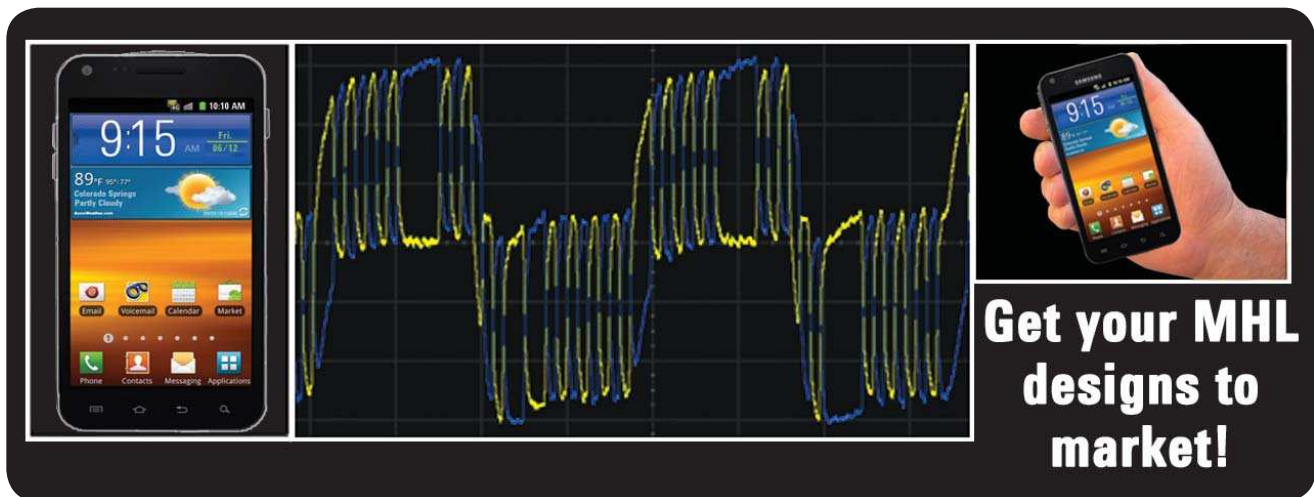




# N6460A MHL Source Compliance Test Software for Infiniium 90000A Series Oscilloscopes

## Data Sheet



Agilent Technologies N6460A MHL source compliance test software for Infiniium 90000 Series oscilloscopes provides you with a fast and easy way to verify and characterize your Mobile High Definition-Link (MHL) designs for mobile devices such as cell phones and tablets. The MHL source compliance test software is used in the MHL Authorized Test Centers (ATCs) and has been tested thoroughly and validated for device compliance testing so you can confidently use it to execute MHL electrical checklist tests as well as employ it as a development tool.

The N6460A MHL source compliance test software performs the full physical layer compliance suite for MHL data transport as identified in the MHL Compliance Test Specification 1.2 and 2.0 (CTS 1.2/2.0). These tests, in conjunction with protocol tests, represent the full compliance regimen to qualify an MHL design at an MHL authorized test center.

As an MHL adopter, your product must successfully pass compliance testing based on the MHL CTS specification so you can get a jump on the process by testing with the same instrumentation and software as the authorized test center in this consumer market where weeks can determine success, this confidence will enable you to attend to higher risk areas in your product's market delivery.

### Features

The N6460A MHL electrical test software offers several features to simplify the validation of MHL designs:

- Test setup wizard for ease-of-use
- Full complement of MHL electrical tests for the high speed interface.
- Automated scope measurement setup
- Test results report generation
- Pass/fail margin analysis



With the MHL electrical test software, you can use the same oscilloscope you use for everyday debugging to perform automated testing and margin analysis based on the MHL-specified test checklist.

