



PCI Express® Test QPHY-PCle



Key Features

- Compliant with the Card Electro-mechanical Specification Rev 1.1 and 2.0
- Support for system and add-in card testing
- Integrated SIGtest libraries into the oscilloscope software enables automation of the exact algorithms used for compliance testing
- Connection diagrams display proper setup using the PCI-SIG® Compliance Base Boards and Compliance Load Boards
- Report generation incorporates CEM test assertions for 2.5 Gb/s, 5.0 Gb/s with 3.5 dB of de-emphasis and 5.0 Gb/s with 6.0 dB of de-emphasis
- Simple and easy-to-use automated testing

The LeCroy QPHY-PCle Test Solution provides automated control for LeCroy oscilloscopes for performing the entire transmitter physical layer tests as described by the Card Electro-mechanical specification Rev 1.1 and 2.0.

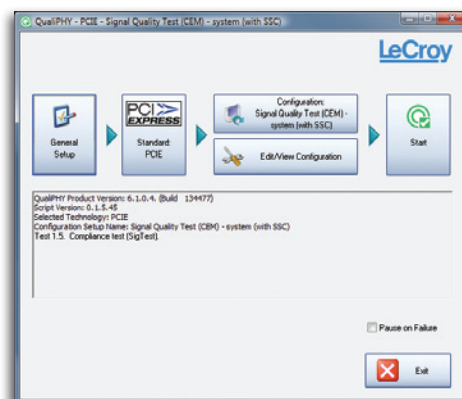
Testing requirements for both system boards and add-in cards are described by the specification. QPHY-PCle has the ability to test compliance in accordance with the specification for both system boards and add-in cards.

By integrating the SIGtest libraries into the oscilloscope software, QPHY-PCle can fully automate all of

the required compliance tests using the exact same algorithms that are described by the specification.

Additionally, QPHY-PCle can run all of the 2.5 GT/s tests, then all of the 5.0 GT/s with 3.5 dB of de-emphasis test, and finally all of the 5.0 GT/s with 6.0 dB of de-emphasis tests. This allows the user to create one test report for all 3 testing phases.

These capabilities make QPHY-PCle an all-inclusive automated test suite that meets the requirements for 2.5 GT/s and 5.0 GT/s PCI Express® transmitter compliance testing.



QPHY-PCle provides a highly automated and easy-to-use solution for PCI Express configurations from 2.5 GT/s and 5.0 GT/s



TOOLS FOR DEBUGGING PCI EXPRESS

Integrated SIGtest Libraries

By integrating the SIGtest libraries into the oscilloscope software, the exact algorithms provided by the PCI-SIG are used for calculating the results. This ensure the same exact answer as running the stand alone SIGtest utility with the added benefit of being able to run this utility from within the oscilloscope software.

Comprehensive and Easy-to-read Test Reports

Measurement results often need to be summarized and tabulated to quickly verify specifications. This information, together with instrument and signal acquisition/test condition setups, results in a fully documented record. QPHY-PCIe streamlines this process by incorporating an automatic HTML report generation engine. The created test reports contain tabulated numerical values for each individual test result, including PASS/FAIL and specification limit columns. Reports can also be saved as PDF, HTML or XML.

Advanced Debug Capability

If a compliance failure is found, LeCroy's SDA II serial data analysis package is available to help find the root cause quickly and easily. SDA II has the ability to perform Eye and Jitter measurements simultaneously and is fully integrated into the oscilloscope application software. In addition, with specialized features such as IsoBER, ISI Plot, Pj Inverse FFT and multiple jitter models, SDA II provides insight into the measured Eye and Jitter parameters making it easier to identify the sources of problems.



QualiPHY Test Report

Overall result: **Pass**

DUT: System
Comment:
Time of session start: 06/11/2010 15:55:22
Operator:
Temperature: 0° C
Standard in use:

Run 1:
Time of run: 2010/06/11 15:55:23
Configuration in use: Signal Quality Test (CEM) - system (with SSC)
Limits in use: PCIe 2.1
Oscilloscope Name: CBUS064-NB Model: SDA813Z1
Oscilloscope Serial #: CBUS064-NB
Computer: CBUS064-NB
Oscilloscope firmware version: 0.6.3.0 (Build 139097)
QualiPHY core version: 6.1.0.5 (Build 136410)
QualiPHY script version: 0.1.5.55

