Abstract Submitted
for the MAR15 Meeting of
The American Physical Society

Chiral spin liquid emerging between competing magnetic order states in the spin-1/2 J1-J2-J3 kagome Heisenberg model SHOUSHU GONG, WEI ZHU, Department of Physics and Astronomy, California State University, Northridge, LEON BALENTS, Kavli Institute for Theoretical Physics, University of California Santa Barbara, DONGNING SHENG, Department of Physics and Astronomy, California State University, Northridge — We studied the extended spin-1/2 kagome model with the first neighbor (J_1), the second (J_2) and third neighbor (J_3) couplings using density matrix renormalization group. We established a quantum phase diagram for $0 \leq J2 \leq 0.25J_1$ and $0 \leq J_3 \leq J_1$, where we find a $q = (0, 0)$ Neel phase, a chiral spin liquid (CSL), a cuboc1 phase that breaks both time-reversal and spin rotational symmetries, and a valence-bond solid at the neighbor of the Heisenberg model, where a possible Z_2 spin liquid has been previously identified. Interestingly, the classical cuboc1 phase could survive in the spin-1/2 system with strong quantum fluctuations, and the CSL emerges between the $q = (0, 0)$ and the cuboc1 phases. We discover that the CSL has the short spin correlation pattern consistent with the cuboc1 phase, but the chiral order structure is totally different. The CSL might be understood as a result of the competitions between the $q = (0, 0)$ and the cuboc1 phases in the presence of strong quantum fluctuations. We further studied the quantum phase transitions from the CSL to the magnetically ordered phases, and to the possible Z_2 spin liquid of the Heisenberg kagome model. Interestingly, the exotic continuous topological phase transition might be realized in the system.

Shoushu Gong
Department of Physics and Astronomy, California State University, Northridge

Date submitted: 14 Nov 2014 Electronic form version 1.4