



Joint Institute for Power and Nuclear
Research – Sosny
B. I. Stepanov Institute of Physics
National Academy of Sciences of Belarus
Joint Institute for Nuclear Research
Belarusian State University

NONLINEAR PHENOMENA IN COMPLEX SYSTEMS

***Fractals, Chaos, Phase Transitions,
Self-organization***

Minsk, Belarus

JUNE 21 – 24, 2022

XXIX International Seminar

Program

<http://npcs.j-npcs.org/>

Minsk, 2022

Tuesday, June 21, 09.00-16.00

9.00 - 10.00 Registration
10.00 - 10.05 Opening
10.05 - 11.05 Plenary Session
11.05 - 11.30 Coffee-Break
11.30 - 13.00 Plenary Session
13.00 - 14.00 Lunch
14.00 - 16.00 Session: Medicine, Biological and Chemical systems

Wednesday, June 22, 09.30 – 18.00

09.30 - 11.00 Plenary Session
11.00 - 11.30 Coffee-Break
11.30 - 13.00 Plenary Session
13.00 - 14.00 Lunch
14.00 - 15.40 Session: Particles
15.40 - 16.10 Coffee-Break
16.10 - 18.00 Session: Quantum and Classical Electrodynamics,
Gravity

Thursday, June 23, 09.30 – 18.00

09.30 - 11.10 Plenary Session
11.10 - 11.30 Coffee-Break
11.30 - 13.10 Plenary Session
13.10 - 14.00 Lunch
14.00 - 16.20 Session: Particles
16.20 - 16.40 Coffee-Break
16.40 - 18.00 Session: Mathematics and Fields

Friday, June 24, 09.30 – 19.00

09.30 - 11.00 Plenary Session
11.00 - 11.20 Coffee-Break
11.20 - 13.00 Session: Modelling and Safety Related Analyses of NPP
13.00 - 14.00 Lunch
14.00 - 15.40 Session: Particles
15.40 - 16.00 Coffee-Break
16.00 - 18.00 On-line Session
18.00 - 18.55 Session: Posters
18.55 - 19.00 Final Discussion: Problems, Perspectives, Philosophy
19.00 – Closing

Tuesday, June 21, 09.00-16.00

9.00 – 10.00 Registration

10.00 - Opening 5 min

Korbut T.N., Shaparau V.A.

10.05 - 11.05 Plenary Session

Chairman: Korbut T.N.

1. **Kokoulina E.S.** et al. (JINR, Dubna, Russia) “MiniSPD stand for testing Si-detectors” (30 min)
2. **Alexander Shalyt-Margolin** (Research Institute for Nuclear Problems, BSU, Minsk) “The Quantum Primordial Black Holes and Some Cosmological Parameters” (30 min)

11.05 - 11.30 Coffee-Break

11.30 - 13.00 Plenary Session

Chairman: Krylov G.G.

1. **Kokoulina E.S.**, N. Barlykov, V. Dudin, V. Dunin, , A. Kutov, V. Nikitin, S. Sinelschikova (JINR, Dubna, Russia) “Study of soft photons at SPD/NICA setup” (30 min)
2. **Kurilkina S.N.**, V. Belyi, N. Petrov, A. Zimin (Institute of Physics, NASB, Minsk, Belarus) “Special Nonexponentially Decaying Localized and Nonlocalized Inhomogeneous Waves at the Boundary of a Hyperbolic Metamaterial” (30 min)
3. **Buymistriuk G.Ya.** (Санкт-Петербургский филиал Технической Академии Росатома, Санкт-Петербург, Россия) “Nonlinear processes of degradation of structural elements of nuclear power facilities and their aging management based on intelligent sensors nets and neural network technologies” (30 min)

13.00 - 14.00 Lunch

14.00 - 16.00 Session: Medicine, Biological and Chemical systems

Chairman: Kuvshinov A.V.

