Generalised Corpuscular Inflation

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Abstract

We extend the corpuscular formulation of inflation from $\phi^2 m^2$ to general single field inflation. We use these results to obtain the corpuscularly corrected values for r and n_s, finally comparing these to results from current observations. This shows how the constraints on inflation are changed when a the graviton condensate view of gravity is employed.

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I. INTRODUCTION

II. CORPUSCULAR INFLATION

We consider the inflating Universe to consist of two condensates. One inflaton condensate with N_ϕ inflatons, and one graviton condensate with N gravitons. The number of inflatons is given by:

$$N_\phi = n_\phi R_H^3 = \frac{n_\phi}{H^3} \tag{II.1}$$

and the number of gravitons by:

$$N = R_H^2 = \frac{1}{H^2} \tag{II.2}$$

The main quantum effect taking place for the bulk of inflations is the quantum depletion of the condensates. As inflatons vastly dominate gravitons, and the inflaton self quantum scattering is negligible, the main contribution to this comes from inflaton-graviton scattering as given by:

$$\dot{N}_\phi^{\rm dep} = \dot{N}_{\rm dep} = -\frac{1}{\sqrt{N}}\frac{N_\phi}{N} \tag{II.3}$$

Below we will work out the actual results of these equations for different types of potentials for single field inflation.

A. Monomial potentials

III. DISCUSSION AND OUTLOOK

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