Abstract Submitted
for the MAR16 Meeting of
The American Physical Society

Quantum Monte Carlo study of strange correlator in interacting topological insulators HAN-QING WU, YUAN-YAO HE, Renmin Univ of China, YI-ZHUANG YOU, CENKE XU, Department of Physics, University of California, Santa Barbara, California , ZI YANG MENG, Institute of Physics, Chinese Academy of Sciences, ZHONG-YI LU, Renmin Univ of China — Distinguishing the nontrivial symmetry-protected topological (SPT) phase from the trivial insulator phase in the presence of electron-electron interaction is an urgent question to the study of topological insulators. In this work, we demonstrate that the strange correlator is a sensitive diagnosis to detect SPT states in interacting systems. Employing large-scale quantum Monte Carlo (QMC) simulations, we investigate the interaction-driven quantum phase transition in the Kane-Mele-Hubbard model. The transition from the quantum spin Hall insulator at weak interaction to an antiferromagnetic Mott insulator at strong interaction can be readily detected by the momentum space behavior of the strange correlator in single-particle, spin, and pairing sectors. The interaction e?ects on the symmetry-protected edge states in various sectors are well captured in the QMC measurements of strange correlators. Moreover, we demonstrate that the strange correlator is technically easier to implement in QMC and more robust in performance than other proposed numerical diagnoses for interacting topological states, as only static correlations are needed. The attempt in this work paves the way for using the strange correlator to study interaction-driven topological phase transitions.

Han-Qing Wu
Renmin Univ of China

Date submitted: 26 Oct 2015 Electronic form version 1.4