PHYSICAL REVIEW A **THIRD SERIES, VOLUME 111, NUMBER 5** **MAY 2025**

ERRATA

Erratum: Precision measurement of the absolute energy of the $2s3s\ ^1S_0$ state in neutral ^{9}Be [Phys. Rev. A **110**, 032818 (2024)] *(1 page)* . . . . . 059901(E)
K. J. Ahrendsen, T. Karani, and W. D. Williams

Erratum: Prospects for the determination of fundamental constants with beyond-state-of-the-art uncertainty using molecular hydrogen ion spectroscopy [Phys. Rev. A **109**, 042825 (2024)] *(3 pages)* . . . . . 059902(E)
S. Schiller and J.-Ph. Karr

This paper was highlighted in the APS publication *Physics* (physics.aps.org).
The editors and referees of PRA find these papers to be of particular interest, importance, or clarity. Please see our Announcement Phys. Rev. A 88, 020001 (2013).

PHYSICAL REVIEW A **THIRD SERIES, VOLUME 111, NUMBER 5** **MAY 2025**

Light interactions with polar quantum systems *(13 pages)* 053704
Piotr Gładysz and Karolina Słowik

Correlated photon-pair generation via single-atom cavity-assisted spontaneous four-wave mixing *(8 pages)* 053705
Yuan Feng (冯媛), Mao-Hua Wang (王茂桦), Jin-Hui Wu (吴金辉), and Xiao-Jun Zhang (张晓军)

Selective band interaction and long-range hopping in a structured environment with giant atoms *(13 pages)* 053706
Ying Xia, Jia-Qi Li, and Xin Wang

Magnon squeezing induced by virtual photons in a magnon-cavity-qubit system *(9 pages)* 053707
Ai-Bo Xia, Jing Cheng, Ding-Li Tian, Cheng-Jun Han, and Y. P. Wang

Compton scattering mediated by quantum entanglement *(13 pages)* 053708
Peter Caradonna

Generalized nonlinear interferometer with SU(1,1) echo *(8 pages)* 053709
Rui Chen, Peng Xu, Shi-Lei Su, and Gao-Xiang Li

Rabi oscillation and fractional population via the bound states in the continuum in a giant-atom waveguide QED setup *(11 pages)* 053710
Hongwei Yu, Xiaojun Zhang, Zhihai Wang, and Jin Wang

High-fidelity generation of Bell and W states in a giant-atom system via bound states in the continuum *(7 pages)* 053711
Mingzhu Weng, Hongwei Yu, and Zhihai Wang

Cavity quantum electrodynamics with atom arrays in free space *(20 pages)* 053712
David Castells-Graells, J. Ignacio Cirac, and Dominik S. Wild

Superradiance-driven optomechanical entanglement *(7 pages)* 053713
Kai-Wei Huang, Xin Wang, Yi Ren, and Hao Xiong

Quantum theory of the diamond maser: Stimulated and superradiant emission *(7 pages)* 053714
Christoph W. Zollitsch and Jonathan D. Breeze

Stochastic collective density-matrix approach for conditional spin squeezing *(17 pages)* 053715
ZhiQing Zhang, Yuan Zhang, HaiZhong Guo, Chongxin Shan, Gang Chen, and Klaus Mølmer

Manipulation of the photonic spin Hall effect in a cavity magnomechanical system *(11 pages)* 053716
Muqaddar Abbas, Ghaisud Din, Hamid R. Hamedi, and Pei Zhang

Analytical solution of the open dispersive Jaynes-Cummings model and perturbative analytical solution of the open quantum Rabi model *(19 pages)* 053717
Antti Vaaranta, Marco Cattaneo, and Paolo Muratore-Ginanneschi

Atomic-optical interferometry in fractured loops: A general solution for Rydberg radio-frequency receivers *(12 pages)* 053718
Bartosz Kasza, Sebastian Borówka, Wojciech Wasilewski, and Michał Parniak

Enhanced photonic spin Hall effect in atomic-ensemble-based cavity optomechanics *(11 pages)* 053719
Akhtar Munir, Muzamil Shah, and Chunfang Wang

(Continued)

This paper was highlighted in the APS publication *Physics* (physics.aps.org).
The editors and referees of PRA find these papers to be of particular interest, importance, or clarity. Please see our Announcement Phys. Rev. A 88, 020001 (2013).

PHYSICAL REVIEW A **THIRD SERIES, VOLUME 111, NUMBER 5** **MAY 2025**

Strong and noise-tolerant entanglement in dissipative optomechanics *(7 pages)* 053512
Jiaojiao Chen, Wei Xiong, Dong Wang, and Liu Ye

Chaotic self-trapped vortex beams induced by initial spatial chirps in nonlocal nonlinear media *(11 pages)* 053513
Junjie Li, Huicong Zhang, Zhixuan Wang, and Lu Wan

Squeezing-induced nonreciprocal transparency and the slow-to-fast-light switch *(11 pages)* 053514
Deng Wang, Bin Yin, Jie Wang, Mei-Yu Peng, HuiZu Lin, Tian-Xiang Lu, and Hui Jing

Intensity correlation measurement to simulate two-body bound states in the continuum and probe nonlinear discrete breathers *(14 pages)* 053515
Trideb Shit, Rishav Hui, Marco Di Liberto, Diptiman Sen, and Sebabrata Mukherjee

Deterministic generation of single soliton microcombs with enhanced stability using thermal self-starting and simplified temperature control *(9 pages)* 053516
Kairong Chen, Shaowu Chen, Beichen Yin, Wei Li, Liangsen Feng, Yudong Li, Jiaxu Chen, and Tenfei Wu

Deterministic generation of nonclassical mechanical states in cavity optomechanics via reinforcement learning *(13 pages)* 053517
Yu-Hong Liu, Qing-Shou Tan, Le-Man Kuang, and Jie-Qiao Liao

$\chi^{(2)}$-enabled non-Hermitian topological light manipulation *(6 pages)* 053518
Chao Zhou, Xuejing Cui, Qiang Wang, Xiaoyi Xu, PengCheng Chen, Hui Liu, Shining Zhu, Min Xiao, and Yong Zhang

