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# Modified Natural Inflation in Light of BICEP2

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In this paper we explored in detail a phenomenological model of modified single field natural inflation in the light of recent cosmological experiments BICEP2. Our main goal is to construct an inflationary model which not only predicts the important cosmological quantities such as $(n_s, r)$ compatible with the experimental observation but also is consistent with the low energy effective theory framework. Therefore, all the fundamental scale apart from $M_P$ and quantities of our interest should be within the sub-Planckian region. In order to achieve our goal we modify the usual single field natural inflationary model by a specific form of higher derivative kinetic term called kinetic gravity braiding ( KGB ). One of our guiding principles to construct such a model is the constant shift symmetry of the axion. We choose a particular class of KGB term such that it correctly predicts the required value of $(n_s, r)$ within the expected range based on the recent cosmological observations. Furthermore for a wide range of parameters space we found our model to be valid with the sub-Planckian axion decay constant $f$ and the scale of inflation $\Lambda$. Within the sub-Planckian value of $f$ our model is also consistent with the reheating after the end of inflation. To our surprise, we also find sub-Planckian field excursion for the axion field $\Delta\phi \simeq f$ for the sufficient number of e-folding $N \simeq 50$. We also discussed in detail about the natural preheating mechanism in our model based on the recently proposed Chern-Simons coupling. We found this gravity mediated preheating is very difficult to achieve in our model. With our general analytic argument, we also would like to emphasize that Chern-Simons mediated preheating is very unlikely to happen in any slow-roll inflationary model.

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