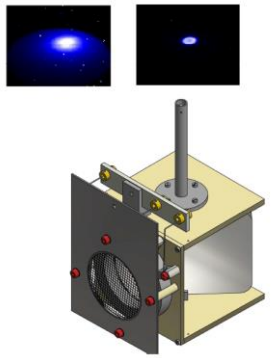
LhARA Capture Meeting

14th October 2021

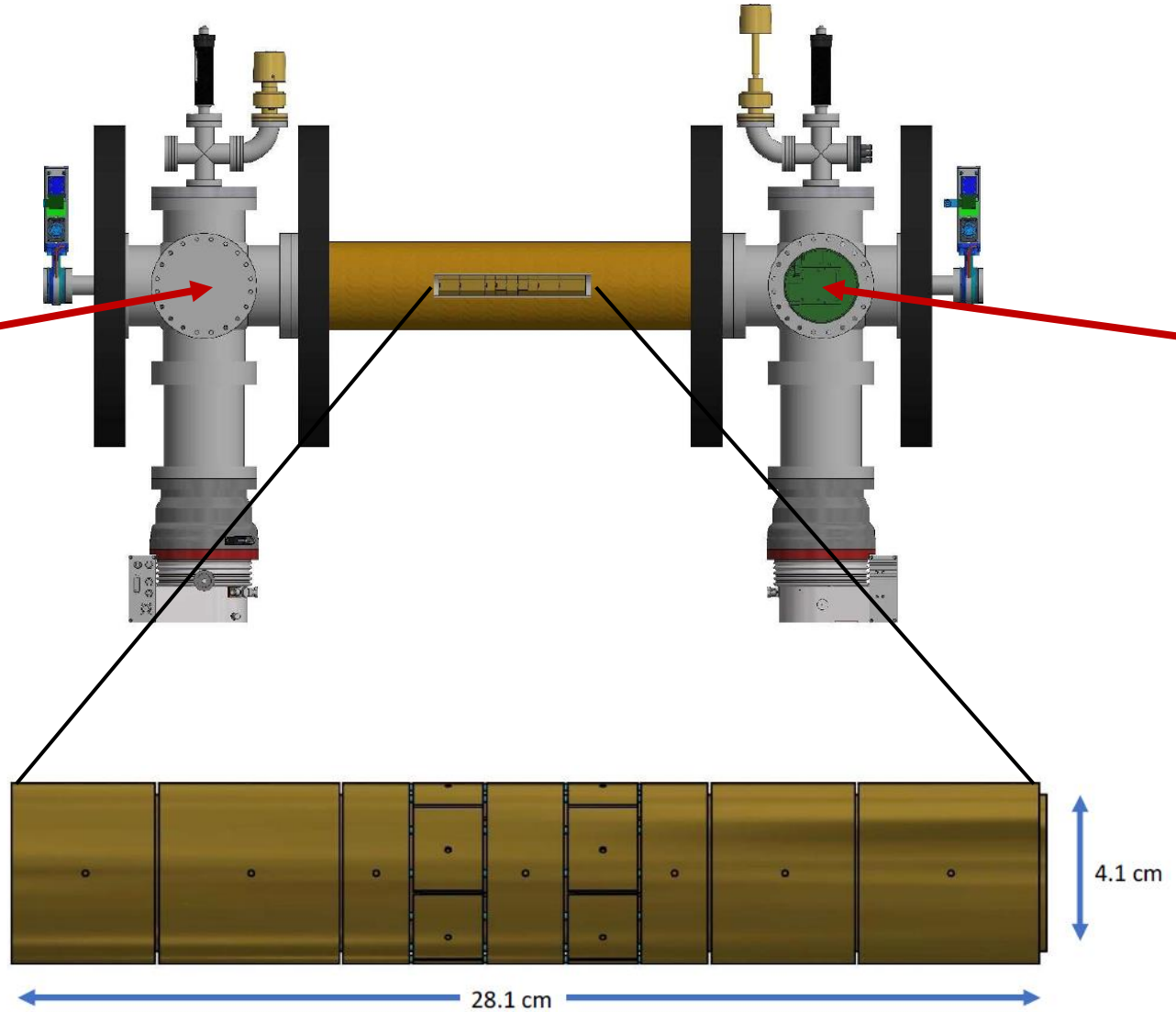
Titus Dascalu

Swansea storage trap



e^- source

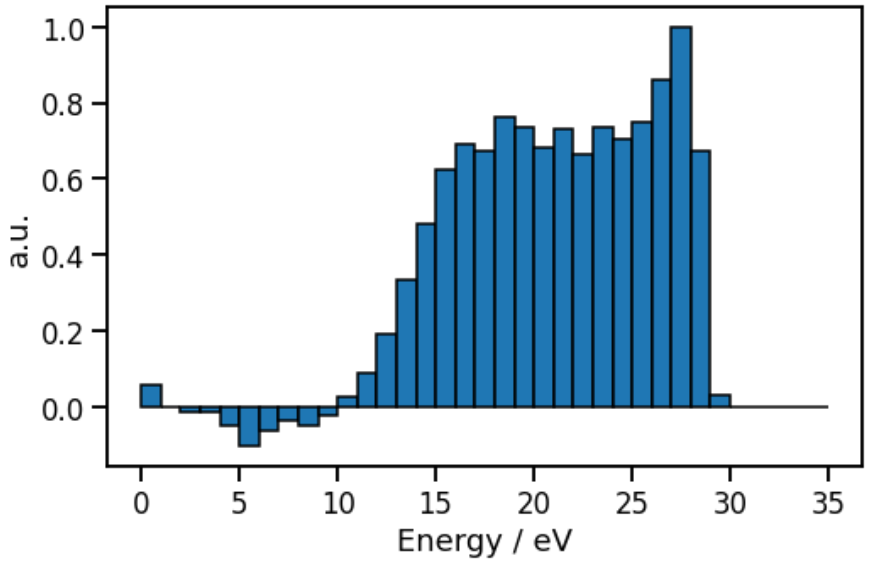
P-screen

