

multiLane 



# Confidence from Development to Deployment

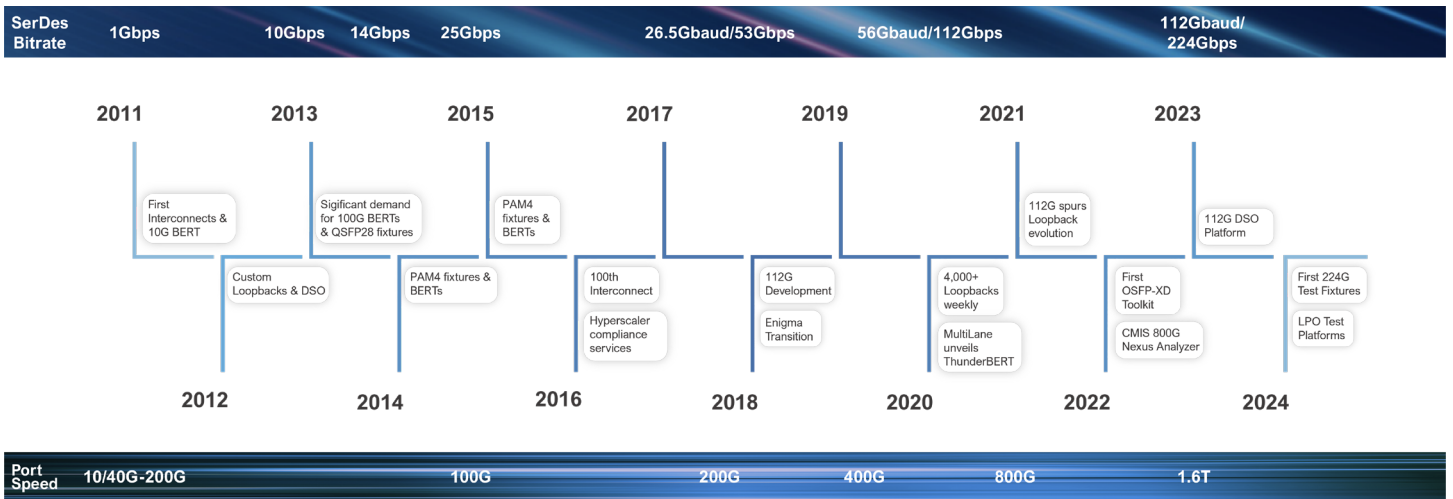
2024 Product Brochure

# A Comprehensive Approach to a Diverse Industry

This brochure reflects the full diversity of MultiLane solutions, from Loopbacks and CMIS management, testing instruments, personalized engineering services, to creating the building blocks for our products with our new interconnects, we have cast a wide net while maintaining our exceptional quality to ensure we can continue to meet and exceed market expectations. Happy browsing!

## Innovation Timeline

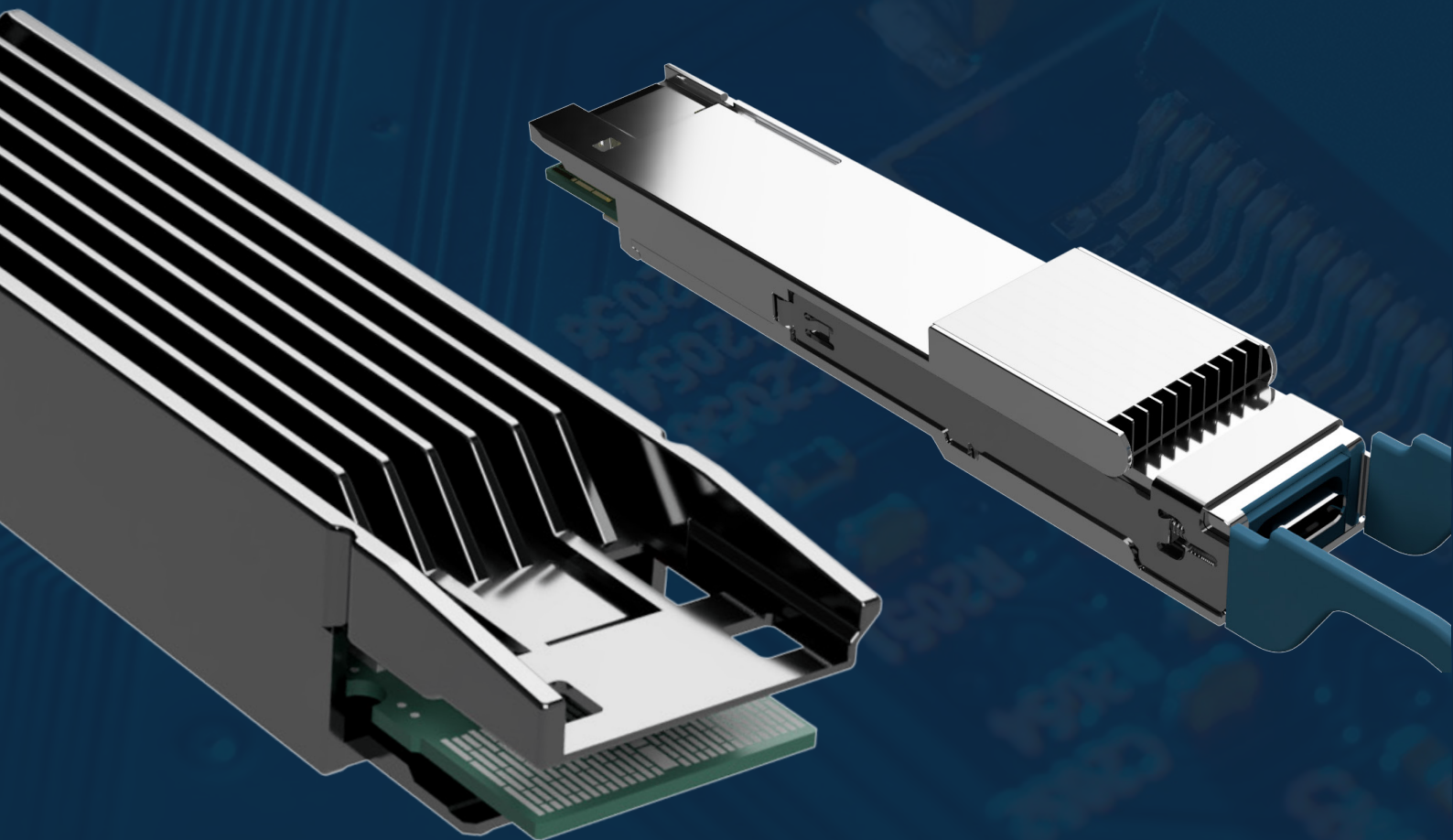
Our journey of growth over the past ten years to meet the rising demands of high speed networks.



# DATA CENTER TEST SOLUTIONS

ACCELERATING HIGH-SPEED ADOPTION ACROSS THE INDUSTRY

MultiLane Data Center Test Solutions offer an extensive selection of testing capabilities to enable the modern day data center. We have ready solutions for the most dominant form factors across many generations. Our focus is on the specialized tools that allow for the development of 800G host ports, and the preliminary steps towards 1.6T; accelerating both the current and next generation of Giga/Terabit ethernet.

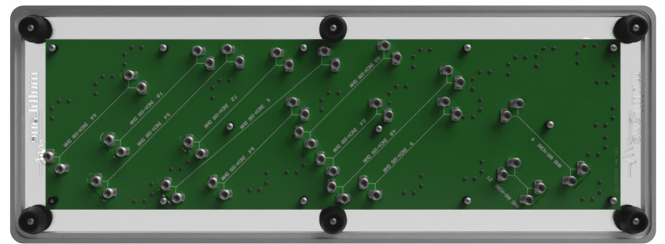


# THE 1.6T ECOSYSTEM

As the race to 224Gbps/lane heats up, MultiLane stands ready to accelerate the development and adoption of this latest technology with three new products in 224Gbps Signal Integrity characterization. Taken together, these products offer a compliance and development suite to accelerate vital R&D for next-gen networks.

## ML224-4067 CHANNEL EMULATION BOARD

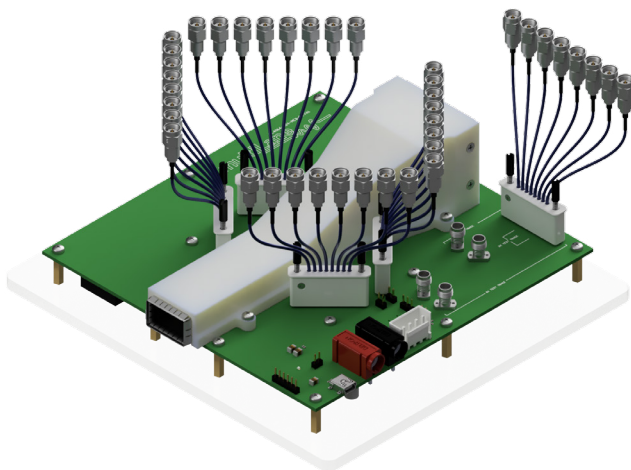
The latest MultiLane Channel Emulation Board, the ML4067-224 provides a comprehensive set of trace paths for 224Gbps signals to test and validate responses to lossy channels. With 11 traces at 92 and another 11 traces at 100 Ohms the ML4067-224 can emulate losses which range from 4 to 30 dB at the target Nyquist frequency of 53.125 GHz. The board supports 1 mm and 1.85 mm connectors.



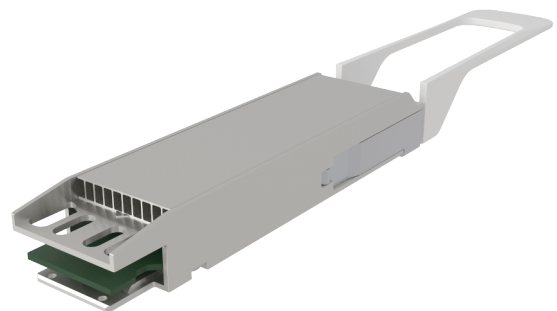
*ML4067-224 Channel Emulation Board*

## 224GBPS/LANE OSFP MODULE COMPLIANCE BOARDS

One of the first 224Gbps/lane MCBs to market, the MultiLane OSFP 224G MCB is designed to validate next-gen pluggables with loss profiles compliant with the IEEE 802.3df, high performance SMPS connectors offering a bandwidth of up to 110GHz, and a USB interface that gives access to a CMIS GUI. The MCB provides a comprehensive approach to compliance and interoperability validation with access to full CMIS implementation in modules



*ML4064-MCB-224*



*ML4064-LB-224*

## 224G ELECTRIC LOOPBACK

The latest MultiLane Electrical Loopbacks for OSFP 224G feature 33 W of power loading. These pluggables are designed to demonstrate host interoperability, establish a baseline performance before introducing outside variables, and run simplified debug routines to save on support cycles and FAE resources.

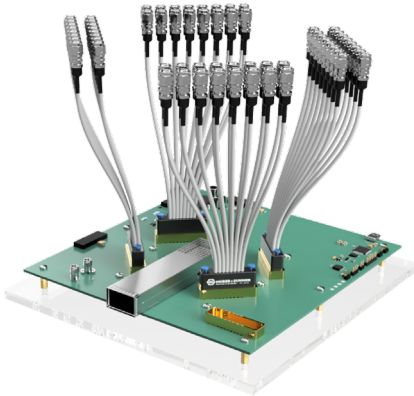
# OSFP-XD

## Test Fixtures

MultiLane's line of OSFP-XD Host and Module Compliance Boards (HCBs and MCBs) are ready to accelerate the industry into the Terabit generation. The ready-to-ship ML4064-XD-MCB-112-MXPM70 provides a means of testing very early OSFP-XD pluggables, while the ML4064-XD-HCB1/2-112 and its series of high-performance SI traces allow for early port characterization/testing. Both test fixtures are compliant with the CEI-56G-VSR-NRZ and IEEE 802.3ck specs.

