

PHYSICAL REVIEW A

For editorial and subscription correspondence,
please see inside front cover
(ISSN: 1050-2947)

PERIODICALS
Postmaster send address changes to:
American Institute of Physics
Suite 1NO1
2 Huntington Quadrangle
Melville, NY 11747-4502

THIRD SERIES, VOLUME 61, NUMBER 3

CONTENTS

MARCH 2000

RAPID COMMUNICATIONS

Quantum information

- Construction of quantum states with bound entanglement (*2 pages*) 030301(R)
Dagmar Bruß and Asher Peres

Atomic and molecular structure and dynamics

- Electron transition probability accompanying inner-shell vacancy production (*4 pages*) 030501(R)
Takeshi Mukoyama and Masayuki Uda
- Feynman-Kac path-integral calculations with high-quality trial wave functions (*3 pages*) 030502(R)
Sumita Datta, J. L. Fry, N. G. Fazleev, S. A. Alexander, and R. L. Coldwell
- Measurement of an unusual $M1$ transition in the ground state of Ti-like W^{52+} (*4 pages*) 030503(R)
S. B. Utter, P. Beiersdorfer, and G. V. Brown

Atomic and molecular collisions and interactions

- Structure of complex atom and photoionization of lithium below $Li^+ 1s3s^3S$ (*4 pages*) 030701(R)
Kwong T. Chung and J. C. Chang
- Photoelectron angular distributions of ns subshells of open-shell atoms as indicators of interchannel coupling:
Sc $4s$ photoionization (*4 pages*) 030702(R)
Zikri Altun and Steven T. Manson
- Generalized oscillator strength for the Na $3s$ - $3p$ transition (*4 pages*) 030703(R)
Zhifan Chen and Alfred Z. Msezane
- Near-threshold triple-photoionization cross section of lithium (*4 pages*) 030704(R)
R. Wehlitz, T. Pattard, M.-T. Huang, I. A. Sellin, J. Burgdörfer, and Y. Azuma

Atomic and molecular processes in external fields

- Time-dependent approach to high-resolution spectroscopy and quantum dynamics of Rydberg atoms in crossed
magnetic and electric fields (*4 pages*) 031401(R)
Xiao-Min Tong and Shih-I Chu
- Multistate non-Hermitian Floquet dynamics in short laser pulses (*4 pages*) 031402(R)
H. C. Day, Bernard Piraux, and R. M. Potvliege
- Compression of cold atoms to very high densities in a rotating-beam blue-detuned optical trap (*4 pages*) 031403(R)
N. Friedman, L. Khaykovich, R. Ozeri, and N. Davidson



Manipulation of cold atoms using a corrugated magnetic reflector (<i>4 pages</i>)	031404(R)
P. Rosenbusch, B. V. Hall, I. G. Hughes, C. V. Saba, and E. A. Hinds	

Matter waves

Coupled-mode theory for Bose-Einstein condensates (<i>4 pages</i>)	031601(R)
Elena A. Ostrovskaya, Yuri S. Kivshar, Mietek Lisak, Bjorn Hall, Federica Cattani, and Dan Anderson	

Quantum optics, physics of lasers, nonlinear optics

Recoil-induced symmetry breaking in superfluorescence (<i>4 pages</i>)	031801(R)
G. R. M. Robb, B. W. J. McNeil, and R. Bonifacio	

