

A new electron beam ion source as charge breeder for rare isotope beams at TRIUMF

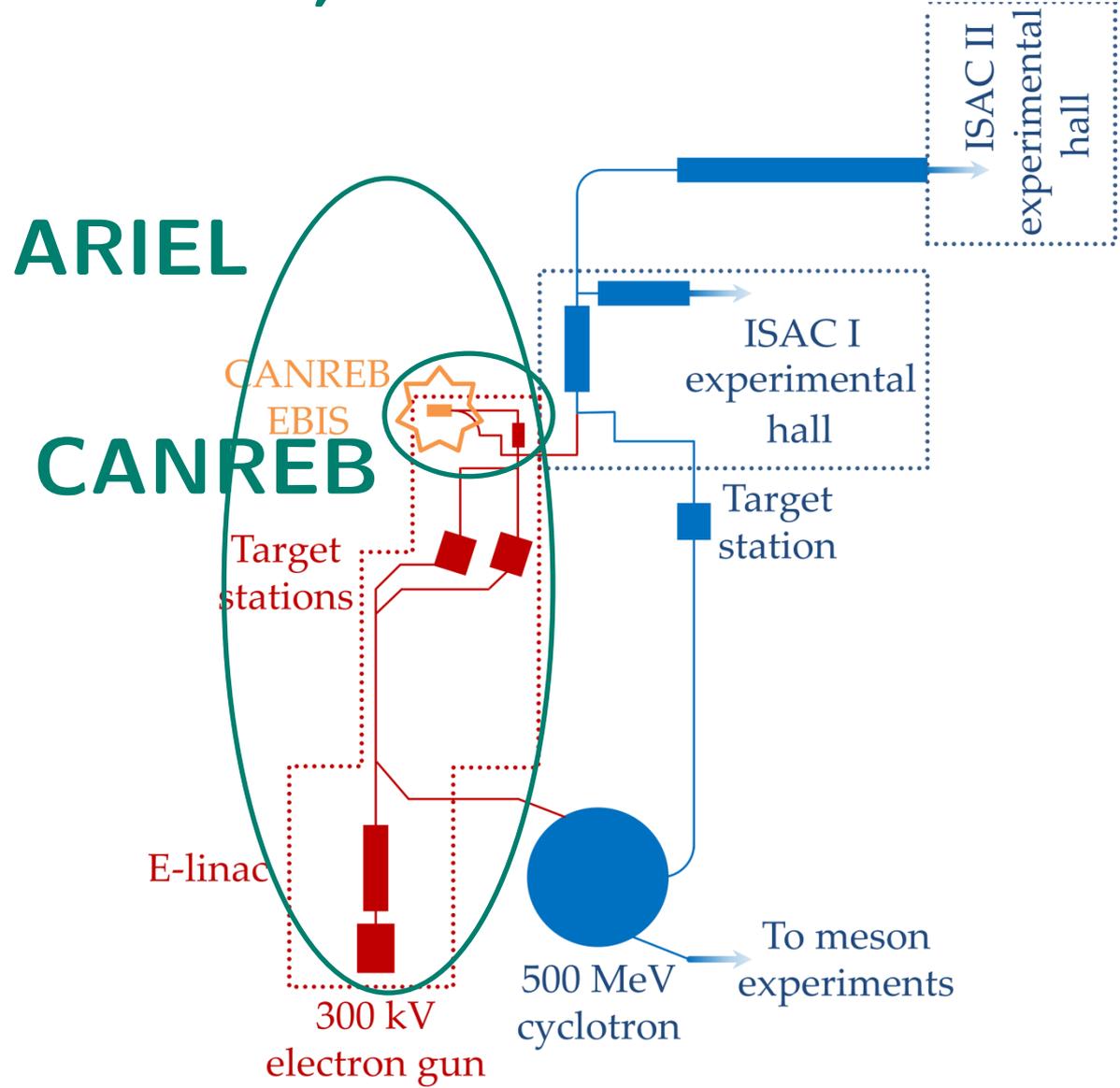
EMILIE Workshop

2016/03/21

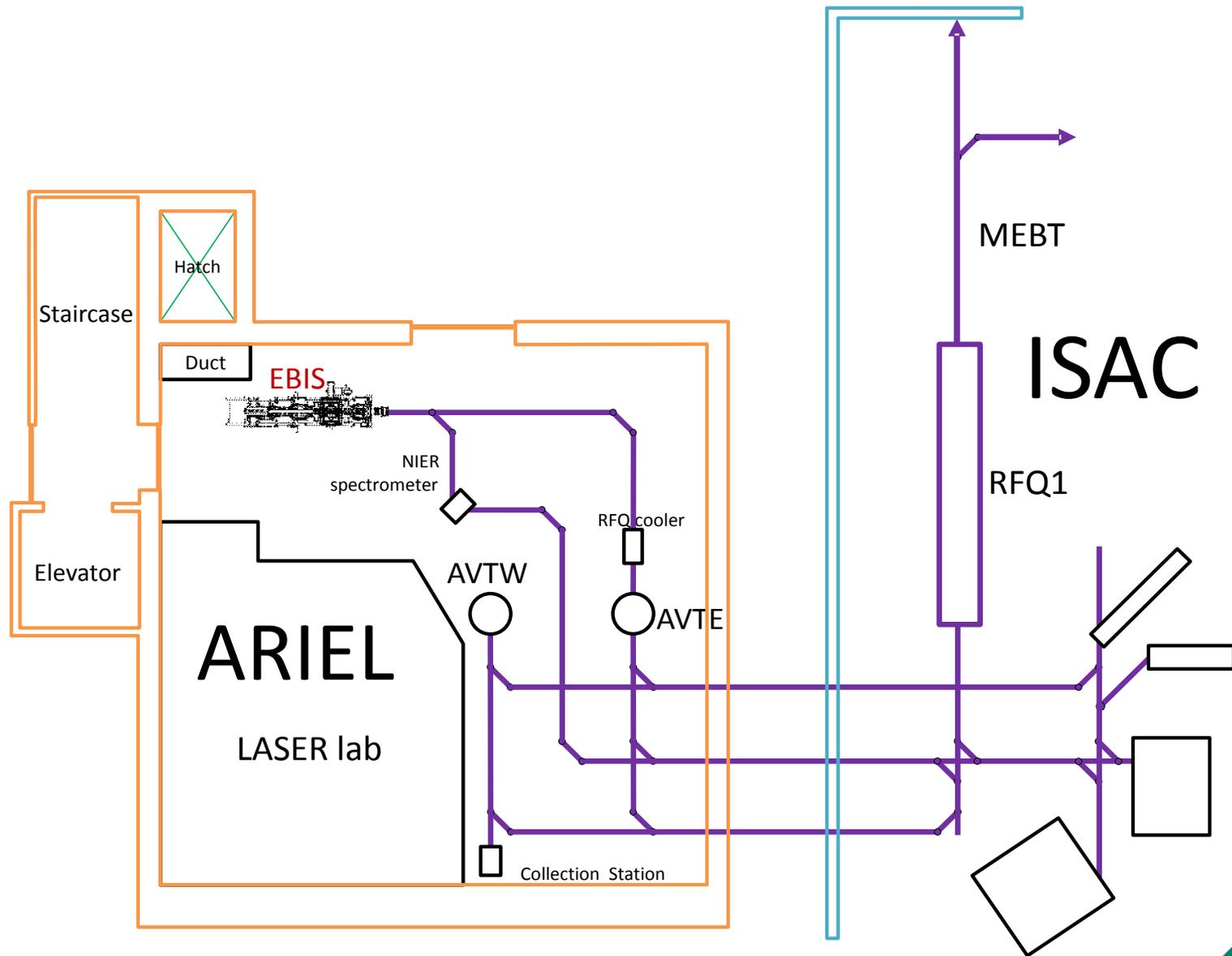
Max-Planck-Institut für Kernphysik

Michael A. Bleszenohl

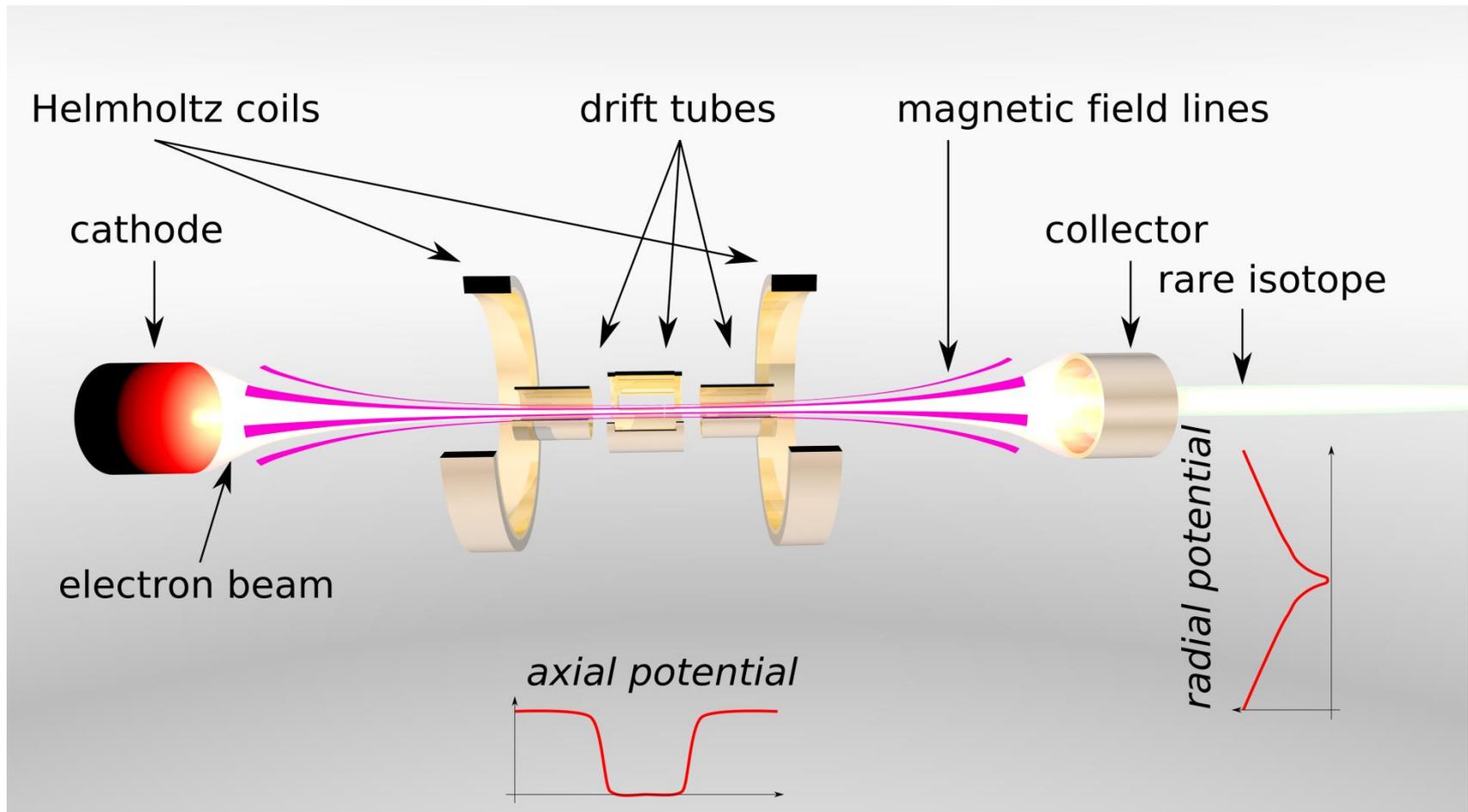
TRIUMF, ARIEL and CANREB



CANREB overview



Electron beam ion source



Challenges and requirements

- $A/q \leq 7$
- 10-20 % in charge state distribution
- 100 Hz repetition rate
- down to 10^6 ions/bunch
- lifetimes of several ms
 - “No ion is left behind”-policy

