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Precision neutrino interaction measurements with the nuSCOPE experiment

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The poor knowledge of neutrino cross sections at the GeV scale is projected to be responsible for some of the leading sources of uncertainty in next-generation oscillation experiments. Building on the ideas and R&D from ENUBET and NuTAG, we present a proposal for the nuSCOPE experiment (see arXiv:2503.21589). nuSCOPE is a high-precision, short-baseline neutrino experiment at CERN that employs neutrino monitoring and tagging. This allows for an exceptionally well controlled muon and electron neutrino flux, with the extraordinary capacity to reconstruct neutrino energy on an event-by-event basis. The opens up the possibility for a wealth of cross-section measurements usually reserved only for electron-scattering experiments. In this talk we show highlights of projected measurements, demonstrating the experiment's unique ability to directly measure aspects of neutrino interaction physics responsible for dominant sources of systematic uncertainty for the upcoming DUNE and Hyper-K experiments, including neutrino energy response functions and muon/electron neutrino cross-section ratios. A talk proposed for WG3 will cover the implementation of the monitored and tagged beamline.

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