ARTICLES**Fundamental concepts**

Multimode interference: Highly regular pattern formation in quantum wave-packet evolution (<i>6 pages</i>)	032101
A. E. Kaplan, I. Marzoli, W. E. Lamb, Jr., and W. P. Schleich	
Quantum-nondemolition modulation of quantum interference (<i>4 pages</i>)	032102
M. Genovese and C. Novero	
Coulomb corrections to the e^+e^- pair production in ultrarelativistic heavy-ion collisions (<i>4 pages</i>)	032103
R. N. Lee and A. I. Milstein	
Planar Dirac electron in Coulomb and magnetic fields (<i>7 pages</i>)	032104
Choon-Lin Ho and V. R. Khalilov	
Violation of the correspondence principle: Breakdown of the Bohm-Newton trajectory correspondence in a macroscopic system (<i>6 pages</i>)	032105
Boon Leong Lan	
Explicit generation of unitary transformations in a single atom or molecule (<i>6 pages</i>)	032106
Viswanath Ramakrishna, Raimund Ober, Xiaobai Sun, Ole Steuernagel, Jair Botina, and Herschel Rabitz	
Generalized coherent states and quantum-classical correspondence (<i>11 pages</i>)	032107
Ronald F. Fox and Mee Hyang Choi	
Disentanglement and inseparability correlation in a two-qubit system (<i>8 pages</i>)	032108
Zheng-Wei Zhou and Guang-Can Guo	
Relativistic contraction and related effects in noninertial frames (<i>8 pages</i>)	032109
Hrvoje Nikolić	
Motion of vortex lines in quantum mechanics (<i>7 pages</i>)	032110
Iwo Bialynicki-Birula, Zofia Bialynicka-Birula, and Cezary Śliwa	

Quantum information

Manipulating two-spin coherences and qubit pairs (<i>5 pages</i>)	032301
A. R. P. Rau	
Improvement on teleportation of continuous variables by photon subtraction via conditional measurement (<i>7 pages</i>)	032302
T. Opatrný, G. Kurizki, and D.-G. Welsch	
Nested quantum search and structured problems (<i>14 pages</i>)	032303
Nicolas J. Cerf, Lov K. Grover, and Colin P. Williams	
Quantum teleportation using quantum nondemolition technique (<i>4 pages</i>)	032304
D. B. Horoshko and S. Ya. Kilin	
Entanglement quantification and purification in continuous-variable systems (<i>8 pages</i>)	032305
S. Parker, S. Bose, and M. B. Plenio	

Quantum-state estimation by self-learning measurements (6 pages)	032306
Dietmar G. Fischer, Stefan H. Kienle, and Matthias Freyberger	
Coupling nanocrystals to a high-Q silica microsphere: Entanglement in quantum dots via photon exchange (5 pages)	032307
Todd A. Brun and Hailin Wang	
Quantum-classical complexity-security tradeoff in secure multiparty computations (9 pages)	032308
H. F. Chau	
Experimental proposal for achieving superadditive communication capacities with a binary quantum alphabet (7 pages)	032309
J. R. Buck, S. J. van Enk, and Christopher A. Fuchs	
Sympathetic cooling of trapped ions for quantum logic (8 pages)	032310
D. Kielpinski, B. E. King, C. J. Myatt, C. A. Sackett, Q. A. Turchette, W. M. Itano, C. Monroe, D. J. Wineland, and W. H. Zurek	
Quantum-information distribution via entanglement (11 pages)	032311
Mio Murao, Martin B. Plenio, and Vlatko Vedral	
Implementing unitary operators in quantum computation (4 pages)	032312
Jaehyun Kim, Jae-Seung Lee, and Soonchil Lee	

Atomic and molecular structure and dynamics

Supermultiplet structure of the doubly excited positronium negative ion (9 pages)	032501
I. A. Ivanov and Y. K. Ho	
van der Waals bonds in density-functional theory (5 pages)	032502
E. Engel, A. Höck, and R. M. Dreizler	
Static properties and the Stark effect of the ground state of the HD molecular ion (7 pages)	032503
A. K. Bhatia and Richard J. Drachman	
Ghost orbits in the diamagnetic hydrogen spectrum using harmonic inversion (9 pages)	032504
Benoît Grémaud and Dominique Delande	
Mechanisms of the rearrangement processes in the $dt\mu$ system: Nonadiabatic transitions and interference effects (9 pages)	032505
V. N. Ostrovsky	
Hollow states of lithium (17 pages)	032506
Micheal J. Conneely and Lester Lipsky	
N -representability problem within the framework of the contracted Schrödinger equation (14 pages)	032507
C. Valdemoro, L. M. Tel, and E. Pérez-Romero	

