Theoretical Study of Charge Carrier Transport in Nanocomposite Photovoltaic Devices

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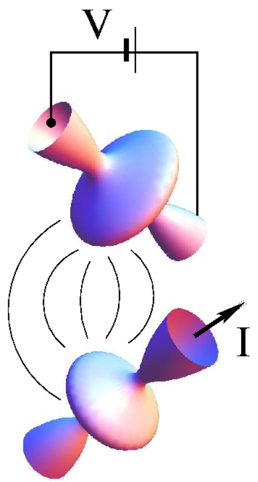
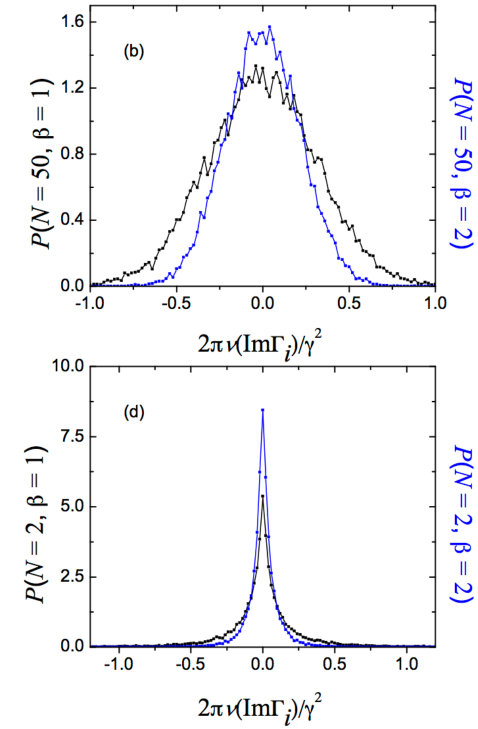
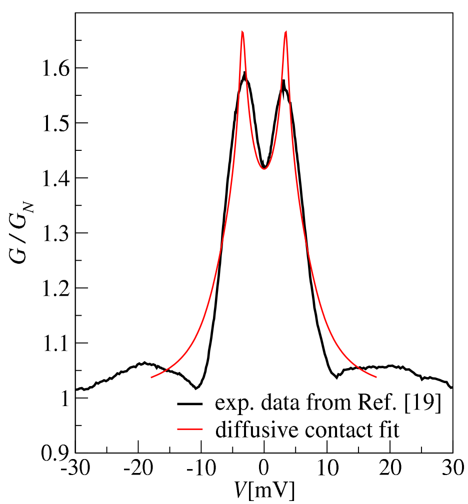


The focus of this project was to develop a theoretical model of electron transport in adjacent nanoscale conductors (top left figure). Electron flow in one conductor may drag electrons in other conductors because of electron-electron interaction between the conductors. This phenomenon is called the **Coulomb drag**. We evaluated dependence of the drag current on system temperature and applied voltage bias. We also investigated statistical distribution of the drag coefficient for single and multi channel quantum dots (right figure).





We also investigated the current through a nanoscale contact between a novel type of superconductor and a metal. Recently discovered iron-based pnictide superconductors are multiband electronic materials. We demonstrated that the inter band scattering off disorder is responsible for broadening of the of the differential conductance curve across the nanoscale contact between such superconductors and normal metals. Our theory is in a quantitative agreement with experiments (bottom left figure).