N7011A/12A Active Termination Adapters

KEYSIGHT

USER'S GUIDE

Notices

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Safety Notices

CAUTION

A **CAUTION** notice denotes a hazard. It calls attention to an operating procedure, practice, or the like that, if not correctly performed or adhered to, could result in damage to the product or loss of important data. Do not proceed beyond a **CAUTION** notice until the indicated conditions are fully understood and met.

WARNING

A WARNING notice denotes a hazard. It calls attention to an operating procedure, practice, or the like that, if not correctly performed or adhered to, could result in personal injury or death. Do not proceed beyond a WARNING notice until the indicated conditions are fully understood and met.

Contents

Contents

1 General Information

The N7011A / N7012A active termination adapters features a user adjustable common termination voltage (V_{term}) and extremely low noise performance. These probes are ideal for high SNR (low noise) measurements for standards such as:

- HDMI,
- DisplayPort
- MIPI M-PHY

CAUTION Before using the N7011A / N7012A adapters, refer to "Safety Information" on page 14. Handle the N7011A / N7012A adapters with care and refer to the safety notices in this manual. Avoid any mechanical shocks to this product in order to guarantee accurate performance and protection.

CAUTION The maximum allowable low frequency (LF) input voltage to the N7011A / N7012A adapter is ±4 V_{DC} to 50 kHz, 2.8 V_{rms} above 50 kHz.

Connecting the N7011A / N7012A

Compatible Oscilloscopes

The N7011A / N7012A adapters are compatible with the Keysight oscilloscopes shown in Table 1. The table also lists the minimum required firmware version for the oscilloscope. The N7011A / N7012A adapters are designed for oscilloscopes with 50 Ω AutoProbe III interface channel inputs. The AutoProbe III interface also provides power to the probes.

Table 1 Compatible Oscilloscopes and Support

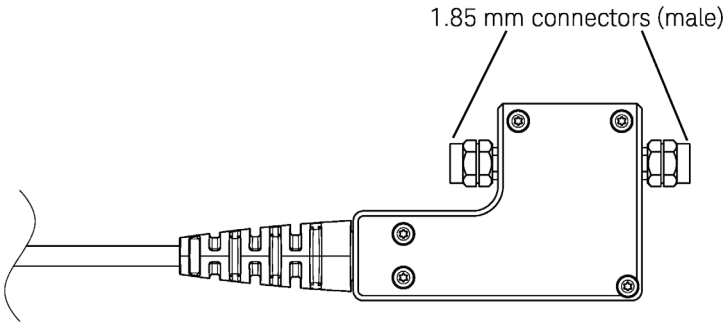
Infiniium Oscilloscopes	Required Firmware Version
UXR-Series 1 and 1.85 mm models	11.71 or higher

NOTE

Is Your Oscilloscope Software Up-to-Date? Keysight periodically releases software updates to support your probe, fix known defects, and incorporate product enhancements. To download the latest firmware, go to www.keysight.com and search for your oscilloscope's topic. Click the "Drivers, Firmware & Software" tab.

N7011A / N7012A Input Connection

The N7011A/12A both have a 1.85 mm (m) connector on both sides.



- For N7011A: 2.4 mm (f) to 2.92 mm (f) connector adapter (P/N: 1250-3782)
- For N7012A: 1.85 mm (f) to 1.85 mm (f) connector adapter (P/N: N5520B)

CAUTION Avoid costly repairs that are caused from making improper connections to the 2.9 mm precision RF input connector. Always properly align any mating connection *before* tightening the connection to the specified torque.

CAUTION Torque all cables and adapter connections to the 2.9 mm connector to 8 in-lbs (90 N-cm).

CAUTION Torque all cables and adapter connections to the 1.85 mm connector saver to 8 in-lbs (90 N-cm).

Using the N7011A / N7012A

This section describes how to use the N7011A / N7012A active termination adapter. Figure 1 shows a block diagram of the N7011A / N7012A connected to the oscilloscope. The V_{off} and V_{term} controls are supplied *from* the oscilloscope via the AutoProbe III connector.

V_{in} Signal Range
$-0.6V \le (V_{in} - V_{term}) \le 0.6V$

V_{term} Range
$-4V \le V_{term} \le 4V$

V_{off} Range
$-4V \le V_{off} \le 4V$

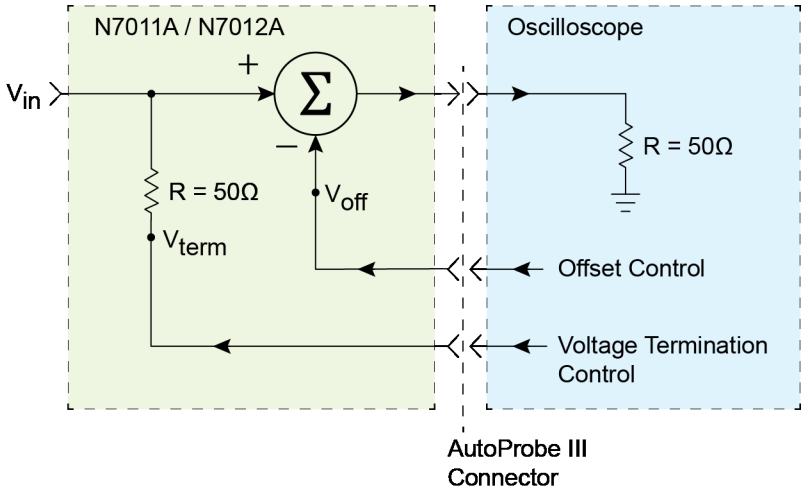


Figure 1 Simplified Function Diagram

CAUTION To avoid damaging the N7011A / N7012A, the maximum low frequency (LF) input voltage must not exceed ± 4 V_{DC} to 50 kHz, 2.8 V_{rms} above 50 kHz.

V_{term} Control

The V_{term} control is used to allow the 50 ohm input of the N7011A / N7012A to be terminated to a voltage rather than to ground, which is required by some devices under tests (DUTs). V_{term} can be set anywhere from –4 V to +4 V, however V_{in} must never be more than 0.6V away from V_{term}.

To set the V_{term} voltage, perform the following steps on the oscilloscope:

1. Click **Setup** > **Probe Configuration** to open the Probe Configuration dialog box.
2. Select the N7011A / N7012A tab.

