Physical Review Research

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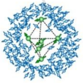
HIGHLIGHTED ARTICLES

EDITORS' SUGGESTION

Understanding decoherence in molecular spin qudits

Leonardo Ratini, Giacomo Sansone, Elena Garlatti, Francesco Petiziol, Stefano Carretta, and Paolo Santini

Phys. Rev. Research **7**, 043125 (2025) - Published 3 November, 2025



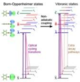
The primary source of error in molecular spin qudits under spin-echo control at low-temperature is pure dephasing, caused by their interactions with surrounding nuclear spins. This work demonstrates that coherence is preserved over time if and only if the expectation values of local spin operators on the involved eigenstates are identical. The analytic result is corroborated by numerical simulations performed using the cluster correlation expansion method to model the non-Markovian dynamics of these systems, providing a strategy to engineer robust qudits for quantum technologies.

EDITORS' SUGGESTION

Vibronic coupling limits the use of high-lying electronic states in complex molecules for laser cooling

Haowen Zhou, Paweł Wójcik, Guo-Zhu Zhu, Guanming Lao, Taras Khvorost, Justin R. Caram, Wesley C. Campbell, Anastassia N. Alexandrova, Anna I. Krylov, and Eric R. Hudson

Phys. Rev. Research **7**, 043180 (2025) - Published 19 November, 2025



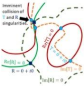
In complex molecules, nonadiabatic coupling can easily mix higher electronic states with the dense vibrational excitations of the lower electronic states, creating additional decay channels that are unfavored for optical cycling. Therefore, only the lowest excited state should be considered when designing laser-cooling schemes for complex molecules.

EDITORS' SUGGESTION

Superuniversal statistics with topological origins for non-Hermitian scattering singularities

Nadav Shaibe, Jared M. Erb, and Steven M. Anlage

Phys. Rev. Research **7**, 043185 (2025) - Published 19 November, 2025



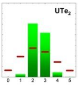
Experiments and simulations are used to show that all scattering singularities (including coherent perfect absorption and exceptional points) in non-Hermitian wave systems exhibit identical, universal statistical features for their abundance in parameter space. In contrast, combinations of independent singularities do not show universal statistics since they lack topological stability.

EDITORS' SUGGESTION

: A narrow-band superconductor

Martin Sundermann, Takaki Okauchi, Naoki Ito, Denise S. Christovam, Andrea Marino, Daisuke Takegami, Andrei Gloskovskii, Priscila F. S. Rosa, Jan Kuneš, Shin-ichi Fujimori, Liu Hao Tjeng, Andrea Severing, and Atsushi Hariki

Phys. Rev. Research **7**, 043195 (2025) - Published 20 November, 2025



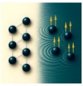
The spin-triplet superconductor UTe has been investigated using DFT + DMFT with material-specific parameters tuned to reproduce x-ray spectroscopic data. The results show that valence fluctuations stem from the degeneracy of the 5 and 5 configurations as well as the hybridization of the 5 electrons with the surrounding electron bath. The 5 bands in UTe turn out to be very narrow, which naturally explains the high tunability of its phase diagram.

EDITORS' SUGGESTION LETTER

How quantum fluctuations freeze a classical liquid and then melt it into a topological one

Hao Chen, Dan Mao, Andrea Kouta Dagnino, Glenn Wagner, Mark H. Fischer, Juraj Hasik, Eun-Ah Kim, and Titus Neupert

Phys. Rev. Research **7**, L042021 (2025) - Published 22 October, 2025



Spinless fermions on a honeycomb lattice with cluster-charging interactions are analyzed using exact diagonalization and high-order perturbation theory. The model features a kinetic-energy-driven sequence: a classical liquid freezes into charge order and subsequently transforms into a fractional Chern insulator as kinematic constraints are gradually lifted.

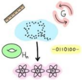
PERSPECTIVES

PERSPECTIVE

Toward structure-preserving quantum encodings

Arthur J. Parzygnat, Tai-Danae Bradley, Andrew Vlasic, and Anh Pham

Phys. Rev. Research **7**, 041001 (2025) - Published 8 December, 2025



In quantum machine learning for classical data, a key step is to encode the data onto the quantum system that will run the learning algorithm. Different tasks and datasets typically have different properties or structures, and this perspective suggests that category theory can be leveraged to offer guidance on the selection of an encoding scheme.

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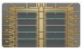
PERSPECTIVE

Blueprint for fault-tolerant quantum computation with topological qubit arrays

David Aasen *et al.*

Phys. Rev. Research **7**, 041002 (2025) - Published 24 December, 2025



This Perspective outlines a staged road map for building a fault-tolerant quantum computer based on topologically protected Majorana-based qubits. The plan spans several device generations, from a single-qubit device used for qubit benchmarking, a two-qubit device for a measurement-based braiding operation, and an eight-qubit device for quantum error detection to extended qubit lattices that support universal logical operations at scale. Key design elements, operating protocols, and the advantages of this approach for scalable, utility-scale quantum computation are highlighted.

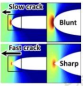
LETTERS

LETTER

Analytical expression for fracture profile in viscoelastic crack propagation

Hokuto Nagatakiya, Naoyuki Sakumichi, Shunsuke Kobayashi, and Ryuichi Tarumi

Phys. Rev. Research **7**, L042001 (2025) - Published 1 October, 2025



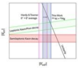
An analytical expression for the strain field during steady-state crack propagation in viscoelastic solids reveals three distinct power-law regions in the fracture profile, explaining the experimentally observed velocity-dependent crack-tip sharpening in rubbers and gels. This work establishes the de Gennes' viscoelastic trumpet on continuum mechanics, bridging scaling arguments with traditional fracture mechanics.

LETTER

Cabibbo-Kobayashi-Maskawa unitarity deficit reduction via finite nuclear size

Mikhail Gorchtein, Vaibhav Katyal, B. Ohayon, B. K. Sahoo, and Chien-Yeah Seng

Phys. Rev. Research **7**, L042002 (2025) - Published 1 October, 2025



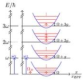
A robust treatment of finite nuclear size effects in the analysis of the Al → Mg decay is shown to reduce the Cabibbo-Kobayashi-Maskawa unitarity deficit by one standard deviation.

LETTER

Quantum Zeno blockade in optomechanical systems

Karl Pelka and André Xuereb

Phys. Rev. Research **7**, L042003 (2025) - Published 2 October, 2025



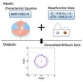
Using a simple yet experimentally feasible driving scheme it is shown how continuous variable quantum systems can be forced to act as qudits through the quantum Zeno effect. Moreover, the dimensionality of the qubit can be tuned through external drive parameters with parameters available in optomechanical experiments.

