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Can cosmological relaxation be reconciled with high reheating temperature?

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We propose a new scenario of cosmological relaxation compatible with reheating temperature higher than the electroweak scale. Cosmological relaxation is a novel solution to the hierarchy problem, which is proposed recently. However, the barrier potential, that settles the relaxion down to realize the correct electroweak scale, vanishes at high temperature where the electroweak symmetry restores. Therefore, the conventional cosmological relaxation scenario is not compatible with high reheating temperature, which is often requested in other cosmological context, e.g. baryogenesis. We tackle this issue by introducing an anomalous coupling of the relaxion with a hidden U(1) gauge field. In this case, the moving relaxion induces an explosive production of the coupled gauge field via tachyonic instability and undergoes significant friction as a backreaction. We show that this efficiently suppresses the excursion of relaxion after reheating. In addition, the introduction of the coupling to a hidden gauge field can mitigate many experimental and observational constraints present in the conventional scenario. Instead, the amount of produced gauge bosons is subject to cosmological constraints. We show the viable parameter region for our scenario and the testability.

Presentation type

Parallel talk

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