3 In the dialog box's Probe System field, click **Options** to open the Probe dialog box.

4 Set the Termination Voltage.

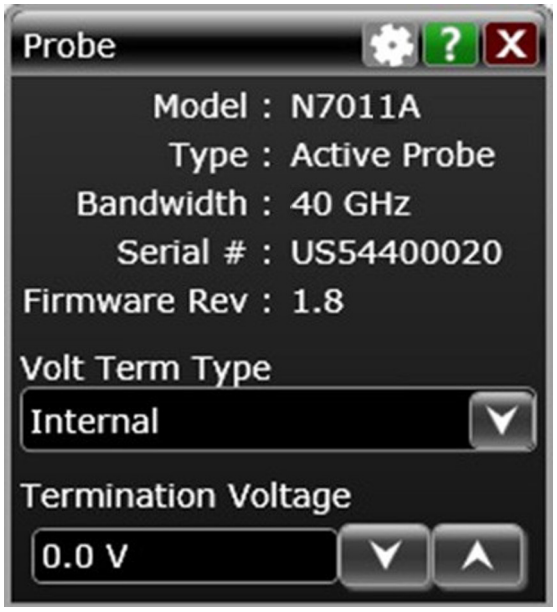


Figure 2 Probe Dialog Box

V_{off} Control

The V_{off} control allows the N7011A / N7012A to subtract the DC voltage component from V_{in} thereby allowing the N7011A / N7012A output to be centered around ground.

To set the V_{off} control, perform the following steps on the oscilloscope:

1 Click **Setup** > **Probe Configuration** to open the Probe Configuration dialog box.

2 Select the N7011A / N7012A tab.

3 In the dialog box's Probe System field, click **Probe Offset** and enter the required offset voltage.

Maximum Signal Input

To avoid distortion, the input signal to the N7011A / N7012A must and be within the following limits:

$$-600\ \text{mV} \leq (V_{input} - V_{termination}) \leq +600\ \text{mV}$$

The maximum allowable input signal (1.2 V_{pp}) occurs when V_{in} is centered on V_{term} and V_{off} is adjusted to remove the DC component of V_{in}, which means the signal into the oscilloscope is centered around ground.

NOTE

V_{in} is the voltage at the input of the N7011A / N7012A. If the source driving the N7011A / N7012A has a non-zero output impedance then V_{term} will interact with V_{in}.

CAUTION

To avoid damaging the N7011A/12A the maximum low frequency (LF) input voltage must not exceed ± 4 V_{DC} to 50 kHz, 2.8 V_{rms} above 50 kHz.

N7011A/N7012A's Low Noise Floor

With the N7011A / N7012A's low attenuation ratio setting (1.18:1), the adapter has an extremely lower noise floor. The following two pictures compare two eye diagrams for the same MIPI M-PHY signal. Figure 3 shows the signal connected directly to the Infiniium oscilloscope's channel input *without* using a N7011A / N7012A. Figure 4 shows the same signal connected to the oscilloscope *through* the N7011A / N7012A. Notice that the N7011A / N7012A doesn't inherently contribute noise.

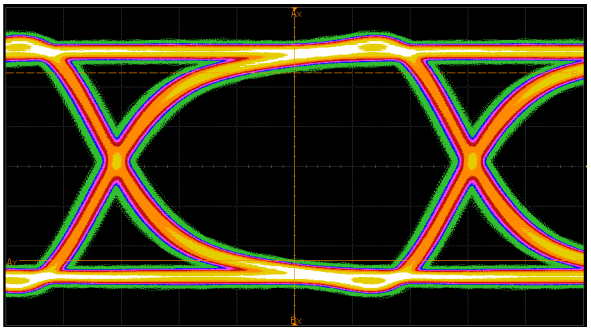


Figure 3 Direct Signal Connect to Infiniium Scope *Without* N7011A / N7012A

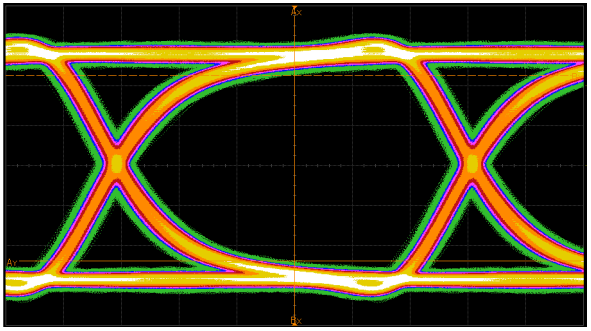


Figure 4 Signal Connected to Infiniium Scope *Through* N7011A / N7012A

Avoiding Costly Repairs

When connecting or using the N7011A / N7012A, use caution to avoid damaging the oscilloscope's channel input circuits due to electrostatic discharge (ESD).

CAUTION

When the N7011A / N7012A is connected to the oscilloscope, the oscilloscope's channel input circuits can be damaged by electrostatic discharge (ESD). Avoid applying static discharges to the N7011A / N7012A's input. Prior to energizing and connecting any accessory cable to the N7011A / N7012A, momentarily short the center and outer conductors of the cable together. Be sure that the instrument is properly earth-grounded to prevent buildup of static charge. Wear a wrist-strap or heel-strap.

Figure 5 on page 13 shows an example of a static-safe work station using two types of ESD protection:

- Conductive table-mat and wrist-strap combination.
- Conductive floor-mat and heel-strap combination.

Both types, when used together, provide a significant level of ESD protection. Of the two, only the table-mat and wrist-strap combination provides adequate ESD protection when used alone. To ensure user safety, the static-safe accessories must provide at least 1 MΩ of isolation from ground. Purchase acceptable ESD accessories from your local supplier.

WARNING

These techniques for a static-safe work station should not be used when working on circuitry with a voltage potential greater than 500 volts.

