TROY TECHNICAL

QUANTUM COMPUTING
WEEKLY REPORT

November 14 - November 20, 2026 | Issue 2026-W46

Verified computational advantage, error control and usable access

10	10
ANALYZED ARTICLES	PRIORITY THEMES

Issued 2026-11-20 | English edition | fixed approved cover artwork



Quantum Computing: the boundary moved from isolated claims to qualification evidence

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

SIGNAL 01 | QUBIT DEVICE

Quantum Position Verification: Device-Independent Protocol 2026

Researchers have experimentally demonstrated a Bell-test quantum position verification (QPV) protocol that secures location authentication using remote untrusted devices.

SIGNAL 02 | CONTROL STACK

QuEra and Berkeley Lab: Quantum Dynamics Study on 180 Qubits

QuEra Computing and Lawrence Berkeley National Laboratory have published a Nature study observing new physical phenomena in quantum systems using the Aquila neutral-atom quantum computer.

SIGNAL 03 | ERROR CORRECTION

CryoCMOS RF Multiplexer: 10 mK Operation and 200 pW Power Specs

Researchers have developed a cryogenic CMOS (cryoCMOS) RF multiplexer capable of operating at 10 millikelvin with a record-low static power consumption of 200 pW.

SIGNAL 04 | SYSTEM ACCESS

Hollow-Core Fiber QKD: Coexistence with 2.3 Tbps Classical Data

Researchers have demonstrated entanglement-based high-dimensional quantum key distribution (HD-QKD) coexisting with classical data over an 18-km hollow-core fiber (HCF) link.

DECISION

Focus this week's management attention on verified computational advantage, error control and usable access. Move only when the linked evidence can be reproduced under your own operating conditions.

THREE MANAGEMENT MOVES

1. Buyers: benchmark valuable workloads against classical alternatives, including total execution and validation cost.
2. Suppliers: tie components and control systems to fidelity, uptime, calibration and scaling evidence.
3. Executives: track error rates, logical qubits, workload advantage, uptime, cost and roadmap timing.

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.

Numbers and evidence anchors that require conditions

98.3%
A04

SOURCE-BOUND CONDITION
The chip achieved a 98.3% win rate in a four-qubit magic square game and scaled classical-beating performance up to 71 qubits.

21%
A07

SOURCE-BOUND CONDITION
The hybrid quantum reservoir network (QRN) reduced forecast error by 21% to 41% compared to classical latent linear baselines.

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

Qubit device

P01/P06

Researchers have experimentally demonstrated a Bell-test quantum position verification (QPV) protocol that secures location.

2

Control stack

P02/P07

QuEra Computing and Lawrence Berkeley National Laboratory have published a Nature study observing new physical phenomena in.

3

Error correcti on

P03/P08

Researchers have developed a cryogenic CMOS (cryoCMOS) RF multiplexer capable of operating at 10 millikelvin with a.

4

System acces s

P04/P09

Researchers have demonstrated entanglement-based high-dimensional quantum key distributi on (HD-QKD) coexistin g with classical.

5

Applications

P05/P10

IBM, NVIDIA, and Fermilab have introduced a modular quantum-classical co-design platform and integrated quantum resource.

EVIDENCE REQUIRED AT EACH HANDOFF

Qubit device to Control stack	Transfer test conditions, acceptance criteria, failure data, owner and decision date. Recheck error rates, logical qubits, workload advantage, uptime, cost and roadmap timing.
Control stack to Error correction	Transfer test conditions, acceptance criteria, failure data, owner and decision date. Recheck error rates, logical qubits, workload advantage, uptime, cost and roadmap timing.
Error correction to System access	Transfer test conditions, acceptance criteria, failure data, owner and decision date. Recheck error rates, logical qubits, workload advantage, uptime, cost and roadmap timing.
System access to Applications	Transfer test conditions, acceptance criteria, failure data, owner and decision date. Recheck error rates, logical qubits, workload advantage, uptime, cost and roadmap timing.

COMMON CONTROL POINT

No theme moves to a commercial commitment until a named owner has reproduced the relevant evidence and documented error rates, logical qubits, workload advantage, uptime, cost and roadmap timing.

Priority map: maturity and next decision locus



P01	Quantum Position Verification: Device-Independent Protocol 2026 Business / rules | cue: infrastructure
P02	QuEra and Berkeley Lab: Quantum Dynamics Study on 180 Qubits System / adoption | cue: order
P03	CryoCMOS RF Multiplexer: 10 mK Operation and 200 pW Power Specs Tech / process | cue: no system/business cue
P04	Hollow-Core Fiber QKD: Coexistence with 2.3 Tbps Classical Data Business / rules | cue: capacity
P05	IBM, NVIDIA, and Fermilab: Quantum Co-Design and Slurm 26.11 Integration System / adoption | cue: Integration
P06	Google Willow Chip: Quantum Contextuality vs Classical Limits Tech / process | cue: no system/business cue
P07	SEAFOOD Platform: Osaka University's Quantum-Supercomputer Integration Timeline System / adoption | cue: Platform
P08	QodeX Quantum and NVIDIA: Forecasting PDEs on 52-Qubit IBM Hardware Tech / process | cue: no system/business cue
P09	Google Quantum AI: Measurement Contextuality on 105 Qubits Tech / process | cue: no system/business cue
P10	Iron-Sulfur Cluster Simulation: IBM, RIKEN, and NVIDIA's 79x Gain Tech / process | cue: no system/business cue

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 Quantum Position Verification: Device-Independent Protocol 2026

A01 | Qubit device | Pilot

2026-11-18

FACT

Researchers have experimentally demonstrated a Bell-test quantum position verification (QPV) protocol that secures location authentication using remote untrusted devices. The system achieves a one-dimensional localization 2.47(2) times smaller than the best non-remote classical protocols, providing a certifiable quantum advantage. This enables digital security to be anchored to physically trusted locations for critical infrastructure and financial transactions.

WHY IT MATTERS

The decision relevance is verified computational advantage, error control and usable access. 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, tie components and control systems to fidelity, uptime, calibration and scaling evidence.

ACTION

Within 30 days, benchmark valuable workloads against classical alternatives, including total execution and validation cost; record the evidence and owner against P01.

UNKNOWN

Still unproven or incompletely stated: error rates, logical qubits, workload advantage, uptime, cost and roadmap timing.

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

P02 QuEra and Berkeley Lab: Quantum Dynamics Study on 180 Qubits

A05 | Control stack | Pilot

2026-11-18

FACT

QuEra Computing and Lawrence Berkeley National Laboratory have published a Nature study observing new physical phenomena in quantum systems using the Aquila neutral-atom quantum computer. The research identified prethermal states and a first-order dynamical phase transition in arrays of up to 180 atoms. These findings enhance the understanding of quantum-scale material processes that are computationally expensive to simulate classically.

WHY IT MATTERS

The decision relevance is verified computational advantage, error control and usable access. 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, tie components and control systems to fidelity, uptime, calibration and scaling evidence.

ACTION

Within 30 days, benchmark valuable workloads against classical alternatives, including total execution and validation cost; record the evidence and owner against P02.

UNKNOWN

Still unproven or incompletely stated: error rates, logical qubits, workload advantage, uptime, cost and roadmap timing.

EDITORIAL SCORE 20/25 | MATURITY 2/5 | DECISION LOCUS: SYSTEM / ADOPTION

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

P03 CryoCMOS RF Multiplexer: 10 mK Operation and 200 pW Power Specs

A02 | Error correction | Pilot

2026-11-14

FACT

Researchers have developed a cryogenic CMOS (cryoCMOS) RF multiplexer capable of operating at 10 millikelvin with a record-low static power consumption of 200 pW. The device enables the multiplexing of readout, flux, and XY drive lines for superconducting qubits, addressing the input-output bottleneck in large-scale quantum systems.

WHY IT MATTERS

The decision relevance is verified computational advantage, error control and usable access. 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, tie components and control systems to fidelity, uptime, calibration and scaling evidence.

ACTION

Within 30 days, benchmark valuable workloads against classical alternatives, including total execution and validation cost; record the evidence and owner against P03.

UNKNOWN

Still unproven or incompletely stated: error rates, logical qubits, workload advantage, uptime, cost and roadmap timing.

