LSU LOUISIANA STATE UNIVERSITY

PHYSICS & ASTRONOMY WEEKLY CALENDAR

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202 NICHOLSON HALL
Louisiana State University
Baton Rouge, Louisiana 70803-4001

WEEKLY CALENDAR

October 11, 2010

Departmental Colloquium

3:40 PM, Wednesday, October 13, 2010
109 Nicholson Hall

"Pinpoint the Physics in Design and Fabrication of Some Metallic Nanostructure Arrays"

Mu Wang
Nanjing University, CHINA

Host: **Rongying Jin**

• Refreshments served at 3:15 PM in 232 (Library) Nicholson Hall •

As an artificial microstructure, metamaterial opens a gateway to achieve electromagnetic properties that are unattainable from natural materials and provides intriguing perspectives for manipulating electromagnetic waves. One of the key issues is to understand the interaction of surface plasmon and electromagnetic wave around nanoapertures. With experiments we show that propagating surface plasmon and the localized surface plasmon can be both excited on a metal surface perforated with an array of nanoapertures. The phase difference between these two waves can be tailored by the geometrical parameters of the array so as to affect the shape of the transmission spectrum. Consequently the transmission spectrum can be manipulated [1]. The nanoaperture array in metal film can be applied as an optical antenna array with strong radiation directivity [2]. These features provide flexibility in engineering surface-wave-based all-optical devices, and might be applied in photovoltaics and optical sensors. The electric and magnetic responses of a system are usually characterized by permittivity and permeability, which depend not only on the intrinsic structure of the material, but also on the polarization of incident light. Studies so far concentrate most on finding new geometries to achieve desired electric and magnetic responses, and very few reserches have been done on the role of external excitation fields. We show that in an assembly of stacked metallic U-shaped resonators, pure magnetic and electric responses are realized respectively, and the magnetic and electric responses can be switched at the same frequency by changing the polarization of incident light for 90 degrees [3], which provides a unique approach in design metamaterials. The physical origin of this unique feature is discussed.

The above mentioned metallic structures are fabricated by micro-fabrication techniques. We also intend to explore a much more economic way to achieve controllable periodic metallic nanostructures. We have developed a unique electrodeposition method [4-6] to grow periodic metallic nanostructures with controllable spatial periodicity. The morphological periodic structures correspond to the alternating deposition of nanocrystallites of metal and metal oxide. The mechanism for the spontaneous formation of periodic nanostructures [4-6] and the optoelectric properties of these structures [7,8] are investigated. This method can also be applied to fabricate magnetic metal filaments with periodic corrugations [9,10], which might have potential application in spintronics, and help to understand the formation/ evolution of microscopic magnetic domains.

Departmental Colloquium

3:40 PM, Thursday, October 14, 2010

109 Nicholson Hall

" String Theory goes Condensed Matter: The Black Holes behind High Tc Superconductivity"

Jan Zaanen
Leiden University

Host: **Mark Jarrell**

• Refreshments served at 3:15 PM in 232 (Library) Nicholson Hall •

Saturday Science at LSU

October 9, 2010
10:00 A.M.
130 Nicholson Hall, LSU

David Young
Department of Physics and Astronomy

"Novel Materials: Magnets and Superconductors"

PUBLICATIONS:

1. "Generalized X states of N qubits and their symmetries", **Sai Vinjanampathy** and **A.R.P. Rau**, Phys. Rev. A 82, 032336 (2010).

2. "Decay of Coherence and Entanglement of A Superposition State For A Continuous Variable System in an Arbitrary Heat Bath", G. W. Ford and **R.F. O'Connell**, International Journal of Quantum Information, Vol 8, No. 5 (2010) 755-763.