PHYSICAL REVIEW B
covering condensed matter and materials physics
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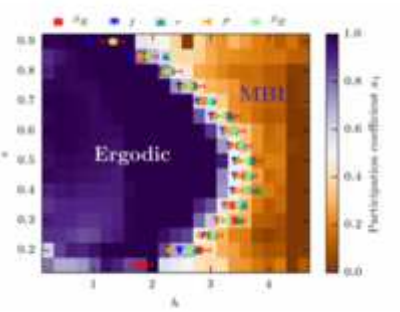
HIGHLIGHTED ARTICLES

Editors' Suggestion **Rapid Communication**

Many-body localization edge in the random-field Heisenberg chain

David J. Luitz, Nicolas Laflorencie, and Fabien Alet

Phys. Rev. B **91**, 081103(R) (2015) – Published 9 February 2015



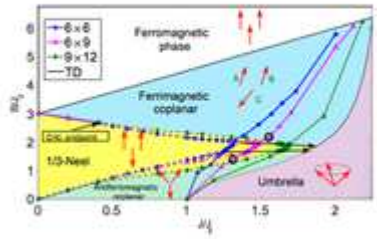
The authors study the phenomena of many-body localization in a random field Heisenberg chain. In this paper the authors use a shift-inverse exact diagonalization approach that allows them to study the mid-spectrum spectral properties of the model for system sizes of up to N=22. This has allow the authors to identify the many-body localization edge.

Editors' Suggestion **Rapid Communication**

Phase diagram of the antiferromagnetic XXZ model on the triangular lattice

Daniel Sellmann, Xue-Feng Zhang (张学锋), and Sebastian Eggert

Phys. Rev. B **91**, 081104(R) (2015) – Published 9 February 2015



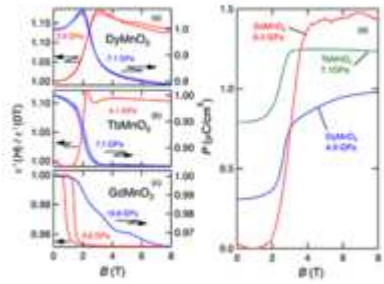
This paper studies studies the spin-1/2 XXZ antiferromagnet on a triangular lattice using a density matrix renormalization group. The authors study the phase diagram of this model as a function of magnetic field and spin anisotropy.

Editors' Suggestion **Rapid Communication**

Multiferroicity in orthorhombic $RMnO_3$ (R=Dy,Tb, and Gd) under high pressure

Takuya Aoyama, Ayato Iyama, Katsuya Shimizu, and Tsuyoshi Kimura

Phys. Rev. B **91**, 081107(R) (2015) – Published 18 February 2015



In type-II multiferroics ferroelectricity is driven by magnetism, and the coupling between the two orders is generally larger than in conventional multiferroic materials. However, a critical problem that needs to be overcome for type-II multiferroics is that their polarization is far too low to be useful for applications. In this Rapid Communication, a group of researchers from Osaka University, Japan, demonstrate that in three prototypical manganites ($TbMnO_3$, $DyMnO_3$, and $GdMnO_3$) magnetic field can induce giant changes in polarization under high pressure. In the gadolinium compound, the change they have observed reaches the record high value of 1.3 $\mu C/cm^2$ among the spin-driven multiferroics.

Editors' Suggestion

Zero modes, bosonization, and topological quantum order: The Laughlin state in second quantization

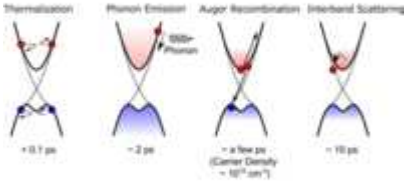
Tahereh Mazaheri, Gerardo Ortiz, Zohar Nussinov, and Alexander Seidel
Phys. Rev. B **91**, 085115 (2015) – Published 20 February 2015

Fractional Quantum Hall (FQH) wave functions are usually obtained in a first-quantized language, using special properties of analyticity of the lowest Landau level (LLL) wave functions. Unfortunately, this formalism is not directly applicable to several systems different from the LLL, such as the recently discovered fractional Chern insulators. Introducing a second-quantized formalism represents an important step towards a new understanding of FQH wave functions in terms of the guiding center degrees of freedom only. In this paper, the authors present several applications of the formalism, including an explicit derivation of the second-quantized version of Read's string order parameter for the Laughlin state.

