

The Table of Contents is a total listing of Parts A and B.
Part A consists of pages L030201–032621, and Part B pages 032801–039903(E).

PART A

LETTERS

Fundamental concepts

Taking the temperature of a pure quantum state (6 pages) L030201
Mark T. Mitchison, Archak Purkayastha, Marlon Brenes, Alessandro Silva, and John Goold

Non-Markovian stochastic Schrödinger equation: Matrix-product-state approach to the hierarchy
of pure states (6 pages) L030202
Xing Gao, Jiajun Ren, Alexander Eisfeld, and Zhigang Shuai

Quantum information science

Unextendible entangled bases and more nonlocality with less entanglement (7 pages) L030401
Saronath Halder and Ujjwal Sen

Identifying Abelian and non-Abelian topological orders in the string-net model using a quantum
scattering circuit (6 pages) L030402
Ze Zhang, Xinyue Long, Xiuzhu Zhao, Zidong Lin, Kai Tang, Hongfeng Liu, Xiaodong Yang,
Xinfang Nie, Jiansheng Wu, Jun Li, Tao Xin, Keren Li, and Dawei Lu

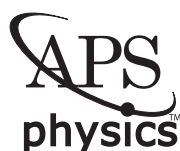
Quantum technologies

High-fidelity multiphoton-entangled cluster state with solid-state quantum emitters in photonic
nanostructures (7 pages) L030601
Konstantin Tiurev, Martin Hayhurst Appel, Pol Llopart Mirambell, Mikkel Bloch Lauritzen,
Alexey Tiranov, Peter Lodahl, and Anders Søndberg Sørensen

Atomic and molecular structure and dynamics; high-precision experiments

Giant retardation effect in electron-electron interaction (7 pages) L030801
Zhimin Hu, Gang Xiong, Zhencen He, Zhihao Yang, Naoki Numadate, Chengwu Huang,
Jiamin Yang, Ke Yao, Baoren Wei, Yaming Zou, Chensheng Wu, Yulong Ma, Yong Wu,
Xiang Gao, and Nobuyuki Nakamura

Measurement of the ⁸⁷Rb *D*-line vector tune-out wavelength (5 pages) L030802
A. J. Fallon, E. R. Moan, E. A. Larson, and C. A. Sackett



Light-induced processes in atomic-scale systems

Generation of metastable krypton using a 124-nm laser (6 pages)	L031101
X.-Z. Dong, F. Ritterbusch, D.-F. Yuan, J.-W. Yan, W.-T. Chen, W. Jiang, Z.-T. Lu, J. S. Wang, X.-A. Wang, and G.-M. Yang	
Nondipole Coulomb sub-barrier ionization dynamics and photon momentum sharing (6 pages)	L031102
Pei-Lun He, Michael Klaiber, Karen Z. Hatsagortsyan, and Christoph H. Keitel	
Negative-travel-time quantum orbits in strong-field ionization by an elliptically polarized laser field (7 pages)	L031103
D. B. Milošević and W. Becker	

Ultracold systems and matter waves

Quantum droplet of a two-component Bose gas in an optical lattice near the Mott insulator transition (6 pages)	L031301
Yoshihiro Machida, Ippei Danshita, Daisuke Yamamoto, and Kenichi Kasamatsu	

Photonics, nonlinear optics, and optomechanics

Chaotic dynamics on exceptional surfaces (6 pages)	L031501
Lei Chen, Wenhao Wu, Feifan Huang, Yao-fei Chen, Gui-Shi Liu, Yunhan Luo, and Zhe Chen	
Intensity $g^{(2)}$ correlations in random fiber lasers: A random-matrix-theory approach (5 pages)	L031502
Ernesto P. Raposo, Iván R. R. González, Edwin D. Coronel, Antônio M. S. Macêdo, Leonardo de S. Menezes, Raman Kashyap, Anderson S. L. Gomes, and Robin Kaiser	

ARTICLES

Fundamental concepts

Optical analogs of pair production and annihilation in binary waveguide arrays with a curved section (8 pages)	032201
Truong X. Tran, Hue M. Nguyen, and Dũng C. Duong	
Witnessing Bell violations through probabilistic negativity (10 pages)	032202
Benjamin Morris, Lukas J. Fiderer, Ben Lang, and Daniel Goldwater	
Exact energy eigenstates of the Coulomb-Stark Hamiltonian (13 pages)	032203
S. Yusofsani and M. Kolesik	
 Experimentally bounding deviations from quantum theory for a photonic three-level system using theory-agnostic tomography (16 pages)	032204
Michael J. Grabowecky, Christopher A. J. Pollack, Andrew R. Cameron, Robert W. Spekkens, and Kevin J. Resch	
Genuine multipartite entanglement and quantum coherence in an electron-positron system: Relativistic covariance (7 pages)	032205
Alexandra T. Petreca, Gabriel Cardoso, Fernando P. Devecchi, and Renato M. Angelo	
Influence of coin symmetry on infinite hitting times in quantum walks (8 pages)	032206
Prithviraj Prabhu and Todd A. Brun	
Generalized phase-space description of nonlinear Hamiltonian systems and Harper-like dynamics (15 pages)	032207
A. E. Bernardini and O. Bertolami	

(Continued)

