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Ion photon networks for quantum computing and quantum repeaters SUSAN CLARK, DAVID HAYES, DAVID HUCUL, I. VOLKAN INLEK, CHRISTOPHER MONROE, University of Maryland and Joint Quantum Institute — Quantum information based on ion-trap technology is well regarded for its stability, high detection fidelity, and ease of manipulation. Here we demonstrate a proof of principle experiment for scaling this technology to large numbers of ions in separate traps by linking the ions via photons. We give results for entanglement between distant ions via probabilistic photonic gates that is then swapped between ions in the same trap via deterministic Coulombic gates. We report fidelities above 65% and show encouraging preliminary results for the next stage of experimental improvement. Such a system could be used for quantum computing requiring large numbers of qubits or for quantum repeaters requiring the qubits to be separated by large distances.

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