

Measurement Guide

Tracking Generator for Anritsu RF and Microwave Handheld Instruments

Spectrum Master™ E-Series

Tracking Generator

Option 20

Spectrum Master™ T-Series

Tracking Generator

Option 809

Option 813

Option 820

The Anritsu logo is located in the bottom right corner of the page. It consists of the word "Anritsu" in a bold, sans-serif font. The letter "A" is significantly larger and more stylized than the other letters, with a slanted top edge. The "n" and "r" are also bold and have a slight slant. The "i" and "t" are smaller and more standard. The "s" and "u" are also bold and have a slight slant. The overall logo is dark grey or black.

TRADEMARK ACKNOWLEDGMENTS

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To prevent the risk of personal injury or loss related to equipment malfunction, Anritsu Company uses the following symbols to indicate safety-related information. For your own safety, please read the information carefully *before* operating the equipment.

Symbols Used in Manuals

Danger



This indicates a risk from a very dangerous condition or procedure that could result in serious injury or death and possible loss related to equipment malfunction. Follow all precautions and procedures to minimize this risk.

Warning



This indicates a risk from a hazardous condition or procedure that could result in light-to-severe injury or loss related to equipment malfunction. Follow all precautions and procedures to minimize this risk.

Caution



This indicates a risk from a hazardous procedure that could result in loss related to equipment malfunction. Follow all precautions and procedures to minimize this risk.

Safety Symbols Used on Equipment and in Manuals

The following safety symbols are used inside or on the equipment near operation locations to provide information about safety items and operation precautions. Ensure that you clearly understand the meanings of the symbols and take the necessary precautions *before* operating the equipment. Some or all of the following five symbols may or may not be used on all Anritsu equipment. In addition, there may be other labels attached to products that are not shown in the diagrams in this manual.



This indicates a prohibited operation. The prohibited operation is indicated symbolically in or near the barred circle.



This indicates a compulsory safety precaution. The required operation is indicated symbolically in or near the circle.



This indicates a warning or caution. The contents are indicated symbolically in or near the triangle.



This indicates a note. The contents are described in the box.



These indicate that the marked part should be recycled.

For Safety

Warning



Always refer to the operation manual when working near locations at which the alert mark, shown on the left, is attached. If the operation, etc., is performed without heeding the advice in the operation manual, there is a risk of personal injury. In addition, the equipment performance may be reduced. Moreover, this alert mark is sometimes used with other marks and descriptions indicating other dangers.

Warning



or



When supplying power to this equipment, connect the accessory 3-pin power cord to a 3-pin grounded power outlet. If a grounded 3-pin outlet is not available, use a conversion adapter and ground the green wire, or connect the frame ground on the rear panel of the equipment to ground. If power is supplied without grounding the equipment, there is a risk of receiving a severe or fatal electric shock.

Warning



This equipment can not be repaired by the operator. Do not attempt to remove the equipment covers or to disassemble internal components. Only qualified service technicians with a knowledge of electrical fire and shock hazards should service this equipment. There are high-voltage parts in this equipment presenting a risk of severe injury or fatal electric shock to untrained personnel. In addition, there is a risk of damage to precision components.

Caution



Electrostatic Discharge (ESD) can damage the highly sensitive circuits in the instrument. ESD is most likely to occur as test devices are being connected to, or disconnected from, the instrument's front and rear panel ports and connectors. You can protect the instrument and test devices by wearing a static-discharge wristband. Alternatively, you can ground yourself to discharge any static charge by touching the outer chassis of the grounded instrument before touching the instrument's front and rear panel ports and connectors. Avoid touching the test port center conductors unless you are properly grounded and have eliminated the possibility of static discharge.

Repair of damage that is found to be caused by electrostatic discharge is not covered under warranty.

Warning



This equipment is supplied with a rechargeable battery that could potentially leak hazardous compounds into the environment. These hazardous compounds present a risk of injury or loss due to exposure. Anritsu Company recommends removing the battery for long-term storage of the instrument and storing the battery in a leak-proof, plastic container. Follow the environmental storage requirements specified in the product data sheet.

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Chapter 1 — General Information

1-1 Introduction

This Measurement Guide documents Option 20 Tracking Generator functions of the Anritsu Spectrum Master E-Series handheld instruments and Option 809, Option 813, and Option 820 of the Spectrum Master T-Series instrument

The Option 20 Tracking Generator has a starting frequency of 500 kHz. The Option 809, Option 813, and Option 820 Tracking Generators have a starting frequency of 100 kHz. The highest frequency is the same as the highest tuning frequency of the spectrum analyzer.

Note

Not all instrument models offer every option or measurement mode. Please refer to the Technical Data Sheet of your instrument for available options.

The screen images on your instrument may vary from those shown in this Measurement Guide.

Options 20, 809, 813, and 820 add Tracking Generator function to the Spectrum Analyzer mode of the instrument. This measurement guide describes only specific Tracking Generator functions.

The tracking generator and spectrum analyzer combination allows a signal to be applied to a device under test (DUT) to measure the frequency response.

General Spectrum Analyzer measurement functions including **Frequency**, **Amplitude**, **Span**, **Bandwidth**, **Marker**, **Sweep**, **Trace**, and **Limit** menus are detailed in the Spectrum Analyzer Measurement Guides (SPA MG) available on the Anritsu Web site:

- E-Series Spectrum Master SPA MG (p/n 10580-00244)
- T-Series Spectrum Master SPA MG (p/n 10580-00349)

Note

Master Software Tools does not support capture of Tracking Generator traces.

1-2 Contacting Anritsu

To contact Anritsu, please visit:

<http://www.anritsu.com/contact.asp>

From here, you can select the latest sales, select service and support contact information in your country or region, provide online feedback, complete a “Talk to Anritsu” form to have your questions answered, or obtain other services offered by Anritsu.

Updated product information can be found on the Anritsu web site:

<http://www.anritsu.com/>

Search for the product model number. The latest documentation is on the product page under the Library tab.

1-3 Selecting Tracking Generator

Press the **Menu** button and select the Tracking Generator measurement shortcut by tapping on the touch screen (Figure 1-1).

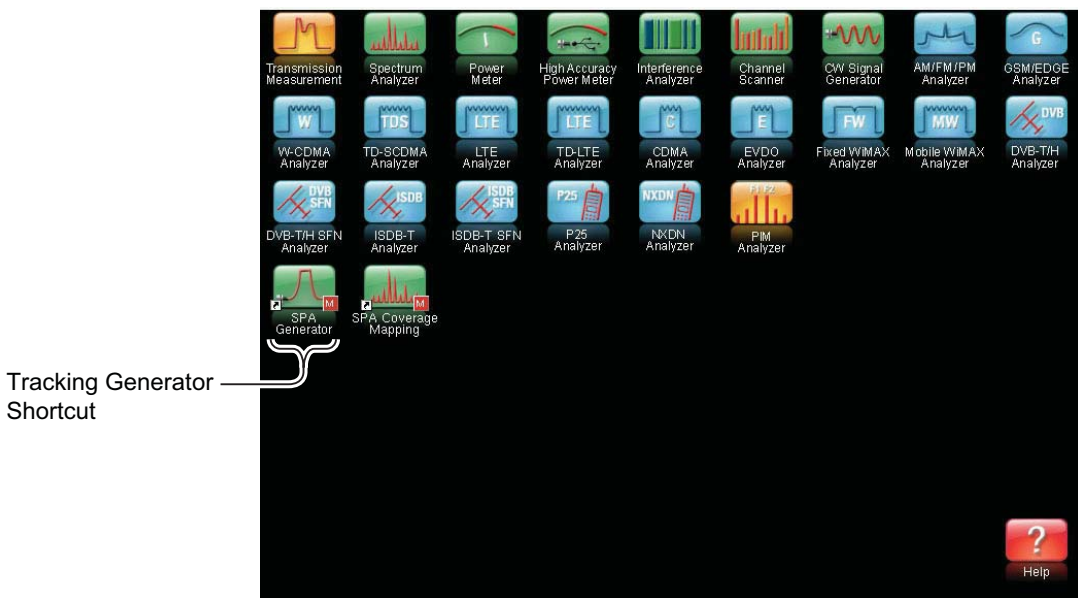


Figure 1-1. Menu Button Screen

You can also press the **Shift** key then the **Mode (9)** key, select Spectrum Analyzer (Figure 1-2) from the list using the rotary knob or the **Arrow** key, and press **Enter**. In Spectrum Analyzer mode, press the **Shift** then **Measure (4)** keys and then press Generator (Figure 1-3 on page 1-3).

