Contribution ID: **1294** Type: **Cosmology**

Massive Neutrino Self-interactions and The Hubble Tension

Monday 24 May 2021 17:00 (15 minutes)

Based on: JCAP 03 (2021) 084 (arXiv: 2012.07519)
We have updated the constraints on flavor universal neutrino self-interactions mediated by a heavy scalar, in the effective 4-fermion interaction limit. Based on the latest CMB temperature data from the Planck 2018 data release as well as auxiliary data we confirm the presence of a region in parameter space with relatively strong self-interactions which provides a better than naively expected fit. However, we also find that the most recent data, in particular high-ℓ polarisation data from the Planck 2018 release, disfavors this solution even though it cannot yet be excluded. Our analysis takes into account finite neutrino masses (parameterized in terms of $\sum m_\nu$) and allows for a varying neutrino energy density (parameterized in terms of $N_{\rm eff}$), and we find that in all cases the neutrino mass bound inferred from cosmological data is robust against the presence of neutrino self-interactions. Finally, we also find that the strong neutrino self-interactions do not lead to a high value of H_0 of around 73 km/s/Mpc being preferred as long as CMB high-ℓ polarisation data from the Planck 2018 is included, i.e. this model does not seem like a viable solution to the current H_0 discrepancy.

Summary

We show that a previously proposed and popular solution to the Hubble tension (strong neutrino non-standard interactions via heavy mediator) comes into a problem with the latest Planck 2018 CMB polarisation data, and does not provide a viable solution to the tension.

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Session Classification: Cosmology II