

# CONTENTS - *Continued*

PHYSICAL REVIEW A

THIRD SERIES, VOLUME 77, NUMBER 6

JUNE 2008

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

- Momentum distributions of electrons ejected during ultrashort laser interactions with multielectron atoms described using the *R*-matrix basis sets (*4 pages*) ..... 065401  
H. W. van der Hart, M. A. Lysaght, and P. G. Burke
- Enhanced atom transfer in a double magneto-optical trap setup (*4 pages*) ..... 065402  
S. R. Mishra, S. P. Ram, S. K. Tiwari, and S. C. Mehendale
- Angularly resolved electron spectra of  $H^-$  by few-cycle laser pulses (*4 pages*) ..... 065403  
Liang-You Peng, Qihuang Gong, and Anthony F. Starace

## Matter waves

- Coherent atom-tetramer conversion: Bright-state versus dark-state schemes (*4 pages*) ..... 065601  
H. Jing and Y. Jiang

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

- Theoretical method for the generation of a dark two-mode squeezed state of a trapped ion (*4 pages*) ..... 065801  
T. Werlang and C. J. Villas-Boas

## COMMENTS

- Comment on “Universal quantum circuit for two-qubit transformations with three controlled-NOT gates” and “Recognizing small-circuit structure in two-qubit operators” (*2 pages*) ..... 066301  
Mark W. Coffey, Ron Deiotte, and Torey Semi
- Comment on “Photodetachment in a strong laser field: An experimental test of Keldysh-like theories” (*2 pages*) ..... 067401  
H. R. Reiss
- Reply to “Comment on ‘Photodetachment in a strong laser field: An experimental test of Keldysh-like theories’ ” (*2 pages*) ..... 067402  
Boris Bergues, Zunaira Ansari, Dag Hanstorp, and Igor Yu. Kiyan

## ERRATA

- Publisher’s Note: Nonperturbative *k*-body to two-body commuting conversion Hamiltonians and embedding problem instances into Ising spins [Phys. Rev. A **77**, 052331 (2008)] (*1 page*) ..... 069901(E)  
J. D. Biamonte
- Publisher’s Note: Ultracold bosons in disordered superlattices: Mott insulators induced by tunneling [Phys. Rev. A **77**, 043618 (2008)] (*1 page*) ..... 069902(E)  
D. Muth, A. Mering, and M. Fleischhauer
- Publisher’s Note: Bosons in one-dimensional incommensurate superlattices [Phys. Rev. A **77**, 063605 (2008)] (*1 page*) ..... 069903(E)  
Tommaso Roscilde
- Publisher’s Note: Enhanced atom transfer in a double magneto-optical trap setup [Phys. Rev. A **77**, 065402 (2008)] (*1 page*) ..... 069904(E)  
S. R. Mishra, S. P. Ram, S. K. Tiwari, and S. C. Mehendale

# CONTENTS - *Continued*

PHYSICAL REVIEW A

THIRD SERIES, VOLUME 77, NUMBER 6

JUNE 2008

|                                                                                                                               |        |
|-------------------------------------------------------------------------------------------------------------------------------|--------|
| Spontaneous emission spectrum of a two-level atom in a very-high- $Q$ cavity (9 pages) . . . . .                              | 063833 |
| Alexia Auffèves, Benjamin Besga, Jean-Michel Gérard, and Jean-Philippe Poizat                                                 |        |
| Mobility of strongly nonlocal solitons in optical lattices (5 pages) . . . . .                                                | 063834 |
| Zhiping Dai, Yuqing Wang, and Qi Guo                                                                                          |        |
| Monte Carlo simulations of pulse propagation in massive multichannel optical fiber communication systems (10 pages) . . . . . | 063835 |
| Yejin Chung and Avner Peleg                                                                                                   |        |
| Nanowire waveguide made from extremely anisotropic metamaterials (11 pages) . . . . .                                         | 063836 |
| Y. J. Huang, W. T. Lu, and S. Sridhar                                                                                         |        |
| Robust control of quantized motional states of a chain of trapped ions by collective adiabatic passage (10 pages) . . . . .   | 063837 |
| I. E. Linington, P. A. Ivanov, N. V. Vitanov, and M. B. Plenio                                                                |        |
| Stability of extended structures stabilized by light as governed by the competition of two length scales (5 pages) . . . . .  | 063838 |
| Zhi Hong Hang, Jack Ng, and C. T. Chan                                                                                        |        |
| Shallow defect states in two-dimensional photonic crystals (18 pages) . . . . .                                               | 063839 |
| K. B. Dossou, L. C. Botten, R. C. McPhedran, C. G. Poulton, A. A. Asatryan, and C. Martijn de Sterke                          |        |
| Temporally multiplexed superposition states of continuous variables (11 pages) . . . . .                                      | 063840 |
| Masahide Sasaki, Masahiro Takeoka, and Hiroki Takahashi                                                                       |        |

## BRIEF REPORTS

### Fundamental concepts

|                                                                                                          |        |
|----------------------------------------------------------------------------------------------------------|--------|
| Bogoliubov's Hamiltonian as a derivative of Dirac's Hamiltonian via a braid relation (3 pages) . . . . . | 064101 |
| Bao-Xing Xie, Kang Xue, and Mo-Lin Ge                                                                    |        |
| Exactly solvable coupled-channel Schrödinger equation (4 pages) . . . . .                                | 064102 |
| L. Gr. Ixaru                                                                                             |        |

### Quantum information

|                                                                                            |        |
|--------------------------------------------------------------------------------------------|--------|
| Quantum SWAP gate in an optical cavity with an atomic cloud (4 pages) . . . . .            | 064301 |
| Gong-Wei Lin, Xu-Bo Zou, Ming-Yong Ye, Xiu-Min Lin, and Guang-Can Guo                      |        |
| Optimal entanglement formulas for entanglement-assisted quantum coding (4 pages) . . . . . | 064302 |
| Mark M. Wilde and Todd A. Brun                                                             |        |

