MAR14-2013-020198

Abstract for an Invited Paper
for the MAR14 Meeting of
the American Physical Society

Quantum phase diagrams and phase transitions in frustrated two-dimensional Heisenberg models[1]

DONNA SHENG, Cal State Univ - Northridge

The quantum spin liquid is an emergent state of matter, which has attracted a lot of recent attention. I will review recent numerical progress based on the density matrix renormalization calculations in identifying gapped spin liquid in two-dimensional frustrated spin systems. I will first focus on extended model with Heisenberg exchange couplings on kagome lattice and demonstrate a topological state with fractionalized spinon and emergent gauge field clearly shown in numerical simulations. I will present concrete results on the quantum phase diagram of the extended kagome Heisenberg model, and compare that with the phase diagrams of the square and honeycomb lattice models with the dominant plaquette valence bond phase in nonmagnetic region. I will discuss numerical effort and theoretical challenge in fully pinning down the nature of the gapped topological phase, and also the nature of the quantum phase transitions in these Heisenberg systems.

[1]The research was supported by the National Science Foundation grant DMR-0906816.