

The Table of Contents is a total listing of Parts A and B.
Part A consists of pages 040001–042615, and Part B pages 042801–049901(E).

PART A

EDITORIALS AND ANNOUNCEMENTS

Editorial: A Welcoming Home for Applied Science (2 pages)	040001
Jessica Thomas and Michael Thoennessen	

LETTERS

Fundamental concepts

Certifying beyond quantumness of locally quantum no-signaling theories through a quantum-input Bell test (6 pages)	L040201
Edwin Peter Lobo, Sahil Gopalkrishna Naik, Samrat Sen, Ram Krishna Patra, Manik Banik, and Mir Alimuddin	

Fractionality and $\mathcal{PT}$ symmetry in a square lattice (6 pages)	L040202
Mario I. Molina	

Quantum information science

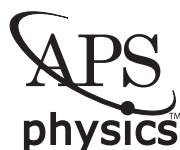
Performance evaluation of invariant-based inverse engineering by quantum speed limits (5 pages)	L040401
Takuya Hatomura	
Certification of incompatible measurements using quantum steering (5 pages)	L040402
Shubhayan Sarkar, Debashis Saha, and Remigiusz Augusiak	

Light-induced processes in atomic-scale systems

Number-resolved detection of dark ions in Coulomb crystals (7 pages)	L041101
Fabian Schmid, Johannes Weitenberg, Jorge Moreno, Theodor W. Hänsch, Thomas Udem, and Akira Ozawa	

Ultracold systems and matter waves

Collisional losses of ultracold molecules due to intermediate complex formation (7 pages)	L041301
Krzysztof Jachymski, Marcin Gronowski, and Michał Tomza	
Route toward classical frustration and band flattening via optical lattice distortion (5 pages)	L041302
Pil Saugmann, José Vargas, Yann Kiefer, Max Hachman, Raphael Eichberger, Andreas Hemmerich, and Jonas Larson	



Photonics, nonlinear optics, and optomechanics

- Twisting an optomechanical cavity (*7 pages*) L041501
Daigo Oue and Mamoru Matsuo

Quantum optics

- Dynamics of multiphoton scattering in a two-level mixer (*6 pages*) L041701
A. V. Vassenin, A. Yu. Dmitriev, S. V. Kadyrmetov, A. N. Bolgar, and O. V. Astafiev

ARTICLES**Fundamental concepts**

- Einstein-Podolsky-Rosen steering in symmetrical Gaussian states (*8 pages*) 042201
E. Benech, A. Auyuanet, and A. Lezama
- Nonlinear three-state quantum walks (*6 pages*) 042202
P. R. N. Falcão, J. P. Mendonça, A. R. C. Buarque, W. S. Dias, G. M. A. Almeida, and M. L. Lyra
- Simulating spin measurement with a finite heat bath model for the environment (*14 pages*) 042203
Thomas Dittrich, Oscar Rodríguez, and Carlos Viviescas
- Dynamics of quantum Fisher information from a time-local non-Markovian master equation with decoherence rates and operators depending on the estimated parameter (*16 pages*) 042204
Mihaela Vatasescu
- Symmetric and antisymmetric constitutive tensors for bi-isotropic and bi-anisotropic media (*18 pages*) 042205
Pedro D. S. Silva, Rodolfo Casana, and Manoel M. Ferreira, Jr.
- Detecting nontrilocal correlations in a triangle network (*14 pages*) 042206
Kaushiki Mukherjee
- Optimal discrimination between real and complex quantum theories (*6 pages*) 042207
Adam Bednorz and Josep Batle
- Threshold size for the emergence of classical-like behavior (*12 pages*) 042208
Alessandro Coppo, Nicola Pranzini, and Paola Verrucchi
- Quantum master equations and steady states for the ultrastrong-coupling limit and the strong-decoherence limit (*20 pages*) 042209
Anton Trushechkin
- Creating and controlling exceptional points of non-Hermitian Hamiltonians via homodyne Lindbladian invariance (*12 pages*) 042210
Fabrizio Minganti, Dolf Huybrechts, Cyril Elouard, Franco Nori, and Ievgen I. Arkhipov
- Evolution of an accelerated charged vortex particle in an inhomogeneous magnetic lens (*13 pages*) 042211
S. S. Baturin, D. V. Grosman, G. K. Sizykh, and D. V. Karlovets
- Entropic and trace-distance-based measures of non-Markovianity (*10 pages*) 042212
Federico Settimo, Heinz-Peter Breuer, and Bassano Vacchini
- Absorbers as detectors for unbound quantum systems (*7 pages*) 042213
Solve Selstø

(Continued)

