TROY TECHNICAL

OPTICAL COMMUNICATIONS & PHOTONICS

WEEKLY REPORT

October 31 - November 6, 2026 | Issue 2026-W44

Link budget, packaging, thermal reliability and deployable supply

12	10
ANALYZED ARTICLES	PRIORITY THEMES



Optical Communications & Photonics: the boundary moved from isolated claims to qualification evidence

12 English articles were reviewed independently from the Japanese edition. Ten themes are retained for management decisions.

SIGNAL 01 | LIGHT SOURCE

NVIDIA Spectrum-X CPO Switches: Liquid Cooling Supply Chain 2026

NVIDIA has moved the Spectrum-X Ethernet CPO switch into mass production, featuring a 100% liquid-cooling coverage architecture.

SIGNAL 02 | PHOTONIC DEVICE

Mixx SxC Connector: Near-Package Optics Specs and EBO MSA Role

Mixx Technologies has introduced the SxC Connector, an expanded-beam design for near-package optics featuring a typical fiber-to-fiber loss of 0.2 dB.

SIGNAL 03 | PACKAGING

Nvidia OOI Technology: CPO Roadmap and Packaging Evolution

Nvidia has introduced Optics-on-Interposer (OOI), a next-generation CPO technology that moves optical engines onto the silicon interposer to reduce power and increase bandwidth density.

SIGNAL 04 | NETWORK SYSTEM

IOWN APN: 775Gbps Long-Distance Data Transfer Specs and Results

A consortium including NII and NTT has demonstrated ultra-high-speed data transfer between Kobe and Kashiwa using IOWN All-Photonics Network (APN) technology.

DECISION

Focus this week's management attention on link budget, packaging, thermal reliability and deployable supply. Move only when the linked evidence can be reproduced under your own operating conditions.

THREE MANAGEMENT MOVES

1. Buyers: evaluate optical architectures by reach, power, latency, interoperability and field service.
2. Suppliers: pair optical performance with packaging yield, test, thermal drift and qualified capacity.
3. Executives: track yield, coupling loss, temperature drift, interoperability, volume and cost.

EVIDENCE DISCIPLINE

FACT states what the collected English source reports. BUSINESS READ and ACTION are editorial interpretations. UNKNOWN lists information that the source file does not establish. A linked article is not treated as independent confirmation of every claim.

Five numbers or evidence anchors that require conditions

100%
A06

SOURCE-BOUND CONDITION
NVIDIA has moved the Spectrum-X Ethernet CPO switch into mass production, featuring a 100% liquid-cooling coverage architecture.

775G
A05

SOURCE-BOUND CONDITION
The experiment achieved speeds of approximately 775Gbps, reducing latency by about 20% compared to the SINET network.

180 G
A07

SOURCE-BOUND CONDITION
The device demonstrates data transmission speeds of 180 Gbit/s across a wavelength range of approximately 67 nm, enabling more compact high-capacity interconnects for AI and cloud data centers.

2.0 GHz
A10

SOURCE-BOUND CONDITION
The system achieves spike rates above 2.0 GHz with 5-bit encoding precision and 0.5 pJ per spike energy consumption, enabling high-speed neuromorphic computing over existing fiber networks.

8x
A02

SOURCE-BOUND CONDITION
PsiQuantum has demonstrated an 8x8 silicon photonics optical circuit switch (OCS) featuring 1.2 dB insertion loss without the use of amplification or moving parts.

HOW TO USE THESE NUMBERS
Each value is shown with the condition stated in the collected English article. Do not compare values across different test methods, device sizes, operating temperatures or commercial stages without normalizing those conditions.

Where the value chain moved

Each stage combines one leading theme and one supporting theme. The report treats handoffs as evidence transfers, not decorative arrows.

1

Light source

P01/P06

NVIDIA has moved the Spectrum-X Ethernet CPO switch into mass production, featuring a 100% liquid-cooling coverage.

2

Photonic device

P02/P07

Mixx Technologies has introduced the SxC Connector, an expanded-beam design for near-packag e optics featuring a typical.

3

Packaging

P03/P08

Nvidia has introduced Optics-on-Interposer (OOI), a next-generatio n CPO technology that moves optical engines onto the.

4

Network system

P04/P09

A consortium including NII and NTT has demonstrated ultra-high-speed data transfer between Kobe and Kashiwa using IOWN.

5

Operations

P05/P10

Researchers have developed an integrated optical transmitter that achieves stable laser operation without an optical isolator.

EVIDENCE REQUIRED AT EACH HANDOFF

Light source to Photonic device	Transfer test conditions, acceptance criteria, failure data, owner and decision date. Recheck yield, coupling loss, temperature drift, interoperability, volume and cost.
Photonic device to Packaging	Transfer test conditions, acceptance criteria, failure data, owner and decision date. Recheck yield, coupling loss, temperature drift, interoperability, volume and cost.
Packaging to Network system	Transfer test conditions, acceptance criteria, failure data, owner and decision date. Recheck yield, coupling loss, temperature drift, interoperability, volume and cost.
Network system to Operations	Transfer test conditions, acceptance criteria, failure data, owner and decision date. Recheck yield, coupling loss, temperature drift, interoperability, volume and cost.

COMMON CONTROL POINT

No theme moves to a commercial commitment until a named owner has reproduced the relevant evidence and documented yield, coupling loss, temperature drift, interoperability, volume and cost.

Priority map: maturity and next decision locus



P01	NVIDIA Spectrum-X CPO Switches: Liquid Cooling Supply Chain 2026 Business / rules | cue: Supply Chain
P02	Mixx SxC Connector: Near-Package Optics Specs and EBO MSA Role Business / rules | cue: standards
P03	Nvidia OOI Technology: CPO Roadmap and Packaging Evolution Tech / process | cue: no system/business cue
P04	IOWN APN: 775Gbps Long-Distance Data Transfer Specs and Results Business / rules | cue: consortium
P05	Isolator-Free Optical Transmitter: Waseda University 180 Gbit/s Specs Business / rules | cue: capacity
P06	Jiuzhang 4: Optical Quantum Computing Speed and PQC Roadmap Tech / process | cue: no system/business cue
P07	All-Optical Spike Encoder: 2.0 GHz Neuromorphic Fiber Integration System / adoption | cue: Integration
P08	ReS2/ReSe2 Heterostructures: Infrared Light Control via Twist-Tuning System / adoption | cue: platform
P09	PsiQuantum Optical Switch: 8x8 Silicon Photonics Specs and Roadmap Tech / process | cue: no system/business cue
P10	OCP Optical Telemetry: Credo and Oracle's 2026 Standard Specs Business / rules | cue: Standard

REPRODUCIBLE POSITIONING RULE

Horizontal position uses five discrete stages: Research, Prototype, Joint evaluation, Product adoption and Scale. The vertical bands classify the next decision locus: Tech / process, System / adoption, or Business / rules (including supply systems). Article-title cues take precedence; the overview is used only when the title is silent. These are categories, not impact ranks. Bubble diameter reflects the editorial score.

FACT is source-bound. BUSINESS READ, ACTION and UNKNOWN are explicit editorial layers.

P01 NVIDIA Spectrum-X CPO Switches: Liquid Cooling Supply Chain 2026

A06 | Light source | Scale-up

2026-11-04

FACT

NVIDIA has moved the Spectrum-X Ethernet CPO switch into mass production, featuring a 100% liquid-cooling coverage architecture. With shipment targets for 2026-2027 increased from 10,000 to 50,000 units, the system establishes a new high-value application for liquid cooling in AI data center interconnects.

WHY IT MATTERS

The decision relevance is link budget, packaging, thermal reliability and deployable supply. The signal should be tested at the application and operating-system level, not accepted from a headline alone.

BUSINESS READ

For operating companies, compare the reported change with current qualification, sourcing and product-roadmap assumptions. For suppliers, pair optical performance with packaging yield, test, thermal drift and qualified capacity.

ACTION

Within 30 days, evaluate optical architectures by reach, power, latency, interoperability and field service; record the evidence and owner against P01.

UNKNOWN

Still unproven or incompletely stated: yield, coupling loss, temperature drift, interoperability, volume and cost.

EDITORIAL SCORE 21/25 | MATURITY 5/5 | DECISION LOCUS: BUSINESS / RULES

P02 Mixx SxC Connector: Near-Package Optics Specs and EBO MSA Role

A01 | Photonic device | Research

2026-11-04

FACT

Mixx Technologies has introduced the SxC Connector, an expanded-beam design for near-package optics featuring a typical fiber-to-fiber loss of 0.2 dB. By integrating with Open CPX and EBO MSA standards, the technology enables high-radix AI inference networks with fiber densities up to 24,576 fibers per OCP rack unit.

WHY IT MATTERS

The decision relevance is link budget, packaging, thermal reliability and deployable supply. The signal should be tested at the application and operating-system level, not accepted from a headline alone.

BUSINESS READ

For operating companies, compare the reported change with current qualification, sourcing and product-roadmap assumptions. For suppliers, pair optical performance with packaging yield, test, thermal drift and qualified capacity.

ACTION

Within 30 days, evaluate optical architectures by reach, power, latency, interoperability and field service; record the evidence and owner against P02.

UNKNOWN

Still unproven or incompletely stated: yield, coupling loss, temperature drift, interoperability, volume and cost.

EDITORIAL SCORE 21/25 | MATURITY 1/5 | DECISION LOCUS: BUSINESS / RULES

FACT is source-bound. BUSINESS READ, ACTION and UNKNOWN are explicit editorial layers.

P03 Nvidia OOI Technology: CPO Roadmap and Packaging Evolution

A04 | Packaging | Research

2026-11-01

FACT

Nvidia has introduced Optics-on-Interposer (OOI), a next-generation CPO technology that moves optical engines onto the silicon interposer to reduce power and increase bandwidth density. This shift reflects a transition in optical communication competition toward advanced chip packaging to overcome the physical limits of high-speed electrical interconnects.

WHY IT MATTERS

The decision relevance is link budget, packaging, thermal reliability and deployable supply. The signal should be tested at the application and operating-system level, not accepted from a headline alone.

BUSINESS READ

For operating companies, compare the reported change with current qualification, sourcing and product-roadmap assumptions. For suppliers, pair optical performance with packaging yield, test, thermal drift and qualified capacity.

ACTION

Within 30 days, evaluate optical architectures by reach, power, latency, interoperability and field service; record the evidence and owner against P03.

UNKNOWN

Still unproven or incompletely stated: yield, coupling loss, temperature drift, interoperability, volume and cost.

EDITORIAL SCORE 20/25 | MATURITY 1/5 | DECISION LOCUS: TECH / PROCESS

P04 IOWN APN: 775Gbps Long-Distance Data Transfer Specs and Results

A05 | Network system | Pilot

2026-11-04

FACT

A consortium including NII and NTT has demonstrated ultra-high-speed data transfer between Kobe and Kashiwa using IOWN All-Photonics Network (APN) technology. The experiment achieved speeds of approximately 775Gbps, reducing latency by about 20% compared to the SINET network.

WHY IT MATTERS

The decision relevance is link budget, packaging, thermal reliability and deployable supply. The signal should be tested at the application and operating-system level, not accepted from a headline alone.

BUSINESS READ

For operating companies, compare the reported change with current qualification, sourcing and product-roadmap assumptions. For suppliers, pair optical performance with packaging yield, test, thermal drift and qualified capacity.

ACTION

Within 30 days, evaluate optical architectures by reach, power, latency, interoperability and field service; record the evidence and owner against P04.

UNKNOWN

Still unproven or incompletely stated: yield, coupling loss, temperature drift, interoperability, volume and cost.

