

Abstract

In this paper the possibility of generating large scale curvature perturbations induced from the entropic perturbations during the waterfall phase transition of standard hybrid inflation model is studied. We show that whether or not appreciable amounts of large scale curvature perturbations are produced during the waterfall phase transition depend crucially on the competition between the classical and the quantum mechanical back-reactions to terminate inflation. If one considers only the classical evolution of the system we show analytically as well as numerically that the highly blue-tilted entropy perturbations induce highly blue-tilted large scale curvature perturbations during the waterfall phase transition which completely dominate over the original adiabatic curvature perturbations. However, we show that the quantum back-reactions of the waterfall field inhomogeneities produced during the phase transition become important before the classical non-linear back-reactions become relevant. The cumulative quantum back-reactions of very small scales tachyonic modes terminate inflation very efficiently and shut off the curvature perturbations evolution during the waterfall phase transition. This indicates that the standard hybrid inflation model is safe under large scale curvature perturbations during the waterfall phase transition.