REVIEW

for the extension of the project "Precision laser metrology for accelerators and detector complexes"

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The document under review - the extension of the project "Precision Laser Metrology for Accelerators and Detector Complexes", contains the results obtained by the metrological group of DLNP JINR for the previous period of work. The breadth and quality of scientific research carried out on the project is impressive. A huge work has been done to improve the main device, on which the team is working - the Precision Laser Inclinometer. Implementation of laser inclinometer technology at CERN and at the VIRGO Interferometric Gravitational Antenna was carried out. The main tasks of the project have been implemented in accordance with the JINR PTP.

Expansion of the project to use the inclinometer in the operation of the VIRGO Interference Gravitational Antenna is undoubtedly a fundamentally important step in the field of direct application of the results of the project in the field of Mega Science.

In the proposed second extension of the project, the main activity is focused on the transition to the next generation of inclinometers - the Compact Precision Laser Inclinometer (PLI). The main substantiated ideas that will lead to the creation of a Compact PLI are given. Since the work on the project is being carried out successfully, it should be assumed that the new version of the PLI will be made within the time frame indicated by the project.

The use of a small-sized version of the inclinometer is envisaged in a number of key sections of the project: measurement of angular microseismic activity in the VIRGO Gravitational Antenna, Einstein's Telescope; in the area of ​​the NIKA, LHC colliders; earthquake forecast in Armenia and Uzbekistan.

The project provides for further improvement of metrological technology: work on the creation of a Laser Reference Line, an Interferometric Length Gauge and a Seismically Isolated Platform. In the new project, these tasks are transferred to the stage of experimental research, which creates the basis for the subsequent use of metrological instruments on physical installations.

The convincing successes of the team of authors of the project at the previous stage of its implementation allow us to assert that the authors have sufficient experience in planning and specific work, and the set large-scale task will be implemented in accordance with the declared Project. Of course, the support of the Directorate of the Laboratory and the Institute is needed.

Remarks.

1. The project describes in detail and convincingly the accuracy of measurements of the angle of the base of the accelerator using an inclinometer, which will take into account the deformation of the collider (NICA, LHC, FCC) and stabilize its position. But angular measurements are not an end in themselves. The goal is to increase the luminosity of the beams and the stability of the machine. But the project does not say anything about this ultimate goal. Do the authors have the ability to quantify the increase in luminosity and its stability?

2. We read in the project: “The deployment and continuous operation of two PLIs for more than one year was our new significant contribution to the experiments on the IGA VIRGO”. It is known that the VIRGO installation was designed to register gravitational waves. How did the placement of the PLI instruments help achieve this goal?

3. In the project we read: "Work is underway to use an inclinometer for forecasting earthquakes .... in Armenia .... and Uzbekistan." Here again, at least a qualitative assessment of the reliability of the forecast obtained is lacking.

4. In the project we read: "On an optical table isolated from ... vibrations of the Earth's surface, it is planned to carry out fundamental physical experiments to measure the gravitational constant and search for ... gravitational-like forces." Here the idea of ​​these experiments and the possible necessary modifications (development) of the PLI device should be mentioned.

5. In fig. 8 ÷ 11, it is desirable to indicate the characteristic dimensions of the depicted objects. This will make the drawing easier to understand. Moreover, the authors are well aware of these dimensions.

6. In fig. 13 the arrows are given numbers, but it is not said what they mean. This is probably the distance from NIKA to the object. Indicate in which units the distances are indicated. The figure of the NIKA complex is outdated. It is advisable to replace it.

7. On page 30 you can find the table “Table. Employment of the Metrological group ”. It lists the names of 14 co-sponsors of the project. And on the first page of the project, we find about 50 names of the co-authors of the project. Does this mean that most of these 50 “co-authors” do not work in the project, but are assigned to increase the project's prestige?

The authors probably have answers to these comments. If it is possible to edit the text, then the authors can improve the text, taking into account the comments.

I recommend approving the second extension of the Precision Laser Metrology project as the first priority of JINR.

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