### ML4064-XD-MCB-112-MXPM70 Key Features

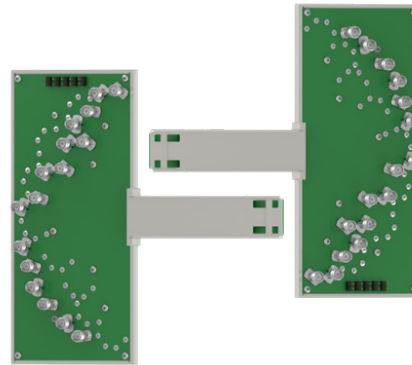
- MCB loss including the 3" MXPM70 cable is compliant with CEI-56G-VSR-NRZ and IEEE 802.3ck.
- CMIS GUI providing comprehensive approach to DUT interoperability, allowing users to access full CMIS implementation in modules. APIs available.
- I2C master driven from both on board microcontroller and/or external pin headers
- On-board LEDs display MSA output alarm states
- On-board buttons/jumpers for MSA input control signals



ML4064-XD-MCB-112-MXPM70

### ML4064-XD-HCB1/2-112 Key Features

- Compliant with IEEE802.3ck and CEI-56G-VSR-NRZ
- Built with high performance PCB Material
- High performance signal integrity traces
- Same low Insertion Loss for all channels
- HCB1 supports 8x112G TX and RX lanes
- HCB2 supports 8x112G TX and RX lanes
- High speed signals accessible through 2.4-mm or 1.85-mm connectors



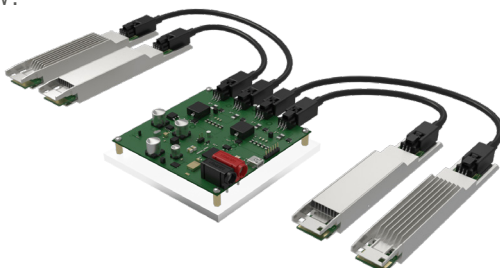
ML4064-XD-HCB1-112

ML4064-XD-HCB2-112

## Thermal Solutions

MultiLane's Thermal Load and Controller Board – the ML4064-XD-TL and ML4064-XD-CNT – provide an early, efficient solution for testing the anticipated 45 W heat dissipation required by the 1.6T generation. Configurable power spots on the thermal load allows for a variety of internal combinations to be tested for both transceiver emulation and cooling solutions.

Up to 4 Thermal Loads can be controlled using the ML4064-XD-CNT Controller Board, allowing for multiple configurations to be tested at once for a total of 176 W.



Four ML4064-XD-TL thermal loads plugged into the ML4064-XD-CNT thermal controller board

### ML4064-XD-TL Key Features

- Total heat dissipation of 44 W using 11 power spots
- 16 power spots of 4 W each for flexible thermal configurations
- 7 temperature sensors to help monitor the
- Available with 2A, 2B, 2C, or 2D heatsinks

### ML4064-XD-CNT Key Features

- Tests up to 4 Thermal Loads simultaneously
- Supports 176 W of dissipation at once
- Power configuration setting through GUI
- Exportable temperature monitoring on all attached modules
- I2C R/W Tab to read/write to the TL EEPROM
- Load/Save MSA for full access to TL EEPROM

**Full specifications available [here](#)**

## Nexus Analyzer

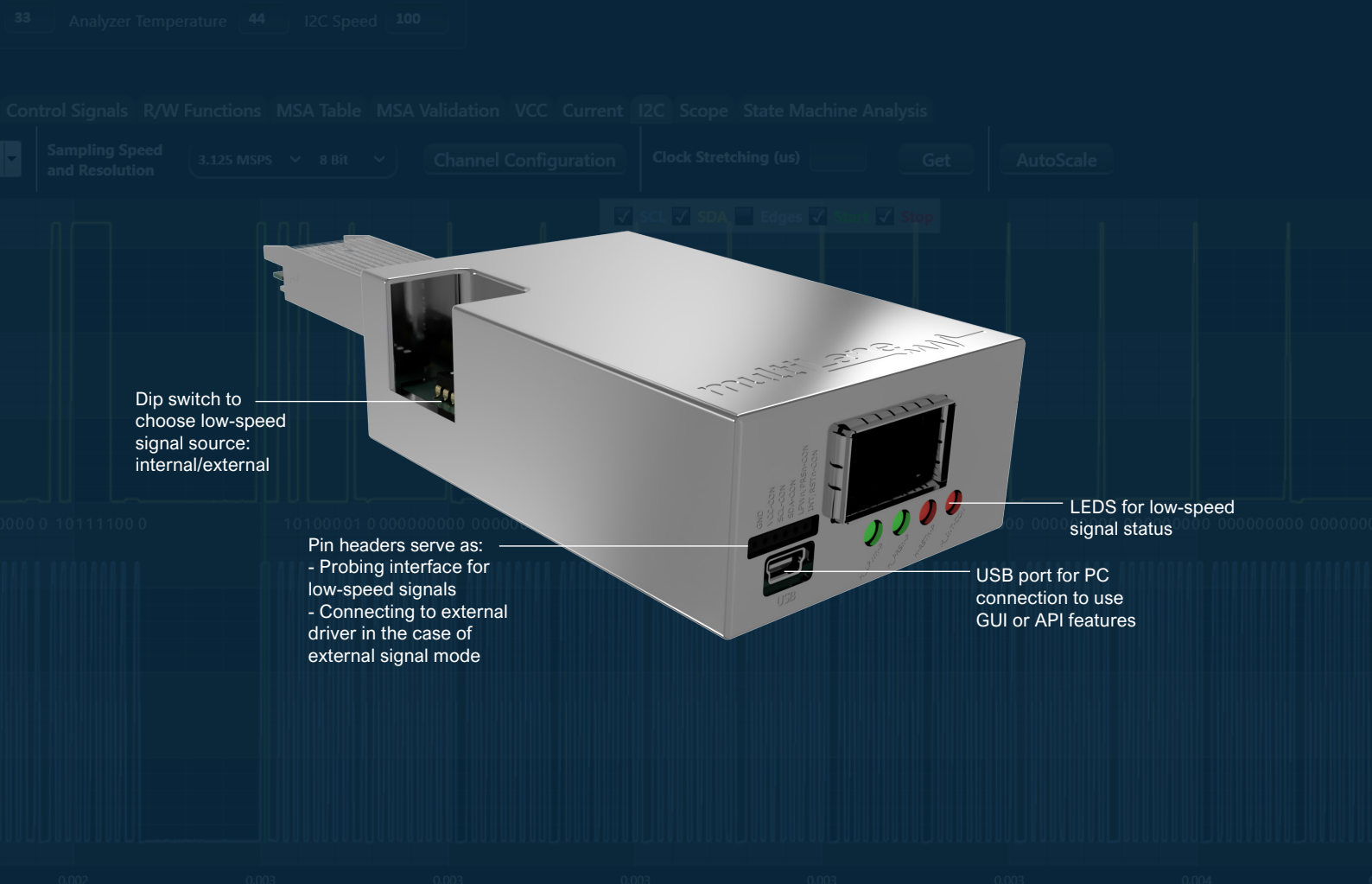
As new CMIS standards are developed and adopted, with a wide variety of small form factor (SFF) and CMIS specs available, CMIS testing becomes increasingly complex and time consuming. The MultiLane Nexus Analyzer is a direct response to this complexity, designed with speed and simplicity at its core. A CMIS/SFF debug tool for interoperability testing and CMIS/SFF failures, the Nexus Analyzer is equipped with a full feature sweep implemented in its GUI.

The Nexus Analyzer is used as a verification tool to validate the CMIS/SFF implementation, with a CMIS/SFF register sweep, state machine and data path state machine testing, I2C R/W commands and packet analysis, included in the product's features.

Capable of running a full system debug in minutes, with pinpoint accuracy on interoperability issues from either the module or host side, the Nexus Analyzer acts as a dramatic accelerant to CMIS adoption across the industry.

The product includes a port extender which connects low speed signals from the host to the plugged module while providing a probing interface at the same time. It also implements SI traces capable of 112G/lane, to connect the TX and RX paths from the host port to the plugged transceiver in the adapter.

Mating onto the adapter through a set of pin headers, the Analyzer gives access to the Nexus GUI with the capabilities to troubleshoot the interoperability between the system and the pluggable. Features include data path state machine testing, a full CMIS/SFF register sweep, I2C communication packets capturing and measurement of voltage and inrush current.



# Nexus Analyzer

## Adapter

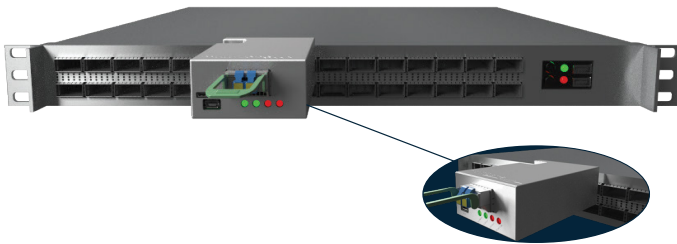
800G Adapter Key Features:

- SI traces and connector support 112G rates
- Support up to 30W modules
- Current and temperature sensor
- Module power ripples and inrush current measurement
- Detection of power spikes during module state transitions
- Probing interface for Vcc and GND pins
- External I2C
- Dip switch to choose low-speed signal source: internal/external
- Available in all SFF/CMIS form factors

## Analyzer

800G Analyzer Key Features:

- Voltage sensor
- ePPS signal validation
- 1 MHz I2C
- Probing interface for low-speed signals
- External control for any low-speed signal:
  - INT/RST
  - LPW/PRS
  - SDA
  - SCL
- LEDs for control/alarm signal status
- USB port for PC connection to use GUI or API features
- Available in all SFF/CMIS form factors



# CHANNEL EMULATION BOARDS

Multilane's Channel Emulation Boards simulate lossy signals allowing vendors to characterize their designs for a variety of real-world environments. The ML4067 features a variety of carefully designed differential test traces, this passive test accessory adds precise ISI (inter-symbol interference) in order to calibrate or stress test DSPs, modules, gearboxes or other relevant systems in real-life environments. The channel emulation board is available to support 112Gbps/lane and 224Gbps/lane, ML4067-112 and ML4067-224, respectively.

