CAA06M

Cable and Antenna Analyzer

User's Guide

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About CAA06M Cable and Antenna Analyzer

CAA06M Cable and Antenna Analyzer

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Open source disclaimer - IMPORTANT READ CAREFULLY

The CAA06M Cable and Antenna Analyzer includes third party software licensed under the terms of separate open source software licenses. By using this software you agree to comply with the terms and conditions of the applicable open source software licenses. Software originated by VIAVI is not subject to third party licenses. Terms of the VIAVI Software License different from applicable third party licenses are offered by VIAVI alone.

Safety and compliance information

Safety consideration

It is mandatory to permanently connect this product to the protective earth.

When powering this instrument externally, always use an AC power cable that includes an earth (safety) ground connection, which is shipped with your instrument.

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.

CAA06M Cable and Antenna Analyzer

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:

3

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.
❶	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 CAA06M

What is CAA06M Cable and Antenna Analyzer?

The majority of problems in mobile networks occur at the base station infrastructure that is consisted of the antenna system, cables, and connectors. It is essential to have the optimal instrument for properly servicing or installing cell sites.

The CAA06M analyzer is the optimal test solution to characterize cell site's infrastructure due to its ease of use and rich functionality.

The CAA06M analyzer has all of the measurement functions necessary to accurately verify the site's transmission line and antenna system from signal reflections (VSWR or Return Loss) to DTF (Distance to Fault) measurement function.

CAA06M Cable and Antenna Analyzer

Top panel view

No.	Description
1	**Reflection / RF Out** port: Reflection and RF out 50-Ohms port.
2	**Bias Voltage** port: You can use this SMA type female connector to supply bias voltage from +12 VDC to +30 VDC with maximum 6 Watts.

Features and capabilities

The CAA06M Cable and Antenna 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 measurement results.

Features

- Up to 2001 data points to locate long distance problems

- Dual display to view multiple measurements simultaneously to reduce test time

- Powerful application software for data management (JDViewer, StrataSync)

- Full remote control of the instrument from VNC on computers and mobile devices

Capabilities

- Reflection measurement in VSWR, Return Loss, or Smith Chart

- DTF (Distance to Fault) measurement in VSWR or Return Loss

- 1 Port Cable Loss measurement and 1 Port Phase measurement

- Report generation in PDF and directly on the instrument

- 2 Port Transmission (gain/insertion loss) measurement

- RF Source Bias Voltage

Specifications

The physical, power supply, and environmental characteristics for the CAA06M Cable and Antenna Analyzer are listed in the tables below.

Physical specifications

Product	Dimension (H x W x D), Weight
CAA06M Cable and Antenna Analyzer	130 mm x 138 mm x 41 mm, 0.43 kg for CAA06MA (0.45 kg for CAA06MB)

Power supply specifications

Power	Descriptions
DC Input	19 V DC, 8.4 A
Power consumption	Option F001 54 W Option F002 64 W

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
Altitude	Up to 4600 m
Overvoltage category	Overvoltage category OVC1
Pollution degree	Pollution degree 2
Operation Temperature	-10 to 55°C
Storage Temperature	-40 to 70°C

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 CAA06M Cable and Antenna Analyzer

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. 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 CAA06M for damage. 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.

Installing CAA06M Cable and Antenna Analyzer

You need to attach the CAA06M Cable and Antenna Analyzer to your mainframe.

1   Power off your mainframe.

2   Put the upper hooks of CAA06M into the holes (A) and push it tightly to fit in the rear panel (B).

3   Screw the lower part of the module with a flat-head screwdriver.

4   Install the dummy module to the connector not in use if you ordered one.

5   Power on your mainframe and perform the O-S-L Calibration by tapping the Cal in the right-side bar on the screen. The instrument displays on-screen instructions for you to follow through.

> **NOTE**
>
> The dummy module is intended to protect the rear connectors (140-pn Edge Card Connector Socket) and it is recommended to install a dummy module for any connector not in use.
>
> For the customer who wants to order the dummy module, the part number is C2K-EMPTYMOD. Each module port's recommended use is for 100 module insertions. If intermittent performance is observed consult VIAVI Technical Support for further assistance.

Installing CAA06M to mainframe
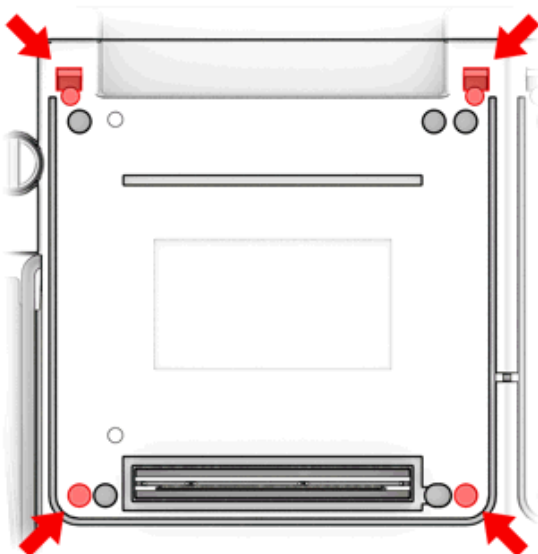
Rear panel (A)
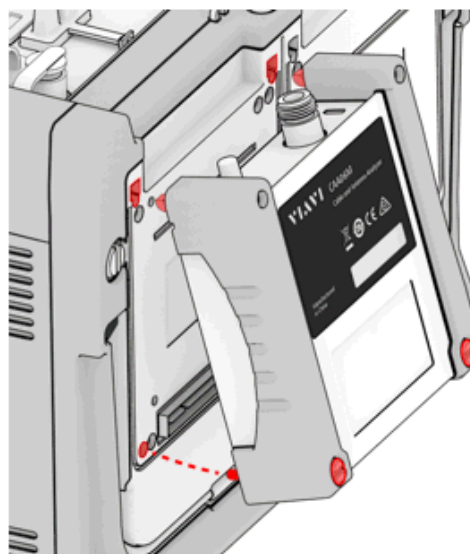
Installing CAA06M to mainframe (B)

Glancing at menus and icons

There are menus and icons that you need to get familiar with to operate CAA06M Cable and Antenna Analyzer efficiently.

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.
☷	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 CAA06M Cable and Antenna Analyzer 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.
Cal	**Calibration**	Tap to perform calibration. The on-screen instruction appears to guide you through the calibration.
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 diagnose Tx and Rx modules by Self Test (**Note**. Disconnect any cable connected to the **Reflection / RF Out** port before Self Test). You can tap the Factory Reset button to reset your instrument.

Managing file

The Cable and Antenna Analyzer lets you save and load screen, result, setup, 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 **Trace** to save the trace information for the current measurement.

   d Select **Trace as CSV** to save the trace information on the screen with a file type, .csv.

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

   f Select **Result as JSON** to save a CDM (Common Data Model) file. It cannot be saved alone but can be saved with other File Types.

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

Creating a report

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

1 Tap the **Report Setup** tab.

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

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

8   Tap the **Image Add** button to add up to six screenshots and tap the **Apply** button.

Using event save

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 **Event Save** tab.

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: **Trace**, **Trace as CSV**, and **Screen**.

4   Specify the **Save To** directory where you want saved files to be stored.

5   Tap to switch the **Save Then Stop** to **On** to save the first event that fails outside the limit(s). 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 **Apply** button to get ready for event saves.

There appears Event Save ( ) indicator up on the screen.

8   Enable your threshold in the **Limit** menu and set **Pass/Fail** to **on**.

Using quick save

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

1   Tap the **Quick Save** tab.

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: **Trace**, **Report**, and **Screen**.

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

Using create favorite

You can save and create favorite files which will be added in the Home > Favorites page.

1   Tap the **Create Favorite** tab.

2   Tap the **Favorite Title** input field and enter the name using the on-screen keyboard.

3   Tap the **Create** button.

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 Cable and Antenna Analyzer 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.

Icon	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.

Using auto naming file

You can save your measurement file in a specific test page that you want using the Save icon on the side bar. Auto Naming feature enables you to save your file name using pre-defined format without manually entering values. The CAA solution provides a default auto naming format tha includes Site ID, Sector, Band, and Date and Time for your reference.

Saving using auto naming file

1 Tap the **Save** (💾) icon on the side bar in a specific test page that you are measuring.

2 Tap the **File Name** field then an Auto Naming pop-up window appears.

3 Tap the **Auto Naming** (🔁 Auto Naming) button appeared in the on-screen keyboard.

4 Select the required **Site ID**, **Sector**, **Band** from the drop-down list.

5 Tap the **Apply** button to apply the changes. You will be directed to the Save page.

6 Select the File Type and tap the **Save** button to save per your selected auto naming template.
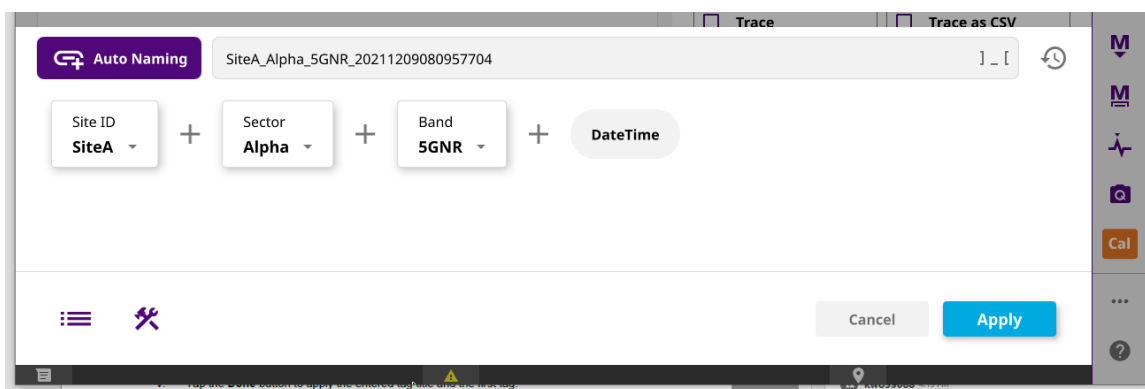
Customizing auto naming template and list

1 Follow the **steps 1 to 4** above 'Saving auto naming file'.

2 Tap the **Tool** ( ) icon to customize the auto naming file and do the following:

    a Tap **Custom**, **Measurement**, or **System** page you want and tap the items you want to add.

    b Tap the **Add** button then tap the **Add to List** button at the bottom right of the page.

    c In the **Custom** page, to add titles and tags, do the following steps:

        i. Tap and highlight the tag block (rectangular box) where you want to add your tag title and first tag.

        ii. Tap the **Add** ( ) icon at the bottom left of the page.

        iii. Tap the **Tag title here** input field and enter a title you want to add using the on-screen keyboard.

        iv. Tap the **Add first tag** button and enter the first tag you want to add using the on-screen keyboard.

        v. Tap the **Done** button to apply the entered tag title and the first tag.

    d Highlight a tag and tap the **Edit** icon to edit the tag.

    e Highlight a tag and tap the **Delete** icon to delete the highlighted tag.

    f Tap the **Delete All** icon to delete all tags that you have made.

> **NOTE**
>
> Next to the Tool icon at the bottom left, you can see the List icon. If you tap it, you can select an auto naming template list that you have added.

Importing and exporting auto naming list

You can import or export your auto naming file saved in the Internal > StrataSync > setupForFavorite folder in your module.

1 Tap the **Import** button on the top right screen to import an auto naming file that you have saved as .afn. Importing an auto naming file overwrites the existing auto naming file list.

2 Tap the **Export** button on the top right screen to save an auto naming file with a specific name that you entered.
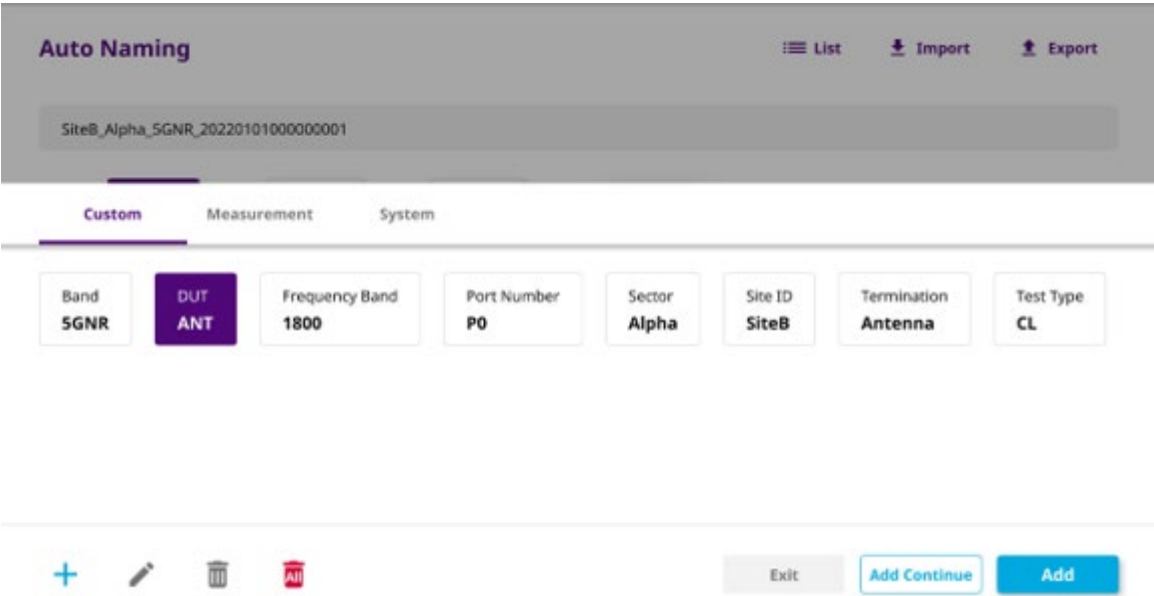
Enabling software options

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 Setting** 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 Setting** 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.

Performing Calibration

Introduction

This chapter provides instructions on how to perform calibration properly in order to obtain accurate measurement results. Topics discussed in this chapter are as follows:

- Understanding calibration
- Performing 1-port calibration
- Performing 2-port calibration

Understanding calibration

Calibration of your instrument to the Open, Short, and Load standards is important to get reliable and accurate measurement results. After setting frequencies and right before making a measurement, you need to perform an O-S-L calibration using a mechanical or electronic calibration kit.

Calibration tools

You need to have the following calibration tools to be able to perform a calibration. This instrument detects the connected calibration kit and displays a different on-screen instruction for it.♣

- Mechanical Y-Cal kit or electronic EZ-Cal kit. **Note**. In case of calibration with Ez-Cal, there is no Cal Off (T)
- Extension cable(s) if necessary

Performing 1-port Calibration

Measurement modes that need the 1-port calibration are Reflection, DTF, 1 Port Cable Loss, 1 Port Phase and Smith Chart.

It is recommended that you perform an O-S-L calibration right at the RF Out / Reflection port of the instrument without using an extension cable in order to minimize a measurement error. If using an extension cable is inevitable, you need to use a phase stable cable and perform the O-S-L calibration at the end of the extension cable.

O-S-L calibration using mechanical Y-Cal kit

Procedure

1 Connect an extension cable, if necessary, to the **Reflection / RF Out** port of the instrument.

2 Tap **Cal** icon in the right side bar. The on-screen instruction appears to guide you through the mechanical O-S-L calibration.

3 Connect the **OPEN** standard of the calibration kit to the instrument's **Reflection / RF Out** port or to the extension cable if used.

4 Tap the **O-S-L** button. The calibration progress bar appears.

5 Disconnect the calibration kit and then connect the **SHORT** standard of the calibration kit to the instrument's the **Reflection / RF Out** port or to the extension cable if used.

6 Tap the **Continue** button. The calibration progress bar appears.

7 Disconnect the calibration kit and then connect the **LOAD** (50 Ω) standard of the calibration kit to the instrument's the **Reflection / RF Out** port or to the extension cable if used.

8 Tap the **Continue** button. The calibration progress bar appears.

9 Check the screen to see if the calibration status is now changed to **Cal ON**.
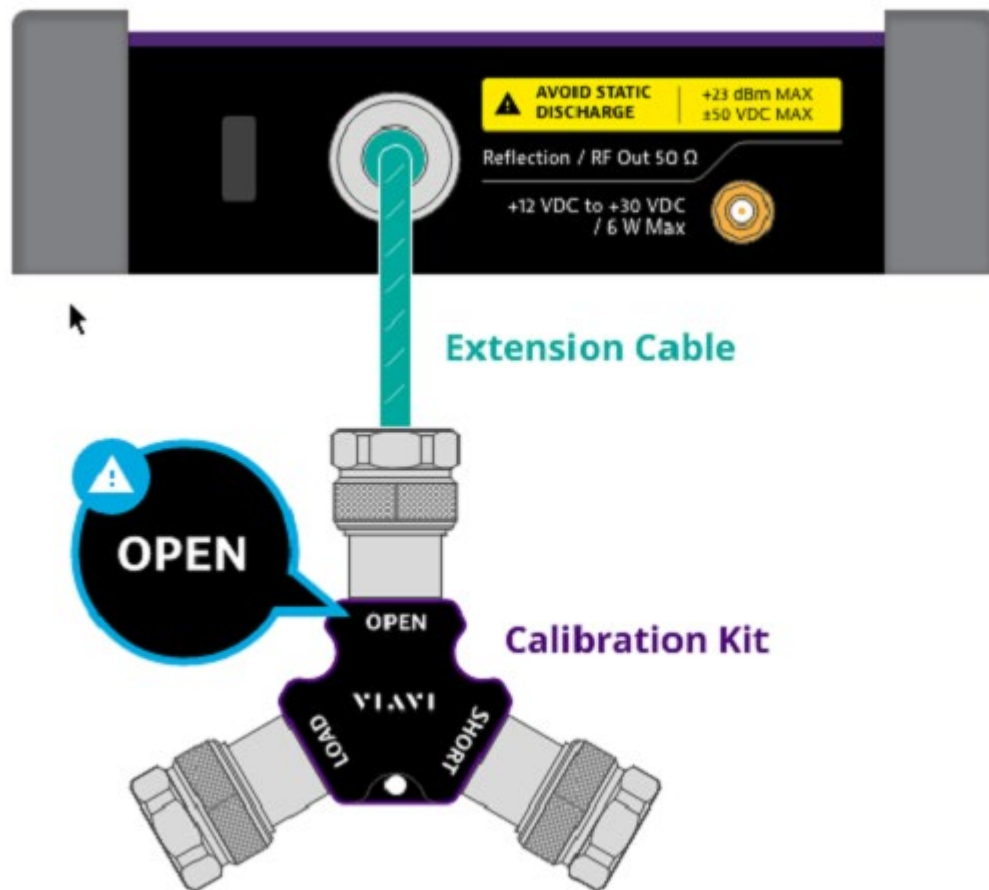
O-S-L calibration using electronic EZ-Cal kit

The e-Calibration is an Open-Short-Load calibration using the electronic EZ-Cal kit, which allows you to perform the O-S-L calibration easy and fast with only one connection of the kit to the instrument.

Procedure

1   Connect an extension cable, if necessary, to the **Reflection / RF Out** port of the instrument.

2   Connect the **EZ-Cal** to the instrument's **Reflection / RF Out** port or to the extension cable if used.

3   Connect the USB cable to the side of the **EZ-Cal** and then to the **USB Host** port to power the e-calibration kit.

4   Tap **Cal** icon in the right side bar. The on-screen instruction appears to guide you through the e-calibration.

5   Tap the **Continue** button. The calibration progress bar appears.

6 Check the screen to see if the calibration status is now changed to **Cal ON**.

7 After the electronic calibration has been completed, the EZ-Cal kit changes its status back to Open.

8 Make sure to disconnect the EZ-Cal kit including its USB connection.

Quick calibration

The Quick calibration that is available only in the DTF measurement mode is useful when you want to measure the cable length only, without having to perform a full calibration. It's only valid only for a DTF measurement in the single layout. If you change the display mode to others, calibration status goes back to the previous one.

Procedure

1   Connect an extension cable, if necessary, to the **Reflection / RF Out** port of the instrument.

2   Tap **Cal** icon in the right side bar. The on-screen instruction appears containing the **Quick Cal** button.

3   Connect the **OPEN** standard of the calibration kit to the instrument's the **Reflection / RF Out** port or to the extension cable if used.

4   Tap the **Quick Cal** button. The calibration progress bar appears.

5   Check the screen to see if the calibration status is now changed to **Cal ON (Q)**.

Performing 2-port Calibration

For 2 Port Transmission measurement mode that needs the 2-port calibration, you must perform the mechanical or electronic O-S-L calibration and then the Thru calibration after setting the frequency and the output power.

Below figure illustrates a connection setup for Thru calibration only. Prior to this Thru calibration, you must perform O-S-L calibration as described in the previous pages.