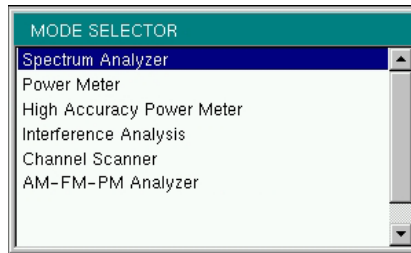


Figure 1-2. Measurement Mode List (example)

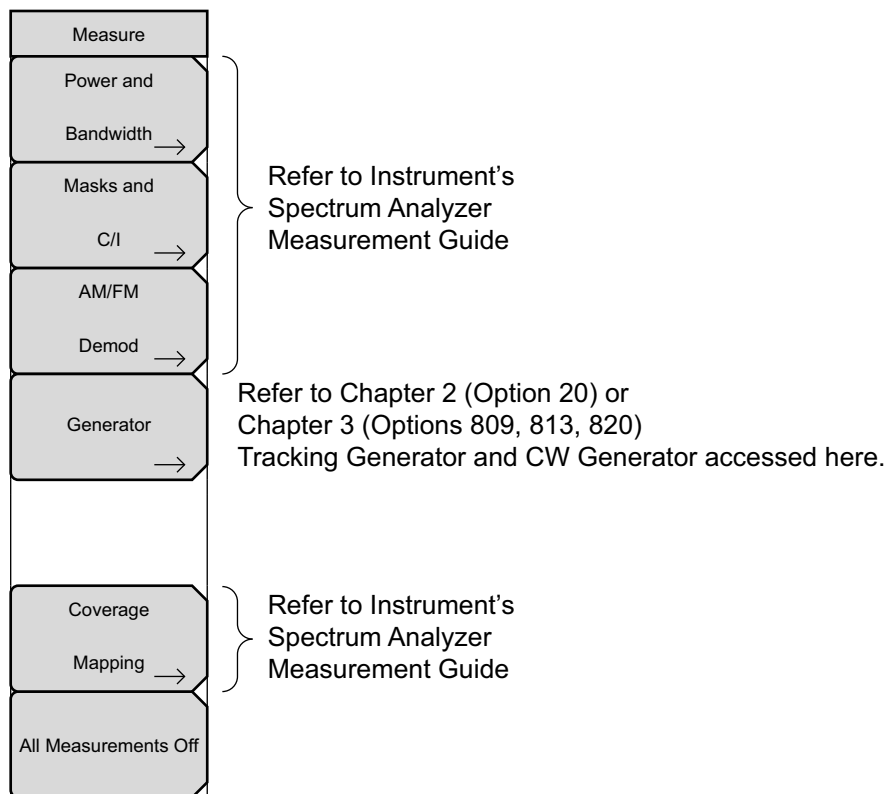


Figure 1-3. Tracking and CW Generator Options

Refer to [Chapter 2, “E-Series Tracking Generator”](#) or [Chapter 3, “T-Series Tracking Generator”](#) for detailed information on the tracking generator operation and menus.

Chapter 2 — E-Series Tracking Generator

(Option 20)

2-1 Generator Mode

Option 20 adds a Tracking Generator to the Spectrum Analyzer mode of the instrument. The Tracking Generator generates a swept signal with an output frequency that is the same as the tuning frequency of the spectrum analyzer.

Additionally, a CW generator feature is included in Option 20. The sine wave output frequency and power is set by the user. Refer to [Section 2-5 “CW Generator Overview” on page 2-8](#).

The output power is leveled and has a specified power range -50 dBm to $+0$ dBm in 0.1 dB steps.

Note	Operation outside this power range is possible. However, performance and compliance with specifications are not guaranteed.
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Power output information is available for both absolute and transmission (normalized) measurements.

Enhanced power level calibration is available for the generator output. Additional information about the enhanced level calibration is provided later in this chapter.

2-2 Tracking Generator Overview

1. Set the **Mode** to Spectrum Analyzer. Refer to [Chapter 1](#) for details.
2. **Preset** the instrument (Shift+1 > Preset).
3. Set the spectrum analyzer frequency range using the Frequency (**Freq**) menu and submenus. Refer to the Spectrum Analyzer Measurement Guide (10580-00244) for additional information.
4. Press the **Shift** key, then the **Measure (4)** key. Press the **Generator** key.
5. Press the **Output Power** button and set the output power (at the output connector before any external attenuation). In tracking mode, the output is leveled and flat over the spectrum analyzer frequency range.
6. Set the **Generator Mode** to Tracking. In Tracking Mode, the output frequency is paired with the spectrum analyzer input sweeping frequency.
7. Turn **Generator Output On**. The output power turns on at the level that has been set previously with the **Output Power** key.

Note

Turning the Tracking Generator On sets the detection type (**Amplitude** > Detection) to Sample and sets the sweep mode (**Sweep** > Sweep Mode) to No FFT. Turning off the generator resets both parameters to their previous settings. Either parameter may be changed by the user with the Tracking Generator on or by the instrument when other measurements are also turned on.

2-3 Measurement Example

This example demonstrates how to connect a Device Under Test (DUT) and make a measurement. This example will characterize the frequency response of a filter in the GSM frequency band.

1. Set the frequency range to cover the range of the DUT being tested. In this example, the center frequency is set to 1.8 GHz with a 1 GHz span.
2. Set the Generator to Tracking Mode with an Output Power of 0.0 dBm. Refer to the previous “[Tracking Generator Overview](#)” section for additional information.
3. Connect the DUT as shown in [Figure 2-1 on page 2-2](#). For connector torque and connector care information, refer to the User Guide for your instrument.
4. Toggle the Generator Output to On.

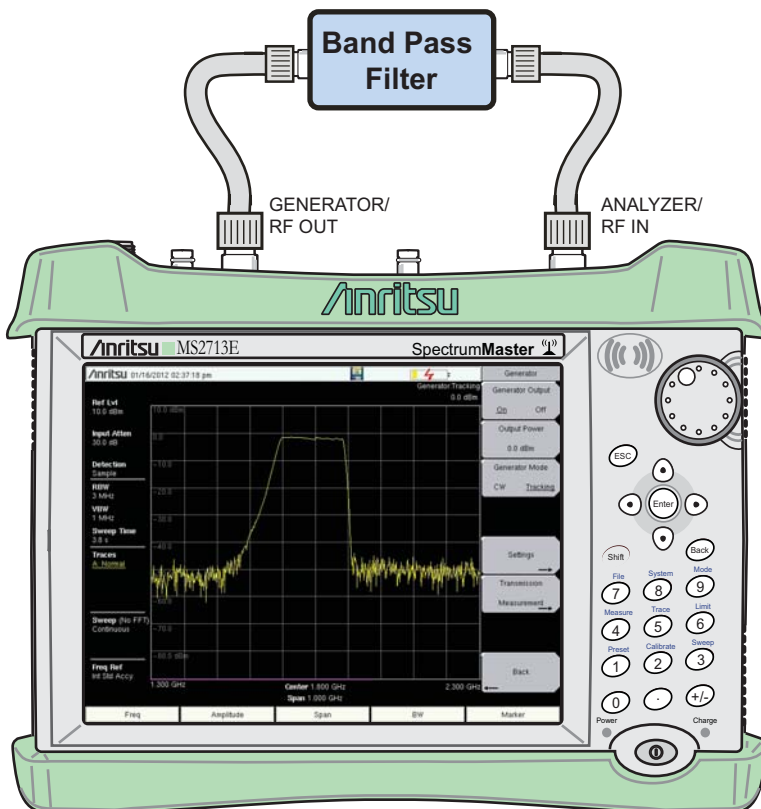


Figure 2-1. Connection of Device Under Test

5. Observe the measurement to confirm that the pass band frequency range covers the required span.
6. If the spectrum analyzer noise floor is too high for the necessary measurements, then reduce the input attenuation and RBW to maximize the dynamic range. [Figure 2-2 on page 2-3](#) shows the sample setup with the input attenuation lowered from 30 dB to 10 dB and with the RBW reduced from 3 MHz to 300 kHz.
7. When measuring a filter with a very high insertion loss in the stop band, press the **Shift** key, then the **Trace (5)** key. Press the Trace A Operations submenu key, then the Average → A submenu key to turn on averaging and clean up the stop band area. An averaging value of 10 will probably be adequate for most filters.
8. Under the Setting submenu turn Power Statistics On ([Figure 2-2](#)) to display the spectrum analyzer received Maximum, Average, and Minimum power of each frequency range sweep.

Note

If the noise floor drops below the visible display, then set the Scale dB/division setting to a value larger than 10. This will increase the displayed amplitude range.

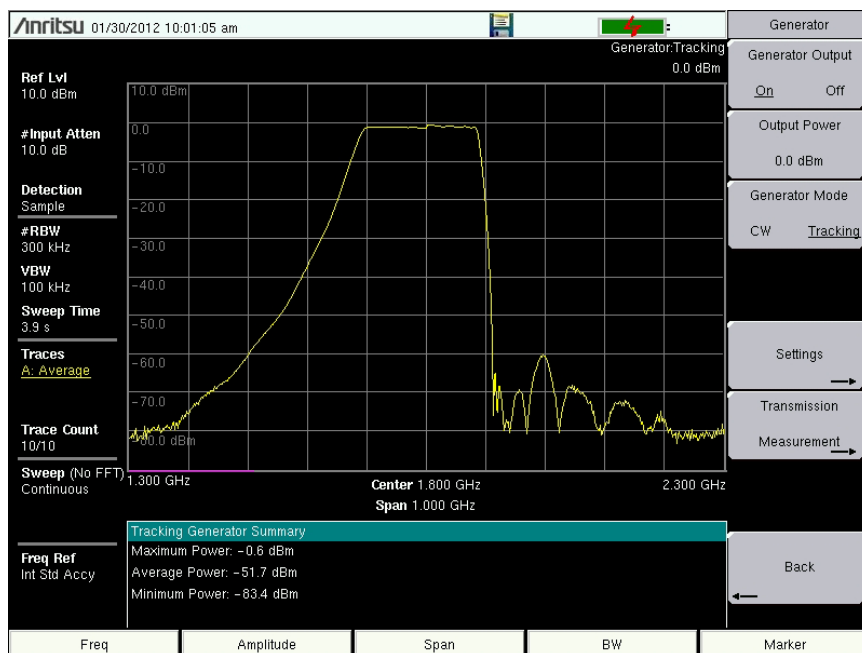


Figure 2-2. Increasing Measurement Dynamic Range, Trace Averaging On, Displaying Power Statistics

Note

Many of displayed settings on the left side of the screen are used as menu shortcuts. Select a parameter by touching the appropriate setting on the touch screen to display the menu and set the parameter for editing.

