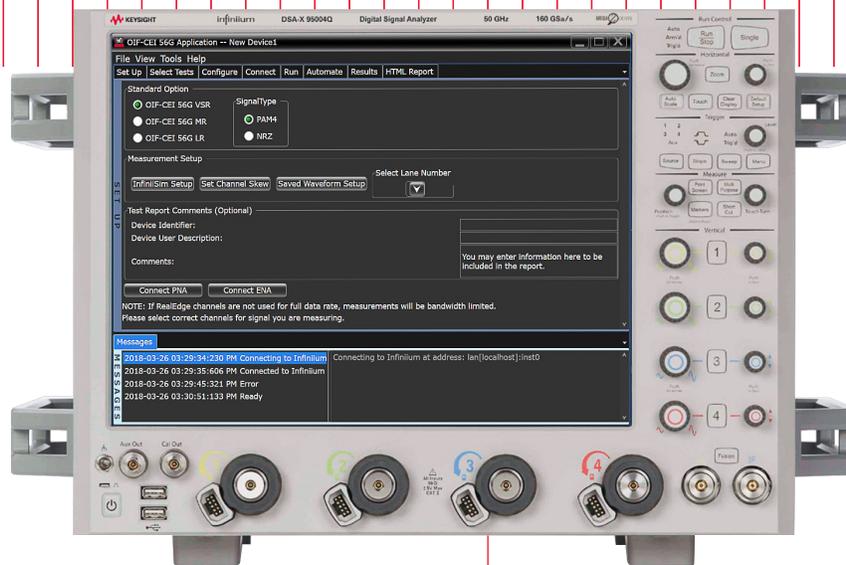


Keysight Technologies

N6473A OIF-CEI 4.0 Compliance Application

For Infiniium Z-Series Oscilloscopes

Data Sheet



Characterize electrical pulse amplitude modulated (PAM) signals quickly and accurately according to OIF-CEI 4.0 specification.



Introduction

More and more industry and standards bodies have adopted pulse amplitude modulation 4-level (PAM4) to increase throughput within a given bandwidth compared to Non-Return-to-Zero (NRZ) technology.

Working groups within the Optical Internetworking Forum - Common Electrical Interface (OIF-CEI 4.0) is one such group that has adapted PAM4 technology.

Transform complexity into simplicity

The Keysight Technologies, Inc. N6473A OIF-CEI 4.0 compliance application for Infiniium real-time oscilloscopes saves you time and money by automating the task of performing PAM4 and NRZ compliance measurements.

The N6473A OIF-CEI 4.0 compliance application for Infiniium real-time oscilloscopes is an easy-to-use oscilloscope application that:

- Saves time in understanding details of standards
- Reduces the time it takes to characterize your PAM4 and NRZ design from hours to minutes
- Helps to debug your device using custom configurations
- Allows you to quickly generate early HTML reports summarizing your device characteristics

Debug and Verify Your Designs Quickly and Easily

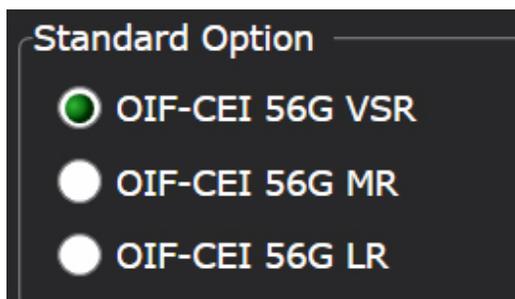
Select your measurement tools

Choose from a wide array of high performance real-time oscilloscopes supporting up to 63 GHz and 160 GSa/s with the lowest noise floor in the industry. The N6473A OIF-CEI 4.0 compliance application can be configured to measure the S-parameters of your device under test as well as control vector network analyzers (VNA) to measure return loss.



Select the desired test suite

The N6473A OIF-CEI 4.0 compliance application covers PAM4 and NRZ transmitter measurements outlined in OIF-CEI4.0 specification. The tests are sorted conveniently by clause. Click on the desired test group, and the appropriate tests are offered in Select Tests (factory-installed options shown).

