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Cosmological decoherence in the framework of stochastic inflation

In this work we propose a classical phase space formulation of the Starobinsky stochastic inflation, which may be suitable for a quantitative study of decoherence of cosmological perturbations in a self-interacting inflationary theory. The precise knowledge of how much cosmological perturbations have decohered is essential to the understanding of acoustic oscillations of CMB photons.
In our approach to decoherence, neglecting observationally inaccessible, non-Gaussian correlators will give rise to an increase in phase space area and Gaussian entropy of the state. The original Starobinsky approach recovers the correct late time behavior of the field correlators at each order in perturbation theory. Likewise, the classical phase space formulation may provide the correct late time growth of the phase space area and Gaussian entropy, which in turn may have an observational effect on the acoustic peaks in the CMB.

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