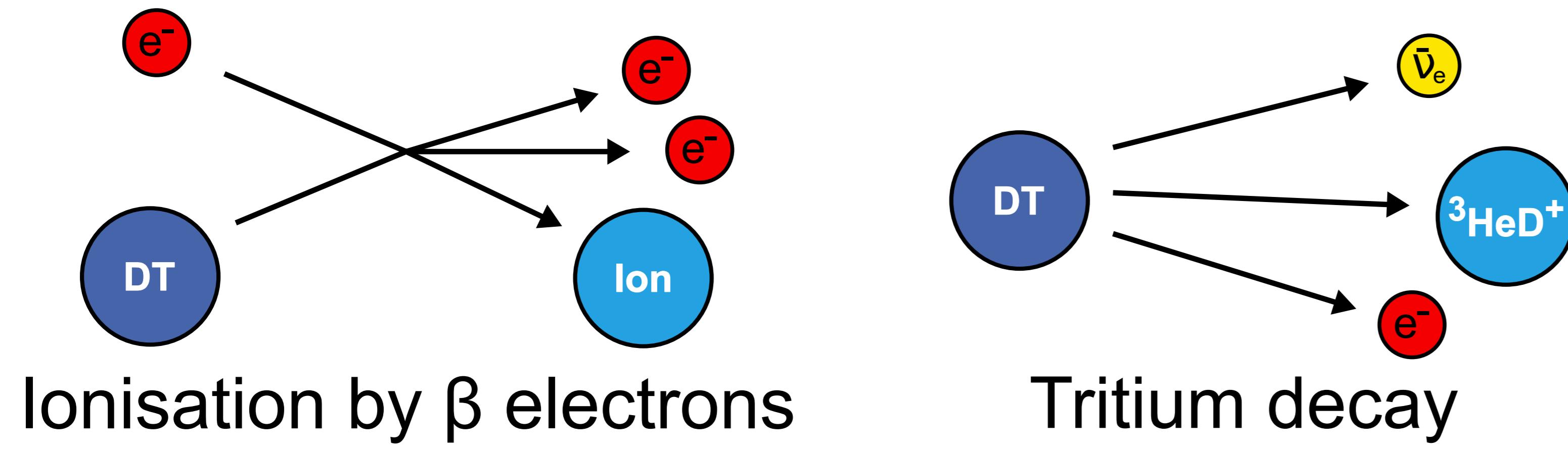


# Tritium ion monitoring during KATRIN First Tritium

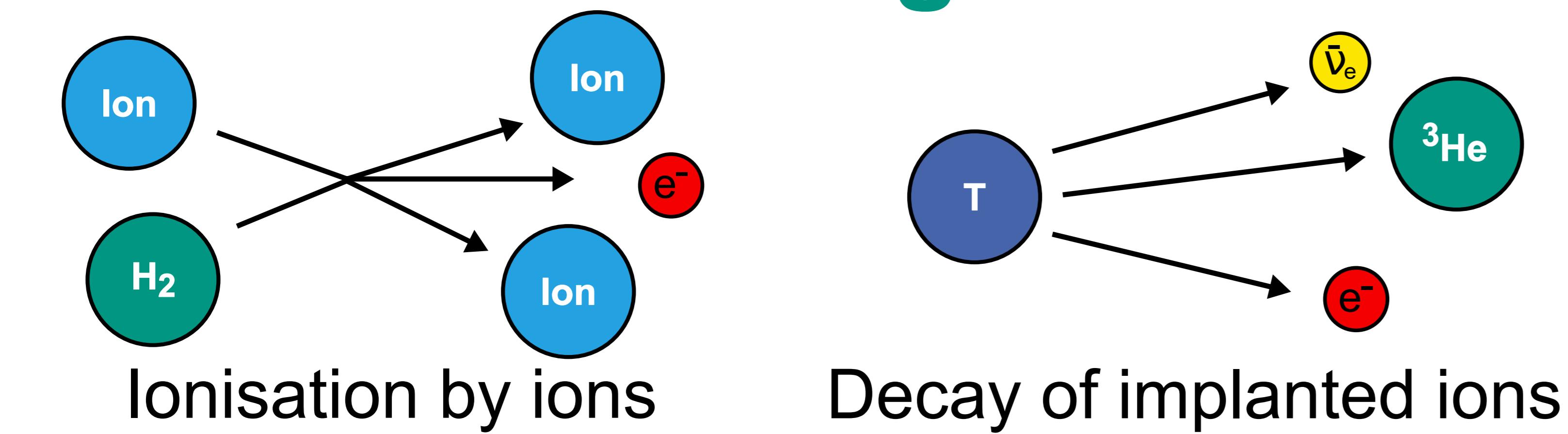
Manuel Klein, Woo-Jeong Baek, Johannes Heizmann, Rudolf Sack, Lutz Schimpf, and Ana Vizcaya Hernandez for the KATRIN Collaboration