Dynamics of Kerr cavity solitons in fiber resonators driven by desynchronized pulses *(7 pages)* 053519
Hongbin Hu, Runhui Zhu, You Yu, Zhiqiang Wang, and Zuxing Zhang

In-phase and out-of-phase period doubling of bound-state solitons in Er-doped mode-locked fiber lasers *(8 pages)* 053520
Jingxing Li, Baole Lu, Chenyue Lv, and Jintao Bai

Modeling nonlinear exciton-polariton microcavities using the transfer-matrix method: Spontaneous symmetry breaking and self-focusing *(13 pages)* 053521
Karol Sajnok and Michał Matuszewski

Exceptional-point-based flat spectrum generation in frequency lattices *(11 pages)* 053522
Lingzhi Zheng, Linhao Qian, Chao Hong, Wenjing Lv, Shaolin Ke, Zhuoxiong Liu, Shuaifei Ren, Mingfeng Wang, and Yiling Song

Enhanced spatiotemporal optical vortices and vortex chains from Hermite-Gauss modes with a tilted pulse front *(9 pages)* 053523
Miguel A. Porras and Spencer W. Jolly

Quantum optics

Latent optical nonclassicality of conditionally prepared states *(12 pages)* 053701
V. S. Kovtoniuk, A. B. Klimov, and A. A. Semenov

Beam splitter for dark and bright states of light *(8 pages)* 053702
Luiz O. R. Solak, Celso J. Villas-Boas, and Daniel Z. Rossatto

Amplifying hybrid entangled states and superpositions of coherent states *(15 pages)* 053703
InU Jeon, Sungjoo Cho, and Hyunseok Jeong

(Continued)

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

The editors and referees of PRA find these papers to be of particular interest, importance, or clarity. Please see our Announcement Phys. Rev. A 88, 020001 (2013).

PHYSICAL REVIEW A **THIRD SERIES, VOLUME 111, NUMBER 5** **MAY 2025**

Ground state of a mixture of SU(3) fermions and scalar bosons *(10 pages)* 053316
J. Silva-Valencia and J. J. Mendoza-Arenas

Persistent breather and dynamical symmetry in a unitary Fermi gas *(11 pages)* 053317
Dali Sun, Jing Min, Xiangchuan Yan, Lu Wang, Xin Xie, Xizhi Wu, Jeff Maki, Shizhong Zhang, Shi-Guo Peng, Mingsheng Zhan, and Kaijun Jiang

Preparation and observation of anomalous counterpropagating edge states in a periodically driven optical Raman lattice *(15 pages)* 053318
Hongting Hou and Long Zhang

Three-body interactions in Rabi-coupled Bose gases: A perturbative approach *(6 pages)* 053319
S. Tiengo, R. Eid, and T. Bourdel

Vortices in tunable dipolar Bose-Einstein condensates with attractive interactions *(10 pages)* 053320
S. Sabari, R. Sasireka, R. Radha, A. Uthayakumar, and Lauro Tomio

Photonics, nonlinear optics, and optomechanics

Phase-driven unconventional superradiance phase transition in non-Hermitian cascaded quantum Rabi cavities *(10 pages)* 053501
Shujie Cheng, Shuai-Peng Wang, G. D. M. Neto, and Gao Xianlong

Optimal conditions for the generation of moderate-order harmonics of a short-wave field by helium atoms *(16 pages)* 053502
V. A. Antonov, I. R. Khairulin, M. Yu. Emelin, M. M. Popova, E. V. Gryzlova, and M. Yu. Ryabikin

Quartic soliton solutions of a normal-dispersion-based mode-locked laser *(14 pages)* 053503
M. Facão, D. Malheiro, and M. I. Carvalho

Kerr-enhanced optomechanical cooling in the unresolved-sideband regime *(15 pages)* 053505
N. Diaz-Naufal, L. Deeg, D. Zoepfl, C. M. F. Schneider, M. L. Juan, G. Kirchmair, and A. Metelmann

Plasmons in metallic nanoclusters exhibit nonharmonic phenomena *(19 pages)* 053506
Janusz Edward Jacak and Witold Aleksander Jacak

Mesoscopic theory of wavefront shaping to focus waves deep inside disordered media *(14 pages)* 053507
Bart A. van Tiggelen, Ad Lagendijk, and Willem L. Vos

Enhancing optomechanical force sensing utilizing synthetic magnetism *(10 pages)* 053508
Ding-hui Xu, Zheng Liu, and Chang-shui Yu

Symmetry breaking and spatiotemporal pattern formation in photonic time crystals *(9 pages)* 053509
Egor I. Kiselev and Yiming Pan

Theory for measuring topology-based enhanced emission in a double-emitter system including plasmonic antennae *(13 pages)* 053510
G. Simone

Macroscopic QED and noise currents in time-varying media *(11 pages)* 053511
S. A. R. Horsley and R. K. Baker

(Continued)

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

The editors and referees of PRA find these papers to be of particular interest, importance, or clarity. Please see our Announcement Phys. Rev. A 88, 020001 (2013).

PHYSICAL REVIEW A **THIRD SERIES, VOLUME 111, NUMBER 5** **MAY 2025**

Ultracold systems and matter waves

Evaporative-cooling dynamics and stability of a continuous Bose-Einstein-condensate source *(9 pages)* 053301
Yun-Jhih Chen, Robert J. Thompson, and James M. Kohel

Vacancy-assisted superfluid drag *(9 pages)* 053302
Thomas G. Kiely, Chao Zhang, and Erich J. Mueller

Vortex phases and domain walls in trapped spinor Bose-Einstein condensates with inhomogeneous spin-orbital-angular-momentum coupling *(9 pages)* 053303
O. O. Prykhodko and L. V. Zadorozhna

Echoes and defects in the Calogero model *(9 pages)* 053304
Benjamin Liégeois, Ramasubramanian Chitra, and Nicolò Defenu

Supersolid spectroscopy *(14 pages)* 053305
L. M. Platt, D. Baillie, and P. B. Blakie

