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

2002 Annual Activity Report

1 Staff of the BLTP Sector 11 in 2002

1. V.B. Belyaev (Prof., Dr. Sc., Principal Researcher)
2. S.S. Kamalov (Dr., Senior Researcher)
3. M.Kh. Khankhasaev (Dr. Sc., Leading Researcher)
4. A.V. Matveenko (Dr. Sc., Leading Researcher)
5. D.E. Monakhov (Dr., Senior Researcher)
6. A.K. Motovilov (Dr., Head of the Group)
7. F.M. Pen'kov (Dr. Sc., Leading Researcher)
8. V.V. Pupyshev (Dr., Senior Researcher)
9. N.V. Shevchenko (M. Sc., Junior Researcher)

   A.F. Os'kin (M. Sc., Ph. D. Student)

2 List of publications

2.1 Journal publications

1. J. Ahrens, ..., S. Kamalov *et al.* [GDH Collaboration], "The helicity amplitudes A(1/2) and A(3/2) for the $D_{13}(1520)$ resonance obtained from the $\gamma p \to p\pi^0$ reaction," *Phys. Rev. Lett.* **88**, *232002, 5p. (2002).*

2. P. Bartsch, ..., S. Kamalov *et al.*, "Measurement of the beam-helicity asymmetry in the $p(e,e'p)\pi^0$ reaction at the energy of the Delta(1232) resonance," *Phys. Rev. Lett.* **88**, *142001, 4p. (2002).*

3. V.M. Bystritsky, ..., F.M. Pen'kov *et al.*, "Deuterium liner and multiparametric studies of the formation of an inverse Z-pinch", *J. Technical Phys.* **47**, *1098–1105 (2002)*

4. V. Hardt, R. Mennicken, and A.K. Motovilov, "Factorization theorem for the transfer function associated with a 2×2 operator matrix having unbounded couplings", *J. Operator Theory* **48** *No. 1,187–226 (2002)*

5. M. Kohl, ..., S. Kamalov *et al.* [A1 Collaboration], "Self energies of the pion and the Delta isobar from the $He^3(e,e'\pi^+)H^3$ reaction," *Phys. Lett. B* **530**, *67–73 (2002).*

6. E.A. Kolganova, Y.K. Ho, and A.K. Motovilov, "Binding energy of the ^{3}He^{4}He$_2$ trimer within the hard-core Faddeev approach", *Czechoslovak J. Phys.* **52** *C649–C654 (2002)*

7. B. Krusche, J. Ahrens, R. Beck, S. Kamalov, V. Metag, R. O. Owens and H. Stroher, "Coherent π^0 Photoproduction From Atomic Nuclei," *Phys. Lett. B* **526**, 287–294 (2002).

8. A. V. Matveenko and J. Czerwonko, "Hyper-trigonometry of the particle triangle: II", *J. Phys. A: Math. Gen.* **35**, *8267-8275 (2002)*

9. V.V. Pupyshev, "Some expansions in the three-body problem" *Phys. Part. Nucl.* **33**, *435–472 (2002)*

10. N.V. Shevchenko, V.B. Belyaev, S.A. Rakityansky, S.A. Sofianos, and W. Sandhas, "Eta photoproduction off three body nuclei", *Nucl. Phys.* **A 699** *165–168 (2002).*

11. L. Tiator, D. Drechsel, S. Kamalov and S. N. Yang, "Recent progress in pion photo- and electroproduction analysis," *PiN Newslett.* **16**, *41–48 (2002).*

2.2 Articles accepted for publication

1. S. Albeverio, K.A. Makarov, and A.K. Motovilov, "Graph subspaces and the spectral shift function", *Canadian Journal of Mathematics*, to appear

2. V.M. Bystritsky and F.M. Pen'kov, "Analytical estimates of the nuclear reaction yields in the ultralow energy range", *Physics of Atomic Nuclei, 2002*, to appear

3. V. Hardt, R. Mennicken, and A.K. Motovilov, "Factorization theorem for the transfer function associated with an unbounded non-self-adjoint 2×2 operator matrix", *Operator Theory: Advances and Applications*, to appear

4. S. S. Kamalov, L. Tiator, D. Drechsel, R. A. Arndt, C. Bennhold, I. I. Strakovsky and R. L. Workman, "Dispersion relation analysis of neutral pion photo- and electroproduction at threshold using the MAID and SAID solutions," *Phys. Rev. C*, to appear (arXiv:nucl-th/0207026)

5. E.A. Kolganova, A.K. Motovilov, and Y.K. Ho, "Complex scaling of the Faddeev equations", *J. Comput. Methods in Sciences and Engineering*, to appear