Thru calibration

Procedure

1   Connect the test cable to the **Reflection / RF Out** port and **RF In** port of the instrument.

2   Tap **Thru Cal** to start calibration. A progress bar is displayed to show the calibration progress in percentage.

3   Check the screen to see if the calibration status is now changed to Cal ON.
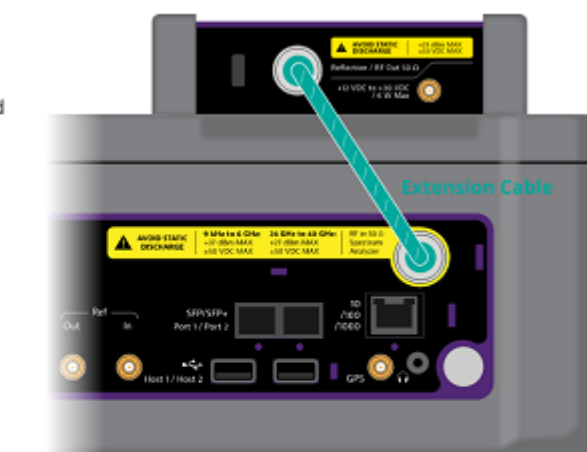
Reflection Test

Introduction

This chapter provides instructions on how to perform Reflection measurements in VSWR or Return Loss. Topics discussed in this chapter are as follows:

- Introducing reflection measurements
- Preparing for a measurement
- Making a measurement

Introducing reflection measurement

Reflection measurements in VSWR or Return Loss are used to characterize cable and antenna system in order to ensure a cell site's impedance matching and signal reflection characteristics.

A proper RF emission in cell sites is achieved with a maximum power transfer from the transmitter to the antenna, where all the transmission media should have an impedance match. A mismatch at the antenna system produces a reflective 'traveling wave' that goes in the opposite direction from the incident wave. As the two traveling waves cross each other in opposite direction, it is produce an interference pattern called a "standing wave". VSWR is the ratio between the power that is sent forward to the cable and/or antenna and the amount of the power that is reflected back to the transmitter.

Some of the consequences of having a high VSWR condition in cellular services are dropped calls, poor reception, and an overall unacceptable performance in the cell (or section of cell) coverage covered by the base station antenna. Therefore, the VSWR of the antenna system including the feed line is one of the most critical factors in the service and maintenance of the RF transmitter systems.

VSWR

In telecommunications, standing wave ratio (SWR) is the ratio of the amplitude of a partial standing wave at its maximum amplitude and at its minimum, in an electrical transmission line. The SWR is usually defined as a voltage ratio called the VSWR, for voltage standing wave ratio. For example, the VSWR value 1.2:1 denotes the maximum standing wave amplitude that is 1.2 times greater than the minimum standing wave value.

Return loss

In telecommunications, return loss is a measure of power reflected from imperfections in an electrical or optical communication link. The ratio (PR / PT), represents the wave power reflected from the imperfection (PR) to that of the incident, or transmitted, wave, (PT). For maximum transmitted power, the return loss should be as small as possible, meaning the ratio PR / PT should be as small as possible.

Return loss is usually expressed in dB and the return loss value describes the reduction in the amplitude of the reflected energy, as compared to the forward energy. It will always be a loss and therefore a negative dB. However, you can write -3 dB simply as 3 dB of loss, dropping the negative sign and adding loss. For example, if a device has 15 dB of return loss, the reflected energy from that device (PR), is always 15 dB lower than the transmitted energy (PT). When expressed in dB, larger (in magnitude) negative numbers represent larger return losses and thus smaller reflected power (PR).

In electrical systems, return losses often occur at junctions between transmission lines and terminating impedances. It is a measure of the dissimilarity between impedances in metallic transmission lines and loads. For devices that are not perfect transmission lines or purely resistive loads, the return loss value varies with the frequency of the transmitted signal.

> **NOTE**
>
> You can also view reflection measurements in Smith Chart to help you graphically identify problems with transmission lines.

Reflection measurement screen
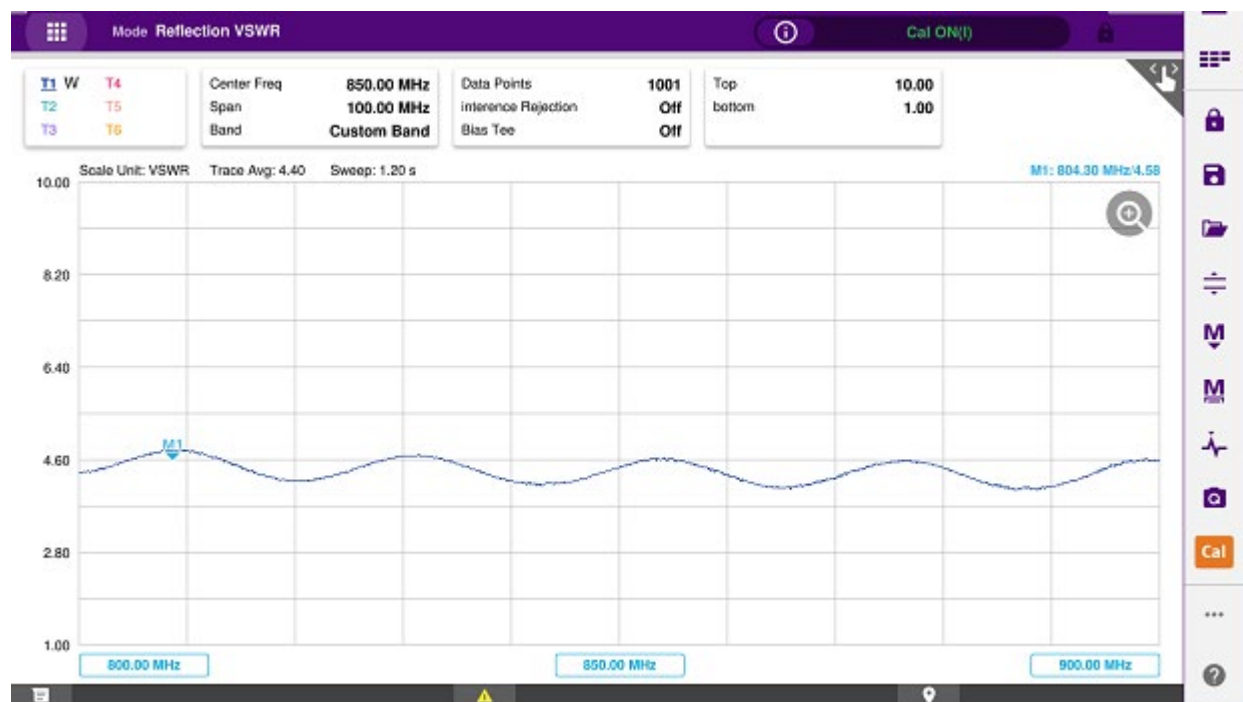
Preparing for a measurement

Selecting measurement mode

1 Tap **Single** under the **Mode & Measure**.

2 Double-tap the **Reflection VSWR** ( ) or **Reflection Return Loss** ( ) icon as needed.

> **NOTE**
>
> You can choose two measurement modes from each window in the **Horizontal** or **Vertical** tab if you want to view dual measurements displayed on one screen.

Setting parameters

Frequency

You can manually set a frequency band to be measured by entering start and stop frequencies or center and span frequencies. You can also select a frequency band from the band list stored in the instrument. It is desirable to set the frequency to a value that covers a normal range of the measurement with enough margins.

1 Tap the **Menu** ( ) key on the side bar and tap **Frequency**.

2 Input the values of **Start Frequency**, **Stop Frequency**, **Center Frequency**, **Span Frequency** using the on-screen keyboard and tap **Apply**.

3 To select a band:

    a Tap the **Band List** then it displays a list of standard bands stored in the instrument and custom bands created in the JDViewer.

    b Tap your choice from the list.

    c Tap the **Apply** button on the Band List box. The instrument automatically updates the values of the **Start Frequency** and **Stop Frequency** according to the selected band.

> **NOTE**
>
> Frequency changes after calibration affect the calibration status. If changed within the registered bands, the status turns into CAL ON (I) and it does not require re-calibration. If changed off the registered band, the status turns into CAL OFF and it requires re-calibration.

Amplitude

You can set maximum and minimum values of the Y-scale manually by setting the Top and Bottom amplitudes or restore the instrument's default full scale defined for each measurement mode. You can also optimize the Y-scale automatically so that an entire trace can be displayed on the measurement chart. Adjusting Y-scale does not affect calibration status.

1 Tap the **Menu (** ≡ **)** key on the side bar and tap **Amplitude**.

2 Input the values of **Top** and **Bottom** amplitudes using the on-screen keyboard and tap **Apply**. The entered values become the maximum and minimum values for the Y-scale.

3 To restore the instrument's default range for the Y-scale, tap **Full Scale**. The amplitude range for the **Reflection** mode is **1 to 65 in VSWR** and **-60 to 0 dB in Return Loss.**

> **NOTE**
>
> You can also tap **AUTO SCALE(** ⇕ **)** any time you need to view the entire trace on the measurement chart. The instrument automatically optimizes the maximum and minimum values of the Y-scale to display the entire trace.

General parameters

You can select options for Data Points, Interference Rejection, and Bias Tee.

1 Tap the **Menu (** ≡ **)** key on the side bar and tap **General**.

2 To set the measurement resolution, select the **Data Points** option from the choices: **126**, **251**, **501**, **1001** and **2001**.

> **NOTE**
>
> Default setting is 1001. It is recommended that you select high resolution data points only for an instance of measuring wide frequency bands or requiring precise measurement data.
>
> The larger number you choose, the higher resolution you get and the longer the instrument takes to sweep and display results. For example, selecting 501 data points provides twice as many measurement points as 251, but it may take twice longer to sweep and display the trace than choosing 251 data points. Changing data points does not affect calibration status.

3 To enable the **Interference Rejection** feature, select **On**.

> **NOTE**
>
> Default setting is **Off**. It is recommended to use this feature only when you

suspect interfering signals in the area as it slows down measurement.

4 *For users with the Bias Tee installed.* To use the Bias Tee, Select **On** for the **Bias Voltage** and input a value between **12** and **30** with 1 V step, as you desire. Tap **Apply** to save the changes.

> **NOTE**
>
> You can choose two measurement modes from each window in the **Horizontal** or **Vertical** tab if you want to view dual measurements displayed on one screen.

Performing calibration

Perform the mechanical or electronic O-S-L Calibration by tapping the **Cal** icon in the right side bar. The instrument displays on-screen instructions for you to follow through.

Making a measurement

Once the O-S-L calibration is done, the instrument is now ready to make a reflection measurement in VSWR or Return Loss.

Procedure

1 Disconnect the calibration kit from the calibration point.

2 Connect an antenna or feed line to the calibration point, which is usually at the extension cable end if used.

3 Your measurement result is displayed on the screen in real time.

> **CAUTION**
>
> Do not apply or connect power exceeding +30 dBm to the **Reflection / RF Out** port. When the input signal power is greater than +30 dBm, it may cause a damage to the CAA module and instrument.

> **NOTE**
>
> Do not change the connected port extension cable or frequency settings, or it may cause a measurement error.

> ⚠️ **WARNING**
>
> Do not attempt to connect the instrument to the antenna when there is a risk of lightning. Electric shock may cause malfunction of or damage to the instrument.

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

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

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

Analyzing measurement results

You can use the Marker, Peak, Trace, Limit, Hold and Auto Scale hard keys and Zoom Zone function for your analysis of the results. You can also use Quick Save, Save and Load functions. See "Analysis" and "Operation" for details.

Reflection VSWR measurement screen (single layout)
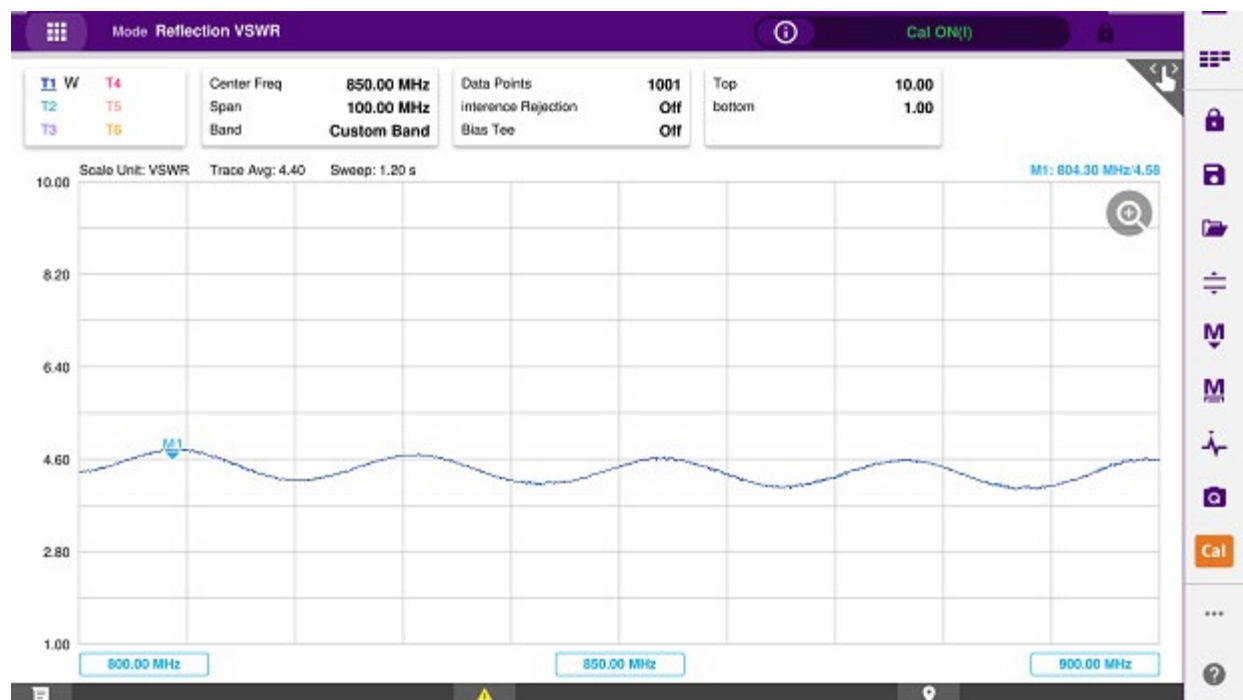
Reflection VSWR measurement screen (zoom zones)
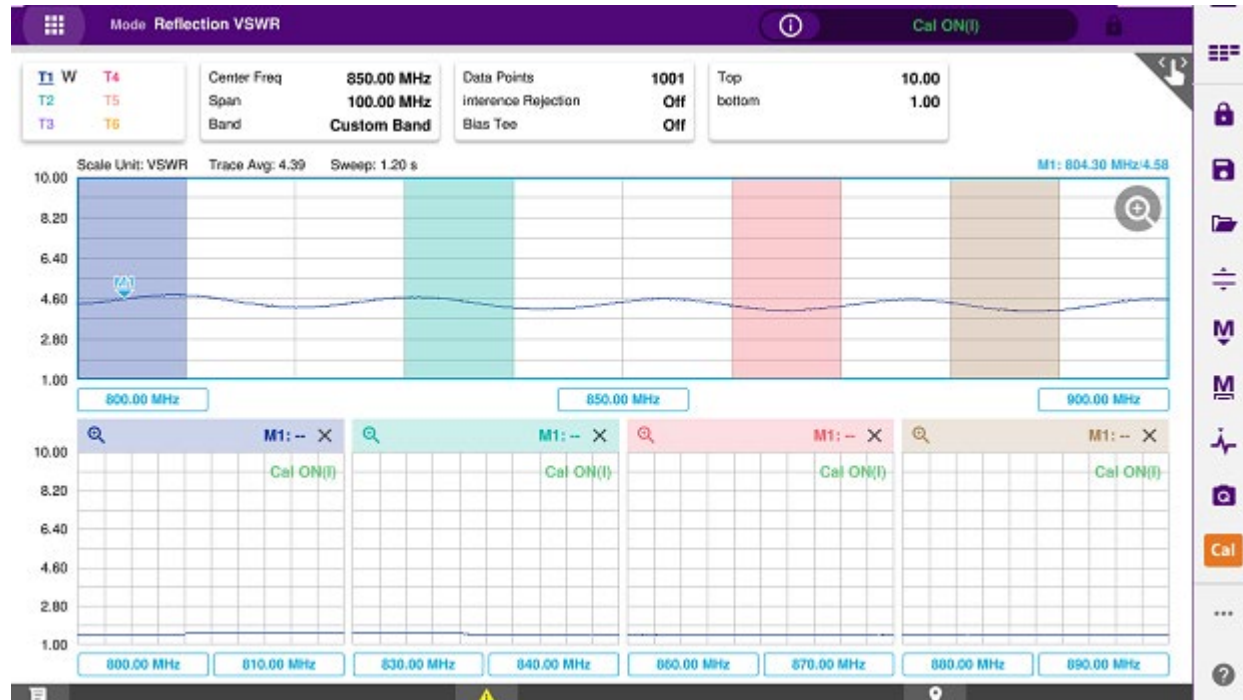
Reflection return loss measurement screen (single layout)
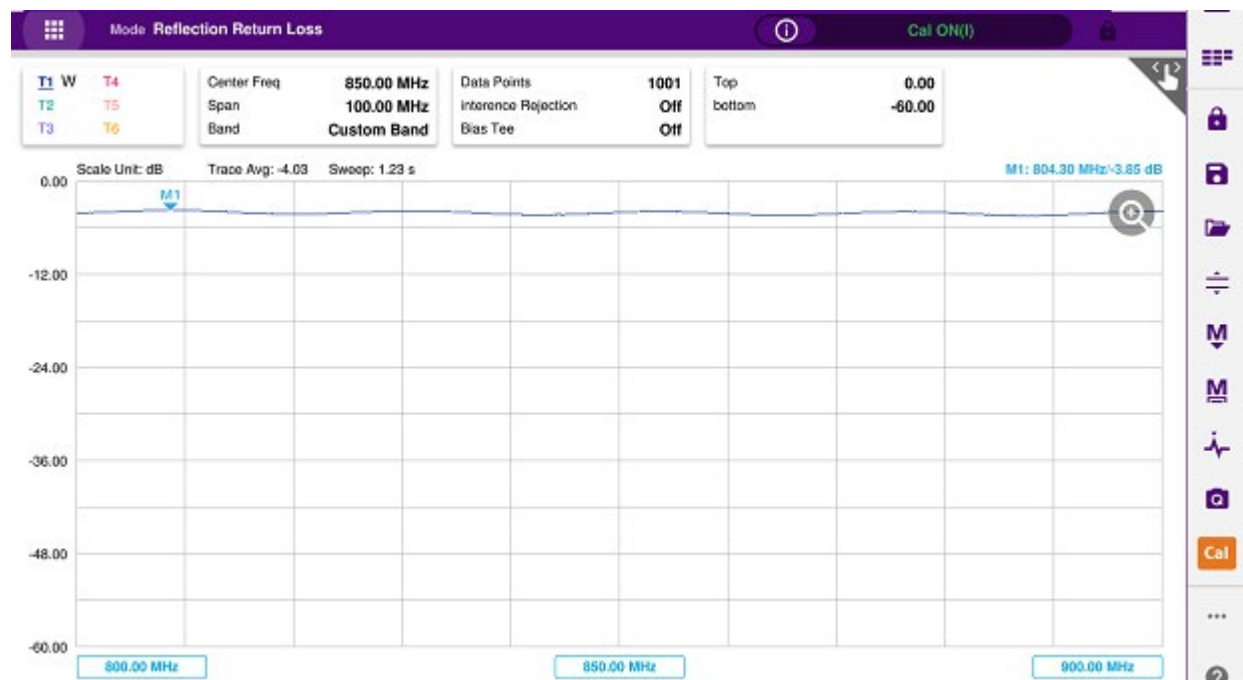
Reflection return loss measurement screen (zoom zones)
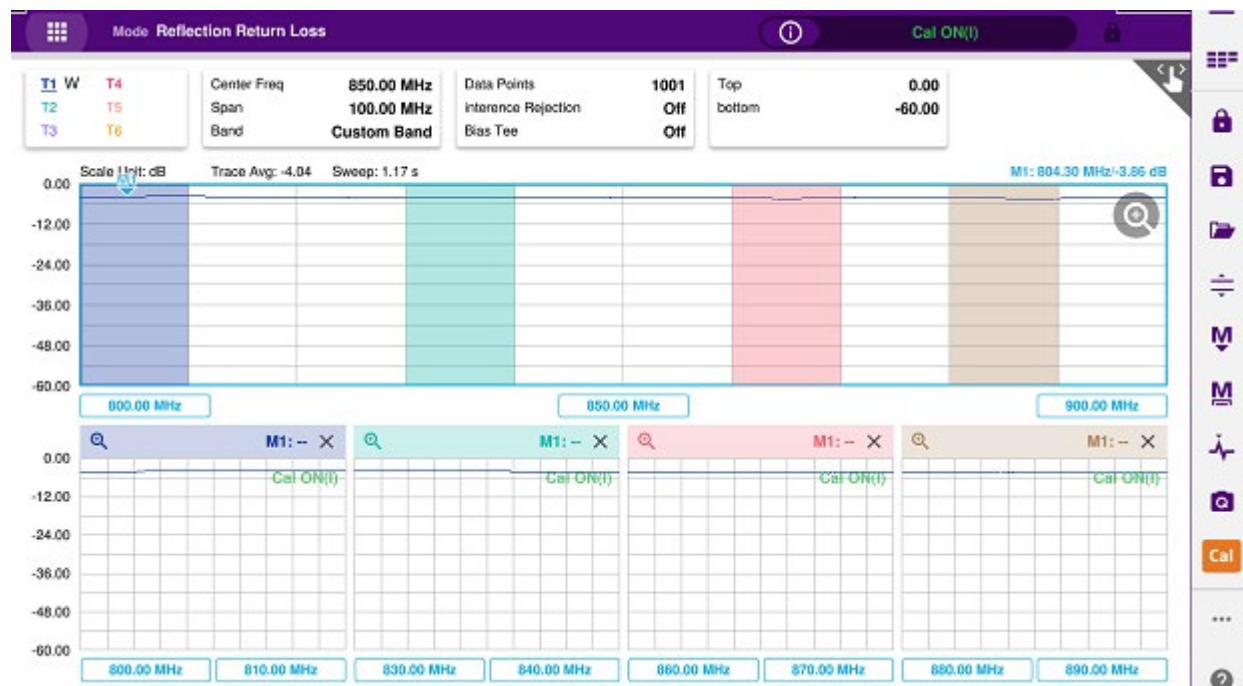
Reflection VSWR & DTF return loss measurement screen (horizontal layout)

