



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

MAY 18 – 21, 2021

XXVIII International Seminar

in memory of Prof. V.I. Kuvshinov

Program

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

Minsk, 2021

Tuesday, May 18, 09.00-18.10

9.00 - 10.00 Registration
10.00 - 10.05 Opening
10.05 - 11.00 Session in memory of Prof. V.I. Kuvshinov
11.00 - 11.30 Coffee-Break
11.30 - 13.00 Plenary Session
13.00 - 14.00 Lunch
14.00 - 16.10 Session: Particles
16.10 - 16.30 Coffee-Break
16.30 - 18.10 Session: Particles

Wednesday, May 19, 09.30 – 18.20

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 - 16.00 Session: Quantum and Classical Electrodynamics,
Gravity
16.00 - 16.20 Coffee-Break
16.20 - 18.20 Session: Mathematics and Fields

Thursday, May 20, 10.00 – 18.10

10.00 - 11.00 Plenary Session
11.00 - 11.30 Coffee-Break
11.30 - 13.00 Plenary Session
12.30 - 14.00 Lunch
14.00 - 16.00 Session: Medicine, biological and chemical systems
16.00 - 16.30 Coffee-Break
16.30 - 18.10 Session: Modelling and Safety Related Analyses of NPP

Friday, May 21, 09.30 – 19.00

09.30 - 11.00 Session: Media
11.00 - 11.30 Coffee-Break
11.30 - 13.00 Session: Media
13.00 - 14.00 Lunch
14.00 - 15.30 Session: Particles
15.30 - 16.00 Coffee-Break
16.00 - 18.00 Session: Particles
18.00 - 18.40 Session: Posters
18.40 - 19.00 Final Discussion: Problems, Perspectives, Philosophy
19.00 – Closing

Tuesday, May 18, 09.00-18.10

9.00 – 10.00 Registration

10.00 - Opening 5 min

Kuzmin A.V., Trifonov A.G.

10.05 - 11.00 Session in memory of Prof. V.I. Kuvshinov

Андрей Кувшинов «Профессор Вячеслав Иванович Кувшинов: страницы биографии, источники вдохновения, мировоззрение и творческий путь»

11.00 - 11.30 Coffee-Break

11.30 - 13.00 Plenary Session

Chairman: Trifonov A.G.

1. E.S. Kokouline, A.Ya. Kutov (Joint Institute for Nuclear Research, Dubna, Russia)
“Collective behaviour of secondary particles in the region of high multiplicity at pp interactions at 50 GeV/s” (30 min)
2. М.Л. Хейфец (Institute of Applied Physics, NASB, Minsk, Belarus), А.Г. Колмаков (РФ), С.А. Клименко (Украина) и др.
“Мультифрактальное и вейвлет-описание комплекса структур материалов и поверхностей” (30 min)
3. A.E. Shalyt-Margolin (Research Institute for Nuclear Problems, BSU, Minsk, Belarus)
“The Black Holes Thermodynamics and UVD problem in QFT” (30 min)

13.00 - 14.00 Lunch

14.00 - 16.10 Session: Particles

Chairman: Galynskii M.V.

1. V.A. Zykunov (Joint Institute for Nuclear Research, Dubna, Russia) “Effects of radiative corrections in the Drell-Yan process at ultra-high invariant mass of dilepton” (30 min)
2. R. Shulyakovsky, M. Nevmerzhitsky, A. Garkun (Institute of Applied Physics, NASB, Minsk, Belarus), A. Manko, E. Kokouline, D. Shohanov, and M. Levchuk
“Correlation characteristics of hadron spectrum in the instanton-induced processes” (30 min)
3. А.В. Афанасьев, А.Н. Ильичев (Research Institute for Nuclear Problems, BSU, Minsk, Belarus)
“Моделирование радиационных эффектов в упругом (анти)лептон-протонном рассеянии” (30 min)
4. M.P. Buhayuskaya (Research Institute for Nuclear Problems, BSU, Minsk, Belarus), V.A. Zykunov
“Precision study of the Drell-Yan process observables in Run 3 at the CMS LHC” (20 min)
5. E.S. Kokouline, M.I. Levchuk, M.N. Nevmerzhitsky, R.G. Shulyakovsky (Institute of Applied Physics, NASB, Minsk, Belarus)
“On tensor analyzing power component T_{20} in the reaction $\gamma d \rightarrow \pi^0 d$ ” (20 min)

16.10 - 16.30 Coffee-Break

16.30-18.10 Session: Particles

Chairman: Shulyakovsky R.G.

