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Phase Diagrams of Lattice Models with Competing Interactions

Abstract

The existence of competing interactions lies at the heart of a variety of original phenomena in magnetic systems, ranging from the spin-glass transitions found in many disordered materials to the modulated phases with an infinite number of commensurate regions, that are observed in certain models with periodic interactions. Ising models with competing interactions has recently been considered extensively because of the appearance of nontrivial magnetic orderings. If competing interactions are defined on prolonged second or third nearest-neighbors, i.e. spins belonging to the same branch then corresponding phase diagram is very rich, and if second or third nearest-neighbors belong to different branches of the tree then corresponding phase diagram consists of paramagnetic, ferromagnetic, paramodulated with period $p = 2$ and anti-ferromagnetic phases. It is shown that for 1-D Ising model with competing interactions one can reach phase transition while for usual 1-D Ising model we don't reach phase transition.