

Photonics

Weekly Intelligence Report

2026-07-26 | 31 articles | 10 countries

troy-technical.jp

This Week's Keyword

AI Optical Interconnects

CPO, SiP, and Photonic Processors Drive AI

31

articles

Total Articles Analyzed

10

countries

Source Countries/Regions

100x

speedup

Optical Data Transfer

>80%

reduction

Interconnect Power

All 31 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	AI Data Centers Shift to Opt	Corporate Strategy						AI data centers are rapidly adopting optical interconnects (CPO, 1.6T transceivers) led by Broadcom/Nvidia.
#02	Silicon Photonics for AI	Market Analysis						Silicon photonics is crucial for AI data centers, enabling 800G/1.6T transceivers and CPO integration.
#03	Nvidia/Broadcom CPO Vol Prod	Corporate Strategy						Nvidia and Broadcom adopt CPO/silicon photonics for volume production, impacting the entire supply chain.
#04	Photonics ETF Investment	Market Trend						AI ETF adds Ayar Labs, new Photonics ETF launches, signaling surging investment in optical interconnects.
#05	Ultra-Low-Voltage TFLN Mod	Research						New TFLN modulator achieves ultra-low voltage, 224 Gbit/s PAM-4, for compact optical transmitters.
#06	Sumitomo Photodetector IP	Patent Analysis						Sumitomo Electric leads optical transceiver photodetector patents, showing strong IP in a maturing market.
#07	Integrated Photonics Timing	Research						Integrated photonics frequency combs achieve robust picosecond timing in mobile environments for portable clocks.
#08	Fujitsu APN & Quantum	Corporate Strategy						Fujitsu, 1Finity, Chunghwa Telecom partner for 2 years to advance All-Photonics Network and quantum tech in Taiwan.
#09	SILITH/UMC SiP Wafers	Corporate Strategy						SILITH receives first mass-produced silicon photonics wafers from UMC's Singapore fab for 1.6T AI optical interconnects.
#10	MIT Solid-State LiDAR Chip	Research						MIT develops solid-state LiDAR chip with wider field of view, no moving parts, for autonomous vehicles.
#11	Tower Semi Japan SiP Fab	Corporate Strategy						Tower Semiconductor invests \$3B in Japan for 300mm silicon photonics manufacturing by late 2027.
#12	Seoul Uni Programmable PIC	Research						Seoul Uni team develops programmable photonic chip to control light speed on-demand for optical computing.

#	Article Title	Type	Tech Novelty	Market Proximity	Market Impact	Data Reliability	US/EU Relevance	Summary
#13	Ultrathin Metasurface 74fs	Research						Ultrathin metasurface manipulates light in record 74 femtoseconds, advancing optical computing and quantum.
#14	STMicro 300mm SiP Prod	Corporate Strategy						STMicroelectronics begins 300mm wafer production of PIC100 silicon photonics for AI data centers.
#15	Hesai Kosmo Spatial AI	New Product						Hesai unveils Kosmo platform, integrating LiDAR 3D perception with full-color sensing for Physical AI.
#16	Lightmatter Photonic Proc	New Product						Lightmatter's photonic processor achieves 10x AI speedup, 3.5-5x power efficiency over GPUs.
#17	YieldWerx Optical I/O	Market Analysis						YieldWerx: In-package optical I/O essential for AI workloads, shifting from system-to-system to in-package.
#18	TSMC COUPE SiP Platform	New Product						TSMC unveils 'COUPE' silicon photonics platform for CPO, targeting 1.6 Tb/s optical engines by 2026.
#19	Marvell SiP Patents Lead	Patent Analysis						Marvell Asia leads photonic integration patents; TSMC, Intel entering, showing CPO/integrated photonics interest.
#20	SmarAct PIC Testing	Corporate Strategy						Germany's SmarAct partners with Akhetronics to revolutionize PIC testing accuracy for optical computing.
#21	Photonics Investment Boom	Market Overview						Photonics attracts billions in investment for AI infrastructure due to breakthroughs in bandwidth, latency, power.
#22	Lightmatter Optical Interc	Corporate Announcement						Lightmatter reports optical interconnects achieve 100x speed, 5x power efficiency; CPO with TSMC/GlobalFoundries by 2028.
#23	AI Optical Chip Growth	Market Overview						AI optical chip market growing due to AI/ML, offering bandwidth, latency, power efficiency for next-gen computing.
#24	Nvidia SiP for GPUs	Corporate Strategy						Nvidia invests billions in silicon photonics for Rubin/Blackwell GPUs, aiming for petabit-scale bandwidth.
#25	Ion-Beam Origami Fab	Research						'Ion-Beam Origami' fabricates 3D photonic nanostructures in seconds (>100x speedup), addressing manufacturing.
#26	Global Optical Tech Exp	Market Overview						UMC ships first silicon photonics wafers, Tower invests \$3B in Japan, accelerating global optical tech expansion.
#27	CamGraPhIC Graphene Tx	Corporate Strategy						UK's CamGraPhIC secures funding for graphene-based photonic transceivers for AI interconnects.
#28	Marvell Celestial AI Acq	Corporate Strategy						Marvell acquires Celestial AI, strengthening on-chip optical expertise, leading with 1.6T/3.2T optical solutions.
#29	Marvell >80% Power Reduct	Corporate Announcement						Marvell's Celestial AI acquisition reduces interconnect power by >80%; GlobalFoundries forecasts doubling SiP revenue.
#30	NSF Quantum Materials	Research Funding						NSF invests in quantum materials research, highlighting photonic quantum systems integration into semiconductor chips.
#31	High-Res ToF LiDAR for AI	Market Overview						High-res direct ToF LiDAR brings spatial intelligence to edge AI, enhancing robotics and AR/VR.

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

Three Questions That Demand Your Decision This Week

❶ Is your AI platform ready for optical interconnects?

Nvidia, Broadcom, and Marvell are rapidly deploying CPO/SiP for 1.6T/3.2T AI interconnects, with volume production starting now. Does your current or planned AI hardware roadmap integrate these technologies, or will you face performance and power bottlenecks?

❷ How will advanced LiDAR disrupt your autonomous strategy?

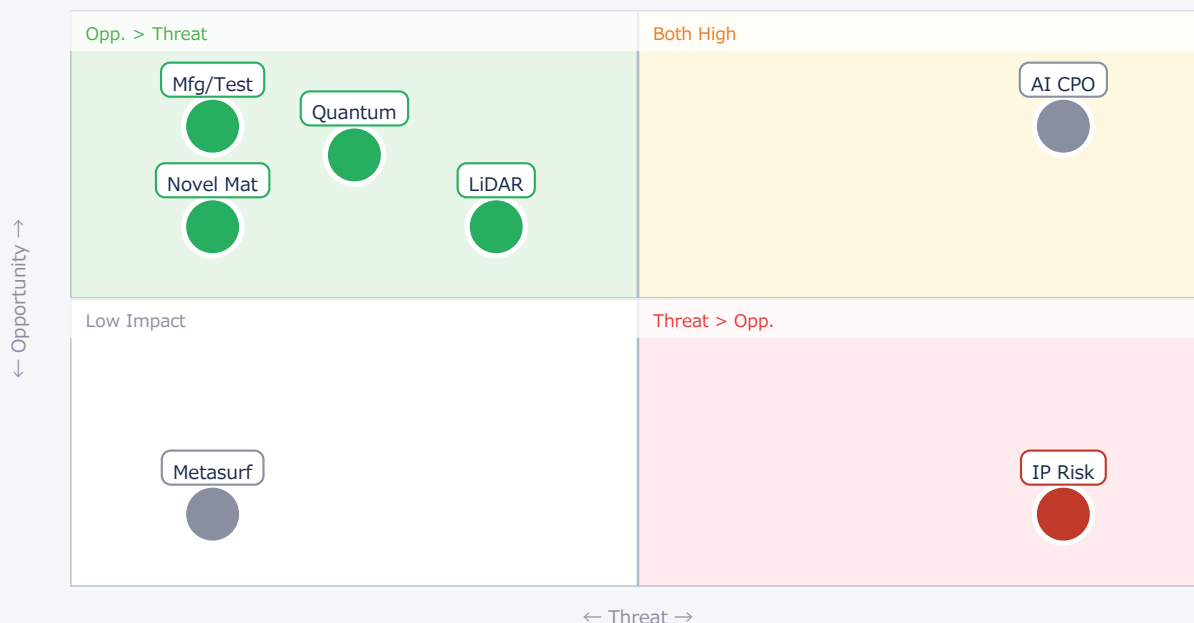
MIT's solid-state LiDAR offers wider FOV without moving parts, while Hesai integrates full-color sensing. Are your current sensor suites competitive, and how will these innovations impact your autonomous vehicle or robotics platform's cost, reliability, and perception capabilities?

❸ Are you investing in next-gen photonics manufacturing?

UMC, Tower Semi, and STMicroelectronics are scaling 300mm silicon photonics production, and 'Ion-Beam Origami' promises >100x fabrication speedup. Is your supply chain prepared for this shift, and are you investing in advanced manufacturing and testing (e.g., SmarAct) to secure future optical chip supply?

Opportunities vs. Threats for US/European Companies

Opportunity vs. Threat Matrix for US/European Companies



Item	Quadrant	↑ Opportunity	↓ Threat
● AI CPO	Critical	New market growth	Platform obsolescence
● Mfg/Test	Opp.	Enable mass prod	Skill gap
● LiDAR	Opp.	New sensor market	Incumbent disruption
● Novel Mat	Opp.	Next-gen perf	Long R&D; cycle
● Quantum	Opp.	Future tech lead	High R&D; cost
● Metasurf	Ref.	Basic research	Limited impact
● IP Risk	Threat	IP licensing	Asian IP dominance

Deep Dive ① — Nvidia & Broadcom Drive CPO Volume

#03 | 2026/07/24 | BigGo Finance | Tech Novelty●●●○○ Proximity●●●●● Market Impact●●●●● Data Reliability●●●●● US/EU Relevance●●●●●

Nvidia and Broadcom are fully adopting Co-Packaged Optics (CPO) and silicon photonics, moving to volume production to meet high-speed, high-efficiency AI data transfer demands. This strategic shift signals significant economic impact across the entire supply chain, confirming CPO technology has advanced beyond experimental stages.

CPO integrates optical interconnects directly within processor/switch chip packages, drastically reducing electrical path length, signal loss, power consumption, and latency. This enables dramatic increases in data bandwidth between AI accelerators, ensuring scalability for next-gen AI/HPC systems.

► Strategic Analyst's Perspective

Strategic Analyst's Perspective: The published numbers and corporate commitments from Nvidia and Broadcom are highly realistic, indicating a definitive shift. Technical barriers for CPO are primarily in high-volume manufacturing yield and thermal management at scale, which are being actively addressed by foundries. [Opportunity] for US/EU materials & component suppliers in advanced packaging, optical components, and test equipment is immense. OEMs & device manufacturers must rapidly integrate CPO into their designs or risk falling behind. [Threat] for traditional copper interconnect suppliers and those without CPO expertise is significant, as their market share will erode rapidly. Next Actions: [Procurement] Identify and qualify CPO component suppliers (optical engines, lasers, packaging services) by Q4 2026. [R&D;] Accelerate internal CPO integration roadmaps for next-gen AI platforms by Q1 2027. [Strategy] Re-evaluate competitive landscape and potential M&A; targets in optical interconnects immediately.

Deep Dive ② — Lightmatter's Photonic AI Processor

#16 | 2026/07/19 | Daily Maverick | Tech Novelty●●●●○ Proximity●●●○○ Market Impact●●●●● Data Reliability●●●●○ US/EU Relevance●●●●●

Lightmatter's photonic processor demonstrates ~10x AI workload speedup and 3.5-5x power efficiency over GPUs. This confirms photonics as indispensable for next-gen computing, especially as Moore's Law limits electrical I/O. Nvidia also shows similar gains with CPO switches.

Photonic processors use photons for computation and data transfer, bypassing electrical limitations like resistance and heat. Lightmatter is manufacturing CPO components with TSMC and GlobalFoundries, targeting shipments by 2028, indicating rapid commercialization of this transformative technology.

► Strategic Analyst's Perspective

Strategic Analyst's Perspective: Lightmatter's performance claims, while impressive, are likely based on specific AI workloads and benchmarks. Real-world integration challenges (e.g., interfacing with existing electrical systems, software stack maturity) remain. The 2028 shipment target is realistic for pilot deployments. [Opportunity] for US/EU OEMs & device manufacturers to partner with photonic computing startups like Lightmatter to gain a first-mover advantage in energy-efficient AI. Technology licensors and IP holders should aggressively pursue patents in photonic AI architectures. [Threat] for incumbent GPU manufacturers if they cannot match these power efficiency and speed gains with their electrical-optical hybrid solutions. Procurement & supply chain managers need to monitor the emergence of these new computing paradigms. Next Actions: [R&D;] Initiate internal feasibility studies on photonic AI accelerators and their integration into existing platforms by Q4 2026. [Business Dev] Explore strategic partnerships or investments in photonic computing startups by Q1 2027. [Executive] Assess long-term impact on core product lines and competitive positioning by mid-2027.

Deep Dive ③ — MIT's Solid-State LiDAR Breakthrough

#10 | 2026/07/22 | ScienceDaily | Tech Novelty●●●●● Proximity●●○○○ Market Impact●●●●○ Data Reliability●●●●○ US/EU Relevance●●●●●

MIT researchers developed a novel silicon photonics LiDAR chip with a wider, clearer field of view and no moving parts. This design minimizes crosstalk by closely integrating antennas of different shapes, promising smaller, more durable sensors.

Eliminating moving parts enhances durability, reduces manufacturing costs, and enables miniaturization, solving issues like mechanical failures and complex calibration. This breakthrough could accelerate mainstream LiDAR adoption for autonomous vehicles, aerial surveying, and industrial monitoring.

► Strategic Analyst's Perspective

Strategic Analyst's Perspective: MIT's research represents a significant technical leap, addressing key limitations of current LiDAR systems. The claims of wider FOV and no moving parts are credible given the silicon photonics approach. Remaining technical barriers include scaling production, achieving automotive-grade reliability under diverse environmental conditions, and cost-effectiveness compared to emerging MEMS-based solutions. [Opportunity] for US/EU OEMs & device manufacturers in automotive, robotics, and industrial automation to integrate this next-gen solid-state LiDAR. Materials & component suppliers can develop specialized silicon photonics components. [Threat] for incumbent mechanical LiDAR manufacturers and those relying on less advanced solid-state designs, as this could render their platforms obsolete. Procurement managers should track this technology's maturation. Next Actions: [R&D;] Evaluate MIT's LiDAR technology for potential licensing or joint development by Q4 2026. [Business Dev] Identify potential applications and market entry strategies for solid-state LiDAR in autonomous systems by Q1 2027. [Strategy] Monitor competitor advancements in solid-state sensing and adjust product roadmaps accordingly by mid-2027.

Other Notable Articles

#05 Ultra-Low-Voltage Thin-Film Lithium Niobate Modulator Supports 224 Gbit/s PAM-4 Signals for Compact Optical Transmitters (ResearchGate)
Tech Novelty●●●●● Proximity●○○○○ Market Impact●●●○○

Academic breakthrough in TFLN modulators promises ultra-low voltage, high-speed optical transmitters for future comms.

#09 SILITH Technology Receives First Mass-Produced Silicon Photonics Wafers from UMC's Singapore 12-inch Fab (Semiconductor Today)
Tech Novelty●●●○○ Proximity●●●●○ Market Impact●●●●○

UMC's mass production of SiP wafers for SILITH's 1.6T platform is a critical step for AI optical interconnect supply.

#14 STMicroelectronics Launches 300mm Wafer Production of PIC100 Silicon Photonics for AI Data Centers (EE Times)
Tech Novelty●●●○○ Proximity●●●●○ Market Impact●●●●○

STMicro's 300mm SiP production for AI data centers highlights EU's role in scaling optical interconnect manufacturing.

#20 Germany's SmarAct Partners with Akhetronics to Revolutionize PIC Testing Accuracy for Optical Computing with Nanopositioning Systems (Physics World)
Tech Novelty●●●○○ Proximity●●●○○ Market Impact●●●○○

German firm SmarAct's nan positioning systems are crucial for high-precision testing of next-gen photonic ICs, accelerating optical computing.

#27 Cambridge Spinoff CamGraPhIC Secures Funding to Advance Graphene-Based Photonic Transceivers for AI Interconnects and Energy Reduction (Cambridge Review)

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

UK-based CamGraPhIC's graphene-based photonics could offer superior speed and energy efficiency for AI interconnects.

Recommended Actions This Week

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

■ Immediate (this week)

- [Procurement] Review current and planned AI hardware supply chains for CPO/SiP integration and potential bottlenecks. Identify alternative suppliers.
- [Strategy] Conduct a rapid competitive analysis of major AI platform providers' optical interconnect roadmaps (Nvidia, Broadcom, Marvell, Intel).

■ Short-term (1 month)

- [R&D;] Begin evaluating novel photonic materials (e.g., graphene, TFLN) for future modulator and transceiver development, assessing performance vs. SiP.
- [Business Dev] Engage with solid-state LiDAR developers (e.g., MIT spinoffs, Ayar Labs) to understand technology readiness and potential for early adoption.
- [Legal/IP] Conduct an IP landscape analysis for photonic integration and CPO to identify licensing opportunities and potential infringement risks.

■ Medium-long term (quarter+)

- [R&D;] Invest in advanced manufacturing and testing capabilities for photonic integrated circuits (PICs), including nanopositioning systems and ion-beam techniques.
- [Strategy] Develop a long-term strategy for integrating quantum photonics into future computing and communication architectures, tracking NSF investments.
- [Executive] Establish cross-functional task force to monitor and respond to the rapid shift to optical computing, reporting quarterly on strategic implications.

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Photonics — Selected Articles

Date: 2026-07-26

Articles: 31

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#01 AI Data Centers Accelerate Shift from Copper to Optical Interconnects, Broadcom and Nvidia Lead CPO and 1.6T Transceiver Deployments

Published July 23, 2026 MLQ News USA



OVERVIEW

AI data centers are undergoing a significant transition from traditional copper cabling to optical interconnects, driven by the inherent limitations of electrical I/O. Key players like Broadcom are deploying Davison CPO products, while Lightmatter's L20 optical engine and Nvidia/Cisco's planned 1.6T optical transceivers for late 2026 highlight this industry shift. This move dramatically enhances data transfer rates and efficiency, crucial for unlocking the full potential of next-generation AI infrastructure, further supported by the new Optical Compute Interconnect (OCI) Multi-Source Agreement.

Key Findings

AI data centers are now decisively transitioning from traditional copper-based interconnects to advanced optical solutions, a shift driven by the performance bottlenecks encountered with electrical I/O. Pioneering technologies such as Co-Packaged Optics (CPO) and Near-Packaged Optics (NPO) are being widely adopted, with Broadcom already deploying its Davisson CPO products and Lightmatter introducing its innovative L20 optical engine. This fundamental change is setting the stage for a new era of high-performance AI infrastructure.

Technical / Clinical Details

The relentless demand for higher bandwidth and lower latency in AI workloads has pushed electrical I/O to its physical limits, manifesting in increased power consumption, signal integrity issues, and restricted routing density. Optical interconnects offer a compelling alternative, delivering significantly greater bandwidth over longer distances with reduced power footprints. CPO integrates optical engines directly into the same package as the processor, drastically shortening the electrical path between the chip and the optical module. This proximity minimizes signal degradation and latency, leading to substantial gains in system efficiency. Lightmatter's L20 optical engine, specifically designed for AI/HPC, leverages photonic computing principles to achieve superior power efficiency and performance. Furthermore, Nvidia and Cisco are poised to deploy 1.6T optical transceivers in the latter half of 2026, promising a radical improvement in network throughput for AI clusters. The recent announcement of the Optical Compute Interconnect (OCI) Multi-Source Agreement also signals a concerted industry effort to establish interoperability standards, fostering wider adoption and accelerating innovation.