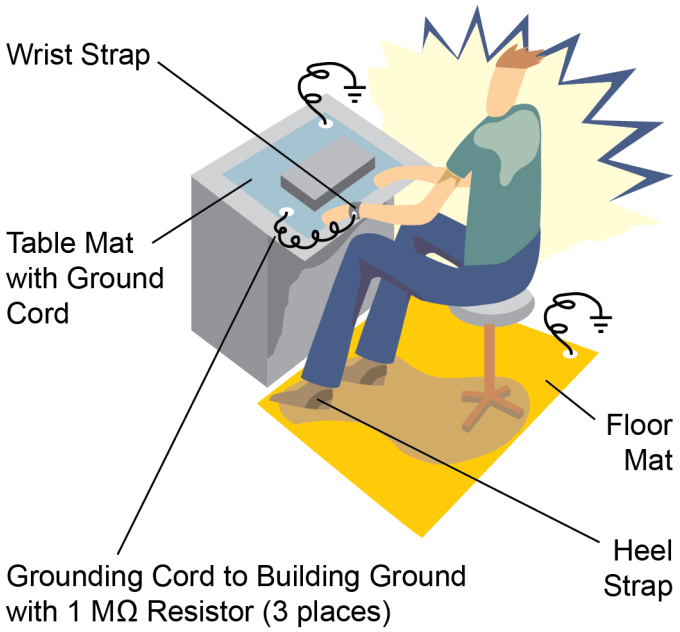


Figure 5 ESD Workstation

Safety Information

This manual provides information and warnings essential for operating the N7011A / N7012A in a safe manner and for maintaining it in safe operating condition. Before using this equipment and to ensure safe operation and to obtain maximum performance from the probe, carefully read and observe the following warnings, cautions, and notes.

This product has been designed and tested in accordance with accepted industry standards, and has been supplied in a safe condition. The documentation contains information and warnings that must be followed by the user to ensure safe operation and to maintain the product in a safe condition.

Note the external markings on the probe that are described in this document.

WARNING **To avoid personal injury and to prevent fire or damage to this product or products connected to it, review and comply with the following safety precautions. Be aware that if you use this probe assembly in a manner not specified, the protection this product provides may be impaired.**

WARNING **Use Only Grounded Instruments.**
Do not connect the probe's ground lead to a potential other than earth ground. Always make sure the probe and the oscilloscope are grounded properly.

WARNING **Connect and Disconnect Properly.**
Connect the probe to the oscilloscope and connect the ground lead to earth ground before connecting the probe to the circuit under test. Disconnect the probe input and the probe ground lead from the circuit under test before disconnecting the probe from the oscilloscope.

WARNING **Do Not Operate Without Covers. To avoid electrical shock or fire hazard, do not operate this probe with the covers removed.**

WARNING **Do Not Operate in Wet / Damp Conditions.**
To avoid electrical shock, do not operate this probe in wet or damp conditions.

WARNING **Do Not Operate in an Explosive Atmosphere.**
To avoid injury or fire hazard, do not operate this probe in an explosive atmosphere.

WARNING **Avoid Exposed Circuit. To avoid injury, remove jewelry such as rings, watches, and other metallic objects. Do not touch exposed connections and components when power is present.**

WARNING **For Indoor Use Only. Only use this probe indoors.**

WARNING **Do Not Operate With Suspected Failures. If you suspect there is damage to this probe, have it inspected by a qualified service personne.**

Concerning the Oscilloscope or Voltage Measuring Instrument to Which the Probe is Connected

WARNING **Whenever it is likely that the ground protection is impaired, you must make the instrument inoperative and secure it against any unintended operation.**

WARNING **If you energize the instrument by an auto transformer (for voltage reduction or mains isolation), the ground pin of the input connector terminal must be connected to the earth terminal of the power source.**

WARNING **Before turning on the instrument, you must connect the protective earth terminal of the instrument to the protective conductor of the (mains) power cord. The mains plug shall only be inserted in a socket outlet provided with a protective earth contact. You must not negate the protective action by using an extension cord (power cable) without a protective conductor (grounding). Grounding one conductor of a two-conductor outlet is not sufficient protection.**

WARNING **Only fuses with the required rated current, voltage, and specified type (normal blow, time delay, etc.) should be used. Do not use repaired fuses or short-circuited fuse holders. To do so could cause a shock or fire hazard.**

WARNING **Capacitors inside the instrument may retain a charge even if the instrument is disconnected from its source of supply.**

Inspecting the N7011A / N7012A

- Inspect the shipping container for damage.

  Keep the damaged shipping container or cushioning material until the contents of the shipment have been checked for completeness and the probe has been checked mechanically and electrically.
- Check the accessories.
- If the contents are incomplete or damaged, notify your Keysight Technologies Sales Office.
- Inspect the N7011A / N7012A. If there is mechanical damage or defect, or if the N7011A / N7012A does not operate properly or pass calibration tests, notify your Keysight Technologies Sales Office.

If the shipping container is damaged, or the cushioning materials show signs of stress, notify the carrier as well as your Keysight Technologies Sales Office. Keep the shipping materials for the carrier's inspection. The Keysight Technologies office will arrange for repair or replacement at Keysight Technologies' option without waiting for claim settlement.

Cleaning the N7011A / N7012A

Disconnect the N7011A / N7012A from the oscilloscope and clean the N7011A / N7012A with a soft cloth dampened with a mild soap and water solution. Make sure that the N7011A / N7012A is completely dry before reconnecting it to an oscilloscope. Avoid using abrasive cleaners and chemicals containing benzene or similar solvents.

Returning the Product for Service

If the N7011A / N7012A is found to be defective, we recommend sending it to an authorized service center for all repair and calibration needs. Perform the following steps before shipping the probe back to Keysight Technologies for service.

1. Contact your nearest Keysight sales office for information on obtaining an RMA number and return address.
2. Write the following information on a tag and attach it to the malfunctioning equipment.
   - Name and address of owner
   - Product model number (for example, N7011A / N7012A)
   - Product Serial Number (for example, USXXXXXXXX)

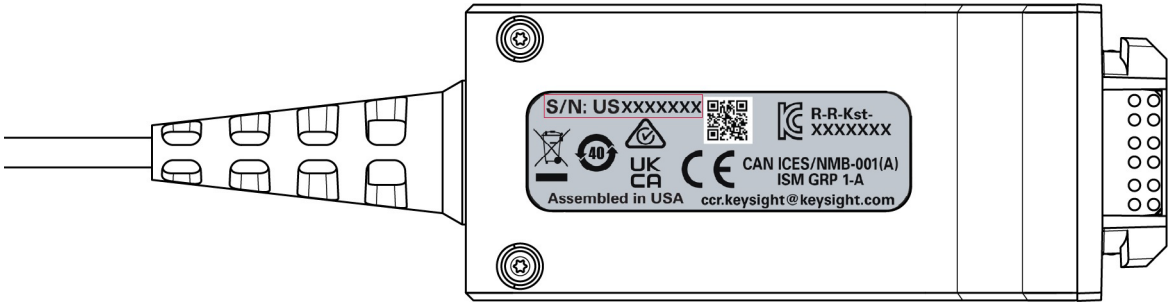


Figure 6 Location of Serial Number

   - Description of failure or service required.

