Measurement Using E5053A and External Mixer

Measurement Using E5053A and External Mixer

- E5053A Microwave Downconverter
- External Mixer
- Frequency Offset Function
- Making phase-noise measurement above 26.5 GHz

E5053A Microwave Downconverter

E5053A Microwave Downconverter

The Agilent E5053A is a microwave downconverter associated with the E5052B signal source analyzer. The E5053A expands the maximum frequency of the E5052B to 26.5 GHz.

- Name and Function of Parts
- Connection of E5052B and E5053A
- Device configuration using E5052B and E5053A
- Setting E5053A Microwave Downconverter
- Effects of setting Downconverter

Name and Function of Parts

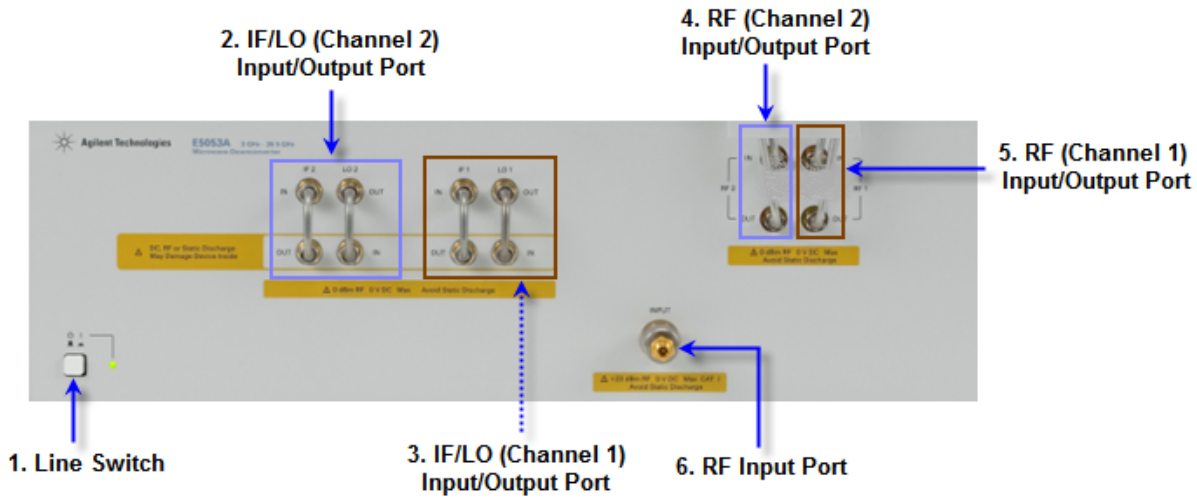
Name and Function of Parts

- Front Panel
- Rear Panel

Front Panel Name and Functions of Parts

The names and functions of the parts on the front panel of the E5053A are described below.

Front Panel



1. *Line switch*

Turns ON/OFF the E5053A.

2. *IF/LO (channel 2) input/output port*

When using an external mixer, disconnect this port.

3. *IF/LO (channel 1) input/output port*

When using an external mixer, disconnect this port.

4. *RF (channel 2) input/output port*

Connect to the E5052B (signal source analyzer) with the RF cable.

5. *RF (channel 1) input/output port*

Connect to the E5052B (signal source analyzer) with the RF cable.

CAUTION Do not apply a DC current or DC voltage to ports 2 - 5 to avoid device failures. Do not connect the measurement sample (DUT) to the port.

The individual ports comply with Installation Category I of IEC60101-1.

6. *RF input port*

Input the RF output signal (signal to be measured) from the DUT. A 3.5-mm (female) connector is used.

CAUTION Do not apply a DC voltage greater than 0 V to the connection port. In particular, there is the risk of the capacitor remaining charged. Connect the measurement sample (DUT) after the analyzer has been completely discharged.

CAUTION Take antistatic measurements when operating the product.

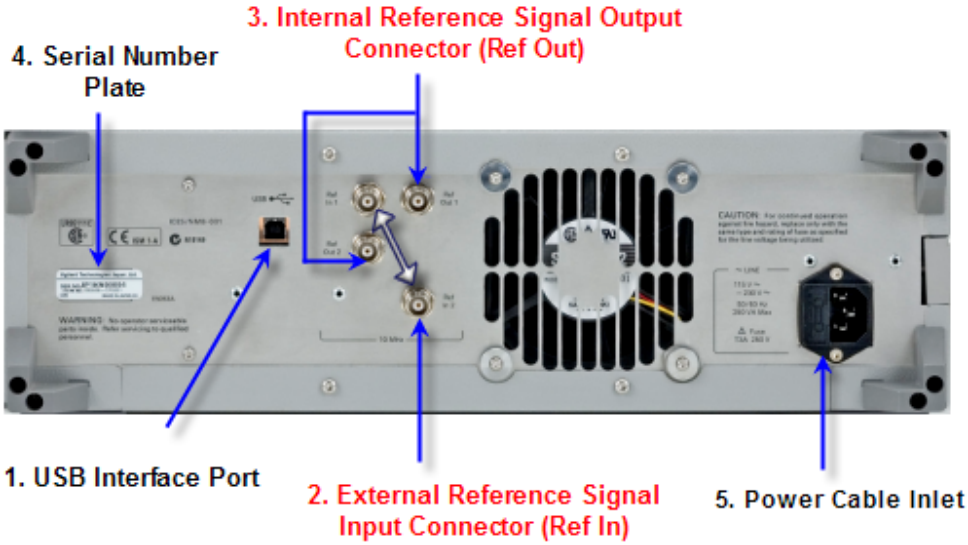
CAUTION Because the E5053A includes semiconductor internal parts that may be damaged by static electricity through the input ports, take appropriate antistatic measures when operating it.

The port complies with Installation Category I of IEC61010-1.

Rear Panel Name and Functions of Parts

The names and functions of the parts on the rear panel of the E5053A are described below.

Rear Panel



1. USB interface port

Connect to the USB port on the rear panel of the E5052B signal source analyzer with the USB cable.

Connector type: Universal serial bus jack, B type (four contacts); female

NOTE Connection of devices other than the E5052B signal source analyzer to the USB port is not supported.

2. External reference signal input connector channel 1/channel 2 (Ref In)

A reference signal input connector in order to phase-lock the E5053A measurement signal with an external frequency reference signal. Supplying a reference signal to this connector improves the accuracy and stability of the E5053A's measurement signal frequency.

Channel 1	Connect to the 10 MHz Ref Out connector of the E5052B with a BNC cable.
Channel 2	Connect to the Channel 1 Ref Out of the E5053A with a BNC cable.

Connector type: BNC connector, female
Input signal (typical): 10 MHz ± 10 Hz, 0 dBm ± 5 dB

3. Internal reference signal output connector channel 1/channel 2 (Ref Out)

Channel 1	Connect to the Channel 2 Ref In of the E5053A with a BNC adapter.
Channel 2	A connector for outputting the internal frequency reference signal from the E5053A. By connecting this output connector to the external reference signal input connector of another device, the device can be phase-locked to the internal reference signal of the E5053A and used under this condition.

Connector type: BNC connector, female
Output signal (typical): 10 MHz ± 50 Hz, 2.5 dBm ± 3 dB
Output impedance (nominal): 50 ohm

4. Serial number plate

The seal showing the serial number of the E5053A.

5. Power cable receptacle

The receptacle to which the power cable is connected.

NOTE Too feed power, use the included three-prong power cable with a ground conductor.

The plug attached to the power cable (on the power outlet side or device side of the cable) serves as the disconnecting device (device that cuts off power supply) of the E5053A. When the power supply must be cut off to avoid danger such as eclectic shock, pull out the

power cable plug (on the power outlet side or device side of the cable). The procedure for turning off the mains in normal use is given in Line switch.

Connection of E5052B and E5053A

This section describes hardware configurations and setups when using the E5053A Microwave Downconverter with the E5052B.

Connection of E5052B and E5053A

Required Devices

Following devices are required when configuring the E5052B and E5053A Microwave Downconverter:

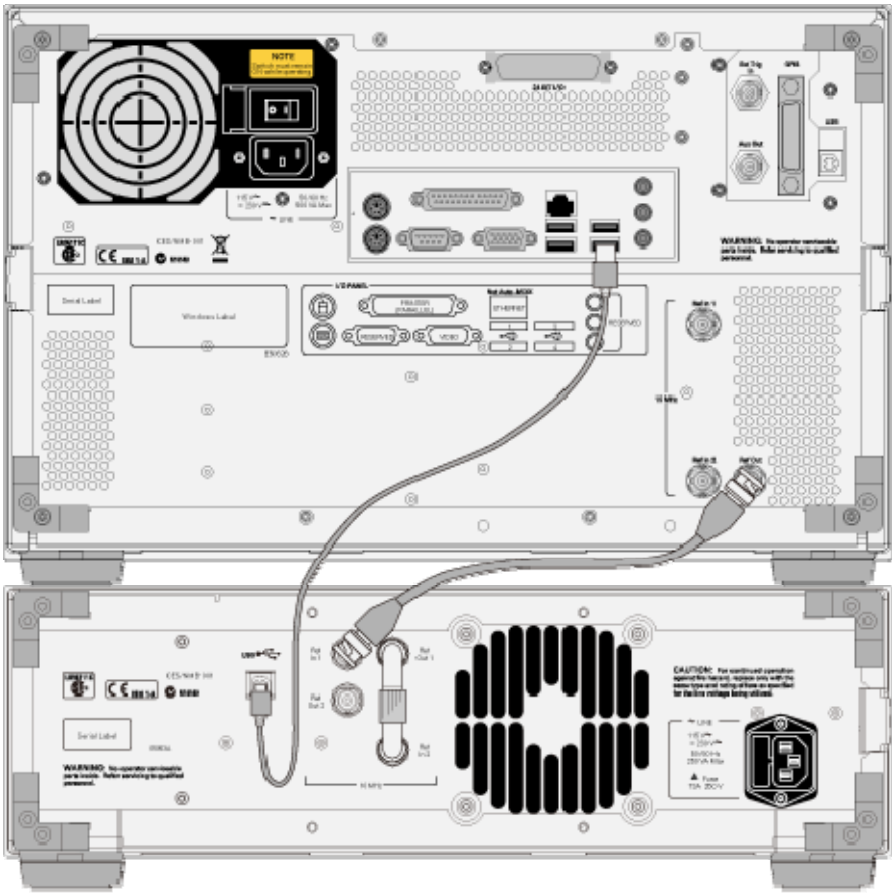
- E5052B
- E5053A Microwave Downconverter
- RF cables of 2 types × 2 (supplied with the E5053A, Agilent part number: E5053-61621, E5053-61622)
- USB cable (supplied with the E5053A, Agilent part number: 8121-0770)
- BNC cable (supplied with the E5053A, Agilent part number: 8120-1839)
- BNC adapter (supplied with the E5053A, Agilent part number: 1250-1859)

Connecting E5052B and E5053A Microwave Downconverter

Check the following connections on the rear panel before turning on both the E5052B and the E5053A, as shown in Connection of the E5052B and the E5053A (rear view).

- USB Cable (PN: 8121-0770): Connecting the USB ports of both the E5052B and E5053A.
- BNC Cable (PN: 8120-1839): Connecting the E5052B internal reference signal output port (Ref Out) and the E5053A external reference signal input port (Ref In) of the channel 1.
- BNC Adaptor (PN: 1250-1859): Connecting the internal reference signal output port (Ref Out) of the channel 1 and the internal reference signal input port (Ref In) of the channel 2 on the E5053A rear panel.

