

Abstract Submitted
for the 4CF14 Meeting of
The American Physical Society

Precision Measurements of Atomic Excited State Lifetimes Using Mode-Locked Femtosecond Lasers JEREMY SNELL, BRIAN PATTERSON, JERRY SELL, ALINA GEARBA, DOUGLAS BUCHANAN, RANDY KNIZE, United States Air Force Academy — Measurements of excited state atomic lifetimes provide a valuable test of atomic theory, allowing comparisons between empirical and calculated atomic matrix elements. However, as calculations have progressed, the most accurate direct lifetime measurements remain at the 0.1-0.2% precision level, partly due to the nonlinearity and calibration in conventional timing electronics. We will present our progress toward precision excited state lifetime measurements in Rb where the timing is based upon the repetition rate of a mode-locked femtosecond laser. Our apparatus consists of counter-propagating atomic beams, which cross perpendicular to excitation and ionization laser beams. A chopped cw laser provides excitation to the relevant atomic state, while the output of a mode-locked laser is amplified and frequency-doubled to produce ionization pulses. We vary the delay between excitation and ionization by a multiple of the mode-locked laser period, resulting in an extremely accurate time base for future precision measurements. This presentation will highlight improvements to the apparatus aimed at reducing the error from the pileup of detected ion events.

Brian Patterson
United States Air Force Academy

Date submitted: 11 Sep 2014

Electronic form version 1.4