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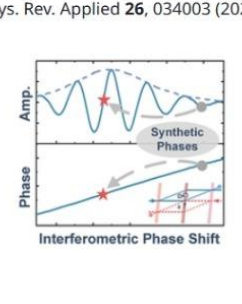
HIGHLIGHTED ARTICLES

EDITORS' SUGGESTION

Closed-loop dual-channel atomic beam interferometry beyond the half-fringe limit

Wei-Chen Jia (贾伟辰), Yue Xin (辛约), Ke Shen (申可), Zhi-Xin Meng (孟至欣), Xiang-Xiang Lu (路想想), Yi-Cheng Deng (邓意成), Yuan-Xing Liu (刘院省), and Yan-Ying Feng (冯焱颖)

Phys. Rev. Applied **26**, 034003 (2026) - Published 1 September, 2026



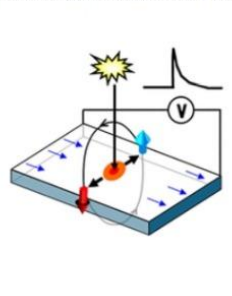
Atomic interferometers offer extraordinary inertial sensitivity, yet their intrinsically periodic response has long prevented continuous operation over a wide dynamic range. The authors demonstrate a dual-channel closed-loop atomic beam interferometer, enabling simultaneous quantum feedback for rotation and acceleration. By converting periodic matter-wave interference into continuously tracked control parameters, the scheme overcomes the conventional half-fringe limitation while preserving precision. This advance brings practical quantum inertial navigation a significant step closer.

EDITORS' SUGGESTION

Direct observation of photon-induced vortices in superconducting films

Takeshi Jodoi, Fuminori Hirayama, Tetsuya Tsuruta, Takahiro Kikuchi, and Daiji Fukuda

Phys. Rev. Applied **26**, 034005 (2026) - Published 2 September, 2026



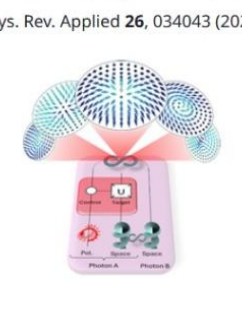
What happens when a photon is absorbed by a superconductor? Although vortex-antivortex pairs have long been suspected to play a central role in superconducting photon detection, their dynamics following photon absorption have eluded direct observation. By monitoring quantized voltage signals generated by photon-induced vortices, the authors reveal their generation statistics and demonstrate photon-number resolution. This work provides a rare microscopic view of photon detection in superconductors, and opens a route toward fast superconducting photon-number-resolving detectors.

EDITORS' SUGGESTION

Reconfigurable circuit for mode-tunable topological quantum structured light

Pedro Ornelas, Tatjana Kleine, André G. de Oliveira, Carmelo Rosales-Guzmán, Andrew Forbes, and Isaac Nape

Phys. Rev. Applied **26**, 034043 (2026) - Published 18 September, 2026



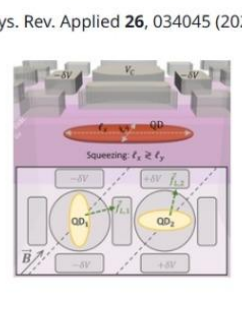
Quantum topological structured light offers a promising route to robust information encoding, but its practical realization is limited by the challenge of generating high-quality states in a reconfigurable manner. The authors demonstrate an interferometric approach that generates high-fidelity topological structured light by mapping spatial-mode entanglement onto hybrid spatial-polarization entangled states, with the interferometer implementing a reconfigurable controlled-unitary operation through programmable spatial modulation. This versatile platform for generating high-quality topological quantum states enables adaptable architectures for photonic quantum information processing.

EDITORS' SUGGESTION

Disorder-independent hole-spin manipulation by hopping

Biel Martinez, Ana Sempere-Sanchis, José C. Abadillo-Uriel, and Yann-Michel Niquet

Phys. Rev. Applied **26**, 034045 (2026) - Published 21 September, 2026



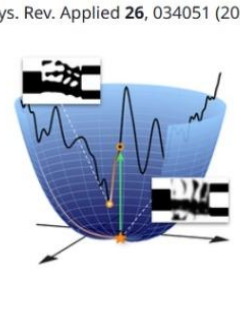
Spin manipulation by hopping has emerged as an attractive approach for efficient spin control in arrays of germanium hole-spin qubits. The physical mechanism relies on disorder-induced differences in the axes of spin precession in neighboring quantum dots, though, and thus is ineffective in the absence of disorder. This work proposes electrostatic squeezing of the quantum dots to engineer the spin-precession axis deterministically, which would render spin manipulation independent of any disorder. Remarkably, the protocol remains robust even under moderate disorder, offering a promising pathway for spin manipulation in large, sparse spin-qubit arrays.

EDITORS' SUGGESTION

Convex preoptimization for electromagnetic inverse design

Nathaniel Morrison, Xujia He, Siqi Zhai, and Eric Y. Ma

Phys. Rev. Applied **26**, 034051 (2026) - Published 23 September, 2026



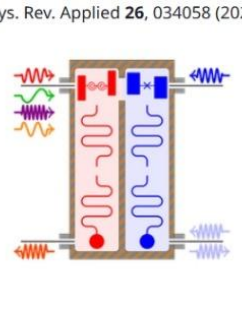
Computers can now autonomously design intricate electromagnetic devices for communication, sensing, and quantum technologies, but optimizers routinely get trapped by *locally* optimal designs that are still far from the best. This work temporarily reshapes the governing physics into a smooth problem that can be solved exactly. The reshaped problem delivers not only a blueprint for the device but also a map of its own uncertainty, showing where to trust the blueprint and where to keep exploring. Across eight distinct photonic and microwave design tasks, this convex preoptimization consistently beats conventional stop-and-restart sweeps while using a fraction of the computing time.

