

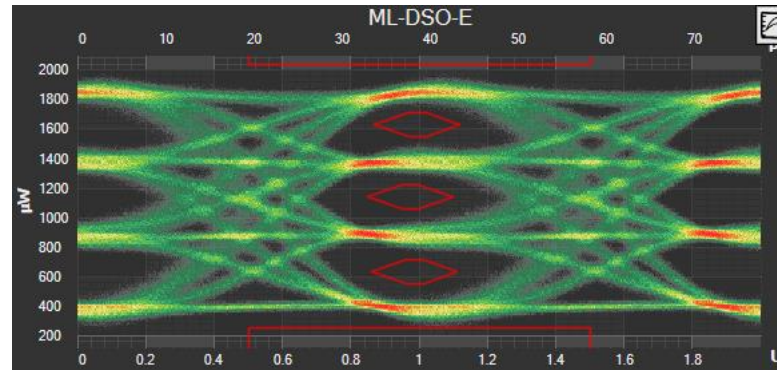


Open Eye MSA Test Solutions

OIDA OSA Webinar

Kees Propstra

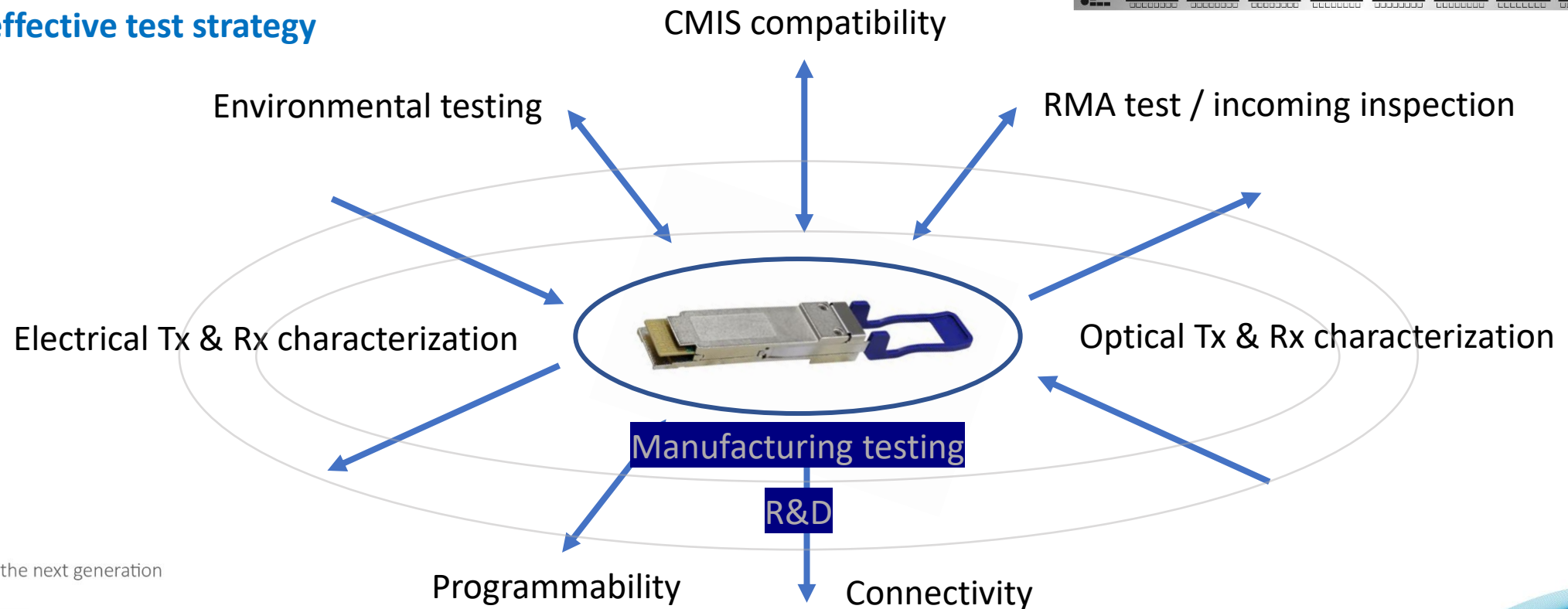
Sept 2020



Test Challenges

Open Eye MSA Test Solutions

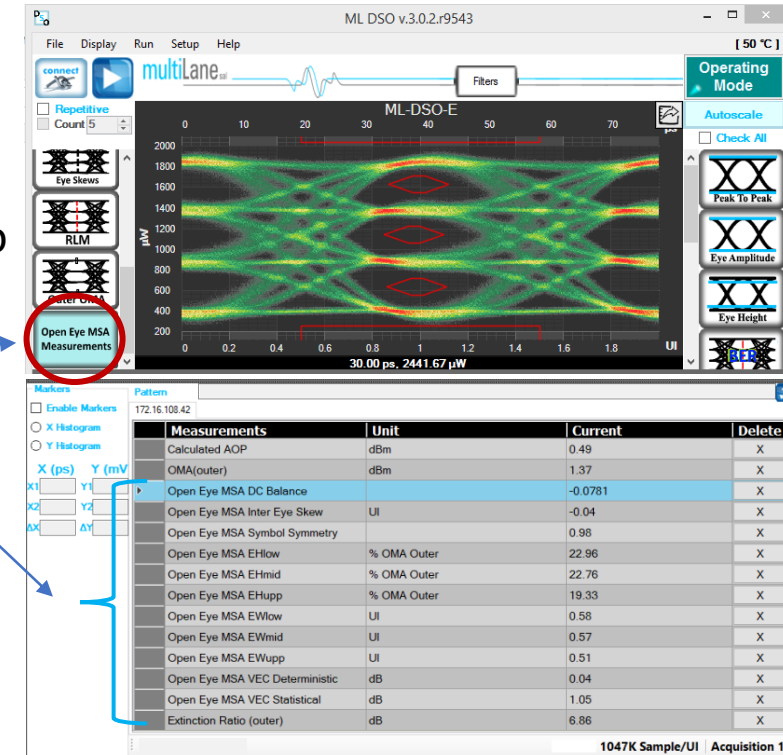
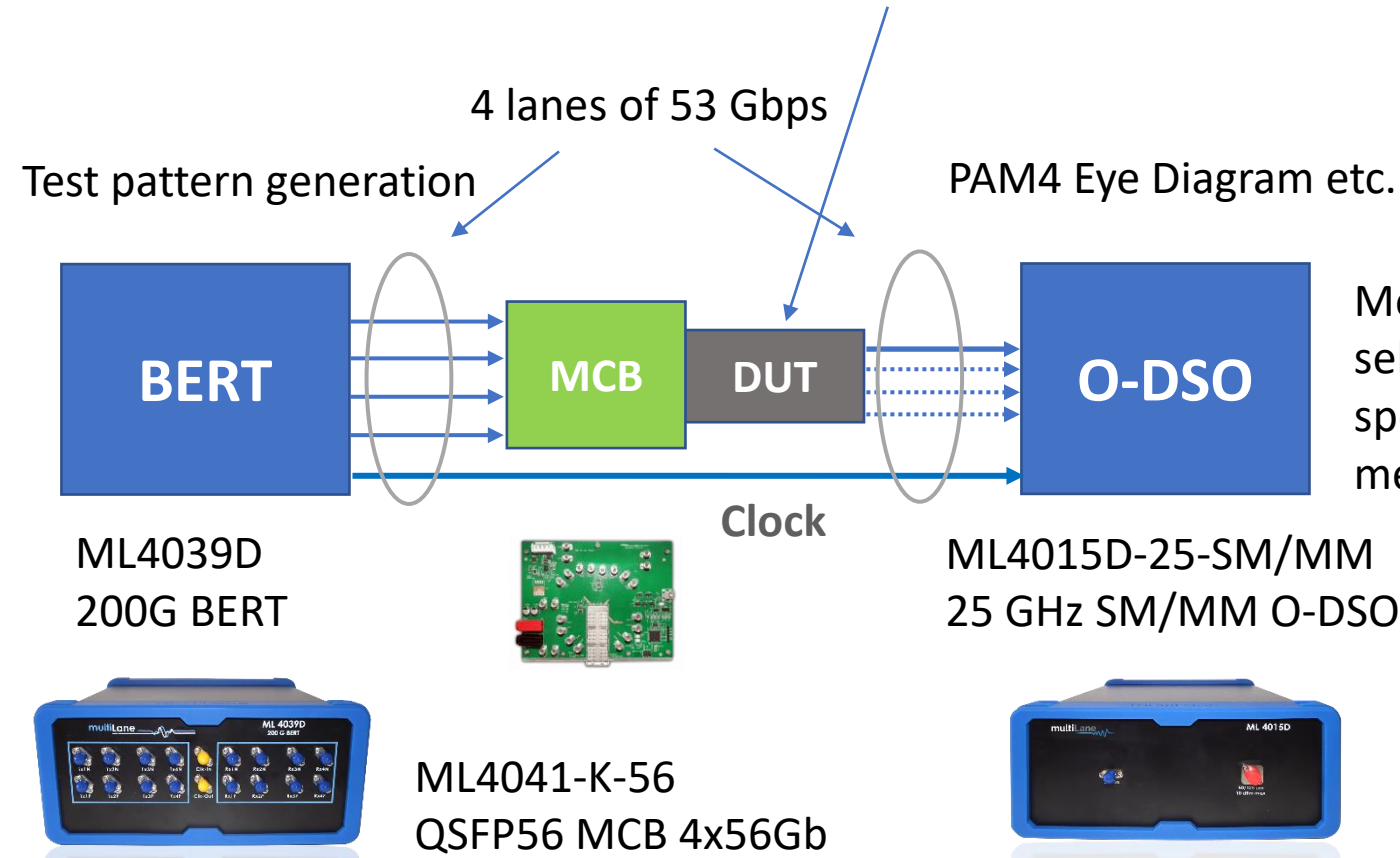
- Accelerate the adoption of PAM4 optical interconnects
- Optical module implementations using less complex, lower cost, lower power architectures
- **Plan effective test strategy**



Optical Testing

Transmitter 200G-FR4/SR4-OPEN EYE MODULE

Open Eye MSA 'personality' on ML4015D O-DSO



Optical Testing

Stressed Receiver Sensitivity – SRS

Test Procedure - stressed eye closure

Set the signaling rate of the test pattern and meet the specifications defined in Table 4-2.

