I. Preamble

The Chair of the PAC for Particle Physics, I. Tserruya, presented an overview of the implementation of the recommendations taken at the previous meeting.

The Programme Advisory Committee for Particle Physics takes note of the information presented by JINR Vice-Director R. Lednický on the Resolution of the 126th session of the JINR Scientific Council (September 2019) and on the decisions of the JINR Committee of Plenipotentiaries (November 2019).

The Scientific Council appreciated the milestones achieved in the development of JINR's flagship programmes, in particular: the completion of the main systems of the Booster synchrotron and of the fabrication of the yoke of the solenoidal magnet for the MPD detector, and the commissioning of the updated computer cluster at VBLHEP.

The Scientific Council looks forward to being informed, and so does the PAC for Particle Physics, of the decision concerning the Neutrino programme, evaluated by the joint session of the PAC for Particle Physics and of the PAC for Nuclear Physics in January 2019, on when and how this programme will be re-evaluated.

The Scientific Council supported the PAC's approach for the evaluation of the JINR's participation in the LHC experiments and the PAC's recommendations on the new project (FASA) and on the continuation of ongoing projects (ALICE, ATLAS, CMS, NA64, MICC and SCAN-3) as outlined in the PAC's minutes.

II. Preparation of the draft Strategic plan for the long-term development of JINR

The PAC takes note of the reports concerning the current preparation of the draft of the Strategic plan for the long-term development of JINR in its major sections, and in particular those related to particle physics, heavy-ion physics and spin physics, presented by B. Sharkov and D. Naumov. The PAC looks forward to being informed about the final version of the Strategic plan.

III. Reports on the Nuclotron-NICA project

The PAC heard with interest the report on the progress towards realization of the Nuclotron-NICA project presented by A. Sidorin. The PAC is pleased to note that all the magnets of the Booster synchrotron have been installed in the ring and that commissioning work has started. The PAC supports the active preparatory work for

starting the collider assembly: test of the RF1 system and progress in the serial production of the collider magnets.

The PAC takes note of the progress report on the infrastructure developments at VBLHEP, including the Nuclotron facility, presented by N. Agapov. The PAC appreciates the openness of the report pointing out at sources of delay in civil construction and suggesting the need to revise procurement procedures.

The PAC takes note of the report on the progress towards realization of the MPD project presented by A. Kisiel. The PAC welcomes the collaboration efforts to develop the detector elements with a view to completing the first stage of the detector construction and commissioning by 2021.

The PAC appreciates the progress towards realization of the BM@N project presented by M. Kapishin. The Committee is pleased to see the efforts toward the completion of the experimental set-up for the heavy-ion run in 2021.

IV. Reports on projects approved for completion in 2020 and proposed for continuation

The PAC takes note of the upgrade plans of the ATLAS detector presented by A. Cheplakov. The PAC appreciates the progress made by the JINR group in fulfilling its obligations in the ATLAS uprade project, in particular the continuation of mass-production of the MicroMegas chambers for the New Small Wheel of the Muon spectrometer. The JINR group is also engaged in the NSW assembly and commissioning at CERN. The group contributes to the development of the readout electronics for the liquid argon hadronic calorimeters. Both Phase-I and Phase-II activities are supported by grants from the Russian Ministry of Science and Higher Education.

The PAC reiterates its concern that the JINR ATLAS team is split into two groups, a hardware group and an analysis team. This splitting encourages the creation of too many scientists who do just analysis while not knowing anything about the detector and vice versa.

Recommendation. The PAC reiterates the recommendation made at its previous meeting to consider unifying the two JINR ATLAS projects, one devoted to physics analysis and operations and the other focused on detector upgrade and R&D, into a single one. The PAC recommends continuation of JINR’s participation in the ATLAS upgrade project for the period 2021–2023 with first priority.

The PAC heard with interest the revised proposal of the NA64 experiment presented by D. Peshekhonov. The PAC is pleased to note that the action plan previously requested from the authors to improve the ratio of FTE to participants, to attract students and to get involved in data analysis, is satisfactorily addressed. The ratio of FTE to participants has increased by 60% and 4 new students were attracted to participate in MC simulation, data analysis, electronics and detector development.

Recommendation. The PAC recommends continuation of JINR's participation in the NA64 project for the period 2021–2023 with first priority.

The PAC takes note of the revised proposal of the FASA experiment presented by S. Avdeev which is aimed at answering the criticism raised at the previous PAC session. Unfortunately, the authors have not convinced the PAC that FASA is a detector capable of resolving the open question of the multifragmentation process. The FASA detector lacks isotope identification of light nuclei like ^{3}He-^{4}He, ^{6}Li-^{7}Li, ^{7}Be-^{9}Be. Data have shown, almost forty years ago, that spectra of these isotopes are very different from each other indicating different times in the reaction mechanism. Furthermore, the FASA detector has limited capability in measuring the full event in 4π geometry.

Recommendation. The PAC recommends rejection of the FASA project.

