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Dynamical mass generation for a massless minimal scalar with quartic plus cubic self interaction in de Sitter spacetime

We consider a minimally massless coupled quantum scalar field with an asymmetric (quartic plus cubic) self interaction, $V(\varphi) = \lambda\varphi^4/4! + \beta\varphi^3/3!$ in the $(3 + 1)$ -dimensional inflationary de Sitter background. This potential is bounded from below regardless the sign of β . The motivation of this study comes from the fact that such a potential may generate negative vacuum expectation value of $V(\varphi)$ at late time, thereby decreasing the value of cosmological constant which is essential to end the inflation.

We investigate this theory via Starobinsky stochastic technique and compare it with the field theoretic results upto $O(\lambda^2)$ and $O(\lambda\beta^2)$. We compute the vacuum expectation value of φ , φ^2 , $V(\varphi)$ and a non-perturbative as well as stochastic computation of the dynamically generated mass. We also estimate the possible shift of the inflationary cosmological constant due to this potential $V(\varphi)$.

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