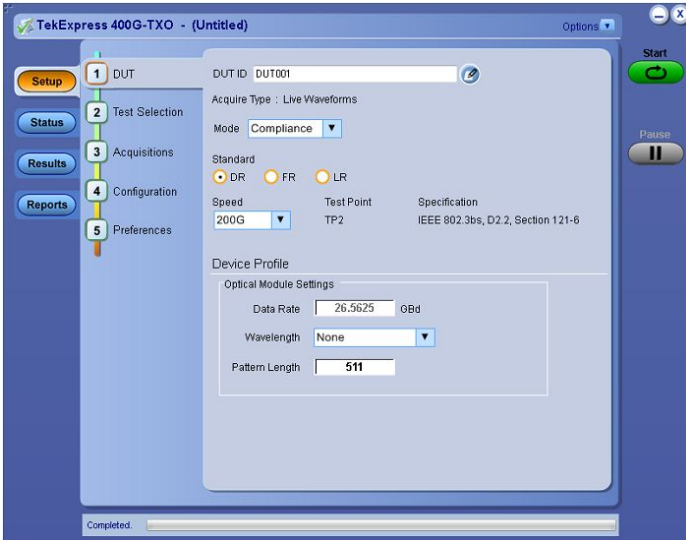
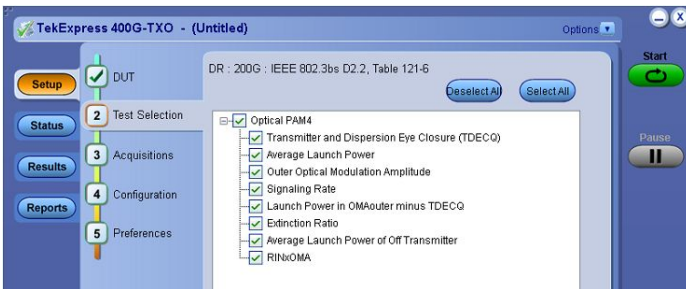


50GBASE-FR/LR, 100GBASE-DR, 200GBASE-DR4/LR4/FR4 & 400GBASE-LR8/FR8/DR4 Optical Conformance and Characterization Solution for Sampling Scopes



TekExpress® 400G-TXO solution



TekExpress® 400G-TXO measurement list

IEEE 802.3bs (200GBASE-DR4/LR4/FR4 and 400GBASE-DR4/LR8/FR8) and IEEE 802.3cd (50GBASE-FR/LR and 100GBASE-DR) Optical Equivalent Time Transmitter Conformance and Characterization Solution

The Tektronix time instrument based characterization automation system provides turnkey testing and debugging for the industries most common optical interfaces. As the designers need to perform the validation of 50GBASE-FR/LR, 100GBASE-DR, 200GBASE-DR4/LR4/FR4 and 400GBASE-LR8/FR8/DR4 standards, these tools are brought together in a single 400G-TXO (Optical Transmitter Validation) package.

400G-TXO application package is an automated conformance and characterization solution for IEEE 802.3bs and IEEE 802.3cd specifications. This package operates on DSA8300 sampling instrument with 80C10C optical module. The 80S400G-TXO offers a selection of 50G, 100G, 200G, and 400G compliance tests according to IEEE 802.3bs and IEEE 802.3cd LR, DR and FR standards. It automatically populates the tests required and data rates for the selected standard. The unique lower noise levels of the DSA8300 sampling architecture in combination with the 80C10C optical sampling module offers a 56 GBaud PAM-4 solution, capable of meeting the 56G ORR standard requirement.

Key features

- 400G-TXO offers a streamlined and fully automated optical compliance and debug tool for TDECQ.
- 400G-TXO offers support for IEEE 802.3bs/cd LR, DR and FR standards.
- Extends 80SJNB for analysis and debug of 50G, 100G, 200G, and 400GBase FR8/LR8/DR4 standards.

Applications

- Optical transmitter measurements for IEEE 802.3bs and IEEE 802.3cd specifications.
- Validation of 50GBASE-FR/LR, 100GBASE-DR, 200GBASE-DR4/LR4/FR4 and 400GBASE-LR8/FR8/DR4 standards.