LETTER

Beyond characteristic equations: A unified one-dimensional non-Bloch band theory via wavefunction data

Haoshu Li

Phys. Rev. Research **7**, L042004 (2025) - Published 2 October, 2025



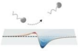
This study shows that the characteristic equation alone can be insufficient for determining open-boundary spectra in non-Hermitian systems and introduces a unified framework that incorporates wavefunction data to accurately capture spectral and response properties, particularly in high-symmetry settings.

LETTER

Hydroelastic scattering and trapping of microswimmers

Sagnik Garai, Ursy Makanga, Akhil Varma, and Christina Kurzthaler

Phys. Rev. Research **7**, L042005 (2025) - Published 3 October, 2025



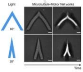
A perturbative approach shows how hydroelastic interactions with deformable surfaces steer microswimmers. Pushers typically scatter, in contrast to their motion near planar walls, while pullers experience enhanced attraction.

LETTER

Geometry-dependent defect merging induces bifurcated dynamics in active networks

Fan Yang, Shichen Liu, Hao Wang, Heun Jin Lee, Rob Phillips, and Matt Thomson

Phys. Rev. Research **7**, L042006 (2025) - Published 3 October, 2025



Microtubule-motor networks can merge defects through active crosslinking, with the outcomes governed by network geometry. Experiments and simulations reveal a bifurcation in V-shaped networks, where cracks merge below a critical angle and buckle open at larger angles.

LETTER

Closed-form survival probabilities for biased random walks at arbitrary step number

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Debendro Mookerjee and Sarah Kostinski

Phys. Rev. Research **7**, L042007 (2025) - Published 3 October, 2025

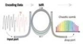
A combinatorial approach yields exact, closed-form expressions for the survival probability of a biased random walker on a one-dimensional lattice. The results are computationally fast and can be used to study the distribution of first passage times and the probability of last passage at arbitrary step number.

LETTER

Optical neuromorphic computing based on chaotic frequency combs in nonlinear microresonators

Negar Shaabani Shishavan, Egor Manuylovich, Morteza Kamalian-Kopae, and Auro M. Perego

Phys. Rev. Research **7**, L042008 (2025) - Published 6 October, 2025



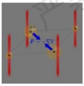
An optical reservoir computer architecture is presented that leverages optical frequency comb formation from modulation instability inside a Kerr microresonator. The proposed solution can enable GHz speed computation—random time-series prediction—at low power consumption and is compatible with on-chip integration.

LETTER

Rydberg atom arrays as quantum simulators for molecular dynamics

Simon Euchner and Igor Lesanovsky

Phys. Rev. Research **7**, L042009 (2025) - Published 6 October, 2025



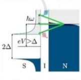
The coupling of electronic and vibrational degrees of freedom in optically trapped Rydberg systems is exploited for the quantum simulation of artificial molecular systems. The approach is tested using simple molecular geometries, revealing molecular instabilities, strong squeezing of motional wave packets in the ground state, and the impact of quantum effects on conformational changes.

LETTER

Rapid on-demand generation of thermal states in superconducting quantum circuits

Timm Mörstedt, Wallace S. Teixeira, Arto Viitanen, Heidi Kivijärvi, Maaria Tiiri, Miika Rasola, Andras Marton Gunyho, Suman Kundu, Louis Lattier, Vasilii Vadimov, Gianluigi Catelani, Vasilii Sevriuk, Johannes Heinsoo, Jukka Räbinä, Joachim Ankerhold, and Mikko Möttönen

Phys. Rev. Research **7**, L042010 (2025) - Published 7 October, 2025



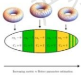
Using a single-junction quantum-circuit refrigerator (QCR) as an tunable environment, thermal states with temperatures up to 500 mK are generated in a transmon qubit within short timescales. Population distributions are monitored through single-shot readout as they respond to different QCR drive pulses.

LETTER

Quantum geometric bounds in spinful systems with trivial band topology

Wojciech J. Jankowski, Robert-Jan Slager, and Gunnar F. Lange

Phys. Rev. Research **7**, L042011 (2025) - Published 9 October, 2025



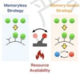
Derived quantum geometric bounds on optical observables are paradoxically applicable to materials with trivial bands, such as elemental bismuth, in which winding arises from projected spin eigenvalues. These novel quantum metrological bounds, moreover, can characterize spin-topological quantum sensors and are robust against disorder effects.

LETTER

Resource limitations induce phase transitions in biological information processing

Takehiro Tottori and Tetsuya J. Kobayashi

Phys. Rev. Research **7**, L042012 (2025) - Published 14 October, 2025



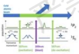
An optimal estimation and control framework is proposed that explicitly accounts for biological resource limitations. Application of this framework to biological information processing shows that resource limitations can induce discontinuous and nonmonotonic phase transitions between memoryless and memory-based strategies.

LETTER

Sub-recoil transverse momentum width in a cold ytterbium atomic beam

Toshiyuki Hosoya, Tomoya Sato, Ryotaro Inoue, and Mikio Kozuma

Phys. Rev. Research **7**, L042013 (2025) - Published 10 October, 2025



A cold ytterbium atomic beam with a sub-recoil transverse momentum width is generated via momentum filtering through a metastable state. The resulting beam is used to realize Bragg diffraction and a Mach-Zehnder interferometer.

LETTER

Finite steady-state current defies non-Hermitian many-body localization

Pietro Brighi, Marko Ljubotina, Federico Roccati, and Federico Balducci

Phys. Rev. Research **7**, L042014 (2025) - Published 14 October, 2025

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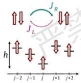


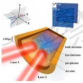
The interplay of disorder and quantum fluctuations can lead to dramatic effects, like Anderson localization. In the context of interacting open quantum systems and in the presence of postselection, localization becomes a property of the steady state, with notable differences from the closed-system scenario.

LETTER

From filamentation to stratification: Instability dynamics in scissors-shaped relativistic beam-plasma system

X. Liu, D. Wu, and J. Zhang

Phys. Rev. Research **7**, L042015 (2025) - Published 15 October, 2025



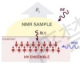
Theoretical analysis and particle-in-cell simulations reveal that breaking the cylindrical symmetry of the beam-plasma system with a scissors-shaped configuration alters the instability dynamics from filamentation to stratification. The subsequent suppression of the stratification mode leads to a state of enhanced beam uniformity compared to the conventional counter-streaming case.

LETTER

Microscale sensing with strongly interacting NV ensembles at high fields

Ainitze Biteri-Uribarren, Ana Martin, and Jorge Casanova

Phys. Rev. Research **7**, L042016 (2025) - Published 16 October, 2025



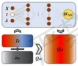
A method for detecting microscale nuclear magnetic resonance signals in high magnetic fields with dense nitrogen-vacancy ensembles is presented. By effectively suppressing dipole-dipole couplings, the approach combines the sensitivity gains of highly doped diamond substrates and elevated fields.

