

I. General considerations

Having considered the JINR Director's proposal, the Scientific Council elected Sergei Kilin as Co-Chair of the Scientific Council for the period of three years starting from this session.

The Scientific Council welcomes its new members, Raghunath Sahoo (India) and Yuntao Song (China), elected by the JINR Committee of Plenipotentiaries in November 2024.

The Scientific Council takes note of the comprehensive report by the JINR Director, G. Trubnikov, covering the decisions of the latest session of the Committee of Plenipotentiaries of the Governments of the JINR Member States (15 November 2024), the results of the implementation of the Seven-Year Plan for the Development of JINR for 2024–2030, the progress in the realization of the projects included in the Topical Plan for 2024 as well as recent events in JINR's scientific activities and international cooperation.

The Scientific Council appreciates recent achievements of the Institute, such as:

- progress in preparation for the NICA collider commissioning, including the launch of a new cryogenic compressor station, installation of the liquid helium pipelines feeding the collider, ongoing assembly and tuning the complex elements, preparation of a detailed program for the physical launch of the complex in the summer of this year;

- successful cooling of the MPD solenoid down to the LHe temperature of 4.5 K, preparation of the MPD detector for the analysis of the first data sets in fixed-target mode;

- progress in the analysis of Xe+Csl experimental data at an energy of 3.8 A GeV recorded by the BM@N experiment;

- development of the ARIADNA collaboration and its research programme, the launch of several channels for applied research, successful operation of the SOCHI chip irradiation station;

- progress in the development of the Baikal-GVD deep-water neutrino telescope in accordance with the Seven-year plan for the development of the JINR, as well as the installation of additional two clusters planned by the collaboration during the 2025 campaign;

- successful participation in the most advanced neutrino experiments, including experiments with reactor neutrinos (JUNO), neutrinos from accelerators (NOvA, T2K), search for neutrinoless double beta decay (LEGEND), and in particular results of the first

joint analysis carried out by the NOvA and T2K collaborations, which allow the enhancement of the sensitivity to three-flavor oscillation parameters they measure;

- efficient work of the JINR group in the COMET experiment at J-PARC (Japan);

- contribution of the Institute in the work of CERN collaborations at the LHC on the second phase of upgrading the ATLAS, CMS, and ALICE detectors, as well as obtaining new results in the CERN-SPS experiments;

- launch of the Institute’s new basic facility LINAC-800 in commissioning mode with an electron energy of up to 200 MeV;

- continuous preparation of experiments on the synthesis of new elements 119 and 120 of the Periodic Table: for this purpose, experiments on the synthesis of element 116 were performed at the SHE Factory using beams of ^{50}Ti and ^{54}Cr ;

- work is underway to prepare for certification of the SHE Factory experimental halls for the first class of radiation safety;

- preparation of an experiment on the spectroscopy of isotopes of element 114 formed in the reaction $^{48}\text{Ca} + ^{242}\text{Pu}$ using a new large-diameter target unit (480 mm) with expected detection of several dozen events of element 114 formation in coincidence with gamma-quanta;

- progress in the commissioning work and testing of primary and secondary beam regimes at the upgraded U-400M accelerator;

- performed test experiments at the ACCULINNA-2 fragment separator, full-scale launch of the experimental programme in the field of studying light nuclei at the boundaries of nucleon stability expected in the second half of 2025;

- final stage of construction work in the premises of the new DC-140 accelerator complex for applied research on heavy-ion beams, and the planned assembly and launch of the cyclotron in 2025;

- progress in the construction of a new experimental building of the U-400R accelerator complex: completion of concrete work and start of installation of engineering systems of the building with planned completion of the construction in 2026, as well as the design of new experimental facilities for the U-400R accelerator in parallel;

- co-organization of two important international conferences on low-energy nuclear physics: the conference “50 Years of Cold Fusion” in Yerevan (Armenia) in November 2024, and “The 2nd International African Symposium on Exotic Nuclei” in Cape Town (South Africa) in December 2024;

