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Cosmological evolution of a PQ field with small self-coupling and its implications for ALP DM

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Axion-like particles (ALPs) are often considered good candidates for dark matter (DM). Several mechanisms for generating the relic abundance of ALP DM have been proposed, involving processes that may occur either before, during, or after cosmic inflation. In all cases, the potential of the corresponding Peccei-Quinn (PQ) field plays an important role. We investigate the radiative, thermal, and space-time curvature corrections to the PQ field dynamics in scenarios where the potential has very small self-coupling. We focus on toy models with a quasi-supersymmetric spectrum and discuss how accounting for these corrections is crucial for accurately estimating the relic abundance of ALP DM.

Author: KOZOW, Pawel

Co-author: OLECHOWSKI, Marek

Presenter: KOZOW, Pawel