EDITORIAL SCORE 20/25 | MATURITY 2/5 | DECISION LOCUS: BUSINESS / RULES

FACT is source-bound. BUSINESS READ, ACTION and UNKNOWN are explicit editorial layers.

P05 Isolator-Free Optical Transmitter: Waseda University 180 Gbit/s Specs

A07 | Operations | Product adoption

2026-11-04

FACT

Researchers have developed an integrated optical transmitter that achieves stable laser operation without an optical isolator by utilizing cross-platform spectral co-design. The device demonstrates data transmission speeds of 180 Gbit/s across a wavelength range of approximately 67 nm, enabling more compact high-capacity interconnects for AI and cloud data centers.

WHY IT MATTERS

The decision relevance is link budget, packaging, thermal reliability and deployable supply. The signal should be tested at the application and operating-system level, not accepted from a headline alone.

BUSINESS READ

For operating companies, compare the reported change with current qualification, sourcing and product-roadmap assumptions. For suppliers, pair optical performance with packaging yield, test, thermal drift and qualified capacity.

ACTION

Within 30 days, evaluate optical architectures by reach, power, latency, interoperability and field service; record the evidence and owner against P05.

UNKNOWN

Still unproven or incompletely stated: yield, coupling loss, temperature drift, interoperability, volume and cost.

EDITORIAL SCORE 20/25 | MATURITY 4/5 | DECISION LOCUS: BUSINESS / RULES

P06 Jiuzhang 4: Optical Quantum Computing Speed and PQC Roadmap

A09 | Light source | Joint evaluation

2026-11-05

FACT

The Jiuzhang 4 optical quantum computing prototype has set a new world record, performing a Gaussian Boson Sampling task in 25 microseconds. This leap in quantum power is accelerating the transition to Post-Quantum Cryptography (PQC) to protect high-value assets against future decryption risks.

WHY IT MATTERS

The decision relevance is link budget, packaging, thermal reliability and deployable supply. The signal should be tested at the application and operating-system level, not accepted from a headline alone.

BUSINESS READ

For operating companies, compare the reported change with current qualification, sourcing and product-roadmap assumptions. For suppliers, pair optical performance with packaging yield, test, thermal drift and qualified capacity.

ACTION

Within 30 days, evaluate optical architectures by reach, power, latency, interoperability and field service; record the evidence and owner against P06.

UNKNOWN

Still unproven or incompletely stated: yield, coupling loss, temperature drift, interoperability, volume and cost.

EDITORIAL SCORE 20/25 | MATURITY 3/5 | DECISION LOCUS: TECH / PROCESS

FACT is source-bound. BUSINESS READ, ACTION and UNKNOWN are explicit editorial layers.

P07 All-Optical Spike Encoder: 2.0 GHz Neuromorphic Fiber Integration

A10 | Photonic device | Pilot

2026-11-06

FACT

Researchers from Fudan University and Zhangjiang Laboratory have developed an all-optical biomimetic spike encoder using optically injected Fabry-Perot (FP) laser neurons. The system achieves spike rates above 2.0 GHz with 5-bit encoding precision and 0.5 pJ per spike energy consumption, enabling high-speed neuromorphic computing over existing fiber networks.

WHY IT MATTERS

The decision relevance is link budget, packaging, thermal reliability and deployable supply. The signal should be tested at the application and operating-system level, not accepted from a headline alone.

BUSINESS READ

For operating companies, compare the reported change with current qualification, sourcing and product-roadmap assumptions. For suppliers, pair optical performance with packaging yield, test, thermal drift and qualified capacity.

ACTION

Within 30 days, evaluate optical architectures by reach, power, latency, interoperability and field service; record the evidence and owner against P07.

UNKNOWN

Still unproven or incompletely stated: yield, coupling loss, temperature drift, interoperability, volume and cost.

EDITORIAL SCORE 19/25 | MATURITY 2/5 | DECISION LOCUS: SYSTEM / ADOPTION

P08 ReS2/ReSe2 Heterostructures: Infrared Light Control via Twist-Tuning

A11 | Packaging | Pilot

2026-11-06

FACT

Researchers at Sungkyunkwan University have developed a method to control the color and polarization of infrared light by twisting layers of atomic-scale semiconductors. The team achieved a light energy control range of approximately 100 meV, providing a new platform for ultra-low power optical devices and quantum computing.

WHY IT MATTERS

The decision relevance is link budget, packaging, thermal reliability and deployable supply. The signal should be tested at the application and operating-system level, not accepted from a headline alone.

BUSINESS READ

For operating companies, compare the reported change with current qualification, sourcing and product-roadmap assumptions. For suppliers, pair optical performance with packaging yield, test, thermal drift and qualified capacity.

ACTION

Within 30 days, evaluate optical architectures by reach, power, latency, interoperability and field service; record the evidence and owner against P08.

UNKNOWN

Still unproven or incompletely stated: yield, coupling loss, temperature drift, interoperability, volume and cost.

EDITORIAL SCORE 19/25 | MATURITY 2/5 | DECISION LOCUS: SYSTEM / ADOPTION

FACT is source-bound. BUSINESS READ, ACTION and UNKNOWN are explicit editorial layers.

P09 PsiQuantum Optical Switch: 8x8 Silicon Photonics Specs and Roadmap

A02 | Network system | Research

2026-10-31

FACT

PsiQuantum has demonstrated an 8x8 silicon photonics optical circuit switch (OCS) featuring 1.2 dB insertion loss without the use of amplification or moving parts. Designed for AI data center GPU networks, the technology aims to reduce power draw and latency by routing light fiber-to-fiber.

WHY IT MATTERS

The decision relevance is link budget, packaging, thermal reliability and deployable supply. The signal should be tested at the application and operating-system level, not accepted from a headline alone.

BUSINESS READ

For operating companies, compare the reported change with current qualification, sourcing and product-roadmap assumptions. For suppliers, pair optical performance with packaging yield, test, thermal drift and qualified capacity.

ACTION

Within 30 days, evaluate optical architectures by reach, power, latency, interoperability and field service; record the evidence and owner against P09.

UNKNOWN

Still unproven or incompletely stated: yield, coupling loss, temperature drift, interoperability, volume and cost.

EDITORIAL SCORE 19/25 | MATURITY 1/5 | DECISION LOCUS: TECH / PROCESS

P10 OCP Optical Telemetry: Credo and Oracle's 2026 Standard Specs

A03 | Operations | Scale-up

2026-11-04

FACT

The Open Compute Project (OCP) Community has approved two new specifications for optical transceiver telemetry developed by Credo and Oracle. These standards establish a common framework for link-health monitoring to reduce network disruptions in large-scale AI fabrics.

WHY IT MATTERS

The decision relevance is link budget, packaging, thermal reliability and deployable supply. The signal should be tested at the application and operating-system level, not accepted from a headline alone.

BUSINESS READ

For operating companies, compare the reported change with current qualification, sourcing and product-roadmap assumptions. For suppliers, pair optical performance with packaging yield, test, thermal drift and qualified capacity.

ACTION

Within 30 days, evaluate optical architectures by reach, power, latency, interoperability and field service; record the evidence and owner against P10.

UNKNOWN

Still unproven or incompletely stated: yield, coupling loss, temperature drift, interoperability, volume and cost.

EDITORIAL SCORE 19/25 | MATURITY 5/5 | DECISION LOCUS: BUSINESS / RULES

Playbook and 0-5 year roadmap

STAKEHOLDER	NOW | 0-30 DAYS	NEXT | 1-12 MONTHS	LATER | 1-5 YEARS
Operating companies	evaluate optical architectures by reach, power, latency, interoperability and field service	Run production-like qualification with explicit acceptance and stop criteria.	Build a portfolio and architecture that can absorb technology and supplier changes.
Materials, equipment and technology suppliers	pair optical performance with packaging yield, test, thermal drift and qualified capacity	Create shared reliability, process-window and failure-analysis data with customers.	Standardize interfaces, traceability, lifecycle support and recovery services.
Trading, investment and legal teams	Map yield, coupling loss, temperature drift, interoperability, volume and cost.	Contract for capacity, quality, change notice, liability, alternatives and exit.	Diversify regional, technical and customer concentration risk.

ROADMAP

NOW | 0-30 DAYS
Evidence ledger
Owner: Strategy + quality
Deliverable: claim, source, condition, owner

NOW | 0-30 DAYS
Risk screen
Owner: Procurement + legal
Deliverable: unknowns, alternatives, stop

NEXT | 1-12 MONTHS
Joint qualification
Owner: R&D + supplier
Deliverable: process window and failure data

NEXT | 1-12 MONTHS
Commercial gate
Owner: Business + finance
Deliverable: unit economics and capacity

LATER | 1-5 YEARS
Platform strategy
Owner: Executive team
Deliverable: portfolio and interface roadmap

LATER | 1-5 YEARS
Service layer
Owner: Operations + channel
Deliverable: monitoring, maintenance and recovery

GO / NO-GO GATES

GATE	OWNER	REQUIRED EVIDENCE	NO-GO CONDITION
G1 Evidence	**Quality**	Source, test conditions and reproducibility	No traceable evidence
G2 Integration	**R&D**	Interface, process window and failure analysis	Cannot meet system conditions
G3 Commercial	**Business**	Capacity, total cost, contract and alternatives	Economics or supply cannot be supported
G4 Lifecycle	**Operations**	Monitoring, maintenance, change notice and exit	No accountable operating plan

ANALYZED ARTICLES | ITEMS 01-12

Every title and URL is displayed in full. URLs wrap without shortening and remain clickable. A verified-reference label means the translated HTML did not retain its original source URL.

ID	FULL ARTICLE TITLE	FULL SOURCE / VERIFIED REFERENCE URL - CLICKABLE
A01	Mixx SxC Connector: Near-Package Optics Specs and EBO MSA Role	https://www.prnewswire.com/news-releases/near-package-optics-is-only-as-reliable-as-its-connector-mixx-backs-open-specifications-for-optics-inside-the-box-302929190.html
A02	PsiQuantum Optical Switch: 8x8 Silicon Photonics Specs and Roadmap	https://news.lavx.hu/article/psiquantum-demos-8x8-optical-switch-for-ai-data-centers-with-1-2-db-loss
A03	OCP Optical Telemetry: Credo and Oracle's 2026 Standard Specs	https://www.aol.com/articles/credo-oracle-advance-optical-transceiver-140000000.html
A04	Nvidia OOI Technology: CPO Roadmap and Packaging Evolution	https://finance.sina.com.cn/tech/roll/2026-11-01/doc-inixfrfw7836335.shtml
A05	IOWN APN: 775Gbps Long-Distance Data Transfer Specs and Results	https://eetimes.itmedia.co.jp/ee/articles/2611/04/news026.html
A06	NVIDIA Spectrum-X CPO Switches: Liquid Cooling Supply Chain 2026	https://hao.cnyes.com/post/275823
A07	Isolator-Free Optical Transmitter: Waseda University 180 Gbit/s Specs	https://www.waseda.jp/top/en/news/90021
A08	Optical Fiber Power Delivery: 10W Transmission for Fire Sensors	https://eetimes.itmedia.co.jp/ee/articles/2611/05/news037.html
A09	Jiuzhang 4: Optical Quantum Computing Speed and PQC Roadmap	https://www.stdaily.com/web/gdxw/2026-11/05/content_609057.html
A10	All-Optical Spike Encoder: 2.0 GHz Neuromorphic Fiber Integration	https://www.miragenews.com/ultrafast-optical-encoder-enables-neuromorphic-1773271/
A11	ReS2/ReSe2 Heterostructures: Infrared Light Control via Twist-Tuning	https://www.usline.kr/news/articleView.html?idxno=35298
A12	Photonic Q-DFT: Simulating LiH with O(log2N) Qubit Scaling	https://quantumzeitgeist.com/fotonica-nanotecnologie-photonic-qubits-lithium-hydride/