- successful completion of repair work at IBR-2 and obtaining an authorization for resuming the operation of the reactor. The restart of the reactor operation with a gradual

increase in power and first experiments are planned for 17 February 2025, spring operation cycles will be carried out for researchers from JINR on the basis of rapid-access beamtime requests;

- further progress in developing a mathematical model of pulsed fast reactor dynamics as an essential work for the stable and reliable operation of IBR-2 and the development of the new advanced neutron source at JINR;

- modernization and enhancement of the components of the JINR Multifunctional Information and Computing Complex: performance of the hyperconverged “Govorun” supercomputer, distributed computing and data storage systems based on Grid technologies and Cloud computing;

- leading position of the Tier1 Grid site for the CMS experiment at the LHC among seven similar sites worldwide, data processing provided by Tier2/CICC for the experiments at the LHC, NICA and other large-scale experiments, as well as its support for users from the JINR Laboratories and the JINR Member States;

- elaboration and enhancement of mathematical methods and software for modeling physical processes and experimental facilities, processing and analyzing data from the BM@N, MPD and SPD projects at the NICA complex, the CMS and ATLAS projects at the LHC, and the projects of the JINR neutrino programme (Baikal-GVD, JUNO, NOvA);

- continued development of the JINR Digital EcoSystem: commissioning PIN-2 in trial mode, trials of the repository of publications of JINR staff members, the development and launch of collaboration services (calendar, document management), creation of a data-bus prototype;

- high publication activity and new important results in the field of theoretical and mathematical physics, nuclear physics, particle physics and relativistic heavy-ion physics, materials science and solid-state physics, including those oriented towards the JINR experimental programmes;

- new results in medical radiobiology obtained in the Laboratory of Radiation Biology: investigation of molecular mechanisms of action of new classes of drugs and their combinations to increase the efficiency of tumor radiation therapy, as well as influence of X-ray irradiation on the rat brain;

- start of collecting applications following the JINR Director’s initiative to organize a programme for the support of inter-laboratory innovative projects;

- scientific and educational activities of the JINR University Centre and the JINR laboratories, aimed, in particular, at increasing the motivation of physics teachers and talented students of high schools in the JINR Member States;
- work of the JINR Dissertation Councils in improving the qualifications of researchers from the Institute and organizations in the Member States;
- successful implementation of the JINR Postdoctoral and Fellowship programmes;
- publication of the first issue of the new JINR scientific journal “Natural Science Review” in December 2024.

II. Discussions of the Director’s report

After the report by the JINR Director, G. Trubnikov, the members of the Scientific Council asked the following questions, which were then answered by the Director.

M. Spiro thanked the JINR Director for the impressive presentation and asked to include a gender balance indicator in the Institute’s performance indicators. The JINR Director responded that JINR was doing a lot in this direction, and in terms of the Institute’s gender balance, it was not only and not so much the gender balance in the number of employees that was important, but rather the provision of equal opportunities to be leaders and the actual implementation of leading roles in scientific research. The Institute is consistently pursuing a balanced personnel policy in this direction.

C. Borcea suggested that since the Institute was acquiring more and more friends from all over the world and new names had appeared among the members of the Scientific Council, he would like them to introduce themselves and their scientific programme in more detail. The JINR Director supported this initiative, agreeing that such notable scientists as Yuntao Song and Raghunath Sahoo represent the world’s leading scientific centres, and suggested the inclusion of brief scientific presentations by newly elected members of the Council in the programme of the next sessions of the Scientific Council.

Z. Vilakazi commended the continuing scientific collaboration between JINR and CERN. G. Trubnikov emphasized in response that the parties were taking all possible actions under the current conditions to support and develop cooperation.

III. Recommendations of the Programme Advisory Committees taken at the meetings in January 2025

The Scientific Council takes note of the recommendations made by the PACs at their meetings in January 2025, as reported at this session by I. Tserruya, Chair of the

PAC for Particle Physics, V. Nesvizhevsky, Chair of the PAC for Nuclear Physics, and D. L. Nagy, Chair of the PAC for Condensed Matter Physics.

Particle physics

The Scientific Council appreciates the PAC's support for the signing of a high-level agreement between JINR and the Ministry of Science and Technology of the People's Republic of China (MOST) on the beginning of the implementation of joint projects.

