the result.

Localizing RSSI data

The Localization feature lets you view averaged and smoothed measurement data with a bold green line on the radar chart that helps you determine the direction of the highest RSSI value. When you have five or more data points plotted on the radar chart, you can perform this localization.

1 Tap the **Setup** ( ) icon on the side bar.

2 Tap **Localization**.
All the measured points turn to green color and you can view the bold green line that indicates the possible direction of the interference source.

3 Tap Localization again to clear all the data plots on the radar chart.

Radar chart

Radar chart localized

Utility

Spectrum Replayer

The Spectrum Replayer lets you retrieve and replay recorded spectrum analyzer traces in interference analysis mode. These traces can be played back in the spectrogram or RSSI. You can configure the limit

line to create failure points when signals exceed it. The failure points are clearly displayed on the trace timeline for quick access during playback.

Setting measure setup

1 Tap the **Setup** ( ) icon on the side bar.

2 Tap **Spectrum Replayer**.
The File Manager window appears.

3 Select the file to be loaded and press the **Load** button.
The replay bar appears at the bottom of the screen. The green color indicates Pass and the red color indicates Fail.

4 Tap the replay direction icon between **FWD** and **REV** to change play direction to forward or reverse.

5 Tap the right and left button to change the speed from the options: **x1**, **x2**, **x3**, and **x4**.

6 Toggle the **Play** button to start playing.

7 Toggle the **Pause** button to pause or stop playing.

8 Tap **Fail** to move to a particular failure position directly and play from there.
The Frame Fail Count in the middle of bar changes.

9 Tap the Frame Fail Count to change the value using the on-screen keyboard. Once tapped, replaying stopped. If you change the value, it jumps to the corresponding index.
You can also change the value by tapping right and left button.

10 Tap to change display mode to **Spectrum**, **Spectogram**, or **RSSI**.
3D display (Waterfall) is not supported in case of spectrum logging.

11 *Optional.* Tap to switch Time Cursor to On or Off to display or hide the time cursor on the screen. This key becomes activated when you play logged data in the Spectrogram mode.

NOTE:

If you connected a USB drive, do not remove it while playing. Doing so may freeze the USB port, which will require you to restart the instrument to get a USB drive recognized again.

PIM detection single carrier

The Passive Intermodulation (PIM) Detection allows you to detect Uplink PIM across the full spectrum for any technology. When PIM is detected, the normal repair mode is to replace the offending cable and what you need to do is replacing the whole cable irrespective of the location of the fault. The following is a measurement for PIM detection single carrier.

Making a measurement

1 Connect cables as instructed on the screen.

2 *Optional.* To check any possibility of PIM existence in red color by calculation, complete the following steps:

   a Tap **Calculated PIM**.

   b Check the Radio 1 Band and its information in the table.

   c Tap **Channel Standard** and select **Technology** and **Band**.

   d Tap the **Apply** button.

   e Tap the **X** button to return to previous screen.

3 Tap **Uplink Center Frequency** and input a value using the on-screen keyboard.

4 Tap **Uplink Span** and input a value using the on-screen keyboard.

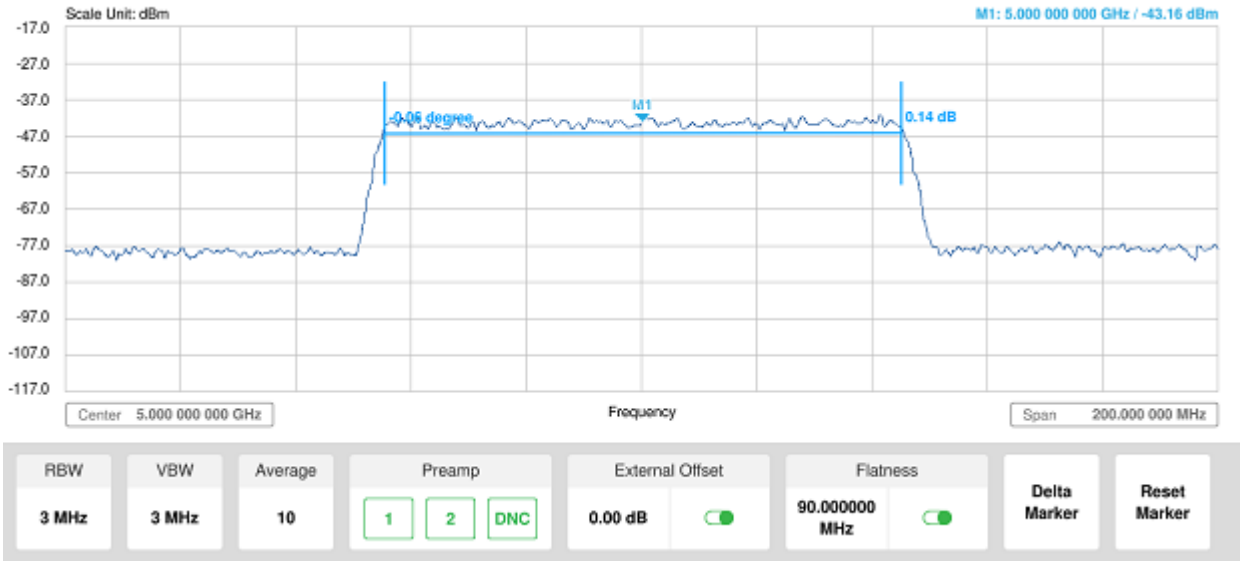
5 Tap **Channel Standard,** select **Technology** and **Band**, and then the **Apply** button.

6 Tap **Channel Number** and input a value using the on-screen keyboard.

7 Tap the **Continue** button on the right edge to continue.

8 Set the parameters appeared on the table below the chart screen as needed.

PIM detection single carrier



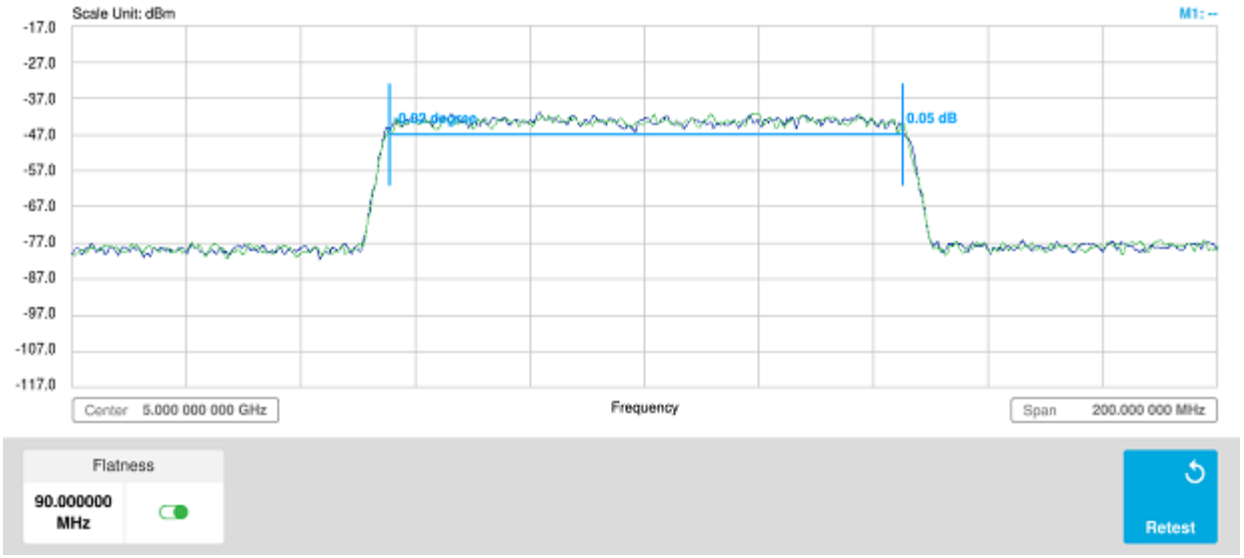
PIM detection multi-carrier

TThe Passive Intermodulation (PIM) Detection allows you to detect Uplink PIM across the full spectrum for any technology. When PIM is detected, the normal repair mode is to replace the offending cable and what you need to do is replacing the whole cable irrespective of the location of the fault. The following is a measurement for PIM detection multi carrier.

Making a measurement

1. Connect cables as instructed on the screen.
2. *Optional.* To check any possibility of PIM existence in red color by calculation, complete the following steps:
   - **a** Tap **Calculated PIM**.
   - **b** Check the Radio 2 Band and its information in the table.
   - **c** Tap to switch **Mode** to **Band** or **Frequency**.
   - **d** If **Band** is selected, tap **Radio 1 Band** and select the technology and band from the channel standard list, and do the same for **Radio 2 Band**.
   - **e** If **Frequency** is selected, tap **Radio 1 Frequency** and select the technology and band from the channel standard list, and do the same for **Radio 2 Frequency**.
   - **f** Tap the **X** button to return to previous screen.
3. Tap **Uplink Center Frequency** and input a value using the on-screen keyboard.
4. Tap **Uplink Span** and input a value using the on-screen keyboard.
5. Tap **Channel Standard,** select **Technology** and **Band**, and then the **Apply** button.
6. Tap **Channel Number** and input a value using the on-screen keyboard.
7. Tap the **Continue Step2/4** button on the right edge to continue.
8. Set the parameters appeared on the table below the chart screen as needed.
9. Tap the **Continue Step3/4** button on the right edge to continue.
10. Follow the instruction on the screen and tap the **Continue Step4/4** button on the right edge to continue.
11. Tap to enable **Flatness** on.

PIM detection multi carrier


Scale Unit: dBm
M1: --
-17.0
-27.0
-37.0
-47.0
-57.0
-67.0
-77.0
-87.0
-97.0
-107.0
-117.0
0.05 dB
Center 5.000 000 000 GHz
Frequency
Span 200.000 000 MHz
Flatness
90.000000 MHz
Retest

Using Real-time Spectrum Analyzer

Introduction

Real-time Spectrum Analysis (RTSA) is a new method that leverages overlapping FFTs and high-speed memory to have a 100% probability of intercept (POI) in even extremely dense environments. Real-time bandwidth, the maximum frequency span offering gap-free overlapping FFT processing, is an important variable factor of an RTSA that can enable more detailed analysis of a spectrum, based on the type of signal content under scrutiny.

The CellAdvisor 5G is the optimal solution to perform following measurements with frequency extension up to 18.5 GHz in addition to existing 24 GHz to 40 GHz:

- Spectrum Analysis
  - Persistent Spectrum
  - Persistent Spectrogram
- Interference Analysis
  - Persistent RSSI
  - Persistent Interference Finder
  - Persistent Radar Chart
- Utility
  - Real-time Spectrum Replayer

Selecting mode and measure

To start measurement, do the following steps:

1 Tap **Real-time Spectrum Analyzer** on the **MODE** panel.

2 Tap any measurement mode from the following choices:

Spectrum Analysis > **Persistent Spectrum** or **Persistent Spectrogram**

Interference Analysis > **Persistent RSSI**, **Persistent Interference Finder** or **Persistent Radar Chart**

Utility > **Real-time Spectrum Replayer**

	NOTE: You can choose **RF Source On** or **Off** in setup menu after tap to **CAA RF Power On** if you have **RF Source** option in your CAA(Cable and Antenna Analyzer).

Conducting spectrum measurements

Persistent spectrum

The persistent spectrum of a signal is a time-frequency view that shows the percentage of the time that a given frequency is present in a signal. It is a histogram in power-frequency space. The longer a particular frequency persists in a signal as the signal evolves, the higher its time percentage and thus the brighter or hotter its color in the display. The persistent spectrum is used to identify signals hidden in other signals.

Setting measure setup for Sound Indicator

If you have configured test parameters as described in the "Configuring Spectrum Measurements", continue to set measure setup. You can simply change Center Frequency and Span by tapping the icons right below the result chart screen.

1 Tap the **Setup** ( ) icon on the side bar.

2 Tap **Sound Indicator**.

- **a** Tap to switch the **Sound** between **On** and **Off** to enable and disable the alarm sound.
- **b** Tap to switch the **Alarm Reference** to **Marker** to set the active marker position as the alarm reference.
- **c** Tap to switch the **Alarm Reference** to **Line** to set the limit as the alarm reference.
  The Reference Line Mode menu becomes activated to be set.
- **d** Select **Reference Line** to specify a threshold for the reference line using the on-screen keyboard.
- **e** *Optional.* To adjust the volume for alarm sound, tap **Volume** and input from 1 to 10 using the on-screen keyboard.

Setting measure setup for Interference ID

The Interference ID automatically classifies interfering signals over a designated spectrum and displays the list of possible signal types corresponding to the selected signal.

1 Tap the **Setup** ( ) icon on the side bar.

2 Tap **Interference ID**.

   a Tap to switch the **Interference ID** between **On** and **Off** to turn the Interference ID on and off.

   b Tap **Threshold** and input a value using the on-screen keyboard.

Setting Heatmap marker

1 Tap **Menu** > **Marker**.
The marker setting table appears.

2 Tap **Heatmap**.
The vertical bar and horizontal bar appear. A heatmap marker shows the hit rate of X-axis (amplitude) and Y-axis whereas a normal trace marker shows a value of the x-axis.

3 Tap the chart screen to move the heatmap marker or move the vertical bar and horizontal bar.

NOTE:

If you select the heatmap marker, you can only use Peak Search and Always Peak options. Delta pair is not available as well. See "Using maker" for more details.

Setting bitmap

1 Tap **Menu** > **Bitmap**.

2 Tap **Dot Persistence Time** and input a value using the on-screen keyboard.
The dot persistence time means the time that accumulates heatmap data.

3 Tap to switch **Bitmap Scale** to **On** to enable auto scale or **Off** to disable auto scale.
If the Bitmap Scale is On, the point where the maximum hit represents maximum colors, if the Bitmap Scale is Off, the bluer color (closer to 0% of the color bar) is mapped with hit.

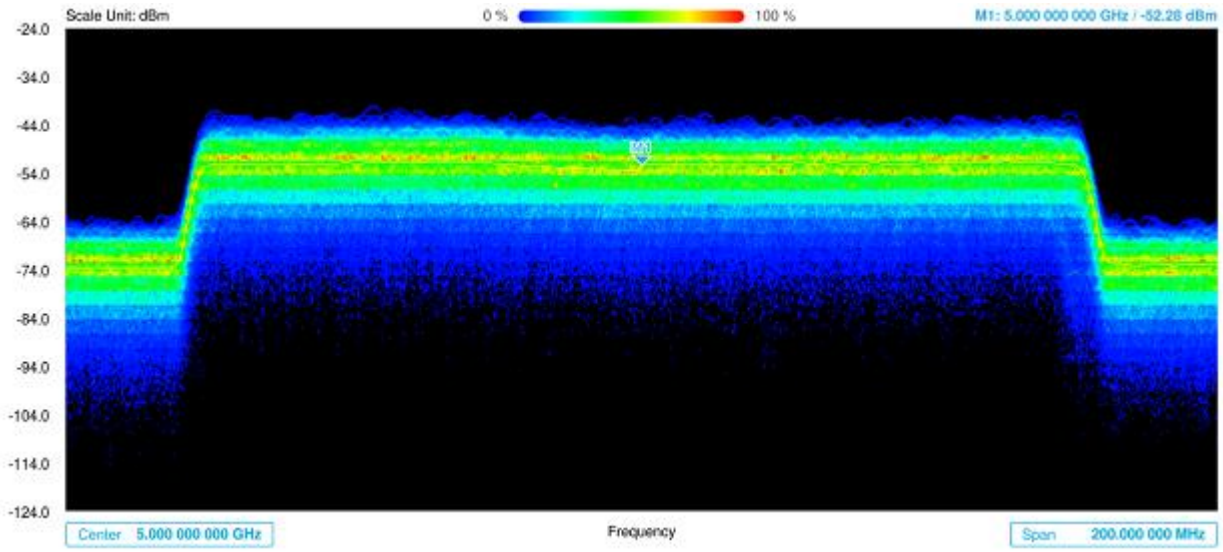
4 Tap **Bitmap Min** and input % value using the on-screen keyboard.
The Bitmap Min represents unused bitmap color range. If you set it to 10%, the color matched with 10% or below does not show.

5 Tap **Bitmap Max** and input % value using the on-screen keyboard.
The Bitmap Max represents max range of bitmap colors to be used. If you set it to 90%, the color that exceeds 90% does not show.

6 Tap **Hit Min** and input % value using the on-screen keyboard.
The Hit Min represents the minimum number of hits not to be converted to colors. If you set it to 10%, the hit matched with 10% or below is not converted to colors.

7 Tap **Hit Max** and input % value using the on-screen keyboard.
The Hit Max represents the maximum number of hits to be converted to colors. If you set it to 90%, the hit matched with 90% or above shows with max colors.

Persistent spectrum measurement



NOTE:

You can go to **Menu** > **Limit** to analyze your measurements with the reference line, multi-segment line, and channel limit table. See “Setting limit" for details.

Persistent spectrogram

The Persistent Spectrogram is particularly useful when attempting to identify periodic or intermittent signals as it captures spectrum activity over time and uses various colors to differentiate spectrum power levels. When the directional antenna is used to receive the signal, you will see a change in the amplitude of the tracked signal as you change the direction of the antenna and see a change in the Spectrogram colors. The source of the signal is located in the direction that results in the highest signal strength.

Setting measure setup

After configuring spectrum measurement in "Configuring Spectrum Measurements", you can set the measure setup to continue your measurement.

1 Tap the **Setup** ( ) icon on the side bar.

2 Tap **Time Interval** to set the amount of time between each trace measurement using the on-screen keyboard.

3 Tap **Time Cursor** to **On** to set the time cursor on a specific trace position.
The Position menu becomes activated to be set. You can also move the time cursor up and down using the move bar on the left edge.

4 Tap **Position** to move the time cursor by inputting a value using the on-screen keyboard.

5 Tap **Type** to switch the chart view type **3D Display** or **Normal**.
You can also change the cart view type using the icon on the chart screen.

6 Tap **Reset/Restart** to start a new measurement.

NOTE:

Enabling the time cursor puts the measurement on hold and you can make postprocessing analysis for each measurement over time using the time cursor.

Setting Heatmap marker

1 Tap **Menu** > **Marker**.
The marker setting table appears.

2 Tap **Heatmap**.
The vertical bar and horizontal bar appear. A heatmap marker shows the hit rate of X-axis (amplitude) and Y-axis whereas a normal trace marker shows a value of the x-axis.

3 Tap the chart screen to move the heatmap marker or move the vertical bar and horizontal bar.

NOTE:

If you select the heatmap marker, you can only use Peak Search and Always Peak options. Delta pair is not available as well. See "Using maker" for more details.

Setting bitmap

1 Tap **Menu** > **Bitmap**.

2 Tap **Dot Persistence Time** and input a value using the on-screen keyboard.
The dot persistence time means the time that accumulates heatmap data.

3 Tap to switch **Bitmap Scale** to **On** to enable auto scale or **Off** to disable auto scale.
If the Bitmap Scale is On, the point where the maximum hit represents maximum colors, if the Bitmap Scale is Off, the bluer color (closer to 0% of the color bar) is mapped with hit.

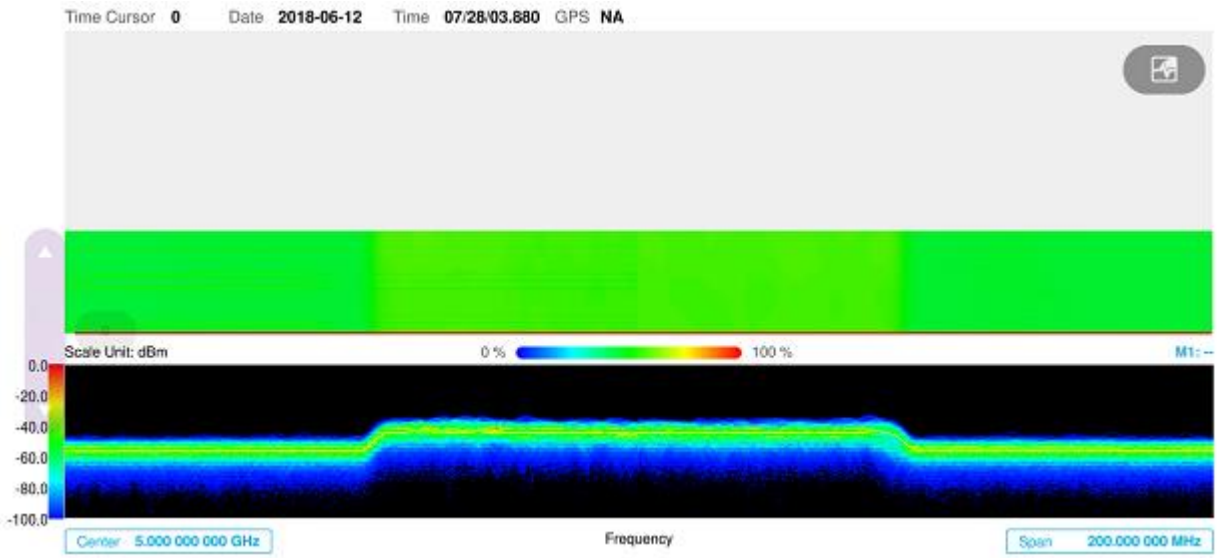
4 Tap **Bitmap Min** and input % value using the on-screen keyboard.
The Bitmap Min represents unused bitmap color range. If you set it to 10%, the color matched with 10% or below does not show.

5 Tap **Bitmap Max** and input % value using the on-screen keyboard.
The Bitmap Max represents max range of bitmap colors to be used. If you set it to 90%, the color that exceeds 90% does not show.

6 Tap **Hit Min** and input % value using the on-screen keyboard.
The Hit Min represents the minimum number of hits not to be converted to colors. If you set it to 10%, the hit matched with 10% or below is not converted to colors.

7 Tap **Hit Max** and input % value using the on-screen keyboard.
The Hit Max represents the maximum number of hits to be converted to colors. If you set it to 90%, the hit matched with 90% or above shows with max colors.

Persistent spectrogram measurement



NOTE:

You can go to **Menu** > **Limit** to analyze your measurements with the reference line, multi-segment line, and channel limit table. See “Setting limit" for details.

Conducting interference analysis

Persistent RSSI

The Received Signal Strength Indicator (RSSI) is a multi-signal tracking metric that is particularly useful for measuring power-level variations over time. The RSSI measurement lets you assign power limit line for audible alarms and increase alarm counters every time a signal exceeds a defined limit line. For long-term analysis, the spectrogram and RSSI measurements can be automatically saved into an external USB memory.

Setting measure setup

After configuring spectrum measurement in "Configuring Spectrum Measurements", you can set the measure setup to continue your measurement.

1 Tap the **Setup** ( ) icon on the side bar.

2 Tap **Alarm** to set the alarm parameters.

3 Tap **Alarm at** and select the marker number from Marker 1 to Marker 6.

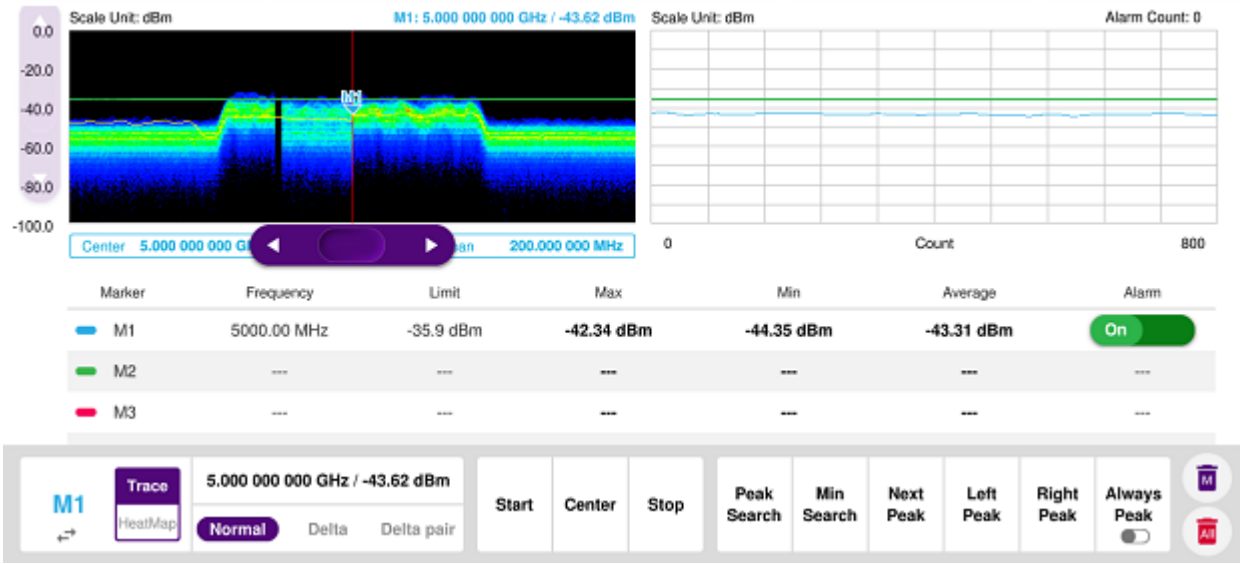
4 Tap **Reference Line** to set a threshold for the alarm and input a value using the on-screen keyboard.

5 Tap to switch **Alarm** to **On** or **Off** to turn the alarm feature on or off.

6 *Optional.* Tap **Volume** to adjust the volume from 1 to 10 using the on-screen keyboard.

> **NOTE:**
>
> You must set the marker(s) for the alarm as this feature use the marker position to sound alarm. See “Using marker” for more details.

Persistent RSSI measurement



You can go to Menu > Limit to analyze your measurements with the display line, multi-segment line, and channel limit. See "Setting limit" for more details. Once you tap the vertical move bar and move it up and down, the reference line value changes.

Persistent interference finder

The Persistent Interference Finder is an automatic triangulation algorithm that uses GPS coordinates to locate possible interference sources based on three measurements. The persistent interference finder calculates possible interference locations using its inscribed circle or circumscribed circle based on measured intersection points. You can plot up to seven measurement points and select three that are more representative for triangulation. CellAdvisor 5G automatically logs measurement positions not to lose them while changing measurement modes. You can switch the main screen from persistent spectrum view to map view and vice versa using the icon, ( ) on the persistent spectrum view screen. Before starting the Persistent Interference Finder, you need to configure spectrum measurements. See "Configuring Spectrum Measurements". Note that the purpose of the measurement is to monitor the intermittent and transient interfering signals.

To make full use of the feature available in the map mode, you will need a GPS receiver and an antenna. For more details, see the antenna connection below.

Antenna connection

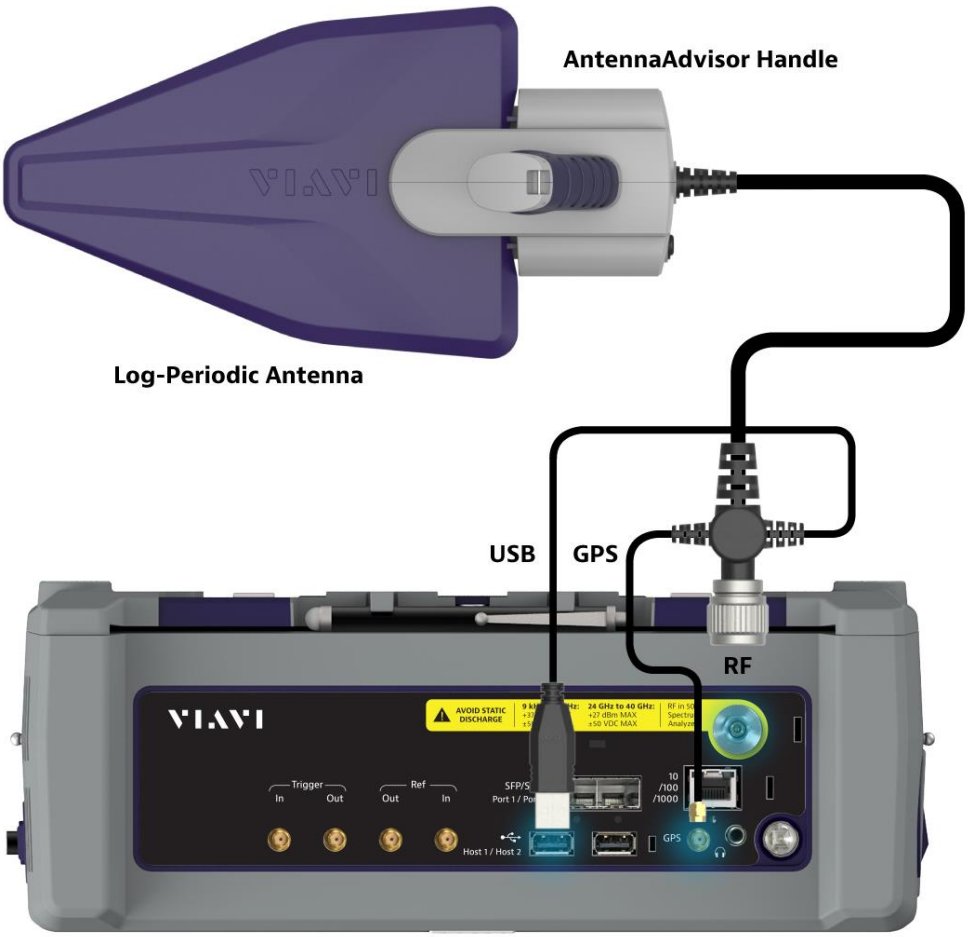
Before starting the measurement, you need to connect the Omni or Log periodic antenna to your instrument. In the Interference Finder mode and the Radar Chart mode, you can perform interference hunting using the optional Antenna Advisor Handle after attaching a broadband directional antenna to it. The handle is a device that has a built-in GPS antenna and LNA. The following are examples of the antenna connection.

1. Mount a broadband antenna to your AntennaAdvisor Handle.
2. Connect the **RF Type-N jack** of the handle to the **RF In port** of the instrument.
3. Connect the **GPS SMA jack** of the handle to the **GPS port** of the instrument.
   The GPS status indicator appears on the instrument screen.
4. Connect the **USB plug** of the handle to the **USB Host port** of the instrument.
   The device icon appears in the system status bar on the screen.

NOTE:

The AntennaAdvisor Handle is an optional item. It is recommended that you use a log periodic antenna with AntennaAdivsor handle to search more exact directional information. You can use a log periodic antenna or Omni antenna alone as well.

Antenna connection example



Loading a map

To use any features related to maps, you need to download and install the maps on the CellAdvisor 5G. The VIAVI JDMapCreator will help you download maps. Make sure the JDMapCreator application on your computer is connected to the instrument via LAN. You can send a map file with a single layer to the instrument directly by using the **Send to EQP** menu in JDMapCreator. For more information on how to use the JDMapCreator, see the *JDMapCreator 2.0 User Guide*.

1 Plug in your USB flash drive that has a map file in `.mcf` file type created in JDMapCreator.

2 Tap the **Load** icon ( ) on the side bar.

3 Navigate the map file you want to open.
The File Information pane displays the file properties including its name, size, type and date modified.

4 Tap the **Load** button on the screen.

Once you loaded the map, you can also control the map using the following icons on the map.

Icon	Description
	Tap to go to your current location on the map. Once tapped, the purple icon appears on the map indicating your current location.
	Tap to switch to the full screen map view.
	Tap to zoom in the map.
	Tap to zoom out the map.
	Tap and select the area where you want to expand.

Initializing AntennaAdvisor

Once you have connected the AntennaAdvisor Handle to your instrument, antenna initialization is required to get the right azimuth data. You need to initialize the antenna handle to calibrate the built-in compass by completing the following steps. Note that the you can adjust Bandwidth based on the center frequency of the interfering signal that you have identified in the Spectrum view by tapping the **Measure Setup** > **Bandwidth**. A message appears at the bottom of the screen to alert you if you have not performed initialization of your connected the antenna handle set.

1 Hold your antenna handle horizontally in its upright position.

2 Point the antenna to the north and tap the **Measure Setup** > **Initialize AntennaAdvisor**.

Setting geographic location

A point is a particular location that contains information about that location. This information includes, for example, GPS coordinates, the time of the measurement or level that has been measured. You can evaluate the Point information directly onsite or save the information for later evaluation.

With this functionality, you can mark locations where you have performed a measurement. Thus, you can analyze the geographical distribution of the received signal strength. This allows you to analyze, for example, the coverage conditions around a base station's coverage area.

In the map view, a point is displayed as a dot with a number. The straight line represents the direction you are facing.

1 Tap the **Point 1**, **Point 2** and **Point 3** on the map.
Make sure to set three location points so that the straight lines started from the point and can create three intersections.

2 Tap each point and use the **Degree** bar or button to change degrees.
Make sure to set three location points so that the straight lines started from the point and can create three intersections.

3 Tap the **GPS** icon to automatically get the selected point's location information.
The instrument displays the latitude and longitude information of the signal received by either the GPS antenna or AntennaAdvisor Handle. This function is only available when the GPS antenna is connected.

4 Tap the **Latitude** and **Longitude** icon and enter the value using the on-screen keyboard to manually define a position.
The values should be input based on the Decimal Degrees.

5 Tap the **Apply** button.

Setting azimuth

Method 1: You can use the AntennaAdvisor Handle. Make sure to initialize AntennaAdvisor first to get more accurate directional information.

1 Press and hold the **TRIGGER** button on the handle and pan the antenna handle to scan through until you find the strongest RSSI value.
RSSI, polarization, elevation and azimuth readings are continuously updated on the screen while pressing the physical button.

2 Release the **TRIGGER** button to stop scanning.

Method 2: You can use the **Degree bar** (functions as a compass) by moving it right and left.

1 Tap the circle on the Degree bar and move it gently until you get the right azimuth.

M**ethod 3**: You can use the log-periodic antenna.

1 Pan your log-periodic antenna to find a signal with the highest RSSI value and measure an azimuth of the interfering signal.

NOTE:

The AntennaAdvisor Handle has a built-in low-noise amplifier (LNA) and you can turn it on and off using the physical On/Off button located on the rear side of the handle unit. For example, if the received signal is weak, you can turn on the switch to improve S/N.

Save position

1 To save the defined position, tap any point on the map where you want to save the position information.

2 Tap the **Save Position** icon.
The instrument stores the saved location points in the internal memory so that you can load them by using the **Load Position** icon. You can save and load up to 10 positions.

Setting display mode

When the triangulation is done with three location points and azimuth for each point, you can view a circumscribed circle by default. You can change the display mode to inscribed circle or double circles to view a narrower area. The center of the green-shaded circle is determined to be where the source of the interfering signal resides.

1 Tap **Measure Setup** > **Display**.

2 Select the option from the following choices.

   a **Circum**: displays a circumscribed circle that meets three vertices of the triangle.

   b **Inscribed**: displays an inscribed circle that meets the three sides of the triangle.

   c **Double**: displays both circumscribed and inscribed circles.

3 Tap **Measure Setup** > **Screen Mode**.

4 Tap the **Screen Mode** to select **Map** or **Full**.

   a **Map**: This option displays what are inside the base map with the map image.

   b **Full**: This option displays three location points and defined circle without the map image.

Persistent interference finder

Persistent Radar chart

If you have identified an interfering signal on your spectrum view, you can move to the Radar Chart mode and measure RSSI power level through 360 degrees at a location received by the connected broadband

directional antenna so that you can determine the direction of the source of the interference. Using a set of the AntennaAdvisor Handle that holds a broadband directional antenna is mandatory in the Radar Chart mode and its built-in compass, GPS antenna, and a built-in low-noise amplifier (LNA) benefits you to determine the direction of the interference. You can switch the main screen from spectrum view to map view and vice versa using the icon, ( ) on the spectrum view screen. Before starting the Interference Finder, you need to set Spectrum measurements. See "Configuring Spectrum Measurements" for more details.

For antenna connection, see antenna connection in "Interference finder"

Loading a map

To use any features related to maps, you need to download and install the maps on the CellAdvisor 5G. The VIAVI JDMapCreator will help you download maps. Make sure the JDMapCreator application on your computer is connected to the instrument via LAN. You can send a map file with a single layer to the instrument directly by using the **Send to EQP** menu in JDMapCreator. For more information on how to use the JDMapCreator, see the *JDMapCreator 2.0 User Guide*.

1. Plug in your USB flash drive that has a map file in `.mcf` file type created in JDMapCreator.
2. Tap the **Load** icon( ) on the side bar.
3. Navigate the map file you want to open.
   The File Information pane displays the file properties including its name, size, type and date modified.
4. Tap the **Load** button on the screen.

Once you loaded the map, you can also control the map using the following icons on the map.

Icon	Description
	Tap to go to your current location on the map. Once tapped, the purple icon appears on the map indicating your current location.
	Tap to switch to the full screen map view.
	Tap to zoom in the map.
	Tap to zoom out the map.
	Tap and select the area where you want to expand.

Initializing AntennaAdvisor

Once you have connected the AntennaAdvisor Handle to your instrument, antenna initialization is required to get the right azimuth data. You need to initialize the antenna handle to calibrate the built-in compass by completing the following steps. Note that the you can adjust Bandwidth based on the center frequency of the interfering signal that you have identified in the Spectrum view by tapping the **Setup** > **Bandwidth**. A message appears at the bottom of the screen to alert you if you have not performed initialization of your connected the antenna handle set.

1 Hold your antenna handle horizontally in its upright position.
To avoid unnecessary impact of external magnetic field, position yourself at the location where the value of magnetic field strength displayed on the instrument is green.

2 Point the antenna to the north and tap the **Setup** > **Initialize AntennaAdvisor**.
The message disappears and the red line for the current antenna direction moves to the 0-degree line and overlaps to let you know that the initialization is done successfully.

NOTE:

It is recommended that you re-initialize the AntennaAdvisor Handle after measurements to re-calibrate the compass when you notice that the red line on the radar chart is not aligned with the north on the map even though you are pointing the antenna to the north.

Obtaining Persistent RSSI data

Once you have connected your antenna handle set and done necessary setups, you can monitor the power level of the received signal, the amount of polarization, and elevation level real time. Using the Trigger button on the antenna handle set, you can plot the RSSI level through 360 degrees at your location.

1 When you have the green GPS indicator, Tap the **GPS** icon on the side panel to set your current location to the center of the radar chart. The latitude and longitude information at the side of the display changes from ‘Unknown Position’ to the obtained position information.

2 Tap the **Save Position** icon on the side panel to save a position to recall for triangulation in the **Interference Finder** mode and select one that you want to save.

3 Monitor the RSSI reading of the received signal. If the signal is weak, turn on the LNA switch on the antenna handle set to improve S/N.

4 The message disappears and the red line for the current antenna direction moves to the 0-degree line and overlaps to let you know that the initialization is done successfully.

NOTE:

The AntennaAdvisor Handle has a built-in low-noise amplifier (LNA) and you can turn it on and off by toggling the physical On/Off switch located on the rear side of the handle unit.

5 Hold the antenna handle set horizontally and then make the following measurement

6 The message disappears and the red line for the current antenna direction moves to the 0-degree line and overlaps to let you know that the initialization is done successfully.

To obtain a Persistent RSSI value, complete the following steps:

a Press the **TRIGGER** button located on the antenna handle.
Every time you press the physical button on the handle, a beep sounds and a power level of the received signal is plotted as a blue dot on the radar chart. Depending on the strength of the measured value, you may hear different tones of beeping.

b With panning the antenna horizontally to vary the angle of the direction, repeat pressing the **TRIGGER** button to obtain at least five points if you want to do the localization.

To obtain Persistent RSSI values continuously, complete the following steps:

a Press and hold the **TRIGGER** button located on the antenna handle to start a continuous measurement.

b Pan the antenna handle horizontally through the angle of 360 degrees you desire. A beep is sounded repeatedly to let you know that the measurement is continuing and measured values are plotted on the radar chart.

c Release the **TRIGGER** button to stop the continuous measurement.

NOTE:

The maximum number you can plot on the radar chart is 2500 points both in the single and continuous measurements. If your measurement reached to 500 points, you need to reset the measurement by pressing the Localization soft key twice or performing the initialization of the AntennaAdvisor Handle. Concentric circles indicate different levels of RSSI. You can use the AMP/SCALE hard to adjust the amplitude scale of the chart.

7 Tap **Setup** > **Screen Mode Full/Map** to change the display mode.

a **Map**: It displays measured points inside the base map image. If you are in the area outside the base map and continue your measurement with the Trigger button, the instrument continues obtaining data even though the radar chart disappears from the screen. You can view obtained data when you change this display option to Full.

b **Full**: It displays measured points without the base map image. In case that you made measurements in the area outside the map image, selecting this option moves your measured data to the center of the display so that you can view the result.

Localizing RSSI data

The Localization feature lets you view averaged and smoothed measurement data with a bold green line on the radar chart that helps you determine the direction of the highest RSSI value. When you have five or more data points plotted on the radar chart, you can perform this localization.

1 Tap the **Setup** ( ) icon on the side bar.

2 Tap **Localization**.
All the measured points turn to green color and you can view the bold green line that indicates the possible direction of the interference source.

3 Tap Localization again to clear all the data plots on the radar chart.

Persistent radar chart

Persistent radar chart_localized

Utility

Real-time spectrum replayer

The Real-time Spectrum Replayer lets you retrieve and replay recorded real-time spectrum analyzer traces in interference analysis mode. These traces can be played back in the persistent spectrum, persistent spectrogram or persistent RSSI. You can configure the limit line to create failure points when signals exceed it. The failure points are clearly displayed on the trace timeline for quick access during playback.

Setting measure setup

1 Tap the **Setup** ( ) icon on the side bar.

2 Tap **Spectrum Replayer**.
The File Manager window appears.

3 Select the file to be loaded and press the **Load** button.
The replay bar appears at the bottom of the screen. The green color indicates Pass and the red color indicates Fail.

4 Tap the replay direction icon between **FWD** and **REV** to change play direction to forward or reverse.

5 Tap the right and left button to change the speed from the options: **x1**, **x2**, **x3**, and **x4**.

6 Toggle the **Play** button to start playing.

7 Toggle the **Pause** button to pause or stop playing.

8 Tap **Fail** to move to a particular failure position directly and play from there.
The Frame Fail Count in the middle of bar changes.

9 Tap the Frame Fail Count to change the value using the on-screen keyboard. Once tapped, replaying stopped. If you change the value, it jumps to the corresponding index.
You can also change the value by tapping right and left button.

10 Tap to change display mode to **Spectrum**, **Spectrogram**, or **RSSI**.
3D display (Waterfall) is not supported in case of spectrum logging.

11 *Optional.* Tap to switch Time Cursor to On or Off to display or hide the time cursor on the screen. This key becomes activated when you play logged data in the Spectrogram mode.

NOTE:

If you connected a USB drive, do not remove it while playing. Doing so may freeze the USB port, which will require you to restart the instrument to get a USB drive recognized again.

Using LTE/LTE-A FDD Analyzer

Introduction

The CellAdvisor 5G LTE/LTE-A FDD Analyzer is the optimal portable test solution for installation and maintenance of cellular base stations and cell sites, running with external AC power or battery for the field. Its touch-based user interface has been specifically designed with customized menus and simple calibration procedures, providing service providers with accurate and reliable LTE/LTE-A FDD measurement results.

The CellAdvisor 5G is the optimal solution to perform following measurements:

- Spectrum Analysis
  - Spectrum
- RF Analysis
  - Channel Power
  - Occupied Bandwidth
  - Spectrum Emission Mask
  - ACLR
  - Multi-ACLR
  - Spurious Emissions (frequency extended up to 18.5 GHz in addition to existing 24 GHz to 40 GHz)
- Power vs Time
  - Power vs Time (Frame)
- Modulation Analysis
  - Constellation
  - Data Channel
  - Control Channel
  - Subframe
  - Frame
  - Time Alignment Error
  - Data Allocation Map
  - Carrier Aggregation

- OTA Analysis
  - OTA Channel Scanner
  - OTA ID Scanner
  - OTA Multipath Profile
  - OTA Control Channel
  - OTA Datagram
  - OTA Route Map
- Miscellaneous
  - Power Statistics CCDF

Selecting mode and measure

To start measurement, do the following steps:

1 Tap **LTE/LTE-A FDD Analyzer** on the **MODE** panel.

2 Tap any measurement mode from the following choices:

Spectrum Analysis > **Spectrum**

RF Analysis > **Channel Power, Occupied Bandwidth, Spectrum Emission Mask, ACLR, Multi-ACLR** or **Spurious Emissions**

Power vs Time > **Power vs Time (Frame)**

Modulation Analysis > **Constellation, Data Channel, Control Channel, Subframe, Frame, Time Alignment Error, Data Allocation Map** or **Carrier Aggregation**

OTA Analysis > OTA Channel Scanner, OTA ID Scanner, OTA Multipath Profile, OTA Control Channel, OTA Datagram or **OTA Route Map**

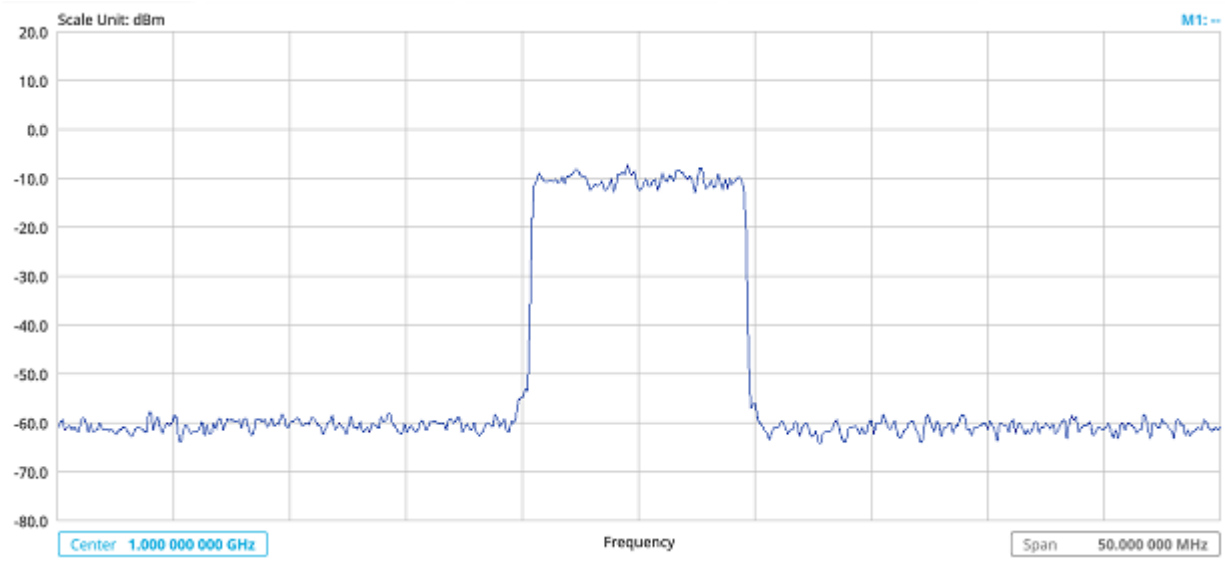
Miscellaneous > Power Statistics CCDF

Conducting spectrum measurement

Spectrum

If you have configured test parameters as described in the "Configuring Spectrum Measurements", your measurement is displayed on the screen as like the following example. You can simply change Center Frequency by tapping the icons right below the result chart screen.

Spectrummeasurement with LTE/LTE-A FDD Analyzer



Conducting RF measurement

Channel Power

The Channel Power measurement is a common test used in the wireless industry to measure the total transmitted power of a radio within a defined frequency channel. It acquires a number of points representing the input signal in the time domain, transforms this information into the frequency domain using Fast Fourier Transform (FFT), and then calculates the channel power. The effective resolution bandwidth of the frequency domain trace is proportional to the number of points acquired for the FFT.

The channel power measurement identifies the total RF power, power spectral density, and Peak to Average Ratio (PAR) of the signal within the channel bandwidth.

Setting measure setup

After configuring spectrum measurement in "Configuring Spectrum Measurements", you can set the measure setup to continue your measurement. The measurement settings can be saved and recalled as

a file by selecting File Type as Setup and load the file onto the instrument using the **Save/Load** icons on the side bar.

1 Tap the **Setup** ( )icon on the side bar.

2 Tap **Bandwidth** and select the value from the following choices: **1.4 MHz**, **3 MHz**, **5MHz**, **10 MHz**, **15 MHz** or **20 MHz**.

You can also tap the rectangle with value,

under the chart screen and input the value using the on-screen keyboard.

3 Tap

to set the center frequency using the on-screen keyboard.

4 Tap **Menu** > **BW/AVG** > **Average** to set the number of measurements to be averaged using the on-screen keyboard.
The input value range is from 1 to 100.

Setting limit

1 Tap **Menu** > **Limit**.

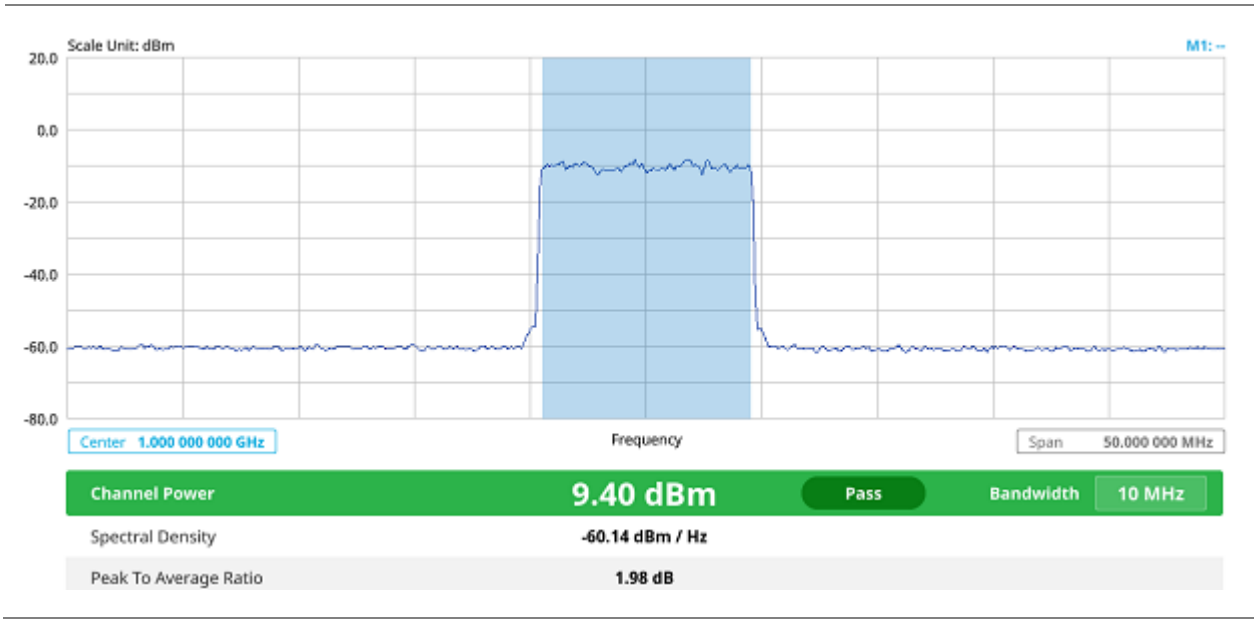
2 Tap to switch the **Test Limits** to **On** or **Off** to enable or disable Pass/Fail indication.
The result table color for Pass is green, and the result table color for Fail is red.

3 Tap **High Limit** to set the upper threshold using the on-screen keyboard.

4 Tap **Low Limit** to set the lower threshold using the on-screen keyboard.

5 *Optional.* Tap the **Save** hot key on the side bar and select the save option from the choices available for your measurement mode.

Channel Power measurement with LTE/LTE-A FDD Analyzer



Channel power measurement result shows channel power and spectrum density in a user specified channel bandwidth. The peak to average ratio (PAR) is shown at the bottom of the screen as well. The shaded area on the display indicates the channel bandwidth.

Occupied bandwidth

The Occupied Bandwidth measures the percentage of the transmitted power within a specified bandwidth. The percentage is typically 99%.

Setting measure setup

After configuring spectrum measurement in "Configuring Spectrum Measurements", you can set the measure setup to continue your measurement. The measurement settings can be saved and recalled as a file by selecting File Type as Setup and load the file onto the instrument using the **Save/Load** icons on the side bar.

1 Tap the **Setup** ( )icon on the side bar.

2 Tap **Bandwidth** and select the value from the following choices: **1.4 MHz**, **3 MHz**, **5MHz**, **10 MHz**, **15 MHz** or **20 MHz**.

You can also tap the rectangle with value,

under the chart screen and input the value using the on-screen keyboard.

3 Tap

to set the center frequency using the on-screen keyboard.

4 Tap **Menu** > **BW/AVG** > **Average** to set the number of measurements to be averaged using the on-screen keyboard.
The input value range is from 1 to 100.

Setting limit

1 Tap **Menu** > **Limit**.

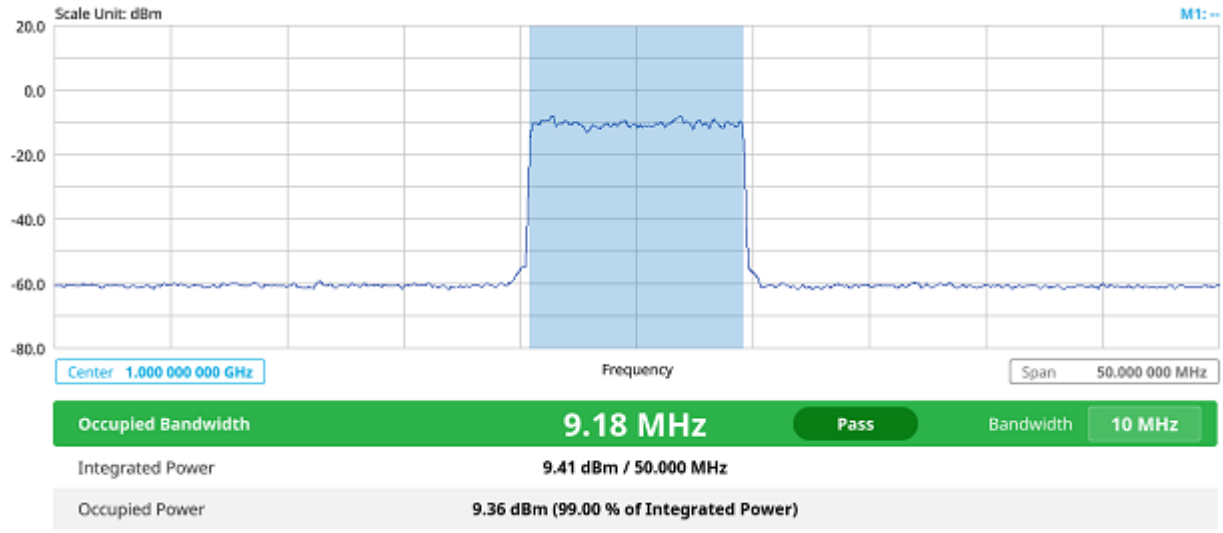
2 Tap to switch the **Test Limits** to **On** or **Off** to enable or disable Pass/Fail indication.
The result table color for Pass is green, and the result table color for Fail is red.

3 Tap **High Limit** to set the upper threshold using the on-screen keyboard.

4 Tap **Low Limit** to set the lower threshold using the on-screen keyboard.

5 *Optional.* Tap the **Save** hot key on the side bar and select the save option from the choices available for your measurement mode.

Occupied Bandwidth with LTE/LTE-A FDD Analyzer



The Occupied Bandwidth measurement shows both of power across the band and power bandwidth in a user specified percentage to determine the amount of spectrum used by a modulated signal. Occupied bandwidth is typically calculated as the bandwidth containing 99% of the transmitted power.

Spectrum Emission Mask (SEM)

The Spectrum Emission Mask (SEM) measurement is to identify and determine the power level of out-of band spurious emission outside the necessary channel bandwidth and modulated signal. It measures the power ratio between in-band and adjacent channels. The CellAdvisor 5G indicates either Pass or Fail based on the specified limit of the signal.

Setting measure setup

After configuring spectrum measurement in "Configuring Spectrum Measurements", you can set the measure setup to continue your measurement. The measurement settings can be saved and recalled as a file by selecting File Type as Setup and load the file onto the instrument using the **Save/Load** icons on the side bar.

1 Tap the **Setup** ( )icon on the side bar.

2 Tap **Bandwidth** and select the value from the following choices: **1.4 MHz**, **3 MHz**, **5MHz**, **10 MHz**, **15 MHz** or **20 MHz**.

You can also tap the rectangle with value,

under the chart screen and input the value using the on-screen keyboard.

3 Tap **Mask Type** and select the type from the following choices: **Wide Area BS A**, **Wide Area BS B**, **Local Area BS**, **Home BS**.

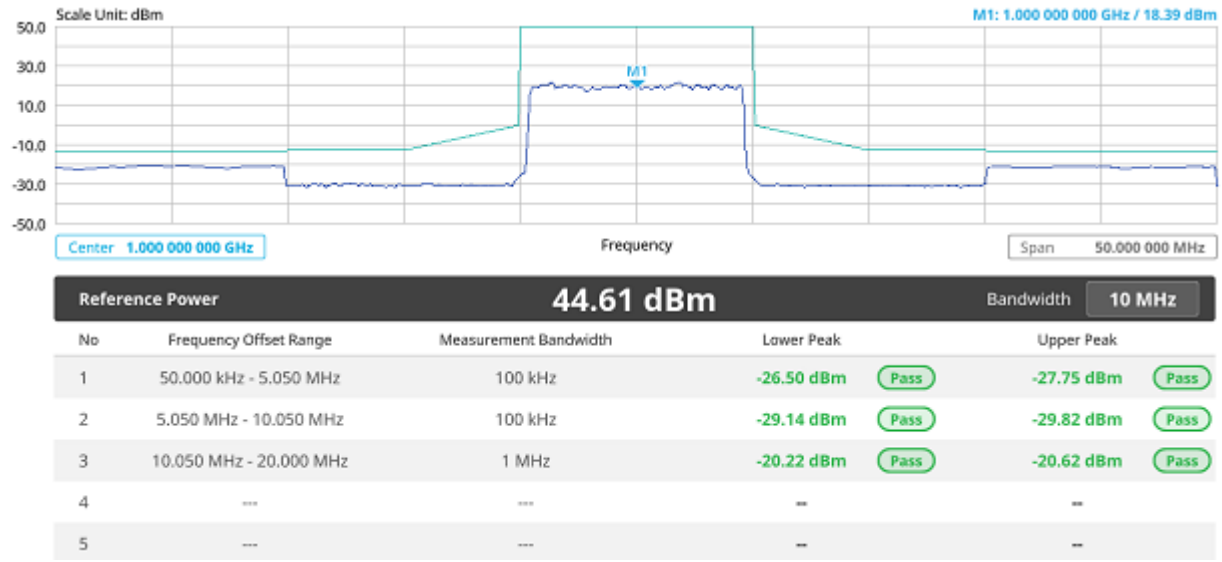
Setting limit

1 Tap **Menu** > **Limit**.

2 Tap to switch the **Test Limits** to **On** or **Off** to enable or disable Pass/Fail indication.
The result table color for Pass is green, and the result table color for Fail is red.