Summary Table

Pass	Run #	Test	Measurement	Current Value	Test Criteria
✓	1	3.2	SG 3.5dB: Mean Unit Interval	199.980 ps	199.940 ps <= x <= 201.060 ps
✓	1	3.2	SG 3.5dB: Min Time Between Crossovers	185.989 ps	x >= 170.000 ps
?	1	3.2	SG 3.5dB: Data Rate	5.000493528 GBIT/S	Informational Only
✓	1	3.2	SG 3.5dB: Max Peak to Peak Jitter	43.913 ps	x <= 74.000 ps
✓	1	3.2	SG 3.5dB: Total Jitter at BER of 10e-12	62.443 ps	x <= 105.000 ps
✓	1	3.2	SG 3.5dB: Deterministic Jitter Delta-Delta	2.075 ps	x <= 57.000 ps
?	1	3.2	SG 3.5dB: Random Jitter (RMS)	4.294 ps	Informational Only
✓	1	3.2	SG 3.5dB: Minimum Transition Eye Voltage	-372.66 mV	-600.00 mV <= x <= -125.00 mV
✓	1	3.2	SG 3.5dB: Maximum Transition Eye Voltage	371.19 mV	125.00 mV <= x <= 600.00 mV
✓	1	3.2	SG 3.5dB: Minimum Non Transition Eye Voltage	-380.46 mV	-600.00 mV <= x <= -125.00 mV
✓	1	3.2	SG 3.5dB: Maximum Non Transition Eye Voltage	371.66 mV	125.00 mV <= x <= 600.00 mV
✓	1	3.2	SG 3.5dB: Minimum Transition Eye Voltage Margin Above Eye	111.18 mV	x > 0.00 mV

Results for c:\Waveforms\PCIe\System\F2_5GT_3.5dB_L15_00000

Sigtest:

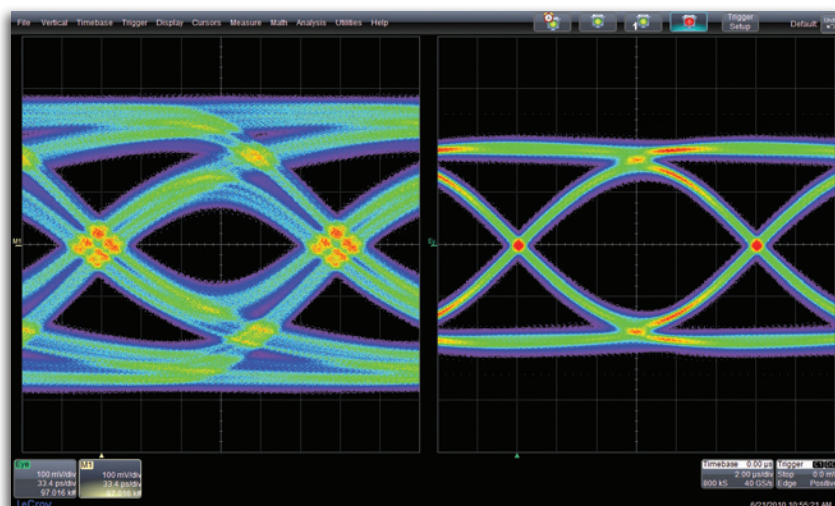
- Overall Sigtest Result: **Pass!**
- Mean Unit Interval (ps): 199.980264
- Min Time Between Crossovers (ps): 185.989237
- Data Rate (Gb/s): 5.000493
- Max Peak to Peak Jitter: 43.912791 ps
- Total Jitter at BER of 10E-12: 62.442925 ps
Total Jitter at BER of 10E-12 Passes Sigtest Limits!
- Deterministic Jitter Delta-Delta: 2.074599 ps
Deterministic Jitter Delta-Delta Passes Sigtest Limits!
- Random Jitter (RMS): 4.293622 ps
Random Jitter (RMS) Passes Sigtest Limits!
- Minimum Transition Eye Voltage: -0.372665 volts
Minimum Transition Eye Voltage Passes Sigtest Limits!
- Maximum Transition Eye Voltage: 0.371192 volts
Maximum Transition Eye Voltage Passes Sigtest Limits!
- Minimum Non Transition Eye Voltage: -0.380462 volts
Minimum Non Transition Eye Voltage Passes Sigtest Limits!
- Maximum Non Transition Eye Voltage: 0.371858 volts
Maximum Non Transition Eye Voltage Passes Sigtest Limits!
- Minimum Transition Eye Voltage Margin Above Eye: 0.111183 volts
Minimum Transition Eye Voltage Margin Above Eye Passes Sigtest Limits!
- Minimum Transition Eye Voltage Margin Below Eye: -0.112308 volts
Minimum Transition Eye Voltage Margin Below Eye Passes Sigtest Limits!
- Minimum Non Transition Eye Voltage Margin Above Eye: 0.127322 volts
Minimum Non Transition Eye Voltage Margin Above Eye Passes Sigtest Limits!