LETTER

Learning heat transport kernels using a nonlocal heat transport theory-informed neural network

Mufei Luo, Charles Heaton, Yizhen Wang, Daniel Plummer, Mila Fitzgerald, Francesco Miniati, Sam M. Vinko, and Gianluca Gregori

Phys. Rev. Research **7**, L042017 (2025) - Published 16 October, 2025



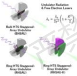
A theory-informed neural network is developed that predicts nonlocal heat flux in plasmas by directly learning spatiotemporal transport kernels from kinetic simulations, thereby enabling accurate modeling across both local and nonlocal regimes.

LETTER

Breakthrough in field amplitude of high-temperature superconductors staggered-array undulators

Ryota Kinjo, Satoshi Sato, and Marco Calvi

Phys. Rev. Research **7**, L042018 (2025) - Published 17 October, 2025


Undulator Radiation & Free Electron Lasers
Bulk HTS Staggered-Array Undulator (BHSAU)
Ring HTS Staggered-Array Undulator (RHSAU)
Ring HTS Staggered-Array Undulator (RHSAU-II)

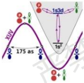
The use of a high-temperature superconductor ring is proposed to increase the magnetic-field output of undulators, with applications to synchrotron facilities and free-electron lasers.

LETTER

Giant counter-rotating oscillations on the attosecond timescale

Jakob Nicolai Bruhnke, Edvin Olofsson, Axel Stenquist, and Jan Marcus Dahlström

Phys. Rev. Research **7**, L042019 (2025) - Published 20 October, 2025



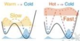
Atomic levels that are strongly coupled by intense XUV light are shown to be significantly affected by the instantaneous electric field. When the excited state is populated, it is polarized on the attosecond timescale, which in the time domain expresses itself as giant counter-rotating oscillations.

LETTER

Experimental study of Mpemba effect in an energy Langevin system

Yuan Tian, Yu Zheng, Lyu-Hang Liu, Long Wang, Guang-Can Guo, and Fang-Wen Sun

Phys. Rev. Research **7**, L042020 (2025) - Published 22 October, 2025



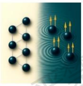
The ability to arbitrarily control the energy distribution of optically levitated nanoparticles provides an ideal platform for studying the Mpemba effect. This work confirms that during thermal relaxation following a temperature change, the potential-well crossing events determine the manifestation of the Mpemba effect.

EDITORS' SUGGESTION LETTER

How quantum fluctuations freeze a classical liquid and then melt it into a topological one

Hao Chen, Dan Mao, Andrea Kouta Dagnino, Glenn Wagner, Mark H. Fischer, Juraj Hasik, Eun-Ah Kim, and Titus Neupert

Phys. Rev. Research **7**, L042021 (2025) - Published 22 October, 2025



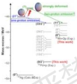
Spinless fermions on a honeycomb lattice with cluster-charging interactions are analyzed using exact diagonalization and high-order perturbation theory. The model features a kinetic-energy-driven sequence: a classical liquid freezes into charge order and subsequently transforms into a fractional Chern insulator as kinematic constraints are gradually lifted.

LETTER

Direct mass measurement of and implications for the isomer structures in : Tracing the two-proton decay branch

Gabriella Kripkó-Koncz *et al.* (for the Super-FRS Experiment Collaboration)

Phys. Rev. Research **7**, L042022 (2025) - Published 23 October, 2025



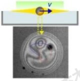
A direct mass measurement of Pd has been performed and shows that there is an incompatibility in the previously reported decay scheme of the (21) high-spin isomer in Ag, which calls into question the observation of the two-proton decay in Ag. State-of-the-art mean-field calculations support the idea of two high-spin isomeric states in Ag with strongly differing deformations, which would resolve this incompatibility.

LETTER

Active particle in a very thin interfacial droplet

Airi N. Kato, Kaili Xie, Benjamin Gorin, Jean-Michel Rampnoux, and Hamid Kellay

Phys. Rev. Research **7**, L042023 (2025) - Published 27 October, 2025



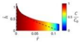
An active particle driven by laser light and confined in a very thin droplet floating at a liquid interface exhibits either periodic circular or irregular intermittent motions. These trajectories result from the coupling between the self-propulsion of the particle and capillary forces induced by spatiotemporal changes in droplet thickness.

LETTER

Polarons and dimerons in the two-dimensional attractive Hubbard model

G. Pascual, J. Boronat, and K. Van Houcke

Phys. Rev. Research **7**, L042024 (2025) - Published 27 October, 2025



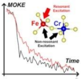
The behavior of a single spin-down impurity in a two-dimensional Fermi-Hubbard lattice in the presence of a finite density of spin-up fermions is studied using variational and diagrammatic Monte Carlo methods. The polaron-to-dimeron transition observed in the continuum is found to disappear at higher filling fractions, highlighting qualitative differences between lattice and continuum systems.

LETTER

Mid-infrared element-specific selective manipulation of the ultrafast magneto-optical Kerr effect dynamics in the ferrimagnet

Davide Soranzio, Matteo Savoini, Fabian Graf, Rafael T. Winkler, Abhishek Nag, Hiroki Ueda, Kenya Ohgushi, Yoshinori Tokura, and Steven L. Johnson

Phys. Rev. Research **7**, L042025 (2025) - Published 27 October, 2025



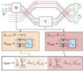
Using time-resolved measurements of the magneto-optic Kerr effect in the ferrimagnet FeCrS, this work shows how mid-infrared excitation through intra-atomic Fe transitions triggers markedly slower dynamics in comparison to nonresonant pumping affecting both of the sublattices simultaneously.

LETTER

Two-detector reconstruction of multiphoton states in linear optical networks

Tudor-Alexandru Isdrailă and Jun-Yi Wu

Phys. Rev. Research **7**, L042026 (2025) - Published 28 October, 2025



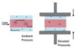
A partial reconstruction method for photonic quantum states reduces the required number of photon-number-resolving detectors from many to just two. This approach provides a scalable and efficient method for characterizing multiphoton states through their Heisenberg–Weyl–reduced density matrices in large-scale photonic systems.

LETTER

High pressure suppresses the laser-induced nucleation of supersaturated aqueous potassium chloride solutions

Kelechi F. Ndukwe-Ajala, Lamia Tahsin, Bruce A. Garetz, and Ryan L. Hartman

Phys. Rev. Research **7**, L042027 (2025) - Published 29 October, 2025



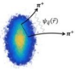
Using high-pressure microfluidics, this study shows that laser-induced nucleation of potassium chloride crystals is significantly suppressed at elevated pressures. The results support the impurity-heating mechanism and associated nanobubble formation.

LETTER

Femtoscopic signatures of unique nuclear structures in relativistic collisions

Dániel Kincses

Phys. Rev. Research **7**, L042028 (2025) - Published 31 October, 2025



By using a multiphase transport model, it is demonstrated that the femtoscopic source parameters of pion pairs can also serve as a robust signal of unique nuclear structure in relativistic collisions.

