Abstract Submitted
for the DAMOP11 Meeting of
The American Physical Society

Monolithic symmetric ion trap for quantum simulation FAYAZ SHAIKH, Georgia Institute of Technology, RICHART SLUSHER, Georgia Tech Research Institute, QUANTUM INFORMATION SYSTEMS TEAM — We describe the novel design of a monolithic two-level ion trap that combines the flexibility and scalability of VLSI silicon microfabrication with the superior trapping characteristics of multi-level traps. Electrostatic simulations demonstrate that the trap has a deep trapping potential (1 eV for Yb+ ion) and radially symmetric RF confinement field. The trap has an angled through-chip slot which allows backside ion loading and through laser access while avoiding surface light scattering and dielectric charging. The geometrical trap features and dimensions are optimized for investigating ion chains with equal ion spacing. Control potentials have been derived to produce linear equally-spaced ion chains of up to 50 ions that can be used to perform simulations of quantum magnets. The potentials are optimized to give ion separations of 5 to 10 microns, micromotion compensation, and constant motional mode axes and frequencies along the chain. The trap is in fabrication at Georgia Tech using techniques similar to those developed for the planar ion traps.

Fayaz Shaikh
Georgia Institute of Technology

Date submitted: 07 Feb 2011 Electronic form version 1.4