

Few-Body Systems Group (Sector 11) at BLTP, JINR

2009 Annual Activity Report

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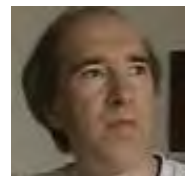
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Dr., Senior Researcher



[Anastasia V. Malykh](#)
Dr., Researcher



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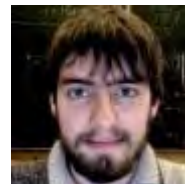
[Vladimir S. Melezhik](#)
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[Vasily V. Pupyshev](#)
Dr.Sc., Leading Researcher



[Ivan I. Shlyk](#)
M.Sc., Researcher



[Evgeni A. Solov'ev](#)
Dr.Sc., Leading Researcher



[Andrei A. Naumkin](#)
M.Sc., Ph.D. Student

2 Publications

2.1 Journal publications

1. S. Albeverio, A. K. Motovilov, and A. A. Shkalikov, “Bounds on variation of spectral subspaces under J -self-adjoint perturbations”, *Integral Equations and Operator Theory* **64**, 455–486 (2009).
2. V. B. Belyaev, W. Sandhas, and I. I. Shlyk, “Two-nucleon ϕ -meson clusters”, *Few-Body Syst.* **45**, 91–95 (2009).
3. R. Di Salvo, . . . , S. S. Kamalov *et al.*, “Measurement of Σ beam asymmetry in π^0 photoproduction off the neutron in the second and third resonances region”, *Eur. Phys. J. A* **42**, 151–157 (2009).
4. S. I. Fedotov, O. I. Kartavtsev, and A. V. Malykh, “Consistent description of the $^{12}\text{C}(0_2^+)$ state”, *Few-Body Syst.* **45**, 153–155 (2009).
5. O. I. Kartavtsev, A. V. Malykh, and S. A. Sofianos, “Bound states and scattering lengths of three two-component particles with zero-range interactions under one-dimensional confinement”, *JETP* **135**, 419–427 (2009).
6. E. A. Kolganova, A. K. Motovilov, and W. Sandhas, “Ultracold collisions in the system of three helium atoms”, *Phys. Part. Nucl.* **40**, 206–235 (2009).
7. G. Laveissière, . . . , S. S. Kamalov *et al.*, Virtual Compton scattering and neutral pion electroproduction in the resonance region up to the deep inelastic region at backward angles, *Phys. Rev. C* **79**, 015201 [18 pages] (2009).
8. A. V. Matveenko, E. O. Alt, and H. Fukuda, “Spheroidal and hyperspheroidal coordinates in the adiabatic representation of scattering states for the Coulomb three-body problem”, *J. Phys. B* **42**, 165003 [5 pages] (2009).
9. A. V. Matveenko, and E. O. Alt, “Elementary hyper-trigonometry of the particle triangle”, *Few Body Syst.* **46**, 45–54 (2009).
10. V. S. Melezhik, “Perspectives of laser-stimulated antihydrogen formation”, *Hyperfine Interactions* **193**, 329 [6 pages] (2009).
11. V. S. Melezhik and P. Schmelcher, “Quantum dynamics of resonant molecule formation in waveguides”, *New J. Phys.* **11**, 073031 [10 pages] (2009).
12. V. V. Pupyshev, “Asymptotics of Raynal-Revai coefficients at large hypermomentum”, *Phys. Atom. Nucl.* **72**, 845–848 (2009).
13. V. V. Pupyshev, “Generalizations of the Fock and Kato expansions to systems of three quantum particles”, *Phys. Part. Nucl.* **40**, 391–460 (2009).
14. E. A. Solov’ev, “On foundation of quantum physics” *Phys. At. Nucl.* **72** 853–857 (2009).

2.2 Articles in paper collections/conference proceedings

1. V. V. Pupyshev, “Modeling of strong- and weakly-bounded states of three identical bosons system”, In: Annual collection of scientific papers “Fundamental physical and mathematical problems and modeling of technique-technology system”, Ed. L.A. Uvarova, Moscow, YANUS-K, vol. 12, pp. 450–460 (2009).

