Physics Colloquium

Michigan Technological University

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

Studying Galactic Diffuse Gamma-Ray Emission with the HAWC Gamma-Ray Observatory in Mexico

Hugo Ayala Solares
Advisor: Dr. Petra Huentemeyer

Abstract: Galactic diffuse gamma-ray emission is the gamma-ray radiation that is produced by the interaction of high-energy cosmic rays with the interstellar medium and radiation fields of our Galaxy. The importance of studying galactic diffuse gamma-ray emission lies with the ability to probe the distribution, spectra and propagation of cosmic rays within in the Galaxy. Cosmic Rays are an important energetic ingredient of the Galaxy and their study will shed light onto the evolution and composition of our Galaxy.

The High Water Altitude Cherenkov detector (HAWC) is a gamma-ray observatory that is currently being built in Mexico. It will be used to study gamma rays in the range of 100GeV to 100TeV. With its significantly improved sensitivity relative to previous experiments, HAWC will reveal more details about the spatial and energetic distribution of Galactic diffuse gamma-ray emission in the TeV range.

A Study of Magnetophotonic Crystals and Magnetic Quantum Dots/Wires Fabricated on Magnetic Garnet Films

Ashim Chakravarty
Advisor: Dr. Miguel Levy

Abstract: Magnetic tuning and detuning of the transmittance spectra of an elliptically polarized beam are studied patterning one-dimensional photonic crystals on the magnetic garnet films. Here, elliptically polarized normal-modes are prepared to analyze the magnetic response of the band structure of the photonic crystal. The present study addresses the issue of enhancement of Faraday rotation by patterning quantum structures in such films. In a magnetic garnet unit cell, Fe atoms are bonded to oxygen atoms either in tetrahedral or octahedral coordination. The electronic charge transfer between different electronic states and coordinations of the Fe ions gives rise to the Faraday rotation in the magnetic garnet films. Our study examines the change of electronic energy levels in quantum magnetic garnet structures to analyze the enhancement of Faraday rotation.

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