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Cosmological limits on the neutrino mass sum for beyond-ΛCDM models

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Cosmic neutrinos are a subdominant part of the cosmological dark matter whose main cosmological effect is to suppress the small-scale clustering. This has enabled an upper limit on the sum of their masses to be placed from astronomical data, with at most 2\% of the dark matter composed of neutrinos at 95\% confidence, or $\Sigma m_\nu < 0.12$ eV. This bound assumes that the cosmological model is ΛCDM, where dark energy is a cosmological constant, the spatial geometry is flat, and the primordial fluctuations follow a pure power-law. Here I present updates on how the mass limit degrades if we relax these assumptions. We use data from \textit{Planck} and SDSS, augmented with new gravitational lensing measurements from the Atacama Cosmology Telescope and the new sample of Type Ia supernovae from the Pantheon+ survey. We find the neutrino mass limit is stable to most model extensions, degrading the limit by less than 10\%. The broadest bound is $\Sigma m_\nu < 0.23$ eV at 95\% confidence for a model with dynamical dark energy, although this scenario is not statistically preferred over the simpler \lcdm\ model. We further explore how our bounds vary when supplementing our datasets with the latest DESI measurements

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