Photonics

Weekly Intelligence Report

2026-08-16 | 10 articles | 4 countries

troy-technical.jp

This Week's Keyword

CPO/NPO Supply Chain

AI demand strains optical interconnects

10	4	2029	$125M
articles	countries	year	contract
Total Articles Analyzed	Source Countries	CPO Mass Prod. Target	PsiQuantum DARPA Award

All 10 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	NPO Gains Momentum	Market Overview	●●●○○	●●●●○	●●●●○	●●●○○	●●●●○	Near-Packaged Optics (NPO) emerges as interim solution for AI data centers due to Co-Packaged Optics (CPO) mass production delays until 2029.
#02	NVIDIA/Broadcom CPO	Supply Chain	●●○○○	●●●●○	●●●●○	●●●○○	●●●●○	NVIDIA and Broadcom dominate 2026 CPO supply chain, with TSMC's COUPE capacity prioritized for AI accelerators, creating bottlenecks.
#03	Photonics Geopolitical	Geopolitics	●●○○○	●●●●○	●●●●○	●●○○○	●●●●○	Photonics becomes a geopolitical flashpoint as US considers curbs on Chinese hardware in AI data centers, impacting global supply chains.
#04	AI Shifts to Optical	Technology Trend	●●○○○	●●●●○	●●●●○	●●○○○	●●●●○	AI data centers accelerate the shift from copper to optical interconnects, facing Co-Packaged Optics (CPO) bottlenecks.
#05	Coherent AI Optics	Corporate Strategy	●●●○○	●●●●○	●●●●○	●●●●○	●●●●○	Coherent unveils an ambitious AI optical communications roadmap, targeting 3.2T transceivers and 6.4T CPO, building on 800G/1.6T products.
#06	Pasqal Quantum Chips	Research	●●●●○	●●○○○	●●●○○	●●●○○	●●●●○	Pasqal develops silicon nitride photonic chips for neutral atom quantum processors, aiming for 10,000 physical atoms and 100 logical qubits.
#07	SJTU Photonic-Elec	Research	●●●●○	●●○○○	●●●○○	●●●●○	●●●○○	Shanghai Jiao Tong University simplifies photonic-electronic integration with reconfigurable Ge-Si photodetectors using FOWLP.
#08	Lightmatter Supply	Industry Advocacy	●○○○○	●●●●○	●●●●○	●●○○○	●●●●○	Lightmatter releases a white paper advocating for an integrated supply chain for AI photonic interconnects to address fragmentation and cost.
#09	Hamamatsu CERN	Corporate PR	●○○○○	●●●●○	●○○○○	●●○○○	●●●○○	Hamamatsu Photonics showcases its advanced photodetectors and photomultiplier tubes supporting CERN's antimatter research.
#10	PsiQuantum DARPA	Corporate Strategy	●●●○○	●●○○○	●●●○○	●●●●○	●●●●○	PsiQuantum secures a $125M DARPA contract and integrates NVIDIA CUDA-Q for fault-tolerant quantum software development.

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

Three Questions That Demand Your Decision This Week

❶ Is your AI interconnect strategy resilient to CPO delays?

Co-Packaged Optics (CPO) mass production is delayed until 2029, pushing Near-Packaged Optics (NPO) as an interim. Are your AI data center roadmaps and procurement plans adapted to this shift, or are you exposed to significant bandwidth and power efficiency bottlenecks?

❷ How will photonics geopolitics impact your supply chain?

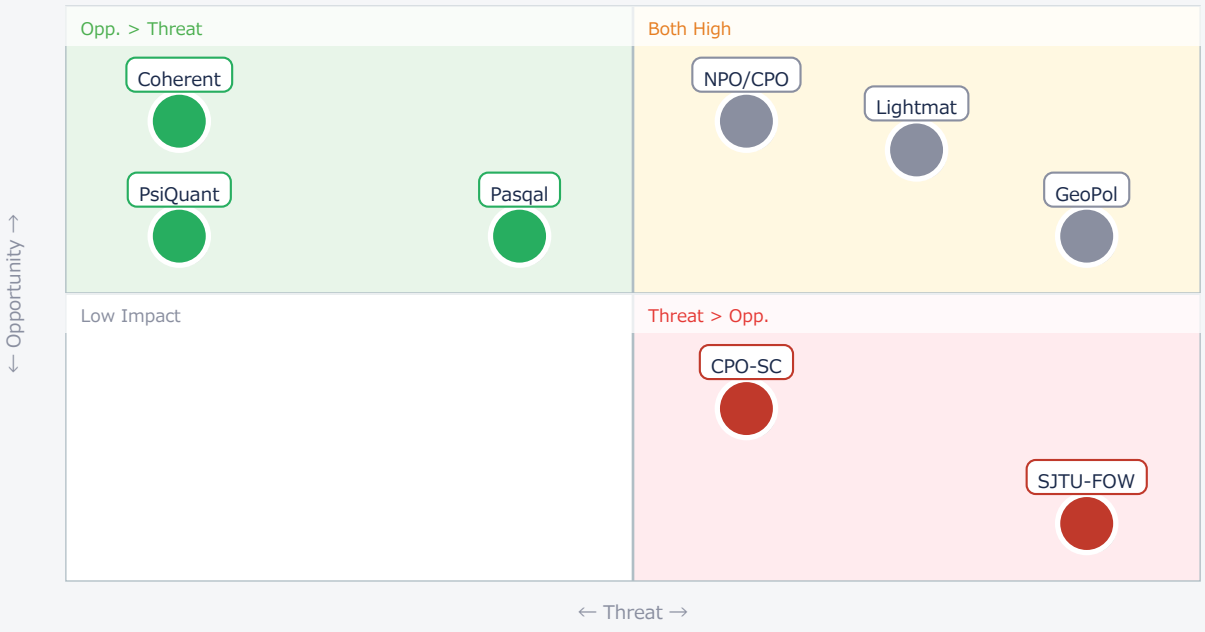
The US is considering curbs on Chinese photonics hardware for AI data centers, making optical interconnects a new strategic flashpoint. Have you assessed your exposure to potential trade restrictions and begun diversifying your optical component supply chain?

❸ Are you investing in next-gen quantum photonics?

Breakthroughs like Pasqal's silicon nitride photonic chips for quantum processors and PsiQuantum's DARPA contract signal rapid progress. Is your R&D; tracking these advancements, and do you have a strategy to leverage or counter quantum computing's long-term disruptive potential?

Opportunities vs. Threats for US/European Companies

Opportunity vs. Threat Matrix for US/European Companies



Item	Quadrant	↑ Opportunity	↓ Threat
Coherent	Opp.	New product lines	—
Pasqal	Opp.	Quantum tech lead	—
PsiQuant	Opp.	US quantum boost	—
NPO/CPO	Critical	NPO market share	CPO delays
GeoPol	Critical	Domestic photonics	Trade restrictions
Lightmat	Critical	Supply collab	Frag. supply chain
CPO-SC	Threat	—	Supply bottleneck

● SJTU-FOW	Threat	—	China tech lead

Deep Dive ① — NPO Emerges as CPO Faces Delays

#01 | 2026/08/13 | Tom's Hardware / XenoSpectrum | Tech Novelty●●●○○ Proximity●●●●● Market Impact●●●●○ Data Reliability●●●○○ US/EU Relevance●●●●●

Near-Packaged Optics (NPO) is gaining traction as an interim solution for AI data center optical interconnects, as Co-Packaged Optics (CPO) mass production is now projected to delay until 2029. The Open CPX MSA aims to standardize socketed optical engine interfaces for both NPO and CPO.

Major players like Broadcom are releasing 3.2T VCSEL-based NPO products, and NVIDIA's Quantum-X Photonics InfiniBand switch also exhibits NPO characteristics. This shift offers a flexible, immediate pathway to address AI infrastructure demand, mitigating CPO's current reliability and supply chain complexities.

▶ Strategic Analyst's Perspective

Strategic Analyst's Perspective: The 2029 CPO mass production delay is realistic given the integration and reliability challenges. NPO offers a pragmatic bridge, but its long-term viability depends on CPO's eventual maturity. Technical barriers for CPO include thermal management, laser integration, and known-good-die issues. [Opportunity] for US/EU materials & component suppliers to capitalize on NPO demand, and for OEMs to deploy NPO solutions sooner. [Threat] for companies over-reliant on CPO timelines or those without a robust NPO strategy. Next actions: [Procurement] immediately assess NPO product availability and supplier roadmaps. [R&D;] evaluate NPO integration challenges and opportunities for existing platforms. [Strategy] re-evaluate CPO adoption timelines and risks by Q4 2026.

Deep Dive ② — Photonics: The New Geopolitical Battleground

#03 | 2026/08/12 | Tom's Hardware | Tech Novelty●●○○○ Proximity●●●●○ Market Impact●●●●● Data Reliability●●○○○ US/EU Relevance●●●●●

Optical interconnects and silicon photonics, critical for AI, are emerging as a geopolitical flashpoint. The US is reportedly considering measures to prevent Chinese hardware dominance in future AI data center optical layers, signaling a new strategic frontier beyond semiconductor chips.

This development highlights photonics' escalating geopolitical importance, with potential for significant disruption to global supply chains and technological collaboration. US concerns include national security risks and supply chain vulnerabilities, prompting strategies to reduce dependence on China.

▶ Strategic Analyst's Perspective

Strategic Analyst's Perspective: The geopolitical tension around photonics is highly realistic and a natural progression from semiconductor controls. The technical barrier is less about the technology itself and more about establishing secure, diversified supply chains and domestic manufacturing capabilities. [Opportunity] for US/EU materials & component suppliers and OEMs to secure government contracts and expand domestic production. [Threat] for US/EU companies with significant reliance on Chinese photonics components or manufacturing, facing potential export controls or market access restrictions. Next actions: [Strategy] conduct a comprehensive photonics supply chain risk assessment by end of Q3 2026. [Procurement] identify alternative non-Chinese suppliers for critical optical components. [Executive] engage with government agencies to understand potential policy shifts and advocate for industry interests immediately.

