PHYSICAL REVIEW A™

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

PERIODICALS
Postmaster send address changes to:

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

THIRD SERIES, VOLUME 93, NUMBER 5 ***CONTENTS*** **MAY 2016**
PARTS A AND B

The Table of Contents is a total listing of Parts A and B.
Part A consists of pages 050101(R)–052716, and Part B pages 053401–059905(E).

PART A

RAPID COMMUNICATIONS

Fundamental concepts

Generalized Kac lemma for recurrence time in iterated open quantum systems *(5 pages)* . . . . . 050101(R)
P. Sinkovicz, T. Kiss, and J. K. Asbóth

Discriminating the effects of collapse models from environmental diffusion with levitated nanospheres *(5 pages)* . . . . . 050102(R)
Jie Li, Stefano Zippilli, Jing Zhang, and David Vitali

Measurement-induced phase transition in a quantum spin system *(5 pages)* . . . . . 050103(R)
Shrabanti Dhar and Subinay Dasgupta

Quantum information

Universal quantum computation with a nonlinear oscillator network *(4 pages)* . . . . . 050301(R)
Hayato Goto

Gaussian benchmark for optical communication aiming towards ultimate capacity *(5 pages)* . . . . . 050302(R)
Jaehak Lee, Se-Wan Ji, Jiyong Park, and Hyunchul Nha

Atomic and molecular structure and dynamics

Angle-resolved Beutler-Fano profile and dynamics for the predissociation of H_2 *(5 pages)* . . . . . 050501(R)
Qingnan Meng, Jie Wang, and Yuxiang Mo

Fano resonances observed in helium nanodroplets *(5 pages)* . . . . . 050502(R)
A. C. LaForge, D. Regina, G. Jabbari, K. Gokhberg, N. V. Kryzhevoi, S. R. Krishnan, M. Hess, P. O'Keeffe, A. Ciavardini, K. C. Prince, R. Richter, F. Stienkemeier, L. S. Cederbaum, T. Pfeifer, R. Moshammer, and M. Mudrich

Atomic and molecular processes in external fields, including interactions with strong fields and short pulses

Nonadiabatic dynamics and multiphoton resonances in strong-field molecular ionization with few-cycle laser pulses *(6 pages)* . . . . . 051401(R)
Vincent Tagliamonti, Péter Sándor, Arthur Zhao, Tamás Rozgonyi, Philipp Marquetand, and Thomas Weinacht

Copyright 2016 by American Physical Society

(Continued)

2469-9926(201605)93:5:A;1-P

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

PHYSICAL REVIEW A **THIRD SERIES, VOLUME 93, NUMBER 5** **MAY 2016**

Possibility of introducing spin into attoscience with spin-polarized electrons produced by a bichromatic circularly polarized laser field *(6 pages)* . . . . . 051402(R)
D. B. Milošević

Avoided level crossings in very highly charged ions *(5 pages)* . . . . . 051403(R)
P. Beiersdorfer, J. H. Scofield, G. V. Brown, M. H. Chen, N. Hell, A. L. Osterheld, D. A. Vogel, and K. L. Wong

Matter waves and collective properties of cold atoms and molecules

Realizing exactly solvable SU(N) magnets with thermal atoms *(7 pages)* . . . . . 051601(R)
Michael E. Beverland, Gorjan Alagic, Michael J. Martin, Andrew P. Koller, Ana M. Rey, and Alexey V. Gorshkov

Atom-optics simulator of lattice transport phenomena *(5 pages)* . . . . . 051602(R)
Eric J. Meier, Fangzhao Alex An, and Bryce Gadway

Simulating frustrated magnetism with spinor Bose gases *(5 pages)* . . . . . 051603(R)
T. Debelhoir and N. Dupuis

Ferromagnetism in a repulsive atomic Fermi gas with correlated disorder *(6 pages)* . . . . . 051604(R)
S. Pilati and E. Fratini

Engineering quantum magnetism in one-dimensional trapped Fermi gases with p-wave interactions *(5 pages)* . . . . 051605(R)
Lijun Yang, Xiwen Guan, and Xiaoling Cui

Quantum optics, physics of lasers, nonlinear optics, classical optics

Coherent manipulation of noise-protected superconducting artificial atoms in the Lambda scheme *(6 pages)* . . . . . 051801(R)
P. G. Di Stefano, E. Paladino, T. J. Pope, and G. Falci

ARTICLES

Fundamental concepts

SU(2) uncertainty limits *(5 pages)* 052101
Saroosh Shabbir and Gunnar Björk

Nonlinear single Compton scattering of an electron wave packet *(9 pages)* 052102
A. Angioi, F. Mackenroth, and A. Di Piazza

Complete positivity, finite-temperature effects, and additivity of noise for time-local qubit dynamics *(6 pages)* . . . 052103
Juho Lankinen, Henri Lyyra, Boris Sokolov, Jose Teittinen, Babak Ziaei, and Sabrina Maniscalco

State-recycling method for testing quantum contextuality *(5 pages)* 052104
Marek Wajs, Su-Yong Lee, Paweł Kurzyński, and Dagomir Kaszlikowski

Strictly-complete measurements for bounded-rank quantum-state tomography *(11 pages)* 052105
Charles H. Baldwin, Ivan H. Deutsch, and Amir Kalev

Reflectivity properties of graphene with a nonzero mass-gap parameter *(13 pages)* 052106
G. L. Klimchitskaya and V. M. Mostepanenko

(Continued)

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

PHYSICAL REVIEW A **THIRD SERIES, VOLUME 93, NUMBER 5** **MAY 2016**

Necessary and sufficient condition for quantum adiabatic evolution by unitary control fields *(9 pages)* 052107
Zhen-Yu Wang and Martin B. Plenio

