Volume 24, Issue 5

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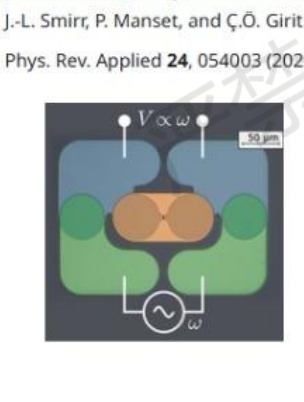
HIGHLIGHTED ARTICLES

EDITORS' SUGGESTION

Tunable Josephson voltage source for quantum circuits

J.-L. Smirr, P. Manset, and Ç.Ö. Girit

Phys. Rev. Applied **24**, 054003 (2025) - Published 3 November, 2025



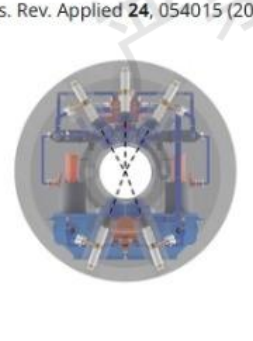
A tunable voltage source with ultralow noise would move the frontier in experimental quantum electronics. The authors have developed a cryogenic superconducting voltage source that provides the same metrological precision as a Josephson voltage standard, while being widely and continuously tunable. They demonstrate how the source can be coupled to quantum circuits, and that it has extremely low noise over a huge voltage range. This tunable Josephson voltage source opens possibilities for observing fresh physical phenomena, and has applications in quantum information and mesoscopic physics.

EDITORS' SUGGESTION

MAX-FLASH: A compact multiangle x-ray system for clinical translation of FLASH radiotherapy

Focheng Liu *et al.*

Phys. Rev. Applied **24**, 054015 (2025) - Published 5 November, 2025



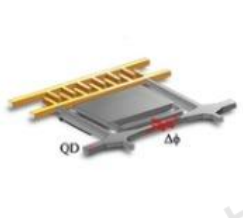
The emerging FLASH radiotherapy (FLASH-RT) technology, featuring ultrahigh dose rate (UHDR) instantaneous radiation to increase the response differences of normal tissues and tumors to ionizing radiation, is recognized as having significant clinical application value. A major challenge for its clinical translation, though, is achieving multiangle UHDR radiation at the millisecond time scale, in a compact system, to combine the FLASH effect with precise radiotherapy techniques. Building upon breakthroughs in several technologies, this study presents a compact multiangle x-ray FLASH-RT (MAX-FLASH) system that can be installed in most hospital radiotherapy treatment rooms.

EDITORS' SUGGESTION

Integration of a GaAs-based nanomechanical phase shifter with quantum-dot single-photon sources

Celeste Qvotrup, Ying Wang, Marcus Albrechtsen, Rodrigo A. Thomas, Zhe Liu, Sven Scholz, Arne Ludwig, and Leonardo Midolo

Phys. Rev. Applied **24**, 054016 (2025) - Published 6 November, 2025



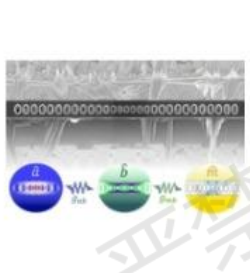
Cryogenically compatible phase shifters are essential for the development of on-chip quantum photonic processors based on solid-state quantum emitters. Conventional thermo-optic phase shifters, however, fail to operate effectively at the low temperatures required for coherent single-photon generation. To overcome this limitation, researchers develop nano-optoelectromechanical systems (NOEMS) based on slot-mode waveguides and integrate them with quantum dots, resulting in a small, low-loss on-chip photon router. This technique offers a pathway to scale quantum photonic circuits with integrated deterministic emitters, and can be directly applied to a wide range of photonic platforms.

EDITORS' SUGGESTION

Photonic crystal cavities based on suspended yttrium iron garnet nanobeams

A. Rashedi, M. Ebrahimi, Y. Huang, M.J. Rudd, J.P. Davis, and V.A.S.V. Bittencourt

Phys. Rev. Applied **24**, 054017 (2025) - Published 6 November, 2025



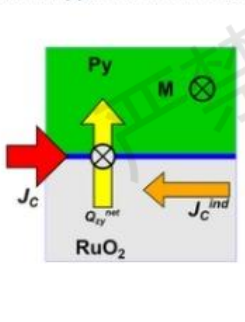
Hybrid platforms that join light, sound, and spin promise chip-scale quantum transducers and precision sensors. Yttrium iron garnet (YIG) has the right mix of transparency and low magnetic damping, but making suspended nanostructures that confine all three excitations on one chip remains a tough challenge. The authors use focused-ion-beam milling to carve an air-suspended YIG photonic crystal nanobeam that supports a confined optical mode plus colocalized gigahertz mechanical and magnonic modes. This approach opens a route to tunable magneto-optomechanics and, with higher optical quality factors, could underpin efficient microwave-to-optical conversion for integrated quantum networks.