## ML4067-112-18/24 Key Features

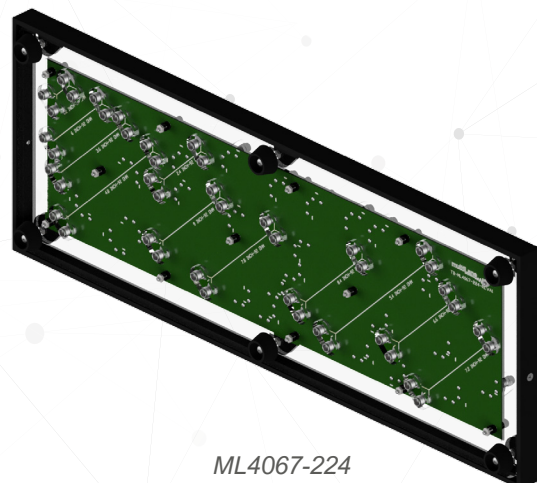
- 13 trace paths
- Loss from 2 dB to 24 dB with a 2 dB increment
- Target Nyquist frequency of 26 GHz
- 100 ohms and 93 ohms differential traces
- Available in 1.85-mm or 2.4-mm connectors



ML4067-112-24/18

## ML4067-224 Key Features

- 11 trace paths
- Loss from 3 dB to 25 dB
- Target Nyquist frequency of 53 GHz
- 100 ohms and 93 ohms differential traces
- Available in 1-mm or 1.85-mm connectors

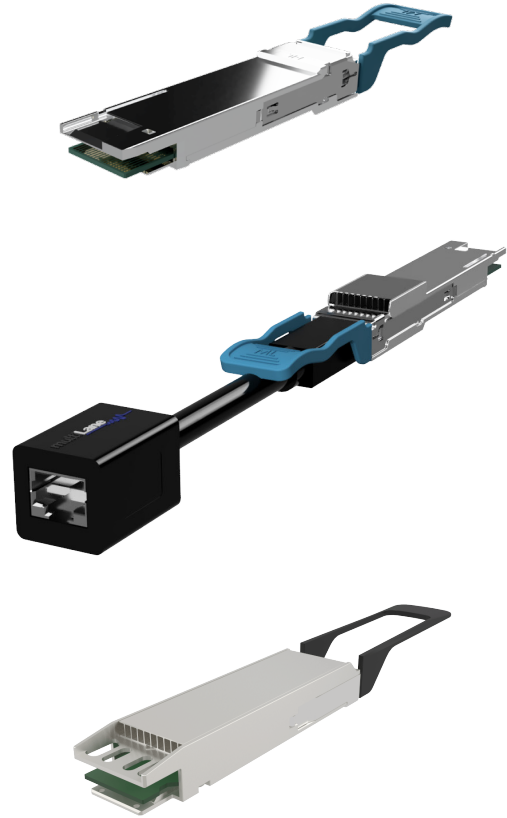


ML4067-224

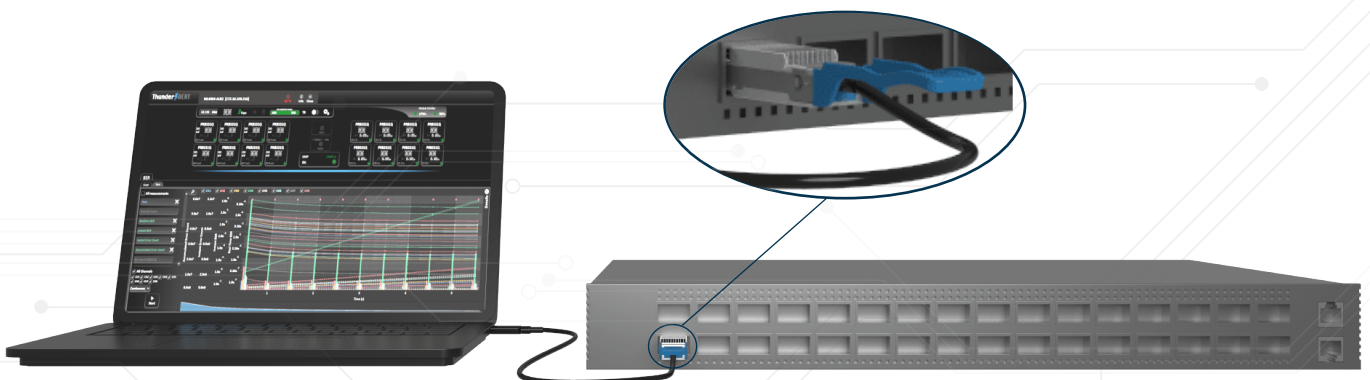
## Active Loopbacks

The move to 800G brings with it a paradigm shift in loopback design. The complex characterization techniques required for host ports at 8x112Gbps necessitate the advent of a new generation of loopbacks to address these challenges. MultiLane's Active Loopbacks are DSP-based modules designed specifically to account for these complex characterization techniques, while also covering the established requirements – thermal management and CMIS interoperability – for host port testing.

- Thermal Emulation
- OSFP800 (ML4064-ALB2-112) QSFP-DD800 (ML4062-ALB2A/2B-112) Form Factors
- PRBS Generator
- BER/ SNR Diagnostics
- Gray Mapping supported
- FIR taps supported
- 800G DSP enables retiming and equalization of host signals
- CMIS Compatible Configuration and EEPROM
- Communication via USB-C, I2C or ethernet
- Programmable MSA memory pages and custom memory maps
- Separate daughter card for configurable power spots, dissipating up to 19W
- DSP dissipates 10W
- Two temperature sensors, voltage sensors



While all Active Loopbacks are CMIS 5.0 compliant, they can also be enhanced with MultiLane's signature ThunderBERT GUI, resulting in a first-of-its-kind combination of instrument and module that can take the place of a full benchtop setup for host port testing. These ThunderBERT enabled ALBs – ALB-TBs – allow for distinct, separate Tx and Rx checking, making use of the ALB's full BER/SNR diagnostics and a PRBS generator through a much faster and more detailed GUI. With instrument-grade measurements packaged in a module's casing MultiLane's ALB-TBs can serve as benchtop replacements in development, speed up testing during production, and can even act as a field debugging tool post deployment.



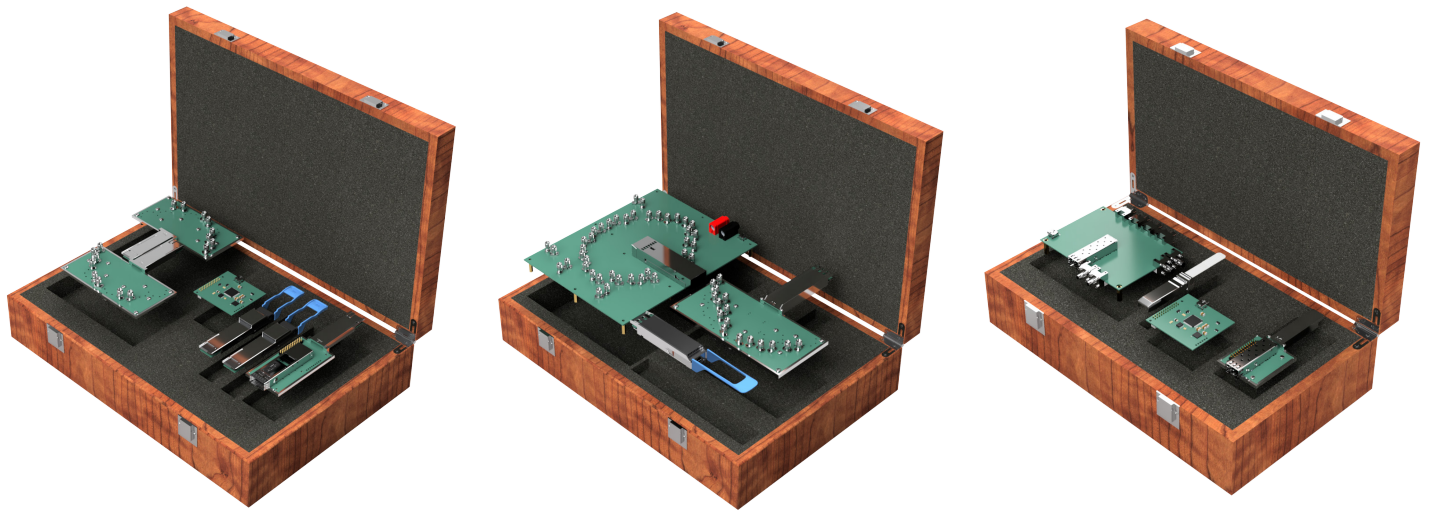


## Data Center DevKits

MultiLane's Data Center DevKits provide an all-in-one solution for network testing and design. Each kit contains the appropriate module/host compliance board, loopbacks, and CMIS analyzers for Module, Host, or Compliance testing across 6 form factors supporting speeds from 50 to 800G.

### Supported Form Factors:

QSFP-DD | OSFP | QSFP | DSFP | SFP-DD | SFP



### Sample 800G QSFP-DD Port Testing Kit:

#### ML4062-MCB-112:

Module Compliance Boards test any pluggables in their respective form factor. They validate the compliance, signal transmission, and any other feature the pluggable has. They also test the thermal capability of modules and can stress test them to evaluate their output.

#### ML4066-QDD and ML4066-ANA-QDD:

Once the compliance of the module is validated, after making sure a clear input signal is followed by a clean output, and after confirming the I2C communication, the module vendor can take a closer look in analyzing the communication between their host, and module.

#### ML4062-LB-112:

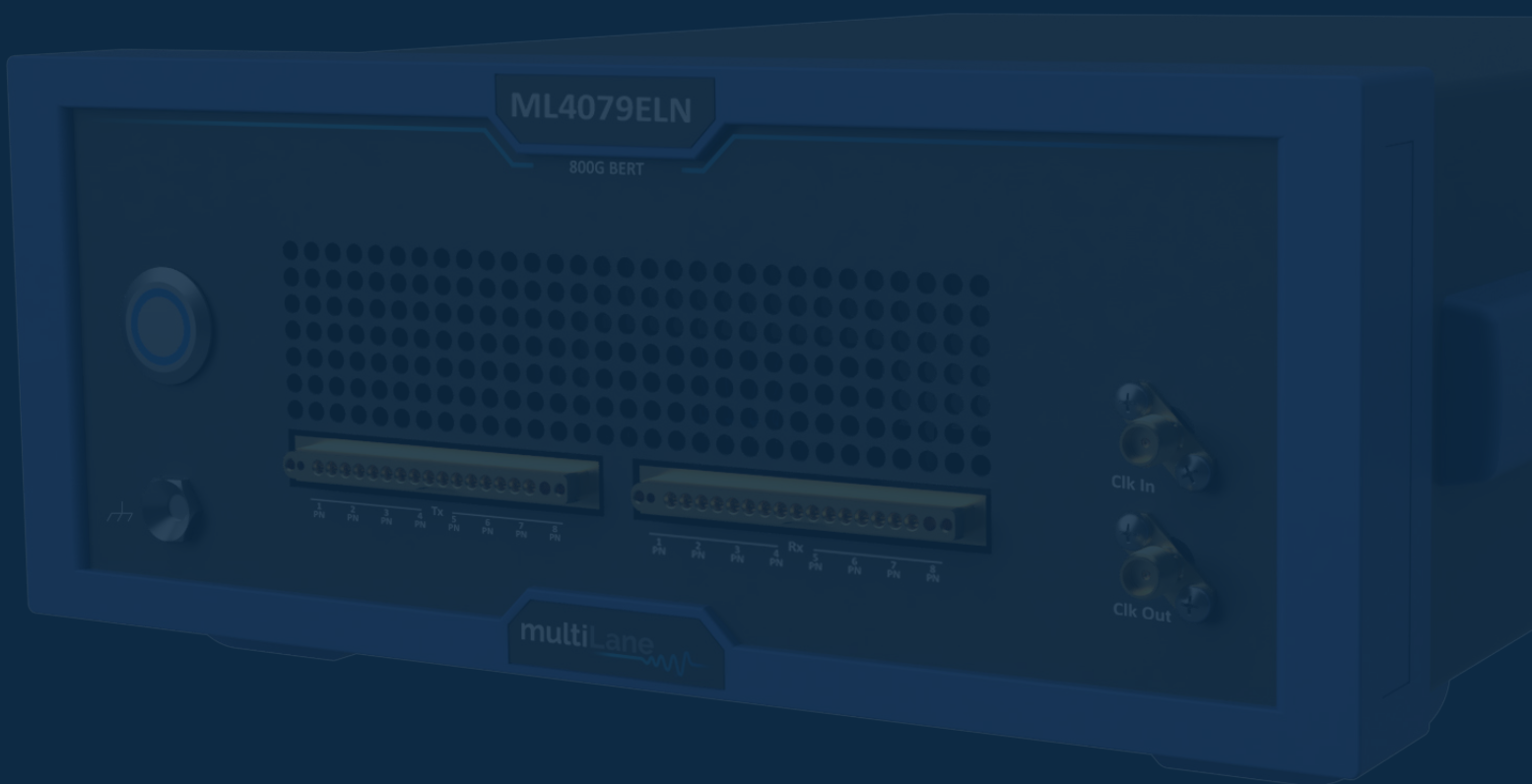
A loopback will loop the TX port back to the RX port. It also emulates the thermal capability of a transceiver. Every loopback is equipped with temperature sensors, and power spots that dissipate a specific amount of power. Module vendors can use the loopback to validate their test setup and to prepare their environment before inserting in and testing their module.

