Abstract Submitted
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Terahertz dynamics of gated thin films of the topological insulator Bi_2Se_3[1] ANDREAS STIER, JAMES NEILSON, LIANG WU, Department of Physics and Astronomy, Johns Hopkins University, NAMRATA BANSAL, MATTHEW BRAHLEK, SEAN OH, Department of Physics and Astronomy, Rutgers, the State University of New Jersey, N. PETER ARMITAGE, Department of Physics and Astronomy, Johns Hopkins University — Topological insulators are a newly discovered class of materials, which in principle exhibit bulk insulating behavior and conducting surface channels with a Dirac like dispersion relation. Real materials, however, suffer from large residual bulk conductance due to donor defect sites. This places the chemical potential in the bulk bands. Ionic liquid gating techniques are capable of moving the chemical potential into the bulk band gap, making the exotic transport characteristics predicted for the surface states accessible. Here, we present terahertz time domain spectroscopy of gated thin films of the topological insulator Bi_2Se_3 utilizing an ionic liquid gel as a top gate. The evolution of the Drude like conductivity features as a function of gate bias show a sharp decrease in the scattering rate which we interpret as the chemical potential moving from the conduction band into the surface states. We also discuss efforts to optically observe potential axionic terms in the action governing Maxwell's equations for this material class, which are reflected in a discontinuous evolution of the Faraday rotation.

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