EDITORS' SUGGESTION

Angle-dependent magnetoresistance induced by interface-generated spin current in $\mathrm{RuO_2}$/permalloy heterostructures

Akashdeep Akashdeep, Ewiese Mohammad Ababneh, Christin Schmitt, Edgar Galíndez-Ruales, Felix Fuhrmann, Timo Kuschel, Mathias Kläui, Vivek Amin, and Gerhard Jakob

Phys. Rev. Applied **24**, 054018 (2025) - Published 6 November, 2025



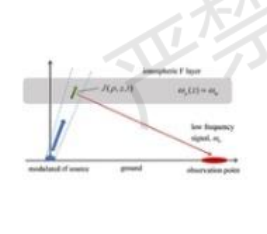
Spin currents in systems without net magnetization are critical for developing next-generation spin-orbit-torque and spintronic memory technologies. While altermagnets should provide such spin currents, they can also originate from pure interfacial effects. The authors take angle-dependent magnetotransport measurements of epitaxial ruthenium dioxide–permalloy heterostructures, revealing that strong interfacial effects dominate over potential altermagnetic contributions. This insight into interfacial spin-transport mechanisms is essential for advancing altermagnet-based spintronic applications.

EDITORS' SUGGESTION

Frequency conversion in the ionosphere for over-the-horizon radar

Phillip Sprangle and Gavin Blair

Phys. Rev. Applied **24**, 054040 (2025) - Published 13 November, 2025



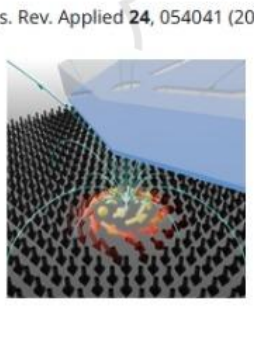
Generation of low-frequency signals in the ionosphere has direct applications for over-the-horizon radar and related processes. The mechanism proposed in this study uses a ground-based modulated rf signal to resonantly excite plasma oscillations in the ionosphere's F layer, creating low-frequency signals that propagate back to the earth's surface. The authors find that a 94-GHz signal, modulated at 9 MHz and operated at 1 MW, can generate a 9-MHz signal on the ground, 500 km from the interaction regime in the ionosphere, at intensities sufficient for detection. This points to practical mobile radar units and atmospheric monitoring.

EDITORS' SUGGESTION

Advanced SQUID-on-lever scanning probe for high-sensitivity magnetic microscopy with sub-100-nm spatial resolution

Timur Weber, Daniel Jetter, Jan Ullmann, Simon A. Koch, Simon F. Pfander, Katharina Kress, Andriani Vervelaki, Boris Gross, Oliver Kieler, Ute Drechsler, Priya R. Baral, Arnaud Magrez, Reinhold Kleiner, Armin W. Knoll, Martino Poggio, and Dieter Koelle

Phys. Rev. Applied **24**, 054041 (2025) - Published 14 November, 2025



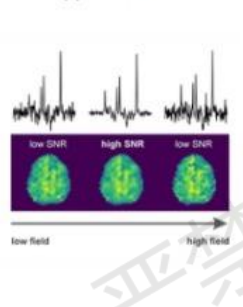
Nanoscale superconducting quantum interference devices (SQUIDs) integrated on scanning probes are important for high-resolution magnetic imaging at low temperatures. Progress has been limited by a lack of robust sensors that can both be fabricated on the wafer scale and provide the highest spatial resolution. The authors combine optical lithography and focused-ion-beam milling to produce niobium nano-SQUIDs on silicon cantilevers, achieving high spatial resolution and sensitivity in magnetic fields of up to 0.5 T at 4.2 K. These sensors can image individual magnetic skyrmions and nanoscale magnetization patterns, significantly expanding the applicability of scanning SQUID microscopy.

EDITORS' SUGGESTION

When more is less: Higher magnetic fields and their limited impact on signal-to-noise ratio per unit of acquisition time in unlocalized and single-voxel magnetic resonance spectroscopy

Guodong Weng and Johannes Slotboom

Phys. Rev. Applied **24**, 054066 (2025) - Published 21 November, 2025



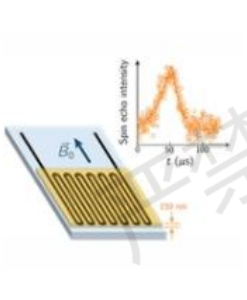
In clinical magnetic resonance spectroscopy (MRS), the signal-to-noise ratio per unit time (SNR_t) dictates how efficiently one can acquire diagnostic-quality spectra. The common assumption is that stronger magnets always improve SNR_t, without fully accounting for constraints on the specific absorption rate (SAR). This study analyzes how SNR_t scales with magnetic field strength under realistic SAR limits. Surprisingly, for a given pulse sequence there exists an optimal field that maximizes SNR_t. This insight should improve clinical MRS by prioritizing the "just right" field strength and SAR-aware pulse timing to achieve truly time-efficient spectroscopy.

EDITORS' SUGGESTION

Superconducting meander-line surface coil for NMR spectroscopy of nanoscale thin films

L. Beaudoin, A. Verrier, Y.A. Bioud, M. Massicotte, B. Reulet, and J.A. Quilliam

Phys. Rev. Applied **24**, 054076 (2025) - Published 25 November, 2025



Nuclear magnetic resonance is a valuable technique for studying a wide variety of quantum materials, but the small magnetic moments involved make it particularly challenging to apply to thin films or two-dimensional materials. This work implements a superconducting meander-line surface coil that achieves a high filling factor, even for very thin samples, and enables one to obtain an NMR signal and perform spin-echo measurements on a sample of boron just 150 nm thick. The article also provides a roadmap for improving this approach to achieve measurements in the single-layer limit, which is quite promising for the study of magnetism and correlated electrons in two-dimensional systems.

