Volume 112, Issue 3 (partial)
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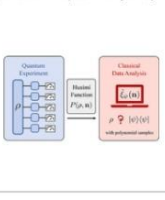
HIGHLIGHTED ARTICLES

EDITORS' SUGGESTION

Bounding the sample fluctuation for pure-state certification with local random measurement

Langxuan Chen and Pengfei Zhang

Phys. Rev. A **112**, 032217 (2025) - Published 18 September, 2025



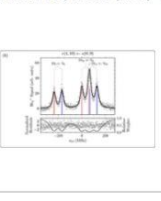
The authors derive lower bounds on sample complexity for quantum state certification, related to the size of measurement operators. These bounds assess protocol efficiency and show that local Haar measurement protocols cannot be efficient for all states.

EDITORS' SUGGESTION

Precision spectroscopy of the fine structure in the $a\,^3\Sigma_u^+\,(\nu = 0)$ and $c\,^3\Sigma_g^+\,(\nu = 4)$ states of the helium dimer

V. Wirth, M. Holdener, and F. Merkt

Phys. Rev. A **112**, 032807 (2025) - Published 15 September, 2025



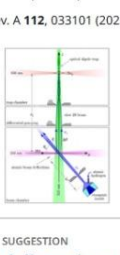
The authors present frequency-comb-referenced spectra of the c-a system in He_2 with full resolution of the rotational, spin-spin, and spin-rotational fine structure. Combining the new data with earlier measurements, they determine transition frequencies, term values, and spectroscopic constants of the constituent states with greatly improved precision, providing benchmark data for comparisons with high-level ab initio theory.

EDITORS' SUGGESTION

Towards trapping of hydrogen atoms for computable optical clock applications

O. Amit, D. Taray, V. Wirthl, V. Weis, M. W. Syed, A. Ozawa, J. Weitenberg, S. G. Karshenboim, J. T. M. Walraven, L. Maisenbacher, R. Pohl, Z. Burkley, F. Schmid, T. W. Hänsch, D. C. Yost, and Th. Udem

Phys. Rev. A **112**, 033101 (2025) - Published 2 September, 2025



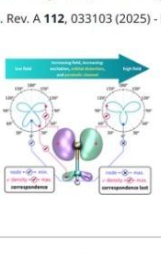
The authors propose a method for trapping atomic hydrogen in a magic-wavelength dipole trap using a combination of magnetic deceleration, velocity-selective deflection, and photon-recoil-assisted loading. The proposal could potentially lead to the development of a hydrogen optical atomic clock, the transition frequency of which can be linked to fundamental constants.

EDITORS' SUGGESTION

Orbital distortion and parabolic channel effects transforming minima in molecular ionization probabilities into maxima

Imam S. Wahyutama, Denawakage D. Jayasinghe, François Mauger, Kenneth Lopata, and Kenneth J. Schafer

Phys. Rev. A **112**, 033103 (2025) - Published 10 September, 2025



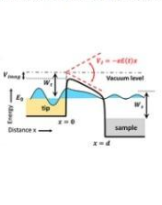
The fact that the shape of orientation-dependent molecular ionization rate curves can deviate from the shape of the ionized orbital at higher field strengths is often attributed to the increasing contribution of excited states in the process. In this work, the authors uncover a different mechanism, and show that orbital distortion and parabolic channel effects, which are independent of excited-state effects, can significantly modify the angular dependence of ionization yields as well.

EDITORS' SUGGESTION

Robust strong-field theory model for ultrafast electron transport through metal-insulator-metal tunneling nanojunctions

Boyang Ma and Michael Krüger

Phys. Rev. A **112**, 033104 (2025) - Published 11 September, 2025



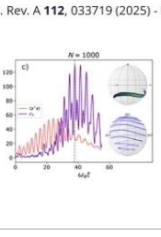
The authors establish a strong-field theory for ultrafast electron transport in ultrathin metal-insulator-metal nanojunctions, accounting for the image potential inside the gap and boundary effects. They find that the Keldysh parameter alone is insufficient for describing the physics in these systems, introduce an additional parameter that accounts for the effects of the limited size of the junction, and provide several interpretations of the parameter that shed new light on the complex physics in the light-driven junction.

EDITORS' SUGGESTION

Quantum trajectory method for highly excited environments in non-Markovian open quantum dynamics

Kai Müller and Walter T. Strunz

Phys. Rev. A **112**, 033719 (2025) - Published 19 September, 2025



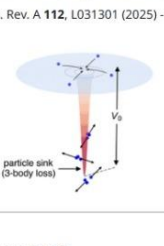
In this manuscript, along with its PRL counterpart, the authors describe a method for quantum trajectory simulations of non-Markovian open quantum systems. They show how the efficiency can be increased with a simple transformation that renders the evolution near unitary. They demonstrate the method using an example problem, the decay of emitters in a cavity, and show that they can achieve exact numerical solutions for system sizes an order of magnitude larger than what was previously possible.

EDITORS' SUGGESTION LETTER

Observation of self-oscillating supersonic flow across an acoustic horizon in two dimensions

Hikaru Tamura, Sergei Khlebnikov, Cheng-An Chen, and Chen-Lung Hung

Phys. Rev. A **112**, L031301 (2025) - Published 2 September, 2025



The authors create a spatially bounded supersonic region in a two-dimensional atomic superfluid, forming an acoustic analogue of a black-hole horizon. The observed superflow appears to be modulated by quasi-periodic bursts of superluminal signals. By measuring their frequencies, the authors find agreement with numerical simulations of soliton oscillation frequencies within the black-hole horizon, where solitons are emitted due to the Landau instability.

LETTERS

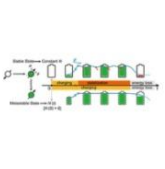
Fundamental concepts

LETTER

Metastability-induced solid-state quantum batteries for powering microwave quantum electronics

Yuanjin Wang, Hao Wu, and Qing Zhao

Phys. Rev. A **112**, L030201 (2025) - Published 15 September, 2025



This study demonstrates a solid-state quantum battery in which metastable states enable stable and long-lived energy storage. The authors further show that the stored energy can be controllably extracted for coherent microwave emission at room temperature.

LETTER

Symmetry-induced failures of tomographic locality: Constructing foil theories by twirling

Daniel Centeno, Marco Erba, Thomas D. Galley, David Schmid, John H. Selby, Robert W. Spekkens, Sina Soltani, Jacopo Surace, Alex Wilce, and Yìlè Yīng

Phys. Rev. A **112**, L030202 (2025) - Published 22 September, 2025

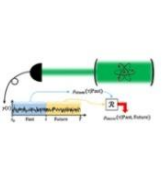
The paper constructs a class of theories by starting from some operational theory (classical, quantum, or post-quantum) and imposing a symmetry. This yields many examples of theories that violate a principle known as tomographic locality, and in turn sheds light on the meaning of this principle.

