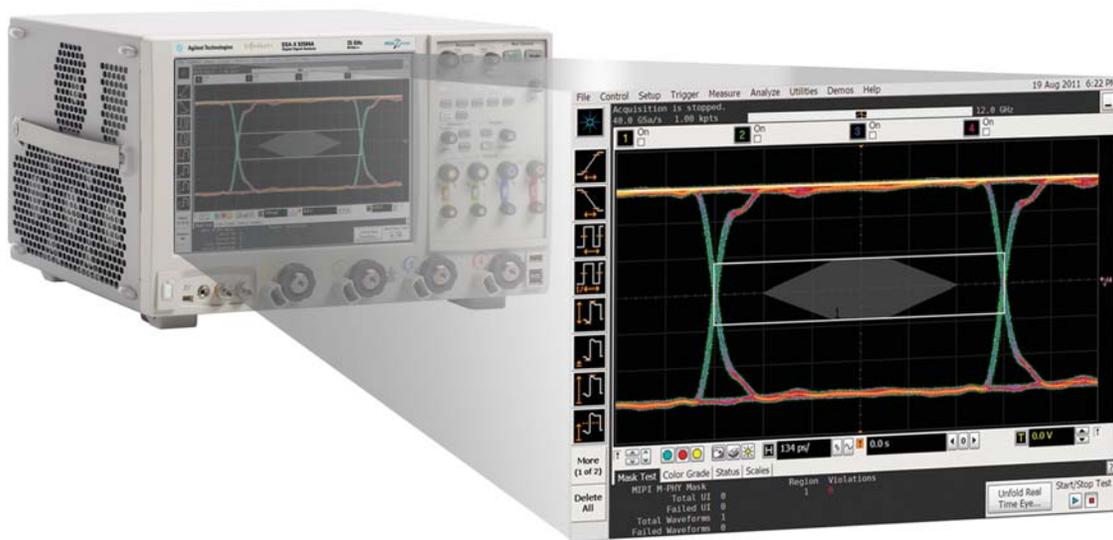


# Agilent U7249A MIPI M-PHY Compliance Test Software for Infiniium Oscilloscopes

## Data Sheet

Validate and debug the electrical performance of your embedded MIPI M-PHY<sup>SM</sup> data links, including DigRF v4<sup>SM</sup>, UniPro<sup>SM</sup> and LLI<sup>SM</sup> protocols quickly and easily



## Introduction

Agilent Technologies' U7249A MIPI M-PHY compliance test software for Infiniium oscilloscopes gives you a fast, easy way to validate and debug your embedded M-PHY data links. The M-PHY electrical test software allows you to automatically execute M-PHY electrical checklist tests for DigRF v4, UniPro and LLI architectures, and displays the results in a flexible report format. In addition to the measurement data, the report provides margin analysis that shows how closely your product passed or failed each test.

The U7249A MIPI M-PHY compliance test software performs a wide range of tests required to meet the physical layer requirements per Section 5.1 of the MIPI Alliance Specification for M-PHY v1.00.00 and M-PHY Conformance Test Suite (CTS) v0.65.

The U7249A MIPI M-PHY compliance test software helps you execute the most difficult physical layer tests for transmitters (TX tests only) that can be measured with a 6 GHz or higher-bandwidth real-time oscilloscope. Although there are not currently any requirements for physical layer compliance verification, it is highly recommended that every MIPI M-PHY link be tested against the limits of the physical layer specification to ensure that it is compliant to the specification and to minimize concerns with protocol level interoperability.



**Agilent Technologies**

## Features

### Features

The U7249A MIPI M-PHY compliance test software offers several features to simplify design validation:

- Complete support for MIPI Alliance Specification for M-PHY v1.00.00 and M-PHY CTS v0.65
- User selection of tests and configuration of data rate
- Automated scope measurement setup and programming for increased accuracy, time-savings and repeatability
- Advanced debug modes for troubleshooting
- Automated margin analysis and pass/fail conformance reporting

With the M-PHY compliance test software, you can use the same oscilloscope you use for everyday debugging to perform automated testing and margin analysis based on the MIPI Alliance Specification for M-PHY v1.00.00 and M-PHY CTS v0.65.