Set the E/O converter extinction ratio approximately to the minimum specified in Table 4-2.

Add filter and select the appropriate bandwidth to create ISI to give a value of stressed eye closure that is ± 0.075 OMA_{outer}.

The remaining vertical stressed eye closure specified in Table 4-3 is achieved by adding sinusoidal/uncorrelated PRBSQ15 data pattern interferer

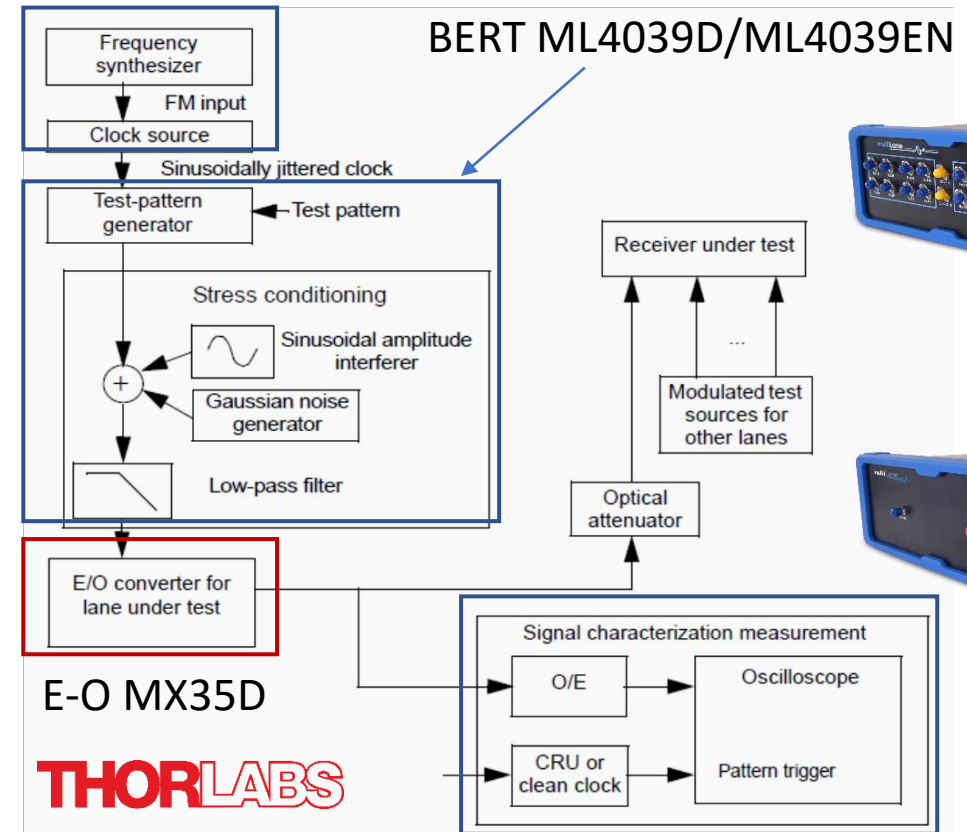
Iterate the adjustments until the required value of stressed eye closure defined in Table 4-3

Add S_j (JTOL)

SRS block diagram



JTOL Clock Source ML407-PAM



Optical Testing

Stressed Receiver Sensitivity – SRS

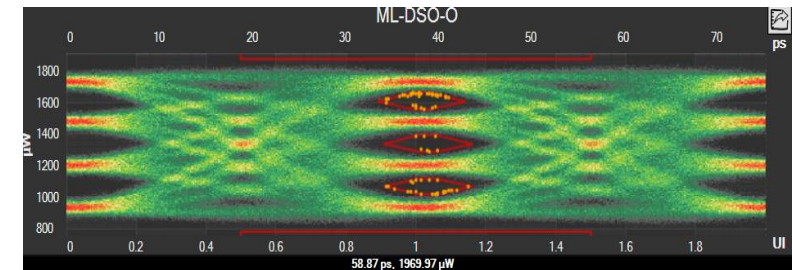
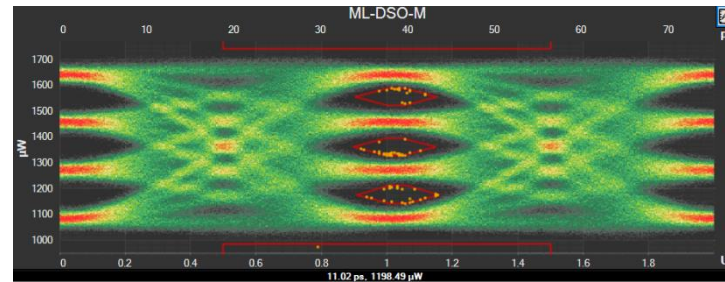
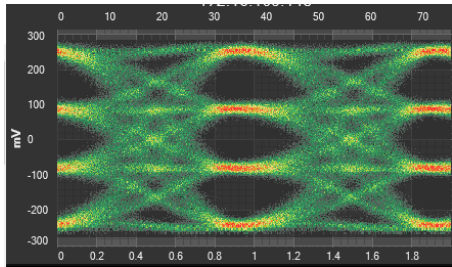
BERT signal