CONTENTS - Continued

PHYSICAL REVIEW A

THIRD SERIES, VOLUME 105, NUMBER 3

MARCH 2022

Fundamental limitations in Lindblad descriptions of systems weakly coupled to baths (<i>14 pages</i>)	032208
Devashish Tupkary, Abhishek Dhar, Manas Kulkarni, and Archak Purkayastha	
Coherence, path predictability, and I concurrence: A triality (<i>7 pages</i>)	032209
Abhinash Kumar Roy, Neha Pathania, Nitish Kumar Chandra, Prasanta K. Panigrahi, and Tabish Qureshi	
Numerical investigation of the logarithmic Schrödinger model of quantum decoherence (<i>13 pages</i>)	032210
Rory van Geleuken and Andrew V. Martin	
Einstein-Podolsky-Rosen steering in two-sided sequential measurements with one entangled pair (<i>6 pages</i>)	032211
Jie Zhu, Meng-Jun Hu, Chuan-Feng Li, Guang-Can Guo, and Yong-Sheng Zhang	
Ground-state separability and criticality in interacting many-particle systems (<i>13 pages</i>)	032212
Federico Petrovich, N. Canosa, and R. Rossignoli	
Conditional probabilities of measurements, quantum time, and the Wigner's-friend case (<i>7 pages</i>)	032213
M. Trassinelli	
Exceptional point in a degenerate system made of a gyrator and two unstable resonators (<i>11 pages</i>)	032214
Kasra Rouhi, Alireza Nikzamir, Alexander Figotin, and Filippo Capolino	
Anharmonicity-induced excited-state quantum phase transition in the symmetric phase of the two-dimensional limit of the vibron model (<i>13 pages</i>)	032215
Jamil Khalouf-Rivera, Francisco Pérez-Bernal, and Miguel Carvajal	
Characterizing nonlocal correlations through various n -locality inequalities in a quantum network (<i>11 pages</i>)	032216
Sneha Munshi and A. K. Pan	
Work extraction from coherently activated maps via quantum switch (<i>12 pages</i>)	032217
Kyrylo Simonov, Gianluca Francica, Giacomo Guarnieri, and Mauro Paternostro	
Quantum information science	
Quantum advantage for noisy channel discrimination (<i>12 pages</i>)	032401
Zane M. Rossi, Jeffery Yu, Isaac L. Chuang, and Sho Sugiura	
Candidate entanglement invariants for two Dirac spinors (<i>24 pages</i>)	032402
Markus Johansson	
Quantum state preparation by adiabatic evolution with custom gates (<i>12 pages</i>)	032403
Eduardo A. Coello Pérez, Joey Bonitati, Dean Lee, Sofia Quaglioni, and Kyle A. Wendt	
$\hbar \rightarrow 0$ limit of the entanglement entropy (<i>9 pages</i>)	032404
G. Mussardo and J. Viti	
Efficient simulation of the dynamics of an n -dimensional $\mathcal{PT}$ -symmetric system with a local-operations-and-classical-communication protocol based on an embedding scheme (<i>15 pages</i>)	032405
Xiaogang Li, Chao Zheng, Jiancun Gao, and Guilu Long	
Improving the efficiency of open-quantum-system simulations using matrix product states in the interaction picture (<i>11 pages</i>)	032406
Kai T. Liu, David N. Beratan, and Peng Zhang	

(Continued)

CONTENTS - *Continued*

PHYSICAL REVIEW A

THIRD SERIES, VOLUME 105, NUMBER 3

MARCH 2022

Local quantum state marking (<i>10 pages</i>)	032407
Samrat Sen, Edwin Peter Lobo, Sahil Gopalkrishna Naik, Ram Krishna Patra, Tathagata Gupta, Subhendu B. Ghosh, Sutapa Saha, Mir Alimuddin, Tamal Guha, Some Sankar Bhattacharya, and Manik Banik	
Detecting the steerability bounds of generalized Werner states via a backpropagation neural network (<i>8 pages</i>) . . .	032408
Jun Zhang, Kan He, Ying Zhang, Yu-yang Hao, Jin-chuan Hou, Fang-Peng Lan, and Bao-Ning Niu	
Simulation of the five-qubit quantum error correction code on superconducting qubits (<i>10 pages</i>)	032409
I. A. Simakov, I. S. Besedin, and A. V. Ustinov	
General lower and upper bounds under minimum-error quantum state discrimination (<i>8 pages</i>)	032410
Elena R. Loubenets	
Improving resilience of quantum-gravity-induced entanglement of masses to decoherence using three superpositions (<i>16 pages</i>)	032411
Martine Schut, Jules Tilly, Ryan J. Marshman, Sougato Bose, and Anupam Mazumdar	
Entanglement properties and ground-state statistics of free bosons (<i>9 pages</i>)	032412
Luca Dell'Anna	
Induced on-demand revival in coined quantum walks on infinite d -dimensional lattices (<i>7 pages</i>)	032413
M. N. Jayakody, I. L. Paiva, A. Nanayakkara, and E. Cohen	
Generation of Greenberger-Horne-Zeilinger states for silicon-vacancy centers using a decoherence- free subspace (<i>11 pages</i>)	032415
Yi-Fan Qiao, Jia-Qiang Chen, Xing-Liang Dong, Bo-Long Wang, Xin-Lei Hei, Cai-Peng Shen, Yuan Zhou, and Peng-Bo Li	
Self-testing of multipartite Greenberger-Horne-Zeilinger states of arbitrary local dimension with arbitrary number of measurements per party (<i>19 pages</i>)	032416
Shubhayan Sarkar and Remigiusz Augusiak	
Coherent ground-state transport of neutral atoms (<i>19 pages</i>)	032417
X. X. Li, J. B. You, X. Q. Shao, and Weibin Li	
Quantum simulation of quantum field theory in the light-front formulation (<i>27 pages</i>)	032418
Michael Kreshchuk, William M. Kirby, Gary Goldstein, Hugo Beauchemin, and Peter J. Love	
Spatial, spin, and charge symmetry projections for a Fermi-Hubbard model on a quantum computer (<i>34 pages</i>)	032419
Kazuhiro Seki and Seiji Yunoki	
Algebraic compression of quantum circuits for Hamiltonian evolution (<i>14 pages</i>)	032420
Efekan Kökcü, Daan Camps, Lindsay Bassman, J. K. Freericks, Wibe A. de Jong, Roel Van Beeumen, and Alexander F. Kemper	
Bound on local minimum-error discrimination of bipartite quantum states (<i>5 pages</i>)	032421
Donghoon Ha and Jeong San Kim	
Noninvertibility as a requirement for creating a semigroup under convex combinations of channels (<i>5 pages</i>) . . .	032422
Vinayak Jagadish, R. Srikanth, and Francesco Petruccione	

(Continued)

