

Review of the proposal „The Precision Laser Metrology for Accelerators and Detector Complexes”

For a laboratory like JINR it is essential to perform basic R&D on accelerators both for its own on-site accelerator infrastructures as well as for key contributions to large international projects. The laboratory has a long standing experience and expertise in many important aspects of this field. Therefore, I consider accelerator R&D a very important and strategic part of the JINR programme.

The report provided on the project “Advanced Studies on Systems of New-Generation Accelerators and Colliders for Fundamental and Applied Research” underlines this statement. The main activities described are:

1. Precision laser metrology for accelerators and detector complexes;
2. R&D on photo-injection systems;
3. The electron linac programme;
4. R&D on free electron lasers.

Very good progress was made in all areas. Examples are design and construction of a photo-injection system, the infrared undulator installed at FLASH, and the completion of LINAC-200 in 2017 allowing for first user experiments. I congratulate JINR to these and other achievements.

Based on the abovementioned project, in which among others the metrology laboratory at DLNP was set up, the precision laser metrology for accelerators and detector complexes is asking for a prolongation until 2021. Three instruments are proposed: a network of Precision Laser Inclometers (PLI) at the LHC, an Interferometric Distance Meter (IDM) at the ATLAS experiment and a Laser Fiducial Line (LDF).

PLIs developed at JINR have been very successful installed and operated at CERN and in Armenia. It is a technology in which JINR is leading. The proposed network of 6 PLIs will help to stabilize the LHC beam position and to maximize the luminosity. The IDM will allow controlling distances of 16m with less than 10 μ m accuracy which will provide a precise connection of the coordinate systems of the two LHC proton beams around the ATLAS experiment with much higher precision. Both developments will be very beneficial for the LHC and the experiments. Evidently, also NICA will strongly profit from this project. The third instrument, the LDF, will investigate a new way to precise distance measurements using high-frequency amplitude modulation. It would significantly simplify the measurement and it is a promising idea which should be followed.

In summary I consider this project of high importance for future large accelerators and detectors for particle physics and other fields. It builds on large and unique expertise at JINR And I strongly support the continuation of this project.

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