

Physics & Astronomy Colloquium

Presents



Helena Garcia Escudero

Ph.D Candidate

University of California, Irvine

Thursday, February 29, 2024
12:10 pm, Webster Room 11

This is a remote talk.

“Visible in the laboratory and invisible in cosmology: Decaying sterile neutrinos”

The expansion history and thermal physical process that happened in the early Universe before big bang nucleosynthesis (BBN) remains relatively unconstrained by observations. Low reheating temperature universes with normalcy temperatures of $T_{RH} \sim 2\text{MeV}$ remain consistent with primordial nucleosynthesis, and accommodate several new physics scenarios that would normally be constrained by high-temperature reheating models, including massive sterile neutrinos. We explore such scenarios? production of keV-scale sterile neutrinos and their resulting constraints from cosmological observations. The parameter space for massive sterile neutrinos is much less constrained than in high- T_{RH} thermal histories, though several cosmological constraints remain. Such parameter space is the target of several current and upcoming laboratory experiments such as TRISTAN (KATRIN), HUNTER, MAGNETO-?. Cosmological constraints remain stringent for stable keV-scale sterile neutrinos. However, we show that sterile neutrinos with a dark decay to radiation through a Z' or a new scalar are largely unconstrained by cosmology. In addition, this mechanism of sterile neutrinos with large mixing may provide a solution to the Hubble tension. We find that keV-scale sterile neutrinos are therefore one of the best probes of the untested pre-BBN era in the early Universe and could be seen in upcoming laboratory experiments.

Host: Dr. Peter Engels

ZOOM Information: Meeting ID: 965 8240 9398 • Passcode: physastro