Experimental investigation of the stronger uncertainty relations for all incompatible observables *(8 pages)* 052108
Kunkun Wang, Xiang Zhan, Zhihao Bian, Jian Li, Yongsheng Zhang, and Peng Xue

Method for constructing shortcuts to adiabaticity by a substitute of counterdiabatic driving terms *(7 pages)* 052109
Ye-Hong Chen, Yan Xia, Qi-Cheng Wu, Bi-Hua Huang, and Jie Song

Stimulated Raman adiabatic passage preparation of a coherent superposition of ThO $H^3\Delta_1$ states for an improved electron electric-dipole-moment measurement *(9 pages)* 052110
C. D. Panda, B. R. O'Leary, A. D. West, J. Baron, P. W. Hess, C. Hoffman, E. Kirilov, C. B. Overstreet, E. P. West, D. DeMille, J. M. Doyle, and G. Gabrielse

Class of exact memory-kernel master equations *(8 pages)* 052111
Salvatore Lorenzo, Francesco Ciccarello, and G. Massimo Palma

Quantitative relations between measurement incompatibility, quantum steering, and nonlocality *(12 pages)* 052112
D. Cavalcanti and P. Skrzypczyk

Conditioned quantum motion of an atom in a continuously monitored one-dimensional lattice *(8 pages)* 052113
Ralf Blattmann and Klaus Mølmer

Estimation of the covariance matrix of macroscopic quantum states *(8 pages)* 052114
László Ruppert, Vladyslav C. Usenko, and Radim Filip

Incompatible quantum measurements admitting a local-hidden-variable model *(5 pages)* 052115
Marco Túlio Quintino, Joseph Bowles, Flavien Hirsch, and Nicolas Brunner

Experimental observation of topological transitions in interacting multispin systems *(6 pages)* 052116
Zhihuang Luo, Chao Lei, Jun Li, Xinfang Nie, Zhaokai Li, Xinhua Peng, and Jiangfeng Du

Radiative processes of uniformly accelerated entangled atoms *(14 pages)* 052117
G. Menezes and N. F. Svaiter

Products of weak values: Uncertainty relations, complementarity, and incompatibility *(9 pages)* 052118
Michael J. W. Hall, Arun Kumar Pati, and Junde Wu

Quantum flywheel *(9 pages)* 052119
Amikam Levy, Lajos Diósi, and Ronnie Kosloff

Quantum information

Quantum walks and discrete gauge theories *(6 pages)* 052301
Pablo Arnault and Fabrice Debbasch

Implementing the Deutsch-Jozsa algorithm with macroscopic ensembles *(16 pages)* 052302
Henry Semenenko and Tim Byrnes

Measurement-device-independent entanglement-based quantum key distribution *(5 pages)* 052303
Xiuqing Yang, Kejin Wei, Haiqiang Ma, Shihai Sun, Hongwei Liu, Zhenqiang Yin, Zuohan Li, Shibin Lian, Yungang Du, and Lingan Wu

(Continued)

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

PHYSICAL REVIEW A **THIRD SERIES, VOLUME 93, NUMBER 5** **MAY 2016**

Power of one qumode for quantum computation *(10 pages)* 052304
Nana Liu, Jayne Thompson, Christian Weedbrook, Seth Lloyd, Vlatko Vedral, Mile Gu, and Kavan Modi

Entanglement dynamics of the ultrastrong-coupling three-qubit Dicke model *(7 pages)* 052305
Lijun Mao, Yanxia Liu, and Yunbo Zhang

Probing anharmonicity of a quantum oscillator in an optomechanical cavity *(7 pages)* 052306
Ludovico Latmiral, Federico Armata, Marco G. Genoni, Igor Pikovski, and M. S. Kim

Blind quantum computation over a collective-noise channel *(10 pages)* 052307
Yuki Takeuchi, Keisuke Fujii, Rikizo Ikuta, Takashi Yamamoto, and Nobuyuki Imoto

Information gain and information leak in quantum measurements *(6 pages)* 052308
Zhengjun Xi

Efficient progressive readout of a register of qubits *(9 pages)* 052309
Antoine Tilloy

℘ Models of reduced-noise, probabilistic linear amplifiers *(12 pages)* 052310
Joshua Combes, Nathan Walk, A. P. Lund, T. C. Ralph, and Carlton M. Caves

Detecting genuine multipartite entanglement in steering scenarios *(7 pages)* 052311
C. Jebaratnam

Continuous-mode operation of a noiseless linear amplifier *(5 pages)* 052312
Yi Li, André R. R. Carvalho, and Matthew R. James

Superiority of photon subtraction to addition for entanglement in a multimode squeezed vacuum *(14 pages)* 052313
Tamoghna Das, R. Prabhu, Aditi Sen(De), and Ujjwal Sen

Measuring nonequilibrium retarded spin-spin Green's functions in an ion-trap-based quantum simulator *(11 pages)* 052314
Bryce T. Yoshimura and J. K. Freericks

Heralded entangled coherent states between spatially separated massive resonators *(10 pages)* 052315
Ali Asadian and Mehdi Abdi

System-environment correlations for dephasing two-qubit states coupled to thermal baths *(9 pages)* 052316
A. C. S. Costa, M. W. Beims, and W. T. Strunz

Minimized state complexity of quantum-encoded cryptic processes *(19 pages)* 052317
Paul M. Riechers, John R. Mahoney, Cina Aghamohammadi, and James P. Crutchfield

