Abstract Submitted
for the MAR10 Meeting of
The American Physical Society

Systematic control of surface Dirac fermion density on topological insulator Bi_2Te_3 SUYANG XU, Princeton University, YUQI XIA, DAVID GRAUER, YEWSAN HOR, ROBERT CAVA, ZAHID HASAN — Three dimensional (3D) topological insulators are quantum materials with a spin-orbit induced bulk insulating gap that exhibit quantum-Hall-like phenomena in the absence of applied magnetic fields. They feature surface states that are topologically protected against scattering by time reversal symmetry. The proposed applications of topological insulators in device geometries rely on the ability to tune the chemical potential on their surfaces in the vicinity of the Dirac node. Here, we demonstrate a suite of surface control methods based on a combination of photo-doping and molecular-doping to tune the Dirac fermion density on the topological (111) surface of Bi_2Te_3. Their efficacy is demonstrated via direct electronic structure measurements using high resolution angle-resolved photoemission spectroscopy. These results open up new opportunities for probing topological behavior of Dirac electrons in Bi_2Te_3. At least one of the methods demonstrated here can be successfully applied to other topological insulators ($Bi_{1-x}Sb_x$, Sb_2Te_3 and Bi_2Se_3). More importantly, our methods of topological surface state manipulation demonstrated here are highly suitable for future spectroscopic studies of topological phenomena which will complement the transport results gained from the traditional electrical gating techniques.

Suyang Xu
Princeton University

Date submitted: 20 Nov 2009 Electronic form version 1.4