Abstract Submitted
for the MAR16 Meeting of
The American Physical Society

Effect of disorder in three dimensional layered Chern insulator SHANG LIU, School of Physics, Peking University, Beijing, 100871, China, TOMI OHTSUKI, Department of Physics, Sophia University, Chiyoda-ku, Tokyo, 102-8554, Japan, RYUICHI SHINDOU, International Center for Quantum Materials, Beijing, 100871, China — Critical nature of quantum phase transition between topological phase and non-topological phase is one of the most fundamental research issues in the studies of topological phases, where a bulk delocalized state is universally observed between distinct phases as a holographic requirement from the stable surface states. In this work, we studied the effects of disorder in a three dimensional layered Chern insulator, which, in the clean limit, is either a Chern insulator or Weyl semimetal (WSM) depending on the strength of an inter-layer coupling. By calculating the localization length with the transfer matrix method and density of states with the kernel polynomial expansion, we found two distinct types of metallic phases between the Anderson insulator and Chern insulator phases; one is a diffusive metallic (DM) phase and the other is a renormalized WSM phase. We showed that the longitudinal conductivity at the zero energy state remains finite not only in the DM phase but also in the renormalized WSM phase, while goes to zero at the semimetal-metal quantum phase transition point. Based on the Einstein relation combined with the self-consistent Born analysis, we also argue the conductivity scaling near the quantum transition point.

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Date submitted: 05 Nov 2015 Electronic form version 1.4