NOTE Include probing and browsing heads if you feel the probe is not meeting performance specifications or a yearly calibration is requested.

3. Protect the probe by wrapping in plastic or heavy paper.
4. Pack the probe in the original carrying case or if not available, use bubble wrap or packing peanuts.
5. Place securely in sealed shipping container and mark container as “FRAGILE”.

NOTE If any correspondence is required, refer to the product by serial number and model number.

Contacting Keysight Technologies

For technical assistance, contact your local Keysight Call Center.

- In the Americas, call 1 (800) 829-4444
- In other regions, visit http://www.keysight.com/find/assist
- Before returning an instrument for service, you must first call the Call Center at 1 (800) 829-4444.

2 Specifications and Characteristics

The tables in this chapter list the specifications and characteristics for the N7011A / N7012A adapter. Bandwidth and input resistance at DC are warranted specifications for the N7011A / N7012A.

Connect the N7011A / N7012A to a powered-on oscilloscope for at least 20 minutes before any testing to allow the adapter to warm up. Ensure that the environmental conditions do not exceed the adapter's specified limits.

Specifications and Characteristics

Table 2 Electrical Specifications and Characteristics

Item	N7011A Characteristics	N7012A Characteristics
Bandwidth (–3 dB) *	40 GHz	59 GHz
Rise time (10% – 90%)	10.9 ps	7.4 ps
Input connector size	1.85 mm (male)	2.4 mm (male)
Probe interface	AutoProbe III	
Attenuation ratio	1.18:1	
Noise with oscilloscope	Refer to "N7011A/N7012A's Low Noise Floor" on page 11	
V_{in} maximum active signal	1.2 V_{pp} (not including DC component)	
V_{term} range	–4 V to +4 V	
V_{term} accuracy	±2 mV	
V_{offset} range	–4 V to +4 V	
Input signal range (|Vin - Vterm| difference)	$-0.6\ V \leq (V_{in} - V_{term}) \leq +0.6\ V$	
Input resistance at DC *	50 Ω ± 3%	
Maximum non-destructive input voltage	± 4 V_{DC} to 50 kHz, 2.8 V_{rms} above 50 kHz	

* Warranted specification

Table 3 Environmental Specifications

Description	Specification
Temperature	Operating: –10 °C to +55 °C Non-operating: –30 °C to +70 °C
Altitude	Operating: 3,000 m (9,842 feet) Non-operating: 15,300 m (50,196 feet)
Humidity	Operating: 25 – 85% room humidity Non-operating: 25 – 85% room humidity
Pollution Degree	Pollution Degree 2

Table 4 N7011A / N7012A Safety and Regulatory Information

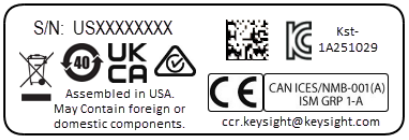
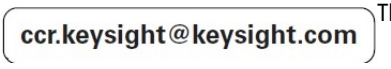
Description

 The crossed out wheeled bin symbol indicates that separate collection for waste electric and electronic equipment (WEEE) is required, as obligated by the EU DIRECTIVE and other National legislation. Refer to keysight.com/go/takeback to understand your Trade in options with Keysight in addition to product takeback instructions.
 This symbol indicates the Environmental Protection Use Period (EPUP) for the product's toxic substances for the China RoHS requirements.
 This mark denotes compliance with the essential requirements of the following applicable UK regulations: ▪ Electromagnetic Compatibility Regulations 2016 No. 1091 (as amended) ▪ Electrical Equipment (Safety) Regulations 2016 No. 1101 (as amended) ▪ The Restriction of the Use of Certain Hazardous Substances in electrical & Electronic Equipment Regulations 2012 No. 3032 (as amended)
 A registered trademark of the Spectrum Management Agency of Australia. This signifies compliance with the Australia EMC Framework regulations under the terms of the Radio Communication Act of 1992.
 The CE mark is a registered trademark of the European Community. ISM GRP 1-A denotes the instrument is an Industrial Scientific and Medical Group 1 Class A product. ICES/NMB-001 indicates product compliance with the Canadian Interference-Causing Equipment Standard.
 This is the Keysight email address required by EU directives applicable to our product.

Table 4 N7011A / N7012A Safety and Regulatory Information

	Description
	The KC mark is the Korean certification mark. This equipment is Class A suitable for professional use and is for use in electromagnetic environments outside of the home. Refer to the Class A EMC Declaration below or visit https://www.rra.go.kr/selform/Kst-1A251029.

South Korean Class A EMC declaration:
Information to the user:
This equipment has been conformity assessed for use in business environments. In a residential environment this equipment may cause radio interference.

※ This EMC statement applies to the equipment only for use in business environment.

사 용 자 안 내 문
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※ 사용자 안내문은 "업무용 방송통신기자재"에만 적용한다.

N7011A / N7012A Dimensions

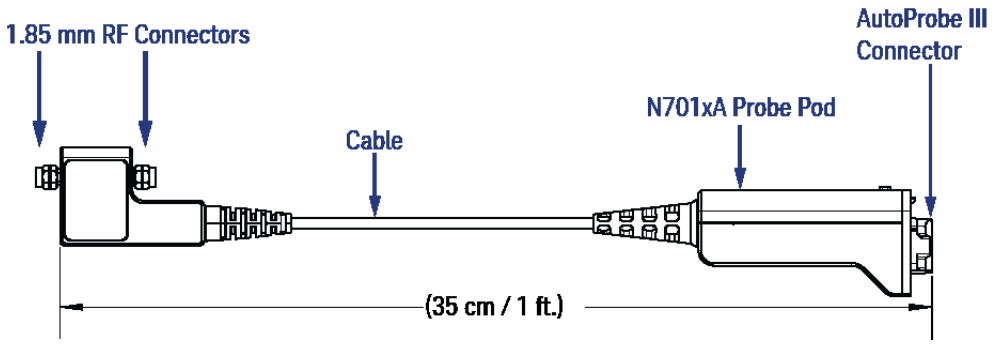

Figure 7 N7011A / N7012A Dimensions

3 Performance Verification

This chapter tests that the N7011A / N7012A meets its specified bandwidth and input resistance at DC.

CAUTION Electrostatic discharge (ESD) can quickly and imperceptibly damage or destroy high performance probes, resulting in costly repairs. Always wear a wrist strap when handling probe components and ensure that cables are discharged before being connected.

CAUTION Ensure that the input voltage to the oscilloscope never exceeds ±4 V.