CONTENTS - *Continued*

PHYSICAL REVIEW A

THIRD SERIES, VOLUME 106, NUMBER 4

OCTOBER 2022

Causal games of work extraction with indefinite causal order (<i>6 pages</i>)	042214
Gianluca Francica	
Boosting unstable particles (<i>10 pages</i>)	042215
L. Gavassino and F. Giacosa	
Sphere on a plane: Two-dimensional scattering from a finite curved region (<i>14 pages</i>)	042216
James R. Anglin and Etienne Wamba	
Possibility of detecting the gravity of an object frozen in a spatial superposition by the Zeno effect (<i>10 pages</i>) . . .	042217
Peter Sidajaya, Wan Cong, and Valerio Scarani	
Sharing nonlocality in a quantum network by unbounded sequential observers (<i>11 pages</i>)	042218
Shyam Sundar Mahato and A. K. Pan	
Preferred basis of states derived from the eigenstate thermalization hypothesis (<i>13 pages</i>)	042219
Hua Yan, Jiaozi Wang, and Wen-ge Wang	
Detection-time distribution for several quantum particles (<i>7 pages</i>)	042220
Roderich Tumulka	
☞ Thermodynamics of quantum measurement and Maxwell's demon's arrow of time (<i>8 pages</i>)	042221
Kagan Yanik, Bibek Bhandari, Sreenath K. Manikandan, and Andrew N. Jordan	
Trace expressions and associated limits for nonequilibrium Casimir torque (<i>19 pages</i>)	042222
Benjamin Strekha, Sean Molesky, Pengning Chao, Matthias Krüger, and Alejandro W. Rodriguez	
Extracting bath information from open-quantum-system dynamics with the hierarchical equations-of-motion method (<i>13 pages</i>)	042223
Chang Woo Kim	
Bell-inequality violation by dynamical Casimir photons in a superconducting microwave circuit (<i>9 pages</i>)	042224
Riddhi Chatterjee and A. S. Majumdar	
Quantum information science	
Improved quantum computing with higher-order Trotter decomposition (<i>9 pages</i>)	042401
Xiaodong Yang, Xinfang Nie, Yunlan Ji, Tao Xin, Dawei Lu, and Jun Li	
Detecting Einstein-Podolsky-Rosen steering via correlation matrices (<i>13 pages</i>)	042402
Lemin Lai and Shunlong Luo	
Explicit attacks on the Bennett-Brassard 1984 protocol with partially distinguishable photons (<i>9 pages</i>)	042403
D. Babukhin, D. Kronberg, and D. Sych	
Unbounded and lossless compression of multiparameter quantum information (<i>9 pages</i>)	042404
Joe H. Jenne and David R. M. Arvidsson-Shukur	
Limit theorems and localization of three-state quantum walks on a line defined by generalized Grover coins (<i>16 pages</i>)	042405
Amrita Mandal, Rohit Sarma Sarkar, Shantanav Chakraborty, and Bibhas Adhikari	
Perturbation theory under the truncated Wigner approximation: How system-environment entanglement formation drives quantum decoherence (<i>20 pages</i>)	042406
Justin Provazza and Roel Tempelaar	

(Continued)

CONTENTS - *Continued*

PHYSICAL REVIEW A

THIRD SERIES, VOLUME 106, NUMBER 4

OCTOBER 2022

Importance of kernel bandwidth in quantum machine learning (<i>11 pages</i>)	042407
Ruslan Shaydulin and Stefan M. Wild	
Enhancing entanglement with the generalized elephant quantum walk from localized and delocalized states (<i>13 pages</i>)	042408
Caio B. Naves, Marcelo A. Pires, Diogo O. Soares-Pinto, and Sílvia M. Duarte Queirós	
Fast-forwarding quantum simulation with real-time quantum Krylov subspace algorithms (<i>9 pages</i>)	042409
Cristian L. Cortes, A. Eugene DePrince, III, and Stephen K. Gray	
Coupled dynamics of spin qubits in optical dipole microtraps: Application to the error analysis of a Rydberg-blockade gate (<i>21 pages</i>)	042410
L. V. Gerasimov, R. R. Yusupov, A. D. Moiseevsky, I. Vybornyi, K. S. Tikhonov, S. P. Kulik, S. S. Straupe, C. I. Sukenik, and D. V. Kupriyanov	
Calculating concentratable entanglement in graph states (<i>9 pages</i>)	042411
Alice R. Cullen and Pieter Kok	
Classical and quantum parts of conditional mutual information for open quantum systems (<i>10 pages</i>)	042412
Zhiqiang Huang (黄志强) and Xiao-Kan Guo (郭肖侃)	
Noise thresholds for classical simulability of nonlinear boson sampling (<i>9 pages</i>)	042413
Gabriele Bressanini, Hyukjoon Kwon, and M. S. Kim	
Steering-based randomness certification with squeezed states and homodyne measurements (<i>9 pages</i>)	042414
Marie Ioannou, Bradley Longstaff, Mikkel V. Larsen, Jonas S. Neergaard-Nielsen, Ulrik L. Andersen, Daniel Cavalcanti, Nicolas Brunner, and Jonatan Bohr Brask	
Unification of coherence and quantum correlations in tripartite systems (<i>12 pages</i>)	042415
Dong-Dong Dong, Geng-Biao Wei, Xue-Ke Song, Dong Wang, and Liu Ye	
Manipulating the quantum steering direction with sequential unsharp measurements (<i>11 pages</i>)	042416
Xin-Hong Han, Hui-Chao Qu, Xuan Fan, Ya Xiao, and Yong-Jian Gu	
Detection of long-range entanglement in gapped quantum spin liquids by local measurements (<i>10 pages</i>)	042417
Shi Feng, Yanjun He, and Nandini Trivedi	
High-dimensional multi-input quantum random access codes and mutually unbiased bases (<i>8 pages</i>)	042418
Rui-Heng Miao, Zhao-Di Liu, Yong-Nan Sun, Chen-Xi Ning, Chuan-Feng Li, and Guang-Can Guo	
Capacity of entanglement for a nonlocal Hamiltonian (<i>12 pages</i>)	042419
Divyansh Shrimali, Swapnil Bhowmick, Vivek Pandey, and Arun Kumar Pati	
Efficient quantum state tomography with mode-assisted training (<i>11 pages</i>)	042420
Yuan-Hang Zhang and Massimiliano Di Ventra	
Evaluating the resilience of variational quantum algorithms to leakage noise (<i>7 pages</i>)	042421
Chen Ding, Xiao-Yue Xu, Shuo Zhang, He-Liang Huang, and Wan-Su Bao	
Quantifying multiqubit magic channels with completely stabilizer-preserving operations (<i>16 pages</i>)	042422
Gaurav Saxena and Gilad Gour	
Loschmidt-echo approach to error estimation in Krylov-subspace approximation (<i>9 pages</i>)	042423
Julian M. Ruffinelli, Emiliano M. Fortes, Diego A. Wisniacki, and Martín Larocca	

