**APPROVED**

**Director of Laboratory**

**/ /**

**" " 202 г.**

**REPORT ON THEME**

**1. General information on the Theme**

**1.1. Theme code** **01-3-1136-2019**

**1.2. Laboratory** BLTP

**1.3. Scientific field Theoretical Physics**

**1.4. Title of the Theme Theory of Nuclear System**

**1.5. Theme Leader Antonenko N. V., Dzhioev A. A., Ershov S. N.**

**1.6. Projects in the Theme**

1. Microscopic models for exotic nuclei and nuclear astrophysics

Voronov V. V., Dzhioev A. A.

2. Low-energy nuclear dynamics and properties of nuclear systems

Ershov S. N., Antonenko N. V.

3. Quantum few-body systems

Motovilov A. K., Melezhik V. S.

4. Relativistic nuclear dynamics and nonlinear quantum processes

Bondarenko S. G.

**2. Scientific report on the Theme**

**2.1. Annotation**

In the framework of the theme "Theory of nuclear systems", topical problems of nuclear physics, nuclear astrophysics, few-body systems, and relativistic nuclear physics were solved. The properties and mechanism of formation of superheavy nuclei, mechanisms of nuclear reactions for obtaining certain isotopes and states of nuclei, nuclear processes under astrophysical conditions, exotic nuclear decays, the relationship between the distribution of nucleons in the nucleus and its states, properties of nuclei at high densities and temperatures, states of few-body systems, nonequilibrium processes in open quantum systems were studied. New theoretical methods are proposed to consider nuclear fission, sub-barrier processes, thermal effects in astrophysical reactions, scattering of light nuclei, atomic states. A comparative analysis of the scattering length of a vector meson on a proton was carried out, a theory of nonlinear quantum processes in strong electromagnetic fields was developed, and a new effective method of sympathetic ion cooling was proposed. Research within the theme was coordinated with work programs at experimental facilities using high-intensity beams of stable and/or radioactive nuclei at JINR and in the world. Studies of high-energy heavy ion collisions are related to the NICA project.

**2.2. A detailed scientific report**

It is shown that at core-collapse supernova conditions neutrinos exhibit exo- and endoenergetic scattering on hot nuclear mater. From the analysis energy transfer due to neutrino-nucleus scattering, it was demonstrated that the average energy transfer changes from positive to negative values when the neutrino energy is about four times the temperature. Similar features were found for neutrino scattering on magnetized nucleon gas.

Electron-capture rates were calculated for neutron-rich semi-magic *N*=50 nuclei (78Ni, 82Ge, 86Kr, 88Sr) at temperatures *T*=0 corresponding to the capture to the ground state and at *T* = 1010 K (0.86 MeV), which is a typical temperature at which the *N*=50 nuclei are abundant during a supernova collapse. It was shown that at astrophysical relevant temperatures, this Pauli blocking of the Gamow-Teller (GT+) strength is overcome by thermal excitations leading to a sizable GT contribution to the electron capture. Therefore, the neutron-rich *N*=50 nuclei do not serve as an obstacle of electron capture during a supernova collapse.

The quasiparticle random phase approximation and the cluster model were applied to explain the mystery of a drastic reduction, by two orders of magnitude, of the strength along the Mo isotopic chain. Both models reproduce the trend and predict that this sharp drop is due to the interference effect between the neutron and proton contributions to the matrix element of the *E*1 transition.

The 1+ spectrum of 130In populated in the *β* decay of 130Cd was studied. The coupling between one- and two-phonon terms in the wave functions of 1+ states was taken into account within the microscopic model based on the Skyrme interaction. It was shown that the dominant contribution to the additional 1+ states comes from the [3+⊗2+] two-phonon configurations constructed from the charge-exchange 3+ phonons. A correlation was found between the low-lying *E*2 transition strengths of the parent 126,128,130In and daughter 126,128,130Cd isobaric companions.

The model was developed for the description of the dipole decay widths, in which the energy-dependent shift of the one-phonon states arising due to the coupling of the one-phonon states with complex configurations can be analytically estimated. The obtained results are in good agreement with those of the microscopic calculations for nuclei around 208Pb.

The self-consistent approach based on the quasiparticle random-phase approximation implemented with Skyrme interaction and taking into account coupling to complex configurations was generalized for describing the process of double γ-decay in an even-even nucleus. For the first time, the γγ-decay of the first quadrupole state of the doubly-magic nucleus 48Ca was studied which could proceed in competition with a single γ-decay. It was shown that the γγ-decay width is sensitive to the mixing of simple and complex configurations in the giant dipole resonance region. The obtained estimate of the γγ-decay probability, 3×10-8, can be tested experimentally.

The recent (α,α′) data on the Isoscalar Giant Monopole Resonance and Isoscalar Giant Quadrupole Resonance (ISGQR) in 92,94,96,98,100Mo were analyzed within a fully self-consistent Quasiparticle Random Phase Approximation approach (QRPA) with Skyrme interactions. It was found that in the ground state the inclusion of pairing correlations and axial deformations play important roles. Comparison between ISGMR and ISGQR distributions confirmed that even at modest deformations there is a deformation-induced coupling of the monopole and quadrupole modes.

The two-step scheme was suggested to search for vortical toroidal states in (*e,e’*) reaction. In the firststep, QRPA calculations are used to determine promising candidates for toroidal states. These states should have a distinctive toroidal distribution of the convective nuclear current and significant *B*(*M*2) and *B*(*E1*) values. In the second step, these states are checked to reproduce a pattern of experimental data for *E*1 and *M*2 transversal form factors in electron scattering to back angles. A description of the interference between spin and orbital currents indicates that a vortical toroidal flow in the chosen state actually takes place.

As shown, the structure of 96Zr indicates that the shape of this nucleus can change dramatically with increasing excitation energy. The structure of 96Zr based on the collective quadrupole Bohr Hamiltonian was studied. This approach allows one to describe all the peculiarities of the structure of 96Zr at low excitation energies. The nucleus 96Zr is spherical in the ground state with a 100% probability but becomes deformed if the excitation energy reaches 1.6 MeV. This result indicates the possibility of radical changes in the shape of the nucleus upon its excitation.

A microscopic interpretation of vortex-free nuclear dynamics is given within the proton-neutron symplectic model.

Based on the collective nuclear Hamiltonian and the microscopic approach to the description of the structure of low-lying states of nuclei, the relationship between excitation energy and the probability of the *E*2 transition to the first 2+ state was theoretically derived.

Using the improved scission-point model, the mass and charge distributions of fragments resulting from the fission of Cf isotopes were calculated and compared with the available experimental data. The change of the shape of mass and charge distributions with increasing excitation energy was predicted for future experiments. The coexistence of symmetric mass and asymmetric charge distributions of fission fragments was examined. The first predictions for superheavy elements were made.

The possibility of application of the dinuclear system model to the simultaneous description of α-decay, cluster radioactivity, and spontaneous fission was investigated. The half-lives of cluster decay and spontaneous fission for the nuclei 232,234,236U, 236,238Pu, 242Cm, and 248Cf were calculated within the same approach and compared with the existing experimental data. The cluster radioactivity in the 248Cf nucleus was predicted.

It was found that taking into account the non-diagonal matrix elements of the coupling matrix, traditionally neglected in the conventional coupled-channels approaches, allows one to explain the difficulties arising in various models in the interpretation of experimental data for the *S*-factor of the fusion reaction of two colliding heavy nuclei.

Based on the energy density functional theory, the nucleus 288Fl was predicted as the next double magic nucleus after 208Pb, and 304120 was identified as the most likely candidate for the next-to-next double magic nucleus.

The possibilities for production of yet unknown neutron-rich isotopes 261–265Md were explored in the multinucleon transfer reactions with stable beams bombarding Cf and Es targets. The production of a given isotope of neutron-rich Md was optimized by appropriate choices of projectile-target combinations and bombarding energies. The production cross sections of neutron-rich Md isotopes in the 0*n-* and 1*n-*evaporation channels of multinucleon transfer reactions were compared. Prospects for the use of radioactive beams in the production of new Md isotopes were discussed.

The production cross sections of the heaviest isotopes of superheavy nuclei with charge numbers 112–118 were predicted in the *xn*–, *pxn*–, and *αxn*–evaporation channels of the 48Ca-induced complete fusion reactions for future experiments. A way was shown to produce currently unknown superheavy isotopes in the 1*n*– or 2*n*–evaporation channels.

For future experiments, the production cross sections of superheavy nuclei with charge numbers 114–117 were predicted in the (5–9)*n* evaporation channels of the 48Ca-induced complete fusion reactions. The structure and the *α-*decay spectra of superheavy nuclei have been studied.

Partial cross-sections of the *nα* and *dt* collisions in the quantum state *Jπ* = 3/2+ near the *dt*-threshold, taken from the available *R*-matrix analysis, were fitted using the semianalytic multi-channel Jost matrix with a proper analytic structure and some adjustable parameters. As a result of such an analytic continuation, the previously established 3/2+ resonance (at 47 keV) and its shadow pole (at 80 keV) were both split in overlapping pairs. Apart from studying the properties of a specific nuclear state, it was also proved for a general multi-channel problem that the Coulomb forces change the topology of the Riemann surface as well as destroy the so-called mirror symmetry of the *S*-matrix.

A family of analytically solvable potential models for the one- and two-channel problems was considered within the Jost matrix approach. The migration of the *S*-matrix poles on the Riemann surface of the energy caused by variations of the potential strength was studied. It was demonstrated that the long-range (~1/*r*2) tails and Coulomb potential (1/*r*) cause unusual behavior of the *S*-matrix poles. The Coulomb tail not only changes the topology of the Riemann surface but also breaks down the so-called mirror symmetry of the poles in both the single-channel and two-channel problems.

For the fermionic or bosonic oscillator fully coupled to several heat baths with mixed statistics, the analytical expressions for the occupation numbers were derived within the non-Markovian quantum Langevin approach. The role of statistics of the system and heat baths in the dynamics of the system was studied. The full coupling of a quantum system to a heat bath usually induces its evolution towards asymptotic equilibrium. It was shown that such equilibrium might never be reached when the system is coupled simultaneously to bosonic and fermionic heat baths unless different thermal reservoirs are related with each other. The conditions under which asymptotic equilibrium can be reached were discussed.

Confinement-induced resonances (CIRs) in atom-ion quantum mixtures in hybrid traps were studied for small atom-ion mass ratios. Specifically, we considered 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 evaluated the impact of the ion intrinsic micromotion on the resonance position. We found that the energy of 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 a 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.

A new efficient method was proposed for sympathetic cooling of ions: the use for this purpose of cold buffer atoms in the region of atom-ion CIRs. It was shown that the destructive effect of ion micromotion on its sympathetic cooling can be suppressed in the vicinity of the atom-ion CIR. The effect of sympathetic cooling around CIRs in atom-ion and atom-atom confined collisions was investigated within the quantum-quasiclassical approach using the Li-Yb+ and Li-Yb confined systems as an example. The region was found near the atom-ion CIR where the sympathetic cooling of the ion by cold atoms is possible in a hybrid atom-ion trap. It was shown that one can improve the efficiency of sympathetic cooling in atomic traps by using atomic CIRs.

Among various understandings of the term “resonance” in quantum mechanics, the two most common interpretations are as follows. (1) Resonance is a complex energy value producing a pole to the scattering matrix analytically continued to the so-called unphysical energy sheet(s). (2) Resonance is a complex eigenvalue of the complexly deformed Hamiltonian under consideration. In the case of the Friedrichs-Faddeev model, it is proven that the resonances understood in the senses (1) and (2) are equivalent. Notice that the Friedrichs-Faddeev model is quite universal. Various concrete quantum-mechanical Hamiltonians, in particular, the two-particle ones with short-range interactions, admit a reduction just to the Friedrichs-Faddeev model.

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 the atom with the field is recorded in the dipole approximation. The mathematical apparatus of the model was 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 was proposed that describes well the amplitude of the probability of populating the atomic level.

The two-dimensional movement of a slow quantum particle was studied in the field of a central long-range potential decreasing as a power function *r-β* with the exponent and *β*>2. For this particle, low-energy asymptotics of the scattering phase shifts and differential cross section were found. A simple approximation for the energies of weakly-bound states was established.

It is shown that the binding of two heavy fermions interacting with a light particle through contact interaction is possible only with a sufficiently large mass ratio of heavy and light particles.

A non-direct product discrete variable representation (npDVR) was developed for treating quantum dynamical problems which involve non-separable angular variables. The npDVR basis was 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 quadratures. The use of the npDVR based on the Lebedev or Popov 2D quadratures substantially accelerates the convergence of the computational scheme.

In the framework of the kinetic models of the Monte Carlo type Quark-Gluon-String-Model (QGSM) and Partons-Hadrons-String-Dynamics (PHSD), the transverse and global polarization of Λ hyperons in interactions of heavy ions in the energy range of the NICA collider was studied. The analysis of the spatial structure of the transverse and diagonal vorticity components relative to the reaction plane was carried out, and the spatial separation of hydrodynamic helicity was revealed. The results of theoretical calculations show satisfactory agreement with the experimental results of the STAR collaboration. In the MPD experiment performed using Monte Carlo simulations, the transverse polarization Λ of hyperons was studied to analyze the detector's sensitivity to this observable.

The structure in the K+/π+ ratio was studied, which appears in the heavy ion collisions (Au+Au and Pb+Pb) at energies √sNN ∼ 7-10 GeV. The Polyakov loop extended Nambu-Jona-Lasinio model was used as it describes both chiral phase transition and deconfinement. It was shown that the splitting of multiplet mass in dense matter is responsible for the difference in the behavior of the *K+/π+* and *K-/π-* ratios; the “peak” structure was interpreted as a sequence of the chiral symmetry restoration and subsequent deconfinement effect; the “horn” is more sensitive to the curvature of the phase diagram at high *μB* than the order of the chiral phase transition; the peak depends on the strangeness neutrality or chemical baryon potential of a strange quark.

