

σ_8 Tension in the Context of Dark Matter-Baryon Scattering

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We explore an interacting dark matter (IDM) model that allows for a fraction of dark matter (DM) to undergo velocity-independent scattering off of baryons. In this scenario, structure on small scales is suppressed relative to the cold DM scenario. Using the effective field theory of large-scale structure, we perform the first systematic analysis of BOSS full-shape galaxy clustering data for the interacting scenario, and we find that this model alleviates the σ_8 tension between large-scale structure (LSS) data and Planck CMB data. Adding the σ_8 prior from DES in our analysis further leads to a mild $\sim 3\sigma$ preference for non-vanishing DM-baryon scattering, assuming $\sim 10\%$ of DM is interacting, and has particle mass of 1 MeV. Such scenario is consistent with other small-scale structure observations, and produces a modest $\sim 20\%$ suppression of the linear power at $k < \sim 1/\text{Mpc}$. Our results can be interpreted as a pointer to the early-time power suppression on small scales as a desirable and generic feature that may have the potential to resolve σ_8 tension between cosmological data sets. The validity of the specific interacting DM model explored here will be critically tested with incoming survey data.

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