Fine Structure Measurements in High-L Rydberg States of Argon.\textsuperscript{1} LAURA E. WRIGHT, ERICA L. SNOW, STEPHEN R. LUNDEEN, Dept. of Physics, Colorado State Univ., W. GREGG STURRUS, Dept. of Physics and Astronomy, Youngstown State Univ. — A Doppler-tuned CO\textsubscript{2} laser has been used to study \( n=9 \) to \( n=17 \) excitation transitions in high-L Rydberg states of Argon, revealing fully-resolved fine structure patterns in states with \( 5 \leq L \leq 8 \). The experimental method is similar to that used previously to study Ba Rydberg levels\textsuperscript{[1]}. A fast beam of Argon Rydberg states with \( n \sim 9 \) is produced by charge exchange between a 9.5 keV Ar\textsuperscript{+} beam and a 9F Rb Rydberg target. Argon atoms excited to \( n=17 \) by the CO\textsubscript{2} laser are detected by Stark ionization. The measured fine structure patterns are used to deduce the dipole polarizability and quadrupole moment of the \( ^2P_{3/2} \) ground state of Ar\textsuperscript{+}. \cite{1} E.L. Snow, et. al., Phys. Rev. A 71, 022510 (2005)

\textsuperscript{1}Supported by the Chemical Sciences, Geosciences, and Biosciences Division of the Office of Basic Energy Science, U.S. Dept. of Energy

Stephen R. Lundeen
Dept. of Physics, Colorado State Univ.

Date submitted: 25 Jan 2006