Abstract Submitted
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Two photon quantum interference of light emitted by two ions[1] P. MAUNZ, M.J. MADSEN, D.L. MOEHRING, K. YOUNGE, R.N. KOHN, JR., C. MONROE, FOCUS Center and Department of Physics, University of Michigan — Entanglement, which is at the base of all quantum computing algorithms, can now routinely be established through the collective motion of nearby trapped atomic ions. However, entangling remotely-located ions remains a challenge. One possible realization requires the interference of two single photons emitted by the ions. Towards this end, we demonstrate the second order interference of single photons emitted from two cadmium ions trapped in an rf Paul trap. In free space we achieve a visibility of about 60%. Additionally, using an ultrafast laser pulse, we demonstrate the excitation of a single ion on a time scale much faster than the lifetime of the excited state. The subsequently emitted photons show near-perfect anti-bunching, demonstrating that from a single laser pulse at most one photon is scattered by the atom. Improving the visibility of the two-photon interference and combining it with the readily available methods of state detection of a trapped ion may allow two ions to be entangled without involving their motion.

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