Atomic and molecular collisions and interactions

Discrete momentum representation of the Lippmann-Schwinger equation and its application to electron-molecule scattering (7 pages)	032701
Martin Polášek, Michael Jurek, Marek Ingr, Petr Čársky, and Jiří Horáček	
Partial-wave dispersion relations: Exact left-hand E -plane discontinuity computed from the Born series (3 pages)	032702
D. Bessis and A. Temkin	
Triplet production by linearly polarized photons (7 pages)	032703
I. V. Akushevich, H. Anlauf, E. A. Kuraev, B. G. Shaikhatdenov, and P. G. Ratcliffe	
Generalization of the atomic random-phase-approximation method for diatomic molecules: N_2 photoionization cross-section calculations (11 pages)	032704
S. K. Semenov, N. A. Cherepkov, G. H. Fecher, and G. Schönhense	
Multipath interference in a multistate Landau-Zener-type model (14 pages)	032705
Yu. N. Demkov and V. N. Ostrovsky	

Electron-impact single ionization of multiply charged manganese ions (9 pages)	032706
R. Rejoub and R. A. Phaneuf	
Measurement of elastic cross section for cold cesium collisions (4 pages)	032707
S. A. Hopkins, S. Webster, J. Arlt, P. Bance, S. Cornish, O. Maragò, and C. J. Foot	
Electron capture in collisions of protons with CO molecules in the keV region: The steric effect (9 pages)	032708
Mineo Kimura, Jian-ping Gu, Gerhard Hirsch, Robert J. Buenker, and P. C. Stancil	
Quenching of Li low- n Rydberg atoms by ground-state He atoms: A low-energy molecular-state calculation (6 pages)	032709
Bidhan C. Saha and Anil Kumar	
Phase shifts of $e^- + \text{Ps}$ scatterings and photodetachment cross sections of Ps^- (5 pages)	032710
A. Igarashi, S. Nakazaki, and A. Ohsaki	
Circular dichroism effects in atomic x-ray scattering (7 pages)	032711
N. L. Manakov, A. V. Meremianin, J. P. J. Carney, and R. H. Pratt	
Vibrational and electronic structure of the $3d^{-1} \rightarrow 4p(\pi, \sigma)^{-2}$ normal Auger spectrum of HBr studied by fully relativistic configuration-interaction calculations (8 pages)	032712
T. Matila, K. Ellingsen, T. Saue, H. Aksela, and O. Gropen	
Spin polarization and cross sections in elastic scattering of electrons from Yb, Rn, and Ra atoms (10 pages)	032713
Neerja, A. N. Tripathi, and A. K. Jain	
Measurement of x-ray emission from Gd, Dy, and Er stimulated by 59.54-keV photons (6 pages)	032714
C. Baraldi, E. Casnati, A. Tartari, G. Di Domenico, and B. Singh	
Galilean Lee model of the δ -function potential (5 pages)	032715
C. R. Hagen	
Riemann surface approach to bound and resonant states: Exotic resonant states for a central rectangular potential (21 pages)	032716
Cornelia Grama, N. Grama, and I. Zamfirescu	
Emergent-angle-dependent charge-state distributions of 2-MeV ^4He transmitted through a thin carbon foil (6 pages)	032717
H. Ogawa, N. Sakamoto, N. Shiomi-Tsuda, and H. Tsuchida	
Neutral fragmentation of superexcited oxygen molecules (7 pages)	032718
A. Karawajczyk, P. Erman, E. Rachlew-Källne, J. Rius i Riu, M. Stankiewicz, K. Yoshiki Franzén, and L. Veseth	
Direct differential-cross-section calculations for ion-atom and atom-atom collisions in the keV range (8 pages)	032719
R. Cabrera-Trujillo, J. R. Sabin, Y. Öhrn, and E. Deumens	
Observation of satellite structures for Tb $L\gamma$ x-ray emission in the presence of M - and N -shell multiple vacancies (5 pages)	032720
Shin Ito, Mitsuo Tosaki, and Nobuhiro Maeda	
Photoionization of helium between the $N=2$ and $N=5$ thresholds of He^+ : Partial differential cross sections (7 pages)	032721
Yuhai Jiang, Jun Yan, Jiaming Li, Jinfeng Sun, and Lingde Wan	
Accurate determination of Compton backscattering in germanium at 86.5 keV on an absolute scale (6 pages)	032722
S. Pašić and K. Ilakovac	
Photon, electron, atom, and molecule interactions with solids and surfaces	
Charge-state changing processes for Ne ions passing through thin carbon foils (6 pages)	032901
A. Blažević, H. G. Bohlen, and W. von Oertzen	
Subthreshold plasmon excitation in proton Al(111) collisions (6 pages)	032902
B. van Someren, P. A. Zeijlmans van Emmichoven, I. F. Urazgil'din, and A. Niehaus	

