## Phenomenology 2025 Symposium



Contribution ID: 1

Type: not specified

## BBN Constraint on Heavy Neutrino Production and Decay

Tuesday 20 May 2025 16:45 (15 minutes)

We explore the big-bang nucleosynthesis (BBN) constraint on heavy neutrino that is a mixture of gauge singlet fermion and active neutrinos in the Standard Model. We work in the minimal model with only two parameters, the heavy neutrino mass  $m_4$  and the mixing parameter  $|U_{a4}|^2$ , where a = e,  $\mu$ , or  $\tau$  stands for the active neutrino flavor. We show that both the early universe production mechanism and decay products of the heavy neutrino are determined by  $m_4$  and  $|U_{a4}|^2$ , with little room for further assumptions. This predictability allows us to present a portrait of the entire BBN excluded parameter space. Our analysis includes various effects including temporary matter domination, energy injections in the form of pions, photons and light neutrinos. The BBN constraint is complementary to terrestrial search for heavy neutrinos (heavy neutral leptons) behind the origin of neutrino masses and portal to the dark sector.

Mini Symposia (Invited Talks Only)

Plenary (Invited talks only)

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Track Classification: Particle Cosmology