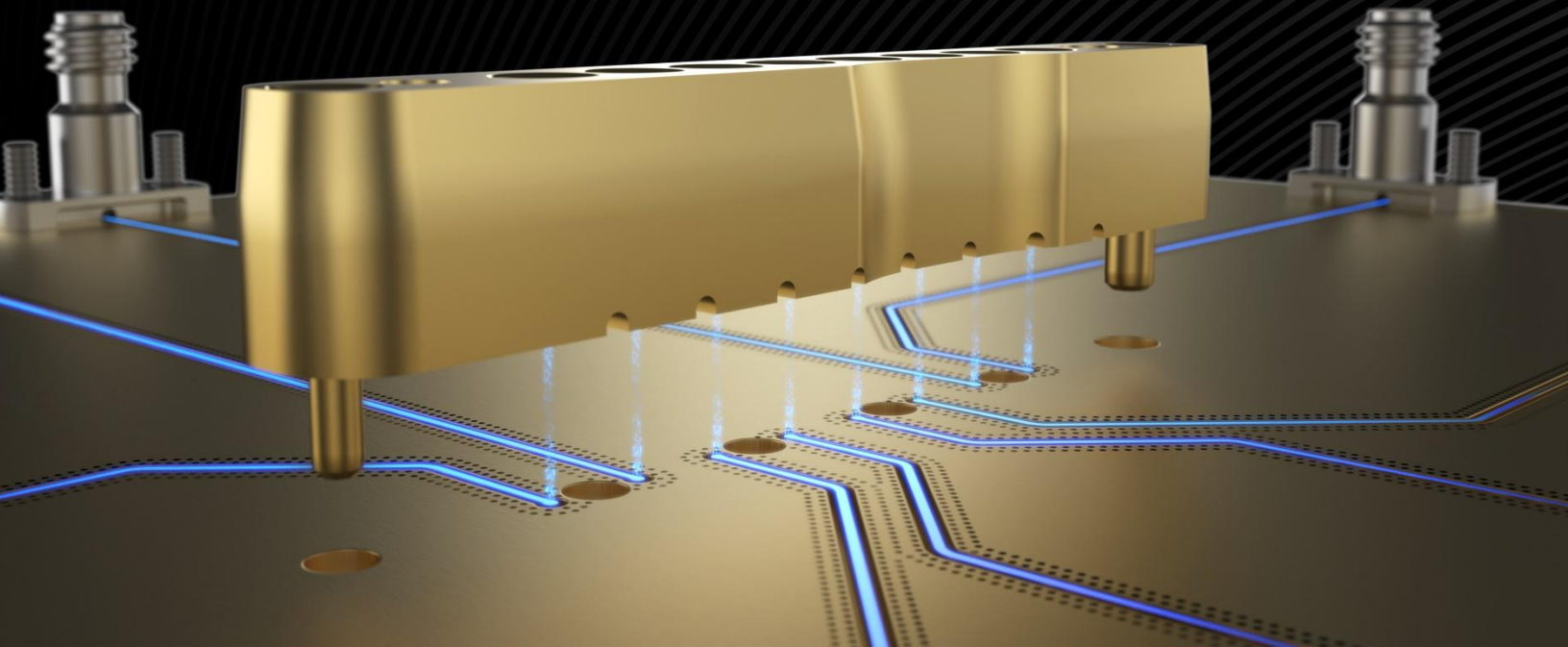




Entering the 448G Era with MultiLane: The Future Is Now

Unlocking 120 GHz with a Cost-Effective PCB Architecture Breakthrough

MultiLane has reached a major milestone in high-frequency interconnect design, demonstrating reliable performance beyond 110 GHz on standard PCB technology, and validated up to 120 GHz, confirming 448G PAM4 capability. This breakthrough is driven by systematic footprint architecture and disciplined electromagnetic design, not exotic or complex materials.

While much of the industry associates 100–120 GHz operation with premium laminates and costly manufacturing, MultiLane proves that disciplined design can deliver the same performance on standard PCB technology.

The innovation spans both the **SMPX multiport ecosystem** and the **RF Precision 1.00 mm ecosystems**, comprising connectors, jumpers, adapters, and terminators. Together, they form a scalable foundation for next-generation ultra-high-speed systems. By pairing high performance with repeatability and manufacturing practicality, MultiLane sets a new benchmark for cost-efficient high-frequency interconnect solutions.

