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High-Precision Transition Amplitude and Polarizability Measurements in Atomic Lead using Faraday Rotation Spectroscopy[1] JOHN LACY, ABDULLAH NASIR, GABRIEL PATENOTTE, PROTIK MAJUMDER, Williams College Physics Dept. — We recently completed a direct measurement of the very weak $(6s^2 6p^2)^3P_0 \rightarrow {}^3P_2$ 939 nm electric quadrupole (E2) transition in atomic lead using an optical polarimeter with microradian resolution.[2] A Faraday rotation spectroscopy technique was used to compare the transition strengths of the E2 transition to the $^3P_0 \rightarrow {}^3P_1$ 1279 nm M1 transition in a lead vapor cell heated to between 800 and 950 °C. We found excellent agreement with new *ab initio* theoretical calculations of relevance to parity nonconservation in lead.[3] Using this highly-sensitive technique we are now studying optical rotation signals in an atomic beam apparatus where we will measure the $(6s^2 6p^2) \rightarrow (6s^2 6p 7s)$ 368 nm (E1) transition using transverse (Doppler-narrowed) Faraday spectroscopy. In recent years, we have completed a series of atomic-beam polarizability measurements in thallium and indium, and we now plan to extend these measurements to excited states of lead which will serve as new, sensitive tests of atomic theory. Current experimental results will be presented.

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[2]Maser *et al.*, Phys. Rev. **A** 100, 052506 (2019)
[3]Porsev *et al.*, Phys. Rev. **A** 93, 012501 (2016)

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