

Neutrino Flavor Transformation and the Cosmic Lepton Asymmetry

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Observational constraints permit a cosmic lepton asymmetry that is orders of magnitude larger than its baryonic counterpart, a possibility of great relevance for leptogenesis, sterile neutrino dark matter, and the flavor evolution of Standard Model neutrinos. It is this last connection that we focus on here: the flavor states of neutrinos in the early universe are coupled to each other, through neutrino-neutrino forward scattering, in a way that depends on the lepton asymmetry. We identify the regimes of flavor transformation that are permitted by constraints and discuss possible ramifications for Big Bang nucleosynthesis. Incidentally, the regime preferred by resonant production of sterile neutrino dark matter is marked by a new flavor-transformation phenomenon, which we analogize to the real-life toy known as a rattleback.

E-mail

ljohns@physics.ucsd.edu

Primary author: JOHNS, Luke (UC San Diego)

Co-authors: FULLER, George (UC San Diego); PARIS, Mark (Los Alamos National Lab); MINA, Mattia (University of Oslo); CIRIGLIANO, Vincenzo (Los Alamos National Lab)

Presenter: JOHNS, Luke (UC San Diego)

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