The combined approach based on solution of the Dyson-Schwinger equations for quark propagators and the Bethe-Salpeter equation for bound states was employed at non-zero temperature. A competition of bound states and quasi-free two-quark states was found at *T≈*100 MeV.

The Bethe-Salpeter-Faddeev formalism was generalized to the case of a nonzero orbital moment of particles in a nucleon pair. The binding energy of the triton and the amplitudes for the states 1S0, 3S1, 3D1, 3P0, 1P1, and 3P1 were calculated. The contribution of the relativistic P and D states to the binding energy of the triton were estimated.

The masses of the ground and excited states of pseudo-scalar glueballs were calculated based on the rainbow approximation to the Dyson-Schwinger and Bethe-Salpeter equations with effective parameters adjusted to lattice QCD data. The structure of the truncated Bethe-Salpeter equation with the gluon and ghost propagators as solutions of the truncated Dyson-Schwinger equations was analyzed in the Landau gauge. Both the Bethe-Salpeter and Dyson-Schwinger equations were solved numerically within the same rainbow-ladder truncation with the same effective parameters which ensure the consistency of the approach. With a set of parameters that provides a good description of the lattice data within the Dyson-Schwinger approach, solutions of the Bethe-Salpeter equation for pseudo-scalar glueballs exhibit a rich mass spectrum that also includes the ground and excited states predicted by lattice calculations.

It was found that in the case of momentum being an independent variable in the Hamiltonian, the Lorentz transformations of the thermodynamic quantities belong to the Planck formalism. However, if velocity is supposed to be the independent variable in the Hamiltonian (though it is not correct from the point of view of the relativistic dynamics), the Lorentz transformations of the thermodynamic quantities belong to the Ott formalism. This demonstrates that the Ott formalism cannot be appropriate. Moreover, it was proven that in the Planck description the first law of thermodynamics was covariant and the Legendre transform of the Lagrangian was preserved. Thus, it was demonstrated that only the Planck formulation of relativistic thermodynamics of a moving body is properly defined and the Ott formalism should be discarded.

A theoretical analysis of elastic scattering and momentum distributions of clusters in breakup reactions of exotic halo-nuclei 8Be, 8,12,14Be was performed. The decisive role of periphery of these nuclei was revealed to describe their scattering and breakup into clusters. It was found that the parameters of the pion-nucleon amplitude differ essentially from those for the pion scattering on free nucleons (“in-medium effect”).

The electromagnetic form factors of three-nucleon systems in the static approximation were calculated for various models of the electromagnetic nucleon form factors at the momentum transfer squared up to 10 GeV2. The calculation of the relativistic corrections to the form factors of three nucleon nuclei associated with Lorentz transformations was also performed.

It was found that in terms of the scaled variables the quark-hadron duality of the lattice QCD and the hadron resonance gas (HRG) model disappears. However, the scaled variables lead to the quark-hadron duality of the lattice QCD and the quantum ideal gas of kaons and antikaons, namely, the ideal gas of those hadrons that contain all the three quarks u, d, s and their antiquarks. Despite the fact that there is no phase transition in an ideal kaon gas, in the present calculations the scaled thermodynamic quantities of the ideal gas and the lattice QCD follow the same qualitative behavior and are consistent with each other.

The hard proton knock-out by the proton from the deuteron at relativistic energies is considered with a focus on the color transparency (CT) effect which influences the initial- and final-state interactions. A well-known behavior of the transparency is mainly preserved up to plab ~ 50 GeV/c, but changes significantly at higher beam momenta due to the interference of valence quark configurations of small and large sizes. As a result, the transparency at small pst exhibits oscillations as a function of the beam momentum (the nuclear filtering effect). The tensor analyzing power due to the longitudinal polarization of the deuteron is calculated. The event rate at NICA is estimated.

The effect of temperature on the bound states of quark-antiquark pairs was studied. The presence of a phase transition was shown. For the first time, a comparative analysis of the scattering length of vector meson (ω, φ, J/ψ) – proton interactions was performed. A non-trivial exponentially strong dependence of the scattering length on the quark content of interacting hadrons was found.

The theory of nonlinear quantum processes in strong electromagnetic fields was developed. For the first time, this method was used to predict the production probabilities of hard Compton photons and electron-positron pairs in interaction of ultra-relativistic electrons with intense laser pulses in a wide range of electron energies and laser beam intensities at the largest European laser project (XFEL, DESY), which is under construction.

2.2.1. List of bibliographic references

**MONOGRAPHS**

E.A.Soloviev, “New Approaches in Quantum Physics”. Moscow, Fizmatlit, 2019 (in Russian).

S.A.Rakityansky, “Jost Functions in Quantum Mechanics. A Unified Approach to Scattering, Bound, and Resonant State Problems”. Springer, 2022.

