Abstract Submitted
for the DAMOP08 Meeting of
The American Physical Society

Hyperfine State-Changing Collisions of Cs($6P_{1/2}$) Atoms with Argon Perturbers LAURIE MORGUS, TYLER MORGUS, Thorlabs, Inc., TYLER DRAKE, Drew University, JOHN HUENNEKENS, Lehigh University — A two-step excitation experiment has been employed to measure the collisional rate coefficients and to study the velocity distribution of Cs($6P_{1/2}$) atoms that have undergone a single hyperfine state-changing collision with Ar. Argon pressure broadening rates and shifts of the Cs $6P_{1/2}(F') \rightarrow 8S_{1/2}(F'')$ transitions have been determined. In the experiment, a narrowband Ti:Sapphire laser is tuned to line center of the $6S_{1/2}(F = 4) \rightarrow 6P_{1/2}(F' = 3$ or 4) transition. Then, the frequency of a narrowband cw dye laser is scanned over the $6P_{1/2} \rightarrow 8S_{1/2}$ manifold to probe the populations of the $6P_{1/2}$ hyperfine levels. Absorption of probe laser photons is monitored by detecting $8S_{1/2} \rightarrow 6P_{3/2}$fluorescence. The experiment is conducted at room temperature, where the Cs density is low. The Ar pressure is varied from 0 – 1.52 Torr, leading to Cs-Ar collisions that transfer population from the directly excited $6P_{1/2}(F')$ level to the other $6P_{1/2}$ hyperfine level. The data are analyzed using a density matrix formalism to yield the rate coefficients for Cs($6P_{1/2}$)-Ar hyperfine state changing collisions. In addition, the one-dimensional velocity changing collision kernel for Cs($6P_{1/2}$) atoms prepared with $v_z = 0$ that undergo $F' = 3 \leftrightarrow F' = 4$ hyperfine state-changing collisions with argon is reported.

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Date submitted: 31 Jan 2008 Electronic form version 1.4