Deep Dive ③ — Pasqal's Photonic Chips for Quantum Computing

#06 | 2026/08/13 | Quantum Computing Report | Tech Novelty●●●●● Proximity●●○○○ Market Impact●●●○○ Data Reliability●●●○○ US/EU Relevance●●●●●

Pasqal has unveiled an innovative silicon nitride photonic chip for neutral atom quantum processors, significantly reducing hardware footprint by replacing traditional bulk optics. This enables scalable manufacturing and supports Pasqal's goal of 10,000 physical atoms and 100 logical qubits.

This breakthrough is a crucial step towards commercializing quantum computers, enhancing the feasibility of complex quantum applications. On-chip integration offers superior stability and reliability, leveraging standard semiconductor processes for mass production.

▶ Strategic Analyst's Perspective

Strategic Analyst's Perspective: Pasqal's development is a significant technical leap, making neutral atom quantum computing more viable. The target of 10,000 physical atoms and 100 logical qubits is ambitious but realistic for the 3-5 year timeframe. Technical barriers include maintaining coherence at scale, precise atom manipulation, and error correction implementation. [Opportunity] for US/EU materials & component suppliers in silicon nitride photonics and for technology licensors in quantum control systems. [Threat] for companies not actively investing in quantum computing R&D;, as this technology could disrupt various industries long-term. Next actions: [R&D;] establish a dedicated quantum photonics research initiative by Q4 2026. [Strategy] evaluate potential quantum computing applications for your industry and competitive landscape over the next 12 months. [Business Dev] explore partnerships with quantum hardware developers like Pasqal.

Other Notable Articles

NVIDIA and Broadcom Dominate 2026 CPO Supply Chain (SupplyICs)
Tech Novelty●●○○○ Proximity●●●●● Market Impact●●●●●

CPO supply is highly concentrated, creating significant procurement hurdles for non-dominant players. Diversification is critical.

Coherent Unveils AI Optics Roadmap: Targeting 3.2T Transceivers and 6.4T CPO (Dr. Robert Castellano's Semiconductor Deep Dive Newsletter)
Tech Novelty●●●○○ Proximity●●●●○ Market Impact●●●●○

Coherent's roadmap highlights the rapid evolution of optical interconnects, driven by AI, with increasing speeds and integration.

Shanghai Jiao Tong University Simplifies Photonic-Electronic Integration with Reconfigurable Germanium-Silicon Photodetectors Using FOWLP (Technology News | Advanced Photonics Nexus (SPIE))
Tech Novelty●●●●○ Proximity●●○○○ Market Impact●●●○○

FOWLP for photonic-electronic integration from China could significantly reduce parasitic losses and enable high-density interconnects.

PsiQuantum Secures $125M DARPA Contract, Integrates NVIDIA CUDA-Q for Fault-Tolerant Quantum Software (PsiQuantum News)
Tech Novelty●●●○○ Proximity●●○○○ Market Impact●●●○○

Significant US government investment and software integration accelerate the path to fault-tolerant quantum computing.

Recommended Actions This Week

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

Immediate (this week)

- [Procurement] Initiate an urgent review of current and planned optical interconnect component suppliers, focusing on CPO/NPO readiness and geopolitical risk exposure.
- [Strategy] Convene a cross-functional task force to assess the implications of potential US restrictions on Chinese photonics hardware for AI data centers.
- [R&D;] Begin evaluating Near-Packaged Optics (NPO) solutions as a viable interim for AI data center interconnects, given CPO delays.

Short-term (1 month)

- [Business Dev] Engage with the Open CPX MSA and other standardization bodies to influence and adapt to emerging NPO/CPO interoperability standards.
- [Procurement] Identify and qualify alternative, geographically diversified suppliers for critical optical components to mitigate supply chain concentration risks.
- [R&D;] Conduct a deep dive into advanced packaging techniques like FOWLP for photonic-electronic integration, assessing competitive advancements from Asia.

Medium-long term (quarter+)

- [Strategy] Develop a long-term investment roadmap for domestic or allied-country photonics R&D; and manufacturing capabilities to reduce geopolitical dependencies.
- [R&D;] Establish or expand internal quantum photonics research programs, focusing on scalable architectures and fault-tolerant computing, leveraging US/EU initiatives.
- [Executive] Formulate a comprehensive quantum computing strategy, including potential applications, competitive threats, and partnership opportunities, by mid-2027.

Photonics — Selected Articles

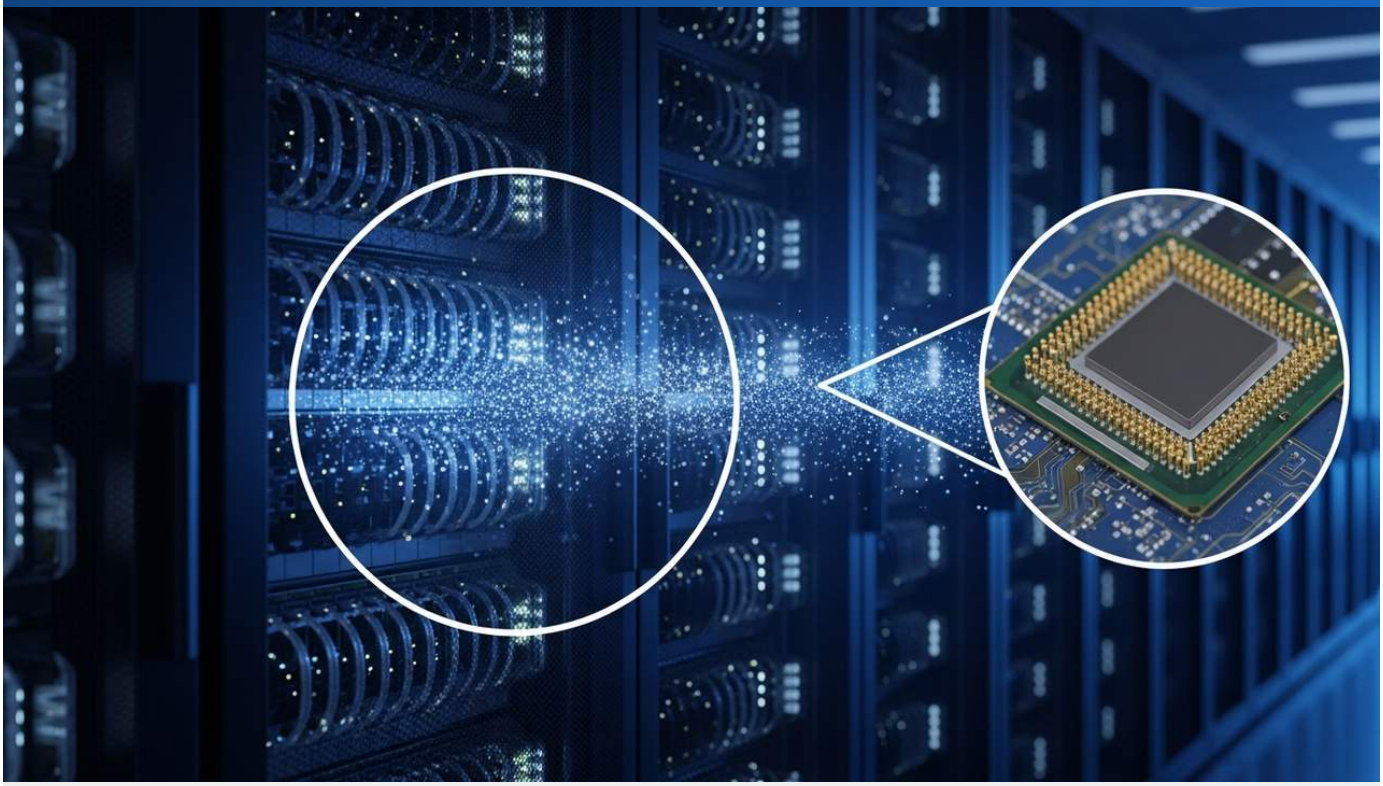
Date: 2026-08-16

Articles: 10

Table of Contents

#01 Near-Packaged Optics Gains Momentum as Co-Packaged Optics Faces 2029 Mass Production Delays; Open CPX MSA Advances Interoperability

Published August 13, 2026 Tom's Hardware / XenoSpectrum USA



OVERVIEW

Near-Packaged Optics (NPO) is rapidly emerging as an interim solution for AI data center optical interconnects, as Co-Packaged Optics (CPO) mass production is now projected to delay until 2029. The Open CPX MSA, established at OFC 2026, aims to standardize socketed optical engine interfaces covering both NPO and CPO. Major players like Broadcom are releasing 3.2T VCSEL-based NPO products, while NVIDIA's Quantum-X Photonics InfiniBand switch also exhibits NPO characteristics, bridging the gap until CPO's widespread adoption. This shift offers a more flexible and immediate pathway to address AI infrastructure's demand for higher bandwidth and lower power consumption, mitigating CPO's current reliability and supply chain complexities.

IN DEPTH

Key Findings

As Co-Packaged Optics (CPO) faces delays in reaching full mass production until 2029, Near-Packaged Optics (NPO) is gaining significant traction as an interim solution for next-generation optical interconnects in AI data centers. This strategic shift is underscored by the establishment of the "Open CPX MSA" at OFC 2026, an initiative to standardize socketed optical engine interfaces compatible with both NPO and CPO architectures, fostering greater industry alignment and interoperability.

