

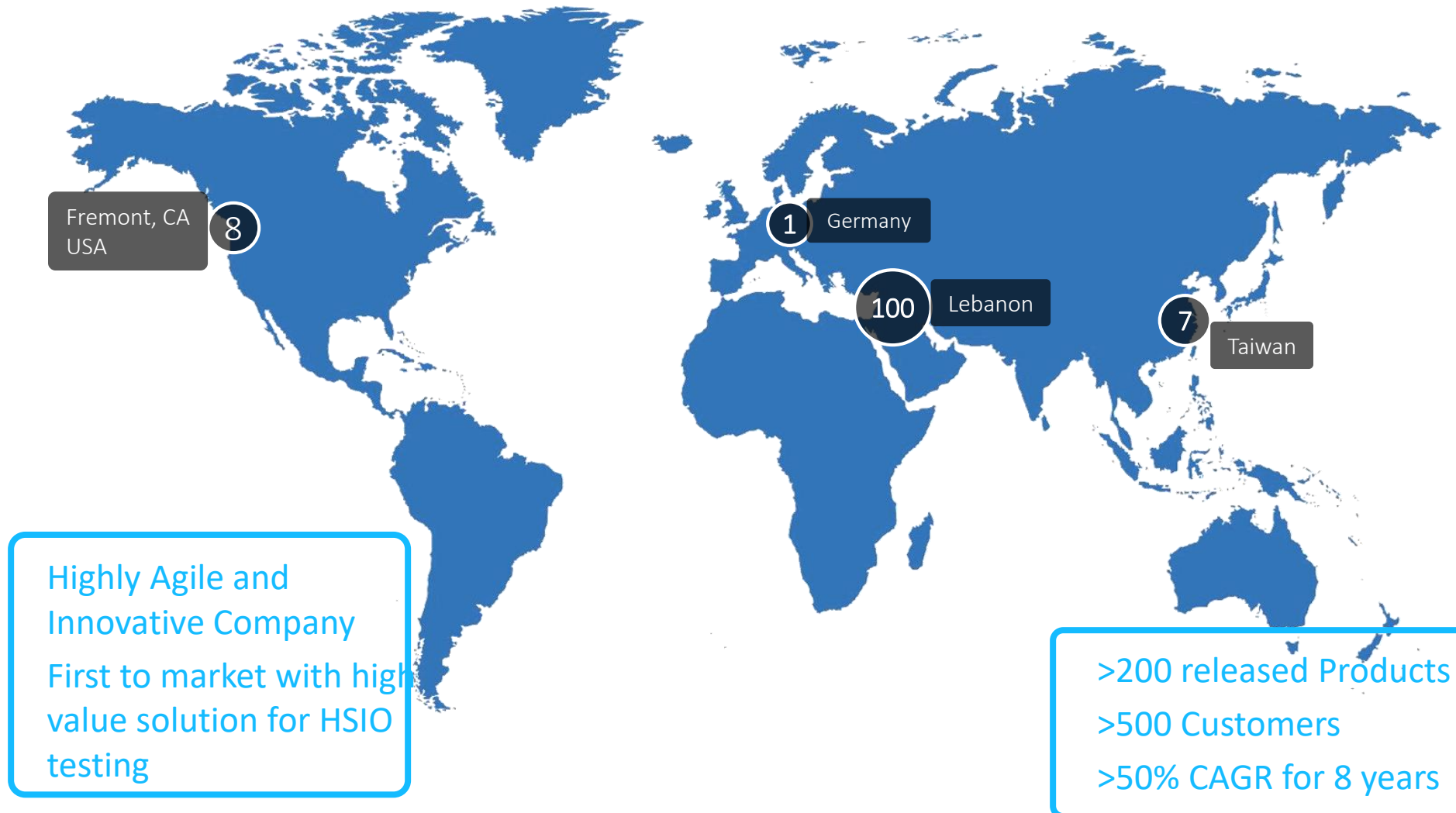


Cost-effective, ultra-high-speed test
solutions for the Data Center and beyond

Fadi Daou



Company Profile



Outline

- MultiLane, HTP & HTP Academy introduction
- Products overview
- Customers
- Test challenges and solutions
- Business model
- Partnerships and collaboration
- Conclusion

