Few-Body Systems Group (DTAN Sector 3) at BLTP, JINR

2019 Annual Activity Report

Содержание

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2 Main results

В рамках методов связанных каналов и искаженных волн проведен теоретический анализ системы d+^{9}Be. Эффекты сильной связи показаны в реакциях одно-нуклонных передач (d,p) и (d,t). Рассчитаны дифференциальные сечения для канала ^{9}Be(d,α)^{7}Li, и было обнаружено, что в данной реакции тяжелый кластер ^{5}He в основном передается одновременно, и его вклад в последовательную передачу в данной реакций на порядок ниже. На основании этих наблюдений можно сделать вывод, что ядро ^{9}Be имеет кластерную структуру [Ja].

In the framework of the coupled channel and distorted wave methods, a theoretical analysis of the d+^{9}Be system is carried out. The strong coupling effects have been shown for the (d,p) and (d,t) one-nucleon transfer nuclear reactions. Furthermore, it was found that in the ^{9}Be(d,α)^{7}Li nuclear reaction the ^{5}He heavy cluster is transferred mainly simultaneously, and the contribution of its sequential transfer is an order of magnitude lower. Based on these observations,it can be concluded that the ^{9}Be nucleus has cluster structure. [Ja].

[Ja] B. A. Urazbekov, A. S. Denikin, S. M. Lukyanov, N. Itaco, D. M. Janseitov, K. Mendibayev, V. Burjan, V. Kroha, J. Mrazek, W. H. Trzaska, M. N. Harakeh, D. Etasse, I. Stefan, D. Verney, T. Issatayev, Y. E. Penionzhkevich, K. A. Kuterbekov, and T. Zholdybayev, "Clusterization and strong coupled-channels effects in deuteron interaction with ^{9}Be nuclei", *J. Phys. G* ***46 (10)****, 105110 (2019).*

Слабо связанные молекулы ^{4}He^{7}Li и ^{4}He^{6}Li изучались с помощью трехмерных уравнений Фаддеева. Для вычисления энергий связи использовался метод прямого решения уравнений Фаддеева с полным моментом равном нулю. Результаты вычисления энергий связи систем He_2^{6}Li и He_2^{7}Li и длины рассеяния в столкновения атома гелия на слабосвязанном димере представлены в [KeR]. Эти результаты показывают, что современные потенциальные модели поддерживают два связанных состояния в обоих тримерах. При этом энергия возбужденного состояния очень близка к энергии нижайшего двухчастичного порога.

Weakly bound ^{4}He^{7}Li and ^{4}He^{6}Li molecules were studied using three-dimensional Faddeev equations. A method of direct solution of the Faddeev equations for the bound-state problem with zero total angular momentum was used to calculate the binding energies. The results for binding energies of ^{4}He^{6}Li and ^{4}He^{7}Li systems and helium atom–HeLi dimer scattering length have been presented in [KeR]. The results show that modern potential models support two bound states in both trimers. In both cases the energy of the excited state is very close to the energy of the lowest two-body threshold.

[KeR] E.A. Kolganova and V.A. Roudnev, "Weakly bound $LiHe_2$ molecules in the framework of three-dimensional Faddeev equations", *Few-Body Systems* ***60****, 32 (2019).*

Рассмотрено нейтрино-ядерное рассеяние с учетом намагничивания в горячем и плотном веществе, соответствующем взрыву сверхновых, слиянию нейтронных звезд, протонейтронным звездам. При ненулевой температуре нейтрино претерпевает экзо- и эндоэнергетическое рассеяние на нуклонах и ядрах, обусловленное гамов-теллеровской компонентой нейтрального тока. Показано, что сечение передачи энергии при нейтрино-нуклонном

рассеянии изменяется с положительных на отрицательные значения при энергии нейтрино, превышающей в четыре раза температуру вещества. Обсуждаются возможные эффекты для транспорта и спектров нейтрино [Ko].

The neutrino scattering on nuclei embedded in hot and dense matter relevant for core collapse supernovae, neutron star mergers, and proto-neutron stars is considered accounting for magnetization. At finite temperature neutrinos undergo exo- and endo-energetic scattering on nuclei due to the neutral current Gamow-Teller component. The energy transfer cross section in neutrino-nuclon scattering is shown to change from positive to negative values at neutrino energies four times the matter temperature. Possible effects in neutrino transport and spectra are discussed [Ko].

[Ko] V. N. Kondratyev, A. A. Dzhioev, A. I. Vdovin, S. Cherubini, and M. Baldo, "Energy exchange in neutrino nuclear scattering", *Phys. Rev. C* ***782****, 045802 (2019) [5 pages]*.

В [KK] численно исследованы энергетические зависимости двумерного диполь-дипольного рассеяния вблизи и вдали от точек резонансов, индуцированных короткодействующим взаимодействием. Резонансные кривые для бозонов монотонно возрастают в пределе низких энергий, в то время как кривые для фермионов имеют ярко выраженную пикообразную форму. Нерезонансные кривые для бозонов также возрастают в пределе низких энергий из-за s-волновой расходимости, характерной для двумерного рассеяния, но с меньшими амплитудами, чем в случае наличия резонансов. Кривые для фермионов при отсутствии резонансов при низких энергиях монотонно убывают. Также исследованы зависимости угловых распределений дифференциальных сечений рассеяния для рассеяния бозонов и фермионов. Обнаружено, что в сравнении с центральными потенциалами дипольное рассеяние в пределе низких энергий может быть сильно анизотропным даже в случае столкновений бозонов, а на его характеристики существенно влияет как параметр короткодействующего взаимодействия, так и направления дипольных моментов. Определены условия отсутствия резонансов упругого двухчастичного рассеяния, требуемые для стабилизации газа ультрахолодных полярных молекул, необходимой для экспериментальной реализации кубитов на основе полярных молекул.

The work [KK] is devoted to a numerical study of energetic dependencies of the two-dimensional dipole-dipole scattering near- and far from- the resonances induced by short-range interaction. Resonance curves for bosons monotonically increase in the low-energy limit, whereas fermionic curves have peak-shaped form. Non-resonance curves of bosons scattering also increase in low-energy limit due to s-wave divergence, but with lower amplitudes, than in case of resonance. We also investigated angular distributions of the differential cross section of bosonic and fermionic scattering. We found, that in contrast with central potentials the dipolar scattering in low-energy limit could be strongly anisotropic even in case of bosonic scattering, and it's properties are highly sensitive both to the short-range interaction parameter and to the dipolar moments directions. The conditions of an absence of resonances in the elastic two-body dipolar scattering cross section dependencies were determined, that are important for the experiments with polar molecules in optical traps.

