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Halo uncertainties in dark matter capture within celestial objects

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Prospects of direct and indirect detection of DM are distinctively correlated to the phase space distribution of DM within the galactic haloes. A promising avenue to detect and constrain the properties of particulate DM is to explore the capture and subsequent heating signatures of DM annihilation from astronomical objects. The aim of this article is to systematically study the impact of observational uncertainties and cosmological simulations on the rate of capture of DM particles within celestial objects. Additionally, we probe a variety of dark matter-nucleon scattering cross-section for some empirically motivated, isotropic velocity distributions. Within the limits of the standard halo model, we find a ~ 10% increase in the capture rate, taking into account the astrophysical uncertainties. Whereas this number can jump upto ~ 100% if the velocity distribution of DM particles within the galactic halo is favored to be a non-standard distribution. We also report a significant dependence of the resolution and sophistication of the cosmological simulations on the capture rates.

Session

Astroparticle Physics and Cosmology

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