LETTER

Retrodictive approach to quantum state smoothing

Mingxuan Liu, Valerio Scarani, Alexia Auffèves, and Kiarn T. Laverick

Phys. Rev. A **112**, L030203 (2025) - Published 25 September, 2025



This paper provides a solution based on quantum retrodiction to the quantum state smoothing problem – conditioning the quantum state of an open system on measurement information obtained both prior and posterior – that always provides a physical quantum state and does not depend on how a secondary (perhaps hypothetical) observer measured the remaining information in the system.

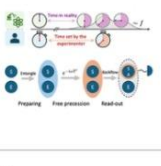
Quantum information science

LETTER

Recovering optimal precision in quantum sensing with time domain imperfections

Zi-Shen Li, Xinyue Long, Xiaodong Yang, Dawei Lu, and Yuxiang Yang

Phys. Rev. A **112**, L030401 (2025) - Published 5 September, 2025



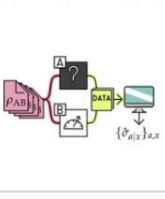
Device imperfections can significantly hinder the application of quantum metrology, inevitably introducing bias in estimation. This work demonstrates, both theoretically and experimentally, that properly engineered quantum control, albeit imperfect, can unlock the ultimate precision of practical quantum metrology.

LETTER

Quantum assemblage tomography

Luis Villegas-Aguilar, Yuanlong Wang, Alex Pepper, Travis J. Baker, Dominick J. Joch, Sven Rogge, Geoff J. Pryde, Sergei Slussarenko, Nora Tischler, and Howard M. Wiseman

Phys. Rev. A **112**, L030402 (2025) - Published 15 September, 2025



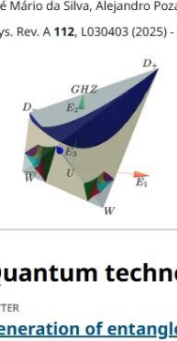
The authors investigate tools for accurately reconstructing quantum state assemblages in the Einstein-Podolsky-Rosen steering scenario. They introduce a robust methodology focused on accounting for typical, yet commonly overlooked, experimental conditions, including provisions for lossy measurements and detection bias.

LETTER

Local models and Bell inequalities for the minimal triangle network

José Mário da Silva, Alejandro Pozas-Kerstjens, and Fernando Parisio

Phys. Rev. A **112**, L030403 (2025) - Published 24 September, 2025



By combining extensive numerical searches with analytical calculations, the authors derive local models for symmetric distributions in the triangle network with two outcomes and no inputs, and put forward conjectures for the associated Bell inequalities. The analysis further narrows the regions where quantum nonlocality in this scenario may arise.

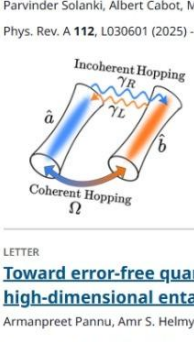
Quantum technologies

LETTER

Generation of entanglement and nonstationary states via competing coherent and incoherent bosonic hopping

Parvinder Solanki, Albert Cabot, Matteo Brunelli, Federico Carollo, Christoph Bruder, and Igor Lesanovsky

Phys. Rev. A **112**, L030601 (2025) - Published 11 September, 2025



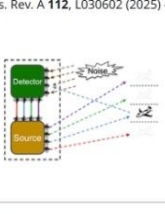
This study shows how incoherent hopping in a Bose–Hubbarddimer enables control of quantum correlations and gives rise tostationary and multiple time-crystal phases. Driven by parity–timesymmetry, the model exhibits both first- and second-order phasetransitions, unveiling a rich landscape of quantum many-body dynamics.

LETTER

Toward error-free quantum target finding: When sequential detection meets high-dimensional entanglement

Armanpreet Pannu, Amr S. Helmy, and Hesham El Gamal

Phys. Rev. A **112**, L030602 (2025) - Published 23 September, 2025



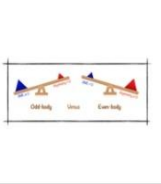
This work shows that in the target-finding problem, where the task is to identify the location of a known target, combining high-dimensional entanglement with a sequential detection strategy can asymptotically drive the error to zero with only finite energy expenditure. This analysis motivates further exploration of quantum sensing protocols that may significantly outperform classical methods in noisy environments.

LETTER

Quantum sensing of even- versus odd-body interactions

Aparajita Bhattacharyya, Debarupa Saha, and Ujjwal Sen

Phys. Rev. A **112**, L030603 (2025) - Published 29 September, 2025



Quantum sensing with nonlocal Hamiltonians exhibits a striking dichotomy: genuine multipartite entanglement is essential for odd-body interactions but dispensable for even-body ones. Yet, this distinction vanishes at the level of precision scaling, where both odd- and even-body interactions enable error bounds that surpass the Heisenberg limit.

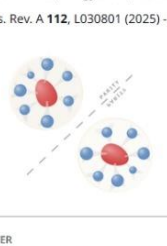
Atomic and molecular structure and dynamics; high-precision experiments

LETTER

Precision comagnetometry for -violation searches in crystals

Bassam Nima, Mingyu Fan, Aleksandar Radak, Andrew M. Jayich, and Amar Vutha

Phys. Rev. A **112**, L030801 (2025) - Published 11 September, 2025



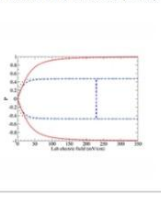
The authors perform precision spectroscopy in a solid-state comagnetometer. They use crystal symmetries to reject undesirable magnetic field noise, to improve searches for physics beyond the standard model.

LETTER

Hyperfine structure and doubling in the molecule

Alexander Petrov

Phys. Rev. A **112**, L030802 (2025) - Published 24 September, 2025



The author shows that the doubling effect in RaOCH symmetric top molecule is only a few kHz, which makes it extremely sensitive to physics beyond the standard model. The parity non-conserving polarizations, , for components of doublets have opposite signs with almost the same absolute values and are saturated at an electric field smaller than V/cm, which makes RaOCH also very sensitive to systematic effects in experiments.

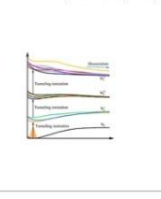
Light-induced processes in atomic-scale systems

LETTER

Modeling the dissociative sequential triple ionization of nitrogen molecules by ultrashort intense infrared laser pulses

Yan-Wen Jia, Hui-Hui Wang, C. H. Yuen, C. D. Lin, and Song-Feng Zhao

Phys. Rev. A **112**, L031101 (2025) - Published 4 September, 2025



The authors developed a density-matrix approach to study the dissociative sequential triple ionization of nitrogen molecules by short, intense infrared laser pulses. Their theory fully incorporates the experimental conditions and successfully reproduces the observed kinetic-energy-release spectrum of the dissociated ions.