CONTENTS - *Continued*

PHYSICAL REVIEW A

THIRD SERIES, VOLUME 105, NUMBER 3

MARCH 2022

Estimation of disorders in the rest positions of two membranes in optomechanical systems (<i>14 pages</i>)	032423
Claudio M. Sanavio, József Zsolt Bernád, and André Xuereb	
Symmetries and local transformations of translationally invariant matrix product states (<i>37 pages</i>)	032424
Martin Hebenstreit, David Sauerwein, Andras Molnar, J. Ignacio Cirac, and Barbara Kraus	
Quantum-classical distance as a tool to design optimal chiral quantum walks (<i>15 pages</i>)	032425
Massimo Frigerio, Claudia Benedetti, Stefano Olivares, and Matteo G. A. Paris	
Conditions for steady-state entanglement of quantum systems in a stationary environment under Markovian dissipation (<i>14 pages</i>)	032426
Yuebing Zhou, Jiawei Hu, and Hongwei Yu	
Variational quantum process tomography of unitaries (<i>8 pages</i>)	032427
Shichuan Xue, Yong Liu, Yang Wang, Pingyu Zhu, Chu Guo, and Junjie Wu	
Distributed phase estimation and networked quantum sensors with <i>W</i> -type quantum probes (<i>8 pages</i>)	032428
Yusef Maleki and M. Suhail Zubairy	
Computable multipartite multimode Gaussian quantum correlation measure and the monogamy relations for continuous-variable systems (<i>18 pages</i>)	032429
Jinchuan Hou, Liang Liu, and Xiaofei Qi	
Robust genuine high-dimensional steering with many measurements (<i>8 pages</i>)	032430
Sébastien Designolle	
Standard quantum annealing outperforms adiabatic reverse annealing with decoherence (<i>12 pages</i>)	032431
Gianluca Passarelli, Ka-Wa Yip, Daniel A. Lidar, and Procolo Lucignano	
Simulating violation of causality using a topological phase transition (<i>11 pages</i>)	032432
Sudipto Singha Roy, Anindita Bera, and Germán Sierra	
Automatic depth optimization for a quantum approximate optimization algorithm (<i>9 pages</i>)	032433
Yu Pan, Yifan Tong, and Yi Yang	
Quantum teleportation of hybrid qubits and single-photon qubits using Gaussian resources (<i>11 pages</i>)	032434
Soumyakanti Bose and Hyunseok Jeong	
Quantum advantages for Pauli channel estimation (<i>17 pages</i>)	032435
Senrui Chen, Sisi Zhou, Alireza Seif, and Liang Jiang	
Quantifying correlations via local channels (<i>11 pages</i>)	032436
Nan Li, Shunlong Luo, and Yuan Sun	
Analytical and experimental study of center-line miscalibrations in Mølmer-Sørensen gates (<i>19 pages</i>)	032437
Fernando Martínez-García, Lukas Gerster, Davide Vodola, Pavel Hrmo, Thomas Monz, Philipp Schindler, and Markus Müller	
Global entanglement in a topological quantum phase transition (<i>8 pages</i>)	032438
Elahe Samimi, Mohammad Hossein Zarei, and Afshin Montakhab	
Quantum-key-expansion protocol based on number-state-entanglement-preserving tensor network with compression (<i>10 pages</i>)	032439
Qiang Zhang, Hong Lai, and Josef Pieprzyk	

(Continued)

CONTENTS - *Continued*

PHYSICAL REVIEW A

THIRD SERIES, VOLUME 105, NUMBER 3

MARCH 2022

Grover search revisited: Application to image pattern matching (<i>14 pages</i>)	032440
Hiroyuki Tezuka, Kouhei Nakaji, Takahiko Satoh, and Naoki Yamamoto	
Security proof for round-robin differential-quadrature-phase-shift quantum key distribution (<i>19 pages</i>)	032441
Yang-Guang Shan, Zhen-Qiang Yin, Hang Liu, Shuang Wang, Wei Chen, De-Yong He, Guang-Can Guo, and Zheng-Fu Han	
Local unitary classes of states invariant under permutation subgroups (<i>12 pages</i>)	032442
David W. Lyons, Jesse R. Arnold, and Ashley F. Swogger	
Quantum transport in a one-dimensional quasicrystal with mobility edges (<i>8 pages</i>)	032443
Yan Xing, Lu Qi, Xuedong Zhao, Zhe Lü, Shutian Liu, Shou Zhang, and Hong-Fu Wang	
Out-of-time-order correlator in the quantum Rabi model (<i>9 pages</i>)	032444
Aleksandrina V. Kirkova, Diego Porras, and Peter A. Ivanov	
Generation of four-dimensional hyperentangled NOON states and beyond with photonic orbital angular momentum and detection-basis control (<i>7 pages</i>)	032445
José César Guerra Vázquez, Emmanuel Narváez Castañeda, Roberto Ramírez Alarcón, Imad Agha, Qiwen Zhan, and William N. Plick	
Demonstration of quantum-limited discrimination of multicopy pure versus mixed states (<i>10 pages</i>)	032446
Arunkumar Jagannathan, Michael Grace, Olivia Brasher, Jeffrey H. Shapiro, Saikat Guha, and Jonathan L. Habif	
Dissipative search of an unstructured database (<i>8 pages</i>)	032447
Armen E. Allahverdyan and David Petrosyan	
Criterion for a state to be distillable via stochastic incoherent operations (<i>6 pages</i>)	032448
C. L. Liu, D. L. Zhou, and C. P. Sun	
Optimized low-depth quantum circuits for molecular electronic structure using a separable-pair approximation (<i>13 pages</i>)	032449
Jakob S. Kottmann and Alán Aspuru-Guzik	
Graph-theoretic approach to quantum error correction (<i>10 pages</i>)	032450
Robert R. Vandermolen and Duncan Wright	
Device-independent secret key rates via a postselected Bell inequality (<i>16 pages</i>)	032451
Sarnava Datta, Hermann Kampermann, and Dagmar Bruß	
Decoherence on staggered quantum walks (<i>10 pages</i>)	032452
Raqueline A. M. Santos and Franklin de L. Marquezino	
Selective quantum state tomography for continuous-variable systems (<i>6 pages</i>)	032453
Virginia Feldman and Ariel Bendersky	
Quantum computing with two independent control functions: Optimal solutions to the teleportation protocol (<i>8 pages</i>)	032454
Emanuel F. de Lima, Marllós E. F. Fernandes, and Leonardo K. Castelano	
Local discrimination of generalized Bell states via commutativity (<i>8 pages</i>)	032455
Mao-Sheng Li, Fei Shi, and Yan-Ling Wang	

