



Inspiral, merger, and ringdown for a pair of black holes, which allowed confirmation of Hawking's area law. Data are from LIGO Hanford (red) and LIGO Livingston (blue). Selected for a Viewpoint in *Physics Magazine* and for an Editors' Suggestion. [A. G. Abac *et al.* (LIGO Scientific, Virgo, and KAGRA Collaborations), Phys. Rev. Lett. **135**, 111403 (2025)]

NEWSPAPER

PHYSICAL REVIEW LETTERS

Contents

Articles published 6 September–12 September 2025

VOLUME 135, NUMBER 11

12 September 2025

Quantum Information, Science, and Technology

Information and Majorization Theory for Fermionic Phase-Space Distributions	110201
Nicolas J. Cerf and Tobias Haas	
Experimental Observation of Genuine Triplewise Monogamy of Contextuality Correlations	110202
Xiang Zhan, Bingzi Huo, Dengke Qu, and Peng Xue	
Prethermal Time-Crystalline Corner Modes	110401
Si Jiang, Dong Yuan, Wenjie Jiang, Dong-Ling Deng, and Francisco Machado	
Quantum Thermodynamic Advantage in Work Extraction from Steerable Quantum Correlations	110402
Tanmoy Biswas, Chandan Datta, and Luis Pedro García-Pintos	
Quantum Information Perspective on Many-Body Dispersive Forces	110403
Christopher Willby, Martin Kiffner, Joseph Tindall, Jason Crain, and Dieter Jaksch	
Quantum Dissipative Continuous Time Crystals	110404
Felix Russo and Thomas Pohl	
Strain-Enhanced Spin Readout Contrast in Silicon Carbide Membranes	110601
Haibo Hu, Guodong Bian, Ailun Yi, Chunhui Jiang, Junhua Tan, Qi Luo, Bo Liang, Zhengtong Liu, Xinfang Nie, Dawei Lu, Shumin Xiao, Xin Ou, Ádám Gali, Yu Zhou, and Qinghai Song	
Covariant Quantum Error-Correcting Codes with Metrological Entanglement Advantage	110801
Cheng-Ju Lin, Zi-Wen Liu, Victor V. Albert, and Alexey V. Gorshkov	
Entangling Two Rydberg Superatoms via Single-Photon Interference	110802
Chao-Wei Yang, Jun Li, Peng-Fei Sun, Zi-Ye An, Xiao-Hui Bao, and Jian-Wei Pan	
Topological Phase Transitions in a Constrained Two-Qubit Quantum Control Landscape	110803
Nicolò Beato, Pranay Patil, and Marin Bukov	
Approaching the Multiparameter Quantum Cramér-Rao Bound via Classical Correlation and Entangling Measurements	110804
Minghao Mi, Ben Wang, and Lijian Zhang	
Optimal Moment-Based Characterization of a Gaussian State	110805
Niels Tripier-Mondancin, Ilya Karuseichyk, Mattia Walschaers, Valentina Parigi, and Nicolas Treps	

Cosmology, Astrophysics, and Gravitation

Resonant Axion-Plasmon Conversion in Neutron Star Magnetospheres	111001
H. Terças, J. T. Mendonça, and R. Bingham	
Could We Observe an Exploding Black Hole in the Near Future?	111002
Michael J. Baker, Joaquim Iguaz Juan, Aidan Symons, and Andrea Thamm	
Systematic Analysis of Parity-Violating Modes	111003
Hong-Ming Zhu (朱弘明) and Ue-Li Pen (彭威禮)	
Two-Step Procedure to Detect Cosmological Gravitational Wave Backgrounds with Next-Generation Terrestrial Gravitational-Wave Detectors	111401
Haowen Zhong, Luca Reali, Bei Zhou, Emanuele Berti, and Vuk Mandic	

(Continued Inside)

This paper was highlighted in the APS publication *Physics* (physics.aps.org).

By suggesting a few manuscripts each week, we hope to promote reading across fields. Please see our Announcement Phys. Rev. Lett. 98, 010001 (2007).