Reflection return loss & smith chart measurement screen (vertical layout)
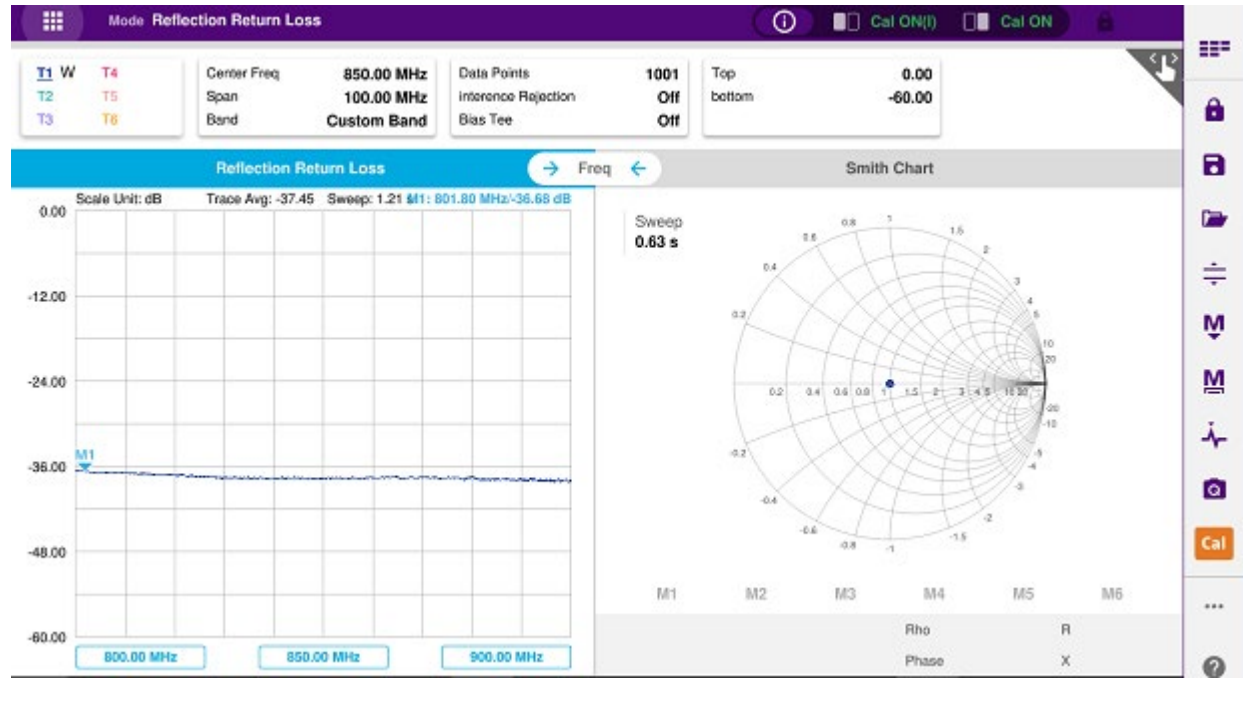
DTF Testing

Introduction

This chapter provides instructions on how to perform DTF (Distance to Fault) measurements in VSWR or Return Loss. Topics discussed in this chapter are as follows:

- Introducing DTF measurements
- Preparing for a measurement
- Making a measurement

Introducing DTF measurements

While VSWR is an indicator to express the efficiency of the cell site's energy transmission, DTF is a measurement to identify the fault locations in the antenna line system. Most of the antenna line system consists of various types of coaxial cables, connectors, and devices such as dividers and surge arrestors.

Since VSWR is a measurement to verify the impedance discontinuity of the total feed line system, it is necessary to perform DTF measurement to identify the exact component that is contributing to the performance degradation of the line system. The DTF measurement makes it easy to identify the fault location by displaying the relative distance of the signal reflections or discontinuities from various points of the transmission system.

In DTF measurements, the instrument transmits a test signal along the conductor or transmission medium. If the conductor is of uniform impedance and properly terminated, the entire transmitted signal will be absorbed in the far-end termination and no signal will be reflected toward the instrument. Any impedance discontinuities will cause some of the incident signal to be sent back towards the source.

Higher impedance creates a reflection that reinforces the original signal whilst lower impedance creates a reflection that opposes the original signal. The resulting reflected signal that is measured at the output/input to the instrument is displayed or plotted as a function of time and, because the speed of signal propagation is relatively constant for a given transmission medium, it can be read as a function of cable length or distance location. Because of this sensitivity to impedance variations, the instrument may be used to verify cable impedance characteristics, splice and connector locations and associated losses, and estimate cable lengths or faulty location.

DTF measurement screen
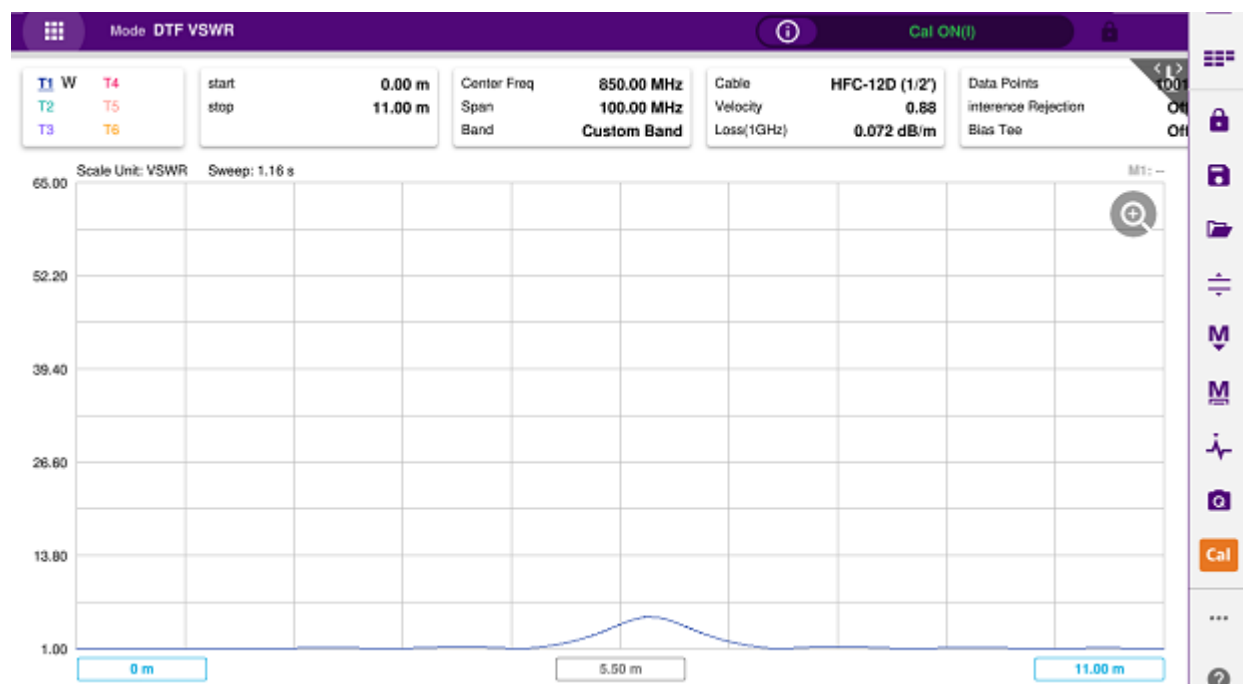
Preparing for a measurement

Selecting measurement mode

1 Tap **Single** under the **Mode & Measure**.

2 Double-tap the **DTF VSWR** ( ) or **DTF Return Loss** ( ) icon as needed.

> **NOTE**
>
> You can choose two measurement modes from each window in **Horizontal** or **Vertical** tab if you want to view dual measurements displayed on one screen..

Setting parameters

Frequency

You can manually set a frequency band to be measured by entering start and stop frequencies or center and span frequencies. You can also select a frequency band from the band list stored in the instrument. It is desirable to set the frequency to a value that covers a normal range of the measurement with enough margins.

1　Tap the **Menu (　≡　)** key on the side bar and tap **Frequency**.

2　Input the values of **Start Frequency**, **Stop Frequency**, **Center Frequency**, **Span Frequency** using the on-screen keyboard and tap **Apply**.

3　To select a band:

    a　Tap the **Band List** then it displays a list of standard bands stored in the instrument and custom bands created in the JDViewer.

    b　Tap your choice from the list.

    c　Tap the **Apply** button on the Band List box. The instrument automatically updates the values of the **Start Frequency** and **Stop Frequency** according to the selected band.

> **NOTE**
>
> Frequency changes after calibration affect the calibration status. If changed within the registered bands, the status turns into CAL ON (I) and it does not require re-calibration. If changed off the registered band, the status turns into CAL OFF and it requires re-calibration.

Distance

You can also manually set a distance to be measured by entering start and stop distances. The maximum measurable distance is dependent on the frequency you set. You can set any values within the maximum measurable distance, but optimum resolution is achieved when you set the distance same as the maximum measurable distance, which is displayed in the measurement setting information bar at the bottom of the measurement screen.

1　Tap the **Menu (　≡　)** key on the side bar and tap **Distance**.

2　Input the values of **Start Distance**, **Stop Distance** using the on-screen keyboard and tap **Apply**.

Amplitude

You can set maximum and minimum values of the Y-scale manually by setting the Top and Bottom amplitudes or restore the instrument's default full scale defined for each measurement mode. You can also optimize the Y-scale automatically so that an entire trace can be displayed on the measurement chart. Adjusting Y-scale does not affect calibration status.

1　Tap the **Menu (　≡　)** key on the side bar and tap **Amplitude**.

2　Input the values of **Top** and **Bottom** amplitudes using the on-screen keyboard and tap **Apply**. The entered values become the maximum and minimum values for the Y-scale.

3　To restore the instrument's default range for the Y-scale, tap **Full Scale**. The amplitude range for the **DTF** mode is **1 to 65 in VSWR** and **-60 to 0 dB in Return Loss**.

NOTE

You can also tap **Auto Scale(⬍)** any time you need to view the entire trace on the measurement chart. The instrument automatically optimizes the maximum and minimum values of the Y-scale to display the entire trace.

General parameters

You can select options for Data Points, Interference Rejection, Windowing, Distance unit and Bias Tee.

1 Tap the **Menu (☰)** key on the side bar and tap **General**.

2 To set the measurement resolution, select the **Data Points** option from the choices: **126**, **251**, **501**, **1001** and **2001**.

NOTE

Default setting is 1001. The larger number you choose, the lower resolution you get even though you can have longer Max Distance to measure. Changing data points does not affect calibration status.

3 To enable the **Interference Rejection** feature, select **On**.

NOTE

Default setting is **Off**. It is recommended to use this feature only when you suspect interfering signals in the area as it slows down measurement.

4 To set the method of video filtering to display the trace, select the **Windowing** option from the following choices: **Rectangular**, **Blackman**, **Nominal Side**, **Low Side** and **Minimum Side**.

NOTE

If the video filtering is activated by selecting a different type of Windowing filters, Rectangular or Blackman, the overshoots of the trace are reduced by smoothing out the sharp transitions so that you can easily discriminate noises and peaks. For example, if you select the Blackman, noises around peaks are reduced and it helps you verify a DTF location clearly.

5 To change the display unit for distance, select the **Unit** option from the choices: **Meter** and **Foot**.

NOTE

Setting your city and time zone automatically changes not only the date and time but also the distance unit in the DTF settings accordingly to Meter or Foot.

6 *For users with the Bias Tee installed.* To use the Bias Tee, Select **On** for the **Bias Voltage** and input a value between **12** and **30** with 1 V step, as you desire. Tap **Apply** to save the changes.

> **NOTE**
>
> If you have set this **Bias Voltage** to **On**, the instrument will supply a DC bias of set level (12 – 30 V) from the **SMA** port to an external bias-tee device.

Cable Definition

You can select a cable from the list of cable names stored in the instrument or define a cable as custom cable by setting the propagation velocity and cable loss parameters.

1   Tap the **Menu (** ≡ **)** key on the side bar and tap **Cable Definition**.

2   Tap **Cable Name** and The Cable List window appears, displaying standard cables stored in the instrument and custom cables created in the JDViewer.

3   Select a cable to choose from the list and then tap **Apply** on the Cable List window. The instrument automatically changes the **Propagation Velocity** and **Cable Loss** values correspondent to the selected cable's propagation velocity and cable loss. Default setting is **HFC-12D (1/2")**.

4   If you want to define a new cable, select the **Propagation Velocity** field, and then enter the propagation velocity of the cable using the on-screen keyboard and tap **Apply**.

> **NOTE**
>
> You can set this relative propagation delay of the cable to be defined. It affects the calculation of distance in DTF measurements.

5   After entering Propagation velocity, tap **Cable Loss** and enter the cable loss value of the cable using the on-screen keyboard and tap **Apply**. The text "Custom Cable" appears in the **Cable Name** field.

> **NOTE**
>
> You can set this cable loss of the cable, for which you like to define. It affects the peak level of discontinuity in DTF measurements. If you select a cable from the list, the cable loss value is displayed as "**@ 1 GHz**". If you define a cable manually, its value is displayed as "**@ Custom Frequency**".

Performing calibration

Perform the mechanical or electronic O-S-L Calibration by tapping the **Cal** icon in the right side bar. The instrument displays on-screen instructions for you to follow through.

Making a measurement

Once the O-S-L or Quick calibration is done, the instrument is now ready to make a DTF measurement in VSWR or Return Loss. If you like to not only measure the DTF cable length but also get highly accurate and reliable data, you need to perform a full O-S-L calibration.

Procedure

1 Disconnect the calibration kit from the calibration point.

2 Connect an antenna or feed line to the calibration point, which is usually at the extension cable end if used.

3 Your measurement result is displayed on the screen in real time.

> ⚠️ **CAUTION**
>
> Do not apply or connect power exceeding +30 dBm to the **Reflection / RF Out** port. When the input signal power is greater than +30 dBm, it may cause a damage to the CAA module and instrument.

> ▷ **NOTE**
>
> If O-S-L or Quick calibration has been done at the end of the port extension cable for DTF measurement, the length of the port extension cable is compensated automatically and is not included in the distance to the point of discontinuity.
>
> Do not change the connected port extension cable or frequency settings, or it may cause a measurement error.

> ⚡ **WARNING**
>
> Do not attempt to connect the instrument to the antenna when there is a risk of lightning. Electric shock may cause malfunction of or damage to the instrument.

Analyzing measurement results

You can use the Marker, Peak, Trace, Limit, Hold and Auto Scale hard keys and Zoom Zone function for your analysis of the results. You can also use Quick Save, Save and Load functions. See "Analysis" and "Operation" for details.

DTF VSWR measurement screen (single layout)
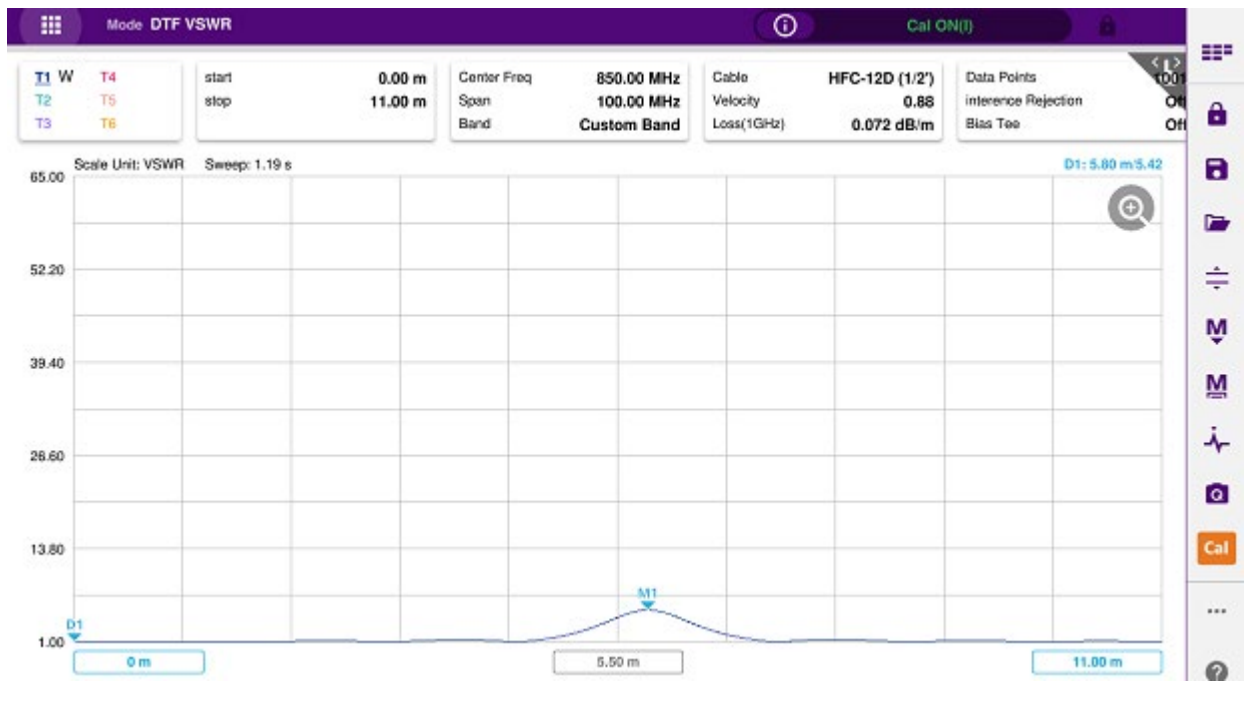
DTF return loss measurement screen (single layout)
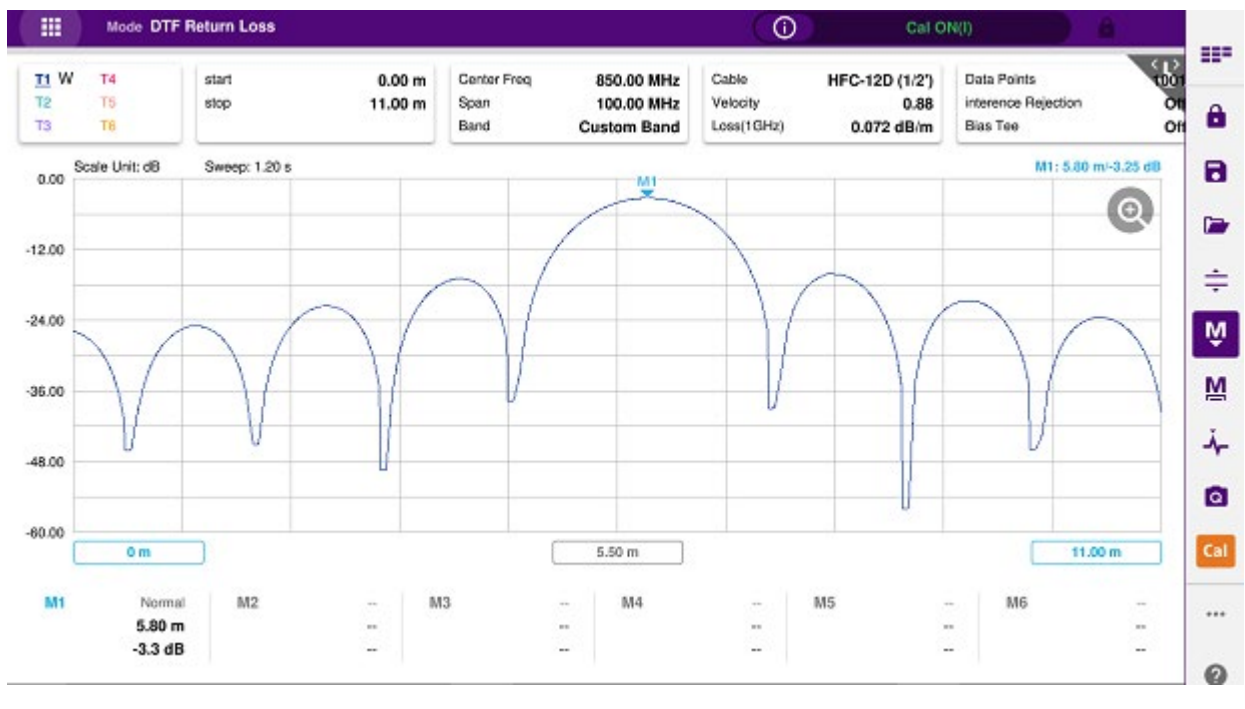
DTF return loss measurement screen (Alt DTF Band on)

