Abstract Submitted
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Evidence for surface-generated photocurrent in $(Bi,Sb)_2Se_3$ and $(Bi,Sb)_2Te_3$ thin films[1] YU PAN, ANTHONY RICHARDELLA, BING YAO, JOON SUE LEE, THOMAS FLANAGAN, ABHINAV KANDALA, NITIN SAMARTH, the Pennsylvania State University, ANDREW YEATS, PETER MINTUN, DAVID AWSCHALOM, University of Chicago — Illumination with circularly polarized light is known produce a helicity-dependent photocurrent in topological insulators such as Bi_2Se_3 [e.g. Nature Nanotech. **7**, 96 (2012)]. However, the exact origin of this effect is still unclear since it is observed with photons well above the bulk band gap. We report measurements of the polarization-dependent photocurrent in a series of $(Bi,Sb)_2Se_3$ thin films with different carrier concentrations and find that the photocurrent is enhanced as we increase the population of the surface states. This finding is supported by a study of helicity-dependent photocurrents in back-gated $(Bi,Sb)_2Te_3$ thin films, where the chemical potential is varied electrostatically. By illuminating our samples at different wavelengths, we show that the helicity-dependent photocurrent is enhanced when the photon energy approaches the energy difference between the lowest and first excited (unoccupied) topological surface states. This leads us to attribute the helicity-dependent photocurrent in topological insulators to optical excitations between these two spin-textured surface states. We will also discuss experiments imaging the spatial variation of these helicity-dependent photocurrents.

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