## N6460A saves you time

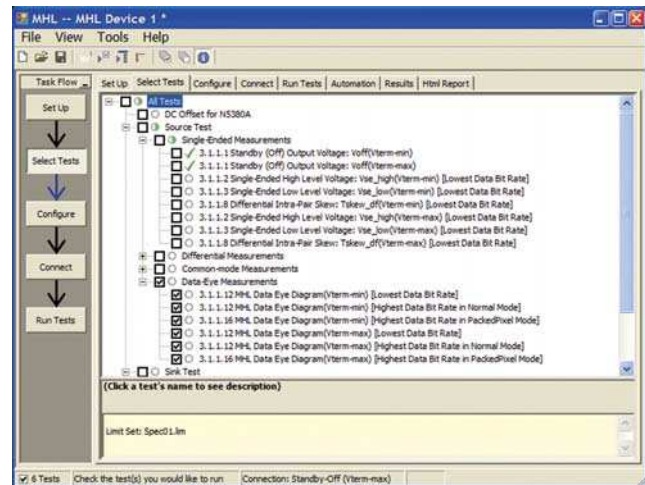
The N6460A MHL source compliance test software saves you time by setting the stage for automatic execution of MHL electrical tests. Part of the difficulty of performing electrical tests for MHL is connecting the oscilloscope to the target device, configuring the instrument for measurement, executing the test procedure, and then analyzing the measured results by comparing them to limits published in the specification. The MHL electrical test software does almost all of this work for you. The software also incorporates calibration functions for MHL signal generators to enable the accurate testing of MHL sinks. Part of the value of having this function available is to characterize cable loss effects etc. which can be helpful in system design.

The N6460A MHL source compliance test software offers all of the single ended, differential and common mode tests required for the MHL CTS. The Agilent automated test engine walks you quickly through the steps required to define the tests, set up the tests, perform them, and view the test results. The user is allowed to pick high level test parameters to suit test process objectives, and then can proceed to select a category of tests all at once, or specify individual tests. The user interface is oriented to minimize your reconnections necessary which saves time as well as 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. The software automatically configures the oscilloscope for each test, prompts the user for test connection and configuration, and it provides an informative results report that includes margin analysis indicating how close your product is to passing or failing that specification. See Table 2 for a complete list of the measurements made by the MHL source compliance test software.

## Test Selection

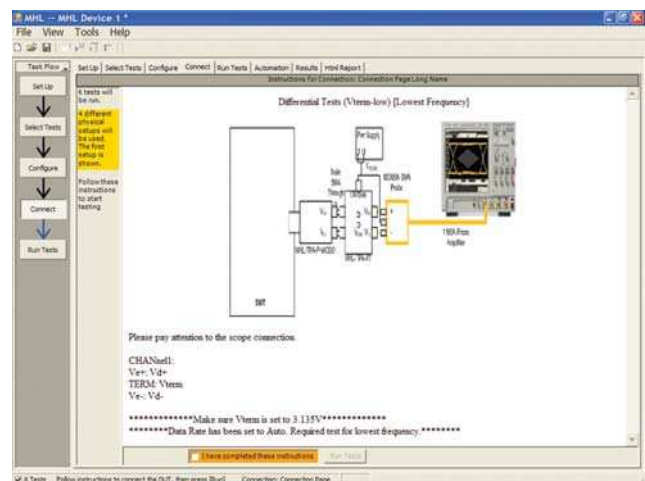
The 'Select Tests' tab shows test selection menu as well as status. As can be seen in Figure 1, a check mark signifies a test selection and will be run subsequently. Also note, however, that there are green checks that indicate a passing result and red 'x's that indicate a fail when tests are opened

to the highest detail. When not opened to specific tests, say for groups of tests instead a status circle is shown which may empty indicating no testing of that group, or may be colored red, green, red and green. These signify states of Fail, Pass, and both Failed and Passed tests, respectively.



