Quantum Repeater and Nuclear Clock

Professor Alex Kuzmich
Georgia Institute of Technology
Atlanta, Georgia

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 transmission channel is necessary, leading to the concept of the quantum repeater. I will outline our program on the use of atomic ensembles 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 state, 7.5 eV relative to the ground state. As the nuclei are affected less by background electromagnetic fields than atoms, laser excitation of the nuclear transition has been proposed as a basis for an ultrastable clock and for tests of time variation of fundamental constants. In this talk, I will report our results on trapping, spectroscopy and atomic lifetime measurements of triply ionized Th-229 and prospects for laser excitation of the nuclear transition.

Friday, September 19, 2008
4:00-5:00 pm
Goudsmit Conference Room, LP 208