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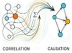
LETTER

Nonlinear correlations underlie linear response and causality

Gabriele Di Antonio and Gianni Valerio Vinci

Phys. Rev. Research **7**, L042029 (2025) - Published 31 October, 2025



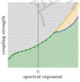
By lifting the dynamics of nonlinear systems into a higher-dimensional space, a novel fluctuation-dissipation relationship is established between generalized correlations and linear response functions in nonlinear systems. This framework yields a practical method to infer causal interactions and predict responses to perturbations from data, crucially, without requiring knowledge of the system's invariant measure.

LETTER

Quantum noise induced relaxation in the spin-boson model

Florian Otterpohl, Peter Nalbach, Elisabetta Paladino, Giuseppe A. Falci, and Michael Thorwart

Phys. Rev. Research **7**, L042030 (2025) - Published 31 October, 2025



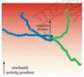
The spin-boson model is extended to quantum 1/ noise with negative spectral exponents. The time-evolving matrix product operator is used to map the dynamic regime and derive an empirical dephasing rate formula at zero temperature. The influence of bath reorganization energy on qubit dephasing is highlighted.

LETTER

Collective dynamics in active polar polymer assemblies

Hossein Vahid, Jens-Uwe Sommer, and Abhinav Sharma

Phys. Rev. Research **7**, L042031 (2025) - Published 5 November, 2025



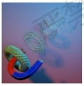
Activity gradients direct polar polymer assemblies toward high-activity regions. Temporal stochasticity in the activity induces the formation of entangled clusters via steric interlocking.

LETTER

Quantum convolutional neural network for phase recognition in two dimensions

Leon C. Sander, Nathan A. McMahon, Petr Zapletal, and Michael J. Hartmann

Phys. Rev. Research **7**, L042032 (2025) - Published 7 November, 2025



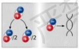
A quantum convolutional neural network is constructed to detect intrinsic topological order in the two-dimensional toric code. The network captures quantum correlations that are inaccessible via direct measurements, allowing for the correct identification of topological order in the presence of strong correlated errors.

LETTER

Exciton fractional Chern insulators in moiré heterostructures

Raul Perea-Causin, Hui Liu, and Emil J. Bergholtz

Phys. Rev. Research **7**, L042033 (2025) - Published 10 November, 2025



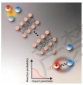
Long-lived interlayer excitons in a twisted bilayer WSe/monolayer MoSe heterostructure are predicted to be able to form bosonic fractional Chern insulators. Exact-diagonalization calculations reveal both Abelian (Laughlin) and non-Abelian (Moore-Read) states stabilized by realistic long-range interactions at filling factors 1/2 and 1 of the lowest-energy topological exciton band.

LETTER

Machine learning prediction of a chemical reaction over 8 decades of energy

Daniel Julian and Jesús Pérez-Ríos

Phys. Rev. Research **7**, L042034 (2025) - Published 12 November, 2025



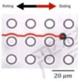
This work shows that a machine can learn the chemistry underlying atom recombination reactions, which require three reactants to yield a molecule and an atom as reaction products. Despite the inherent complexity of these reactions, a machine learning model can predict the probability of a reaction as a function of the collision energy spanning from the cold to hyperthermal regimes.

LETTER

Rolling, sliding, and trapping of driven particles in square obstacle lattices

Galor Geva, Arin Escobar Ortiz, Paula Magrinya, Pablo Llombart, Alfredo Alexander-Katz, Laura R. Arriaga, and Juan L. Aragones

Phys. Rev. Research **7**, L042035 (2025) - Published 14 November, 2025



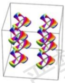
A rotating particle near a substrate patterned with a square lattice of cylindrical posts reverses direction as the obstacle area fraction is varied, reflecting a balance between shear driven rolling and pressure driven sliding.

LETTER

Construction of hopfion crystals

Wen-Tao Hou, Zhuoxian Xiang, Yizhou Liu, and Jiadong Zang

Phys. Rev. Research **7**, L042036 (2025) - Published 19 November, 2025



A systematic approach for constructing ordered three-dimensional arrays of hopfions, that is, hopfion crystals, is established by combining the Hopf map and rational maps. The framework enables creation of hopfion crystals with various cubic symmetries and tunable topology like torus rings, links, and knots.

LETTER

Ballistic-to-diffusive transition in engineered counterpropagating quantum Hall channels

Aifei Zhang, Kenji Watanabe, Takashi Taniguchi, Patrice Roche, Carles Altimiras, François D. Parmentier, and Olivier Maillet

Phys. Rev. Research **7**, L042037 (2025) - Published 19 November, 2025

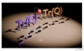
The equilibration between counterpropagating edge channels of the quantum Hall effect is simulated in an experiment where two independent graphene Hall bars are connected oppositely. The results show a ballistic-to-diffusive transition controlled by the number of counterpropagating channels, reproducing and explaining previous observations in exotic quantum Hall systems.

LETTER

Multipole expansion for dispersion forces

Jivesh Kaushal, Chris Boldt, Stefan Scheel, Athanasios Laliotis, and Paolo Pedri

Phys. Rev. Research **7**, L042038 (2025) - Published 19 November, 2025



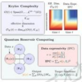
This work shows that, in the theory of electromagnetic dispersion interactions, there are situations in which the application of the commonly used traceless multipole moments are invalid.

LETTER

From Krylov complexity to observability: Capturing phase space dimension with applications in quantum reservoir computing

Saud Čindrak, Kathy Lüdge, and Lina Jaurigue

Phys. Rev. Research **7**, L042039 (2025) - Published 20 November, 2025



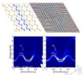
Krylov observability is introduced as a measure of the phase-space dimension associated with the quantum evolution of multiple operators. Its relationship with data expressivity in quantum reservoir computing is examined, finding correlations of up to 0.97 across a broad range of parameters.

LETTER

Bond-dependent interactions and ill-ordered state in the honeycomb cobaltate

A. Devillez, J. Robert, E. Lhotel, R. Ballou, C. Cavenel, F. Denis Romero, Q. Faure, H. Jacobsen, J. Lass, D. G. Mazzone, U. Bengaard Hansen, M. Enderle, S. Raymond, S. De Brion, V. Simonet, and M. Songvilay

Phys. Rev. Research **7**, L042040 (2025) - Published 21 November, 2025



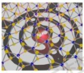
Low temperature magnetization, ac susceptibility, and neutron scattering measurements are used to investigate the magnetic properties and excitations of the Kitaev candidate material BaCo(AsO). The results highlight an ill-ordered collinear magnetic ground state with chainlike defects. Monte Carlo and linear spin wave simulations enable the determination of a spin model including bond-dependent Kitaev-like interactions, compatible with this magnetic order, the excitation dispersion, and the field-induced magnetization plateau.

LETTER

Strong coupling between a dielectric nanocavity and a monolayer transition metal dichalcogenide

F. Schröder, P. Wyborski, M. Xiong, G. Kountouris, B. Munkhbat, M. Wubs, P. T. Kristensen, J. Mørk, and N. Stenger

Phys. Rev. Research **7**, L042041 (2025) - Published 24 November, 2025



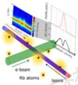
An inverse-design-inspired dielectric nanocavity confines electromagnetic fields on length scales previously known from plasmonic cavities but now without the associated ohmic absorption losses. The resulting deep subwavelength fields enable strong interactions with excitons in monolayer tungsten ditelluride, opening a pathway toward quantum nonlinearities at the single-photon level.

