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Photon extraction and conversion for scalable ion-trap quantum computing SUSAN CLARK, FRANCISCO BENITO, HAYDEN MCGUINNESS, DANIEL STICK, Sandia National Laboratories — Trapped ions represent one of the most mature and promising systems for quantum information processing. They have high-fidelity one- and two-qubit gates, long coherence times, and their qubit states can be reliably prepared and detected. Taking advantage of these inherent qualities in a system with many ions requires a means of entangling spatially separated ion qubits. One architecture achieves this entanglement through the use of emitted photons to distribute quantum information - a favorable strategy if photon extraction can be made efficient and reliable. Here I present results for photon extraction from an ion in a cavity formed by integrated optics on a surface trap, as well as results in frequency converting extracted photons for long distance transmission or interfering with photons from other types of optically active qubits. Sandia National Laboratories is a multi-program laboratory managed and operated by Sandia Corporation, a wholly owned subsidiary of Lockheed Martin Corporation, for the U. S. Department of Energy's National Nuclear Security Administration under contract DE-AC04-94AL85000.

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