Abstract Submitted
for the MAR16 Meeting of
The American Physical Society

Finite-size driven topological and metal-insulator transition in $(Bi_{1-x}In_x)_2Se_3$ thin films MARYAM SALEHI, Rutgers University, HASSAN SHAPOURIAN, University of Illinois at Urbana-Champaign, NIKESH KOIRALA, Rutgers University, MATTHEW BRAHLEK, Pennsylvania State University, JISOO MOON, SEONGSHIK OH, Rutgers University — In a topological insulator (TI), if one of its heavy elements is replaced by a light one, the spin-orbit coupling (SOC) strength decreases and eventually the TI transforms into a normal insulator beyond a critical level of substitution.This is the standard description of the topological phase transition (TPT). However, this notion of TPT, driven solely by the SOC (or something equivalent), is not complete for finite size samples considering that the thickness of the topological surface states diverges at the critical point. Here, on specially-engineered $(Bi_xIn_{1-x})_2Se_3$ thin films, using systematic transport measurments we show that not only the SOC but also the finite sample size can induce TPT. This study sheds light on the role of spatial confinement as an extra tuning parameter controlling the topological critical point.

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Date submitted: 02 Nov 2015 Electronic form version 1.4