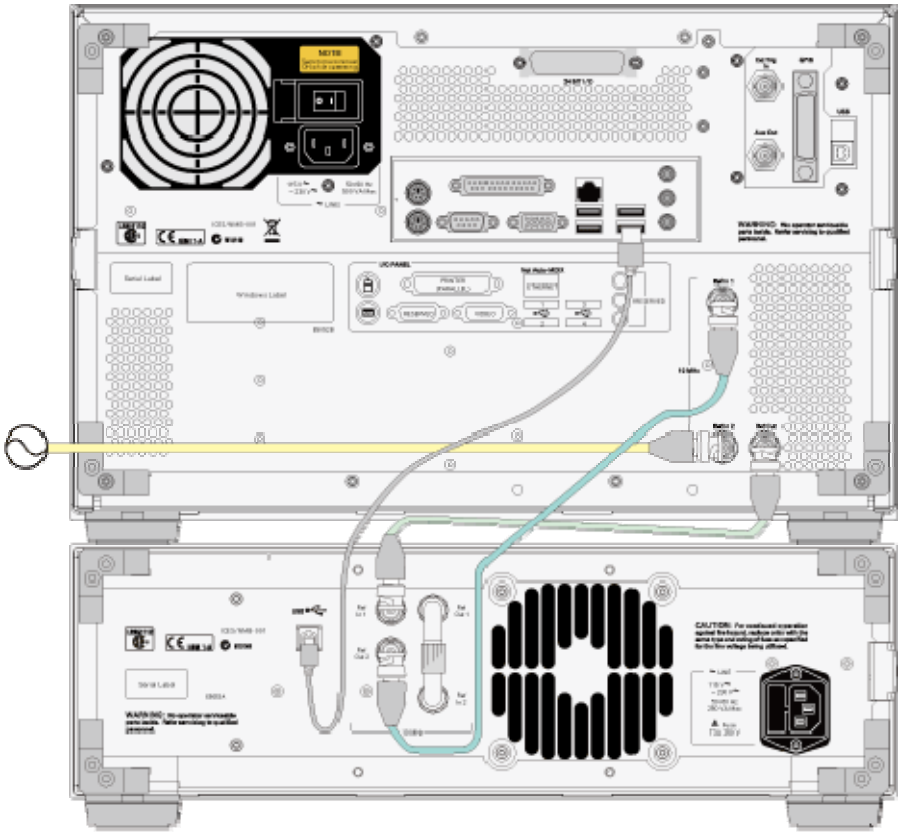
Connection of the E5052B and the E5053A (rear view)



ssa0006

When the narrow-narrow mode in the transient measurement is selected, the Ref Out 2 connector on the E5053A should be connected with the Ref In 1 connector on the E5052B as shown in the following figure. If external signal source is used, is should be connected with the Ref In 2 connector on the E5052B.

Connection of the E5052B and the E5053A (rear view) : Narrow-Narrow Mode



ssa0190

NOTE Do not connect or disconnect the USB cable during the measurement.

Check the following connections on the front panel as shown in Connection of E5052B and E5053A (front view).

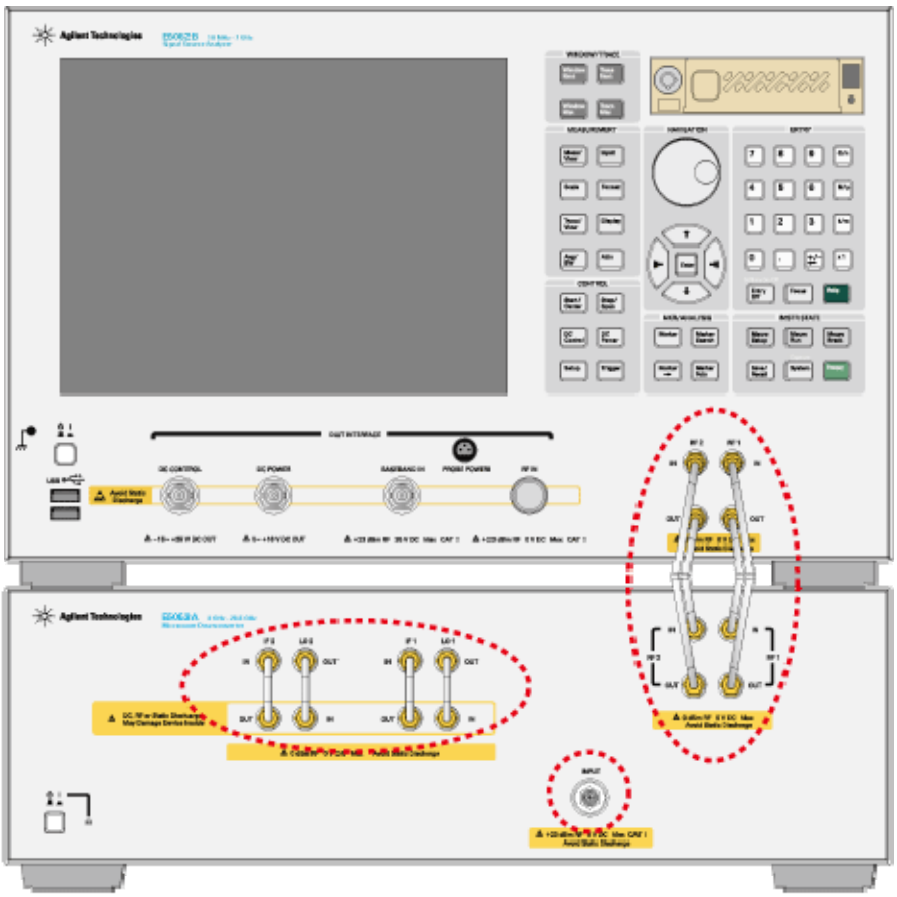
- RF Cable (PN: E5053-61621): Connecting the E5052B RF output ports and the E5053A RF input ports
- RF Cable (PN: E5053-61622): Connecting the E5052B RF input ports and the E5053A RF output ports

NOTE When mounting the E5053A and the E5052B with the rack mount kit, use the following RF cables.

- RF Cable (PN: E5053-61623): Connecting the E5052B RF output ports and the E5053A RF input ports

- RF Cable (PN: E5053-61624): Connecting the E5052B RF input ports and the E5053A RF output ports

Connection of E5052B and E5053A (front view)



ssa0007

NOTE Use the torque wrench when the semi-rigid cable or adapter is fastened on the following connectors of E5052B and E5053A. The recommended torque and open-ended wrenches are shown below.

Connector	Recommended Torque	Recommended Wrench
SMA	5.7 kgf-cm (56 N-cm/ 5 in-lb)	Wrench PN 8710-1582
3.5 mm	9.2 kgf-cm (90 N-cm/ 8 in-lb)	Wrench PN 8710-1765

Turning On E5053A Microwave Downconverter

Turn on the E5053A Microwave Downconverter first, and then turn on the E5052B.

The E5052B automatically detects the E5053A Microwave Downconverter whenever it is connected. If there's an auto recall file, the instrument state is also set along with the settings defined in the auto recall file.

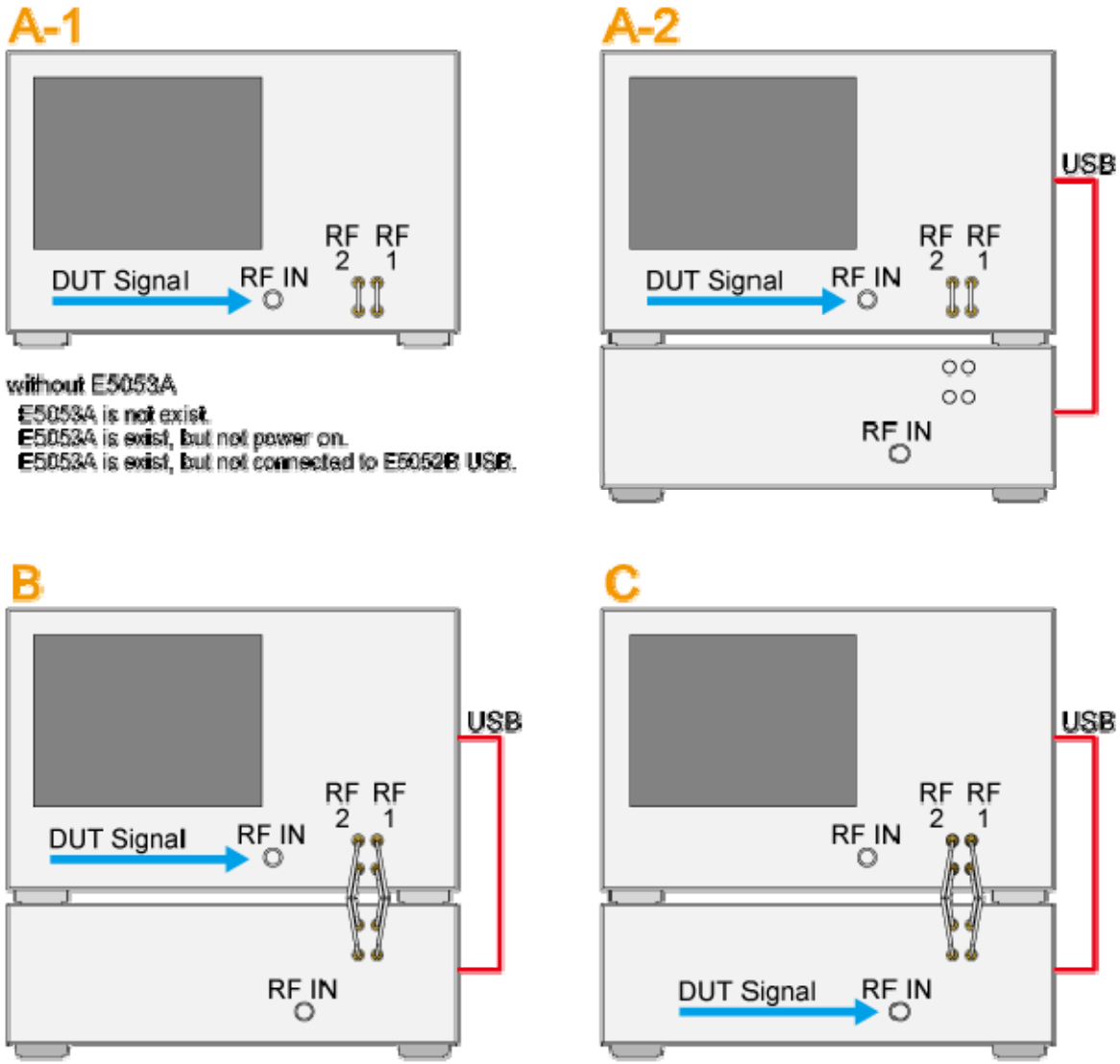
NOTE When the E5052B fails to detect the downconverter and you try to activate the E5053A Microwave Downconverter, "No downconverter unit connected" error message is displayed. In this case, the E5052B instrument state is initiated as the settings of the E5052B standalone by the firmware, even if there's an auto recall file that includes any instrument setups that relate the E5053A settings.

See also Selecting Device Configuration for more information.

Device configuration using E5052B and E5053A

There are 4 types of device configurations using the E5052B and the E5053A Microwave Downconverter including the standalone use of the E5052B: A-1, A-2, B, and C (See the figure below).

Device Configurations Using E5052B and E5053A



ssa0008

The device configurations of the E5052B and the E5053A Microwave Downconverter are classified by the following factors.

- Connection of the USB cable
- Input port for DUT signals (the RF IN port of the E5052B or the INPUT port of the E5053A)
- Connection of the RF1 and RF2 ports

NOTE The device configuration A-1 (standalone use of the E5052B) includes the configuration where the E5053A Microwave Downconverter is not turned on and the configuration where no USB cable is connected.

Selecting Device Configuration

Following items should be specified in order to identify the device configuration: A (A-1, A-2), B, or C.

