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SBN@CERN: A short-baseline neutrino beam at CERN for high-precision cross-section measurements

A new generation of neutrino cross-section experiments at the GeV scale is crucial in the precision era of oscillation physics and lepton flavor studies. In this document, we present a novel neutrino beam design that leverages the experience and R&D achievements of the NP06/ENUBET and NuTag Collaborations and explore its potential implementation at CERN. This beam enables flux monitoring at the percent level and provides a neutrino energy measurement independent of final state particle reconstruction at the neutrino detector. As a result, it eliminates the two primary sources of systematic uncertainty in cross-section measurements: flux normalization and energy bias caused by nuclear effects. We provide a detailed description of the beam technology and instrumentation, along with an overview of its physics potential, with particular emphasis on cross-sections relevant to DUNE and Hyper-Kamiokande.

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