2.3 Articles accepted for publication

1. S. Alberverio and A. K. Motovilov, “Operator integrals with respect to a spectral measure and solutions to some operator equations”, *Trans. Moscow. Math. Soc.* (accepted).
2. N. Markovska, J. Pop-Jordanov, and E. Solov’ev, “Quantum resonance effects and solar cell efficiency”, Ch. 05 in: “Physics of Nanostructured Solar Cells”, Eds. V. Badescu and M. Paulescu, Nova Publishers, N. Y. 2010.

2.4 Preprints and data bases

1. S. Alberverio, A. K. Motovilov, and C. Tretter, “Bounds on the spectrum and reducing subspaces of a J -self-adjoint operator”, *arXiv:0909.1211*.
2. V. B. Belyaev, W. Sandhas, and I. I. Shlyk, “3- and 4-body meson-nuclear clusters”, *arXiv: 0903.1703*.
3. L. Tiator, D. Drechsel, S. S. Kamalov and M. Vanderhaeghen, “Baryon Resonance Analysis from MAID”, *arXiv:0909.2335*.

2.5 Conference presentations

1. V. B. Belyaev, “Meson-nuclear clusters”, [19th International IUPAP Conference on Few-Body Problems in Physics](#) (August 31 – September 5, 2009, Bonn, Germany), oral presentation.
2. V. B. Belyaev, W. Sandhas, and I. I. Shlyk, “Few- body meson- nuclear clusters”, [Seminar “Computational Physics”](#) (October 29 – 30, 2009, Petergof, St. Petersburg, Russia), oral presentation.
3. S. I. Fedotov, O. I. Kartavtsev, and [A. V. Malykh](#), “Consistent description of the 0_2^+ states in ^{12}C ”, [International Conference “Nuclear Structure and Related Topics”](#) (June 30 - July 4, 2009, Dubna, Russia), poster.
4. S. S. Kamalov, “Nucleon resonance analysis from Dubna-Mainz-Taipei dynamical model”, [The 5th International Pion-Nucleon PWA Workshop and Interpretation of Baryon Resonances](#), (June 1 – 5, 2009, ECT*, Trento, Italy), invited talk.
5. S. S. Kamalov, “Recent results from the MAID”, [XIII Advanced Research Workshop on High Energy Spin Physics](#) (September 1 – 5, 2009, Dubna, Russia), oral presentation.

6. O. I. Kartavtsev, and A. V. Malykh, “Low-energy dynamics of two-component three-body systems”, [Seminar “Computational Physics”](#) (October 29 – 30, 2009, Petergof, St. Petersburg, Russia), invited talk.
7. E. A. Kolganova, “Efimov trimers in the framework of Faddeev approach”, [Workshop “Efimov States in Molecules and Nuclei: Theoretical Methods and New Experiments”](#) (Rome, Italy, October 19-21 2009), invited talk.
8. E. A. Kolganova, “Ultracold Helium trimer in the framework of Faddeev approach”, [19th International IUPAP Conference on Few-Body Problems in Physics](#) (August 31 – September 5, 2009, Bonn, Germany), oral presentation.
9. E. A. Kolganova, “Helium trimer in the framework of Faddeev approach”, [International Bogolyubov Conference “Problems of Theoretical and Mathematical Physics”](#) (August 21 – 27, 2009, Dubna, Russia), invited talk.
10. E. A. Kolganova, “Helium three-atomic systems in the framework of the Faddeev differential equations”, [Seminar “Computational Physics”](#) (October 29 – 30, 2009, Petergof, St. Petersburg, Russia), invited talk.
11. A. V. Malykh, “Cluster structure of the ^{12}C nucleus”, [Seminar for Young Scientists from CIS](#) November 13, 2009, Dubna, Russia), oral presentation.
12. A. V. Matveenko, E. O. Alt, and H. Fukuda, “Definition of free hyperradial dynamics for the three-body problem”, [International Bogolyubov Conference “Problems of Theoretical and Mathematical Physics”](#) (August 21 – 27, 2009, Moscow – Dubna, Russia), oral presentation.
13. A. V. Matveenko, E. O. Alt, and H. Fukuda, “Definition of an appropriate free dynamics and the physical \mathcal{S} -matrix in multichannel hyperradial adiabatic scattering”, [19th International IUPAP Conference on Few-Body Problems in Physics](#) (August 31 – September 5, 2009, Bonn, Germany), oral presentation.
14. V. S. Melezhik and P. Schmelcher, “Resonant formation of ultracold molecules in waveguides”, [International Conference on Applied Atomic Optics](#) (July 27 – 29, 2009, Bad Honnef, Germany), poster
15. V. S. Melezhik, “Multi-channel atomic scattering and confinement-induced resonances in waveguides”, [International Conference “Mathematical Modeling and Computational Physics”](#) (July 7 – 11, 2009, Dubna, Russia), oral presentation.
16. A. K. Motovilov, “Bounds on variation of spectral subspaces under J-self-adjoint perturbations”, [International Conference “Modern problems of mathematics, mechanics and their applications, dedicated to seventieth anniversary of Academician V.A.Sadovnichii](#) (March 30 – April 2, 2009, Moscow, Russia), oral presentation.
17. A. K. Motovilov, “Optimal bounds on rotation of spectral subspaces”, [International Bogolyubov Conference “Problems of Theoretical and Mathematical Physics”](#) (August 21 – 27, 2009, Moscow – Dubna, Russia), oral presentation.