EDITORS' SUGGESTION

Experimental signatures of a $\hat{Z}\hat{X}$ beam-splitter interaction between Kerr-cat and transmon qubits

Josiah Cochran, Haley M. Cole, Hebah Goderya, Zhuoqun Hao, Yao-Chun Chang, Theo Shaw, Aikaterini Kargioti, and Shyam Shankar

Phys. Rev. Applied **26**, 034058 (2026) - Published 24 September, 2026



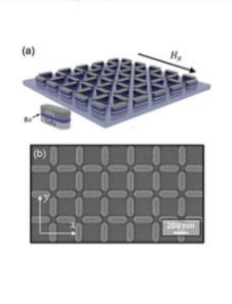
Fault-tolerant quantum computing depends on ancilla qubits that can extract error syndromes from data qubits, but ancilla errors can propagate back to the data qubits, contaminating the very information they are meant to protect. The *Kerr-cat qubit* has been proposed as a better ancilla, but a suitable interaction between Kerr-cat and transmon qubits needs to be experimentally verified. This study finds a beam-splitter interaction between a Kerr-cat and a transmon, producing an effective $\hat{Z}\hat{X}$ coupling suitable for parity readout, and confirms expected behavior across different cat sizes and drive strengths.

EDITORS' SUGGESTION

Roles of quadratic and biquadratic couplings in the spin-wave modes of Co–Fe/Ru/Ni–Fe artificial spin ices

Riccardo Fornari, Mohammad Tomal Hossain, Raffaele Silvani, Vinayak Shantaram Bhat, Rawnak Sultana, M. Benjamin Jungfleisch, and Gianluca Gubbiotti

Phys. Rev. Applied **26**, 034063 (2026) - Published 25 September, 2026



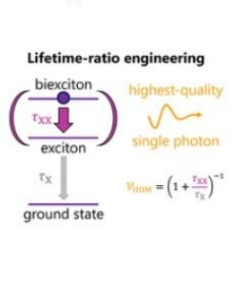
Artificial spin ices are promising for reconfigurable magnonics and unconventional computing because their magnetic states and spin-wave spectra can be tailored, but available control mechanisms are limited. The authors pattern an exchange-coupled Co-Fe/Ru/Ni-Fe synthetic ferrimagnet into an artificial spin lattice and study its static and dynamic behavior. They show that quadratic and biquadratic interlayer exchange coupling can stabilize orthogonal layer magnetizations, drive hard-axis alignment, and reshape the spin-wave spectrum. This additional degree of freedom may enable field-reconfigurable magnonic crystals, spin-wave filters, and artificial-spin-ice metamaterials.

EDITORS' SUGGESTION

High-quality single photons from cavity-enhanced biexciton-to-exciton transition

Nils Heinisch, Francesco Salusti, Mark R. Hogg, Timon L. Baltisberger, Malwina A. Marczak, Sascha R. Valentin, Arne Ludwig, Klaus D. Jöns, Richard J. Warburton, and Stefan Schumacher

Phys. Rev. Applied **26**, 034068 (2026) - Published 29 September, 2026



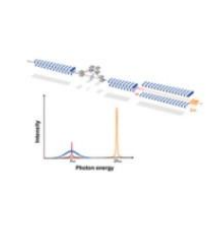
Semiconductor quantum dots are excellent deterministic sources of single photons. One of the best routes to generate pure single photons is through the biexciton-exciton cascade, but achieving high Hong-Ou-Mandel visibility (or photon indistinguishability) is fundamentally hindered by the finite ratio of radiative lifetimes of the two excited electronic states in that cascade. This study reduces the biexciton lifetime by selective cavity enhancement, and uses the single photon from the biexciton-to-exciton transition. This approach is a powerful path to achieving excellent single-photon indistinguishability and purity, plus high brightness.

EDITORS' SUGGESTION

Self-seeded x-ray free-electron laser with high spectral density and photon energy

Lu Cao, Tianyun Long, Winfried Decking, Marc Guetg, Vitali Kocharyan, Naresh Kujala, Christoph Lechner, Anders Madsen, Theophilos Maltezopoulos, Giovanni Perosa, Weilun Qin, Evgeni Saldin, Matthias Scholz, Svitozar Serkez, Andrei Trebushinin, Jiawei Yan, Shan Liu, and Gianluca Geloni

Phys. Rev. Applied **26**, 034071 (2026) - Published 29 September, 2026



Producing narrow-band, high-spectral-density pulses from an x-ray free-electron laser (XFEL) is important for demanding applications at extreme photon energies, such as high-resolution spectroscopy and studies of structural dynamics, but conventional hard-x-ray self-seeding becomes increasingly limited as photon energy increases. This study extends hard-x-ray self-seeding at the European XFEL to 18 keV, and explores second-harmonic-generation self-seeding as a route toward even higher photon energies. Experiments demonstrate coherent amplification of the second harmonic at 15 and 18 keV, while simulations show the potential for narrowband operation at 30 keV.

LETTERS

LETTER

Perturbative sensing of nanoscale quantum materials with millimeter-wave photonic crystals

Kevin K. S. Multani, Zhurun Ji, Wentao Jiang, Siyuan Qiu, Akasha G. Hayden, Gitanjali Multani, Sharon R. Platt, Emilio A. Nanni, Zhi-Xun Shen, and Amir H. Safavi-Naeini

Phys. Rev. Applied **26**, L031001 (2026) - Published 1 September, 2026

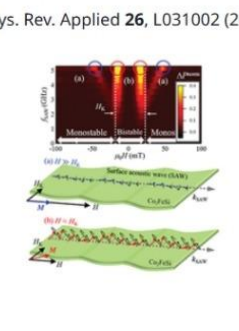
Millimeter waves sit at the energy scale of many collective excitations in quantum materials, but probing microscopic samples at these frequencies is difficult: Spectroscopic alignment is hard in a cryostat, and superconducting cavities stop working in high magnetic fields. This Letter reports an all-silicon (no metal or superconductor) photonic crystal cavity functioning as a chip-scale conductivity sensor near 100 GHz, reaching a quality factor above 10^5 at 4.3 K. The all-dielectric platform should work at the strong fields and low temperatures where quantum Hall edge modes, magnetoplasmons, and field-tuned correlated phases exist, and it may be scalable to terahertz frequencies.

LETTER

Enhancement of magnon-phonon coupling in ferromagnetic Co_2FeSi alloy using the monostable-bistable magnetic transition

Kazuto Yamanoi, Shinya Yamada, Kohei Hamaya, and Yukio Nozaki

Phys. Rev. Applied **26**, L031002 (2026) - Published 2 September, 2026



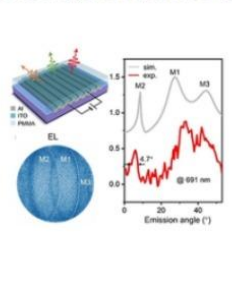
Magnon-phonon hybridization enables coupled control of spin and mechanical excitations, but the limited frequency tunability of conventional surface-acoustic-wave (SAW) devices is restrictive. The authors develop a SAW platform with a fundamental frequency of 193 MHz, enabling quasicontinuous mapping of magnon-phonon resonances up to 5.6 GHz in an epitaxial Co_2FeSi film. Magnon-induced SAW absorption is enhanced near the transition between monostable and bistable magnetization states; even so, the two regimes exhibit distinct frequency scalings. This approach provides a route toward tunable, potentially energy-efficient magnonic devices and dynamic spin control in hybrid systems.

