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Exploring New Physics via High Energy Neutrinos at IceCube

Neutrino BSM interactions and DM particles are open questions in particle physics. At IceCube, the detection of astrophysical neutrinos opens up new opportunities for probing such new interactions. We have explored the potential of IceCube in unravelling new interactions of neutrinos with both dark matter and ordinary matter. We show that DM interactions with astrophysical neutrinos can lead to flux suppression at high energies, and hence may reconcile various source models that predict large flux at energy 1 PeV.

The changes in flavour ratio can be an important probe of the interiors of such sources. Further, IceCube is a better probe of neutrino-quark NC NSI, for both intermediate-mass Z' , of mass around 10 GeV and very heavy Z' with a mass around 500 GeV. Thus, IceCube has enormous prospects for testing the non-standard neutrino interactions with high energy astrophysical neutrinos. Such a study has vast scopes pertaining to the upcoming experiments, e.g., IceCube-Gen2, PINGU, GRAND, KM3NeT, etc., which will offer improved probes of such new physics interactions.

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