Sep 6, 2026 – Sep 7 • Daily Brief

Japan's NEC exits the superconducting quantum hardware race, pivots to an alternative approach

37 items • 11 sources | PDF | This issue's roundup is free

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Items	37
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Reading time	~61 min read

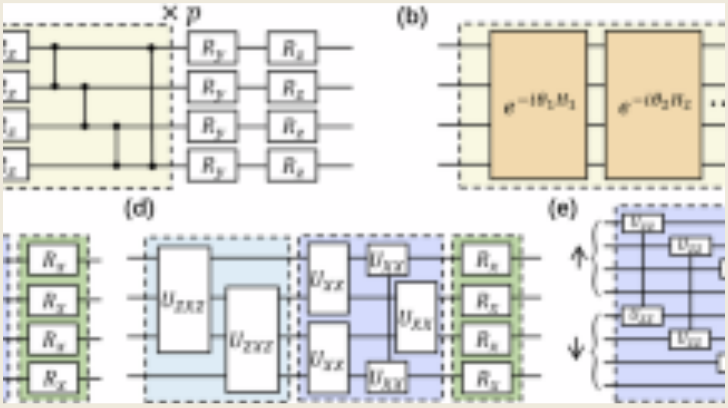
CURRENTSOTA

Physical qubits	**1,180**
2Q fidelity	**99.99%**
Logical qubits	**96 LQ**

Quantum hardware SOTA table →

01 Other

Today's Three Key Stories



1 **Sparrow Quantum's single-photon source hits 500 million photons per second** A deterministic single-photon source operating at a 1 GHz repetition rate delivers more than 500 million single photons per second into single-mode fiber, with fiber coupling efficiency above 50%, claimed as the highest single-photon flux to date [25] — raising both halves of the "brightness ×

efficiency" bottleneck that most constrains the photonic approach.

1 **NEC halts superconducting quantum computer development** NEC has terminated development of superconducting quantum computers, citing an overly long commercialization timeline and excessive capital investment, pivoting to quantum-inspired annealing and classical simulation; Fujitsu thereby becomes Japan's principal corporate developer of enterprise-grade superconducting hardware [12] — large corporations are beginning to set stop-loss lines on quantum hardware according to financial discipline.

1 **G7 defines post-quantum migration as a whole-of-society undertaking** The G7 Cyber Expert Group has determined that quantum computing poses a growing threat to public-key cryptography, and argues that post-quantum cryptography (PQC, a new generation of encryption resistant to attack by quantum computers) migration must cover all sectors rather than critical infrastructure alone [13] — the compliance clock starts simultaneously for banks, payments, and cloud services.

Hardware Frontier

Photonics

Sparrow Quantum reports a deterministic single-photon source delivering more than 500 million single photons per second into single-mode fiber, with the device running at a 1 GHz repetition rate and fiber-end efficiency above 50%, while maintaining high single-photon purity and two-photon indistinguishability[25].

Achieving all three metrics simultaneously is the key point: historically, high brightness has come at the cost of degraded purity or indistinguishability — and indistinguishability is precisely the prerequisite for fusion gates (merging the quantum states of two photons into a single logical operation) on the photonic path. Against the internal baseline library (not a source from today), PsiQuantum's Omega on 300mm wafers reports independent-source HOM indistinguishability of 99.50%±0.25% and two-qubit fusion fidelity of 99.22%±0.12%; this

report gives no corresponding fidelity breakdown, so whether it surpasses that set of records cannot be determined. All that can be said is that it ranks well on the single dimension of "source brightness," and on a vendor-reported basis.

What is still missing is clear: on the photonic path, all fidelities are values conditioned on "a photon was detected," and without an end-to-end loss budget (a loss breakdown for each stage: source → on-chip transmission → switching → detection), there is no way to compute how much of the 500 million/s into-fiber flux remains at the computational endpoint. For full-system teams like PsiQuantum and Xanadu, a high-flux commercial source means one more supply-chain option — a component-level positive on a 1–2 year horizon that does not change full-system timelines.

Superconducting

Two superconducting qubits separated by a meter of cable were driven into an entangled state, with the entanglement produced not by isolating them from environmental noise but induced by the environment itself[10].