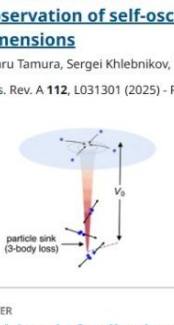
Ultracold systems and matter waves

EDITORS' SUGGESTION LETTER

Observation of self-oscillating supersonic flow across an acoustic horizon in two dimensions

Hikaru Tamura, Sergei Khlebnikov, Cheng-An Chen, and Chen-Lung Hung

Phys. Rev. A **112**, L031301 (2025) - Published 2 September, 2025



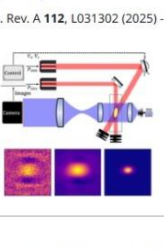
The authors create a spatially bounded supersonic region in a two-dimensional atomic superfluid, forming an acoustic analogue of a black-hole horizon. The observed superflow appears to be modulated by quasi-periodic bursts of superluminal signals. By measuring their frequencies, the authors find agreement with numerical simulations of soliton oscillation frequencies within the black-hole horizon, where solitons are emitted due to the Landau instability.

LETTER

Multimode feedback cooling of the collective modes of a Bose-Einstein condensate

Ryan J. Thomas, Jordan A. McMahon, Zain Mehdi, Stuart S. Szigeti, Simon A. Haine, Samuel Legge, John D. Close, and Joseph J. Hope

Phys. Rev. A **112**, L031302 (2025) - Published 5 September, 2025



The authors experimentally demonstrate simultaneous feedback control and cooling of multiple low-lying collective modes in a Bose-Einstein condensate. The results demonstrate that ground-state cooling of the center-of-mass modes can be achieved even without a cavity to enhance the signal-to-noise.

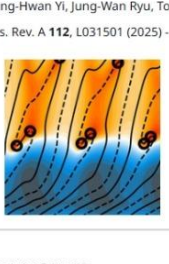
Photonics, nonlinear optics, and optomechanics

LETTER

Robust exceptional point chains and chirality switch in a vast optical parameter space

Chang-Hwan Yi, Jung-Wan Ryu, Tom Simon Rodemund, and Martina Hentschel

Phys. Rev. A **112**, L031501 (2025) - Published 22 September, 2025



The authors show the emergence of exceptional-point chains in coupled, deformed microcavity systems that extend to intercavity distances of several wavelengths relevant for applications. In addition, the mode chirality switches abruptly at a specific refractive index determined by the properties of the single cavity.

ARTICLES

Fundamental concepts

Quantum information engines: Bounds on performance metrics by measurement time

Henning Kirchberg and Abraham Nitzan

Phys. Rev. A **112**, 032201 (2025) - Published 2 September, 2025

Robust quantification of spectral transitions in perturbed quantum systems

Zsolt Szabó, Stefan Gehr, Paolo Facchi, Kazuya Yuasa, Daniel Burgarth, and Davide Lonigro

Phys. Rev. A **112**, 032202 (2025) - Published 2 September, 2025

Proposal for implementing quantum walks on multidimensional networks

Qi-Ping Su, Rui-Qi Shen, Li Yu, Yu Wang, Yi-Hao Kang, Lijiong Shen, Wei Feng, Guo-Qiang Zhang, and Chui-Ping Yang

Phys. Rev. A **112**, 032203 (2025) - Published 2 September, 2025

Coarse-grained dynamics in quantum many-body systems using the maximum entropy principle

Adán Castillo, Carlos Pineda, Erick Sebastián Navarrete, and David Davalos

Phys. Rev. A **112**, 032204 (2025) - Published 2 September, 2025

Strongest quantum nonlocality in -partite systems

Mengying Hu, Ting Gao, and Fengli Yan

Phys. Rev. A **112**, 032205 (2025) - Published 3 September, 2025

Dissipative qutrit-mediated stable charging

Chen-yi Zhang and Jun Jing

Phys. Rev. A **112**, 032206 (2025) - Published 4 September, 2025

Vector space constructions of Kochen-Specker sets using Hadamard matrices

Petr Lisoněk and Liam Salt

Phys. Rev. A **112**, 032207 (2025) - Published 5 September, 2025

Retrodiction of measurement outcomes on a single quantum system revealing entanglement with its environment

Julien Pinske and Klaus Mølmer

Phys. Rev. A **112**, 032208 (2025) - Published 5 September, 2025

Ergotropic Mpemba effect in non-Markovian quantum systems

Yan Li, Wenlin Li, and Xingli Li

Phys. Rev. A **112**, 032209 (2025) - Published 9 September, 2025

Characterizing quantum measurement through environmental stochastic entropy production in a two-spin-1/2 system

Sophia M. Walls, Adam Bloss, and Ian J. Ford

Phys. Rev. A **112**, 032210 (2025) - Published 9 September, 2025

Symplectic structures in quantum entanglement

Piotr Dulian and Adam Sawicki

Phys. Rev. A **112**, 032211 (2025) - Published 10 September, 2025

Unpolarized prethermal discrete time crystal

Takeru Yokota and Tatsuhiko N. Ikeda

Phys. Rev. A **112**, 032212 (2025) - Published 10 September, 2025

Reviving coherence and time crystals with nonreciprocal coupling

K. Karthiga, D. V. Senthilkumar, and V. K. Chandrasekar

Phys. Rev. A **112**, 032213 (2025) - Published 15 September, 2025

Conserved operators and exact conditions for pair condensation

Federico Petrovich and R. Rossignoli

Phys. Rev. A **112**, 032214 (2025) - Published 15 September, 2025

Optimizing the incident electron momentum for resonant few-photon Kapitza-Dirac scattering in bichromatic laser fields

Ingo Elsner and Carsten Müller

Phys. Rev. A **112**, 032215 (2025) - Published 15 September, 2025

Spin textures in curved paths on a curved surface

Guo-Hua Liang, Ai-Guo Mei, Zhi-Hui Yang, and Ze-Lin Wei

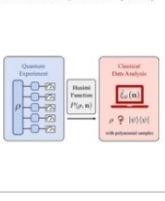
Phys. Rev. A **112**, 032216 (2025) - Published 15 September, 2025

EDITORS' SUGGESTION

Bounding the sample fluctuation for pure-state certification with local random measurement

Langxuan Chen and Pengfei Zhang

Phys. Rev. A **112**, 032217 (2025) - Published 18 September, 2025



The authors derive lower bounds on sample complexity for quantum state certification, related to the size of measurement operators. These bounds assess protocol efficiency and show that local Haar measurement protocols cannot be efficient for all states.

