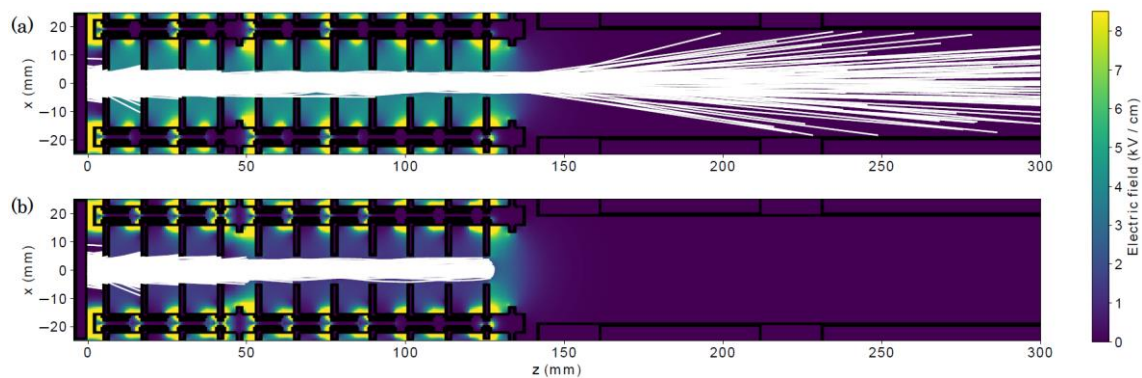


## A Multi-ring Electrostatic Guide for Rydberg Positronium

M. H. Rayment, L. Gurung, R. E. Sheldon<sup>\*</sup>, S. D. Hogan and D. B. Cassidy

*Department of Physics and Astronomy, University College London,  
Gower Street, London, WC1E 6BT, United Kingdom,*

If positronium (Ps) atoms are excited to Rydberg-Stark states their lifetimes can be significantly increased [1], and they may possess large electric dipole moments [2]. These properties can be exploited to produce a long-lived Ps beam using inhomogeneous electric fields, which has been previously demonstrated in a continuous quadrupole device [3]. Here we present measurements made using an electrostatic guide comprising a multi-ring electrode structure. This configuration allows time-varying potentials to be applied to individual electrodes, and can in principle decelerate and trap Ps atoms [2]. Our measurements are in good agreement with particle trajectory calculations and show that Ps atoms may be guided and focused in this device, which can also facilitate crossed beam scattering experiments [4]. Applications to future deceleration and trapping will be discussed.



**Figure 1** Calculated trajectories of (a)  $n = 13$  and (b)  $n=19$  Ps atoms guided through a multi-ring electrode structure. The  $n=19$  atoms ionize at the large potential between the final electrode and the grounded flange whereas the  $n=13$  atoms propagate into the flange. Different potentials were applied to each case to demonstrate field ionisation.

### References

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<sup>\*</sup>Corresponding author, Email: ucalesh@ucl.ac.uk