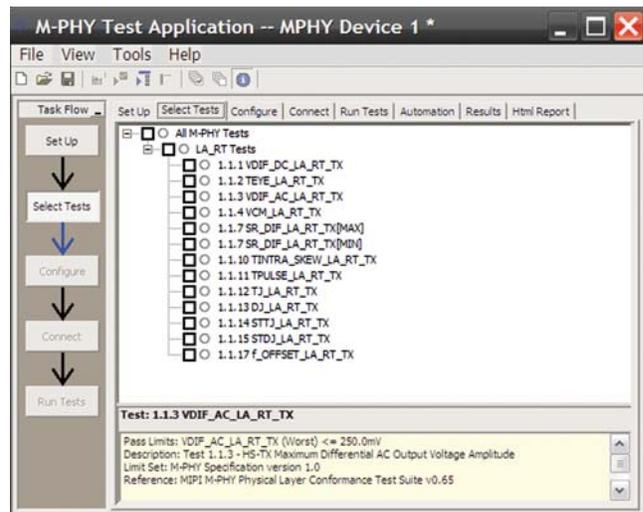
### U7249A saves you time

The U7249A compliance test software saves you time by setting the stage for automatic execution of required electrical tests. The primary difficulty of performing electrical tests for M-PHY is connecting the oscilloscope to the target device, correctly configuring the scope's measurement system for ultimate accuracy, issuing the proper commands to perform the tests and then analyzing the measured results by comparing them to limits published in the specification. The M-PHY compliance test software automates this work to provide rapid, accurate and repeatable test execution. In addition, if you discover a problem with your product, debug tools in the scope are available to aid in root-cause analysis.

See Table 1 for a complete list of the measurements you can make with the U7249A MIPI M-PHY compliance test software

### Easy test definition

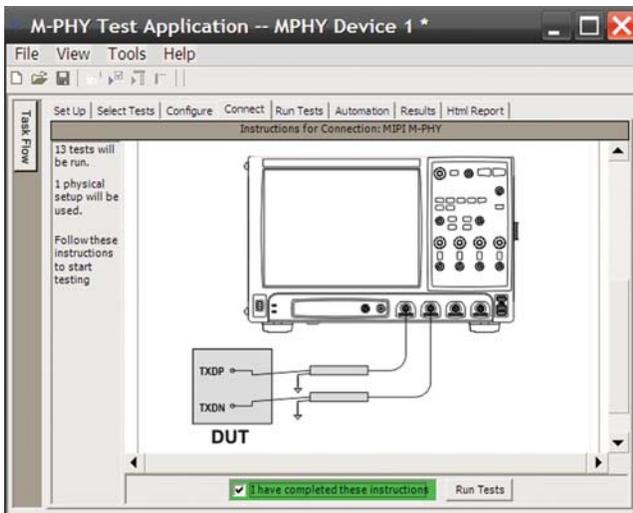
The U7249A MIPI M-PHY compliance test software extends the ease-of-use advantages of Agilent's Infiniium oscilloscopes to testing M-PHY designs. The Agilent automated test engine walks you quickly through the steps required to define and configure the tests, execute the tests, and view the test results. You can select a category of tests all at once or specify individual tests. The user interface is oriented to minimize unnecessary reconnections, which saves time and ensures accuracy and repeatability of tests. You can save tests and configurations as project files and recall them later for quick re-testing or review of previous test. Straightforward menus let you perform tests with a minimum of mouse clicks.



**Figure 1.** You can easily select individual tests or groups of test with a mouse-click and customize your output report based on the test results you want to see.

