

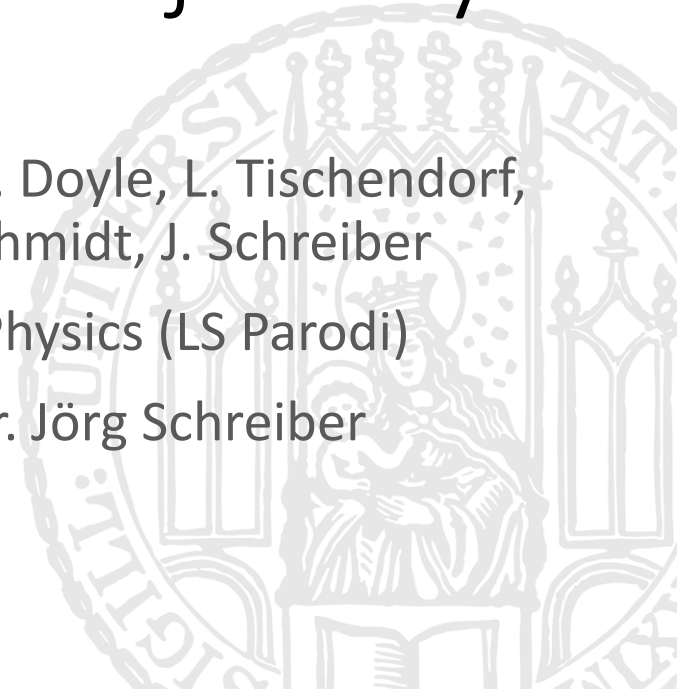
# A Transmission Ionization Chamber for Online Monitoring of Ion Bunch Fluence and Trajectory

June 29, 2020

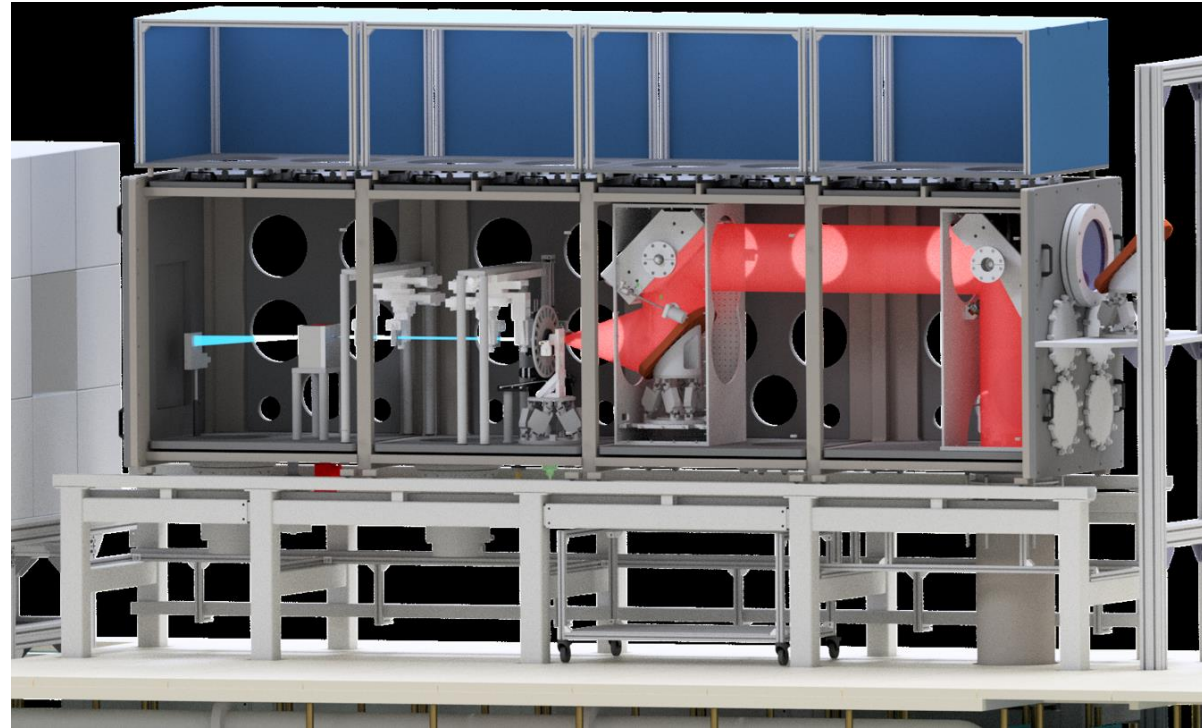
L. Flaig, J. Bortfeldt, J. Hartmann, T. Rösch, L. Doyle, L. Tischendorf,  
M. Berndl, F. Balling, S. Gerlach, A.-K. Schmidt, J. Schreiber

