

# 400G Transceiver Test Solutions

Hyperscaler Applications for Next-Gen Port Speeds

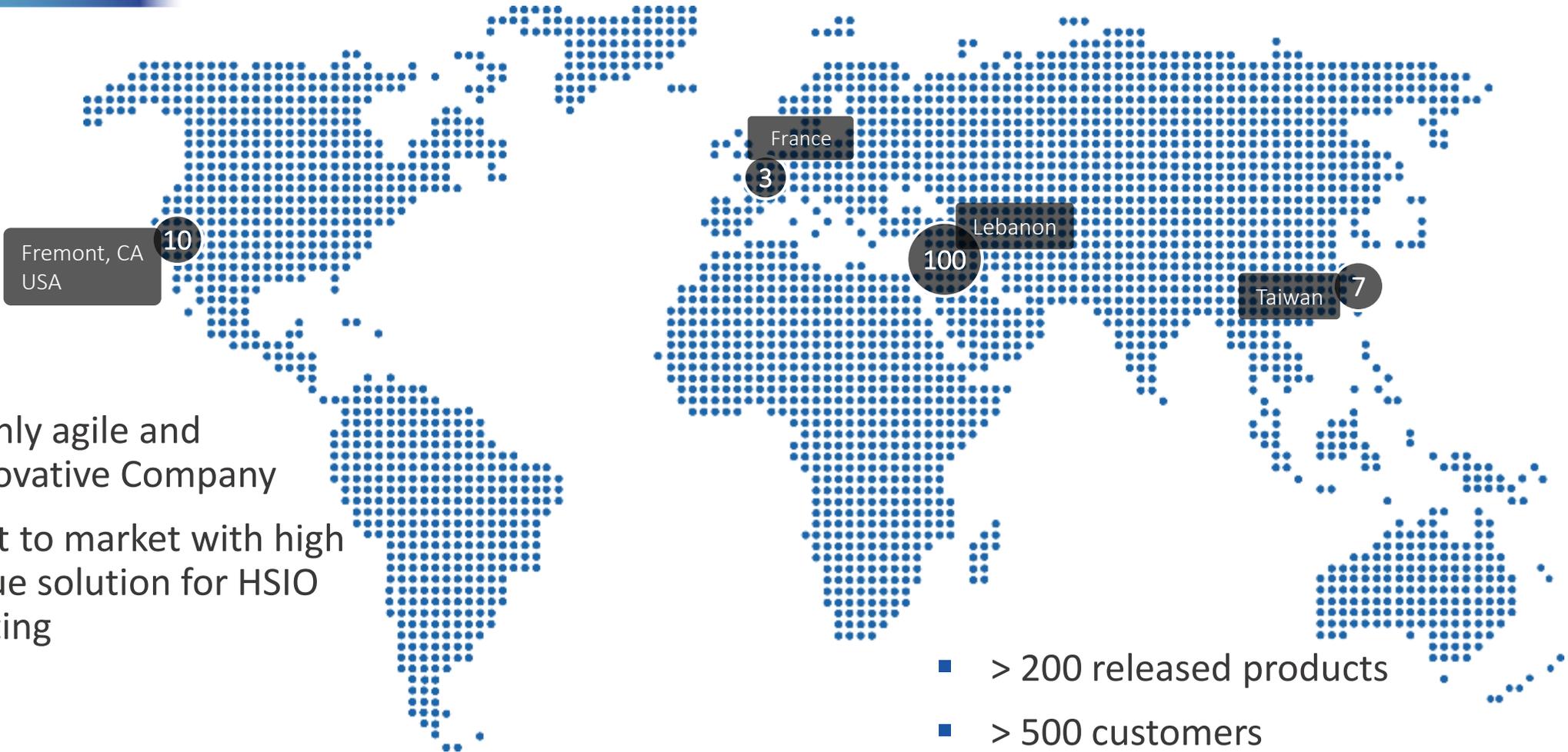
August 2020

# 400G Transceiver Test Solutions - Outline

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- MultiLane Overview
- Module Testing Snapshot
- Electrical Characterization
  - ❖ TX and RX Equalization
  - ❖ Pre-FEC Analysis with ThunderBERT
- Optical TX Characterization
  - ❖ OpenEye MSA and TDECQ measurement suites
- CMIS Validation
- FEC Analysis
- Multi-Corner Testing (Temp. and Voltage)
- Automated RMA Testing with the ML7007