Add filter (FFE)



Add sinusoidal interferer and an uncorrelated PRBSQ data pattern interferer



Open Eye MSA EHlow	% OMA Outer	8.02
Open Eye MSA EHmid	% OMA Outer	7.02
Open Eye MSA EHupp	% OMA Outer	8.09

Vertical Eye Opening
+/-0.075 OMAouter

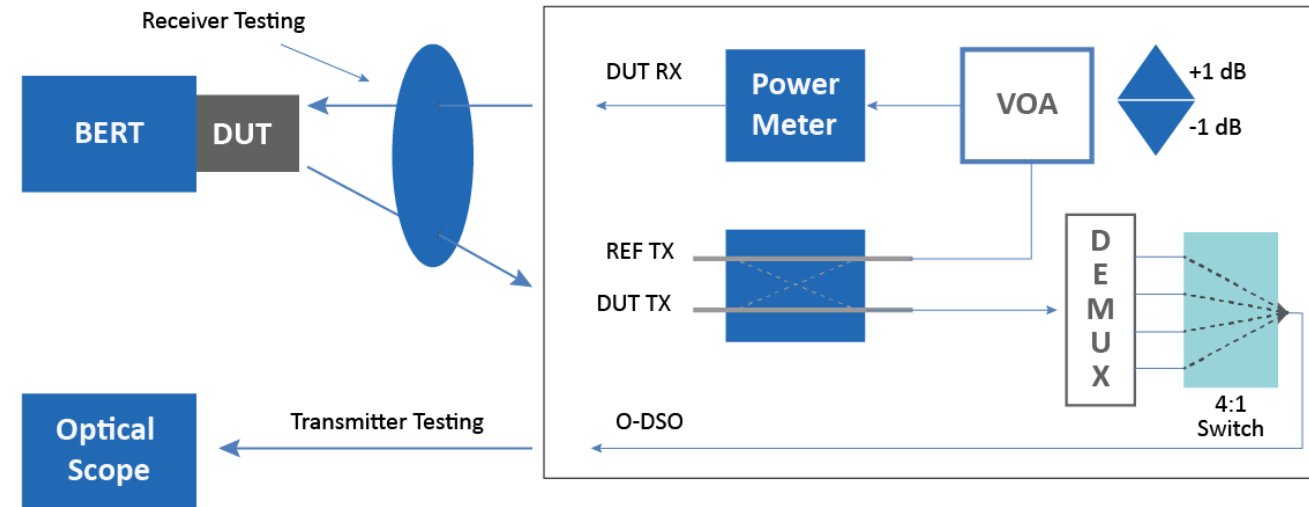
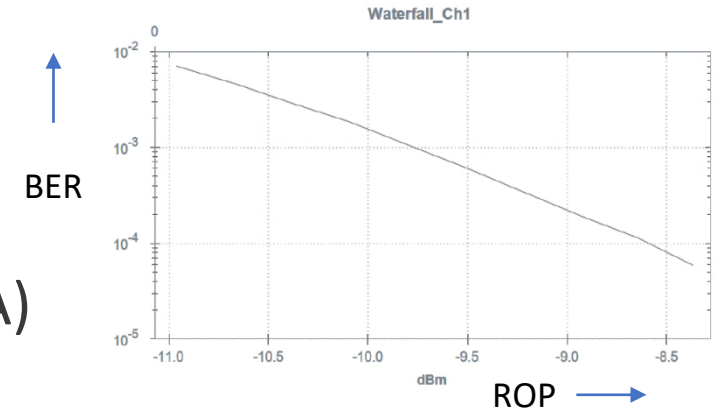
Open Eye MSA EHlow	% OMA Outer	6.43
Open Eye MSA EHmid	% OMA Outer	7.95
Open Eye MSA EHupp	% OMA Outer	6.76