LETTER

Electron beam characterization via quantum coherent electric field imaging

Rob Behary, Kevin Su, Nicolas DeStefano, Mykhailo Vorobiov, T. Averett, Alexandre Camsonne, Shukui Zhang, Charles T. Fancher, Neel Malvania, Eugeniy E. Mikhailov, Seth Aubin, and Irina Novikova

Phys. Rev. Research **7**, L042042 (2025) - Published 25 November, 2025



A demonstration of how Rydberg atoms can be used as sensitive, minimally perturbative probes for high-resolution spatial mapping of the electric field produced by an electron beam. This method enables determination of the beam's width, central position, and current in a single measurement.

LETTER

Magnetic phase diagram of : The influence of hyperfine interactions

J. Knapp, L. V. Levitin, J. Nyéki, B. Cowan, M. Brando, C. Geibel, K. Kliemt, C. Krellner, and J. Saunders

Phys. Rev. Research **7**, L042043 (2025) - Published 25 November, 2025

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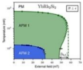


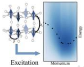
The magnetic phase diagram of the canonical heavy fermion metal YbRhSi has been extended to below 1 mK. This work demonstrates the influence of hyperfine interactions, which both stabilize low-temperature electronuclear spin-density-wave order and modify the boundary of the well-known antiferromagnetic state.

LETTER

-type antiferromagnetic ordering with strong anisotropic exchange interactions in

Xiang Li, Xiaoting Li, Jiaqi Lin, Zahirul Islam, Mary H. Upton, Vivek Thampy, Yifan Jiang, Yuan Wan, Haizhong Guo, and Xuerong Liu

Phys. Rev. Research **7**, L042044 (2025) - Published 26 November, 2025



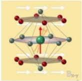
Resonant magnetic x-ray scattering is used to identify the spin pattern of the antiferromagnetic order in SrIrSnO, a spin-diluted derivative from paramagnetic SrIrO. The magnon dispersion extracted from resonant inelastic x-ray scattering data shows large and anisotropic exchange interactions.

LETTER

Nature of quantum criticality in the Ising ferromagnet

Tianxiong Han, R. D. McKenzie, Joanna Blawat, Tyler J. Slade, Bing Li, Y. Lee, D. M. Pajerowski, John Singleton, Paul C. Canfield, Liqin Ke, Ross McDonald, Rebecca Flint, and R. J. McQueeney

Phys. Rev. Research **7**, L042045 (2025) - Published 26 November, 2025



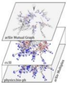
Inelastic neutron scattering and transverse-field magnetization measurements on the kagome metal TbVSn identify the Ising doublet ground state and a spin-reorientation transition driven by the mixing of crystal electric field (CEF) levels. Mean-field modeling indicates that the system resides near a regime where quantum critical and tricritical behavior can be controlled by the field direction and fine-tuning of CEF parameters.

LETTER

Multiplexity amplifies geometry in networks

Jasper van der Kolk, Dmitri Krioukov, Marián Boguñá, and M. Ángeles Serrano

Phys. Rev. Research **7**, L042046 (2025) - Published 1 December, 2025



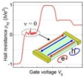
How interlayer correlations in multilayer networks amplify geometric organization is analyzed. This mechanism is shown to account for the high levels of edge and triangle overlap observed across diverse real-world networks.

LETTER

Quantum Hall effect and zero-resistance plateau in bulk HgTe

M. L. Savchenko, D. A. Kozlov, S. S. Krishtopenko, N. N. Mikhailov, S. A. Dvoretsky, Z. D. Kvon, A. Pimenov, and D. Weiss

Phys. Rev. Research **7**, L042047 (2025) - Published 1 December, 2025



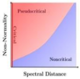
In addition to the typical quantum Hall effect plateaus, a nominally bulk HgTe film exhibits a zero Hall resistance plateau. This zero plateau is generated by counterpropagating chiral electron-hole edge channels resembling the quantum spin Hall effect, which exhibit suppressed backscattering on a macroscopic scale.

LETTER

Unifying framework for amplification mechanisms: Spectral criticality, resonance, and nonnormality

Virgile Troude and Didier Sornette

Phys. Rev. Research **7**, L042048 (2025) - Published 1 December, 2025



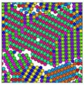
Amplification mechanisms are unified in this study through two parameters: the spectral distance to bifurcation or resonance and the non-normality index measuring the obliqueness of the eigenvectors of the dynamical operator. Together, they yield universal amplification laws and phase diagrams that reveal broad pseudocritical regimes overlooked by single-parameter approaches.

LETTER

Orientational order in confined systems of self-driven spinners

Rushil Pingali and Erik Luijten

Phys. Rev. Research **7**, L042049 (2025) - Published 2 December, 2025



Through direct numerical simulation of three-dimensional hydrodynamics, it is shown that self-driven spinning colloids generate unique collective flows when confined over a substrate. A tunable state space with multiple accessible forms of spatial and orientational order emerges purely from these hydrodynamic interactions.

LETTER

Controllable operations of edge states in cross-one-dimensional topological chains

Xian-Liang Lu and Ze-Liang Xiang

Phys. Rev. Research **7**, L042050 (2025) - Published 3 December, 2025

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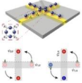


A scheme is proposed to implement controllable operations on edge states using local interactions in cross-one-dimensional topological emitter chains. It enables robust quantum state transfer and tunable SWAP gates via a double-quench protocol, without requiring global, adiabatic modulations. The dissipative dynamics is investigated for emitters coupled to an environment, where the edge-state qubit can exhibit superradiant and subradiant behavior.

LETTER

Probing lambda-gravity with Bose-Einstein condensates

Hector A. Fernandez-Melendez, Alexander Belyaev, Vahe Gurzadyan, and Ivette Fuentes

Phys. Rev. Research **7**, L042051 (2025) - Published 3 December, 2025

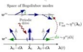
A proposal to use a trapped Bose-Einstein condensate to measure two components of the gravitational potential, the Newtonian term, and the contribution from the cosmological constant by exploiting phononic excitations and a tritter operation. The setup allows measurements of Newton's constant with an improvement of 2 orders of magnitude over current measurements, establishes a laboratory-based upper limit on the cosmological constant Λ, and enables measurement of the distance-dependent behavior of each term in the gravitational potential, providing a means to test modified gravity theories.