By integrating the SIGtest libraries into the oscilloscope the oscilloscope application can measure the exact same results as the stand alone SIGtest application. (QPHY-PCIe report top, SIGtest report bottom)

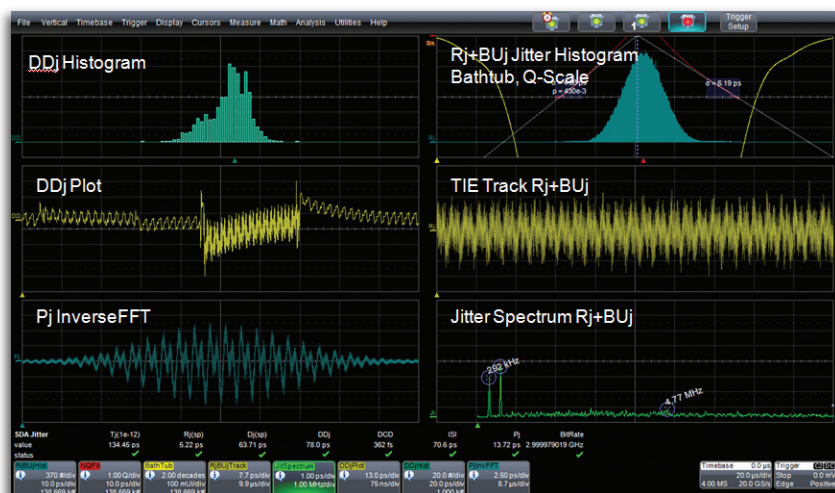
The Eye Doctor™ II analysis software allows the user to view their signal after Continuous Time Linear Equalization (CTLE), Feed Forward Equalization (FFE) and/or Decision Feedback Equalization (DFE). This gives the user the ability to see how an actual receiver that utilizes equalization would interpret their signal.

LeCroy's SDA II analysis software contains integrated jitter and timing analysis for clock and data signals. It allows analysis of data up to the memory limit of the oscilloscope and using X-Stream™ II technology, SDA II can display eye diagrams and jitter decomposition results up to 50 times faster than other solutions. Additionally, the specific PLL for PCI Express is selectable from a list of pre-configured PLLs. Lastly, SDA II contains 2 separate methods for jitter decomposition; the industry standard spectral method, and the NQ-Scale methods. NQ-Scale is critical for properly distinguishing between random and deterministic jitter in systems where cross-talk is present.

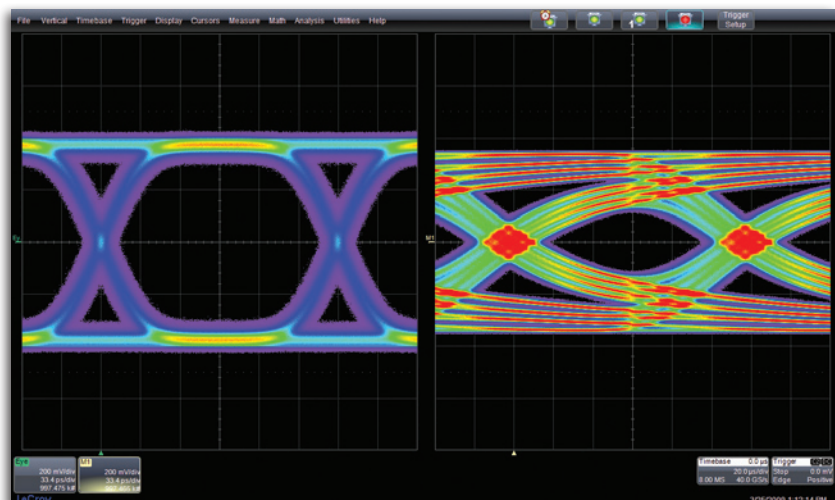
Additionally, the Eye Doctor II analysis software also enables channel emulation. For PCIe testing, a design engineer will perform their serial data measurement at the output of the transmitter. However, analysis at the far side of a reference serial data channel is very useful for debugging problems. To accomplish this they could either use a physical channel to make their measurement after the channel or they can use channel emulation to see what their serial data signal would look like if it had been transmitted through the channel.