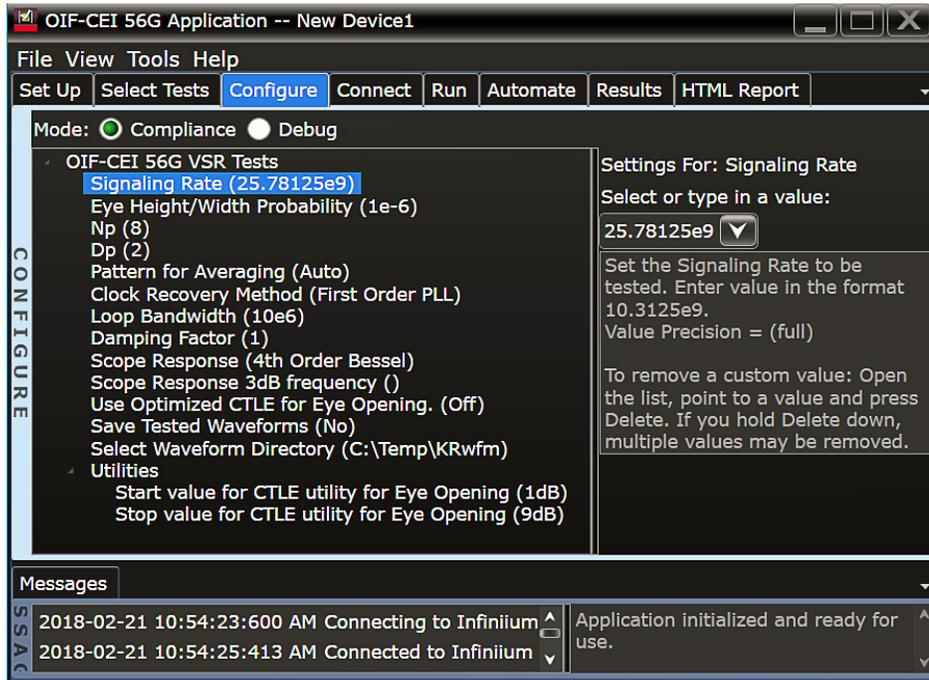


N6473A-1FP performs PAM4 and NRZ transmitter tests outlined in:

- OIF-CEI-56G-VSR-PAM4 (Very Short Reach interface)
- OIF-CEI-56G-MR-PAM4 (Medium Reach interface)
- OIF-CEI-56G-LR-PAM4 (Long Reach interface)

Configure your measurements

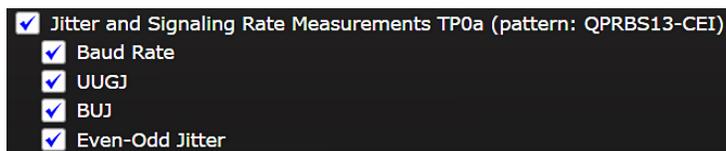
Customize parameters that are specific to your setup, such as signaling rate and attenuation. Use default values or enter your own settings including number of waveforms taken, type of pattern, and pattern symbol length. Choose Normal mode to test within limits, or choose Debug mode to test to your custom limits and adjust other test parameters.



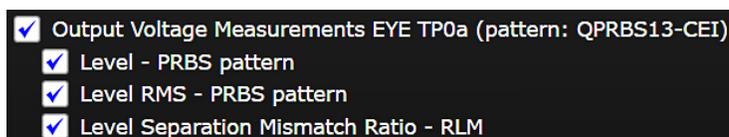
Choose your tests

The N6473A OIF-CEI 4.0 compliance application provides comprehensive coverage of all PAM4 and NRZ tests that are specific to the clause you are testing. You may click on all available tests, a group of tests, or select individual tests to run. The full test name appears in the test list and is also shown in the test results and reports. A description of the test and reference to the Standard/IA is shown for each test.

Jitter and signaling rate measurements



Eye output voltage measurements



Output waveform measurements

- Output Waveform Measurements TP0a (pattern: QPRBS13-CEI)
 - Steady-State Voltage Vf
 - Linear Fit Pulse Peak
 - Signal-to-noise-and-distortion ratio

Transition time measurements

- Transition Time Measurements TP0a (pattern: QPRBS13-CEI)
 - Transition Time - Rise Time (20%-80%)
 - Transition Time - Fall Time (20%-80%)

Main voltage measurements

- Main Voltage Measurements TP0a (pattern: QPRBS13-CEI)
 - DC Common Mode Voltage
 - Common Mode Noise, RMS
 - Differential Voltage, pk-pk

Automated return loss measurements

When used in conjunction with an ENA or PNA vector network analyzer the N6473A OIF-CEI 4.0 compliance application performs Differential and Common mode return loss measurements.