(Continued)

CONTENTS - *Continued*

PHYSICAL REVIEW A

THIRD SERIES, VOLUME 105, NUMBER 3

MARCH 2022

Practical parallel self-testing of Bell states via magic rectangles (<i>20 pages</i>)	032456
Sean A. Adamson and Petros Wallden	
Hardy-like quantum pigeonhole paradox and the projected-coloring graph state (<i>8 pages</i>)	032457
Weidong Tang	
State transformations within entanglement classes containing permutation-symmetric states (<i>33 pages</i>)	032458
Martin Hebenstreit, Cornelia Spee, Nicky Kai Hong Li, Barbara Kraus, and Julio I. de Vicente	
Quantum technologies	
Phase-reference-intensity attack on continuous-variable quantum key distribution with a local oscillator (<i>8 pages</i>)	032601
Yun Shao, Yang Li, Heng Wang, Yan Pan, Yaodi Pi, Yichen Zhang, Wei Huang, and Bingjie Xu	
Simple and loss-tolerant free-space quantum key distribution using a squeezed laser (<i>9 pages</i>)	032602
Nedasadat Hosseini-dehaj, Matthew S. Winnel, and Timothy C. Ralph	
High-connectivity quantum processor nodes using single-ion qubits in rare-earth-ion-doped crystals (<i>14 pages</i>)	032603
Adam Kinos, Lars Rippe, Diana Serrano, Andreas Walther, and Stefan Kröll	
Universal quantum operation of spin-3/2 Blume-Capel chains (<i>8 pages</i>)	032604
Silas Hoffman, Yiyuan Chen, Hai-Ping Cheng, and X.-G. Zhang	
Projection-operator-based Newton method for the trajectory optimization of closed quantum systems (<i>10 pages</i>)	032605
Jieqiu Shao, Joshua Combes, John Hauser, and Marco M. Nicotra	
Quasiprobabilities of work and heat in an open quantum system (<i>11 pages</i>)	032606
P. Solinas, M. Amico, and N. Zanghi	
Deterministic linear-optical quantum control gates utilizing path and polarization degrees of freedom (<i>10 pages</i>)	032607
Hongyi Meng	
Microscopic treatment of instantaneous spectral diffusion and its effect on quantum gate fidelities in rare-earth-ion-doped crystals (<i>21 pages</i>)	032608
Adam Kinos, Lars Rippe, Andreas Walther, and Stefan Kröll	
Supersensitivity of Kerr phase estimation with two-mode squeezed vacuum states (<i>9 pages</i>)	032609
Yun-Feng Guo, Wei Zhong, Lan Zhou, and Yu-Bo Sheng	
Experimental violations of Leggett-Garg inequalities on a quantum computer (<i>11 pages</i>)	032610
Alessandro Santini and Vittorio Vitale	
Entangling spin and charge degrees of freedom in semiconductor quantum dots (<i>5 pages</i>)	032611
Marko J. Rančić	
Combating the effects of disorder in quantum state transfer (<i>9 pages</i>)	032612
Catherine Keele and Alastair Kay	
Noise-reducing encoding strategies for spin chains (<i>9 pages</i>)	032613
Catherine Keele and Alastair Kay	

(Continued)

CONTENTS - *Continued*

PHYSICAL REVIEW A

THIRD SERIES, VOLUME 105, NUMBER 3

MARCH 2022

Trusted quantum remote sensing based on self-testing of entangled states (<i>7 pages</i>)	032615
Xing-Xiang Peng, Wen-Hao Zhang, Peng Yin, Gong-Chu Li, Lei Chen, Geng Chen, Chuan-Feng Li, and Guang-Can Guo	
Variational estimation of capacity bounds for quantum channels (<i>11 pages</i>)	032616
Junaid ur Rehman, Seongjin Hong, Yong-Su Kim, and Hyundong Shin	
Quantum parameter estimation of nonlinear coupling in a trilinear Hamiltonian with trapped ions (<i>7 pages</i>)	032617
Peter A. Ivanov	
Dispersive optical systems for scalable Raman driving of hyperfine qubits (<i>13 pages</i>)	032618
Harry Levine, Dolev Bluvstein, Alexander Keesling, Tout T. Wang, Sepehr Ebadi, Giulia Semeghini, Ahmed Omran, Markus Greiner, Vladan Vuletić, and Mikhail D. Lukin	
Measuring kinetic parameters using quantum plasmonic sensing (<i>22 pages</i>)	032619
K. T. Mpofo, C. Lee, G. E. M. Maguire, H. G. Kruger, and M. S. Tame	
Model-free readout-error mitigation for quantum expectation values (<i>8 pages</i>)	032620
Ewout van den Berg, Zlatko K. Mineev, and Kristan Temme	
Decomposing the generalized Toffoli gate with qutrits (<i>6 pages</i>)	032621
A. S. Nikolaeva, E. O. Kiktenko, and A. K. Fedorov	

PART B

Atomic and molecular structure and dynamics; high-precision experiments

Cross sections for valence-shell excitations of H ₂ O in the 9.85–12.15-eV energy-loss range studied by high-energy inelastic electron scattering (<i>9 pages</i>)	032801
Wei-Qing Xu, Yi-Geng Peng, Jian-Hui Zhu, Xiao-Jiao Du, Yuan-Chen Xu, Li-Han Wang, Bo Li, Hao-Ran Zhang, Bei-Yuan Zhang, Zi-Ru Ma, Shu-Xing Wang, Yong Wu, Jian-Guo Wang, and Lin-Fan Zhu	
Z-dependent crossing of excited-state energy levels in highly charged galliumlike lanthanide atomic ions (<i>12 pages</i>)	032802
Fumihiro Koike, Chihiro Suzuki, Izumi Murakami, Daiji Kato, Naoki Tamura, and Nobuyuki Nakamura	
First-principles simulation of the electronic stopping power of He ions in Al at finite temperature (<i>10 pages</i>)	032803
Su-Na Pang, Feng Wang, Ya-Ting Sun, Fei Mao, and Xiao-Li Wang	
Multiphoton ionization and dissociation of polycyclic aromatic hydrocarbon molecules of astrophysical interest (<i>8 pages</i>)	032804
Roby Chacko, Saroj Barik, Shreyak Banhatti, and G. Aravind	
Fully differential investigation of two-center interference in dissociative capture in $p + \text{H}_2$ collisions (<i>7 pages</i>)	032805
S. Bastola, M. Dhital, B. Lamichhane, A. Silvus, R. Lomsadze, J. Davis, A. Hasan, A. Igarashi, and M. Schulz	
General formulation of interactions and energy loss of particles in plasmas: Quantum-wave-packet model versus a semiclassical approach (<i>20 pages</i>)	032806
C. D. Archubi and N. R. Arista	
Optimal robust stimulated Raman exact passage by inverse optimization (<i>12 pages</i>)	032807
Xavier Laforgue, Ghassen Dridi, and Stéphane Guérin	

