DATA SHEET

D9010ETHC 10M/100M/1GBASE-T and Energy Efficient Ethernet Compliance Test Application Software

The Keysight Technologies, Inc. compliance test application provides a fast and effortless way to test, debug and characterize your 10M/100M/1GBASE-T Ethernet designs. The Keysight D9010ETHC 10M/100M/1GBASE-T compliance application software for Infiniium real-time oscilloscopes saves you time and money by automating the task of preforming compliance measurements. The tests performed by the D9010EBSC software are based on the IEEE 802.3-2005 and ANSI X3.263-1995 standards specification and for Energy Efficient Ethernet the IEEE802.3az-2010 standard. The test application offers a user-friendly setup wizard and a comprehensive report that includes margin analysis.

To make 1000BASE-T, 100BASE-TX and 10BASE-T measurements with the D9010ETHC 10M/100M/1GBASE-T and Energy Efficient Ethernet compliance application software, you also need the Keysight N5395C Ethernet electrical conformance test fixture. For Energy Efficient Ethernet compliance testing order the Wilder Technologies Energy Efficient Ethernet fixture (P/N: EEE-TPA-ERK). If you If you want to make 1000BASE-T jitter measurements, you also need the Keysight N5396A Gigabit Ethernet jitter test cable. In addition, you can use a wide variety of Keysight waveform generators including the Keysight 33612A as a disturbing signal source and choose from a variety of Keysight vector network analyzers such as the E5080A ENA vector network analyzer to make return loss measurements. Performing these tests gives you confidence in your design. The D9010ETHC 10M/100M/1GBASE-T and Energy Efficient Ethernet compliance application software helps you execute a wide subset of the conformance tests that can be measured with an oscilloscope.

KEYSIGHT TECHNOLOGIES

Transform complexity into simplicity

- Setup wizard for quick setup, configuration and test selection.
- Execution speed and proven test algorithm which minimizes test time.
- User-select tests based on the IEEE 802.3-2005 and ANSI X3.263-1995 standards
- For Energy Efficient Ethernet tests the IEEE 802.3az-2010 standard is referenced.
- Reduces the time it takes to characterize your Ethernet design from hours to minutes.
- Reports multi trial results with statistics for each measurement and worst-case result.
- Accurate and repeatable results with Keysight Technologies Infiniium oscilloscopes
- Automated reporting in a comprehensive HTML format with margin analysis

With the D9010ETHC 10M/100M/1GBASE-T and Energy Efficient Ethernet Compliance Test Application Software, you can use the same oscilloscope you use for everyday debugging to perform automated testing and margin analysis based on the IEEE802.3 standard.

D9010ETHC 10M/100M/1GBASE-T with Energy Efficient Ethernet Compliance Application Software Saves You Time

The D9010ETHC 10M/100M/1GBASE-T and Energy Efficient Ethernet compliance test application software saves you time by setting the stage for automatic execution of 10M/100M/1GBASE-T and Energy Efficient Ethernet electrical tests. Part of the difficulty of performing electrical tests for Ethernet transmitters is properly connecting to the oscilloscope, loading the proper setup files, and then analyzing the measured results by comparing them to limits published in the specification. The D9010ETHC 10M/100M/1GBASE-T and Energy Efficient Ethernet Compliance Test Application Software does much of this work for you. The D9010ETHC 10M/100M/1GBASE-T and Energy Efficient Ethernet Compliance Test Application Software automatically configures the oscilloscope for each test, and it provides an informative results report that includes margin analysis indicating how close your product is to passing or failing that test specification.

Easy test definition

The D9010ETHC 10M/100M/1GBASE-T and Energy Efficient Ethernet compliance test application software extends the ease-of-use advantages of Keysight's Infiniium oscilloscopes to testing 10M/100M/1GBASE-T designs. The Keysight automated test engine walks you quickly through the steps required to define the tests you want to make, set up the tests, perform the tests, and view the test results. A setup page enables you to quickly make decisions from the outset regarding the choice of tests and perform functions that affect the testing task. The test selections available in the following steps are then filtered according to the choices made in the setup page. While selecting tests, you can select a category of tests all at once or specify individual tests. 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.