Timescales and necessary conditions for hydrodynamization in one-dimensional Bose gases *(17 pages)* 053306
Yicheng Zhang, Yuan Le, David S. Weiss, and Marcos Rigol

Transition from spontaneous to explicit symmetry breaking in a finite-sized system: Bosonic bound states of an impurity *(12 pages)* 053307
L. Chergui, F. Brauneis, T. Arnone Cardinale, M. Schubert, A. G. Volosniev, and S. M. Reimann

Non-Hermitian Thouless pumping: Interplay between topological charge pumping and directional tunneling *(9 pages)* 053308
Xiaoyi Yang, Chengming Tan, Yangqian Yan, and Ren Zhang

Two-component atomic Fermi superfluid with spin-orbital coupling in thin-spherical-shell geometry *(12 pages)* 053309
Yan He and Chih-Chun Chien

Many-body interferometry of one-dimensional integrable systems *(10 pages)* 053310
Min Liu, Maksims Arzamasovs, Yue Zhang, Rui Tian, Zehou Li, Shuai Li, and Bo Liu

Coexistence of Majorana zero modes and the Fulde-Ferrell-Larkin-Ovchinnikov state in a dipolar fermionic gas with laser-assisted interwire tunneling *(10 pages)* 053311
Jin-Xin Li, Xing-Dong Zhao, Xue-Jing Feng, Ying-Ying Zhang, Jing-Xue Liu, Lu Qin, Zun-Lue Zhu, Wu-Ming Liu, and Liang-Liang Wang

Interaction-induced higher-order topological insulator via Floquet engineering *(11 pages)* 053312
Chun-Ping Su, Zhao-Fan Cai, and Tao Liu

Three-body scattering hypervolume of two-component fermions in three dimensions *(20 pages)* 053313
Jiansen Zhang, Zipeng Wang, and Shina Tan

Vortices in the many-body excited states of interacting bosons in two dimensions *(8 pages)* 053314
Mateusz Ślusarczyk and Krzysztof Pawłowski

Time-dependent Jastrow ansatz: Exact quantum dynamics, shortcuts to adiabaticity, and quantum quenches in strongly correlated many-body systems *(23 pages)* 053315
Jing Yang and Adolfo del Campo

(Continued)

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

The editors and referees of PRA find these papers to be of particular interest, importance, or clarity. Please see our Announcement Phys. Rev. A 88, 020001 (2013).

PHYSICAL REVIEW A **THIRD SERIES, VOLUME 111, NUMBER 5** **MAY 2025**

Four-body Coulomb explosion of HCl dimers in strong laser fields *(7 pages)* 053106
Xinning Zhao, Xinyu Zhang, Hui Liu, Pan Ma, Xiaokai Li, Chuncheng Wang, Sizuo Luo, and Dajun Ding

Relativistic configuration-interaction and coupled-cluster calculations of Ir^{17+} transition energies and properties for optical clock applications *(20 pages)* 053107
H. X. Liu, Y. M. Yu, B. B. Suo, Y. F. Ge, and Y. Liu

Single and double photoionization of the Li-like B^{2+} ion: Strong ionization-excitation contributions *(13 pages)* 053108
A. Müller, P.-M. Hillenbrand, S.-X. Wang, S. Schippers, S. Reinwardt, M. Martins, J. Seltmann, F. Trinter, I. Bray, D. V. Fursa, and A. S. Kheifets

Using the Th III ion for a nuclear clock and searches for new physics *(8 pages)* 053109
V. A. Dzuba and V. V. Flambaum

Complete classification and additional saddle-point solutions for high-order above-threshold ionization induced by a strong laser field. II. Classical considerations *(14 pages)* 053110
D. Habibović, W. Becker, and D. B. Milošević

Interference structures of an Ar atom by orthogonally polarized laser pulses *(9 pages)* 053111
Ying Guo, Shu-Juan Yan, Cong-Cong Cheng, Xin-Yu Hao, Aihua Liu, and Jing Guo

Orientation-dependent ionization rate of diatomic molecules *(9 pages)* 053112
Paul Winter and Manfred Lein

Photoionization dynamics in intense few-cycle twisted laser pulses *(12 pages)* 053113
Danish Furekh Dar, Anne Weber, Shreyas Ramakrishna, and Stephan Fritzsche

Phase-space Gaussian quantum ensemble for high-order harmonic generation *(12 pages)* 053114
Sen Qiao, Liang Li, Hubin Cui, Shiyu Zeng, Shiqi Liang, Pengfei Lan, and Peixiang Lu

Probing electron correlations in sequential double ionization on the attosecond timescale *(8 pages)* 053115
Xu Zhang, Yang Li, Miao Yu, Mingrui He, Wei-Chao Jiang, Yueming Zhou, and Peixiang Lu

Interferometric circular dichroism in photoelectron momentum distributions *(16 pages)* 053116
S. McKay, H. B. Ambalampitiya, D. Peng, A. Saenz, and J. M. Ngoko Djiokap

Ionization-coherence-enhanced-vibration photoexcitation in nitrogen ions *(8 pages)* 053117
Chaohui Zhou, Liang Xu, Jiahao Dong, Shuqiao Li, Yuanqian Yang, Zhengyang Bai, Feng He, Aurélien Houard, André Mysyrowicz, Vladimir T. Tikhonchuk, and Yi Liu

Coulomb-related symmetry in laser-induced tunneling ionization of atoms and molecules *(15 pages)* 053118
Z. Y. Chen, S. Q. Shen, Y. P. Li, Z. Q. Yang, J. Y. Che, and Y. J. Chen

High-energy polarized electron beams from the ionization of isolated spin polarized hydrogen atoms *(8 pages)* . . . 053119
Dimitris Sofikitis, Lars Reichwein, Marios G. Stamatakis, Christos Zois, Dimitrios G. Papazoglou, Samuel Cohen, Markus Büscher, Alexander Pukhov, and T. Peter Rakitzis

Forces on alkali Rydberg atoms due to nonlinearly polarized light *(14 pages)* 053120
A. Bhowmik and D. Blume

Schwinger pair production in counterpropagating laser pulses: Identifying volume factors *(15 pages)* 053121
A. G. Tkachev, I. A. Aleksandrov, and V. M. Shabaev

(Continued)

This paper was highlighted in the APS publication *Physics* (physics.aps.org).
The editors and referees of PRA find these papers to be of particular interest, importance, or clarity. Please see our Announcement Phys. Rev. A 88, 020001 (2013).

