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Relaxing Cosmological Neutrino Mass Bounds with Unstable Neutrinos

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At present, cosmological observations set the most stringent bound on the neutrino mass scale. Within the standard cosmological model (ΛCDM), the Planck collaboration reports $\Sigma m_\nu < 0.12$ eV at 95% CL. This bound, taken at face value, excludes many neutrino mass models. However, unstable neutrinos, with lifetimes shorter than the age of the universe $\tau_\nu < t_U$, represent a particle physics avenue to relax cosmological neutrino mass constrains.

In this talk, based on ArXiv:2007.04994, I will review the cosmological evolution of neutrinos and show how decaying neutrinos can relax cosmological neutrino mass bounds. In addition, I will present a simple extension of the type I seesaw scenario in which neutrino decays can loosen the neutrino mass bounds up to $\Sigma m_\nu \sim 1$ eV, without spoiling the light neutrino mass generation mechanism. I will conclude by highlighting the role that unstable neutrinos can play in light of current and upcoming laboratory and cosmology experiments searching for the neutrino mass scale.

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