

Abstract Submitted
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Investigations of Positron Annihilation with Atoms and Molecules using PsARS¹ W.E. KAUPPILA, J.J. EDWARDS, E.G. MILLER, T.S. STEIN, E. SURDUTOVICH, Wayne State University — Positrons, being the antiparticles of electrons, ultimately annihilate either directly with electrons (that are free or attached to atoms or molecules), or via the formation of positronium (Ps, a short-lived atom composed of a positron and an electron) with subsequent annihilation. In this work we have developed positronium annihilation ratio spectroscopy (PsARS), and are using PsARS to investigate the formation and destruction of Ps [1], as well as positron attachment to molecules. For this experiment a 3 to 100 eV positron beam obtained from a sodium-22 radioactive source is passed through a gas scattering cell and resulting annihilation gamma rays of different energies are detected in coincidence. Annihilation measurements, such as these, have astrophysical relevance since characteristic positron annihilation gamma rays have been observed from various extraterrestrial sources (e.g., solar flares and the direction towards the center of our galaxy). [1] W.E. Kauppila, E.G. Miller, H.F.M. Mohamed, K. Pipinos, T.S. Stein and E. Surdutovich, Phys. Rev. Lett. 93, 113401 (2004).

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