LETTER

Quantum geometry of bosonic Bogoliubov quasiparticles

Isaac Tesfaye and André Eckardt

Phys. Rev. Research **7**, L042052 (2025) - Published 3 December, 2025



The quantum geometric characterization of bosonic Bogoliubov-de Gennes systems is developed through the symplectic quantum geometric tensor, which encompasses both the symplectic Berry curvature and a distance-defining symplectic quantum metric. These geometric quantities are directly measurable via integrated excitation rates under periodic parameter modulations, and the symplectic Berry curvature governs anomalous transverse velocity of Bogoliubov wave packets under external forcing.

LETTER

Stability of algebraic spin liquids coupled to quantum phonons

Francesco Ferrari, Josef Willsher, Urban F. P. Seifert, Roser Valentí, and Johannes Knolle

Phys. Rev. Research **7**, L042053 (2025) - Published 5 December, 2025

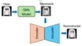
The stability of enigmatic quantum spin liquids is poorly understood in two dimensions, with many candidate materials showing ordering at low temperature. This work studies the stability of the quantum spin-liquid regime of the - Heisenberg model on the triangular lattice in the presence of phonons, confirming the presence of a spin-Peierls instability.

LETTER

Classical autoencoder distillation of quantum adversarial manipulations

Amena Khatun and Muhammad Usman

Phys. Rev. Research **7**, L042054 (2025) - Published 8 December, 2025



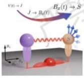
A quantum-classical machine learning framework is presented in which a classical autoencoder is used to distill quantum-generated adversarial manipulations. This approach restores quantum classifier accuracy under FGSM and PGD attacks on MNIST and Fashion-MNIST datasets, demonstrating effective mitigation of quantum adversarial manipulations.

LETTER

Efficient driving of a spin qubit using single-atom magnets

Jose Reina-Gálvez, Hoang-Anh Le, Hong Thi Bui, Soo-hyon Phark, Nicolás Lorente, and Christoph Wolf

Phys. Rev. Research **7**, L042055 (2025) - Published 8 December, 2025



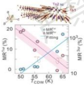
Atomic dimers are the smallest building blocks for spin-based qubits. In this work, a quantum magnet under an ac voltage enables electric-field-driven control of a nearby spin-1/2 qubit through modulation of the exchange coupling.

LETTER

Disorder-mediated linear and nonlinear magnetotransport in the charge-density-wave material

Xiaodong Sun, Jiabin Qiao, Yuanzhe Li, Wanli He, Jiali Chen, Jinjin Liu, Yuxiang Chen, Yuchen Ma, Meiling Jin, Jianlin Luo, Jie Chen, Wei Wu, Zhiwei Wang, Wei Jiang, Xiang Li, and Yugui Yao

Phys. Rev. Research **7**, L042056 (2025) - Published 8 December, 2025



This study investigates the disorder-mediated linear and nonlinear magnetotransport in the charge-density-wave regime of TaNiSe. The work reveals a correlation between the sample's residual resistance ratio and its charge-density-wave transition temperature and observes magnetic-field-dependent signals, suggesting the involvement of Berry curvature and quantum geometry.

LETTER

Observation of supersensitivity of non-Hermitian skin effect

Qing Wang, Zhonghao Fu, Liping Ye, Hailong He, Weiyin Deng, Jiuyang Lu, Manzhu Ke, and Zhengyou Liu

Phys. Rev. Research **7**, L042057 (2025) - Published 9 December, 2025

The supersensitivity of the non-Hermitian skin effect is revealed, showing that the addition of a single unit cell at the boundary can transform the skin effect from bidirectional to unidirectional. This supersensitivity offers an approach for wave manipulation and high-sensitivity measurements based on non-Hermitian systems.

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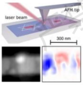
LETTER

Switching of magnetic domains in a noncollinear antiferromagnet at the nanoscale

Atul Pandey, Prajwal Rigvedi, Edouard Lesne, Jitul Deka, Jiho Yoon, Wolfgang Hoppe, Chris Koerner, Banabir Pal, James M. Taylor, Stuart S. P. Parkin, and Georg Woltersdorf

Phys. Rev. Research **7**, L042058 (2025) - Published 9 December, 2025



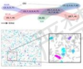
Chiral antiferromagnets like MnSn are promising materials for ultrafast, low-power spintronic technologies, but they exhibit resistance to full magnetic ordering. This work shows that even in the presence of strong magnetic fields, regions of MnSn thin films fail to align as they get pinned by grain boundaries.

LETTER

Flocking with random nonreciprocal interactions

Jiwon Choi, Jae Dong Noh, and Heiko Rieger

Phys. Rev. Research **7**, L042059 (2025) - Published 11 December, 2025



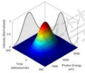
Mixtures of large numbers of randomly and nonreciprocally aligning and antialigning self-propelled particles pick their "friends" and form transient microflocks or cliques.

LETTER

Enhanced generation of single-spike hard x-ray free-electron laser pulses with lower charge and shorter electron beams in the injector

Eduard Prat, Alexander Malyzhenkov, Gian Luca Orlandi, Tobias Weilbach, and Sven Reiche

Phys. Rev. Research **7**, L042060 (2025) - Published 10 December, 2025



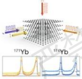
Starting with lower-charge and shorter electron beams at the injector of a free-electron laser (FEL) is shown to enhance the generation of short pulses via strong compression. Hard x-ray FEL radiation is produced in which virtually all pulses consist of a single spike with estimated pulse durations of 300 attoseconds.

LETTER

Isotope-agnostic motional ground-state cooling of neutral Yb atoms

Ronen M. Kroeze, René A. Villela, Er Zu, Tim O. Höhn, and Monika Aidelsburger

Phys. Rev. Research **7**, L042061 (2025) - Published 12 December, 2025



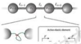
High-fidelity ground-state cooling in 2D and 3D optical lattices, crucial for diverse quantum applications, is achieved via chirped sideband cooling on an optical clock transition. This approach is broadly applicable to alkaline-earth-like atoms, particularly bosonic isotopes, with the frequency chirp compensating for inherent trap inhomogeneities that are accurately captured by theoretical modeling.

LETTER

Mechanical inhibition of dissipation in a thermodynamically consistent active solid

Luca Cocconi, Michalis Chatzittofi, and Ramin Golestanian

Phys. Rev. Research **7**, L042062 (2025) - Published 16 December, 2025



A thermodynamically consistent active solid model is presented, in which interacting "active springs" undergo chemically driven stochastic rest-length dynamics, revealing a coupling between mechanical loading and dissipation. The analysis shows that entropy production peaks at intermediate stresses but becomes strongly suppressed under larger stresses, yielding an effectively passive mechanical response.

LETTER

Walsh-Floquet theory of periodic kick drives

James Walkling and Marin Bukov

Phys. Rev. Research **7**, L042063 (2025) - Published 16 December, 2025

Periodically driven dynamics can be computed numerically by truncating the problem in an enlarged state space. For periodic kick drives, the resulting steplike features are captured more accurately using the Walsh basis than the conventional Fourier representation, which can be understood via localization in frequency space.