## Ion creation in the tritium source



**Ion creation rate:**  $6 \cdot 10^9$  ions/s

## Ion induced background in the MS



→ Ion flux limit into the PS:  $10^4$  ions/s

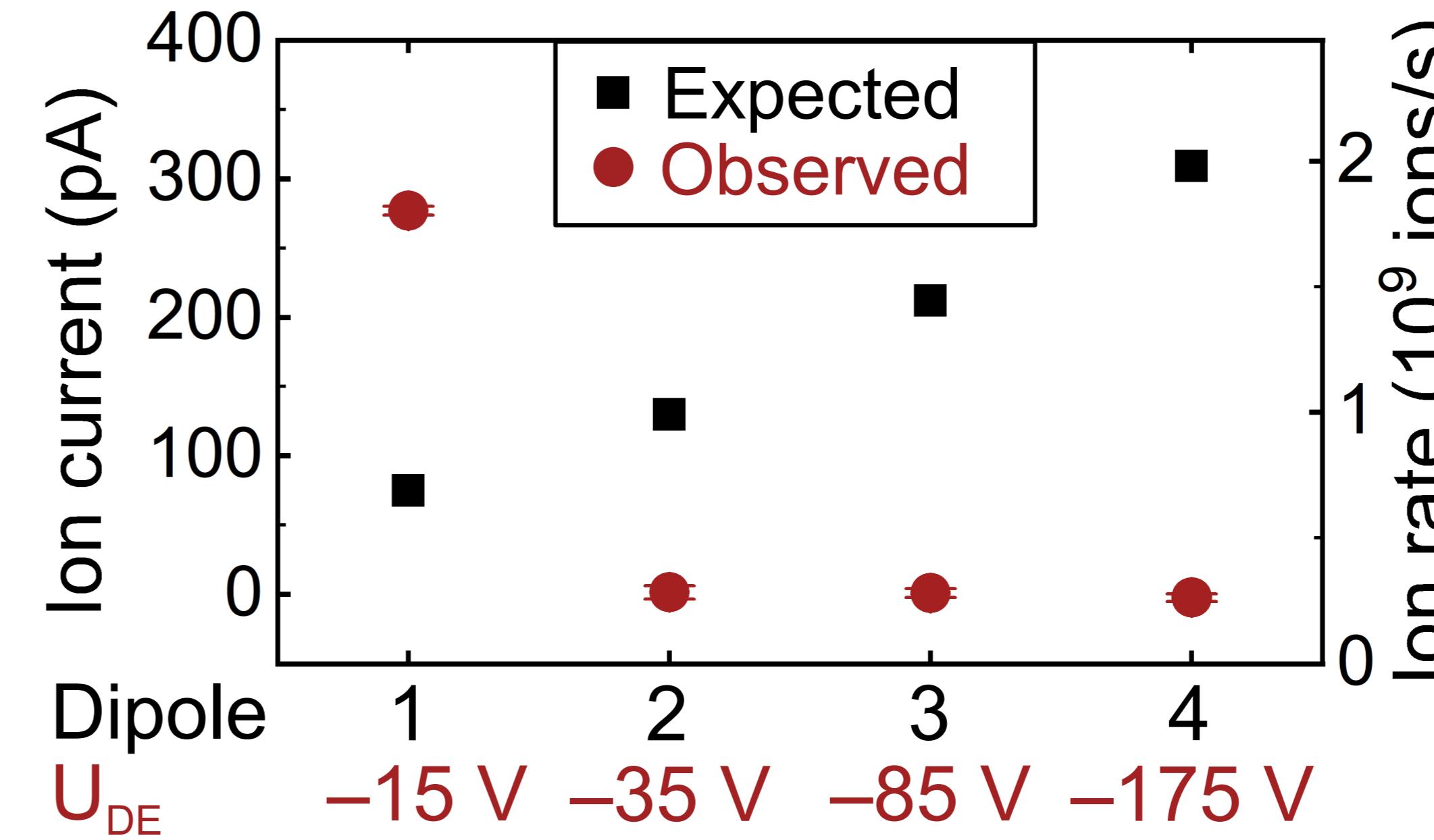
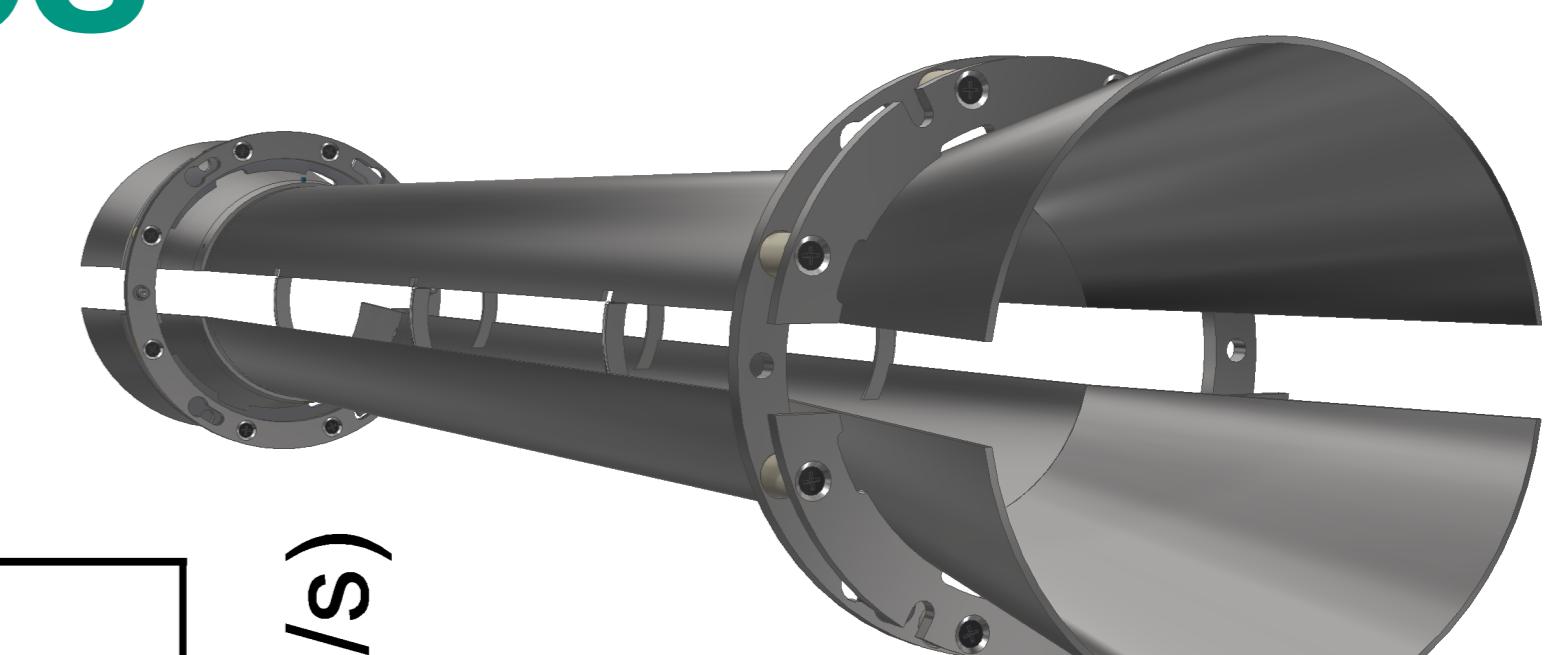
## Ring electrodes