NOTE Allow the N7011A / N7012A termination adapter to warm up for at least 20 minutes.

NOTE Let the oscilloscope warm up before testing. The oscilloscope under test must be warmed up (with the oscilloscope application running) for at least 30 minutes prior to the start of any performance test.

Test 1 - Bandwidth

Table 5 Bandwidth Specification for N7011A/N7012A Adapters

Model Number	Input Connectors	Maximum Bandwidth	Warranted Bandwidth (-3dB)
N7011A	2.4 mm (m)	40 GHz	40 GHz
N7012A	1.85 mm (m)	59 GHz	59 GHz

Table 6 Required Test Equipment

Test Equipment	Critical Specification	Recommended Model or Part
Oscilloscope	Supported Oscilloscope	UXR series Infiniium Oscilloscope. (Or other Keysight Oscilloscope with an Auto-Probe III active probe interface)
Microwave CW Generator	Frequency Range: 50 MHz to 67 GHz Power range: -25 dBm to +25 dBm into 50 Ω Output impedance = 50 Ω	Keysight E8257D OPT 567
Power Splitter	Two Resistor Power Splitter DC to 67 GHz (1.85 mm (f)) Maximum frequency ≥ 67 GHz	Keysight 11667D
Power Meter	Keysight P-series with power sensor compatibility	Keysight N1912A
Power Sensor	Maximum Frequency ≥ 59 GHz Power range: -24 dBm to +20 dBm	Keysight N8488A
Microwave Cable	50 Ω Characteristic Impedance 1.85 mm (m) to 1.85 mm (f) test port cables Maximum frequency ≥ 67 GHz	Keysight N4421B-K67
Adapter (Input Power sensor)	1.85 mm (f) to 1.85 mm (f)	N5520B

Procedure

1. Turn on and preset the power meter.
2. Ensure that the power sensor is disconnected from any source and set the power meter to zero.

3 Connect the power sensor to the power meter's Power Ref connector and calibrate the meter.

4 Set up the power meter to display measurements in units of Watts.

5 Connect the test setup as shown in Figure 8 and Figure 9. Do not use any additional cabling or adapters.

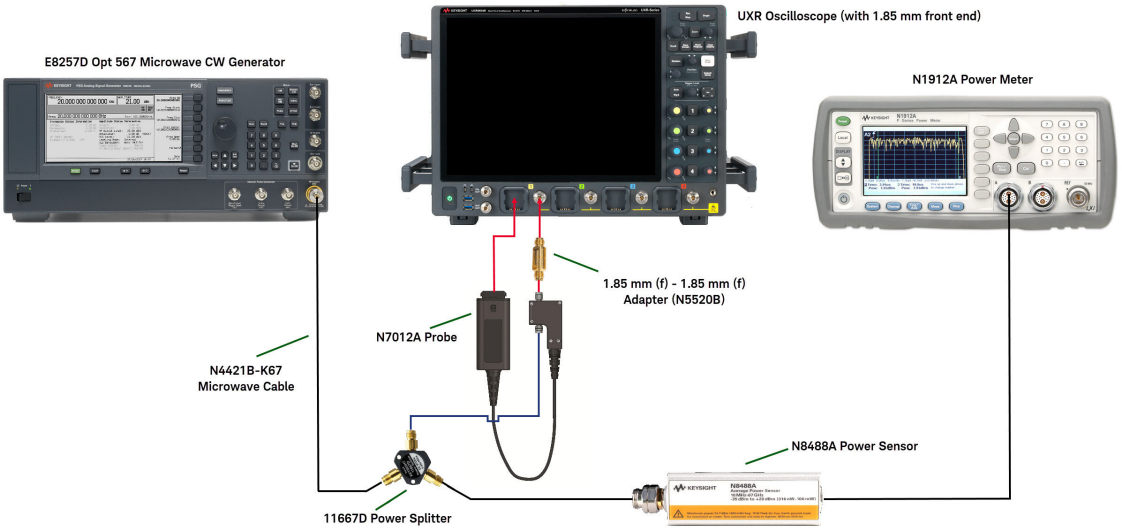

Figure 8 Test setup for Bandwidth Verification tests - setup1

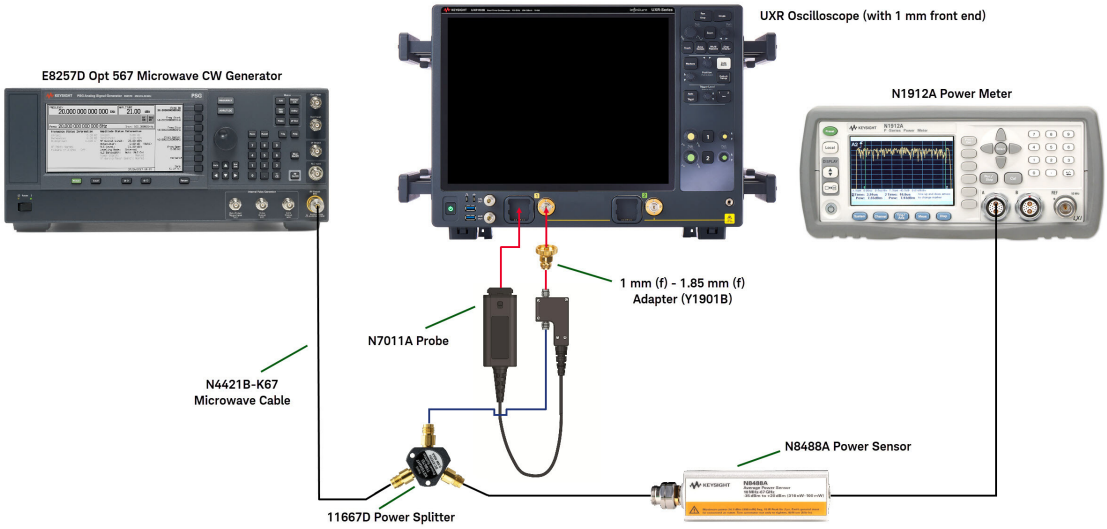

Figure 9 Test setup for Bandwidth Verification tests - setup2

a Identify the connector size on the oscilloscope's Channel 1 and attach the appropriate adapter to the N7011A/N7012A:

- For 1.85 mm Oscilloscope Channels: N5520B 1.85 mm (f) to 1.85 mm (f) adapter
- For 1.0 mm Oscilloscope Channels: Y1901B 1.0 mm (f) to 1.85 mm (f) adapter

b Connect the N7011A/N7012A to Channel 1.

c Connect a N5520B adapter from the microwave cable to the power splitter's input.

d Tighten all 2.4 mm and 1.85 mm connectors to 8 in-lbs (90 N-cm).

