

Title: Reheating and inflationary dynamics driven by an inverse tangent potential

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Abstract: We study the early universe inflation and the post-inflation reheating era employing an inverse tangent potential of the form $V = V_0 \cdot [\tan^{-1}(\kappa\phi/m_p)]^2$, where κ is a free parameter of the potential and m_p is the reduced Planck mass. We derive the slow roll parameters, the number of e-folds(N), the scalar spectral index n_s , the tensor-to-scalar ratio r , and the tensor spectral index n_T for the inverse tangent potential. We examine the inflationary observables using the data of the Planck-2018 and recent ACT collaboration and obtain constraints on the potential parameter κ . We also employ a reheating analysis by invoking the conservation of entropy between today and the time when reheating starts. We obtain bounds on the reheating temperature T_{re} and the number of e-folds of the reheating N_{re} using the spectral-index n_s constraints from Planck 2018 and the ACT results. We show that this inverse-tangent potential can act as an alternative to the standard inflationary potentials like Starobinsky which are excluded at 2σ level by the recent sixth data release (DR6) of the Atacama Cosmology Telescope (ACT) collaboration.

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