PHYSICAL REVIEW A **THIRD SERIES, VOLUME 111, NUMBER 5** **MAY 2025**

Collision parameters needed to measure polarization-dependent nonlinear pair creation *(9 pages)* 052808
Mathias Samuelsson and Thomas G. Blackburn

Frequency measurement of the $2\,^3S_1$–$8\,^3D_1$ two-photon transition in atomic ^{4}He *(5 pages)* 052809
Mu-Hao Wu and Li-Bang Wang

Influence of the vortex-electron spatial distribution on atomic scattering *(13 pages)* 052810
N. Sheremet, A. Chaikovskaia, D. Grosman, and D. Karlovets

Anomalies in the rotational spectra of ^{86}Sr ultralong-range Rydberg molecule dimers *(7 pages)* 052811
C. Wang, Y. Lu, A. Li, S. K. Kanungo, T. C. Killian, F. B. Dunning, and S. Yoshida

Quasi-Sturmian basis set for problems of single ionization of helium by proton impact with rearrangement *(11 pages)* 052812
S. A. Zaytsev, D. S. Zaytseva, A. S. Zaytsev, L. U. Ancarani, K. A. Kouzakov, and Yu. V. Popov

Precision study of structural and elastic electron scattering properties of muonic helium systems *(8 pages)* 052813
K. Hu, K.-D. Wang, D.-X. Zhao, M.-S. Wu, J.-Y. Zhang, Z.-C. Yan, and K. Varga

Nonreciprocal and nonconservative forces on binary systems of identical atoms *(11 pages)* 052814
J. Sánchez-Cánovas and M. Donaire

Electron spin polarization around magnetic nodes under the chirped rotating electric field *(10 pages)* 052815
Jinhui Bai, Zhaoyuan Chen, Orkash Amat, and Mamat Ali Bake

Testing reachability of the plane-wave impulse approximation in terms of the ratio of spectroscopic factors for $(e, 2e)$ ionization of Ne $2s$ and $2p$ electrons *(9 pages)* 052816
Isao Nakajima, Masakazu Yamazaki, Yuri V. Popov, Salim Houamer, and Masahiko Takahashi

Dissociative positronium attachment in halogen gases *(9 pages)* 052817
R. S. Wilde, G. F. Gribakin, and I. I. Fabrikant

Light-induced processes in atomic-scale systems

Frequency shift induced by multielectron polarization in high-order harmonic generation from polar molecules *(13 pages)* 053101
Kim-Ngan H. Nguyen, Doan-An Trieu, Cam-Tu Le, Van-Hoang Le, and Ngoc-Loan Phan

Probing ultrafast nuclear dynamics in dissociative double ionization of H_2 and D_2 using a multicycle elliptically polarized femtosecond laser pulse *(7 pages)* 053102
Junyang Ma, Shuqi Li, Fan Yang, Yan Yang, and Zhenrong Sun

Pulsed dual-axis alkali-metal–noble-gas comagnetometer *(12 pages)* 053103
J. Wang, J. Lee, H. Loughlin, M. Hedges, and M. V. Romalis

Fano resonance in the XUV generated by helium with few-cycle intense laser pulses and its classical analogy *(10 pages)* 053104
S. A. Bondarenko and V. V. Strelkov

Application of the uniform approximation to integrals occurring in ionization by a strong elliptically polarized laser field *(16 pages)* 053105
D. B. Milošević

(Continued)

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

The editors and referees of PRA find these papers to be of particular interest, importance, or clarity. Please see our Announcement Phys. Rev. A 88, 020001 (2013).

PHYSICAL REVIEW A THIRD SERIES, VOLUME 111, NUMBER 5 MAY 2025

Uncertain quantum critical metrology: From single- to multiparameter sensing *(9 pages)* 052621
George Mihailescu, Steve Campbell, and Karol Gietka

Continuous dynamical decoupling in non-Hermitian two-level systems *(9 pages)* 052622
Yu-bing Yao, Xiang-Fa Zhou, Zheng-Wei Zhou, and Xing-Xiang Zhou

Low-temperature quantum metrology enhanced by strong coupling *(14 pages)* 052623
Ze-Zhou Zhang, Hong-Gang Luo, and Wei Wu

Graph state fission *(6 pages)* 052624
Jorge Miguel-Ramiro and Wolfgang Dür

Fidelity-enhanced variational quantum optimal control *(13 pages)* 052625
R. J. P. T. de Keijzer, L. Y. Visser, O. Tse, and S. J. J. M. F. Kokkelmans

Quantum logic for state preparation, readout, and leakage detection with binary subspace measurements *(8 pages)* 052627
R. Tyler Sutherland

Efficient large-scale quantum optimization via counterdiabatic ansatz *(15 pages)* 052628
Jie Liu and Xin Wang

Detecting errors in a quantum network with Pauli checks *(12 pages)* 052629
Alvin Gonzales, Daniel Dilley, Bikun Li, Liang Jiang, and Zain H. Saleem

PART B

Atomic and molecular structure and dynamics; high-precision experiments

Z dependence of $4f$-$5s$ electric-octupole emission in Ag-like ions *(9 pages)* 052801
H. A. Sakaue, E. Takacs, Dipti, D. Kato, N. Nakamura, H. Staiger, J. N. Tan, I. Murakami, H. Ohashi, and Yu. Ralchenko

$M\alpha$- and $M\beta$-satellite x-ray emission induced by electron impact on rhenium *(12 pages)* 052802
Alejo Carreras, Gustavo Castellano, Jorge Trincavelli, Silvina Segui, María del Rosario Torres Deluigi, and Silvina Limandri

