

Strong Millicharge and Long-Lived Particle Searches at FerMINI and LongQuest

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The Fermilab 120 GeV proton facilities, including the NuMI beam and the Main Injector beam for SpinQuest, provide exciting opportunities to search for millicharged particles (mCP) and long-lived particles (LLPs). We present two low-cost, robust, symbiotic proposals to search for these exotic BSM particles.

FerMINI is a scintillator-based detector proposed to be installed at the MINOS hall (downstream of the NuMI beam). With strong millicharge particle production at the target and the dump, FerMINI can provide leading sensitivity for mCP in the MeV to a few GeV mass range. FerMINI can later be installed in the DUNE near-detector complex to extend its sensitivity reach.

LongQuest is a versatile experimental proposal upgrading the SpinQuest facility. The plan is to install one of the spare detectors from the sPHENIX experiment in the back room of the SpinQuest experiment, to provide improved sensitivities for long-lived particles, including dark photons, dark Higgs, heavy neutral leptons, and axion-like particles. LongQuest has a longer baseline than DarkQuest, but would have the shielding from a 10-meter iron block for background reduction, and can be installed without much interference with the SpinQuest missions.

Presenter: TSAI, Yu-Dai (University of California, Irvine)

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