**PAPERS**

1. E.T. Gregor, N.N. Arsenyev, M. Scheck, T.M. Shneidman, M. Thurauf, C. Bernards, A. Blanc, R. Chapman, F. Drouet, A.A. Dzhioev, G. de France, M. Jentschel, J. Jolie, J.M. Keatings, “Decay properties of the 3-1 level in 96Mo*”, J. Phys. G: Nucl. Part. Phys.* **49**, 075101 (2019).
2. H. G. Ganev, “E1 transitions in the extended proton-neutron symplectic model”, *Phys. Rev. C* **99**, 054304 [10 pages] (2019).
3. E.O. Sushenok, A.P. Severyukhin, N.N. Arsenyev, I.N. Borzov, “Effects of tensor interaction and neutron-proton pairing on beta-decay characteristics of 130,132Cd”, *Acta Physica Polonica B* **50**, 261-267 (2019).
4. J. Kvasil, A. Repko, V.O. Nesterenko, “Elimination of spurious modes before the solution of quasiparticle random-phase-approximation equations”, *Eur. Phys. J. A* **55**, 213 [15 pages] (2019).
5. A. Repko, J. Kvasil, V.O. Nesterenko,”Elimination of spurious modes within quasiparticle random-phase approximation*”, Phys. Rev. C* **99**, 044307 [14 pages] (2019)
6. V. N. Kondratyev, Alan A. Dzhioev, A. I. Vdovin, S. Cherubini, M. Baldo, “Energy exchange in neutrino nuclear scattering”, *Phys. Rev. C* **100**, [5 pages] 045802 (2019)
7. V.O. Nesterenko, A. Repko, J. Kvasil, P.-G. Reinhard, “Individual dipole toroidal states: main features and search in (e,e’) reaction”, *Phys. Rev. C* **100**, 064302 [11 pages] (2019)
8. H. G. Ganev, “Microscopic structure of the low-lying negative-parity states in 154Sm”, *Phys. Rev. C* **99**, 054305 [9 pages] (2019)
9. H. G. Ganev, “Some U(d1+d2) > U(d1) x U(d2) isoscalar factors involving two-rowed initial and final representations”, *Int. J. Mod. Phys. E* **28**, 1950071 [10 pages] (2019)
10. A. Repko, V.O. Nesterenko, J. Kvasil, P.-G. Reinhard, “Systematics of toroidal dipole modes in Ca, Ni, Zr, and Sn isotopes”, *Eur. Phys. J. A* **55**, 242 [15 pages] (2019)
11. E. B. Balbutsev, I.V. Molodtsova, P. Schuck, “The nuclear spin scissors mode – theory and experiment”, *Acta Phys. Pol. B* **12**, 637-648 (2019)
12. A.A. Dzhioev, A. I. Vdovin, Ch. Stoyanov, “Thermal quasiparticle random-phase approximation calculations of stellar electron capture rates with the Skyrme effective interaction”, *Phys. Rev. C* **100**, 025801 [16 pages] (2019)
13. H. G. Ganev, “U(6) quasi-dynamical symmetry in 238U”, *Nucl. Phys. A* **987**, 112-127 (2019)
14. Е. О. Сушенок, А. П. Северюхин, Н. Н. Арсеньев, И.Н. Борзов, “Влияние динамического спаривания на бета-распадные характеристики нейтронно-избыточных ядер”, *Ядерная физика* **82**, 132–140 (2019)
15. И.Н. Борзов, C.В. Толоконников, “Самосогласованное описание изобар-аналоговых резонансов в нейтронно-избыточных ядрах со спариванием”, *Ядерная Физика* **82**, 471-483 (2019)
16. П. Н. Усманов, А. И. Вдовин, Э. К. Юсупов, У. С. Салихбаев, “Феноменологический анализ характеристик ротационных полос изотопов 158,160Gd”, *Письма в ЭЧАЯ* **16**, 509-519 (2019)
17. L. M. Donaldson, J. Carter, P. von Neumann-Cosel, V. O. Nesterenko, R. Neveling, P.-G. Reinhard, I. T. Usman, P. Adsley, C. A. Bertulani, J. W. Brummer, E. Z. Buthelezi, G. R. J. Cooper, R. W. Fearick, S. V. Fortsch, H. Fujita, Y. Fujita, M. Jingo, N. Y. Kheswa, W. Kleinig, C. O. Kureba, J. Kvasil, M. Latif, K. C. W. Li, J. P. Mira, F. Nemulodi, P. Papka, L. Pellegri, N.Pietralla, V. Yu. Ponomarev, B. Rebeiro, A. Richter, N. Yu. Shirikova, E. Sideras-Haddad, A. V. Sushkov, F. D. Smit, G. F. Steyn, J. A. Swartz, A. Tamii, “Fine structure of the isovector giant dipole resonance in 142–150Nd and 152Sm”, *Phys. Rev. C* **102**, 064327 [17 pages] (2020)
18. G. Colo, D. Gambacurta, W. Kleinig, J. Kvasil, V. O.Nesterenko, A. Pastore, ”Isoscalar monopole and quadrupole modes in Mo isotopes: Microscopic analysis”, *Phys. Lett. B* **811**, 135940 [6 pages] (2020)
19. V.N. Kondratyev, A.A. Dzhioev, A.A., Vdovin, “Magnetic and thermal effects in neutrino scattering in hot and dense nuclear matter”, *Bull. Russ. Ac. Sc.* **84**, 962–967 (2020)
20. T. Fischer, G. Guo, A.A. Dzhioev, G. Martinez-Pinedo, Meng-Ru Wu, A. Lohs, Yong-Zhong Qian, “Neutrino signal from proto-neutron star evolution: Effects of opacities from charged-current–neutrino interactions and inverse neutron decay”, *Phys. Rev. C* **101**, 025804 [15 pages] (2020)
21. A.P. Severyukhin, N.N. Arsenyev, I.N. Borzov, E.O. Sushenok, D. Testov, D. Verney, “Two-phonon structure of low-energy 1+ excitations of 130In”, *Phys. Rev. C* **101**, 054309 [7 pages] (2020)
22. A.A. Dzhioev, K. Langanke, G. Martinez-Pinedo, A.I. Vdovin, Ch. Stoyanov, “Unblocking of stellar electron capture for neutron-rich N=50 nuclei at finite temperature”, *Phys. Rev. C* **101**, 025805 [9 pages] (2020)
23. I.N. Borzov, S.V. Tolokonnikov, “Fully self-consistent study of isobaric analog resonances”, *Phys. At. Nucl.* **83**, 567-576 (2020)
24. I.N. Borzov, “Global calculations of beta-decay properties based on the Fayans functional”, *Phys. At. Nucl.* **83**, 413–426 (2020)
25. S. Mishev, V.V. Voronov, “Matter density in a simple core-plus-particle model”, *Bull. Russ. Ac. Sc.* **84**, 1534-1536 (2020)
26. A.P. Severyukhin, N.N. Arsenyev, I.N. Borzov, R.G. Nazmitdinov, S. Åberg, “On statistical properties of the Gamow-Teller strength distribution in 60Ca”, *Phys. At. Nucl*. **83**, 171–178 (2020)
27. I.N. Borzov, S.V. Tolokonnikov, “Self-consistent calculation of the charge radii in the 58-82Cu isotopic chain”, *Phys. At. Nucl.* **83**, 482-494 (2020)
28. A. A. Dzhioev, S. V. Sidorov, A. I. Vdovin, T. Yu. Tretyakova, “Tensor interaction effects on stellar electron capture and beta-decay Rates”, *Phys. At. Nucl.* **83**, 143-160 (2020)
29. E. B. Balbutsev, I. V. Molodtsova, P. Schuck, “Triplet of nuclear scissors modes”, *Phys. At. Nucl.* **83**, 212-218 (2020)
30. П. Н. Усманов, А. И. Вдовин, Э. К. Юсупов, “Анализ магнитных характеристик состояний 158,160Gd в рамках феноменологической модели”, *Известия РАН. Сер. Физ.* **84**, 1174 (2020)
31. И.Н. Борзов, С.В. Толоконников, “Функционал Фаянса: самосогласованное описание изоспиновых возбуждений”, Ядерная Физика, 83, 25-33 (2020)
32. P. Dimitriou, I.Dillmann, B.Singh, V.Piksaikin.P.Rykaczewski, J.L.Taing, A.Algora, K.Banerjee, I.N. Borzov, D. Cano-Ott, T. Chiba, M. Fallot, D.Foligno, R. Grzywacz, X.Huang, “Development of a reference database for beta-delayed neutron emission”, *Nucl. Data Sheets* **173**, 144-238 (2021)
33. A. P. Severyukhin, N. N. Arsenyev, N. Pietralla, “First calculation of the γγ-decay width of a nuclear 21+ state: The case of 48Ca”, *Phys. Rev. C* **104**, 024310 [6 pages] (2021)
34. A.P. Severyukhin, S. Åberg, N.N. Arsenyev, R.G. Nazmitdinov, “Hybrid model for the damped transient response of giant dipole resonances”, *Phys. Rev. C* **104**, 044327 [9 pages] (2021)
35. P. Adsley, V.O. Nesterenko, M. Kimura, L.M. Donaldson, R. Neveling, J.W. Brummer, D.G. Jenkins, N.Y. Kheswa, J. Kvasil, K.C.W. Li, D.J. Marin-Lambarri, Z. Mabika, P. Papka, “Isoscalar monopole and dipole transitions in 24Mg, 26Mg, and 28Si”, *Phys. Rev. C* **103**, 044315 [18 pages] (2021)
36. H.G. Ganev, “Matrix elements in the SU(1,1) x SO(6) limit of the proton-neutron symplectic model”, *Chinese Phys. C* **45**, 114101 [9 pages] (2021)
37. V. O. Nesterenko, P. I. Vishnevskiy, J. Kvasil, A. Repko, W. Kleinig, “Microscopic analysis of low-energy spin and orbital magnetic dipole excitations in deformed nuclei”, *Phys. Rev. C* **103**, 064313 [14 pages] (2021)
38. H. G. Ganev, “Microscopic shell-model counterpart of the Bohr–Mottelson model”, *Eur. Phys. J. A* **57**, 181 [14 pages] (2021)
39. N.N. Arsenyev, A.P. Severyukhin, “Origin of low- and high-energy monopole collectivity in 132 Sn”, *Universe* **7**, 145 [13 pages] (2021)
40. D. A. Testov, A. P. Severyukhin, B. Roussiere, N. Arsenyev, F. Ibrahim, M. Lebois, I. Matea, Yu. Penionzhkevich, V. Smirnov, E. Sokol, I. Stefan, D. Susuki, D. Verney, Jh. Wilson,”Study of 123Ag beta-decay at ALTO”, *Eur. Phys. J. A* **57**, 59 [6 pages] (2021)
41. П.Н. Усманов, А.И. Вдовин, Э.К. Юсупов, “Электрические свойства ротационных состояний ядра 156Gd*”, Известия РАН, Cер. Физ.***85**, 1423-1429 (2021)
42. A. Bahini, V.O. Nesterenko, I.T. Usman, P. von Neumann-Cosel, R. Neveling, J. Carter, J. Kvasil, A. Repko, P. Adsley, N. Botha, J. W. Brummer, L.M. Donaldson, S. Jongile, “Isoscalar giant monopole resonance in 24Mg and 28Si: effect of coupling between the isoscalar monopole and quadrupole strength”, *Phys. Rev. C* **105**, 024311 [15 pages] (2022)
43. H. G. Ganev, “Microscopic shell-model description of strongly deformed nuclei: 158Gd”, *Int. J. Mod. Phys. E* **31**, 2250047 [14 pages] (2022)
44. H. G. Ganev, “Microscopic shell-model description of transitional nuclei”, *Eur. Phys. J. A* **58**, 182 [10 pages] (2022)
45. N.Yu. Shirikova, A.V.Sushkov, R.V.Jolos, “Coriolis mixing of the K=1 and K=0 mixed symmetry states in the well deformed even-even nuclei”, *Eur. Phys. J. A* **58**, 98 [6 pages] (2022)
46. N.Yu.Shirikova, A.V.Sushkov, L.A.Malov, E.A.Kolganova, R.V.Jolos, “Prediction of the excitation energies of the 2+1 states for superheavy nuclei based on the microscopically derived Grodzins relation”, *Phys. Rev. C* **105**, 024309 [6 pages] (2022)
47. H. G. Ganev, “Proton-neutron symplectic model description of 20Ne”, *Chinese Phys. C* **46**, 044105 [9 pages] (2022)
48. E. B. Balbutsev, I. V. Molodtsova, A. V. Sushkov, N. Yu. Shirikova, P. Schuck, “Spin-isospin structure of the nuclear scissors mode”, *Phys. Rev. C* **105**, 044323 [20 pages] (2022)
49. N.N. Arsenyev, A.P. Severyukhin, “Microscopic description of isoscalar giant monopole resonance in 48Ca”, *Phys. At. Nucl.* **85**, 6, 581-586 (2022)
50. A. P. Severyukhin, N. N. Arsenyev, “On the double γ-decay width of the quadrupole state: the case of 132Sn”, Яд. Физ. **85**, 573-580 (2022)
51. N.E. Solonovich, N.N. Arsenyev, A.P. Severyukhin, “The dipole polarizability of the doubly magic nuclei”, Phys. *Part. Nucl. Lett*.,**19**, 473-476 (2022)
52. П.Н. Усманов, А.И. Вдовин, А.Н. Нишонов, “Исследование энергий и электромагнитных характеристик состояний отрицательной четности ядра 156Gd”, *Известия РАН, Cер. Физ.* **86**, 1112-1118 (2022)
53. Джиоев А. A., Вдовин А. И., “Метод супероператоров в теории нагретых ядер и астрофизические приложения. I. Спектральные характеристики нагретых ядер”, *ЭЧАЯ* **53**, 1007-1110 (2022)
54. Джиоев А. A., Вдовин А. И., “Метод супероператоров в теории нагретых ядер и астрофизические приложения. II. Захват электронов в звездах”, *ЭЧАЯ* **53**, 1111-1218 (2022)
55. Джиоев А. A., Вдовин А. И., “Метод супероператоров в теории нагретых ядер и астрофизические приложения. III. Нейтрино-ядерные реакции в звездах”, *ЭЧАЯ* **53**, 1281-1338 (2022)
56. H. G. Ganev, “Microscopic shell-model description of the irrotational-flow dynamics”,  
    *The European Physical Journal A* **59**, 9 [pages 11] (2023)
57. Sh.A. Kalandarov, I.B. Abdurakhmanov, Z.Kanokov, G.G. Adamian, N.V. Antonenko, “Angular momentum of open quantum systems in external magnetic field”, *Phys. Rev. A* **99**, 062109 [6 pages] (2019)
58. H. Pasca, A.V. Andreev, G.G. Adamian, N.V. Antonenko, “Change of the shape of mass and charge distributions in fission of Cf isotopes with excitation energy”, *Phys. Rev. C* **99**, 064611 [10 pages] (2019)
59. V.V. Sargsyan, H. Lenske, G. G. Adamian, N. V. Antonenko, “Close Binary Galaxies: Application to Source of Energy and Expansion in Universe*”, Int. J. Mod. Phys. E* **28**, 1950031 [14 pages] (2019)
60. 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, Yu. E. Penionzhkevich, K. A. Kuterbekov,T. Zholdybayev, “Clusterization and strong coupled-channels effects in deuteron interaction with 9Be nuclei”, *J. Phys. G: Nucl. Part. Phys.* **46**, 105110 [17 pages] (2019)
61. 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 [10 pages] (2019)
62. D.A. Sazonov, E.A. Kolganova, T.M. Shneidman, R.V. Jolos, N. Pietralla, W. Witt, “Description of shape coexistence in 96Zr based on the quadrupole-collective Bohr Hamiltonian”, *Phys. Rev. C* **99**, 031304 [6 pages] (2019)
63. A. Heusler, R.V.Jolos, P. von Brentano, “Description of the one particle-one hole configurations coupled to the 3-- yrast state in the double magic nucleus 208Pb”, *Phys. Rev. C* **99**, 034323 [10 pages] (2019)
64. N. Hernandez-Haro, J.Ortega-Castro, Ya.B.Martynov, R.G.Nazmitdinov, A. Frontera, “DFT prediction of band gap in organic-inorganic metal halide perovskites: An exchange-correlation functional benchmark study*”, Chem. Phys.* **516**, 225-231 (2019)
65. I. S. Rogov, G. G. Adamian, N. V. Antonenko, “Dynamics of a dinuclear system in charge-asymmetry coordinates: alpha decay, cluster radioactivity, and spontaneous fission”, *Phys. Rev. C*, **100**, 024606 [8 pages] (2019)