### Atomic and molecular collisions and interactions

|                                                                                                              |        |
|--------------------------------------------------------------------------------------------------------------|--------|
| Soft fragmentation of carbon monoxide by slow highly charged ions (4 pages) . . . . .                        | 064701 |
| E. Wells, T. Nishide, H. Tawara, R. L. Watson, K. D. Carnes, and I. Ben-Itzhak                               |        |
| Low-energy charge transfer for collisions of $\text{Si}^{3+}$ with atomic hydrogen (4 pages) . . . . .       | 064702 |
| H. Bruhns, H. Kreckel, D. W. Savin, D. G. Seely, and C. C. Havener                                           |        |
| Theoretical rate of dissociative recombination of $\text{HCO}^+$ and $\text{DCO}^+$ ions (4 pages) . . . . . | 064703 |
| Nicolas Douguet, Viatcheslav Kokkoouline, and Chris H. Greene                                                |        |

(Continued)

# CONTENTS - Continued

PHYSICAL REVIEW A

THIRD SERIES, VOLUME 77, NUMBER 6

JUNE 2008

|                                                                                                                                          |        |
|------------------------------------------------------------------------------------------------------------------------------------------|--------|
| Chirality quantum phase transition in the Dirac oscillator (13 pages) .....                                                              | 063815 |
| A. Bermudez, M. A. Martin-Delgado, and A. Luis                                                                                           |        |
| Cone emission induced by femtosecond excitation in rubidium vapor (6 pages) .....                                                        | 063816 |
| H. Skenderović, T. Ban, N. Vujičić, D. Aumiler, S. Vdović, and G. Pichler                                                                |        |
| Single-photon side bands (7 pages) .....                                                                                                 | 063817 |
| T. C. Ralph, E. H. Huntington, and T. Symul                                                                                              |        |
| Time-resolved measurements of the angular distribution of the Ni-like Pd soft-x-ray laser emission (5 pages) .....                       | 063818 |
| C. Imesch, F. Staub, and J. E. Balmer                                                                                                    |        |
| Photon statistics for a two-level system interacting with a sequence of two laser pulses (15 pages) .....                                | 063819 |
| F. Shikerman, Y. He, and E. Barkai                                                                                                       |        |
| Dynamics of the Bloch vector in the thermal Jaynes-Cummings model (10 pages) .....                                                       | 063820 |
| Hiroo Azuma                                                                                                                              |        |
| Solitary-wave solutions for few-cycle optical pulses (7 pages) .....                                                                     | 063821 |
| Sh. Amiranashvili, A. G. Vladimirov, and U. Bandelow                                                                                     |        |
| Control of coherent population transfer via spontaneous decay-induced coherence (6 pages) .....                                          | 063822 |
| Xihua Yang and Shiyao Zhu                                                                                                                |        |
| Dark-state polaritons for multicomponent and stationary light fields (6 pages) .....                                                     | 063823 |
| F. E. Zimmer, J. Otterbach, R. G. Unanyan, B. W. Shore, and M. Fleischhauer                                                              |        |
| Nonlocal lattice solitons in thermal media (6 pages) .....                                                                               | 063824 |
| Nikolaos K. Efremidis                                                                                                                    |        |
| Effect of vacuum-induced coherences on coherent population trapping of moving atoms (8 pages) .....                                      | 063825 |
| Guojian Yang, Min Xie, Ze Zhang, and Kaige Wang                                                                                          |        |
| Toward real maximally path-entangled $N$ -photon-state sources (8 pages) .....                                                           | 063826 |
| Milena D'Angelo, Augusto Garuccio, and Vincenzo Tamma                                                                                    |        |
| Slow light by coherent hole burnings (5 pages) .....                                                                                     | 063827 |
| Qiong-Yi He, Bing Zhang, Xiao-Gang Wei, Jin-Hui Wu, Shang-Qi Kuang, and Jin-Yue Gao                                                      |        |
| Observation of spectral asymmetry in cw-pumped type-II spontaneous parametric down-conversion (4 pages) .....                            | 063828 |
| Zhi Zhao, Kent A. Meyer, William B. Whitten, Robert W. Shaw, Ryan S. Bennink, and Warren P. Grice                                        |        |
| Interacting multiwave mixing in a five-level atomic system (13 pages) .....                                                              | 063829 |
| Zhiqiang Nie, Huaibin Zheng, Peizhe Li, Yongming Yang, Yanpeng Zhang, and Min Xiao                                                       |        |
| Virtual dielectric waveguide mode description of a high-gain free-electron laser. I. Theory (8 pages) .....                              | 063830 |
| Erik Hemsing, Avraham Gover, and James Rosenzweig                                                                                        |        |
| Virtual dielectric waveguide mode description of a high-gain free-electron laser. II. Modeling and numerical simulations (8 pages) ..... | 063831 |
| Erik Hemsing, Avraham Gover, and James Rosenzweig                                                                                        |        |
| Fourier-transform spectroscopy combined with a 5-fs broadband pulse for multispectral nonlinear microscopy (13 pages) .....              | 063832 |
| Keisuke Isobe, Akira Suda, Masahiro Tanaka, Fumihiko Kannari, Hiroyuki Kawano, Hideaki Mizuno, Atsushi Miyawaki, and Katsumi Midorikawa  |        |

(Continued)

