

Photonics

Weekly Intelligence Report

2026-07-19 | 13 articles | 6 countries

troy-technical.jp

This Week's Keyword

AI Photonics

Solving AI's energy & data bottlenecks

13

articles

Analyzed this week

6

countries

Source diversity

5M+

PICs

Shipped for AI DCs

1

Pbps

AI chip data transfer

All 13 Articles This Week — 5-Axis Evaluation Matrix

How to read columns — Tech Novelty: degree of breakthrough Market Proximity: closeness to commercialization Market Impact: industry-wide effect Data Reliability: quantitative data & peer review US/EU Relevance: direct impact on US/European companies & supply chains

#	Article Title	Type	Tech Novelty	Market Proximity	Market Impact	Data Reliability	US/EU Relevance	Summary
#01	MIT Electronic-Photonic	Research						MIT's novel optical coupler enables 1 Pbps data transfer for AI chips, targeting 10 Pbps by 2030 to resolve AI energy crisis.
#02	Marvell/Tower PICs	Product Launch						Marvell ships over 5 million Tower Semiconductor PICs, accelerating AI data center optical networking deployment.
#03	Microsoft/3M EBO	Partnership						Microsoft integrates 3M's Expanded Beam Optical (EBO) technology into Azure to transform AI data center infrastructure.
#04	Marvell CPO Deployment	Corporate Strategy						Marvell accelerates Co-Packaged Optics (CPO) deployment to revolutionize AI infrastructure scaling and efficiency.
#05	STMicro PIC100 300mm	Corporate Strategy						STMicroelectronics ramps PIC100 silicon photonics production on 300mm wafers for AI data center optical interconnects.
#06	China 3D Print ONN	Research						Chinese researchers 3D print 4 million 500nm optical neurons on a chip in 15 minutes, achieving record ONN fabrication.
#07	Hamamatsu InGaAs Sensor	New Product						Hamamatsu Photonics launches C16795 series InGaAs image sensor for high-speed, high-sensitivity industrial inspection.
#08	PsiQuantum QC	Corporate Strategy						PsiQuantum accelerates fault-tolerant photon-based quantum computer development with GlobalFoundries, targeting 2027 hub ops.
#09	AIM Photonics Funding	Funding						AIM Photonics secures over \$321M from AFRL and SUNY for silicon photonics R&D,, advancing US tech advantage.
#10	Lightmatter DWDM Link	Product Launch						Lightmatter joins NVIDIA NVLink Fusion, achieves first 16-wavelength bidirectional DWDM link, boosting AI connectivity 8x.
#11	Hamamatsu CMOS Sensors	Corporate Strategy						Hamamatsu Photonics Europe expands advanced imaging solutions by strengthening Fairchild Imaging CMOS sensor technologies.
#12	imec Optical I/O	Research						imec drives 2.5D/3D optical I/O integration closer to the chip to overcome AI inference performance bottlenecks.

#	Article Title	Type	Tech Novelty	Market Proximity	Market Impact	Data Reliability	US/EU Relevance	Summary
#13	Optical Fiber Demand	Market Report						Global optical fiber demand surges due to AI data center expansion, with Corning emphasizing its criticality in Mexico.

High Med-High Med Low | Yellow highlight = featured article

Three Questions That Demand Your Decision This Week

❶ Is your AI data center strategy ready for petabit-scale optical interconnects?

MIT's 1 Pbps chip and Lightmatter's 8x DWDM link signal a paradigm shift. Are your procurement and R&D; teams evaluating these next-gen photonic solutions to avoid bottlenecks and escalating energy costs?

❷ How will photon-based quantum computing disrupt your long-term R&D; roadmap?

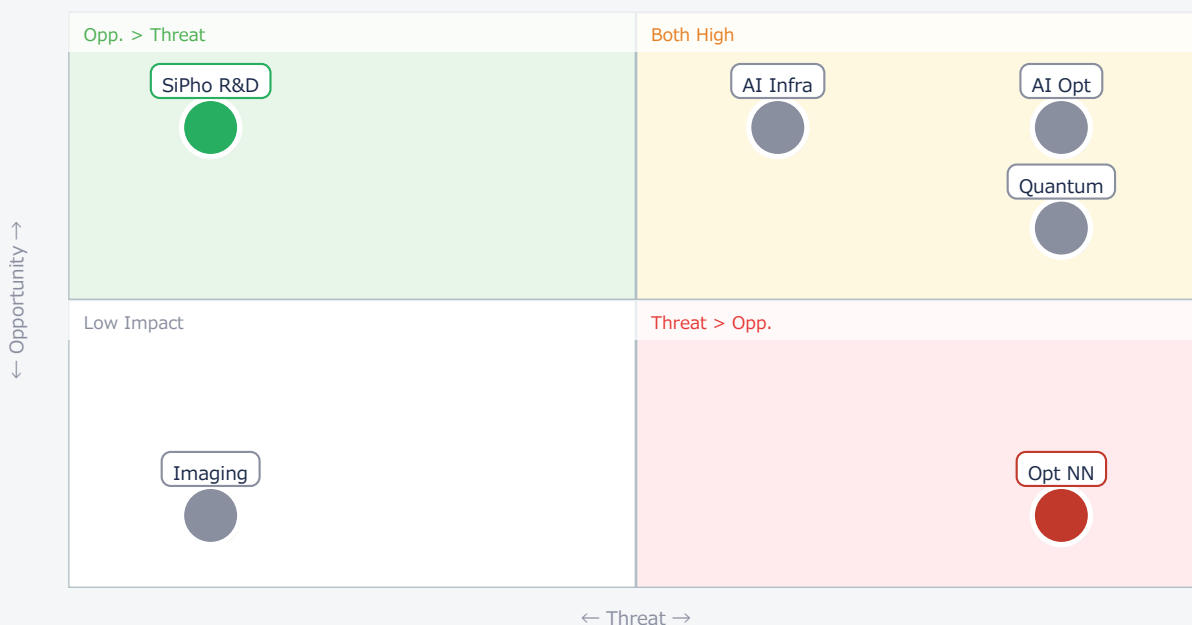
PsiQuantum's \$1B funding and 2027 hub target for fault-tolerant quantum computers could redefine computational limits. Are you investing in quantum-aware talent and exploring future applications or risks?

❸ Are your optical supply chains resilient against intensifying global competition?

US investments in silicon photonics (AIM Photonics) and China's rapid ONN advancements highlight a tech race. Does your supply chain strategy account for geopolitical shifts and ensure access to critical photonic components?

Opportunities vs. Threats for US/European Companies

Opportunity vs. Threat Matrix for US/European Companies



Item	Quadrant	↑ Opportunity	↓ Threat
● AI Opt	Critical	Boost AI performance	Obsolete infrastructure
● AI Infra	Critical	Supply AI components	Lose market share
● Quantum	Critical	New computing era	Tech obsolescence
● SiPho R&D;	Opp.	Strengthen US/EU IP	—
● Opt NN	Threat	—	Future AI hardware
● Imaging	Ref.	Niche market growth	Limited impact

Deep Dive ① — MIT's Petabit-Scale Photonic AI Chip

#01 | 2026/07/15 | MarketWise | Tech Novelty●●●●● Proximity●●○○○ Market Impact●●●●● Data Reliability●●●○○ US/EU Relevance●●●●●

MIT's FUTUR-IC program has developed a novel optical coupler enabling AI chips to transfer data at over 1 petabit per second (Pbps), with a target of 10 Pbps by 2030. This electronic-photonic integration dramatically reduces power consumption and boosts bandwidth, addressing the critical AI energy crisis.

The breakthrough overcomes traditional electrical signal limitations by using on-chip, light-based data transmission, offering significantly faster and lower-energy data movement. Major chipmakers like Nvidia and AMD are already investing in similar photonic technologies, validating the market direction.

► Strategic Analyst's Perspective

Strategic Analyst's Perspective: The 1 Pbps achievement is a significant academic breakthrough, and the 10 Pbps target by 2030 is ambitious but plausible given the rapid pace of AI hardware innovation. Technical barriers include scaling manufacturability, ensuring thermal stability at such densities, and integrating these complex optical components seamlessly into existing chip architectures. [Opportunity] for US/EU materials & component suppliers to develop advanced optical materials and packaging solutions. OEMs & device manufacturers must explore licensing or partnerships to integrate this technology, potentially leading next-gen AI platforms. [Threat] is significant for US/EU companies relying on traditional electrical interconnects, facing rapid obsolescence and increased operational costs. Next actions: [R&D;] teams must immediately assess the technical feasibility and integration challenges. [Business Dev] should explore early-stage partnerships with MIT or related spin-offs within 6 months.

Deep Dive ② — Marvell's 5M+ Photonic IC Shipments for AI

#02 | 2026/07/11 | simplywall.st (NasdaqGS:MRVL) | Tech Novelty●●●○○ Proximity●●●●● Market Impact●●●●● Data Reliability●●●●○ US/EU Relevance●●●●●

Tower Semiconductor has shipped over 5 million coherent photonic integrated circuits (PICs) for Marvell Technology's global customers, signaling Marvell's aggressive deployment of optical networking products for AI data centers.

This milestone confirms Marvell's optical solutions are transitioning from prototyping to large-scale, real-world AI data center construction. Coherent PICs offer high bandwidth and low power, essential for efficient data traffic in expanding AI infrastructure, strengthening Marvell's competitive position.

► Strategic Analyst's Perspective

Strategic Analyst's Perspective: The shipment of over 5 million PICs is a concrete indicator of commercial maturity and market adoption, making the published numbers highly realistic. Remaining technical barriers primarily involve further cost reduction, standardization across different vendor ecosystems, and continued integration density improvements. [Opportunity] for US/EU materials & component suppliers to become key partners in the optical interconnect supply chain, providing advanced substrates, lasers, and packaging. OEMs & device manufacturers must integrate these proven optical solutions to remain competitive in AI data center performance. [Threat] for those not actively adopting or developing optical interconnects, risking performance lags and higher energy consumption compared to competitors. Next actions: [Procurement] teams should immediately evaluate Marvell's optical product roadmap and supply chain resilience. [Business Dev] should explore partnerships with Tower Semiconductor for manufacturing capabilities within 3 months.