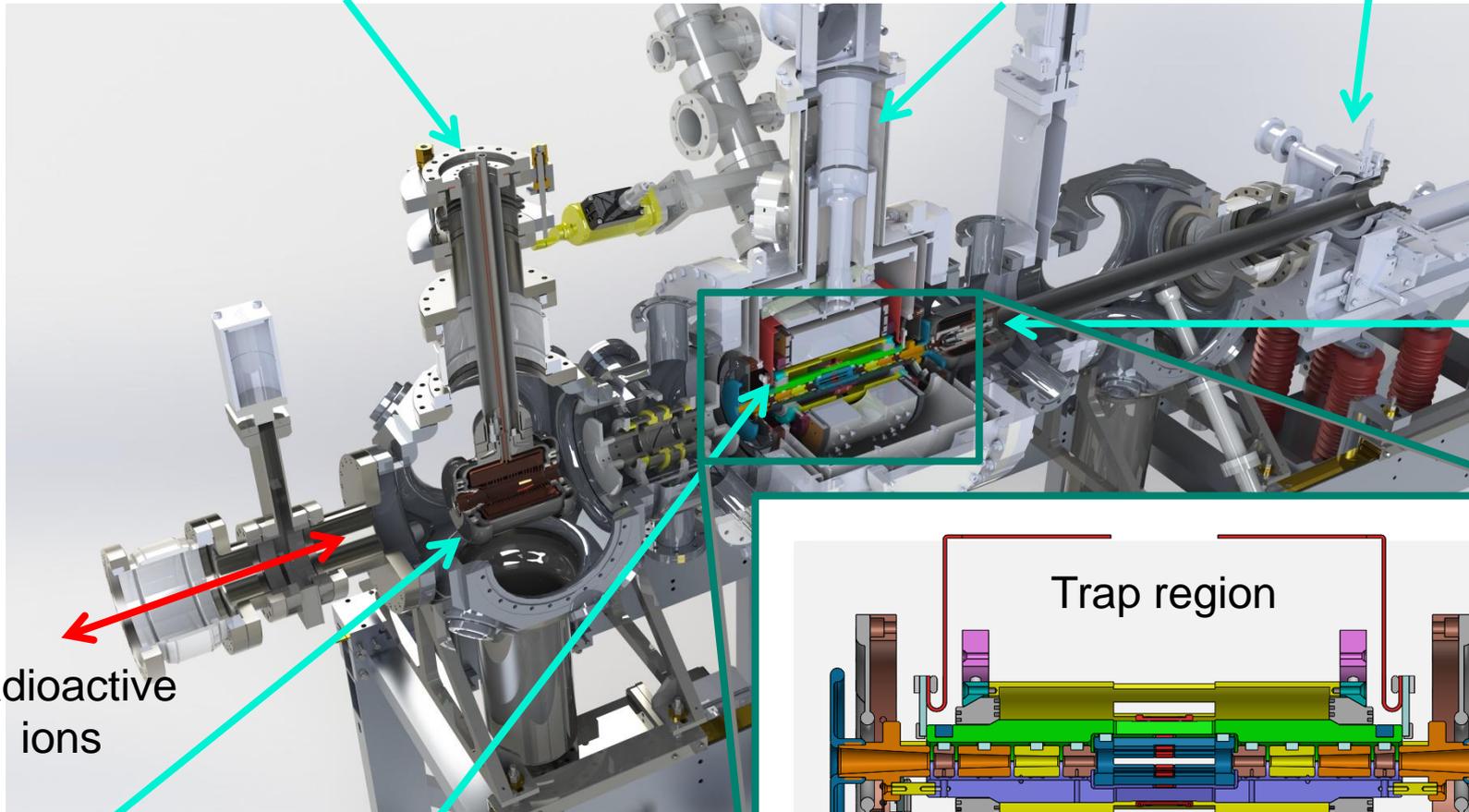
Current design status

Gun manipulator

Collector manipulator

Cryo head

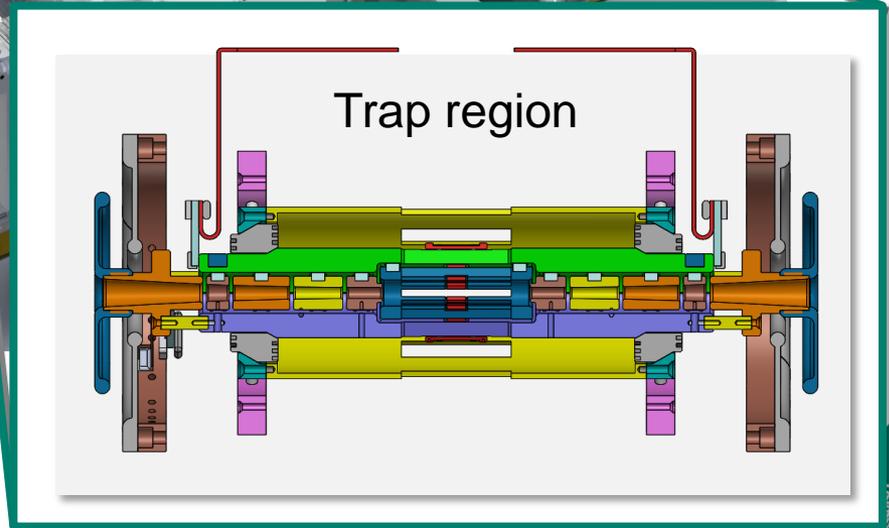
Electron gun



Radioactive ions

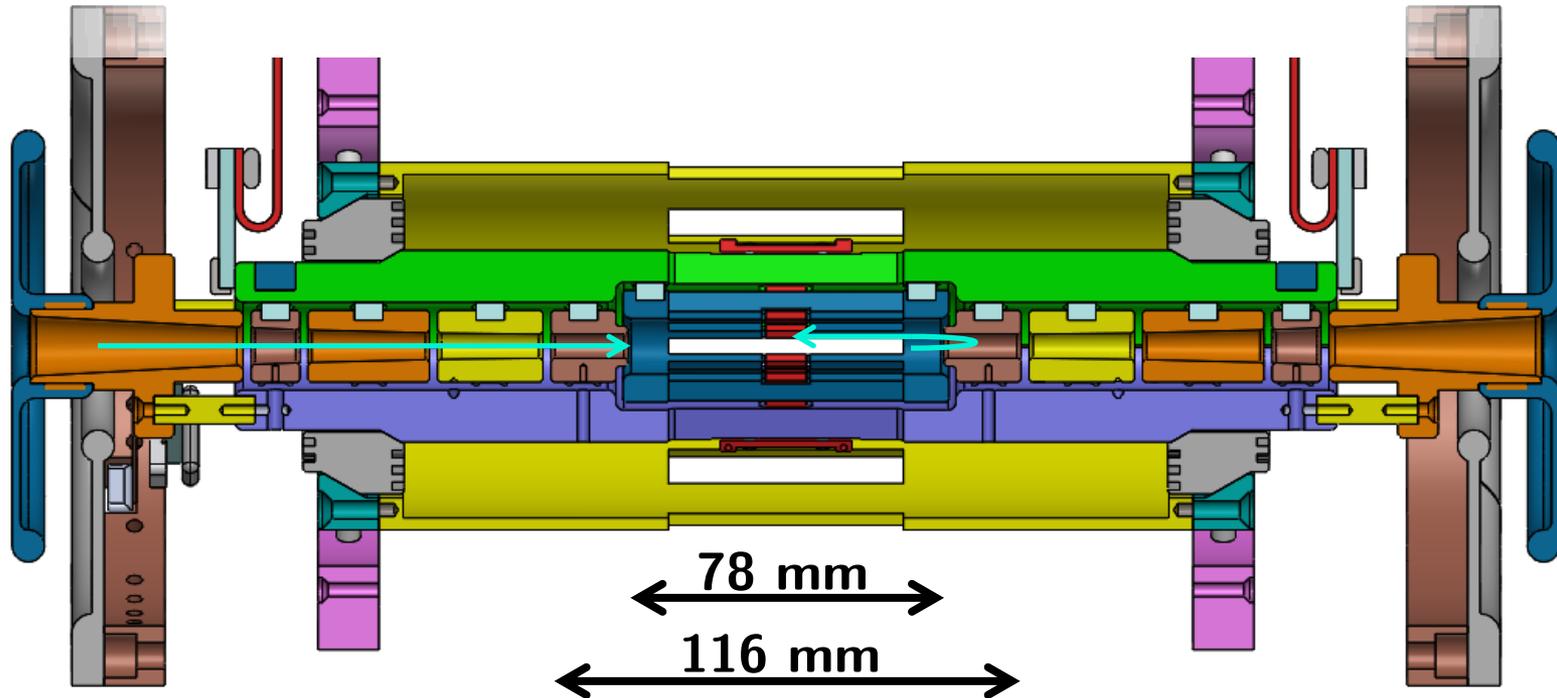
Collector

Superconducting Helmholtz magnet



Trap region

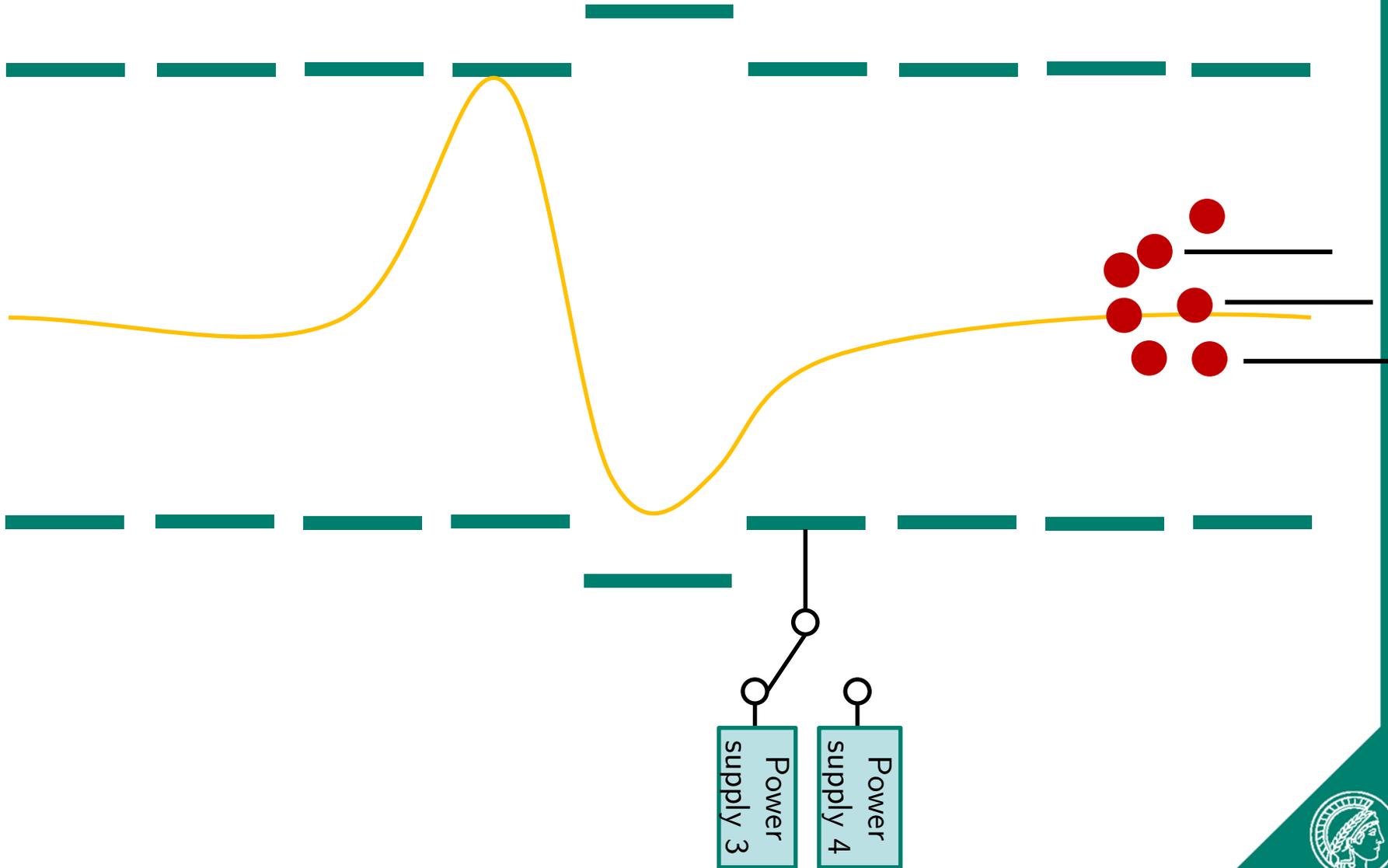
