Abstract Submitted
for the MAR13 Meeting of
The American Physical Society

Manipulating Surface-induced Ferromagnetism in Modulation-doped Topological Insulators[1] XUFENG KOU, LIANG HE, MURONG LANG, YABIN FAN, University of California, Los Angeles, YING JIANG, YONG WANG, Zhejiang University, FAXIAN XIU, Iowa State University, KANG WANG, University of California, Los Angeles, DEVICE RESEARCH LABORATORY TEAM, CENTER FOR ELECTRON MICROSCOPY AND STATE KEY LABORATORY OF SILICON MATERIALS COLLABORATION, ECE DEPARTMENT COLLABORATION — The manipulation of topological surface states is a key to realize applicable devices of topological insulators. In addition to the direct engineering of time-reversal-symmetry protected surface states, recent work suggests that various physical responses can be obtained from surface helical states by integrating additional ferromagnetism or superconductivity to the original topological order. Here, we report the coexistence and tunability of bulk carrier density-independent and surface-mediated electrically controllable ferromagnetisms in modulation-doped Crx(BiySb1-y)2Te3 epitaxial thin films. We demonstrate for the first time a dramatic enhancement of surface-induced magnetization on TI / Cr-TI bilayer devices. The surface magneto-electric effects can be either enhanced significantly or completely switched-off, by tuning the separation of the surface from the magnetic impurities. The electric-field-modulated ferromagnetism in our modulation-doped TI hetero-structures is fundamentally important for the realization of the quantum anomalous Hall Effect as well as the axion electromagnetic dynamics, and thus provides a new approach for spintronics applications.

[1]The authors would also like to acknowledge helpful discussions with Dr. Alexei Fedorov and Dr. Mathew Marcus from the Advanced Light Source at Berkeley.

Xufeng Kou
University of California, Los Angeles

Date submitted: 11 Nov 2012 Electronic form version 1.4