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Denis V. Bulaev

Date of birth: April 28, 1978
Place of birth: Saransk, Russia
Citizenship: Russia

Education

Nov. 2000 – Oct. 2003 – **Ph. D. in Physics**
Dept. of Theoretical Physics, Mordovian State University, Saransk, Russia

Thesis Title: *Magnetic and Electrodynamic Response of Nonplanar Nanostructures*
Advisor: Prof. V.A. Margulis

Aug. 1995 – June 2000 – **M. A. in Physics**
Dept. of Theoretical Physics, Mordovian State University, Saransk, Russia

Thesis Title: *Magnetic Response of a Quantum Ellipsoid of Revolution*
Advisor: Prof. V.A. Margulis

Employment

May 2004 – present – **Postdoctoral Researcher**
Dept. of Physics and Astronomy, University of Basel, Basel, Switzerland

Jan. 2004 – Aug. 2005 – **Assistant Professor**
Dept. of Math. Analysis, Mordovian State University, Saransk, Russia

Sep. – Dec., 2003 – **Lecturer**
Dept. of Theoretical Physics, Mordovian State University, Saransk, Russia

Sep. 2001 – June 2003 – **Teaching Assistant**
Dept. of Theoretical Physics, Mordovian State University, Saransk, Russia

Teaching Experience

SS 2007: Spintronics in Nanostructures at University of Basel (lectures)
WS 2006/2007: Quantum Mechanics at University of Basel (exercises)
SS 2006: Physics IV at University of Basel (exercises)
WS 2005/2006: Physics III (Introduction to Quantum Mechanics) at University of Basel (exercises)
SS 2005: Physics IV at University of Basel (exercises)
WS 2004/2005: Physics III (Introduction to Quantum Mechanics) at University of Basel (exercises)
SS 2004: Mathematical Foundation of Quantum Mechanics at Mordovian State University (lectures)
SS 2004: Higher Mathematics at Mordovian State University (lectures and exercises)
WS 2003/2004: Methods of Mathematical Physics at Mordovian State University (lectures and exercises)

SS 2003:	Quantum Mechanics at Mordovian State University (exercises)
WS 2002/2003:	Quantum Mechanics at Mordovian State University (exercises)
SS 2002:	Quantum Mechanics at Mordovian State University (exercises)
WS 2001/2002:	Quantum Mechanics at Mordovian State University (exercises)

Research Interests

- Spintronics
- Spin coherence in semiconductor nanostructures
- Quantum computation
- Electron transport in nanostructures

Grants and Awards

2003	Grant of the Russian Ministry of Education for Young Scientists
2003	Grant of the Russian Foundation for Basic Research for Young Scientists
2003	Grant of the Mordovian State University for Postgraduate Strudents
2001	George Soros Fellowship for Postgraduate Students
2000	The Russian Ministry of Education Prize for the Best Student's Paper

Scientific Visits

Nov.27 – Dec.4,	Group of Prof. Jochen Brüning
2005	Department of Mathematics, Humboldt university, Berlin, Germany
June 1 – 30,	Group of Prof. Daniel Loss
2003	Dept. of Physics and Astronomy, University of Basel, Basel, Switzerland

Invited Talks

Sept. 6, 2007	Anomalous spin relaxation in nanotubes (in Russian) ITP Seminar, Kapitza Institute for Physical Problems RAS, Moscow, Russia.
Sept. 4, 2007	Spin qubits based on quantum dots in III-V semiconductors and graphene (in Russian) Semiconductor Physics Seminar, Institute for Physics of Microstructures RAS, Nizhny Novgorod, Russia.
Apr. 20, 2007	Spin relaxation and decoherence in low-dimensional nanostructures (in Russian) Theoretical Seminar, Institute of Solid State Physics RAS, Chernogolovka, Russia.
Apr. 19, 2007	Spin qubits based on quantum dots in III-V semiconductors and graphene (in Russian) ITP Seminar, Kapitza Institute for Physical Problems RAS, Moscow, Russia.
Apr. 17, 2007	Spin properties of electrons and holes in quantum dots (in Russian) Condensed Matter Theory Seminar, P.N. Lebedev Physical Institute RAS, Moscow, Russia.

- Sept. 22, 2006** **Electric dipole spin resonance and spin decoherence for heavy holes in quantum dots**
Condensed Matter Theory Seminar,
University of Basel, Basel, Switzerland.
- Sept.13, 2006** **Electric dipole spin resonance and spin decoherence for heavy holes in quantum dots**
Russian – Swiss Seminar “Excitons and exciton condensates in confined semiconductor systems”, P.N. Lebedev Physical Institute
Russian Academy of Sciences, Moscow, Russia.
- Nov. 30, 2005** **Spectral Properties of a 2D Spin-Orbit Hamiltonian**
Seminar on Geometrical Analysis and Spectral Theory,
Humboldt-Universität zu Berlin, Berlin, Germany.
- Nov. 25, 2004** **Anticrossing and spin relaxation of electrons and holes in quantum dots**
Condensed matter theory seminar, University of Basel.
- June 5, 2003** **Effect of the surface curvature on the spectrum, magnetic, and transport properties of mesoscopic systems**
Condensed matter theory seminar, University of Basel.
- May 20, 2003** **Magnetic and Electrodynamic Response of Nonplanar Nanostructures** (in Russian)
Seminar on Semiconductor Physics,
Institute for physics of microstructures RAS, Nizhni Novgorov.
- March 25, 2003** **Magnetic and Electrodynamic Response of Nonplanar Nanostructures** (in Russian)
Seminar of the Theoretical Physics Department,
Nizhni Novgorod State University, Nizhni Novgorov