Configuration	Description
Downconverter	On/off **Input > Downconverter - Downconverter [ON | OFF]**
Input port for DUT signals	E5052B RF IN port/E5053A INPUT port **Input** > **Downconverter** - **RF Input** - **Downconverter** | **E5052B Direct**

The device configuration A-2 is a configuration where the E5053A Microwave Downconverter is turned on and the USB cable is connected, but the E5053A Microwave Downconverter is disabled by the firmware. The basic functions available with this configuration is the same as those in A-1.

The device configuration B is a configuration where the E5053A Microwave Downconverter is enabled by the firmware, and the input port for the DUT signals is set to the RF IN port of the E5052B.

The device configuration C is a configuration where the E5053A Microwave Downconverter is enabled by the firmware, and the input port for the DUT signals is set to the INPUT port of the E5053A.

Discrepancy Between Device Configuration and Setting

The firmware recognizes none of discrepancy between the device configuration and settings but connection of the USB cable. Therefore, the E5052B performs processing based on the firmware setting which could be different than actual connection of the input port for the DUT signals or connection of the RF1 and RF2 ports. In this case, measurement cannot be performed properly. In addition, an error may occur during measurement.

The connection of the USB cable is recognized by the firmware, therefore discrepancy in each configuration can be eliminated as described below.

- Configuration A-1 (when the E5053A Microwave Downconverter is not present)

  You cannot activate the downconverter setting with the softkey. You can

activate it by loading a configuration file with the downconverter setting enabled, but an error "No downconverter unit connected." appears.

To correct this error, deactivate the downconverter setting, or connect the E5053A Microwave Downconverter.

- Configurations A-2, B, and C (when the E5053A Microwave Downconverter is present)

  When power-on the E5052B, connection is checked and the downconverter setting is automatically activated if the E5053A Microwave Downconverter is recognized. Note that, if Auto Recall is set, the setting loaded by the function will be used.

- When the E5053A Microwave Downconverter is added to the configuration

  When the E5053A Microwave Downconverter is turned on (previously off) or the USB cable is connected (previously not connected), the downconverter setting remains disabled. It is not activated automatically. You need to activate the downconverter setting.

- When the E5053A Microwave Downconverter is removed from the configuration

  When the E5053A Microwave Downconverter is present in the configuration and it is turned off or the USB cable is disconnected, the E5052B does no particular action if the downconverter setting is disabled. If the downconverter setting is activated, an error "No downconverter unit connected." appears.

  Take the same corrective action as that for configuration A-1.

Setting E5053A Microwave Downconverter

This section describes the differences of the settings when the E5053A Microwave Downconverter is used from that of the E5052B standalone operations.

Common to All Measurement Modes

1. Setting Downconverter and External Mixer

   Follow these steps to make the setting when using the E5053A Microwave Downconverter.

1.

1. Press **Preset** > **Factory**
2. Press **Input** > **Downconverter**.
3. Press **Downconverter** to toggle on/off.
4. If the Downconverter is turned on, press **RF Input** > **Downconverter** | **E5052B Direct** to select an RF input source.
5. If the Downconverter is turned on and the RF input is set to Downconverter, press **External Mixer** - **Not Used** | **ON** to select whether to use the external mixer.

NOTE The settings when using the Downconverter and the external mixer include:

- Setting of LO frequency and power
- Setting of DC bias current (CH1, CH2)
- Setting of IF gain inside Downconverter
- Setting of Downconverter ΔIF frequency

2. Selecting the input port

The RF input port has to be selected first depending on the device configuration as well as the carrier frequency range. Selecting External Mixer ON is available only when Downconverter ON is selected AND Downconverter is selected in the RF Input menu.

Input > **Downconverter** > **External Mixer** > **Not Used** | **ON**

3. Setting of the attenuator

For the device configuration C in Device Configurations Using E5052B and E5053A, the attenuator setting is fixed to 10 dB when the external mixer is off. For the device configurations A (A-1, A-2) and B and the device configuration C with the external mixer on, you can change the attenuator setting.

Attn > **Input Attenuator**

Phase-noise Measurement

The following settings for phase-noise measurement mode differ from the settings when using the E5052B alone.

1. Setting of the carrier frequency band

Set the frequency band for the carrier frequency.

Setup > **Frequency Band** > **10 M - 41 MHz** | • • • | **9 G - 26.5 GHz**

Frequency Band	Range
Band 1	10 M - 41 MHz
Band 2	39 M -101 MHz
Band 3	99 M -1.5 GHz
Band 4	250 M - 7 GHz (300 M - 3 GHz)
Band 5	3 G -10 GHz
Band 6	9 G - 26.5 GHz

For the device configuration A in Device Configurations Using E5052B and E5053A, you can set Band 1 to Band 4. You cannot specify Band 5 and Band 6.

For the device configuration B, you can set Band 1 to Band 4. Note that the frequency range of Band 4 is changed to 300 M - 3 GHz. You cannot specify Band 5 and Band 6.

For the device configuration C, you can set Band 5 and Band 6 when the external mixer is off. You cannot specify Band 1 to Band 4.

NOTE For the device configuration C with the external mixer ON, actual settings are dependent on the external mixer settings and/or the frequency function used. For more information, see External Mixer and Frequency Offset Function.

1. Input of the nominal frequency

   Set the nominal frequency of the carrier frequency.

Setup > **Nominal Frequency**

You can make this setting only when the device configuration is C in Device Configurations Using E5052B and E5053A and the external mixer is off. If the device configuration is C with the external mixer on or if the device configuration is A or B, you cannot make this setting.

The allowable range is limited by the range of the carrier frequency band.

3. Carrier search function

This function searches for the carrier signal, and reflects the result on the nominal frequency. To execute this function:

Setup > **Carrier Search**

You can execute this function only when the device configuration is C in Device Configurations Using E5052B and E5053A and the external mixer is off. If the device configuration is C with the external mixer on or if the device configuration is A or B, you cannot execute this function.

The range to be searched is the range of the carrier frequency band.

4. Display of the carrier power

Information on the carrier signal is displayed.

For the device configuration A in Device Configurations Using E5052B and E5053A, the measurement value of the power meter of the E5052B is displayed.

For the device configurations B and C, the measurement value of FFT is displayed.

Spectrum Monitor Measurement

The following settings for spectrum monitor measurement mode differ from the settings when using the E5052B alone.

1. Start, Stop, Center, Span frequencies

Set the 4 frequencies to determine the sweep range.

Start/Center (**Stop/Span**) > **Start** (**Stop**, **Center**, **Span**)

For the device configuration A in Device Configurations Using E5052B and E5053A, the following limits are applied.

Setting	Range
Start	9 M -6.99999995 GHz
Stop	10.00005 M -7.0075 GHz
Center	10 M -7 GHz
Span	100 - 15 MHz

For the device configuration B, the upper limit of Center is 3 GHz, and that of Stop is 3.0075 GHz. Other settings are the same as those for the device configuration A.

For the device configuration C with the external mixer off, the range of Center is 3 G - 26.5 GHz. The range of Start is 2.9925 G - 26.49999995 GHz, the range of Stop is 3.00000005 G - 26.5075 GHz, and the range of Span is 100 - 15 MHz.

NOTE For the device configuration C with the external mixer ON, actual settings are dependent on the external mixer settings and/or the frequency function used. For more information, see External Mixer and Frequency Offset Function.

2. Harmonic measurement function

Set the frequency band to measure the harmonics of the carrier signal. To set the frequency band:

Start/Center (**Stop/Span**) > **Carrier to** - **Frequency Band** - **10 M - 1.5 GHz** | • • • | **9 G - 26.5 GHz**

Setting	Range
Low (Band 1)	10 M -1.5 GHz
High (Band 2)	250 M - 7 GHz (300 M - 3 GHz)
Band 3	3 G -10 GHz
Band 4	9 G - 26.5 GHz

For the device configuration A in Device Configurations Using E5052B and E5053A, you can set Low (Band 1) and High (Band 2). You cannot specify Band 3 and Band 4.

For the device configuration B, you can set Low (Band 1) and High (Band 2). Note that the frequency range of High (Band 2) is changed to 300 M - 3 GHz. You cannot specify Band 3 and Band 4.

For the device configuration C, you can set Band 3 and Band 4 when the external mixer is off. You cannot specify Low (Band 1) and High (Band 2).

Frequency/Power Measurement

The following settings for frequency/power measurement mode differ from the settings when using the E5052B alone.

1. Setting of the carrier frequency band

Set the frequency band for the carrier frequency.

Setup > **Frequency Band** > **10 M - 1.5 GHz** | • • • | **9 G - 26.5 GHz**

Setting	Range
Low (Band 1)	10 M -1.5 GHz
High (Band 2)	250 M - 7 GHz (300 M - 3 GHz)

Band 3	3 G -10 GHz
Band 4	9 G - 26.5 GHz

For the device configuration A in Device Configurations Using E5052B and E5053A, you can set Low (Band 1) and High (Band 2). You cannot specify Band 3 and Band 4.

For the device configuration B, you can set Low (Band 1) and High (Band 2). Note that the frequency range of High (Band 2) is changed to 300 M - 3 GHz. You cannot specify Band 3 and Band 4.

For the device configuration C, you can set Band 3 and Band 4 when the external mixer is off. You cannot specify Low (Band 1) and High (Band 2).

NOTE For the device configuration C with the external mixer ON, actual settings are dependent on the external mixer settings and/or the frequency function used. For more information, see External Mixer and Frequency Offset Function.

1. Input of the nominal frequency

Set the nominal frequency of the carrier frequency.

Setup > **Nominal Frequency**

You can make this setting only when the device configuration is C in Device Configurations Using E5052B and E5053A and the external mixer is off. If the device configuration is C with the external mixer on or if the device configuration is A or B, you cannot make this setting.

The settable range is limited to the range of the carrier frequency band.

3. Carrier search function

This function searches for the carrier signal, and reflects the result on the nominal frequency. To execute this function:

Setup > **Carrier Search**

You can execute this function only when the device configuration is C in Device Configurations Using E5052B and E5053A and the external mixer is off. If the device configuration is C with the external mixer on or if the device configuration is A or B, you cannot execute this function.

The range to be searched is the range of the carrier frequency band.

4. Setting of the maximum input level

Set the maximum input level value of the measurement signal inputted from the Input port of the E5053A Microwave Downconverter. To execute this function:

Setup > **Max Input Level**

You can make this setting only when the device configuration is C in Device Configurations Using E5052B and E5053A and the external mixer is off. If the device configuration is C with the external mixer on or if the device configuration is A or B, you cannot make this setting.

5. Measurement value of power measurement

For the device configuration A in Device Configurations Using E5052B and E5053A, the measurement value of the power meter of the E5052B is displayed. For the device configurations B and C, the measurement value of FFT is displayed.

Transient Measurement

The following settings for transient measurement mode differ from the settings when using the E5052B alone.

1. Setting of the frequency band of the input signal (wide band)

Set the frequency band (wide band) of the input signal. To execute this function:

Setup > **Wide Freq Range** > **50 M - 150 MHz** | • • • | **2.4 G - 7.2 GHz**

Frequency band	
50 M -150 MHz	1 G -3 GHz
100 M -300 MHz	1.2 G -3.6 GHz
200 M -600 MHz	1.4 G -4.2 GHz
300 M -900 MHz	1.6 G -4.8 GHz
400 M -1.2 GHz	1.8 G -5.4 GHz
500 M -1.5 GHz	2 G -6 GHz
600 M -1.8 GHz	2.2 G -6.6 GHz
800 M -2.4 GHz	2.4 G -7.2 GHz

For the device configuration A in Device Configurations Using E5052B and E5053A, you can set any of the above frequency bands.

For the device configuration B, you can set 50 M - 150 MHz to 1 G - 3 GHz. You cannot set frequency bands equal to or greater than 1.2 G - 3.6 GHz.

