Abstract Submitted
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Detection of barium 6sng to 6snh, 6sni and 6snk microwave transitions using selective excitation to autoionizing states[1] JIRAKAN NUNKAEW, Department of Physics and Materials Science, Chiang Mai University, EVAN KIM, THOMAS GALLAGHER, Department of Physics, University of Virginia — In this experiment, we measure the $6sng \longrightarrow 6snh$, $6sni$ and $6snk$, $15 \leq n \leq 18$, microwave transitions of barium. The high angular momentum Rydberg states of barium are detected by the selective laser excitation to the autoionizing states. This detection technique is based on the difference in the optical cross sections of the $6snl \longrightarrow 6p_{1/2}nl$ and $6snl' \longrightarrow 6p_{1/2}nl'$ isolated core excitation (ICE) transitions where the outermost electron remains a spectator during the excitation. We analyze the measured data jointly with the data from the previous work of Gallagher et al.[2] and Snow and Lundeen[3] using the non-adiabatic core polarization model. We extract the dipole (α_d) and quadrupole (α_q) polarizabilities of barium to be $\alpha_d = 124.82(12)\ a_0^3$ and $\alpha_q = 2517(18)\ a_0^5$, respectively. The results indicate that the detection technique provides an alternative and reliable way to experimentally extract the values of the ionic dipole and quadrupole polarizabilities of the alkaline-earth atoms.

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[3]E. L. Snow, and S. R. Lundeen, Phys. Rev. A 76, 052505 (2007).

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