Find a full rundown of the DevKits in their own dedicated catalogue [here](#).

# MEASUREMENT SOLUTIONS

LEADING INSTRUMENTS FOR A MULTITUDE OF USECASES

A core competency at MultiLane, our Measurement Solutions offer a diversity of instruments for equally diverse applications. Whether the latest long reach capabilities of the ML4079ELN BERT, the ML4079EN jitter and noise injection BERT, or ML4081 wideband noise injector, to the clarity and enhanced performance of our new 3rd-Gen Oscilloscopes, to our PAM8-capable ML9004E AWG, or the fastest passive cable testing in the industry with the ML 1105, our Measurement Solutions portfolio has you covered.



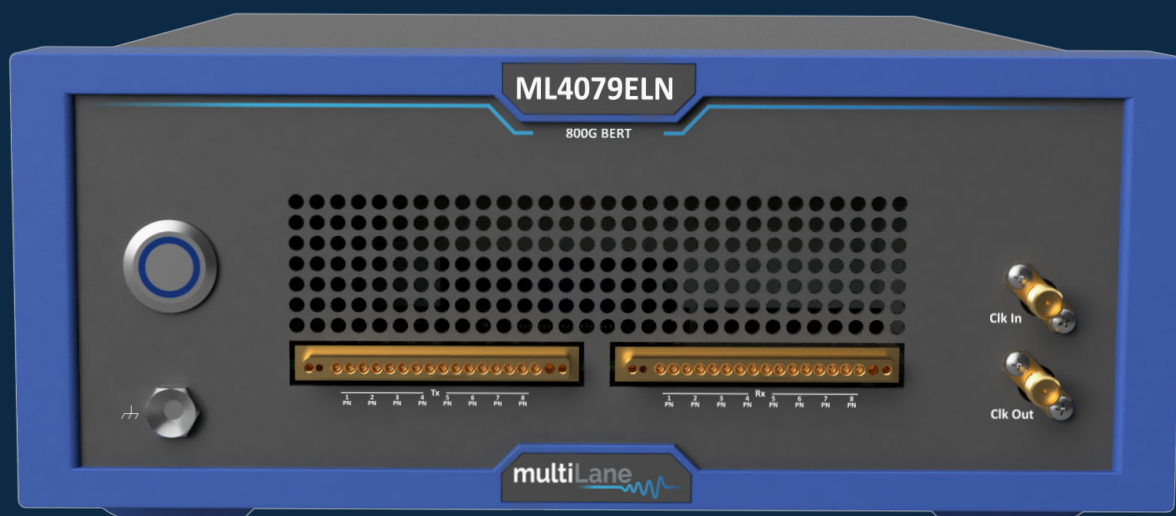
## ML4079ELN | Versatile Long Reach BERT

Designed as an all-in-one solution for the widest variety of applications yet, the ML4079ELN is a long reach 8-channel 800G BERT featuring an Rx equalization of up to 34 dB making it ideal to validate passive and active interconnects including Linear Pluggable Optics, with line rates for ethernet, PCIe gen 3, 5, 6, 7, and low rate for Automotive applications.

The ML4079ELN features a wide range of line rate coverage, up to 34dB equalization, built-in AWGN noise injection, and ratio level mismatch (RLM), control, providing a single platform for testing up to 8x66 GBaud. The ML4079ELN includes transmitter equalization (3 or 7 taps FFE), and receiver equalization. The ML4079ELN can provide measurements for Signal-to-Noise Ratio (SNR), histogram measurements, and Real Time BER Measurements and FEC Measurements.

### ML4079ELN Key Features

- DFE and CTLE Equalization
- Independent control of inner eye levels
- Up to 800 mVpp controllable Tx Amplitude swing
- Supports Gray coding
- Error injection
- 3-tap Pre- and Post-emphasis or 7-tap linear FFE
- Real hardware FEC
- Burst and random noise injection
- SNR monitoring over time
- Automatic pattern detection
- LOS indicators
- Up to 34dB Equalization Capabilities



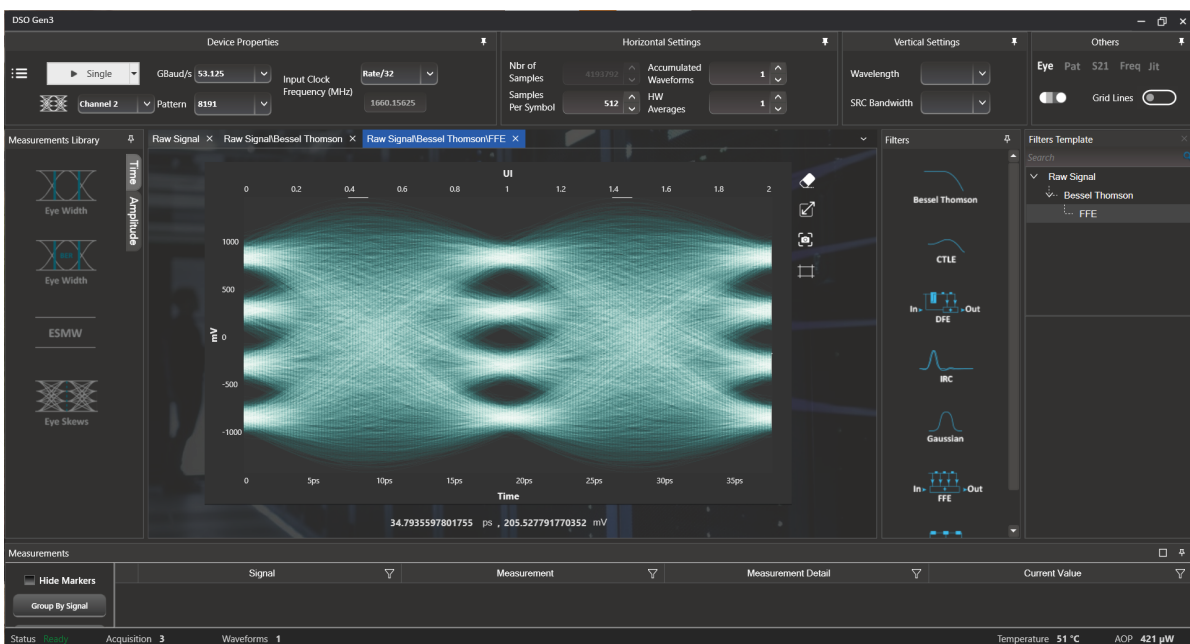
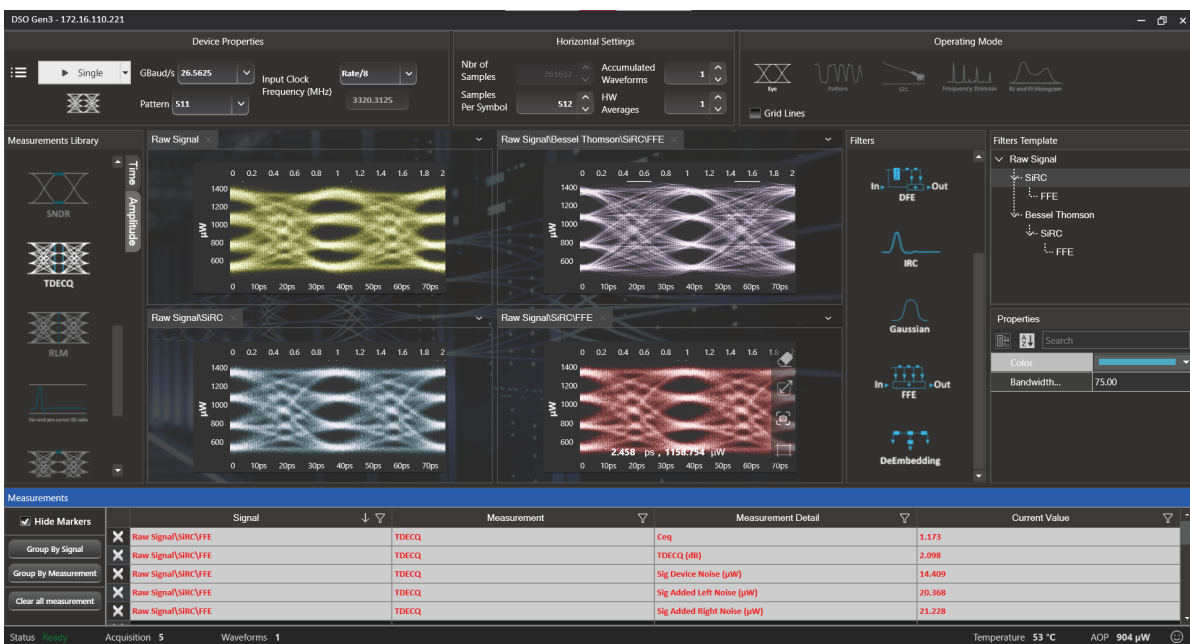
# 3<sup>rd</sup>-Gen Oscilloscopes – Optimized for 112G Optical/Electrical Signals

## Revamped GUI | Seamless Workflow, Streamlined UI, Unrivaled Performance

Built from the ground up with continuous feedback from MultiLane partners, the latest oscilloscope GUI is tailored to the industry’s most requested requirements. Designed for use with the latest lineup of 3rd-Gen MultiLane DSOs, the revamped GUI emphasizes clarity, user-friendliness, and flexibility, allowing users to take full advantage of the powerful new hardware underpinning MultiLane’s most advanced scopes to date.

### Key Features

- Highly configurable to a variety of user requirements
- Save/Load environments with distinct user profiles
- Streamlined experience without compromising performance
- Developed with direct customer feedback



## Instruments

### ML4015E

Serving as either an optical or electrical oscilloscope, the ML4015E is a fully-featured DSO designed for 1G to 800G network testing. With enhanced hardware options offering very low intrinsic noise and phase-based trigger to reduce intrinsic jitter to ensure minimal insertion loss, the ML4015E is particularly effective at capturing 112Gbps/lane signals, benchtop optical characterization, and sensitivity testing for optical receivers.

