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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 $_8$ tension between large-scale structure (LSS) data and Planck CMB data. Adding the $_8$ prior from DES in our analysis further leads to a mild $\sim 3\sigma$ preference for non-vanishing DM-baryon scattering, assuming ~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 $<\sim 1$/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 $_8$ 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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