Abstract Submitted
for the MAR14 Meeting of
The American Physical Society

Quantum-interference effects in single- and poly-crystalline topological insulator $Bi_{2-x}Te_3$[1] SHAO-PIN CHIU, Institute of Physics, National Chiao Tung University, JUHN-JONG LIN, Department of Electrophysics and Institute of Physics, National Chiao Tung University — We have studied the carrier transport properties of both single- and poly-crystalline topological insulator (TI) $Bi_{2-x}Te_3$ samples. Single-crystalline microflakes were made by exfoliation from a single-crystalline Bi_2Te_3 bulk. Polycrystalline samples were made by flash evaporation of 5N purity Bi_2Te_3 sheets. In single-crystalline Bi_2Te_3 microflakes, temperature dependent resistances revealed two-dimensional (2D) electron-electron interaction effect. The extracted Coulomb screening parameter is negative, in accord with the situation of strong spin-orbit coupling in the TI materials. Positive magnetoresistances (MRs) originated from 2D weak-antilocalization (WAL) effect were measured in low magnetic fields, and satisfactorily described by a multichannel-conduction model. Especially, as T below 1 K and under high positive backgate voltages, signature of two coherent conduction channels was found. We discuss our results in terms of Dirac fermion states on the bottom surface, in addition to the bulk states. Polycrystalline $Bi_{2-x}Te_3$ thin films were patterned by electron-beam lithography. In low perpendicular magnetic fields, positive MRs due to the 2D WAL effect were observed. In parallel magnetic fields, Aharonov-Bohm oscillations were measured, suggesting the presence of metallic surface states.

[1]This work was supported by the Taiwan National Science Council through Grant No. NSC102-2120-M-009-003 (J.J.L.)

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Date submitted: 15 Nov 2013 Electronic form version 1.4