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Exploring neutrino long-range interactions in the cosmos

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Cosmology is well suited to study the effects of long range interactions due to the large densities in the early Universe. In this talk, I will explore how the energy density and equation of state of cosmological neutrinos diverge from the commonly assumed ideal gas form under the presence of scalar long range interactions with a range much smaller than cosmological scales. In this scenario, “small”-scale physics can impact our largest-scale observations.
Performing an analysis to present and future cosmological data, I will show that the current cosmological neutrino mass bound is fully avoided in the presence of a long range interaction. This opens the possibility for a laboratory neutrino mass detection in the near future. I will also demonstrate an interesting complementarity between neutrino laboratory experiments and the future EUCLID survey.

Summary

Based on arXiv:2101.05804

Author: ESTEBAN, Ivan (CCAPP, Ohio State University)

Co-author: Dr SALVADO, Jordi (Institute of Cosmos Sciences, University of Barcelona)

Presenter: ESTEBAN, Ivan (CCAPP, Ohio State University)

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