Physics Senior Poster Presentations

Michigan Technological University

Thursday, April 18, 2013
1:00 to 3:00pm
Room 139 in Fisher Hall

Characterization of Correlated Photon-pair in Highly Nonlinear Fiber

Eric Kaphengst
Advisor: Dr. Kim Fook Lee

Abstract: We study the polarization state of coherent light by measuring the Stokes parameters to obtain the Stokes vector and degree of polarization of the coherent light. Then, we generate a correlated photon-pair in an optical fiber through four wave mixing process. We use this photon-pair for preparing a heralded single photon. We characterize the purity of the heralded single-photon source by using coincidence detection. We also characterize the Stokes parameter of the heralded single photon. The goal is to produce high success rate of quantum key generation.

Hillock Formation on Graphite

Ethan Miltenberger
Advisor: Dr. John Jasczcak

Abstract: The purpose of this investigation is to determine the growth process of the naturally occurring hillock Structures on Graphite. Graphite has two accepted forms of growth. The simplest is layer by layer, the carbon atoms bond together to form a layer then more carbon atoms bind to the surface creating a second layer. A spiral feature could be generated on the surface when a defect occurs in a layer. The graphene layer would then grow in a spiral type feature. The investigation was done through the use of an Atomic Force Microscope to image the top of the hillock and attempting to isolate a single graphene layer off of the hillock. The result of the project was that no spiral features where viewed on the surface of the hillock.

Development of an Optical Trapping Apparatus

Jacob W. Smock
Advisor: Dr. Claudio Mazzoleni

Abstract: Optical trapping via intense focusing of a laser beam is a common method that has been used in various laboratories around the world to levitate and observe isolated particles. My research goal was that of constructing a trapping apparatus in which to isolate a small water droplet (~10μm) for atmospheric science applications. The trapping system uses a 532nm laser and a custom-made inverted microscope based on a 100x oil immersion Nikon objective. The design of my apparatus is based on the paper by Smith et. al. (*Inexpensive optical tweezers for undergraduate laboratories,* Am. J. Phys. 67, 26-35, 1998). The design difficulties and solutions will be discussed, along with future prospects for the apparatus.