block ions with +200 V

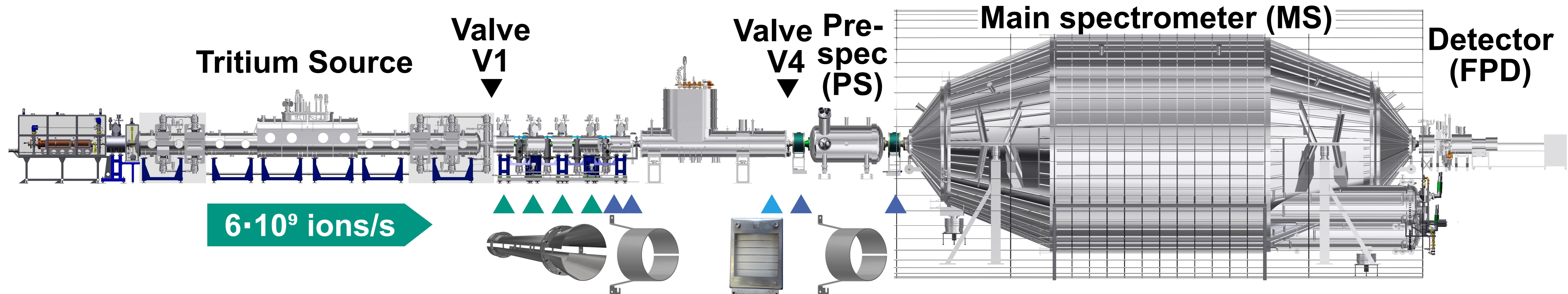


## Dipole electrodes

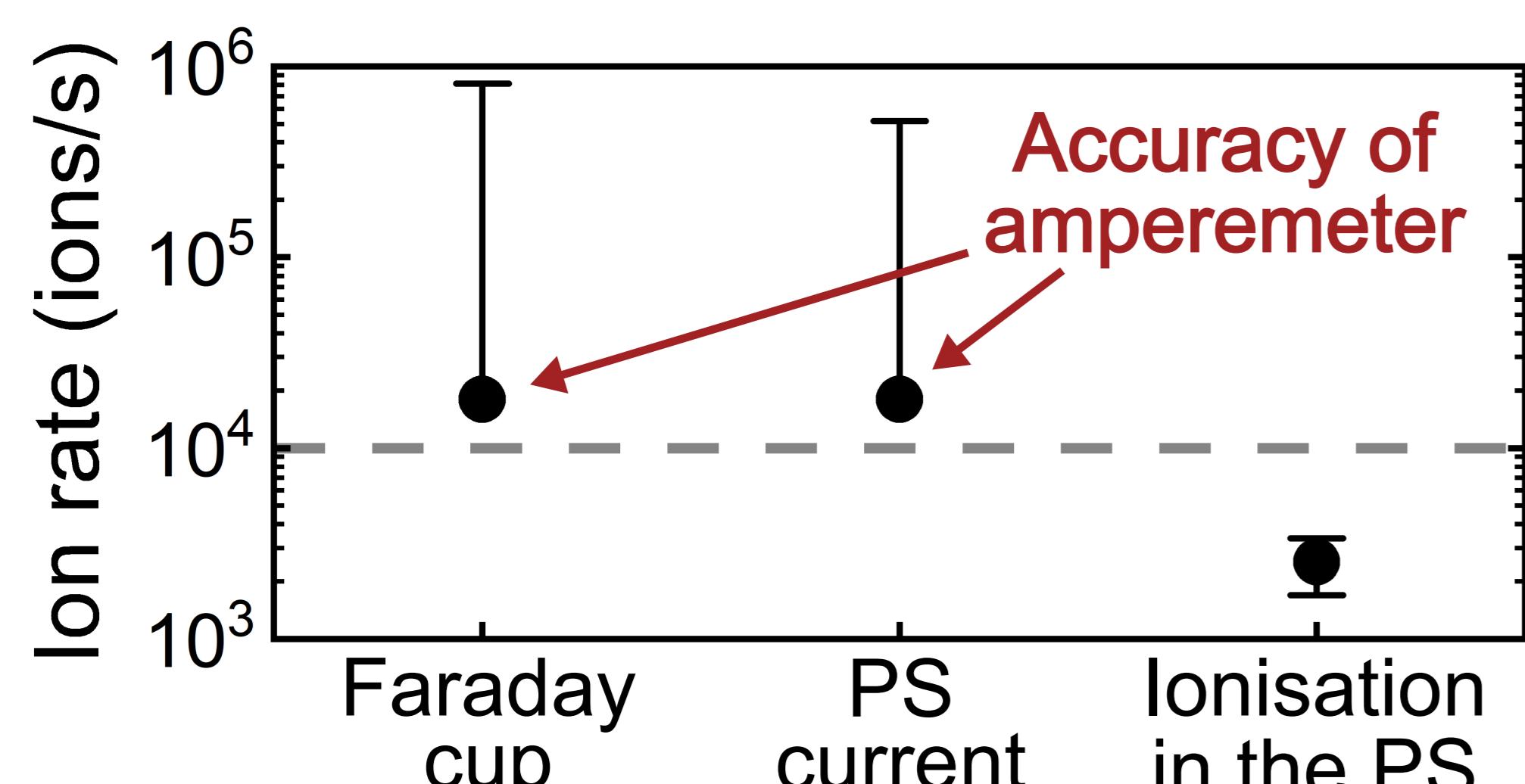
remove ions via E $\times$ B-drift and measure the current from ion neutralisation



Ions are inadvertently blocked, partially in front of and behind dipole 1!