The Scientific Council acknowledges the significant progress achieved in preparation for the NICA collider commissioning, including the installation of the collider magnetic cryostat system, RF stations and final focusing lenses, the merging of the high-vacuum sections in the West and East arcs, the installation of cryogenic equipment and power supplies in the collider building, and the connection of power lines and energy evacuation systems. A high-level of readiness of the collider's cryogenic supply system has been achieved: satellite refrigerators and a new cryogenic compressor station have been launched, and liquid helium pipelines feeding the collider have been installed and tested. A detailed programme for the physical launch of the complex has been developed that foresees first collisions in the summer of this year. Several channels for applied research are ready for operation; 5 runs have already been conducted at the SOCHI chip irradiation station. The Scientific Council joins the PAC in congratulating the NICA team on these achievements.

The Scientific Council notes that the main elements of all detector subsystems of the Phase-I MPD are produced, including the time-projection chamber (TPC), the time-of-flight system (TOF), the electromagnetic calorimeter (EMCal), the forward fast detector (FFD) and the front hadronic calorimeter (FHCAL). Their assembly, testing and calibration are currently underway. Extensive work has been done to assemble and commission the MPD solenoid superconducting magnet. A test cooling of the magnet to LHe temperatures was successfully performed at the end of 2024. The Scientific Council joins the PAC in congratulating the team on successfully achieving this significant milestone. The MPD experimental facility is in the final stage of construction, with the detector commissioning expected in late 2025. The Scientific Council shares the PAC's concern about a significant delay in the readiness of the MPD detector compared to the anticipated timeline of the NICA collider, and urges the MPD Collaboration to speed up the construction and installation tasks. The Scientific Council endorses the recommendation of the PAC to extend the MPD project for 5 years with ranking A.

The Scientific Council appreciates the progress in the implementation of the BM@N project: ongoing physics analyses of the Xe-CsI collisions at an energy of 3.8 A GeV and preparation for the next physics run with a Xe beam at an energy of 2–3 A GeV.

The Scientific Council notes with satisfaction that having finalized the Technical Design Report, the SPD team has started work on the first stage of the detector. Manufacturing the elements of the main detector systems has started, and progress has been achieved in establishing the computing infrastructure of the project.

The Scientific Council supports the PAC's recommendation to open a new project "Study of neutrino properties in accelerator experiments", comprising JINR's participation in the ongoing accelerator neutrino experiments NOvA, T2K, FASER, and DsTau, for three years with ranking A. The main objectives of the project are measurements of the neutrino masses ordering and lepton CP violation, searches for neutrinos from supernovae and exotic signals, as well as measurement of cross-sections and development of neutrino interactions models. The presented project combines the participation of JINR in experiments with neutrinos from accelerators into one project, which will make it possible to use the complementary experience of the participating groups.

The Scientific Council appreciates the contributions of the JINR teams participating in the LHC experiments in physics analyses and detector upgrades.

Nuclear physics

The Scientific Council appreciates the scientific significance of the Baikal-GVD project and the leading role of JINR in its implementation. The Gigaton-scale neutrino telescope Baikal-GVD, the largest operating neutrino telescope in the Northern Hemisphere, is capable of investigating cosmic neutrinos and identifying their sources, searching for neutrinos from the dark matter annihilation and other rare phenomena. For detection of neutrinos, the water of Lake Baikal is used. Optical sensors are deployed deep under water, they detect Cherenkov radiation of secondary particles resulting from interactions of high-energy neutrinos within the observed volume. In 2016–2024, the Baikal-GVD Collaboration deployed 13 fully functional clusters. At present, the underwater facility comprises 4104 optical modules placed on 114 garlands. The ongoing rate of production of detector components and deployment of further clusters in Lake Baikal will make it possible to reach by 2028 an observable water volume of 1 km³ for detecting astrophysical neutrinos with about 6000 optical modules.

