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Boosted Dark Matter Search in the ICARUS T-600 Detector at Gran Sasso

Boosted Dark Matter (BDM) is a dark matter (DM) model that uses a minimal U(1)' extension to the Standard Model (SM) of particle physics. By introducing three DM particles $_0$,$_1$,and $_2$ and the dark photon (DP) X to the dark sector, gravitational anomalies can be explained, and the interactions with the SM can exist via a kinetic mixing between the DP and the SM photon. An interesting aspect of this model is the search for inelastic BDM (iBDM). A pair of the abundant dark matter $_0$ annihilates in the galactic center and produces a pair of lighter dark matter $_1$, which is kinetically boosted. $_1$ enters the detector and inelastically scatters with an electron, making $_1$ upscatter to the excited state $_2$. This particle decays via X emission back to a $_1$ and an e^+e^- pair via photon conversion because of the dark photons couple with the SM photon. The total process is $_1e^- \to _2e^- \to _1Xe^- \to _1e^+e^-e^-$. The goal is to detect the recoil electron from the initial interaction and the e^+e^- pair produced at the final stage of the $_2$ decay. In this presentation, I will detail the search for iBDM events in the ICARUS T-600 Liquid Argon Time Projection Chamber (LArTPC) detector during its operation in the Gran Sasso underground laboratory in Italy. I will present the different stages to simulate iBDM events in the detector and event topologies along with the status and plans for the analysis on the monte carlo iBDM signal and real data.

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