Abstract Submitted
for the MAR12 Meeting of
The American Physical Society

Possible transport evidence for a surface state gap in a magnetically doped topological insulator D.M. ZHANG, A. RICHARDELLA, D.W. RENCH, A. KANDALA, T.C. FLANAGAN, P. SCHIFFER, N. SAMARTH, Dept. of Physics, Penn State University, University Park 16802, S.-Y. XU, H. BEIDENKOPF, A. YAZDANI, M.Z. HASAN, Dept. of Physics, Princeton University, Princeton, NJ 08544, A.L. YEATS, B.B. BUCKLEY, P. KLIMOV, D.D. AWSCHALOM, Dept. of Physics, University of California, Santa Barbara CA 93016 — We report magnetoresistance measurements in thin films of a magnetically doped topological insulator $Bi_{2-x}Mn_xSe_3$ synthesized by molecular beam epitaxy. We observe a crossover from positive magnetoresistance to negative magnetoresistance at low temperature ($T \lesssim 15$ K), accompanied by onset of ferromagnetic signatures (hysteresis and anisotropic magnetoresistance). The observations are consistent with the prediction of a transition of diffusive quantum transport from the symplectic to the unitary class due to a magnetically induced surface state gap. This interpretation is supported by the observation of strongly suppressed surface states at the Dirac point in angle-resolved photoemission spectroscopy. We use the magneto-optical Kerr effect, anomalous Hall effect, SQUID magnetometry, electron microscopy and scanning tunneling microscopy to clarify the source of the ferromagnetism in these samples. Supported by DARPA, ONR and NSF-MRSEC.

Nitin Samarth
Dept. of Physics, Penn State University, University Park 16802

Date submitted: 14 Nov 2011 Electronic form version 1.4