Abstract Submitted
for the MAR11 Meeting of
The American Physical Society

Electron transport properties of bilayer graphene KOSTYANTYN BORYSENKO[1], [1] Department of Electrical and Computer Engineering, North Carolina State University, Raleigh, NC 27695-7911, JEFFREY MULLEN[2], [2] Department of Physics, North Carolina State University, Raleigh, NC 27695-8202, XIAODONG LI[1], YURIY SEMENOV[1], JOHN ZAVADA[1], MARCO BUONGIORNO NARDELLI[2,3], [3] CSMD, Oak Ridge National Laboratory, Oak Ridge, TN 37831, KI WOOK KIM[1] — We investigate the role of different phonon scattering mechanisms in determining the electron transport properties of bilayer graphene (BLG). The ever-present electron-phonon interaction imposes the limitations on transport characteristics of any device and thus, must be always taken into account. However, in a realistic device setup, when BLG is laid (or epitaxially grown) on the top of a substrate, extrinsic scattering mechanisms (due to charged impurities, surface polar phonons, etc.) will dominate. The electron coupling with surface polar phonons of the substrate is always present and this scattering mechanism can be dominant. Using first principles approach (density functional perturbation theory) we calculate the electron-phonon matrix elements of BLG and estimate the intrinsic electron scattering rates. We show that the transport properties of the free-standing BLG resemble those of the bulk graphite. Using the Monte Carlo simulation we estimate the low-field mobility and saturation velocity of the free-standing BLG, as well as BLG on various substrates (SiC, SiO_2, HfO_2).

Kostyantyn Borysenko
Dept of Electrical and Computer Engineering,
North Carolina State University, Raleigh, NC 27695-7911

Date submitted: 27 Nov 2010 Electronic form version 1.4