For the device configuration C, you cannot set the frequency band of the input signal because the maximum frequency of the input signal must be specified when the external mixer is off.

NOTE For the device configuration C with the external mixer ON, actual settings are dependent on the external mixer settings and/or the frequency function used. For more information, see External Mixer and Frequency Offset Function.

1. Setting of the maximum frequency of the input signal

For the device configuration C in Device Configurations Using E5052B and E5053A with the external mixer off, you specify the maximum frequency of the input signal instead of the frequency band setting of the input signal. To execute this function:

Setup > **Wide Max Frequency**

For the device configuration C with the external mixer off, the settable range is 3.5 G - 26.5 GHz. The frequency span is fixed to 500 MHz, and cannot be changed.

NOTE For the device configuration C with the external mixer ON, actual settings are dependent on the external mixer settings and/or the frequency function used. For more information, see External Mixer and Frequency Offset Function.

3. Setting of the center frequency (wide band) of the video trigger

   This setting is required when Wide Video is selected for the video trigger.

Setup > **Video Trigger** > **Wide Freq**

The settable range is limited to within the frequency band setting of the input signal described above, or below the maximum frequency of the input signal.

4. Setting of the target frequency

   Set the target frequency for narrow band measurement.

Setup > **Target Freq**

For the device configuration A in Device Configurations Using E5052B and E5053A, the valid input range is 10 M - 7 GHz.

For the device configuration B, the valid input range is 10 M - 3 GHz.

For the device configuration C with the external mixer off, the valid input range is 3 G - 26.5 GHz.

NOTE For the device configuration C with the external mixer off, the setting of the target frequency or the setting of the maximum frequency of the input signal, whichever made later, has precedence.

More specifically, if the inputted target frequency is greater than the setting value of the maximum frequency of the input signal, the setting value of the maximum frequency is changed so that it is greater than the target frequency.

On the other hand, if the maximum frequency of the inputted input signal is smaller than the setting value of the target frequency, the setting value of the target frequency is changed so that it is smaller than the maximum frequency of the input signal.

NOTE For the device configuration C with the external mixer on, this setting differs depending on the setting of the external mixer and the setting of the frequency offset function. For more information, see External Mixer and Frequency Offset Function.

5. Setting of the phase reference frequency

The phase deviation within the narrow band measurement range can be calculated based on the result of frequency transient (narrow band) measurement. The phase reference frequency is a frequency used as the reference when calculating the phase deviation.

Setup > **Phase Reference**

The setting range is limited to within the measurement range determined by the target frequency and the measurement range.

6. Setting of the center frequency (narrow band) of the video trigger

This setting is required when Narrow Video is selected for the video trigger.

Setup > **Video Trigger** > **Narrow Freq**

The setting range is limited to within the measurement range determined by the target frequency and the measurement range.

Auto Frequency Control Function

The following settings for auto frequency control measurement mode differ from the settings when using the E5052B alone.

1. Setting of the frequency band

Set the frequency band that contains the carrier signal to be measured.

DC Control > **Auto Freq Control** > **Frequency Band** - **10 M - 1.5 GHz** | • • • | **9 G - 26.5 GHz**

Setting	Range
Low (Band 1)	10 M -1.5 GHz
High (Band 2)	250 M - 7 GHz (300 M - 3 GHz)
Band 3	3 G -10 GHz (added)
Band 4	9 G - 26.5 GHz (added)

For the device configuration A in Device Configurations Using E5052B and E5053A, you can set Low (Band 1) and High (Band 2). You cannot specify Band 3 and Band 4.

For the device configuration B, you can set Low (Band 1) and High (Band 2). Note that the frequency range of High (Band 2) is changed to 300 M - 3 GHz. You cannot specify Band 3 and Band 4.

For the device configuration C, you can set Band 3 and Band 4 when the external mixer is off. You cannot specify Low (Band 1) and High (Band 2).When the external mixer is on, you cannot make this setting because the auto frequency control function itself is not available.

2. Setting of the target frequency

   Set the target frequency for the DUT output.

   DC Control > **Auto Freq Control** > **Target**

   For the device configuration A in Device Configurations Using E5052B and E5053A, you can set 10 M - 7 GHz.

   For the device configuration B, you can set 10 M - 3 GHz.

   For the device configuration C, you can set 3 G - 26.5 GHz when the external mixer is off. When the external mixer is on, you cannot make this setting because the auto frequency control function itself is not available.

3. Setting of the maximum input level

   Set the maximum input level value of the measurement signal inputted from the Input port of the E5053A Microwave Downconverter. To execute this function:

   DC Control > **Auto Freq Control** > **Max Input Level**

   You can make this setting only when the device configuration is C in Device Configurations Using E5052B and E5053A and the external mixer is off. If the device configuration is C with the external mixer on or if the device configuration is A or B, you cannot make this setting.

Effects of Setting of Downconverter and Input Port for RF Signals

The table below lists items whose setting range changes or whose display is affected depending on the setting of the E5053A Microwave Downconverter and the setting of the input port of the RF signal.

Measurement mode	**Affected items**	**Downconverter**		
		OFF	**ON**	
			Input port	
			E5052B direct	**E5053A downconverter**
Common to all modes	Setting of attenuator	Available (0,5,10,15,20,25,30,35 dB)	Available (0,5,10,15,20,25,30,35 dB)	fixed to 10dB
Phase-noise measurement mode	Setting of carrier frequency band	10 M - 41 MHz 39 M - 101 MHz 99 M -1.5 GHz 300 M - 250MHz	10 M - 41 MHz 39 M - 101 MHz 99 M -1.5 GHz 300 M - 250 MHz	3 G -10 GHz 9 G - 26.5 GHz
	Setting of nominal frequency	N/A	N/A	Yes (Allowable range is limited by carrier frequency band.)
	Carrier search function	N/A	N/A	Can be executed
Spectrum monitor measurement	Setting of start frequency	9 M - 6.99999995 GHz	9 M - 6.99999995 GHz	2.9925 G - 26.49999995 GHz
	Setting of	10.00005 M -	10.00005 M -	3.0000000

mode	stop frequency	7.0075 GHz	3.0075 GHz	5 G - 26.5075 GHz
	Setting of center frequency	10 M -7 GHz	10 M -3 GHz	3 G -26.5 GHz
	Setting of span frequency	100 - 15 MHz	100 - 15 MHz	100 - 15 MHz
	Setting of carrier frequency band for harmonic measurement function	10 M -1.5 GHz 300 M -7 GHz	10 M -1.5 GHz 300 M - 3 GHz	3 G -10 GHz 9 G - 26.5 GHz
Frequency /power measurement mode	Setting of carrier frequency band	10 M -1.5 GHz 300 M -7 GHz	10 M -1.5 GHz 300 M - 3 GHz	3 G -10 GHz 9 G - 26.5 GHz
	Setting of nominal frequency	N/A	N/A	Yes (Allowable range is limited by carrier frequency band.)
	Carrier search function	N/A	N/A	Yes
	Setting of maximum input level	N/A	N/A	Yes (-45 to 30 dBm)
Transient measure	Setting of frequency	50 M -150 MHz	50 M -150 MHz 100 M -300 MHz	N/A (set with

ment mode	band of input signal (wide band)	100 M -300 MHz 200 M -600 MHz 300 M -900 MHz 400 M -1.2 GHz 500 M -1.5 GHz 600 M -1.8 GHz 800 M -2.4 GHz 1 G -3 GHz 1.2 G -3.6 GHz 1.4 G -4.2 GHz 1.6 G -4.8 GHz 1.8 G -5.4 GHz 2 G -6 GHz 2.2 G -6.6 GHz 2.4 G -7.2 GHz	200 M -600 MHz 300 M -900 MHz 400 M -1.2 GHz 500 M -1.5 GHz 600 M -1.8 GHz 800 M -2.4 GHz 1 G -3 GHz	maximum frequency of input signal)
	Setting of maximum frequency of input signal (wide band)	N/A (set with frequency band of input signal (wide band))	N/A (set with frequency band of input signal (wide band))	Allowable range: 3 G - 26.5 GHz Setting resolution: 50 MHz (3.5 G - 10.85 GHz) 150 MHz (10.85 G - 26.5 GHz)

				Frequency span: 500 MHz
	Setting of center frequency of video trigger (wide band)	Limited to within setting of frequency band of input signal (wide band)	Limited to within setting of frequency band of input signal (wide band)	Limited to value less than or equal to setting value of maximum frequency of input signal (wide band)
	Setting of target frequency (narrow band)	10 M -7 GHz	10 M -3 GHz	3 G -26.5 GHz
	Setting of phase reference frequency (narrow band)	Limited to within measurement range determined by target frequency (narrow band) and measurement range (narrow band).	Limited to within measurement range determined by target frequency (narrow band) and measurement range (narrow band).	Limited to within measurement range determined by target frequency (narrow band) and measurement range (narrow band).
	Setting of center frequency of video trigger	Limited to within measurement range determined by	Limited to within measurement range determined by	Limited to within measurement range determined

	(narrow band)	target frequency (narrow band) and measurement range (narrow band).	target frequency (narrow band) and measurement range (narrow band).	by target frequency (narrow band) and measurement range (narrow band).
Auto frequency control function (AFC)	Setting of frequency band	10 M -1.5 GHz 300 M -7 GHz	10 M -1.5 GHz 300 M - 3 GHz	3 G -10 GHz 9 G - 26.5 GHz
	Setting of target frequency	10 M -7 GHz	10 M -3 GHz	3 G -26.5 GHz
	Setting of maximum input level	N/A	N/A	Yes (-45 to 30 dBm)

NOTE In the above table, the setting of the external mixer and the setting of the frequency offset are not taken into consideration. The table assumes that they are disabled.

External Mixer

- Overview
- Setup Parameters
- Limitations

Other topics about Measurement Using E5053A and External Mixer

This section describes settings and limitations when using the external mixer.

Overview

The E5053A Microwave Downconverter with the external mixer connected enables measurement up to 110 GHz.

Setting the E5052B when used with the E5053A Microwave Downconverter and the external mixer is based on the frequency of the RF signal (*IF* signal of the downconverter) supplied to the E5052B.

NOTE

In practice, the hardware in the E5052B narrows the measurement range of a signal down-converted by the E5053A Microwave Downconverter.

The frequency offset function described later is supported also when using the external mixer. You can use this function to display the setting values and measurement results of the E5052B in terms of DUT frequencies (frequencies before down-conversion).

Setup Parameters

The settings of the external mixer are common to all measurement modes (phase-noise measurement, spectrum monitor measurement, frequency/power measurement, and transient measurement).

The settings are applied to the hardware immediately when the device configuration is C in Device configuration using E5052B and E5053A and the external mixer is on.

Other than the phase-noise measurement mode, use the identical LO frequency for each channel (channel 1 and channel 2), while the LO frequency of channel 1 and channel2 can be set differently.

In the phase-noise measurement mode, the carrier frequency is measured using the channel2 path. In the frequency/power/DC current measurement, the carrier frequency is measured using the channel1 path.

Both channel paths are required to complete the measurement other than spectrum monitor mode, which uses channel2 path only.

In the transient measurement mode, the channel1 path is used for the wideband transient measurement, and the channel2 path is used for the narrowband transient measurement.

The settings when using the downconverter and the external mixer include:

- Setting of LO
- Setting of DC bias current (CH1, CH2)
- Setting of the IF gain inside the downconverter
- Setting of the downconverter ΔIF frequency

Setting of LO

Set the external signal source (LO).

(Channel 1 side)

System > **Instrument Setup** > **Downconverter Manual Setup** > **LO1 Frequency**

System > **Instrument Setup** > **Downconverter Manual Setup** > **LO1 Level**

(Channel 2 side)

System > **Instrument Setup** > **Downconverter Manual Setup** > **LO2 Frequency**

System > **Instrument Setup** > **Downconverter Manual Setup** > **LO2 Level**

Allowable range of the LO frequency setting is 2.975 G - 10.025 GHz, and setting resolution setting is 50 MHz.

