

Keysight Technologies

N6472A IEEE802.3bs/cd Compliance Application

For Infiniium Z-Series Oscilloscopes

Data Sheet



Characterize electrical pulse amplitude modulated (PAM) and Non-Return-to-Zero (NRZ) signals quickly and accurately according to IEEE802.3bs and IEEE802.3cd 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 IEEE802.3bs and IEEE802.3cd are one such group that has adapted PAM4 technology.

Transform complexity into simplicity

The Keysight N6472A IEEE802.3bs/cd compliance application for Infiniium real-time oscilloscopes saves you time and money by automating the task of performing PAM4 and NRZ compliance measurements.

The N6472A IEEE802.3bs/cd 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 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

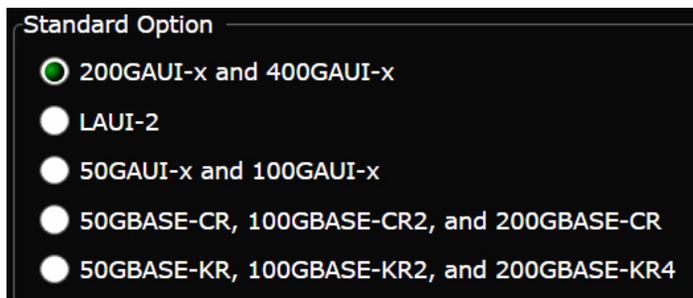
Select your measurement tools

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 N6472A IEEE802.3bs/cd 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 N6472A IEEE802.3bs/cd compliance application covers PAM4 and NRZ transmitter measurements outlined in IEEE802.3bs and IEEE802.3cd specifications. 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).

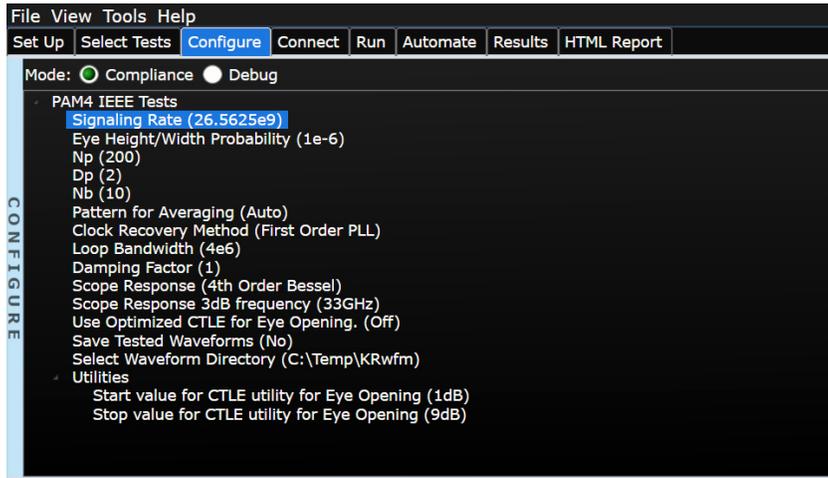


N6472A-1FP performs PAM4 and NRZ transmitter tests outlined in:

- IEEE P802.3bs, Annex 120D, CDAUI-8 chip-to-chip
- IEEE P802.3bs, Annex 120E, CDAUI-8 chip-to-module
- IEEE P802.3cd, Clause 135B.3.1 LAUI-2 chip-to chip
- IEEE P802.3cd, Clause 135D.3.1 50GAUI-x and 100GAUI-x chip-to chip
- IEEE P802.3cd, Clause 136A.2 50GAUI-CR and 100GAUI-CR2 and 200GBASE-CR4 chip-to chip
- IEEE P802.3cd, Clause 137.9.2 50GAUI-KR and 100GAUI-KR2 and 200GBASE-KR4 chip-to chip

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.



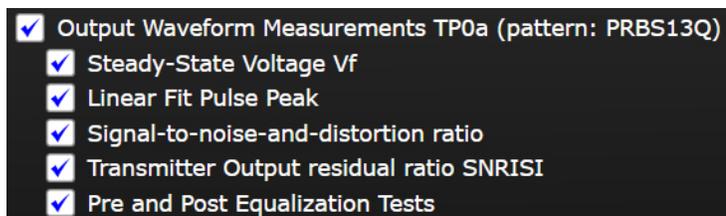
Choose your tests

The N6472A IEEE802.3bs/cd compliance application provides comprehensive coverage of all PAM4 and NRZ 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.

