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Precise measurements of ^{203}Tl and ^{205}Tl excited state hyperfine splittings and isotope shifts using two-step vapor cell spectroscopy[1] P.K. MAJUMDER, SAU MAN CHENG, P.M. RUPASINGHE, Williams College Physics Dept. — We have undertaken a series of high-precision atomic structure measurement in thallium to test ongoing *ab initio* atomic structure calculations of relevance to symmetry violation tests in this element. We are currently completing two-step spectroscopy measurements of the $8P_{1/2}$ and $8P_{3/2}$ hyperfine structure and isotope shift using a heated thallium vapor cell and two external cavity semiconductor diode lasers. One laser, locked to the thallium $6P_{1/2} \rightarrow 7S_{1/2}$ 378 nm transition excites one or both naturally-occurring isotopes to an intermediate state. A second red laser overlaps the UV beam within the thallium vapor cell in both a co-propagating and counter-propagating configuration. Analysis of subsequent Doppler-free absorption spectra of the $7S_{1/2} \rightarrow 8P_{1/2,3/2}$ visible transitions allows us to extract both hyperfine and isotope shift information for these excited states with uncertainties below 1 MHz. Frequency modulation of the red laser provides convenient *in situ* frequency calibration. Recent measurements in our group have shown significant discrepancies from older hyperfine structure measurements in thallium excited states. Current results will be presented.

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