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Absence of Dipole Glass Transition for Randomly Dilute Classical Ising Dipoles[1] CLARE YU, JOSEPH SNIDER[2], University of California, Irvine — Randomly dilute dipoles with long range dipolar interactions appear in a variety of solid insulating materials. Based on theoretical studies of spin glasses with long range interactions, one would expect such dilute dipolar systems to undergo a spin glass-like transition as the temperature decreases. However, there has been no experimental evidence for such a transition in very dilute systems. One example where such a transition has not been definitively observed is two level systems that dominate the physics of glasses at low temperatures. Another is $LiHo_xY_{1-x}F_4$ with $x = 4.5\%$. We have investigated the absence of a phase transition in dilute dipolar glasses. Using Wang-Landau Monte Carlo simulations, we show that at low concentrations x, dipoles randomly placed on a cubic lattice with dipolar interactions do not undergo a phase transition as the temperature decreases. We define a characteristic "glass" temperature T_g as the temperature where the distribution $P(q, T)$ is flattest. q is the overlap order parameter. We find that in the thermodynamic limit T_g goes to zero as $1/\sqrt{N}$ where N is the number of dipoles. The entropy per particle at low temperatures is larger for lower concentrations ($x = 4.5\%$) than for higher concentrations ($x = 20\%$).

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