1. D.V. Sinegribov, V.R. Kurylenka (Gomel State University, Gomel, Belarus), A.A. Pankov “Model and model-independent analysis of the effects of new heavy gauge bosons at high energy electron-positron colliders” (20 min)
2. A.A. Sadouski, A.A. Babich, A.A. Pankov (Gomel State Technical University, Gomel, Belarus) “Energy behaviour of physical observables in the muon pair production at high energy electron-positron collider” (20 min)
3. I.A. Shershan, T.V. Shishkina (Belarus State University, Minsk, Belarus) “Bremsstrahlung calculations of single gauge boson production on linear colliders in context of “new physics” searching” (20 min)
4. Y.A. Rusak, L.F. Babichev (Joint Institute for Power and Nuclear Research – Sosny, NASB, Minsk, Belarus) “Monte-Carlo simulation of hot and dense matter in heavy ion collisions using partonic model” (20 min)
5. A.Yu. Manko (Institute of Physics, NASB, Minsk, Belarus), R.G. Shulyakovsky “The production quarks and gluons at LHC by instanton mechanism” (20 min)

Wednesday, May 19, 09.30-18.20

09.30 - 11.00 Plenary Session

Chairman: Trifonov A.G.

1. T.H. Корбут (Joint Institute for Power and Nuclear Research – Sosny, NASB, Minsk, Belarus) «Развитие культуры ядерной безопасности в Республике Беларусь» (30 min)
2. S.N. Sytova, A.P. Dunets, A.N. Kavalenka, S.V. Charapitsa (Institute for Nuclear Problems, Belarusian State University, Belarus) “Original belarusian information system for regulatory authority in the field of nuclear and radiation safety under the IAEA supervision” (30 min)
3. N. Harbachova, N. Kuzmina, N. Kulich, S. Yatsko, J. Korcheva (Joint Institute for Power and Nuclear Research – Sosny, NASB, Minsk, Belarus) “Natural and Climatic Factor Impact Assessment on the Aquifers Protection During the Disposal of Radioactive Waste in the Host Geological Environment” (30 min)

11.00 - 11.30 Coffee-Break

11.30 - 13.00 Plenary Session

Chairman: Galynskii M.V.

1. Halina Grushevskaya and George Krylov (Belarus State University, Minsk, Belarus) “Effects of topological non-triviality of charge carriers in polarization of graphene” (30 min)
2. S. Kurilkina, V. Belyi, N. Kazak (Institute of Physics, NASB, Minsk, Belarus) “Surface waves in azimuthally symmetric metasurfaces” (30 min)
3. N.V. Efimova (Belarus State University, Minsk, Belarus) “Internet Studies: the main ideas and trends” (30 min)

13.00 - 14.00 Lunch

14.00 - 16.00 Session: Quantum and Classical Electrodynamics, Gravity

Chairman: Redkov V.M.

1. V.A. Savva, S. Banjak (Belarus State Technological University, Minsk, Belarus) “Laser coherent excitation of quantum systems with non-uniform Fourier space” (20 min)
2. Yu.A. Kurochkin and V.S. Otchik (University of Civil Protection, Minsk, Belarus) “On the pseudocrossings in the problem of two Coulomb centers” (20 min)
3. A.S. Garkun (Institute of Applied Physics, NASB, Minsk, Belarus), V.I.Kudin and A.V.Minkevich “Exact spherically-symmetric solution in Poincare gauge theory of gravity” (20 min)
4. Stanislav Komarov, Alexander Gorbatsievich (Belarus State University, Minsk, Belarus) “On the reconstruction of a star motion in the equatorial plane of rotating black hole from the redshift of the electromagnetic spectrum” (20 min)
5. A.O. Shaplov (Institute of Applied Physics, NASB, Minsk, Belarus) “Equations of motion of an arbitrary rigid body in an external gravitational field in the framework of 5-dimensional Projective Unified Field Theory” (20 min)
6. V.V. Kudryashov and A.V. Baran (Institute of Physics, NASB, Minsk, Belarus) “Influence of Rashba and Dresselhaus spin-orbit interactions of equal strengths on electron states in circular quantum dot” (20 min)

16.00 - 16.20 Coffee-Break

16.20 - 18.20 Session: Mathematics and Fields

Chairman: Krylov G.G.