Electronic stopping of swift partially stripped molecules and clusters (<i>14 pages</i>)	032903
J. Jensen and P. Sigmund	
Clusters (including fullerenes)	
Semiclassical versus quantal time-dependent mean-field descriptions of electron dynamics in ion-cluster collisions (<i>7 pages</i>)	033201
L. Plagne, J. Daligault, K. Yabana, T. Tazawa, Y. Abe, and C. Guet	
Cluster ionization via two-plasmon excitation (<i>6 pages</i>)	033202
G. F. Bertsch, N. Van Giai, and N. Vinh Mau	
Atomic and molecular processes in external fields	
Atomic motion in hollow submicron circular cylinders (<i>13 pages</i>)	033401
S. Al-Awfi and M. Babiker	
Rescattering effect on phase-dependent ionization of atoms in two-color intense fields (<i>8 pages</i>)	033402
J. Chen, J. Liu, and S. G. Chen	
Relativistic semiclassical approach in strong-field nonlinear photoionization (<i>8 pages</i>)	033403
J. Ortner and V. M. Rylyuk	
Cross-revival of molecular wave packets (<i>7 pages</i>)	033404
Tony Hansson	
Photodetachment in combined static and dynamic electric fields (<i>4 pages</i>)	033405
Chitra Rangan and A. R. P. Rau	
Laser-modified electron bremsstrahlung in a Coulomb field (<i>12 pages</i>)	033406
Anca Florescu and Viorica Florescu	
Dissociation and dynamics of the high-vibrational-state HF molecules under intense half-cycle and few-cycle pulses (<i>8 pages</i>)	033407
J. T. Lin, S. H. Lin, and T. F. Jiang	
Lasing on the D_2 line of sodium in a helium atmosphere due to optical pumping on the D_1 line (up-conversion) (<i>4 pages</i>)	033408
A. A. Apolonsky, S. A. Babin, S. I. Kablukov, R. V. Markov, A. I. Plekhanov, and A. M. Shalagin	
Interference effects in a two-color laser beam interaction with alkali-metal atoms (<i>11 pages</i>)	033409
Janusz Czub, Wiesław Miklaszewski, and Jan Fiutak	
<i>Ab initio</i> analysis of autoionization of H_3 molecules using multichannel quantum-defect theory and new quantum-defect surfaces (<i>16 pages</i>)	033410
I. Mistrík, R. Reichle, U. Müller, H. Helm, M. Jungen, and J. A. Stephens	
Guiding laser-cooled atoms in hollow-core fibers (<i>6 pages</i>)	033411
Dirk Müller, Eric A. Cornell, Dana Z. Anderson, and Eric R. I. Abraham	
Simulation of the hyperfine-resolved Zeeman spectrum of Eu atoms in a magnetic trap (<i>5 pages</i>)	033412
Long Cai, Bretislav Friedrich, and John M. Doyle	
Nonsequential double ionization of molecular fragments (<i>6 pages</i>)	033413
Chunlei Guo, Ming Li, John P. Nibarger, and George N. Gibson	
Multiphoton radiative recombination of electron assisted by a laser field (<i>8 pages</i>)	033414
M. Yu. Kuchiev and V. N. Ostrovsky	
Matter waves	
Quantum kinetic theory. V. Quantum kinetic master equation for mutual interaction of condensate and noncondensate (<i>26 pages</i>)	033601
C. W. Gardiner and P. Zoller	