Background & Context

As AI models scale in complexity and data volumes explode, the interconnects within data centers have become a critical bottleneck. Modern GPU clusters and AI accelerators, requiring several terabytes per second of bandwidth, can no longer be efficiently linked using conventional copper. This challenge has fueled intense investment and development in optical technologies, particularly CPO and silicon photonics. Major semiconductor manufacturers, hyperscale cloud providers, and system integrators are now heavily investing in in-package optics and optical I/O solutions to meet the insatiable demands of AI workloads. This trend underscores the essential role of photonics in the future of high-performance computing.

Strategic Significance & Outlook

The evolution of optical interconnect technology is poised to revolutionize AI data center architectures. With the commercialization of CPO gaining momentum and industry leaders like Nvidia and Cisco deploying next-generation optical transceivers, the training speeds and inference capabilities of AI models are set for exponential growth. This transition will not only enhance chip-to-chip communication but also extend to intra-rack and inter-data center connectivity, maximizing the overall efficiency and scalability of AI infrastructure. Consequently, the development of even larger and more sophisticated AI models will become feasible, accelerating AI's impact across diverse fields such as autonomous driving, drug discovery, and climate modeling, marking a profound shift in how we build and deploy AI systems globally.

Source: <https://mlq.ai/news/inside-the-copper-to-optics-shift-in-ai-data-centers/>

Collected: July 24, 2026 | Automated Research System (Gemini API)

#02 Silicon Photonics Emerges as Key for AI Data Centers, Driving 800G/1.6T Transceivers and CPO Integration to Overcome Electrical Limits

Published July 22, 2026 MarketWise USA



OVERVIEW

As AI infrastructure approaches the limits of electrical interconnects, silicon photonics is rapidly becoming the essential technology for achieving high bandwidth and efficiency in data centers. The commercial deployment of next-generation 800G and 1.6T optical transceivers, optical I/O, and Co-Packaged Optics (CPO) is accelerating. Leading companies such as NVIDIA, Broadcom, Marvell, STMicroelectronics, Ayar Labs, and Lightmatter are providing integrated solutions in this domain, shaping the future of AI computing.

Key Findings

As AI infrastructure pushes against the fundamental limits of electrical interconnects in terms of bandwidth and power efficiency, silicon photonics technology is rapidly gaining prominence as the critical enabler for the next generation of data centers. At the forefront of this revolution is the accelerated commercial deployment of ultra-high-speed 800G and 1.6T optical transceivers, chip-level optical I/O, and Co-Packaged Optics (CPO) that integrate optical modules directly with processors.

Technical / Clinical Details

Silicon photonics allows for the integration of optical components like waveguides, modulators, and detectors onto silicon wafers using standard semiconductor manufacturing processes. This approach significantly reduces manufacturing costs while achieving high integration density and superior performance for optical interconnects. While 800Gbps Ethernet interfaces are becoming common in current data centers, the explosive growth of AI/HPC workloads necessitates a swift transition to 1.6Tbps and beyond. Silicon photonics not only enables these extremely high-speed transceivers but also drastically improves power efficiency and latency through CPO, where optical I/O is placed in close proximity to or directly within the AI chip package. This technology is crucial for minimizing power loss and signal degradation associated with long-distance electrical signal transmission, thereby maximizing data transfer rates between AI accelerators.

Background & Context

AI data centers consume massive amounts of power annually, with a significant portion allocated to data transfer and cooling. Electrical interconnects can consume several watts over just tens of centimeters, whereas silicon photonics-based optical interconnects achieve significantly faster communication with orders of magnitude lower power consumption over the same distances. Semiconductor giants like NVIDIA, Broadcom, and Marvell, along with specialized manufacturers like STMicroelectronics, and innovative startups such as Ayar Labs and Lightmatter, are engaged in fierce development competition in the silicon photonics space. These companies are striving to offer integrated solutions at the chip, module, and system levels, optimizing the technology across the entire value chain.

Strategic Significance & Outlook

The advancements in silicon photonics are poised to redefine the future of AI computing. In the coming years, CPO technology is expected to be adopted across a broader range of AI chips, fundamentally transforming the power efficiency and scalability of data centers. Progress in manufacturing silicon photonics on 300mm wafers will further accelerate cost reduction and mass production, making this technology more accessible. Ultimately, optical interconnects are anticipated to become a standard feature in AI chip design, leading to an entirely optical-based data center architecture. This shift will contribute to the realization of exascale AI and the creation of new computing paradigms, making silicon photonics an indispensable element for the sustainable development of AI and unlocking the next frontier for data-intensive applications worldwide.

Source: <https://abovea.tech/insights-strategies/silicon-photonics-guide/>

Collected: July 24, 2026 | Automated Research System (Gemini API)

#03 Nvidia and Broadcom Adopt CPO/Silicon Photonics for Volume Production, Bringing Profit Waves to Supply Chain

Published July 24, 2026 BigGo Finance USA



OVERVIEW

Nvidia and Broadcom have initiated full adoption of Co-Packaged Optics (CPO) and silicon photonics technologies, moving their respective ecosystems into the volume shipment phase. This strategic shift aims to meet the demand for high-speed, high-efficiency data transfer in AI data centers, signaling a significant economic impact across the entire supply chain. The transition to volume production indicates CPO technology has advanced beyond experimental stages, with specific companies poised to benefit from this innovation.

Key Findings

Leading AI chip developer Nvidia and communication semiconductor powerhouse Broadcom have fully embraced Co-Packaged Optics (CPO) and silicon photonics technologies, pushing their associated supply chain ecosystems into the volume production phase. This strategic move is intended to dramatically enhance data transfer capabilities and efficiency within AI data centers, promising to usher in a significant transformation across the industry.

Technical / Clinical Details

CPO technology involves integrating optical interconnects directly within the same package as processors or switching chips. This significantly reduces the electrical trace length between the chip and the optical module, leading to decreased signal loss, lower power consumption, and improved transmission latency. Silicon photonics, the foundational technology for CPO, enables the generation, modulation, transmission, and detection of optical signals on a silicon chip. The full-scale volume production by industry titans like Nvidia and Broadcom signifies that CPO has transcended research and development, entering a phase of widespread commercial application. This advancement will lead to a dramatic increase in data bandwidth between AI accelerators, ensuring the scalability of next-generation AI models and High-Performance Computing (HPC) systems.

Background & Context

As the scale and complexity of AI models continue to grow, the volume of data movement within AI data centers has exploded. Traditional copper-based electrical interconnects have struggled to keep pace with this enormous data traffic, leading to escalating power consumption and severe bandwidth bottlenecks. CPO and silicon photonics have emerged as the most promising technologies to address these challenges, garnering significant industry attention for their practical implementation. The comprehensive adoption and transition to volume production by industry giants such as Nvidia and Broadcom strongly pave the way for CPO to become a standard technology in AI infrastructure. This move is expected to create new business opportunities and profitability for various companies across the CPO supply chain, including optical module manufacturers, silicon photonics foundries, and advanced packaging providers.

Strategic Significance & Outlook

The entry of the CPO ecosystem into volume production marks a paradigm shift in the design and operation of AI data centers. This will further push the performance boundaries of AI computing, enabling the efficient processing of larger and more complex AI workloads. The widespread adoption of CPO technology will not only accelerate the growth of the optical communication components market but also profoundly impact related fields such as semiconductor manufacturing, packaging, and testing. In the future, CPO adoption is expected to expand beyond AI chips to include general-purpose CPUs and other high-performance processors, potentially evolving the entire data center architecture toward an optical-centric model. This technological innovation is set to further accelerate the application of AI in diverse fields such as autonomous driving, drug discovery, and climate simulation, serving as a powerful catalyst for digital transformation globally.

Source: <https://finance.biggo.com/news/18d4225c-e1a8-4df5-9217-be8dc0929a91>

#04 AI ETF AGIX Adds Private Photonics Pioneer Ayar Labs, KraneShares Launches Photonics ETF LUMA, Signaling Surge in Optical Interconnect Investment

Published July 21, 2026 ETF Stream (via KraneShares) USA



OVERVIEW

The AI-focused ETF, AGIX, has added Ayar Labs, a private company pioneering optical interconnect and Co-Packaged Optics (CPO), to its portfolio. This inclusion indicates growing investor confidence in Ayar Labs' in-package optical I/O technology, which aims to overcome power, bandwidth, and latency bottlenecks in AI and high-performance computing. Additionally, KraneShares' launch of LUMA, a new photonics ETF, further confirms the accelerating investment trend in the photonics sector.

Key Findings

AGIX, an exchange-traded fund (ETF) specializing in artificial intelligence, has announced the inclusion of Ayar Labs, a privately held company at the forefront of optical interconnect and Co-Packaged Optics (CPO) technology, into its investment portfolio. This significant move underscores the market's strong recognition that advanced photonics technology is indispensable for supporting the growth of AI and High-Performance Computing (HPC).

Technical / Clinical Details

Ayar Labs is a leader in developing in-package optical I/O technology, designed to address severe power, bandwidth, and latency bottlenecks in AI and HPC systems. Its TeraPHY optical I/O chiplet platform converts electrical signals into optical ones, facilitating data transfer between processors and memory, or between processors themselves, using light. This approach significantly alleviates the limitations of traditional electrical wiring, enhancing the scalability of AI accelerators and GPU clusters and enabling the efficient processing of larger, more complex AI models. The integration of Ayar Labs into a prominent AI ETF like AGIX clearly demonstrates investor confidence in the technology's potential market value and the critical importance of optical solutions in AI infrastructure.

Background & Context

The evolution of AI is creating unprecedented demands for both computational power and data transfer capabilities within data centers. Traditional electrical interconnects struggle to provide both high bandwidth and low power consumption simultaneously, becoming a significant bottleneck for AI computing. Consequently, interest in optical communication technologies, particularly CPO and optical I/O, has rapidly intensified. The launch of the new photonics ETF 'LUMA' by KraneShares serves as further evidence that this technological sector is transitioning from a mere research and development phase to one of practical implementation and market growth. ETFs like LUMA offer investors an accessible means to gain exposure to a diverse range of photonics-related companies, facilitating investment in this burgeoning field.

Strategic Significance & Outlook

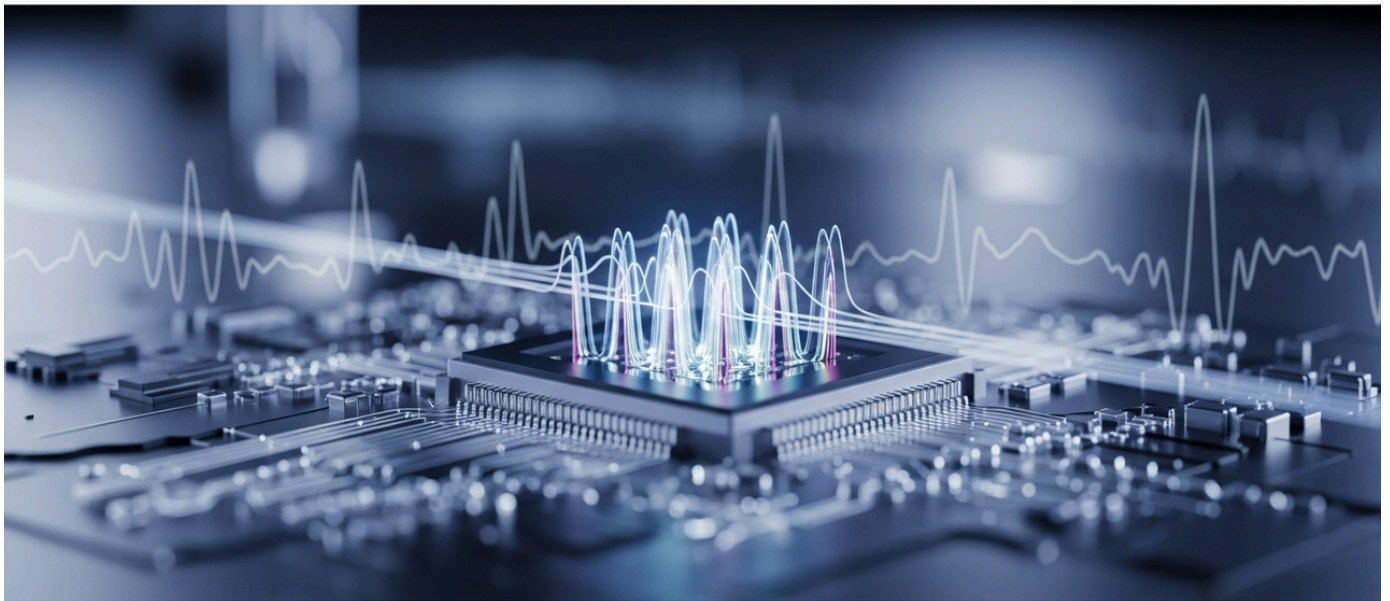
The inclusion of Ayar Labs in AGIX and the launch of KraneShares' LUMA ETF signify that photonics technology is being recognized as a key enabler for the AI era, with a substantial increase in attention from capital markets. Moving forward, optical interconnect technologies are expected to see expanded adoption not only in AI data centers but also in broader applications such as edge computing, autonomous driving, and quantum computing. This heightened investor interest is anticipated to further accelerate research, development, and commercialization in the sector, fostering new technological innovations and market opportunities. Photonics is poised to drive the next wave of digital transformation, contributing to significant improvements in efficiency and performance across industries worldwide.

Source: <https://kraneshares.com/ai-etf-agix-adds-private-photonics-company-ayar-labs-kraneshares-launches-photonics-etf-luma/>

Collected: July 24, 2026 | Automated Research System (Gemini API)

#05 Ultra-Low-Voltage Thin-Film Lithium Niobate Modulator Supports 224 Gbit/s PAM-4 Signals for Compact Optical Transmitters

Published July 16, 2026 ResearchGate Unknown



OVERVIEW

Researchers have proposed and demonstrated an ultra-low-voltage thin-film lithium niobate (TFLN) electro-optic modulator featuring Gaussian-shaped dual-layer electrodes and a high-permittivity cladding. This device achieves high modulation efficiency and electro-optic bandwidth by enhancing the overlap between electric field intensity and optical mode, all while maintaining low optical loss and broad bandwidth, successfully supporting 224 Gbit/s PAM-4 signals. This breakthrough offers a low-cost, high-performance solution for miniaturizing TFLN-based multi-channel optical transmitter chips, paving the way for faster and more integrated optical communication systems.

Key Findings

This research proposes and demonstrates an ultra-low-voltage thin-film lithium niobate (TFLN) electro-optic modulator featuring Gaussian-shaped dual-layer electrodes and a high-permittivity cladding. This novel modulator achieves high modulation efficiency and electro-optic bandwidth, successfully supporting 224 Gbit/s PAM-4 signals, thereby contributing to the miniaturization and enhanced performance of next-generation optical communication chips.

Technical & Clinical Details

The developed TFLN modulator dramatically improves the overlap between electric field intensity and the optical mode through an optimized electrode structure and a high-permittivity cladding layer. This innovative design overcomes previous trade-offs between optical loss and bandwidth inherent in existing TFLN modulators, achieving high modulation efficiency and broad electro-optic bandwidth simultaneously at practical levels. Specifically, it is capable of handling high data rate formats such as 224 Gbit/s PAM-4 signals, which represents a significant leap in optical data transmission capacity. This technology is critically important for enabling faster and more efficient data transmission, particularly in data centers and long-haul optical communication networks.

Background & Industry Context

The explosive growth in information traffic necessitates urgent advancements in modulator performance within optical communication systems. Low-voltage, wide-bandwidth, and low-loss modulators are key to reducing power consumption, miniaturizing overall systems, and enabling higher integration densities. Thin-film lithium niobate (TFLN) has garnered significant attention as a material for next-generation high-speed modulators due to its superior electro-optic effect, yet conventional designs struggled to balance modulation efficiency and bandwidth. This research provides a groundbreaking solution to this challenge by introducing a novel electrode structure and cladding material, addressing a critical bottleneck in optical interconnect technology.

Strategic Significance & Outlook

This ultra-low-voltage TFLN modulator holds the potential to significantly enhance the integration density of optical communication modules by facilitating the miniaturization and cost reduction of TFLN-based multi-channel optical transmitter chips. It will enable stable operation at data rates exceeding 224 Gbit/s in both intra-data center interconnects and long-haul fiber optic communications, paving the way for future transmission speeds of 1.6 Tbps and beyond. Ultimately, this will improve the overall energy efficiency of optical communication systems and contribute to building robust infrastructures capable of supporting the sustained increase in high-speed data traffic globally, further cementing photonics' role in AI-driven data infrastructures.

Source: https://www.researchgate.net/publication/410136871_Ultra-Low-Voltage_Thin-Film_Lithium_Niobate_Modulator_with_Gaussian-Shaped_Dual-Layer_Electrodes

Collected: July 24, 2026 | Automated Research System (Gemini API)

#06 Sumitomo Electric Industries Leads Optical Transceiver Photodetector Patent Landscape with 85 Patents

Published July 22, 2026 Patsnap Insights Team Singapore



OVERVIEW

A report by Patsnap Insights Team reveals that Sumitomo Electric Industries holds a dominant position in the optical transceiver photodetector patent landscape, possessing 85 patents and significantly outperforming competitors like Fujitsu and NEC. This patent leadership, observed in a maturing market that saw peak annual filings in 2018, underscores the company's robust intellectual property strategy. Sumitomo Electric's strong vertical integration, spanning from semiconductor device design to optical module assembly, positions it as a key player in the evolving optical communications market.

Key Findings

According to a recent report by Patsnap Insights Team, Sumitomo Electric Industries stands as the industry leader in the optical transceiver photodetector patent landscape, holding 85 patents. This significantly surpasses key competitors like Fujitsu and NEC, clearly demonstrating Sumitomo's robust intellectual property strategy and technological leadership in the optical communications sector.

Technical & Market Details

The report highlights that annual patent filings for optical transceiver photodetectors peaked in 2018, indicating a maturing market. Sumitomo Electric Industries' substantial patent portfolio of 85 patents in such a competitive environment is strong evidence of its aggressive pursuit of a vertically integrated business model, spanning from semiconductor device design to optical module assembly. This patent count underscores the company's deep expertise and innovative capabilities in photodetector material science, device structures, manufacturing processes, and integration technologies.

Background & Industry Context

The optical communication market, particularly the optical transceiver market supporting high-speed data centers and communication networks, continues to grow rapidly due to increasing data traffic. Photodetectors are critical components within optical transceivers, responsible for converting optical signals into electrical signals, and their performance directly impacts communication speed and efficiency. Consequently, acquiring patents in related technologies is paramount for securing competitive advantage in the market. The strong patent portfolio built by companies like Sumitomo Electric Industries in this field serves as a significant indicator for forecasting future market trends and technological shifts, especially as the industry moves towards silicon photonics and higher integration.

