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Gravitational production during reheating phase: the possibility of purely Gravitational reheating

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My talk will mainly focus on an interesting reheating scenario where minimal gravitational interaction plays an important role that was ignored in the literature due to its supposedly weak strength. We take a systematic approach toward building a reheating scenario that can provide model-independent observable predictions. I shall start the discussion with the dark matter (DM) sector first, where it is assumed to be produced from both inflaton and radiation bath through minimal gravitational interaction only. Since the gravitational production process is always present, we can't ignore this. However, we introduce arbitrary coupling between inflaton and standard model particles to achieve the radiation-dominated universe. After successfully generating the present dark matter abundance through gravitational production during the reheating phase, a natural question we can ask: is it possible to reheat our universe purely gravitationally? Surprisingly, such a scenario has turned out to be possible because the energy scale of any physical processes during reheating could be as large as 10^{15} GeV, and that leads gravity mediated decay process to become strong enough to reheat the universe. This is the possibility we will also explore in this talk. We will name it gravitational reheating (GRe). Therefore here, we remove all arbitrary couplings between inflaton and daughter fields, which implies the inflaton sector is coupled with the observable sector only through gravitational interaction. Interestingly, only gravitational interaction turned out to be enough to reheat our universe successfully. In this phase, DM mass is the only free parameter except for the inflationary parameters. We will see how such less freedom naturally makes GRe a unique mechanism compared to reheating scenarios discussed so far in the literature. All the massless decay products from inflaton will be collectively called radiation, and massive ones are DM. Given the present state of the universe, the GRe scenario is consistent with a very limited class of inflation models and a narrow range of DM masses. However, if DM couples with the radiation bath, gravitational production sets the maximum limit on the DM mass. It is the s-channel graviton exchange process through which inflaton converts its energy to radiation and DM during reheating.
References. 1. Phys.Rev.D 106 (2022) 2, 023506,
2. e-Print: 2201.02348.

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