Abstract Submitted
for the MAR07 Meeting of
The American Physical Society

The dynamics of Bloch electrons in 2D hexagonal systems M. J. RAVE, W. C. KERR, Wake Forest University — We investigate the semiclassical equations of motion (EOM) for Bloch electrons in a 2D hexagonal lattice. When a system has a non-zero Berry curvature, there are additional terms in these EOM beyond the familiar group velocity and classical electric and magnetic force terms. We investigate the existence and consequences of these terms for Bloch electrons in a 2D hexagonal tight-binding model, parameterized so that it can represent either graphene or a single layer of boron nitride (h-BN). We calculate these terms in the vicinity of a K point in the first Brillouin Zone of h-BN using perturbation theory carried to sufficiently high order to give a non-constant Berry curvature. These terms can be written in terms of momentum operator matrix elements, which we estimate using the tight-binding wave functions. We show the effects of these terms on electron trajectories in the presence of external fields.

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Date submitted: 20 Nov 2006 Electronic form version 1.4