Equalization Emulation



Specialize SDA II features for Eye Diagram and Jitter Analysis



Channel emulation is a powerful tool for debugging compliance test failures.

SPECIFICATIONS AND ORDERING INFORMATION

QPHY-PCIe Test Coverage Specifications

2.5 GT/s Signal Quality Test

Mean Unit Interval

Max Unit Interval

Min Unit Interval

Min Time Between Crossovers

Data Rate

Per Edge RMS Jitter

Mean Median to Peak Jitter

Max Median to Peak Jitter

Min Median to Peak Jitter

Mean Peak to Peak Jitter

Max Peak to Peak Jitter

Min Peak to Peak Jitter

Minimum Transition (Non Transition) Eye Voltage

Maximum Transition (Non Transition) Eye Voltage

Minimum Transition (Non Transition) Eye Voltage Margin Above Eye

Maximum Transition (Non Transition) Eye Voltage Margin Below Eye

Mask Violations Transition (Non Transition) Eye

5.0 GT/s Signal Quality Test

Mean Unit Interval

Min Time Between Crossovers

Data Rate

Max Peak to Peak Jitter

Total Jitter at BER of 10e-12

Deterministic Jitter Delta-Delta

Random Jitter (RMS)

Minimum Transition (Non Transition) Eye Voltage

Maximum Transition (Non Transition) Eye Voltage

Minimum Transition (Non Transition) Eye Voltage Margin Above Eye

Minimum Transition (Non Transition) Eye Voltage Margin Below Eye

Mask Violations Transition (Non Transition) Eye

Ordering Information

Product Description

QualiPHY Enabled PCIe Software Option
(for Gen 1 and Gen 2 Testing)

Product Code

QPHY-PCIe

Recommended Oscilloscopes (for 5.0 GT/s Testing)

13–16 GHz, 40 GS/s, 4 Ch, 20 Mpts/Ch *WaveMaster 813Zi, 816Zi

Serial Data Analyzer with 15.3" WXGA

Color Display. 50 Ω and 1 M Ω Input

20, 25, 30 GHz, 80 GS/s, 2 Ch, 40 Mpts/Ch *WaveMaster 820Zi

Serial Data Analyzer with 15.3" WXGA

Color Display. 50 Ω and 1 M Ω Input

(16 GHz, 40 GS/s, 4 Ch, 20 Mpts/Ch)

825Zi, 830Zi

*SDA and DDA 8 Zi oscilloscopes are also supported.

Recommended Oscilloscope (for 2.5 GT/s Testing)

6 GHz, 20 GS/s, 4 Ch, 10 Mpts/Ch

*WavePro 760Zi

(40 GS/s and 20 Mpts/Ch in interleaved mode)

with 50 Ω and 1 M Ω Input

*SDA and DDA 7 Zi oscilloscopes are also supported

Required Equipment Not Available from LeCroy

PCI-SIG Compliance Base Board CBB2
(For 5.0 GT/s Add-In Card Testing Only)

PCI-SIG Compliance Load Board x4/x8CLB2
(For 5.0 GT/s x4 or x8 Lane System Testing Only)

PCI-SIG Compliance Load Board x1/x16CLB2
(For 5.0 GT/s x1 or x16 Lane System Testing Only)

PCI-SIG Compliance Base Board CBB1
(For 2.5 GT/s Add-In Card Testing Only)

PCI-SIG Compliance Load Board CLB1
(For 2.5 GT/s System Testing Only)

SMA or SMP Terminators for each unused SMA Connector
on CBB or CLB

Customer Service

LeCroy oscilloscopes and probes are designed, built, and tested to ensure high reliability. In the unlikely event you experience difficulties, our digital oscilloscopes are fully warranted for three years and our probes are warranted for one year.

This warranty includes:

- No charge for return shipping
- Long-term 7-year support
- Upgrade to latest software at no charge



1-800-5-LeCroy
www.lecroy.com

Local sales offices are located throughout the world.
Visit our website to find the most convenient location.