6. V. Kostrykin, K.A. Makarov, and A.K. Motovilov, "Existence and uniqueness of solutions to the operator Riccati equation. A geometric approach", *AMS Contemporary Mathematics*, to appear (arXiv:math.SP/0207125)

7. V. Kostrykin, K.A. Makarov, and A.K. Motovilov, "On a subspace perturbation problem", *Proceedings of the American Mathematical Society*, to appear (arXiv:math.SP/0203240)

8. A.V. Matveenko and E.O. Alt, "Rotational states of the He-trimer in the symmetry-adapted hyperradial-adiabatic approach", *Few-Body Systems*, to appear

9. V.V. Pupyshev, "An example of three-body collapse", *J. Phys. A* **36**, *L13-L20 (2003)*

10. N.V. Shevchenko, V.B. Belyaev, S.A. Rakityansky, S.A. Sofianos, and W. Sandhas, "Near-threshold photoproduction of eta-mesons on three-nucleon nuclei", *Nuclear Physics A*, to appear

2.3 Preprints and data bases

1. V.M. Bystritsky, ..., F.M. Pen'kov *et al.*, "Measurement of the astrophysical S factor for the *dd* reaction in ultralow deuteron collision energies using inverse Z-Pinch", *Preprint JINR D15-2002-200, Dubna, 2002*

2. G. Y. Chen, S. Kamalov, S. N. Yang, D. Drechsel, and L. Tiator, "Excitation of S_{11} resonances in pion scattering and pion photoproduction on the proton," *arXiv:nucl-th/0210013*

3. S.S. Kamalov, L. Tiator, D. Drechsel, R.A. Arndt, C. Bennhold, I.I. Strakovsky, and R.L. Workman, "Dispersion relation analysis of neutral pion photo- and electroproduction at threshold using the MAID and SAID solutions", *arXiv:nucl-th/0207026*

4. V. Kostrykin, K.A. Makarov, and A.K. Motovilov, "On the existence of solutions to the operator Riccati equation and the $\tan\Theta$ theorem", *arXiv:math.SP/0210032*

5. F.M. Pen'kov, "A one-parameter dependence of the spectrum, scattering length, and recombination coefficient for a three-boson system", *Preprint JINR P4-2002-282, Dubna, 2002 (Russian)*

6. V.V. Pupyshev, “Structure of the regular solutions to the three-body Schrödinger equation in the vicinity of the two-body collision point”, *Preprint JINR, P5-2002-73, Dubna, 2002 (Russian)*

7. J. Revai and V.B. Belyaev, “Search for long-lived states in antiprotonic lithium”, *arXiv: physics/0208102*

8. N.V. Shevchenko, V.B. Belyaev, S.A. Rakityansky, S.A. Sofianos, and W. Sandhas, “Near-threshold photoproduction of eta-mesons on three-nucleon nuclei”, *arXiv:nucl-th/0211051*

2.4 Conference contributions

1. A.V. Matveenko, “Nonexistence of bound rotational states of Helium trimer”, XVIII European Conference on Few-Body Problems in Physics, September 8-14, 2002, Bled, Slovenia.

2. A.K. Motovilov, “Factorization problem for operator-valued Herglotz functions: Geometric approach”, Talk at the UAB 2002 International Conference on Differential Equations and Mathematical Physics, 26–30 March 2002, Birmingham (Alabama), USA.

3. V.V. Pupyshev,“Spline-algorithm for solving the Faddeev integro-differential equations”. In Abstract book of 5th International Congress on Mathematical Modelling, Dubna, 2002, 30.09-6.10, 2002, p. 169.

4. E. Oset, D. Jido, J. Palomar, A. Ramos, C. Bennhold and S. Kamalov, “Chiral dynamics in systems with strangeness,” (Talk given at 18th European Conference on Few-Body Problems in Physics, Bled, Slovenia, 8-14 Sep 2002), arXiv:nucl-th/0210077.

5. N.V. Shevchenko, “Eta photoproduction on three body nuclei”, Gordon Research Conference on Photonuclear Reactions, 18–23 August 2002, Tilton school, USA.

