Electron-Phonon Scattering in NW FETs

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Objective:

- Solve one of the Grand Challenge problems in device simulation: the simultaneous inclusion of an atomistic description of the simulation domain, a full-band description of the materials, and electron-phonon scattering

Approach:

- Use of the **$sp^3d^5s^*$** tight-binding model to describe electrons and holes
- Use of the Non-equilibrium Green's Function (**NEGF**) formalism to solve quantum transport
- Electron-phonon scattering in the self-consistent **Born** approximation
- Efficient multi-level parallelization scheme

Results and Impacts:

- Modification of current distribution and band edges and reduction of drain current
- First dissipative quantum transport simulations of realistically extended nanowire transistor structures

Ongoing Work:

- Mobility extraction in n- and p-doped nanowires with different crystal orientations
- Look for experimental data to verify the model

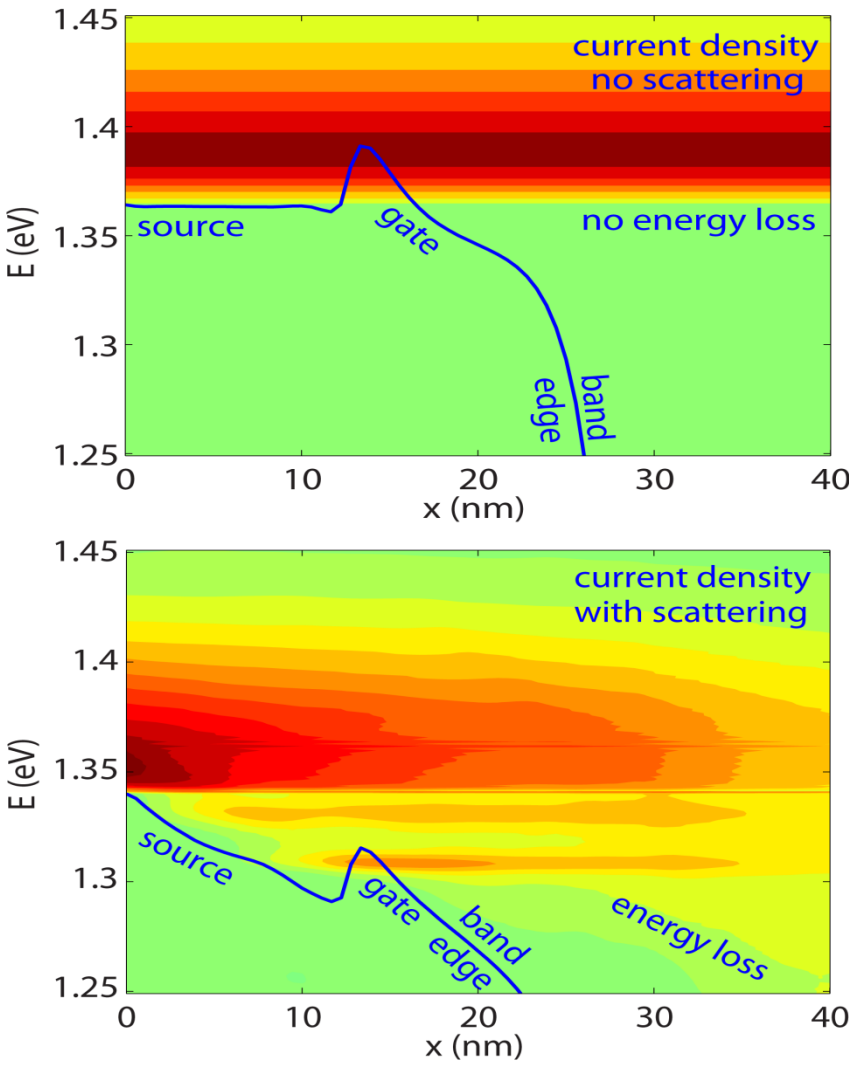

Image Caption

Energy-resolved current distribution in a nanoscale NW FET. Up: coherent transport without energy loss. Down: with phonon scattering. Energy loss and source access resistance.