I. Preamble

The Programme Advisory Committee for Particle Physics takes note of the information presented by JINR Vice-Director R. Lednický on the Resolution of the 122nd session of the JINR Scientific Council (September 2017) and on the decisions of the JINR Committee of Plenipotentiaries (November 2017).

The PAC is pleased to note that all recommendations of its previous meetings have been accepted by the JINR Scientific Council and Directorate. In particular, the Scientific Council:

– was pleased to note the successful development of the Nuclotron–NICA accelerator complex, including the recent production of polarized proton beams with the new source of polarized particles. It shared the PAC's concern about the availability of sufficient manpower for the efficient Booster construction and urged the JINR management to take corrective actions;

– welcomed the significant advance in the yoke construction for the MPD magnet. It appreciated the ongoing efforts for the detector development and appreciated the progress and efforts towards defining the participation and commitments of groups from China and Mexico in the MPD experiment;

– was very pleased with the progress towards realization of the BM@N experiment and acknowledged the achievements in the Nuclotron runs with deuteron and carbon beams. The Scientific Council shared the PAC's concern about the lack of manpower to analyse the data collected in these runs and urged the project and laboratory management to undertake the necessary steps to attract external groups to the BM@N experiment. The Scientific Council was pleased with the proposal to extend the BM@N physics programme to "Probing Short-Range Correlations", involving a group from Tel Aviv University together with groups from CEA, GSI and MIT.

The Scientific Council appreciated the work accomplished by the Machine Advisory Committee and Detector Advisory Committees for the MPD and BM@N experiments in assisting the realization of the Nuclotron-NICA project.

On the whole, the Scientific Council commended the dynamic progress of the NICA project, encouraged further expansion of the international collaborations around the planned experiments, and expressed hope that the challenging work for the NICA complex would be successfully continued.

The Scientific Council highly appreciated the efforts undertaken by the JINR Directorate towards developing the Institute's research infrastructure and integrating it into the European scientific landscape. It noted, in particular, the inclusion, in 2017, of the NICA accelerator complex and the SHE Factory in the NuPECC long-range plan "Perspectives in Nuclear Physics".

II. Reports on the Nuclotron-NICA project

The PAC takes note of the report on the progress towards realization of the Nuclotron-NICA project presented by A. Sidorin and notes the steady progress in developing the accelerator complex. The PAC congratulates the Laboratory's staff on the successful preparation of the KRION-6T heavy-ion source for operation in Run 55. The PAC appreciates the regular commissioning of new equipment and supports the programme of timely modernization of existing elements of the accelerator complex, in particular, the upgrade of LU-20 and the subsequent substantial increase in beam intensity.

The PAC takes note of the report on the infrastructure developments at VBLHEP, including the Nuclotron facility, presented by N. Agapov. The PAC recognizes the steady progress in the development of the key infrastructure elements including the upgrade of the power supply system of beam channels, the launch of the new Nuclotron control system, the commissioning of the new helium liquifier, the progress in upgrading the existing cryogenic complex, the preparation for the installation of the booster synchrotron, and the work carried out for the preparation of the collider magnet system. The PAC is pleased with the progress achieved in the civil construction of the collider complex and with the roadmap for the construction of the NICA Center building.

The PAC takes note of the report about the forced interruption of Run 55 of the Nuclotron and the plans for 2018 presented by H. Khodzhibagiyan. The PAC is concerned about the problems encountered with the operation of the cooling system of the superconducting magnets. It notes with satisfaction the successful completion of the efforts undertaken by the Laboratory for the rapid restoration of work at the cryogenic helium facility. The PAC appreciates the information provided by the project management on the measures taken to prevent recurrence of similar accidents in the future.

The PAC is very pleased with the presentation by V. Kekelidze about the recent initiatives to attract new non-JINR collaborators to the MPD and BM@N experiments. The PAC welcomes the plans to hold a three-day meeting at JINR in April 2018 to

officially launch the MPD and BM@N international collaborations and strongly encourages the initiative to establish a grant programme to attract and support research conducted at the NICA facility.

The PAC takes note of the report on the progress towards realization of the MPD project presented by V. Kolesnikov. The PAC appreciates the recent advance in the MPD magnet construction but is concerned about the delay in the magnet delivery to JINR. The Committee urges the team to ensure timely and successful completion of the contract avoiding any further delay. The PAC is pleased to note that the SAMPA chip has been finally chosen for the TPC front-end electronics and encourages the TPC team to complete the remaining design and prototype work. It acknowledges the efforts undertaken by the JINR and Laboratory managements to strengthen the participation of groups from China in the construction of the MPD electromagnetic calorimeter. The PAC encourages this international team to focus on the optimization of the detector specifications and design in view of finalizing the ECAL TDR. This should include results of realistic simulation of physics processes, fabrication and integration issues.

The PAC appreciates the report on the progress towards realization of the BM@N project presented by M. Kapishin. It welcomes the commissioning of new equipment and the first use of the large-area GEM tracking detectors. The PAC reiterates its concern about the lack of manpower for an in-depth analysis of the data collected in recent runs. The Committee looks forward to a report on the detector operation during Run 55 with the new heavy-ion source, KRION-6T, and on the study of short-range correlations.

