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Shimmering darkness: Mapping the evolution of supernova-neutrino-boosted dark matter across the sky

Wednesday, 25 June 2025 16:30 (30 minutes)

Supernova-neutrino-boosted dark matter (SNν BDM) has emerged as a promising portal for probing sub-GeV dark matter, offering the distinctive capability of DM mass differentiation via time-of-flight information. In this work, we randomly generate the spatial locations and ages of core-collapse supernovae (CCSNe) in the Milky Way (MW) over the past one hundred thousand years by Monte Carlo simulation and estimate their cumulative contribution to the present-day BDM flux at Earth. This study aims to address two crucial aspects for DM detection: {\it where} and {\it when} to search for BDM signatures. We systematically demonstrate that a spatial and temporal averaging of the total BDM signal is valid only when the duration of the BDM flux from an individual CCSN greatly exceeds the average time interval between two successive CCSNe in the MW. Particularly in a region when the ratio of BDM kinetic energy to DM mass is less than 5. Otherwise, the BDM signal must be resolved on a per-source basis. For completeness, we also discuss the results obtained using the observed supernova remnant data.

Please choose your topic

Dark Matter

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