Referee report on the project

Study of Neutrino Oscillations in NOvA experiment

(JINR Participation)

Neutrino physics is a big part of DLNP scientific program. In a current situation it is reasonable since neutrino remains to be the most unknown particle of the Standard Model and this topic is of the first priority worldwide. Therefore, besides the home project at Baikal lake, the oversee projects are also of major attraction. Having great experience in detectors and in theoretical neutrino physics it is quite natural to participate in neutrino collaborations abroad if financial resources and manpower is sufficient.

The previous years of JINR participation in NOvA long base neutrino experiment at Fermilab should be acknowledged as successful. JINR group was very active in developing the data analysis not only in neutrino oscillation experiment, which was the main aim of the project, but in analysis of supernova, atmospheric neutrino and monopole searches. One of the most essential contributions was the development of theoretical approach to nuN interactions build in Monte Carlo program. Following the modern remote approach to data analysis, the powerful computer infrastructure was created which made it possible to have shifts and preliminary analysis directly at JINR. A series of methodic research works have been done which allow to understand the detector performance and comparison of Monte Carlo with real data. The JINR group has also prepared for the continuation of the project at higher statistics and for the future project of a higher scale DUNE.

The scientific outcome of NOvA experiment is yet to be improved with improved statistics but already the current data on neutrino oscillations are quite impressive. The main aim is to measure the CP phase in lepton mixing matrix, the value of the angle teta_23 and the mass hierarchy of neutrinos. It is actually done though with low statistics! The obtained results are still within 1-2 sigma but the future runs will definitely improve the accuracy and give the answers to these fundamental questions. The other scientific targets of NOvA also promise to be on the highest modern level. Apparently the continuation of JINR participation in NOvA should be very welcome.

Few critical remarks might be added. This concerns the visibility of the JINR group in NOvA experiment in general and of theoretical support in particular. If one looks at the publication list and the list of talks of the JINR group in their report, one finds mostly talks at collaboration meetings, at PACs at JINR and the other internal conferences and publications in internal reports. It tell us of a big activity of the JINR group, however, there are very few talks on physics at international conferences on behalf of the collaboration. Maybe it is too early and such talks will come with the new results but this should be a taken care of by the group leaders. The second comment is related to a big amount of theoretical work done in improvement of analysis in particular within the GENIE Neutrino Monte Carlo Generator. It seems that this work is not really appreciated. Certain efforts have to be undertaken in this direction.

Summarizing, I believe that participation of JINR in this first class international neutrino experiment providing access to modern analysis, instrumentation and computer facilities is of

great importance. The requested resources seem to be adequate. I recommend to approve the continuation of JINR participation in NOvA experiment with highest priority.

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