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Absolute measurements of differential cross sections in low energy positron scattering

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The measurement of positron scattering cross sections has been transformed by the development of the Surko trap and beam system¹, which provides a high energy resolution source of positrons² with which to make measurements of low energy scattering processes³. By taking advantage of the fact that the resulting positron beam is magnetised, new experimental techniques have been developed to enable the determination of absolute cross sections for a range of scattering processes that have previously been unable to be measured quantitatively. One of the many scattering cross sections that can now be accurately measured is the elastic differential scattering cross section. This provides a sensitive window into the scattering process, being a good test of the quality of any theoretical calculation. In addition, the differential information can be used in simulations of positron transport in biological systems, allowing a more complete and accurate picture of the underlying processes in positron thermalisation. Recent measurements have also shed light on some longstanding disagreements between previous positron scattering measurements⁴. This talk will give an overview of the experimental techniques used to measure positron scattering cross sections and then present a variety of DCS measurements, from targets relevant to fundamental and applied studies. The importance of these measurements will be discussed with regards to understanding positron scattering data and application to biomedical processes.

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²S. J. Gilbert et al., Appl. Phys. Lett. **70**, 1944 (1997)

³J. P. Sullivan et al., Phys. Rev. A **66**, 042708 (2002)

⁴J. P. Sullivan et al., J. Phys. B: At. Mol. Opt. Phys. **44** (2011) 035201