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The LAGUNA/LBNO neutrino observatory in Europe

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The LAGUNA and LAGUNA-LBNO consortia have performed two detailed design studies from 2008 to 2014 to define the optimal combination of baseline and detector technology for the next generation neutrino observatory. Starting from seven sites and three detector technologies we have prioritized our options and selected the Pyhäsalmi mine in Finland, 2300 km from CERN at 1400 m depth, using a liquid Argon double phase TPC as detector. The combination of the very long baseline and a detector deep underground allows a full neutrino astrophysics program, the test of BSM physics by measuring proton decay and long baseline neutrino physics. We will demonstrate the capability of LBNO to discover the mass hierarchy at the >5 sigma level within 4 years running using a 20 kt DLAr detector and an upgraded classical neutrino beam based on 400 GeV protons from the CERN SPS achieving 750 kW beam power. Knowing the mass hierarchy allows the determination of the CP violating phase δ_{cp} . This measurement uses the full figure of the oscillatory behaviour, the L/E dependence of the oscillation probability, predicted by the three neutrino-mixing paradigm. The very long baseline allows disentangling and demonstrating the matter effect from CP violating effects.

Summary

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