(Continued)

CONTENTS - *Continued*

PHYSICAL REVIEW A

THIRD SERIES, VOLUME 106, NUMBER 4

OCTOBER 2022

Robust one-sided self-testing of two-qubit states via quantum steering (<i>16 pages</i>)	042424
Yukun Wang, Xinjian Liu, Shaoxuan Wang, Haoying Zhang, and Yunguang Han	
Applications of the Hillery-Zubairy entanglement criteria to N -qubit systems: The Tavis-Cummings model (<i>12 pages</i>)	042425
Wanqing Cheng and Julio Gea-Banacloche	
Magic-state resource theory for the ground state of the transverse-field Ising model (<i>6 pages</i>)	042426
Salvatore F. E. Oliviero, Lorenzo Leone, and Alioscia Hama	
Long-range multipartite quantum correlations and factorization in a one-dimensional spin-1/2 XY chain (<i>16 pages</i>)	042427
Lin-Lin Su, Jun Ren, Z. D. Wang, and Yan-Kui Bai	
Universal method to estimate quantum coherence (<i>8 pages</i>)	042428
Liang-Liang Sun and Sixia Yu	
Measuring out-of-time-ordered correlation functions without reversing time evolution (<i>11 pages</i>)	042429
Philip Daniel Blocher, Serwan Asaad, Vincent Mourik, Mark A. I. Johnson, Andrea Morello, and Klaus Mølmer	
Generation of cat states by a weak parametric drive and a transitionless tracking algorithm (<i>11 pages</i>)	042430
Shuai Liu, Ye-Hong Chen, Yu Wang, Yi-Hao Kang, Zhi-Cheng Shi, Jie Song, and Yan Xia	
Training quantum embedding kernels on near-term quantum computers (<i>18 pages</i>)	042431
Thomas Hubregtsen, David Wierichs, Elies Gil-Fuster, Peter-Jan H. S. Derks, Paul K. Faehrmann, and Johannes Jakob Meyer	
Detection of a quantum phase transition in a spin-1 chain through multipartite high-order correlations (<i>8 pages</i>)	042432
Dongkeun Lee, Adel Sohbi, and Wonmin Son	
Avoiding barren plateaus with classical deep neural networks (<i>10 pages</i>)	042433
Lucas Friedrich and Jonas Maziero	
Optimizing continuous dynamical decoupling with machine learning (<i>10 pages</i>)	042434
Miao Cai and Keyu Xia (夏可宇)	
Density matrix reconstruction using non-negative matrix product states (<i>7 pages</i>)	042435
Donghong Han, Chu Guo, and Xiaoting Wang	
Quantum speed limits for observables (<i>12 pages</i>)	042436
Brij Mohan and Arun Kumar Pati	
Quantum optical communication in the presence of strong attenuation noise (<i>33 pages</i>)	042437
Francesco Anna Mele, Ludovico Lami, and Vittorio Giovannetti	
Circuit depth scaling for quantum approximate optimization (<i>6 pages</i>)	042438
V. Akshay, H. Philathong, E. Campos, D. Rabinovich, I. Zacharov, Xiao-Ming Zhang, and J. D. Biamonte	
Role of nonclassical temporal correlation in powering quantum random access codes (<i>13 pages</i>)	042439
Subhankar Bera, Ananda G. Maity, Shiladitya Mal, and A. S. Majumdar	

(Continued)

CONTENTS - *Continued*

PHYSICAL REVIEW A

THIRD SERIES, VOLUME 106, NUMBER 4

OCTOBER 2022

Quantum error precompensation for quantum noisy channels (<i>9 pages</i>)	042440
Chengjie Zhang, Liangsheng Li, Guodong Lu, Haidong Yuan, and Runyao Duan	
Entanglement between a trapped-ion qubit and a 780-nm photon via quantum frequency conversion (<i>9 pages</i>) . . .	042441
John Hannegan, James D. Sivers, and Qudsia Quraishi	
Applications of universal parity quantum computation (<i>8 pages</i>)	042442
Michael Fellner, Anette Messinger, Kilian Ender, and Wolfgang Lechner	
Optimization of variational-quantum-eigensolver measurement by partitioning Pauli operators using multiqubit Clifford gates on noisy intermediate-scale quantum hardware (<i>6 pages</i>)	042443
Andrew Jena, Scott N. Genin, and Michele Mosca	
Quantum Fourier addition simplified to Toffoli addition (<i>6 pages</i>)	042444
Alexandru Paler	
Security research on practical measurement-device-independent quantum key distribution (<i>15 pages</i>)	042445
Wei Li and Shengmei Zhao	
Approximating the quantum approximate optimization algorithm with digital-analog interactions (<i>14 pages</i>)	042446
David Headley, Thorger Müller, Ana Martin, Enrique Solano, Mikel Sanz, and Frank K. Wilhelm	
Success probability for postselective transformations of pure quantum states (<i>6 pages</i>)	042447
D. A. Kronberg	
Quantum technologies	
Experimental investigation of a quantum battery using star-topology NMR spin systems (<i>8 pages</i>)	042601
Jitendra Joshi and T. S. Mahesh	
Linear-depth quantum circuits for multiqubit controlled gates (<i>6 pages</i>)	042602
Adenilton J. da Silva and Daniel K. Park	
Coherent control of a local phonon in trapped ions using dynamical decoupling (<i>8 pages</i>)	042603
Ryutaro Ohira, Shota Kume, and Kenji Toyoda	
Pauli component erasing quantum channels (<i>11 pages</i>)	042604
Jose Alfredo de Leon, Alejandro Fonseca, François Leyvraz, David Davalos, and Carlos Pineda	
Dynamics of a dispersively coupled transmon qubit in the presence of a noise source embedded in the control line (<i>19 pages</i>)	042605
Antti Vaaranta, Marco Cattaneo, and Russell E. Lake	
Data postprocessing for the one-way heterodyne protocol under composable finite-size security (<i>12 pages</i>)	042606
Alexander G. Mountogiannakis, Panagiotis Papanastasiou, and Stefano Pirandola	
Quantum optimization of complex systems with a quantum annealer (<i>20 pages</i>)	042607
Steve Abel, Andrew Blance, and Michael Spannowsky	
Robust self-testing of multipartite Greenberger-Horne-Zeilinger-state measurements in quantum networks (<i>10 pages</i>)	042608
Qing Zhou, Xin-Yu Xu, Shuai Zhao, Yi-Zheng Zhen, Li Li, Nai-Le Liu, and Kai Chen	
Entanglement-assisted, noise-assisted, and monitoring-enhanced quantum bath tagging (<i>12 pages</i>)	042609
Donato Farina, Vasco Cavina, Marco G. Genoni, and Vittorio Giovannetti	