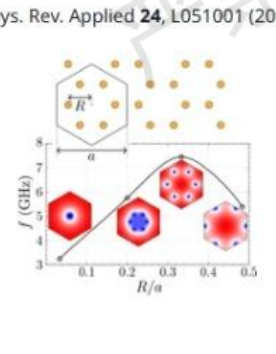
LETTERS

LETTER

Volume-preserving deformation of honeycomb wire media enables broad plasma-frequency tunability

Denis Sakhno, Jim A. Enriquez, and Pavel A. Belov

Phys. Rev. Applied **24**, L051001 (2025) - Published 19 November, 2025



Wire metamaterials are attractive for tunable resonators in dark-matter detection and electromagnetic technologies, but tuning the plasma frequency over a wide range remains challenging. This work employs a volume-preserving deformation of a honeycomb wire medium to realize over 60% plasma-frequency tuning, in both simulations and experiments. Introducing a quarter-wavelength air gap reproduces infinite-medium behavior within compact hexagonal cavities. These findings open the door to mechanically tunable, high-performance resonators for axion haloscopes and reconfigurable metamaterial devices.

ARTICLES

Strain effects on the fluctuation properties in noncollinear antiferromagnets: A first-principles and macrospin-based study

Mohammad M. Rahman, Farzad Mahfouzi, Matthew W. Daniels, and Mark D. Stiles

Phys. Rev. Applied **24**, 054001 (2025) - Published 3 November, 2025

Tailoring entanglement with a symmetry: Anomalous ghost diffraction

Yue Zeng, Yuan Li, Wuhong Zhang, Yangjian Cai, and Lixiang Chen

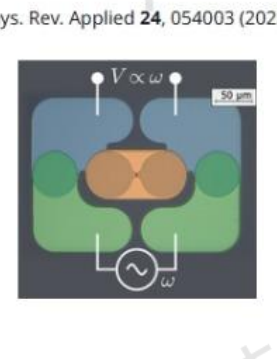
Phys. Rev. Applied **24**, 054002 (2025) - Published 3 November, 2025

EDITORS' SUGGESTION

Tunable Josephson voltage source for quantum circuits

J.-L. Smirr, P. Manset, and Ç.Ö. Girit

Phys. Rev. Applied **24**, 054003 (2025) - Published 3 November, 2025



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Power-consumption back door in quantum key distribution

Beatriz Lopes da Costa, Matías R. Bolaños, Ricardo Chaves, Claudio Narduzzi, Marco Avesani, Davide Giacomo Marangon, Andrea Stanco, Giuseppe Vallone, Paolo Villoresi, and Yasser Omar

Phys. Rev. Applied **24**, 054004 (2025) - Published 3 November, 2025

Quantum algorithm for solving nonlinear algebraic equations

Nhat A. Nghiem and Tzu-Chieh Wei

Phys. Rev. Applied **24**, 054005 (2025) - Published 3 November, 2025

Upper bounds on focusing light through multimode fibers

Amna Ammar, Sarp Feykun Şener, Mert Ercan, and Hasan Yılmaz

Phys. Rev. Applied **24**, 054006 (2025) - Published 4 November, 2025

Topologically enhanced guided acoustic wave sensors

Tommaso Maggioli, Niccolò Scalise Pantuso, Marco Galli, Jacopo M. De Ponti, Onurcan Kaya, Siddhartha Ghosh, Marco Colangelo, and Cristian Cassella

Phys. Rev. Applied **24**, 054007 (2025) - Published 4 November, 2025

Photophoretic lift for carbon-nanotube-coated polyester film: A combined numerical and experimental approach

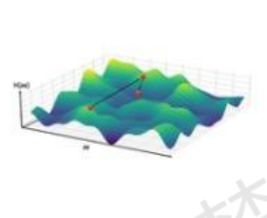
Haohuan Han, Xinjie Li, Hao Zhu, Hang Yu, Linxiao Liu, Zheng Wang, Junqing He, Bijiao He, and Ruizhi Li

Phys. Rev. Applied **24**, 054008 (2025) - Published 4 November, 2025

Improved update rule for probabilistic computers

Andrew Rockovich, Gregory Lafyatis, and Daniel J. Gauthier

Phys. Rev. Applied **24**, 054009 (2025) - Published 4 November, 2025



Ising machines realized on field-programmable gate arrays are used to solve combinatorial optimization problems. Performance is limited by the speed of the digital clocked arithmetic that is part of the algorithm, so in this study the authors simplify the Ising machine by replacing all arithmetic with a set of look-up tables, while retaining the polynomial scaling of chip resources with problem size. The result is reduction of both resource usage and time to solution by more than an order of magnitude, compared to previous approaches. Future implementations of Ising machines may be inspired by this simplified design.

Forced destabilization of a granular raft

Chase T. Gabbard, Edward Whitesell, and Joshua B. Bostwick

Phys. Rev. Applied **24**, 054010 (2025) - Published 4 November, 2025

Cross-modal Willis metasurfaces for perfect control of elastic wave refraction in solids

Chan Wook Park, Jeseung Lee, and Yoon Young Kim

Phys. Rev. Applied **24**, 054011 (2025) - Published 5 November, 2025

Tunable terahertz source on a chip with decade-long stability using layered-superconductor elliptical microcavities

Mingqi Zhang, Shungo Nakagawa, Yuki Enomoto, Yoshihiko Kuzumi, Ryuta Kikuchi, Yuki Yamauchi, Toshiaki Hattori, Richard A. Klemm, Kazuo Kadowaki, Takanari Kashiwagi, and Kaveh Delfanazari

