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Precision Measurement of Lithium Hyperfine and Fine Structure Intervals

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A number of experiments have precisely measured fine and hyperfine structure splittings as well as isotope shifts for several transitions at optical frequencies for $6,7\text{Li}$ [1]. These data offer an important test of theoretical techniques developed by two groups to accurately calculate effects due to QED and the finite nuclear size in 2 and 3 electron atoms. The work by multiple groups studying several transitions in both Li^+ and neutral Li permits a critical examination of the consistency of separately the experimental work as well as theory. Combining the measured isotope shifts with the calculated energy shifts passing these consistency tests permits the determination of the relative nuclear charge radius with an uncertainty approaching 1×10^{-18} meter which is more than an order of magnitude better than obtained by electron scattering. Progress toward a precision measurement of the fine structure constant is also discussed.

1. W. A. van Wijngaarden & B. Jian, *European Physical Journal D*, 222, 2057-2066 (2013)

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