Photonics — Selected Articles

Date: 2026-11-08

Articles: 12

Table of Contents

#01 Mixx SxC Connector: Near-Package Optics Specs and EBO MSA Role

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#04 Nvidia OOI Technology: CPO Roadmap and Packaging Evolution

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#06 NVIDIA Spectrum-X CPO Switches: Liquid Cooling Supply Chain 2026

#07 Isolator-Free Optical Transmitter: Waseda University 180 Gbit/s Specs

#08 Optical Fiber Power Delivery: 10W Transmission for Fire Sensors

#09 Jiuzhang 4: Optical Quantum Computing Speed and PQC Roadmap

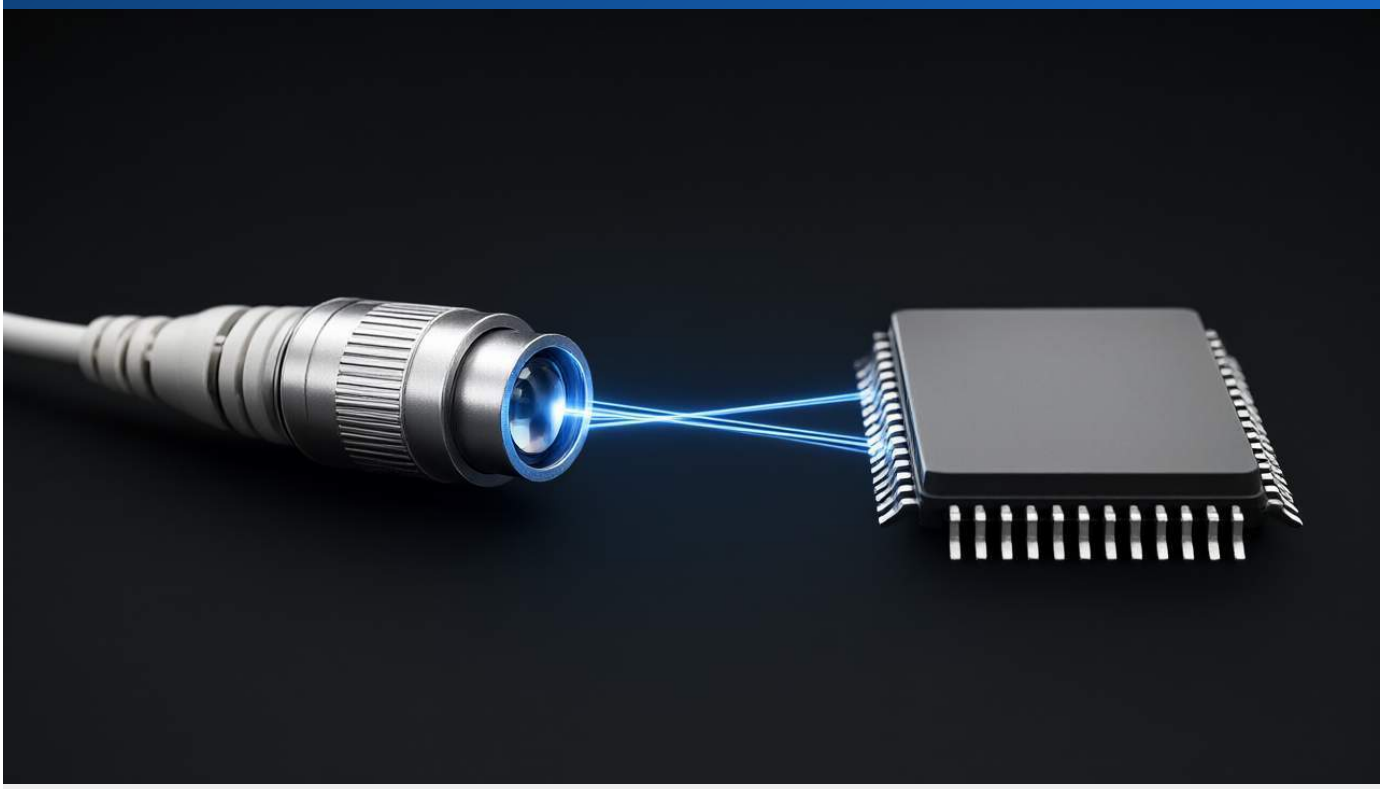
#10 All-Optical Spike Encoder: 2.0 GHz Neuromorphic Fiber Integration

#11 ReS2/ReSe2 Heterostructures: Infrared Light Control via Twist-Tuning

#12 Photonic Q-DFT: Simulating LiH with $O(\log_2 N)$ Qubit Scaling

#01 Mixx SxC Connector: Near-Package Optics Specs and EBO MSA Role

Published November 04, 2026 PR Newswire (Mixx Technologies) USA



OVERVIEW

Mixx Technologies has introduced the SxC Connector, an expanded-beam design for near-package optics featuring a typical fiber-to-fiber loss of 0.2 dB. By integrating with Open CPX and EBO MSA standards, the technology enables high-radix AI inference networks with fiber densities up to 24,576 fibers per OCP rack unit.

IN DEPTH

Key Findings

Mixx Technologies is deploying the SxC Connector, the connectivity layer of its HBxIO platform, to address the reliability and density challenges of near-package optics. The connector achieves a typical fiber-to-fiber loss of 0.2 dB and a maximum loss of under 0.5 dB. Designed for hyperscale AI infrastructure, the SxC Connector supports high-radix networks, allowing up to 24,576 fibers in a single Open Compute Project (OCP) rack unit, which is four times the density of MMC.

Technical Details

The SxC Connector utilizes an expanded-beam design to mitigate the vulnerabilities of physical-contact connectors. While physical-contact systems rely on a 9-micron core susceptible to dust and oil, expanded-beam optics widen the beam to approximately 80 microns across an air gap. According to the Expanded Beam Optics Multi-Source Agreement (EBO MSA), this approach results in an 85% reduction in installation and cleaning time and a 20x reduction in mating force.

To resolve industry bottlenecks in fiber termination, Mixx applies semiconductor assembly techniques to enable high-throughput production. Furthermore, Mixx is developing an Open CPX module that pairs the HBxIO optical engine with a detachable SxC connector, allowing the engine and fiber to be tested and replaced independently in the field.

Background and Context

The industry is transitioning toward co-packaged optics, with "near-package optics"—placing optics inside the box next to the host chip—as the current critical step. Data from ECOC 2026 indicates that 80% of network issues are cleaning-related and 95% of maintenance requests involve cleaning. Because connectors inside the box are harder to access, the EBO MSA was created in March 2026 to develop open, interoperable specifications, including a 128-fiber design specification.

Significance and Outlook

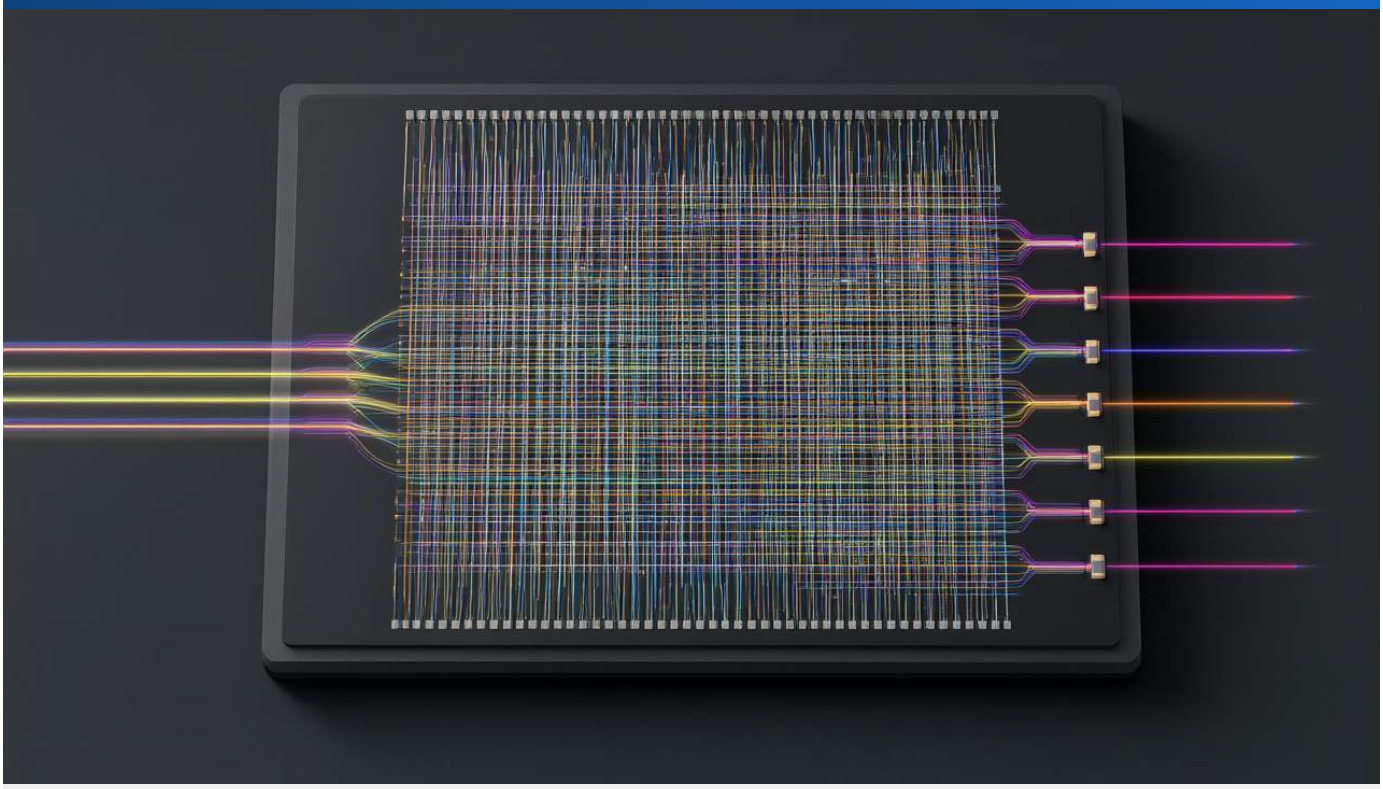
Higher radix reduces the number of switching layers required for all-to-all connectivity in AI inference, lowering latency and power consumption. By minimizing loss at the connector level, Mixx provides architectural headroom and economic advantages for hyperscalers moving optics deeper into the network.

Source: https://www.prnewswire.com/news-releases/near-package-optics-is-only-as-reliable-as-its-connector-mixx-backs-open-specifications-for-optics-inside-the-box-302929190.html

Collected: November 07, 2026 | Automated Research System (AI)

#02 PsiQuantum Optical Switch: 8x8 Silicon Photonics Specs and Roadmap

Published October 31, 2026　LavX News（Tom's Hardware記事の転載）　USA



OVERVIEW

PsiQuantum has demonstrated an 8x8 silicon photonics optical circuit switch (OCS) featuring 1.2 dB insertion loss without the use of amplification or moving parts. Designed for AI data center GPU networks, the technology aims to reduce power draw and latency by routing light fiber-to-fiber.

IN DEPTH

Key Findings

PsiQuantum has debuted a prototype 8x8 optical circuit switch that achieves an insertion loss of 1.2 dB (approximately 24% light loss) in laboratory tests. The device operates in the O-band, the standard wavelength range for GPU server links, and features a reconfiguration time of under 3 ms and 40 dB crosstalk. Unlike competitors Salience Labs and iPronics, PsiQuantum’s chip does not utilize built-in amplification to stay below the 3 dB loss ceiling tolerated by data center optics.