Reflection VSWR & DTF return loss measurement screen (horizontal layout)

DTF VSWR & Smith chart measurement screen (vertical layout)
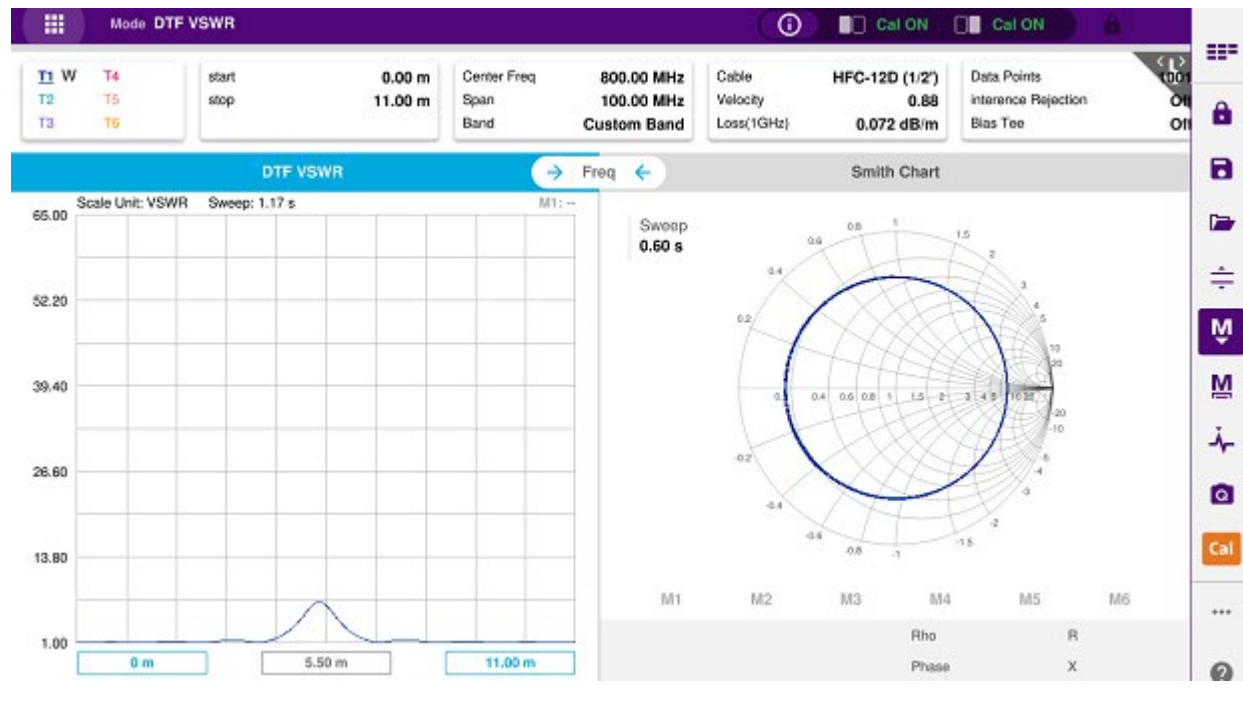
1-Port Cable Loss Testing

Introduction

This chapter provides instructions on how to perform 1 Port Cable Loss measurements that are used to quantify signal loss in a cable or other device without connecting both ends of the cable or device to the instrument. Topics discussed in this chapter are as follows:

- Introducing 1-port cable loss measurements

- Preparing for a measurement

- Making a measurement

Introducing 1-port cable loss measurements

The 1 Port Cable Loss measurement checks the signal attenuation level of the cable. The frequency band to measure the characteristics of a cable must be calibrated before performing the cable loss measurement. This measurement can be especially useful in measuring the loss of feed line connected to the antenna. By placing a short at the end of the cable or leaving it open, the signal is reflected back and the energy lost in the cable can be computed. Cables with larger diameter generally have less insertion loss and better power handling capabilities than cables with smaller diameter.

1 port cable loss measurement screen
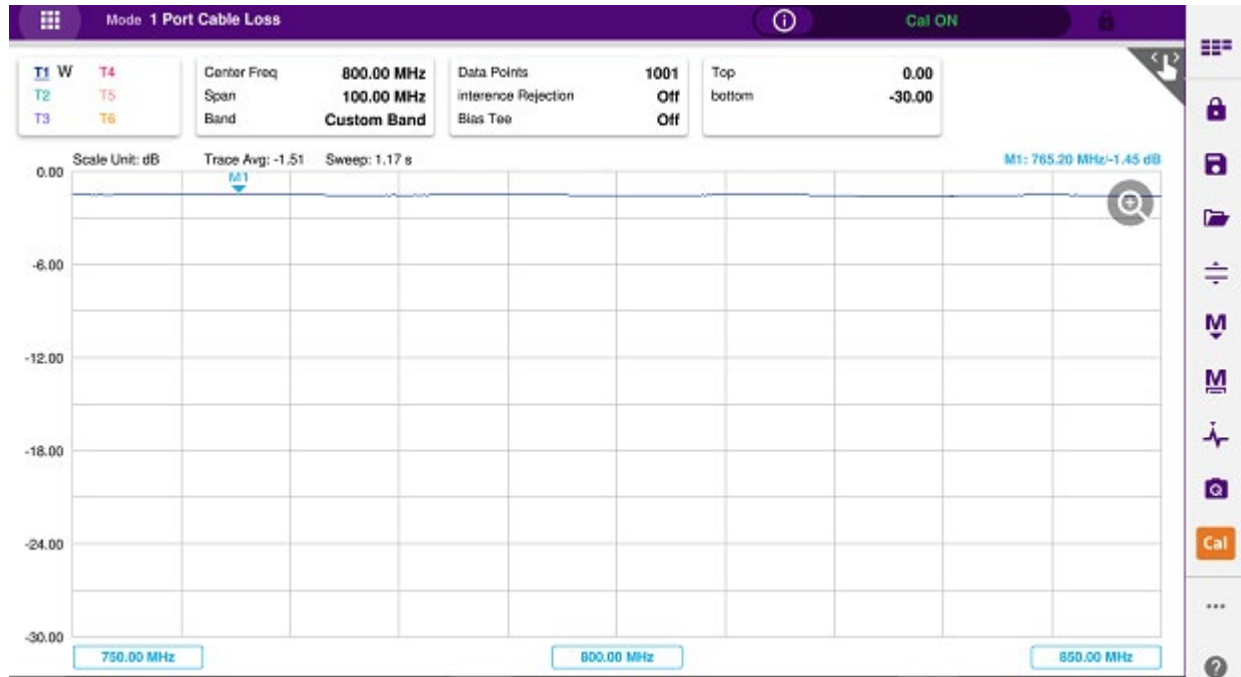
Preparing for measurement

Selecting measurement mode

1   Tap **Single** under the **Mode & Measure**.

2   Double-tap the **1 Port Cable Loss** ( ) icon.

> **NOTE**
>
> You can choose two measurement modes from each window in the **Horizontal** or **Vertical** tab if you want to view dual measurements displayed on one screen.

Setting parameters

Frequency

You can manually set a frequency band to be measured by entering start and stop frequencies or center and span frequencies. You can also select a frequency band from the band list stored in the instrument. It is desirable to set the frequency to a value that covers a normal range of the measurement with enough margins.

1 Tap the **Menu (** ☰ **)** key on the side bar and tap **Frequency**.

2 Input the values of **Start Frequency**, **Stop Frequency**, **Center Frequency**, **Span Frequency** using the on-screen keyboard and tap **Apply**.

3 To select a band tap the **Band List** then it displays a list of standard bands stored in the instrument and custom bands created in the JDViewer. Tap your choice from the list and tap the **Apply** button on the Band List box. The instrument automatically updates the values of the **Start Frequency** and **Stop Frequency** according to the selected band.

> **NOTE**
>
> Frequency changes after calibration affect the calibration status. If changed within the registered bands, the status turns into CAL ON (I) and it does not require re-calibration. If changed off the registered band, the status turns into CAL OFF and it requires re-calibration.

Amplitude

You can set maximum and minimum values of the Y-scale manually by setting the Top and Bottom amplitudes or restore the instrument's default full scale defined for each measurement mode. You can also optimize the Y-scale automatically so that an entire trace can be displayed on the measurement chart. Adjusting Y-scale does not affect calibration status.

1 Tap the **Menu (** ☰ **)** key on the side bar and tap **Amplitude**.

2 Input the values of **Top** and **Bottom** amplitudes using the on-screen keyboard and tap **Apply**. The entered values become the maximum and minimum values for the Y-scale.

3 To restore the instrument's default range for the Y-scale, tap **Full Scale**. The amplitude range for this measurement mode is **0 to 30 dB**.

> **NOTE**
>
> You can also tap **Auto Scale(** ⇳ **)** any time you need to view the entire trace on the measurement chart. The instrument automatically optimizes the maximum and minimum values of the Y-scale to display the entire trace and the limit.

General parameters

You can select options for Data Points, Interference Rejection, and Bias Tee.

1 Tap the **Menu (** ☰ **)** key on the side bar and tap **General**.

2 To set the measurement resolution, select the **Data Points** option from the choices: **126**, **251**, **501**, **1001** and **2001.**

> **NOTE**
>
> Default setting is 1001. It is recommended that you select high resolution data points only for an instance of measuring wide frequency bands or requiring precise measurement data.
>
> The larger number you choose, the higher resolution you get and the longer the instrument takes to sweep and display results. For example, selecting 501 data points provides twice as many measurement points as 251, but it may take twice longer to sweep and display the trace than choosing 251 data points. Changing data points does not affect calibration status.

3 To enable the **Interference Rejection** feature, select **On**.

> **NOTE**
>
> Default setting is **Off**. It is recommended to use this feature only when you suspect interfering signals in the area as it slows down measurement.

4 *For users with the Bias Tee installed.* To use the Bias Tee, Select **On** for the **Bias Voltage** and input a value between **12** and **30** with 1 V step, as you desire. Tap **Apply** to save the changes.

> **NOTE**
>
> If you have set this **Bias Voltage** to **On**, the instrument will supply a DC bias of set level (12 – 30 V) from the **SMA** port to an external bias-tee device.

Performing calibration

Perform the O-S-L Calibration by tapping the **Cal** icon in the right side bar. The instrument displays on-screen instructions for you to follow through.

Making a measurement

Once the O-S-L calibration is done, the instrument is now ready to make a cable loss measurement.

Procedure

1 Disconnect the calibration kit from the calibration point.

2 Connect the calibration kit's SHORT standard.

3 Your measurement result is displayed on the screen in real time.

> **NOTE**
>
> Do not change the connected port extension cable or frequency settings, or it may cause a measurement error.

Analyzing measurement results

You can use the Marker, Peak, Trace, Limit, Hold and Auto Scale hard keys and Zoom Zone function for your analysis of the results. You can also use Quick Save, Save and Load functions. See "Analysis" and "Operation" for details.

1 port cable loss measurement screen (single layout)
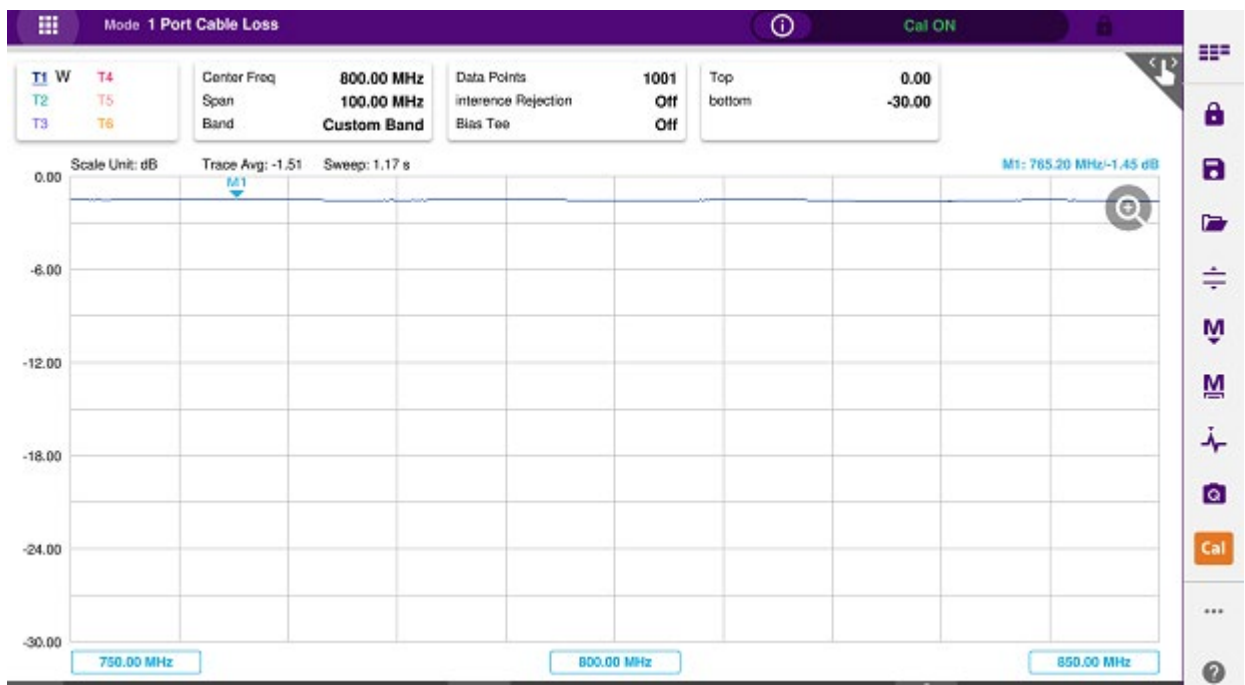
1 port cable loss measurement screen (zoom zones)

1-Port Phase Testing

Introduction

This chapter provides instructions on how to perform 1 Port Phase measurements to tune DUT's impedance matching and phase match cables. Topics discussed in this chapter are as follows:

- Introducing 1-port phase measurements
- Preparing for a measurement
- Making a measurement

Introducing 1-port phase measurements

You can use 1 Port Phase mode to measure S11 phase when you want to tune antennas and phase match cables.

1 port phase measurement screen

Preparing for a measurement

Selecting measurement mode

1   Tap **Single** under the **Mode & Measure**.

2   Double-tap the **1 Port Phase** ( ) icon.

> **NOTE**
>
> You can choose two measurement modes from each window in the **Horizontal** or **Vertical** tab if you want to view dual measurements displayed on one screen.

Setting parameters

Frequency

You can manually set a frequency band to be measured by entering start and stop frequencies or center and span frequencies. You can also select a frequency band from the band list stored in the instrument. It is desirable to set the frequency to a value that covers a normal range of the measurement with enough margins.

1   Tap the **Menu (** **)** key on the side bar and tap **Frequency**.

2   Input the values of **Start Frequency**, **Stop Frequency**, **Center Frequency**, **Span Frequency** using the on-screen keyboard and tap **Apply**.

3   To select a band:

    a   Tap the **Band List** then it displays a list of standard bands stored in the instrument and custom bands created in the JDViewer.

    b   Tap your choice from the list.

    c   Tap the **Apply** button on the Band List box. The instrument automatically updates the values of the **Start Frequency** and **Stop Frequency** according to the selected band.

> **NOTE**
>
> Frequency changes after calibration affect the calibration status. If changed within the registered bands, the status turns into CAL ON (I) and it does not require re-calibration. If changed off the registered band, the status turns into CAL OFF and it requires re-calibration.

Amplitude

You can set maximum and minimum values of the Y-scale manually by setting the Top and Bottom amplitudes or restore the instrument's default full scale defined for each measurement mode. You can also optimize the Y-scale automatically so that an entire trace can be displayed on the measurement chart. Adjusting Y-scale does not affect calibration status.

1 Tap the **Menu (** ≡ **)** key on the side bar and tap **Amplitude**.

2 Input the values of **Top** and **Bottom** amplitudes using the on-screen keyboard and tap **Apply**. The entered values become the maximum and minimum values for the Y-scale.

3 To restore the instrument's default range for the Y-scale, tap **Full Scale**. The amplitude range for this measurement mode is **-180 to 180 Degree**.

> **NOTE**
>
> You can also tap **Auto Scale(** ≑ **)** any time you need to view the entire trace on the measurement chart. The instrument automatically optimizes the maximum and minimum values of the Y-scale to display the entire trace.

General parameters

You can select options for Data Points, Interference Rejection, and Bias Tee.

1 Tap the **Menu (** ≡ **)** key on the side bar and tap **General**.

2 To set the measurement resolution, select the **Data Points** option from the choices: **126**, **251**, **501**, **1001** and **2001.**

> **NOTE**
>
> Default setting is 1001. It is recommended that you select high resolution data points only for an instance of measuring wide frequency bands or requiring precise measurement data.
>
> The larger number you choose, the higher resolution you get and the longer the instrument takes to sweep and display results. For example, selecting 501 data points provides twice as many measurement points as 251, but it may take twice longer to sweep and display the trace than choosing 251 data points. Changing data points does not affect calibration status.

3 To enable the **Interference Rejection** feature, select **On**.

> **NOTE**
>
> Default setting is **Off**. It is recommended to use this feature only when you

suspect interfering signals in the area as it slows down measurement.

4 *For users with the Bias Tee installed.* To use the Bias Tee, Select **On** for the **Bias Voltage** and input a value between **12** and **30** with 1 V step, as you desire. Tap **Apply** to save the changes.

> **NOTE**
>
> If you have set this **Bias Voltage** to **On**, the instrument will supply a DC bias of set level (12 – 30 V) from the **SMA** port to an external bias-tee device.

Performing calibration

Perform the O-S-L Calibration by tapping the **Cal** icon in the right side bar. The instrument displays on-screen instructions for you to follow through.

Making a measurement

Once the O-S-L calibration is done, the instrument is now ready to make a cable loss measurement.

Procedure

1 Disconnect the calibration kit from the calibration point.

2 Connect an antenna or feed line to the calibration point, which is usually at the extension cable end if used.

3 Your measurement result is displayed on the screen in real time.

> **CAUTION**
>
> Do not apply or connect power exceeding +30 dBm to the **Reflection / RF Out** port. When the input signal power is greater than +30 dBm, it may cause a damage to the CAA module and instrument.

> **NOTE**
>
> Do not change the connected port extension cable or frequency settings, or it may cause a measurement error.

> ⚠️ **WARNING**
>
> Do not attempt to connect the instrument to the antenna when there is a risk of lightning. Electric shock may cause malfunction of or damage to the instrument.

Analyzing measurement results

You can use the Marker, Peak, Trace, Limit, Hold and Auto Scale hard keys and Zoom Zone function for your analysis of the results. You can also use Quick Save, Save and Load functions. See "Analysis" and "Operation" for details.