[KK] E. A. Koval and O. A. Koval, "Energetic dependencies of total cross section of quantum anisotropic scattering in two dimensions", *AIP Conference Proceedings* ***2163****, 0900094 (2019) [4 pages]*.

Решена задача рассеяния на короткодействующем потенциале с аксиальной симметрией. В системе координат где потенциал сохраняет указанную симметрию, решение представимо в виде ряда по z-компоненте углового момента $l_z = 0, \pm 1, \pm 2....$ Каждый член ряда является решением двумерного уравнения. Примером использования служит расчет рассеяния нейтронов на ядрах с ярко выраженной несферической формой или большим коэффициентом деформации β. Проведены расчеты для ядер ^{10}Be [KP]. Показано, что учет несферичной формы ядра приводит к существенным изменениям в поведении дифференциальнного и полного сечений.

The problem of scattering at short-range potential with axial symmetry has been solved. At the coordinate system where potential haves this symmetry the solution is the row at z-component of the angular momentum $l_z = 0, \pm 1, \pm 2....$ Every term of this sequence is a solution of a two-dimension equation. Calculation of neutron scattering off strongly deformed nuclei has been done for the example a ^{10}Be nucleus [KP]. It has been showed that taking into account of the non-spherical form of nuclei makes significant changes of differential and total cross section.

[KP] P.M. Krassovitskiy and F.M.Pen'kov, "Determination of the scattering amplitude in a limited area of calculation", *Bulletin of the Russian Academy of Sciences: Physics* ***83****, 469–472 (2019)* .

Для однозначного задания гамильтониана системы, состоящей из двух тождественных частиц массы M и частицы массы m, взаимодействующих посредством потенциала нулевого радиуса, требуется вводить дополнительный трехчастичный параметр b на некотором интервале отношения масс частиц $\mu_r < M/m \leq \mu_c$. Значения μ_r и μ_c зависят от полного углового момента L и четности P трехчастичной системы. Для систем с отношением масс $\mu_r(L^P) < M/m \leq \mu_c(L^P)$ изучена зависимость трехчастичного спектра от параметров M/m и b, построены фазовые диаграммы, показывающие количество связанных состояний на плоскости параметров. Проанализирована зависимость спектра и критические значения его параметров от углового момента L [KM].

For unambiguous definition of a Hamiltonian for the system formed by two identical particles of mass M and a distinct particle of mass m, an additional three-body parameter b is needed in the mass-ratio interval $\mu_r < M/m \leq \mu_c$. The values of μ_r and μ_c depend on the total angular momentum L and parity P of three-body system. For mass-ratio intervals $\mu_r(L^P) < M/m \leq \mu_c(L^P)$, dependence of the bound-state energies on parameters M/m and b is studied and "phase diagrams" representing a number of the bound states in the plane of these two parameters are constructed. The dependence of spectra and their critical parameters on the total angular momentum L are analyzed [KM].

[KM] O.I. Kartavtsev and A.V. Malykh, "Three two-component fermions with contact interactions: correct formulation and energy spectrum", arXiv:1904.04943, 32 pages (2019).

Исследованы геометрические резонансы в атомно-ионных квантовых смесях, находящихся в гибридных ловушках, при малом отношении масс атома и иона [MIN]. В частности, рассмотрены столкновения иона, плененного в радиочастотной ловушке Пауля с линейной

геометрией, с атомом в квазиодномерном оптическом волноводе внутри ионной ловушки. Рассчитано влияние собственного микродвижения ионов на положение резонанса. Показано, что собственное микродвижение иона не разрушает резонанс, а его положение может настраиваться радиочастотными полями. Это обеспечивает дополнительную возможность для настройки атом-ионных взаимодействий в низкоразмерных системах.

Confinement-induced resonances in atom-ion quantum mixtures confined in hybrid traps have been studied for small atom-ion mass ratios [MIN]. Specifically, we consider an ion confined in a time-dependent radio-frequency Paul trap with linear geometry, while the atom is constrained to move into a quasi-one-dimensional optical waveguide within the ion trap. We evaluate the impact of the ion intrinsic micromotion on the resonance position. Thus, we solve the atom-ion dynamics semiclassically, namely, the atom dynamics is governed by the three-dimensional time-dependent Schrodinger equation, whereas the ion motion is described by the classical Hamilton equations. We find that the energy of the ion provided by the oscillating radio-frequency fields can affect the resonance position substantially. Notwithstanding, the peculiar phenomenology of those resonances regarding perfect transmission and reflection is still observable. These findings indicate that the intrinsic micromotion of the ion is not detrimental for the occurrence of the resonance and that its position can be controlled by the radio-frequency fields. This provides an additional means for tuning atom-ion interactions in low spatial dimensions.

[MIN] V. S. Melezhik, Z. Idziaszek, and A. Negretti, “Impact of ion motion on atom-ion confinement-induced resonances in hybrid traps”, *Phys. Rev. A* ***100****, 063406 (2019) [12 pages]*.

В [MSh] рассмотрена задача неограниченных несамосопряженных возмущений неограниченного самосопряженного оператора. Установлены условия на положение и длины лакун в спектре невозмущенного оператора, а также на характер подчиненности возмущения, гарантирующие безусловную базисность инвариантных подпространств возмущенного оператора, отвечающих изолированным частям его спектра.

In [MSh], the problem of unbounded non-self-adjoint perturbations of an unbounded self-adjoint operator is considered. Main result consists in establishing of conditions on position and lengths of gaps in the spectrum of the unperturbed operator as well as subordination restrictions on the perturbation ensuring the unconditional basis property for the invariant subspaces of the perturbed operator associated with isolated parts of its spectrum.

[MSh] A. K. Motovilov and A. A. Shkalikov, “Preserving of the unconditional basis property under non-self-adjoint perturbations of self-adjoint operators”, *Funct. Anal. Appl.* ***53****:3 (2019), 192–204*.

Впервые получены аналитические формулы для расчета амплитуд заселенности атомных уровней в результате взаимодействия атома с электромагнитным полем лазера. Потенциал взаимодействия атома с полем задается в дипольном приближении. Математический аппарат модели основан на комплексном скейлинге штарковского гамильтониана и ряде математических теорем, которые сопровождают такое описание. Впервые предложен ряд,

который описывает амплитуду вероятности заселенности атомного уровня. Он состоит из суммы произведений полиномов и стандартных адиабатических экспонент. Полуаналитические расчеты удовлетворительно согласуются с численными расчетами. [Po].

