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The European Spallation Source neutrino Super Beam project

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The European Spallation Source 5 MW proton linac will be the world's most powerful accelerator, enabling the production of the world's most intense neutron flux. The proton driver can also be used to produce a very intense neutrino beam for CP violation discovery and measurement in the leptonic sector, very important for the understanding of matter-antimatter asymmetry in the Universe. During the last four years an EU supported Design Study of an ESS neutrino Super Beam (ESSnuSB) has been successfully performed with the participation of physicists from 15 European institutions. Within this study it has been designed the upgrade of the linac required to increase its power to 10 MW by the provision of extra H⁻ pulses between the proton linac pulses, of a 400 m circumference accumulator ring to compress the 3 ms long linac pulses to 1.3 μ s, of a set of four high power neutrino targets with focusing horns and a kiloton near and a megaton far water Cherenkov neutrino detector, the latter at a distance of 360 km, at the location of the second neutrino oscillation maximum. The publication of the ESSnuSB Conceptual Design Report has been done in which all details are given including the facility costing. The physics performance obtained overpast all initial expectations. More recently a study of the use of the intense muon flux produced together with neutrinos has been started, aiming at a design of, in the first stage, of a low-energy nuSTORM facility for neutrino cross-section measurements, and ultimately a Muon Collider Higgs Factory. The plan for this High Intensity Frontier Initiative (HIFI) design work will also be presented.

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