Abstract Submitted for the MAR14 Meeting of The American Physical Society

Unusual Surface Termination of the Topological Insulator Bi2Se3 ANDREW HEWITT, JINGYING WANG, Department of Physics, North Carolina State University, JONATHON BOLTERSDORF, Department of Chemistry, North Carolina State University, TIANSHUIA GUAN, Department of Physics, North Carolina State University, PAUL MAGGARD, Department of Chemistry, North Carolina State University, DANIEL DOUGHERTY, Department of Physics, North Carolina State University — The strong three-dimensional topological insulator has been heralded as a new state of matter with metallic topological surface states (TSS's) of interest for spintronic applications. Recent experiments of the strong 3-D TI Bi<sub>2</sub>Se<sub>3</sub> have shown surprising discrepancies about whether the atomic termination of Bi2Se3 is either Se or Bi with evidence for both types. We have observed both metallic Bi and Se terminated surfaces on single crystals of Bi<sub>2</sub>Se<sub>3</sub> synthesized by established growth techniques and purchased from commercial suppliers. X-ray Photoelectron Spectroscopy reveals little oxidation for air-cleaves in either the Bi4f or the Se3d core levels. However, a low binding energy component for the Bi4fs is often observed which is indicative of Bi-Bi bonds near the surface. This termination is observed in approximately 50% of air-cleaved samples that have been stored in air, whereas samples stored in rough vacuum have a lower tendency ( $\sim 10\%$ ) to have a Bi-terminated surface. Angle-Resolved Photoelectron Spectroscopy shows unusual valence band structure for Bi-terminated samples which upon annealing revert to a similar band structure for Se-terminated surfaces. Understanding the surface of these materials is essential for interpreting transport measurements on cleaved single crystals.

> Andrew Hewitt Department of Physics, North Carolina State University

Date submitted: 15 Nov 2013

Electronic form version 1.4