Technical / Clinical Details

- **The Rise of NPO**: CPO, which aims to integrate optical transceivers directly onto processor packages, promises superior performance and power efficiency. However, it currently grapples with significant challenges related to technological maturity, reliability in high-volume manufacturing, cost, and supply chain complexity. NPO, in contrast, positions the optical engine "near" the chip within the package but often utilizes detachable external laser modules. This design provides a pragmatic approach, mitigating CPO's inherent risks by offering greater flexibility in deployment and simpler supply chain management.
- **Industry Leaders' Approaches**:
    - **Broadcom**: At OFC 2026, Broadcom unveiled a 3.2T VCSEL-based NPO product, signaling a clear commitment to NPO solutions. Concurrently, the company continues to advance CPO, with its 51.2T Bailly CPO switch already in mass production and the 102.4T Tomahawk 6 Davisson having shipped since October 2025, demonstrating parallel progress in both integration strategies.
    - **NVIDIA**: The Quantum-X Photonics InfiniBand switch, despite being labeled CPO by NVIDIA, incorporates silicon photonics engines with detachable external laser modules—a design characteristic closer to NPO. This approach highlights a practical, deployable solution that addresses immediate needs without fully committing to the most extreme CPO integration.
    - **Meta**: The social media giant presented crucial findings on CPO reliability, emphasizing the long-term operational challenges and demanding requirements for CPO deployment within hyperscale data centers.

- **Standardization Efforts**: The formation of the Open CPX MSA is a critical step towards establishing common standards for NPO and CPO interfaces. This initiative seeks to ensure interoperability across various vendors and accelerate the broader adoption of these advanced optical interconnect technologies by providing a clear, standardized framework.

Background & Context

The explosive growth of AI/ML workloads has drastically increased data transfer volumes within data centers. Traditional electrical interconnects are rapidly approaching their limits in terms of power consumption, latency, and reach. The transition to optical interconnects is therefore imperative. While CPO represents the ultimate vision for this transition, its inherent complexity necessitates a gradual adoption curve. NPO serves as a vital bridge technology, addressing the immediate market demand for enhanced optical connectivity while allowing the industry to mature CPO manufacturing and reliability processes.

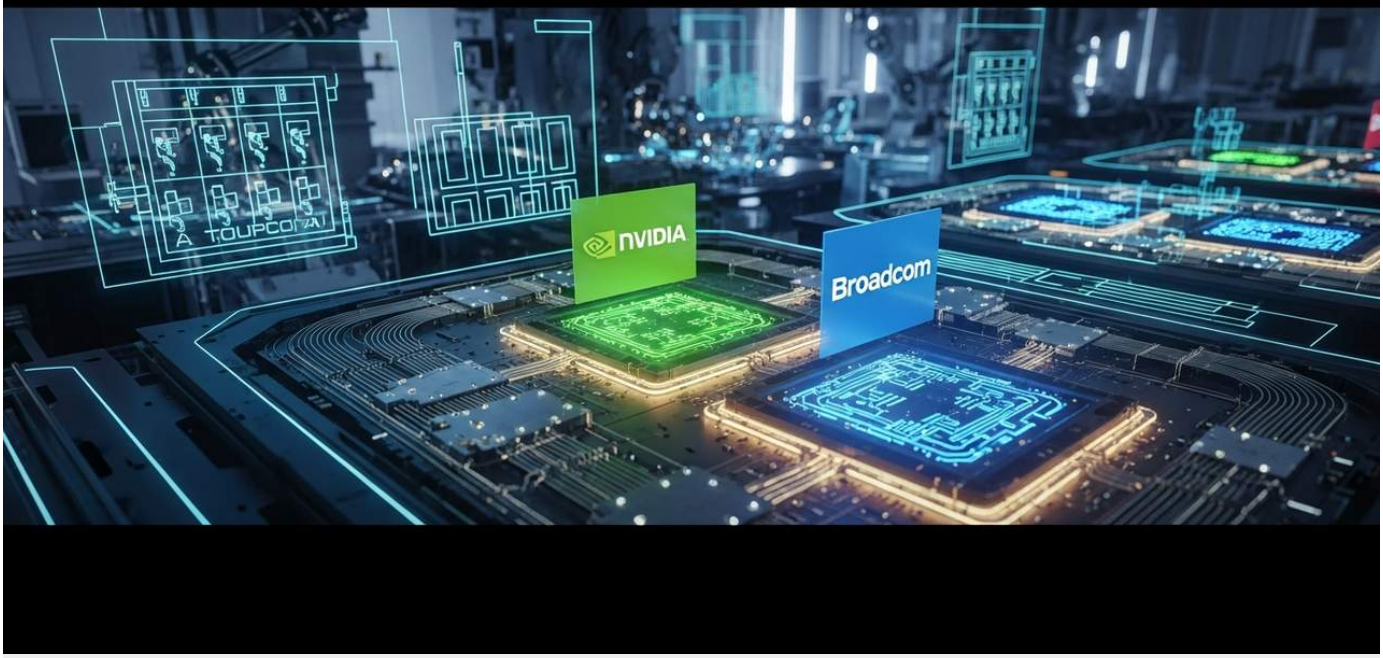
Strategic Significance & Outlook

The ascendancy of NPO acts as a crucial enabler for AI data center evolution, providing a viable path forward until the technical hurdles of CPO are fully resolved. Through standardization efforts like the Open CPX MSA, the industry aims to establish seamless migration pathways between NPO and CPO, ultimately moving towards more tightly integrated CPO solutions. NPO deployments will also contribute invaluable experience and help optimize the supply chain, paving the way for CPO's anticipated mass production ramp-up from 2029 onwards. This measured, two-pronged approach ensures continuous innovation and scalability for AI infrastructure.

Source: https://www.tomshardware.com/tech-industry/near-packaged-optics-gains-ground-aso-the-industry-hedges-against-co-packaged-optics-growing-pains

#02 NVIDIA and Broadcom Dominate 2026 CPO Supply Chain; TSMC's COUPE Capacity Prioritized for AI Accelerators

Published August 07, 2026 SupplyICs USA



OVERVIEW

The 2026 Co-Packaged Optics (CPO) supply chain is facing severe challenges, characterized by a concentrated production landscape where NVIDIA and Broadcom largely control key platforms. A critical bottleneck stems from TSMC's advanced COUPE (Chip-on-Wafer-on-Substrate with Underfill and Epoxy) packaging capacity being primarily reserved for high-demand AI accelerators, leaving limited availability for independent optical engine markets. While NVIDIA's Spectrum-X Photonics is set for a Q4 2026 launch with 10,000-15,000 units expected this year, Broadcom's Bailly CPO switch is already in mass production, demonstrating early market leadership. This dynamic highlights how intense AI infrastructure demand is strategically influencing and constraining the CPO supply landscape.

IN DEPTH

Key Findings

The Co-Packaged Optics (CPO) supply chain in 2026 is grappling with significant challenges and a highly concentrated market structure, largely dominated by NVIDIA and Broadcom. A primary constraint is the allocation of Taiwan Semiconductor Manufacturing Company's (TSMC) advanced COUPE (Chip-on-Wafer-on-Substrate with Underfill and Epoxy) production capacity. This critical packaging technology is predominantly reserved for high-priority AI accelerators, creating a near-absence of an open market for standalone optical engines and thus limiting broader CPO adoption.

Technical / Clinical Details

- **Supply Concentration**: The CPO supply chain is currently heavily driven by NVIDIA and Broadcom, two industry titans. These companies are integrating CPO technology into their own AI accelerator and network switch products, managing their supply chains with a vertically integrated approach. This strategy, while securing their own production, creates significant procurement hurdles for other enterprises aspiring to implement CPO technology.
- **TSMC's Pivotal Role and Limitations**: Advanced packaging solutions like TSMC's COUPE are indispensable for achieving the performance and integration levels required by CPO products. However, the scarcity and high cost of this cutting-edge capacity lead to its prioritization for high-revenue products such as GPUs and AI accelerators. This allocation strategy exacerbates the bottleneck in optical engine production, contributing to an overall CPO supply shortage—a direct consequence of the insatiable demand fueled by the AI boom across the semiconductor ecosystem.

- **Key Product Deployments**:
  - **NVIDIA**: The company's Spectrum-X Photonics platform is slated for launch in the latter half of 2026, with an anticipated shipment of 10,000 to 15,000 units within the year. This aggressive rollout signifies NVIDIA's recognition of optical interconnects as a cornerstone for future AI infrastructure.
  - **Broadcom**: Broadcom's Bailly CPO switch has already reached mass production, positioning the company as a leader in the early commercialization of CPO technology. Furthermore, their 102.4T Tomahawk 6 Davisson began shipping in October 2025, underscoring the accelerating deployment of CPO in high-performance networking markets.

Background & Context

As AI models grow exponentially in size and complexity, the demand for higher data transmission speeds and bandwidth within data centers has reached unprecedented levels. Traditional electrical interconnects are encountering fundamental limits in terms of power consumption and performance, making the transition to optical interconnects, particularly CPO, inevitable. CPO significantly reduces electrical trace lengths by placing optical engines proximate to the switch or processor silicon dies, minimizing signal loss and achieving substantial improvements in power efficiency and bandwidth. Nevertheless, the supply chain for this transformative technology is still in its nascent stages, marked by intricate manufacturing processes and a restricted pool of suppliers.