# CONTENTS - *Continued*

PHYSICAL REVIEW A

THIRD SERIES, VOLUME 77, NUMBER 6

JUNE 2008

|                                                                                                                                                                                            |        |
|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|--------|
| Longitudinal character of atom-chip-based rf-dressed potentials (9 pages) . . . . .                                                                                                        | 063623 |
| J. J. P. van Es, S. Whitlock, T. Fernholz, A. H. van Amerongen, and N. J. van Druten                                                                                                       |        |
| Matter-wave squeezing and the generation of SU(1,1) and SU(2) coherent states via Feshbach resonances (9 pages) . . . . .                                                                  | 063624 |
| I. Tikhonenkov, E. Pazy, Y. B. Band, and A. Vardi                                                                                                                                          |        |
| Transition to quantum turbulence in a Bose-Einstein condensate through the bending-wave instability of a single-vortex ring (4 pages) . . . . .                                            | 063625 |
| T.-L. Horng, C.-H. Hsueh, and S.-C. Gou                                                                                                                                                    |        |
| <b>Quantum optics, physics of lasers, nonlinear optics, classical optics</b>                                                                                                               |        |
| Delayed polarization dynamics in Nd <sup>3+</sup> -doped yttrium-aluminum-garnet lasers (11 pages) . . . . .                                                                               | 063801 |
| Guy Verschaffelt, Guy Van der Sande, Jan Danckaert, Bernard Ségard, Pierre Glorieux, and Thomas Erneux                                                                                     |        |
| Stimulated rotational Raman scattering by a polarization-modulated femtosecond pulse (7 pages) . . . . .                                                                                   | 063802 |
| Yuichiro Kida, Shin-ichi Zaitsev, and Totaro Imasaka                                                                                                                                       |        |
| Noise effects in intrinsic laser polarization switching (4 pages) . . . . .                                                                                                                | 063803 |
| K. Al Naimee, I. Leyva, I. P. Mariño, R. Meucci, and F. T. Arecchi                                                                                                                         |        |
| Spatiotemporal vortices in optical fiber bundles (11 pages) . . . . .                                                                                                                      | 063804 |
| Hervé Leblond, Boris A. Malomed, and Dumitru Mihalache                                                                                                                                     |        |
| Effects of chirped laser pulses on nonclassical correlations and entanglement of photon pairs (6 pages) . . . . .                                                                          | 063805 |
| C. H. Raymond Ooi                                                                                                                                                                          |        |
| Nonlinear localization of light in disordered optical fiber arrays (10 pages) . . . . .                                                                                                    | 063806 |
| Gowri Srinivasan, Alejandro Aceves, and Daniel M. Tartakovsky                                                                                                                              |        |
| Subnatural linewidth for probe absorption in an electromagnetically-induced-transparency medium due to Doppler averaging (5 pages) . . . . .                                               | 063807 |
| S. M. Iftiquar, G. R. Karve, and Vasant Natarajan                                                                                                                                          |        |
| Photorefractive manipulation of light pulses (10 pages) . . . . .                                                                                                                          | 063808 |
| B. I. Sturman, E. V. Podivilov, and M. V. Gorkunov                                                                                                                                         |        |
| Trichromatic phase dependence of squeezing in resonance fluorescence (6 pages) . . . . .                                                                                                   | 063809 |
| Xiang-ming Hu and Xue-hua Zhang                                                                                                                                                            |        |
| Vortex solitons in an off-resonant Raman medium (8 pages) . . . . .                                                                                                                        | 063810 |
| A. V. Gorbach, D. V. Skryabin, and C. N. Harvey                                                                                                                                            |        |
| Atomic spin squeezing in an optical cavity (8 pages) . . . . .                                                                                                                             | 063811 |
| Anne E. B. Nielsen and Klaus Mølmer                                                                                                                                                        |        |
| Stimulated thermal scattering induced by two-photon absorption and experimental observation of genuine stimulated Brillouin scattering in the near-ultraviolet region (14 pages) . . . . . | 063812 |
| V. B. Karpov and V. V. Korobkin                                                                                                                                                            |        |
| Intrinsic metrological resolution as a distance measure and nonclassical light (8 pages) . . . . .                                                                                         | 063813 |
| Ángel Rivas and Alfredo Luis                                                                                                                                                               |        |
| Alternate oscillations in quasistadium laser diodes (5 pages) . . . . .                                                                                                                    | 063814 |
| Muhan Choi, Takehiro Fukushima, and Takahisa Harayama                                                                                                                                      |        |

(Continued)

# CONTENTS - *Continued*

PHYSICAL REVIEW A

THIRD SERIES, VOLUME 77, NUMBER 6

JUNE 2008

|                                                                                                                                                                             |        |
|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------|--------|
| Bosons in one-dimensional incommensurate superlattices ( <i>21 pages</i> ) . . . . .                                                                                        | 063605 |
| Tommaso Roscilde                                                                                                                                                            |        |
| Mapping of Coulomb gases and sine-Gordon models to statistics of random surfaces ( <i>5 pages</i> ) . . . . .                                                               | 063606 |
| Adilet Imambekov, Vladimir Gritsev, and Eugene Demler                                                                                                                       |        |
| Self-trapping of Bose-Einstein condensates expanding into shallow optical lattices ( <i>7 pages</i> ) . . . . .                                                             | 063607 |
| Matthias Rosenkranz, Dieter Jaksch, Fong Yin Lim, and Weizhu Bao                                                                                                            |        |
| Goos-Hänchen-like shifts in atom optics ( <i>7 pages</i> ) . . . . .                                                                                                        | 063608 |
| Jianhua Huang, Zhenglu Duan, Hong Y. Ling, and Weiping Zhang                                                                                                                |        |
| Reentrant quantum phase transition in double-well optical lattices ( <i>5 pages</i> ) . . . . .                                                                             | 063609 |
| Ippei Danshita, Carlos A. R. Sá de Melo, and Charles W. Clark                                                                                                               |        |
| Barrier transmission for the one-dimensional nonlinear Schrödinger equation: Resonances and transmission profiles ( <i>11 pages</i> ) . . . . .                             | 063610 |
| K. Rapedius and H. J. Korsch                                                                                                                                                |        |
| Dipole oscillations in Bose-Fermi mixtures in the time-dependent Gross-Pitaevskii and Vlasov equations ( <i>13 pages</i> ) . . . . .                                        | 063611 |
| Tomoyuki Maruyama and George F. Bertsch                                                                                                                                     |        |
| Molecular formations in ultracold mixtures of interacting and noninteracting atomic gases ( <i>16 pages</i> ) . . . . .                                                     | 063612 |
| T. Nishimura, A. Matsumoto, and H. Yabu                                                                                                                                     |        |
| BCS-BEC crossover of a quasi-two-dimensional Fermi gas: The significance of dressed molecules ( <i>5 pages</i> ) . . . . .                                                  | 063613 |
| Wei Zhang (張威), G.-D. Lin (林俊達), and L.-M. Duan (段路明)                                                                                                                       |        |
| Superradiant Raman scattering in an ultracold Bose gas at finite temperature ( <i>7 pages</i> ) . . . . .                                                                   | 063614 |
| H. Uys and P. Meystre                                                                                                                                                       |        |
| Bose-Einstein condensate inside a Bragg-reflecting atom cavity ( <i>5 pages</i> ) . . . . .                                                                                 | 063615 |
| R. Zhang, R. E. Sapiro, N. V. Morrow, R. R. Mhaskar, and G. Raithel                                                                                                         |        |
| BCS-BEC crossover and effects of density fluctuations in a two-component Fermi gas described by the three-dimensional attractive Hubbard model ( <i>9 pages</i> ) . . . . . | 063616 |
| H. Tamaki, Y. Ohashi, and K. Miyake                                                                                                                                         |        |
| Magnetization profile and core-level spectroscopy in a multiply quantized vortex of imbalanced Fermi superfluids ( <i>11 pages</i> ) . . . . .                              | 063617 |
| K. M. Suzuki, T. Mizushima, M. Ichioka, and K. Machida                                                                                                                      |        |
| Approaching the Heisenberg limit in an atom laser ( <i>4 pages</i> ) . . . . .                                                                                              | 063618 |
| M. Jeppesen, J. Dugué, G. R. Dennis, M. T. Johnsson, C. Figl, N. P. Robins, and J. D. Close                                                                                 |        |
| Density-density correlation of incoherent atoms with angular momentum released from an optical lattice ( <i>7 pages</i> ) . . . . .                                         | 063619 |
| Shujuan Liu, Hongwei Xiong, and Baolong Lu                                                                                                                                  |        |
| Twin stimulated amplification of light and matter waves in an atom-photon pair laser ( <i>13 pages</i> ) . . . . .                                                          | 063620 |
| Thomas Salzburger and Helmut Ritsch                                                                                                                                         |        |
| Optical properties of atomic Mott insulators: From slow light to dynamical Casimir effects ( <i>16 pages</i> ) . . . . .                                                    | 063621 |
| Iacopo Carusotto, Mauro Antezza, Francesco Bariani, Simone De Liberato, and Cristiano Ciuti                                                                                 |        |
| Long-wavelength spin dynamics of ferromagnetic condensates ( <i>4 pages</i> ) . . . . .                                                                                     | 063622 |
| Austen Lamacraft                                                                                                                                                            |        |