18. A. K. Motovilov, "Bounds on the Spectrum and Spectral Subspaces of Few-Body Hamiltonians", [19th International IUPAP Conference on Few-Body Problems in Physics](#) (August 31 – September 5, 2009, Bonn, Germany), oral presentation.
19. A. K. Motovilov, "Bounds on the shift of the spectrum and variation of the spectral subspaces and their applications to few-body problems", [Seminar "Computational Physics"](#) (October 29 – 30, 2009, Petergof, St. Petersburg, Russia), invited talk.
20. A. K. Motovilov, "Bounds on variation of reducing subspaces of a J-self-adjoint operator", [Conference "Spectral Problems and Related Topics"](#) (November 18 – 21, 2009, Moscow, Russia), invited talk.
21. V. V. Pupyshev, "Structure of wave functions of three-body systems nearly the triple collision point", [Seminar "Computational Physics"](#) (October 29 – 30, 2009, Petergof, St. Petersburg, Russia), invited talk.
22. I. I. Shlyk, "Meson-nuclear clusters in few-body approaches", [Seminar "Computational Physics"](#) (October 29 – 30, 2009, Petergof, St. Petersburg, Russia), oral presentation.
23. E. A. Solov'ev, "Spontaneous decay of excited states of hydrogen atom - classical approach", Seminar dedicated to the 90th anniversary of G. F. Drukarev (April 21, 2009, St. Petersburg, Russia), invited talk

3 Visits

3.1 Conferences, schools

1. V. B. Belyaev, [19th International IUPAP Conference on Few-Body Problems in Physics](#) (August 31 - September 5, 2009, Bonn, Germany).
2. V. B. Belyaev, [The Seventh International Conference "Modern Problems of Nuclear Physics"](#) (September 22 – 25, 2009, Tashkent, Uzbekistan).
3. E. A. Kolganova, [Seminar "Computational Physics"](#) (October 29 – 30, 2009, Petergof, St. Petersburg, Russia).
4. E. A. Kolganova, [Workshop "Efimov States in Molecules and Nuclei: Theoretical Methods and New Experiments"](#) (October 19 – 21, 2009, Rome, Italy).
5. E. A. Kolganova, [19th International IUPAP Conference on Few-Body Problems in Physics](#) (August 31 - September 5, 2009, Bonn, Germany).
6. A. V. Malykh, [Seminar "Computational Physics"](#) (October 29 – 30, 2009, Petergof, St. Petersburg, Russia).
7. V. S. Melezhik, [International Conference on Applied Atomic Optics](#) (July 27 – 29, 2009, Bad Honnef, Germany).

