Abstract Submitted
for the MAR17 Meeting of
The American Physical Society

Electronic transport in the quantum spin Hall state due to the presence of adatoms in graphene LEANDRO LIMA, CAIO LEWENKOPF, Universidade Federal Fluminense — Heavy adatoms, even at low concentrations, are predicted to turn a graphene sheet into a topological insulator with substantial gap. The adatoms mediate the spin-orbit coupling that is fundamental to the quantum spin Hall effect. The adatoms act as local spin-orbit scatterer inducing hopping processes between distant carbon atoms giving origin to transverse spin currents. Although there are effective models that describe spectral properties of such systems with great detail, quantitative theoretical work for the transport counterpart is still lacking. We developed a multiprobe recursive Green's function technique with spin resolution to analyze the transport properties for large geometries. We use an effective tight-binding Hamiltonian to describe the problem of adatoms randomly placed at the center of the honeycomb hexagons, which is the case for most transition metals. Our choice of current and voltage probes is favorable to experiments since it filters the contribution of only one spin orientation, leading to a quantized spin Hall conductance of e^2/h. We also discuss the electronic propagation in the system by imaging the local density of states and the electronic current densities.

Leandro Lima
Universidade Federal Fluminense

Date submitted: 11 Nov 2016 Electronic form version 1.4