Ion time of flight in the trap



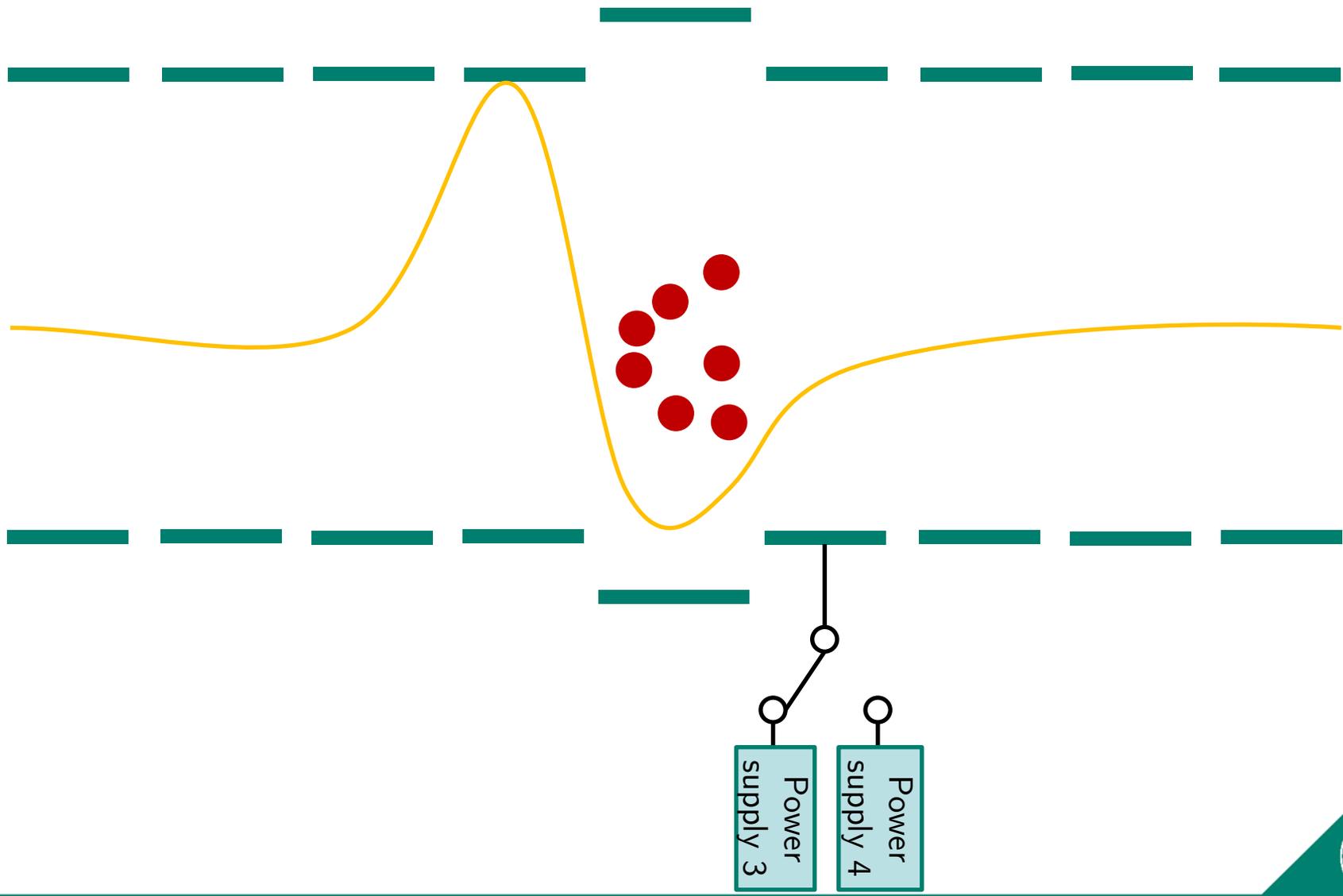
Example calculation:

- Kinetic energy in the trap: 500 eV.
- Time of flight for 2×78 mm: $2.2 \mu\text{s}$ ($M = 20$); $5.8 \mu\text{s}$ ($M = 132$).
- Time of flight for 2×116 mm: $3.3 \mu\text{s}$ ($M = 20$); $8.6 \mu\text{s}$ ($M = 132$).

