Abstract Submitted
for the MAR15 Meeting of
The American Physical Society

Demonstration of large field effect in topological insulator films via a high-κ back gate C.Y. WANG, H.Y. LIN, Dept. of Physics, Natl Tsing Hua Univ., Hsinchu 30013, Taiwan, Y.H. LIN, K.H. CHEN, B.Y. YANG, Graduate Institute of Applied Physics and Dept. of Physics, Natl Taiwan Univ., Taipei 10617, Taiwan, K.H.M. CHEN, Z.J. PENG, Dept. of Physics, Natl Tsing Hua Univ., Hsinchu 30013, Taiwan, S.F. LEE, Institute of Physics, Academia Sinica, Taipei 11529, Taiwan, M. HONG, Graduate Institute of Applied Physics and Dept. of Physics, Natl Taiwan Univ., Taipei 10617, Taiwan, J. KWO, Dept. of Physics, Natl Tsing Hua Univ., Hsinchu 30013, Taiwan — In topological insulators (TI) the spins are locked to opposite momentum direction when the Fermi level passes through Dirac point of its helical surface states, and the electrical field effect is a very promising way to modulate TI spins for spintronic devices. We have fabricated the back gate structure by growing TI films on high-κ oxide layers including amorphous oxides of Al_2O_3 and Y_2O_3 deposited on conducting substrates for applying the field effect with smaller operating voltage compared to SiO_2, and keeping the top surface entirely open for subsequent fabrications of FM/TI, SC/TI structures intended for various studies. For Bi_2Se_3 grown on these amorphous oxide thin films, streaky RHEED patterns indicated the film is highly crystalline. Weak antilocalization effect was observed to verify the time-reversal symmetry protected transport property. Very large field effect was demonstrated; for example, in the 6QL samples we are able to modulate as much as 2E13 cm^{-2} holes in applying negative gate bias. Field effect of Sb doped Bi_2Te_3 to realize sign reversal of carrier concentration will also be presented.

J. Kwo
Dept. of Physics, Natl Tsing Hua Univ., Hsinchu 30013, Taiwan

Date submitted: 14 Nov 2014 Electronic form version 1.4