Keysight Technologies

U7239A MB-OFDM Ultra-wideband (UWB) Physical Layer Validation and Compliance Software

WiMedia-and Wireless USB-based test software for Infiniium Series oscilloscopes

Data Sheet

KEYSIGHT TECHNOLOGIES

Verify the performance of your MB-OFDM physical layer

Keysight Technologies, Inc. U7239A MB-OFDM ultrawideband (UWB) physical layer (PHY) validation and compliance software for Infiniium Series oscilloscopes provides you with an easy way to verify that your MB-OFDM-based UWB designs perform within the boundaries established by the WiMedia MB-OFDM UWB specification. The Keysight physical layer test software is designed for verifying products that use WiMedia MB-OFDM/ECMA-368 UWB radios. It displays the measurement data results in a flexible report format, and the report also provides a margin analysis that shows how closely your device passed or failed each test.

You can conduct measurements with the U7239A UWB PHY test software and the Infiniium Series oscilloscope via a simple connection to the SMA input or by attaching the receiver antenna directly to the input of the oscilloscope for radiated testing.

The U7239A UWB PHY test software performs a wide range of tests required to meet the WiMedia/ECMA-368 UWB PHY specification. The U7239A software is designed to test the requirements documented in the WiMedia[1] PHY test specifications versions 1.0 and 1.2. Products that incorporate technologies such as Wireless USB, wireless HDMI, and higher-data-rate Bluetooth® devices that use MB-OFDM need to successfully pass a variety of compliance tests typically based on the original WiMedia specification. The U7239A software allows you to simply select between testing to the original WiMedia specifications or testing to specifications defined by the USB-IF.

Features

The U7239A UWB PHY test software offers features to simplify the validation of MB-OFDM PHY performance:

- Full physical-layer transmitter testing as defined by WiMedia PHY test specifications
- WiMedia and Wireless USB test modes
- Test status tracking
- Measurement process configurability
- Automated scope measurement setup
- Test results reports with pass/fail margin analysis

Leverage your existing

With the MB-OFDM UWB PHY test software, you can use the same oscilloscope you use for everyday debugging to perform automated testing and margin analysis based on the MB-OFDM PHY specification.

Save time

The U7239A MB-OFDM UWB PHY test software saves you time by setting the stage for automatic execution of UWB tests.

Easy test definition

The U7239A MB-OFDM PHY test software extends the ease-of-use advantages of Keysight's Infiniium Series oscilloscopes to test UWB designs. The Keysight automated test engine walks you quickly through the steps required to define the device under test, to select the tests, set up the tests, perform the tests, and view the test results. You can pick high-level test parameters to suit your test process objectives, and then you can proceed to select a category of tests all at once, or specify individual tests. The user interface is oriented to minimize reconnections, which saves you time and minimizes potential for operator error. You can save tests and configurations as project files and recall them later for quick testing and review of previous test results. Straightforward menus let you perform tests with a minimum of mouse clicks.

1. WiMedia Alliance **www.wimedia.org**
   Universal Serial Bus Integrators Forum (USB-IF) **www.usb.org**
   Bluetooth Special Interest Group (Bluetooth SIG) **www.bluetooth.org**

Test setup and device type selection

The U7239A setup screens let you specify whether you want to test the PHY with a radiated setup, as in Wireless USB testing, or a conducted setup, as in WiMedia PHY testing.

The U7239A software guides you through selecting important test information:

- Device type: WiMedia-based PHY or Wireless USB end product
- Test information: For Wireless USB the compliance software requires pre-selecting the TFC and data rate. For WiMedia PHY testing, the software automatically detects these parameters.