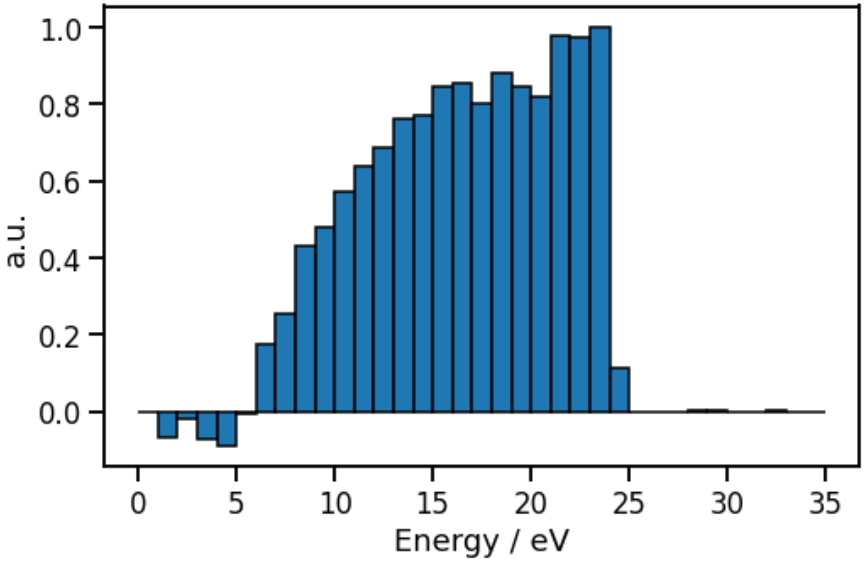


(Images from C. Baker)

Electron source

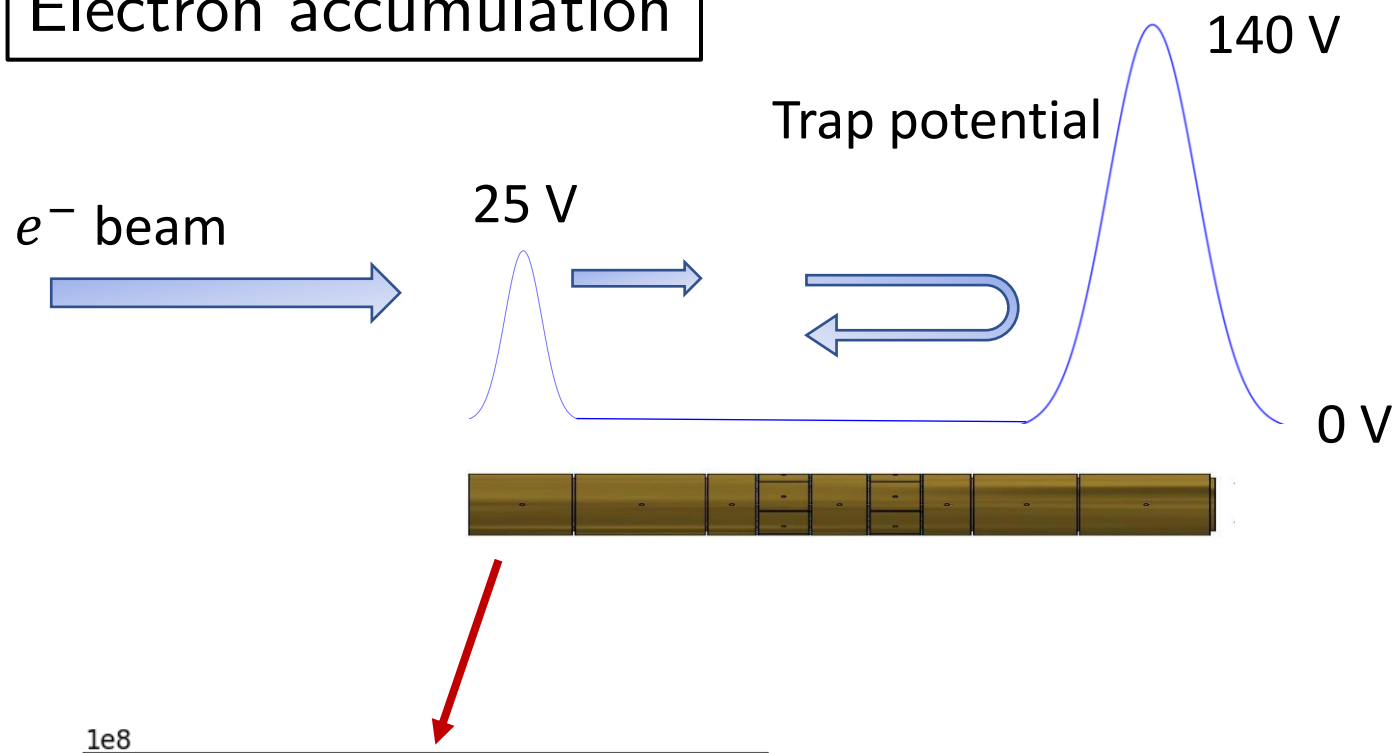
- W-filament on manipulator
- Beam currents typically 1-2 uA
- Relatively wide beam energy spread

