PHYSICAL REVIEW A **THIRD SERIES, VOLUME 103, NUMBER 4** **APRIL 2021**

Positive operator-valued measure for two-photon detection via sum-frequency generation *(9 pages)* 043711
Sofiane Merkouche, Valérian Thiel, and Brian J. Smith

Superradiance from nonideal initial states: A quantum trajectory approach *(10 pages)* 043712
Sebastian Fuchs, András Vukics, and Stefan Yoshi Buhmann

Gain without inversion and enhancement of refractive index via intervalley quantum coherence transfer in hybrid WS_2-metallic nanoantenna systems *(8 pages)* 043713
Seyed M. Sadeghi and Judy Z. Wu

Collectively driven optical nanoantennas *(12 pages)* 043714
Jian Wen Choong, Nikita Nefedkin, and Alex Krasnok

Quantum Zeno effect in self-sustaining systems: Suppressing phase diffusion via repeated measurements *(9 pages)* 043715
Wenlin Li, Najmeh Es'haqi-Sani, Wen-Zhao Zhang, and David Vitali

Single collective excitation of an atomic array trapped along a waveguide: A study of cooperative emission for different atomic chain configurations *(12 pages)* 043716
V. A. Pivovarov, L. V. Gerasimov, J. Berroir, T. Ray, J. Laurat, A. Urvoy, and D. V. Kupriyanov

Correspondence Fourier-transform ghost imaging *(11 pages)* 043717
Chenyu Hu, Ruiguo Zhu, Hong Yu, and Shensheng Han

Quantum Borrmann effect for dissipation-immune photon-photon correlations *(10 pages)* 043718
Alexander V. Poshakinskiy and Alexander N. Poddubny

Microwave multiphoton conversion via coherently driven permanent dipole systems *(7 pages)* 043719
Alexandra Mîrzac, Sergiu Carlig, and Mihai A. Macovei

Engineering multipartite coupling in doubly pumped parametric down-conversion processes *(16 pages)* 043720
Alessandra Gatti, Enrico Brambilla, and Ottavia Jedrkiewicz

Quantum limits for stationary force sensing *(13 pages)* 043721
Farid Ya. Khalili and Emil Zeuthen

Photon-induced atom recoil in collectively interacting planar arrays *(12 pages)* 043722
Deepak A. Suresh and F. Robicheaux

Pulsed field transmission by atomic frequency combs and random spike media:
The prominent role of dispersion *(15 pages)* 043723
P. R. Berman and J.-L. Le Gouët

Strong photon blockade in an all-fiber emitter-cavity quantum electrodynamics system *(10 pages)* 043724
Zigeng Li, Xiaomiao Li, and Xiaolan Zhong

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 103, NUMBER 4 APRIL 2021

Spectral singularities with directional sensitivity *(7 pages)* 043516
Hamidreza Ramezani

Fundamental entropic processes in the theory of optical thermodynamics *(11 pages)* 043517
Nikolaos K. Efremidis and Demetrios N. Christodoulides

Early-time behavior of quantum subharmonic generation *(5 pages)* 043518
Yunjin Choi, Boerge Hemmerling, Shan-Wen Tsai, and Allen P. Mills, Jr.

Quantum estimation in strong fields: *In situ* ponderomotive sensing *(18 pages)* 043519
A. S. Maxwell, A. Serafini, S. Bose, and C. Figueira de Morisson Faria

Continuous-variable multipartite vibrational entanglement *(11 pages)* 043520
Mehdi Abdi

Thermophonon flux in double-cavity optomechanics *(9 pages)* 043521
Yu Wu, Wenjie Nie, Guoyao Li, Aixi Chen, and Yueheng Lan

Quantum optics

Wave-function engineering via conditional quantum teleportation with a non-Gaussian entanglement resource *(12 pages)* 043701
Warit Asavanant, Kan Takase, Kosuke Fukui, Mamoru Endo, Jun-ichi Yoshikawa, and Akira Furusawa

Linear combination estimator of multiple-outcome detections with discrete measurement outcomes *(9 pages)* 043702
L. K. Zhou, J. H. Xu, W.-Z. Zhang, J. Cheng, T. S. Yin, Y. B. Yu, R. P. Chen, A. X. Chen, G. R. Jin, and W. Yang

Directional emission of down-converted photons from a dielectric nanoresonator *(13 pages)* 043703
Anna Nikolaeva, Kristina Frizyuk, Nikita Olekhno, Alexander Solntsev, and Mihail Petrov

Magnon-assisted photon-phonon conversion in the presence of structured environments *(10 pages)* 043704
Shi-fan Qi and Jun Jing

Ancilla-mediated qubit readout and heralded entanglement between rare-earth dopant ions in crystals *(11 pages)* 043705
Kamanasish Debnath, Alexander Holm Kiilerich, and Klaus Mølmer

Enhancing spin-photon coupling with a micromagnet *(10 pages)* 043706
Xin-Lei Hei, Xing-Liang Dong, Jia-Qiang Chen, Cai-Peng Shen, Yi-Fan Qiao, and Peng-Bo Li

Violating the Leggett-Garg inequalities with classical light *(9 pages)* 043707
Hadrien Chevalier, A. J. Paige, Hyukjoon Kwon, and M. S. Kim

Multiple ground-state instabilities in the anisotropic quantum Rabi model *(7 pages)* 043708
Xiang-You Chen, Liwei Duan, Daniel Braak, and Qing-Hu Chen