**Figure 1. The Agilent 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. Also easily seen is the test status for the device under test.**

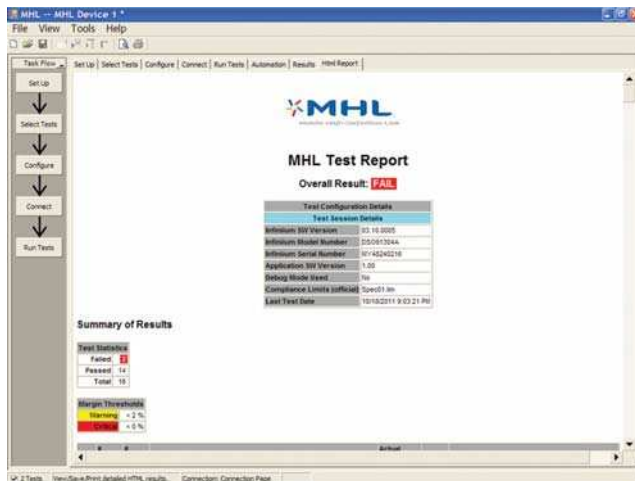
After configuring the test according to your needs, the N6460A User Interface will then present you the connection screen which is shown in Figure 2 illustrating the connection guidance provided for standard MHL device.



**Figure 2. When you make multiple tests where the connections must be changed, the software prompts you with connection diagrams and/or photographs.**

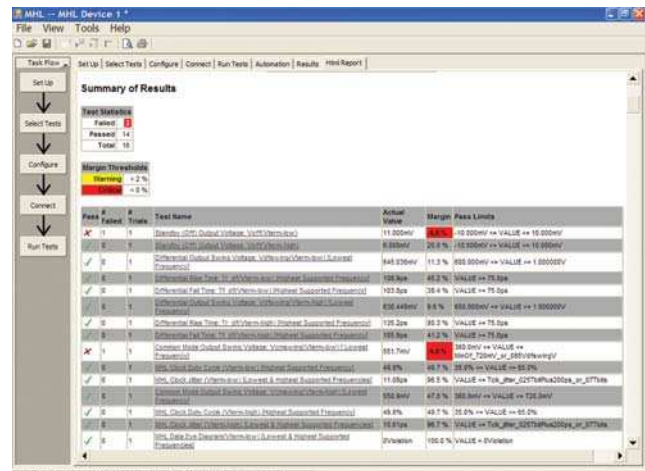
## Thorough Performance Reporting

The N6460A MHL Source compliance test software generates thorough reports that not only capture the performance and status of the device under test, but also the screen shots of the your most significant measurements for your perusal 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.

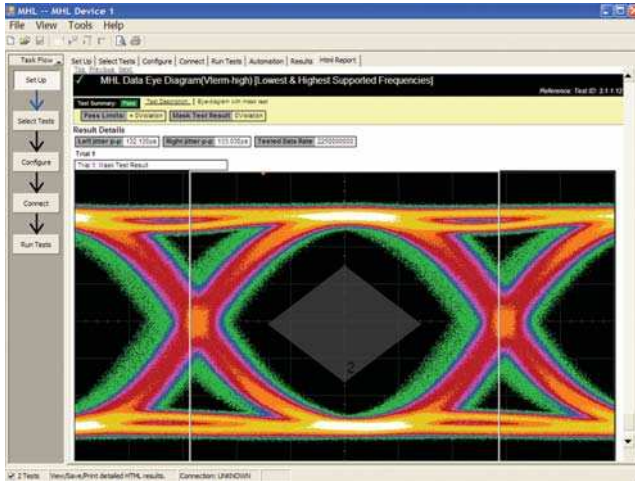


**Figure 3.** The N6460A software generates a summary report where you can see the total test results for your device quickly and clearly. This is the title page illustrating the important session information regarding the connection, device and measurement equipment.

The report then lists the summary of results in a table form. This table has a wealth of information that is immediately visible to the user. The status of the device (pass or fail) is shown immediately to the left in very obvious form. If you should have many test runs or several resolutions at which to test you will be alerted to your overall status for a given test by the number of trials of that test and number of times that test failed. The test name is hot linked and will take you directly to results you desire to dig into (see eye result below, Figure 5). This data is also available in the 'Results' tab as shown in Figure 6.