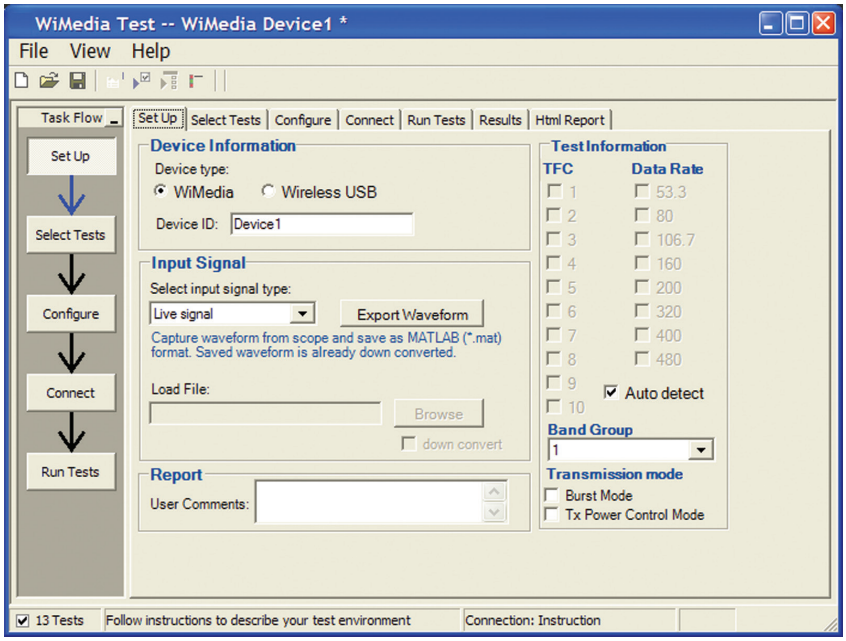

Figure 1. U7239A MB-OFDM test setup

Test selection

After you define the test environment, you are presented with only those tests that are appropriate for the environment you chose. For instance, if you select WiMedia, the testing will use the WiMedia procedures and tests. This includes aspects such as averaging multiple packets for EVM.

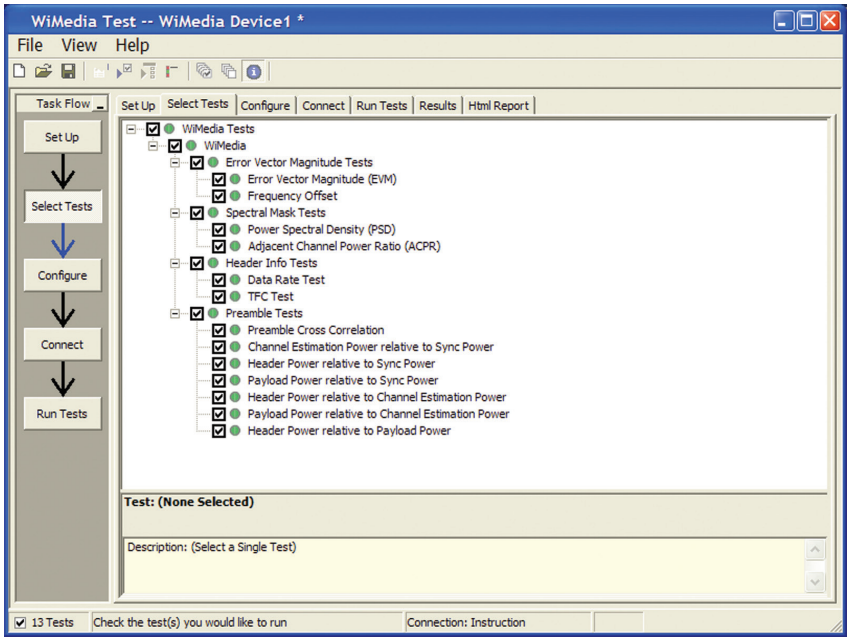

Figure 2. The Keysight automated test engine guides you quickly through selecting tests and configuring tests, setting up the connection, running the tests, and viewing the results. You can easily select individual tests or groups of tests with a mouse-click. You also can easily see the test status for the device under test.

Configurability and guided connections

The U7239A MB-OFDM PHY test software provides flexibility in your test setup. It guides you to make connection changes with hookup diagrams when the tests you select require it. For test parameters such as data channel selection, you can select appropriate values. For more critical parameters, such as averaging, default values are tied to the compliance standard; these values can only be altered in the debug screen.

