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Quantum antiferromagnet on a Bethe lattice at percolation II.Effective Hamiltonian for dangling spins SHIVAM GHOSH, HITESH CHANGLANI, SUMIRAN PUJARI, C.L. HENLEY, Cornell University — The lowest energy excitations of spin 1/2 Heisenberg antiferromagnets on percolation clusters (about the Neel ordered state) were believed to be "quantum rotor states" scaling with cluster size as 1/N, until Wang and Sandvik [Wang et al, Phys. Rev. B 81, 054417 (2010)] discovered a class of states in the diluted square lattice that had even lower energies and had a different finite size scaling of the gap exponent. They conjectured these anomalous states were due to local even/odd sublattice imbalances, leading to emergent local moments called "dangling spins" that interact over large distances, mediated through intervening spins. We have pursued this question on the z=3 Bethe lattice at the percolation threshold. Exact diagonalization shows, forevery cluster, a split-off group of low-energy states having the same quantum numbers as can be made using the dangling spins. We identify these with the Wang-Sandvik anomalous states and model their energies using an effective pair Hamiltonian coupling the "dangling spins." The couplings are a function of separation and geometry; the parameters are solved by fitting to a database of different clusters.The separation dependence of these interactions can be related to the gap scaling with N. We will also compare the effective Hamiltonian predictions to the intersite susceptibility matrix of each cluster.

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