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New limits on neutrino decay from the Glashow resonance of high-energy cosmic neutrinos

Discovering neutrino decay would be strong evidence of new physics. Presently, there are only lax lower limits on the lifetime τ of neutrinos, of $\tau/m > 10^{-3}$ s eV^{-1} or worse, where m is the neutrino mass. Fortunately, TeV-PeV cosmic neutrinos offer superior sensitivity to decay due to their cosmological-scale baselines. We employ a promising method, recently proposed, that uses the Glashow resonance $\bar{\nu}_e + e \to W$, triggered by $\bar{\nu}_e$ of 6.3 PeV, to test decay with only a handful of detected events. Based on the recent detection of the first Glashow resonance candidate in IceCube, we place new lower limits on the lifetimes of ν_1 and ν_2 in the inverted mass ordering. For ν_2, our limit is the current best. For ν_1, our limit is close to the current best and will surpass it soon.

Mini-abstract

The first Glashow resonance candidate disfavors neutrino decay in the inverted mass ordering

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