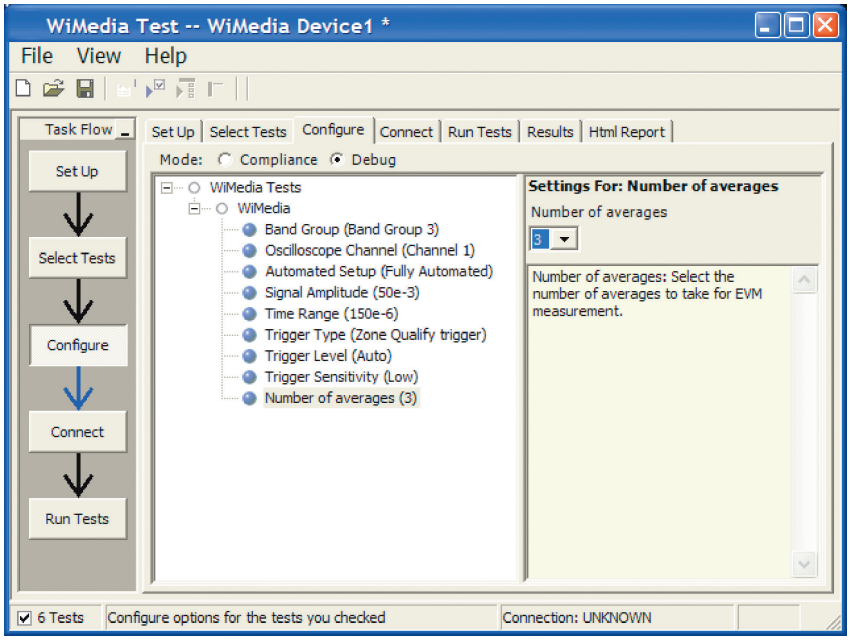

Figure 3. The U7239A configuration screen allows you to alter "soft" parameters for testing to assist in characterization and debug activities.

After you configure the test to meet your needs, the U7239A user interface displays the connection screen, which is specific to the configuration data you have selected. Figure 4 illustrates the typical connection guidance provided for a radiated test of a shipping product with integrated antenna.

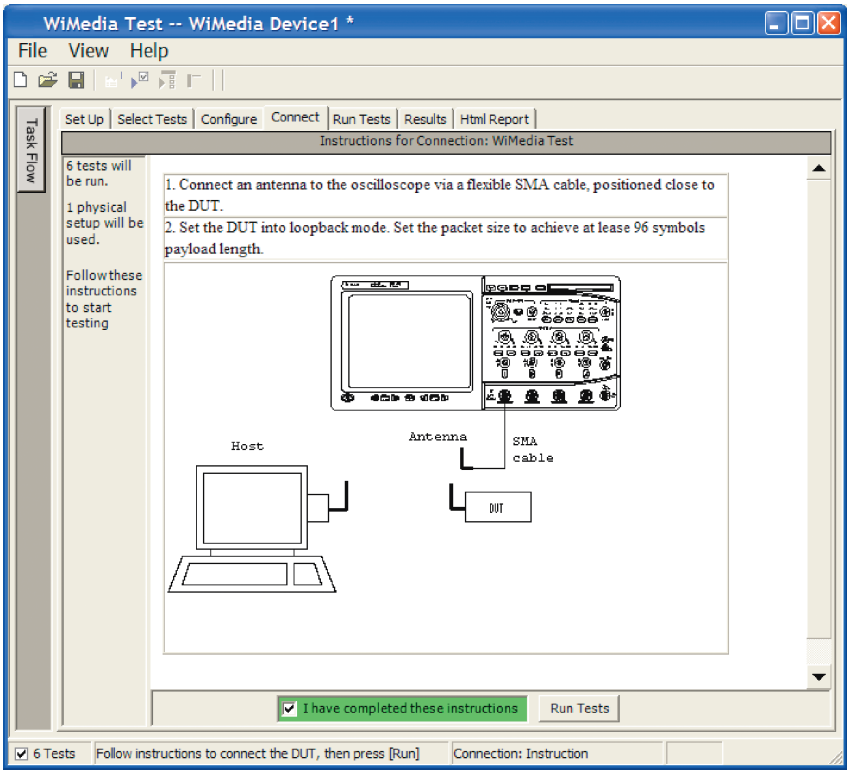

Figure 4. The final step before test is to illustrate the anticipated connection for the test.

Margin analysis

In addition to providing you with measurement results, the U7239A MB-OFDM PHY test software provides a report format that shows you not only where your product passes or fails, but also reports how close you are to the limits specified for a particular test assertion. You select the margin test report parameter, which means you can specify the level at which warnings are issued to alert you to the electrical tests where your product is operating close to the official test limit defined by the MB-OFDM test specification for a given test assertion.