Experimental replication of single-qubit quantum phase gates *(7 pages)* 052318
M. Mičuda, R. Stárek, I. Straka, M. Miková, M. Sedlák, M. Ježek, and J. Fiurášek

Ansatz for Majorana modes for a quantum walk in a finite wire *(6 pages)* 052319
Ho Tat Lam, Yue Yu, and Kwok Yip Szeto

Degeneracy, degree, and heavy tails in quantum annealing *(12 pages)* 052320
Andrew D. King, Emile Hoskinson, Trevor Lanting, Evgeny Andriyash, and Mohammad H. Amin

Functional quantum computing: An optical approach *(6 pages)* 052321
Timothy M. Rambo, Joseph B. Altepeter, Prem Kumar, and G. Mauro D'Ariano

(Continued)

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

PHYSICAL REVIEW A **THIRD SERIES, VOLUME 93, NUMBER 5** **MAY 2016**

Upper bound for SL-invariant entanglement measures of mixed states *(5 pages)* 052322
Andreas Osterloh

Incompatible measurements on quantum causal networks *(23 pages)* 052323
Michal Sedlák, Daniel Reitzner, Giulio Chiribella, and Mário Ziman

Physically feasible three-level transitionless quantum driving with multiple Schrödinger dynamics *(6 pages)* 052324
Xue-Ke Song (宋学科), Qing Ai (艾清), Jing Qiu (邱静), and Fu-Guo Deng (邓富国)

Error correction for encoded quantum annealing *(4 pages)* 052325
Fernando Pastawski and John Preskill

Passive interferometric symmetries of multimode Gaussian pure states *(11 pages)* 052326
Natasha Gabay and Nicolas C. Menicucci

Simultaneous generation of two spin-wave–photon entangled states in an atomic ensemble *(8 pages)* 052327
Yuelong Wu, Long Tian, Zhongxiao Xu, Wei Ge, Lirong Chen, Shujing Li, Haoxiang Yuan, Yafei Wen, Hai Wang, Changde Xie, and Kunchi Peng

Systematically generated two-qubit anyon braids *(9 pages)* 052328
Caitlin Carnahan, Daniel Zeuch, and N. E. Bonesteel

Superadiabatic control of quantum operations *(9 pages)* 052329
Jonathan Vandermause and Chandrasekhar Ramanathan

Quantum Fisher information on two manifolds of two-mode Gaussian states *(16 pages)* 052330
Paulina Marian and Tudor A. Marian

Quantum speed limits, coherence, and asymmetry *(12 pages)* 052331
Iman Marvian, Robert W. Spekkens, and Paolo Zanardi

Gauge color codes in two dimensions *(12 pages)* 052332
Cody Jones, Peter Brooks, and Jim Harrington

Phase-context decomposition of diagonal unitaries for higher-dimensional systems *(5 pages)* 052333
Kerstin Beer and Friederike Anna Dziemba

Quantum algorithm for obtaining the eigenstates of a physical system *(5 pages)* 052334
Hefeng Wang

Energy cost of creating quantum coherence *(8 pages)* 052335
Avijit Misra, Uttam Singh, Samyadeb Bhattacharya, and Arun Kumar Pati

Schmidt-number benchmarks for continuous-variable quantum devices *(11 pages)* 052336
Ryo Namiki

Necessity of an energy barrier for self-correction of Abelian quantum doubles *(17 pages)* 052337
Anna Kómár, Olivier Landon-Cardinal, and Kristan Temme

Strong monogamy inequalities for four qubits *(6 pages)* 052338
Bartosz Regula, Andreas Osterloh, and Gerardo Adesso

(Continued)

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

PHYSICAL REVIEW A THIRD SERIES, VOLUME 93, NUMBER 5 MAY 2016

Atomic and molecular structure and dynamics

Microwave pump-probe spectroscopy of the dipole-dipole interaction in a cold Rydberg gas *(6 pages)* 052501
Hyunwook Park, T. F. Gallagher, and P. Pillet

Isotope shifts of the $2p_{3/2}$-$2p_{1/2}$ transition in B-like ions *(10 pages)* 052502
N. A. Zubova, A. V. Malyshev, I. I. Tupitsyn, V. M. Shabaev, Y. S. Kozhedub, G. Plunien, C. Brandau, and Th. Stöhlker

Pump-probe spectroscopy of cold rubidium atoms in an integrating sphere *(8 pages)* 052503
Wen-Li Wang, Ri-Chang Dong, Jian-Liao Deng, and Yu-Zhu Wang

Casimir force between a half-space and a plate of finite thickness *(7 pages)* 052504
Johan S. Høye and Iver Brevik

Effective Landau-Zener transitions in the circuit dynamical Casimir effect with time-varying modulation frequency *(9 pages)* 052505
A. V. Dodonov, B. Militello, A. Napoli, and A. Messina

℘ Enhanced sensitivity to a possible variation of the proton-to-electron mass ratio in ammonia *(5 pages)* 052506
A. Owens, S. N. Yurchenko, W. Thiel, and V. Špirko

Precision measurement of the branching fractions of the $5p\,^2P_{1/2}$ state in $^{88}Sr^+$ with a single ion in a microfabricated surface trap *(9 pages)* 052507
Jean-Pierre Likforman, Vincent Tugayé, Samuel Guibal, and Luca Guidoni

Accurate electron affinity of Co and fine-structure splittings of Co^- via slow-electron velocity-map imaging *(5 pages)* 052508
Xiaolin Chen and Chuangang Ning

Atomic many-body effects and Lamb shifts in alkali metals *(10 pages)* 052509
J. S. M. Ginges and J. C. Berengut