#### Key Features

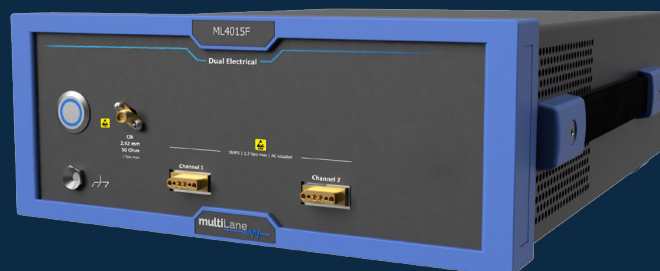
- High-throughput
- Noise floor of 5  $\mu$ W at an analog bandwidth of 25 GHz, and 6-7  $\mu$ W at 40 GHz bandwidth.
- Sensitivity level of -11 dBm for a 25.78 Gbps NRZ signal.
- Up to 50 - 70 MHz sampling rate.
- Less than 10 seconds TDECQ on an SSPRQ pattern.
- An extensive library of built-in DSP filters
- Comprehensive eye mask library

### ML4015F

Built for 224Gbps/lane applications, the ML4015F is a 70GHz Electrical Sampling Oscilloscope that provides a cost-effective, well-correlated solution to measuring 224Gbps signals at scale. The ML4015F is available with single or dual channels with an extensive set of features and functions.

#### Key Features

- A noise floor of 1.2mV at 70GHz bandwidth
- Up to 50 - 70 MHz sampling rate
- Less than 10 seconds TDECQ on an SSPRQ pattern
- An extensive library of built-in DSP filters
- Comprehensive eye mask library
- Individual impulse response calibration performed at factory
- Comprehensive set of APIs and associated sample scripts to accelerate automation



### ML4003BX-BTP

The ML4003BX-BTP is a combined BERT, Optical and Electrical DSO, the ML4003BX-BTP is designed for both production and R&D testing for GPON, EPON, receiver sensitivity, backplane, and data center interconnect testing. The ML4003BX-BTP is available either as a benchtop instrument or a cPCI configuration to fit into a chassis or rack.

#### Key Features

- Up to 32G BERT NRZ
- Real-HW filters for 1G, 2G, and 10G
- 32 GHz Optical DSO
- 32 GHz Electrical DSO with Clock Data Recovery (CDR)
- Loopback from BERT Mode
- External Clock Mode
- Built-in SFP port to directly plug in SFP transceivers
- 2.92 mm k-connectors



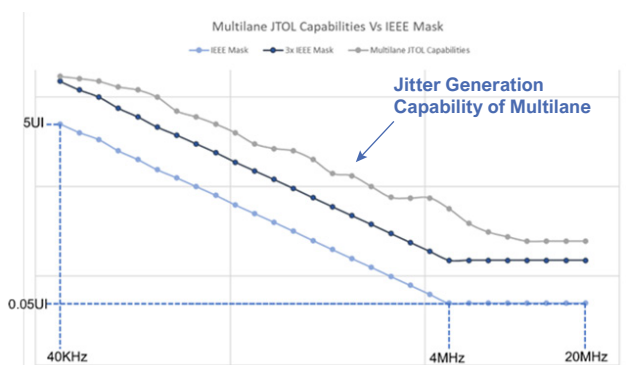
# Stress Receiver Integrated Features

## Are Your Designs Resilient Enough?

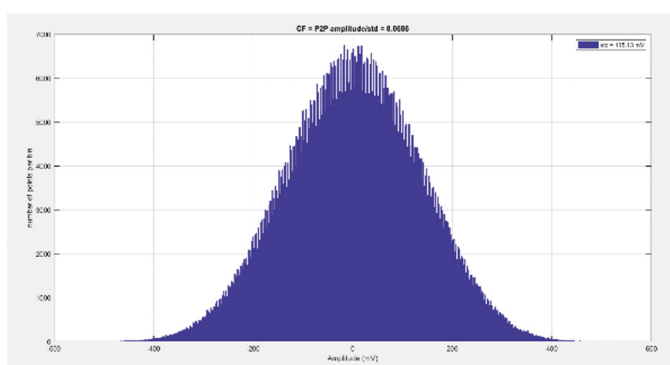
Ensure your devices can stand up to the resilience and sensitivity requirements of the 112G/lane PAM4 ecosystem with MultiLane's new Integrated Stressed Receiver Testing solutions. A new holistic methodology, SITOL integrates ITOL, JTOL, and margin testing into a validation cycle that ensures your designs are capable of meeting and exceeding the expectations at 112G/lane. Even minor dB gains at 100-800G can offer a significant advantage to ensuring server uptime and maximizing results, making an understanding of the margins by which DUTs exceed the base requirements all the more important. With noise injection capabilities three times the standard set by the IEEE, MultiLane's award-winning suite of SITOL capabilities provide a vital edge in an ecosystem that is coming to favor more resilient designs.

MultiLane takes IEEE standard requirements to another level. With automated Jitter and Noise Solutions, we are able to accurately establish not only whether a DUT is resilient enough to operate reliably under real-world conditions, but also determine its operating margins above the spec limit.

MultiLane JTOL Performance



MultiLane ITOL Performance



# Time Domain Reflectometry

## Pulsar

MultiLane Pulsar is a 4-channel Time Domain Reflectometry analyzer that simplifies troubleshooting by providing full SI insights, enabling the detection of impedance mismatches, discontinuities, and skew measurements. Pulsar is designed with scalability for parallel measurements and optimized for high-throughput, making it ideal for testing high-density ports.



ML4025E-PLS



ML4025F-PLS



MultiLane Pulsar

## ML4035

The MultiLane ML4035 3-in-1 400G BERT, TDR, and DSO offers a full range of testing capabilities from 400G BER measurements, to NRZ and PAM4 eye diagram characterization, and TDR and S-parameter evaluation, all in one compact package

### Key Features

- 4-lane sampling scope
- 4-lane 53 GBd PPG
- 4-lane true-differential TDR/TDT
- 400G BERT
- Automation SW for Cable Testing
- High Throughput



## Instruments

### ML4081/4081-X

A dedicated AWGN injector and Pick off-Tee board, respectively, the ML4081 and ML4081-X are designed to highlight the effects of noise on both a signal's BER and eye diagram. Used in a setup with a BERT, a clean signal is passed through the ML4081-X, where the ML4081 injects random noise. The resulting lossy signal is then routed to an awaiting DSO for the eye diagram, and looped back into the BERT to check the effect on the BER. The ML4081/ML4081-X are ideal for use in BIST applications for ATE, margin testing services, or PCIe BIST test applications.

#### Key Features

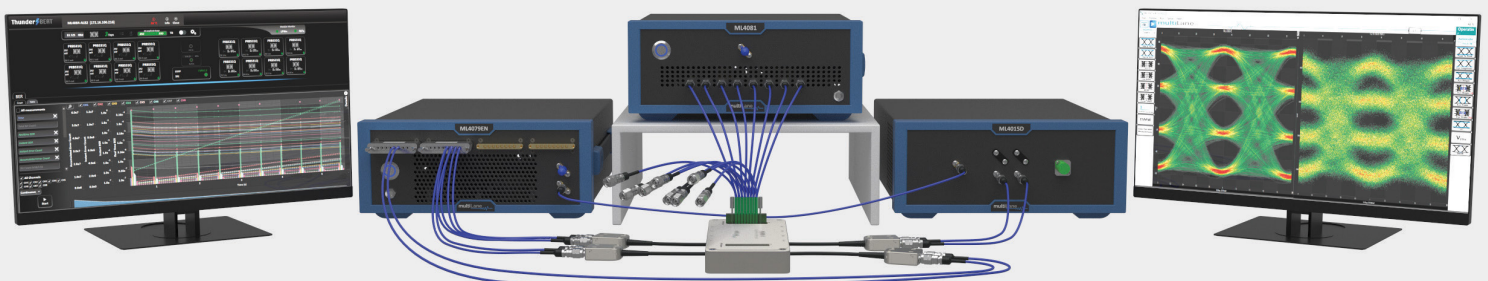
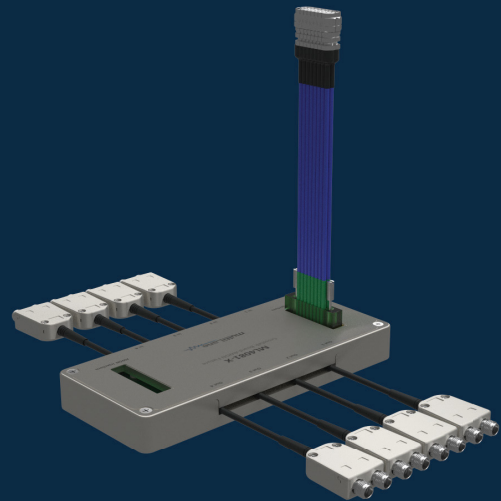
##### ML4081: AWGN Generator

- IEEE Interference
- Crest Factor >5
- 4 differential or 8 single ended channels
- Programmable Bandwidth 1-30 GHz
- Amplitude -30 dBm to -2 dBm
- Programmable Spectral Shaping
- Calibrated Amplitude accuracy 2 %
- Amplitude noise resolution 0.3 Db
- 2.4 dB Noise flatness to 30 GHz



##### ML4081-X: Pick Off-Tee Board

- 8 or 16 differential Lanes
- Routing for both clean and Noisy Signals
- Creates a defined stress source for receivers under test



Full ML4081/4081-X Setup



# Instruments

## ML4079E

The ML4079E is an 800G BERT featuring signal to noise ratio (SNR) and histogram measurements, and allows users to implement transmitter and receiver equalizers. Most importantly, it supports real hardware FEC analysis, crucial to 800G setups, providing a clear picture of DUT behavior in a real-world environment. The ML4079E can be combined with the ML407-PAM jitter clock source for jitter tolerance testing.

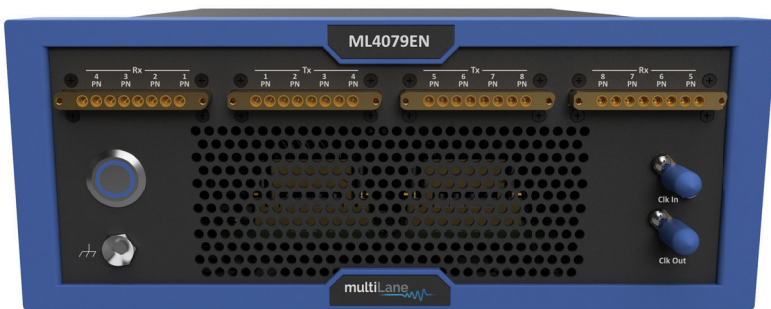
### Key Features

- 23-29 & 46-56 GBd PAM4/NRZ
- Real Hardware FEC (KR4/KP4 Analysis)
- Dense M-SMPM connectors



## ML4079EN

The ML4079EN provides the same basic setup as the ML4079E – real hardware FEC analysis – but with unique stress testing capabilities (JTOL, ITOL...), and an output of 1.5 V. An 800G BERT with signal to noise ratio (SNR) and histogram measurements, and transmitter and receiver equalizers.



### Key Features

- 20-29 & 36-61 GBd PAM4/NRZ
- Real Hardware FEC (KR4/KP4 Analysis)
- Dense M-SMPM connectors
- Stress Testing Features: Manual and Automated JTOL and ITOL, Inner/Outer Eye Control
- Up to 1.2Vpp Tx amplitude swing

## Instruments

### AWG ML9004E

The MultiLane ML9004E – the company’s most advanced AWG to date – offers high-speed SerDes transceiver and amplifier validation, with Rx jitter tolerance testing. A versatile instrument, the ML9004E supports compliance PHY and protocol stress testing of MIPI C/D-PHY, MIPI M-PHY, PCIe5, USB4, and more. The ML9004E is also designed for 400G ZR Coherent module development and validation with BER and FER testing capabilities.

