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Soft Scattering Evaporation of Dark Matter Subhalos by Inner Galactic Gases

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The large gap between a galactic dark matter subhalo's velocity and its own gravitational binding velocity creates the situation that dark matter soft-scattering on baryons to evaporate the subhalo, if kinetic energy transfer is efficient by low momentum exchange. Small subhalos can evaporate before dark matter thermalize with baryons due to the low binding velocity. In case dark matter acquires an electromagnetic dipole moment, the survival of low-mass subhalos requires stringent limits on the photon-mediated soft scattering. We calculate the subhalo evaporation rate via soft collision by ionization gas and accelerated cosmic rays, and place an upper limit on the DM's electromagnetic form factor by assuming the survival of subhalos in the ionized Galactic interior. We also show that subhalos lighter than $10^{-5} M_{\odot}$ in the gaseous inner galactic region are subject to evaporation via dark matter's effective electric and magnetic dipole moments below current direct detection limits.

In-person participation

No

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