Abstract Submitted
for the MAR16 Meeting of
The American Physical Society

Entanglement of Vortex Lattices for Ultracold Bose Gases in a Non-Abelian Gauge Potential SZU-CHENG CHENG, Department of Optoelectric Physics, Chinese Culture University, Taiwan, ROC, T. F. JIANG, SHIH-DA JHENG, Institute of Physics, National Chiao Tung University, Taiwan, ROC, ATOMIC AND MOLECULAR PHYSICS TEAM, ATOMIC AND MOLECULAR PHYSICS TEAM — We develop a theory, referred to as the von Neumann lattice in a higher Landau level, for vortex lattices labelled by an integral number of flux quantums per unit cell in a higher Landau level. Using this lattice theory, we study the vortex lattice states of a pseudospin-1/2 ultracold Bose gas with contact interactions in a non-Abelian gauge potential. In addition to a uniform magnetic field, the Bose gas is also subjected to a non-Abelian gauge field, which creates an effect of the spin-orbit coupling to lift the spin degeneracy of the Landau levels. Because of interactions from the spin-orbit coupling, there are new degenerate points of the single particle spectrum due to the crossings of two Landau levels at certain coupling strengths. We show that interactions from the spin-orbit coupling force the nature and structure of the vortex lattice changing dramatically if the strength of the non-Abelian gauge field is increasing. We also find that the ground state of the vortex lattice at a degenerate point exhibits strong correlation and entanglement involving vortex lattices from different Landau levels. This entangled state builds the connection between two phases of vortex lattices during the first order phase transition of the adiabatic evolution.

Szu-Cheng Cheng
Chinese Culture Univ

Date submitted: 05 Nov 2015 Electronic form version 1.4