1. **Voitikova M.V.** (Institute of Physics, NASB, Minsk, Belarus) “Nonlinear dynamic analysis of arterial blood pressure time series” (30 min)
2. **Kuvshinov A.V.** (Belarusian State Medical University, Minsk, Belarus) “Modern technologies in dentistry: the main directions of development and the results of our scientific research” (30 min)
3. **Korenkova O.B.**, A.V. Radkevich, N.I. Voronik (Joint Institute for Power and Nuclear Research – Sosny, Minsk, Belarus) “Study of the species of ruthenium radionuclides in aqueous solutions in the presence of boric acid and iron (III) hydroxoforms” (30 min)
4. **Shaparava E.A.** (Joint Institute for Power and Nuclear Research – Sosny, Minsk, Belarus) “Свойства поверхности оксидных материалов на основе хрома(III) и цинка(II), полученных соосаждением из растворов” (30 min)

Wednesday, June 22, 09.30-18.00

09.30 - 11.00 Plenary Session

Chairman: Shaparau V.A.

1. **H. V. Grushevskaya** and G. G. Krylov (Belarusian State University, Minsk, Belarus) “Simulation of graphene magnetoresistance in high-intensity magnetic fields” (40 min)
2. **Кабанов В.В.**, Негриенко А.О. (Институт физики НАН Беларуси, Минск) “Высокоэффективное воспроизведение объектного лазерного пучка методом адаптивно-цифровой голографии” (50 min)

11.00 - 11.30 Coffee-Break

11.30 - 13.00 Plenary Session

Chairman: Kokoulina E.S.

1. **Red'kov V.M.**, A.V. Ivashkevich, O.A. Semenyuk, E.M. Ovsyuk, A.V. Bury, V.V. Kisel (Institute of Physics, NASB, Minsk, Belarus) “Spin 2 particle, cylindric symmetry, projective operator method, external magnetic field” (30 min)
2. **Galynskii M.V.** (Joint Institute for Power and Nuclear Research – Sosny, Minsk, Belarus) “Polarization effects in elastic electron-proton scattering” (30 min)
3. **Boyarkin O.M.**, G.G. Boyarkina, V.V. Makhnatch (International Sakharov Environmental Institute of Belarusian State University, Minsk, Belarus) “The $(g-2)_\mu$ anomaly within the left-right symmetric model” (30 min)

13.00 - 14.00 Lunch

14.00 - 15.40 Session: Particles

Chairman: Galynskii M.V.

1. **Chernichenko Yu.D.** (Gomel State Technical University, Belarus) “Semiclassical Quantization Condition of the energy levels for the Relativistic System of Two Fermions with Arbitrary Masses” (25 min)
2. **Lashkevich V.I.**, O.P. Solovtsova, O.V. Teryaev (Gomel State Technical University, Belarus) “Analytical results for the contributions of 4-bubble diagrams to the anomalous magnetic moment of leptons” (25 min)
3. **Haurysh V.Yu.**, V. V. Andreev (Gomel State Technical University, Belarus) “Semileptonic decay of mesons in point form of Poincare-invariant quantum mechanics” (25 min)
4. **Sergeenko M.N.** “Mesons in Relativistic Quantum Mechanics With Constraints” (25 min)

15.40 - 16.10 Coffee-Break

16.10 - 18.00 Session: Quantum and Classical Electrodynamics, Gravity

Chairman: Gorbatshevich A.K.

1. **V.A. Savva**, S. Banjak (Belarus State Technological University, Minsk, Belarus) “Discrete spectral method reveals both complex periodical and non-periodical level population dynamics of micro-particles in semi-classical Rabi problem” (30 min)
2. **A.V. Baran**, V.V. Kudryashov (Institute of Physics, NASB, Minsk, Belarus) “Influence of magnetic field on electron states in circular quantum dot in the presence of Rashba and Dresselhaus spin-orbit interactions of equal strengths” (3 min)
3. **Комаров С. О.**, Горбацевич А. К., Верещагин Г.В., Гаркун А.С. (Белорусский государственный университет) “Электромагнитное поле точечного заряда, находящегося вблизи черной дыры” (25 min)
4. **Горбацевич А.К.**, Князева А.Г., Романовская В.Д. (БГУ, Минск) “Одноэлектронный атом в окрестности кротовой норы” (25 min)

Thursday, June 23, 09.30-18.00

09.30 - 11.10 Plenary Session

Chairman: Trifonov A.G.

