Introduction to beta-delayed particle spectroscopy by the OTPC technique

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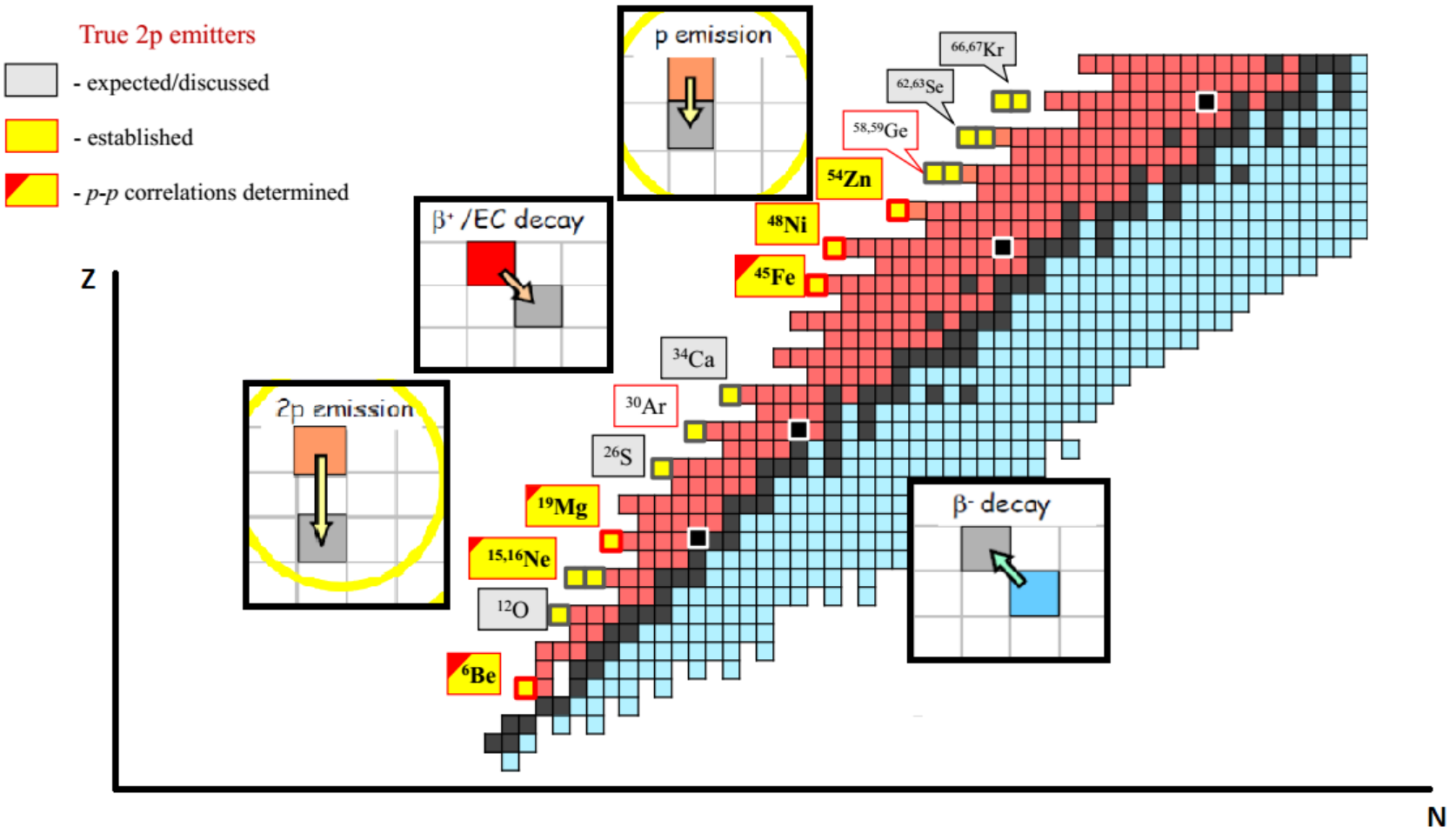
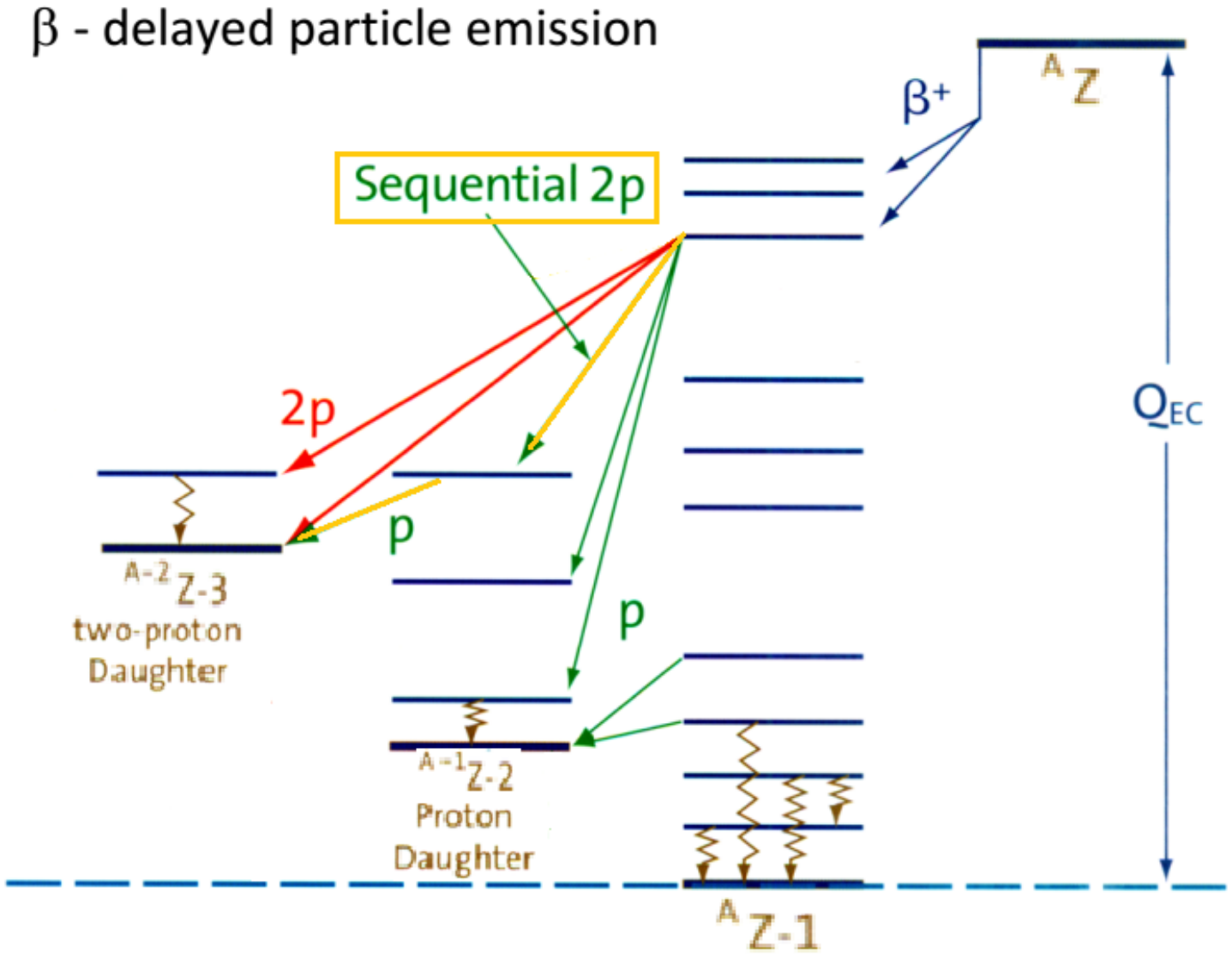
Introduction

