

The HighNESS Project at the European Spallation Source

The European Spallation Source (ESS), currently under construction in Lund, will be a multi-disciplinary international laboratory that, at full specifications, will operate the world's most powerful pulsed neutron source. Taking advantage of the construction of such a facility, the HIBEAM/NNBAR collaboration has proposed a two-stage program of experiments to conduct a high precision series of experiments to search for baryon number violation via the conversion of neutrons to anti-neutrons and/or sterile neutrons. This culminates with an ultimate sensitivity increase for $n \rightarrow \bar{n}$ oscillations of three orders of magnitude over the previously attained limit, obtained at the Institut Laue-Langevin (ILL). In this talk, I will focus on the second stage of the program, the NNBAR experiment, which will exploit a large beam port specifically designed in the ESS target monolith for this experiment to provide the maximum possible neutron flux for the high sensitivity search for $n \rightarrow \bar{n}$ oscillations.

Supported by a 3 MEuro Research and Innovation Action within the EU Horizon 2020 program, a design study (HighNESS) is currently in progress for the design of the ESS second neutron source, which will be optimized in order to increase the performance of the NNBAR experiment. Part of the project is also dedicated to the Conceptual design report of the NNBAR experiment.

This talk will discuss the HighNESS program and the ongoing developments in the NNBAR collaboration, including the design of the source, the neutron extraction system and the NNBAR detector.

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