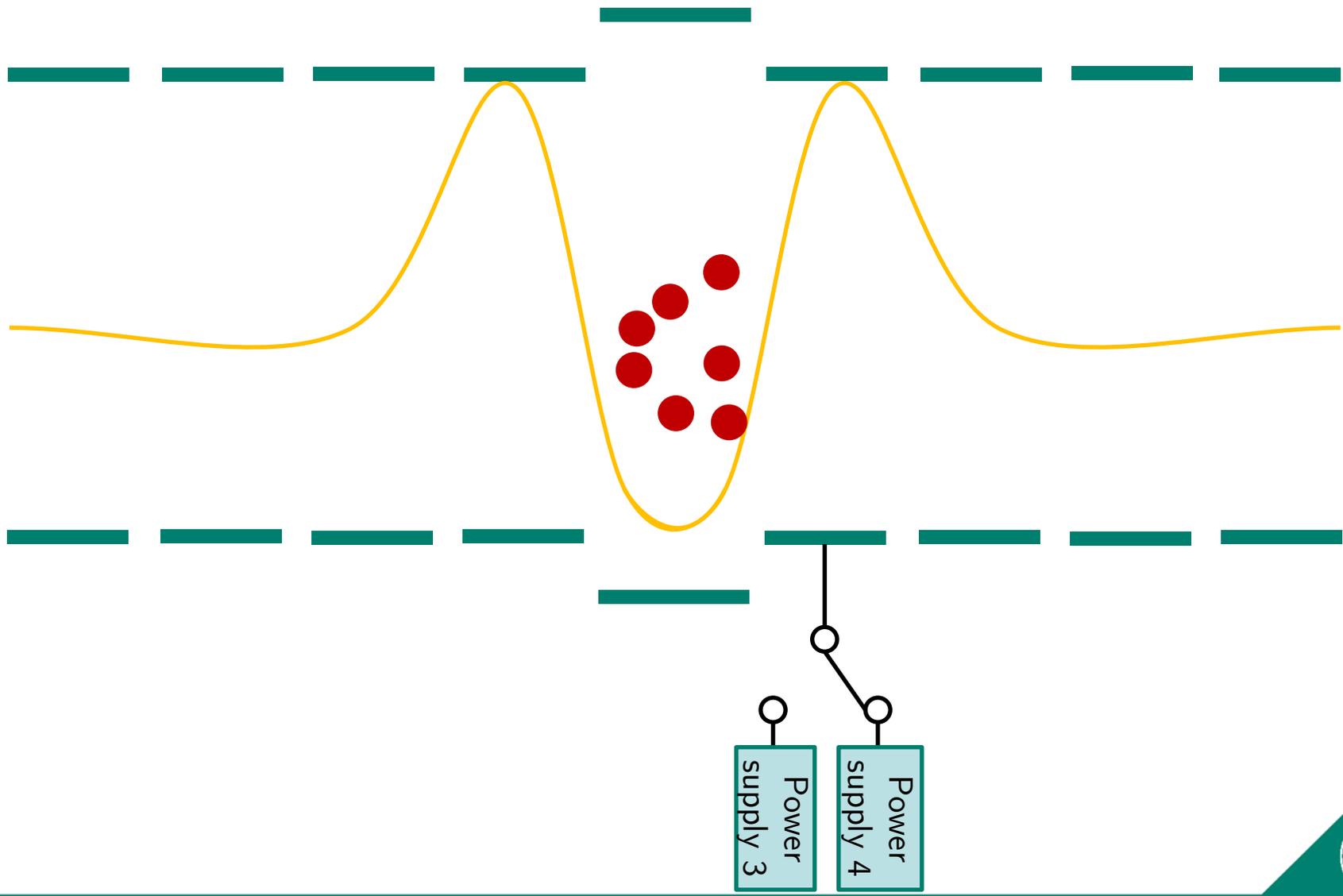
Injection scheme



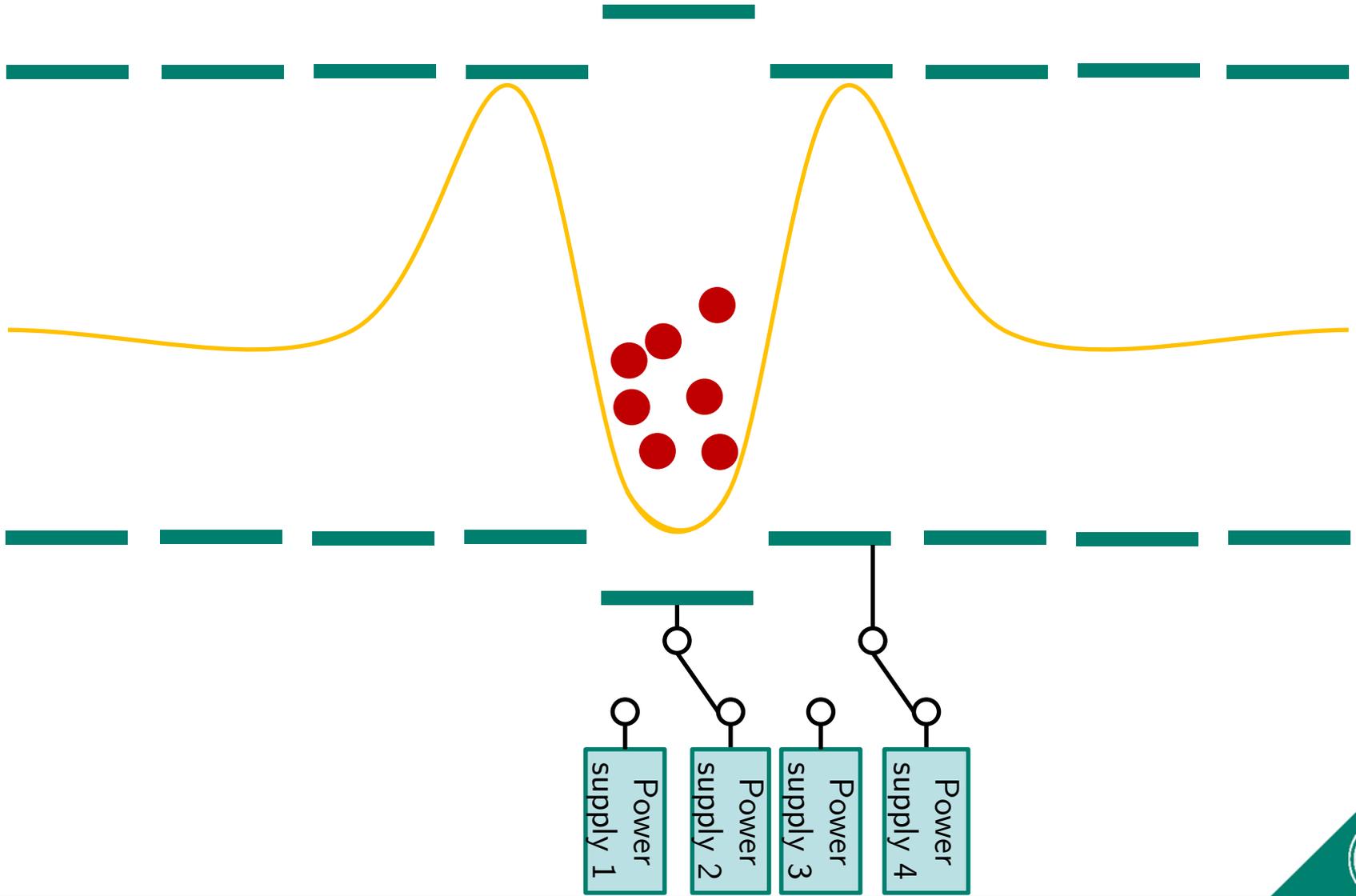
Injection scheme



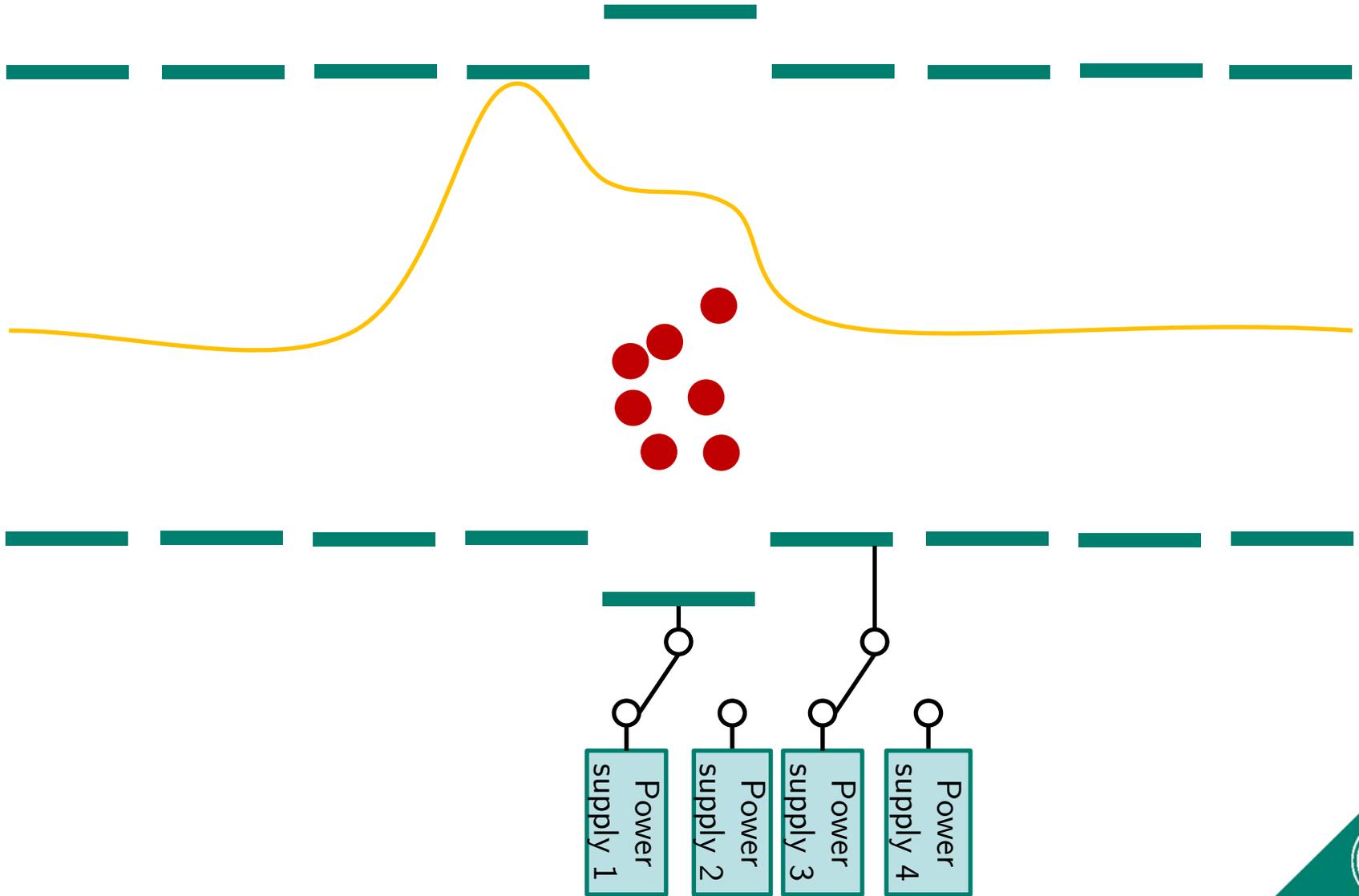
