Referee Report by H. H. Gutbrod for

THE PRECISION LASER METROLOGY FOR ACCELERATORS AND DETECTOR COMPLEXES

THEME 02-0-1127-2016/2021

NAMES OF PROJECT LEADERS Julain BUDAGOV

NAME OF PROJECT DEPUTY LEADERS Mikhail LYABLIN

The project is imbedded into the activities at CERN and the JINR group requests continuation into 2021. I quote some important points from the proposal:

*a) The Precision Laser Inclinometer developed at DLNP is the world first angular seismograph*

*that registers microseismic oscillations of the Earth surface with the accuracy of 2.4∙10-11 rad/Hz1/2 in the frequency range [10-6 Hz;4 Hz], that provides registration of all known microseismic phenomena.*

*b) In DLNP the development of a metrological laboratory is coming to its finish; it is equipped with a precision climate system of aerial environment in the volume of 23x6x3 m3.*

*...*

*Thus, the prolongation of the Project for 2019-2021 envisages:*

*- The development of a network of 6 PLI for visualization of deformation of the Earth surface*

*caused by seismic waves.*

*- To accomplish work of ILM development with the 16 m length.*

*- To accomplish work of the vacuumed LFL prototype development with the length of 150 m.*

*- Additional activity: On the PLI basis to develop a laboratory prototype of a research*

*platform seismically isolated from angular oscillations of the Earth surface.*

*...*

*c) Threats*

*The cuts of the funding from the BMBF foundation and/or from JINR budget will stop the*

*creation of the PLI for CERN and GARNI. The deterioration of the foreign policy environment will not allow the purchasing of necessary electronic and optical equipment, which will slow down the creation of our metrological devices.*

To a)

The group has achieved the goals of the past project and has acquired knowledge in a demanding technological field. Its contribution to the CERN LHC program is well recognized. DLNP has acquired insight into modern alignment technologies.

To b)

The proposed plan is integrated in the CERN NETWORK of PLIs. It foresees the construction of additional PLIs at DLNP and installation into the LHC tunnel.

However, the scientific participation of DLNP in this project is not clear, it looks like DLNP is making only a technical contribution based on work at the mechanical shop of DLNP.

To c)

Unfortunately, the group fears to have no access to optical or electronic parts necessary to build up the 6 PLIs for the NETWORK at CERN. Furthermore, the group fears cuts in the funding from BMBF funds. For CERN this should not be a problem, since work could be procured differently.

My recommendation is as follows:

The know-how of this collaboration with CERN will benefit JINR on the technical side in present or future scientific JINR programmes, but only, **if** the DLNP team is addressing and solving the optical and electronic problems independent of the Western sources. This could lead to a further modernization of the scientific/technical infrastructure at JINR, benefitting present and future research projects of JINR.

The scientific contribution of the DLNP team in exploiting the present and future data has not been shown convincingly, nor the application of the technology to

At present, I cannot give a positive evaluation unless I see efforts of solving problems mentioned above, and those expressed as *fears* in the proposal. As presented it is not a certain project for young scientists, both in technology development at JINR nor in financing (although the latter will be solved soon, I guess).

However, this project could be taken out of this HEP PAC scientific evaluation and decided on by management decision for the development of the infrastructure of JINR.