Standards overview

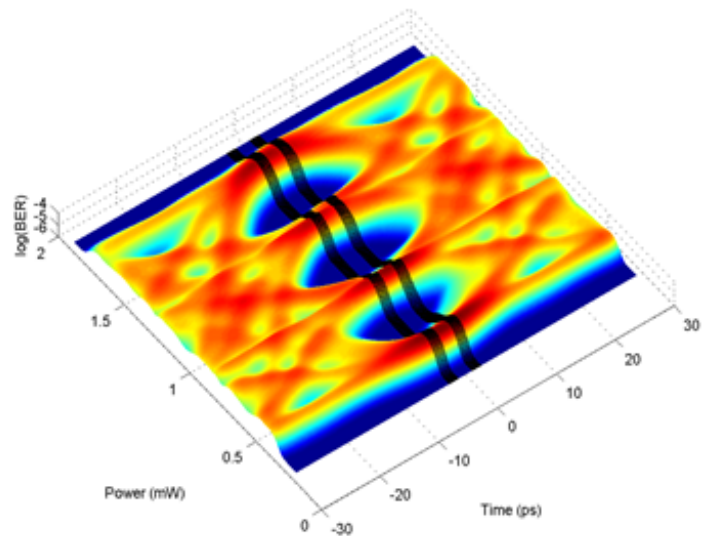
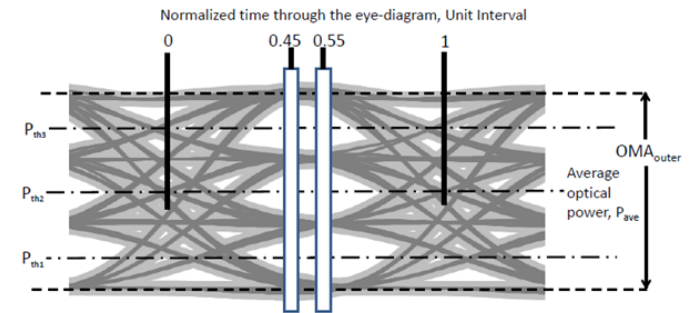
Data Rate	Standards
50G (26.5625 GBd)	50GBASE-FR 50GBASE-LR
100G (53.125 GBd)	100GBASE-DR
200G (26.5625 GBd)	200GBASE-DR4 200GBASE-FR4 200GBASE-LR4
400G (26.5625 GBd)	400GBASE-FR8 400GBASE-LR8
400G (53.125 GBd)	400GBASE-DR4

IEEE 802.3bs and IEEE 802.3cd Optical Transmitter fully automated measurements

Mapping of TP2 measurements to specification

Test Point	Supported measurements	Specification reference
TP2	Transmitter and Dispersion Eye Closure (TDECQ)	IEEE 802.3bs or IEE802.3cd
	Average Launch Power	IEEE 802.3bs or IEE802.3cd
	Outer Optical Modulation Amplitude	IEEE 802.3bs or IEE802.3cd
	Signaling Rate	IEEE 802.3bs or IEE802.3cd
	Launch Power in OMA outer minus TDECQ	IEEE 802.3bs or IEE802.3cd
	Extinction Ratio	IEEE 802.3bs or IEE802.3cd
	Average Launch Power of Off Transmitter	IEEE 802.3bs or IEE802.3cd
	RINxOMA	IEEE 802.3bs or IEE802.3cd

Test Point	Supported optical transmitter specifications	Specification reference
TP2	50GBASE-FR/LR	IEEE 802.3cd, section D1.0, table 139-6
	100GBASE-DR	IEEE 802.3cd, section D1.0, table 140-6
	200GBASE-DR4	IEEE 802.3bs, section D2.2, table 121-6
	200GBASE-LR4/FR4	IEEE 802.3bs, section D2.2, table 122-9
	400GBASE-LR8/FR8	IEEE 802.3bs, section D2.2, table 122-10
	400GBASE-DR4	IEEE 802.3bs, section D2.2, table 124-6



Measurement selection

The setup and test execution are simple with the 400G-TXO software. The oscilloscope acquisition and analysis are controlled through the 400G-TXO automation solution. The graphical User Interface (GUI) provides an intuitive and easily repeatable work-flow for setup and testing.