66. N.S. Simonovic, R.G. Nazmitdinov, “Effect of the magnetic field on electron density distributions in two-electron quantum dots*”, J. Phys. A: Math. Theor.* **52**, 435303 [21 pages] (2019)
67. N.Yu. Shirikova, A.V. Sushkov, R.V. Jolos, N. Pietralla, T. Beck, “Excitation energy dependence of the moments of inertia of well deformed nuclei”, *Phys. Rev. C* **99**, 044319 [6 pages] (2019)
68. Sargsyan, V.V., Lenske, H., Adamian, G.G., Antonenko, N.V., “From dinuclear systems to close binary stars: Application to mass transfer”, *Acta Phys. Pol. B* **50**, 507-516 (2019)
69. S. Pirrone, G. Politi, B. Gnoffo, M. La Commara, E. De Filippo, P. Russotto, M. Trimarchi, M. Vigilante, M. Colonna, Sh. A. Kalandarov, F. Amorini, L. Auditore, C. Beck, “Isospin influence on fragments production in 78Kr + 40Ca and 86Kr + 48Ca collisions at 10 MeV/nucleon”, *Eur. Phys. J. A* **55**, 22[13 pages] (2019)
70. S. A. Rakityansky, S. N. Ershov, “Jost-matrix analysis of the resonance 5He\*(3/2+) near the dt-threshold”, *Int. J. Mod. Phys. E* **28**,1950064 [37 pages] (2019)
71. M. Pudlak, R.G. Nazmitdinov, “Klein collimation by rippled graphene superlattice”, *J. Phys.: Cond. Matt.* **31**, 495301 [8 pages] (2019)
72. I.B. Abdurakhmanov, G.G. Adamian, N.V. Antonenko, Z. Kanokov, “Open quantum system in external magnetic field within non-Markovian quantum Langevin approach”, *Physica A: Stat. Mech. Appl*. **514**, 957–973 (2019)
73. V.V. Sargsyan, H. Lenske, G.G. Adamian, N.V. Antonenko, “Origin of the orbital period change in contact binary stars”, *Int. J. Mod. Phys*. E **28**, 1950044 [11 pages] (2019)
74. Myeong-Hwan Mun, Kyujin Kwak, G.G. Adamian, N.V. Antonenko, “Possible production of neutron-rich Md isotopes in multinucleon transfer reactions with Cf and Es targets”, *Phys. Rev. C* **99**, 054627 [8 pages] (2019)
75. S. A. Rakityansky, S. N. Ershov, and T. J. Tshipi, “Resonant states 0+ of the Boron isotope 8B from the Jost-matrix analysis of the partial cross-sections”, *Int. J. Mod. Phys. E* **28**, 1950083 [21 pages] (2019)
76. F. Bonnin-Ripoll, Y.B. Martynov, G. Cardona, R.G. Nazmitdinov, R.Pujol-Nadal, “Synergy of the ray tracing+carrier transport approach: On efficiency of perovskite solar cells with a back reflector”, *Solar Energy Materials and Solar Cells* **200**, 110050 [10 pages] (2019)
77. A. K. Nasirov, B. M. Kayumov, G. Mandaglio, G. Giardina, K. Kim, Y. Kim, “The effect of the neutron and proton numbers ratio in colliding nuclei on the formation of the evaporation residues in the 34S + 208Pb and 36S + 206Pb reactions”, *Eur. Phys. J. A* **55**, 29 [14 pages] (2019)
78. Butler, P.A., Gaffney, L.P., Spagnoletti, P., Konki, J., Scheck, M., Smith, J.F., Abrahams, K., Bowry, M., Cederkall, J., Chupp, T., de Angelis, G., De Witte, H., Garrett, P.E., Goldkuhle, A., Henrich, C., Illana, A., Johnston, K., Joss, D.T., Keatings, J.M., Kelly, N.A., Komorowska, M., Krell, T., Lozano, M., Nara Singh, B.S., O’Donnell, D., Ojala, J., Page, R.D., Pedersen, L.G., Raison, C., Reiter, P., Rodriguez, J.A., Rosiak, D., Rothe, S., Shneidman, T.M., Siebeck, B., Seidlitz, M., Sinclair, J., Stryjczyk, M., Van Duppen, P., Vinals, S., Virtanen, V., Warr, N., Wrzosek-Lipska, K., Zielinska, M. “The observation of vibrating pear-shapes in radon nuclei”, *Nature Communications* **10**, 2473 [5 pages] (2019)
79. S. N. Ershov, “B-Splines and Bernstein Basis Polynomials”, *Phys. Part. Nucl. Lett.* **16**, 593-601 (2019)
80. R. G. Nazmitdinov, “From Chaos to Order in Mesoscopic Systems”, *Phys. Part. Nucl. Lett.* **16**, 159-169 (2019)
81. J. Busa, M. Pudlak, R. G. Nazmitdinov, “On Electron Scattering through a Single Corrugated Graphene Sructure”, *Phys. Part. Nucl. Lett.* **16**, 729–733 (2019)
82. A.I. Svirikhin, A.V. Andreev, A.V. Yeremin, Н.И. Zamyatin, I.N. Izosimov, A.V. Isaev, A.N. Kuznetsov, A.A. Kuznetsova, O.N. Malyshev, A.G. Popeko, Y.A. Popov, E.A. Sokol, M.S. Tezekbayeva, M.L. Chelnokov, V.I. Chepigin, T.M. Schneidman, B. Andel, S. Antalic, A. Bronis, P. Mosat, B. Gall, O. Dorvaux, B. M. Retailleau, K. Hauschild, A. Lopez-Martenz, P. Chauveau, E. Stefanova, D. Tonev , “Prompt neutrons of 254Rf spontaneous fission”, *Phys. Part. Nucl. Lett.* **16**, 768–771 (2019)
83. Худоба В., Григоренко Л.В., Фомичев А.С., Безбах А.А., Егорова И.А., Ершов С.Н., Горшков А.В., Горшков В.А., Каминьски Г., Крупко С.А., Муха И., Никольский Е.Ю., Парфенова Ю.Л., “Детальное изучение внешних корреляций в низкоэнергетическом спектре бериллия-6”, *Известия РАН, сер. Физ.* **83**, 443-450 (2019)
84. Р.В.Джолос, Е.А.Колганова, Д.А.Сазонов, “Параметр развязывания для ротационных полос, основанных на состояниях со смешанной симметрией”, *Ядерная Физика* **82**, 129-131 (2019)
85. T. Beck, V. Werner, N. Pietralla, M. Bhike, N. Cooper, U. Friman-Gayer, J. Isaak, R.V. Jolos, J. Kleemann, Krishichayan, O. Papst, W. Tornow, C. Bernards, B.P. Crider, “*∆K*=0 M1 Excitation Strength of the Well-Deformed Nucleus 164Dy from K Mixing”, *Phys. Rev. Lett.* **125**, 092501 [6 pages] (2020)
86. W. von Oertzen, A. K. Nasirov, “A new radioactive decay mode, true ternary fission, the decay of heavy nuclei into three comparable fragments”, *Eur. Phys. J. A* **56**, 299 [24 pages] (2020)
87. A.A.Hovhannisyan, V.V.Sargsyan, G.G.Adamian, N.V.Antonenko, D.Lacroix, “Asymptotic equilibrium in quantum system fully coupled simultaneously to mixed fermionic–bosonic heat baths”, *Physica A: Statistical Mechanics and its Applications* **545**, 123653 [9 pages] (2020)
88. L.V.Grigorenko, Yu.L. Parfenova, N.B.Shulgina, M.V.Zhukov, “Asymptotic normalization coefficient method for two-proton radiative capture”, *Phys. Lett. B* **811**, 135852 [8 pages] (2020)
89. A. Rahmatinejad, T. M. Shneidman, N. V. Antonenko, A. N. Bezbakh, G. G. Adamian, L. A. Malov, “Collective enhancements in the level densities of Dy and Mo isotopes”, Phys. Rev. C 101, 054315 (2020)
90. O. K. Ganiev and A. K. Nasirov, “Comparative analysis of the Coulomb barrier in heavy-ion collisions by the double-folding method*”, J. Phys. G: Nucl. Part. Phys*. **47**, 045115 [26 pages] (2020)
91. Shilpi Gupta, K.Mahata, A.Shrivastava, K.Ramachandran, S.K.Pandit, P.C.Rout, V.V.Parkar, R.Tripathi, Shilpi Gupta, K.Mahata, A.Shrivastava, K.Ramachandran, S.K.Pandit, P.C.Rout, V.V.Parkar, R.Tripathi, A.Kumar, B.K.Nayak, E.T.Mirgule, A.Saxena, S.Kailas, A.Jhingan, A.K.Nasirov, G.A.Yuldasheva, P.N.Nadtochy, C.Schmitt, “Competing asymmetric fusion-fission and quasifission in neutron-deficient sub-lead nuclei”, *Phys. Lett. B* **803**, 135297 [5 pages] (2020)
92. Juhee Hong, G.G. Adamian, N.V. Antonenko, “Could new isotopes of superheavies with Z=112–118 be produced in 48Ca-induced cold fusion reactions?”, *Phys. Lett. B* **805**, 135438 [5 pages] (2020)
93. E. V. Mardyban, E. A. Kolganova, T. M. Shneidman, R. V. Jolos, and N. Pietralla, “Description of the low-lying collective states of 96Zr based on the collective Bohr Hamiltonian including the triaxiality degree of freedom”, *Phys. Rev. C* **102**, 034308 [10 pages] (2020)
94. Butler, P.A., Gaffney, L.P., Spagnoletti, P., Konki, J., Scheck, M., Smith, J.F., Abrahams, K., Bowry, M., Cederkall, J., Chupp, T., de Angelis, G., De Witte, H., Garrett, P.E., Goldkuhle, A., Henrich, C., Illana, A., Johnston, K., Joss, D.T., Keatings, J.M., Kelly, N.A., Komorowska, M., Krell, T., Lozano, M., Nara Singh, B.S., O’Donnell, D., Ojala, J., Page, R.D., Pedersen, L.G., Raison, C., Reiter, P., Rodriguez, J.A., Rosiak, D., Rothe, S., Shneidman, T.M., Siebeck, B., Seidlitz, M., Sinclair, J., Stryjczyk, M., Van Duppen, P., Vinals, S., Virtanen, V., Warr, N., Wrzosek-Lipska, K., Zielinska, M. “Evolution of Octupole Deformation in Radium Nuclei from Coulomb Excitation of Radioactive 222Ra and 228Ra Beams”, *Phys. Rev. Lett.* **124**, 042503 [6 pages] (2020)
95. H. Pasca, A. V. Andreev, G. G. Adamian, N. V. Antonenko, “Examination of coexistence of symmetric mass and asymmetric charge distributions of fission fragments*”, Phys. Rev. C* **101**, 064604 [11 pages] (2020)
96. V. V. Sargsyan, G.G.Adamian, N. V. Antonenko, H. Lenske, “Extended quantum diffusion approach to reactions of astrophysical interests”, *Eur. Phys. J. A* **56**, 19 [9 pages] (2020)
97. P. V. Laveen, E. Prasad, N. Madhavan, A. K. Nasirov, J. Gehlot, S. Nath, G. Mandaglio, G. Giardina, A. M. Vinodkumar, M. Shareef, A. Shamlath, S. K. Duggi, P. Sandya Devi, Tathagata Banerjee, M. M. Hosamani, Khushboo, P. Jisha, Neeraj Kumar, Priya Sharma, and T. Varughese, “Fusion studies in 35,37Cl+181Ta reactions via evaporation residue cross section measurements”, *Phys. Rev. C* **102**, 034613 [11 pages] (2020)
98. L.V. Grigorenko, N.B. Shulgina , M.V. Zhukov, “High-precision studies of the soft dipole mode in two-neutron halo nuclei: The 6He case”, *Phys. Rev. C* **102**, 014611 [15 pages] (2020)
99. G. Adamian, N. Antonenko, A. Diaz-Torres, S. Heinz, “How Does One Extend the Chart of Nuclides?”, *Nuclear Physics News* **30**, 22-26 (2020)
100. G. G. Adamian, N. V. Antonenko, A. Diaz-Torres, S. Heinz, “How to extend the chart of nuclides?”, *Eur. Phys. J. A* **56**, 47 [51 pages] (2020)
101. G. Nikoghosyan, A. Balabekyan, E.A. Kolganova, R.V. Jolos, D. A. Sazonov, “Isovector pair correlations in analytically solvable models”, *Int. J. Mod. Phys. E* **29**, 2050091 [13 pages] (2020)
102. K. Pichugin, A. Puente, R. Nazmitdinov, “Kramers Degeneracy and Spin Inversion in a Lateral Quantum Dot”, *Symmetry* **12,** 2043 (2020)
103. P.W. Wen, A.K. Nasirov, C.J. Lin and H.M. Jia, “Multinucleon transfer reaction from view point of dynamical dinuclear system method”, *J. Phys. G: Nucl. Part. Phys.* **47**, 075106 [12 pages] (2020)
104. P. W. Wen, O. Chuluunbaatar, A. A. Gusev, R. G. Nazmitdinov, A. K. Nasirov, S. I. Vinitsky, C. J. Lin, and H. M. Jia, “Near-barrier heavy-ion fusion: Role of boundary conditions in coupling of channels”, *Phys. Rev. C* **101**, 014618 [10 pages] (2020)
105. A.A. Hovhannisyan, V.V. Sargsyan, G.G. Adamian, N.V. Antonenko, D. Lacroix, “Non-Markovian dynamics of quantum systems coupled with several mixed fermionic-bosonic heat baths”, *Phys. Rev. E* **101**, 062115 [13 pages] (2020)
106. D. Lacroix, V.V. Sargsyan, G.G. Adamian, N.V. Antonenko, A.A. Hovhannisyan, “Non-Markovian modeling of Fermi-Bose systems coupled to one or several Fermi-Bose thermal baths”, *Phys. Rev. A* **102**, 022209 [12 pages] (2020)
107. I.S.Rogov, G.G.Adamian, N.V.Antonenko, T.M.Shneidman, H.Lenske, “Nucleon density distribution in description of nuclear decays”, *Nucl. Phys. A* **1002**, 121995 [15 pages] (2020)
108. M. Pudlak, J. Smotlacha, R. Nazmitdinov, “On Symmetry Properties of The Corrugated Graphene System”, *Symmetry* **12**, 533 (2020)
109. G. G. Adamian, N. V. Antonenko, H. Lenske, V. V. Sargsyan, “On the evolution of compact binary black holes”, *Int. J. Mod. Phys. E* **29**, 2050094 [7 pages] (2020)
110. J. Hong, G.G. Adamian, N.V. Antonenko, P. Jachimowicz, M. Kowal, “Possibilities of direct production of superheavy nuclei with Z=112–118 in different evaporation channels*”, Phys. Lett. B* **809**, 135760 [8 pages] (2020)
111. Mun Myeong-Hwan, Kyujin Kwak, Adamian G.G., Antonenko N.V., “Possible production of neutron-rich No isotopes”, *Phys. Rev. C* **101**, 044602 [8 pages] (2020)
112. G. G. Adamian, N. V. Antonenko, H. Lenske, L. A. Malov,”Predictions of identification and production of new superheavy nuclei with Z=119 and 120”, Phys. Rev. C 101, 034301 (2020)
113. Sh.A. Kalandarov, G.G. Adamian, N.V. Antonenko, H.M. Devaraja, S. Heinz, “Production of neutron deficient isotopes in the multinucleon transfer reaction 48Ca (Elab=5.63 MeV/nucleon) +248Cm”, *Phys. Rev. C* **102**, 024612 [6 pages] (2020)
114. M.Pudlak, R.G. Nazmitdinov, “Spin-dependent electron transmission across the corrugated graphene”, *Physica E* **118**, 113846 [6 pages] (2020)
115. L.V.Grigorenko, N.B.Shulgina, M.V.Zhukov, “Three-body vs. dineutron approach to two-neutron radiative capture in 6He”, *Phys. Lett. B* **807**, 135557 [6 pages] (2020)
116. Рогов И.С., Антоненко Н.В., Адамян Г.Г., Шнейдман Т.М., “Влияние распределения нуклонной плотности на описание распада ядра”, *Ядерная Физика* **83**, 16-24 (2020)
117. Е. В. Мардыбан, Т. М. Шнейдман, Е. А. Колганова, Р. В. Джолос, “Описание стабилизации октупольной деформации в полосах переменной четности тяжелых ядер”, *Ядерная Физика* **83**, 53-59 (2020)
118. В. В. Саргсян, Х. Ленске, Г. Г. Адамян, Н. В. Антоненко, “От двойной ядерной системы к тесным двойным звездам и галактикам”, *Ядерная физика* **83**, 61-69 (2020)
119. Безбах А. Н., Неджад А. Рахмати, Шнейдман Т. М., Антоненко Н. В., “Плотность уровней ядер с Z = 112–120”, *Изв. РАН. Сер. Физ*. **84**, 1147-1151 (2020)
