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Study of Neutrino Production Rate Dependence on the Target Dimension for Low-Mass Dark Matter Searches in Future Neutrino Experiments AAYUSH BHATTARAI, WOOYOUNG JANG, JAEHOON YU, The University of Texas at Arlington — Dark matter is perceived to make up about 85 percent of the mass in the entire universe. It is a compelling observational motivation in the search for new physics since the Standard Model of Particle Physics cannot explain its existence. Future neutrino experiments, such as the Deep Underground Neutrino Experiment (DUNE), use high-intensity proton beams impinging on a fixed target. The unprecedented intensity of the proton beams enables us to look for low-mass dark matter (LDM) and other particles produced in the proton interactions with the target. With the possibility of charge neutral LDM being produced in the target, a large number of neutrinos will be generated alongside which will be the primary background to the LDM signal. To understand the neutrino production rate dependence to target lateral volume, we simulated the proton interactions in DUNE neutrino target using GEANT4 for 1000 protons on target with different radii: 1cm, 2cm, 4cm, 10cm, 20cm, and 40cm. This presentation will provide the results of data analysis of neutrinos production, energy, and angular distribution for different target radii. We also compared the data for the different species of neutrinos to understand their dependence on the target volume.

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