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Precise measurements of hyperfine structure, isotope shifts, and transition amplitudes in thallium, indium, and lead atoms using vapor cell spectroscopy[1] ELI HOENIG, NATHANIEL VILAS, BINGYI WANG, P.M. RUPASINGHE, P.K. MAJUMDER, Physics Dept., Williams College — In recent years, we have completed a series of high-precision atomic structure measurements in thallium and indium in our group. The results from our experiments test state-of-the-art *ab initio* atomic structure calculations in these atoms. Most recently, we used two-step, two-color vapor cell spectroscopy to determine hyperfine splittings and isotope shifts in the $8p$ excited states of thallium, and hyperfine constants in the $7p$ excited states of indium. One diode laser, locked to an electric dipole transition from the ground state to an intermediate state, is sent through the oven containing the thallium or indium. We scan a second, spatially-overlapped laser across the relevant hyperfine splitting. This procedure results in a Doppler-free absorption features whose splittings were determined with sub-MHz accuracy. Presently, we are pursuing vapor cell spectroscopy measurements in lead isotopes, to test new atomic theory calculations in this four-valence-electron system. These will include isotope shift and hyperfine structure measurements, as well as relative E2/M1 transition amplitude measurements in the ground state $^3P_0 \rightarrow^3 P_1$ and $^3P_0 \rightarrow^3 P_2$ transitions at 1279 nm and 939 nm respectively.

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