The Scientific Council notes an important outcome achieved by the analysis of data obtained in 2018–2023 — confirmation of the diffuse astrophysical neutrino flux observed

by the IceCube experiment with a significance of above 5σ . The Scientific Council agreed that continued work on developing the detector with testing its possible next-generation components is necessary and relevant. Also, the Scientific Council notes the importance of maintaining and developing both the shore infrastructure of the project and the production and research capabilities at the JINR sites.

The Scientific Council notes extensive work underway to start the LINAC-200 facility at DLNP JINR, which is part of the future LINAC-800 accelerator. A major overhaul of Building 118 has been carried out, ventilation, electrical and water supply systems have been put into operation, a modern system of radiation monitoring as well as blocking and signaling systems have been developed and installed. The accelerator has been transferred to JINR from NIKHEF (Netherlands) and underwent extensive modernization. The key subsystems of the accelerator have been designed anew, and four experimental beam extraction channels with energies of 24, 60, 133 and 207 MeV have been designed and constructed. In future, it is planned to gradually put into operation the accelerator structures up to energies of 800 MeV.

Requests from the JINR Laboratories and research teams of JINR participating countries are the primary focus when forming the user research program at the accelerator. The plan is to use the extracted beams of LINAC-200 for testing prototypes of electromagnetic calorimeters and coordinate detectors for the MPD and SPD experiments at the NICA collider, applied work in the field of radiation materials science, radiobiology and radiochemistry, experiments in the field of nuclear physics. In this respect, the role of the FLAP collaboration is important in conducting practical training for students and specialists from participating countries through the JINR University Centre.

The Scientific Council wishes success with the LINAC-200 commissioning stage in 2025 and recommends that the DLNP Directorate should concentrate its efforts on preparing the first experiments at LINAC-200.

The Scientific Council acknowledges tremendous efforts to prepare for long-term experiments on the spectroscopy of the isotopes of superheavy elements synthesized in the $^{48}\text{Ca} + ^{242}\text{Pu}$ reaction. During preparation for long-term experiments on the study of SHE properties, several experiments were conducted at the GRAND separator, commissioned in 2022, with the aim of investigating the capabilities of the setup. The experiments were carried out with heavy ion beams of Mg, Ar, and Ca extracted from the DC-280 cyclotron. The separator was tuned using complete fusion reactions with Nd, Sm, Pb, and Pu targets. In addition, several important research results were obtained. A new plutonium isotope ^{227}Pu was synthesized, and novel data were obtained on the

radioactive decays of other yet-to-be-thoroughly investigated isotopes $^{228-231}\text{Pu}$. Production cross-sections for neutron-deficient nobelium nuclei were measured, and improved data were obtained on the decay modes (^{249}No) and the probability of isomeric state population (^{250}No). Short-lived isotopes $^{178,179,180}\text{Hg}$ produced in the $^{40}\text{Ar} + ^{144}\text{Sm} = ^{184-x}\text{Hg} + xn$ reaction were used for tuning the Cryodetector setup designed for experiments on the study of the chemical properties of SHE, in which the GRAND facility plays the role of a pre-separator.

During the tests of the new target assembly with a diameter of 480 mm (previously 240 mm), the well-known reaction $^{48}\text{Ca} + ^{206}\text{Pb} = ^{252}\text{No} + 2n$ was employed. At a ^{48}Ca intensity of $6 \text{ p}\cdot\mu\text{A}$, around 3 nobelium nuclei per second were registered in the focal plane of the GRAND separator.

Plans for the nearest use of the GRAND separator include the first long-term experiments on the spectroscopy of the isotopes of superheavy elements and the study of the properties of spontaneous fission of nuclei in the radioactive decay chains of $^{286,287}\text{Fl}$ isotopes synthesized in the $^{48}\text{Ca} + ^{242}\text{Pu}$ reaction. Furthermore, work is scheduled to study the chemical properties of flerovium and copernicium using the Cryodetector setup.

The Scientific Council greatly supports the proposed programme for studying the properties of the isotopes of superheavy elements. Given the unique and copious production of SHE within reach, the Scientific Council endorses the recommendations of the PAC for Nuclear Physics to explore in more detail the possibility of designing a station to detect the mass and TKE distributions of the fission fragments. This would greatly enhance the comprehension of the fission process in an unknown mass region.