# Company Profile



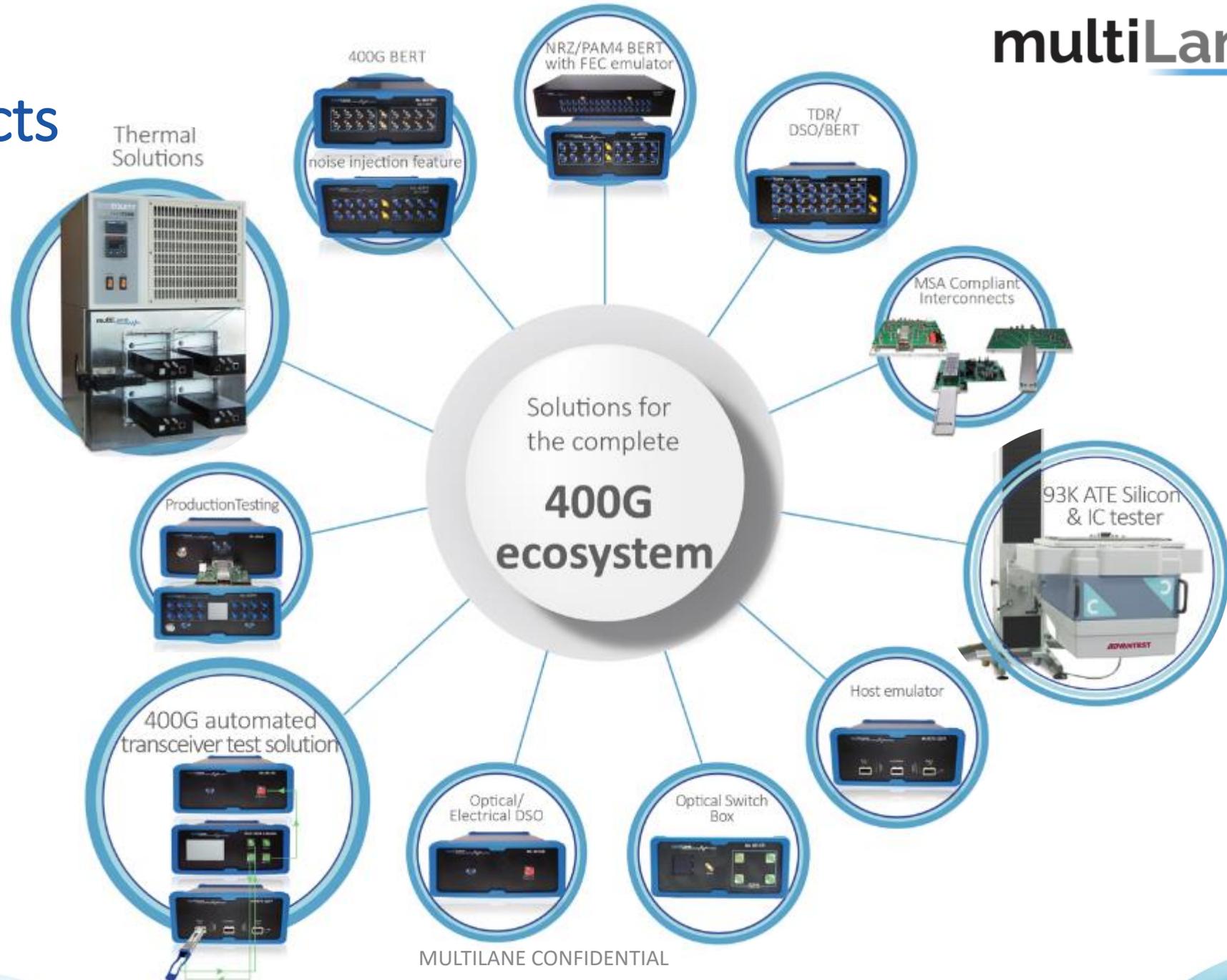
- Highly agile and innovative Company
- First to market with high value solution for HSIO testing

