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Double-electron capture by highly-ionized atoms isolated at very low energy[1] SHANNON FOGWELL HOOGERHEIDE, JOAN M. DREILING, NIST - Natl Inst of Stds Tech, ARDA SAHINER, Thomas S. Wootton High School, JOSEPH N. TAN, NIST - Natl Inst of Stds Tech — Charge exchange with background gases, also known as electron capture processes, is important in the study of comets [1], controlled fusion energy [2], anti-matter atoms [3], and proposed one-electron ions in Rydberg states. However, there are few experiments in the very low energy regime that could be useful for further theoretical development. At NIST, highly-charged ions extracted from an electron-beam ion trap can be isolated with energy < 10 eV in a compact Penning trap. By controlling the background gas pressure and composition, the charge exchange rates can be studied. Fully stripped neon or other ions are held in the trap for varying lengths of time and allowed to interact with different background gases at multiple pressures. The ions are then pulsed to a time-of-flight detector to count the population of each charge state. Analysis using a system of rate equations yields information about the ion cloud expansion and single-electron capture rates. A substantial amount of double-electron capture is also observed. We present the relative rates and discuss the error budget.

[1] T. E. Cravens, Science 296, 1042 (2002)
[2] R. C. Isler, Plasma Phys. Control. Fusion 36, 171-208 (1994)
[3] C. H. Storry, et. al., Phys. Rev. Lett. 93, 263401 (2004)

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