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Mesonic states in quantum spin ice[1] OLGA PETROVA, Ecole Normale Superieure , RODERICH MOESSNER, Max Planck Institute for the Physics of Complex Systems, SHIVAJI SONDHI, Princeton University — We study magnetic monopoles in quantum spin ice, whose dynamics is induced by a transverse field term. We find that the bipartiteness of the state graph of the model and the local spin ice rule constraints result in the presence of an approximately flat band at the classical energy of the nearest neighbor monopole pair. The degeneracy of the so-called mesonic states making up the flat band splits at the same order as the spin ice ground state manifold. We show that the mesonic states result in a crisp neutron scattering signature of magnetic monopoles in the system, and that the momentum dependence of the structure factor may allow for the detection of quantum fluctuations in a spin ice system near the classical limit.

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