

*The Table of Contents is a total listing of Parts A, B, and C.  
Part A consists of pages L020201–022472, Part B pages 022601–023329, and Part C pages 023501–029905(E).*

## PART A

### LETTERS

#### Fundamental concepts

Hamiltonian thresholds for objective records (6 pages) ..... L020201  
Jie Gu

Fractional power-law decay in the spontaneous emission of a two-level system (6 pages) ..... L020202  
Hiroki Nakabayashi, Hayato Kinkawa, Takano Taira, and Naomichi Hatano

#### Quantum information science

Error-correcting transition pulses for colocated spin ensembles without frequency selectivity (7 pages) ..... L020401  
K. L. Wood and W. A. Terrano

#### Atomic and molecular structure and dynamics; high-precision experiments; chemical physics

Geometry-enabled radiation from structured paraxial electrons (7 pages) ..... L020801  
M. S. Epov, I. E. Shenderovich, and S. S. Baturin

Resolving the blueshift in calculations of the EUV spectrum of multiply charged tin ions (7 pages) ..... L020802  
M. L. Reitsma, J. Sheil, O. O. Versolato, E. V. Kahl, and J. C. Berengut

#### Light-induced processes in atomic-scale systems

Strong collective chiroptical response from electric-dipole interactions in atomic systems (7 pages) ..... L021101  
Marcella L. Xavier, Felipe A. Pinheiro, and Romain Bachelard

Femtosecond chiroptical switching mediated by a geometric phase (6 pages) ..... L021102  
Yang Liu, Peipei Ge, Yueming Zhou, Xiaosong Zhu, Min Li, and Peixiang Lu

#### Ultracold systems and matter waves

Vortex dipoles in expanding shell-shaped Bose-Einstein condensates (6 pages) ..... L021301  
A. Tononi

Topological transport of solitons in composite linear-nonlinear lattices (6 pages) ..... L021302  
Yaroslav V. Kartashov, Vladimir V. Konotop, and Dmitry A. Zezyulin



(Continued)



2469-9926(202608)114:2:A;1-R

# CONTENTS - *Continued*

PHYSICAL REVIEW A

THIRD SERIES, VOLUME 114, NUMBER 2

AUGUST 2026

|                                                                                                                         |         |
|-------------------------------------------------------------------------------------------------------------------------|---------|
| Engineering the winding number of a toroidal Bose condensate by accelerating dark solitons ( <i>6 pages</i> ) . . . . . | L021303 |
| Xiao-Lin Li, Ming Gong, Yu-Hao Wang, and Li-Chen Zhao                                                                   |         |

## Quantum optics

|                                                                                             |         |
|---------------------------------------------------------------------------------------------|---------|
| Momentum correlations of the Hawking effect in a quantum fluid ( <i>6 pages</i> ) . . . . . | L021701 |
| Marcos Gil de Olivera, Malo Joly, Antonio Z. Khoury, Alberto Bramati, and Maxime J. Jacquet |         |

## ARTICLES

### Fundamental concepts

|                                                                                                                                                                  |        |
|------------------------------------------------------------------------------------------------------------------------------------------------------------------|--------|
| Universal scaling of quantum caustics in the dynamics of interacting particles ( <i>11 pages</i> ) . . . . .                                                     | 022201 |
| Monalisa Singh Roy, Jesse Mumford, Amit Ozer, Oded Porat, D. H. J. O'Dell, and Emanuele G. Dalla Torre                                                           |        |
| Quantum refrigerator embedded in spin-star environments: Scalings of temperature and refrigeration time ( <i>27 pages</i> ) . . . . .                            | 022202 |
| Sukrut Mondkar, Aparajita Bhattacharyya, and Ujjwal Sen                                                                                                          |        |
| Input phase noise in Gaussian boson sampling ( <i>10 pages</i> ) . . . . .                                                                                       | 022203 |
| Magdalena Parýzková, Craig S. Hamilton, Igor Jex, Michael Stefszky, and Christine Silberhorn                                                                     |        |
| Photon position eigenstates in configuration space ( <i>16 pages</i> ) . . . . .                                                                                 | 022204 |
| Artemio González-López and Luis Martínez Alonso                                                                                                                  |        |
| Giant-atom quantum battery ( <i>10 pages</i> ) . . . . .                                                                                                         | 022205 |
| Lei Qiao and P. Z. Zhao                                                                                                                                          |        |
| Optimal nonlocality transfer matrix in quantum chains with translational symmetry breaking ( <i>14 pages</i> ) . . . . .                                         | 022206 |
| Xue-Yi Lei, Hong-Guang Cheng, Zihan Xu, Ian P. McCulloch, Liang Yan, and Zhao-Yu Sun                                                                             |        |
| Typicality of contextuality ( <i>19 pages</i> ) . . . . .                                                                                                        | 022207 |
| Vinicius P. Rossi, Beata Zjawin, Roberto D. Baldijão, David Schmid, John H. Selby, and Ana Bélen Sainz                                                           |        |
| Clauser-Horne-Shimony-Holt game, Tsirelson's bound, and causal locality ( <i>9 pages</i> ) . . . . .                                                             | 022208 |
| Jacob A. Barandes, Mahmudul Hasan, and David Kagan                                                                                                               |        |
| Dynamics of two particles with quasiperiodic long-range interactions ( <i>10 pages</i> ) . . . . .                                                               | 022209 |
| Yun Zou                                                                                                                                                          |        |
| Boosting the performance of a Lipkin-Meshkov-Glick quantum battery via symmetry-breaking quenches or a single-mode bosonic charger ( <i>15 pages</i> ) . . . . . | 022210 |
| Le Bin Ho, Duc Tuan Hoang, Tran Duong Anh-Tai, Thomas Busch, and Thomás Fogarty                                                                                  |        |
|  Conservation laws for partially coherent waves ( <i>8 pages</i> ) . . . . .   | 022211 |
| Mengdi Li, Hugo F. Schouten, and Taco D. Visser                                                                                                                  |        |
| Dynamics and Stokes phases in multilevel non-Hermitian Landau-Zener transitions ( <i>14 pages</i> ) . . . . .                                                    | 022212 |
| Z. H. Zhou, Xin Wang, and H. D. Liu                                                                                                                              |        |
| Nonstationary hierarchical equations of motion in complex time ( <i>25 pages</i> ) . . . . .                                                                     | 022213 |
| Mauro Cirio and Pengfei Liang                                                                                                                                    |        |

(Continued)

# CONTENTS - *Continued*

PHYSICAL REVIEW A

THIRD SERIES, VOLUME 114, NUMBER 2

AUGUST 2026

|                                                                                                                                           |        |
|-------------------------------------------------------------------------------------------------------------------------------------------|--------|
| Algebraic structure of Fock-state lattices ( <i>20 pages</i> ) . . . . .                                                                  | 022214 |
| Piergiorgio Ferraro, Caio B. Naves, and Jonas Larson                                                                                      |        |
| Localization without disorder: Quantum walks on structured graphs ( <i>18 pages</i> ) . . . . .                                           | 022215 |
| Shyam Dhamapurkar and K. Venkata Subrahmanyam                                                                                             |        |
| Torsion-induced gauge structure in curved quantum waveguides ( <i>13 pages</i> ) . . . . .                                                | 022216 |
| Xu-Yang Hou, Xianlong Gao, and Hao Guo                                                                                                    |        |
| Nonreciprocal Landau-Zener tunneling with heat-bath colored noise ( <i>11 pages</i> ) . . . . .                                           | 022217 |
| Yi Cao and Jie Liu                                                                                                                        |        |
| Correlated decoherence in a common environment activated by relative motion ( <i>17 pages</i> ) . . . . .                                 | 022218 |
| Yang Wang, Zhilei Sun, Feiyi Liu, Min Guo, Yuhan Jiang, and Mingyang Liu                                                                  |        |
| <b>Quantum information science</b>                                                                                                        |        |
| Quantum-error-correction-inspired multiparameter quantum metrology ( <i>17 pages</i> ) . . . . .                                          | 022401 |
| Sivaprasad Omanakuttan, Jonathan A. Gross, and Tyler Volkoff                                                                              |        |
| Learning spectral density functions in open quantum systems ( <i>10 pages</i> ) . . . . .                                                 | 022402 |
| Felipe Peleteiro, João Victor Shiguetsugo Kawanami Lima, Pedro Marcelo Prado, Felipe Fernandes Fanchini, and Ariel Norambuena             |        |
| Non-Hermitian skin effect in a semi-infinite Fock-state lattice ( <i>9 pages</i> ) . . . . .                                              | 022403 |
| Zhi Jiao Deng, Xing Yao Mi, Ruo Kun Cai, Chun Wang Wu, and Ping Xing Chen                                                                 |        |
| Quantum Davis-Putnam-Logemann-Loveland and generalized constraints in iterative quantum algorithms ( <i>14 pages</i> ) . . . . .          | 022404 |
| Lucas T. Brady and Stuart Hadfield                                                                                                        |        |
| Floquet-informed learning of time-periodic Hamiltonians ( <i>15 pages</i> ) . . . . .                                                     | 022405 |
| Keren Li                                                                                                                                  |        |
| Non-normality and dissipation in Markovian quantum dynamics: Implications for quantum simulation ( <i>15 pages</i> ) . . . . .            | 022406 |
| Shakib Daryanoosh                                                                                                                         |        |
| Advantage of flexible catalysis for entanglement and quantum thermodynamics ( <i>10 pages</i> ) . . . . .                                 | 022407 |
| Jingsong Ao, Aby Philip, and Alexander Streltsov                                                                                          |        |
| Upper bounds on the purity of Wigner non-negative quantum states that verify the Wigner entropy conjecture ( <i>6 pages</i> ) . . . . .   | 022408 |
| Qipeng Qian and Christos N. Gagatsos                                                                                                      |        |
| Overflow-safe polylog-time parallel minimum-weight perfect-matching decoder: Toward feasible implementation ( <i>13 pages</i> ) . . . . . | 022409 |
| Ryo Mikami and Hayata Yamasaki                                                                                                            |        |
| Restriction-based certificate of bipartite Schmidt rank in hypergraph states ( <i>10 pages</i> ) . . . . .                                | 022410 |
| C. Fajardo and M. Paraschiv                                                                                                               |        |