Giant Kerr nonlinearities and magneto-optical rotations in a Rydberg-atom gas via double electromagnetically induced transparency *(16 pages)* 043709
Yue Mu, Lu Qin, Zeyun Shi, and Guoxiang Huang

Fully autocompensating high-dimensional quantum cryptography by quantum degenerate four-wave mixing *(12 pages)* 043710
Jesús Liñares, Xesús Prieto-Blanco, Daniel Balado, and Gabriel M. Carral

(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 103, NUMBER 4 APRIL 2021

Photonics, nonlinear optics, and optomechanics

Atomic Faraday beam splitter for light generated from pump-degenerate four-wave mixing in a hollow-core photonic crystal fiber *(8 pages)* 043501
Ioannis Caltzidis, Harald Kübler, Tilman Pfau, Robert Löw, and Mark A. Zentile

Nonlinear dynamics of coupled light and particle beam propagation *(10 pages)* 043502
Prabhat Kumar, Derek Kuldinow, Andres Castillo, Alexandros Gerakis, and Kentaro Hara

Spectral correlations in a fiber-optical parametric oscillator *(9 pages)* 043503
Mohamed Touil, Rezki Becheker, Thomas Godin, and Ammar Hideur

Effect of Coulomb interaction on the transient optical response of electrons in field-coupled quantum dots *(19 pages)* 043504
Xuejun Lu, Danhong Huang, and Shanhui Fan

Switching the angular direction of radiation by the handedness of a circular dipole in the vicinity of a subwavelength Mie scatterer *(11 pages)* 043505
Jorge R. Zurita-Sánchez

Laguerre-Gaussian optical sum-sideband generation via orbital angular momentum exchange *(8 pages)* 043506
Hao Xiong, Ya-Min Huang, and Ying Wu

Conditional robustness of propagating bound states in the continuum in structures with two-dimensional periodicity *(10 pages)* 043507
Lijun Yuan and Ya Yan Lu

Maxwell-Bloch modeling of an x-ray-pulse amplification in a one-dimensional photonic crystal *(10 pages)* 043508
O. Peyrusse, P. Jonnard, and J.-M. André

Two-photon blockade generated and enhanced by mechanical squeezing *(6 pages)* 043509
Ling-Juan Feng and Shang-Qing Gong

Tuning exceptional points with Kerr nonlinearity *(8 pages)* 043510
Shahab Ramezanpour and Andrey Bogdanov

Feedback-induced locking in semiconductor lasers with strong amplitude-phase coupling *(11 pages)* 043511
Jan Hausen, Bastian Herzog, Alexander Nelde, Stefan Meinecke, Nina Owschimikow, and Kathy Lüdge

Circularly polarized states and propagating bound states in the continuum in a periodic array of cylinders *(8 pages)* 043512
Amgad Abdrabou and Ya Yan Lu

Coherent single-spin electron resonance spectroscopy manifested at an exceptional-point singularity in doped polyacetylene *(18 pages)* 043513
Yujin Dunham, Kazuki Kanki, Savannah Garmon, Satoshi Tanaka, and Gonzalo Ordonez

Theory of nanoparticle cooling by elliptic coherent scattering *(14 pages)* 043514
Henning Rudolph, Jonas Schäfer, Benjamin A. Stickler, and Klaus Hornberger

Transition between optical turbulence and dissipative solitons in a complex Ginzburg-Landau equation with quasi-cw noise *(7 pages)* 043515
Ruijing He, Jiangyong He, Caiyun Li, Luhe Zhang, Longfei Zhu, Mengjie Zhou, Kaiyan Zhu, Yange Liu, Yang Yue, and Zhi 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 103, NUMBER 4** **APRIL 2021**

Quantum adiabatic doping for atomic Fermi-Hubbard quantum simulations *(8 pages)* 043320
Jue Nan, Jian Lin, Yuchen Luo, Bo Zhao, and Xiaopeng Li

Intercomponent entanglement entropy and spectrum in binary Bose-Einstein condensates *(14 pages)* 043321
Takumi Yoshino, Shunsuke Furukawa, and Masahito Ueda

Driven-dissipative control of cold atoms in tilted optical lattices *(10 pages)* 043322
Vaibhav Sharma and Erich J. Mueller

Rydberg atom-ion collisions in cold environments *(8 pages)* 043323
Henrik Hirzler and Jesús Pérez-Ríos

Collisionless sound of bosonic superfluids in lower dimensions *(6 pages)* 043324
L. Salasnich and F. Sattin

Dynamical evolution in a one-dimensional incommensurate lattice with $\mathcal{PT}$ symmetry *(11 pages)* 043325
Zhihao Xu and Shu Chen

Bosonic quantum dynamics following colliding potential wells *(11 pages)* 043326
Fabian Köhler and Peter Schmelcher

Spatial entanglement in interacting Bose-Einstein condensates *(14 pages)* 043327
N. Sánchez-Kuntz and S. Floerchinger

Interaction-induced topological Bogoliubov excitations in a spin-orbit-coupled Bose-Einstein condensate *(8 pages)* 043328
Guan-Hua Huang, Guang-Quan Luo, Zhigang Wu, and Zhi-Fang Xu

Geometry and superfluidity of the flat band in a non-Hermitian optical lattice *(10 pages)* 043329
Peng He, Hai-Tao Ding, and Shi-Liang Zhu

