Lightmatter Achieves World-First 16-Wavelength Bidirectional Link on Single-Mode Optical Fiber

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8X Leap in Bidirectional Wavelengths per Fiber Paves the Way for Next-Generation AI Data Centers

Mountain View, CA – August 18, 2025 – Lightmatter, the leader in photonic (super)computing, today announced a groundbreaking achievement in optical communications: a 16-wavelength bidirectional Dense Wavelength Division Multiplexing (DWDM) optical link operating on one strand of standard single-mode (SM) fiber. Powered by Lightmatter's industry-leading Passage™ interconnect and Guide™ laser technologies, this breakthrough shatters previous limitations in fiber bandwidth density and spectral utilization, setting a new benchmark for high-performance, resilient data center interconnects.

With the rise of complex trillion-parameter Mixture of Experts (MoE) models, scaling AI workloads is increasingly bottlenecked by bandwidth and radix (I/O port count) limitations in data center infrastructure. Lightmatter's Passage technology delivers an unprecedented 800 Gbps bidirectional bandwidth (400 Gbps transmit and 400 Gbps receive) per single-mode fiber for distances of several hundred meters or more. This achievement advances chip I/O design by simultaneously increasing both radix and bandwidth per fiber compared to existing co-packaged optics (CPO) solutions.

While commercial bidirectional (BiDi) transmission on a single fiber has been limited mainly to two wavelengths, achieving 16 wavelengths (also referred to as "lambdas") has historically required multiple or specialized fibers. This Lightmatter milestone addresses significant technical challenges related to managing complex wavelength-dependent propagation characteristics, power budget constraints, optical nonlinearity, and mitigating crosstalk and backscattering in a single fiber. Such innovations pave the way for the next major advances in AI model development, which demand more extensive and efficient high-bandwidth networking than exists today.

"Data centers are the new unit of compute in the AI era, with the next 1000X performance gain coming largely from ultra-fast photonic interconnects," said Nicholas Harris, founder and CEO of Lightmatter. "Our 16-lambda bidirectional link is an architectural leap forward. Hyperscalers can achieve significantly higher bandwidth density with standard single-mode fiber, reducing both capital expenditure and operational complexity, while enabling higher 'radix'—more connections per XPU or switch."

"Lightmatter's innovation arrives at a pivotal moment for hyperscale AI infrastructure. The ability to dramatically increase bandwidth density on existing single-mode fiber, coupled with the technology's robust thermal performance, is a game-changer for data center scalability and efficiency. This solves one of the most pressing challenges in AI development and brings advanced Co-Packaged Optics a giant step closer to market," said Alan Weckel, co-founder and analyst, 650 Group.

Lightmatter's breakthrough incorporates a proprietary closed-loop digital stabilization system that actively compensates for thermal drift, ensuring continuous, low-error transmission over wide temperature fluctuations. In addition, architectural innovations make the Passage 3D CPO platform inherently polarization-insensitive, maintaining robust performance even when the fibers are being handled or subject to mechanical stress. Standard SM fiber, while offering immense bandwidth potential, does not inherently maintain light's polarization state, unlike specialized and more costly polarization-maintaining (PM) fiber. By achieving polarization insensitivity, Lightmatter enables the use of cost-effective SM fiber for its industry-leading bidirectional DWDM technology.

This combination of unparalleled fiber bandwidth density, efficient spectral utilization, and robust performance makes Lightmatter's Passage technology foundational for the industry's transition from electrical to optical interconnects in AI data centers. It empowers customers to accelerate development of larger and more capable AI models with more powerful, efficient, and scalable data centers.

For more information about Passage technology, please visit https://lightmatter.co/

About Lightmatter

Lightmatter is leading the revolution in AI data center infrastructure, enabling the next giant leaps in human progress. The company's groundbreaking Passage™ platform—the world's first 3D-stacked silicon photonics engine—connects thousands to millions of processors at the speed of light. Designed to eliminate critical data bottlenecks, Lightmatter's technology enables unparalleled efficiency and scalability for the most advanced AI and high-performance computing workloads, pushing the boundaries of AI infrastructure.

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