(Continued)

# CONTENTS - *Continued*

PHYSICAL REVIEW A

THIRD SERIES, VOLUME 114, NUMBER 2

AUGUST 2026

|                                                                                                                                            |        |
|--------------------------------------------------------------------------------------------------------------------------------------------|--------|
|                                                                                                                                            | 022411 |
| Qian Zhang, Kai-Yu Yuan, Yan-Xin Rong, Zhen Shang, Yong-Jian Gu, and Ya Xiao                                                               |        |
| Asymptotically optimal joint phase and dephasing-strength estimation using spin-squeezed states (9 pages)                                  | 022412 |
| Arkadiusz Kobus and Rafał Demkowicz-Dobrzański                                                                                             |        |
| Experimental prime factorization via feedback quantum control (9 pages)                                                                    | 022413 |
| K. B. Hari Krishnan, Vishal Varma, and T. S. Mahesh                                                                                        |        |
| Variational quantum operator simulation (11 pages)                                                                                         | 022414 |
| Satoru Shoji, Kosuke Ito, Yukihiro Shimizu, and Keisuke Fujii                                                                              |        |
| Pre-distillation of magic states via composite schemes (23 pages)                                                                          | 022415 |
| Muhammad Erew, Moshe Goldstein, Yaron Oz, and Haim Suchowski                                                                               |        |
| Universal operator-norm bounds on instantaneous rates in quantum batteries (11 pages)                                                      | 022416 |
| Sen-Yan Guo, Lu Wang, Na-Na Li, Rui-Yuan Li, Feng-lin Wu, and Si-Yuan Liu                                                                  |        |
| Equivalence between exponential concentration in quantum machine learning kernels and barren plateaus in variational algorithms (10 pages) | 022417 |
| Pranav Kairon, Jonas Jäger, and Roman V. Krems                                                                                             |        |
| Mitigating barren plateaus in quantum denoising diffusion probabilistic models (15 pages)                                                  | 022418 |
| Haipeng Cao, Kaining Zhang, Dacheng Tao, and Zhaofeng Su                                                                                   |        |
| Tabletop reversibility of phase-covariant operations (15 pages)                                                                            | 022419 |
| Fangzhen Chen and Xueyuan Hu                                                                                                               |        |
| Quantum coherence and entanglement in wireless quantum batteries (12 pages)                                                                | 022420 |
| Jun-Jie Jiang, Jin-Di Cao, Yu-Fei Zhang, Meng-Long Song, and Dong Wang                                                                     |        |
| Geometric and resource-theoretic characterization of nonstabilizerness in quantum algorithms (14 pages)                                    | 022421 |
| Tom Krueger and Wolfgang Maurer                                                                                                            |        |
| Comparing quantum to simulated reverse annealing in mean-field models (18 pages)                                                           | 022422 |
| Christopher L. Baldwin                                                                                                                     |        |
| Noise tolerance via reinforcement in the quantum search problem (9 pages)                                                                  | 022423 |
| Marjan Homayouni-Sangari and Abolfazl Ramezanzpour                                                                                         |        |
| More global randomness from less-random local gates (24 pages)                                                                             | 022424 |
| Ryotaro Suzuki, Hosho Katsura, Yosuke Mitsuhashi, Tomohiro Soejima, Jens Eisert, and Nobuyuki Yoshioka                                     |        |
| <i>In situ</i> rewiring of two-dimensional ion lattice interactions using metastable state shelving (8 pages)                              | 022425 |
| Ilyoung Jung, Antonis Kyprianidis, Frank G. Schroer, Thomas W. Burkley, Jack Lyons, and Philip Richerme                                    |        |
| Frequency shifts heralding ground-state squeezing and entanglement of two coupled harmonic oscillators (11 pages)                          | 022426 |
| Safoura Mirkhalaf, Helmut Ritsch, and Karol Gietka                                                                                         |        |
| Fault-tolerant resource comparison of qudit and qubit encodings for diagonal quadratic operators (21 pages)                                | 022427 |
| Samuel Godwood, Doğa Murat Kürkçüoğlu, Gabriel N. Perdue, Marina Maneyro, and Alessandro Roggero                                           |        |

(Continued)

# CONTENTS - *Continued*

PHYSICAL REVIEW A

THIRD SERIES, VOLUME 114, NUMBER 2

AUGUST 2026

|                                                                                                                                                                                             |        |
|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|--------|
| Local-observable-guided generative quantum circuits for degenerate ground spaces ( <i>13 pages</i> ) . . . . .                                                                              | 022428 |
| Yiying Chen (陈怡颖), Lingxia Zhang (张凌霞), Yanzheng Zhu (朱彦铮),<br>Kaiyan Yang (杨恺雁), Xiao Zeng (曾骁), and Zizhu Wang (王子竹)                                                                      |        |
| Joint parameter estimation and multidimensional reconciliation for continuous-variable quantum key<br>distribution ( <i>11 pages</i> ) . . . . .                                            | 022429 |
| Jisheng Dai, Xue-Qin Jiang, Peng Huang, Tao Wang, and Guihua Zeng                                                                                                                           |        |
| Classical simulation of noisy quantum circuits via locally entanglement-optimal unravelings ( <i>25 pages</i> ) . . . . .                                                                   | 022430 |
| Simon Cichy, Paul K. Faehrmann, Lennart Bittel, Jens Eisert, and Hakop Pashayan                                                                                                             |        |
| Hyperlink representation of entanglement and the inclusion-exclusion principle ( <i>10 pages</i> ) . . . . .                                                                                | 022431 |
| Silvia N. Santalla, Sudipto Singha Roy, Germán Sierra, and Javier Rodríguez-Laguna                                                                                                          |        |
| Characterizing energy transfer and distribution in quantum batteries through continuous-time quantum<br>walks ( <i>13 pages</i> ) . . . . .                                                 | 022432 |
| Lu Wang, Feng-lin Wu, Na-Na Li, Sen-Yan Guo, Rui-Yuan Li, and Si-Yuan Liu                                                                                                                   |        |
|  Distributions of noisy expectation values over sets of measurement operators ( <i>20 pages</i> ) . . . . . | 022434 |
| Matthew Dushenes, Roger G. Melko, Juan Carrasquilla, and Raymond Laflamme                                                                                                                   |        |
| Optimized network-steering inequality based on the distribution character of network parties ( <i>11 pages</i> ) . . . . .                                                                  | 022435 |
| Hongyan Li, Shuyuan Yang, Jinchuan Hou, and Kan He                                                                                                                                          |        |
| Achieving double-logarithmic precision dependence in optimization-based quantum unstructured<br>search ( <i>21 pages</i> ) . . . . .                                                        | 022436 |
| Zhijian Lai, Dong An, Jiang Hu, and Zaiwen Wen                                                                                                                                              |        |
| Information geometry of bosonic Gaussian thermal states ( <i>22 pages</i> ) . . . . .                                                                                                       | 022437 |
| Zixin Huang and Mark M. Wilde                                                                                                                                                               |        |
| Probing quantum information scrambling via local randomized measurements ( <i>12 pages</i> ) . . . . .                                                                                      | 022438 |
| Yan-Ming Chen and Dan-Bo Zhang                                                                                                                                                              |        |
| Experimental realization of an orthogonal-state-encoding quantum cryptography system driven by broadband<br>quantum memory ( <i>7 pages</i> ) . . . . .                                     | 022439 |
| Mingshuo Sun, Chunhui Zhang, Zhiyuan Zhou, Yun Liu, Gaoxiang Fu, Lechen Xu, Yizhen Luo,<br>Guigen Zeng, Jian Li, and Qin Wang                                                               |        |
| Spin stiffness and resilience phase transition in a noisy toric-rotor code ( <i>11 pages</i> ) . . . . .                                                                                    | 022440 |
| Morteza Zarei and Mohammad Hossein Zarei                                                                                                                                                    |        |
| Sub-Riemannian lift advantage in quantum control ( <i>12 pages</i> ) . . . . .                                                                                                              | 022441 |
| Ryan Choi, Vwani Roychowdhury, and Louis-S. Bouchard                                                                                                                                        |        |
| Gravitational decoherence estimation in optomechanical systems ( <i>10 pages</i> ) . . . . .                                                                                                | 022442 |
| Leonardo A. M. Souza, Olimpio P. de Sá Neto, Enrico Russo, Rosario Lo Franco, and Gerardo Adesso                                                                                            |        |
| Entropy density benchmarking of near-term quantum circuits ( <i>18 pages</i> ) . . . . .                                                                                                    | 022443 |
| Marine Demarty, James Mills, Kenza Hammam, and Raúl García-Patrón                                                                                                                           |        |
| Auxiliary-field quantum Monte Carlo on quantum hardware via unitary dilation ( <i>13 pages</i> ) . . . . .                                                                                  | 022444 |
| Xiantao Li                                                                                                                                                                                  |        |