LMU Munich, Department of Medical Physics (LS Parodi)

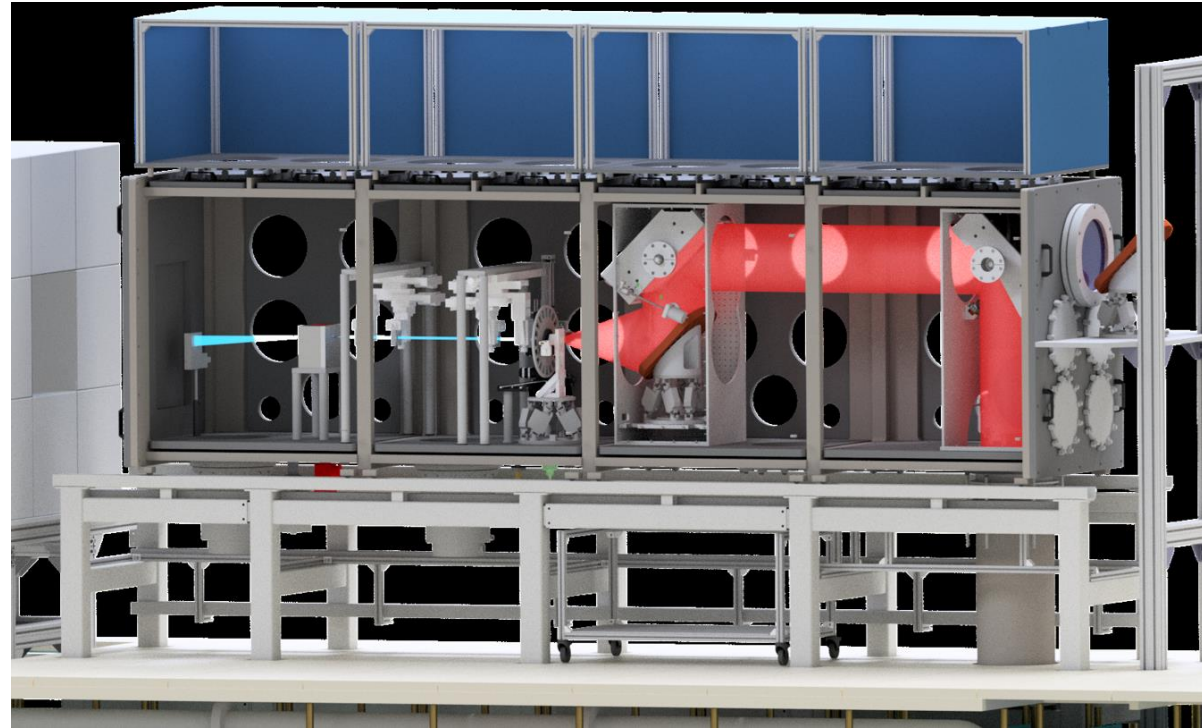
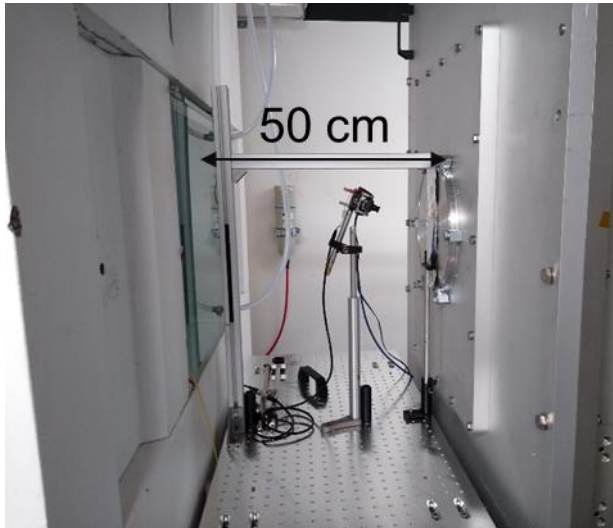
Laser Ion Acceleration Group, Prof. Dr. Jörg Schreiber



