Abstract Submitted
for the GEC14 Meeting of
The American Physical Society

Positron cooling by vibrational and rotational excitation of a molecular gas[1] M.R. NATISIN, J.R. DANIELSON, C.M. SURKO, University of California, San Diego — A better understanding of low energy positron-molecule collisions and thermalization processes will aid in the development of novel experimental techniques and technology. In particular, cryogenic positron plasmas would allow the creation of positron beams with significantly higher energy resolution than currently available, enabling the study of scattering features and annihilation processes not measurable using current techniques.[2] Measurements of positron temperature as a function of time are presented when a positron gas, confined in an electromagnetic trap at an elevated temperature ($\geq$ 1200 K), is cooled by interactions with the 300 K molecular gases CF_4, N_2 and CO. A simple model describing positron thermalization by coupling to vibrational and rotational modes is also presented and used to make cooling-rate predictions calculated in the Born approximation. Comparisons to the measured positron cooling-rate curves permit estimates of the magnitudes of the relevant cross sections. Positron cooling rates are compared for these gases at 300 K, and estimates of their effectiveness in cooling positrons to cryogenic temperatures is discussed.

[1]Work supported by NSF grant PHY 10-68023.
[2]A. C. L. Jones et al., *Phys. Rev. Lett.* **108**, 093201 (2010).

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Date submitted: 13 Jun 2014 Electronic form version 1.4