

## The Laguna-LBNO neutrino oscillation project: status and plan

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The LAGUNA-LBNO European design study aims at defining a deep underground neutrino observatory for the study of neutrino oscillations at long baselines, the investigation of the Grand Unification of elementary forces and for the detection of known and unknown astrophysical sources of neutrinos. For the neutrino oscillation studies, the project is specifically considering long baseline neutrino beams from CERN towards two possible far sites, Fréjus (130 km) and Pyhäsalmi (2300 km) with three detector technologies, Water Cherenkov, Liquid Scintillator and Liquid Argon.

The design study work findings and physics case led the consortium to select as a first priority option a very long baseline of 2300 km with a multi-GeV neutrino beam produced at CERN towards the Pyhäsalmi underground site and a large Liquid Argon TPC with double phase readout and a mass of 20 kton as a first phase. This LBNO setup allows for effectively measuring the oscillation patterns as a function of the energy over the first and the second maxima, assessing the neutrino oscillation phenomenology with an optimal sensitivity to the mass hierarchy determination and a competitive CP search reach.

A unique possibility of having a second neutrino beam from Protvino accelerator complex to Pyhäsalmi (1160 km) is also considered. The physics reach and performances of the neutrino detectors with the various neutrino beam options will be reviewed together with the LAGUNA-LBNO perspectives and status.

**Primary author:** BLONDEL, Alain (DPNC UNiversity of Geneva)

**Presenter:** BLONDEL, Alain (DPNC UNiversity of Geneva)

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