3 *Optional.* Tap the **Save** hot key on the side bar and select the save option form the choices available for your measurement mode.

Spectrum Emission Mask measurement with LTE/LTE-A FDD Analyzer



If Lower Peak or Upper Peak indicates Fail, the mask line becomes red.

NOTE:

If the Trace View is set to Off, the Reference Power, Lower Peak, and Upper Peak is not shown. If the Trace View is set to On and the Trace Type is selected other than Clear Write, the Reference Power, Lower Peak, and Upper Peak is shown with value and "*" at the end of the value.

ACLR

The Adjacent Channel Power Ratio (ACPR), designated by the 3GPP LTE/LTE-A specifications as the Adjacent Channel Leakage power Ratio (ACLR), is the power contained in a specified frequency channel bandwidth relative to the total carrier power. It may also be expressed as a ratio of power spectral densities between the carrier and the specified offset frequency band.

Setting measure setup

After configuring spectrum measurement in "Configuring Spectrum Measurements", you can set the measure setup to continue your measurement. The measurement settings can be saved and recalled as a file by selecting File Type as Setup and load the file onto the instrument using the **Save/Load** icons on the side bar.

1 Tap the **Setup** ( )icon on the side bar.

2 Tap **Bandwidth** and select the value from the following choices: **1.4 MHz**, **3 MHz**, **5MHz**, **10 MHz**, **15 MHz** or **20 MHz**.

You can also tap the rectangle with value,

under the chart screen and input the value using the on-screen keyboard.

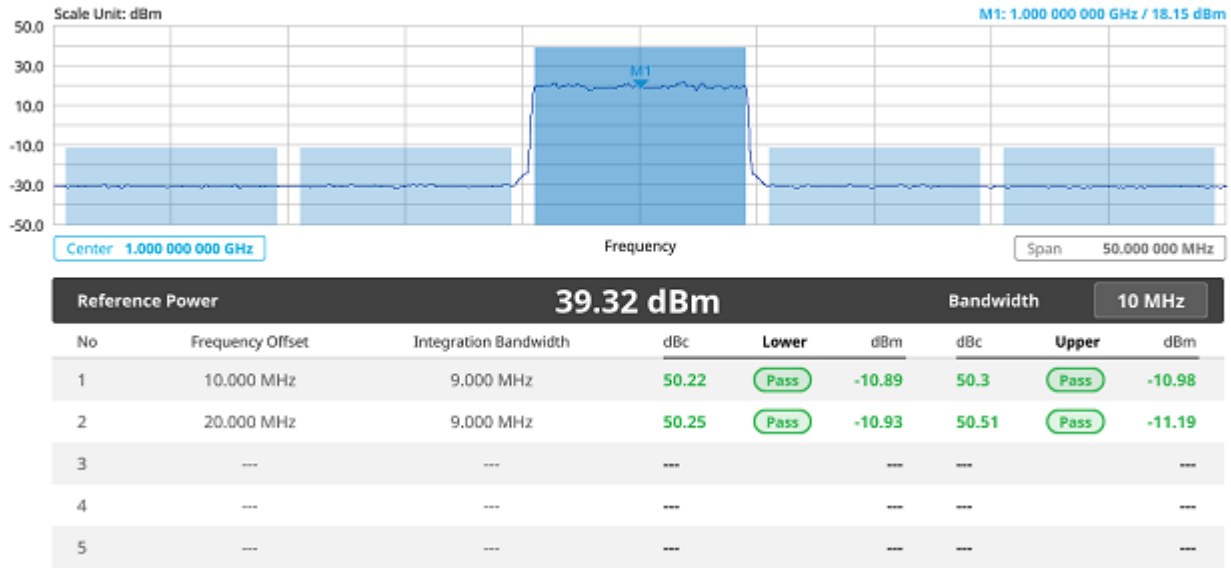
Setting limit

1 Tap **Menu** > **Limit**.

2 Tap to switch the **Test Limits** to **On** or **Off** to enable or disable Pass/Fail indication.
The result table color for Pass is green, and the result table color for Fail is red.

3 *Optional.* Tap the **Save** hot key on the side bar and select the save option form the choices available for your measurement mode.

ACLR measurement with LTE/LTE-A FDD Analyzer



No	Frequency Offset	Integration Bandwidth	dBc	Lower	dBm	dBc	Upper	dBm
1	10.000 MHz	9.000 MHz	50.22	Pass	-10.89	50.3	Pass	-10.98
2	20.000 MHz	9.000 MHz	50.25	Pass	-10.93	50.51	Pass	-11.19
3	---	---	---		---	---		---
4	---	---	---		---	---		---
5	---	---	---		---	---		---

Multi-ACLR

The Multi-ACLR measurement is used to perform multi-channel ACLR measurements with as many channels as possible. It helps you to measure ACLR in multi-channel transmitting Base Station environment.

Setting measure setup

After configuring spectrum measurement in "Configuring Spectrum Measurements", you can set the measure setup to continue your measurement. The measurement settings can be saved and recalled as a file by selecting File Type as Setup and load the file onto the instrument using the **Save/Load** icons on the side bar.

1 Tap the **Setup** ( )icon on the side bar.

2 Tap **Bandwidth** and select the value from the following choices: **1.4 MHz**, **3 MHz**, **5MHz**, **10 MHz**, **15 MHz** or **20 MHz**.

You can also tap the rectangle with value,

under the chart screen and input the value using the on-screen keyboard.

3 To set the center frequency, complete the following steps:

a Tap the **Lowest Frequency** to set the starting center frequency.

b Enter the value using the on-screen keyboard (**GHz**, **MHz**, **kHz**, **Hz**).

c Tap the **highest frequency** to set the stopping center frequency and enter the value.

d Enter the value using the on-screen keyboard (**GHz**, **MHz**, **kHz**, **Hz**).

4 To set the channel number, complete the following steps:

- **a** Tap the **Lowest Channel Number** to set the starting channel.
- **b** Enter the value using the on-screen keyboard (**GHz**, **MHz**, **kHz**, **Hz**).
- **c** Tap the **highest Channel Number** to set the stopping channel.
- **d** Enter the value using the on-screen keyboard (**GHz**, **MHz**, **kHz**, **Hz**).

NOTE

Selecting **Channel Standard** sets the channel to **Band Global** automatically.

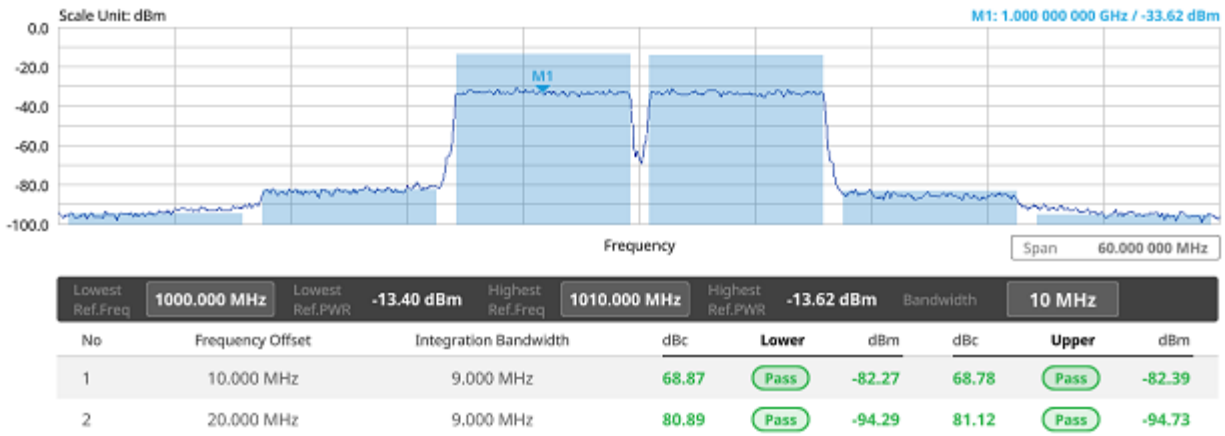
Setting limit

1 Tap **Menu** > **Limit**.

2 Tap to switch the **Test Limits** to **On** or **Off** to enable or disable Pass/Fail indication.
The result table color for Pass is green, and the result table color for Fail is red.

3 *Optional.* Tap the **Save** icon on the side bar and select the save option form the choices available for your measurement mode.

Multi-ACLR measurement with LTE/LTE-A FDD Analyzer



No	Frequency Offset	Integration Bandwidth	dBc	Lower	dBm	dBc	Upper	dBm
1	10.000 MHz	9.000 MHz	68.87	Pass	-82.27	68.78	Pass	-82.39
2	20.000 MHz	9.000 MHz	80.89	Pass	-94.29	81.12	Pass	-94.73

NOTE

You can set the Lowest Ref. Frequency and Highest Ref. Frequency by tapping the rectangle with value using the on-screen keyboard.

Spurious Emissions

The Spurious Emissions measurement is to identify or determine the power level of in-band or out-of-band spurious emissions within the necessary channel bandwidth and modulated signal. The CellAdvisor 5G indicates either Pass or Fail based on the specified limit of the signal. Frequency extended up to 18.5 GHz in addition to existing 24 GHz to 40 GHz.

Setting measure setup

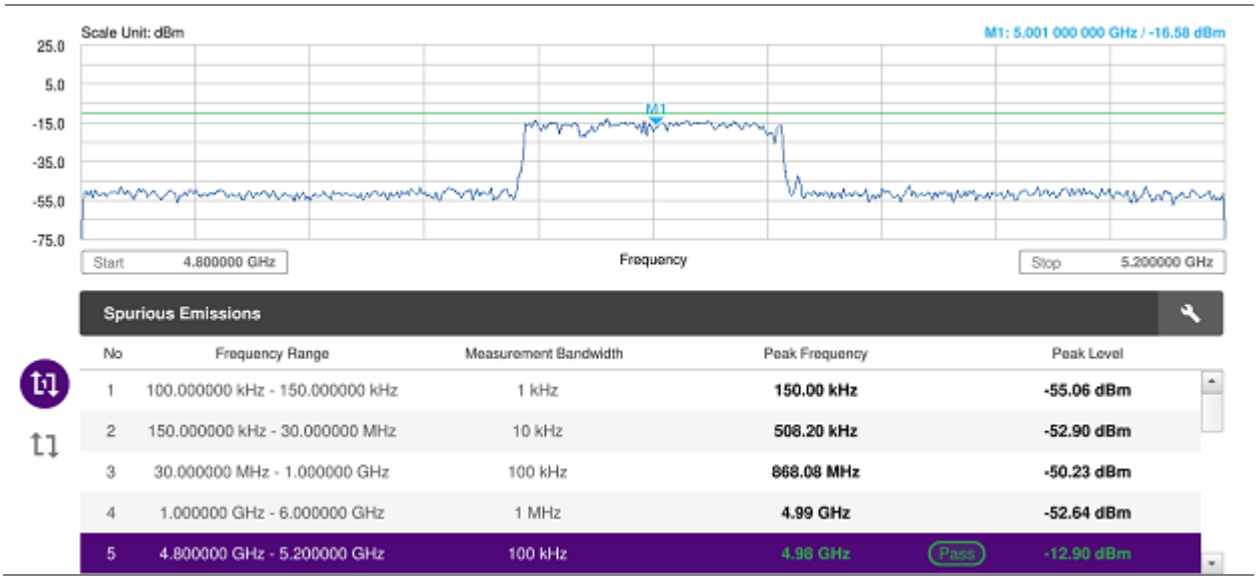
After configuring spectrum measurement in "Configuring Spectrum Measurements", you can set the measure setup to continue your measurement. The frequency setting is not used in the Spurious Emissions mode. The measurement settings can be saved and recalled as a file by selecting File Type as Setup and load the file onto the instrument using the **Save/Load** icons on the side bar.

1. Tap the **Setup** ( ) icon on the side bar.
2. Tap **Configuration** and select **Range** under the chart screen and switch to **On** to display or **Off** to hide the selected range in the result table.
3. Select the range number between **1** and **20** to add as a new or change the existing settings.
4. Tap **Start Frequency/Stop Frequency** and enter the value for the selected range using the on-screen keyboard.
5. Tap **Start Limit/Stop Limit** and enter the lower limit/upper limit for Pass/Fail indication.
6. Tap **Attenuation/RBW/VBW** and specify or select the value.
7. Tap **Measurement Type** between **Full** and **Examine**.
   The **Examine** mode displays only the selected range while the **Full** mode lets the instrument automatically change the selected range from one another.
8. Tap **Average** on the box of upper screen or under the **menu BW/AVG** and enter the value between **1** and **100** to set the number of measurements to be averaged.

Setting limit

1. Tap **Menu** > **Limit**.
2. Tap to switch the **Test Limits** to **On** or **Off** to enable or disable Pass/Fail indication.
3. *Optional.* Tap the **Save** icon on the side bar and select the save option form the choices available for your measurement mode.

Spurious emissions measurement with LTE/LTE-A FDD Analyzer



NOTE:

You can only set the frequency range and attenuation by tapping the Configuration icon. If you select the first icon next to the Range table above, it only shows the selected range and if you select the second icon next to the Range table, it keeps moving from the first selected range to the final selected range.

Power vs Time

Power vs Time (Frame)

The Power vs. Time (Frame) measures the modulation envelope in the time domain, showing the power of each time slot in a LTE/LTE-A FDD signal.

Setting measure setup

After configuring spectrum measurement in "Configuring Spectrum Measurements", you can set the measure setup to continue your measurement. The measurement settings can be saved and recalled as a file by selecting File Type as Setup and load the file onto the instrument using the **Save/Load** icons on the side bar.

1 Tap the **Setup** ( )icon on the side bar.

2 Tap **Bandwidth** and select the value from the following choices: **1.4 MHz**, **3 MHz**, **5MHz**, **10 MHz**, **15 MHz** or **20 MHz**.

3 Tap **Subframe Number** to set the number of subframe using the on-screen keyboard.

4 Tap **Physical Cell ID** and select the type **Manual** or **Auto**.

- **Auto** lets the instrument detect the Physical Cell ID for the LTE signal automatically.
- **Manual** sets a specific Physical Cell ID for the LTE signal manually in order to speed up the synchronization with a BTS.

5 *Optional.* Tap **Miscellaneous** under **Menu** to do the following as needed:

- To select the number of antenna ports, tap the **MIMO** and select **2x2** or **4x4**.
- To assign a antenna port number automatically or manually, tap the **Antenna Port** under **Antenna menu** and select the option: **Auto**, **Antenna 0**, **Antenna 1**, **Antenna 2**, or **Antenna 3**. If the MIMO is set to 2x2, the antenna ports 2 and 3 are disabled.
- To select the Cyclic Prefix, tap **Cyclic Prefix** and select **Normal** or **Extended**.
- To set the delay, tap **Delay** and enter the value using the on-screen keyboard.

NOTE

The Delay setting is used only when there is a time offset in the signals to be measured.

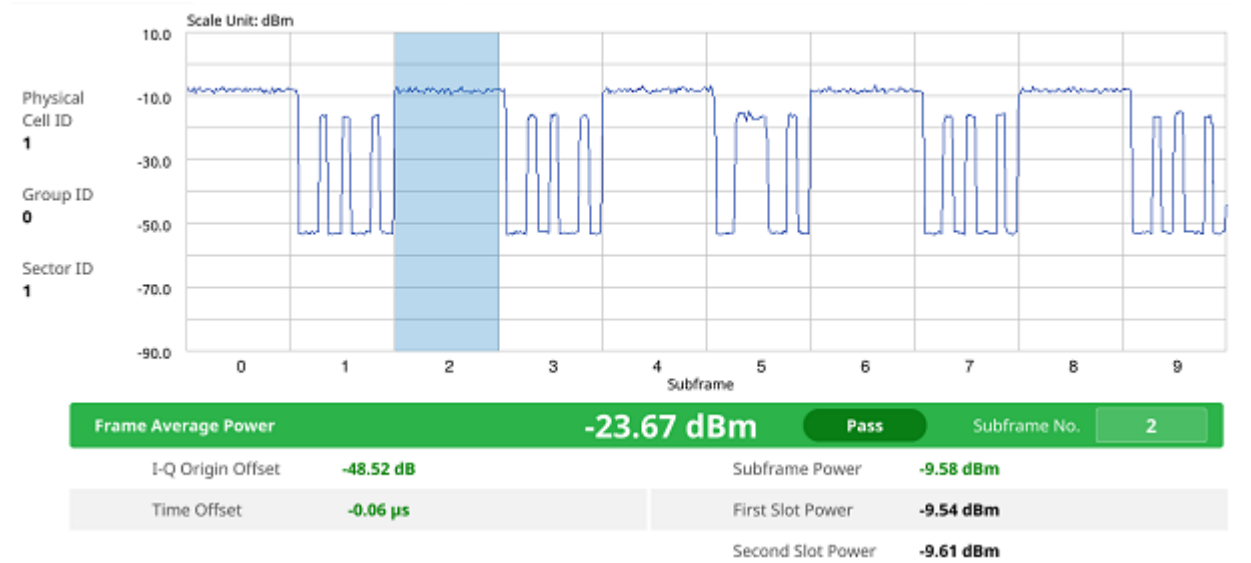
Setting limit

1 Tap **Menu** > **Limit**.

2 Tap to switch the **Subframe Power/ Frame Avg Pwer/ Time Error/ IQ Origin Offset** to set the **Test limits** to **On** or **Off** with setting **High and (Low) Limits** using the on-screen keyboard to enable or disable Pass/Fail indication.

3 *Optional.* Tap the **Save** icon on the side bar and select the save option form the choices available for your measurement mode.

Power vs Time (Frame) measurement with LTE/LTE-A FDD Analyzer



NOTE

You can set the Subframe No. from 0 to 9 based on your need using the on-screen keyboard.

Modulation Analysis

Constellation

The Constellation is used to observe some aspects of modulation accuracy and can reveal certain fault mechanisms such as I/Q amplitude imbalance or quadrature imbalance. It displays constellation diagram by modulation types.

Setting measure setup

After configuring spectrum measurement in "Configuring Spectrum Measurements", you can set the measure setup to continue your measurement. The measurement settings can be saved and recalled as a file by selecting File Type as Setup and load the file onto the instrument using the **Save/Load** icons on the side bar.

1 Tap the **Setup** ( )icon on the side bar.

2 Tap **Bandwidth** and select the value from the following choices: **1.4 MHz**, **3 MHz**, **5MHz**, **10 MHz**, **15 MHz** or **20 MHz**.

3 Tap **Subframe Number** to set the number of subframe using the on-screen keyboard.

4 *Optional.* Tap **Physical Cell ID** and select the type **Manual** or **Auto**.

- **Auto** lets the instrument detect the Physical Cell ID for the LTE signal automatically.
- **Manual** sets a specific Physical Cell ID for the LTE signal manually in order to speed up the synchronization with a BTS.

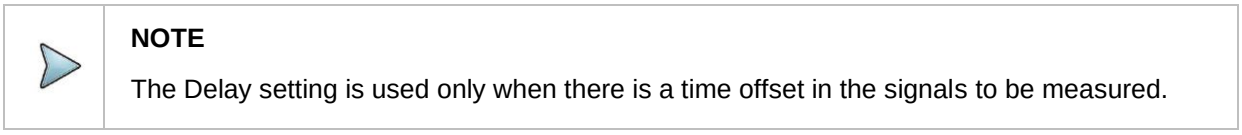
5 *Optional.* Tap **CFI** and select the type **Manual** or **Auto**.

- **Auto** lets the instrument set the number of OFDM symbols used for transmitting PDCCHs in a subframe.
- **Manual** set the number of OFDM symbols manually. The set of OFDM symbols that can be used for PDCCH in a subframe is given by **0**, **2**, **3** or **4** in 1.4 MHz bandwidth and **1**, **2** or **3** in other bandwidths.

6 *Optional.* Tap **PHICH Ng** to set the number of PHICH groups (Ng): **1/6**, **1/2**, **1**, **2**, **E-1/6**, **E-1/2**, **E-1**, or **E-2**.

7 *Optional.* Tap **Miscellaneous** under **Menu** to do the following as needed:

- To select the number of antenna ports, tap the **MIMO** and select **2x2** or **4x4**.
- To assign a antenna port number automatically or manually, tap the **Antenna Port** under **Antenna menu** and select the option: **Auto**, **Antenna 0**, **Antenna 1**, **Antenna 2**, or **Antenna 3**. If the MIMO is set to 2x2, the antenna ports 2 and 3 are disabled.
- To turn the Multimedia Broadcast Multicast Service (MBMS) feature on or off, tap **MBMS** and select **On** or **Off**. For proper MBMS testing, you need to set the **Subframe Number** in the upper right screen with the same PMCH subframe number. If this setting is on, the measurement item MBSFN RS appears in the result table.
- To set the Multicast Broadcast Single Frequency Network(**MBSFN**) detection automatically or manually for MBMS testing, tap **MBSFN** and select **Auto** or **Manual**. An automatically detected or manually entered MBSFN ID appears on the screen.
- To set the delay, tap **Delay** and enter the value using the on-screen keyboard.



NOTE

The Delay setting is used only when there is a time offset in the signals to be measured.

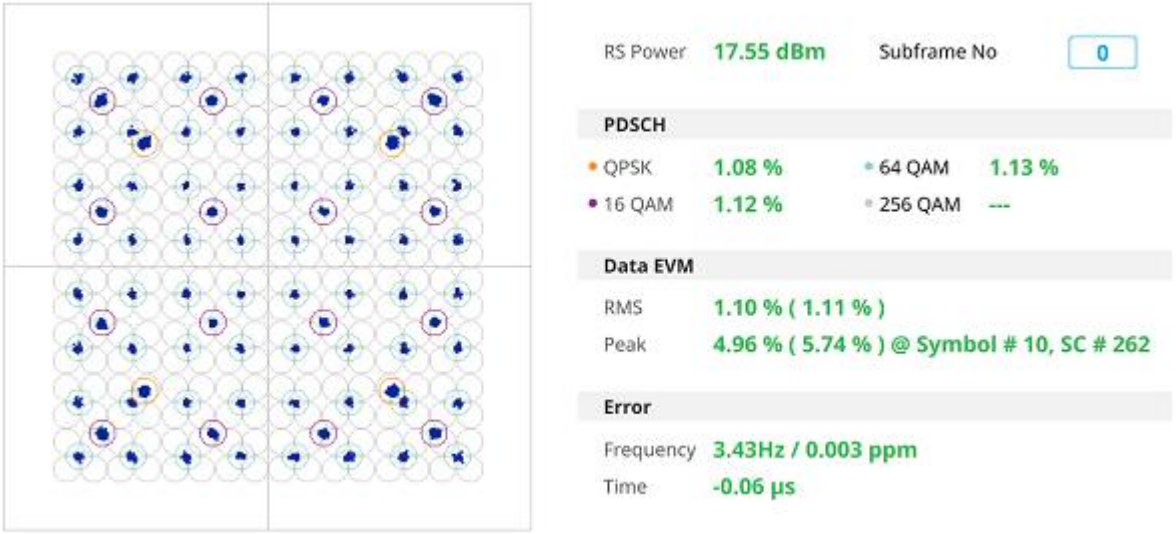
- To select the Cyclic Prefix, tap **Cyclic Prefix** and select **Normal** or **Extended**.
- To set the threshold for PDSCH, tap **PDSCH Threshold** and enter a value by using the on-screen keyboard.
- Tap **PDSCH Modulation Type**, and then select the modulation type option:**Auto, QPSK, 16 QAM, 64 QAM, 256 QAM, E-TM3.3, E-TM3.2, E-TM3.1a, E-TM3.1, E-TM2a, E-TM2, E-TM1.2 or E-TM1.1.** If two or more modulation types are used in a frame, select **Auto**. If the PDSCH uses the same modulation type in a frame or in a subframe, select a specific modulation type to get more accurate EVM.
- Tap **PDSCH Precoding** to set **On** or **Off** to enable or disable the PDSCH precoding.

Setting limit

1 Tap **Menu** > **Limit**.

2 Tap to switch the **Freqency Error/ PDSCH EVM/ PMCH EVM/ Data EVM RMS/ Data EVM Peak/ DL RS Power/ Time Error** to set the **Test limits** to **On** or **Off** with setting **High and (Low) Limits** using the on-screen keyboard to enable or disable Pass/Fail indication.

Constellation measurement with LTE/LTE-A FDD Analyzer



Data Channel

The Data Channel measures the constellation for the specified resource block as well as the modulation accuracy of each PDSCH at the specified subframe.

Setting measure setup

After configuring spectrum measurement in "Configuring Spectrum Measurements", you can set the measure setup to continue your measurement. The measurement settings can be saved and recalled as a file by selecting File Type as Setup and load the file onto the instrument using the **Save/Load** icons on the side bar.

1 Tap the **Setup** ( )icon on the side bar.

2 Tap **Bandwidth** and select the value from the following choices: **1.4 MHz**, **3 MHz**, **5MHz**, **10 MHz**, **15 MHz** or **20 MHz**.

3 Tap **Subframe Number** to set the number of subframe using the on-screen keyboard.

> **NOTE**
>
> For MBMS testing, this subframe number must be neither 0 nor 5 as these subframes 0 and 5 are not available for MBMS and it must be set to the MBMS transmitted channel's subframe number.

4 *Optional.* Tap **Physical Cell ID** and select the type **Manual** or **Auto**.

- **Auto** lets the instrument detect the Physical Cell ID for the LTE signal automatically.
- **Manual** sets a specific Physical Cell ID for the LTE signal manually in order to speed up the synchronization with a BTS.

5 *Optional.* Tap **CFI** and select the type **Manual** or **Auto**.

- **Auto** lets the instrument set the number of OFDM symbols used for transmitting PDCCHs in a subframe.
- **Manual** set the number of OFDM symbols manually. The set of OFDM symbols that can be used for PDCCH in a subframe is given by **0**, **2**, **3** or **4** in 1.4 MHz bandwidth and **1**, **2** or **3** in other bandwidths.

6 *Optional.* Tap **PHICH Ng** to set the number of PHICH groups (Ng): **1/6**, **1/2**, **1**, **2**, **E-1/6**, **E-1/2**, **E-1**, or **E-2**.

7 Tap **Event Hold** and select **On** or **Off** to enable or disable the event hold feature. When enabled, the display line for the PDSCH threshold appears**.**

When an event occurs, the measurement is put on hold until you tap **Hold** ( ).

8 *Optional.* Tap **Miscellaneous** under **Menu** to do the following as needed:

- To select the number of antenna ports, tap the **MIMO** and select **2x2** or **4x4**.
- To assign a antenna port number automatically or manually, tap the **Antenna Port** under **Antenna menu** and select the option: **Auto**, **Antenna 0**, **Antenna 1**, **Antenna 2**, or **Antenna 3**. If the MIMO is set to 2x2, the antenna ports 2 and 3 are disabled.
- To turn the Multimedia Broadcast Multicast Service (MBMS) feature on or off, tap **MBMS** and select **On** or **Off**. For proper MBMS testing, you need to set the **Subframe Number** in the upper right screen with the same PMCH subframe number. If this setting is on, the measurement item MBSFN RS appears in the result table.
- To set the Multicast Broadcast Single Frequency Network(**MBSFN**) detection automatically or manually for MBMS testing, tap **MBSFN** and select **Auto** or **Manual**. An automatically detected or manually entered MBSFN ID appears on the screen.
- To set the delay, tap **Delay** and enter the value using the on-screen keyboard to set the amount of delay in μs.

> **NOTE**
>
> The Delay setting is used only when there is a time offset in the signals to be measured.

- To select the Cyclic Prefix, tap **Cyclic Prefix** and select **Normal** or **Extended**.
- To set the threshold for PDSCH, tap **PDSCH Threshold** and enter a value by using the on-screen keyboard.
- Tap **PDSCH Modulation Type**, and then select the modulation type option:**Auto, QPSK, 16 QAM, 64 QAM, 256 QAM, E-TM3.3, E-TM3.2, E-TM3.1a, E-TM3.1, E-TM2a, E-TM2, E-TM1.2 or E-TM1.1.** If two or more modulation types are used in a frame, select **Auto**. If the PDSCH uses the same modulation type in a frame or in a subframe, select a specific modulation type to get more accurate EVM.
- Tap **PDSCH Precoding** to set **On** or **Off** to enable or disable the PDSCH precoding.

Setting limit

1 Tap **Menu** > **Limit**.

2 Tap to switch the **Data EVM RMS/Data EVM Peak/IQ Origin Offset** to set the **Test limits** to **On** or **Off** with setting **High Limits** using the on-screen keyboard to enable or disable Pass/Fail indication.

Using Marker

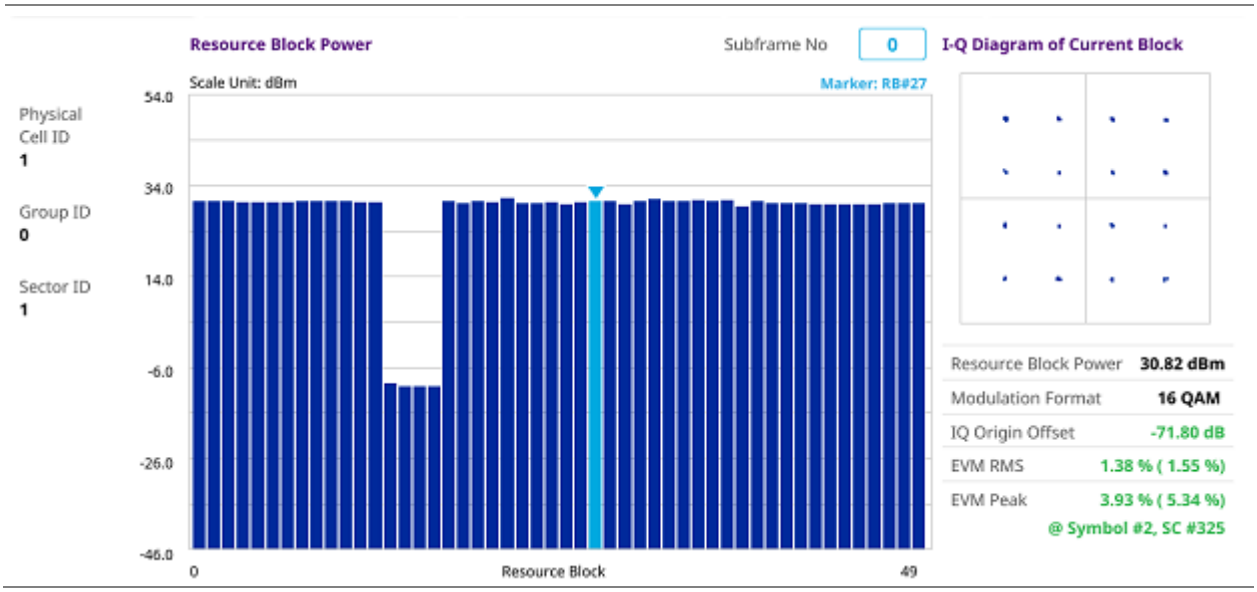
You can use **Marker** to place a marker on a resource block and display the IQ diagram for the selected resource block.

1 Tap **Menu** > **Marker**.

2 Tap **RB Number** to select the resource block to be marked and enter the resource block number using the on-screen keyboard. The marker appears on the selected resource block.

3 Tap **Marker View** between **On** and **Off** to display or dismiss the result of the selected resource block.

Data Channel measurement with LTE/LTE-A FDD Analyzer



Control Channel

The Control Channel measures the constellation for the specified control channel as well as modulation accuracy of the control channel at the specified subframe.

Setting measure setup

After configuring spectrum measurement in "Configuring Spectrum Measurements", you can set the measure setup to continue your measurement. The measurement settings can be saved and recalled as a file by selecting File Type as Setup and load the file onto the instrument using the **Save/Load** icons on the side bar.

1 Tap the **Setup** ( )icon on the side bar.

2 Tap **Bandwidth** and select the value from the following choices: **1.4 MHz**, **3 MHz**, **5MHz**, **10 MHz**, **15 MHz** or **20 MHz**.

3 Tap **Subframe Number** to set the number of subframe using the on-screen keyboard.

NOTE

For MBMS testing, this subframe number must be neither 0 nor 5 as these subframes 0 and 5 are not available for MBMS and it must be set to the MBMS transmitted channel's subframe number.

4 *Optional.* Tap **Physical Cell ID** and select the type **Manual** or **Auto**.

- **Auto** lets the instrument detect the Physical Cell ID for the LTE signal automatically.
- **Manual** sets a specific Physical Cell ID for the LTE signal manually in order to speed up the synchronization with a BTS.

5 *Optional.* Tap **CFI** and select the type **Manual** or **Auto**.

- **Auto** lets the instrument set the number of OFDM symbols used for transmitting PDCCHs in a subframe.
- **Manual** set the number of OFDM symbols manually. The set of OFDM symbols that can be used for PDCCH in a subframe is given by **0**, **2**, **3** or **4** in 1.4 MHz bandwidth and **1**, **2** or **3** in other bandwidths.

6 *Optional.* Tap **PHICH Ng** to set the number of PHICH groups (Ng): **1/6**, **1/2**, **1**, **2**, **E-1/6**, **E-1/2**, **E-1**, or **E-2**.

7 Tap **EVM Detection Mode** and select **Single** or **Combine**.

- **Single:** Testing on one single antenna connected to your CA5G series with a cable.

- **Combine:** Testing on multiple antennas connected to your CA5G series with a 2x1 or 4x1 combiner or an antenna.

8 *Optional.* Tap **Miscellaneous** under **Menu** to do the following as needed:

- To select the number of antenna ports, tap the **MIMO** and select **2x2** or **4x4**.
- To assign a antenna port number automatically or manually, tap the **Antenna Port** under **Antenna menu** and select the option: **Auto**, **Antenna 0**, **Antenna 1**, **Antenna 2**, or **Antenna 3**. If the MIMO is set to 2x2, the antenna ports 2 and 3 are disabled.
- To turn the Multimedia Broadcast Multicast Service (MBMS) feature on or off, tap **MBMS** and select **On** or **Off**. For proper MBMS testing, you need to set the **Subframe Number** with the same PMCH subframe number. If this setting is on, the measurement item MBSFN RS appears in the result table.
- To set the Multicast Broadcast Single Frequency Network(**MBSFN**) detection automatically or manually for MBMS testing, tap **MBSFN** and select **Auto** or **Manual**. An automatically detected or manually entered MBSFN ID appears on the screen.
- To set the delay, tap **Delay** and enter the value using the on-screen keyboard.

NOTE

The Delay setting is used only when there is a time offset in the signals to be measured.

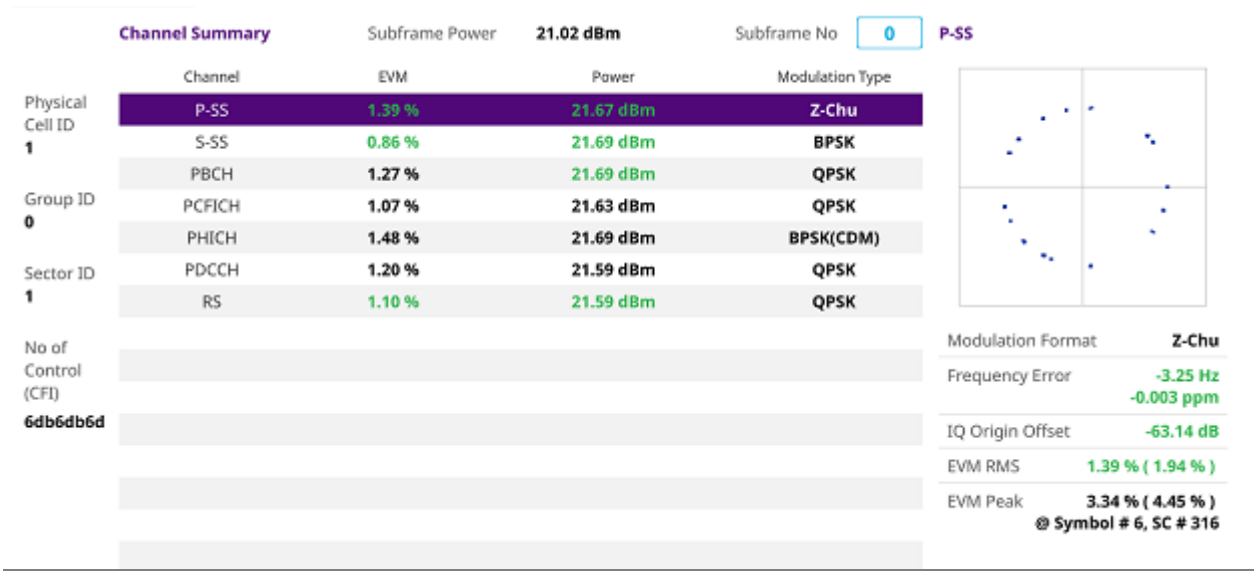
- To select the Cyclic Prefix, tap **Cyclic Prefix** and select **Normal** or **Extended**.
- To set the threshold for PDCCH, tap **PDCCH Threshold** and enter a value by using the on-screen keyboard.
- Tap **PDCCH Mode** to select **REG** to calculate EVM based on Resource Element Group or **Average** to calculate EVM after adding all the PDCCH signals from one subframe.

Setting limit

1 Tap **Menu** > **Limit**.

2 Tap to switch the **Frequency error/ RS EVM/ P-SS EVM/ S-SS EVM/ DL RS Power/ P-SS Power/ S-SS Power/ PBCH Power/ IQ Origin Offset** to set the **Test limits** to **On** or **Off** with setting **High and (Low) Limits** using the on-screen keyboard to enable or disable Pass/Fail indication.

Control Channel measurement with LTE/LTE-A FDD Analyzer



Subframe

The Subframe measures the modulation accuracy of all the data and control channels at the specified subframe (1 ms).

Setting measure setup

After configuring spectrum measurement in "Configuring Spectrum Measurements", you can set the measure setup to continue your measurement. The measurement settings can be saved and recalled as a file by selecting File Type as Setup and load the file onto the instrument using the **Save/Load** icons on the side bar.

1 Tap the **Setup** ( )icon on the side bar.

2 Tap **Bandwidth** and select the value from the following choices: **1.4 MHz**, **3 MHz**, **5MHz**, **10 MHz**, **15 MHz** or **20 MHz**.

3 Tap **Subframe Number** to set the number of subframe using the on-screen keyboard.

NOTE

For MBMS testing, this subframe number must be neither 0 nor 5 as these subframes 0 and 5 are not available for MBMS and it must be set to the MBMS transmitted channel's subframe number.

4 *Optional.* Tap **Physical Cell ID** and select the type **Manual** or **Auto**.

- **Auto** lets the instrument detect the Physical Cell ID for the LTE signal automatically.

- **Manual** sets a specific Physical Cell ID for the LTE signal manually in order to speed up the synchronization with a BTS.

5 *Optional.* Tap **CFI** and select the type **Manual** or **Auto**.

- **Auto** lets the instrument set the number of OFDM symbols used for transmitting PDCCHs in a subframe.
- **Manual** set the number of OFDM symbols manually. The set of OFDM symbols that can be used for PDCCH in a subframe is given by **0**, **2**, **3** or **4** in 1.4 MHz bandwidth and **1**, **2** or **3** in other bandwidths.

6 *Optional.* Tap **PHICH Ng** to set the number of PHICH groups (Ng): **1/6**, **1/2**, **1**, **2**, **E-1/6**, **E-1/2**, **E-1**, or **E-2**.

7 Tap **EVM Detection Mode** and select **Single** or **Combine**.

- **Single:** Testing on one single antenna connected to your CA5G series with a cable.
- **Combine:** Testing on multiple antennas connected to your CA5G series with a 2x1 or 4x1 combiner or an antenna.

8 Tap **Uplink-Downlink Config** and select the number of uplink/downlink from one to six using the on-screen keyboard.

9 *Optional.* Tap **Miscellaneous** under **Menu** to do the following as needed:

- To select the number of antenna ports, tap the **MIMO** and select **2x2** or **4x4**.
- To assign a antenna port number automatically or manually, tap the **Antenna Port** under **Antenna menu** and select the option: **Auto**, **Antenna 0**, **Antenna 1**, **Antenna 2**, or **Antenna 3**. If the MIMO is set to 2x2, the antenna ports 2 and 3 are disabled.
- To turn the Multimedia Broadcast Multicast Service (MBMS) feature on or off, tap **MBMS** and select **On** or **Off**. For proper MBMS testing, you need to set the **Subframe Number** with the same PMCH subframe number. If this setting is on, the measurement item MBSFN RS appears in the result table.
- To set the Multicast Broadcast Single Frequency Network(**MBSFN**) detection automatically or manually for MBMS testing, tap **MBSFN** and select **Auto** or **Manual**. An automatically detected or manually entered MBSFN ID appears on the screen.
- To set the delay, tap **Delay** and enter the value using the on-screen keyboard.

NOTE

The Delay setting is used only when there is a time offset in the signals to be measured.

- To select the Cyclic Prefix, tap **Cyclic Prefix** and select **Normal** or **Extended**.
- Tap **PDSCH Modulation Type**, and then select the modulation type option:**Auto, QPSK, 16 QAM, 64 QAM, 256 QAM, E-TM3.3, E-TM3.2, E-TM3.1a, E-TM3.1, E-TM2a, E-TM2, E-TM1.2 or E-TM1.1.** If two or more modulation types are used in a frame, select **Auto**. If the PDSCH uses the same modulation type in a frame or in a subframe, select a specific modulation type to get more accurate EVM.

- To set the threshold for PDSCH, tap **PDSCH Threshold** and enter a value by using the on-screen keyboard.
- To set the threshold for PDCCH, tap **PDCCH Threshold** and enter a value by using the on-screen keyboard.
- Tap **PDCCH Mode** to select **REG** to calculate EVM based on Resource Element Group or **Average** to calculate EVM after adding all the PDCCH signals from one subframe.
- Tap **PDSCH Precoding** to set **On** or **Off** to enable or disable the PDSCH precoding.

Setting limit

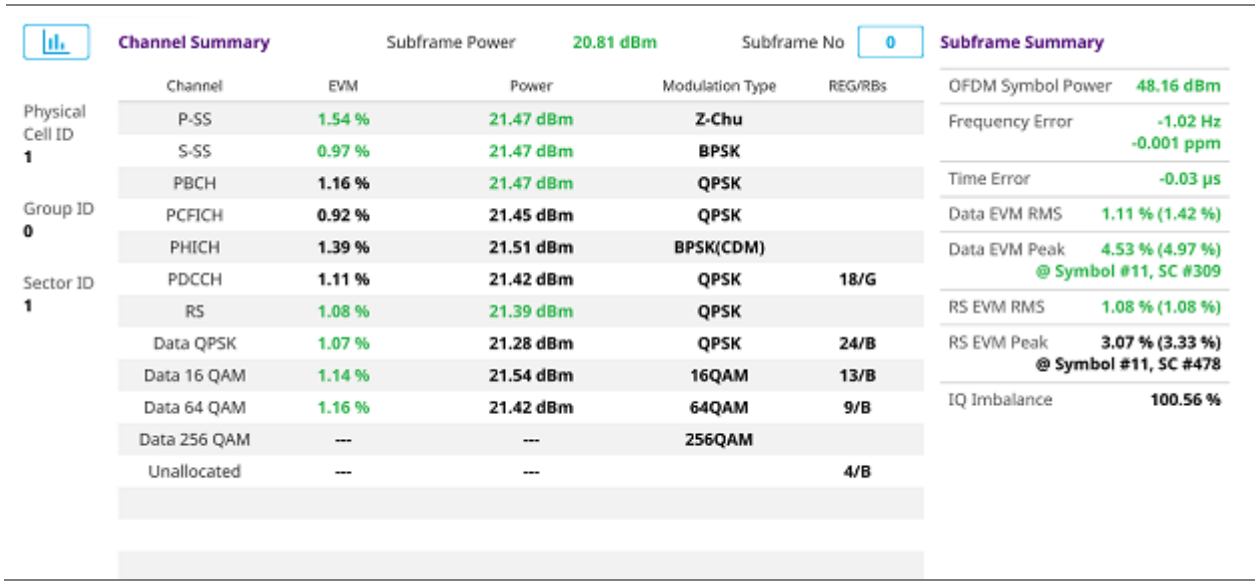
1. Tap **Menu** > **Limit**.
2. Tap to switch the **Frequency error/ EVM/ Power/ Time Error** to set the **Test limits** to **On** or **Off** with setting **High and Low Limits/Required Options** using the on-screen keyboard to enable or disable Pass/Fail indication.

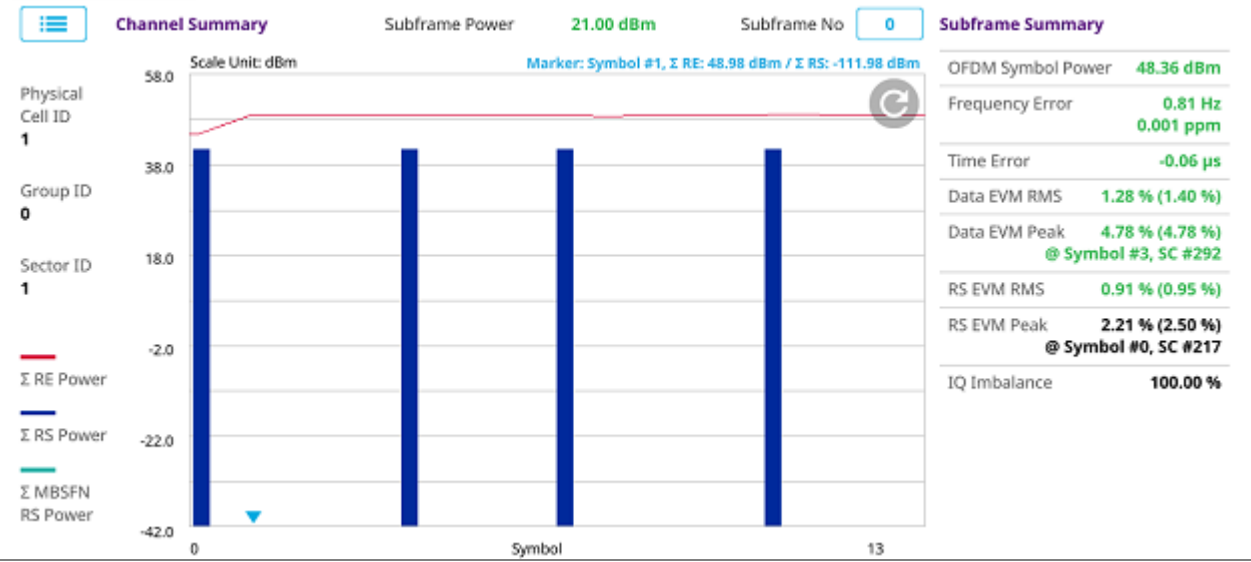
Using Marker

If you turn the Chart view on, you can use **Marker** to place a marker at a specific symbol.

1. Tap **Menu** > **Marker**.
2. Tap **Marker View** between **On** and **Off** to display or dismiss the marker on the chart.
3. Tap **Symbol** to select the symbol number to which the marker is placed. Enter the value using the on-screen keyboard.

Subframe measurement with LTE/LTE-A FDD Analyzer





Frame

The Frame measures the modulation accuracy of all the data and control channels at the frame (10 ms).

Setting measure setup

After configuring spectrum measurement in "Configuring Spectrum Measurements", you can set the measure setup to continue your measurement. The measurement settings can be saved and recalled as a file by selecting File Type as Setup and load the file onto the instrument using the **Save/Load** icons on the side bar.

1 Tap the **Setup** ( )icon on the side bar.

2 Tap **Bandwidth** and select the value from the following choices: **1.4 MHz**, **3 MHz**, **5MHz**, **10 MHz**, **15 MHz** or **20 MHz**.

3 *Optional.* Tap **Physical Cell ID** and select the type **Manual** or **Auto**.

- **Auto** lets the instrument detect the Physical Cell ID for the LTE signal automatically.
- **Manual** sets a specific Physical Cell ID for the LTE signal manually in order to speed up the synchronization with a BTS.

4 *Optional.* Tap **CFI** and select the type **Manual** or **Auto**.

- **Auto** lets the instrument set the number of OFDM symbols used for transmitting PDCCHs in a subframe.
- **Manual** set the number of OFDM symbols manually. The set of OFDM symbols that can be used for PDCCH in a subframe is given by **0**, **2**, **3** or **4** in 1.4 MHz bandwidth and **1**, **2** or **3** in other bandwidths.

5 *Optional.* Tap **PHICH Ng** to set the number of PHICH groups (Ng): **1/6**, **1/2**, **1**, **2**, **E-1/6**, **E-1/2**, **E-1**, or **E-2**.

6 Tap **EVM Detection Mode** and select **Single** or **Combine**.

- **Single:** Testing on one single antenna connected to your CA5G series with a cable.
- **Combine:** Testing on multiple antennas connected to your CA5G series with a 2x1 or 4x1 combiner or an antenna

7 *Optional.* Tap **Miscellaneous** under **Menu** to do the following as needed:

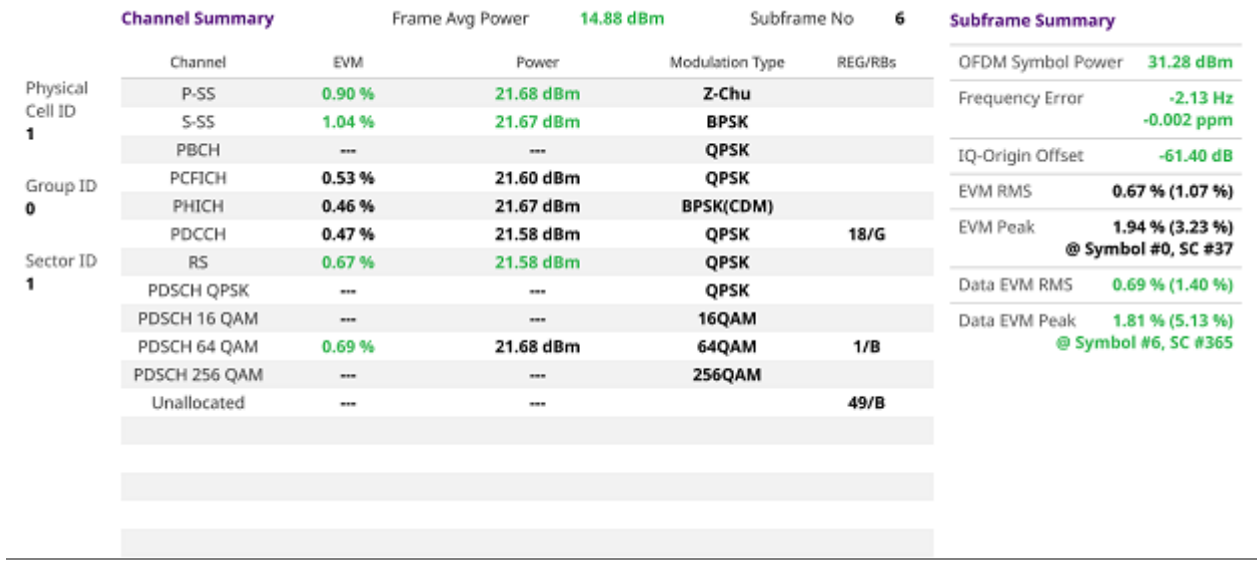
- To select the number of antenna ports, tap the **MIMO** and select **2x2** or **4x4**.
- To assign a antenna port number automatically or manually, tap the **Antenna Port** under **Antenna menu** and select the option: **Auto**, **Antenna 0**, **Antenna 1**, **Antenna 2**, or **Antenna 3**. If the MIMO is set to 2x2, the antenna ports 2 and 3 are disabled.
- To turn the Multimedia Broadcast Multicast Service (MBMS) feature on or off, tap **MBMS** and select **On** or **Off**. For proper MBMS testing, you need to set the **Subframe Number** with the same PMCH subframe number. If this setting is on, the measurement item MBSFN RS appears in the result table.
- To set the Multicast Broadcast Single Frequency Network(**MBSFN**) detection automatically or manually for MBMS testing, tap **MBSFN** and select **Auto** or **Manual**. An automatically detected or manually entered MBSFN ID appears on the screen.
- To select the Cyclic Prefix, tap **Cyclic Prefix** and select **Normal** or **Extended**.
- Tap **PDSCH Modulation Type**, and then select the modulation type option:**Auto, QPSK, 16 QAM, 64 QAM, 256 QAM, E-TM3.3, E-TM3.2, E-TM3.1a, E-TM3.1, E-TM2a, E-TM2, E-TM1.2 or E-TM1.1.** If two or more modulation types are used in a frame, select **Auto**. If the PDSCH uses the same modulation type in a frame or in a subframe, select a specific modulation type to get more accurate EVM.
- To set the threshold for PDSCH, tap **PDSCH Threshold** and enter a value by using the on-screen keyboard.
- To set the threshold for PDCCH, tap **PDCCH Threshold** and enter a value by using the on-screen keyboard
- Tap **PDCCH Mode** to select **REG** to calculate EVM based on Resource Element Group or **Avg** to calculate EVM after adding all the PDCCH signals from one subframe.
- Tap **PDSCH Precoding** to set **On** or **Off** to enable or disable the PDSCH precoding.

Setting limit

1 Tap **Menu** > **Limit**.

2 Tap to switch the **Frequency error/ EVM/ Power/ IQ Origin Offset** to set the **Test limits** to **On** or **Off** with setting **High and Low Limits/required options** using the on-screen keyboard to enable or disable Pass/Fail indication.

Frame measurement with LTE/LTE-A FDD Analyzer



Time Alignment Error

In eNode-B supporting Tx Diversity transmission, signals are transmitted from two or more antennas. These signals shall be aligned. The time alignment error in Tx diversity is specified as the delay between the signals from two antennas at the antenna ports.

Setting measure setup

After configuring spectrum measurement in "Configuring Spectrum Measurements", you can set the measure setup to continue your measurement. The measurement settings can be saved and recalled as a file by selecting File Type as Setup and load the file onto the instrument using the **Save/Load** icons on the side bar.

1 Tap the **Setup** ( )icon on the side bar.

2 Tap **Bandwidth** and select the value from the following choices: **1.4 MHz**, **3 MHz**, **5MHz**, **10 MHz**, **15 MHz** or **20 MHz**.

3 *Optional.* Tap **Physical Cell ID** and select the type **Manual** or **Auto**.

- **Auto** lets the instrument detect the Physical Cell ID for the LTE signal automatically.
- **Manual** sets a specific Physical Cell ID for the LTE signal manually in order to speed up the synchronization with a BTS.

4 *Optional.* Tap **Miscellaneous** under **Menu** to do the following as needed:

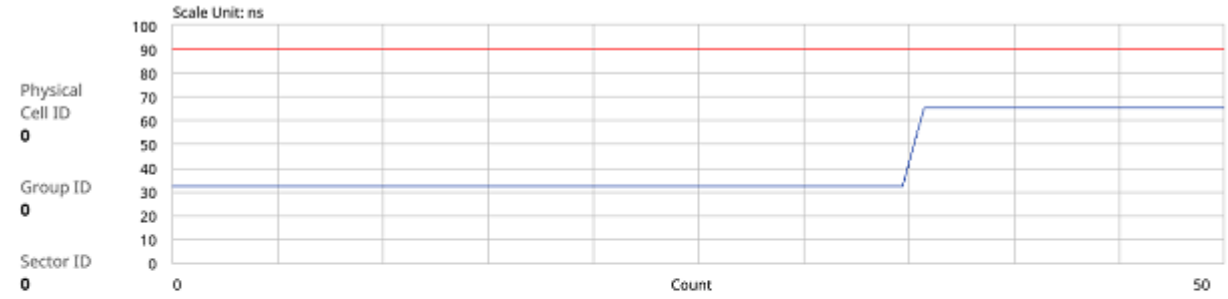
- To select the number of antenna ports, tap the **MIMO** and select **2x2** or **4x4**.
- To assign a antenna port number automatically or manually, tap the **Antenna Port** under **Antenna menu** and select the option: **Auto**, **Antenna 0**, **Antenna 1**, **Antenna 2**, or **Antenna 3**. If the MIMO is set to 2x2, the antenna ports 2 and 3 are disabled.
- To select the Cyclic Prefix, tap **Cyclic Prefix** and select **Normal** or **Extended**.

Setting limit

1 Tap **Menu** > **Limit**.

2 Tap to switch the **RS EVM/ DL RS Power/ MIMO** to set the **Test limits** to **On** or **Off** with setting **High and (Low) Limits** using the on-screen keyboard to enable or disable Pass/Fail indication.

Time Alignment Error measurement with LTE/LTE-A FDD Analyzer



Time Alignment Error	65.10 ns (65.10 ns) / ANT0 - ANT3	RS Power Difference	0.35 dB

Antenna	RS Power	RS EVM	RS Time Difference
0	18.39 dBm	0.95 %	0.00 ns
1	18.74 dBm	1.07 %	32.55 ns
2	18.71 dBm	1.14 %	32.55 ns
3	18.75 dBm	1.72 %	65.10 ns

Data Allocation Map

The Data Allocation Map function represents data allocation as a frame.

Setting measure setup

After configuring spectrum measurement in "Configuring Spectrum Measurements", you can set the measure setup to continue your measurement. The measurement settings can be saved and recalled as a file by selecting File Type as Setup and load the file onto the instrument using the **Save/Load** icons on the side bar.

1 Tap the **Setup** ( )icon on the side bar.

2 Tap **Bandwidth** and select the value from the following choices: **1.4 MHz**, **3 MHz**, **5MHz**, **10 MHz**, **15 MHz** or **20 MHz**.

3 Tap **Subframe Number** to set the number of subframe using the on-screen keyboard.

NOTE

For MBMS testing, this subframe number must be neither 0 nor 5 as these subframes 0 and 5 are not available for MBMS and it must be set to the MBMS transmitted channel's subframe number.

3 *Optional.* Tap **Physical Cell ID** and select the type **Manual** or **Auto**.

- **Auto** lets the instrument detect the Physical Cell ID for the LTE signal automatically.
- **Manual** sets a specific Physical Cell ID for the LTE signal manually in order to speed up the synchronization with a BTS.

4 *Optional.* To set the threshold for PDSCH, tap **PDSCH Threshold** and enter a value by using the on-screen keyboard.