1 port phase measurement screen (single layout)
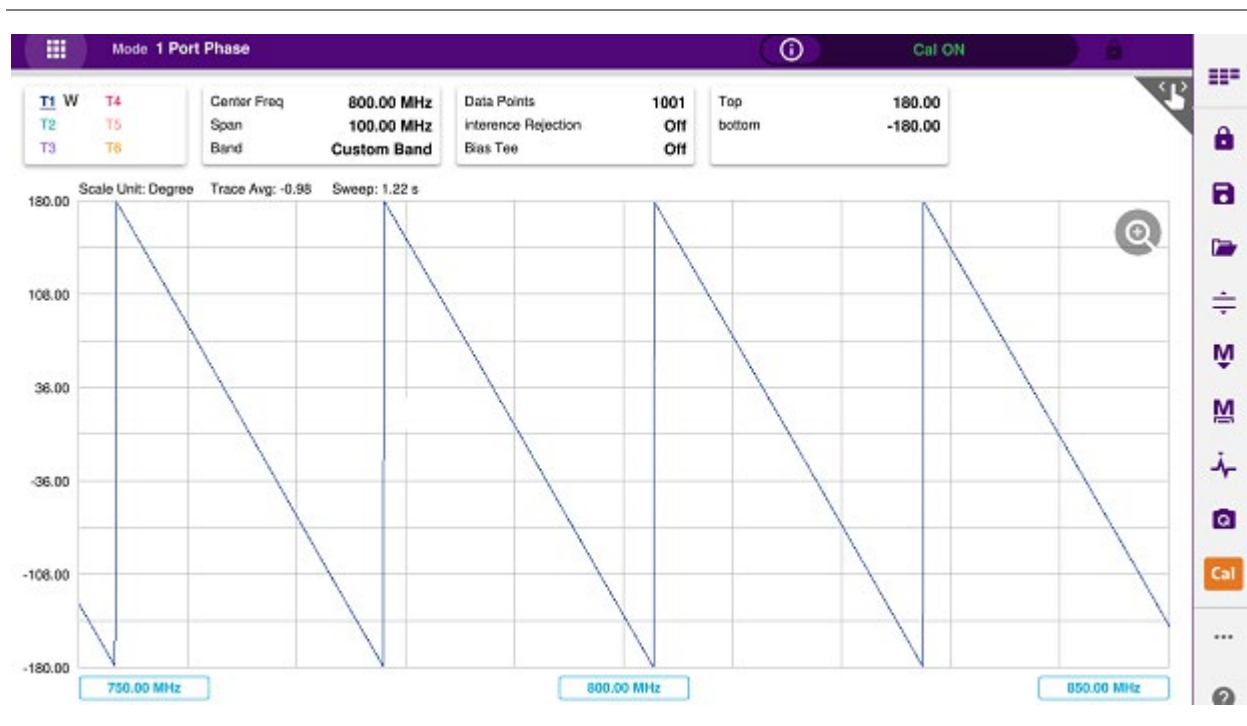
Smith Chart Testing

Introduction

This chapter provides instructions on how to perform reflection measurements in Smith Chart. Topics discussed in this chapter are as follows:

- Introducing Smith chart measurements
- Preparing for a measurement
- Making a measurement

Introducing Smith chart measurements

You can view reflection measurements in Smith Chart, which is used to display impedance matching characteristics in the cable and antenna system as well as filter and duplexers devices. It helps you graphically identify problems with transmission lines.

Smith chart measurement screen
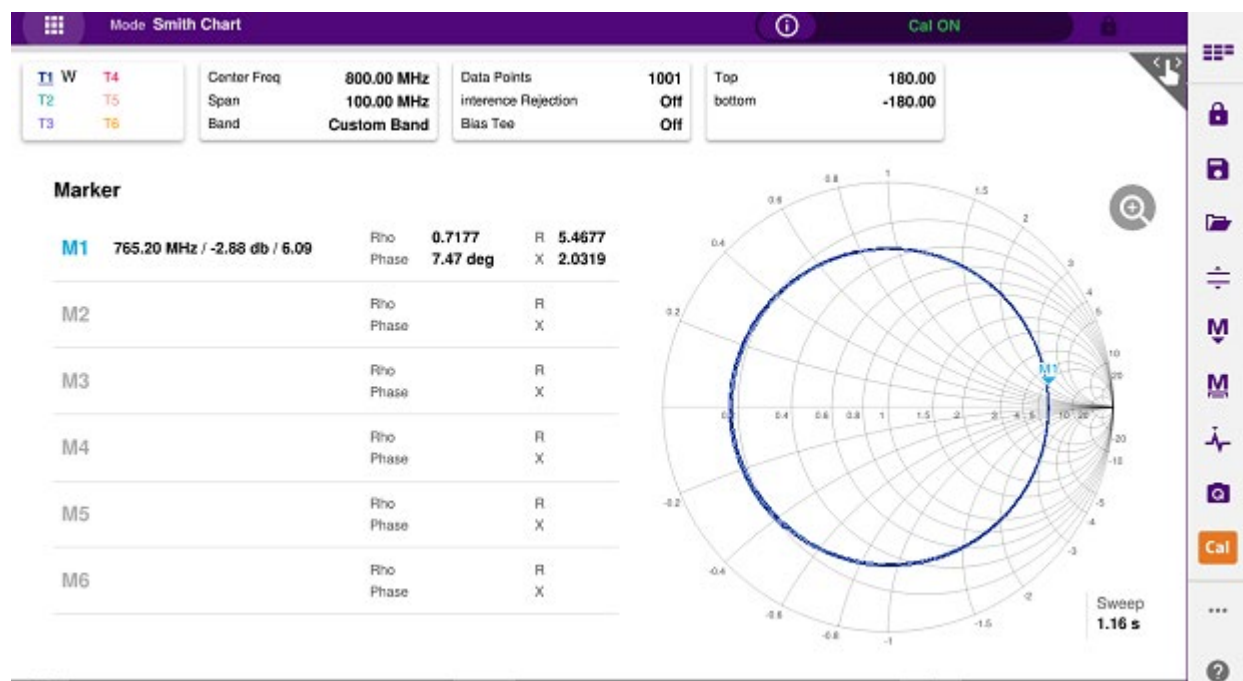
Preparing for a measurement

Selecting measurement mode

1   Tap **Single** under the **Mode & Measure**.

2   Double-tap the **Smith Chart** (   ) icon.

> **NOTE**
>
> You can choose two measurement modes from each window in the **Horizontal** or **Vertical** tab if you want to view dual measurements displayed on one screen.

Setting parameters

Frequency

You can manually set a frequency band to be measured by entering start and stop frequencies or center and span frequencies. You can also select a frequency band from the band list stored in the instrument. It is desirable to set the frequency to a value that covers a normal range of the measurement with enough margins.

1 Tap the **Menu (** ☰ **)** key on the side bar and tap **Frequency**.

2 Input the values of **Start Frequency**, **Stop Frequency**, **Center Frequency**, **Span Frequency** using the on-screen keyboard and tap **Apply**.

3 To select a band:

    a Tap the **Band List** then it displays a list of standard bands stored in the instrument and custom bands created in the JDViewer.

    b Tap your choice from the list.

    c Tap the **Apply** button on the Band List box. The instrument automatically updates the values of the **Start Frequency** and **Stop Frequency** according to the selected band.

> **NOTE**
>
> Frequency changes after calibration affect the calibration status. If changed within the registered bands, the status turns into CAL ON (I) and it does not require re-calibration. If changed off the registered band, the status turns into CAL OFF and it requires re-calibration.

General parameters

You can select options for Data Points, Interference Rejection, and Bias Tee.

1 Tap the **Menu (** ☰ **)** key on the side bar and tap **General**.

2 To set the measurement resolution, select the **Data Points** option from the choices: **126**, **251**, **501**, **1001** and **2001.**

> **NOTE**
>
> Default setting is 1001. It is recommended that you select high resolution data points only for an instance of measuring wide frequency bands or requiring precise measurement data.
>
> The larger number you choose, the higher resolution you get and the longer the instrument takes to sweep and display results. For example, selecting 501 data points provides twice as many measurement points as 251, but it may take twice longer to sweep and display the trace than choosing 251 data points. Changing data points does not affect calibration status.

3 To enable the **Interference Rejection** feature, select **On**.

> **NOTE**
>
> Default setting is **Off**. It is recommended to use this feature only when you suspect interfering signals in the area as it slows down measurement.

4 *For users with the Bias Tee installed.* To use the Bias Tee, Select **On** for the **Bias Voltage** and input a value between **12** and **30** with 1 V step, as you desire. Tap **Apply** to save the changes.

> ▷ **NOTE**
>
> If you have set this **Bias Voltage** to **On**, the instrument will supply a DC bias of set level (12 – 30 V) from the **SMA** port to an external bias-tee device.

Performing calibration

Perform the O-S-L Calibration by tapping the **Cal** icon in the right side bar. The instrument displays on-screen instructions for you to follow through.

Making a measurement

Once the O-S-L calibration is done, the instrument is now ready to make a cable loss measurement.

Procedure

1 Disconnect the calibration kit from the calibration point.

2 Connect an antenna or feed line to the calibration point, which is usually at the extension cable end if used.

3 Your measurement result is displayed on the screen in real time.

> ⚠ **CAUTION**
>
> Do not apply or connect power exceeding +30 dBm to the **Reflection / RF Out** port. When the input signal power is greater than +30 dBm, it may cause a damage to the CAA module and instrument.

> ▷ **NOTE**
>
> Do not change the connected port extension cable or frequency settings, or it may cause a measurement error.

Analyzing measurement results

You can use the Marker, Peak, Trace, Limit, Hold and Auto Scale hard keys and Zoom Zone function for your analysis of the results. You can also use Quick Save, Save and Load functions. See "Analysis" and "Operation" for details.

Smith chart measurement screen (single layout)
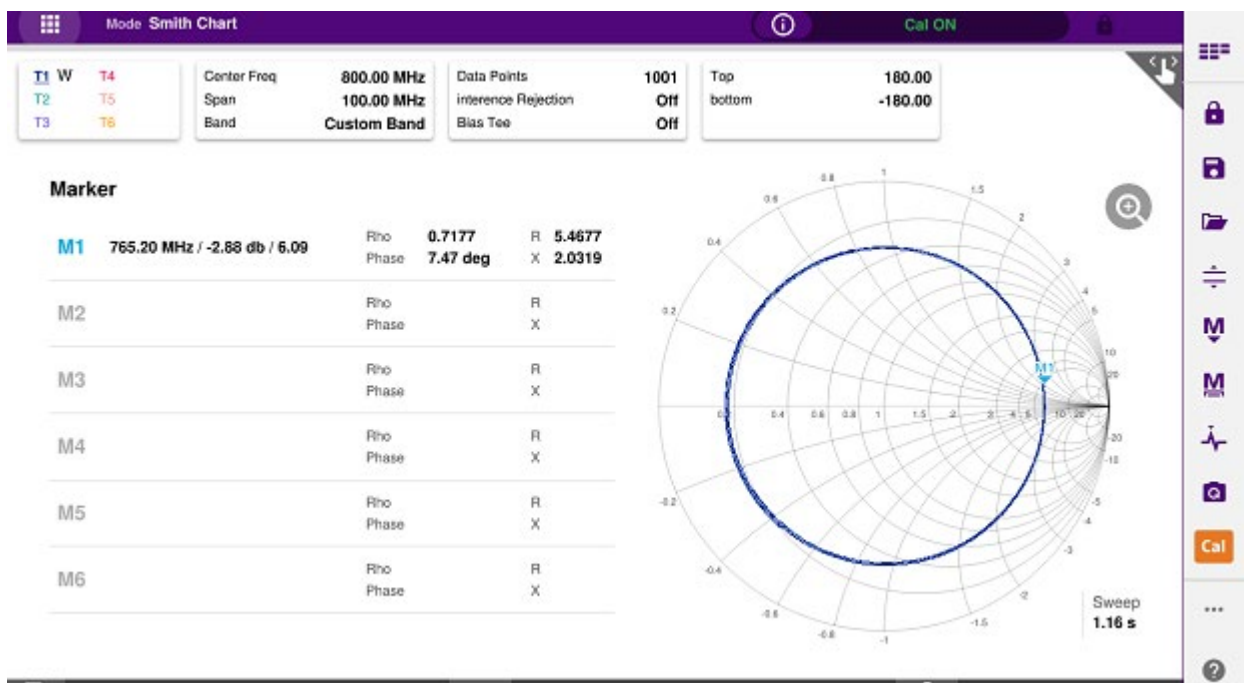
DTF VSWR & Smith chart measurement screen (vertical layout)
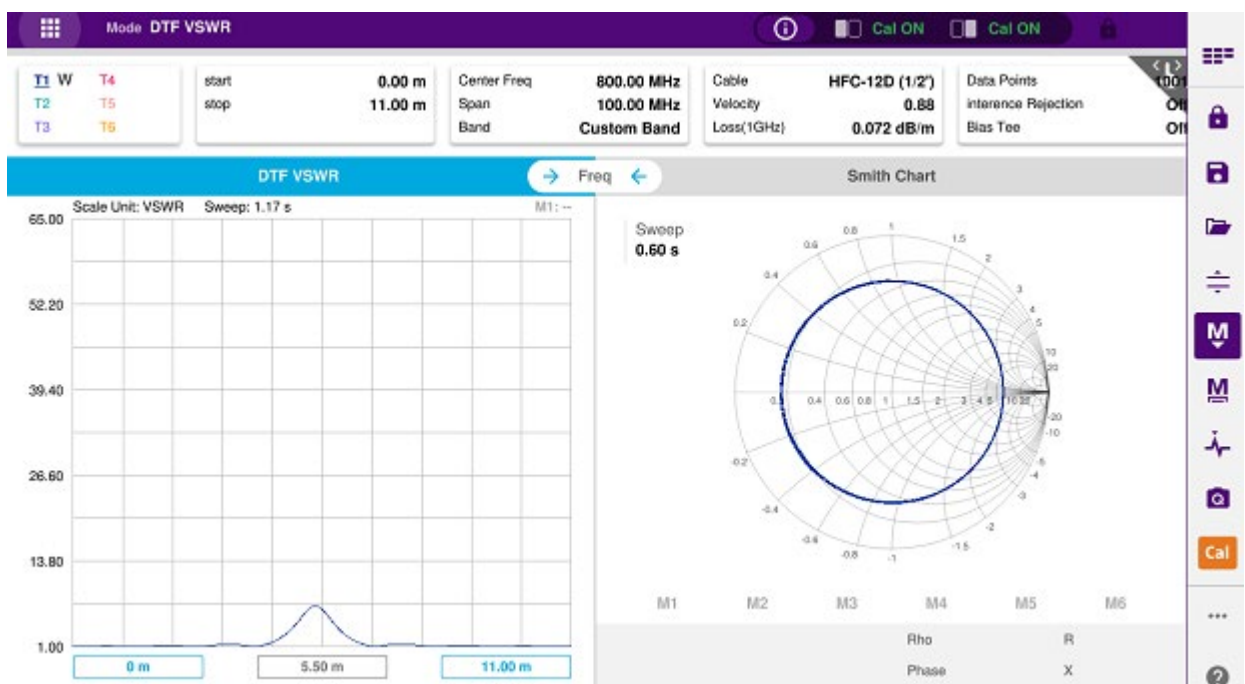
2-Port Transmission Testing

Introduction

This chapter provides instructions on how to perform the 2-Port Transmission measurement. It is used to quantify signal gain or loss in a cable or other devices with connecting both ends of the cable or device to the instrument. Topics discussed in this chapter are as follows:

- Introducing 2-port transmission measurements
- Preparing for a measurement
- Making a measurement

Introducing 2-port transmission measurement

The 2 Port Transmission measures the level of the signal attenuation of passive RF elements such as cables and filters, or the level of gains of active RF elements such as amplifiers. The frequency band to measure the characteristics of a cable must be calibrated before performing the insertion loss/gain measurement.

Gain

The gain is the gain resulting from the insertion of a device in a transmission line, expressed as the ratio of the signal power delivered to that part of the line following the device to the signal power delivered to that same part before insertion.

Insertion loss

The insertion loss is the loss of the transmitted signal power resulting from the insertion of a device in a transmission line. It is usually expressed relative to the signal power delivered to that same part before insertion. In most systems, insertion loss is introduced by things such as connectors, splitters, or couplers.

The insertion loss of a device (which may be a whole line) may also be referred to as attenuation. Line terminations play an important part in the insertion loss because they reflect some of the power. Apart from this, it is clear that not all of the power that is sent in to the line at one end appears at the other. This is because of radiation losses, resistive losses in the conductor as well as losses in the surrounding dielectric. The loss resulted from inserting a transmission line between a source and a load is called the insertion loss of the line.

If the power transmitted by the source is PT and the power received by the load is PR, then the insertion loss is given by PR divided by PT. For maximum power transfer the insertion loss should be as small as possible. In other words, the ratio PR/PT should be as close to one as possible, which in decibels means as close to 0 dB as possible.

2 port transmission measurement screen
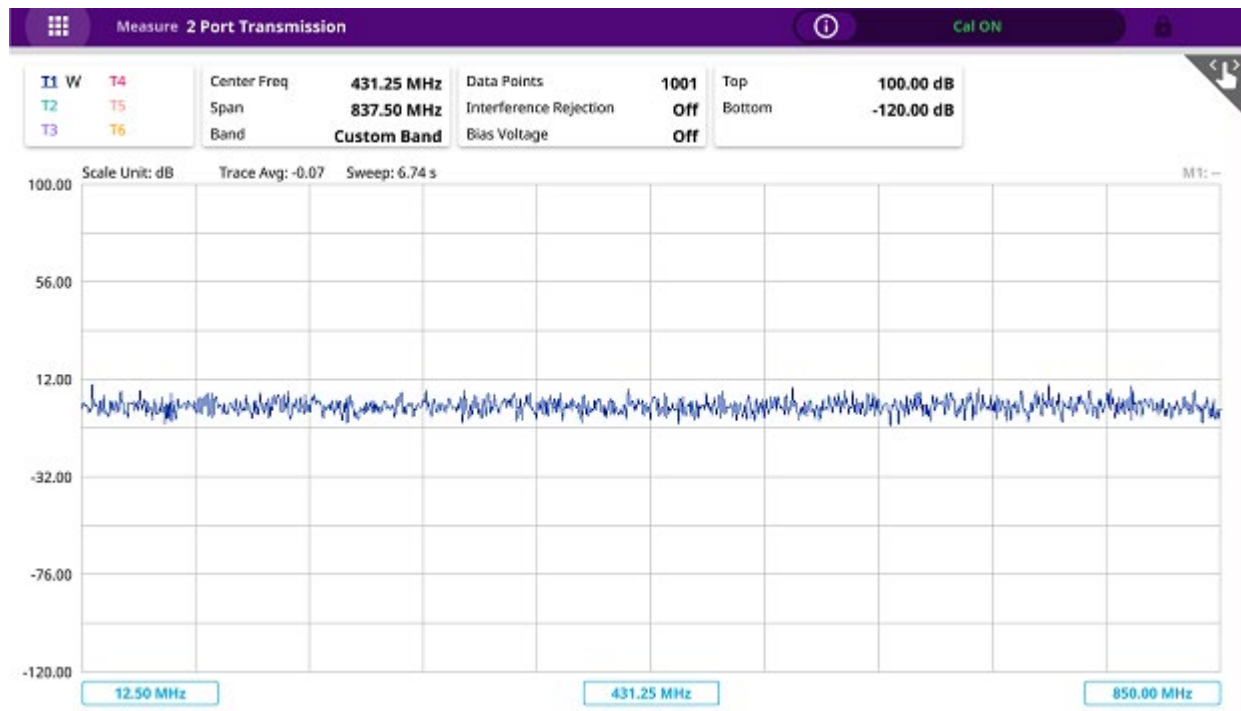
Preparing for a measurement

Selecting measurement mode

1 Tap **Single** under the **Mode & Measure**.

2 Double-tap the **2 Port Transmission** ( ) icon.

> **NOTE**
>
> You can choose two measurement modes from each window in the **Horizontal** or **Vertical** tab if you want to view dual measurements displayed on one screen.

Setting parameters

Frequency

You can manually set a frequency band to be measured by entering start and stop frequencies or center and span frequencies. You can also select a frequency band from the band list stored in the instrument. It is desirable to set the frequency to a value that covers a normal range of the measurement with enough margins.

1 Tap the **Menu (** ☰ **)** key on the side bar and tap **Frequency**.

2 Input the values of **Start Frequency**, **Stop Frequency**, **Center Frequency**, **Span Frequency** using the on-screen keyboard and tap **Apply**.

3 To select a band:

    a Tap the **Band List** then it displays a list of standard bands stored in the instrument and custom bands created in the JDViewer.

    b Tap your choice from the list.

    c Tap the **Apply** button on the Band List box. The instrument automatically updates the values of the **Start Frequency** and **Stop Frequency** according to the selected band.

> **NOTE**
>
> Frequency changes after calibration affect the calibration status. If changed within the registered bands, the status turns into CAL ON (I) and it does not require re-calibration. If changed off the registered band, the status turns into CAL OFF and it requires re-calibration.

Amplitude

You can set maximum and minimum values of the Y-scale manually by setting the Top and Bottom amplitudes or restore the instrument's default full scale defined for each measurement mode. You can also optimize the Y-scale automatically so that an entire trace can be displayed on the measurement chart. Adjusting Y-scale does not affect calibration status.