LETTER

Orbital magnetization as the origin of the nonlinear Hall effect

Zesheng Zhang, Xin-Zhi Li, and Wen-Yu He

Phys. Rev. Research **7**, L042064 (2025) - Published 19 December, 2025

Orbital magnetization is established as the origin of the nonlinear Hall effect by deriving an explicit formula connecting the electric-field-induced orbital magnetization to the second-order nonlinear Hall conductivity. The applied electric field is shown to play dual roles in generating the nonlinear Hall effect by first generating a nonequilibrium orbital magnetization and then perturbing the associated edge states, and a unique nonlinear Hall effect is predicted in isotropic chiral metals driven by a noncollinear bichromatic electric field.

LETTER

Probing superfluidity with quantum vortex necklaces and Leggett's bounds

Andrea Richaud and Pietro Massignan

Phys. Rev. Research **7**, L042065 (2025) - Published 19 December, 2025

This article shows a mechanism by which a rotating vortex necklace of the majority component creates a moving periodic landscape for the minority one on a binary Bose-Einstein condensate. The transfer of angular momentum from the majority to the minority one allows for the determination of the superfluid fraction, which can then be compared with Leggett's bounds evaluated solely from its density profile.

LETTER

Quench spectroscopy for Lieb-Liniger bosons in the presence of harmonic trap

Jiachen Yu, Yuanzhe Hu, Wenhan Chen, Jianing Yang, Xuzong Chen, and Hepeng Yao

Phys. Rev. Research **7**, L042066 (2025) - Published 22 December, 2025

The authors use quench spectroscopy on one-dimensional bosons in optical lattices with the presence of a harmonic trap to probe their excitation spectrum. The energy gap of a Mott insulator is detected with a broadening shape and a momentum cutoff, which arise from the excitations under harmonic confinement. These findings elucidate the application of quench spectroscopy to inhomogeneous experimental systems.

LETTER

Characterizing correlated noise with single-qubit operations

Balázs Gulácsi, Joris Kattemölle, and Guido Burkard

Phys. Rev. Research **7**, L042067 (2025) - Published 26 December, 2025

Spatially correlated noise affects multiple qubits simultaneously, which is particularly harmful for quantum computation. This work refines standard single-qubit spectroscopy techniques to bound and quantify spatially correlated relaxation and dephasing.

LETTER

Unified boson sampling

Luca Bianchi, Carlo Marconi, Laura Ares, Davide Bacco, and Jan Sperling

Phys. Rev. Research **7**, L042068 (2025) - Published 26 December, 2025

A unified framework for boson sampling is presented that merges photonic and Gaussian resources into a single protocol. The work develops an analytical toolbox, a complexity benchmark, and an entanglement certifier to characterize its performance.

LETTER

Tunable molecular interactions near an atomic Feshbach resonance: Stability and collapse of a molecular Bose-Einstein condensate

Zhiqiang Wang, Ke Wang, Zhendong Zhang, Qijin Chen, Cheng Chin, and K. Levin

Phys. Rev. Research **7**, L042069 (2025) - Published 29 December, 2025

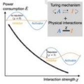
Just as for atomic scattering lengths, molecular scattering lengths are shown to be effectively controlled and tuned near a Feshbach resonance of bosonic atoms. Universal analytical expressions for these scattering lengths are obtained and used to characterize the phase stability of a molecular Bose–Einstein condensate near the resonance.

LETTER

Physical interactions enable energy-efficient Turing patterns

Cathelijne ter Burg and David Zwicker

Phys. Rev. Research **7**, L042070 (2025) - Published 30 December, 2025



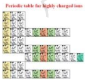
A thermodynamically consistent reaction-diffusion model is developed to quantify the energy input required for forming Turing patterns. Repulsive activator-inhibitor interactions are shown to lower the required energy input.

LETTER

Periodic table for highly charged ions

Chunhai Lyu, Christoph H. Keitel, and Zoltán Harman

Phys. Rev. Research **7**, L042071 (2025) - Published 31 December, 2025


Periodic table for highly charged ions

Using the principle of angular momentum coupling of relativistic orbitals, researchers have developed a new periodic table for multiply charged ions. This table enables the identification and classification of hundreds of ultra-accurate optical clock transitions.

ARTICLES

Topological transition from a hopfion to a toron via flexoelectric self-polarization in chiral liquid crystals

Paul Leask

Phys. Rev. Research **7**, 043001 (2025) - Published 1 October, 2025

Precision polarization tuning for light shift mitigation in trapped-ion qubits

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Hengchao Tu, Chun-Yang Luan, Menglin Zou, Zihan Yin, Kamran Rehan, and Kihwan Kim

Phys. Rev. Research **7**, 043002 (2025) - Published 1 October, 2025

Construction of quantum bisource based on dressed-state-assisted photon blockade effect

Hui Yang, Xinlong Zhou, Yuxuan Wang, and Zhihai Yao

Phys. Rev. Research **7**, 043003 (2025) - Published 1 October, 2025

In situ observation of proton-induced DNA fragmentation in the Bragg peak: Evidence for protective role of water

R. Liénard, P. Barberet, K. Chatzipapas, G. Devès, T. Dhôte, T. Guérin, H. Seznec, and F. Gobet

Phys. Rev. Research **7**, 043004 (2025) - Published 1 October, 2025

Nonmonotonic effects of nonreciprocal interactions on glass transition and diffusion in a two-dimensional emergent active system

Rui-xue Guo, Jia-jian Li, Chun-hua Zeng, Ya-feng He, and Bao-quan Ai

Phys. Rev. Research **7**, 043005 (2025) - Published 1 October, 2025

Ultrafast all-optical measurement of squeezed vacuum in a lithium niobate nanophotonic circuit

James Williams, Elina Sendonaris, Rajveer Nehra, Robert M. Gray, Ryoto Sekine, Luis Ledezma, and Alireza Marandi

Phys. Rev. Research **7**, 043006 (2025) - Published 1 October, 2025

Topological sound in nonreciprocal active-liquid networks

Minqi Cheng, Jingming Chen, Linyun Yang, and Zhen Gao

Phys. Rev. Research **7**, 043007 (2025) - Published 1 October, 2025

Scaling laws for phase coexistence in multicomponent mixtures

Yicheng Qiang, Chengjie Luo, and David Zwicker

Phys. Rev. Research **7**, 043008 (2025) - Published 1 October, 2025

Coherent information as a mixed-state topological order parameter of fermions

Ze-Min Huang, Luis Colmenarez, Markus Müller, and Sebastian Diehl

Phys. Rev. Research **7**, 043009 (2025) - Published 1 October, 2025

Using matrix-product states for time-series machine learning

Joshua B. Moore, Hugo P. Stackhouse, Ben D. Fulcher, and Sahand Mahmoodian

Phys. Rev. Research **7**, 043010 (2025) - Published 1 October, 2025

Optical chirality in Raman scattering

Yi-Jing Wu, Jing-Han Zhuang, Zi-Qiang Wang, Yin-Mei Li, and Lei Gong

Phys. Rev. Research **7**, 043011 (2025) - Published 2 October, 2025

Thermal state preparation by repeated interactions at and beyond the Lindblad limit