8. E. A. Kolganova, [19th International IUPAP Conference on Few-Body Problems in Physics](#) (August 31 - September 5, 2009, Bonn, Germany).
9. A. K. Motovilov, [International Conference “Modern problems of mathematics, mechanics and their applications, dedicated to seventieth anniversary of Academician V.A.Sadovnichii](#) (March 30 – April 2, 2009, Moscow, Russia).
10. A. K. Motovilov, [19th International IUPAP Conference on Few-Body Problems in Physics](#) (August 31 – September 5, 2009, Bonn, Germany).
11. A. K. Motovilov, [Seminar “Computational Physics”](#) (October 29 – 30, 2009, Petergof, St. Petersburg, Russia).
12. A. K. Motovilov, [Conference “Spectral Problems and Related Topics”](#) (November 18 – 21, 2009, Moscow, Russia).
13. I. I. Shlyk, [Seminar “Computational Physics”](#) (October 29 – 30, 2009, Petergof, St. Petersburg, Russia).
14. I. I. Shlyk, [The Xth International School-Seminar “Actual Problems of Microworld physics”](#) (July 15 – 17, 2009, Gomel, Belarus).
15. E. A. Solov’ev, [Seminar dedicated to the 90th anniversary of G. F. Drukarev](#) (April 21, 2009, St. Petersburg, Russia).

3.2 Collaboration visits

1. V. B. Belyaev, Physics Institute, Bonn University, Bonn, Germany, 15.08.2009–07.09.2009.
2. V. B. Belyaev, Physics Institute, Bonn University, Bonn, Germany, 20.12.2009–11.01.2010.
3. S. S. Kamalov, Institute of Nuclear Physics, Mainz University, Mainz, Germany, 15.05.2009–15.06.2009.
4. S. S. Kamalov, Institute of Nuclear Physics, Mainz University, Mainz, Germany, 23.09.2009–20.10.2009.
5. E. A. Kolganova, Physics Institute, Bonn University, Bonn, Germany, 29.01.2009–10.02.2009.
6. E. A. Kolganova, Physics Institute, Bonn University, Bonn, Germany, 28.05.2009–04.06.2009.
7. E. A. Kolganova, Physics Institute, Bonn University, Bonn, Germany, 30.08.2009–15.09.2009.
8. A. V. Matveenko, Institute of Physics, Mainz University, Mainz, Germany, 16.11.2009–26.11.2009.

9. V. S. Melezhik, Institute of Physics, Heidelberg University, Heidelberg, Germany, 26.01.2009–15.02.2009.
10. V. S. Melezhik, Institute of Physics, Heidelberg University, Heidelberg, Germany, 13.07.2009–02.08.2009.
11. V. S. Melezhik, Institute of Physics, Heidelberg University, Heidelberg, Germany, 07.12.2009–17.12.2009.
12. A. K. Motovilov, Institute for Applied Mathematics, Bonn University, Bonn, Germany, 25.05.2009-19.06.2009.
13. A. K. Motovilov, Institute for Applied Mathematics, Bonn University, Bonn, Germany, 30.08.2009-13.09.2009.
14. E. A. Soloviev, Max Born Institute, Berlin, Germany, 06.05.2008-25.05.2009.

4 Visitors

1. Hiroshi Fukuda, Kitasato University, Sagamihara, Kanagawa, Japan, 13.08.2009–21.08.2009.
2. [Werner Sandhas](#), Physics Institute, Bonn University, Bonn, Germany, 23.07.2009–01.08.2009.
3. Peter Schmelcher, Institute of Physics, Heidelberg University, Heidelberg, Germany, 10.06.2009–14.06.2009.
4. Ledwig Tim, Institute of Nuclear Physics, Mainz University, Mainz, Germany, 01.09.2009–19.09.2009.
5. Panagiotis Yannakeas, Institute of Physics, Heidelberg University, Heidelberg, Germany, 15.05.2009–28.05.2009.
6. Alessandro Zampini, Hausdorff-Zentrum für Mathematik, Universität Bonn, Germany, 19.10.2009–26.10.2009.

