

NEUTRINO PHYSICS AFTER LAGUNA

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LAGUNA and LAGUNA-LBNO Design Studies made a significant contribution to the R&D for the new generation of giant, deep-underground neutrino detectors. Although the proposal to build such a detector in the Pyhäsalmi mine did not gain sufficient support from the physics community and from the European science and funding agencies, the knowhow and the legacy of LAGUNA have now been transferred to the leading-edge experiments in China and in the USA. The two main detector technologies considered by LAGUNA were LENA – a liquid scintillator – and GLACIER – a double phase Liquid Argon Time Projection Chamber (LAr TPC). By the end of 2014 most of the LENA community has joined JUNO – the successor of the Daya Bay experiment. JUNO will use neutrino flux generated by the reactors totaling 36 GW of thermal power and located at the ~ 60 km oscillation maximum from a 20 kton LS detector placed 600 m underground. JUNO has a broad scientific program [1] with the main goal to determine neutrino mass hierarchy. The detector is scheduled to start taking data by 2020 and yield a 3σ result within 6 years of operation.

The GLACIER community applied and was granted CERN support within the Neutrino Platform for WA105 experiment. Its goal is to design, build and test with SPS beams a large prototype of a double phase LAr TPC. At the same time preparations were made to form a global program aimed at determination of the phase of the CP violation in the leptonic sector. Combining the expertise gained from LAGUNA and LAGUNA-LBNO Design Studies with that of our US colleagues from the LBNE project and backed by the support from FNAL and CERN, in the spring of 2015 the DUNE Collaboration was formed. It has already grown to ~ 800 members representing 146 institutes from 27 countries. Deep Underground Neutrino Experiment [2-5] will project neutrino beams produced at the Long-Baseline Neutrino Facility at Fermilab towards a 4×10 kton Liquid Argon TPC detector complex located 1300 km away and 1.5 km underground at the Sanford Underground Research Facility in Lead, South Dakota.

Finland is a member of both JUNO and DUNE collaboration.

[1] Neutrino Physics with JUNO, <http://arxiv.org/abs/1507.05613v2>

[2] CDR-vol1, DUNE overview, <http://arxiv.org/abs/1601.05471>

[3] CDR-vol2, DUNE physics, <http://arxiv.org/abs/1512.06148>

[4] CDR-vol3, DUNE beam (LBNF) <http://arxiv.org/abs/1601.05823>

[5] CDR vol4, DUNE detector, <http://arxiv.org/abs/1601.02984>