Abstract Submitted
for the MAR13 Meeting of
The American Physical Society

Valence bond solid order and phase transitions of honeycomb lattice models KENJI HARADA, Graduate school of informatics, Kyoto university, Japan, HARUHIKO MATSUO, Research Organization for Information Science and Technology, Japan, TAKAFUMI SUZUKI, Graduate school for engineering, University of Hyogo, Japan, SYNGE TODO, NAOKI KAWASHIMA, Institute for Solid State Physics, University of Tokyo, Japan — We investigate the ground states of generalized SU(N) Heisenberg models on honeycomb lattices. From large-scale quantum Monte Carlo simulations, we confirm the columnar valence bond solid (c-VBS) orders for $N \geq 5$ at low temperatures, which corresponds to Kekulé distortion. It is consistent with Read and Sachdev's prediction[N. Read and S. Sachdev, Phys Rev B **42**, 4568 (1990)]. If we introduce the designed six-body interactions on hexagonal plaquettes, the c-VBS order occurs even in the SU(2) case. While the c-VBS state on a square lattice breaks Z_4 rotational symmetry, Z_3 rotational symmetry breaks on a honeycomb lattice. The difference may changes the nature of c-VBS phase. In particular, we will report phase transitions from a c-VBS phase to a paramagnetic or Néel phase in details. These results give us insight for deconfinement critical phenomena.

Kenji Harada
Graduate school of informatics, Kyoto university, Japan

Date submitted: 27 Nov 2012 Electronic form version 1.4