(Continued)

# CONTENTS - *Continued*

PHYSICAL REVIEW A

THIRD SERIES, VOLUME 77, NUMBER 6

JUNE 2008

|                                                                                                                                                                                              |        |
|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|--------|
| Protecting coherence in optimal control theory: State-dependent constraint approach ( <i>11 pages</i> ) . . . . .                                                                            | 063412 |
| José P. Palao, Ronnie Kosloff, and Christiane P. Koch                                                                                                                                        |        |
| Low-energy excitations of a boson pair in a double-well trap ( <i>14 pages</i> ) . . . . .                                                                                                   | 063413 |
| D. S. Murphy and J. F. McCann                                                                                                                                                                |        |
| Nonlinear radiation imprisonment in magneto-optical vapor traps ( <i>11 pages</i> ) . . . . .                                                                                                | 063414 |
| N. N. Bezuglov, A. F. Molisch, F. Fuso, M. Allegrini, and A. Ekers                                                                                                                           |        |
| Enhanced excitation and ionization of $H_2^+$ by a single- and two-color intense laser pulse ( <i>10 pages</i> ) . . . . .                                                                   | 063415 |
| Xue-Bin Bian, Liang-You Peng, and Ting-Yun Shi                                                                                                                                               |        |
| Electron stripping and reattachment at atomic centers using attosecond half-cycle pulses ( <i>8 pages</i> ) . . . . .                                                                        | 063416 |
| Agapi Emmanouilidou and T. Uzer                                                                                                                                                              |        |
| Faraday spectroscopy of atoms confined in a dark optical trap ( <i>6 pages</i> ) . . . . .                                                                                                   | 063417 |
| Matthew L. Terraciano, Mark Bashkansky, and Fredrik K. Fatemi                                                                                                                                |        |
| Landau-Dykhne approach for relativistic electron momentum and angular distributions for the ionization of multicharged atomic ions by superintense laser fields ( <i>6 pages</i> ) . . . . . | 063418 |
| V. P. Krainov and A. V. Sofronov                                                                                                                                                             |        |
| Enhancement of dielectronic recombination in combined electric and magnetic fields ( <i>9 pages</i> ) . . . . .                                                                              | 063419 |
| E. S. Shuman, W. Yang, and T. F. Gallagher                                                                                                                                                   |        |
| Optimal control of a three-level quantum system by laser fields plus von Neumann measurements ( <i>10 pages</i> ) . . . . .                                                                  | 063420 |
| D. Sugny and C. Kontz                                                                                                                                                                        |        |
| Zeeman effect of the hyperfine-structure levels in lithiumlike ions ( <i>14 pages</i> ) . . . . .                                                                                            | 063421 |
| D. L. Moskovkin, V. M. Shabaev, and W. Quint                                                                                                                                                 |        |
| Intensity dependence in the dissociation branching ratio of $ND^+$ using intense femtosecond laser pulses ( <i>7 pages</i> ) . . . . .                                                       | 063422 |
| J. McKenna, A. M. Sayler, B. Gaire, Nora G. Johnson, E. Parke, K. D. Carnes, B. D. Esry, and I. Ben-Itzhak                                                                                   |        |
| Optimizing the photon flux of double optical gated high-order harmonic spectra ( <i>5 pages</i> ) . . . . .                                                                                  | 063423 |
| Hiroki Mashiko, Steve Gilbertson, Chengquan Li, Eric Moon, and Zenghu Chang                                                                                                                  |        |
| Optomechanical coupling in a one-dimensional optical lattice ( <i>25 pages</i> ) . . . . .                                                                                                   | 063424 |
| J. K. Asbóth, H. Ritsch, and P. Domokos                                                                                                                                                      |        |
| Quantum multiobservable control ( <i>11 pages</i> ) . . . . .                                                                                                                                | 063425 |
| Raj Chakrabarti, Rebing Wu, and Herschel Rabitz                                                                                                                                              |        |
| <b>Matter waves</b>                                                                                                                                                                          |        |
| Ground-state properties of a Tonks-Girardeau gas in a split trap ( <i>7 pages</i> ) . . . . .                                                                                                | 063601 |
| J. Goold and Th. Busch                                                                                                                                                                       |        |
| Incompressible liquid, stripes, and bubbles in rapidly rotating Bose atoms at $\nu=1$ ( <i>10 pages</i> ) . . . . .                                                                          | 063602 |
| Hidetsugu Seki and Kazusumi Ino                                                                                                                                                              |        |
| Pair condensation of bosonic atoms induced by optical lattices ( <i>7 pages</i> ) . . . . .                                                                                                  | 063603 |
| María Eckholt and Juan José García-Ripoll                                                                                                                                                    |        |
| Atomic current in optical lattices: Reexamination of the Esaki-Tsu equation ( <i>5 pages</i> ) . . . . .                                                                                     | 063604 |
| Andrey R. Kolovsky                                                                                                                                                                           |        |