Allowable range of the LO level setting is 10 - 16 dBm when the setting frequency is 2.975 G - 6 GHz; it is fixed to 10 dBm when the setting frequency is 6 G - 10.025 GHz.

Setting of DC Bias Current

Set a bias current supplied to the external mixer.

(Channel 1 side)

System > **Instrument Setup** > **Downconverter Manual Setup** > **Mixer 1 Bias**

System > **Instrument Setup** > **Downconverter Manual Setup** > **Current**

(Channel 2 side)

System > **Instrument Setup** > **Downconverter Manual Setup** > **Mixer 2 Bias**

System > **Instrument Setup** > **Downconverter Manual Setup** > **Current**

Valid input range of the bias current is -10 mA to 10 mA both for Channel 1 and Channel 2.

Setting of downconverter IF Gain

Set IF gain inside the downconverter.

(Channel 1 side)

System > **Instrument Setup** > **Downconverter Manual Setup** > **IF Gain 1**

(Channel 2 side)

System > **Instrument Setup** > **Downconverter Manual Setup** > **IF Gain 2**

Valid input range of the downconverter IF gain is 0 dB to 35 dB both for Channel 1 and Channel 2.

Setting of downconverter ΔIF Frequency

Set frequency difference when the IF frequency (RF frequency of the E5052B) of the downconverter differs between Channel 1 and Channel 2.

System > **Instrument Setup** > **Downconverter Manual Setup** > **ΔIF = IF2 - IF1**

Set the value ΔIF obtained by the following equation.

ΔIF = IF (Channel 2) - IF (Channel 1)

Limitations

Using the external mixer has following limitations:

- Limitations on the auto frequency control function and the carrier search function

When the external mixer is enabled, the auto frequency control function (AFC) is not available. Also not available is the carrier search function.

- The LO frequency of the downconverter is not changed automatically.

When using the external mixer, values are not changed automatically so the settings should be done manually

For example, when you make measurement in analyzer mode for frequency/power measurement, if the measurement frequency exceeds a valid measurement range during a sweep, LO frequency of the downconverter is not changed automatically. (The frequency is not changed automatically to follow the excess of frequency.)

Frequency Offset Function

- Overview
- Setting Items
- Frequency Conversion Equations
- Consideration on Frequency Setting
- Applicable Measurement Results

Other topics about Measurement Using E5053A and External Mixer

This section describes the frequency offset function and applicable setting values/measurement values.

Overview

This function offsets the frequency readouts when using an external downconverter or external mixers. All the frequency data and marker readouts are converted along with the equation below.

RF = N × LO -/+ IF

Where RF is the DUT frequency, N is the harmonic number, LO is the LO frequency of the external downconverter or the mixer used.

You can use this function to display the setting values and measurement results of the E5052B in terms of DUT frequencies (frequencies before down-conversion).

This function supports an offset not only when the internal local signal (LO) supplied to the internal mixer is at the lower frequency side of the DUT signal, but also when it is at the higher frequency side.

The frequency offset function is available when the device configuration is A or B in Device configuration using E5052B and E5053A, and when the device configuration is C with the external mixer enabled.

Setting Items

Setting items to use the frequency offset function are as follows.

- On/off setting of the frequency offset function
- Setting of the conversion mode
- Setting of the frequency of the local signal (LO)
- Setting of the harmonic

NOTE Settings of the frequency offset function are common to all measurement modes (phase-noise measurement mode, spectrum monitor measurement mode, frequency/power measurement mode, and transient measurement mode).You cannot make these settings for each measurement mode separately.

On/Off Setting of Frequency Offset Function

Turn on/off the frequency offset function.

System > **Instrument Setup** > **Frequency Offset (User Downconv.)** > **Frequency Offset** > **ON** | **OFF**

Setting of Conversion Mode

Set the conversion mode of the frequency offset function.

System > **Instrument Setup** > **Frequency Offset (User Downconv.)** > **Conversion Mode** > **RF = n * LO + IF** | **RF = n * LO - IF**

When you select RF = n × LO + IF, Upper Side Band (USB) mode is used, while selecting RF = n × LO - IF, Lower Side Band (LSB) mode is used.

For information on the frequency conversion equations, see Frequency Conversion Equations.

Setting of LO Frequency

Set the LO frequency of a mixer or a downconverter used.

The LO frequency range is as follows:

- 10 M to 110 GHz for the USB conversion mode
- 500 M to 110 GHz for the LSB conversion mode

System > **Instrument Setup** > **Frequency Offset (User Downconv.)** > **LO Frequency**

The LO frequency is used for the equations as described Frequency Conversion Equations. When the conversion mode is USB, the setting range is 10 M - 330 GHz, and when the conversion mode is LSB, 500 M - 330 GHz.

Setting of Harmonic Number

Set the harmonic number of a mixer.

System > **Instrument Setup** > **Frequency Offset (User Downconv.)** > **Harmonic #**

The harmonic number is used for the conversion equations as described in Frequency Conversion Equations. The setting range is 1-34.

Frequency Conversion Equations

The frequency conversion equations are as follows.

1. When the conversion mode is USB. (RF > N × LO)

RF = N × LO + IF

2. When the conversion mode is LSB. (RF < N × LO)

RF = N × LO - IF

,where RF is the DUT frequency, LO is the LO frequency of a mixer or a downconverter used, IF is the IF frequency of the downconverted signal, and N is the harmonic number.

Consideration on Frequency Setting

All the measurement setup parameters concerning frequency can be input as DUT frequency when frequency offset function is applied. The applicable frequency range is from 20 M to 117 GHz. There are some constraints on measurement setup parameters actually depending on the IF frequency of the downconverted signal being fed into the E5052B, and it is determined by the measurement range of the E5052B.

The listed below may be needed on considering the frequency setting when using the frequency offset function.

1. Setting common to all measurement modes
   - Setting of the target frequency of the auto frequency control function
2. Spectrum monitor measurement mode
   - Setting of Start, Stop, and Center frequencies

   NOTE That the start and stop frequency may be limited by the actual IF signal being inputted to the E5052B. For example, the IF frequency is 10 MHz, the maximum span is limited up to 2 MHz, 10 percent of the IF frequency, not the RF frequency.
3. Transient measurement mode
   - Setting of the frequency range (wide band) or the maximum frequency

When the frequency offset function is on, the **Wide Freq Range** softkey is not available, and the **Wide Freq Span** softkey appears instead. Use the **Wide Max Frequency** softkey to set the maximum frequency.

- Setting of the target frequency (narrow band)
- Setting of the phase reference frequency (narrow band, phase transient measurement)
- Setting of the video trigger frequency (wide band)
- Setting of the video trigger frequency (narrow band)

Applicable Measurement Results

The listed below are the measurement results that the frequency data is converted by the use of frequency offset function.

1. Phase-noise measurement mode

- Frequency of the carrier signal

2. Frequency/power measurement mode
   - Measurement data array for frequency measurement (frequency data of all measurement points in analyzer mode)
   - Frequency measurement data in tester mode
3. Transient measurement mode
   - Measurement data array for frequency transient measurement (wide band)
   - Measurement data array for frequency transient measurement (narrow band)

Making phase-noise measurement above 26.5 GHz

- Basic configuration for expanding frequency range
- Setup considerations for >26.5 GHz measurement
- Measurement noise floor
- Configuring millimeter wave phase noise measurement setup
- Advanced measurement techniques for a free running source measurement
- Large frequency drift
- High phase noise that may saturate phase detector
- Prescaler techniques to suppress frequency drift and high phase noise
- Configuring millimeter wave phase noise measurement setup
- Operation of the AgtmmWave VBA macro
- Setup for prescaler techniques

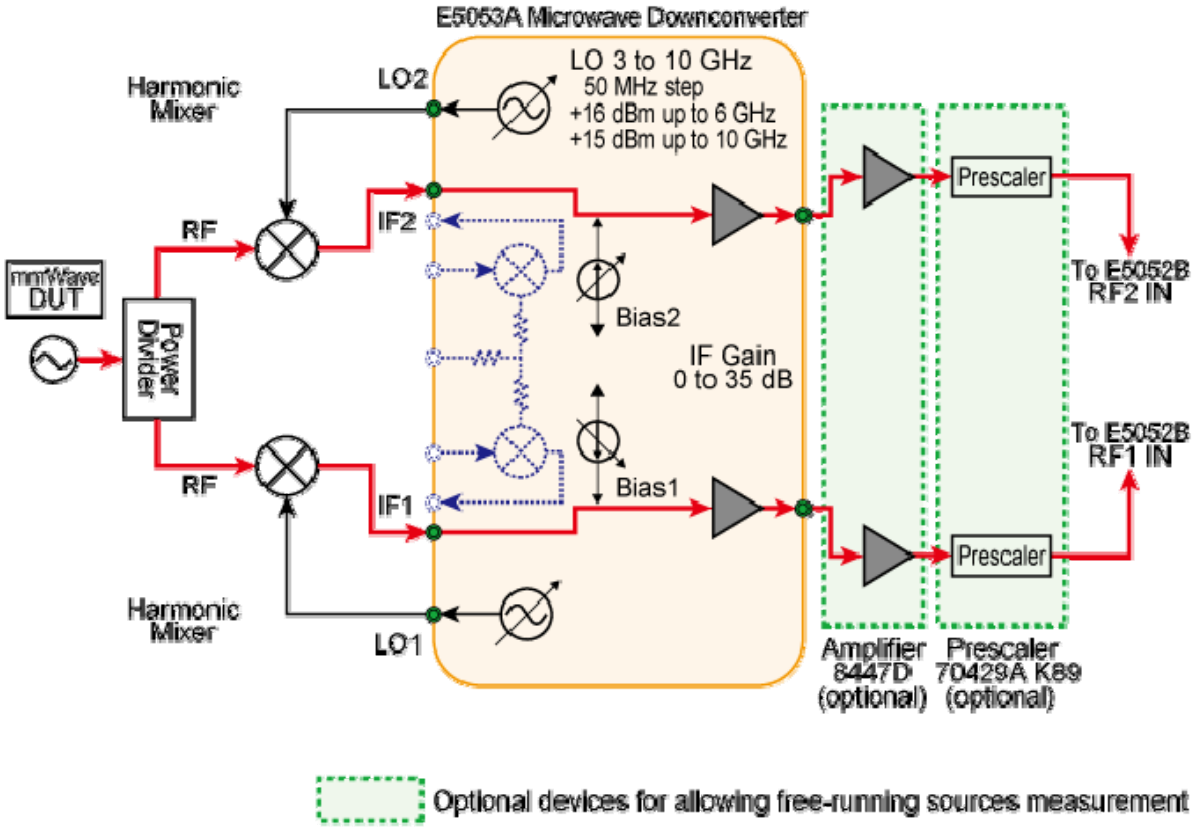
Other topics about Measurement Using E5053A and External Mixer

This chapter contains information on making phase-noise measurements of signal sources above 26.5 GHz. This information is fundamental to configuring millimeter-wave phase-noise measurement systems with the Agilent E5052B and E5053A.

Basic configuration for expanding frequency range

The E5053A is designed to use two independent paths for the signal downconversion from RF to IF. Above 26.5 GHz, a power divider and a pair of external mixers can be added to extend the scheme of the E5053A. External mixers can be driven by the E5053A's built-in LOs. A block diagram of the basic setup is shown below .

