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Experimental Study of Hyperfine State Changing Collisions in the Cs($6P_{1/2}$) State using Argon Perturbers LAURIE MORGUS, Drew University, TYLER MORGUS, East Stroudsburg University, JOHN HUENNEKENS, Lehigh University — A two-step excitation experiment has been employed to measure the collisional rate coefficient and to study the velocity distribution of Cs($6P_{1/2}$) atoms that have undergone a single hyperfine state changing collision with Ar. First, a single-mode, cw 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 single-mode cw dye laser is scanned over the various $6P_{1/2} \rightarrow 8S_{1/2}$ hyperfine transitions to measure relative populations in the $6P_{1/2}$ hyperfine levels. Absorption of the probe laser 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 ($n \sim 3.4 \times 10^{10}$ atoms cm^{-3}),and thus Cs-Cs collisions are negligible. The Ar pressure is varied from 0 – 3 Torr, and Cs-Ar collisions cause transfer of population from the directly excited $6P_{1/2}(F')$ level to the other $6P_{1/2}$ hyperfine level. The data are analyzed in the single collision, strong pump, and weak probe limits to yield the rate coefficient 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 is reported, as is the $6P_{1/2} \rightarrow 8S_{1/2}$ argon pressure broadening rate.

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