Space-time-symmetric nonrelativistic quantum mechanics in dimensions: Time and position of arrival from complementary wave functions

Eduardo O. Dias

Phys. Rev. A **112**, 032218 (2025) - Published 22 September, 2025

Interplay between defects and the non-Hermitian skin effect

Yin Huang, Wenna Zhang, Yu Zhou, Yuecheng Shen, Georgios Veronis, and Wenchen Luo

Phys. Rev. A **112**, 032219 (2025) - Published 24 September, 2025

Constructing the nonclassical lifetime distribution of two-level systems via quantum reliability

Yaotian Li, Y.-M. Du, Wenkai Ding, Zhaoyu Fei, Libin Fu, and Xiaoguang Wang

Phys. Rev. A **112**, 032220 (2025) - Published 25 September, 2025

Coherence-assisted entanglement activation during open evolution

Masaya Takahashi and Jarosław K. Korbicz

Phys. Rev. A **112**, 032222 (2025) - Published 25 September, 2025

Searching for Bloch wave packets with almost definite momentum direction

Arseni Goussev and Gregory V. Morozov

Phys. Rev. A **112**, 032223 (2025) - Published 26 September, 2025

Exact WKB analysis for dynamical and geometric exponents in generalized and nonlinear Landau-Zener transitions

Tomohiro Matsuda

Phys. Rev. A **112**, 032224 (2025) - Published 26 September, 2025

Theory of tunneling splitting in symmetric double well systems: Equivalence of the two-state approximation and the Herring formula

Eli Pollak and Michele Ceotto

Phys. Rev. A **112**, 032225 (2025) - Published 26 September, 2025

Quantum Stirling heat engine based on two-qubit quantum Rabi model with spin-spin coupling

Luxin Xu, Chunfeng Wu, and Changliang Ren

Phys. Rev. A **112**, 032226 (2025) - Published 26 September, 2025

Quantum information science

Network nonlocality without entanglement of all sources

Kaushiki Mukherjee and Biswajit Paul

Phys. Rev. A **112**, 032401 (2025) - Published 2 September, 2025

Multipartite continuous-variable quantum nondemolition interaction and entanglement certification and monitoring

Vinícius V. Seco and Alencar J. de Faria

Phys. Rev. A **112**, 032402 (2025) - Published 2 September, 2025

Decoherence mitigation for geometric quantum computation

X. Y. Sun and P. Z. Zhao

Phys. Rev. A **112**, 032403 (2025) - Published 2 September, 2025

Self-testing of the -partite Greenberger-Horne-Zeilinger state and observables using the Svetlichny inequality

Ritesh K. Singh, Souradeep Sasmal, and A. K. Pan

Phys. Rev. A **112**, 032404 (2025) - Published 2 September, 2025

Continuous majorization in quantum phase space for Wigner-positive states and proposals for Wigner-negative states

Jan de Boer, Giuseppe Di Giulio, Esko Keski-Vakkuri, and Erik Tonni

Phys. Rev. A **112**, 032405 (2025) - Published 2 September, 2025

Characterizing Gaussian quantum processes with Gaussian resources

Logan W. Grove, Pratik J. Barge, and Kevin Valson Jacob

Phys. Rev. A **112**, 032406 (2025) - Published 2 September, 2025

Scalability challenges in variational quantum optimization under stochastic noise

Adelina Bärligea, Benedikt Poggel, and Jeanette Miriam Lorenz

Phys. Rev. A **112**, 032407 (2025) - Published 3 September, 2025

Passive leakage removal unit based on a disordered transmon array

Gonzalo Martín-Vázquez, Taneli Tolppanen, and Matti Silveri

Phys. Rev. A **112**, 032408 (2025) - Published 3 September, 2025

Bogoliubov-Born-Green-Kirkwood-Yvon hierarchy for quantum error mitigation

Theo Saporiti, Oleg Kaikov, Vasily Sazonov, and Mohamed Tamaazousti

Phys. Rev. A **112**, 032409 (2025) - Published 3 September, 2025

Quantum algorithm for vector set orthogonal normalization and matrix QR decomposition with polynomial speedup

Zi-Ming Li and Yu-xi Liu

Phys. Rev. A **112**, 032410 (2025) - Published 3 September, 2025

Quantum noise spectroscopy by qudit spectators

Clara Javaherian and Chris Ferrie

Phys. Rev. A **112**, 032411 (2025) - Published 4 September, 2025

Recycling reflections for perfect photon capture

Yat Wong and Liang Jiang

Phys. Rev. A **112**, 032412 (2025) - Published 5 September, 2025

Entanglement, steering, and separability in Compton-scattered annihilation photons

Peter Caradonna and Kenji Shimazoe

Phys. Rev. A **112**, 032413 (2025) - Published 5 September, 2025

Improving quantum channel discrimination with resourceful states

Kenji Nakahira

Phys. Rev. A **112**, 032414 (2025) - Published 8 September, 2025

Phase transitions, symmetries, and tunneling in Kerr parametric oscillators

Miguel A. Prado Reynoso, Edson M. Signor, Jamil Khalouf-Rivera, Alexandre D. Ribeiro, Francisco Pérez-Bernal, and Lea F. Santos

Phys. Rev. A **112**, 032415 (2025) - Published 9 September, 2025

Achieving the Heisenberg limit of metrology via measurement on an ancillary qubit

Peng Chen and Jun Jing

Phys. Rev. A **112**, 032416 (2025) - Published 9 September, 2025

Regularizing quantum loss landscapes by noise injection

Daniil S. Bagaev, Maxim A. Gavreev, Alena S. Mastiukova, Aleksey K. Fedorov, and Nikita A. Nemkov

Phys. Rev. A **112**, 032417 (2025) - Published 9 September, 2025

Subuniversal variational circuits for combinatorial optimization problems

Gal Weitz, Lirandë Pira, Chris Ferrie, and Joshua Combes

Phys. Rev. A **112**, 032418 (2025) - Published 9 September, 2025

High-rate extended binomial codes for multiqubit encoding

En-Jui Chang

Phys. Rev. A **112**, 032419 (2025) - Published 9 September, 2025

Extremality of stabilizer states

Kaifeng Bu

Phys. Rev. A **112**, 032420 (2025) - Published 10 September, 2025

Stabilizer configuration interaction: Finding molecular subspaces with error detection properties

