I. Preamble

The Chairman of the PAC for Nuclear Physics, M. Lewitowicz, introduced the new members of the PAC, Adam Maj and Valery Nesvizhevsky.

The Chairman presented an overview of the implementation of the recommendations taken at the previous meeting.

JINR Vice-Director M. Itkis informed the PAC about the Resolution of the 123rd session of the Scientific Council (February 2018) and the decisions of the Committee of Plenipotentiaries (March 2018).

The PAC was pleased to note that the recommendations of the 47th PAC meeting concerning JINR research in the areas of nuclear physics have been accepted by the Scientific Council and the Directorate, in particular with respect to the dedicated meeting of the Quinta-BURT research programme, cooperation of Baikal GVD and KM3NET, improvements of local infrastructure at Lake Baikal and cooperation with the ECT* Centre in Trento (Italy).

Concerning neutrino physics, the Scientific Council reiterated its recommendation that all ongoing and planned neutrino experiments should be presented and discussed within a joint meeting of the PAC for Particle Physics and of the PAC for Nuclear Physics, leading to a more coordinated neutrino physics programme and therefore allowing implementation of priorities in a more concerted and efficient way.

Following the proposal of the PAC for Particle Physics and the PAC for Nuclear Physics, the joint session on neutrino physics and dark matter research will take place on 22 January 2019. The agenda and the modalities of the evaluation of the presented projects will be prepared by the Chairmen of both PACs in close collaboration with the JINR Directorate by September-October 2018.

II. Recommendations on the theme “Improvement of the JINR Phasotron and Design of Cyclotrons for Fundamental and Applied Research”

The PAC took note of the report presented by G. Karamysheva on the results of numerous activities within the theme “Improvement of the JINR Phasotron and Design of Cyclotrons for Fundamental and Applied Research” focused on the development and improvement of accelerators for hadron therapy applications. The Phasotron still operates mainly for medical research, but should be phased out and replaced within a few years due to its enormous cost in manpower and resources. The plan is to replace it

by a superconducting isochronous cyclotron SC202 which has been jointly developed by JINR and the Institute of Plasma Physics of the Chinese Academy of Sciences in Hefei. According to the agreement, two cyclotrons are manufactured in China: one to be operated in Hefei and the second one at JINR. The ongoing development is still facing a number of difficulties which require much attention by experts. The PAC appreciates JINR's expertise in cyclotron simulation programmes licensed by various companies and in modifying the original design of the magnet.

Recommendations. The PAC is worried about the progress in realization of the new SC202 cyclotrons which is a new task for the Hefei Institute. It recommends an even closer collaboration, e.g. by establishing a permanent presence at Hefei. JINR should insure that enough resources are also allocated locally for all further tests and installations.

The PAC recommends extension of the theme "Improvement of the JINR Phasotron and Design of Cyclotrons for Fundamental and Applied Research" until the end of 2019 with first priority. It expects a new complete project to be ready next year, focused on the timely realization of the SC202 compact cyclotron.

III. Development of the JINR Educational Programme

The PAC took note of the information on the concluding theme "Organization, Support, and Development of the JINR Educational Programme" and on the opening of a new theme "Organization, Support, and Development of the JINR Human Resources Programme", presented by the Director of the JINR University Centre (UC), S. Pakuliak. The PAC highly appreciates the results achieved by the UC in addressing issues of training scientific and engineering personnel in order to realize large-scale projects both on the basis of the JINR Laboratories and in research centres of the Member States. The PAC recognizes the successful implementation of the JINR Summer Student Programme, which ensures a stable number of interested young people coming to the summer practical courses at JINR.

The PAC supports the recommendations of the 48th meeting of the PAC for Condensed Matter Physics (14–15 June 2018) on the opening of the new theme by the UC. The PAC suggests extending the UC's international cooperation, especially towards common "double degree" programmes with JINR Member and Associate States.

IV. Status of the Factory of Superheavy Elements

The PAC heard with great interest the report on the status and quality assurance of the DC-280 cyclotron — the central part of the Factory of Superheavy Elements (SHE), presented by I. Kalagin. The autonomous tuning work is approaching its final phase. The start of the complex launching of the DC-280 accelerator with ion beams is scheduled for September 2018. The commissioning of DC-280 and first test experiments are being planned for the end of 2018. In addition to constructing the experimental set-ups, a great deal of effort is also focused on licensing which must be finished prior to the first experiments.

Recommendations. The PAC recommends that the JINR and FLNR Directorates put all necessary efforts to allow for the timely completion of the construction, licensing, and commissioning of the SHE Factory in 2018. The PAC recommends that the quality assurance system devised at FLNR be used during launching and tuning work and the commissioning of the main systems of the SHE Factory. The PAC recommends that thorough monitoring be provided during the commissioning of all the above-mentioned systems and set-ups of the SHE Factory in order to guarantee a reliable performance of the facility with design parameters. The PAC also recommends that the FLNR Directorate focus on the preparation of Day-1 experiments and make a presentation on the planned scientific programme at the next PAC meeting.