Deep Dive ③ — PsiQuantum's Photon-Based Quantum Computer

#08 | 2026/07/15 | PsiQuantum (Official Website) | Tech Novelty●●●●● Proximity●●○○○ Market Impact●●●●●
Data Reliability●●●●○ US/EU Relevance●●●●●

PsiQuantum is accelerating the construction of its fault-tolerant, photon-based large-scale quantum computer, leveraging GlobalFoundries' Omega silicon photonics platform. The modular system aims for 1 million logical qubits.

With approximately \$1 billion raised and hubs targeting operation by 2027 in Chicago and Australia, PsiQuantum's approach uses photons as qubits, offering stability at room temperature and scalability via standard telecom optical fiber, a unique path to practical quantum computing.

► Strategic Analyst's Perspective

Strategic Analyst's Perspective: PsiQuantum's vision of 1 million logical qubits by 2027 is extremely ambitious, but the significant funding and partnership with GlobalFoundries lend credibility to their photonics-based approach. Key technical barriers include achieving true fault tolerance, scaling the complex photonic circuits with high yield, and integrating 100 cryogenic cabinets into a functional system. [Opportunity] for US/EU technology licensors and IP holders in quantum algorithms, software, and specialized cryogenic or optical components. OEMs & device manufacturers should begin strategic planning for quantum-enabled applications. [Threat] is existential for industries reliant on current encryption or computational methods, as a functional large-scale quantum computer could render them obsolete. US/EU nations must invest heavily in their quantum industrial supply chain to avoid becoming mere consumers. Next actions: [R&D;] teams should immediately establish a quantum computing monitoring group. [Strategy] should assess long-term business model impacts and IP implications within 6 months.

Other Notable Articles

Microsoft and 3M Forge Strategic Alliance (Microsoft (Official Press Release))

Tech Novelty●●●○○ Proximity●●●●○ Market Impact●●●●○

Microsoft's adoption of 3M's EBO tech for Azure enhances AI data center reliability and simplifies optical connections.

Lightmatter Joins NVIDIA NVLink Fusion Ecosystem (Lightmatter (Official Website))

Tech Novelty●●●●○ Proximity●●●○○ Market Impact●●●●○

Lightmatter's 16-wavelength DWDM link boosts AI data center optical connectivity 8x, joining NVIDIA's ecosystem.

STMicroelectronics Ramps PIC100 Silicon Photonics Platform (EE Times)

Tech Novelty●●●○○ Proximity●●●●○ Market Impact●●●●○

STMicro scales 300mm silicon photonics production for AI data centers, aiming for a 'one-stop-shop' solution.

As AI Shifts to Inference, imec Drives 2.5D/3D Optical I/O Integration (EE Times)

Tech Novelty●●●●○ Proximity●●○○○ Market Impact●●●●○

imec pushes optical I/O closer to the chip to overcome AI inference bottlenecks, redefining future AI computing.

Recommended Actions This Week

Action recommendations based on article evaluation matrix and opportunity/threat analysis.

■ Immediate (this week)

- [R&D;] Assess MIT's optical coupler technology and Lightmatter's DWDM link for potential integration and performance gains in AI hardware roadmaps.
- [Procurement] Review Marvell's optical interconnect offerings and 3M's EBO technology for current and future AI data center infrastructure upgrades.
- [Strategy] Initiate a competitive analysis of Chinese advancements in optical neural networks and 3D printing for long-term AI hardware implications.

■ Short-term (1 month)

- [Business Dev] Investigate partnership opportunities with Tower Semiconductor for PIC manufacturing and with MIT/FUTUR-IC for next-gen photonic IP.
- [R&D;] Establish a dedicated monitoring group for photon-based quantum computing progress, particularly PsiQuantum's 2027 targets.
- [Executive] Evaluate the strategic importance of silicon photonics R&D; funding (e.g., AIM Photonics) and potential for US/EU collaboration or investment.

■ Medium-long term (quarter+)

- [Strategy] Develop a comprehensive quantum computing strategy, including talent acquisition, ecosystem engagement, and long-term business model impacts.
- [Legal/IP] Review intellectual property landscape for advanced photonic integration (CPO, 2.5D/3D optical I/O) to identify licensing opportunities or risks.
- [Procurement] Diversify optical fiber and component supply chains, considering global demand surges and geopolitical risks, especially in emerging markets like Mexico.

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Photonics — Selected Articles

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#12 PsiQuantum Accelerates Fault-Tolerant Photon-Based Quantum Computer Development with GlobalFoundries' Omega Silicon Photonics, Targeting Hub Operations by 2027

#13 AIM Photonics Secures Over \$321M from Air Force Research Lab and SUNY Research Foundation to Advance Silicon Photonics R&D

#14 Lightmatter Joins NVIDIA NVLink Fusion Ecosystem, Boosts AI Data Center Optical Connectivity 8x with First 16-Wavelength Bidirectional DWDM Link

#15 Hamamatsu Photonics Europe Expands Advanced Imaging Solutions for Medical and Scientific Fields by Strengthening Fairchild Imaging CMOS Sensor Technologies Post-Acquisition

#16 As AI Shifts to Inference, imec Drives 2.5D/3D Optical I/O Integration Closer to Chip to Overcome Performance Bottlenecks

#17 Optical Fiber Demand Surges Amidst AI Data Center Expansion; Corning Emphasizes Criticality in Mexico

#02 MIT's Electronic-Photonic Chip Achieves Over 1 Pbps Data Transfer, Targets 10 Pbps by 2030 to Resolve AI Energy Crisis

Published July 15, 2026 MarketWise USA



OVERVIEW

A novel optical coupler developed through MIT's FUTUR-IC program enables AI chips to transfer data at over 1 petabit per second (Pbps), with ambitions for 10 Pbps by 2030. This electronic-photonic integration dramatically reduces power consumption in AI data centers while simultaneously boosting speed and bandwidth, positioning it as a critical solution to the burgeoning AI energy crisis. Major chipmakers, including Nvidia, AMD, Broadcom, and Marvell, are already investing billions in CPO and photonic technologies, signaling strong industry validation.

IN DEPTH

An innovative optical coupler emerging from MIT's FUTUR-IC program promises to dramatically enhance AI chip data transfer capabilities and fundamentally alter the energy efficiency landscape of AI data centers. This technology will enable AI chips to transfer over 1 petabit per second (Pbps) of data, with a target of 10 Pbps by 2030.

Technical Details

This breakthrough is achieved through 'electronic-photonic integration' technology, which integrates both electronic and optical circuits onto a single chip. Traditional electrical signal data transmission has faced significant challenges with power consumption and heat generation due to the enormous data volumes and computational demands of AI data centers. The new optical coupler overcomes these physical limitations by enabling on-chip, light-based data transmission. Specifically, optical signals can transmit data far faster and with significantly lower energy consumption than electrical signals, thus dramatically improving the overall power efficiency of data centers. This technology is expected to eliminate data transfer bottlenecks, accelerating AI model training and inference.

Background & Context

The evolution of AI has heightened its dependence on high-performance hardware, making data center power consumption a global concern. Conventional copper interconnects generate heat due to electrical resistance, leading to increased power consumption. This issue is exacerbated as AI workloads scale, with projections suggesting that continued growth of AI data centers at the current pace could place significant strain on global power grids. Consequently, leading chip manufacturers like Nvidia, AMD, Broadcom, and Marvell are making multi-billion dollar investments in photonic technologies, including Co-Packaged Optics (CPO) and silicon photonics. They recognize optical technology as key to sustainable AI computing scaling and are already integrating it into their next-generation products.

Strategic Significance & Outlook

MIT's technology offers a promising solution to the AI data center power consumption problem, establishing a foundation for further AI development. If 10 Pbps data transfer speeds are realized in the future, it would enable the efficient processing of massive models and complex tasks currently unimaginable in AI systems. This could revolutionize all fields where AI is applied, such as autonomous driving, new drug discovery, and climate change modeling. As commercialization progresses, it will also lead to reduced data center operational costs, making it an attractive sector for investors. International collaboration and standardization will be key to accelerating the widespread adoption of this technology.

Source: <https://marketwise.com/investing/mit-electronic-photonic-integration-ai-data-center-energy-crisis/>

Collected: July 17, 2026 | Automated Research System (Gemini API)

#05 Marvell Technology Accelerates AI Data Center Deployment with Shipment of Over 5 Million Tower Semiconductor Photonic Integrated Circuits

Published July 11, 2026 simplywall.st (NasdaqGS:MRVL) USA

The Marvell Technology logo, featuring the word "MARVELL" in a bold, white, sans-serif font, underlined with a thin white line.

Marvell Technology ships 5 Tower Semiconductor photonic integrated, accelerating AI data center deployments

Publication, July 11, 2026
SIMPLYWALL



OVERVIEW

Tower Semiconductor announced the shipment of over 5 million coherent photonic integrated circuits (PICs) for Marvell Technology's global customers, signifying Marvell's aggressive deployment of optical networking products for AI data centers. This milestone confirms Marvell's optical solutions are transitioning beyond prototyping to large-scale, real-world AI data center construction, highlighting accelerated market adoption. The massive shipment underscores the maturity and critical role of Marvell's technology in supporting the rapidly expanding AI infrastructure.

IN DEPTH

Tower Semiconductor has announced the shipment of over 5 million coherent photonic integrated circuits (PICs) for Marvell Technology's global customers. This landmark shipment figure validates Marvell's aggressive acceleration in bringing its optical networking products to market for AI-specific data centers.