1. Чижик С.А. (ИТМО НАНБ), **Хейфец М.Л.**, Венгринович В.Л., Винтов Д.А. (ИПФ НАНБ), Эм В.Т., Карпов И.В. (ПИЯФ-НИЦ Курчатовский институт) “Определение напряженно-деформированного состояния металла зондовым наноиндентированием и дифракцией нейтронов” (25 min)
2. Гаркун А.С., Дайнеко А.Е.(БНТУ), **Хейфец М.Л.**, Якутович Е.Н. (ИПФ НАНБ), Шолоник В.Е., Гориченко С.Ф. (УП Мингаз) “Оптимизация структуры и повышение эффективности управления интегрированной системой менеджмента предприятия” (25 min)
3. **Alexander I. Melker**, Maria A. Krupina, Aleksandra N. Matvienko (St. Petersburg Academy of Sciences on Strength Problems, St. Petersburg, Russian Federation) “Nucleation and growth of fullerenes and nanotubes having five-fold t-symmetry” (25 min)
4. **Alexander I. Melker** (St. Petersburg Academy of Sciences on Strength Problems, St. Petersburg, Russian Federation) “Nuclear geometry: from potassium to titanium” (25 min)

11.10 - 11.30 Coffee-Break

11.30 - 13.10 Plenary Session

Chairman: Trifonov A.G.

1. **George Krylov** and Halina Grushevskaya (Belarus State University, Minsk, Belarus) “Anomalous contributions to electric conductivity stipulated by non-trivial topology of the charge carriers in quasi-relativistic graphene model” (25 min)
2. **Zhemzhurov M.L.**, Kuzmina N.D. (Joint Institute for Power and Nuclear Research – Sosny, Minsk, Belarus) “On the disposal of very low-level, low-level and short-lived intermediate-level radioactive waste of the Belarusian NPP” (25 min)

3. **Anishchenko S.**, Baryshevsky V., Gurinovich A. (Research Institute for Nuclear Problems, BSU, Minsk) “Phase diffusion in high-power microwave sources” (25 min)
4. **Макаров Д.В.** (ТОИ ДВО РАН, Владивосток, Россия) “Finite-time Stability in Randomly Driven Classical and Quantum Systems” (25 min)

13.10 - 14.00 Lunch

14.00 - 16.20 Particles

Chairman: Shaparau V.A.

1. **Shaparau V.A.** (Joint Institute for Power and Nuclear Research – Sosny, Minsk, Belarus) “Squeezing and Entanglement effects in QCD Jet Ring” (20 min)
2. **Shaikovskaya N.D.** (Institute of Physics, NASB, Minsk, Belarus) “Free motion of a quantum particle in the Gaussian space” (20 min)
3. **Avakyan S.L.**, E.Z. Avakyan (Sukhoi State Technical University of Gomel, Belarus) “Hardronic Interactions of Strange Mesons” (20 min)
4. **Avakyan E.Z.**, S.L. Avakyan (Sukhoi State Technical University of Gomel, Belarus) “The Role of Intermediate Scalar States in the Description of Pseudoscalar Meson Scattering Processes” (20 min)
5. **Rusak Y.A.**, L.F. Babichev (Joint Institute for Power and Nuclear Research – Sosny, Minsk, Belarus) “Analysis of observables obtained in the simulation of heavy ion collisions using various parton energy loss models” (20 min)
6. **Nevmerzhitsky M.N.**, E.S. Kokoulina, M.I. Levchuk, R.G. Shulyakovsky (Institute of Applied Physics, Minsk, Belarus) “On the observables of the reaction $\gamma d \rightarrow \pi NN$ in the threshold energy region” (20 min)
7. **Manko A.Yu.**, R.G. Shulyakovsky (Institute of Physics, NASB, Minsk, Belarus) “Lepton pair production at LHC by using of two-boson mechanism” (20 min)

16.20 - 16.40 Coffee-Break

16.40 - 18.00 Session: Mathematics and Fields

Chairman: Krylov G.G.

1. **P.P. Andrusevich** (Brest State College of Communications)
“Dirac Like Equations and Generalized Majorana Fields, Symmetry Aspects” (20 min)
2. **N.G. Krylova** (Belarusian State Agrarian Technical University, Minsk, Belarus) “Geometrization of the quantum-mechanical problem for Dirac particle in the Newman-Unti-Tamburino space-time” (20 min)
3. **A. Shaplov** (Institute of Applied Physics, Minsk, Belarus)
“Investigation of the Exact Static Spherically Symmetric Solution in the term of 5 Dimensional Projective Unified Field Theory (PUFT)” (20 min)
4. Alexander D. Egorov, **Anatoly Zherelo** (Belarusian State University, Minsk, Belarus) “Linear Skorokhod SDE and Approximations of its Expectations” (20 min)

Friday, June 24, 09.30-19.00

09.30 - 11.00 Plenary Session

Chairman: Trifonov A.G.

