Abstract Submitted
for the DAMOP20 Meeting of
The American Physical Society

Measurements of f-, g-, and h-state quantum defects in Rydberg states of potassium[1] CHARLES CONOVER, ABE HILL, HUAN QUANG BUI, Colby College — We report measurements of the quantum defects for the f, g, and h Rydberg states in potassium for principal quantum numbers $n = 26 - 29$. We made millimeter-wave measurements of the transition frequencies between nd_j and the $n\ell$ states. Using the previously measured d-state quantum defects we can readily determine the $n\ell$ state quantum defects. We also report ionic dipole and quadrupole polarizabilities based on our measurements. The experiments were done in a magneto-optical trap. The cold atoms are excited to Rydberg states in steps from $4s$ to $5p$ and from $5p$ to nd_j states using crossed, focussed (waist size 100 μm), lasers at 405 nm and 980 nm. Stray electric fields are nulled to less than 25 mV/cm in three dimensions using potentials applied to a set of mutually perpendicular rods surrounding the MOT cloud. Limits to the resolution of the measurements are due to the inhomogeneity of the stray fields. Our measurements of the f-state quantum defects are 5% smaller than prior measurements and are, to the best of our knowledge, the first measurements of the g- and h-state quantum defects.

[1]This work was supported by Colby College.

Charles Conover
Colby College

Date submitted: 01 Feb 2020 Electronic form version 1.4