## Limit on residual ion flux

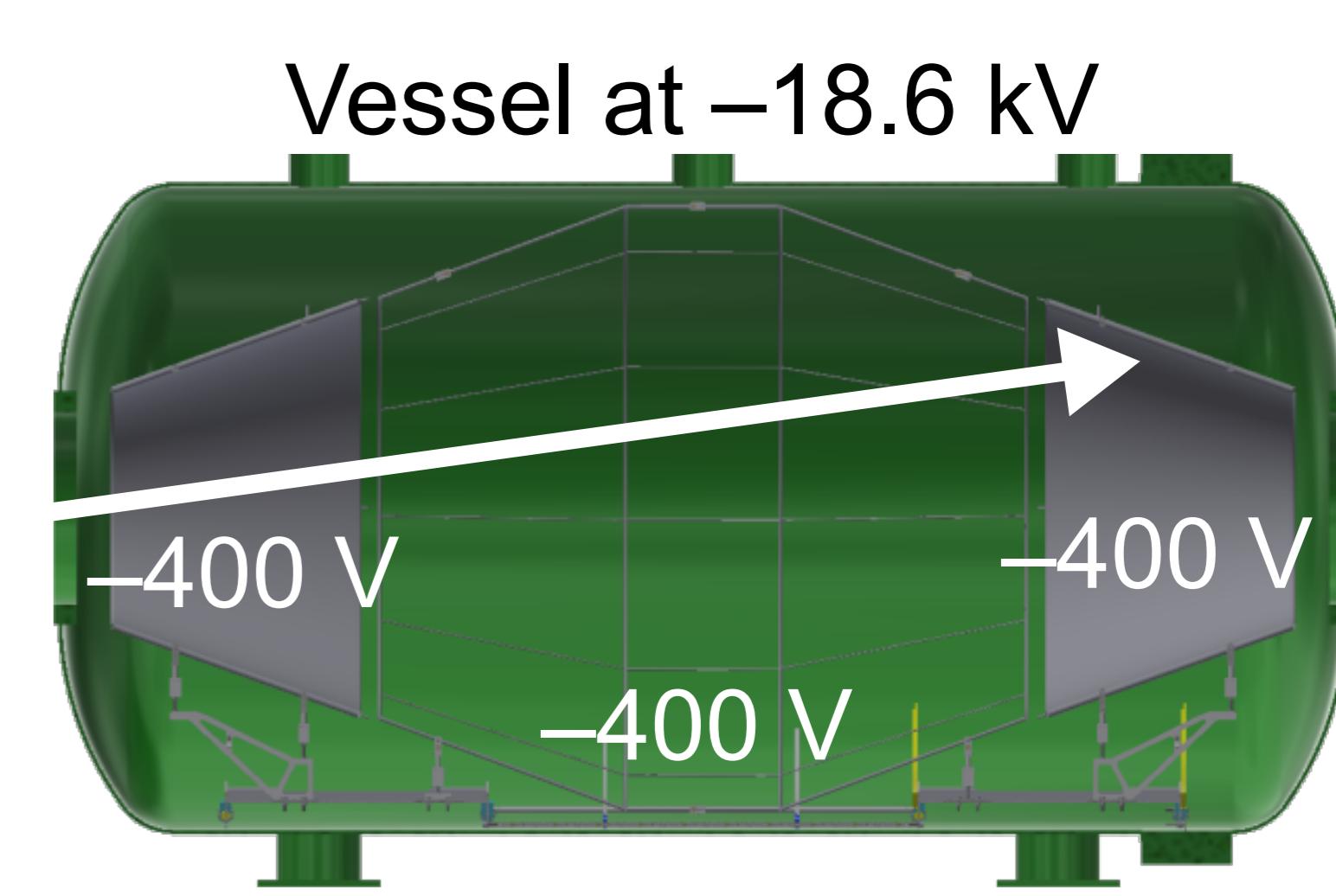


Ion blocking successful!

