MAS17-2017-000058

Abstract for an Invited Paper
for the MAS17 Meeting of
the American Physical Society

The quantized magnetoelectric effect 3D topological insulator

N. PETER ARMITAGE, The Johns Hopkins University

Topological insulators have been proposed to be best characterized as bulk magnetoelectric materials that show response functions quantized in terms of fundamental physical constants. Here we lower the chemical potential of three-dimensional (3D) Bi_2Se_3 films to $\sim$30 meV above the Dirac point, and probe their low-energy electrodynamic response in the presence of magnetic fields with high-precision time-domain terahertz polarimetry. For fields higher than 5 T, we observed quantized Faraday and Kerr rotations, whereas the DC transport is still semi-classical. A non-trivial Berry phase offset to these values gives evidence for axion electrodynamics and the quantized topological magnetoelectric effect. This is the quantized response that establishes topological insulators as a unique state of matter. Among other things, the time structure used in these measurements allows a direct measure of the fine structure constant based on a topological invariant of a solid-state system.