Innovation for the next generation

Mission Statements

MultiLane

- Provide quick-turnaround, customer-driven, high performance T&M solutions at very competitive prices
- Be the leading Data Center Interconnect test solution provider
- Become a top-tier T&M company serving multiple leading-edge technology sectors

HTP

- Enhance career and educational opportunities of current and future generations
- Create an eco-system to enable the high technology sector in Lebanon
 - Create high value jobs
 - Export high technology products
- Want our kids to stay in their land, and compete globally from Lebanon

Innovation for the next generation

New Facility

An Environment Of Growth

Moving to a 5,000 m²
facility next month

500 sqm facility



2018



2019



- 3,000 sqm office space
- 2,000 sqm clean rooms & labs



- 8,000 sqm facility



- Capacity to accommodate a total of 1,000 employees



HTP



- Incubator and workspace for technology companies, big or small
- State of the art research and development laboratories
- Goal to provide >1000 engineering job opportunities



HTP Academy



- Achieve global level excellence in scientific study through the advancement of human potential within the technology sector
- Applied training center covering topics like data centers, photonics, semiconductors and more



Innovation for the next generation

Final year projects offered by the academy



Projects offered this year

- FPGA based BERT for PCIe
- Calibration of Coherent Optical Receiver
- Precision Time-base Implementation
- Time Domain Network Analysis Calibration
- Periodic and Random Jitter decomposition
- Network Protocol Analyzer
- XGPON
- Mixed Signal Oscilloscope
- Frequency Response Shaper Circuit
- Ultra-Low Jitter Phase Lock Loop Design

Innovation for the next generation

Products and Solutions

Instruments

BERTs, Scopes, TDR, TDA

Interconnects

QSFP-DD, OSFP, QSFP28, etc.

ATE Solutions

Advantest V93K test heads

Optical Switch Boxes

CWDM4, PSM4, LR4, SR4

Services

Compliance testing 100/400G

Solutions

Automated transceiver testing

Thermal solutions

Receiver stress testing

DAC/TIA testing

I2C CMIS analysis



>200 released Products

>500 Customers

>50% CAGR for 7 years

World-wide customers





Test challenges and solutions

Cost-of-test

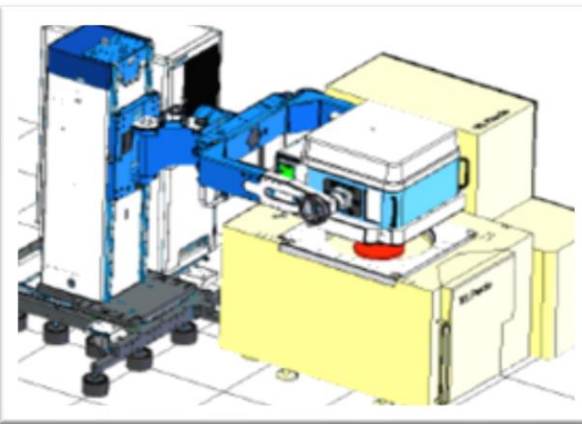
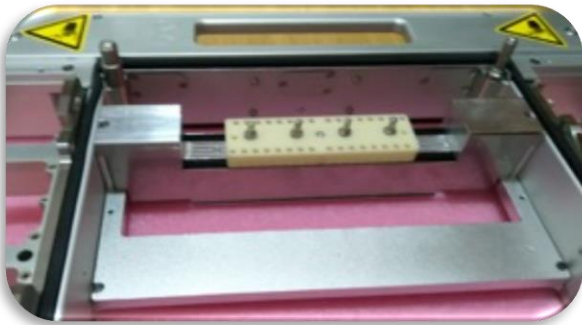
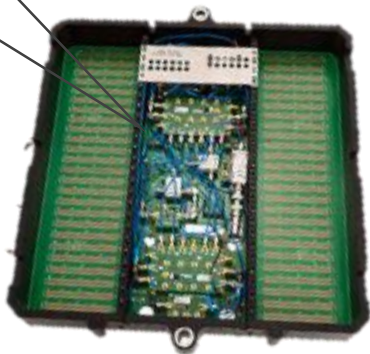
At-speed, high performance test solutions