Editors' Suggestion

Ultrafast carrier relaxation through Auger recombination in the topological insulator $Bi_{1.5}Sb_{0.5}Te_{1.7}Se_{1.3}$

Yoshito Onishi, Zhi Ren, Kouji Segawa, Wawrzyniec Kaszub, Maciej Lorenc, Yoichi Ando, and Koichiro Tanaka
Phys. Rev. B **91**, 085306 (2015) – Published 17 February 2015



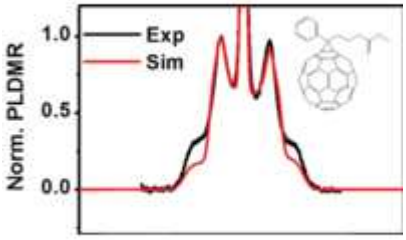
Using pump-probe spectroscopy a Japanese research team studies the physical properties of an intrinsic topological insulator material. Monitoring initial non-equilibrium photo-excitation they find that Auger recombination is an essential relaxation mechanism, in addition to thermalization, cooling, and population relaxation and dominates for higher carrier densities.

Editors' Suggestion

Spin-dependent photophysics in polymers lightly doped with fullerene derivatives: Photoluminescence and electrically detected magnetic resonance

B. Zerai Tedlla, F. Zhu, M. Cox, B. Koopmans, and E. Goovaerts

Phys. Rev. B **91**, 085309 (2015) – Published 23 February 2015



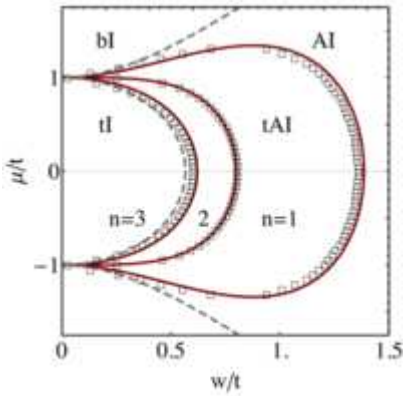
The authors use photoluminescence- and electrically-detected magnetic resonance spectroscopies to trace and characterize triplet exciton states in lightly fullerene-doped polymers. This approach can provide an improved analysis of charge excitations and their spin dependent interactions in organic electronics devices, in particular organic light emitting diodes, with the potential to enhance their performance.

Editors' Suggestion

Topology versus Anderson localization: Nonperturbative solutions in one dimension

Alexander Altland, Dmitry Bagrets, and Alex Kamenev

Phys. Rev. B **91**, 085429 (2015) – Published 27 February 2015



This paper presents a comprehensive study of the interplay of Anderson localization and topological phase transitions in five symmetry classes that allow topological insulators in one dimension.

RAPID COMMUNICATIONS

Electronic structure and strongly correlated systems

Rapid Communication

Electronic origin of the volume collapse in cerium

N. Devaux, M. Casula, F. Decremps, and S. Sorella
Phys. Rev. B **91**, 081101(R) (2015) – Published 2 February 2015
Rapid Communication

Dynamical spin structure factor of one-dimensional interacting fermions
Vladimir A. Zyuzin and Dmitrii L. Maslov
Phys. Rev. B **91**, 081102(R) (2015) – Published 4 February 2015
Editors' Suggestion **Rapid Communication**

Many-body localization edge in the random-field Heisenberg chain
David J. Luitz, Nicolas Laflorencie, and Fabien Alet
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Phys. Rev. B **91**, 081104(R) (2015) – Published 9 February 2015
Rapid Communication

Hyperfine coupling and spin polarization in the bulk of the topological insulator Bi_2Se_3
S. Mukhopadhyay, S. Krämer, H. Mayaffre, H. F. Legg, M. Orlita, C. Berthier, M. Horvatić, G. Martinez, M. Potemski, B. A. Piot, A. Materna, G. Strzelecka, and A. Hruban
Phys. Rev. B **91**, 081105(R) (2015) – Published 17 February 2015
Rapid Communication

Tunable circular dichroism due to the chiral anomaly in Weyl semimetals
Pavan Hosur and Xiao-Liang Qi
Phys. Rev. B **91**, 081106(R) (2015) – Published 17 February 2015
Editors' Suggestion **Rapid Communication**