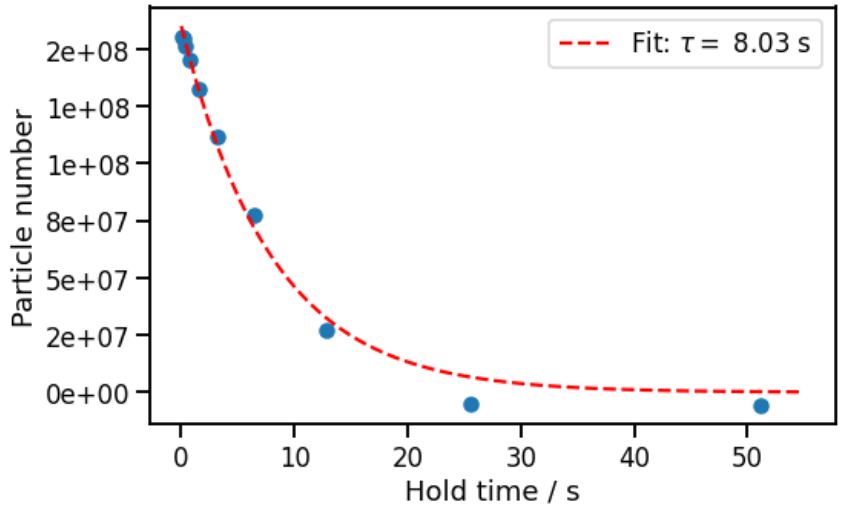


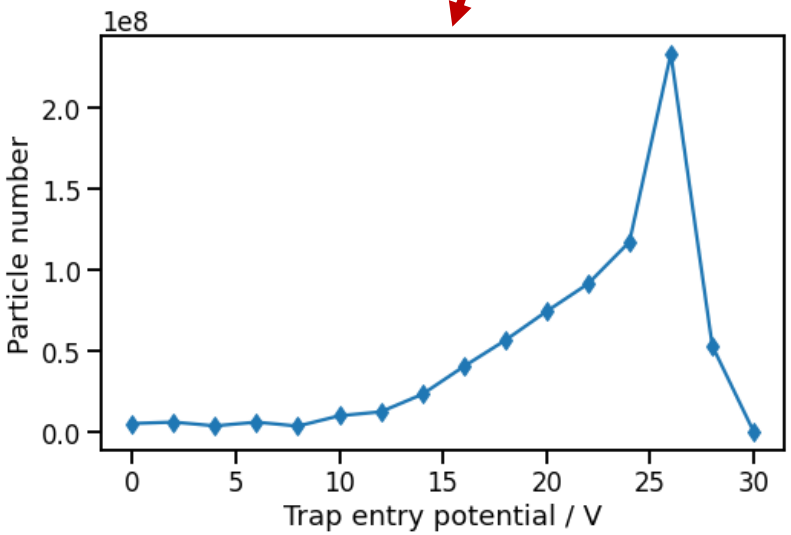


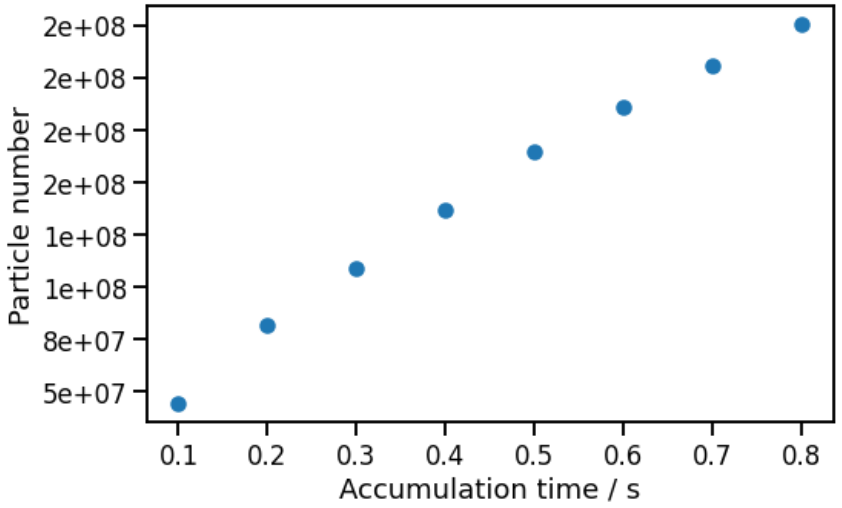
Accelerating voltage
difference applied to source: 30 V 25 V

