

Low frequency electrodynamics of topological insulator surface states

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I will report on our studies of high quality MBE grown Bi₂Se₃ and strained HgTe topological insulator thin films using time domain terahertz spectroscopy (TDTS). In the Bi₂Se₃ case, we explicitly demonstrate the 2D character of the response by studying films of different thicknesses. We show that prolonged exposure of these thin films to atmospheric conditions actually suppresses their bulk response. In our measurements we take advantage of a unique feature of TDTS that allows to use the time structure of the THz pulses to measure the Faraday and Kerr rotation angles in a single experiment. We find an unprecedentedly large value of the Kerr rotation that is due to the cyclotron resonance of the 2D Dirac fermions. I will talk about our extension of these measurements to the strained HgTe topological insulator system.

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