Conventional practice treats noise as the enemy — decoherence (randomization of the

quantum state and loss of information) is the top cost item on the superconducting path, and well over half the budget for dilution refrigerators and filter chains goes to suppressing noise. This work inverts that logic, using the dissipative channel as a resource for generating entanglement. A meter-scale separation is a meaningful scale: it falls in the range of chip-to-chip interconnect rather than on-chip coupling, corresponding to the pain point of modular scaling.

For reference, in the internal baseline library (not a source from today), the photonic path's chip-to-chip interconnect fidelity has reached 99.72%±0.04% (42 m of fiber, PsiQuantum), while the superconducting camp lacks a public figure on the same basis; this report likewise gives neither fidelity nor generation rate, so it counts as a mechanism demonstration rather than an engineering metric. What stands between this and practical use is stability validation: TLS (two-level defects in materials) fluctuations in superconducting devices cause T_1 to drift over a 2–3× range, and whether a noise-induced scheme can hold up under such drift is the central question next.

Neutral Atoms

npj Quantum Information published a scheme realizing a Rydberg (Rydberg — exciting atoms

into very large electron orbitals to produce strong interactions) phase gate in a single operation, with the mechanism being dynamical suppression of population[3].

Mainstream Rydberg CZ gates mostly use a two-pulse sequence; halving the pulse count directly compresses gate time and the window of exposure to decoherence. The best neutral-atom two-qubit gate level recorded in the internal baseline library is 99.5% (60 atoms in parallel, Harvard/Lukin), with Atom Computing reporting 99.6% on the commercial side (neither from today's sources); this item's source gives only title and issue information, with no experimental fidelity, and whether the work is a purely theoretical proposal or includes experimental validation awaits reading the original paper, so no comparison with the above records is possible for now. The real weakness of neutral atoms is not gate fidelity but cycle repetition rate (typically 1–10 Hz) and mid-circuit measurement; a single-operation gate relieves only the gate-duration component of that.

Detectors

An analysis aimed at device selection unpacks the three-way trade-off in quantum detectors: detection efficiency, timing jitter, and

operating wavelength — you cannot have all three[19].

This item is more useful to purchasers than to labs — full-system performance in quantum networking and quantum sensing is often bottlenecked at the single point of the detector, and the internal baseline library's due-diligence threshold of ≥95% detection efficiency for SNSPDs (superconducting nanowire single-photon detectors) is only a pass mark; jitter and wavelength mismatch will wreck a link budget just as thoroughly.

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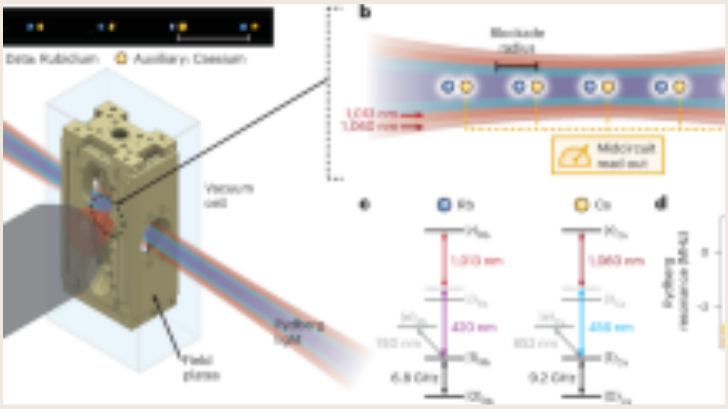
03 Algorithms

Algorithms and Software



> **Quantum machine learning for predicting quantum system evolution**

Quantum Gaussian process regression has been applied to channel prediction, with its scope of applicability extended from the

previously limited case of unitary evolution to systems of up to 64 qubits; simulations show that a rescaled kernel function lifts the original restriction, restoring accurate learning of larger-scale, globally acting quantum channels as measurement data increases, and the method also shows resilience when tested on real hardware[20].

64 qubits is a meaningful threshold: it exceeds the comfort zone of exact classical simulation, meaning the value of such predictors does not stop at small-system validation. "Globally acting channels" were previously a failure regime for methods of this kind, and the rescaled kernel addresses precisely that failure mode. The beneficiaries are hardware teams doing device characterization and calibration — inferring channel behavior from less measured data saves machine time directly.

