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Numerical Study of Perturbations in Dipolar Spin Ice TAORAN LIN, University of Waterloo, JAAN ALTOSAAR, McGill University, PATRIK HENELIUS, KTH Royal Institute of Technology, MICHEL GINGRAS, University of Waterloo — Competing interactions in geometrically frustrated magnets can lead to highly degenerate and non-trivially correlated ground states. One topical example, the spin ice compound $Dy_2Ti_2O_7$, exhibits such a ground state which possesses a Pauling's residual entropy analogous to that of water ice. At temperatures well below the temperature scale set by the frustrated and dominant dipolar interactions, the material displays a classical spin liquid like state. As a result, small perturbations may become significant for the low temperature physics. In this project we consider perturbations from further neighbor interactions and from stuffing impurities in an attempt to account for some of the observed experimental low temperature behaviors. In particular, we determine the third neighbor interactions using Monte Carlo (MC) simulations by fitting to experimental data in a magnetic field near the [112] direction. The effects on the zero-field specific heat due to variation of the exchange parameters are studied using a cumulant method in conjunction with the MC simulations. We also studied the effects of stuffing Dy magnetic ions on the Ti site, which can trigger large variations in the equilibrium value of the specific heat below temperatures of 0.5K.

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