Atomic interference patterns in the transverse plane (6 pages)	033602
M. Boustimi, V. Bocvarski, B. Viaris de Lesegno, K. Brodsky, F. Perales, J. Baudon, and J. Robert	
Time-dependent tunneling of Bose-Einstein condensates (7 pages)	033603
O. Zobay and B. M. Garraway	
Genericity property of comoving potentials (5 pages)	033604
R. Mathevet, J. Robert, and J. Baudon	
Scattering of light and atoms in a Fermi-Dirac gas with Bardeen-Cooper-Schrieffer pairing (12 pages)	033605
J. Ruostekoski	
Rigorous calculation of heating in alkali-metal traps by background gas collisions (6 pages)	033606
H. C. W. Beijerinck	
Phase diagrams of $F=2$ spinor Bose-Einstein condensates (5 pages)	033607
C. V. Ciobanu, S.-K. Yip, and Tin-Lun Ho	
He-atom diffraction from nanostructure transmission gratings: The role of imperfections (15 pages)	033608
R. E. Grisenti, W. Schöllkopf, J. P. Toennies, J. R. Manson, T. A. Savas, and Henry I. Smith	
Coherent dynamics of Bose-Einstein condensates in high-finesse optical cavities (5 pages)	033609
Peter Horak, Stephen M. Barnett, and Helmut Ritsch	
Filtered Talbot lens: Producing $\lambda/2n$ -periodic atomic patterns with standing-wave fields having period λ (7 pages)	033610
J. L. Cohen, B. Dubetsky, P. R. Berman, and J. Schmiedmayer	
1S-2S spectrum of a hydrogen Bose-Einstein condensate (12 pages)	033611
Thomas C. Killian	
Excitation of a dipole topological state in a strongly coupled two-component Bose-Einstein condensate (9 pages)	033612
J. Williams, R. Walser, J. Cooper, E. A. Cornell, and M. Holland	
Soluble model of many interacting quantum particles in a trap (8 pages)	033613
Magdalena A. Załuska-Kotur, Mariusz Gajda, Arkadiusz Orłowski, and Jan Mostowski	
Quantum propagation of neutral atoms in a magnetic quadrupole guide (13 pages)	033614
E. A. Hinds and Claudia Eberlein	

Quantum optics, physics of lasers, nonlinear optics

Analysis of a nonfeedback technique for transient steering in class-B lasers (10 pages)	033801
P. A. Porta, L. M. Hoffer, H. Grassi, and G. L. Lippi	
Down-conversion of electronic frequencies and their dephasing dynamics: Interferometric four-wave-mixing spectroscopy with broadband light (14 pages)	033802
Jason C. Kirkwood and A. C. Albrecht	
Quantum theory of microcavity-modified fluorescence decay rate under a strong coupling condition (6 pages)	033803
Ying Wu	
Computational investigation of the Ni-like Gd collisionally pumped x-ray laser (9 pages)	033804
S. McCabe and G. J. Pert	
Coherent population trapping and four-wave mixing via dark states in a Doppler-broadened open Rb system (4 pages)	033805
S. Wang, D. G. Ducreay, R. Pina, Min Yan, and Yifu Zhu	
Effect of four-wave mixing on induced waveguiding (7 pages)	033806
D. Bortman-Arbiv, A. D. Wilson-Gordon, and H. Friedmann	
Quantum analysis and the classical analysis of spontaneous emission in a microcavity (13 pages)	033807
Yong Xu, Reginald K. Lee, and Amnon Yariv	
Finite-difference time-domain analysis of spontaneous emission in a microdisk cavity (10 pages)	033808
Yong Xu, Reginald K. Lee, and Amnon Yariv	

