Abstract Submitted
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Steps towards fault-tolerant quantum operations in trapped-ion Quantum information experiments[1] R. OZERI, C. LANGER, J.D. JOST , R.B. BLAKESTAD, J. BRITTON, J. CHIAVERINI, D. HUME, W.M. ITANO, E. KNILL, D. LEIBFRIED, R. REICHLE, S. SEIDELIN, J.H. WESENBERG, D.J. WINELAND, Time and Frequency Division, NIST, Boulder, CO 80305 — Fault-tolerant Quantum Information Processing (QIP) requires that the error in a quantum gate be smaller than a certain threshold, currently believed to be on the $\sim 10^{-4}$ level. Here we discuss progress toward realizing such low error rates in trapped-ion QIP experiments at NIST. Memory coherence times are extended using a qubit transition which, to first order, is independent of the magnetic field. The fundamental limits to laser driven quantum gates are investigated by studying the effect of spontaneous scattering of photons on hyperfine coherence. It is shown that the error due to the scattering of photons can be, at least in principle, reduced to very low values.

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