Strategic Significance & Outlook

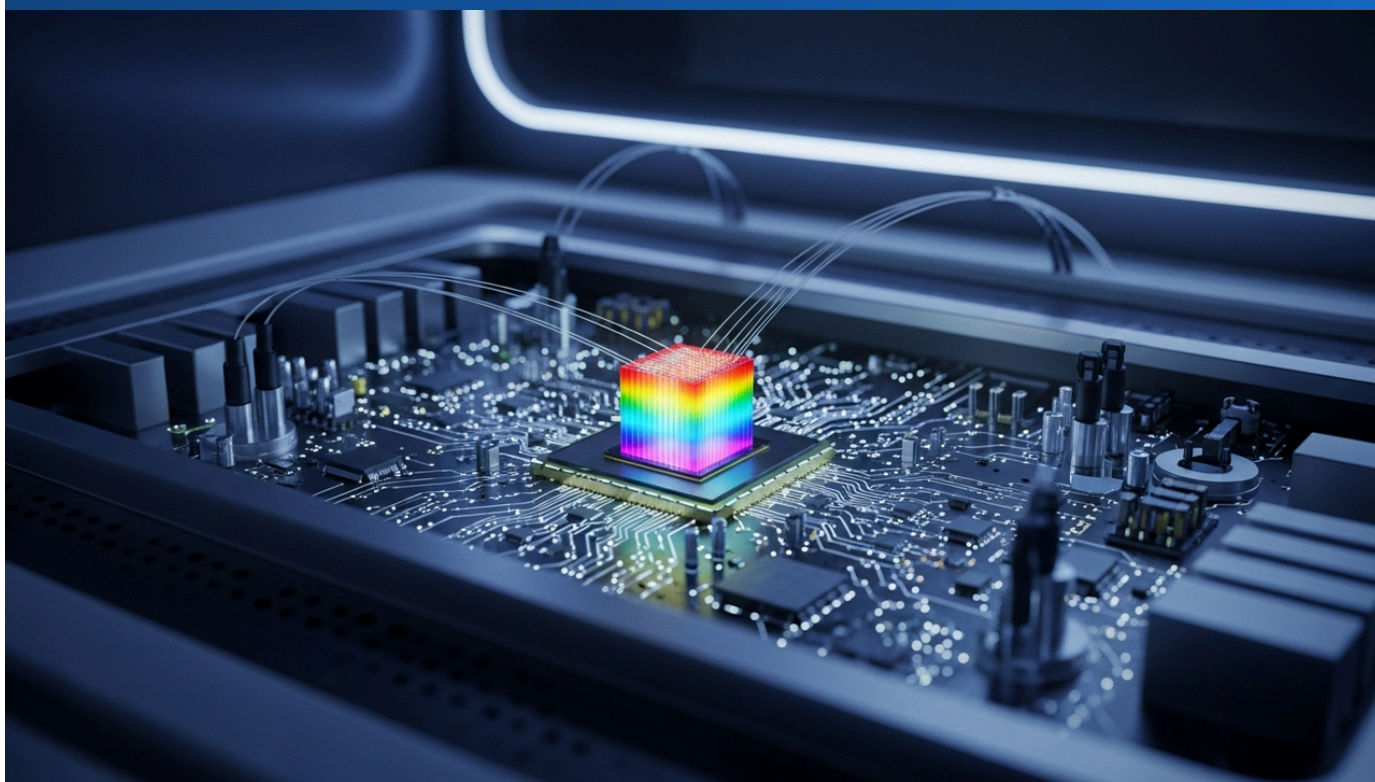
Sumitomo Electric Industries' patent dominance suggests that the company is highly likely to play a central role in the evolution of next-generation optical communication technologies, particularly those addressing high-speed, high-capacity optical networks for AI workloads. A strong intellectual property foundation can serve as a technical defense line against competitors and enable further product development and market expansion. The company's vertical integration strategy combined with its patent leadership will form the bedrock of its long-term competitiveness and profitability in the optical communication component market. This case also exemplifies Japan's enduring technological prowess in the global semiconductor industry, particularly in specialized areas like optical components.

Source: <https://www.patsnap.com/resources/blog/rd-blog/optical-transceiver-photodetector-patent-landscape/>

Collected: July 24, 2026 | Automated Research System (Gemini API)

#07 Compact Integrated Photonics Frequency Combs Achieve Robust Picosecond Timing in Mobile Environments

Published July 17, 2026 ResearchGate Unknown



OVERVIEW

Researchers have developed integrated photonics-based optical frequency combs, co-integrating lasers with microwave division electronics, to achieve state-of-the-art clock stability within a compact footprint. These frequency combs demonstrated robust performance in challenging conditions, including moving vehicles and sustained acceleration, proving their utility for portable iodine optical clocks and next-generation timing networks. This breakthrough enables highly precise and accurate measurements outside of controlled laboratory environments, significantly advancing scientific metrology and industrial applications in the field.

Key Findings

Researchers have developed compact, integrated photonics-based optical frequency combs that achieve state-of-the-art clock stability. This device demonstrates robust performance even under conditions of vehicular motion and sustained acceleration, enabling high-precision, picosecond-level timing measurements outside of traditional laboratory settings for portable iodine optical clocks and next-generation timing networks.

Technical & Clinical Details

The developed optical frequency combs achieve their miniaturization and high stability through the co-integration of lasers and microwave division electronics. This integration significantly reduces the overall system footprint, enabling operation outside of controlled laboratory environments. Crucially, the research demonstrated that clock stability is maintained under harsh conditions, including mobile environments and continuous acceleration. This has profound implications for applications requiring picosecond-level timing synchronization in field deployments, such as advanced positioning services, Earth observation, military applications, and sophisticated scientific research. The technology is particularly anticipated for integration into portable iodine optical clocks and broader next-generation timing networks.

Background & Industry Context

High-precision timing synchronization underpins many modern technologies, yet traditional high-precision atomic clocks and frequency comb systems have largely been confined to laboratory use due to their complexity, size, and cost. However, there is a growing demand across diverse fields—including new GPS-independent navigation systems, high-precision sensor networks, distributed quantum computing, and high-bandwidth data communications—for more portable, robust, and accurate timing solutions. Integrated photonics has emerged as a promising platform to meet these demands, and this research exemplifies its potential to miniaturize complex optical systems without compromising performance. This addresses a global need for accessible precision timing.

Strategic Significance & Outlook

This integrated photonics optical frequency comb has the potential to democratize high-precision measurement technology, opening new application frontiers beyond laboratory walls. The realization of smaller, more robust devices could enable integration into spacecraft, autonomous vehicles, and even medical devices, dramatically enhancing the performance and reliability of these systems. As a critical component in building next-generation picosecond optical timing networks, it is expected to significantly contribute to the widespread adoption and evolution of high-precision timekeeping, with broad impacts across science, industry, and society as a whole, setting new international benchmarks for portable precision timing.

Source:

https://www.researchgate.net/publication/409990464_Integrated_photonics_enabled_frequency_combs_for_next_generation_picosecond_optical_timing_networks

Collected: July 24, 2026 | Automated Research System (Gemini API)

#08 Fujitsu, 1Finity, and Chunghwa Telecom Forge 2-Year Strategic Partnership to Advance All-Photonics Network and Quantum Technologies in Taiwan

Published July 22, 2026 Fujitsu Global Newsroom Japan



OVERVIEW

Fujitsu, its group company 1Finity Inc., and Chunghwa Telecom Co. Ltd. have announced a two-year strategic partnership aimed at expanding the application of All-Photonics Network (APN) and jointly exploring future quantum technologies in Taiwan. This collaboration is set to bolster the deployment of advanced optical network infrastructure and investigate the potential of quantum technologies within the region. The partnership represents a significant step towards building the foundation for next-generation communication and computational capabilities in Taiwan.

Key Findings

Fujitsu, its group company 1Finity Inc., and Chunghwa Telecom Co. Ltd. have announced a two-year strategic partnership to accelerate the deployment of All-Photonics Network (APN) and jointly explore future quantum technologies in Taiwan. This groundbreaking collaboration is set to bolster Taiwan's digital infrastructure and expand the possibilities of next-generation communication technologies.

Technical & Implementation Details

The partnership combines Fujitsu and 1Finity's advanced optical networking expertise with Chunghwa Telecom's extensive communication infrastructure and operational know-how in Taiwan. The All-Photonics Network (APN) minimizes conventional electrical signal conversions, transmitting data purely as optical signals to achieve ultra-high speed, large capacity, low latency, and low power consumption communication. Expanding APN application aims to enhance the digital service experience across Taiwan. Furthermore, the joint exploration of future quantum technologies includes advancing fundamental research and proof-of-concept experiments in cutting-edge areas such as quantum cryptography and quantum computing, potentially developing Taiwan into a quantum technology hub in the Asia-Pacific region.

Background & Industry Context

With an explosive increase in global data traffic, nations worldwide are prioritizing the construction of next-generation communication infrastructure as a national strategy. All-Photonics Networks are indispensable foundational technologies supporting ultra-high-speed communication for the 5G/6G era, IoT, AI, and cloud services. Concurrently, quantum technologies hold the potential to shatter current computing and security limitations, leading to fierce global development competition. Taiwan is no exception, and strengthening its competitiveness in this field is critical for both economic growth and national security. The partnership between Fujitsu and Chunghwa Telecom represents a significant step in elevating Taiwan's position in this international technological race.

Strategic Significance & Outlook

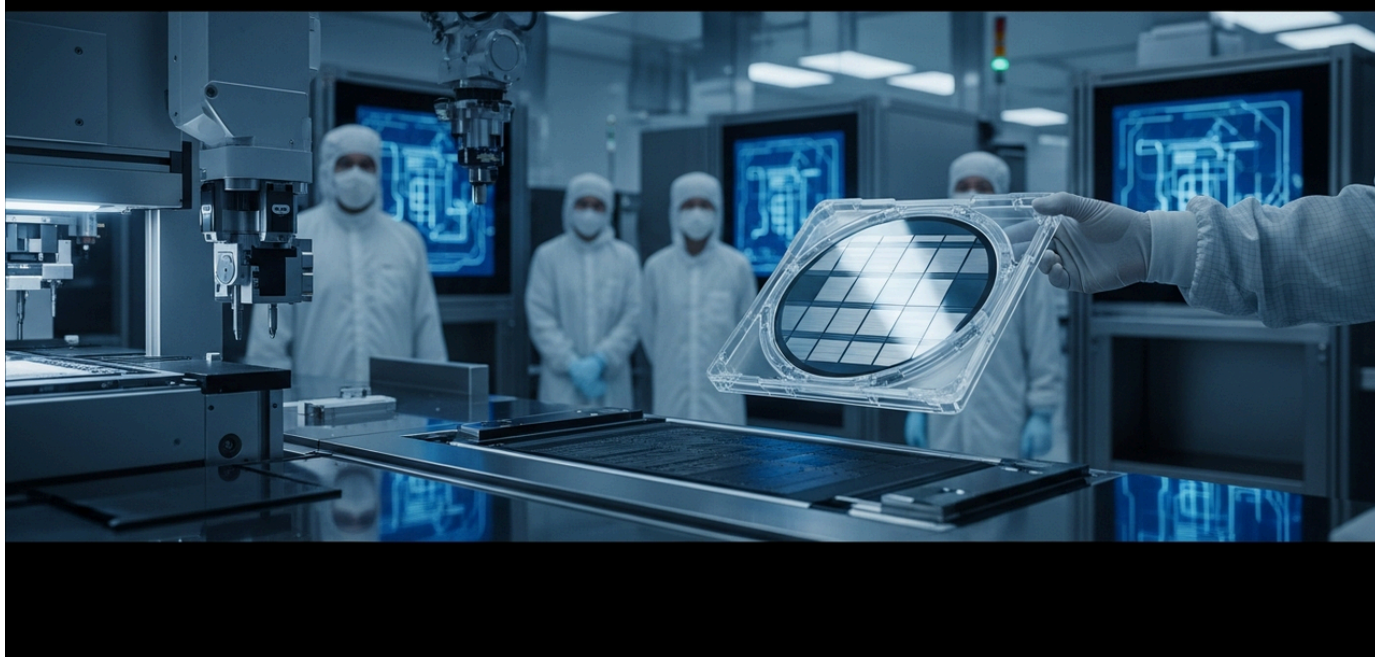
This two-year strategic partnership is expected to accelerate APN deployment in Taiwan, leading to a more robust and efficient communication infrastructure that will further drive the digital economy. While the joint exploration of quantum technologies is in its early stages, it holds the potential to yield future breakthroughs, helping Taiwan establish itself as a center for advanced technological development. This collaboration also holds significant importance for the Fujitsu Group in strengthening its presence in the global digital infrastructure market and is anticipated to become a model case for driving digital innovation in the Asia-Pacific region, aligning with global trends toward optical and quantum-enabled communication. The integration of 1Finity's specialized capabilities highlights the strategic importance of specialized optical hardware in Fujitsu's overall vision.

Source: <https://global.fujitsu/en-global/pr>

Collected: July 24, 2026 | Automated Research System (Gemini API)

#09 SILITH Technology Receives First Mass-Produced Silicon Photonics Wafers from UMC's Singapore 12-inch Fab

Published July 22, 2026 Semiconductor Today Singapore



OVERVIEW

SILITH Technology, a Singaporean fabless silicon photonics company, has received its first mass-produced photonic IC wafers from UMC's 12-inch fab in Singapore. This collaboration aims to scale up next-generation silicon photonics manufacturing to meet the surging demand for high-speed AI optical interconnects in AI and hyperscale data centers. SILITH's 1.6T silicon photonics platform is designed to support pluggable optics, co-packaged optics (CPO), and future optical I/O architectures, marking a significant milestone for energy-efficient, high-speed data transfer in the AI ecosystem.

Key Findings

SILITH Technology, a fabless silicon photonics company based in Singapore, has announced the receipt of its first mass-produced photonic integrated circuit (PIC) wafers from United Microelectronics Corporation's (UMC) 12-inch fab in Singapore. This achievement represents a critical step towards significantly scaling up next-generation silicon photonics manufacturing capabilities, directly addressing the escalating demand for high-speed AI optical interconnects within AI and hyperscale data center networks.

Technical / Clinical Details

The collaboration between SILITH Technology and UMC combines cutting-edge silicon photonics design with UMC's established 12-inch wafer manufacturing expertise. UMC's Singapore fab offers the high yields and economies of scale necessary for the volume production of complex photonic ICs. SILITH's 1.6T silicon photonics platform is engineered to cover a broad spectrum of applications, from current pluggable optics requirements in data centers to more advanced co-packaged optics (CPO) and even future on-chip optical I/O architectures. This platform is designed to deliver enhanced data transfer rates, reduced power consumption, and increased interconnect density, particularly benefiting the efficiency of demanding AI workloads.

Background & Context

The proliferation of AI and the expansion of hyperscale data centers have revealed the inherent bandwidth and power consumption limitations of traditional electrical interconnects. Silicon photonics, which utilizes light for data transmission at high speeds and lower power, is emerging as a crucial technology to overcome this 'copper wall.' The entry of a major foundry like UMC into silicon photonics manufacturing, coupled with partnerships with innovative fabless companies like SILITH, underscores a clear industry-wide shift towards optical-based computing. This trend is in line with significant investments from semiconductor giants and startups, including NVIDIA, Broadcom, and Intel, all accelerating their initiatives in optical technology.

Strategic Significance & Outlook

The receipt of mass-produced wafers by SILITH Technology signals a future where 1.6T and beyond optical interconnects will become central to AI infrastructure. The widespread adoption of this technology promises not only to dramatically improve the performance of AI servers but also to significantly enhance the overall energy efficiency of data centers. Furthermore, the introduction of co-packaged optics is poised to become a new standard in chip design, integrating optical modules directly with CPUs and GPUs for further performance gains and miniaturization. These advancements are expected to have ripple effects across other technological domains, such as autonomous vehicles and advanced sensing systems, driving broader innovation in the photonics ecosystem.

Source: https://www.semiconductor-today.com/news_items/2026/jul/silith-umc-220726.shtml

Collected: July 24, 2026 | Automated Research System (Gemini API)

#10 MIT Develops Novel Solid-State LiDAR Chip with Wider Field of View, Potentially Revolutionizing Autonomous Vehicles

Published July 22, 2026 ScienceDaily USA



OVERVIEW

MIT researchers have developed a new silicon photonics LiDAR chip that provides a wider and clearer field of view without any moving parts. This innovative design achieves minimal crosstalk by closely integrating antennas of different shapes. The breakthrough could lead to smaller, more durable LiDAR sensors for autonomous vehicles, aerial surveying, and industrial monitoring, significantly enhancing current LiDAR system performance and reliability.

Key Findings

Researchers at the Massachusetts Institute of Technology (MIT) have developed a novel silicon photonics chip that eliminates all moving parts in LiDAR (Light Detection and Ranging) sensors, promising to revolutionize the technology. This breakthrough design delivers a significantly wider and clearer field of view compared to conventional systems, poised to enhance the performance and reliability of LiDAR across autonomous vehicles and various other applications.

Technical / Clinical Details

At the core of this new LiDAR chip's design is a sophisticated technique for placing antennas of varying shapes in close proximity on a silicon photonics platform, while simultaneously minimizing crosstalk between them. This precise arrangement enables the electronic manipulation of light beams, allowing for high-speed, high-accuracy scanning over a broad angular range. The elimination of moving parts is crucial for increasing sensor durability, reducing manufacturing costs, and achieving miniaturization. This makes the LiDAR system more resilient to external environmental factors and ensures stable, long-term operation, fundamentally solving issues such as mechanical failures due to vibration and complex calibration requirements that plague traditional mechanical LiDARs.

Background & Context

LiDAR technology is an indispensable component for autonomous vehicles to perceive their surroundings in 3D, utilized for high-precision mapping, obstacle detection, and navigation. However, existing LiDAR systems often rely on expensive mechanical components, which present challenges in terms of cost, size, and robustness. MIT's breakthrough addresses these critical limitations, potentially accelerating the mainstream adoption of LiDAR technology. Beyond autonomous driving, there is growing demand for LiDAR in diverse applications such as aerial surveying, drone inspections, robotics, industrial automation, and smart city infrastructure. This new chip promises to facilitate LiDAR adoption in these sectors, opening new market opportunities.

Strategic Significance & Outlook

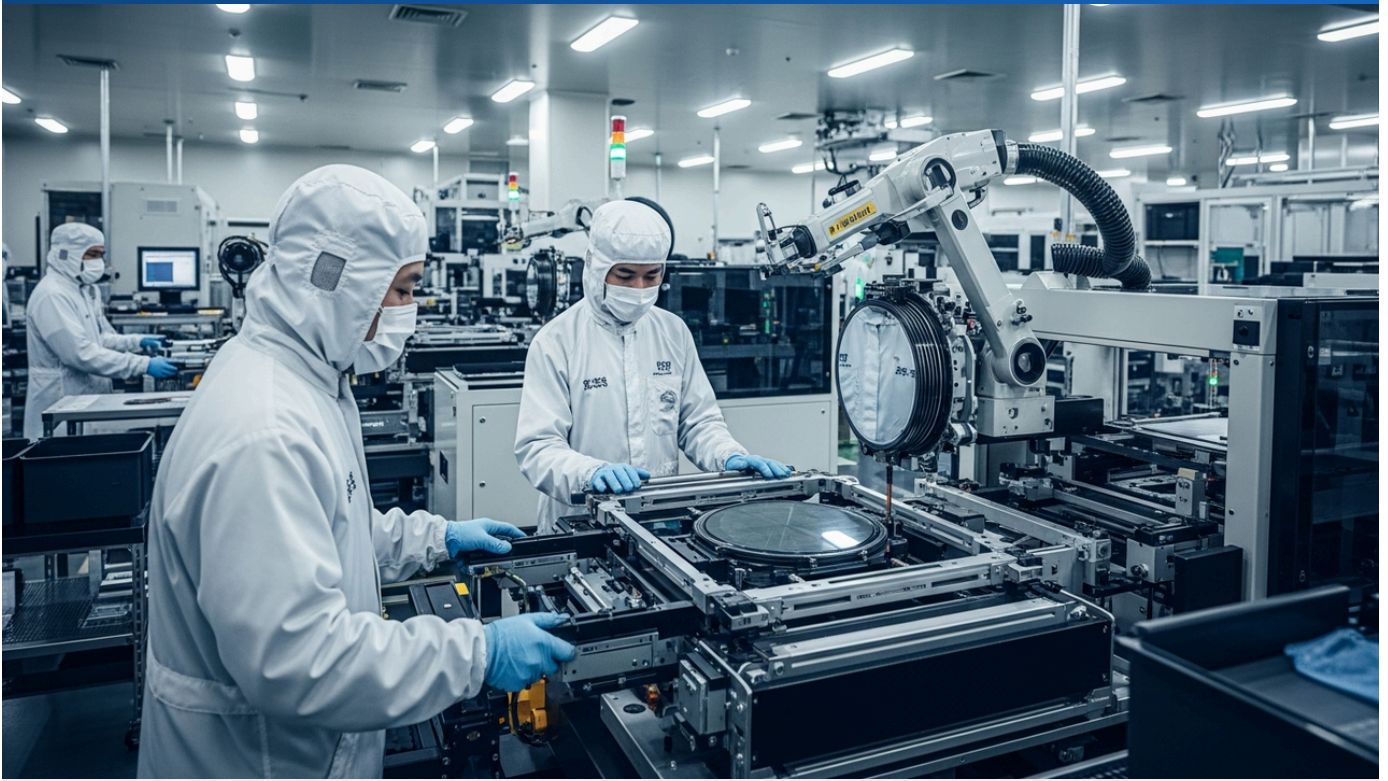
This MIT research marks a groundbreaking step in the future of LiDAR technology, paving the way for smaller, more affordable, and more robust sensors. Solid-state LiDAR is easier to scale in production and integrate into vehicle designs, making it a key enabler for the widespread adoption of autonomous vehicles. Furthermore, this technology is expected to be applied in other edge AI applications that require high-precision 3D spatial awareness, such as AR/VR (augmented reality/virtual reality) devices, smart robots, and logistics management systems. In the long term, this silicon photonics-based LiDAR chip has the potential to establish a new standard for spatial intelligence across numerous industries.