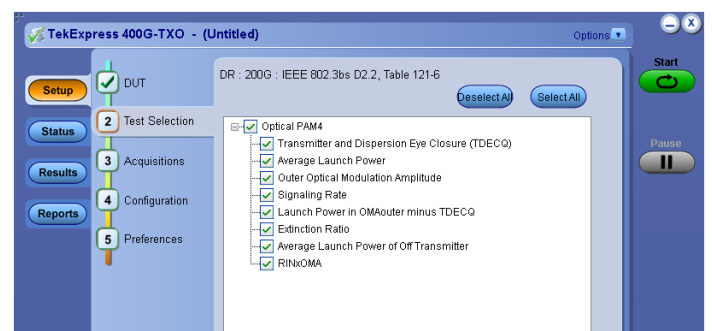
TEDECQ measurement

TDECQ is the penalty given by the ratio of the noise a receiver could add to an ideal transmitter and ideal channel to get a certain symbol error rate (SER) to the noise a receiver could add to the device under test (DUT) and worst case channel to get same SER.

TDECQ is measured on equalized PAM4 signal. Average optical power of the equalized eye diagram is determined and crossing points (0 UI and 1 UI) are determined by the average of eye diagram crossing times at P_{ave} . Two vertical histograms are measured through the eye diagram, centered at 0.45 UI and 0.55 UI. Each of the histogram windows spans all of the modulation levels of the eye diagram.

Default histogram window width is 0.04 UI and it is configurable. Each histogram window has outer height boundaries which are set beyond the extremes of the eye diagram.

Instrument noise and equalizer gain are compensated while computing TDECQ.

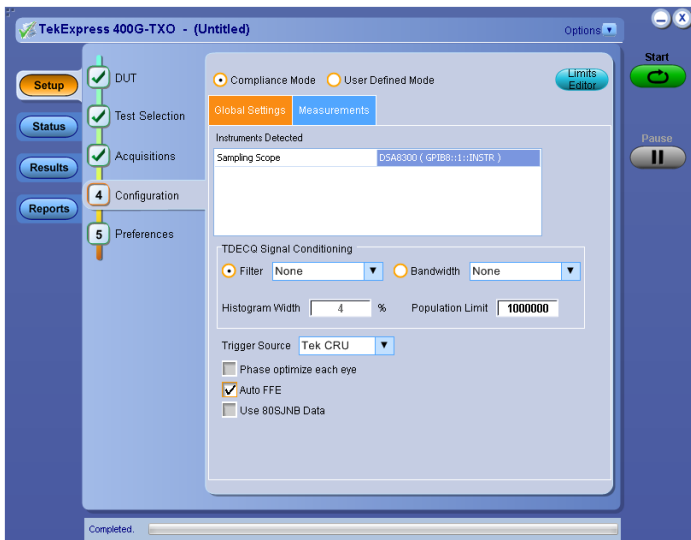


TekExpress® 400G-TXO measurement list

TekExpress 400G-TXO offers flexible control over the test configuration such as analysis windows and other parameters.

Test selection

Users can select the standard and parameters to be tested. This supports characterization measurement in compliance with the standard and reduces the test time and complexity.



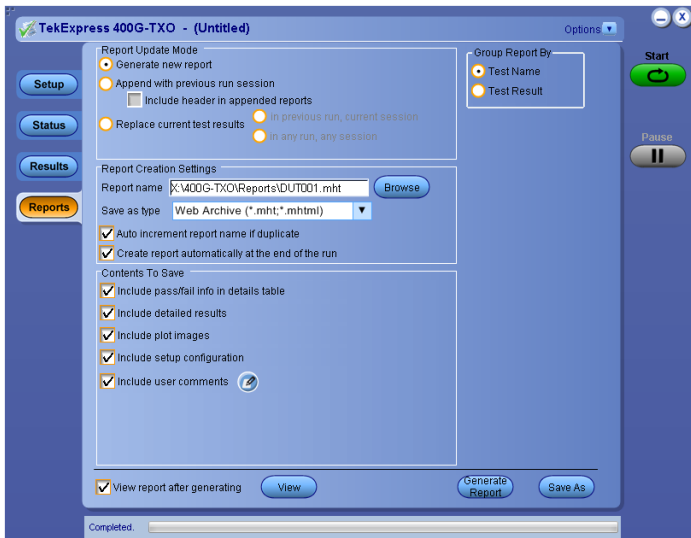
Tektronix TekExpress 400G-TXO Test Report DR (200G)

