

Higgs-boson induced reheating and ultraviolet freeze-in dark matter

jeudi 2 juin 2022 14:40 (20 minutes)

According to the standard model of cosmology, the Universe at its very beginning underwent a phase of rapid, exponential expansion, followed by a reheating period. During this epoch, the energy density, initially accumulated in the oscillations of the inflaton field, was injected into the visible sector, eventually setting the initial conditions for the hot big bang. In this talk, I will discuss the perturbative production of the Standard Model (SM) radiation and dark matter (DM) adopting a non-standard post-inflationary scenario with a generic equation-of-state w . In particular, I will study a class of models where reheating is achieved by the inflaton ϕ decay to the SM Higgs boson

h through a cubic coupling of the form ϕh^2 . In the presence of such interaction, the Higgs doublet acquires a ϕ -dependent mass which generates a vacuum expectation value that oscillates in time and breaks the SM gauge symmetry. Moreover, the non-zero mass of the Higgs field leads to a time-dependent inflaton decay rate and generates a kinematical suppression of the SM radiation production. This, in turn, has non-trivial consequences for the dynamics of the reheating period, modifying the evolution of the radiation energy density and thus the UV freeze-in production of DM.

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Classification de Session: Parallel Session 1