Injection scheme



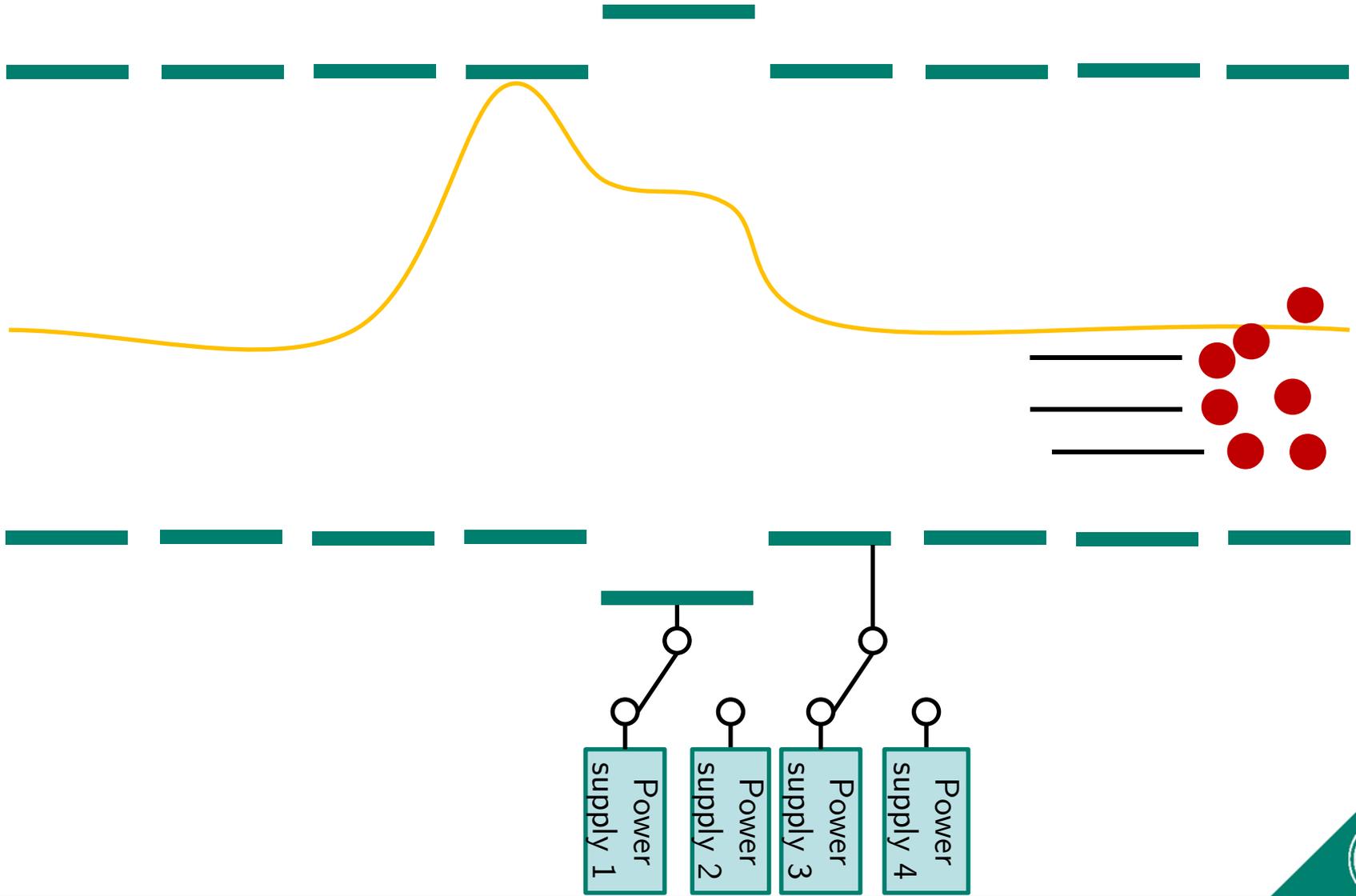
Simple extraction scheme



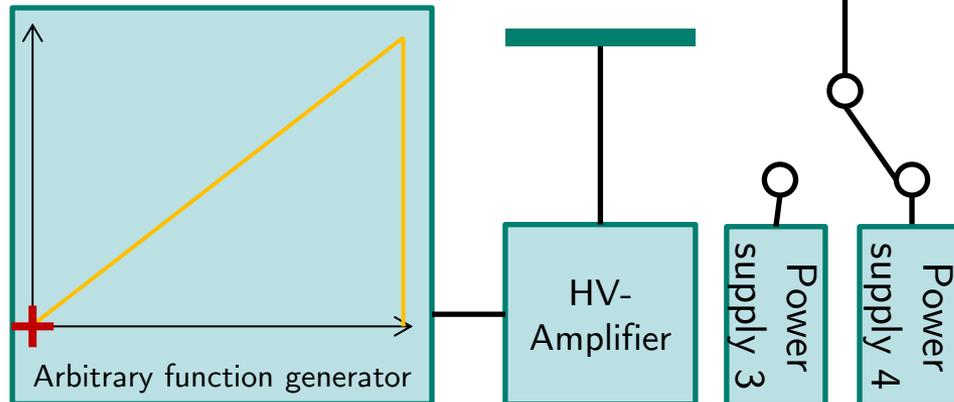
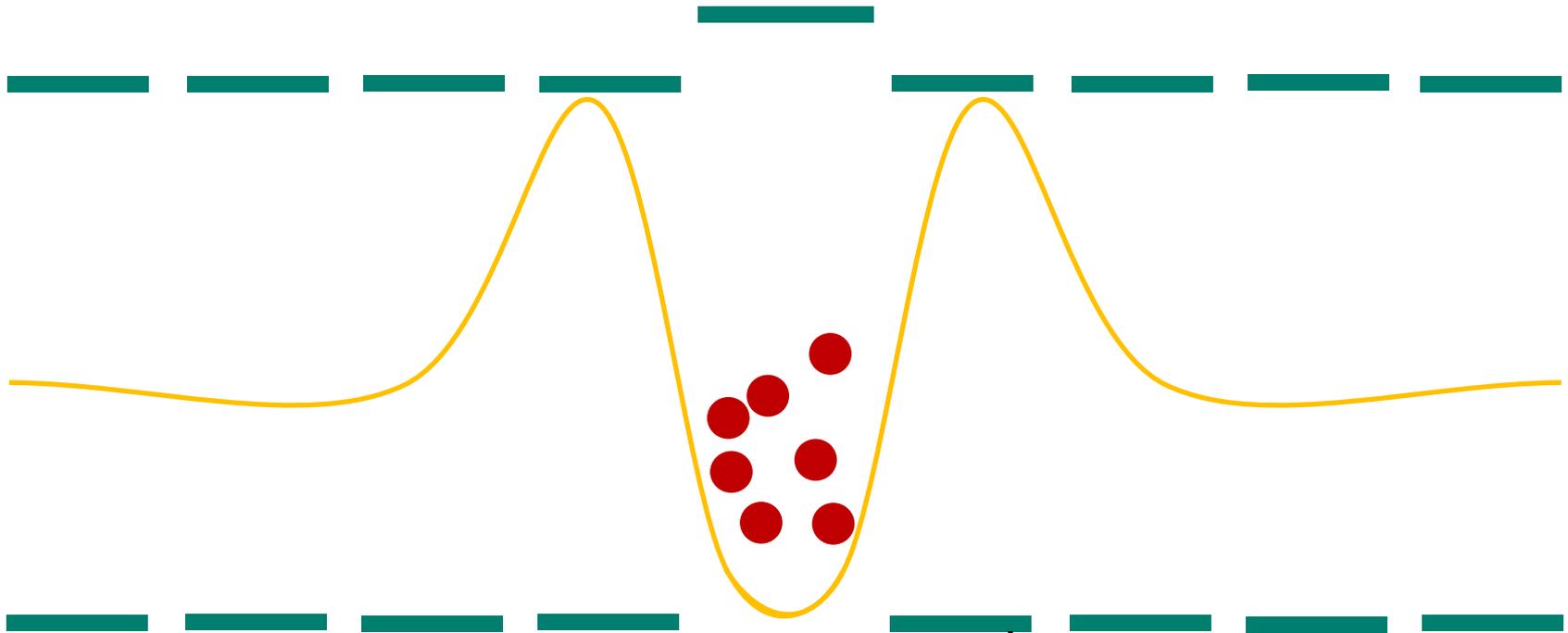