EDITORIAL SCORE 20/25 | MATURITY 2/5 | DECISION LOCUS: TECH / PROCESS

P04 Hollow-Core Fiber QKD: Coexistence with 2.3 Tbps Classical Data

A03 | System access | Product adoption

2026-11-17

FACT

Researchers have demonstrated entanglement-based high-dimensional quantum key distribution (HD-QKD) coexisting with classical data over an 18-km hollow-core fiber (HCF) link. The system achieved an average secret key rate of 10.56 kbps while supporting a theoretical data capacity of up to 2.3 Tbps. This approach overcomes the nonlinearity limits of silica-core fibers, enabling scalable quantum-classical integration.

WHY IT MATTERS

The decision relevance is verified computational advantage, error control and usable access. 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, tie components and control systems to fidelity, uptime, calibration and scaling evidence.

ACTION

Within 30 days, benchmark valuable workloads against classical alternatives, including total execution and validation cost; record the evidence and owner against P04.

UNKNOWN

Still unproven or incompletely stated: error rates, logical qubits, workload advantage, uptime, cost and roadmap timing.

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

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

P05 IBM, NVIDIA, and Fermilab: Quantum Co-Design and Slurm 26.11 Integration

A08 | Applications | Research

2026-11-16

FACT

IBM, NVIDIA, and Fermilab have introduced a modular quantum-classical co-design platform and integrated quantum resource scheduling into Slurm 26.11. The initiative includes GPU-accelerated QEC tools and the co-location of NVIDIA DGX B200 systems with IBM Quantum Nighthawk processors to advance simulations in nuclear physics and neutrino interactions.

WHY IT MATTERS

The decision relevance is verified computational advantage, error control and usable access. 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, tie components and control systems to fidelity, uptime, calibration and scaling evidence.

ACTION

Within 30 days, benchmark valuable workloads against classical alternatives, including total execution and validation cost; record the evidence and owner against P05.

UNKNOWN

Still unproven or incompletely stated: error rates, logical qubits, workload advantage, uptime, cost and roadmap timing.

EDITORIAL SCORE 20/25 | MATURITY 1/5 | DECISION LOCUS: SYSTEM / ADOPTION

P06 Google Willow Chip: Quantum Contextuality vs Classical Limits

A04 | Qubit device | Research

2026-11-19

FACT

Google Quantum AI's Willow processor demonstrated quantum advantage in cooperative games by beating classical winning limits using quantum contextuality. The chip achieved a 98.3% win rate in a four-qubit magic square game and scaled classical-beating performance up to 71 qubits. These results provide a new method for identifying hardware errors that traditional checks may miss.

WHY IT MATTERS

The decision relevance is verified computational advantage, error control and usable access. 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, tie components and control systems to fidelity, uptime, calibration and scaling evidence.

ACTION

Within 30 days, benchmark valuable workloads against classical alternatives, including total execution and validation cost; record the evidence and owner against P06.

UNKNOWN

Still unproven or incompletely stated: error rates, logical qubits, workload advantage, uptime, cost and roadmap timing.

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

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

P07 SEAFOOD Platform: Osaka University's Quantum-Supercomputer Integration Timeline

A09 | Control stack | Pilot

2026-11-14

FACT

The University of Osaka has developed SEAFOOD, a hybrid infrastructure linking the OCTOPUS supercomputer with domestic superconducting quantum processors. Scheduled for formal operation in December 2026, the platform enables the partitioning of complex workloads between classical and quantum hardware to optimize drug discovery and materials engineering simulations.

WHY IT MATTERS

The decision relevance is verified computational advantage, error control and usable access. 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, tie components and control systems to fidelity, uptime, calibration and scaling evidence.

ACTION

Within 30 days, benchmark valuable workloads against classical alternatives, including total execution and validation cost; record the evidence and owner against P07.

UNKNOWN

Still unproven or incompletely stated: error rates, logical qubits, workload advantage, uptime, cost and roadmap timing.

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

P08 QodeX Quantum and NVIDIA: Forecasting PDEs on 52-Qubit IBM Hardware

A07 | Error correction | Research

Prior release 2026-11-13

FACT

A research collaboration has demonstrated gradient-free forecasting of nonlinear partial differential equations (PDEs) on unstructured engineering meshes using an IBM Quantum Heron r3 processor. The hybrid quantum reservoir network (QRN) reduced forecast error by 21% to 41% compared to classical latent linear baselines. This approach enables the decoupling of complex boundary geometries from quantum circuit topology.

WHY IT MATTERS

The decision relevance is verified computational advantage, error control and usable access. 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, tie components and control systems to fidelity, uptime, calibration and scaling evidence.

ACTION

Within 30 days, benchmark valuable workloads against classical alternatives, including total execution and validation cost; record the evidence and owner against P08.

UNKNOWN

Still unproven or incompletely stated: error rates, logical qubits, workload advantage, uptime, cost and roadmap timing.

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

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

P09 Google Quantum AI: Measurement Contextuality on 105 Qubits

A10 | System access | Pilot

2026-11-19

FACT

Google Quantum AI has demonstrated that quantum measurement contextuality persists at a many-body scale using 72-qubit and 105-qubit Willow processors. The research establishes a hardware benchmark for coherent control errors and shows measurable computational separations in bounded-resource tasks.

WHY IT MATTERS

The decision relevance is verified computational advantage, error control and usable access. 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, tie components and control systems to fidelity, uptime, calibration and scaling evidence.

ACTION

Within 30 days, benchmark valuable workloads against classical alternatives, including total execution and validation cost; record the evidence and owner against P09.

UNKNOWN

Still unproven or incompletely stated: error rates, logical qubits, workload advantage, uptime, cost and roadmap timing.

EDITORIAL SCORE 19/25 | MATURITY 2/5 | DECISION LOCUS: TECH / PROCESS

P10 Iron-Sulfur Cluster Simulation: IBM, RIKEN, and NVIDIA's 79x Gain

A06 | Applications | Pilot

2026-11-16

FACT

IBM, RIKEN, and NVIDIA have achieved a 79-fold improvement in energy accuracy for quantum-classical simulations of strongly correlated iron-sulfur clusters. By utilizing broken-symmetry unrestricted Hartree-Fock (BS-UHF) reference states, the team brought ground-state energy estimates within 4.3 millihartree of high-precision benchmarks. This advancement enables more accurate modeling of biological electron transfer and catalysis.

WHY IT MATTERS

The decision relevance is verified computational advantage, error control and usable access. 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, tie components and control systems to fidelity, uptime, calibration and scaling evidence.

ACTION

Within 30 days, benchmark valuable workloads against classical alternatives, including total execution and validation cost; record the evidence and owner against P10.

UNKNOWN

Still unproven or incompletely stated: error rates, logical qubits, workload advantage, uptime, cost and roadmap timing.

EDITORIAL SCORE 19/25 | MATURITY 2/5 | DECISION LOCUS: TECH / PROCESS

Playbook and 0-5 year roadmap

STAKEHOLDER	NOW | 0-30 DAYS	NEXT | 1-12 MONTHS	LATER | 1-5 YEARS
Operating companies	benchmark valuable workloads against classical alternatives, including total execution and validation cost	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	tie components and control systems to fidelity, uptime, calibration and scaling evidence	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 error rates, logical qubits, workload advantage, uptime, cost and roadmap timing.	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 01-10

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	Quantum Position Verification: Device-Independent Protocol 2026	https://doi.org/10.1038/s41586-026-11247-3
A02	CryoCMOS RF Multiplexer: 10 mK Operation and 200 pW Power Specs	https://doi.org/10.1038/s41534-026-01424-7
A03	Hollow-Core Fiber QKD: Coexistence with 2.3 Tbps Classical Data	https://doi.org/10.1038/s41534-026-01417-6
A04	Google Willow Chip: Quantum Contextuality vs Classical Limits	https://thequantuminsider.com/2026/11/19/googles-quantum-chip-beats-classical-limits-in-tests-of-teamwork/
A05	QuEra and Berkeley Lab: Quantum Dynamics Study on 180 Qubits	https://thequantuminsider.com/2026/11/18/quera-berkeley-lab-study-quantum-dynamics-aquila/
A06	Iron-Sulfur Cluster Simulation: IBM, RIKEN, and NVIDIA's 79x Gain	https://quantumcomputingreport.com/ibm-riken-and-nvidia-achieve-79x-accuracy-gain-in-quantum-classical-simulations-of-iron-sulfur-clusters/
A07	QodeX Quantum and NVIDIA: Forecasting PDEs on 52-Qubit IBM Hardware	https://quantumcomputingreport.com/qodex-quantum-nvidia-rtx-bbn-and-u-s-navy-researchers-forecast-unstructured-pdes-on-52-qubit-ibm-hardware/
A08	IBM, NVIDIA, and Fermilab: Quantum Co-Design and Slurm 26.11 Integration	https://quantumcomputingreport.com/ibm-fermilab-and-nvidia-unveil-modular-quantum-co-design-platform-slurm-hres-integration-and-gpu-qec-tools-at-sc26/
A09	SEAFOOD Platform: Osaka University's Quantum-Supercomputer Integration Timeline	https://quantumcomputingreport.com/university-of-osaka-integrates-domestic-superconducting-quantum-processors-with-octopus-supercomputer-via-seafood-platform/
A10	Google Quantum AI: Measurement Contextuality on 105 Qubits	https://quantumcomputingreport.com/google-quantum-ai-demonstrates-measurement-contextuality-across-105-qubits-on-willow-processors/