112 Gbps

Time-to-market



At-speed 112 Gbps ATE solutions



DSO	BERT		
AT4025-50	AT4039D	AT4039E	AT4039EML
- 4 channel 50 GHz sampling oscilloscope	- 4 lane 56 Gbps (PAM4) or 28 Gbps (NRZ) BERT	- 4 lane 112 Gbps (PAM4) or 56 Gbps (NRZ) BERT	- 4 lane 112 Gbps (PAM4) or 56 Gbps (NRZ) BERT
- SSPRQ & PRBS16 pattern lock	- 1500 mVppd	- 800 mVppd	- 1800 mVppd
- 1200 mVppd			

2018

2019

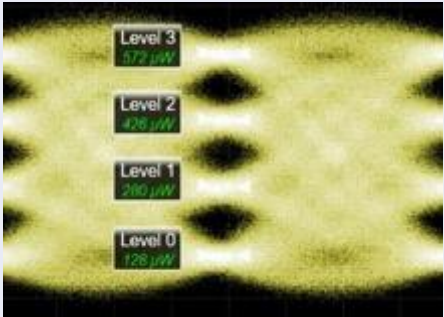
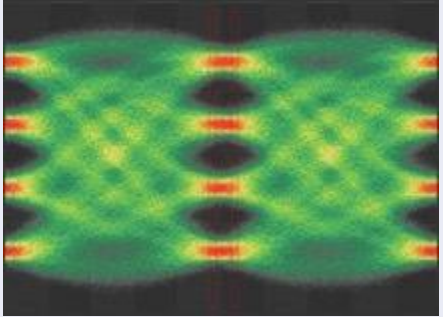
Instruments used to be integrated
in load boards

Instruments re-formed to become a V93K Test-head Extender

200-400G transceiver test challenges

TDECQ - Transmitter Dispersion Eye Closure (Quaternary)

- TDECQ is the “new” mask margin test of PAM4, it is a predictor of system performance of a PAM4 transmitter
- It is critical that measurement accuracy is ensured and that multiple test vendors provide identical results.

Eye diagram – TDECQ result		
	Keysight	MultiLane
TDECQ	2.54 dB	2.48 dB
RLM	0.95	0.99
OMA	453 mW	470 mW
AOP	-4.5 dBm	-4.3 dBm
Eye Diagram		