Technical Details

The switch is constructed using silicon nitride waveguides etched on a silicon substrate. The architecture is monolithic with no moving mirrors or microelectromechanical systems (MEMS), eliminating the mechanical wear associated with mirror-based approaches. While the current demo uses a thermally switched silicon nitride platform, the company is exploring barium titanate (BTO) as a material for future products to enable faster switching via strong light bending under voltage at gigahertz rates.

According to a 2025 Nature paper, the company's baseline performance includes:

- Waveguide losses: 0.5 dB per meter
- Splitters: 0.5 millidecibels
- Crossings: 1.2 millidecibels
- Chip-to-fiber coupling: approximately 60 millidecibels (1.4% loss)

Background and Context

Optical switches are critical as AI clusters move massive data between GPUs, surpassing the distance and bandwidth limits of copper. While Google's Palomar (136 ports) and Lumentum's R300 (300 ports) handle larger scales, PsiQuantum's 8x8 is a proof of concept. The company has already taped out a 64x64 version and is developing a 72x72 design. Nvidia, which collaborates with PsiQuantum on GPU-QPU integration and silicon photonics through NVentures, has also invested in rival iPronics.

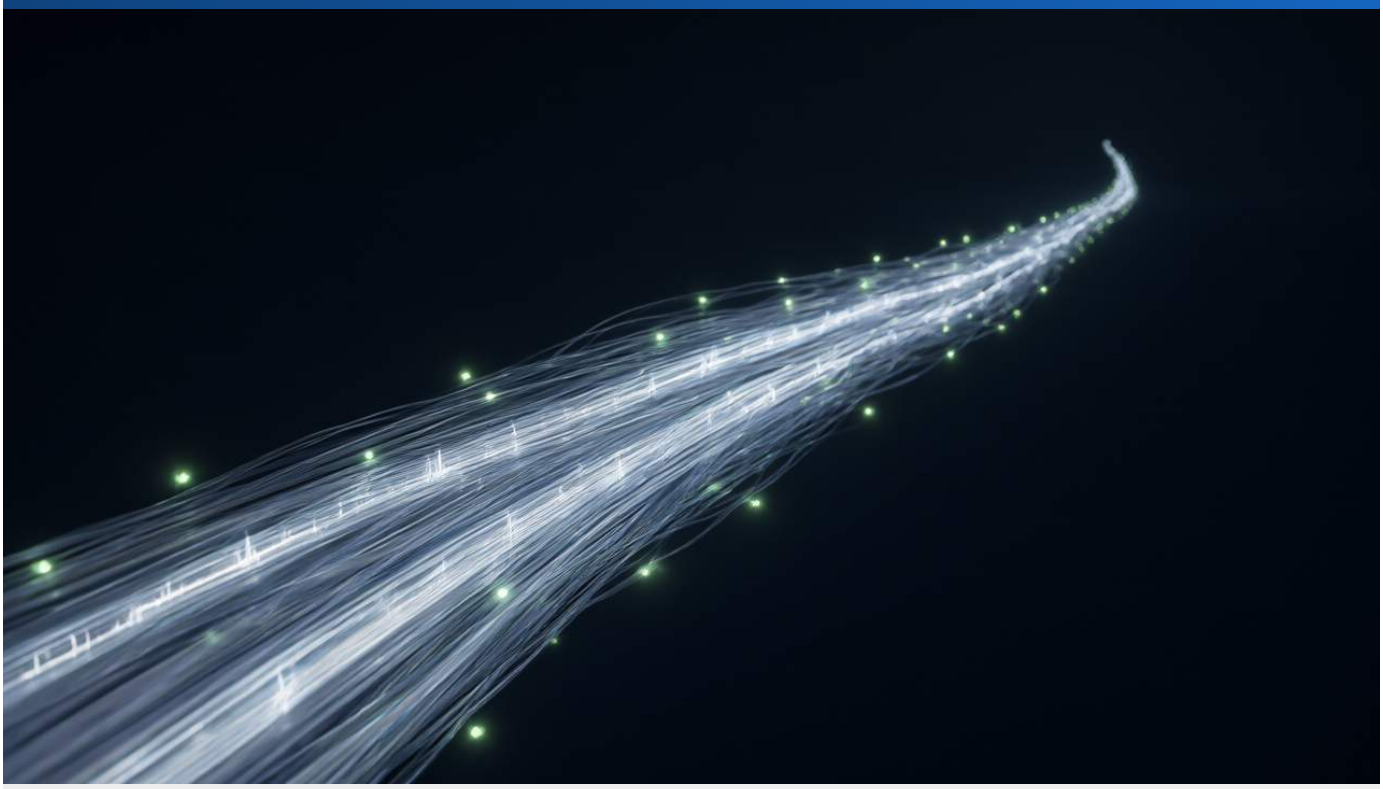
Significance and Outlook

PsiQuantum intends to use conventional AI networking applications to reduce packaging and supply chain risks for its quantum computing components. Samples and testing kits have been delivered to hyperscalers and GPU vendors. Commercial product announcements and updates on larger devices are expected in the coming months.

Source: https://news.lavx.hu/article/psiquantum-demos-8x8-optical-switch-for-ai-data-centers-with-1-2-db-loss

#03 OCP Optical Telemetry: Credo and Oracle's 2026 Standard Specs

Published November 04, 2026　AOL（Credo Technology Group プレスリリース）　USA



OVERVIEW

The Open Compute Project (OCP) Community has approved two new specifications for optical transceiver telemetry developed by Credo and Oracle. These standards establish a common framework for link-health monitoring to reduce network disruptions in large-scale AI fabrics.

IN DEPTH

Key Findings

The Open Compute Project (OCP) has approved two new contributions aimed at enhancing telemetry for optical transceivers. Developed by the Optics Reliability Workstream—led by Chris Collins of Credo and Steve Manley of Oracle—these specifications provide an open, interoperable standard for optical transceivers and hosts to coordinate out-of-band communication.

Technical Details

The approved specifications consist of two primary components:

- **Enhanced Telemetry Optics Product Software Specification:** This allows transceivers and hosts to share Layer 1 (L1) telemetry, calculate a common link-health metric, and log significant link events. It supports configurable, automated responses designed to prevent, localize, and remediate link flaps.
- **Transparent Remote Optical Transceiver Messaging with ePPS Design Specification:** This defines the standard for optical DSPs to coordinate out-of-band communication across a live link without affecting traffic, serving as a critical component of the Enhanced Telemetry specification.

Background & Context

The Optics Reliability Workstream was established within OCP's Networking Project in January 2026. The effort utilized Credo's ZeroFlap host specification as its technical foundation and incorporated input from the broader OCP Community to reach the final specifications. The initiative addresses the challenges of scaling AI infrastructure to clusters containing hundreds of thousands of optical links, where brief disruptions can stall training runs and degrade cluster returns.

Significance & Outlook

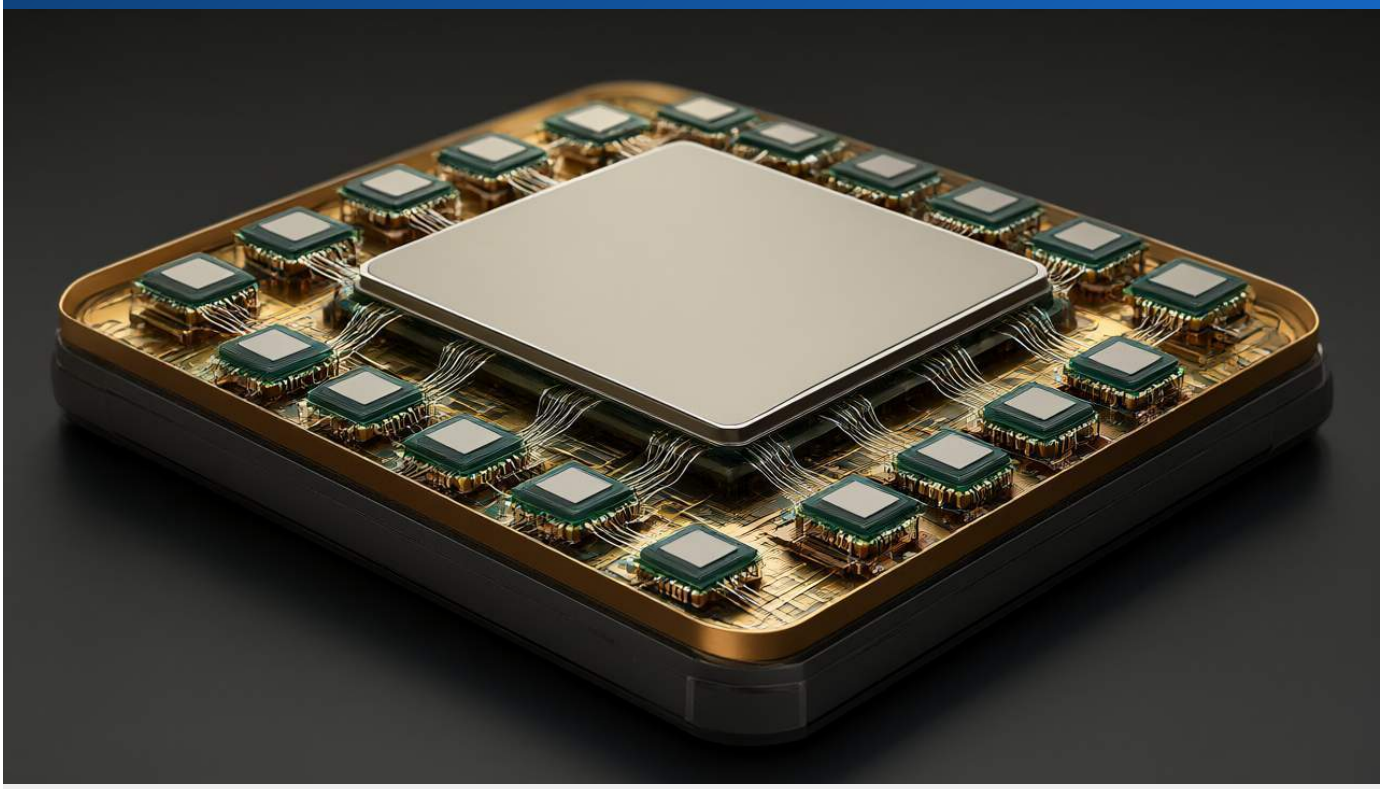
By turning optical transceivers into intelligent diagnostic endpoints, these standards provide operators with the visibility needed to address link flaps in environments where direct access is limited and disruption costs are high. James Kelly of the OCP Foundation noted that the true impact of these specifications will depend on ecosystem adoption. Further information is available via the OCP Academy's Optical Connectivity and Reliability for AI Infrastructure learning plan and the OCP Networking/OpticsReliability documentation.

Source: https://www.aol.com/articles/credo-oracle-advance-optical-transceiver-140000000.html

Collected: November 07, 2026 | Automated Research System (AI)

#04 Nvidia OOI Technology: CPO Roadmap and Packaging Evolution

Published November 01, 2026　新浪科技（DeepTech深科技より転載）　China



OVERVIEW

Nvidia has introduced Optics-on-Interposer (OOI), a next-generation CPO technology that moves optical engines onto the silicon interposer to reduce power and increase bandwidth density. This shift reflects a transition in optical communication competition toward advanced chip packaging to overcome the physical limits of high-speed electrical interconnects.

