

Massachusetts Institute of Technology
Department of Physics

Condensed Matter Theory Seminar

" Disentangling Surface and Bulk States of a Topological Crystalline Insulator
by Optics"

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Abstract: The surface states of topological crystalline insulators (TCI) arise from the topology of the bulk bands and are protected by crystalline symmetries. Both surface and bulk properties of TCIs are of great interest; however, the former remain mostly elusive so far in optical and transport experiments. We investigated the infrared (IR) reflectance spectrum of a TCI $\text{Pb}_{1-x}\text{Sn}_x\text{Se}$ in zero and high magnetic fields with alloy compositions in both the trivial and TCI phases. Analysis of the interband Landau level transitions of the TCI phase shows that their bulk bands can be well described by massive Dirac fermions. Moreover, our optical data have revealed several signatures of the surface states in the TCI phase. We show that: (1) a significant portion (more than 50%) of the free carrier (Drude) absorption of the TCI sample is due to surface states; (2) the low energy resonance in the IR spectrum in magnetic field is dominated by Landau level transitions of the surface states. We will discuss and compare the mobility and DC conductivity of the surface and bulk states. These findings provide new insights in the unique surface states of TCIs.

12:00pm
Wednesday, February 17, 2016
Duboc Room (4-331)