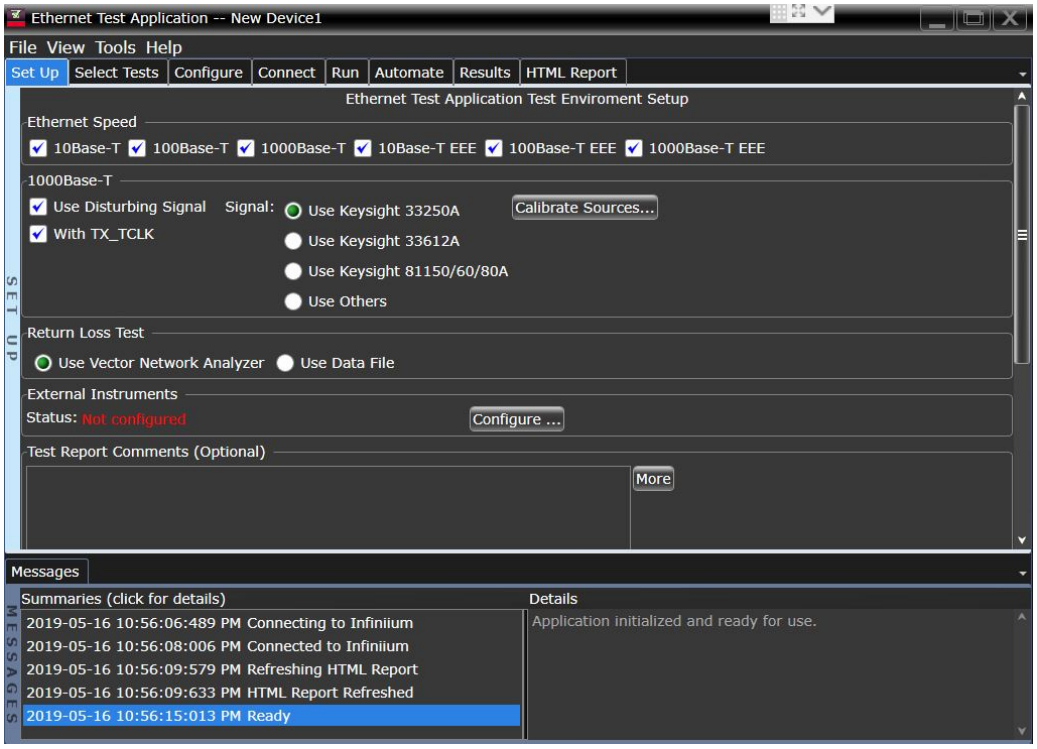

Figure 1. The clean interface of the setup page enables you to quickly make decisions and perform functions that affect the testing task.

Compliance measurement tests

The D9010ETHC 10M/100M/1GBASE-T and Energy Efficient Ethernet compliance test application software allows you to run single or multiple tests based on your needs. Highlight a test to show more details including tests limits and references to related details of the specification. Accurate and repeatable results give you confidence in your measurements.

You can also specify the number of test trials and only stop running selected tests when the stop condition is met. The application will save the worst-case test result to help you track down the anomalies in your signals.

