Abstract Submitted
for the MAR12 Meeting of
The American Physical Society

Novel disordering mechanisms in dipolar spin glasses and ferromagnets MOSHE SCHECHTER, Physics Department, Ben Gurion University of the Negev, JUAN CARLOS ANDERSEN, Department of Physics, ETH Zurich, HELMUT KATZGRABER, Department of Physics and Astronomy, Texas A&M University and ETH Zurich — At and below the critical dimension the disordering of an ordered phase by a random field occurs via a collective effect of large domains at infinitesimal random field [Imry & Ma, Phys. Rev. Lett. **35**, 1399 (1975)]. At larger space dimensions the disordering requires a large random field, of the order of the interaction energy. In a random field, the lower critical dimension is 2 for Ising ferromagnets, whereas it is infinity for spin glasses. We have generalized the Imry-Ma argument for ferromagnets with competing interactions and an underlying spin-glass phase, and for dilute dipolar spin glasses. For dilute dipolar spin glasses we have found [EPL **88**, 66002 (2009)] that the broad distribution of random fields dictates more efficient disordering of the glass phase, and domain sizes which depend explicitly on the concentration, i.e., do not obey simple scaling. Here we show that as a result of a competing spin-glass phase, the disordering of the ferromagnet occurs at a finite random field, which is yet much smaller than the interactions. Our results are verified numerically, explain the recently-observed peculiar linear dependence of T_c on the random field strength [Nature **448**, 567 (2007)], and predict a zero-temperature random-field driven transition between a ferromagnetic and a quasi spin glass phase.

Moshe Schechter
Physics Department, Ben Gurion University of the Negev

Date submitted: 18 Nov 2011 Electronic form version 1.4