

Epsilon-expansion in the N-component ϕ^4 model

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Abstract

The formalism of projection Hamiltonians is applied to the N-component $O(N)$ -invariant ϕ^4 model in the Euclidean and p-adic spaces. We use two versions of the ε -expansion (with $\varepsilon = 4 - d$ and with $\varepsilon = \alpha - 3d/2$, where α is the renormalization group parameter) and evaluate the critical indices ν and η up to the second order of the perturbation theory. The results for the $(4 - d)$ -expansion then coincide with the known results obtained via the quantum-field renormalization-group methods. Our calculations give evidence that in dimension three, both expansions describe the same non-Gaussian fixed point of the renormalization group. © 2006 Springer Science+Business Media, Inc.

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Keywords

ε -expansion, Critical indices, Euclidean models, p-adic models, Perturbation theory, Renormalization group