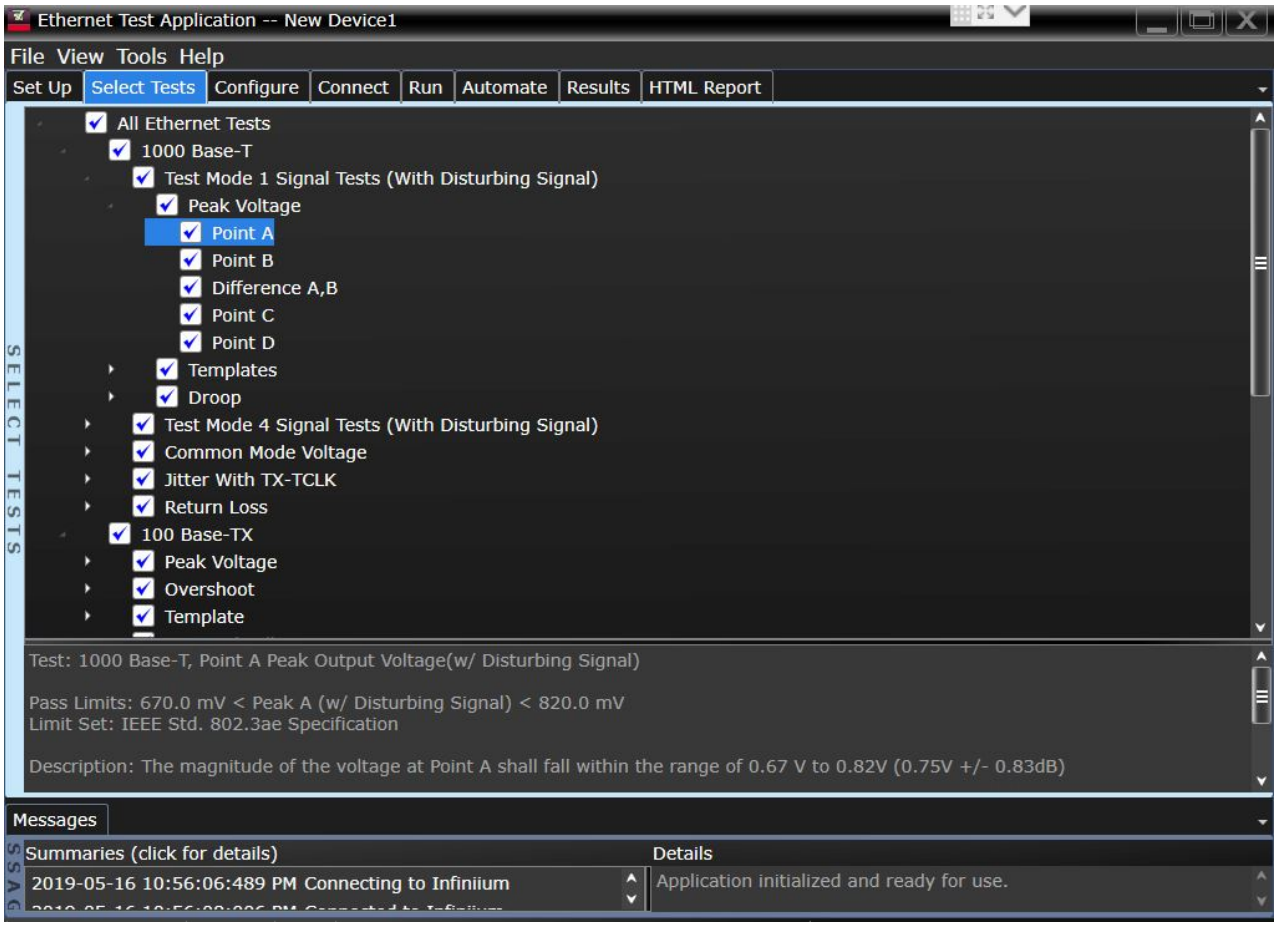

Figure 2. The Keysight automated test engine quickly guides you through selecting and configuring tests, setting up the connection, running the tests, and viewing the results. You can easily select individual tests or groups of tests with a mouse-click.

Tests performed

The D9010ETHC 10M/100M/1GBASE-T and Energy Efficient Ethernet compliance test application software performs the following tests as per the IEEE 802.3-2005, ANSI X3.263-1995 and IEEE802.3az-2010 standards. The previous standards have been updated to reflect the IEEE802.3-2018 specification where appropriate.

The following clauses and annexes are included in the D9010ETHC compliance test application:

1000BASE-T Standard reference	Description
IEEE802.3.2005 Sub clause 40.6.1.2.1	Difference A, B peak output voltage [1]
IEEE802.3.2005 Sub clause 40.6.1.2.1	Point A peak output voltage [1]
IEEE802.3.2005 Sub clause 40.6.1.2.3	Point A template test [1]
IEEE802.3.2005 Sub clause 40.6.1.2.1	Point B peak output voltage [1]
IEEE802.3.2005 Sub clause 40.6.1.2.3	Point B template test [1]
IEEE802.3.2005 Sub clause 40.6.1.2.1	Point C peak output voltage [1]
IEEE802.3.2005 Sub clause 40.6.1.2.3	Point C template test [1]
IEEE802.3.2005 Sub clause 40.6.1.2.1	Point D peak output voltage [1]
IEEE802.3.2005 Sub clause 40.6.1.2.3	Point D template test [1]
IEEE802.3.2005 Sub clause 40.6.1.2.3	Point F template test [1]
IEEE802.3.2005 Sub clause 40.6.1.2.2	Point G droop test [1]
IEEE802.3.2005 Sub clause 40.6.1.2.3	Point H template test [1]
IEEE802.3.2005 Sub clause 40.6.1.2.2	Point J droop test [1]
IEEE802.3-2005 Sub clause 40.8.3.3	MDI common mode output voltage
IEEE802.3-2005 Sub clause 40.6.1.2.5	Jitter master filtered
IEEE802.3-2005 Sub clause 40.6.1.2.5	Jitter master unfiltered
IEEE802.3-2005 Sub clause 40.6.1.2.5	Jitter slave filtered
IEEE802.3-2005 Sub clause 40.6.1.2.5	Jitter slave filtered
IEEE802.3-2005 Sub clause 40.8.3.1	MDI return loss
IEEE802.3-2005 Sub clause 40.6.1.2.4	Transmitter distortion [1]

1. With or without disturbing signal.

100BASE-TX Standard reference	Description
ANSI X3.263-1995, Section 9.1.3	+Vout overshoot
ANSI X3.263-1995, Section 9.1.3	+Vout overshoot decay
ANSI X3.263-1995, Section 9.1.3	–Vout overshoot
ANSI X3.263-1995, Section 9.1.3	–Vout overshoot decay
ANSI X3.263-1995, Section 9.1.6	AOI +Vout rise time
ANSI X3.263-1995, Section 9.1.6	AOI +Vout fall time
ANSI X3.263-1995, Section 9.1.6	AOI +Vout rise/fall time symmetry
ANSI X3.263-1995, Section 9.1.6	AOI –Vout rise time
ANSI X3.263-1995, Section 9.1.6	AOI –Vout fall time
ANSI X3.263-1995, Section 9.1.6	AOI –Vout rise/fall time symmetry
ANSI X3.263-1995, Section 9.1.8	Duty cycle distortion
ANSI X3.263-1995, Section 9.1.4	Signal amplitude symmetry
ANSI X3.263-1995, Section 9.1.9 and IEEE802.3-2005 Sub clause 25.4.5	Transmit jitter
ANSI X3.263-1995, Annex J	UTP AOI template
ANSI X3.263-1995, Section 9.1.2.2	UTP +Vout differential output voltage
ANSI X3.263-1995, Section 9.1.2.2	UTP –Vout differential output voltage
ANSI X3.263-1995, Section 9.1.5	Transmitter return loss
ANSI X3.263-1995, Section 9.2.2	Receiver return loss