(Continued)

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

- Surface erosion and modification by highly charged ions (*10 pages*) ..... 062901  
 Z. Insepov, M. Terasawa, and K. Takayama

**PART B****Clusters (including fullerenes)**

- Harmonic emission from cluster nanoplasmas subject to intense short laser pulses (*11 pages*) ..... 063201  
 S. V. Popruzhenko, M. Kundu, D. F. Zaretsky, and D. Bauer
- Evaporative attachment of slow electrons to alkali-metal nanoclusters (*4 pages*) ..... 063202  
 Roman Rabinovitch, Chunlei Xia, and Vitaly V. Kresin

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

- Time-series analysis of vibrational nuclear wave-packet dynamics in  $D_2^+$  (*12 pages*) ..... 063401  
 Uwe Thumm, Thomas Niederhausen, and Bernold Feuerstein
- Instabilities of molecule motion in a linear ac trap (*8 pages*) ..... 063402  
 Peter Lützwow, Melanie Schnell, and Gerard Meijer
- Single-active-electron approximation for describing molecules in ultrashort laser pulses and its application to molecular hydrogen (*17 pages*) ..... 063403  
 Manohar Awasthi, Yulian V. Vanne, Alejandro Saenz, Alberto Castro, and Piero Decleva
- All-optical control and direct detection of ultrafast spin polarization in a multi-valence-electron system (*4 pages*) ..... 063404  
 Takashi Nakajima, Yukari Matsuo, and Tohru Kobayashi
- Ellipticity effects and the contributions of long orbits in nonsequential double ionization of atoms (*10 pages*) ..... 063405  
 N. I. Shvetsov-Shilovski, S. P. Goreslavski, S. V. Popruzhenko, and W. Becker
- Many-mode Floquet theoretical approach for coherent control of multiphoton dynamics driven by intense frequency-comb laser fields (*8 pages*) ..... 063406  
 Sang-Kil Son (손상길) and Shih-I Chu (朱時宜)
- Suppression effect in the nonsequential double ionization of molecules by an intense laser field (*7 pages*) .... 063407  
 X. Y. Jia, W. D. Li, J. Fan, J. Liu, and J. Chen
- Impact of the Meissner effect on magnetic microtraps for neutral atoms near superconducting thin films (*9 pages*) ..... 063408  
 D. Cano, B. Kasch, H. Hattermann, D. Koelle, R. Kleiner, C. Zimmermann, and J. Fortágh
- Spectra of molecular gases trapped in deep optical lattices (*5 pages*) ..... 063409  
 P. F. Barker, S. M. Purcell, and M. N. Shneider
- Vibrational spectroscopy of  $H_2^+$ : Hyperfine structure of two-photon transitions (*10 pages*) ..... 063410  
 Jean-Philippe Karr, Franck Bielsa, Albane Douillet, Jofre Pedregosa Gutierrez, Vladimir I. Korobov, and Laurent Hilico
- Fine structures of the harmonic and hyper-Raman spectrum of the hydrogen atom in an intense high-frequency laser pulse (*6 pages*) ..... 063411  
 Zhaoyan Zhou and Jianmin Yuan

**Atomic and molecular collisions and interactions**

|                                                                                                                                                                    |        |
|--------------------------------------------------------------------------------------------------------------------------------------------------------------------|--------|
| Relativistic $B$ -spline $R$ -matrix method for electron collisions with atoms and ions: Application to low-energy electron scattering from Cs (7 pages) . . . . . | 062701 |
| Oleg Zatsarinny and Klaus Bartschat                                                                                                                                |        |
| Elementary statistical models for collision-sequence interference effects (10 pages) . . . . .                                                                     | 062702 |
| John Courtenay Lewis                                                                                                                                               |        |
| Emission characteristics of three final continuum electrons produced in low-energy double ionization of helium (5 pages) . . . . .                                 | 062703 |
| S. P. Cao, X. Ma, A. Dorn, M. Dür, and J. Ullrich                                                                                                                  |        |
| Electron-impact excitation and ionization cross sections for the Si, Cl, and Ar isonuclear sequences (6 pages) . . . . .                                           | 062704 |
| J. Colgan, H. L. Zhang, and C. J. Fontes                                                                                                                           |        |
| Hartree-Fock studies of the triple differential cross section for electron-impact ionization of the hydrogen atom (6 pages) . . . . .                              | 062705 |
| Hari P. Saha                                                                                                                                                       |        |
| Double ionization of helium by ion impact analyzed using four-body Dalitz plots (12 pages) . . . . .                                                               | 062706 |
| M. F. Ciappina, M. Schulz, T. Kirchner, D. Fischer, R. Moshhammer, and J. Ullrich                                                                                  |        |
| Electron-impact ionization of atoms in high-temperature dense plasmas (4 pages) . . . . .                                                                          | 062707 |
| M. S. Pindzola, S. D. Loch, J. Colgan, and C. J. Fontes                                                                                                            |        |
| Electron-impact excitation of the $B\ ^1\Sigma_u^+$ and $C\ ^1\Pi_u$ electronic states of $H_2$ (7 pages) . . . . .                                                | 062708 |
| H. Kato, H. Kawahara, M. Hoshino, H. Tanaka, L. Campbell, and M. J. Brunger                                                                                        |        |
| Branching ratios of x-ray photons from dielectronic recombination processes in H-like titanium ions (9 pages) . . . . .                                            | 062709 |
| B. E. O'Rourke, F. J. Currell, H. Kuramoto, S. Ohtani, H. Watanabe, Y. M. Li, T. Tawara, and X. M. Tong                                                            |        |
| Distorted-wave ionization and x-ray production cross sections of the $K$ shell of Cu and the $L$ shells of Ag, In, and Sn by positron impact (8 pages) . . . . .   | 062710 |
| Michael Dingfelder, Silvina Segui, and José M. Fernández-Varea                                                                                                     |        |
| Electron-impact excitation of the $(5d^{10}6s)^2S_{1/2} \rightarrow (5d^{10}6p)^2P_{1/2,3/2}$ resonance transitions in gold atoms (8 pages) . . . . .              | 062711 |
| M. Maslov, M. J. Brunger, P. J. O. Teubner, O. Zatsarinny, K. Bartschat, D. Fursa, I. Bray, and R. P. McEachran                                                    |        |
| Interplay of initial and final states for $(e, 3e)$ and $(\gamma, 2e)$ processes on helium (12 pages) . . . . .                                                    | 062712 |
| L. U. Ancarani, G. Gasaneo, F. D. Colavecchia, and C. Dal Cappello                                                                                                 |        |
| Experimental and theoretical study of the elastic-electron-indium-atom scattering in the intermediate energy range (11 pages) . . . . .                            | 062713 |
| M. S. Rabasović, V. I. Kelemen, S. D. Tošić, D. Šević, M. M. Dovhanych, V. Pejčev, D. M. Filipović, E. Yu. Remeta, and B. P. Marinković                            |        |
| Completeness relation in the $R$ -matrix theory of scattering (6 pages) . . . . .                                                                                  | 062714 |
| Kazuo Takayanagi                                                                                                                                                   |        |