Phys. Rev. Applied **24**, 054012 (2025) - Published 5 November, 2025

Measuring the ferromagnetic resonance cone angle via static dipolar fields using diamond spins

B.A. McCullian, M. Chilcote, H. Yusuf, E. Johnston-Halperin, and G.D. Fuchs

Phys. Rev. Applied **24**, 054013 (2025) - Published 5 November, 2025

Transfer learning of many-body electronic correlation entropy from local measurements

Faluke Aikebaier, Teemu Ojanen, and Jose L. Lado

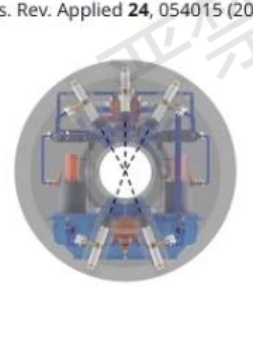
Phys. Rev. Applied **24**, 054014 (2025) - Published 5 November, 2025

EDITORS' SUGGESTION

MAX-FLASH: A compact multiangle x-ray system for clinical translation of FLASH radiotherapy

Focheng Liu *et al.*

Phys. Rev. Applied **24**, 054015 (2025) - Published 5 November, 2025



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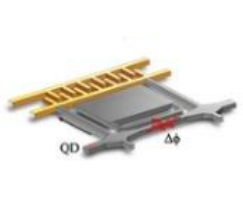
EDITORS' SUGGESTION

Integration of a GaAs-based nanomechanical phase shifter with quantum-dot single-photon sources

Celeste Qvotrup, Ying Wang, Marcus Albrechtsen, Rodrigo A. Thomas, Zhe Liu, Sven Scholz, Arne Ludwig, and Leonardo Midolo

Phys. Rev. Applied **24**, 054016 (2025) - Published 6 November, 2025



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A. Rashedi, M. Ebrahimi, Y. Huang, M.J. Rudd, J.P. Davis, and V.A.S.V. Bittencourt

Phys. Rev. Applied **24**, 054017 (2025) - Published 6 November, 2025

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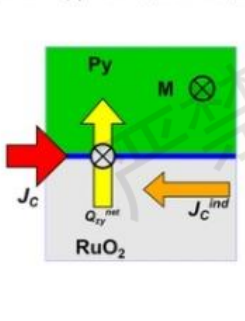
EDITORS' SUGGESTION

Angle-dependent magnetoresistance induced by interface-generated spin current in $\mathrm{RuO_2}$/permalloy heterostructures

Akashdeep Akashdeep, Ewiese Mohammad Ababneh, Christin Schmitt, Edgar Galíndez-Ruales, Felix Fuhrmann, Timo Kuschel, Mathias Kläui, Vivek Amin, and Gerhard Jakob

Phys. Rev. Applied **24**, 054018 (2025) - Published 6 November, 2025



Spin currents in systems without net magnetization are critical for developing next-generation spin-orbit-torque and spintronic memory technologies. While altermagnets should provide such spin currents, they can also originate from pure interfacial effects. The authors take angle-dependent magnetotransport measurements of epitaxial ruthenium dioxide–permalloy heterostructures, revealing that strong interfacial effects dominate over potential altermagnetic contributions. This insight into interfacial spin-transport mechanisms is essential for advancing altermagnet-based spintronic applications.

Nonvolatile cryogenic phase-slip memory with single-shot readout

Lukas Nulens, Davi A.D. Chaves, Stijn Reniers, Ruben Dillemans, Ivo P.C. Cools, Kristiaan Temst, Bart Raes, Margriet J. Van Bael, and Joris Van de Vondel

Phys. Rev. Applied **24**, 054019 (2025) - Published 6 November, 2025

Tunable broad-temperature-range grating based on the liquid crystal flexoelectric effect and its spectral scanning: Forming one-dimensional, two-dimensional, and annular diffraction patterns at different orientations

Hao Cheng, Yitong Li, Jiaxuan Wang, Jieyu Li, Xiaoran Guan, Xiangming Kong, Hongyu Xing, and Wenjiang Ye

Phys. Rev. Applied **24**, 054020 (2025) - Published 6 November, 2025

Picosecond acoustics for mass characterization of nanoparticles on thin membranes

E. Glushkov, N. Glushkova, F. Soldevila, L. Belliard, S. Baltogiannis, P. Pačko, S. Jo, A. Mihi, D. Torrent, and O. Boyko

Phys. Rev. Applied **24**, 054021 (2025) - Published 7 November, 2025

Subterahertz collective spin-resonance modes and field-adaptive reservoir computing in the chiral helimagnet $\mathrm{Cr_{1/3}TaS_2}$

Zishuang Li, Shuai Zhang, Zhenyu Gao, Fanying Meng, Jun Cui, Wei Liu, Wei Tong, Liyuan Li, Lina Chen, Haozhe Wang, Xiao Xiao, Meiye Hou, Shengbo Gao, Qi Zhang, Lei Zhang, and Ronghua Liu

Phys. Rev. Applied **24**, 054022 (2025) - Published 7 November, 2025

Prototype reactor-antineutrino detector based on $^6\mathrm{Li}$-doped pulse-shape-discriminating plastic scintillator