Enhancing Accuracy

For detailed power level measurements, the output flatness of the tracking generator can be calibrated in the field.

1. After the frequency range and other settings are determined, disconnect the DUT and make a through connection between the GENERATOR/RF OUT connector and the ANALYZER/RF IN connector. For the most accurate results, use the same cables and adapters for this connection as were used to connect the DUT.
2. From the Generator > Setting submenu, press Enhanced Generator Power Accuracy.
3. Select the number of external Matching Pad (3 dB) pads to use for calibration and measurements. Press Enhanced Accuracy Calibration. External attenuators will need to be inserted for the 3 dB and 6 dB pad options.

Note

Matching 3 dB external attenuators are not required. Attenuators do provide a more accurate 50 ohm match to the generator output and analyzer input. This may help in cases where transmission ripple needs to be minimized.

For the most accurate results, use the same 3 dB pad setup (0, 1, or 2 pads) in measurements as were used for calibration.

4. Follow the onscreen instructions shown in [Figure 2-3 on page 2-5](#).

During the Enhanced Accuracy Calibration process, the instrument calibrates across the frequency range, reducing any output ripple. After the successful completion, the (+Accy) label will be displayed after the Generator output power ([Figure 2-5 on page 2-6](#)).

5. [Figure 2-4 on page 2-5](#) is a detail of the top of the filter trace shown in [Figure 2-2](#) before calibration. [Figure 2-5](#) shows the same trace section after enhanced calibration using two 3 dB pads.

The 7.5 dB loss from the 0 dBm generator power is from the two 3 dB pads, the filter, and cables connected between the Generator port and Spectrum Analyzer receiver.

Caution

The Enhanced Accuracy calibrations are eliminated at Preset, Power-on, or when the generator output level is changed. The calibrations are not saved nor recalled with Save/Recall.

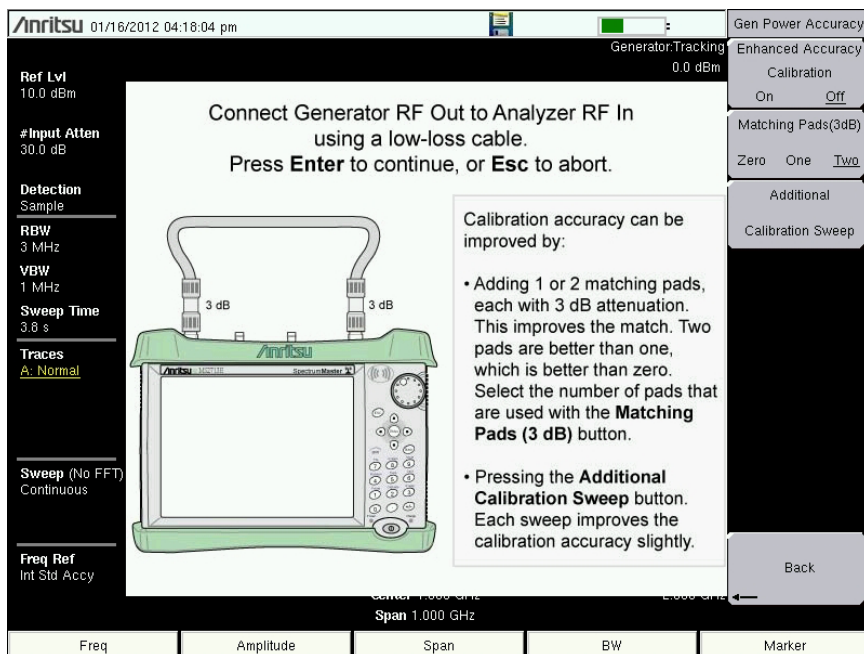


Figure 2-3. Enhanced Generator Accuracy

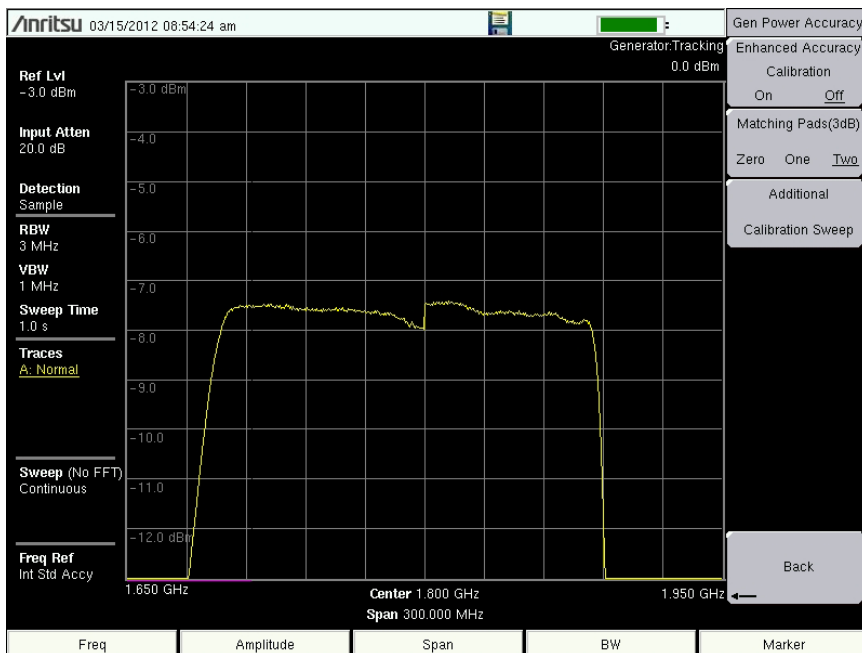


Figure 2-4. Before Enhanced Accuracy Calibration

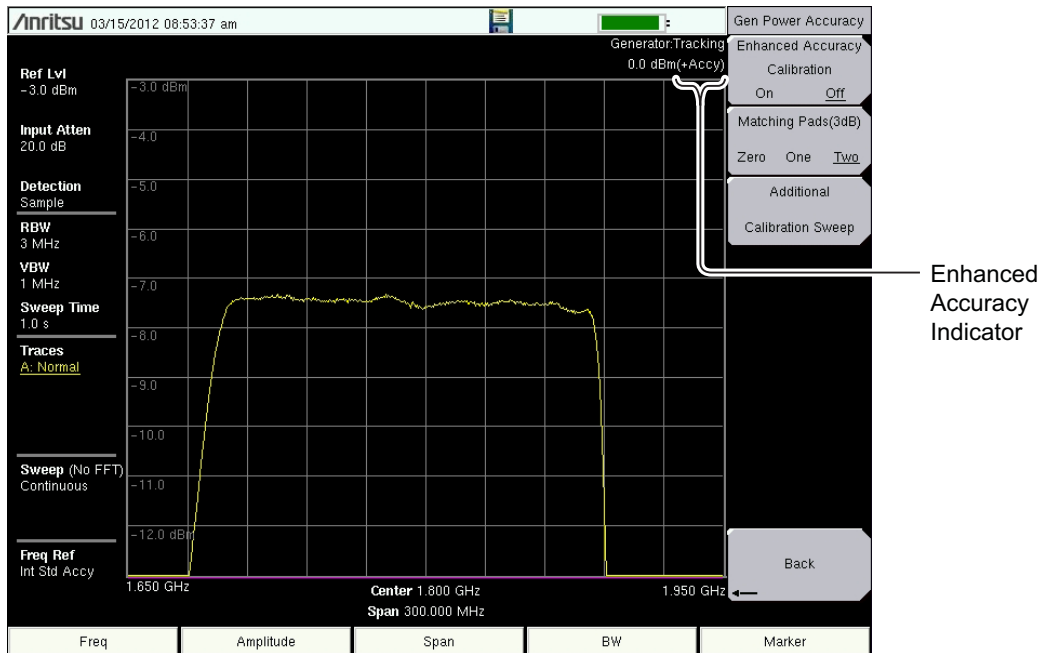


Figure 2-5. After Enhanced Accuracy Calibration

2-4 Transmission Measurements

Option 20 includes normalized transmission measurements. This functionality is similar to a previous option, Option 21 “2-Port Transmission Measurement”.

1. Connect a through cable between GENERATOR/RF OUT and ANALYZER/RF In connectors. From the Generator submenu, press the Transmission Measurement submenu key and then set Normalize On.
2. [Figure 2-6](#) shows a through cable measurement after normalization. Note the relative scale numbers on the graticule lines (in increments of 10 dB) on the right side of the sweep window now that Normalization is ON. If desired, the resolution bandwidth and video bandwidth can be changed after normalization without needing to renormalize. After the normalization sweep is completed, reconnect the DUT between the GENERATOR/RF OUT and ANALYZER/RF In connectors.