1. N.G. Krylova (Belarusian State Agrarian Technical University, Minsk, Belarus), V. Balan, V.M. Red'kov "Bogomolny - Prasad - Zommerfeld monopole in spaces of constant curvature: Kosambi - Cartan - Chern geometrical approach" (20 min)
2. A.V. Ivashkevich, E. M. Ovsiyuk, V.M. Red'kov (Institute of Physics, NASB, Minsk, Belarus) "Massless spin 3/2 field, spherical solutions, eliminating the gauge degrees of freedom" (20 min)
3. A.V. Ivashkevich (Institute of Physics, NASB, Minsk, Belarus) "On eliminating the gauge degrees of freedom in the theory of massless spin 3/2 field, the plane wave solutions" (20 min)
4. A.V. Ivashkevich, O.A. Vasiluyk, V.V. Kisel, V.M. Red'kov (Institute of Physics, NASB, Minsk, Belarus) "Spin 3/2 particle: the Fradkin theory, non-relativistic approximation" (20 min)
5. A. Zherelo, V. Obolonkin (Belarus State University, Minsk, Belarus) "On one well-known model" (20 min)
6. Praskovya D. Serowa, Natalya V. Maygula, Ivan A. Kovalew & Dmitry W. Serow (State Institute of Economy Finance Law and Technology, Gatchina, Russia) "On the Vortex Streets Topological Classification and Colourings" (20 min)

Thursday, May 20, 10.00-18.10

10.00 - 11.00 Plenary Session

Chairman: Kokoulina E.S.

1. V.I. Lashkevich, O.P. Solovtsova (Gomel State Technical University, Gomel, Belarus), O.V. Teryaev “Estimations of the hadronic contribution to the anomalous magnetic moments of leptons using the analytic approach” (30 min)
2. M.V. Galynskii (Joint Institute for Power and Nuclear Research – Sosny, NASB, Minsk, Belarus) “Criterion for assessing the reliability of measurements of the Sachs form factors ratio using the Rosenbluth technique” (30 min)

11.00 - 11.30 Coffee-Break

11.30 - 12.30 Plenary Session

Chairman: Trifonov A.G.

1. George Krylov and Halina Grushevskaya (Belarus State University, Minsk, Belarus) “On resonant scattering states in graphene circular quantum dots” (30 min)
2. Dmitry Martyanov, Efrem Soukhovitskii (Joint Institute for Power and Nuclear Research – Sosny, NASB, Minsk, Belarus), Roberto Capote, Jose Quesada, and Satoshi Chiba “Recent development of a phenomenological coupled channel optical model for heavy deformed nuclei” (30 min)

12.30 - 14.00 Lunch

14.00 - 16.00 Session: Medicine, biological and chemical systems

Chairman: Radkevich A.V.

1. A.V. Kuvshinov (Belarusian State Medical University, Minsk, Belarus) “Antimicrobial Photodynamic Therapy: Cellular Molecular Mechanisms and Prospects for Application in Dentistry” (20 min)
2. Margarita Voitikova (Institute of Physics, NASB, Minsk, Belarus) “Sleep apnea identification using single-lead ECG features” (20 min)
3. Elena A. Shaparava (Joint Institute for Power and Nuclear Research – Sosny, NASB, Minsk, Belarus) “Reaction dynamics of hydrolytic cationic forms of Chromium (III) and Zinc (II)” (20 min)
4. E.E. Venhlinkaya, T.L. Shubarova, V.V. Toropova, V.V. Saskovets (Joint Institute for Power and Nuclear Research – Sosny, NASB, Minsk, Belarus) “The efficiency of cesium, strontium and cobalt radionuclides sorption from LRW-simulating aqueous solutions by thermally destructed oil-shale” (20 min)
5. O.B. Korenkova, A.V. Radkevich; N.I. Voronik (Joint Institute for Power and Nuclear Research – Sosny, NASB, Minsk, Belarus) “Determination of the species of the ruthenium radionuclides in aqueous solutions in a wide pH range” (20 min)
6. A.Н. Иванова, А.А. Слободов, В.Г. Крицкий, А.В. Гаврилов (ИТМО University, Russia) “Определение связи pH водной среды в условиях аварии АЭС с ВВЭР при потере теплоносителя с составом термодинамическими методами” (20 min)