IN DEPTH

Key Findings

Nvidia is advancing its Co-Packaged Optics (CPO) strategy by introducing Optics-on-Interposer (OOI), a technology that integrates optical engines directly onto the silicon interposer shared with the computing chip. While OOI remains in the research phase, Nvidia is simultaneously scaling existing CPO production, partnering with SPIL to increase CPO optical engine capacity 15-fold by mid-2027 and doubling it again by the end of 2028.

Technical Details

OOI differs from current CPO solutions by bypassing the organic packaging substrate, shortening the electrical signal path between the chip and the optical engine. This design mirrors the logic of HBM connectivity. Additionally, Nvidia is researching Dense Wavelength Division Multiplexing (DWDM) to achieve a total bandwidth of 256Gb/s using eight different wavelengths in a single fiber.

The company's Spectrum-X Ethernet Photonics switches for the Vera Rubin platform have entered mass production. These systems provide 512 ports of 800Gb/s, totaling 409.6Tb/s of switching bandwidth. According to Nvidia, CPO reduces the power consumption of each 1.6Tb/s port to approximately one-fifth compared to traditional pluggable solutions.

Background and Context

The shift toward OOI is driven by the physical limitations of electrical interconnects. As single-channel rates reach 200Gb/s, signal loss across circuit boards and connectors increases, requiring higher power for equalization and driving circuits. To mitigate this, Nvidia is exploring "wider, slower" parallel interfaces on silicon interposers to reduce complexity and energy consumption.

Significance and Outlook

Integrating optical engines closer to the chip introduces significant engineering challenges, specifically thermal management for temperature-sensitive optical components and increased maintenance costs since integrated engines cannot be replaced as easily as pluggable modules. Testing efficiency is also a bottleneck; TrendForce notes that testing a photonic integrated circuit (PIC) can take over 100 seconds.

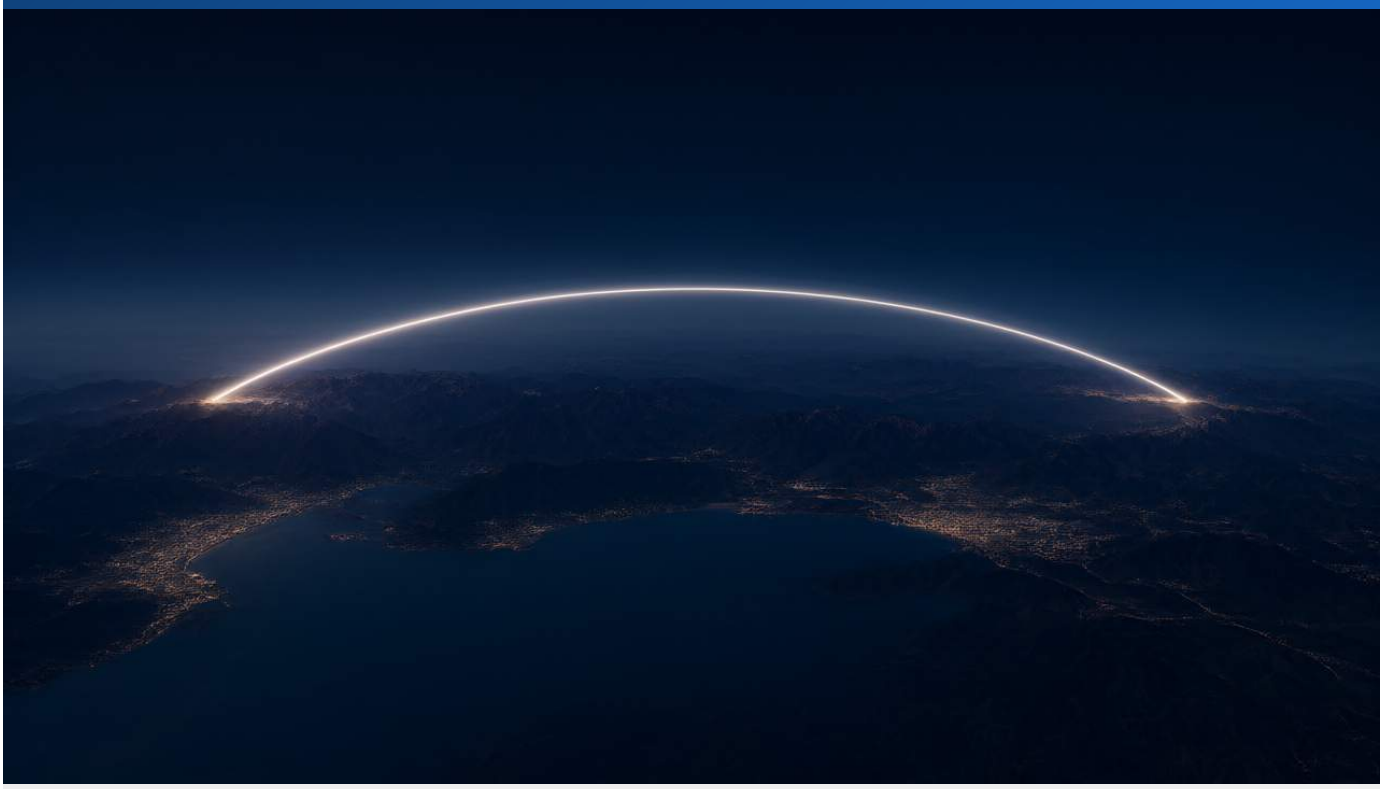
This evolution is reshaping the supply chain. Nvidia's current ecosystem includes TSMC for silicon photonics and COUPE technology, SPIL for packaging and testing, Lumentum and Coherent for external laser sources, and Foxconn for system integration.

Source: https://finance.sina.com.cn/tech/roll/2026-11-01/doc-inixfrfw7836335.shtml

Collected: November 07, 2026 | Automated Research System (AI)

#05 IOWN APN: 775Gbps Long-Distance Data Transfer Specs and Results

Published November 04, 2026 EE Times Japan Japan



OVERVIEW

A consortium including NII and NTT has demonstrated ultra-high-speed data transfer between Kobe and Kashiwa using IOWN All-Photonics Network (APN) technology. The experiment achieved speeds of approximately 775Gbps, reducing latency by about 20% compared to the SINET network.

IN DEPTH

Key Findings

Researchers have successfully demonstrated ultra-high-speed data transfer between storage systems located in Kobe and Kashiwa, Japan. Utilizing the All-Photonics Network (APN) based on the IOWN infrastructure, the team recorded a maximum transfer speed of approximately 775Gbps against a line bandwidth of 800Gbps, representing approximately 97% efficiency. The group confirmed that speeds exceeding 750Gbps could be maintained for several minutes.

Technical Details

The experimental setup connected an NTT West office in Osaka with an NTT East office in Kashiwa via an 800Gbps APN line. The endpoints—RIKEN Center for Computational Science (R-CCS) in Kobe and the University of Tokyo's Kashiwa campus—were connected to their nearest offices using two 400Gbps lines each. To verify performance, the team used two applications: the second-generation HPCI shared storage and "MMCFTP," a high-speed file transfer tool developed by NII. The MMCFTP setup utilized NII servers equipped with NVMe SSDs, connected via one 400GbE and four 100GbE interfaces. When both applications were used simultaneously, the peak speed of 775Gbps was achieved. Additionally, latency measurements showed a reduction of approximately 20% compared to the SINET academic network.

Background and Context

The project involves the National Institute of Informatics (NII), RIKEN, the University of Tokyo, NTT East, and NTT West. RIKEN's R-CCS operates the "Fugaku" supercomputer and seeks to enhance research environments by integrating AI, simulation, and quantum computing. The University of Tokyo's Information Infrastructure Center provides computing bases for "AI for Science." Together, RIKEN and the University of Tokyo already operate the HPCI shared storage, with each possessing approximately 100 petabytes of storage.

Significance and Outlook

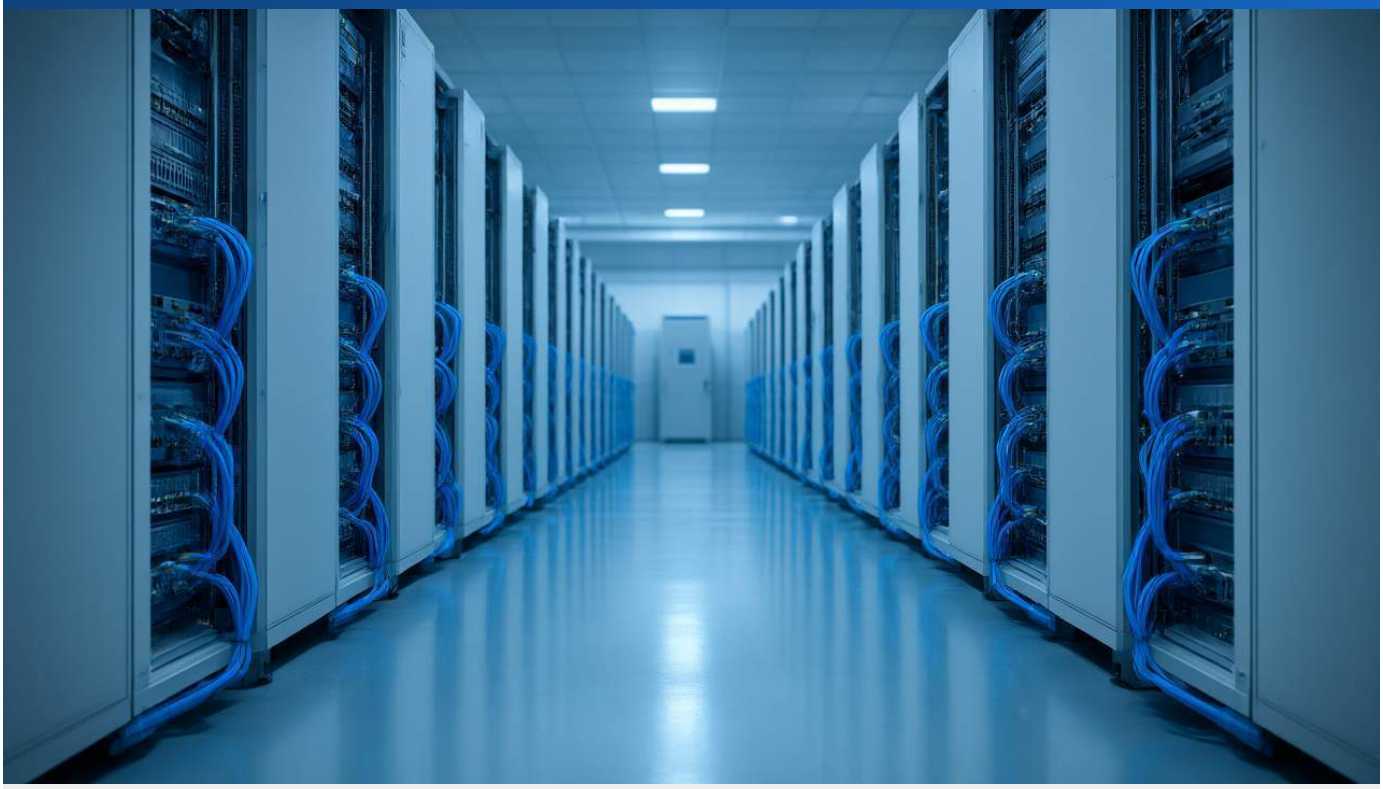
The group plans to conduct further Proof of Concept (PoC) tests for high-quality, large-scale data transfers. In November 2026, the team intends to extend the 400Gbps segment of this environment to Chicago for the SC26 conference. This will mark the first time a file transfer experiment between Japan and the U.S. utilizes lines of 400Gbps or higher across all sections, including international lines and servers.