Source: <https://www.sciencedaily.com/releases/2026/07/260722032127.htm>

Collected: July 24, 2026 | Automated Research System (Gemini API)

#11 Tower Semiconductor Invests \$3 Billion in Japan with METI Support, Reviving Fab for 300mm Silicon Photonics Manufacturing

Published July 16, 2026 Tom's Hardware Japan



OVERVIEW

Tower Semiconductor has announced a \$3 billion investment, backed by Japan's Ministry of Economy, Trade and Industry (METI), to expand its semiconductor operations in Japan, focusing on 300mm silicon photonics, silicon germanium, and advanced packaging. The Arai plant is expected to be ready for 300mm silicon photonics manufacturing by late 2027. This significant investment aims to localize and strengthen the supply chain for optical interconnect technologies, meeting the increasing demands of AI infrastructure, with Tower targeting \$3.6 billion in revenue by 2028.

Key Findings

Tower Semiconductor has announced a \$3 billion investment, significantly backed by Japan's Ministry of Economy, Trade and Industry (METI), to expand its semiconductor manufacturing capabilities in Japan. This substantial investment is earmarked for enhancing 300mm silicon photonics, silicon germanium, and advanced packaging operations. The company's Arai plant, a revitalized former Panasonic facility, is projected to be fully equipped for 300mm silicon photonics production by late 2027, aiming to meet the escalating demands for optical interconnects in AI infrastructure.

Technical / Clinical Details

The establishment of 300mm wafer silicon photonics manufacturing capabilities is a critical step towards scaling production volumes and reducing manufacturing costs. Silicon photonics, a technology that uses light for high-speed, low-power data transmission within and between chips, is becoming indispensable in AI data centers as a solution to overcome the limitations of traditional electrical wiring. This technology is closely aligned with NVIDIA's co-packaged optics roadmap, with 1.6 Tb/s optical engines expected in products by 2026. Tower Semiconductor's expansion plans are anticipated to leverage technologies developed for platforms such as TSMC's COUPE co-packaged optics.

Background & Context

With the rapid advancement of AI, the immense data communication required between GPU clusters demands bandwidth and low latency unachievable with conventional copper cables. To address this 'copper wall' issue, global investment in optical interconnect technologies, including silicon photonics, is accelerating. METI's support aligns with Japan's national strategy to strengthen its advanced semiconductor manufacturing base and enhance supply chain resilience, thereby boosting the country's competitiveness in the global semiconductor industry. This move is part of a worldwide optical technology investment boom, exemplified by UMC's initiation of silicon photonics wafer mass production in Singapore.

Strategic Significance & Outlook

Tower Semiconductor's \$3 billion investment and the revival of the Arai plant mark a significant turning point for Japan's semiconductor industry, with the company targeting annual revenues of \$3.6 billion by 2028. This expansion will contribute to stabilizing the supply of optical interconnect technologies that underpin high-performance AI workloads, fostering further evolution in AI data centers. Furthermore, establishing advanced technology manufacturing bases domestically enhances Japan's technological autonomy and strengthens its presence in the international semiconductor supply chain. In the future, these manufacturing capabilities are expected to extend to other high-growth sectors such as autonomous driving and 5G/6G communications, driving widespread technological innovation.

Source: <https://www.tomshardware.com/tech-industry/semiconductors/tower-semiconductor-revives-shuttered-panasonic-era-fab-in-3-billion-japan-photonics-expansion>

Collected: July 24, 2026 | Automated Research System (Gemini API)

#12 Seoul University Team Develops Programmable Photonic Chip to Control Light Speed On-Demand, Enhancing Optical Computing

Published July 18, 2026 ScienceDaily South Korea



OVERVIEW

Researchers from Seoul National University and University of Seoul have developed a groundbreaking programmable photonic integrated circuit (PIC) capable of controlling light propagation speed on demand. This technology offers crucial delay, synchronization, and buffering functionalities essential for optical-based computing. It promises significant reductions in energy consumption, cost, and complexity for AI servers and data centers, laying a foundation for next-generation computing architectures.

Key Findings

Researchers from Seoul National University and the University of Seoul have successfully developed a groundbreaking programmable photonic integrated circuit (PIC) that enables on-demand control over the propagation speed of light. This breakthrough promises to provide the essential dynamic delay, precise synchronization, and efficient buffering functionalities critical for optical-based computing systems, thereby dramatically enhancing data processing efficiency and flexibility.

Technical / Clinical Details

The developed photonic chip leverages advanced silicon photonics technology to dynamically adjust the speed of light signals as they propagate through the chip by electrically reconfiguring their paths. Specifically, it integrates multiple optical waveguides and electro-optic modulators designed for precise control over the phase and amplitude of light. This allows light to be delayed as needed and synchronized accurately to match specific algorithmic or data flow requirements. This on-demand control capability is particularly vital for massively parallel processing applications like AI workloads, where it can resolve computational bottlenecks and optimize overall system performance.

Background & Context

In modern computing, especially within AI servers and hyperscale data centers, limitations in data transfer speed and processing capacity represent significant challenges. Traditional electrical interconnects struggle to simultaneously achieve higher speeds and reduced power consumption due to physical constraints, a phenomenon known as the 'copper wall.' Optical-based computing is envisioned as the next-generation technology to overcome these challenges, promising high-speed and energy-efficient data processing through the speed of light and low loss characteristics. However, dynamic control of optical signals has been technically challenging, posing a major barrier to practical implementation. This programmable chip breaks through this barrier, significantly advancing the path towards practical optical computing.

Strategic Significance & Outlook

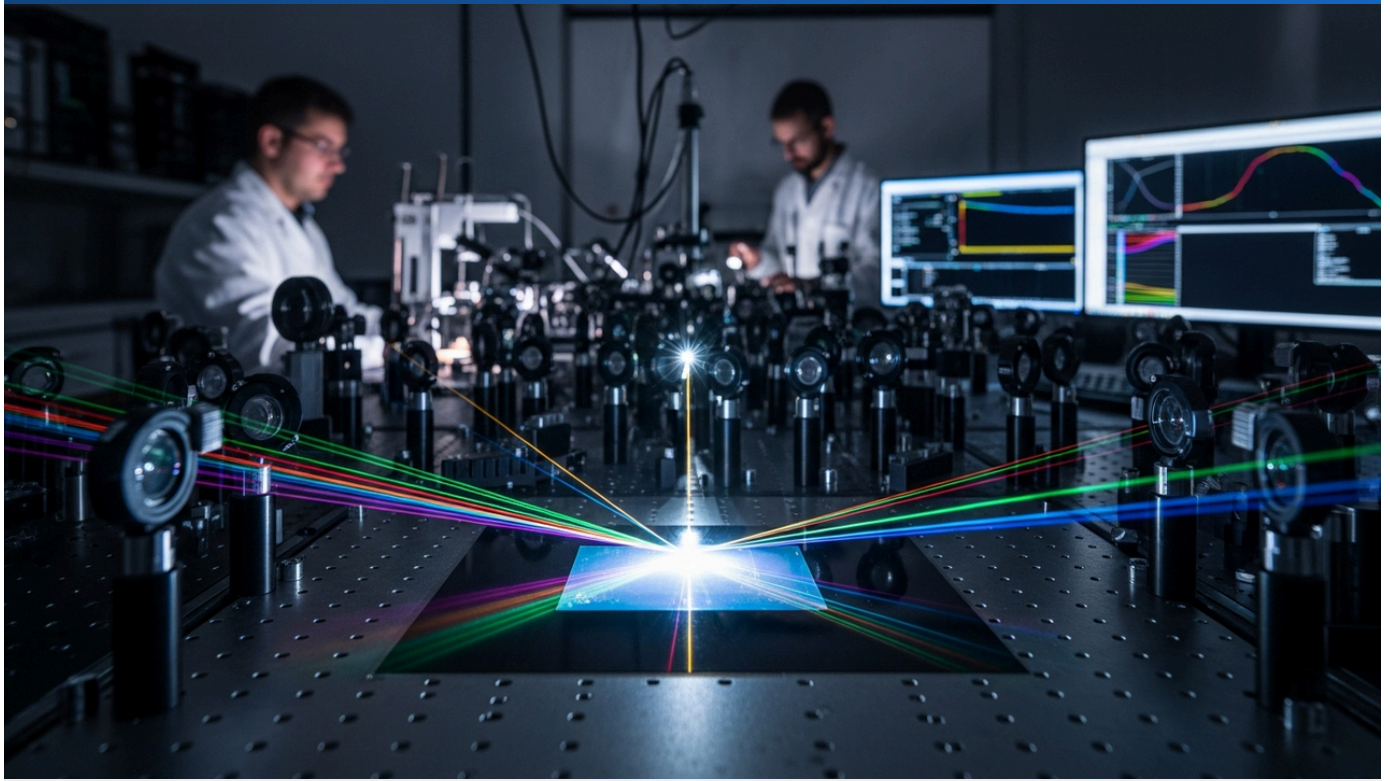
The development of this programmable photonic chip holds immense potential to significantly reduce energy consumption, operational costs, and system design complexity in AI servers and data centers. The ability to precisely control the speed of light enables the construction of more powerful and flexible AI accelerators and optical neural networks. Future applications are expected across a wide range of fields where optical technology is central, including quantum computing, ultra-high-speed communications, and edge AI devices. This technology is poised to establish a new paradigm in information processing, pushing the boundaries of energy efficiency and computational power, thus forming the backbone of next-generation computing.

Source: <https://www.sciencedaily.com/releases/2026/07/260718010149.htm>

Collected: July 24, 2026 | Automated Research System (Gemini API)

#13 International Team Including Tel Aviv University Sets New Record: Ultrathin Metasurface Manipulates Light in 74 Femtoseconds

Published July 22, 2026 Ynet News イスラエル



OVERVIEW

An international research team, led by Tel Aviv University, has achieved a new world record in optical control by demonstrating an ultrathin metasurface capable of manipulating light in an astonishing 74 femtoseconds. This unprecedented speed promises to dramatically accelerate the development of next-generation optical computing, ultra-high-speed communication networks, and advanced quantum technologies. The precision and rapidity of this light manipulation lay a crucial foundation for future information processing systems, far exceeding the capabilities of current optical modulators.

Background

The relentless pursuit of faster and more efficient information processing has pushed conventional electronic circuits to their physical limits. This has intensified the focus on optical computing and communication, which utilize photons instead of electrons, as the inevitable next generation of information technology. A persistent challenge in this transition has been the precise and high-speed manipulation of light, analogous to the control we exercise over electrical signals. This new metasurface technology presents a significant leap forward, offering a promising solution to overcome current bottlenecks in optical signal processing. It lays a foundational groundwork for critical modern applications, including the acceleration of AI, real-time big data analytics, and the robust transmission of quantum information.

The Breakthrough

An international research collaboration, prominently featuring scientists from Tel Aviv University, has shattered previous records in light manipulation speed. The team announced the successful development of an innovative, ultrathin metasurface capable of controlling light within an astonishingly brief 74 femtoseconds (a femtosecond being one quadrillionth of a second). This landmark achievement promises to unlock unprecedented levels of speed and precision across a spectrum of advanced fields, including optical computing, ultra-high-speed communication systems, and nascent quantum technologies.

Technical Details

The core of this innovation is a novel metasurface, meticulously engineered as an ultrathin layer composed of precisely structured nanoscale elements. This architecture enables the instantaneous and precise alteration of incident light's fundamental properties, including its phase, amplitude, and polarization. The record-breaking 74-femtosecond response time means light can be manipulated while it traverses a mere 22 micrometers—roughly one-quarter the width of a human hair. This represents a speed orders of magnitude greater than that achievable by conventional optical modulators. Such extreme speeds are indispensable for developing next-generation communication systems pushing petabit-per-second data rates, and for quantum computing applications where exquisite control over individual photon behavior is paramount. The researchers achieved this unparalleled optical responsiveness by synergistically combining ultrafast pulsed laser technology with cutting-edge advancements in materials science.

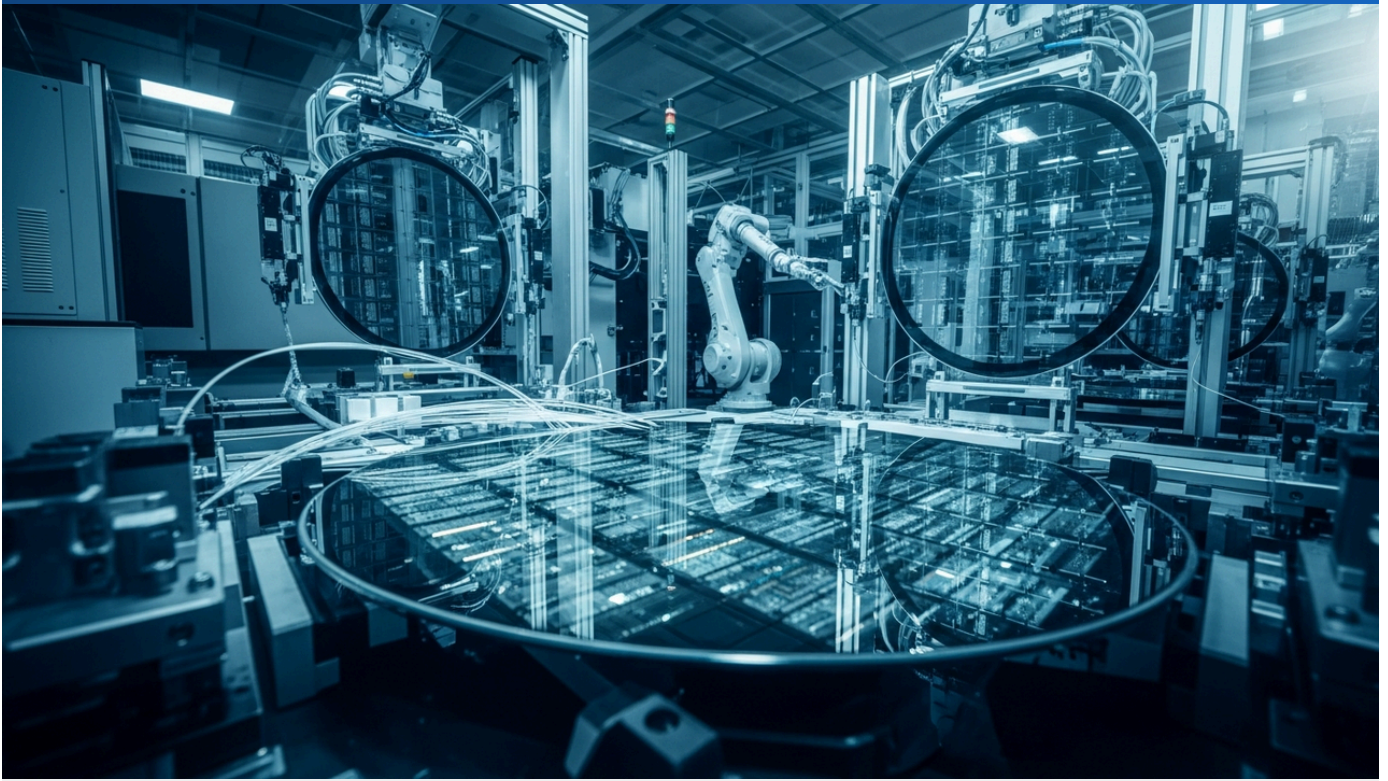
Implications and Outlook

This 74-femtosecond light control technology is poised to profoundly impact the development of foundational technologies for quantum computers, providing the swift and precise light manipulation essential for quantum optics. It will also dramatically enhance the performance of ultrafast optical switches and transceivers, thereby accelerating the deployment of next-generation communication networks capable of terabit-scale data transfer rates. Moreover, the unprecedented ability to manipulate light over such incredibly short timescales opens doors to entirely new breakthroughs across diverse sectors. These include the development of optical-based AI accelerators, advancements in high-resolution imaging, and the creation of novel optical sensing modalities. This groundbreaking technology is thus expected to become an indispensable cornerstone in shaping the future of our information society.

Source: https://www.ynetnews.com/health_science/article/byc1w11c4ze

#14 STMicroelectronics Launches 300mm Wafer Production of PIC100 Silicon Photonics for AI Data Centers

Published July 16, 2026 EE Times International



OVERVIEW

STMicroelectronics has begun mass production of its PIC100 silicon photonics platform on 300mm wafers to meet the escalating demands of AI data centers. This platform integrates BiCMOS for laser drivers with advanced packaging options, delivering more compact, high-bandwidth optical engines. As AI clusters expand, optical interconnects are becoming as crucial as computational power, resolving data transfer bottlenecks and improving power efficiency, thereby accelerating the scaling of AI workloads.

Key Findings

STMicroelectronics has transitioned its PIC100 silicon photonics platform to mass production on 300mm wafers to address the burgeoning demands of AI data centers. This strategic decision reflects the increasing importance of optical interconnects within AI clusters, now considered as critical as computational power itself. This move facilitates the realization of more compact, higher-bandwidth optical engines, effectively breaking through the limitations of traditional electrical interconnects.

Technical / Clinical Details

STMicroelectronics' PIC100 platform utilizes a BiCMOS process that integrates silicon photonics with CMOS technology, specifically optimizing the performance and efficiency of laser driving circuits. Coupled with advanced packaging options, this achieves miniaturization and higher density for the entire optical module. Manufacturing on 300mm wafers is essential for significantly increasing production capacity and reducing per-unit costs. As AI workloads require massive amounts of data to be exchanged at high speeds between GPU clusters, optical interconnects are gaining traction as a solution that dramatically enhances data transfer rates and substantially reduces power consumption compared to conventional copper wiring.

Background & Context

With the evolution of AI, particularly for large language models and complex inference tasks, AI clusters comprising tens of thousands of GPU chips operating in concert are being built. In such environments, data transfer between chips and servers becomes a bottleneck, significantly impacting overall performance. As Moore's Law approaches its limits, the semiconductor industry is focusing not only on improving data processing capabilities but also on enhancing data transfer efficiency and power efficiency. Silicon photonics is a promising solution to this challenge, with major players like NVIDIA and Intel investing heavily in this domain. STMicroelectronics' transition to 300mm wafers is seen within the industry as accelerating the full-scale industrialization of optical communication technology in the AI era.

Strategic Significance & Outlook

The initiation of 300mm wafer silicon photonics mass production by STMicroelectronics holds the potential to significantly improve the cost and energy efficiency in the construction of AI data centers. The widespread adoption of this technology will enhance the scalability of AI computing, enabling the deployment of larger and more complex AI models. In the future, a transition towards more tightly integrated optical interconnect solutions, such as co-packaged optics (CPO) and on-chip optical I/O, is expected to accelerate. This will lead to fundamental changes in data center design, strengthening the technological foundation for AI to permeate deeply into all aspects of society.

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

Collected: July 24, 2026 | Automated Research System (Gemini API)

#15 Hesai Unveils 'Kosmo Spatial Intelligence Platform' at WAIC 2026, Integrating 3D Perception with Full-Color Sensing

Published July 20, 2026 Hesai Technology China



OVERVIEW

Hesai showcased its Kosmo spatial intelligence platform and robotic LiDAR at WAIC 2026, emphasizing its Physical AI vision. The Kosmo platform combines LiDAR-based 3D perception, full-color sensing, and spatial data generation to transform physical environments into high-fidelity 3D models. The ETX series LiDAR offers ultra-high-resolution color sensing for L2-L4 autonomous driving, while the JT series LiDAR enhances embedded AI for AMRs. This technology paves new ways for AI to understand and interact with the physical world more precisely.