QuantumComputing — Selected Articles

Date: 2026-11-21

Articles: 10

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#06 Iron-Sulfur Cluster Simulation: IBM, RIKEN, and NVIDIA's 79x Gain

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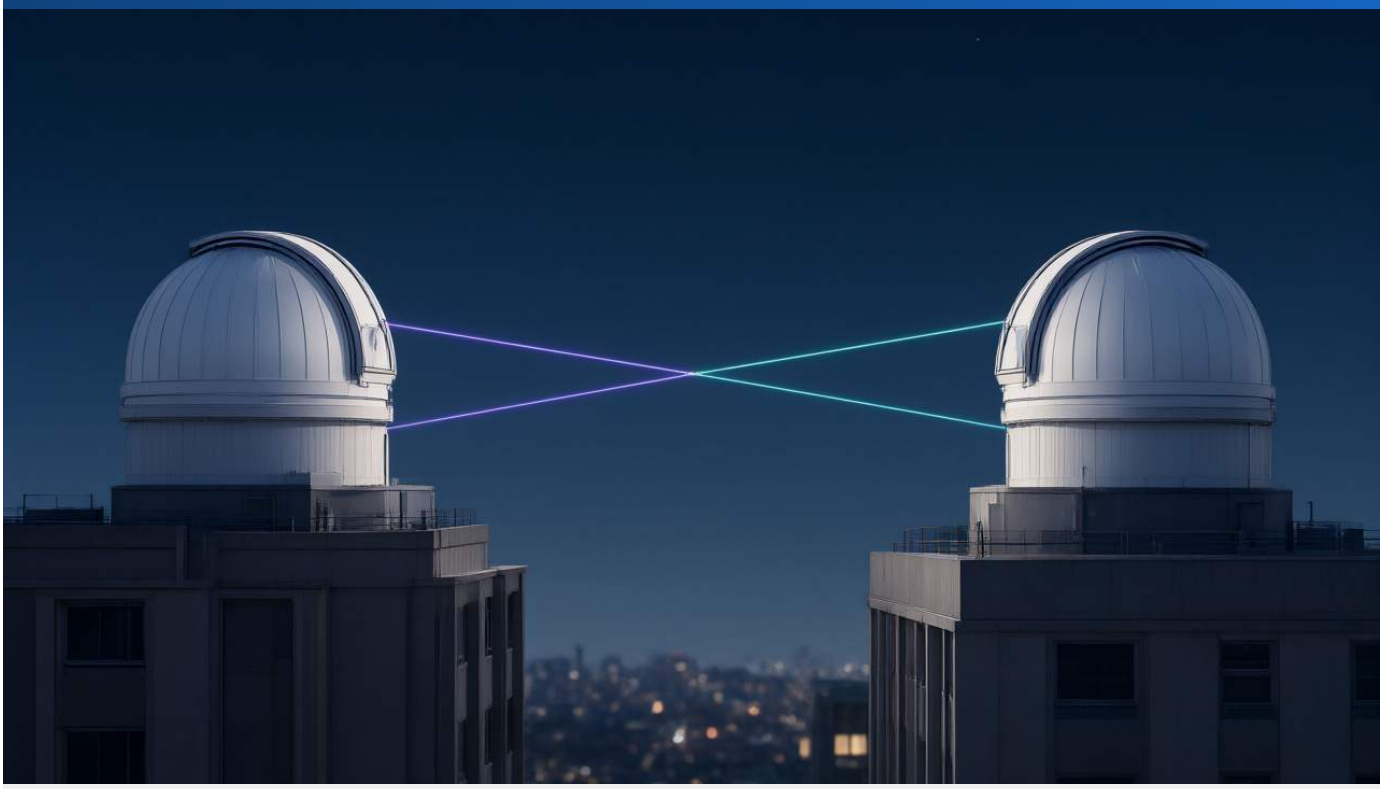
#10 Google Quantum AI: Measurement Contextuality on 105 Qubits

#01 Quantum Position Verification: Device-Independent Protocol 2026

Published November 18, 2026 Nature



OVERVIEW

Researchers have experimentally demonstrated a Bell-test quantum position verification (QPV) protocol that secures location authentication using remote untrusted devices. The system achieves a one-dimensional localization 2.47(2) times smaller than the best non-remote classical protocols, providing a certifiable quantum advantage. This enables digital security to be anchored to physically trusted locations for critical infrastructure and financial transactions.

IN DEPTH

Key Findings

The experimental demonstration of the Bell-test quantum position verification protocol achieves a certifiable quantum advantage in localization precision. Specifically, the protocol achieves a one-dimensional localization 2.47(2) times smaller than the best, necessarily non-remote, classical localization protocol. When compared to classical protocols with identical latencies, the localization volume is 4.53(5) times smaller.

Technical Details

The protocol implements device-independent quantum position verification, which guarantees security based solely on observed correlations from a loophole-free Bell test across a quantum network. In the reported experiment, the version of the protocol was implemented against adversaries who are weakly entangled before each trial. The general Bell-test protocol is designed to be loss-tolerant and remains secure against adversaries possessing substantial quantum resources.

Background and Context

Position information is fundamental to navigation, timing, authentication, and critical infrastructure. While classical methods exist to prove that information originates from a specific position, they remain vulnerable to spoofing. Previous quantum technology attempts to overcome these limitations have relied on trust in quantum hardware—which can be undermined—or have required quantum computers and specific bounds on adversarial computation.

Significance and Outlook

By removing the requirement to trust the underlying quantum hardware, this device-independent approach allows digital security to be anchored to physically trusted locations. This capability enables the development of new position-based authentication protocols for high-security applications, including:

- Financial transactions
- Legal agreements

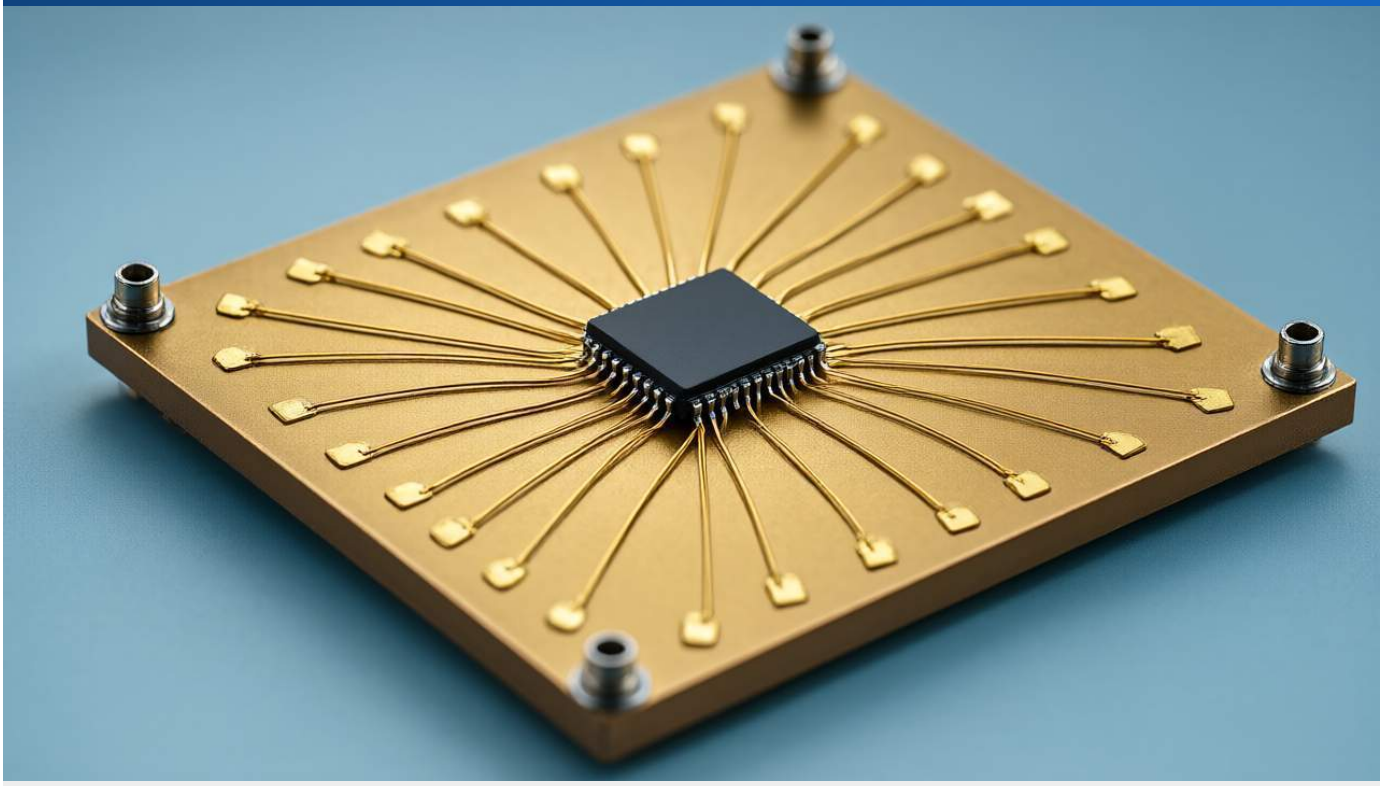
- Securing critical infrastructure

Source: https://doi.org/10.1038/s41586-026-11247-3

Collected: November 21, 2026 | Automated Research System (AI)

#02 CryoCMOS RF Multiplexer: 10 mK Operation and 200 pW Power Specs

Published November 14, 2026 npj Quantum Information ベルギー



OVERVIEW

Researchers have developed a cryogenic CMOS (cryoCMOS) RF multiplexer capable of operating at 10 millikelvin with a record-low static power consumption of 200 pW. The device enables the multiplexing of readout, flux, and XY drive lines for superconducting qubits, addressing the input-output bottleneck in large-scale quantum systems.

IN DEPTH

Key Findings

The demonstrated cryoCMOS RF multiplexer operates at 10 millikelvin and achieves a record-low static power consumption of 200 pW. When connected directly to transmon qubits, the device marginally affects coherence times in the 100 µs range. This allows for the multiplexing of readout and flux lines, and in principle, XY drive lines, directly at the qubit plane.

Technical Details

The multiplexer provides the following performance specifications across a frequency range of DC-8 GHz:

- Insertion loss: < 2 dB
- Isolation: > 30 dB
- Static power consumption: 200 pW
- Operating temperature: 10 millikelvin

Background & Context

Large-scale cryogenic quantum systems, particularly superconducting qubit platforms, face a significant input-output bottleneck between room-temperature electronics and millikelvin stages. This issue is most acute regarding output lines, where the use of bulky and expensive microwave components limits the overall scalability of the system. Performing signal multiplexing directly at the qubit plane is proposed as a promising approach for scalable characterization and testing.

Significance & Outlook

By reducing the reliance on bulky external components and minimizing power dissipation at millikelvin temperatures, these cryoCMOS multiplexers serve as valuable tools for high-throughput cryogenic characterization. This development advances the co-integration of quantum-classical control, which is essential for the realization of future large-scale quantum processors.

Source: https://doi.org/10.1038/s41534-026-01424-7

Collected: November 21, 2026 | Automated Research System (AI)

#03 Hollow-Core Fiber QKD: Coexistence with 2.3 Tbps Classical Data

Published November 17, 2026 npj Quantum Information China



OVERVIEW

Researchers have demonstrated entanglement-based high-dimensional quantum key distribution (HD-QKD) coexisting with classical data over an 18-km hollow-core fiber (HCF) link. The system achieved an average secret key rate of 10.56 kbps while supporting a theoretical data capacity of up to 2.3 Tbps. This approach overcomes the nonlinearity limits of silica-core fibers, enabling scalable quantum-classical integration.

IN DEPTH

Key Findings

The study demonstrates the successful coexistence of entanglement-based quantum keys and classical data signals within a single 18-km hollow-core fiber (HCF) link. During 24 hours of continuous operation, the system maintained an average secret key rate (SKR) of 10.56 kbps. The quantum channel operated alongside bidirectional received power of 0 dBm, which corresponds to a theoretical classical data capacity of up to 2.3 Tbps.

Technical Details

The implementation utilizes time-encoded high-dimensional quantum key distribution (HD-QKD). By guiding light predominantly in air rather than a solid core, the HCF architecture provides intrinsically ultra-low nonlinearity. This physical property strongly suppresses nonlinear noise, specifically Raman scattering and four-wave mixing, which typically interfere with quantum signals when multiplexed with classical data.

Background and Context

Integrating quantum information and classical signals into a single fiber is critical for leveraging existing optical fiber infrastructure for future quantum networks. Traditional pure silica core fibers (PSCFs) are fundamentally limited by high nonlinearity, which generates substantial noise that degrades quantum signal integrity. HCFs serve as an alternative medium to mitigate these nonlinear effects, allowing for more efficient multiplexing of quantum and classical channels.

Significance and Outlook

The results indicate significantly improved performance compared to PSCF-based systems. Theoretical analysis suggests that by employing state-of-the-art low-loss HCFs, secret key rates could exceed 135 kbps over transmission distances greater than 200 km. This demonstration highlights the potential of HCFs to support scalable quantum-classical coexistence compatible with established fiber-optic network architectures.

Source: https://doi.org/10.1038/s41534-026-01417-6

Collected: November 21, 2026 | Automated Research System (AI)

#04 Google Willow Chip: Quantum Contextuality vs Classical Limits

Published November 19, 2026 The Quantum Insider USA



OVERVIEW

Google Quantum AI's Willow processor demonstrated quantum advantage in cooperative games by beating classical winning limits using quantum contextuality. The chip achieved a 98.3% win rate in a four-qubit magic square game and scaled classical-beating performance up to 71 qubits. These results provide a new method for identifying hardware errors that traditional checks may miss.

IN DEPTH

Key Findings

Google Quantum AI has used its Willow processor to demonstrate that quantum contextuality allows a system to outperform classical limits in cooperative games where communication is prohibited. In a four-qubit magic square game, the chip achieved a winning rate of 98.3%, significantly exceeding the classical ceiling of 88.9%. The researchers further scaled this advantage in a separate game, beating classical limits with up to 71 qubits.

Technical Details

The experiments focused on quantum contextuality—the property where measurement results depend on which other measurements are performed concurrently. The researchers conducted three primary tests:

- **Magic Square Game:** Two players filled a 3x3 grid with +1 or -1. To win, they had to agree on a shared square without communicating. While classical strategies are limited to an 88.9% win rate due to inherent contradictions in grid requirements, Willow's entangled qubits achieved 98.3%.
- **GHZ State Game:** Using a Greenberger-Horne-Zeilinger (GHZ) state, the team tested scalability. The winning rate remained above the classical ceiling for up to 71 players (qubits), though the margin decreased as more qubits were added. The team verified that up to 45 qubits were genuinely entangled as a group.
- **Hidden Linear Function:** In a mathematical problem using 105 qubits, the chip returned valid answers more than half the time. However, the quantum advantage here remains an open question as the classical benchmark relies on a conjecture.