Publications

Articles

- [1] Denis V. Bulaev, Bjoern Trauzettel, Daniel Loss.
Spin-orbit interaction and anomalous spin relaxation in carbon nanotube quantum dots
arXiv:0712.3767
- [2] D. Heiss, S. Schaeck, H. Huebl, M. Bichler, G. Abstreiter, J. J. Finley, D. V. Bulaev, Daniel Loss.
Observation of extremely slow hole spin relaxation in self-assembled quantum dots
Phys. Rev. B **76**, 241306(R) (2007); arXiv:0705.1466
- [3] B. Trauzettel, Denis V. Bulaev, Daniel Loss, Guido Burkard.
Spin qubits in graphene quantum dots
Nature Physics **3**, 192 (2007); cond-mat/0611252
- [4] Denis V. Bulaev, Daniel Loss.
Electric Dipole Spin Resonance for Heavy Holes in Quantum Dots.
Phys. Rev. Lett. **98**, 097202 (2007); cond-mat/0608410
- [5] Denis V. Bulaev, Daniel Loss.
Spin Relaxation and Decoherence of Holes in Quantum Dots.
Phys. Rev. Lett. **95**, 076805 (2005); cond-mat/0503181

- [6] Denis V. Bulaev, Daniel Loss.
Spin relaxation and anticrossing in quantum dots: Rashba versus Dresselhaus spin-orbit coupling.
Phys. Rev. B **71**, 205324 (2005); cond-mat/0409614
- [7] D.V. Bulaev, V.A. Geyler, V.A. Margulis.
Effect of surface curvature on magnetic moment and persistent currents in two-dimensional quantum rings and dots.
Phys. Rev. B **69**, 195313 (2004); cond-mat/0308500
- [8] D.V. Bulaev, V.A. Margulis.
Magnetic moment of an electron gas on the surface of constant negative curvature.
Eur. Phys. J. B **36**, 183–186 (2003); cond-mat/0307401
- [9] D.V. Bulaev, V.A. Geyler, V.A. Margulis.
Quantum Hall effect on the Lobachevsky plane.
Physica B **337**, 180–185 (2003); cond-mat/0305086
- [10] D.V. Bulaev, V.A. Margulis.
Magnetic moment of a two-dimensional quantum ring on the surface of constant negative curvature (in Russian)
Izv. VUZov. Povolzhskii reg. Est. nauki. No.2, 133–140 (2003)
- [11] D.V. Bulaev, V.A. Margulis.
Electrodynamic response of a nanosphere placed in a magnetic field.
Fiz. Tverd. Tela **45**, 349–358 (2003)
[Sov. Phys. Solid State **45**, 369–380 (2003)]
- [12] D.V. Bulaev, V.A. Margulis.
Absorption of Electromagnetic Radiation by Electrons of a Nanosphere.
Fiz. Tverd. Tela **44**, 1557–1567 (2002)
[Sov. Phys. Solid State **44**, 1632–1642 (2002)]
- [13] D.V. Bulaev, V.A. Geyler, V.A. Margulis.
Electrodynamic Response of a Nanosphere.
Fiz. Tverd. Tela **44**, 471–472 (2002)
[Sov. Phys. Solid State **44**, 490–492 (2002)]
- [14] D.V. Bulaev, V.A. Geyler, V.A. Margulis.
Magnetic response for an ellipsoid of revolution in a magnetic field.
Phys. Rev. B **62**, 11517–11526 (2000)
- Contributed Talks**
- [15] Bjoern Trauzettel, Denis V. Bulaev, Daniel Loss, Guido Burkard
Spin qubits in graphene quantum dots. APS March Meeting, Denver, USA, March 5 - 9, 2007.
- [16] Denis V. Bulaev, Daniel Loss.
Electric Dipole Spin Resonance for Heavy Holes in Quantum Dots. APS March Meeting, Denver, USA, March 5 - 9, 2007.
- [17] Denis V. Bulaev, Daniel Loss.
Hole Spin Decoherence in Quantum Dots. Int. Conf. on Nanoscience and Technology (ICN+T 2006) (Basel, Switzerland, July 30 - August 4, 2006)
- [18] D.V. Bulaev.