Multiferroicity in orthorhombic $RMnO_3$ *(*R*=*Dy*,*Tb*, and* Gd*) under high pressure*
Takuya Aoyama, Ayato Iyama, Katsuya Shimizu, and Tsuyoshi Kimura
Phys. Rev. B **91**, 081107(R) (2015) – Published 18 February 2015
Rapid Communication

Criticalities in the itinerant ferromagnet UGe_2
Marcin M. Wysokiński, Marcin Abram, and Józef Spałek
Phys. Rev. B **91**, 081108(R) (2015) – Published 20 February 2015
Rapid Communication

Observation of incompressibility at $\nu=4/11$ *and* $\nu=5/13$
N. Samkharadze, I. Arnold, L. N. Pfeiffer, K. W. West, and G. A. Csáthy
Phys. Rev. B **91**, 081109(R) (2015) – Published 23 February 2015
Rapid Communication

Entanglement entropy scaling laws and eigenstate typicality in free fermion systems
Hsin-Hua Lai and Kun Yang
Phys. Rev. B **91**, 081110(R) (2015) – Published 23 February 2015
Rapid Communication

$CaFeAs_2$: A staggered intercalation of quantum spin Hall and high-temperature superconductivity
Xianxin Wu, Shengshan Qin, Yi Liang, Congcong Le, Heng Fan, and Jiangping Hu
Phys. Rev. B **91**, 081111(R) (2015) – Published 24 February 2015
Rapid Communication

Anomalous spectral-weight transfers unraveling oxygen screening and electronic correlations in the insulator-metal transition of VO_2
L. H. Yeo, A. Srivastava, M. A. Majidi, R. Sutarto, F. He, S. M. Poh, C. Diao, X. Yu, M. Motapothula, S. Saha, S. Ojha, D. Kanjilal, P. E. Trevisanutto, M. B. H. Breese, T. Venkatesan, and A. Rusydi
Phys. Rev. B **91**, 081112(R) (2015) – Published 25 February 2015
Rapid Communication

Universality lost: Relation between quantizations of the Hall conductance and the edge exponents in fractional quantum Hall effect

Jimmy A. Hutasoit
Phys. Rev. B **91**, 081113(R) (2015) – Published 27 February 2015

Rapid Communication

Ultrafast charge and lattice dynamics in one-dimensional Mott insulator of CuO-chain compound Ca_2CuO_3 investigated by femtosecond absorption spectroscopy
H. Matsuzaki, H. Nishioka, H. Uemura, A. Sawa, S. Sota, T. Tohyama, and H. Okamoto
Phys. Rev. B **91**, 081114(R) (2015) – Published 27 February 2015

Semiconductors I: bulk

Rapid Communication

Direct measurement of the bulk spin structure of noncentrosymmetric BiTeCl
Gabriel Landolt, Sergey V. Eremeev, Oleg E. Tereshchenko, Stefan Muff, Konstantin A. Kokh, Jürg Osterwalder, Evgueni V. Chulkov, and J. Hugo Dil
Phys. Rev. B **91**, 081201(R) (2015) – Published 10 February 2015

Semiconductors II: surfaces, interfaces, microstructures, and related topics

Rapid Communication

Cation ordering induced polarization enhancement for $PbTiO_3-SrTiO_3$ferroelectric-dielectric superlattices
Junkai Deng, Alex Zunger, and Jefferson Zhe Liu
Phys. Rev. B **91**, 081301(R) (2015) – Published 17 February 2015

Rapid Communication

Split Dirac cones in HgTe/CdTe quantum wells due to symmetry-enforced level anticrossing at interfaces
S. A. Tarasenko, M. V. Durnev, M. O. Nestoklon, E. L. Ivchenko, Jun-Wei Luo, and Alex Zunger
Phys. Rev. B **91**, 081302(R) (2015) – Published 18 February 2015

Rapid Communication

Model for the light-induced magnetization in singly charged quantum dots
A. B. Henriques, R. C. Cordeiro, P. M. Koenraad, F. W. M. Otten, and M. Bayer
Phys. Rev. B **91**, 081303(R) (2015) – Published 23 February 2015