## Configurability and guided connections

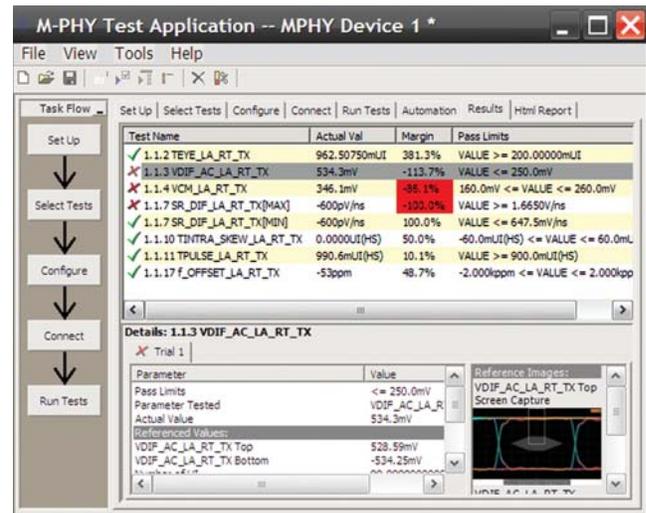
The U7249A MIPI M-PHY compliance test software provides flexibility in your test setup. The M-PHY compliance test software provides you with user-defined controls for critical test parameters such as channel probe configurations, number of measurement observations for tests and the low- power trigger threshold. After you configure the tests to meet your needs, the U7249A user interface will present you the connection screen that is specific to the configuration data you have selected. This includes the oscilloscope channels used for the test and the routing of any necessary probing needed to perform the tests. In some cases, a configuration change may be necessary to properly make a new set of measurements. Guided configuration diagrams will be presented when each change is needed to ensure proper configuration for the tests. The software is designed to minimize connection changes to increase the efficiency of test operation and save you time.



**Figure 2. Guided configuration diagrams provide you with channel and probe configurations needed to properly connect to your product and accurately perform tests.**

## Results reports with margin analysis

In addition to providing you with measurement results, the U7249A MIPI M-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 specification for a given test assertion.



**Figure 3. Results reports quickly highlight test margins versus specified limits and a summary of measurements that pass/fail or violate the margin warnings you have set.**

## Configurability and guided connections

The U7249A M-PHY compliance software generates thorough reports that not only capture the performance and status of the device under test, but capture the screen shots of your most significant measurements for your documentation and evaluation.

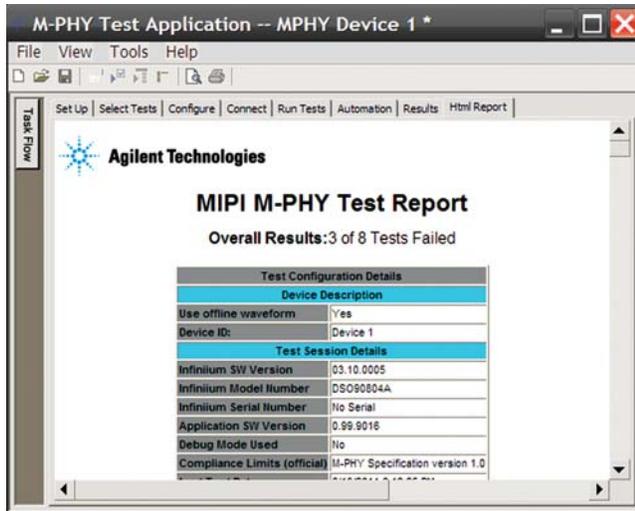


Figure 4. A complete HTML-formatted report provides a results summary for documentation and archiving with full detail on measurement definitions referenced to the specification and screen images from the oscilloscope during test.

## Measurement requirements

To use the U7249A M-PHY compliance software you will need an Agilent 9000, 90000 or 90000 X Series Infiniium oscilloscope with at least 6 GHz of analog, real-time bandwidth. You will also need the E2688A Serial Data Analysis (Option 003 on new scopes) and N5400A EZJIT Plus jitter analysis software (Option 004 on new scopes) and a license for the U7249A. In order to use the U7249A compliance test software, your product will need to be able to source the necessary high-speed mode (HS-MODE) and low-speed mode (LS-MODE) in the supported GEAR and RATE. Besides that, your product has to be able to transmit the required HS-BURST consisting of Compliance Random Pattern (CRPAT) and Compliance Jitter Test Pattern (CJTPAT) to perform the testing.

## Extensibility

You may add additional custom tests or steps to your application using the N5467A User Defined Application (UDA) development tool ([www.agilent.com/find/uda](http://www.agilent.com/find/uda)). Use UDA to develop functional “Add-Ins” that you can plug into your application.