Source: https://eetimes.itmedia.co.jp/ee/articles/2611/04/news026.html

Collected: November 07, 2026 | Automated Research System (AI)

#06 NVIDIA Spectrum-X CPO Switches: Liquid Cooling Supply Chain 2026

Published November 04, 2026　鉅亨號（Anue鉅亨）　Taiwan



OVERVIEW

NVIDIA has moved the Spectrum-X Ethernet CPO switch into mass production, featuring a 100% liquid-cooling coverage architecture. With shipment targets for 2026–2027 increased from 10,000 to 50,000 units, the system establishes a new high-value application for liquid cooling in AI data center interconnects.

IN DEPTH

Key Findings

NVIDIA's Spectrum-X Ethernet CPO (Co-Packaged Optics) switches have entered mass production, marking the first mass-produced 200G/lane CPO switch system. Foxconn (Hon Hai Technology Group) is the primary partner for system design, integration, and mass production, with Industrial Futuristic (FII) acting as the direct order recipient. Foxconn has established automated production lines for fiber alignment, assembly, and testing to transition CPO manufacturing from laboratory settings to industrial scale.

Technical Specifications

The switches are based on the Spectrum-6 chip, delivering a maximum single-chip bandwidth of 102.4Tb/s. Utilizing TSMC's 4nm silicon photonics and 3D advanced packaging, the system achieves the following performance improvements over previous generations:

- Laser count reduced by 4 times.
- Total power consumption reduced by 5 times.
- Mean Time Between Interrupts (MTBI) improved by 10 times.
- Optical signal loss reduced from 22dB to 4dB.
- Signal integrity improved by 64 times.

Liquid Cooling Architecture

The Spectrum-X CPO switches, specifically the SN6810-LD and SN6800-LD models, utilize a full liquid-cooling design with 100% coverage from the CPO chip to the optical modules. The SN6800-LD employs four Spectrum-6 ASICs with a maximum power consumption of approximately 10.5kW. The cooling system includes cold plate modules for the switch chip and integrated optical modules, stainless steel corrugated pipes, distribution manifolds, and high-precision quick-connect joints.

Supply Chain and Market Outlook

The product was jointly developed by TSMC, Lumentum, Silicon Labs, TFC (Tianyuan Communication), and Foxconn, with early commercial adoption by CoreWeave, Lambda, and Oracle. Within the liquid cooling supply chain, AVC (Asia Vital Components) holds the core supply share for cold plate modules, with Cooler Master holding a smaller portion. NVIDIA has revised its shipment targets for 2026–2027 upward from 10,000 to 50,000 units, creating a dedicated demand for 50,000 sets of CPO-specific liquid cooling systems.

Source: https://hao.cnyes.com/post/275823

Collected: November 07, 2026 | Automated Research System (AI)

#07 Isolator-Free Optical Transmitter: Waseda University 180 Gbit/s Specs

Published November 04, 2026 Waseda University Japan



OVERVIEW

Researchers have developed an integrated optical transmitter that achieves stable laser operation without an optical isolator by utilizing cross-platform spectral co-design. The device demonstrates data transmission speeds of 180 Gbit/s across a wavelength range of approximately 67 nm, enabling more compact high-capacity interconnects for AI and cloud data centers.

IN DEPTH

Key Findings

A research team led by Professor Tomohiro Kita of Waseda University has developed an integrated optical transmitter that eliminates the need for an optical isolator. The device achieves stable single-mode laser operation and demonstrates data transmission speeds of 180 Gbit/s. It operates across a broad wavelength range of approximately 67 nm and maintains stability without active temperature control.

Technical Details

The transmitter architecture integrates three primary components: a semiconductor gain chip, a silicon photonics circuit, and a thin-film lithium niobate (TFLN) modulator. Specifically, the system employs:

- **Silicon Nitride (SiN) Ring Resonators:** Two resonators form a Vernier filter that selects the lasing wavelength.
- **TFLN Modulator:** Incorporates an asymmetric Mach–Zehnder interferometer (AMZI) for high-speed data encoding.
- **Spectral Co-design:** By coordinating the wavelength-dependent transmission response of the AMZI with the SiN Vernier filter, the researchers shape the optical feedback returning to the laser, mitigating the destabilizing effects of reflections.

Background and Context

The rise of generative AI and cloud services has increased the demand for faster, more energy-efficient data exchange between data centers. While integrating silicon photonics-based tunable lasers with TFLN modulators is a promising path, these different platforms often introduce unwanted optical reflections. Conventional systems rely on optical isolators to block this backward-travelling light; however, these components increase the physical footprint of the transmitter.

Significance and Outlook

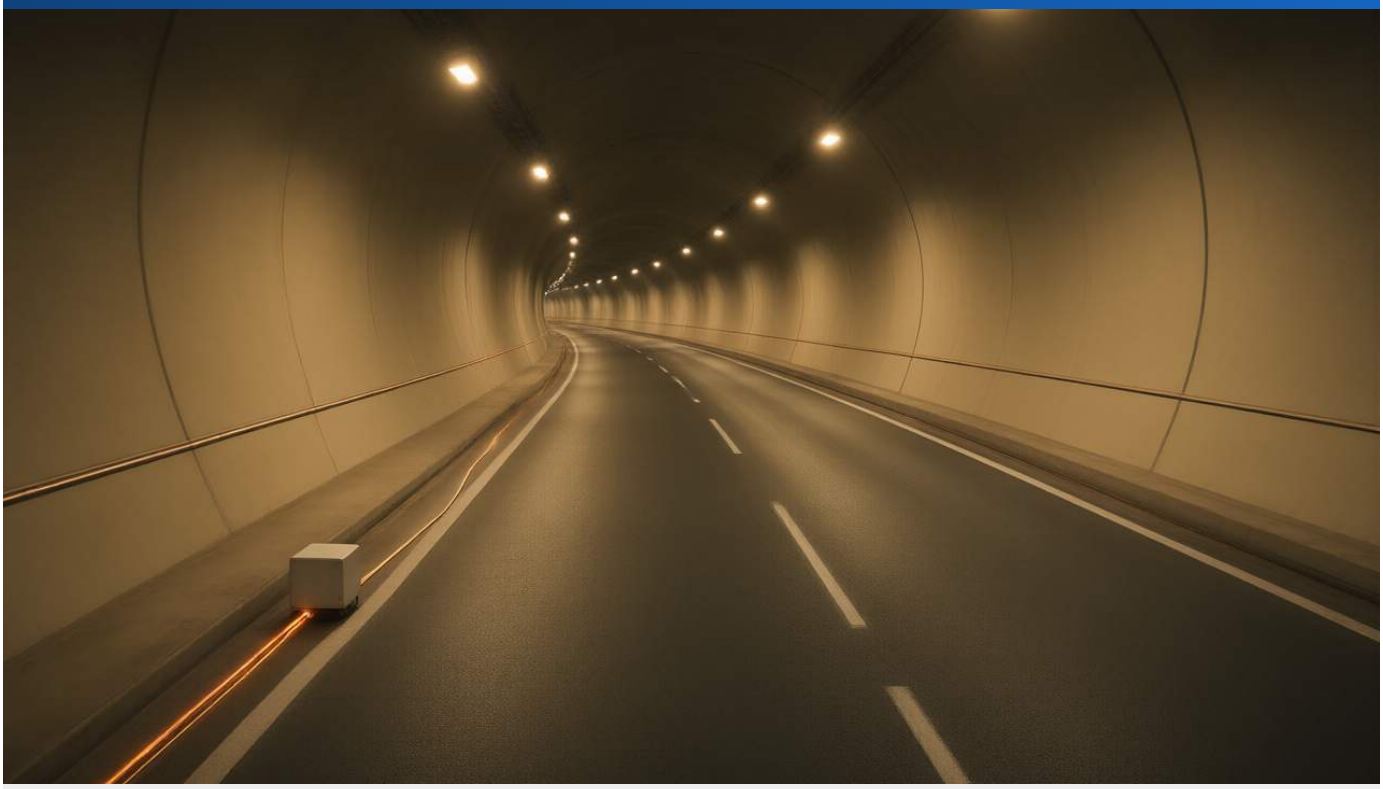
Eliminating the optical isolator simplifies the transmitter design and reduces its overall footprint, facilitating the integration of diverse photonic technologies into compact devices. According to Professor Kita, the broad wavelength tunability makes this technology particularly suitable for wavelength-division multiplexing, where multiple data channels are transmitted through a single fiber. This approach provides a pathway for next-generation photonic integrated circuits and high-capacity interconnects in AI data centers.

Source: https://www.waseda.jp/top/en/news/90021

Collected: November 07, 2026 | Automated Research System (AI)

#08 Optical Fiber Power Delivery: 10W Transmission for Fire Sensors

Published November 05, 2026 EE Times Japan Japan



OVERVIEW

The University of Electro-Communications and the Japan Expressway Engineering Center have achieved simultaneous bidirectional signal transmission and power delivery exceeding 10W over a single optical fiber. This technology enables the elimination of local power sources for fire detectors in highway tunnels, significantly reducing vulnerability to lightning strikes.

IN DEPTH

Key Findings

Researchers from the University of Electro-Communications and the Japan Expressway Engineering Center have successfully demonstrated a system capable of delivering over 10W of power while simultaneously transmitting bidirectional fire detection signals through a single optical fiber. This achievement allows for the "powerless" operation of fire detectors and transmitters located within highway tunnels, as they can be powered by a single light source located at a control station.

Technical Details

The system utilizes a double-clad optical fiber featuring a large-diameter pure silica core. This specific architecture allows for power delivery levels ten times higher than previous methods. While double-clad fibers consisting of a small-diameter core for signals and a large-diameter core for power already existed, they were unable to provide sufficient power to drive fire detection equipment. The implementation of the pure silica large-diameter core resolved this limitation. In the experimental setup, the researchers utilized an optical fiber with a length of 300m.

Background and Context

Electrical equipment installed along highways is susceptible to failure caused by induced currents from lightning strikes. In mountainous regions where lightning is frequent, the failure of fire detectors or control station equipment in tunnels can lead to severe accidents. To mitigate this risk, the research team sought to utilize optical fibers as power lines, as they are immune to the electrical interference that affects traditional copper wiring.

