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Magnetic monopoles in quantum spin ice OLGA PETROVA, RODERICH MOESSNER, Max Planck Institute for the Physics of Complex Systems, SHIVAJI SONDHI, Princeton University — Typical spin ice materials can be modeled using classical Ising spins. The geometric frustration of the pyrochlore lattice causes the spins to satisfy ice rules, whereas a violation of the ice constraint constitutes an excitation. Flipping adjacent spins fractionalizes the excitation into two monopoles. Long range dipolar spin couplings result in Coulombic interactions between charges, while the leading effect of quantum fluctuations is to provide the monopoles with kinetic energy. We study the effect of adding quantum dynamics to spin ice, a well-known classical spin liquid, with a particular view of how to best detect its presence in experiment. For the weakly diluted quantum spin ice, we find a particularly crisp phenomenon, namely, the emergence of hydrogenic excited states in which a magnetic monopole is bound to a vacancy at various distances [1].

[1] O. Petrova, R. Moessner, S. L. Sondhi, Phys. Rev. B **92**, 100401 (2015)

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