Key Findings

The delivery of more than 5 million PICs to Marvell Technology's customers is a significant indicator of the large-scale adoption and maturity of the company's optical networking technology within AI data centers. It signifies a transition from mere prototyping to practical deployment in commercial environments.

Technical Details

Coherent photonic integrated circuits are at the heart of next-generation optical interconnect technologies, characterized by high bandwidth and low power consumption. These circuits are essential for efficiently and rapidly transmitting the massive data traffic generated within AI data centers. Compared to traditional electrical signal-based interconnects, optical interconnects offer superior advantages such as less signal degradation and longer transmission distances, especially for communication between nodes in large-scale AI clusters. Tower Semiconductor, through advanced semiconductor manufacturing processes, produces these PICs based on Marvell's designs, achieving high yields and reliability, which has facilitated this large-volume shipment.

Background & Context

With the explosive growth of AI workloads, data movement within data centers has become as critical, if not more so, than the computing itself. The speed of data transfer between GPUs and between GPUs and memory dictates overall system performance, leading to a rapidly increasing demand for optical interconnects. Marvell Technology, as a key player in this field, has focused on developing cutting-edge optical networking solutions to meet the demands of AI data centers. This shipment milestone demonstrates that Marvell's technology is gaining market acceptance and becoming an indispensable component in AI infrastructure construction, further strengthening its competitive position in the market.

Strategic Significance & Outlook

Marvell's high-volume PIC shipments represent a crucial step towards the standardization and widespread adoption of optical connectivity in AI data centers. As AI continues to scale, the demand for even higher-performance and more integrated optical solutions is expected to grow. Marvell is likely to further strengthen its technological innovation and manufacturing partnerships to maintain its leadership in this domain. This will contribute to the evolution of AI infrastructure and the realization of more efficient and powerful AI systems.

Source: <https://simplywall.st/stocks/us/semiconductors/nasdaq-mrvl/marvell-technology/news/marvell-mrvl-lands-5-million-photon-chip-shipments-for-ai>

Collected: July 17, 2026 | Automated Research System (Gemini API)

#06 Microsoft and 3M Forge Strategic Alliance to Transform AI Data Center Infrastructure, Integrating 3M's Expanded Beam Optical Technology into Azure

Published July 15, 2026 Microsoft (Official Press Release) USA



OVERVIEW

Microsoft and 3M announced a strategic partnership to accelerate AI data center infrastructure and enterprise transformation. Microsoft will become the first hyperscale cloud provider to deploy 3M's proprietary Expanded Beam Optical (EBO) technology in its Azure Cloud and AI infrastructure. EBO technology, designed with an expanded beam optical interface rather than direct physical contact, aims to expedite fiber optic connection installation, enhance contamination resistance, and simplify maintenance. This collaboration supports Azure's AI cloud performance and scalability in the burgeoning \$2 billion optical interconnect market, with 3M's stock rising 2.5% on the news.

IN DEPTH

Microsoft and 3M have announced a strategic partnership aimed at advancing AI data center infrastructure and enterprise transformation. This groundbreaking collaboration positions Microsoft as the first hyperscale cloud provider to deploy 3M's proprietary Expanded Beam Optical (EBO) technology within its Azure Cloud and AI infrastructure.

Key Findings

By integrating 3M's EBO technology, Microsoft Azure will significantly enhance the reliability, installation speed, and maintainability of fiber optic connections critical for AI workloads. This is expected to reduce signal loss in high-density server racks and safeguard the performance and scalability of AI cloud operations.

Technical Details

3M's Expanded Beam Optical (EBO) technology dramatically improves resistance to microscopic dust and contamination by utilizing an expanded light beam, unlike traditional optical connectors that require direct physical contact between fiber ends. This "non-contact" approach reduces the frequency of connector cleaning and maintenance, simplifies the installation process, and cuts overall operational costs and downtime. The EBO cable connector system is engineered to ensure stable, high-speed data transmission and minimize signal loss within dense AI data center environments. This is critically important for efficiently processing the enormous data volumes required for AI model training and inference.

Background & Context

The rapid adoption of AI and the expansion of cloud services have led to an explosion in demand for optical interconnects within data centers. AI workloads impose significantly higher demands on data transmission speeds and bandwidth within data centers compared to traditional computing tasks. Consequently, the optical interconnect market is now estimated to be worth approximately \$2 billion. Microsoft's adoption of 3M's EBO technology for its Azure platform demonstrates that innovation in physical network infrastructure is essential to meet the demands of AI growth and cloud services. This partnership aims to combine the expertise of both companies to overcome data center challenges in the AI era and accelerate enterprise AI transformation. 3M is investing in expanding its EBO manufacturing capabilities, intending to further accelerate the market deployment of this technology. Following the announcement, 3M's stock rose by 2.5%, indicating high market expectations.

Strategic Significance & Outlook

This partnership between Microsoft and 3M underscores the crucial role of optical connectivity in the future of AI data centers. The adoption of innovative technologies like EBO will significantly impact data center design, construction, and operational practices, contributing to the realization of a more robust and efficient AI infrastructure. This is expected to accelerate the further proliferation of AI technologies and innovations across various industrial sectors. Furthermore, other hyperscalers may consider adopting similar optical connectivity solutions, creating ripple effects across the entire market.

Source: <https://news.microsoft.com/source/2026/07/15/3m-and-microsoft-announce-strategic-partnership-to-advance-ai-data-center-infrastructure-and-enterprise-transformation/>

#07 Marvell Technology Accelerates Co-Packaged Optics (CPO) Deployment to Revolutionize AI Scaling

Published July 10, 2026 Marvell Technology (YouTube) USA



OVERVIEW

Marvell Technology is accelerating the deployment of Co-Packaged Optics (CPO) as the next leap in AI infrastructure scaling. CPO revolutionizes data center connectivity by directly integrating computing and switching components with optical connections within a single package. This innovative approach is crucial for addressing the high-density and power consumption challenges faced by AI infrastructure. Marvell demonstrates its commitment to this advanced technology through new products designed to optimize optical interconnects in modern data centers.

IN DEPTH

Marvell Technology is accelerating the deployment of Co-Packaged Optics (CPO) technology to enable a significant leap in AI infrastructure scaling. CPO is a transformative technology for data center connectivity, directly integrating computing and switching components with optical connections within a single package.

Key Findings

Through the aggressive adoption of CPO technology, Marvell aims to overcome the major challenges faced by AI data centers: increasing density, power consumption, and data bandwidth limitations. The company's new product portfolio is specifically designed to address these issues, maximizing the performance of optical interconnects.

Technical Details

CPO physically integrates optical transceivers with electrical chips, in contrast to traditional pluggable optical modules that are located further away from switches or processors. This close proximity significantly shortens the distance electrical signals travel over board-level traces, dramatically reducing signal degradation, latency, and power consumption. Particularly for AI workloads, which require ultra-high-speed movement of massive data volumes between GPU clusters, CPO becomes an indispensable technology. Marvell's CPO solutions provide levels of bandwidth density and power efficiency that were previously difficult to achieve with existing technologies, potentially saving data center rack space, easing cooling requirements, and lowering overall operational costs.

Background & Context

The increasing complexity and scale of AI models are placing unprecedented demands on interconnects within data centers. Traditional electrical interconnects are nearing their physical limits in terms of supporting bandwidth requirements exceeding tens of terabits per second (Tbps) and stringent power consumption constraints. Consequently, there is an industry-wide shift towards next-generation optical interconnect technologies like CPO. Major chip manufacturers and data center operators such as NVIDIA, Intel, and Broadcom are also intensifying their investments in CPO technology, which is expected to become the new standard for data centers in the AI era. Marvell, by combining its optical connectivity expertise with its chip design capabilities, stands at the forefront of this transformation.