[Figure 2-7](#) shows the filter measurement after normalization. Displaying the trace required changing the Relative Ref (top of the graticule) and the Relative Scale (db range between grids).

Refer to “[Transmission Measurement Menu](#)” on page 2-13 for additional information including Transmission Statistics and Transmission Offset.

Note Set the appropriate input attenuation needed before turning Normalization ON.
The **Amplitude** menus and the **Frequency** menus are disabled while Normalization is ON.

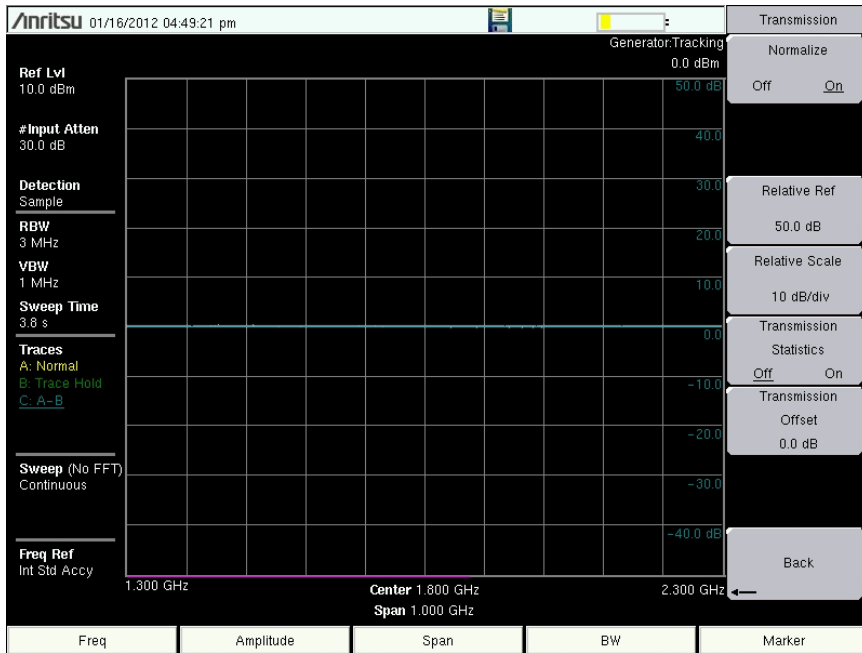


Figure 2-6. Normalized Through Cable (Trace at 0 dB)

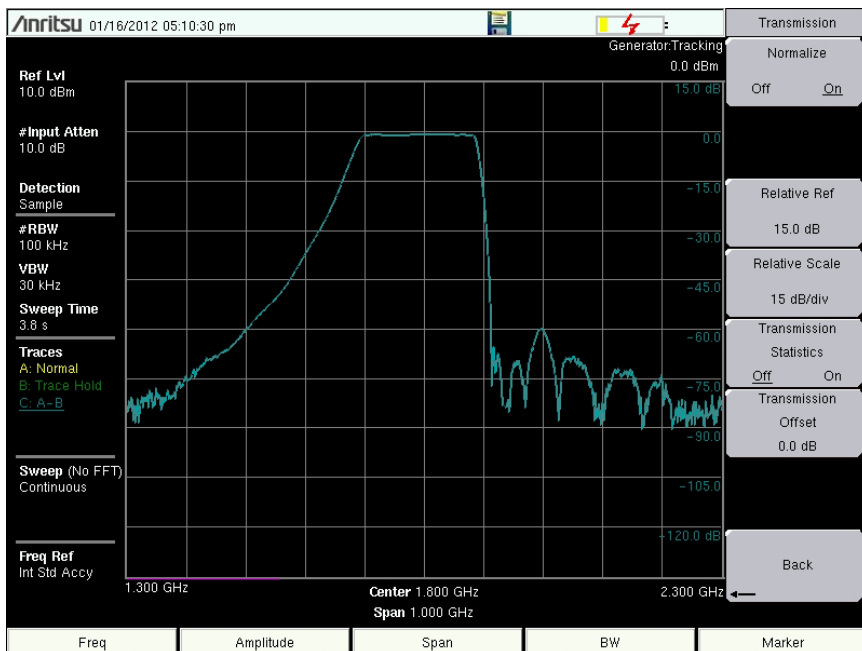


Figure 2-7. Normalized Filter Trace

2-5 CW Generator Overview

Option 20 includes a CW Generator. The CW Signal Generator provides a continuous wave (CW) signal from the GENERATOR/RF OUT port of the instrument.

The following example displays the generator CW signal on the instrument display.

1. Connect a THROUGH cable between the GENERATOR/RF OUT and ANALYZER/RF In connectors as shown in [Figure 2-8](#)

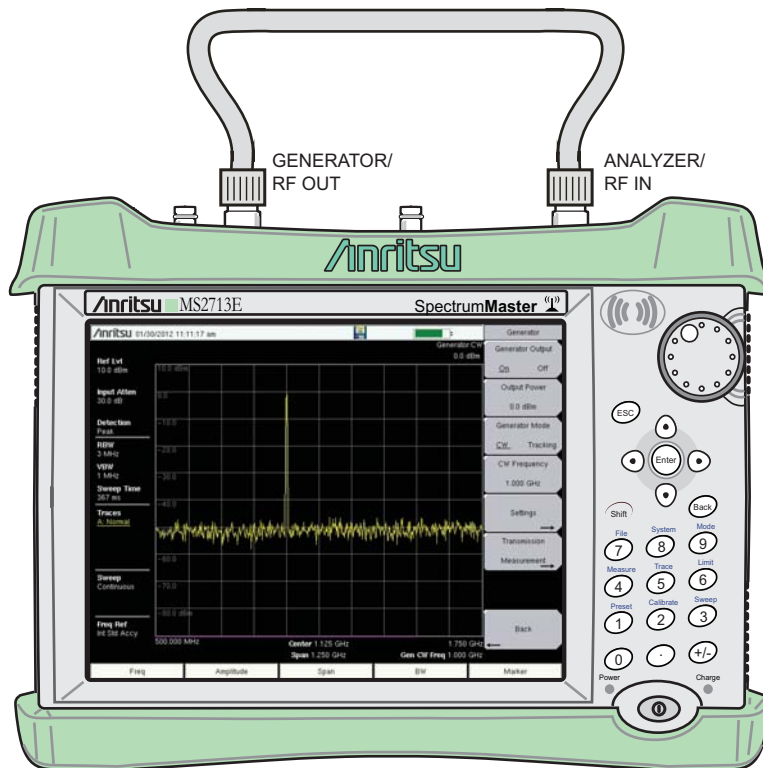


Figure 2-8. Through Cable Setup Example

2. Set the **Mode** to Spectrum Analyzer. Refer to [Chapter 1](#) for details.
3. **Preset** the instrument (Shift+1 > Preset).
4. Set the spectrum analyzer frequency range using the Frequency (**Freq**) menu and submenus. Refer to the Spectrum Analyzer Measurement Guide (10580-00244) for additional information.
5. Press the **Shift** key, then the **Measure (4)** key. Press the Generator key.
6. Press the Output Power button and set the output power (at the output connector before any external attenuation).

- Set the Generator Mode to CW and set the CW Frequency.

Note Confirm that the CW Frequency is set within the spectrum analyzer span, or the signal will not be displayed on the instrument.

- Turn Generator Output On. The output power turns on at the level that has been set previously with the Output Power key.

Note Turning the CW Generator On sets the detection type (**Amplitude** > Detection) to Peak and sets the sweep mode (**Sweep** > Sweep Mode) to Performance. Turning off the generator resets both parameters to their previous settings. Either parameter may be changed by the user with the Tracking Generator on or by the instrument when other measurements are also turned on.

- Figure 2-9 displays the CW output at 1 GHz frequency and 0.0 dBm power. Refer to “Generator Menu” on page 2-11 for additional information.

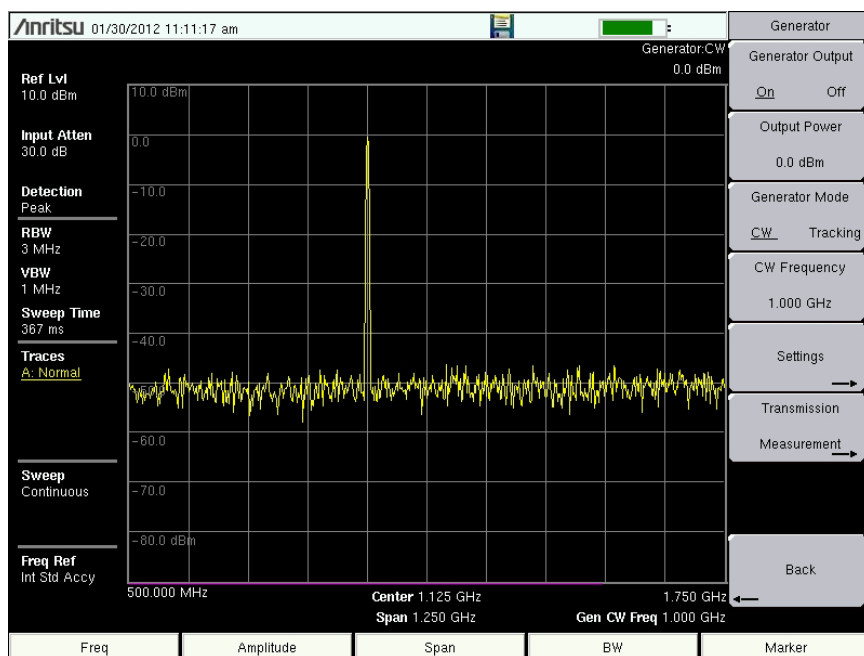


Figure 2-9. CW Output Example

2-6 Tracking Generator Menus

To access the functions under the Measure menu, press the **Shift** key, then the **Measure** (4) key. The addition of Option 20 adds the Tracking Generator submenu key and subsequent menus, as shown [Figure 2-10](#). Menu maps typically display all possible submenu keys, although some keys are displayed on the instrument only under special circumstances (refer to menu descriptions).

