

Relaxion dark matter from large fluctuations

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Light scalar fields, such as axion-like particles (ALP), are promising dark matter candidates as they can be produced from the vacuum misalignment mechanism. In this work we investigate the mechanism in a less conventional regime where the ALP is subject to large fluctuations during its early dynamics. Our analysis is applied to the mechanism of cosmological relaxation of the electroweak scale, where the small value of the Higgs mass is selected dynamically by an ALP field i.e. the relaxion. We identify modified stopping conditions for such dynamics of the relaxion and find the new parameter space. In a wide region of the parameter space, the ALP can solve the hierarchy problem and, at the same time, account for the observed dark matter density in the universe. We describe various cosmological, astrophysical, as well as laboratory probes and constraints of such ALPs.

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