Physics Colloquium

Michigan Technological University

Thursday, April 25, 2013
at 4:00 pm
in Room 139 Fisher

Studying Very High Energy Gamma-Ray Emission from Pulsars and Pulsar Wind Nebulae: Geminga and Boomerang

Hao Zhou
Advisor: Dr. Petra Huentemeyer

Abstract: A pulsar is a rapidly rotating neutron star whose rotation axis is misaligned with the axis of the magnetic dipole. It emits electromagnetic radiation and particles in a broad energy range which power the surrounding nebula, the pulsar wind nebula. Very high energy (TeV) gamma-ray radiation can be produced in a pulsar/pulsar wind nebula. Geminga and Boomerang are two pulsar wind nebulae coincident with the Fermi pulsars J0634.0+1745 and J2229.0+6114, respectively. The Geminga pulsar is a nearby pulsar, the particles from which may contribute to cosmic ray anisotropy observed from the Earth. The Boomerang pulsar is one of the most energetic pulsars. The High Altitude Water Cherenkov (HAWC) observatory is currently being built in Mexico and will consist of 300 water Cherenkov detectors (WCDs). A partial array of 30 WCDs began operation in Fall 2012, an array of 100 WCDs (HAWC100) will begin operation in the coming summer, and the full array of 300 WCDs will be taking data in Fall 2014. With improved sensitivity and angular resolution from its predecessor, HAWC will be able to detect both sources within one year with high significance and allow more precise spectral and morphology studies. In my presentation, I will describe gamma-ray emission mechanisms in pulsars/pulsar wind nebulae, and what we can learn from their observation with HAWC.

Atomic Moments and Polarizabilities of Ni II

Marwa Abdalmoneam
Advisor: Dr. Donald Beck

Abstract: Polarizabilities and moments of atoms are needed to develop effective core potentials for experimental studies of Rydberg states of atoms. In the past we have calculated for Ni II some of the most important quantities for the ground state (dipole polarizabilities, quadrupole moments).This talk extends the work to parameters involving the excited state (scalar and off-diagonal tensor polarizabilties). The calculations use the ab initio Relativistic Configuration Interaction method.

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