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Absolute frequency measurements of the lithium D lines using an optical frequency comb CLAYTON SIMIEN, NIST, SAMUEL BREWER, Univ. of Maryland, JOSEPH TAN, JOHN GILLASPY, CRAIG SANSONETTI, National Institute of Standards and Technology — High precision spectroscopic measurements of the isotope shift of low-lying lithium transitions can be combined with precise theory to probe the relative nuclear charge radii of various lithium isotopes. This technique is of particular interest for exotic isotopes for which scattering experiments are not feasible. But recently measured isotope shifts for the D1 and D2 lines of the stable isotopes ^{6}Li and ^{7}Li remain in strong disagreement with each other and with theory. Experimental values for the splitting isotope shift (SIS), believed to be the most reliable prediction, are not even consistent as to sign and disagree with theory by as much as 16 standard deviations. We will report results from a new experiment in progress at the NIST. We observe the D lines by crossing a highly collimated lithium beam with a very stable tunable laser. Unlike previous experiments, we directly measure the optical frequency of the laser at every data point by using an optical frequency comb referenced to a cesium clock. Initial results suggest that fully resolved lithium hyperfine components will be determined with an uncertainty of a few tens of kilohertz. We expect to obtain precise new values for the fine structure, hyperfine structure, and isotope shifts of the lithium D lines and a definitive test of the calculated SIS.

Joseph Tan
National Institute of Standards and Technology

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