Key Findings

Hesai prominently showcased its Kosmo Spatial Intelligence Platform and its latest robotic LiDAR technologies at WAIC 2026 (World Artificial Intelligence Conference), underscoring the company's vision for Physical AI. The Kosmo platform represents a groundbreaking solution that integrates LiDAR-based 3D perception capabilities with full-color sensing and high-precision spatial data generation. This comprehensive approach transforms the physical world into high-fidelity 3D models, providing AI systems with a foundation for deeper and more accurate understanding and interaction with reality.

Technical / Clinical Details

At the core of the Kosmo platform are advanced LiDAR modules that simultaneously deliver multiple data streams, including precise depth maps, infrared images, reflectivity information, ambient light measurements, and confidence data. This rich information enables AI to identify objects with high accuracy and understand their states even in complex environments. Specifically, the ETX series LiDAR is designed for Level 2 to Level 4 autonomous driving systems, offering ultra-high-resolution color sensing that accurately captures color information from road conditions, traffic signs, and pedestrians, thereby enhancing recognition accuracy. Meanwhile, the JT series LiDAR is optimized for Autonomous Mobile Robots (AMRs), strengthening their embedded AI to facilitate more efficient and safer navigation and operations in dynamic environments like warehouses and factories.

Background & Context

The evolution of AI is rapidly expanding beyond cyberspace into interactions with the physical world. In numerous application areas such as autonomous vehicles, robotics, smart factories, and AR/VR devices, AI's ability to accurately perceive physical environments and react in real-time is indispensable. Traditional 2D cameras and radar alone struggle to precisely capture the shape, distance, and movement of objects in 3D space. While LiDAR technology plays a crucial role in addressing this challenge, Hesai's Kosmo platform further extends LiDAR's capabilities by combining it with color sensing and advanced spatial data generation, bringing true 'spatial intelligence' to AI. This advancement boosts the capabilities of edge AI, accelerating automation and intelligence across various industries.

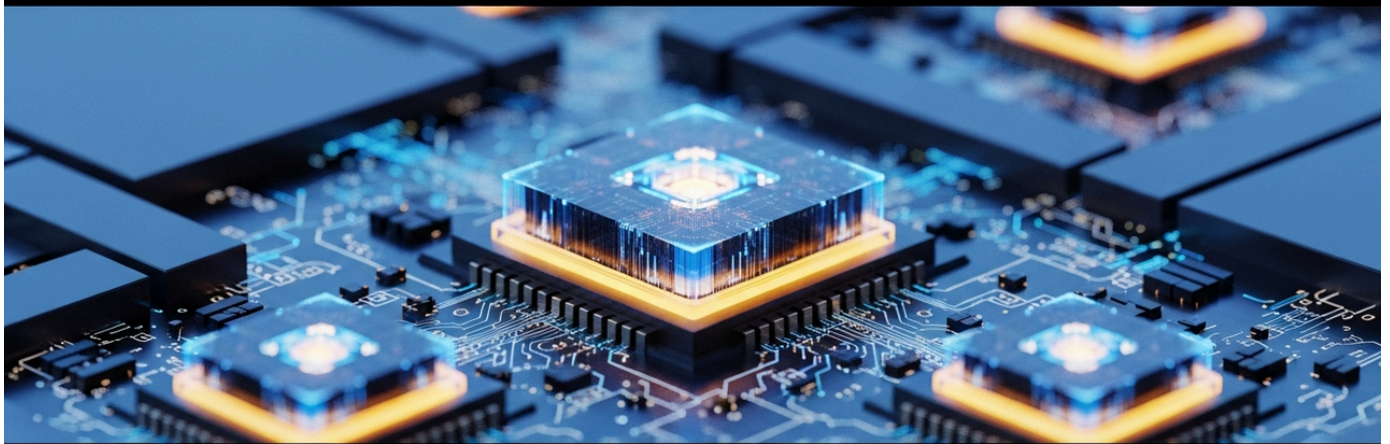
Strategic Significance & Outlook

Hesai's Kosmo platform and robotic LiDAR technology provide a foundational layer not only for safer and more reliable autonomous vehicles but also for more efficient AMRs in warehouses and smarter functioning smart cities. The vision of Physical AI suggests a future where AI is not merely a computational engine but an agent that directly perceives, learns, and acts in the real world. This technology has the potential to fundamentally transform automation and decision-making processes across a wide range of industries, including construction, agriculture, security, and consumer robotics. Hesai's innovation will play a crucial role in accelerating a future where AI seamlessly integrates with the physical world.

Source: <https://www.hesaitech.com/hesai-showcases-kosmo-spatial-intelligence-platform-and-robotic-lidar-at-waic-2026-underscoring-its-physical-ai-vision/>

#16 Lightmatter's Photonic Processor Achieves ~10x AI Workload Speedup and 3.5-5x Power Efficiency Over GPUs

Published July 19, 2026 Daily Maverick USA



DAILY MAVERICK'S

OVERVIEW

Lightmatter's photonic processor has demonstrated the ability to execute AI workloads approximately 10 times faster than traditional GPUs, while also improving power efficiency by 3.5 to 5 times. This achievement strongly indicates that photonics is an indispensable technology for enhancing next-generation computing and AI, particularly as Moore's Law approaches its physical limits. Nvidia has also achieved 3.5-5x power efficiency gains and 10x network resiliency with co-packaged optics switches, highlighting optical technology as key to breaking the 'copper wall' in AI infrastructure.

Key Findings

Lightmatter has announced groundbreaking results, demonstrating that its photonic processor can execute artificial intelligence (AI) workloads approximately 10 times faster than conventional GPUs, while simultaneously achieving a 3.5 to 5-fold improvement in power efficiency. This discovery unequivocally indicates that photonics, or light-based technology, is an indispensable innovation for driving the advancement of next-generation high-performance computing and AI, especially as the industry confronts the looming physical limits of Moore's Law.

Technical / Clinical Details

Lightmatter's photonic processor performs computations and data transfer using photons instead of electrons. This approach bypasses physical limitations associated with electron movement, such as resistance and heat generation, leading to dramatically higher data transfer speeds and significantly reduced power consumption. Specifically, optical interconnects hold the potential to transfer data up to 100 times faster than their electrical counterparts. Furthermore, NVIDIA, in collaboration with TSMC, has achieved 3.5 to 5 times better power efficiency and 10 times greater network resiliency with its new co-packaged optics (CPO) switches, further validating the superiority of optical technology in high-performance AI clusters. Lightmatter is actively manufacturing CPO components with TSMC and GlobalFoundries, targeting shipments by 2028.

Background & Context

As Moore's Law approaches its physical limits and the pace of semiconductor chip performance improvement slows, the demand for AI and large-scale data processing is exploding. This creates bottlenecks in data transfer between chips and across systems, with power consumption and heat generation becoming major challenges, particularly in compute-intensive environments like GPU clusters. Photonics is emerging as a radical solution to this 'memory wall' and 'copper wall' problem, with optical-based computing anticipated as a new frontier for growth. Global investments in photonics technology are accelerating, evidenced by initiatives such as China establishing a key lab for integrated photonic computing chips and systems in Shanghai.

Strategic Significance & Outlook

The acceleration of AI workloads and improved power efficiency offered by Lightmatter's photonic processor will fundamentally transform the design of AI servers and data centers. Widespread adoption of this technology could dramatically shorten AI training times and reduce operational costs. In the future, this will enable more dense and energy-efficient AI accelerators, accelerating progress in all fields where AI is applied, including autonomous vehicles, medical image analysis, and scientific simulations. Photonics is also expected to find applications in other areas such as quantum technologies and ultra-high-speed communications, potentially ushering in a new era for information technology as a whole.

Source: <https://www.dailymaverick.co.za/article/2026-07-19-crossed-wires-let-there-be-light-why-photonics-is-the-future-of-computing/>

Collected: July 24, 2026 | Automated Research System (Gemini API)

#17 YieldWerx Analyzes 2026 Photonics & Optical I/O Trends: In-Package Optical I/O Becomes Essential for AI Workloads

Published July 24, 2026 yieldWerx USA



OVERVIEW

YieldWerx has released an analysis of key trends and challenges in photonics and optical I/O for 2026, highlighting that optical interconnects are undergoing a dramatic shift from system-to-system to in-package communication driven by AI workloads. As electrical interconnects reach their limits in power density, reach, and latency determinism, in-package optical I/O is becoming indispensable for AI systems to surpass copper's limitations. Manufacturers now face the new challenge of correlating electrical and photonic test data across wafers, ports, wavelengths, and entire packages.

Key Findings

YieldWerx has released a comprehensive analysis on the key trends and challenges in photonics and optical I/O innovations for 2026. The report emphasizes that optical interconnects are undergoing their most dramatic paradigm shift, moving from inter-system communication to in-package communication, driven by the fundamental demands of AI workloads. As electrical interconnects are reaching their physical limits in terms of power density, reach, and latency determinism, in-package optical I/O is positioned as an indispensable technology for AI systems to deliver performance beyond the capabilities of traditional copper wiring.

Technical / Clinical Details

In-package optical I/O refers to the technology of directly integrating optical transceivers within the same package as high-performance processors like CPUs and GPUs. This approach drastically shortens the distance between chips, enabling data transfer via optical signals that are significantly faster and incur much lower loss than electrical signals. While traditional pluggable optical modules handled communication between server racks, in-package optical I/O aims to eliminate bottlenecks in inter-chip communication within AI clusters. This technology provides the high bandwidth, low latency, and superior power efficiency essential for demanding AI workloads. However, with this increasing integration, manufacturers face a new and complex challenge: establishing accurate correlation between electrical and photonic test data from wafer-level to the final package, which is crucial for ensuring manufacturing yield and reliability.

Background & Context

The rapid advancement of AI and the emergence of massive neural network models are placing unprecedented demands on data center computing infrastructure. Particularly in AI clusters where tens of thousands of GPUs operate in concert, the 'memory wall' problem, where data movement consumes more power and time than computation itself, has become prominent. Electrical signal data transfer faces increasing power consumption, signal attenuation, and physical limits in interconnect density, hindering further AI scaling. Consequently, industry leaders such as NVIDIA, Intel, and TSMC are making massive investments in optical technologies like silicon photonics and co-packaged optics (CPO) as the core of next-generation AI systems. The YieldWerx analysis highlights these urgent industry needs and technical challenges.

Strategic Significance & Outlook

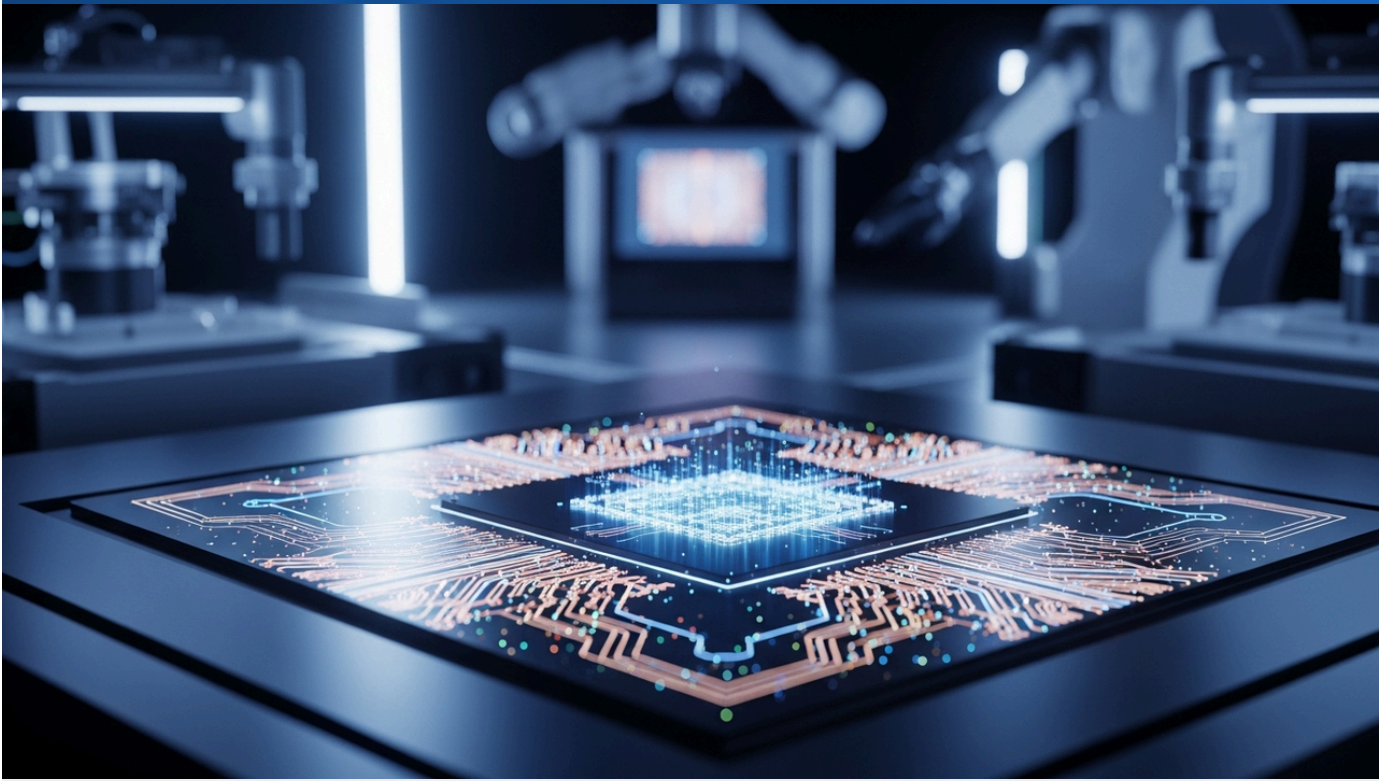
The proliferation of in-package optical I/O holds the potential to fundamentally transform the performance and energy efficiency of AI computing. This technology will enable the training and inference of larger and more complex AI models to be executed faster and more economically. While the testing and verification challenges pointed out by YieldWerx are significant, overcoming them will allow photonics technology to integrate even deeper into mainstream computing applications. In the future, optical I/O is expected to become a standard feature in chip design, fostering new innovations in all fields requiring high bandwidth and low latency, such as autonomous vehicles, AR/VR, and quantum computing. This technological innovation will be an indispensable component in shaping the foundation of next-generation digital infrastructure.

Source: <https://yieldwerx.com/blog/2026-photonics-optical-io-trends-challenges/>

Collected: July 24, 2026 | Automated Research System (Gemini API)

#18 TSMC Unveils Next-Gen 'COUPE' Silicon Photonics Platform for AI Optical Interconnect, Targeting 1.6 Tb/s Optical Engines by 2026

Published July 19, 2026 Tech Investments Taiwan



OVERVIEW

TSMC has announced 'COUPE,' a silicon photonics platform for co-packaged optics (CPO) in the AI era. COUPE innovatively stacks two dies—a photonic IC and an electronic IC—using SoIC bonding, placing the optical module adjacent to the XPU (CPU/GPU). This platform aligns with Nvidia's optical interconnect roadmap, with 1.6 Tb/s optical engines expected in products by 2026. This technology will dramatically enhance power efficiency and bandwidth for high-speed data transfer between AI chips.

Key Findings

TSMC (Taiwan Semiconductor Manufacturing Company) has announced the development of 'COUPE,' an advanced silicon photonics platform specifically designed for co-packaged optics (CPO) in the AI era. COUPE employs an innovative approach, stacking two distinct dies—a photonic integrated circuit (PIC) and an electronic integrated circuit (EIC)—using TSMC's proprietary System-on-Integrated Chips (SoIC) bonding technology. By closely placing this optical module next to the XPU (such as CPU or GPU), it aims to dramatically enhance data transfer speeds and power efficiency between AI chips.

Technical / Clinical Details

The core of the COUPE platform is its high-density 3D stacking enabled by SoIC bonding. This minimizes the distance between optical and electrical interconnects, drastically reducing signal propagation delay and power loss. Fully aligned with NVIDIA's next-generation optical interconnect roadmap, products featuring a 1.6 Terabit per second (Tb/s) optical engine are anticipated to hit the market by 2026. This is a critical component for achieving petabit-scale bandwidth within GPU clusters with minimal heat generation and power consumption. Compared to traditional pluggable optical modules, co-packaged optics enable higher bandwidth density and efficient data transfer over shorter distances, fundamentally addressing bottlenecks in AI systems.

Background & Context

The explosive growth of AI workloads has imposed unprecedented demands on data transfer bandwidth and power consumption in data centers. As Moore's Law approaches its limits, conventional electrical wiring has struggled to improve both inter-chip communication speed and energy efficiency. To address this 'copper wall' problem, the semiconductor industry is decisively shifting towards optical interconnect technologies that utilize photons. The active entry of the world's largest foundry like TSMC into this domain, in collaboration with AI hardware leaders such as NVIDIA, serves as a strong signal accelerating the industry's overall transition to optical technology. Other developments, like Marvell acquiring Celestial AI to integrate their Photonic Fabric, and GlobalFoundries establishing silicon photonics facilities, further underscore this trend.

Strategic Significance & Outlook

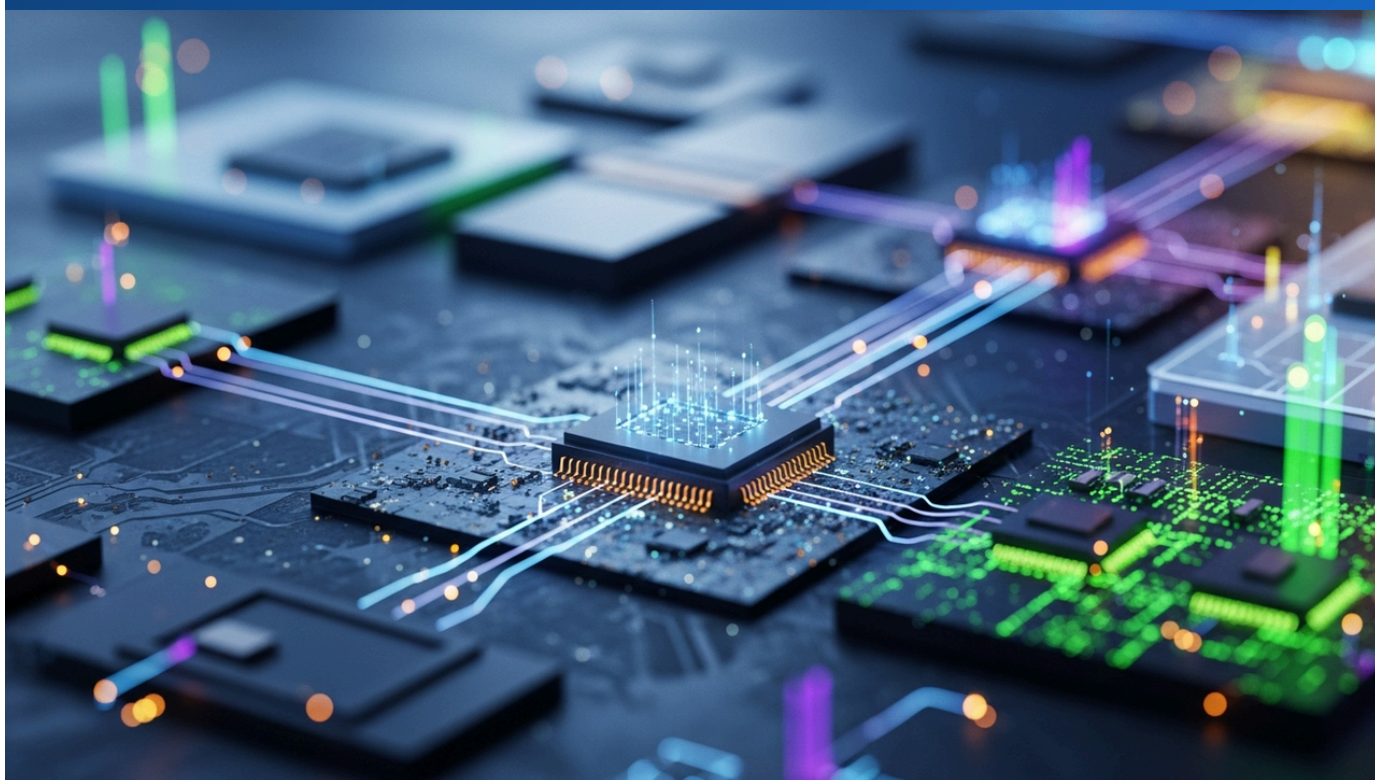
The emergence of TSMC's COUPE platform and its alignment with NVIDIA's roadmap holds immense significance for shaping the future of AI computing. The introduction of products with 1.6 Tb/s optical engines in 2026 will dramatically boost the performance of AI servers and data centers, enabling the deployment of larger and more complex AI models. In the future, co-packaged optics technologies like COUPE may become the standard for AI chip design, fostering new innovations in all fields requiring high bandwidth and low latency, including autonomous vehicles, high-performance computing, and quantum computing. This technological innovation is expected to strengthen the foundation of the information society and accelerate the further evolution of AI.