Add-ins may be designed as:

- Complete custom tests (with configuration variables and connection prompts)
- Any custom steps such as pre or post processing scripts, external instrument control and your own device control

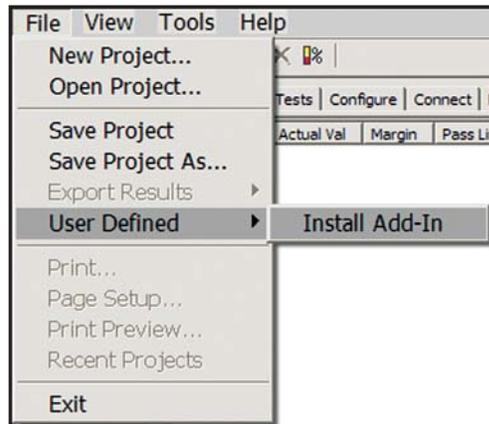


Figure 5. Importing a UDA Add-In into your test application.

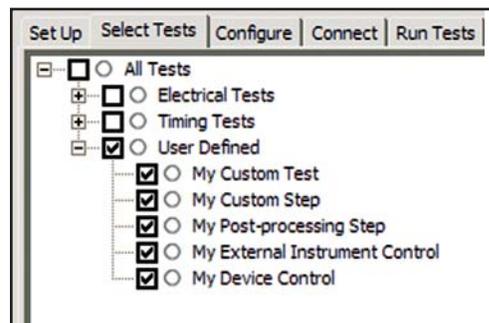


Figure 6. UDA Add-In tests and utilities in your test application.

## Automation

You can completely automate execution of your application's tests and Add-Ins from a separate PC using the included N5452A Remote Interface feature (download free toolkit from [www.agilent.com/find/scope-apps-sw](http://www.agilent.com/find/scope-apps-sw)). You can even create and execute automation scripts right inside the application using a convenient built-in client.

The commands required for each task may be created using a command wizard or from "remote hints" accessible throughout the user interface.

Using automation, you can accelerate complex testing scenarios and even automate manual tasks such as:

- Opening projects, executing tests and saving results
- Executing tests repeatedly while changing configurations
- Sending commands to external instruments
- Executing tests out of order

Combine the power of built-in automation and extensibility to transform your application into a complete test suite executive:

- Interact with your device controller to place it into desired states or test modes before test execution.
- Configure additional instruments used in your test suite such as a pattern generator and probe switch matrix.
- Export data generated by your tests and post-process it using your favorite environment, such as MATLAB, Python, LabVIEW, C, C++, Visual Basic etc.
- Sequence or repeat the tests and "Add-In" custom steps execution in any order for complete test coverage of the test plan.

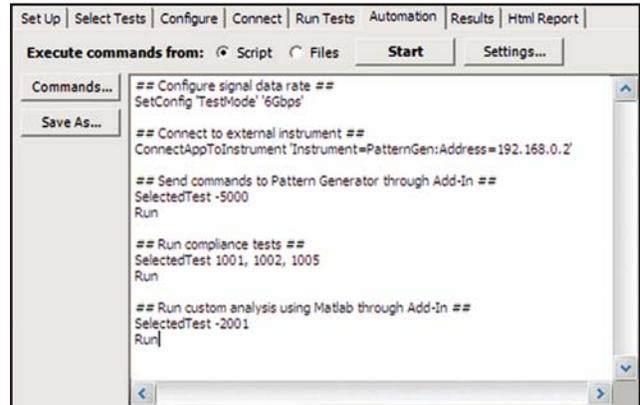


Figure 7. Remote Programming script in the Automation tab.