- Up to 1 Hz repetition rate
- Currently between 10 and 20 MeV protons

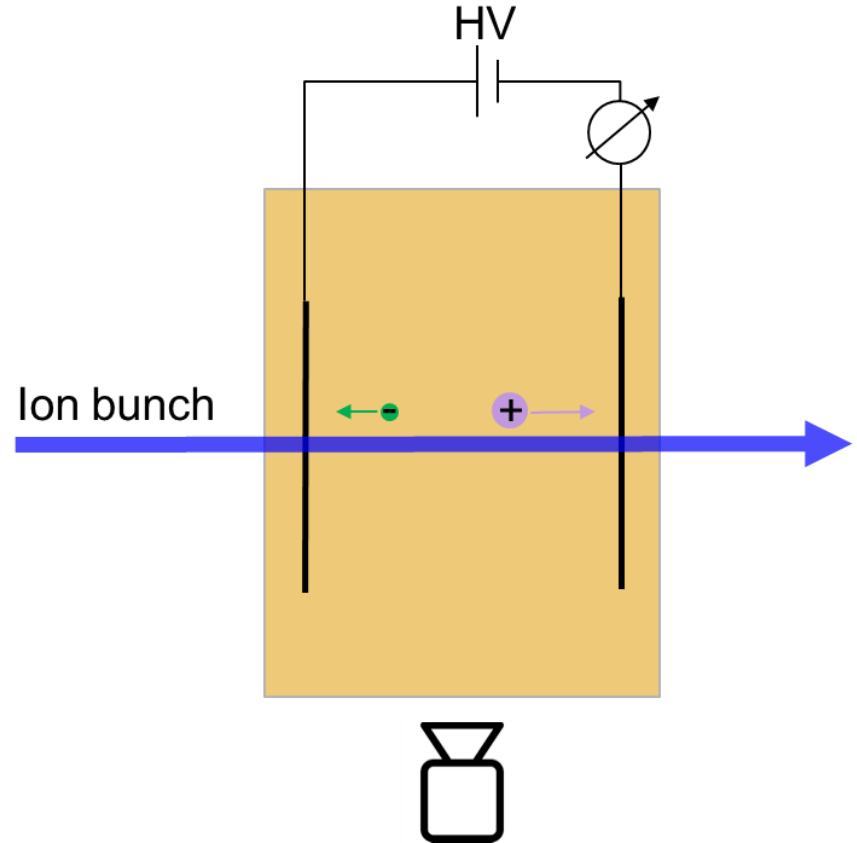