Surface physics, nanoscale physics, low-dimensional systems

Rapid Communication

Calculation of the graphene C 1s core level binding energy
Toma Susi, Duncan J. Mowbray, Mathias P. Ljungberg, and Paola Ayala
Phys. Rev. B **91**, 081401(R) (2015) – Published 2 February 2015

Rapid Communication

Electrical plasmon detection in graphene waveguides
Iacopo Torre, Andrea Tomadin, Roman Krahne, Vittorio Pellegrini, and Marco Polini
Phys. Rev. B **91**, 081402(R) (2015) – Published 5 February 2015

Rapid Communication

Observation of anomalous Hanle spin precession line shapes resulting from interaction with localized states
J. J. van den Berg, W. Strupinski, and B. J. van Wees
Phys. Rev. B **91**, 081403(R) (2015) – Published 12 February 2015

Rapid Communication

Optical bistability in electrically driven polariton condensates
M. Amthor, T. C. H. Liew, C. Metzger, S. Brodbeck, L. Worschech, M. Kamp, I. A. Shelykh, A. V. Kavokin, C. Schneider, and S. Höfling
Phys. Rev. B **91**, 081404(R) (2015) – Published 18 February 2015

Rapid Communication

Probing Majorana physics in quantum-dot shot-noise experiments
Dong E. Liu, Meng Cheng, and Roman M. Lutchyn
Phys. Rev. B **91**, 081405(R) (2015) – Published 24 February 2015

Rapid Communication

Non-Abelian parafermions in time-reversal-invariant interacting helical systems
Christoph P. Orth, Rakesh P. Tiwari, Tobias Meng, and Thomas L. Schmidt
Phys. Rev. B **91**, 081406(R) (2015) – Published 25 February 2015

Rapid Communication

Electrically tunable quantum spin Hall state in topological crystalline insulator thin films
Junwei Liu and Liang Fu
Phys. Rev. B **91**, 081407(R) (2015) – Published 27 February 2015

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Kondo versus indirect exchange: Role of lattice and actual range of RKKY interactions in real materials
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Single-electron shell occupation and effective g factor in few-electron nanowire quantum dots
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Algebraic approach to the study of zero modes of Haldane pseudopotentials
Li Chen and Alexander Seidel
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Dynamic polarizability tensor for circular cylinders
Diana Strickland, Arturo Ayón, and Andrea Alù
Phys. Rev. B **91**, 085104 (2015) – Published 6 February 2015

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Yi Zhang, Akash V. Maharaj, and Steven Kivelson
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N. Wakeham, Y. Q. Wang, Z. Fisk, F. Ronning, and J. D. Thompson
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Superconductivity in the two-band Hubbard model
Akihisa Koga and Philipp Werner
Phys. Rev. B **91**, 085108 (2015) – Published 12 February 2015

Resolving unoccupied electronic states with laser ARPES in bismuth-based cuprate superconductors
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Exotic magnetic phases in an Ising-spin Kondo lattice model on a kagome lattice
Hiroaki Ishizuka and Yukitoshi Motome
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Electronic and structural ground state of heavy alkali metals at high pressure
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Survival of sharp $n=0$ Landau levels in massive tilted Dirac fermions: Role of the generalized chiral operator
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Multiplicity of transmission coefficients in photonic crystal and split ring resonator waveguides with Kerr nonlinear impurities
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Nature of ground states in one-dimensional electron-phonon Hubbard models at half filling
H. Bakrim and C. Bourbonnais
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Zero modes, bosonization, and topological quantum order: The Laughlin state in second quantization
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Quasiparticle properties of the superconducting state of the two-dimensional Hubbard model
E. Gull and A. J. Millis
Phys. Rev. B **91**, 085116 (2015) – Published 20 February 2015
$S=\frac{1}{2}$ ferromagnetic-antiferromagnetic alternating Heisenberg chain in a zinc-verdazyl complex
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Masaki Adachi, Hiroaki Matsui, Munetoshi Seki, Hiroyasu Yamahara, and Hitoshi Tabata
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Free-fermion entanglement spectrum through Wannier interpolation
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Phys. Rev. B **91**, 085119 (2015) – Published 20 February 2015
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Chemical pressure tuning of URu_2Si_2 via isoelectronic substitution of Ru with Fe
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$La_2O_3Fe_2Se_2$: A Mott insulator on the brink of orbital-selective metallization
Gianluca Giovannetti, Luca de' Medici, Markus Aichhorn, and Massimo Capone
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Topological Hofstadter insulators in a two-dimensional quasicrystal
Duc-Thanh Tran, Alexandre Dauphin, Nathan Goldman, and Pierre Gaspard
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Quantum phases of a one-dimensional dipolar Fermi gas
Hamid Mosadeq and Reza Asgari
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Martin Nuss, Martin Ganahl, Enrico Arrigoni, Wolfgang von der Linden, and Hans Gerd Evertz
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Magnetic and electronic properties of $CaMn_2Bi_2$: A possible hybridization gap semiconductor
Q. D. Gibson, H. Wu, T. Liang, M. N. Ali, N. P. Ong, Q. Huang, and R. J. Cava
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Structural, electronic and hyperfine characterization of pure and Ta-doped$ZrSiO_4$

