Abstract Submitted
for the MAR16 Meeting of
The American Physical Society

Topological Surface States in Sb Quantum Wells on GaSb(111)A Substrates[1] KAUSHINI WICKRAMASINGHE, CHOMANI GASPE, SHAYNE CAIRNS, NOLAN TEASDALE, TETSUYA MISHIMA, JOEL KEAY, METTHEW JOHNSON, SHEENA MURPHY, MICHAEL SANTOS, University of Oklahoma — A topoelectronic transition is predicted as a function of Sb quantum-well (QW) thickness. Bulk Sb is a semimetal with a negative bandgap, with neither the conduction band minimum nor the valence band maximum at the Γ point. Our goal is to measure the topological surface states by suppression of the bulk conductivity through quantum confinement and enhancement of the surface conductivity through remote n-type doping at the Γ point. Conductivity measurements on undoped QWs (0.7 to 6 nm thick) show a suppression of the bulk states, such that the surface conductivity is about 15% for a 3.6 nm QW. Hall-effect measurements, which nominally indicate p-type conduction, are complicated by the presence of both electrons and holes. We have begun experiments to populate the topological electron states by doping the GaSb barrier with Te atoms, creating donor states at the Γ point. At the Γ point of the QW, the topological electron states have a lower energy than the bulk conduction band minimum. We observe n-type conduction for a remotely-doped Sb QW with a 94 nm spacer between the doped GaSb layer and the Sb QW. We plan to make high-field magneto-transport measurements to verify that the Sb surface states are populated.

[1]This material is based upon work supported by the NSF under Grant No. DMR-1207537

Michael Santos
University of Oklahoma

Date submitted: 24 Nov 2015 Electronic form version 1.4