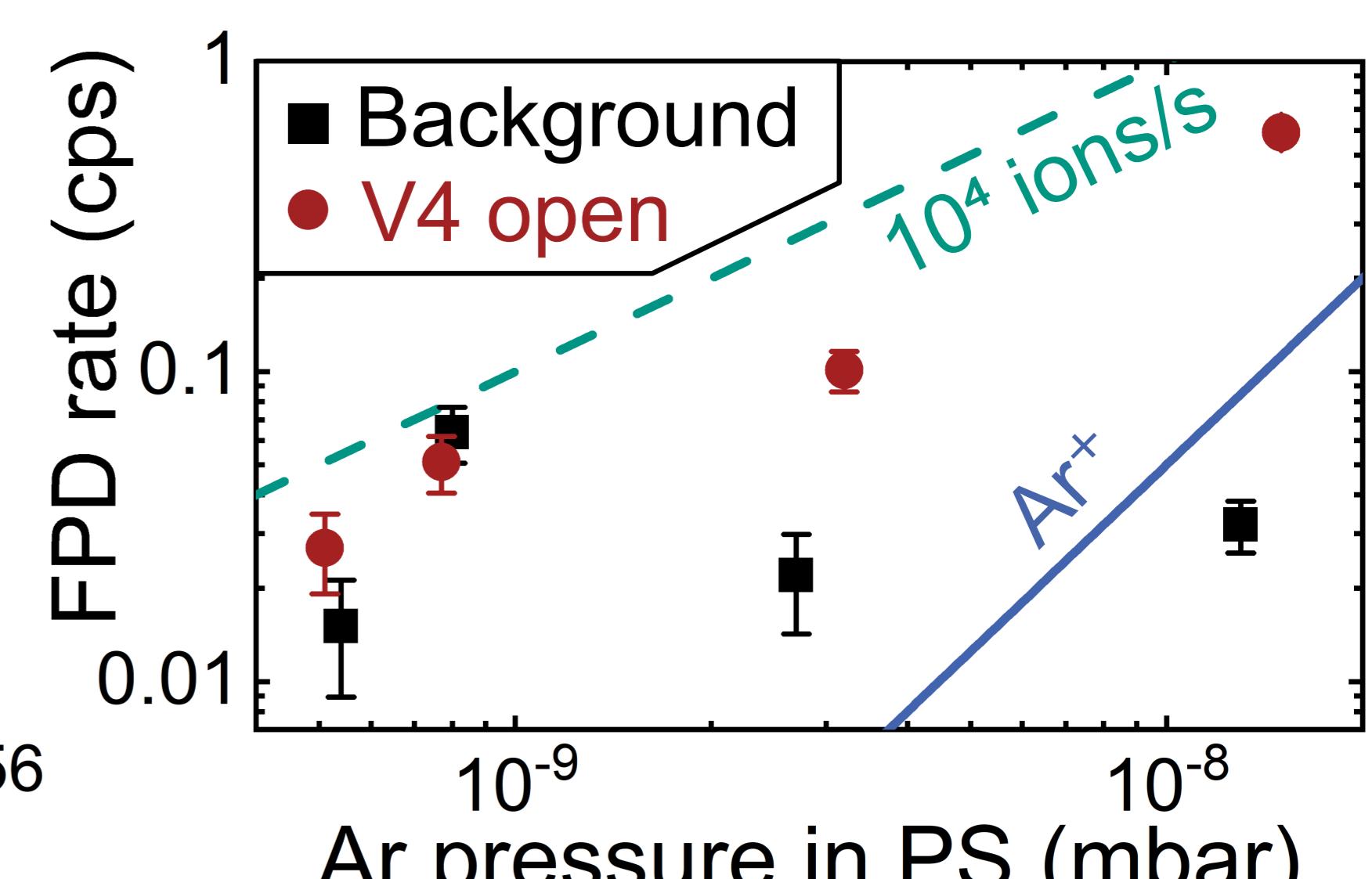