> **Variational algorithms with guiding states obtain theoretical guarantees**

One work provides theoretical guarantees for variational quantum algorithms with a guiding state (a known approximate solution used as the algorithm's starting point)[5].

The long-standing weak point of variational algorithms is that they "run, but nobody knows why they run or when they will fail" — barren

plateaus (gradients in parameter space nearly vanishing, stalling optimization) make empirical results hard to extrapolate. Provable guarantees under the premise of a guiding state move this class of algorithms one notch from heuristic toward conditionally analyzable. For software vendors in quantum chemistry and materials simulation, results of this kind determine whether they can promise customers convergence, not merely whether they can demo.

> **A correction on shadow tomography for quantum Fisher information estimation**

npj Quantum Information issued a publisher correction to a paper on estimating quantum Fisher information via Krylov shadow tomography[2].

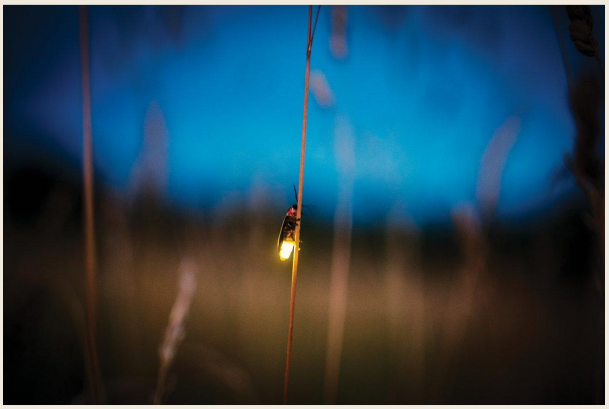
Quantum Fisher information is the metric for the precision ceiling in quantum sensing, and shadow tomography (reconstructing partial properties of a state from a small number of random measurements) can compress measurement overhead from exponential to polynomial. The correction is a publisher erratum rather than a retraction of conclusions, and does not affect the original method's standing.

Dimensional reduction for solving light–matter coupling models

A University of Turku team reduced the complexity of polariton (polariton — a quasiparticle formed by coupling light and matter) calculations from doubly exponential growth in both emitter number and excitation number to a matrix solve depending only on excitation number[24].

Removing the emitter-number dimension entirely from the exponential scaling means that large-scale cavity quantum electrodynamics systems previously beyond computation become tractable. Models of this kind are the underlying tool for designing photon–atom interfaces in quantum networks; the beneficiaries are experimental groups working on quantum repeaters and optical cavity devices, and this counts as an immediately usable tool-level improvement.

Industry and Ecosystem



NEC exits superconducting hardware

NEC has halted development of superconducting quantum computers, pivoting to quantum-inspired annealing and classical simulation with a focus on software and optimization services; according to Nikkei Asia, the move makes Fujitsu Japan's principal corporate developer of enterprise-grade superconducting hardware[12] [33].

The business logic is more worth reading than the technical logic: NEC's stated reasons are a long commercialization timeline and high capital expenditure — this is a company with the capacity to continue actively concluding that the payback period is unacceptable. The capital intensity of the superconducting path is a hard fact: the fixed outlay for dilution refrigerators, microwave control chains, and packaging does not amortize with qubit count, while the median two-qubit gate fidelity for

production systems recorded in the internal baseline library still sits in the 99.5%–99.9% range (not from today's sources), leaving an order-of-magnitude engineering investment short of the fault-tolerance threshold.

The impact spans three layers: within Japan, enterprise-grade superconducting hardware development converges on Fujitsu as the primary actor, with other technology paths not addressed by the source; globally, the superconducting camp loses one secondary player, which for IBM, Google, IQM, and Rigetti is competitive relief rather than good news, because it simultaneously signals that "large companies are starting to exit"; on the annealing and classical simulation side, one more branded supplier enters a market that was already crowded, increasing price pressure. The timescale is immediate — an exit decision requires no transition period.

> **G7 sets the tone on post-quantum migration**

The G7 Cyber Expert Group has determined that quantum computing poses a growing threat to public-key cryptography, affecting both public and private organizations; the group argues that PQC migration requires action across all sectors rather than being limited to critical infrastructure, and calls for

collective participation and coordinated planning[13].

