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Constraint on Relic Neutrino Overdensity with Decaying Neutrinophilic Dark Matter

The existence of relic neutrino background is a strong prediction of the Big Bang cosmology. But because of their extremely small kinetic energy today, the direct detection of relic neutrinos remains elusive. On the other hand, we know very little about the nature of dark matter. In this work, we propose to probe the cosmic neutrino background by using their resonant scattering with ultra high-energy neutrinos coming from decaying heavy dark matter. We find that depending on the dark matter lifetime and the local overdensity of relic neutrinos, the resonant absorption effect is potentially observable at the next-generation ultra-high energy neutrino telescopes, such as IceCube-Gen2.

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