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DETERMINATION OF THE CORE POLARIZABILITY OF ^{87}RB USING RF SPECTROSCOPY OF RYDBERG STATES[1] SETH BERL, CHARLES SACKETT, THOMAS GALLAGHER, University of Virginia
— The core electrons make a significant contribution to the total electric polarizability α of many-electron atoms like Rb. If the core contribution can be determined accurately, the remaining valence contribution to α provides constraints on the wave function and matrix elements of the valence electron. This can be useful for interpreting experiments such as parity violation or radiation shifts in atomic clocks. We report here on a measurement of the core polarizability based on radio-frequency spectroscopy of Rydberg states with large angular momentum. Preliminary results are 9.07 0.01 a.u. for the dipole polarizability α_d and 18.3 0.5 a.u. for the quadrupole polarizability α_q. These preliminary results are consistent with previous measurements, and uncertainties are reduced by approximately a factor of 4. The dipole polarizability is consistent with high-precision theoretical calculations, but a large discrepancy between theory and experiment persists for the quadrupole value.

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