Abstract Submitted
for the MAR14 Meeting of
The American Physical Society

Direct evidence of reentrance in three-dimensional random-bond Ising models HELMUT G. KATZGRABER, Texas A&M University, RUBEN S. ANDRIST, Santa Fe Institute — We numerically investigate the reentrant behavior in the disorder–temperature phase diagram of the three-dimensional random-bond Ising model with a fraction p of antiferromagnetic bonds using large scale Monte Carlo simulations. The two-point finite-size correlation function divided by the system size is ideally suited to pinpoint second-order phase transitions in disordered magnetic systems: Because the observable is dimensionless, data for different system sizes cross at the putative transition, up to corrections to scaling. Here we show that a direct measurement of the two-point finite-size correlation function divided by the system size down to very low temperatures shows two crossings at different temperatures for $p = 22.8\%$, therefore clearly signaling reentrant behavior in the phase diagram. This means that for a fraction $p = 22.8\%$ of antiferromagnetic bonds the system undergoes two phase transitions with an ordered ferromagnetic phase existing only for intermediate temperatures. Furthermore, we attempt to probe the universality classes for both transitions via an innovative finite-size scaling analysis of the susceptibility.

Helmut G. Katzgraber
Texas A&M University

Date submitted: 13 Nov 2013 Electronic form version 1.4