MAR06-2005-000629

Abstract for an Invited Paper
for the MAR06 Meeting of
the American Physical Society

Frustrated dipolar interactions – why spin ice obeys the ice rules

RODERICH MOESSNER, CNRS and ENS Paris

The low temperature entropy of the the spin ice compounds, such as $Ho_2Ti_2O_7$ and $Dy_2Ti_2O_7$, is well described by the nearest-neighbor antiferromagnetic Ising model on the pyrochlore lattice, i.e. by the "ice rules". This is surprising since the dominant coupling between the spins is their long ranged dipole interaction. We show that this phenomenon can be understood rather elegantly: one can construct a model dipole interaction, by adding terms of shorter range, which yields *precisely* the same ground states, and hence $T = 0$ entropy, as the nearest neighbor interaction. A treatment of the small difference between the model and true dipole interactions reproduces the numerical work by Gingras et al in detail. We are also led to a more general concept of projective equivalence between interactions. S. V. Isakov, R. Moessner, S. L. Sondhi, Phys. Rev. Lett. **95**, 217201 (2005)