Bound-bound transitions in the emission spectra of Ba^+-He excimer *(6 pages)* 052510
P. Moroshkin and K. Kono

Positronium energy levels at order $m\alpha^7$: Product contributions in the two-photon-annihilation channel *(8 pages)* 052511
Gregory S. Adkins, Lam M. Tran, and Ruihan Wang

Generalization of the Kohn-Sham system that can represent arbitrary one-electron density matrices *(8 pages)* 052512
Hubertus J. J. van Dam

Plasma screening effects on the electronic structure of multiply charged Al ions using Debye and ion-sphere models *(9 pages)* 052513
Madhulita Das, B. K. Sahoo, and Sourav Pal

Vibrational memory in quantum localized states *(8 pages)* 052514
Y. Ajili, T. Trabelsi, O. Denis-Alpizar, T. Stoecklin, A. G. Császár, M. Mogren Al-Mogren, J. S. Francisco, and M. Hochlaf

Dynamics of observables and exactly solvable quantum problems: Using time-dependent density-functional theory to control quantum systems *(12 pages)* 052515
M. Farzanehpour and I. V. Tokatly

(Continued)

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

PHYSICAL REVIEW A **THIRD SERIES, VOLUME 93, NUMBER 5** **MAY 2016**

Tune-out wavelength around 413 nm for the helium $2\,^3S_1$ state including relativistic and finite-nuclear-mass corrections *(6 pages)* 052516
Yong-Hui Zhang, Li-Yan Tang, Xian-Zhou Zhang, and Ting-Yun Shi

Hyperfine-induced electric dipole contributions to the electric octupole and magnetic quadrupole atomic clock transitions *(6 pages)* 052517
V. A. Dzuba and V. V. Flambaum

Resonance ionization spectroscopy of sodium Rydberg levels using difference frequency generation of high-repetition-rate pulsed Ti:sapphire lasers *(9 pages)* 052518
P. Naubereit, J. Marín-Sáez, F. Schneider, A. Hakimi, M. Franzmann, T. Kron, S. Richter, and K. Wendt

Atomic and molecular collisions and interactions

Rayleigh scattering of two x-ray photons by an atom *(8 pages)* 052701
Alexey N. Hopersky, Alexey M. Nadolinsky, and Sergey A. Novikov

Recombination of W^{19+} ions with electrons: Absolute rate coefficients from a storage-ring experiment and from theoretical calculations *(6 pages)* 052703
N. R. Badnell, K. Spruck, C. Krantz, O. Novotný, A. Becker, D. Bernhardt, M. Grieser, M. Hahn, R. Repnow, D. W. Savin, A. Wolf, A. Müller, and S. Schippers

Dynamics of dissociative electron attachment to ammonia *(10 pages)* 052704
T. N. Rescigno, C. S. Trevisan, A. E. Orel, D. S. Slaughter, H. Adaniya, A. Belkacem, Marvin Weyland, Alexander Dorn, and C. W. McCurdy

Ionization and electron-capture cross sections for single- and multiple-electron removal from H_2O by Li^{3+} impact *(12 pages)* 052705
H. Luna, W. Wolff, E. C. Montenegro, André C. Tavares, H. J. Lüdde, G. Schenk, M. Horbatsch, and T. Kirchner

Two-atom interaction energies with one atom in an excited state: van der Waals potentials versus level shifts *(10 pages)* 052706
M. Donaire

Resonances in a positron-lithium (e^+-Li) system *(6 pages)* 052707
Muhammad Umair and Svante Jonsell

Charge-state-dependent energy loss of slow ions. I. Experimental results on the transmission of highly charged ions *(4 pages)* 052708
Richard A. Wilhelm, Elisabeth Gruber, Valerie Smejkal, Stefan Facsko, and Friedrich Aumayr

Charge-state-dependent energy loss of slow ions. II. Statistical atom model *(8 pages)* 052709
Richard A. Wilhelm and Wolfhard Möller

Analysis of x-ray emission spectra in charge-exchange collisions of C^{6+} with He and H_2 *(11 pages)* 052710
Anthony C. K. Leung and Tom Kirchner

Cross sections for ionization of tetrahydrofuran by protons at energies between 300 and 3000 keV *(16 pages)* 052711
Mingjie Wang, Benedikt Rudek, Daniel Bennett, Pablo de Vera, Marion Bug, Ticia Buhr, Woon Yong Baek, Gerhard Hilgers, and Hans Rabus

Formation of positron-atom bound states in collisions between Rydberg Ps and neutral atoms *(17 pages)* 052712
A. R. Swann, D. B. Cassidy, A. Deller, and G. F. Gribakin

(Continued)

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

PHYSICAL REVIEW A **THIRD SERIES, VOLUME 93, NUMBER 5** **MAY 2016**

Approach to chaos in ultracold atomic and molecular physics: Statistics of near-threshold bound states for Li+CaH and Li+CaF *(11 pages)* 052713
Matthew D. Frye, Masato Morita, Christophe L. Vaillant, Dermot G. Green, and Jeremy M. Hutson

Reactive collisions of two ultracold particles in a harmonic trap *(9 pages)* 052714
Joanna Jankowska and Zbigniew Idziaszek

Electron-impact excitation and ionization of atomic boron at low and intermediate energies *(8 pages)* 052715
Kedong Wang, Oleg Zatsarinny, and Klaus Bartschat

Relativistic theory for the elementary process of bremsstrahlung induced by heavy spin-zero nuclei *(11 pages)* . . . 052716
D. H. Jakubassa-Amundsen

PART B

Atomic and molecular processes in external fields, including interactions with strong fields and short pulses

