Quantum phase transitions of a disordered antiferromagnetic topological insulator

Paul Baireuther
Instituut Lorentz, Leiden University, Leiden, The Netherlands
e-mail: baireuther@lorentz.leidenuniv.nl

We have studied the effect of electrostatic disorder on the conductivity of a three-dimensional antiferromagnetic insulator (a stack of anomalous quantum Hall layers with staggered magnetization). The phase diagram contains regions where the increase of disorder first causes the appearance of surface conduction (via a topological phase transition), followed by the appearance of bulk conduction (via a metal-insulator transition). The conducting surface states are stabilized by an effective time-reversal symmetry that is broken locally by the disorder but restored on long length scales. A simple self-consistent Born approximation reliably locates the boundaries of this so called "statistical" topological phase.