#### Key Features

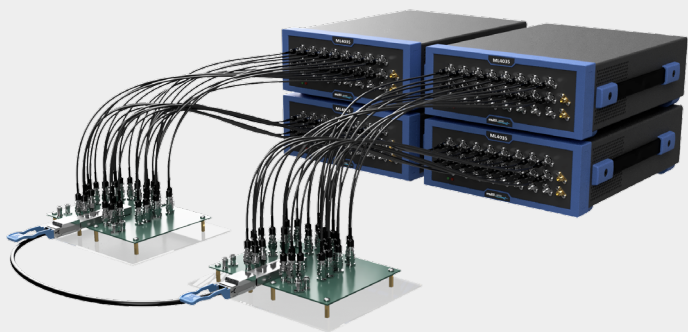
- 4-channel Differential AWG (0.1-64 GB) and User Defined Modulation
- Programmable RJ and SJ (dual tones) Jitter injection in AWG mode
- Cross talk emulation by BUJ jitter injection
- ISI emulation (LPF) and de-emphasis in AWG mode
- 2 Dual-Channel (I/Q) Differential PPG (25-64 GB) with NRZ/PAM4 modulation
- Coherent signals generation for QAM modulation
- Built-in 7-tap or 60-tap FFE in PPG mode



# MultiLane Cable Testing Solutions

## Multiport Cable Testers

MultiLane cable testers are the fastest on the market, capturing S-parameter measurements on 16 differential lanes in seconds while providing the industry's simplest calibration procedure. Optimized for high-volume manufacturing, incoming inspection, RMA, and high-density backplane cables, our multiport cable testing solutions are scalable to over 64 ports. Making full use of our 3 in 1 BERT, TDR, and DSO the ML4035, the user-friendly setup can be fully automated to generate a pass/fail report based on time and frequency domain measurements including insertion loss, return loss, crosstalk, and TDR.



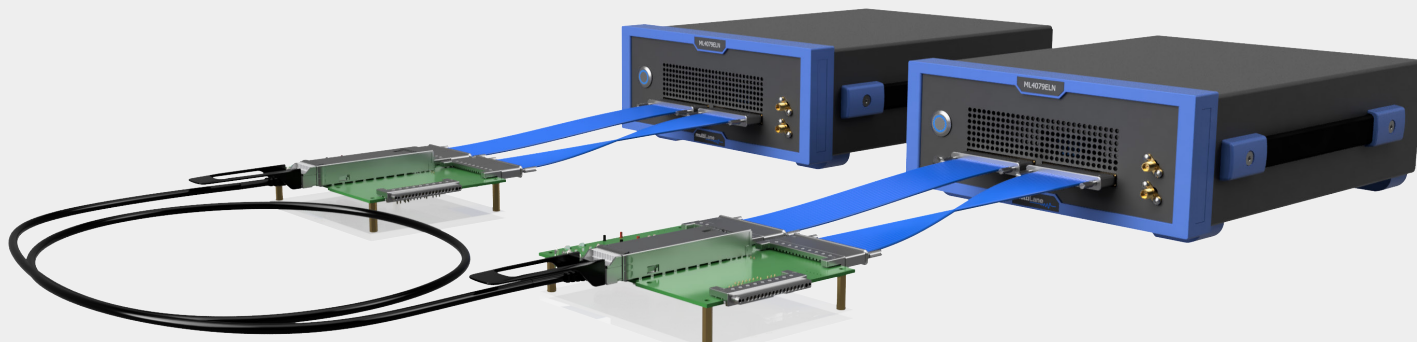
## Active Copper Testers

MultiLane covers the full range of active copper testing, with redriver and retimer solutions for Active Copper Cables (ACC) and Active Electrical Cables (AEC) respectively. Our AEC testing is fully HiWire compliant, using our ML4054E 800G BERTs for real hardware pre- and post-FEC measurements and CMIS validation. Our ACC solution – which uses our ML4035 3 in 1 BERT, TDR, and DSO – is the fastest on the market, capturing S-parameter measurements on 16 differential lanes in seconds, while providing the industry's simplest calibration procedure. All our active cable solutions include fully automated pass/fail report generation, BER, eye diagram, and S-parameter/crosstalk testing, making them ideal for R&D, manufacturing, and RMA.



## The ML4079ELN for Cable Testing

The ML4079ELN's high equalization capabilities makes it the go-to solution for test both active and passive interconnects. Users can validate BER, FEC, and push DUT limitations to their full extent, with built in noise injection.



# Automated Test Equipment

## A New Class of Instrument for Wafer Level Testing

MultiLane has partnered with leading ATE providers to codesign turnkey solutions for an industry that stands to benefit from a new class of high-speed external instruments at wafer probe. MultiLane has demonstrated the viability of production level wafer testing with successful measurements taken at 28 GBd and 56 GBd PAM4. Our ATE solutions bring our same benchtop signature eye for accurate, scalable solutions, reconfigured to fit into the popular industry SOC tester platforms.

### Highspeed Multi-port Datacom Test

- 400/800 Gigabit Ethernet
- PCIe Gen4/5/6
- USB4

### Leading Performance

- Up to 112 Gbps/lane
- NRZ/PAM4
- Multisite
- PRBS waveforms
- User-defined waveforms

### Field Deployed

- KGD wafer and packaged parts
- USA OSATs
- Asia OSATs

### Semiconductor ATE Compatible

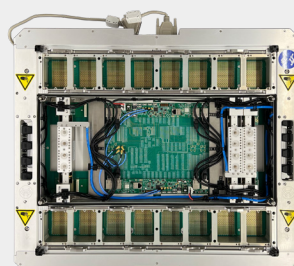
- Hardware
- Software
- Mechanical



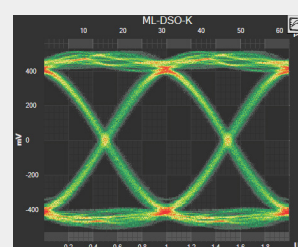
OT4039FN  
4-lane, 224 Gbps (112GBaud) BERT cassette



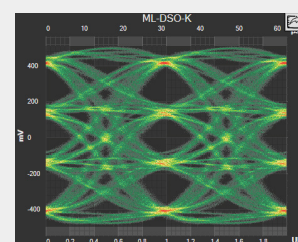
OT4025-70GHz  
4-channel, 70 GHz bandwidth digital sampling oscilloscope cassette



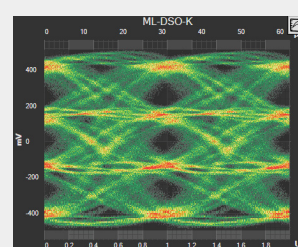
32G NRZ PCIe Gen 5



32G PAM4 PCIe Gen 6



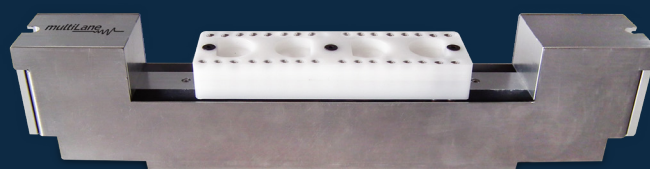
With Jitter Injection



## AT4080

- 4-Lane Arbitrary Waveform Generator
- 1-64 GBd selectable Baud Rate
- User defined modulation
- NRZ/PAM4 modulation
- Independent 7-tap FFE on each transmitter
- Generate coherent signals for QAM modulation
- Independent control of inner eye levels
- Tune the bit rate in very fine steps

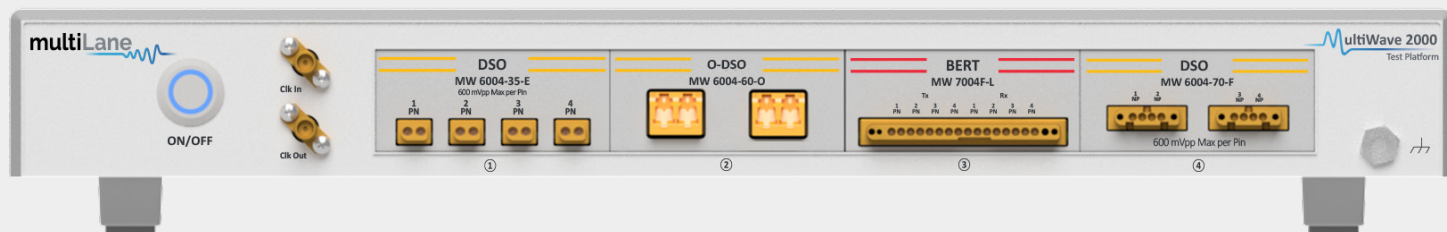
[Read full specifications here](#)



# Next-Gen Measurement Solutions

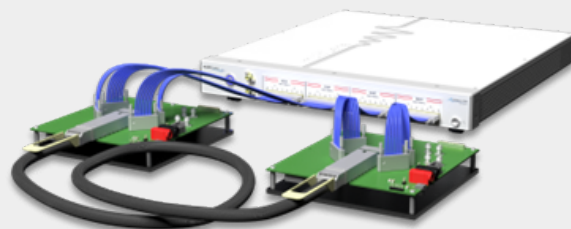
## MultiWave Test Platform

The MultiWave Test Platform (MWTP) is the latest measurement solution from MultiLane, with top-tier performance and flexibility across a wide variety of testing applications. Using the latest MultiLane Mirage Enclosure, the MWTP can house up to 6 different instruments in a single rack unit – for both data center and benchtop environments – offering a range of solutions suited to any testing need.



## MultiWave Modules

- MW 7004F-L 224Gbps/lane 4-channel BERT
- MW 7008E-LFN 8-Lane 112Gbps/lane Long Reach BERT
- MW 7004E-SNJ 4-Lane 112Gbps/lane BERT
- MW 6004-70-E 4-channel 70GHz electrical DSO
- MW 6004-35-E 4-channel 35GHz electrical DSO
- MW 9004E Differential Arbitrary Waveform Generator



## Your Instrument, Your Way

The MWTP provides the perfect balance of flexibility and ease of use. The expanded enclosure allows us to offer a series of models and options, placing any combination of MultiLane instruments into a custom-built MultiWave Test Platform. The resulting instrument allows for specific user-defined testing in a fixed package, suitable for any lab.

## MWTP Applications

- Post silicon Validation
- V&V Characterization
- End-of-Line Board-level test
- High-speed component manufacturing
- Field Failure Analysis
- High-density passive and active interconnect characterization & testing

## Specialty Instruments

Working at the forefront of high-speed I/O innovation, MultiLane offers pre-built solutions tailored to some of the most common testing applications required by the industry. These Specialty Instruments target specific – and common – usecases, ensuring an accelerated time to market for technologies in high demand.



# ENGINEERING TEST SERVICES

## TESTING AS A SERVICE

With a decade of experience developing solutions at the forefront of the industry, MultiLane has cultivated a wealth of engineering and high speed physical layer testing expertise that stands ready to be placed at your fingertips. Our Engineering Test Services provide customised requests either in the form of a plan to validate or test your products at one of MultiLane's labs, team augmentation, or custom engineering solutions.



## ABOUT US

Since 2006, MultiLane has been offering high speed test and measurement equipment for data communications. We help chart industry evolution and accelerate the adoption of new technologies with a complete cycle support of data center test solutions encompassing IC and transceiver characterization, host line card testing, and link testing. We provide a range of form factors and architectures, from portable instruments, to stand-alone bench top instruments to automated test platforms. We also assist our customer base with compliance and interoperability test services. We serve developers, module vendors, network installers, and data center operators with high-performance, reliable equipment at an attractive price-point. MultiLane provides leading-edge solutions for the latest data center technologies and well-established technologies, from 800G at 112Gbps/lane to industry-first 1.6T thermal testing solutions, with a comprehensive set of development solutions for MSAs ranging from SFP, DSFP, QSFP, QSFP-DD, QSFP-DD800, and OSFP800.

