Abstract Submitted
for the MAR13 Meeting of
The American Physical Society

Electron-electron interactions in non-equilibrium bilayer graphene[1] WEI-ZHE LIU, ICQD, Hefei National Laboratory for Physical Sciences at the Microscale, University of Science and Technology of China, Hefei 230026, Anhui, China, ALLAN MACDONALD, Department of Physics, The University of Texas at Austin, Austin TX 78712, DIMITRIE CULCER, ICQD, Hefei National Laboratory for Physical Sciences at the Microscale, University of Science and Technology of China, Hefei 230026, Anhui, China — The charge conductivity of doped bilayer graphene can be understood as a net steady-state pseudospin polarization. Due to the chirality inherent in the Hamiltonian, electron-electron interactions renormalize this polarization even at zero temperature, when the phase space for electron-electron scattering vanishes. Nevertheless, at usual transport densities the electron-electron interaction contribution displays only a weak density dependence and has a negligible effect on the conductivity. This smallness is due to the large value of the interlayer tunneling parameter. Interestingly, the effect of interactions in transport vanishes as the carrier number density tends to zero, in contrast to single-layer graphene and topological insulators. The vanishing is attributed to the fact that the pseudospin winds twice around the Fermi surface. Our study relies on the quantum Liouville equation in the first Born approximation with respect to the scattering potential, with electron-electron interactions taken into account self-consistently in the Hartree-Fock approximation, and screening in the random phase approximation.

[1]This work is supported by the National Natural Science Foundation of China under grant number 91021019.

Wei-Zhe Liu
ICQD, Hefei National Laboratory for Physical Sciences at the Microscale,
University of Science and Technology of China, Hefei 230026, Anhui, China

Date submitted: 26 Nov 2012 Electronic form version 1.4