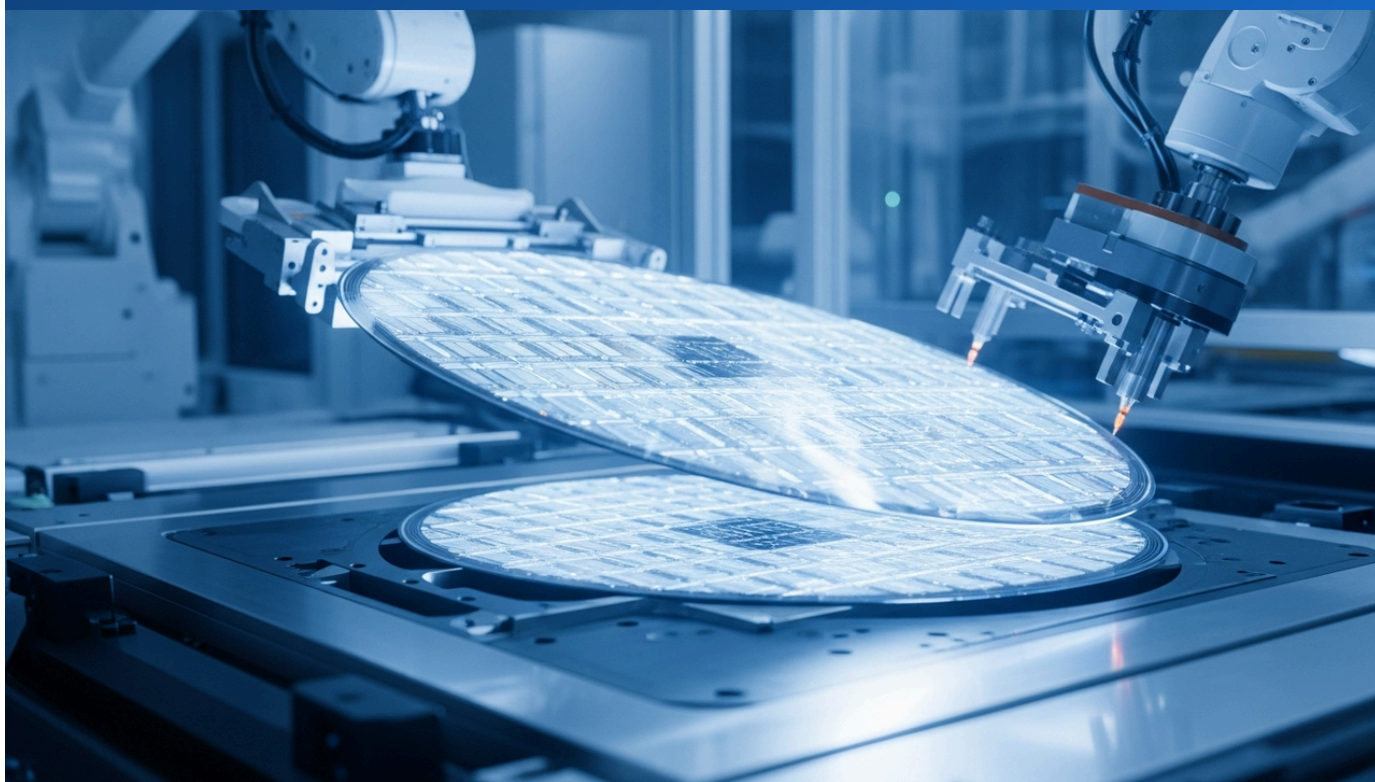
Strategic Significance & Outlook

Marvell's commitment to CPO technology will have a significant impact on the scalability and sustainability of AI data centers. Widespread adoption of this technology will enable larger and more powerful AI systems, further expanding the application scope of AI in various fields such as autonomous driving, drug discovery, and climate modeling. CPO also has the potential to redefine the design principles of future data center architectures and accelerate overall industry innovation. Marvell aims to solidify its leadership in this domain through strengthened partnerships and continuous research and development.

Source: <https://www.youtube.com/watch?v=H1JpsN1qI5I>

#09 STMicroelectronics Ramps PIC100 Silicon Photonics Platform Production on 300mm Wafers to Meet AI Data Center Demand

Published July 16, 2026 EE Times Switzerland



OVERVIEW

STMicroelectronics is scaling up production of its PIC100 silicon photonics platform on 300mm wafers to address the escalating demand for high-capacity optical interconnects in AI data centers. This initiative involves developing advanced packaging and electrical integration capabilities to bring optical interconnects closer to processors and switch ASICs. As AI clusters expand and traditional copper interconnects reach their limits in reach, power efficiency, and signal integrity, photonics has become essential for faster, more compact optical engines. ST aims to be a 'one-stop-shop' for optical interconnects by combining advanced packaging, including Through-Silicon Vias (TSVs), with silicon photonics and BiCMOS technology.

IN DEPTH

STMicroelectronics is moving forward with a strategy to ramp up production of its PIC100 silicon photonics platform on 300mm wafers to meet the burgeoning demand for high-capacity optical interconnects in AI data centers. This initiative is being pursued in parallel with the development of advanced packaging and electrical integration capabilities, which are essential for physically bringing optical interconnects closer to processors and switch ASICs.

Key Findings

The ramped production of STMicroelectronics' PIC100 platform on 300mm wafers will enable AI data centers to deploy high-density, energy-efficient optical interconnect solutions at scale. This will significantly enhance the performance and scalability of AI workloads, overcoming the physical limitations inherent in existing copper interconnects.

Technical Details

As AI clusters expand exponentially, the volume of data movement becomes as critical as the computing process itself. Traditional copper interconnects are reaching their physical limits in terms of reach, power efficiency, and signal integrity, with these challenges becoming particularly pronounced for high-speed transmissions exceeding hundreds of gigabits per second (Gbps). Silicon photonics resolves these issues by offering superior reach, lower losses, and excellent signal integrity. STMicroelectronics is developing advanced packaging technologies, such as Through-Silicon Vias (TSVs), within its PIC100 platform. TSVs reduce interconnect losses between photonic ICs, substrates, and electronic ICs, contributing to component miniaturization, improved signal integrity, and enhanced overall performance. Furthermore, the company aims to combine silicon photonics with BiCMOS technology to offer a 'one-stop-shop' solution for integrated optical and electrical components, making it easier for customers to design and manufacture complex optical interconnect systems.

Background & Context

The increasing computational requirements for AI training and inference are forcing fundamental changes in data center architectures. High-speed, low-latency data transmission between processors (GPUs and ASICs), memory, and switching networks is crucial for resolving AI performance bottlenecks. Consequently, there is an accelerating trend toward integrating optical technologies at the chip level, such as Co-Packaged Optics (CPO) and near-package optical interconnects. Major semiconductor manufacturers like STMicroelectronics are strengthening their investments in silicon photonics technology to address this paradigm shift and support the evolution of AI infrastructure. The transition to 300mm wafers will enable reduced manufacturing costs and increased production capacity, further facilitating the widespread adoption of silicon photonics technology.

Strategic Significance & Outlook

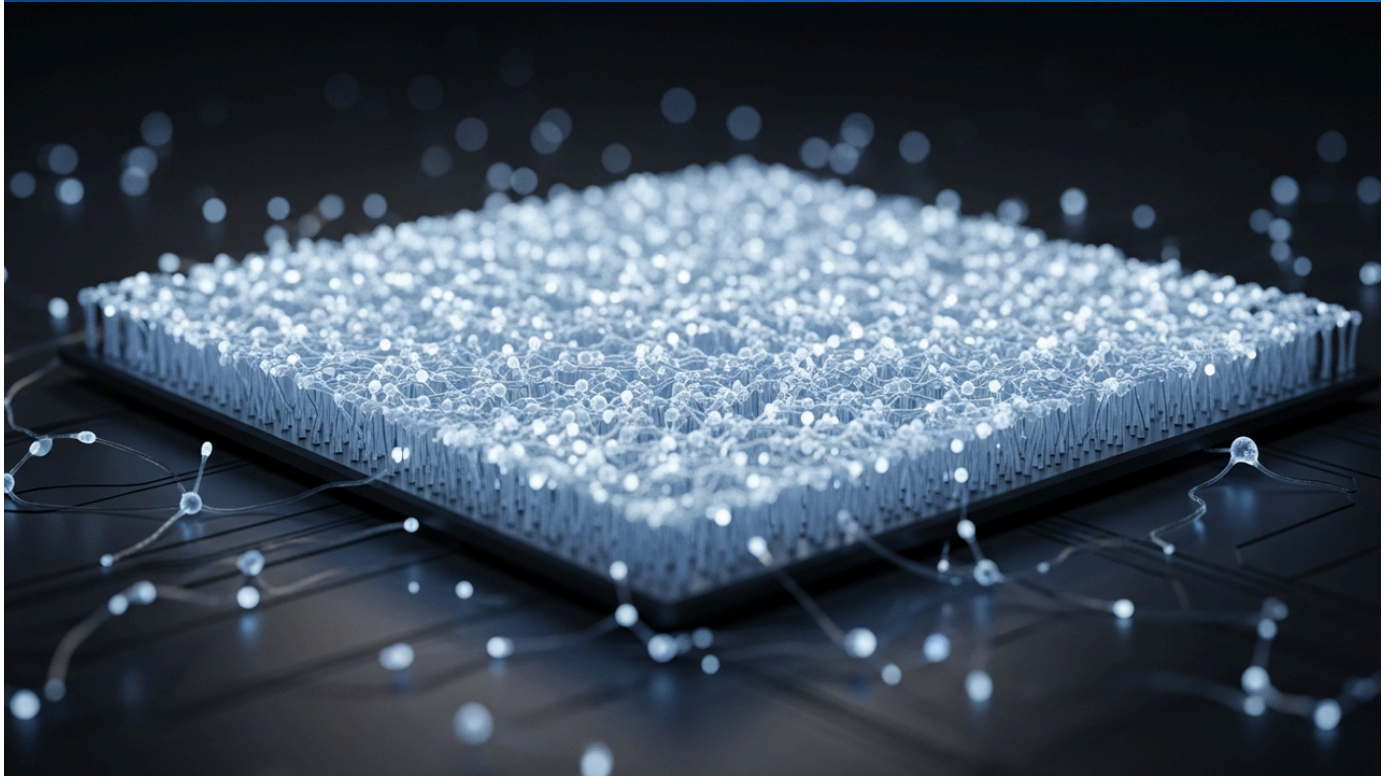
STMicroelectronics' increased production of silicon photonics on 300mm wafers offers a critical solution to the energy and performance challenges faced by AI data centers. This move is essential for silicon photonics to establish its position as a leading interconnect technology in the AI era, and it will promote further integration of optical technology in data centers, HPC, and even edge AI devices in the future. This is expected to improve the performance of AI applications and enable more sustainable data processing. ST will maintain its technological leadership in this field and play a central role in shaping next-generation AI infrastructure.

Source: <https://www.eetimes.com/ai-data-centers-push-silicon-photonics-toward-300-mm-scale/>

Collected: July 17, 2026 | Automated Research System (Gemini API)

#10 Chinese Researchers Achieve Record 3D Printing of 4 Million 500nm Optical Neurons on Millimeter-Scale Chip in 15 Minutes

Published July 17, 2026 Light: Advanced Manufacturing (EINPresswire.com經由)
China



OVERVIEW

A team of Chinese researchers has achieved a world-record breakthrough in optical neural network (ONN) device fabrication, rapidly 3D printing 4 million 500-nanometer optical neurons onto a millimeter-scale chip in just 15 minutes. This feat, enabled by an optical encoder using 3D-printed diffractive layers, produced an ONN device demonstrating impressive 97%–99% classification accuracy across diverse AI tasks. The advancement marks a significant step towards bridging the gap between high-precision prototyping and the scalable manufacturing of ONN devices.