**Atomic and molecular structure and dynamics**

|                                                                                                                                                                                                    |        |
|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|--------|
| Lamb shift due to surface plasmon polariton modes (6 pages) . . . . .                                                                                                                              | 062501 |
| Qingqing Sun, M. Al-Amri, Ali Kamli, and M. Suhail Zubairy                                                                                                                                         |        |
| Measurement of the $3s3p\ ^3P_1$ lifetime in magnesium using a magneto-optical trap (4 pages) . . . . .                                                                                            | 062502 |
| P. L. Hansen, K. T. Therkildsen, N. Malossi, B. B. Jensen, E. D. van Ooijen, A. Bruschi, J. H. Müller, J. Hald, and J. W. Thomsen                                                                  |        |
| Time-reversal symmetry in general coupled cluster theory (9 pages) . . . . .                                                                                                                       | 062503 |
| Timo Fleig                                                                                                                                                                                         |        |
| Inner-shell $2p$ photoionization and Auger decay of atomic silicon (9 pages) . . . . .                                                                                                             | 062504 |
| K. Jänkälä, S. Urpeläinen, M. Huttula, S. Fritzsche, S. Heinäsmäki, S. Aksela, and H. Aksela                                                                                                       |        |
| Measurement of the cesium $7d\ ^2D_{3/2}$ hyperfine coupling constants in a thermal beam using two-photon fluorescence spectroscopy (5 pages) . . . . .                                            | 062505 |
| A. Kortyna, V. Fiore, and J. Farrar                                                                                                                                                                |        |
| Angular momentum dependence of photoionization cross section from the excited states of lithium isotopes (5 pages) . . . . .                                                                       | 062506 |
| M. Saleem, Shahid Hussain, and M. A. Baig                                                                                                                                                          |        |
| Vibrational spectroscopy of $H_2^+$ : Precise evaluation of the Zeeman effect (9 pages) . . . . .                                                                                                  | 062507 |
| Jean-Philippe Karr, Vladimir I. Korobov, and Laurent Hilico                                                                                                                                        |        |
| State-selective detection of the PbF molecule by doubly resonant multiphoton ionization (5 pages) . . . . .                                                                                        | 062508 |
| P. Sivakumar, C. P. McRaven, Dustin Combs, N. E. Shafer-Ray, and Victor Ezhov                                                                                                                      |        |
| Three lowest $S$ states of $^9Be^+$ calculated with including nuclear motion and relativistic and QED corrections (7 pages) . . . . .                                                              | 062509 |
| Monika Stanke, Jacek Komasa, Dariusz Kędziera, Sergiy Bubin, and Ludwik Adamowicz                                                                                                                  |        |
| Two-loop QED corrections with closed fermion loops (12 pages) . . . . .                                                                                                                            | 062510 |
| V. A. Yerokhin, P. Indelicato, and V. M. Shabaev                                                                                                                                                   |        |
| Real-time resolution of the causality paradox of time-dependent density-functional theory (9 pages) . . . . .                                                                                      | 062511 |
| Giovanni Vignale                                                                                                                                                                                   |        |
| Photoionization spectroscopy of even-parity autoionizing Rydberg states of argon: Experimental and theoretical investigation of Fano profiles and resonance widths (11 pages) . . . . .            | 062512 |
| J. D. Wright, T. J. Morgan, Leping Li, Quanli Gu, J. L. Knee, I. D. Petrov, V. L. Sukhorukov, and H. Hotop                                                                                         |        |
| Coincidence method for measuring the mass of neutral fragments emitted in a delayed fragmentation process from a singly charged molecule: Fragmentation pathway of adenine (7 pages) . . . . .     | 062513 |
| S. Martin, R. Brédy, A. R. Allouche, J. Bernard, A. Salmoun, B. Li, and L. Chen                                                                                                                    |        |
| Direct calculation of interaction-induced molecular properties: An application to the relativistic mass-velocity and Darwin terms in the interaction energy of hydrogen atoms (12 pages) . . . . . | 062514 |
| Konrad Piszczatowski, Grzegorz Łach, and Bogumił Jeziorski                                                                                                                                         |        |
| Reexamination of the LeRoy-Bernstein formula for weakly bound molecules (8 pages) . . . . .                                                                                                        | 062515 |
| Haikel Jelassi, Bruno Viaris de Lesegno, and Laurence Pruvost                                                                                                                                      |        |
| Relativistic coupled-cluster studies of dipole polarizabilities in closed-shell atoms (5 pages) . . . . .                                                                                          | 062516 |
| B. K. Sahoo and B. P. Das                                                                                                                                                                          |        |