Demand for higher bandwidth and faster data rates continues to push interconnect technology to the limits. While today's connectors can operate well above 100 GHz, PCB transitions remain the dominant bottleneck, restricting real system performance.

MultiLane's latest advancement demonstrates that exceptional high-frequency behavior can be achieved without premium laminates or costly processes. By focusing on intelligent footprint architecture and systematic engineering, MultiLane has unlocked new potential across its SMPX multiport and RF Precision 1.00 mm product families — establishing a practical path toward commercially viable 448G PAM4-class systems.

The Bottleneck

Modern PCB technology has improved considerably, yet as designs approach millimeter-wave frequencies, several physical constraints converge: conductor behavior, dielectric consistency, launch symmetry, and fabrication variability all begin to impose measurable penalties.

Small inconsistencies in manufacturing or transition design can degrade performance rapidly—leading to a natural ceiling where the PCB, not the connector, becomes the limiting factor. Historically, surpassing this threshold has relied on expensive laminates, specialized stack-ups, and ultra-tight tolerances — approaches that work but increase cost and limit practical scalability.

This has cemented the industry perception that the 100 GHz+ region is a practical upper limit for standard PCB-based interconnects. MultiLane's work directly challenges that assumption.

The Breakthrough — Cost-Effective Footprint Architecture Across MultiLane Product Ecosystems

MultiLane's engineering team addressed a challenge that the industry often associates with high cost: achieving reliable, repeatable performance for both multiport and single-port connectors at frequencies approaching 110 GHz, and successfully tested up to 120 GHz, making it **448G PAM4 capable**.

Rather than relying on exotic materials, or ultra-tight manufacturing tolerances, the team focused on design intelligence; demonstrating that high-frequency performance can be unlocked through systematic footprint architecture. This design-first approach challenges the prevailing assumption that millimeter-wave performance requires expensive boards. Instead MultiLane's approach shows that PCB architecture, when engineered correctly, can outperform material-driven strategies.

The resulting design now applies across MultiLane's key product ecosystems:

- **SMPX Multiport High-Density Connectors and Cable Assemblies** – enabling dense, multiport layouts and high-performance cable interconnects to operate at unprecedented bandwidths
- **RF Precision 1.00 mm Ecosystem** – including connectors, jumpers, adapters, and terminators, ensuring consistent performance across all components

Key achievements of the footprint design:

- **VNA-Verified High-Frequency Performance:** Measured up to 110 GHz on a standard test board and successfully validated at 120 GHz
- **Practical Manufacturing:** Constructed using widely available PCB processes typically intended for 50–70 GHz designs, demonstrating cost-effectiveness
- **Systematic Design Approach:** Performance improvements come from engineering and layout refinement, not premium materials or exotic processes
- **Cross-Family Impact:** Unlocks high-frequency potential across SMPX and RF Precision systems, making next-generation interconnects commercially feasible

This milestone confirms that PCB transitions are no longer a limiting factor for high-speed interconnects. By leveraging disciplined design over costly materials, MultiLane delivers high-performance, scalable, and cost-efficient solutions — laying the foundation for 448G PAM4-class systems across its product offerings.

Validation and Test Evidence — Demonstrating Reliable, Repeatable Performance

Testing was performed using a 120 GHz Vector Network Analyzer, enabling full-band characterization of the newly developed footprint architecture. The measurement chain included:

- SMPX 1×8 multiport board-mount connector
- RF Precision 1.00 mm vertical board-mount (CPW) connector
- SMPX-to-1.00 mm coax cable assembly (15 cm)

Multiple channels and multiple board samples were tested to verify repeatability. Results showed:

- Smooth, predictable S-parameters up to 110 GHz
- Successful 120 GHz validation for 448G PAM4 capability
- Consistent performance across lanes and board revisions
- Evidence that systematic design improvement—not exotic materials—is the enabler

These results prove the footprint architecture is robust and manufacturable, delivering ultra-high-frequency performance across both SMPX and RF Precision ecosystems.

