Abstract Submitted
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A Scalable Microfabricated Ion Trap for Quantum Information Processing[1] PETER MAUNZ, RAYMOND HALTLI, ANDREW HOLLOWELL, DANIEL LOBSER, JONATHAN MIZRAHI, JOHN REMBETSKI, PAUL RESNICK, JONATHAN D. STERK, DANIEL L. STICK, MATTHEW G. BLAIN, Sandia National Laboratories — Trapped Ion Quantum Information Processing (QIP) relies on complex microfabricated trap structures to enable scaling of the number of quantum bits[2]. Building on previous demonstrations of surface-electrode ion traps[3], we have designed and characterized the Sandia high-optical-access (HOA-2) microfabricated ion trap. This trap features high optical access, high trap frequencies, low heating rates, and negligible charging of dielectric trap components. We have observed trap lifetimes of more than 100h, measured trap heating rates for ytterbium of less than 40quanta/s, and demonstrated shuttling of ions from a slotted to an above surface region and through a Y-junction. Furthermore, we summarize demonstrations of high-fidelity single and two-qubit gates realized in this trap. Sandia is a multiprogram laboratory operated by Sandia Corporation, a Lockheed Martin Company, for the United States Department of Energy's National Nuclear Security Administration under Contract DE-AC04-94AL85000.

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