McCormick

Northwestern Engineering

Electrical Engineering and Computer Science

SOLID STATE & PHOTONICS DIVISION(SSP)

Title: Distributed quantum systems / Nuclear laser spectroscopy

Friday,

11/20/09

Time: 9:30am

Room: TECH L324

Speaker:

Prof. Alex Kuzmich,

Georgia Institute of Technology

The SSP division contains faculty whose main research interests include the design, analysis, and proof-of-concept development of solid-state and photonic devices and systems.

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Abstract: Quantum mechanics provides a mechanism for absolutely secure communication between remote parties. For distances greater than 100 kilometers direct quantum communication via optical fiber is not viable, due to fiber losses, and intermediate storage of the quantum information along the trans-mission channel is necessary, leading to the concept of the quantum repeater. I will outline our program on the use long-lived atomic memories as an interface for quantum information transfer and the prospects for long distance quantum networks.
Th-229 nucleus has an exceptionally low-lying first excited (isomer) state, 7.5 eV relative to the ground state. Laser excitation of the corresponding M1 nuclear transition has been proposed as a basis for sensitive tests of time variation of fundamental constants and for an optical clock of improved precision. I will describe our results on trapping, spectroscopy and laser cooling of triply ionized Th and prospects for laser excitation of the nuclear isomer.

Biography/research interests:

Prof. Alex Kuzmich is an Associate Professor of Physics at Georgia Institute of Technology. He received his Ph.D. in Physics in 2000 from University of Rochester. He is a recipient of Office of Naval Research Young Investigator Award (2005-2008) and of Sloan Foundation Fellowship (2005), and is a Fellow of American Physical Society since 2009. Prof. Kuzmich's laboratory is investigating topics in atomic physics, quantum metrology, and quantum information. The research utilizes samples of ultra-cold atoms and ions suspended in high vacuum using electromagnetic fields. Subjects of current interest are 1) laser excitation of a nuclear isomer in Th-229 and 2) long-lived quantum memories and their applications to scalable quantum communication networks.