Abstract Submitted
for the MAR12 Meeting of
The American Physical Society

Klein, anti-Klein tunneling and pseudo-spintronics in graphene heterojunctions[1] REDWAN SAJJAD, AVIK GHOSH, University of Virginia — Electrons in monolayer graphene act like massless spin-1/2 Dirac fermions. Backscattering is suppressed due to the pseudospin orthogonality of the forward and reverse scattering modes. The resulting Klein tunneling provides unit transmission for normally incident electrons at a pn junction, regardless of barrier height. By combining voltage gating with a tunnel barrier, we can realize a gate tunable metal insulator transition that promotes subthermal switching [1] and also makes the conduction unipolar. In contrast, bilayer graphene electrons act like parabolic spin-1 systems with perfect reflection for normal incidence (anti-Klein tunneling). For n^+n or p^+p junction, the transmission maximizes for normal incidence like single layer, but unlike monolayer graphene, it's barrier-dependent. We also perform atomistic numerical calculation of graphene sheets with experimentally relevant size (hundreds of nanometer) using non-equilibrium Green's function formalism and we show that the conductance can be varied substantially with gate voltage for multiple sequenced pn junctions with smoothly varying potential.

[1] Sajjad and Ghosh, APL 99, 123101 (2011).

[1]The authors acknowledge funding from NSF-NRI.

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Date submitted: 22 Nov 2011 Electronic form version 1.4