Abstract Submitted
for the MAR13 Meeting of
The American Physical Society

Graphene under spatially varying external potentials: Landau levels, magnetotransport, and topological modes SI WU, MATTHEW KILLI, ARUN PARAMEKANTI, Department of Physics, University of Toronto — Superlattices (SLs) in monolayer and bilayer graphene, formed by spatially periodic potential variations, lead to a modified bandstructure with extra finite-energy and zero-energy Dirac fermions with tunable anisotropic velocities. We theoretically show that transport in a weak perpendicular (orbital) magnetic field allows one to not only probe the number of emergent Dirac points but also yields further information about their dispersion. or monolayer graphene, we find that a moderate magnetic field can lead to a strong reversal of the transport anisotropy imposed by the SL potential, an effect which arises due to the SL induced dispersion of the zero energy Landau levels. This effect may find useful applications in switching or other devices. For bilayer graphene, we discuss the structure of Landau level wave functions and local density of states in the presence of a uniform bias, as well as in the presence of a kink in the bias which leads to topologically bound 'edge states'. We consider implications of these results for scanning tunneling spectroscopy measurements, valley filtering, and impurity induced breakdown of the quantum Hall effect in bilayer graphene.

Si Wu
Department of Physics, University of Toronto

Date submitted: 08 Nov 2012 Electronic form version 1.4