Abstract Submitted
for the DAMOP05 Meeting of
The American Physical Society

Hyperfine-State Coherence in the Presence of Spontaneous Photon Scattering[1] R. OZERI, C. LANGER, J.D. JOST, B.L. DEMARCO[2], A. BENKISH[3], R.B. BLAKESTAD, J. BRITTON, J. CHIAVERINI, D. HUME, W.M. ITANO, D. LEIBFRIED, R. REICHLE, T. ROSENBAND, P. SCHMIDT, D.J. WINELAND, Time & Frequency Division, NIST, 325 Broadway, Boulder CO 80305
— Hyperfine-state superpositions are important to many atomic physics applications and experiments. In many of these experiments, off-resonance laser light is used either to manipulate or trap atoms. Spontaneous scattering of photons can therefore play an important role in hyperfine-state decoherence. We study experimentally the coherence of a hyperfine-state of a trapped $^9Be^+$ ion, in the presence of off-resonance light. It is shown that it is only Raman spontaneous scattering of photons which affects coherence. Raman scattering of photons is largely suppressed at a laser detuning which is much larger than the fine-splitting of the excited state. Coherence times that exceed the average scattering time of 19 photons are measured. This result implies that laser light can be used to manipulate hyperfine-state superpositions with very small decoherence.

[1]Research supported by ARDA/NSA NIST.
[2]present address: University of Illinois, Urbana
[3]present address: Technion, Haifa, Israel

Chris Langer
Time & Frequency Division, NIST, 325 Broadway, Boulder CO 80305

Date submitted: 28 Jan 2005 Electronic form version 1.4