Stressed input Eye Height (EH)
+/-0.070 OMAouter

Optical Testing

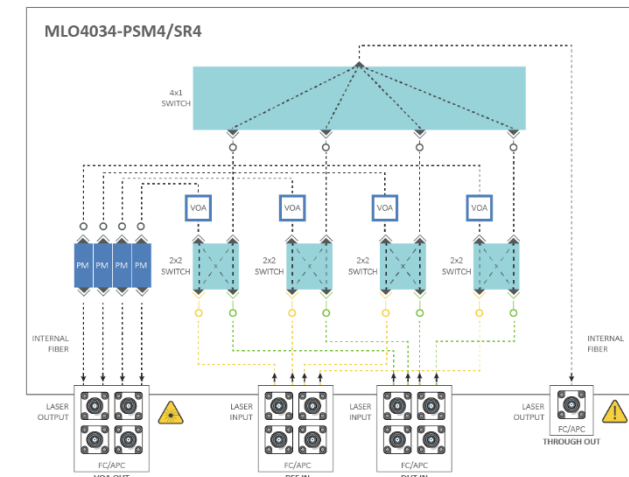
Receiver Sensitivity

Measure BER as a function of optical power (AOP, OMA)



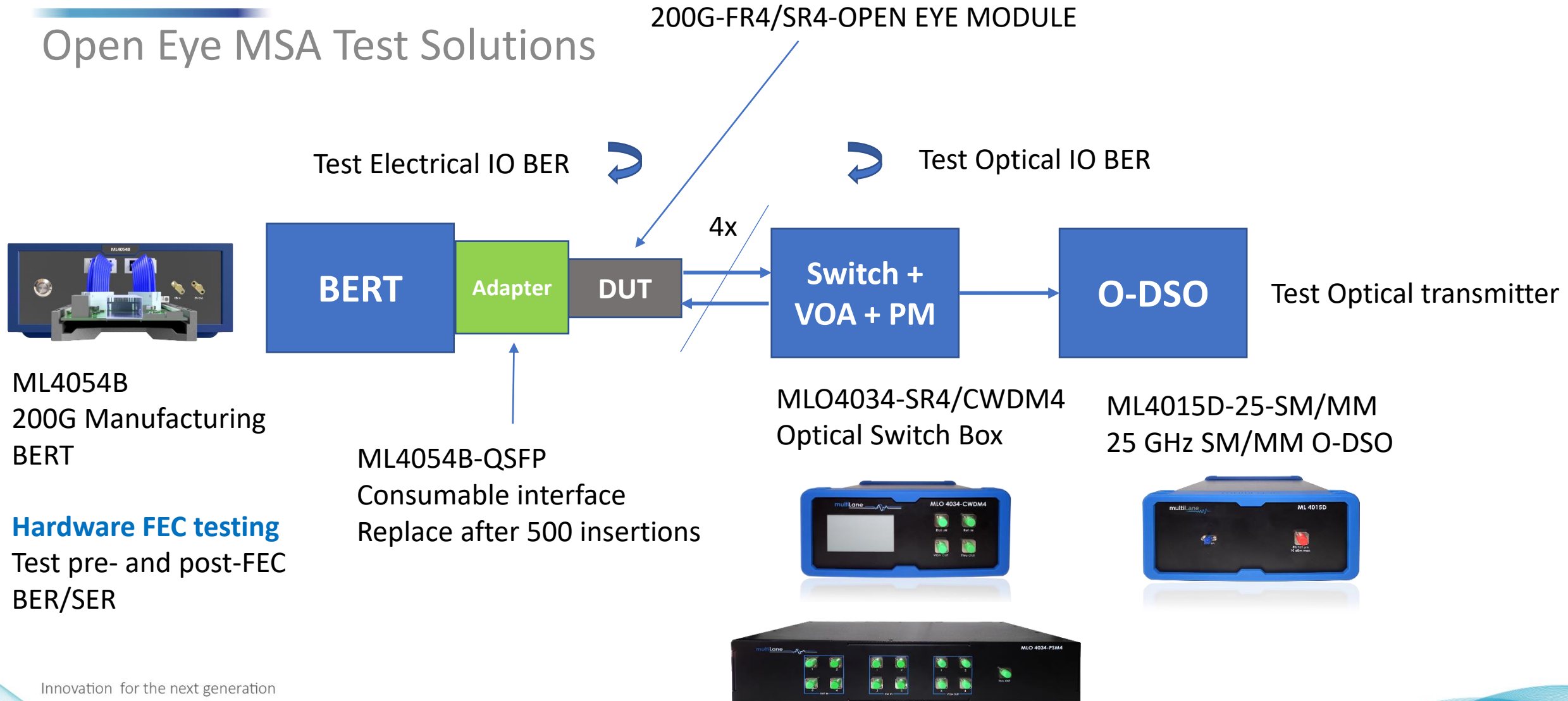
Integrated Optical Switch Box for SR4 and FR4 transceivers

