College of Science
Department of Physics & Astronomy

WEEKLY CALENDAR

TEL: 225-578-2261
FAX: 225-578-5855
http://www.phys.lsu.edu

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

WEEKLY CALENDAR

March 17 - 21, 2014

DEPARTMENTAL COLLOQUIUM

"The Uncertainty Principle in the Presence of Quantum Memory"

3:30 PM March 20, 2014
109 Nicholson Hall

Mario Berta
California Institute of Technology
Host: Mark Wilde

• Refreshments served at 3:10 PM in 232 (Library) Nicholson Hall •

The uncertainty principle, originally formulated by Heisenberg, dramatically illustrates the difference between classical and quantum mechanics. The principle bounds the uncertainties about the outcomes of two incompatible measurements, such as position and momentum, on a particle. It implies that one cannot predict the outcomes for both possible choices of measurement to arbitrary precision, even if information about the preparation of the particle is available in a classical memory. However, if the particle is prepared entangled with a quantum memory, a device which is likely to soon be available, it is possible to predict the outcomes for both measurement choices precisely. In this work we strengthen the uncertainty principle to incorporate this case, providing a lower bound on the uncertainties which depends on the amount of entanglement between the particle and the quantum memory. We detail the application of our result to witnessing entanglement and to quantum key distribution.

LA-SiGMA
Louisiana Alliance for Simulation-Guided Materials Applications

Fall Seminar

Matthew Escarra
Tulane University

"Photonic Solutions for 21st Century Problems: Quantum cascade lasers, optical metamaterials, and full spectrum solar energy conversion"

3:30pm - 4:30pm, Wednesday, March 19, 2014

1008B, Digital Media Center, Louisiana State University

LA-SiGMA

Louisiana Alliance for Simulation-Guided Materials Applications

Fall Seminar
3:30pm - 4:30pm, Wednesday, March 19, 2014
1008B, Digital Media Center, Louisiana State University

Photonic Solutions for 21st Century Problems: Quantum cascade lasers, optical metamaterials, and full spectrum solar energy conversion

By

Matthew Escarra

Tulane University

Photonic materials and devices hold great potential to address pressing societal issues related to energy use, environmental monitoring, human health, and more. In this talk I will address three key technologies that harness light-material interactions for these important application areas. 1) Quantum cascade (QC) lasers have emerged as a key light source for trace chemical detection, with applications ranging from pollutant monitoring to breath diagnostics and industrial process control. I will discuss how these devices work and will highlight a few recent advances in improving their performance. Development of these light sources for the market will be discussed within the context of two start-up ventures. 2) Novel photonic metamaterials offer the potential for revolutionary new optical functionality by enabling light manipulation by design. Here I will mention bulk all-semiconductor metamaterials and future possibilities for low-loss metasurfaces. 3) Ultra-high efficiency (η > 50%) solar modules may open new application areas to photovoltaic technology. High efficiency spectrum splitting design approaches will be discussed, with a particular focus on a holographic spectrum splitting module design.

Matthew Escarra is an assistant professor in Physics and Engineering Physics at Tulane University. He received his Ph.D. in electrical engineering at Princeton University in 2011 in the group of Prof. Claire Gmachl. He also received a certificate in Science, Technology, and Environmental Policy while at Princeton. He went on to complete postdoctoral training at the California Institute of Technology, where he developed new approaches to high efficiency solar energy conversion in the group of Prof. Harry Atwater. He also has worked with two start-up companies, Daylight Solutions and Sentinel Photonics, and larger companies such as Shell and Dow Chemical. Matthew's undergraduate studies were in electrical engineering at Rice University. His current research interests include low-loss photonic metasurfaces, optoelectronics from two-dimensional semiconductors, and engineering concentrating photovoltaics for new applications.

UNO *– 234, Liberal Arts Building ~* ***LSU*** *– 1008B, Digital Media Center*
LATech *– 122, Nethken Hall*

Note, this seminar will ONLY be available via Abobe connect
http://connect.lsu.edu/la-sigma/