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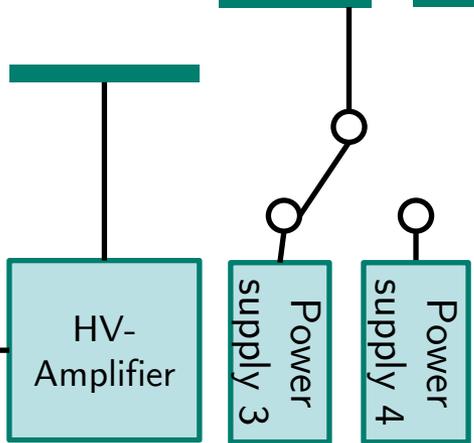
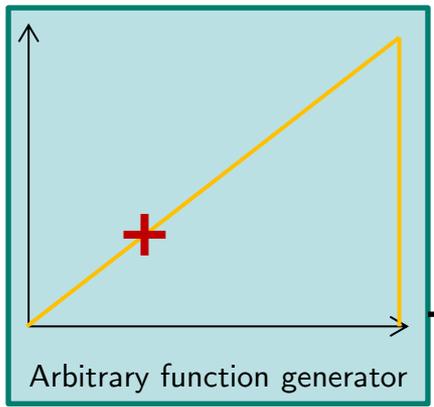
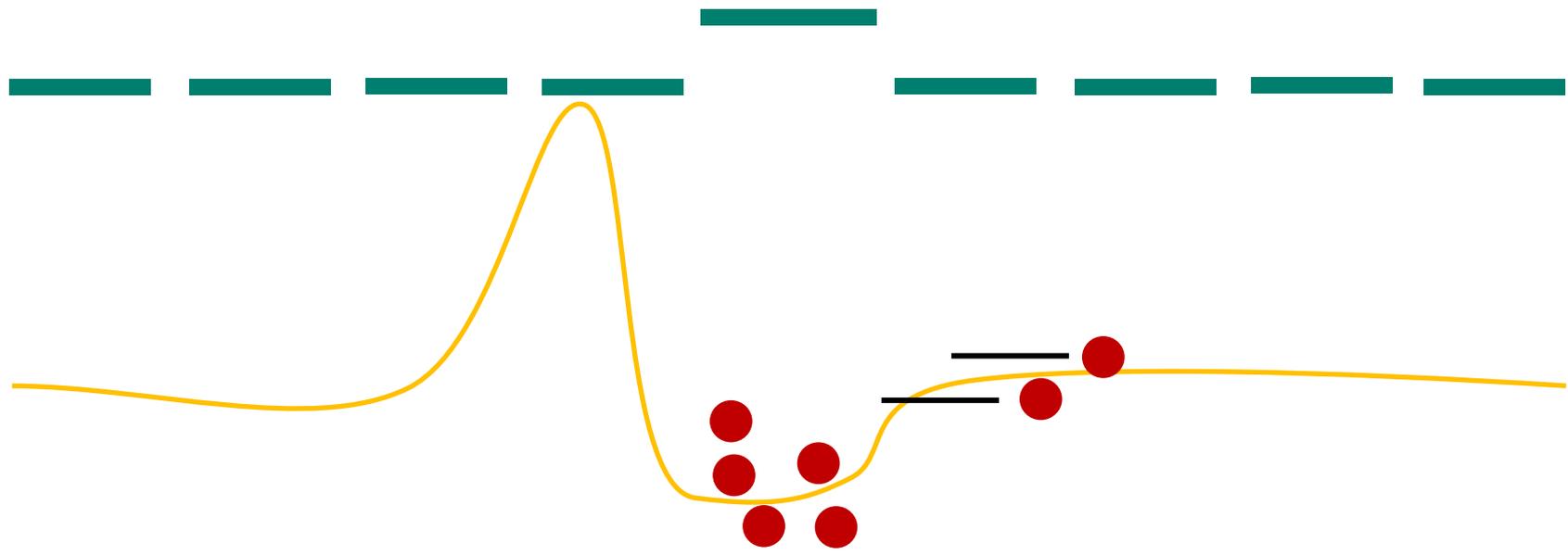