Abhinav Anand and Kenneth R. Brown

Phys. Rev. A **112**, 032421 (2025) - Published 10 September, 2025

Time-optimal control based on path distance

Lin-Feng Du, Li-Guo Qin, Qin Guo, Xue-Xiang Xu, and Jie-Hui Huang

Phys. Rev. A **112**, 032422 (2025) - Published 11 September, 2025

Encoding quantumlike information in classical synchronizing dynamics

Graziano Amati and Gregory D. Scholes

Phys. Rev. A **112**, 032423 (2025) - Published 12 September, 2025

Multipartite entanglement measures based on the thermodynamic framework

Chen-Ming Bai and Yu Luo

Phys. Rev. A **112**, 032424 (2025) - Published 12 September, 2025

Exploring nonmultiplicativity in the geometric measure of entanglement

Daniel Dilley, Jerry Chang, Jeffrey Larson, and Eric Chitambar

Phys. Rev. A **112**, 032425 (2025) - Published 15 September, 2025

Global locations of Schmidt-number witnesses

Kyung Hoon Han and Seung-Hyeok Kye

Phys. Rev. A **112**, 032426 (2025) - Published 15 September, 2025

Efficient sampling for Pauli-measurement-based shadow tomography in direct fidelity estimation

Hyunho Cha and Jungwoo Lee

Phys. Rev. A **112**, 032427 (2025) - Published 15 September, 2025

Dynamical decoupling protection for three-level systems

P. Z. Zhao and Lei Qiao

Phys. Rev. A **112**, 032428 (2025) - Published 18 September, 2025

Long-distance device-independent conference key agreement

Makoto Ishihara, Anders J. E. Bjerrum, Wojciech Roga, Jonatan B. Brask, Ulrik L. Andersen, and Masahiro Takeoka

Phys. Rev. A **112**, 032429 (2025) - Published 19 September, 2025

Improved entanglement entropy estimates from filtered bitstring probabilities

Avi Kaufman, James Corona, Zane Ozzello, Blake Senseman, Muhammad Asaduzzaman, and Yannick Meurice

Phys. Rev. A **112**, 032430 (2025) - Published 19 September, 2025

Quantum curriculum learning

Quoc Hoan Tran, Yasuhiro Endo, and Hirotaka Oshima

Phys. Rev. A **112**, 032431 (2025) - Published 22 September, 2025

Witnessing the dynamics of entanglement and manipulating the sudden death of entanglement under the influence of a squeezed thermal reservoir

M. Hunza, Ming-Da Huang, Qi Qin, and T. Abbas

Phys. Rev. A **112**, 032432 (2025) - Published 23 September, 2025

All multipartite entanglements are quantum coherences in locally distinguishable bases

Ahana Ghoshal, Swati Choudhary, and Ujjwal Sen

Phys. Rev. A **112**, 032433 (2025) - Published 25 September, 2025

Bosonic quantum error correction using squeezed Fock states

E. N. Bashmakova, S. B. Korolev, and T. Yu. Golubeva

Phys. Rev. A **112**, 032434 (2025) - Published 25 September, 2025

Qudit vs. qubit: Simulated performance of error-correction codes in higher dimensions

James Keppens, Quinten Eggerickx, Vukan Levajac, George Simion, and Bart Sorée

Phys. Rev. A **112**, 032435 (2025) - Published 25 September, 2025

Distillation of multipartite entangled states for arbitrary subsets of parties in noisy quantum networks of increasing size

Aitor Balmaseda and Julio I. de Vicente

Phys. Rev. A **112**, 032436 (2025) - Published 26 September, 2025

Quantifying nonclassicality via metric-adjusted skew information

Liang Tang and Fan Wu

Phys. Rev. A **112**, 032437 (2025) - Published 26 September, 2025

Nonsymmetric Greenberger-Horne-Zeilinger states: Weighted hypergraph and controlled-unitary graph representations

Hrachya Zakaryan, Konstantinos-Rafail Revis, and Zahra Raissi

Phys. Rev. A **112**, 032438 (2025) - Published 29 September, 2025

Saturation of the quantum Cramér-Rao bound for distributed sensing via error sensitivity in SU(1,1)-SU() interferometry

Girish S. Agarwal

Phys. Rev. A **112**, 032439 (2025) - Published 29 September, 2025

Quantum-resource-theoretical analysis of the role of vibrational structure in photoisomerization

Siddharth Tiwary, Giovanni Spaventa, Susana F. Huelga, and Martin B. Plenio

Phys. Rev. A **112**, 032440 (2025) - Published 29 September, 2025

Quantum technologies

Statistical analysis of multipath entanglement purification in quantum networks

Rajni Bala, Md Sohel Mondal, and Siddhartha Santra

Phys. Rev. A **112**, 032601 (2025) - Published 2 September, 2025

Quantum detection of millimeter wave electric fields with driving surface-state electrons

Miao Zhang, Y. F. Wang, X. Y. Peng, X. N. Feng, S. R. He, Y. F. Li, and L. F. Wei

Phys. Rev. A **112**, 032602 (2025) - Published 2 September, 2025

Verifiable blind quantum computation for two types of clients via iterated gate teleportation

Yuxun Wang, Qunfeng Dai, and Qin Li

Phys. Rev. A **112**, 032603 (2025) - Published 2 September, 2025

Quantum-enhanced change detection and joint communication detection

Zihao Gong and Saikat Guha

Phys. Rev. A **112**, 032604 (2025) - Published 4 September, 2025

Universal quantum control by non-Hermitian Hamiltonian

Zhu-yao Jin and Jun Jing

Phys. Rev. A **112**, 032605 (2025) - Published 4 September, 2025

Minimally universal parity quantum computing

Isaac D. Smith, Berend Klaver, Hendrik Poulsen Nautrup, Wolfgang Lechner, and Hans J. Briegel

Phys. Rev. A **112**, 032606 (2025) - Published 8 September, 2025

Over-rotation coherent error induced by pseudotwirling of quantum gates

Tanmoy Pandit and Raam Uzdin

Phys. Rev. A **112**, 032607 (2025) - Published 10 September, 2025

Generation of counterpropagating photon pairs in periodically poled

Albert Peralta Amores, Andrius Zukauskas, Patrick Mutter, Fredrik Laurell, Valdas Pasiskevicius, and Marcin Swillo

Phys. Rev. A **112**, 032608 (2025) - Published 11 September, 2025

Superresolution of unequal-brightness thermal sources for stellar interferometry

Chenyu Hu, Ben Wang, Jiandong Zhang, Kunxu Wang, Huigen Liu, Jilin Zhou, and Lijian Zhang

Phys. Rev. A **112**, 032609 (2025) - Published 11 September, 2025

Quantum simulation of dynamical response functions of equilibrium states

Esther Cruz, Dominik S. Wild, Mari Carmen Bañuls, and J. Ignacio Cirac

Phys. Rev. A **112**, 032610 (2025) - Published 12 September, 2025

Scalable universal quantum gates between nitrogen-vacancy centers in levitated nanodiamond arrays