120. V.V. Sargsyan, A.A. Hovhannisyan, G.G. Adamian, N.V. Antonenko, D. Lacroix, “Applicability of the absence of equilibrium in quantum system fully coupled to several fermionic and bosonic heat baths”, *Phys. Rev. E* **103**, 012137 [7 pages] (2021)
121. G. G. Adamian, N. V. Antonenko, H. Lenske, V. V. Sargsyan, “Application of Regge Theory to Astronomical Objects”, *Physics* **3**, 669–677 (2021)
122. I.S. Rogov, G.G. Adamian, N.V. Antonenko, “Cluster approach to spontaneous fission of even-even isotopes of U, Pu, Cm, Cf, Fm, No, Rf, Sg, and Hs”, *Phys. Rev. C* **104**,034618 [9 pages] (2021)
123. R. V. Jolos, E. A. Kolganova, D. A. Sazonov, “Collective model with isovector pair and alpha-particle type correlations”, *Int. J. Mod. Phys. E* **30**, 2150083 [16 pages] (2021)
124. A. V. Isaev, A. V. Andreev, M. L. Chelnokov, V. I. Chepigin, I. N. Izosimov, A. A. Kuznetsova, O. N. Malyshev, R. S. Mukhin, A. G. Popeko, Y. A. Popov, T. M. Shneidman, E. A. Sokol, A. I. Svirikhin, M. S. Tezekbayeva, A. V. Yeremin, N. I. Zamyatin, P. Brionnet, O. Dorvaux, B. Gall, K. Kessaci, A. Sellam, K. Hauschild, A. Lopez-Martens, S. Antalic, P. Mosat, “Comparative Study of Spontaneous-Fission Characteristics of 252No and 254No Isotopes”, *Physics of Particles and Nuclei Letters* **18**, 449–456 (2021)
125. W.M. Seif, G.G. Adamian, N.V. Antonenko, A.S. Hashem, “Correlations of alpha-decay properties and isospin-asymmetry”, Phys. Rev. C 104, 014317 (2021)
126. R.V.Jolos, E.A.Kolganova, “Derivation of the Grodzins relation in collective nuclear model”, *Phys. Lett. B* **820**, 136581 [4 pages] (2021)
127. A. Rahmatinejad, R. Razavi, and L. Elahizadeh, “First-order phase transition in 97,98Mo isotopes”, *Mod. Phys. Lett. A* **36**, 2150133 [8 pages] (2021)
128. S. N. Ershov, S. A. Rakityansky, “Jost matrices for some analytically solvable potential models”, *Phys. Rev. C* **103**, 024612 [16 pages] (2021)
129. L. A. Malov, G. G. Adamian, N. V. Antonenko, H. Lenske, “Landscape of the island of stability with self-consistent mean-field potentials”, *Phys. Rev. C* **104**, 064303 [12 pages] (2021)
130. A. Rahmatinejad, T. Shneidman, G. Adamian, N.V. Antonenko, P. Jachimowicz, M. Kowal, “Level Densities of Heavy Nuclei and Fission Dynamics”, *Bulg. J. Phys*. **48**, 485-494 (2021)
131. Rahmatinejad A., Bezbakh A.N., Shneidman T.M., Adamian G.G., Antonenko N.V., Jachimowicz P., Kowal M., “Level-density parameters in superheavy nuclei”, *Phys. Rev. C* **103**, 034309 [10 pages] (2021)
132. Ma.von Tresckow, M.Rudigier, T.M.Shneidman, Th.Kroll *et al*, “New evidence for alpha clustering structure in the ground state band of 212Po”, *Phys. Lett B* **821**, 136624 [7 pages] (2021)
133. F. Bonnin-Ripoll, Ya. B. Martynov, R. G. Nazmitdinov, G. Cardona, R. Pujol-Nadal, “On the efficiency of perovskite solar cells with a back reflector: effect of a hole transport material”, *Phys. Chem. Chem. Phys.* **23**, 26250-26262 (2021)
134. E.Kh. Alpomishev, G.G. Adamian, N.V. Antonenko, “Orbital diamagnetism of two-dimensional quantum systems in a dissipative environment: Non-Markovian effect and application to graphene”, *Phys. Rev. E* **104**, 054120 [13 pages] (2021)
135. P. W. Wen, C. J. Lin, R. G. Nazmitdinov, S. I. Vinitsky, O. Chuluunbaatar, A. A. Gusev, A. K. Nasirov, H. M. Jia, A. Gozdz, “Potential roots of the deep sub-barrier heavy-ion fusion hindrance phenomenon within the sudden approximation approach”, *Phys. Rev. C* **103**, 054601 [6 pages] (2021)
136. J. Hong, G.G. Adamian, N.V. Antonenko, P. Jachimowicz, M. Kowal, “Rate of decline of the production cross section of superheavy nuclei with Z=114--117 at high excitation energies”, *Phys. Rev. C* **103**, L041601 [5 pages] (2021)
137. I. A. Muzalevskii, A. A. Bezbakh, E. Yu. Nikolskii, V. Chudoba, S. A. Krupko, S. G. Belogurov, D. Biare, A. S. Fomichev, E. M. Gazeeva, A. V. Gorshkov, L. V. Grigorenko, G. Kaminski, O. Kiselev, D. A. Kostyleva, M. Yu. Kozlov, B. Mauyey, I. Mukha, Yu. L. Parfenova, W. Piatek, A. M. Quynh, V. N. Schetinin, A. Serikov, S. I. Sidorchuk, P. G. Sharov, N. B. Shulgina, R. S. Slepnev, S. V. Stepantsov, A. Swiercz, P. Szymkiewicz, G. M. Ter-Akopian, R. Wolski, B. Zalewski, M.V. Zhukov, “Resonant states in 7H: Experimental studies of the 2H(8He,3He) reaction”, Phys. Rev. C **103**, 044313 (2021)
138. Adamian G.G., Antonenko N.V., Lenske H., Malov L.A., Zhou S.-G., “Self-consistent methods for structure and production of heavy and superheavy Nuclei”, *Eur. Phys. J. A* **57**, 89 [62 pages] (2021)
139. L.A. Malov, G.G. Adamian, N.V. Antonenko, H. Lenske, “Shaping the archipelago of stability by the competition of proton and neutron shell closures”, *Phys. Rev. C* **104**, L011304 [5 pages] (2021)
140. H. Pasca, A. V. Andreev, G. G. Adamian, N. V. Antonenko, “Simultaneous description of charge, mass, total kinetic energy, and neutron multiplicity distributions in fission of Th and U isotopes”, *Phys. Rev. C* **104**, 014604 [8 pages] (2021)
141. Б.А. Уразбеков, А.С. Деникин, Н. Итако, Д. Джансейтов, “Применение 2a+n трехтельной кластерной модели ядра 9Be в реакции 9Be(3He, 3He)9Be”, *Ядерная Физика* **84**, 200-207 (2021)
142. А.В. Исаев, А.В. Андреев, А.В. Ерёмин, Н.И. Замятин, И.Н. Изосимов, А.А. Кузнецова, О.Н. Малышев, Р.С. Мухин, А.Г. Попеко, Ю.А. Попов, А.И. Свирихин, Е.А. Сокол, М.С. Тезекбаева, М.Л. Челноков, В.И. Чепигин, Т.М. Шнейдман, П. Брионе, Б. Галл, К. Кессаси, А. Селлам, О. Дорво, А. Лопез-Мартенс, К. Хошилд, С. Анталик, П. Мошать, “Сравнение характеристик спонтанного деления изотопов 252,254No”, *Письма в ЭЧАЯ* **18**, 362–372 (2021)
143. Р.В.Джолос, Е.А.Колганова, “Фазовые переходы в атомных ядрах”, *Успехи физических наук* **191**, 337-357 (2021)
144. B. M. Kayumov, O. K. Ganiev, A. K. Nasirov, and G. A. Yuldasheva, “Analysis of the fusion mechanism in the synthesis of superheavy element 119 via the 54Cr + 243Am reaction”, *Phys. Rev. C* **105**, 014618 [15 pages] (2022)
145. M. R. Piatek, R. G. Nazmitdinov, A. Puente, A. R. Pietrykowski, “Classical conformal blocks, Coulomb gas integrals and Richardson–Gaudin models”, *J. High Energy Physics* **2022**, 098 [48 pages] (2022)
146. V.V. Sargsyan, G.G. Adamian, N.V. Antonenko, H. Lenske, “Constraints on the appearance of a maximum in astrophysical S -factor”, *Phys. Lett. B* **824**, 136792 [5 pages] (2022)
147. P. Spagnoletti, P. A. Butler, L. P. Gaffney, K. Abrahams, M. Bowry, J. Cederkӓll, T. Chupp, G. de Angelis, H. De Witte, P. E. Garrett, A. Goldkuhle, C. Henrich, A. Illana, K. Johnston, D. T. Joss, J. M. Keatings, N. A. Kelly, M. Komorowska, J. Konki, T. Kroll, M. Lozano, B. S. Nara Singh, D. O’Donnell, J. Ojala, R. D. Page, L. G. Pedersen, C. Raison, P. Reiter, J. A. Rodriguez, D. Rosiak, S. Rothe, M. Scheck, M. Seidlitz, T. M. Shneidman *et al*, “Coulomb excitation of 222Rn”, *Phys. Rev. C* **105**, 024323 [10 pages] (2022)
148. N. V. Antonenko, G. G. Adamian, V. V. Sargsyan, H. Lenske, “Double-folding nucleus–nucleus interaction potential based on the self-consistent calculations”, *Eur. Phys. J. A* **58**, 211 [10 pages] (2022)
149. T. M. Shneidman, N. Minkov , G.G. Adamian, N.V. Antonenko, “Effect of Coriolis mixing on lifetime of isomeric states in heavy nuclei”, *Phys. Rev. C* **106**, 014310 [8 pages] (2022)
150. L.A. Malov, A.N. Bezbach, G.G. Adamian, N.V. Antonenko, R.V. Jolos, “Electromagnetic transitions between low-lying nonrotational states of odd-neutron nuclei in alpha-decay chains starting from 265,267,269Hs”, *Phys. Rev. C* **106**, 034302 [9 pages] (2022)
151. A. Rahmatinejad, T.M. Shneidman, G.G. Adamian, N.V. Antonenko, P. Jachimowicz, M. Kowal, “Energy dependent ratios of level-density parameters in superheavy nuclei”, *Phys. Rev. C* **105**, 044328 [9 pages] (2022)
152. E.V. Mardyban, E.A. Kolganova, T.M. Shneidman, and R.V. Jolos, “Evolution of the phenomenologically determined collective potential along the chain of Zr isotopes”, *Phys. Rev. C* **105**, 024321 [10 pages] (2022)
153. C.G. Wang, R. Han, C. Xu, H. Hua, R.A. Bark, S.Q. Zhang, S.Y. Wang, T.M. Shneidman, S.G. Zhou et al, “First evidence of an octupole rotational band in Ge isotopes”, *Phys. Rev. C* **106**, L011303 [6 pages] (2022)
154. Juhee Hong, G.G. Adamian, N.V. Antonenko, M. Kowal, P. Jachimowicz, “Hot and cold fusion reactions leading to the same superheavy evaporation residue”, *Eur. Phys. J. A* **58**, 180 [4 pages] (2022)
155. Juhee Hong, G.G. Adamian, N.V. Antonenko, P. Jachimowicz, M. Kowal, “Isthmus connecting mainland and island of stability of superheavy nuclei”, *Phys. Rev. C* **106**, 014614 [5 pages] (2022)
156. G.G. Adamian, N.V. Antonenko, H. Lenske, V.V. Sargsyan, “On the possibility of formation of binary cosmic systems from the single cosmic objects”, *Int. J. Mod. Phys. E* **31**, 2250071 [14 pages] (2022)
157. G.G. Adamian, N.V. Antonenko, “Optimal ways to produce heavy and superheavy nuclei”, *Eur. Phys. J. A* **58**, 111 [34 pages] (2022)
158. A. V. Isaev, R. S. Mukhin, A. V. Andreev, M. A. Bychkov, M. L. Chelnokov, V. I. Chepigin, H. M. Devaraja, O. Dorvaux, M. Forge, B. Gall, K. Hauschild, I. N. Izosimov, K. Kessaci, A. A. Kuznetsova, A. Lopez-Martens, O. N. Malyshev, A. G. Popeko, Yu. A. Popov, A. Rahmatinejad, B. Sailaubekov, T. M. Shneidman, E. A. Sokol, A. I. Svirikhin, D. A. Testov, M. S. Tezekbayeva, A. V. Yeremin, N. I. Zamyatin, K. Sh. Zhumadilov, “Prompt neutron emission in the spontaneous fission of 246Fm”, *Eur. Phys. J. A* **58**, 108 [7 pages] (2022)
159. E.V. Mardyban, T.M. Shneidman, N.V. Antonenko, G.G. Adamian, “Reflection Asymmetry in Ra Isotopes”, *Bulgarian Journal of Physics* **49**, 78-88 (2022)
160. T. J. Tshipi, S. A. Rakityansky, S. N. Ershov, “Resonant states 3+ and 2- of the Boron isotope 8B”, *Int. J. Mod. Phys. E* **31**, 2250067 [11 pages] (2022)
161. A. N. Bezbakh, G. G. Adamian, and N. V. Antonenko, “Role of spin-orbit strength in the prediction of closed shells in superheavy nuclei”, *Phys. Rev. C* **105**, 054305 [6 pages] (2022)
162. B. A. Urazbekov, B. K. Karakozov, N. T. Burtebayev, D. M. Janseitov, M. Nasrulla, D. Alimov, D. S. Valiolda, S. H. Kazhykenov, A. S. Denikin, A. S. Demyanova, A. N. Danilov and V. A. Starastcin, “Single-particle and cluster modes of 13C excited states of 3.09, 8.86 and 9.89Mev”, *Int. J. Mod. Phys. E* **31**, 2250031 [11 pages] (2022)
163. M. Pudlak, R. Nazmitdinov, “Spin Interference Effects in a Ring with Rashba Spin-Orbit Interaction Subject to Strong Light–Matter Coupling in Magnetic Field”, *Symmetry* **14,** 1194 [11 pages] (2022)
164. I. S. Rogov, G. G. Adamian, N. V. Antonenko, “Spontaneous fission hindrance in even-odd nuclei within a cluster approach”, *Phys. Rev. C* **105**, 034619 [7 pages] (2022)
165. E. V. Mardyban, T. M. Shneidman, E. A. Kolganova, R. V. Jolos, “Influence of Triaxiality on the Description of Low-Energy Excitation Spectrum of 96Zr*”, Physics of Particles and Nuclei Letters* **19**, 463-466 (2022)
166. A. Rahmatinejad, T. M. Shneidman, “Kinetic Energy Distribution in Multi-Step Neutron Emission from Superheavy Nuclei”, *Physics Particles and Nuclei Letters* **19**, 470-472 (2022)
167. W. M. Seif, A. Adel, N. V. Antonenko, G. G. Adamian, “Enhanced alpha-decays to negative-parity states in even-even nuclei with octupole deformation”, *Physical Review C* **107**, 044601 [pages 9] (2023)
168. H. Pasca, A. V. Andreev, G. G. Adamian, N. V. Antonenko, “Excitation-energy dependence of the fission-fragment neutron-excess ratio”, *Physical Review C* **107**, 024603 [pages 5] (2023)
169. R.V.Jolos, E.A.Kolganova, E.V.Mardyban, T.M.Shneidman, “Reflection-asymmetric mode in the structure of heavy nuclei”, *International Journal of Modern Physics E* **32**, 2340002 [pages 23] (2023)
170. V.S. Bagnato, R.G. Nazmitdinov, V.I. Yukalov, “Symmetry in Many-Body Physics”,  
     *Symmetry* **15**, 72 [pages 5] (2023)
171. T. P. Grozdanov, E. A. Solov’ev, “Classical representation for hydrogen atom in s-states”, *Quantum Stud.: Math. Found*, **6**, 225–233 (2019)
172. I.A. Gnilozub, A. Galstyan, Yu.V. Popov, I.P. Volobuev, “Compton scattering from hydrogen and helium atoms”, *J. Phys. B* **52**, 035204 [9 pages] (2019)
173. S. Shadmehri, V.S. Melezhik, “Confinement-induced resonances in two-center problem via a pseudopotential approach”, *Phys. Rev. A* **99**, 032705 [11 pages] (2019)
174. A.A. Gusev, S.I. Vinitsky, O. Chuluunbaatar, A. Gozdz, A. Dobrowolski, K. Mazurek, P.M. Krassovitskiy, “Finite element method for solving the collective nuclear model with tetrahedral symmetry”, *Acta Phys. Pol. B* **12**, 589–594 (2019)
175. V.S. Melezhik, Z. Idziaszek, A. Negretti, “Impact of ion motion on atom-ion confinement-induced resonances in hybrid traps”, *Phys. Rev. A* **12**, 063406 [12 pages] (2019)
