

New Probes of Fundamental Physics in Diffuse Astrophysical Backgrounds

Tuesday 25 March 2025 15:15 (15 minutes)

The Universe could be filled with faint relics of new fundamental processes—diffuse backgrounds of neutrinos including from dark stars, axions, and even magnetic monopoles. These cosmic whispers offer intriguing portals into physics beyond the Standard Model, including diffuse axion background that can appear from axion star explosions, diffuse neutrino background that can appear from dark stars and magnetic monopole background that can appear from interstellar collisions. I will present new production mechanisms and methods to probe such backgrounds and also mention connections with multimessenger astronomy and quantum sensors. I'll also briefly comment on how evaporating black holes may contribute to sterile neutrino production and X-ray backgrounds. Together, such diffuse messengers outline a broader framework for exploring physics beyond the Standard Model through the silent signals of the cosmos.

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Session Classification: SESSION 8: Dark Matter Theory (CHAIR: Tommaso Treu -UCLA)