

How the Cosmic Microwave Background knows about dark radiation

Monday, July 21, 2025 4:25 PM (25 minutes)

Measurements of the Cosmic Microwave Background (CMB) have determined cosmological parameters to remarkable precision, allowing us to test Beyond Standard Model physics. In this talk, I will examine what the CMB can tell us about potential new, light particles from hidden dark sectors. I will focus on two limiting cases of their dynamics: either collisionless particles such as Standard Model neutrinos or relics with considerable self-interactions such that they can be treated as a perfect fluid. I will first review how the CMB is sensitive to both the abundance and composition of this new dark radiation via a succinct rephrasing of the physical effects. I will then explain the differential impact that these two types of light relics have on cosmological observables as well as their degeneracies with other parameters that could potentially obscure their signals. Next, I will provide and interpret updated constraints on the radiation sector of our Universe with the latest analysis of data from the Planck satellite. Furthermore, I will show how galaxy survey data from the Dark Energy Spectroscopic Instrument hint at a detection of new, strongly-interacting light relics.

Presenter: SARAVANAN, Murali (University of Washington)

Session Classification: Contributions