176. N. Burtebayev, M. Nassurlla, A. Sabidolda, S. B. Sakuta, A. A. Karakhodjaev, F. X. Ergashev, K. Rusek, E. Piasecki, A. Trzciska, M. Woliska-Cichocka, Michal Kowalczyk, D. Janseitov et al, “Measurement and analysis of 10B+12C elastic scattering at energy of 41.3MeV”, *Int. J. Mod. Phys. E* **28**, 1950028 [9 pages] (2019)
177. P.Vaandrager, S.A.Rakityansky, “Residues of the S-matrix for several alpha-12C resonances from the Jost function analysis”, *Nucl. Phys. A* **992**, 121627 [15 pages] (2019)
178. O. Chuluunbaatar, K. A. Kouzakov, S. A. Zaytsev, A. S. Zaytsev, V. L. Shablov, Yu. V. Popov, H. Gassert, M. Waitz, H.-K. Kim, T. Bauer, A. Laucke, Ch. Muller, J. Voigtsberger, M. W et al, “Single ionization of helium by fast proton impact in different kinematical regimes”, *Phys. Rev. A* **99**, 062711 [11 pages] (2019)
179. A. Galstyan, V.L. Shablov, Yu.V. Popov, F. Mota-Furtado, P.F. O'Mahony, B. Piraux, “Static field limit of excitation probabilities in laser-atom interactions”, *J. Phys. B* **52**, 085004 [12 pages] (2019)
180. A. Deveikis, A.A. Gusev, V.P. Gerdt, S. I. Vinitsky, A. Gozdz, A. Pedrak, C. Burdik, “Symbolic-Numerical Algorithm for Large Scale Calculations the Orthonormal SU(3) BM Basis”, *Lecture Notes in Computer Science* **1166**, 91-106 (2019)
181. A.K.Motovilov, “Unphysical energy sheets and resonances in the Friedrichs-Faddeev model”, *Few-Body Systems* **60**, 21 [9 pages] (2019)
182. E.A.Kolganova, V. Roudnev, “Weakly Bound LiHe2 Molecules in the Framework of Three-Dimensional Faddeev Equations”, *Few-Body Systems* **60**, 32 [7 pages] (2019)
183. V.S. Melezhik, “Efficient computational scheme for ion dynamics in RF-field of Paul trap”, *Discrete and Continuous Models and Applied Computational Science* **27**, 378-385 (2019)
184. Пупышев В.В., “Двумерное движение медленной квантовой частицы в поле центрального дальнодействующего потенциала”, *Теоретическая и математическая физика* **199**, 405—428 (2019)
185. С.Альбеверио, А.К.Мотовилов, “Разрешимость операторного уравнения Риккати в фешбаховском случае”, *Математические заметки* **105**, 483–506 (2019)
186. А. К. Мотовилов, А. А. Шкаликов, “Сохранение свойства безусловной базисности при несамосопряженных возмущениях самосопряженных операторов”, *Функциональный анализ и его приложения* **53**, 45–60 (2019)
187. В.Н. Кондратьев, “Магнитоэмиссия магнитаров”, *ЭЧАЯ*, **50**, 613-615 (2019)
188. В.Н. Кондратьев, “Нуклеосинтез при сильном намагничивании и проблема титана”, *ЭЧАЯ*, **50**, 576–580 (2019)
189. S. Shadmehri, S. Saeidian, V. S. Melezhik, “2D nondirect product discrete variable representation for Schrodinger equation with nonseparable angular variables”, *J. Phys. B* **53**, 085001 [7 pages] (2020)
190. S.I. Vinitsky, P.W. Wen, A.A. Gusev, O. Chuluunbaatar, R.G. Nazmitdinov, A.K. Nasirov, C.J. Lin, H.M. Jia, A. Gozdz, “Application of KANTBP Program of Finite Element Method in the Coupled-channels Calculations for Heavy-ion Fusion Reactions”, *Acta Phys. Pol. B* **13**, 549-558 (2020)
191. E.A. Koval, O.A. Koval, “Aspects of arbitrarily oriented dipoles scattering in plane: short-range interaction influence”, *Phys. Rev. A* **102**, 042815 [11 pages] (2020)
192. S. Houamer, O. Chuluunbaatar, I.P. Volobuev, Yu.V. Popov, “Compton ionization of hydrogen atom near threshold by photons in the energy range of a few keV: Nonrelativistic approach”, *Eur. Phys. J. D* **74**, 81 [9 pages] (2020)
193. T. P. Grozdanov, A. A. Gusev, E. A. Solov’ev, S.I. Vinitsky, “Frozen-planet resonances in doubly excited helium atom; adiabatic approach”, *Eur. Phys. J. D* **74**, 161 [7 pages] (2020)
194. T. P. Grozdanov, E. A. Solov’ev, “Hidden-crossing explanation of frozen-planet resonances in antiprotonic helium; their positions and widths”, *Eur. Phys. J. D* **74**, 50 [5 pages] (2020)
195. D.M. Janseitov, N. Burtebayev, Zh. Kerimkulov, D. Alimov, M. Nassurlla, B. Mauyey, D.S. Valiolda, A.S. Demyanova, A. Danilov, Sh. Hamada, A. Aimaganbetov, “Investigation of Deuteron Scattering from 13C at Low Energy”, *Acta Physica Polonica B* **51**, 745-750 (2020)
196. 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. Bagschik, M. N. Pianc et al, “Kinematically complete experimental study of Compton scattering at helium atoms near the threshold”, *Nature Physics* **16**, 756-760 (2020)
197. A.S. Demyanova, V. I. Starastsin, A. N. Danilov, A. A. Ogloblin, S. V. Dmitriev, S. A. Goncharov, T. L. Belyaeva, V. A. Maslov, Yu. G. Sobolev, W. Trzaska, P. Heikkinen, G. P. Gur et al, “Possible neutron and proton halo structure in the isobaric analog states of A=12 nuclei”, *Phys. Rev. C* **102**, 054612 [8 pages] (2020)
198. V.N.Kondratyev, “Properties and Composition of Magnetized Nuclei”, *Particles* **3**, 272–277 (2020)
199. E.A.Solov'ev, “Semiclassical approach in classical representation”, *Quantum Stud.: Math. Found* **7**, 1 [4 pages] (2020)
200. M. Nassurlla, N. Burtebayev, D.M. Janseitov, Zh. Kerimkulov, D. Alimov, A.K. Morzabayev, K. Talpakova, Y. Mukhamejanov, L.I. Galanina, A.S. Demyanov, A.N. Danilov, V. Starastsin, “Study of elastic and inelastic scattering of deuterons by 9Be at energy E=14.5 MeV”, Acta Physica Polonica B 51, 751-756 (2020)
201. A. Deveikis, A.A. Gusev, V. P. Gerdt, S.I. Vinitsky, A. Gozdz, A. Pedrak, C. Burdik, G.S. Pogosyan, “Symbolic-Numeric Algorithm for Computing Orthonormal Basis of O(5) SU(1,1) Group”, *Lecture Notes in Computer Science* **12291**, 206-227 (2020)
202. Demyanova, A. S., Danilov, A. N., Ogloblin, A. A., Starastsin, V. I., Dmitriev, S. V., Trzaska, W. H., Goncharov, S. A., Belyaeva, T. L., Maslov, V. A., Sobolev, Yu. G. et al., “States of 12N with Enhanced Radii”, *JETP Letters* **111**, 483-484 (2020)
203. Пупышев В.В., “Двумерное низкоэнергетическое рассеяние квантовой частицы в суммарном поле кулоновского и степенного потенциалов,” *Теоретическая и математическая физика* **203**, 280-299 (2020)
204. Пупышев В.В., “Правило квантования Бора-Зоммерфельда в случае двумерного движения квантовой частицы в поле убывающего степенного потенциала”, *ЭЧАЯ* **51**, 494-500 (2020)
205. Е.А.Колганова, В.Руднев, “Слабосвязанные трехатомные LiHe2молекулы”, *Известия РАН серия физическая* **84**, 607-610 (2020)
206. G. Chuluunbaatar, A. Gusev, V. Derbov, S. Vinitsky, O. Chuluunbaatar, L.L. Hai, V. Gerdt, “A Maple implementation of the finite element method for solving boundary-value problems for systems of second-order ordinary differential equations”, Communications in Computer and Information *Science* **1414**, 152-166 (2021)
207. O. Chuluunbaatar, S. Houamer, Yu.V. Popov, I.P. Volobuev, M. Kircher, R. Doerner, “Compton ionization of atoms as a method of dynamical spectroscopy”, *Journal of Quantitative Spectroscopy and Radiative Transfer* **272**, 107820 [9 pages] (2021)
208. V.S. Melezhik, “Improving efficiency of sympathetic cooling in atom-ion and atom-atom confined collisions”, *Phys. Rev. A* **103**, 053109 [13 pages] (2021)
209. B. Piraux, A. Galstyan, Yu.V. Popov, F. Mota-Furtado, P.F. O’Mahony, “Perturbative treatment of the Coulomb potential in laser-atom interactions”, *Eur. Phys. J. D* **75**, 196 [9 pages] (2021)
210. V.N. Kondratyev, “R-Process with Magnetized Nuclei at Dynamo-Explosive Supernovae and Neutron Star Mergers” *Universe* **7,** 487-493 (2021)
211. V.L.Derbov, G.Chuluunbaatar, A.A.Gusev, O.Chuluunbaatar, S.I.Vinitsky, A.Gozdz, P.M.Krassovitskiy, I.Filikhin, A.V.Mitin, “Spectrum of beryllium dimer in ground X1 Sigma\_g+ state”, *Journal of Quantitative Spectroscopy and Radiative Transfer* **262**, 107529 [10 pages] (2021)
212. V. Starastsin, A. Demyanova, A. Danilov, A. Ogloblin, S. Dmitriev, S. Goncharov, Cheng-Jian Lin, Lei Yang, Dong-Xi Wang, Hui-Ming Jia, Fu-Peng Zhong, Feng Yang, Yong-Jin Yao, Shan-Hao Zhong, Pei-Wei Wen, Nan-Ru Ma, Huan-Qiao Zhang, D. Janseitov, N. Burtebayev, S. Khlebnikov, G. Adamian, N. Antonenko, “Structures of the excited states in 9Be studied by scattering of 23 MeV deuterons”, *Eur. Phys. J. A* **57**, 334 [12 pages] (2021)
213. A. Deveikis, A. Gusev, S. Vinitsky, A. Gozdz, A. Pedrak, C. Burdik, G.Pogosyan, “Symbolic-Numeric Algorithms for Computing Orthonormal Bases of SU(3) Group for Orbital Angular Momentum”, *Lecture Notes in Computer Science* **12865**, 100-120 (2021)
214. A. Demyanova, V. Starastsin, A. Ogloblin, A. Danilov, S. Dmitriev, W. Trzaska, P. Heikkinen, T.Belyaeva, S. Goncharov, V. Maslov, Yuri S et al, “The spin-parities of the 13.35 MeV state and high-lying excited states around 20 MeV in 12C nucleus”, *Eur. Phys. J. A* **57**, 204 [13 pages] (2021)
215. A.S. Demyanova, A.N. Danilov, S.V. Dmitriev, A.A. Ogloblin, V.I. Starastsin, S.A. Goncharov, D.M. Janseitov, “Search for Exotic States in 13C”, *JETP Letters* **114**, 303-308 (2021)
216. Пупышев В.В., “Низкоэнергетические асимптотики фаз двумерного рассеяния квантовой частицы центральным дальнодействующим потенциалом”, *Теоретическая и математическая физика* **207**, 72-98 (2021)
217. С. И. Виницкий, А. А. Гусев, В. Л. Дербов, П. М. Красовицкий, Ф. М. Пеньков, Г. Чулуунбаатар, “Редуцированная модель SIR пандемии COVID-19”, *Журнал вычислительной математики и математической физики* **61**, 400-412 (2021)
218. В. Н. Кондратьев, “Синтез намагниченных тяжелых ядер*”, Известия РАН. Сер. Физ*. **85**, 673 – 677 (2021)
219. T.P. Grozdanov, E.A. Solov’ev, “3D scattering by 2D periodic zero-range potentials: total reflection/transmission and threshold effects”, *Eur. Phys. J. B* **95**, 16 [14 pages] (2022)
220. I. S. Stepantsov, I.P. Volobuev, Yu. V. Popov, “Comparative analysis of the Compton ionization of hydrogen and positronium”, *Eur. Phys. J. D* **76**, 30 [9 pages] (2022)
221. O. Chuluunbaatar, S. Houamer, Yu.V. Popov, I.P. Volobuev, M. Kircher, R. Doerner, “Compton double ionization of the helium atom: Can it be a method of dynamical spectroscopy of ground state electron correlation?”, *Journal of Quantitative Spectroscopy and Radiative Transfer* **272**, 108020 [9 pages] (2022)
222. Yu. V. Popov, I. P. Volobuev, O. Chuluunbaatar, S. Houamer, “Compton Ionization of Atoms as a New Method of Spectroscopy of Outer Shells Physics of Particles and Nuclei”, *Physics of Particles and Nuclei* **53**, 191-196 (2022)
223. Kondratyev, V.N., Lobanovskaya, T.D., Torekhan, D.B., “Effect of Protoneutron Star Magnetized Envelops in Neutrino Energy Spectra”, *Particles* **5**, 128–134 (2022)
224. D. Valiolda, D. Janseitov, V. Melezhik, “Investigation of low-lying resonances in breakup of halo nuclei within the time-dependent approach”, *Eur. Phys. J. A* **58**, 34 [13 pages] (2022)
225. M. Kircher, F. Trinter, S. Grundmann, G. Kastirke, M. Weller, I. Vela-Perez, A.Khan, C. Janke, M. Waitz, S. Zeller, T. Mletzko, D. Kirchner, V. Honkimaki, S.Houamer, O. Chuluunbaa et al, “Ion and electron momentum distributions from single and double ionization of helium induced by Compton scattering”, *Phys. Rev. Lett*. **128**, 053001 [6 pages] (2022)
226. O. Chuluunbaatar, A.A. Gusev, S.I. Vinitsky and A.G. Abrashkevich, P.W. Wen, C.J. Lin, “KANTBP 3.1: A program for computing energy levels, reflection and transmission matrices, and corresponding wave functions in the coupled-channel and adiabatic approaches”, *Computer Physics Communications* **278**, 108397 [14 pages] (2022)
227. V.P. Tsvetkov, S.A. Mikheev, I.V. Tsvetkov, V.L. Derbov, A.A. Gusev, S.I. Vinitsky, “Modeling the multifractal dynamics of COVID-19 pandemic”, *Chaos, Solitons and Fractals* **161**, 110301 [9 pages] (2022)
228. S.Albeverio, A.K.Motovilov, “Optimal bounds on the speed of subspace evolution”, *J. Physics A* **55**, 235203 [17 pages] (2022)
229. G.Chuluunbaatar, O.Chuluunbaatar, A.A.Gusev, S.I.Vinitsky, “PI-type fully symmetric quadrature rules on the 3-, …, 6-simplexes”, *Computers & Mathematics with Applications* **124**, 89-97 (2022)
230. A. Deveikis, A.A. Gusev, S.I. Vinitsky, Y.A. Blinkov, A. Gozdz, A. Pedrak, P.O. Hess, “Symbolic-Numeric Algorithm for Calculations in Geometric Collective Model of Atomic Nuclei”, *Lecture Notes in Computer Science* **13066**, 103-123 (2022)
231. V.S. Melezhik, “A New Mechanism for Sympathetic Cooling of Atoms and Ions in Atomic and Ion-Atomic Traps”, *Physics of Particles and Nuclei* **53**, 795-799 (2022)
232. O. I. Kartavtsev and A. V. Malykh, “Minlos-Faddeev regularization of zero-range interactions in the three-body problem”, *JETP Letters* **116**, 179-180 (2022)
233. S.Albeverio, A.K.Motovilov, “Quantum speed limits for time evolution of a system subspace”, *Physics of Particles and Nuclei* **53**, 287-291 (2022)