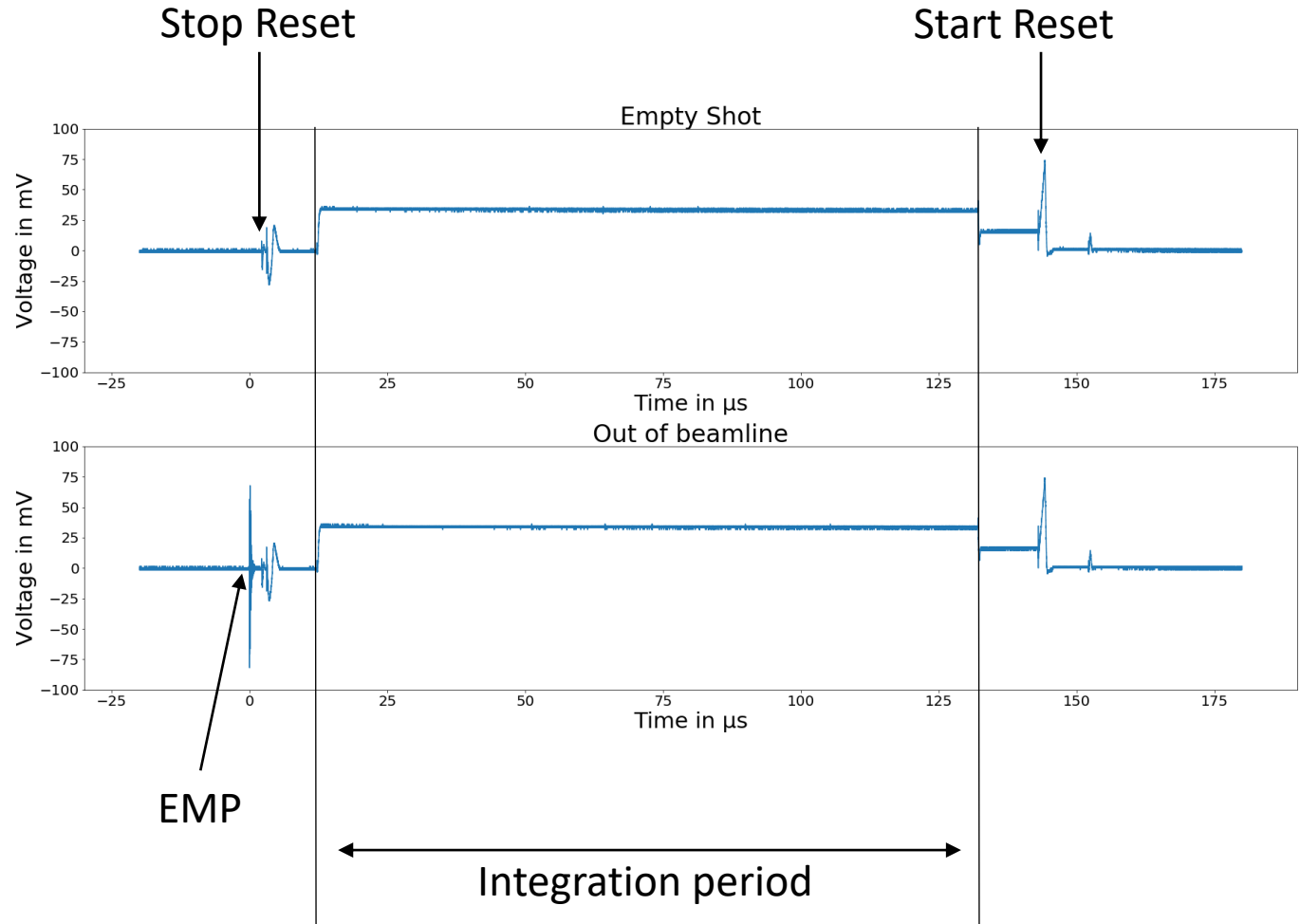
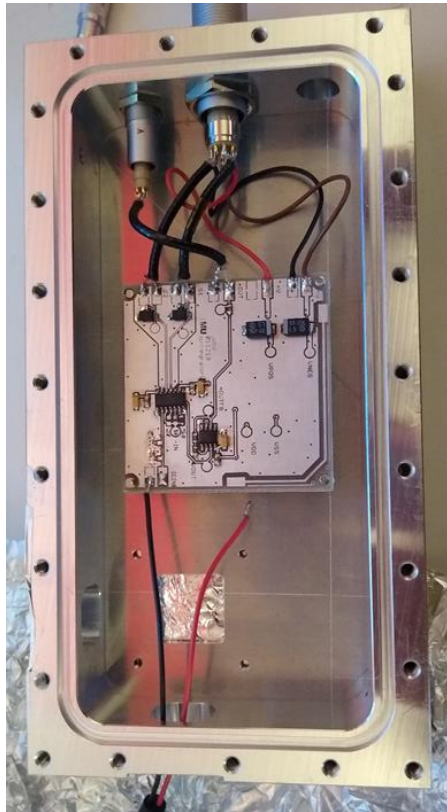