(Continued)

CONTENTS - *Continued*

PHYSICAL REVIEW A

THIRD SERIES, VOLUME 105, NUMBER 3

MARCH 2022

QED theory of the nuclear magnetic shielding in H and ^3He (15 pages)	032808
Dominik Wehrli, Mariusz Puchalski, and Krzysztof Pachucki	
Effect of the Breit interaction on the angular distribution of Auger electrons following electron-impact excitation of highly charged Be-like ions (8 pages)	032809
Z. W. Wu, Y. Li, Z. Q. Tian, and C. Z. Dong	
Proposal for measuring line profiles and angular distributions of the radiative-electron-capture transition in low-energy ion-atom collisions: Beyond the impulse approximation (6 pages)	032810
Tian Li and Deyang Yu	
Rotating and vibrating symmetric-top molecule RaOCH_3 in fundamental $\mathcal{P}$, $\mathcal{T}$ -violation searches (9 pages)	032811
Anna Zakharova	
Laser spectroscopy of the $y\ ^7P^\circ_f$ states of Cr I (10 pages)	032812
E. B. Norrgard, D. S. Barker, S. P. Eckel, S. G. Porsev, C. Cheung, M. G. Kozlov, I. I. Tupitsyn, and M. S. Safronova	
Static electric dipole moment of the francium atom induced by axionlike particle exchange (8 pages)	032813
D. E. Maison and L. V. Skripnikov	
Partial-wave approach to the Stark resonance problem of the water molecule (16 pages)	032814
Patrik Pirkola and Marko Horbatsch	
Gradient-descent optimization of fermion nodes in the diffusion Monte Carlo technique (11 pages)	032815
John McFarland and Efstratios Manousakis	
Strong isotopic selectivity on dication formation of benzene (5 pages)	032816
L. Sigaud, W. Wolff, and E. C. Montenegro	
Dynamic screening and two-center effects in neutral and partially dressed ion-atom collisions (8 pages)	032817
N. J. Esponda, M. A. Quinto, R. D. Rivarola, and J. M. Monti	
Evolution of the xenon (e , $2e$) differential cross section from a coplanar geometry to the perpendicular plane in the intermediate-energy regime (9 pages)	032818
Manish Patel, Matthew Harvey, Ahmad Sakaamini, and Andrew James Murray	
Determination of quadrupole polarizabilities of the excited states of alkali-metal atoms (9 pages)	032819
Harpreet Kaur, Sukhjit Singh, Bindiya Arora, and B. K. Sahoo	
Charge-state evolution from W^{5+} to W^{7+} at energies below the ionization potentials (10 pages)	032820
C. L. Yan, Q. Lu, Y. M. Xie, B. L. Li, N. Fu, Y. Zou, C. Chen, and J. Xiao	
He atom in a quantum dot: Structural, entanglement, and information-theoretical measures (22 pages)	032821
Santanu Mondal, Kalidas Sen, and Jayanta K. Saha	
Spectroscopic effects of velocity-dependent Casimir-Polder interactions induced by parallel plates (6 pages)	032822
Joseph Durnin, Juliane Klatt, Robert Bennett, and Stefan Yoshi Buhmann	
Experimental study of the $3^3\Pi_g$ and $4^3\Sigma_g^+$ states of the rubidium dimer (11 pages)	032823
P. T. Arndt, V. B. Sovkov, J. Ma, X. Pan, D. S. Beecher, J. Y. Tsai, R. Livingston, V. M. Marcune, A. M. Lyrya, and E. H. Ahmed	

(Continued)