Setup Information			
DUT ID	DUT001	Scope Information	DSA8300
Date/Time	2017-03-27 20:36:11	Scope F/W Version	6.5.1.0a
TekExpress 400G-TXO Version	0.0.0.66	80S_INB Version	4.2.1.0
TekExpress Framework Version	4.2.1.1	Optical Module Model Number	CHI 80C10C-F1
Specification Version	IEEE 802.3bs, D2.2, Section 121-6	Optical Module Serial Number	CHI QD00005
Execution Mode	Live	Data Rate	25.78125 GbD
Compliance Mode	False	Pattern Length	1022
Overall Test Result	Pass	Vertical Noise Calibration Status	FAIL
Overall Execution Time	0:16:38		
DUT Comment	DR-200G		

Test Name Summary Table	
Transmitter and Dispersion Eye Closure (TDECQ)	Pass
Average Launch Power	Pass
Outer Optical Modulation Amplitude	Pass
Signaling Rate	Pass
Launch Power in OMAouter minus TDECQ	Pass
Extinction Ratio	Pass
Average Launch Power of Off Transmitter	Pass
RINxOMA	Pass

Transmitter and Dispersion Eye Closure (TDECQ)									
Measurement Details	Iteration	Measured Value	Test Result	Margin	Low Limit	High Limit	Units	Comments	
TDECQ	4	0.92216	Pass	H: 1.5778	N.A	2.5	dB	OMA: 1.06 mW	
Comments		Population: 1000000, Histogram Width: 4							Back to Summary Table

Reports & Measurement Results



Test Name	Details	Pass/Fail	Value	Units	Margin
Transmitter and Dispersion Eye Closure (TDECQ)	TDECQ	Pass	1.72304	dB	H: 0.7770
Average Launch Power	AOP	Pass	-0.66977	dBm	L: 3.9302 H: 3.6698
Outer Optical Modulation Amplitude	OMAOuter	Pass	0.19101	dBm	L: 2.6910 H: 2.6090
Launch Power in OMAouter minus ECQ	OMAminusTDECQ	Pass	-1.53203	dBm	L: 1.9680
Extinction Ratio	ExtinctionRatio	Pass	6.34122	dB	L: 1.8412
RINxOMA	RINxOMA	Pass	-122.19101	dB/Hz	H: -19.8127

Models

IEEE802.3bs and IEEE802.3cd Optical Conformance Test Application Software Solution for DSA8300 Oscilloscope

To order with oscilloscope	Oscilloscope Option DSA8300 order 80S400G-TXO
To upgrade an oscilloscope	Oscilloscope Option DSA8300 DSA83UP 80S400G-TXO

Software options

Option 80S400G-TXO	IEEE 802.3bs (200GBASE-DR4/LR4/FR4 and 400GBASE-DR4/LR8/FR8) and IEEE 802.3cd (50GBASE-FR/LR and 100GBASE-DR) Optical Transmitter Conformance Solution for DSA8300 (requires option ADVTRIG, JNB02, and PAM4)
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Instrument and accessories required

Clock Recovery Unit	CR286A (optional, supported upto 28.6 GBd)
Optical Modules for 200G-DR4/ FR4/LR4 and 400G-FR8/LR8	80C10C, 80C15
Optical Modules for 400G-DR4	80C10C
Optical Power Meter supporting DR4, FR4, LR4 wavelength range	No recommendation
Phase Reference	82A04B with 80X01 extender (optional)

CE Marking Not Applicable.



Tektronix is registered to ISO 9001 and ISO 14001 by SRI Quality System Registrar.



Product(s) complies with IEEE Standard 488.1-1987, RS-232-C, and with Tektronix Standard Codes and Formats.

50GBASE-FR/LR, 100GBASE-DR, 200GBASE-DR4/LR4/FR4 & 400GBASE-LR8/FR8/DR4 Optical Datasheet

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People's Republic of China 400 820 5835
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