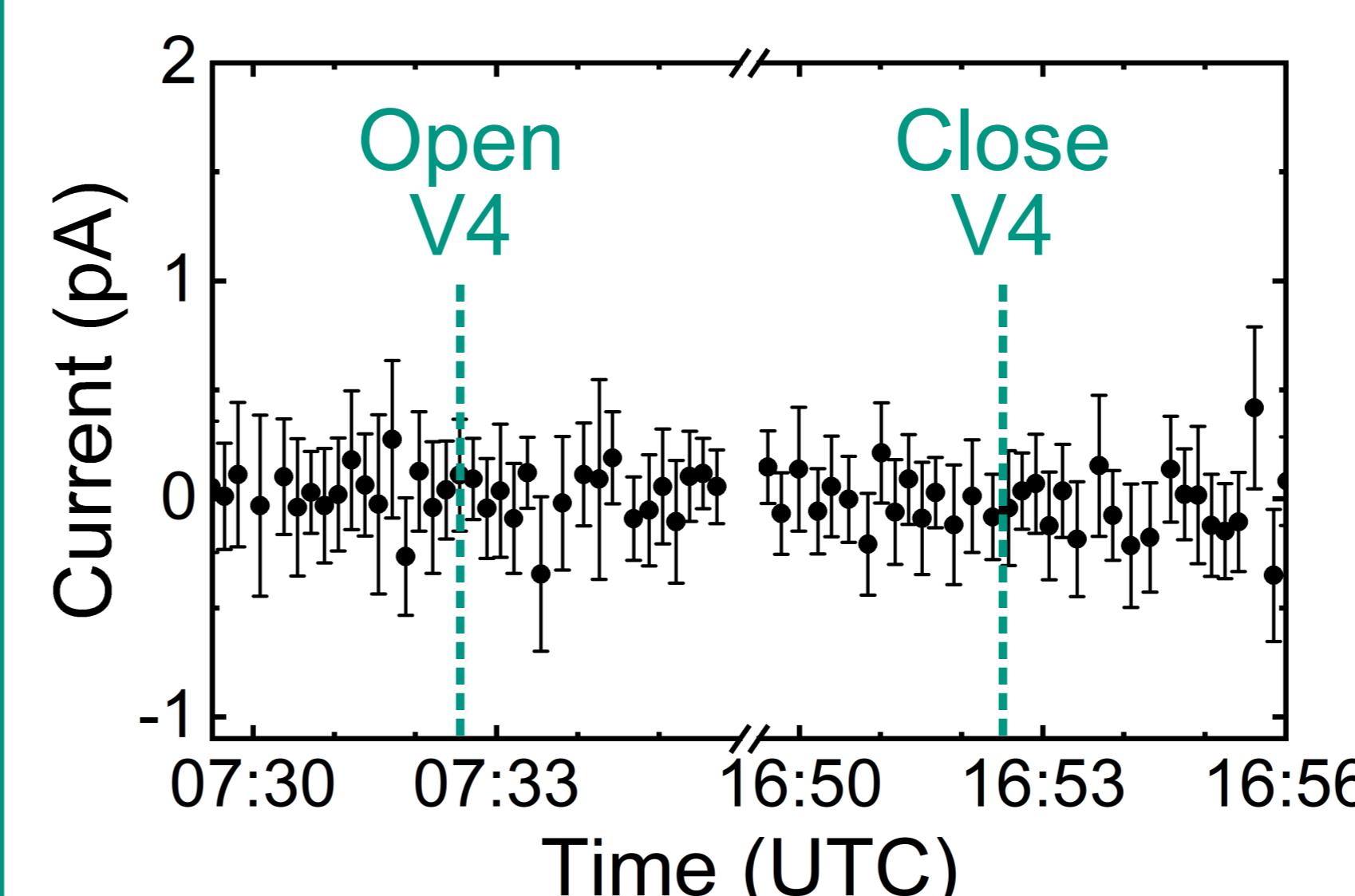
## Pre-spectrometer at -19 kV