1. **Svetlana N. Sytova** (Research Institute for Nuclear Problems, BSU, Minsk) “Nuclear knowledge management system in the Republic of Belarus” (30 min)
2. **Yafimava Nadzeva** (Belarusian State University, Minsk, Belarus) “Sociological Research of Internet” (30 min)

10.30 - 11.00 Coffee-Break

11.00 - 13.00 Session: Modelling and Safety Related Analyses of NPP

Chairman: Trifonov A.G.

1. **E. Mikhalychева**, K. Artemyeva (Joint Institute for Power and Nuclear Research – Sosny, Minsk, Belarus) “Probabilistic Safety Analysis of the Large LOCA Accident in the VVER Reactor Plant” (20 min)
2. **N. Harbachova**, N. Kulich, N. Kuzmina, S. Yatsko, J. Korchova (Joint Institute for Power and Nuclear Research – Sosny, Minsk, Belarus) “Informational Approach to Identification of the Probabilistic Distribution Function of the Sample of Radionuclide Concentrations Measurements in Radioactive Waste Characterization Practice” (20 min)
3. **I. Rudziankou**, L.Babichev (Joint Institute for Power and Nuclear Research – Sosny, Minsk, Belarus) “Isotopic Composition of the Core and Antineutrino Production in the VVER-1200 Reactor” (20 min)
4. **V.I. Orlovskaya**, A.G. Trifonov, A.V. Pestsova (Joint Institute for Power and Nuclear Research – Sosny, Minsk, Belarus) “Assessment of wet precipitation of radioactive aerosol at the NPP industrial site” (20 min)

5. **Moroz I.O.**, Trifonov A.G. (Joint Institute for Power and Nuclear Research – Sosny, Minsk, Belarus) “Modeling of multicomponent flows of gases and radioactive aerosols in separate rooms of the containment” (20 min)

13.00 - 14.00 Lunch

14.00 - 15.40 Session: Particles

Chairman: Krylov G.G.

1. **Ivashkevich A.V.** (Institute of Physics, NASB, Minsk, Belarus) “Spin 1 particle with electric quadruple moment in external electric field, solutions with cylindric symmetry” (20 min)
2. **Buryy A.V.**, Ivashkevich A.V., Semenyuk O.A. (Institute of Physics, NASB, Minsk, Belarus) “Spin 1 particle in external magnetic field and projective operators” (20 min)
3. **Semenyuk O.A.**, Buryy A.V., Ivashkevich A.V. (Brest State University) “Massless spin 1 particle in cylindrical coordinates, exact solutions (20 min)
4. **E.M. Ovsyuk**, A.P. Safronov, A.V. Ivashkevich, O.A. Semenyuk (Mozyr State Pedagogical University) “Stuckelberg particle in the external uniform magnetic field, and the method of projective operators” (20 min)

15.40 - 16.00 Coffee-Break

16.00 - 18.00 On-line Session

Chairman: Redkov V.V.

1. **Alexander J. Silenko** (Research Institute for Nuclear Problems, BSU, Minsk) “Gravitational and inertial masses of moving particles” (25 min)
2. **Pankov A.A.**, I.A. Serenkova (JINR, Dubna, Russia) “Updated constraints on heavy resonances decaying into bosonic and leptonic final states at the LHC” (20 min)

