

Referee report on the Daya-Bay/JUNO projects (JINR participation)

(referee Antonio Ereditato; antonio.ereditato@unibe.ch)

The report given to the Program Advisory Committee of JINR on 21 June 2023 outlines the proposal submitted by JINR neutrino physics researchers to extend their participation in the JUNO experiments in China, for the period 2024-2026.

Several experiments worldwide are planned or running to address some of the outstanding open issues in the study of the PMNS neutrino mixing-matrix, such as the neutrino mass eigenvalue hierarchy and the existence of a possible CP violation phase in the matrix. The relevance of these subjects and the smallness of the expected effects set serious constraints to the projects and justify their complexity, their long-term schedules and their cost. Daya-Bay has made a fundamental discovery by measuring a non-zero θ_{13} mixing angle, a major result in neutrino physics, by studying the anti-neutrino flux from nuclear reactors and has provided its results. Certainly, more is expected to come from JUNO, a larger and complex liquid scintillator neutrino reactor detector, whose main goal will be the first determination of the neutrino mass hierarchy at the 3 sigma level by ~ 2029 , in addition to a rich side program, principally on the PMNS matrix.

The JINR group has been very active and productive so far, both in the running and exploitation of the data from Daya-Bay, and in the construction of JUNO, with relatively large financial and person power contributions from JINR. As far as JUNO is concerned, being the group a major international player within the international collaboration, they took relevant responsibilities (and some more could be still envisioned): 1) responsibility for the design and realization of the high-voltage units for both large- and small-size PMTs; 2) contribution to the construction and operation of the Top Tracker detector; 3) testing and commissioning of the large PMTs by a new testing stations; 4) contribution to the design and construction of the TAO near detector. Moreover, the JINR group is also commissioning a computer center aimed at Monte Carlo data production, storage and processing. This will be one of the main centers handling the experiment data. The contribution of the JINT researchers so far has been very noticeable, with large financial and person power efforts.

A rather large effort has been paid in trying to secure student and young scientist participation. The number of heads is large (33) but with an acceptable $\sim 50\%$ FTE quota. The referee appreciates that there just a couple of 10% participations and that the number of students of all kinds is adequate. The latter is a good figure, as the involvement of young researchers in top international projects is essential for their training. However, these positive aspects should not prevent the group from getting more responsibilities, from the management and coordination

sides, in particular.

For many reasons the activities since last report were not at the expected level and some delays are observed here and there. Despite that, the JUNO experiment is a flagship JINR project. This implies a high level of support but also a consequent request for high performance, important deliverables, and international impact from the participants. The evaluation from the referee is therefore positive.



Prof. Dr. Antonio Ereditato