- MLO4034-SR4
- MLO4034-CWDM4



Manufacturing testing

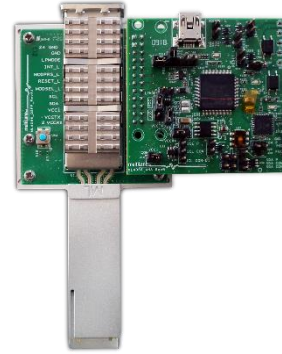
Open Eye MSA Test Solutions



Hardware FEC testing
Test pre- and post-FEC BER/SER

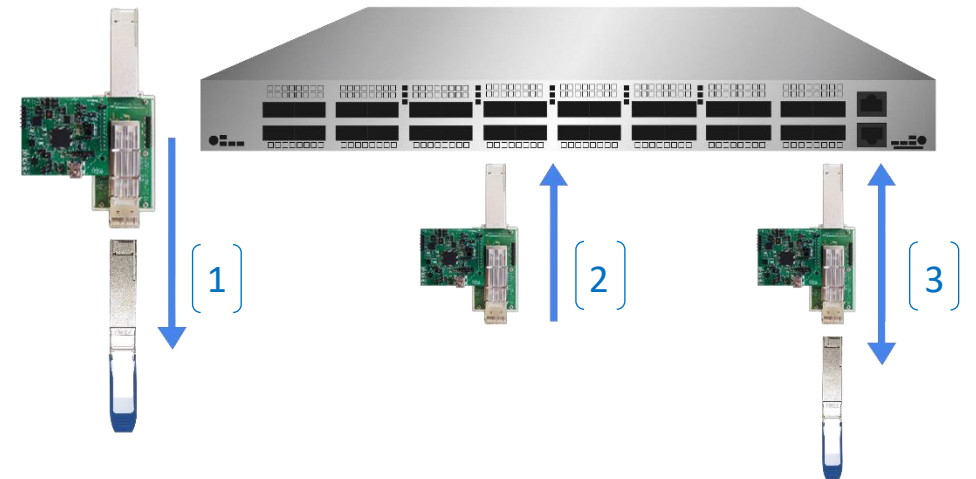
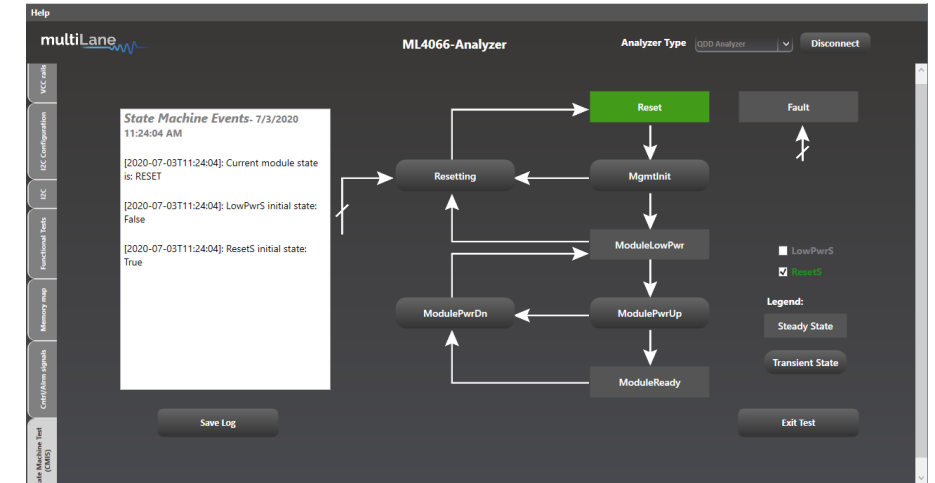
CMIS testing

Open Eye MSA Test Solutions



ML4066 Adapters and Analyzers

- Validate CMIS compliance
- Monitor and save I2C transactions between host and pluggable
- Pass/Fail State Machine test
- Force host alarms (high/low/tri-state)
- Enable versatile CMIS testing in three modes:
 - Mode1: Analyzer behaves as a host for a module DUT
 - Mode2: Analyzer behaves as a module for a Switch DUT
 - Bypass/Sniffer mode: Analyzer reports on communication between module and switch

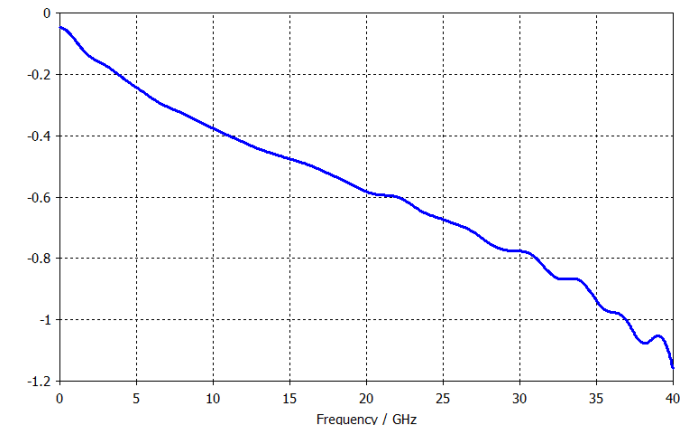


Connectivity/programming

Open Eye MSA Test Solutions

ML4041-K-56 QSFP56 Module Compliance Board

- User friendly GUI for I2C R/W commands and loading custom MSA Memory Maps
- Gain access to all high-speed Tx and Rx signals
- Compliant with CEI-56G-VSR
- DUT voltage supply control
- DUT Current Sense
- Temperature Monitor
- On-board LEDs showing MSA output Alarm states