Pairing and the spin susceptibility of the polarized unitary Fermi gas in the normal phase *(11 pages)* 043330
Lukas Rammelmüller, Yaqi Hou, Joaquín E. Drut, and Jens Braun

Cluster dynamics in two-dimensional lattice gases with intersite interactions *(8 pages)* 043331
Wei-Han Li, Arya Dhar, Xiaolong Deng, and Luis Santos

Finite-size scaling analysis of localization transitions in the disordered two-dimensional Bose-Hubbard model within the fluctuation operator expansion method *(15 pages)* 043332
Andreas Geißler

Ground states of two-dimensional tilted dipolar bosons with density-induced hopping *(8 pages)* 043333
Chao Zhang, Jin Zhang, Jin Yang, and Barbara Capogrosso-Sansone

Extracting nonlocal interpolaron interactions from collisional dynamics *(7 pages)* 043334
Junichi Takahashi, Hiroyuki Tajima, Eiji Nakano, and Kei Iida

Quantum lock-in detection of a vector light shift *(6 pages)* 043335
Kosuke Shibata, Naota Sekiguchi, and Takuya Hirano

Collective excitations of superfluid Fermi gases near the transition temperature *(20 pages)* 043336
S. N. Klimin, J. Tempere, and H. Kurkjian

(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 103, NUMBER 4** **APRIL 2021**

Temporal fluctuation-induced order in conventional superconductors *(8 pages)* 043303
D. C. W. Foo and G. J. Conduit

Stability analysis and attractor dynamics of three-dimensional dark solitons with localized dissipation *(7 pages)* 043304
Christian Baals, Alexandre Gil Moreno, Jian Jiang, Jens Benary, and Herwig Ott

Stability of supercurrents in a superfluid phase of spin-1 bosons in an optical lattice *(20 pages)* 043305
Shion Yamashika, Ryosuke Yoshii, and Shunji Tsuchiya

Aberrations in (3+1)-dimensional Bragg diffraction using pulsed Laguerre-Gaussian laser beams *(20 pages)* 043306
A. Neumann, M. Gebbe, and R. Walser

Field-theoretical aspects of one-dimensional Bose and Fermi gases with contact interactions *(16 pages)* 043307
Yuta Sekino and Yusuke Nishida

Rydberg-dressed Fermi liquid: Correlations and signatures of droplet crystallization *(9 pages)* 043308
Iran Seydi, Saeed H. Abedinpour, Reza Asgari, Martin Panholzer, and B. Tanatar

Understanding superradiant phenomena with synthetic vector potentials in atomic Bose-Einstein condensates *(23 pages)* 043309
Luca Giacomelli and Iacopo Carusotto

Effect of disorder on topological charge pumping in the Rice-Mele model *(14 pages)* 043310
A. L. C. Hayward, E. Bertok, U. Schneider, and F. Heidrich-Meisner

Magic conditions for multiple rotational states of bialkali molecules in optical lattices *(11 pages)* 043311
Q. Guan, Simon L. Cornish, and S. Kotochigova

Simulating an exact one-dimensional transverse Ising model in an optical lattice *(7 pages)* 043312
Ren Liao, Fangyu Xiong, and Xuzong Chen

Enhanced sensitivity to ultralight bosonic dark matter in the spectra of the linear radical SrOH *(14 pages)* 043313
Ivan Kozyryev, Zack Lasner, and John M. Doyle

Dynamical localization of interacting bosons in the few-body limit *(10 pages)* 043314
Radu Chicireanu and Adam Rançon

Controlling directed atomic motion and second-order tunneling of a spin-orbit-coupled atom in optical lattices *(12 pages)* 043315
Xiaobing Luo, Zhao-Yun Zeng, Yu Guo, Baiyuan Yang, Jinpeng Xiao, Lei Li, Chao Kong, and Ai-Xi Chen

Thermal instability, evaporation, and thermodynamics of one-dimensional liquids in weakly interacting Bose-Bose mixtures *(11 pages)* 043316
Giulia De Rosi, Grigori E. Astrakharchik, and Pietro Massignan

Finite-temperature instabilities of a two-dimensional dipolar Bose gas at arbitrary tilt angle *(6 pages)* 043317
Pengtao Shen and Khandker F. Quader

Engineering analog quantum chemistry Hamiltonians using cold atoms in optical lattices *(25 pages)* 043318
Javier Argüello-Luengo, Tao Shi, and Alejandro González-Tudela

Universal nomogram for the atomtronic quantum rotation sensor *(7 pages)* 043319
Ehsan Arabahmadi, Daniel Schumayer, and David A. W. Hutchinson

(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 103, NUMBER 4** **APRIL 2021**

Establishing a nearly closed cycling transition in a polyatomic molecule *(13 pages)* 043111
Louis Baum, Nathaniel B. Vilas, Christian Hallas, Benjamin L. Augenbraun, Shivam Raval, Debayan Mitra, and John M. Doyle

Quantum control of entangled photon-pair generation in electron-atom collisions driven by laser-synthesized free-electron wave packets *(13 pages)* 043112
R. Esteban Goetz and Klaus Bartschat

Multichannel-resolved dynamics in resonance-enhanced below-threshold harmonic generation of H_2^+ molecular ions *(6 pages)* 043113
Peng-Cheng Li, Zhi-Bin Wang, and Shih-I Chu