- > 200 released products
- > 500 customers
- > 50% CAGR for 8 years

# Worldwide Customers

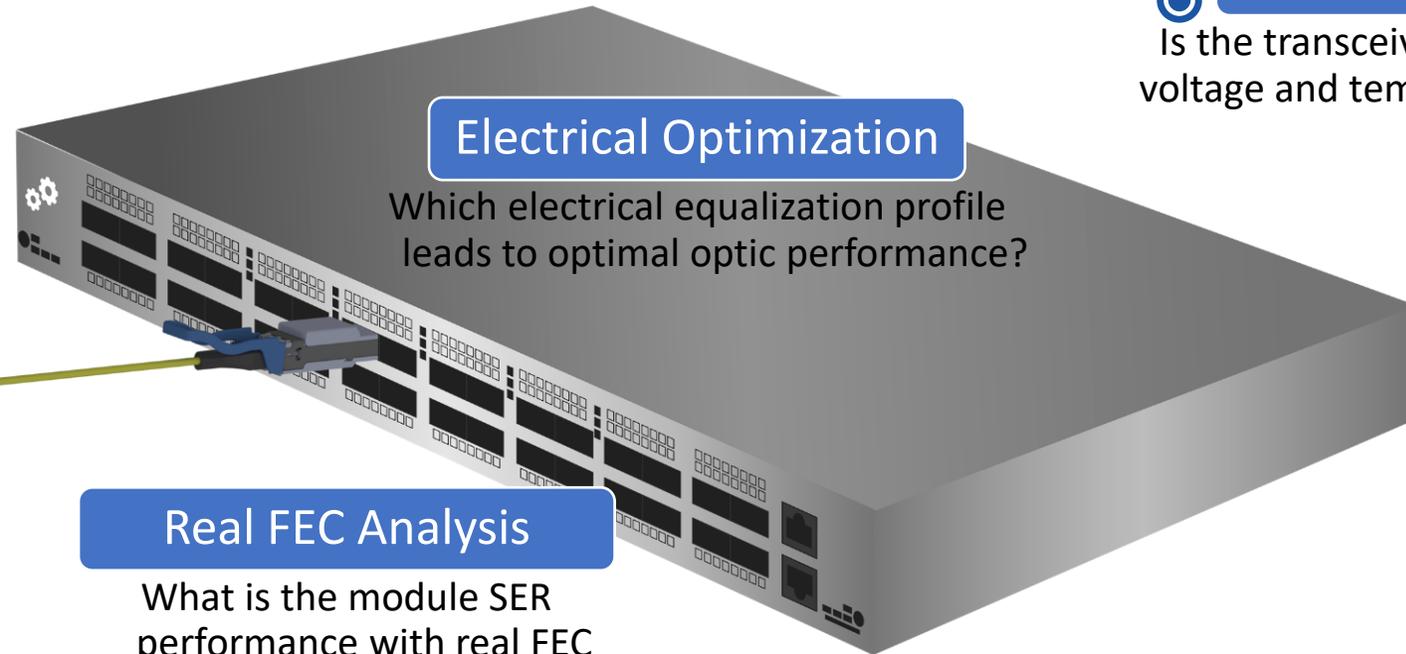


# Our Products



# 400G Module Testing Snapshot

Comprehensive Validation Required



## Electrical Optimization

Which electrical equalization profile leads to optimal optic performance?

## Real FEC Analysis

What is the module SER performance with real FEC encoding?



