

Modular invariant Inflation and reheating

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We use modular symmetry as an organizing principle that attempts to simultaneously address the lepton flavor puzzle, inflation, and post-inflationary reheating. We demonstrate this approach using the finite modular group A_4 in the lepton sector. In our model, neutrino masses are generated via the Type-I see-saw mechanism, with modular symmetry dictating the form of the Yukawa couplings and right-handed neutrino masses. The modular field also drives inflation, providing an excellent fit to recent Cosmic Microwave Background (CMB) observations. The corresponding prediction for the tensor-to-scalar ratio is very small, $r \sim \mathcal{O}(10^{-7})$, while the prediction for the running of the spectral index, $\alpha \sim -\mathcal{O}(10^{-3})$, could be tested in the near future. An appealing feature of the setup is that the inflaton-matter interactions required for reheating naturally arise from the expansion of relevant modular forms. Although the corresponding inflaton decay rates are suppressed by the Planck scale, the reheating temperature can still be high enough to ensure successful Big Bang nucleosynthesis.

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