## Abstract Submitted for the MAR10 Meeting of The American Physical Society

Doping effects in  $Bi_2Se_3$  and  $Bi_2Te_3$  topological insulators<sup>1</sup> Y.S. HOR, A.J. WILLIAMS, J.G. CHECKELSKY, P. ROUSHAN, J. SEO, A. RICHARDELLA, Y. XIA, Q. XU\*, H.W. ZANDBERGEN\*, M.Z. HASAN, A. YAZ-DANI, N.P. ONG, R.J. CAVA, PRINCETON UNIV TEAM, \*DELFT INST OF TECH TEAM — Topological insulators are found to have a bulk electronic gap and a gapless surface state. The surface state has been observed in  $Bi_2Se_3$  and Bi<sub>2</sub>Te<sub>3</sub> by ARPES and STM, but is still considered a challenging problem for transport measurements due to the dominant bulk conductance. By chemical doping, the Fermi level can be tuned to fall inside the band  $gap^2$  and therefore suppress the bulk conductivity. Non-metallic conducting Bi<sub>2</sub>Se<sub>3</sub> crystals are obtained. Previously unobserved p-type behavior has been induced<sup>3</sup> and a novel magnetofingerprint signal<sup>4</sup> is seen through low level Ca-doping in Bi<sub>2</sub>Se<sub>3</sub>. Bi<sub>2</sub>Se<sub>3</sub> can also be tuned to a bulk superconductor, with  $T_c \sim 3.8$  K, by Cu-intercalation in the van der Waals gaps.<sup>5</sup> This shows that Cooper pairing is possible in  $Bi_2Se_3$  with implications for Majorana fermion physics study and potential quantum computing devices. Mn-doped Bi<sub>2</sub>Te<sub>3</sub> has ferromagnetic transition at  $\sim 15$  K, suggesting a possible magnetic topological insulator.

 $^{1}$ Funding: FAA9550-06-1-0530 (AFOSR), DMR-0819860 (NSF MRSEC).  $^{2}$ Hor et al. PRB **79** 195208 (09)  $^{3}$ Ibid.  $^{4}$ Checkelsky et al. arXiv:0909.1840  $^{5}$ Hor et al. arXiv:0909.2890.

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