Polarization control of quasimonochromatic XUV light produced via resonant high-order harmonic generation *(8 pages)* 043114
M. A. Khokhlova, M. Yu. Emelin, M. Yu. Ryabikin, and V. V. Strelkov

Comparison study on atomic and molecular ellipticity dependence of high-order harmonic generation *(9 pages)* 043115
Qinghua Gao, Shi Chen, Hongjing Liang, Yichen Wang, Chengrui Bi, Shuai Ben, Ri Ma, Dajun Ding, and Jing Chen

Atomic spin-exchange collisions in magnetic fields *(15 pages)* 043116
Wei Xiao, Teng Wu, Xiang Peng, and Hong Guo

Enhancement of high-order harmonic generation in two-dimensional materials by plasmonic fields *(8 pages)* 043117
Xiao-Yuan Wu, Hao Liang, Xiao-Shuang Kong, Qihuang Gong, and Liang-You Peng

Distortion of Rabi oscillations in a compact cold-atom clock *(6 pages)* 043118
Xinchuan Ouyang, Bowen Yang, Qingqing Hu, Hanghang Qi, Ling Xiao, Jinyin Wan, and Huadong Cheng

Super-Coster-Kronig decay of Kr 3*p* core-hole states studied by multielectron coincidence spectroscopy *(8 pages)* 043119
Y. Hikosaka, P. Lablanquie, T. Kaneyasu, J. Adachi, H. Tanaka, I. H. Suzuki, M. Ishikawa, and T. Odagiri

Strong-field ionization of water: Nuclear dynamics revealed by varying the pulse duration *(9 pages)* 043120
A. J. Howard, C. Cheng, R. Forbes, G. A. McCracken, W. H. Mills, V. Makhija, M. Spanner, T. Weinacht, and P. H. Bucksbaum

Observation of the quantum shift of a backward rescattering caustic by carrier-envelope phase mapping *(12 pages)* 043121
Tomoya Mizuno, Nobuhisa Ishii, Teruto Kanai, Philipp Rosenberger, Dominik Zietlow, Matthias F. Kling, Oleg I. Tolstikhin, Toru Morishita, and Jiro Itatani

Angle-resolved Rabi flopping in strong-field dissociation of molecules *(6 pages)* 043122
Chen-Xi Hu, Wei-Zhe Li, Wen-Bin Zhang, Xiao-Chun Gong, Jian Wu, and Feng He

Ultracold systems and matter waves

Preparation of one-dimensional chains and dense cold atomic clouds with a high numerical aperture four-lens system *(8 pages)* 043301
Antoine Glicenstein, Giovanni Ferioli, Ludovic Brossard, Yvan R. P. Sortais, Daniel Barredo, Florence Nogrette, Igor Ferrier-Barbut, and Antoine Browaeys

Eigenspectrum, Chern numbers and phase diagrams of ultracold color-orbit-coupled SU(3) fermions in optical lattices *(14 pages)* 043302
Man Hon Yau and C. A. R. Sá de Melo

(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 103, NUMBER 4 APRIL 2021

Redefined vacuum approach and gauge-invariant subsets in two-photon-exchange diagrams for a closed-shell system with a valence electron *(16 pages)* 042818
R. N. Soguel, A. V. Volotka, E. V. Tryapitsyna, D. A. Glazov, V. P. Kosheleva, and S. Fritzsche

Parity-violation effects in the vibrational spectra of CHFClBr and CDFClBr *(9 pages)* 042819
Guntram Rauhut and Peter Schwerdtfeger

Anomalous light-induced broadening of the spin-noise resonance in cesium vapor *(9 pages)* 042820
A. A. Fomin, M. Yu. Petrov, G. G. Kozlov, A. K. Vershovskii, M. M. Glazov, and V. S. Zapasskii

Cesium Rydberg-state ionization study by three-dimensional ion-electron correlation: Toward a monochromatic electron source *(8 pages)* 042821
R. Hahn, A. Trimeche, C. Lopez, D. Comparat, and Y. J. Picard

PART B

Light-induced processes in atomic-scale systems

Analog de Sitter space in a controlled Coulomb explosion *(5 pages)* 043101
Eugene B. Kolomeisky

Probing ultrafast coherent dynamics in core-excited xenon by using attosecond XUV-NIR transient absorption spectroscopy *(11 pages)* 043102
Daria Kolbasova, Maximilian Hartmann, Rui Jin, Alexander Blättermann, Christian Ott, Sang-Kil Son, Thomas Pfeifer, and Robin Santra

Selective dissociation of the spectator Auger final states in O_2 molecules *(6 pages)* 043103
Lifang Tian, Bocheng Ding, Christophe Nicolas, Ruichang Wu, Yunfei Feng, Minna Patanen, Saikat Nandi, John Bozek, Catalin Miron, and Xiao-Jing Liu

Evolution of the velocity distribution of atoms under the action of the bichromatic force *(8 pages)* 043104
V. I. Romanenko and L. P. Yatsenko

Preparing narrow velocity distributions for quantum memories in room-temperature alkali-metal vapors *(7 pages)* 043105
D. Main, T. M. Hird, S. Gao, E. Oguz, D. J. Saunders, I. A. Walmsley, and P. M. Ledingham

Origin of symmetry-forbidden high-order harmonic generation in the time-dependent Kohn-Sham formulation *(9 pages)* 043106
Xiaoning Zang, Ce Shang, Pengcheng Zhang, Yalei Zhu, Zhiyong Zhu, and Udo Schwingenschlögl