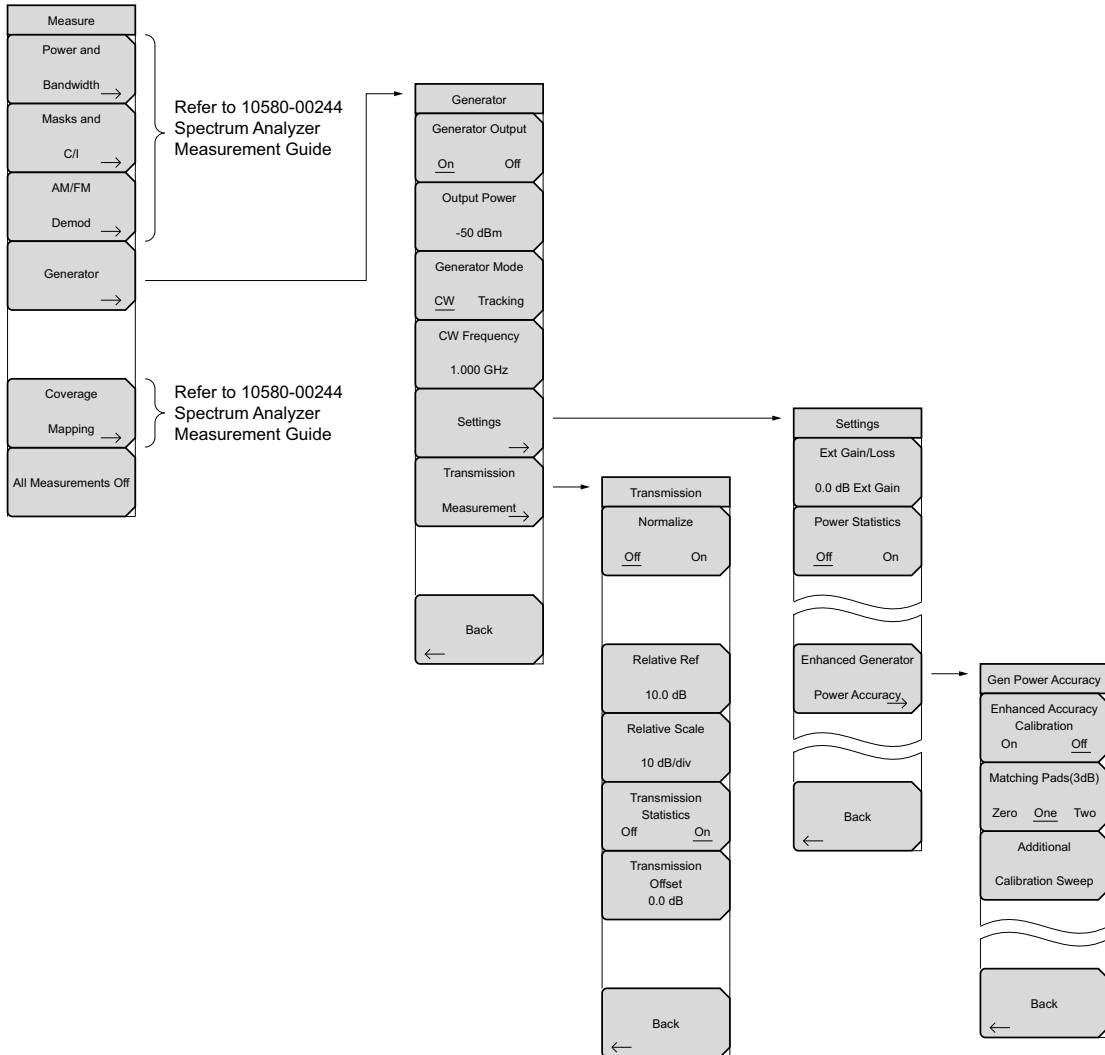


Figure 2-10. Measure Menu with Tracking Generator (Option 20)

Note

General Spectrum Analyzer measurement menu including **Frequency, Amplitude, Span, Bandwidth, Marker, Sweep, Trace, and Limit** menus are detailed in the Spectrum Analyzer Measurement Guide (p/n 10580-00244).

General instrument operating functions including the **Preset, File, Mode and System** are described in the instrument User Guide.

2-7 Generator Menu

Key Sequence: **Measure (Shift + 4)** > Generator

Generator	<p>Generator On Off: Press to turn the tracking generator On or Off. The output power is turned on at the level that was previously set with the Output Power submenu key.</p> <p>Output Power: Press to set the output power of the generator. The specified range is from -80 dBm to 15 dBm. If the user has entered an external gain or loss value, that value will be added to the displayed value.</p> <p>Generator Mode: Press to toggle the Generator Mode between CW and Tracking. In CW Mode, the output frequency is fixed and set by the CW Frequency submenu. In Tracking Mode, the output frequency is paired with the spectrum analyzer input sweeping frequency. The frequency range is set using the Freq main menu and submenu keys. Setting Generator Mode to Tracking will automatically, set Sweep Mode to NO FFT and Detection to Sample.</p> <p>CW Frequency: Sets the frequency of the output when the Generator Mode is set to CW.</p> <p>Settings: Displays the “Settings Menu” on page 2-12.</p> <p>Transmission Measurement: Displays the “Transmission Measurement Menu” on page 2-13.</p> <p>Back: Returns to the Measure menu.</p>
Generator Output	
On Off	
Output Power	
-50 dBm	
Generator Mode	
CW Tracking	
CW Frequency	
1.000 GHz	
Settings →	
Transmission Measurement →	
Back ←	

Figure 2-11. Generator Menu

Settings Menu

Key Sequence: **Measure (Shift + 4)** > Generator > Settings

Ext Gain/Loss: Sets the tracking generator (GENERATOR/RF OUT) external attenuation or gain. Press the Ext Gain/Loss submenu key and select a value from 0 dB to 100 dB, then select either dB External Loss or dB External Gain. The Generator Gain/Loss setting (other than 0 dB) is displayed in the upper-right corner after the Generator output power level. The external attenuation or gain is also reflected in the displayed output power.

Power Statistics: Press to display the Tracking Generator Summary table displaying the spectrum analyzer received Maximum, Average, and Minimum power of each frequency range sweep. Only available with Generator Mode set to tracking.

Enhanced Generator Accuracy: Displays the Gen Power Accuracy submenu.

Enhanced Accuracy Calibration: Improves the output accuracy of the generator when turned on. The calibration can be done in both Tracking Generator and CW Generator modes. Changing the output power turns enhanced calibration OFF. (+Acy) is displayed after the Generator power level when Enhanced Accuracy is ON.

Matching Pads(3dB) Zero One Two: Sets the number of external 3 dB attenuators used during the Enhanced Accuracy Calibration procedure.

Additional Calibration Sweep: Pressing this key after Enhanced Accuracy Calibration is completed starts an additional set of calibration sweeps to improve the power accuracy level of the generator output.

Back: Press to return to the [“Generator Menu” on page 2-11](#).

Figure 2-12. Settings Menu

Transmission Measurement Menu

Key Sequence: **Measure (Shift + 4)** > Generator [Generator = ON] [Generator Mode = Tracking]
> Transmission Measurement

Transmission	<p>Normalize: Press to toggle Normalization On or Off. When turned On, a calibration process is started. Make a THROUGH connection between the tracking Generator Output and the Spectrum Analyzer Input connectors before performing normalization. For the most accurate results, use the same cables and adapters that will be used for the normalization as will be used for the measurement. The current state (Off or On) is underlined.</p>
Normalize <u>Off</u> On	<p>Relative Ref: Press to set the value of the top graticule line in dB relative to the THROUGH connection that was made when normalization was performed.</p>
Relative Ref 10.0 dB	<p>Relative Scale: Press to set the scale factor from 1 dB/division to 15 dB/division in 1 dB steps.</p>
Relative Scale 10 dB/div	<p>Transmission Statistics: Press to display the Transmission Measurement Statistics table displaying the received spectrum analyzer Maximum, Average, and Minimum relative power of each frequency range sweep.</p>
Transmission Statistics Off <u>On</u>	<p>Transmission Offset: Sets the offset for the normalized trace. Offset value is displayed in the Transmission Measurement Statistics.</p>
Transmission Offset 0.0 dB	<p>Back: Press to return to the “Generator Menu” on page 2-11.</p>
Back ←	

Figure 2-13. Transmission Measurement Menu

Chapter 3 — T-Series Tracking Generator

(Option 809, Option 813, and Option 820)

3-1 Generator Mode

Options 809, 813, and 820 add a Tracking Generator to the Spectrum Analyzer mode of the instrument. The Tracking Generator generates a swept signal with an output frequency that is the same as the tuning frequency of the spectrum analyzer.

