Properties of Edge States at the Graphene P-N Junction Interface

SON LE, NIKOLAI KLIMOV, DAVID NEWELL, NIST - Natl Inst of Stds Tech, JUN YAN, University of Massachusetts, Amherst, JI UNG LEE, SUNY PI, NY, CURT RICHTER, NIST - Natl Inst of Stds Tech — The Landau level edge states from the p- and the n-section of a graphene P/N junction (\(pnJ\)) interact with each other differently across the junction depending upon the properties of the junction and the graphene. Full equilibration was reported for a two terminal graphene \(pnJ\) device in Williams et al. [1]. In our four-terminal device, however, only the lowest Landau level edge state is equilibrated across the \(pnJ\) [2]. When the two devices are compared, the LL energy spacings, the length of the edge states along the \(pnJ\) interface, and the carrier mobility are similar. Electrostatic simulations for our device geometry and that of [1] contrast the rate of change of the electrostatic potential across the \(pnJs\). Edge states at an electrostatically smooth junction are spatially further apart than those at a relatively abrupt junction, which decreases the probability of edge states mixing. Thus, we attribute the difference in equilibration in our device and that of [1] to the dramatic difference in the shape of the electrostatic junction. [1] J. R. Williams, L. DiCarlo, and C. M. Marcus, Science 317, 638 (2007) [2] Nikolai N. Klimov, Son T. Le, et al., Phys. Rev. B: Rapid Comm. (2015)