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Large Blue Spectral Index from a Conformal Limit of a Rotating Complex Scalar

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A well-known method for generating a large blue spectral index for axionic isocurvature perturbations involves a flat direction without a quartic potential term for the axion field's radial partner. In this work, we demonstrate how a large blue spectral index can be achieved even with a quartic potential term linked to the Peccei-Quinn symmetry breaking radial partner. We utilize the fact that a large radial direction with a quartic term can naturally induce a conformal limit, producing an isocurvature spectral index of 3. This conformal representation differs intrinsically from the conventional equilibrium axion scenario or massless fields in Minkowski spacetime. Alternatively, this limit can be seen as the angular momentum of the initial conditions slowing the radial field or as a superfluid limit. The quantization of the non-static system, where the derivatives of the radial and angular fields do not commute, is meticulously treated to determine the vacuum state. We also discuss the parametric region consistent with axion dark matter and isocurvature cosmology.

Track type

Inflation

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