Electromagnetically-induced-transparency ground-state cooling of long ion strings *(10 pages)* 053401
Regina Lechner, Christine Maier, Cornelius Hempel, Petar Jurcevic, Ben P. Lanyon, Thomas Monz, Michael Brownnutt, Rainer Blatt, and Christian F. Roos

Experimental and theoretical study on nonsequential double ionization of carbon disulfide in strong near-IR laser fields *(6 pages)* 053402
Wanlong Zuo, Shuai Ben, Hang Lv, Lei Zhao, Jing Guo, Xue-Shen Liu, Haifeng Xu, Mingxing Jin, and Dajun Ding

Time evolution of the lateral-velocity distribution for a strong-field-ionization process *(8 pages)* 053403
I. A. Ivanov

Strong-field atomic ionization in an elliptically polarized laser field and a constant magnetic field *(25 pages)* 053404
V. M. Rylyuk

Fragmentation of long-lived hydrocarbons after strong field ionization *(8 pages)* 053405
Seyedreza Larimian, Sonia Erattupuzha, Erik Lötstedt, Tamás Szidarovszky, Raffael Maurer, Stefan Roither, Markus Schöffler, Daniil Kartashov, Andrius Baltuška, Kaoru Yamanouchi, Markus Kitzler, and Xinhua Xie (谢新华)

℘ Controlling electron-ion rescattering in two-color circularly polarized femtosecond laser fields *(13 pages)* 053406
Christopher A. Mancuso, Daniel D. Hickstein, Kevin M. Dorney, Jennifer L. Ellis, Elvedin Hasović, Ronny Knut, Patrik Grychtol, Christian Gentry, Maithreyi Gopalakrishnan, Dmitriy Zusin, Franklin J. Dollar, Xiao-Min Tong, Dejan B. Milošević, Wilhelm Becker, Henry C. Kapteyn, and Margaret M. Murnane

Identifying a cooperative control mechanism between an applied field and the environment of open quantum systems *(10 pages)* 053407
Fang Gao, Roberto Rey-de-Castro, Yaoxiong Wang, Herschel Rabitz, and Feng Shuang

℘ Field-free long-lived alignment of molecules with a two-dimensional optical centrifuge *(7 pages)* 053408
A. A. Milner, A. Korobenko, and V. Milner

Floquet surface hopping: Laser-driven dissociation and ionization dynamics of H_2^+ *(17 pages)* 053409
T. Fiedlschuster, J. Handt, and R. Schmidt

(Continued)

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

PHYSICAL REVIEW A **THIRD SERIES, VOLUME 93, NUMBER 5** **MAY 2016**

Pulse-duration effect in nonsequential double ionization of Ar atoms *(5 pages)* 053410
Shansi Dong, Xiang Chen, Jingtao Zhang, and Xianghe Ren

Ionization dynamics beyond the dipole approximation induced by the pulse envelope *(9 pages)* 053411
Aleksander Skjerlie Simonsen, Tor Kjellsson, Morten Førre, Eva Lindroth, and Sølve Selstø

Critical evaluation of attosecond time delays retrieved from photoelectron streaking measurements *(14 pages)* . . . 053412
Hui Wei, Toru Morishita, and C. D. Lin

Closed-orbit theory for photodetachment in a time-dependent electric field *(11 pages)* 053413
B. C. Yang and F. Robicheaux

Photodetachment of H^- from intense, short, high-frequency pulses *(8 pages)* 053414
Hua-Chieh Shao and F. Robicheaux

Raman sideband cooling of a $^{138}Ba^+$ ion using a Zeeman interval *(10 pages)* 053415
Christopher M. Seck, Mark G. Kokish, Matthew R. Dietrich, and Brian C. Odom

Bimodal momentum distribution of laser-cooled atoms in optical lattices *(10 pages)* 053416
Claude M. Dion, Svante Jonsell, Anders Kastberg, and Peder Sjölund

Three-photon process for producing a degenerate gas of metastable alkaline-earth-metal atoms *(8 pages)* 053417
D. S. Barker, N. C. Pisenti, B. J. Reschovsky, and G. K. Campbell

Monotonic convergent quantum optimal control method with exact equality constraints on the optimized control fields *(6 pages)* 053418
Chuan-Cun Shu, Tak-San Ho, and Herschel Rabitz

Different time scales in plasmonically enhanced high-order-harmonic generation *(10 pages)* 053419
C. Zagoya, M. Bonner, H. Chomet, E. Slade, and C. Figueira de Morisson Faria

Sum rules for the polarization correlations in photoionization and bremsstrahlung *(9 pages)* 053421
R. H. Pratt, R. A. Müller, and A. Surzhykov

Complete characterization of single-cycle double ionization of argon from the nonsequential to the sequential ionization regime *(9 pages)* 053422
M. Kübel, C. Burger, Nora G. Kling, T. Pischke, L. Beaufore, I. Ben-Itzhak, G. G. Paulus, J. Ullrich, T. Pfeifer, R. Moshammer, M. F. Kling, and B. Bergues

Bichromatic magneto-optical trapping for $J \rightarrow J, J-1$ configurations *(7 pages)* 053423
Anne Cournol, Pierre Pillet, Hans Lignier, and Daniel Comparat

All-optical production and transport of a large ^6Li quantum gas in a crossed optical dipole trap *(6 pages)* 053424
Ch. Gross, H. C. J. Gan, and K. Dieckmann

Photoelectron momentum distributions of molecules in bichromatic circularly polarized attosecond UV laser fields *(10 pages)* 053425
Kai-Jun Yuan, Szczepan Chelkowski, and André D. Bandrauk

