Abstract Submitted
for the MAR12 Meeting of
The American Physical Society

Magnetic Field Signatures of Topological States in 3D Time-Reversal Invariant Insulators BRIAN DELLABETTA, Department of Electrical and Computer Engineering, University of Illinois at Urbana-Champaign, TAYLOR HUGHES, Department of Physics, University of Illinois at Urbana-Champaign, BENJAMIN LEV, Department of Applied Physics, Stanford University, MATTHEW GILBERT, Department of Electrical and Computer Engineering, University of Illinois at Urbana-Champaign — While the topological behavior of Bi_2Se_3 has been identified experimentally[1] [2], characterization by electron transport has been difficult due to high bulk transport caused by inadvertent doping of the crystal.[3] We perform self-consistent quantum transport calculations to show that patterned surfaces offer a unique environment in which the system may be characterized by resultant magnetic field distributions. We compare doped and undoped Bi_2Se_3 samples with normal metals to show a qualitative difference in current flow around the patterned surface. We find that the surface to bulk conductance ratio can be inferred from the magnetic field in patterned systems due to the spatial separation of bulk and surface currents created by the corrugation, which applies even in heavily doped systems. The magnetic field is sufficiently large so as to be observed using ultracold atom microscopy.

[1]Y.L. Chen et al., *Science* **325**, 178 (2009).
[2]P. Roushan et al., *Nature* **460**, 7259 (2010).
[3]N. P. Butch et al., *Phys. Rev. B.* **81**, 24 (2010).

Brian Dellabetta
University of Illinois at Urbana-Champaign

Date submitted: 11 Nov 2011 Electronic form version 1.4