

Abstract

We study the effect on the primordial cosmological perturbations of a sharp transition from inflationary to a radiation and matter dominated epoch respectively. We assume that the perturbations are generated by the vacuum fluctuations of a scalar field slowly rolling down its potential, and that the transition into the subsequent epoch takes place much faster than a Hubble time. The behaviour of the superhorizon perturbations corresponding to cosmological scales in this case is well known. However, it is not clear how perturbations on scales of and smaller than the Hubble horizon scale at the end of inflation may evolve through such a transition. We derive the evolution equation for the gravitational potential Ψ , which allows us to study the evolution of the perturbations on all scales under these circumstances. We show that for a certain range of scales inside the horizon at the end of inflation, the amplitude of the perturbations are enhanced relative to the superhorizon scales. This enhancement may lead to the overproduction of Primordial Black Holes (PBHs), and therefore constrain the dynamics of the transitions that take place at the end of inflation.

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