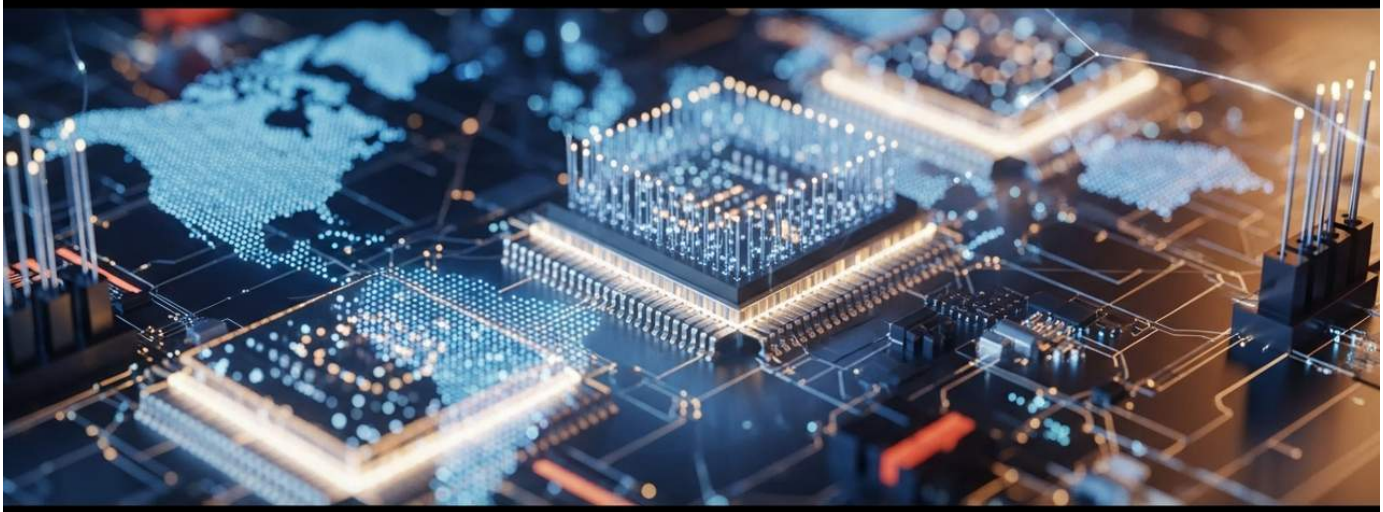
Strategic Significance & Outlook

The current state of the CPO supply chain poses a potential bottleneck to the rapid advancement of AI infrastructure. The market dominance of NVIDIA and Broadcom, coupled with TSMC's production capacity constraints, presents considerable barriers for new entrants and the widespread adoption of CPO technology. In the coming years, it is anticipated that more foundries will develop advanced packaging capabilities, and the number of optical engine suppliers will increase, leading to a more diversified and distributed CPO supply chain. This evolution is crucial for CPO technology to permeate a broader range of AI data centers and High-Performance Computing (HPC) applications, thereby serving as a foundational pillar for dramatically enhancing information processing capabilities in the age of AI.

Source: https://supplyics.com/insights/supply-chain/co-packaged-optics-cpo-supply-chain-2026/

#04 Photonics Becomes Geopolitical Flashpoint: US-China Summit May Address Optical Interconnects as US Considers Curbs on Chinese Hardware in AI Data Centers

Published August 12, 2026 Tom's Hardware USA



OVERVIEW

Optical interconnects and silicon photonics, critical next-generation technologies for AI, are emerging as potential key topics for a looming US-China summit. The United States is reportedly considering measures, potentially disruptive in the short term, to prevent future AI data center optical layers from being dominated by Chinese hardware. This signals a new strategic frontier in the technology competition beyond semiconductor chips, highlighting photonics' escalating geopolitical importance and its potential to significantly impact global supply chains and technological collaboration.

IN DEPTH

Key Findings

As optical interconnects and silicon photonics rapidly emerge as pivotal next-generation technologies underpinning AI infrastructure, these strategic domains are increasingly likely to become a central topic at a prospective summit between the United States and China. Reports indicate that the U.S. is considering aggressive measures, potentially causing short-term market disruptions, to safeguard against a future where the optical communication layer of data centers is controlled by Chinese hardware. This development signifies a strategic shift, with the technology rivalry, previously centered on semiconductor manufacturing, now extending fiercely into the photonics sector.

Technical / Clinical Details

- **Strategic Importance of Optical Interconnects**: The exponential demand for AI, High-Performance Computing (HPC), and cloud computing has made data transfer speeds and efficiency within data centers paramount. Traditional electrical signaling faces inherent limitations in bandwidth, power consumption, and signal attenuation. Consequently, the adoption of optical interconnects, particularly silicon photonics technology, is becoming essential. Silicon photonics integrates optical circuits onto silicon substrates, enabling compact, high-bandwidth, low-power, and cost-effective optical communication solutions.
- **U.S. Concerns**: The U.S. government is increasingly wary of China's expanding influence in optical communication technologies, a critical component of AI infrastructure. Concerns include potential national security risks and supply chain vulnerabilities should Chinese entities establish dominance in optical interconnect components and systems. In response, the U.S. is exploring strategies to reduce technological dependence on China, including strengthening domestic technology bases and forging deeper alliances with partner nations.
- **Potential Measures**: While the report does not specify exact measures, historical precedents in the semiconductor sector suggest potential actions such as enhanced export controls, blacklisting of specific companies, and restrictions on technology transfer. Such measures could lead to immediate disruptions in global supply chains and impact the business strategies of involved companies.

Background & Context

Following semiconductor chips, optical technology is recognized as the next strategic frontier in the AI era. A significant portion of data center power consumption is attributed to data movement, and optical interconnects are key to dramatically reducing this consumption while improving overall system performance. China's "Made in China 2025" initiative explicitly targets self-sufficiency and global leadership in critical technology sectors, including photonics, intensifying the technological competition with the U.S. This rivalry is framed as a fundamental issue affecting national economies and security.

Strategic Significance & Outlook

The escalating tension between the U.S. and China over photonics technology is expected to have long-term implications for R&D, manufacturing, and international collaboration in this field. Companies will be compelled to re-evaluate their supply chains and investment strategies, accounting for increased geopolitical risks. This move is part of a broader U.S. strategy to maintain its technological advantage and potentially limit China's AI infrastructure development. Consequently, the optical communication and photonics industry is anticipated to remain highly susceptible to international political dynamics, potentially accelerating innovation while simultaneously risking market fragmentation.

Source: https://www.tomshardware.com/tech-industry/photonics/how-optical-interconnects-and-silicon-photonics-emerged-as-ais-next-hot-commodity-looming-us-china-summit-puts-photonics-into-the-crosshairs

Collected: August 14, 2026 | Automated Research System (Gemini API)

#05 AI Data Centers Accelerate Shift from Copper to Optical Interconnects, Facing Co-Packaged Optics Bottlenecks

Published August 11, 2026 YouTube (Denver Stock Lab) USA

OVERVIEW

AI data centers are rapidly transitioning from traditional copper cabling to optical interconnects due to critical bandwidth and power efficiency limitations, with a detailed explanation of the shift and current bottlenecks in Co-Packaged Optics (CPO) technology. The video highlights the CPO concept, specific announcements from NVIDIA regarding CPO integration, and the crucial roles of optical pathway companies like Lumentum. This inevitable evolution addresses the exponential growth of AI workloads, though overcoming existing physical constraints remains a key challenge for widespread adoption.

IN DEPTH

Key Findings

Driven by the explosive growth of AI, data centers are accelerating a massive transition from conventional copper cabling to optical interconnects as copper reaches its performance and power efficiency limits. A comprehensive overview outlined the primary drivers behind this shift and the current bottlenecks inherent in Co-Packaged Optics (CPO) technology. CPO is positioned as a pivotal technology, crucial for determining the future scalability and sustainability of data centers.

Technical / Clinical Details

- **The Transition from Copper to Light**: AI workloads demand immense bandwidth and ultra-low latency for data transfer between GPUs and Application-Specific Integrated Circuits (ASICs). Copper cables face severe limitations; as speeds increase, power consumption escalates dramatically, and signal loss becomes prohibitive for distances beyond a few meters. In contrast, optical fibers enable low-power, long-distance, and high-speed data transmission, providing a critical solution to alleviate performance bottlenecks in AI data centers.
- **Concept of Co-Packaged Optics (CPO)**: CPO involves integrating optical transceivers either very close to or directly within the same package as the network switch or AI accelerator silicon chip. This minimizes the electrical trace distance before signals are converted to light, drastically reducing signal loss and power consumption. Compared to traditional pluggable optical modules, CPO is deemed essential for achieving next-generation data rates of 800G, 1.6T, and beyond.
- **NVIDIA's CPO Initiatives**: NVIDIA is aggressively pursuing the adoption of CPO technology within its powerful AI computing platforms. By integrating CPO into its GPUs and InfiniBand switches, NVIDIA aims to maximize the overall performance and efficiency of its AI clusters, a strategic investment crucial for maintaining its leadership in AI development.
- **Key Players in the Optical Ecosystem**: Companies like Lumentum play a vital role in the optical interconnect ecosystem by supplying essential optical components for CPO, including VCSELs (Vertical-Cavity Surface-Emitting Lasers), silicon photonics, and photodiodes. These firms contribute significantly to the technological innovation and mass production capabilities required for CPO's practical implementation.

- **Current Bottlenecks**: Major hurdles in CPO deployment include the complexity of advanced packaging technologies, the nascent stage of the supply chain, and challenges related to the reliability and cost of optical engines. Specifically, securing external laser sources, managing thermal dissipation, and ensuring compatibility with existing infrastructure remain significant obstacles.

Background & Context

The explosive growth of generative AI is fundamentally reshaping data center design philosophies. While traditional data centers were optimized for general-purpose computing and storage, AI workloads demand vast bandwidth and low-latency interconnections between GPUs. This has led to a growing proportion of data center power consumption being attributed to interconnects, making the shift to optical technology an urgent necessity for both energy efficiency and performance.