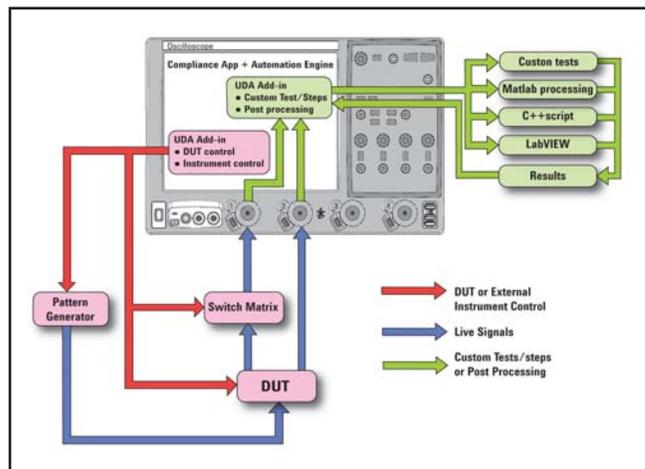


Figure 8. Combine the power of built-in automation and extensibility to transform your application into a complete test suite executive.

## Oscilloscope compatibility

The U7249A M-PHY compliance software is compatible with Agilent 9000, 90000 and 90000 X Series Infiniium oscilloscopes with software revision 3.11 or higher. For oscilloscopes with earlier software revisions, free upgrade software is available at

[www.agilent.com/find/scope-apps-sw](http://www.agilent.com/find/scope-apps-sw).

## Test Performed

The U7249A MIPI M-PHY compliance software performs the following tests as per MIPI Alliance Specification for M-PHY v1.00.00 and M-PHY CTS v0.65.

### Group 1: HS-TX Requirements

- Test 1.1.1 – HS-TX Differential DC Output Voltage Amplitude (VDIF-DC-xA-xT-TX)
- Test 1.1.2 – HS-TX Transmitter Eye Opening (TEYE-TX)
- Test 1.1.3 – HS-TX Maximum Differential AC Output Voltage Amplitude (VDIF-AC-xA-xT-TX)
- Test 1.1.4 – HS-TX Common Mode Output Voltage Amplitude (VCM-xA-TX)
- Test 1.1.6 – HS-TX Lane-to-Lane Skew (TL2L-SKEW-HS-TX)
- Test 1.1.7 – HS-TX Slew Rate (SRDIF-TX)
- Test 1.1.10 – HS-TX Intra-Lane Output Skew (TINTRA-SKEW-TX)
- Test 1.1.11 – HS-TX Transmitter Pulse Width (TPULSE-TX)
- Test 1.1.12 – HS-TX Total Jitter (TJTX)
- Test 1.1.13 – HS-TX Deterministic Jitter (DJTX)
- Test 1.1.14 – HS-TX Short-Term Total Jitter (STTJTX)
- Test 1.1.15 – HS-TX Short-Term Deterministic Jitter (STDJTX)
- Test 1.1.17 – HS-TX Transmitter Frequency Offset (fOFFSET-TX)

Date rate	Recommended Oscilloscopes	Bandwidth Requirements
Gear 1 (Up to 1457.6Mbps)	DSO/DSA90604A	6 GHz
Gear 2 (Up to 2915.2Mbps)	DSO/DSA91204A	12 GHz
Gear 3 (Up to 5830.4Mbps)	DSOX/DSAX92504A	25 GHz

Scope Model	Scope Bandwidth
DSO/DSA9404A	4 GHz
DSO/DSA90604A	6 GHz
DSO/DSA90804A	8 GHz
DSO/DSA91204A	12 GHz
DSO/DSA91304A	13 GHz
DSO/DSAX91604A	16 GHz
DSO/DSAX92004A	20 GHz
DSO/DSAX92504A	25 GHz
DSO/DSAX92804A	28 GHz
DSO/DSAX93204A	32 GHz

