Abstract Submitted
for the MAR17 Meeting of
The American Physical Society

**Engineering topological surface states of Cr-doped Bi2Se3 films by spin reorientation and electric field.** JEONGWOO KIM, Department of Physics and Astronomy, University of California, Irvine, SEUNG-HOON JHI, 2Department of Physics, Pohang University of Science and Technology, RUQIAN WU, Department of Physics and Astronomy, University of California, Irvine — We propose new ways to achieve the quantum anomalous Hall phase and unusual metal-insulator transition in Cr-doped Bi2Se3 films based on results of model analyses and the first-principles calculations. Using the combination of in-plane and perpendicular components of spins along with electric fields, we demonstrate that the topological state and band structures of TI films exhibit rich possibilities, from the shift of Dirac cones to the opening of nontrivial band gaps. Furthermore, then-plane magnetization leads to the significant suppression of inter-TSS scattering. Our work provides new strategies to obtain the desired electronic structures for the device, complementary to the effort of extensive material search. Work was supported as part of the SHINES, an Energy Frontier Research Center funded by the U.S. Department of Energy, Office of Science, Basic Energy Sciences, under Grant No. SC0012670. Calculations were performed on parallel computers at NERSC supercomputer centers.

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Date submitted: 11 Nov 2016 Electronic form version 1.4