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Dirac cone shift and potential fluctuations in a passivated In_2Se_3/Bi_2Se_3 topological interface state[1] GREGORY S. JENKINS, A.B. SUSHKOV, D.C. SCHMADEL, M.-H. KIM, H.D. DREW, Department of Physics, University of Maryland at College Park, G. KOBLMUELLER, M. BICHLER, Walter Schottky Institut and Physik Department, Technische Universitat Munchen, N. BANSAL, M. BRAHLEK, S. OH, Department of Physics and Astronomy, The State University of New Jersey, Piscataway — The topological interface state of Bi_2Se_3 capped with In_2Se_3 is measured by gated THz cyclotron resonance. An observed shift of 70 meV in the position of the Dirac point towards mid-gap due to the physical properties of the trivial insulator In_2Se_3 on Bi_2Se_3 opens new possibilities in tailoring Dirac cone properties in topological insulators. Modulating and sweeping a semi-transparant gate while probing at terahertz frequencies in magnetic field enables characterization of the burried In_2Se_3/Bi_2Se_3 topological interface state, even in the presence of significant bulk conductivity. Near the Dirac point, the mobility is 3500 $cm^2/V{\cdot}s$ with potential fluctuations of 60 meV. The scattering rate shows a precipitous drop with Fermi energy indicating decoupling of the surface states from bulk states. At Fermi energies above the conduction band edge, a plateau is observed in the real part of the Faraday angle that is 80 times flatter than the step size expected from a single Landau Level, quantized in units of the fine structure constant.

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