Contents (Continued)

 Probing the Nature of Dark Matter Using Strongly Lensed Gravitational Waves from Binary Black Holes  Souvik Jana, Shasvath J. Kapadia, Tejaswi Venumadhav, Surhud More, and Parameswaran Ajith	111402
 GW250114: Testing Hawking's Area Law and the Kerr Nature of Black Holes  A. G. Abad <i>et al.</i> (LIGO Scientific, Virgo, and KAGRA Collaborations)	111403
Particles and Fields	
 Superradiant Neutrino Lasers from Radioactive Condensates  B. J. P. Jones and J. A. Formaggio	111801
 Evidence for Longitudinally Polarized W Bosons in the Electroweak Production of Same-Sign W Boson Pairs in Association with Two Jets in $p p$ Collisions at $\sqrt{s} = 13$ TeV with the ATLAS Detector  G. Aad <i>et al.</i> (ATLAS Collaboration)	111802
 Precise Measurement of the Form Factors in $D^0 \rightarrow K^*(892)^-\mu^+\nu_\mu$, and Test of Lepton Universality with $D^0 \rightarrow K^*(892)^-\ell^+\nu_\ell$ Decays  M. Ablikim <i>et al.</i> (BESIII Collaboration)	111803
 Nucleon Decays into Light New Particles in Neutrino Detectors  Julian Heeck and Ian M. Shoemaker	111804
 Measurement of Two-Point Energy Correlators within Jets in $p + p$ Collisions at $\sqrt{s} = 200$ GeV  B. E. Aboona <i>et al.</i> (STAR Collaboration)	111901
 Bayesian Inferring Nucleon Gravitational Form Factors via Near-Threshold J/ψ Photoproduction  Yuxun Guo, Feng Yuan, and Wenbin Zhao	111902
Nuclear Physics	
 Probing Gluon Fluctuations in Nuclei with the First Energy-Dependent Measurement of Incoherent J/ψ Photoproduction in Ultraperipheral PbPb Collisions  V. Chekhovsky <i>et al.</i> (CMS Collaboration)	112301
 Modification of the Jet Energy-Energy Correlator in Cold Nuclear Matter  Yu Fu, Berndt Müller, and Chathuranga Sirimanna	112302
 Evidence of Oscillating Neutron-Capture Cross Sections  P. E. Koehler and A. Stamatopoulos	112501
 Contribution of Subthreshold States to the Residual Energy Distribution of ^{159}Dy  Tadafumi Kishimoto and Toru Sato	112502
Atomic, Molecular, and Optical Physics	
 Testing Strong-Field QED to Second Order in the Highly Correlated Atomic System Berylliumlike Pb^{78+} by Electron-Ion Collision Spectroscopy  S. Schippers, C. Brandau, S. Fuchs, M. Lestinsky, S. X. Wang, C. Y. Zhang, N. R. Badnell, A. Borovik, M. Fogle, V. Hannen, Z. Harman, P.-M. Hillenbrand, E. B. Menz, Y. Zhang, Z. Andelkovic, F. Herfurth, R. Heß, A. Kalinin, C. Kozhuharov, C. Krantz, S. Litvinov, B. Lorentz, U. Spillmann, M. Steck, G. Vorobyev, D. Banaś, S. Fritzsch, E. Lindroth, X. Ma, A. Müller, R. Schuch, A. Surzhykov, M. Trassinelli, K. Ueberholz, C. Weinheimer, and Th. Stöhlker	113001
 Selective Bond Breaking in CO_2^{2+} Induced by Photoelectron Recoil  J. Weiherer, N. Melzer, M. Kircher, A. Pier, L. Kaiser, J. Kruse, N. Anders, J. Stindl, L. Sommerlad, O. D. McGinnis, M. Schmidt, J. Drnec, F. Trinter, M. S. Schöffler, L. Ph. H. Schmidt, N. Sisourat, S. Eckart, T. Jahnke, and R. Dörner	113002
 Molecular Wave Plate for the Control of Ultrashort Pulses Carrying Orbital Angular Momentum  Chengqing Xu, Lixin He, Wanchen Tao, Xiaosong Zhu, Feng Wang, Long Xu, Lu Xu, Pengfei Lan, Ilya Averbukh, Yehiam Prior, and Peixiang Lu	113201
 Nonlinear Stage of Modulational Instability in Repulsive Two-Component Bose-Einstein Condensates  S. Mossman, S. I. Mistakidis, G. C. Katsimiga, A. Romero-Ros, G. Biondini, P. Schmelcher, P. Engels, and P. G. Kevrekidis	113401
 Medium-Enhanced Polaron Repulsion in a Dilute Bose Mixture  Jesper Levinsen, Olivier Bleu, and Meera M. Parish	113402

(Continued on Preceding Page)

 This paper was highlighted in the APS publication *Physics* (physics.aps.org).