Dissociation dynamics of multiply charged CH_3I in moderately intense laser fields *(11 pages)* 043107
Arnab Sen, S. Mandal, Sanket Sen, Bhas Bapat, R. Gopal, and V. Sharma

Calculation of multiphoton ionization amplitudes and cross sections of few-electron atoms *(11 pages)* 043108
Andrej Mihelič and Martin Horvat

Triple ionization and frustrated triple ionization in triatomic molecules driven by intense laser fields *(7 pages)* . . . 043109
M. B. Peters, V. P. Majety, and A. Emmanouilidou

Coherent scattering of an optically modulated electron beam by atoms *(20 pages)* 043110
Yuya Morimoto, Peter Hommelhoff, and Lars Bojer Madsen

(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 103, NUMBER 4** **APRIL 2021**

$\mathcal{P}, \mathcal{T}$-odd Faraday rotation in intracavity absorption spectroscopy with a molecular beam as a possible way to improve the sensitivity of the search for time-reflection-noninvariant effects in nature *(8 pages)* 042802
D. V. Chubukov, L. V. Skripnikov, A. N. Petrov, V. N. Kutuzov, and L. N. Labzowsky

Quantum corrections to the classical electrostatic interaction between induced dipoles *(7 pages)* 042803
Yongshun Hu, Jiawei Hu, and Hongwei Yu

Single ionization of an asymmetric diatomic system by relativistic charged projectiles *(15 pages)* 042804
A. Jacob, C. Müller, and A. B. Voitkiv

Observation of asymmetric line shapes in precision microwave spectroscopy of the positronium $2\,^3S_1 \rightarrow 2\,^3P_J$ ($J = 1, 2$) fine-structure intervals *(18 pages)* 042805
L. Gurung, T. J. Babij, J. Pérez-Ríos, S. D. Hogan, and D. B. Cassidy

Blackbody-radiation-noise broadening of quantum systems *(8 pages)* 042806
Eric B. Norrgard, Stephen P. Eckel, Christopher L. Holloway, and Eric L. Shirley

Radiative polarization dynamics of relativistic electrons in an intense electromagnetic field *(9 pages)* 042807
Yuhui Tang, Zheng Gong, Jinqing Yu, Yinren Shou, and Xueqing Yan

Imaging ring-current wave packets in the helium atom *(10 pages)* 042808
J. Venzke, A. Becker, and A. Jaron-Becker

Complete $\alpha^7 m$ Lamb shift of helium triplet states *(10 pages)* 042809
Vojtěch Patkóš, Vladimir A. Yerokhin, and Krzysztof Pachucki

Dissociative ionization of OCS induced by highly charged ion impact *(11 pages)* 042810
Bo Wang, Jie Han, Xiaolong Zhu, Long Wei, Baihui Ren, Yu Zhang, Wandong Yu, Shuncheng Yan, Xinwen Ma, Yaming Zou, Li Chen, and Baoren Wei

Fermi-Löwdin-orbital self-interaction correction using the optimized-effective-potential method within the Krieger-Li-Iafrate approximation *(13 pages)* 042811
Carlos M. Diaz, Tunna Baruah, and Rajendra R. Zope

Magnetic moments of lanthanide van der Waals dimers *(11 pages)* 042812
Joseph McCann, John L. Bohn, and Lucie D. Augustovičová

Coulomb-explosion imaging of carbon monoxide dimers *(12 pages)* 042813
A. Méry, V. Kumar, X. Fléchard, B. Gervais, S. Guillous, M. Lalande, J. Rangama, W. Wolff, and A. Cassimi

Confined variational calculations of low-energy electron-helium scattering *(6 pages)* 042814
J.-Y. Wan, M.-S. Wu, J.-Y. Zhang, and Z.-C. Yan

Role of triple excitations in calculating different properties of Ba^+ *(8 pages)* 042815
S. G. Porsev and M. S. Safronova

Collins conjecture and information entropy in dissociating diatomic molecules *(7 pages)* 042816
Yu Wang, Feng Wang, Xiaowei Sheng, Yafei Yu, P. J. Knowles, and Jian Wang

Observation of electric-dipole transitions in the laser-cooling candidate Th^- and its application for cooling antiprotons *(12 pages)* 042817
Rulin Tang, Ran Si, Zejie Fei, Xiaoxi Fu, Yuzhu Lu, Tomas Brage, Hongtao Liu, Chongyang Chen, and Chuangang Ning

(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 103, NUMBER 4** **APRIL 2021**

Experimental realization of Hamiltonian tomography by quantum quenches *(7 pages)* 042429
Xi Chen, Yuchen Li, Ze Wu, Ran Liu, Zhaokai Li, and Hui Zhou

Quantum technologies

Generalization of Rayleigh's criterion on parameter estimation with incoherent sources *(10 pages)* 042601
Lijun Peng and Xiao-Ming Lu

Experimental function estimation from quantum phase measurements *(8 pages)* 042602
Ilaria Gianani, Francesco Albarelli, Valeria Cimini, and Marco Barbieri

Modeling noisy quantum circuits using experimental characterization *(11 pages)* 042603
Megan L. Dahlhauser and Travis S. Humble

Experimental Pauli-frame randomization on a superconducting qubit *(9 pages)* 042604
Matthew Ware, Guilhem Ribeill, Diego Ristè, Colm A. Ryan, Blake Johnson, and Marcus P. da Silva

