

Probing features in inflaton potential and reionization history with future CMB space observations

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Abstract

© 2018 IOP Publishing Ltd and Sissa Medialab. We consider the prospects of probing features in the primordial power spectrum with future Cosmic Microwave Background (CMB) polarization measurements. In the scope of the inflationary scenario, such features in the spectrum can be produced by local non-smooth pieces in an inflaton potential (smooth and quasi-flat in general) which in turn may originate from fast phase transitions during inflation in other quantum fields interacting with the inflaton. They can fit some outliers in the CMB temperature power spectrum which are unaddressed within the standard inflationary Λ CDM model. We consider Wiggly Whipped Inflation (WWI) as a theoretical framework leading to improvements in the fit to the Planck 2015 temperature and polarization data in comparison with the standard inflationary models, although not at a statistically significant level. We show that some type of features in the potential within the WWI models, leading to oscillations in the primordial power spectrum that extend to intermediate and small scales can be constrained with high confidence (at 3σ or higher confidence level) by an instrument as the Cosmic ORigins Explorer (CORE). In order to investigate the possible confusion between inflationary features and footprints from the reionization era, we consider an extended reionization history with monotonic increase of free electrons with decrease in redshift. We discuss the present constraints on this model of extended reionization and future predictions with CORE. We also project, to what extent, this extended reionization can create confusion in identifying inflationary features in the data.

<http://dx.doi.org/10.1088/1475-7516/2018/02/017>

Keywords

CMBR experiments, CMBR polarization, inflation, reionization

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