The PAC takes note of the report on the progress towards realization of the SPD project presented by R. Tsenov. The PAC endorses the proposed plan for the preparation of the Conceptual Design Report of the SPD detector, backed by local theoretical support, which will be submitted to this PAC in January 2019, and for the formal establishment of the SPD Collaboration.

III. Reports on projects approved for completion in 2018 and proposed for continuation

The PAC takes note of the report on JINR's participation in the upgrade programme of the ATLAS detector at the LHC, presented by A. Cheplakov. The Committee is pleased to hear about the commissioning of the Micromegas chamber production site at JINR. It appreciates the realization of a second workshop dedicated to the production of smaller-size muon chambers for domestic projects. The PAC is

satisfied with the progress achieved by the JINR team in the detector modernizations, and recommends continuation of JINR's participation in the ATLAS upgrade project until the end of 2020.

The PAC takes note of the report on JINR's participation in the upgrade programme of the CMS detector, presented by A. Zarubin. The Committee appreciates the progress achieved by the JINR group in the CMS Phase-I detector upgrade and R&D work for the HL-LHC. It recommends continuation of JINR's participation in the project until the end of 2020.

The PAC takes note of the report on the Borexino/SOX/DarkSide project presented by D. Naumov. The Committee appreciates the broad spectrum of important results obtained in the Borexino experiment. However, it also notes that Borexino, SOX and Dark Side are three distinct experiments with rather diversified physics goals and timelines. Given the interest in the continuation of the Borexino programme on pp-, geo- and CNO-neutrinos, it is recommended that the group carry on the data analysis until the end of 2019. Concerning SOX, due to the issues admitted by the proponents about potential delays, the PAC proposes that a detailed status report be presented at the next PAC meeting in order to decide on a possible recommendation. Finally, the PAC notes the scientific interest of the dark matter DarkSide 20k project. However, considering the different scientific scope with respect to Borexino, and given the scale and the complexity of the experiment, the PAC recommends that the proponents and the JINR management first establish a global strategy to be presented to the PAC at the next meeting in order to allow a thorough evaluation of all aspects of the project related to science, contributions and consistency of the group, investments and timeline.

IV. Reports on the scientific results obtained by the JINR groups in the LHC experiments

The PAC takes note of the new results obtained by the JINR group in the ALICE experiment, presented by B. Batyunya. The PAC notes the progress in the study of the kaon femtoscopy, ultraperipheral Pb+Pb collisions and the test results of the ALICE electromagnetic calorimeter PHOS with new electronics modules TQDC-16E made by the JINR group.

The PAC takes note of the new results obtained and current activities of the JINR group working on the ATLAS experiment, presented by I. Yeletskih. The Committee appreciates the new results on searches for physics beyond the Standard Model in the Zγ final states, measurements of the differential cross-section of the W/Z + heavy

flavour production, searches for pentaquark states in decays of Λ_b baryons, and studies of $B_c(2S)$ mesons.

The PAC takes note of the results obtained by the JINR group in the CMS experiment, presented by M. Savina. It appreciates the significant contribution of the JINR group to the study of di-muon production and multijet states in the Standard Model and in the context of BSM searches.

V. Scientific report

The PAC takes note of the report “Factorization theorem and duality: from low-energy to high-energy regimes” presented by I. Anikin and thanks the speaker for the presentation.

VI. Young scientists at JINR

The PAC reviewed 30 poster presentations in particle physics by young scientists from DLNP, LIT and VBLHEP. The Committee has selected the poster “Limit on the effective magnetic moment of solar neutrinos using Borexino data” presented by A. Vishneva to be reported at the session of the Scientific Council in February 2018.

The PAC reiterates its recommendation that the posters should focus on the actual work of the young scientists.

VII. Miscellaneous

The PAC takes note of the actions taken by the COMPASS group, as reported by A. Nagaytsev, in response to the Committee’s recommendations given at the previous session. In particular, the size of the group is now decreased by 25% and the travel expenses are lowered by 10%. The PAC considers that these are very modest steps but is pleased to know that further reductions will be implemented after completion of the 2018 run at the CERN SPS. The PAC is pleased that these changes will enable a stronger participation of the group members in the SPD project.

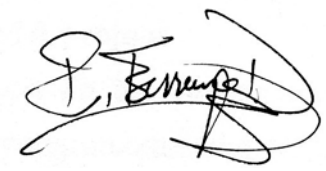
VIII. Next meeting of the PAC

The next meeting of the PAC for Particle Physics will be held on 18–19 June 2018.

The following items are proposed to be included in the agenda of the next meeting:

– follow-up on the to-do-list from this PAC meeting;
– consideration of new projects;

– reports and recommendations on the projects to be completed in 2018;
– status report on the Nuclotron-NICA project;
– status report on the MPD project including simulation results;
– status report on infrastructure issues including Nuclotron;
– report from the Coordinator of the experimental programme with Nuclotron beams;
– report on the BM@N project including simulation results and the new addendum to the physics programme;
– posters from young physicists.



I. Tserruya

Chairman of the PAC
for Particle Physics

A. Cheplakov

Scientific Secretary of the PAC
for Particle Physics