ML4041K-56 Insertion Loss

Electrical Testing

Receiver Stress testing

200G-FR4/SR4-OPEN EYE MODULE



JTOL Clock

ML407-PAM
JTOL Clock Source

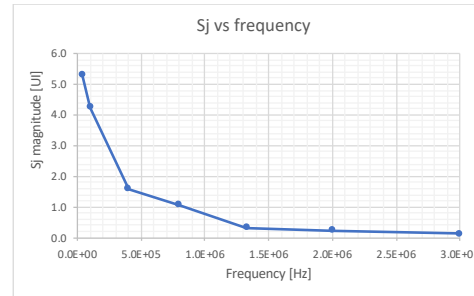
BERT

ML4039EN
200/400G BERT
With Crosstalk Noise

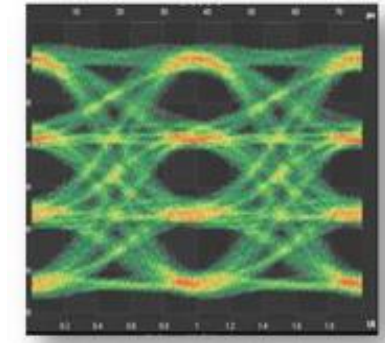


Optical loopback

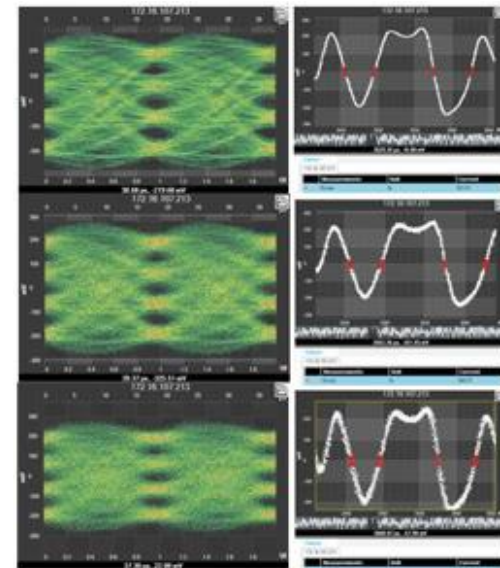
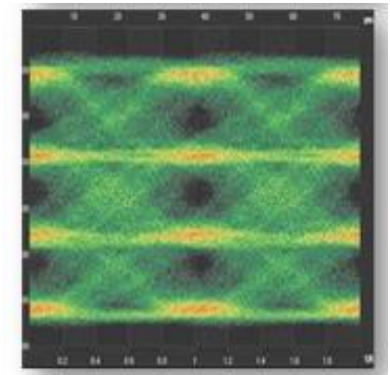
ML4041-K-56
QSFP56 MCB 4x56Gb