LETTER

Collimated light emission from inelastic electron tunneling enabled by a nonlocal plasmonic metasurface

Yu Wu, Dudu Song, Zhengyi Lu, Shunping Zhang, and Hongxing Xu

Phys. Rev. Applied **26**, L031003 (2026) - Published 3 September, 2026



Light emission via inelastic electron tunneling (LEIT) is an ultrabroadband light source with potential impact in visible-light communication, intelligent optical sensing, and on-chip optoelectronics. Its low efficiency is typically addressed using plasmonic tunneling junctions, but their subwavelength size results in omnidirectional radiation with poor collimation. The authors combine a plasmonic tunneling junction with a metasurface to collimate LEIT to a narrow divergence angle across a broad spectral window. The supported hybrid plasmon-photon modes both enhance the local density of states and extend spatial coherence, mitigating the trade-off between response speed and collimation.

LETTER

Toward high-resolution low-energy electron spectroscopy with transition-edge sensors

R. Ammendola *et al.* (PTOLEMY Collaboration)

Phys. Rev. Applied **26**, L031004 (2026) - Published 9 September, 2026

Transition-edge sensors (TESs) have already been proven to detect electrons with kinetic energy of about 100 eV, with a Gaussian energy resolution of 1 eV, comparable to the photon energy resolution of the same device. This study investigates how changes in the experimental setup influence the energy resolution of TES devices, for electrons produced by a 'cold' source of vertically aligned carbon nanotubes. Decreasing the size of both TES and electron source, the energy resolution for electrons significantly improves by a factor of more than 21. These results open up possibilities for the high-resolution spectroscopy of low-energy electrons, for *e.g.* the measurement of neutrino mass.

LETTER

High-fidelity transmon reset with a multimode acoustic resonator

Andraž Omahen, Simon Storz, Igor Kladarić, and Yiwen Chu

Phys. Rev. Applied **26**, L031005 (2026) - Published 16 September, 2026

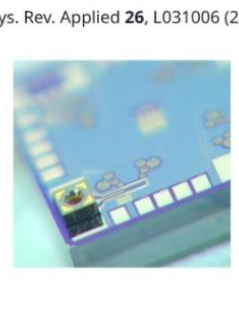
Superconducting qubits must be initialized in their ground state with very high fidelity, for quantum computing and sensing. Conventional reset schemes are limited, as they operate the qubit within the same noisy electromagnetic environment used for its everyday control. This study couples a transmon qubit to a high-overtone bulk acoustic resonator, a physically distinct bath that is intrinsically colder than its electromagnetic surroundings. The authors use its multimode structure to repeatedly extract entropy from the qubit. This simple, feedback-free protocol yields residual excited-state populations one to two orders of magnitude lower than for typical schemes.

LETTER

Fast optical data transfer into a Josephson-junction array

K. Kohopää, J. Nissilä, E. Mykkänen, P. Selvasundaram, T. Fordell, K. Langi, E. T. Mannila, S. Kafanov, S. Ahopelto, H. Systä, M. Ribeiro, P. Sethi, M. Kiviranta, R. Loreto, J.-W. Lee, T. Rantanen, V. Vesterinen, O. Kieler, M. Bieler, J. Govenius, J. Senior, and A. Kemppinen

Phys. Rev. Applied **26**, L031006 (2026) - Published 23 September, 2026



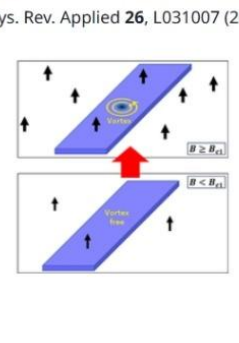
Arrays of Josephson junctions can generate highly accurate voltage waveforms at cryogenic temperatures, and when optically driven are promising for low-dissipation control of superconducting quantum circuits. Their use in quantum computing has been limited, though, by the frequency at which control data can be delivered to the arrays. Combining externally shunted junctions of high characteristic frequency and low critical current, fast optical pulses, and a high-bandwidth photodiode, this study demonstrates data transfer at frequencies up to 60 GHz, about four times as high as usual for Josephson arbitrary-waveform synthesizers—and even higher frequencies may be attainable.

LETTER

Microscopic theory of the lower critical field in superconducting thin-film strips

Takayuki Kubo

Phys. Rev. Applied **26**, L031007 (2026) - Published 24 September, 2026



Narrow superconducting strips are key elements of photodetectors, resonators, and quantum circuits, in which magnetic vortices can degrade device performance. The lower critical field (above which a vortex-containing state is favorable) for such strips is usually estimated using Pearl-London theory, which cannot yield the vortex core's temperature dependence microscopically. By solving the two-dimensional Usadel equations self-consistently, this study provides a microscopic calculation of the lower critical field at any temperature below the superconducting critical temperature, giving a quantitative basis for predicting the vortex-free field tolerance of superconducting thin-film devices.

ARTICLES

Scalable suppression of XY crosstalk by pulse-level control in superconducting quantum processors

Hui-Hang Chen and Chiao-Hsuan Wang

Phys. Rev. Applied **26**, 034001 (2026) - Published 1 September, 2026

Tensor-network representation of excitations in Josephson-junction arrays

Emilio Rui, Joachim Cohen, and Alexandru Petrescu

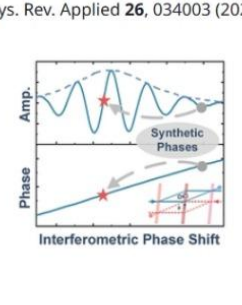
Phys. Rev. Applied **26**, 034002 (2026) - Published 1 September, 2026

EDITORS' SUGGESTION

Closed-loop dual-channel atomic beam interferometry beyond the half-fringe limit

Wei-Chen Jia (贾伟辰), Yue Xin (辛约), Ke Shen (申可), Zhi-Xin Meng (孟至欣), Xiang-Xiang Lu (路想想), Yi-Cheng Deng (邓意成), Yuan-Xing Liu (刘院省), and Yan-Ying Feng (冯焱颖)

Phys. Rev. Applied **26**, 034003 (2026) - Published 1 September, 2026



Atomic interferometers offer extraordinary inertial sensitivity, yet their intrinsically periodic response has long prevented continuous operation over a wide dynamic range. The authors demonstrate a dual-channel closed-loop atomic beam interferometer, enabling simultaneous quantum feedback for rotation and acceleration. By converting periodic matter-wave interference into continuously tracked control parameters, the scheme overcomes the conventional half-fringe limitation while preserving precision. This advance brings practical quantum inertial navigation a significant step closer.

