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Order-by-disorder in frustrated diamond lattice antiferromagnets
JASON ALICEA, DORON BERGMAN, UCSB, EMANUEL GULL, ETH Zurich, SIMON TREBST, Station Q, LEON BALENTS, UCSB — Normal spinels constituting antiferromagnets on a diamond lattice have recently been the subject of intensive experimental study. To understand the behavior of the many systems in this class exhibiting strong frustration, such as $MnSc_2S_4$, we have studied theoretically a model for frustrated diamond lattice antiferromagnets that exhibits complex behavior in accord with numerous observations. Remarkably, with sufficiently strong frustration a massive ground state degeneracy develops amongst coplanar spirals whose propagation wavevectors reside on a two-dimensional "spiral surface" in momentum space. We argue that an important ordering mechanism is entropic splitting of these degenerate states, an elusive phenomenon known as order-by-disorder. Extensive Monte Carlo simulations reveal the order-by-disorder phase, with a low ordering temperature.

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