Strategic Significance & Outlook

The adoption of optical interconnects in AI data centers is expected to accelerate further in the coming years. As CPO technology matures and supply chain challenges are resolved, data center architectures will evolve toward more integrated and power-efficient designs. The synergy between technological innovations from optical component suppliers like Lumentum and the strategic adoption by major tech firms like NVIDIA will make CPO an indispensable component supporting the foundational infrastructure of the AI era. Ultimately, CPO solutions capable of overcoming current physical constraints and delivering terabit-scale data transfer are anticipated to become mainstream.

Source: https://m.youtube.com/watch?v=hgxDGpD1PuE

#06 Coherent Unveils AI Optics Roadmap: Targeting 3.2T Transceivers and 6.4T CPO, Building on 800G/1.6T Core

Published August 13, 2026 Dr. Robert Castellano's Semiconductor Deep Dive Newsletter USA

OVERVIEW

Coherent has detailed an ambitious AI optical communications roadmap, positioning 800G and 1.6T products as its current growth platforms. The company plans to evolve towards 3.2T transceivers, optical circuit switches, 6.4T data center interconnect products, and Co-Packaged Optics (CPO) to meet the high-bandwidth, low-latency demands of AI clusters. Coherent leverages competitive advantages across multiple layers of the optical value chain, including InP lasers, VCSELs, silicon photonics, and external laser sources, underscoring AI's transformative influence on optical communication architectures.

IN DEPTH

Key Findings

Coherent has unveiled a comprehensive and ambitious roadmap for AI optical communications, specifically designed to address the escalating demand for high-bandwidth and low-latency interconnects driven by the exponential growth of AI workloads. The company currently anchors its strategy on 800G and 1.6T products, with a clear trajectory to advance towards 3.2T transceivers, optical circuit switching, 6.4T data center interconnect solutions, and ultimately, highly integrated Co-Packaged Optics (CPO). This strategic direction firmly establishes AI as a primary catalyst for innovation and evolution in optical communication architectures.

Technical / Clinical Details

- **Roadmap Phases**:
  - **Current Platform**: Coherent is actively delivering 800G and 1.6T optical transceiver products, which serve as the primary solutions addressing the immediate high-speed demands of AI clusters and data center interconnects. These offerings are crucial for enhancing the performance of AI infrastructure by providing high data rates and superior power efficiency.
  - **Next-Generation Products**: Planned future products include the development of ultra-high-speed 3.2T transceivers, enabling even denser data transmission capabilities. The roadmap also incorporates the introduction of Optical Circuit Switches (OCS), which are expected to dramatically improve data center flexibility and efficiency by allowing dynamic routing and bandwidth allocation.
  - **Long-Term Vision**: The ultimate goals encompass the realization of 6.4T data center interconnect products and Co-Packaged Optics (CPO) solutions, where optical engines are directly integrated with processors. CPO is considered the ultimate solution for breaking electrical interconnect bottlenecks, drastically reducing both power consumption and latency.

- **Coherent's Competitive Edge**: Coherent possesses a vertically integrated strength across the optical value chain. The company not only provides complete optical transceiver products but also demonstrates robust capabilities in developing and manufacturing critical underlying components, including Indium Phosphide (InP) lasers, Vertical-Cavity Surface-Emitting Lasers (VCSELs), photodetectors, silicon photonics components, optical switches, and external laser sources. This broad portfolio and technical prowess serve as a significant differentiator against competitors and contribute to securing supply chain stability.

Background & Context

Training and inference of AI models necessitate massive computing clusters where thousands to tens of thousands of GPUs operate in concert. Within such clusters, data transfer volumes between GPUs and across server racks have exploded, pushing traditional electrical interconnects to their limits in terms of bandwidth, power efficiency, and latency. Optical communication technology offers the only viable pathway to overcome these challenges, fundamentally transforming data center architectures. Companies like Coherent are at the forefront of this technological revolution.

Strategic Significance & Outlook

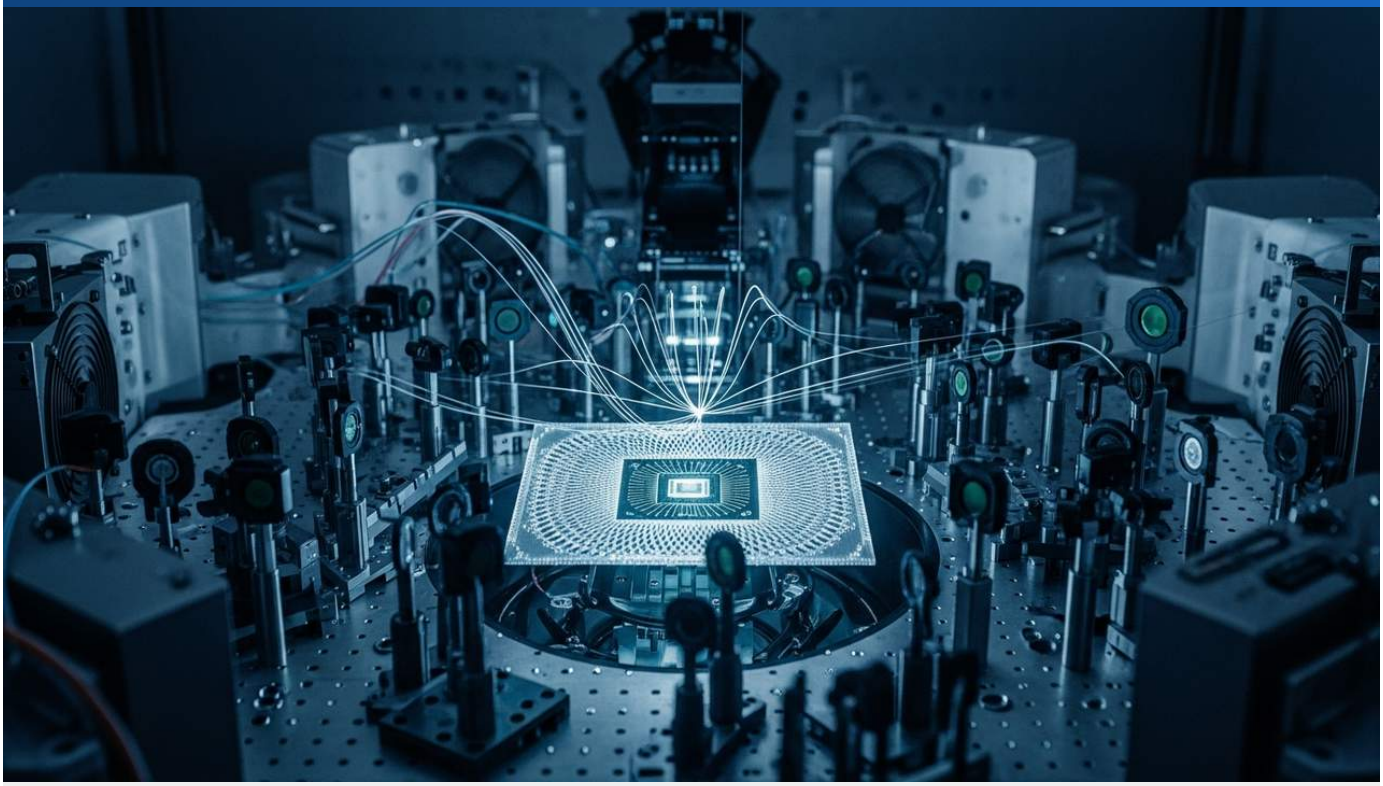
Coherent's roadmap exemplifies how AI demand is driving innovation across the entire optical communications industry. The company's comprehensive technological portfolio and vertical integration strategy will play a critical role in supplying the high-performance, power-efficient optical interconnect solutions required for future AI data centers. The transition to 3.2T and 6.4T CPO solutions will propel AI computing performance to the next level, laying the foundation for more complex and larger-scale AI applications. This strategy positions Coherent as a key leader in the AI-driven optical communications market.

Source: https://drrobertcastellano.substack.com/p/an-autopsy-on-coherent-jim-anderson

Collected: August 14, 2026 | Automated Research System (Gemini API)

#07 Pasqal Develops Silicon Nitride Photonic Chips for Neutral Atom Quantum Processors, Targeting 10,000 Physical Atoms and 100 Logical Qubits

Published August 13, 2026 Quantum Computing Report USA



OVERVIEW

Pasqal has unveiled an innovative silicon nitride photonic chip designed for neutral atom quantum processors, significantly reducing hardware footprint by replacing traditional bulk optics. This technological advancement enables scalable manufacturing and strongly supports Pasqal's ambitious goal to scale Quantum Processing Units (QPUs) to over 10,000 physical atoms and 100 logical qubits. This represents a crucial step towards the commercialization and practical application of quantum computers, enhancing the feasibility of complex quantum applications.

IN DEPTH

Key Findings

Pasqal has announced a groundbreaking development: an innovative silicon nitride photonic chip specifically designed for neutral atom quantum processors. This innovation significantly reduces the hardware footprint of quantum computers by replacing cumbersome traditional bulk optics with compact, on-chip solutions. The technology facilitates scalable manufacturing processes, providing a robust pathway for Pasqal to achieve its ambitious goal of scaling its Quantum Processing Units (QPUs) to over 10,000 physical atoms and ultimately 100 logical qubits.

