College of Science
Department of Physics & Astronomy

WEEKLY CALENDAR

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WEEKLY CALENDAR

February 11 - 15, 2013

DEPARTMENTAL COLLOQUIUM

"Radiogenic cancer risk for children receiving craniospinal irradiation in a developing country versus in a developed country"

3:30 PM, February 14, 2013
109 Nicholson Hall

Phillip J. Taddei
The University of Texas, M.D. Anderson Cancer Center

Host: Wayne Newhauser

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

The long-term risk of treatment-related health effects for survivors of childhood cancer is high and increases with years of follow-up. The late effect of greatest concern for patients receiving radiotherapy is a radiogenic secondary cancer. Advanced radiotherapy techniques like proton therapy may reduce the risk of radiogenic cancer, but these techniques are scarcely available for children in developing countries. In an international collaboration between, we compared the predicted risk of radiogenic cancer in children receiving proton craniospinal irradiation (CSI) in a developed country versus had they been treated with photon CSI in a developing country. For small sample set of patients, in each setting, equivalent dose was determined in organs and tissues that are sensitive to radiation carcinogenesis, including radiation dose outside of the treatment fields. Then the risk of radiogenic cancer was predicted based on risk models from the literature. The predicted risk of radiogeni c cancer was almost twofold for photon CSI in a developing country versus proton CSI in a developed country. This finding suggests that the risk of radiogenic cancer may be significantly reduced and quality of life may be improved in children receiving photon CSI in developing countries if they instead receive proton therapy.

PUBLICATIONS:

1. "Un primer curso en gravedad cuantica de lazos", R. Gambini, **Jorge Pullin**, Editorial Reverte, Mexico, 210p (2013).

LA-SiGMA

Louisiana Alliance for Simulation-Guided Materials Applications

Spring Seminar Series
3:30pm - 4:30pm, Wednesday February 13, 2013
Tilton Hall 305, Tulane University

Two-Level System Material Defects in Superconducting Qubit Dielectrics

by

Dr. Kevin D. Osborn

Laboratory for Physical Sciences, College Park, MD

Johnston Hall Room 338

Superconducting qubits have steadily improved their coherence time for over a decade such that quantum information algorithms are now implemented with an integrated circuit. However, material defects at the requisite millikelvin temperatures, often referred to as two-level systems (TLS), interact with the microwave photon fields and continue to limit the coherence of qubits. These TLS also limit the performance of astronomy photon detectors, which are made with superconducting circuits. In this talk, I will focus on TLS which are electrically and resonantly coupled to the microwave fields, and are particularly troublesome for these devices. Unfortunately the microscopic model of these low temperature defects is often unknown, but I will argue that a particular Hydrogen-based defect recently identified by ab-initio calculations in alumina is the likely TLS defect. In addition, I will show how data from resonators allows one to quantify the influence of the TLS using the loss tangent. Next I will show how non-equilibrium data on TLS can be taken with a new device called a microwave bridge resonator. Coupled with new theoretical work, these measurements increase our understanding of TLS out of equilibrium, and allow the practical extraction of the TLS dipole moment.

Dr. Kevin D. Osborn received his doctorate in physics from the University of Illinois at Urbana-Champaign in 2001, with a thesis on the critical fluctuations of the superfluid density in high-temperature superconducting films. He then started postdoctoral research at the National Institute of Standards and Technology in Boulder, Colorado and measured individual InGaAs quantum dots using Al single-electron transistors. In 2004 he received a National Research Council postdoctoral associate award which allowed him to perform studies at NIST on decoherence mechanisms in superconducting phase qubits. In 2007 Dr. Osborn transitioned to the Laboratory for Physical Sciences in College Park, Maryland, to set up a new research group as a US government physicist. His group currently studies decoherence mechanisms in superconducting qubits, with an emphasis on condensed matter phenomena related to two-level systems.