Predicting accurate x-ray absorption spectra for interstellar molecules CN^+, CN, and CN^-: Insights from *ab initio* simulations *(12 pages)* 052803
Jinyu Li, Sheng-Yu Wang, Lu Zhang, Guoyan Ge, Minrui Wei, Junxiang Zuo, and Weijie Hua

Use of single-body potentials to accurately describe virtual positronium formation in positron collisions *(13 pages)* 052804
Eliton Popovicz Seidel, Jan Franz, Wagner Tenfen, and Felipe Arretche

Relaxation effects in the photoionization time delay near the $3s$ Cooper minimum of Ar *(5 pages)* 052805
A. Ganesan, S. Banerjee, S. Baral, J. Jose, P. C. Deshmukh, and S. T. Manson

Target excitation and ionization in $\bar{p}$ + He($1\,^1S$, $2\,^3S$) collisions *(11 pages)* 052806
N. W. Antonio and A. S. Kadyrov

Nonlinear spin dynamics induced by feedback under continuous Larmor frequency distributions *(9 pages)* 052807
Tishuo Wang, Zhihuang Luo, Shizhong Zhang, and Zhenhua Yu

(Continued)

This paper was highlighted in the APS publication *Physics* (physics.aps.org).
The editors and referees of PRA find these papers to be of particular interest, importance, or clarity. Please see our Announcement Phys. Rev. A 88, 020001 (2013).

PHYSICAL REVIEW A **THIRD SERIES, VOLUME 111, NUMBER 5** **MAY 2025**

Principles for optimizing quantum transduction in piezo-optomechanical systems *(23 pages)* 052605
James Schneeloch, Erin Sheridan, A. Matthew Smith, Christopher C. Tison, Daniel L. Campbell, Matthew D. LaHaye, Michael L. Fanto, and Paul M. Alsing

Accelerating fermionic system simulation on quantum computers *(13 pages)* 052606
Qing-Song Li, Jiaxuan Zhang, Huan-Yu Liu, Qingchun Wang, Yu-Chun Wu, and Guo-Ping Guo

Narrowband and passband composite rotational quantum gates *(16 pages)* 052607
Hayk L. Gevorgyan

Effects of systematic error on quantum-enhanced atom interferometry *(15 pages)* 052608
Joshua Goldsmith, Joseph Hope, and Simon Haine

Multiuser quantum communication network via time-bin-entanglement-based frequency conversion and Bell-state measurement *(6 pages)* 052609
Zhantong Qi, Yilin Yang, Chennan Wu, Zixuan Liao, Bo Tang, Jiani Lei, Yuanhua Li, Jia Lin, Yuanlin Zheng, and Xianfeng Chen

Multiqubit entanglement generation with squeezed modes *(14 pages)* 052610
Alexandru Macridin, Andrew Cameron, Cristian Pena, Si Xie, Raju Valivarthi, and Panagiotis Spentzouris

Exact space-depth trade-offs in multicontrolled Toffoli decomposition *(12 pages)* 052611
Suman Dutta, Siyi Wang, Anubhab Baksi, Anupam Chattopadhyay, and Subhamoy Maitra

Open-quantum-system simulation through exploiting noise on quantum computers *(7 pages)* 052612
Michael Rose, Sabre Kais, and David A. Mazziotti

Superoscillating quantum control induced by sequential selections *(10 pages)* 052613
Yongcheng Ding, Yiming Pan, and Xi Chen

Quantum algorithms for inverse participation ratio estimation in multiqubit and multiqudit systems *(13 pages)* . . . 052614
Yingjian Liu, Piotr Sierant, Paolo Stornati, Maciej Lewenstein, and Marcin Płodzień

Tensor-decomposition technique for qubit encoding of maximal-fidelity Lorentzian orbitals in real-space quantum chemistry *(19 pages)* 052615
Taichi Kosugi, Xinchi Huang, Hirofumi Nishi, and Yu-ichiro Matsushita

Short two-qubit pulse sequences for exchange-only spin qubits in two-dimensional layouts *(15 pages)* 052616
Jason D. Chadwick, Gian Giacomo Guerreschi, Florian Luthi, Mateusz T. Mądzik, Fahd A. Mohiyaddin, Prithviraj Prabhu, Albert T. Schmitz, Andrew Litteken, Shavindra Premaratne, Nathaniel C. Bishop, Anne Y. Matsuura, and James S. Clarke

Improving adiabatic quantum factorization via chopped random-basis optimization *(12 pages)* 052617
Tianlai Yang, Mo Xiong, Ming Xue, Xinwei Li, and Jinbin Li

Geodesic algorithm for unitary gate design with time-independent Hamiltonians *(15 pages)* 052618
Dylan Lewis, Roeland Wiersema, Juan Carrasquilla, and Sougato Bose

Simulating the Fermi-Hubbard model with long-range hopping on a quantum computer *(14 pages)* 052619
Tatiana A. Bespalova, Karlo Delić, Guido Pupillo, Francesco Tacchino, and Ivano Tavernelli

Dynamical phonon blockade with a high time resolution in a hybrid system *(13 pages)* 052620
Zhuang Geng, Yong-Yuan Jiang, Yan Xia, and Jie Song

(Continued)

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

The editors and referees of PRA find these papers to be of particular interest, importance, or clarity. Please see our Announcement Phys. Rev. A 88, 020001 (2013).