Significance and Outlook

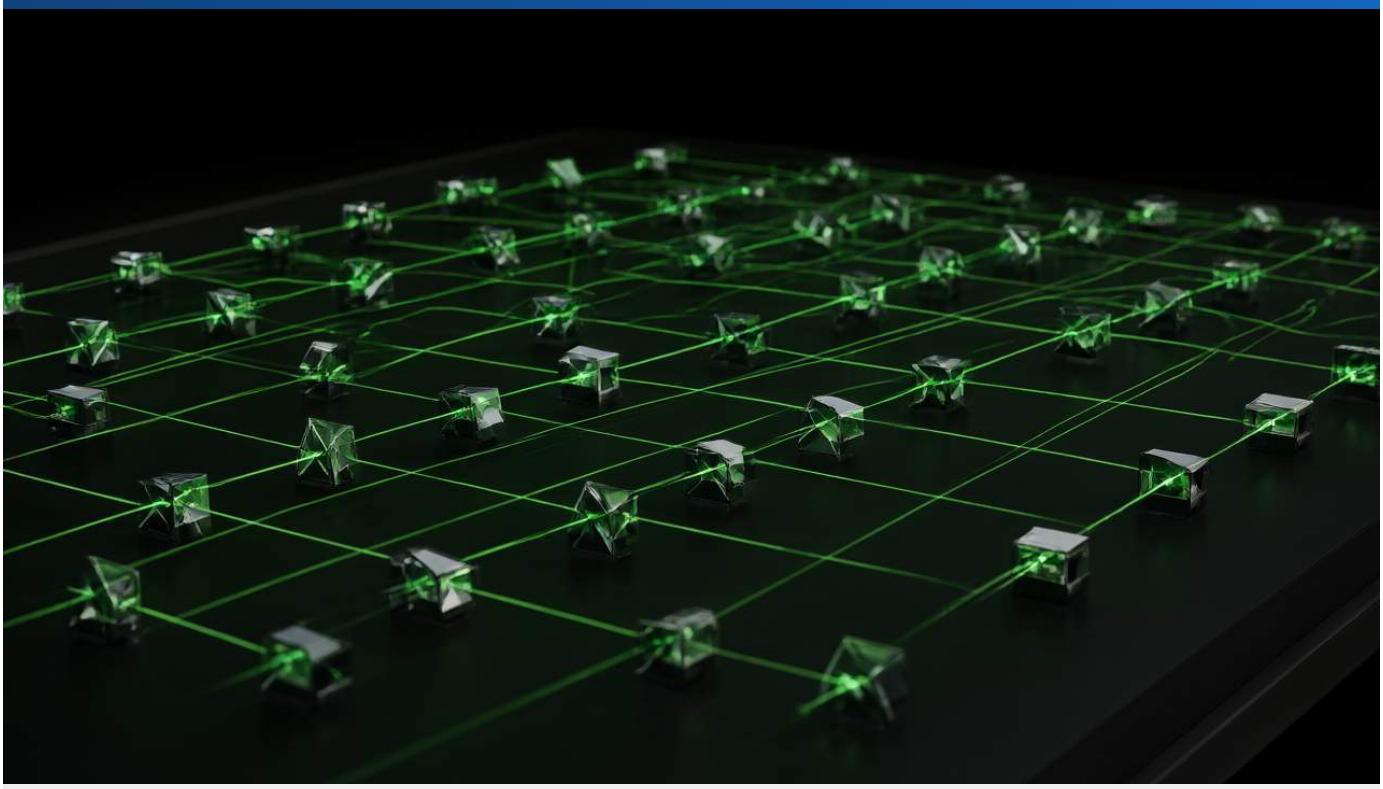
By removing the need for local power supplies at the sensor site, the system enhances the reliability of critical safety infrastructure in high-risk environments. Moving forward, the research group intends to conduct further verification experiments over longer distances to move toward the practical implementation of this optical fiber-powered fire detection system.

Source: https://eetimes.itmedia.co.jp/ee/articles/2611/05/news037.html

Collected: November 07, 2026 | Automated Research System (AI)

#09 Jiuzhang 4: Optical Quantum Computing Speed and PQC Roadmap

Published November 05, 2026　中国科技网（科技日报）　China



OVERVIEW

The Jiuzhang 4 optical quantum computing prototype has set a new world record, performing a Gaussian Boson Sampling task in 25 microseconds. This leap in quantum power is accelerating the transition to Post-Quantum Cryptography (PQC) to protect high-value assets against future decryption risks.

IN DEPTH

Key Findings

The "Jiuzhang 4" optical quantum computing prototype, led by the University of Science and Technology of China, received the Leading Technology Award at the 2026 World Internet Conference on November 2. It was one of only two basic research achievements selected from over 430 entries submitted by 43 countries and regions.

Technical Details

In solving the specific mathematical problem of Gaussian Boson Sampling, Jiuzhang 4 generated a sample in 25 microseconds. In comparison, the El Capitan supercomputer, using the most advanced classical algorithms, would require more than 10^42 years to complete the same task. This represents a computational speed increase of 10^54 times over the supercomputer, establishing a new world record in optical quantum computing.

Background and Context

The acceleration of quantum computing has highlighted urgent security vulnerabilities. On March 31, 2026, Google published a white paper estimating that an optimized Shor's algorithm could derive a private key from a public key for Bitcoin's Elliptic Curve Cryptography (ECC-256) in 9 minutes, theoretically requiring approximately 500,000 physical qubits.

In response, the U.S. National Institute of Standards and Technology (NIST) released "Transitioning to Post-Quantum Cryptography Standards" on October 27. The guidelines mandate that federal high-value assets and high-impact systems complete the migration of key establishment by the end of 2030 and digital signatures by the end of 2031, with an overall migration target year of 2035.

Significance and Outlook

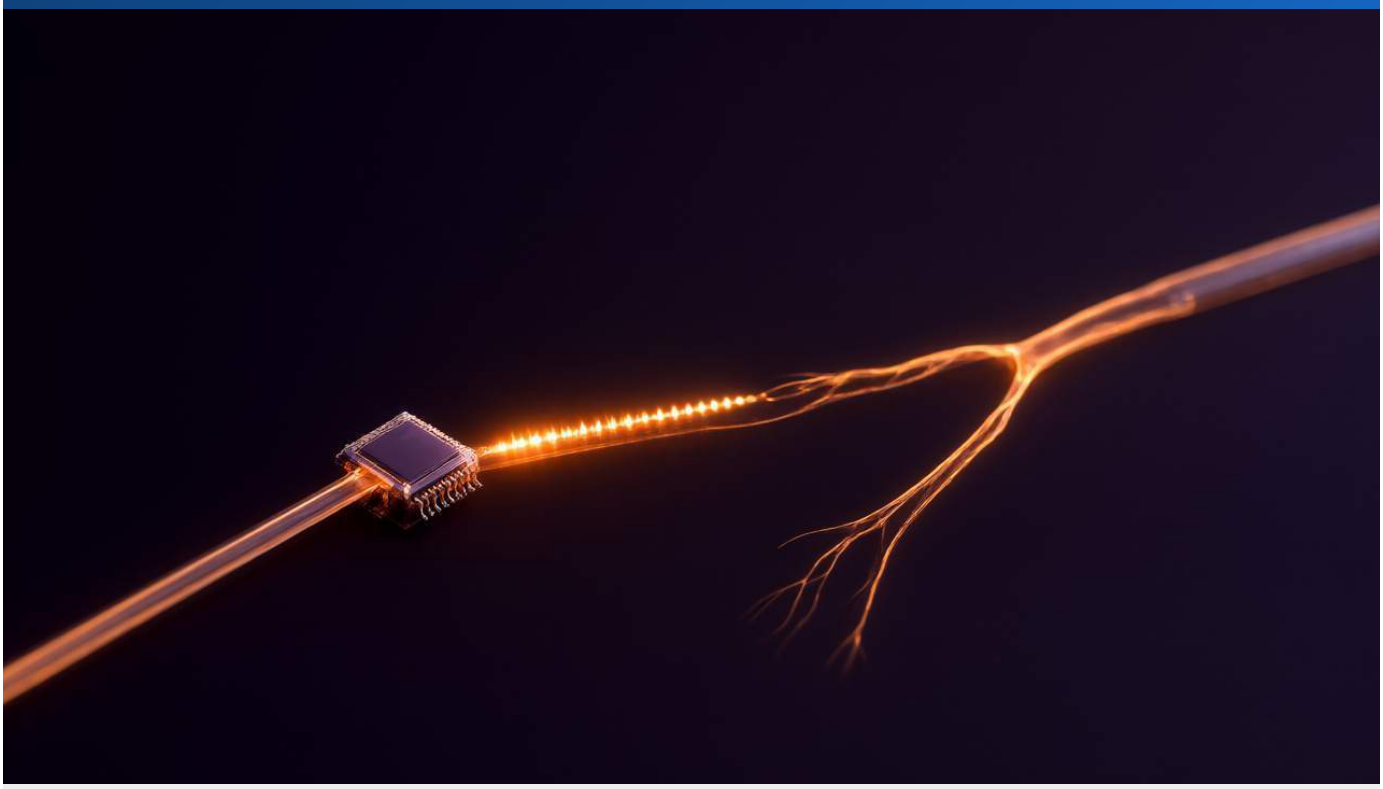
Engineering responses to these threats are emerging. In September 2026, Xuanyue Technology, incubated by the Zhejiang University Huzhou Research Institute, released the "Xuanyue Tianjian Quantum Zero Trust" system. This system utilizes a hybrid route combining national cryptographic standards with PQC, supporting ML-KEM key encapsulation and ML-DSA digital signatures integrated with the SM2/SM4/TLCP framework. This approach aims to protect data with secrecy cycles of ten or more years against "harvest now, decrypt later" quantum risks.

Source: https://www.stdaily.com/web/gdxw/2026-11/05/content_609057.html

Collected: November 07, 2026 | Automated Research System (AI)

#10 All-Optical Spike Encoder: 2.0 GHz Neuromorphic Fiber Integration

Published November 06, 2026 Mirage News China



OVERVIEW

Researchers from Fudan University and Zhangjiang Laboratory have developed an all-optical biomimetic spike encoder using optically injected Fabry–Perot (FP) laser neurons. The system achieves spike rates above 2.0 GHz with 5-bit encoding precision and 0.5 pJ per spike energy consumption, enabling high-speed neuromorphic computing over existing fiber networks.

IN DEPTH

Key Findings

The developed all-optical spike encoder enables the conversion of analogue sensory signals into optical spike sequences with spike rates exceeding 2.0 GHz. Operating at the 1,550 nm telecommunication band, the system demonstrates approximately 5-bit encoding precision and consumes only 0.5 pJ of energy per spike. When integrated with digital spiking neural networks (SNNs), the system achieved a 94.1% classification accuracy for handwritten digit recognition using the MNIST dataset.

Technical Details

The encoder is based on optically injected Fabry–Perot (FP) laser neurons. Unlike previous binary-output devices, this setup establishes a steady monotonic correlation where stronger input optical intensity results in a higher spike firing rate. The team achieved amplitude-to-rate encoding by tuning the following parameters:

- Injection power
- Laser frequency detuning
- FP laser bias current

The architecture is scalable, supporting both time-division and wavelength-division multiplexing. Testing confirmed that spike encoding performance remains robust after transmission over 10 km of single-mode fiber.

Background & Context

Brain-inspired SNNs offer lower latency and energy consumption than conventional artificial neural networks by processing information via discrete spike pulses. However, a significant hurdle has been the efficient conversion of real-world analogue signals into reliable optical spikes. Existing electrical generators are limited by low spike rates, while previous optical devices often lacked stable linear mapping between input strength and firing frequency or compatibility with standard fiber-optic infrastructure.

