

Abstract Submitted  
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**Observation of resonance in second harmonic generation measurements of topologically insulating Bi<sub>2</sub>Se<sub>3</sub> thin films**<sup>1</sup> MIKEL HOLCOMB, YURI GLINKA, SERCAN BABAKIRAY, TRENT JOHNSON, ALAN BRISTOW, DAVID LEDERMAN, West Virginia University, CENTER FOR ENERGY EFFICIENT ELECTRONICS TEAM — Second harmonic generation is an ideal probe of topological insulator surface states due to its sensitivity to space inversion symmetry breaking, which naturally occurs at a material's surface. We measured the angular dependence of second harmonic intensity for s-s, p-p, s-p and p-s polarization configurations of the incoming and outgoing light in films ranging in thickness from 6 to 40 nm of the topological insulator Bi<sub>2</sub>Se<sub>3</sub>. We assign each of these angular arrangements to the symmetry of specific Se and Bi atomic layers near the surface of the material. Exploiting this information, we separate the bulk and surface crystal structure contributions. Modelling the response requires use of a conventional second-order nonlinear term and a third-order electric-field induced SHG term. The latter dominates the thickness dependence showing a strong peak at about 10 nm. We apply appropriate models to explain this behavior and will discuss the resonance-like feature observed within a small thickness range and its implications.

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