PHYSICAL REVIEW A **THIRD SERIES, VOLUME 111, NUMBER 5** **MAY 2025**

Stochastic noise can be helpful for variational quantum algorithms *(14 pages)* 052441
Junyu Liu, Frederik Wilde, Antonio Anna Mele, Xin Jin, Liang Jiang, and Jens Eisert

Bounding large-scale Bell inequalities *(7 pages)* 052442
Luke Mortimer

Quantum nonlocal nonstabilizerness *(9 pages)* 052443
Dongheng Qian and Jing Wang

Mitigating shot noise in local overlapping quantum tomography with semidefinite programming *(12 pages)* 052444
Zherui Jerry Wang, David Dechant, Yash J. Patel, and Jordi Tura

Exploring the quantum capacity of a Gaussian random-displacement channel using Gottesman-Kitaev-Preskill codes and maximum-likelihood decoding *(14 pages)* 052445
Mao Lin and Kyungjoo Noh

Measuring network quantum steerability utilizing artificial neural networks *(10 pages)* 052446
Mengyan Li, Yanning Jia, Fenzhuo Guo, Haifeng Dong, Sujuan Qin, and Fei Gao

Quantum trajectory sensing problem and its solution *(47 pages)* 052447
Zachary E. Chin and Isaac L. Chuang

Efficient classical algorithm for simulating boson sampling with heterogeneous partial distinguishability *(9 pages)* 052448
S. N. van den Hoven, E. Kanis, and J. J. Renema

Distinguishing graph states by the properties of their marginals *(17 pages)* 052449
Lina Vandré, Jarn de Jong, Frederik Hahn, Adam Burchardt, Otfried Gühne, and Anna Pappa

Symmetric quantum joint measurements on multiple qubits *(8 pages)* 052450
Dong Ding, Ying-Qiu He, Ting Gao, and Feng-Li Yan

Complementarity relations in multipath interferometers via decomposition of the uncertainty *(9 pages)* 052451
Shuangshuang Fu and Xiaohui Li

Using detector likelihood for benchmarking quantum error correction *(11 pages)* 052452
Ian Hesner, Bence Hetényi, and James R. Wootton

Exploring the local landscape in the triangle network *(21 pages)* 052453
Elisa Bäumer, Victor Gitton, Tamás Kriváchy, Nicolas Gisin, and Renato Renner

Quantum technologies

Deterministic two-photon controlled-Z gate with the two-photon quantum Rabi model *(11 pages)* 052601
Jia-Cheng Tang, Jin Zhao, Haitao Yang, Junlong Tian, Pinghua Tang, Shuai-Peng Wang, Lucas Lamata, and Jie Peng

High-rate amplitude-damping Shor codes with immunity to collective coherent errors *(13 pages)* 052602
En-Jui Chang and Ching-Yi Lai

Generating graph states with a single quantum emitter and the minimum number of fusions *(16 pages)* 052604
Matthias C. Löbl, Love A. Pettersson, Andrew Jena, Luca Dellantonio, Stefano Paesani, and Anders S. Sørensen

(Continued)

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

The editors and referees of PRA find these papers to be of particular interest, importance, or clarity. Please see our Announcement Phys. Rev. A 88, 020001 (2013).

PHYSICAL REVIEW A **THIRD SERIES, VOLUME 111, NUMBER 5** **MAY 2025**

Carving entangled multiparticle states with exponentially improved fidelity *(7 pages)* 052426
Joshua Ramette, Josiah Sinclair, Zeyang Li, and Vladan Vuletić

Sequential information-theoretic protocols in continuous-variable systems *(12 pages)* 052427
Sudipta Das, Ayan Patra, Rivu Gupta, Aditi Sen(De), and Himadri Shekhar Dhar

Measuring entanglement along collective operators *(18 pages)* 052428
Éloi Descamps, Arne Keller, and Pérola Milman

Parallel transport in rotating frames and projective holonomic quantum computation *(7 pages)* 052429
Ole Sönnerborn

Isoholonomic inequality and tight implementations of holonomic quantum gates *(7 pages)* 052430
Ole Sönnerborn

Continuous-variable entanglement with orbital angular momentum multiplexing in coherently prepared media *(14 pages)* 052431
Fan Meng, Hao Zhu, Xin-Yao Huang, and Guo-Feng Zhang

Simple Hamiltonian dynamics as a powerful resource for image classification *(16 pages)* 052432
Akitada Sakurai, Aoi Hayashi, W. J. Munro, and Kae Nemoto

Unification of finite symmetries in the simulation of many-body systems on quantum computers *(27 pages)* 052433
Victor M. Bastidas, Nathan Fitzpatrick, K. J. Joven, Zane M. Rossi, Shariful Islam, Troy Van Voorhis, Isaac L. Chuang, and Yuan Liu

Locally stable sets without entanglement with minimum cardinality *(10 pages)* 052434
Xiao-Fan Zhen, Su-Juan Qin, Zheng-Ping Jin, Hui-Juan Zuo, and Fei Gao

Quantum simulations of macrorealism violation via the quantum nondemolition measurement protocol *(9 pages)* 052435
D. Melegari, M. Cardi, and P. Solinas

Supervised binary classification of small-scale digit images and weighted graphs with a trapped-ion quantum processor *(11 pages)* 052436
Ilia V. Zalivako, Alexander I. Gircha, Evgeniy O. Kiktenko, Anastasiia S. Nikolaeva, Denis A. Drozhzhin, Alexander S. Borisenko, Andrei E. Korolkov, Nikita V. Semenin, Kristina P. Galstyan, Pavel A. Kamenskikh, Vasilii N. Smirnov, Mikhail A. Aksenov, Pavel L. Sidorov, Ksenia Yu. Khabarova, Aleksey K. Fedorov, Nikolay N. Kolachevsky, and Ilya A. Semerikov

Quantum entanglement and Einstein-Podolsky-Rosen steering in ultrastrongly light-matter-coupled systems *(11 pages)* 052437
Yu-qiang Liu, Shan Sun, Yi-jia Yang, Zheng Liu, Xingdong Zhao, Zunlue Zhu, Wuming Liu, and Chang-shui Yu

Geometry from quantum temporal correlations *(5 pages)* 052438
James Fullwood and Vlatko Vedral

Observation of a full hierarchy of temporal quantum correlations with a superconducting qubit *(6 pages)* 052439
Hao-Cheng Weng, Chen-Yeh Wei, Huan-Yu Ku, Shin-Liang Chen, Yueh-Nan Chen, and Chih-Sung Chuu

Relation between quantum illumination and quantum parameter estimation *(13 pages)* 052440
Wei Zhong, Dong-Qing Wang, Wen-Yi Zhu, Lan Zhou, Ming-Ming Du, and Yu-Bo Sheng

(Continued)

This paper was highlighted in the APS publication *Physics* (physics.aps.org).
The editors and referees of PRA find these papers to be of particular interest, importance, or clarity. Please see our Announcement Phys. Rev. A 88, 020001 (2013).