For the first time, analytical formulas were obtained for calculating amplitudes of the population of atomic levels as a result of interactions of the atom with the EM field of the laser. The interaction potential of an atom with a field is recorded in the dipole approximation. The mathematical apparatus of the model is based on complex scaling of the Stark Hamiltonian and on a number of mathematical theorems that accompany such a description. For the first time, a series has been proposed that describes the amplitude of the probability of population of an atomic level. It consists of the sum of the products of polynomials and standard adiabatic exponents. Semi-analytical calculations are in satisfactory agreement with the numerical calculations [Po].

[Po] A. Galstyan, V.L. Shablov, Yu.V. Popov, F. Mota-Furtado, P.F. O'Mahony, and B. Piraux, "Static field limit of excitation probabilities in laser-atom interactions", *J. Phys. B:* ***52****, 085004 (2019) [12 pages]*.

В статье [VP] проведено исследование двумерного движения медленной квантовой частицы в поле центрального дальнодействующего потенциала, убывающего в пределе больших расстояний r как степенная функция $r^{-\beta}$ с показателем $\beta \in (1, 2)$. Найдены низкоэнергетические асимптотики всех парциальных фаз и дифференциального сечения рассеяния такой частицы. Получено простое приближение для энергий ее слабосвязанных состояний.

The work [VP] is devoted to the study of two-dimensional motion of a slow quantum particle in the field of a central long-range potential decreasing in the limit of large distance r as a power function $r^{-\beta}$ with the exponent $\beta \in (1, 2)$. For this particle, the low-energy asymptotics of the scattering phase shifts and differential cross section have been found as well as a simple approximation for the energies of weakly-bound states was established.

[VP] V. V. Pupyshev, "Two-dimensional motion of a slow quantum particle in the field of a central long-range potential", *Theor. Math. Phys.* ***199****, 828–848 (2019)*.

Разработано двумерное представление дискретной переменной для решения динамических квантовых задач с неразделяющимися угловыми переменными [ShM]. Базис этого представления построен на сферических функциях, ортогонализированных на сетках двумерных квадратур Лебедева или Попова на единичной сфере, вместо прямого произведения одномерных квадратурных по каждой угловой переменной. Сходимость и эффективность предложенной вычислительной схемы по сравнению со старой схемой (в которой использовалось прямое произведение одномерных гауссовых квадратур) продемонстрирована на примере расчета спектра атома водорода в магнитном и электрическом полях, произвольно ориентированных друг к другу. Самая быстрая сходимость в случае квадратур Попова.

For treating quantum dynamical problems which involve nonseparable angular variables, a nondirect product discrete variable representation is developed [ShM]. The corresponding basis is constructed on spherical functions orthogonalized on the grids of the Lebedev or Popov

2D quadratures for the unit sphere instead of the direct product of 1D quadrature rules. The convergence and efficiency of the proposed computational scheme is compared with the old one (which used the product of 1D Gaussian quadratures) by calculating, as an example, the spectrum of a hydrogen atom in the magnetic and electric fields arbitrarily oriented to one another. The fastest convergence is obtained through the npDVR based on the Popov quadratures, which has the largest efficiency coefficient among other quadratures on the unit sphere.

[ShM] S. Shadmehri, S. Saeidian, and V. S. Melezhik, "2D nondirect product discrete variable representation for schrödinger equation with nonseparable angular variables", arXiv:1909.01578.

Развито квазиклассическое приближение в классическом представлении [So]. Доказано, что классическое условие квантования совпадает с условием Бора-Зоммерфельда в координатном представлении.

Semiclassical approach is developed in the classical representation. It is proved that the semiclassical quantization condition in the classical representation coincides with the Bohr–Sommerfeld quantization rule in the initial coordinate representation [So].

[So] E. A. Solov'ev, "Semiclassical approach in classical representation", *Quant. Stud.: Math. Found.* ***6****:2, 225–233 (2019)*.

A new calculation scheme of a finite element method (FEM) has been suggested for for solving an elliptic boundary-value problem describing a quadrupole vibration collective nuclear model with tetrahedral symmetry. For solving a two-dimensional problem, the shape functions are constructed with interpolation Lagrange polynomials on a triangle finite element grid. The efficiency of the elaborated method and program are demonstrated by analysis and comparison of the FEM results with those obtained earlier by a finite difference method [SV].
Предложена новая вычислительная схема метода конечных элементов (МКЭ) для решения эллиптической краевой задачи, описывающей квадрупольную колебательную модель коллективного ядра с тетраэдрической симметрией. Для решения двумерной задачи построены базисные функции МКЭ из интерполяционных полиномов Лагранжа на треугольной конечно-элементной сетке. Эффективность разработанного метода и программы показана анализом и сравнением результатов МКЭ с результатами, полученными ранее методом конечных разностей [SV].

[SV] A.A. Gusev, S.I. Vinitsky, O. Chuluunbaatar, A. Gózdź, A. Dobrowolski, K. Mazurek, P.M. Krassovitskiy, "Finite element method for solving the collective nuclear model with tetrahedral symmetry", *Acta Physica Polonica B Proc. Suppl.* **12**, 589–594 (2019).

3 Publications

3.1 Books

1. E. A. Soloviev, "New Approaches in Quantum Physics", Fizmatlit, Moscow, 2019. – 215 p. (in Russian).

3.2 Journal publications

1. I. S. Ishmukhamedov and A. S. Ishmukhamedov, "Tunneling of two interacting atoms from excited states", *Physica E* ***109****, 24–29 (2019)*.

2. N. Burtebayev, Zh. K. Kerimkulov, D. M. Janseitov, A. S. Demyanova, L. I. Galanina, D. K. Alimov. Y. S. Mukhamejanov, N. Amangeldi, M. Nassurlla, A. Aimaganbetov, Y. Nurtazin, K. Talpakova, R. Khodjaev, A. Sabidolda, S. M. Bekbaev, D. Ya. Kurban and B. S. Mammetov, "Study of elastic and inelastic scattering of deuterons by ^{13}C nuclei at energy E(d)=18 MeV ", *News of the National Academy of Sciences of the Republic of Kazakhstan* ***3 (325)****, 114 (2019) [5 pages]*.

3. N. Burtebayev, M. Nassurlla, A. Sabidolda, S. B. Sakuta, A. A. Karakhodjaev, F. X. Ergashev, K. Rusek, E. Piasecki, A. Trzciska, M. Woliska-Cichocka, M. Kowalczyk, D. Janseitov, B. Mauyey, B. Zalewski, Sh. Hamada, K. W. Kemper and A. A. Ibraheem, "Measurement and analysis of ^{10}B+^{12}C elastic scattering at energy of 41.3 MeV ", *Int. Jour. Mod. Phys. E* ***28 (04)****, 1950028 (2019) [9 pages]* .