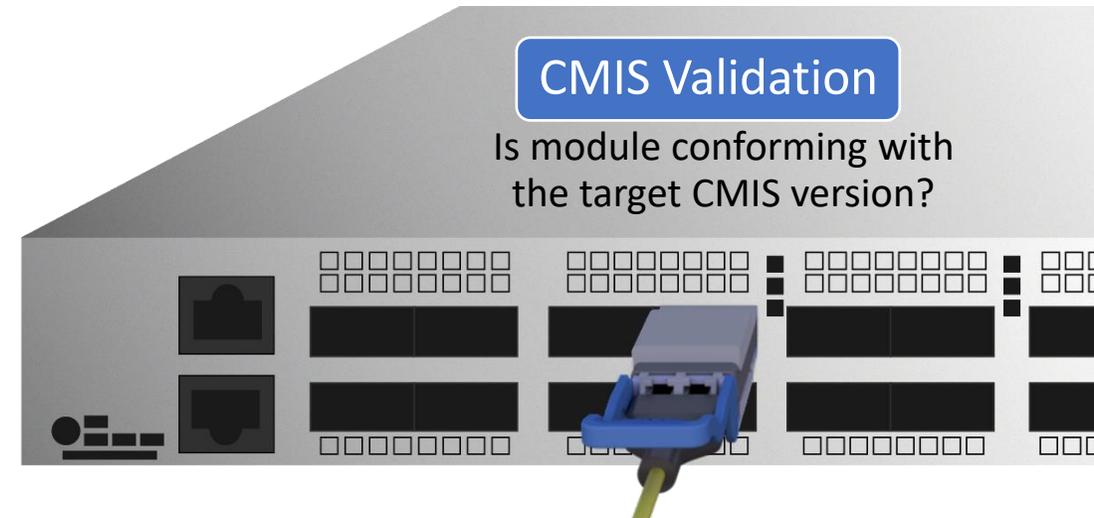
## Corner Testing



Is the transceiver compliant over voltage and temperature spec limits?

## CMIS Validation

Is module conforming with the target CMIS version?



## Optical Compliance

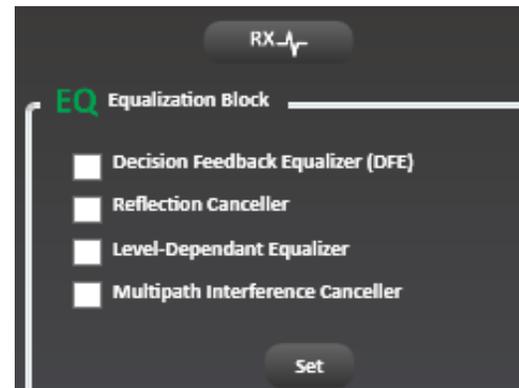
Is TX optical eye compliant with OpenEye/IEEE guidelines?

# Electrical Characterization

## Comprehensive Equalization Control on TX and RX

- New ThunderBERT GUI enables precise Layer-1 control and analysis
- Fine Equalization of TX
  - ❖ 3-Tap, 7-Tap or Auto-Cal Modes
- Rx Equalization:
  - ❖ Decision Feedback Equalizer (DFE)
  - ❖ Reflection Canceller
  - ❖ Level-Dependent Equalizer
  - ❖ Multipath Interference Canceller
- Rx Diagnostic Tools:
  - ❖ Real-Time 15-Tap FFE
  - ❖ Real-Time SNR Calculation
  - ❖ Histogram