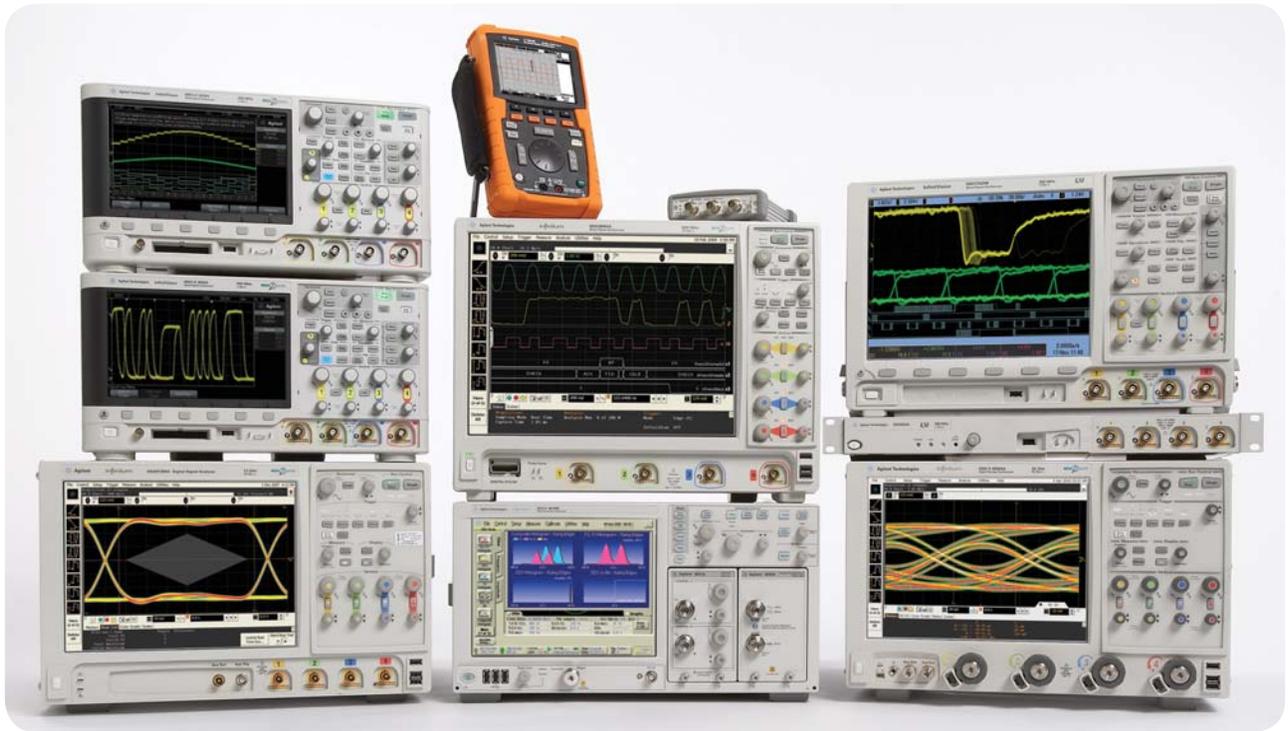
## Ordering information

To purchase the U7249A MIPI M-PHY compliance software with a new or existing Agilent Infiniium 9000, 90000 and 90000 X-Series oscilloscope, order the model numbers shown:

Model Number	Description	Quantity
DSO/DSA90604	Infiniium Series oscilloscope	1
U7249A	MIPI M-PHY compliance test software for Infiniium Oscilloscopes (Option 047 on new oscilloscopes or option N5435A-043 for server based licence)	1
E2688A	High-Speed Serial Data Analysis (Option 003 on new oscilloscopes or N5435A-003 for server based license)	1
N5400A	EZJIT Plus jitter analysis software (Option 004 on new oscilloscopes or N5435A-001 for server based license)	1
1134A	InfiniiMax 7-GHz differential probe amplifier (Qty 3 is recommended for DigRF v4 for probing at SYS-CLK)	2
E2669A	Differential probe connectivity kit (contains needed probe heads)	1
N2809A	Recommended - PrecisionProbe for probe and cable correction (Option 001 on new oscilloscopes or N5435A-045 for server based license)	1

## Related Literature

Publication title	Publication type	Publication number
<i>Infiniium DSO/DSA 90000A Series Oscilloscopes</i>	Data sheet	5989-7819EN
<i>E2688A High-Speed Serial Data Analysis</i>	Data sheet	5989-0108EN
<i>N5400A EZJIT Plus Jitter Analysis Software</i>	Data sheet	5989-0109EN
<i>RDX Protocol Solutions Test Solutions for DigRF</i>	Data sheet	5989-9575EN
<i>Infiniium DSO/MSO9000A Series Oscilloscope</i>	Data sheet	5990-3746EN
<i>Agilent Technologies Infiniium 90000 X-Series Oscilloscopes</i>	Data sheet	5990-5271EN



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