Guangyu Zhang, Huaijin Zhang, and Zhang-Qi Yin

Phys. Rev. A **112**, 032611 (2025) - Published 15 September, 2025

Quantum-enhanced sensing of bosonic modes with cat states

Xiao-Wei Zheng, Jun-Cong Zheng, Xue-Feng Pan, and Pengbo Li

Phys. Rev. A **112**, 032612 (2025) - Published 15 September, 2025

Optimization of two-qubit gates in tunable-coupler architectures using single-flux-quantum control

Boyan Torosov, Bohdan Kulchytskyy, Florian Hopfmueller, John Gunderson, Xiangzhou Kong, and Pooya Ronagh

Phys. Rev. A **112**, 032613 (2025) - Published 15 September, 2025

Speeding up dissipation-based quantum state engineering with Lyapunov control

Du Ran, Qin Xie, Bai-Yun Zhang, Zhuo-Qing Zhang, Shuai Liu, Ze-Long He, Ya-dong Li, and Sui-Hu Dang

Phys. Rev. A **112**, 032614 (2025) - Published 15 September, 2025

Superadditivity of quantum capacity in simple channels

Zhen Wu, Qi Zhao, and Zhihao Ma

Phys. Rev. A **112**, 032615 (2025) - Published 15 September, 2025

Understanding the physics of D-Wave annealers: From Schrödinger to Lindblad to Markovian dynamics

Vrinda Mehta, Hans De Raedt, Kristel Michielsen, and Fengping Jin

Phys. Rev. A **112**, 032616 (2025) - Published 16 September, 2025

Measurement-based simulation of geometric gates in topological qubits on noisy intermediate-scale quantum devices

Matthew Brooks, Foster Sabatino, Charles Tahan, and Silas Hoffman

Phys. Rev. A **112**, 032617 (2025) - Published 17 September, 2025

Teleportation fidelity of quantum repeater networks

Ganesh Mylavarapu, Subrata Ghosh, Chittaranjan Hens, Indranil Chakrabarty, and Subhadip Mitra

Phys. Rev. A **112**, 032618 (2025) - Published 17 September, 2025

Local fermion-to-qudit mappings: A practical recipe for four-level systems

Rodolfo Carobene, Andrea Giachero, Stefano Barison, and Jannes Nys

Phys. Rev. A **112**, 032619 (2025) - Published 19 September, 2025

Impact of polarization mode dispersion on entangled photon distribution

Vadim Rodimin, Konstantin Kravtsov, Rui Ming Chua, Gianluca De Santis, Aleksei Ponasenko, Yury Kurochkin, Alexander Ling, and James A. Grieve

Phys. Rev. A **112**, 032620 (2025) - Published 22 September, 2025

iSWAP gate with polar molecules: Robustness criteria for entangling operations

Matteo Bergonzoni, Sven Jandura, and Guido Pupillo

Phys. Rev. A **112**, 032621 (2025) - Published 22 September, 2025

Mitigating multiple frequency-dependent errors in superconducting quantum chips using message-passing neural networks

Hao Ai, Guo-Zheng Zhu, and Yu-xi Liu

Phys. Rev. A **112**, 032622 (2025) - Published 24 September, 2025

Variational quantum subspace construction via symmetry-preserving cost functions

Hamzat A. Akande, Alexandre Perrin, Bruno Senjean, and Matthieu Saubanère

Phys. Rev. A **112**, 032623 (2025) - Published 25 September, 2025

Probabilistic pulse-position modulation for classical communication on quantum channels

Farzad Kianvash and Matteo Rosati

Phys. Rev. A **112**, 032624 (2025) - Published 25 September, 2025

Experimental realization of remote two-qubit state preparation using single-particle operations

Ziyang Ou, Qiao Xu, and Xiaoqi Zhou

Phys. Rev. A **112**, 032625 (2025) - Published 25 September, 2025

Upgrading quantum metrology by combined sensitivity resources in mixed linear-nonlinear light-matter interactions with bias field

Zu-Jian Ying

Phys. Rev. A **112**, 032626 (2025) - Published 26 September, 2025

Dynamics and computation in linear open quantum walks

Pedro Linck Maciel and Nadja K. Bernardes

Phys. Rev. A **112**, 032627 (2025) - Published 26 September, 2025

Atomic and molecular structure and dynamics; high-precision experiments

Rovibrational spectroscopy of state-selected ions through spatially resolved fluorescence collection

Qian-Yu Zhang, Wen-Li Bai, Zhi-Yuan Ao, Wen-Cui Peng, Sheng-Guo He, and Xin Tong

Phys. Rev. A **112**, 032801 (2025) - Published 2 September, 2025

Three-body fragmentation dynamics of produced by 200-eV electron-impact triple ionization

Xintai Hao, Menhao Yang, Jiaqi Zhou, Xiaorui Xue, Qibo Ma, Lei Wang, Peng Li, and Xueguang Ren

Phys. Rev. A **112**, 032802 (2025) - Published 5 September, 2025

Multiply differential study of detachment with simultaneous target excitation in anion-atom collisions

M. Schulz, F. Herrmann, W. Zhang, D. V. Chicharro, A. Dorn, M. Grieser, F. Grussie, H. Kreckel, O. Novotny, F. Trost, A. Wolf, T. Pfeifer, C. D. Schröter, and R. Moshammer

Phys. Rev. A **112**, 032803 (2025) - Published 9 September, 2025

Velocity-map imaging and mechanisms of dissociative electron attachment to

Samrat Saha, Soumya Ghosh, Jaroslav Kočišek, Roman Čurík, Dhananjay Nandi, Juraj Fedor, and Pamir Nag

Phys. Rev. A **112**, 032804 (2025) - Published 10 September, 2025

Transcorrelated theory for transition-metal atoms

Kristoffer Simula, Maria-Andreea Filip, and Ali Alavi

Phys. Rev. A **112**, 032805 (2025) - Published 11 September, 2025

Coupled-channel calculations of fully differential cross sections for ionization in 75-keV collisions

K. H. Spicer, N. W. Antonio, M. S. Schöffler, M. Schulz, and A. S. Kadyrov

Phys. Rev. A **112**, 032806 (2025) - Published 12 September, 2025

EDITORS' SUGGESTION

Precision spectroscopy of the fine structure in the and states of the helium dimer

V. Wirth, M. Holdener, and F. Merkt

Phys. Rev. A **112**, 032807 (2025) - Published 15 September, 2025

The authors present frequency-comb-referenced spectra of the c-a system in He with full resolution of the rotational, spin-spin, and spin-rotational fine structure. Combining the new data with earlier measurements, they determine transition frequencies, term values, and spectroscopic constants of the constituent states with greatly improved precision, providing benchmark data for comparisons with high-level ab initio theory.