# CONTENTS - *Continued*

PHYSICAL REVIEW A

THIRD SERIES, VOLUME 77, NUMBER 6

JUNE 2008

|                                                                                                                                                      |        |
|------------------------------------------------------------------------------------------------------------------------------------------------------|--------|
| Nonlocal entanglement concentration scheme for partially entangled multipartite systems with nonlinear optics<br>(7 pages) .....                     | 062325 |
| Yu-Bo Sheng, Fu-Guo Deng, and Hong-Yu Zhou                                                                                                           |        |
| Decoy states for quantum key distribution based on decoherence-free subspaces (6 pages) .....                                                        | 062326 |
| Zhen-Qiang Yin, Yi-Bo Zhao, Zheng-Wei Zhou, Zheng-Fu Han, and Guang-Can Guo                                                                          |        |
| Decoherence-free preparation of Dicke states of trapped ions by collective stimulated Raman adiabatic passage<br>(14 pages) .....                    | 062327 |
| I. E. Linington and N. V. Vitanov                                                                                                                    |        |
| Linear optical scheme to demonstrate genuine multipartite entanglement for single-particle $W$ states<br>(5 pages) .....                             | 062328 |
| Hyunchul Nha                                                                                                                                         |        |
| Perturbative gadgets at arbitrary orders (8 pages) .....                                                                                             | 062329 |
| Stephen P. Jordan and Edward Farhi                                                                                                                   |        |
| Dynamics of entanglement in a one-dimensional Ising chain (6 pages) .....                                                                            | 062330 |
| G. B. Furman, V. M. Meerovich, and V. L. Sokolovsky                                                                                                  |        |
| Limit distributions of two-dimensional quantum walks (9 pages) .....                                                                                 | 062331 |
| Kyohei Watabe, Naoki Kobayashi, Makoto Katori, and Norio Konno                                                                                       |        |
| Interaction- and measurement-free quantum Zeno gates for universal computation with single-atom and<br>single-photon qubits (13 pages) .....         | 062332 |
| Y. P. Huang and M. G. Moore                                                                                                                          |        |
| Entanglement and purity of one- and two-photon states (10 pages) .....                                                                               | 062333 |
| Jun O. S. Yin and S. J. van Enk                                                                                                                      |        |
| Experimentally accessible geometric measure for entanglement in $N$ -qubit pure states (11 pages) .....                                              | 062334 |
| Ali Saif M. Hassan and Pramod S. Joag                                                                                                                |        |
| Asymmetric quantum error correction via code conversion (5 pages) .....                                                                              | 062335 |
| Ashley M. Stephens, Zachary W. E. Evans, Simon J. Devitt, and Lloyd C. L. Hollenberg                                                                 |        |
| Universal quantum computation with trapped ions in thermal motion by adiabatic passage (5 pages) .....                                               | 062336 |
| Xun-Li Feng, Chunfeng Wu, C. H. Lai, and C. H. Oh                                                                                                    |        |
| Control-limited perfect state transfer, quantum stochastic resonance, and many-body entangling gate in<br>imperfect qubit registers (10 pages) ..... | 062337 |
| C. Di Franco, M. Paternostro, D. I. Tsomokos, and S. F. Huelga                                                                                       |        |
| Hyperfine-interaction-induced decoherence and deterministic teleportation of electrons in a quantum-dot<br>nanostructure (5 pages) .....             | 062338 |
| Siqing Yu, Yechao Zhu, and Ye Yeo                                                                                                                    |        |
| Quantum entanglement via two-qubit quantum Zeno dynamics (6 pages) .....                                                                             | 062339 |
| Xiang-Bin Wang, J. Q. You, and Franco Nori                                                                                                           |        |
| Remote extraction and destruction of spread qubit information (12 pages) .....                                                                       | 062340 |
| Yoshiko Ogata and Mio Murao                                                                                                                          |        |
| Spin squeezing via ladder operations on an atomic coherent state (6 pages) .....                                                                     | 062341 |
| Christopher C. Gerry and Adil Benmoussa                                                                                                              |        |

(Continued)

