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Precision polarizability measurements of atomic cesium's $8s\,^2S_{1/2}$ and $9s\,^2S_{1/2}$ states[1] HANNAH WEAVER, ANDREW KORTYNA, Lafayette College — We report hyperfine-resolved scalar polarizabilities for cesium's $8s\,^2S_{1/2}$ and $9s\,^2S_{1/2}$ states using resonant two-photon spectroscopy. Two single-mode, external-cavity diode lasers drive the $6s\,^2S_{1/2} \rightarrow 6p\,^2P_{1/2} \rightarrow ns\,^2S_{1/2}$ transition ($n = 8$ or 9). Both laser beams are split and counter-propagate through an effusive beam and a vapor cell. An electric field applied across two parallel plates imposes Stark shifts on the $ns\,^2S_{1/2}$ levels in the effusive beam. Electric-field strengths are measured *in situ*. The laser frequency is calibrated in the vapor cell using a phase modulation technique, with the modulation frequency referenced to the ground-state hyperfine splitting of atomic rubidium. Our measured $8s\,^2S_{1/2}$ polarizability, $38370 \pm 380 a_0^3$, agrees with previous theory and experiments. Our measured $9s\,^2S_{1/2}$ polarizability, $150700 \pm 1100 a_0^3$, agrees within two sigma of theory, but we are unaware of previous measurements. We also verify that these polarizabilities are independent of the hyperfine levels, placing upper limits on the differential polarizabilities of $200 \pm 260 a_0^3$ for the $8s\,^2S_{1/2}$ state and $490 \pm 450 a_0^3$ for the $9s\,^2S_{1/2}$ state.

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