Dissipation and Criticality in the Lowest Landau Level of Graphene

PALLAB GOSWAMI, Rice University, XUN JIA, SUDIP CHAKRAVARTY, UCLA — The lowest Landau level of graphene is studied numerically by considering a tight-binding Hamiltonian with disorder. The Hall conductance $\sigma_{xy}$ and the longitudinal conductance $\sigma_{xx}$ are computed. We demonstrate that bond disorder can produce a plateau-like feature centered at $\nu = 0$, while the longitudinal conductance is nonzero in the same region, reflecting a band of extended states between $\pm E_c$, whose magnitude depends on the disorder strength. The critical exponent corresponding to the localization length at the edges of this band is found to be $2.47 \pm 0.04$. When both bond disorder and a finite mass term exist the localization length exponent varies continuously between $\sim 1.0$ and $\sim 7/3$.

1NSF Grant No. DMR-0705092