WEEKLY CALENDAR

Physics & Astronomy

202 Nicholson Hall

Louisiana State University

November 8, 2004

Baton Rouge, LA 70803-4001
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GENERAL SEMINAR

"Observing Black Holes with 1m Telescopes"

Dr. Charles Bailyn

Harvard University

Thursday, November 11, 2004, 3:40 PM in Room 109 Nicholson Hall

Host: Dr. Bradley Schaefer

(Refreshments served at 3:15 p.m. in Room 229 Nicholson)

Abstract

Over the past 6 years, we have been engaged in an extensive program of optical/IR observations of transient X-ray binary systems. Dynamical mass measurements show that many of these systems contain compact objects with masses greater than the upper limit for neutron stars - these systems are sometimes referred to as "Dynamically Confirmed Black Hole Candidates" (DCBHCs). Detailed study of accretion flows onto DCBHCs holds the promise of identifying and studying strong-field relativistic effects. But these flows are complex, and require multiwavelength observations to constrain their properties. Curiously, the X-ray data, acquired at great expense, are often more complete than the O/IR data, which can be obtained with small ground-based telescopes. The need to acquire appropriate O/IR data is one of the principal science goals of the Small and Moderate Aperture Research Telescope System (SMARTS). In this talk, I will discuss both the organization and capabilities of SMARTS, and recent scientific results on DCBHBs.

QUANTUM SCIENCE & TECHNOLOGIES SEMINAR I

Photonic Band Gap Materials—A Resource for Renewable Energy Technologies

Dr. Leo DiDomenico

NASA-JPL, Caltech

Monday, November 8, 2004 at 3:40 p.m., Room 435 Nicholson Annex

Host: Dr. Jonathan Dowling

Abstract

In this talk I will discuss how structures called optical photonic crystals— structures with, for example, spatially periodic dielectric constants—might be used to create energy conversion technologies with applications in renewable energy. In particular, Photonic Crystals exhibit energy band gaps that are similar to the electronic energy band gaps found in semi-conductors and under suitable conditions all electromagnetic radiation is forbidden inside these optical-band-gap regions including propagating radiation modes, spontaneous emission, and even quantum zero-point vacuum fluctuations. However, other modes of energy transport, like heat energy conduction, are still allowed thus creating a unique interplay between radiant energy transport and other forms of energy transport that may be exploited to create efficient engines. I will discuss several photonic crystal energy applications for the near-term (under development) and the long-term (speculative) that could be part of a renewable energy future for humanity.

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QUANTUM SCIENCE & TECHNOLOGIES SEMINAR II

Quantum and Nonlinear Optics in Photonic Crystals

Dr. Marian Florescu

NASA-JPL, Caltech

Wednesday, November 10, 2004 at 3:40 p.m.

Room 435 Nicholson Annex

Host: Dr. Jonathan Dowling

Abstract

Photonic crystals, and in particular photonic band gap materials, constitute a new class of materials, in which the basic electromagnetic interaction is controllably altered over certain frequency and length scales. These systems lead to strong localization of light, enhancement or suppression of the spontaneous emission, and the formation of a photon-atom bound state. In the presence of a photonic band gap material, a control laser beam can drive a collection of two-level atoms to an almost totally inverted state, a phenomenon strictly forbidden in ordinary vacuum. In this talk, I will review some of the novel phenomena in the quantum optics of photonic crystals, and I will present our work on single and collective switching of two-level atoms near a photonic band edge. I will also describe a practical implementation of a deterministic and unidirectional single-photon source based on the strong enhancement of the photonic density of states in a photonic crystal and stimulated Raman adiabatic passage pumping, and I will discuss the prospects of all-optical devices based on photonic crystals.

Quantum Science and Technologies Seminar III

"Quantum dynamics, measurement and decoherence in Bose-Einstein condensates"

Dr. Diego Dalvit

Los Alamos National Laboratory

Friday, November 12, 2004 at 3:40 p.m.

Room 435 Nicholson Annex

Host: Dr. Jonathan Dowling

Abstract

Bose-Einstein condensates (BECs), though first demonstrated only in 1995, have already revolutionized quantum and atomic physics. In a very real sense, BECs represent the ultimate in control over matter at the quantum level. In this talk I will review recent results about quantum dynamics and quantum phase transitions of BECs trapped in optical lattices. I will mainly concentrate on highly non-classical states of BECs, such as cat and squeezed states, their generation, dynamics, and control of decoherence effects.

Announcements and Reminders

Tax treaty benefits expire December 31, 2004. Any employee who is eligible for treaty benefits for 2005 should go to the lobby of Thomas Boyd Hall on either Wednesday, November 10 or Thursday, November 11 between the hours of 8:30 a.m. to 4:00 p.m. Bring your passport, Visa, I-94, I-20, or DS2019 form. It will take about 20 minutes to complete the paperwork.