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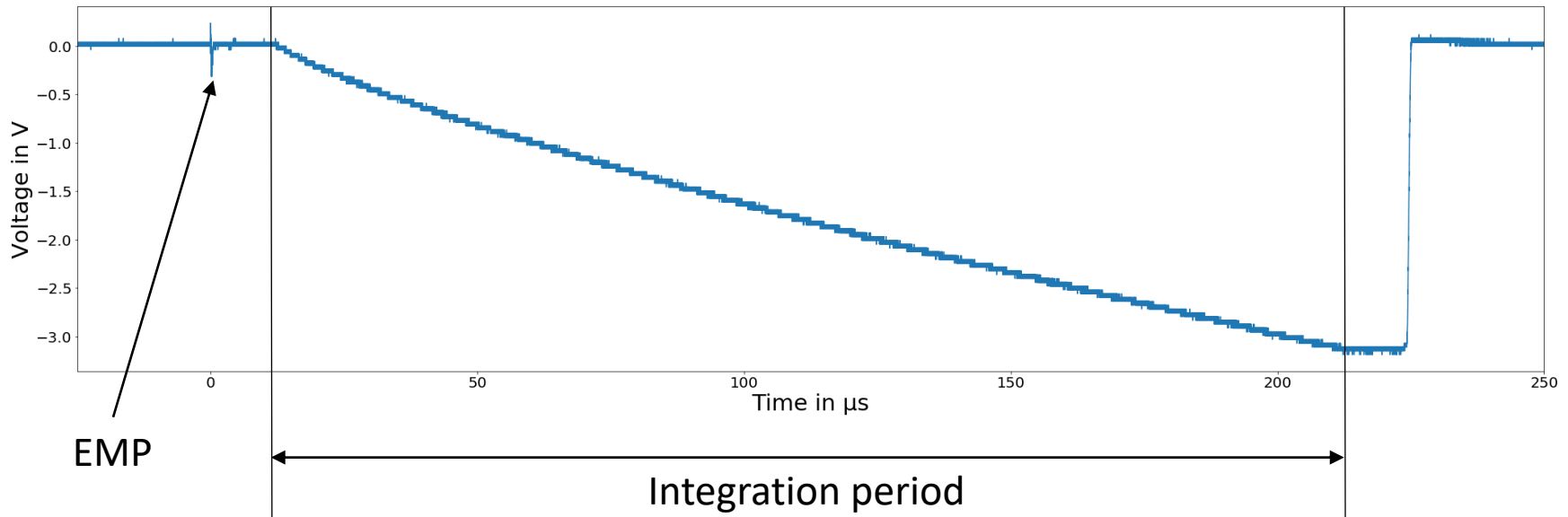


