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Lina Necib (Caltech): Empirical Determination of the Dark Matter Velocity Distribution

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Using the hydrodynamic simulation Eris, we found that the kinematics of dark matter follows closely the kinematics of old metal poor stars, present in the Milky Way's stellar halo. We use this correspondence to obtain the first empirical measurement of the local velocity distribution of dark matter, by analyzing the Gaia data and computing the velocity distribution of metal poor stars. We find that this velocity distribution is peaked at lower velocities than the generally assumed Maxwell Boltzmann distribution, leading to a weakening of direct detection limits at dark matter masses less than 10 GeV by almost a factor of two. We also found a few kinematic outliers in the stellar data that might be hints of dark matter substructure.

Presenter: NECIB, Lina (MIT)

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