Mitigating measurement errors in multiqubit experiments *(12 pages)* 042605
Sergey Bravyi, Sarah Sheldon, Abhinav Kandala, David C. Mckay, and Jay M. Gambetta

Classical communication through quantum causal structures *(11 pages)* 042606
Kaumudibikash Goswami and Fabio Costa

Continuous real-time sensing with a nitrogen-vacancy center via coherent population trapping *(10 pages)* 042607
Shu-Hao Wu, Ethan Turner, and Hailin Wang

Full-field quantum imaging with a single-photon avalanche diode camera *(11 pages)* 042608
Hugo Defienne, Jiuxuan Zhao, Edoardo Charbon, and Daniele Faccio

Consistency testing for robust phase estimation *(21 pages)* 042609
Antonio E. Russo, William M. Kirby, Kenneth M. Rudinger, Andrew D. Baczewski, and Shelby Kimmel

Singularities, mixing, and non-Markovianity of Pauli dynamical maps *(6 pages)* 042610
Shrikant Utagi, Vinod N. Rao, R. Srikanth, and Subhashish Banerjee

Double-port measurements for robust quantum optical metrology *(10 pages)* 042611
Wei Zhong, Lan Zhou, and Yu-Bo Sheng

MaxCut quantum approximate optimization algorithm performance guarantees for $p > 1$ *(15 pages)* 042612
Jonathan Wurtz and Peter Love

Recycling qubits in near-term quantum computers *(10 pages)* 042613
Galit Anikeeva, Isaac H. Kim, and Patrick Hayden

Idler-free channel position finding *(12 pages)* 042614
Jason L. Pereira, Leonardo Banchi, Quntao Zhuang, and Stefano Pirandola

Generalizable control for multiparameter quantum metrology *(13 pages)* 042615
Han Xu, Lingna Wang, Haidong Yuan, and Xin Wang

Atomic and molecular structure and dynamics; high-precision experiments

Spatial and temporal distribution of a 1-MeV proton microbeam guided through a poly(tetrafluoroethylene) macrocapillary *(12 pages)* 042801
G. U. L. Nagy, Z. T. Gaál, I. Rajta, and K. Tőkési

(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 103, NUMBER 4** **APRIL 2021**

Effect of source statistics on utilizing photon entanglement in quantum key distribution *(12 pages)* 042411
Radim Hošák, Ivo Straka, Ana Predojević, Radim Filip, and Miroslav Ježek

Quantum algorithms with local particle-number conservation: Noise effects and error correction *(12 pages)* 042412
Michael Streif, Martin Leib, Filip Wudarski, Eleanor Rieffel, and Zhihui Wang

Error rates and resource overheads of repetition cat qubits *(15 pages)* 042413
Jérémie Guillaud and Mazyar Mirrahimi

Quantum operator growth bounds for kicked tops and semiclassical spin chains *(9 pages)* 042414
Chao Yin and Andrew Lucas

Quantum spectral clustering *(11 pages)* 042415
Iordanis Kerenidis and Jonas Landman

Promoting quantum correlations in deterministic quantum computation with a one-qubit model via postselection *(7 pages)* 042416
Elisa I. Goettems, Thiago O. Maciel, Diogo O. Soares-Pinto, and E. I. Duzzioni

Exploring the relationship between the faithfulness and entanglement of two qubits *(9 pages)* 042417
Gabriele Riccardi, Daniel E. Jones, Xiao-Dong Yu, Otfried Gühne, and Brian T. Kirby

Fundamental limits for reciprocal and nonreciprocal non-Hermitian quantum sensing *(13 pages)* 042418
Liying Bao, Bo Qi, Daoyi Dong, and Franco Nori

Efficient phase-factor evaluation in quantum signal processing *(22 pages)* 042419
Yulong Dong, Xiang Meng, K. Birgitta Whaley, and Lin Lin

Quantum error correction architecture for qudit stabilizer codes *(20 pages)* 042420
Priya J. Nadkarni and Shayan Srinivasa Garani

Min-entropy as a resource for one-shot private state transfer, quantum masking, and state transition *(6 pages)* 042421
Seok Hyung Lie, Seongjeon Choi, and Hyunseok Jeong

Quantum-classical algorithms for skewed linear systems with an optimized Hadamard test *(18 pages)* 042422
Bujiao Wu, Maharshi Ray, Liming Zhao, Xiaoming Sun, and Patrick Rebentrost

Coherence as uncertainty *(9 pages)* 042423
Yuan Sun and Shunlong Luo

Quantum-enhanced algorithms for classical target detection in complex environments *(28 pages)* 042424
Peter B. Weichman

Fast high-fidelity multiqubit state transfer with long-range interactions *(11 pages)* 042425
Yifan Hong and Andrew Lucas

Coherence of operations and interferometry *(19 pages)* 042426
Michele Masini, Thomas Theurer, and Martin B. Plenio

Robust in practice: Adversarial attacks on quantum machine learning *(15 pages)* 042427
Haoran Liao, Ian Convy, William J. Huggins, and K. Birgitta Whaley

Average quantum coherence of pure-state decomposition *(7 pages)* 042428
Ming-Jing Zhao, Teng Ma, and Rajesh Pereira

(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 103, NUMBER 4** **APRIL 2021**