R. E. Alonso, L. Errico, M. Taylor, A. Svane, and N. E. Christensen
Phys. Rev. B **91**, 085129 (2015) – Published 27 February 2015

Semiconductors I: bulk

Temperature-dependent lattice dynamics and electronic transitions in $0.93Pb(Zn_{1/3}Nb_{2/3})O_3-0.07PbTiO_3$ single crystals: Experiment and theory

Jinzhong Zhang (张金中), Wen-Yi Tong (童文旖), Jiajun Zhu (诸佳俊), Jiayue Xu (徐家跃), Zhihua Duan (段志华), Liping Xu (徐丽萍), Zhigao Hu (胡志高), Chun-Gang Duan (段纯刚), Xiangjian Meng (孟祥建), Ziqiang Zhu (朱自强), and Junhao Chu (褚君浩)
Phys. Rev. B **91**, 085201 (2015) – Published 4 February 2015

Superdiffusive heat conduction in semiconductor alloys. I. Theoretical foundations
Bjorn Vermeersch, Jesús Carrete, Natalio Mingo, and Ali Shakouri
Phys. Rev. B **91**, 085202 (2015) – Published 10 February 2015

Superdiffusive heat conduction in semiconductor alloys. II. Truncated Lévy formalism for experimental analysis
Bjorn Vermeersch, Amr M. S. Mohammed, Gilles Pernot, Yee Rui Koh, and Ali Shakouri
Phys. Rev. B **91**, 085203 (2015) – Published 10 February 2015

Coexistence of trapped and free excess electrons in $SrTiO_3$
Xianfeng Hao, Zhiming Wang, Michael Schmid, Ulrike Diebold, and Cesare Franchini
Phys. Rev. B **91**, 085204 (2015) – Published 12 February 2015

Optical measurement of doping efficiency in poly(3-hexylthiophene) solutions and thin films
Chenchen Wang, Duc T. Duong, Koen Vandewal, Jonathan Rivnay, and Alberto Salleo
Phys. Rev. B **91**, 085205 (2015) – Published 17 February 2015

Phonon heat conduction in layered anisotropic crystals
A. J. Minnich
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Understanding the role and interplay of heavy-hole and light-hole valence bands in the thermoelectric properties of PbSe
Thomas C. Chasapis, Yeseul Lee, Euripides Hatzikraniotis, Konstantinos M. Paraskevopoulos, Hang Chi, Ctirad Uher, and Mercouri G. Kanatzidis
Phys. Rev. B **91**, 085207 (2015) – Published 27 February 2015

Semiconductors II: surfaces, interfaces, microstructures, and related topics

Toward reversing Joule heating with a phonon-absorbing heterobarrier
Seungha Shin and Massoud Kaviany
Phys. Rev. B **91**, 085301 (2015) – Published 2 February 2015

Adiabatic preparation of a cold exciton condensate
V. Shahnazaryan, O. Kyriienko, and I. A. Shelykh
Phys. Rev. B **91**, 085302 (2015) – Published 3 February 2015

Excitonic complexes in natural InAs/GaAs quantum dots
M. Zieliński, K. Gołasa, M. R. Molas, M. Goryca, T. Kazimierczuk, T. Smoleński, A. Golnik, P. Kossacki, A. A. L. Nicolet, M. Potemski, Z. R. Wasilewski, and A. Babiński
Phys. Rev. B **91**, 085303 (2015) – Published 6 February 2015

