Detecting the surface spin polarization of topological materials with resonant X-ray reflectometry

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Topological insulators (TI) are insulting in the bulk but exhibit symmetry protected metallic states on its edges or surfaces[1]. One important property of TI's is spin-momentum locking at surface states. Because of this spin-momentum locking, an applied current induces a net spin polarization on the TI's surface states[2]. Moreover, if the current density is large enough, the spin polarization can be sufficient to manipulate the magnetization of an adjacent magnetic film[3]. Here we present an effort to detect the current induced spin polarization at TI surfaces using X-ray resonant reflectometry on MBE grown films consisting of topological material, $(Bi_{0.5}Sb_{0.5})_2Te_3$, and soft magnet layer, $Co_{40}Fe_{40}B_{20}$.

[1] M. Z. Hasan and C. L. Kane. Rev. Mod. Phys. **82**, 3045 (2010).

[2] C. H. Li, et al. Nature nanotechnology, **9**(3), 218 (2014).

[3] A. R. Mellnik, et al. Nature **511**, 449 (2014).