4. B. A. Urazbekov, A. S. Denikin, S. M. Lukyanov, N. Itaco, D. M. Janseitov, K. Mendibayev, V. Burjan, V. Kroha, J. Mrazek, W. H. Trzaska, M. N. Harakeh, D. Etasse, I. Stefan, D. Verney, T. Issatayev, Y. E. Penionzhkevich, K. A. Kuterbekov and T. Zholdybayev, "Clusterization and strong coupled-channels effects in deuteron interaction with ^{9}Be nuclei ", *J. Phys. G* ***46 (10)****, 105110 (2019) [17 pages]*.

5. E.A. Kolganova and V.A. Roudnev, "Weakly bound $LiHe_2$ molecules in the framework of three-dimensional Faddeev equations", *Few-Body Systems* ***60****, 32 (2019).*

6. D.A. Sazonov, E.A. Kolganova, T.M. Shneidman, R.V. Jolos, N. Pietralla, and W. Witt, "Description of shape coexistence in ^{96}Zr based on the quadrupole-collective Bohr Hamiltonian", *Phys. Rev. C* ***99****, 031304(R) (2019).*

7. G. Nikoghosyan, E.A. Kolganova, D.A. Sazonov, and R.V. Jolos, "Collective treatment of the isovector pair correlations: Boson representation", *Eur. Phys. J. A* **55**, 189 (2019)

8. A.A. Korobitsin and E.A. Kolganova, "Investigation of the helium trimer via Faddeev differential equations", Memoirs of the Faculty of Physics, Lomonosov Moscow State University, **4**, 1941502 (2019) (in Russian, http://uzmu.phys.msu.ru/file/2019/4/1941502.pdf).

9. M.A. Mardyban, D.A. Sazonov, T.M. Shneidman, E.A. Kolganova, and R.V. Jolos, "Analysis of the shape evolution phenomena in ^{96}Zr and ^{96}Mo based on the collective Bohr Hamiltonian", Memoirs of the Faculty of Physics, Lomonosov Moscow State University, **6**, 1960203 (2019) [4 pages] (in Russian, http://uzmu.phys.msu.ru/abstract/2019/6/1960203/).

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12. V. N. Kondratyev, "Magnetoemission of magnetars", *Phys. Part. Nucl.* ***50****:5, 613–615 (2019)*.

13. V. N. Kondratyev, "Zeeman effect at explosive nuclide formation", *Phys. Atom. Nuclei,* ***81****, 890–893 (2018)* (Online first in February 2019).

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16. S. Shadmehri and V. S. Melezhik, "Confinement-induced resonances in two-center problem via a pseudopotential approach", *Phys. Rev. A* ***99****, 032705 (2019) [11 pages]*.

17. A. K. Motovilov and A. A. Shkalikov, "Preserving of the unconditional basis property under non-self-adjoint perturbations of self-adjoint operators", *Funct. Anal. Appl.* ***53****:3 (2019), 192–204*.

18. S. Albeverio and A. K. Motovilov, "Solvability of the operator Riccati equation in the Feshbach case", *Math. Notes* ***105****:4 (2019), 485–502*.

19. A.K. Motovilov, "Unphysical energy sheets and resonances in the Friedrichs-Faddeev model", *Few-Body Syst.* ***60****:21 (2019) [9 pages]*.

20. A. Galstyan, V.L. Shablov, Yu.V. Popov, F. Mota-Furtado, P.F. O'Mahony, and B. Piraux. "Static field limit of excitation probabilities in laser-atom interactions", *J. Phys. B:* ***52****, 085004 (2019) [12 pages]*.

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24. T. P. Grozdanov and E. A. Solov'ev, "Classical representation for hydrogen atom in s-states", *Quantum Stud.: Math. Found.* ***6****:225, 2019 [4 pages]*.

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3.3 Articles in paper collections/conference proceedings

1. E. V. Mardyban, T. M. Shneidman, E. A. Kolganova, R. V. Jolos, "Description of octupole deformation dynamics in alternating parity bands of actinides", *AIP Conf. Proc.* **2163**, 090010 (2019)

2. E. A. Koval and O. A. Koval, "Energetic dependencies of total cross section of quantum anisotropic scattering in two dimensions", *AIP Conference Proceedings **2163**, 0900094 (2019) [4 pages]*.

3. S. Vinitsky, C. Burdik, A. Gusev, A. Deveikis, A. Góz'z, A. Pedrak, and P. M. Krassovitskiy, "On generation of the Bargmann-Moshinsky basis of SU(3) group", *J. Phys. Conf. Ser. **1194**, 012109 (2019)*.

4. A. A. Gusev, O. Chuluunbaatar, S. I. Vinitsky, V. L. Derbov, A. Góźdź, P. M. Krassovitskiy, I. Filikhin, A. V. Mitin, L. L. Hai, and T. T. Lua, "On rotational-vibrational spectrum of diatomic beryllium molecule", *Proc. SPIE **11066**, 1106619 (2019)*.

5. Y.V. Popov, A. Galstyan, B. Piraux, P.F. O'Mahony, F. Mota-Furtado, P. Decleva, and O. Chuluunbaatar, "Separable potentials model for atoms and molecules in strong ultrashort laser pulses", *"Progress in Photon Science: Recent Advances" (eds. K. Yamanouchi, S. Tunic, V. Makarov), Springer Series in Chemical Physics **119**, 221-242 (2019)*.

6. A. A. Gusev, S. I. Vinitsky, O. Chuluunbaatar, A. Góźdź, A. Dobrowolski, K. Mazurek, and P. M. Krassovitskiy, "Finite element method for solving the collective nuclear model with tetrahedral symmetry", *Acta Phys. Pol. B Proc. Suppl. **12**, 589–594 (2019)*.

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8. A.K. Motovilov, "Friedrichs-Faddeev model: Complex deformation and resonances", in: *Contemporary Problems of Mathematics and Mechanics. Proceedings of the international conference dedicated to the 80th anniversary of Academician V.A. Sadovnichy*. MAKS Press, Moscow, 2019.– P. 601–604.

3.4 Articles accepted for publication

1. N. Burtebayev, D. M. Janseitov, Zh. Kerimkulov, D. Alimov, M. Nassurlla, D. S. Valiolda, B. Mauyey, B. Urazbekov, A. S. Demyanova, and A. N. Danilov, "Elastic scattering of alpha particles from ^{9}Be in the framework of optical model", *J. Phys. Conf. Ser.* (accepted for publication).

2. N. Burtebayev, D. M. Janseitov, Zh. Kerimkulov, D. Alimov, M. Nassurlla, B. Mauyey, D. S. Valiolda, A. S. Demyanova, A. N. Danilov, Sh. Hamada, and A. Aimaganbetov, "Investigation of deuteron scattering from ^{13}C at low energy ", *Acta Physica Polonica B* (accepted for publication).