Background and Significance

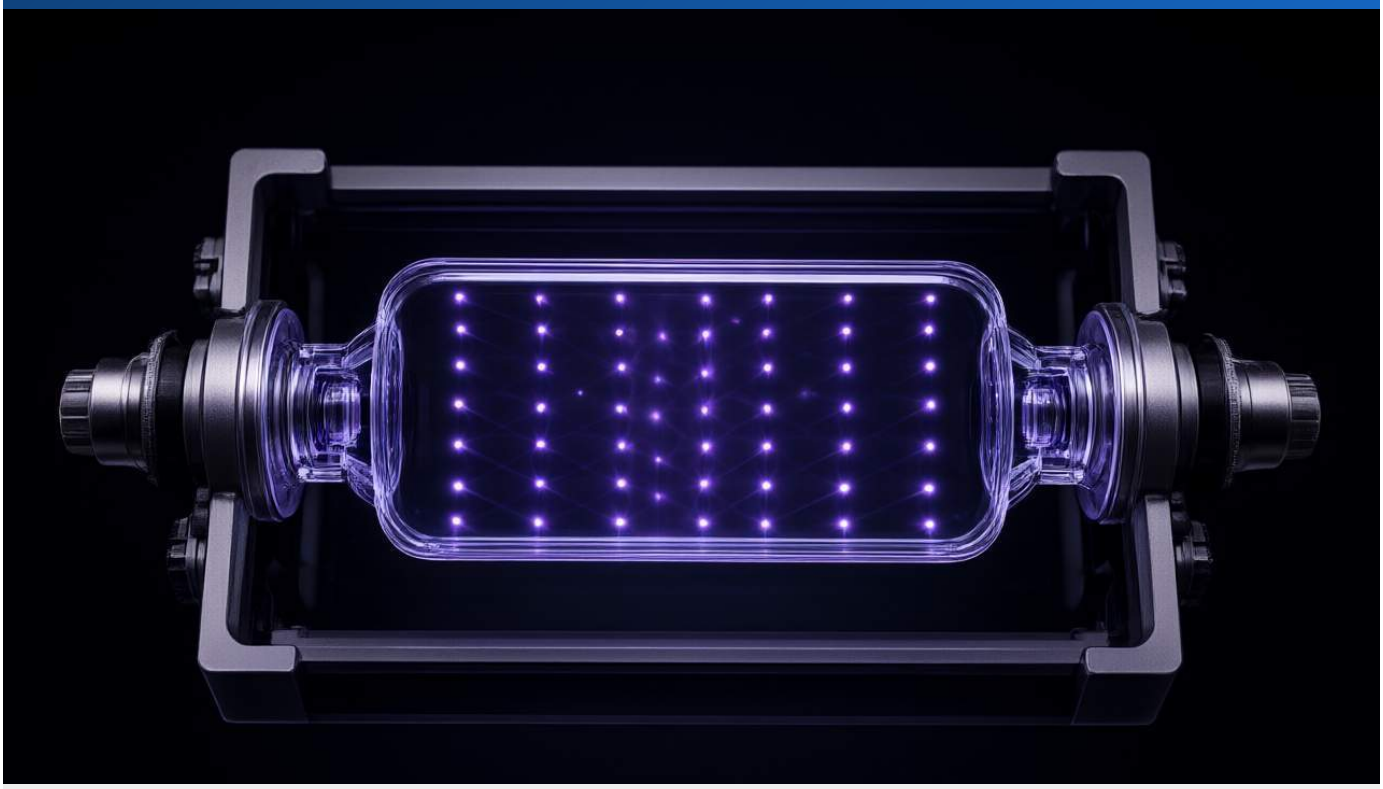
The cooperative games provided a firm comparison because they established precise classical winning limits. By measuring how much of the quantum effect survived as more qubits were integrated, researchers could gauge the stability of the system. Beyond theoretical benchmarks, these tests have practical implications for quantum error correction, as they can help engineers detect hardware errors that other diagnostic checks might overlook.

Source: https://thequantuminsider.com/2026/11/19/googles-quantum-chip-beats-classical-limits-in-tests-of-teamwork/

Collected: November 21, 2026 | Automated Research System (AI)

#05 QuEra and Berkeley Lab: Quantum Dynamics Study on 180 Qubits

Published November 18, 2026 The Quantum Insider USA



OVERVIEW

QuEra Computing and Lawrence Berkeley National Laboratory have published a Nature study observing new physical phenomena in quantum systems using the Aquila neutral-atom quantum computer. The research identified prethermal states and a first-order dynamical phase transition in arrays of up to 180 atoms. These findings enhance the understanding of quantum-scale material processes that are computationally expensive to simulate classically.

IN DEPTH

Key Findings

The research team observed three primary physical phenomena when investigating how quantum systems evolve following sudden changes. First, they identified long-lived prethermal states where the system maintained stable patterns longer than expected. Second, they documented "resonant melting," where these prethermalization patterns broke down at predictable points. Third, in two-dimensional arrays, the team discovered a first-order dynamical phase transition that has no direct equilibrium counterpart, meaning the abrupt change occurs in how the matter evolves over time rather than in its state of matter.

Technical Details

The experiments utilized Aquila, QuEra's analog neutral-atom quantum computer, accessed via Amazon Braket. The team tested various array shapes and sizes, ranging from chains of up to 52 atoms to two-dimensional grids of up to 180 atoms. The process involved initializing atomic qubits into their lowest-energy state, applying a laser field for a few millionths of a second, and measuring every qubit.

To validate these results, the team integrated quantum experiments with classical calculations performed on NERSC's Perlmutter supercomputer. Using QuEra's open-source Bloqade software, NERSC ran exact classical calculations on small probing systems to provide a baseline of confidence for the results observed at larger scales on Aquila.

Background & Context

This study is part of a broader collaboration between QuEra and U.S. Department of Energy National Labs. Earlier this year, a separate collaboration between QuEra and Los Alamos National Lab published results regarding a quantum error correction architecture called Transversal STAR. The use of a programmable quantum computer in this study allowed the team to sidestep the scaling issues associated with classical simulations, which struggle with the rapid growth of quantum entanglement over time.

Significance & Outlook

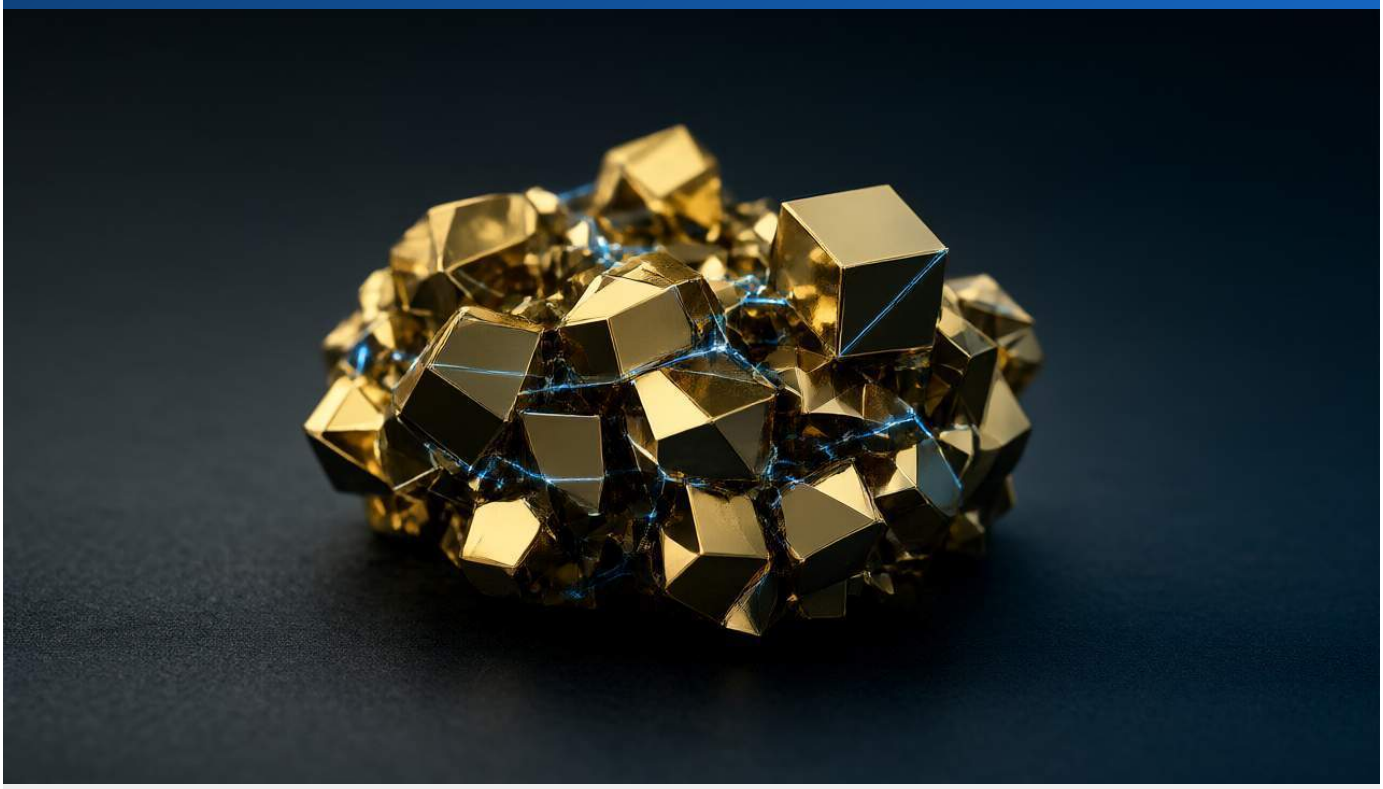
The ability to model the evolution of larger quantum systems provides critical data for materials science. QuEra intends to apply the experience gained from operating the research-grade Aquila machine to the development of Libra, its first fault-tolerant quantum computer, which is expected to be available on Amazon Braket in 2028.

