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Long range ordering in SU(N) Heisenberg models

We discuss the quantum fluctuation driven ordering in the SU(3) and SU(4) Heisenberg models on triangular, square and honeycomb lattices. In the case of the SU(3) symmetric model on the square lattice, a three sublattice stripe like long-range order develops from a classically degenerate manifold. The SU(4) model undergoes a spontaneous dimerization on the square lattice, and since the ground state of a dimer is not a singlet for SU(4) but a 6-dimensional irrep, this leaves the door open for further symmetry breaking. We provide evidence that, unlike in SU(4) ladders, where dimers pair up to form singlet plaquettes, here the SU(4) symmetry is additionally broken, leading to a gapless spectrum in spite of the broken translational symmetry. The results are achieved by a combination of analytical and numerical methods.

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