(Continued)

CONTENTS - *Continued*

PHYSICAL REVIEW A

THIRD SERIES, VOLUME 106, NUMBER 4

OCTOBER 2022

Localization and delocalization in networks with varied connectivity (<i>12 pages</i>)	042610
Tamoghna Ray, Amit Dey, and Manas Kulkarni	
Quantum phase measurement of two-qubit states in an open waveguide (<i>9 pages</i>)	042611
Ya. S. Greenberg and A. A. Shtygashev	
Effect of micromotion and local stress in quantum simulations with trapped ions in optical tweezers (<i>7 pages</i>) . . .	042612
Liam Bond, Lisa Lenstra, Rene Gerritsma, and Arghavan Safavi-Naini	
General off-resonance-error-robust symmetric composite pulses with three elementary operations (<i>13 pages</i>)	042613
Shingo Kukita, Haruki Kiya, and Yasushi Kondo	
Universal quantum computation with optical four-component cat qubits (<i>22 pages</i>)	042614
Daiqin Su, Ish Dhand, and Timothy C. Ralph	
Guaranteed-accuracy quantum annealing (<i>12 pages</i>)	042615
Takashi Imoto, Yuya Seki, Yuichiro Matsuzaki, and Shiro Kawabata	

PART B

Atomic and molecular structure and dynamics; high-precision experiments

Nuclear versus electronic ring currents in oriented torsional molecules induced by magnetic fields.	
I. Nuclear currents of toluene (<i>13 pages</i>)	042801
Dongming Jia, Maria Dimitrova, Yuan Man, Dage Sundholm, and Yonggang Yang	
Nuclear versus electronic ring currents in oriented torsional molecules induced by magnetic fields.	
II. Electronic currents of toluene (<i>8 pages</i>)	042802
Maria Dimitrova, Dongming Jia, Jörn Manz, and Dage Sundholm	
Triple-differential cross sections in three-dimensional kinematics for electron-impact-ionization dynamics of tetrahydrofuran at 250-eV projectile energy (<i>7 pages</i>)	
042803	
Xiaorui Xue, Deepthy Maria Mootheril, Esam Ali, Maomao Gong, Shaokui Jia, Jiaqi Zhou, Enliang Wang, Jian-Xing Li, Xiangjun Chen, Don Madison, Alexander Dorn, and Xueguang Ren	
Quantum electrodynamics of two-body systems with arbitrary masses up to α^6 order (<i>15 pages</i>)	042804
Jacek Zatorski, Vojtěch Patkóš, and Krzysztof Pachucki	
Hadronic vacuum polarization correction to atomic energy levels (<i>7 pages</i>)	042805
S. Breidenbach, E. Dizer, H. Cakir, and Z. Harman	
General time-dependent configuration-interaction singles. II. Atomic case (<i>15 pages</i>)	042806
Stefanos Carlström, Mattias Bertolino, Jan Marcus Dahlström, and Serguei Patchkovskii	
Levy-Lieb embedding of density-functional theory and its quantum kernel: Illustration for the Hubbard dimer using near-term quantum algorithms (<i>10 pages</i>)	042807
C. D. Pemmaraju and Amol Deshmukh	
Determination of the $2s^2 2p^5 - 2s 2p^6$ transition energy in fluorine-like nickel utilizing a low-lying dielectronic resonance (<i>11 pages</i>)	042808
S. X. Wang, Z. K. Huang, W. Q. Wen, W. L. Ma, H. B. Wang, S. Schippers, Z. W. Wu, Y. S. Kozhedub, M. Y. Kaygorodov, A. V. Volotka, K. Wang, C. Y. Zhang, C. Y. Chen, C. Liu, H. K. Huang, L. Shao, L. J. Mao, X. M. Ma, J. Li, M. T. Tang, K. M. Yan, Y. B. Zhou, Y. J. Yuan, J. C. Yang, S. F. Zhang, X. Ma, and L. F. Zhu	

(Continued)