Measurements of charge transfer and target-electron-loss cross sections for H^+ , D^+ , and He^+ impact on lithium at low energies (<i>8 pages</i>)	032824
Paul Oxley	
Light-induced processes in atomic-scale systems	
rf-induced heating dynamics of noncrystallized trapped ions (<i>17 pages</i>)	033101
Martin W. van Mourik, Pavel Hrmo, Lukas Gerster, Benjamin Wilhelm, Rainer Blatt, Philipp Schindler, and Thomas Monz	
Isotope-selective laser ablation ion-trap loading of $^{137}Ba^+$ using a $BaCl_2$ target (<i>10 pages</i>)	033102
Brendan M. White, Pei Jiang Low, Yvette de Sereville, Matthew L. Day, Noah Greenberg, Richard Rademacher, and Crystal Senko	
Photoexcitation of atoms by cylindrically polarized Laguerre-Gaussian beams (<i>8 pages</i>)	033103
S. Ramakrishna, J. Hofbrucker, and S. Fritzsche	
Asymmetric electron angular distributions in H_2 induced by intense ultrashort soft-x-ray laser pulses (<i>13 pages</i>)	033104
Arturo Sopena, Fabrice Catoire, Alicia Palacios, Fernando Martín, and Henri Bachau	
Polarization dependence of atomic high-order harmonic generation: Description using a discrete basis (<i>6 pages</i>)	033105
József Kasza, István Magashegyi, Péter Dombi, and Péter Földi	
Magneto-optical trapping of mercury at high phase-space density (<i>9 pages</i>)	033106
Quentin Lavigne, Thorsten Groh, and Simon Stellmer	
Observation of anomalous heat transport in a trapped ion chain (<i>7 pages</i>)	033107
Z.-C. Mao, Y.-Z. Xu, Q.-X. Mei, W.-D. Zhao, Y. Jiang, Z.-J. Cheng, X.-Y. Chang, L. He, L. Yao, Z.-C. Zhou, Y.-K. Wu, and L.-M. Duan	
Theoretical study of the molecular-frame photoemission time delay for K -shell photoionization of N_2 (<i>7 pages</i>)	033108
Dmitrii V. Rezvan, Nikolay M. Novikovskiy, Lukas Martin, Anton N. Artemyev, and Philipp V. Demekhin	
Schrödinger cat states of a macroscopic charged particle co-trapped with an ion (<i>14 pages</i>)	033109
S. Leontica and C. J. Foot	
Quasi-one-dimensional diffuse laser cooling of atoms (<i>5 pages</i>)	033110
Jin-Yin Wan, Xin Wang, Xiao Zhang, Yan-Ling Meng, Wen-Li Wang, Yuan Sun, and Liang Liu	
Theoretical investigation of orbital alignment of x-ray-ionized atoms in exotic electronic configurations (<i>14 pages</i>)	033111
Laura Budewig, Sang-Kil Son, and Robin Santra	
Theoretical study of the alignment-to-orientation conversion in magneto-optical rotation based on atomic multipole moments (<i>13 pages</i>)	033112
Pan-li Qi, Xu-xing Geng, Guo-qing Yang, Shao-ping Wu, Guang-ming Huang, and Gao-xiang Li	
Enantioselective chiral orientation induced by a combination of a long and a short laser pulse (<i>10 pages</i>)	033113
Long Xu	
Ultracold systems and matter waves	
Machine-learning classification of two-dimensional vortex configurations (<i>12 pages</i>)	033301
Rama Sharma and Tapio P. Simula	

(Continued)

CONTENTS - Continued

PHYSICAL REVIEW A

THIRD SERIES, VOLUME 105, NUMBER 3

MARCH 2022

☞ Characterization of an atom interferometer in the quasi-Bragg regime (13 pages)	033302
A. Béguin, T. Rodzinka, J. Vigué, B. Allard, and A. Gauguier	
Snapshot-based characterization of particle currents and the Hall response in synthetic flux lattices (11 pages) . . .	033303
Maximilian Buser, Ulrich Schollwöck, and Fabian Grusdt	
Topological phases and collective modes in U(1) and SU(2) sectors of spin-orbit-coupled two-dimensional superfluid Fermi gases (10 pages)	033304
Jeroen P. A. Devreese, Jacques Tempere, and Carlos A. R. Sá de Melo	
Nonequilibrium Bose-Einstein condensation (12 pages)	033305
Vishwanath Shukla and Sergey Nazarenko	
Spin-orbit-coupled Bose gases with nonlocal Rydberg interactions held under a toroidal trap (9 pages)	033306
Xiao-Fei Zhang, Lin Wen, Lin-Xue Wang, G.-P. Chen, R.-B. Tan, and Hiroki Saito	
Doppler cooling of buffer-gas-cooled barium monofluoride molecules (5 pages)	033307
Yuhe Zhang, Zixuan Zeng, Qian Liang, Wenhao Bu, and Bo Yan	
Two-body continuum states in noninteger geometry (11 pages)	033308
E. R. Christensen, E. Garrido, and A. S. Jensen	
Subdiffusion in wave packets with periodically kicked interactions (10 pages)	033309
Clément Duval, Dominique Delande, and Nicolas Cherroret	
Topological optical Raman superlattices (9 pages)	033310
Jia-Hui Zhang, Bei-Bei Wang, Feng Mei, Jie Ma, Liantuan Xiao, and Suotang Jia	
Supersolid-like square- and honeycomb-lattice crystallization of droplets in a dipolar condensate (9 pages)	033311
Luis E. Young-S. and S. K. Adhikari	
Discrete scale-invariant boson-fermion duality in one dimension (9 pages)	033312
Satoshi Ohya	
Dynamics of a vortex ring encountering a spherical obstacle in Bose-Einstein condensates (8 pages)	033313
Lihua Pan, Xiaojie Zhu, Qing-Li Zhu, Yongjun Liu, and Jin An	
Mean field versus random-phase approximation calculation of the energy of an impurity immersed in a spin-1/2 superfluid (9 pages)	033314
A. Bigué, F. Chevy, and X. Leyronas	
Ergodic-nonergodic transition with cold spinless fermions in a cavity (7 pages)	033315
Wei-Jie Huang, Yu-Biao Wu, Guang-Can Guo, and Xu-Bo Zou	
☞ Measurement of the order parameter and its spatial fluctuations across Bose-Einstein condensation (10 pages) . . .	033316
Louise Wolswijk, Carmelo Mordini, Arturo Farolfi, Dimitris Trypogeorgos, Franco Dalfovo, Alessandro Zenesini, Gabriele Ferrari, and Giacomo Lamporesi	
Finite-temperature strong-coupling expansions for the SU(N) Hubbard model (8 pages)	033317
Rajiv R. P. Singh and Jaan Oitmaa	
Atom interferometry using $\sigma^+ - \sigma^-$ Raman transitions between $ F = 1, m_F = \mp 1\rangle$ and $ F = 2, m_F = \pm 1\rangle$ (12 pages)	033318
J. Bernard, Y. Bidel, M. Cadoret, C. Salducci, N. Zahzam, S. Schwartz, A. Bonnin, C. Blanchard, and A. Bresson	

(Continued)

