

This project investigates the optimization of muon production from electron-fixed target collisions for use in the Light Dark Matter eXperiment (LDMX), with the goal of enabling a high-quality muon beam to probe dark sector physics. Using the Geant4 simulation framework, we model interactions between an 8 GeV electron beam and a tungsten target to evaluate muon yield and background processes under varying target geometries. We systematically explored the impact of target thickness on both the muon and background yields, finding that increasing thickness and narrowing the angular limits improves muon-to-background ratios without significantly reducing muon yield. Additionally, we performed spatial and angular analysis of muon emission and background particle fluxes to inform filtering strategies. We also performed numerical calculations based on the characterization of the muon flux to understand the sensitivity of the experiment that can be performed with muons.