Analysis/Reduction of Residual Amplitude Modulation in Phase/Frequency Modulation by an EOM

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The anapole moment of a nucleus is a parity non-conserving (PNC) term that arises from weak interactions between the nucleons. It can only be detected in a PNC experiment. In this work, we study an anapole moment induced (PNC) experiment at the Stony Brook Superconducting Luminex (LUX) that can detect up to 10^10 fr atoms. The anapole moment is detected by using interference techniques to enhance the effect of the anapole-induced E1 transition. Finally, the population in the excited state is measured using a microwave transition for very high detection efficiency. The presence of the far off-resonance trap can cause unwanted effects that may mimic the parity violating signal. We analyze both red and blue detuned situations and find that the advantages and disadvantages for the proposed measurements. We study other possible systematic errors involved in the measurement, such as imperfect polarization, stability requirements, along with steps to minimize them.

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Reference
modulation field. This spatial dependence of RAM is caused by beam angle swinging due to the slight inhomogeneity in the field applied to the EOM. It is NOT caused by output position dither due to a non-normal input angle to the EOM, nor to piezo-electric resonances.

Figure 3 shows the RAM time dependent stability. The observed RAM is stable even at an averaging time of 1 minute.

2.3 RAM reduction system
We suggest RAM reduction system with acoustic-optic modulator (AOM) amplitude stabilization system. A wide band servo can suppress RAM actively.

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Two-Photon Spectroscopy of Low-Lying States of Lithium: Energy Levels, Hyperfine Structure, and Isotope Shifts

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In recent years there have been rapid advances in theoretical models and calculational techniques for few-electron systems. Atomic structure calculations for He and He-like ions now include not only the non-relativistic energy but also relativistic and quantum electrodynamic (QED) contributions. The calculations are carried out with such high precision that they challenge the most accurate experimental measurements.

Extension of these calculations to three-electron systems has become a field of intense activity. A recent review article by King summarizes the developments of theory over the past decade. Rapid advances in the calculation of energy levels, ionization potentials, fine- and hyperfine-structure, and isotope shifts for Li and Li-like ions have created a need for improved experimental data, as many measurements have uncertainties too large to be good tests of theory.

We have used non-resonant two-photon laser spectroscopy to observe the 2S–3S and 2S–4S transitions of Li. The structure of these levels is shown in Fig. 1. As the laser scans across each of these transitions, four are observed, as shown in Figs. 2 and 3. For each of these resonances we manually set the laser to the peak of a transition. A computer-controlled vacuum Fabry-Pérot wavemeter determines the laser frequency with respect to an I2-stabilized He-Ne laser with an accuracy of a few parts in 107. From these measurements we obtain precise transition energies between the ground state and excited state hyperfine levels. Because the ground state hyperfine splitting is known to extremely high precision, we are able to calculate the excited state hyperfine constants for the 3S and 4S states with a precision of about 1 MHz for both isotopes. Our value for the 3S hyperfine constant resolves a discrepancy between an earlier high precision experimental determination and recent theoretical calculations.

The centers of gravity of the 3S and 4S levels are determined with an absolute accuracy of better than 2 MHz. These are the highest precision measurements of the energy levels to date, reducing prior uncertainties by a factor of twenty. The transition isotope shift is also determined to be...