Abstract Submitted
for the MAR14 Meeting of
The American Physical Society

Linear magnetoresistance in disordered magnetically doped topological insulator Bi2Te3 INNA KORZHOVSKA, LUKAS ZHAO, ZHIYI CHEN, MILAN BEGLIARBEKOV, HAIMING DENG, City College of New York-CUNY, SIMONE RAOUX, IBM Research - Yorktown Hts, LIA KRUSIN-ELBAUM, City College of New York-CUNY — First-principle calculations predict that certain topological insulators (TIs) can turn ferromagnetic (ferro-TIs) when doped with magnetic ions such as Fe or Cr. These ferro-TIs support anomalous Hall effect (AHE) that becomes quantized in the thin film limit. In the absence of disorder, doping with vanadium (SP = 0.7 eV per V, comparable to Fe) is not expected to produce a ferro-TI due to the position of vanadium 3D bands. Here we show that disorder introduced by doping vanadium into Bi_2Te_3 thin films has three remarkable effects:(i) it shows unusual AHE as seen in the hysteretic behavior of Hall conductance that does not scale with magnetization M, (ii) it forms a donor band that turns conductivity type from p- to n- and turns R vs. T from metallic to semiconducting-like, and (iii) it results in a large region below 100 K that has negative linear magnetoresistance (MR) in high magnetic fields. A large positive linear MR was observed in silver chalcogenides $Ag_{2+\delta}Se$ and $Ag_{2+\delta}Te$, consistent with the predicted quantum linear MR in disordered semimetals. We will discuss this mechanism in a TI, including the MR sign reversal arising from frustrated magnetic doping. * Supported in part by NSF-DMR-1122594, NSF-DMR-1312483-MWN, and DOD-W911NF-13-1-0159

Inna Korzhovska
City College of New York-CUNY

Date submitted: 15 Nov 2013 Electronic form version 1.4