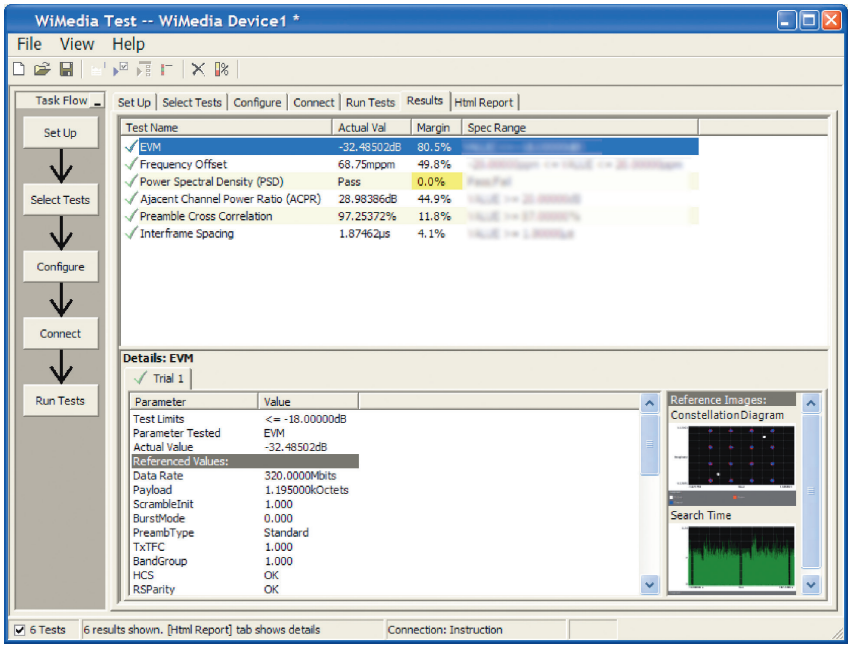

Figure 5. The MB-OFDM UWB PHY test software results report documents your test, indicates the pass/fail status, the test specification range, the measured values, and the margin.

Thorough performance reporting

The U7239A MB-OFDM PHY validation software generates thorough reports that not only capture the performance and status of the device under test, but also the screen images of your most significant measurements for your review and evaluation. The first page of the report lists equipment and configuration details required in standard quality assurance programs. It also provides a hot-linked results table that will quickly get you to the measurement report section of interest.

Margin Thresholds	
Warning	< 2 %
Critical	< 0 %

Example only

Pass	# Failed	# Trials	Test Name	Worst Actual	Worst Margin	Test Assertion Number
✓	0	1	EVM	-32.48502dB	80.5 %	3.5.1-3
✓	0	2	EVM (53MBps)	-33.16911dB	107.3 %	3.51
✓	0	2	EVM (80MBps)	-32.50780dB	103.2 %	3.51
✓	0	1	EVM (106MBps)	-33.95848dB	112.2 %	3.51
✓	0	1	EVM (160MBps)	-34.19439dB	113.7 %	3.51
✓	0	1	EVM (200MBps)	-33.96249dB	112.3 %	3.52
✓	0	1	EVM (320MBps)	-33.97673dB	88.8 %	3.52
✓	0	1	EVM (400MBps)	-33.92855dB	88.5 %	3.52
✓	0	1	EVM (480MBps)	-34.04154dB	89.1 %	3.52
✓	0	10	Frequency Offset	-154.87mppm	49.6 %	3.10
✓	0	10	Power Spectral Density (PSD)	Pass	0.0 %	3.4.1-4
✓	0	10	Ajacent Channel Power Ratio (ACPR)	27.68582dB	38.4 %	3.4.1.2
✓	0	10	Preamble Cross Correlation	99.16540%	14.0 %	3.2.2.1
✓	0	10	Interframe Spacing	1.87493µs	4.2 %	3.1.1

Figure 6. The U7239A software generates a summary report where you can see the total test results for your device quickly and clearly. Additional details are available for each test, including the test limits, test description, and test results, including waveforms, if appropriate. In addition, the margin of the result is indicated to provide further insight.

Report Detail

✓ EVM

Test Summary: Pass Test Description:

Test Limits: <= -18.00000dB EVM -32.48502dB

Result Details

Data Rate 320.0000Mbits	Payload 1.195000kOctets	ScrambleInit 1.000	BurstMode 0.000	PreambType Standard	TxTFC 1.000	BandGroup 1.000	HCS OK
RSParity OK	EVM Low Band dB -31.51656dB	EVM Mid Band dB -34.69850dB	EVM High Band dB -31.87997dB	EVM RMS 2.375466%rms	EVM Peak 7.353199%		
EVM Peak Index 105symbol	CPE 569.3936m%rms	IQ Offset -48.61353dB	Quad Err -521.8545mdeg	Gain Imbalance -46.25935mdB	Overall EVM Rms 2.370042%rms		
Overall EVM dB -32.50488dB	Header EVM Rms 2.299531%rms	Header EVM dB -32.76721dB	Payload EVM Rms 2.375466%rms	Payload EVM dB -32.48502dB			
Constellation Diagram (see image)	Search Time (see image)						