234. S. Shadmehri, V. S. Melezhik, “A Hydrogen Atom in Strong Elliptically Polarized Laser Fields within Discrete-Variable Representation”, *Laser Physics* **33**, 026001 [14 pages] (2023)
235. A.A.Gusev, E.A.Solovev, S.I.Vinitsky, “ARSENY: A program for computing inelastic transitions via hidden crossings in one-electron atomic ion–ion collisions with classical description of nuclear motion”, *Computer Physics Communications* **286**, 108662 [10 pages] (2023)
236. T.P.Grozdanov, E.A.Solov’ev, “Bohmian tunneling times in strong field ionization”,  
     The European Physical Journal D **77**, 23 [11 pages] (2023)
237. O.I. Kartavtsev and A.V. Malykh, “Mass-ratio condition for non-binding of three two-component particles with contact interactions”, *The* *European Physical Journal Plus*  **138**, 147-158 (2023)
238. V. B. Belyaev, S. A. Rakityansky, I. M. Gopane, “Recovering the Two-Body Potential from a Given Three-Body Wave Function”, *Few-Body Systems* **64**, 4 [pages 12] (2023)
239. L.P. Kaptari, A.V. Kotikov, N.Yu. Chernikova, P. Zhang, “Longitudinal Structure Function FL at Small x Extracted from the Berger–Block–Tan Parametrization of F2”, *JETP Letters* **109**, 281-286 (2019)
240. Yu. B. Ivanov, V. D. Toneev, A. A. Soldatov, “Estimates of hyperon polarization in heavy-ion collisions at collision energies √ sNN = 4 – 40 GeV”, *Phys. Rev. C* **100**, 014908 [7 pages] (2019)
241. L.P. Kaptari, A.V. Kotikov, N.Yu. Chernikova, P. Zhang, “Extracting the longitudinal structure function FL(x,Q2) at small x from a Froissart-bounded parametrization of F2(x,Q2)”, *Phys. Rev. D* **99**, 096019 [16 pages] (2019)
242. A.S. Parvan, “Lorentz transformations of the thermodynamic quantities”, *Annals of Physics* **401**, 130-138 (2019)
243. V.K.Lukyanov, D.N.Kadrev, E.V.Zemlyanaya, K.V.Lukyanov, A.N.Antonov, M.K.Gaidarov, “Microscopic analysis of quasielastic scattering and breakup reactions of the neutron-rich nuclei 12,14Be”, *Phys. Rev. C* **100**, 034602 [12 pages] (2019)
244. L.P. Kaptari, B. Kaempfer, P. Zhang, “Modeling the gluon and ghost propagators in Landau gauge by truncated Dyson-Schwinger equations”, *Eur. Phys. J. Plus* **8**, 383-397 (2019)
245. S. Bondarenko, Ya. Dydyshka, L. Kalinovskaya, L. Rumyantsev, R. Sadykov, and V. Yermolchyk, “One-loop electroweak radiative corrections to polarized *e+ e →Z H”, Phys. Rev. D* **100**, 073002 [6 pages] (2019)
246. S.M. Dorkin, L.P. Kaptari, B. Kaempfer, “Pseudo-Scalar *qq-* Bound States at Finite Temperatures Within a Dyson-Schwinger–Bethe-Salpeter Approach”, *Few Body Systems* **60**, 20-39 (2019)
247. A. V. Friesen, Yu. L. Kalinovsky, V. D. Toneev, “Strange matter and kaon to pion ratio in the SU(3) Polyakov–Nambu–Jona-Lasinio model”, *Phys. Rev. C* **99**, 045201 [7 pages] (2019)
248. A. Friesen, Yu. L. Kalinovsky, V. D. Toneev, “Kaon to pion ratio in SU(3) PNJL model”, *Physics of Particles and Nuclei Letters* **16**, 681-689 (2019)
249. B. M. Abramov, M.Baznat, Yu.A.Borodin, S. A. Bulychjov, I. A. Dukhovskoy, A.P.Krutenkova, V. V. Kulikov, M. A. Martemianov1, M. A. Matsyuk, E.N. Turdakina, and A. I. Khanov, “Nuclear Fragments in 12C + 9Be Interactions at an Energy of 2 GeV per Nucleon”, *Physics of Particles and Nuclei* **82**, 623-629 (2019)
250. С. Г. Бондаренко, В.В. Буров, С.А. Юрьев, “О вкладе парциальных P- и D- состояний в энергию связи тритона в формализме Бете-Солпитера-Фадеева”, *Ядерная Физика* **82**, 1-7 (2019)
251. Д.Ю. Бардин, П.Х. Христова, Л.В. Калиновская, В.A. Колесников, Л.А. Румянцев, Р.Р. Садыков, А.А. Сапронов, Е.Д. Углов, В.Б. фон Шлиппе, А.Б. Арбузов, С.Г. Бондаренко, Г. Нанава, А. и др., “Прецизионное описание процессов на коллайдерах в системе SANC”, *ЭЧАЯ* **50**, 395–432 (2019)
252. A. Arbuzov, S. Bondarenko, L. Kalinovskaya, “Asymmetries in Processes of Electron-Positron Annihilation”, *Symmetry* **12**, 1132 [14 pages] (2020)
253. D. Blaschke, A. V. Friesen, Yu. L. Kalinovsky, A. Radzhabov, “Chiral phase transition and kaon-to-pion ratios in the entanglement SU(3) PNJL model”, *Eur. Phys. J. Special Topics* **229**, 3517 – 3536 (2020)
254. I. Strakovsky, L. Pentchev, A.I. Titov, “Comparative analysis of ω-p, φ-p, and J/ψ-p scattering lengths from A2, CLAS, and GlueX threshold measurements”, *Phys. Rev. C* **101**, 045201 [4 pages] (2020)
255. A.S. Parvan, “Equivalence of the phenomenological Tsallis distribution to the transverse momentum distribution of q-dual statistics”, *Eur. Phys. J. A* **56**, 106 [5 pages] (2020)
256. A.S. Parvan, T. Bhattacharyya, “Hadron transverse momentum distributions of the Tsallis normalized and unnormalized statistics”, *Eur. Phys. J. A* **56**, 72 [20 pages] (2020)
257. L.P. Kaptari, B. Kaempfer, “Mass Spectrum of Pseudo-Scalar Glueballs from a Bethe–Salpeter Approach with the Rainbow–Ladder Truncation”, *Few Body Systems* **61**, 28 [10 pages] (2020)
258. A.I. Titov, A. Otto, B. Kaempfer, “Multi-photon regime of non-linear Breit-Wheeler and Compton processes in short linearly and circularly polarized laser pulses”, *Eur. Phys. J. D* **74**, 39 [13 pages] (2020)
259. A.I. Titov and B. Kaempfer, “Non-linear Breit–Wheeler process with linearly polarized beams”, *Eur. Phys. J. D* **74**, 218 [9 pages] (2020)
260. U. Hernandez Acosta, A. Otto, B. Kaempfer, and A.I. Titov, “Nonperturbative signatures of nonlinear Compton scattering”, *Phys. Rev. D* **102**, 116016 [11 pages] (2020)
261. Yu. D. Chernichenko, O. P. Solovtsova, L. P. Kaptari, “On resummation S-factor for a system of two relativistic spinor particles of arbitrary masses”, *Nonlinear phenomena in complex systems* **23**, 449-457 (2020)
262. S. Bondarenko, Ya. Dydyshka, L. Kalinovskaya, R. Sadykov, V. Yermolchyk, “One-loop electroweak radiative corrections to lepton pair production in polarized electron-positron collisions”, *Phys. Rev. D* **102**, 033004 [11 pages] (2020)
263. S.G. Bondarenko, V.V. Burov, S. Yurev, “Relativistic rank-one separable kernel for helium-3 charge form factor”, *Nuclear Physics A* **1004**, 122065 [13 pages] (2020)
264. A.S. Parvan, “Scaled variables and the quark-hadron duality”, *Eur. Phys. J. A* **56**, 192 [7 pages] (2020)
265. J.H.Khushvaktov, P.Tich, J.Adam, A.A.Baldin, M.Baznat, M.Bruniakov, W.I.Furman, S.A.Gustov, D.Krol, A.A.Solnyshkin, V.I.Stegailov, J.Svoboda, V.M.Tsoupko-Sitnikov, S.I.Tyutyunni et al. “Study of the residual nuclei generation in a massive lead target irradiated with 660 MeV protons”, *Nuclear Instruments & Methods in Physics Research A* **959,** 163542 [8 pages] (2020)
266. D. Blaschke, A. Friesen, Y. Kalinovsky, A. Radzhabov, “Using the Beth–Uhlenbeck Approach to Describe the Kaon to Pion Ratio in a 2 + 1 Flavor PNJL Model”, *Particles* **3**, 169-177 (2020)
267. Л.И.Голяткина, Ю.Л.Калиновский, Е.Д.Рогожина, А.В.Фризен, “Application of a computer algebra systems to the calculation of the pion-pion -scattering amplitude”, *Discrete and Continuous Models and Applied Computational Science* **28**, 216-229 (2020)
268. M. Baznat, A. Botvina, G. Musulmanbeko, V. Toneev, V. Zhezher, “Monte-Carlo Generator of Heavy Ion Collisions DCM-SMM”, *Physics of Particles and Nuclei Letters* **17**, 303–324 (2020)
269. Ю.Л.Калиновский, В.Д.Тонеев, А.В.Фризен, “The role of the chiral phase transition in modelling the kaon to pion ratio”, *JETP Letters* **111**, 147-148 (2020)
270. Yu. B. Ivanov, V. D. Toneev, A. A. Soldatov, “Vorticity and Particle Polarization in Relativistic Heavy-Ion Collisions”, *Physics of atomic nuclei* **83**, 179–187 (2020)
271. V.K. Lukyanov, E.V. Zemlyanaya, K.V. Lukyanov, I. Abdul-Magead, “Analysis of the Pion-Nucleus Scattering within the Folding and the Kisslinger Type Potentials”, *Nucl. Phys. A* **1010**, 122190 [13 pages] (2021)
272. T. Bhattacharyya, A.S. Parvan, “Analytical Results for the Classical and Quantum Tsallis Hadron Transverse Momentum Spectra: the Zeroth Order Approximation and beyond”, *Eur. Phys. J. A* **57**, 206 [11 pages] (2021)
273. H. Abramowicz, A.I. Titov, A. Zhemchukov, “Conceptual design report for the LUXE experiment”, *Eur. Phys. J. Special Topic* **230**, 2445-2560 (2021)
274. A. Arbuzov, S. Bondarenko, L. Kalinovskaya, R. Sadykov, V. Yermolchyk, “Electroweak effects in *e+e- -- > Z H* process”, *Symmetry* **13**, 1256 [14 pages] (2021)
275. L.P. Kaptari, B. Kaempfer, “Ghost and Gluon Propagators at Finite Temperatures within a Rainbow Truncation of Dyson–Schwinger Equations”, *JETP Letters* **114**, 501-506 (2021)
276. A. S. Khvorostukhin, E. E. Kolomeitsev, and V. D. Toneev, “Hybrid model with viscous relativistic hydrodynamics: a role of constraints on the shear-stress tensor”, *Eur. Phys. J. A* **57**, 294 [25 pages] (2021)
277. B. Kampfer, A.I. Titov, “Impact of laser polarization on q-exponential photon tails in nonlinear Compton scattering”, *Phys. Rev. A* **103**, 033101 [11 pages] (2021)
278. E. Nazarova, R. Akhat, M. Baznat, O. Teryaev, A. Zinchenko, “Monte Carlo Study of Lambda Polarization at MPD*”, Phys.Part. Nucl. Lett.,* **18**, 429-438 (2021)
279. A. I. Titov, U. Hernandez Acosta, and B. Kaempfer, “Positron energy distribution in a factorized trident process”, *Phys. Rev. A* **104** 062811 [9 pages] (2021)
280. Chernichenko Yu.D., Kaptari L.P. Solovtsova O.P., “Relativistic Coulomb S-factor of two spinor particles with arbitrary masses”, *Eur. Phys. J. Plus* **136**, 302 [17 pages] (2021)
281. A.S. Parvan, T. Bhattacharyya, “Remarks on the phenomenological Tsallis distributions and their link with the Tsallis statistics”, *J. Phys. A* **54**, 325004 [16 pages] (2021)
282. U. Hernandez-Acosta, A.I. Titov, B.Kampfer, “Rise and fall of laser-intensity effects in spectrally resolved Compton process”, *New Journal of Physics* **23**, 095008 [32 pages] (2021)
283. L.P. Kaptari, O.P. Solovtsova, Yu. Chernichenko, “Spin Effects in the Sommerfeld-Gamow-Sakharov Factor”, *Nonlinear Dynamics and Applications* 27, 101-113 (2021)
284. S.G. Bondarenko, V.V. Burov, S. Yurev, “Trinucleon form factors with relativistic multirank separable kernels”, *Nuclear Physics A* **1014**, 122251 [13 pages] (2021)
285. Abramov, B.M., Baznat, M., Borodin, Y.A., Bulychjov, S.A., Dukhovskoy, I.A., Krutenkova, A.P., Kulikov, V.V., Martemianov, M.A., Matsyuk, M.A., Turdakina, E.N., “Cumulative pi-Mesons in 12C + 9Be-Interactions at 3.2 GeV/Nucleon”, *Physics of Atomic Nuclei* **84**, 467-474 (2021)
286. L. V. Bravina, M. I. Baznat, Yu. B. Ivanov, E. E. Zabrodin, “Investigation of Vorticity, Directed Flow and Freeze-Out in A + A Collisions at Energies of the NICA Collider”, *Physics of Particles and Nuclei* **52**, 544-548 (2021)
287. В.В. Абрамов, А. Алешко, В.А. Басков, Э. Боос, В. Буничев, О.Д. Далькаров, Р. Эль-Холи, А. Галоян, А.В. Гуськов, В.Т. Ким, Е.С. Кокоулина, И.А. Кооп, Б.Ф. Костенко, А.Д. Коваленко, и др., “Возможные исследования на начальной стадии работы коллайдера NICA с поляризованными и неполяризованными пучками протонов и дейтронов”, ЭЧАЯ **52**, 1392-1529 (2021)
288. Л.П. Каптарь, Б. Кэмпфер, “Температурная зависимость пропагаторов глюонов и духов в подходе Дайсона-Швингенра в приближении радуги”, *Письма в ЖЭТФ* **114**, 579-585 (2021)
289. Titarenko Yu.E., Batyaev V.F., Pavlov K.V., Titarenko A.Yu. et al, 206,207,208,natPb(*p,x*)194Hg and 209Bi(p,x)194Hg excitation functions in the energy range 0.04–2.6 GeV”, *Nuclear Instruments & Methods in Physics Research A* **1026**, 166151 [9 pages] (2022)
290. A.B. Larionov, “Color Transparency in pbar A Reactions”, *Physics* **4**, 294—300 (2022)
291. A.B. Arbuzov, S.G. Bondarenko, L.V. Kalinovskaya, L.A. Rumyantsev, V.L. Yermolchyk, “Electroweak effects in polarized muon-electron scattering”, *Phys. Rev. D* **105**, 033009 [14 pages] (2022)
292. D. Goderidze, A. Friesen, Yu. Kalinovsky, “Pion damping width and pion spectral function in hot pion gas”, *International Journal of Modern Physics A* **37**, 2250135 [11 pages] (2022)
293. A.S. Parvan, “Study of invariance of nonextensive statistics under the uniform energy spectrum translation”, *Physica A* **588**, 126556 [12 pages] (2022)
294. A. B. Larionov and L. von Smekal, “Effects of chiral symmetry restoration on meson and dilepton production in relativistic heavy-ion collisions”, *Phys. Rev. C*, **105**, 034914 [16 pages] (2022)
295. A. B. Larionov, “Color coherence effects in the reaction 2H(p, 2p)n”, *Physical Review C* **107**, 014605 [pages 19] (2023)
296. Serge Bondarenko, Yahor Dydyshka, Lidia Kalinovskaya, Renat Sadykov, Vitaly Yermolchyk, “Hadron-hadron collision mode in ReneSANCe-v1.3.0”, *Computer Physics Communications* **285**, 108646 [12 pages] (2023)
297. O.P. Solovtsova, V.I. Lashkevich, L.P. Kaptari, “Lepton anomaly from QED diagrams with vacuum polarization insertions within the Mellin-Barnes representation”, *The European Physical Journal Plus* **138**, 212-220 (2023)

