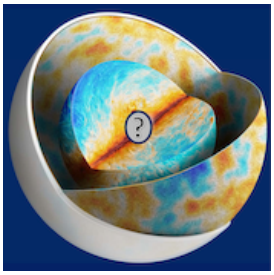

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Moment expansion: a new path towards capturing the CMB B-modes with LiteBIRD

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In the quest for the Cosmic Microwave Background (CMB) primordial B-modes, being able to accurately characterise the polarised foregrounds will be decisive. The mismodeling of their complex spectral properties could lead to a bias on the final estimation of the tensor-to-scalar ratio r. Finding a method to avoid this issue is central for future key surveys like the LiteBIRD satellite, which aims at constraining the faint primordial signal leftover by Inflation with an accuracy allowing to constrain r down to 1×10^{-3}. Part of the problem lies in the knowledge of spatial variations of the spectral properties of the astrophysical sources over the sky (in the instrumental beam and through harmonic expansion) and along the line of sight. Such variations lead to unavoidable distortions of the spectral energy distribution (SED) that can not be easily anticipated by standard component separation methods.This issue may be tackled using a moment expansion of the foreground SEDs. As proposed by Chluba et al (2017) ,this innovative parametrisation method imposes no a priory assumptions on the sky complexity.
In this paper, we apply this formalism in spherical harmonic space to LiteBIRD simulated data, considering only the dominant polarised foreground source at high frequency : thermal dust emission. Different scenarios of increasing complexity are considered. In the most realistic case, pushing the expansion around the canonical modified black body allows us to remove biases on r, while insuring an error budget compatible with LiteBIRD requirements. The direction just opened by moment expansion is promising to face the challenges set by LiteBIRD, and more generally, next generation CMB experiments. However, we note the existence of degeneracies between r and the parameters of the moment expansion, that may compromise a simple analysis in the presence of complex dust SED. The existence of correlations between the dust complexity and the tensor-to-scalar ratio could be problematic for component separation methods even beyond the moment expansion.

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