3. N. Burtebayev, D. M. Janseitov, Zh. Kerimkulov, D. Alimov, M. Nassurlla, A. K. Morzabayev, K. Talpakova, Y. Mukhamejanov, L. I. Galanina, A. S. Demyanova, A. N. Danilov, and V. Starastsin, "Study of elastic and inelastic scattering of deuterons by ^{9}Be at energy E=14.5 MeV", *Acta Physica Polonica B* (accepted for publication).

4. E. V. Mardyban, T. M. Shneidman, E. A. Kolganova, R. V. Jolos, "Analytical description of the excited state phase transition to octupole deformed shape in alternating parity bands", *Phys. At. Nucl.* ***83****, No. 1 (2020)* (accepted for publication).

5. P. M. Krassovitskiy, F. M. Pen'kov "Model of three-dimension scattering for nuclear and molecular application", *Bull. RAS. Ser. phys.* (accepted for publication).

6. V. S. Melezhik, "Low-dimensional few-body processes in confined geometry of atomic and hybrid atom-ion traps", N. Orr et al. (eds.): *Recent Progress in Few-Body Physics, Springer Proceedings in Physics* ***238****, Chapter 9–1–4 (2020).*

7. V.S. Melezhik and L.A. Sevastianov, "Calculation of probability density distribution of ultracold atoms and molecules in waveguide-like traps", *V.M. Vishnevskiy et al. (Eds.) Distributed Computer and Communication Networks, Communications in Computer and Information Science* ***1141****, pp. 1–11 (2020).*

8. V. V. Pupyshev, "Two-dimensional scattering of a quantum particle in the combined field of the Coulomb and power potential", *Theor. Math. Phys.* (accepted for publication); JINR Preprint P4-2019-53, Dubna, JINR, 2019..

3.5 Preprints and data bases

1. O.I. Kartavtsev and A.V. Malykh, "Three two-component fermions with contact interactions: Correct formulation and energy spectrum", E-print arXiv:1904.04943, 32 pages (2019).

2. S. Shadmehri, S. Saeidian, and V. S. Melezhik,"2D Nondirect product discrete variable representation for Schrödinger equation with nonseparable angular variables", arXiv:1909.01578 (submitted to *J. Phys. B*).

3. M. Kircher, F. Trinter, S. Grundmann, I. Vela-Perez, S. Brennecke, N. Eicke, J. Rist, S. Eckart, S. Houamer, O. Chuluunbaatar, Yu. V. Popov, I. P. Volobuev, K. Bagschick, M. N. Piancastelli, M. Lein, T. Jahnke, M. S. Schoeffler, and R. Doerner, "Compton scattering near threshold", arXiv:1911.04780 (2019).

4 Conference and seminar presentations

4.1 Conference presentations

1. I. S. Ishmukhamedov, "Tunneling of two interacting atoms from excited states", The XXIII International Scientific Conference of Young Scientists and Specialists (AYSS-2019) (15.04.2019–19.04.2019, Laboratory of Information Technologies, Joint Institute for Nuclear Research, Dubna, Russia), section talk.

2. D. M. Janseitov, N. Burtebayev, Zh. K. Kerimkulov, M. Nassurlla, D. S. Valiolda, A. S. Demyanova, A. N. Danilov and V. Starostin, "Study of deuteron interactions with ^{9}Be nuclei", XXIII International School on Nuclear Physics, Neutron Physics and Applications) (22.09.2019–28.09.2019, Varna, Bulgaria), oral presentation.

3. D. M. Janseitov, N. Burtebayev, Zh. K. Kerimkulov, M. Nassurlla, A. S. Demyanova, A. N. Danilov and D. S. Valiolda, "The cluster states in light nuclei" Euroschool on Exotic Beams 2019 (25.08.2019–31.08.2019, Aarhus, Denmark), poster session.

4. D. M. Janseitov, N. Burtebayev, Zh. K. Kerimkulov, D. Alimov, M. Nassurlla, A. S. Demyanova, and A. N. Danilov, "Study of elastic and inelastic scattering of alpha particles by ^{9}Be nuclei at energy E=29 MeV", LXIX International Conference "Nucleus-2019" (01.07.2019–05.07.2019, Dubna, Russia), oral presentation.

5. D. M. Janseitov, N. Burtebayev, Zh. K. Kerimkulov, M. Nassurlla,"Investigation of the excited states of ^{11}B nucleus", The XXIII International Scientific Conference of Young Scientists and Specialists (AYSS - 2019) (15.04.2019–19.04.2019, Dubna, Russia), oral presentation.

6. D. M. Janseitov, N. Burtebayev, Zh. K. Kerimkulov, M. Nassurlla, D. S. Valiolda, A. S. Demyanova and A. N. Danilov, "Exotic states of 1p shell nuclei" 49th meeting of the PAC for Nuclear Physics (22.01.2019–23.01.2019, Dubna, Russia), poster session.

7. E. A. Kolganova, "Weakly bound triatomic He_2Li Molecules", LXIX International Conference "Nucleus-2019", (01.07.2019–05.07.2019, Dubna, Russia), section talk.

8. E. A. Kolganova, "Van der Waals Three-body Systems", International Bogolyubov Conference "Problems of Theoretical and Mathematical Physics" (09.09.2019–13.09.2019, Dubna, Russia), section talk.

9. E. A. Kolganova, "Shape Coexistence in ^{96}Zr within collective geometrical model", BLTP/JINR-KLTP/CAS Joint Workshop on Physics of Strong Interacting Systems (27.10.2019–01.11.2019, Guangzhou, China), oral presentation.

10. V. N. Kondratyev, "Synthesis of magnetized nuclei at the Zeeman regime", LXIX International Conference "Nucleus-2019", (01.07.2019–05.07.2019, Dubna, Russia), section talk.

11. V. N. Kondratyev, A. A. Dzhioev, A. I. Vdovin, S. Cherubini, and M. Baldo, "Magnetic and thermal effects in neutrino scattering in hot and dense nuclear matter", LXIX International Conference "Nucleus-2019" (01.07.2019–05.07.2019, Dubna, Russia), poster presentation.

12. V. N. Kondratyev, “Properties and synthesis of magnetized nuclei”, The interdisciplinary workshop ”Infinite and Finite Nuclear Matter” (20.03.2019–22.03.2019, BLTP, JINR, Dubna, Russia), oral presentation.

13. V. N. Kondratyev, A. A. Dzhioev, and A. I. Vdovin, ”Synthesis of magnetized nuclei at the Zeeman regime”, All-Russian Conference ”High Energy Astrophysics: Today and Tomorrow” (18.12.2019–28.12.2019, IKI RAS, Moscow, Russia), poster presentation

14. V. N. Kondratyev, “Self-organized critical dynamics in coupled discrete systems”, XXVIth International Conference on Integrable Systems and Quantum symmetries (08.07.2019–12.07.2019, Prague, Czech Republic). section talk.