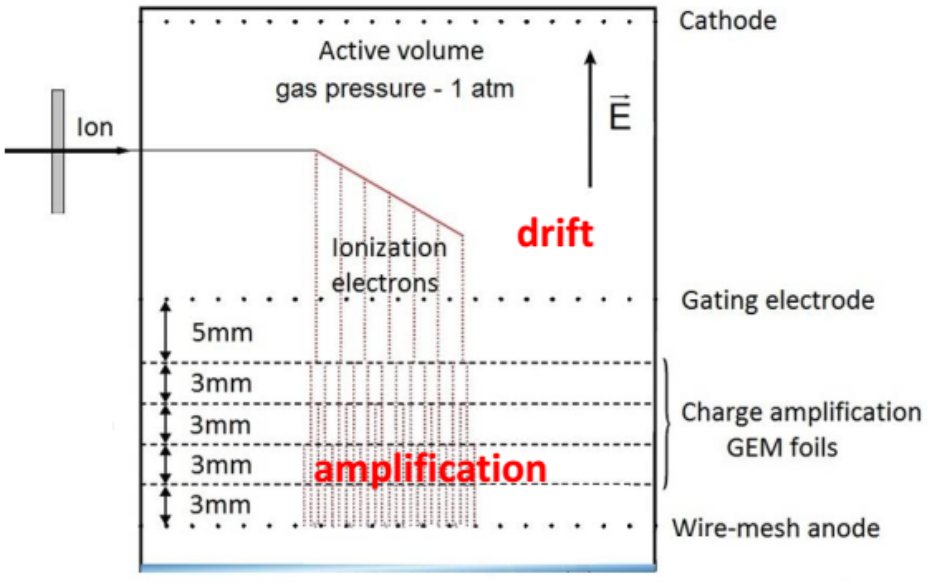
Interest in nuclei at the borders of stability