 By suggesting a few manuscripts each week, we hope to promote reading across fields. Please see our Announcement Phys. Rev. Lett. 98, 010001 (2007)

Contents (Continued)

Selective Collective Emission from a Dense Atomic Ensemble Coupled to a Nanophotonic Resonator	113601
Xinchao Zhou, Deepak A. Suresh, F. Robicheaux, and Chen-Lung Hung	
Temporally Localized Quantum Operations on Continuous-Wave Thermal Light	113602
Yunkai Wang, Yujie Zhang, and Virginia O. Lorenz	
Floquet Engineering of Interactions and Entanglement in Periodically Driven Rydberg Chains	113603
Nazli Ugur Koyluoglu, Nishad Maskara, Johannes Feldmeier, and Mikhail D. Lukin	
Optimal Diffractive Focusing of Matter and Light Waves	113604
Maxim A. Efremov, Felix Hufnagel, Hugo Larocque, Wolfgang P. Schleich, and Ebrahim Karimi	
Ultraflat Soliton Microcombs in Driven Quadratic-Kerr Nonlinear Microresonators	113801
Gangzhou Wu, Yating Wei, Lingfang Li, Shihua Chen, Lili Bu, Fabio Baronio, Tong Lin, Min Zhu, Stefano Trillo, and Zhenhua Ni	
Theory and Experimental Observation of Scattering by a Space-Time Corner	113802
Luca Stefanini, Emanuele Galiffi, Shixiong Yin, Sahitya Singh, Diego M. Solís, Nader Engheta, Alessandro Toscano, Davide Ramaccia, Filiberto Bilotti, and Andrea Alù	
Condensed Matter and Materials	
Spontaneous Vortex-Antivortex Lattice and Majorana Fermions in Rhombohedral Graphene	116001
Filippo Gaggioli, Daniele Guerci, and Liang Fu	
Berezinskii-Kosterlitz-Thouless Renormalization Group Flow at a Quantum Phase Transition	116002
Matthias Thamm, Harini Radhakrishnan, Hatem Barghathi, C. M. Herdman, Arpan Biswas, Bernd Rosenow, and Adrian Del Maestro	
Fast Crystallization Driven by Quasiatomic Electrons at Ultralow Temperatures	116101
Long Zhao, Hongxiang Zong, Artem R. Oganov, Xiangdong Ding, Jun Sun, and Graeme J. Ackland	
Hydrophobic Versus Hydrophilic Nature of the Gold-Water Interface Determined by Fluctuating Local Water Orientation	116201
Tadneem Tabassum, Banshi Das, Chanbum Park, Soumya Ghosh, Dennis Naujoks, Stefan M. Piontek, Alfred Ludwig, Dominik Marx, and Poul B. Petersen	
Design of Frictionless Interfaces for Moiré Layers	116202
Zichong Zhang and Shuze Zhu	
Electric Hall Effect and Quantum Electric Hall Effect	116301
Chaoxi Cui, Run-Wu Zhang, Yuhui Qiu, Yilin Han, Zhi-Ming Yu, and Yugui Yao	
Universal Transport at Lifshitz Metal-Insulator Transitions in Two Dimensions	116302
Harry Tomlins and Jan M. Tomczak	
Thermally Bianisotropic Metamaterials Induced by Spatial Asymmetry	116303
Gal Shmuel and John R. Willis	
✉ Exciton Photoemission from a Ground State of a Solid: $Ta_2Pd_3Te_5$	116401
Siwon Lee, Kyung-Hwan Jin, SeongJin Kwon, Hyunjin Jung, Choongjae Won, Sang-Wook Cheong, Gil Young Cho, Jaeyoung Kim, and Han Woong Yeom	
Generalized Neumann's Principle as a Unified Framework for Fractional Quantum and Conventional Ferroelectricity	116402
Hongsheng Pang and Lixin He	
✉ Observation of Electridelike s States Coexisting with Correlated d Electrons in $NdNiO_2$	116501
Chihao Li, Yutong Chen, Xiang Ding, Yezhao Zhuang, Nan Guo, Zhihui Chen, Yu Fan, Jiahao Ye, Zhitong An, Suppanut Sangphet, Shenglin Tang, Xiaoxiao Wang, Hai Huang, Haichao Xu, Donglai Feng, and Rui Peng	
Generalized Peierls Substitution for Wannier Obstructions: Response to Disorder and Interactions	116502
Shuai A. Chen, Roderich Moessner, and Tai Kai Ng	
✉ Interlayer Charge Transfer Induced by Electronic Instabilities in the Natural van der Waals Heterostructure $4H_b$ -TaS ₂	116503
R. Mathew Roy, X. Feng, M. Wenzel, V. Hasse, C. Shekhar, M. G. Vergniory, C. Felser, A. V. Pronin, and M. Dressel	
Unveiling Stripe-Shaped Charge Density Modulations in Doped Mott Insulators	116504
Ning Xia, Yuchen Guo, and Shuo Yang	
Observation of Hybrid Degenerate Point in Projected Non-Hermitian Metasurfaces	116601
Jingyi Chen, Zhiling Zhou, Yu Xiao, Nengyin Wang, Xu Wang, and Yong Li	

(Continued on Preceding Page)



This paper was highlighted in the APS publication *Physics* (physics.aps.org).