PHYSICAL REVIEW A **THIRD SERIES, VOLUME 111, NUMBER 5** **MAY 2025**

Port-based telecloning of an unknown quantum state *(10 pages)* 052408
Reiji Okada, Kohtaro Kato, and Francesco Buscemi

Characterization of randomness in quantum circuits of continuous gate sets *(36 pages)* 052409
Yosuke Mitsuhashi, Ryotaro Suzuki, Tomohiro Soejima, and Nobuyuki Yoshioka

Extremal maximal entanglement *(10 pages)* 052410
Wanchen Zhang, Yu Ning, Fei Shi, and Xiande Zhang

Dynamics of correlations and entanglement generation in electron-molecule inelastic scattering *(16 pages)* 052411
Martin Mendez and Federico M. Pont

Generating entanglement of two acoustic modes by driving the qubit in a circuit quantum acoustodynamics system *(8 pages)* 052412
Mei-Rong Wei, Qi Guo, Gang Li, and Tiancai Zhang

Noise-adapted quantum error correction for non-Markovian noise *(15 pages)* 052413
Debjyoti Biswas, Shrikant Utagi, and Prabha Mandayam

Symmetry-protected Landau-Zener-Stückelberg-Majorana interference and nonadiabatic topological transport of edge states *(10 pages)* 052414
Shi Hu, Shihao Li, Meiqing Hu, and Zhoutao Lei

Dynamical multipartite entanglement in a generalized Tavis-Cummings model with XY spin interaction *(11 pages)* 052415
Yuguo Su, Zhijie Sun, Yiying Yan, Hengyan Wang, Junyan Luo, Tiantian Ying, Hongbin Liang, and Yi-Xiao Huang

Quantum walk on a square lattice with identical particles *(14 pages)* 052416
Gonzalo Camacho, Jasmin Meinecke, and Janik Wolters

Insufficiency of pure-state ensembles in characterizing transformations of entangled states under local operations and classical communication *(7 pages)* 052417
C. L. Liu, Baoqing Sun, and D. L. Zhou

Unexpected consequences of postquantum theories in the graph-theoretical approach to correlations *(7 pages)* . . . 052418
José Nogueira, Carlos Vieira, and Marcelo Terra Cunha

High-fidelity initialization of a logical qubit with multiple injections *(8 pages)* 052419
Zhi-Cheng He and Zheng-Yuan Xue

Quantifying magic resource for quantum channels via channel-state duality *(12 pages)* 052420
Xiaohui Li, Shunlong Luo, and Zijian Zhang

Informational nonequilibrium concentration *(8 pages)* 052423
Chung-Yun Hsieh, Benjamin Stratton, Hao-Cheng Weng, and Valerio Scarani

Inevitable negativity: Additivity commands negative quantum channel entropy *(12 pages)* 052424
Gilad Gour, Doyeong Kim, Takla Nateeboon, Guy Shemesh, and Goni Yoeli

Characterizing non-Markovian quantum processes by fast Bayesian tomography *(11 pages)* 052425
R. Y. Su, J. Y. Huang, N. Dumoulin Stuyck, M. K. Feng, W. Gilbert, T. J. Evans, W. H. Lim, F. E. Hudson, K. W. Chan, W. Huang, Kohei M. Itoh, R. Harper, S. D. Bartlett, C. H. Yang, A. Laucht, A. Saraiva, A. S. Dzurak, and T. Tanttu

(Continued)

This paper was highlighted in the APS publication *Physics* (physics.aps.org).
The editors and referees of PRA find these papers to be of particular interest, importance, or clarity. Please see our Announcement Phys. Rev. A 88, 020001 (2013).

PHYSICAL REVIEW A **THIRD SERIES, VOLUME 111, NUMBER 5** **MAY 2025**

Entropy flow in a parametric amplifier *(9 pages)* 052210
Sergei Khlebnikov

Möbius games and other Bell tests for relativity *(15 pages)* 052211
Eleftherios-Ermis Tselentis and Ämin Baumeler

Effect of atom-oscillator interaction on the aging transition in coupled oscillators *(11 pages)* 052212
Huining Zhang, X. Z. Hao, and X. X. Yi

Heisenberg and Heisenberg-like representations via Hilbert-space-bundle geometry in the non-Hermitian regime *(7 pages)* 052213
Chia-Yi Ju, Adam Miranowicz, Jacob Barnett, Guang-Yin Chen, and Franco Nori

Subskin modes in a nonlinear non-Hermitian system *(6 pages)* 052214
C. Yuce

Parametric hypersensitivity and transport in the steady-state open-system Holstein model *(14 pages)* 052215
Nishaant Jacobus, Paul Brumer, and Chern Chuang

Topological quantum thermometry *(9 pages)* 052216
Anubhav Kumar Srivastava, Utso Bhattacharya, Maciej Lewenstein, and Marcin Płodzień

Negativity of nondemolition quasiprobability distribution as a necessary and sufficient condition for macrorealism violation *(10 pages)* 052217
Paolo Solinas and Stefano Gherardini

Spatial offset of excited states in non-Hermitian lattices *(6 pages)* 052218
Xiaohan Jiang, Yuanyuan Pan, Yang Zhang, and Ye Xiong

Quantum information science

Clifford-dressed variational principles for precise Loschmidt echoes *(7 pages)* 052401
Antonio Francesco Mello, Alessandro Santini, and Mario Collura

Slow decay rate of correlations induced by long-range extended Dzyaloshinskii-Moriya interactions *(13 pages)* 052402
Tanoy Kanti Konar, Leela Ganesh Chandra Lakkaraju, and Aditi Sen(De)

Machine-learning insights into the entanglement-trainability correlation of parametrized quantum circuits *(11 pages)* 052403
Shikun Zhang, Yang Zhou, Zheng Qin, Rui Li, Chunxiao Du, Zhisong Xiao, and Yongyou Zhang

Improving parameter estimation in Gaussian channels using quantum coherence *(14 pages)* 052404
Jonas F. G. Santos, Carlos H. S. Vieira, and Wilder R. Cardoso

Quantum data-hiding scheme using orthogonal separable states *(8 pages)* 052405
Donghoon Ha and Jeong San Kim

Hypothesis testing of symmetry in quantum dynamics *(12 pages)* 052406
Yu-Ao Chen, Chenghong Zhu, Keming He, Yingjian Liu, and Xin Wang

Broadband spectroscopy of quantum noise *(27 pages)* 052407
Yuanlong Wang and Gerardo A. Paz-Silva

(Continued)

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

The editors and referees of PRA find these papers to be of particular interest, importance, or clarity. Please see our Announcement Phys. Rev. A 88, 020001 (2013).