Constellation Diagram

Trial 1: Constellation Diagram

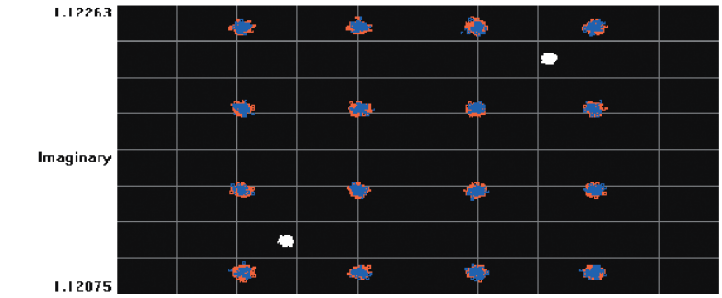

Figure 7. Summary report detail:
The U7239A software's summary report provides screen shots of all the measurements that have been performed.

Test status tracking

The U7239A software can keep track of the status in a test plan either for compliance testing or for user defined testing and is visually viewable in the Test Run menu (Figures 8).

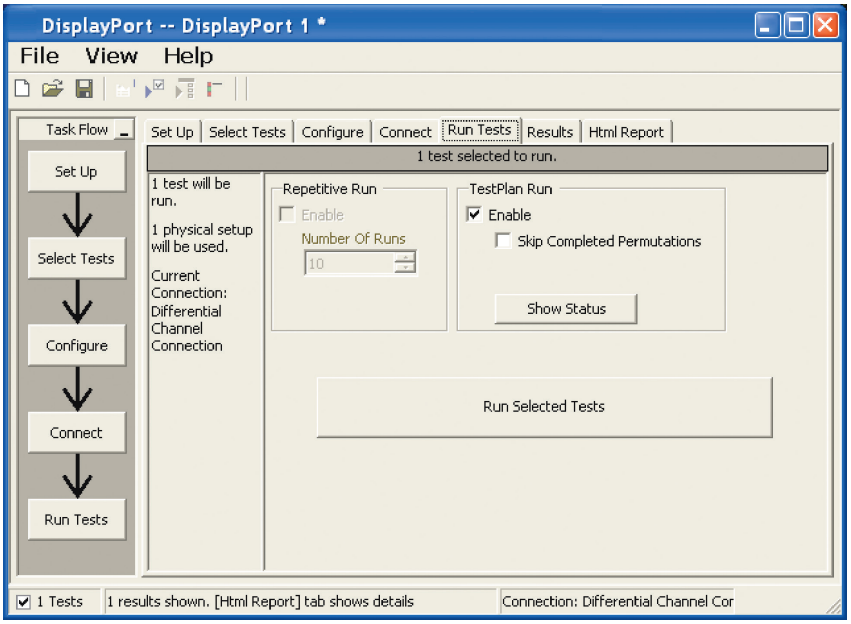

Figure 8. Show test status: Test status selected in the Run Tests menu

Additional considerations

When you use the U7239A MB-OFDM PHY validation and compliance software, it is important to understand the particular UWB technology you are testing and the analysis requirements. The U7239A software is designed to be easy to use and handle most of the testing and documentation needs for WiMedia PHY or Wireless USB verification and compliance testing. For deeper debugging of MB-OFDM UWB PHYs, the 89601A Option BHB is recommended.

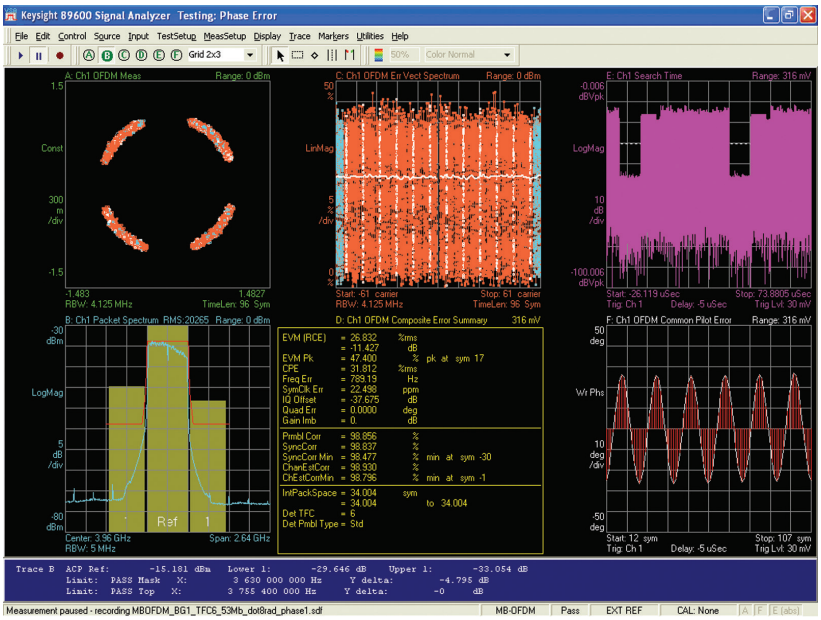

Figure 9. 89600 Vector signal analysis software Option BHB debugging phase rotation in a MB-OFDM UWB PHY.