5 *Optional.* Tap **Miscellaneous** under **Menu** to do the following as needed:

- To select the number of antenna ports, tap the **MIMO** and select **2x2** or **4x4**.
- To assign a antenna port number automatically or manually, tap the **Antenna Port** under **Antenna menu** and select the option: **Auto**, **Antenna 0**, **Antenna 1**, **Antenna 2**, or **Antenna 3**. If the MIMO is set to 2x2, the antenna ports 2 and 3 are disabled.
- To turn the Multimedia Broadcast Multicast Service (MBMS) feature on or off, tap **MBMS** and select **On** or **Off**. For proper MBMS testing, you need to set the **Subframe Number** with the same PMCH subframe number. If this setting is on, the measurement item MBSFN RS appears in the result table.
- To set the Multicast Broadcast Single Frequency Network(**MBSFN**) detection automatically or manually for MBMS testing, tap **MBSFN** and select **Auto** or **Manual**. An automatically detected or manually entered MBSFN ID appears on the screen.
- To select the Cyclic Prefix, tap **Cyclic Prefix** and select **Normal** or **Extended**.

Setting Display

1 Tap **Menu** > **Display**.

2 Select the display mode from the choice: **PDSCH**, **PMCH** or **Both**.

Using Marker

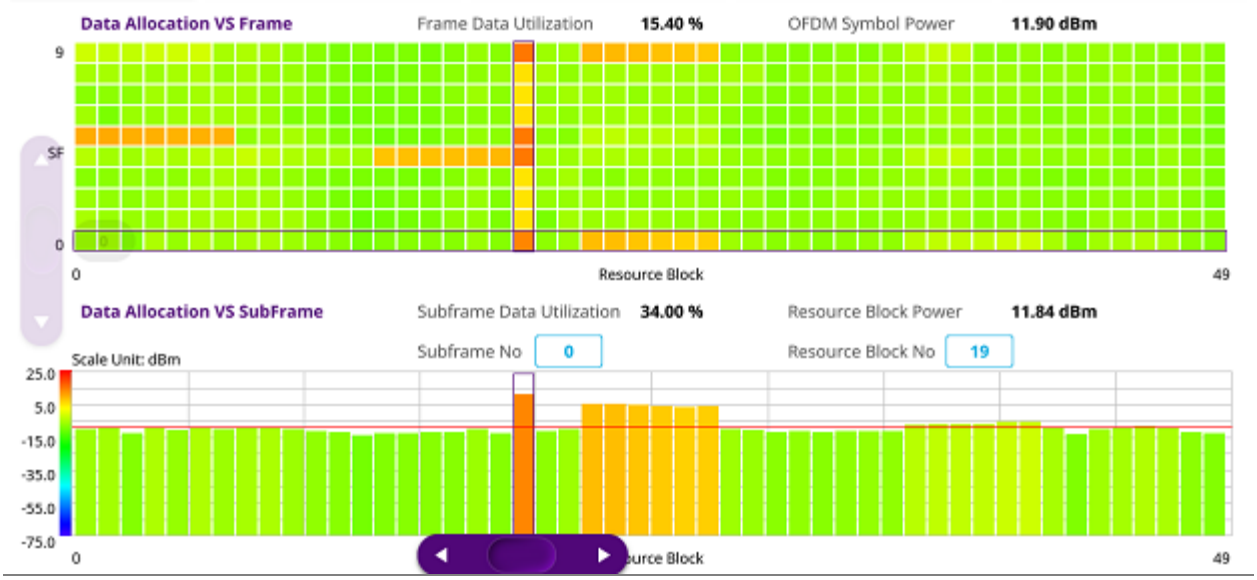
1 Tap **Menu** > **Marker**.

2 Tap the **Marker View** to **On** or **Off** to display or hide the marker on the chart.

3 To select the resource block number, tap the **RB Number** and enter a value by using the on-screen keyboard.

4 To select the subframe block number, tap the **Subframe No** and enter a value by using the on-screen keyboard.

Data Allocation Map measurement with LTE/LTE-A FDD Analyzer



Carrier Aggregation

Carrier aggregation enables a maximum of five multiple LTE carriers to be used together in order to provide high data rate required for LTE-Advanced. Component carriers to be aggregated can be intra-band contiguous, intra-band non-contiguous, or inter-band. The CA5G provides carrier aggregation measurements supporting for all the different modes with carrier aggregation bands added to the channel standard.

Setting measure setup

After configuring spectrum measurement in "Configuring Spectrum Measurements", you can set the measure setup to continue your measurement. The measurement settings can be saved and recalled as a file by selecting File Type as Setup and load the file onto the instrument using the **Save/Load** icons on the side bar.

1 Tap the **Setup** ( )icon on the side bar.

2 Tap **CA Configuration** then the component carrier configuration window appears.

3 Select the number of the component carrier to be set between one and five by tapping the number in **Range** box.

4 Set the Range **On** to set parameters and view the results for the selected component carrier on the screen or **Off** to turn it off.

5 Tap **LAA**(License Assisted Access) and select one among the three options: **2.4 GHz**, **5 GHz**, or **Off**.

6 Set the following parameters as needed: **Center Frequency**, **Channel No**, **Bandwidth**, **Physical Cell ID**, **MBMS**, **MBSFN**, **MIMO**, **Antenna Port**, **Subframe No**, **CFI, PHICH Ng**, **Cyclic Prefix**, **EVM Detection Mode** and **PDSCH Modulation Type**.

7 Tap **EVM Detection Mode** and select **Single** or **Combine** as desired.

- **Single**: Testing on one single antenna connected to your CA5G with a cable.
- **Combine**: Testing on multiple antennas connected to your CA5G with a 2x1 or 4x1 combiner or an antenna.

8 To select the subframe number to be measured, do one of the following:

  – If the **EVM Detection Mode** is set to **Single**, tap **Subframe Number** and set the subframe number.

  – If the **EVM Detection Mode** is set to **Combine**, tap **Subframe Number** and then select 0 or 5.

9 To set the threshold for PDSCH, tap **PDSCH Threshold** and enter a value by using the on-screen keyboard.

10 Tap **PDSCH Precoding** between **On** and **Off** to enable or disable the PDSCH precoding.

11 To select the number of antenna ports, tap the **MIMO** and select **2x2** or **4x4**.

Setting limit

1 Tap **Menu** > **Limit**.

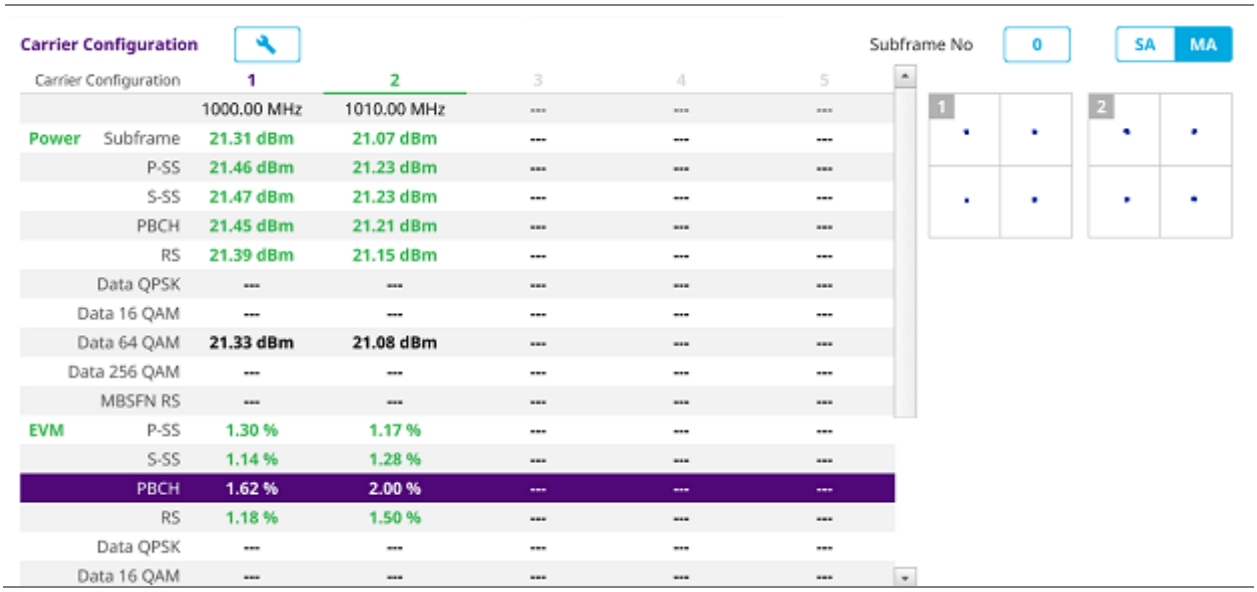
2 Tap **Frequency Error** to set the **Test limits** between **On** and **Off**, and set **High** and **Low Limits** using the on-screen keyboard to enable or disable Pass/Fail indication.

3 Tap **EVM** to select **PDSCH EVM**, **RS EVM**, **P-SS EVM**, **S-SS EVM** or **PMCH EVM** and set the **Test limits** between **On** and **Off**. Then set **High Limits** using the on-screen keyboard to enable or disable Pass/Fail indication.

4 Tap **Power** to select the **DL RS Power**, **R-SS Power**, **S-SS Power**, **PBCH Power**, **Subframe Power** or **Channel Power** and set the **Test limits** between **On** and **Off**. Then set **High** and **Low Limits** using the on-screen keyboard to enable or disable Pass/Fail indication.

5 Tap **TAE** to set the **Test limits** between **On** and **Off**. Then enter the value using the on-screen keyboard for each **Intra Cont High**, **Intra Non-Cont High** and **Inter Band High** to enable or disable Pass/Fail indication.

Carrier Aggregation measurement with LTE/LTE-A FDD Analyzer



OTA Analysis

Channel Scanner

The Channel Scanner is a radio receiver that can automatically tune or scan two or more discrete frequencies and multi-channels, indicating when it finds a signal on one of them and then continuing scanning when that frequency goes silent.

Setting measure setup

After configuring spectrum measurement in "Configuring Spectrum Measurements", you can set the measure setup to continue your measurement. The measurement settings can be saved and recalled as a file by selecting File Type as Setup and load the file onto the instrument using the **Save/Load** icons on the side bar.

1 Tap the **Setup** ( )icon on the side bar and to select the number of antenna ports, tap the **MIMO** and select **2x2** or **4x4**.

2 Tap **Amp/Scale** under **Menu** to set **Reference Level**, **Attenuation** or **External Offset** as required.

3 Tap **Sweep Mode** to select **Single** or **Continue**.

4 Tap **Trigger** to set **Internal**, **External** or **GPS** as required.

5 Tap **Limit** to set **Limit Line On** or **Off** and enter **Limit Line value** as required.

OTA Channel Scanner measurement with LTE/LTE-A FDD Analyzer

Detected List

No	Frequency	PCI (Grp,Sctr)	Channel Power	RSSI	RSRP	RSRQ	RS-SINR	Ant
1	889.00 MHz	410 (136,2)	-43.98 dBm	-41.73 dBm	-67.49 dBm	-5.76 dB	8.50 dB	Antenna0
2	2630.00 MHz	25 (8,1)	-57.53 dBm	-58.97 dBm	-84.59 dBm	-5.63 dB	3.21 dB	Antenna1
3	2650.00 MHz	225 (75,0)	-56.60 dBm	-58.60 dBm	-82.52 dBm	-3.92 dB	4.55 dB	Antenna0
4	---	---	---	---	---	---	---	---
5	---	---	---	---	---	---	---	---
6	---	---	---	---	---	---	---	---

ID Scanner

The LTE mobile receives signals from multiple base stations that all of these signals share the same spectrum and are present at the same time. Each base station has unique scrambling code assigned to the particular base station and it differentiates its signal from other base stations in the area.

The ID Scanner shows key parameters such as RSRP (Reference Signal Received Power) and RSRQ (Reference Signal Received Quality) that predict the downlink coverage quickly. RSRPs from entire cells help to rank between the different cells as input for handover and cell reselection decisions. RSRQ provides additional information when RSRP is not sufficient to make a reliable handover or cell reselection decision.

Setting measure setup

After configuring spectrum measurement in "Configuring Spectrum Measurements", you can set the measure setup to continue your measurement. The measurement settings can be saved and recalled as a file by selecting File Type as Setup and load the file onto the instrument using the **Save/Load** icons on the side bar.

1 Tap the **Setup** ( )icon on the side bar.

2 Tap **Bandwidth** and select the value from the following choices: **1.4 MHz**, **3 MHz**, **5MHz**, **10 MHz**, **15 MHz** or **20 MHz**.

3 To select the number of antenna ports, tap the **MIMO** and select **2x2** or **4x4**.

4 To select the Cyclic Prefix, tap **Cyclic Prefix** and select **Normal** or **Extended**.

5 *Optional.* Tap the **Save** icon on the side bar and select the save option form the choices available for your measurement mode.

OTA ID Scanner measurement with LTE/LTE-A FDD Analyzer

Detected ID List

No	PCI (Grp,Sctr)	RSRP	RSRQ	PS-SNR	RS-SINR	S-SS RSSI	P-SS	S-SS	S-SS Ec/Io
1	**498 (166,0)**	**-35.01 dBm**	**-12.01 dB**	**20.42 dB**	**-1.01 dB**	**-18.22 dBm**	**-35.01 dBm**	**-36.14 dBm**	**-1.31 dB**
2	**0 (0,0)**	**-35.90 dBm**	**-12.65 dB**	**45.50 dB**	**-2.79 dB**	**-17.03 dBm**	**-35.90 dBm**	**-34.95 dBm**	**-2.14 dB**
3	---	---	---	---	---	---	---	---	---
4	---	---	---	---	---	---	---	---	---
5	---	---	---	---	---	---	---	---	---
6	---	---	---	---	---	---	---	---	---

Multipath Profile

The Multipath Profile enables you to determine RF environmental conditions of testing area. It indicates the amount of power of the dominant pilot signal that is dispersed outside the main correlation peak due to multipath echoes that are expressed in dB. This value should be very small ideally.

The multipath profile is the result of portions of the original broadcast signal arriving at the receiving antenna out of phase. This can be caused by the signal being reflected off objects such as buildings, or being refracted through the atmosphere differently from the main signal.

Setting measure setup

After configuring spectrum measurement in "Configuring Spectrum Measurements", you can set the measure setup to continue your measurement. The measurement settings can be saved and recalled as a file by selecting File Type as Setup and load the file onto the instrument using the **Save/Load** icons on the side bar.

1 Tap the **Setup** ( )icon on the side bar.

2 Tap **Bandwidth** and select the value from the following choices: **1.4 MHz**, **3 MHz**, **5MHz**, **10 MHz**, **15 MHz** or **20 MHz**.

3 Tap **RS Window** and select the RS window option: **2 µs**, **4 µs**, or **8 µs**.

4 To select the number of antenna ports, tap the **MIMO** and select **2x2** or **4x4**.

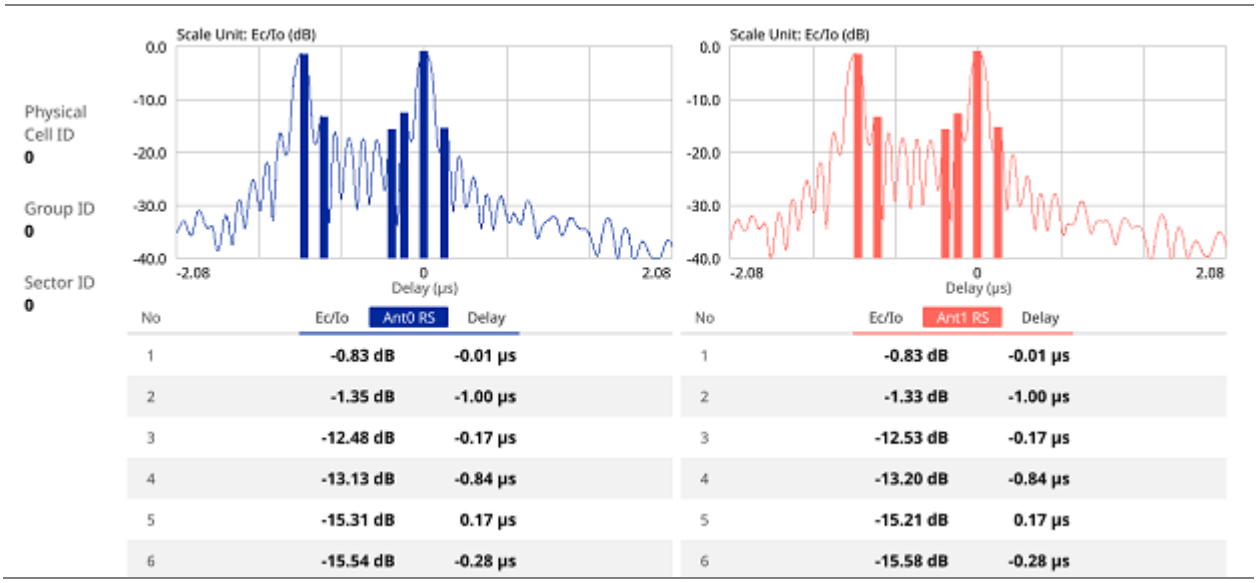
5 To select the Cyclic Prefix, tap **Cyclic Prefix** and select **Normal** or **Extended**.

6 To turn the Multimedia Broadcast Multicast Service (MBMS) feature on or off, tap **MBMS** and select **On** or **Off**. For proper MBMS testing, you need to set the **Subframe Number** with the same PMCH subframe number. If this setting is on, the measurement item MBSFN RS appears in the result table.

7 To set the Multicast Broadcast Single Frequency Network(**MBSFN**) detection automatically or manually for MBMS testing, tap **MBSFN** and select **Auto** or **Manual**. An automatically detected or manually entered MBSFN ID appears on the screen.

8 *Optional.* Tap the **Save** icon on the side bar and select the save option from the choices available for your measurement mode.

OTA Multipath Profile measurement with LTE/LTE-A FDD Analyzer



No	Ec/Io	Ant0 RS	Delay
1	-0.83 dB		-0.01 µs
2	-1.35 dB		-1.00 µs
3	-12.48 dB		-0.17 µs
4	-13.13 dB		-0.84 µs
5	-15.31 dB		0.17 µs
6	-15.54 dB		-0.28 µs

No	Ec/Io	Ant1 RS	Delay
1	-0.83 dB		-0.01 µs
2	-1.33 dB		-1.00 µs
3	-12.53 dB		-0.17 µs
4	-13.20 dB		-0.84 µs
5	-15.21 dB		0.17 µs
6	-15.58 dB		-0.28 µs

Control Channel

DL RS power is the resource element power of Downlink Reference Symbol. The absolute DL RS power is indicated on the BCH. The absolute accuracy is defined as the maximum deviation between the DL RS power indicated on the BCH and the DL RS power at the BS antenna connector.

The OTA Control Channel provides summary of all control channels including RS power trend over time. GPS coordinates (latitude and longitude) will be displayed on the screen if a GPS antenna is connected and locked to the GPS satellites.

Setting measure setup

After configuring spectrum measurement in "Configuring Spectrum Measurements", you can set the measure setup to continue your measurement. The measurement settings can be saved and recalled as

a file by selecting File Type as Setup and load the file onto the instrument using the **Save/Load** icons on the side bar.

1 Tap the **Setup** ( )icon on the side bar.

2 Tap **Bandwidth** and select the value from the following choices: **1.4 MHz**, **3 MHz**, **5MHz**, **10 MHz**, **15 MHz** or **20 MHz**.

3 Tap **Subframe Number** to set the number of subframe using the on-screen keyboard.

NOTE

For MBMS testing, this subframe number must be neither 0 nor 5 as these subframes 0 and 5 are not available for MBMS and it must be set to the MBMS transmitted channel's subframe number.

4 *Optional.* Tap **Physical Cell ID** and select the type **Manual** or **Auto**.

- **Auto** lets the instrument detect the Physical Cell ID for the LTE signal automatically.
- **Manual** sets a specific Physical Cell ID for the LTE signal manually in order to speed up the synchronization with a BTS.

5 *Optional.* To select the number of antenna ports, tap the **MIMO** and select **2x2** or **4x4**.

6 *Optional.* To assign a antenna port number automatically or manually, tap the **Antenna Port** under **Antenna menu** and select the option: **Auto**, **Antenna 0**, **Antenna 1**, **Antenna 2**, or **Antenna 3**. If the MIMO is set to 2x2, the antenna ports 2 and 3 are disabled.

7 To turn the Multimedia Broadcast Multicast Service (MBMS) feature on or off, tap **MBMS** and select **On** or **Off**. For proper MBMS testing, you need to set the **Subframe Number** with the same PMCH subframe number. If this setting is on, the measurement item MBSFN RS appears in the result table.

8 To set the Multicast Broadcast Single Frequency Network(MBSFN) detection automatically or manually for MBMS testing, tap **MBSFN** and select **Auto** or **Manual**. An automatically detected or manually entered MBSFN ID appears on the screen.

9 *Optional.* To select the Cyclic Prefix, tap **Cyclic Prefix** and select **Normal** or **Extended**.

10 Tap **Menu** > **Display** and select **EVM** or **Power**. The screen changes according to the selected option.

Setting limit

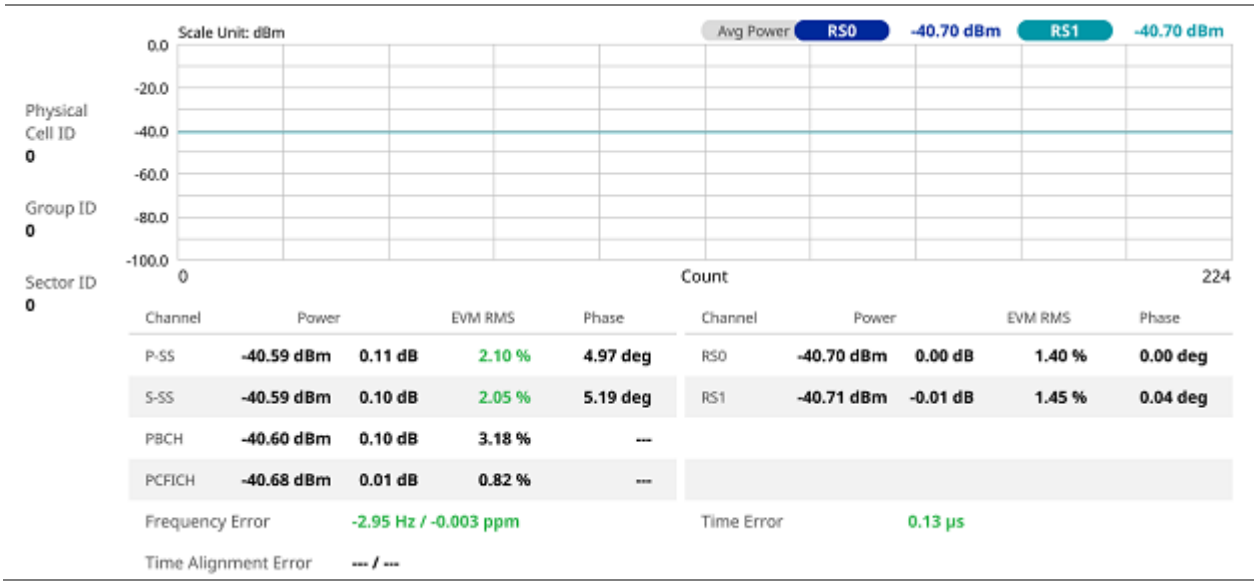
1 Tap **Menu** > **Limit**.

2 Tap **RS EVM** to set the limit for RS error vector magnitude. Select **RS0 EVM**, **RS1 EVM**, **RS2 EVM** or **RS3 EVM** and set the Limit Line **On** or **Off**, entering the value of **Limit Line** using on-screen keyboard to enable or disable Pass/Fail indication.

3 Tap to switch the **P-SS EVM**/ **S-SS EVM**/ **Frequency Error**/ **Time Error**/ **Time Alignment Error** to set the **Test limits** to **On** or **Off** with setting **High and (Low) Limits** using the on-screen keyboard to enable or disable Pass/Fail indication.

4 Optional : Tap the **Save** icon on the side bar and select the save option from the choices available for your measurement mode.

OTA Control Channel measurement with LTE/LTE-A FDD Analyzer



Datagram

The OTA Datagram is a time-varying spectral representation that shows how the power of a signal varies with time. The power allocated to the specific resource block will be represented with an amplitude axis (in dBm) and the waterfall diagram will show the trend of past resource block power over certain period. Using a marker function facilitates analysis of accumulated resource block power for data utilization.

Setting measure setup

After configuring spectrum measurement in "Configuring Spectrum Measurements", you can set the measure setup to continue your measurement. The measurement settings can be saved and recalled as a file by selecting File Type as Setup and load the file onto the instrument using the **Save/Load** icons on the side bar.

1 Tap the **Setup** ( )icon on the side bar.

2 Tap **Bandwidth** and select the value from the following choices: **1.4 MHz**, **3 MHz**, **5MHz**, **10 MHz**, **15 MHz** or **20 MHz**.

3 Tap **Subframe Number** to set the number of subframe using the on-screen keyboard.

4 Tap **Position** to set the number of position using the on-screen keyboard when **Time Cursor** is set to **On**.

5 *Optional.* Tap **Physical Cell ID** and select the type **Manual** or **Auto**.

- **Auto** lets the instrument detect the Physical Cell ID for the LTE signal automatically.
- **Manual** sets a specific Physical Cell ID for the LTE signal manually in order to speed up the synchronization with a BTS.

6 *Optional.* To set the threshold for PDSCH, tap **PDSCH Threshold** and enter a value by using the on-screen keyboard.

7 To set the time cursor at a specific position, tap **Time Cursor** and select **On**.

> **NOTE**
>
> Enabling the time cursor puts the measurement on hold and you can make post-processing analysis for each measurement over time using the time cursor.

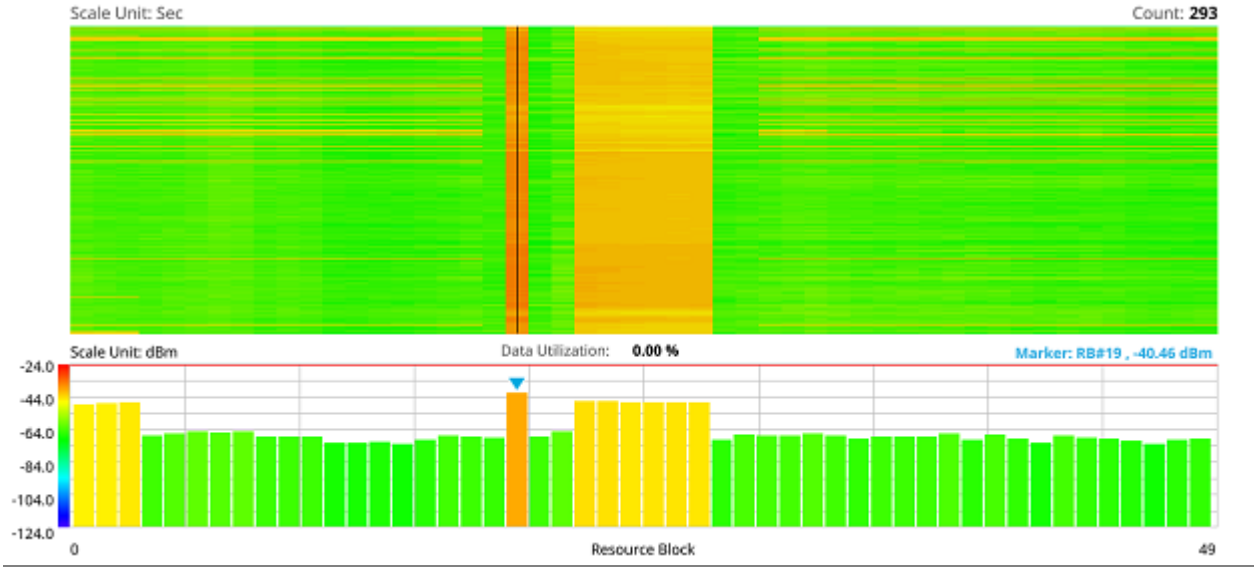
8 To start a new measurement, tap **Reset**.

9 *Optional.* To select the number of antenna ports, tap the **MIMO** and select **2x2** or **4x4**.

10 *Optional.* To select the Cyclic Prefix, tap **Cyclic Prefix** and select **Normal** or **Extended**.

11 *Optional.* Tap the **Save** icon on the side bar and select the save option from the choices available for your measurement mode.

OTA Datagram measurement with LTE/LTE-A FDD Analyzer



Route Map

5G route map traces the power level of the strongest beam corresponding a particular time and geographical position and presents it in a geographical map as a measurement point. All the collected measurements can be exported for post-processing purposes, including data of the eight strongest beams for each measurement point, including its measurement time and geographical location.

Loading a map

To use any features related to maps, you need to download and install the maps on the CellAdvisor 5G. The VIAVI JDMapCreator will help you download maps. Make sure the JDMapCreator application on your computer is connected to the instrument via LAN. You can send a map file with a single layer to the instrument directly by using the **Send to EQP** menu in JDMapCreator. For more information on how to use the JDMapCreator, see the *JDMapCreator 2.0 User Guide*.

1 Plug in your USB flash drive that has a map file in `.mcf` file type created in JDMapCreator.

2 Tap the **Load** icon( ) on the side bar.

3 Navigate the map file you want to open.
The File Information panel displays the file properties including its name, size, type and date modified.

4 Tap the **Load** button on the screen.

Once you loaded the map, you can also control the map using the following icons on the map.

Icon	Description
	Tap to go to your current location on the map. Once tapped, the purple icon appears on the map indicating your current location.
	Tap to switch to the full screen map view.
	Tap to zoom in the map.
	Tap to zoom out the map.
	Tap and select the area where you want to expand.

Setting measure setup

Before starting the Route Map measurement, you need to set Spectrum measurements displayed on the quick access and display tab. See "Configuring Spectrum Measurements" for more details.

1 If required, connect a GPS receiver to your CellAdvisor 5G for outdoor mapping. Indoor mapping does not necessarily need a GPS antenna.

2 Tap the **Setup** ( ) icon on the side bar.

3 Tap to switch the **Plot Point** to **GPS** or **Position**.

   a To collect data/plot points automatically as you move around in a vehicle or outside (outdoor), select **GPS** and then tap to switch to the **Screen Mode** between **Map** and **Full**.
   With the **Map** setting, you can view only the collected points that can be seen within the boundary of the loaded map. With the **Full** setting, you can view all the collected points of the route without the loaded map.

   b To collect data/plot points manually in indoor layout without a GPS antenna, select **Position**.

4 Tap to switch **Plot Item** to **RSRP**, **RSRQ**, **RS-SINR**, **S-SS RSSI**, **P-SS Power**, **S-SS Power** or **S-SS Ec/Io**.

5 Tap **Bandwidth** and select the value from the following choices: **1.4 MHz**, **3 MHz**, **5MHz**, **10 MHz**, **15 MHz** or **20 MHz**.

	NOTE: The instrument does not automatically save the collected data. It is recommended that you save the result. Otherwise, you will lose all the collected data.

Logging data

1 Follow the **step 1 to 3** in Setting measure setup.

2 Tap the **Start** button ( ) on the right panel of the map to start plotting on the map. When you select a point on the map, a marker appears and the Information window appears on the right panel.

3 Tap the **Stop** ( ) button to stop plotting.

4 Tap the **Pause** button ( ) to pause plotting, then the **Pause** button changes to ( ) and GPS point cannot be plotted.

5 Save the logging file to your USB.

Viewing the logging data

1 Load the saved logging file using the **Load** icon( ) on the side bar. Make sure the file extension is `.gomv`.

2 If the PCI is set to Auto, the point on the map appears with a color representing the largest **BRSRP** value.

When you select a point on the map, a marker appears and the Information window appears on the right panel.

3 Set the **PCI** to **Manual** and tap the **Select** button.
The Select PCI window appears.

4 Select **PCI** on the left and then the corresponding Beam Index appeared on the right.

5 Tap the **Apply** button.
The point color of the map changes to the corresponding BRSRP value, and if there is no detected Beam Index, the point will be hidden.

Setting limit

You can set the thresholds for the two different color indicators, red and blue. The maximum value is the Limit for **Good**, and the minimum value is the Limit for **Poor**. See below to check the plot point color based on the Legend Color Table.

Red	Green	Blue	Color
0	0	255	Poor
0	32	255	
0	64	255	
0	128	255	
0	255	255	
0	255	170	
0	255	85	
0	255	0	
85	255	0	
170	255	0	
255	255	0	
255	128	0	
255	64	0	
255	32	0	
255	0	0	Excellent

1 Tap **Menu** > **Limit**.

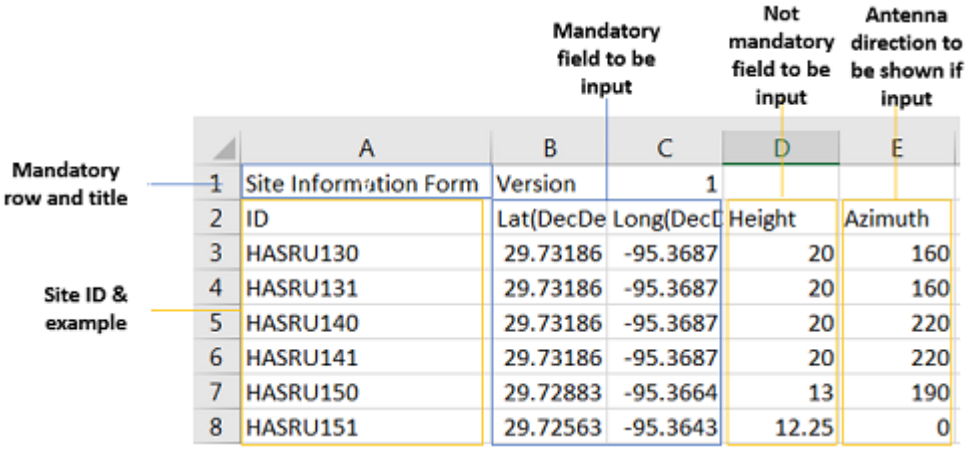
2 Tap **Good** and set a value using the on-screen keyboard.

3 Tap **Poor** and set a value using the on-screen keyboard.

Importing cellsite DB

You can import the site DB by creating the 5G site information form.

1 Create the 5G site information with an excel file as below.



2 Input the two mandatory fields: **Lat (DecDeg)** and **Long (DecDeg)**.

3 Input the **Azimuth** field if you want to check the direction of antenna.

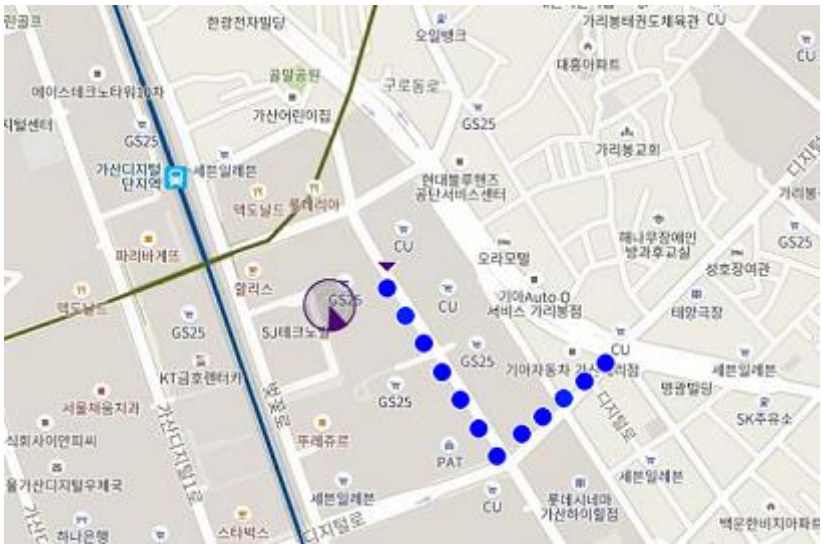
4 Make sure to save the file as (Comma delimited) (*.csv).

5 Copy the file to the USB memory stick and insert it to the **USB A** or **USB B** port of the instrument.

6 Tap the **Load** ( ) hot key on the side bar.

7 Import the saved file.
Once the file is loaded, the following cellsite information appears with an icon.

Route map measurement with site information screen



	NOTE: The purple icon (,) indicates the base station (site) location and the direction of antenna. If the site is beyond the latitude and longitude of the map file, it will not show.

OTA Route Map measurement with LTE/LTE-A FDD Analyzer

Miscellaneous

Power Statistics CCDF

The Power Statistics Complementary Cumulative Distribution Function (CCDF) measurement characterizes the power statistics of the input signal. It provides PAR (Peak to Average power Ratio) versus different probabilities.

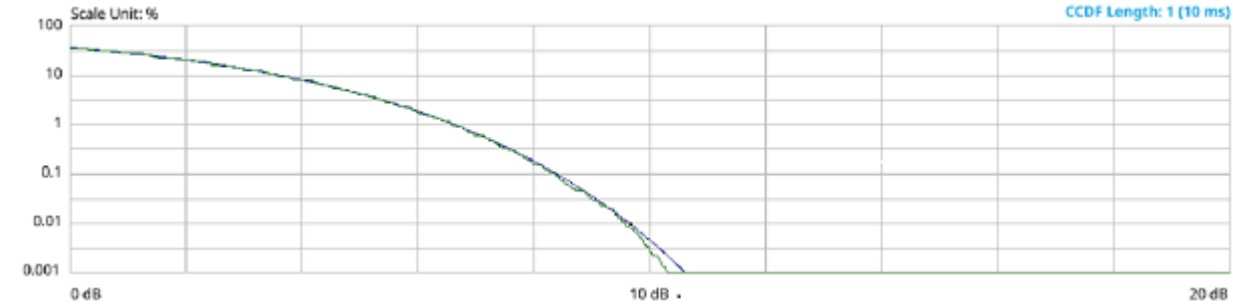
Setting measure setup

After configuring spectrum measurement in "Configuring Spectrum Measurements", you can set the measure setup to continue your measurement. The measurement settings can be saved and recalled as a file by selecting File Type as Setup and load the file onto the instrument using the **Save/Load** icons on the side bar.

1 Tap the **Setup** ( )icon on the side bar.

2 Tap **CCDF Length** and select the value between 1 and 100.

CCDF measurement with LTE/LTE-A FDD Analyzer



Power		Probability		Distribution	
Average Power	**-52.74 dBm**	[10 %]	**3.55 dB**	4 dB	**8.19 %**
Max Power	**-41.78 dBm**	[1 %]	**6.55 dB**	8 dB	**0.16 %**
Crest Factor	**10.96 dB**	[0.1 %]	**8.34 dB**	12 dB	**0.00 %**
		[0.01 %]	**9.55 dB**	16 dB	**0.00 %**
		[0.001 %]	**10.26 dB**	20 dB	**0.00 %**

Using LTE/LTE-A TDD Analyzer

Introduction

The CellAdvisor 5G LTE/LTE-A TDD Analyzer is the optimal portable test solution for installation and maintenance of cellular base stations and cell sites, running with external AC power or battery for the field. Its touch-based user interface has been specifically designed with customized menus and simple calibration procedures, providing service providers with accurate and reliable LTE/LTE-A TDD measurement results.

The CellAdvisor 5G is the optimal solution to perform following measurements:

- Spectrum Analysis
  - Spectrum
- RF Analysis
  - Channel Power
  - Occupied Bandwidth
  - Spectrum Emission Mask
  - ACLR
  - Multi-ACLR
  - Spurious Emissions (frequency extended up to 18.5 GHz in addition to existing 24 GHz to 40 GHz)
- Power vs Time
  - Power vs Time (Frame)
  - Power vs Time (Slot)
- Modulation Analysis
  - Constellation
  - Data Channel
  - Control Channel
  - Subframe
  - Time Alignment Error
  - Data Allocation Map
  - Carrier Aggregation

- OTA Analysis
  - OTA Channel Scanner
  - OTA ID Scanner
  - OTA Multipath Profile
  - OTA Control Channel
  - OTA Datagram
  - OTA Route Map
- Miscellaneous
  - Power Statistics CCDF

Selecting mode and measure

To start measurement, do the following steps:

1 Tap **LTE/LTE-A TDD Analyzer** on the **MODE** panel.

2 Tap any measurement mode from the following choices:

Spectrum Analysis > **Spectrum**

RF Analysis > **Channel Power, Occupied Bandwidth, Spectrum Emission Mask, ACLR, Multi-ACLR** or **Spurious Emissions**

Power vs Time > **Power vs Time (Frame)** or **Power vs Time (Slot)**

Modulation Analysis > **Constellation, Data Channel, Control Channel, Subframe, Time Alignment Error, Data Allocation Map** or **Carrier Aggregation**

OTA Analysis > OTA Channel Scanner, OTA ID Scanner, OTA Multipath Profile, OTA Control Channel, OTA Datagram or **OTA Route Map**

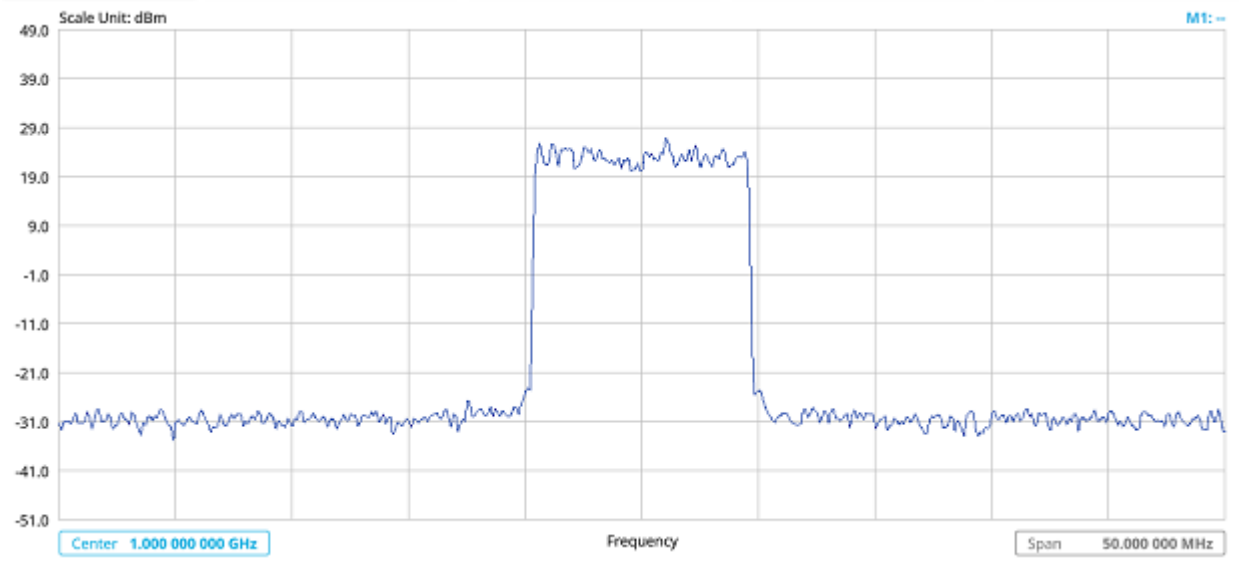
Miscellaneous > Power Statistics CCDF

Conducting Spectrum Measurement

Spectrum

If you have configured test parameters as described in the "Configuring Spectrum Measurements", your measurement is displayed on the screen as like the following example. You can simply change Center Frequency by tapping the icons right below the result chart screen.

Spectrummeasurement with LTE/LTE-A FDD Analyzer



Conducting RF measurement

Channel Power

The Channel Power measurement is a common test used in the wireless industry to measure the total transmitted power of a radio within a defined frequency channel. It acquires a number of points representing the input signal in the time domain, transforms this information into the frequency domain using Fast Fourier Transform (FFT), and then calculates the channel power. The effective resolution bandwidth of the frequency domain trace is proportional to the number of points acquired for the FFT.

The channel power measurement identifies the total RF power, power spectral density, and Peak to Average Ratio (PAR) of the signal within the channel bandwidth.

Setting measure setup

After configuring spectrum measurement in "Configuring Spectrum Measurements", you can set the measure setup to continue your measurement. The measurement settings can be saved and recalled as a file by selecting File Type as Setup and load the file onto the instrument using the **Save/Load** icons on the side bar.

1 Tap the **Setup** ( )icon on the side bar.

2 Tap **Bandwidth** and select the value from the following choices: **1.4 MHz**, **3 MHz**, **5MHz**, **10 MHz**, **15 MHz** or **20 MHz**.

You can also tap the rectangle with value, Bandwidth 10 MHz under the chart screen and input the value using the on-screen keyboard.

3 Tap Center 1.000 000 000 GHz to set the center frequency using the on-screen keyboard.

4 Tap **Menu** > **BW/AVG** > **Average** to set the number of measurements to be averaged using the on-screen keyboard.
The input value range is from 1 to 100.

Setting limit

1 Tap **Menu** > **Limit**.

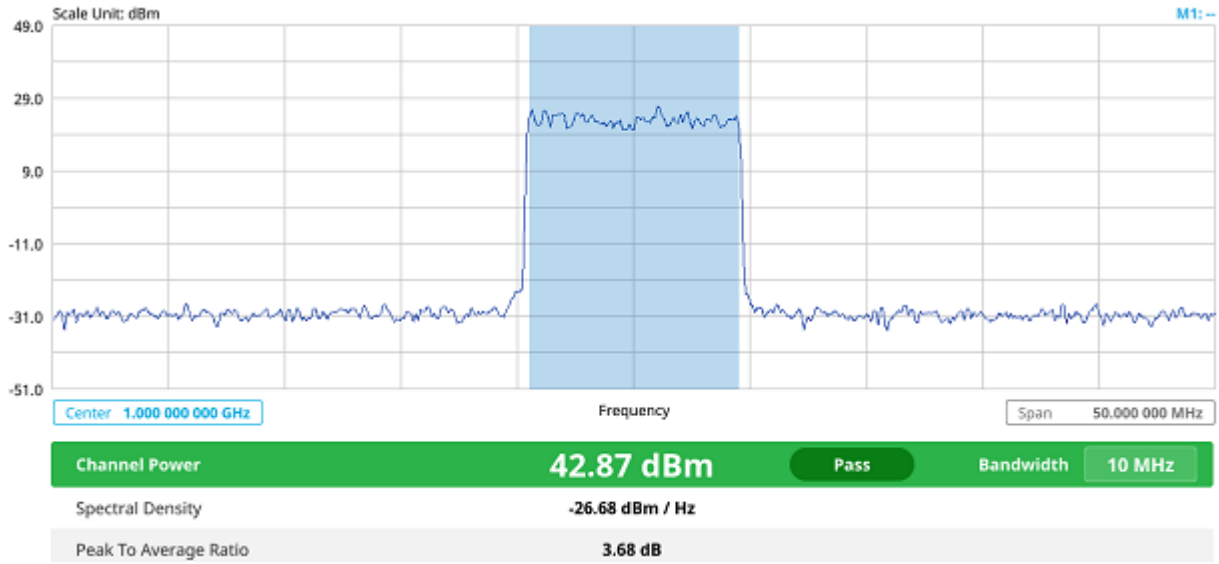
2 Tap to switch the **Test Limits** to **On** or **Off** to enable or disable Pass/Fail indication.
The result table color for Pass is green, and the result table color for Fail is red.

3 Tap **High Limit** to set the upper threshold using the on-screen keyboard.

4 Tap **Low Limit** to set the lower threshold using the on-screen keyboard.

5 *Optional.* Tap the **Save** hot key on the side bar and select the save option from the choices available for your measurement mode.

Channel Power measurement with LTE/LTE-A TDD Analyzer



Channel power measurement result shows channel power and spectrum density in a user specified channel bandwidth. The peak to average ratio (PAR) is shown at the bottom of the screen as well. The shaded area on the display indicates the channel bandwidth.

Occupied Bandwidth

The Occupied Bandwidth measures the percentage of the transmitted power within a specified bandwidth. The percentage is typically 99%.

Setting measure setup

After configuring spectrum measurement in "Configuring Spectrum Measurements", you can set the measure setup to continue your measurement. The measurement settings can be saved and recalled as a file by selecting File Type as Setup and load the file onto the instrument using the **Save/Load** icons on the side bar.

1 Tap the **Setup** ( )icon on the side bar.

2 Tap **Bandwidth** and select the value from the following choices: **1.4 MHz**, **3 MHz**, **5MHz**, **10 MHz**, **15 MHz** or **20 MHz**.

You can also tap the rectangle with value,

under the chart screen and input the value using the on-screen keyboard.

3 Tap

to set the center frequency using the on-screen keyboard.

4 Tap **Menu** > **BW/AVG** > **Average** to set the number of measurements to be averaged using the on-screen keyboard.
The input value range is from 1 to 100.

Setting limit

1 Tap **Menu** > **Limit**.

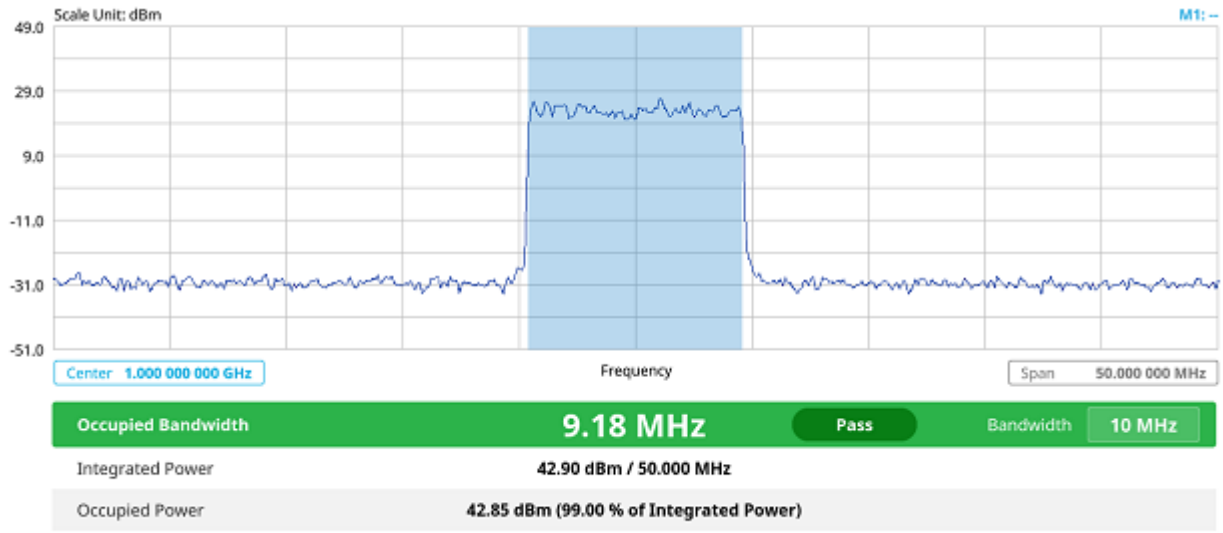
2 Tap to switch the **Test Limits** to **On** or **Off** to enable or disable Pass/Fail indication.
The result table color for Pass is green, and the result table color for Fail is red.

3 Tap **High Limit** to set the upper threshold using the on-screen keyboard.

4 Tap **Low Limit** to set the lower threshold using the on-screen keyboard.

5 *Optional.* Tap the Save hot key on the side bar and select the save option from the choices available for your measurement mode.

Occupied Bandwidth with LTE/LTE-A TDD Analyzer



The Occupied Bandwidth measurement shows both of power across the band and power bandwidth in a user specified percentage to determine the amount of spectrum used by a modulated signal. Occupied bandwidth is typically calculated as the bandwidth containing 99% of the transmitted power.

Spectrum Emission Mask (SEM)

The Spectrum Emission Mask (SEM) measurement is to identify and determine the power level of out-of band spurious emission outside the necessary channel bandwidth and modulated signal. It measures the power ratio between in-band and adjacent channels. The CellAdvisor 5G indicates either Pass or Fail based on the specified limit of the signal.

Setting measure setup

After configuring spectrum measurement in "Configuring Spectrum Measurements", you can set the measure setup to continue your measurement. The measurement settings can be saved and recalled as a file by selecting File Type as Setup and load the file onto the instrument using the **Save/Load** icons on the side bar.

1 Tap the **Setup** ( )icon on the side bar.

2 Tap **Bandwidth** and select the value from the following choices: **1.4 MHz**, **3 MHz**, **5MHz**, **10 MHz**, **15 MHz** or **20 MHz**.

You can also tap the rectangle with value,

under the chart screen and input the value using the on-screen keyboard.

3 Tap **Mask Type** and select the type from the following choices: **Wide Area BS A**, **Wide Area BS B**, **Local Area BS**, **Home BS**.

4 Tap **Subframe Number** to set the number of subframe using the on-screen keyboard.

5 *Optional.* Tap **Physical Cell ID** and select the type **Manual** or **Auto**.

- **Auto** lets the instrument detect the Physical Cell ID for the LTE signal automatically.
- **Manual** sets a specific Physical Cell ID for the LTE signal manually in order to speed up the synchronization with a BTS.

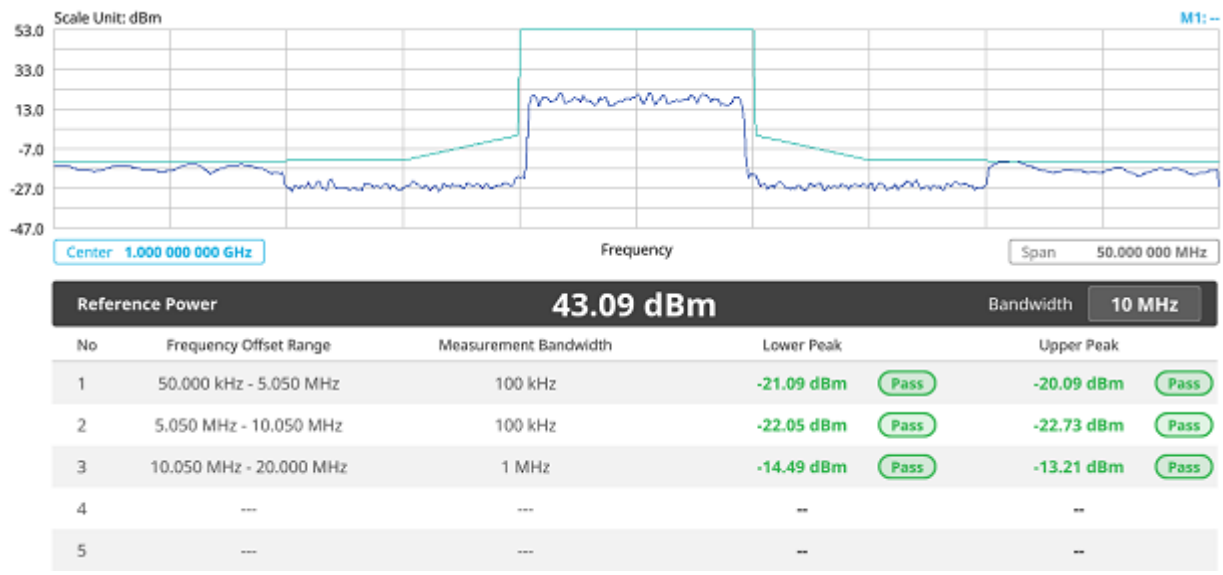
Setting limit

1 Tap **Menu** > **Limit**.

2 Tap to switch the **Test Limits** to **On** or **Off** to enable or disable Pass/Fail indication.
The result table color for Pass is green, and the result table color for Fail is red.

3 *Optional.* Tap the **Save** hot key on the side bar and select the save option form the choices available for your measurement mode.

Spectrum Emission Mask measurement with LTE/LTE-A TDD Analyzer



If Lower Peak or Upper Peak indicates Fail, the mask line becomes red.

NOTE:

If the Trace View is set to Off, the Reference Power, Lower Peak, and Upper Peak is not shown. If the Trace View is set to On and the Trace Type is selected other than Clear Write, the Reference Power, Lower Peak, and Upper Peak is shown with value and "*" at the end of the value.

ACLR

The Adjacent Channel Power Ratio (ACPR), designated by the 3GPP LTE/LTE-A specifications as the Adjacent Channel Leakage power Ratio (ACLR), is the power contained in a specified frequency channel bandwidth relative to the total carrier power. It may also be expressed as a ratio of power spectral densities between the carrier and the specified offset frequency band.

Setting measure setup

After configuring spectrum measurement in "Configuring Spectrum Measurements", you can set the measure setup to continue your measurement. The measurement settings can be saved and recalled as a file by selecting File Type as Setup and load the file onto the instrument using the **Save/Load** icons on the side bar.

1 Tap the **Setup** ( )icon on the side bar.

2 Tap **Bandwidth** and select the value from the following choices: **1.4 MHz**, **3 MHz**, **5MHz**, **10 MHz**, **15 MHz** or **20 MHz**.

You can also tap the rectangle with value,

under the chart screen and input the value using the on-screen keyboard.

3 Tap **Subframe Number** to set the number of subframe using the on-screen keyboard.

4 *Optional.* Tap **Physical Cell ID** and select the type **Manual** or **Auto**.

- **Auto** lets the instrument detect the Physical Cell ID for the LTE signal automatically.
- **Manual** sets a specific Physical Cell ID for the LTE signal manually in order to speed up the synchronization with a BTS.

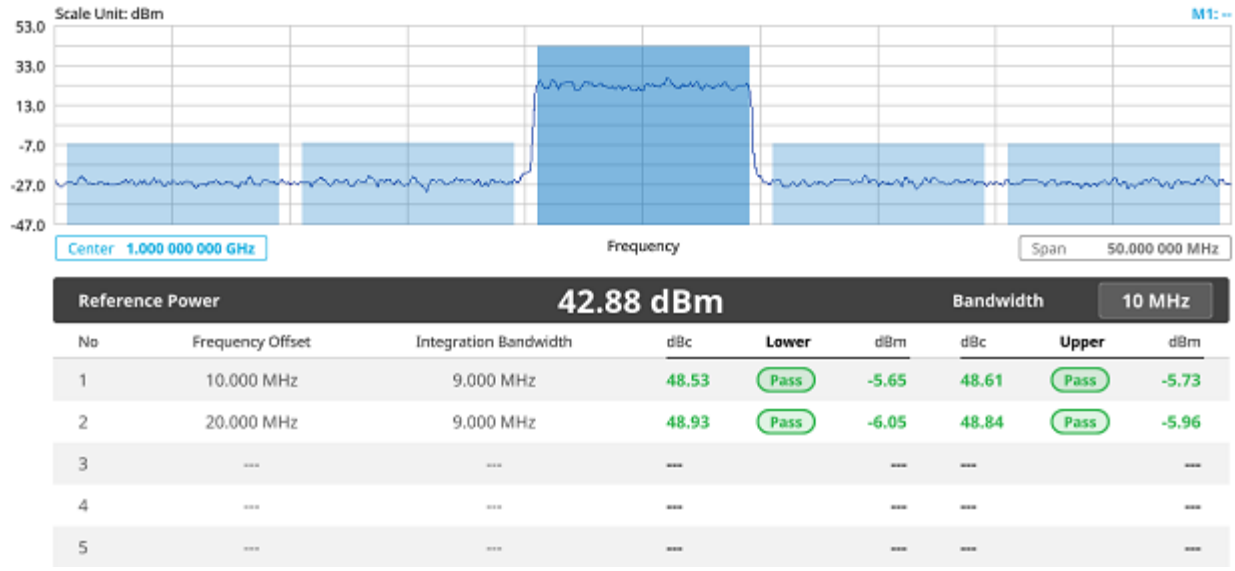
Setting limit

1 Tap **Menu** > **Limit**.

2 Tap to switch the **Test Limits** to **On** or **Off** to enable or disable Pass/Fail indication.
The result table color for Pass is green, and the result table color for Fail is red.

