The study of the inflation epoch gives us a unique probe of very high energy physics of order $10^{15}-10^{16} GeV$. A detection of non-Gaussianities and/or isocurvature modes would be particularly interesting since both could rule out the simple single-field inflation models and demonstrate the presence of multiple fields interacting at very high energy. The measured power spectrum of the Cosmic Microwave Background (CMB) is for now compatible with purely adiabatic perturbations. Furthermore, the 3-point correlation function or bispectrum does not show any evidence of non-Gaussian features of either adiabatic or isocurvature components. To improve the constraints on the isocurvature modes, we perform a joint analysis of the power spectrum and the bispectrum. In order to link the bispectrum and the power spectrum amplitudes, we assume a generic two field model generating arbitrarily correlated adiabatic and isocurvature modes. We have shown that, if we leave the parameters in the model completely free, without a detection of either isocurvature modes (in the power spectrum) or non-Gaussianities, it is impossible to improve the constraints on the isocurvature modes with a joint analysis. This is the case for the Planck 2018 data. Next we studied the impact of fixing the amplitude of the non-Gaussianities or the correlation between the fields. We show that it is possible to improve the constraints if the non-Gaussianity is large enough or equivalently if the correlation between adiabatic and isocurvature mode is low enough.

We show forecasts for LiteBIRD, LiteBIRD+CMB-S4 and a CORE-like experiment separately for the power spectrum and the bispectrum. We study the possibility of detecting isocurvature modes and their non-Gaussian features in a Planck-compatible fiducial sky. Thus, we can find parameter ranges for which we know from the theory we developed that the joint analysis will improve the constraints. We then explicitly show this improvement of the isocurvature constraints in a favorable case.