Background

The relentless evolution of artificial intelligence (AI) necessitates increasingly high-performance and energy-efficient hardware. Deep learning models, in particular, face significant challenges related to their computational cost and power consumption, hindering the sustainable development of AI. Optical computing has emerged as a promising alternative, processing information using photons, which fundamentally eliminates the electrical resistance and heat generation associated with electron movement. Compared to conventional electronic neural networks, optical neural networks (ONNs) leverage the inherent parallelism of light to achieve significantly faster computations with far lower power consumption. Despite their theoretical advantages, ONNs have largely remained confined to laboratory prototyping due to manufacturing complexities, limiting their adoption as practical AI hardware.

Key Findings

A team of Chinese researchers has shattered a world record in optical neural network (ONN) device fabrication, successfully 3D printing an astonishing 4 million 500-nanometer optical neurons on a millimeter-scale chip in just 15 minutes. This groundbreaking achievement was facilitated by a novel optical encoder that performs random projections through specifically engineered, 3D-printed diffractive layers.

The fabricated ONN device demonstrated exceptional performance, achieving classification accuracies ranging from 97% to 99% across a diverse array of AI tasks, including handwritten digit recognition, human behavior analysis, and facial keypoint detection. This marks a critical step towards bridging the long-standing gap between high-precision laboratory prototyping and the scalable, industrial-grade manufacturing of ONN devices.

This innovative manufacturing approach allows for the creation of complex optical circuits at speeds and densities previously unattainable with traditional microfabrication techniques like photolithography or electron beam lithography. The minute 500-nanometer neuron size is instrumental in realizing high-density ONNs, enabling the integration of a vast number of computational elements within a compact, millimeter-scale chip. Furthermore, the adoption of 3D printing technology significantly enhances manufacturing flexibility, drastically shortens design iteration cycles, and opens pathways for the rapid development of custom ONN solutions.

This record-breaking manufacturing speed combined with high classification accuracy represents a major leap forward for optical computing. Looking ahead, this technology promises to enable the direct execution of more sophisticated AI models on-chip, dramatically enhancing the performance of real-time AI applications such as autonomous vehicle decision-making and high-speed image processing on edge devices. Reductions in manufacturing costs and shortened development cycles will also be pivotal for the widespread adoption of optical neural networks across various industrial sectors, positioning optical computing as a foundational technology in shaping the future of AI.

Source: <https://www.einpresswire.com/article/927336298/optical-computing-random-projection-optical-neural-networks-printed-at-record-speeds>

Collected: July 17, 2026 | Automated Research System (Gemini API)

#11 Hamamatsu Photonics Launches High-Speed, High-Sensitivity InGaAs Image Sensor Module 'C16795 Series' for Food and Semiconductor Inspection

Published July 10, 2026 Engineer Live Japan



OVERVIEW

Hamamatsu Photonics has unveiled its C16795 series image sensor module, designed for high-speed and high-sensitivity applications in industrial sectors like food inspection, plastic sorting, semiconductor inspection, and traffic monitoring. Featuring an InGaAs area image sensor, the module delivers low noise and superior image quality, significantly reducing thermal noise through an advanced cooling system. It achieves real-time data processing and image acquisition at 503 frames per second, boasting a wide dynamic range of 3500, thus contributing to high-precision inspection and monitoring.

IN DEPTH

Hamamatsu Photonics has introduced its C16795 series image sensor module, specifically designed for industrial applications. This new module provides high-speed and high-sensitivity imaging capabilities required in diverse fields such as food inspection, plastic sorting, semiconductor inspection, and traffic monitoring.

Key Findings

The C16795 series achieves real-time data processing and image acquisition at a high speed of 503 frames per second, coupled with a remarkably wide typical dynamic range of 3500. This enables accurate capture of detailed information even in dynamic environments, facilitating high-precision analysis.

Technical Details

At the core of this module is a highly sensitive InGaAs (Indium Gallium Arsenide) area image sensor. InGaAs sensors exhibit high sensitivity not only in the visible light spectrum but also in the near-infrared range, making them superior for detecting subtle material differences and hidden defects that are difficult for conventional silicon sensors to discern. For example, they can be applied in foreign object detection in food, differentiation of various plastic types, and internal defect inspection of semiconductor wafers. Furthermore, the C16795 series incorporates a low-noise design and integrates an advanced cooling system to effectively suppress thermal noise generated by the sensor chip. This ensures the generation of clear, high-quality images even from faint light signals, enhancing measurement reliability. A dynamic range of 3500 allows the module to capture a broad range of brightness from very bright to very dark areas simultaneously, preventing information loss in complex scenes.

Background & Context

Many industrial sectors, including manufacturing quality control, automated sorting in recycling, and smart traffic systems, are experiencing a rapid increase in demand for automation and high-precision inspection and monitoring. The widespread adoption of AI-driven image recognition systems, in particular, is strongly driving the need for enhanced sensor technology performance. Previously, it was challenging for conventional image sensors to simultaneously achieve high speed, high sensitivity, and a wide dynamic range. The C16795 series effectively addresses these conflicting requirements at a high level, providing an effective solution to these industrial challenges. Hamamatsu Photonics is leveraging its long-standing expertise in optical technology to strengthen its leadership in the industrial imaging market.

Strategic Significance & Outlook

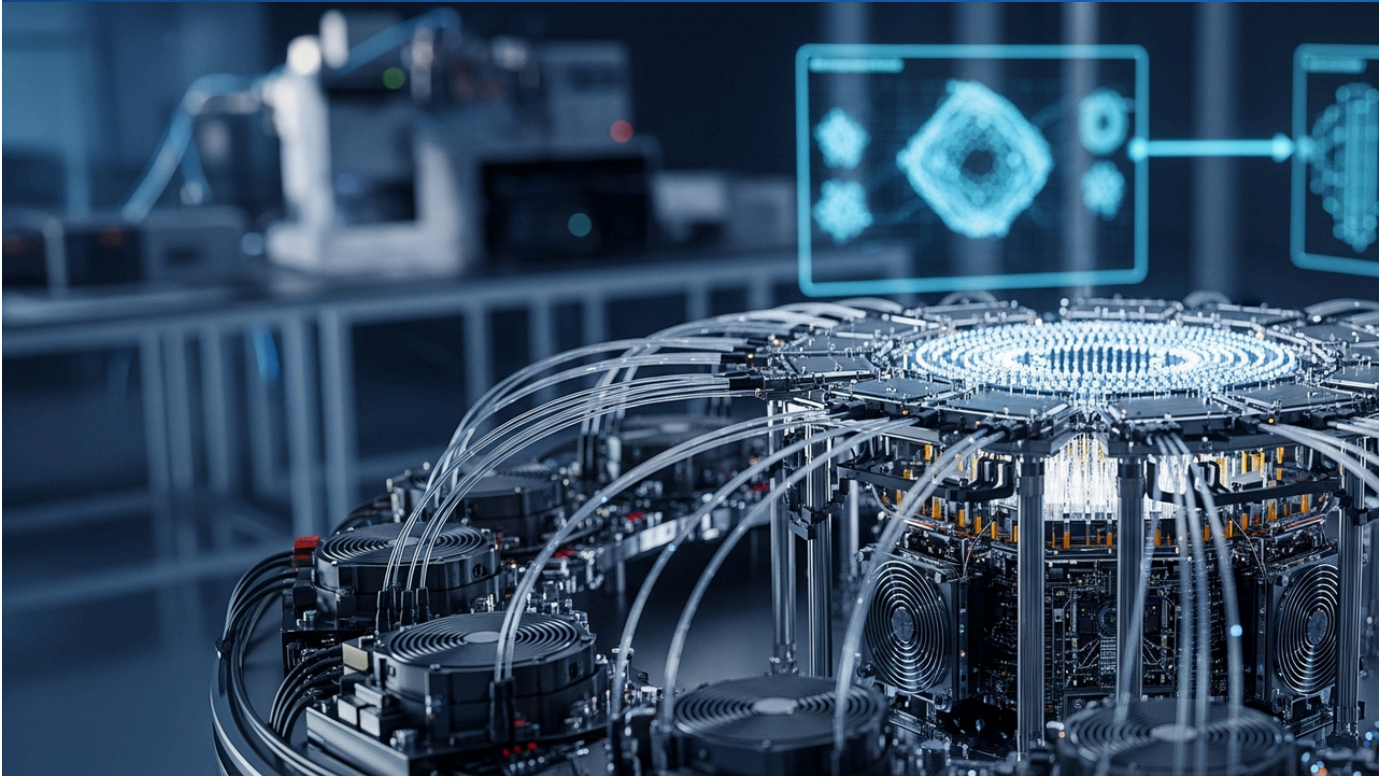
The introduction of the C16795 series raises the performance benchmark for inspection and monitoring systems to a new level. This technology will enable more advanced automation, improved production efficiency, and stringent product quality control, accelerating digital transformation across industries. Particularly when combined with AI, it will allow for the automation of complex visual inspections previously performed by humans, reducing human error while enabling 24-hour operation. This is expected to lead to reduced manufacturing costs and enhanced market competitiveness, with expanding applications in social infrastructure sectors such as infrastructure monitoring and security.

Source: <https://engineerlive.com/hamamatsu-launches-image-sensor-module/>

Collected: July 17, 2026 | Automated Research System (Gemini API)

#12 PsiQuantum Accelerates Fault-Tolerant Photon-Based Quantum Computer Development with GlobalFoundries' Omega Silicon Photonics, Targeting Hub Operations by 2027

Published July 15, 2026 PsiQuantum (Official Website) USA



OVERVIEW

Quantum computing firm PsiQuantum is accelerating the construction of its fault-tolerant, photon-based large-scale quantum computer, leveraging GlobalFoundries' Omega silicon photonics platform. This modular platform is designed for scalability using standard telecom optical fiber without conversion, aiming for 1 million logical qubits. The company has raised approximately \$1 billion and is establishing hubs in Chicago and Australia, with both facilities targeted for operation by 2027.

IN DEPTH

Quantum computing firm PsiQuantum is accelerating the construction of its fault-tolerant, photon-based large-scale quantum computer, leveraging the advanced Omega silicon photonics platform manufactured by GlobalFoundries as its core technology.