Electron accumulation

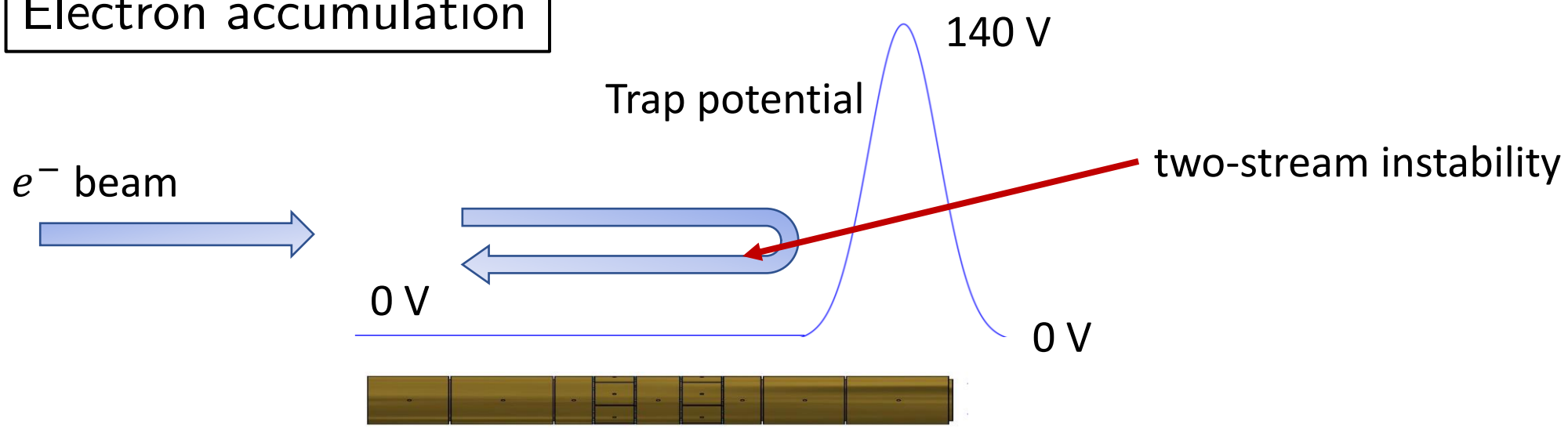


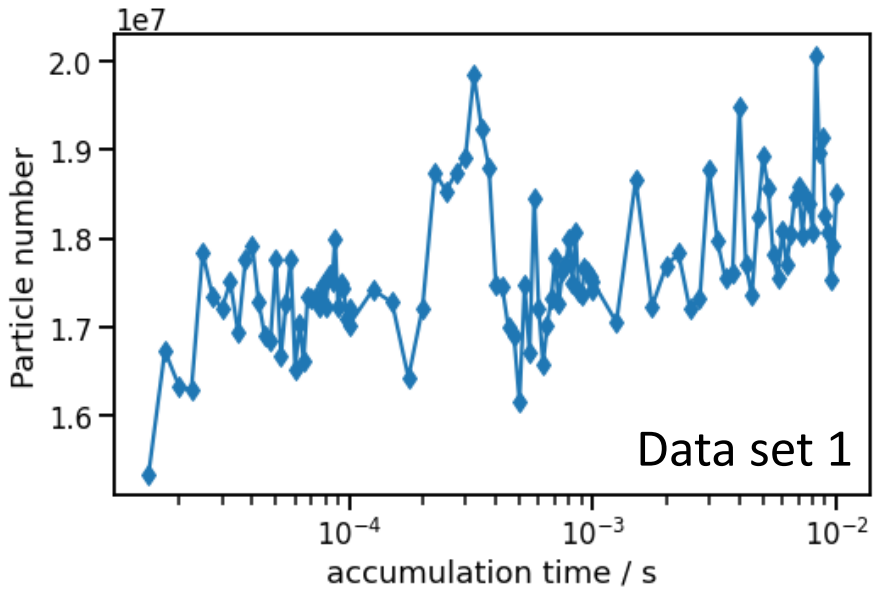


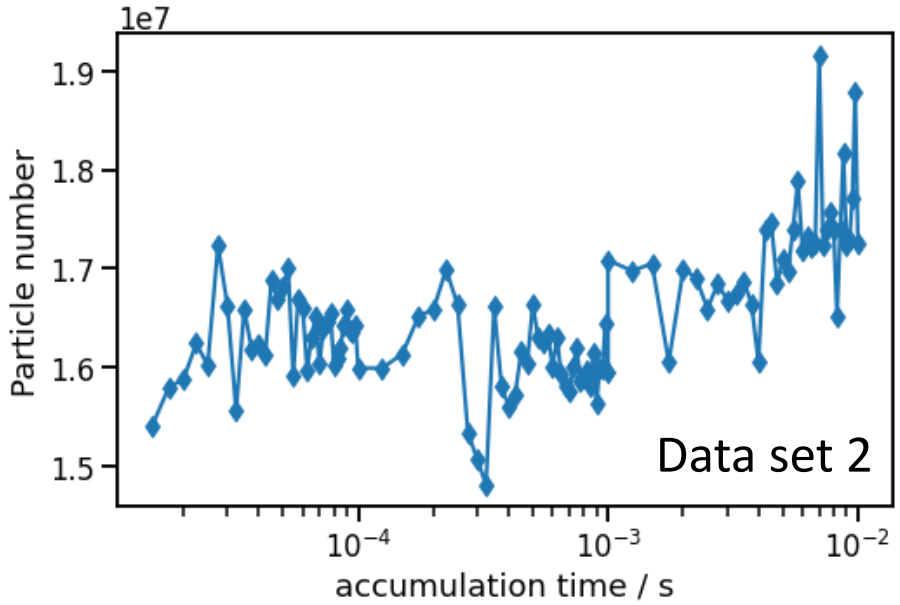




Electron accumulation

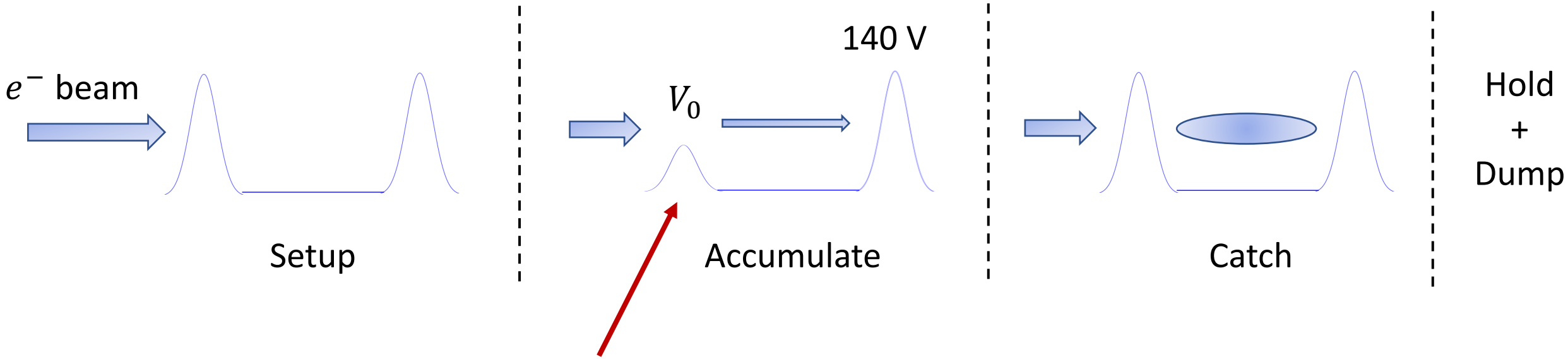