N1092A

List price ~ 150 kUSD

N1078A

ML4015D

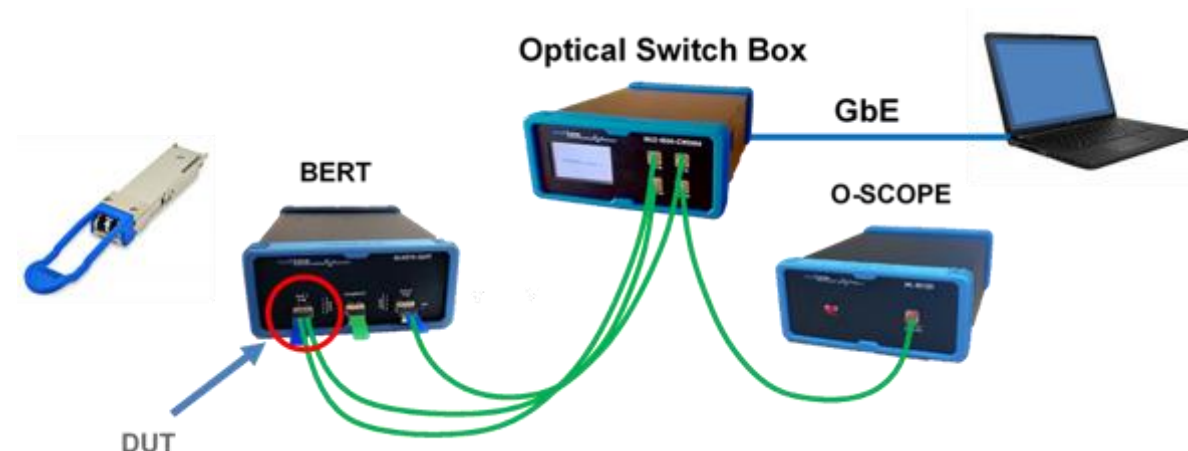
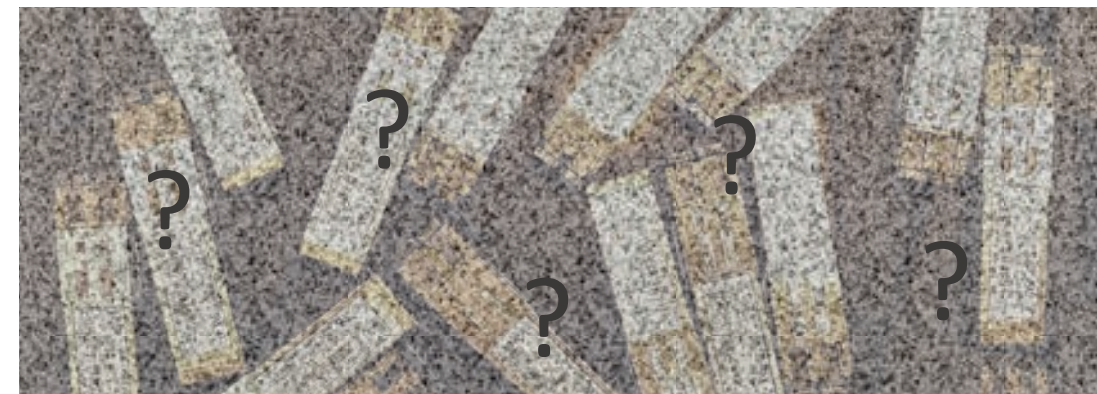
List price < 50 kUSD

ML1016D-CR



Fully automated RMA tester – ‘Optics PhD in a box’

- How to test your suspicious optical transceivers?
- Fully automated RMA tester
 - Optical transmitter and receiver sensitivity test
 - Complex optical signal integrity tests
 - Determines pass/fail quickly
 - Test report
 - Technician/operator
 - Single push of a button
- Used by key Data Center system company to test all their suspicious 10-100G Optics

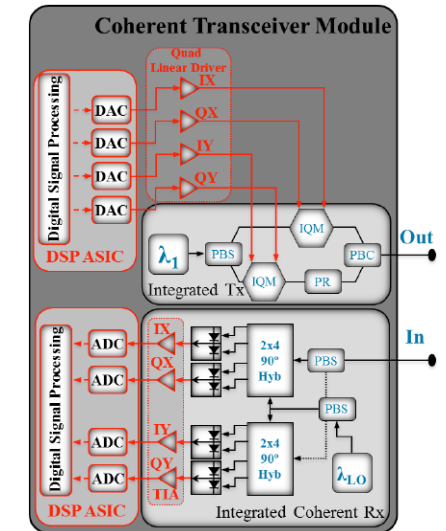


Unique solution by MultiLane

400G ZR Coherent Optical test challenges

- Advanced technology for Data Center Interconnects
 - DSP-heavy
 - Complex Tx and Rx electro-optical components
 - Lots of parameters that need characterization and tuning
 - CD, PMD, PDL, IQ offset, Quadrature Error, IQ Skew, IQ Gain Imbalance, etc.
- Testing requirements
 - Optical front end (LO)
 - High bandwidth, high ENOB real-time acquisition
 - Complex analysis software
- Current solutions based on ultra-high bandwidth scopes
 - Prohibitively expensive (>500k USD) even for use in R&D

