**Report from the NICA Cost & Schedule Review Committee**

Dubna, 26 February 2020

***General comments***

The NICA Cost & Schedule Review Committee met at JINR on 24-26 February 2020.

NICA is a large and ambitious project which is expected to start (Phase I) in the fall of 2022. Its goal is to study the features of dense baryonic matter, the nature and properties of strong interactions between quarks and gluons, the phase transition between hadronic matter and quark-gluon plasma, together with the basic properties of the strong interaction vacuum and QCD symmetries.

The visit to the NICA complex and its many workshops on the first morning has allowed the Committee to concretely see the progress made in the last two years. The progress is impressive in several areas. For example:

- Civil engineering for the accelerator complex, including its experimental halls and services, is clearly advancing;

- Both Linacs are ready for operation and beam commissioning;

- The Booster injection beam line is under technical commissioning;

- The Booster is almost totally installed (75%) and will be soon completed;

- The RF’s are ready for installation;

- The electron controller is commissioned;

- Superconducting magnet production is going on as foreseen;

- Detectors for NICA Phase I are being built and tested.

In general the Committee observed how important this progress is with all the major technical equipments and was very impressed by the huge achievements so far.

The Committee also acknowledged the amazing efforts made by JINR to meet the time and cost constraints of such a challenging and promising endeavour and expressed its overall positive consideration, congratulating the laboratory for its ongoing commitment and encouraging it at the same time for a successful completion of the NICA Project.

The information provided was of high quality. The Committee acknowledged how much work has gone in the preparation of this review and therefore gratefully thanks everybody involved. The total transparency of the presentations and the fruitful conversations that went along have been especially appreciated.

The Committee has seen that the NICA management and teams understand and do handle the complexity of the project. Each team is aware of the planning of the equipment it is in charge of. However, the Committee felt a lack of a global and coherent planning view.

The Committee would like to focus its report on a few major observations and recommendations which are felt to present a significant concern for the schedule and cost of the NICA Stage I.

***Observations***

- Despite the impressive progress over the last years a significant increase of efforts is required to meet the goal of first collisions at the end of 2022.

- There is a serious lack of experienced and skilled personnel in certain critical areas concerning for example the cryogenics and electric power installations.

- There is often a long-time delay between the appearance of a problem and the corresponding action taken.

- An increase in the volume of the construction work and corresponding engineering equipment led to the inevitable shift of the construction time as a whole by at least 21 months. This can lead to critical delays of the NICA Project.

- Not much has been presented about safety considerations. This is a very important issue and should be taken very seriously.

- The detectors for NICA Phase I, MPD and BM@N, are in general well advanced and the planning includes sufficient time contingency.

-- It would be good to define more milestones and to improve the reporting on the earned value of the project.

- Comments on budget issues require further insight.

***Recommendations***

1. Set up a Project Office with clearly defined personal responsibilities (schedule, logistics, budget, safety, quality control).
2. Produce a resource loaded global plan.
3. Define milestones to assess progresses with a periodicity of 3 months.
4. Identify critical items for NICA Phase I.
5. Develop a risk analysis and mitigation plan for the most critical items

We would like to thank the JINR management, Vladimir Kekelidze (Director of the JINR Veksler and Baldin Laboratory of High Energy Physics) and JINR Director Victor Matveev for their hospitality and engagement in the review. And we thank all JINR staff involved in the review for their clear and open presentations.