Landé -factor measurements for the hyperfine levels of

Qi Zhao, M. D. K. Lee, Qin Qichen, Zhao Zhang, N. Jayjong, K. J. Arnold, and M. D. Barrett

Phys. Rev. A **112**, 032808 (2025) - Published 18 September, 2025

Single-photon ionization of aligned diatomic molecules in near-circular laser fields with lower photon energy

Z. Y. Chen, S. Q. Shen, M. Q. Liu, J. Y. Che, and Y. J. Chen

Phys. Rev. A **112**, 032809 (2025) - Published 19 September, 2025

Hyperfine van der Waals repulsion between open-shell polar molecules

Etienne F. Walraven and Tijs Karman

Phys. Rev. A **112**, 032810 (2025) - Published 19 September, 2025

Fock-space perturbed relativistic coupled-cluster calculations of electric dipole polarizability and nuclear spin-dependent parity nonconservation in Cs

Suraj Pandey, Ravi Kumar, D. Angom, and B. K. Mani

Phys. Rev. A **112**, 032811 (2025) - Published 22 September, 2025

Hydrogen adsorption and scattering on graphene with electron dynamics: Effects of incident point and kinetic energy

Samuel S. Taylor, Nicholas Skoufis, Hongbo Du, Cody Covington, and Kálmán Varga

Phys. Rev. A **112**, 032812 (2025) - Published 22 September, 2025

Isotope shift for total electron binding energy of atoms

V. A. Dzuba and V. V. Flambaum

Phys. Rev. A **112**, 032813 (2025) - Published 24 September, 2025

Superkick effect in vortex scattering: Møller scattering

Shiyu Liu, Bei Liu, Igor P. Ivanov, and Liangliang Ji

Phys. Rev. A **112**, 032814 (2025) - Published 25 September, 2025

Constrained search in imaginary time

Markus Penz and Robert van Leeuwen

Phys. Rev. A **112**, 032815 (2025) - Published 26 September, 2025

Theoretical characterization of the barium II and radium II ions

Robin B. Cserveny and Benjamin M. Roberts

Phys. Rev. A **112**, 032816 (2025) - Published 26 September, 2025

Structure calculations for the low-charged ion clock

Hong-Yuan Zheng and Li-Yan Tang

Phys. Rev. A **112**, 032817 (2025) - Published 26 September, 2025

QED effects in quadratic Zeeman splitting in highly charged hydrogen-like ions

V. A. Agababaev, E. A. Prokhorchuk, D. A. Glazov, A. V. Malyshev, V. M. Shabaev, and A. V. Volotka

Phys. Rev. A **112**, 032818 (2025) - Published 29 September, 2025

Extended locally monochromatic approximations of strong-field QED processes

Nikita Larin and Daniel Seipt

Phys. Rev. A **112**, 032819 (2025) - Published 29 September, 2025

Light-induced processes in atomic-scale systems

EDITORS' SUGGESTION

Towards trapping of hydrogen atoms for computable optical clock applications

O. Amit, D. Taray, V. Wirthl, V. Weis, M. W. Syed, A. Ozawa, J. Weitenberg, S. G. Karshenboim, J. T. M. Walraven, L. Maisenbacher, R. Pohl, Z. Burkley, F. Schmid, T. W. Hänsch, D. C. Yost, and Th. Udem

Phys. Rev. A **112**, 033101 (2025) - Published 2 September, 2025

The authors propose a method for trapping atomic hydrogen in a magic-wavelength dipole trap using a combination of magnetic deceleration, velocity-selective deflection, and photon-recoil-assisted loading. The proposal could potentially lead to the development of a hydrogen optical atomic clock, the transition frequency of which can be linked to fundamental constants.

Continuous pump-probe experiment to observe Zeeman wave-packet dynamics

K. L. Romans, K. Foster, S. Majumdar, B. P. Acharya, O. Russ, A. H. N. C. De Silva, and D. Fischer

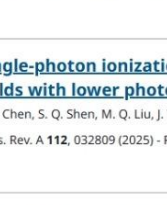
Phys. Rev. A **112**, 033102 (2025) - Published 5 September, 2025

EDITORS' SUGGESTION

Orbital distortion and parabolic channel effects transforming minima in molecular ionization probabilities into maxima

Imam S. Wahyutama, Denawakage D. Jayasinghe, François Mauger, Kenneth Lopata, and Kenneth J. Schafer

Phys. Rev. A **112**, 033103 (2025) - Published 10 September, 2025



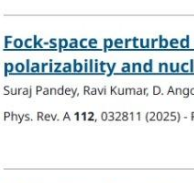
The fact that the shape of orientation-dependent molecular ionization rate curves can deviate from the shape of the ionized orbital at higher field strengths is often attributed to the increasing contribution of excited states in the process. In this work, the authors uncover a different mechanism, and show that orbital distortion and parabolic channel effects, which are independent of excited-state effects, can significantly modify the angular dependence of ionization yields as well.

EDITORS' SUGGESTION

Robust strong-field theory model for ultrafast electron transport through metal-insulator-metal tunneling nanojunctions

Boyang Ma and Michael Krüger

Phys. Rev. A **112**, 033104 (2025) - Published 11 September, 2025



The authors establish a strong-field theory for ultrafast electron transport in ultrathin metal-insulator-metal nanojunctions, accounting for the image potential inside the gap and boundary effects. They find that the Keldysh parameter alone is insufficient for describing the physics in these systems, introduce an additional parameter that accounts for the effects of the limited size of the junction, and provide several interpretations of the parameter that shed new light on the complex physics in the light-driven junction.

Determining ion Coulomb crystal temperatures with ConvNeXt and a vision transformer

Chu Zhang, Dawei Liu, Mingqing Song, Ying Jiang, Dongdong Zhang, and Dajun Ding

Phys. Rev. A **112**, 033105 (2025) - Published 11 September, 2025

Spontaneous Raman scattering out of a metastable atomic qubit

I. D. Moore, A. Quinn, J. O'Reilly, J. Metzner, S. Brudney, G. J. Gregory, D. J. Wineland, and D. T. C. Allcock

Phys. Rev. A **112**, 033106 (2025) - Published 12 September, 2025

Spontaneous Raman scattering from metastable states of

Timothy J. Burke, Xiaoyang Shi, Jasmine Sinanan-Singh, Isaac L. Chuang, and John Chiaverini

Phys. Rev. A **112**, 033107 (2025) - Published 12 September, 2025

Generation of ultrarelativistic longitudinally spin-polarized electrons via nonlinear Compton scattering

Dejia Dai, Xiaofei Shen, and Bin Qiao

Phys. Rev. A **112**, 033108 (2025) - Published 12 September, 2025

Autocorrelation measurement of attosecond pulses based on two-photon double ionization