(Continued)

# CONTENTS - *Continued*

PHYSICAL REVIEW A

THIRD SERIES, VOLUME 114, NUMBER 2

AUGUST 2026

|                                                                                                                               |        |
|-------------------------------------------------------------------------------------------------------------------------------|--------|
| Spatial Leggett-Garg inequalities ( <i>8 pages</i> ) . . . . .                                                                | 022446 |
| Guillem Müller-Rigat, Donato Farina, Maciej Lewenstein, and Andrea Tononi                                                     |        |
| Asymmetric and fast Rydberg gate protocol for entanglement outside of the blockade regime ( <i>8 pages</i> ) . . . . .        | 022447 |
| Daniel C. Cole, Vikas Buchemavari, and Mark Saffman                                                                           |        |
| Complex heat capacity as a witness of spatio-temporal entanglement ( <i>7 pages</i> ) . . . . .                               | 022448 |
| Mia Stamatova and Vlatko Vedral                                                                                               |        |
| Correcting non-Pauli noise with detector error models estimated from syndrome measurements ( <i>16 pages</i> ) . . . . .      | 022449 |
| Evangelia Takou and Kenneth R. Brown                                                                                          |        |
| Cloning encrypted quantum states in arbitrary dimensions ( <i>13 pages</i> ) . . . . .                                        | 022450 |
| Filip-Ioan Ceară                                                                                                              |        |
| Leakage-suppressed parametric entangling gates in a spin-resonator hybrid system ( <i>15 pages</i> ) . . . . .                | 022451 |
| Jin-Rong Liu, Ao-Lin Guo, Bo-Ya Zhang, and Xing-Yu Zhu                                                                        |        |
| Distinguishing universality classes of two entanglement percolation protocols ( <i>11 pages</i> ) . . . . .                   | 022452 |
| Haigang Wang, Jinchuan Hou, and Kan He                                                                                        |        |
| Measure of set imaginarity ( <i>12 pages</i> ) . . . . .                                                                      | 022453 |
| Yu Guo, Jiabo Pan, Yuqin Wang, and Shuanping Du                                                                               |        |
| Multipartite entanglement in the quantum tetrahedron ( <i>15 pages</i> ) . . . . .                                            | 022454 |
| Robert Amelung and Hanno Sahlmann                                                                                             |        |
| Dissipation-protected energy storage in interacting multilevel quantum batteries ( <i>13 pages</i> ) . . . . .                | 022455 |
| Yiğit Perçin and Özgür E. Müstecaplıoğlu                                                                                      |        |
| General quantum resources providing advantages in work-extraction tasks ( <i>12 pages</i> ) . . . . .                         | 022456 |
| Chung-Yun Hsieh and Manuel Gessner                                                                                            |        |
| Asymmetric polaron picture for the quantum Rabi model ( <i>21 pages</i> ) . . . . .                                           | 022457 |
| Feng Qiao, Qiu-Yi Chen, and Zu-Jian Ying                                                                                      |        |
| Symmetry enforcing entanglement at high temperatures ( <i>16 pages</i> ) . . . . .                                            | 022458 |
| Amir-Reza Negari, Leonardo A. Lessa, and Subhayan Sahu                                                                        |        |
| Squeezed quantum multiplets: Properties and phase space representation ( <i>10 pages</i> ) . . . . .                          | 022459 |
| Juan Pablo Paz, Corina Révora, and Christian Tomás Schmiegelow                                                                |        |
| Qudit gate decomposition for lattice gauge theories on superconducting radio-frequency cavities ( <i>17 pages</i> ) . . . . . | 022460 |
| Doğa Murat Kürkçüoğlu, Henry Lamm, and Andrea Maestri                                                                         |        |
| Advantage framework for resource engines ( <i>26 pages</i> ) . . . . .                                                        | 022461 |
| Jakub Czartowski and Rafał Bistróń                                                                                            |        |
| Dynamical imaginarity measures induced by channel divergences ( <i>16 pages</i> ) . . . . .                                   | 022462 |
| Peihua Tian and Yuan Sun                                                                                                      |        |
| Reinforcement learning for robust calibration of multiqubit quantum gates ( <i>13 pages</i> ) . . . . .                       | 022463 |
| Amine Jaouadi and Sahel Ashhab                                                                                                |        |

(Continued)

# CONTENTS - *Continued*

PHYSICAL REVIEW A

THIRD SERIES, VOLUME 114, NUMBER 2

AUGUST 2026

|                                                                                                                                                                   |        |
|-------------------------------------------------------------------------------------------------------------------------------------------------------------------|--------|
| Mixed-dimensional quantum MacWilliams identity: Bounds for codes and absolutely maximally entangled states in heterogeneous systems ( <i>24 pages</i> ) . . . . . | 022464 |
| David González-Lociga and Simeon Ball                                                                                                                             |        |
| Fisher information of complete quantum measurements ( <i>6 pages</i> ) . . . . .                                                                                  | 022465 |
| Rakesh Saini, Jukka Kiukas, Daniel Burgarth, and Alexei Gilchrist                                                                                                 |        |
| Full-state information-disturbance tradeoff for direction estimation with antiparallel spin-coherent pairs ( <i>17 pages</i> ) . . . . .                          | 022466 |
| Massimiliano F. Sacchi                                                                                                                                            |        |
| Permutation-invariant Holstein-Primakoff spin codes for local and collective noise ( <i>17 pages</i> ) . . . . .                                                  | 022467 |
| Sivaprasad Omanakuttan, Tyler G. Thurtell, Andrew K. Forbes, Vikas Buchemmavari, and Ben Q. Baragiola                                                             |        |
| General perturbation theory for local quantum uncertainty and its formulation in the linear-response regime ( <i>14 pages</i> ) . . . . .                         | 022468 |
| A. A. Jimenez-Romero and F. Rojas                                                                                                                                 |        |
| Universality classes split by strong and weak symmetries ( <i>11 pages</i> ) . . . . .                                                                            | 022469 |
| Jongjun M. Lee, Myung-Joong Hwang, and Igor Boettcher                                                                                                             |        |
| Frustration-enhanced quantum annealing correction models with additional inter-replica interactions ( <i>17 pages</i> ) . . . . .                                 | 022470 |
| Tomohiro Hattori and Shu Tanaka                                                                                                                                   |        |
| Dissipative continuation for ground-state preparation at chemical transition states ( <i>33 pages</i> ) . . . . .                                                 | 022471 |
| Thomas W. Watts, Soumya Sarkar, Daniel Collins, Nam Nguyen, Luke Quezada, Michael J. Bremner, and Samuel J. Elman                                                 |        |
| Experimental demonstration of a brachistochrone nonadiabatic holonomic single-qubit gate scheme in a trapped ion ( <i>8 pages</i> ) . . . . .                     | 022472 |
| Xi Wang, Hui Ren, L.-N. Sun, K.-F. Cui, J.-T. Bu, S.-L. Su, L.-L. Yan, and G. Chen                                                                                |        |

## PART B

### Quantum technologies

|                                                                                                                                                                                     |        |
|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|--------|
| Scalable repeater architecture for long-range quantum energy teleportation in gapped systems ( <i>13 pages</i> ) . . . . .                                                          | 022601 |
| M. Y. Abd-Rabbou, Irfan Siddique, Saeed Haddadi, and Cong-Feng Qiao                                                                                                                 |        |
| Optical downlink modeling for low-earth-orbit and medium-earth-orbit satellites under atmospheric turbulence with a quantum-state-tomography use case ( <i>19 pages</i> ) . . . . . | 022602 |
| Artur Czerwinski, Jakub J. Borkowski, Maciej Wiśniewski, and Saeed Haddadi                                                                                                          |        |
| Probing an electron-spin ensemble with squeezed microwave signals ( <i>12 pages</i> ) . . . . .                                                                                     | 022603 |
| P. Oehrl, F. Fesquet, K. E. Honasoge, M. Handschuh, A. Marx, R. Gross, K. G. Fedorov, and H. Huebl                                                                                  |        |
| Refrigeration of a one-dimensional gas of microwave photons ( <i>14 pages</i> ) . . . . .                                                                                           | 022604 |
| Lukas Schamriß, Louis Garbe, and Peter Rabl                                                                                                                                         |        |
| Fast quantum calibration using Bayesian optimization with state parameter estimator for non-Markovian environment ( <i>19 pages</i> ) . . . . .                                     | 022605 |
| Peng Qian, Shahid Qamar, Xiao Xiao, Yanwu Gu, Xudan Chai, Zhen Zhao, Nicolò Forcellini, and Dong E. Liu                                                                             |        |

(Continued)