Technical / Clinical Details

- **Advantages of Silicon Nitride Photonic Chips**:
  - **Miniaturization**: Traditional neutral atom quantum computers require complex bulk optical systems, comprising numerous lasers and optical components, to trap and manipulate individual atoms. The silicon nitride photonic chip integrates these optical functions directly onto the chip, dramatically reducing system size, weight, and power consumption.
  - **Scalability**: By leveraging standard semiconductor manufacturing processes like photolithography, photonic chips can be mass-produced, enhancing the scalability of quantum computers. This approach promises to lower the manufacturing cost of QPUs with tens of thousands of physical atoms in the future.
  - **Stability and Reliability**: On-chip integration offers superior stability against external vibrations and temperature fluctuations compared to bulk optical systems, leading to improved long-term reliability for quantum operations.
- **Pasqal's Ambitious Goals**: Pasqal is a leading developer of neutral atom-based quantum computers, and this photonic chip is set to significantly boost the performance of their systems. Scaling to over 10,000 physical atoms is a critical milestone, approaching the number of physical qubits required for fault-tolerant quantum computing. Achieving 100 logical qubits marks a substantial step toward practical quantum computers capable of executing complex quantum algorithms.

Background & Context

Quantum computing is expected to deliver novel solutions for problems currently intractable for classical computers, spanning fields such as drug discovery, materials science, and financial modeling. Neutral atom quantum computers operate by trapping individual neutral atoms with optical tweezers and manipulating them with lasers to act as qubits. This approach is promising for building large-scale quantum systems due to its long coherence times and high connectivity, but has previously faced challenges in physical footprint and scalability. Pasqal's innovation provides a key solution to these challenges.

Strategic Significance & Outlook

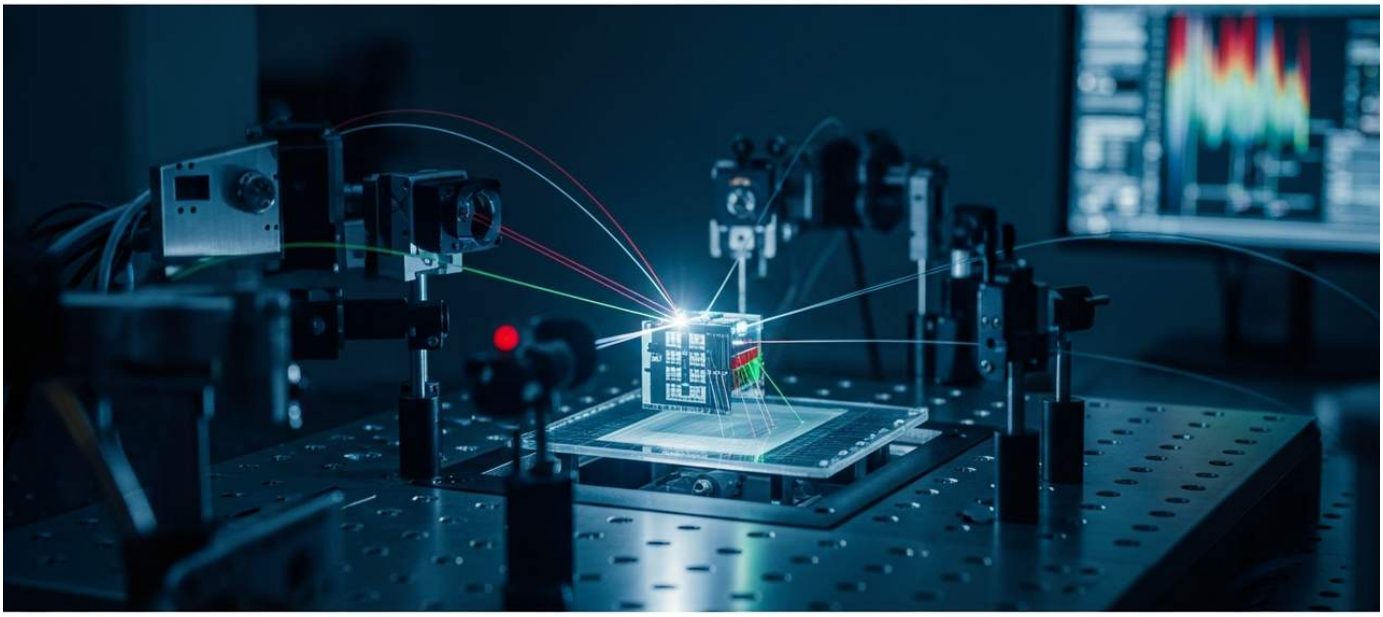
Pasqal's development of silicon nitride photonic chips represents a breakthrough in scaling and commercializing neutral atom quantum computing. This technology will accelerate the realization of smaller, more robust quantum processors, thereby lowering the barriers to quantum hardware adoption. In the long term, this integrated photonic technology is anticipated to drive the proliferation of more powerful and practical quantum computers, fostering the development of quantum applications across diverse industries including finance, chemistry, and logistics. The achievement of 10,000 physical atoms and 100 logical qubits opens the door to an era where quantum computers possess the capability to solve real-world problems.

Source: https://quantumcomputingreport.com/news/

Collected: August 14, 2026 | Automated Research System (Gemini API)

#08 Shanghai Jiao Tong University Simplifies Photonic-Electronic Integration with Reconfigurable Germanium-Silicon Photodetectors Using FOWLP

Published August 06, 2026 Technology News | Advanced Photonics Nexus (SPIE) China



OVERVIEW

Researchers at Shanghai Jiao Tong University have developed reconfigurable germanium-silicon photodetectors utilizing a low-loss integration strategy based on Fan-Out Wafer Level Packaging (FOWLP). This innovation enables seamless integration of electronic and photonic ICs without traditional wire bonding, significantly reducing parasitic losses and improving signal integrity. By achieving high-density interconnects and low insertion loss, this technology directly addresses the urgent demand for faster and more efficient data centers.

IN DEPTH

Key Findings

Researchers at Shanghai Jiao Tong University have developed an innovative reconfigurable germanium-silicon photodetector utilizing a low-loss integration strategy based on Fan-Out Wafer Level Packaging (FOWLP). This groundbreaking technology facilitates the seamless integration of electronic integrated circuits (ICs) and photonic ICs without the need for conventional wire bonding. This approach dramatically reduces parasitic losses and enhances signal integrity, marking a significant breakthrough in addressing the challenges of high-density interconnects and low insertion loss in optical communication systems, ultimately meeting the escalating demands of data centers.

Technical / Clinical Details

- **Reconfigurable Photodetector**: The developed germanium-silicon photodetector features "reconfigurability," meaning its characteristics can be dynamically adjusted to meet diverse optical signal processing requirements. This enhances system design flexibility and efficiency. Germanium offers superior absorption efficiency over a broader wavelength range than silicon, particularly in the near-infrared spectrum, making it highly effective for the primary communication wavelengths used in data centers.
- **Fan-Out Wafer Level Packaging (FOWLP)**: FOWLP is an advanced semiconductor packaging technology where chips are embedded directly onto a wafer, encapsulated in resin, and then interconnected via redistribution layers. Adopting this technology provides several key benefits:
    - **Elimination of Wire Bonding**: Compared to traditional wire bonding, FOWLP significantly shortens electrical paths, reducing parasitic capacitance and inductance. This minimizes signal degradation in high-speed data transmission.
    - **High-Density Integration**: FOWLP enables the high-density integration of multiple chips (both electronic and photonic ICs) to realize system miniaturization and increased interconnect density.
    - **Low Insertion Loss**: Signal losses at the electronic-optical interface are minimized, improving the overall efficiency of the optical communication system.

- **Data Center Application**: Data centers increasingly require faster and more power-efficient interconnects for data transmission within and between server racks. This technology serves as a foundational element for realizing terabit-class optical transceivers and Co-Packaged Optics (CPO), expected to meet the vast data bandwidth and low power consumption demands of AI/ML workloads.

Background & Context

With the advent of AI and High-Performance Computing (HPC), data traffic within data centers has surged exponentially. Traditional electrical interconnects based on copper wires are now facing limitations in terms of power consumption, latency, and bandwidth. Consequently, the transition to optical interconnects is inevitable, and there is an urgent need for photonic-electronic integration technologies that more closely combine electronic and optical circuits. Efficient packaging techniques are pivotal for achieving this integration.

