Abstract Submitted
for the MAR12 Meeting of
The American Physical Society

Monte Carlo simulations of the $LiHo_xY_{1-x}F_4$ diluted dipolar magnet JUAN CARLOS ANDRESEN, Department of Physics, ETH Zurich, MOSHE SCHECHTER, Department of Physics, Ben Gurion University, HELMUT G. KATZGRABER, Department of Physics and Astronomy, Texas A&M University and ETH Zurich —
Recent intriguing experimental results on $LiHo_xY_{1-x}F_4$, a diluted dipolar magnet, along with new analytical insights, suggest that neither a mean-field treatment nor simulations using simplified versions of the underlying Hamiltonian adequately describe these materials. Not only does this imply that novel disordering mechanism might be present, it requires a detailed numerical analysis that incorporates all terms in the Hamiltonian. We present large-scale Monte Carlo simulations of the diluted dipolar magnet with competing interactions on a LiHo lattice with the inclusion of a random field term. For low concentrations of Ho atoms we reproduce the peculiar linear dependence of the transition temperature as a function of the random-field strength found in recent experimental results by Silevich *et al.* [Nature **448**, 567 (2007)]. We then find a zero-temperature phase transition between the ferromagnetic and quasi-spin-glass phases, suggesting that it is the underlying spin-glass phase that dictates the above linear dependence of T_c on the random field. For large concentrations we recover the quadratic dependence of the critical temperature as a function of the random field strength.

Juan Carlos Andresen
Department of Physics, ETH Zurich

Date submitted: 10 Nov 2011 Electronic form version 1.4