Source: <https://www.techinvestments.io/p/tsmcs-tech-roadmap-outlook-and-the>

Collected: July 24, 2026 | Automated Research System (Gemini API)

#19 Marvell Asia Leads Optical Transceiver Photonic Integration Patents Amidst Accelerating Entry of TSMC, Intel, and Other New Players

Published July 22, 2026 Patsnap International



OVERVIEW

The field of photonic integration for optical transceivers is experiencing active growth, with Marvell Asia holding the lead in patent families. New entrants like TSMC, Intel, Lyte AI, and Lipac indicate widespread commercial interest in co-packaged and integrated photonics. TSMC's technical focus on optical elements and advanced semiconductor device packaging aligns with its co-packaged optics and silicon photonics foundry goals. This patent trend reflects the increasing importance of optical interconnect technology in the AI era.

Key Findings

According to a patent landscape analysis conducted by Patsnap, the field of photonic integration for optical transceivers is currently undergoing a highly active growth phase, with Marvell Asia leading the industry in terms of patent families. The presence of numerous new entrants, including TSMC, Intel, Lyte AI, and Lipac, clearly indicates a rapidly expanding commercial interest in co-packaged optics (CPO) and other integrated photonics technologies.

Technical / Clinical Details

Photonic integration is the technology of integrating multiple optical components (such as lasers, modulators, and detectors) onto a single chip, enabling the miniaturization, higher performance, lower power consumption, and reduced cost of optical transceivers. Marvell Asia's extensive patent portfolio suggests its strong intellectual property foundation in optical interconnect technology, particularly for AI data center solutions. TSMC's focus on optical elements and advanced semiconductor device packaging directly aligns with its goals for co-packaged optics platforms (e.g., COUPE) and silicon photonics foundry services. The influx of new players underscores the recognition that this technology is key to resolving bottlenecks in next-generation computing and communications.

Background & Context

The explosive growth of AI workloads has pushed data center data transfer requirements beyond the limits of traditional electrical interconnects. To address this 'copper wall' problem, optical technology has emerged as an essential solution, enabling high-speed, low-power communication between chips and boards. The surge in patent activity is evidence that companies are actively striving to establish competitive advantages in this high-growth market. Specifically, co-packaged optics (CPO) is gaining significant attention as a next-generation solution that integrates optical transceivers with CPUs or GPUs in the same package, thereby minimizing data transfer latency and maximizing power efficiency, making it a primary focus for patenting efforts.

Strategic Significance & Outlook

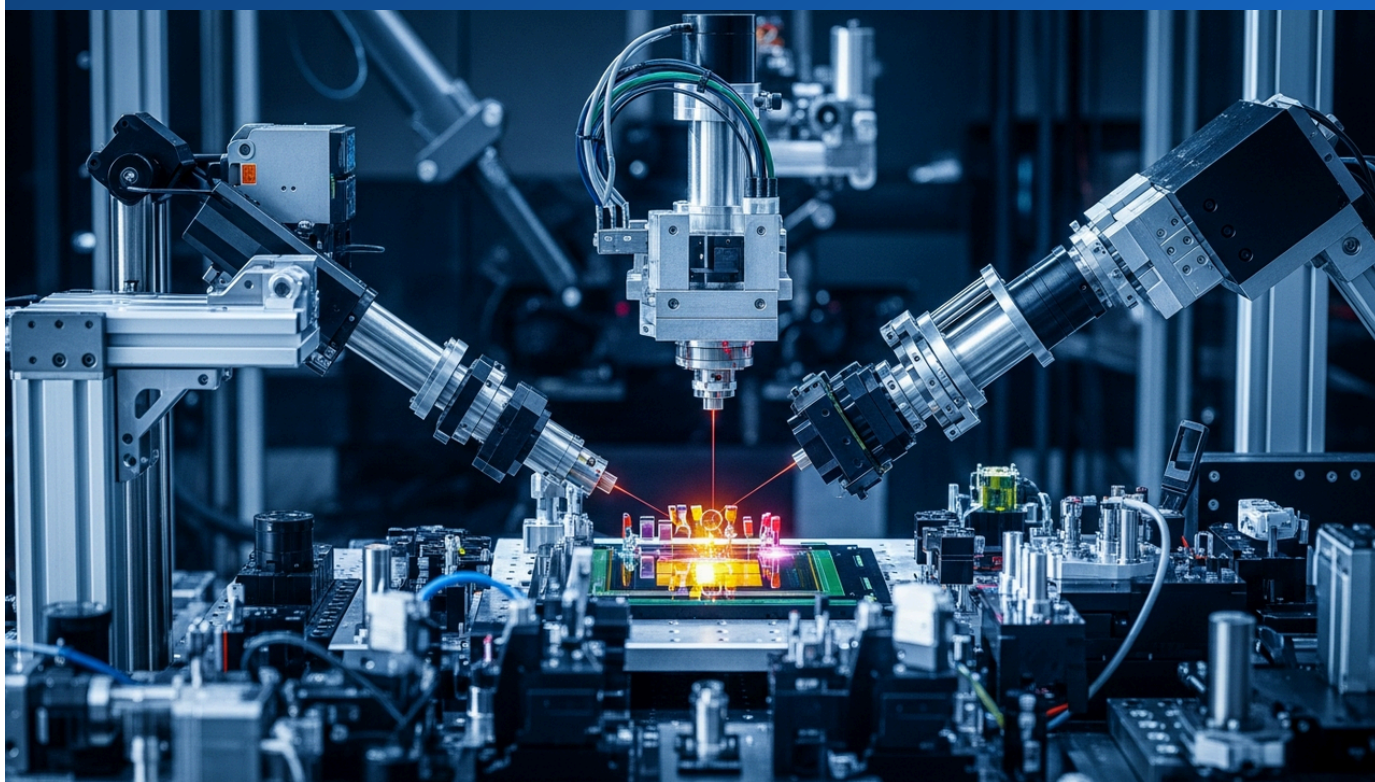
The vigorous patent activity and the entry of major new players in optical transceiver photonic integration suggest that this sector will undergo significant technological innovation and market growth in the coming years. Marvell Asia's leadership and TSMC's strategic investments will solidify the central role of optical interconnects in AI data centers, high-performance computing, and future communication networks. The increase in patents indicates that companies are actively competing to overcome technical barriers and develop scalable, cost-effective manufacturing solutions. This competition will ultimately accelerate the widespread adoption of high-performance AI chips and systems, driving the next frontier of information technology.

Source: <https://www.patsnap.com/resources/blog/rd-blog/optical-transceiver-photonic-integration-patent-landscape/>

Collected: July 24, 2026 | Automated Research System (Gemini API)

#20 Germany's SmarAct Partners with Akhetonics to Revolutionize PIC Testing Accuracy for Optical Computing with Nanopositioning Systems

Published July 23, 2026 Physics World Germany



OVERVIEW

Germany's SmarAct, specializing in high-precision positioning, automation, and measurement systems, is developing technology to translate optical computing's theoretical potential into scalable real-world applications. Collaborating with Akhetonics, SmarAct is leveraging nanopositioning systems as the precision motion core for test workstations, achieving unparalleled accuracy in characterizing next-generation photonic integrated circuits (PICs). This innovation is crucial for accelerating the practical implementation of optical computing technologies.

Key Findings

SmarAct, a German company specializing in high-precision positioning, automation, and measurement systems, is developing groundbreaking technology through its collaboration with Akhetonics to translate the theoretical potential of optical computing into scalable real-world applications. By utilizing nanopositioning systems as the precision motion core for test workstations, they are achieving unprecedented accuracy and reliability in characterizing next-generation photonic integrated circuits (PICs). This advancement holds critical significance for accelerating the commercialization and widespread adoption of optical computing technologies.

Technical / Clinical Details

SmarAct's nanopositioning systems, capable of moving and positioning optical fibers, probes, and other optical components with sub-nanometer precision, play a crucial role in optical coupling and testing of PICs. In collaboration with Akhetonics, this nanopositioning system has been integrated as the core of a versatile test setup designed for detailed optical and electrical performance characterization of next-generation PICs. This enables maximization of optical coupling efficiency into and out of PIC ports, precise measurement of optical losses within the chip, and detection of subtle defects in optical pathways. A high-precision testing environment is indispensable for shortening design iteration cycles and improving PIC manufacturing yields, ultimately accelerating the practical implementation of high-performance optical computing devices.

Background & Context

Optical computing is widely anticipated as a next-generation technology to overcome the speed, power consumption, and heat generation limits faced by traditional electrical-based computing. Particularly with the increasing volume of AI workloads, the importance of optical interconnects for resolving data transfer bottlenecks is growing. However, the manufacturing of photonic integrated circuits, which involves manipulating structures at micro- to nanoscale, demands extremely high precision at every stage from design to fabrication and testing. Currently, the testing and verification process remains one of the primary barriers to the widespread adoption of PICs. The efforts by SmarAct and Akhetonics are aimed at removing this barrier and paving the way for the mass production of advanced optical chips.

Strategic Significance & Outlook

The technology developed by SmarAct and Akhetonics will serve as a crucial tool for quality assurance and performance optimization in the development of next-generation optical computing devices. The proliferation of this high-precision testing technology will accelerate the market introduction of diverse applications built upon optical technology, including AI accelerators, quantum computing hardware, and ultra-high-speed communication systems. In the future, it will enable the design and manufacturing of more complex and larger-scale PICs, strengthening the technological foundation for optical computing to establish itself as a mainstream computing paradigm. This collaboration holds the potential to serve as an international benchmark in advancing the precision manufacturing and testing capabilities essential for the commercial success of optical computing.

Source: <https://physicsworld.com/a/nanopositioning-customization-and-control-opening-new-frontiers-in-optical-computing/>

#21 Photonics Achieves Bandwidth, Latency, and Power Efficiency Breakthroughs, Attracting Billions in New Investments for AI Infrastructure

Published July 23, 2026 International Banker International



**AI Infrastructure
attracting billions
in new investments
photonics achieves
low latency, power efficiency**

OVERVIEW

Photonics is attracting billions of dollars in new investment due to its essential role in AI infrastructure, achieving groundbreaking breakthroughs in bandwidth, latency, and energy efficiency. Nvidia has invested heavily in optical networking, and Lightmatter has joined Nvidia's NVLink Fusion ecosystem to deploy high-performance optical connectivity. Globally, countries like China are also establishing integrated photonic computing labs, underscoring photonics' recognition as a core technology supporting next-generation AI systems.

Key Findings

Recognized for its absolutely critical role in artificial intelligence (AI) infrastructure, photonics technology is currently attracting billions of dollars in new investments worldwide. This technology is overcoming the limitations inherent in traditional electronic technologies, achieving groundbreaking breakthroughs in all aspects of data transfer: bandwidth, latency, and energy efficiency. This surge clearly indicates that the advancement of AI is driving a new paradigm shift in computing itself.

Technical / Clinical Details

Photonics is the technology that transmits and processes information using photons instead of electrons. This approach bypasses physical constraints associated with electrical signal transmission, such as resistance, heat generation, and electromagnetic interference, achieving overwhelming speed, low power consumption, and high density. NVIDIA is making massive investments in optical networking for high-speed, high-capacity data transfer within AI clusters. Lightmatter has joined NVIDIA's NVLink Fusion ecosystem to deploy high-performance optical connectivity; Lightmatter's photonic processors have already demonstrated the capability to execute AI workloads approximately 10 times faster than traditional GPUs, with 3.5 to 5 times greater power efficiency. This dramatically improves data transfer, which has been a significant bottleneck in AI computing.

Background & Context

As Moore's Law approaches its physical limits, the performance improvement of semiconductor chips has become highly dependent on data transfer capabilities. Especially in large-scale AI models, communication between GPUs has become a bottleneck for overall computational power, leading to immense power consumption and heat generation. To address this 'copper wall' problem, governments and companies worldwide are focusing on photonics technology and accelerating investments. China, for instance, is making strategic efforts at a national level by establishing integrated photonic computing chip and system key labs in Shanghai to support next-generation AI systems. Goldman Sachs also projects that the optical networking market in AI infrastructure will reach \$154 billion by 2028, underscoring the high expectations for this sector.

Strategic Significance & Outlook

The massive investments in photonics technology will accelerate the fundamental transformation of AI infrastructure, enabling the realization of higher-performance and more energy-efficient AI systems. This will facilitate shorter AI training times, reduced operational costs, and the deployment of larger and more complex AI models. In the future, more tightly integrated optical interconnect solutions, such as co-packaged optics (CPO) and on-chip optical I/O, are likely to become widespread and potentially become the standard for AI chip design. Photonics will not only accelerate progress in all fields where AI is applied—including autonomous driving, medical diagnostics, scientific research, and quantum computing—but will also serve as an indispensable foundational technology opening new frontiers for information technology as a whole.

Source: <https://internationalbanker.com/technology/what-is-photonics-and-why-is-this-emerging-technology-attracting-billions-of-dollars-of-new-investment/>

Collected: July 24, 2026 | Automated Research System (Gemini API)

#22 Lightmatter Reports Optical Interconnects Achieve 100x Data Transfer Speed, Up to 5x Power Efficiency as AI Industry Races to Scale Integration

Published July 23, 2026 Tom's Hardware USA



OVERVIEW

As copper wiring approaches its physical limits, photonic interconnects are rapidly emerging as an innovative solution for AI workload data centers. Lightmatter's CEO states that optical interconnects can boost data transfer speeds by up to 100x and power efficiency by 3.5 to 5x. Lightmatter is pursuing co-packaged optics (CPO) component manufacturing with TSMC and GlobalFoundries for 2028 shipments, moving towards a more integrated interposer approach. This clearly shows the AI industry's accelerating race to deeply integrate optical technology into its infrastructure.

Key Findings

With traditional copper wiring approaching its physical limits, photonic interconnects are rapidly emerging as a transformative solution for data centers handling AI workloads. The CEO of Lightmatter indicates that optical interconnects have the potential to boost data transfer speeds by up to 100 times and improve power efficiency by 3.5 to 5 times. Lightmatter is actively pursuing the manufacturing of co-packaged optics (CPO) components with leading foundries, TSMC and GlobalFoundries, targeting shipments by 2028. This move towards a more integrated interposer approach is driving the significant adoption of optical technology within the AI industry.

Technical / Clinical Details

Photonic interconnects achieve substantial increases in bandwidth and significant reductions in power consumption by utilizing optical signals (photons) instead of electrical signals for data transmission. Lightmatter's technology leverages photons for on-chip data transfer, effectively overcoming the bottlenecks faced by conventional electrical interconnects, such as signal attenuation, heat generation, and electromagnetic interference. Co-packaged optics (CPO) is a key technology that integrates high-performance processors like CPUs and GPUs with optical transceivers within the same package, thereby minimizing data transfer latency and maximizing power efficiency. Lightmatter's collaboration with major foundries like TSMC and GlobalFoundries provides a strong impetus for the mass production and widespread adoption of this technology. This integrated interposer approach is considered one of the most efficient solutions to the 'memory wall' problem between AI chips.

Background & Context

The explosive growth of AI, particularly with the advent of large language models and generative AI, has imposed unprecedented demands on data center computing infrastructure. In AI clusters where tens of thousands of GPUs operate in concert, data movement often consumes more power and time than computation itself, a challenge that conventional copper wire technology can no longer effectively address. To tackle this 'copper wall' problem, semiconductor giants such as NVIDIA, Intel, and Broadcom are accelerating massive investments in optical technologies like co-packaged optics and silicon photonics. The entire AI industry is engaged in a fierce competition to deeply integrate optical technology into its infrastructure, aiming to improve the scalability and energy efficiency of AI workloads.

Strategic Significance & Outlook

Lightmatter's efforts hold immense significance in shaping the future of AI data centers. The dramatic increase in data transfer speeds and improvements in power efficiency will enable faster AI training, reduced operational costs, and the deployment of larger and more complex AI models. The target of CPO component shipments by 2028 suggests that optical interconnect technology will become mainstream in the AI industry within a few years. In the future, this technology is expected to spill over into other fields requiring high bandwidth and low latency, such as autonomous vehicles, AR/VR, and quantum computing, fostering widespread technological innovation. This shift towards optical technology in the AI industry is poised to be a defining trend for the next era of information technology.

Source: <https://www.tomshardware.com/tech-industry/inside-optical-and-the-battle-for-scale-how-the-ai-industry-is-racing-to-integrate-photonics-interconnects>

#23 Advanced AI Optical Chip Technologies Fuel Strong Growth Across Next-Generation Computing Applications

Published July 20, 2026 Semiconductor-knowledge-hub International



OVERVIEW

The AI optical chip market is experiencing significant expansion driven by the growth of AI and machine learning applications. AI optical chips utilize light for data transmission and processing, offering substantial improvements in bandwidth, latency, and power efficiency compared to traditional electronic chips. This makes them indispensable for scaling AI workloads in data centers and high-performance computing environments, pushing the performance limits of AI systems and establishing new computing paradigms.

Key Findings

The AI optical chip market is currently experiencing substantial growth, fueled by the explosive expansion of artificial intelligence (AI) and machine learning (ML) applications. This groundbreaking technology leverages light for both data transmission and processing, achieving dramatic improvements in bandwidth, latency, and power efficiency across the board compared to conventional electronic chips. Consequently, AI optical chips are establishing themselves as an indispensable foundational technology for scaling AI workloads within data centers and high-performance computing (HPC) environments.

Technical / Clinical Details

AI optical chips integrate state-of-the-art photonics technologies, including silicon photonics, co-packaged optics (CPO), and optical neural networks. This enables light signals to transmit data at high speeds with low loss both within and between chips, effectively overcoming the 'copper wall' problem—namely, increasing power consumption and bandwidth limitations—inherent in traditional electrical wiring. Specifically, they significantly alleviate the I/O bandwidth constraints of electronic chips, efficiently handling the immense data flow required for AI model training and inference. As a result, AI clusters can be deployed with higher density, improving the utilization efficiency of computational resources and reducing overall operational costs.

Background & Context

The evolution of AI places unprecedented demands on computing infrastructure. Training large-scale AI models requires massive data transfers between GPUs, which has historically been a bottleneck for conventional electronic interconnects. As Moore's Law approaches its physical limits, the semiconductor industry is focusing not only on enhancing data processing capabilities but also on improving data transfer efficiency and power efficiency. Leading companies such as NVIDIA, Intel, and Lightmatter recognize optical technology as key to next-generation AI systems and are making massive investments in this field. The increasing demand for AI optical chips clearly indicates that this technology is essential for shaping the future of AI.

