Report on Daya Bay and JUNO experiments

1 Goal of the experiment

Daya Bay is a world-leading experiment in reactor neutrino physics to measure oscillations parameters. This experiment has reached the most precise measurement of the theta13 neutrino oscillation parameters.

The aim of JUNO is to determine the neutrino mass hierarchy and to measure solar and supernovae neutrinos. This experiment will look also for some exotic neutrino physics.
The neutrino mass hierarchy is one of the most important questions in neutrino physics. There is a strong competition and complementarity with future neutrino accelerator experiments or atmospheric neutrino detectors. Juno has attracted the global community of reactor neutrino.

Both experiments are based on the same detection principle (liquid scintillator coupled to photomultipliers, loaded in Gd for DB and pure for JUNO)

2, Contributions of the JINR Group

Daya Bay: contribution on the software for signal detection and background selection. Development of a fit of the oscillation parameters for capture on Gd. Development of a global analysis for neutrino oscillations. GNA
Contributions are only on the analysis. They are visible with the selection of JINR method for the result of the collaboration in 2016 and the first experimental limit on the parameters of the coherence of neutrino wave packet.

JUNO:
The JINR team is involved in the PMT characterisation of JUNO with development of scanning stations. Strong contribution to the top tracker to tag cosmic rays (Data acquisition, slow control, tracking algorithm). Contribution in the HV, design with companies, tests, purchasing of 25 000 units. Background and sensitivity studies.

JINR team has key contributions in the hardware of JUNO detector and in the preparation of the analysis.
The JINR team has positions in the management of both collaboration with stronger involvement in JUNO.

3 Plan

The plans are well detailed

For Daya Bay, the main plan is to continue to develop GNA software and to contribute to the final data analysis.

In the case of JUNO, the planned contribution concerns the ests of the PMT, preparation of the analysis of the top tracker, modelisation of the optical model of PMT, and sensitivity studies within GNA framework.

4 Publications

12 papers for Daya Bay with visible implication of JINR team.

No publication for JUNO

5 PhD theses

2 PhD in Daya bay

6 Talks

9 plenary talks and 25 parallel session in the last three years.

7 Group size, composition and budget

29 staff people involved (9 in Daya bay and 29 in JUNO) including 4 students. This number of physicist is required to have visible contribution and impact in a big collaboration such a JUNO. The number of students could be increased.

The budget is in adequation with the commitments on the hardware part of JUNO.

Comments

The participation of JINR in Daya Bay and JUNO experiment is very relevant.
Daya Bay has allowed the measurement of the theta13 angle and the measurement is most precise. The contribution of JINR is exclusively on the analysis. It is very visible and for the results on anti-neutrino oscillation, the JINR team analysis has been selected for the publication that is recognition of the quality of the contribution.
JUNO has aggregated most of the neutrino reactor community and will the main experiment in the future for neutrino reactor but also for solar and supernovae neutrinos. In JUNO, JINR team has key hardware contribution for the PMT and the associated HV. It is involved in the scanning of the PMT and on the HV design, purchase and test. The team is rather big and insure a visibility of the JINR in the collaboration and at the international level. Some physicists of the team have visible management position corresponding to the involvement of JINR. The number of student seems to be low compared to the number of permanent people and may be some action should be done to attract more students.
The main focus of the JINR team in the future analysis (NH, Solar neutrino, SN neutrino, exotic physics,…) is not detailed and is missing in the document.