

Large-scale structure with Planck-2018 and DESI BAO DR2 Measurement

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Abstract

In this project, we will investigate the cosmological implications of interacting dark matter–dark energy models for the expansion history of the Universe, the growth of cosmic structure, and their potential to alleviate current cosmological tensions. The analysis will be carried out within the framework of linear cosmological perturbation theory and confronted with observational data, including Cosmic Microwave Background (CMB) measurements from the Planck 2018 release and Baryon Acoustic Oscillation (BAO) data from the Dark Energy Spectroscopic Instrument (DESI) DR2. Theoretical predictions and parameter constraints will be obtained using standard cosmological tools such as the Boltzmann solver CLASS and the Bayesian inference packages Cobaya and Kosmulator. Particular attention will be given to the effects of dark-sector interactions on the matter distribution, growth history, and CMB temperature and polarisation anisotropy spectra.