

nuSTORM; Neutrinos from Stored Muons

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A rich cross-section and “beyond the Standard Model” (BSM) search programme will be served by the intense ν_e and ν_μ beams that will be provided by the neutrinos from stored muons (nuSTORM) facility. Exceptional precision in cross section measurement and exquisite sensitivity in BSM searches are afforded at nuSTORM by the precise knowledge of the flavour composition and the energy distribution of the neutrino beams. These unique features are complemented by the ability to tune the mean energy of the beams and use this freedom to analyse the data using synthetic beams of limited energy spread.

The precision that nuSTORM will provide is critical to the elucidation of neutrino-nucleus scattering dynamics. Especially appealing are the prospects for new precise direct or indirect measurement of neutrino scattering cross sections on single nucleons. Such measurements will be a priceless input to the development of event generators and provide valuable information about hadron structure in the axial sector. The sensitivity of which nuSTORM is capable will allow exquisitely sensitive searches for short-baseline flavour transitions, covering topics such as light sterile neutrinos, non-standard interactions, and non-unitarity of the neutrino mixing matrix. In synergy with the goals of the neutrino-scattering program, BSM searches will also profit from measurements of exclusive final states. This would allow BSM neutrino interactions to be probed by means of precise measurements of neutrino-electron scattering, as well by searching for exotic final states, such as dileptons or single-photon signatures. We will describe the status of the development of the nuSTORM facility and the simulation of its performance. Illustrative examples of the precision and sensitivity that can be achieved will be presented. The implementation of nuSTORM as part of a Muon Collider “demonstrator facility” will also be discussed.

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