O. Benevides Rodrigues *et al.* (The Mobile Antineutrino Demonstrator Project)

Phys. Rev. Applied **24**, 054023 (2025) - Published 7 November, 2025

Anisotropic spin dynamics in the intrinsic ferromagnet $\mathrm{Fe_3GaTe_2}$

Yang Yang, Wei Liu, Jingjing Ma, Jingxin Li, Xuguang Liu, Min Ge, Jiyu Fan, Chunlan Ma, Li Pi, Zhe Qu, and Lei Zhang

Phys. Rev. Applied **24**, 054024 (2025) - Published 7 November, 2025

Self-induced manipulation of biphoton entanglement in topologically distinct modes

Wei-Wei Zhang, Chao Chen, and Jizhou Wu

Phys. Rev. Applied **24**, 054025 (2025) - Published 7 November, 2025

Tip-based proximity ferroelectric switching and piezoelectric response in wurtzite multilayers

Eugene A. Eliseev, Anna N. Morozovska, Sergei V. Kalinin, Long-Qing Chen, and Venkatraman Gopalan

Phys. Rev. Applied **24**, 054026 (2025) - Published 10 November, 2025

Harnessing coherent-wave control for sensing applications

Pablo Jara, Arthur Goetschy, Hui Cao, and Alexey Yamilov

Phys. Rev. Applied **24**, 054027 (2025) - Published 10 November, 2025

Composable finite-size security of high-dimensional quantum-key-distribution protocols

Florian Kanitschar and Marcus Huber

Phys. Rev. Applied **24**, 054028 (2025) - Published 10 November, 2025

Long-distance interaction of gate-defined quantum dots under Floquet driving

Xiao-Fei Liu, Zhi-Hai Liu, Tie-Jun Wang, Chuan Wang, and Hongqi Xu

Phys. Rev. Applied **24**, 054029 (2025) - Published 10 November, 2025

All-rf-based coarse-tuning algorithm for quantum devices using machine learning

Barnaby van Straaten, Federico Fedele, Florian Vigneau, Joseph Hickie, Daniel Jirovec, Andrea Ballabio, Daniel Chrastina, Giovanni Isella, Georgios Katsaros, and Natalia Ares

Phys. Rev. Applied **24**, 054030 (2025) - Published 10 November, 2025

Simultaneous sweet-spot locking of gradiometric fluxonium qubits

Denis Bénâtre, Mathieu Féchant, Nicolas Zapata, Nicolas Gosling, Patrick Paluch, Thomas Reisinger, and Ioan M. Pop

Phys. Rev. Applied **24**, 054031 (2025) - Published 12 November, 2025

Quantitative calibration of a traveling-wave parametric amplifier applied to an optomechanical platform

Alexandre Delattre, Ilya Golokolenov, Richard Pedurand, Nicolas Roch, Arpit Ranadive, Martina Esposito, Luca Planat, Andrew Fefferman, Eddy Collin, Xin Zhou, Mika A. Sillanpää, Laure Mercier de Lépinay, Andrew D. Armour, and Jonas Glatthard

Phys. Rev. Applied **24**, 054032 (2025) - Published 12 November, 2025

Stable and efficient charging of superconducting capacitively shunted flux quantum batteries

Li Li, Si-Lu Zhao, Yun-Hao Shi, Bing-Jie Chen, Xinhui Ruan, Gui-Han Liang, Wei-Ping Yuan, Jia-Cheng Song, Cheng-Lin Deng, Yu Liu, Tian-Ming Li, Zheng-He Liu, Xue-Yi Guo, Xiaohui Song, Kai Xu, Heng Fan, Zhongcheng Xiang, and Dongning Zheng

Phys. Rev. Applied **24**, 054033 (2025) - Published 12 November, 2025

Angular tunability of spin-wave dynamics in nanoscale bicomponent magnetic fractals

Riya Mehta and Susmita Saha

Phys. Rev. Applied **24**, 054034 (2025) - Published 12 November, 2025

Modeling coupled constellation dynamics for TianQin under self-gravity

Yuzhou Fang, Xuefeng Zhang, and Hongyin Li

Phys. Rev. Applied **24**, 054035 (2025) - Published 12 November, 2025

Fast quench detection via coolant-gas-temperature monitoring of a high-temperature superconducting magnet

Oriol Fernández-Serracanta, Ivan V. Konoplev, Shailendra Chouhan, Heng Zhang, Jin Zhang, Yisong Yang, Xiaodong Chen, and Min Zhang

Phys. Rev. Applied **24**, 054036 (2025) - Published 13 November, 2025

Erbium quantum memory platform with long optical coherence via back-end-of-line deposition on foundry-fabricated photonics

Shobhit Gupta, Robert M. Pettit, Ananthesh Sundaresh, Vasileios Niaouris, Skylar Deckoff-Jones, Daniel P. Crowley, Lewis G. Carpenter, Alan M. Dibos, Manish Kumar Singh, and Sean E. Sullivan

Phys. Rev. Applied **24**, 054037 (2025) - Published 13 November, 2025

Exact amplitudes of parametric processes in driven Josephson circuits

Roman Baskov, Daniel K. Weiss, and Steven M. Girvin

Phys. Rev. Applied **24**, 054038 (2025) - Published 13 November, 2025

Quantum-dot-based device for high-performance magnetic microscopy and spin filtering in the Kondo regime

Pierre Lombardo, Imam Makhfudz, Steffen Schäfer, and Roland Hayn

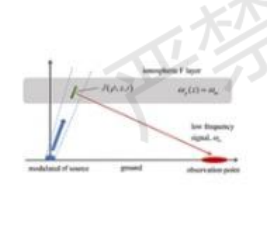
Phys. Rev. Applied **24**, 054039 (2025) - Published 13 November, 2025