CONTENTS - *Continued*

PHYSICAL REVIEW A	THIRD SERIES, VOLUME 105, NUMBER 3	MARCH 2022
Droplet-superfluid compounds in binary bosonic mixtures (<i>8 pages</i>)		033319
M. Nilsson Tengstrand and S. M. Reimann		
Superfluid properties of bright solitons in a ring (<i>10 pages</i>)		033320
Koichiro Furutani and Luca Salasnich		
Bistable multipole quantum droplets in binary Bose-Einstein condensates (<i>7 pages</i>)		033321
Liangwei Dong, Dongshuai Liu, Zhijing Du, Kai Shi, and Wei Qi		
Quantum information scrambling in molecules (<i>11 pages</i>)		033322
Chenghao Zhang, Peter G. Wolynes, and Martin Gruebele		
Site-resolved imaging of a bosonic Mott insulator of ^7Li atoms (<i>8 pages</i>)		033323
Kiryang Kwon, Kyungtae Kim, Junhyeok Hur, SeungJung Huh, and Jae-yoon Choi		
BCS-BEC crossover of atomic Fermi superfluid in a spherical bubble trap (<i>9 pages</i>)		033324
Yan He, Hao Guo, and Chih-Chun Chien		
Photonics, nonlinear optics, and optomechanics		
Signature of edge states in resonant wave scattering (<i>10 pages</i>)		033501
H. S. Xu, K. L. Zhang, L. Jin, and Z. Song		
Tunable spin-glass optical simulator based on multiple light scattering (<i>9 pages</i>)		033502
Gianni Jacucci, Louis Delloye, Davide Pierangeli, Mushegh Rafayelyan, Claudio Conti, and Sylvain Gigan		
Multiphonon quantum dynamics in cavity optomechanical systems (<i>7 pages</i>)		033503
Mihai A. Macovei and Adriana Pálffy		
Bound states in the continuum from a symmetric mode with a dominant toroidal dipole resonance (<i>5 pages</i>)		033504
Maohua Gong, Peng Hu, Qianju Song, Hong Xiang, and Dezhuan Han		
Anomalous localization and transport behavior of amplifying periodic-on-average random systems at critical disorder (<i>8 pages</i>)		033505
Krishna Joshi, Randhir Kumar, and Sushil Mujumdar		
Coherence Poincaré sphere of partially polarized optical beams (<i>8 pages</i>)		033506
Jyrki Laatikainen, Ari T. Friberg, Olga Korotkova, and Tero Setälä		
Optical sensing of magnons via the magnetoelastic displacement (<i>8 pages</i>)		033507
Zhi-Yuan Fan, Rui-Chang Shen, Yi-Pu Wang, Jie Li, and J. Q. You		
Nonlinear quantum behavior of ultrashort-pulse optical parametric oscillators (<i>23 pages</i>)		033508
Tatsuhiko Onodera, Edwin Ng, Chris Gustin, Niels Lörch, Atsushi Yamamura, Ryan Hamerly, Peter L. McMahon, Alireza Marandi, and Hideo Mabuchi		
Modification of cavity ring-up spectroscopy (<i>6 pages</i>)		033509
Meng-Chong Shen, Ming-Yong Ye, and Xiu-Min Lin		
Optical turbulence control by non-Hermitian potentials (<i>6 pages</i>)		033510
Salim B. Ivars, Muriel Botey, Ramon Herrero, and Kestutis Staliunas		
Generation of bimodal solitons in a sapphire whispering-gallery-mode maser at millikelvin temperatures (<i>12 pages</i>)		033511
Catriona A. Thomson, Michael E. Tobar, and Maxim Goryachev		

(Continued)

CONTENTS - *Continued*

PHYSICAL REVIEW A

THIRD SERIES, VOLUME 105, NUMBER 3

MARCH 2022

Subspace-induced Dirac point and nondissipative wave dynamics in a non-Hermitian optical lattice (<i>13 pages</i>) . . .	033512
Shan Li, Shulin Wang, Shuyue Chen, Yanting Wu, Shaolin Ke, Bing Wang, and Peixiang Lu	
Chiral discrimination by polarization singularities of a metal sphere (<i>8 pages</i>)	033513
Shiqi Jia, Jie Peng, Yuqiong Cheng, and Shubo Wang	
Nonlinear interaction effects in a three-mode cavity optomechanical system (<i>14 pages</i>)	033514
Jing Qiu, Li-Jing Jin, Zhen-Yang Peng, Stefano Chesi, and Ying-Dan Wang	
Quantum squeezing of slow-light dark solitons via electromagnetically induced transparency (<i>13 pages</i>)	033515
Jinzhong Zhu and Guoxiang Huang	
Stabilization of light bullets in nonlinear metamaterial waveguides (<i>9 pages</i>)	033516
A. K. Shafeeqe Ali, A. Govindarajan, and M. Lakshmanan	
Breakdown of light transport models in photonic scattering slabs with strong absorption and anisotropy (<i>11 pages</i>)	033517
Ozan Akdemir, Ad Lagendijk, and Willem L. Vos	
Enhanced sensitivity of an all-dielectric refractive index sensor with an optical bound state in the continuum (<i>5 pages</i>)	033518
Dmitrii N. Maksimov, Valery S. Gerasimov, Andrey A. Bogdanov, and Sergey P. Polyutov	
Cavity-QED simulation of a quantum metamaterial with tunable disorder (<i>11 pages</i>)	033519
Grigoriy S. Mazhorin, Ilya N. Moskalenko, Ilya S. Besedin, Dmitriy S. Shapiro, Sergey V. Remizov, Walter V. Pogosov, Dmitry O. Moskalev, Anastasia A. Pishchimova, Alina A. Dobronosova, I. A. Rodionov, and Alexey V. Ustinov	
Electrically and thermally tunable multifunctional terahertz metasurface array (<i>8 pages</i>)	033520
Yue Wang, Dajian Cui, Yu Wang, Guohui Yang, and Chunhui Wang	
Multiple-weak-value quantum measurement for precision estimation of time delay (<i>9 pages</i>)	033521
Yongsheng Wang, Wenshuai Zhang, Shizhen Chen, Shuangchun Wen, and Hailu Luo	
Optical resonances in graded index spheres: A resonant-state-expansion study and analytic approximations (<i>20 pages</i>)	033522
Z. Sztranyovszky, W. Langbein, and E. A. Muljarov	
Double-layered transformation cavities: Crossover between local and global transformations (<i>5 pages</i>)	033523
Jung-Wan Ryu	
Degenerate squeezing in a dual-pumped integrated microresonator: Parasitic processes and their suppression (<i>14 pages</i>)	033524
H. Seifoory, Z. Vernon, D. H. Mahler, M. Menotti, Y. Zhang, and J. E. Sipe	
Self-consistent transverse modes in a geometric-phase-plate-assisted optical resonator (<i>7 pages</i>)	033525
Pengcheng Chen, Dunzhao Wei, Yipeng Zhang, Yong Zhang, and Min Xiao	
Tunable partial polarization beam splitter and optomechanically induced Faraday effect (<i>8 pages</i>)	033526
Xuan Mao, Guo-Qing Qin, Hong Yang, Zeguo Wang, Min Wang, Gui-Qin Li, Peng Xue, and Gui-Lu Long	
Real-time full-field imaging through scattering media by all-optical feedback (<i>12 pages</i>)	033527
Ronen Chriki, Simon Mahler, Chene Tradonsky, Asher A. Friesem, and Nir Davidson	