10BASE-TX Standard reference	Description
IEEE802.3-2005 Sub clause 14.3.1.2.5	Common mode output voltage
IEEE802.3.2005 Sub clause 14.3.1.2.1, Figure 14-9, Table 14-1	Template MAU
IEEE802.3.2005 Sub clause 14.3.1.2.1, Figure 14-10	Template TP_IDL with TPM
IEEE802.3.2005 Sub clause 14.3.1.2.1, Figure 14-10	Template TP_IDL without TPM
IEEE802.3.2005 Sub clause 14.3.1.2.1, Figure 14-12	Template Link Pulse with TPM
IEEE802.3-2005 Sub clause 14.3.1.2.1	Peak differential output voltage
IEEE802.3.2005 Sub clause 14.3.1.2.1	Harmonic content
IEEE802.3.2005 Sub clause 14.3.1.2.1 and Annex B.4.1 and B.4.3.3	Jitter with TPM
IEEE802.3.2005 Sub clause 14.3.1.2.1 and Annex B.4.1 and B.4.3.3	Jitter without TPM
IEEE802.3.2005 Sub clause 14.3.1.2.2 and Annex B.4.3.2	Transmitter return loss
IEEE802.3.2005 Sub clause 14.3.1.3.4 and Annex B.4.3.5	Receiver return loss

Energy Efficient Ethernet Tests

1000BASE-Te Standard reference	Description
IEEE 802.3az, Sub clause 78.2, Table 78-2, Sub clause 40.4.5.2	Quiet time
IEEE 802.3az, Sub clause 40.4.6.1, Figure 40-15b, Sub clause 40.4.5.2	Refresh time
IEEE 802.3az, Sub clause 40.6.1.2.5	Transmitter timing jitter

100BASE-TXe Standard reference	Description
IEEE 802.3az, Sub clause 78.2, Table 78-2, Sub clause 24.8.3.5	Quiet time
IEEE 802.3az, Sub clause 78.2, Table 78-2, Sub clause 24.8.3.5	Refresh time
IEEE 802.3az, Sub clause 25.4.6	Transmitter timing jitter

10BASE-Te Standard reference	Description
IEEE 802.3az, 14.3.1.2.1, Figure 14-12	LTP, w/TPM
IEEE 802.3az, 14.3.1.2.1, Figure 14-10	TP_IDL, w/TPM
IEEE 802.3az, 14.3.1.2.1, Figure 14-9, Table 14-1	MAU template
IEEE 802.3az, 14.3.1.2.1, and Annex B.4.1, B.4.3.3	Jitter w/TPM
IEEE 802.3az, 14.3.1.2.1	Peak differential voltage

Configurability and Guided Connection

The D9010ETHC 10M/100M/1GBASE-T and Energy Efficient Ethernet compliance test application software provides flexibility in your test setup. The application lets you define controls for critical test parameters such as signaling rate, clock recovery used for analysis and customizable violation settings. Once you have configured the tests, the connection page will display the connection diagram for the test you have selected. The compliance application guides you to make connection changes with hookup diagrams when the tests you select require it.

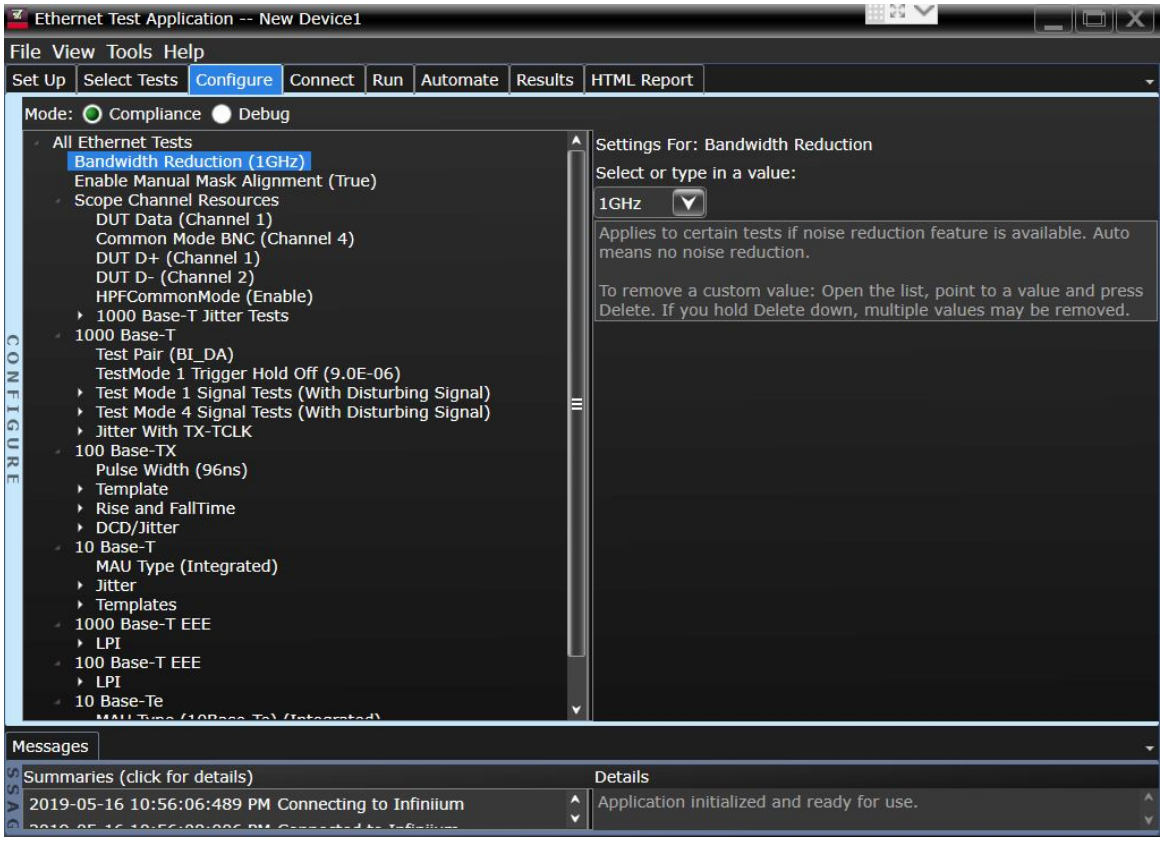

Figure 3. To set up tests, you define the device to test, its configuration, and how the oscilloscope is connected to it.

