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Advancements in Computing and Simulation Techniques for the HIBEAM-NNBAR Experiment

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The HIBEAM-NNBAR experiment at the European Spallation Source is a multidisciplinary two-stage program of experiments that includes high-sensitivity searches for neutron oscillations, searches for sterile neutrons, searches for axions, as well as the search for exotic decays of the neutron. The computing framework of the collaboration includes diverse software, from particle generators to Monte Carlo transport codes, which are uniquely interfaced together. Significant advances have been made in computing and simulation for HIBEAM-NNBAR, particularly with machine learning applications and with the introduction of fast parametric simulations in Geant4. A summary of the simulation steps of the experiment, including beamline, cosmic veto system, as well as detector simulations and estimation of the background processes, will be presented.

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