**Figure 4.** Additional details 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.



**Figure 5. Summary Report Detail: the N6460A software's summary report yields all the screen shots of all the measurements that have been performed. In this figure you can see the Data-Eye. Observe the clear status and description at top and the measurement data just above the eye.**

## Margin Analysis

In addition to providing you with measurement results, the N6460A MHL source compliance 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 MHL Compliance Test Specification for a given test assertion.

### Margin is calculated:

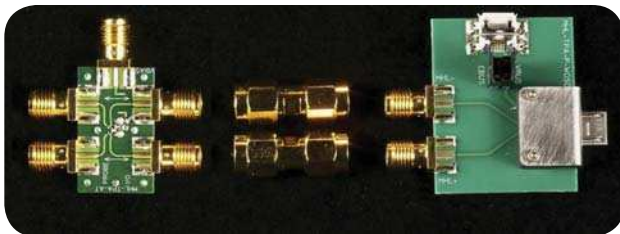
#### Single-sided Specification:

$$\text{Margin} = (\text{ValueSpecification} - \text{Valueactual}) / \text{ValueSpecification}$$

#### Double-sided Specification:

$$\text{Margin} = \text{Lowest of: } (\text{ValueSpecification\_High} - \text{Valueactual}) / \text{RangeSpecification} \text{ and } (\text{ValueSpecification\_Low} - \text{Valueactual}) / \text{RangeSpecification}$$

## MHL Test Point Adapters



**Figure 5a. The MHL Test Point Adapters for MHL Source Test (available from Wilder Technologies or through Bitifye Corp).**

Test Name	Actual Val	Margin	Pass Limits
✓ Standby (DPI) Output Voltage: v0(F)(Term-Lo)	11.000mV	100.0%	10.000mV <= VALUE <= 10.000mV
✓ Standby (DPI) Output Voltage: v0(F)(Term-High)	6.000mV	25.0%	10.000mV <= VALUE <= 10.000mV
✓ Differential Output Swing Voltage: v0(F)(Term-Lo) [Lowest Frequency]	845.628mV	11.2%	800.000mV <= VALUE <= 1.000000V
✓ Differential Rise Time: Tr_0(F)(Term-Lo) [Highest Supported Frequency]	305.5ps	45.2%	VALUE <= 75.0ps
✓ Differential Fall Time: Tf_0(F)(Term-Lo) [Highest Supported Frequency]	203.8ps	78.4%	VALUE <= 75.0ps
✓ Differential Output Swing Voltage: v0(F)(Term-High) [Lowest Frequency]	1.01.488mV	9.6%	600.000mV <= VALUE <= 1.000000V
✓ Differential Rise Time: Tr_0(F)(Term-High) [Highest Supported Frequency]	127.2ps	80.2%	VALUE <= 75.0ps
✓ Differential Fall Time: Tf_0(F)(Term-High) [Highest Supported Frequency]	105.5ps	41.2%	VALUE <= 75.0ps
✓ Common Mode Output Swing Voltage: vCommon(F)(Term-Lo) [Lowest Frequency]	55.1.3mV	100.0%	360.0mV <= VALUE <= 360.0mV
✓ MHL Clock Duty Cycle (Term-Lo) [Highest Supported Frequency]	48.9%	48.7%	35.0% <= VALUE <= 65.0%
✓ MHL Clock Other (Term-Lo) [Lowest Supported Frequency]	11.80ps	96.3%	VALUE <= 75.0ps
✓ Common Mode Output Swing Voltage: vCommon(F)(Term-High) [Lowest Frequency]	350.3mV	47.8%	265.0mV <= VALUE <= 725.0mV
✓ MHL Clock Duty Cycle (Term-High) [Highest Supported Frequency]	48.9%	48.7%	35.0% <= VALUE <= 65.0%
✓ MHL Clock Other (Term-High) [Lowest Supported Frequency]	20.4.0ps	96.3%	VALUE <= 75.0ps
✓ MHL Data Eye Diagram (Term-Lo) [Lowest & Highest Supported Frequencies]	Division	100.0%	VALUE = Division
✓ MHL Data Eye Diagram (Term-High) [Lowest & Highest Supported Frequencies]	Division	100.0%	VALUE = Division