Beam catching

- Used for studying the diocotron motion

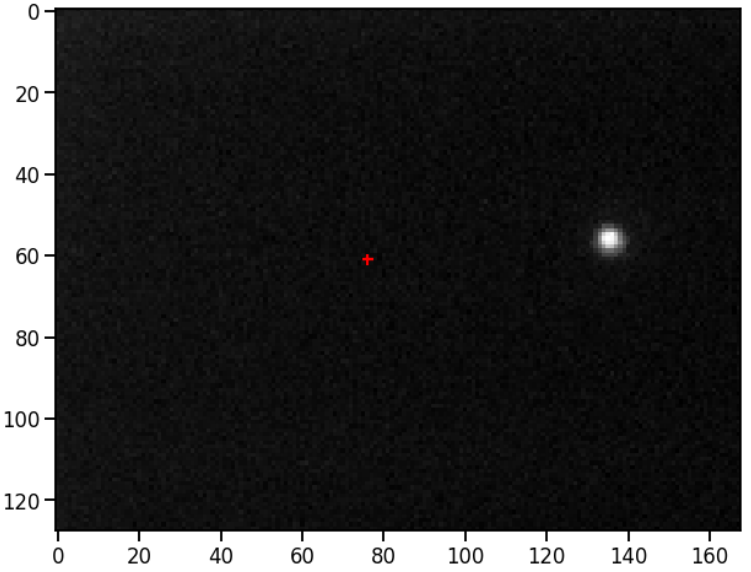


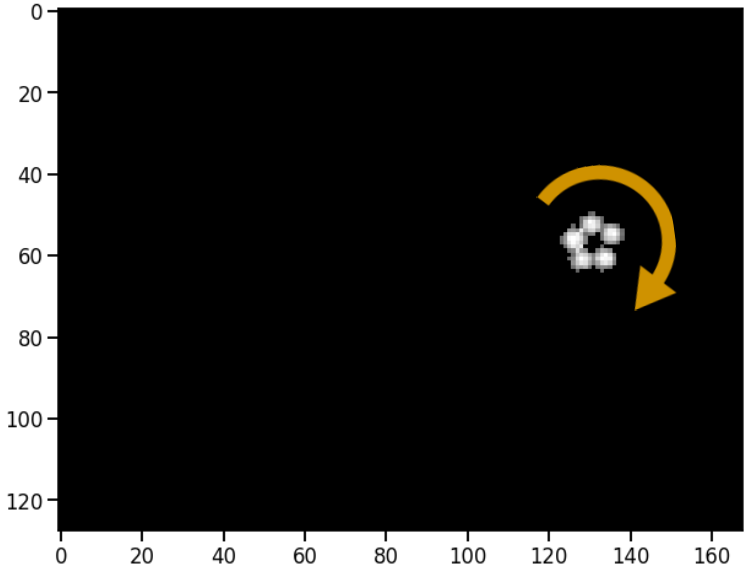
Time required for gate to
"open&close" limited to $\sim 30\ \mu s$

