Abstract Submitted
for the DAMOP16 Meeting of
The American Physical Society

Progress towards Generating Rydberg State, One Electron Ions
JOAN DREILING, SHANNON FOGWELL HOOGERHEIDE, AUNG NAING, JOSEPH TAN, National Institute of Standards and Technology, Gaithersburg, MD
— We report on progress towards producing hydrogen-like ions in Rydberg states from bare nuclei. Fully stripped neon atoms (Ne^{10+}) are produced by the electron beam ion trap (EBIT) at NIST. These ions are extracted via a beamline from the EBIT into a second apparatus where they are captured at low energy in a unitary Penning trap [1]. The second apparatus has a cross-beam configuration, with a perpendicular beam of laser excited Rb atoms intersecting the ion beam at the Penning trap. While stored in the trap, the ions can interact with the Rb and, through charge exchange interactions, the bare nuclei can capture one or more electrons from the Rb. The ions are then analyzed by dumping the trap to a time-of-flight detector, which allows determination of the ion charge state evolution [1]. This work builds towards laser spectroscopy on hydrogen-like ions in circular Rydberg states to obtain a value for the Rydberg constant independent of nuclear size effects [2]. Such a measurement could shed some light on the proton radius puzzle [3]. [1] S.F. Hoogerheide *et al.*, Atoms **3**, 367 (2015). [2] U.D. Jentschura *et al.*, Phys. Rev. Lett. **100**, 160404 (2008). [3] R. Pohl *et al.*, Annu. Rev. Nucl. Part. Sci. **63**, 175 (2013).

Joan Dreiling
National Institute of Standards and Technology, Gaithersburg, MD

Date submitted: 28 Jan 2016 Electronic form version 1.4