Abstract Submitted
for the MAS15 Meeting of
The American Physical Society

Polarization dependent photocurrent in topological insulators tuned by an in plane magnetic field YU PAN, TIMOTHY PILLSBURY, BRITTANY GRIMM, ANTHONY RICHARDELLA, THOMAS FLANAGAN, NITIN SAMARTH, The Pennsylvania State Unversity — Illumination with circularly polarized light is known to produce a helicity dependent photocurrent in topological insulators such as Bi_2Se_3 [Nature Nanotech. **7**, 96 (2012)]. Symmetry considerations suggest that this "circular photo-galvanic effect" (CPGE) arises purely from the surface. However, whether or not the CPGE is directly related to optical excitations from the helical surface states is still under debate. Since the helical surface states of a 3D topological insulator are not greatly perturbed by a static in-plane magnetic field, the response of the CPGE to an in-plane magnetic field could help elucidate the origin of the CPGE. We report photocurrent measurements in Al capped $(Bi, Sb)_2Te_3$ thin films as an in-plane magnetic field is applied. The polarization dependent photocurrent is greatly enhanced by the in-plane magnetic field, reversing sign as the field switches direction. Further, we find that field-dependence of the photocurrent is much weaker in similar $(Bi, Sb)_2Te_3$ films without Al capping. Control measurements on Al capped n-Si rule out a field-dependent CPGE that originates in the Al overlayer. We thus attribute the field-dependent photocurrent to the interface between the Al and $(Bi, Sb)_2Te_3$ thin film. This work is supported by ONR.

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Date submitted: 28 Sep 2015 Electronic form version 1.4