3 Sector seminars in 2002

(For abstracts see the Sector's Seminars Board for 2002
at http://thsun1.jinr.ru/perl-cgi/seminar_fb.pl?2002)

1. Pupyshev V.V.: An example of the tree-body collapse (12.02.02)
2. Monakhov D.E.: Core degree of freedom in the Borromean halo nuclei (12.02.02)
3. Pupyshev V.V.: A structure of the regular solutions to the three-body Schroedinger equation nearly two-body collision point (19.02.02)
4. Korobov V.I.: Variational Exponential Expansion and Its Application to the Three Body Coulomb Problem and nonrelativistic QED (19.03.02)
5. Korobov V.I.: Variational Exponential Expansion and Its Application to the Three Body Coulomb Problem and nonrelativistic QED (Part II) (09.04.02)
6. Roudnev V.A.: St.Petersburg State University Numerical solution of differential Faddeev equations in total angular momentum representation for elastic He-He_2 scattering (16.04.02)
7. Pupyshev V.V.: Construction of the spurious solutions to the Faddeev equations (21.05.02)
8. Zakhariev B.N. and Chabanov V.M.: The amusing exercises with spectra of model systems (23.05.02)
9. Pupyshev V.V.: Analysis of the Faddeev component for three identical boson system with S-wave centrifugal interactions (28.05.02)
10. Motovilov A.K. On a subspace perturbation problem (25.06.02)
11. Topolnikov A. Dynamics of collapsing bubble in liquid under laser and neutron action (06.08.02)
12. Dineykhan M., Zhaugasheva C.A, and Sakhyev S.K.: On formation mechanism of the light nucleus atomcule (13.08.02)
13. Lipson A.G.: Neutron Emission During Electric Breakdown of Cavitation Bubbles in Deuterated Liquids (01.10.02)
14. Pupyshev V.V.: Spline algorithm for solving of the Faddeev equations in the bispherical basis (08.10.02)
15. Pen'kov F.M.: One-parameter dependence of spectra, lengths of scattering and coefficient of recombinations for a three-boson system (10.12.02)

4 Visits

4.1 Conferences, schools

1. V.B. Belyaev , “9th Course on Astrofundamental Physics”, 7–18 September 2002, Palermo-Sicily, Italy
2. S. Kamalov, 18th European Conference on Few-Body Problems in Physics, 8–14 September 2002, Bled, Slovenia.
3. M. Khankhasayev, Joint US–Russian JCCEM Workshop on Demonstration of Electrochemical and Foam-decontamination processes, 21–24 October 2002, St. Petersburg, Russia.
4. M. Khankhasayev, NATO/CCMS Pilot Study Meeting on “Environmental Decision-Making for Sustainable Development in Central Asia”, 16–20 March 2002, Brussels, Belgium.
5. M. Khankhasayev, NATO Advanced Research Workshop on Risk Assessment as a Tool for Water Resources Decision-Making in Central Asia, 23–25 September 2002, Almaty, Kazakhstan.
6. M. Khankhasayev, International Conference “Russia - World Intellectual Bridge”, 24–27 December 2002, Dubna, Russia.
7. A.V. Matveenko, XVIII European Conference on Few-Body Problems in Physics, September 8-14, 2002, Bled, Slovenia.
8. A.K. Motovilov, UAB 2002 International Conference on Differential Equations and Mathematical Physics, 26–30 March 2002, Birmingham (Alabama), USA.
9. V.V. Pupyshev, 5th International Congress on Mathematical Modelling, 30 September – 6 October 2002, Dubna, Russia
10. N.V. Shevchenko, Gordon Research Conference on Photonuclear Reactions, 18–23 August 2002, Tilton School, USA.

4.2 Collaboration visits

1. V.B. Belyaev, Institute for Physics, University of Bonn, Bonn, Germany, 26.11.02-31.01.02
2. S.S. Kamalov, Institute of Nuclear Physics, Mainz University, Mainz, Germany, 03.10.2002–20.03.2002 and 14.10.2002–10.11.2002
3. S.S. Kamalov, Taipei National University, Taipei, Taiwan, 21.03.2002–22.06.2002
4. A.V. Matveenko, University of Mainz, Germany, 29.11–13.12.2002.
5. D.E. Monakhov, University of South Africa, Pretoria, South Africa, 1.01.2002–1.02.2002
6. D.E. Monakhov, University of Aarhus, Denmark 12.11.2002 –18.11.2002
7. A.K. Motovilov, St. Petersburg State University, St. Petersburg (Russia), 11.08.2002–17.08.2002
8. N.V. Shevchenko, Theoretical Physics Department, KFKI, Budapest, Hungary, 23.09.–19.11.2002.

5 Visitors

1. Prof. H. Fukuda, University of Shizuoka, Japan (19.03.2002–02.04.2002).
2. J. Revai, Theoretical Physics Department, KFKI, Budapest, Hungary (2 weeks in July 2002)
3. S.A. Rakityansky, Physics Department, UNISA, Pretoria, South Africa (05.06.–01.07.2002)
4. V.A. Roudnev, St. Petersburg State University, St. Petersburg (Russia), and Kansas State University, Manhattan, Kansas, USA, 14.02–28.04.2002, 18–22.06.2002, and 24.09–2.10.2002
5. L. Tiator, Institute of Nuclear Physics, Mainz University, Mainz, Germany (20.07.2002–04.08.2002)