Abstract Submitted
for the MAR13 Meeting of
The American Physical Society

Can we reduce the OFF currents of graphene without hurting their ON currents? FRANK TSENG, University of Virginia, GIANLUCA FIORI, University of Pisa, AVIK GHOSH, University of Virginia — The current-voltage characteristics of graphene can be understood from Landauer-Keldysh theory. The low bias conductivity is dominated by tunneling through closely spaced modes. The mid-voltage regime is dominated by Coulomb scattering from charge puddles and remote optical phonons that compete with each other towards quasi-saturation. Finally, the high bias physics is given by band-to-band (Zener) tunneling. The overall I-V, consistent with experiments is limited by the lack of a band-gap that compromises the overall gain and inverter characteristics, also seen experimentally. Conversely, structural band-gaps increase the effective mass of the electrons as well as their phase space for scattering, reducing their overall mobility. We show that a way around this dilemma is to engineer sequences of gates that stagger the Dirac point regions in the separately gated graphene segments (equivalently, bandgapped regions for nanoribbons and nanotubes) so as to effectively increase the transmission gap and suppressing subthreshold conduction by two orders of magnitude and extending current saturation without overall ON-current.

Frank Tseng
University of Virginia

Date submitted: 10 Nov 2012

Electronic form version 1.4