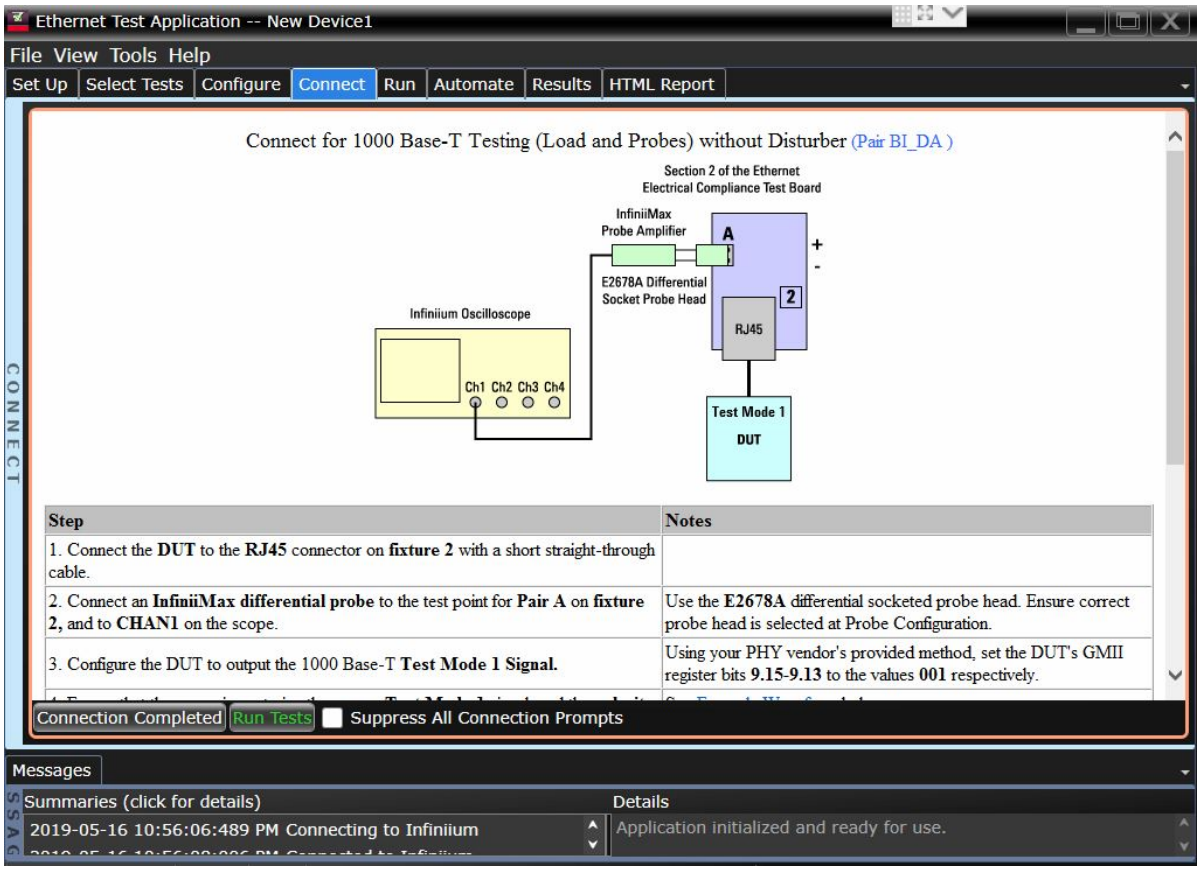

Figure 4. When you make multiple tests where the connections must be changed, the software prompts you with connection diagrams.

Comprehensive Result Analysis

In addition to providing you with measurement results, the D9010ETHC 10M/100M/1GBASE-T and Energy Efficient Ethernet compliance test application 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 test. You can select the margin test report parameter, which means you can specify the level at which warnings are issued to alert you to electrical tests where your product is operating close to the official test limit defined by the 10M/100M/1GBASE-T and Energy Efficient Ethernet specifications.

