

Physics Graduate Students Poster Session Michigan Technological University

April 21 (Thursday) 2005, 2:30 to 4:00 pm
Main Lobby at Fisher Hall

Poster 1:

Growth of Bismuth Yttrium Iron Garnet Multi-layers by Sputtering for Single Mode Magneto-Optic Waveguides

Presenter: Samuel L. Mensah
Advisor: Dr. Miguel Levy

The growth of multi-layers of substituted bismuth yttrium iron garnet (BiYIG) on to magnetic garnet substrates by rf magnetron sputtering is described, paying particular attention to the film deposited on the substrate. The substrate is gadolinium gallium garnet (GGG). Intrinsic properties of the films grown such as lattice constant, birefringence, Faraday rotation and refractive indices are measured. The multilayer structure is used for non-reciprocal symmetric single mode magneto-optic waveguides for communication systems in the wavelength range 1.3 – 1.6 μ m. The layers are sputtered under different sputtering conditions resulting in refractive index differences of 1.93 - 2.23. Growth conditions, composition, lattice mismatch and magneto-optic properties of the layers are described.

Poster 2:

The 2004 Perseids Meteor Shower as Captured by Night Sky Live CONCAMs

Presenter: Shet Vithal Tilvi
Advisor: Dr R. Nemiroff

With the success and improved performance of CONCAMs (CONtinuous CAMeras), the Perseids, one of the brightest and most popular meteor showers of 2004, was monitored by inspecting data returned to the Night Sky Live (NSL) global network project site <http://NightSkyLive.net>. The fisheye lenses on CONCAMs give a view of 180 degrees, from horizon to horizon. Preliminary data of the brightest meteors from the 2004 Perseids meteor shower will be presented. Photometric CCD light curves produced by two fireballs show not only an asymmetry expected for classical meteor light curves, but also peaks indicative of meteoroid fragmentation. Nearly symmetrical Perseid meteor light curves are also found, however, for a small fraction of Perseid meteors.

Poster 3:

A Primer on Ultra High Energy Cosmic Rays

Presenter: Patrick Younk
Advisor: Brian Fick

"Ultra High Energy Cosmic Rays (UHECR) are defined as particles with energy above 10^{18} eV entering the earth's atmosphere from space. This poster will give a brief historical background of cosmic ray research, discuss several problems with UHECRs yet to be resolved, and describe the Auger Collaboration's contribution to solving them. This poster is meant to serve as a primer for people unfamiliar with cosmic ray research."

Poster 4:

A Performance Analysis of NQR Gradiometers in Non-Ideal Conditions

Presenter: Adam Webb
Advisor: Dr. Bryan Suits

Nuclear Quadrupole Resonance(NQR) spectroscopy has recently drawn attention as a promising method for land mine detection. Detection of the NQR signal is accomplished using field gradient detectors, gradiometers, which in ideal conditions are capable of detecting field gradients produced by nearby sources while being relatively insensitive to distant sources. This study investigates how small variations from ideal conditions effect the performance of the gradiometer. These variations include imperfections in gradiometer fabrication as well as imperfections in the gradiometers surrounding environment. Of the environmental imperfections, the most inevitable for land mine detection is the introduction of an inhomogeneous lossy ground.

Poster 5:

Studies of Turbulence-Induced Cloud Droplet Clustering with Phase Doppler Anemometry

Presenter: Eli Ochshorn on behalf of Ewe Wei Saw
Advisor: Dr. Raymond Shaw

Recent studies in the field of cloud physics reveal cloud droplet clustering and its importance for cloud processes (in particular precipitation and radiative transfer). Evidence suggests that clustering is a consequence of turbulent flow in clouds. It is hypothesized that this clustering is the result of droplet being thrown out of strong vortices, thus transiently clumped at region of low vorticity. Our work involves using advanced Phase Doppler Anemometry technique (PDA) to carry out experimental studies of clustering of cloud droplets as a function of droplet inertia (Stokes number) and turbulent energy dissipation rate. Experiments were carried out in wind tunnel with grid generated turbulent flow and in situ studies in cloud are underway.

Poster 6:

Hyperspectral Imaging Application in Nano-Tube Growing Process

Presenter: Ankita Roy
Advisor: Mike Roggemann, Co-advisor: Jacek Borysow
(This work is conducted in the laboratory of Dr. Yoke Khin Yap with the assisted of Laksman Kumar Vanga)

Spectral Imaging can prove an important tool for detecting the plasma spectra used during a carbon Nano-Tube growth. The MTU Visible Hyperspectral Imager (VFTHSI), which has been successfully used to establish a Physically motivated correlation Formalism in a Pattern/Target recognition problem was used to for radical detection of plasma spectra after hyper-spectral analysis. The plasma used was typically Methane plasma and Argon plasma (used for calibration). The specie detection in the plasma chamber would enable better growth of vertically aligned multi-walled carbon nanotubes (VA-MWCNTs), grown by a technique called dual-RF-plasma enhanced (PECVD). There were some operational, instrumentation as well as calibration difficulties, which have been addressed in this poster followed by a spectral analysis.