THz Spectroscopy of Rydberg Positronium

Rebecca J. Daly [1, †], **David B. Cassidy** [1]

[1]Department of Physics and Astronomy, University College London, Gower Street, London, WC1E 6BT, United Kingdom
†corresponding author's email: rebecca.daly.18@ucl.ac.uk

Positronium (Ps) is purely leptonic, making its spectroscopy ideal for tests of bound-state QED theory. Specifically, spectroscopy of Ps in Rydberg states can be used to obtain a measurement of the Rydberg constant. Here, we present the results of spectroscopy performed in the THz regime between Rydberg states of Ps. Using a trap-based pulsed positron beam, we produce ground-state Ps atoms and subsequently optically excite them to a range of Rydberg states. Using a quadrupole guide, the Rydberg Ps atoms are guided around a 45-degree bend, and away from the guiding magnetic fields along the positron beam-line. At the end of the quadrupole guide, a THz multiplier is used to drive transitions between different Rydberg states, and the population transfer is measured by selective field-ionization of the states involved.