Abstract Submitted
for the MAR10 Meeting of
The American Physical Society

Inducing topological order in 2D using a metallic layer TAMAR PEREG-BARNEA, GIL REFAEL, California Institute of Technology — In our work we consider the possibility of inducing a topological insulator phase in a honeycomb lattice using a metallic gate. We start with a simple nearest-neighbor tight-binding model on a two dimensional honeycomb lattice, without spin-orbit interaction. We then add a metallic layer above the honeycomb sheet and allow density-density interaction without particle tunneling. After integrating out the metal, this induces complex hopping terms with range that depends on the Fermi wavelength of the metal. A strong next-nearest-neighbor hopping, as in the Haldane model, can be achieved by tuning the Fermi wavelength to the honeycomb next-nearest-neighbor distance. This effect might be used to enhance the weak intrinsic spin-orbit coupling in graphene or similar systems to drive the system to a topological insulator phase.

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Date submitted: 19 Nov 2009 Electronic form version 1.4