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Nonlinear optical properties of bismuth selenide DEREK BAS, SERCAN BABAKIRAY, TUDOR STANESCU, DAVID LEDERMAN, ALAN BRISTOW, West Virginia University — Bismuth selenide (Bi2Se3) is a topological insulator with many interesting photonic properties. Much research has been done involving various types of photocurrents in an attempt to highlight the differences between the bulk electronic states and massless conducting surface states. Here, Bi2Se3 films varying in thickness from 6 to 40 quintuple layers have been produced via molecular beam epitaxy as a means to vary the relative contributions of bulk and surface. On these samples, optical measurements were performed at around 1.6 eV, which is enough energy to stimulate transitions from the Fermi level to a region near the second Dirac cone. Z-scan was used to measure saturable absorption, time-resolved two-color pump-probe was used to measure two-photon absorption, and a Fourier transform infrared spectrometer was used to measure linear absorption. Results were examined and analyzed with respect to thickness. Thickness-dependent band structures were produced using a tight-binding model and used to compare with experimental results.

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