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Entering in the Era of Dark Matter Astronomy: Galactic DM Sensitivities in the X-ray and Gamma-ray Band

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Dark matter (DM) accounts for 85% of matter in the universe, but its particle properties still remain unknown. Several studies have focused on X-ray and γ-ray signals of DM from the Milky Way, other L* galaxies and galaxies clusters. With the help of upcoming advanced detectors, it is expected to find DM astronomical smoking gun in the future. In this project, we evaluate Galactic DM radiation and detectability based on spatial and kinematic information extracted from the "m12i" galaxy in Latte suite of Feedback In Realistic Environments (FIRE-2). In particular, we estimate the all-sky centroid energy shift patterns of DM narrow emission lines and discuss its potential as DM signal diagnosis with symmetric observations about $\ell = 0^o$. Specifically, with an exposure at $\ell \sim 90^o$ and $\ell \sim 270^o$ (-90^o), the spectrometers on future X-ray telescopes XRISM, Athena and Lynx have the capability to perform DM diagnosis for Galactic DM decay emission line at ~ 3.5 keV. Finally, we present all-sky luminosity maps for both DM annihilation and decay signals and evaluate the signal-to-noise (S/N) for DM detections taking into account realistic X-ray and γ-ray backgrounds. Our study aims to be a valuable guideline for the forthcoming era of DM astronomy.

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