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Apker Award Talk: Atomic Beam Measurement of the Indium $6p_{1/2}$ Scalar Polarizability

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We report on the first measurement of the scalar polarizability of the indium $6p_{1/2}$-excited state using two-step laser spectroscopy in an atomic beam. This is one in a series of precise atomic structure measurements by the Majumder lab at Williams College, which serve as stringent tests of *ab initio* calculation methods for three-valence-electron systems. We stabilize a laser to the indium $5p_{1/2} \rightarrow 6s_{1/2}$ 410 nm transition and scan a second laser across the $6s_{1/2} \rightarrow 6p_{1/2}$ 1343 nm transition. The two laser beams are overlapped and interact transversely with a collimated atomic beam of indium. Two-tone FM spectroscopy allows us to observe the small (<1 part in 10^3) IR absorption, and characteristic sideband features in the RF-demodulated lineshape provide built-in frequency calibration. Application of DC electric fields up to 20 kV/cm give rise to Stark shifts of order 100 MHz. Because our group has previously measured the difference in polarizabilities within the 410 nm transition, we can determine the $6p_{1/2}$ polarizability with no loss of precision. Preliminary results are in excellent agreement with recent theoretical calculations and can be used to infer accurate values for the indium $6p$-$5d$ matrix elements.