

Physics Colloquium

Michigan Technological University

Thursday, April 10, 2014

at 4:00 pm

Room 139 Fisher Hall

Electric Field Manipulation of Spin Current in a Molecular Spin-valve Device

Kamal B. Dhungana

Advisor: Dr. Ranjit Pati

Abstract: Manipulation of the spin current in a molecular spin-valve device using an external electric field is a challenging as well as an exciting task from both fundamental and technological points of view. The weak spin-orbit and hyperfine interactions in organic molecules make them potential candidates for spin conserved tunneling. Experimental measurements of spin current in single molecular junction have been recently demonstrated. In this talk, I will present a model of three terminal molecular spin-valve device, in which spin polarized current is controlled by transverse gate field. We use a single-particle many-body Green's function approach together with spin unrestricted density functional theory to calculate the spin-current.

Observing the Galactic Diffuse Gamma-Ray Emission

Hugo Ayala Solares

Advisor: Dr. Petra Huentemeyer

Abstract: The interactions of high-energy cosmic rays with the interstellar medium, such as giant molecular clouds, and radiation fields, like the cosmic background radiation, produce the Galactic diffuse gamma-ray emission. While the sources of gamma rays point to the accelerators of cosmic rays, the diffuse emission let us know about how the cosmic rays diffuse and propagate within the Galaxy as well as the existence of any spatial dependence of the cosmic-ray spectrum.

The High Altitude Water Cherenkov detector (HAWC) is a gamma-ray observatory that is currently being built in Mexico. It is designed to study gamma rays in the range of 100 GeV to 100 TeV. Due to its high duty cycle and improved sensitivity with respect to previous experiments, one of the main strengths of HAWC will be the detection of the Galactic diffuse gamma-ray emission at very high energies. At HAWC energies, this will provide a clue for cosmic rays accelerated at \sim PeV energies.