Theory of dissociative tunneling ionization *(10 pages)* 053426
Jens Svensmark, Oleg I. Tolstikhin, and Lars Bojer Madsen

Same-period emission and recombination in nonsequential double-recombination high-order-harmonic generation *(5 pages)* 053427
Kenneth K. Hansen and Lars Bojer Madsen

(Continued)

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

PHYSICAL REVIEW A **THIRD SERIES, VOLUME 93, NUMBER 5** **MAY 2016**

Linear and nonlinear magneto-optical rotation on the narrow strontium intercombination line *(6 pages)* 053428
K. Pandey, C. C. Kwong, M. S. Pramod, and D. Wilkowski

Rydberg polaritons in a thermal vapor *(5 pages)* 053429
Fabian Ripka, Yi-Hsin Chen, Robert Löw, and Tilman Pfau

Matter waves and collective properties of cold atoms and molecules

Fermi polaron in a one-dimensional quasiperiodic optical lattice: The simplest many-body localization challenge *(7 pages)* 053601
Hui Hu, An-Bang Wang, Su Yi, and Xia-Ji Liu

Dynamics of a coupled spin-vortex pair in dipolar spinor Bose-Einstein condensates *(7 pages)* 053602
Tiantian Li, Su Yi, and Yunbo Zhang

Sagnac interferometry with coherent vortex superposition states in exciton-polariton condensates *(13 pages)* 053603
Frederick Ira Moxley III, Jonathan P. Dowling, Weizhong Dai, and Tim Byrnes

Numerical study of the unitary Fermi gas across the superfluid transition *(8 pages)* 053604
Olga Goulko and Matthew Wingate

Spin Hall effect in a spinor dipolar Bose-Einstein condensate *(10 pages)* 053605
T. Oshima and Y. Kawaguchi

Beliaev damping in quasi-two-dimensional dipolar condensates *(6 pages)* 053606
Ryan M. Wilson and Stefan Natu

Coherence of interacting bosons in optical lattices in synthetic magnetic fields with a large number of subbands *(8 pages)* 053607
B. Grygiel, K. Patucha, and T. A. Zaleski

Dipolar matter-wave solitons in two-dimensional anisotropic discrete lattices *(11 pages)* 053608
Huaiyu Chen, Yan Liu, Qiang Zhang, Yuhan Shi, Wei Pang, and Yongyao Li

Population-imbalanced lattice fermions near the BCS-BEC crossover: Thermal physics of the breached pair and Fulde-Ferrell-Larkin-Ovchinnikov phases *(23 pages)* 053609
Madhuparna Karmakar and Pinaki Majumdar

Hidden nonsymmorphic symmetry in optical lattices with one-dimensional spin-orbit coupling *(7 pages)* 053610
Hua Chen, Xiong-Jun Liu, and X. C. Xie

Universal clusters as building blocks of stable quantum matter *(7 pages)* 053611
Shimpei Endo, Antonio M. García-García, and Pascal Naidon

Optimal nonlinear coherent mode transitions in Bose-Einstein condensates utilizing spatiotemporal controls *(11 pages)* 053612
David Hocker, Julia Yan, and Herschel Rabitz

Analytic vortex dynamics in an annular Bose-Einstein condensate *(6 pages)* 053613
L. A. Toikka and K.-A. Suominen

Pfaffian states in coupled atom-cavity systems *(5 pages)* 053614
Andrew L. C. Hayward and Andrew M. Martin

(Continued)

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

PHYSICAL REVIEW A **THIRD SERIES, VOLUME 93, NUMBER 5** **MAY 2016**

Effect of the Gaussian distribution of both atomic cloud and laser intensity in an atom gravimeter *(6 pages)* 053615
Min-Kang Zhou, Le-Le Chen, Qin Luo, Ke Zhang, Xiao-Chun Duan, and Zhong-Kun Hu

Effective long-distance interaction from short-distance interaction in a periodically driven one-dimensional classical system *(14 pages)* 053616
Lingzhen Guo, Modan Liu, and Michael Marthaler

Hysteresis of noninteracting and spin-orbit-coupled atomic Fermi gases with relaxation *(12 pages)* 053617
Mekena Metcalf, Chen-Yen Lai, and Chih-Chun Chien

Work fluctuations in bosonic Josephson junctions *(9 pages)* 053618
R. G. Lena, G. M. Palma, and G. De Chiara

Thermometry of ultracold atoms via nonequilibrium work distributions *(6 pages)* 053619
T. H. Johnson, F. Cosco, M. T. Mitchison, D. Jaksch, and S. R. Clark

Entanglement growth and correlation spreading with variable-range interactions in spin and fermionic tunneling models *(11 pages)* 053620
Anton S. Buyskikh, Maurizio Fagotti, Johannes Schachenmayer, Fabian Essler, and Andrew J. Daley

Quench dynamics of a Bose-Einstein condensate under synthetic spin-orbit coupling *(8 pages)* 053621
Tian-Shu Deng, Wei Zhang, Wei Yi, and Guang-Can Guo

Spatial correlation of two-dimensional bosonic multimode condensates *(7 pages)* 053622
Wolfgang H. Nitsche, Na Young Kim, Georgios Roumpos, Christian Schneider, Sven Höfling, Alfred Forchel, and Yoshihisa Yamamoto

Unconventional Bose-Einstein condensation in a system with two species of bosons in the p-orbital bands in an optical lattice *(7 pages)* 053623
Jhih-Shih You, I-Kang Liu, Daw-Wei Wang, Shih-Chuan Gou, and Congjun Wu