15. A. A. Korobitsin and E. A. Kolganova, “The properties of ^{4}He three-atomic clusters”, LXIX International Conference “Nucleus-2019” (01.07.2019–05.07.2019, Dubna, Russia), oral presentation.

16. A. A. Korobitsin and E. A. Kolganova, “Ultracold three-body systems”, VIII Annual Conference of Young Scientists and Specialists “Alushta–2019” (10.06.2019–17.06.2019, Alushta), oral presentation.

17. A. A. Korobitsin and E. A. Kolganova, “Using differential Faddeev equations for study of few-body systems”, XXVI International Scientific Conference of Students and Young Scientists “Lomonosov-2019” (08.04.2019–12.04.2019, Moscow, Russia), oral presentation

18. A. A. Korobitsin and E. A. Kolganova, “Ultracold clusters in the framework of Faddeev equations”, 49th Meeting of the PAC for Nuclear Physics (22.01.2019–23.01.2019, JINR, Dubna), poster presentation.

19. E. A. Koval and O. A. Koval, “Low-energy 2d scattering of bosonic dipoles: differential cross section angular distributions”, 13th European Conference on Atoms, Molecules and Photons (8.04.2019–12.04.2019, Florence University, Florence, Italy), poster presentation.

20. E. A. Koval and O. A. Koval, “Energetic dependencies of total cross section of quantum anisotropic scattering in two dimensions”, The XXIII International Scientific Conference of Young Scientists and Specialists (AYSS-2019) (15.04.2019–19.04.2019, Dubna, Russia), oral presentation.

21. E. A. Koval and O. A. Koval, “Binding Energies of Few-body Dipolar Complexes in Two Spatial Dimensions”, LXIX International Conference “Nucleus-2019” (01.07.2019–05.07.2019, Dubna, Russia), poster presentation

22. E. A. Koval and O. A. Koval, “Theoretical investigation of the quantum dynamics of few-body ultracold dipole complexes in low-dimensional changing geometries of optical traps in non-stationary external fields”, Reporting Conference on the Competition of Fundamental Scientific Research Projects Carried out by Young Scientists, Funded by the Russian Foundation for Basic Research (11.11.2019, Moscow), oral presentation.

23. P. M. Krassovitskiy and F. M. Pen’kov, “Model of three-dimension scattering for nuclear and molecular application”, LXIX International Conference “Nucleus-2019” (01.07.2019–05.07.2019, Dubna, Russia), oral presentation

24. P. M. Krassovitskiy and F. M. Pen'kov, "Effect of non-spherical scattering for nuclei of actinide series", XXVI Nuclear Physics Workshop (24.09.2019–29.09.2019, Kazimierz Dolny, Poland), oral presentation.

25. O. I. Kartavtsev, A. V. Malykh,and P. Zhang, "On the spectrum of three-body states in the one-dimensional harmonic trap", LXIX International Conference "Nucleus-2019" (01.07.2019–05.07.2019, Dubna, Russia), section talk.

26. E. V. Mardyban, T. M. Shneidman, E. A. Kolganova, and R. V. Jolos, "Shape phase transitions in atomic nuclei with increase of the angular momentum ", 49th meeting of the PAC for Nuclear Physics (22.01.2019–23.01.2019, JINR, Dubna, Russia), poster.

27. E. V. Mardyban, T. M. Shneidman, E. A. Kolganova, and R. V. Jolos, "Analytical description of shape transition in nuclear alternating parity bands", XXIII International Scientific Conference of Young Scientists and Specialists (AYSS-2019) (15.04.2019–19.04.2019, JINR, Dubna, Russia), section talk.

28. E. V. Mardyban, T. M. Shneidman, E. A. Kolganova, and R. V. Jolos, "Phase transitions in alternating parity bands of heavy nuclei within the framework of collective model", LXIX International Conference "Nucleus-2019" (01.07.2019–05.07.2019, JINR, Dubna, Russia), section talk.

29. E. V. Mardyban, E. A. Kolganova, D. A. Sazonov, R. V. Jolos, and T. M. Shneidman, "Phenomenon of shape coexistence in ^{96}Zr", All-Russian Scientific and Practical Conference "Nature. Society. Man" (21.11.2019–23.11.2019, Dubna State University, Dubna, Russia), section talk.

30. M. A. Mardyban and D. A. Sazonov, "Shape evolution of ^{96}Zr and ^{96}Mo with excitation energy increase", International scientific conference of students and young scientists "Lomonosov-2019" (8.04.2019–12.04.2019, Moscow Lomonosov State University, Moscow, Russia), section talk.

31. M. A. Mardyban, D. A. Sazonov, E. A. Kolganova, and R. V. Jolos, "Study of the change in the shape of the ^{96}Zr and ^{96}Mo nuclei with an increase in the excitation energy", XXVI scientific and practical conference of students, PhD students and young specialists (04.04.2019–26.04.2019, Dubna State University, Dubna, Russia), section talk.

32. V. S. Melezhik, "Quantum-quasiclassical model for calculation of cooling/heating processes in hybrid atom-ion traps", International Conference Mathematical Modeling and Computational Physics (MMCP2019)(01.07.2019–07.07.2019, Stara Lesna, Slovakia), plenary talk.

33. V. S. Melezhik,"Quantum-quasiclassical model for resonant and cooling/heating processes in atom-ion traps", 28 Annual International Laser Physics Workshop (08.07.2019–12.07.2019, Gyeongju, South Korea), invited talk.

34. V. S. Melezhik and S. Shadmehri, "Modeling of atomic electrons dynamics and high-harmonics generation in strong laser fields with 2D DVR", 28th Annual International Laser Physics Workshop (LPHYS'19) (08.07.2019–12.07.2019, Gyeongju, South Korea), oral presentation.

35. V. S. Melezhik,"Low-dimensional few-body collisional processes in atom-ion traps", 24th European Conference on Few-Body Problems in Physics (01.09.2019–06.09.2019, Guildford, United Kingdom), invited section talk.

36. V. S. Melezhik,"Quantum-quasiclassical model for calculation of resonant processes in hybrid atom-ion traps", International Conference on Advanced Scientific Computing (12.09.2019–14.09.2019, Sinaia, Romania), invited talk.

37. V.S. Melezhik, "Impact of ion motion on atom-ion confinement-induced resonances in hybrid traps", All-Russian conference "Physics of Ultracold Atoms – 2019" (16.12.2019–18.12.2019, Novosibirsk State University, Novosibirsk, Russia), invited talk.

