

## 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  $T > T_c$ .

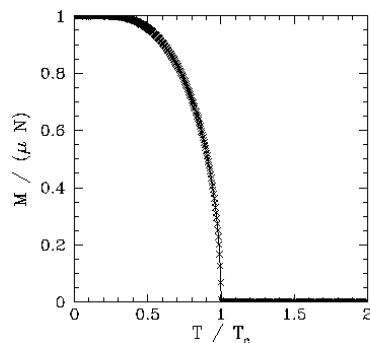


Figure 1: The net magnetization,  $M$ , of a collection of  $N$  ferromagnetic atoms as a function of the temperature,  $T$ , in the absence of an external magnetic field. Calculation performed using the mean field approximation.

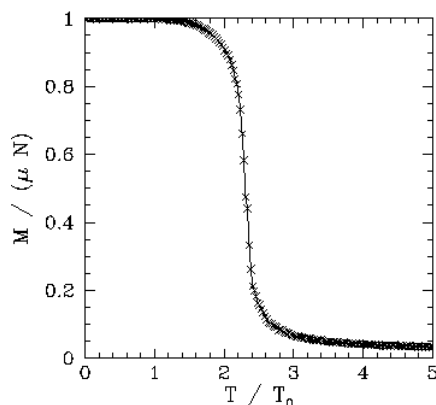


Figure 2: The net magnetization,  $M$ , of a  $40 \times 40$  array of ferromagnetic atoms as a function of the temperature,  $T$ , in the absence of an external magnetic field. Monte-Carlo simulation.