3. **Sery A.I.** (Brest State A.S. Pushkin University, Brest, Belarus) “To the problem of the contribution of spin-polarized protons to Baryshevsky–Luboshits effect” (25 min)
4. **Kozhevnikova M.E.**, A.G. Oganessian, O.V. Teryaev and O.P. Solovtsova (Joint Institute for Nuclear Research, Dubna, Russia) “Nonperturbative corrections and hypothesis of vacuum dominance” (25 min)
5. **Slobodov A.A.**, Ivanova A.N. (ITMO University; Institute of Technology, St. Petersburg, Russia) “Possibilities and Problems of Mathematical Modeling of Physico-Chemical Processes in Water Coolant of Nuclear Power Plants” (25 min)
7. **Y.A. Rusak**, L.F. Babichev (Joint Institute for Power and Nuclear Research – Sosny, Minsk, Belarus) “Analysis of conserved quantities fluctuations using different hydrodynamic and transport models”
8. A. Kotlorz, **D. Kotlorz** and O.V. Teryaev (JINR, Dubna, Russia) “Evaluation of the Gottfried sum and antimatter asymmetry in the proton incorporating the most recent Drell-Yan data from the Fermilab SeaQuest/E906 experiment”
9. **I. Rudziankou**, L.Babichev (Joint Institute for Power and Nuclear Research – Sosny, Minsk, Belarus) “DYN3D IWQS = 24 library generation using Serpent for VVER”
10. **A.A. Tishchenko**, A.G. Trifonov (Joint Institute for Power and Nuclear Research – Sosny, Minsk, Belarus) “Assessment of conditions of steam-gas explosions occurrence in NPP reactor installations based on deterministic approach”

18.00 - 18.55 Session: Posters

Chairman: Shaparau V.A.

1. **Ivashkevich A.V.** (Institute of Physics, NASB, Minsk, Belarus) “Spin 1 particle with anomalous magnetic and quadruple electric moments in presence of external uniform electric field”
2. **Buryy A.V.**, Ivashkevich A.V. (Institute of Physics, NASB, Minsk, Belarus) “Exact solutions of the equation for a massless vector particle in spherical coordinates; the gauge symmetry for the spin 2 field”
3. E.S. Timoshin, **S.I. Timoshin** (Gomel State Technical University) “The polarization of the valence quarks and strange sea in neutrino experiments off polarized deuterons”
4. L.P. Kaptari, **V.I. Lashkevich**, O.P. Solovtsova (Gomel State Technical University) “The Mellin-Barnes technique and exact form of the three bubble-diagram contributions to the lepton anomaly”
5. **Yu.D. Chernichenko**, L. P. Kaptari (Gomel State Technical University) “Decay Widths for the Composite System of Two Spin Particles with Equal Maseses in the Relativistic Quasipotential Approach”
6. **С.Н. Довыденко** (Белорусский государственный университет) “Влияние структурных характеристик метаповерхности на ее оптические свойства”
11. Yu.A. Kurochkin and **V.S. Otchik** (University of Civil Protection, Minsk, Belarus) “On the resonances widths in the Stark effect in hydrogen”
12. **Pushkarchuk A.L.**, S.Ya. Kilin, A. P. Nizovtsev, S. A. Kuten, V.A. Pushkarchuk, Dominik Ludewig Michels, Dmitry Lyakhov (Institute of Physical Organic Chemistry, NASB, Minsk, Belarus) "Structural, electronic and spin properties of two NV centers in nanodiamond: quantum chemical simulation"
13. **Pushkarchuk A.L.**, T.V. Bezyazychnaya, V.I. Potkin, E.A. Dikusar, A.G. Soldatov, S.Ya. Kilin, A. P. Nizovtsev, S.A. Kuten, V.A. Pushkarchuk, Dominik Ludewig Michels, Dmitry Lyakhov, V.A. Kulchitsky (Institute of Physical Organic Chemistry, NASB, Minsk, Belarus) "DFT Simulation of geometry and electronic structure of fulleranol - carboplatin conjugate as agent of cancer therapy"
14. **В.А. Шапоров**, Е.А. Шапорова (Объединенный институт энергетических и ядерных исследований – Сосны НАН Беларуси) «Моделирование стационарных состояний теплоносителя в первом контуре ВВЭР-1200 энергоблока № 1 Белорусской АЭС с помощью кода ATHLET»

15. N.V. Maygula, P.D. Serowa, I.A. Kovalew, **D.W. Serow** (State Institute of Economics, Finance, Law and Technology, St. Petersburg, Russian Federation) “On Measuring Birkhoff Curves”
16. Гурко О.Б., Казазян В.Т., **Козел М.А.** (Объединенный институт энергетических и ядерных исследований – Сосны НАН Беларуси) «Основы нормативного регулирования физической защиты в Беларуси»

18.55 - 19.00 Final Discussion: Problems, Perspectives, Philosophy
Chairman: Trifonov A.G.

19.00 Closing