Microwave magnetoplasma resonances of two-dimensional electrons in MgZnO/ZnO heterojunctions
V. E. Kozlov, A. B. Van'kov, S. I. Gubarev, I. V. Kukushkin, V. V. Solovyev, J. Falson, D. Maryenko, Y. Kozuka, A. Tsukazaki, M. Kawasaki, and J. H. Smet
Phys. Rev. B **91**, 085304 (2015) – Published 9 February 2015

Carrier relaxation in colloidal nanocrystals: Bridging large electronic energy gaps by low-energy vibrations
Peng Han and Gabriel Bester
Phys. Rev. B **91**, 085305 (2015) – Published 17 February 2015
Editors' Suggestion

Ultrafast carrier relaxation through Auger recombination in the topological insulator $Bi_{1.5}Sb_{0.5}Te_{1.7}Se_{1.3}$
Yoshito Onishi, Zhi Ren, Kouji Segawa, Wawrzyniec Kaszub, Maciej Lorenc, Yoichi Ando, and Koichiro Tanaka
Phys. Rev. B **91**, 085306 (2015) – Published 17 February 2015

Lattice-mismatched heteroepitaxy of IV-VI thin films on PbTe(001): An ab initio *study*
Chang-Eun Kim, Young-Joo Tak, Keith T. Butler, Aron Walsh, and Aloysius Soon
Phys. Rev. B **91**, 085307 (2015) – Published 17 February 2015

Saturation and bistability of defect-mode intersubband polaritons
Simone Zanotto, Federica Bianco, Lucia Sorba, Giorgio Biasiol, and Alessandro Tredicucci
Phys. Rev. B **91**, 085308 (2015) – Published 19 February 2015

Editors' Suggestion

Spin-dependent photophysics in polymers lightly doped with fullerene derivatives: Photoluminescence and electrically detected magnetic resonance
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Phys. Rev. B **91**, 085309 (2015) – Published 23 February 2015

Giant mesoscopic fluctuations of the elastic cotunneling thermopower of a single-electron transistor
A. S. Vasenko, D. M. Basko, and F. W. J. Hekking
Phys. Rev. B **91**, 085310 (2015) – Published 27 February 2015

Role of boron diffusion in CoFeB/MgO magnetic tunnel junctions
Sumanta Mukherjee, Ronny Knut, S. M. Mohseni, T. N. Anh Nguyen, S. Chung, Q. Tuan Le, Johan Åkerman, Johan Persson, Anindita Sahoo, Abhijit Hazarika, Banabir Pal, Sebastian Thiess, Mihaela Gorgoi, P. S. Anil Kumar, Wolfgang Drube, Olof Karis, and D. D. Sarma
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Two-electron $n-p$ double quantum dots in carbon nanotubes
E. N. Osika and B. Szafran
Phys. Rev. B **91**, 085312 (2015) – Published 27 February 2015

Effective g-factor tensor for carriers in IV-VI semiconductor quantum wells
E. Ridolfi, E. A. de Andrada e Silva, and G. C. La Rocca
Phys. Rev. B **91**, 085313 (2015) – Published 27 February 2015

Surface physics, nanoscale physics, low-dimensional systems

Rayleigh-Bénard instability in graphene
O. Furtmaier, M. Mendoza, I. Karlin, S. Succi, and H. J. Herrmann
Phys. Rev. B **91**, 085401 (2015) – Published 2 February 2015

Atomic structure of Bi_2Se_3 and Bi_2Te_3 (111) surfaces probed by photoelectron diffraction and holography
Mikhail V. Kuznetsov, Lada V. Yashina, Jaime Sánchez-Barriga, Ilya I. Ogorodnikov, Andrey S. Vorokh, Andrey A. Volykhov, Roland J. Koch, Vera S. Neudachina, Marina E. Tamm, Anna P. Sirotina, Andrei Yu. Varykhalov, Gunther Springholz, Günther Bauer, John D. Riley, and Oliver Rader
Phys. Rev. B **91**, 085402 (2015) – Published 2 February 2015

Atomistic theory of dark excitons in self-assembled quantum dots of reduced symmetry
M. Zieliński, Y. Don, and D. Gershoni
Phys. Rev. B **91**, 085403 (2015) – Published 4 February 2015

All-optical injection of charge, spin, and valley currents in monolayer transition-metal dichalcogenides
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