V. First results of the ACCULINNA-2 fragment separator

The PAC heard a report on experiments performed with the ACCULINNA-1 facility and on first experiments carried out at the new ACCULINNA-2 fragment separator, presented by A. Fomichev. The PAC highly appreciates the work on the commissioning of the new set-up and, more particularly, that the collaboration has accepted to follow the recommendation of the previous PAC meeting to add a gas target system for the ^{7}H flagship experiment to be scheduled at the end of 2018. The PAC acknowledges the recent publication of the review article entitled “The ACCULINNA-2 project: The physics case and technical challenges” by A. S. Fomichev et al. in Eur. Phys. J. A 54, 97 (2018).

Recommendations. The PAC endorses the first experiment on the ACCULINNA-2 fragment separator aimed at studying the properties of ^{7}H in the ^{8}He(d, ^{3}He)^{7}H reaction and the requested beam time at the U-400M accelerator for its implementation.

VI. Status of the MAVR high-resolution magnetic analyser

The PAC heard a detailed report on the MAVR high-resolution magnetic analyser, presented by S. Lukyanov. MAVR analyser is constructed based on the MSP-144 magnet with stepped poles. To increase the solid angle of the MAVR magnetic-optical system, a doublet of quadrupole lenses is installed in front of the MSP-144 magnet. MAVR is mounted in the U400 experimental hall. Now the installation work for the analyser and ion beam tracing systems is being completed. MAVR analyser will allow FLNR physicists to detect products of nuclear reactions with stable and radioactivity beams with higher efficiency, and with better energy and spatial resolution, in order to study the structure of exotic nuclei in different mass regions.

Recommendations. The PAC appreciates the scientific goals and the current progress of the MAVR analyser, recommends completing integration of all its mechanical and electrical systems and suggests performing the in-beam commissioning experiment as soon as possible as to verify whether the projected performance is achieved.

VII. Supercomputer "Govorun"

The PAC heard with interest the report "Supercomputer "Govorun" — new prospects for heterogeneous computations in nuclear physics", presented by D. Podgainy and notes the substantial progress in developing the high-performance computing component of the multifunctional centre for storage, processing and analysis of data at JINR.

The PAC supports the efforts of LIT to develop the supercomputer "Govorun" as one of the essential tools for a further fast development of experimental and theoretical physics at JINR and its Member States.

VIII. Scientific reports

The PAC heard the excellent report "State-of-the-art and future prospects of neutron activation analysis at the IBR-2 reactor" presented by M. Frontasyeva.

The PAC heard the report "Investigation of subsurface layers of solids with the help of charged particle beams accelerated at the EG-5 electrostatic generator", presented by A. Kobzev.

The PAC heard the report "Appearance of quasi-fission in reactions of heavy-ion collisions" presented by A. Nasirov.

IX. Poster presentations

The PAC appreciated the high quality of presentations of new results and proposals by young scientists in the field of nuclear physics research. The best posters selected are: “The fusion-fission and quasi-fission in the near barrier reaction of $^{32}S + ^{197}Au$” presented by I. Harca, “Spectroscopy of the isotopes of transfermium elements in Dubna: present status and perspectives” presented by A. Kuznetsova, and “Orientation of statically deformed heavy nuclei in multinucleon transfer reactions” presented by V. Saiko.

The PAC recommends the poster “The fusion-fission and quasi-fission in the near barrier reaction of $^{32}S + ^{197}Au$” to be reported at the session of the Scientific Council in September 2018.

X. Next meeting of the PAC

The next meeting of the PAC for Nuclear Physics will be held on 22–23 January 2019.

Its tentative agenda will include:

– reports and recommendations on themes and projects to be completed in 2019;
– status of the Factory of Superheavy Elements and its scientific programme;
– evaluation of projects of neutrino physics and dark matter research jointly with the PAC for Particle Physics;
– operation of the existing experimental set-ups with beams of the FLNR cyclotrons and the obtained scientific results;
– consideration of new projects;
– scientific reports;
– poster presentations of new results and proposals by young scientists in the field of nuclear physics research.

It is agreed on that for the future PAC meetings more exhaustive reports on projects/themes under evaluation will be prepared at least two weeks before the meeting. The PAC members, at the latest one week prior to the meeting, will prepare referee reports containing additional questions which have to be answered during the oral presentations at the meeting.

The PAC suggests that the JINR Directorate trigger a discussion on the evaluation procedure of interdisciplinary topics and projects.

M. Lewitowicz

Chairman of the PAC
for Nuclear Physics

N. Skobelev

Scientific Secretary of the PAC
for Nuclear Physics