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Improved measurements of the cesium nd hyperfine structure using photoion spectroscopy of a thermal beam[1] ANDREW KORTYNA, JENNIFER GRAB, Department of Physics, Lafayette College, Easton, PA USA — The $6d\,^2D_{3/2}$ and $7d\,^2D_{3/2}$ states of ^{133}Cs are studied using photoion spectroscopy. The goal is to improve measurements of the associated hyperfine coupling constants. Two single-mode, external-cavity diode lasers counter-propagate normal to a collimated thermal beam of cesium. The first laser is center locked to the $6s\,^2S_{1/2} \rightarrow 6p\,^2P_{1/2}$ transition, and the second laser is scanned across the $6p\,^2P_{1/2} \rightarrow nd\,^2D_{3/2}$ manifold. Photoions are produced by absorption of a third photon, and ions are analyzed in a time-of-flight mass spectrometer. The frequency scale of the second laser is calibrated through phase modulation at a precise frequency. Photoion spectroscopy has high collection efficiency and low background, producing improved sensitivity compared to the more common technique of fluorescence spectroscopy. This improved sensitivity allows for lower laser power, minimizing power-broadening. Fast scans are also permitted, reducing the effect of thermal drifts on the frequency resolution.

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Andrew Kortyna
Lafayette College

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