

MAR13-2012-020738

Abstract for an Invited Paper  
for the MAR13 Meeting of  
the American Physical Society

**Quantum information processing with trapped ions<sup>1</sup>**

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Trapped ions are one promising architecture for scalable quantum information processing. Ion qubits are held in multizone traps created from segmented arrays of electrodes and transported between trap zones using time varying electric potentials applied to the electrodes. Quantum information is stored in the ions' internal hyperfine states and quantum gates to manipulate the internal states and create entanglement are performed with laser beams and microwaves. Recently we have made progress in speeding up the ion transport and cooling processes that were the limiting tasks for the operation speed in previous experiments. We are also exploring improved two-qubit gates and new methods for creating ion entanglement.

<sup>1</sup>This work was supported by IARPA, ARO contract No. EAO139840, ONR and the NIST Quantum Information Program