Abstract Submitted
for the DAMOP09 Meeting of
The American Physical Society

Precise measurement of the hyperfine splittings within the $6p_{3/2}$ level of atomic indium using two-color diode laser spectroscopy. MEVAN GUNAWARDENA, HUAJIE CAO, PAUL W. HESS, P.K. MAJUMDER, Williams College Physics Dept. — The hyperfine splittings of the $6P_{3/2}$state of indium(I=9/2) have been measured for the first time using a two-step, two-color excitation scheme. These results provide a precise experimental test of new *ab initio* wavefunction calculations of three-valence-electron atomic systems such as indium and thallium. We first excite ground-state atoms in a heated quartz indium cell to the intermediate $6S_{1/2}$ state using a blue (GaN) diode laser at 410 nm. By measuring the differential atomic vapor cell absorption of double-passed, second-order-diffracted beams from an acousto-optic modulator, we are able to stabilize the blue laser frequency to the sub-MHz level [M. Gunawardena et al., Rev. Sci. Instrum. 79. 103110 (2008)]. A second laser beam at 1291 nm overlaps the first in the vapor cell, exciting Doppler-narrowed hyperfine transitions to the $6P_{3/2}$ excited state. By modulating the blue laser beam and using lock-in detection, we obtain background-free and Dopper-free IR spectra. By locking first to one then the other intermediate hyperfine level, we determine all three hyperfine splittings, as well as the A, B, and C hyperfine constants, for the $6P_{3/2}$ excited state. Our experimental value for the 'A' hyperfine constant agrees with the published theoretical value to within 2%. Details of the measurement and analysis will be presented.

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Date submitted: 27 Jan 2009 Electronic form version 1.4