Significance & Outlook

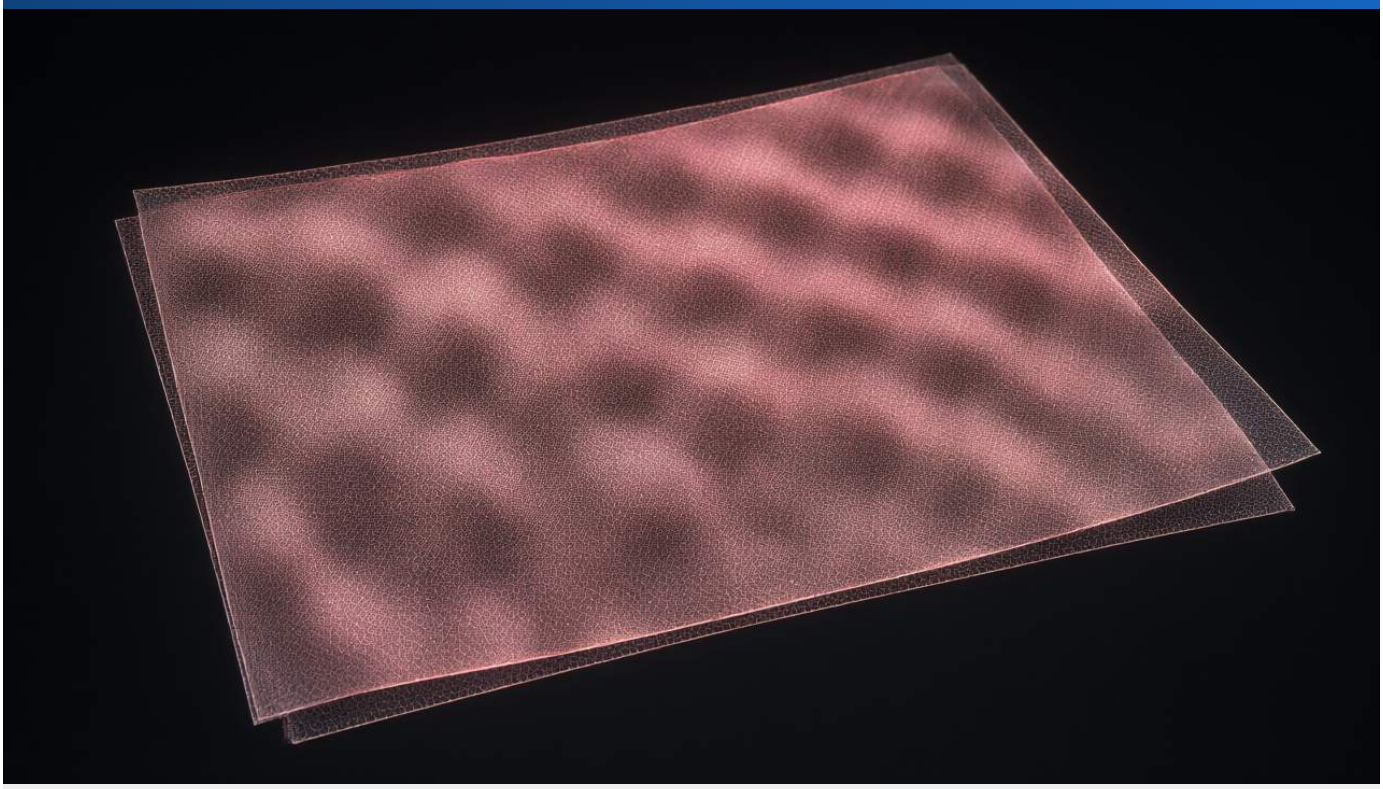
This research, published in Volume 5 of the Opto-Electronic Science journal on October 19, 2026, provides a practical route for merging photonic spike encoders with existing fiber networks. The team demonstrated proof-of-concept applications in intelligent healthcare diagnosis, including chest X-ray screening, electrocardiogram arrhythmia identification, and heart-sound classification. By translating continuous physiological and audio waveforms into ordered spike trains, the technology moves photonic neuromorphic computing toward practical, low-power communication and healthcare applications.

Source: https://www.miragenews.com/ultrafast-optical-encoder-enables-neuromorphic-1773271/

Collected: November 07, 2026 | Automated Research System (AI)

#11 ReS2/ReSe2 Heterostructures: Infrared Light Control via Twist-Tuning

Published November 06, 2026 유스라인 South Korea



OVERVIEW

Researchers at Sungkyunkwan University have developed a method to control the color and polarization of infrared light by twisting layers of atomic-scale semiconductors. The team achieved a light energy control range of approximately 100 meV, providing a new platform for ultra-low power optical devices and quantum computing.

IN DEPTH

Key Findings

A research team led by Professor Jung-Yong Kim at Sungkyunkwan University has developed a world-first technology to freely control the color (energy) and vibration direction (polarization) of infrared light. By stacking two atomic-layer semiconductors and adjusting the twist angle, the team successfully generated stable interlayer exciton light in the infrared spectrum across various rotation angles.

Technical Details

The researchers utilized anisotropic semiconductor materials, specifically rhenium disulfide (ReS2) and rhenium diselenide (ReSe2). By twisting the layers at angles ranging from 1 to 88 degrees, they created "Moiré patterns" within the atomic lattices, similar to the patterns formed by overlapping mosquito nets.

- **Energy Control:** By combining the twist angle and the number of layers, the team achieved a light energy control range of approximately 100 meV, which is described as a world-leading level for 2D semiconductors.
- **Intensity and Polarization:** Increasing the number of layers enhanced light brightness by more than 10 times and enabled the precise control of the polarization direction.

Background & Context

When light hits a semiconductor, electrons (negative charge) and holes (positive vacancies) pair to form "excitons." In "interlayer excitons," where the electron and hole reside in different layers, the lifespan is dozens of times longer than standard excitons, making them easier to manipulate via external voltage. Previously, 2D semiconductors were limited to specific angles (0 or 60 degrees) for light emission or polarization changes, restricting their practical application.

Significance & Outlook

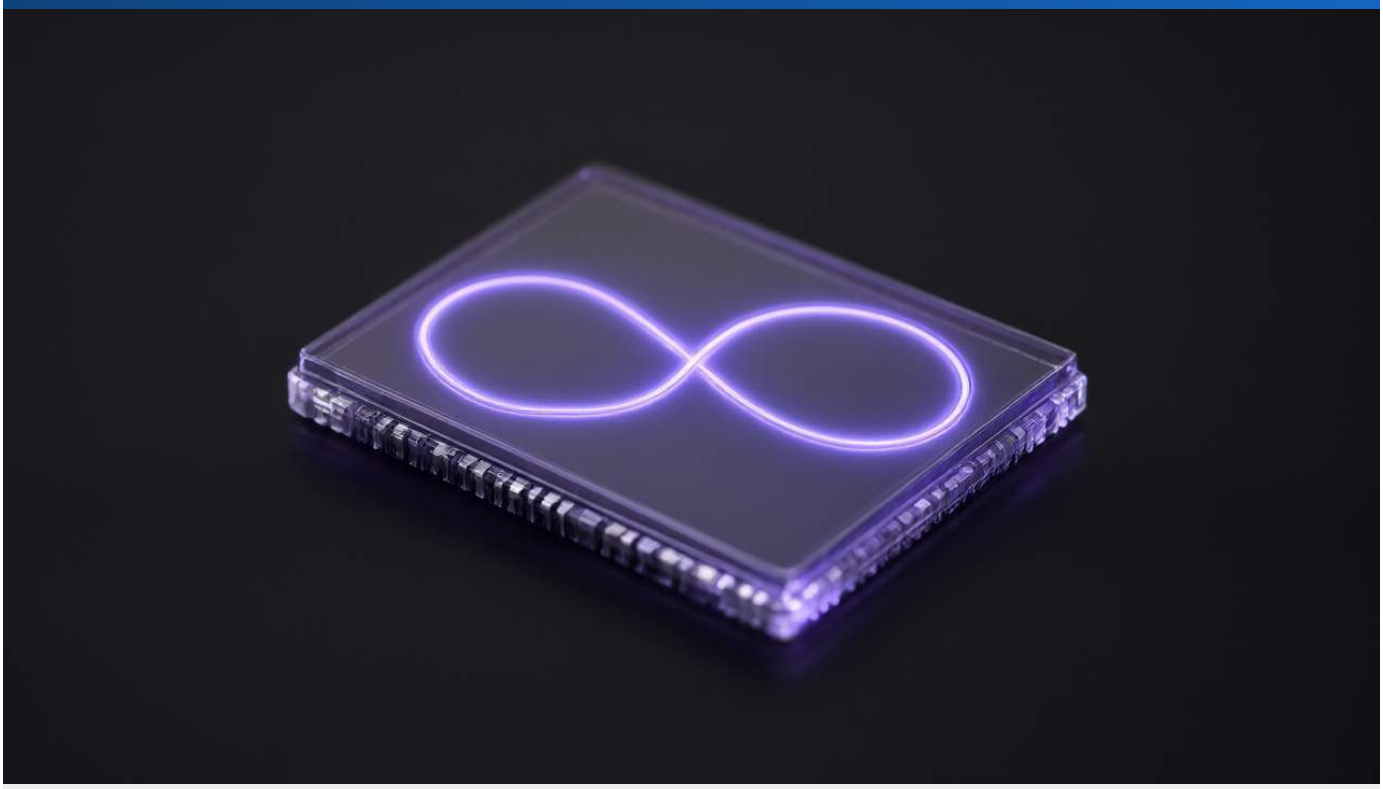
This technology overcomes the structural limitations of existing 2D materials by providing a single nano-semiconductor platform that simultaneously controls light energy and polarization. Potential applications include LiDAR for autonomous vehicles, night vision surveillance equipment, and high-precision biosensors. The research was supported by the National Research Foundation of Korea (NRF) and published in *ACS Nano*.

Source: https://www.usline.kr/news/articleView.html?idxno=35298

Collected: November 07, 2026 | Automated Research System (AI)

#12 Photonic Q-DFT: Simulating LiH with $O(\log_2 N)$ Qubit Scaling

Published November 04, 2026 Quantum Zeitgeist USA



OVERVIEW

Researchers have simulated the electronic structure of lithium hydride (LiH) using a quantum density functional theory (Q-DFT) approach on a programmable integrated photonic circuit. The method reduces qubit requirements to $O(\log_2 N)$ scaling, allowing the simulation of LiH with only two qubits compared to the twelve required by conventional wavefunction theory. This efficiency establishes a pathway for simulating larger, more complex molecular systems on near-term quantum hardware.

IN DEPTH

Key Findings

Researchers from Sapienza Università di Roma and the Istituto di Fotonica e Nanotecnologie (IFN-CNR) have successfully simulated the electronic structure of lithium hydride (LiH) using a quantum density functional theory (Q-DFT) approach. The primary achievement is the reduction of qubit scaling to $O(\log_2 N)$ for a system of N orbitals. In a practical application, the team simulated the LiH molecule using only two qubits, whereas conventional wavefunction theory approaches typically require twelve qubits for the same system.

Technical Details

The simulation was implemented on a programmable integrated photonic circuit integrating a deterministic quantum dot single-photon source. The team utilized an ensemble extension of the variational quantum eigensolver (VQE) paradigm to minimize the energy of the LiH molecule within the subspace of its ground and first excited states. To refine the simulation, the researchers used the qlass software for state-vector simulations paired with a classical COBYLA optimizer.

- **Convergence Criteria:** Energy change below 10–5 Hartree and root mean square deviation change in density below 10–4 between iterations.
- **Performance:** The self-consistent field loop required six iterations in noiseless simulations, compared to seven iterations in reference PySCF results.
- **Validation:** Ten simulations initialized with random parameter values and using 10^9 shots showed consistent convergence.

Background & Context

Conventional quantum computing architectures typically demand a linear increase in qubit count as system size grows, creating a significant hardware hurdle for complex molecular modeling. This research bypasses that limitation by reformulating the many-body problem into a Kohn-Sham reference system. The study also included noisy models that accounted for photon-counting statistics and partial photon distinguishability. Contributions to the research were also provided by Nathan Shammah (Unitary Fund France) and Bruno Senjean (ICGM, Université de Montpellier, CNRS, ENSCM).

Significance & Outlook

The integration of qubit-efficient algorithms with reconfigurable photonic hardware allows for the simulation of molecular systems previously inaccessible due to hardware constraints. While the current accuracy is limited by the approximate density functional employed, the researchers indicate that improvements in theoretical methods could enhance precision. This architecture provides a viable pathway for near-term quantum chemistry applications involving increasingly complex molecular systems.

Source: https://quantumzeitgeist.com/fotonica-nanotecnologie-photonic-qubits-lithium-hydride/

Collected: November 07, 2026 | Automated Research System (AI)