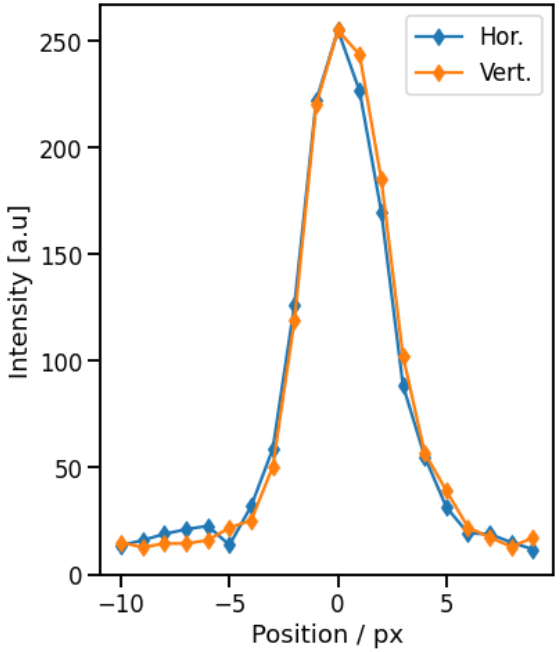
Diocotron motion

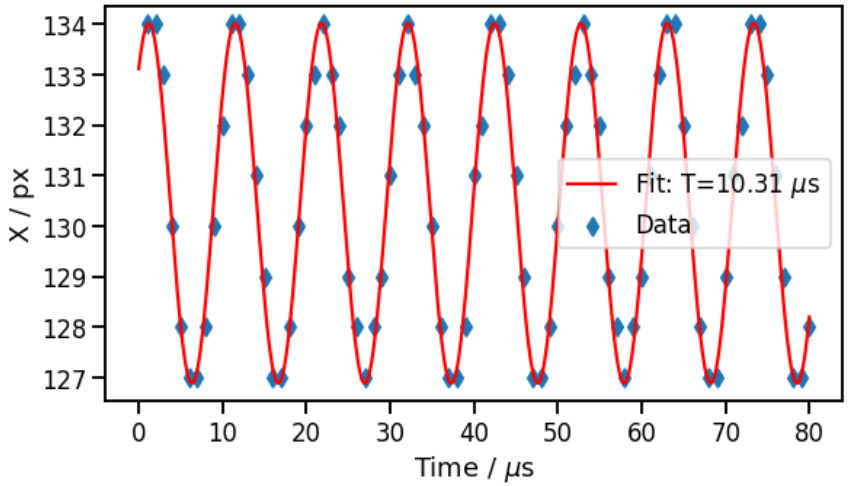
- Thin plasma column
- Low charge (V_0 = 20V)
- Small amplitude