# CONTENTS - *Continued*

PHYSICAL REVIEW A

THIRD SERIES, VOLUME 114, NUMBER 2

AUGUST 2026

|                                                                                                                                                                                                                                           |        |
|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|--------|
| Minimal-energy optimal control of tunable two-qubit gates in superconducting platforms using continuous dynamical decoupling ( <i>14 pages</i> ) . . . . .                                                                                | 022606 |
| Adonai Hilário da Silva, Octávio da Motta, Leonardo K. Castelano, and Reginaldo de Jesus Napolitano                                                                                                                                       |        |
| Interferometer-based quantum optical generative models with optimized fidelity and success probability ( <i>13 pages</i> ) . . . . .                                                                                                      | 022607 |
| Haosen Chen and Xiangdong Zhang                                                                                                                                                                                                           |        |
| Developing a universal logical state-purification strategy ( <i>13 pages</i> ) . . . . .                                                                                                                                                  | 022608 |
| Chandrima B. Pushpan, Tanoy Kanti Konar, Aditi Sen(De), and Amit Kumar Pal                                                                                                                                                                |        |
| Remote high-temperature quantum thermometry using blackbody-radiation-induced shifts of Rydberg electromagnetically induced transparency resonances ( <i>13 pages</i> ) . . . . .                                                         | 022609 |
| Assaf Alassaf and Ramiz Hamid                                                                                                                                                                                                             |        |
| Parameter trajectory engineering for state transfer and quantum sensing in non-Hermitian two-level systems ( <i>15 pages</i> ) . . . . .                                                                                                  | 022610 |
| Qi-Cheng Wu, Yan-Hui Zhou, Biao-liang Ye, Tong Liu, Yi-Hao Kang, Qi-Ping Su, and Chui-Ping Yang                                                                                                                                           |        |
| Continuous-variable quantum key distribution with composable security and tight error-correction bound towards constrained-device implementations ( <i>14 pages</i> ) . . . . .                                                           | 022611 |
| Panagiotis Papanastasiou, Carlo Ottaviani, Stefano Pirandola, Poonam Yadav, and Marco Lucamarini                                                                                                                                          |        |
| Agnostic parameter estimation with large spins ( <i>10 pages</i> ) . . . . .                                                                                                                                                              | 022612 |
| Huining Zhang and X. X. Yi                                                                                                                                                                                                                |        |
| Robust two-qubit gates for semiconductor spin qubits based on dynamical dimensionality reduction ( <i>8 pages</i> ) . . .                                                                                                                 | 022613 |
| Qi-Pei Liu, Jian Zhou, and Zheng-Yuan Xue                                                                                                                                                                                                 |        |
| Physical origins of shortest control time from feasibility boundaries in quantum control ( <i>7 pages</i> ) . . . . .                                                                                                                     | 022614 |
| I-Yun Hsiao and Yoshiaki Teranishi                                                                                                                                                                                                        |        |
|  Optimal absorption and emission of itinerant fields into a spin-ensemble memory ( <i>16 pages</i> ) . . . . .                                           | 022615 |
| Linda Greggio, Tristan Lorriaux, Alexandru Petrescu, Mazyar Mirrahimi, and Audrey Bienfait                                                                                                                                                |        |
| Multipartite entanglement generation via unsharp-measurement-feedback control ( <i>13 pages</i> ) . . . . .                                                                                                                               | 022616 |
| Du Ran, Ze-Long He, Peng-Yu Su, Sui-Hu Dang, Ya-dong Li, and Shuai Liu                                                                                                                                                                    |        |
| Radial fast entangling gates under micromotion in trapped-ion quantum computers ( <i>17 pages</i> ) . . . . .                                                                                                                             | 022617 |
| Phoebe Grosser, Monica Gutierrez Galan, Isabelle Savill-Brown, Alexander K. Ratcliffe, Haonan Liu, Varun D. Vaidya, Simon A. Haine, C. Ricardo Viteri, Joseph J. Hope, and Zain Mehdi                                                     |        |
| Four-photon subtraction from picosecond squeezed vacuum demonstrating Wigner negativity without loss correction ( <i>16 pages</i> ) . . . . .                                                                                             | 022618 |
| Mamoru Endo, Takefumi Nomura, Tatsuki Sonoyama, Kazuma Takahashi, Sachiko Takasu, Daiji Fukuda, Takahiro Kashiwazaki, Asuka Inoue, Takeshi Umeki, Rajveer Nehra, Petr Marek, Radim Filip, Kan Takase, Warit Asavanant, and Akira Furusawa |        |
| Adiabatic Ramsey interferometry for measuring weak nonlinearities with super-Heisenberg precision ( <i>10 pages</i> ) . . . . .                                                                                                           | 022619 |
| Venelin P. Pavlov, Bogomila S. Nikolova, and Peter A. Ivanov                                                                                                                                                                              |        |

(Continued)

# CONTENTS - *Continued*

PHYSICAL REVIEW A

THIRD SERIES, VOLUME 114, NUMBER 2

AUGUST 2026

|                                                                                                                                                |        |
|------------------------------------------------------------------------------------------------------------------------------------------------|--------|
| Entanglement certification and entropy bounds in the asymmetric Clauser-Horne-Shimony-Holt scenario (12 pages) . . . . .                       | 022620 |
| Xingyuan Bu, Xin Kuang, and Yunguang Han                                                                                                       |        |
| Refined coherent control of atomic qubits via a wave-function approach conditioned on no-decay (9 pages) . . . . .                             | 022621 |
| Yuan Sun                                                                                                                                       |        |
| Impact of acoustic phonons on biexciton preparation using shortcuts to adiabaticity (20 pages) . . . . .                                       | 022622 |
| Sutirtha Biswas, Dionisis Stefanatos, and Emmanuel Paspalakis                                                                                  |        |
| Encoding computationally hard problems in triangular Rydberg atom arrays (14 pages) . . . . .                                                  | 022623 |
| Xi-Wei Pan, Huan-Hai Zhou, Yi-Ming Lu, and Jin-Guo Liu                                                                                         |        |
| Collective dynamics versus entanglement in quantum battery performance (18 pages) . . . . .                                                    | 022624 |
| Rohit Kumar Shukla, Sunil K. Mishra, and Ujjwal Sen                                                                                            |        |
| <b>Atomic and molecular structure and dynamics; high-precision experiments; chemical physics</b>                                               |        |
| Breit corrections to moderately charged ions in all-order calculations (11 pages) . . . . .                                                    | 022801 |
| Andoni Skoufris and Benjamin M. Roberts                                                                                                        |        |
| Symmetry-based perturbation theory for electronic structure calculations (17 pages) . . . . .                                                  | 022802 |
| Hiromichi Nishimura, Nam Nguyen, Tanvi Gujarati, and Mario Motta                                                                               |        |
| Angular distribution of Auger electrons following dielectronic capture for hydrogenlike ions (15 pages) . . . . .                              | 022803 |
| Yunping Wang, Tianluo Luo, Zhencen He, Zhihao Yang, and Zhimin Hu                                                                              |        |
| Bound-state Compton scattering of linearly polarized photons (13 pages) . . . . .                                                              | 022804 |
| Jonas Sommerfeldt, Nick M. Mayer, Anna Maiorova, Wilko Middents,<br>Stephan Fritzsche, Thomas Stöhlker, and Andrey Surzhykov                   |        |
| Criterion for an effective discretization of a continuous Schrödinger spectrum using a pseudostate basis (7 pages) . . . . .                   | 022805 |
| Tom Kirchner and Marko Horbatsch                                                                                                               |        |
| Parity nonconservation in the isotope chain of tin (11 pages) . . . . .                                                                        | 022806 |
| V. A. Dzuba, V. V. Flambaum, D. DeMille, Jianwei Wang, and Geoffrey Zheng                                                                      |        |
| Isotope shifts and hyperfine splitting of the $^1S_0 \rightarrow ^3P_1$ transition in zinc (8 pages) . . . . .                                 | 022807 |
| Felix Waldherr, Lukas Möller, and Simon Stellmer                                                                                               |        |
| Single- and double-electron capture at intermediate energies for $\text{Ne}^{8+}$ colliding with He (12 pages) . . . . .                       | 022808 |
| Yadong Liu, Yunyu Wu, Ling Liu, Yong Wu, Xiangjun Chen, and Jianguo Wang                                                                       |        |
| Electronic stopping power of protons in the rare-earth lanthanide metal Gd: Contribution from the $p$ -electron excitation (7 pages) . . . . . | 022809 |
| Yan-Long Fu, Zhi-Yi Ni, Lei Xue, Chao-Yong Feng, Xue-Song Li, Yang Liu, and Feng-Shou Zhang                                                    |        |
| Vibrational-excitation cross sections by electron impact on the CH radical for nonthermal plasmas (9 pages) . . . . .                          | 022810 |
| V. Laporta, M. Telmini, R. Ghosh, and K. Chakrabarti                                                                                           |        |
| Spin-flip configuration interaction for strong static correlation in molecular cavity quantum electrodynamics (12 pages) . . . . .             | 022811 |
| Braden M. Weight, Sergei Tretiak, and Zheng Pei                                                                                                |        |

(Continued)

