Abstract Submitted
for the MAR11 Meeting of
The American Physical Society

DMRG Study of the $S = 1/2$ Kagome Antiferromagnetic Heisenberg Model SIMENG YAN, UCI, STEVEN WHITE, DAVID HUSE — Recently we have completed a density matrix renormalization group (DMRG) study of the spin-$\frac{1}{2}$ Kagome antiferromagnetic Heisenberg model. We studied a variety of cylindrical geometries, with widths up to 12 lattice spacings and total sizes up to 400-500 sites. We found a spin liquid ground state with much lower energies than the valence bond crystal found using other approaches. Our energies are variational except for very tiny edge effects, and are comparable to Lanczos energies on 36 or 42 site. The spin liquid can be viewed as a melted valence bond crystal formed from 8 site diamond loops and dimers, with a 12 site unit cell, called the "diamond pattern." In this talk we will focus on the narrowest cylinders, in particular a cylinder with a circumference of 4 lattice spacings which accomodates the diamond pattern, but for which the spin liquid ground state, while metastable in DMRG, is higher in energy than another state with a "topological string" and a resulting "valence bond density wave" broken translational symmetry. We discuss singlet and triplet gaps relative to these two states. The peculiar behavior of this narrow cylinder is presumably due to short resonance loops around the cylinder.

Simeng Yan
UCI

Date submitted: 07 Dec 2010 Electronic form version 1.4