### Ion tracking simulations

- <  $10^{-4}$  of ions reach the MS
- 98% of ions hit cone electrode
- $1 \cdot 10^{-6}$  FPD counts per ion at  $10^{-10}$  mbar Ar



### Neutralisation current



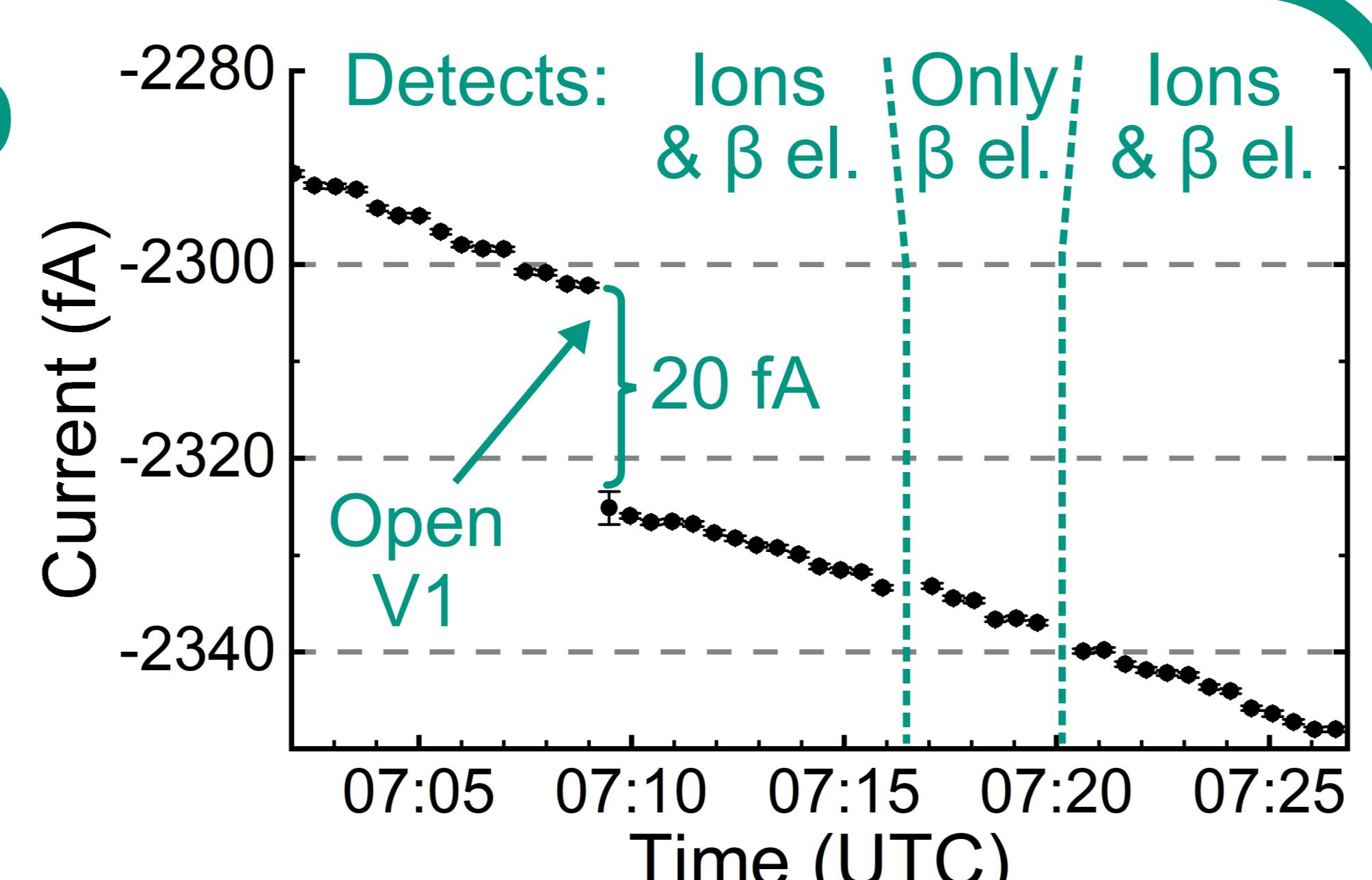
Continuous ion monitoring

<  $10^4$  ions/s from the source

