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## CMB Constraints on Natural Inflation with Gauge Field Production

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The natural inflation model with a periodic cosine potential is ruled out by recent Planck 2018 data for the decay constant f

lesssim 5.5  $M_{\rm Pl}$ . If the Planck data is combined with the BICEP Keck array and BAO data, the model is excluded (at 2- $\sigma$ ) for all values of f. In this context, we revisit the model when the pseudoscalar inflation  $\phi$  is coupled with a gauge field via a coupling of the form  $\frac{\alpha}{f}\phi F\tilde{F}$ , where  $F(\tilde{F})$  denotes the gauge field (dual) strength tensor, and  $\alpha$  is the coupling constant. The back-reactions associated with the gauge field production during the later stages of inflation extend the duration of inflation. We numerically evaluate the dynamics of the fields while neglecting the effects due to the perturbations in the inflaton field. It allows us to determine the scalar and tensor power spectra leading to the calculations of observables at the Cosmic Microwave Background (CMB) scales. We find that the natural inflation model survives the test of the latest data only for a certain range of the coupling constant  $\alpha$ . Our analysis shows that the latest constraints coming from the scalar spectral index are more stringent than the ones arising from the non-gaussianities and the running of the scalar spectrum. This leads to lower and upper bounds on  $\xi_*$ , the parameter that controls the growth of the gauge field.

## Track type

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