Abstract Submitted
for the MAR16 Meeting of
The American Physical Society

Interplay of Dirac surface states and magnetic fluctuations in topological insulator heterostructures HILARY M. HURST, DMITRY K. EFIMKIN, VICTOR GALITSKI, Joint Quantum Institute and Condensed Matter Theory Center, University of Maryland, College Park — We consider the proximity effect between Dirac states at the surface of a topological insulator and a ferromagnet with easy plane anisotropy, which is described by the XY-model and undergoes a Berezinskii-Kosterlitz-Thouless (BKT) phase transition. Classical magnetic fluctuations interacting with the surface states of a topological insulator can be described by an effective gauge field. This model can be mapped onto the problem of Dirac fermions in a random magnetic field, however this analogy is only partial in the presence of electron-hole asymmetry or warping of the Dirac dispersion which results in screening of magnetic fluctuations. We show that this proximity coupling leads to anomalous transport behavior of the surface states near the BKT transition temperature.

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Date submitted: 06 Nov 2015 Electronic form version 1.4