Topological Uhlmann phase transitions for a spin-*j* particle in a magnetic field *(6 pages)* 042221
D. Morachis Galindo, F. Rojas, and Jesús A. Maytorena

Quantum-walk-based state-transfer algorithms on the complete *M*-partite graph *(16 pages)* 042222
S. Skoupý and M. Štefaňák

Time-traveling billiard-ball clocks: A quantum model *(13 pages)* 042223
Lachlan G. Bishop, Fabio Costa, and Timothy C. Ralph

Continuous-variable Clauser-Horne Bell-type inequality: A tool to unearth the nonlocality of continuous-variable quantum-optical systems *(13 pages)* 042224
Chandan Kumar, Gaurav Saxena, and Arvind

Uniformly accelerated quantum counting detector in Minkowski and Fulling vacuum states *(10 pages)* 042225
M. S. Soares, N. F. Svaiter, C. A. D. Zarro, and G. Menezes

Nonclassicality of bright Greenberger-Horne-Zeilinger–like radiation of an optical parametric source *(10 pages)* 042226
Konrad Schlichtholz, Bianka Woloncewicz, and Marek Żukowski

Quantum information science

Stoquasticity in circuit QED *(15 pages)* 042401
A. Ciani and B. M. Terhal

Phase estimation of time-bin qudits by time-resolved single-photon counting *(8 pages)* 042402
Artur Czerwinski, Karolina Sedziak-Kacprowicz, and Piotr Kolenderski

Quantum gradient algorithm for general polynomials *(9 pages)* 042403
Pan Gao, Keren Li, Shijie Wei, Jiancun Gao, and Guilu Long

Generalized figure of merit for qubit readout *(15 pages)* 042404
B. D'Anjou

Improving Hamiltonian encodings with the Gray code *(17 pages)* 042405
Olivia Di Matteo, Anna McCoy, Peter Gysbers, Takayuki Miyagi, R. M. Woloshyn, and Petr Navrátil

Continuous quantum error correction for evolution under time-dependent Hamiltonians *(21 pages)* 042406
J. Atalaya, S. Zhang, M. Y. Niu, A. Babakhani, H. C. H. Chan, J. M. Epstein, and K. B. Whaley

Noncommutative graphs based on finite-infinite system couplings: Quantum error correction for a qubit coupled to a coherent field *(7 pages)* 042407
G. G. Amosov, A. S. Mokeev, and A. N. Pechen

Concise security bounds for sending-or-not-sending twin-field quantum key distribution with finite pulses *(11 pages)* 042408
Tingting Song, Peiya Li, and Jian Weng

Quantum secure learning with classical samples *(7 pages)* 042409
Wooyeong Song, Youngrong Lim, Hyukjoon Kwon, Gerardo Adesso, Marcin Wieśniak, Marcin Pawłowski, Jaewan Kim, and Jeongho Bang

Single-particle digitization strategy for quantum computation of a ϕ^4 scalar field theory *(23 pages)* 042410
João Barata, Niklas Mueller, Andrey Tarasov, and Raju Venugopalan

(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 103, NUMBER 4** **APRIL 2021**

Entropic uncertainty relations for general symmetric informationally complete positive operator-valued measures and mutually unbiased measurements *(9 pages)* 042205
Shan Huang, Zeng-Bing Chen, and Shengjun Wu

Invariant-based investigation of shortcut to adiabaticity for quantum harmonic oscillators under a time-varying frictional force *(11 pages)* 042206
T. Kiran and M. Ponmurugan

Nonorientability-induced $\mathcal{PT}$ phase transition in ladder lattices *(8 pages)* 042207
Jung-Wan Ryu, Nojoon Myoung, Martina Hentschel, and Hee Chul Park

Magnetic-field measurement and analysis for the Muon $g-2$ Experiment at Fermilab *(35 pages)* 042208
T. Albahri *et al.* (The Muon $g-2$ Collaboration)

Exact variational dynamics of the multimode Bose-Hubbard model based on SU(M) coherent states *(13 pages)* 042209
Yulong Qiao and Frank Grossmann

Uniqueness of the observable leaving redundant imprints in the environment in the context of quantum Darwinism *(10 pages)* 042210
Hui-Feng Fu

Certified randomness from a remote-state-preparation dimension witness *(5 pages)* 042211
Xing Chen, Kai Redeker, Robert Garthoff, Wenjamin Rosenfeld, Jörg Wrachtrup, and Ilja Gerhardt

Topological behavior of a neutral spin-1/2 particle in a background magnetic field *(19 pages)* 042212
B. Zygelman

Probing coherence and noise tolerance in discrete-time quantum walks: Unveiling self-focusing and breathing dynamics *(7 pages)* 042213
A. R. C. Buarque and W. S. Dias

Self-consistency of the two-point energy measurement protocol *(9 pages)* 042214
M. Hamed Mohammady

Determination of the mean tunneling flight time in the Büttiker-Landauer oscillating-barrier model as the reflected phase time *(9 pages)* 042215
Reuven Ianconescu and Eli Pollak

Impossibility of extending the Ghirardi-Rimini-Weber model to relativistic particles *(13 pages)* 042216
C. Jones, T. Guaita, and A. Bassi

Single-particle steering and nonlocality: The consecutive Stern-Gerlach experiments *(12 pages)* 042217
E. Benítez Rodríguez, E. Piceno Martínez, and L. M. Arévalo Aguilar