Key Findings

PsiQuantum is pursuing a unique approach to building a practical, large-scale quantum computer by fabricating chips in existing semiconductor production facilities and connecting approximately 100 cryogenic cabinets to form the functional system. This modular platform is designed to scale using standard telecommunications optical fibers without requiring additional conversion steps when increasing the number of qubits, with an ultimate goal of achieving one million logical qubits.

Technical Details

Photon-based quantum computers utilize photons as quantum bits (qubits) to perform computations based on quantum mechanical principles such as superposition and entanglement. PsiQuantum's silicon photonics platform constructs integrated circuits for generating, manipulating, and detecting photons directly on silicon chips, leading to highly stable qubits. GlobalFoundries' manufacturing processes enable the high-precision, large-scale production of these complex photonic circuits. The 'Omega' platform is specifically designed with robust fault-tolerance capabilities, which is key to realizing 'logical qubits' with extremely low error rates. Unlike traditional superconducting or ion-trap qubits, photons can maintain their quantum states at room temperature, eliminating the need for extensive cryogenic systems and offering a significant advantage in scalability. This allows the entire system to be composed of approximately 100 cooling cabinets, targeting the achievement of one million logical qubits.

Background & Context

Quantum computing holds the potential to solve complex problems that are intractable for conventional supercomputers, spanning applications in drug discovery, materials science, financial modeling, and cryptography. However, building practical 'large-scale' quantum computers has faced significant technical challenges related to qubit stability, error correction, and scalability. PsiQuantum's approach aims to overcome these challenges by leveraging existing semiconductor manufacturing technologies. The company has raised a substantial sum, approximately \$1 billion, indicating strong investor confidence in the potential of photon-based quantum computing. By establishing hubs in Chicago and Australia, PsiQuantum is laying the groundwork for global R&D and deployment, aiming for facility operations by 2027. Furthermore, the importance of European nations investing in the quantum technology industrial supply chain to avoid merely being consumers has been highlighted, signaling intensifying international competition in quantum technology.

Strategic Significance & Outlook

The advancements in PsiQuantum's photon-based quantum computer have the potential to be a game-changer in the quantum computing field. The realization of a practical, fault-tolerant quantum computer would lead to transformative breakthroughs across a wide range of industries, including pharmaceuticals, chemistry, materials science, and finance. Specifically, by building upon silicon photonics, the company can leverage the existing semiconductor ecosystem, promising faster industrialization and scaling compared to other quantum computing modalities. The planned operationalization of its hubs by 2027 represents a critical milestone in the company's roadmap and is a concrete step towards providing actual quantum computing services. Amidst intensifying international competition, PsiQuantum's technology stands as a strong candidate to achieve quantum advantage and bring truly useful quantum computers to market.

Source: <https://www.psiquantum.com/>

#13 AIM Photonics Secures Over \$321M from Air Force Research Lab and SUNY Research Foundation to Advance Silicon Photonics R&D

Published July 15, 2026 optics.org USA



OVERVIEW

The American Institute of Manufacturing Photonics (AIM Photonics) has secured a new 7-year cooperation agreement exceeding \$321 million with the Air Force Research Laboratory (AFRL) and the SUNY Research Foundation. This significant funding will enable the next phase of silicon photonics R&D for defense and other critical applications, aiming to advance the nation's competitive technological advantage and national security interests. AIM Photonics is developing Process Design Kits (PDKs) to support chip-to-package electronic-photonic design automation, which is expected to substantially reduce prototype development costs.

IN DEPTH

The American Institute for Manufacturing Photonics (AIM Photonics) has signed a new 7-year cooperation agreement with the Air Force Research Laboratory (AFRL) and the SUNY Research Foundation, totaling over \$321 million. This substantial funding is intended to propel the next phase of silicon photonics research and development (R&D) in the United States, specifically targeting defense applications and reinforcing the nation's competitive technological advantage and national security interests.

Key Findings

With this new funding, AIM Photonics will accelerate the development of Process Design Kits (PDKs) that support chip-to-package electronic-photonic design automation. This will enable a significant reduction in the time and cost associated with prototyping complex photonic integrated circuits, thereby speeding up the innovation cycle.

Technical Details

Silicon photonics is a technology that integrates optical circuits onto silicon chips, leveraging existing CMOS semiconductor manufacturing processes. It offers advantages such as high-speed data transmission, low power consumption, and miniaturization. This technology holds the potential to revolutionize a wide range of fields, including data centers, communication networks, sensors, and medical devices. In defense applications particularly, it is crucial for enabling secure, high-speed communication, high-precision sensors, and lightweight, robust systems. The PDKs developed by AIM Photonics will provide a standardized toolset that allows designers to efficiently develop silicon photonics-based devices and seamlessly transition them to manufacturing. This reduces design complexity and development risks, fostering an environment where innovative ideas can be rapidly commercialized.

Background & Context

The U.S. government is making significant investments to secure domestic leadership in semiconductor and advanced computing technologies. Silicon photonics is a key technology for resolving data transmission bottlenecks and improving energy efficiency, especially with the advancements in artificial intelligence (AI) and high-performance computing (HPC). As competing nations like China rapidly enhance their technological capabilities in this field, the U.S., through such large-scale funding injections, aims to strengthen its domestic R&D capacity and maintain its technological edge. Public-private innovation hubs like AIM Photonics serve as critical mechanisms for universities, industry, and government agencies to collaborate, rapidly commercialize research outcomes, and maximize economic and strategic benefits.

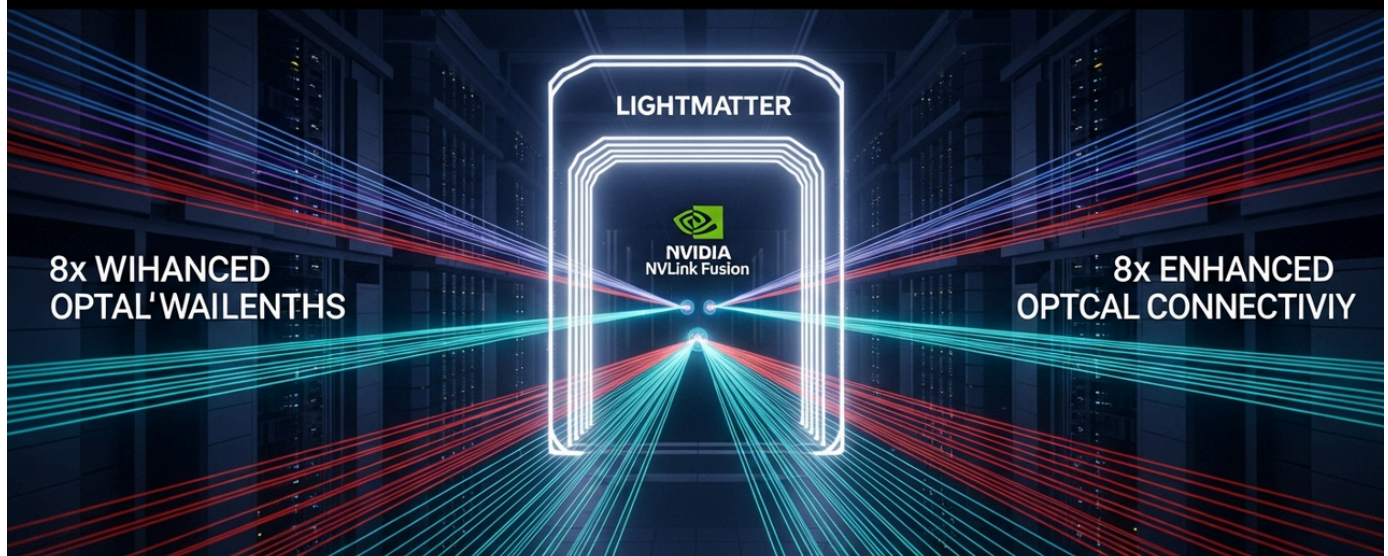
Strategic Significance & Outlook

The funding exceeding \$321 million provides a strong foundation for AIM Photonics to further push the frontiers of silicon photonics technology. Over the next seven years, this capital will be allocated towards developing higher-performance optical communication components, more sophisticated optical sensors, and new optical computing architectures. Applications in the defense sector, in particular, could provide a significant technological advantage by improving U.S. military communication and intelligence-gathering capabilities to address modern threats. Furthermore, the standardization and widespread adoption of PDKs will make it easier for a broad range of companies, including startups and small-to-medium enterprises, to leverage silicon photonics technology, thereby fostering overall innovation and growth in the U.S. economy.

Source: <https://optics.org/news/aim-photonics-wins-321m-to-further-its-silicon-photonics-randd>

#14 Lightmatter Joins NVIDIA NVLink Fusion Ecosystem, Boosts AI Data Center Optical Connectivity 8x with First 16-Wavelength Bidirectional DWDM Link

Published July 17, 2026 Lightmatter (Official Website) USA



OVERVIEW

Photonic computing company Lightmatter has advanced its photonic computing and interconnect technology for AI data centers, joining the NVIDIA NVLink Fusion ecosystem. The company achieved the world's first 16-wavelength bidirectional optical DWDM link, successfully increasing fiber bandwidth density eightfold. Lightmatter's Passage M1000 3D photonic superchip is positioned as a platform enabling massive scale-up bandwidth for AI model training clusters, with the company's technology aiming to overcome the physical limitations of electrical interconnects.

IN DEPTH

Lightmatter, a pioneer in photonic computing, has announced groundbreaking advancements in its photonic computing and interconnect technology for AI data centers, including its entry into the NVIDIA NVLink Fusion ecosystem.

Key Findings

Lightmatter has successfully achieved the world's first 16-wavelength bidirectional optical DWDM (Dense Wavelength Division Multiplexing) link, which has increased fiber bandwidth density by eightfold per single optical fiber. This achievement is a critical technology underpinning the company's Passage M1000 3D photonic superchip, designed to enable massive scale-up bandwidth for AI model training clusters.