Condensed matter physics

The Scientific Council is pleased with the progress of work at IBR-2 in preparation for resuming the operation of the reactor and highly appreciates the efforts of the JINR Directorate to resume regular cycles for users, as well as its plans to extend the operation of the reactor with high-performance parameters by loading new fuel. The Scientific Council supports the PAC's recommendations that in the time remaining until the resumption of regular cycles, work with potential users should be intensified in order to attract the maximum number of researchers to JINR, primarily from the Member States.

The Scientific Council notes the FLNP activities on modelling the dynamics of pulsed fast reactors, which indicate that exceeding the stability limits of a pulsed reactor may be caused by at least two factors: thermal expansion of the fuel and dynamic bending of the fuel rods, or bending of the fuel assemblies during a pulse. The Scientific Council shares

the PAC's opinion on the continuation of activities on modelling the dynamics of pulsed fast reactors and considers this work essential both for the operation of IBR-2 and the development of the new neutron source at JINR.

The Scientific Council welcomes the constant attention of the PAC to the status of the project of the new neutron source at JINR. It also notes the continuation of developing new advanced devices and technologies for cryogenic moderators of the new neutron source.

The Scientific Council notes with satisfaction the progress in the IBR-2 instrumentation development during the technical shutdown of the IBR-2 reactor and considers these activities important for the successful realization of the FLNP scientific programme and the user programme at a level competitive with other world neutron centres.

Reports by young scientists

The Scientific Council followed with interest the reports by young scientists, selected by the PACs for presentation at this session: "Construction of the ISCRA and SIMBO stations for applied research on high-energy ion beams. Radiation hardness testing of microchips by low energy pulsed ion beams at the SOCHI station" by A. Slivin, "Intense metallic ion beams for SHE synthesis" by D. Pugachev, and "Structural and vibrational properties of the $\text{Cu}_3\text{Bi}(\text{SeO}_3)_2\text{O}_2\text{Cl}$ francisite at high-pressure" by A. Rutkauskas. The Scientific Council thanks the speakers and welcomes such selected reports in the future.

IV. Memberships of the PACs

The Scientific Council appoints Sakin Jabarov (Supreme Attestation Commission under the President of the Republic of Azerbaijan, Baku, Azerbaijan) as a member of the PAC for Condensed Matter Physics for a term of three years.

V. Awards and prizes

The Scientific Council approves the proposal of the JINR Director, G. Trubnikov, to award the title "Honorary Doctor of JINR" to Mahmoud Sakr (Arab Republic of Egypt) for his great personal contribution to enhancing the role of the Arab Republic of Egypt in JINR's scientific life, strengthening scientific cooperation between the Arab Republic of Egypt and JINR.

The Scientific Council approves the Jury's recommendations presented by Vice-Director S. Dmitriev on awarding the JINR annual prizes for best papers in the fields

of theoretical and experimental research, methodology and technology research, and applied technology research (Appendix).

VI. Election and announcement of vacancies in the directorates of JINR Laboratories

The Scientific Council elected S. Sidorchuk as Director of the Flerov Laboratory of Nuclear Reactions (FLNR) for a second term of five years. The Scientific Council appreciated the quality and diversity of all the applicants.

The Scientific Council endorsed the appointments of A. Boreyko and I. Padrón Díaz as Deputy Directors of the Laboratory of Radiation Biology (LRB) until the completion of the term of service of the current LRB Director, A. Bugay.

The Scientific Council announces the vacancies of positions of FLNR Deputy Directors. The endorsement of appointments will take place at the 138th session of the Scientific Council in September 2025.

The Scientific Council recommends to the JINR Directorate, when announcing the vacancies of positions of laboratory Directors and Deputy Directors, to provide job descriptions for these positions.

VII. Next sessions of the Scientific Council

The 138th session of the Scientific Council will be held on 15–16 September 2025.

The 139th session of the Scientific Council will be held in February 2026, the dates to be decided at the 138th session.



G. Trubnikov

Chair of the Scientific Council



S. Kilin

Co-chair of the Scientific Council



S. Nedelko

Secretary of the Scientific Council