The key increment is "scope," not "threat" — the threat assessment has long been consensus; expanding applicability from critical infrastructure to all sectors effectively spreads migration costs from a few regulated industries across the entire economy. What financial readers should watch is when this language becomes a mandatory clause in their own jurisdiction's regulation: G7-level statements typically lead specific national regulations by 12–24 months. The most directly affected are institutions holding long-lifetime encrypted data (banks, insurance, healthcare), because "harvest now, decrypt later" risk is priced by data retention duration, not by when a quantum computer gets built.

> **IonQ heads to Dubai to discuss migration sequencing**

An IonQ team will attend the third Quantum Innovation Summit in Dubai on September 28–30, on the topic of sequencing in post-quantum migration[21].

"Migration sequencing" is a pragmatic commercial signal: the pitch is not selling quantum computers but selling advice on "which system to swap first." This item and the

G7 statement are two sides of one coin — policy sets the scope, vendors take on implementation, and the Middle East is currently among the regions most willing to spend PQC budget.

India's fintech show puts quantum on the main stage

The 2026 Global Fintech Fest in India lists quantum technology alongside tokenization as a headline topic[31].

Quantum entering a financial industry main venue rather than a specialist conference indicates that buy-side perception has shifted from "research news" to "compliance and infrastructure planning." For quantum-security vendors, India is an incremental market not yet carved up.

Regional ecosystems

Oak Ridge National Laboratory (ORNL) hosted the 2026 Southeast Quantum Conference in Tennessee, promoting new collaborations within the US quantum ecosystem[16]. QML4Africa was held in Lagos, highlighting growth in Africa's quantum research community[32]. In Southeast Asia, SEA Quantum presented quantum machine learning work at AQIS 2026 and discussed it in

person with Professor Richard Jozsa, co-author of the Deutsch–Jozsa algorithm[23]. A PhD/postdoc opening at the intersection of formal verification and quantum is open until September 30, 2026[11].

The intersection of formal verification and quantum is an underrated direction: as logical qubits and error-correction compilation stacks grow more complex, "is this circuit correct" itself needs to be machine-provable — manual checking is no longer sufficient.

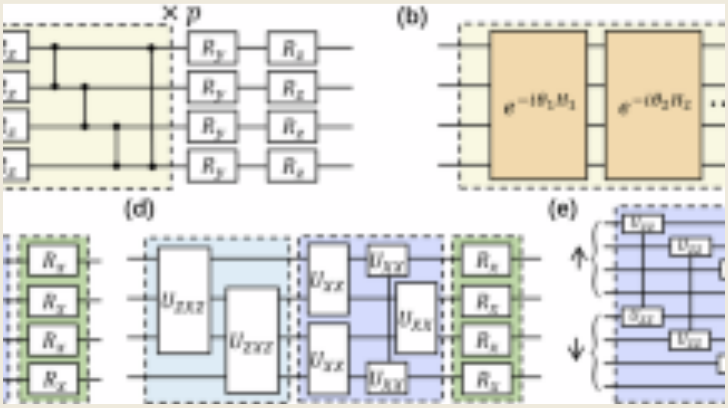
Compute side

AMD Instinct MI430X GPUs and 6th-generation EPYC CPUs will power LUMI-AI, a new European supercomputer[14]. The connection to quantum lies in decoders: the real-time classical compute demands of error-correction decoding are turning supercomputing resources into a mandatory complement to quantum systems rather than an option.

One viewpoint holds that hyperscale centralized data centers will be phased out[1] — this is commentary rather than factual reporting, logged only as noise.

05 Other

Academic Frontier



> **Symmetry-protected topological order realized on a 100-site spin chain**

Researchers realized symmetry-protected topological order (SPT — a class of phases protected by symmetry and not distinguishable by local measurement) in a 100-site spin chain on a digital quantum computer[7].

100 sites is at the upper end of the range for many-body physics on current uncorrected digital devices, and topological order is more sensitive to noise than typical ground-state preparation tasks — being able to measure the order parameter at this scale indicates that the product of circuit depth and gate error fell within a usable window. The internal baseline library (not from today's sources) records physical qubit counts for superconducting production systems on the order of 105 (Google Willow) to 120 (IBM Nighthawk); however, the source states only that this was

done on a digital quantum computer without disclosing the specific hardware platform, so what fraction of chip resources 100 sites corresponds to cannot be computed. The value of results like this lies in providing empirical support for "quantum simulation arriving before quantum computing," and the beneficiaries are condensed-matter theory groups and materials-simulation software companies, on a timescale of immediate reuse.