Strategic Significance & Outlook

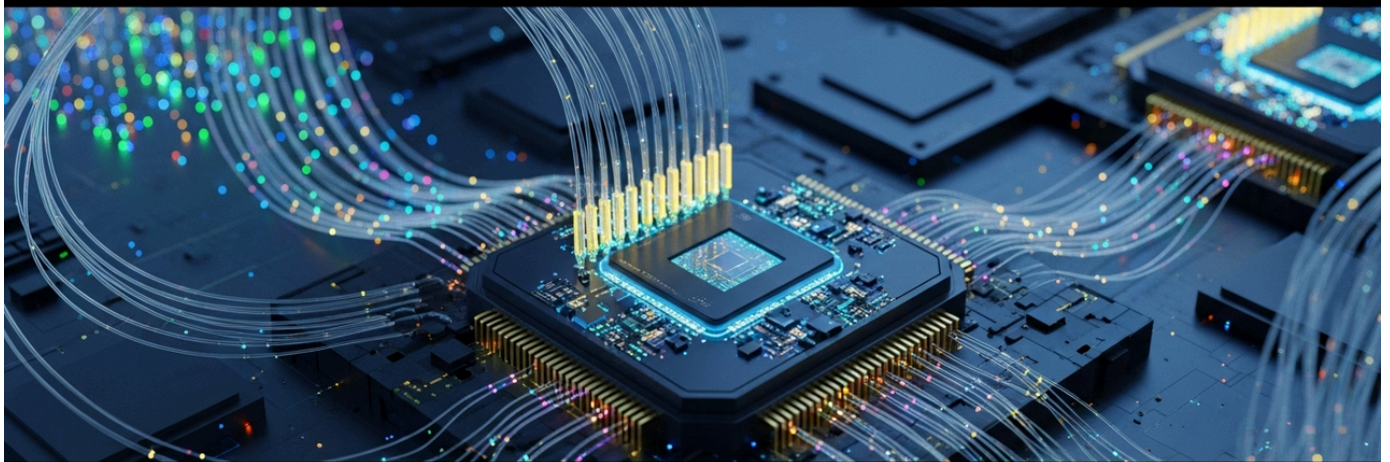
AI optical chip technology is projected to continue its strong growth across next-generation computing applications, particularly in AI. The widespread adoption of this technology will not only dramatically boost the performance of AI servers but also holds the potential to significantly improve the overall energy efficiency of data centers. In the future, more densely integrated optical I/O solutions are expected to become prevalent and serve as standard features in chip design. This is anticipated to foster new innovations in all fields requiring high bandwidth and low latency, such as autonomous driving, AR/VR, quantum computing, and healthcare diagnostics. AI optical chips will strengthen the foundation of the information society and build the technological base for AI to deeply permeate all aspects of society.

Source: <https://semiconductorknowledgehub.wordpress.com/2026/07/20/advanced-ai-optical-chip-technologies-fuel-strong-growth-across-next-generation-computing-applications/>

Collected: July 24, 2026 | Automated Research System (Gemini API)

#24 Nvidia Invests Billions in Silicon Photonics for Rubin & Blackwell GPUs, Aiming for Petabit-Scale Bandwidth with Minimal Heat

Published July 19, 2026 Medium USA



OVERVIEW

Silicon photonics is shifting its focus from long-haul links to short-reach inter-chip interconnects within data centers and AI accelerators, addressing the 'memory wall' problem. Nvidia is investing billions in photonics for its Rubin and Blackwell GPUs, aiming to replace copper wiring with silicon photonics links to achieve petabit-scale bandwidth with minimal heat generation. This is a critical strategy to break AI computing performance limits and resolve data transfer bottlenecks.

Key Findings

Silicon photonics technology is emerging as a core solution to the 'memory wall' problem, expanding its application scope from long-haul links to short-reach inter-chip interconnects within data centers and AI accelerators for high-speed data transfer. NVIDIA is making multi-billion dollar investments in this photonics technology for its next-generation Rubin and Blackwell GPU architectures. The goal is to replace traditional copper wiring with high-performance silicon photonics links, thereby achieving petabit-scale bandwidth (quadrillions of bits per second) with minimal heat generation.

Technical / Clinical Details

Silicon photonics leverages optical signals to transmit data, overcoming the bandwidth, latency, and power consumption limitations inherent in electrical signals. NVIDIA's Rubin and Blackwell GPUs will integrate advanced silicon photonics technologies such as co-packaged optics (CPO) and on-chip optical I/O, dramatically boosting data transfer speeds between GPUs. This enables the immense volumes of data required for AI model training and inference to be processed faster and more power-efficiently. Compared to copper wiring, optical links suffer less signal attenuation and generate significantly less heat, contributing to higher-density AI clusters and reduced cooling costs. NVIDIA is further accelerating its photonics integration by heavily investing in laser suppliers like Lumentum and Coherent.

Background & Context

The explosive growth of AI workloads has exacerbated the 'memory wall' problem, which is the gap between data center computing power and data transfer capabilities. In large AI models, GPUs often spend a dominant amount of time waiting for data to be transferred from memory to the CPU/GPU while computations are idle, thus degrading overall performance. As Moore's Law approaches its physical limits, this issue cannot be solved solely by increasing chip speed. Therefore, industry leaders like NVIDIA are turning to optical technology to resolve data transfer bottlenecks. This massive investment in silicon photonics is a strategic move to redefine the future of AI computing, signifying a fundamental paradigm shift from conventional electronic technologies.

Strategic Significance & Outlook

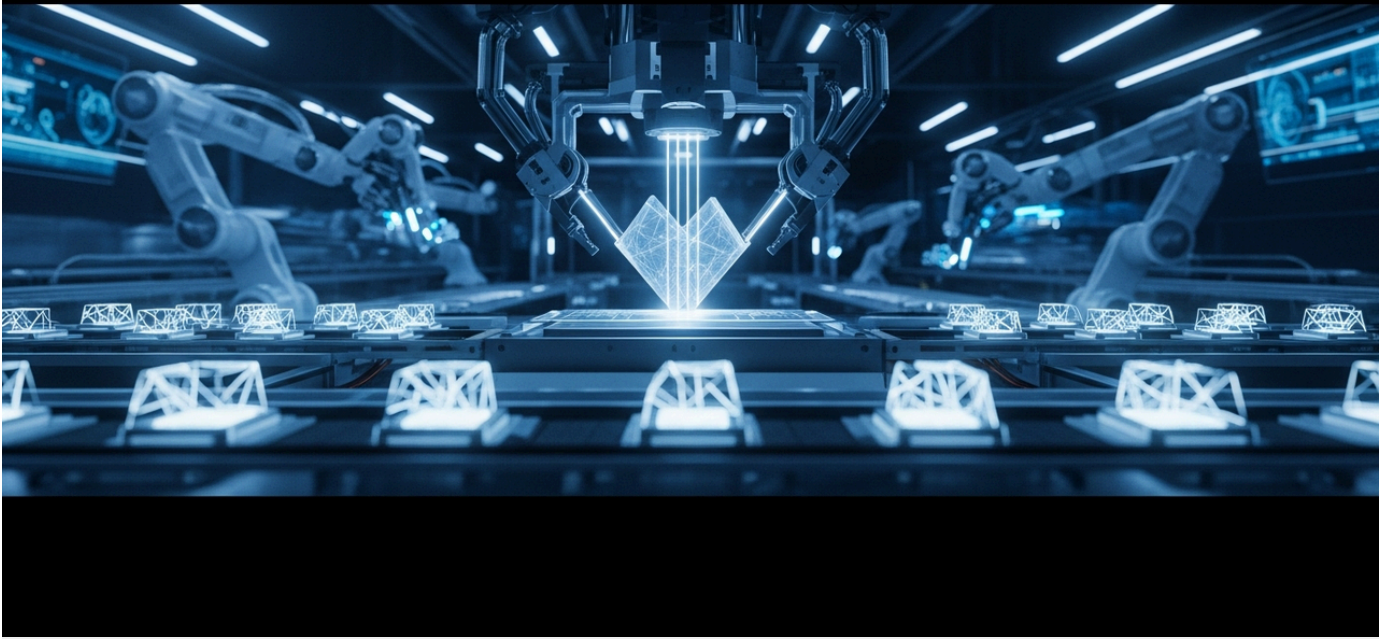
NVIDIA's integration of silicon photonics into its Rubin and Blackwell GPUs will dramatically enhance AI computing performance and energy efficiency. Petabit-scale bandwidth with minimal heat generation will enable the training and inference of larger and more complex AI models, elevating AI capabilities to new levels. In the future, this technology is expected to accelerate progress in all fields where AI is applied, including autonomous driving, robotics, medical diagnostics, and scientific research. Furthermore, silicon photonics is anticipated to fundamentally transform data center design philosophy, serving as a foundational technology for achieving more dense and sustainable computing environments. NVIDIA's investment marks a crucial step in leading the entire AI industry into the optical era.

Source: <https://medium.com/illumination/the-speed-of-light-why-photonics-is-the-new-backbone-ai-2597953551da>

Collected: July 24, 2026 | Automated Research System (Gemini API)

#25 Ion-Beam Origami Cuts 3D Optical Chip Fabrication to Seconds, Achieving >100x Speedup Over Conventional Methods

Published July 20, 2026 Intelligent Living International



OVERVIEW

Researchers have developed 'Ion-Beam Origami,' a technique capable of fabricating 3D photonic nanostructures across an entire wafer in mere seconds. This breakthrough achieves over 100x speed improvement compared to traditional methods, addressing a major barrier in scaling 3D optical chip manufacturing. As companies like Lightmatter and Intel develop photonic chips for AI workloads, this manufacturing innovation becomes increasingly crucial for mainstream computing, significantly advancing the practical implementation of optical computing technology.

Key Findings

Researchers have developed an innovative technique called 'Ion-Beam Origami,' which enables the fabrication of 3D photonic nanostructures across an entire wafer in just seconds. This groundbreaking manufacturing method achieves over 100 times faster speeds compared to traditional techniques, effectively overcoming the largest barrier to scalability in high-performance 3D optical chip manufacturing. This advancement holds the potential to dramatically accelerate the commercialization and widespread adoption of optical computing technologies.

Technical / Clinical Details

Ion-Beam Origami refers to a process that precisely controls focused ion beams (FIB) to directly create intricate nanoscale structures on materials, subsequently forming 3D architectures through self-assembly. Conventional 3D photonic chip manufacturing relies on multi-stage lithography processes or additive manufacturing techniques, which are both time-consuming and costly. This new technology significantly simplifies these complex steps, enabling the batch fabrication of intricate 3D optical chip structures on a single wafer in an astonishingly short time, ranging from seconds to minutes. By reducing manufacturing costs and substantially expanding production volumes, this breakthrough paves the way for the mass production of optical chips essential for applications like AI accelerators and high-speed communication devices.

Background & Context

The explosive growth of AI workloads has exacerbated data transfer bottlenecks in data centers and high-performance computing (HPC). Optical computing is anticipated as a next-generation technology to overcome the speed, power consumption, and heat generation limits faced by traditional electronic computing. Major companies like Lightmatter and Intel are actively developing photonic chips for AI workloads, but one of the biggest challenges for their practical implementation has been establishing scalable and cost-effective manufacturing methods. This Ion-Beam Origami technology is of paramount importance in resolving this manufacturing bottleneck and accelerating the industrialization of optical technology.

Strategic Significance & Outlook

The dramatic acceleration of 3D optical chip manufacturing through Ion-Beam Origami will be an indispensable factor in promoting the adoption of optical technology in mainstream computing. This manufacturing breakthrough will enable the mass production of higher-performance, energy-efficient AI accelerators, optical neural networks, and ultra-high-speed optical communication devices. In the future, this technology is expected to accelerate the market introduction of diverse applications built upon optical technology, including quantum computing, AR/VR, and autonomous vehicles. This innovative manufacturing technique will play a crucial role in ushering in a new era of information processing and strengthening the technological foundation for AI to deeply permeate all aspects of society.

Source: <https://www.intelligentliving.co/optical-chip-fabrication-hours-seconds/>

Collected: July 24, 2026 | Automated Research System (Gemini API)

#26 UMC Ships First Silicon Photonics Wafers, Tower Semiconductor Invests \$3 Billion in Japan: AI Data Center Demand Accelerates Global Optical Tech Expansion

Published July 16, 2026 PhotonCap International



OVERVIEW

UMC has shipped its first mass-produced silicon photonics wafers from its Singapore 12-inch fab, while Tower Semiconductor announced a \$3 billion investment in Japan to expand 300mm silicon photonics manufacturing. These concurrent moves directly address the rapid demand surge from AI data centers, highlighting a global optical technology investment boom. TSMC's COUPE co-packaged optics platform is also underway, integrating optics into its advanced packaging roadmap. This active investment is crucial for breaking the 'copper wall' in AI infrastructure.

Key Findings

The global semiconductor industry is accelerating massive investments in optical technology to meet the explosive growth of AI data centers. On the same day that UMC (United Microelectronics Corporation) announced the shipment of its first mass-produced silicon photonics wafers from its 12-inch fab in Singapore, Tower Semiconductor also unveiled plans to invest \$3 billion in Japan to expand its 300mm silicon photonics manufacturing capabilities. These simultaneous announcements clearly illustrate the urgent and global nature of the escalating demand for optical interconnects in AI infrastructure.

Technical / Clinical Details

UMC's shipment of silicon photonics wafers demonstrates its cutting-edge manufacturing capabilities to support the volume production of high-performance photonic integrated circuits (PICs). This will stabilize the supply of optical modules essential for high-speed data transfer and low power consumption within AI clusters. Meanwhile, Tower Semiconductor's 300mm silicon photonics expansion in Japan aims to reduce per-unit costs and improve production efficiency by manufacturing on larger wafer sizes. Furthermore, TSMC's COUPE co-packaged optics (CPO) platform, which stacks photonic ICs and electronic ICs using SoIC bonding and places them adjacent to XPU's, is a critical project integrating optics into its advanced packaging roadmap. This addresses the 'copper wall' problem between AI chips, enabling petabit-scale bandwidth with low power consumption.

Background & Context

The surging AI workloads have exposed the physical and electrical limits of traditional electrical interconnects, creating bottlenecks in data center performance and power efficiency. Consequently, investments in optical interconnect technologies such as silicon photonics and co-packaged optics have become a top priority for the semiconductor industry. Tower Semiconductor's investment, supported by Japan's Ministry of Economy, Trade and Industry (METI), also aligns with national strategies to strengthen domestic semiconductor manufacturing bases and enhance supply chain resilience. These developments highlight the crucial role of optical communications as an indispensable infrastructure for AI's evolution and demonstrate the accelerating competition and collaboration among major global players in this technological domain.

Strategic Significance & Outlook

The simultaneous announcements by UMC and Tower Semiconductor suggest that the global expansion of silicon photonics manufacturing capabilities is indispensable for shaping the future of AI computing. These investments will significantly improve the cost and energy efficiency in building AI data centers, enabling the deployment of larger and more complex AI models. In the future, co-packaged optics are expected to become a standard feature in AI chip design, fostering new innovations in all fields requiring high bandwidth and low latency, including autonomous driving, high-performance computing, and quantum computing. This global collaboration and investment will strengthen the technological foundation for the further evolution of AI.

Source: <https://photoncap.net/p/the-more-silicon-wins-the-more-inp>

#27 Cambridge Spinoff CamGraPhIC Secures Funding to Advance Graphene-Based Photonic Transceivers for AI Interconnects and Energy Reduction

Published July 21, 2026 Cambridge Review UK



OVERVIEW

Cambridge spinoff CamGraPhIC has secured funding to advance its graphene-based photonic transceivers, aiming to enhance AI interconnectivity and reduce energy consumption. This move signals a broader industry shift towards energy-efficient, high-bandwidth AI acceleration, with ongoing research into alternative photonic materials and neuromorphic photonics. CamGraPhIC's technology holds the potential to significantly curb data center power consumption.

Key Findings

CamGraPhIC, a spin-off company from the University of Cambridge, has secured significant funding aimed at further developing its graphene-based photonic transceivers. This investment is strategically targeted at substantially enhancing interconnectivity within artificial intelligence (AI) infrastructure while simultaneously dramatically reducing data center energy consumption. This development clearly signals a broader industry shift towards energy-efficient and high-bandwidth AI acceleration, showcasing the potential for graphene, as a novel material, to play a crucial role in shaping the future of photonics.

Technical / Clinical Details

The graphene-based photonic transceivers being developed by CamGraPhIC potentially offer several advantages over existing silicon photonics technology, including higher modulation speeds, operation across a broader wavelength range, and reduced manufacturing costs. Graphene's unique optical and electrical properties are expected to enable extremely fast and low-power optical signal modulation and detection. This capability is particularly critical for inter-chip communication within AI clusters and for long-haul communication between data centers, allowing for exponential increases in data transfer speeds while improving power efficiency. The secured funding will be utilized to further mature this graphene technology and facilitate its integration into next-generation AI interconnect solutions such as co-packaged optics (CPO) and on-chip optical I/O.

Background & Context

The explosive growth of AI workloads has dramatically increased data center power consumption and cooling costs, making the development of sustainable computing infrastructure an urgent imperative. Traditional electrical interconnects are facing fundamental limits in signal attenuation and heat generation at higher speeds, leading photonics technology to be seen as key to breaking this 'copper wall.' While silicon photonics is becoming mainstream, alternative photonic materials like graphene, thin-film lithium niobate, and gallium nitride hold promise for further performance enhancements and novel functionalities. CamGraPhIC's funding reflects this growing interest in R&D for alternative materials and the exploration of new computing paradigms such as neuromorphic photonics.

Strategic Significance & Outlook

The evolution of CamGraPhIC's graphene-based photonic transceivers is poised to play a vital role in dramatically improving the energy efficiency of AI data centers and reducing the environmental footprint of AI computing. This technology, by achieving both high bandwidth and low power consumption, will enable the training and inference of larger and more complex AI models, thereby accelerating the further evolution of AI. In the future, graphene photonics is expected to proliferate into diverse fields requiring high-efficiency data transfer, including autonomous driving, AR/VR, IoT edge devices, and quantum communication, fostering new innovations. This Cambridge-born technological innovation will serve as an indispensable foundation for building next-generation AI hardware and sustainable digital infrastructure.

Source: <https://cambridgereview.uk/articles/cambridge-photonic-ai-hardware>

Collected: July 24, 2026 | Automated Research System (Gemini API)

#28 Marvell Technology Strengthens On-Chip Optical Expertise with Celestial AI Acquisition, Leading AI Market with 1.6T and 3.2T Optical Solutions

Published July 22, 2026 Kavout USA



OVERVIEW

Marvell Technology is strategically addressing the need for faster, more efficient data movement within and between AI clusters by integrating Celestial AI's on-chip optical expertise into its portfolio. Its electro-optical portfolio, including PAM DSP, coherent solutions, and Photonic Fabric, is a key area for sustained growth. Marvell leads with 1.6 Terabit solutions and has demonstrated 3.2 Terabit technology for 2028 deployment, reinforcing its dominant role in high-performance AI clusters, accelerating resolution of data transfer bottlenecks.

Key Findings

Marvell Technology is strategically addressing the critical need for faster and more efficient data movement within and between AI clusters by acquiring Celestial AI and integrating its on-chip optical expertise into its portfolio. The company's electro-optical portfolio, which encompasses Pulse Amplitude Modulation Digital Signal Processors (PAM DSPs), coherent solutions, and the innovative Photonic Fabric technology, is positioned as a significant growth driver for the coming years. Marvell currently leads the industry with its 1.6 Terabit (Tb) solutions and has already demonstrated 3.2 Tb technology for deployment in 2028, further solidifying its dominant role in high-performance AI clusters.

Technical / Clinical Details

The acquisition of Celestial AI brings deep expertise in on-chip optical technology to Marvell, accelerating the development of co-packaged optics (CPO) and advanced optical interconnect solutions. PAM DSPs maximize data transmission capabilities over existing copper wiring, while coherent solutions improve the efficiency and bandwidth of long-haul optical communication. The Photonic Fabric is a groundbreaking technology that enables high-density, low-latency optical interconnects between AI chips, fundamentally transforming data transfer, which has been a major bottleneck for AI workloads. Through the integration of these technologies, AI clusters can achieve dramatically higher data transfer speeds and reduce power consumption by up to 80% compared to traditional electrical connections. The market leadership of 1.6 Tb/s solutions and the demonstration of 3.2 Tb/s technology underscore Marvell's established technological superiority in next-generation AI infrastructure.

Background & Context

The explosive growth of AI is placing unprecedented demands on data center computing infrastructure, with massive data transfers between GPU clusters becoming a critical bottleneck. As Moore's Law approaches its physical limits, traditional copper wiring struggles to achieve both high speeds and power efficiency. To address this 'copper wall' problem, major players like NVIDIA, Intel, and Broadcom are accelerating massive investments in optical technologies. Marvell's acquisition of Celestial AI is part of a broader trend where the AI industry is placing optical interconnect technology at its core, further fostering competition and innovation in this sector. The industry as a whole holds high expectations for the future of optical technology, with GlobalFoundries, for example, forecasting a doubling of its silicon photonics revenue.