Technical Details

Electrical interconnects are facing physical limitations in terms of power consumption, latency, and bandwidth density as AI workloads continue to scale. Lightmatter's photonic technology addresses these challenges by utilizing photons as the medium for data transmission. The 16-wavelength bidirectional DWDM link means that 16 different optical wavelengths are simultaneously used to transmit and receive data over a single optical fiber, dramatically increasing effective data transmission capacity. Compared to traditional copper cabling and existing optical interconnects, Lightmatter's solution offers significantly higher bandwidth at lower power consumption, enabling the ultra-fast communication required between AI accelerators within data centers. The Passage M1000 3D photonic superchip combines advanced 3D packaging technology with silicon photonics to closely integrate optical connectivity with computing units, achieving highly efficient AI processing.

Background & Context

AI training and inference require processing vast amounts of data and constant data movement between GPUs and AI accelerators within data centers. This data movement often becomes the system's performance bottleneck, particularly problematic in large-scale AI clusters. Lightmatter's participation in the NVIDIA NVLink Fusion ecosystem signifies that its photonic interconnect technology has been recognized for its value and effectiveness by an industry leader. NVIDIA NVLink is widely adopted as a high-speed interconnect between GPUs, and the integration of Lightmatter's technology is expected to further enhance the overall efficiency and scalability of AI systems. This is a crucial step towards enabling AI developers to build larger, more complex models and obtain results more quickly.

Strategic Significance & Outlook

Lightmatter's technology is poised to revolutionize AI data center architectures and lay the foundation for next-generation AI computing capabilities. Achievements like the 16-wavelength bidirectional DWDM link clearly demonstrate that optical connectivity is essential for overcoming the limitations of electrical connections and shaping the future of AI. Widespread adoption of this technology is expected to dramatically reduce AI model training times and significantly cut power consumption, improving AI's sustainability and economic viability. Furthermore, higher-performance AI infrastructure is anticipated to drive new innovations in various fields where AI is applied, such as autonomous driving, drug discovery, and climate change modeling. Lightmatter will strengthen its leadership in this domain and play a vital role in defining the future of AI computing.

Source: <https://lightmatter.co/>

#15 Hamamatsu Photonics Europe Expands Advanced Imaging Solutions for Medical and Scientific Fields by Strengthening Fairchild Imaging CMOS Sensor Technologies Post-Acquisition

Published July 10, 2026 Hamamatsu Photonics Europe (Press Release) Japan



OVERVIEW

Following its 2024 acquisition of Fairchild Imaging, Hamamatsu Photonics Europe is strengthening its advanced imaging solutions by actively promoting Fairchild's CMOS sensor technologies. This integration broadens Hamamatsu's capabilities to support demanding applications like X-ray, medical, scientific, and space imaging. The enhanced sensors offer exceptionally low noise (0.25 e^- RMS) and high dynamic range, improving Hamamatsu's ability to deliver high-performance CMOS sensors crucial for image quality, reliability, and application-specific designs.

IN DEPTH

Hamamatsu Photonics Europe has announced a significant enhancement to its imaging solution portfolio through the integration and active promotion of advanced CMOS sensor technologies acquired from Fairchild Imaging in 2024.

Key Findings

This integration has dramatically boosted Hamamatsu Photonics' imaging capabilities, particularly in fields requiring extremely high performance, such as X-ray imaging, medical imaging, scientific imaging, and space-related imaging. This enables the provision of high-performance CMOS sensors that combine exceptionally low noise (0.25 e^- RMS) with an excellent dynamic range.

Technical Details

Fairchild Imaging's CMOS sensor technology, inherently characterized by low noise, high sensitivity, and fast readout, creates synergistic effects when combined with Hamamatsu Photonics' long-standing expertise in photodetector technology. The ultra-low noise of 0.25 e^- RMS offers a decisive advantage, especially in scientific experiments where faint light signals must be detected, and in medical diagnostics (e.g., low-dose X-ray imaging) where noise directly impacts image quality. Furthermore, the high dynamic range allows for detailed capture of information in both bright and dark areas within scenes containing mixed illumination, minimizing information loss during image processing. This contributes to improved diagnostic accuracy, enhanced reliability of research results, and better detection capabilities for faint celestial objects in space observation. Additionally, Hamamatsu is strengthening its application-specific sensor design capabilities, enabling the rapid provision of custom solutions tailored to specific customer requirements.

Background & Context

Fields such as medicine, science, defense, and space consistently demand the highest standards of imaging performance. The accuracy of diagnoses, reproducibility of research, and success of missions heavily depend on the quality of image sensors. With the advancement of digitalization and AI-driven analysis, the demand for cleaner and more detailed image data has never been higher. The 2024 acquisition of Fairchild Imaging was a strategic move by Hamamatsu Photonics to establish its position in this high-end CMOS sensor market and build a competitive advantage. This recent technological enhancement demonstrates the concrete realization of that acquisition's benefits in products and solutions, underscoring Hamamatsu Photonics' intent to play a leading role in the global advanced imaging market.

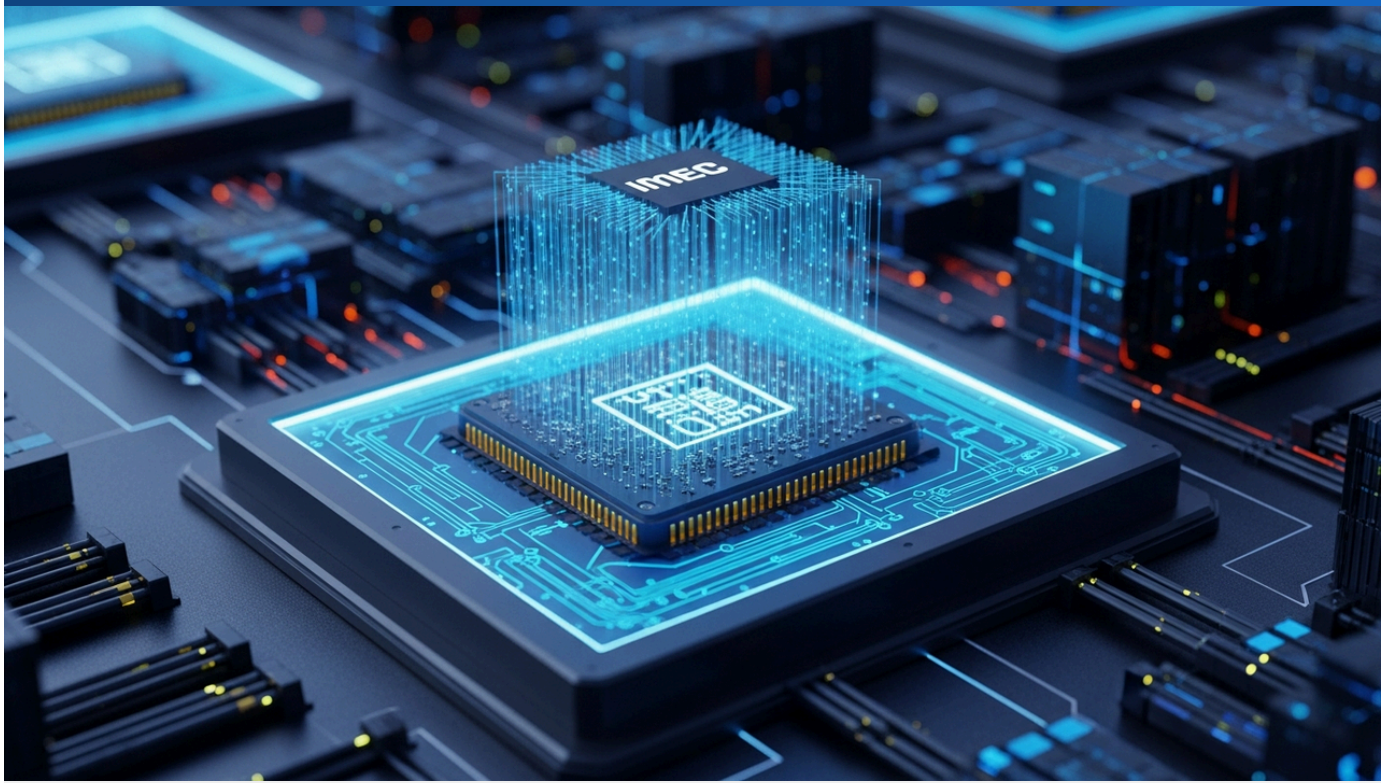
Strategic Significance & Outlook

The strengthening of Fairchild Imaging CMOS sensor technologies by Hamamatsu Photonics Europe will significantly impact the high-precision imaging market. In the medical field, it will enable earlier and more accurate disease diagnoses, contributing to improved patient prognoses. In scientific research, it will allow for more detailed observation of microscopic phenomena and high-speed processes than ever before, fostering new discoveries. For space-related applications, it will enable the observation of more distant celestial bodies and higher-resolution Earth observation, contributing to scientific exploration and national security. This technological innovation is poised to set new standards for high-performance CMOS sensors and serve as a foundation for accelerating digitalization and automation across various sectors.

Source: <https://www.hamamatsu.com/eu/en/news/press-releases/2026/advanced-imaging-with-fairchild-cmos-sensors.html>

#16 As AI Shifts to Inference, imec Drives 2.5D/3D Optical I/O Integration Closer to Chip to Overcome Performance Bottlenecks

Published July 09, 2026 EE Times ベルギー



OVERVIEW

As AI workloads pivot from training to inference, the demand for high-speed, low-latency data transfer necessitates a radical shift in data center connectivity. imec is spearheading 2.5D and 3D optical I/O technologies to integrate optical interconnects directly onto or within processor packages, aiming to overcome critical bottlenecks in memory, bandwidth, latency, and energy consumption. This transformative approach promises unprecedented AI scaling, despite facing significant challenges in materials, manufacturing, and thermal management.

