

The ESSnuSB Target Station

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The ESSnuSB project, recently granted by the EU H2020 programme for a 4-year design study, proposes to use the protons produced by the linac (2 GeV, 5 MW) of the European Spallation Source (ESS) currently in construction in Lund (Sweden) to deliver a neutrino super beam. It follows the studies made by the FP7 Design Study EUROv[1] (2008-2012), regarding future neutrino facilities. The primary proton beam line completing the linear accelerator will consist of one or several accumulator rings and a proton beam switchyard. The secondary beam line producing neutrinos will consist of a four-horn/target station, a decay tunnel and a beam dump. A challenging component of this project is the enormous target heat-load generated by the 5 MW proton beam. In order to reduce this heat-load there will be four targets, which will be hit in sequence by the compressed proton pulses, thereby reducing the beam power on each target to 1.25 MW. Following the EUROv studies, a packed bed of titanium spheres cooled with helium gas has become the baseline design for a Super Beam based on a 2-5 GeV proton beam with a power of up to 1 MW per target, with other targets being considered for comparison. The hadron collection will be performed by four hadron collectors (magnetic horns), one for each target. Each of these target/hadron-collector assemblies will receive proton pulses three times more frequently than in present projects, and by an average beam power of 1.25 MW, which is twice as high as in present neutrino projects. The feasibility of the target/horn station for the ESSnuSB project is discussed here.

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