Additionally, a CW generator feature is included in these options. The sine wave output frequency and power is set by the user. Refer to [Section 3-5 “CW Generator Overview” on page 3-6](#).

The output power is leveled and has a specified power range from -40 dBm to $+0$ dBm in 0.1 dB steps.

Note

Operation outside this power range is possible. However, performance and compliance with specifications are not guaranteed.

Power output information is available for both absolute and transmission (normalized) measurements.

3-2 Tracking Generator Overview

1. Set the **Mode** to Spectrum Analyzer. Refer to [Chapter 1](#) for details.
2. **Preset** the instrument (Shift+1 > Preset).
3. Set the spectrum analyzer frequency range using the Frequency (**Freq**) menu and submenus. Refer to the Spectrum Analyzer Measurement Guide (10580-00349) for additional information.
4. Press the **Shift** key, then the **Measure (4)** key. Press the **Generator** key.
5. Press the **Output Power** button and set the output power (at the output connector before any external attenuation). In tracking mode, the output is leveled and flat over the spectrum analyzer frequency range.
6. Set the **Generator Mode** to Tracking. In Tracking Mode, the output frequency is paired with the spectrum analyzer input sweeping frequency.
7. Turn **Generator Output On**. The output power turns on at the level that has been set previously with the **Output Power** key.

Note

Turning the Tracking Generator On sets the detection type (**Amplitude** > Detection) to Sample and sets the sweep mode (**Sweep** > Sweep Mode) to No FFT. Turning off the generator resets both parameters to their previous settings. Either parameter may be changed by the user with the Tracking Generator on or by the instrument when other measurements are also turned on.

3-3 Measurement Example

This example demonstrates how to connect a Device Under Test (DUT) and make a measurement. This example characterizes the frequency response of a filter in the GSM frequency band.

1. Set the frequency range to cover the range of the DUT being tested. In this example, the center frequency is set to 1.8 GHz with a 1 GHz span.
2. Set the Generator to Tracking Mode with an Output Power of 0.0 dBm. Refer to the previous “[Tracking Generator Overview](#)” section for additional information.
3. Connect the DUT as shown in [Figure 3-1 on page 3-2](#). For connector torque and connector care information, refer to the User Guide for your instrument.
4. Toggle the Generator Output to On.

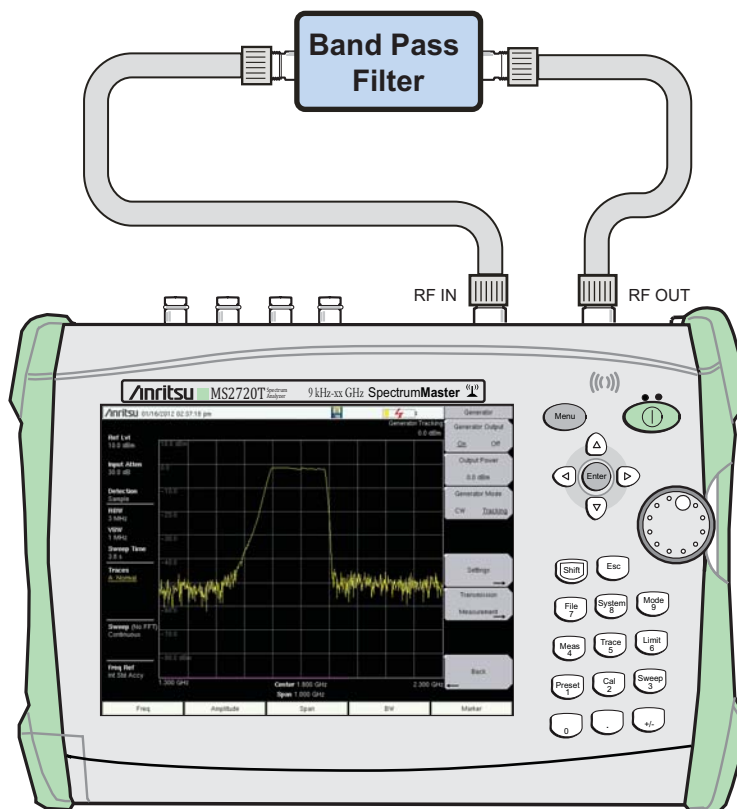


Figure 3-1. Connection of Device Under Test

5. Observe the measurement to confirm that the pass band frequency range covers the required span.
6. If the spectrum analyzer noise floor is too high for the necessary measurements, then reduce the input attenuation and RBW to maximize the dynamic range. [Figure 3-2 on page 3-3](#) shows the sample setup with the input attenuation lowered from 30 dB to 15 dB and with the RBW reduced from 3 MHz to 300 kHz.

7. When measuring a filter with a very high insertion loss in the stop band, press the **Shift** key, then the **Trace (5)** key. Press the Trace A Operations submenu key, then the **Average** → **A** submenu key to turn on averaging and clean up the stop band area. An averaging value of 10 will probably be adequate for most filters.
8. Under the **Setting** submenu turn **Power Statistics On** (Figure 3-2) to display the spectrum analyzer received Maximum, Average, and Minimum power of each frequency range sweep.

Note If the noise floor drops below the visible display, then set the Scale dB/division setting to a value larger than 10. This will increase the displayed amplitude range.

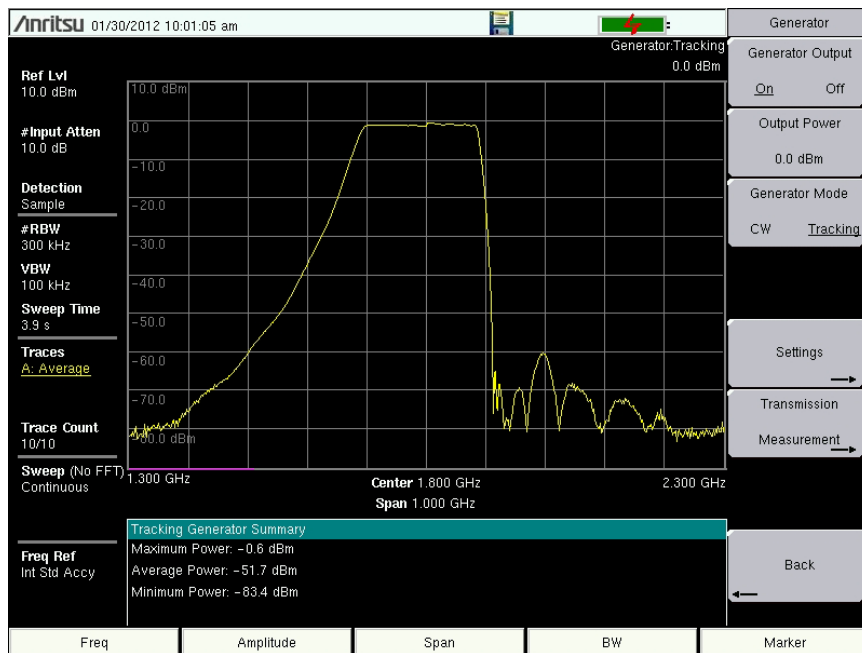


Figure 3-2. Increasing Measurement Dynamic Range, Trace Averaging On, Displaying Power Statistics

Note Many of displayed settings on the left side of the screen are used as menu shortcuts. Select a parameter by touching the appropriate setting on the touch screen to display the menu and set up the parameter for editing.

3-4 Transmission Measurements

Each Tracking Generator option includes normalized transmission measurements.

1. Set the frequency and amplitude parameter required for the DUT.
2. Press the **Shift** key, then the **Measure (4)** key. Press the Generator key. Set the Generator Mode to Tracking and turn Generator Output On.
3. Connect a through cable between the RF OUT and RF In connectors. From the Generator submenu, press the Transmission Measurement submenu key ([Figure 3-3](#)).

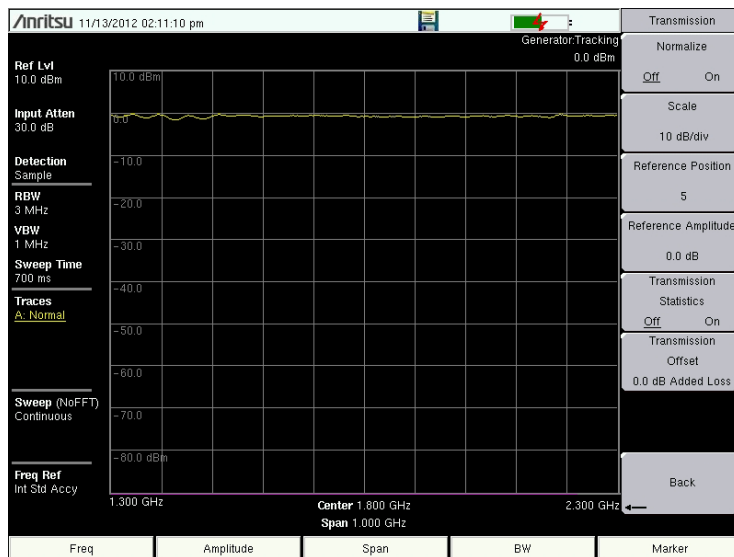


Figure 3-3. Normalize Off (Trace at ~0 dBm)