6 On the oscilloscope, press **[Default Setup]** and configure the following settings:

Channel 1: ON

Channels 2, 3, 4: OFF

Vertical scale (Channel 1): 50 mV/div

Horizontal scale: 20 ns/div (display 10 cycles of a 50 MHz waveform)

Figure 10 Oscilloscope horizontal scale entry

7 Select **Setup > Acquisition** and set up the acquisition parameters as follows:

Sin(x)/x Interpolation: Auto

Averaging: Disabled

Analog Memory Depth: Automatic

Analog Sampling rate: 256 GSa/s (maximum)

8 Click **Measure** > **Add Measurement**.

9 In the **Add Measurement** dialog, select the Vertical RMS measurement as shown in Figure 11.

10 In the dialog box, configure the measurement as follows:

Source: Channel 1

Measurement Area: Entire Display

RMS Type: AC

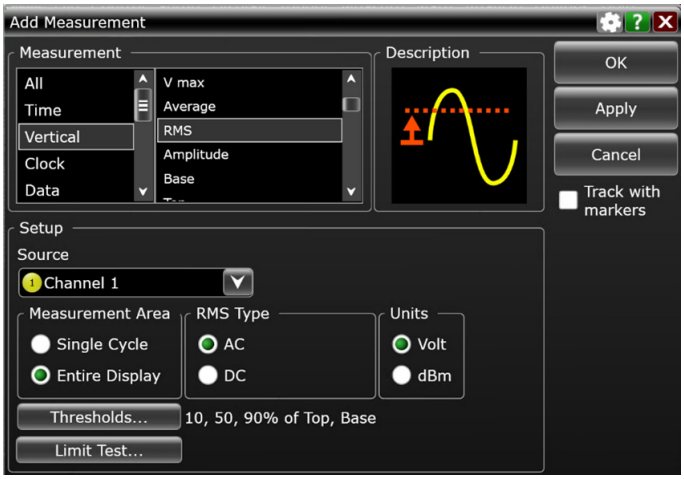

Figure 11 Add Measurement window

11 Set the Microwave CW generator to the following settings:

Waveform: sine wave

Frequency: 50 MHz

Amplitude: 0.4 Vp-p (-4 dBm)

Adjust the generator's output power setting such that the peak-to-peak amplitude of the oscilloscope's displayed waveform is close to four divisions.

12 The power meter reads the input power to the scope channel. Convert this measurement to V_{rms} using the following expression.

$$V_{in} = \sqrt{P_{meas} \times 50\Omega}$$

For example, if the power meter reading is 90 µW, then according to the equation:

$$V_{in} = \sqrt{90 \times 10^{-6} \times 50\Omega} = 67.1\ mV_{rms}$$

13 Record the V_{in} value in Table 8 on page 38 as V_{in} at 50 MHz.

14 On the oscilloscope, press **[Clear Display]** and locate the oscilloscope's Mean V_{rms} reading, which is labeled "Mean" in the Measurements display area at the bottom of the screen. Record this value in Table 8 on page 38 as V_{out} at 50 MHz.

15 Calculate the reference gain at 50 MHz using the following expression.

$$\text{Gain}_{50\ \text{MHz}} = \frac{V_{\text{out @50 MHz}}}{V_{\text{in @50 MHz}}}$$

Record this value in Table 8 on page 38 as the Calculated Gain at 50 MHz.

16 Change the microwave generator's frequency:

- 40 GHz for N7011A
- 59 GHz for N7012A

17 Change the oscilloscope's horizontal scale:

- 25 ps/div for N7011A
- 17 ps/div for N7012A

Figure 12 Setting Horizontal Scale to 25 ps/div for N7011A & 17 ps/div for N7012A

18 The power meter reads the input power to the scope channel. Convert this measurement to V_{rms} using the following expression.

$$V_{in} = \sqrt{P_{meas} \times 50\Omega}$$

For example, if the power meter reading is 90 µW, then according to the equation:

$$V_{in} = \sqrt{90 \times 10^{-6} \times 50\Omega} = 67.1\ \text{mV}_{rms}$$

19 Record the V_{in} value in Table 8 on page 38 as V_{in} at Max GHz.

20 On the oscilloscope, press **[Clear Display]** and locate the oscilloscope's Mean V_{rms} reading, which is labeled "Mean" in the Measurements display area at the bottom of the screen. Record this value in Table 8 on page 38 as V_{out} at Max GHz.

Note that Max GHz (bandwidth) is 40 GHz for N7011A and 59 GHz for N7012A.

21 Calculate the reference gain at maximum frequency using the following expression.

$$\text{Gain}_{\text{Max GHz}} = 20\log_{10}\left[\frac{(V_{\text{out @ Max GHz}})/(V_{\text{in @ Max GHz}})}{\text{Gain}_{\text{50 MHz}}}\right]$$

The gain at 50 MHz was calculated at step 15 and recorded in Table 8 on page 38 as the calculated Gain at 50 MHz.

For example, if

$$V_{\text{out}} \text{ @ Max GHz} = 35.260 \text{ mV}$$

$$V_{\text{in}} \text{ @ Max GHz} = 35.010 \text{ mV}$$

$$\text{Gain @ 50 MHz} = 0.9768, \text{then}$$

$$\text{Gain}_{\text{Max GHz}} = 20\log_{10}\left[\frac{(35.260 \text{ mV})/(35.010 \text{ mV})}{0.9768}\right] = 0.266$$

22 Record this value in Table 8 on page 38 as the calculated Gain at 40 GHz or 59 GHz for (N7011A and N7012A respectively).

To pass this test, this value must be greater than -3.0 dB.