Source: https://thequantuminsider.com/2026/11/18/quera-berkeley-lab-study-quantum-dynamics-aquila/

Collected: November 21, 2026 | Automated Research System (AI)

#06 Iron-Sulfur Cluster Simulation: IBM, RIKEN, and NVIDIA's 79x Gain

Published November 16, 2026 Quantum Computing Report USA



OVERVIEW

IBM, RIKEN, and NVIDIA have achieved a 79-fold improvement in energy accuracy for quantum-classical simulations of strongly correlated iron-sulfur clusters. By utilizing broken-symmetry unrestricted Hartree-Fock (BS-UHF) reference states, the team brought ground-state energy estimates within 4.3 millihartree of high-precision benchmarks. This advancement enables more accurate modeling of biological electron transfer and catalysis.

IN DEPTH

Key Findings

Researchers from IBM Quantum, RIKEN, and NVIDIA demonstrated a 79x accuracy gain in the simulation of strongly correlated iron-sulfur clusters. The team achieved ground-state energy estimates for a 72-qubit $[Fe_4S_4(SCH_3)_4]^{2-}$ active space that fall within 4.3 millihartree of classical density-matrix renormalization group (DMRG) benchmarks. This represents a significant leap over previous Sample-Based Quantum Diagonalization (SQD) studies initialized from restricted Hartree-Fock (RHF) determinants, which stalled more than 500 millihartree above exact benchmarks.

Technical Details

The accuracy improvement was driven by initializing SQD with broken-symmetry unrestricted Hartree-Fock (BS-UHF) reference states. The team extended the open-source qcsc-prefect workflow to create spin-polarized, fragment-localized Noodleman initial guesses, which were verified through internal and external stability analysis. The hardware stack included:

- **Quantum Processing:** The ibm_kingston processor (and ibm_fez for initial 40-qubit [2Fe-2S] dimer validation).
- **Classical Computing:** RIKEN's ROQUO supercomputer powered by NVIDIA GB200 GPUs.
- **Scaling:** Configuration recovery was scaled to 36 nodes utilizing 144 NVIDIA GB200 GPUs.

The researchers also demonstrated cross-architecture checkpoint portability across the CPU-based Fugaku supercomputer and JCAHPC's Miyabi-G GPU cluster.

Background & Context

Iron-sulfur cubane clusters are essential for biological catalysis and electron transfer. However, their antiferromagnetically coupled iron centers create dense multireference electronic correlations that typically challenge closed-shell quantum chemistry approximations. This project was supported by Japan's New Energy and Industrial Technology Development Organization (NEDO) as part of its quantum-supercomputer hybrid platform initiative.

Significance & Outlook

The study identifies reference-state preparation as a primary driver of SQD accuracy, alongside GPU-accelerated Davidson diagonalization and subspace size. By steering quantum sampling toward chemically relevant magnetic configurations, the researchers have established a more viable path for simulating complex biological clusters using hybrid quantum-classical architectures.

Source: https://quantumcomputingreport.com/ibm-riken-and-nvidia-achieve-79x-accuracy-gain-in-quantum-classical-simulations-of-iron-sulfur-clusters/

Collected: November 21, 2026 | Automated Research System (AI)

#07 QodeX Quantum and NVIDIA: Forecasting PDEs on 52-Qubit IBM Hardware

Published November 13, 2026 Quantum Computing Report USA



OVERVIEW

A research collaboration has demonstrated gradient-free forecasting of nonlinear partial differential equations (PDEs) on unstructured engineering meshes using an IBM Quantum Heron r3 processor. The hybrid quantum reservoir network (QRN) reduced forecast error by 21% to 41% compared to classical latent linear baselines. This approach enables the decoupling of complex boundary geometries from quantum circuit topology.

IN DEPTH

Key Findings

A research team comprising QodeX Quantum, NVIDIA, RTX BBN, the University of South Carolina, and the Naval Surface Warfare Center Panama City Division has successfully forecasted nonlinear PDEs on unstructured engineering meshes. Utilizing up to 52 qubits on the IBM Quantum Heron r3 (ibm_boston) processor, the team achieved a test NRMSE of 0.257 in 10-step closed-loop autoregressive rollouts on the cylinder flow dataset. This performance outperformed a classical persistence baseline (1.126) and a noiseless CUDA-Q simulation (0.707), indicating that physical hardware noise acted as an effective regularizer.

Technical Details

The researchers implemented a hybrid quantum reservoir network (QRN) to overcome the limitations of conventional gate-based solvers, such as barren plateaus and measurement overheads. The architecture consists of:

- **Preprocessing:** A pretrained graph neural network autoencoder that decouples complex boundary geometries from the quantum circuit.
- **Quantum Reservoir:** A fixed, untrained reservoir divided into memory and readout registers.
- **Mechanism:** Latent flow variables are encoded into the memory register via data-reuploading rotations and coupled to readout qubits through tunable partial-SWAP gates.
- **Stability:** The system employs mid-circuit measurement and reset of the readout register, creating a controlled amplitude-damping channel. This allows continuous evolution for up to 28 times median qubit T1 and 24 times median T2 without collapsing the memory register.

To manage readout shot requirements, the team utilized a post-hoc Pauli-weight truncation method.

Background and Significance

Historically, quantum solvers for computational fluid dynamics have been limited to shallow variational circuits, low Reynolds numbers, or uniform grids. By utilizing a QRN, this research demonstrates the ability to handle unstructured meshes. Additionally, QodeX Quantum used this study to validate modules of AlphaPsi, its agentic quantum workflow platform. The technical manuscript and open-source implementation code have been made available via arXiv and GitHub.

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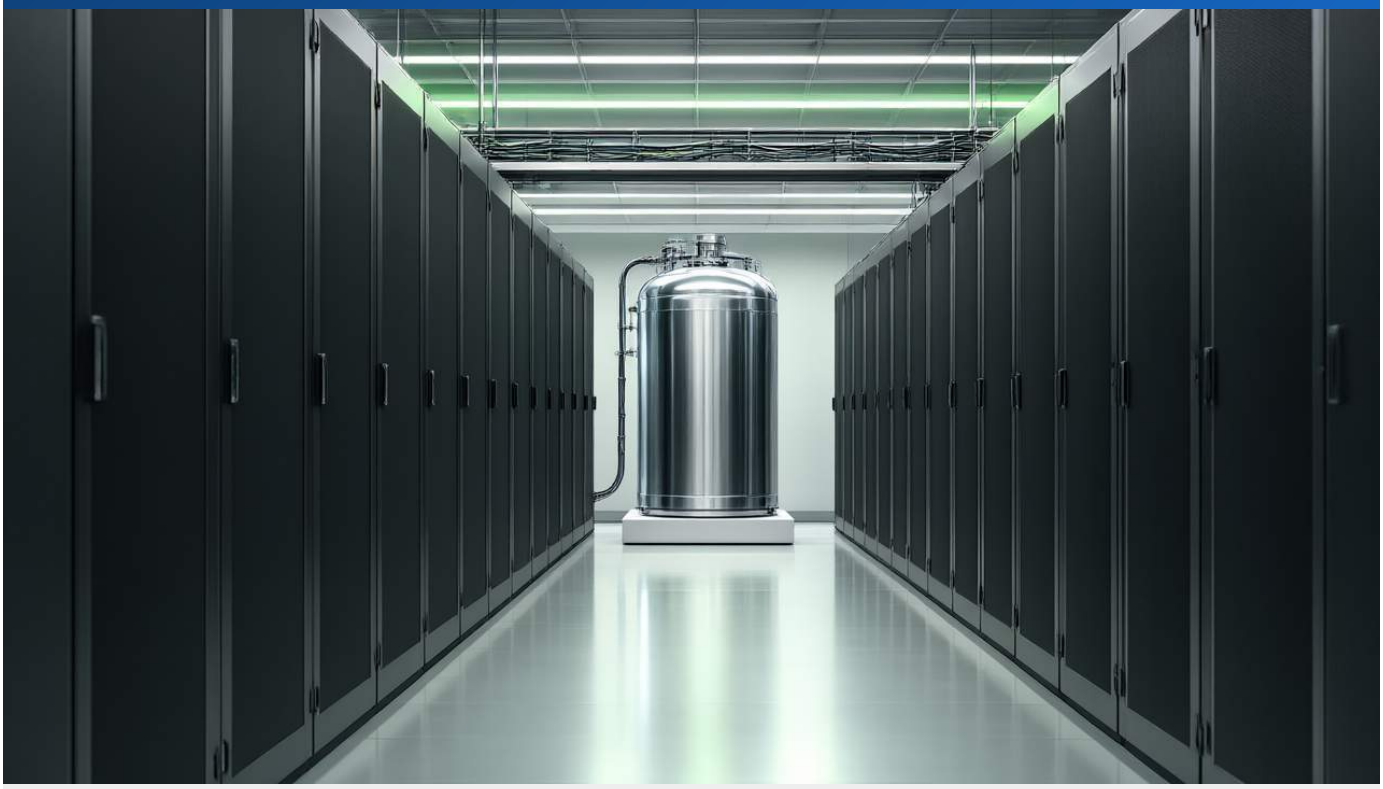
Source: https://quantumcomputingreport.com/qodex-quantum-nvidia-rtx-bbn-and-u-s-navy-researchers-forecast-unstructured-pdes-on-52-qubit-ibm-hardware/

