Abstract Submitted
for the MAR07 Meeting of
The American Physical Society

Integrated Optics Approach to State Manipulation and Detection in Ion Trap Quantum Computation.[1] JUNGSANG KIM, CHANGSOON KIM, Duke University — Ions trapped in RF Paul trap represent strong candidate physical system for realizing quantum information processor, evidenced by recent experimental demonstration in long coherence times and high fidelity quantum logic gate operations. The next level of progress requires a much more integrated approach to increase the number of physical qubits in the system, which will enable realization of a complete error-protected qubit. The nature of this challenge is highly technological, and advanced integration technologies can be used to dramatically increase the density of qubits handled in the system. In this paper, we discuss two classes of integrated optics technologies that can be utilized to enable the higher density manipulation of ion qubits. The first is the strategies for using optical micro-electromechanical systems (MEMS) technologies for creating miniaturized optical systems to increase the density of laser beams used to manipulate the ion states. The second is the use of micro-optical components and high efficiency detectors to realize scalable detection of ion states. We will present the estimated optical performance as well as preliminary updates on experimental progress.

[1]This work is supported by NSF.

Jungsang Kim
Duke University

Date submitted: 20 Nov 2006 Electronic form version 1.4