External quantum efficiency of exciplex-based OLEDs: Emission mechanisms revealed by magnetic field effects

Xi Zhao, Maowen Xie, Dan Yuan, Li Xie, Shigang Li, Zhaofu Ren, Meng Qin, Hao Xu, Dong Zheng, QiaoMing Zhang, Jing Chen, Jingjing Wang, Xiaoqing Wu, and Zuhong Xiong

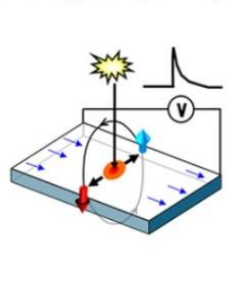
Phys. Rev. Applied **26**, 034004 (2026) - Published 1 September, 2026

EDITORS' SUGGESTION

Direct observation of photon-induced vortices in superconducting films

Takeshi Jodoi, Fuminori Hirayama, Tetsuya Tsuruta, Takahiro Kikuchi, and Daiji Fukuda

Phys. Rev. Applied **26**, 034005 (2026) - Published 2 September, 2026



What happens when a photon is absorbed by a superconductor? Although vortex-antivortex pairs have long been suspected to play a central role in superconducting photon detection, their dynamics following photon absorption have eluded direct observation. By monitoring quantized voltage signals generated by photon-induced vortices, the authors reveal their generation statistics and demonstrate photon-number resolution. This work provides a rare microscopic view of photon detection in superconductors, and opens a route toward fast superconducting photon-number-resolving detectors.

Arm qubit: A superconducting qubit co-designed for coherence and coupling

Jeremy B. Kline, Alec Yen, Stanley Chen, and Kevin P. O'Brien

Phys. Rev. Applied **26**, 034006 (2026) - Published 2 September, 2026

Sub-5-nm 7-armchair hydrogened graphene nanoribbon transistors: More symmetric n- and p-type performance for homogeneous CMOS applications

Linqiang Xu, Shiqi Liu, Qiuhui Li, Ying Li, Shibo Fang, Ying Guo, Yee Sin Ang, Chen Yang, and Jing Lu

Phys. Rev. Applied **26**, 034007 (2026) - Published 2 September, 2026

Polarization-induced anisotropic plasmonic nanobubbles

Yukun Ji, Yatao Ren, and Hong Qi

Phys. Rev. Applied **26**, 034008 (2026) - Published 3 September, 2026

Fast readout of quantum dot spin qubits via Andreev spins

Michèle Jakob, Katharina Laubscher, Patrick Del Vecchio, Anasua Chatterjee, Valla Fatemi, and Stefano Bosco

Phys. Rev. Applied **26**, 034009 (2026) - Published 3 September, 2026

Chip-scale terahertz distributed-feedback cherenkov laser in a silicon grating

Hossein Shirvani and Yen-Chieh Huang

Phys. Rev. Applied **26**, 034010 (2026) - Published 3 September, 2026

Multifunctional $VN_2B_2S_2$ monolayer: A promising two-dimensional material for spintronic and optoelectronic applications

Xiaozheng Fan, Mehrdad Shiri, Jiajun Li, Tengda Fan, Junshuai Wang, Shuaikang Zhang, Kun Wang, Chunlan Ma, Shijing Gong, Chuanxi Zhao, and Yipeng An

Phys. Rev. Applied **26**, 034011 (2026) - Published 4 September, 2026

Dynamically tunable Fano sensor based on diode-reconfigurable spoof surface plasmons

Dongchao Zou, Kai-Da Xu, Ke Zhang, Junlong Li, Jintao Lai, Yuanmei Xu, and Xue-Shi Li

Phys. Rev. Applied **26**, 034012 (2026) - Published 4 September, 2026

Bridging gaps in Rydberg rf receivers using modulation-transfer bandwidth enhancement

Mickael Branco, K. V. Adwaith, Gabriel Boccara, Duc-Anh Trinh, Sacha Welinski, Pierre Berger, Fabienne Goldfarb, and Fabien Bretenaker

Phys. Rev. Applied **26**, 034013 (2026) - Published 8 September, 2026

Enhanced sensitivity in whispering-gallery-mode sensors through mode hybridization

Vivek Gualani, Sofia Sisteré, Josep Salvans-Tort, Maria Riera, Wenle Weng, Josep Sanjuan, and Miquel Nofrarias

Phys. Rev. Applied **26**, 034014 (2026) - Published 8 September, 2026

RASER-resolved ^{129}Xe chemical shifts in an inhomogeneous ultralow magnetic field

Sebastian W. Atalla, Andrew K. Maresca, Aaron J. Ferreira, Nikolas M. Jauch, and Rosa T. Branca

Phys. Rev. Applied **26**, 034015 (2026) - Published 8 September, 2026

Programmable dynamic phase control of a quasiperiodic optical lattice

Andrew O. Neely, Cedric C. Wilson, Ryan Everly, Yu Yao, Raffaella F. Zanetti, and Charles D. Brown

Phys. Rev. Applied **26**, 034016 (2026) - Published 8 September, 2026

Distributed variational quantum computing with deterministic entanglement tuning

Ilhwan Kim, Yong-Su Kim, Kwang Jo Lee, Hyukjoon Kwon, Yosep Kim, and Hyang-Tag Lim

Phys. Rev. Applied **26**, 034017 (2026) - Published 9 September, 2026

Models of liquid-sample confinement for nanoscale NMR

Santiago Oviedo-Casado, Daniel Cohen, Allan Josué González-Villalobos, and Javier Cerrillo

Phys. Rev. Applied **26**, 034018 (2026) - Published 9 September, 2026

Dynamic control of orbital angular momentum of light in strong atmospheric turbulence for free-space optical communication

