Abstract Submitted
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Theory of quantum kagome ice and vison zero modes[1] YI-PING HUANG, MICHAEL HERMELE, Univ of Colorado - Boulder — We derive an effective Z_2 gauge theory to describe the quantum kagome ice (QKI) state that has been observed by Carrasquilla *et. al.* in Monte Carlo studies of the $S = 1/2$ kagome XYZ model in a Zeeman field. The numerical results on QKI are consistent with, but do not confirm or rule out, the hypothesis that it is a Z_2 spin liquid. Our effective theory allows us to explore this hypothesis and make a striking prediction for future numerical studies, namely that symmetry-protected vison zero modes arise at lattice disclination defects, leading to a Curie defect term in the spin susceptibility, and a characteristic $(N_{dis} - 1) \ln 2$ contribution to the entropy, where N_{dis} is the number of disclinations. Only the Z_2 Ising symmetry is required to protect the vison zero modes. This is remarkable because a unitary Z_2 symmetry cannot be responsible for symmetry-protected degeneracies of local degrees of freedom. We also discuss other signatures of symmetry fractionalization in the Z_2 spin liquid, and phase transitions out of the Z_2 spin liquid to nearby ordered phases.

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