Abstract Submitted
for the DPP05 Meeting of
The American Physical Society

De-Excitation of High-Rydberg Antihydrogen in a Strongly Magnetized Pure Positron Plasma[1] E.M. BASS, D.H.E. DUBIN, UCSD — The rate at which highly excited atoms relax to deeper binding is found with classical theories and simulations. This rate relates to antihydrogen formation experiments where such atoms are formed in pure-positron, Penning trap plasmas.[2] The analysis concerns atoms that have passed the kinetic bottleneck at binding energy $\varepsilon \approx 4kT$.[3] Energy loss caused by collisions between atoms and plasma positrons is calculated in two ways: For close collisions, a molecular dynamics simulation gives the energy loss; for large-impact parameter collisions, theoretical expressions based on Fokker-Planck theory are employed.[4] For a finite magnetic field, the energy loss rate scales as $1/\varepsilon$, just as for infinite field,[2] but with a larger coefficient. A statistical description of energy loss by radiation and Stark mixing will also be discussed.

[1]Supported by NSF PHY-0354979.
[2]G.Gabrielse, N.S. Bowden, P. Oxley, *et al.*, Phys. Rev. Lett. **89**, 213401 (2002); M. Amoretti, C. Amsler, G. Bonomi, *et al.*, Nature (London) **419**, 456 (2002).
[3]M.E. Glinsky and T.M. O'Neil, Phys. Fluids B **3**, 1279 (1991).
[4]Eric M. Bass and Daniel H.E. Dubin, Phys. Plasmas **11**, 1240 (2004).

D.H.E. Dubin
UCSD

Date submitted: 25 Jul 2005 Electronic form version 1.4