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A First Look at Sky Anisotropies of High-Energy Neutrino Flavours

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High-energy astrophysical neutrinos, with TeV–PeV energies and cosmological-scale baselines, provide us with a unique opportunity to study fundemental physics. By looking for the differences in the distribution of arrival directions of neutrinos of different flavours, we can probe physics beyond the Standard Model that predicts directionally-varying flavour ratios under the reasonable assumption of directionally isotropic flavour ratios in astrophysical neutrino production. Using 7.5 years of IceCube High Energy Starting Events, we model a flavour-dependent spherical harmonic expansion of the neutrino flux and ground our predictions in realistic detector simulations. Further, we forecast the near-future reach of current and upcoming neutrino telescopes to constrain and detect these flavour anisotropies. We discuss the application of these predictions to constrain anisotropy-generating parameters, including those arising from Lorentz invarience violation, as well as flavour-dependant couplings of neutrinos to dark matter.

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