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Disorder-Induced Quantum Spin Liquid in Spin Ice Pyrochlores

LUCILE SAVARY, Massachusetts Institute of Technology, LEON BALENTS, Kavli Institute for Theoretical Physics, University of California, Santa Barbara — We discuss disorder in spin ice materials, and in particular in compounds with non-Kramers magnetic ions. We show that in the minimal relevant model, disorder succeeds in inducing a long-range entangled Coulombic quantum spin liquid phase. The phase diagram also contains an analog of the Mott glass state, envisioned in dirty boson systems with particle-hole symmetry. We discuss the relevance of our results to the material $\text{Pr}_2\text{Zr}_2\text{O}_7$, and how these ideas might be applied to convert a classical spin ice to a quantum one.

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