Block diagram for making phase-noise measurement above 26.5 GHz



ssa0009

Required equipment for expanding frequency range > 26.5 GHz

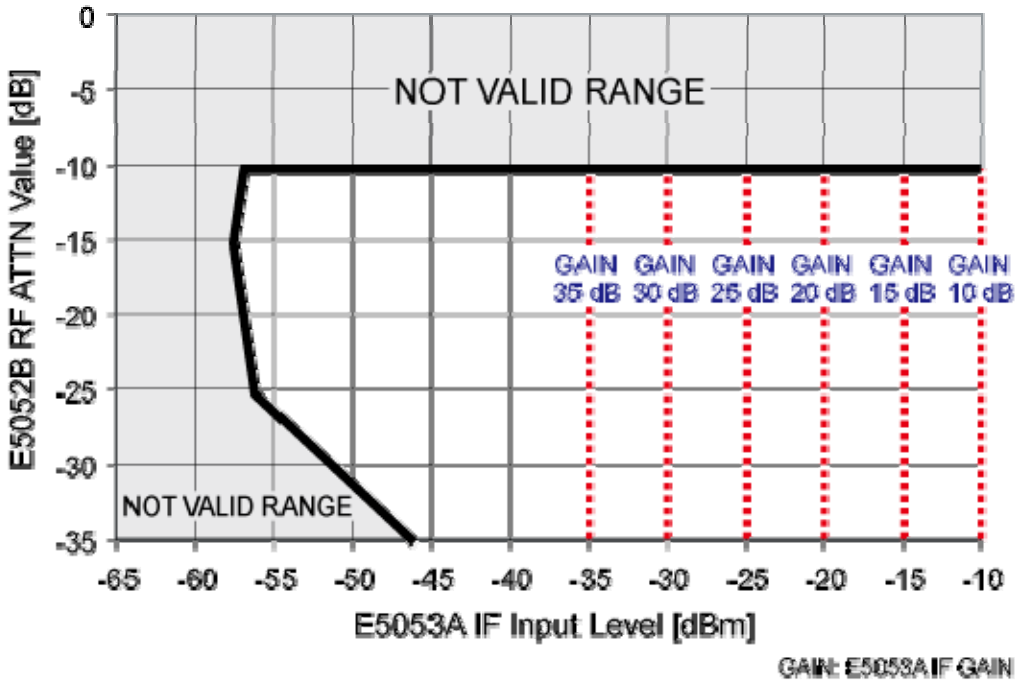
Equipment	Quantity	Note
11970 Series	2	
Hybrid matched tee	1	Available from third-party vendors of millimeter-wave equipment
Waveguide termination	1	Available from third-party vendors of millimeter-wave equipment

Waveguide bend	2	Available from third-party vendors of millimeter-wave equipment
Coax cables	4	
70429A K89 frequency divider (prescaler)	2	Required if the frequency drift and/or high phase-noise pedestal of your DUT has difficulties with phase lock. Refer to Advanced measurement techniques for a free running source measurement.
8447D Option 011 Dual Channel amplifier	1	Required if the IF power level is insufficient. Refer to Advanced measurement techniques for a free running source measurement.

Setup considerations for > 26.5 GHz measurement

If a source is not able to provide a sufficient power level, it may be necessary to insert an amplifier between the output of the mixer and the IF input of the E5052B. The allowable power level at the E5053A IF input port depends on the equipment's IF Gain setting (Allowable power level at E5053A IF input port). The detailed power requirements of your DUT along with the millimeter-wave mixers selected are shown in Applicable power level by selected harmonic mixer.

Allowable power level at E5053A IF input port



ssa0010

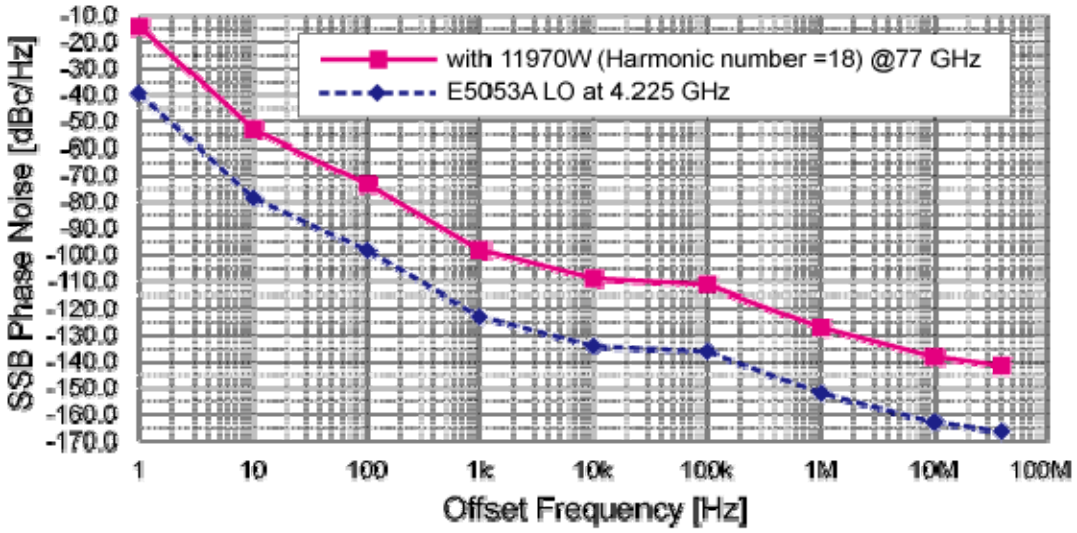
Applicable power level by selected harmonic mixer

Harmonic mixer	Frequency band [GHz]	Maximum conversion loss [dB]	Gain Compression [dBm] (typ.)	Minimum power level of DUT [dBm]
11970A	26.5 to 40	26	-5	-29 approx.
11970Q	33 to 50	28	-7	-27 approx.
11970U	40 to 60	28	-7	-27 approx.
11970V	50 to 75	40	-3	-15 approx.
11970W	75 to 110	46	-1	-9 approx.

Measurement noise floor

Using harmonic mixers alone degrades the phase noise of the LO of the E5053A, depending on the harmonics number. Figure A-3 shows an example of 77-GHz millimeter-wave measurement. If you need to insert amplifiers to boost the IF signal, the noise of the inserted amplifier will also be summed into the measured noise level along with the noise of your device under test. Setting a correlation rate reduces the additive noise of the inserted dual-channel amplifier.

Example of millimeter-wave phase-noise sensitivity (start offset = 1 Hz, correlation = 1)



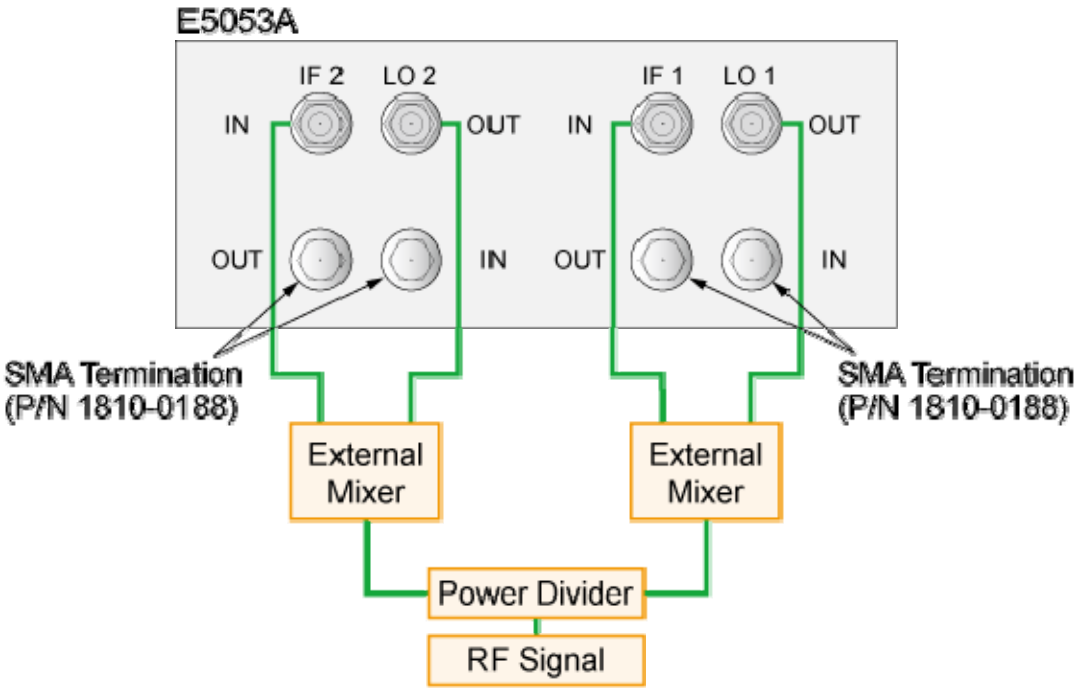
ssa0011

Configuring millimeter-wave phase-noise measurement setup

A typical millimeter-wave measurement setup is shown in the figure below.

CAUTION To prevent damage to the Agilent E5053A hardware, input signals MUST NOT be applied to the signal output connector of the E5053A. Also, to pre-vent unexpected static discharge during operation, terminate the output signal connectors with coax-sma termination, part number 1810-0118.

Millimeter-wave measurement setup for stable source



ssa0012

Advanced measurement techniques for a free-running source measurement

Some free-running oscillators exhibit large frequency drift and high phase noise, especially in the millimeter-wave frequency range. Sometimes these oscillators cause measurement difficulties, such as PLL unlock and/or invalid measurement. Prescaler techniques can help you overcome these difficulties.

Large frequency drift

The E5052B automates the phase-noise measurement in several steps: measuring carrier frequency and power level, calibrating phase detector constant, tuning the built-in LO, closing the phase-locked loop, and measuring the noise signal coming out of the phase detector.

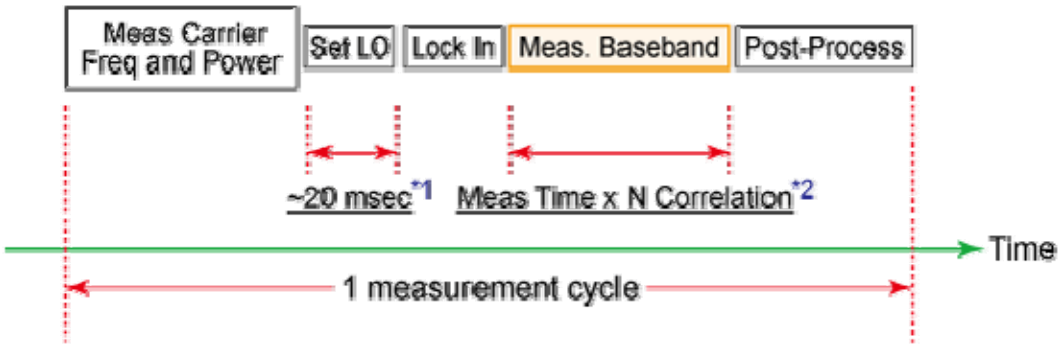
The tracking ability of the E5052B is limited by:

- Instantaneous peak-to-peak frequency drift threw rate when attaining phase lock.
- Peak-to-peak frequency change during a single measurement.

1. Check whether the instantaneous peak-to-peak frequency drift threw rate exceeds the maximum allowable threw rate, which is approximately 5 kHz per 20 msec with 0 or 10 dB IF GAIN. The instantaneous peak-to-peak frequency drift can be checked with the transient measurement mode. Measure the downconverted frequency profile over time by setting the time length to 20 msec or 50 msec.

2. Check whether your peak-to-peak frequency change exceeds 0.4% of the carrier frequency or the downconverted IF signal frequency. Note that this is also a function of measurement time depending on the start offset you select and/or the number of cross-correlations you set. (Refer to table xx for specification, page xx). Taking a longer time for a single measurement increases the chances of losing phase lock.