5 Teaching

1. V. B. Belyaev: adviser of of A.Naumkin, student and, later on, Ph.D. student at Moscow State University, Moscow.
2. V. B. Belyaev: Lecture course “Nuclear Astrophysics” at Dubna University, Dubna.
3. E. A. Kolganova: Diploma adviser of A. Korobotsin, student of Dubna University, Dubna.

4. E. A. Kolganova: Diploma adviser of E. Kaneva, student of Dubna University, Dubna.
5. E. A. Kolganova: Dozent of the Dubna University, lecture course “Mathematical modeling and numerical methods” (February–June and September–December 2009).
6. V. S. Melezhik: Professor of Dubna University, lecture course “General physics” (all the academic year), lecture course “History and methodology of physics” (September–December 2009), lecture course “Modern problems of quantum physics” (September–December 2009).
7. V. S. Melezhik: Ph. D. Thesis co-adviser of Panagiotis Yannakeas, Ph. D. student at Institute of Physics, Heidelberg University, Heidelberg, Germany.
8. V. S. Melezhik: Diploma adviser of V. Zaitzeva (Verhoglyadova), student of Dubna University, Dubna.
9. V. S. Melezhik: Diploma adviser of Yu. Loginova, student of Dubna University, Dubna.
10. A. K. Motovilov: Professor of Dubna University, lecture course and seminars on calculus for 1st year students (September–December 2009).
11. A. A. Naumkin: Laboratory practice “Rutherford backscattering”, Moscow State University, Moscow

6 Organizational activity

1. V. B. Belyaev: Member of the BLTP Scientific Council.
2. V. B. Belyaev: Member of the BLTP NTS.
3. V. B. Belyaev: Chairman of the Council for conferring of bachelor and magister degrees at the Faculty of Physics, Veliky Novgorod State University, Veliky Novgorod.
4. V. B. Belyaev: Member of Advisory Committee of the [19th International IUPAP Conference on Few-Body Problems in Physics](#) (31.08–05.09.2009, Bonn, Germany)
5. E. A. Kolganova: Scientific Secretary of the Council for conferring of bachelor and magister degrees at the Theoretical Physics Department, Dubna University.
6. E. A. Kolganova: Scientific Secretary, [International Conference “Symmetries in Physics”](#) (6 – 9 July 2009, Dubna, Russia).
7. E. A. Kolganova: Member of Organizing Committee, [XIII Advanced Research Workshop on High Energy Spin Physics – DSPIN-09](#) (1 – 5 September 2009, Dubna, Russia).
8. E. A. Kolganova: Member of Organizing Committee, [Advanced Studies Institute on Symmetries and Spin](#) (26 July - 2 August, 2009, Prague, Czech Republic).

9. E. A. Kolganova: Member of Organizing Committee, [International Summer School on Modern Mathematical Physics](#) (20 – 29 July 2009, Dubna, Russia).
10. E. A. Kolganova: Scientific Secretary, [The International Bogolyubov Conference “Problems of Theoretical and Mathematical Physics”](#) (21 – 27 August 2009, Moscow – Dubna, Russia).
11. E. A. Kolganova: Support of the [BLTP website](#).
12. A. V. Malykh: Scientific Secretary, [Workshop on Precision Physics and Fundamental Physical Constants](#) (1 – 4 December 2009, Dubna, Russia).
13. A. V. Malykh: Secretary of the [Sector 11 seminar](#).
14. V. S. Melezhik: Member of the D. Sc. Panel of LIT JINR.
15. V. S. Melezhik: Member of the BLTP Expert commission.
16. A. K. Motovilov: Member of the BLTP NTS.
17. A. K. Motovilov: Member of Organizing Committee, [Seminar “Computational Physics”](#) (October 29 – 30, 2009, Petergof, St. Petersburg, Russia).
18. V. V. Pupyshev: Secretary of the BLTP Commission for Ph.D. (C.Sc) examinations.