3 *Optional.* Tap the **Save** hot key on the side bar and select the save option form the choices available for your measurement mode.

ACLR measurement with LTE/LTE-A TDD Analyzer



Multi-ACLR

The Multi-ACLR measurement is used to perform multi-channel ACLR measurements with as many channels as possible. It helps you to measure ACLR in multi-channel transmitting Base Station environment.

Setting measure setup

After configuring spectrum measurement in "Configuring Spectrum Measurements", you can set the measure setup to continue your measurement. The measurement settings can be saved and recalled as a file by selecting File Type as Setup and load the file onto the instrument using the **Save/Load** icons on the side bar.

1 Tap the **Setup** ( )icon on the side bar.

2 Tap **Bandwidth** and select the value from the following choices: **1.4 MHz**, **3 MHz**, **5MHz**, **10 MHz**, **15 MHz** or **20 MHz**.

You can also tap the rectangle with value,

under the chart screen and input the value using the on-screen keyboard.

3 Setting the center frequency, tap the **Lowest Frequency** to set the starting center frequency and enter the value using the on-screen keyboard. Next tap the **highest frequency** to set the stopping center frequency and enter the value.

4 Setting the channel number, tap the **Lowest Channel Number** to set the starting channel and enter the value using the on-screen keyboard. Next tap the **highest Channel Number** to set the stopping Channel and enter the value.

5 Selecting **Channel Standard** sets the channel to **Band Global** automatically.

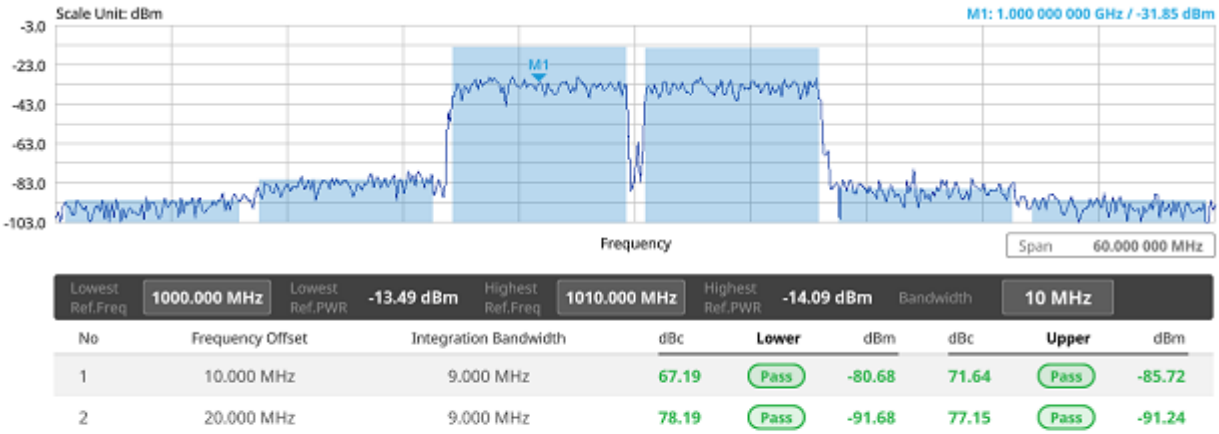
Setting limit

1 Tap **Menu** > **Limit**.

2 Tap to switch the **Test Limits** to **On** or **Off** to enable or disable Pass/Fail indication.
The result table color for Pass is green, and the result table color for Fail is red.

3 *Optional.* Tap the **Save** icon on the side bar and select the save option form the choices available for your measurement mode.

Multi-ACLR measurement with LTE/LTE-A TDD Analyzer



No	Frequency Offset	Integration Bandwidth	dBc	Lower	dBm	dBc	Upper	dBm
1	10.000 MHz	9.000 MHz	67.19	Pass	-80.68	71.64	Pass	-85.72
2	20.000 MHz	9.000 MHz	78.19	Pass	-91.68	77.15	Pass	-91.24

NOTE

You can set the Lowest Ref. Frequency and Highest Ref. Frequency by tapping the rectangle with value using the on-screen keyboard.

Spurious Emissions

The Spurious Emissions measurement is to identify or determine the power level of in-band or out-of-band spurious emissions within the necessary channel bandwidth and modulated signal. The CellAdvisor 5G indicates either Pass or Fail based on the specified limit of the signal. Frequency extended up to 18.5 GHz in addition to existing 24 GHz to 40 GHz.

Setting measure setup

After configuring spectrum measurement in "Configuring Spectrum Measurements", you can set the measure setup to continue your measurement. The frequency setting is not used in the Spurious Emissions mode. The measurement settings can be saved and recalled as a file by selecting File Type as Setup and load the file onto the instrument using the **Save/Load** icons on the side bar.

1 Tap the **Setup** ( ) icon on the side bar.

2 Tap **Configuration** and select **Range** under the chart screen and switch to **On** to display or **Off** to hide the selected range in the result table.

3 Select the range number between **1** and **20** to add as a new or change the existing settings.

4 Tap **Start Frequency/Stop Frequency** and enter the value for the selected range using the on-screen keyboard.

5 Tap **Start Limit/Stop Limit** and enter the lower limit/upper limit for Pass/Fail indication.

6 Tap **Attenuation/RBW/VBW** and specify or select the value.

7 Tap **Measurement Type** between **Full** and **Examine.**

> **NOTE**
>
> The **Examine** mode displays only the selected range while the **Full** mode lets the instrument automatically change the selected range from one another.

8 Tap **Average** on the box of upper screen or tap **Average** under the **menu BW/AVG** and enter the value between **1** and **100** to set the number of measurements to be averaged.

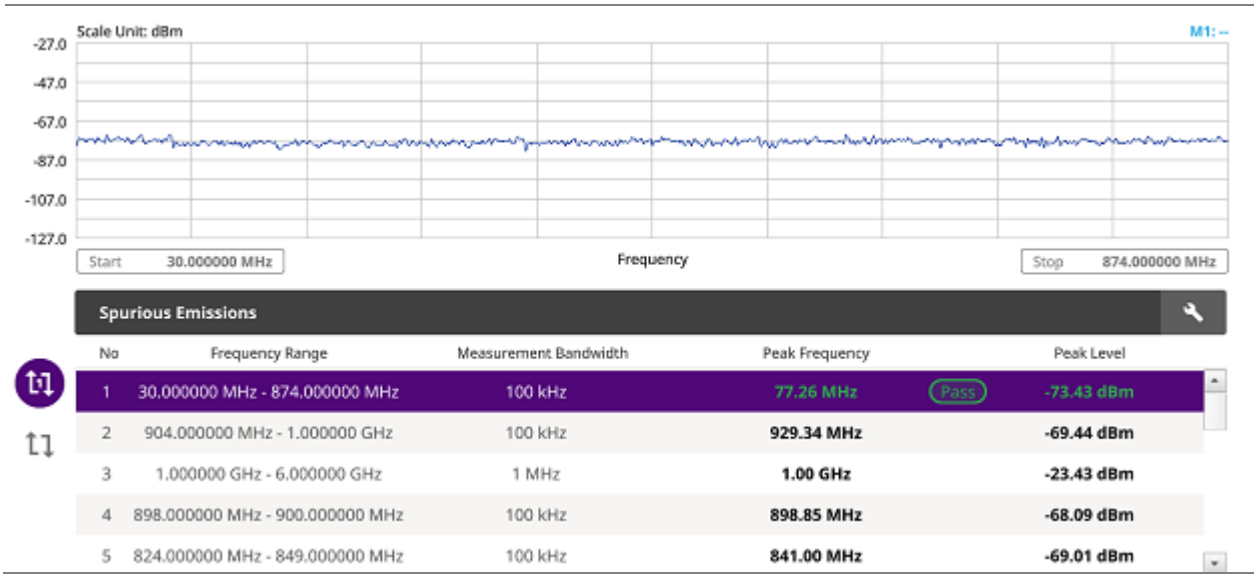
Setting limit

1 Tap **Menu** > **Limit**.

2 Tap to switch the **Test Limits** to **On** or **Off** to enable or disable Pass/Fail indication.

3 *Optional.* Tap the **Save** icon on the side bar and select the save option form the choices available for your measurement mode.

Spurious Emissions measurement with LTE/LTE-A TDD Analyzer



NOTE:

You can only set the frequency range and attenuation by tapping the Configuration icon. If you select the first icon next to the Range table above, it only shows the selected range and if you select the second icon next to the Range table, it keeps moving from the first selected range to the final selected range.

Power vs Time

Power vs Time (Frame)

The Power vs. Time (Frame) measures the modulation envelope in the time domain, showing the power of each time slot in a LTE/LTE-A TDD signal.

Setting measure setup

After configuring spectrum measurement in "Configuring Spectrum Measurements", you can set the measure setup to continue your measurement. The measurement settings can be saved and recalled as a file by selecting File Type as Setup and load the file onto the instrument using the **Save/Load** icons on the side bar.

1 Tap the **Setup** ( )icon on the side bar.

2 Tap **Bandwidth** and select the value from the following choices: **1.4 MHz**, **3 MHz**, **5MHz**, **10 MHz**, **15 MHz** or **20 MHz**.

3 Tap **Subframe Number** to set the number of subframe using the on-screen keyboard.

4 Tap **Physical Cell ID** and select the type **Manual** or **Auto**.

- **Auto** lets the instrument detect the Physical Cell ID for the LTE signal automatically.
- **Manual** sets a specific Physical Cell ID for the LTE signal manually in order to speed up the synchronization with a BTS.

5 To select the number of antenna ports, tap the **MIMO** and select **2x2** or **4x4**.

6 To assign a antenna port number automatically or manually, tap the **Antenna Port** under **Antenna menu** and select the option: **Auto**, **Antenna 0**, **Antenna 1**, **Antenna 2**, or **Antenna 3**. If the MIMO is set to 2x2, the antenna ports 2 and 3 are disabled.

7 Tap **Cyclic Prefix** and select **Normal** or **Extended**.

8 Tap **Delay** and enter a value using the on-screen keyboard to set the amount of delay in µs.

9 Tap **Special Subframe** and enter a value using the on-screen keyboard.

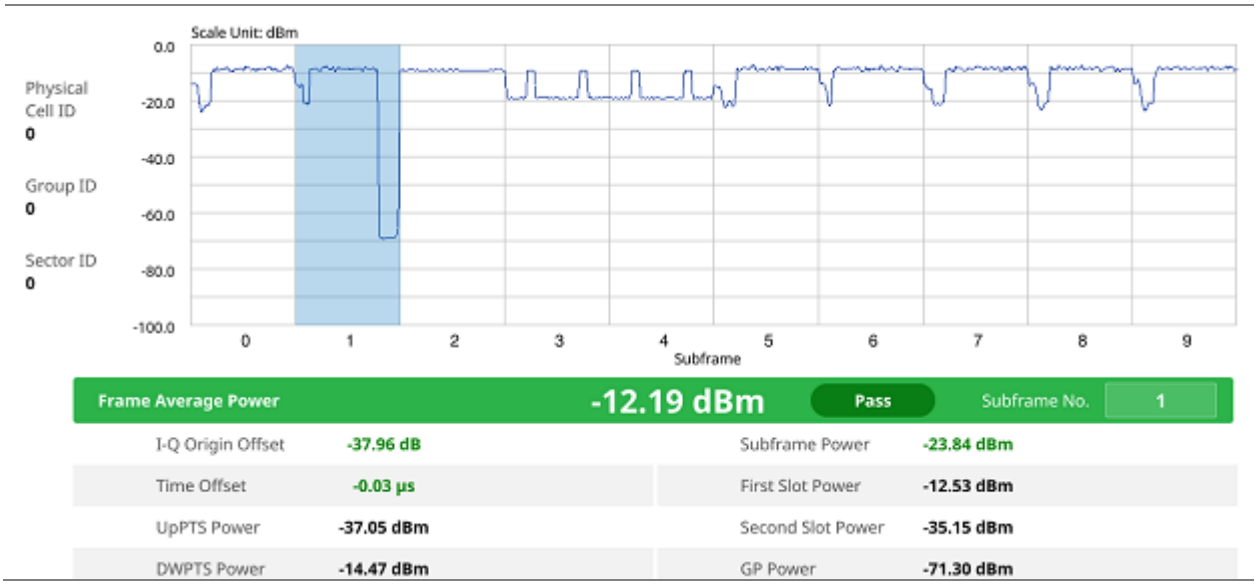
Setting limit

1 Tap **Menu** > **Limit**.

2 Tap to switch the **Subframe Power/ Frame Avg Power/ Time Error/ IQ Origin Offset** to set the **Test limits** to **On** or **Off** with setting **High and (Low) Limits** using the on-screen keyboard to enable or disable Pass/Fail indication.

3 *Optional.* Tap the **Save** icon on the side bar and select the save option form the choices available for your measurement mode.

Power vs Time (Frame) measurement with LTE/LTE-A TDD Analyzer



NOTE

You can set the Subframe No. from 0 to 9 based on your need using the on-screen keyboard.

Power vs Time (Slot)

The Power vs. Time (Slot) in LTE/LTE-A TDD Signal Analyzer measures the modulation envelope in the time domain, showing the signal rise and fall shapes of LTE/LTE-A TDD signal.

NOTE:

In this measurement, desirable level of the input power is lower than -10 dBm. If the input power to be measured is -10 dBm or higher, it is highly recommended that you use an external attenuator..

Setting measure setup

After configuring spectrum measurement in "Configuring Spectrum Measurements", you can set the measure setup to continue your measurement. The measurement settings can be saved and recalled as a file by selecting File Type as Setup and load the file onto the instrument using the **Save/Load** icons on the side bar.

1 Tap the **Setup** ( )icon on the side bar.

2 Tap **Bandwidth** and select the value from the following choices: **1.4 MHz**, **3 MHz**, **5MHz**, **10 MHz**, **15 MHz** or **20 MHz**.

3 Tap **Slot Number** to set the number of slot using the on-screen keyboard.

4 *Optional.* Tap **Physical Cell ID** and select the type **Manual** or **Auto**.

- **Auto** lets the instrument detect the Physical Cell ID for the LTE signal automatically.
- **Manual** sets a specific Physical Cell ID for the LTE signal manually in order to speed up the synchronization with a BTS.

5 To select the number of antenna ports, tap the **MIMO** and select **2x2** or **4x4**.

6 To assign a antenna port number automatically or manually, tap the **Antenna Port** under **Antenna menu** and select the option: **Auto**, **Antenna 0**, **Antenna 1**, **Antenna 2**, or **Antenna 3**. If the MIMO is set to 2x2, the antenna ports 2 and 3 are disabled.

7 Tap **Cyclic Prefix** and select **Normal** or **Extended**.

8 Tap **Delay** and enter a value using the on-screen keyboard to set the amount of delay in µs.

NOTE

The Delay setting is used only when there is a time offset in the signals to be measured.

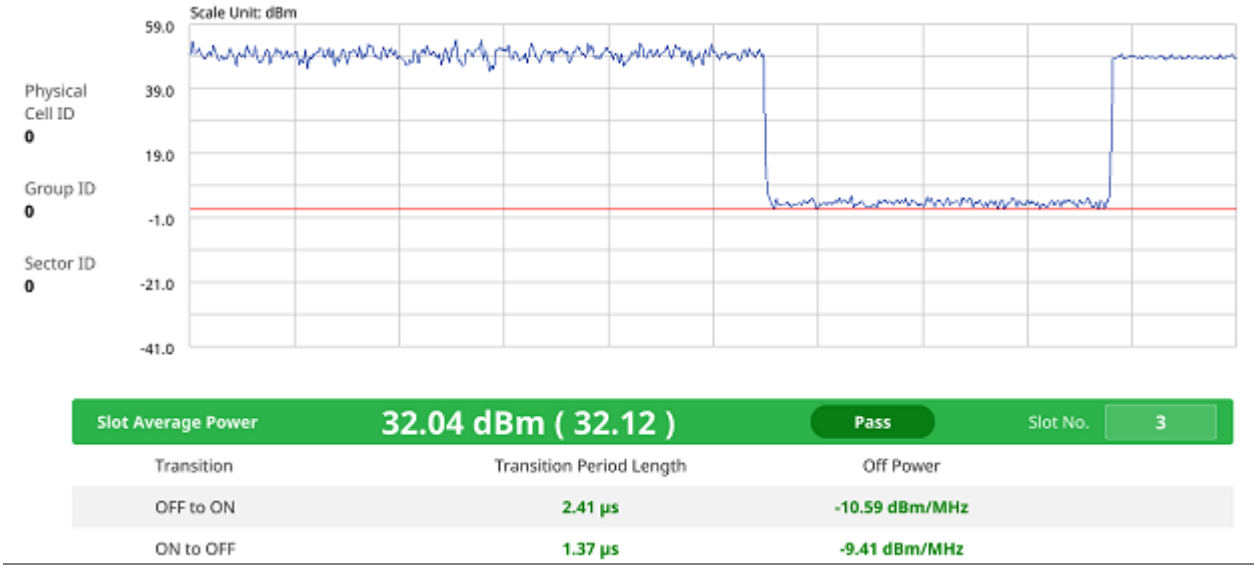
Setting limit

1 Tap **Menu** > **Limit**.

2 Tap to switch the **Slot Avg Power/ Off Power/ Transition Period** to set the **Test limits** to **On** or **Off** with setting **High and (Low) Limits** using the on-screen keyboard to enable or disable Pass/Fail indication.

3 Optional. Tap the **Save** icon on the side bar and select the save option form the choices available for your measurement mode.

Power vs Time (Slot) measurement with LTE/LTE-A TDD Analyzer



Modulation Analysis

Constellation

The Constellation is used to observe some aspects of modulation accuracy and can reveal certain fault mechanisms such as I/Q amplitude imbalance or quadrature imbalance. It displays constellation diagram by modulation types.

Setting measure setup

After configuring spectrum measurement in "Configuring Spectrum Measurements", you can set the measure setup to continue your measurement. The measurement settings can be saved and recalled as a file by selecting File Type as Setup and load the file onto the instrument using the **Save/Load** icons on the side bar.

1 Tap the **Setup** ( )icon on the side bar.

2 Tap **Bandwidth** and select the value from the following choices: **1.4 MHz**, **3 MHz**, **5MHz**, **10 MHz**, **15 MHz** or **20 MHz**.

3 Tap **Subframe Number** to set the number of subframe using the on-screen keyboard.

4 *Optional.* Tap **Physical Cell ID** and select the type **Manual** or **Auto**.

- **Auto** lets the instrument detect the Physical Cell ID for the LTE signal automatically.
- **Manual** sets a specific Physical Cell ID for the LTE signal manually in order to speed up the synchronization with a BTS.

5 *Optional.* Tap **CFI** and select the type **Manual** or **Auto**.

- **Auto** lets the instrument set the number of OFDM symbols used for transmitting PDCCHs in a subframe.
- **Manual** sets the number of OFDM symbols manually. The set of OFDM symbols that can be used for PDCCH in a subframe is given by **0**, **2**, **3** or **4** in 1.4 MHz bandwidth and **1**, **2** or **3** in other bandwidths.

6 *Optional.* Tap **PHICH Ng** to set the number of PHICH groups (Ng): **1/6**, **1/2**, **1**, **2**, **E-1/6**, **E-1/2**, **E-1**, or **E-2**

7 Tap **Uplink-Downlink Config** and select the number of uplink/downlink using the on-screen keyboard.

8 *Optional.* Tap **Miscellaneous** under **Menu** to do the following as needed:

- To select the number of antenna ports, tap the **MIMO** and select **2x2** or **4x4**.
- To assign a antenna port number automatically or manually, tap the **Antenna Port** under **Antenna menu** and select the option: **Auto**, **Antenna 0**, **Antenna 1**, **Antenna 2**, or **Antenna 3**. If the MIMO is set to 2x2, the antenna ports 2 and 3 are disabled.
- To turn the Multimedia Broadcast Multicast Service (MBMS) feature on or off, tap **MBMS** and select **On** or **Off**. For proper MBMS testing, you need to set the **Subframe Number** in the upper right screen with the same PMCH subframe number. If this setting is on, the measurement item MBSFN RS appears in the result table.
- To set the Multicast Broadcast Single Frequency Network(**MBSFN**) detection automatically or manually for MBMS testing, tap **MBSFN** and select **Auto** or **Manual**. An automatically detected or manually entered MBSFN ID appears on the screen.
- To set the delay, tap **Delay** and enter the value using the on-screen keyboard.

NOTE

The Delay setting is used only when there is a time offset in the signals to be measured.

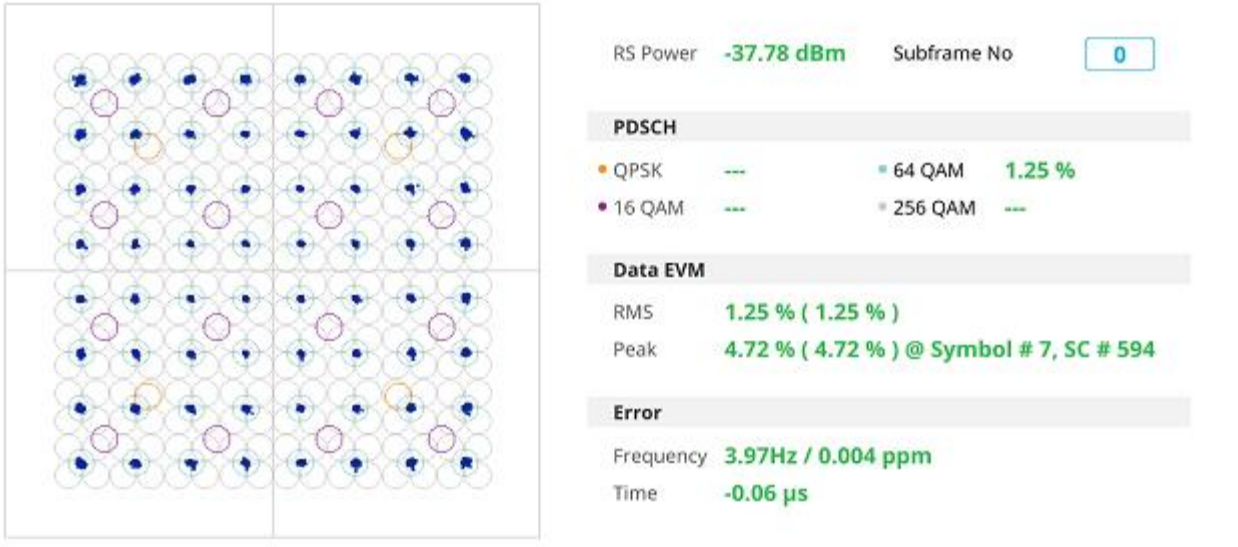
- To select the Cyclic Prefix, tap **Cyclic Prefix** and select **Normal** or **Extended**.
- To set the threshold for PDSCH, tap **PDSCH Threshold** and enter a value by using the on-screen keyboard.
- Tap **PDSCH Modulation Type**, and then select the modulation type option:**Auto, QPSK, 16 QAM, 64 QAM, 256 QAM, E-TM3.3, E-TM3.2, E-TM3.1a, E-TM3.1, E-TM2a, E-TM2, E-TM1.2 or E-TM1.1.** If two or more modulation types are used in a frame, select **Auto**. If the PDSCH uses the same modulation type in a frame or in a subframe, select a specific modulation type to get more accurate EVM.
- Tap **PDSCH Precoding** to set **On** or **Off** to enable or disable the PDSCH precoding.

Setting limit

1 Tap **Menu** > **Limit**.

2 Tap to switch the **Freqency Error/ PDSCH EVM/ PMCH EVM/ Data EVM RMS/ Data EVM Peak/ DL RS Power/ Time Error** to set the **Test limits** to **On** or **Off** with setting **High and (Low) Limits** using the on-screen keyboard to enable or disable Pass/Fail indication.

Constellation measurement with LTE/LTE-A TDD Analyzer



Data Channel

The Data Channel measures the constellation for the specified resource block as well as the modulation accuracy of each PDSCH at the specified subframe.

Setting measure setup

After configuring spectrum measurement in "Configuring Spectrum Measurements", you can set the measure setup to continue your measurement. The measurement settings can be saved and recalled as a file by selecting File Type as Setup and load the file onto the instrument using the **Save/Load** icons on the side bar.

1 Tap the **Setup** ( )icon on the side bar.

2 Tap **Bandwidth** and select the value from the following choices: **1.4 MHz**, **3 MHz**, **5MHz**, **10 MHz**, **15 MHz** or **20 MHz**.

3 Tap **Subframe Number** to set the number of subframe using the on-screen keyboard.

NOTE

For MBMS testing, this subframe number must be neither 0 nor 5 as these subframes 0 and 5 are not available for MBMS and it must be set to the MBMS transmitted channel's subframe number.

4 *Optional.* Tap **Physical Cell ID** and select the type **Manual** or **Auto**.

- **Auto** lets the instrument detect the Physical Cell ID for the LTE signal automatically.
- **Manual** sets a specific Physical Cell ID for the LTE signal manually in order to speed up the synchronization with a BTS.

5 *Optional.* Tap **CFI** and select the type **Manual** or **Auto**.

- **Auto** lets the instrument set the number of OFDM symbols used for transmitting PDCCHs in a subframe.
- **Manual** sets the number of OFDM symbols manually. The set of OFDM symbols that can be used for PDCCH in a subframe is given by **0**, **2**, **3** or **4** in 1.4 MHz bandwidth and **1**, **2** or **3** in other bandwidths.

6 *Optional.* Tap **PHICH Ng** to set the number of PHICH groups (Ng): **1/6**, **1/2**, **1**, **2**, **E-1/6**, **E-1/2**, **E-1**, or **E-2**

7 Tap **Event Hold** and select **On** or **Off** to enable or disable the event hold feature. When enabled, the display line for the PDSCH threshold appears**.**

When an event occurs, the measurement is put on hold until you tap **Hold** ( ).

NOTE

You can view detailed current resource block on the I-Q diagram, particularly in a dynamic field environment.

8 Tap **Uplink-Downlink Config** and select the number of uplink/downlink using the on-screen keyboard.

9 *Optional.* Tap **Miscellaneous** under **Menu** to do the following as needed:

- To select the number of antenna ports, tap the **MIMO** and select **2x2** or **4x4**.
- To assign a antenna port number automatically or manually, tap the **Antenna Port** under **Antenna menu** and select the option: **Auto**, **Antenna 0**, **Antenna 1**, **Antenna 2**, or **Antenna 3**. If the MIMO is set to 2x2, the antenna ports 2 and 3 are disabled.
- To turn the Multimedia Broadcast Multicast Service (MBMS) feature on or off, tap **MBMS** and select **On** or **Off**. For proper MBMS testing, you need to set the **Subframe Number** in the upper right screen with the same PMCH subframe number. If this setting is on, the measurement item MBSFN RS appears in the result table.
- To set the Multicast Broadcast Single Frequency Network(**MBSFN**) detection automatically or manually for MBMS testing, tap **MBSFN** and select **Auto** or **Manual**. An automatically detected or manually entered MBSFN ID appears on the screen.
- To set the delay, tap **Delay** and enter the value using the on-screen keyboard to set the amount of delay in µs.

NOTE

The Delay setting is used only when there is a time offset in the signals to be measured.

- To select the Cyclic Prefix, tap **Cyclic Prefix** and select **Normal** or **Extended**.
- To set the threshold for PDSCH, tap **PDSCH Threshold** and enter a value by using the on-screen keyboard.
- Tap **PDSCH Modulation Type**, and then select the modulation type option:**Auto, QPSK, 16 QAM, 64 QAM, 256 QAM, E-TM3.3, E-TM3.2, E-TM3.1a, E-TM3.1, E-TM2a, E-TM2, E-TM1.2 or E-TM1.1.** If two or more modulation types are used in a frame, select **Auto**. If the PDSCH uses the same modulation type in a frame or in a subframe, select a specific modulation type to get more accurate EVM.
- Tap **PDSCH Precoding** to set **On** or **Off** to enable or disable the PDSCH precoding.

Setting limit

1 Tap **Menu** > **Limit**.

2 Tap to switch the **Data EVM RMS/Data EVM Peak/IQ Origin Offset** to set the **Test limits** to **On** or **Off** with setting **High Limits** using the on-screen keyboard to enable or disable Pass/Fail indication.

Using Marker

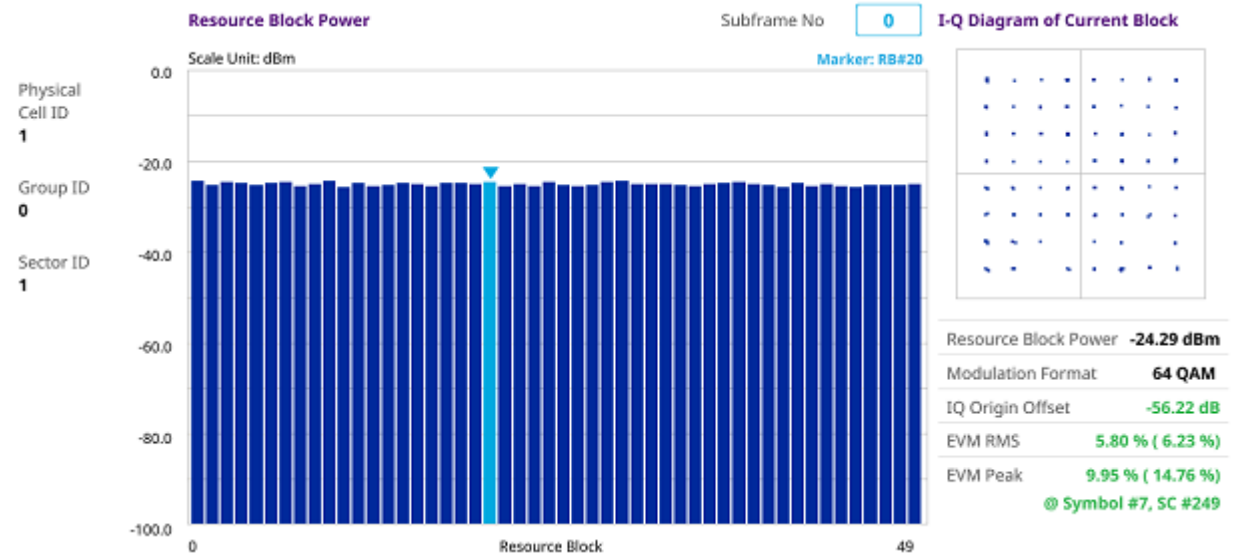
You can use **Marker** to place a marker on a resource block and display the IQ diagram for the selected resource block.

1 Tap **Menu** > **Marker**.

2 Tap **RB Number** to select the resource block to be marked and enter the resource block number using the on-screen keyboard. The marker appears on the selected resource block.

3 Tap **Marker View** between **On** and **Off** to display or dismiss the result of the selected resource block.

Data Channel measurement with LTE/LTE-A TDD Analyzer



Control Channel

The Control Channel measures the constellation for the specified control channel as well as modulation accuracy of the control channel at the specified subframe.

Setting measure setup

After configuring spectrum measurement in "Configuring Spectrum Measurements", you can set the measure setup to continue your measurement. The measurement settings can be saved and recalled as a file by selecting File Type as Setup and load the file onto the instrument using the **Save/Load** icons on the side bar.

1 Tap the **Setup** ( )icon on the side bar.

2 Tap **Bandwidth** and select the value from the following choices: **1.4 MHz**, **3 MHz**, **5MHz**, **10 MHz**, **15 MHz** or **20 MHz**.

3 Tap **Subframe Number** to set the number of subframe using the on-screen keyboard.

NOTE

For MBMS testing, this subframe number must be neither 0 nor 5 as these subframes 0 and 5 are not available for MBMS and it must be set to the MBMS transmitted channel's subframe number.

4 *Optional.* Tap **Physical Cell ID** and select the type **Manual** or **Auto**.

- **Auto** lets the instrument detect the Physical Cell ID for the LTE signal automatically.
- **Manual** sets a specific Physical Cell ID for the LTE signal manually in order to speed up the synchronization with a BTS.

5 *Optional.* Tap **CFI** and select the type **Manual** or **Auto**.

- **Auto** lets the instrument set the number of OFDM symbols used for transmitting PDCCHs in a subframe.
- **Manual** set the number of OFDM symbols manually. The set of OFDM symbols that can be used for PDCCH in a subframe is given by **0**, **2**, **3** or **4** in 1.4 MHz bandwidth and **1**, **2** or **3** in other bandwidths.

6 *Optional.* Tap **PHICH Ng** to set the number of PHICH groups (Ng): **1/6**, **1/2**, **1**, **2**, **E-1/6**, **E-1/2**, **E-1**, or **E-2**.

7 Tap **EVM Detection Mode** and select **Single** or **Combine**.

- **Single:** Testing on one single antenna connected to your CA5G series with a cable.
- **Combine:** Testing on multiple antennas connected to your CA5G series with a 2x1 or 4x1 combiner or an antenna.

8 *Optional.* Tap **Miscellaneous** under **Menu** to do the following as needed:

- To select the number of antenna ports, tap the **MIMO** and select **2x2** or **4x4**.
- To assign a antenna port number automatically or manually, tap the **Antenna Port** under **Antenna menu** and select the option: **Auto**, **Antenna 0**, **Antenna 1**, **Antenna 2**, or **Antenna 3**. If the MIMO is set to 2x2, the antenna ports 2 and 3 are disabled.
- To turn the Multimedia Broadcast Multicast Service (MBMS) feature on or off, tap **MBMS** and select **On** or **Off**. For proper MBMS testing, you need to set the **Subframe Number** with the same PMCH subframe number. If this setting is on, the measurement item MBSFN RS appears in the result table.
- To set the Multicast Broadcast Single Frequency Network(**MBSFN**) detection automatically or manually for MBMS testing, tap **MBSFN** and select **Auto** or **Manual**. An automatically detected or manually entered MBSFN ID appears on the screen.
- To set the delay, tap **Delay** and enter the value using the on-screen keyboard.

NOTE

The Delay setting is used only when there is a time offset in the signals to be measured.

- To select the Cyclic Prefix, tap **Cyclic Prefix** and select **Normal** or **Extended**.

– To set the threshold for PDCCH, tap **PDCCH Threshold** and enter a value by using the on-screen keyboard.

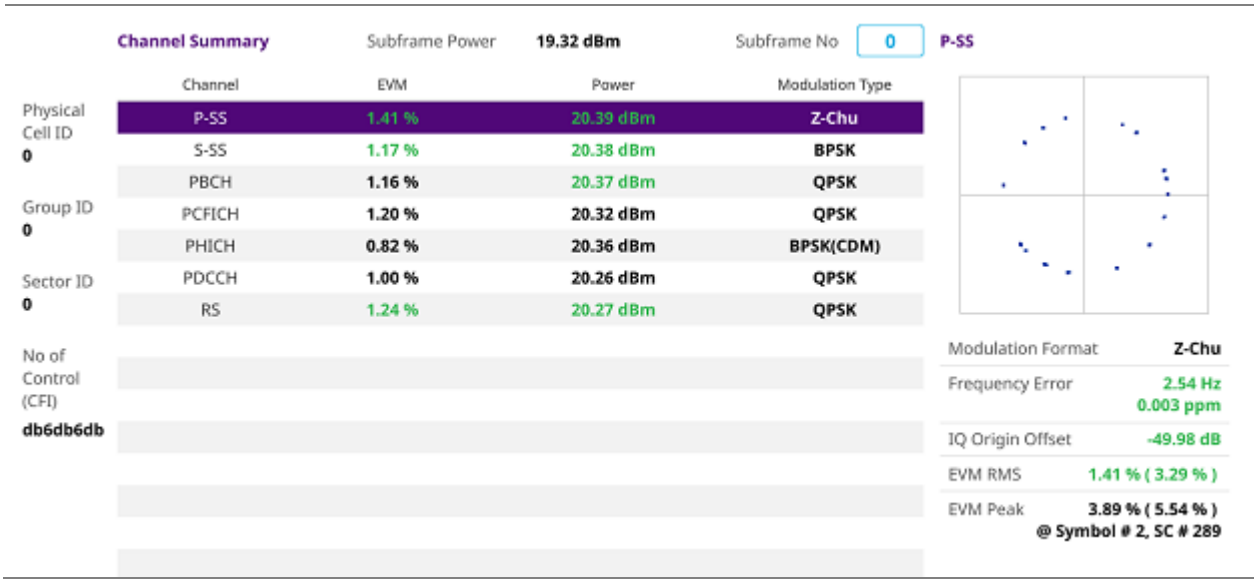
– Tap **PDCCH Mode** to select **REG** to calculate EVM based on Resource Element Group or **Average** to calculate EVM after adding all the PDCCH signals from one subframe.

Setting limit

1 Tap **Menu** > **Limit**.

2 Tap to switch the **Frequency error/ RS EVM/ P-SS EVM/ S-SS EVM/ DL RS Power/ P-SS Power/ S-SS Power/ PBCH Power/ IQ Origin Offset** to set the **Test limits** to **On** or **Off** with setting **High and (Low) Limits** using the on-screen keyboard to enable or disable Pass/Fail indication.

Control Channel measurement with LTE/LTE-A TDD Analyzer



Subframe

The Subframe measures the modulation accuracy of all the data and control channels at the specified subframe (1 ms).

Setting measure setup

After configuring spectrum measurement in "Configuring Spectrum Measurements", you can set the measure setup to continue your measurement. The measurement settings can be saved and recalled as a file by selecting File Type as Setup and load the file onto the instrument using the **Save/Load** icons on the side bar.

1 Tap the **Setup** ( )icon on the side bar.

2 Tap **Bandwidth** and select the value from the following choices: **1.4 MHz**, **3 MHz**, **5MHz**, **10 MHz**, **15 MHz** or **20 MHz**.

3 Tap **Subframe Number** to set the number of subframe using the on-screen keyboard.

NOTE

For MBMS testing, this subframe number must be neither 0 nor 5 as these subframes 0 and 5 are not available for MBMS and it must be set to the MBMS transmitted channel's subframe number.

4 *Optional.* Tap **Physical Cell ID** and select the type **Manual** or **Auto**.

- **Auto** lets the instrument detect the Physical Cell ID for the LTE signal automatically.
- **Manual** sets a specific Physical Cell ID for the LTE signal manually in order to speed up the synchronization with a BTS.

5 *Optional.* Tap **CFI** and select the type **Manual** or **Auto**.

- **Auto** lets the instrument set the number of OFDM symbols used for transmitting PDCCHs in a subframe.
- **Manual** sets the number of OFDM symbols manually. The set of OFDM symbols that can be used for PDCCH in a subframe is given by **0**, **2**, **3** or **4** in 1.4 MHz bandwidth and **1**, **2** or **3** in other bandwidths.

6 *Optional.* Tap **PHICH Ng** to set the number of PHICH groups (Ng): **1/6**, **1/2**, **1**, **2**, **E-1/6**, **E-1/2**, **E-1**, or **E-2**.

7 Tap **EVM Detection Mode** and select **Single** or **Combine**.

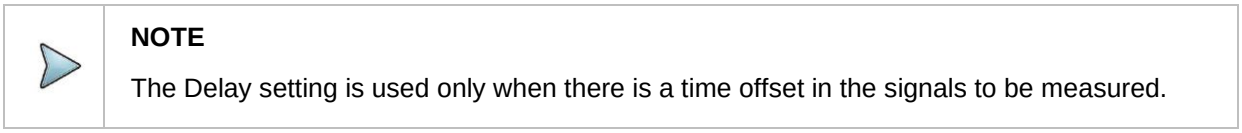
- **Single:** Testing on one single antenna connected to your CA5G series with a cable.
- **Combine:** Testing on multiple antennas connected to your CA5G series with a 2x1 or 4x1 combiner or an antenna.

8 Tap **Uplink-Downlink Config** and select the number of uplink/downlink from one to six using the on-screen keyboard.

9 *Optional.* Tap **Miscellaneous** under **Menu** to do the following as needed:

- To select the number of antenna ports, tap the **MIMO** and select **2x2** or **4x4**.
- To assign a antenna port number automatically or manually, tap the **Antenna Port** under **Antenna menu** and select the option: **Auto**, **Antenna 0**, **Antenna 1**, **Antenna 2**, or **Antenna 3**. If the MIMO is set to 2x2, the antenna ports 2 and 3 are disabled.
- To turn the Multimedia Broadcast Multicast Service (MBMS) feature on or off, tap **MBMS** and select **On** or **Off**. For proper MBMS testing, you need to set the **Subframe Number** with the same PMCH subframe number. If this setting is on, the measurement item MBSFN RS appears in the result table.

- To set the Multicast Broadcast Single Frequency Network(**MBSFN**) detection automatically or manually for MBMS testing, tap **MBSFN** and select **Auto** or **Manual**. An automatically detected or manually entered MBSFN ID appears on the screen.
- To set the delay, tap **Delay** and enter the value using the on-screen keyboard.



NOTE

The Delay setting is used only when there is a time offset in the signals to be measured.

- To select the Cyclic Prefix, tap **Cyclic Prefix** and select **Normal** or **Extended**.
- Tap **PDSCH Modulation Type**, and then select the modulation type option:**Auto, QPSK, 16 QAM, 64 QAM, 256 QAM, E-TM3.3, E-TM3.2, E-TM3.1a, E-TM3.1, E-TM2a, E-TM2, E-TM1.2 or E-TM1.1.** If two or more modulation types are used in a frame, select **Auto**. If the PDSCH uses the same modulation type in a frame or in a subframe, select a specific modulation type to get more accurate EVM.
- To set the threshold for PDSCH, tap **PDSCH Threshold** and enter a value by using the on-screen keyboard.
- To set the threshold for PDCCH, tap **PDCCH Threshold** and enter a value by using the on-screen keyboard.
- Tap **PDCCH Mode** to select **REG** to calculate EVM based on Resource Element Group or **Average** to calculate EVM after adding all the PDCCH signals from one subframe.
- Tap **PDSCH Precoding** to set **On** or **Off** to enable or disable the PDSCH precoding.

Setting limit

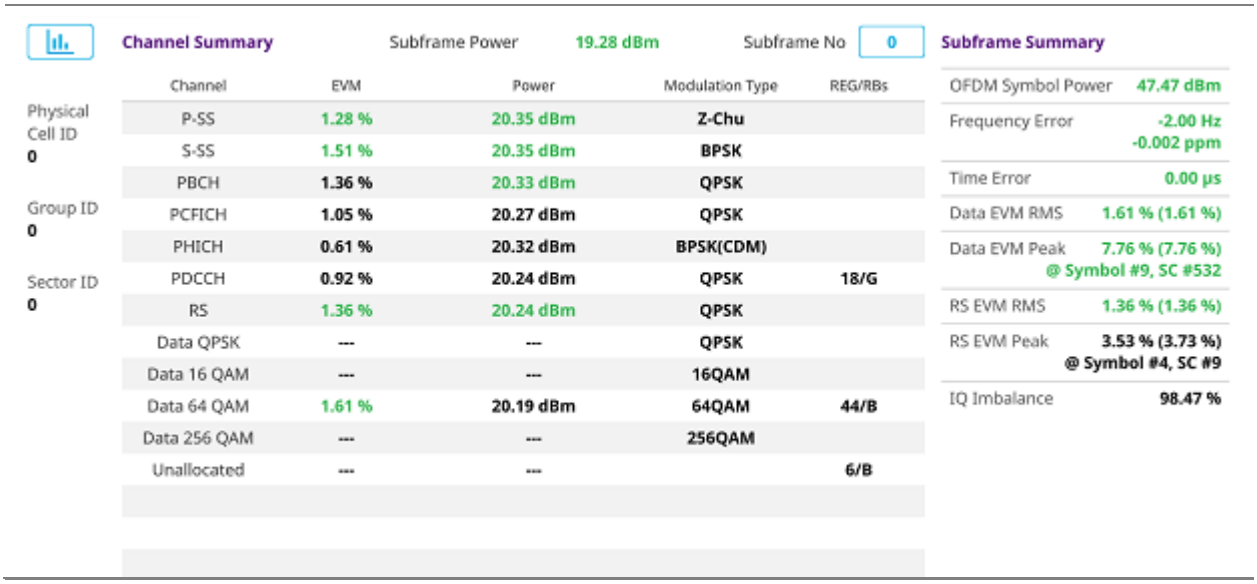
1. Tap **Menu** > **Limit**.
2. Tap to switch the **Frequency error/ EVM/ Power/ Time Error** to set the **Test limits** to **On** or **Off** with setting **High and Low Limits/required options** using the on-screen keyboard to enable or disable Pass/Fail indication.

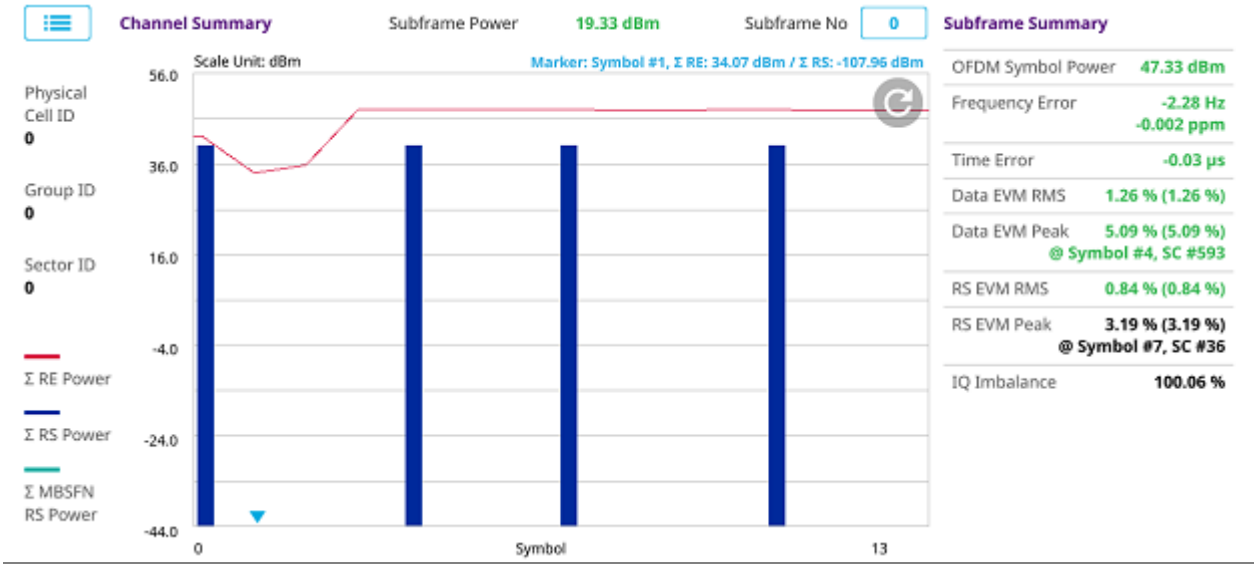
Using Marker

If you tap the **Chart** to **On** under **Display Menu** , you can use **Marker** to place a marker at a specific symbol.

1. Tap **Menu** > **Marker**.
2. Tap **Marker View** between **On** and **Off** to display or dismiss the marker on the chart.
3. Tap **Symbol** to select the symbol number to which the marker is placed. Enter the value using the on-screen keyboard.

Subframe measurement with LTE/LTE-A TDD Analyzer





Time Alignment Error

In eNode-B supporting Tx Diversity transmission, signals are transmitted from two or more antennas. These signals shall be aligned. The time alignment error in Tx diversity is specified as the delay between the signals from two antennas at the antenna ports.

Setting measure setup

After configuring spectrum measurement in "Configuring Spectrum Measurements", you can set the measure setup to continue your measurement. The measurement settings can be saved and recalled as a file by selecting File Type as Setup and load the file onto the instrument using the **Save/Load** icons on the side bar.

1 Tap the **Setup** ( )icon on the side bar.

2 Tap **Bandwidth** and select the value from the following choices: **1.4 MHz**, **3 MHz**, **5MHz**, **10 MHz**, **15 MHz** or **20 MHz**.

3 *Optional.* Tap **Physical Cell ID** and select the type **Manual** or **Auto**.

- **Auto** lets the instrument detect the Physical Cell ID for the LTE signal automatically.
- **Manual** sets a specific Physical Cell ID for the LTE signal manually in order to speed up the synchronization with a BTS.

4 *Optional.* To select the number of antenna ports, tap the **MIMO** and select **2x2** or **4x4**.

5 To assign a antenna port number automatically or manually, tap the **Antenna Port** under **Antenna menu** and select the option: **Auto**, **Antenna 0**, **Antenna 1**, **Antenna 2**, or **Antenna 3**. If the MIMO is set to 2x2, the antenna ports 2 and 3 are disabled.

6 To set the delay, tap **Delay** and enter the value using the on-screen keyboard to set the amount of delay in µs.

NOTE

The Delay setting is used only when there is a time offset in the signals to be measured.

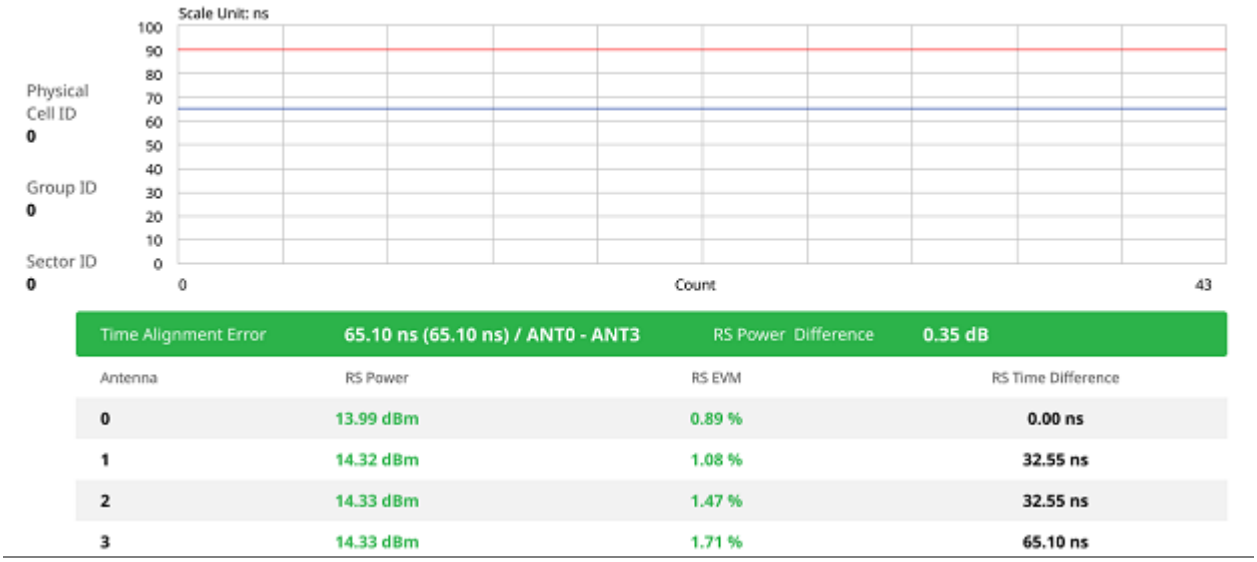
7 *Optional.* To select the Cyclic Prefix, tap **Cyclic Prefix** and select **Normal** or **Extended**.

Setting limit

1 Tap **Menu** > **Limit**.

2 Tap to switch the **RS EVM/ DL RS Power/ MIMO** to set the **Test limits** to **On** or **Off** with setting **High and (Low) Limits** using the on-screen keyboard to enable or disable Pass/Fail indication.

Time Alignment Error measurement with LTE/LTE-A TDD Analyzer



Data Allocation Map

The Data Allocation Map function represents data allocation as a frame.

Setting measure setup

After configuring spectrum measurement in "Configuring Spectrum Measurements", you can set the measure setup to continue your measurement. The measurement settings can be saved and recalled as a file by selecting File Type as Setup and load the file onto the instrument using the **Save/Load** icons on the side bar.

1 Tap the **Setup** ( )icon on the side bar.

2 Tap **Bandwidth** and select the value from the following choices: **1.4 MHz**, **3 MHz**, **5MHz**, **10 MHz**, **15 MHz** or **20 MHz**.

3 Tap **Subframe Number** to set the number of subframe using the on-screen keyboard.

4 Optional : Tap **Physical Cell ID** and select the type **Manual** or **Auto**. (**Auto** lets the instrument detect the Physical Cell ID for the LTE signal automatically. **Manual** sets a specific Physical Cell ID for the LTE signal manually in order to speed up the synchronization with a BTS.)

5 Tap **Uplink-Downlink Config** and select the number of uplink/downlink using the on-screen keyboard.

6 Optional : To set the threshold for PDSCH, tap **PDSCH Threshold** and enter a value by using the on-screen keyboard.

7 Optional : Tap **Miscellaneous** under **Menu** to do the following as needed :

8 To select the number of antenna ports, tap the **MIMO** and select **2x2** or **4x4**.

9 To assign a antenna port number automatically or manually, tap the **Antenna Port** under **Antenna menu** and select the option: **Auto**, **Antenna 0**, **Antenna 1**, **Antenna 2**, or **Antenna 3**. If the MIMO is set to 2x2, the antenna ports 2 and 3 are disabled.

10 To turn the Multimedia Broadcast Multicast Service (MBMS) feature on or off, tap **MBMS** and select **On** or **Off**. For proper MBMS testing, you need to set the **Subframe Number** with the same PMCH subframe number. If this setting is on, the measurement item MBSFN RS appears in the result table.

11 To set the Multicast Broadcast Single Frequency Network(**MBSFN**) detection automatically or manually for MBMS testing, tap **MBSFN** and select **Auto** or **Manual**. An automatically detected or manually entered MBSFN ID appears on the screen.

12 To select the Cyclic Prefix, tap **Cyclic Prefix** and select **Normal** or **Extended**.

Setting Display

1 Tap **Menu** > **Display**.

2 Select the display mode from the choice: **PDSCH**, **PMCH** or **Both**.

Using Marker

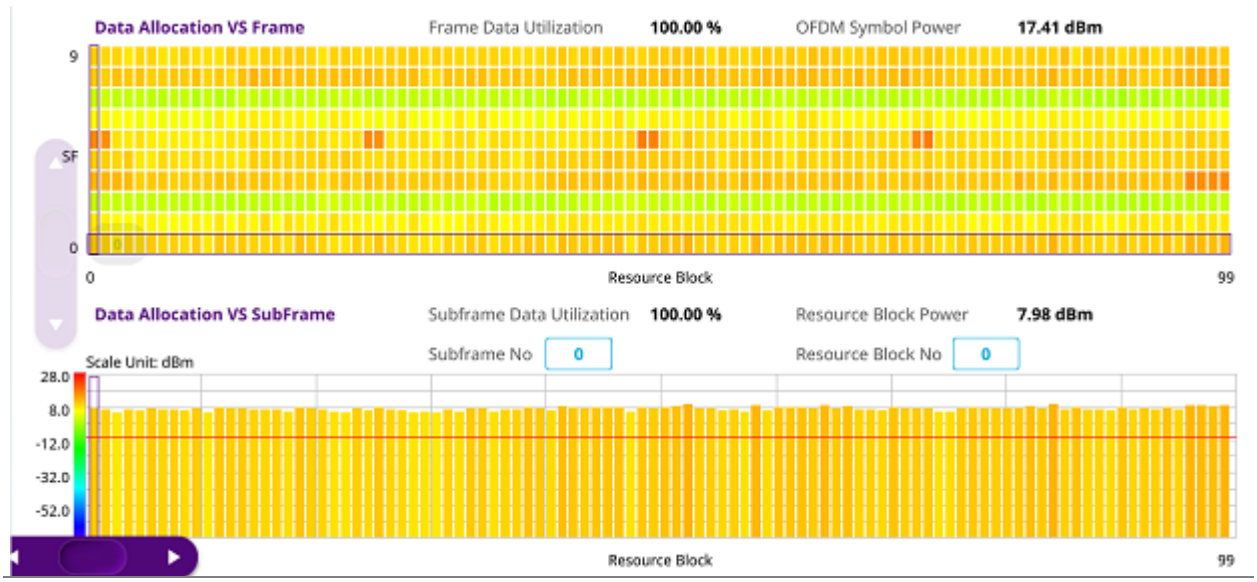
1 Tap **Menu** > **Marker**.

2 Tap the **Marker View** to **On** or **Off** to display or hide the marker on the chart.

3 To select the resource block number, tap the **RB Number** and enter a value by using the on-screen keyboard.

4 To select the subframe block number, tap the **Subframe No** and enter a value by using the on-screen keyboard.

Data Allocation Map measurement with LTE/LTE-A TDD Analyzer



Carrier Aggregation

Carrier aggregation enables a maximum of five multiple LTE carriers to be used together in order to provide high data rate required for LTE-Advanced. Component carriers to be aggregated can be intra-band contiguous, intra-band non-contiguous, or inter-band. The CA5G provides carrier aggregation measurements supporting for all the different modes with carrier aggregation bands added to the channel standard.

Setting measure setup

After configuring spectrum measurement in "Configuring Spectrum Measurements", you can set the measure setup to continue your measurement. The measurement settings can be saved and recalled as a file by selecting File Type as Setup and load the file onto the instrument using the **Save/Load** icons on the side bar.

1 Tap the **Setup** ( )icon on the side bar.

2 Tap **CA Configuration** then the component carrier configuration window appears.

3 Select the number of the component carrier to be set between one and five by tapping the number in **Range** box.

4 Set the Range **On** to set parameters and view the results for the selected component carrier on the screen or **Off** to turn it off.

5 Tap **LAA**(License Assisted Access) and select one among the three options: **2.4 GHz**, **5 GHz**, or **Off**.

6 Set the following parameters as needed: **Center Frequency**, **Channel No**, **Bandwidth**, **Physical Cell ID**, **MBMS**, **MBSFN**, **MIMO**, **Antenna Port**, **Subframe No**, **CFI, PHICH Ng**, **Cyclic Prefix**, **EVM Detection Mode** and **PDSCH Modulation Type**.

