Abstract Submitted
for the MAR17 Meeting of
The American Physical Society

Measurement of the topological surface state optical conductance in bulk-insulating Sn-doped $Bi_{1.1}Sb_{0.9}Te_2S$ single crystals BING CHENG, LIANG WU, Johns Hopkins Univ, SATYA KUSHWAHA, ROBERT CAVA, Princeton Univ, PETER ARMITAGE, Johns Hopkins Univ — Topological surface states have been extensively observed via optics in thin films of topological insulators. However, in typical thick single crystals of these materials, bulk states are dominant and it is difficult for optics to verify the existence of topological surface states definitively. In this work, we studied the charge dynamics of the newly formulated bulk-insulating Sn-doped $Bi_{1.1}Sb_{0.9}Te_2S$ crystal by using time-domain terahertz spectroscopy. This compound shows much better insulating behavior than any other bulk-insulating topological insulators reported previously. The transmission can be enhanced an amount which is 5% of the zero-field transmission by applying magnetic field to 7 T, an effect which we believe is due to the suppression of topological surface states. This suppression is essentially independent of the thicknesses of the samples, showing the two-dimensional nature of the transport. The suppression of surface states in field allows us to use the crystal slab itself as a reference sample to extract the surface conductance, mobility, charge density and scattering rate. Our measurements set the stage for the investigation of phenomena out of the semi-classical regime, such as the topological magneto-electric effect.

Bing Cheng
Johns Hopkins Univ

Date submitted: 10 Nov 2016 Electronic form version 1.4