

Abstract Submitted
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What does the Observed, Universal Dark Matter Surface Density of Galaxies tell us about Halo Substructure? CHRIS PELIKAN, CASEY WATSON, Millikin University — Recent observations suggest a universal, core dark matter (DM) surface density ($\mu_0 = \rho_0 r_0$) for galaxies at all observed mass and luminosity scales. We show that this result emerges naturally if the gravitational field at the core radius of a DM halo is spherically symmetric. This result is independent of the scale of the DM halo core being considered as well as the assumed DM density profile. If a spherically symmetric gravitational field is the correct interpretation of the universal value of μ_0 , it implies that no dark matter substructure can exist, even within the largest core radius for which the universal μ_0 relation holds, lest it spoil the symmetry – except in the highly contrived scenario that substructure is symmetrically distributed in the cores of DM halos at all scales for which the universal μ_0 relation is observed. Ignoring this extremely unlikely special case, the symmetry condition translates into an upper bound on the mass of the dark matter particle. Our result, which favors lower mass candidates, is consistent with the findings of several other recent studies.

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