Orbital magnetism of ultracold fermionic gases in a lattice: Dynamical mean-field approach *(8 pages)* 053624
Agnieszka Cichy and Andrii Sotnikov

Ordered phases in a bilayer system of dipolar fermions *(7 pages)* 053626
B. P. van Zyl and W. Ferguson

Kohn-Sham approach to Fermi gas superfluidity: The bilayer of fermionic polar molecules *(9 pages)* 053627
Francesco Ancilotto

Magnetic-field-induced dynamical instabilities in an antiferromagnetic spin-1 Bose-Einstein condensate *(5 pages)* 053628
Zhengguo Pu, Jun Zhang, Su Yi, Dajun Wang, and Wenxian Zhang

Analytical approach to a bosonic ladder subject to a magnetic field *(6 pages)* 053629
Shun Uchino

Rashba-type spin-orbit coupling in bilayer Bose-Einstein condensates *(12 pages)* 053630
S.-W. Su, S.-C. Gou, Q. Sun, L. Wen, W.-M. Liu, A.-C. Ji, J. Ruseckas, and G. Juzeliūnas

Quantum optics, physics of lasers, nonlinear optics, classical optics

Zeptonewton force sensing with nanospheres in an optical lattice *(5 pages)* 053801
Gambhir Ranjit, Mark Cunningham, Kirsten Casey, and Andrew A. Geraci

(Continued)

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

PHYSICAL REVIEW A **THIRD SERIES, VOLUME 93, NUMBER 5** **MAY 2016**

Squeezed-light spin noise spectroscopy *(7 pages)* 053802
Vito Giovanni Lucivero, Ricardo Jiménez-Martínez, Jia Kong, and Morgan W. Mitchell

Resonance fluorescence beyond the dipole approximation of a quantum dot in a plasmonic nanostructure *(7 pages)* 053803
Chun-Jie Yang and Jun-Hong An

Symmetry-protected single-photon subradiance *(5 pages)* 053804
Han Cai, Da-Wei Wang, Anatoly A. Svidzinsky, Shi-Yao Zhu, and Marlan O. Scully

Enhanced estimation of loss in the presence of Kerr nonlinearity *(9 pages)* 053805
Matteo A. C. Rossi, Francesco Albarelli, and Matteo G. A. Paris

Coherent control of high-order-harmonic generation via tunable plasmonic bichromatic near fields in a metal nanoparticle *(11 pages)* 053806
Wen-Xing Yang, Xiao-Tao Xie, Ai-Xi Chen, Ziwen Huang, and Ray-Kuang Lee

Dissipation-enabled efficient excitation transfer from a single photon to a single quantum emitter *(9 pages)* 053807
N. Trautmann and G. Alber

Clausius-Mossotti Lorentz-Lorenz relations and retardation effects for two-dimensional crystals *(6 pages)* 053808
Luca Dell'Anna and Michele Merano

Absorption in dipole-lattice models of dielectrics *(12 pages)* 053809
R. J. Churchill and T. G. Philbin

Beam propagation near the dispersionless wavelength at 790 nm in rubidium *(7 pages)* 053810
Hui Xia, Christopher O'Brien, Szymon Suckewer, and Marlan O. Scully

Optically defined mechanical geometry *(6 pages)* 053811
Abeer Z. Barasheed, Tina Müller, and Jack C. Sankey

High-order optical processes in intense laser field: Towards nonperturbative nonlinear optics *(10 pages)* 053812
V. V. Strelkov

Vector-valued Lambertian fields and their sources *(10 pages)* 053813
Kasimir Blomstedt, Tero Setälä, Jani Tervo, Bernhard J. Hoenders, Jari Turunen, and Ari T. Friberg

Fano line-shape control and superluminal light using cavity quantum electrodynamics with a partially transmitting element *(9 pages)* 053814
Jiahua Li, Rong Yu, Jiuyang Liu, Chunling Ding, and Ying Wu

Generalized Schrödinger cat states and their classical emulation *(8 pages)* 053815
Armando Perez-Leija, Alexander Szameit, Irán Ramos-Prieto, Hector Moya-Cessa, and Demetrios N. Christodoulides

Nonlinear excitations in the honeycomb lattice: Beyond the high-symmetry points of the band structure *(11 pages)* 053816
Edward Arévalo and Luis Morales-Molina

Programmable two-photon quantum interference in 10^3 channels in opaque scattering media *(6 pages)* 053817
Tom A. W. Wolterink, Ravitej Uppu, Georgios Ctistis, Willem L. Vos, Klaus-J. Boller, and Pepijn W. H. Pinkse

Nonclassical-state generation in macroscopic systems via hybrid discrete-continuous quantum measurements *(11 pages)* 053818
T. J. Milburn, M. S. Kim, and M. R. Vanner

(Continued)

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

PHYSICAL REVIEW A **THIRD SERIES, VOLUME 93, NUMBER 5** **MAY 2016**

Numerical studies of the scattering of light from a two-dimensional randomly rough interface between two dielectric media *(21 pages)* 053819
Ø. S. Hetland, A. A. Maradudin, T. Nordam, and I. Simonsen

Hawking spectrum for a fiber-optical analog of the event horizon *(13 pages)* 053820
David Bermudez and Ulf Leonhardt

Coupling of four-wave mixing and Raman scattering by ground-state atomic coherence *(7 pages)* 053821
Michał Parniak, Adam Leszczyński, and Wojciech Wasilewski

Photorefractive surface nonlinearly chirped waveguide arrays *(7 pages)* 053822
Pengfei Qi, Tianrun Feng, Sainan Wang, Rong Han, Zhijian Hu, Tianhao Zhang, Jianguo Tian, and Jingjun Xu

