1 Theory

1.1 Ising model

The Ising model is applied for the study of phase transistions at finite temperatures for magnetic systems. Energy is expressed as:

$$E = -J \sum_{<kl>}^{N} s_k s_l \qquad s_k = \pm 1 \tag{1}$$

N is the number of spins and J is a constant expressing the interaction between neighboring spins. The sum is over the nearest neighbours only, indicated by ¡kl¿ the above equation. For J ¿ 0 it is energetically favorable for neighboring spins to align. Leading to, at low temperatures, T, spontanious magnetisation.

A probability distribution is neede in order to calculate the mean energy ¡E¿ and magnetization ¡M¿ at a given temperature. The distribution is given by:

$$P_i(\beta) = \sum_{i=1}^{M} s_k s_l \exp -\beta E_i, \tag{2}$$

where M is all the microstates, P_i is the probability of having the system in a state/configuration i.