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Phenomenology of Neutrino-Dark Matter Interaction in DSNB and AGN

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We investigate a neutrino-scalar dark matter (DM) $\nu\phi$ interaction encountering distinctive neutrino sources, namely Diffuse Supernova Neutrino Background (DSNB) and Active Galactic Nuclei (AGN). The interaction is mediated by a fermionic particle F , in which the $\nu\phi$ scattering cross section characterizes different energy dependent with respect to the kinematic regions, and manifests itself through the attenuation of neutrino fluxes from these sources. We model the unscattered neutrino flux from DSNB via core-collapse supernova (CCSN) and star-formation rate (SFR), then incorporate the present Super-Kamionkande and future DUNE/Hyper-Kamiokande experiments to set limits on DM-neutrino interaction. For AGNs, NGC 1068 and TXS 0506+056, where the neutrino carries energy above TeV, we select the kinematic region $m_F^2 \gg E_\nu m_\phi \gg m_\phi^2$ such that the $\nu\phi$ scattering cross section features an enhancement at high energy. Furthermore, taking into account the DM spike profile at the center of AGN, we constrain on m_ϕ and scattering cross section via computing the neutrino flux at IceCube, where the $\phi\phi^*$ annihilation cross
section is implemented to determine the saturation density of the spikes.

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