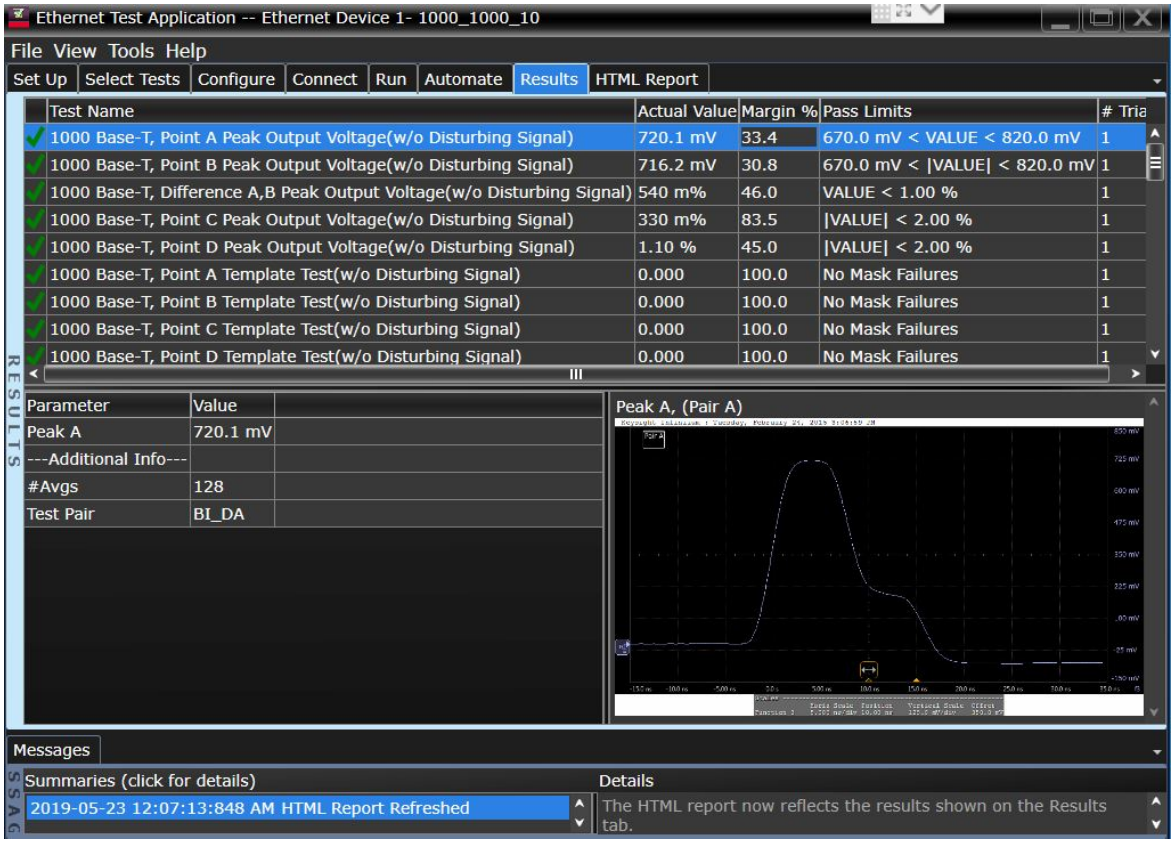

Figure 5. The D9010ETHC 10M/100M/1GBASE-T with Energy Efficient Ethernet compliance test application software results screen shows a summary of the tests performed, pass/fail status, and margin. Hyperlinks direct you to the more details of that test.

Thorough Performance Reporting

The D9010ETHC 10M/100M/1GBASE-T with Energy Efficient Ethernet compliance test application software generates HTML reports that captures the performance, status and margins of your device under test. It also captures screenshots of critical measurements of your reference and documentation. This report is suitable for printing and sharing with your test vendors, customers and suppliers.