Mulin Yu, Yakun Wang, Yizhou Liu, Lingfei Xu, Yahong Chen, Jiayi Yu, and Fei Wang

Phys. Rev. Applied **26**, 034019 (2026) - Published 9 September, 2026

Passive quantum interconnects: Multiplexed remote entanglement generation with cavity-assisted photon scattering

Seigo Kikura, Kazufumi Tanji, Akihisa Goban, and Shinichi Sunami

Phys. Rev. Applied **26**, 034021 (2026) - Published 10 September, 2026

Carbon nanowalls integrated on silicon nitride waveguide for photothermoelectric near-infrared detection

Alexandr M. Mumlyakov, Nikita Yu. Dmitriev, Maksim V. Shibalov, Ivan A. Filippov, Igor V. Trofimov, Alexandr S. Rykov, Nikolay V. Porokhov, Sergey A. Sokolov, Maksim S. Bitkov, Galina V. Molodtsova, Egor V. Kungurtsev, Igor A. Bilenko, and Michael A. Tarkhov

Phys. Rev. Applied **26**, 034022 (2026) - Published 10 September, 2026

Octahedral-field-informed machine learning for accelerated discovery of two-dimensional magnets with perpendicular magnetic anisotropy

Yanyan Yang, Xinyu Chen, Qian Xia, Qionghua Zhou, Qian Chen, and Jinlan Wang

Phys. Rev. Applied **26**, 034023 (2026) - Published 10 September, 2026

Designing Willis metamaterials with desired deformation pathways via incremental contrastive learning

Li Huang, Yuxuan Tang, and Yangyang Chen

Phys. Rev. Applied **26**, 034024 (2026) - Published 11 September, 2026

Analytical modeling of atomic free-induction-decay dynamics for near-zero-field vector magnetometry

Yaoguo Wang, Di Zhan, Jixi Lu, Ping Xu, Zhuo Wang, Yanan Gao, Bowen Sun, Danyue Ma, Xiujie Fang, and Jiancheng Fang

Phys. Rev. Applied **26**, 034025 (2026) - Published 11 September, 2026

Engineered broadband Purcell protection using a shared Π filter for multiplexed superconducting qubits

Samuel D. Escribano, Yael Kriheli, Samuel Goldstein, Daniel Dahan, and Nadav Katz

Phys. Rev. Applied **26**, 034026 (2026) - Published 11 September, 2026

Artificial neural network—oscillatory neural network hybrid system using domain-wall synapse devices and nanoconstriction spin Hall nano-oscillators

Raman Hissariya, Gajjala Venkata Sreekar Reddy, Ashwin Tulapurkar, and Debanjan Bhowmik

Phys. Rev. Applied **26**, 034027 (2026) - Published 11 September, 2026

Generation and amplification of microwave signals via planar waveguides with embedded paramagnetic color centers

Stefano Lagomarsino and Mario Agio

Phys. Rev. Applied **26**, 034028 (2026) - Published 14 September, 2026

Near-field planar antenna for microwave excitation of paramagnetic quantum emitters

Stefano Lagomarsino and Mario Agio

Phys. Rev. Applied **26**, 034029 (2026) - Published 14 September, 2026

Spectator-transition crosstalk in a spin-$3/2$ silicon-vacancy qudit in silicon carbide revealed by broadband Ramsey interferometry

Jun-Jae Choi, Seung-Jae Hwang, Seoyoung Paik, Juhwan Kim, Jawad Ul-Hassan, Nguyen Tien Son, Hiroshi Abe, Takeshi Ohshima, Jaekwon Suk, Hyeon-Ho Jeong, Dong-Hee Kim, and Sang-Yun Lee

Phys. Rev. Applied **26**, 034030 (2026) - Published 15 September, 2026

Radiation-induced defect dynamics in two-dimensional/three-dimensional systems: A dimensionality advantage preserved within patterned graphene–SiC heterostructures

Maciej J. Szary, Jakub Jagiełło, Wiktoria Reddig, Artur Dobrowolski, Tymoteusz Ciuk, Rafał Prokopowicz, Maciej Ziemba, Marek Wzorek, and Semir El-Ahmar

Phys. Rev. Applied **26**, 034031 (2026) - Published 15 September, 2026

Quadrature-symmetric pulse scheme for robust quantum control beyond the ideal-pulse approximation

Mayur Jhamnani, Venkata SubbaRao Redrouthu, José P. Carvalho, Ethan Feldman, Anders B. Nielsen, Phani Kumar, Niels Chr. Nielsen, P. K. Madhu, and Asif Equbal

Phys. Rev. Applied **26**, 034032 (2026) - Published 15 September, 2026

Composition-dependent $\mathbf{k}\cdot\mathbf{p}$ band parameters for wurtzite (Al,Ga)N alloys from density functional theory

Amit Kumar Singh, Alvaro Gomez-Iglesias, and Stefan Schulz

Phys. Rev. Applied **26**, 034033 (2026) - Published 16 September, 2026

Electrically and optically active charge carrier traps in silicon-doped few-layer GaSe

M. Bissolo, R. Li, M. Ogura, Z. Sofer, S. Polesya, D. Han, A. W. Holleitner, C. Kastl, G. Koblmüller, H. Ebert, E. Zallo, and J. J. Finley

Phys. Rev. Applied **26**, 034034 (2026) - Published 16 September, 2026

Single-photon-boosted type-I fusion gates

A. A. Melkozerov, S. S. Straupe, and M. Yu. Saygin

Phys. Rev. Applied **26**, 034035 (2026) - Published 16 September, 2026

Nonideal subthreshold swing in aligned carbon nanotube transistors due to variable-occupancy discrete charge traps

Saurabh S. Sawant, Teo Lara, François Léonard, Zhi (Jackie) Yao, and Andrew Nonaka

Phys. Rev. Applied **26**, 034036 (2026) - Published 17 September, 2026

Four-dimensional imaging using a one-dimensional transducer array combining photoacoustic signals with ultrasonic timecoding

Yingjie Feng, Simin Wang, Yang Liu, Qiuqin Mao, Tianxiang Zuo, Yifan Yang, Chao Tao, and Xiaojun Liu

Phys. Rev. Applied **26**, 034037 (2026) - Published 17 September, 2026

Mitigation of magnetic flux trapping in superconducting electronics using moats

Rohan T. Kapur, Sergey K. Tolpygo, Alex Wynn, Pauli Kehayias, Adam A. Libson, Collin N. Muniz, Michael J. Gold, Justin L. Mallek, Danielle A. Braje, and Jennifer M. Schloss

