Abstract Submitted
for the MAR16 Meeting of
The American Physical Society

Gate Tunable Infrared Optical Response of $(Bi_{1-x}Sb_x)_2Te_3$ Topological Insulators WILLIAM WHITNEY, VICTOR BRAR, California Institute of Technology, YUNBO OU, Institute of Physics, Chinese Academy of Sciences, KE HE, QI-KUN XUE, Tsinghua University, HARRY ATWATER, California Institute of Technology — The electronic properties of topological insulators – narrow band-gap semiconductors that exhibit insulating bulk and semimetallic Dirac surface states – have been the subject of intense study over the past several years. The optical and optoelectronic behavior of these materials, however, remain widely uncharacterized. It has previously been shown that electrostatic gating can be used to tune the Fermi level in the Dirac semimetal graphene, modifying interband transitions and free carrier absorption. We report here experiments that demonstrate electronic control of the optical properties of 5-20 nm thick $(Bi_{1-x}Sb_x)_2Te_3$ films grown by Van der Waals epitaxy and transferred to silicon dioxide on silicon via an epitaxial lift off process. We find that infrared transmission and reflection from 3 to 10 microns are consistent with modulation of free-carrier absorption and bulk interband transitions in $(Bi_{1-x}Sb_x)_2Te_3$. We discuss transport results as well as the contributions that bulk and topological surface electronic transitions make to the optical response of these materials.

William Whitney
California Institute of Technology

Date submitted: 06 Nov 2015 Electronic form version 1.4