7 Tap **EVM Detection Mode** and select **Single** or **Combine** as desired.

- **Single**: Testing on one single antenna connected to your CA5G with a cable.
- **Combine**: Testing on multiple antennas connected to your CA5G with a 2x1 or 4x1 combiner or an antenna.

8 To select the subframe number to be measured, do one of the following:

- If the **EVM Detection Mode** is set to **Single**, tap **Subframe Number** and set the subframe number.
- If the **EVM Detection Mode** is set to **Combine**, tap **Subframe Number** and then select 0 or 5.

9 To set the threshold for PDSCH, tap **PDSCH Threshold** and enter a value by using the on-screen keyboard.

10 Tap **PDSCH Precoding** between **On** and **Off** to enable or disable the PDSCH precoding.

11 To select the number of antenna ports, tap the **MIMO** and select **2x2** or **4x4**.

Setting limit

1 Tap **Menu** > **Limit**.

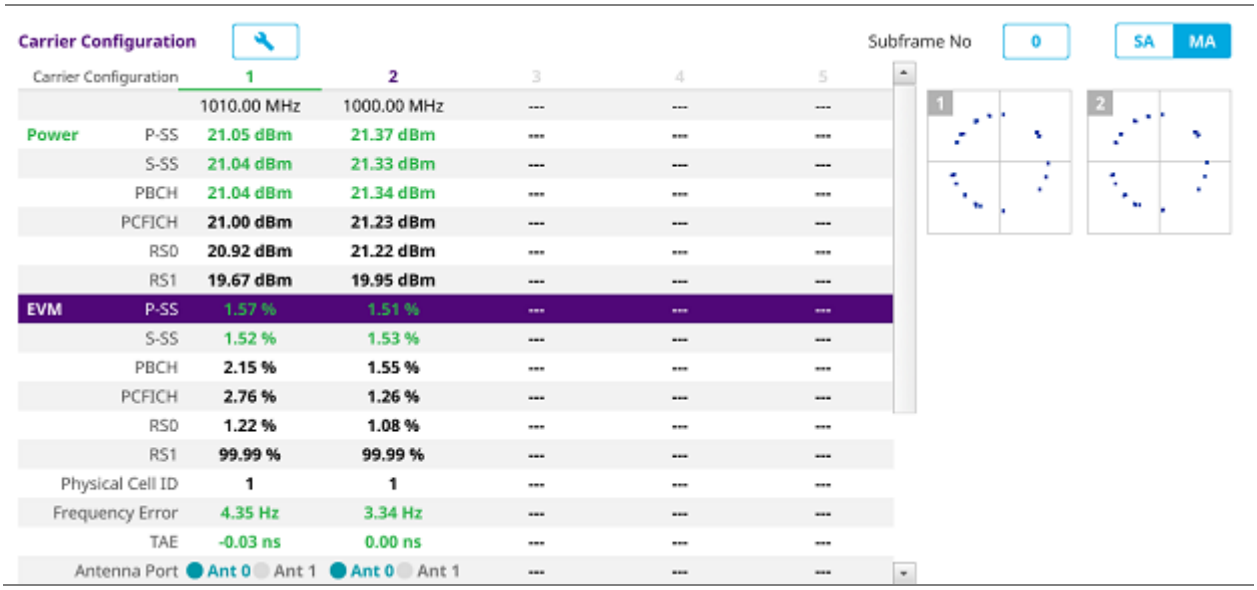
2 Tap **Frequency Error** to set the **Test limits** between **On** and **Off** Then set **High** and **Low Limits** using the on-screen keyboard to enable or disable Pass/Fail indication.

3 Tap **EVM** to select **PDSCH EVM**, **RS EVM**, **P-SS EVM**, **S-SS EVM** or **PMCH EVM** and set the **Test limits** between **On** and **Off**. Then set **High Limits** using the on-screen keyboard to enable or disable Pass/Fail indication.

4 Tap **Power** to select the **DL RS Power**, **R-SS Power**, **S-SS Power**, **PBCH Power**, **Subframe Power** or **Channel Power** and set the **Test limits** between **On** and **Off**. Then set **High** and **Low Limits** using the on-screen keyboard to enable or disable Pass/Fail indication.

5 Tap **TAE** to set the **Test limits** between **On** and **Off**. Then enter the value using the on-screen keyboard for each **Intra Cont High**, **Intra Non-Cont High** and **Inter Band High** to enable or disable Pass/Fail indication.

Carrier Aggregation measurement with LTE/LTE-A TDD Analyzer



OTA Analysis

Channel Scanner

The Channel Scanner is a radio receiver that can automatically tune or scan two or more discrete frequencies and multi-channels, indicating when it finds a signal on one of them and then continuing scanning when that frequency goes silent.

Setting measure setup

After configuring spectrum measurement in "Configuring Spectrum Measurements", you can set the measure setup to continue your measurement. The measurement settings can be saved and recalled as a file by selecting File Type as Setup and load the file onto the instrument using the **Save/Load** icons on the side bar.

1 Tap the **Setup** ( )icon on the side bar and to select the number of antenna ports, tap the **MIMO** and select **2x2** or **4x4**.

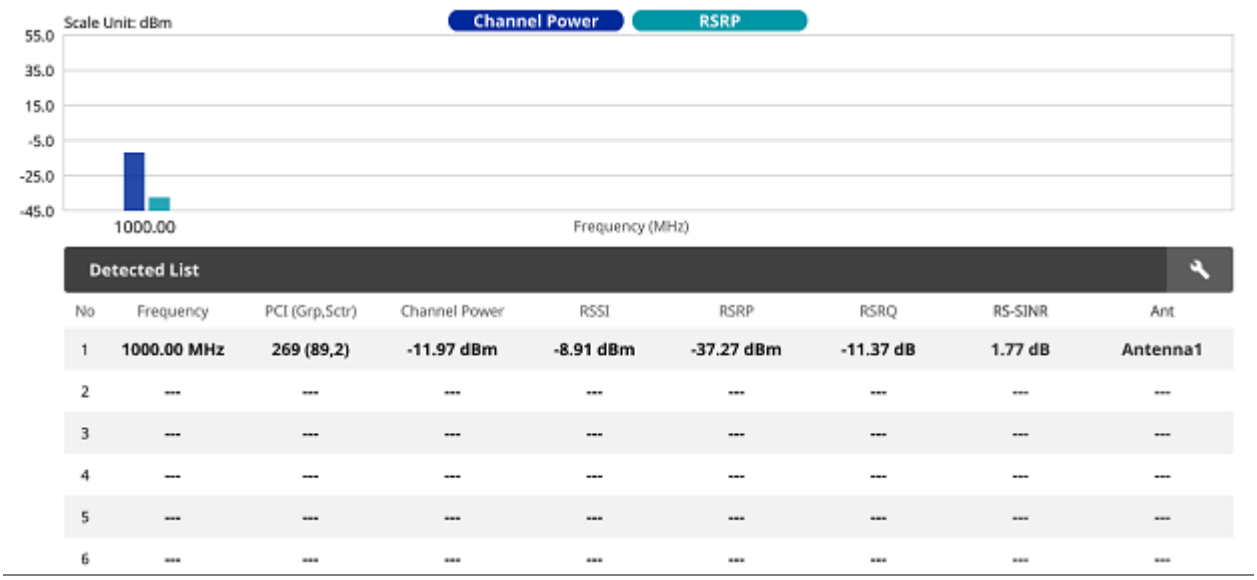
2 Tap **Amp/Scale** under **Menu** to set **Reference Level, Attenuation** or **External Offset** as required.

3 Tap **Sweep Mode** to select **Single** or **Continue**.

4 Tap **Trigger** to set **Internal**, **External** or **GPS** as required.

5 Tap **Limit** to set **Limit Line On** or **Off** and enter Limit Line value as required.

OTA Channel Scanner measurement with LTE/LTE-A TDD Analyzer



No	Frequency	PCI (Grp,Sctr)	Channel Power	RSSI	RSRP	RSRQ	RS-SINR	Ant
1	1000.00 MHz	269 (89,2)	-11.97 dBm	-8.91 dBm	-37.27 dBm	-11.37 dB	1.77 dB	Antenna1
2	---	---	---	---	---	---	---	---
3	---	---	---	---	---	---	---	---
4	---	---	---	---	---	---	---	---
5	---	---	---	---	---	---	---	---
6	---	---	---	---	---	---	---	---

ID Scanner

The LTE mobile receives signals from multiple base stations that all of these signals share the same spectrum and are present at the same time. Each base station has unique scrambling code assigned to the particular base station and it differentiates its signal from other base stations in the area.

The ID Scanner shows key parameters such as RSRP (Reference Signal Received Power) and RSRQ (Reference Signal Received Quality) that predict the downlink coverage quickly. RSRPs from entire cells help to rank between the different cells as input for handover and cell reselection decisions. RSRQ provides additional information when RSRP is not sufficient to make a reliable handover or cell reselection decision.

Setting measure setup

After configuring spectrum measurement in "Configuring Spectrum Measurements", you can set the measure setup to continue your measurement. The measurement settings can be saved and recalled as a file by selecting File Type as Setup and load the file onto the instrument using the **Save/Load** icons on the side bar.

1 Tap the **Setup** ( )icon on the side bar.

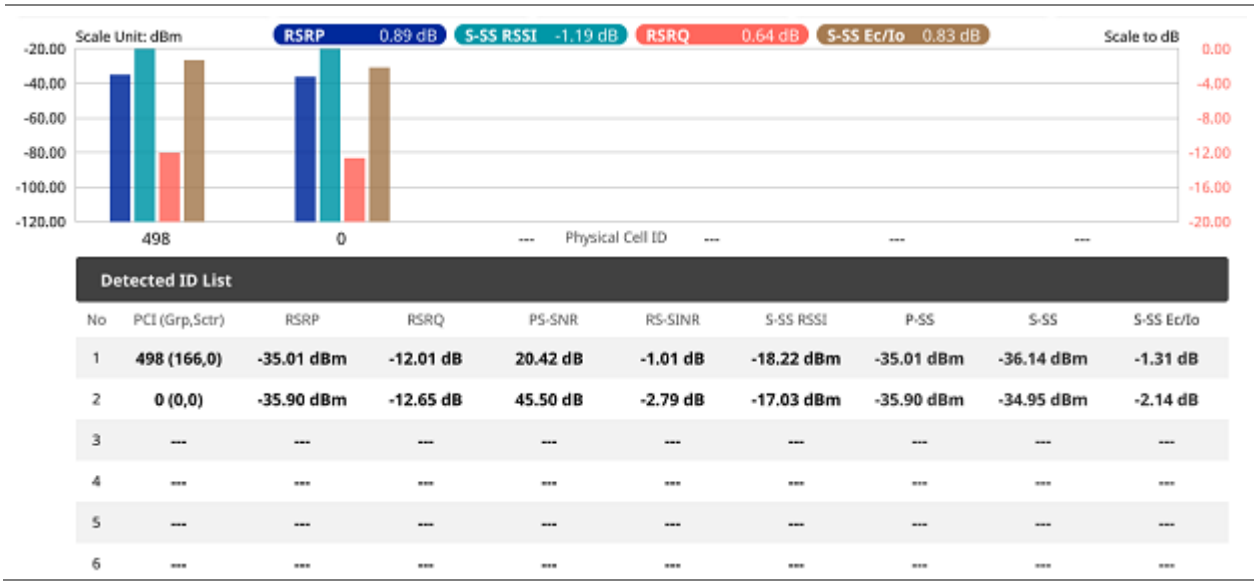
2 Tap **Bandwidth** and select the value from the following choices: **1.4 MHz**, **3 MHz**, **5MHz**, **10 MHz**, **15 MHz** or **20 MHz**.

3 To select the number of antenna ports, tap the **MIMO** and select **2x2** or **4x4**.

4 To select the Cyclic Prefix, tap **Cyclic Prefix** and select **Normal** or **Extended**.

5 *Optional.* Tap the **Save** icon on the side bar and select the save option form the choices available for your measurement mode.

OTA ID Scanner measurement with LTE/LTE-A TDD Analyzer



No	PCI (Grp,Sctr)	RSRP	RSRQ	PS-SNR	RS-SINR	S-SS RSSI	P-SS	S-SS	S-SS Ec/Io
1	498 (166,0)	-35.01 dBm	-12.01 dB	20.42 dB	-1.01 dB	-18.22 dBm	-35.01 dBm	-36.14 dBm	-1.31 dB
2	0 (0,0)	-35.90 dBm	-12.65 dB	45.50 dB	-2.79 dB	-17.03 dBm	-35.90 dBm	-34.95 dBm	-2.14 dB
3	---	---	---	---	---	---	---	---	---
4	---	---	---	---	---	---	---	---	---
5	---	---	---	---	---	---	---	---	---
6	---	---	---	---	---	---	---	---	---

Multipath Profile

The Multipath Profile enables you to determine RF environmental conditions of testing area. It indicates the amount of power of the dominant pilot signal that is dispersed outside the main correlation peak due to multipath echoes that are expressed in dB. This value should be very small ideally.

The multipath profile is the result of portions of the original broadcast signal arriving at the receiving antenna out of phase. This can be caused by the signal being reflected off objects such as buildings, or being refracted through the atmosphere differently from the main signal.

Setting measure setup

After configuring spectrum measurement in "Configuring Spectrum Measurements", you can set the measure setup to continue your measurement. The measurement settings can be saved and recalled as a file by selecting File Type as Setup and load the file onto the instrument using the **Save/Load** icons on the side bar.

1 Tap the **Setup** ( )icon on the side bar.

2 Tap **Bandwidth** and select the value from the following choices: **1.4 MHz**, **3 MHz**, **5MHz**, **10 MHz**, **15 MHz** or **20 MHz**.

3 Tap **Display** and select **RS** or **Sync**. If RS is selected, tap **RS Window** and select the RS window option: **2 µs**, **4 µs**, or **8 µs**.

4 To select the number of antenna ports, tap the **MIMO** and select **2x2** or **4x4**.

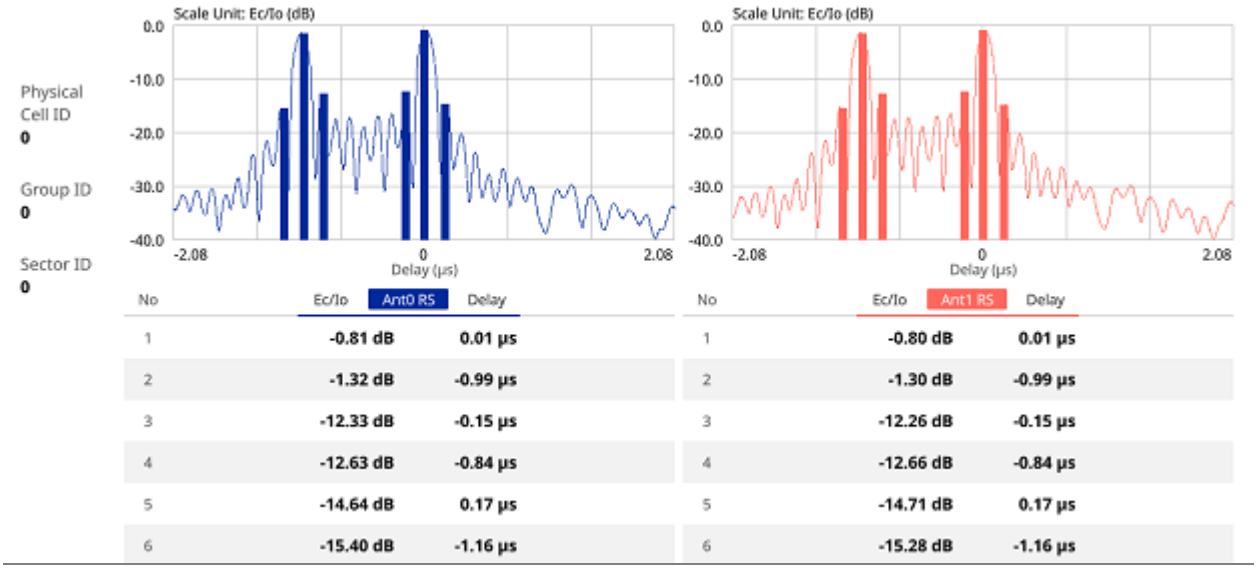
5 To select the Cyclic Prefix, tap **Cyclic Prefix** and select **Normal** or **Extended**.

6 To turn the Multimedia Broadcast Multicast Service (MBMS) feature on or off, tap **MBMS** and select **On** or **Off**. For proper MBMS testing, you need to set the **Subframe Number** with the same PMCH subframe number. If this setting is on, the measurement item MBSFN RS appears in the result table.

7 To set the Multicast Broadcast Single Frequency Network(**MBSFN**) detection automatically or manually for MBMS testing, tap **MBSFN** and select **Auto** or **Manual**. An automatically detected or manually entered MBSFN ID appears on the screen.

8 *Optional.* Tap the **Save** icon on the side bar and select the save option from the choices available for your measurement mode.

OTA Multipath Profile measurement with LTE/LTE-A TDD Analyzer



Control Channel

DL RS power is the resource element power of Downlink Reference Symbol. The absolute DL RS power is indicated on the BCH. The absolute accuracy is defined as the maximum deviation between the DL RS power indicated on the BCH and the DL RS power at the BS antenna connector.

The OTA Control Channel provides summary of all control channels including RS power trend over time. GPS coordinates (latitude and longitude) will be displayed on the screen if a GPS antenna is connected and locked to the GPS satellites.

Setting measure setup

After configuring spectrum measurement in "Configuring Spectrum Measurements", you can set the measure setup to continue your measurement. The measurement settings can be saved and recalled as a file by selecting File Type as Setup and load the file onto the instrument using the **Save/Load** icons on the side bar.

1 Tap the **Setup** ( )icon on the side bar.

2 Tap **Bandwidth** and select the value from the following choices: **1.4 MHz**, **3 MHz**, **5MHz**, **10 MHz**, **15 MHz** or **20 MHz**.

3 Tap **Subframe Number** to set the number of subframe using the on-screen keyboard.

NOTE

For MBMS testing, this subframe number must be neither 0 nor 5 as these subframes 0 and 5 are not available for MBMS and it must be set to the MBMS transmitted channel's subframe number.

4 *Optional.* Tap **Physical Cell ID** and select the type **Manual** or **Auto**.

- **Auto** lets the instrument detect the Physical Cell ID for the LTE signal automatically.
- **Manual** sets a specific Physical Cell ID for the LTE signal manually in order to speed up the synchronization with a BTS.

5 *Optional.* To select the number of antenna ports, tap the **MIMO** and select **2x2** or **4x4**.

6 *Optional.* To assign a antenna port number automatically or manually, tap the **Antenna Port** under **Antenna menu** and select the option: **Auto**, **Antenna 0**, **Antenna 1**, **Antenna 2**, or **Antenna 3**. If the MIMO is set to 2x2, the antenna ports 2 and 3 are disabled.

7 To turn the Multimedia Broadcast Multicast Service (MBMS) feature on or off, tap **MBMS** and select **On** or **Off**. For proper MBMS testing, you need to set the **Subframe Number** with the same PMCH subframe number. If this setting is on, the measurement item MBSFN RS appears in the result table.

8 To set the Multicast Broadcast Single Frequency Network(MBSFN) detection automatically or manually for MBMS testing, tap **MBSFN** and select **Auto** or **Manual**. An automatically detected or manually entered MBSFN ID appears on the screen.

9 *Optional.* To select the Cyclic Prefix, tap **Cyclic Prefix** and select **Normal** or **Extended**.

10 Tap **Menu** > **Display** and select **EVM** or **Power**. The screen changes according to the selected option.

Setting limit

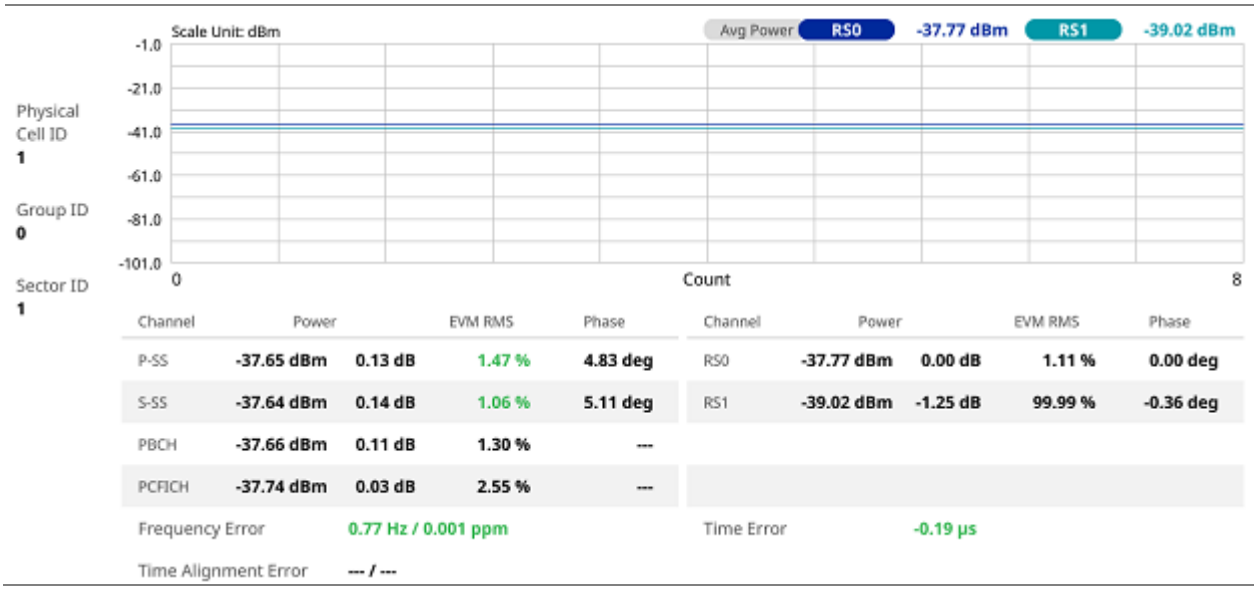
1 Tap **Menu** > **Limit**.

2 Tap **RS EVM** to set the limit for RS error vector magnitude. Select **RS0 EVM**, **RS1 EVM**, **RS2 EVM** or **RS3 EVM** and set the Limit Line **On** or **Off**, entering the value of **Limit Line** using the on-screen keyboard to enable or disable Pass/Fail indication.

3 Tap to switch the **P-SS EVM**/ **S-SS EVM**/ **Frequency Error**/ **Time Error**/ **Time Alignment Error** to set the **Test limits** between **On** and **Off** with setting **High and (Low) Limits** using the on-screen keyboard to enable or disable Pass/Fail indication.

4 *Optional.* Tap the **Save** icon on the side bar and select the save option from the choices available for your measurement mode.

OTA Control Channel measurement with LTE/LTE-A TDD Analyzer



Datagram

The OTA Datagram is a time-varying spectral representation that shows how the power of a signal varies with time. The power allocated to the specific resource block will be represented with an amplitude axis (in dBm) and the waterfall diagram will show the trend of past resource block power over certain period. Using a marker function facilitates analysis of accumulated resource block power for data utilization.

Setting measure setup

After configuring spectrum measurement in "Configuring Spectrum Measurements", you can set the measure setup to continue your measurement. The measurement settings can be saved and recalled as a file by selecting File Type as Setup and load the file onto the instrument using the **Save/Load** icons on the side bar.

1 Tap the **Setup** ( )icon on the side bar.

2 Tap **Bandwidth** and select the value from the following choices: **1.4 MHz**, **3 MHz**, **5MHz**, **10 MHz**, **15 MHz** or **20 MHz**.

3 Tap **Subframe Number** to set the number of subframe using the on-screen keyboard.

4 Tap **Position** to set the number of position using the on-screen keyboard when **Time Cursor** is set to **On**.

5 *Optional.* Tap **Physical Cell ID** and select the type **Manual** or **Auto**.

- **Auto** lets the instrument detect the Physical Cell ID for the LTE signal automatically.
- **Manual** sets a specific Physical Cell ID for the LTE signal manually in order to speed up the synchronization with a BTS.

6 *Optional.* To set the threshold for PDSCH, tap **PDSCH Threshold** and enter a value by using the on-screen keyboard.

7 To set the time cursor at a specific position, tap **Time Cursor** and select **On**.

> **NOTE**
>
> Enabling the time cursor puts the measurement on hold and you can make post-processing analysis for each measurement over time using the time cursor.

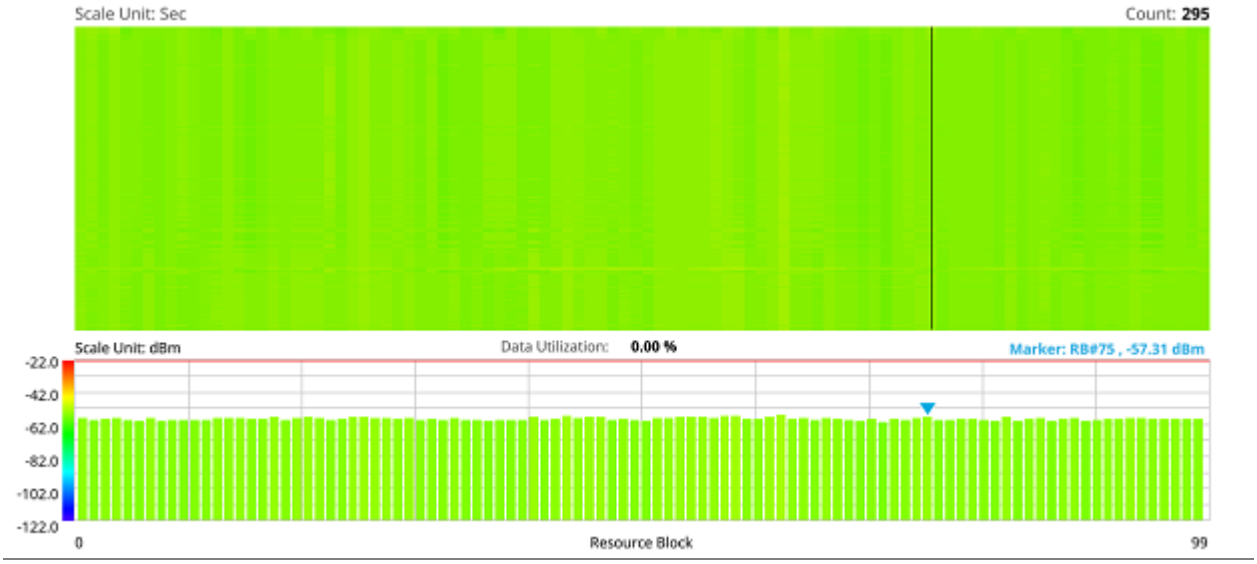
8 To start a new measurement, tap **Reset**.

9 *Optional.* To select the number of antenna ports, tap the **MIMO** and select **2x2** or **4x4**.

10 *Optional.* To select the Cyclic Prefix, tap **Cyclic Prefix** and select **Normal** or **Extended**.

11 *Optional.* Tap the **Save** icon on the side bar and select the save option from the choices available for your measurement mode.

OTA Datagram measurement with LTE/LTE-A TDD Analyzer



Route Map

5G route map traces the power level of the strongest beam corresponding a particular time and geographical position and presents it in a geographical map as a measurement point. All the collected measurements can be exported for post-processing purposes, including data of the eight strongest beams for each measurement point, including its measurement time and geographical location.

Loading a map

To use any features related to maps, you need to download and install the maps on the CellAdvisor 5G. The VIAVI JDMapCreator will help you download maps. Make sure the JDMapCreator application on your computer is connected to the instrument via LAN. You can send a map file with a single layer to the instrument directly by using the **Send to EQP** menu in JDMapCreator. For more information on how to use the JDMapCreator, see the *JDMapCreator 2.0 User Guide*.

1 Plug in your USB flash drive that has a map file in `.mcf` file type created in JDMapCreator.

2 Tap the **Load** icon( ) on the side bar.

3 Navigate the map file you want to open.
The File Information panel displays the file properties including its name, size, type and date modified.

4 Tap the **Load** button on the screen.

Once you loaded the map, you can also control the map using the following icons on the map.

Icon	Description
	Tap to go to your current location on the map. Once tapped, the purple icon appears on the map indicating your current location.
	Tap to switch to the full screen map view.
	Tap to zoom in the map.
	Tap to zoom out the map.
	Tap and select the area where you want to expand.

Setting measure setup

Before starting the Route Map measurement, you need to set Spectrum measurements displayed on the quick access and display tab. See "Configuring Spectrum Measurements" for more details.

1 If required, connect a GPS receiver to your CellAdvisor 5G for outdoor mapping. Indoor mapping does not necessarily need a GPS antenna.

2 Tap the **Setup** ( ) icon on the side bar.

3 Tap to switch the **Plot Point** to **GPS** or **Position**.

   a To collect data/plot points automatically as you move around in a vehicle or outside (outdoor), select **GPS** and then tap to switch to the **Screen Mode** between **Map** and **Full**.
   With the **Map** setting, you can view only the collected points that can be seen within the boundary of the loaded map. With the **Full** setting, you can view all the collected points of the route without the loaded map.

   b To collect data/plot points manually in indoor layout without a GPS antenna, select **Position**.

4 Tap to switch **Plot Item** to **RSRP**, **RSRQ**, **RS-SINR**, **S-SS RSSI**, **P-SS Power**, **S-SS Power** or **S-SS Ec/Io**.

5 Tap **Bandwidth** and select the value from the following choices: **1.4 MHz**, **3 MHz**, **5MHz**, **10 MHz**, **15 MHz** or **20 MHz**.

NOTE:

The instrument does not automatically save the collected data. It is recommended that you save the result. Otherwise, you will lose all the collected data.

Logging data

1 Follow the **step 1 to 3** in Setting measure setup.

2 Tap the **Start** button ( ) on the right panel of the map to start plotting on the map. When you select a point on the map, a marker appears and the Information window appears on the right panel.

3 Tap the **Stop** ( ) button to stop plotting.

4 Tap the **Pause** button ( ) to pause plotting, then the **Pause** button changes to ( ) and GPS point cannot be plotted.

5 Save the logging file to your USB.

Viewing the logging data

1 Load the saved logging file using the **Load** icon( ) on the side bar. Make sure the file extension is . `gomv`.

2 If the PCI is set to Auto, the point on the map appears with a color representing the largest **BRSRP** value.
When you select a point on the map, a marker appears and the Information window appears on the right panel.

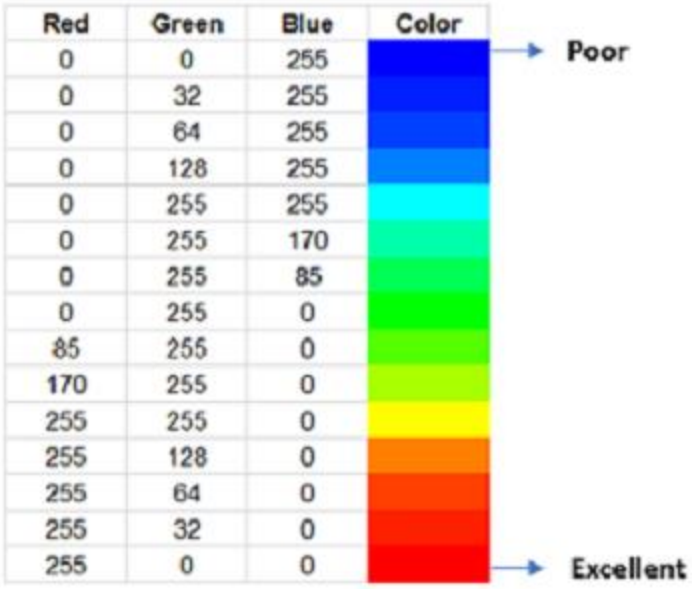
3 Set the **PCI** to **Manual** and tap the **Select** button.
The Select PCI window appears.

4 Select **PCI** on the left and then the corresponding Beam Index appeared on the right.

5 Tap the **Apply** button.
The point color of the map changes to the corresponding BRSRP value, and if there is no detected Beam Index, the point will be hidden.

Setting limit

You can set the thresholds for the two different color indicators, red and blue. The maximum value in red is the Limit for **Good,** and the minimum value in blue is the Limit for **Poor**. See below to check the plot point color based on the Legend Color Table.



1 Tap **Menu** > **Limit**.

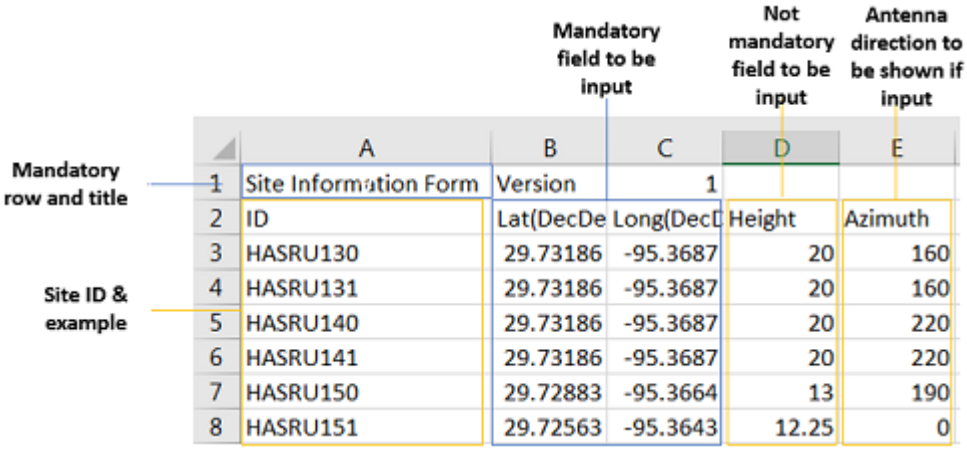
2 Tap **Good** and set a value using the on-screen keyboard.

3 Tap **Poor** and set a value using the on-screen keyboard.

Importing cellsite DB

You can import the site DB by creating the 5G site information form.

1 Create the 5G site information with an excel file as below.



2 Input the two mandatory fields: **Lat (DecDeg)** and **Long (DecDeg)**.

3 Input the **Azimuth** field if you want to check the direction of antenna.

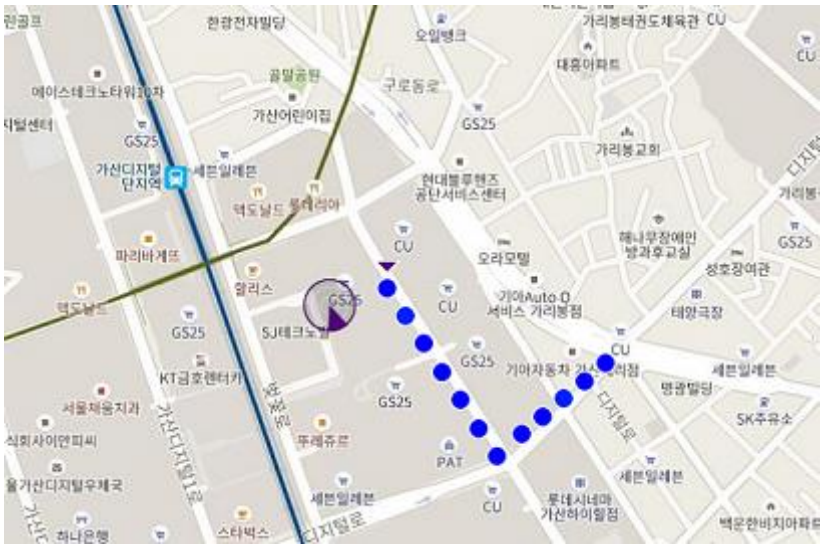
4 Make sure to save the file as (Comma delimited) (*.csv).

5 Copy the file to the USB memory stick and insert it to the **USB A** or **USB B** port of the instrument.

6 Tap the **Load** ( ) hot key on the side bar.

7 Import the saved file.
Once the file is loaded, the following cellsite information appears with an icon.

Route map measurement with site information screen



	NOTE: The purple icon (,) indicates the base station (site) location and the direction of antenna. If the site is beyond the latitude and longitude of the map file, it will not show.

OTA Route Map measurement with LTE/LTE-A TDD Analyzer

Miscellaneous

Power Statistics CCDF

The Power Statistics Complementary Cumulative Distribution Function (CCDF) measurement characterizes the power statistics of the input signal. It provides PAR (Peak to Average power Ratio) versus different probabilities.

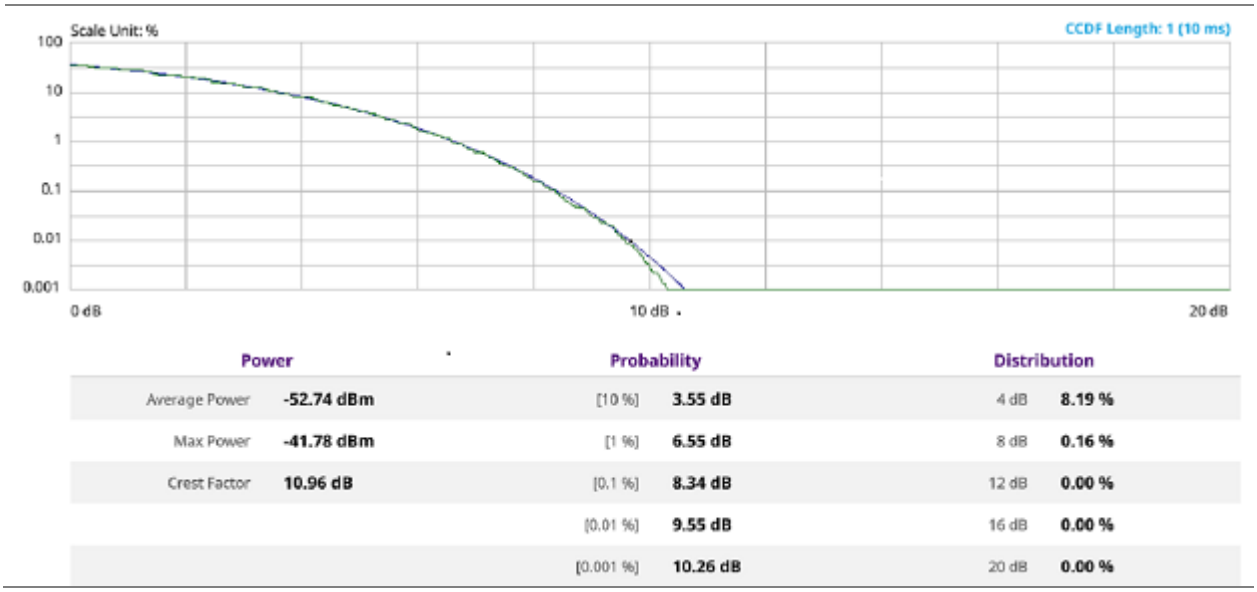
Setting measure setup

After configuring spectrum measurement in "Configuring Spectrum Measurements", you can set the measure setup to continue your measurement. The measurement settings can be saved and recalled as a file by selecting File Type as Setup and load the file onto the instrument using the **Save/Load** icons on the side bar.

1 Tap the **Setup** ( )icon on the side bar.

2 Tap **CCDF Length** and select the value between 1 and 100.

CCDF measurement with LTE/LTE-A TDD Analyzer



Power		Probability		Distribution	
Average Power	**-52.74 dBm**	[10 %]	**3.55 dB**	4 dB	**8.19 %**
Max Power	**-41.78 dBm**	[1 %]	**6.55 dB**	8 dB	**0.16 %**
Crest Factor	**10.96 dB**	[0.1 %]	**8.34 dB**	12 dB	**0.00 %**
		[0.01 %]	**9.55 dB**	16 dB	**0.00 %**
		[0.001 %]	**10.26 dB**	20 dB	**0.00 %**

Using Scanner

Introduction

A Scanner is a radio receiver that can automatically tune or scan two or more discrete frequencies and multi-channels, indicating when it finds a signal on one of them and then continuing scanning when that frequency goes silent.

You can measure up to 20 channels with this channel scanner. Using existing format-based or custom parameters, you will be able to easily verify improper multi-channel power levels. The frequency has been extended up to 18.5 GHz in addition to existing 24 GHz to 40 GHz.

- Scanner
  - Channel Scanner
  - Frequency Scanner
  - Custom Scanner (Channel or Frequency)

Selecting mode and measure

To start measurement, do the following steps:

1 Tap **Scanner** on the **MODE** panel.

2 Tap any measurement mode from the following choices:

Scanner > **Channel Scanner**, **Frequency Scanner**, or **Custom Scanner**

Channel scanner

Before starting the Channel Scanner, you need to set Spectrum measurements displayed on the quick access and display tab. See "Configuring Spectrum Measurements" for more details.

Setting measure setup

You need to set the channel to be scanned.

1 Tap the **Menu** ( ) icon on the side bar and tap **Channel**.
Channel menus appears.

2 Tap **Channel Standard** to select the standard channel.
The channel standard window appears.

   a Select **Technology** and then select the band to be measured.

3 Tap **Link** to switch it to **Uplink** or **Downlink**.

4 Tap **Start Channel** to set the starting channel using the on-screen keyboard.

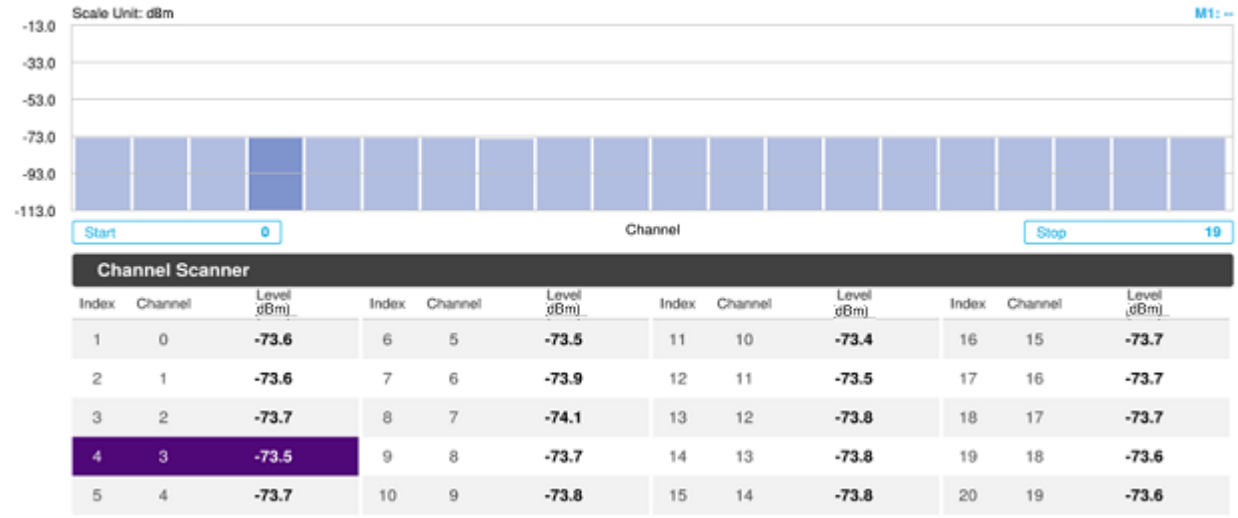
5 Tap **Channel Step** to set the amount of channel increment in scanning channel using the on-screen keyboard.

6 Tap **Integration BW** and input a value using the on-screen keyboard.

7 Tap **# of Channels** to set the number of channels to be displayed in the measurement table using the on-screen keyboard.

Channel scanner measurement

Test results can be saved as a `.csv` file format so that you can work on it in any spreadsheet software.



Channel Scanner

Index	Channel	Level (dBm)	Index	Channel	Level (dBm)	Index	Channel	Level (dBm)	Index	Channel	Level (dBm)
1	0	-73.6	6	5	-73.5	11	10	-73.4	16	15	-73.7
2	1	-73.6	7	6	-73.9	12	11	-73.5	17	16	-73.7
3	2	-73.7	8	7	-74.1	13	12	-73.8	18	17	-73.7
4	3	-73.5	9	8	-73.7	14	13	-73.8	19	18	-73.6
5	4	-73.7	10	9	-73.8	15	14	-73.8	20	19	-73.6

NOTE:

You can go to **Menu** > **Limit** to analyze your measurements with the limit line using the on-screen keyboard and the channel limit turning channel limit table On or Off.

You can go to **Menu** > **Marker** to analyze your measurements with markers. See "Using marker" for details.

Frequency scanner

Before starting the Frequency Scanner, you need to set Spectrum measurements displayed on the quick access and display tab. See "Configuring Spectrum Measurements" for more details.

Setting measure setup

You need to set the frequency to be scanned.

1 Tap the **Menu** ( ) icon on the side bar and tap **Frequency**.
Frequency menus appears.

2 Tap **Start Frequency** to set the starting center frequency using the on-screen keyboard.

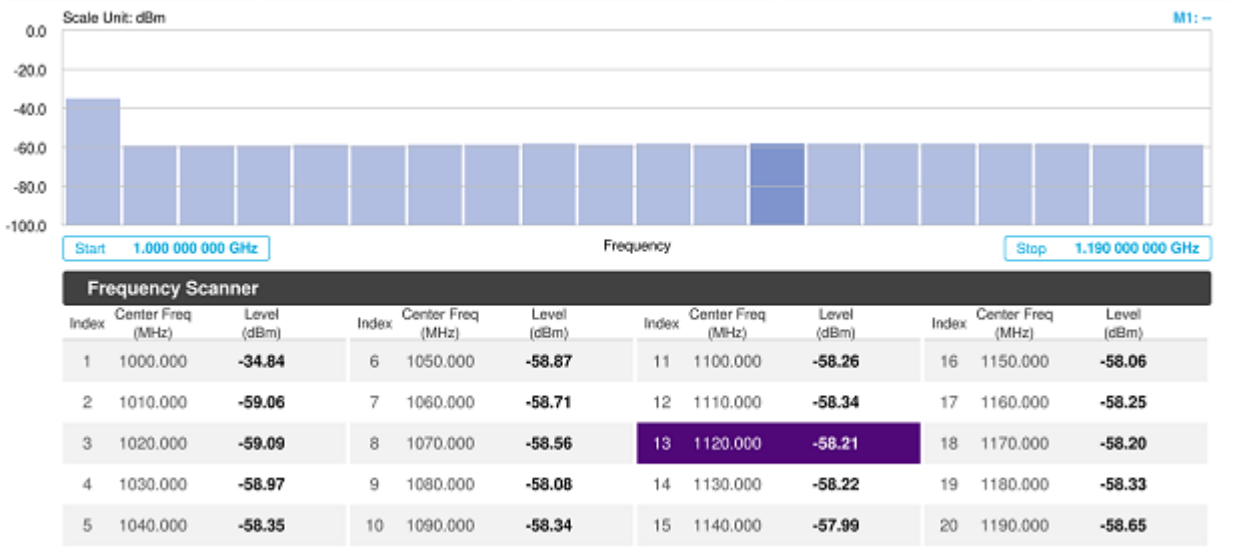
3 Tap **Frequency Step** to set the amount of frequency increment in scanning channel using the on-screen keyboard.

4 Tap **Integration BW** and input a value using the on-screen keyboard.

5 Tap **# of Frequency** to set the number of channels to be displayed in the measurement table using the on-screen keyboard.

Frequency scanner measurement

Test results can be saved as a `.csv` file format so that you can work on it in any spreadsheet software.



Frequency Scanner

Index	Center Freq (MHz)	Level (dBm)	Index	Center Freq (MHz)	Level (dBm)	Index	Center Freq (MHz)	Level (dBm)	Index	Center Freq (MHz)	Level (dBm)
1	1000.000	-34.84	6	1050.000	-58.87	11	1100.000	-58.26	16	1150.000	-58.06
2	1010.000	-59.06	7	1060.000	-58.71	12	1110.000	-58.34	17	1160.000	-58.25
3	1020.000	-59.09	8	1070.000	-58.56	13	1120.000	-58.21	18	1170.000	-58.20
4	1030.000	-58.97	9	1080.000	-58.08	14	1130.000	-58.22	19	1180.000	-58.33
5	1040.000	-58.35	10	1090.000	-58.34	15	1140.000	-57.99	20	1190.000	-58.65

NOTE:

You can go to **Menu** > **Limit** to analyze your measurements with the limit line using the on-screen keyboard and the channel limit turning channel limit table On or Off.

You can go to **Menu** > **Marker** to analyze your measurements with markers. See "Using marker" for details.

Custom scanner

Before starting the Frequency Scanner, you need to set Spectrum measurements displayed on the quick access and display tab. See "Configuring Spectrum Measurements" for more details.

Setting measure setup

You can customize channels or frequencies to be scanned.

To set the channels to be scanned

1 Tap the **Setup** ( ) icon on the side bar.

2 Tap **Configuration** or Tap the **Edit** icon on the result table.
Setup table appears as below.

3 Tap **Channel Standard** to select the channel standard.
The channel standard window appears.

4 Select **Technology** and then the band to be measured by tapping.

5 Tap the **Apply** button to apply the settings.

6 Tap to switch the **Link** to **uplink** or **downlink**.

7 Tap **Index** and select the number from 1 to 20.

8 Tap **Channel No** to set the channel number for the selected index using the on-screen keyboard.
The instrument displays a corresponding center frequency for the channel number.

9 Tap **Integration Bandwidth** to set the integration bandwidth for the selected index using the on-screen keyboard.

10 Tap to switch the **Delete** button to **Add** to add more channels to be scanned and repeat steps **7-9**.

11 Tap the **X** button to dismiss the channel list window and view the scanning result.

To set the frequencies to be scanned

1 Tap the **Index** and select the number from 1 to 20.

2 Tap **Center Frequency** to set the center frequency for the selected index using the on-screen keyboard.

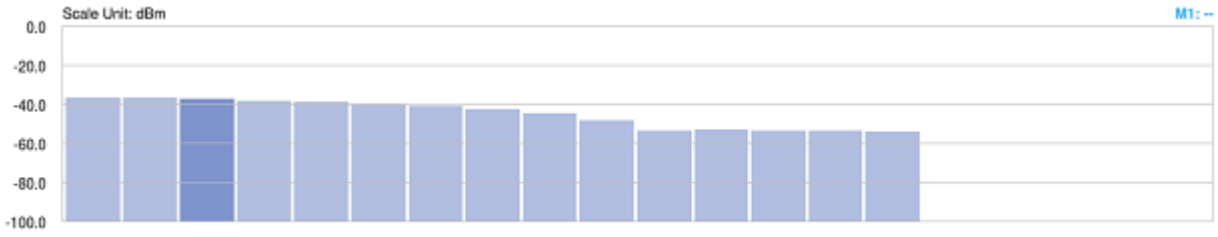
3 Tap **Integration Bandwidth** to set the integration bandwidth for the selected index using the on-screen keyboard.

4 Tap to switch the **Delete** button to **Add** to add more channels to be scanned and repeat steps **1-3**.

5 Tap the **X** button to dismiss the channel list window and view the scanning result.

Custom scanner measurement

Test results can be saved as a `.csv` file format so that you can work on it in any spreadsheet software.



Custom Scanner Edit

Index	Center Freq (MHz)	Level (dBm)	Index	Center Freq (MHz)	Level (dBm)	Index	Center Freq (MHz)	Level (dBm)	Index	Center Freq (MHz)	Level (dBm)
1	879.000	-36.03	6	884.000	-39.23	11	889.000	-53.18			
2	880.000	-36.09	7	885.000	-40.48	12	890.000	-52.91			
3	881.000	-36.72	8	886.000	-42.08	13	891.000	-53.04			
4	882.000	-37.65	9	887.000	-43.93	14	892.000	-53.19			
5	883.000	-38.46	10	888.000	-47.86	15	893.000	-53.59			

NOTE:

You can go to **Menu** > **Limit** to analyze your measurements with the limit line using the on-screen keyboard and the channel limit turning channel limit table On or Off.

You can go to **Menu** > **Marker** to analyze your measurements with markers. See "Using marker" for details.

Using 5G TF Signal Analyzer

Introduction

VIAVI CellAdvisor 5G is the ideal field portable solution to validate 5G radio access. Its main 5G TF test functions are carrier scanner measuring up to eight single component carriers' power as well as the strongest beam and its power level, beam analyzer assessing individual beam’s ID, power level and signal to noise levels, and coverage verification including real-time coverage map as well as data available for post-processing.

- OTA Analysis
  - Beam Analyzer
  - Carrier Scanner
  - Route Map

Selecting mode and measure

To start measurement, do the following steps:

1 Tap **5G TF Signal Analyzer** on the **MODE** panel.

2 Tap any measurement mode from the following choices:

OTA Analysis > **Beam Analyzer**, **Carrier Scanner** or **Route Map**

Conducting OTA measurements

Beam analyzer

5G Beam Analyzer provides the beamforming profile of each transmission carrier, including the eight strongest beams and the corresponding power levels during its transmission period, and includes:

- **BRSRP (Beam Reference Signal Received Power)** — cumulative power measurement of the beam through the entire transmission bandwidth (90 MHz)

- **PSS-RSSI (Primary Synchronization Signal – Received Signal Strength Indicator)** — average power measurement through all the primary sync signals
- **BRS-SNR (Beam Reference Signal – Signal to Noise Ratio)** — is the ratio between the average power of the beam reference signals through the transmission bandwidth (90MHz) and average noise level of the carrier's guard-band

Setting measure setup

Before starting the Beam Analyzer, you need to set Spectrum measurements displayed on the quick access and display tab. See "Configuring Spectrum Measurements" for more details.

1 Tap the **Setup** ( ) icon on the side bar.

2 Tap **BRS Tx Period** and select the options from **< 5 ms**, **5 ms**,**10 ms**, **20 ms** or **Auto**.
Set the BRS transmission period as the following: 1 slot <5 ms, 1 subframe =5 ms, 2 subframes =10 ms, 4 subframes =20 ms. If you set it to Auto, the CellAdvisor 5G automatically decodes MIB.

3 Tap **Beam Index** and select between **symbol order** and **subframe region**.
You can select symbol order if you want to allocate the beam index in a sequential symbol order in the same antenna. You can select subframe region if you want to allocate the beam index from 0 to 111 within a subframe.

4 Tap to switch **PCI** (**Physical Cell ID**) to **Manual** or **Auto**.

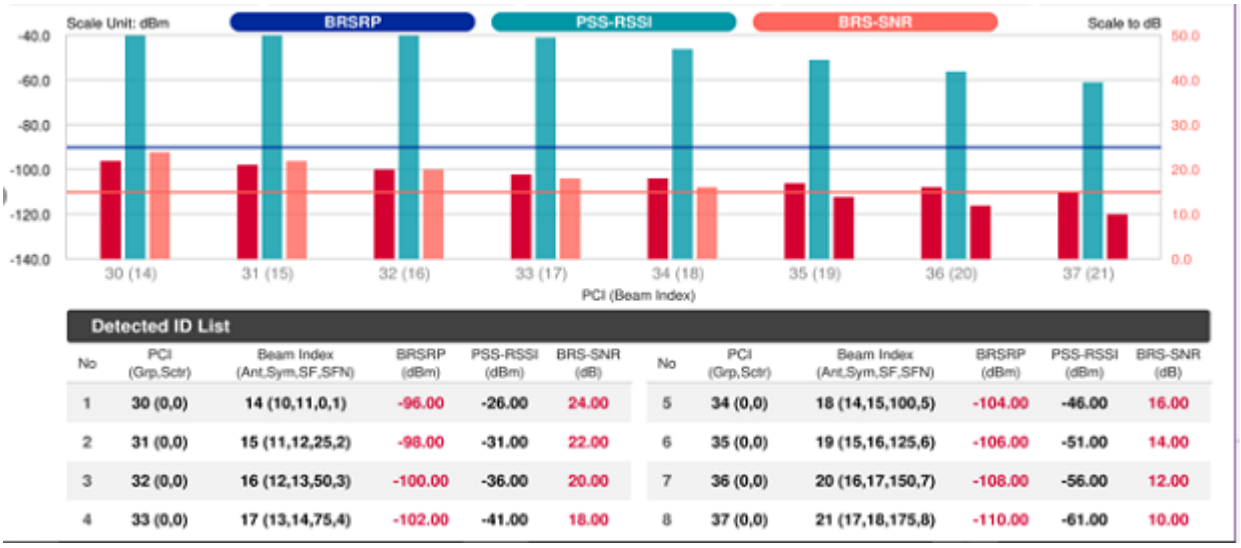
5 Tap **PCI** and input a value using the on-screen keyboard.
The **PCI** switches to **Manual**.

6 Tap to switch **BRSRP Type** to **Average** or **Cumulative**.
You can select Cumulative if you want to see the sum of all BRS (82*8 resource elements) within one symbol. You can select Average to see the average value.

NOTE:

You can go to **Menu** > **Frequency** > **Frequency List** to add frequently used center frequency using the **Add** button in the Frequency List or to delete the selected frequency using the **Delete** button. You can also apply one of the default frequencies in the Frequency List by tapping the **Apply** button.

Beam analyzer measurement



Detected ID List

No	PCI (Grp,Sctr)	Beam Index (Ant,Sym,SF,SFN)	BRSRP (dBm)	PSS-RSSI (dBm)	BRS-SNR (dB)	No	PCI (Grp,Sctr)	Beam Index (Ant,Sym,SF,SFN)	BRSRP (dBm)	PSS-RSSI (dBm)	BRS-SNR (dB)
1	30 (0,0)	14 (10,11,0,1)	-96.00	-26.00	24.00	5	34 (0,0)	18 (14,15,100,5)	-104.00	-46.00	16.00
2	31 (0,0)	15 (11,12,25,2)	-98.00	-31.00	22.00	6	35 (0,0)	19 (15,16,125,6)	-106.00	-51.00	14.00
3	32 (0,0)	16 (12,13,50,3)	-100.00	-36.00	20.00	7	36 (0,0)	20 (16,17,150,7)	-108.00	-56.00	12.00
4	33 (0,0)	17 (13,14,75,4)	-102.00	-41.00	18.00	8	37 (0,0)	21 (17,18,175,8)	-110.00	-61.00	10.00

NOTE:

The undetected values in the Detected ID List table will be indicated as "--". You cannot save the measurement as a Result. Logging as CSV option is added. For more details, see Managing files.

Carrier scanner

5G Carrier Scanner provides an easy and fast response power measurements of up to eight single component carriers of 100 MHz. The power measurement for each carrier includes:

- **Channel Power** — integrated power of the entire channel bandwidth (100MHz) during an entire transmission frame (10ms)
- **BRSRP (Beam Reference Signal Received Power)** — cumulative power measurement of the strongest beam in the corresponding carrier through the entire transmission bandwidth (90MHz) during the beam's transmission period (one symbol or 10 ms/700)

Setting measure setup

Before starting the Carrier Scanner, you need to set Spectrum measurements displayed on the quick access and display tab. See "Configuring Spectrum Measurements" for more details.

