Physics Colloquium

Michigan Technological University

Thursday, April 11, 2013
at 4:00 pm
in Room 139 Fisher

Charge and Spin Transport in a Single Molecular Junction

Kamal B. Dhungana
Advisor: Dr. Ranjit Pati

Abstract: Achieving atomic level control at the metal-molecule interface in a single molecule conductance measurement is a difficult task that hinders the progress in molecular electronics. The lack of atomic level structural information of the interface makes the theoretical interpretation of experimental data much harder. To address these challenges, we create an ensemble of device structure by varying metal-molecule binding sites, the orientation of the molecule at the interface, interface distance, and conformational change within the molecule to study junction dependent conductance behavior in Ruthenium-Bis(terpyridine) molecular wire, which has been fabricated and characterized. An orbital dependent DFT in conjunction with a parameter free, single particle Green's function approach is used to study the I-V characteristics. Our calculation for the weakly-coupled ONTOP junction geometry yields a relatively small (OFF state) current value below a threshold voltage (Vth). The current value is found to increase at ⇠ Vth and remains flat (ON state) after the threshold value. A similar non-linear I-V curve with a current switching behavior has been reported experimentally. I will also present our recent result on spin dependent transport in molecular wire coupled to ferromagnetic electrodes; the e↵ect of transverse electric field on magnetoresistance will be explored.

Investigating Hadronic Interactions with the Pierre Auger Observatory

Tolga Yapici
Advisor: Dr. Brian Fick

Abstract: For particle accelerators to retrieve the hadronic interaction parameters (cross-section, inelasticity and multiplicity) at high energies (E>10^{18}eV) at the current technology level is impossible. The important information about these parameters can be probed using the Pierre Auger Observatory Extensive Air Shower data. In this presentation, an Artificial Neural Network model that predicts cross-sections for the hadronic interactions in EASs will also be discussed. In addition, the results of the model regarding the composition of the cosmic rays will be presented.

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