ABSENCE OF PHASE TRANSITIONS IN $2D$ CLASSICAL $O(N)$ SYMMETRIC HEISENBERG MODEL WITH LARGE N, ANALYSIS OF RENORMALIZATION GROUP FLOW

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We investigate the renormalization group flow of $2D$ classical $O(N)$ symmetric Heisenberg model by introducing the auxiliary field first used by Brydges et al to keep N component boson field on the surface of a ball of arbitrary large radius. We employ mathematically controllable block spin transformation introduced by Gawedzki and Kupiainen some decades ago. We apply block spin transformation to this system which consists of the boson and the auxiliary fields. Except for domain wall regions which have small probabilities to exit, the main flow is described by 4 terms, i.e., two free Hamiltonians of N component boson and the auxiliary field, the term describing the inverse temperature and the term which has no effects on phase transitions since it is a function of the sizes of spins (no inner products). The effective inverse temperature decreases, namely the radius of the ball shrinks, as we iterate the block spin transformations. Thus it is concluded that there exist no phase transitions in the system.