EDITORS' SUGGESTION

Frequency conversion in the ionosphere for over-the-horizon radar

Phillip Sprangle and Gavin Blair

Phys. Rev. Applied **24**, 054040 (2025) - Published 13 November, 2025



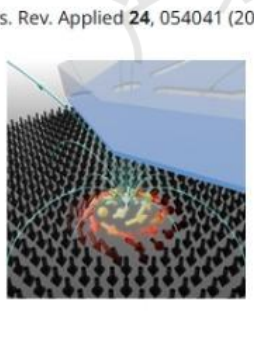
Generation of low-frequency signals in the ionosphere has direct applications for over-the-horizon radar and related processes. The mechanism proposed in this study uses a ground-based modulated rf signal to resonantly excite plasma oscillations in the ionosphere's F layer, creating low-frequency signals that propagate back to the earth's surface. The authors find that a 94-GHz signal, modulated at 9 MHz and operated at 1 MW, can generate a 9-MHz signal on the ground, 500 km from the interaction regime in the ionosphere, at intensities sufficient for detection. This points to practical mobile radar units and atmospheric monitoring.

EDITORS' SUGGESTION

Advanced SQUID-on-lever scanning probe for high-sensitivity magnetic microscopy with sub-100-nm spatial resolution

Timur Weber, Daniel Jetter, Jan Ullmann, Simon A. Koch, Simon F. Pfander, Katharina Kress, Andriani Vervelaki, Boris Gross, Oliver Kieler, Ute Drechsler, Priya R. Baral, Arnaud Magrez, Reinhold Kleiner, Armin W. Knoll, Martino Poggio, and Dieter Koelle

Phys. Rev. Applied **24**, 054041 (2025) - Published 14 November, 2025



Nanoscale superconducting quantum interference devices (SQUIDs) integrated on scanning probes are important for high-resolution magnetic imaging at low temperatures. Progress has been limited by a lack of robust sensors that can both be fabricated on the wafer scale and provide the highest spatial resolution. The authors combine optical lithography and focused-ion-beam milling to produce niobium nano-SQUIDs on silicon cantilevers, achieving high spatial resolution and sensitivity in magnetic fields of up to 0.5 T at 4.2 K. These sensors can image individual magnetic skyrmions and nanoscale magnetization patterns, significantly expanding the applicability of scanning SQUID microscopy.

Slit-loaded coplanar waveguide for color-center spin qubits

Haruko Toyama, Kosuke Tahara, Taro Ikeda, Hiroya Tanaka, Atsushi Miura, Shin-ichi Tamura, Maria Emma Villamin, Toshinori Numata, Naotaka Iwata, Yuichi Yamazaki, Takeshi Ohshima, Katsuhiro Kutsuki, and Hideo Iizuka

Phys. Rev. Applied **24**, 054042 (2025) - Published 14 November, 2025

High-resolution imaging of ultrasonic fields through a multimode optical fiber

Benjamin Keenlyside, Dylan Marques, David B. Phillips, Edward Zhang, Paul Beard, and James Guggenheim

Phys. Rev. Applied **24**, 054043 (2025) - Published 14 November, 2025

Topology-protected displacement metrology using broadband unpolarized light

Di Liu, Han Liu, H.P. Urbach, and Zheng Xi

Phys. Rev. Applied **24**, 054044 (2025) - Published 14 November, 2025

Reprogrammable self-assembly of magnetic lattices in two dimensions

Audrey A. Watkins and Osama R. Bilal

Phys. Rev. Applied **24**, 054045 (2025) - Published 14 November, 2025

Thickness-driven optimization of optical properties and mechanical loss in nanolaminates for precision metrology

Shenghuan Fang, Zhenyin Lu, Xiaochuan Ji, Dianhao Dong, Hongfei Jiao, Xinbin Cheng, Zhanshan Wang, and Jinlong Zhang

Phys. Rev. Applied **24**, 054046 (2025) - Published 17 November, 2025

Discrete time crystal for periodic-field sensing with quantum-enhanced precision

Rozhin Yousefjani, Saif Al-Kuwari, and Abolfazl Bayat

Phys. Rev. Applied **24**, 054047 (2025) - Published 17 November, 2025

High-throughput spin-bath characterization of spin defects in semiconductors

Abigail N. Poteshman, Mykyta Onizhuk, Christopher Egerstrom, Daniel P. Mark, David D. Awschalom, F. Joseph Heremans, and Giulia Galli

Phys. Rev. Applied **24**, 054048 (2025) - Published 17 November, 2025

Multiuser quantum key distribution using quotient graph states derived from continuous-variable dual-rail cluster states

Akash nag Oruganti

Phys. Rev. Applied **24**, 054049 (2025) - Published 17 November, 2025

Physical-layer machine learning with multimode interferometric photon counting

Jia-Jin Feng, Anthony J. Brady, and Quntao Zhuang

Phys. Rev. Applied **24**, 054050 (2025) - Published 17 November, 2025

Selective control of single quantum dots with surface acoustic waves

Rui Zhu, Jingnan Yang, Xiqing Chen, Wenshuo Dai, Hancong Li, Longlong Yang, Sai Yan, Hanqing Liu, Zhikai Ma, Yu Yuan, Bowen Fu, Zhanchun Zuo, Haiqiao Ni, Zhichuan Niu, Can Wang, Kuijuan Jin, Qihuang Gong, and Xiulai Xu

