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# Searches for baryon number violation via neutron conversions at the European Spallation Source

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The observation of neutrons converting to antineutrons and/or sterile neutrons would demonstrate Baryon Number Violation (BNV) for the first time. BNV is an essential condition needed to produce the matter/anti-matter asymmetry in the universe and appears in a number of theories beyond the Standard Model. The existence of sterile neutrons would address the issue of a possible dark sector of particles. The HIBEAM/NNBAR project is a proposed series of experiments for the European Spallation Source (ESS), in Lund, Sweden, that can open up a discovery window for BNV by observing free neutrons transforming to antineutrons and/or sterile neutrons. A series of competitive searches are planned with an ultimate improvement in sensitivity of three orders of magnitude compared with the previous free neutron to anti-neutron search at Institut Laue-Langevin. This talk describes the HIBEAM/NNBAR experiment. The motivation for the experiment and theories predicting neutron conversions are described, followed by a description of the ESS and those ESS facilities which can be exploited for the experiment. The set-ups and sensitivities of the neutron conversion searches are shown. Special focus is placed on the annihilation detector which would use a Time Projection Chamber and calorimeter system exploiting scintillators and lead-glass. Geant-based simulations of the annihilation signature within a detector are shown and compared with background predictions

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