Abstract Submitted
for the MAR15 Meeting of
The American Physical Society

Observing the Zeeman effect of topological surface state YING-SHUANG FU, Huazhong University of Science and Technology; RIKEN Center for Emergent Matter Science, TETSUO HANAGURI, RIKEN Center for Emergent Matter Science, SHUHEI YAMAMOTO, KYUSHIRO IGARASHI, Tokyo Institute of Technology, MINORU KAWAMURA, YUHKI KOHSAKA, KATSUYA IWAYA, RIKEN Center for Emergent Matter Science, HIDENORI TAKAGI, University of Tokyo; Max-Planck-Institut für Festkörperforschung, TAKAO SASAGAWA, Tokyo Institute of Technology — Dirac fermions in the topological surface state (TSS) have helical spin textures. This is different from those in graphene, which are both valley and spin degenerated. The spin degeneracy can be lifted by Zeeman effect, which is manifested as a spin-splitting of Landau levels (LLs). In the case of TSS, LLs instead should exhibit monotonic shift with magnetic field since the spin degeneracy is lacking. While the Zeeman splitting of LLs in graphene has been successfully observed, the expected features in TSS still lack experimental proof. With scanning tunneling microscopy and spectroscopy, we observed the Zeeman shifting of zeroth LL in the TSS of Bi2Se3 and Sb2Te2Se unambiguously. Moreover, we exclude the extrinsic influence on LL shifting from potential variations and the nonideal band dispersions of TSS in actual materials by modeling. The surface g factor in Sb2Te2Se and Bi2Se3 is estimated as -10 and 16, respectively. This observation indicates that the g factor of TSS is significantly material dependent, which may be related to the atomic orbital character of the compound.

Yingshuang Fu
Huazhong University of Science and Technology

Date submitted: 13 Nov 2014 Electronic form version 1.4