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Probing Dark Matter-Proton Interactions with Cosmic Reservoirs

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Dark Matter (DM) existence is a milestone of the cosmological standard model and, yet, its discovery still remains a complete conundrum. In this contribution, we investigate a unique and original way to probe properties of light-particle dark matter candidates, exploiting the nature of the cosmic-ray (CR) transport inside starburst nuclei (SBNs). Indeed, SBNs are considered CR reservoirs, trapping them for ~10^5 years up to ~ PeVs energies, leading to copious production of gamma-rays and neutrinos. As a result, interactions between DM and protons might indelibly change CR transport in these galaxies, perturbing the gamma-rays and neutrino production. We are going to show that current gamma-ray observations pose strict limits on the elastic cross section down to σ_χp⊠10^-34 cm^-2 for DM masses m_χ≤10^-3 MeV and that they have considerable room for improvement with the future gamma-ray measurements in the 0.1-10 TeV range from the Cherenkov Telescope Array.

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