1 Tap the **Setup** ( ) icon on the side bar.

2 Tap **BRS Tx Period** and select the options from **< 5 ms**, **5 ms**,**10 ms**, **20 ms**, or **Auto**.**region**.
Set the BRS transmission period as the following: 1 slot <5 ms, 1 subframe =5 ms, 2 subframes =10 ms, 4 subframes =20 ms. If you set it to Auto, the CellAdvisor 5G automatically decodes MIB.

3 Tap **Beam Index** and select between **symbol order** and **subframe region**.
You can select symbol order if you want to allocate the beam index in a sequential symbol order in the same antenna. You can select subframe region if you want to allocate the beam index from 0 to 111 within a subframe.

4 Tap **Configuration** to set **Center Frequency** for each carrier from 1 to 8.

You can also tap the **Configuration** ( ) under the chart screen.

5 If you select the carrier number and switch it to **On**, the carrier scanner table appears with the selected carrier number highlighted purple.

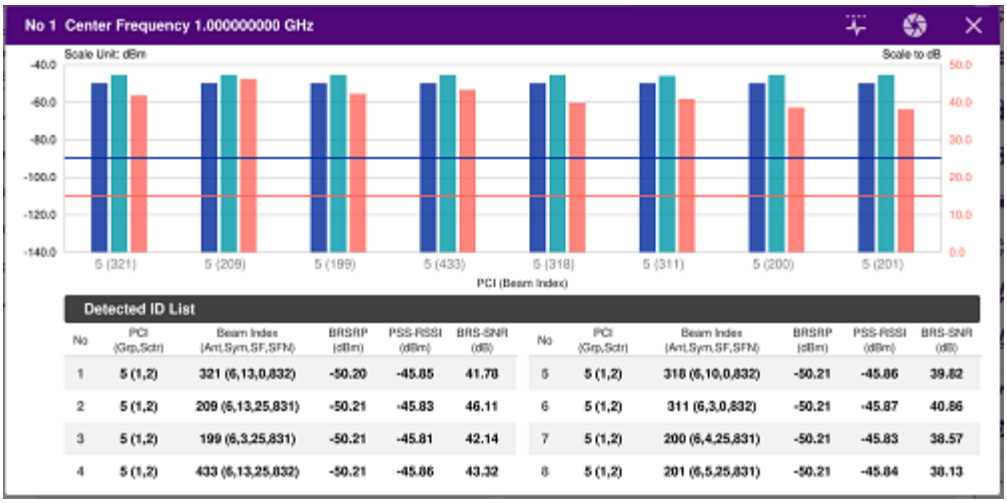
6 Tap **X** button to close the center frequency setup table.

7 Tap the **Search** icon of the selected carrier in the carrier scanner table to set the limit. This enables you to check the beam information without changing the measurement mode to Beam Analyzer.
The beam information pops up for the selected carrier.

a Select the **Limit** ( ) icon to set **BRSRP Line** and **BRS-SNR Line** to **On** or **Off**. When selecting on, set the limit using the on-screen keyboard.
You can also set limits moving the BRSRP Line Limit (default: blue) bar on the left edge and BRS-SNR Line Limit (default: orange) bar on the right edge. If the setting value is smaller than the limit, the line bar color and the result text color of the table become red.

b Select the **Quick Save** ( ) icon to capture the current screen.

c Select the **Close** ( ) icon to close the Beam Information window.



8 Tap to switch **BRSRP Type** to **Average** or **Cumulative**.
You can select Cumulative if you want to see the sum of all BRS (82*8 resource elements) within one symbol. You can select Average to see the average value.

Carrier scanner measurement

NOTE:

You cannot save the measurement as a Result or Result as CSV.

Route map

5G route map traces the power level of the strongest beam corresponding a particular time and geographical position and presents it in a geographical map as a measurement point. All the collected measurements can be exported for post-processing purposes, including data of the eight strongest beams for each measurement point, including its measurement time and geographical location.

Loading a map

To use any features related to maps, you need to download and install the maps on the CellAdvisor 5G. The VIAVI JDMapCreator will help you download maps. Make sure the JDMapCreator application on your computer is connected to the instrument via LAN. You can send a map file with a single layer to the instrument directly by using the **Send to EQP** menu in JDMapCreator. For more information on how to use the JDMapCreator, see the *JDMapCreator 2.0 User Guide*.

1. Plug in your USB flash drive that has a map file in `.mcf` file type created in JDMapCreator.
2. Tap the **Load** icon( ) on the side bar.
3. Navigate the map file you want to open.
   The File Information pane displays the file properties including its name, size, type and date modified.

4 Tap the **Load** button on the screen.

Once you loaded the map, you can also control the map using the following icons on the map.

Icon	Description
	Tap to go to your current location on the map. Once tapped, the purple icon appears on the map indicating your current location.
	Tap to switch to the full screen map view.
	Tap to zoom in the map.
	Tap to zoom out the map.
	Tap and select the area where you want to expand.

Setting measure setup

Before starting the Route Map measurement, you need to set Spectrum measurements displayed on the quick access and display tab. See "Configuring Spectrum Measurements" for more details.

1 If required, connect a GPS receiver to your CellAdvisor 5G for outdoor mapping. Indoor mapping does not necessarily need a GPS antenna.

2 Tap the **Setup** ( ) icon on the side bar.

3 Tap to switch the **Plot Point** to **GPS** or **Position**.

   a To collect data/plot points automatically as you move around in a vehicle or outside (outdoor), select **GPS** and then tap to switch to the **Screen Mode** between **Map** and **Full**.
   With the **Map** setting, you can view only the collected points that can be seen within the boundary of the loaded map. With the **Full** setting, you can view all the collected points of the route without the loaded map.

   b To collect data/plot points manually in indoor layout without a GPS antenna, select **Position**.

4 Tap to switch **Plot Item** to **PSS-RSSI** or **BRSRP**.

5 Tap **BRS Tx Period** and select the options from **< 5 ms**, **5 ms**,**10 ms**, **20 ms**, or **Auto**.
Set the BRS transmission period as the following: 1 slot <5 ms, 1 subframe =5 ms, 2 subframes =10 ms, 4 subframes =20 ms. If you set it to Auto, the CellAdvisor 5G automatically decodes MIB.

6 Tap **Beam Index** and select between **symbol order** and **subframe region**.
You can select symbol order if you want to allocate the beam index in a sequential symbol order in the same antenna. You can select subframe region if you want to allocate the beam index from 0 to 111 within a subframe.

7 Tap to switch **BRSRP Type** to **Average** or **Cumulative**.
You can select Cumulative if you want to see the sum of all BRS (82*8 resource elements) within one symbol. You can select Average to see the average value.

NOTE:

The instrument does not automatically save the collected data. It is recommended that you save the result. Otherwise, you will lose all the collected data.

Logging data

1 Follow the **step 1 to 3** in Setting measure setup.

2 Tap the **Start** button ( ) on the right panel of the map to start plotting on the map.
When you select a point on the map, a marker appears and the Information window appears on the right panel.

3 Tap the **Stop** ( ) button to stop plotting.

4 Tap the **Pause** button ( ) to pause plotting, then the **Pause** button changes to ( ) and GPS point cannot be plotted.

5 Save the logging file to your USB.

Viewing the logging data

1 Load the saved logging file using the **Load** icon( ) on the side bar. Make sure the file extension is `. gomv`.

2 If the PCI is set to Auto, the point on the map appears with a color representing the largest **BRSRP** value.
When you select a point on the map, a marker appears and the Information window appears on the right panel.

3 Set the **PCI** to **Manual** and tap the **Select** button.
The Select PCI window appears.

4 Select **PCI** on the left and then the corresponding Beam Index appeared on the right.

5 Tap the **Apply** button.
The point color of the map changes to the corresponding BRSRP value, and if there is no detected Beam Index, the point will be hidden.

Setting limit

You can set the thresholds for the two different color indicators. The maximum value is the Limit for Excellent, and the minimum value is the Limit for Poor. See below to check the plot point color based on the Legend Color Table.

Red	Green	Blue	Color	
0	0	255		Poor
0	32	255		
0	64	255		
0	128	255		
0	255	255		
0	255	170		
0	255	85		
0	255	0		
85	255	0		
170	255	0		
255	255	0		
255	128	0		
255	64	0		
255	32	0		
255	0	0		Excellent

1 Tap **Menu** > **Limit**.

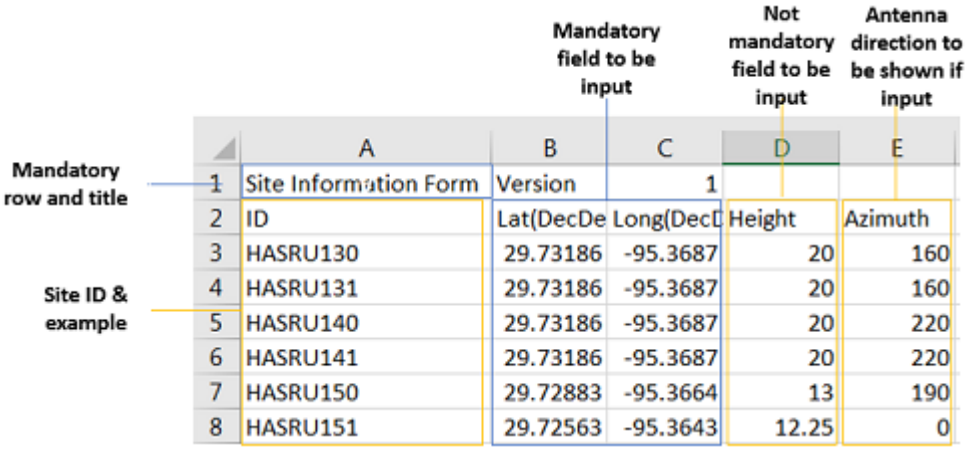
2 Tap **Excellent** and set a value using the on-screen keyboard.

3 Tap **Poor** and set a value using the on-screen keyboard.

Importing cellsite DB

You can import the site DB by creating the 5G site information form.

1 Create the 5G site information with an excel file as below.



	A	B	C	D	E
1	Site Information Form	Version	1		
2	ID	Lat(DecDe	Long(DecD	Height	Azimuth
3	HASRU130	29.73186	-95.3687	20	160
4	HASRU131	29.73186	-95.3687	20	160
5	HASRU140	29.73186	-95.3687	20	220
6	HASRU141	29.73186	-95.3687	20	220
7	HASRU150	29.72883	-95.3664	13	190
8	HASRU151	29.72563	-95.3643	12.25	0

2 Input the two mandatory fields: **Lat (DecDeg)** and **Long (DecDeg)**.

3 Input the **Azimuth** field if you want to check the direction of antenna.

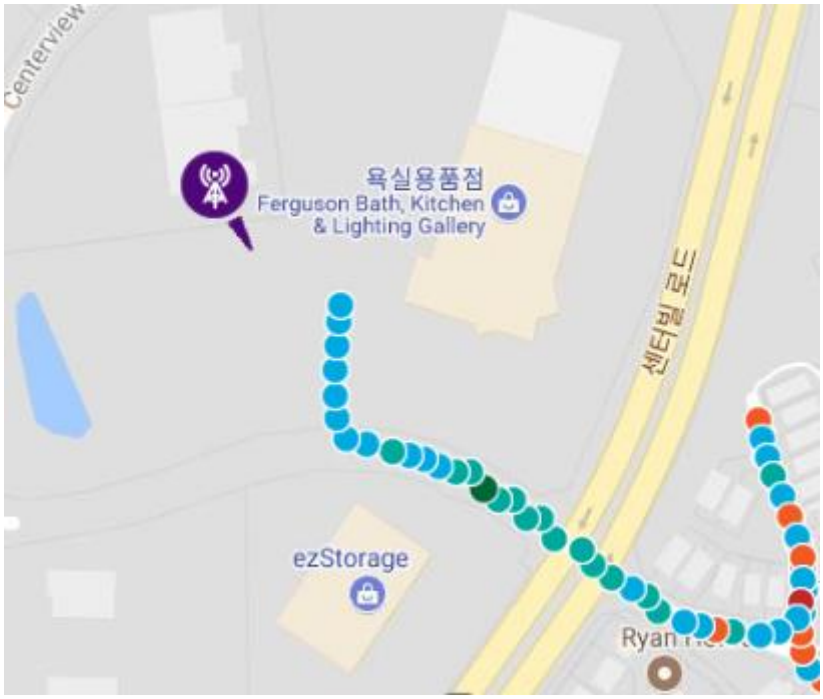
4 Make sure to save the file as (Comma delimited) (*.csv).

5 Copy the file to the USB memory stick and insert it to the **USB A** or **USB B** port of the instrument.

6 Tap the **Load** ( ) hot key on the side bar.

7 Import the saved file.
Once the file is loaded, the following cellsite information appears with an icon.

Route map measurement with site information screen



NOTE:

The purple icon indicates the base station (site) location and the direction of antenna. If the site is beyond the latitude and longitude of the map file, it will not show.

Route map measurement screen

-130.00
-80.00
PCI
30
Auto
Manual
Select
BRSRP
-78.00 dBm
-140.00
-40.00
200 m
1000 ft
Google

Using 5G NR Signal Analyzer

Introduction

VIAVI CellAdvisor 5G NR is the ideal field portable solution to validate 3GPP 5G NR radio access. Its main 5GNR test functions are RF measurement, over-the-air measurement, and demodulation measurement. The RF measurement includes channel power, ACLR, SEM and occupied bandwidth based on triggered spectrum analysis. The over-the-air measurement includes beam analyzer, carrier scanner and route map. The demodulation measurement includes PDSCH EVM and constellation. The carrier scanner is measuring up to eight single component carriers' power as well as the strongest beam and its power level. The beam analyzer is assessing individual beam’s ID, power level and signal to noise levels, and coverage verification including real-time coverage map as well as data available for post-processing.

- Spectrum Analysis
  - Trigger Spectrum
- RF Analysis
  - Channel Power
  - Occupied Bandwidth
  - Spectrum Emission Mask
  - ACLR
  - Multi-ACLR
  - Spurious Emissions (frequency extended up to 18.5 GHz in addition to existing 24 GHz to 40 GHz)
- OTA Analysis
  - Beam Analyzer
  - Carrier Scanner
  - Route Map
  - Beam Availability Index
- Modulation Analysis
  - Constellation
- Power vs Time
  - Power vs Time (Symbol)

- Power vs Time (Frame)

Selecting mode and measure

To start measurement, do the following steps:

1 Tap **5G NR Signal Analyzer** on the **MODE** panel.

2 Tap any measurement mode from the following choices:

Spectrum Analysis > Trigger Spectrum

RF Analysis > **Channel Power**, **Occupied Bandwidth**, **Spectrum Emission Mask**, **ACLR**, **Multi-ACLR**, or **Spurious Emissions**

OTA Analysis > **Beam Analyzer**, **Carrier Scanner**, **Route Map** or **Beam Availability Index**

Modulation Analysis > **Constellation**

Power vs Time > **Power vs Time (Symbol)** or **Power vs Time (Frame)**

3 For measurements except **Multi-ACLR** and **Spurious Emissions**, you can select **Search Type** under the **Setup** ( )icon among below.

a GCSN: If you need to search SSB based on ARFCN raster, it would take too long time since ARFCN raster is very narrow. Therefore, it is recommended that you define a SSB searching frequency in wider steps. This is the usage/purpose of GSCN. You can search the frequency corresponding to GSCN in maximum 100 MHz bandwidth of ARFCN that CellAdvisor 5G supports.

b Full-Raster: You can search in RB offset unit that CellAdvisor 5G defines (FR1: 180 KHz, FR2: 720 KHz).

c Full-Raster & SCS: You can search in SCS unit for the selected SSB (FR1: 15K or 30K, FR2: 120K or 240K).

Conducting spectrum measurement

Trigger spectrum

Setting measure setup

After configuring spectrum measurement in "Configuring Spectrum Measurements", you can set the measure setup to continue your measurement. The measurement settings can be saved and recalled as a file by selecting File Type as Setup and load the file onto the instrument using the **Save/Load** icons on the side bar.

1 Tap the **Setup** ( )icon on the side bar.

2 Tap **Bandwidth/SSB SCS** and select the Setting in the pop-up window based on your need. SSB is abbreviation for Synchronization Signal Block or SS Block and it actually refers to Synchronization PBCH block since the synchronization signal and PBCH channel are packed as a single block that always moves together. SSB should be detected first in 5G NR frame.
The following table shows the setting criteria based on the operating frequency.

Operating Frequency	L	Case	SCS	Slots in a burst period (slot duration)
< 3 GHz (FR1)	4	A {2,8} +14*n	15 kHz	5 (1 ms)
		B {4,8,16,20} +28*n	30 kHz	10 (0.5 ms)
		C {2,8} +14*n	30 kHz	10 (0.5 ms)
3 to 6 GHz (FR1)	8	A {2,8} +14*n	15 kHz	5 (1 ms)
		B {4,8,16,20} +28*n	30 kHz	10 (0.5 ms)
		C {2,8} +14*n	30 kHz	10 (0.5 ms)
> 6 GHz (FR2)	64	D {4,8,16,20} +28*n	120 kHz	40 (0.125 ms)
		E {8,12,16,20,32,36,40,44} +56*n	240 kHz	80 (62.5 µs)

3 Tap **Sync Raster Offset** to set the sync raster resolution to 180 kHz (FR1) or to 720 kHz (FR2) for carrier frequency center using the on-screen keyboard.
The following table shows the sync raster offset range per SSB SCS and sync raster resolution.

SSB SCS (kHz)	Sync Raster Resolution (kHz)	Sync Raster Offset Range	SSB Frequency = Carrier Frequency

15	180	0 to 250	125
30	180	0 to 506	253
120	720	0 to 92	46
240	720	0 to 48	24

4 Tap **L** to set the maximum number of SS-PBCH blocks within a single SS burst set (A set of SS being transmitted in 5 ms window of SS transmission) among **4**, **8** and **64**.
Refer to the selection criteria based on the table in **Step 2**.

5 Tap the **SSB Periodicity** and select the options from **5 ms**, **10 ms**, **20 ms**, **40 ms**, **80 ms**, or **160 ms**.
The SS burst period (SSB periodicity) is defined by each base station and network configurable. 20 ms is the default for the initial cell selection.

6 Tap to switch **SSB Auto Search** to **Stop** to set the SSB periodicity based on the base station or to **Start** to search SCS, type, and the number of SSB automatically.
Once **Start** is selected, the progress bar appears. If it fails to perform the auto search, a fail message appears and the SSB switches to Manual.

7 Tap the **Slot Formats** and input the value from 0 to 55 using the on-screen keyboard.
The slot format means how to use one slot between downlink and uplink.

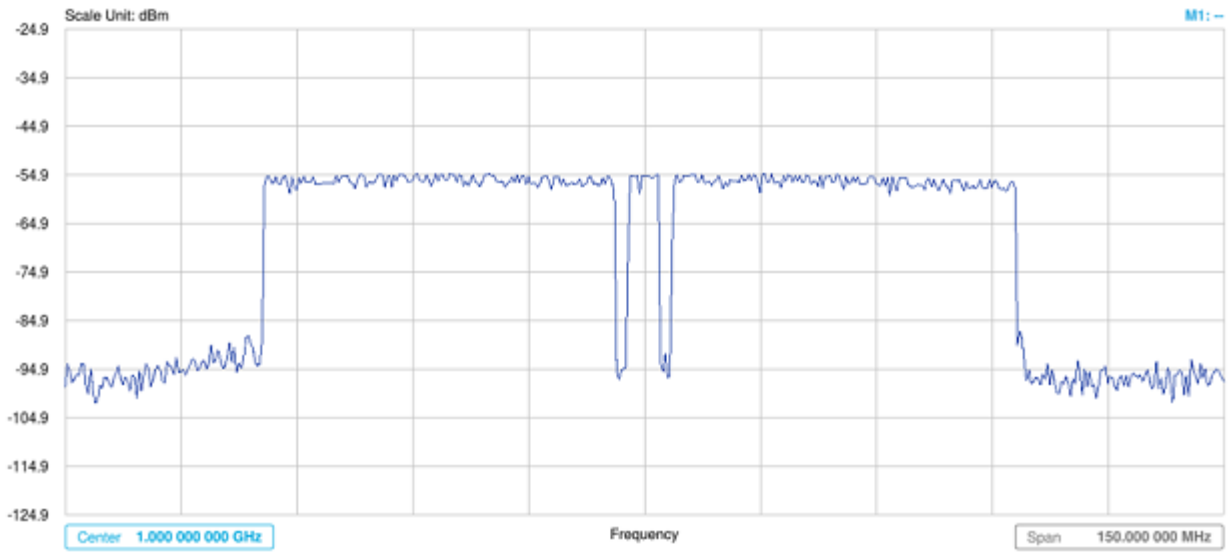
8 Tap to switch **Link** to **UL** or **DL**.

9 Tap to switch **PCI** (**Physical Cell ID**) to **Manual** or **Auto**.

10 Tap **PCI** and input a value from 0 to 1007 using the on-screen keyboard.
The **PCI** switches to **Manual**.

11 Tap **Menu** > **BW/AVG** > **Average** to set the number of measurements to be averaged using the on-screen keyboard.
The input value range is from 1 to 100.

Trigger spectrummeasurement with 5G NR



Conducting RF measurement

Channel Power

The Channel Power measurement is a common test used in the wireless industry to measure the total transmitted power of a radio within a defined frequency channel. It acquires a number of points representing the input signal in the time domain, transforms this information into the frequency domain using Fast Fourier Transform (FFT), and then calculates the channel power. The effective resolution bandwidth of the frequency domain trace is proportional to the number of points acquired for the FFT.

The channel power measurement identifies the total RF power, power spectral density, and Peak to Average Ratio (PAR) of the signal within the channel bandwidth.

Setting measure setup

After configuring spectrum measurement in "Configuring Spectrum Measurements", you can set the measure setup to continue your measurement. The measurement settings can be saved and recalled as a file by selecting File Type as Setup and load the file onto the instrument using the **Save/Load** icons on the side bar.

1 Tap the **Setup** ( )icon on the side bar.

2 Tap **Bandwidth/SSB SCS** and select the Setting in the pop-up window based on your need. SSB is abbreviation for Synchronization Signal Block or SS Block and it actually refers to Synchronization PBCH block since the synchronization signal and PBCH channel are packed as a single block that

always moves together. SSB should be detected first in 5G NR frame.
The following table shows the setting criteria based on the operating frequency.

Operating Frequency	L	Case	SCS	Slots in a burst period (slot duration)
< 3 GHz (FR1)	4	A {2,8} +14*n	15 kHz	5 (1 ms)
		B {4,8,16,20} +28*n	30 kHz	10 (0.5 ms)
		C {2,8} +14*n	30 kHz	10 (0.5 ms)
3 to 6 GHz (FR1)	8	A {2,8} +14*n	15 kHz	5 (1 ms)
		B {4,8,16,20} +28*n	30 kHz	10 (0.5 ms)
		C {2,8} +14*n	30 kHz	10 (0.5 ms)
> 6 GHz (FR2)	64	D {4,8,16,20} +28*n	120 kHz	40 (0.125 ms)
		E {8,12,16,20,32,36,40,44} +56*n	240 kHz	80 (62.5 µs)

3 Tap **Sync Raster Offset** to set the sync raster resolution to 180 kHz (FR1) or to 720 kHz (FR2) for carrier frequency center using the on-screen keyboard.
The following table shows the sync raster offset range per SSB SCS and sync raster resolution.

SSB SCS (kHz)	Sync Raster Resolution (kHz)	Sync Raster Offset Range	SSB Frequency = Carrier Frequency
15	180	0 to 250	125
30	180	0 to 506	253
120	720	0 to 92	46

240	720	0 to 48	24

4 Tap **L** to set the maximum number of SS-PBCH blocks within a single SS burst set (A set of SS being transmitted in 5 ms window of SS transmission) among **4**, **8** and **64**.
Refer to the selection criteria based on the table in **Step 2**.

5 Tap the **SSB Periodicity** and select the options from **5 ms**, **10 ms**, **20 ms**, **40 ms**, **80 ms**, or **160 ms**.
The SS burst period (SSB periodicity) is defined by each base station and network configurable. 20 ms is the default for the initial cell selection.

6 Tap to switch **SSB Auto Search** to **Stop** to set the SSB periodicity based on the base station or to **Start** to search SCS, type, and the number of SSB automatically.
Once **Start** is selected, the progress bar appears. If it fails to perform the auto search, a fail message appears and the SSB switches to Manual.

NOTE:

You can go to **Menu** > **Frequency** > **Frequency List** to add frequently used center frequency using the **Add** button in the Frequency List or to delete the selected frequency using the **Delete** button. You can also apply one of the default frequencies in the Frequency List by tapping the **Apply** button.

7 Tap the **Slot Formats** and input the value from 0 to 55 using the on-screen keyboard.
The slot format means how to use one slot between downlink and uplink.

8 Tap to switch **PCI** (**Physical Cell ID**) to **Manual** or **Auto**.

9 Tap **PCI** and input a value from 0 to 1007 using the on-screen keyboard.
The **PCI** switches to **Manual**.

10 Tap **Menu** > **BW/AVG** > **Average** to set the number of measurements to be averaged using the on-screen keyboard.
The input value range is from 1 to 100.

11 Tap **EIRP** at the lower left corner and EIRP and Peak EIRP values are displayed.

Setting limit

1 Tap **Menu** > **Limit**.

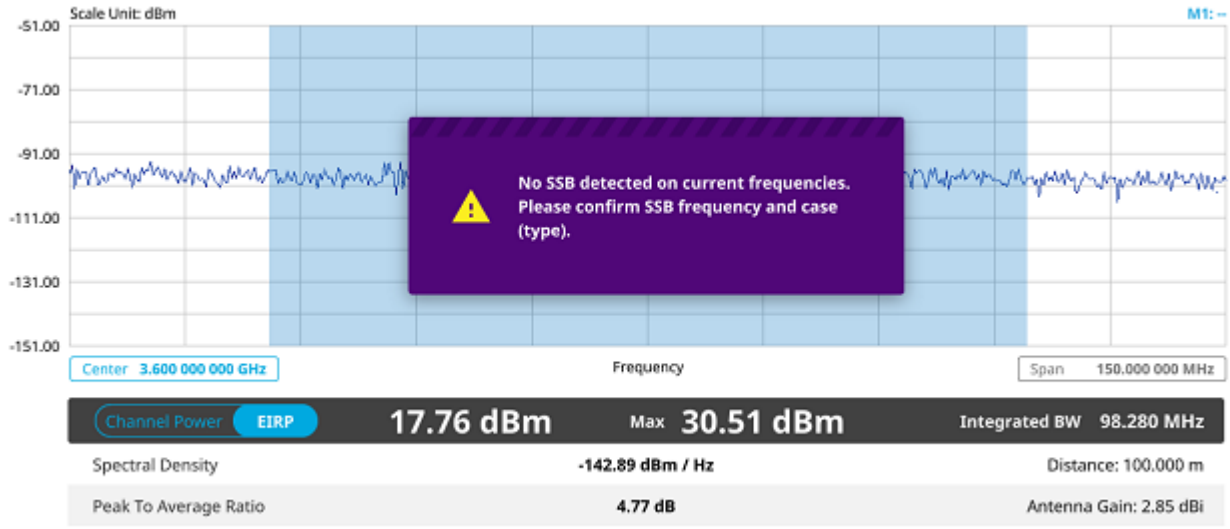
2 Tap to switch the **Test Limits** to **On** or **Off** to enable or disable Pass/Fail indication.
The result table color for Pass is green, and the result table color for Fail is red.

3 Tap **High Limit** to set the upper threshold using the on-screen keyboard.

4 Tap **Low Limit** to set the lower threshold using the on-screen keyboard.

5 *Optional.* Tap the **Save** hot key on the side bar and select the save option form the choices available for your measurement mode.

Channel power measurement with 5G NR



Channel power measurement result shows channel power and spectrum density in a user specified channel bandwidth. The peak to average ratio (PAR) is shown at the bottom of the screen as well. The shaded area on the display indicates the channel bandwidth.

Occupied bandwidth

The Occupied Bandwidth measures the percentage of the transmitted power within a specified bandwidth. The percentage is typically 99%.

Setting measure setup

After configuring spectrum measurement in "Configuring Spectrum Measurements", you can set the measure setup to continue your measurement. The measurement settings can be saved and recalled as a file by selecting File Type as Setup and load the file onto the instrument using the **Save/Load** icons on the side bar.

1 Tap the **Setup** ( )icon on the side bar.

2 Tap **Bandwidth/SSB SCS** and select the Setting in the pop-up window based on your need. SSB is abbreviation for Synchronization Signal Block or SS Block and it actually refers to Synchronization PBCH block since the synchronization signal and PBCH channel are packed as a single block that always moves together. SSB should be detected first in 5G NR frame.
The following table shows the setting criteria based on the operating frequency.

Operating Frequency	L	Case	SCS	Slots in a burst period (slot duration)

< 3 GHz (FR1)	4	A {2,8} +14*n	15 kHz	5 (1 ms)
		B {4,8,16,20} +28*n	30 kHz	10 (0.5 ms)
		C {2,8} +14*n	30 kHz	10 (0.5 ms)
3 to 6 GHz (FR1)	8	A {2,8} +14*n	15 kHz	5 (1 ms)
		B {4,8,16,20} +28*n	30 kHz	10 (0.5 ms)
		C {2,8} +14*n	30 kHz	10 (0.5 ms)
> 6 GHz (FR2)	64	D {4,8,16,20} +28*n	120 kHz	40 (0.125 ms)
		E {8,12,16,20,32,36,40,44} +56*n	240 kHz	80 (62.5 µs)

3 Tap **Sync Raster Offset** to set the sync raster resolution to 180 kHz (FR1) or to 720 kHz (FR2) for carrier frequency center using the on-screen keyboard.
The following table shows the sync raster offset range per SSB SCS and sync raster resolution.

SSB SCS (kHz)	Sync Raster Resolution (kHz)	Sync Raster Offset Range	SSB Frequency = Carrier Frequency
15	180	0 to 250	125
30	180	0 to 506	253
120	720	0 to 92	46
240	720	0 to 48	24

4 Tap **L** to set the maximum number of SS-PBCH blocks within a single SS burst set (A set of SS being transmitted in 5 ms window of SS transmission) among **4**, **8** and **64**.
Refer to the selection criteria based on the table in **Step 2**.

5 Tap the **SSB Periodicity** and select the options from **5 ms**, **10 ms**, **20 ms**, **40 ms**, **80 ms**, or **160 ms**.
The SS burst period (SSB periodicity) is defined by each base station and network configurable. 20 ms is the default for the initial cell selection.

6 Tap to switch **SSB Auto Search** to **Stop** to set the SSB periodicity based on the base station or to **Start** to search SCS, type, and the number of SSB automatically.
Once **Start** is selected, the progress bar appears. If it fails to perform the auto search, a fail message appears and the SSB switches to Manual.

7 Tap the **Slot Formats** and input the value from 0 to 55 using the on-screen keyboard.
The slot format means how to use one slot between downlink and uplink.

8 Tap to switch **PCI** (**Physical Cell ID**) to **Manual** or **Auto**.

9 Tap **PCI** and input a value from 0 to 1007 using the on-screen keyboard.
The **PCI** switches to **Manual**.

10 Tap **Menu** > **BW/AVG** > **Average** to set the number of measurements to be averaged using the on-screen keyboard.
The input value range is from 1 to 100.

Setting Limit

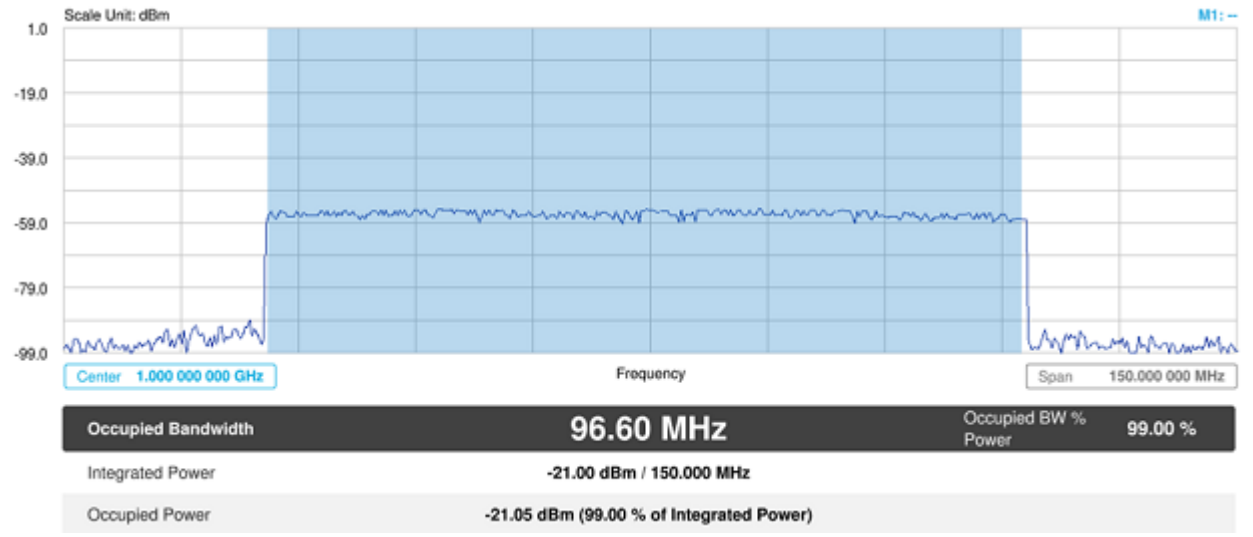
1 Tap **Menu** > **Limit**.

2 Tap to switch the **Test Limits** to **On** or **Off** to enable or disable Pass/Fail indication.
The result table color for Pass is green, and the result table color for Fail is red.

3 Tap **High Limit** to set the upper threshold using the on-screen keyboard.

4 *Optional.* Tap the **Save** icon on the side bar and select the save option form the choices available for your measurement mode.

Occupied bandwidth with 5G NR



The Occupied Bandwidth measurement shows both of power across the band and power bandwidth in a user specified percentage to determine the amount of spectrum used by a modulated signal. Occupied bandwidth is typically calculated as the bandwidth containing 99% of the transmitted power.

Spectrum emission mask

The Spectrum Emission Mask (SEM) measurement is to identify and determine the power level of out-of band spurious emission outside the necessary channel bandwidth and modulated signal. It measures the power ratio between in-band and adjacent channels. The CellAdvisor 5G indicates either Pass or Fail based on the specified limit of the signal.

Setting measure setup

After configuring spectrum measurement in "Configuring Spectrum Measurements", you can set the measure setup to continue your measurement. The measurement settings can be saved and recalled as a file by selecting File Type as Setup and load the file onto the instrument using the **Save/Load** icons on the side bar.

1 Tap the **Setup** ( )icon on the side bar.

2 Tap **Bandwidth/SSB SCS** and select the Setting in the pop-up window based on your need. SSB is abbreviation for Synchronization Signal Block or SS Block and it actually refers to Synchronization PBCH block since the synchronization signal and PBCH channel are packed as a single block that always moves together. SSB should be detected first in 5G NR frame.
The following table shows the setting criteria based on the operating frequency.

Operating Frequency	L	Case	SCS	Slots in a burst period (slot duration)
< 3 GHz (FR1)	4	A {2,8} +14*n	15 kHz	5 (1 ms)
		B {4,8,16,20} +28*n	30 kHz	10 (0.5 ms)
		C {2,8} +14*n	30 kHz	10 (0.5 ms)
3 to 6 GHz (FR1)	8	A {2,8} +14*n	15 kHz	5 (1 ms)
		B {4,8,16,20} +28*n	30 kHz	10 (0.5 ms)

		C {2,8} +14*n	30 kHz	10 (0.5 ms)
> 6 GHz (FR2)	64	D {4,8,16,20} +28*n	120 kHz	40 (0.125 ms)
		E {8,12,16,20,32,36,40,44} +56*n	240 kHz	80 (62.5 µs)

3 Tap **Sync Raster Offset** to set the sync raster resolution to 180 kHz (FR1) or to 720 kHz (FR2) for carrier frequency center using the on-screen keyboard.
The following table shows the sync raster offset range per SSB SCS and sync raster resolution.

SSB SCS (kHz)	Sync Raster Resolution (kHz)	Sync Raster Offset Range	SSB Frequency = Carrier Frequency
15	180	0 to 250	125
30	180	0 to 506	253
120	720	0 to 92	46
240	720	0 to 48	24

4 Tap **L** to set the maximum number of SS-PBCH blocks within a single SS burst set (A set of SS being transmitted in 5 ms window of SS transmission) among **4**, **8** and **64**.
Refer to the selection criteria based on the table in **Step 2**.

5 Tap the **SSB Periodicity** and select the options from **5 ms**, **10 ms**, **20 ms**, **40 ms**, **80 ms**, or **160 ms**.
The SS burst period (SSB periodicity) is defined by each base station and network configurable. 20 ms is the default for the initial cell selection.

6 Tap to switch **SSB Auto Search** to **Stop** to set the SSB periodicity based on the base station or to **Start** to search SCS, type, and the number of SSB automatically.
Once **Start** is selected, the progress bar appears. If it fails to perform the auto search, a fail message appears and the SSB switches to Manual.

7 Tap the **Slot Formats** and input the value from 0 to 55 using the on-screen keyboard.
The slot format means how to use one slot between downlink and uplink.

8 Tap to switch **PCI** (**Physical Cell ID**) to **Manual** or **Auto**.

9 Tap **PCI** and input a value from 0 to 1007 using the on-screen keyboard.
The **PCI** switches to **Manual**.

10 Tap **BS Type** and select the option from **1-C/1-H**, **1-O**, or **2-O**.
Set 1-C (Conducted)/1-H (Hybrid) for multi-band operation with mapping of transceivers to one or more antenna connectors (1-C) or TAB (transceiver array boundary) connectors for 1-H. Set 1-O when BS operates at FR1 and 2-0 when BS operates at FR2.

11 Tap **Category** and select the option from **Wide Area BS A**, **Wide Area BS B**, **Medium Range BS**, or **Local Area BS**.
The category is defined with base station type. Set Wide Area BS A/B for macro cell, Medium Range BS for micro cell, and Local Area Base Station for pico cell.

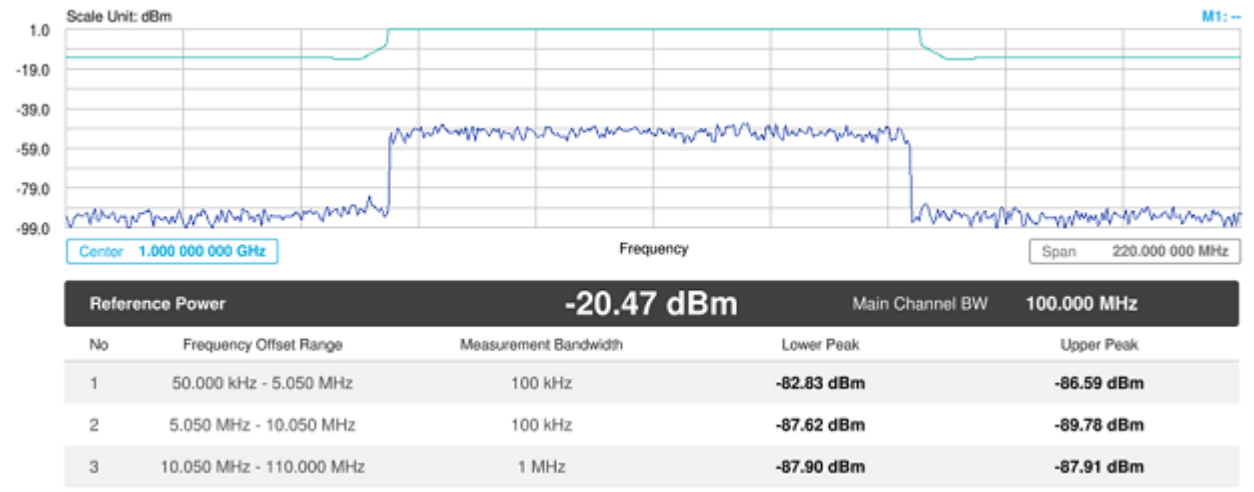
Setting limit

1 Tap **Menu** > **Limit**.

2 Tap to switch the **Test Limits** to **On** or **Off** to enable or disable Pass/Fail indication.
The result table color for Pass is green, and the result table color for Fail is red.

3 *Optional.* Tap the **Save** hot key on the side bar and select the save option form the choices available for your measurement mode.

Spectrum emission mask measurement with 5G NR



If Lower Peak or Upper Peak indicate Fail, the mask line becomes red.

ACLR

The Adjacent Channel Power Ratio (ACPR), designated by the 3GPP WCDMA specifications as the Adjacent Channel Leakage power Ratio (ACLR), is the power contained in a specified frequency channel bandwidth relative to the total carrier power. It may also be expressed as a ratio of power spectral densities between the carrier and the specified offset frequency band.

Setting measure setup

After configuring spectrum measurement in "Configuring Spectrum Measurements", you can set the measure setup to continue your measurement. The measurement settings can be saved and recalled as a file by selecting File Type as Setup and load the file onto the instrument using the **Save/Load** icons on the side bar.

1 Tap the **Setup** ( )icon on the side bar.

2 Tap **Bandwidth/SSB SCS** and select the Setting in the pop-up window based on your need. SSB is abbreviation for Synchronization Signal Block or SS Block and it actually refers to Synchronization PBCH block since the synchronization signal and PBCH channel are packed as a single block that always moves together. SSB should be detected first in 5G NR frame.
The following table shows the setting criteria based on the operating frequency.

Operating Frequency	L	Case	SCS	Slots in a burst period (slot duration)
< 3 GHz (FR1)	4	A {2,8} +14*n	15 kHz	5 (1 ms)
		B {4,8,16,20} +28*n	30 kHz	10 (0.5 ms)
		C {2,8} +14*n	30 kHz	10 (0.5 ms)
3 to 6 GHz (FR1)	8	A {2,8} +14*n	15 kHz	5 (1 ms)
		B {4,8,16,20} +28*n	30 kHz	10 (0.5 ms)
		C {2,8} +14*n	30 kHz	10 (0.5 ms)
> 6 GHz (FR2)	64	D {4,8,16,20} +28*n	120 kHz	40 (0.125 ms)
		E {8,12,16,20,32,36,40,44} +56*n	240 kHz	80 (62.5 µs)

3 Tap **Sync Raster Offset** to set the sync raster resolution to 180 kHz (FR1) or to 720 kHz (FR2) for carrier frequency center using the on-screen keyboard.
The following table shows the sync raster offset range per SSB SCS and sync raster resolution.

SSB SCS (kHz)	Sync Raster Resolution (kHz)	Sync Raster Offset Range	SSB Frequency = Carrier Frequency
15	180	0 to 250	125
30	180	0 to 506	253
120	720	0 to 92	46
240	720	0 to 48	24

4 Tap **L** to set the maximum number of SS-PBCH blocks within a single SS burst set (A set of SS being transmitted in 5 ms window of SS transmission) among **4**, **8** and **64**.
Refer to the selection criteria based on the table in **Step 2**.

5 Tap the **SSB Periodicity** and select the options from **5 ms**, **10 ms**, **20 ms**, **40 ms**, **80 ms**, or **160 ms**.
The SS burst period (SSB periodicity) is defined by each base station and network configurable. 20 ms is the default for the initial cell selection.

6 Tap to switch **SSB Auto Search** to **Stop** to set the SSB periodicity based on the base station or to **Start** to search SCS, type, and the number of SSB automatically.
Once **Start** is selected, the progress bar appears. If it fails to perform the auto search, a fail message appears and the SSB switches to Manual.

7 Tap the **Slot Formats** and input the value from 0 to 55 using the on-screen keyboard.
The slot format means how to use one slot between downlink and uplink.

8 Tap to switch **PCI** (**Physical Cell ID**) to **Manual** or **Auto**.

9 Tap **PCI** and input a value from 0 to 1007 using the on-screen keyboard.
The **PCI** switches to **Manual**.

10 Tap **BS Type** and select the option from **1-C/1-H**, **1-O**, or **2-O**.
Set 1-C (Conducted)/1-H (Hybrid) for multi-band operation with mapping of transceivers to one or more antenna connectors (1-C) or TAB (transceiver array boundary) connectors for 1-H. Set 1-O when BS operates at FR1 and 2-0 when BS operates at FR2.

11 Tap **Menu** > **Trigger** and tap to switch **Triggered Spectrum** to **On** or **Off**, which takes time for FPGA change.

- **On**: Functions as Threshold RMS Spectrum. Automatically sets UI Update Rate 100 ms, Average 100, RBW 100 kHz, VBW 100 kHz.
- **Off**: Functions as PSS Correlation Spectrum. Automatically sets UI Update Rate 600 ms, Average 1, RBW 100 kHz, VBW 100 kHz.

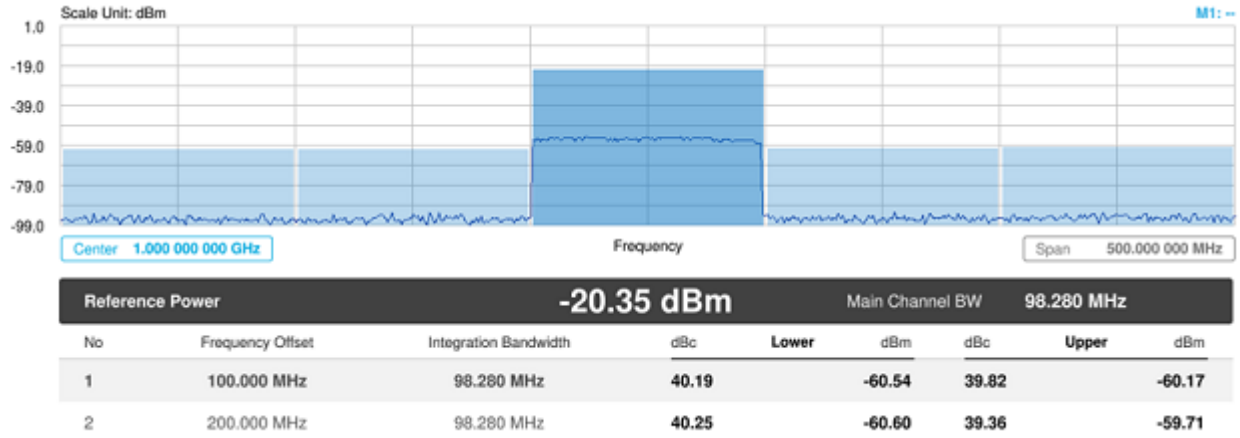
Setting limit

1 Tap **Menu** > **Limit**.

2 Tap to switch the **Test Limits** to **On** or **Off** to enable or disable Pass/Fail indication.
The result table color for Pass is green, and the result table color for Fail is red.

3 *Optional.* Tap the **Save** hot key on the side bar and select the save option form the choices available for your measurement mode.

ACLR measurement with 5G NR



Multi-ACLR

The Multi-ACLR measurement is used to perform multi-channel ACLR measurements with as many channels as possible. It helps you to measure ACLR in multi-channel transmitting Base Station environment.

Setting measure setup

After configuring spectrum measurement in "Configuring Spectrum Measurements", you can set the measure setup to continue your measurement. The measurement settings can be saved and recalled as a file by selecting File Type as Setup and load the file onto the instrument using the **Save/Load** icons on the side bar.

1 Tap the **Setup** ( )icon on the side bar.

2 Tap **Bandwidth/SSB SCS** and select the Setting in the pop-up window based on your need. SSB is abbreviation for Synchronization Signal Block or SS Block and it actually refers to Synchronization PBCH block since the synchronization signal and PBCH channel are packed as a single block that always moves together. SSB should be detected first in 5G NR frame.
The following table shows the setting criteria based on the operating frequency.

Operating Frequency	Case	SCS
< 3 GHz (FR1)	A {2,8} +14*n	15 kHz
	B {4,8,16,20} +28*n	30 kHz
	C {2,8} +14*n	30 kHz
3 to 6 GHz (FR1)	A {2,8} +14*n	15 kHz
	B {4,8,16,20} +28*n	30 kHz
	C {2,8} +14*n	30 kHz
> 6 GHz (FR2)	D {4,8,16,20} +28*n	120 kHz
	E {8,12,16,20,32,36,40,44} +56*n	240 kHz

3 Tap **BS Type** and select the option from **1-C/1-H**, **1-O**, or **2-O**.
Set 1-C (Conducted)/1-H (Hybrid) for multi-band operation with mapping of transceivers to one or more antenna connectors (1-C) or TAB (transceiver array boundary) connectors for 1-H. Set 1-O when BS operates at FR1 and 2-0 when BS operates at FR2.

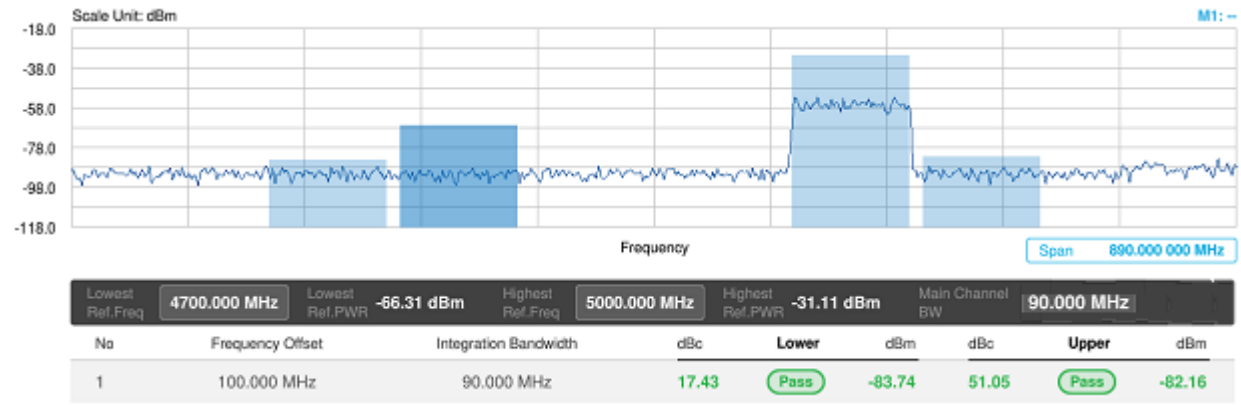
Setting limit

1 Tap **Menu** > **Limit**.

2 Tap to switch the **Test Limits** to **On** or **Off** to enable or disable Pass/Fail indication.
The result table color for Pass is green, and the result table color for Fail is red.

3 *Optional.* Tap the **Save** icon on the side bar and select the save option form the choices available for your measurement mode.

Multi-ACLR measurement with 5G NR



NOTE

You can set the Lowest Ref. Frequency and Highest Ref. Frequency by tapping the rectangle with value using the on-screen keyboard.

Spurious emissions

The Spurious Emissions measurement is to identify or determine the power level of in-band or out-of-band spurious emissions within the necessary channel bandwidth and modulated signal. The CellAdvisor 5G indicates either Pass or Fail based on the specified limit of the signal. Frequency extended up to 18.5 GHz in addition to existing 24 GHz to 40 GHz.

Setting measure setup

After configuring spectrum measurement in "Configuring Spectrum Measurements", you can set the measure setup to continue your measurement. The frequency setting is not used in the Spurious Emissions mode. The measurement settings can be saved and recalled as a file by selecting File Type as Setup and load the file onto the instrument using the **Save/Load** icons on the side bar.

1. Tap the **Setup** ( ) icon on the side bar.
2. Tap **BS Type** and select the option from **1-C/1-H**, **1-O**, or **2-O**.
   Set 1-C (Conducted)/1-H (Hybrid) for multi-band operation with mapping of transceivers to one or more antenna connectors (1-C) or TAB (transceiver array boundary) connectors for 1-H. Set 1-O when BS operates at FR1 and 2-0 when BS operates at FR2.
3. Tap **Measure Type** and select the option from **Transmitted** or **Receiver**.
4. Tap **Category** and select the option from **Wide Area BS A**, **Wide Area BS B**, **Medium Range BS**, or **Local Area BS**.

The category is defined as a base station type. Set Wide Area BS A/B for macro cell, Medium Range BS for micro cell, and Local Area Base Station for pico cell.

5 Tap **Menu** > **BW/AVG** > **Average** to set the number of measurements to be averaged using the on-screen keyboard.
The input value range is from 1 to 100.

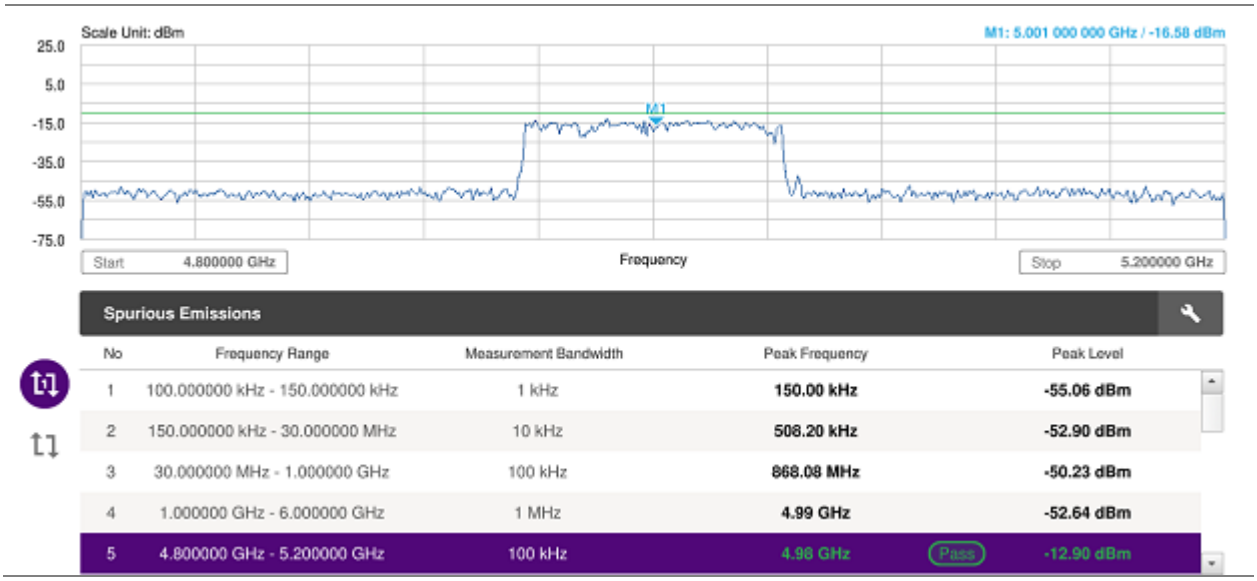
Setting limit

1 Tap **Menu** > **Limit**.

2 Tap to switch the **Test Limits** to **On** or **Off** to enable or disable Pass/Fail indication.

3 *Optional.* Tap the **Save** icon on the side bar and select the save option form the choices available for your measurement mode.

Spurious emissions measurement with 5G NR



NOTE:

You can only set the frequency range and attenuation by tapping the Configuration icon. If you select the first icon next to the Range table above, it only shows the selected range and if you select the second icon next to the Range table, it keeps moving from the first selected range to the final selected range.

Conducting OTA measurement

Beam analyzer

5G NR provides the beamforming profile of each transmission carrier, including the eight strongest beams and the corresponding power levels during its transmission period, and includes:

- **SS-RSRP (Synchronized Signal – Reference Signal Received Power)** — linear average over the power contributions (in Watts) of the resource elements which carry secondary synchronization signals
- **PS-RSRP (Primary Synchronization Signal – Reference Signal Received Power)** — average power measurement through all the primary sync signals
- **SS-SINR (Secondary Synchronization Signal – Signal to Interference plus Noise Ratio)** — linear average over the power contribution (in Watts) of the resource elements carrying secondary synchronization signals divided by the linear average of the noise and interference power contribution (in Watts) over the resource elements carrying secondary synchronization signals within the same frequency bandwidth
- **SS-RSRQ (Secondary Synchronization Signal – Reference Signal Received Quality)** — ratio of N x SS-RSRP/NR carrier RSSI. Here N refers to number of resource blocks in NR carrier RSSI measurement Bandwidth
- **PS-SNR (Primary Synchronization Signal - Signal to Noise Ratio)** — ratio of signal power to the noise power through the primary sync signals

Setting measure setup

Before starting the Beam Analyzer, you need to set Spectrum measurements displayed on the quick access and display tab. See "Configuring Spectrum Measurements" for more details.

1 Tap the **Setup** ( )icon on the side bar.

2 Tap **Bandwidth/SSB SCS** and select the Setting in the pop-up window based on your need. SSB is abbreviation for Synchronization Signal Block or SS Block and it actually refers to Synchronization PBCH block since the synchronization signal and PBCH channel are packed as a single block that always moves together. SSB should be detected first in 5G NR frame.
The following table shows the setting criteria based on the operating frequency.

Operating Frequency	L	Case	SCS	Slots in a burst period (slot duration)
< 3 GHz (FR1)	4	A {2,8} +14*n	15 kHz	5 (1 ms)
		B {4,8,16,20} +28*n	30 kHz	10 (0.5 ms)
		C {2,8} +14*n	30 kHz	10 (0.5 ms)

3 to 6 GHz (FR1)	8	A {2,8} +14*n	15 kHz	5 (1 ms)
		B {4,8,16,20} +28*n	30 kHz	10 (0.5 ms)
		C {2,8} +14*n	30 kHz	10 (0.5 ms)
> 6 GHz (FR2)	64	D {4,8,16,20} +28*n	120 kHz	40 (0.125 ms)
		E {8,12,16,20,32,36,40,44} +56*n	240 kHz	80 (62.5 µs)

3 Tap **Sync Raster Offset** to set the sync raster resolution to 180 kHz (FR1) or to 720 kHz (FR2) for carrier frequency center using the on-screen keyboard.
The following table shows the sync raster offset range per SSB SCS and sync raster resolution.

SSB SCS (kHz)	Sync Raster Resolution (kHz)	Sync Raster Offset Range	SSB Frequency = Carrier Frequency
15	180	0 to 250	125
30	180	0 to 506	253
120	720	0 to 92	46
240	720	0 to 48	24

4 Tap **L** to set the maximum number of SS-PBCH blocks within a single SS burst set (A set of SS being transmitted in 5 ms window of SS transmission) among **4**, **8** and **64**.
Refer to the selection criteria based on the table in **Step 2**.

5 Tap the **SSB Periodicity** and select the options from **5 ms**, **10 ms**, **20 ms**, **40 ms**, **80 ms**, or **160 ms**.
The SS burst period (SSB periodicity) is defined by each base station and network configurable. 20 ms is the default for the initial cell selection.

