Abstract Submitted
for the DAMOP09 Meeting of
The American Physical Society

Dual Degeneracy of Lithium and Cesium Atoms for Scalable Quantum Information Processing KATHY-ANNE SODERBERG, ARJUN SHARMA, KARA LAMB, PETER SCHERPELZ, ANDREAS KLINGER, SKYLER DEGENKOLB, NATHAN GEMELKE, CHENG CHIN, Department of Physics and The James Franck Institute, The University of Chicago — We describe first steps in an experiment aimed at scalable quantum information processing with quantum degenerate gases of two atomic species. We discuss simultaneous evaporation of fermionic ^{6}Li and bosonic ^{133}Cs atoms. Both atomic species are cooled and trapped in independent magento-optical traps and subsequently transferred to a single dipole trap for evaporative cooling. Cooling the ^{6}Li atoms into a degenerate band-insulator will allow uniform loading into the optical lattice of one atom/site. These atoms will act as quantum bits (qubits) to store quantum information. A second lattice will confine ^{133}Cs messenger atoms that will have a low filling ratio of $\sim$1 atom per 100 sites. By translating one lattice relative to the other, the ^{133}Cs messengers can be transported to any ^{6}Li qubit for entangling operations. Initial experiments study the interspecies collision properties, serving to guide strategies to implement collision-based entangling operations.

Kathy-Anne Soderberg
Department of Physics and The James Franck Institute,
The University of Chicago

Date submitted: 23 Jan 2009 Electronic form version 1.4