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Translational symmetry breaking in two-dimensional antiferromagnets and superconductors

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It was argued many years ago that translational symmetry breaking due to the appearance of spin-Peierls ordering (or bond-charge stripe order) is a fundamental property of the quantum paramagnetic states of a large class of square lattice antiferromagnets. Recently, such states were shown to be a convenient point of departure for studying translational symmetry breaking in doped antiferromagnets: these results are briefly reviewed here with an emphasis on experimental implications. In the presence of stronger frustration, it was also argued that the insulating antiferromagnet can undergo a transition to a deconfined state with no lattice symmetry breaking. This transition is described by a fully-frustrated Ising model in a transverse field: details of this earlier derivation of the Ising model are provided here—this is motivated by the reappearance of the same Ising model in a recent study of the competition between antiferromagnetism and d-wave superconductivity by Senthil and Fisher.

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