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**Slow Decay Processes of Electrostatically Trapped Nitric Oxide Rydberg Molecules**[1] STEPHEN HOGAN, ADAM DELLER, MATTHEW RAYMENT, University College London — The large static electric dipole moments associated with high Rydberg states of atoms and molecules make samples in these states amenable to deceleration and electrostatic trapping using inhomogeneous electric fields. In this talk we will describe experiments in which these methods of Rydberg-Stark deceleration have been implemented for the first time to control the motion of nitric oxide (NO) molecules initially traveling in pulsed supersonic beams. In this work the molecules were prepared in long-lived Rydberg-Stark states, with static electric dipole moments of up to 7000 D, by resonance-enhanced two-color two-photon excitation from the ground state. They were then loaded into the traveling electric traps of a chip-based Rydberg Stark decelerator. While confined in these traps the molecules were decelerated from 800 m/s to rest in the laboratory-fixed frame of reference in a time of 250 $\mu$s and over a distance of 105 mm. The trapped molecules were detected in situ in the decelerator by pulsed electric field ionization. Measurements of the decay of the molecules from the traps over timescales of up to 1 ms, performed with the decelerator operated at 295 K and at 30 K provide new insight into the slow decay processes of long-lived Rydberg states of NO.

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Stephen Hogan
University College London

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