PHYSICAL REVIEW A THIRD SERIES, VOLUME 111, NUMBER 5 MAY 2025

Ultracold systems and matter waves

Unconventional spin Hall effect in $\mathcal{PT}$-symmetric spin-orbit-coupled quantum gases *(6 pages)* L051301
Hui Tang, Guan-Hua Huang, Shizhong Zhang, Zhongbo Yan, and Zhigang Wu

Interaction shift of the Bose-Einstein condensation temperature in a dipolar gas *(5 pages)* L051303
Milan Krstajić, Jiří Kučera, Lucas R. Hofer, Gavin Lamb, Péter Juhász, and Robert P. Smith

Dimer problem on a spherical surface *(6 pages)* L051304
A. Tononi, D. S. Petrov, and M. Lewenstein

Shortcut to spin dynamics in quantum mixtures *(6 pages)* L051305
Pablo Capuzzi, Zehra Akdeniz, and Patrizia Vignolo

Semisuper Efimov effect induced by resonant pair exchange in mixed dimensions *(5 pages)* L051306
Yusuke Nishida

Self-sustained Josephson dynamics and self-trapping in supersolids *(6 pages)* L051307
Aitor Alaña, Michele Modugno, Pablo Capuzzi, and D. M. Jezek

ARTICLES

Fundamental concepts

General-relativistic particle trajectories via quantum mechanical weak values and the Schwarzschild-Alcubierre spacetime *(12 pages)* 052201
Joshua Foo, Cameron Bellamy, and Timothy C. Ralph

Superclassical non-Markovian open quantum dynamics *(11 pages)* 052202
Adrián A. Budini

Parametric approximation as an open-quantum-system problem *(11 pages)* 052203
Artem Karasev and Alexander Teretenkov

Two fundamental solutions to the rigid Kochen-Specker set problem and the solution to the minimal Kochen-Specker set problem under one assumption *(16 pages)* 052204
Stefan Trandafir and Adán Cabello

Characterizing quantum state-space with a single quantum measurement *(10 pages)* 052205
Matthew B. Weiss

Time-convolutionless master equation applied to adiabatic elimination *(20 pages)* 052206
Masaaki Tokieda and Angela Riva

Spin-dependent force and inverted harmonic potential for rapid creation of macroscopic quantum superpositions *(15 pages)* 052207
Run Zhou, Qian Xiang, and Anupam Mazumdar

Measurement incompatibility at both parties unrelated to Bell nonlocality in a two-input and two-output setting *(8 pages)* 052208
Priya Ghosh, Chirag Srivastava, Swati Choudhary, and Ujjwal Sen

Quantum thermodynamics as a gauge theory *(19 pages)* 052209
Gabriel Fernandez Ferrari, Łukasz Rudnicki, and Lucas C. Céleri

(Continued)

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

The editors and referees of PRA find these papers to be of particular interest, importance, or clarity. Please see our Announcement Phys. Rev. A 88, 020001 (2013).

PHYSICAL REVIEW A™

For editorial and subscription correspondence, please see inside front cover
(ISSN: 2469-9926)

PERIODICALS
Postmaster send address changes to:

APS Subscription Services
P.O. Box 41
Annapolis Junction, MD 20701

THIRD SERIES, VOLUME 111, NUMBER 5
PARTS A AND B

CONTENTS

MAY 2025

The Table of Contents is a total listing of Parts A and B.
Part A consists of pages 050101–052629, and Part B pages 052801–059902(E).

PART A

Perspectives

Antihydrogen chemistry *(17 pages)* 050101
Mark C. Zammit, Christopher J. Baker, Svante Jonsell, Stefan Eriksson, and Michael Charlton

LETTERS

Fundamental concepts

Optimal control in nearly adiabatic two-level quantum systems via time-dependent resonance *(6 pages)* L050201
Takayuki Suzuki

Manifolds of exceptional points and effective Zeno limit of an open two-qubits system *(6 pages)* L050202
Vladislav Popkov, Carlo Presilla, and Mario Salerno

Generalization of exact operators of the Foldy-Wouthuysen transformation to arbitrary-spin particles in nonstationary fields *(6 pages)* L050203
Alexander J. Silenko

Quantum information science

Erasing imaginarity: An operational method *(6 pages)* L050401
Xian Shi

Direct and efficient detection of quantum superposition *(6 pages)* L050402
Daniel Kun, Teodor Strömberg, Michele Spagnolo, Borivoje Dakić, Lee A. Rozema, and Philip Walther

Atomic and molecular structure and dynamics; high-precision experiments

Hyperfine anomaly in mercury and test of the Moskowitz-Lombardi rule *(6 pages)* L050801
J. Vandeleur, G. Sanamyan, B. M. Roberts, and J. S. M. Ginges

Laser spectroscopy on the hyperfine structure and isotope shift of sympathetically cooled $^{229}Th^{3+}$ ions *(5 pages)* L050802
G. Zitzer, J. Tiedau, Ch. E. Düllmann, M. V. Okhapkin, and E. Peik

(Continued)

2469-9926(202505)111:5:B;1-U

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

The editors and referees of PRA find these papers to be of particular interest, importance, or clarity. Please see our Announcement Phys. Rev. A 88, 020001 (2013).