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Nature of triplet excitations in the diluted 2D Heisenberg model
LING WANG, ANDERS SANDVIK, Boston University — We study the nature of ground state excitations of the 2D S=1/2 Heisenberg model on percolating clusters. We have previously argued that they involve weakly interacting localized moments, which are formed due to local sublattice imbalance [1]. We here discuss further confirmation of this picture for clusters with singlet ground states. First, we study a hard-core classical dimer-monomer model on percolating clusters. We find that the monomers are localized in small regions of local sublattice imbalance, and these regions coincide with regions of small local gaps (large local magnetic susceptibility), thus supporting the existence of localized magnetic moments due to sublattice imbalance. Second, we use quantum Monte Carlo simulations in the valence bond basis [2], with which we can study the spatial distribution of a triplet bond in the lowest-energy excited state. We find that the triplets are localized predominantly in a subset of the regions of localized monomers, supporting the notion that the lowest excitation is the singlet-triplet excitation of a small number of interacting effective moments. Supported by NSF grant DMR-0513930.

[1] L. Wang and A. W. Sandvik, Phys. Rev. Lett. 97, 117204 (2006).
[2] A. W. Sandvik, Phys. Rev. Lett. 95, 207203 (2005).

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