Single- and double-electron capture in intermediate-energy $\text{Ar}^{8+} + \text{He}$ collisions (7 pages)	042809
Y. W. Zhang, J. W. Gao, Y. Wu, J. G. Wang, N. Sisourat, and A. Dubois	
Calculation of energies and hyperfine-structure constants of $^{233}\text{U}^+$ and ^{233}U (7 pages)	042810
S. G. Porsev, C. Cheung, and M. S. Safronova	
High-precision measurement of the hyperfine splitting and ac Stark shift of the $7d\ ^2D_{3/2}$ state in atomic cesium (9 pages)	042811
Bubai Rahaman and Sourav Dutta	
Nuclear cusps and singularities in the nonadditive kinetic potential bifunctional from analytical inversion (12 pages)	042812
Mojdeh Banafsheh, Tomasz A. Wesolowski, Tim Gould, Leeor Kronik, and David A. Strubbe	
Determination of quadrupolar dispersion coefficients of the alkali-metal atoms interacting with different material media (11 pages)	042813
Harpreet Kaur, Vipul Badhan, Bindiya Arora, and B. K. Sahoo	
Experimental and theoretical near-edge x-ray-absorption fine-structure studies of NO^+ (8 pages)	042814
Rebecka Lindblad, Ludvig Kjellsson, Emiliano De Santis, Vicente Zamudio-Bayer, Bernd von Issendorff, Stacey L. Sorensen, J. Tobias Lau, Weijie Hua, Vincenzo Carravetta, Jan-Erik Rubensson, Hans Ågren, and Rafael C. Couto	
Higher-order corrections to the spin-orbit and spin-spin tensor interactions in HD^+ (7 pages)	042815
Mohammad Haidar, Vladimir I. Korobov, Laurent Hilico, and Jean-Philippe Karr	
Tune-out wavelengths for the $2\ ^3S_1$ state of the Li^+ ion (6 pages)	042816
Fang-Fei Wu, Ke Deng, and Ze-Huang Lu	
QED corrections to the Abraham and Aharonov-Casher forces on Rydberg atoms (9 pages)	042817
R. Le Fournis, B. A. van Tiggelen, and M. Donaire	
Convergent close-coupling calculations of electron scattering on HeH^+ (15 pages)	042818
Liam H. Scarlett, Mark C. Zammit, Igor Bray, Barry I. Schneider, and Dmitry V. Fursa	
Theory of rotationally resolved two-dimensional infrared spectroscopy including polarization dependence and rotational coherence dynamics (19 pages)	042819
Grzegorz Kowzan and Thomas K. Allison	
Light-induced processes in atomic-scale systems	
High-accuracy optical clocks based on group-16-like highly charged ions (9 pages)	043101
Saleh O. Allehabi, S. M. Brewer, V. A. Dzuba, V. V. Flambaum, and K. Beloy	
Steering the longitudinal photoelectron momentum in the above-threshold ionization with two not-quite-collinear laser beams (7 pages)	043102
Birger Böning and Stephan Fritzsche	
Knee structure in the laser-intensity dependence of harmonic generation for graphene (12 pages)	043103
Fulong Dong and Jie Liu	
☞ General time-dependent configuration-interaction singles. I. Molecular case (13 pages)	043104
Stefanos Carlström, Michael Spanner, and Serguei Patchkovskii	

(Continued)

CONTENTS - *Continued*

PHYSICAL REVIEW A

THIRD SERIES, VOLUME 106, NUMBER 4

OCTOBER 2022

Laser-induced electron diffraction in the over-the-barrier-ionization regime (<i>10 pages</i>)	043105
B. Belsa, K. M. Ziems, A. Sanchez, K. Chirvi, X. Liu, S. Gräfe, and J. Biegert	
Mapping the direction of electron ionization to phase delay between VUV and IR laser pulses (<i>10 pages</i>)	043106
M. Mountney, G. P. Katsoulis, S. H. Møller, K. Jana, P. Corkum, and A. Emmanouilidou	
Environment-modified three-body energy transfer (<i>9 pages</i>)	043107
Madeline C. Waller and Robert Bennett	
Thomas–Reiche–Kuhn correction for truncated configuration-interaction spaces: Case of laser-assisted dynamical interference (<i>11 pages</i>)	043108
Mattias Bertolino, Stefanos Carlström, Jasper Peschel, Felipe Zapata, Eva Lindroth, and Jan Marcus Dahlström	
Momentum scalar triple product as a measure of chirality in electron ionization dynamics of strongly driven atoms (<i>5 pages</i>)	043109
G. P. Katsoulis, Z. Dube, P. B. Corkum, A. Staudte, and A. Emmanouilidou	
Reversible electron spirals by chirped attopulses at zero time delay (<i>9 pages</i>)	043110
N. J. Strandquist, Jr. and J. M. Ngoko Djiokap	
Probing van der Waals interactions and detecting polar molecules by Förster-resonance energy transfer with Rydberg atoms at temperatures below 100 mK (<i>6 pages</i>)	043111
J. Zou and S. D. Hogan	
Twisted quantum interference in photoelectron holography with elliptically polarized fields (<i>20 pages</i>)	043112
G. Kim, C. Hofmann, A. S. Maxwell, and C. Figueira de Morisson Faria	
Coherent control of the vibrational dynamics of aligned heteronuclear diatomic molecules (<i>12 pages</i>)	043113
László Biró and András Csehi	
Rydberg atomic antenna in strongly driven multielectron atoms (<i>9 pages</i>)	043114
Stefanos Carlström, Jan Marcus Dahlström, Misha Yu Ivanov, and Serguei Patchkovskii	
Elliptically polarized attosecond pulse generation by corotating bicircular laser fields (<i>9 pages</i>)	043115
Wenqing Li, Xiaosong Zhu, Pengfei Lan, and Peixiang Lu	
Surface explosion and subsequent core expansion of laser-heated clusters probed by time-resolved photoelectron spectroscopy (<i>8 pages</i>)	043116
Akinobu Niozu, Hironobu Fukuzawa, Toru Hagiya, Akifumi Yamamoto, Daehyun You, Shu Saito, Yudai Ishimura, Tadashi Togashi, Shigeki Owada, Kensuke Tono, Makina Yabashi, Shin-ichi Wada, Kazuhiro Matsuda, Kiyoshi Ueda, and Kiyonobu Nagaya	
Two-XUV-photon double ionization of neon (<i>8 pages</i>)	043117
I. Orfanos, E. Skantzakis, A. Nayak, M. Dumergue, S. Kühn, G. Sansone, M. F. Kling, H. Schröder, B. Bergues, Janos Csontos, Szabolcs Toth, Ádám Börzönyi, S. Kahaly, K. Varjú, A. Foremski, L. A. A. Nikolopoulos, P. Tzallas, and D. Charalambidis	
Disappearance and reappearance of above-threshold-ionization peaks (<i>6 pages</i>)	043118
Lars Bojer Madsen	
Correlation-enhanced Goos-Hänchen shift in Rydberg atomic gases (<i>9 pages</i>)	043119
Di-Di Zheng, Hui-Min Zhao, Xiao-Jun Zhang, and Jin-Hui Wu	

