Critical temperature and density of spin flips in the anisotropic random-field Ising model.

Mostovoy M, Figge MT, Knoester J (1998) Critical temperature and density of spin flips in the anisotropic random-field Ising model. *Physical Review B* 58(5), 2626-2634.

Abstract

We present analytical results for the strongly anisotropic random field Ising model, consisting of weakly interacting spin chains. We combine the mean-field treatment of interchain interactions with an analytical calculation of the average chain free energy ("chain mean-field" approach). The free energy is found using a mapping on a Brownian motion model. We calculate the order parameter and give expressions for the critical random magnetic field strength below which the ground state exhibits long range order and for the critical temperature as a function of the random magnetic field strength. In the limit of vanishing interchain interactions, we obtain corrections to the zero-temperature estimate by Imry and Ma [Phys. Rev. Lett. 35, 1399 (1975)] of the ground state density of domain walls (spin-flips) in the one-dimensional random field Ising model. One of the problems to which our model has direct relevance is the lattice dimerization in disordered quasi-one-dimensional Peierls materials, such as the conjugated polymer *trans*-polyacetylene.

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