Oscilloscope compatibility

The U7239A MB-OFDM UWB performance validation is compatible with the new Keysight 90000 Series oscilloscopes with operating software revision 1.40 or higher. It is a good idea to always check for the latest software revisions. Free upgrade software is available at **www.keysight.com/find/infiniium_software**

Table 1. Recommended oscilloscopes and bandwidth for MB-OFDM UWB testing

Keysight oscilloscopes for MB-OFDM UWB test[1]	
Recommended new purchase	**Oscilloscope bandwidth**
DSO90604A or DSA90604A	6 GHz
DSO90804A or DSA90804A[2]	8 GHz
DSO91204A or DSA91204A	12 GHz
DSO91304A or DSA91304A	13 GHz

1. 6 GHz bandwidth is required for Band Group 1 testing
2. The DSO90000 Series oscilloscopes are upgradable in bandwidth from 2 to 13 GHz. DSA models have jitter analysis and clock recovery packages.

Tests performed

The U7239A MB-OFDM UWB performance validation software performs the required tests and many of the informative ones listed in the WiMedia PHY Compliance Test Specification and USB-IF Wireless USB Compliance Test.

Ordering information

To purchase the U7239A MB-OFDM UWB PHY validation and compliance software with a new or existing Infiniium 90000 Series oscilloscope, order the following:

Model number	Description	Quantity
DSO90000A	Oscilloscope (see Table 1)	1
Option 100	100 Megabytes of memory (2.5 ms of time capture at full sample rate, for debug, recommended if purchasing 89601A vector signal analyzer software)	1 (optional)
U7239A	MB-OFDM UWB PHY test software for Infiniium Series oscilloscopes	1
89601A	Vector signal analyzer software (optional for deep level debug)	1 (optional)
89601A Option BHB	MB-OFDM Ultra-wideband modulation analysis	1 (optional)

Wireless USB PHY test accessories

Some required test accessories are available only through the USB-IF. Please go to **www.usb.org** for more information.

Measurement and test accessories

To complete your test setup, Keysight provides a wide range of cables, adapters, terminations, etc.

Model number	Description
11667B	Power splitter, DC to 26.5 GHz, 3.5-mm (f) connectors
11636B	Power divider, DC to 26.5 GHz, 3.5-mm (f) connectors
8493B	Coaxial attenuator (3, 6, 10, 20 or 30 dB), DC to 18-GHz, SMA connector
1250-1158	SMA (f - f) adapter, DC to 18 GHz
1250-1159	SMA (m - m) adapter, DC to 18 GHz
1250-1397	Right-angle adapter, SMA (m - m)
1250-1741	Right-angle adapter, SMA (f - m)
1250-1698	SMA tee adapter (m, f, f), DC to 12.4 GHz
1250-1694	SMA (m) to SMA (f) Adapter
15442A	Cable kit, four 90-cm (36-in) SMA (m - m) cables
15443A	Matched cable pair, two 90-cm (36-in) SMA (m - m) cables, propagation delay within 25 ps
1810-0118	SMA (m) 50 Ω termination
33SMA-Q50-0-4	SMA push-on adaptors from S.M. Electronics (or equivalent)
8494B	11-dB mechanical step attenuator (1-dB steps)
8495D	70-dB mechanical step attenuator (10-dB steps)

Related Keysight literature

For copies of this literature, contact your Keysight representative or visit **www.keysight.com/find/scope-apps**

Publication title	Pub number
Keysight Infiniium DSA/DSO90000A Series Data Sheet	5989-7819EN
Keysight 89600 Series Vector Signal Analysis Software	5989-1679EN
Keysight Technologies Solutions for MB-OFDM ultrawideband	5989-5280EN
89600 Vector Signal Analysis Software Option BHB: Multiband-OFDM Modulation Analysis	5989-5452EN

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For other unlisted countries:
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