

Renormalization of ϕ^4 -theory in the 2PI Hartree approximation scheme for non-vanishing background field

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In the study of phase transitions in the early universe, methods based on N particle irreducible effective actions have become very important for describing the out of equilibrium dynamics of these phenomena. Equations of motion for classical 1-, up to N -point functions can be obtained from stationarity conditions. However, in order to extract physical information, the action must first be renormalized. Self-consistent schemes for doing so have been presented in the literature. Typically, when performing the renormalization, it is assumed that the classical field vanishes. We have adopted the renormalization procedure presented by Berges et al. [arXiv:hep-ph/0503240], applying it to a ϕ^4 toy model and explicitly perform the renormalization in the Hartree approximation, assuming a non-vanishing classical field.

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