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Insufficient Fermion Reheating in Quartic Inflaton Potentials

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The transition between cosmic inflation to a phase of radiation domination, e.g. reheating, is an essential ingredient of any theory of inflation. The reheating stage is typically characterized by an inflaton oscillating about the minimum of its potential. Such dynamics, inducing the growth of inhomogeneities and non-perturbative dynamics have been shown to be relevant for a reheating stage achieved by coupling the inflaton field to bosons. However, the case of fermions remains insufficiently explored. We explore such possibility by considering a inflaton potential quartic about its minimum, known to trigger a significant growth of inhomogeneities resulting in the fast fragmentation of the inflaton condensate. We investigate, in conjuncture with the fragmentation process, the full non-perturbative production of fermions, accounting for a smooth transition from cosmic inflation to the reheating stage and by comparing with a more standard Boltzmann approach. In doing so we are able to demonstrate the insufficiency of fermions to reheat the Universe in quartic inflaton potentials even for large couplings, contrary to previous findings.

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