The results of the work are presented in 102 reports at various scientific events.

4 habilitation and 3 PhD dissertations have been defended.

Lectures were given at the University of Dubna, UC JINR, and Tomsk Polytechnic University.

3 JINR awards were granted for the best scientific works.

1 patent was obtained (R.G.Nazmitdinov et al. "Solar thermal collector for heat removal from solar photovoltaic panel" RU 210191).

**3. International scientific and technical cooperation**

The countries, institutions and organizations actually involved.

|  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- |
| **Country or International Organization** | **City** | **Institute or**  **laboratory** |  |  |  |  |  |
| Armenia | Yerevan | RAU |  |  |  |  |  |
|  |  | YSU |  |  |  |  |  |
| Belarus | Gomel | GSU |  |  |  |  |  |
|  | Minsk | IP NASB |  |  |  |  |  |
| Belgium | Brussels | ULB |  |  |  |  |  |
|  | Louvain-la-Neuve | UCL |  |  |  |  |  |
| Brazil | Florianopolis, SC | UFSC |  |  |  |  |  |
|  | Niteroi, RJ | UFF |  |  |  |  |  |
|  | Sao Jose dos Campos, SP | ITA |  |  |  |  |  |
|  | Sao Paulo, SP | UEP |  |  |  |  |  |
| Bulgaria | Sofia | INRNE BAS |  |  |  |  |  |
|  |  | NBU |  |  |  |  |  |
| China | Beijing | CIAE |  |  |  |  |  |
|  |  | ITP CAS |  |  |  |  |  |
|  |  | PKU |  |  |  |  |  |
|  | Lanzhou | IMP CAS |  |  |  |  |  |
| Czech Republic | Prague | CU |  |  |  |  |  |
| Egypt | Giza | CU |  |  |  |  |  |
| France | Caen | GANIL |  |  |  |  |  |
|  | Orsay | IJCLab |  |  |  |  |  |
| Germany | Berlin | HZB |  |  |  |  |  |
|  | Bielefeld | Univ. |  |  |  |  |  |
|  | Bonn | UniBonn |  |  |  |  |  |
|  | Cologne | Univ. |  |  |  |  |  |
|  | Darmstadt | GSI |  |  |  |  |  |
|  |  | TU Darmstadt |  |  |  |  |  |
|  | Dresden | HZDR |  |  |  |  |  |
|  |  | TU Dresden |  |  |  |  |  |
|  | Erlangen | FAU |  |  |  |  |  |
|  | Frankfurt/Main | Univ. |  |  |  |  |  |
|  | Giessen | JLU |  |  |  |  |  |
|  | Hamburg | Univ. |  |  |  |  |  |
|  | Leipzig | UoC |  |  |  |  |  |
|  | Mainz | JGU |  |  |  |  |  |
|  | Rostock | Univ. |  |  |  |  |  |
|  | Siegen | Univ. |  |  |  |  |  |
| Greece | Athens | INP NCSR "Demokritos" |  |  |  |  |  |
| Hungary | Budapest | Wigner RCP |  |  |  |  |  |
|  | Debrecen | Atomki |  |  |  |  |  |
| India | Chandigarh | PU |  |  |  |  |  |
|  | Kasaragod | CUK |  |  |  |  |  |
|  | New Delhi | IUAC |  |  |  |  |  |
| Iran | Zanjan | IASBS |  |  |  |  |  |
| Italy | Catania | INFN LNS |  |  |  |  |  |
|  | Messina | UniMe |  |  |  |  |  |
|  | Naples | INFN |  |  |  |  |  |
|  | Turin | UniTo |  |  |  |  |  |
| Japan | Kobe | Kobe Univ. |  |  |  |  |  |
|  | Morioka | Iwate Univ. |  |  |  |  |  |
|  | Osaka | Osaka Univ. |  |  |  |  |  |
|  |  | RCNP |  |  |  |  |  |
| Kazakhstan | Almaty | INP |  |  |  |  |  |
|  |  | KazNU |  |  |  |  |  |
| Lithuania | Kaunas | VMU |  |  |  |  |  |
| Mexico | Mexico City | UNAM |  |  |  |  |  |
| Moldova | Chisinau | IAP |  |  |  |  |  |
| Norway | Bergen | UiB |  |  |  |  |  |
|  | Oslo | UiO |  |  |  |  |  |
| Poland | Krakow | INP PAS |  |  |  |  |  |
|  | Lublin | UMCS |  |  |  |  |  |
|  | Otwock (Swierk) | NCBJ |  |  |  |  |  |
|  | Warsaw | UW |  |  |  |  |  |
| Republic of Korea | Daegu | KNU |  |  |  |  |  |
|  | Daejeon | IBS |  |  |  |  |  |
|  | Jeonju | JBNU |  |  |  |  |  |
|  | Seoul | SNU |  |  |  |  |  |
| Romania | Bucharest | IFIN-HH |  |  |  |  |  |
|  |  | UB |  |  |  |  |  |
|  | Cluj-Napoca | UBB |  |  |  |  |  |
| Russia | Dolgoprudny | MIPT |  |  |  |  |  |
|  | Gatchina | NRC KI PNPI |  |  |  |  |  |
|  | Khabarovsk | PNU |  |  |  |  |  |
|  | Moscow | MSU |  |  |  |  |  |
|  |  | NNRU "MEPhI" |  |  |  |  |  |
|  |  | NRC KI |  |  |  |  |  |
|  |  | PFUR |  |  |  |  |  |
|  |  | SINP MSU |  |  |  |  |  |
|  | Moscow, Troitsk | INR RAS |  |  |  |  |  |
|  | Omsk | OmSU |  |  |  |  |  |
|  | Saratov | SSU |  |  |  |  |  |
|  | St. Petersburg | SPbSU |  |  |  |  |  |
|  | Tomsk | TPU |  |  |  |  |  |
|  | Vladivostok | FEFU |  |  |  |  |  |
| Serbia | Belgrade | IPB |  |  |  |  |  |
| Slovakia | Bratislava | CU |  |  |  |  |  |
|  |  | IP SAS |  |  |  |  |  |
| South Africa | Johannesburg | WITS |  |  |  |  |  |
|  | Pretoria | UP |  |  |  |  |  |
|  | Somerset West | iThemba LABS |  |  |  |  |  |
|  | Stellenbosch | SU |  |  |  |  |  |
| Spain | Palma | UiB |  |  |  |  |  |
| Sweden | Goteborg | Chalmers |  |  |  |  |  |
|  | Lund | LU |  |  |  |  |  |
| Ukraine | Kiev | KINR NASU |  |  |  |  |  |
|  |  | NUK |  |  |  |  |  |
| United Kingdom | Guildford | Univ. |  |  |  |  |  |
| USA | Notre Dame, IN | ND |  |  |  |  |  |
|  | University Park, PA | Penn State |  |  |  |  |  |
| Uzbekistan | Namangan | NamMTI |  |  |  |  |  |
|  | Tashkent | Assoc. P.-S. PTI |  |  |  |  |  |
|  |  | IAP NUU |  |  |  |  |  |
|  |  | INP AS RUz |  |  |  |  |  |
|  |  |  |  |  |  |  |  |

**4. Analysis of planed vs actually used resources: manpower (including associated personnel), financial, IT, infrastructure**

**4** **.1. Manpower (actual at the time of reporting)**

|  |  |  |  |
| --- | --- | --- | --- |
| **No.** | **Personnel category** | **JINR staff,**  **FTE amount** | **JINR associated personnel,**  **FTE amount** |
| 1. | research scientists | **54** | **1** |
| 2. | engineers |  |  |
| 3. | specialists |  |  |
|  | **Total:** | **54** | **1** |

**4.2. Actual cost of the Theme / LRIP**

|  |  |  |  |
| --- | --- | --- | --- |
| **No.** | **Items of expenditure** | **Full cost**  **(thousands of US** **dollars)** | **Expenditure for the last year,**  **(thousands of US dollars)** |
| 1. | International cooperation |  | **74.8** |
| 2. | Materials |  |  |
| 3. | Equipment, Third-party company services |  |  |
| 4. | Commissioning |  |  |
| 5. | R&D contracts with other research organizations |  |  |
| 6. | Software purchasing |  |  |
| 7. | Design/construction |  |  |
| 8. | Service costs (*planned in case of direct project affiliation)* |  |  |
| **TOTAL:** | |  |  |

**4.3. Other resources**

**5. Conclusion**

**The planned work has been completed.**

**Theme leader**

**/\_\_\_\_\_\_\_\_\_\_\_ /**

**" " 202\_г.**

**Project leader**

**/\_\_\_\_\_\_\_\_\_\_ \_/**

**" " 202\_г.**

**Project leader**

**/\_\_\_\_\_\_\_\_\_\_ \_/**

**" " 202\_г.**

**Project leader**

**/\_\_\_\_\_\_\_\_\_\_ \_/**

**" " 202\_г.**

**Project leader**

**/\_\_\_\_\_\_\_\_\_\_\_ /**

**" " 202\_г.**

**Laboratory Economist**

**/\_\_\_\_\_\_\_\_\_\_ \_/**

**" " 202\_ г.**