6 Tap to switch **SSB Auto Search** to **Stop** to set the SSB periodicity based on the base station or to **Start** to search SCS, type, and the number of SSB automatically.
Once **Start** is selected, the progress bar appears. If it fails to perform the auto search, a fail message appears and the SSB switches to Manual.

7 Tap to switch **PCI** (**Physical Cell ID**) **Mode** to **Manual** or **Auto**.

8 Tap **PCI** and input a value from 0 to 1007 using the on-screen keyboard.
The **PCI** switches to **Manual**.

NOTE:

You can go to **Menu** > **Frequency** > **Center Frequency List** to add frequently used center frequency using the **Add** button in the Frequency List or to delete the selected frequency using the **Delete** button. You can also apply one of the default frequencies in the Frequency List by tapping the **Apply** button.

Setting the sweep speed

1 Tap **Menu** > **Sweep**.

2 Tap **Sweep Speed** and you can choose between **Fast** and **Normal**.

Beam analyzer measurement

Detected ID List

No	PCI (Grp,Sctr)	SSB Index (DM-RS,PBCH)	SS-RSRP (dBm)	PS-RSRP (dBm)	PS-SNR (dB)	SS-SINR (dB)	SS-RSRQ (dB)
1	944 (314,2)	6 (6,--)	-85.55	-85.68	29.29	5.73	1.85
2	944 (314,2)	1 (1,--)	-88.52	-88.22	29.71	4.24	1.03
3	944 (314,2)	3 (3,--)	-90.13	-90.37	28.24	4.15	1.12
4	944 (314,2)	4 (4,--)	-90.59	-91.42	27.11	4.18	1.02
5	944 (314,2)	2 (2,--)	-90.99	-90.93	27.04	3.40	0.72
6	944 (314,2)	0 (0,--)	-93.74	-92.81	24.39	3.80	-1.56
7	-- (--,--)	-- (--,--)	--	--	--	--	--
8	-- (--,--)	-- (--,--)	--	--	--	--	--

NOTE:

The undetected values in the Detected ID List table will be indicated as "--". You cannot save the measurement as a Result. Logging as CSV option is added. For more details, see Managing files.

Carrier scanner

5G Carrier Scanner provides an easy and fast response power measurements of up to eight single component carriers of 100 MHz. The power measurement for each carrier includes:

- **SS-RSRP (Synchronized Signal – Reference Signal Received Power)** — linear average over the power contributions (in Watts) of the resource elements which carry secondary synchronization signals
- **PS-SNR (Primary Synchronization Signal - Signal to Noise Ratio)** — ratio of signal power to the noise power through the primary sync signals
- **Channel Power** — integrated power of the entire channel bandwidth (100 MHz) during an entire transmission frame (10 ms)

Setting measure setup

Before starting the Carrier Scanner, you need to set Spectrum measurements displayed on the quick access and display tab. See "Configuring Spectrum Measurements" for more details.

1 Tap the **Setup** ( )icon on the side bar.

2 Tap **Bandwidth/SSB SCS** and select the Setting in the pop-up window based on your need. SSB is abbreviation for Synchronization Signal Block or SS Block and it actually refers to Synchronization PBCH block since the synchronization signal and PBCH channel are packed as a single block that always moves together. SSB should be detected first in 5G NR frame.
The following table shows the setting criteria based on the operating frequency.

Operating Frequency	L	Case	SCS	Slots in a burst period (slot duration)
< 3 GHz (FR1)	4	A {2,8} +14*n	15 kHz	5 (1 ms)
		B {4,8,16,20} +28*n	30 kHz	10 (0.5 ms)
		C {2,8} +14*n	30 kHz	10 (0.5 ms)
3 to 6 GHz (FR1)	8	A {2,8} +14*n	15 kHz	5 (1 ms)
		B {4,8,16,20} +28*n	30 kHz	10 (0.5 ms)
		C {2,8} +14*n	30 kHz	10 (0.5 ms)

> 6 GHz (FR2)	64	D {4,8,16,20} +28*n	120 kHz	40 (0.125 ms)
		E {8,12,16,20,32,36,40,44} +56*n	240 kHz	80 (62.5 µs)

3 Tap **Sync Raster Offset** to set the sync raster resolution to 180 kHz (FR1) or to 720 kHz (FR2) for carrier frequency center using the on-screen keyboard.
The following table shows the sync raster offset range per SSB SCS and sync raster resolution.

SSB SCS (kHz)	Sync Raster Resolution (kHz)	Sync Raster Offset Range	SSB Frequency = Carrier Frequency
15	180	0 to 250	125
30	180	0 to 506	253
120	720	0 to 92	46
240	720	0 to 48	24

4 Tap **L** to set the maximum number of SS-PBCH blocks within a single SS burst set (A set of SS being transmitted in 5 ms window of SS transmission) among **4**, **8** and **64**.
Refer to the selection criteria based on the table in **Step 2**.

5 Tap the **SSB Periodicity** and select the options from **5 ms**, **10 ms**, **20 ms**, **40 ms**, **80 ms**, or **160 ms**.
The SS burst period (SSB periodicity) is defined by each base station and network configurable. 20 ms is the default for the initial cell selection.

6 Tap to switch **SSB Auto Search** to **Stop** to set the SSB periodicity based on the base station or to **Start** to search SCS, type, and the number of SSB automatically.
Once **Start** is selected, the progress bar appears. If it fails to perform the auto search, a fail message appears and the SSB switches to Manual.

7 Tap to switch **PCI** (**Physical Cell ID**) to **Manual** or **Auto**.

8 Tap **PCI** and input a value from 0 to 1007 using the on-screen keyboard.
The **PCI** switches to **Manual**.

Setting center frequency table

1 Tap **Configuration** ( ) to set **Center Frequency** for each carrier from 1 to 8 under the chart screen.

2 If you select the carrier number and switch it to **On**, the carrier scanner table appears with the selected carrier number highlighted purple.

3 Tap **Center Frequency** and input the desired value using the on-screen keyboard.

4 Tap **Channel Standard** and select and apply the desired channel.

5 Tap **Channel Number** and input the desired value using the on-screen keyboard.

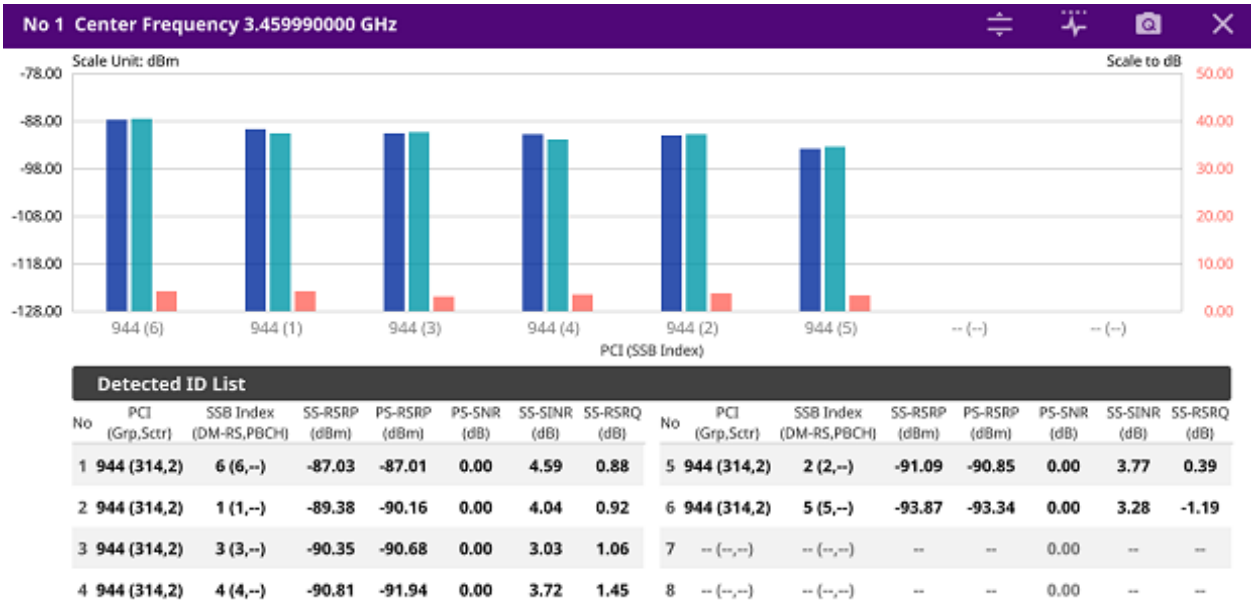
6 Tap **X** button to close the center frequency setup table.

7 Tap the **Search** icon of the selected carrier in the carrier scanner table to set the limit. This enables you to check the beam information without changing the measurement mode to Beam Analyzer. The beam information pops up for the selected carrier.

   a Select the **Limit** ( ) icon to set **SS-RSRP Line** and **SS-SINR Line** to **On** or **Off**. When selecting on, set the limit using the on-screen keyboard.
   You can also set limits moving the SS-RSRP Line Limit (default: blue) bar on the left edge and SS-SINR Line Limit (default: orange) bar on the right edge. If the setting value is smaller than the limit, the line bar color and the result text color of the table become red.

   b Select the **Quick Save** ( ) icon to capture the current screen.

   c Select the **Close** ( ) icon to close the Beam Information window.

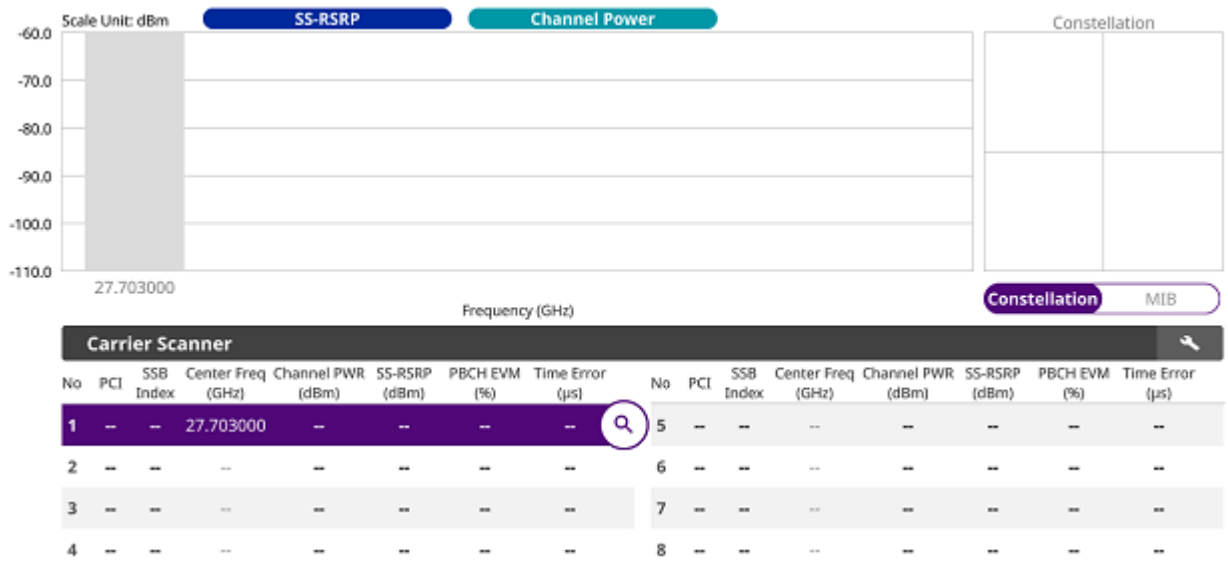


Setting the sweep speed

1 Tap **Menu** > **Sweep**.

2 Tap **Sweep Speed** and choose between **Fast** and **Normal**.

Carrier scanner measurement



NOTE:

You cannot save the measurement as a Result or Result as CSV.

Route map

5G route map traces the power level of the strongest beam corresponding a particular time and geographical position and presents it in a geographical map as a measurement point. All the collected measurements can be exported for post-processing purposes, including data of the eight strongest beams for each measurement point, including its measurement time and geographical location.

Loading a map

To use any features related to maps, you need to download and install the maps on the CellAdvisor 5G. The VIAVI JDMapCreator will help you download maps. Make sure the JDMapCreator application on your computer is connected to the instrument via LAN. You can send a map file with a single layer to the instrument directly by using the **Send to EQP** menu in JDMapCreator. For more information on how to use the JDMapCreator, see the *JDMapCreator 2.0 User Guide*.

1. Plug in your USB flash drive that has a map file in `.mcf` file type created in JDMapCreator.
2. Tap the **Load** icon( ) on the side bar.
3. Navigate the map file you want to open.
   The File Information pane displays the file properties including its name, size, type and date modified.
4. Tap the **Load** button on the screen.

Once you load the map, you can also control the map using the following icons on the map. (The left-most Cellsite icon is activated when you import the cellsite information file. Refer to below **Importing cellsite DB**.)

Icon	Description
	Tap to go to your current location on the map. Once tapped, the purple icon appears on the map indicating your current location.
	Tap to switch to the full screen map view.
	Tap to zoom in the map.
	Tap to zoom out the map.
	Tap and select the area where you want to expand.

Setting measure setup

Before starting the Route Map measurement, you need to set Spectrum measurements displayed on the quick access and display tab. See "Configuring Spectrum Measurements" for more details.

1 If required, connect a GPS receiver to your CellAdvisor 5G for outdoor mapping. Indoor mapping does not necessarily need a GPS antenna.

2 Tap the **Setup** ( ) icon on the side bar.

3 Tap **Map Config** to switch the **Plot Point** to **GPS** or **Position** or **Time**.

   a To collect data/plot points automatically as you move around in a vehicle or outside (outdoor), select **GPS** and then tap to switch to the **Screen Mode** between **Map** and **Full**.
   With the **Map** setting, you can view only the collected points that can be seen within the boundary of the loaded map. With the **Full** setting, you can view all the collected points of the route without the loaded map.

   b To collect data/plot points manually in indoor layout without a GPS antenna, select **Position**.(If you tap the **Start** button ( ) on the right panel of the map, the Undo icon appears).

4 Tap to switch **Plot Item** to **SS-RSRQ**, **SS-SINR**, **SS-RSRP** or **PS-RSRP**.

5 Tap **Bandwidth/SSB SCS** and select the Setting in the pop-up window based on your need. SSB is abbreviation for Synchronization Signal Block or SS Block and it actually refers to Synchronization PBCH block since the synchronization signal and PBCH channel are packed as a single block that

always moves together. SSB should be detected first in 5G NR frame.
The following table shows the setting criteria based on the operating frequency.

Operating Frequency	L	Case	SCS	Slots in a burst period (slot duration)
< 3 GHz (FR1)	4	A {2,8} +14*n	15 kHz	5 (1 ms)
		B {4,8,16,20} +28*n	30 kHz	10 (0.5 ms)
		C {2,8} +14*n	30 kHz	10 (0.5 ms)
3 to 6 GHz (FR1)	8	A {2,8} +14*n	15 kHz	5 (1 ms)
		B {4,8,16,20} +28*n	30 kHz	10 (0.5 ms)
		C {2,8} +14*n	30 kHz	10 (0.5 ms)
> 6 GHz (FR2)	64	D {4,8,16,20} +28*n	120 kHz	40 (0.125 ms)
		E {8,12,16,20,32,36,40,44} +56*n	240 kHz	80 (62.5 µs)

6 Tap **Sync Raster Offset** to set the sync raster resolution to 180 kHz (FR1) or to 720 kHz (FR2) for carrier frequency center using the on-screen keyboard.
The following table shows the sync raster offset range per SSB SCS and sync raster resolution

SSB SCS (kHz)	Sync Raster Resolution (kHz)	Sync Raster Offset Range	SSB Frequency = Carrier Frequency
15	180	0 to 250	125
30	180	0 to 506	253
120	720	0 to 92	46

240	720	0 to 48	24

7 Tap **L** to set the maximum number of SS-PBCH blocks within a single SS burst set (A set of SS being transmitted in 5 ms window of SS transmission) among **4**, **8** and **64**.
Refer to the selection criteria based on the table in **Step 5**.

8 Tap the **SSB Periodicity** and select the options from **5 ms**, **10 ms**, **20 ms**, **40 ms**, **80 ms** ,or **160 ms**.
The SS burst period (SSB periodicity) is defined by each base station and network configurable. 20 ms is the default for the initial cell selection.

9 Tap to switch **SSB Auto Search** to **Stop** to set the SSB periodicity based on the base station or to **Start** to search SCS, type, and the number of SSB automatically.
Once **Start** is selected, the progress bar appears. If it fails to perform the auto search, a fail message appears and the SSB switches to Manual.

10 Tap to switch **PCI** (**Physical Cell ID**) to **Manual** or **Auto**.

11 Tap **PCI** and input a value from 0 to 1007 using the on-screen keyboard.
The **PCI** switches to **Manual**.

NOTE:

The instrument does not automatically save the collected data. It is recommended that you save the result. Otherwise, you will lose all the collected data.

Logging data

1 Follow the **step 1 to 3** in Setting measure setup.

2 Tap the **Start** button ( ) on the right panel of the map to start plotting on the map.
When you select a point on the map, a marker appears and the Information window appears on the right panel.

3 Tap the **Stop** ( ) button to stop plotting.

4 Tap the **Pause** button ( ) to pause plotting, then the **Pause** button changes to ( ) and GPS point cannot be plotted.

5 If you start test and select **Setup** > **Map Config** > **Plot Point** > **position**, you can undo by tapping the **Start** button.

6 If you select **Stop** button, **Plot Stop** popup window appears.

7 Save the logging file to your USB.

Viewing the logging data

1 Load the saved logging file using the **Load** icon( ) on the side bar. Make sure the file extension is `. gomv`.

2 If the PCI is set to Auto, the point on the map appears with a color representing the largest **SS-RSRP** value.
When you select a point on the map, a marker appears and the Information window appears on the right panel.

3 Set the **PCI** to **Manual** and tap the **Select** button.
The Select PCI window appears.

4 Select **PCI** on the left and then the corresponding Beam Index appeared on the right.

5 Tap the **Apply** button.
The point color of the map changes to the corresponding SS-RSRP value, and if there is no detected Beam Index, the point will be hidden.

Setting the sweep speed

1 Tap **Menu** > **Sweep**.

2 Tap **Sweep Speed** and you can choose between **Fast** and **Normal**.

Setting limit

You can set the thresholds for the two different color indicators. The maximum value is the Limit for Excellent, and the minimum value is the Limit for Poor. See below to check the plot point color based on the Legend Color Table.

Red	Green	Blue	Color	
0	0	255		Poor
0	32	255		
0	64	255		
0	128	255		
0	255	255		
0	255	170		
0	255	85		
0	255	0		
85	255	0		
170	255	0		
255	255	0		
255	128	0		
255	64	0		
255	32	0		
255	0	0		Excellent

1 Tap **Menu** > **Limit**.

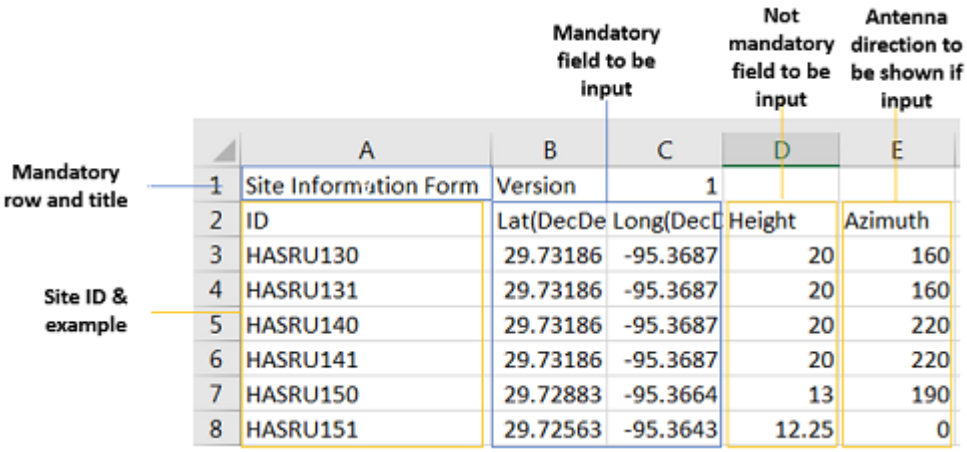
2 Tap **Excellent** and set a value using the on-screen keyboard.

3 Tap **Poor** and set a value using the on-screen keyboard.

Importing cellsite DB

You can import the site DB by creating the 5G site information form.

1 Create the 5G site information with an excel file as below.



	A	B	C	D	E
1	Site Information Form	Version	1		
2	ID	Lat(DecDe	Long(DecD	Height	Azimuth
3	HASRU130	29.73186	-95.3687	20	160
4	HASRU131	29.73186	-95.3687	20	160
5	HASRU140	29.73186	-95.3687	20	220
6	HASRU141	29.73186	-95.3687	20	220
7	HASRU150	29.72883	-95.3664	13	190
8	HASRU151	29.72563	-95.3643	12.25	0

2 Input the two mandatory fields: **Lat (DecDeg)** and **Long (DecDeg)**.

3 Input the **Azimuth** filed if you want to check the direction of antenna.

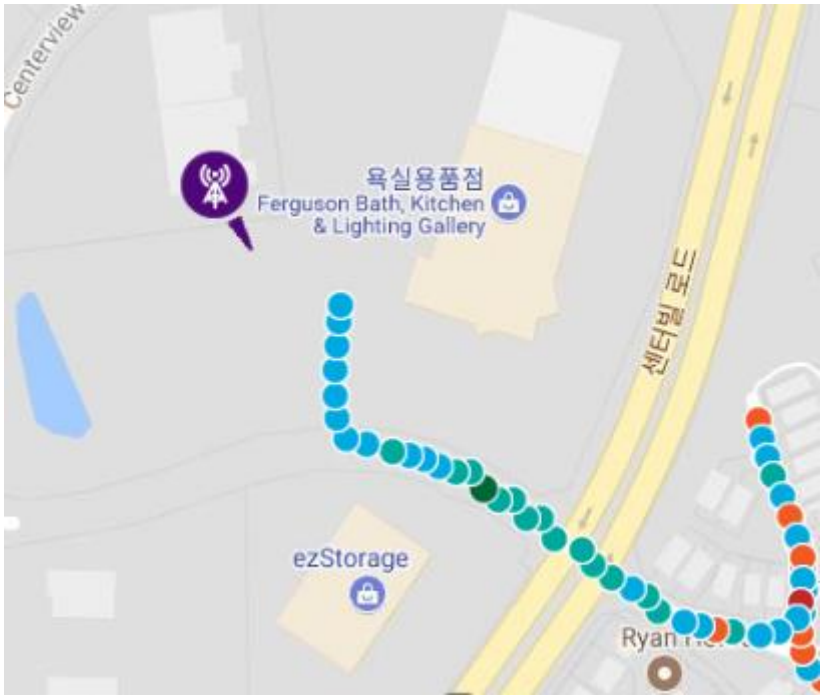
4 Make sure to save the file as (Comma delimited) (*.csv).

5 Copy the file to the USB memory stick and insert it to the **USB A** or **USB B** port of the instrument.

6 Tap the **Load** ( ) hot key on the side bar.

7 Import the saved file.
Once the file is loaded, the following cellsite information appears with an icon.

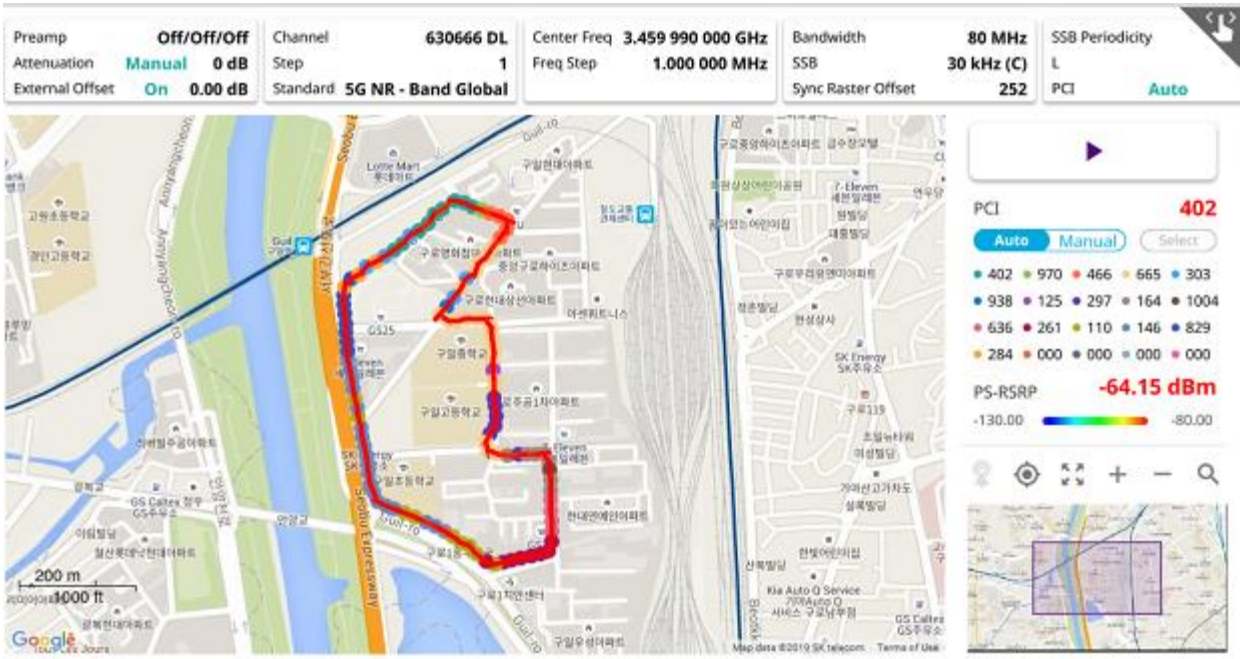
Route map measurement with site information screen



NOTE:

The purple icon indicates the base station (site) location and the direction of antenna. If the site is beyond the latitude and longitude of the map file, it will not show.

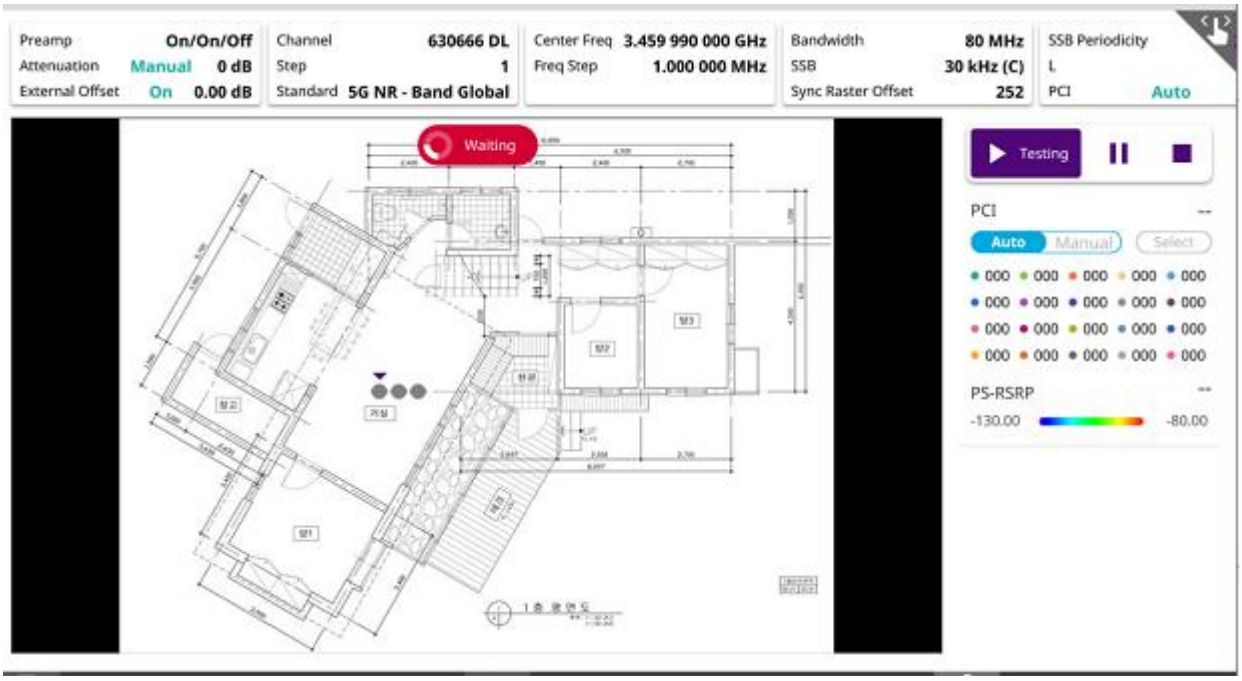
Route map measurement screen with 5G NR Signal Analyzer



NOTE:

20 different PCI colors in small circle and Beam power in line are displayed.

Route map measurement screen (Plot Point to Time) with 5G NR Signal Analyzer



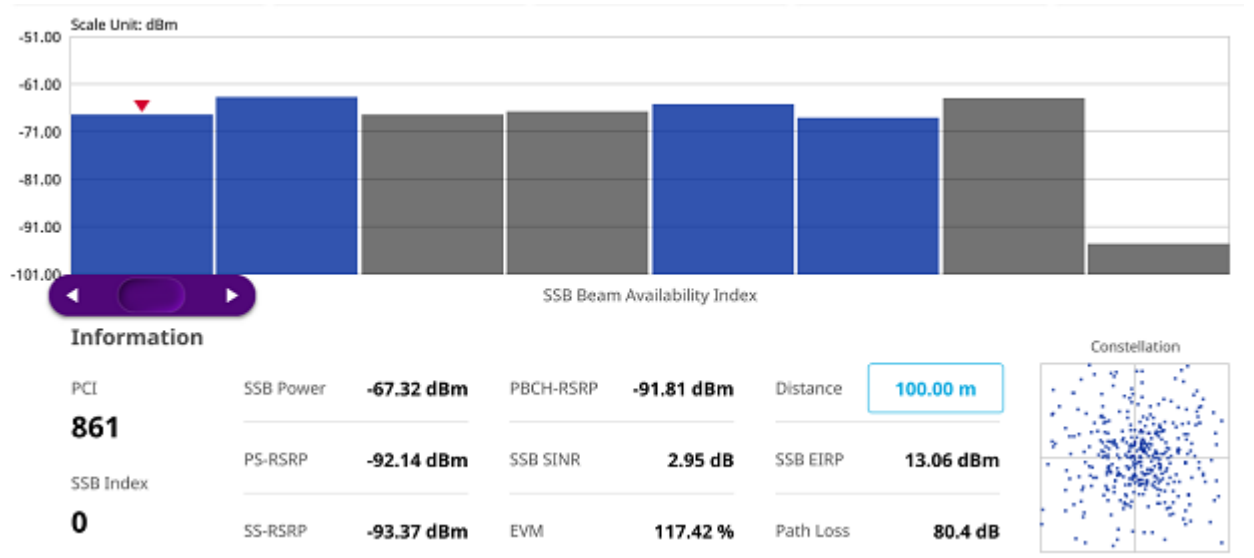
NOTE:

When you setup **Plot Point** to **Time** and tap the **Testing** button, you cannot touch the screen to active. After the waiting indicator(Waiting) stops, the active indicator(00 Data) shows up.

Beam availability index

Beam availability index measurement enables showing the maximum beam resource blocks with its power for each detected PCI. Normally recognized beam color is blue and unrecognized one is gray.

Beam availability index measurement



Conducting modulation measurement

Constellation

The Constellation is used to observe some aspects of modulation accuracy and can reveal certain fault mechanisms such as I/Q amplitude imbalance or quadrature imbalance. It displays constellation diagram by modulation types.

Setting measure setup

After configuring spectrum measurement in "Configuring Spectrum Measurements", you can set the measure setup to continue your measurement. The measurement settings can be saved and recalled as a file by selecting File Type as Setup and load the file onto the instrument using the **Save/Load** icons on the side bar.

1 Tap the **Setup** ( )icon on the side bar.

2 Tap **Bandwidth/SSB SCS** and select the Setting in the pop-up window based on your need. SSB is abbreviation for Synchronization Signal Block or SS Block and it actually refers to Synchronization PBCH block since the synchronization signal and PBCH channel are packed as a single block that always moves together. SSB should be detected first in 5G NR frame.
The following table shows the setting criteria based on the operating frequency.

Operating Frequency	L	Case	SCS	Slots in a burst period (slot duration)

< 3 GHz (FR1)	4	A {2,8} +14*n	15 kHz	5 (1 ms)
		B {4,8,16,20} +28*n	30 kHz	10 (0.5 ms)
		C {2,8} +14*n	30 kHz	10 (0.5 ms)
3 to 6 GHz (FR1)	8	A {2,8} +14*n	15 kHz	5 (1 ms)
		B {4,8,16,20} +28*n	30 kHz	10 (0.5 ms)
		C {2,8} +14*n	30 kHz	10 (0.5 ms)
> 6 GHz (FR2)	64	D {4,8,16,20} +28*n	120 kHz	40 (0.125 ms)
		E {8,12,16,20,32,36,40,44} +56*n	240 kHz	80 (62.5 µs)

3 Tap **Sync Raster Offset** to set the sync raster resolution to 180 kHz (FR1) or to 720 kHz (FR2) for carrier frequency center using the on-screen keyboard.
The following table shows the sync raster offset range per SSB SCS and sync raster resolution.

SSB SCS (kHz)	Sync Raster Resolution (kHz)	Sync Raster Offset Range	SSB Frequency = Carrier Frequency)
15	180	0 to 250	125
30	180	0 to 506	253
120	720	0 to 92	46
240	720	0 to 48	24

4 Tap **L** to set the maximum number of SS-PBCH blocks within a single SS burst set (A set of SS being transmitted in 5 ms window of SS transmission) among **4**, **8** and **64**.
Refer to the selection criteria based on the table in **Step 2**.

5 Tap the **SSB Periodicity** and select the options from **5 ms**, **10 ms**, **20 ms**, **40 ms**, **80 ms**, or **160 ms**. The SS burst period (SSB periodicity) is defined by each base station and network configurable. 20 ms is the default for the initial cell selection.

6 Tap to switch **SSB Auto Search** to **Stop** to set the SSB periodicity based on the base station or to **Start** to search SCS, type, and the number of SSB automatically.
Once **Start** is selected, the progress bar appears. If it fails to perform the auto search, a fail message appears and the SSB switches to Manual.

7 Tap the **Slot Formats** and input the value from 0 to 55 using the on-screen keyboard.
The slot format means how to use one slot between downlink and uplink.

8 Tap to switch **PCI** (**Physical Cell ID**) to **Manual** or **Auto**.

9 Tap **PCI** and input a value from 0 to 1007 using the on-screen keyboard.
The **PCI** switches to **Manual**.

Setting limit

1 Tap **Menu** > **Limit**.

2 Tap the test items and set the limits depending on your selected measurement mode:

To set the limit for	Select	Set
Frequency error	Frequency error	Test limits On/Off, High Limit/Low Limit
Time error	Time error	Test limits On/Off, High Limit/Low Limit
SS-RSRP Power	SS-RSRP Power	Test limits On/Off, High Limit/Low Limit
PDSCH error vector magnitude	PDSCH EVM	Test limits On/Off, High Limit (QPSK), High Limit (16QAM), High Limit (64QAM), High Limit (256QAM)
RMS for data error vector magnitude	Data EVM RMS	Test limits On/Off, High Limit
Peak for data error vector magnitude	Data EVM Peak	Test limits On/Off, High Limit

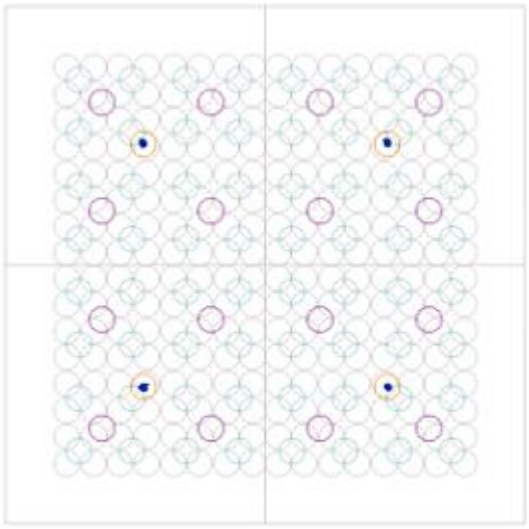
3 *Optional.* Tap the **Save** icon on the side bar and select the save option form the choices available for your measurement mode.

NOTE:

The CellAdvisor 5G currently measures the PDSCH EVM values based on SIB1 contained PDSCH RB. The CellAdvisor 5G performs the 3GPP recommended call protocol connection to get SIB1 RDSCH RB which should have the following pieces of information required for proper measuring support:

- **Pdcch-configSIB1 of MIB (Master Information Block)** determines the common search space of type-0 PDCCH
- **DCI (Downlink Control information) format 1_0** is used to get the information of SIB1 PDSCH RB location
- **SIB1 (System Information Block type 1)**

Constellation measurement with 5G NR Signal Analyzer



SS-RSRP Power	-60.92 dBm	PCI	901
Data SCS	30 kHz	SSB Index	4
		SSB Periodicity	5 ms
PDSCH			
QPSK	0.33 %	64 QAM	--
16 QAM	--	256 QAM	--
Data EVM			
RMS	0.33 % (29.61 %)		
Peak	2.93 % (114.16 %)		
Error			
Frequency	-9604.26 Hz / -9.604 ppm		
Time	--		

Power vs Time

Power vs Time (Symbol)

The Power vs. Time measurement measures the mean transmission power during the useful part of SSB bursts and verifies that the power ramp fits within the defined mask. It also lets you view the rise, fall, and useful part of the SSB burst.

This measurement provides masks for both of Base Transceiver Station (BTS) and Mobile Station (MS).

Setting measure setup

After configuring spectrum measurement in "Configuring Spectrum Measurements", you can set the measure setup to continue your measurement. The measurement settings can be saved and recalled as a file.

1 Tap the **Setup** ( ) icon on the side bar.

2 Tap **Bandwidth/SSB SCS** and select the Setting in the pop-up window based on your need. SSB is abbreviation for Synchronization Signal Block or SS Block and it actually refers to Synchronization PBCH block since the synchronization signal and PBCH channel are packed as a single block that always moves together. SSB should be detected first in 5G NR frame.
The following table shows the setting criteria based on the operating frequency.

Operating Frequency	L	Case	SCS	Slots in a burst period (slot duration)
< 3 GHz (FR1)	4	A {2,8} +14*n	15 kHz	5 (1 ms)
		B {4,8,16,20} +28*n	30 kHz	10 (0.5 ms)
		C {2,8} +14*n	30 kHz	10 (0.5 ms)
3 to 6 GHz (FR1)	8	A {2,8} +14*n	15 kHz	5 (1 ms)
		B {4,8,16,20} +28*n	30 kHz	10 (0.5 ms)
		C {2,8} +14*n	30 kHz	10 (0.5 ms)
> 6 GHz (FR2)	64	D {4,8,16,20} +28*n	120 kHz	40 (0.125 ms)
		E {8,12,16,20,32,36,40,44} +56*n	240 kHz	80 (62.5 µs)

3 Tap **Sync Raster Offset** to set the sync raster resolution to 180 kHz (FR1) or to 720 kHz (FR2) for carrier frequency center using the on-screen keyboard.
The following table shows the sync raster offset range per SSB SCS and sync raster resolution.

SSB SCS (kHz)	Sync Raster Resolution (kHz)	Sync Raster Offset Range	SSB Frequency = Carrier Frequency)
15	180	0 to 250	125
30	180	0 to 506	253
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4 Tap **L** to set the maximum number of SS-PBCH blocks within a single SS burst set (A set of SS being transmitted in 5 ms window of SS transmission) among **4**, **8** and **64**.
Refer to the selection criteria based on the table in **Step 2**.

5 Tap the **SSB Periodicity** and select the options from **5 ms**, **10 ms**, **20 ms**, **40 ms**, **80 ms**, or **160 ms**.
The SS burst period (SSB periodicity) is defined by each base station and network configurable. 20 ms is the default for the initial cell selection.

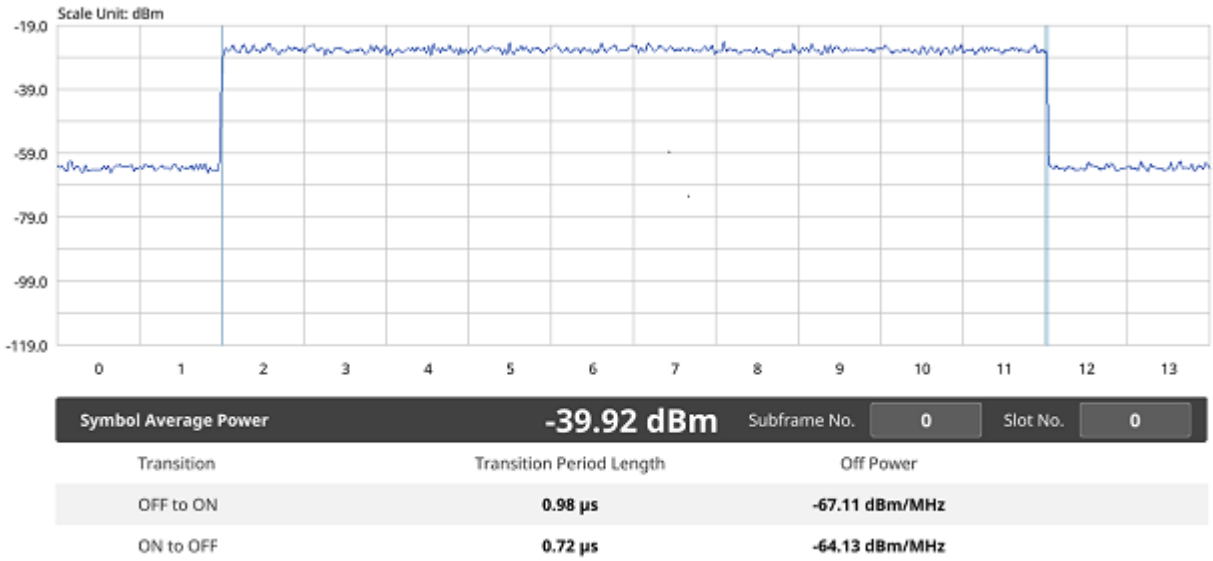
6 Tap to switch **SSB Auto Search** to **Stop** to set the SSB periodicity based on the base station or to **Start** to search SCS, type, and the number of SSB automatically.
Once **Start** is selected, the progress bar appears. If it fails to perform the auto search, a fail message appears and the SSB switches to Manual.

7 Tap the **Slot Formats** and input the value from 0 to 55 using the on-screen keyboard.
The slot format means how to use one slot between downlink and uplink.

8 Tap to switch **PCI** (**Physical Cell ID**) to **Manual** or **Auto**.

9 Tap **PCI** and input a value from 0 to 1007 using the on-screen keyboard.
The **PCI** switches to **Manual**.

Power vs Time (Symbol) measurement with 5G NR



NOTE

You can set the Subframe No. from 0 to 9 and Slot No. between 0 and 1 based on your need using the on-screen keyboard.

NOTE:

You cannot save the measurement as a Result. Logging as CSV option is added. For more details, see Managing files.

Power vs Time (Frame)

The Power vs. Time (Frame) measures the modulation envelope in the time domain, showing the power of each time slot in a NR signal.

Setting measure setup

After configuring spectrum measurement in "Configuring Spectrum Measurements", you can set the measure setup to continue your measurement. The measurement settings can be saved and recalled as a file.

1 Tap the **Setup** ( )icon on the side bar.

2 Tap **Bandwidth/SSB SCS** and select the Setting in the pop-up window based on your need. SSB is abbreviation for Synchronization Signal Block or SS Block and it actually refers to Synchronization PBCH block since the synchronization signal and PBCH channel are packed as a single block that always moves together. SSB should be detected first in 5G NR frame.
The following table shows the setting criteria based on the operating frequency.

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		C {2,8} +14*n	30 kHz	10 (0.5 ms)
3 to 6 GHz (FR1)	8	A {2,8} +14*n	15 kHz	5 (1 ms)
		B {4,8,16,20} +28*n	30 kHz	10 (0.5 ms)
		C {2,8} +14*n	30 kHz	10 (0.5 ms)
> 6 GHz (FR2)	64	D {4,8,16,20} +28*n	120 kHz	40 (0.125 ms)
		E {8,12,16,20,32,36,40,44} +56*n	240 kHz	80 (62.5 µs)

3 Tap **Sync Raster Offset** to set the sync raster resolution to 180 kHz (FR1) or to 720 kHz (FR2) for carrier frequency center using the on-screen keyboard.
The following table shows the sync raster offset range per SSB SCS and sync raster resolution.

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Refer to the selection criteria based on the table in **Step 2**.

5 Tap the **SSB Periodicity** and select the options from **5 ms**, **10 ms**, **20 ms**, **40 ms**, **80 ms**, or **160 ms**.
The SS burst period (SSB periodicity) is defined by each base station and network configurable. 20 ms is the default for the initial cell selection.

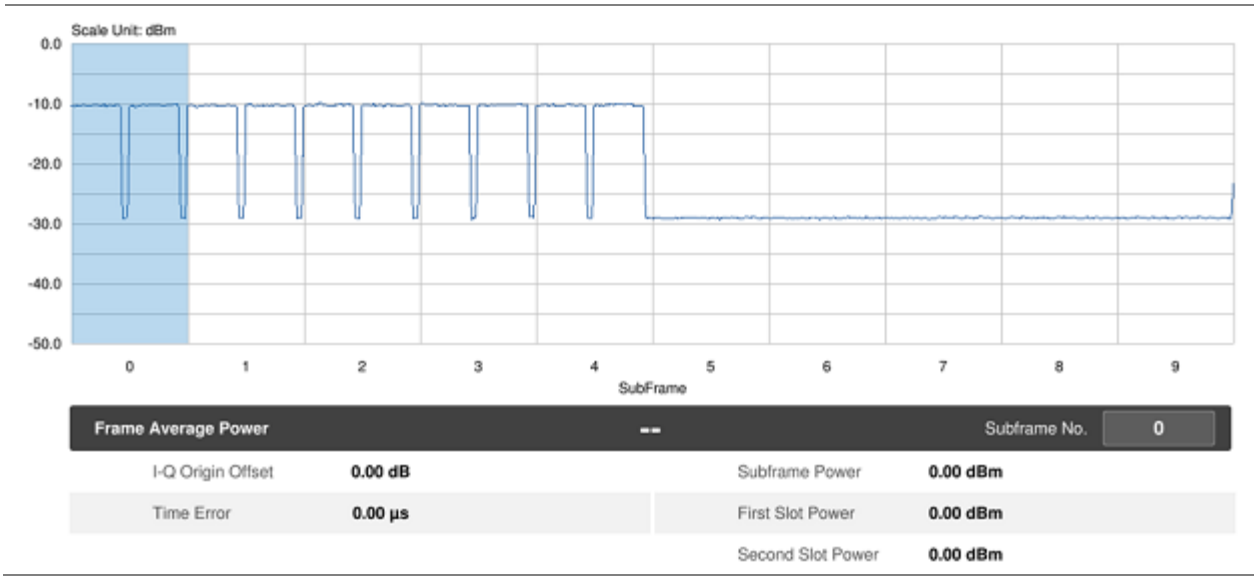
6 Tap to switch **SSB Auto Search** to **Stop** to set the SSB periodicity based on the base station or to **Start** to search SCS, type, and the number of SSB automatically.
Once **Start** is selected, the progress bar appears. If it fails to perform the auto search, a fail message appears and the SSB switches to Manual.

7 Tap the **Slot Formats** and input the value from 0 to 55 using the on-screen keyboard.
The slot format means how to use one slot between downlink and uplink.

8 Tap to switch **PCI** (**Physical Cell ID**) to **Manual** or **Auto**.

9 Tap **PCI** and input a value from 0 to 1007 using the on-screen keyboard.
The **PCI** switches to **Manual**.

Power vs Time (Frame) measurement with 5G NR



NOTE

You can set the Subframe No. from 0 to 9 based on your need using the on-screen keyboard.

NOTE:

You cannot save the measurement as a Result. Logging as CSV option is added. For more details, see Managing files.

Using Power Meter

Introduction

The Power Meter of the CellAdvisor 5G uses power measurement based on spectrum measurement results to provide an accurate power measurement result unlike a general spectrum analyzer, of which power accuracy may be degraded if the span is set too wide.

The power meter also provides Pass/Fail indication with user-defined lower and upper limits.

Display Maximum/Minimum of Amp/Scale can be measured on screen.

- Power Meter
  - Internal RF Power Meter (frequency extended up to 18.5 GHz in addition to existing 24 GHz to 40 GHz)
  - External RF Power Meter

Selecting mode and measure

To start measurement, do the following steps:

1 Tap **Power Meter** on the **MODE** panel.

2 Tap any measurement mode from the following choices:

Power Meter> **Internal RF Power Meter**, or **External RF Power Meter**

Internal RF power meter

The internal power measurement of the CellAdvisor 5G collects powers from the raw data of spectrum analyzer in the optimal span and integrates the powers up to the specified user span, which results in an accurate power measurement, independent of the span setting. The frequency is extended up to 18.5 GHz in addition to existing 24 GHz to 40 GHz. Before starting the Internal RF Power Meter, you need to set Spectrum measurements displayed on the quick access and display tab. See "Configuring Spectrum Measurements" for more details.

Setting measure setup

1 Tap the **Setup** ( ) icon on the side bar.

2 Tap **Resolution** and select the resolution option from the following choices:

- **0**: Displays the reading with no decimal place
- **1**: Displays the reading with one decimal place
- **2**: Displays the reading with no decimal place

3 Tap **RBW** to set the resolution bandwidth and select from the 8 options available.

4 Tap **Accuracy Mode** and select the accuracy mode option: **Low**, **Middle**, or **High**.
Select High when the measurement accuracy is high comparing to speed and select Low when the measurement accuracy is low comparing to speed.

5 Tap **Average** to specify the number of measurements to be averaged from 1 to 100 using the on-screen keyboard.

6 Tap **Menu** > **Amp/Scale** > **Reference Type** to set **Relative**, then the **Set Reference** shows up on chart.

7 Tap to switch the **Limit** to **On** or **Off** to enable or disable the Pass/Fail Indication on bottom of result screen.

a Tap the value box next to **High** to set a threshold value using the on-screen keyboard.

b Tap the value box next to **Low** to set a threshold value using the on-screen keyboard.

Internal RF power measurement

NOTE:

You cannot select the Detector Mode in the RF power measurement.

External RF power meter

This instrument performs radio output power measurement with the use of optional external power sensors including JD730 series power sensors. It serves as the highly accurate RF power meter and gives wider range of power measurement. Before starting the External RF Power Meter, you need to set Spectrum measurements displayed on the quick access and display tab. See "Configuring Spectrum Measurements" for more details.

Connecting a cable

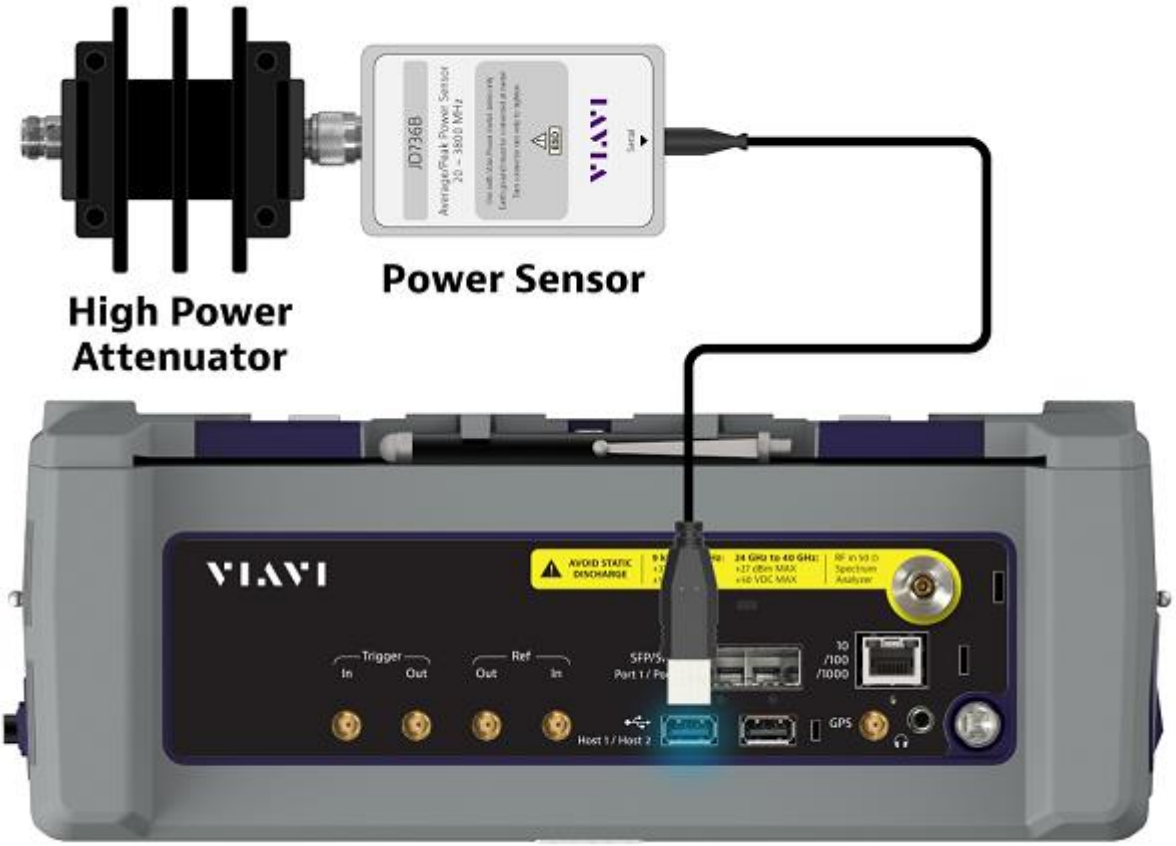
There are two types of power sensors. Directional power sensors are used in in-service power measurement. Terminating power sensors are used in out-of-service power measurement. See below to check the external power sensor type.

Part Number	Description	Frequency Range	Power Range
JD731B	Directional Power Sensor	300-3800 MHz	Average: +21.76 to +51.76 dBm (0.15 to 150 W), Peak: +36.02 to +56.02 dBm (4 to 400 W)
JD732B	Terminating Power Sensor	20-3800 MHz	Average: -30 to +20 dBm
JD733A	Directional Power Sensor	150-3500 MHz	Average/Peak: +20 to +47 dBm (0.1 to 50 W)
JD734B	Terminating Power Sensor	20-3800 MHz	Peak: -30 to +20 dBm
JD736B	Terminating Power Sensor	20-3800 MHz	Average/Peak: -30 to +20 dBm

Terminating power sensor connection

1 Connect an external power sensor to the **USB Host** port of the CellAdvisor 5G and to the RF output port of BTS.
The CellAdvisor 5G automatically detects and initializes the power sensor connected to the instrument. Connecting an external power sensor is mandatory.

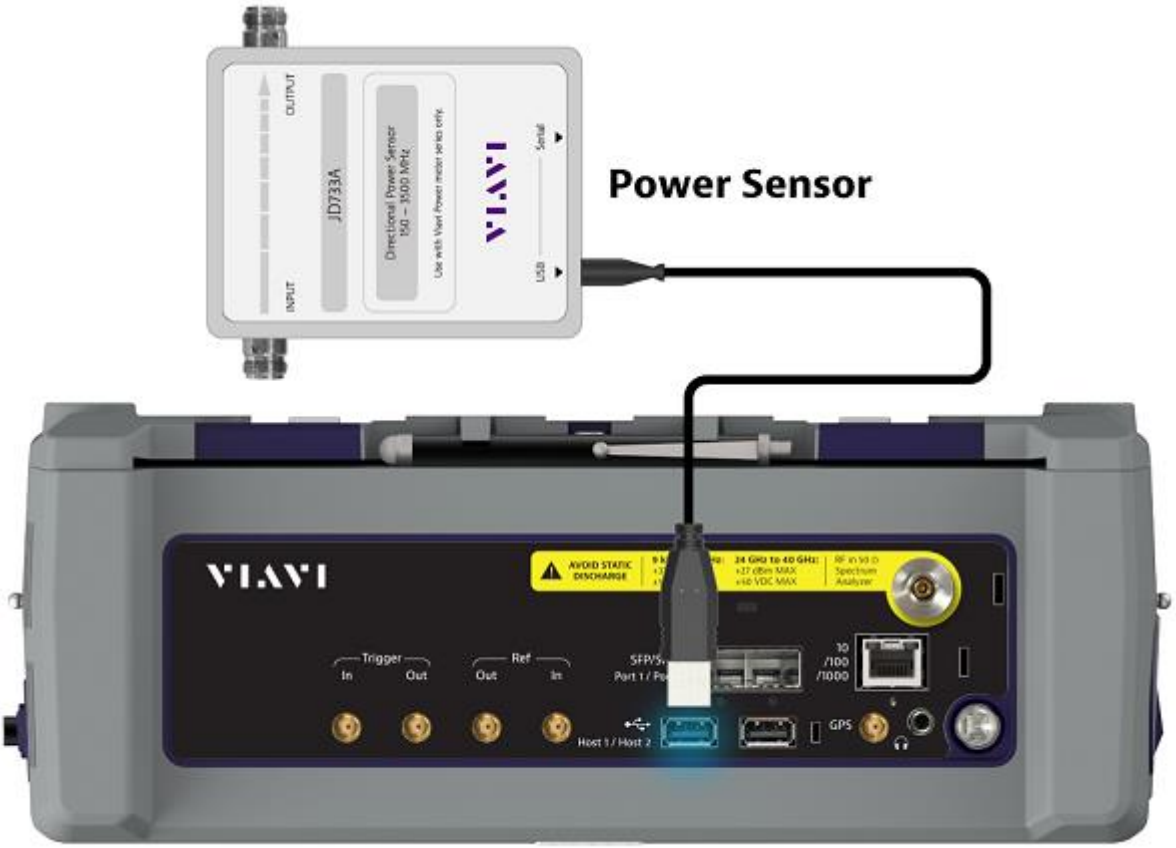
Terminating power sensor connection



Directional power sensor connection

1 Connect an external power sensor to the **USB Host** port of the CellAdvisor 5G and to the RF output port of BTS as shown in the below figure.
The CellAdvisor 5G automatically detects and initializes the power sensor connected to the instrument. Connecting an external power sensor is mandatory.