Collected: November 21, 2026 | Automated Research System (AI)

#08 IBM, NVIDIA, and Fermilab: Quantum Co-Design and Slurm 26.11 Integration

Published November 16, 2026 Quantum Computing Report USA



OVERVIEW

IBM, NVIDIA, and Fermilab have introduced a modular quantum-classical co-design platform and integrated quantum resource scheduling into Slurm 26.11. The initiative includes GPU-accelerated QEC tools and the co-location of NVIDIA DGX B200 systems with IBM Quantum Nighthawk processors to advance simulations in nuclear physics and neutrino interactions.

IN DEPTH

Key Findings

At the SC26 conference in Chicago, IBM, NVIDIA, and Fermilab announced a modular quantum-classical co-design platform and the integration of native quantum resource scheduling into Slurm 26.11. This collaboration focuses on physically co-locating NVIDIA DGX B200 systems with IBM Quantum Nighthawk processors, managed via Fermilab's HEPCloud infrastructure. Additionally, NVIDIA released CUDA-Q QEC 0.9.0, featuring the TCBP-JOBS algorithm for GPU-accelerated quantum error correction (QEC).

Technical Details

The co-design platform will initially emulate inter-module communication to analyze routing errors, latency, and classical feedback. Future phases will integrate Fermilab’s ultracoherent superconducting radio-frequency (SRF) cavity hardware to serve as quantum memories and entanglement buffers. Regarding QEC, the TCBP-JOBS algorithm combines Trajectory-Calibrated Belief Propagation with Jittered Ordered Statistics Decoding Beam Search. At physical error rates of 0.1% to 0.4%, it achieves millisecond-scale serial latencies, specifically 4.08 ms for 12-round gross-code memory and 13.5 ms for logical lattice surgery at 0.2% error.

Other technical releases include:

- CUDA-Q QEC 0.9.0: Includes a containerized Decoding Server and Relay-BP kernels that are 1.3x to 3.2x faster.
- Slurm 26.11: Integrates the Quantum Resource Management Interface (QRMI) and Quantum Device Management Interface (QDMI) into the Hierarchical Resources (HRES) scheduler.
- Pelagos: An open-source GPU simulation suite developed by IBM and AMD.

Background & Context

The integration into Slurm 26.11 aims to remove custom middleware for approximately 30 supercomputing centers globally that operate more than 50 quantum processors. By treating QPUs as shared multi-node resources rather than node-local accelerators, HRES allows administrators to manage quantum hardware under standard cluster policies alongside CPUs and GPUs.

Significance & Outlook

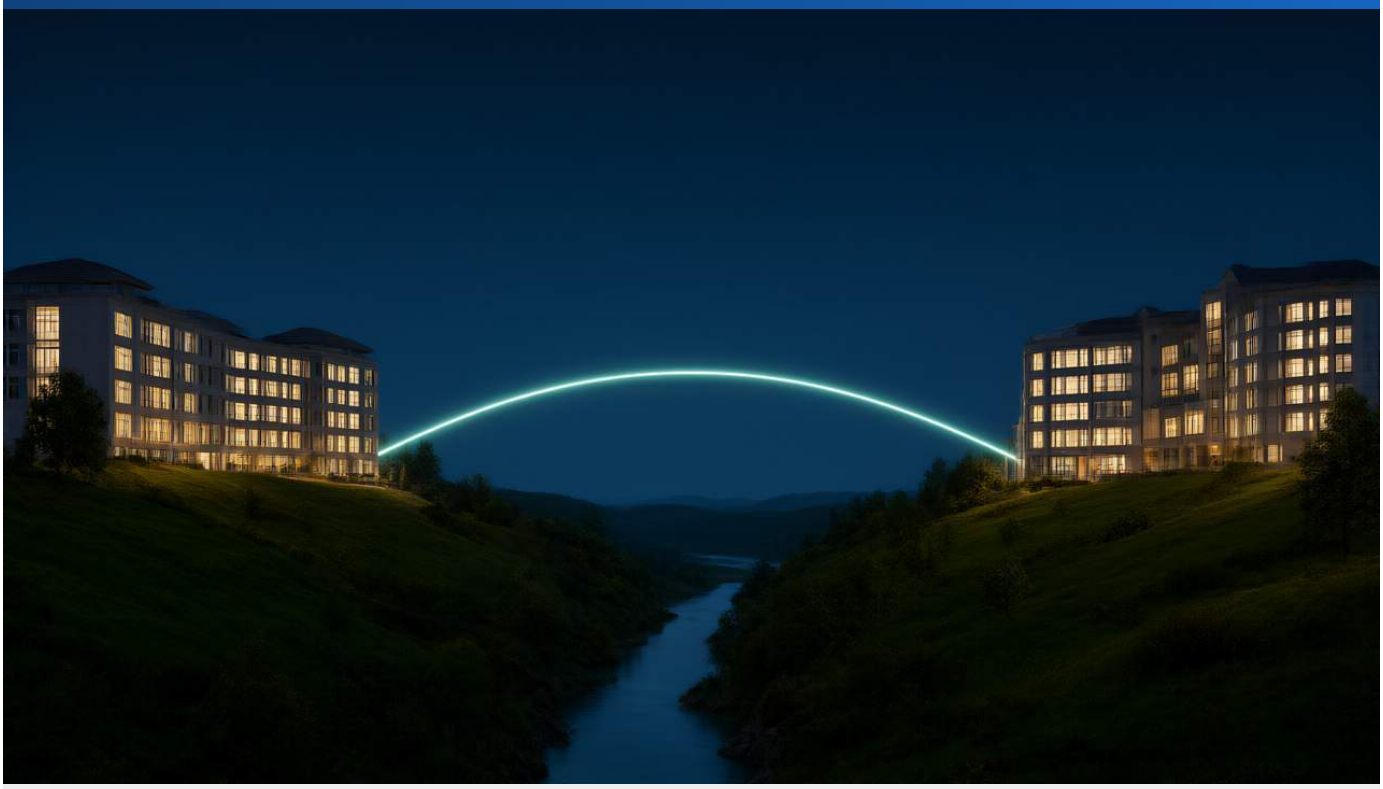
This ecosystem expansion enables high-performance hybrid workflows for studying lattice gauge theories and nuclear physics. The combination of GPU-accelerated decoders and standardized scheduling reduces the overhead of managing multi-node QPU resources, while the co-location of high-end GPUs and quantum processors addresses the latency requirements of feed-forward operations in neutral-atom and trapped-ion systems.