Carlos Ramon-Escandell, Alessandro Prositto, and Dvira Segal

Phys. Rev. Research **7**, 043012 (2025) - Published 2 October, 2025

Pre-Floquet states facilitating coherent subharmonic response of periodically driven many-body systems

Steffen Seligmann, Hamed Koochaki Kelardeh, and Martin Holthaus

Phys. Rev. Research **7**, 043013 (2025) - Published 2 October, 2025

Bosonic entanglement and quantum sensing from energy transfer in two-tone Floquet systems

Yinan Chen, Andreas Elben, Angel Rubio, and Gil Refael

Phys. Rev. Research **7**, 043014 (2025) - Published 3 October, 2025

Delta-kick collimation of heteronuclear Feshbach molecules

T. Estrampes, J. P. D'Incao, J. R. Williams, T. A. Schulze, E. M. Rasel, E. Charron, and N. Gaaloul

Phys. Rev. Research **7**, 043015 (2025) - Published 3 October, 2025

Extending the capillary wave model to include the effect of bending rigidity: X-ray reflectivity and diffuse scattering

Chen Shen (沈辰), Honghu Zhang (张洪湖), Beate Klösgen, and Benjamin M. Ocko

Phys. Rev. Research **7**, 043016 (2025) - Published 3 October, 2025

Nonequilibrium thermodynamics of gravitational objective-collapse models

Simone Artini, Gabriele Lo Monaco, Sandro Donadi, and Mauro Paternostro

Phys. Rev. Research **7**, 043017 (2025) - Published 3 October, 2025

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Recipe for local simulation of strongly correlated fermionic matter on quantum computers: The two-dimensional Fermi-Hubbard model

Arash Jafarizadeh, Frank Pollmann, and Adam Gammon-Smith

Phys. Rev. Research **7**, 043018 (2025) - Published 7 October, 2025

Effective dynamics from minimizing dissipation

Antonio F. Rotundo, Paolo Perinotti, and Alessandro Bisio

Phys. Rev. Research **7**, 043019 (2025) - Published 6 October, 2025

Optimal spatial searches with long-range tunneling

Emma C. King, Moritz Linnebacher, Peter P. Orth, Matteo Rizzi, and Giovanna Morigi

Phys. Rev. Research **7**, 043020 (2025) - Published 6 October, 2025

Demonstration of hardware efficient photonic variational quantum algorithm

Iris Agresti, Koushik Paul, Peter Schiansky, Simon Steiner, Zhenghao Yin, Ciro Pentangelo, Simone Piacentini, Andrea Crespi, Yue Ban, Francesco Ceccarelli, Roberto Osellame, Xi Chen, and Philip Walther

Phys. Rev. Research **7**, 043021 (2025) - Published 8 October, 2025

Identifying entanglement phases with bipartite projected ensembles

Zi-Yong Ge and Franco Nori

Phys. Rev. Research **7**, 043022 (2025) - Published 6 October, 2025

Nonlinear spin and orbital Rashba-Edelstein effects induced by a femtosecond laser pulse: Simulations for Au(001)

Oliver Busch, Franziska Ziolkowski, Börge Göbel, Ingrid Mertig, and Jürgen Henk

Phys. Rev. Research **7**, 043023 (2025) - Published 6 October, 2025

Compensating spherical and chromatic aberrations of ultrafast electron microscopes with laser beams

Zdeněk Nekula, Thomas Juffmann, and Andrea Konečná

Phys. Rev. Research **7**, 043024 (2025) - Published 6 October, 2025

BlockBP decoder for the surface code

Aviad Kaufmann and Itai Arad

Phys. Rev. Research **7**, 043025 (2025) - Published 7 October, 2025

Revisiting the physics of hole-conjugate fractional quantum Hall channels

D. C. Glattli, C. Boudet, A. De, and P. Roulleau

Phys. Rev. Research **7**, 043026 (2025) - Published 7 October, 2025

Mechanical feedback drives asynchronous cell divisions during embryogenesis

Abdul N. Malmi-Kakkada, Sumit Sinha, and D. Thirumalai

Phys. Rev. Research **7**, 043027 (2025) - Published 7 October, 2025

Fermi surface and Berry phase analysis for Dirac nodal line semimetals: Cautionary tale from and

Yuxiang Gao, Yichen Zhang, Shiming Lei, Neil Harrison, Mun Keat Chan, Jonathan D. Denlinger, Sergey Gorovikov, Sanu Mishra, Yan Sun, Ming Yi, and Emilia Morosan

Phys. Rev. Research **7**, 043028 (2025) - Published 7 October, 2025

Emergent symmetries and phases in quantum spin chains coupled to a Kuramoto model

V. M. Bastidas

Phys. Rev. Research **7**, 043029 (2025) - Published 8 October, 2025

Symmetry-enhanced counterdiabatic quantum algorithm for qudits

Alberto Bottarelli, Mikel Garcia de Andoin, Pranav Chandarana, Koushik Paul, Xi Chen, Mikel Sanz, and Philipp Hauke

Phys. Rev. Research **7**, 043030 (2025) - Published 8 October, 2025

Cooperative effects in thin dielectric layers: Long-range Dicke superradiance

Ankit Kundu, Rahul Trivedi, Alisa Javadi, and Hadiseh Alaeian

Phys. Rev. Research **7**, 043031 (2025) - Published 9 October, 2025

Compressing local vertex functions from the multipoint numerical renormalization group using quantics tensor cross interpolation

Markus Frankenbach, Marc K. Ritter, Mathias Pelz, Nepomuk Ritz, Jan von Delft, and Anxiang Ge

Phys. Rev. Research **7**, 043032 (2025) - Published 8 October, 2025

Ladder equation for the three-particle vertex and its approximate solution

Patrick Kappl, Tin Ribic, Anna Kauch, and Karsten Held

Phys. Rev. Research **7**, 043033 (2025) - Published 8 October, 2025

Langevin equations and a geometric integration scheme for the overdamped limit of rotational Brownian motion of axisymmetric particles

Felix Höfling and Arthur V. Straube

Phys. Rev. Research **7**, 043034 (2025) - Published 9 October, 2025

Universal distributions of overlaps from generic dynamics in quantum many-body systems

Alexios Christopoulos, Amos Chan, and Andrea De Luca

Phys. Rev. Research **7**, 043035 (2025) - Published 9 October, 2025

Topological spin textures enabling quantum transmission

Ji Zou, Stefano Bosco, Jelena Klinovaja, and Daniel Loss

Phys. Rev. Research **7**, 043036 (2025) - Published 9 October, 2025

Star Log-extended eMulation: A method for efficient computation of the Tolman-Oppenheimer-Volkoff equations

Sudhanva Lalit, Alexandra C. Semposki, and Joshua M. Maldonado

Phys. Rev. Research **7**, 043037 (2025) - Published 10 October, 2025

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