Abstract Submitted
for the MAR10 Meeting of
The American Physical Society

Localization length in edge-disordered armchair-edge graphene nanoribbons[1] DANIEL GUNLYCKE, CARTER WHITE, Naval Research Laboratory — To find a conductance in a graphene nanoribbon that is of the order $2e^2/h$, the length of the ribbon should be chosen to be shorter than its localization length. The localization length is an intrinsic property that depends on the disorder in the material. Arguably the most serious form of disorder in graphene ribbons is edge disorder. Edge disorder could be topological as well as environmental. In this presentation, analytical expressions for the localization length for ribbons with both types of disorder will be presented. The expressions show that the maximum localization length near the Fermi level scales with the square of the width of the ribbon. The origin of this dependence, which could partly explain why it is challenging to obtain large conductances in narrow ribbons, will be discussed. The analytical expressions are in excellent agreement with numerical transport calculations that are based on multi-band tight-binding Hamiltonians.

[1]This work was supported by the Office of Naval Research, directly and through the Naval Research Laboratory.

Daniel Gunlycke
Naval Research Laboratory

Date submitted: 20 Nov 2009 Electronic form version 1.4