Directional power sensor connection



Making a measurement

1 Depending your connected power sensor, check the Detector Mode from the one of the following:

- For JD736B, select the power range option: **Average Power**, **Peak Power**, or **Pulse Power**.
- For JD734B, select **Peak Power**.
- For JD732B, select **Average Power**.
- For JD731B, select the power range option: **Forward Avg Power**, **Reverse Avg Power**, **Forward Peak Power**, **Pulse Power**, or **VSWR**.
- For JD733A, select the power range option: **Forward Avg Power**, **Reverse Avg Power**, **Forward Peak Power**, or **VSWR**.

2 Tap the **Setup** ( ) icon on the side bar.

3 Tap **Resolution** and select the resolution option from the following choices:

- **0**: Displays the reading with no decimal place
- **1**: Displays the reading with one decimal place

- **2**: Displays the reading with no decimal place

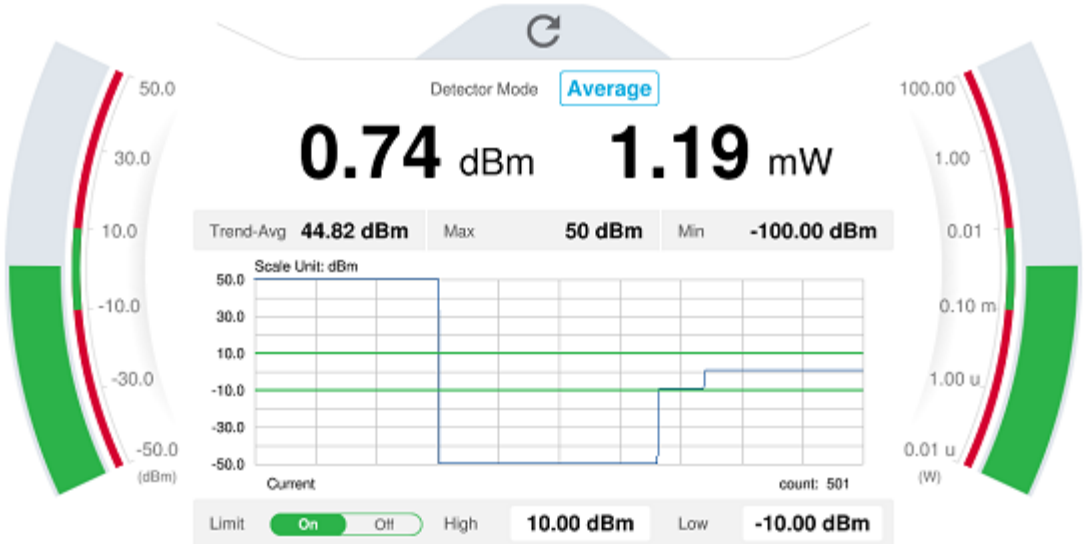
4 Tap to switch the **Limit** to **On** or **Off** to enable or disable the Pass/Fail Indication on bottom of result screen.

a Tap the value box next to **High** to set a threshold value using the on-screen keyboard.

b Tap the value box next to **Low** to set a threshold value using the on-screen keyboard.

External RF power measurement

You can measure and understand a trend of a system output in operation where output power constantly varies depending on the amount of calls being processed by the BTS or Repeater. In addition, the Log graph benefits you to easily examine the discontinuance of output power caused by the transmission problems or defective connection.



Using RFoCPRI Analyzer

Introduction

Cell sites today have a distributed architecture of the radio that consists of the radio equipment control (REC) or base band unit (BBU) installed at the bottom of the tower and the radio equipment (RE) or remote radio head (RRH) installed at the top of the tower. These two elements communicate with each other via the Common Public Radio Interference (CPRI) protocol over fiber links.

This distributed architecture provides the benefit of replacing coax-based feeders with fiber- based feeders, significantly reducing the problems of signal loss and reflections. However, since all the RF interfaces reside on the RRH, any RF maintenance or troubleshooting requires climbing to the top of the tower to access the RRH, increasing operational cost and unnecessary safety issues.

CellAdvisor 5G provides the option of RFoCPRI that allows you to perform RF maintenance and troubleshooting activities on the ground via the fiber interfaces at the BBU, significantly reducing maintenance time and operational expenses. Thanks to the RFoCPRI technology, you can verify the CPRI control signals and extracts the IQ data transmitted between the BBU and RRH to monitor and analyze the uplink interferences and the downlink signals.

You can also monitor current and history CPRI alarm status for LOS and LOF displayed on the interference measurement screen.

The RFoCPRI testing provides following measurements:

- Spectrum Analysis
  - Spectrum
  - Spectrogram
  - Spectrum Replayer

Selecting mode and measure

To start measurement, do the following steps:

1 Tap **RFoCPRI** on the **MODE** panel.

2 Tap any measurement mode from the following choices:

Spectrum Analysis> **Spectrum, Spectrogram** or **Spectrum Replayer**

NOTE:

You can choose **RF Source On** or **Off** in Setup menu after tap to **CAA RF Power On** if you have **RF Source** option in your CAA(Cable and Antenna Analyzer).

Connecting cables

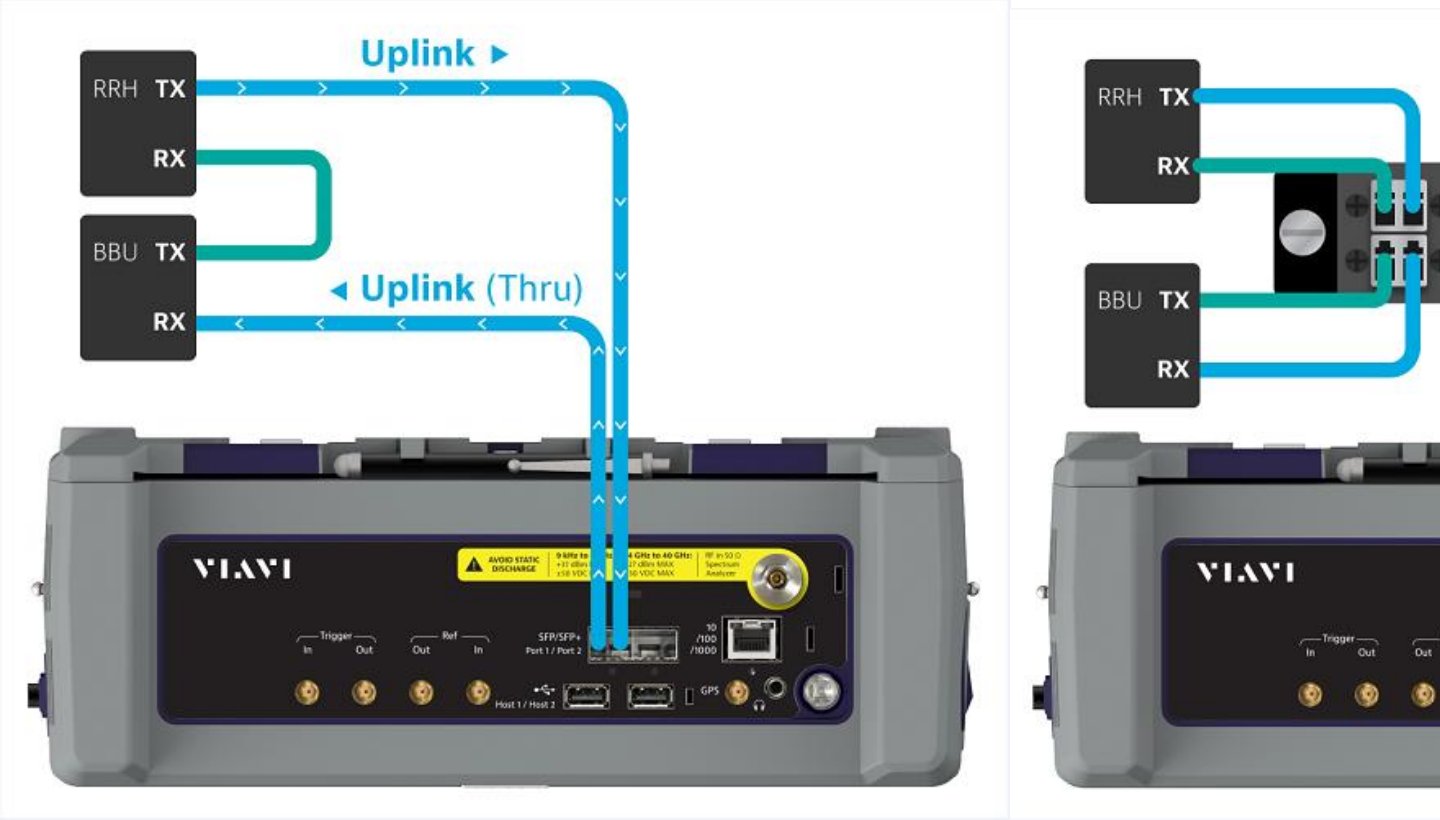
You can connect cables with a tap or without a tap as illustrated below. If you have connected cables directly from RRH and BBU without using the nTap, you must turn on the through mode (Thru) in the CPRI parameter settings.

A SFP/SFP+ transceiver that is connected to your CellAdvisor 5G must be compatible with your DUT and you must have your module information such as line rate, wavelength, and mode (MM or SM) handy.

Connection diagram for interference analysis

Without nTap (both Thru On/Off)

With nTap (Thru On only)



Selecting port

CellAdvisor 5G supports two antenna ports for signal transmission, and each port can generate up to four different waveforms selectively and simultaneously. User can select the port to use for the measurement in any measurement modes of RFoCPRI mode.

1 Tap the **Setup (** **)** icon on the side bar of each measurement mode and choose **Rx Settings** or **Port Configuration**.

2 Select **Port 1** or **Port 2** in **Select Port** line.

Configuring test parameters

Configuration of test parameters described in this section is used in the RFoCPRI mode including spectrum, spectrogram and spectrum replayer measurements.

Setting frequency

You can set the frequency with either frequency or channel number. If a frequency to be set matches to the frequency corresponding to the selected channel standard, the instrument calculates its channel number and updates the screen with it automatically.

To set the frequency with center frequency:

1 Tap **Frequency** under **Menu** ( ).

2 Tap **Center Frequency** and enter a value by using the on-screen keyboard.

3 Select a unit from **GHz, MHz, kHz**, or **Hz** and tap **Apply**.

To set the frequency with channel number:

1 Tap **Channel** under **Menu** ( ).

2 To select the standard channel:

   a Tap **Channel Standard**, then the standard channel window appears.

   b Tap the band to be measured.

3 Tap **Link** between **Uplink** and **Downlink**.

4 Tap **Channel Number**,

5 Enter a value by using the on-screen keyboard and tap **Apply**.
The CellAdvisor 5G automatically displays the corresponding center frequency value for the selected channel number.

Setting reference level

You can set the reference level automatically or manually to optimize the display of the traces measured, as you desire.

To automatically set the reference level:

1 Tap **Amp/Scale** under **Menu** ( ).

2 Tap **Auto Scale**.
Each time you tap, the Y-axis scale changes to be optimized with some margin.

To set the reference level manually:

1 Tap **Amp/Scale** under **Menu** ( ).

2 To set the maximum reference value on the Y-axis manually:

   a Tap **Reference Level**

b Enter a value by using the on-screen keyboard and tap **Apply**.

Optional. **To change the scale unit:**

1 Select **Scale Unit** under **Amp/Scale**.

2 Select the unit of the display scale from: **dBm**, **dBV**, **dBmV**, **dBµV**, **V**, or **W**.
The scale unit on the screen changes accordingly.

Setting scale per division

You can use the **Scale Division** feature to change the scale per division, representing the value of one division on the horizontal scale. The default setting is 10 dB per division and the maximum value can be set up to 20 dB.

1 Tap **Scale Division** under **Amp/Scale**.

2 Enter a value between 1 and 20 by using the on-screen keyboard and tap **Apply**.

Setting external offset

You can turn the **External Offset** on and manually set the external offset value. An offset consists of a cable loss and a user offset, and the measurement result shows the value reflecting both offset values. When the external offset value is set at 40 dB, the measurement result compensates 40 dB.

1 Tap **External Offset Mode** to **On** under **Amp/Scale**.

2 Tap **External Offset**

3 Enter a value by using the on-screen keyboard and tap **Apply**.

4 To turn the external offset off, tap **External Offset Mode** to **Off**.

Enabling Auto leveling

It is normal that you see higher level of RSSI in CPRI spectrum than you have seen in RF spectrum because the digital signal has a different gain level from RF's. If you use the Auto Leveling feature and enter the Noise Figure (NF) for the system to be tested, the instrument calculates an offset that compensates the digital gain of RRH and applies it to the spectrum automatically to displace the level of spectrum to a known RSSI power even though its accuracy cannot be guaranteed. Offset calculation for Auto Leveling is based on the following:

Auto Level offset = (Noise Floor of RFoCPRI) – (Ideal Noise Floor of RRH), where (Idea Noise Floor) = N.F (RRH) + Thermal Noise + 10log (RBW)

1 Tap **Auto leveling** under **Amp/Scale**.
A calculated level of offset without NF is applied as the external offset and the user input field is activated for entry of the noise figure value.

2 Enter a noise figure value by using the on-screen keyboard.

3 Tap **Apply** to complete the entry.
New external offset value appears in the **External Offset** menu box.

4 Tap **External Offset** to **Off**, then **Auto Leveling** will be **Off**.

	NOTE: Having the noise figure factored in the offset calculation for Auto Leveling will enable you to view the CPRI spectrum closer to what you can view in the RF spectrum, but if you do not know the noise figure, you can skip this noise figure setting.

Setting RBW

You can set the RBW and VBW in the Spectrum, Spectrogram modes. The RBW range is limited as per the bandwidth of the signal under test.

1 Tap **BW/AVG** under **Menu (** **)**.

2 Tap **RBW** to set the resolution bandwidth.

3 Choose one of the following options: **100 kHz**, **30 kHz**, **10 kHz** or **7.5 kHz**.

- For signal bandwidths 1.4 MHz and 3 MHz: RBW from 1 kHz to 30 kHz
- For signal bandwidths 5 MHz, 10 MHz, 15 MHz, and 20 MHz: RBW from 1 kHz to 100 kHz

4 Tap **VBW** to set the video bandwidth and choose one of the following options: **100 kHz**, **30 kHz**, **10 kHz** or **7.5 kHz**.

Setting average

You can set the number of measurements to be averaged for the trace presentation in the Spectrum, Spectrogram modes. A maximum of 100 times of averaging can be set. When the averaging reaches your setting, a new measurement value replaces the measurement value in sequence from the earliest.

1 Tap **BW/AVG** under **Menu (** **)**.

2 Tap **Average** and enter a value between 1 and 100 as needed by using the on-screen keyboard.

Setting sweep mode

In the RFoCPRI Spectrum and Spectrogram measure modes, different sweep settings are available for better measurement including the sweep run mode (**Single**, **Continue**).

1 Tap **Sweep** under **Menu (** **)**.

2 Select the desired sweep run mode by tapping the **Sweep Mode** between **Single** and **Continue**

- **Single**: In this mode, the instrument performs a single sweep and waits for further entries.
- **Continue** (default): In this mode, the instrument is continuously measuring and updating result.

3 *Optional*. In the Single mode, tap **Sweep Once** to get a new measurement.

Setting trace

You can display up to six traces on the measurement chart simultaneously.

1 Tap **Trace** under **Menu (** **)**.

2 Tap **Select Trace** and select the trace number: **Trace 1**, **Trace 2**, **Trace 3**, **Trace 4**, **Trace 5**, or **Trace 6**.

3 Complete one of the followings by tapping **Trace Type**:

- **Clear Write**: Clear current data and display with new measurements
- **Max** : Display the input signal's maximum response only (unlimited or for a certain amount of time)
- **Min** : Display the input signal's minimum response only (unlimited or for a certain amount of time)
- **Capture**: Capture the selected trace and compare traces
- **Load**: Load a saved trace
- **Trace View** to **Off**: Hide the displayed trace
- **Trace Set Max/Min** : To set Trace 1, Trace 2, and Trace 3 to Clear Write, Max, and Min (only available in spectrum mode)

4 To **r**emove all the traces and initialize the trace settings, tap **Trace Clear All**.

NOTE:

For the **Max** and **Min**, your instrument compares newly acquired data with the active trace and displays larger maximum values or smaller minimum values on the screen.

5 To select the detection option, tap **Detectors**, and then complete one of the followings:

- Select **Normal** to display **'**Random noise better than the peak without missing signals'
- Select **Peak** to display 'The highest value in each data point'
- Select **RMS** to display 'The root mean squared average power across the spectrum'
- Select **Negative Peak** to display 'The lowest value in each data point'
- Select **Sample** to display 'The center value in each data point'

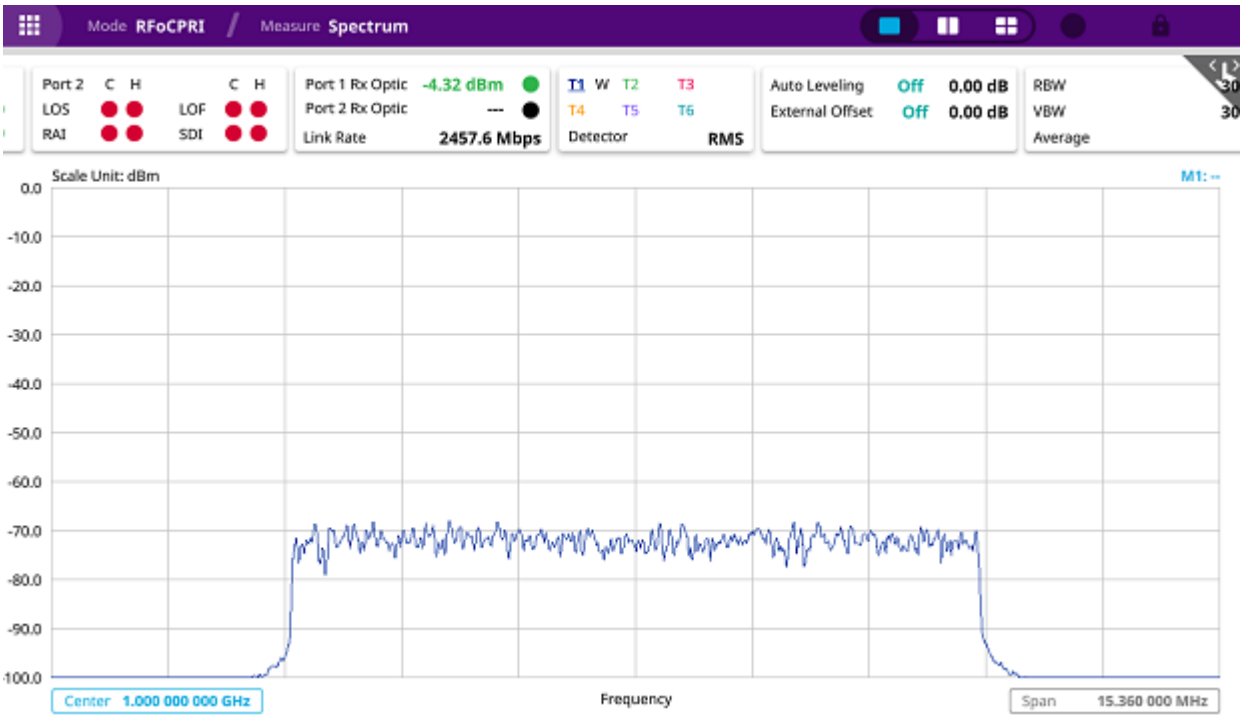
6 *Optional.* **Select Trace Info**, and then select the trace number to view the trace's parameter setting information stored at the time of the measurement or **None** to hide the information display.

7 *Optional.* If you have the two traces Trace 1 and Trace 2, you can perform trace math. To view the power difference between the traces, tap **T1 – T2 -> T5** or **T2 – T1 -> T6**. The result is overlaid on the screen along with the second Y-axis.

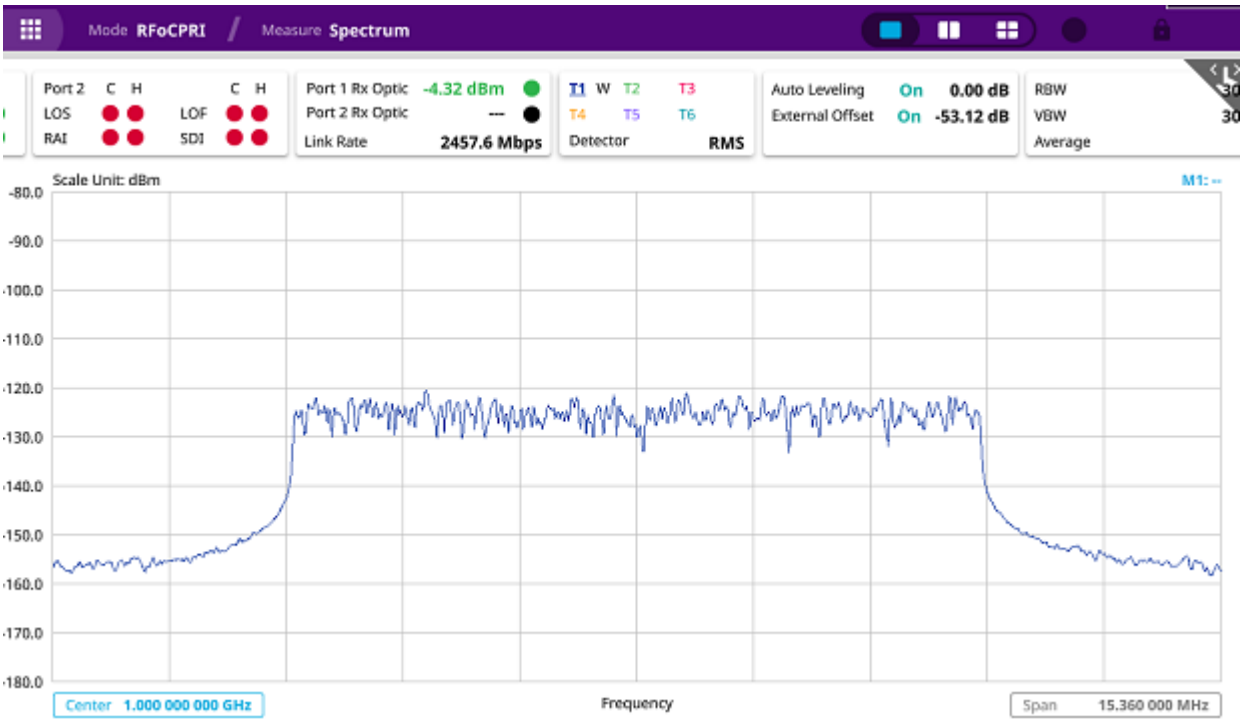
NOTE:

To be able to load a trace, the trace to be overlaid must be saved in the same measurement mode and frequency setting as the current measurement.

Before enabling Auto Leveling



After enabling Auto Leveling



Selecting network technology

Before you start performing the interference analysis, you need to choose a network technology to analyze.

1 Tap the **Setup** ( ) icon on the side bar of each measurement mode.

2 Tap **Rx Settings > Technology** and select a desired network technology form the menu bar: **LTE** (default), **WCDMA**.

Depending on the network technology you selected, the settings on the Rx Parameter menu change accordingly.

Configuring Rx parameters

Because each network technology requires different Rx parameter settings, you need to configure the Rx parameters for the network technology you selected.

To configure Rx parameters for LTE, WCDMA:

1 Tap the **Setup** ( )icon on the side bar of each measurement mode.

2 Tap **Rx Settings**.

3 To set the antenna per carrier group, tap one of the **Map Position (AxC 0 to AxC 7) box** and enter a value by using the on-screen keyboard.

NOTE:

Maximum number of the AxC Group is determined by the factors of link rate, sample width, oversampling, and signal bandwidth.

4 To set the I and Q sample widths, tap **IQ Sample Width** and enter a value between 4 and 20 by using the on-screen keyboard.

NOTE:

According to the CPRI specification, the IQ sample width shall be between 4 and 20 bits for I and Q in the uplink and between 8 and 20 bits in the downlink.

5 To set the stuffing bit, tap **Stuffing Bit** and enter a value between 0 and 20 by using the on-screen keyboard.

6 To set the first bit position of each AxC Container in the IQ data block of a basic frame, complete the following steps:

a Tap **Map Position**.

b Select the AxC Container number you want to set from: **AxC 0**, **AxC 1**, **AxC 2**, **AxC 3**, **AxC 4**, **AxC 5**, **AxC 6**, or **AxC 7**. Not all of these are activated depending on the bandwidth setting of the network technology you selected.

c Enter a value by using the on-screen keyboard.

NOTE:

The Antenna-Carrier (AxC) is the amount of digital baseband (IQ) U-plane data necessary for either reception or transmission of one carrier at one independent antenna element. The number of required AxC Container for a basic frame are two AxCs for 5 MHz, four AxCs for 10 MHz, and eight AxCs for 20 MHz.

7 To set the bandwidth of the downlink signal, complete the following steps:

a Tap **Bandwidth**.

b Select the bandwidth among **3 MHz**, **5 MHz**, **10 MHz (3 AxC)**, **10 MHz (4 AxC)**, **15 MHz (4 AxC)**, **15 MHz (5 AxC)**, **15 MHz (6 AxC)**, **20 MHz (5 AxC)**, or **20 MHz (6 AxC)**, **20 MHz (7 AxC)**, **20 MHz (8 AxC)**. The RBW range changes depending on the bandwidth you selected. Required number of AxC containers may vary depending on the bandwidth you selected.

8 To use the pre-configured settings for NEM, select an **NEM** among **None** (no pre-configuration), **Alcatel-Lucent (UL/DL)**, **Samsung (UL/DL)**, **Huawei > Huawei (UL)** or **Huawei (DL)** and **ZTE (UL/DL)**.

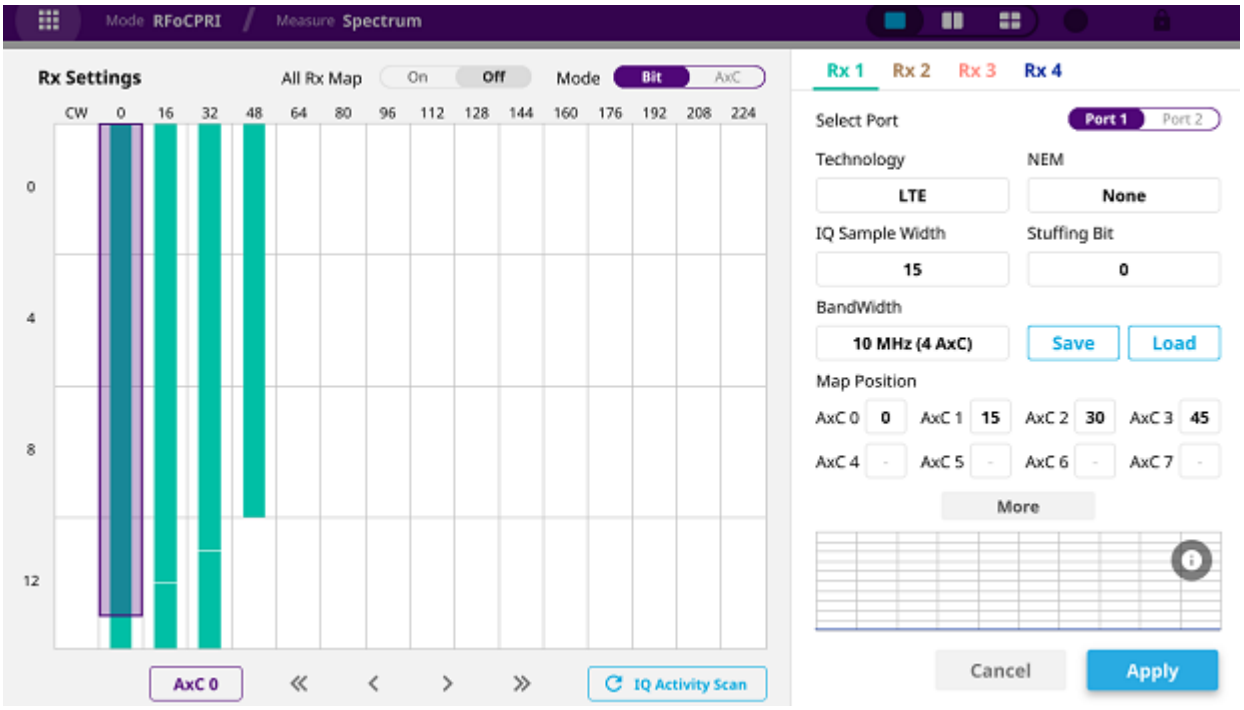
NOTE:

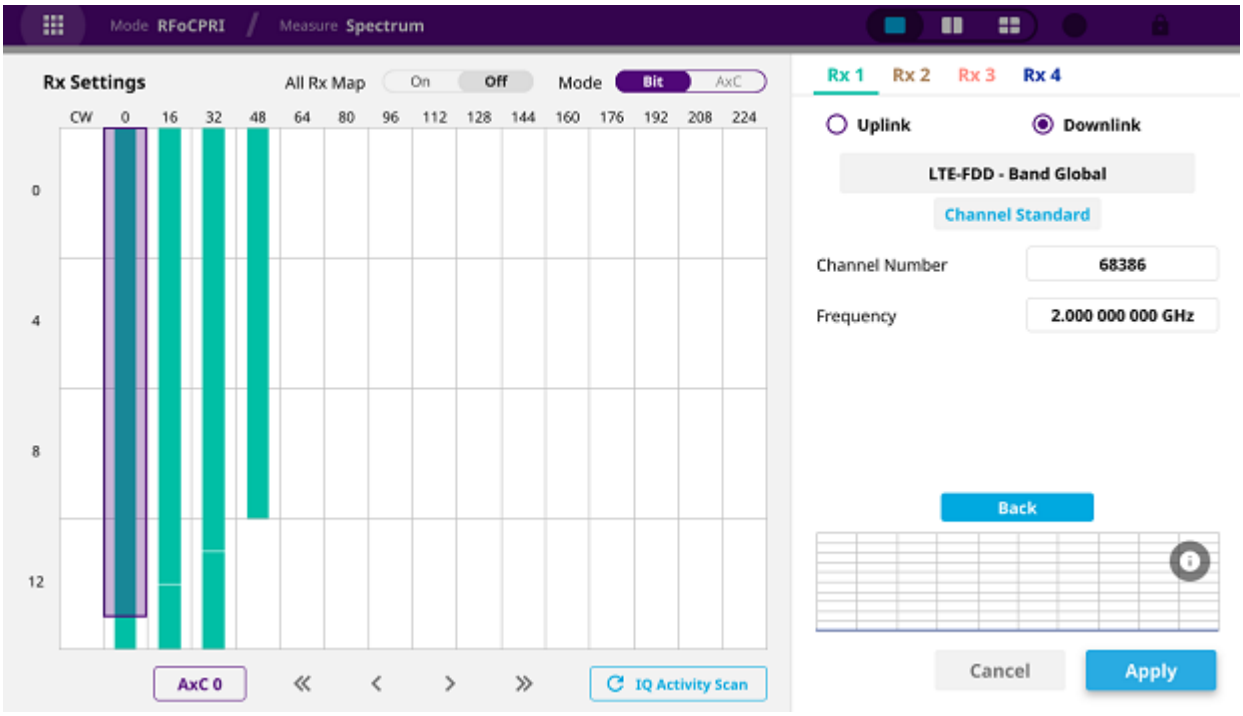
If you have selected a NEM, the instrument sets the Map Position and other related settings automatically based on the selected NEM and you cannot edit the map position setting. The

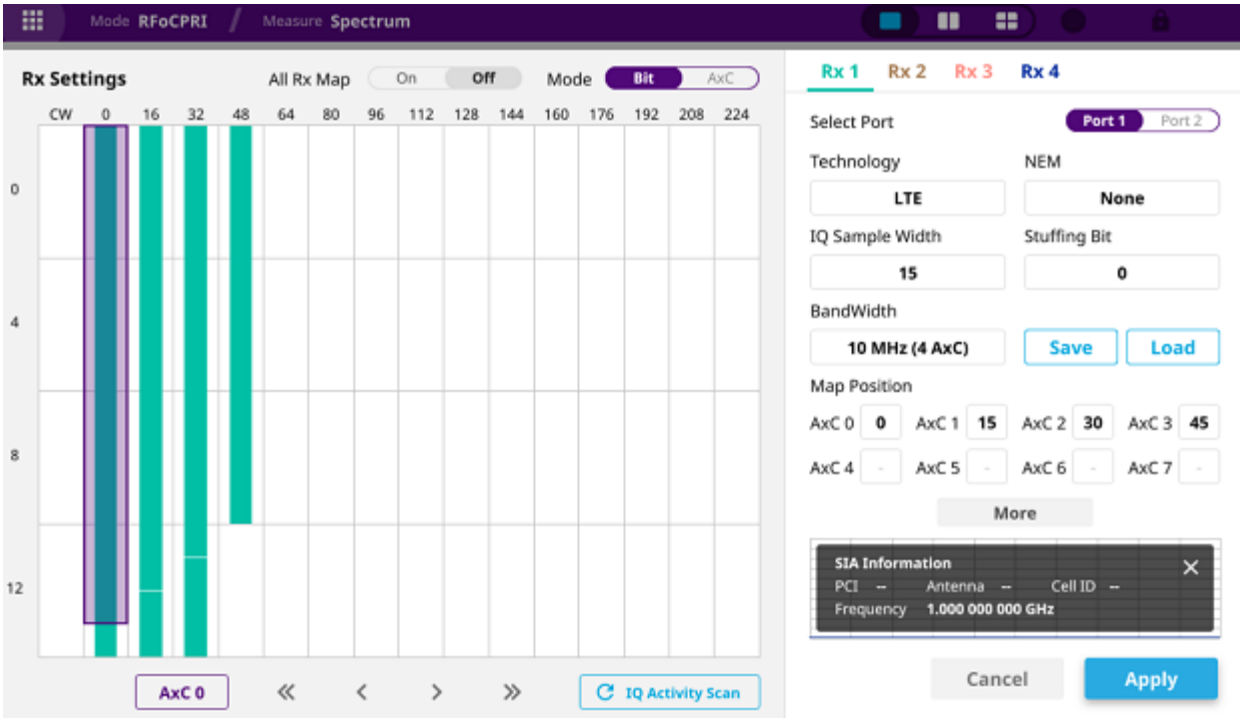
	pre-configured information may be subject to changes at any times by NEMs.

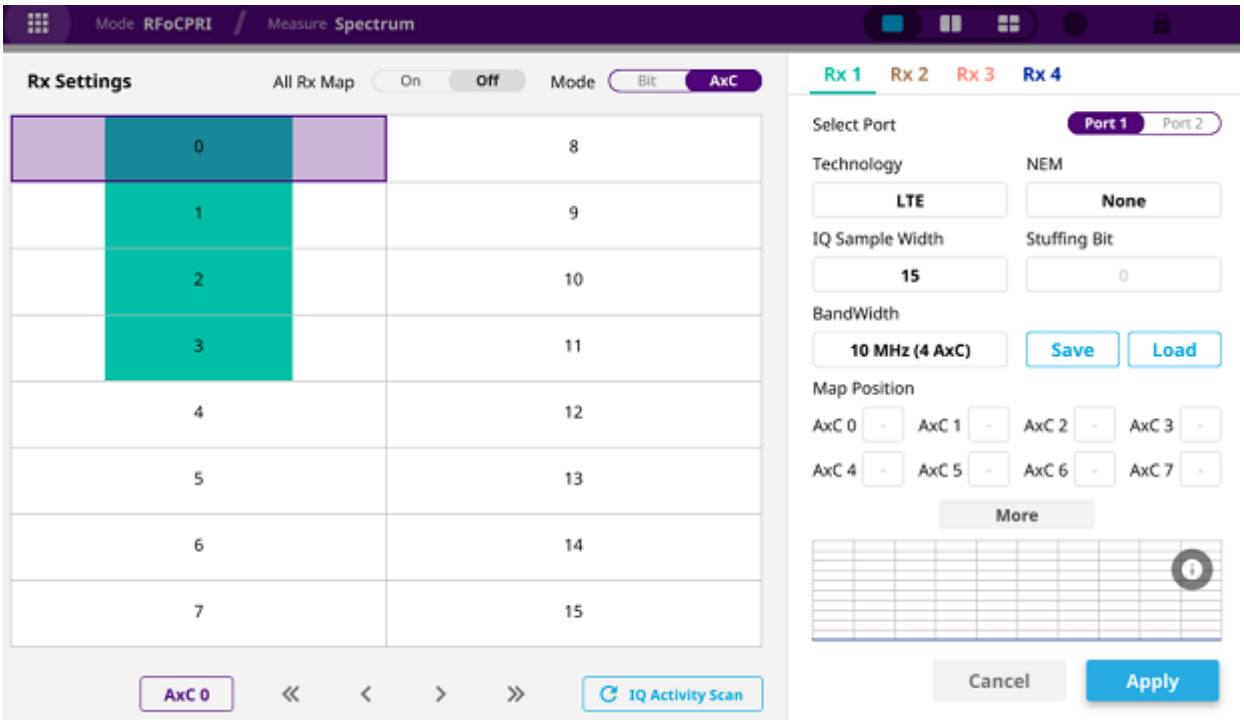
9 To choose **Uplink** or **Downlink** and Band to be tested, tap **More** and select your preferred band after tapping **Channel Standard**.

Rx Settings with RFoCPRI Analyzer




Mode RFoCPRI
Measure Spectrum
Rx Settings
All Rx Map
On
Off
Mode
Bit
AxC
CW 0 16 32 48 64 80 96 112 128 144 160 176 192 208 224
0
4
8
12
AxC 0
IQ Activity Scan
Rx 1
Rx 2
Rx 3
Rx 4
Uplink
Downlink
LTE-FDD - Band Global
Channel Standard
Channel Number
68386
Frequency
2.000 000 000 GHz
Back
Cancel
Apply


Mode RFoCPRI
Measure Spectrum
Rx Settings
All Rx Map
On
Off
Mode
Bit
AxC
CW 0 16 32 48 64 80 96 112 128 144 160 176 192 208 224
0
4
8
12
AxC 0
IQ Activity Scan
Rx 1
Rx 2
Rx 3
Rx 4
Select Port
Port 1
Port 2
Technology
LTE
NEM
None
IQ Sample Width
15
Stuffing Bit
0
BandWidth
10 MHz (4 AxC)
Save
Load
Map Position
AxC 0 0
AxC 1 15
AxC 2 30
AxC 3 45
AxC 4
AxC 5
AxC 6
AxC 7
More
SIA Information
PCI --
Antenna --
Cell ID --
Frequency 1.000 000 000 GHz
Cancel
Apply



Setting measure setup

1 Tap the **Setup** ( )icon on the side bar of each measurement mode.

2 To set the CPRI line bit rate, tap **Link Rate** under **Port Configuration** and select the CPRI link rate option from **614.4 Mbps**, **1228.8 Mbps**, **2457.6 Mbps**, **3072.0 Mbps**, **4915.2 Mbps**, **6144.0 Mbps**, **9830.4 Mbps** or **10137.6 Mbps**.

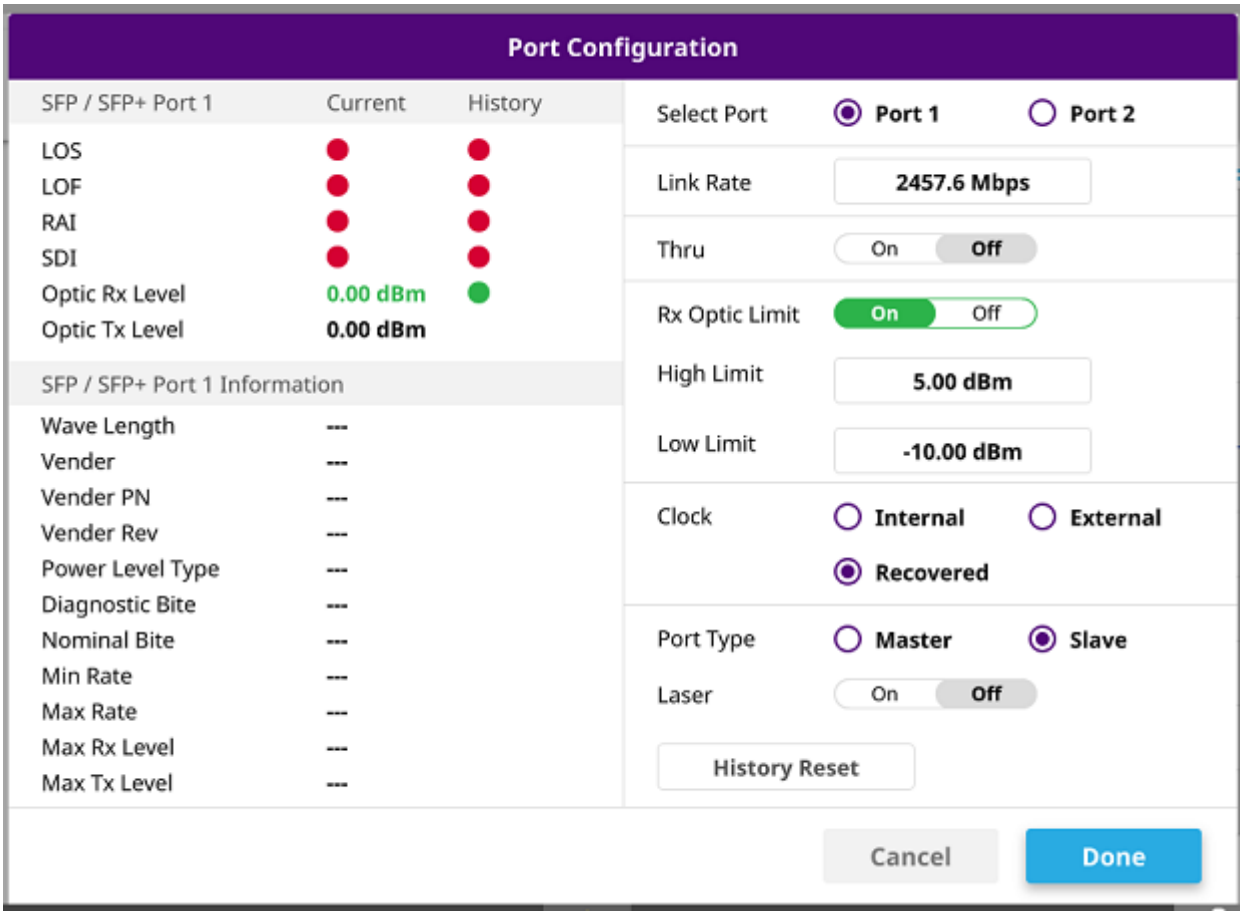
> **NOTE:**
>
> It is important that you set the link rate correctly to avoid any misleading LOS and LOF alarms displayed on the screen.

3 To turn on or off the through mode, tap **On** or **Off** in **Thru** line.

4 To set the Tx Clock, tap **Recovered** (default) in **Clock** box.

5 Tap **Port Type** to **Slave** (default).

Port Configuration with RFoCPRI Analyzer



Conducting spectrum measurement

After setting test parameters as described in "Configuring test parameters", you can perform spectrum measurements with an audible indicator. You can also turn on the interference ID.

1 Tap the **Setup** ( )icon on the side bar of **Spectrum Measure** mode.

2 To set the sound indicator, complete the following steps:

a Tap **Sound Indicator > Alarm Reference** then, choose either **Marker** or **Line**.

– **Marker**: Sets the active marker position as the alarm reference if you have enabled a marker on the spectrum.

– **Line**: Makes the reference line as the alarm reference.

b If you have set the alarm reference to **Line**, tap the **Reference Line** to set a threshold for an alarm.

c Enter a value by tapping + or -, and tap **Apply**.

d Tap **Sound** either **On** or **Off** to turn on/off the alarm sound.

e *Optional.* To adjust the volume for alarm sound, tap **Volume**, and adjust the volume.

> **NOTE:**
>
> The Sound Indicator is used to identify interfering signals with alarm sound. It is especially useful for locating interferer sources with a directional antenna.

3 To set the interference ID, complete the following steps:

a Tap **Interference ID** and **Threshold**.

b Enter a value and tap the **dBm**.

c Tap **Interference ID** and choose either **On** or **Off** to turn on/off the Interference ID.

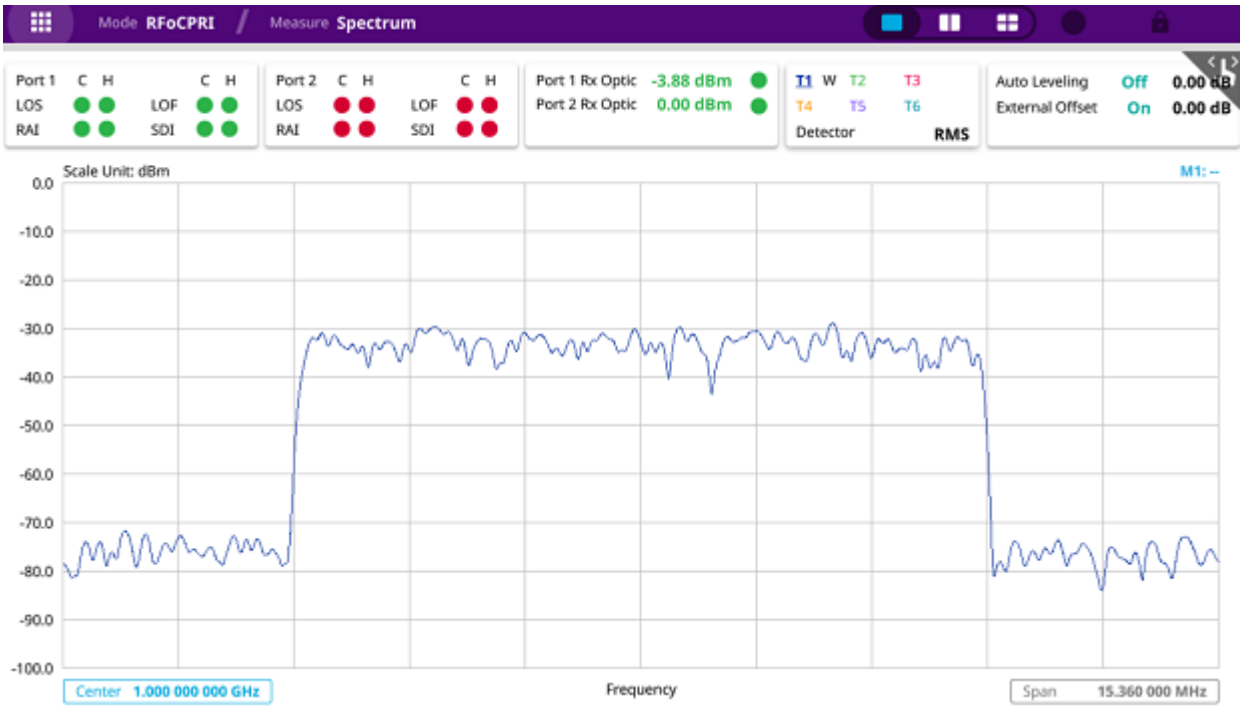
> **NOTE:**
>
> The Interference ID automatically classifies interfering signals over a designated spectrum and displays a list of possible signal types corresponding to the selected signal.

4 To clear current (C) and history (H) status of CPRI alarm on LOS and LOF and start a new monitoring, tap the **Port Configuration** under **Setup** ( ) icon and **History Reset**.

5 O*ptional.* Go to **Save**( ) icon on the side bar, and then select the save option from the choices available for your measurement mode. If you have saved logging data, you can play them in the Spectrum Replayer mode.

> **NOTE:**
>
> You can use the **Limit** menu to analyze your measurements with the display line.

RFoCPRI spectrum measurement



Conducting spectrogram

The Spectrogram is particularly useful when attempting to identify periodic or intermittent signals as it captures spectrum activity over time and uses various colors to differentiate spectrum power levels. When the directional antenna is used to receive the signal, you will see a change in the amplitude of the tracked signal as you change the direction of the antenna and see a change in the Spectrogram colors. The source of the signal is located in the direction that results in the highest signal strength.

After setting test parameters as described in “Configuring test parameters”, you can perform spectrogram measurements.

1 Tap the **Setup** ( )icon on the side bar of **Spectrogram Measure** mode.

2 To set the amount of time between each trace measurement, tap **Time Interval** and enter a value by using the on-screen keyboard.

3 To set the time cursor on a specific trace position, complete the following steps:

   a Tap **Time Cursor** to **On**.

   b Tap **Position** to enter a value. You can also use the move bar (up and down arrows) in the lower left screen to move the time cursor.

   c To turn the time cursor off, tap **Time Cursor** to **Off**.

NOTE:

Enabling the time cursor puts the measurement on hold and you can make post-processing analysis for each measurement over time using the time cursor.

4 To start a new measurement, tap **Reset/Restart**.

5 To clear current (C) and history (H) status of CPRI alarm on LOS and LOF and start a new monitoring, tap the **Port Configuration** under **Setup** ( ) icon and tap **History Reset.**

6 *Optional.* Go to **Save**( ) icon on the side bar, and then select a desired save option for your measurement mode.

NOTE:

You can use the **Limit** menu to analyze your measurements with the display line.

RFoCPRI interference measurement in spectrogram

Performing spectrum replayer

The Spectrum Replayer lets you retrieve and replay recorded spectrum analyzer traces in interference analysis mode. These traces can be played back in the spectrogram or RSSI. You can configure the limit line to create failure points when signals exceed it. The failure points are clearly displayed on the trace timeline for quick access during playback.

1 Select a file to be loaded, and then tap **Load**. The measure setup menu appears below on the screen.

2 Tap **FWD** or **REV** to change play direction to forward or reverse.

3 Tap the left or right arrow of **Speed** to select the speed option: **X1**, **X2**, **X3**, or **X4**.

4 Tap **Play** to start playing.

5 Tap **Pause** to pause or stop playing data.

6 To move to a particular failure position directly and play from there, tap **Index Fail** and enter a value by using the on-screen keyboard.

7 *Optional.* Tap **Time Cursor** under the **Setup** ( ) icon between **On** and **Off** to display or dismiss the time cursor on the screen. This key becomes activated when you play logged data in the Spectrogram mode.

NOTE:

If you connect a USB drive, do not remove it while playing to prevent freezing the USB port, which will require you to restart the instrument to get a USB drive recognized again.

Setting Display

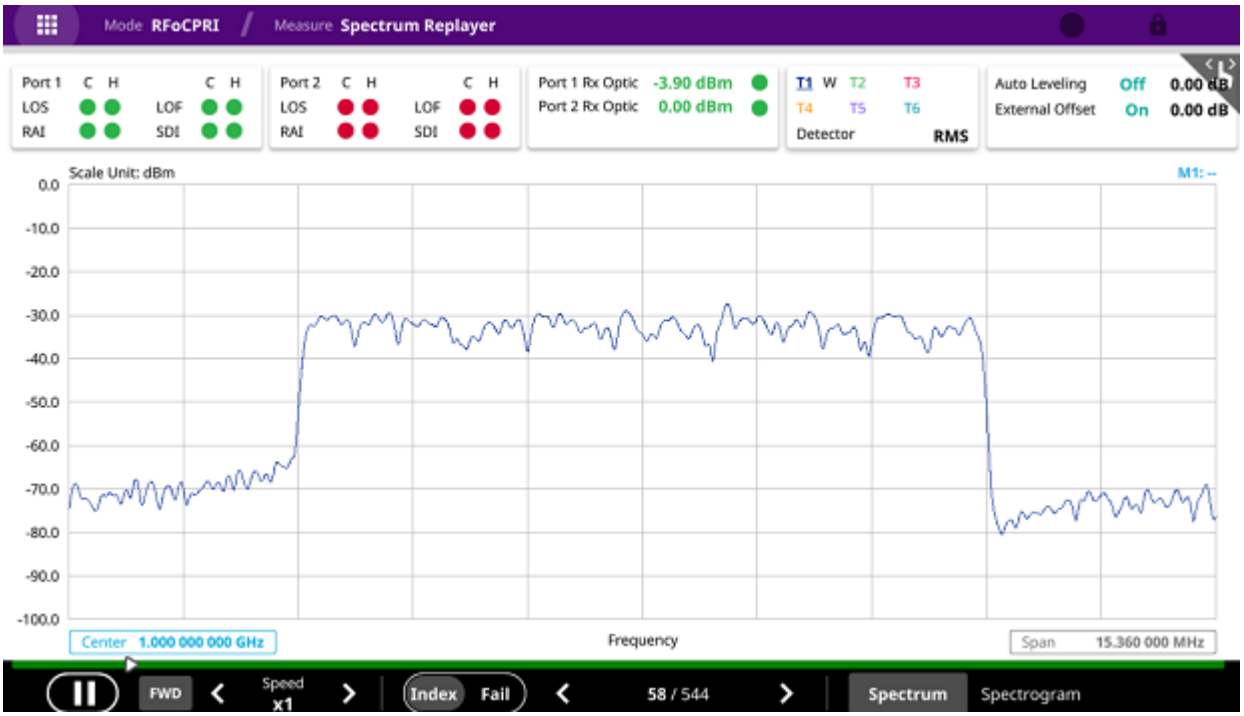
You can select the display option to view data in a different mode.

1 Select the display option from **Spectrum** or **Spectrogram** in the lower right screen.

NOTE:

You can use the **Limit** menu to analyze your measurements with the display line.

RFoCPRI spectrum replay


Mode RFoCPRI
Measure Spectrum Replayer
Port 1 C H
LOS
RAI
LOF
SDI
Port 2 C H
LOS
RAI
LOF
SDI
Port 1 Rx Optic -3.90 dBm
Port 2 Rx Optic 0.00 dBm
T1 W T2 T3
T4 T5 T6
Detector RMS
Auto Leveling Off 0.00 dB
External Offset On 0.00 dB
Scale Unit: dBm
M1: --
0.0
-10.0
-20.0
-30.0
-40.0
-50.0
-60.0
-70.0
-80.0
-90.0
-100.0
Center 1.000 000 000 GHz
Frequency
Span 15.360 000 MHz
FWD
Speed x1
Index Fail
58 / 544
Spectrum
Spectrogram

Appendix

A. Ordering information

The Warranty Period for VIAVI Solutions Accessories shall apply to all the standard and optional accessories listed below. The warranty period varies by product and is generally one (1) year unless otherwise specified.

CA5000 CellAdvisor 5G

Internal Hardware Options

Catalog Number	Description
CA5000-F001	Frequency for 5G NR FR1 up to 6 GHz
CA5000-F002	Frequency for 5G NR FR1 up to 6 GHz and FR2 up to 40 GHz
CA5000-F001-O	Frequency for 5G NR FR1 up to 6 GHz with optic HW
CA5000-F002-O	Frequency for 5G NR FR1 up to 6 GHz and FR2 up to 40 GHz with optic HW

Hardware Upgrade Options

Catalog Number	Description
CA5000-FU02	Frequency upgrade to FR2 up to 40 GHz (Requires F001 or F001-O)
CA5000-OU01	Upgrade Optic Hardware

Bandwidth Range

Catalog Number	Description

CA5000-B100	100 MHz/100 MHz analysis bandwidth

Options

Catalog Number	Description
CA5000-S002	GPS connectivity with antenna
CA5000-S003	Bluetooth connectivity
CA5000-S004	Wi-Fi connectivity
CA5000-S010	50 MHz bandwidth real-time spectrum analyzer
CA5000-S011	100 MHz bandwidth real-time spectrum analyzer (Requires B100)
CA5000-S012	Upgrade RtSA BW from 50 MHz to 100 MHz (Requires B100 and S010)
CA5000-S013	Interference analyzer
CA5000-S014	Route map
CA5000-S015	Gate sweep
CA5000-S016	Channel scanner
CA5000-S040	5G TF signal analyzer (Requires B100)

Accessories

Catalog Number	Description

G700050150	98 Wh Lithium-Ion Battery
G700050340	RF omni antenna Type-K (f), 26 GHz to 40 GHz
G700050390	GPS SMA mount antenna
G700050431	CA5G soft carrying case
G700050551	RF cable DC to 40 GHz, K(m) to K(f), 0.8 m

B. RoHS information

This appendix describes the RoHS (Restriction of Hazardous Substances) information, which is a mandatory requirement from China. The RoHS directive consists in the restriction on the use of certain hazardous substances in electrical or electronic equipment sold or used in the European Union, after July 1, 2006. These substances are: lead, mercury, cadmium, hexavalent chromium, polybrominated biphenyls, and polybrominated diphenyl ethers.

“中国 RoHS”

《电子信息产品污染控制管理办法》（信息产业部，第 39 号）

附录 (Additional Information required for the Chinese Market only)

本附录按照“中国 RoHS”的要求说明了有关电子信息产品环保使用期限的情况，并列出了产品中含有的有毒、有害物质的种类和所在部件。本附录适用于产品主体和所有配件。

产品系列: CA5000
(Product Family)

环保使用期限：

本标识标注于产品主体之上，表明该产品或其配件含有有毒、有害物质（详情见下表）。
其中的数字代表在正常操作条件下至少在产品生产日期之后数年内该产品或其配件内含有的有毒、有害物质不会变异或泄漏。该期限不适用于诸如电池等易耗品。
有关正常操作条件，请参见产品用户手册。
产品生产日期请参见产品的原始校准证书。

有毒、有害物质的类型和所在部件

	有毒、有害物质和元素					
元器件 (Component)	铅(Pb)	汞 (Hg)	镉(Cd)	六价铬 (CR^{6+})	多溴联苯 (PBB)	多溴二苯醚 (PBDE)
产品主体 (Main Product)						
印刷电路板组件 (PCB Assemblies)	X	O	O	O	O	O
内部配线 (Internal wiring)	X	O	O	O	O	O
显示器 (Display)	O	O	O	O	O	O
电池 (Batteries)	O	O	O	O	O	O
电源 (Power Supply)	O	O	O	O	O	O
电工零件 (Electro-mechanical parts)	O	O	O	O	O	O
光模块 / 辅助模块 (Optical modules) / (Auxiliary modules)	X	O	O	O	O	O
金属外壳零件和紧扣件 (Metal case parts and fixings)	X	O	O	O	O	O
塑料外壳零件 (Plastic case parts)	O	O	O	O	O	O
标签和胶带 (Labels and tapes)	O	O	O	O	O	O
配件 (Accessories)						
外接电缆和适配器 (External cables and adapters)	X	O	O	O	O	O
USB	X	O	O	O	O	O
手册和其它印刷材料 (Handbooks and other printed material)	O	O	O	O	O	O
包装箱和绳带 (Carrying case and strap)	O	O	O	O	O	O
其它配件 (Other accessories)	X	O	O	O	O	O

本表是按照 S / T 11364 的规定编制的:
O：表示该有害物质在该部件所有均质材料中的含量均在 GB/T 26572 规定的限量要求以下。
X：表示该有害物质至少在该部件的某一均质材料中的含量超出 GB/T 26572 规定的限量要求。

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English

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