Clean signal



Impaired signal



Clean signal

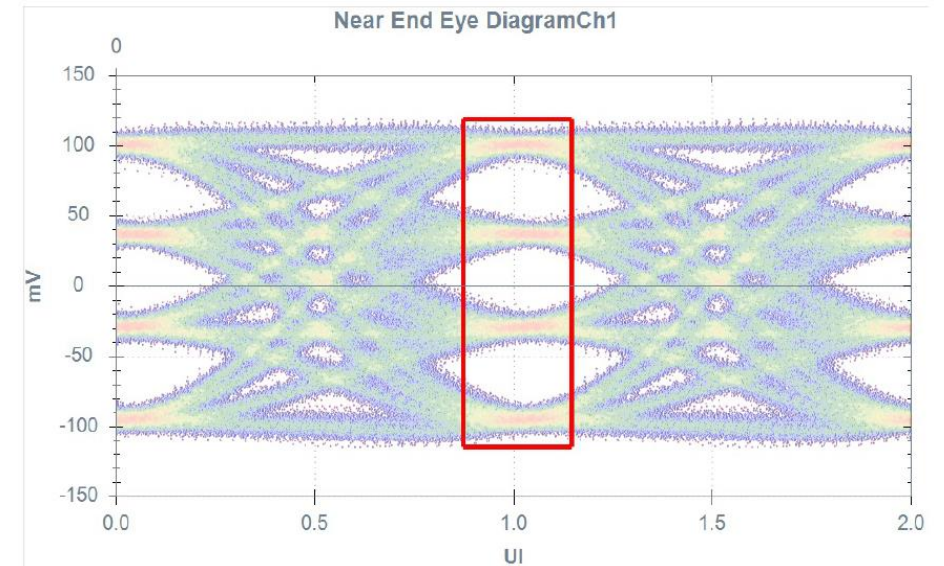
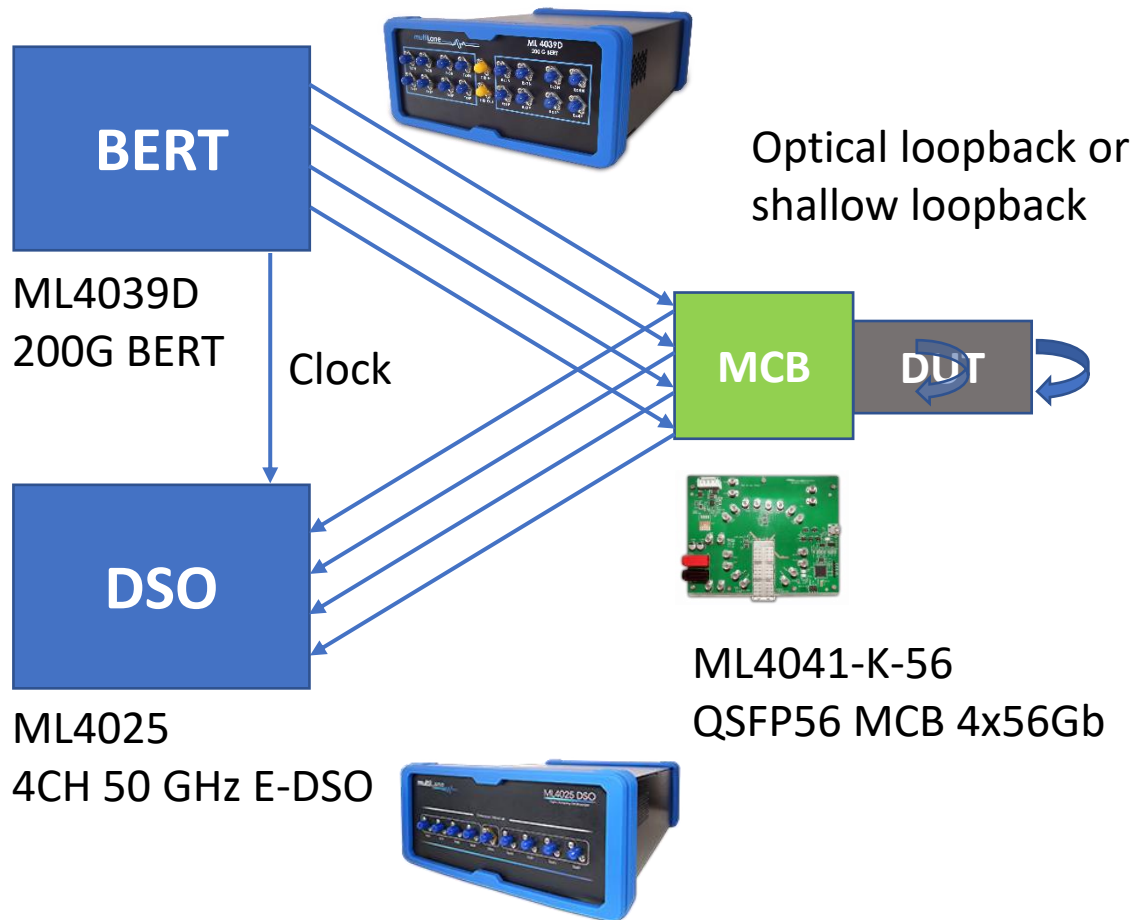
5 mV RN added

1.6 ps RJ added



Electrical Testing

Transmitter testing



TX Tests:

Peak-to-Peak (mV)
Near-End Eye Height (mV)
Far-End Eye Height (mV)
Near-End ESMW (UI)
Far-End ESMW (UI)
Transition Time (ps)
Pass/Fail

Figures of merit 200GAUI-4

Other

Open Eye MSA Test Solutions

Thermal testing

MLT8000 Thermal Test Solutions

- Test multiple DUT at the same time
- Scalable to 4, 8, 16 DUTs



Low-profile BERT



RMA testing / incoming inspection

ML7007 Automated Transceiver Test

- Turn-key solution
- Test report generation
- Test optical Tx and Rx parameters
- ‘Optics PhD in a box’



Conclusions

Open Eye MSA Test Solutions

Testing Open Eye MSA transceivers requires a broad spectrum of test solutions

MultiLane has the **expertise** and **solutions** to support all your testing needs

Solution	Required Equipment
Optical Tx	ML4039D, ML4041-K-56, ML4015D
Optical Rx SRS	ML407-PAM, ML4039D/EN, ML4015D, MX35D*
Optical Rx RS	ML4039D, ML4041-K-56, MLO4034-SR4/CWDM4
Electrical Rx	ML407-PAM, ML4039EN, ML4041-K-56
Electrical Tx	ML4039D, ML4041-K-56, ML4025
Manufacturing	ML4054B, ML4054B-QSFP, MLO4034-SR4/CWDM4, ML4015D
CMIS testing	ML4066-QSFP, ML4066-ANA-QSFP
Connectivity	ML4041-K-56
RMA test	ML7007
Thermal	MLT8000

* Thorlabs part 



THANK YOU

Innovation for the next generation

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