Phys. Rev. Applied **26**, 034038 (2026) - Published 17 September, 2026

Laser-control switch for electron correlation in double ionization: Toward application-specific pathway selection

Xuan Luo, Yugang Yang, Liguang Jiao, Aihua Liu, and Xueshen Liu

Phys. Rev. Applied **26**, 034039 (2026) - Published 17 September, 2026

Noise-resilient phase detection enabled via nonlinear non-Hermitian electronics

Yan-qiang Ma, An Chen, Yi-fei Xia, Jing Yang, Bin Liang, and Jian-chun Cheng

Phys. Rev. Applied **26**, 034040 (2026) - Published 17 September, 2026

Investigating spectral dynamics and spin signatures of a mechanically isolated quantum emitter in hBN

Sajedeh Shahbazi, Alexander Pachl, Kathrin Schwer, Patrick Maier, and Alexander Kubanek

Phys. Rev. Applied **26**, 034041 (2026) - Published 18 September, 2026

Frequency collisions in parametrically modulated superconducting circuits

Zhuang Ma, Peng Zhao, Xinsheng Tan, and Yang Yu

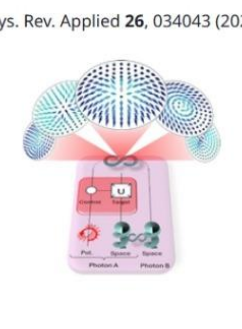
Phys. Rev. Applied **26**, 034042 (2026) - Published 18 September, 2026

EDITORS' SUGGESTION

Reconfigurable circuit for mode-tunable topological quantum structured light

Pedro Ornelas, Tatjana Kleine, André G. de Oliveira, Carmelo Rosales-Guzmán, Andrew Forbes, and Isaac Nape

Phys. Rev. Applied **26**, 034043 (2026) - Published 18 September, 2026



Quantum topological structured light offers a promising route to robust information encoding, but its practical realization is limited by the challenge of generating high-quality states in a reconfigurable manner. The authors demonstrate an interferometric approach that generates high-fidelity topological structured light by mapping spatial-mode entanglement onto hybrid spatial-polarization entangled states, with the interferometer implementing a reconfigurable controlled-unitary operation through programmable spatial modulation. This versatile platform for generating high-quality topological quantum states enables adaptable architectures for photonic quantum information processing.

Extended depth-of-field magneto-optical Kerr microscopy for applications in three-dimensional nanomagnetism

Le Zhao, Alexander Rabensteiner, Miguel Ángel Cascales-Sandoval, Naëmi Leo, Sabri Koraltan, and Amalio Fernández-Pacheco

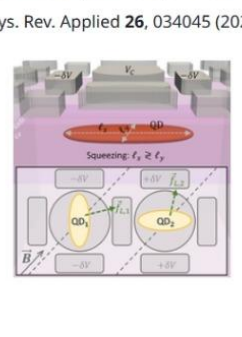
Phys. Rev. Applied **26**, 034044 (2026) - Published 21 September, 2026

EDITORS' SUGGESTION

Disorder-independent hole-spin manipulation by hopping

Biel Martinez, Ana Sempere-Sanchis, José C. Abadillo-Uriel, and Yann-Michel Niquet

Phys. Rev. Applied **26**, 034045 (2026) - Published 21 September, 2026



Spin manipulation by hopping has emerged as an attractive approach for efficient spin control in arrays of germanium hole-spin qubits. The physical mechanism relies on disorder-induced differences in the axes of spin precession in neighboring quantum dots, though, and thus is ineffective in the absence of disorder. This work proposes electrostatic squeezing of the quantum dots to engineer the spin-precession axis deterministically, which would render spin manipulation independent of any disorder. Remarkably, the protocol remains robust even under moderate disorder, offering a promising pathway for spin manipulation in large, sparse spin-qubit arrays.

Narrow-linewidth Brillouin laser for a two-photon rubidium frequency standard

Kyle W. Martin, River Beard, Andrei Isichenko, Kaikai Liu, Daniel J. Blumenthal, Seth E. Erickson, Kaleb Campbell, and Sean Krzyzewski

Phys. Rev. Applied **26**, 034046 (2026) - Published 21 September, 2026

Phonon decoherence produced by two-level tunneling states

Ryan O. Behunin, Taylor Ray, Dylan Chapman, Andrew J. Shepherd, Yizhi Luo, and Peter T. Rakich

Phys. Rev. Applied **26**, 034047 (2026) - Published 22 September, 2026

Integration architecture for a pocket-sized quantum vector magnetometer using spin defects in silicon carbide

Andreas Gottscholl, Corey J. Cochrane, and Hannes Kraus

Phys. Rev. Applied **26**, 034048 (2026) - Published 22 September, 2026

Nonideal absorbers in hot-carrier and hot-absorber solar cells: Losses and heat recycling

Inés Durán, Simon Svatek, Irene Artacho, Elisa Antolín, and Antonio Martí

Phys. Rev. Applied **26**, 034049 (2026) - Published 22 September, 2026

Transverse relaxation time–aware qubit-mapping algorithm for noisy intermediate-scale quantum devices

Yifei Huang, Pascal Jahan Elahi, Ugo Varetto, Kan He, Jinchuan Hou, and Shusen Liu

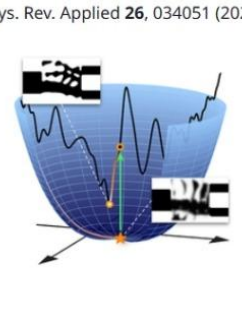
Phys. Rev. Applied **26**, 034050 (2026) - Published 22 September, 2026

EDITORS' SUGGESTION

Convex preoptimization for electromagnetic inverse design

Nathaniel Morrison, Xujia He, Siqi Zhai, and Eric Y. Ma

Phys. Rev. Applied **26**, 034051 (2026) - Published 23 September, 2026



Computers can now autonomously design intricate electromagnetic devices for communication, sensing, and quantum technologies, but optimizers routinely get trapped by *locally* optimal designs that are still far from the best. This work temporarily reshapes the governing physics into a smooth problem that can be solved exactly. The reshaped problem delivers not only a blueprint for the device but also a map of its own uncertainty, showing where to trust the blueprint and where to keep exploring. Across eight distinct photonic and microwave design tasks, this convex preoptimization consistently beats conventional stop-and-restart sweeps while using a fraction of the computing time.