Stay tuned for MultiLane's solution



Source: OIF



Tektronix



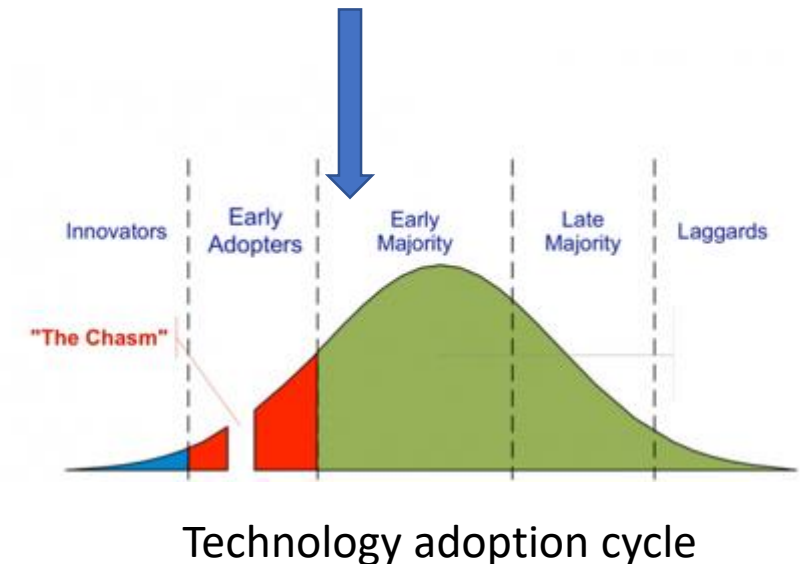
Keysight

Business model – the key to our success

- Deep understanding of market
- Work with leading customers
 - Understand customer requirements
- Use leading edge merchant silicon and technology (ADC, O-E, SerDes)
- Quick turn around product development
 - Hardware
 - Software GUI
 - Solution software – helps customers do their job
- Low cost engineering/manufacturing in Lebanon

Solution available

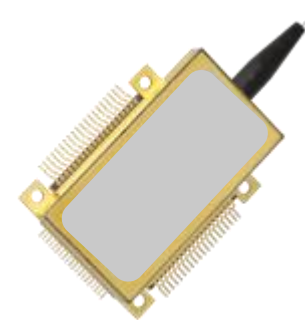
- Meeting customer needs
- Leading edge, high performance
- Just in time for mass adoption
- Cost-effective



Partnerships & collaboration

Technology

- Source and/or co-develop key enabling technologies
 - DAC, ADC, O-E, E-O, TIA



Manufacturing services

- Photonics integration, assembly, packaging
- NPI pilot manufacturing



Testing services

- ATE testing
- Interop and compliance testing

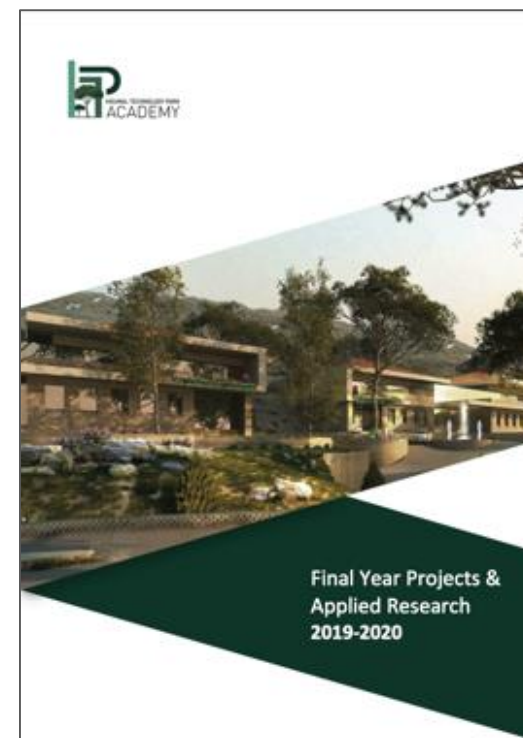


Education

- Applied Training and HTP Academy

Co-working space

- Share facilities with other multi-nationals



What can we do for you?

&

What you do for us?

- Looking for collaboration for Testing SIPho during Wafer Probing
- We private label many instruments for the HSIO and Optical Testing, and want to develop a solution for the automotive market
- We can offer you a trained workforce, co-working space, R&D Labs

Conclusion

- Rapidly becoming the leading Data Center Interconnect test solutions provider
- Looking for more growth
 - New core technologies to incorporate into our products
 - New applications in adjacent fields
- Please reach out for partnerships
 - Fadi Daou, CEO
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This presentation was presented at EPIC World Photonics Technology Summit 2019

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