Contribution ID: **159** Type: **not specified**

CERN Accelerator Infrastructure for Neutrino Physics

The CERN's potential for future Neutrino Physics based on accelerator-generated neutrinos is described. CERN is presently operating the CNGS neutrino beam, which will soon successfully complete its approved program. The design and operation of this second generation conventional neutrino beam facility provides important expertise towards the realization of future projects. CERN is also participating in various EU funded design studies
for future neutrino facilities, done in collaboration with several European Labs and international efforts gathering experts from worldwide.

CNGS uses the proton beam from SPS, which already today offers sufficient beam power at the sub-MW range to create competitive neutrino beams for neutrino oscillation physics, with further improvement possible in the future, as a side product of the foreseen injector upgrade for LHC (LIU project). The conventional neutrino beam technology of CNGS could be further optimized to produce lower energy neutrino beams, as presently favored by the recent measurements of the neutrino mixing parameters (è13). This technology can be exploited with the creation of a neutrino facility with a short baseline conventional neutrino beam in support of physics measurements and neutrino detector R&D, or as a first stage for a third-generation long (2300 km)-baseline conventional neutrino beam to a far site located in Europe. Such a program could provide unique physics opportunities, complementary to other programs world-wide. In a second stage, this facility, depending on the physics landscape at that time, could be upgraded to reach additional physics goals like precision measurements in the neutrino/lepton sector, using either an upgraded high-power (2 MW) proton driver or a lowenergy neutrino factory to the same long-baseline beam, or alternatively, to a near (130 km)-baseline site using a high-power (4 MW) super-beam or/and beta-beam.

CERN has a long tradition in developing neutrino beams. The available expertise and ongoing R&D for a high-power proton Linac (SPL), targetry (including for radioactive ion beams), horns, and superconducting magnets, combined with the existing infrastructure and know-how on building large accelerator projects, are significant assets that can be of benefit and at the
same time important ingredients in future neutrino programs. The CERN laboratory participates in the design studies and has developed a close collaboration network with colleagues world-wide working on neutrino beams, which can be further expanded and continue on mutually interesting targeted R&D topics or collaborations.

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