Theoretical Study of Charge Carrier Transport in Nanocomposite Photovoltaic Devices

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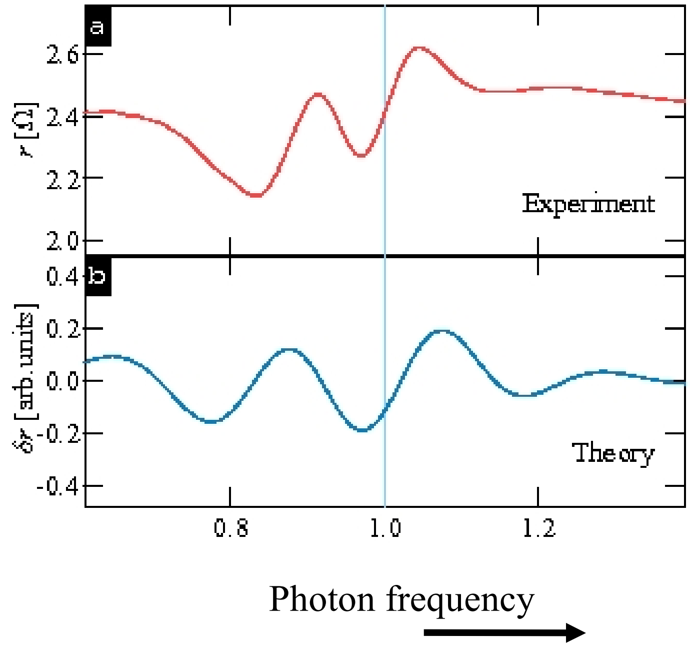
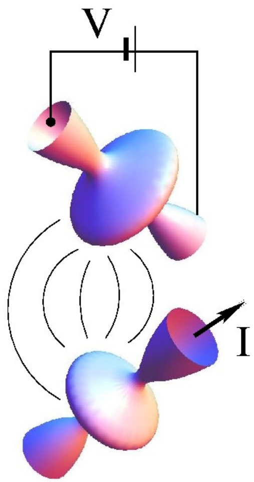
The theoretical work was applied to explain recent experiments performed with high-mobility electron quantum wells. We developed a theoretical model based on quantum kinetics which captures all important characteristics of the phenomenon. We showed that this unusual effect owes to the quantum oscillations in the density of states and a crucial role played by multi-photon processes. Our model captures all important characteristics of the phenomenon. Namely, the period, the phase, and the amplitude of the oscillations are all in excellent agreement with experimental observations.





The current research effort focuses on development of a theoretical model of electron transport in adjacent nanoscale conductors. 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. Quantitative analysis of the Coulomb blockade is important for understanding electronic transport in networks of nanoscale conductors in photo voltaic elements.