1 Tap the **Menu (** ☰ **)** key on the side bar and tap **Amplitude**.

2 Input the values of **Top** and **Bottom** amplitudes using the on-screen keyboard and tap **Apply**. The entered values become the maximum and minimum values for the Y-scale.

3 To restore the instrument's default range for the Y-scale, tap **Full Scale**. The amplitude range for this measurement mode is **-120 to 100 dB**.

> **NOTE**
>
> You can also tap **Auto Scale(** ⯅⯆ **)** any time you need to view the entire trace on the measurement chart. The instrument automatically optimizes the

> maximum and minimum values of the Y-scale to display the entire trace and
> the limit.

General parameters

You can select options for Data Points, Interference Rejection, and Bias Tee.

1 Tap the **Menu (** ≡ **)** key on the side bar and tap **General**.

2 To set the measurement resolution, select the **Data Points** option from the choices: **126**, **251**, **501**, **1001** and **2001**.

> **NOTE**
>
> Default setting is 1001. It is recommended that you select high resolution data points only for an instance of measuring wide frequency bands or requiring precise measurement data.
>
> The larger number you choose, the higher resolution you get and the longer the instrument takes to sweep and display results. For example, selecting 501 data points provides twice as many measurement points as 251, but it may take twice longer to sweep and display the trace than choosing 251 data points. Changing data points does not affect calibration status.

3 You can choose the **Output Power** between **-30 dBm** and **5 dBm** by 1 dB step.

> **NOTE**
>
> Changing the output power level after calibration affects the calibration status and it requires you to perform a new calibration.

4 To set the number of measurements to be averaged, tap **Average** and enter a value between 1 and 100.

5 To enable the **Interference Rejection** feature, select **On**.

> **NOTE**
>
> Default setting is **Off**. It is recommended to use this feature only when you suspect interfering signals in the area as it slows down measurement.

6 *For users with the Bias Tee installed.* To use the Bias Tee, Select **On** for the **Bias Voltage** and input a value between **12** and **30** with 1 V step, as you desire. Tap **Apply** to save the changes.

> **NOTE**
>
> If you have set this **Bias Voltage** to **On**, the instrument will supply a DC bias of set level (12 – 30 V) from the **SMA** port to an external bias-tee device.

Performing calibration

Perform the O-S-L-Thru Calibration by tapping the **Cal** icon in the right side bar. The instrument displays on-screen instructions for you to follow through.

Making a measurement

Once the O-S-L calibration is done, the instrument is now ready to make a measurement.

Procedure

1   Disconnect the calibrated extension cable from the **Reflection / RF Out** port of the instrument.

2   Connect your DUT between the extension cable and the **Reflection / RF Out** port.

3   Your measurement result is displayed on the screen in real time.

> **NOTE**
>
> Do not change the connected port extension cable or frequency settings, or it may cause a measurement error.

Analyzing measurement results

You can use the Marker, Peak, Trace, Limit, Hold and Auto Scale hard keys and Zoom Zone function for your analysis of the results. You can also use Quick Save, Save and Load functions. See "Analysis" and "Operation" for details.

2 port transmission measurement screen
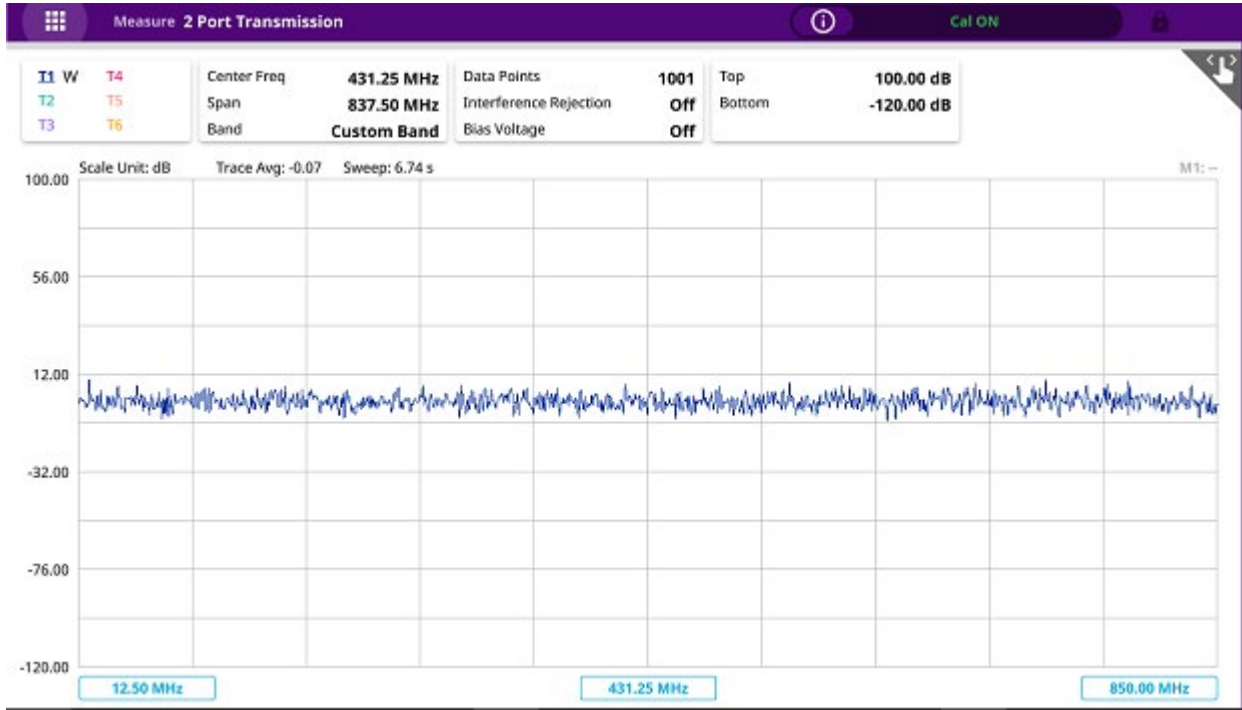
CW Signal Generating

Introduction

This chapter provides instructions on how to use the CW Signal Generator function. Topics discussed in this chapter are as follows:

- Introducing RF source
- Using RF source

Introducing RF source

If RF CW Source option (CA5000-S006) is installed on your instrument, you can use the RF Source feature to provide different power levels as like using a CW signal generator.

RF source screen
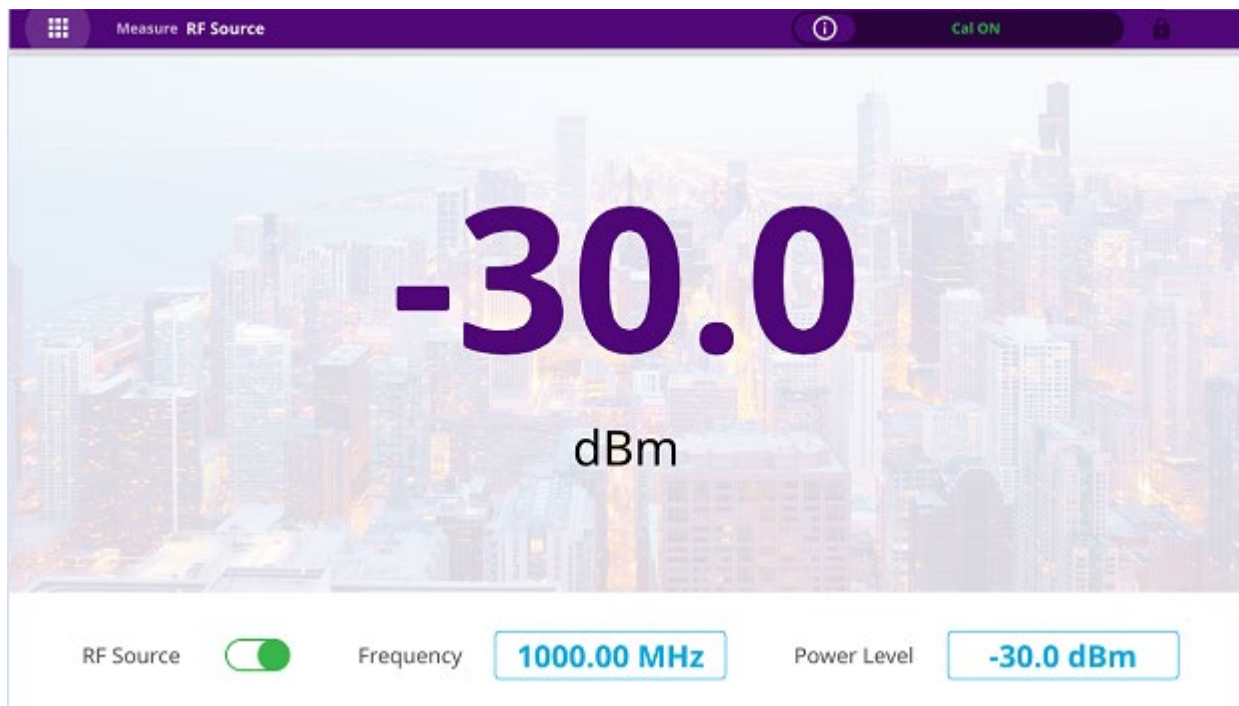
Using RF source

Selecting measurement mode

1 Tap **Single** under the **Mode & Measure**.

2 Double-tap the **RF Source** ( ) icon.

> **NOTE**
>
> You can choose two measurement modes from each window in the **Horizontal** or **Vertical** tab if you want to view dual measurements displayed on one screen.

Turing on RF source

You can turn on the RF Source feature to generate a CW signal of different output power levels.

1 Tap **Frequency box** and input a value within the frequency range of your instrument between **12.5 MHz and 6 GHz** by using the on-screen keyboard and tap **Apply**.

2 To set the output level of the CW signal to be injected, tap **Power Level box** and enter a value within the output range for the frequency you have set between **-30 dBm** and **10 dBm.**

3 To start generating the set signal, tap **RF Source oval** to green. To stop generating the signal, tap **RF Source oval** to gray.

CAA Check

Introduction

This chapter provides instructions on how to use the CAA Check function. Topics discussed in this chapter are as follows:

- Introducing CAA Check measurements
- Preparing for a measurement
- Setting a test
- Saving a profile
- Loading a profile
- Running a test
- Creating a report

Introducing CAA Check measurement

CAA Check is a standard feature that you can use on CAA06M Cable and Antenna Analyzer. It enables you to create and run task systematically as defined in the testing sequence with minimal manual work and intervention.

You can create a configuration profile for routine and repetitive testing beforehand in this CAA Check mode and reuse the file to achieve the following:

- Reduced testing time and workload
- Systematic, automatic, and reliable testing with minimal manual work
- Consistent and reliable test results from any technicians with different skill level

CAA Check landing screen
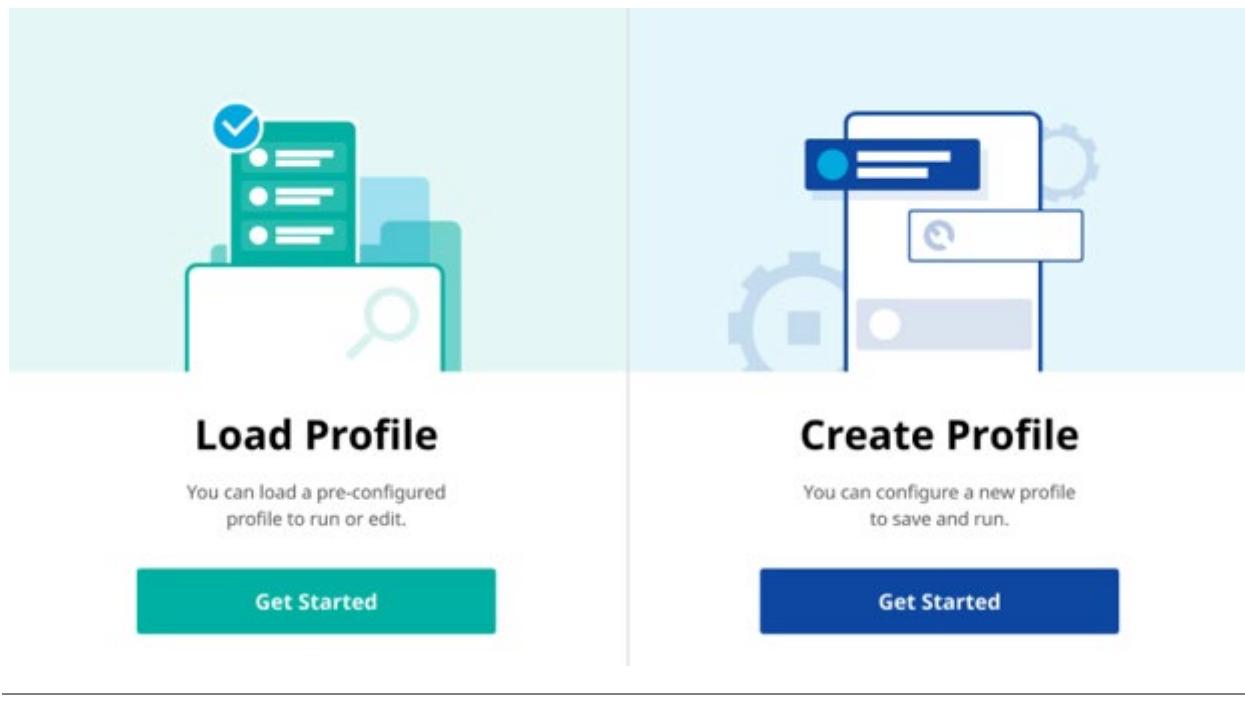
Preparing for a measurement

Selecting measurement mode

1   Tap **Single** under the **Mode**.

2   Double-tap the **CAA Check** ( ) icon. Once tapped, the CAA Check landing page appears.

> **NOTE**
>
> CAA Check is only available in **Single** tab and viewing dual measurement display is not available.

Adding a task

You can create tasks to be tested by tapping the **Get Started** button in the **Create Profile** pane on the right.

The CAA Check lets you create a user-defined task, edit, move, and delete tasks easily using the icons below.

Icon	Name	Description
+	**Add**	Tap the **Add** icon to add a task. You can add up to
∨	**Move down**	Tap to move the added task down.
∧	**Move up**	Tap to move the added task up.
✎	**Edit**	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 task. The confirmation dialog box appears. Once the task is deleted, you cannot recover it.

1 Tap the **Add** button to add a task for testing.
The Add Task pop-up window appears with each measurement.

2 Tap to select a measurement you want to test.

3 Tap the **Close** button to apply your choice.

4 *Optional.* Tap to switch the **Troubleshooting** to on (green) or off (gray).
You can add Troubleshooting under the selected task as a sub-task.

> **NOTE**
>
> You can add several troubleshooting steps under the parent task and it only works when the parent task fails. Once finished troubleshooting, go back to your parent task.

Setting a test

Once you add a task, you will see three tabs, Parameter, Prompt, and Actions to be set on the right pane.

Setting parameters

Cable

You can select a cable from the list of cable names stored in the instrument.

1 Tap **Cable Name** and select a cable from the cable list pop-up window.
The instrument automatically changes the Propagation Velocity and Cable Loss values correspondent
to the selected cable's propagation velocity and cable loss. Default setting is HFC-12D (1/2").

2 Tap the **Propagation Velocity** and enter a value using the on-screen keyboard.

3 Tap the **Apply** button.

> **NOTE**
>
> Cable setting is available when you add a task for DTF VSWR or DTF Return
> Loss.

Frequency

You can manually set a frequency band to be measured by entering start and stop frequencies. It is
desirable to set the frequency to a value that covers a normal range of the measurement with enough
margins.

1 Input the values of **Start Frequency** and **Stop Frequency** using the on-screen keyboard.

2 Tap the **Apply** button.

Distance

You can manually set start and stop distance to be measured by entering start and stop distances. The
maximum measurable distance is dependent on the frequency you set. You can set any values within the
maximum measurable distance, but optimum resolution is achieved when you set the distance same as
the maximum measurable distance.

1 Input the values of **Start Distance** and **Stop Distance** using the on-screen keyboard.

2 Tap the **Apply** button.

> **NOTE**
>
> Distance setting is available when you add a task for DTF VSWR or DTF Return
> Loss.

Amplitude

You can set maximum and minimum values of the Y-scale manually by setting the Top and Bottom
amplitudes or restore the instrument's default full scale defined for each measurement mode. You can
also optimize the Y-scale automatically so that an entire trace can be displayed on the measurement
chart. Adjusting Y-scale does not affect calibration status.

1   Input the values of **Top** and **Bottom** amplitudes using the on-screen keyboard.

2   Tap the **Apply**.
The entered values become the maximum and minimum values for the Y-scale.

Limit

The Limit Line is a straight horizontal line that you can enable to analyze your measurement results.

1   Tap **Limit Value** and enter a pass/f ail threshold value using on-screen keyboard.

2   Tap the **Apply** button.

3   Tap **Limit Line** to select **On**.

The green limit line appears at the set value on the screen in case of pass.

4   Tap **Warning Value** to set the warning threshold and enter a threshold value using on-screen keyboard.

5   Tap the **Apply** button.

6   Tap **Warning Line** to select **On**.

The warning line appears at the set value on the screen.

Setting prompt

If you want to prompt a message on the measurement screen while running a test, you can select a prompt from the following three options.

1   **None** is no prompt message pops up while testing when selected.

2   **Connect 50 Ω LOAD at the end of DUT** is a default prompt and it pops up while testing when selected.

3   **Connect SHORT or OPEN at the end of DUT is prompted while testing when selected**.

4   **Custom** is a user-customized prompt that pops-up while testing when selected. You can also attach images on demand.

Setting actions

You can set actions for a test as the following:

1   Tap **New** or **Current if valid** for **Calibration**.
Tap New if you want a new OSL calibration, or tap Current if valid.

2   Tap to select a marker position.
You can easily find a peaks or valley on the trace, 4 peaks or valleys, and peak or valley between two markers.

- **None**: Searches no peak or valley

- **Peak**: Searches for the highest peak on the trace

- **4 Peaks**: Searches for four peaks with four Normal markers from M1 to M4 regardless of the previous marker setting

- **Valley**: Searches for the lowest peak (valley) on the trace

- **4 Valleys**: Searches for four valleys with four Normal markers from M1 to M4 regardless of the previous marker setting

3 Tap to select **Scale** from the three options.

- **Full**: Restores the instrument default scale defined for each measurement mode

- **Auto**: Views entire trace on the measurement chart. The instrument automatically optimizes the maximum and minimum values of the Y-scale to display the entire trace and the limit

- **Keep amplitude settings**: Keeps the instrument amplitude settings as it is.

Saving results from a task

You can specify a file name so that the instrument can automatically save results after running the task.

1 Tap the **File Name** field.
On-screen keyboard pops-up to enter a file name.

2 Input a file name using the on-screen keyboard and tap **Enter**.

3 Tap to select a **File Type** from **Trace**, **Screen**, or **CSV** on demand.

Saving a profile

Once you set all the parameters for a test, you can save it as a profile file.

1 Tap **Save Profile** at the bottom of the screen in the middle.

2 Tap the **File Name** field.
On-screen keyboard pops-up to enter a file name.

3 Input a file name using the on-screen keyboard and tap **Enter**.

4 Tap the **Save** button.
If you have saved a file with the same name, a pop-up message appears asking you to overwrite the file name or to save with a timestamp (YYYY-MM-DD HH:MM:SS).