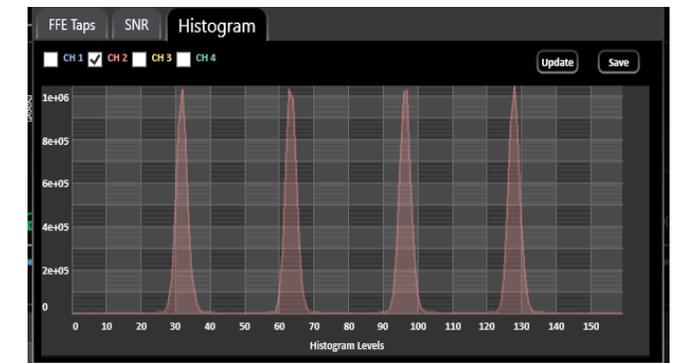
### Multiple RX Equalization Techniques



### 7-Tap TX Equalization



### RX Logic Level Histogram

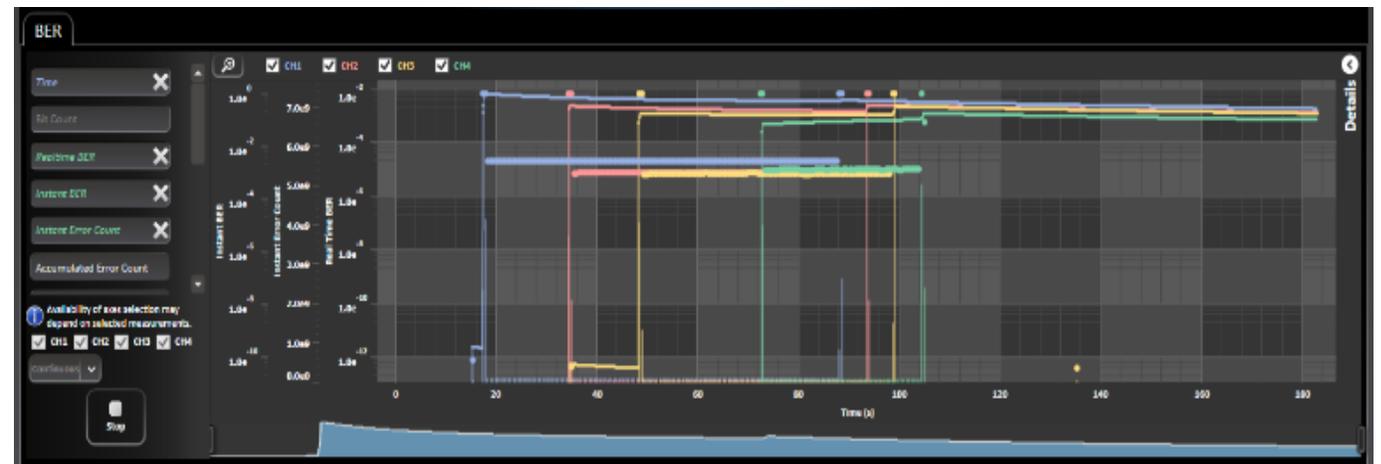


# Electrical Characterization

## Intuitive BER Analysis with ThunderBERT

- Single and multichannel **BER**
- **Accumulated** and **instant** BER
- **History Navigation** gives detailed analysis of L1 statistics every 100 ms

### Realtime and Instant BER

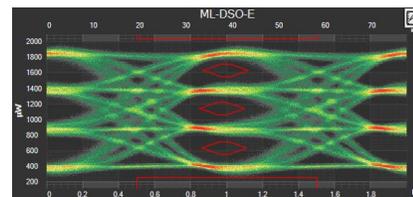


# Optical Characterization

## Measuring Transmitter Performance

### ■ ML4015D:

- ❖ Sampling Oscilloscope
- ❖ Available in **single-mode** & **multi-mode**
- ❖ Up to 40GHz
- ❖ SSPRQ & up to PRBS15 pattern lock
- ❖ CTLE, S2P De-embedding, FFE, DFE, etc.
- ❖ Full Eye and mask measurements including:
  - Eye Mask
  - EA, EH, EW, etc..
  - OMA outer
  - **TDECQ**
  - Jitter & Noise
  - **Open EYE MSA measurements**