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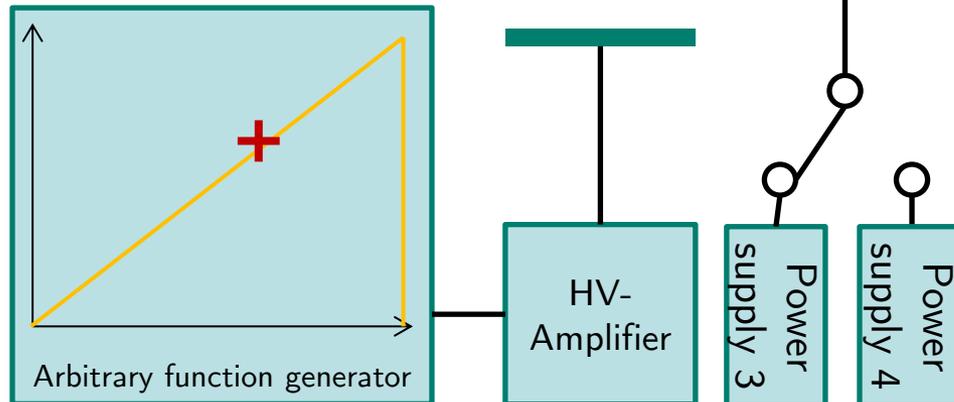
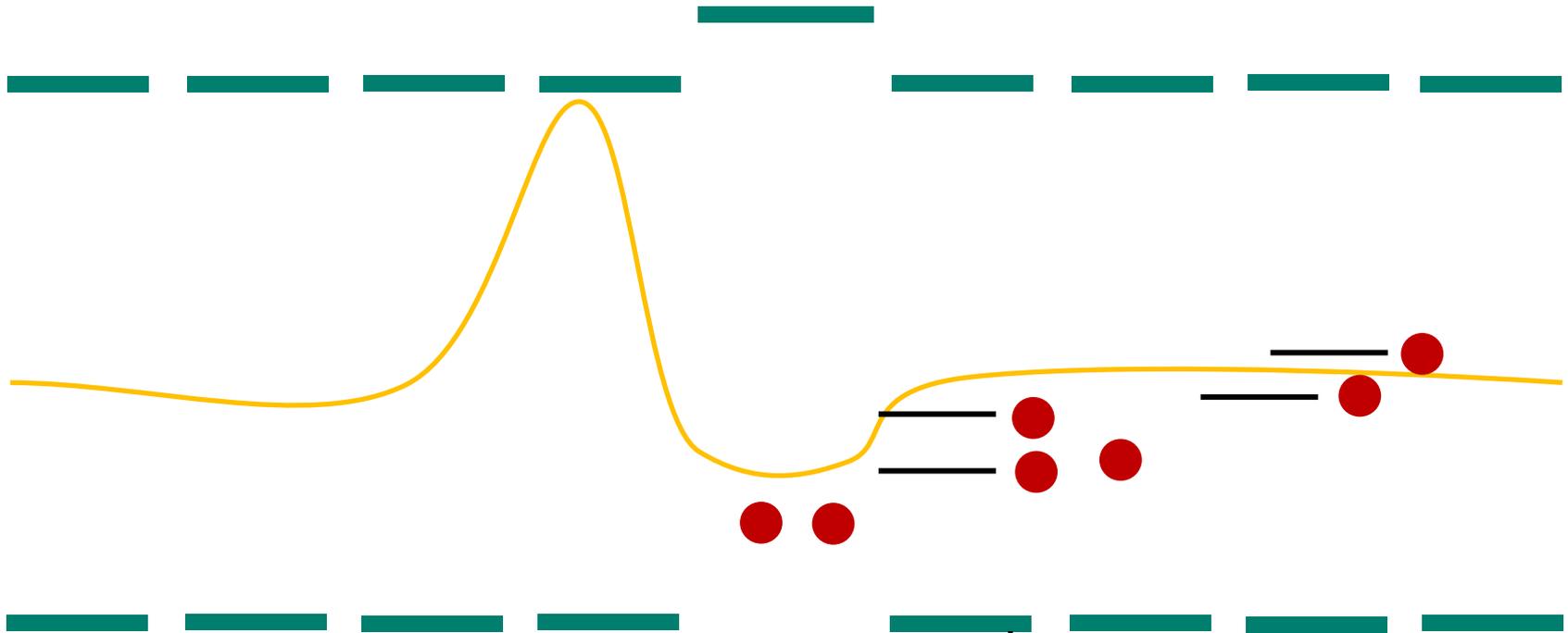
Advanced extraction scheme