16.00 - 16.30 Coffee-Break

16.30 - 18.10 Session: Session: Modelling and Safety Related Analyses of NPP

Chairman: Trifonov A.G.

1. A.G. Lukashevich, D.A. Bortnik, E.G. Vashetko, V.V. Gilewsky (Joint Institute for Power and Nuclear Research – Sosny, NASB, Minsk, Belarus) “Comparative analysis of severe accidents (small- and large-break loss-of-coolant accident) for a VVER-1200 reactor” (20 min)
2. E. Mikhalycheva (Joint Institute for Power and Nuclear Research – Sosny, NASB, Minsk, Belarus) “Probability safety assessment of spent fuel pool cooling system taking into account internal events and internal hazards” (20 min)
3. V.I. Orlovskaya, A. G. Trifonov (Joint Institute for Power and Nuclear Research – Sosny, NASB, Minsk, Belarus) “Analysis of turbulent dispersion of radioactive aerosols taking into account the infrastructure of NPP industrial site” (20 min)
4. I.V. Rudziankou and L.F. Babichev (Joint Institute for Power and Nuclear Research – Sosny, NASB, Minsk, Belarus) “Estimation of the fluence on the vessel and near-vessel space of a VVER reactor using the Serpent” (20 min)
5. I.O. Zhuraukova, A.G. Trifonov (Joint Institute for Power and Nuclear Research – Sosny, NASB, Minsk, Belarus) “Analysis of gas dynamics for multicomponent jets in closed volumes” (20 min)

Friday, May 21, 09.30-19.00

09.30 - 11.00 Session: Media

Chairman: Krylov G.G.

1. H.V. Krylova, A.I. Timoshchenko, E.A. Avdanina, I.V. Lipnevich (Belarus State University, Minsk, Belarus) “Gamma-ray scattering in a MWCNT bilayer” (30 min)
2. Ivan Siutsou, Aksana Kurhuzava (Institute of Physics, NASB, Minsk, Belarus) “Instantaneous and time-integrated spectra of photon-thin gamma-ray bursts with non-trivial distribution of internal energy in diffusion approximation” (20 min)
3. H.V. Grushevskaya, V.P. Egorova, N.G. Krylova, I.V. Lipnevich, E.V. Vaskovtsev (Belarus State University, Minsk, Belarus) “High-performance genotyping based on effects of shielding and low-temperature enhancement of light scattering by DNA/carbon nanotube complexes” (20 min)
4. Iliia Maroz, Evgeny Gurnevich (Research Institute for Nuclear Problems, BSU, Minsk, Belarus) “Radiation of charge moving between two planar periodic wire structures obliquely to the axes of wires” (20 min)

11.00 - 11.30 Coffee-Break

11.30 - 13.00 Session: Media

Chairman: Krylov G.G.

1. Pavel Molchanov (Research Institute for Nuclear Problems, BSU, Minsk, Belarus) “Single frequency generation regime of an intense electron beam on electromagnetic modes of a photonic crystal with extended flat tops” (20 min)
2. S.V. Anishchenko and V.G. Baryshevsky (Research Institute for Nuclear Problems, BSU, Minsk, Belarus) “Synchronization of short-pulse radiation sources” (20 min)

3. S.V. Anishchenko, V.G. Baryshevsky, A.A. Gurinovich (Research Institute for Nuclear Problems, BSU, Minsk, Belarus) “Electrostatic cumulation for high energy density physics” (20 min)
4. A.V. Naumenko, S. Andrukhovich, V. Kabanov, Yu. Kurochkin, E. Saprunov, Dz. Shoukavy (Institute of Physics, NASB, Minsk, Belarus) “Submersible in situ NaI(Tl) gamma spectrometers: methods of passive and active temperature stabilization of spectra, temperature dependences of characteristics” (20 min)

13.00 - 14.00 Lunch

14.00 - 15.30 Session: Particles

Chairman: Shaparau V.A.