(Continued)

CONTENTS - *Continued*

PHYSICAL REVIEW A

THIRD SERIES, VOLUME 105, NUMBER 3

MARCH 2022

Lambertian illumination of dielectric scattering media with monochromatic light (<i>8 pages</i>)	033528
Felix Ott and Alwin Kienle	
K-space thermodynamic funneling of light via heat exchange (<i>6 pages</i>)	033529
Zhongfei Xiong, Fan O. Wu, Jing-Tao Lü, Zhichao Ruan, Demetrios N. Christodoulides, and Yuntian Chen	
Quantum optics	
Master equation for the quantum Rabi model in the adiabatic regime (<i>18 pages</i>)	033701
L. O. Castanos-Cervantes	
☞ Modifying quantum optical states by zero-photon subtraction (<i>7 pages</i>)	033702
C. M. Nunn, J. D. Franson, and T. B. Pittman	
Retardation-dependent decaying modes of a single excitation in an atomic array coupled to a one-dimensional waveguide (<i>8 pages</i>)	033703
Lezhi Lo and C. K. Law	
Improvement of phase sensitivity in an SU(1,1) interferometer via a phase shift induced by a Kerr medium (<i>14 pages</i>)	033704
Shoukang Chang, Wei Ye, Huan Zhang, Liyun Hu, Jiehui Huang, and Sanqiu Liu	
Decay of a single photon in a cavity with atomic mirrors (<i>9 pages</i>)	033705
Chaofan Zhou, Zeyang Liao, and M. Suhail Zubairy	
Atom recoil in collectively interacting dipoles using quantized vibrational states (<i>8 pages</i>)	033706
Deepak A. Suresh and F. Robicheaux	
Generation of entangled photons via parametric down-conversion in semiconductor lasers and integrated quantum photonic systems (<i>19 pages</i>)	033707
Mikhail Tokman, Yongrui Wang, Qianfan Chen, Leon Shterengas, and Alexey Belyanin	
High-fidelity synchronization and transfer of quantum states in optomechanical hybrid systems (<i>9 pages</i>)	033708
Hugo Molinares, Vitalie Eremeev, and Miguel Orszag	
Exchange of orbital angular momentum of light via noise-induced coherence (<i>10 pages</i>)	033709
Seyyed Hossein Asadpour, Ziauddin, Muqaddar Abbas, and Hamid R. Hamed	
Coherence-mediated squeezing of a cavity field coupled to a coherently driven single quantum dot (<i>8 pages</i>)	033710
Parvendra Kumar and Agnikumar G. Vedeshwar	
Telefilters, telemirrors, and causality (<i>24 pages</i>)	033711
Joshua Foo, Sho Onoe, Magdalena Zych, and Timothy C. Ralph	
Effect of the atomic dipole-dipole interaction on the phase diagrams of field-matter interactions: Variational procedure (<i>12 pages</i>)	033712
S. Cordero, O. Castaños, R. López-Peña, and E. Nahmad-Achar	
Tunable giant two-dimensional optical beam shift from a tilted linear polarizer (<i>8 pages</i>)	033713
Niladri Modak, Sayantan Das, Priyanuj Bordoloi, and Nirmalya Ghosh	
☞ Strong laser fields and their power to generate controllable high-photon-number coherent-state superpositions (<i>24 pages</i>)	033714
J. Rivera-Dean, Th. Lamprou, E. Pisanty, P. Stammer, A. F. Ordóñez, A. S. Maxwell, M. F. Ciappina, M. Lewenstein, and P. Tzallas	

(Continued)

CONTENTS - *Continued*

PHYSICAL REVIEW A

THIRD SERIES, VOLUME 105, NUMBER 3

MARCH 2022

Long-time Bell states of waveguide-mediated qubits via continuous measurement (<i>8 pages</i>)	033715
Huiping Zhan and Huatang Tan	
Revisiting the phase transitions of the Dicke model (<i>10 pages</i>)	033716
Pragna Das and Auditya Sharma	

COMMENTS

Comment on “Possibility of small electron states” (<i>3 pages</i>)	036201
Iwo Bialynicki-Birula and Zofia Bialynicka-Birula	
Comment on “Nonlinear quantum effects in electromagnetic radiation of a vortex electron” (<i>8 pages</i>)	036202
Aviv Karnieli, Roei Remez, Ido Kaminer, and Ady Arie	
Reply to “Comment on ‘Nonlinear quantum effects in electromagnetic radiation of a vortex electron’ ” (<i>4 pages</i>)	036203
D. V. Karlovets and A. M. Pupasov-Maksimov	

ERRATA

Erratum: Conversion of Gaussian states to non-Gaussian states using photon-number-resolving detectors [Phys. Rev. A 100 , 052301 (2019)] (<i>2 pages</i>)	039901(E)
Daiqin Su, Casey R. Myers, and Krishna Kumar Sabapathy	
Erratum: Phase-space-simulation method for quantum computation with magic states on qubits [Phys. Rev. A 101 , 012350 (2020)] (<i>2 pages</i>)	039902(E)
Robert Raussendorf, Juani Bermejo-Vega, Emily Tyhurst, Cihan Okay, and Michael Zurel	
Erratum: Elastic rate coefficients for Li+H ₂ collisions in the calibration of a cold-atom vacuum standard [Phys. Rev. A 99 , 042704 (2019)] (<i>2 pages</i>)	039903(E)
Constantinos Makrides, Daniel S. Barker, James A. Fedchak, Julia Scherschligt, Stephen Eckel, and Eite Tiesinga	