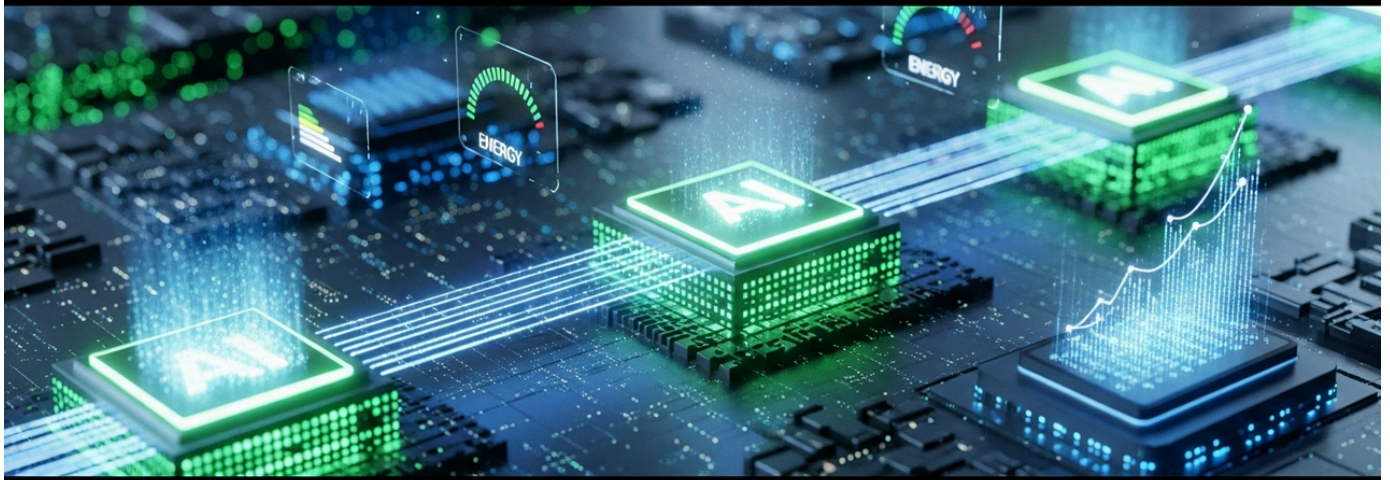
Strategic Significance & Outlook

Marvell Technology's strategic moves will solidify its leadership in the high-performance AI cluster market. The market introduction of 1.6 Tb/s solutions and the demonstration of 3.2 Tb/s technology will dramatically enhance the performance and energy efficiency of AI data centers, enabling the deployment of larger and more complex AI models. In the future, Marvell's Photonic Fabric technology is expected to accelerate the widespread adoption of co-packaged optics (CPO), becoming a standard in AI chip design, and fostering new innovations in all fields requiring high bandwidth and low latency, including autonomous driving, AR/VR, and quantum computing. Marvell's investments will play an indispensable role in shaping the next generation of AI infrastructure.

Source: <https://www.kavout.com/market-lens/is-marvell-technology-s-q4-beat-a-game-changer-for-investors>

#29 Marvell's Celestial AI Acquisition Reduces Interconnect Power by >80%; GlobalFoundries Forecasts Doubling Silicon Photonics Revenue by 2025

Published July 21, 2026 NAI 500 USA



OVERVIEW

Silicon photonics is solving the 'copper problem' in AI clusters, enabling faster data speeds, increased bandwidth, and reduced power consumption. Marvell acquired Celestial AI, reducing interconnect power consumption by over 80% with its Photonic Fabric technology. GlobalFoundries predicts its silicon photonics revenue will double in 2025 and again in 2026, planning to launch a silicon photonics and advanced packaging CPO facility in Malta, NY, in 2025. This trend indicates rapid adoption of optical technology in AI infrastructure.

Key Findings

Silicon photonics technology is playing a central role in resolving the 'copper problem'—the limitations of traditional electrical interconnects—faced by artificial intelligence (AI) clusters, enabling dramatic improvements in data speeds, increased bandwidth, and significant reductions in power consumption. Marvell has reported that its acquisition of Celestial AI and its Photonic Fabric technology has reduced interconnect power consumption by over 80%. Concurrently, GlobalFoundries predicts its silicon photonics revenue will double in 2025 and again in 2026, clearly demonstrating the strong growth momentum in this market.

Technical / Clinical Details

Celestial AI's Photonic Fabric technology, acquired by Marvell, uses photons for data transfer between AI chips, achieving significantly higher power efficiency compared to traditional electrical signal pathways. A reduction of over 80% in power consumption is critical for substantially lowering the operational costs of AI data centers and mitigating their environmental impact. GlobalFoundries, a key foundry in silicon photonics manufacturing, plans to launch a dedicated silicon photonics and advanced packaging Co-Packaged Optics (CPO) facility in Malta, New York, in 2025. This new facility will enable the mass production of CPO solutions that integrate chips and optical transceivers into the same package for AI accelerators and high-performance computing, driving further performance enhancements and power efficiency optimization.

Background & Context

The explosive growth of AI workloads is placing unprecedented demands on data center computing infrastructure. Particularly in GPU clusters, the 'memory wall' problem, where data movement consumes more power and time than computation itself, has become acute. Traditional copper wiring faces physical limits such as signal attenuation, heat generation, and electromagnetic interference at higher speeds, hindering further AI scaling. Consequently, semiconductor giants like NVIDIA, Intel, and Broadcom are accelerating massive investments in optical technologies. Marvell's acquisition of Celestial AI and GlobalFoundries' capital investments are part of a broader trend where the entire AI industry is deeply integrating optical technology into its infrastructure to realize next-generation AI computing.

Strategic Significance & Outlook

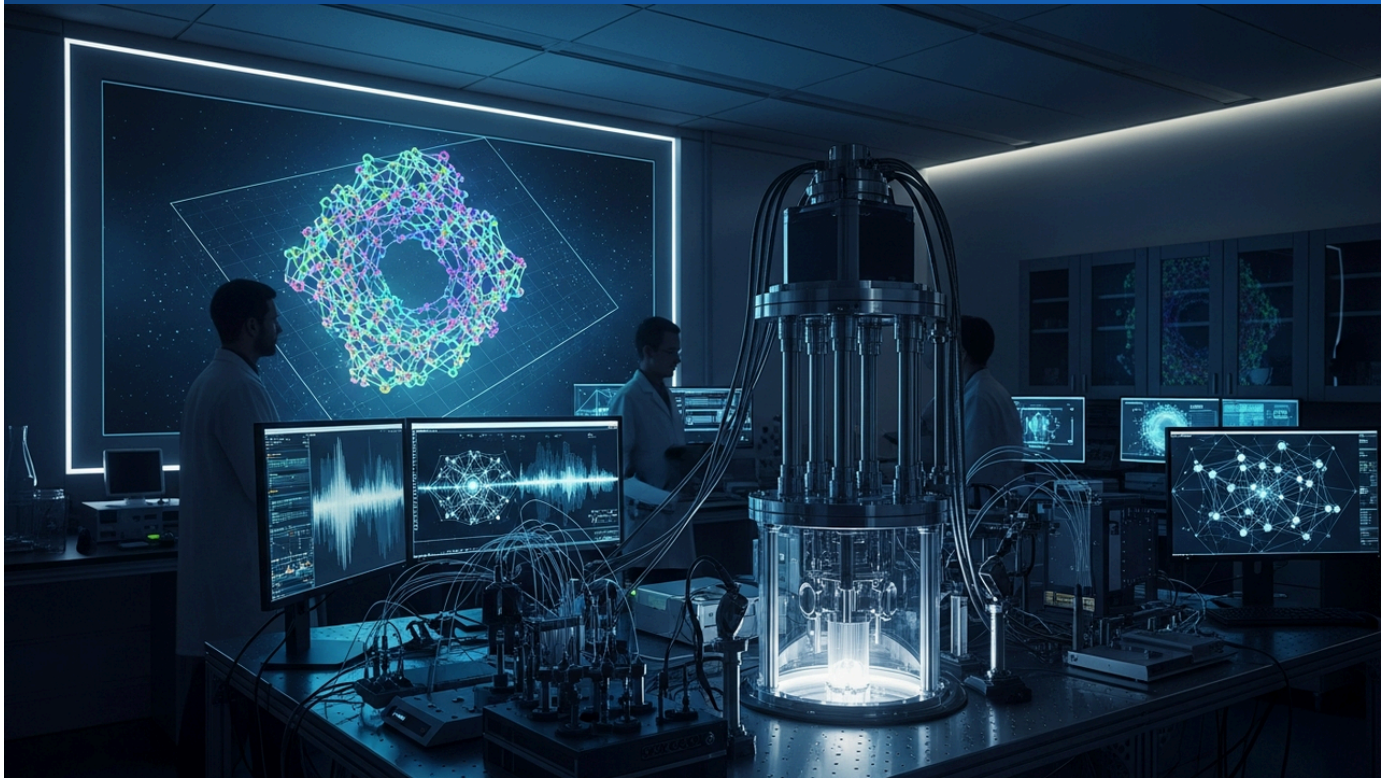
Marvell's achievement of over 80% power consumption reduction and GlobalFoundries' forecast for doubling silicon photonics revenue indicate that silicon photonics technology is indispensable for shaping the future of AI data centers. These advancements will enable the training and inference of larger and more energy-efficient AI models, elevating AI capabilities to new levels. GlobalFoundries' new facility in Malta is likely to accelerate the mass production of co-packaged optics technology, potentially becoming a standard in AI chip design. In the future, this technology is expected to proliferate into all fields requiring high bandwidth and low latency, such as autonomous vehicles, AR/VR, and quantum computing, fostering widespread technological innovation. This strong market growth underscores that optical technology is an essential component in forming the foundation of next-generation digital infrastructure.

Source: <https://nai500.com/blog/2026/07/silicon-photonics-stock-pileup-mrvl-avgo-crdo-gfs-cohr/>

Collected: July 24, 2026 | Automated Research System (Gemini API)

#30 U.S. National Science Foundation (NSF) Invests in Quantum Materials Research for Quantum Computing, Sensing, and Networking

Published July 21, 2026 U.S. National Science Foundation USA



OVERVIEW

The U.S. National Science Foundation (NSF) is bolstering investments in quantum materials research to deepen our understanding of matter and unlock new possibilities for future technologies like quantum computers, advanced sensing, and ultra-secure communications. NSF's support aids in building the scientific foundation for quantum materials, computing, sensing, and networking. Notably, breakthroughs in integrating photonic quantum systems into conventional semiconductor chips are highlighted, expected to accelerate the practical application of quantum technologies.

Key Findings

The U.S. National Science Foundation (NSF) is significantly increasing its investments in quantum materials research, aiming to deepen fundamental understanding of matter and unlock new possibilities for future transformative technologies such as quantum computers, advanced sensing, and ultra-secure communication. NSF's targeted support plays an indispensable role in building the scientific foundation for key areas including quantum materials, quantum computing, quantum sensing, and quantum networking. Particularly noteworthy are breakthroughs in integrating photonic quantum systems into conventional semiconductor chips, which are expected to dramatically accelerate the practical implementation of quantum technologies.

Technical / Clinical Details

Quantum materials are a class of substances possessing unique properties—such as superconductivity, spin, and topological characteristics—that cannot be explained by classical physics. Manipulating these materials enables the realization of quantum computers with immensely high computational power, quantum sensors with unprecedented sensitivity, and ultra-secure, unhackable quantum communication networks. One of the breakthroughs highlighted by NSF involves the integration of photonic quantum systems, which use photons as information carriers in quantum circuits, with existing silicon-based semiconductor chips. This is expected to improve qubit stability, scalability, and the potential for room-temperature operation, while also reducing the manufacturing cost and complexity of quantum computing hardware. Photons are also well-suited for long-distance transmission of quantum information due to minimal loss.

Background & Context

Major countries worldwide recognize the potential of quantum technologies to fundamentally transform the 21st-century economy and national security, and are making massive investments in this field. Quantum computers could solve complex problems currently intractable for even the most powerful supercomputers, potentially revolutionizing drug discovery, materials science, and financial modeling. However, qubit stability, coherence time, and scalability remain significant technical challenges. NSF's investments are a crucial effort to address these fundamental challenges and ensure U.S. leadership in the quantum technology race. Integration with semiconductor technology, in particular, is considered a practical approach to leverage existing infrastructure and accelerate the commercialization of quantum technologies.

Strategic Significance & Outlook

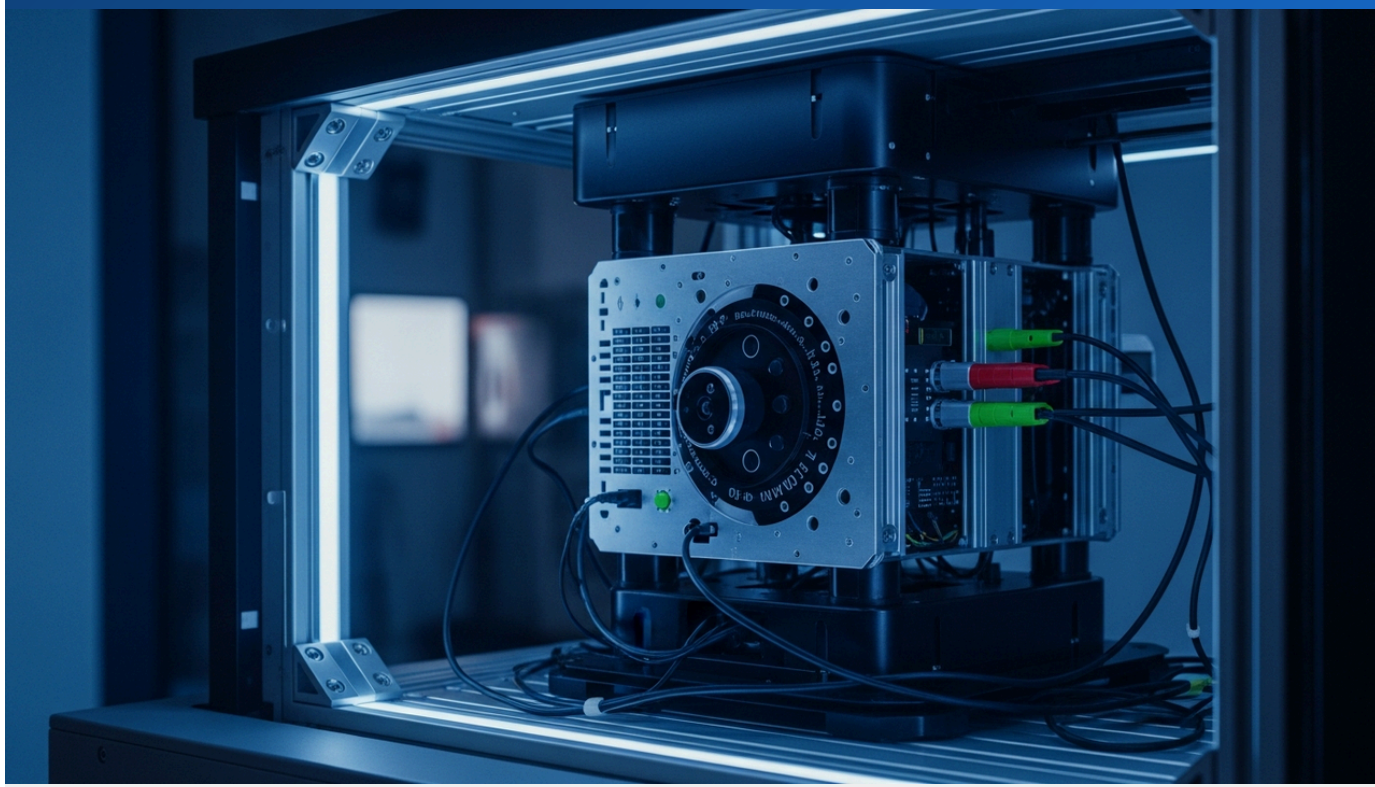
NSF's continuous investment in quantum materials research will accelerate the progress of quantum technologies, profoundly impacting society in the decades to come. The integration of photonic quantum systems and semiconductor chips is a critical step towards realizing scalable and robust quantum computing platforms, increasing the likelihood that quantum computers will move beyond the laboratory into practical applications. Furthermore, quantum sensing will dramatically improve the precision of medical diagnostics, earth sciences, and navigation, while quantum networks will elevate internet security and data transfer capabilities to the next level. NSF's initiatives are building the foundation for a quantum age that spans from scientific discovery to technological innovation and societal benefit.

Source: <https://www.nsf.gov/science-matters/engineering-materials-quantum-age>

Collected: July 24, 2026 | Automated Research System (Gemini API)

#31 High-Resolution Direct ToF LiDAR Brings Spatial Intelligence to Edge AI, Enhancing Robotics and AR/VR

Published July 20, 2026 Laser Focus World International



OVERVIEW

High-resolution direct Time-of-Flight (ToF) LiDAR modules are delivering groundbreaking spatial intelligence to edge AI by simultaneously providing multiple data streams, including depth maps, infrared images, reflectivity information, ambient light measurements, and confidence data. This technology dramatically improves sensing capabilities across various fields like robotics, AR/VR, and industrial applications. It strengthens the foundation for AI to understand and interact with the physical environment more accurately in real-time.

Key Findings

High-resolution direct Time-of-Flight (ToF) LiDAR modules are bringing groundbreaking spatial intelligence to edge AI by simultaneously providing multiple data streams, including precise depth maps, infrared images, reflectivity information, ambient light measurements, and confidence data. This innovative technology dramatically enhances sensing capabilities across a wide range of fields such as robotics, augmented reality/virtual reality (AR/VR), and industrial applications. It establishes a robust foundation for AI systems to more accurately understand and interact with the physical world in real-time.

Technical / Clinical Details

Direct ToF LiDAR precisely measures distance by emitting light pulses and directly calculating the time it takes for the reflected light to return from an object. High-resolution capabilities enable the generation of 3D models of environments with millimeter-level accuracy, significantly improving object recognition and obstacle avoidance, especially in complex scenes. The simultaneous provision of multiple data streams means that richer information can be extracted from a single sensor. For example, infrared images enhance visibility in darkness or low-light conditions, while reflectivity information helps identify material properties of objects. Confidence data quantifies measurement uncertainty, allowing AI algorithms to make more robust decisions. When integrated into edge AI, this data is processed in real-time on the device, supporting instantaneous decision-making and action.

Background & Context

The evolution of AI is expanding its application scope from cyberspace to the physical world, making the ability of autonomous systems and smart devices to accurately perceive and act upon their surroundings indispensable. Traditional 2D cameras excel in color information but lack depth, while radar is strong in depth but low in resolution. LiDAR fills these gaps by providing high-precision 3D depth information, but higher resolution and multi-functionality are crucial for addressing more complex AI tasks. Solutions like Hesai's Kosmo Spatial Intelligence Platform are also noteworthy in elevating LiDAR's capabilities to spatial intelligence, with the entire industry focusing on building digital twins of the physical world and real-time interaction.

Strategic Significance & Outlook

The enhancement of spatial intelligence through high-resolution direct ToF LiDAR provides a foundation for robots to operate more safely and autonomously, and for AR/VR experiences to become more immersive and interactive. In industrial applications, it will revolutionize precise quality inspection, automated material handling, and worker safety monitoring. In the future, this technology is expected to be applied in a wide range of fields, including autonomous vehicles, smart homes, medical diagnostics, and security systems, accelerating the realization of 'Physical AI' where AI seamlessly merges with the physical world. This technological innovation will be an indispensable component in forming the foundation of next-generation digital infrastructure and driving societal automation and intelligence.

Source: <https://www.laserfocusworld.com/test-measurement/article/55391021/high-resolution-direct-time-of-flight-lidar-brings-spatial-intelligence-to-edge-ai>

Collected: July 24, 2026 | Automated Research System (Gemini API)