High resolution, low energy positron scattering from neon

James P. Sullivan, Adric Jones, Peter Caradonna, Casten Makochekanwa and Stephen J. Buckman[1]

[1]*Centre for Antimatter-Matter Studies, Research School of Physical Sciences and Engineering, Asutralian National University, Canberra, Australia*

jps107@rsphysse.anu.edu.au

While positron scattering from the noble gases has been investigated both experimentally and theoretically for many years, there is large disagreement between different theories and experiments for even the grand total and total elastic cross sections. A new positron scattering apparatus has been constructed at the Australian National University, with an energy resolution of 60 meV, which promises to make highly accurate measurements of these cross sections, as well as for a host of other scattering processes.

The apparatus is based on a Surko trap [1], combined with a rare gas moderator, and provides a pulsed beam of positrons which is magnetically confined in a 500 gauss magnetic field. This beam is directed through a gas cell containing the target gas (neon in the case of this paper) and then energy analysed and detected using a retarding potential analyser and microchannel plate combination. The resultant energy spread contains information about the scattering cross sections for the positron-target interaction [2].

The goal of the work presented in this paper is to make some progress towards benchmark standards for positron scattering from rare gas targets. In addition to elastic and grand total scattering measurements, the total positron formation cross section has been measured and future plans to measure other processes, such as ionisation and electronic excitation will be presented.

[1] T. Murphy, C.M. Surko, Phys. Rev. A **46** (1992) 5696.
[2] J. P. Sullivan, S. J. Gilbert, J. P. Marler, R. G. Greaves, S. J. Buckman and C. M. Surko, Phys. Rev. A **66** (2002) 042708.