# CONTENTS - *Continued*

PHYSICAL REVIEW A

THIRD SERIES, VOLUME 114, NUMBER 2

AUGUST 2026

|                                                                                                                                                                                                                                              |        |
|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|--------|
| Electric-field-dependent $g$ factors of $\text{RaOCH}_3$ molecule (6 pages) . . . . .                                                                                                                                                        | 022812 |
| Alexander Petrov                                                                                                                                                                                                                             |        |
| Vibronic quantum dynamics of ultralong-range high- $\ell$ Rydberg molecules (13 pages) . . . . .                                                                                                                                             | 022813 |
| Felix Giering, Rohan Srikumar, and Peter Schmelcher                                                                                                                                                                                          |        |
| Effect of an applied magnetic field on $^{84}\text{Sr } n^1D_2$ ultralong-range Rydberg dimers (10 pages) . . . . .                                                                                                                          | 022814 |
| S. Yoshida, C. Wang, A. Li, S. K. Kanungo, T. C. Killian, and F. B. Dunning                                                                                                                                                                  |        |
| Signatures of nuclear motion in a model study of ultrafast single-pulse two-photon ionization of diatomic molecules (18 pages) . . . . .                                                                                                     | 022815 |
| Jan Dvořák, Robert R. Lucchese, Roger Y. Bello, and C. William McCurdy                                                                                                                                                                       |        |
| Simulation of vibrational dynamics using qubits and qudits (15 pages) . . . . .                                                                                                                                                              | 022816 |
| Erik Lötstedt and Kaoru Yamanouchi                                                                                                                                                                                                           |        |
| Charge transfer in low-energy collisions of ground and metastable states of $\text{C}^+$ ions with $\text{H}_2$ molecules (9 pages) . . . . .                                                                                                | 022817 |
| Yun-Yu Wu, Ya-Dong Liu, Ling Liu, Yong Wu, and Jian-Guo Wang                                                                                                                                                                                 |        |
| Applications of the Schwinger multichannel method to the scattering of slow electrons by the $Z\text{-C}$ , $E\text{-C}$ , and $N$ isomers of cyanomethanimine: Shape resonances, bound states, and dipole bound states (12 pages) . . . . . | 022818 |
| Barbara M. Monaro, Luiz V. S. Dalagnol, and Márcio H. F. Bettega                                                                                                                                                                             |        |
| Robust control for atom-molecule conversion in a heteronuclear triatomic system via optimal inverse engineering (8 pages) . . . . .                                                                                                          | 022819 |
| Hong Cao, Hong-cen Liu, and Song-gui Lü                                                                                                                                                                                                      |        |
| Nonlocal current-response theory of structured-light dichroism (9 pages) . . . . .                                                                                                                                                           | 022820 |
| Akihito Kato and Nobuhiko Yokoshi                                                                                                                                                                                                            |        |
| Precision measurement of the $2^3S_1 \rightarrow 2^3P_2$ interval in positronium using phase-variation Ramsey spectroscopy (10 pages) . . . . .                                                                                              | 022821 |
| D. M. Newson and D. B. Cassidy                                                                                                                                                                                                               |        |
| Quantum study of excitation exchange in ultracold $\text{Rb-Sr}^+$ collisions (13 pages) . . . . .                                                                                                                                           | 022822 |
| Tibor Jónás, Romain Vexiau, Nadia Bouloufa-Maafa, Eliane Luc-Koenig, Olivier Dulieu, and Andrea Orbán                                                                                                                                        |        |
| Excitation function of detachment with simultaneous target ionization in slow collisions of $\text{D}^-$ with He and Ar (10 pages) . . . . .                                                                                                 | 022823 |
| M. Schulz, F. Herrmann, W. Zhang, A. B. Voitkiv, B. Najjari, M. Siddiki, A. Dorn, M. Grieser, F. Grussie, H. Kreckel, O. Novotny, A. Wolf, T. Pfeifer, C. D. Schröter, and R. Moshhammer                                                     |        |
| Revealing collective nonradiative coherence with anomalous sidebands in zero-quantum two-dimensional coherent spectroscopy of alkali-metal atoms (8 pages) . . . . .                                                                         | 022824 |
| YiFeng Geng, Can Ma, Zhong Zuo, SongPo Xu, LinQiang Hua, ShaoGang Yu, and XiaoJun Liu                                                                                                                                                        |        |
| Collective resonances of two atoms revealed by zero-quantum two-dimensional coherent spectroscopy (10 pages) . . . . .                                                                                                                       | 022825 |
| Lexter R. Savio, Ashmita Shah, and Hebin Li                                                                                                                                                                                                  |        |
| Experimental evidence for projectile electronic structure effects in slow multielectron capture collisions (6 pages) . . . . .                                                                                                               | 022826 |
| Akash Srivastav, Sumit Srivastav, and Bhas Bapat                                                                                                                                                                                             |        |

(Continued)

## CONTENTS - Continued

PHYSICAL REVIEW A

**THIRD SERIES, VOLUME 114, NUMBER 2**

AUGUST 2026

|                                                                                                                                                                                                                                                                                                                                                                                                                                               |        |
|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|--------|
| Theory for the Rydberg states of helium: Quantum defect extensions and comparison with experiment up to $n = 102$ for the singlet and triplet $P$ states ( <i>14 pages</i> ) .....                                                                                                                                                                                                                                                            | 022827 |
| G. W. F. Drake and Aaron T. Bondy                                                                                                                                                                                                                                                                                                                                                                                                             |        |
| Fringe-field-induced spin-orbit angular momentum mixing of twisted electrons ( <i>9 pages</i> ) .....                                                                                                                                                                                                                                                                                                                                         | 022828 |
| S. V. Gatalina and S. S. Baturin                                                                                                                                                                                                                                                                                                                                                                                                              |        |
| Electron loss and target excitation in keV-energy proton collisions with B and C <sup>+</sup> ( <i>14 pages</i> ) .....                                                                                                                                                                                                                                                                                                                       | 022829 |
| N. W. Antonio, I. B. Abdurakhmanov, A. Espinosa-Gayosso, and A. S. Kadyrov                                                                                                                                                                                                                                                                                                                                                                    |        |
| Post-pulse dipole instability in adiabatic time-dependent density functional theory:<br>Fact versus artifact ( <i>12 pages</i> ) .....                                                                                                                                                                                                                                                                                                        | 022830 |
| Davood B. Dar, Dhyey Ray, and Neepa T. Maitra                                                                                                                                                                                                                                                                                                                                                                                                 |        |
| <b>Light-induced processes in atomic-scale systems</b>                                                                                                                                                                                                                                                                                                                                                                                        |        |
| X-ray diffraction from chiral molecules with twisted beams ( <i>10 pages</i> ) .....                                                                                                                                                                                                                                                                                                                                                          | 023101 |
| Akilesh Venkatesh, Phay J. Ho, and J  r  my R. Rouxel                                                                                                                                                                                                                                                                                                                                                                                         |        |
| Theoretical investigation of near-threshold photoionization of N <sub>2</sub> ( <i>8 pages</i> ) .....                                                                                                                                                                                                                                                                                                                                        | 023102 |
| Conner Penson, Mehdi Ayouz, and Viatcheslav Kokouline                                                                                                                                                                                                                                                                                                                                                                                         |        |
| Absence of far-detuned attractive optical traps for alkali Rydberg atoms ( <i>23 pages</i> ).....                                                                                                                                                                                                                                                                                                                                             | 023103 |
| Gabriel E. Patenotte, Youngshin Kim, Samuel Gebretsadkan, and Kang-Kuen Ni                                                                                                                                                                                                                                                                                                                                                                    |        |
| Resolving subcycle phase and amplitude modulation in strong-field ionization ( <i>7 pages</i> ) .....                                                                                                                                                                                                                                                                                                                                         | 023104 |
| Danish Furekh Dar, Tao Chen, Fang Liu, and Stephan Fritzsche                                                                                                                                                                                                                                                                                                                                                                                  |        |
| Influence of the binding energy on Compton-scattering-driven ionization ( <i>12 pages</i> ).....                                                                                                                                                                                                                                                                                                                                              | 023105 |
| N. Melzer, M. Kircher, G. Kastirke, J. Rist, D. Tsitsonis, A. Pier, L. Kaiser, J. Kruse, N. Anders, J. Stindl,<br>L. Sommerlad, O. D. McGinnis, M. Schmidt, L. Nowak, A. K  gler, I. Dwojak, P. Daum, P. Roth,<br>M. Astaschov, J. Drnec, K. Lin, N. Wong, F. Trinter, M. S. Sch  ffler, L. Ph. H. Schmidt, D. M. Haubenre   er,<br>N. M. Novikovskiy, N. Diehl, Ph. V. Demekhin, S. Brennecke, M. Lein, S. Eckart, T. Jahnke, and R. D  rner |        |
| Transient-energy-backflow-enhanced ergotropy in an open qubit quantum battery assisted by an auxiliary<br>oscillator ( <i>9 pages</i> ) .....                                                                                                                                                                                                                                                                                                 | 023106 |
| Shun-Cai Zhao                                                                                                                                                                                                                                                                                                                                                                                                                                 |        |
| Proposal of a waveguide-integrated optical nanolens for near-field single-atom trapping ( <i>8 pages</i> ) .....                                                                                                                                                                                                                                                                                                                              | 023107 |
| Aiping Liu, Xiaofeng Jian, Ling-Xiao Wang, Lei Xu, Guang-Jie Chen, Xin-Biao Xu, Yujing Wang,<br>Guo-Yong Xiang, and Chang-Ling Zou                                                                                                                                                                                                                                                                                                            |        |
| Infrared carrier-envelope-phase modulation of attosecond transient absorption spectra gated by pulse area<br>in a singly excited helium atom ( <i>14 pages</i> ).....                                                                                                                                                                                                                                                                         | 023108 |
| Feier Xu, Yong Fu, Guanglu Yuan, Jiahao You, Shengfei Wu, Bin Lu, Jianan Zhao,<br>Bincheng Wang, and Cheng Jin                                                                                                                                                                                                                                                                                                                                |        |
| Relativistic effects on photoabsorption cross sections of highly charged ions ( <i>9 pages</i> ) .....                                                                                                                                                                                                                                                                                                                                        | 023109 |
| Anvar Khujakulov and Caterina Cocchi                                                                                                                                                                                                                                                                                                                                                                                                          |        |
| Double and triple photoionization of the Be-like B <sup>+</sup> ion: Role of double- $K$ -shell-vacancy states ( <i>13 pages</i> ) .....                                                                                                                                                                                                                                                                                                      | 023110 |
| A. M  ller, P.-M. Hillenbrand, S.-X. Wang, S. Schippers, S. Reinwardt, M. Martins, J. Seltsmann,<br>F. Trinter, I. Bray, D. V. Fursa, and A. S. Kheifets                                                                                                                                                                                                                                                                                      |        |

