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High-precision polarizability measurements in excited states of indium using two-step spectroscopy in an atomic beam[1] NATHANIEL VILAS, P.M. RUPASINGHE, P.K. MAJUMDER, Williams College — Recent measurements in our group of indium scalar polarizability within two low-lying transitions showed excellent agreement with ab initio atomic theory at the 1-2% level. We are now completing measurements of the polarizability within the $6s_{1/2} \rightarrow 7p_{1/2,3/2}$ excited-state transitions. In our experiment, two external cavity semiconductor diode lasers interact transversely with a collimated indium atomic beam. We tune a 410 nm laser to the $5p_{1/2} \rightarrow 6s_{1/2}$ transition, keeping the laser locked to the exact Stark-shifted resonance frequency. We overlap a second (685 or 690 nm) laser to reach the $7p$ excited states, using lock-in detection to observe its very small absorption in the atomic beam. Monitoring the two-step excitation signal in a field-free supplemental vapor cell provides frequency reference and calibration. Scalar polarizabilities for the $7p$ states are 1-2 orders of magnitude larger than in previously measured transitions, so that application of modest, precisely calibrated electric fields of a few kV/cm produce Stark shifts of order 100 MHz. Fields of order 15 kV/cm can also be applied in order to extract the tensor polarizability of the $7p_{3/2}$ state. Experimental details and latest results will be presented.

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