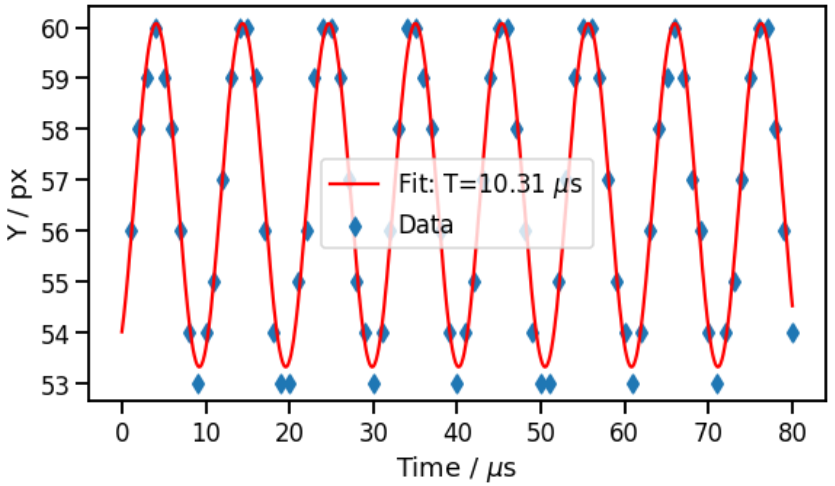
P-screen image







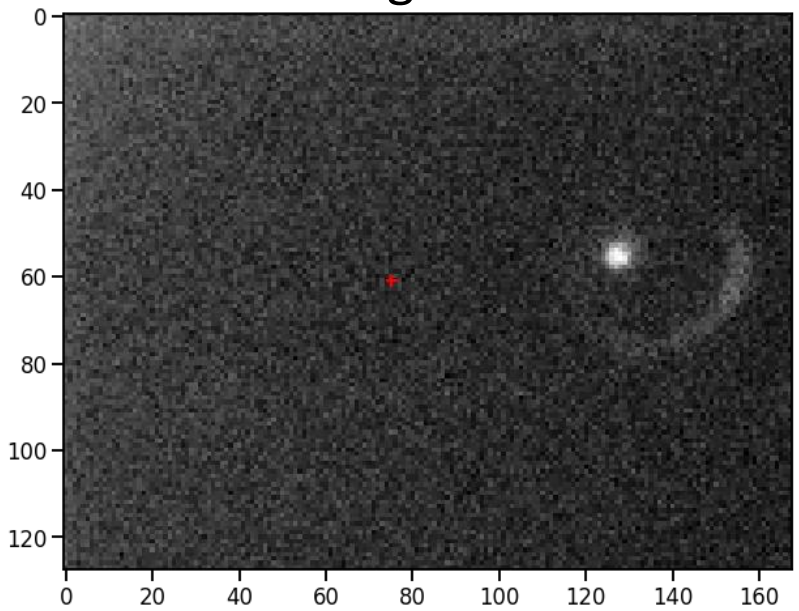


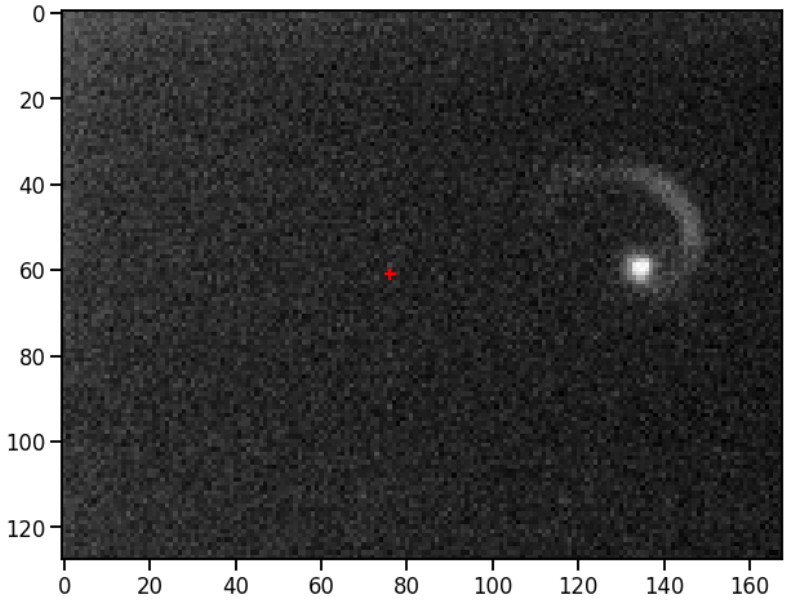


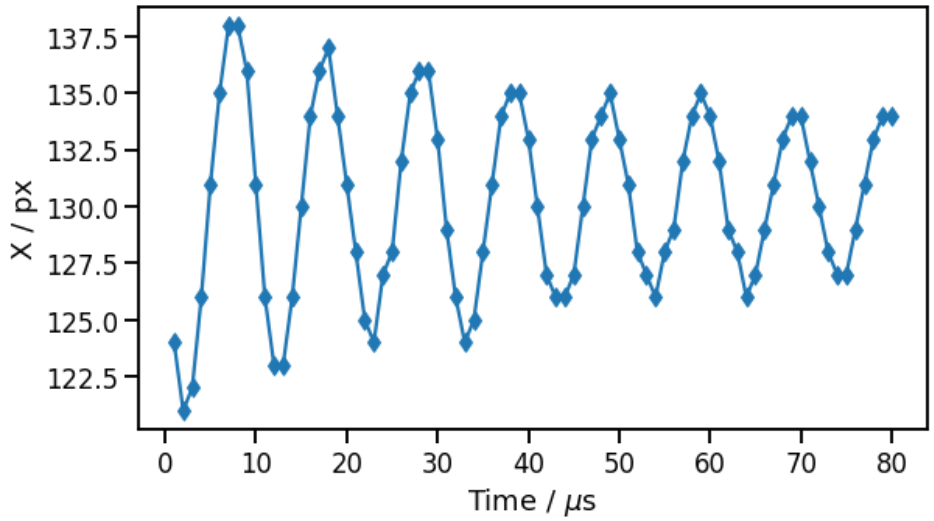
Diocotron motion

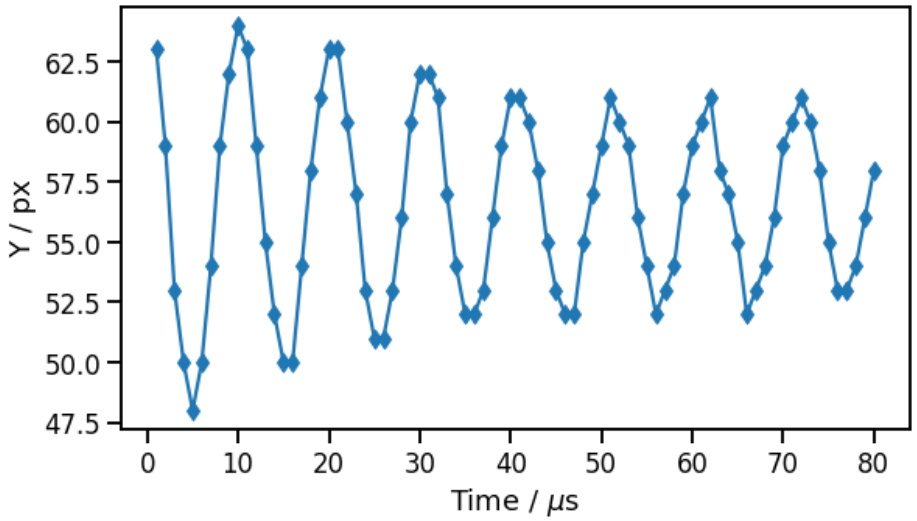
- Larger amplitudes lead to formation of a ‘tail’

