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Higgs-Modular Inflation

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We investigate the role of the Higgs field as a fundamental scalar in the Standard Model within the framework of modular inflation models, where a modulus field acts as the inflaton and its interactions are governed by an underlying modular symmetry. In general, the Higgs field can participate in the dynamics of modular inflation, leading to a two-field inflationary system—termed Higgs-Modular inflation—which exhibits non-trivial dynamics and interesting phenomenological implications. We analyze Higgs-Modular inflation both analytically and numerically, highlighting its attractor behavior and the resulting observational constraints. In particular, we find that Higgs-Modular inflation is favored by the latest data release from the Atacama Cosmology Telescope (ACT) in certain regions of parameter space. This is in contrast to both pure Higgs inflation and pure modular inflation with a Starobinsky-type potential, which tend to predict a relatively low spectral index. Additionally, we discuss the cutoff scale of this inflationary model and the reheating processes induced by the decays of the modulus and the Higgs field.

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