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Gate tunable quantum transport in double layer graphene heterostructures[1] KOSTYANTYN KECHEDZHI, EUYHEON HWANG, SANKAR DAS SARMA, CMTC, Department of Physics, University of Maryland College Park — Motivated by the recently observed highly resistive state in double layer graphene heterostructures [1] we consider a system of two layers of graphene, "studied" and "control," separated by an insulating layer. We theoretically analyze the effect of additional screening provided by Dirac electrons in the "control" graphene layer on the transport characteristics of the "studied" graphene layer. We find that in a typical device geometry fabricated on top of SiO2 substrate [1] the suppression of charge inhomogeneity is less efficient than initially expected and is limited by about a factor of 2. We also analyze the effect of additional screening on the quantum correction to the conductivity of the "studied" layer in this system in the metallic regime. We find that "control" layer screening is very efficient at suppressing electron-electron interactions in the "studied" layer which results in improved coherence and a novel gate tunable quantum correction to conductivity. The results of this work are summarized in [2].

[1] L. A. Ponomarenko et. al. Nat. Phys. 7, 958 (2011).
[2] K. Kechedzhi, E. H. Hwang, and S. Das Sarma Phys. Rev. B 86, 165442 (2012).

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