P-screen image





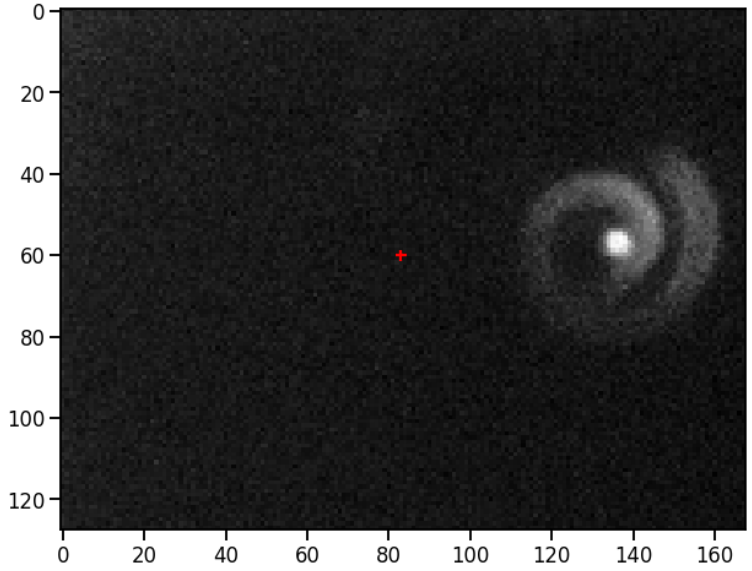


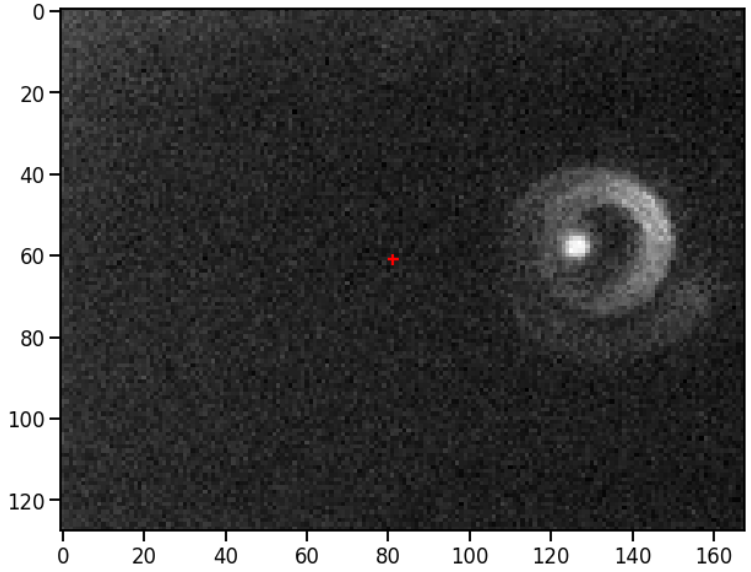


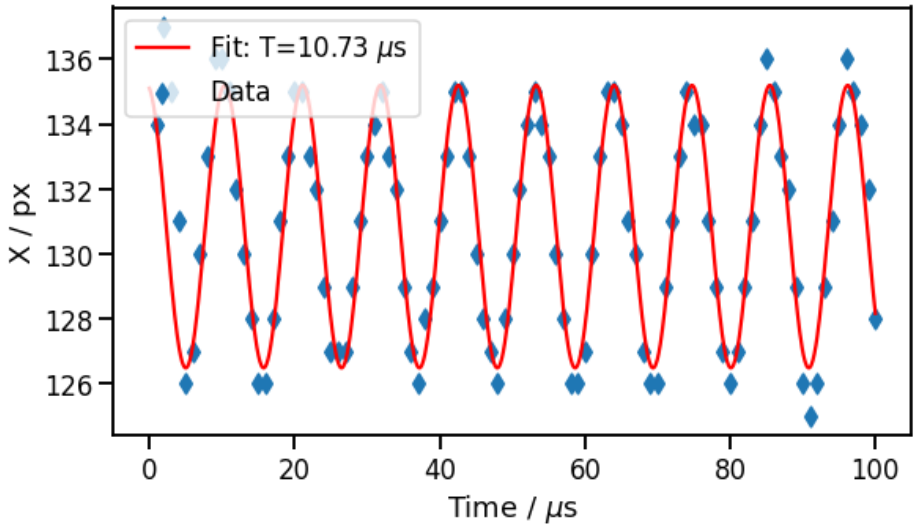
Diocotron motion

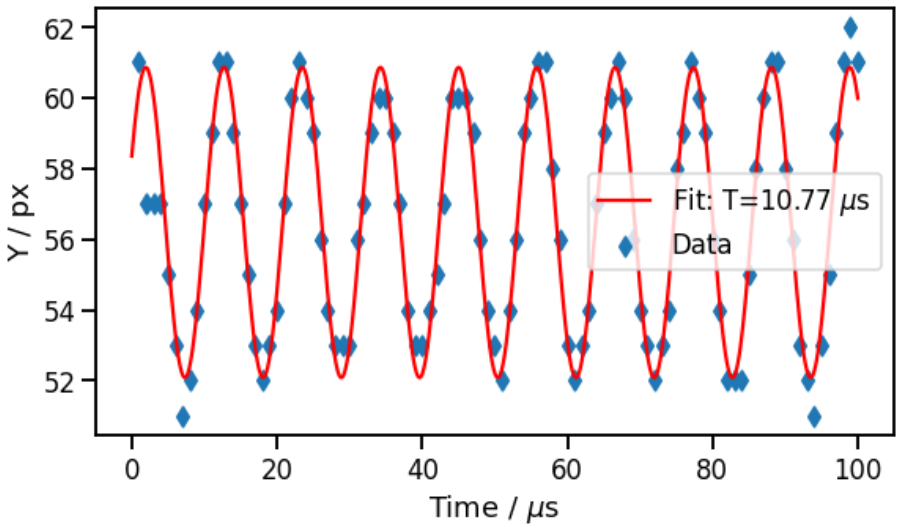
- Higher charge (V_0 = 0V)
  - ~ 4 times higher
- Small amplitude

P-screen image









Further observations

- ‘Tails’ start to appear for higher space-charge when
  - The beam current increases
  - Gate potential V_0 decreases

- Gate response time is comparable with the diocotron period
  - Captured electrons start to rotate while beam is still injected into the trap

- Next step:
  - Capture and accumulate beam on-axis + kick the plasma column radially