Strategic Significance & Outlook

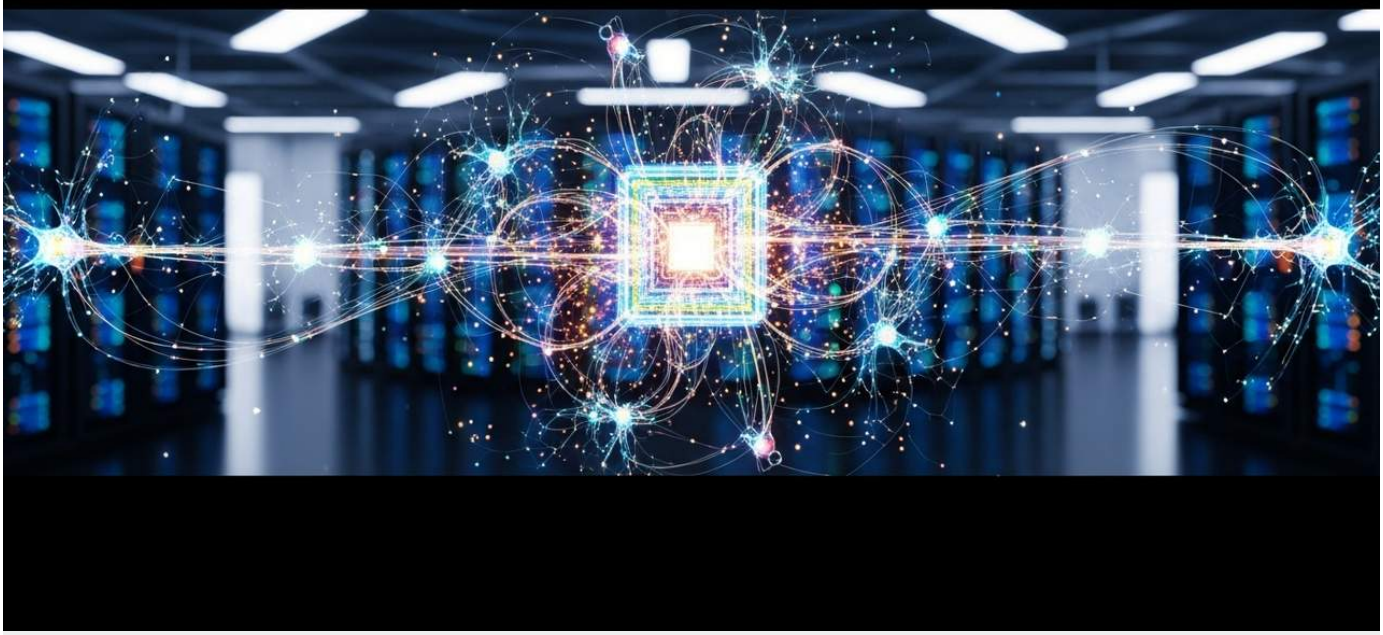
The research achievement from Shanghai Jiao Tong University marks a critical step forward in photonic-electronic integration. The reconfigurable germanium-silicon photodetector, enhanced by FOWLP, holds the potential to dramatically improve the performance and efficiency of next-generation optical interconnects in data centers. Further development and mass production of this technology could contribute to cost reduction and miniaturization of optical transceivers, thereby accelerating the widespread deployment of AI infrastructure. In the future, this technology is also anticipated to find applications in more complex optical signal processing and advanced fields like quantum photonics.

Source: https://www.photonics.com/Articles/Advanced-Packaging-Simplifies-Complex/a72271

Collected: August 14, 2026 | Automated Research System (Gemini API)

#09 Lightmatter Releases White Paper Advocating Integrated Supply Chain for AI Photonic Interconnects

Published August 13, 2026 digitimes Taiwan



OVERVIEW

Lightmatter unveiled an infrastructure white paper at OCP APAC Summit 2026, addressing supply chain fragmentation and adoption barriers for photonic interconnects in AI infrastructure. Bijan Nowroozi, Head of Ecosystem Development, stated the paper aims to foster a more unified and less fragmented supply chain, thereby resolving interconnect bottlenecks and high-cost issues faced by AI infrastructure. This initiative is crucial for accelerating the widespread adoption of photonics technology and improving data center efficiency in the AI era.

IN DEPTH

Key Findings

Lightmatter has released a comprehensive infrastructure white paper aimed at addressing the critical challenges confronting the adoption of photonic interconnects in AI infrastructure, particularly concerning supply chain fragmentation and cost. Announced by Bijan Nowroozi, the company's Head of Ecosystem Development, at the OCP APAC Summit 2026, the white paper advocates for the establishment of a more unified and less fragmented supply chain for photonic interconnects, seeking to resolve the severe interconnect bottlenecks and high cost issues currently impeding AI infrastructure development.

Technical / Clinical Details

- **Importance of Photonic Interconnects**: The explosive growth of AI workloads places unprecedented demands on data transfer volumes and speeds within data centers. Traditional electrical interconnects are encountering fundamental limits in terms of power consumption, latency, and bandwidth. Consequently, the transition to optical data transmission, i.e., photonic interconnects, has become inevitable. This shift promises enhanced overall system performance and significant improvements in energy efficiency.
- **Supply Chain Challenges**: The current supply chain for photonic interconnects is highly fragmented due to the technology's complexity, the diversity of components, and specialized manufacturing processes. This fragmentation drives up product costs and creates significant barriers to adoption. The issue is particularly pronounced for advanced technologies like Co-Packaged Optics (CPO), which require sourcing and integrating disparate components from multiple vendors.
- **White Paper Recommendations**: Lightmatter's white paper emphasizes the critical importance of collaboration among suppliers, designers, and end-users to establish common standards and an open ecosystem. Specifically, it proposes:
    - Adoption of common interface standards.
    - Standardization of manufacturing processes.
    - More transparent supplier collaboration models.

    These recommendations aim to streamline the entire supply chain and reduce costs.

- **Impact on AI Infrastructure**: Optimizing the supply chain will accelerate the widespread adoption of photonic interconnects in AI accelerators and network switches. This will directly translate into improved overall performance of AI clusters, leading to faster training times and enhanced inference efficiency.

Background & Context

The evolution of AI is driving significant transformations not only in semiconductor chip design but also in the interconnect technologies that link them. With a substantial portion of data center power consumption now attributed to data movement, the shift to energy-efficient optical technologies is critically important from both economic and environmental sustainability perspectives. However, this transition necessitates not only overcoming technical complexities but also achieving extensive coordination across the entire supply chain, from manufacturing to integration, underscoring the need for industry-wide consensus and standardization.

Strategic Significance & Outlook

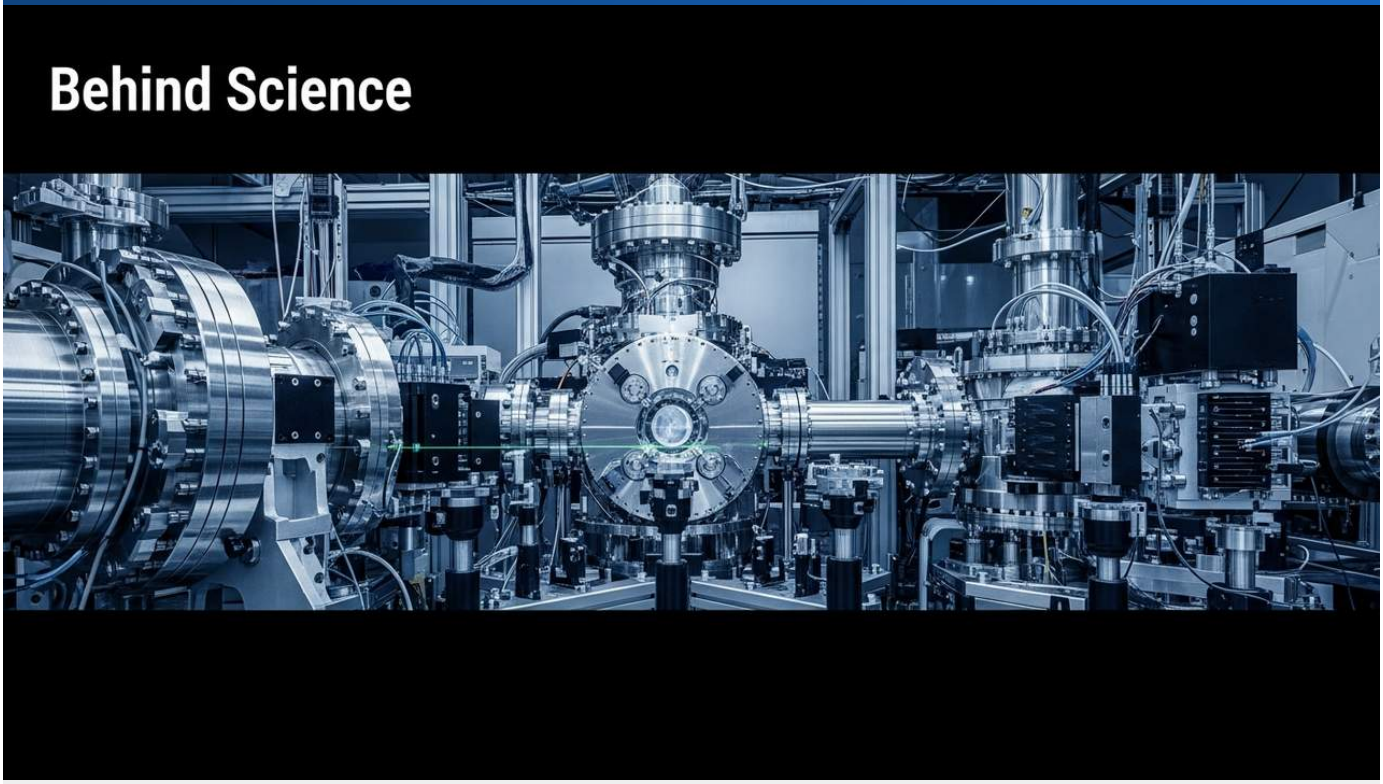
Lightmatter's white paper presents concrete solutions to the structural supply chain challenges confronting the photonics industry. If these recommendations are widely adopted and implemented, the cost and complexity of photonic interconnects are expected to decrease, accelerating their widespread integration into AI infrastructure. This will, in turn, foster further advancements and proliferation of AI technology, strengthening the foundation for a new era of high-performance computing. A unified supply chain will enable faster innovation and time-to-market, ultimately serving as a crucial step towards realizing the benefits of AI technology across society.

Source: https://www.digitimes.com/news/a20260813PD223/photonics-data-infrastructure-supply-chain-transmission-2026.html

Collected: August 14, 2026 | Automated Research System (Gemini API)

#10 Hamamatsu Photonics Features Advanced Photonics Technologies Supporting CERN's Antimatter Research in "Behind the Science" Series

Published Published August 10, 2026　浜松ホトニクス　Japan



OVERVIEW

Hamamatsu Photonics has released a new "Behind the Science" feature, highlighting its pivotal role in CERN's quest to unravel the mysteries of matter-antimatter asymmetry. Their high-sensitivity photodetectors and photomultiplier tubes are essential for detecting faint, high-speed signals in particle physics experiments. This showcases the company's significant contributions to fundamental physics and understanding the universe's most profound questions.

