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Precision Laser Spectroscopy of Lithium WILLIAM A. VAN WIJNGAARDEN, JIE WANG, BIN JIAN, York University — A number of recent experiments have employed novel spectroscopic techniques to precisely measure the fine and hyperfine structure splittings as well as the isotope shifts for several transitions at optical frequencies for the stable (^{6,7}Li) and radioactive isotopes (^{8,9,11}Li) of lithium. These data offer an important test of theoretical techniques that have been developed over the last decade by several groups to accurately calculate effects due to Quantum Electrodynamics and the finite nuclear size in 2 and 3 electron atoms. Theory and experiment have studied several transitions in both singly ionized lithium and neutral lithium. The work by multiple groups permits a critical examination of the consistency of separately, the experimental work as well as the theoretical calculations. 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. These results are about two orders of magnitude more accurate than those obtained by electron scattering experiments and give insight into the mass and charge distributions of the nuclear constituents.

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