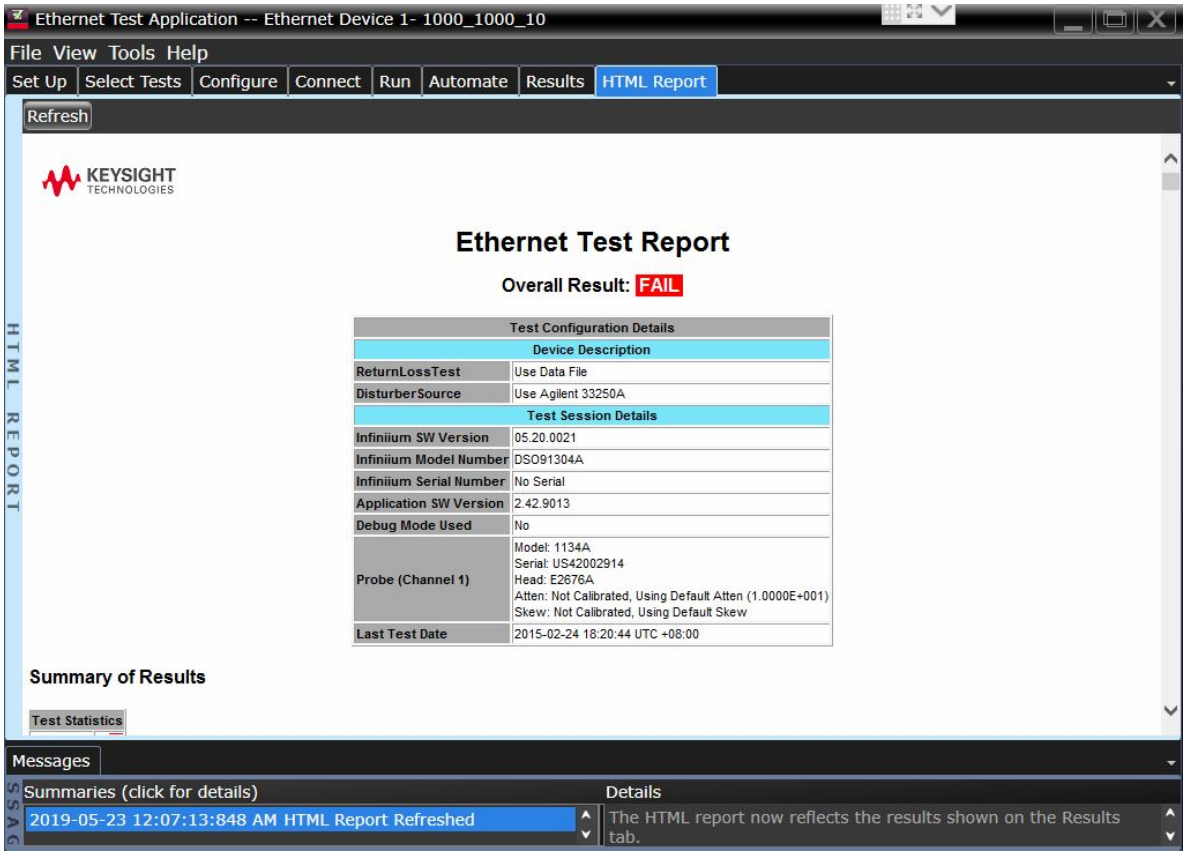

Figure 6. Additional details are available for each test, including the test limits, test description, and test results, including waveforms, if appropriate.

Recommended Ethernet Fixtures

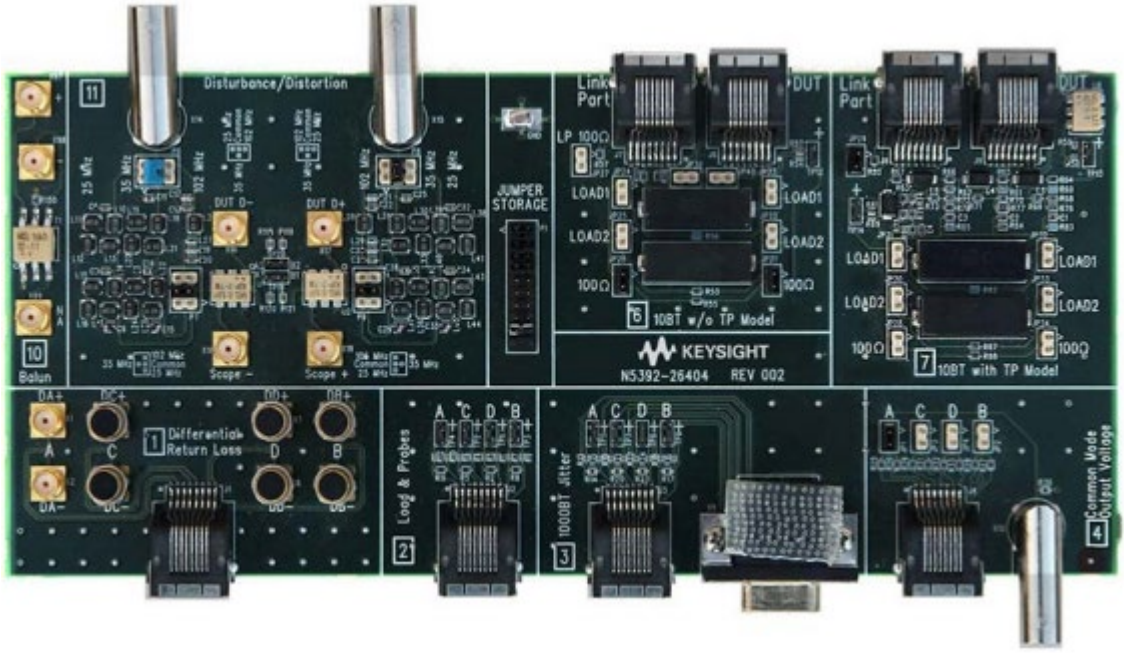

Figure 7. The N5395C standard Ethernet test fixture allows you to test the 10BASE-T, 100BASE-TX and 1000BASE-T transmitter signals. The fixture kit includes a CAT5E cable and the return loss fixture shown below.

Figure 8. The return loss fixture is used to calibrate the VNA for return loss measurements and is included in the standard Ethernet fixture kit.