Simple and compact ytterbium magneto-optical trap

Benjamin White, Rachel F. Offer, Ashby P. Hilton, Elizaveta Klantsataya, Christopher J. Billington, Nicolas Bourbeau Hébert, Montanna Nelligan, and Andre N. Luiten

Phys. Rev. Applied **26**, 034052 (2026) - Published 23 September, 2026

Spectral side channels of wavelength-division multiplexer in quantum key distribution under laser damage

Binwu Gao, Junxuan Liu, Ekaterina Borisova, Hao Tan, Mingyang Zhong, Zihao Chen, Qingquan Peng, Weixu Shi, Anastasiya Ponosova, Vadim Makarov, and Anqi Huang

Phys. Rev. Applied **26**, 034053 (2026) - Published 23 September, 2026

Nanoscale wireframe SQUID on a cantilever by corner lithography

Thijs J. Roskamp, Tim Horstink, Melissa J. Goodwin, Erwin Berenschot, Edin Sarajilic, Roeland Huijink, Niels Tas, and Hans Hilgenkamp

Phys. Rev. Applied **26**, 034054 (2026) - Published 23 September, 2026

Compressed qubit noise spectroscopy: Piecewise-linear modeling and Rademacher measurements

Kaixin Huang, Demitry Farfurnik, Dror Baron, and Yi-Kai Liu

Phys. Rev. Applied **26**, 034055 (2026) - Published 24 September, 2026

Bridging fidelity gaps in the design of triply periodic minimal surfaces-based elastic metamaterials using neural networks

Yu-Tong Wang, Andrew Fanton, and Yun Jing

Phys. Rev. Applied **26**, 034056 (2026) - Published 24 September, 2026

Robust nonadiabatic holonomic gating in qutrits via inverse-engineered pulse shaping and error compensation

Jie Lu, Ji-Ze Han, Jie-Dong Huang, Yang Qian, Ying Yan, and Zhi-Guo Huang

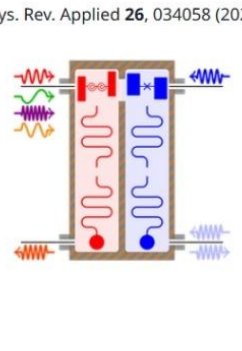
Phys. Rev. Applied **26**, 034057 (2026) - Published 24 September, 2026

EDITORS' SUGGESTION

Experimental signatures of a $\hat{Z}\hat{X}$ beam-splitter interaction between Kerr-cat and transmon qubits

Josiah Cochran, Haley M. Cole, Hebah Goderya, Zhuoqun Hao, Yao-Chun Chang, Theo Shaw, Aikaterini Kargioti, and Shyam Shankar

Phys. Rev. Applied **26**, 034058 (2026) - Published 24 September, 2026



Fault-tolerant quantum computing depends on ancilla qubits that can extract error syndromes from data qubits, but ancilla errors can propagate back to the data qubits, contaminating the very information they are meant to protect. The *Kerr-cat qubit* has been proposed as a better ancilla, but a suitable interaction between Kerr-cat and transmon qubits needs to be experimentally verified. This study finds a beam-splitter interaction between a Kerr-cat and a transmon, producing an effective $\hat{Z}\hat{X}$ coupling suitable for parity readout, and confirms expected behavior across different cat sizes and drive strengths.

Modular and integrable cryogen-free dilution refrigerator

Xiang Guan, Pei Liu, De Ming Wang, Yong Jie Xie, Yu Qun Xu, Jie Fan, Zhong Qing Ji, Yi Rong Jin, and Haifeng Yu

Phys. Rev. Applied **26**, 034059 (2026) - Published 25 September, 2026

Analytical framework for controlling antenna performance using near-zero-index metamaterials

Amir Jafargholi and Romain Fleury

Phys. Rev. Applied **26**, 034060 (2026) - Published 25 September, 2026

Momentum-selective coupling-driven transport behavior in two-dimensional Janus multiferroic $InCrS_3$

Kexin Song, Chun-Sheng Liu, Shaohui Yu, Xiaohong Zheng, Hua Hao, and Weiyang Wang

Phys. Rev. Applied **26**, 034061 (2026) - Published 25 September, 2026

Circulators based on coupled quantum anomalous Hall insulators and resonators

Luis A. Martinez, Nick Du, Nicholas Materise, Sean O'Kelley, Xian Wu, Gang Qiu, Kang L. Wang, Gianpaolo P. Carosi, Tony Low, and Dong-Xia Qu

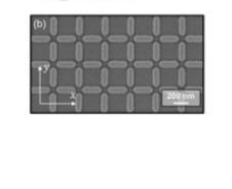
Phys. Rev. Applied **26**, 034062 (2026) - Published 25 September, 2026

EDITORS' SUGGESTION

Roles of quadratic and biquadratic couplings in the spin-wave modes of Co–Fe/Ru/Ni–Fe artificial spin ices

Riccardo Fornari, Mohammad Tomal Hossain, Raffaele Silvani, Vinayak Shantaram Bhat, Rawnak Sultana, M. Benjamin Jungfleisch, and Gianluca Gubbiotti

Phys. Rev. Applied **26**, 034063 (2026) - Published 25 September, 2026



Artificial spin ices are promising for reconfigurable magnonics and unconventional computing because their magnetic states and spin-wave spectra can be tailored, but available control mechanisms are limited. The authors pattern an exchange-coupled Co-Fe/Ru/Ni-Fe synthetic ferrimagnet into an artificial spin lattice and study its static and dynamic behavior. They show that quadratic and biquadratic interlayer exchange coupling can stabilize orthogonal layer magnetizations, drive hard-axis alignment, and reshape the spin-wave spectrum. This additional degree of freedom may enable field-reconfigurable magnonic crystals, spin-wave filters, and artificial-spin-ice metamaterials.