(Continued)

**Ultracold systems and matter waves**

|                                                                                                                                                                                  |        |
|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|--------|
| Mott-insulating phases of the Bose-Hubbard model on quasi-one-dimensional ladder lattices ( <i>12 pages</i> ) . . . . .                                                          | 023301 |
| Lorenzo Carfora, Callum W. Duncan, Stefan Kuhr, and Peter Kirton                                                                                                                 |        |
| Continuous accumulation of cold atoms in an optical cavity ( <i>9 pages</i> ) . . . . .                                                                                          | 023302 |
| Edward Gheorghita, Sebastian Wald, Andrea PupiĆ, and Onur Hosten                                                                                                                 |        |
| Preparation of a quasi-two-dimensional Bose mixture of ultracold $^{23}\text{Na}$ and $^{87}\text{Rb}$ atoms ( <i>13 pages</i> ) . . . . .                                       | 023303 |
| Ji-Kai Liao, Hao-Ran Zhang, Xiao-Rong Yu, Ya-Qun Qi, Yi-Cheng Guo, Bo Zhao, Jun Rui, and Jian-Wei Pan                                                                            |        |
| Trapping-potential dependence of the unitary Fermi gas at the BCS-BEC crossover ( <i>18 pages</i> ) . . . . .                                                                    | 023304 |
| Silas R. Beane, Adèle Le Borgne, Domenico Orlando, and Susanne Reffert                                                                                                           |        |
| Determination of the ground-state polarizability of $^{162}\text{Dy}$ near 530 nm ( <i>6 pages</i> ) . . . . .                                                                   | 023305 |
| Alexandre Journeaux, Maxime Lecomte, Julie Veschambre, Maxence Lepers, Jean Dalibard, and Raphael Lopes                                                                          |        |
| Gravitationally induced entanglement in atom interferometry ( <i>16 pages</i> ) . . . . .                                                                                        | 023306 |
| Richard Howl, Nathan Cooper, and Lucia Hackermüller                                                                                                                              |        |
| Asymmetric Floquet sidebands with long-lived symmetric coherence under spin-1 Bose-Einstein-condensate continuous dynamical decoupling ( <i>10 pages</i> ) . . . . .             | 023307 |
| Fangde Liu, Mingqing Yuan, Xinjiang Yao, Yunda Li, Feifan Zhao, Jiahao Wang, Zhuxiong Ye, Liangchao Chen, Lianghui Huang, Pengjun Wang, Wei Han, Jing Zhang, and Zengming Meng   |        |
| Understanding interaction-driven transport in flux lattices with evolution-path symmetry ( <i>11 pages</i> ) . . . . .                                                           | 023308 |
| Jian-Song Pan, Xiaofan Zhou, and Wei Yi                                                                                                                                          |        |
| Structure of the mean-field yrast spectrum of a two-component Bose gas in a ring: Role of the interaction asymmetry ( <i>11 pages</i> ) . . . . .                                | 023309 |
| Hui Tang, Guan-Hua Huang, Shizhong Zhang, Zhigang Wu, and Eugene Zaremba                                                                                                         |        |
|  Soliton turbulence of a strongly driven one-dimensional Bose gas ( <i>12 pages</i> ) . . . . . | 023310 |
| Manon Ballu, Romain Dubessy, Aurélien Perrin, Hélène Perrin, and Anna Minguzzi                                                                                                   |        |
| Proposal for experimental realization of quantum spin chains with quasiperiodic interactions using Rydberg atoms ( <i>14 pages</i> ) . . . . .                                   | 023311 |
| Takaharu Yoshida, Masaya Kunimi, and Tetsuro Nikuni                                                                                                                              |        |
| Quantum phase diagrams for bosons in hexagonal optical potentials: A continuous-space quantum Monte Carlo study ( <i>14 pages</i> ) . . . . .                                    | 023312 |
| Danilo Nascimento Guimaraes and Laurent Sanchez-Palencia                                                                                                                         |        |
| Floquet engineering of quantum transport through two driven impurities ( <i>31 pages</i> ) . . . . .                                                                             | 023313 |
| Vincenzo Bruno, Corinna Kollath, Roberta Citro, and Ameneh Sheikhan                                                                                                              |        |
| Dipole condensates in synthetic rank-2 electric fields ( <i>7 pages</i> ) . . . . .                                                                                              | 023314 |
| Jiali Zhang, Wenhui Xu, Qi Zhou, and Shaoliang Zhang                                                                                                                             |        |
| Magnetic-field control of interactions in alkaline-earth Rydberg atoms and applications to $XXZ$ models ( <i>22 pages</i> ) . . . . .                                            | 023315 |
| Masaya Kunimi and Takafumi Tomita                                                                                                                                                |        |

(Continued)

# CONTENTS - *Continued*

PHYSICAL REVIEW A

THIRD SERIES, VOLUME 114, NUMBER 2

AUGUST 2026

|                                                                                                                                                                                              |        |
|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|--------|
| Pair scattering from time-modulated impurity in the Bose-Hubbard model ( <i>8 pages</i> ) . . . . .                                                                                          | 023316 |
| Neda Ahmadi, Ameneh Sheikhan, and Corinna Kollath                                                                                                                                            |        |
| Attracting fermions on a lattice with anticorrelated disorder ( <i>14 pages</i> ) . . . . .                                                                                                  | 023317 |
| Lolita I. Knyazeva and Vladimir I. Yudson                                                                                                                                                    |        |
| Implosive dynamics from topological quenches in Bose-Einstein condensates ( <i>5 pages</i> ) . . . . .                                                                                       | 023318 |
| Marios Kokmotos, Dimitri M. Gangardt, and Giovanni Barontini                                                                                                                                 |        |
| Stability of Bose-Fermi mixtures in two dimensions: A lowest-order constrained variational approach ( <i>14 pages</i> ) . . . . .                                                            | 023319 |
| Pietro Cordioli, Leonardo Pisani, and Pierbiagio Pieri                                                                                                                                       |        |
| Impact of light-shift inhomogeneities on the contrast of light-pulse atom interferometers ( <i>9 pages</i> ) . . . . .                                                                       | 023320 |
| Maxime Pesche, Diego Alejandro Lancheros Naranjo, Rayan Si-Ahmed, Gabriel Ducasse, Franck Pereira Dos Santos, and Sébastien Merlet                                                           |        |
| Arithmetic tuning of dynamical critical exponents in quasiperiodic localization transitions ( <i>11 pages</i> ) . . . . .                                                                    | 023321 |
| Tian-Cheng Yi, Yi-Fan Liu, Enguo Guan, and Wen-Long You                                                                                                                                      |        |
| Site-selective preparation of two-dimensional dipolar quantum gases in an optical beat-note lattice ( <i>7 pages</i> ) . . . . .                                                             | 023322 |
| Niclas Höllrigl, Marian Kreyer, Rudolf Grimm, and Emil Kirilov                                                                                                                               |        |
| Equal-spin and opposite-spin density-density correlations in the BCS-BEC crossover: Gauge symmetry, Pauli exclusion principle, Wick's theorem, and experiments ( <i>11 pages</i> ) . . . . . | 023323 |
| Nikolai Kaschewski, Axel Pelster, and Carlos A. R. Sá de Melo                                                                                                                                |        |
| Rabi-coupling-induced three-component quantum droplet in ultracold Bose gases ( <i>7 pages</i> ) . . . . .                                                                                   | 023324 |
| Xiao Ding, Dajun Wang, and Xiaoling Cui                                                                                                                                                      |        |
| Interaction-driven Floquet superfluidity in a two-component Fermi gas ( <i>9 pages</i> ) . . . . .                                                                                           | 023325 |
| Ming-Yue Yang, Lin Wen, An-Chun Ji, and Qing Sun                                                                                                                                             |        |
| Time-resolved detection of spin-spatial-coupling-induced dynamical phase transitions ( <i>7 pages</i> ) . . . . .                                                                            | 023326 |
| J. O. Austin-Harris, Z. N. Hardesty-Shaw, C. Binegar, P. Sigdel, N. Rago, T. Bilitewski, and Y. Liu                                                                                          |        |
| Quantum droplets in one-dimensional mixtures of quasi-Bose-Einstein condensates and Tonks-Girardeau gases ( <i>9 pages</i> ) . . . . .                                                       | 023327 |
| Wen-Bin He, Su Yi, and Thomas Busch                                                                                                                                                          |        |
| Artificial-gauge-field-driven reentrant charge-density-wave phase in a three-leg Bose-Hubbard ladder ( <i>14 pages</i> ) . . . . .                                                           | 023328 |
| Takayuki Yokoyama and Yasuhiro Tada                                                                                                                                                          |        |
| Orbital-dependent dimensional crossover of a <i>p</i> -wave Feshbach resonance ( <i>10 pages</i> ) . . . . .                                                                                 | 023329 |
| Hang Yu, Liao Sun, Shaokun Liu, Shuai Peng, Jiaming Li, and Le Luo                                                                                                                           |        |

