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Fundamental Physics with HIBEAM at the ESS

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One of the great open questions in modern physics is the origin of the matter-antimatter asymmetry. This requires baryon-number violation, which has never been experimentally observed. Baryon-number violation may arise in the neutron sector as the direct conversion between neutrons and antineutrons, or with a sterile/mirror neutron.
This process will be probed with the proposed HIBEAM/NNBAR program, a two-stage experiment at the European Spallation Source. The initial stage of the program, HIBEAM, will present opportunities to search for baryon-number violation in neutron conversion to antineutrons, or to sterile neutrons (as a disappearance search) or to sterile neutrons and into neutrons/antineutrons, with discovery potential reaching a factor of ten higher than previous experiments. HIBEAM also presents unprecedented sensitivity for direct searches for low mass axions as a dark matter candidate, surpassing previous results by two-to-three orders of magnitude for axion masses between 10^-22 eV to 10^-16 eV. Additionally, HIBEAM presents opportunities to search for a nonzero neutron electric charge as well as an electric dipole moment of the neutron with world-leading sensitivity.
In this talk we present the fundamental physics opportunities of HIBEAM at the European Spallation Source.

Secondary track

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