The MultiLane portfolio encompasses optical and electrical oscilloscopes, bit error rate testers, time domain reflectometers (TDR) for TIA and cable testing, interconnect products, as well as fully automated DAC and transceiver test solutions, and compliance test services for 100G and 800G technologies. Developers, manufacturers, and installers of these new technologies all need the wide portfolio of solutions to be able to do their jobs successfully.

## MULTILANE EXPERTISE AT YOUR FINGERTIPS

With a decade of experience developing solutions at the forefront of the industry, MultiLane has cultivated a wealth of engineering and high speed physical layer testing expertise that stands ready to be placed at your fingertips. MultiLane Engineering Test Services leverage Tier-1 instrumentation solutions to ensure optical transceivers, cables, and systems adhere to the highest industry standards.

# Test as a Service

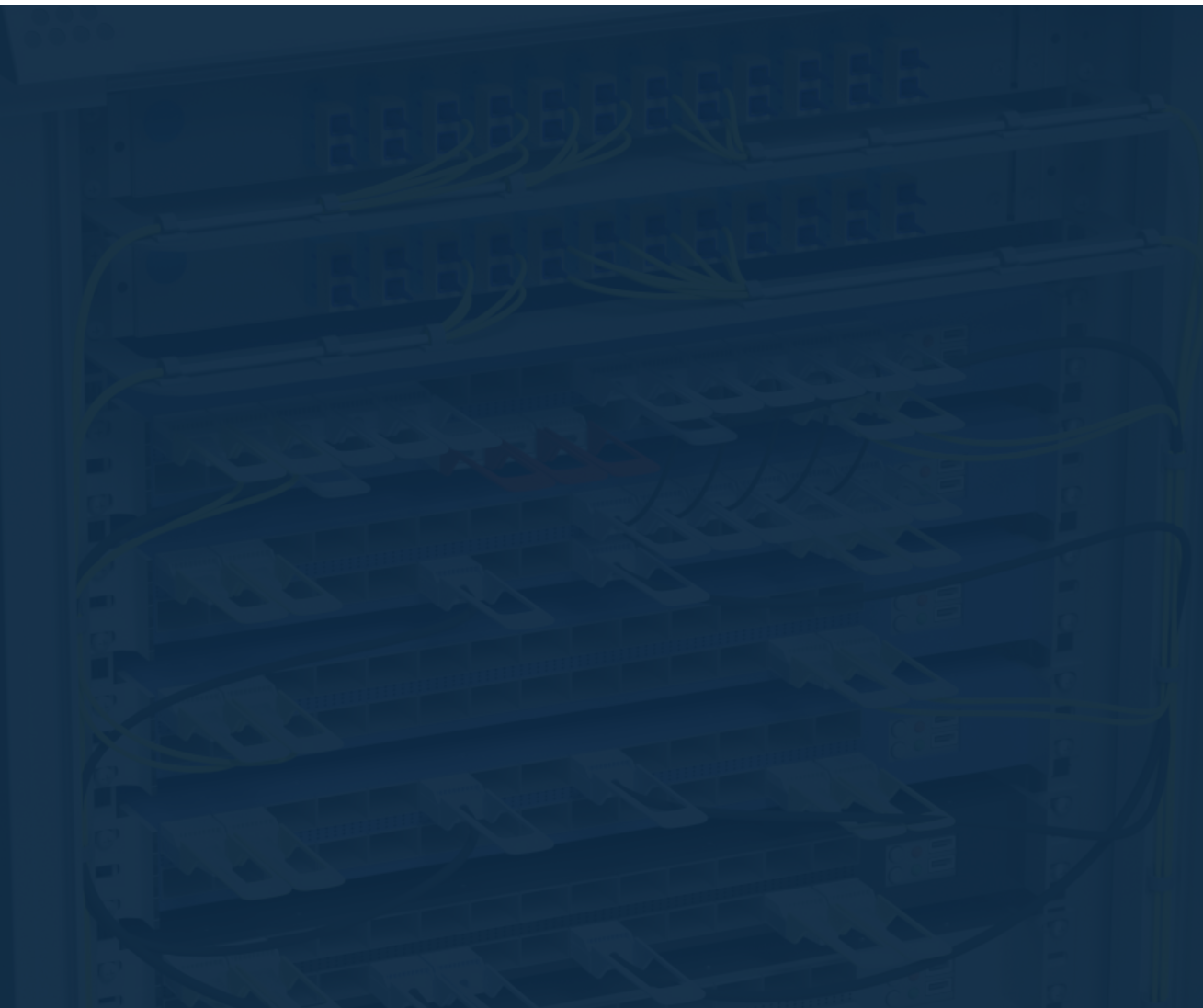
MultiLane Engineering Test Services (ETS) are committed to confidence, enabling accelerated pluggable development and qualification thanks to comprehensive compliance testing and team augmentation. MultiLane testing services are optimized for high-throughput, enabling volume testing for pre-production and RMA scale validation.

## Compliance Testing

Multilane compliance testing services encompass the entire spectrum of Tx and Rx testing for transceivers, cables and modules ranging from 1G to 800G; covering rigorous evaluations for electrical, optical and environmental measurement as well as extensive testing capabilities for jitter and noise analysis.

MultiLane multi-corner environment tests allow for a fully customisable approach to seeing how devices perform in a variety of situations, with any combination of the following factors:

- High, low, or nominal temperature
- High, low, or nominal voltage





# A Comprehensive Suite of Tests

## Module-Level Electrical, Optical, and VNA Testing

Test Category	Subset of Supported Measurements	Trace Number	VNA Measurements
Electrical TX Test	<ul style="list-style-type: none"> <li>• Rise Time</li> <li>• Fall Time</li> <li>• Near End ESMW</li> <li>• Near End Eye Height</li> <li>• Far End ESMW</li> <li>• Far End Eye Height</li> <li>• Differential output voltage</li> <li>• Differential PK-PK Input Voltage</li> </ul>	1	Output return loss Sdd22
		2	Output common to differential mode conversion Scd22
		3	Input return loss Sdd11
		4	Input differential to common mode conversion Sdc11
Electrical RX Test	<ul style="list-style-type: none"> <li>• BER</li> <li>• Stress Input Low &amp; High Loss Channel</li> <li>• Jitter Injection and Tolerance</li> <li>• Noise/Crosstalk Injection and Tolerance</li> </ul>		
Optical TX Test	<ul style="list-style-type: none"> <li>• Transmit Power (OMA, AOP)</li> <li>• TDEC(Q)</li> <li>• Extinction Ratio</li> <li>• Transmitter Eye Mask Definition</li> <li>• Rise Time</li> <li>• Fall Time</li> </ul>		
Optical RX Test	<ul style="list-style-type: none"> <li>• Receiver Sensitivity</li> <li>• Waterfall Curve</li> <li>• Stressed Receiver Sensitivity</li> </ul>		

## MultiLane System-Level Testing

MultiLane system-level services use instruments and Ethernet Switches to provide system-level insight and real-world DUT performance.

### Types of System Testing



#### BER Switch Test:

Validate switch performance at different optical attenuations with MLO4034 optical switch box.

#### FEC Link Test

Pre- and Post- FEC BER validation with real-HW FEC enabled MultiLane BERTs

#### CMIS Testing

Extensive Host to Module and Module to Host CMIS validation

# Interoperability Between Two Modules

## Ensure Seamless Communication Across Single and Multi-Switch Configurations

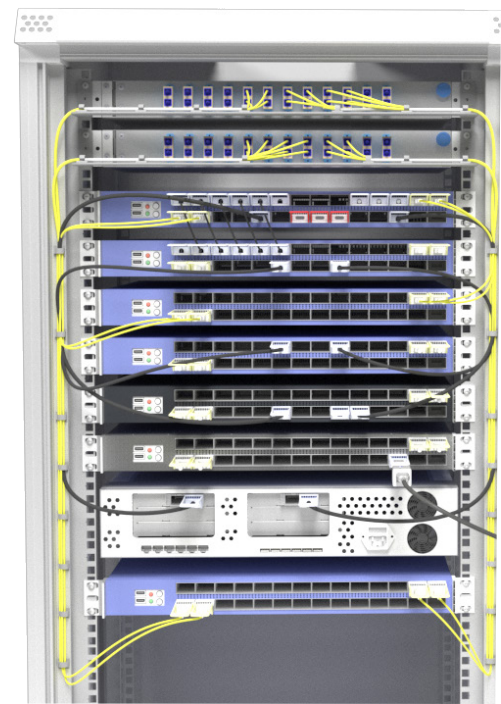
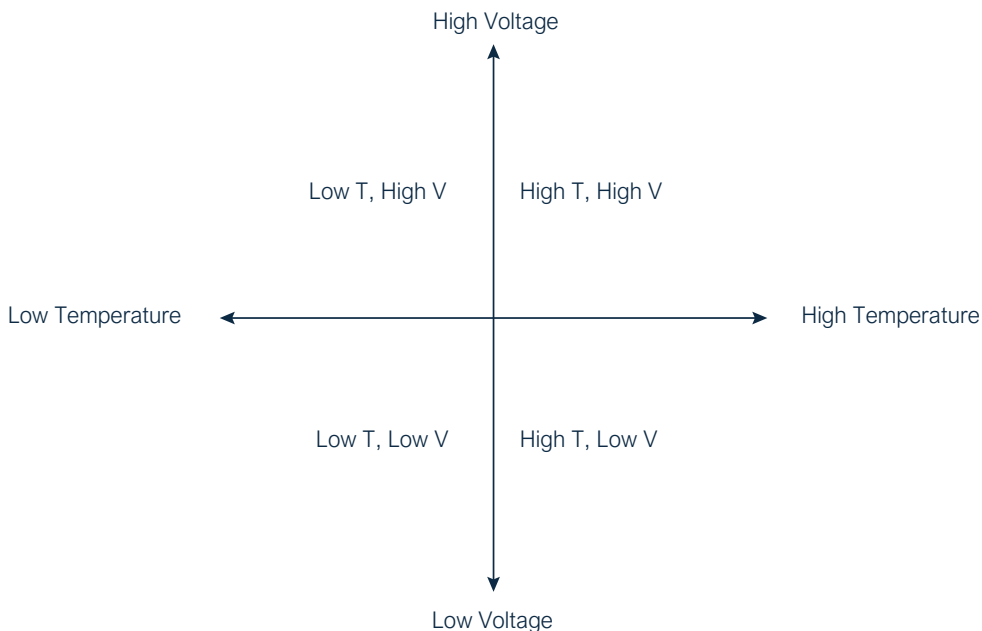
- Verify seamless communication and data transmission between two different optical modules from different manufacturers
- Conduct L2/L3 Traffic Testing across complete system topology
- Test Forward Error Correction (FEC) and Bit Error Rate (BER) to focus on marginal-performance links
- Entire test bed can be placed in thermal chamber to specifically emulate all environmental conditions



# Full System Interoperability

## Pre-Deployment Rack Certification

- Complete Rack Integration with all supported transceiver/switch topologies
- Layer 2+ traffic testing with industry-standard Ethernet traffic generators
- A-to-Z test automation
- Large thermal chambers for multi-corner testing with full load traffic
- **Moldable capacity tailored to the customer's specific business needs**
- Available in both Fremont and Lebanon facilities



# INTERCONNECT PORTFOLIO

DEPLOY YOUR INSTRUMENTS WITH OUR INNOVATIVE INTERCONNECTS

MultiLane Interconnects use the most advanced manufacturing technology available, to develop a suite of solutions emphasizing high density & repeatability for single ended & differential cable assemblies, test boards, precision adaptors, terminators, coaxial adapters, and RF cable assemblies in high volume. All products are designed and assembled with industry-leading quality in our USA branch and Lebanon headquarters.

