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Carrier transport in disordered graphene bilayers SHAFFIQUE ADAM, Center for Nanoscale Science and Technology, National Institute of Standards and Technology, Gaithersburg, MD 20899, HONGKI MIN, CNST, National Institute of Standards and Technology, Gaithersburg, MD 20899 and Maryland NanoCenter, University of Maryland, College Park, MD 20742, MARK STILES, Center for Nanoscale Science and Technology, National Institute of Standards and Technology, Gaithersburg, MD 20899 — Biased graphene bilayers are expected to have an excitation gap, and indeed recent optical experiments have demonstrated robust spectrum gaps as large as 200 meV [Zhang et al. Nature (2009); Mak et al. PRL (2009)]. Yet these same experiments showed no evidence of a transport gap i.e. the bilayer graphene remained conducting with a finite minimum d.c. conductivity. In this theoretical work, we study the conductivity of both biased and unbiased graphene bilayers close to the charge neutrality point. We employ a self-consistent Poisson equation to determine the band structure and calculate the conductivity using an effective medium theory that averages over the inhomogeneous carrier density in electron and hole puddles induced by the disorder potential. We discuss how transport through these electron and hole puddles could explain the unusual transport properties.

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