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High energy neutrinos as probes of soft lepton number violation

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Ever since the discovery of neutrinos, we have wondered if neutrinos are their own antiparticles, and whether lepton number is violated or not. One remarkable possibility is that lepton-number violation in the Standard Model is soft. In such scenarios, neutrinos have a pseudo-Dirac nature, with a tiny mass difference between active and sterile states, having oscillations driven by this tiny mass difference. Such oscillations can only be visible over very long distances. In this talk, I will discuss how analyzing the neutrino data from far away sources like supernovae as well as other high energy neutrino sources in the light of active-sterile oscillations can be used to test the possible, albeit tiny, violation of lepton number.

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