### ■ MLO4034:

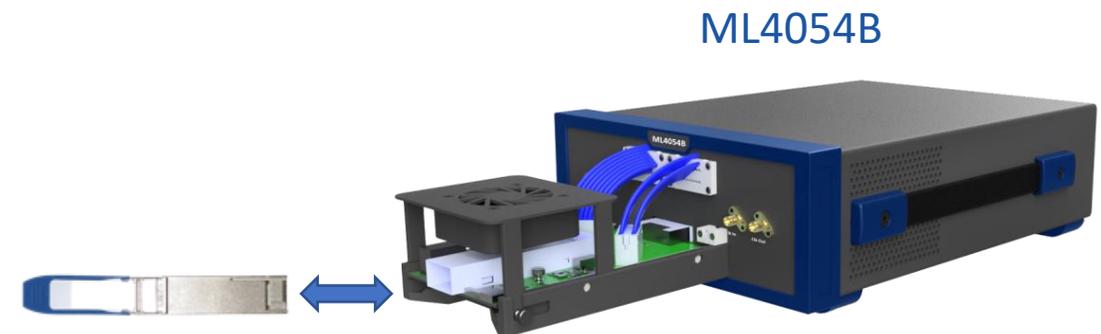
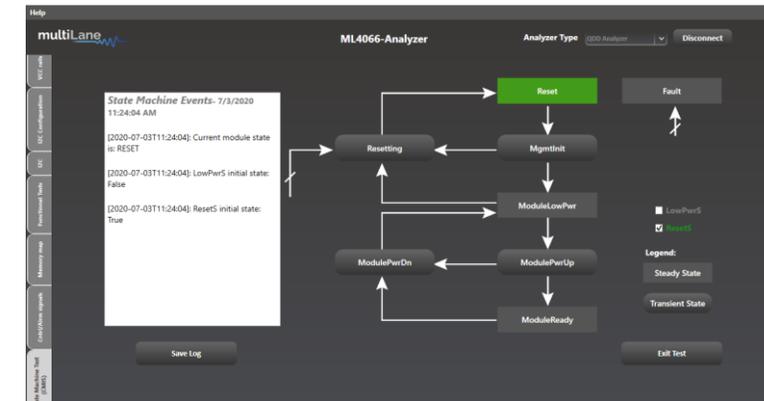
- ❖ Enables Tx Optical and Rx sensitivity testing without reconnecting
- ❖ Available in **single-mode** & **multi-mode**
- ❖ Up to 4 channels
- ❖ Integrated WDM Demuxer, switches, VOA, and PM
- ❖ Automated or manual operation



# CMIS Validation

## Confirming Host-Module Interop

- CMIS X.X complexity is a **limiting factor** for 400GE deployments
- CMIS Analysis Solution enables OEMs to certify CMIS implementation
- Validate the operation of the low speed I2C CMIS interface with the **ML4066** analyzer or the **ML4054B**:
  - ❖ Load and Save Entire MSA files to or from pluggable module
  - ❖ Monitor module response to single register adjustments
  - ❖ Read or write individual module registers
  - ❖ Stretch I2C clock to desired frequency
- Learn more about our **CMIS Tests Solutions [here](#)**



# Real FEC Analysis

## Understand Real-Life DUT Performance

- MultiLane BERTs deliver Real **RS-FEC** analysis capability (RS-528, RS-544)
- Encoding/Decoding of real FEC blocks gives **most accurate** performance of 400G components, optics and hosts
- Capture **real** DUT performance with codeword counters, SER histograms, post-FEC BER and more via **ThunderBERT GUI**
- Learn more about FEC in the 400G world with our new **white paper**, available today [at this link](#)



ML4054B



# Multi-Corner Testing

## Stressing Transceiver Operational Conditions

- Stress a DUT transceiver by validating compliance at high/low operational corners of voltage and temperature
- The ML4054B includes an integrated host with **variable supply voltage control**
- To achieve desired temperatures two setups are available:
  - ❖ **ML4054B** with external mounted thermal stream
  - ❖ **ML4054B-LP** featuring same hardware inside a special enclosure that mounts on a custom door of a TestEquity temperature chamber

ML4054B-LP



MLT8000



Thermal Stream



ML4054B



# Automated Transceiver Testing

## ML7007 Series Productivity Software Overview

- Transceiver failure is a major hot point in data center environments; RMA process can be logistical issue
- **ML7007** automated SW conducts full compliance test of transceivers (10G, 40G, 100G)
- Automatic Pass/Fail result by pressing one button -> expedite RMA process
- Provide field technicians with ability to produce expert-level **failure analysis reports**
- Applications:
  - ❖ Transceiver Manufacturing
  - ❖ Compliance Testing for RMA
  - ❖ Characterization & Validation

■ Learn more [here](#)

Innovation for the next generation



**400G Version Coming Soon**



THANK YOU

**Innovation for the next generation**

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