- Return Loss PNA/ENA Measurements
 - Differential Output Return Loss
 - Common-mode Output Return Loss

Guided connection diagrams for easy setup

Simply follow the steps to connect and configure your device under test and click Run Tests. The N6473A OIF-CEI 4.0 compliance application automatically configures and controls your supported Infiniium real-time oscilloscope.

CONNECT

Please pay attention to the scope connection

- This test is testing with Tx **Enabled**. Make sure Tx is enabled.
- Set device to a **PRBS13Q pattern**.
- Connect the scope to the **DUT Signals** as follows:

Channel 1:
Ve+: DUT+
Ve-: GND

Channel 3:
Ve+: DUT-
Ve-: GND

TP1

Transmitter Under Test

DUT+

DUT-

Connection Completed **Run Tests** Suppress All Connection Prompts

RUN

Run Pause

Sequencer

Run tests Once

Event

Detect events

Store Mode

During run, store details for Worst trials (up to 25)

Email

Send email when run is paused or stopped

Summary:

- Run tests once
- Store details for up to 25 worst trials (margin)

Messages

2018-02-26 04:04:26 PM Connected to Infiniium Application initialized and

More Features Streamline Development

Generate reports

Your team members and your customers are interested in the performance of your device. Share a test results report with them that shows the test conditions, summary of pass/fail, summary of all tests, and details for each test. Many include a test-specific screen shot of the measured parameter.

Test Report
Overall Result: **FAIL**

Test Configuration Details

Measurement Option	Device Description
2002A1x and 4002A1x	
Signal Type	PAM4
Channel Pair	Real Edge
Lane Number	Lane0
User Comments	You may enter information here to be included in the report.

Test Session Details

Infiniium SW Version	6.20.527.0
Infiniium Model Number	000202A4A
Infiniium Serial Number	No Serial
Application SW Version	0.99.9018.0
Debug Mode Used	No
Compliance Limits	PAM-4 200G/40 400G/40 Test Limit (official)
Last Test Date	2018-02-28 13:36 UTC -07:00

Summary of Results

Test Statistics

Failed	5
Passed	5
Total	11

Margin Thresholds

Warning	< 5%
Error	< 0%

Pass/Fail/Total Test Name Actual Value Margin Pass Limits

Pass	Fail	Total	Test Name	Actual Value	Margin	Pass Limits
✓	0	1	Spreading Rate	26.55248472 GHz @ 49.9%	27.8%	26.559843750 GHz <= VALUE <= 26.565156250 GHz
✓	0	1	JRS	16.6 mUI	27.8%	VALUE <= 23.0 mUI
✗	1	1	J4	171.2 mUI	36.1%	VALUE <= 118.0 mUI
✓	0	1	Even-odd jitter	800 ps	99.8%	VALUE <= 18.0 mUI
✓	0	1	Level - PRBS pattern	202.26 mV	Information Only	
✓	0	1	Level RMS - PRBS pattern	0.0000 V	Information Only	
✗	1	1	Level Separation Mismatch Ratio - RLM	947.27 m	33.3%	VALUE <= 950.00 m
✓	0	1	Steady-State Voltage V1	400 mV	40.0%	400 mV <= VALUE <= 600 mV
✓	0	1	Linear Fit Pulse Peak	403 mV	403.0%	VALUE <= LinearFit V
✓	0	1	Signal-to-noise-and-distortion ratio	32.891 dB	34.5%	VALUE <= 31.500 dB
✗	1	1	Transmitter Output residual ratio SNRIS	34.278 dB	35.5%	VALUE <= 34.800 dB

Control your device or other equipment

The Automation tab enables you to enter commands to control external devices or equipment, and to further sequence your tests or control timing.

File View Tools Help

Task Flow: Set Up | Select Tests | Configure | Connect | Run Tests

Execute commands from: Script Files Start Settings...

Commands: Create Automation Commands

Save As...

Create: Single Command Entire Script

1. Select application tab or menu and desired action:

Set Up | Select Tests | Configure | Connect | Run Tests | File Menu

Click Radio Button Select Existing Value from Combo Box
 Click Check Box Enter New Value In Combo Box (if accepts user text)
 Type in Text Box Connect App to External Instrument

2. Use command(s):

SetConfig VARIABLE "VALUE"

To Do:
 Replace VARIABLE with actual variable name.
 Replace VALUE with desired value.

