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JOHANNES GUTENBERG UNIVERSITÄT MAINZ

Theorie-Palaver

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Anna Socha
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Higgs boson-induced reheating and its implications for dark matter

According to the standard model of cosmology, the Universe at its very beginning underwent a phase of rapid expansion, followed by a reheating period. During this epoch, the energy density, initially accumulated in the coherent 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 perturbative production of the Standard Model (SM) particles adopting a non-standard post-inflationary scenario with a generic equation-of-state parameter $\bar{w}$. To specify the inflaton dynamics, I will employ the α -attractor T-model of inflation, such that ϕ has a monomial potential $V(\phi) \propto \phi^{2n}$ about the minimum. Moreover, I will explore the Higgs boson-induced reheating, assuming that it is achieved through a cubic inflaton-Higgs coupling $\phi|\mathcal{H}|^2$. In the presence of such interaction, the Higgs field acquires a ϕ -dependent mass which generates a vacuum expectation value that oscillates in time and breaks the electroweak gauge symmetry. Interestingly, the non-zero Higgs mass leads to a time-dependent inflaton decay rate and generates a phase-space suppression of the reheating efficiency. This, in turn, has non-trivial consequences for the reheating dynamics, modifying the evolution of the SM radiation energy density or the duration of the reheating phase. Furthermore, the implications of the non-standard reheating for the dark sector will be discussed, exemplified by the UV freeze-in dark matter model.

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