Abstract Submitted
for the MAR12 Meeting of
The American Physical Society

Projected wave function study of Z_2 spin liquids on the kagome lattice for the spin-1/2 quantum Heisenberg antiferromagnet FEDERICO BECCA, CNR Istituto Officina dei Materiali and SISSA, YASIR IQBAL, DIDIER POILBLANC, Laboratoire de Physique Theorique UMR-5152, CNRS and Universite' de Toulouse — Within the class of Gutzwiller projected fermionic wave functions, by using quantum variational Monte Carlo simulations, we investigated the energetics of all possible Z_2 spin liquids that can potentially occur as ground states of the nearest-neighbor S=1/2 quantum Heisenberg model on the Kagome lattice [1]. We conclusively show that all gapped and gapless Z_2 spin liquids are higher in energy compared to the U(1) gapless states in whose neighborhoods they lie. In particular, the most promising gapped Z_2 spin liquid (the so-called $Z_2[0,\pi]\beta$ state), conjectured to describe the ground state [2], is always higher in energy compared to the U(1) Dirac spin liquid. We also extended the U(1) Dirac state and the uniform RVB spin liquid to include next-nearest-neighbor hopping terms, and studied its local and global stability towards various valence bond crystal patterns. We found that a non-trivial 36-site VBC is stabilized upon addition of a small ferromagnetic exchange coupling [3].

[1] Y. Iqbal, F. Becca, and D. Poilblanc, Phys. Rev. B 84, 020407(R) (2011)
[2] Y.-M. Lu, Y. Ran, and P.A. Lee. Phys. Rev. B 83, 224413 (2011)
[3] Y. Iqbal, F. Becca, and D. Poilblanc, Phys. Rev. B 83, 100404(R) (2011)

Federico becca
CNR Istituto Officina dei Materiali and SISSA

Date submitted: 15 Nov 2011 Electronic form version 1.4