4. Toggle Normalize On ([Figure 3-4](#)). A message will flash when the process is complete.

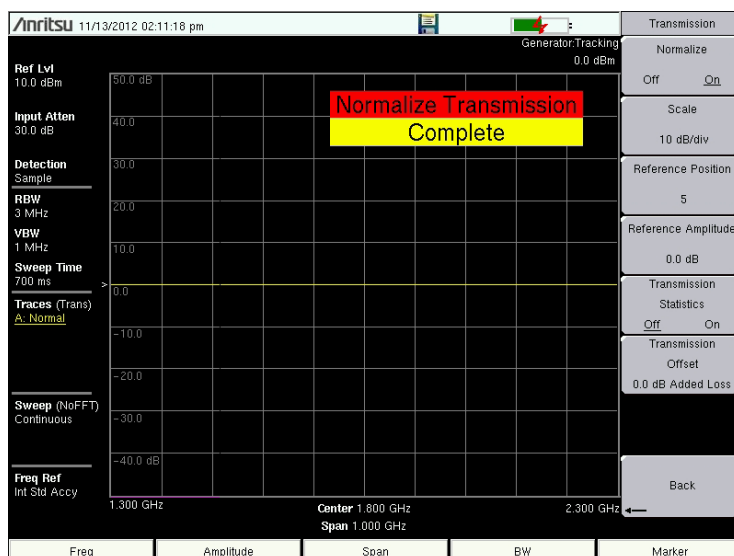


Figure 3-4. Normalize On (Trace at 0 dB)

After Normalization:

- Units in the Amplitude scale change from absolute (dBm) to relative (dB).
- The trace is centered in the graticule at 0 dB when Reference Position is set 5 (default) and Reference Amplitude is 0.0 dB (default).
- (Trans) is added after the **Traces** header on the left of the display.

Note Set the appropriate input attenuation needed *BEFORE* turning Normalization ON. Changes to the **Amplitude** menus or the **Frequency** menus will automatically turn OFF Normalization.

After the normalization sweep is completed, reconnect the DUT between the RF OUT and RF In connectors.

Figure 3-5 shows a filter measurement after the normalization process. Displaying the trace required changing the Reference Position to 9 and the Scale (db range between grids).

Refer to “Transmission Measurement Menu” on page 3-11 for additional information including Transmission Statistics and Transmission Offset.

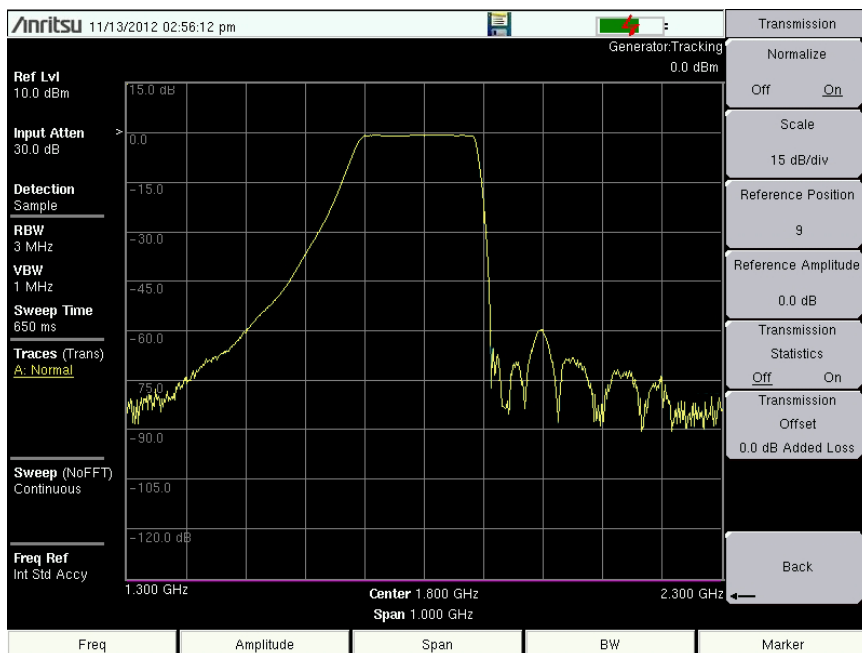


Figure 3-5. Normalized Filter Trace

3-5 CW Generator Overview

These Tracking Generator options include a CW Generator. The CW Signal Generator provides a continuous wave (CW) signal from the GENERATOR/RF OUT port of the instrument.

The following example displays the generator CW signal on the instrument display.

1. Connect a THROUGH cable between the RF OUT and RF In connectors as shown in [Figure 3-6](#)

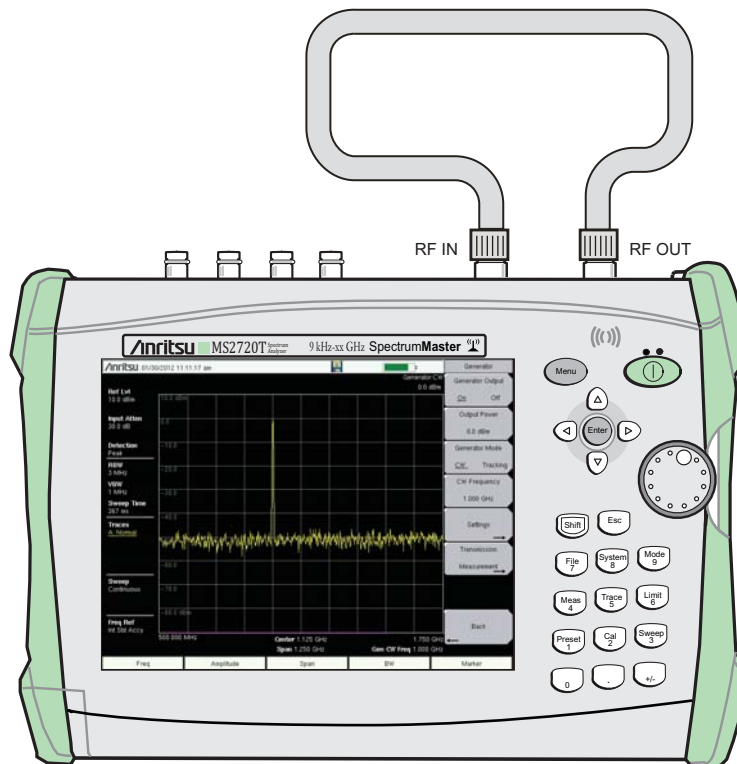


Figure 3-6. Through Cable Setup Example

2. Set the **Mode** to Spectrum Analyzer. Refer to [Chapter 1](#) for details.
3. **Preset** the instrument (Shift+1 > Preset).
4. Set the spectrum analyzer frequency range using the Frequency (**Freq**) menu and submenus. Refer to the Spectrum Analyzer Measurement Guide (10580-00349) for additional information.
5. Press the **Shift** key, then the **Measure (4)** key. Press the **Generator** key.
6. Press the **Output Power** button and set the output power (at the output connector before any external attenuation).

- Set the Generator Mode to CW and set the CW Frequency.

Note Confirm that the CW Frequency is set within the spectrum analyzer span, or the signal will not be displayed on the instrument.

- Turn Generator Output On. The output power turns on at the level that has been set previously with the Output Power key.
- Figure 3-7 displays the CW output at 1 GHz frequency and 0.0 dBm power. Refer to “Generator Menu” on page 3-9 for additional information.

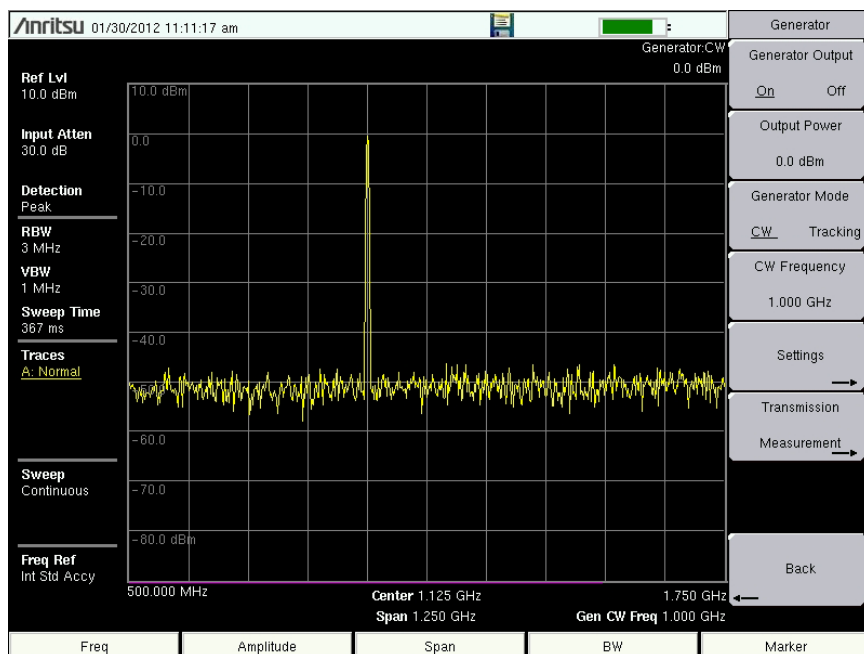


Figure 3-7. CW Output Example

3-6 Tracking Generator Menus

To access the functions under the Measure menu, press the **Shift** key, then the **Measure (4)** key. The addition of Option 809, Option 813, and Option 820 adds the Tracking Generator submenu key and subsequent menus, as shown **Figure 3-8**. Menu maps typically display all possible submenu keys, although some keys are displayed on the instrument only under special circumstances (refer to menu descriptions).

