Abstract Submitted
for the MAR11 Meeting of
The American Physical Society

Effective potential study of the Diluted Antiferromagnet in a Field DAVID YLLANES, L.A. FERNANDEZ, V. MARTIN-MAYOR — We present a numerical study of the three-dimensional Diluted Antiferromagnet in a Field (DAFF), one of the experimental realizations of the Random Field Ising Model. We work in a constrained ensemble (tethered ensemble) where the Helmholtz effective potential is featured, rather than the free energy. Our method cures the problem of a strong violation of self-averaging, thus allowing us to compute the correlation length for systems sizes up to $L = 32$. This quantity, when measured in units of the lattice size, is independent of the system size at the critical point, a strong indication of a second-order phase transition. This scale invariance allows us to apply finite-size scaling in the form of Nightingale's phenomenological renormalization. We obtain accurate estimates of the critical exponents. Since our method reconstructs the effective potential, we can also compute accurately the hyperscaling violation exponent. We perform as well an investigation of the geometrical properties of the instanton-like configurations, namely, the minimal cost configurations joining the two ordered phases. This study sheds light on previous claims of a first-order phase transition in this system.

David Yllanes
Universidad Complutense de Madrid

Date submitted: 19 Nov 2010 Electronic form version 1.4