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# Simulating photonuclear backgrounds in the hadron calorimeter for the Light Dark Matter Experiment

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The constituents of dark matter are still unknown, and the viable possibilities span a very large mass range. The Light Dark Matter eXperiment (LDMX) is a planned fixed-target experiment at SLAC that will probe a variety of dark matter models in the sub-GeV mass range using a missing momentum technique. A subset of rare photonuclear (PN) events can produce neutral hadrons that escape the detector without any energy deposition, mimicking the missing momentum signature of a dark matter particle. To combat this, a hadron calorimeter (Hcal) is needed to veto these neutral hadron backgrounds. But we must also understand to what degree neutral hadron backgrounds in the Hcal can be mitigated. The Hcal uses segmented layers of steel absorbers and plastic scintillators, and is partially based on the design of the Mu2e cosmic ray veto. In this talk, we investigate the veto efficiency of the Hcal to neutrons and neutral kaons. We simulate these neutral hadrons passing through the Hcal using a Geant4-based simulation package. We have observed through these detailed simulations that different versions of, and hadronic models within, Geant4 yield different background detection efficiencies in the Hcal. These discrepancies prompt a more careful inspection of the underlying physics in the simulations, and ultimately these ongoing studies will inform us on the details of the Hcal design.

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