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Stark Wave Packets in the Heavy Rydberg System $H^+ \ldots F^-$ R.C. SHIELL, Trent University, Canada and University of Sussex, UK, E. REINHOLD, Laser Centre, Vrije Universiteit, The Netherlands, F. MAGNUS, University of Sussex, UK, W. UBACHS, Laser Centre, Vrije Universiteit, The Netherlands — Heavy Rydberg systems are unusual molecules that comprise a weakly-bound anion and cation orbiting their center of mass. Due to a combination of their size and simple internal structure these molecules represent novel systems with which to study molecular dynamics and light-molecule interactions. We report the formation and control of the weakly-bound $H^+..F^-$ system by exciting HF molecules using a 1 XUV + 1 UV excitation scheme in an electric field. By using a narrow-band laser pulse for the second step, Stark wave packets are formed that evolve in the DC field. A ramped, zero-crossing electric field pulse applied after a variable time delay results in fragment ions arriving at the detector at two distinct times, corresponding to products from two different dissociation channels. By increasing the delay time, these channels alternate in intensity with a period that agrees perfectly with the expected Stark oscillation frequency.[1] This study verifies the mass-scaling of heavy Rydberg systems and the viability of these novel molecular systems for further wave packet studies.

[1]R. C. Shiell, E. Reinhold, F. Magnus and W. Ubachs, "Control of diabatic vs adiabatic field dissociation in a heavy Rydberg system," *Phys. Rev. Lett.* **95**, 213002 (2005)

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