Abstract Submitted
for the MAR16 Meeting of
The American Physical Society

Landauer's formula with finite-time relaxation: Kramers' crossover in electronic transport[1] DANIEL GRUSS, Center for Nanoscale Science and Technology, National Institute of Standards and Technology, KIRILL VELIZHANIN, Theoretical Division, Los Alamos National Laboratory, MICHAEL ZWOLAK, Center for Nanoscale Science and Technology, National Institute of Standards and Technology — Landauer's formula relates the conductance of a region of interest to its transmission probability. It is the standard theoretical tool to examine ballistic transport in nano- and meso-scale junctions and devices. This view of transport as transmission necessitates a simplified view of transmission, one occurring through an essentially fixed structure. Starting from a description of transport that includes relaxation of electrons in the reservoirs, we derive a Landauer-like formula for the steady-state current. We demonstrate that the finite relaxation time gives rise to three regimes of behavior. Weak relaxation within a small region nearby to the junction gives a contact limited current. Strong relaxation also influences the current by localizing electrons, distorting their natural dynamics and reducing the current. In an intermediate regime, the standard Landauer view is recovered. This behavior is analogous to Kramers' turnover in chemical reactions.

[1]Supported by UMD/CNST Cooperative Research Agreement, Award 70NANB10H193

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Date submitted: 04 Nov 2015 Electronic form version 1.4