Phys. Rev. Applied **24**, 054051 (2025) - Published 18 November, 2025

CMOS-compatible processing and room-temperature characterization at the wafer level for scalable quantum computing

S.J.K. Lang, T. Mayer, J. Weber, C. Dhieb, I. Eisele, W. Lerch, Z. Luo, C. Morán Guizán, E. Music, L. Sturm-Rogon, D. Zahn, R.N. Pereira, and C. Kutter

Phys. Rev. Applied **24**, 054052 (2025) - Published 18 November, 2025

Anonymous and private parameter estimation in networks of quantum sensors

Jarn de Jong, Santiago Scheiner, Naomi R. Solomons, Ziad Chaoui, Damian Markham, and Anna Pappa

Phys. Rev. Applied **24**, 054053 (2025) - Published 18 November, 2025

Optimization of the dual-pumped normal-dispersion integrated parametric oscillator in the presence of thermal effects

Alexander K. Vorobyev, Nikolay A. Kapridov, Timur R. Yunusov, Danila V. Morozov, Andrei N. Danilin, Alexey D. Ivanov, Artem E. Shitikov, Valery E. Lobanov, Igor A. Bilenko, and Dmitry A. Chermoshentsev

Phys. Rev. Applied **24**, 054054 (2025) - Published 18 November, 2025

Interfacial topological states in one-dimensional phononic crystals with a virtual dimension

Bartlomiej Piwowarczyk, Michael J. Leamy, and Pawel Packo

Phys. Rev. Applied **24**, 054055 (2025) - Published 18 November, 2025

Influence of photon-magnon coupling on spin-wave-excitation enhancement

Liubov Ivzhenko, Sergey Polevoy, Sergey Nedukh, and Maciej Krawczyk

Phys. Rev. Applied **24**, 054056 (2025) - Published 19 November, 2025

Generation of spin-squeezed states using dipole-coupled spins

Yifan Song, Nabiha Hasan, and Susumu Takahashi

Phys. Rev. Applied **24**, 054057 (2025) - Published 19 November, 2025

Stress and strain energy dynamics in $\mathrm{Zn/VO_2}$ battery electrodes under cyclic electrochemical loading

Yuchuan Sun, Wen Wen, Xiuling Shi, Faysal MD, and Kaikai Li

Phys. Rev. Applied **24**, 054058 (2025) - Published 19 November, 2025

Estimation of the second-order coherence function using quantum reservoir and ensemble methods

Dogyun Ko, Stanisław Świerczewski, Andrzej Opala, Michał Matuszewski, and Amir Rahmani

Phys. Rev. Applied **24**, 054059 (2025) - Published 19 November, 2025

Amplitude-noise-resilient entangling gates for trapped ions

Nguyen H. Le, Modesto Orozco-Ruiz, Sahra A. Kulmiya, James G. Urquhart, Samuel J. Hile, Winfried K. Hensinger, and Florian Mintert

Phys. Rev. Applied **24**, 054060 (2025) - Published 20 November, 2025

Magneto-optical spectroscopy based on pump-probe strobe light

Shihao Zhou, Yujie Zhu, Chunli Tang, Rui Sun, Junming Wu, Yuzan Xiong, Ingrid E. Russell, Yi Li, Dali Sun, Frank Tsui, Binbin Yang, Valentine Novosad, Jia-Mian Hu, Wencan Jin, and Wei Zhang

Phys. Rev. Applied **24**, 054061 (2025) - Published 20 November, 2025

Single atom enables extraordinary light transmission through a zero-mode waveguide

V.V. Klimov

Phys. Rev. Applied **24**, 054062 (2025) - Published 20 November, 2025

Tunable cavity coupling of a single Sn-V^- center in nanodiamond across the bad-emitter and bad-cavity regimes

S. Sachero, R. Berghaus, F. Feuchtmayr, N. Lettner, P. Maier, E. Nieto Hernandez, S. Ditalia Tchernij, and A. Kubanek

Phys. Rev. Applied **24**, 054063 (2025) - Published 20 November, 2025

Efficiency of optimal control for noisy spin qubits in diamond

Hendry M. Lim, Genko T. Genov, Roberto Sailer, Alfaiz Fahrurrachman, Muhammad A. Majidi, Fedor Jelezko, and Ressa S. Said

Phys. Rev. Applied **24**, 054064 (2025) - Published 20 November, 2025

Order in disorder: Increased carrier mobility of downscaled amorphous semiconductors as exemplified by hydrogenated amorphous silicon

Yuezhou Luo and Andrew John Flewitt

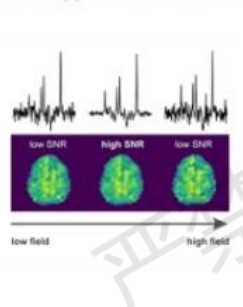
Phys. Rev. Applied **24**, 054065 (2025) - Published 21 November, 2025

EDITORS' SUGGESTION

When more is less: Higher magnetic fields and their limited impact on signal-to-noise ratio per unit of acquisition time in unlocalized and single-voxel magnetic resonance spectroscopy

Guodong Weng and Johannes Slotboom

Phys. Rev. Applied **24**, 054066 (2025) - Published 21 November, 2025



In clinical magnetic resonance spectroscopy (MRS), the signal-to-noise ratio per unit time (SNR_t) dictates how efficiently one can acquire diagnostic-quality spectra. The common assumption is that stronger magnets always improve SNR_t, without fully accounting for constraints on the specific absorption rate (SAR). This study analyzes how SNR_t scales with magnetic field strength under realistic SAR limits. Surprisingly, for a given pulse sequence there exists an optimal field that maximizes SNR_t. This insight should improve clinical MRS by prioritizing the "just right" field strength and SAR-aware pulse timing to achieve truly time-efficient spectroscopy.