Entangled particles revive a 35-year-old Standard Model test

Physicists in the BESIII collaboration used a technique shelved by the experimental community for nearly 35 years to reactivate a test of one of the core ideas of the Standard Model [8].

The reason a technique gets revived is usually that the statistics have arrived — the yield and detection precision for entangled particle pairs crossed a threshold, making the mothballed method usable again. This is a case of quantum information concepts flowing back into high-energy physics; it produces no commercial impact, but there is methodological spillover for quantum sensing.

> **A chromium-based material shows three quantum phases, pointing to spin-triplet superconductivity**

Three quantum phases were observed in a chromium-based material, suggesting it is a spin-triplet superconductor[9].

Spin-triplet pairing is one candidate host for the Majorana zero modes required by topological quantum computing. The topological path currently has no comparable fidelity or qubit-count entries in the public baseline, and material discoveries of this kind constitute accumulation of the path's preconditions, on a timescale measured in years; they do not constitute a near-term investment signal.

> **A laser pulse rewrites the magnetic behavior of electrons in a copper oxide**

A laser pulse altered the magnetic behavior of electrons in an electron-doped copper oxide superconductor, observed through the study of collective magnetic excitations[15]. That photoexcitation can change the magnetic behavior of electrons in an already-doped copper oxide superconductor is an experimental handle for understanding the high-temperature superconducting pairing mechanism.

An electric field takes control of vibrational angular momentum in a material

Researchers demonstrated reversible electric-field control of phonon angular momentum in $BaTiO_3$ (barium titanate), revealing a robust nonvolatile electrogyration effect[22].

Nonvolatile means the state persists after the field is removed, a necessary property for memory devices; and directly manipulating the angular momentum of vibrational degrees of freedom with an electric field amounts to one more control handle that does not depend on magnetic fields — worth tracking.

Dissipative time crystals for quantum sensing

Monitored dissipative time crystals have been used to obtain quantum sensing enhancement[6]. Treating dissipation as a resource rather than a loss makes this and the "noise-induced entanglement" superconducting item in this issue two instances of the same idea.

Causal asymmetry in autonomous agents

One work compares causal asymmetry in classical versus quantum autonomous agents[4]. Causal asymmetry refers to the

differing memory required to simulate a process forward versus backward; quantum models can compress this gap, which falls under the memory-advantage direction in quantum modeling.

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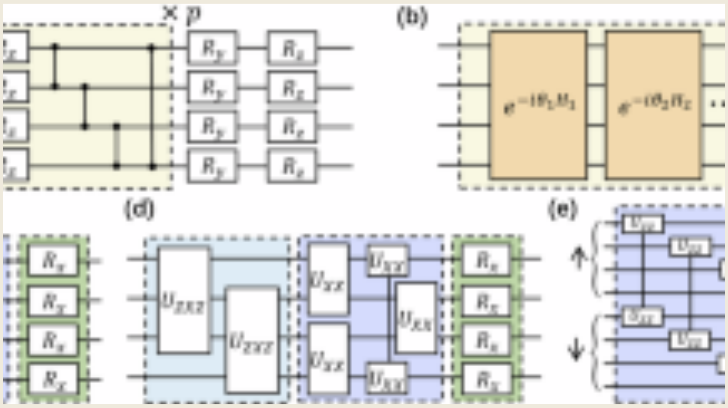
06 Other

Today's Implications



1 **Compliance leads: the scope of PQC migration was just expanded** The G7 extended the target of PQC migration from critical infrastructure to all sectors [13], meaning enterprises that previously considered themselves "out of regulatory scope" need to reassess. Next, watch whether national regulators write this language into their own specific provisions within the next 12–24 months, and whether the migration-sequencing methodology

vendors like IonQ present at the Dubai summit becomes a reusable template[21].

1. **Investors in the superconducting path: one more negative reference point** NEC's stated reasons for exiting are commercialization timeline and capital expenditure, not technical infeasibility[12]. This provides the first clear sample of how a large company sets a stop-loss on quantum hardware. Next, watch whether domestic Japanese resources flow toward Fujitsu, and whether other secondary superconducting players follow with retrenchment.

