MAR16-2015-009203

Abstract for an Invited Paper
for the MAR16 Meeting of
the American Physical Society

Hidden landscapes in thin film topological insulators: between order and disorder, 2D and 3D, normal and topological phases[1]

SEONGSHIK OH, Department of Physics and Astronomy, Rutgers, The State University of New Jersey

Topological insulator (TI) is one of the rare systems in the history of condensed matter physics that is initiated by theories and followed by experiments. Although this theory-driven advance helped move the field quite fast despite its short history, apparently there exist significant gaps between theories and experiments. Many of these discrepancies originate from the very fact that the worlds readily accessible to theories are often far from the real worlds that are available in experiments. For example, the very paradigm of topological protection of the surface states on Z2 TIs such as Bi2Se3, Bi2Te3, Sb2Te3, etc, is in fact valid only if the sample size is infinite and the crystal momentum is well-defined in all three dimensions. On the other hand, many widely studied forms of TIs such as thin films and nano-wires have significant confinement in one or more of the dimensions with varying level of disorders. In other words, many of the real world topological systems have some important parameters that are not readily captured by theories, and thus it is often questionable how far the topological theories are valid to real systems. Interestingly, it turns out that this very uncertainty of the theories provides additional control knobs that allow us to explore hidden topological territories. In this talk, I will discuss how these additional knobs in thin film topological insulators reveal surprising, at times beautiful, landscapes at the boundaries between order and disorder, 2D and 3D, normal and topological phases.

[1]This work is supported by Gordon and Betty Moore Foundation's EPiQS Initiative (GBMF4418)