Abstract Submitted
for the MAR11 Meeting of
The American Physical Society

Schwinger boson spin liquid states on honeycomb lattice: projective symmetry group analysis and critical field theory FA WANG, Department of Physics, MIT — Motivated by the numerical evidence of a gapped spin liquid in the honeycomb Hubbard model [Meng et al. Nature 464, 847 (2010)], we analyse possible Z_2 spin liquids with gapped bosonic spinons coupled to Z_2 gauge field on honeycomb lattice within the Schwinger boson formalism. By the projective symmetry group method we find that there are only two relevant Z_2 spin liquids on honeycomb lattice with different (zero or π) gauge flux in the elemental hexagon. The zero-flux state seems to be a good candidate for the numerically observed spin liquid. It can acquire collinear AFM Neel order via a continuous O(4) transition. In the critical field theory of this transition the coupling of bosonic spinons to the Higgs field contains cubic powers of spatial derivatives, therefore does not break honeycomb lattice symmetry and allows for a continuous transition to a commensurate collinear Neel order. We will also discuss several observable features of this spin liquid.

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Date submitted: 16 Nov 2010 Electronic form version 1.4