Abstract Submitted
for the DAMOP05 Meeting of
The American Physical Society

Precision lifetime measurements of a single trapped ion with fast laser pulses DAVID MOEHRING, MARTIN MADSEN, BORIS BLINOV, RUDOLPH KOHN, RICHARD VALLERY, DAVID GIDLEY, CHRISTOPHER MONROE, FOCUS Center and University of Michigan Department of Physics — We report precision measurements of the excited state lifetime of the $^2P_{1/2}$ and $^2P_{3/2}$ levels of the atomic Cd^+ ion. A fast laser pulse (length of order 2 psec) promotes a single trapped Cd^+ ion to its excited state (lifetime of order 3 nsec). Arrival of the spontaneously emitted photon from the ion is correlated in time with the excitation pulse, and the distribution of time delays from many such events provides the information for the excited state lifetime. By using this technique, we are able to eliminate prevalent systematic errors such as pulse pileup, radiation trapping, flight from view, sub/superradiance, non-selective excitation and/or detection, and potential effects from applied light during the measurement interval. With uncertainties of less than 0.3%, these results are among the most precise measurements of atomic state lifetimes to date. This work is supported by the U.S. National Security Agency and the Advanced Research and Development Activity under Army Research Office contract, and the National Science Foundation ITR program.

David Moehring
FOCUS Center and University of Michigan Department of Physics

Date submitted: 05 Apr 2005 Electronic form version 1.4