NICA MAC results and recommendations.

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17 – 18 October 2013

NICA MAC was represented by 11 members:
B.Sharkov (FAIR), M.Steck (GSI), A.Feschenko (INR RAS), T.Katayama (FZJ), P.Zenkevich (ITEP), R.Stassen (FZJ), V.Lebedev (FNAL), S.Nagaitsev (FNAL), A.Fedotov (BNL), A.Ageev (IHEP), A.Kolomiets (ITEP)

The NICA MAC has heard 14 reports reviewing status of the NICA project and its elements development.

MAC has noted that the progress in the NICA project developments is generally good. In general a steady progress was demonstrated though different in different areas.

MAC has noted especially an importance of the success achieved in experiment on stochastic cooling of deuterons in Nuclotron (June 2013) and MAC members congratulate the NICA team for attaining this important mile-stone.

MAC appreciates the results of experimental operation of the control system segment based on the TANGO concept at the Nuclotron.

MAC is satisfied with the progress achieved in the Nuclotron performance.

MAC has noted with satisfaction that NICA project team has implemented the majority of MAC recommendations formulated at previous meeting (June 2012).

In general, MAC is satisfied with the answers to the requests of the previous MAC meeting. MAC agrees with the proposed correction scheme for the collider. A reasonable preliminary concept of the collider feed-back system was noted.

Progress in the description of quadrupole, sextupole, octupole magnets was achieved. The required tunability of the collider rings was reported. Some details of the injection/extraction system elements were presented. The development of the ion sources is satisfactory. The progress in the construction of HILac is well progressing. Information about the status of design stages and project time-table was presented.

MAC has underlined the approaching by the project the phase of mass element production that requires a rise of project managing level.

However a lot of important tasks are not yet completed and MAC has formulated the tasks to be solved by the next MAC meeting:

- to study the possibility of improvement of the momentum acceptance up to +-1%;
- to provide the scheme of the vertical dispersion correction;

- to present full report about instabilities, specifications of the RF system along with feed-back for the beam load compensation, functional specification of the feed-back systems, both transverse and longitudinal;

- to consider the possibility to use the turbines instead of the Joule-Thompson valves in the nitrogen liquefier and in the nitrogen;

- to present concepts of the machine and radiation protection system for NICA;

- to present work-chart distribution of various responsibilities, assigned personal to specific tasks starting with the project chef engineer. The work on time table development has to be continued and the results have to be presented.

The lattice design based on a single-particle analysis is nearly finished. However, matching it with real magnets is at an initial stage for the straight lines. At the next stage it is necessary to provide simulations with taking into account collective effects, space charge effects and beam-beam effects.

Concept of the Stochastic Cooling System (SCS) system was presented, but conceptual design is in the preliminary stage. The work has to be intensified with the help of outside leading experts. The conceptual design has to be presented to the next MAC meeting.

The presented conceptual project of the Booster injection/extraction system seems to be reasonable. But MAC requests for more detail information.

The presented project of the control system looks adequate. MAC appreciates the results of experimental operation of the control system segment at the Nuclotron. But functional specification of diagnostics for the start-up configuration has to be presented and documented for the next MAC meeting.

After special detail consideration MAC has endorsed the presented start up version of the NICA project and has noted its relevance to the staged construction of the MPD.

For the start-up configuration of the NICA collider MAC recommends the following restraints to the minimal set of equipment: no electron cooling; reduced version of stochastic cooling, however the longitudinal cooling is mandatory; reduced RF system which has to include the Barrier Bucket Cavity and at least 2 cavities of RF2 or RF3 per ring; no feed-back systems.

The proposed start-up version of the accelerator complex and MPD will provide luminosity of 10^{25} $cm^{-2}s^{-1}$ which satisfies the requirements of the NICA experimental program at the beginning.

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MAC strongly supports the staging of the collider commissioning. The proposed execution strategy meets the requirements of the NICA experimental program. MAC doesn't see show-stoppers in the proposed technical solutions for the collider systems. There is an interference between electron and stochastic cooling locations in the presented collider lattice, it has to be resolved before the next MAC meeting.

The proposed solution for the NICA cryogenic system is based on maximum usage of the existing equipment, which has to be supplemented by similar equipment and by creation of autonomous liquid nitrogen system. MAC believes that it is an optimum choice and it will satisfy the requirements of the NICA accelerators and detectors.

MAC recommends providing some tests of the diagnostics at the Nuclotron to demonstrate the resolution required for the collider at start-up configuration.

As the stochastic cooling is one of the key technical issues for the NICA project, further study of stochastic cooling in the Nuclotron especially for the bunched beam is mandatory. For construction of the stochastic cooling system a high level RF technology is required. It is strongly recommended to continuously explore the collaboration with other institutes to receive their expertise and helpful detailed advices.

MAC appreciates the efforts of JINR directorate for consolidation of human and financial resources on the NICA project and this strategy has to be continued.

MAC recommends to strengthen the role of the Project Chief Engineer who is responsible for the technical supervision of the development, production or operation of an engineering phase of the project. As a team leader, the project chief engineer works with other managerial staff to ensure the project completion in an efficient manner. He/she oversees each phase of the design, integration, construction, installation, and commissioning so that the team meets project specifications and complies with federal regulations and JINR engineering manual standards and procedures.

MAC appreciates the efforts of JINR directorate for extension NICA to Russian Federation Mega-science project and to provide another additional funding.