

HighNESS and Future Free Neutron Oscillation Searches @ ESS

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The European Spallation Source (ESS), presently under construction, in Lund, Sweden, is a multi-disciplinary international laboratory that will operate the world's most powerful pulsed neutron source. Supported by 3MEuro Research and Innovation Action within the EU Horizon 2020 program, a design study (HighNESS) is now underway for a lower liquid deuterium moderator and associated experiments made possible by the moderator. These experiments include a search for neutron conversions to antineutrons (nnbar) and measurements with ultra cold neutrons. A fundamental physics program is part of the mandate of the ESS and was identified as a missing capability of the highest importance in a recent ESS prioritization exercise. This talk focuses on the HighNESS program and other fundamental physics possibilities at the ESS with an emphasis on the nnbar program. The nnbar experiment is a two-step program, starting with the HIBEAM stage which would make high precision searches for free neutrons converting to sterile neutrons and thus probing a possible dark sector whilst also performing R&D for the second stage of the experiment at which an improvement in sensitivity, compared with the last such search, to neutrons converting to antineutrons by three orders of magnitude can be obtained.

Abstract Track

Instrumentation & facilities (including ESS and MAX IV)

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