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Optical transitions to second Dirac point in a ferromagnetic topological insulator SHREYAS PATANKAR, University of California, Berkeley, JOEL GRIESMAR, Ecole Polytechnique, ANDREW BESTWICK, ELI FOX, Stanford University, XUFENG KOU, YABIN FAN, KANG WANG, University of California, Los Angeles, DAVID GOLDHABER-GORDON, Stanford University, JOSEPH ORENSTEIN, Lawrence Berkeley National Laboratory — It is well known that the bismuth telluride family of 3D topological insulators has a surface state in the bulk gap and that doping with magnetic impurities opens a gap in its Dirac-like dispersion. Recent two-photon ARPES measurements [Sobota et al., PRL, 2013] have revealed the existence of a second Dirac band about 1.8eV above the energy of the surface state node. To probe transitions from the first to second Dirac bands we studied the spectral response of thin films of the magnetic topological insulator Cr:$(Bi,Sb)_2Te_3$ using magneto-optic Kerr (MOKE) spectroscopy at visible and near-infrared frequencies. We observe a strong resonant enhancement of the Kerr response near 1.8eV. The enhancement enables measurement of Kerr rotation in ultrathin films, allowing us to explore the predicted [Lu et al., PRB, 2010] transitions between topologically trivial and non-trivial states as a function film thickness.

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