38. A.K. Motovilov, "Friedrichs-Faddeev model: Complex deformation and resonances", International Scientific Conference "Contemporary problems of mathematics and mechanics", dedicated to the 80th birthday of academician V. A. Sadovnichii (13.05.2019–15.05.2019, Lomonosov Moscow State University, Moscow, Russia), section talk.

39. A.K. Motovilov, "Equivalence between the complex rotation resonances and scattering matrix resonances", LXIX International Conference "Nucleus-2019" (01.07.2019–05.07.2019, Dubna, Russia), section talk.

40. A.K. Motovilov, "Link between the complex rotation resonances and scattering matrix resonances", The 24th European Conference on Few-Body Problems in Physics (01.09.2019–06.09.2019, University of Surrey, Guildford, UK), section talk.

41. A.K. Motovilov, "Unphysical sheets and resonances in the Friedrichs-Faddeev model", International Bogolyubov Conference "Problems of Theoretical and Mathematical Physics" (09.09.2019–13.09.2019, Moscow–Dubna, Russia), section talk.

42. A.K. Motovilov, "On the link between complex-rotation and scattering-matrix resonances", International Conference "Mathematical Challenge of Quantum Transport in Nanosystems — Pierre Duclos Workshop" (19.09.2019–20.09.2019, ITMO University, Saint Petersburg, Russia), invited talk.

43. A.K. Motovilov, "Equivalence between the complex-rotation and scattering-matrix resonances in the Friedrichs-Faddeev model", Workshop on Operator Theory and Krein Spaces (dedicated to the memory of Hagen Neidhardt) (19.12.2019–22.12.2019, Technische Universität Wien, Vienna, Austria), section talk.

44. B. Piraux, Y.V. Popov, A. Galstyan, "Faddeev's perturbation series for ionization amplitude of atom by strong laser pulse", LXIX International Conference "Nucleus-2019" (01.07.2019–05.07.2019, Dubna, Russia), section talk.

45. V. V. Pupyshev, "Bohr-Zommerfeld quantization rule in the case of decreasing power potential", International Bogolyubov Conference "Problems of Theoretical and Mathematical Physics" (09.09.2019–13.09.2019, Moscow–Dubna, Russia), section talk.

46. S. Shadmehri and V. S. Melezhik, "Confinement-induced resonances in two-center problem", "Frontiers of Quantum and Mesoscopic Thermodynamics" dedicated to Marlan Scully (FQMT'19) (14.07.2019–20.07.2019, Prague, Czech Republic), poster presentation.

47. S. Shadmehri and V. S. Melezhik, “Confinement-induced resonances in two-center problem”, International Bogolyubov Conference ”Problems of Theoretical and Mathematical Physics” (09.09.2019–13.09.2019, Moscow–Dubna, Russia), section talk.

48. D. S. Valiolda, D. M. Janseitov and S. Zhaugasheva, “Coulomb breakup of halo nuclei of ^{11}Be” XXIII International School on Nuclear Physics, Neutron Physics and Applications) (22.09.2019–28.09.2019, Varna, Bulgaria), oral presentation.

49. D. S. Valiolda and D. M. Janseitov, “Theoretical study of the halo nucleus of ^{11}Be” Euroschool on Exotic Beams 2019 (25.08.2019–31.08.2019, Aarhus, Denmark), poster session.

50. D. S. Valiolda, D. M. Janseitov and S. Zhaugasheva, “Coulomb breakup of halo nuclei”, LXIX International Conference “Nucleus-2019”(01.07.2019–05.07.2019, Dubna, Russia), oral presentation.

51. D. S. Valiolda and D. M. Janseitov,“The study of breakup of ^{11}Be nuclei in quantum mechanical approach”, The XXIII International Scientific Conference of Young Scientists and Specialists (AYSS – 2019) (15.04.2019–19.04.2019, Dubna, Russia), oral presentation.

52. D. S. Valiolda and D. M. Janseitov, “Theoretical study of the halo nucleus of ^{11}Be ” 49th meeting of the PAC for Nuclear Physics (22.01.2019–23.01.2019, Dubna, Russia), poster session.

53. S.I. Vinitsky, “Finite element method and programs for investigation of quantum few-body systems”, International Conference on Advanced Scientific Computing, (12.09.2019–14.09.2019, Sinaia, Romania), section talk.

54. A. Deveikis, A. Gusev, V. Gerdt, S. Vinitsky, A. Gózdź, A. Pedrak, and C. Burdik, “Symbolic-numerical algorithm for large scale calculation of the orthonormal SU(3) BM basis,” The 21st International Workshop on Computer Algebra in Scientific Computing (26.08.2019–30.08.2019, Moscow, Russia), oral presentation.

55. S.I. Vinitsky, “Application of KANTBP program of the finite element method in the coupled-channels calculations for heavy-ion fusion reactions”, XXVI Nuclear Physics Workshop (24.09.2019–29.09.2019, Kazimierz Dolny, Poland), invited talk.

56. S. Vinitsky, “KANTBP 4M program for solving the scattering problem for a system of ordinary second-order differential equations,” The International Conference “Mathematical Modeling and Computational Physics”, (01.07.2019–05.07.2019, Stara Lesna, Slovakia), section talk.

57. S. Vinitsky, “Scattering problem with complex and PT-symmetric potentials”, The XXVIth International Conference on Integrable Systems and Quantum Symmetries, (08.07.2019–12.07.2019, Prague, Czech Republic), section talk.

4.2 Seminar talks

1. I. S. Ishmukhamedov, “Theoretical research of two-atom one-dimensional systems in anharmonic traps” (31.05.2019, Seminar based on materials of Cand. Sci. (Phys.–Math.) thesis, Department of Theory of Nuclear Systems, Bogoliubov Laboratory of Theoretical Physics, JINR, Dubna).

   D. M. Janseitov and D. Valiolda, “Excited states of ^{11}B and ^{13}C nuclei” (12.02.2019, Seminar on Few-Body Systems, Bogoliubov Laboratory of Theoretical Physics, JINR, Dubna).

2. V. N. Kondratyev, A. A. Dzhioev, and A. I. Vdovin, “Nuclear inelastic scattering effect in supernova neutrino spectra” (28.10.2019, Seminar of Nuclear Physics Department of BLTP, JINR, Dubna).

3. V. S. Melezhik, “24th European Conference on Few-Body Problems in Physics” (25.11..2019, Seminar of Nuclear Physics Department of BLTP, JINR, Dubna).

4. V. S. Melezhik, “Confinement-induced resonances in two-center problem” (21.03.2019, Seminar of the Department of physical, mathematical and natural science of RUDN, Moscow).

