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What is the quantum ground state of dipolar spin ice? PAUL MCCLARTY, ISIS Neutron and Muon Source, STFC, OLGA SIKORA, NTU, RODERICH MOESSNER, MPIPKS, KARLO PENC, Institute for Solid State Physics and Optics, Budapest, FRANK POLLMANN, MPIPKS, NIC SHANNON, Okinawa Institute of Science and Technology — Recent work on Dy2Ti2O7 spin ice has revealed a partial loss of residual entropy deep within the spin ice state [1]. It has been known for some time that the spin ice materials should have either magnetically ordered [2] or quantum spin liquid [3] ground states and this latest work hints at the possibility of determining them experimentally. We study a natural model for the dipolar spin ice materials and map out the entire ground state phase diagram in the presence of quantum tunneling between the ice states [4]. In the classical case, we show that the ground states in our 3D long-range interacting model can be determined from those of a short-range interacting 2D model and, remarkably, in the quantum case, only a very small tunneling coupling compared to the dipolar coupling is necessary to enter the quantum spin liquid state.

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[4] P. McClarty et al., arXiv:1410.0451

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