1. **Photonic full-system teams: component supply improves, but the math isn't settled** A commercial source delivering 500 million single photons per second into fiber lowers the source-end bottleneck[25], but until an end-to-end loss budget is available, its actual contribution to full-system gate counts cannot be computed. Next, watch whether this source appears in the published configuration of any third-party full system.

1. **Hardware teams doing device characterization: calibration costs may fall** Quantum Gaussian process regression now covers 64-qubit global channels and shows resilience on real machines[20], pointing toward inferring channel behavior from less

measured data. Next, watch whether it can be embedded in vendors' routine calibration workflows rather than remaining at paper-level validation.

1 **A commercialization window for quantum simulation** Topological order on a 100-site spin chain [7] and the Turku team's dimensional reduction for polariton solving [24] push the size of simulable systems up from the hardware side and the algorithm side respectively. Next, watch whether materials and chemistry software companies convert such results into services customers can order.

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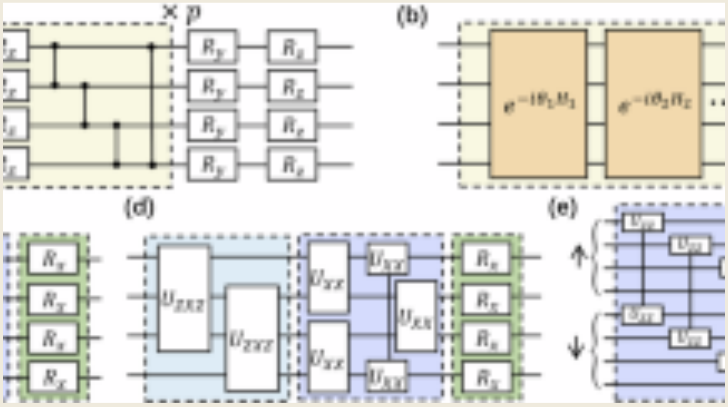
07 Other

Editor's Note



What most deserves to be remembered today is not any single technical number, but that a company with the capacity to continue chose

not to. The difficulty of the superconducting path was never "it can't be built," but "how much money must be burned, and for how long, before it is" — and when the answer to that arithmetic problem fails to clear an internal corporate board, exiting is rational. This is a fundamentally different logic from that of research institutions: national laboratories can pay for a capability ten years out; a listed company's patience is measured in quarters. What is worth watching next is whether this financial discipline replicates on other capital-intensive paths, and where the exiting resources go — back into businesses closer to cash flow, like classical optimization, or into the lower-barrier software and services layer. The latter is already crowded.

The other undercurrent is a shift in how noise is regarded. Two independent works today treat something that was supposed to be eliminated as a resource instead — two superconducting qubits a meter apart entangled via environmental coupling, and dissipative time crystals used for sensing enhancement. The idea is not new, but two instances on the same day indicate it is moving from the margins toward the mainstream. Its significance lies not in immediately improving any particular metric, but in rewriting engineering intuition: if some decoherence

channels can be engineered to be useful, then the necessity of refrigeration, shielding, and filtering — which account for the bulk of hardware cost — needs to be re-argued item by item. Paradigm loosening of this kind typically appears in papers for three to five years before it shows up in system architecture; it is nowhere near time to write it into a cost model, but it deserves a slot on the watch list.

References

[1] Kensho and Classiq Partner to Expand Access to Quantum Software in Taiwan

[2] Scientek and Classiq Partner to Accelerate Quantum Software Adoption in Taiwan

[3] The Coming Asteroids Disrupting Data Center Madness

[4] Publisher Correction: Superiority of Krylov shadow tomography in estimating quantum Fisher information: from bounds to exactness

[5] Single-operation Rydberg phase gates via dynamic population suppression

[6] Causal asymmetry of classical and quantum autonomous agents

[7] Theoretical guarantees of variational quantum algorithm with guiding states

[8] Attaining quantum sensing enhancement from monitored dissipative time crystals

[9] Symmetry-protected topological order in a 100-site spin chain on a digital quantum computer

[10] Entangled particles revive a 35-year-old test of the Standard Model

[11] Three quantum phases in chromium-based material hint at a spin-triplet superconductor

[12] Noise that entangles may accelerate the dawn of quantum technologies

[13] PhD/Postdoc positions in formal verification and quantum