## Faraday Cup

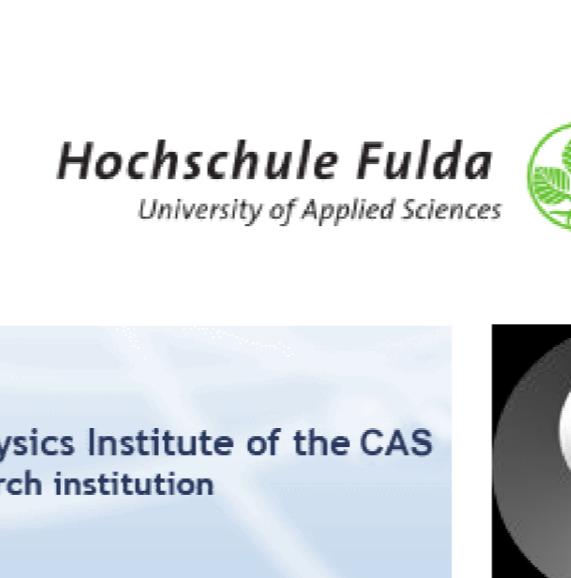
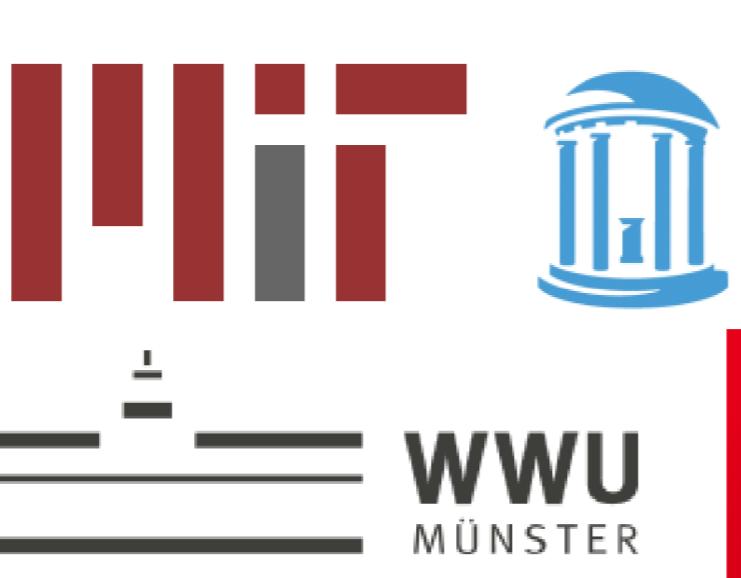
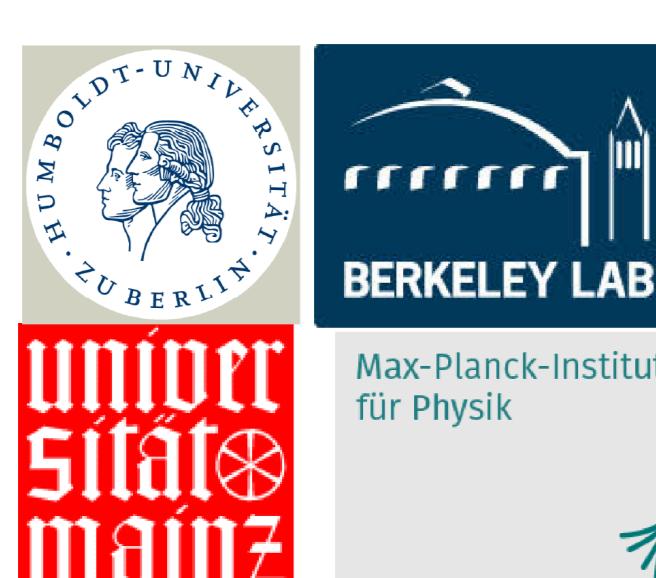


$\beta$  electron current  
Expected: 900 fA  
Observed: 20 fA



Missing beta rate

No ions observed



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