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Connecting the modified hybrid inflation to the electroweak vacuum stability

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We study the connection of the Hybrid Inflation to the Electro-weak Vacuum Stability conditions. We show how the issue of the standard model electroweak Higgs vacuum stability can be treated via its interaction with singlet scalar field(s), which also participate in modifying the hybrid inflation model. The so-called hybrid Higgs-inflaton model leads to a positive correction for the Higgs quartic coupling which is shown to have a very significant effect in stabilizing the vacuum up to the Planck scale. We consider a hybrid inflation model which can typically be implemented with the inflaton field rolling towards the origin. It gives a spectral index $n_s < 1$, in contrast to the conventional 2-field hybrid inflation, for super-Planckian values of the field and a small tensor-scalar ratio r , as desired. It can be seen that the new proposed physics parameters, which connect both frameworks, are pretty sufficient to give very good inflationary observables which are in high consistency with Planck and Bicep 2021 results.

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