Example of profile saving
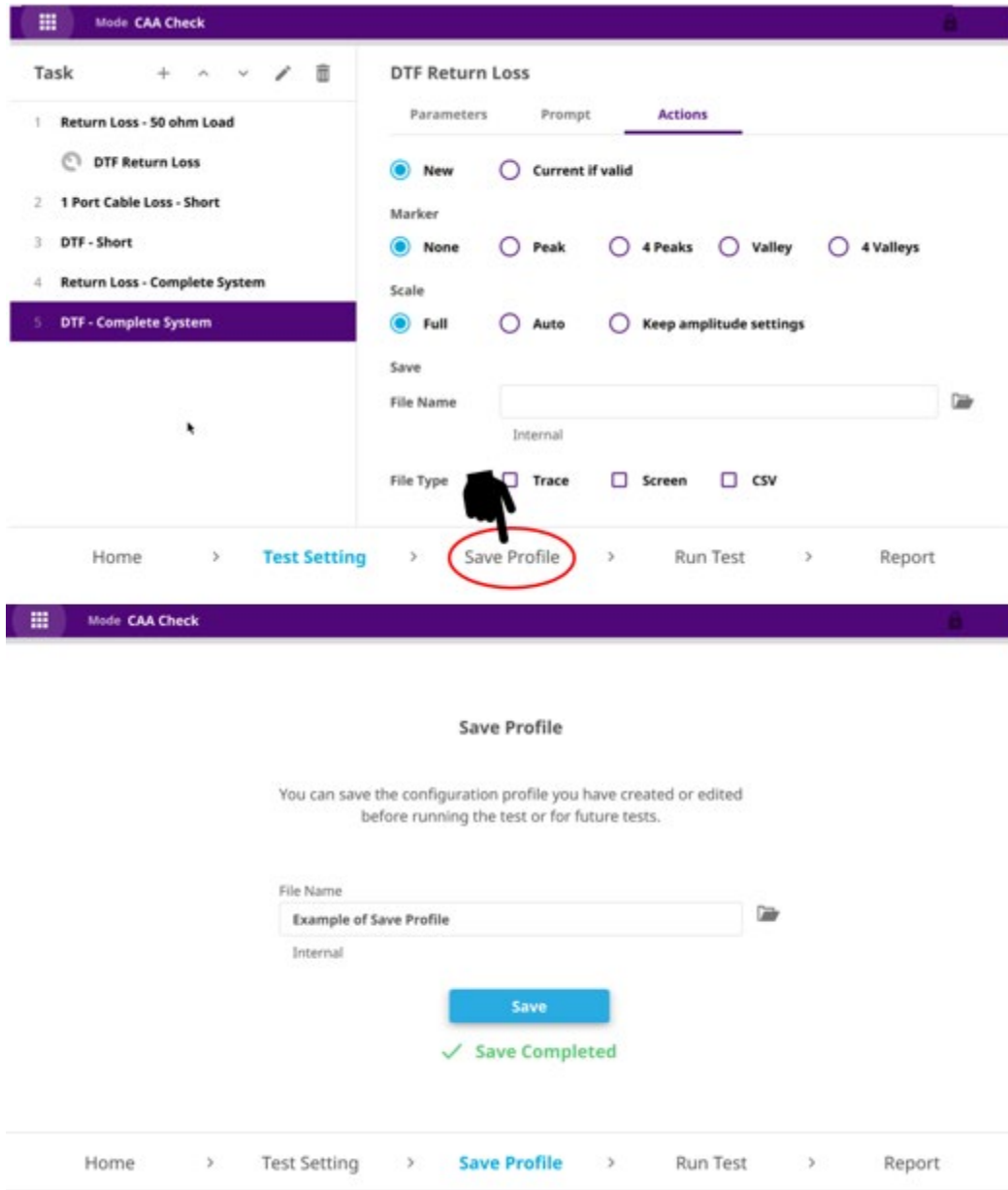
Loading a profile

You can directly create a new profile or load your saved profile before running a test. If you have any saved profiles in your instrument, you can load one by tapping the **Get Started** button in the Load Profile pane on the left.

The CAA Check lets you create a user-defined folder, select, copy, cut, paste, and delete profile files saved in the internal memory or in your USB memory drive. You can manage your profile 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.

1   Tap the file or folder that you want to load.
    If you want to load files in the folders, you need to tap the folder to see the saved files in it.

2   Tap the **Load** button to load files.
    You can load multiple profiles by selecting the files you want.

3   You will be directed to **Run Test** page.
    If you want to test, refer to <u>Running a test</u> and start testing.

Running a test

Once you have saved a profile file, you can run a test.

1   Tap **Run Test**.
    A table which shows a list of tasks, summary, status, retest and result appears.

2   Tap the **Start** button to start testing.
    All the added tasks are tested and you will see the number of tasks in progress with elapsed time.

3   Tap the **Stop** button to stop testing.
    If Stop is tapped, the testing will be stopped and the **Continue** and **Re-start** buttons appear.

4   *Optional.* Tap **Continue** to continue the stopped test or **Re-start** to start the testing from the first beginning.

> **NOTE**
>
> If you move to Home, Test Setting, or Save Profile in the middle of running a test, a pop-up message appears. Tap the **No** button to move without saving a report or tap the **Yes** button to move to Report and save it.

Example of running a test

> **NOTE**
>
> The **Live** button in light blue indicates that the test is in progress now. If you want to see the measurement (test) screen on live, tap the **View Test** button.

Example of stopping a test

While running a test, you will see the Settings, Status, Retest, and Result icons next to the added task. See the table below for definition.

Icon	Name	Description
🔍	Settings	Tap the **Settings** icon to see the summary of the test settings. A pop-up Settings window appears with its parameters previously set.
↻	Retest	Tap the **Retest** icon to test a added task one by one.
🖼	Result	Tap the **Result** icon to see the test result. It will direct you to the captured measurement (test) screen.

Creating a report

When all tests are completed, the test results are transferred to Job Manager automatically. If you want to add more information to the result, you can create a test report right away on the instrument. The report will be created as .PDF format and saved on your instrument's storage.

1 Tap **Report**.

2 Fill in the information as needed by using the on-screen keyboard.

- **Customer**: Customer's name

- **Technician ID**: Tester's ID in the cell site

- **Work Order ID**: Work order identification

- **Test Location**: Summary of the site where the test was proceeded

- **Radio**: Radio setting

- **Band**: Band setting

- **Cell Site Info**: Address of the site location where you started the test

- **Notes**: Notes to add remarks

- **File Name**: File name that you want to save

3 *Optional.* Tap **View report after creation** if you want.

4 *Optional.* Tap the **Preview** button to view the report before saving.

5 Tap the **Create Report** button.

> **NOTE**
>
> If you have activated a job and launched the CAA Check in Job Manager, information in the Job Manager will be pre-populated.

Analysis

Introduction

This chapter provides instructions to analyze measurement results. Topics discussed in this chapter are as follows:

- Using zoom zones
- Using alternate DTF band
- Using markers
- Searching for peak or valley
- Displaying traces
- Setting test limits
- Holding a measurement

Using zoom zones

User-definable zones on frequency sub-bands enable visual identification of uplink and downlink frequencies for compliance verification with a single measurement window.

You can use the Zoom function to have a closer look at the user-definable zoom zones in different windows up to four zones. All the four zoom zones are turned off by default. It is available for Reflection, 1 Port Cable Loss, 1 Port Phase and 2 Port Transmission measurement in the single layout view.

Setting sub-band frequency

1. Tap the **Menu ( )** key on the side bar and tap **Zoom**.
2. To enable a zoom zone, select **On** in the **Zone [1|2|3|4]** pane.
3. Input the start and stop frequencies for each zoom zone by touching zone start and stop frequency boxes.
4. To disable a zoom zone, select **Off** for the zoom zone.

Tips for zoom zones

1   The top half of the screen shows the chart with the trace for the full O-S-L calibration band while the bottom half of the screen displays zoom zones that you have enabled in the Zoom setting.

2   Individual zoom zones on the screen are independent from one other. Function keys correspond only with the selected zone, which is called as the "active" chart with outside borders surrounded.

Example of zoom zones screen
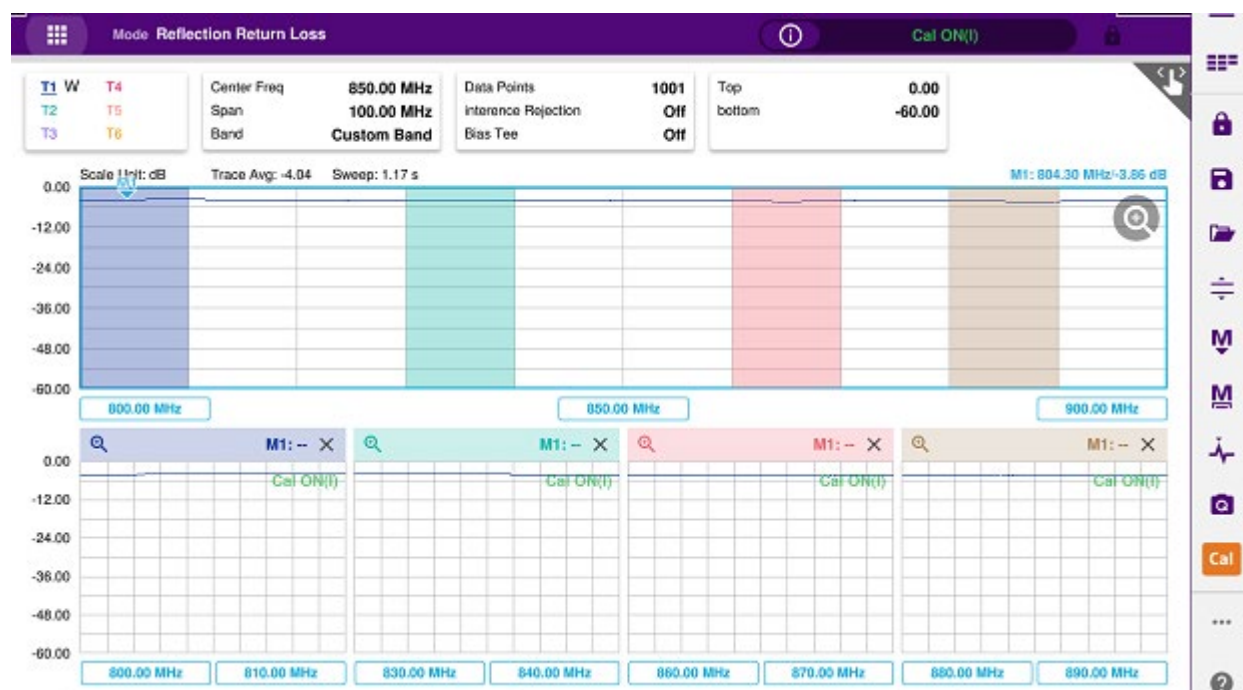
Using alternate DTF band

You can use the **Alt DTF Band** that is available only in DTF measurements after a calibration to scale down of a specific sub-band without a need of an additional calibration.

Two independent sweeps can be performed, for example, one Reflection measurement and the other DTF measurement.

Setting alternate DTF band

1   Tap the **Menu (≡)** key on the side bar and tap **Alt DFT Band**. If you have dual displays on the screen, make sure to select a DTF measurement display for which you like to set. The alternate DTF band setting window appears.

2   Select **On** for the **Alt DTF Band** to enable or **Off** to disable. Input the values of **Start Frequency**, **Stop Frequency**, **Center Frequency**, **Span Frequency** using the on-screen keyboard.

> ▷ **NOTE**
>
> Minimum value for the Alternate Span is 2% of what you have set for the Span in the Frequency/Distance tab.

3   Input the **Start Distance** and **Stop Distance**.

4   The text "Alt DTF Band: On" appears at the top left corner of the DTF measurement plot.

Example of alternate DTF band
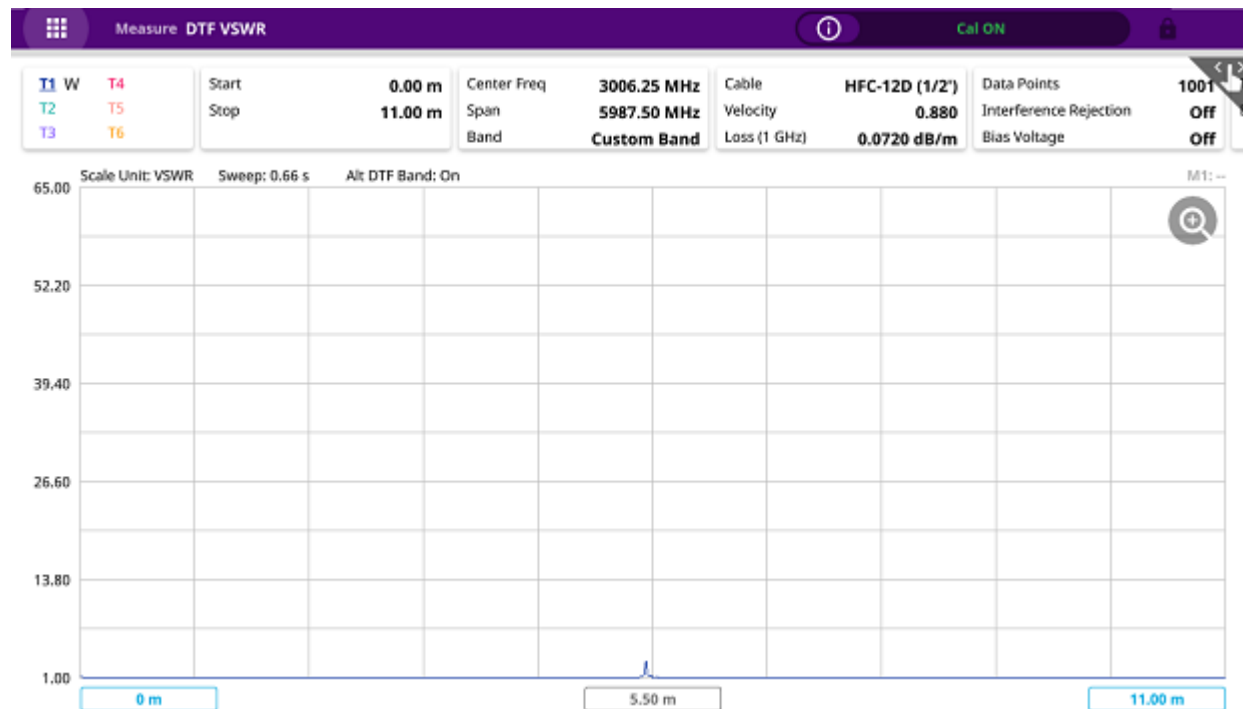
Using markers

You can have up to six markers on the measurement display simultaneously. The instrument displays the Marker menu in the side-bar on the screen. As you set a marker on the trace, you can see readouts of each marker position that is displayed in its marker screen key on the Marker screen menu bar.

A colorful marker indicates that the marker is the active marker now and you can manipulate it as you like including changing marker type or setting the marker off. The measurement display carries the active marker's position readouts at the top right corner on the display.

Setting a marker

1 Tap the marker menu ( ) on the side bar.

2 Tap one of the six marker screen keys (M1 to M6), which you like to position on the trace. The active marker's readout is displayed on the screen as shown in below screen capture.

3 To change the active marker type, tap the marker number screen key and then select the marker type option from the following choices:

  ▪ **Normal**: A Normal marker provides the reading of a marker position on the trace along with the marker number set between 1 and 6. When you select a marker screen key, the Normal marker type is set by default.

  ▪ **Delta**: A Delta marker 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 display the difference compared with the Delta marker. The reference position will be fixed. This setting is not used in the Smith Chart measurement mode.

  ▪ **Delta Pair**: A Delta Pair marker 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 display the difference compared with the Delta Pair marker. The reference position will vary as the trace changes. This setting is not used in the Smith Chart measurement mode.

4 Repeat the steps **2-3** to set more markers as needed. If there are two or more markers on the trace, you can change the active marker.

5 To set a marker as the active marker, simply tap the marker screen key. The color of the text in the marker's screen key changes from grey to blue to indicate the active marker.

Active marker and its readout
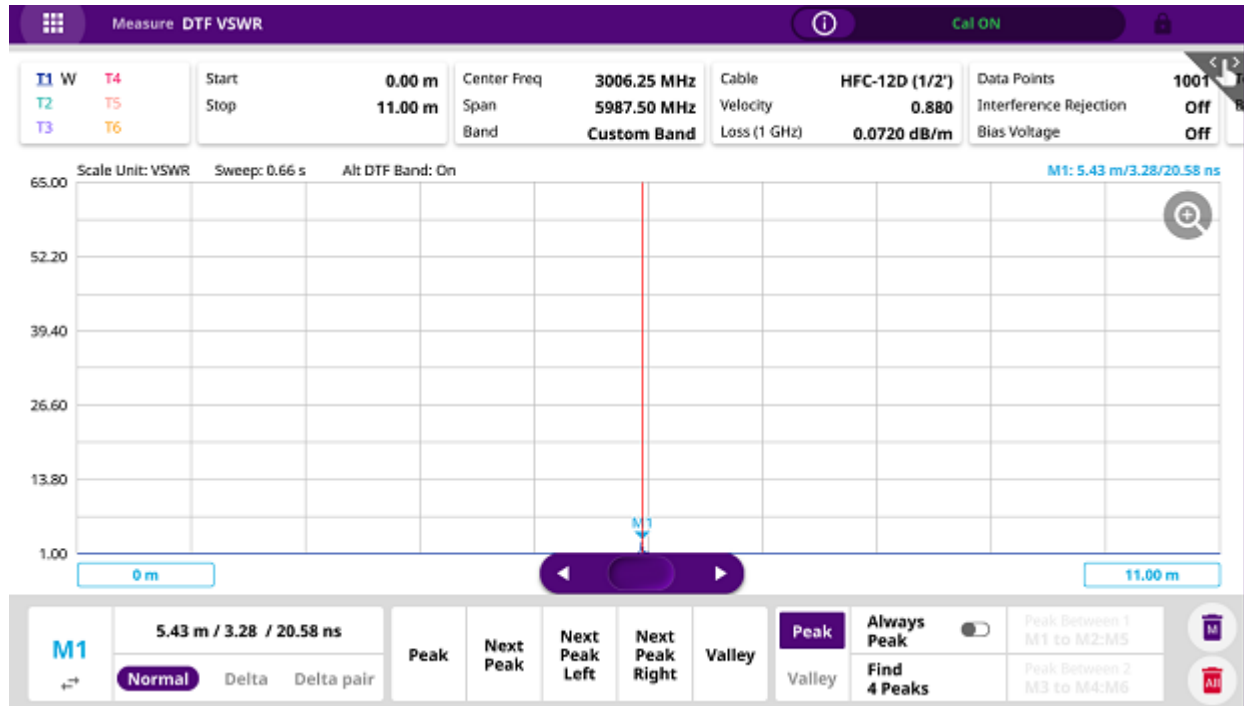
Moving, hiding, and clearing a marker

1 To move the active marker, do one of the following:

    a Tap a new position on the trace. The active marker jumps to the new position on the active trace.

    b Tap a new marker in the marker table below. The active marker moves directly to the specified position on the active trace

2 To hide the active marker, complete the following steps:

    a Tap the active marker on the screen and tap the **Marker** to **Off**. To have the marker back on the screen, tap the **Marker** to **On**.

> **NOTE**
>
> The instrument keeps the last status of marker type and position internally so that you can have the marker back on the trace with the previous information when you select Marker On in the same measurement mode.

3 To clear all the markers displayed on the chart:

    a Tap any marker screen key that has marker properties.

    b Tap **Marker Clear All** and all the existing markers disappear and their marker properties are deleted.

Searching for peak or valley

You can easily find a peaks or valley on the trace, 4 peaks or valleys, and peak or valley between two markers. When a zoom zone is selected, you will have a different set of menus.

Finding a peak or valley

1 Tap the peak search menu, ( ) on the side bar.

2 Select one of the Peak screen keys to do tasks as needed, from the following choices:

- **Peak**: Searches for the highest peak on the trace.

- **Next Peak**: Searches for the second highest peak on the trace.

- **Next Peak Left**: Searches for the highest peak to the left from the current position.

- **Next Peak Right**: Searches for the highest peak to the right from the current position.

- **Valley**: Searches for the lowest peak (valley) on the trace.

- **Find 4 Peaks/Valleys**: Searches for four peaks or valleys with four Normal markers from M1 to M4 regardless of the previous marker setting. If you tap the **Find 4 Peaks/Valleys**, the **Always Peak/Valley** automatically changes to Off.

- **Always Peak/Valley**: Searches for the highest peak or valley on the trace automatically every time the trace is refreshed.

- **Peak/Valley Between 1**: Searches for the highest peak or valley in between M1 and M2 and automatically assigns M5 if there are M1 and M2 on the trace.

- **Peak/Valley Between 2**: Searches for the highest peak or valley in between M3 and M4 and automatically assigns M6 if there are M3 and M4 on the trace.

Finding a peak or valley in zoom zones

1 After selecting any of the zoom zones enabled on the screen, tap the peak menu, lower **M** on the side bar for the zoom zones.

2 Same choices as above (**Peak** to **Peak/Valley Between 2**) for each zoom zone are supported.

Displaying traces

You can write, capture, and load to 6 traces on the measurement display simultaneously.

Adding a trace

1 Tap **Trace** in the **Menu (** ≡ **)** key on the side bar. By default, the instrument sets the first trace, **Trace 1** on and displays "**T1 W** ".

2 Tap one of the six traces **(Trace 1 to Trace 6)**, which you want to set, and tap to **Trace View On**.

3 Do one of the options from the following choices:

- **Clear Write**: Clears current data and writes new measurement.

- **Capture:** Captures the active trace to compare with other trace(s).

- **Load**: Loads and overlays a saved trace to do comparison analysis of up to 4 traces by superimposing them on one measurement display.

> **NOTE**
>
> The trace(s) to be overlaid must have the same measurement mode and frequency settings as the current measurement. For the DTF mode, the stop distance setting must be equal or shorter than the one of the current measurement.

- **Trace View On**: Displays the turned-off trace back on the chart.

- **Trace View Off**: Hides the active trace.

