Abstract Submitted
for the MAR13 Meeting of
The American Physical Society

Theory of low-energy electron reflectivity from graphene RANDALL FEENSTRA, NISHTHA SRIVASTAVA, MICHAEL WIDOM, Dept. Physics, Carnegie Mellon University, Pittsburgh, PA, IVAN VLASSIOUK, Oak Ridge National Laboratory, P.O. Box 2008, Oak Ridge, TN — We have developed a self-consistent description of low-energy electron reflectivity spectra, yielding results that compare well with experimental data for graphene on SiC and on Cu substrates (obtained by our group as well as by other groups [1]). Our approach utilizes wavefunctions for a thin multilayer graphene slab, computed with a first-principles method. By combining wavefunctions for positive and negative wavevectors, we forms states with only outgoing character on one side of the slab, and hence deduce the electron reflectivity. For free-standing n-layer graphene, we obtain the reflectivity curves that show n-1 reflectivity minima over the energy range 0 - 10 eV. The minima are shown to arise from states with wavefunctions localized between the graphene layers (not on the layers, as previously suggested [1]). For graphene on a substrate, we match the states on one side of the graphene slab to bulk states of the substrate. For graphene on Cu(111) substrates, we find the same set of reflectivity minima as for free-standing graphene, together with an additional minimum whose location varies with the graphene-Cu separation. Hence, this separation can be deduced by comparing experimental and theoretical spectra. [1] H. Hibino et al., Phys. Rev. B 77, 075413 (2008).

Randall Feenstra
Dept. Physics, Carnegie Mellon University, Pittsburgh, PA

Date submitted: 09 Nov 2012 Electronic form version 1.4