Test 2 - Input Resistance at DC

Table 7 Required Test Equipment

Test Equipment	Recommended Model or Part
Oscilloscope	UXR series Infiniium Oscilloscope (or other Keysight Oscilloscope with an Auto-Probe III active probe interface)
Digital voltmeter	Keysight U1272A or any equivalent DVM with similar or better accuracy
BNC(f) to Banana Plug adapter	(Recommended) Pasternack PE3W06020 Banana Plug to SMA Male Cable
2.4 mm (f) to 2.92 mm (m) adapter	1250-3782

Procedure

1. Power up the Infiniium oscilloscope. After it boots up, attach the N7011A/N7012A to Channel 1 using the appropriate adapter.
2. On the oscilloscope, press **[Default Setup]**.
3. In the **Probe Configuration** menu for Channel 1, select **Options** for the N701xA block and make sure that the **Termination Voltage** is set to zero.
4. Connect the BNC cable to the N7011A/N7012A using the SMA (m) to BNC (f) followed by the 2.4 mm (f) to 2.92 mm (m) adapter as shown in Figure 13 and Figure 14.
5. Connect the remaining end of the BNC cable to the BNC (f) to the banana plug adapter.
6. Set the DVM for 2 wire ohms (**Ω**) and auto ranging.
7. Connect the banana plug to the DVM in either orientation. Record the measured input resistance (R_a).
8. Reverse the banana plug connection to the DVM. Record the measured input resistance (R_b).

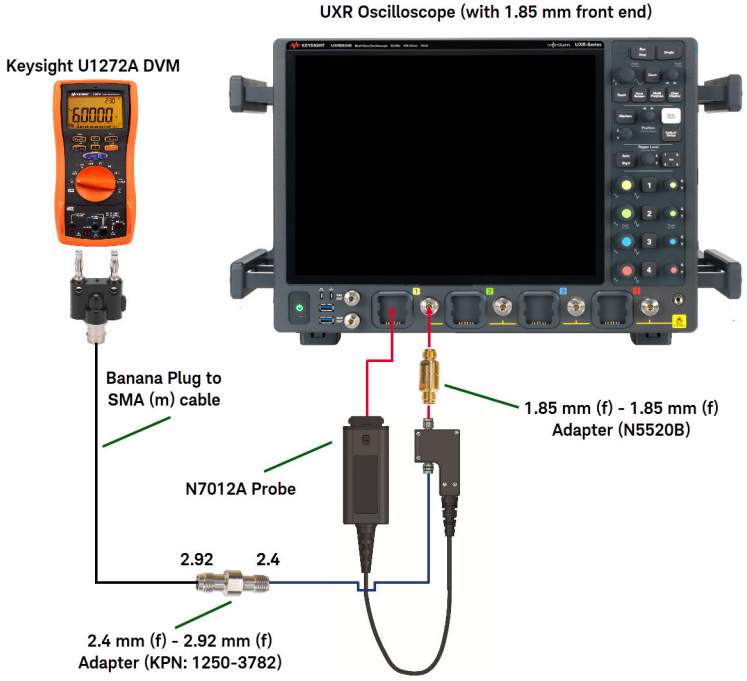

Figure 13 Test setup for Input Resistance at DC tests - setup1

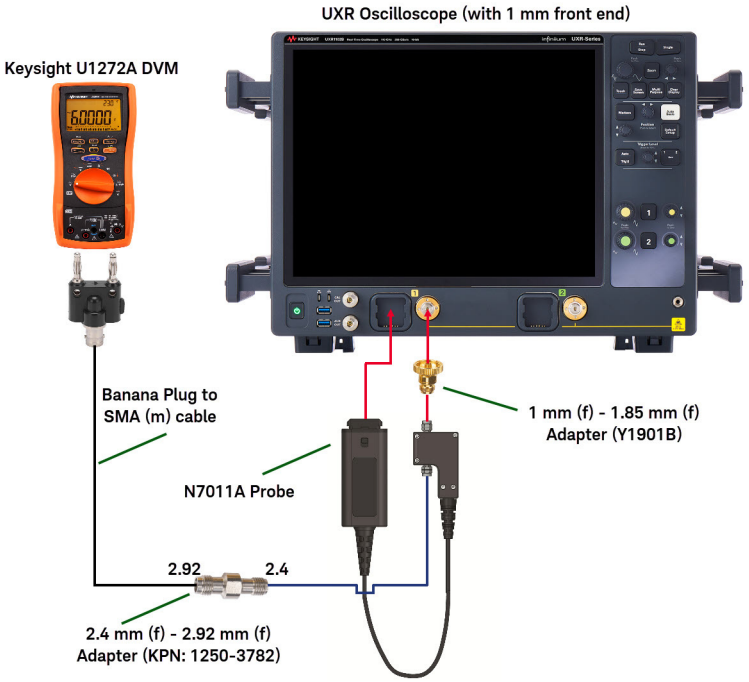

Figure 14 Test setup for Input Resistance at DC tests - setup2

9 Calculate the average input resistance using the following expression and record this value in Table 9 on page 38.

$$\text{Average Input Resistance} = \frac{R_a + R_b}{2}$$

The average input resistance must meet the 50 ohms ±3% specification:

$$48.5\Omega \leq \text{Average Input Resistance} \leq 51.5\Omega$$

Performance Test Record

Serial #:
Date:
Tested by:
Recommended Next Test Date:

Table 8 Results for Test 1. Bandwidth

Test Frequency	V_{in} (Read on Power Meter)	V_{out} (Read on Oscilloscope)	Calculated Gain (Test Limit ≥ –3 dB)
50 MHz			
Max. GHz			