Eye voltage measurements



Output waveform measurements



Jitter and signaling rate measurements

- Jitter and Signaling Rate Measurements TP0a (pattern: PRBS13Q)
 - Signaling Rate
 - JRMS
 - J4
 - Even-Odd Jitter

Main voltage measurements

- Main Voltage Measurements TP0a (pattern: PRBS13Q)
 - Differential Peak to Peak Output Voltage Test with TX disabled
 - DC Common Mode Output Voltage Test
 - AC Common Mode Output Voltage Test
 - Differential Peak to Peak Output Voltage Test

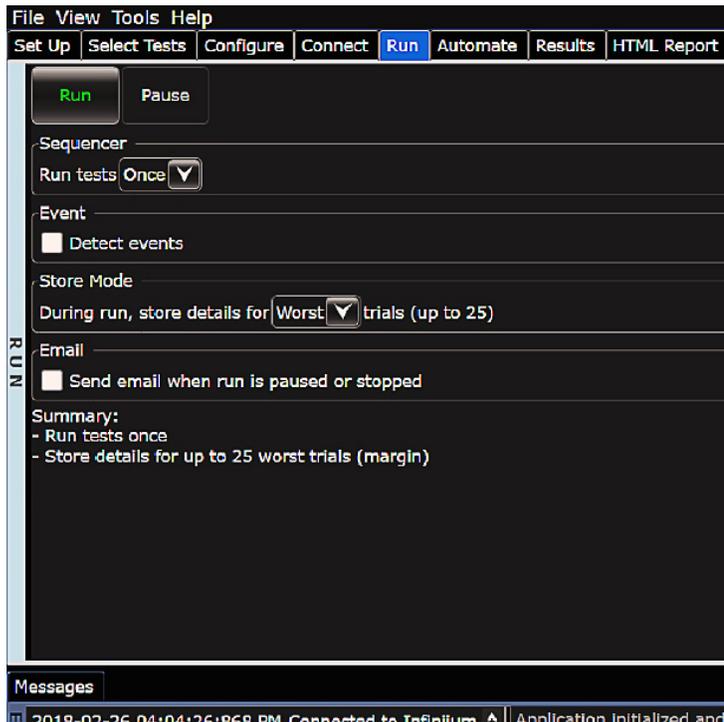
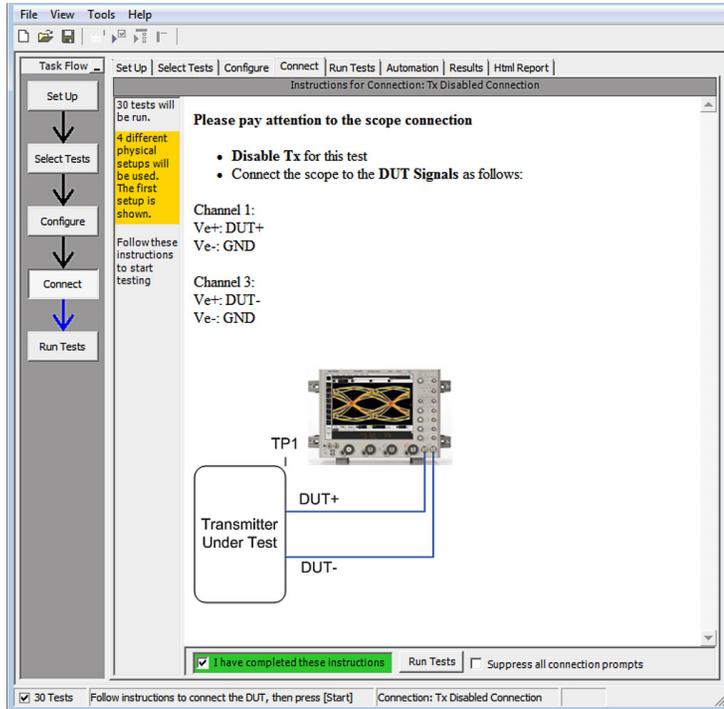
Automated return loss measurements

When used in conjunction with an ENA or PNA vector network analyzer, the N6472A IEEE802.3bs/cd 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 N6472A IEEE802.3bs/cd compliance application automatically configures and controls your supported Infiniium real-time oscilloscope.



