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## Cosmological case study of a tower of neutrino states

*Monday 13 May 2024 14:45 (15 minutes)*

In this talk, we discuss the cosmological effects of a tower of neutrino states (equivalently a tower of warm dark matter) on cosmic microwave background (CMB) and large-scale structure. For concreteness, we considered the  $N$ -Naturalness model which is a proposed mechanism to solve the electroweak Hierarchy problem. The model predicts a tower of neutrino states, which act as warm dark matter, with increasing mass and decreasing temperature compared to the standard model neutrino. Compared to a single neutrino state, such a neutrino tower induces a more gradual suppression of the matter power spectrum. The suppression increases with the total number of states in the neutrino tower.

We explore these effects quantitatively in the scalar  $N$ -naturalness model and show the parameter space allowed by the CMB, weak lensing, and Lyman- $\alpha$  dataset. We found that neutrinos-induced suppression of the power spectrum at the small scale puts stringent constraints on the model. We emphasize the need for a faster Boltzmann solver to study the effects of the tower of neutrino states on smaller scales.

### Mini Symposia (Invited Talks Only)

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