E5052B tracking ability



ssa0013

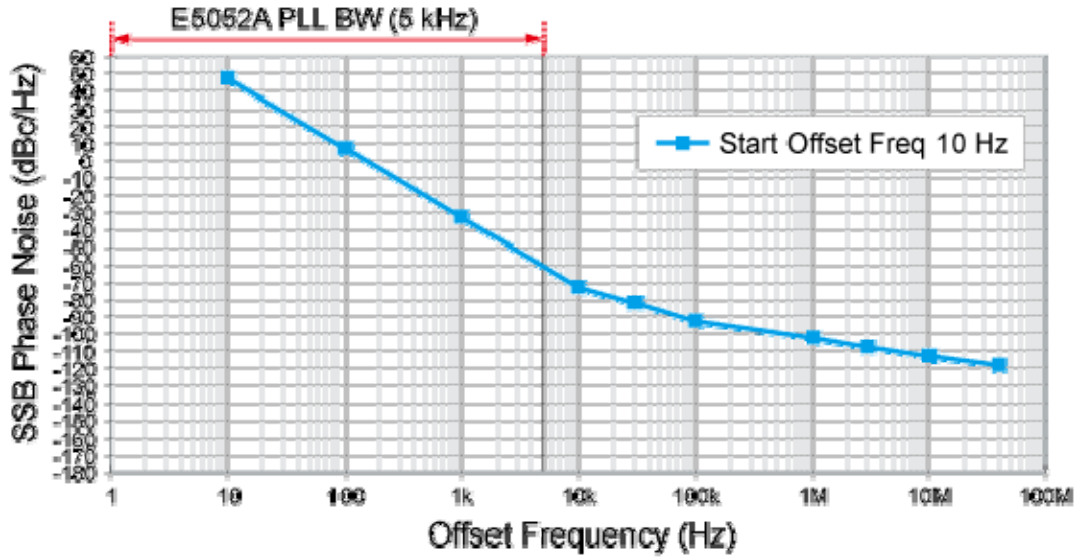
*1. Maximum E5052B PLL BW
Approximately 5 kHz (IF GAIN = 0, 10 dB)

*2. Maximum LO Tunable Range During Baseband Measurement
0.4% of downconverted IF Signal

High phase noise that may saturate phase detector

An average noise level of the input signals that exceeds approximately 0.2 radian rms, integrated outside of the phase-locked loop (PLL) bandwidth, can prevent the Agilent E5052B from attaining phase lock. Please confirm that the expected phase noise of your DUT does not exceed the limit line shown below.

Phase-noise measurement limit line



ssa0014

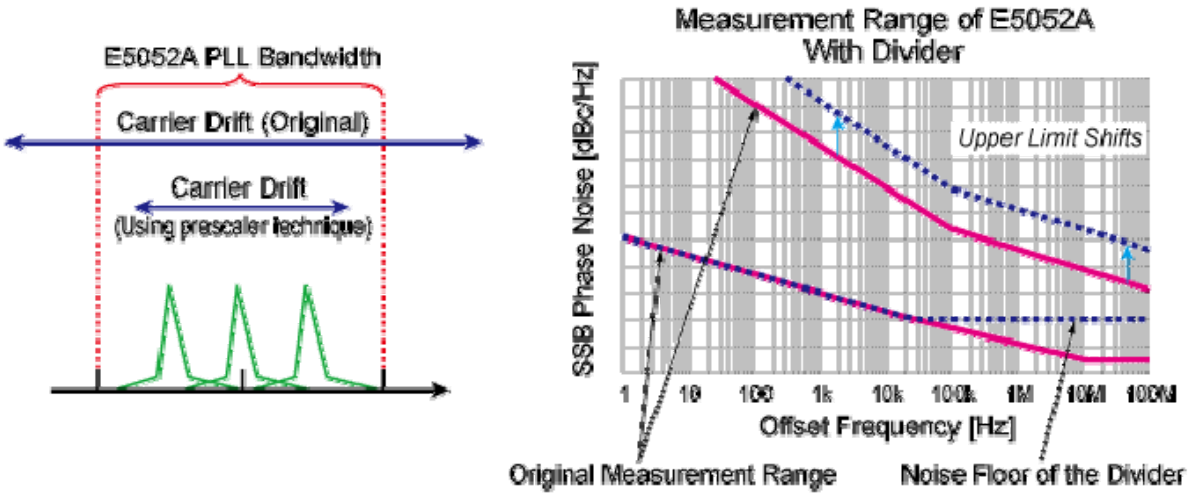
In either case, prescaler techniques can help you overcome problems related to this issue.

Prescaler techniques to suppress frequency drift and high phase noise

Inserting frequency dividers (prescaler) reduces the frequency drift as well as phase-noise level in order to make valid phase-noise measurement with the E5052B.

Note that the additive noise of the inserted frequency dividers will be summed into the noise level to determine the noise floor of the measurement. By taking advantage of the dual-prescaler technique for setting the appropriate the number of correlations, you can reduce the additive noise of the prescaler used.

Effect of prescaler techniques



ssa0015

Configuring millimeter-wave setup to allow prescaler techniques

CAUTION To prevent damage to the Agilent E5052B and E5053A hardware, the input signal MUST NOT be applied to the signal input connector until the input attenuator has been correctly set for the desired configuration. Apply the input signal when the AgtmmWave VBA macro form appears. (See the section "Operation of VBA macro AgtmmWave".)

A typical millimeter-wave measurement setup is shown below.

Setup for millimeter-wave phase-noise measurement with prescaler techniques

ssa0140

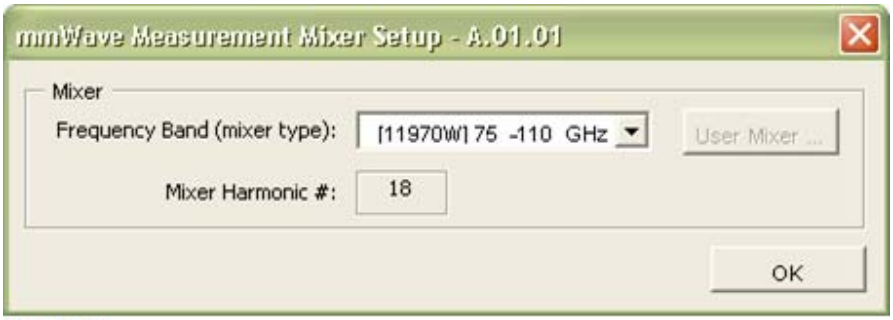
Operation of the AgtmmWave VBA macro

The "AgtmmWave" macro in the assistant tool, which is a VBA macro program running on the E5052B, is used to automate the setup of the E5053A and E5052B when making millimeter-wave phase-noise measurement.

Start up the AgtmmWave macro

1. Press **Macro Setup**.
2. Press **Application** > **mmWave** to start up the macro
   The macro window shown below appears on the E5052B display.

AgtmmWave macro window

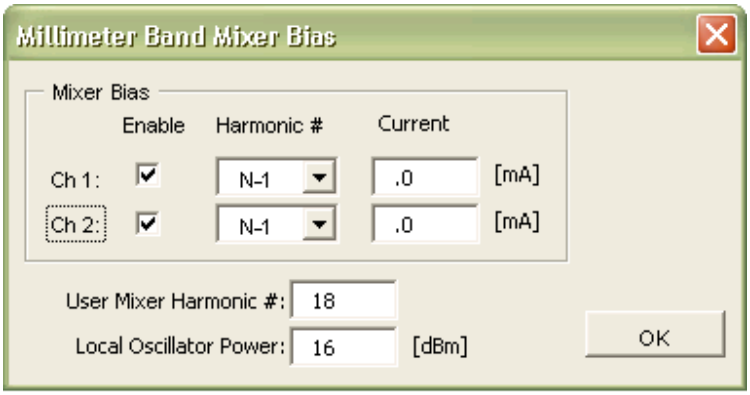


ssa0148

Set up millimeter-wave measurement parameters

1. Select a frequency band from the pull-down menu of the macro window (AgtmmWave macro window).
2. If you select "User Mixer" from the menu, press the **User Mixer...** button to set up the necessary parameters of the harmonic mixer used (**User Mixer setup menu)**.

User Mixer setup menu



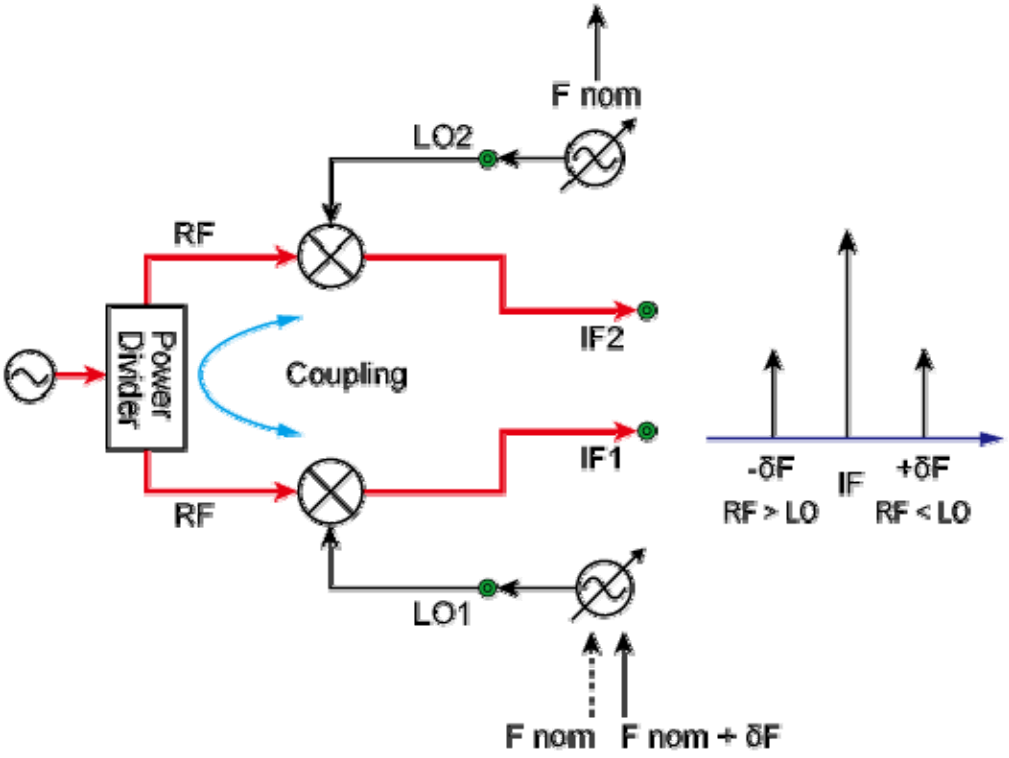
ssa0149

3. Click **OK**.
4. Input DUT Frequency (SSA Input ATTN and D/C IF Gain menu).

   The AgtmmWave automatically sets the E5053A LO to output the appropriate IF frequency of the downconverted signal.

   NOTE The AgtmmWave VBA macro sets the downconverted IF frequency differently between channel 1 and channel 2 without prescaler techniques. This is to avoid the generation of spurs by the E5053A. The E5053A uses slightly different reference frequencies for the LOs of channel 1 and channel 2. In order to take the advantage of the cross-correlation technique, both LOs have to be incoherent to each other. If the E5053A uses the same nominal LO frequency for both channels, whose frequencies are even slightly different from each other, inter-modulation signals are generated and fall into the baseband signal as spurious signals due to the coupling of channel 1 and channel 2.

