

ON THE TYPE OF THE TEMPERATURE PHASE TRANSITION IN $O(N)$ MODELS WITHIN A PERTURBATIVE ANALYSIS

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We investigate the type of the temperature phase transition in the N component $\lambda\phi^4(O(N))$ model of scalar fields. Actual calculations are carried out in the beyond-super-daisy approximation (BSDA). The cases $N = 1$ and larger N are considered separately. Using the solutions to gap equations we show that the character of the phase transition depends on the account for BSDA graphs. The role of different kind diagrams (especially the “sunset” one) is clarified. It is shown in a perturbation theory in the effective expansion parameter $N^{-1/3}$ that the kind of the phase transition depends on the value of coupling λ . It turns from a weak first-order to the second-order one for increasing λ . This is in agreement with the observation found recently for the $O(1)$ model in Monte Carlo simulations on a lattice. Comparison with results of other authors is given.