**Figure 6. The MHL source compliance test software results report documents your test, indicates the pass/fail status, the test specification range, the measured values, and the margin.**

To make measurements with the N6460A MHL source compliance test software, you will require signal access which is achieved through test point access (TPA) fixture set designed by Wilder Technologies. This fixture set interfaces to the micro USB connector of the device under test and performs two functions. One function is to break out low frequency signaling so the device under test may be controlled as desired—for example by connection to a sink device or to any other device that conveys EDID information. The second function is to break out the high speed lines of MHL for measurement verification.

## Measurement requirements

To use the N6460A MHL source compliance test software with the Wilder Technologies TPAs, you will need at least two 10GHz or higher InfiniiMax probe amplifiers (1168A, or 1169A) with appropriate differential SMA probe heads (N5380A). These are used to measure the differential and single ended parameters identified in the compliance test specification. They function to terminate the transmission lines in 50 ohms and to pull up the signal to 3.3 volts. To measure the common mode parameters where the bandwidth requirements are relaxed (1 GHz), an E2678A socketed differential probe head is needed.

## Oscilloscope compatibility

The N6460A MHL electrical performance validation and compliance software is compatible with 90000A and 90000X Series oscilloscopes with operating software revision A.3.11 or higher. For oscilloscopes with earlier software revisions, free upgrade software is available at [http://www.agilent.com/find/infiniium\\_software](http://www.agilent.com/find/infiniium_software).

Agilent Oscilloscopes for MHL Compliance Testing	
Recommended for New Purchase	Oscilloscope Bandwidth
DSO90804A	8 GHz†
Other Suitable Models	
DSO91204A	12 GHz††
DSO91304A	13 GHz††
DSOX91604A	16 GHz††
DSOX92004A	20 GHz††
DSOX92504A	25 GHz††
DSOX93204A	32 GHz††

† The DSO90000A series of Oscilloscopes are upgradable in bandwidth from 2 to 13GHz  
 †† The N6460A software will automatically control the bandwidth setting of the oscilloscope. Default value is 8GHz.

**Table 1: Recommended Oscilloscopes and Bandwidth for MHL 1.2/2.0 Specification.**

## Tests performed

The N6460A MHL electrical performance validation and compliance software performs the following tests as per the MHL Compliance Test Specifications 1.2 and 2.0

Assertion No.	Description
<b>Section 3.1.1</b>	<b>Transmitter tests</b>
Test ID 3.1.1.1	Standby (Off) Output voltage: VOFF
Test ID 3.1.1.2	Single-Ended High Level Voltage: VSE_HIGH
Test ID 3.1.1.3	Single-Ended Low Level Voltage: VSE_LOW
Test ID 3.1.1.4	Differential Output Swing Voltage: VDFSWING
Test ID 3.1.1.5	Common Mode Output Swing Voltage: VCMSWING
Test ID 3.1.1.6	Differential Rise and Fall Times: TR_DF TF_DF
Test ID 3.1.1.7	Common Mode Rise and Fall Times: TR_CM TF_CM
Test ID 3.1.1.8	Differential Intra-Pair Skew: TSKEW_DF
Test ID 3.1.1.10	MHL Clock Duty Cycle (24 Bit Mode)
Test ID 3.1.1.11	MHL Clock Jitter (24 Bit Mode)
Test ID 3.1.1.12	MHL Data Eye Diagram (24 Bit Mode)
Test ID 3.1.1.14	MHL Clock Duty-Cycle (Packed Pixel Mode) [MHL 2.0 only]
Test ID 3.1.1.15	MHL Clock Jitter (Packed Pixel Mode) [MHL 2.0 only]
Test ID 3.1.1.16	MHL Data Eye Diagram (Packed Pixel Mode) [MHL 2.0 only]
<b>Section 4.1.1</b>	<b>Sink Test Support (used to calibrate the MHL signal generator and debug)</b>
	Sink Eye with TP1 or TP2 mask
	2m/5m cable Equalization
	Sink Jitter Measurement