Parametric phase modulation in superconducting circuits

Zhuang Ma, Xianke Li, Hongyi Shi, Ruonan Guo, Jianwen Xu, Xinsheng Tan, and Yang Yu

Phys. Rev. Applied **24**, 054067 (2025) - Published 21 November, 2025

Attention-enhanced reservoir computing as a multiple-dynamical-system approximator

Felix Köster, Kazutaka Kanno, and Atsushi Uchida

Phys. Rev. Applied **24**, 054068 (2025) - Published 21 November, 2025

Dynamic Josephson-junction metasurfaces for multiplexed control of superconducting qubits

Mustafa Bakr

Phys. Rev. Applied **24**, 054069 (2025) - Published 21 November, 2025

Security of the BB84 protocol with passive biased basis choice by the receiver

Shun Kawakami, Atsushi Taniguchi, Yoshihide Tonomura, Koichi Takasugi, and Koji Azuma

Phys. Rev. Applied **24**, 054070 (2025) - Published 24 November, 2025

Compact dual-beam Zeeman slower for high-flux cold atoms

Chen Chen, Kejun Liu, Dezhou Deng, Shuchang Ma, Peng Zhu, Zhichang He, J.F. Chen, Xiaoxiao Wu, and Peng Chen

Phys. Rev. Applied **24**, 054071 (2025) - Published 24 November, 2025

Semideterministic quantum dot placement in heteroepitaxy

Zihang Wang and Dirk Bouwmeester

Phys. Rev. Applied **24**, 054072 (2025) - Published 24 November, 2025

Enhanced Z-scheme photocatalytic water splitting in g-$\mathrm{C_3N_4}$ monolayers via out-of-plane doping and heterostructure design

Wen-Jie Shi, Chuan-Lu Yang, Xiaohu Li, Yuliang Liu, Wenkai Zhao, and Feng Gao

Phys. Rev. Applied **24**, 054073 (2025) - Published 24 November, 2025

Shallow-water waveguide with hybrid boundaries for underwater acoustic metamaterial measurements

Chen-Yang Li, Hong-Tao Zhou, Yan-Feng Wang, and Yue-Sheng Wang

Phys. Rev. Applied **24**, 054074 (2025) - Published 25 November, 2025

High-throughput computational screening of two-dimensional oxides for high-performance electronic and optoelectronic devices

Zongmeng Yang, Xingyue Yang, Qiang Li, Qiuhui Li, Jichao Dong, Ying Li, Lay Kee Ang, Yee Sin Ang, Shibo Fang, and Jing Lu

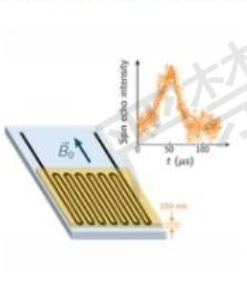
Phys. Rev. Applied **24**, 054075 (2025) - Published 25 November, 2025

EDITORS' SUGGESTION

Superconducting meander-line surface coil for NMR spectroscopy of nanoscale thin films

L. Beaudoin, A. Verrier, Y.A. Bioud, M. Massicotte, B. Reulet, and J.A. Quilliam

Phys. Rev. Applied **24**, 054076 (2025) - Published 25 November, 2025



Nuclear magnetic resonance is a valuable technique for studying a wide variety of quantum materials, but the small magnetic moments involved make it particularly challenging to apply to thin films or two-dimensional materials. This work implements a superconducting meander-line surface coil that achieves a high filling factor, even for very thin samples, and enables one to obtain an NMR signal and perform spin-echo measurements on a sample of boron just 150 nm thick. The article also provides a roadmap for improving this approach to achieve measurements in the single-layer limit, which is quite promising for the study of magnetism and correlated electrons in two-dimensional systems.

High-performance robust ScN_x/Nb/ScN_x heaters for an integrated silicon nitride low-loss photonic platform

Nikita Yu. Dmitriev, Alexandr M. Mumlyakov, Maksim V. Shibalov, Ivan A. Filippov, Galina V. Molodtsova, Igor V. Trofimov, Darja A. Brukvina, Igor A. Bilenko, and Michael A. Tarkhov

Phys. Rev. Applied **24**, 054077 (2025) - Published 25 November, 2025

Miniaturized magnetic-field sensor based on nitrogen-vacancy centers

Stefan Johansson, Dennis Lönard, Isabel Cardoso Barbosa, Jonas Gutsche, Jonas Witzenrath, and Artur Widera

Phys. Rev. Applied **24**, 054078 (2025) - Published 26 November, 2025

Inverse design of broadband antennas for terahertz devices based on two-dimensional materials

M.Y. Lukianov, A. Maevskiy, N. Kazeev, D. Mylnikov, D.A. Svintsov, K.S. Novoselov, A. Ustyuzhanin, and D.A. Bandurin

Phys. Rev. Applied **24**, 054079 (2025) - Published 26 November, 2025

Modeling and design of integrated circuits based on ionic bipolar junction transistors

Soichiro Tottori and Rohit Karnik

Phys. Rev. Applied **24**, 054080 (2025) - Published 26 November, 2025

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