Mechanism of spurs generation due to incoherent LO of E5053A



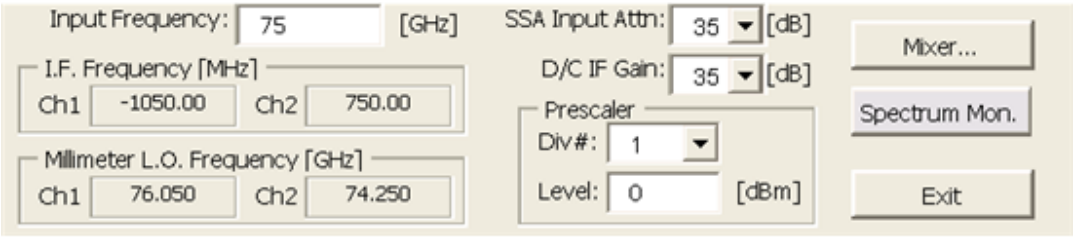
ssa0016

5. Select the appropriate **SSA Input Attn** and **D/C IF GAIN** from the pull down menus (SSA Input ATTN and D/C IF Gain menu).

   Change the **SSA Input Attn** value if a warning message "Set RF ATTN to xx dB" is displayed. The default setting is 35 dB ATTN for preventing damage to the E5052B from unexpectedly high applied IF power.

   Change the **D/C IF Gain** value from the pull down menu if an error message such as "IF A/D overflow" or "IF Level overload" is displayed. The default setting is 35 dB for maximum gain.

SSA Input ATTN and D/C IF Gain menu

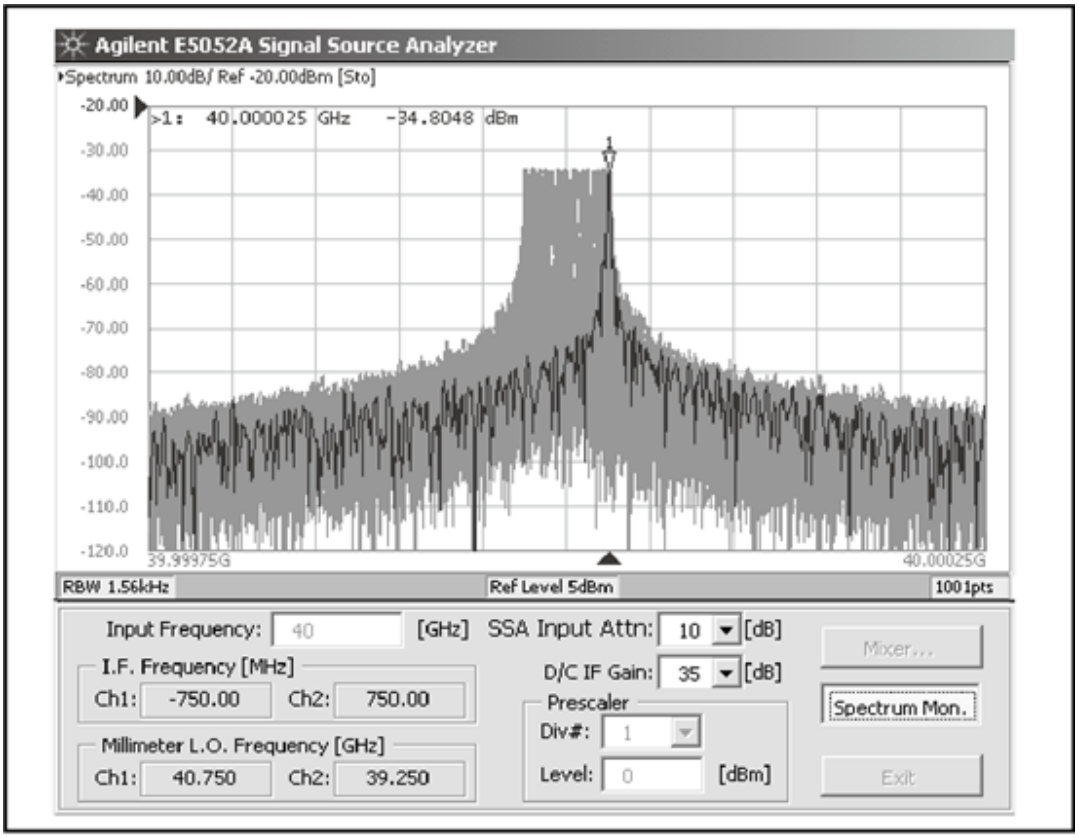


ssa0150

NOTE

If you fail to measure phase noise (phase-locked loop unlock error or IF not found) or get an unstable phase-noise measurement result, you can check the signal quality of the downconverted IF signal. Press **Spectrum Mon.** to verify that the IF signal is present. If no IF signal is present, vary the input frequency slightly until the IF signal is found. If the frequency drift is large, the use of prescaler techniques is recommended. (Refer to Advanced measurement techniques for a free-running source measurement)

Verify downconverted IF signal with spectrum monitor function



e5052auj5030

Setup for prescaler techniques (Advanced technique for measuring a free-running source)

CAUTION

To prevent damage to the Agilent E5052B hardware, the input signal MUST NOT be applied to the RF1 IN and RF2 IN connectors until the E5052B in-put attenuator has been set to 35 dB. Do not connect anything as the E5052B is turning off because the INPUT ATTN is automatically set to 0 dB during shutdown.

CAUTION To prevent damage to the Agilent E5052B hardware, the input signal MUST:

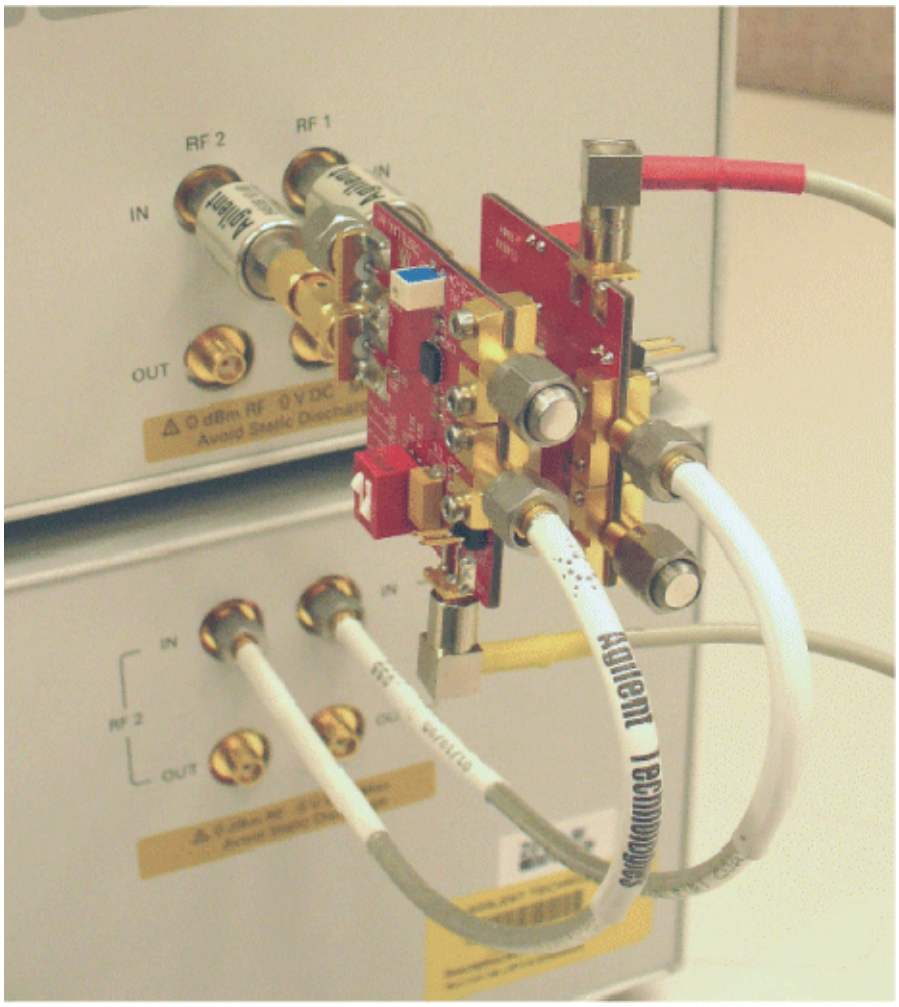
- NOT BE GREATER THAN 0 dBm RF OUTPUT POWER
- NOT CONTAIN DC OFFSET VOLTAGE

when applied to the RF1 IN and RF2 IN connectors. Use an external attenuator to ensure that the input signal to RF1 IN and RF2 IN is less than or equal to 0 dBm. Use DC Blocking Capacitors if the DC voltage is present at the output signal of the prescaler used.

1. Set **SSA Input Attn** to 35 dB.

Connect prescalers between RF1 OUT of the E5053A and RF1 IN of the E5052B and between RF2 OUT of the E5053A and RF2 IN of the E5052B.

Connecting prescalers



e5052auj5032

2. Select **Div#** and input the prescaler output power level (SSA Input ATTN and D/C IF Gain menu).

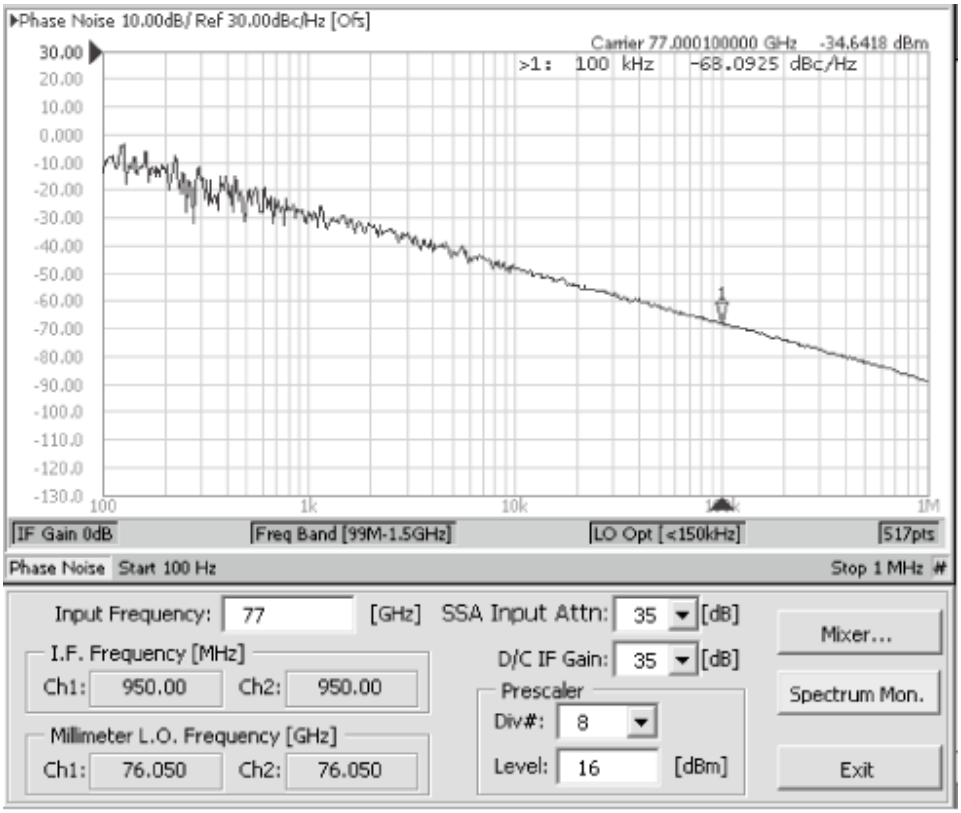
   NOTE Set an appropriate D/C IF Gain if the downconverted signal-power level is not sufficient for the required input-power level of the prescaler used.

The phase-noise measurement amplitude is automatically corrected according to the following equation, and the results are shown in Phase-noise correction with prescaler techniques.

Corrected Phase Noise = Phase Noise at Prescaler Output + 20 * LOG(N)

N = Prescaler's Dividing Number

Phase-noise correction with prescaler techniques



ssa0151