

A Neutron-Antineutron Annihilation Detector for the NNBAR Experiment

Tuesday 24 November 2020 17:00 (15 minutes)

The existence of baryon number violating processes is considered a necessary condition to explain the observed matter-antimatter asymmetry in the universe. The construction of the European Spallation Source (ESS) provides a unique opportunity to exploit a high intensity beam of free, cold neutrons to perform searches for baryon number violation. The NNBAR/HIBEAM experiment will be the cutting-edge free neutron search for $n \rightarrow \bar{n}$ and $n \rightarrow \text{sterile } n$ oscillations housed at the ESS, with a >1000 gain in sensitivity compared to the previous 1990s search at ILL.

The NNBAR detector will be capable of identifying neutron-antineutron annihilation events within a Carbon foil target. The signal is a multiplicity of pions with a final state invariant mass < 2 GeV. The major detector subsystems will be vertex reconstruction with silicon, tracking with an Argon TPC, and a novel calorimeter design. Calorimetry for lower energy pions is a technical challenge due to poor energy resolution due to large fluctuations in energy deposition from the showers created in traditional sampling calorimeters. This talk will present the NNBAR detector concept, as well as ongoing work towards a prototype calorimeter at Stockholm University.

Abstract Track

Instrumentation & facilities (including ESS and MAX IV)

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