Source: https://quantumcomputingreport.com/ibm-fermilab-and-nvidia-unveil-modular-quantum-co-design-platform-slurm-hres-integration-and-gpu-qec-tools-at-sc26/

Collected: November 21, 2026 | Automated Research System (AI)

#09 SEAFOOD Platform: Osaka University's Quantum-Supercomputer Integration Timeline

Published November 14, 2026 Quantum Computing Report USA



OVERVIEW

The University of Osaka has developed SEAFOOD, a hybrid infrastructure linking the OCTOPUS supercomputer with domestic superconducting quantum processors. Scheduled for formal operation in December 2026, the platform enables the partitioning of complex workloads between classical and quantum hardware to optimize drug discovery and materials engineering simulations.

IN DEPTH

Key Findings

Researchers at the University of Osaka's D3 Center and Center for Quantum Information and Quantum Biology (QIQB) have created SEAFOOD (Supercomputing Entangled by Ambitious Fusion of OQTOPUS and OCTOPUS at D3C). This hybrid computing infrastructure integrates domestically built superconducting quantum processors with the university's OCTOPUS supercomputer across separate campuses. It marks the first time a Japanese-developed quantum computer and an on-campus supercomputer have been integrated at a single academic institution in Japan.

Technical Details

The SEAFOOD architecture employs a three-layer stack to partition workloads, ensuring each processor executes mathematical routines optimized for its specific hardware design. This approach addresses the high computational cost of simulating strongly correlated electronic structures on classical clusters and the noise and qubit count constraints of current quantum processors.

In a Quantum-Selected Configuration Interaction (QSCI) demonstration, the system functioned as follows:

- The quantum processor was used to sample dominant electron configurations.
- The high-memory compute nodes of the OCTOPUS supercomputer constructed and diagonalized the resulting subspace Hamiltonian.

Background & Context

The project was led by Professor Susumu Date (D3 Center) and Associate Professor Hiroshi Ueda (QIQB). Development was supported by several Japanese initiatives, including JST Moonshot Goal 6, MEXT Q-LEAP, JST COI-NEXT, CSTI SIP, and NEDO's Post-5G quantum-supercomputer hybrid platform program. The project also utilizes the open-source OQTOPUS software stack and QSCI methodology published in Physical Review Research.

Significance & Outlook

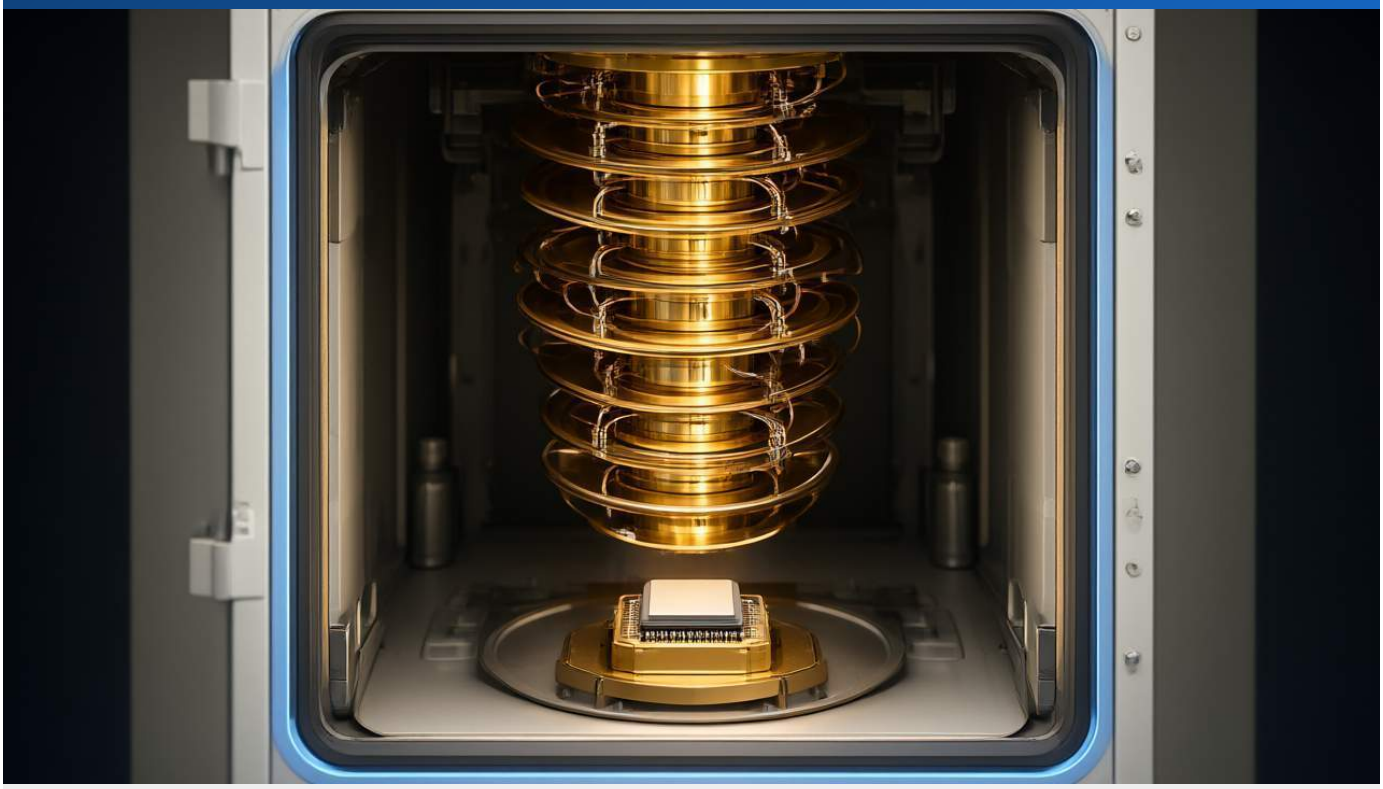
SEAFOOD is scheduled to enter formal operation in December 2026. In fiscal year 2027, the D3 Center will provide trial access to up to 10 research teams via a proposal-based program. This phase is intended to refine hybrid job scheduling before the platform opens for broader external access through Japan’s nationwide JHPC-quantum initiative.

Source: https://quantumcomputingreport.com/university-of-osaka-integrates-domestic-superconducting-quantum-processors-with-octopus-supercomputer-via-seafood-platform/

Collected: November 21, 2026 | Automated Research System (AI)

#10 Google Quantum AI: Measurement Contextuality on 105 Qubits

Published November 19, 2026 Quantum Computing Report USA



OVERVIEW

Google Quantum AI has demonstrated that quantum measurement contextuality persists at a many-body scale using 72-qubit and 105-qubit Willow processors. The research establishes a hardware benchmark for coherent control errors and shows measurable computational separations in bounded-resource tasks.

IN DEPTH

Key Findings

Google Quantum AI has demonstrated that quantum measurement contextuality persists at a many-body scale on superconducting processors. Using Willow processors with 72 and 105 qubits, the team moved contextuality testing from small few-particle systems to large two-dimensional qubit arrays. The experiments revealed that contextuality yields measurable computational separations in tasks with bounded resources.

Technical Details

To verify contextuality without disturbing the quantum register during the state-independent Kochen-Specker-Bell test, researchers employed a resettable ancilla qubit and calibrated virtual-Z phase rotations. This setup allowed for 540 consecutive quantum nondemolition (QND) measurements per run. The team utilized two primary methods for scaling:

- Randomized breadth-first-search Greenberger-Horne-Zeilinger (GHZ) state preparation, which sustained contextuality up to 71 qubits.
- Constant-depth four-layer controlled-Z circuits, which solved 2D hidden linear function instances across grids of up to 105 qubits.

Background and Context

Measurement contextuality differs from entanglement in that it captures the principle that quantum observables do not have predetermined values independent of the compatible measurements performed alongside them. While the Clifford-based test circuits used in this research remain efficiently simulable classically via tools such as Stim, the study probes the theoretical resource linked to non-Clifford magic states essential for fault-tolerant computing.

Significance and Outlook

The researchers noted that contextuality tasks serve as a sensitive hardware diagnostic for structured applications, including materials science and molecular simulations in chemistry. Because hidden-function and structured parity tests require exact multi-qubit phase agreement, they can expose small coherent over-rotations. This provides a fixed physical ceiling for calibrating future processors, as these errors are often averaged out during random-circuit sampling.

Source: https://quantumcomputingreport.com/google-quantum-ai-demonstrates-measurement-contextuality-across-105-qubits-on-willow-processors/

Collected: November 21, 2026 | Automated Research System (AI)