Renormalization-group approach to the problem of light-beam self-focusing (10 pages)	033809
V. F. Kovalev, V. Yu. Bychenkov, and V. T. Tikhonchuk	
Quantum noise of multitransverse mode laser fields (7 pages)	033810
K. Staliunas and A. Berzanskis	
Response of a two-level atom to a narrow-bandwidth squeezed-vacuum excitation (8 pages)	033811
A. Messikh, R. Tanaś, and Z. Ficek	
Quantum noise in a laser with nonorthogonal polarization modes (13 pages)	033812
A. M. van der Lee, A. L. Mieremet, M. P. van Exter, N. J. van Druten, and J. P. Woerdman	
Nonlinear dynamics of a multimode microchip laser due to enhanced stimulated absorption (7 pages)	033813
G. Kozyreff and Paul Mandel	
Dispersive atomic evolution in a dissipative-driven cavity (7 pages)	033814
S. M. Chumakov, A. B. Klimov, and C. Saavedra	
Nonclassical correlations of phase noise and photon number in quantum nondemolition measurements (10 pages)	033815
Holger F. Hofmann	
Quantum control of ground-state rotational coherence in a linear molecule (4 pages)	033816
E. Hertz, O. Faucher, B. Lavorel, F. Dalla Via, and R. Chaux	
Local field correction to the second laser threshold (5 pages)	033817
François Sanchez, Marc Brunel, Gilles Martel, and Kamel Aït Ameer	

BRIEF REPORTS**Fundamental concepts**

Connection between two Wigner functions for spin systems (3 pages)	034101
Sergey M. Chumakov, Andrei B. Klimov, and Kurt Bernardo Wolf	
Spontaneous emission between two parallel plates, one or both infinitely permeable (4 pages)	034102
D. T. Alves, C. Farina, and A. C. Tort	

Quantum information

Probabilistic teleportation and entanglement matching (3 pages)	034301
Wan-Li Li, Chuan-Feng Li, and Guang-Can Guo	

Atomic and molecular structure and dynamics

Electron affinities and $E1$ f values for 15 bound states of Ce^- formed by $6p$ and $5d$ attachment (4 pages) ..	034501
Steven M. O'Malley and Donald R. Beck	
Atomic optical clocks and search for variation of the fine-structure constant (3 pages)	034502
V. A. Dzuba and V. V. Flambaum	
Description of a homogeneous electron gas with simple functionals of the one-particle density matrix (3 pages)	034503
Jerzy Cioslowski and Katarzyna Pernal	

Atomic and molecular collisions and interactions

Total and state-selective electron capture cross sections for $B^{4+} + H$ collisions (3 pages)	034701
H. C. Tseng and C. D. Lin	
Cross sections for singly differential and total ionization of helium by electron impact (4 pages)	034702
Yong-Ki Kim, Walter R. Johnson, and M. Eugene Rudd	

CONTENTS - *Continued*

PHYSICAL REVIEW A

THIRD SERIES, VOLUME 61, NUMBER 3

MARCH 2000

Realization of the Calogero-Moser scattering states as coherent states (<i>3 pages</i>)	034703
N. Gurappa, P. S. Mohanty, and Prasanta K. Panigrahi	

Photon, electron, atom, and molecule interactions with solids and surfaces

Electrons above a helium surface and the one-dimensional Rydberg atom (<i>4 pages</i>)	034901
Michael Martin Nieto	

Atomic and molecular processes in external fields

Proposals for improved methods for magnetic trapping and measurements of neutral atoms (<i>4 pages</i>)	035401
V. E. Shapiro	
Classical versus quantum dynamics for a driven relativistic oscillator (<i>3 pages</i>)	035402
R. E. Wagner, P. J. Peverly, Q. Su, and R. Grobe	

Quantum optics, physics of lasers, nonlinear optics

Phenomenological damping in optical response tensors (<i>4 pages</i>)	035801
A. D. Buckingham and P. Fischer	

ERRATA

Erratum: Relativistic many-body calculations of electric-dipole transitions between $n=2$ states in B-like ions [Phys. Rev. A 60 , 996 (1999)](<i>1 page</i>)	039901(E)
U. I. Safronova, W. R. Johnson, and A. E. Livingston	

Selected Abstracts From Other Physical Review Journals	i
--	---

Cumulative Author Index	ii
-----------------------------------	----