Precise measurement of the $7P_{1/2}$-state hyperfine splittings and isotope shift in $^{203}$Tl and $^{205}$Tl

TARYN SIEGEL, GAMBHIR RANJIT, P.K. MAJUMDER, Williams College, Dept. of Physics — We have undertaken a series of high-precision atomic structure measurements in thallium to test ongoing \textit{ab initio} atomic structure calculations of relevance to various symmetry violation tests in this particular element. Currently we are using a two-color, two-step spectroscopy scheme to measure of $7P_{1/2}$ hyperfine structure and isotope shift using a heated quartz thallium vapor cell. Our group recently completed a similar experiment in indium.$^1$ Here, one laser, locked near the thallium $6P_{1/2} \rightarrow 7S_{1/2}$ 378 nm transition excites both naturally-occurring 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 IR absorption spectra as we scan across the $7S_{1/2} \rightarrow 7P_{3/2}$ transition allows us to extract both hyperfine and isotope shift information for this excited state. Frequency modulation of the IR laser provides convenient \textit{in situ} calibration method for the measured splittings. Our goal is to determine the thallium splittings with an accuracy of 0.1 MHz. Current results will be presented.