Abstract Submitted
for the MAR13 Meeting of
The American Physical Society

Universality in the three-dimensional random-field Ising model

VICTOR MARTIN-MAYOR, NIKOLAOS FYTAS, Departamento de Fisica Teorica I, Universidad Complutense de Madrid — We present the results of a large scale numerical simulation of the three-dimensional random-field Ising model at zero temperature. A combination of graph theoretical algorithms with a proper re-weighting scheme allows us to obtain data for systems with linear sizes $L \leq 192$ and extreme ensembles of disorder realizations, up to 5×10^7. Three types of field distributions are considered, namely the Gaussian, the Poissonian, and the double Gaussian for two values of its width. In particular, for the double Gaussian case we choose parameters such that the distribution of random fields is bimodal. Our finite-size scaling analysis, based on the quotients method and universal quantities, indicates the existence of a unique random fixed-point. Therefore, the random-field Ising model is ruled by a single universality class, in disagreement with early mean-field theory predictions and the current opinion in the literature. The complete set of critical exponents characterizing this universality class is given, including the correction-to-scaling exponent ω and the violation of hyper-scaling exponent θ. Finally, discrepancies with previous works are explained in terms of strong scaling corrections.

Victor Martin-Mayor
Departamento de Fisica Teorica I, Universidad Complutense de Madrid

Date submitted: 06 Nov 2012 Electronic form version 1.4