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**Atomic structure measurements and tests of fundamental symmetries in a thallium atomic beam**[1] PROTIK MAJUMDER, DAVID BUTTS, RALPH UHL, Physics Dept., Williams College — Using a thallium atomic beam apparatus, we are undertaking a series of laser spectroscopy measurements with the goal of providing precise, independent cross-checks on the accuracy of new calculations of parity nonconservation in thallium, as well as probing possible new symmetry-violating forces. In our apparatus, a diode laser beam interacts transversely with a dense, thallium beam and reveals roughly tenfold Doppler narrowing of the absorption profile. Having completed a new 0.4% measurement of the Stark shift in the 378 nm E1 transition in thallium, we are now studying the M1/E2 1283 nm $6P_{1/2} - 6P_{3/2}$ transition in the atomic beam. To enhance the detectability of this weak transition, we are utilizing both a two-tone frequency modulation method, as well as an entirely new scheme to measure differential optical cavity phase shifts induced by the atoms. In the course of this work, we have developed a new laser stabilization method suitable for locking near this E1-forbidden transition. We use low-field Faraday rotation polarimetry and achieve sub-MHz frequency stability. Future work includes two-step atomic beam excitation and Stark shift experiments in thallium, as well as a search for long-range T-odd, P-even symmetry-violating forces in thallium. Current results will be presented.

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