V. Proposal of a new project

The PAC heard with interest the proposal of a new project "Search for new physics in the charged lepton sector" which includes three experiments: Mu2e and MEG-II presented by V Glagolev, and COMET presented by Z. Tsamalaidze. The PAC recognizes the scientific merit of the charged-lepton flavor violation processes as probes for new physics. The PAC considers the authors' experience adequate to carry out these experiments and appreciates the involvement of young scientists. The PAC also notes the hardware contributions of JINR in the three experiments: the production of the Mu2e cosmic veto system, the visualization of the MEG-II event display, and the successful R&D for ultrasonic welding of 12μm thin-walled straw tubes for the COMET experiment. However, the PAC considers that participation in three different experiments with very similar scientific goals and competing with each other is not fully justified and not in line with the recommendations made at the joint session of the PAC for Particle Physis and the PAC for Nuclear Physics in January 2019.

Recommendation. The PAC proposes that efforts and resources be focused on one single experiment, thus providing better conditions for the JINR team to achieve stronger impact, visibility and leadership in that experiment. The PAC also realizes the complexity associated with such a decision and thus recommends approval of the project with the three experiments for only one year. This should allow enough time for the proponents, in coordination with the DLNP Director and JINR management, to consider the PAC's proposal and to decide on their long-term involvement in this interesting physics project.

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

The PAC takes note of the report on the results obtained by the JINR group in the ALICE experiment at the LHC presented by E. Rogochaya. The group has published several results concerning the photoproduction of light vector mesons in ultraperipheral Pb-Pb collisions at 5.02 TeV and, for the first time, the identical charged kaon femtoscopic correlations in p-Pb collisions at the energy of $\sqrt{s_{NN}}$ = 5.02 TeV that showed consistency with the predictions of hydrodynamic models. The JINR-ALICE group is also interested in a femtoscopic correlation analysis for pairs of opposite sign kaons produced in Pb-Pb collisions at 2.76 TeV. The PAC appreciates the effort of the JINR team in physics analyses and encourages further increase of this effort. The main efforts of the group in the next years will be focused on the study of femtoscopic correlations in pp, p-Pb and Pb-Pb collisions, the photoproduction of vector mesons in ultraperipheral p-Pb and Pb-Pb collisions and the development of the thermal model describing particle production in pp and A-A collisions. The group will also contribute to the maintenance and development of the GRID-ALICE analysis at JINR and to the photon spectrometer upgrade. In response to the recommendations made by the PAC concerning rejuvenation, three PhD and one undergraduate students were invited to work on the data analysis. The PAC requests the group to submit at the next PAC meeting a detailed plan of its future activities with milestones.

The PAC takes note of the report on the physics results obtained by the JINR group in the ATLAS experiment at the LHC presented by E. Khramov. The group's members have continued their analyses in defining the structure of the proton at ultrahigh energies, in searches for Zγ, Wγ and Hγ resonances in boosted jet plus photon final states and Supersymmetry processes, and in the search for a valence-like

nonperturbative component of heavy quarks in the proton. Results on the search for Pentaquark, for B_c excited states and associated production of the ttbar quark pair and Higgs boson were reported at various international conferences. The JINR group received an ATLAS Software Development Grant to participate in the development of the event trigger indexing infrastructure and implementation of the new configuration mechanism for the AthenaMT framework. This allowed it to increase the Institutional Commitments coverage from 50% in 2018 to 90% in 2019. The PAC appreciates the group's plans to continue the above-mentioned analyses and expand its participation in the ATLAS software development.

The PAC takes note of the new results and current activities of the JINR group in the CMS experiment at the LHC, presented by A. Aleksakhin. The PAC appreciates the contribution of the JINR group in the search for extra gauge bosons and extra dimensions in the dimuon channel, the recent results on searches for extra Higgs bosons decaying into a pair of b-quarks and muons, and the cross-section measurements of Drell–Yan lepton pair production. The PAC also commends the operation and service work carried out by the group in the Phase 1 upgrage project, in the operation of the Tier1 and Tier2 computer centres, as well as the CMS Regional Operation Centre. The PAC appreciates the JINR group's activity in the R&D work for the Phase 2 upgrade of the CMS detector.

VII. Scientific report

The PAC heard the report "Pion at various stages of heavy-ion collisions" presented by E. Kolomeitsev, and thanks the speaker for his presentation.

VIII. Young scientists at JINR

The PAC reviewed 18 poster presentations in particle physics by young scientists from DLNP, BLTP and VBLHEP. The PAC has selected the poster "Real-time detection of supernova neutrino signal" presented by A. Sheshukov to be reported at the session of the Scientific Council in February 2020.

IX. Next meeting of the PAC

The next meeting of the PAC for Particle Physics will be held on 29–30 June 2020.

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 2020;
– 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 and physis results;
– posters from young physicists.

I. Tserruya

Chair of the PAC
for Particle Physics

A. Cheplakov

Scientific Secretary of the PAC
for Particle Physics