Abstract Submitted
for the MAR12 Meeting of
The American Physical Society

High-temperature topological insulator states in strained graphene DMITRY ABANIN, Harvard University, DMITRO PESIN, University of Texas, Austin — Recently, it was realized that the electronic properties of graphene can be manipulated via mechanical deformations, which opens prospects for both studying the Dirac fermions in new regimes and for device applications. More specifically, non-uniform strains give rise to pseudomagnetic fields that are opposite in the two valleys of Dirac fermions. Certain natural configurations of strain generate large nearly uniform pseudo-magnetic field, leading to flat spin- and valley-degenerate Landau levels (LL). Here we consider the effect of the Coulomb interactions in strained graphene with nearly uniform pseudo-magnetic field. We show that the spin/valley degeneracies of the LL get lifted, giving rise to topological insulator-like states. We find that both anomalous quantized Hall states and quantum spin Hall states can be realized. These many-body states are characterized by quantized conductance and persist to high temperature scale set by the Coulomb interactions. This work provides a new route to designing robust topological insulator states in mesoscopic graphene and other 2D Dirac materials.

[1] D. A. Abanin, D. A. Pesin, submitted.

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Date submitted: 12 Dec 2011 Electronic form version 1.4