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Proton Decay Searches with DUNE KEVIN WOOD, Stony Brook University — The Deep Underground Neutrino Experiment (DUNE) will be comprised of a beam line and near detector complex at Fermilab, Illinois as well as a massive far detector located 1300 km away at Sanford Underground Research Facility (SURF), South Dakota. To achieve its rich physics program, DUNE plans to construct a 40kt fiducial volume Liquid Argon Time Projection Chamber (LArTPC) far detector almost a mile underground. The size, location, and technology of the proposed far detector make it an attractive tool to search for proton decay, which has yet to be observed. Observation of such a rare event requires high sensitivity to the signal and high background rejection rate. A particular background of interest arises from cosmic muons interacting with rock surrounding the detector and producing a variety of particles which can enter the detector and leave signatures similar to that of proton decay. In order to keep this background to a reasonable level without sacrificing signal acceptance efficiency, precise tracking, made possible by the LArTPC technology, is required. Precise 3D localization of proton decay events relies on the detector's ability to identify the prompt emission of scintillation light from proton decay events as the t0-defining signal. Therefore, low background rate and high detection efficiency of this light are the crucial to the search. This work examines these characteristics in a detailed Monte Carlo simulation using DUNE's far detector reference design and demonstrates a high signal efficiency while keeping the expected number of cosmogenic background events sufficiently low.

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