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Exact ground states for the nearest neighbor quantum XXZ model on the kagome and other lattices with triangular motifs at $J_z/J_{xy} = -1/2$[1] HITESH CHANGLANI, Johns Hopkins University, KRISHNA KUMAR, DMITRII KOCHKOV, EDUARDO FRADKIN, BRYAN CLARK, University of Illinois at Urbana-Champaign — We report the existence of a quantum macroscopically degenerate ground state manifold on the nearest neighbor XXZ model on the kagome lattice at the point $J_z/J_{xy} = -1/2$. On many lattices with triangular motifs (including the kagome, sawtooth, icosidodecahedron and Shastry-Sutherland lattice for a certain choice of couplings) this Hamiltonian is found to be frustration-free with exact ground states which correspond to three-colorings of these lattices. Several results also generalize to the case of variable couplings and to other motifs (albeit with possibly more complex Hamiltonians). The degenerate manifold on the kagome lattice corresponds to a "many-body flat band" of interacting hard-core bosons; and for the one boson case our results also explain the well-known non-interacting flat band. On adding realistic perturbations, state selection in this manifold of quantum many-body states is discussed along with the implications for the phase diagram of the kagome lattice antiferromagnet.

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