On the effect of renormalization group improvement on the cosmological power spectrum

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Abstract

Asymptotically safe quantum gravity predicts running gravitational and cosmological constants, while it remains a meaningful quantum field theory because of the existence of a finite number of non–Gaussian ultraviolet fixed points. Here we have investigated the effect of such running couplings on the cosmological perturbations. We have obtained the improved Mukhanov–Sassaki equation and solved it for two models. The effect of such running of the coupling constants on the cosmological power spectrum is also studied.

I Introduction

The quest to construct a covariant renormalizable quantum gravity attracted more attention in recent years. Different motivations to quantize gravity is classified by Kiefer [1] into three categories. First, the unification. After having a worthy quantum field theory for non–gravitational interactions, unifying quantum theory and general relativity would be a logical wish. The next motivation comes from singularities of general theory of relativity. It seems that these singularities break down the theory and it is expected to be solved with an appropriate quantum theory of gravity. Finally the last motivation arises from the fact that there are different concepts