# CONTENTS - *Continued*

PHYSICAL REVIEW A

THIRD SERIES, VOLUME 77, NUMBER 6

JUNE 2008

|                                                                                                                                                              |        |
|--------------------------------------------------------------------------------------------------------------------------------------------------------------|--------|
| Quantum beat laser as a source of entangled radiation (7 pages) . . . . .                                                                                    | 062308 |
| Shahid Qamar, Fazal Ghafoor, Mark Hillery, and M. Suhail Zubairy                                                                                             |        |
| Correlation-function Bell inequality with improved visibility for three qubits (5 pages) . . . . .                                                           | 062309 |
| Chunfeng Wu, Jing-Ling Chen, L. C. Kwek, and C. H. Oh                                                                                                        |        |
| Distilling entanglement from random cascades with partial “which path” ambiguity (8 pages) . . . . .                                                         | 062310 |
| E. A. Meirom, N. H. Lindner, Y. Berlatzky, E. Poem, N. Akopian, J. E. Avron, and D. Gershoni                                                                 |        |
| Berry’s phase under the Dzyaloshinskii-Moriya interaction (5 pages) . . . . .                                                                                | 062311 |
| M. K. Kwan, Zeynep Nilhan Gurkan, and L. C. Kwek                                                                                                             |        |
| Generation of four-partite Greenberger-Horne-Zeilinger and $W$ states by using a high-finesse bimodal cavity (13 pages) . . . . .                            | 062312 |
| D. Gona, S. Fritzsche, and T. Radtke                                                                                                                        |        |
| Decoherence-free quantum information in the presence of dynamical evolution (8 pages) . . . . .                                                              | 062313 |
| Peter G. Brooke, James D. Cresser, and Manas K. Patra                                                                                                        |        |
| Staggered magnetization and entanglement enhancement by magnetic impurities in a $S=\frac{1}{2}$ spin chain (5 pages) . . . . .                              | 062314 |
| Tony J. Apollaro, Alessandro Cuccoli, Andrea Fubini, Francesco Plastina, and Paola Verrucchi                                                                 |        |
| Large-amplitude coherent-state superposition generated by a time-separated two-photon subtraction from a continuous-wave squeezed vacuum (9 pages) . . . . . | 062315 |
| Masahiro Takeoka, Hiroki Takahashi, and Masahide Sasaki                                                                                                      |        |
| Demonstration of a scheme for the generation of “event-ready” entangled photon pairs from a single-photon source (4 pages) . . . . .                         | 062316 |
| Qiang Zhang, Xiao-Hui Bao, Chao-Yang Lu, Xiao-Qi Zhou, Tao Yang, Terry Rudolph, and Jian-Wei Pan                                                             |        |
| Reduced state uniquely defines the Groverian measure of the original pure state (6 pages) . . . . .                                                          | 062317 |
| Eylee Jung, Mi-Ra Hwang, Hungsoo Kim, Min-Soo Kim, DaeKil Park, Jin-Woo Son, and Sayatnova Tamaryan                                                          |        |
| Phase-space patterns of quantum transport on ordered and disordered networks (10 pages) . . . . .                                                            | 062318 |
| Xin-Ping Xu and Feng Liu                                                                                                                                     |        |
| Bures distance as a measure of entanglement for symmetric two-mode Gaussian states (6 pages) . . . . .                                                       | 062319 |
| Paulina Marian and Tudor A. Marian                                                                                                                           |        |
| Investigation of planar Coulomb crystals for quantum simulation and computation (8 pages) . . . . .                                                          | 062320 |
| I. M. Buluta, M. Kitaoka, S. Georgescu, and S. Hasegawa                                                                                                      |        |
| Fidelity approach to Gaussian transitions (8 pages) . . . . .                                                                                                | 062321 |
| Yu-Chin Tzeng (曾郁欽), Hsiang-Hsuan Hung (洪祥軒), Yung-Chung Chen, and Min-Fong Yang                                                                             |        |
| Dynamics of global entanglement under decoherence (5 pages) . . . . .                                                                                        | 062322 |
| Afshin Montakhab and Ali Asadian                                                                                                                             |        |
| Schemes for quantum key distribution with higher-order alphabets using single-photon fractional Fourier optics (9 pages) . . . . .                           | 062323 |
| S. P. Walborn, D. S. Lemelle, D. S. Tasca, and P. H. Souto Ribeiro                                                                                           |        |
| Universal and nonuniversal contributions to block-block entanglement in many-fermion systems (6 pages) . . . . .                                             | 062324 |
| V. V. Frana and K. Capelle                                                                                                                                  |        |

(Continued)

# CONTENTS - *Continued*

PHYSICAL REVIEW A

THIRD SERIES, VOLUME 77, NUMBER 6

JUNE 2008

|                                                                                                                                              |        |
|----------------------------------------------------------------------------------------------------------------------------------------------|--------|
| Wave-packet entanglement (7 pages) . . . . .                                                                                                 | 062104 |
| Mayer A. Landau and C. R. Stroud, Jr.                                                                                                        |        |
| Weak measurements with entangled probes (4 pages) . . . . .                                                                                  | 062105 |
| David Menzies and Natalia Korolkova                                                                                                          |        |
| Mermin inequalities for perfect correlations (5 pages) . . . . .                                                                             | 062106 |
| Adán Cabello, Otfried Gühne, and David Rodríguez                                                                                             |        |
| Repulsive and attractive Casimir forces in a glide-symmetric geometry (5 pages) . . . . .                                                    | 062107 |
| Alejandro W. Rodriguez, J. D. Joannopoulos, and Steven G. Johnson                                                                            |        |
| Criteria for generalized macroscopic and mesoscopic quantum coherence (13 pages) . . . . .                                                   | 062108 |
| E. G. Cavalcanti and M. D. Reid                                                                                                              |        |
| Geometry of quantum correlations (5 pages) . . . . .                                                                                         | 062109 |
| Itamar Pitowsky                                                                                                                              |        |
| Relevance of Bell's theorem as a signature of nonlocality: Case of classical angular momentum distributions (11 pages) . . . . .             | 062110 |
| A. Matzkin                                                                                                                                   |        |
| Spontaneous emission of a moving atom in vacuum (4 pages) . . . . .                                                                          | 062111 |
| Wei Guo                                                                                                                                      |        |
| Process positive-operator-valued measure: A mathematical framework for the description of process tomography experiments (4 pages) . . . . . | 062112 |
| Mário Ziman                                                                                                                                  |        |
| Controlled decoherence in a quantum Lévy kicked rotator (15 pages) . . . . .                                                                 | 062113 |
| Henning Schomerus and Eric Lutz                                                                                                              |        |
| Adiabatic condition and quantum geometric potential (6 pages) . . . . .                                                                      | 062114 |
| Jian-da Wu, Mei-sheng Zhao, Jian-lan Chen, and Yong-de Zhang                                                                                 |        |
| <b>Quantum information</b>                                                                                                                   |        |
| Robust and efficient quantum repeaters with atomic ensembles and linear optics (7 pages) . . . . .                                           | 062301 |
| Nicolas Sangouard, Christoph Simon, Bo Zhao, Yu-Ao Chen, Hugues de Riedmatten, Jian-Wei Pan, and Nicolas Gisin                               |        |
| Limiting distribution of decoherent quantum random walks (14 pages) . . . . .                                                                | 062302 |
| Kai Zhang                                                                                                                                    |        |
| Origination and survival of qudit-qudit entanglement in open systems (7 pages) . . . . .                                                     | 062303 |
| Jerzy Dajka and Jerzy Łuczka                                                                                                                 |        |
| Hierarchies of geometric entanglement (15 pages) . . . . .                                                                                   | 062304 |
| M. Blasone, F. Dell'Anno, S. De Siena, and F. Illuminati                                                                                     |        |
| Entanglement propagation through spin chains in the presence of a staggered magnetic field (5 pages) . . . . .                               | 062305 |
| R. H. Crooks and D. V. Khveshchenko                                                                                                          |        |
| Experimental quantum-information processing with $^{43}\text{Ca}^+$ ions (9 pages) . . . . .                                                 | 062306 |
| J. Benhelm, G. Kirchmair, C. F. Roos, and R. Blatt                                                                                           |        |
| Multipartite continuous-variable solution for the Byzantine agreement problem (11 pages) . . . . .                                           | 062307 |
| Rodion Neigovzen, Carles Rodó, Gerardo Adesso, and Anna Sanpera                                                                              |        |

(Continued)