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
200CAL1x and 400CAL1x	
Signal Type	PAM4
Channel Pair	Real Edge
Lane Number	Lane0
Block 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	00020344A
Infiniium Serial Number	No Serial
Application SW Version	0.99.9918.0
Debug Mode Used	No
Compliance Limits	PAM-4 200CAL1 400CAL1 Test Limit (official)
Last Test Date	2018-02-28 13:36:16 UTC -37:00

Summary of Results

Test Statistics

Failed	5
Passed	5
Total	11

Margin Thresholds

Warning	< 5%
Failure	< 0%

Pass/Fail	# Tests	Test Name	Actual Value	Margin	Peak Limits
✓	0	1	Spreading Rate	26.562484472 0Bd 49.9%	26.559843750 0Bd << VALUE >> 26.565156250 0Bd
✓	0	1	JRS	16.6 mA	27.8% VALUE >> 23.0 mA
✗	1	1	J4	171.2 mA	36.1% VALUE >> 118.0 mA
✓	0	1	Even-odd jitter	800 ps	99.8% VALUE >> 18.0 m
✓	0	1	Level - PRBS pattern	302.26 mV	Information Only
✓	0	1	Level RMS - PRBS pattern	0.90000 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 rate 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

Set Up Select Tests Configure Connect Run Automate Results HTML Report

Execute commands from: Script Files Start Settings...

Automate

Commands... Save As...

Create Automation Commands

Create: Single Command Entire Script

Choose menu or application tab and select desired action:

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

Open Project from Default Location Save Project to Default Location

Open Project from Another Location Save Project to Another Location

Start New Project

Automation command(s):

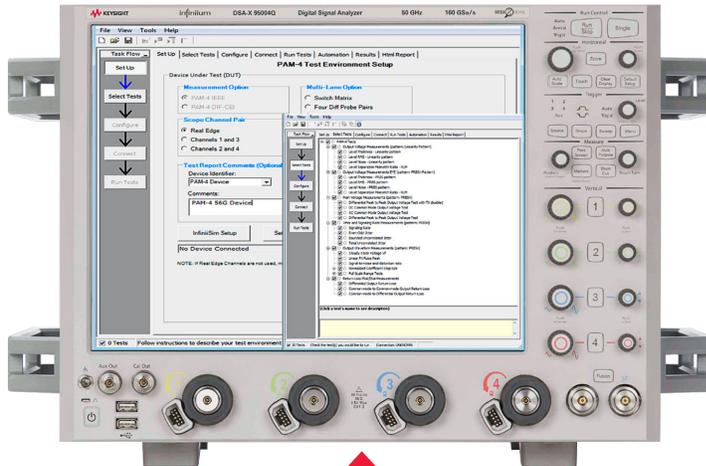
Include instructions as Comments (lines starting with #)

Copy to Clipboard Append to Script More Info Close

Try a command: Command status:

Flexible licensing and VNA control for return loss measurements

The N6472A IEEE802.3bs/cd compliance application can be licensed to enable a single dedicated oscilloscope 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 oscilloscope that is. In addition, for return loss measurements, the N6472A IEEE802.3bs/cd 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 N6472A IEEE802.3bs/cd 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 N6472A IEEE802.3bs/cd compliance application with a new Infiniium oscilloscope, please order the option indicated in the following table.

License options: IEEE802.3bs/cd compliance

License Type			Infiniium Z-Series	Infiniium Offline
N6472A Compliance Application	Fixed	Factory-installed	N6472A-1FP	
		User-installed	N6472A-1FP	
	Floating	Transportable	N6472A-1TP	N6472A-1TP
		Server-based	N5435A-130	

Required software options

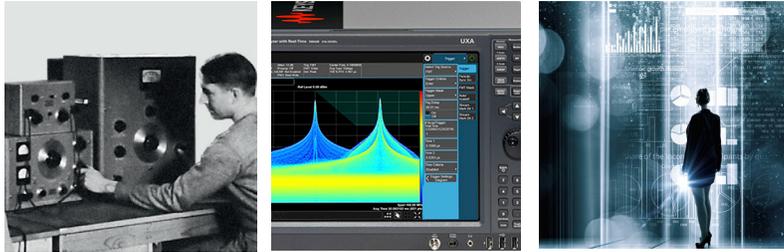
The N6472A requires that the E2688A serial data analysis package, N8823B EZJIT complete and the N8827A PAM4 analysis software also be licensed on the platform.

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 N6472A, then N8900-006 and N8900-002 must also be licensed in addition to the appropriate N6472A software option indicated in the above table.

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Taiwan	0800 047 866
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