1. Valery Shaparau (Joint Institute for Power and Nuclear Research – Sosny, NASB, Minsk, Belarus) “The next stage of nonperturbative QCD jet evolution in time as a source of new gluon states” (30 min)
2. O.M. Boyarkin, G.G. Boyarkina (International Sakharov Environmental Institute, BSU, Minsk, Belarus), V.V. Makhnatch “Effects of neutrino charge radius on neutrino oscillations” (30 min)
3. Yu. A. Kurochkin, N. D. Shaikovskaya (Institute of Physics, NASB, Minsk, Belarus) “Lobachevsky geometry method in relativistic kinematics of particle collisions: a special frame of reference” (30 min)

15.30 - 16.020 Coffee-Break

16.00 - 18.00 Session: Particles

Chairman: Boyarkin O.M.

1. L.N. Smirnova (Lomonosov Moscow State University, Faculty of Physics, Moscow, Russia) “Совместное рождение тяжелых бозонов и фермионов в протонных взаимодействиях” (30 min)
2. A.I. Sery (Brest State A.S. Pushkin University, Brest, Belarus) “To the problem of the contribution of spin-polarized hadrons to Baryshevsky–Luboshits effect at low energies of photons” (30 min)
3. Alexander J. Silenko, Pengming Zhang, and Liping Zou (Research Institute for Nuclear Problems, BSU, Minsk, Belarus) “Comparative analysis of Dirac and Foldy-Wouthuysen representations” (30 min)
4. G.Y. Buymistriuk (The Technical Academy of Rosatom, SPb branch, Saint-Petersburg, Russia) “Embedded nerve-similar sensory networks with neural network processing and metrological self-checking function” (30 min)

18.00 - 18.40 Session: Posters

Chairman: Trifonov A.G.

1. L.P. Kaptari, O.P. Solovtsova, Yu.D. Chernichenko (Gomel State Technical University, Gomel, Belarus) “Spin effects in the Gamow-Sommerfeld-Sakharov factor”
2. E.M. Ovsiyuk (Mozyr State Pedagogical University, Mozyr, Belarus), A.P. Safronov, V.V. Kisel “P-nonsymmetrical particle with spin 1/2 and anomalous magnetic moment, general theory and solutions in presence of external magnetic field”
3. E.V. Ovsiyuk, A.D. Koral'kov (Mozyr State Pedagogical University, Mozyr, Belarus) “Hydrogen atom in spherical space, Dirac theory, exact solutions and energy spectrum”

4. N.G. Krylova (Belarusian State Agrarian Technical University, Minsk, Belarus), H.V. Grushevskaya, G.G. Krylov “Finsler-Lagrange modeling of domain structure in Langmuir monolayer at first order phase transition”
5. O.A. Vasiluyk (Brest State University, Brest, Minsk), V.V. Kisel, V.M. Red'kov “Spin 2 particle with anomalous magnetic moment in external electromagnetic and gravitational fields”
6. J. Korchova, N. Harbachova, N. Kulich, N. Kuzmina, S. Yatsko (Joint Institute for Power and Nuclear Research – Sosny, NASB, Minsk, Belarus) “Analysis of potential hazard of the spent nuclear fuel at the intermediate and long-term stages of the nuclear fuel cycle (NFC) of the Belarusian NPP”
7. V.Yu. Haurysh (Gomel State Technical University, Gomel, Belarus), V.V. Andreev “ $\pi^0 \rightarrow \gamma\gamma$ decay in point form of Poincare-invariant quantum mechanics” (20 min)

18.40 - 19.00 Final Discussion: Problems, Perspectives, Philosophy

Chairman: Trifonov A.G.

19.00 Closing