Quantum transitions and quantum entanglement from Dirac-like dynamics simulated by trapped ions *(12 pages)* 053823
Victor A. S. V. Bittencourt, Alex E. Bernardini, and Massimo Blasone

Noncommutative q-photon-added coherent states *(9 pages)* 053824
Sanjib Dey and Véronique Hussin

Quantum calculation of the Vavilov-Cherenkov radiation by twisted electrons *(11 pages)* 053825
I. P. Ivanov, V. G. Serbo, and V. A. Zaytsev

Proposal for reversing the weak measurement with arbitrary maximum photon number *(8 pages)* 053826
Xiaodong Zeng, M. Al-Amri, Shiyao Zhu, and M. Suhail Zubairy

Response of a mechanical oscillator in an optomechanical cavity driven by a finite-bandwidth squeezed vacuum excitation *(12 pages)* 053827
H. Lotfipour, S. Shahidani, R. Roknizadeh, and M. H. Naderi

Unifying Brillouin scattering and cavity optomechanics *(15 pages)* 053828
Raphaël Van Laer, Roel Baets, and Dries Van Thourhout

Experimental violation of Tsirelson's bound by Maxwell fields *(12 pages)* 053829
N. Sandeau, H. Akhouayri, A. Matzkin, and T. Durt

Role of stationary invariant manifolds in the spatiotemporal dynamics of a nonlinear-wave system of finite extension: Application to polarization attraction in optical fibers *(10 pages)* 053830
K. Hamraoui, M. Guasoni, A. Picozzi, E. Assémat, H. R. Jauslin, and D. Sugny

Enhancement of squeezing in resonance fluorescence of a driven quantum dot close to a graphene sheet *(11 pages)* 053831
Wei Fang, Qing-lin Wu, Shao-ping Wu, and Gao-xiang Li

Relativistic analysis of field-kinetic and canonical electromagnetic systems *(10 pages)* 053832
Cheyenne J. Sheppard and Brandon A. Kemp

Chirality sorting using two-wave-interference–induced lateral optical force *(5 pages)* 053833
Huajin Chen, Chenghua Liang, Shiyang Liu, and Zhifang Lin

Spectral transfer from phase to intensity in Fresnel diffraction *(12 pages)* 053834
S. Hahn, Y. Müller, R. Hofmann, J. Moosmann, O. Öktem, L. Helfen, J.-P. Guigay, Th. van de Kamp, and T. Baumbach

(Continued)

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

PHYSICAL REVIEW A **THIRD SERIES, VOLUME 93, NUMBER 5** **MAY 2016**

Direct measurement of time-frequency analogs of sub-Planck structures *(5 pages)* 053835
Ludmila Praxmeyer, Chih-Cheng Chen, Popo Yang, Shang-Da Yang, and Ray-Kuang Lee

Weak-value amplification of the fast-light effect in rubidium vapor *(6 pages)* 053836
Mohammad Mirhosseini, Gerardo I. Viza, Omar S. Magaña-Loaiza, Mehul Malik, John C. Howell, and Robert W. Boyd

Giant in-particle field concentration and Fano resonances at light scattering by high-refractive-index particles *(22 pages)* 053837
Michael I. Tribelsky and Andrey E. Miroshnichenko

Method for identifying electromagnetically induced transparency in a tunable circuit quantum electrodynamics system *(8 pages)* 053838
Qi-Chun Liu, Tie-Fu Li, Xiao-Qing Luo, Hu Zhao, Wei Xiong, Ying-Shan Zhang, Zhen Chen, J. S. Liu, Wei Chen, Franco Nori, J. S. Tsai, and J. Q. You

Singular optical axes in biaxial crystals and analysis of their spectral dispersion effects in β-Ga_2O_3 *(8 pages)* 053839
Chris Sturm and Marius Grundmann

Observation of optical second-harmonic generation in porous-silicon-based photonic crystals in the Laue diffraction scheme *(7 pages)* 053840
D. A. Kopylov, S. E. Svyakhovskiy, L. V. Dergacheva, V. A. Bushuev, B. I. Mantsyzov, and T. V. Murzina

ERRATA

Erratum: Quantum metrology for a general Hamiltonian parameter [Phys. Rev. A **90**, 022117 (2014)] *(1 page)* . . . 059901(E)
Shengshi Pang and Todd A. Brun

Erratum: Frequency shift between coherent superposition states induced by the Berry phase evolving linearly in time [Phys. Rev. A **92**, 013403 (2015)] *(2 pages)* . . . . . 059902(E)
Atsuo Morinaga and Yasushi Hasegawa

Erratum: Dynamical manifestation of an evolving Berry phase as a frequency shift of the resonance transition between two eigenstates [Phys. Rev. A **84**, 062103 (2011)] *(1 page)* . . . . . 059903(E)
Koichi Toriyama, Akihide Oguchi, and Atsuo Morinaga

Erratum: Dependence of Berry's phase on the sign of the g factor for conical rotation of a magnetic field, measured without any dynamical phase shift [Phys. Rev. A **83**, 052109 (2011)] *(1 page)* . . . . . 059904(E)
Atsuo Morinaga, Koichi Toriyama, Hirotaka Narui, Takatoshi Aoki, and Hiromitsu Imai

Erratum: s-wave scattering lengths of the strongly dipolar bosons ^{162}Dy and ^{164}Dy [Phys. Rev. A **92**, 022703 (2015)] *(1 page)* . . . . . 059905(E)
Yijun Tang, Andrew Sykes, Nathaniel Q. Burdick, John L. Bohn, and Benjamin L. Lev