(Continued)

Nonsequential double ionization of Ne with elliptically polarized laser pulses (<i>8 pages</i>)	043120
Fang Liu, Shuqi Li, Zhangjin Chen, Birger Böning, and Stephan Fritzsche	
Laser-controlled electronic symmetry breaking in a phenylene ethynylene dimer: Simulation by the hierarchical equations of motion and optimal control (<i>15 pages</i>)	043121
Amine Jaouadi, Joachim Galiana, Etienne Mangaud, Benjamin Lasorne, Osman Atabek, and Michèle Desouter-Lecomte	
Shift of the photoelectron momentum against the radiation pressure force in linearly polarized intense midinfrared laser fields (<i>7 pages</i>)	043122
Rešad Kahvedžić and Stefanie Gräfe	
Ultracold systems and matter waves	
Quantum phases of dipolar bosons in a multilayer optical lattice (<i>17 pages</i>)	043301
Soumik Bandyopadhyay, Hrushikesh Sable, Deepak Gaur, Rukmani Bai, Subroto Mukerjee, and D. Angom	
Molecular state in a spin-orbital-angular-momentum coupled Fermi gas (<i>7 pages</i>)	043302
Yiwen Han, Shi-Guo Peng, Ke-Ji Chen, and Wei Yi	
Floquet-engineered pair and single-particle filters in the Fermi-Hubbard model (<i>6 pages</i>)	043303
Friedrich Hübner, Christoph Dauer, Sebastian Eggert, Corinna Kollath, and Ameneh Sheikhan	
Low-energy prethermal phase and crossover to thermalization in nonlinear kicked rotors (<i>12 pages</i>)	043304
Maxime Martinez, Pierre-Élie Larré, Dominique Delande, and Nicolas Cherroret	
Generation of Josephson vortices in stacked toroidal Bose-Einstein condensates (<i>9 pages</i>)	043305
Nataliia Bazhan, Anton Svetlichnyi, Dominik Pfeiffer, Daniel Derr, Gerhard Birkel, and Alexander Yakimenko	
Dynamics of spin helices in the one-dimensional XX model (<i>9 pages</i>)	043306
Darren Pereira and Erich J. Mueller	
Dynamics of a pair of overlapping polar bright solitons in spin-1 Bose-Einstein condensates (<i>12 pages</i>)	043307
Gautam Hegde, Sandra M. Jose, and Rejish Nath	
Role of the effective range in the density-induced BEC-BCS crossover (<i>12 pages</i>)	043308
Hiroyuki Tajima and Haozhao Liang	
Phase-space stochastic quantum hydrodynamics for interacting Bose gases (<i>22 pages</i>)	043309
S. A. Simmons, J. C. Pillay, and K. V. Kheruntsyan	
Stability against three-body clustering in one-dimensional spinless p -wave fermions (<i>10 pages</i>)	043310
Yixin Guo (郭一昕) and Hiroyuki Tajima (田島裕之)	
Dipole modes of a trapped bosonic mixture: Fate of the sum-rule approach (<i>8 pages</i>)	043311
Chiara Fort and Michele Modugno	
Local phase shift due to interactions in an atom interferometer (<i>8 pages</i>)	043312
Zhibin Yao, Cyrille Solaro, Corentin Carrez, Pierre Cladé, and Saïda Guellati-Khelifa	
Crossing the superfluid-supersolid transition of an elongated dipolar condensate (<i>8 pages</i>)	043313
Aitor Alaña, Nicolò Antolini, Giulio Biagioni, Iñigo L. Egusquiza, and Michele Modugno	

(Continued)

