Abstract Submitted
for the DAMOP09 Meeting of
The American Physical Society

Precision Lifetime Measurement of the Cesium $6P_{3/2}$ State JERRY SELL, BRIAN PATTERSON, RANDY KNIZE, United States Air Force Academy, THOMAS EHRENREICH, Nufern — We will report the final results from our precision measurement of the cesium $6P_{3/2}$ atomic state lifetime. The measurement technique consists of an initial pulse ($\sim$ nJ) selected from a mode-locked Ti:Sapphire laser which excites cesium atoms in counter-propagating thermal beams to the cesium $6P_{3/2}$ state. A subsequent laser pulse is amplified in a regenerative amplifier ($\sim \mu$J) and also frequency doubled, resulting in pulses which nonresonantly ionize the cesium atoms in the $6P_{3/2}$ state. The ions are collected and counted while varying the delay between the excitation and ionization pulses allowing us to measure the excited state lifetime. Dominant systematic errors in the measurement include: effects from the misalignment of the excitation and ionization laser beams, quantum beats in the photoionization detection, and radiation trapping affecting the observed lifetime. These systematic errors along with others are examined which lead to a total systematic error of 0.04%. Currently our statistical error of 0.1% results in a total measurement uncertainty of 0.11%, making these among the most precise direct measurements of an atomic lifetime.

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Date submitted: 23 Jan 2009 Electronic form version 1.4