Contribution ID: **59** Type: **Oral Presentation**

Random Field Ising Models: Fractal Morphologies and their Implications

Tuesday, 12 July 2016 12:20 (20 minutes)

Abstract content
   (Max 300 words)
Formatting &
Special chars

We use a computationally efficient graph cut method to obtain ground state ($T = 0$) morphologies of the random field Ising model (RFIM) on (i) simple cubic (SC), (ii) body-centered cubic (BCC) and (iii) face-centered cubic (FCC) lattices. We determine the critical disorder strength Δ_c with high accuracy. For the SC, BCC and FCC lattices, $\Delta_c = 2.278 \pm 0.002$, 3.316 ± 0.002 and 5.160 ± 0.002 respectively and are the most accurate estimates in the literature so far. The ground states states consist of correlated "domains" of up and down spins, analogous to those in phase ordering systems. The small-r behaviour of the correlation function exhibits a {\it cusp regime} characterized by a cusp exponent α signifying rough fractal interfaces. It is distinct for the three lattice types in the ferromagnetic phase, but identical in the paramagnetic phase. Our computations indicate that the activation energy for growth of a domain of size L obeys a power law $E_B(L) \sim L^{2-\alpha}$, and is consistent with theoretical predictions. Consequently, the barrier energy for a domain of size L is significantly different for the three lattice types. This observation emphasizes the crucial role played by the lattice structure on domain growth and relaxation in complex systems. The implications of ground state morphologies in diverse experimental systems, well represented by the RFIM, are also examined.

Related Papers:

1. Arunkumar Bupathy, Varsha Banerjee and Sanjay Puri, Physical Review E, 93, 012104 (2016).
2. Gaurav P. Shrivastav, Manoj Kumar, Varsha Banerjee and Sanjay Puri, Physical Review E, 90, 032140 (2014).
3. Gaurav P. Shrivastav, Siddharth Krishnamoorthy, Varsha Banerjee and Sanjay Puri, Europhysics Letters, 96, 36003 (2011).

Primary author: Prof. BANERJEE, Varsha (Indian Institute of Technology, New Delhi 110016, India)

Presenter: Prof. BANERJEE, Varsha (Indian Institute of Technology, New Delhi 110016, India)

Session Classification: Parallel Track A: Astrophysics and Space Physics, Plasma, Gravitation and Cosmology