5. V. V. Pupyshev, “Two-dimensional scattering of a quantum particle in the combined field of the Coulomb and power potential” (13.11.2018, Seminar on Few-Body Systems, Bogoliubov Laboratory of Theoretical Physics, JINR, Dubna).

6. T. P. Grozdanov and E. A. Soloviev “Hidden-crossing explanation of frozen-planet resonances in antiprotonic helium: their positions and widths” (21.10.2019, Seminar of Nuclear Physics Department of BLTP, JINR, Dubna).

5 Teaching

1. E. A. Kolganova: PhD co-adviser of E.V. Mardyban, Univeristy Dubna.

2. E. A. Kolganova: PhD adviser of O.P. Klimenko, Univeristy Dubna.

3. E. A. Kolganova: PhD co-adviser of G. Nikoghosyan, Yerevan State University, Armenia.

4. E. A. Kolganova: Diploma adviser of M.A. Mardyban (bachelor thesis), student of Dubna State University.

5. E. A. Kolganova: Diploma adviser of M.A. Makhnovets (master diploma), student of Dubna State University.

6. E. A. Kolganova: Dozent of the Dubna University, lecture course “Mathematical modeling and numerical methods” (February–June and September–December, 2019).

7. V. N. Kondratyev, Dozent of the Dubna State University, lecture course and seminars “Nucleosynthesis” (September, 2018–June, 2019).

8. E. V. Mardyban: Assistent of the Dubna State University, lecture course “Computer applications” (February–June 2019).

9. V. S. Melezhik: Ph. D. Thesis adviser of I. Ishmukhamedov, Jr.Sc. of Al-Farabi Kazakh National University, Almaty, Republic of Kazakhstan and BLTP JINR, Dubna.

10. V. S. Melezhik: Professor of the Dubna University, lecture course "General physics"(all the academic year), lecture course "Modern problems and methodology of physics" (September–December 2019).

11. V. S. Melezhik: scientific adviser of D. Valiolda, Ph. D student of Al-Farabi Kazakh National University, Almaty, Republic of Kazakhstan and Junior Researcher of BLTP JINR, Dubna.

12. A. K. Motovilov: Professor of Dubna State University, lectures and seminars on the course "Scattering theory for few-body systems" for post graduate students (September 2019 – January 2020).

6 Organizational activity

1. E. A. Kolganova: Scientific Secretary of the JINR STC.

2. E. A. Kolganova: Member of Scientific Council of Dubna State University.

3. E. A. Kolganova: Scientific Secretary of the Council for conferring of bachelor and magister degrees at the Theoretical Physics Department, Dubna State University.

4. E. A. Kolganova: Member of Editorial Board of the journal "Mathematical Modelling and Geometry"'

5. E. A. Kolganova: member of Advisory Committee 24th European Conference on Few-Body Problems in Physics (EFB24) (1 – 6 September, 2019, Surrey, UK).

6. E. A. Kolganova: member of Organizing Committee International Bogolyubov Conference "Problems of Theoretical and Mathematical Physics" (9 – 13 September, 2019, Moscow - Dubna, Russia).

7. E. A. Kolganova: Scientific Secretary XIV Workshop on Particle Correlations and Femtoscopy (3 – 7 June, 2019, JINR, Dubna).

8. E. A. Kolganova, Member of Organizing Committee The XVIIIth International workshop on High Energy Spin Physics (DSPIN-19) (2 – 6 September, 2019, BLTP JINR).

9. E. A. Kolganova: Support of the BLTP Website.

10. V. N. Kondratyev: Member of Editorial Board of the International Journal of Astronomy and Astrophysics.

11. V. N. Kondratyev: Member of Editorial Board of the International Journal of Advanced Astronomy.

12. V. N. Kondratyev: Member of Editorial Board of "Research and Applications in Astronomy".

13. V. N. Kondratyev: Member of Editorial Board of American Research Journal of Physics.

14. A. A. Korobitsin: Member of Organizing Committee, VIII Annual Conference of Young Scientists and Specialists "Alushta–2019" (10.06.2019–17.06.2019, Alushta, Russia).

15. A. A. Korobitsin: Organization, preparation and holding, VI All-Russian Science Festival "Days of Physics" (12.04.2019–14.04.2019, Dubna).

16. A.V.Malykh: Secretary of Seminar on Few-Body Systems.

17. E. V. Mardyban: member of Organizing Committee International Bogolyubov Conference "Problems of Theoretical and Mathematical Physics" (9 – 13 September, 2019, Moscow–Dubna, Russia).

18. M.A. Mardyban: Member of Organizing Committee, XIV Workshop on Particle Correlations and Femtoscopy dedicated to the 100th birthday of Podgoretsky (03.06.2019–07.06.2019, Dubna, Russia).

19. V. S. Melezhik: Member of the D. Sc. Panel of LIT, JINR.

20. V. S. Melezhik: Member of the Committee of the STC of BLTP for selection of the D. Sc. Panel.

21. V.S. Melezhik: Member of the BLTP NTS.

22. V. S. Melezhik: Federal expert of Russian Ministry of Education and Science (since 27.02.2014).

23. V. S. Melezhik: Member of International Program Committee of International Conference "Mathematical Modeling and Computational Physics" (1-5 July 2019, Stara Lesna, Slovakia).

24. V. S. Melezhik: Chairman of Scientific Advisory Board / Technical Program Committee, International Conference on Advanced Scientific Computing (Sinaia, Romania, 12–14 September 2019).

25. V. S. Melezhik: Member of the State Commission for state examination and conferring of bachelor and magister degrees at Dubna State University.

26. V. S. Melezhik: thesis reviewer of the Dr. Sc. dissertation of M.D. Malikh (Department of physical, mathematical and natural sciences, RUDN, Moscow).

27. A. K. Motovilov: Member of the Council for the main educational program in magistracy "Applied physics and mathematics", St. Petersburg State University.

28. A. K. Motovilov: Member of Editorial Board of the "Few-Body Systems" journal.

29. A. K. Motovilov: Member of the BLTP NTS.

30. S. I. Vinitsky: Member of Advisory Board of the XXVI Nuclear Physics Workshop, Structure and dynamics of atomic nuclei, (24.09.2019–29.09.2019, Kazimierz Dolny, Poland)

31. S. I. Vinitsky: Member of International Program Committee of the Saratov Fall Meeting – 19, Workshop on Laser Physics and Photonics XXI (23.09.2019–27.09.2019, Saratov, Russia)

32. S. I. Vinitsky: Editor of the "Izvestiya of Saratov University. New Series: Series Physics".

33. S. I. Vinitsky: Editor-in-Chief of "Mathematical Modelling and Geometry".

34. S. I. Vinitsky: Member of the Dissertational Council D 212.203.28, RUDN, Moscow.