CONTENTS - Continued

PHYSICAL REVIEW A

THIRD SERIES, VOLUME 106, NUMBER 4

OCTOBER 2022

 Observation of low-field Feshbach resonances between ^{161}Dy and ^{40}K (14 pages)	043314
Zhu-Xiong Ye, Alberto Canali, Elisa Soave, Marian Kreyer, Yaakov Yudkin, Cornelis Ravensbergen, Emil Kirilov, and Rudolf Grimm	
Dimers, trimers, tetramers, and other multimers in a multiband Bose-Hubbard model (10 pages)	043315
M. Iskin and A. Keleş	
Resonant superfluidity in the Rabi-coupled spin-dependent Fermi-Hubbard model (10 pages)	043316
Mathias Mikkelsen, Ryui Kaneko, Daichi Kagamihara, and Ippei Danshita	
Light-pulse atom interferometric test of continuous spontaneous localization (9 pages)	043317
Sascha Vowe, Sandro Donadi, Vladimir Schkolnik, Achim Peters, Bastian Leykauf, and Markus Krutzik	
Detecting topological phase transitions in a double kicked quantum rotor (8 pages)	043318
Nikolai Bolik, Caspar Groiseau, Jerry H. Clark, Gil S. Summy, Yingmei Liu, and Sandro Wimberger	
Rotational pendulum dynamics of a vortex molecule in a channel geometry (11 pages)	043319
Sarthak Choudhury and Joachim Brand	
Rapid generation of all-optical ^{39}K Bose-Einstein condensates using a low-field Feshbach resonance (10 pages)	043320
A. Herbst, H. Albers, K. Stolzenberg, S. Bode, and D. Schlippert	
Classical route to ergodicity and scarring phenomena in a two-component Bose-Josephson junction (10 pages)	043321
Debabrata Mondal, Sudip Sinha, Sayak Ray, Johann Kroha, and Subhasis Sinha	
Spectral analysis for compressible quantum fluids (15 pages)	043322
Ashton S. Bradley, R. Kishor Kumar, Sukla Pal, and Xiaoquan Yu	
Dynamical excitation processes and correlations of three-body two-dimensional mixtures (17 pages)	043323
G. Bougas, S. I. Mistakidis, P. Giannakeas, and P. Schmelcher	
Two ultracold highly magnetic atoms in a one-dimensional harmonic trap (13 pages)	043324
Michał Suchorowski, Anna Dawid, and Michał Tomza	
Meissner effect in Fock space (7 pages)	043325
J. Mumford	
Photonics, nonlinear optics, and optomechanics	
Significant optoelectrical entanglement and mechanical squeezing in a multimodulated optoelectromechanical system (7 pages)	043501
Sampreet Kalita, Saumya Shah, and Amarendra K. Sarma	
Switching dynamics of femtosecond solitons in parity-time-symmetric coupled optical waveguides (6 pages)	043502
Ambareesh Sahoo, Dipti Kanika Mahato, A. Govindarajan, and Amarendra K. Sarma	
Born-Padé approach to electromagnetic scattering in complex one-dimensional inhomogeneous slabs (8 pages)	043503
J. A. Rebouças and P. A. Brandão	
Topological edge and interface states in phoxonic crystal cavity chains (12 pages)	043504
Tian-Xue Ma, Jing Liu, Chuanzeng Zhang, and Yue-Sheng Wang	

(Continued)

CONTENTS - *Continued*

PHYSICAL REVIEW A

THIRD SERIES, VOLUME 106, NUMBER 4

OCTOBER 2022

Valley-resolved interband excitation and emission in gapped graphene (7 pages)	043505
Hubin Cui, Liang Li, Tengfei Huang, Jiapeng Li, Pengfei Lan, and Peixiang Lu	
Linear-polarization–gradient-phase coupling (6 pages)	043506
Shangdong Zhao, Yu Liu, Kai Niu, and Shaohua Tao	
Counterpropagating light in ring resonators: Switching fronts, plateaus, and oscillations (16 pages)	043507
Graeme N. Campbell, Shuangyou Zhang, Leonardo Del Bino, Pascal Del’Haye, and Gian-Luca Oppo	
Expanding the memory effect in scattering imaging by manipulating photon distributions (12 pages)	043508
Zhengjia Zhang, Zhengjun Liu, and Shutian Liu	
Effect of external cavity length on the coherence properties in a multimode semiconductor laser (5 pages)	043509
Neethu K. and S. Sivaprakasam	
Parametric conversion via second harmonic generation and two-hump solitons in phase-matched microresonators (10 pages)	043510
Vladislav V. Pankratov and Dmitry V. Skryabin	
Optomechanical sideband asymmetry explained by stochastic electrodynamics (11 pages)	043511
L. Novotny, M. Frimmer, A. Militaru, A. Norrman, O. Romero-Isart, and P. Maurer	
Geometric spin Hall effect of a laser beam beyond the paraxial approximation (8 pages)	043512
Mengdi Luo and Zhaoying Wang	
Four-vector optical Dirac equation and spin-orbit interaction of structured light (6 pages)	043513
Longlong Feng and Qianfan Wu	
Propagation effects of bichromatic laser pulses on the induced terahertz-radiation generation in a gaseous medium (6 pages)	043514
Xiaofang Shu, Zhifang Feng, Chengxin Yu, and Jie Liu	
Nonlinear index of a two-level model: The essential role of the population inversion (10 pages)	043515
Hervé Leblond and Charles Ciret	
Nonperturbative approach to the nonlinear photon echo of a V-type system (14 pages)	043516
Xue Zhang and Hui Dong	
Harmonic generation in bent graphene with artificially enhanced spin-orbit coupling (9 pages)	043517
Arttu Nieminen and Marco Ornigotti	
Dipole-forbidden transitions induced by the gradient of optical near fields (9 pages)	043518
Yongkun Chen, Yueming Zhou, Yijie Liao, Jintai Liang, Xu Zhang, Wei Cao, Min Li, Marcelo F. Ciappina, and Peixiang Lu	
Helicity, chirality, and spin of optical fields without vector potentials (13 pages)	043519
Andrea Aiello	
Quantum optics	
Photon generation and entanglement in a double superconducting cavity (16 pages)	043701
Cruz I. Velasco, Nicolás F. Del Grosso, Fernando C. Lombardo, Alejandro Soba, and Paula I. Villar	
Optimal control and selectivity of qubits in contact with a structured environment (10 pages)	043702
Quentin Ansel, Jonas Fischer, Dominique Sugny, and Bruno Bellomo	

