

No Need for Speed: Extracting Halo Independent Information from Dark Matter Electron Scattering Data

Dark matter direct detection experiments and the interpretation of their results are sensitive to the velocity structure of the galactic halo. However, the halo model is subject to large uncertainties. In this talk I will present a formalism to analyze DM-electron scattering events without assuming a particular DM velocity distribution. Using simulated data, I will show that halo-independent information about DM properties can be extracted via numerical fits in which the DM velocity is treated as a collection of nuisance parameters. I will argue that the complementarity of target materials with different response functions is essential to inferring the DM mass, interaction structure, and velocity distribution. Finally, I will discuss an application of the technique to real data from the SENSEI and EDELWEISS experiments and make predictions for a possible future GaAs experiment.

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