- Experimental platform (e.g. for radiobiological studies)
- Monitoring of individual bunches

- Collection of ionized gas in sensitive volume
  - Total number of ionizing events
  - Ion bunch fluence
- Transmission of ion bunch
  - Low material budget
  - Gaseous detector with thin foil electrodes/windows (aluminized 2  $\mu\text{m}$  Mylar)

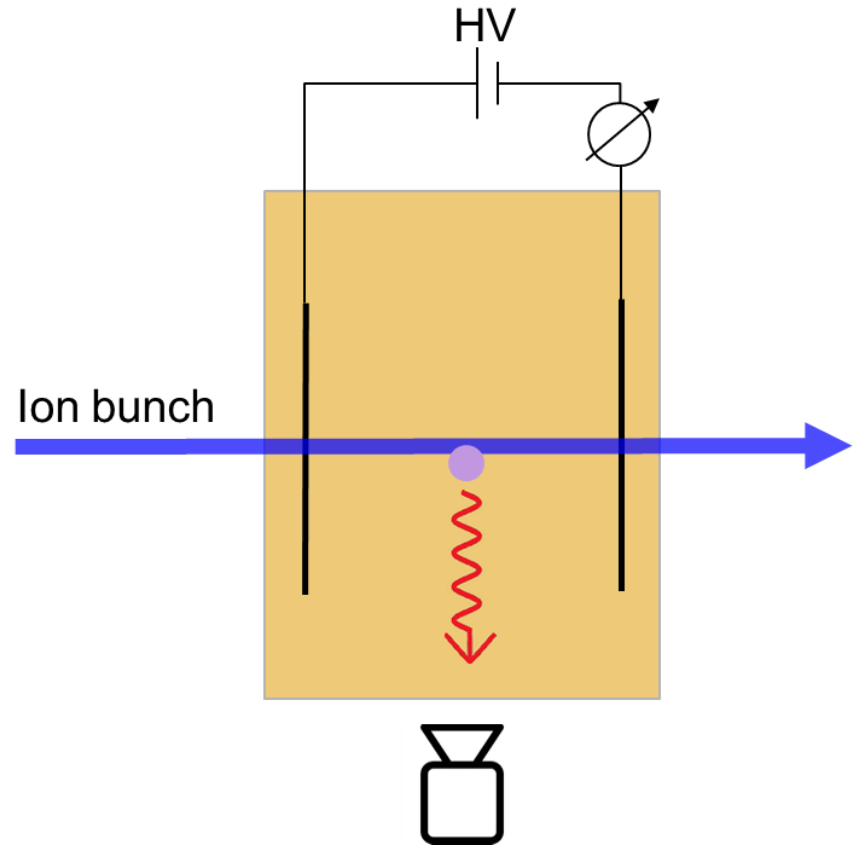






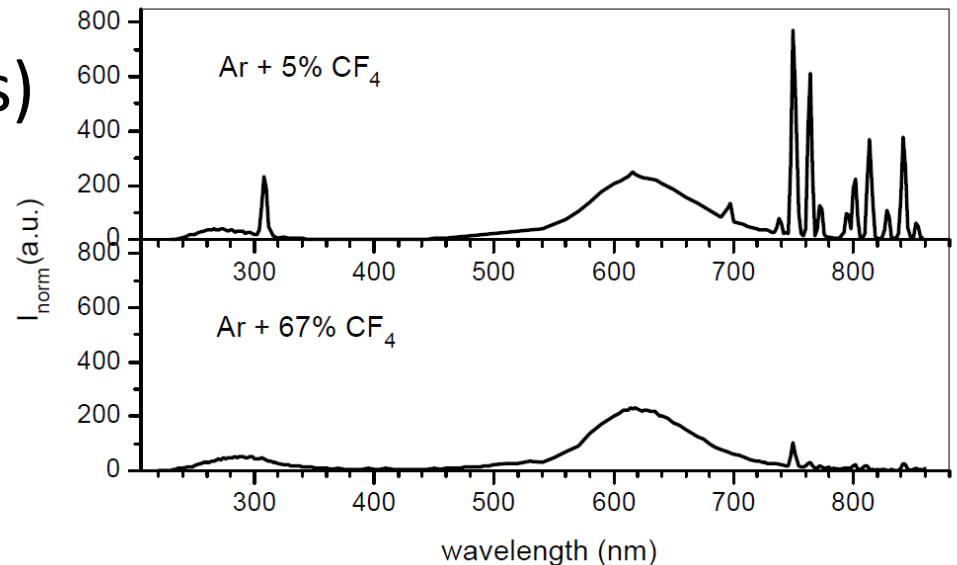
- Unfiltered bunch from target  
→ Contributions from electrons/X-rays
- Collected charge  $\sim 10^9 e$

- Mixture of Argon with Tetrafluoromethane ( $\text{CF}_4$ )
  - Scintillation in sensitive volume
- Lateral view from two sides
  - Bunch position and size
  - No further interference with ion bunch





