

Abstract Submitted
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Substrate Coupling, Transport, and Exchange Interactions of Graphene on Boron Nitride ASHLEY DASILVA, Department of Physics, University of Texas Austin, JEIL JUNG, SHAFFIQUE ADAM, Graphene Research Centre and Department of Physics National University of Singapore, ALLAN MACDONALD, Department of Physics, University of Texas Austin — Boron nitride has proven to be a nearly ideal substrate for high quality graphene devices. Graphene sheet electrons are nevertheless coupled to the boron nitride by Coulomb interactions with boron and nitrogen ions, and by weak distortions of the graphene sheet bonding structure. Because the lattice constants of graphene and boron nitride differ and because the hexagonal lattices of the two sheets are usually misoriented, the substrate interaction produces a long-period moire pattern. We report on a theory of how the substrate interactions influence the electronic structure and the transport properties of the graphene sheet. Our theory is based on a low-energy effective model [1] of the graphene sheet which accounts for both electrostatic interactions and bonding pattern variations. We find that the conductivity has a minimum when the number of carriers per spin per moire period is an integer, and that exchange interactions have a large influence on the gap at the Dirac point. [1] Ab initio theory of moire bands in layered two-dimensional materials, J. Jung, A. Raoux, Z. H. Qiao and A. H. MacDonald, (submitted).

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