Phenomenology 2025 Symposium



Contribution ID: 32

Type: not specified

Impact of Galactic Dark Matter Velocity Distribution on Single Phonon Scattering Rate

Monday 19 May 2025 15:00 (15 minutes)

In this work, we investigate the dependence of dark matter (DM) direct detection results, specifically single phonon scattering observables, on the astrophysical properties of the local DM halo. We analyze the impact of uncertainties in DM halo velocity distributions on both total cross-sections and daily modulation in single phonon excitation rates. Employing the Standard Halo Model (SHM), Tsallis model, and an empirical model, we explore the effects of varying key astrophysical parameters, including the local circular velocity (v_0), escape velocity (v_{esc}), and earth's velocity (v_E). We find that the uncertainties of these parameters cause substantial deviations in direct detection projected reach for DM-single phonon scattering, with the impact being highly pronounced for low DM masses. Our findings underscore the paramount importance of accurately determining astrophysical inputs for a reliable interpretation of experimental efforts targeting DM detection via single phonon excitations.

Mini Symposia (Invited Talks Only)

Plenary (Invited talks only)

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Session Classification: Dark Matter

Track Classification: Dark Matter Theory and Detection