4 Repeat the steps **2-3** to set more traces as needed.

5 To clear all the traces displayed on the chart:

   a Tap any **Trace** you want to choose.

   b Tap **Trace Clear All**. Then all the existing traces disappear and the default trace T1 is displayed with measurements.

Performing trace math

If you have the traces T1 and T2 on your measurement chart, you can perform trace arithmetic functions.

1 Tap **Trace** and select either **Trace 1** or **Trace 2** trace.

2 Tap **Trace Math Type** and do one of the trace math functions from the following choices:

   a **T1+T2**: Adds the traces T1 and T2 and displays the result.

   b **T1-T2:** Subtracts the trace T2 from the trace T1 and displays the result.

   c **T1*T2**: Multiplies the traces T1 and T2 and displays the result.

   d **T1/T2**: Divides the trace T1 by the trace T2 and displays the result.

The Trace Math window appears in the lower half of the screen.

> **NOTE**

> Trace math is not available in the DTF and Smith Chart modes.

3 To turn off the trace math function, tap **Trace Math Type** to **Off.**

Loading a saved trace

You can load a saved trace whenever you need. Unlike the trace overlay, the display layout mode changes to the single display and measurement settings such as measurement mode and X and Y scales are restored as saved.

1 To load a save trace, see "**Performing Save and Load**" in Operation book.

2 To dismiss the loaded trace data, tap **No Overlay Exit** screen key. Your current measurement appears back on the screen.

Trace screen example
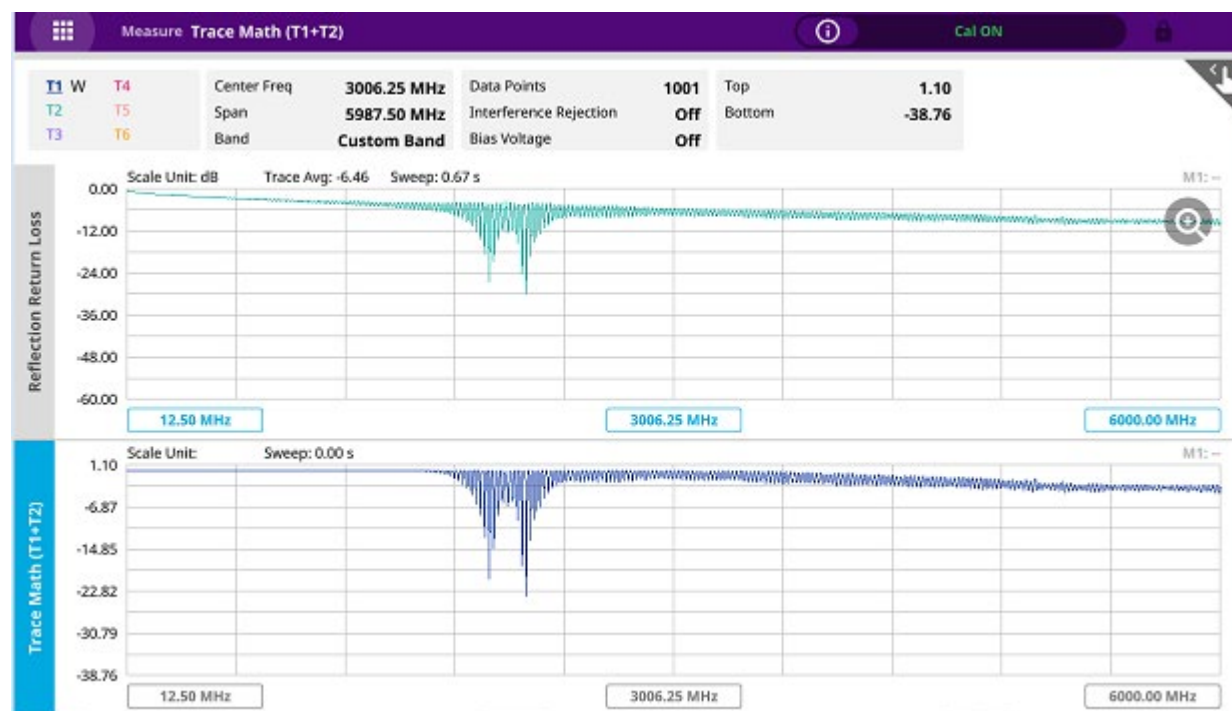
> **NOTE**
>
> You can set the Subframe No. from 0 to 9 and Slot No. between 0 and 1 based on your need using the on-screen keyboard.

Setting test limits

You can define test limits for automatic Pass/Fail and Warning indication and display a limit line with single or multiple segments or a limit window. It makes it easy to verify that a measurement exceeds defined thresholds with alarming option, which sounds if any portion of the trace falls outside the limit settings.

Setting a limit line

The Limit Line is a straight horizontal line that you can enable to analyze your measurement results.

1 Tap **Limit** in the **Menu (** ≡ **)** key on the side bar.

2 Select the **Alarm Sound** option between **On** and **Off**. If you select **On**, the instrument goes off an alarm when a result falls outside of defined limits.

3 Select the **Pass/Fail** result option between **On** and **Off**. If you select **On**, the instrument displays "PASS" or "FAIL" result on the screen.

4 Tap **Limit Line** and tap **Limit Value** on screen below.

　　a Enter a pass/fail threshold value using on-screen keyboard.

　　b Tap **Limit Line** to select **On**. The green limit line appears at the set value on the screen in case of pass.

5 *Optional*. If you have enabled the pass/fail limit line, you can display a warning line.

　　a To set the warning threshold, tap **Warning Value** and enter a threshold value using on-screen keyboard.

　　b Tap **Warning Line** to select **On**.

The warning line appears at the set value on the screen.

6 Optional. To save the limit settings, tap **Save (** 🖫 **)**.

Setting a Multi Segment limit Line

The Multi-Segment limit Line (**MSL**) is a mask you can define and use to analyze your measurement results.

1 Tap **Limit** in the **Menu (** ≡ **)** key on the side bar.

2 Select the **Alarm Sound** option between **On** and **Off**. If you select **On**, the instrument goes off an alarm when a result falls outside of defined limits.

3 Select the **Pass/Fail** result option between **On** and **Off**. If you select **On**, the instrument displays "PASS" or "FAIL" result on the screen.

4 Tap **Multi Segment Line** and **Upper/Lower** to select **Upper** or **Lower** as desired.

5 To set the number of segments for the **MSL**, tap **Segments**. Enter a value between **1** and **50** using on-screen keyboard.

6 Tap **Auto Set** for the instrument to automatically set values for the **MSL** segment(s).

7 Tap **Display** and select **On** to display the MSL line.

8 To edit each segment of the **MSL**:

    a Tap Segment Edit and arrow. The red point indicates your current selection.

    b To select a point to redefine the frequency or amplitude value, tap **Move MSL** and arrow.

    c Do the following as needed:

       – To change the X-axis coordinate of the point, tap **Frequency** and enter a value using the on-screen keyboard.

       – To change the Y-axis coordinate of the point, tap **Amplitude** and enter a value using the on-screen keyboard.

       – To add a new segment, tap **Segments** and input the number of segment you want.

9 To move the current MSL line, tap **Move MSL** and enter a value by using the on-screen keyboard.

    Optional: To save the limit settings, tap **Save** (▣).

Upper and lower MSL line
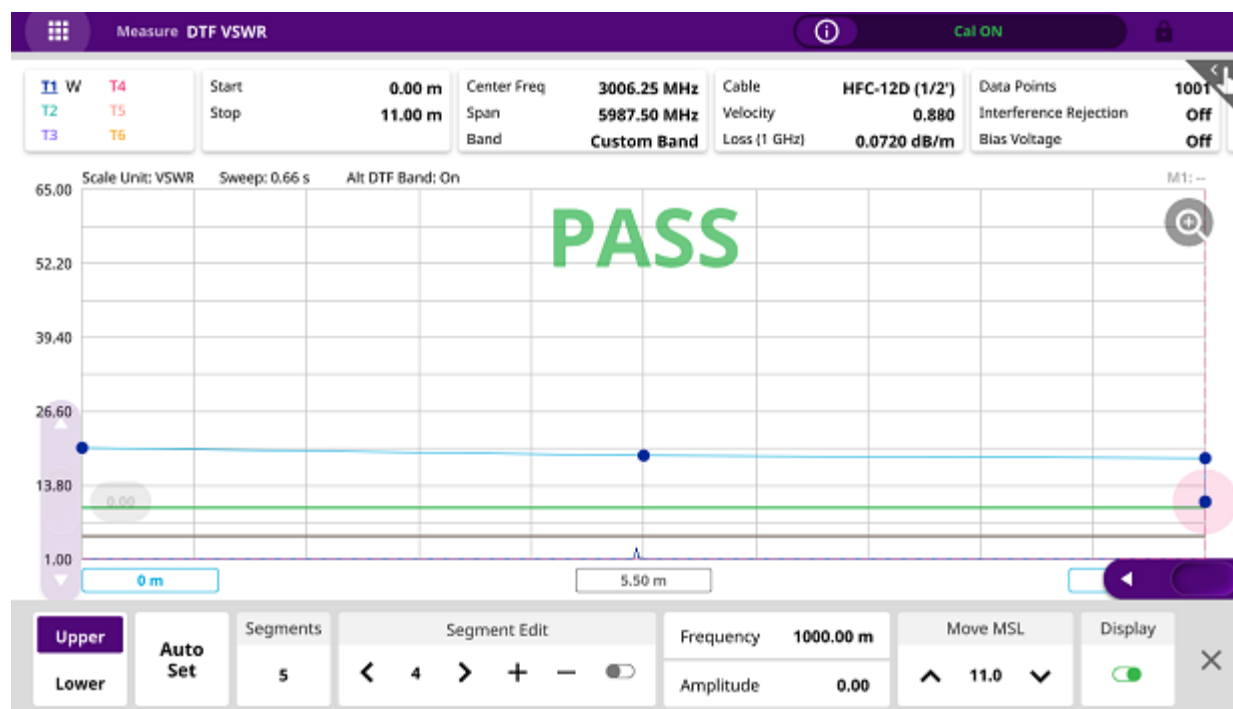
MSL line with red point

Setting a limit window

1 Tap **Limit** in the **Menu (≡)** key on the side bar.

2 Select the **Alarm Sound** option between **On** and **Off**. If you select **On**, the instrument goes off an alarm when a result falls outside of defined limits.

3 Select the **Pass/Fail** result option between **On** and **Off**. If you select **On**, the instrument displays "PASS" or "FAIL" result on the screen.
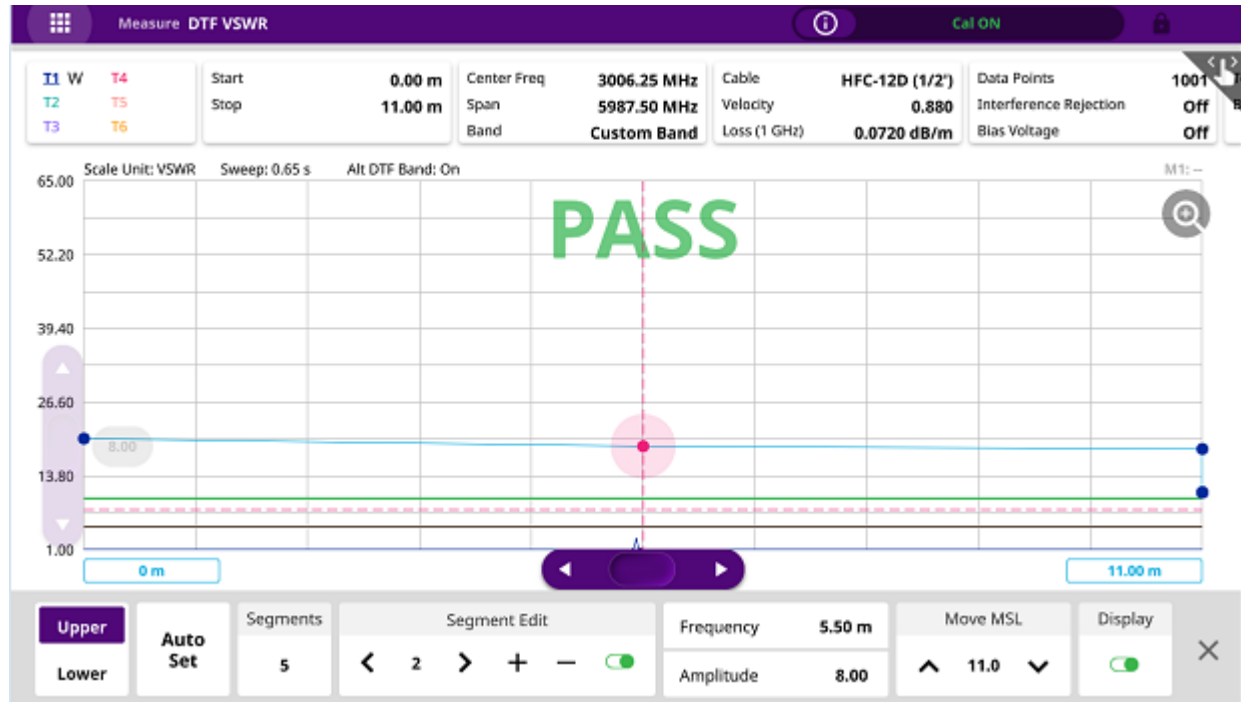
4 Tap **Limit Window** and **Limit Window On/Off** to select **On**. The green limit line appears at the set value on the screen.

5 To edit the frequency or amplitude value of the limit window segments, complete the following steps:

   a Tap **Move**. The red point indicates your current selection.

   b To select a point to redefine the frequency or amplitude value, tap the arrow of **Move**. Each time you tap this key, the selection moves to right or left.

   c To change the X-axis coordinate of the point, tap **Frequency / Distance** and enter a value using the on-screen keyboard.

   d To change the Y-axis coordinate of the point, tap **Amplitude** and enter a value using the on-screen keyboard.

   e *Optional*: To save the limit settings, tap **Save** (🖫).

Limit window
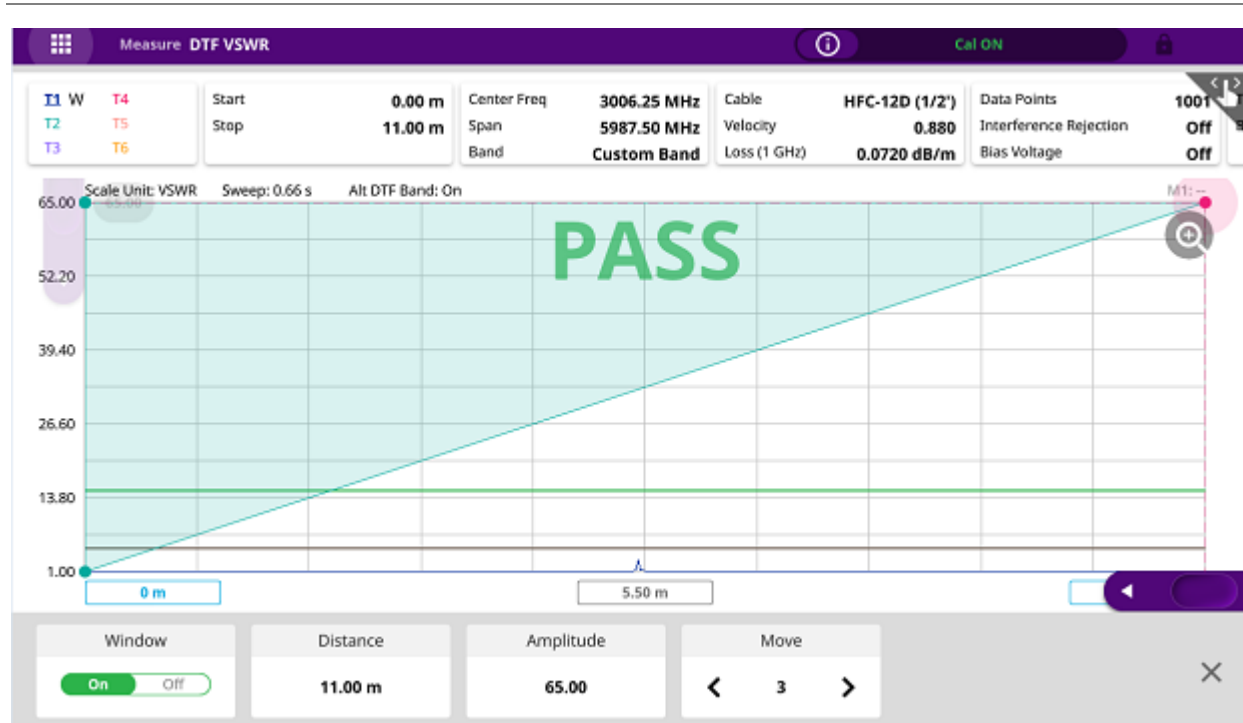
Holding a measurement

You can put a measurement on hold and resume sweeping as needed.

1 Tap **Hold** (🔒) icon on the side bar. Sweeping is paused.

2 To resume the measurement, tap **Hold** (🔒) icon again. Sweeping is continued.

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 3 years for CAA Modules and 1 year for other accessories unless otherwise specified.

Part #s for CAA06M Cable and Antenna Analyzer

Catalog Number	Description
CAA06MA	6 GHz Cable and Antenna Analyzer Module
CAA06MB	6 GHz Cable and Antenna Analyzer Module with Bias Power and Bias-Tee
CA5000-DMC	Dual Module Carrier with Dummy Module for CellAdvisor 5G
CA5000-S005 or ONA-CAA-2P	2 Port Transmission Measurement (SW option)
CA5000-S006 or ONA-CAA-RFS	RF CW Source (SW option)
CAA06M-CR	CAA Module Calibration Report

Part #s for CAA06M Cable and Antenna Analyzer Accessories

Catalog Number	Description
G700050653	Bias-Tee, N(m), N(f), BNC(f), 2.5 to 6000 MHz, 1W with 250 mm BNC(f) to SMA(m) Cable

JD78050509	Y-Calibration Kit, Type-N(m), DC to 6 GHz, 50 ohm
JD78050510	Y-Calibration Kit, DIN(m), DC to 6 GHz, 50 ohm
JD70050509	EZ-Cal kit Type-N(m), DC to 6 GHz, 50 ohm
JD78050507	Dual port Type-N 6 GHz calibration kit
JD78050508	Dual port DIN 6 GHz calibration kit
G700050530	RF cable DC to 8 GHz Type-N(m) to Type-N(m), 1.0 m
G700050531	RF cable DC to 8 GHz Type-N(m) to Type-N(f), 1.5 m
G700050532	RF cable DC to 8 GHz Type-N(m) to Type-N(f), 3.0 m
G710050536	RF cable DC to 6 GHz Type-N(m) to DIN(f), 1.5 m
G700050540	Phase-stable RF cable w grip DC to 6 GHz Type-N(m) to Type-N(f), 1.5 m
G700050541	Phase-stable RF cable w grip DC to 6 GHz Type-N(m) to DIN(f), 1.5 m
G700050571	Adapter Type-N(m) to DIN(f), DC to 7.5 GHz, 50 ohm
G700050572	Adapter DIN(m) to DIN(m), DC to 7.5 GHz, 50 ohm
G700050573	Adapter Type-N(m) to SMA(f) DC to 18 GHz, 50 ohm
G700050574	Adapter Type-N(m) to BNC(f), DC to 4 GHz, 50 ohm
G700050575	Adapter Type-N(f) to Type-N(f), DC to 18 GHz 50 ohm
G700050576	Adapter Type-N(m) to DIN(m), DC to7.5 GHz, 50 ohm

G700050577	Adapter Type-N(f) to DIN(f), DC to 7.5 GHz, 50 ohm
G700050578	Adapter Type-N(f) to DIN(m), DC to 7.5 GHz, 50 ohm
G700050579	Adapter DIN(f) to DIN(f), DC to 7.5 GHz, 50 ohm
G700050580	Adapter Type-N(m) to Type-N(m), DC to 11 GHz 50 ohm
G700050581	Adapter N(m) to QMA(f), DC to 6.0 GHz, 50 ohm
G700050582	Adapter N(m) to QMA(m), DC to 6.0 GHz, 50 ohm
G700050583	Adapter N(m) to 4.1/9.5 MINI DIN (f), DC to 6.0 GHz, 50 ohm
G700050584	Adapter N(m) to 4.1/9.5 MINI DIN (m), DC to 6.0 GHz, 50 ohm
G700050585	Adapter N(m) to 4.3-10 (f), DC to 6.0 GHz, 50 ohm
G700050586	Adapter N(m) to 4.3-10 (m), DC to 6.0 GHz, 50 ohm
G700050587	Adapter N(f) to SMA(f), DC to 18 GHz, 50 ohm

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

元器件 (Component)	有毒、有害物质和元素					
	铅(Pb)	汞 (Hg)	镉(Cd)	六价铬 (CR⁶⁺)	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 Assembles)	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
包装箱和缚带 (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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