Simultaneous detection, demodulation, and angle-of-arrival determination of communication signals using a dual-ladder Rydberg receiver

Stone B. Oliver, Samuel Berweger, Eugeniy E. Mikhailov, Dixith Manchaiah, Nikunjkumar Prajapati, Christopher L. Holloway, and Matthew T. Simons

Phys. Rev. Applied **26**, 034064 (2026) - Published 28 September, 2026

Designing lattice proteins with variational quantum algorithms

Hanna Linn, Lucas Knuthson, Anders Irbäck, Sandipan Mohanty, Laura García-Álvarez, and Göran Johansson

Phys. Rev. Applied **26**, 034065 (2026) - Published 28 September, 2026

Multislice hollow ptychography for simultaneous atomic-layer-resolved three-dimensional structural imaging and spectroscopy

Yu Lei and Peng Wang

Phys. Rev. Applied **26**, 034066 (2026) - Published 28 September, 2026

Two-photon-excited fluorescence spectroscopy of Rb atoms in a magneto-optical trap

Alan McLean, Christian Drago, Daniel Podos, Chengyi Luo, Caleb Brzezinski, Ting-Wei Hsu, J. E. Sipe, and Ralph Jimenez

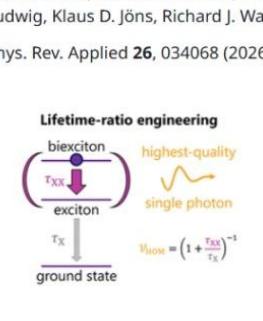
Phys. Rev. Applied **26**, 034067 (2026) - Published 28 September, 2026

EDITORS' SUGGESTION

High-quality single photons from cavity-enhanced biexciton-to-exciton transition

Nils Heinisch, Francesco Salusti, Mark R. Hogg, Timon L. Baltisberger, Malwina A. Marczak, Sascha R. Valentin, Arne Ludwig, Klaus D. Jöns, Richard J. Warburton, and Stefan Schumacher

Phys. Rev. Applied **26**, 034068 (2026) - Published 29 September, 2026



Semiconductor quantum dots are excellent deterministic sources of single photons. One of the best routes to generate pure single photons is through the biexciton-exciton cascade, but achieving high Hong-Ou-Mandel visibility (or photon indistinguishability) is fundamentally hindered by the finite ratio of radiative lifetimes of the two excited electronic states in that cascade. This study reduces the biexciton lifetime by selective cavity enhancement, and uses the single photon from the biexciton-to-exciton transition. This approach is a powerful path to achieving excellent single-photon indistinguishability and purity, plus high brightness.

Asymptotic stability of laser-driven lightsails: Enhancement by optical dispersion engineering in gratings

Jadon Y. Lin, Liam van Ravenstein, C. Martijn de Sterke, Michael S. Wheatland, Alex Y. Song, and Boris T. Kuhlmey

Phys. Rev. Applied **26**, 034069 (2026) - Published 29 September, 2026

Neural-network-based design and implementation of fast and robust quantum gates

Marko Kuzmanović, Ilya Moskalenko, Yu-Han Chang, Ognjen Stanisavljević, Christopher Warren, Emil Hogedal, Anuj Aggarwal, Irshad Ahmad, Janka Biznárová, Mamta Dahiya, Marcus Rommel, Andreas Nylander, Giovanna Tancredi, and Gheorghe Sorin Paraoanu

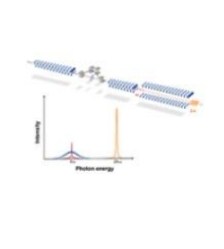
Phys. Rev. Applied **26**, 034070 (2026) - Published 29 September, 2026

EDITORS' SUGGESTION

Self-seeded x-ray free-electron laser with high spectral density and photon energy

Lu Cao, Tianyun Long, Winfried Decking, Marc Guetg, Vitali Kocharyan, Naresh Kujala, Christoph Lechner, Anders Madsen, Theophilos Maltezopoulos, Giovanni Perosa, Weilun Qin, Evgeni Saldin, Matthias Scholz, Svitozar Serkez, Andrei Trebushinin, Jiawei Yan, Shan Liu, and Gianluca Geloni

Phys. Rev. Applied **26**, 034071 (2026) - Published 29 September, 2026



Producing narrow-band, high-spectral-density pulses from an x-ray free-electron laser (XFEL) is important for demanding applications at extreme photon energies, such as high-resolution spectroscopy and studies of structural dynamics, but conventional hard-x-ray self-seeding becomes increasingly limited as photon energy increases. This study extends hard-x-ray self-seeding at the European XFEL to 18 keV, and explores second-harmonic-generation self-seeding as a route toward even higher photon energies. Experiments demonstrate coherent amplification of the second harmonic at 15 and 18 keV, while simulations show the potential for narrowband operation at 30 keV.

Multifrequency Floquet engineering of magnon polaritons

L. Hackner, A. R. Myatt, W. Wustmann, and N. J. Lambert

Phys. Rev. Applied **26**, 034072 (2026) - Published 30 September, 2026

SOFI-based spatial superresolution in nanosensing with blinking emitters

Alexander Mikhalychev and Alex Ulyanenkov

Phys. Rev. Applied **26**, 034073 (2026) - Published 30 September, 2026

Obstacles to continuous quantum error correction via parity measurements

Anton Halaski and Christiane P. Koch

Phys. Rev. Applied **26**, 034074 (2026) - Published 30 September, 2026

Hot-carrier distribution spectroscopy by transconductance in two-dimensional field-effect transistors

Katsunori Wakabayashi

Phys. Rev. Applied **26**, 034075 (2026) - Published 30 September, 2026

Damping dynamics of the centroid oscillation of a relativistic laser pulse in a plasma channel

Yuhui Xia, Zhenan Wang, Ziyao Tang, Jianghao Hu, Xinyang Liu, Letian Liu, Laifu Man, Zhuo Pan, Di Wu, Jacob R. Pierce, Xueqing Yan, Chen Lin, and Xinlu Xu

Phys. Rev. Applied **26**, 034076 (2026) - Published 30 September, 2026

In situ differentiable complex-field calibration for high-fidelity Hamiltonian evaluation in spatial photonic Ising machines

Haijun Zhou, Maolin Wang, Qin Luo, Hengyang Li, Yu Xiao, Xiahui Tang, Yingxiong Qin, Lin Wu, and Gang Xu

Phys. Rev. Applied **26**, 034077 (2026) - Published 30 September, 2026

ERRATA

Erratum: *In situ* quantum verification of polarization-stabilized optical channels [Phys. Rev. Applied 25, 034090 (2026)]

Matthew L. Stevens, Noah I. Wasserbeck, Zachary Goisman, Arefur Rahman, John Michael Record, Taman Truong, Ariq Haqq, Muneer Alshowkan, Brian T. Kirby, Nils T. Otterstrom, and Joseph M. Lukens

Phys. Rev. Applied **26**, 039901 (2026) - Published 14 September, 2026

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