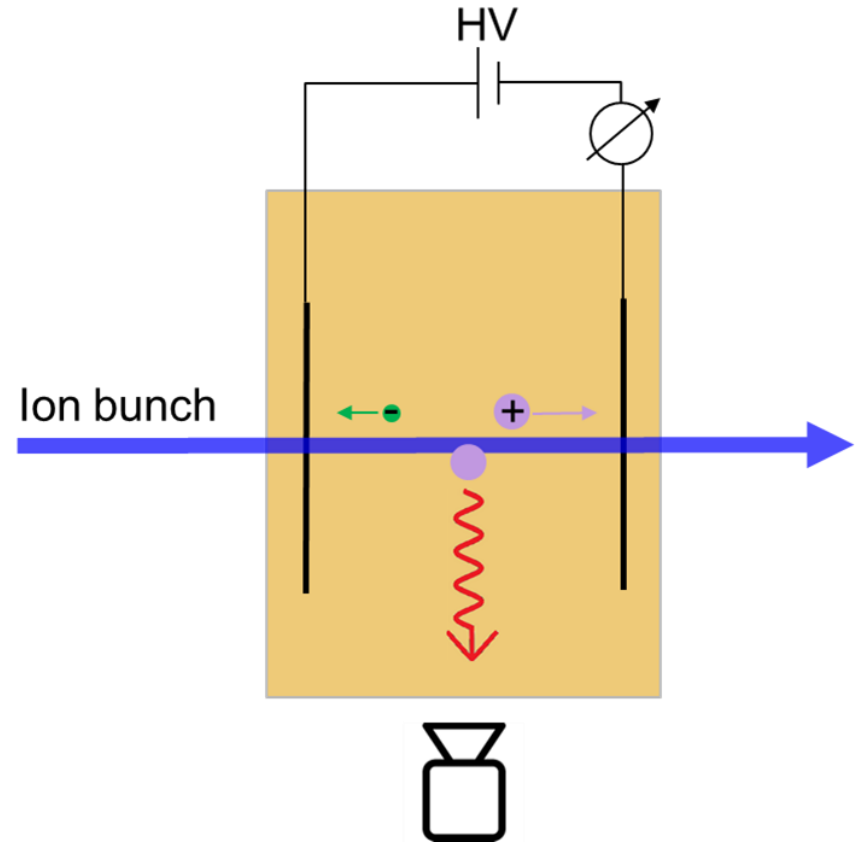
- High scintillation yield in visible spectrum
  - Conventional camera sensitive
- Short decay time ( $\sim 100$  ns)
  - Highly localized



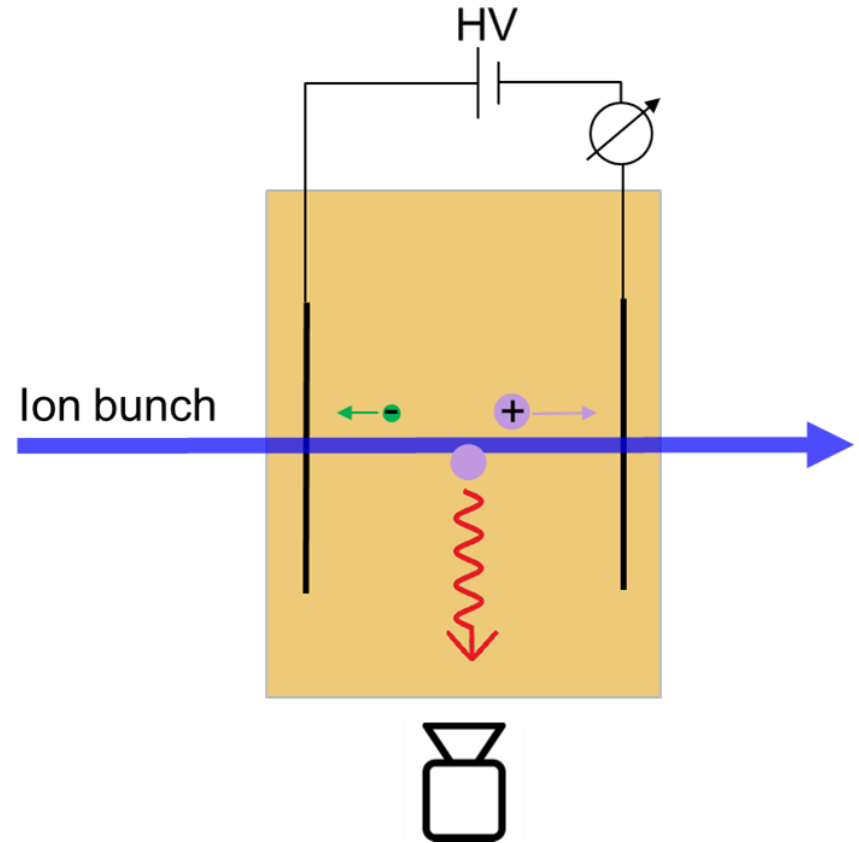
M.M.F.R. Fraga et al., *Nucl. Instrum. Meth.A* 504 (2003) 88.



- Minimally invasive transmission monitor
- Dual read-out
  - Ion bunch fluence due to charge collection
  - Localization of ion bunch due to scintillation



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- Dual read-out
  - Ion bunch fluence due to charge collection
  - Localization of ion bunch due to scintillation



Thank you!

# Back-up slides