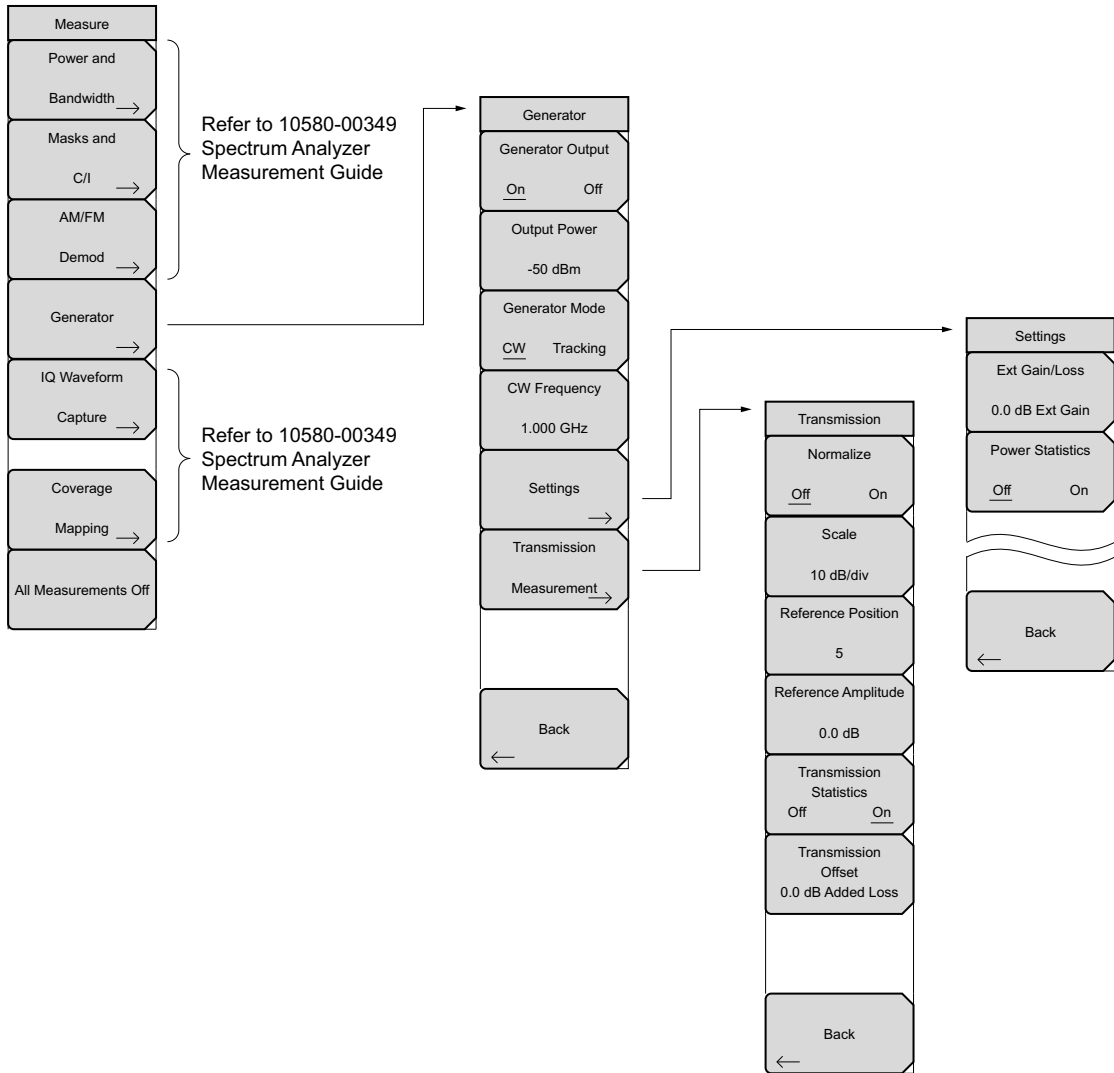


Figure 3-8. Measure Menu with Tracking Generator (Options 809, 813, and 820)

Note General Spectrum Analyzer measurement menu including **Frequency, Amplitude, Span, Bandwidth, Marker, Sweep, Trace, and Limit** menus are detailed in the Spectrum Analyzer Measurement Guide (p/n 10580-00349). General instrument operating functions including the **Preset, File, Mode** and **System** are described in the instrument User Guide.

3-7 Generator Menu

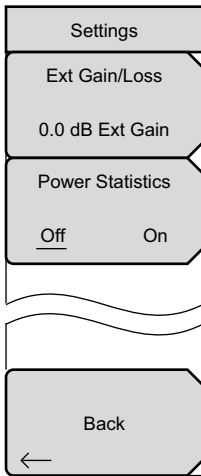
Key Sequence: **Measure (Shift + 4)** > Generator

<div style="border: 1px solid black; padding: 2px;">Generator</div>	<p>Generator On Off: Press to turn the tracking generator On or Off. The output power is turned on at the level that was previously set with the Output Power submenu key.</p> <p>Output Power: Press to set the output power of the generator. The specified range is from -40 dBm to 0 dBm. The range that can be requested is -50 dBm to $+15$ dBm, which the instrument will deliver on a best efforts basis. Levels beyond -40 dBm to 0 dBm are not warranted. If the user has entered an external gain or loss value, that value will be added to the displayed value.</p> <p>Generator Mode: Press to toggle the Generator Mode between CW and Tracking. In CW Mode, the output frequency is fixed and set by the CW Frequency submenu. In Tracking Mode, the output frequency is paired with the spectrum analyzer input sweeping frequency. The frequency range is set using the Freq main menu and submenu keys.</p> <p>CW Frequency: Sets the frequency of the output when the Generator Mode is set to CW.</p> <p>Settings: Displays the “Settings Menu” on page 3-10.</p> <p>Transmission Measurement: Displays the “Transmission Measurement Menu” on page 3-11. To enter into Transmission mode, the Generator Mode must be set to Tracking and the Generator Output must be set to On.</p> <p>Back: Returns to the Measure menu.</p>
<div style="border: 1px solid black; padding: 2px;">Generator Output</div>	
<div style="border: 1px solid black; padding: 2px;">On Off</div>	
<div style="border: 1px solid black; padding: 2px;">Output Power</div>	
<div style="border: 1px solid black; padding: 2px;">-40 dBm</div>	
<div style="border: 1px solid black; padding: 2px;">Generator Mode</div>	
<div style="border: 1px solid black; padding: 2px;">CW Tracking</div>	
<div style="border: 1px solid black; padding: 2px;">CW Frequency</div>	
<div style="border: 1px solid black; padding: 2px;">1.000 GHz</div>	
<div style="border: 1px solid black; padding: 2px;">Settings →</div>	
<div style="border: 1px solid black; padding: 2px;">Transmission Measurement →</div>	
<div style="border: 1px solid black; padding: 2px;">Back ←</div>	

Figure 3-9. Generator Menu

Settings Menu

Key Sequence: **Measure (Shift + 4)** > Generator > Settings



Ext Gain/Loss: Sets the tracking generator (RF OUT) external attenuation or gain. Press the Ext Gain/Loss submenu key and select a value from 0 dB to 100 dB, then select either dB External Loss or dB External Gain. The Generator Gain/Loss setting adjusts the Generator output power level displayed in the upper-right corner.

Regardless of the external gain or loss setting, the output power range of the tracking generator will not change.

Power Statistics: Press to display the Tracking Generator Summary table displaying the spectrum analyzer received Maximum, Average, and Minimum power of each frequency range sweep. Only available with Generator Mode set to tracking.

Back: Press to return to the [“Generator Menu” on page 3-9](#).

Figure 3-10. Settings Menu

Transmission Measurement Menu

Key Sequence: **Measure (Shift + 4)** > Generator [Generator = ON] [Generator Mode = Tracking]
> Transmission Measurement

Transmission	Normalize: Press to toggle Normalization On or Off. When turned On, a calibration process is started. Make a THROUGH connection between the tracking Generator Output and the Spectrum Analyzer Input connectors before performing normalization. For the most accurate results, use the same cables and adapters that will be used for the normalization as will be used for the measurement. The current state (Off or On) is underlined.
Normalize <u>Off</u> On	Scale: Press to set the scale factor from 1 dB/division to 15 dB/division in 1 dB steps.
Scale 10 dB/div	Reference Position: Press to set the graticle position of the Reference Amplitude. A setting of 5 uses the middle grid line. Position indicated by the > symbol.
Reference Position > 5	Reference Amplitude: Press to set the reference amplitude. The Reference Amplitude value is placed at the defined Reference Position and the displayed amplitude values are adjusted based on the Scale division.
Reference Amplitude 0.0 dB	Transmission Statistics: Press to display the Transmission Measurement Statistics table displaying the received spectrum analyzer Maximum, Average, and Minimum relative power of each frequency range sweep.
Transmission Statistics Off <u>On</u>	Transmission Offset: Sets the offset for the normalized trace. Offset value is displayed in the Transmission Measurement Statistics.
Transmission Offset 0.0 dB Added Loss	Back: Press to return to the “Generator Menu” on page 3-9 .
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Figure 3-11. Transmission Measurement Menu

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