

Answer on Question #42177-Physics-Solid State Physics

What is the difference between mean field approximation and Monte Carlo method Ising model?

Answer

T_c is critical temperature.

The main difference between mean field approximation and Monte-Carlo calculations is the presence of a magnetization "tail" for $T > T_c$ in the Monte-Carlo simulations: i.e., in the Monte-Carlo simulations the spontaneous magnetization does not collapse to zero once the critical temperature is exceeded - there is a small lingering magnetization for $T > T_c$.

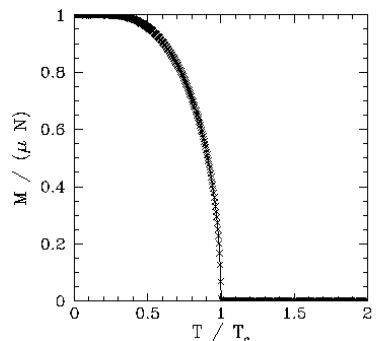


Figure 1: The net magnetization, M , of a collection of N ferromagnetic atoms as a function of the temperature, T , in the absence of an external magnetic field. Calculation performed using the mean field approximation.

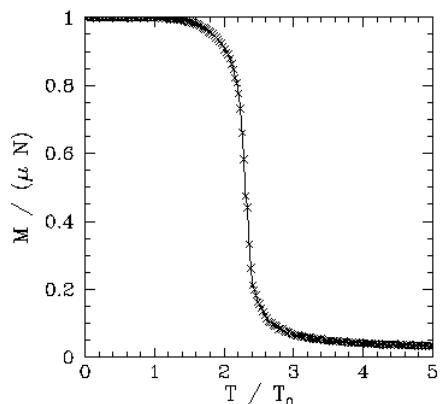


Figure 2: The net magnetization, M , of a 40×40 array of ferromagnetic atoms as a function of the temperature, T , in the absence of an external magnetic field. Monte-Carlo simulation.