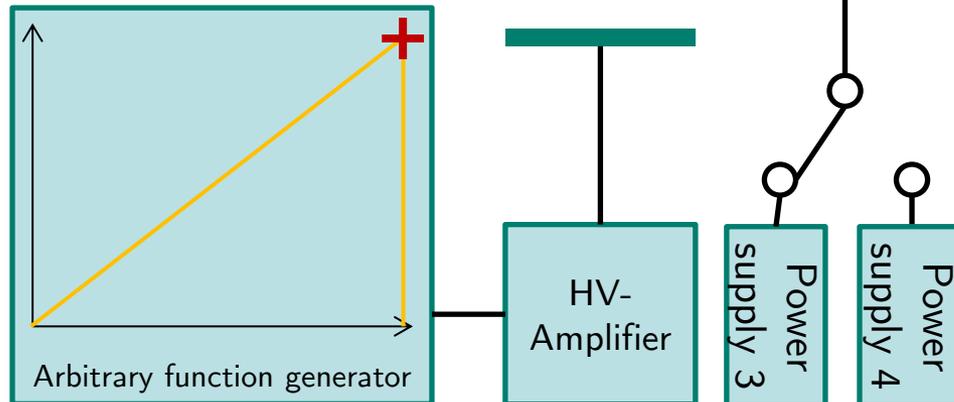
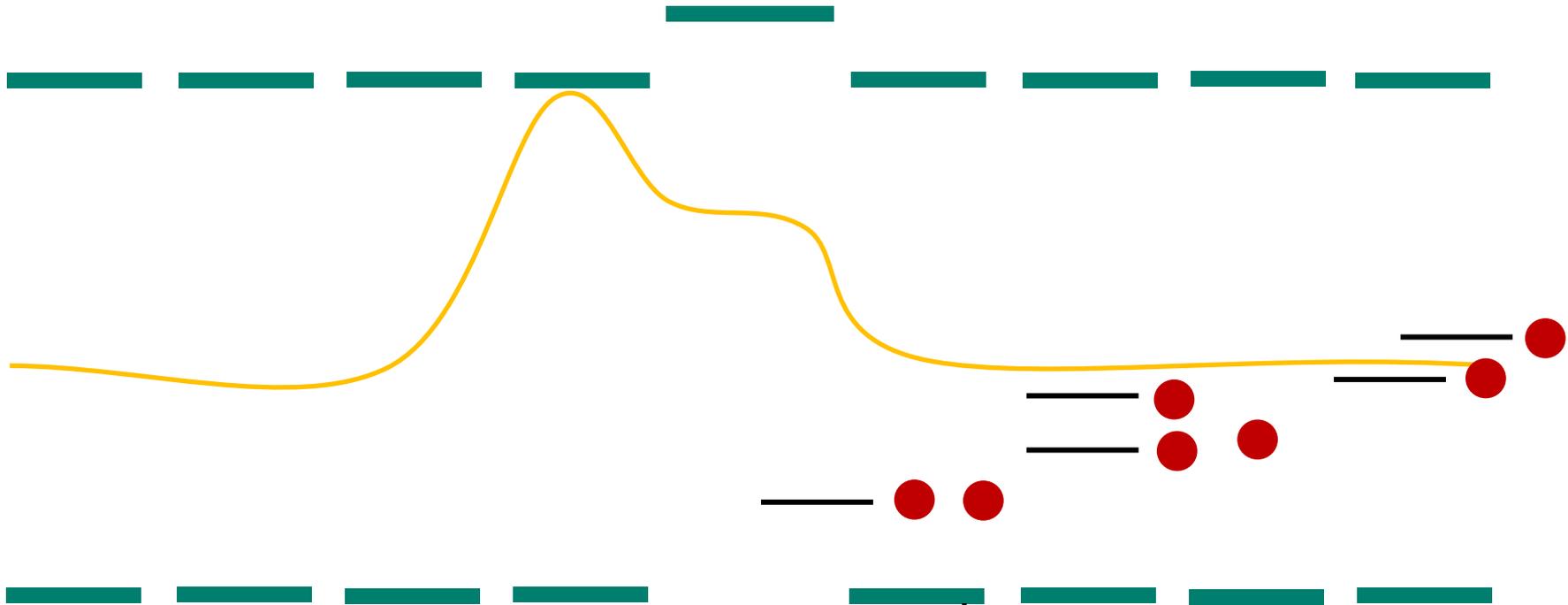
Advanced extraction scheme



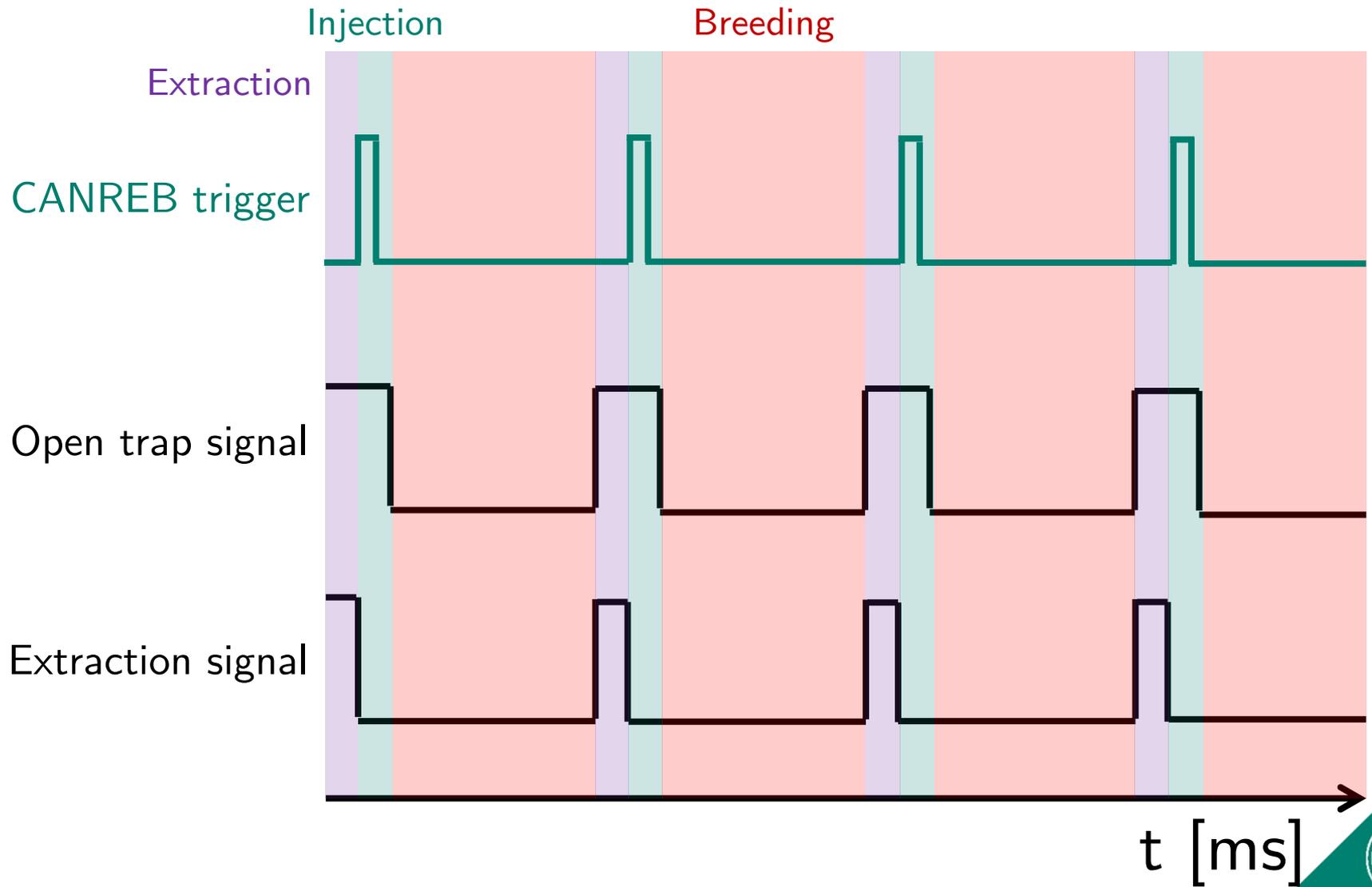
Advanced extraction scheme



Advanced extraction scheme



Timing



Thank you for your attention.