**Table 2. MHL electrical tests performed by the N6460A software**

## Ordering information

To purchase the N6460 MHL electrical performance validation and compliance software with a new or existing 90000 Series oscilloscope, order the following:

Model number	Description	Quantity
(See Table 1)	8GHz Oscilloscope (Minimum bandwidth) 20 MB Memory Standard MHL Source compliance test software: New purchase: DSO90000-opt054 or DSOX-90000opt054 Existing: N6460A Server Based License: N5435A option 050	1
1168A/1169A	10/12GHz Probe Amplifiers. 1169A Recommended.	2
N5380A	12GHZ SMA Probe Heads for differential and single-ended measurements.	2
E2678A	Differential socketed Probe head	1
E3633A/ E3646A	Multimeter/ DC Supply	Optional

**Table 3a. MHL Oscilloscope solution ordering information**

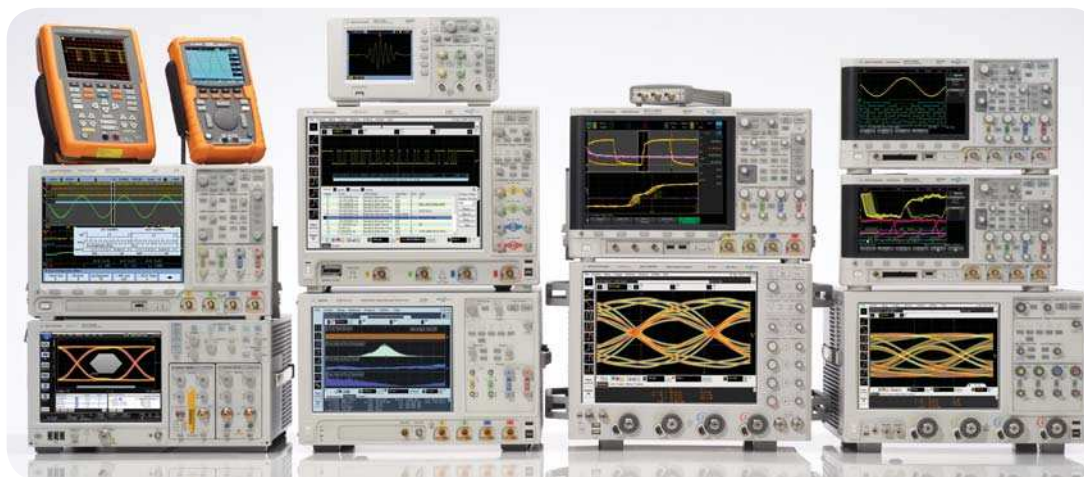
For physical connections to an MHL device to perform tests with the N6460A MHL compliance test software, order the following:

Model Number	Description	Supplier	Quantity
MHL-TPA-AGIL-S0	MHL Source Test Adapter Kit PN 640-0466-000	Wilder Technologies	1
BIT-1070-0000-0	MHL Source Test Fixture Kit	BITIFEYE Corp.	1

**Table 3b. MHL Test Adapter solution ordering information**

### Related Agilent literature

Publication title	Publication type	Publication number
<i>Infiniium 90000 Series Oscilloscopes</i>	Data Sheet	5989-7819EN
<i>N5990A Automation Software</i>	Data Sheet	5989-5483EN
<i>HDMI Test Point Adapters (for EDID board)</i>	Data Sheet	5989-5771EN



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