

Abstract Submitted
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Positron cooling by vibrational and rotational excitation of molecular gases¹ J.R. DANIELSON, M.R. NATISIN, C.M. SURKO, Univ of California - San Diego — Measurements of positron temperature as a function of time are presented² when a positron gas, confined in an electromagnetic trap at an elevated temperature (≥ 1200 K), is cooled by interactions with the 300 K molecular gases CF_4 , N_2 and CO . A simple model describing positron cooling and thermalization by coupling to vibrational modes (CF_4 , CO), dipole-coupled rotational modes (CO), and quadrupole-coupled rotational modes (CO , N_2) is presented with 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. The results are compared with experiment for the case of vibrational excitation, where direct measurements exist; and they provide estimates of the rotational excitation cross sections where direct measurements are not currently possible. A new experiment using cryogenically cooled buffer gases is underway, and measurements of positron cooling to 50 K will be presented.

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