Note:
 To discover actual variable names and allowed values for this application:
 View user interface hints:
 (Menu) View > Preferences > Remote tab : Remote Options : Show Hints (As).
 Right-click the Radio Button on the Set Up tab.
 Information is displayed.
 - or -
 View the remote programming help file:
 (Menu) Help > Remote Interface
 (C:\Program Files (x86)\Keysight\Infiniium\Apps\FAM-4 Test\help\)

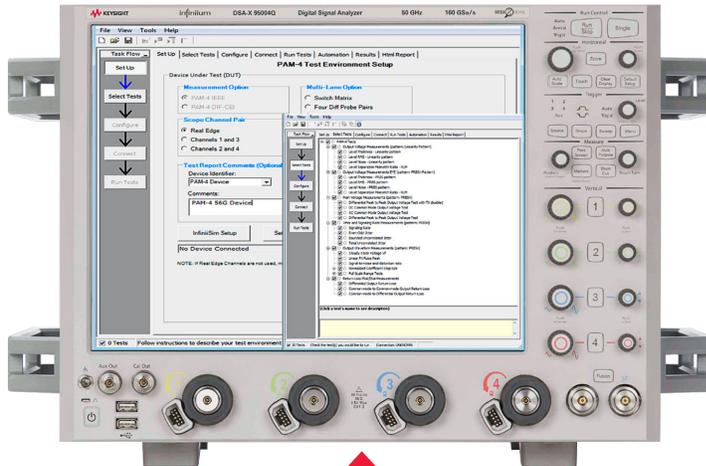
Example:
 SetConfig Pattern "1100110"

Include Instructions As Comments (lines starting with #)

Response: Copy To Clipboard Append To Script More Info Cancel

Flexible licensing and VNA control for return loss measurements

The N6473A OIF-CEI 4.0 compliance application can be licensed to enable a single dedicated scope for you to use in your lab, or you can purchase a server-based license, which allows you to check out a license that can be used on any supported scope you have available to you. In addition, for return loss measurements, the N6473A OIF-CEI 4.0 compliance application can control an ENA/PNA vector network analyzer to perform measurements automatically.



Oscilloscope compatibility

Oscilloscopes	Software Revision
Keysight Infiniium Z-Series	6.2 or higher

Ordering instructions

The N6473A OIF-CEI 4.0 compliance application is available as an option when you order a Keysight Z-Series oscilloscope. It is also available as a standalone license that is assigned by the user to a single Infiniium oscilloscope, or may be ordered as a transportable license (-1TP) that can be moved by the user from one instrument (or PC) to another. To purchase the N6473A OIF-CEI 4.0 compliance application with a new Infiniium oscilloscope, please order the option indicated in the following table.

License options: OIF-CEI 4.0 compliance application

License Type			Infiniium Z-Series	Infiniium Offline
N6473A compliance application	Fixed	Factory-installed	N6473A-1FP	
		User-installed	N6473A-1FP	
	Floating	Transportable	N6473A-1TP	N6473A-1TP
		Server-based	N5435A-131	

Required software options

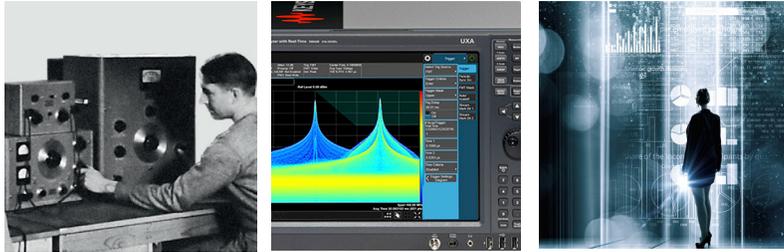
The N6473A requires that the E2688A serial data analysis package, N8823B EZJIT complete and the N8827A PAM4 analysis software also be licensed on the platform.

If users wish to perform optional features such as equalization and de-embeddeing the N5461B Infiniium Serial Data Equalization and N5465B InfiniiSim Waveform Transformation Toolset must also be licensed to the platform.

If you are using the N8900A Infiniium Offline software with the N6473A, then N8900-006 and N8900-002 must also be licensed in addition to the appropriate N6473A software option indicated in the above table.

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