Background

As the primary focus of AI workloads shifts from training to inference, the demands on data center infrastructure are undergoing a fundamental evolution. The explosive growth of AI has made data center power consumption a global concern, with current electrical interconnects emerging as a significant bottleneck. While GPUs and AI accelerators continue to advance in density and performance, the limitations of the electrical links connecting them increasingly hinder further scaling. Belgian research institution imec, a global R&D leader, is actively promoting 2.5D and 3D optical I/O technologies to integrate optical interconnects far more closely with processor chips than ever before.

Current solutions like Co-Packaged Optics (CPO) represent a step forward, but imec's vision extends further, aiming to "embed" optical connectivity directly into the chip or package. This proactive stance is driven by predictions that future AI systems will demand data bandwidths reaching tens of petabits per second (Pbps) and extremely low latencies. Major semiconductor manufacturers and cloud providers recognize this advanced optical integration as crucial for addressing AI's looming "energy crisis" and for building the next generation of AI infrastructure, actively collaborating with research institutions like imec to accelerate its realization.

Key Findings

imec's initiatives directly target the persistent bottlenecks inherent in traditional electronic systems, including limitations in memory access, network bandwidth, data latency, and energy consumption. By integrating optical interconnects intimately with processor chips, the research promises a dramatic improvement in the overall performance and energy efficiency of future AI systems.

Technical Details

AI inference workloads demand high-speed, real-time processing of massive data volumes, characterized by distinct computational patterns and data flows compared to the training phase. In this context, the inherent speed and power consumption limitations of electrical signals become acutely pronounced, particularly in communication paths between processors and memory, and between processors themselves. imec's 2.5D and 3D optical I/O technologies address this by enabling the placement of optical transceivers either within the processor package or, ultimately, directly on the chip.

This close integration eliminates the need for electrical signals to traverse lengthy traces, thereby significantly mitigating signal degradation, reducing latency, and cutting power loss. In 2.5D packaging, optical engines are integrated with processors via a silicon interposer. The more advanced 3D stacking approach envisions the vertical integration of optical components directly onto the chip stack. However, such pioneering integration introduces new technical hurdles, including ensuring compatibility between disparate optical and electrical materials, achieving high manufacturing yields in complex fabrication processes, and implementing effective thermal management strategies at the chip level. imec is actively researching novel materials science, advanced process technologies, and innovative design methodologies to surmount these formidable challenges.

Strategic Significance & Outlook

imec's advancement of 2.5D and 3D optical I/O technologies holds the potential to fundamentally redefine the future landscape of AI computing. Should this technology mature and achieve widespread deployment, AI accelerator performance is projected to improve dramatically, accompanied by a drastic reduction in power consumption. This transformative shift will enable more sophisticated AI models to operate at near real-time speeds, fostering groundbreaking innovations across a diverse array of application areas, including autonomous driving, augmented/virtual reality (AR/VR), advanced medical diagnostics, and complex scientific simulations.

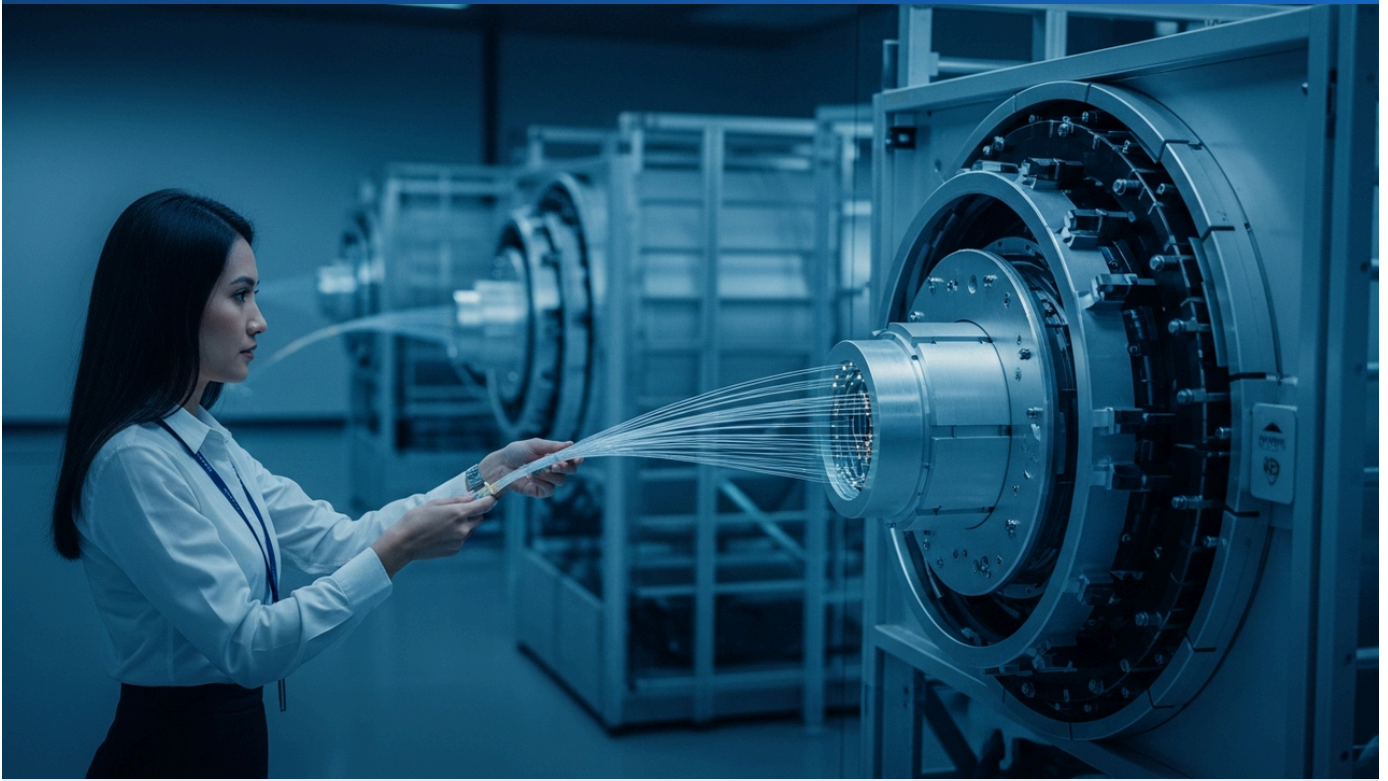
While overcoming significant engineering challenges, particularly in material compatibility and thermal management, remains paramount, imec's pioneering research is poised to play a central role in establishing optics as the most critical interconnect technology in the rapidly evolving AI era.

Source: <https://www.eetimes.com/as-ai-moves-from-training-to-inference-optics-moves-closer-to-the-chip/>

Collected: July 17, 2026 | Automated Research System (Gemini API)

#17 Optical Fiber Demand Surges Amidst AI Data Center Expansion; Corning Emphasizes Criticality in Mexico

Published July 13, 2026 Mexico Business News メキシコ



OVERVIEW

The global surge in AI infrastructure and data center expansion is fueling unprecedented demand for optical fiber, with Mexico emerging as a key growth region. Carlos Zúñiga of Corning Optical Communications underscores fiber's strategic importance, declaring it 'as essential for AI performance as processing power itself.' This trend is compelling hyperscalers to actively secure fiber supply and invest in advanced photonic solutions for direct-to-processor optical connectivity, thereby enhancing data transfer speeds and energy efficiency.

Background

The proliferation of AI infrastructure and the escalating build-out of data centers worldwide are driving an unprecedented surge in global demand for optical fiber. This trend is particularly pronounced in the Mexican market, where a confluence of nearshoring initiatives and a burgeoning digital economy is stimulating significant data center investments.

This escalating demand directly fuels the need for advanced AI and High-Performance Computing (HPC) infrastructure, intrinsically linked to robust optical fiber and related optical communication technologies. Data center operators now view network infrastructure upgrades as an urgent strategic imperative to maximize AI performance capabilities. The global emphasis on supply chain resilience further underscores the criticality of securing local optical fiber production capacity and ensuring its stable, uninterrupted supply, creating substantial opportunities for fiber manufacturers.

Key Findings

Carlos Zúñiga, Latin America Regional Director for Corning Optical Communications, emphatically stated that 'optical fiber is becoming as essential to AI performance as processing power itself.' This assertion positions data transmission capabilities as holding strategic value commensurate with raw computing power in the AI era.

Technically, modern AI model training and inference workflows necessitate the real-time movement of colossal datasets, demanding bandwidths in the tens to hundreds of gigabits per second (Gbps), often across vast GPU clusters and specialized AI accelerators within data centers. Traditional copper-based interconnects inherently face severe limitations in signal degradation, power consumption, and transmission distance at this scale. Optical fiber effectively surmounts these challenges, providing superior data transmission at significantly higher speeds, over extended distances, and with minimal signal loss. This capability empowers data center architects to design more flexible, scalable, and energy-efficient infrastructure.

Consequently, hyperscalers are not only aggressively securing optical fiber supply but are also investing heavily in advanced photonic technologies. This includes innovations like Co-Packaged Optics (CPO) and near-package optical interconnects, which integrate optical components directly with processors. The primary objective is to dramatically minimize data transfer latency and further reduce overall energy consumption at the chip-to-chip and rack-to-rack level.

This surge in optical fiber demand transcends a temporary market fluctuation, reflecting a fundamental structural shift within the AI-driven digital economy. As AI applications continue their expansive trajectory, optical fiber and photonics are poised to become the indispensable 'nervous system' of data centers. The robust growth in emerging markets like Mexico is set to accelerate the global optical communications industry's expansion, driving continuous investment in production capacity and technological innovation to deliver increasingly high-performance and cost-effective optical solutions.

Source: <https://mexicobusiness.news/cloudanddata/news/optical-fiber-demand-surges-data-centers-expand>

Collected: July 17, 2026 | Automated Research System (Gemini API)