Relaxation to equilibrium in controlled-NOT quantum networks *(9 pages)* 042218
J. Novotný, A. Mariano, S. Pascazio, A. Scardicchio, and I. Jex

Floquet engineering of continuous-time quantum walks: Toward the simulation of complex and next-nearest-neighbor couplings *(14 pages)* 042219
Leonardo Novo and Sofia Ribeiro

Local probability conservation in discrete-time quantum walks *(8 pages)* 042220
Samuel T. Mister, Benjamin J. Arayathel, and Anthony J. Short

(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 103, NUMBER 4 APRIL 2021

Light-induced processes in atomic-scale systems

Phase diagram of spatiotemporal instabilities in a large magneto-optical trap *(5 pages)* L041101
M. Gaudesius, Y.-C. Zhang, T. Pohl, R. Kaiser, and G. Labeyrie

Watching the formation and reshaping of a Fano resonance in a macroscopic medium *(5 pages)* L041102
Yu He, Zuoye Liu, Nan Xue, Christian Ott, Thomas Pfeifer, Adrian N. Pfeiffer, and Bitao Hu

Controlling the degree of rotational directionality in laser-induced molecular dynamics *(6 pages)* L041103
Alexander A. Milner and Valery Milner

Ultracold systems and matter waves

Reducing anomalous reflection from complex absorbing potentials: A semiclassical approach *(6 pages)* L041301
Micheline B. Soley, Kobra N. Avanaki, and Eric J. Heller

Finite-range effects in the two-dimensional repulsive Fermi polaron *(6 pages)* L041302
Raúl Bombín, Viktor Cikojević, Juan Sánchez-Baena, and Jordi Boronat

Observation of spin-exchange dynamics between itinerant and localized ^{171}Yb atoms *(5 pages)* L041303
Koki Ono, Yoshiki Amano, Toshiya Higomoto, Yugo Saito, and Yoshiro Takahashi

Photonics, nonlinear optics, and optomechanics

Quantum electrodynamics description of localized surface plasmons at a metal nanosphere *(7 pages)* L041501
Kuniyuki Miwa and George C. Schatz

Second-harmonic generation via double topological valley-Hall kink modes in all-dielectric photonic crystals *(5 pages)* L041502
Zhihao Lan, Jian Wei You, Qun Ren, Wei E. I. Sha, and Nicolae C. Panoiu

Quantum optics

Intensity correlation speckles as a technique for removing Doppler broadening *(4 pages)* L041701
R. Merlin, N. Green, I. Szapudi, and G. Tarlé

ARTICLES

Fundamental concepts

Hierarchy recurrences in local relaxation *(6 pages)* 042201
Sheng-Wen Li (李圣文) and C. P. Sun (孙昌璞)

Spin-state estimation using the Stern-Gerlach experiment *(15 pages)* 042202
Javier Martínez-Cifuentes and K. M. Fonseca-Romero

Relativistic time-dependent quantum dynamics across supercritical barriers for Klein-Gordon and Dirac particles *(7 pages)* 042203
M. Alkhateeb, X. Gutiérrez de la Cal, M. Pons, D. Sokolovski, and A. Matzkin

Quantum jump Monte Carlo approach simplified: Abelian symmetries *(12 pages)* 042204
Katarzyna Macieszczak and Dominic C. Rose

(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 103, NUMBER 4
PARTS A AND B

CONTENTS

APRIL 2021

The Table of Contents is a total listing of Parts A and B.
Part A consists of pages L040201–042821, and Part B pages 043101–043724.

PART A

LETTERS

Fundamental concepts

Numerical simulation of quantum nonequilibrium phase transitions without finite-size effects *(5 pages)* L040201
Edward Gillman, Federico Carollo, and Igor Lesanovsky

Nonlinear topological edge states in a non-Hermitian array of optical waveguides embedded in an atomic gas *(6 pages)* L040202
Chao Hang, Dmitry A. Zezyulin, Guoxiang Huang, and Vladimir V. Konotop

Quantum jamming: Critical properties of a quantum mechanical perceptron *(5 pages)* L040203
Claudia Artiaco, Federico Balducci, Giorgio Parisi, and Antonello Scardicchio

Quantum information science

Breaking adiabatic quantum control with deep learning *(6 pages)* L040401
Yongcheng Ding, Yue Ban, José D. Martín-Guerrero, Enrique Solano, Jorge Casanova, and Xi Chen

Experimental entanglement characterization of two-rebit states *(7 pages)* L040402
Nidhin Prasannan, Syamsundar De, Sonja Barkhofen, Benjamin Brecht, Christine Silberhorn, and Jan Sperling

Generic detection-based error mitigation using quantum autoencoders *(6 pages)* L040403
Xiao-Ming Zhang, Weicheng Kong, Muhammad Usman Farooq, Man-Hong Yung, Guoping Guo, and Xin Wang

Atomic and molecular structure and dynamics; high-precision experiments

Sensitivity to new physics of isotope-shift studies using the coronal lines of highly charged calcium ions *(7 pages)* L040801
Nils-Holger Rehbehn, Michael K. Rosner, Hendrik Bekker, Julian C. Berengut, Piet O. Schmidt, Steven A. King, Peter Micke, Ming Feng Gu, Robert Müller, Andrey Surzhykov, and José R. Crespo López-Urrutia

Copyright 2021 by American Physical Society

(Continued)

2469-9926(202104)103:4:A;1-1

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).