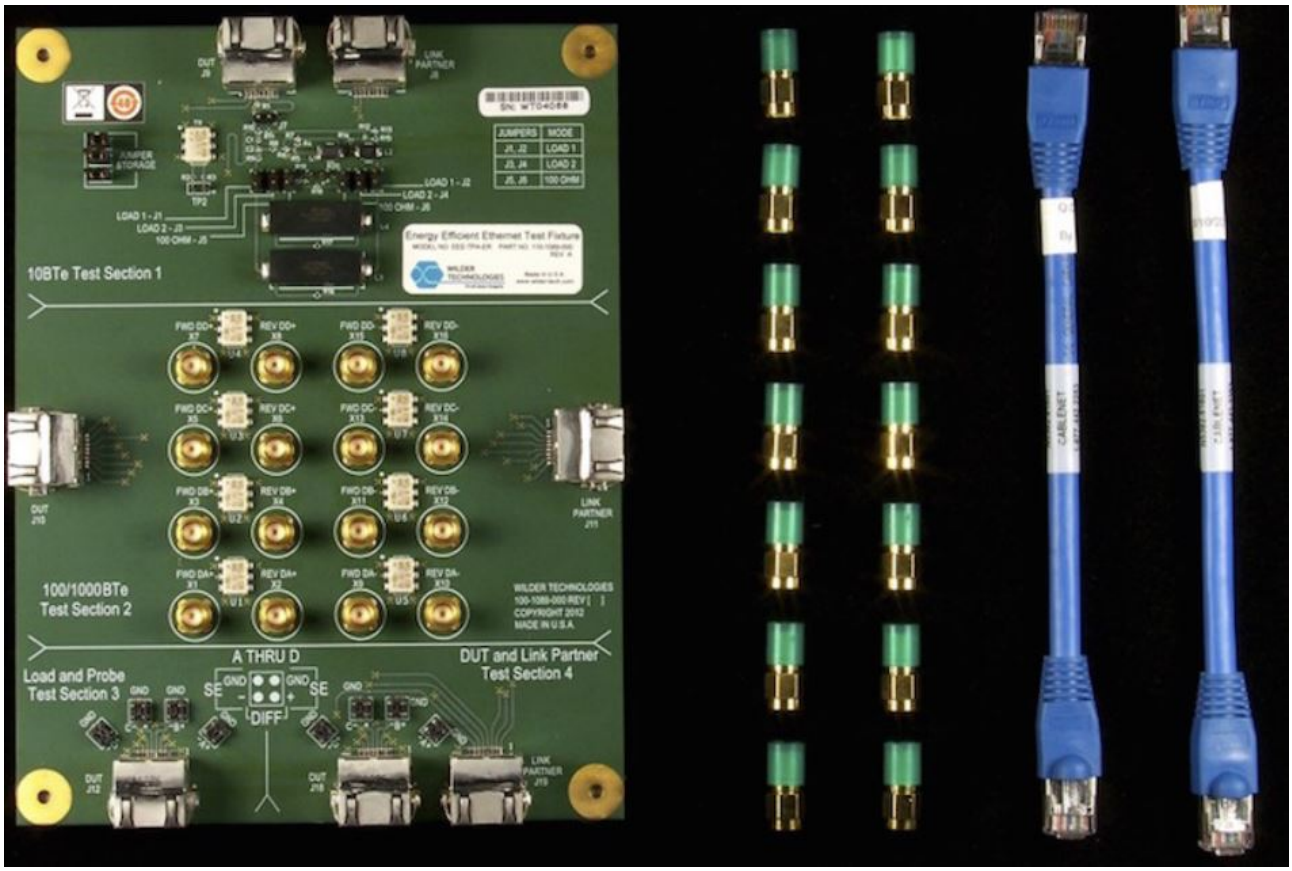

Figure 9. The EEE-TPA-ERK Wilder Technologies Energy Efficient Ethernet test fixture allows you to test to the 10BASE-Te, 100BASE-TXe and 1000BASE-Te Energy Efficient Ethernet standards. Sold separately through Wilder-Technologies.

Note: If you are not testing Energy Efficient Ethernet, this fixture is not required.

Recommended Oscilloscope

The D9010ETHC 10M/100M/1GBASE-T and Energy Efficient Ethernet compliance test application software is compatible with Keysight Infiniium Series oscilloscopes with operating software revision 6.30 or higher.

Data rate	Minimum Bandwidth	Minimum Channels	Description
1000BASE-T (4x250Mb/s)	1 GHz	2	S-Series, V-Series, Z-Series, MXR-Series and UXR-Series

Note: Scope bandwidth is based on the highest data rate for standard Ethernet at 4x250 Mb/s.

Ordering Information

Software

Model number	Description	Note
D9010ETHC	10M/100M/1GBASE-T with Energy Efficient Ethernet compliance test application software	Required
D9010SCNA/D9020SCNA	InfiniiScan Event Identification Software	Required
D9010JITA/D9020JITA	EZJIT Complete - Jitter and Vertical Noise Analysis Software	Required
D9020ASIA	Advanced Signal Integrity Software (EQ, InfiniiSim Advanced)	Optional

Example of hardware configuration

Model number	Description	Quantity
DSOS104A	1 GHz 4 channel Infiniium S Series Oscilloscope	1
N5395C	Standard Ethernet test fixture kit	1
Wilder Technologies EEE-TPA-ERK P/N 640-0581-001	Energy Efficient Ethernet test fixture kit	1
N5396A	Gigabit Ethernet jitter test cable (for 1000BASE-T jitter test)	1
113XA or 116XA or N2750A	InfiniiMax active differential probe	1
E2678A (used with 113XA or 116XA) or N4822A (used with N2750A)	InfiniiMax socketed differential probe head	1
33612A	80-MHz arbitrary waveform generator (for disturbing signal)	1
E5071C	Vector Network Analyzer that can measure in the 10-100 MHz range.	1

Supported network analyzers: E5080A, E5071C, 8752x/53x, 4395x/96x, E5070x/71x, E5061x/62x, E5063A, N5230A.

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