Electron states in a two-dimensional quantum ring on the Lobachevsky Plane (in Russian). Int. Winter School “Semiconductor Physics” (St. Petersburg, Russia, 2003), p. 4–5

- [19] D.V. Bulaev, V.A. Geyler, V.A. Margulis.
Density of states and quantum Hall effect on the Lobachevsky plane (in Russian). XII Conf. “Mathematical Simulation and Boundary Problems” (Samara, Russia, 2002), p. 15–17
- [20] D.V. Bulaev.
Magnetic moment of electrons on the Lobachevsky plane (in Russian). Interregional Scientific School “Materials of Mano-, Micro-, and Optoelectronics: Physical Properties and Applications” (Saransk, Russia, 2002), p. 45
- [21] D.V. Bulaev.
Effect of the surface curvature on the Quantum Hall Effect of 2D electron gas (in Russian). IV Russian Conf. “Semiconductor Physics and Semiconductor Opto- and Nanoelectronics” (St. Petersburg, Russia, 2002), p. 54
- [22] D.V. Bulaev and V.A. Margulis.
Absorption of electrodynamic radiation of a nanosphere in magnetic fields (in Russian). Inter. Conf. “Optics, Optoelectronics, and Technology” (Ulyanovsk, Russia, 2001), p. 105
- [23] D.V. Bulaev, V.V. Demidov, V.A. Margulis.
Magnetic response of a triangle quantum well (in Russian). Proc. Regional Scient. Conf. “Critical Technologies in Regions with Deficiency in Natural Resources” (Saransk, Russia, 2000), p. 126–128
- [24] O.G. Kostrov, D.V. Bulaev.
Energy spectrum of C_{60} in a magnetic field (in Russian). II Int. Conf. “Physical Problems and Applications” (Saransk, Russia, 1999), p. 139
- Posters**
- [25] Björn Trauzettel, Denis V. Bulaev, Daniel Loss, Guido Burkard.
Spin qubits in graphene quantum dots. Graphene Workshop (Leiden, Netherlands, February 5 - 9, 2007).
- [26] Denis V. Bulaev, Daniel Loss
Heavy-hole spin resonance in quantum dots. International seminar and workshop “Dynamics and Relaxation in Complex Quantum and Classical Systems and Nanostructures”, Dresden, Germany, July 24 - October 06, 2006.
- [27] Denis V. Bulaev, Daniel Loss.
Heavy-Hole Spin Relaxation and Decoherence in Quantum Dots. Advanced Research Workshop NanoPiter2006 “Fundamentals of electronic nanosystems” (St. Petersburg, Russia, June 24 - 30, 2006).
- [28] Denis V. Bulaev, Daniel Loss.
Hole Spin Relaxation and Decoherence in Quantum Dots. International Symposium on Mesoscopic Superconductivity and Spintronics 2006 (MS+S2006) (Atsugi, Japan, February 27- March 2, 2006).
- [29] Denis V. Bulaev, Daniel Loss.
Heavy-Hole Spin Relaxation and Decoherence in Quantum Dots. NCCR Nanoscale Science Annual Meeting, (Gwatt, Switzerland, October 6-7,

2005).

- [30] Denis V. Bulaev, Daniel Loss.
Heavy-Hole Spin Relaxation and Decoherence in Quantum Dots. Control and Manipulation of Quantum Systems (Ascona, Switzerland, July 10 - 15, 2005).
- [31] Denis V. Bulaev, Daniel Loss.
Spin Relaxation and Anticrossing in Quantum Dots: Rashba versus Dresselhaus Spin-Orbit Coupling. Annual meeting of Spintronics RTN, Technical University of Budapest (Hungary, October 4 - 7, 2004).
- [32] D. Bulaev.
Effect of the surface curvature on the magnetic response of 2D quantum rings. Int. Conf. “Theoretical Trends in Low-Dimensional Magnetism” (Florence, Italy, 2003), p. 31
- [33] D.V. Bulaev.
Magnetic response of a two-dimensional quantum ring on the Lobachevsky plane (in Russian). XXXIII Russian Conf. “Low Temperature Physics” (Ekaterinburg, Russia, 2003), p. 284–285
- [34] D.V. Bulaev, V.A. Geyler, V.A. Margulis.
Electrodynamic response of a nanosphere. V Int. Work. “Fullerenes and Atomic Clusters” (St. Petersburg, Russia, 2001), p. 301
- [35] D.V. Bulayev, V.A. Geyler, V.A. Margulis.
Magnetic response of the C_{70} fullerene structure: an ellipsoid of revolution model. IV Int. Work. “Fullerenes and Atomic Clusters” (St. Petersburg, Russia, 1999), p. 165 (Florence, Italy, 2003), p. 31
- PhD Thesis** [36] D.V. Bulaev.
Magnetic and Electrodynamic Response of Nonplanar Nanostructures (in Russian). Dissertation (Mordovian State University, 2003).
- Diploma Thesis** [37] D.V. Bulaev.
Magnetic Response of a Quantum Ellipsoid of Revolution (in Russian). Diploma work (Mordovian State University, 2000).