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Nucleon Decay and Atmospheric Neutrino Reconstruction in DUNE

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Despite the enormous success of the Standard Model explaining many experimental results, it sheds no light on the unification of the strong and electroweak forces. Different attempts at unifying these forces into a single larger group have been made in Grand Unified Theories (GUT). In most GUTs, the proton is not a stable particle and the predicted lifetime is within reach of kiloton-scale experiments located deep underground with a low background rate. Two main modes characterize two groups of GUTs: decays to a positron and a neutral pions usually have the highest branching fraction for non-supersymmetric GUTs while decays to K+ and an anti-neutrino are usually dominant when supersymmetry is present. Liquid Argon Time Projection Chambers (LArTPC) experiments are capable of tracking the kaon and measuring its momentum very precisely, in contrast to water Cherenkov detectors where the kaon is below Cherenkov threshold. The Deep Underground Neutrino Experiment (DUNE) far detector, a 40-kton LArTPC located deep underground in the Sanford Underground Research Facility, will be capable of reconstructing nucleon decay events with high efficiency and low background rate due to its location. We will present the current efforts of reconstruction of nucleon decay events and atmospheric neutrino events in the DUNE far detector, concentrating, for nucleon decay, on the modes with a kaon in the final state where DUNE can possibly make an observation based on a single event.

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