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The ESSnuSB neutrino beam and its accumulator (12'+3')

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The 2.0 GeV, 5 MW proton linac for the European Spallation Source, ESS, will have the capacity to send extra pulses to a neutrino target, giving an excellent opportunity to produce an unprecedented high performance neutrino beam, the ESS neutrino Super Beam, ESSnuSB. The proton pulse power for the neutrino target can be as high as 5 MW, which will be the world's most powerful neutrino source, while the linac structure does not have to be changed too much. Due to the limitation of the neutrino target focusing system, the pulse duration will need to be as short as a few microseconds. An accumulator ring is needed to compress the 2.86 ms pulses from the ESS linac for 3 orders of magnitude, while maintaining the pulse intensity up to 1.1×10^{15} . One of the main challenges of this accumulator ring is the injection of the particles due to very high beam intensity. The injection method currently used in the design is H⁻ stripping and painting. Some alternative methods like two-plane direct proton injection is investigated as well. Different pulse schemes and beam distributions are studied in order to make sure that the beam properties meet the requirements for the extraction region, the transfer line and the target system as well. The 4-target station is designed to mitigate the total beam power for each target and different configurations of beam switchyard are designed. An overview of the plans for how the ESSnuSB neutrino beam facility will be constructed will be introduced, including the linac upgrade and the target station, but that the main subject will be the design of the accumulator.

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