By suggesting a few manuscripts each week, we hope to promote reading across fields. Please see our Announcement Phys. Rev. Lett. 98, 010001 (2007)

Contents (Continued)

Inversion-Asymmetric Itinerant Antiferromagnets by the Space Group Symmetry	116701
Changhee Lee and P. M. R. Brydon	
Single-Shot Magnetization Reversal in Ferromagnetic Spin Valves via Heat Control	116702
Kazuaki Ishibashi, Junta Igarashi, Alberto Anadón, Michel Hehn, Yann Le Guen, Satoshi Iihama, Julius Hohlfeld, Jon Gorchon, Stéphane Mangin, and Grégory Malinowski	
Stabilization and Observation of Large-Area Ferromagnetic Bimeron Lattice	116703
Miming Cai, Shangyuan Wang, Yuelin Zhang, Xiaoqing Bao, Dekun Shen, Jinghua Ren, Lei Qiu, Haiming Yu, Zhenlin Luo, Mathias Kläui, Shilei Zhang, Nicolas Jaouen, Gerrit van der Laan, Thorsten Hesjedal, Ka Shen, and Jinxing Zhang	
Near-Field Dynamical Casimir Effect	116901
Renwen Yu and Shanhui Fan	
Inverse Faraday Effect in Disordered Two-Dimensional Electronic Systems	116902
Maxim Dzero	
Extended XY Model for Spinor Polariton Simulators	116903
A. Kudlis, D. Novokreschenov, and I. A. Shelykh	
Photoinduced Dynamics and Momentum Distribution of Chiral Charge Density Waves in 1T-TiSe ₂	116904
Qingzheng Qiu, Sae Hwan Chun, Jaeku Park, Dogeun Jang, Li Yue, Yeongkwan Kim, Yeojin Ahn, Mingi Jho, Kimo Han, Xinyi Jiang, Qian Xiao, Tao Dong, Jia-Yi Ji, Nanlin Wang, Jeroen van den Brink, Jasper van Wezel, and Yingying Peng	
Microwave Negative Refractive Index Enabled by Anti-Parity-Time Symmetry in a Coupled Photon-Magnon Hybrid System	116905
Junyoung Kim, Bojung Kim, and Sang-Koog Kim	
Picosecond Expansion in LaAlO ₃ Resonantly Driven by Infrared-Active Phonons	116906
Jakob Gollwitzer, Jeffrey Z. Kaaret, Y. Eren Suyolcu, Guru Khalsa, Rylan C. Fernandes, Oleg Gorobtsov, Sören Buchenau, ChanJu You, Jayanti Higgins, Ryan S. Russell, Ziming Shao, Yorick A. Birkhölzer, Takahiro Sato, Matthieu Chollet, Giacomo Coslovich, Mario Brützam, Christo Guguschev, John W. Harter, Ankit S. Disa, Darrell G. Schlom, Nicole A. Benedek, and Andrej Singer	
Polymers, Chemical Physics, Soft Matter, and Biological Physics	
Single-Chain Nanoparticles Break the Strength-Toughness-Processability Trilemma in Polymer Glasses	118101
Lei Zhang, Xu-Ze Zhang, Rui Shi, Shi-Long Wu, Chao-Hao Xu, Ji-Chun You, Yu Zhang, Ming-Yang Li, Wen-Yu Xu, Qing-Lin Li, Zhen-Zhong Yang, Zhong-Yuan Lu, and Hu-Jun Qian	
Power Spectra of Velocity Fluctuations in Granular Heap Flow	118201
Shuchang Yu, Jin Shang, Yangrui Chen, Ran Li, Quan Chen, Hui Yang, Hu Zheng, and Jie Zhang	
Channel Flows of Deformable Nematics	118202
Ioannis Hadjifrangiskou, Sumesh P. Thampi, and Julia M. Yeomans	
Magic Sizes Enable Minimal-Complexity High-Fidelity Assembly of Programmable Shells	118203
Botond Tyukodi, Fernando Caballero, Daichi Hayakawa, Douglas M. Hall, W. Benjamin Rogers, Gregory M. Grason, and Michael F. Hagan	
Negative Drag Force on Beating Flagellar-Shaped Bodies in Active Fluids	118301
Timo Knippenberg, Robin Bebon, Thomas Speck, and Clemens Bechinger	



This paper was highlighted in the APS publication *Physics* (physics.aps.org).

By suggesting a few manuscripts each week, we hope to promote reading across fields. Please see our Announcement Phys. Rev. Lett. 98, 010001 (2007).



The American Physical Society's free online publication, *Physics* (physics.aps.org), provides thought-provoking analysis and spotlights exceptional research.