

Aritra De & Rafid Mahbub: Numerically modelling stochastic inflation

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We present a complete numerical treatment of inflationary dynamics under the influence of stochastic corrections from sub-Hubble modes. We discuss how to exactly model the stochastic noise terms arising from the sub-Hubble quantum modes that give rise to the coarse-grained inflaton dynamics in the form of stochastic differential equations. The stochastic differential equations are solved event-by-event on a discrete time grid. We then compute the power spectrum of curvature perturbations that can be compared with the power spectrum computed in the traditional fashion using the Mukhanov-Sasaki equation by canonically quantizing the inflaton fluctuations. Our numerical procedure helps us to easily extend the formalism to ultra slow-roll inflation and study the possibility of primordial black hole formation.