Abstract Submitted
for the MAR12 Meeting of
The American Physical Society

**Scanning tunneling spectroscopic studies of Dirac fermions and impurity resonances in the surface-state of a strong topological insulator $Bi_2Se_3$** H. CHU, M.L. TEAGUE, C.-C. HSU, N.-C. YEH, Caltech, L. HE, K.-L. WANG, UCLA, F.-X. XIU, Iowa State Univ. — Scanning tunneling spectroscopic studies of MBE-grown $Bi_2Se_3$ epitaxial films on Si (111) revealed surface-state (SS) characteristics of Dirac fermions and signatures of strong impurity resonances. The impurity resonances in this three-dimensional strong topological insulator (3D-STI) occurred near the Dirac energy ($E_D$) and diverged as the Fermi level ($E_F$) approached $E_D$. They were also highly localized within a region of radius $\sim$ 0.2 nm, beyond which the SS spectra of the 3D-STI recovered quickly, suggesting robust topological protection against non-magnetic impurities. Similar spectral characteristics and separations between $E_F$ and $E_D$ were also observed in the MBE-grown $Bi_2Se_3$ films on CdS. For sufficiently thin samples, opening of an energy gap due to wave-function overlap between the surface and interface layers was observed. The Rashba-like spin-orbit splitting further gave rise to spin-preserving quasiparticle interferences. Finally, the effect of different impurities (e.g. Cr and Mn) on the SS spectra of $Bi_2Se_3$ as a function of magnetic field will be reported. This work was supported by FENA and DARPA.

H. Chu
Caltech

Date submitted: 20 Nov 2011 Electronic form version 1.4