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Dark Radiation Isocurvature from Cosmological Phase Transitions

Abstract

Cosmological first-order phase transitions are typically associated with physics beyond the Standard Model, and thus of great theoretical and observational interest. In this talk, I will show that a broad class of non-thermal first-order phase transitions could generate distinct large-scale isocurvature in dark radiation that can be observable in the CMB. We derive constraints on ΔN_{eff} from phase transitions based on CMB+BAO data, which can be much stronger than that from adiabatic initial conditions. I will also demonstrate that since perturbations of dark radiation have a non-Gaussian origin, searches for non-Gaussianity in the CMB could also place a stringent bound on ΔN_{eff} .