

Abstract Submitted  
for the DAMOP14 Meeting of  
The American Physical Society

**Progress Towards a Multispecies Ion System for Remote and Local Entanglement Generation** GRAHAME VITTORINI, ISMAIL INLEK, DAVID HUCUL, CLAYTON CROCKER, CHRISTOPHER MONROE, Univ of Maryland-College Park — Entanglement within and across remote trapped ion quantum registers has been previously demonstrated with  $^{171}\text{Yb}^+$ . In order to generate remote entanglement, a pulsed laser excites an ion in each register and the spontaneously emitted photons are collected. However, there is a similar probability that uncollected photons will scatter from adjacent ions, resulting in the loss of locally stored quantum information. To address this issue, we are implementing a multispecies system in which  $\text{Yb}^+$  acts as a quantum memory and  $\text{Ba}^+$  provides a photonic interlink. Not only does this minimize disruption of the  $\text{Yb}^+$  quantum memory qubits, but photons from both the 493 nm and 650 nm transition in  $\text{Ba}^+$  are more easily converted to telecom wavelengths. We report progress on such a system which requires co-trapping of these species, quantum logic spectroscopy for state detection, and the implementation of a multi-species phase gate utilizing a single pulsed laser.

Grahame Vittorini  
Univ of Maryland-College Park

Date submitted: 31 Jan 2014

Electronic form version 1.4