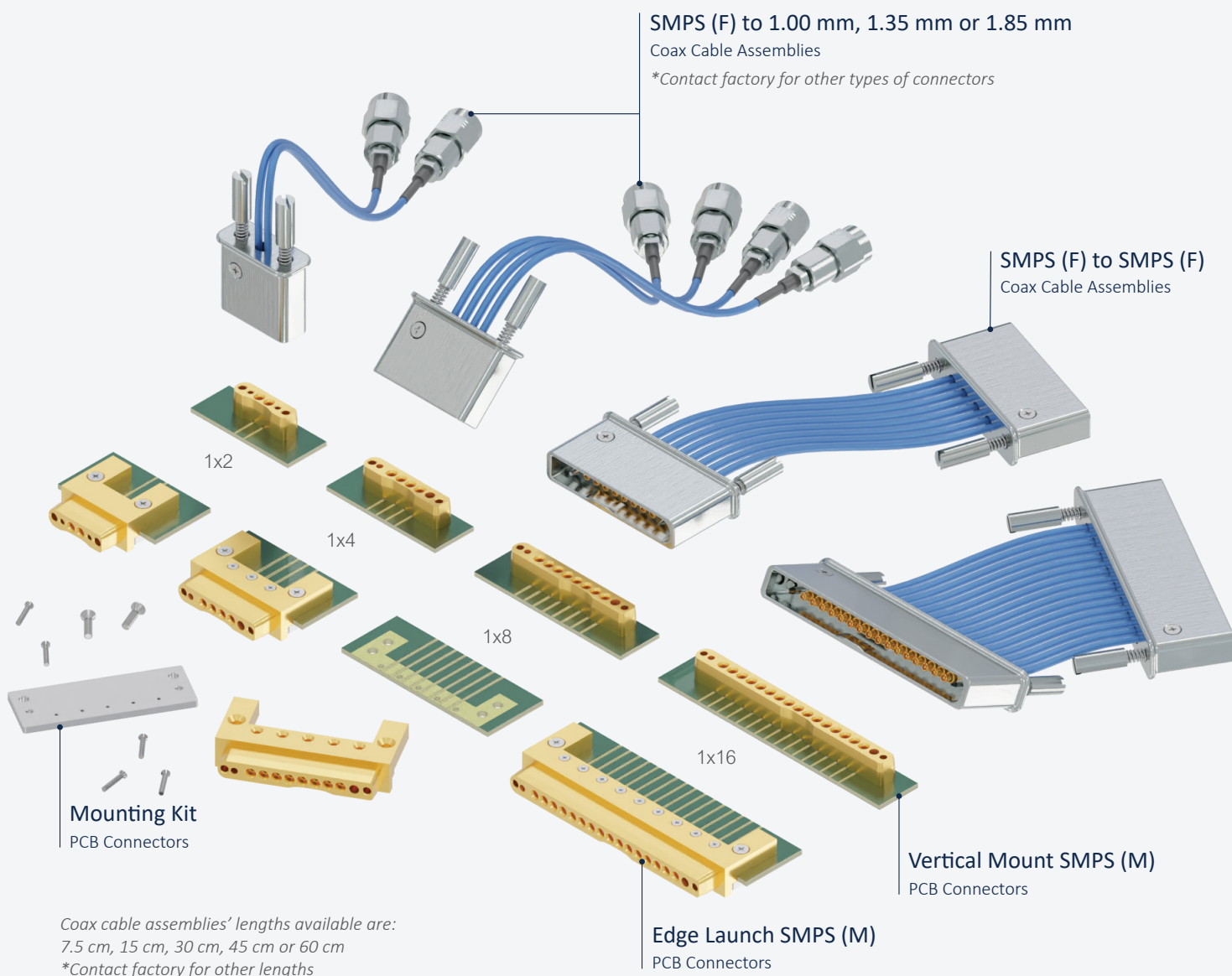




# SMPS Interconnects | DC- 110 GHz

## Subminiature Push On Sub-micro

A Comprehensive Offering:



### Features:

- Solderless design
- High density 2.54 mm pitch
- High performance DC-110 GHz
- Blind-mateable mating interface
- Coplanar waveguide & stripline compatible

### Benefits:

- Compact footprint
- Easy field installation & replacement for lower cost, fast cycle time and high repeatability
- Fully customizable
- Cost effective



**Higher Density**

Responding to increased channel count

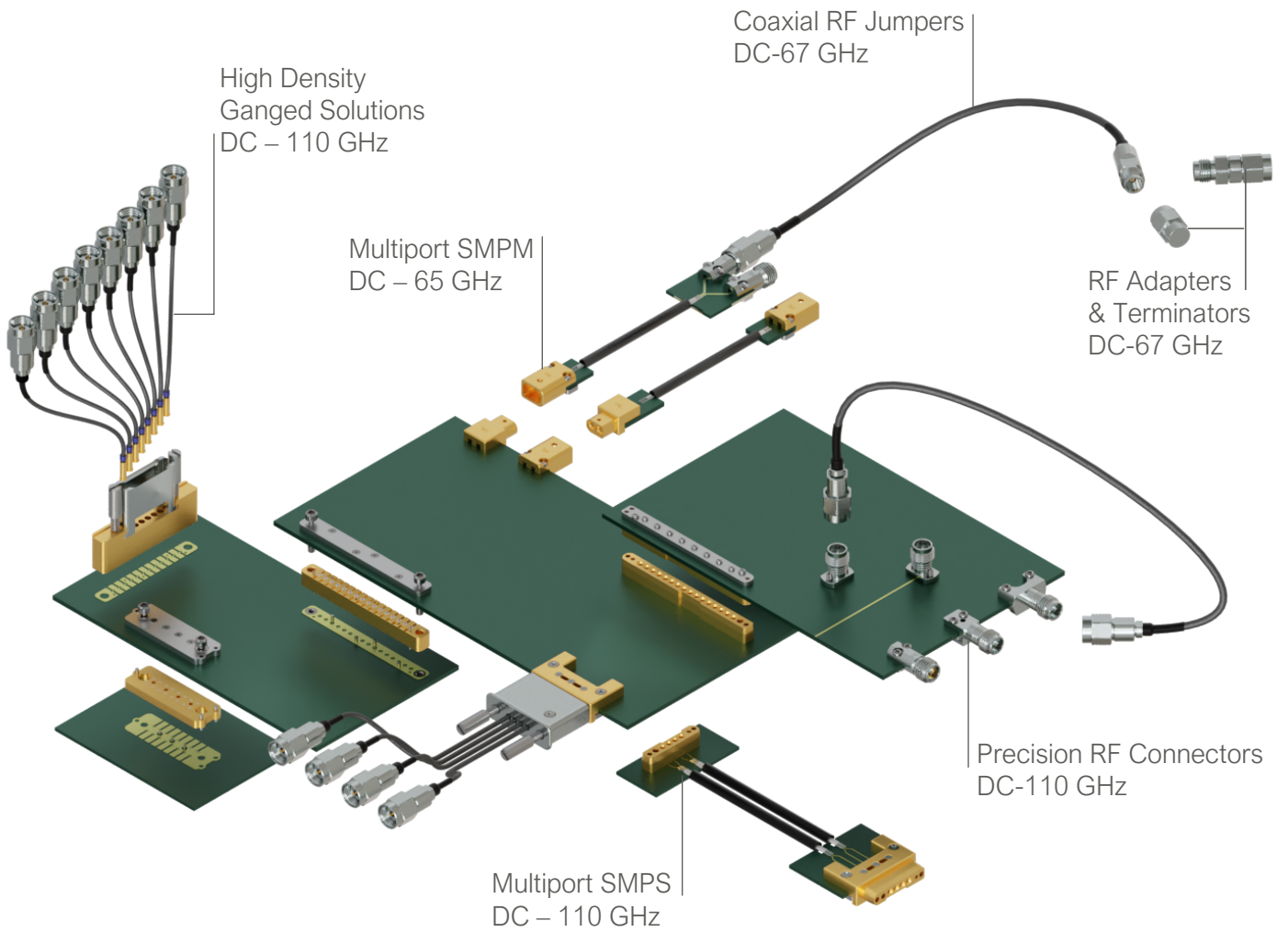


**Higher Performance**

Higher Performance Accommodating higher frequency & higher data rates



**Cost Effectiveness & Global Supply**

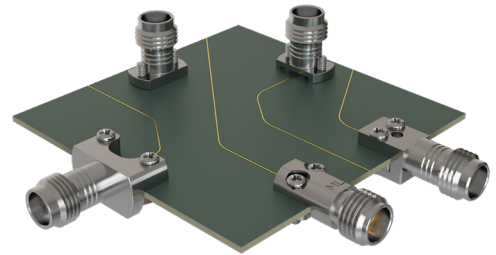


# INDUSTRY'S MOST REQUESTED

## An interconnect for every instrument

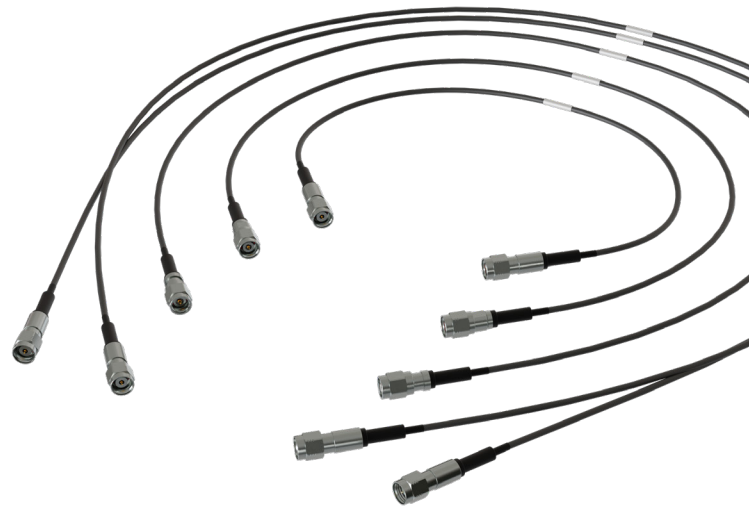
### Solderless Board Mount Precision RF Connectors | DC-110GHz

- Vertical Launch: Coplanar Waveguide and Stripline transmission lines compatible
- Edge Launch: EMI, Wide Body, Narrow Body both Coplanar Waveguide and Stripline transmission lines compatible
- 1.00 mm, 1.35 mm, 1.85 mm, 2.40 mm, 2.92 mm
- Configurable footprint to stack up
- Test boards available
- Customization offered



### Rf Jumpers | DC-67GHz

- Ø.047 Coax Cables with 1.00mm, 1.35 mm, 1.85 mm, 2.40 mm & 2.92 mm precision connector interfaces
- Ø.086 Coax Cables with 1.85 mm, 2.40 mm & 2.92 mm precision connector interfaces
- Phase stable assemblies sold individually and in pairs matched to 2 picoseconds
- 12 in, 24 in, 32 in, 39 in & custom length available
- 50-ohm cable assemblies
- Customization offered



### Adapters | DC-67GHz

- 1.85mm, 2.40 mm & 2.92 mm
- Between Series & Within Series
- Straight configuration
- 50 ohms coaxial adapters
- Rated to 500 mating cycles typical

### Terminators | DC-67GHz

- 1.85mm, 2.40 mm & 2.92 mm
- Male & Female straight configuration
- 50 ohms coaxial terminators
- Rated to 500 mating cycles typical



# multiLane



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