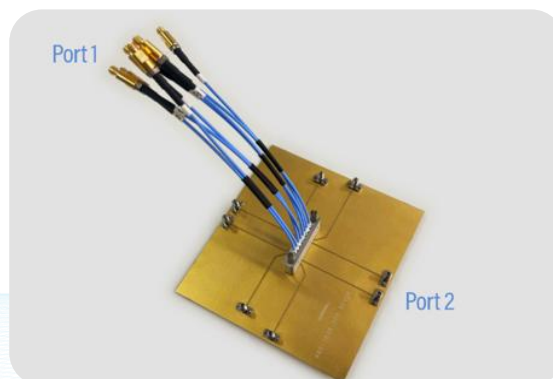


Figure 1: Board Setup for Testing

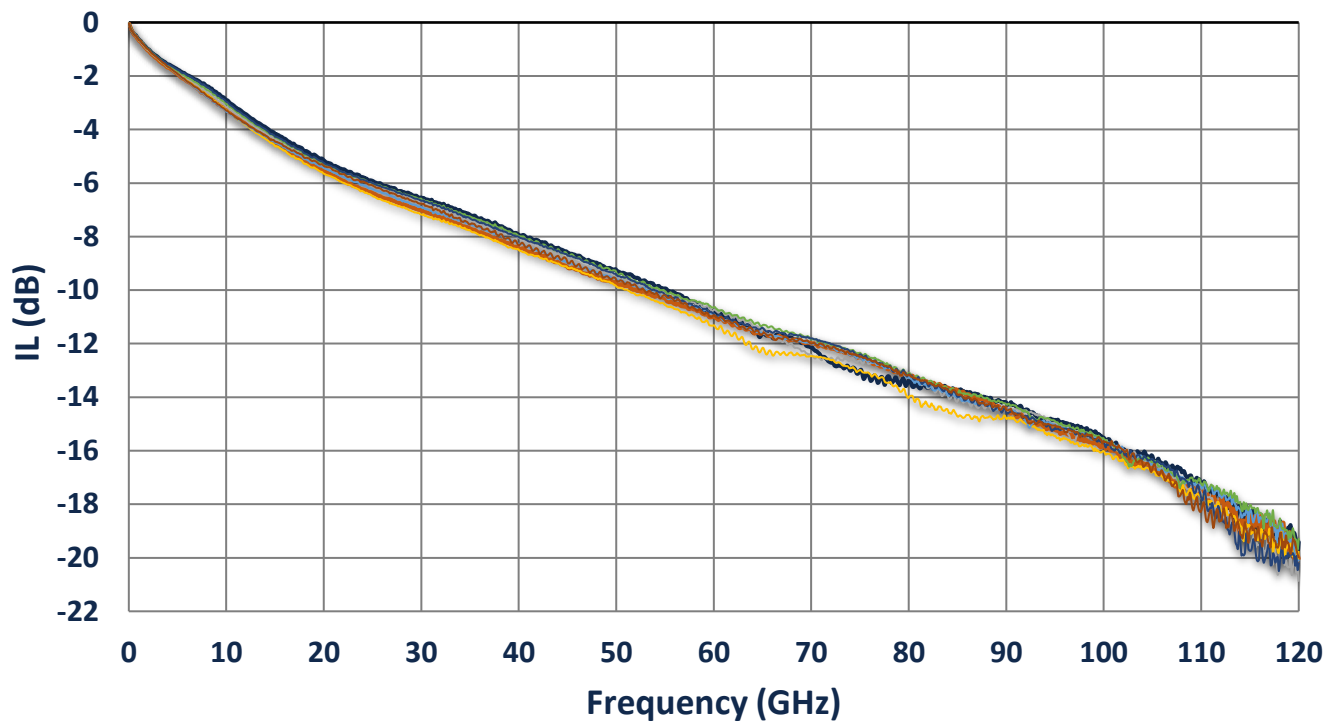


Figure 2: Insertion Loss measured across all 8 channels

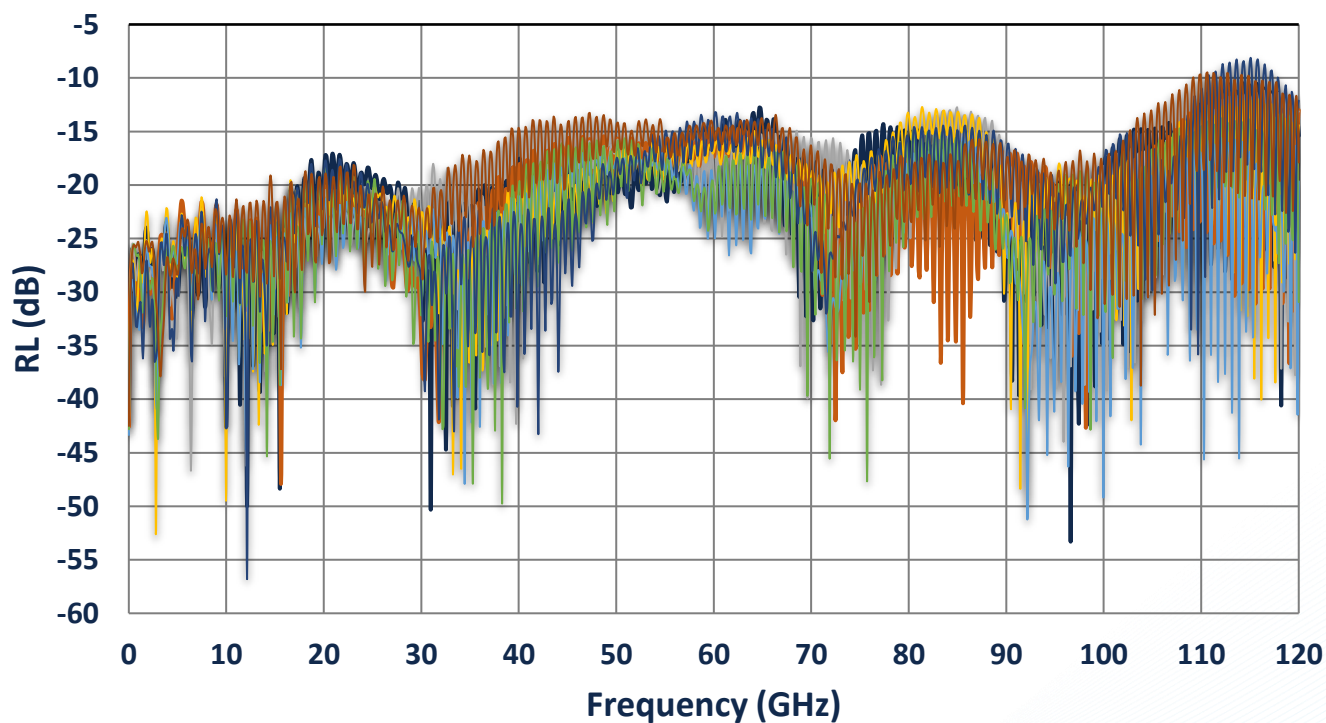


Figure 3: Return Loss measured across all 8 channels (SMPX)

Looking Ahead – A New Era in Interconnect Design

This breakthrough fundamentally changes how the industry can approach next-generation data rates:

- **Cost-Efficient High-Speed Operation:** Achieve 100 GHz+ performance without premium materials
- **Cross-Product Enablement:** Benefits both multiport and single-port systems across MultiLane's portfolio
- **Higher System Reliability:** Repeatable, predictable results reduce validation complexity and risk
- **A Practical Path to 448G-Class Systems:** With the PCB bottleneck removed, system designers can move confidently toward the next generation of bandwidth-intensive architectures

The key takeaway: **Intelligent engineering now outperforms material-driven approaches.**

MultiLane's achievement marks a turning point in high-frequency interconnect design. By demonstrating that performance beyond 100 GHz can be reliably achieved through thoughtful, systematic design rather than expensive materials, and validated at 120 GHz for 448G PAM4 capability, the company has set a new benchmark for cost-effective, scalable solutions.

This breakthrough not only validates the capabilities of the SMPX multiport connectors and cable assemblies and RF Precision 1.00 mm ecosystems but also opens the door to the next generation of ultra-high-speed interconnect systems. It underscores a fundamental shift: the limits of high-speed PCB transitions are no longer dictated solely by materials or fabrication complexity, but by intelligent engineering and disciplined design practices.

As the industry moves toward ever higher bandwidths, MultiLane Interconnect is positioned at the forefront, providing practical, reliable, and economically feasible solutions — enabling designers and system integrators to innovate with confidence, without compromising performance or cost.