Abstract Submitted
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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] PROTIK MAJUMDER, GABRIELLE VUKASIN, DAVID KEALHOFER, GAMBIR RANJIT, Physics Dept., Williams College — 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 experiments in this element. We have recently completed a two-color, two-step spectroscopy experiment to measure of $7P_{1/2}$ hyperfine structure and isotope shift using a heated thallium vapor cell. One laser, locked to the thallium $6P_{1/2} \rightarrow 7S_{1/2}$ 378 nm transition excites both naturally-occurring stable isotopes to an intermediate state. A second laser at 1301 nm overlaps the UV beam within the thallium vapor cell in both a co-propagating and counter-propagating configuration. Analysis of subsequent Doppler-free IR absorption spectra of the $7S_{1/2} \rightarrow 7P_{1/2}$ transition allows us to extract both hyperfine and isotope shift information for this excited state. Frequency modulation of the IR beam provides convenient *in situ* calibration method for the splittings. Our results significantly disagree with older measurements of these intervals. We have currently substituted a new red diode laser system (671 nm) in place of the infrared laser and are studying the thallium $8p_{1/2}$ state hyperfine structure.

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