IN DEPTH

Background

The profound asymmetry between matter and antimatter remains one of the most significant unsolved problems in modern physics, holding keys to understanding the universe's evolution and fundamental structure. The European Organization for Nuclear Research (CERN) stands at the forefront of this quest, conducting experiments at facilities like the Large Hadron Collider (LHC) to investigate particle creation and decay. This ambitious research necessitates state-of-the-art detection technologies capable of functioning under extreme conditions and precisely measuring faint, ultra-high-speed light signals.

Hamamatsu Photonics has a long-standing legacy of pioneering advancements in optical science and technology. Its photodetectors are globally recognized as a standard in high-energy physics, broadly contributing from fundamental research to industrial applications, and are integral to CERN's efforts.

Key Findings

Hamamatsu Photonics' newly released "Behind the Science" feature spotlights its indispensable photonics technologies that are instrumental in supporting CERN's cutting-edge endeavors to unravel the mysteries of matter and antimatter. The company's core products, specifically high-sensitivity photodetectors and photomultiplier tubes (PMTs), play a crucial role in particle physics experiments, enabling pivotal discoveries at the forefront of basic science.

These advanced detectors are critical for capturing the fleeting signals generated in CERN's experiments. Hamamatsu Photonics' **Photomultiplier Tubes (PMTs)** are renowned for their ability to convert and amplify extremely weak photons into measurable electrical signals. They are deployed in CERN's large-scale detectors to capture Cherenkov radiation and scintillation light, produced by cosmic rays or high-energy collision experiments. Their exceptional high temporal resolution and sensitivity are vital for precise measurements of particle types, energies, and trajectories.

Furthermore, **Silicon Photomultipliers (SiPMs)** from Hamamatsu Photonics offer compact and robust detection solutions, particularly valuable in high magnetic field environments or confined spaces within CERN's complex detector arrays. Their superior photon detection efficiency and low noise characteristics enable the construction of more sophisticated and efficient detection systems.

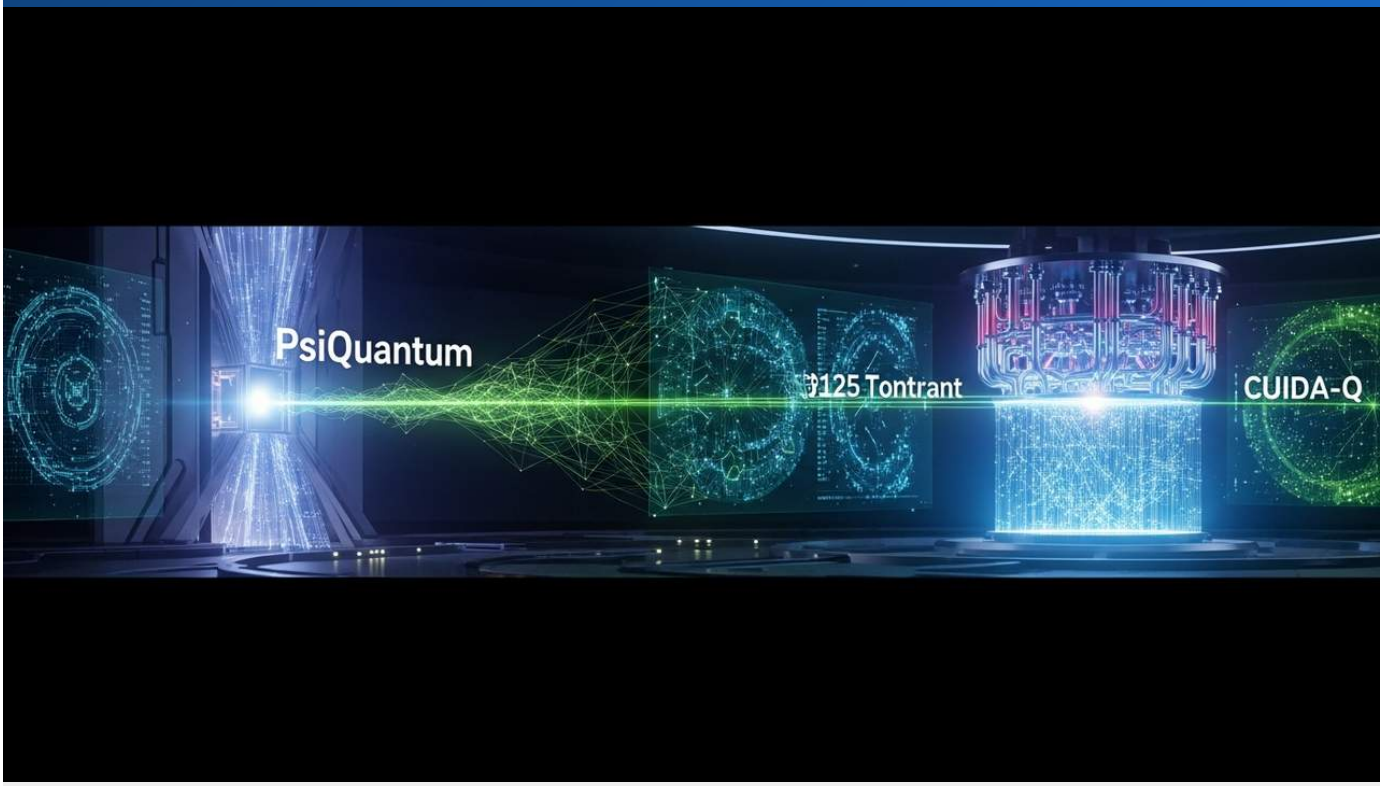
These optical detectors are seamlessly integrated into crucial components like calorimeters and particle identification systems across several major CERN experiments, including ATLAS, CMS, and LHCb. By forming the backbone of these vast data collection infrastructures, Hamamatsu Photonics' technologies are directly contributing to addressing fundamental questions about the universe's origins and the enigmatic asymmetry between matter and antimatter.

Source: https://www.hamamatsu.com/eu/en/news/news-all.html

Collected: August 14, 2026 | Automated Research System (Gemini API)

#11 PsiQuantum Secures $125M DARPA Contract, Integrates NVIDIA CUDA-Q for Fault-Tolerant Quantum Software

Published August 11, 2026 PsiQuantum News USA



OVERVIEW

PsiQuantum has secured a substantial $125 million contract under DARPA's Quantum Benchmarking Initiative (QBI) program, marking a significant step toward realizing fault-tolerant quantum computing. Concurrently, the company announced the integration of NVIDIA CUDA-Q into its "Construct" fault-tolerant quantum application development software suite, enhancing the environment for developers to efficiently design and execute large-scale quantum problems. This contract and integration accelerate the practical implementation of quantum computing, promising significantly improved capabilities for solving complex problems.

IN DEPTH

Key Findings

PsiQuantum has been awarded a significant $125 million contract under the U.S. Defense Advanced Research Projects Agency (DARPA)'s Quantum Benchmarking Initiative (QBI) program. This substantial investment is set to accelerate research and development towards the realization of fault-tolerant quantum computing. In tandem, the company announced the integration of NVIDIA's CUDA-Q quantum computing platform into its "Construct" fault-tolerant quantum application development software suite. These two advancements collectively represent crucial milestones towards the development of large-scale, practical quantum computers.

Technical / Clinical Details

- **Significance of the DARPA Contract**: The DARPA QBI program aims to establish benchmarks for the development and evaluation of large-scale quantum computers. PsiQuantum's contract award signifies recognition of its approach to fault-tolerant quantum computing—particularly its light-based quantum computing architecture—as strategically vital for U.S. national security and technological superiority. The funding will be allocated to R&D efforts crucial for achieving fault-tolerant qubits, improving error correction techniques, and constructing large-scale quantum systems.

- **Integration with NVIDIA CUDA-Q**:
  - **Construct Suite**: PsiQuantum's Construct is a comprehensive software environment designed for designing, simulating, and executing fault-tolerant quantum algorithms.
  - **Role of CUDA-Q**: NVIDIA CUDA-Q is a powerful platform aimed at accelerating quantum algorithms and controlling quantum devices. Its integration with Construct will enable developers to leverage NVIDIA's GPU acceleration for more efficient simulation of larger quantum circuits, thereby accelerating the architectural design and algorithm development for fault-tolerant quantum computers.
  - **Impact on Developers**: This integration will empower quantum software developers to explore complex quantum problems more rapidly and lower the barriers to implementing fault-tolerant quantum computing. It will also strengthen the quantum application development ecosystem.
- **Fault-Tolerant Quantum Computing**: Fault-tolerant quantum computers are essential for enabling practical large-scale quantum computations, as they can autonomously correct errors caused by qubit decoherence and noise. PsiQuantum leads in this field with an approach that utilizes photons as qubits.

Background & Context

Quantum computing holds the potential to solve complex problems intractable for current classical computers—such as new drug discovery, material design, and cryptography—but it faces significant challenges related to qubit instability. Fault-tolerant quantum computing is the next frontier, aiming to overcome these issues and enable large-scale, reliable quantum computers applicable to real-world problems. Significant investments from government agencies like DARPA indicate the recognition that quantum technologies offer strategic advantages at a national level.

Strategic Significance & Outlook

PsiQuantum's DARPA contract and NVIDIA CUDA-Q integration are set to accelerate the roadmap toward achieving fault-tolerant quantum computing. This will drive forward research and demonstration of quantum error correction and enhance the ability to efficiently control and manipulate a larger number of qubits. In the long term, these advancements have the potential to expedite the timeline for quantum computers to deliver practical value across industries such as pharmaceuticals, finance, and defense. PsiQuantum's approach underscores the critical importance of optical technology in shaping the future of quantum computing.

Source: https://www.psiquantum.com/news