## PART C

### Photonics, nonlinear optics, and optomechanics

|                                                                                                                            |        |
|----------------------------------------------------------------------------------------------------------------------------|--------|
| Compound symmetries and double antisymmetry groups in linear time-invariant photonic systems ( <i>21 pages</i> ) . . . . . | 023501 |
| Yunrui Wang, Shiyu Li, and Cheng Guo                                                                                       |        |

(Continued)

# CONTENTS - *Continued*

PHYSICAL REVIEW A

THIRD SERIES, VOLUME 114, NUMBER 2

AUGUST 2026

|                                                                                                                                            |        |
|--------------------------------------------------------------------------------------------------------------------------------------------|--------|
| Energy estimates for wave amplification in quasiperiodic Fibonacci time-modulated media ( <i>6 pages</i> ) . . . . .                       | 023502 |
| Ilya Ruchiev and Bryn Davies                                                                                                               |        |
| Generalized optical Riemann pulses in strong nonlinear media with normal higher-order dispersion ( <i>10 pages</i> ) . . .                 | 023503 |
| Zhiteng Wang, Dongyang Liu, Xiaoqing Luo, Xiaohui Ling, Xingwang Bai, and Lifu Zhang                                                       |        |
| Tunable flat spectra based on Floquet exceptional points with linear quasienergy bands in frequency lattices ( <i>16 pages</i> ) . . . . . | 023504 |
| Yiling Song, Wenjing Lv, Lingzhi Zheng, Yibin Dong, Chao Hong, Mingfeng Wang, Shaolin Ke, Weiwei Liu, and Peixiang Lu                      |        |
| Pulsed generation of continuous-variable cluster states in a phononic quantum network ( <i>13 pages</i> ) . . . . .                        | 023505 |
| Anuvetha Govindarajan, Mitch Mazzei, Hailin Wang, and Lin Tian                                                                             |        |
| Localized states in the Manakov system on top of the elliptic-function periodic background ( <i>12 pages</i> ) . . . . .                   | 023506 |
| Mu-Wei Liu, Zhi-Yang Zhang, Xiao-Wei Xing, Xi-Wei Huang, Wen-Rong Sun, Ping Fang, Boris A. Malomed, and Wen-Jun Liu                        |        |
| Predictive model for the dissipation dilution of soft-clamped modes in polygon resonators ( <i>9 pages</i> ) . . . . .                     | 023507 |
| Zhihao Niu and Yuanyuan Zhao                                                                                                               |        |
| Enhancement of midinfrared optical force within the Reststrahlen band ( <i>10 pages</i> ) . . . . .                                        | 023508 |
| Takuma Goto, Yoshua Albert Darmawan, Taiki Yanagishima, Takao Fuji, and Tetsuhiro Kudo                                                     |        |
| Modeling quantum optomechanical stimulated Raman adiabatic passage ( <i>8 pages</i> ) . . . . .                                            | 023509 |
| Ian Hedgepeth, Youqiu Zhan, Vitaly Fedoseev, and Dirk Bouwmeester                                                                          |        |
| Optical entanglement facilitated by a hot mechanical oscillator ( <i>12 pages</i> ) . . . . .                                              | 023510 |
| Aleksandr V. Karpenko, Andrey B. Matsko, and Sergey P. Vyatchanin                                                                          |        |
| Unconventional refraction and broadband Klein tunneling in <i>T</i> -graphene-like lattice photonic crystals ( <i>16 pages</i> )           | 023511 |
| Yu Zhao, Jie-Yun Yan, Zheng-Mei Yang, Nan Xie, and Yang Yang                                                                               |        |
| Edge modulation of the vectorial optical field ( <i>13 pages</i> ) . . . . .                                                               | 023512 |
| Shu Wang, Liu Lu, Jiahui Mao, Yue Liu, Fangwen Sun, Guangcan Guo, Yunkun Wu, and Xi-Feng Ren                                               |        |
| Measurement-based acceleration of optical computations ( <i>7 pages</i> ) . . . . .                                                        | 023513 |
| I. V. Vovchenko, A. A. Zyablovsky, A. A. Pukhov, and E. S. Andrianov                                                                       |        |
| Modeling the non-Markovian Brownian motion of an optomechanical resonator ( <i>13 pages</i> ) . . . . .                                    | 023514 |
| Aritra Ghosh, Malay Bandyopadhyay, and M. Bhattacharya                                                                                     |        |
| Single-atom detection with a quantum-controlled mechanical oscillator ( <i>6 pages</i> ) . . . . .                                         | 023515 |
| Maxime Perdriat, Maciej Dziewiecki, Josef-Anton Agner, Massimiliano Rossi, Frédéric Merkt, Martin Frimmer, and Lukas Novotny               |        |
| Fundamental limits of free-space microwave-to-optical frequency conversion efficiency using Rydberg atoms ( <i>15 pages</i> ) . . . . .    | 023516 |
| Ya-Nan Lv, Yan-Lei Zhang, Xu-Bo Zou, Guang-Can Guo, Shui-Ming Hu, and Chang-Ling Zou                                                       |        |
| Infinitesimal environmental dust as a photonic bath at infinity ( <i>12 pages</i> ) . . . . .                                              | 023517 |
| Gaomin Tang, Yuhua Ren, and Jian-Sheng Wang                                                                                                |        |

(Continued)

# CONTENTS - *Continued*

PHYSICAL REVIEW A

THIRD SERIES, VOLUME 114, NUMBER 2

AUGUST 2026

|                                                                                                                                                                             |        |
|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------|--------|
| Laser filamentation in molecular gases: Single-shot visualization of a long-range plasma and precise modeling including alignment-dependent ionization (20 pages) . . . . . | 023518 |
| Devi Sapkota, Nicole A. Batista, Yuxuan Zhang, Jack W. Agnes, Dennis Dempsey,<br>Garima C. Nagar, and Bonggu Shim                                                           |        |
| Deterministic polarization states in partially coherent vector light beams (8 pages) . . . . .                                                                              | 023519 |
| Yao Zhao, Zhongyi Hu, Jiahui Shen, Yimeng Zhu, Yonglei Liu, Lin Liu,<br>Yangjian Cai, Fei Wang, and Yahong Chen                                                             |        |
| Structured-light propagation in a medium with uniform torsion: Polarization textures, geometric birefringence, and beam-resolved optical activity (26 pages) . . . . .      | 023520 |
| Edilberto O. Silva                                                                                                                                                          |        |
| Robustness of bound states in the continuum in anisotropic slab waveguides (10 pages) . . . . .                                                                             | 023521 |
| Md. Matiar Rahman, Ya Yan Lu, and Aminur Rahman Khan                                                                                                                        |        |
| Manipulation of temporal cavity solitons in pulsed-driving Kerr fiber resonators (11 pages) . . . . .                                                                       | 023522 |
| Jun Ji, Zhibin Ren, Benli Yu, and Zhiqiang Wang                                                                                                                             |        |
| Engineering multipole plasmons via surface nonlinearity (16 pages) . . . . .                                                                                                | 023523 |
| Yunfei Zhang, Zhenyu Li, Bo Ren, Fuhua Gao, and Fan Yang                                                                                                                    |        |
| Polarization replica symmetry breaking in passively mode-locked fiber laser (9 pages) . . . . .                                                                             | 023524 |
| Yu Long, Lei Gao, Qiang Wu, Ai Liu, Shiyun Dai, Wei Huang, Ligang Huang, and Tao Zhu                                                                                        |        |
| Shortcuts to adiabaticity for rapid soliton compression in nonlocal media (11 pages) . . . . .                                                                              | 023525 |
| Yingjia Li, Qian Kong, Xihua Yang, and Xi Chen                                                                                                                              |        |
| Higher-order exceptional points via orbital-angular-momentum-induced gauge flux (8 pages) . . . . .                                                                         | 023526 |
| Haokan Tong, Baoyan Tian, Lu Ding, Dong Zhao, and Shaolin Ke                                                                                                                |        |
| <b>Quantum optics</b>                                                                                                                                                       |        |
| Long-time entanglement in open atomic systems driven by a dissipative squeezed cavity (7 pages) . . . . .                                                                   | 023701 |
| Hao Liu, Mingzhu Weng, and Tian Tian                                                                                                                                        |        |
| Enhancing frequency metrology with Rydberg arrays (13 pages) . . . . .                                                                                                      | 023702 |
| Li-Na Sun, Peng Xu, Jie Song, and Shi-Lei Su                                                                                                                                |        |
| Simultaneous nonreciprocal unconventional photon blockades via two degenerate optical parametric amplifiers in spinning resonators (23 pages) . . . . .                     | 023703 |
| J. X. Yang, Zi-Lin Zhao, Ze Wang, T. Z. Luan, Shuang Xu, Cheng Shang, Yan-Hui Zhou, and H. Z. Shen                                                                          |        |
| Chiral cavity magnonic system for the unidirectional photon blockade (11 pages) . . . . .                                                                                   | 023704 |
| Jiaxin Yang, Yilou Liu, Rui-Shan Zhao, Xinchun Liu, Hongjun Zhang, and Xiao-Tao Xie                                                                                         |        |
| Using antisqueezed Schrödinger cat states for detection of a given phase shift (12 pages) . . . . .                                                                         | 023705 |
| V. L. Gorshenin, K. D. Dyadkin, and S. D. Chikalkin                                                                                                                         |        |
| Toward spectral engineering of squeezed light in high-gain parametric down-conversion (17 pages) . . . . .                                                                  | 023706 |
| Jatin Kumar, Aleksa Krstić, Sina Saravi, and Frank Setzpfandt                                                                                                               |        |