Fei Li, Kun Zhao, Bingbing Wang, Xin-Kui He, and Zhi-Yi Wei

Phys. Rev. A **112**, 033109 (2025) - Published 15 September, 2025

Generation of isolated elliptically polarized sub-100-as pulses from Ne atoms in combined chirped fields

Si-Qi Zhang, Bing Zhang, Bo Yan, Xiang-Qian Jiang, Jing Guo, and Xiu-Dong Sun

Phys. Rev. A **112**, 033110 (2025) - Published 16 September, 2025

Theory of the photoeffect with vortex photoelectrons

Kirill V. Bazarov and Oleg I. Tolstikhin

Phys. Rev. A **112**, 033111 (2025) - Published 16 September, 2025

Incorporating dephasing effects into simulations of harmonic generation from finite-size topological insulators

Chuan Yu

Phys. Rev. A **112**, 033112 (2025) - Published 19 September, 2025

Efficiency of double ionization of a three-electron atom in moderate laser-field intensities

Dmitry K. Efimov

Phys. Rev. A **112**, 033113 (2025) - Published 23 September, 2025

Fast and robust detection of single Rydberg excitations in mesoscopic ensembles

Sven Schmidt, Aaron Thielmann, Thomas Niederprüm, and Herwig Ott

Phys. Rev. A **112**, 033114 (2025) - Published 24 September, 2025

Spin squeezing via one-axis twisting in a quadrupolar NMR system under relaxation effects

Adriane Consuelo Leal Auccaise and Antonio Sérgio Magalhães de Castro

Phys. Rev. A **112**, 033116 (2025) - Published 24 September, 2025

Enhancement of superconducting pairing via quantum Lyapunov control

Oleksandr Povitchan, Denys I. Bondar, and Andrii G. Sotnikov

Phys. Rev. A **112**, 033117 (2025) - Published 29 September, 2025

Carrier-envelope-phase effects in one- and two-photon directional photoionization of nonisotropic atomic states

Juan J. Omiste and Lars Bojer Madsen

Phys. Rev. A **112**, 033118 (2025) - Published 29 September, 2025

Lateral diffusion in coated vapor cells under light-induced atomic desorption

Xingqing Jin, Shuyuan Chen, Wentian Xiang, Wenlong Lyu, Changping Du, Xiang Peng, and Hong Guo

Phys. Rev. A **112**, 033119 (2025) - Published 29 September, 2025

Ultracold systems and matter waves

Light-induced localized vortices in multicomponent Bose-Einstein condensates

Y. Braver, D. Burba, S. S. Nair, G. Žlabys, E. Anisimovas, Th. Busch, and G. Juzeliūnas

Phys. Rev. A **112**, 033301 (2025) - Published 2 September, 2025

Phase transitions and dynamics of one-dimensional solitons in spin-orbit-coupled Bose-Bose mixtures

Gui-hua Chen, Hongcheng Wang, Boris A. Malomed, Haiming Deng, and Yongyao Li

Phys. Rev. A **112**, 033302 (2025) - Published 3 September, 2025

Dynamics of supersolid state: Normal fluid, superfluid, and supersolid velocities

Wayne M. Saslow

Phys. Rev. A **112**, 033303 (2025) - Published 3 September, 2025

Dynamics of topological defects in a Rashba spin-orbit-coupled Bose-Einstein condensate

Sheng Liu and Yong-Sheng Zhang

Phys. Rev. A **112**, 033304 (2025) - Published 3 September, 2025

Dynamical crossover of vortex-pair annihilation in two-dimensional quantum turbulence

Toshiaki Kanai and Chuanwei Zhang

Phys. Rev. A **112**, 033305 (2025) - Published 4 September, 2025

Self-adapted Josephson oscillation of dark-bright solitons under constant forces

Ling-Zheng Meng, Xi-Wang Luo, and Li-Chen Zhao

Phys. Rev. A **112**, 033306 (2025) - Published 4 September, 2025

Composite-boson-superposition ansatz approach to one-dimensional trapped few-fermion systems

Francisco Figueiredo and Itzhak Roditi

Phys. Rev. A **112**, 033307 (2025) - Published 5 September, 2025

Equilibrium, relaxation, and fluctuations in homogeneous Bose-Einstein condensates: Linearized classical field analysis

Nils A. Krause and Ashton S. Bradley

Phys. Rev. A **112**, 033308 (2025) - Published 8 September, 2025

Bose-Einstein condensates in a synthetic magnetic field with tunable orientation

Fengtao Pang, Huaxin He, Yongping Zhang, and Chunlei Qu

Phys. Rev. A **112**, 033309 (2025) - Published 9 September, 2025

Bridging the classical and quantum regimes in a dissipative Ising chain

Zhenming Zhang, Haowei Li, and Wei Yi

Phys. Rev. A **112**, 033310 (2025) - Published 9 September, 2025

Dynamics of magnetic evaporative beamline cooling for the preparation of cold atomic beams

A. Ashtari Esfahani *et al.* (Project 8 Collaboration)

Phys. Rev. A **112**, 033311 (2025) - Published 11 September, 2025

Rayleigh-Taylor, Kelvin-Helmholtz, and immiscible-to-miscible quenching instabilities in binary Bose-Einstein condensates

R. Kishor Kumar, S. Sabari, Arnaldo Gammal, and Lauro Tomio

Phys. Rev. A **112**, 033312 (2025) - Published 11 September, 2025

Unit-density SU(3) Fermi-Hubbard model with spin-flavor imbalance

Zewen Zhang, Qinyuan Zheng, Eduardo Ibarra-García-Padilla, Richard T. Scalettar, and Kaden R. A. Hazzard

Phys. Rev. A **112**, 033313 (2025) - Published 12 September, 2025

Determination of the tilt of Raman lasers using the tilt-scanned fringe for atom gravimeters

Xiaochun Duan, Wenxin Geng, Huaqing Luo, Yaoyao Xu, and Zhongkun Hu

Phys. Rev. A **112**, 033314 (2025) - Published 12 September, 2025

Confinement-induced unatomic trimer states in mass-imbalanced systems

R. M. Francisco, D. S. Rosa, T. Frederico, G. Krein, and M. T. Yamashita

Phys. Rev. A **112**, 033315 (2025) - Published 15 September, 2025

Velocity correlations of vortices and rarefaction pulses in compressible planar quantum fluids

Ashton S. Bradley and Nils A. Krause

Phys. Rev. A **112**, 033316 (2025) - Published 15 September, 2025

Operator-valued-flow-equation approach to the bosonic lattice polaron: Dispersion renormalization beyond the Fröhlich paradigm

Jan-Philipp Christ, Pit Bermes, and Fabian Grusdt

Phys. Rev. A **112**, 033317 (2025) - Published 15 September, 2025