(Continued)

CONTENTS - *Continued*

PHYSICAL REVIEW A

THIRD SERIES, VOLUME 106, NUMBER 4

OCTOBER 2022

Unconventional quantum electrodynamics with a Hofstadter-ladder waveguide (<i>12 pages</i>)	043703
Xin Wang, Zhao-Min Gao, Jia-Qi Li, Huai-Bing Zhu, and Hong-Rong Li	
Sub-Planck phase-space structure and sensitivity for SU(1,1) compass states (<i>14 pages</i>)	043704
Naeem Akhtar, Barry C. Sanders, and Gao Xianlong	
Multicopy observables for the detection of optically nonclassical states (<i>16 pages</i>)	043705
Matthieu Arnhem, Célia Griffet, and Nicolas J. Cerf	
Two-photon-absorption measurements in the presence of single-photon losses (<i>17 pages</i>)	043706
Shahram Panahiyan, Carlos Sánchez Muñoz, Maria V. Chekhova, and Frank Schlawin	
Two strategies for modeling nonlinear optics in lossy integrated photonic structures (<i>18 pages</i>)	043707
Milica Banic, Luca Zatti, Marco Liscidini, and J. E. Sipe	
Dynamical stabilization by vacuum fluctuations in a cavity: Resonant electron scattering in the ultrastrong light-matter coupling regime (<i>6 pages</i>)	043708
D. A. Zezyulin, S. A. Kolodny, O. V. Kibis, I. V. Tokatly, and I. V. Iorsh	
Atomic-coherence-assisted multipartite entanglement generation with dressing-energy-level-cascaded four-wave mixing (<i>12 pages</i>)	043709
Yuliang Liu, Jiajia Wei, Mengqi Niu, Yixin Lin, Zhili Chen, Jin Yan, Binshuo Luo, Feng Li, Yin Cai, and Yanpeng Zhang	
Spatial-nonlocality-induced non-Markovian electromagnetically induced transparency in a single giant atom (<i>14 pages</i>)	043710
Y. T. Zhu, S. Xue, R. B. Wu, W. L. Li, Z. H. Peng, and M. Jiang	
Beyond one-axis twisting: Simultaneous spin-momentum squeezing (<i>10 pages</i>)	043711
John Drew Wilson, Simon B. Jäger, Jarrod T. Reilly, Athreya Shankar, Maria Luisa Chiofalo, and Murray J. Holland	
Threshold detection statistics of bosonic states (<i>14 pages</i>)	043712
J. F. F. Bulmer, S. Paesani, R. S. Chadwick, and N. Quesada	
Complete positive operator-valued measure description of multichannel quantum electro-optic sampling with monochromatic field modes (<i>15 pages</i>)	043713
Emanuel Hubenschmid, Thiago L. M. Guedes, and Guido Burkard	
Tunable frequency-bin multimode squeezed vacuum states of light (<i>10 pages</i>)	043714
Christian Drago and Agata M. Brańczyk	
Loss-induced suppression, revival, and switch of photon blockade (<i>11 pages</i>)	043715
Yunlan Zuo, Ran Huang, Le-Man Kuang, Xun-Wei Xu, and Hui Jing	
Theory of magnon polaritons in quantum Ising materials (<i>20 pages</i>)	043716
R. D. McKenzie, M. Libersky, D. M. Silevitch, and T. F. Rosenbaum	
Concentrated subradiant modes in a one-dimensional atomic array coupled with chiral waveguides (<i>15 pages</i>) . . .	043717
Mengjie Yang, Luojia Wang, Xiaoxiong Wu, Han Xiao, Danying Yu, Luqi Yuan, and Xianfeng Chen	
Correlated two-photon modulation based on nonlinear effects in a photonic synthetic lattice (<i>17 pages</i>)	043718
Chen-Xi Zhu, Xiang-Fa Zhou, and Zheng-Wei Zhou	

(Continued)

CONTENTS - *Continued*

PHYSICAL REVIEW A

THIRD SERIES, VOLUME 106, NUMBER 4

OCTOBER 2022

Optimizing the coupling efficiency of spontaneous parametric down-conversion photon pairs into single-mode fibers (<i>8 pages</i>)	043719
Nicolas Schwaller, Geobae Park, Ryo Okamoto, and Shigeki Takeuchi	
Macroscopic distinguishability and scalability of N -mode field states (<i>10 pages</i>)	043720
C. Muñoz, A. B. Klimov, and B. M. Garraway	
All-optical generation of deterministic squeezed Schrödinger-cat states (<i>12 pages</i>)	043721
Zhucheng Zhang, Lei Shao, Wangjun Lu, and Xiaoguang Wang	
Generation of nonreciprocal single photons in the chiral waveguide-cavity-emitter system (<i>10 pages</i>)	043722
Wen-ju Gu, Lei Wang, Zhen Yi, and Li-hui Sun	
Chirality-driven delocalization in disordered waveguide-coupled quantum arrays (<i>11 pages</i>)	043723
Gleb Fedorovich, Danil Kornovan, Alexander Poddubny, and Mihail Petrov	

COMMENTS

Comment on “Revisiting the phase transitions of the Dicke model” (<i>5 pages</i>)	047701
Ángel L. Corps and Armando Relaño	

ERRATA

Erratum: Examining the correctness of anonymity for practical quantum networks [Phys. Rev. A 101 , 062311 (2020)] (<i>1 page</i>)	049901(E)
Yu-Guang Yang, Yong-Li Yang, Xin-Long Lv, Yi-Hua Zhou, and Wei-Min Shi	