(Continued)

# CONTENTS - *Continued*

PHYSICAL REVIEW A

THIRD SERIES, VOLUME 114, NUMBER 2

AUGUST 2026

|                                                                                                                                                                                |        |
|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|--------|
| Reshaping coupled bosonic networks: A bipartite-graph framework for optimal quantum excitation transfer ( <i>19 pages</i> ) . . . . .                                          | 023707 |
| Cheng Liu, Yu-Hong Liu, Le-Man Kuang, Franco Nori, and Jie-Qiao Liao                                                                                                           |        |
| Internal cyclotron probe of the vertical polarizability of a surface-state electron on helium ( <i>8 pages</i> ) . . . . .                                                     | 023708 |
| Kirill Shulga                                                                                                                                                                  |        |
| Transition from statistical to hardware-limited scaling in photonic quantum state reconstruction ( <i>13 pages</i> ) . . . . .                                                 | 023709 |
| Attila Baumann, Zsolt Kis, János Koltai, and Gábor Vattay                                                                                                                      |        |
| Single-photon frequency conversion in a giant-atom waveguide QED system ( <i>10 pages</i> ) . . . . .                                                                          | 023710 |
| Wen-An Li                                                                                                                                                                      |        |
|  Theory of the collective many-body subradiance in waveguide QED ( <i>18 pages</i> ) . . . . . | 023711 |
| Xin Wang, Junjun He, and Zeyang Liao                                                                                                                                           |        |
| Directional charging of topological quantum energy-storage devices driven by the non-Hermitian skin effect ( <i>12 pages</i> ) . . . . .                                       | 023712 |
| Yanlong Chang, Xiaoli Wang, and Hongrong Li                                                                                                                                    |        |
| Pseudomode approach to the Fano effect in dissipative cavity quantum electrodynamics ( <i>10 pages</i> ) . . . . .                                                             | 023713 |
| Kazuki Kobayashi and Tatsuro Yuge                                                                                                                                              |        |
| Non-Markovian giant-atom dynamics in a disordered lattice ( <i>9 pages</i> ) . . . . .                                                                                         | 023714 |
| Maohua Wang and Yan Zhang                                                                                                                                                      |        |
| Implementation of a hybrid tripartite interaction between a two-level atom and two cavities in the strong-driving regime ( <i>8 pages</i> ) . . . . .                          | 023715 |
| Tong Liu, Yan-Hui Zhou, Bao-Qing Guo, Qi-Cheng Wu, Dong-Xu Chen, and Chui-Ping Yang                                                                                            |        |
| Momentum diffusion, decoherence, and drag force on a magnetic nanoparticle ( <i>14 pages</i> ) . . . . .                                                                       | 023716 |
| Agya Sewara Alam and Anupam Mazumdar                                                                                                                                           |        |
| Analytical model for structured light propagation through a turbulent atmosphere ( <i>12 pages</i> ) . . . . .                                                                 | 023717 |
| Konstantin Kravtsov                                                                                                                                                            |        |
| Angular momentum flux of twisted light in paraxial and nonparaxial regimes ( <i>12 pages</i> ) . . . . .                                                                       | 023718 |
| N. A. Vlasov, N. V. Filina, and S. S. Baturin                                                                                                                                  |        |
| Phase-tunable photon circulation in a giant $\Lambda$ -type atom-waveguide system ( <i>8 pages</i> ) . . . . .                                                                 | 023719 |
| Jing Li, Jing Lu, Lan Xu, and Lan Zhou                                                                                                                                         |        |
| Channel-capacity optimization in superheterodyne Rydberg atomic receivers ( <i>10 pages</i> ) . . . . .                                                                        | 023720 |
| Chuan Qu and Jian Zhang                                                                                                                                                        |        |
| Nonclassicality of mixed states with photon-number coherence ( <i>24 pages</i> ) . . . . .                                                                                     | 023721 |
| Spencer Rogers, Salman Shahid, and Wenchao Ge                                                                                                                                  |        |
| Connection between the Liouvillian gap closing and bound states in the continuum:<br>Diverse dynamics in a giant-atom waveguide QED setup ( <i>11 pages</i> ) . . . . .        | 023722 |
| Hongwei Yu, Mingzhu Weng, Zhihai Wang, and Jin Wang                                                                                                                            |        |
| Ultrafast single-photon interference with a dipole qubit in a nanocavity ( <i>17 pages</i> ) . . . . .                                                                         | 023723 |
| Athul S. Rema, Adrián E. Rubio López, and Felipe Herrera                                                                                                                       |        |

(Continued)

# CONTENTS - *Continued*

PHYSICAL REVIEW A

THIRD SERIES, VOLUME 114, NUMBER 2

AUGUST 2026

|                                                                                                                                                                             |        |
|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------|--------|
| Effects of atomic state detection on microlasers with finite atomic transit time ( <i>10 pages</i> ) . . . . .                                                              | 023724 |
| Deshui Yu, Xiaomin Qin, Shougang Zhang, Duo Pan, and Jingbiao Chen                                                                                                          |        |
| Correlation functions for quantum dynamics of coupled quasinormal modes and quantum emitters interacting via finite-delay propagating photons ( <i>27 pages</i> ) . . . . . | 023725 |
| Robert Meiners Fuchs, Juanjuan Ren, Sebastian Franke, Stephen Hughes, and Marten Richter                                                                                    |        |
| Nonreciprocity in three optical modes with non-Markovian effects ( <i>17 pages</i> ) . . . . .                                                                              | 023726 |
| H. Yi, T. Z. Luan, W. Y. Hu, Zhi-Cheng Shi, Cheng Shang, Yan-Hui Zhou, and H. Z. Shen                                                                                       |        |
| Robust universal photon blockade in a bimodal Jaynes-Cummings model via Kerr nonlinearity ( <i>11 pages</i> ) . . . . .                                                     | 023727 |
| Guohao Chang, Hunduz Halemjan, Shangyun Liu, Raziya Anwar, and Ahmad Abliz                                                                                                  |        |
| Timing quantum emission: Coherence, superradiance, and entanglement in order ( <i>8 pages</i> ) . . . . .                                                                   | 023728 |
| Nur Fadhilah Binti Rahimi, Norman Tze Wei Koo, Daniel Schumayer, Christopher Gies, Leong Chuan Kwek, and David A. W. Hutchinson                                             |        |
| Phase-dependent optical response and quantum sensing of a V-type quantum emitter near a graphene monolayer ( <i>16 pages</i> ) . . . . .                                    | 023729 |
| Sofia Evangelou                                                                                                                                                             |        |
| Propagation of two-photon Zernike states in atmospheric turbulence ( <i>14 pages</i> ) . . . . .                                                                            | 023730 |
| Hakob Avetisyan and Vahagn Abgaryan                                                                                                                                         |        |
| Boundary-induced phases in the dissipative Dicke lattice model ( <i>15 pages</i> ) . . . . .                                                                                | 023731 |
| Peng-Fei Wei, Yilun Xu, Fengxiao Sun, Qiongyi He, Peter Rabl, and Zhihai Wang                                                                                               |        |
| Bound, antibound, and resonance two-photon states in chiral waveguide QED ( <i>10 pages</i> ) . . . . .                                                                     | 023732 |
| Jiaming Shi and Alexander Poddubny                                                                                                                                          |        |

## ERRATA

|                                                                                                                                                                                                  |           |
|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-----------|
| Erratum: Test of charge-conjugation symmetry via microwave spectroscopy of positronium [Phys. Rev. A <b>112</b> , 062801 (2025)] ( <i>1 page</i> ) . . . . .                                     | 029901(E) |
| R. J. Daly, K. P. Habdas, D. M. Newson, J. Pérez-Ríos, R. E. Sheldon, and D. B. Cassidy                                                                                                          |           |
| Erratum: Quantum non-Markovian “casual bystander” environments [Phys. Rev. A <b>104</b> , 062216 (2021)] ( <i>1 page</i> ) . . . . .                                                             | 029902(E) |
| Adrián A. Budini                                                                                                                                                                                 |           |
| Erratum: Embedding cyclic information-theoretic structures in acyclic space-times: No-go results for indefinite causality [Phys. Rev. A <b>110</b> , 022227 (2024)] ( <i>2 pages</i> ) . . . . . | 029903(E) |
| V. Vilasini and Renato Renner                                                                                                                                                                    |           |
| Erratum: Qudit-based quantum error-correcting codes from irreducible representations of $SU(d)$ [Phys. Rev. A <b>112</b> , 042402 (2025)] ( <i>1 page</i> ) . . . . .                            | 029904(E) |
| Robert Frederik Uy and Dorian A. Gangloff                                                                                                                                                        |           |
| Erratum: Instability threshold for an array of coupled semiconductor lasers [Phys. Rev. A <b>46</b> , 6093 (1992)] ( <i>1 page</i> ) . . . . .                                                   | 029905(E) |
| Herbert G. Winful                                                                                                                                                                                |           |