Frequency Measurement of the $2s\,^2S_{1/2} - 3s\,^2S_{1/2}$ of ^{7}Li and ^{6}Li

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High-resolution laser spectroscopy of isotope shifts, combined with high accuracy mass shift calculations, has recently allowed the determination of changes in nuclear charge radii between isotopes of stable and unstable lithium and helium isotopes [1, 2, 3, 4]. Extraction of absolute charge radii from these measurements requires a reference radius for at least one isotope. While the charge radius of ^{4}He is known with an accuracy of 0.5 % from elastic electron scattering, the uncertainty for lithium is on the order of 2 % for stable ^{7}Li or ^{6}Li used as a reference. More accurate absolute charge radii of these stable isotopes would be highly desirable. In principle, high-resolution two-photon laser spectroscopy could be used to extract these radii as has been done for hydrogen [5]. However, this requires improvement in both the theoretical calculation of point-nuclear-charge transition energies and experimental measurement of actual transition frequencies. The latter has been achieved recently. In this contribution we report on the first measurement of the $2s\,^2S_{1/2} - 3s\,^2S_{1/2}$ transitions in ^{7}Li and ^{6}Li using a frequency comb. The accuracy has been improved by about an order of magnitude compared to the most accurate previous measurement [6].

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