Table 9 Results for Test 2. Input Resistance at DC

Test	Test Limits	Result
Average Input Resistance	48.5Ω ≤ measured ≤ 51.5Ω	

N701xA Performance Plots

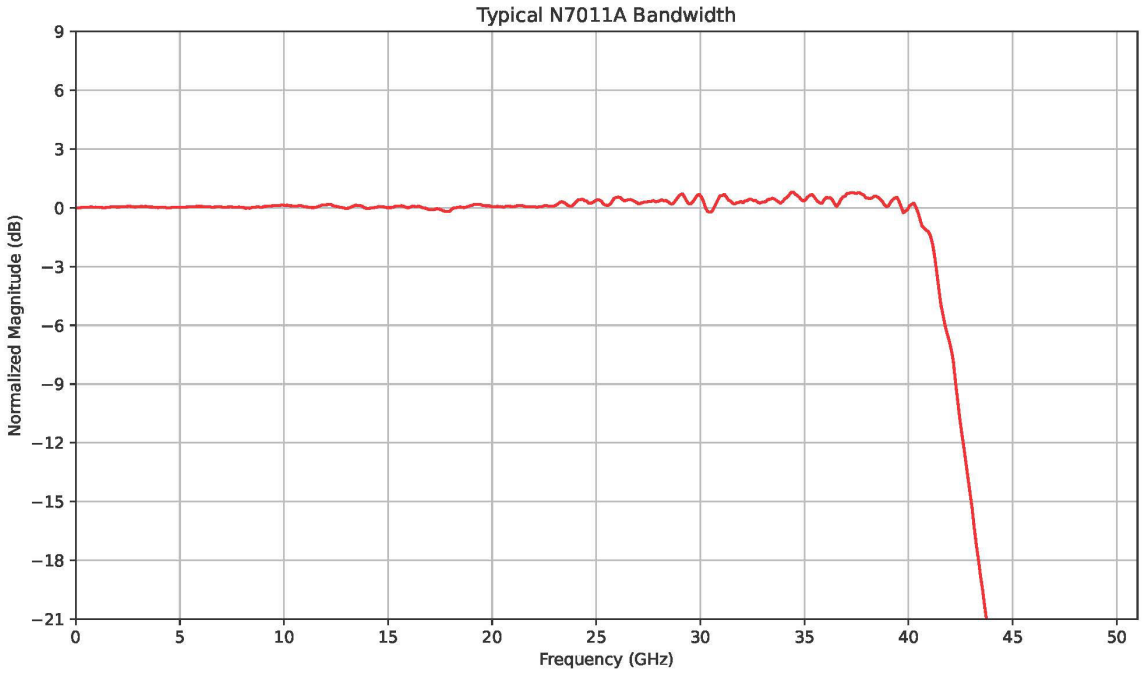

Figure 15 Bandwidth Response for N7011A probes (Freq vs. Normalized Magnitude)

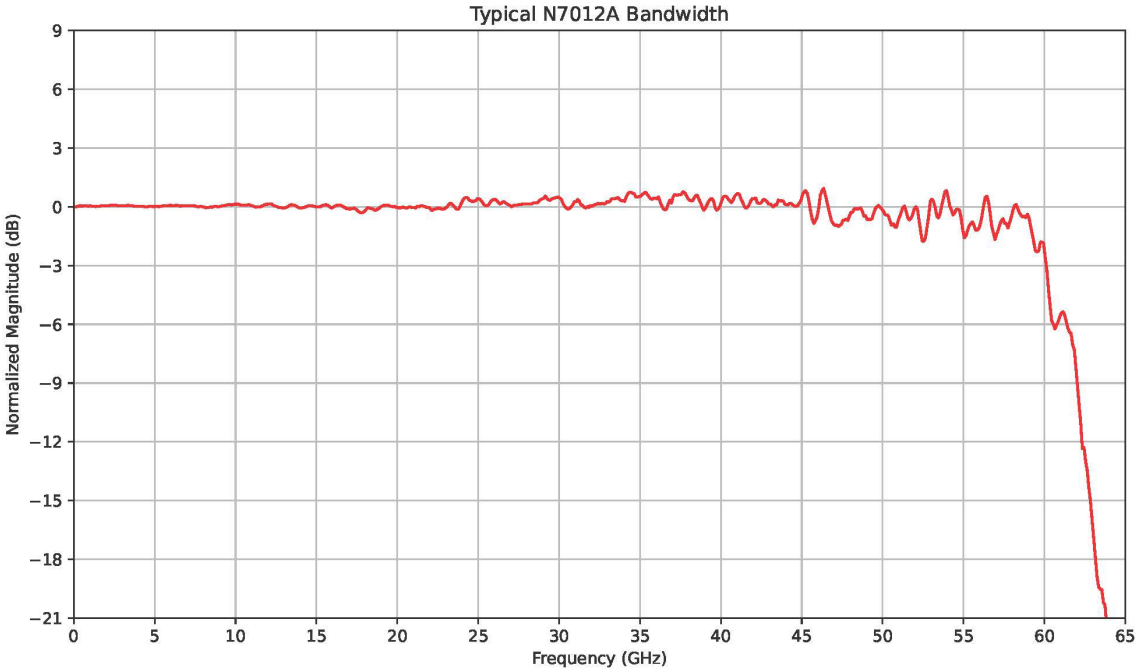

Figure 16 Bandwidth Response for N7012A probes (Freq vs. Normalized Magnitude)

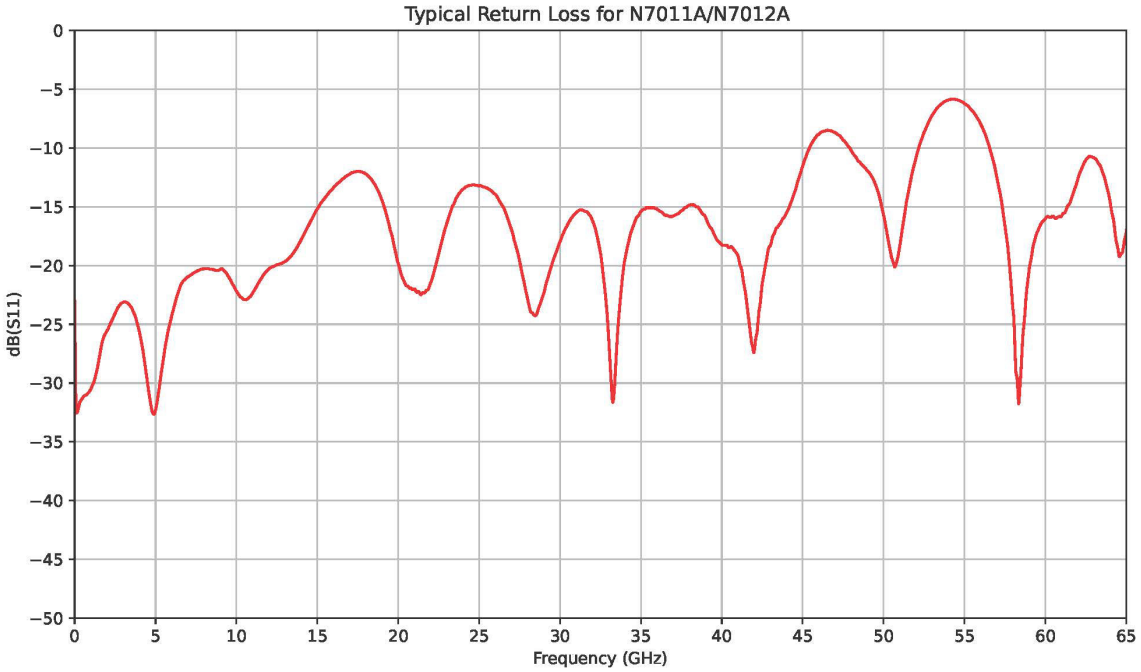

Figure 17 Return Loss for N7011A/N7012A probes

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