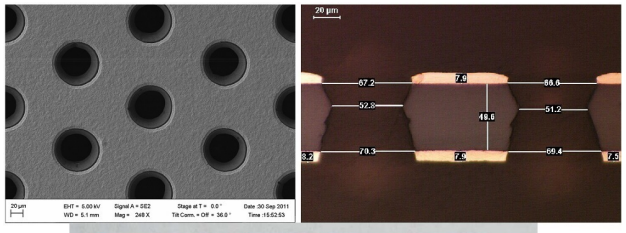


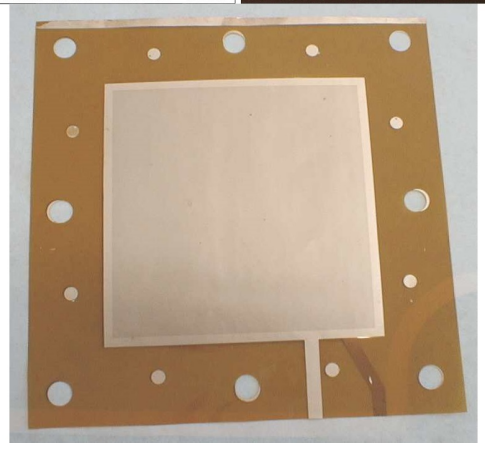

β - delayed particle emission
β+
A Z
Sequential 2p
2p
p
p
A-2 Z-3
two-proton
Daughter
A-1 Z-2
Proton
Daughter
A Z-1
QEC

Principle of work

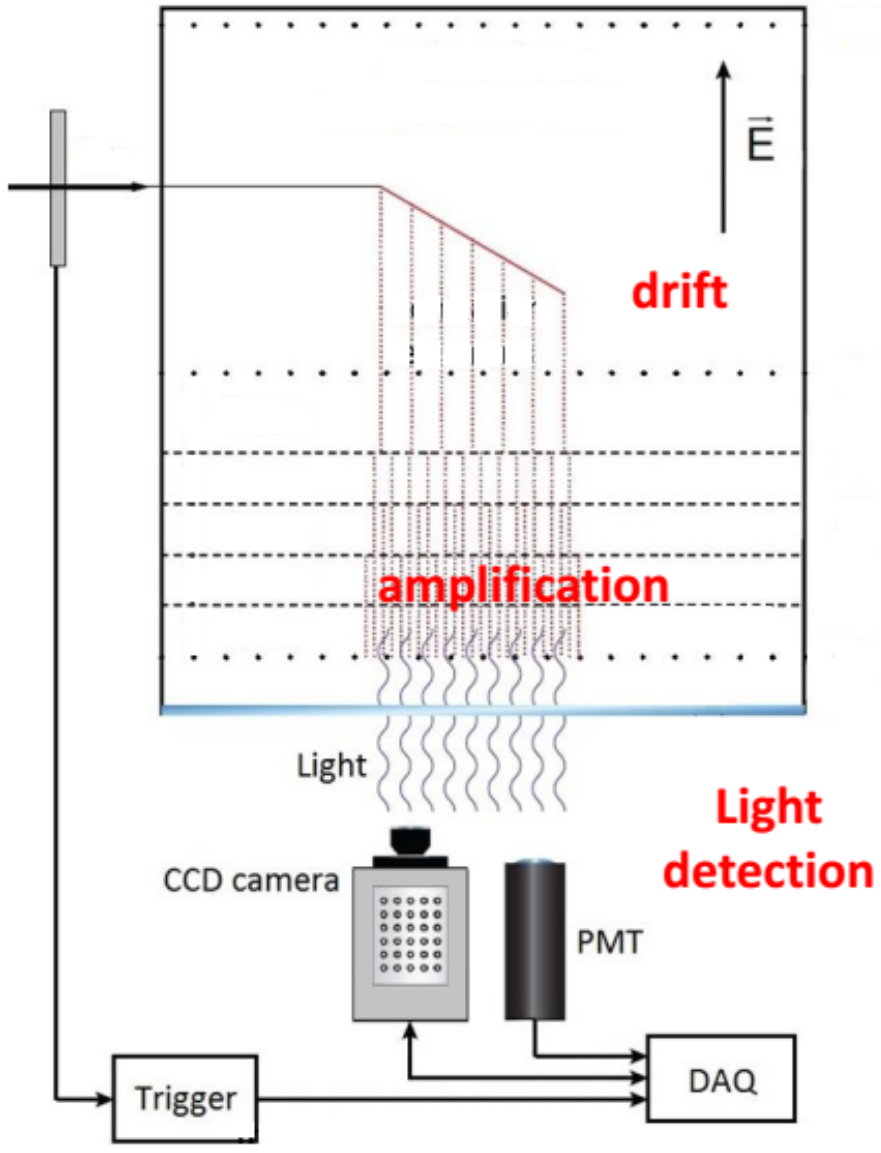
Optical Time-Projection Chamber and GasElectronMultiplier



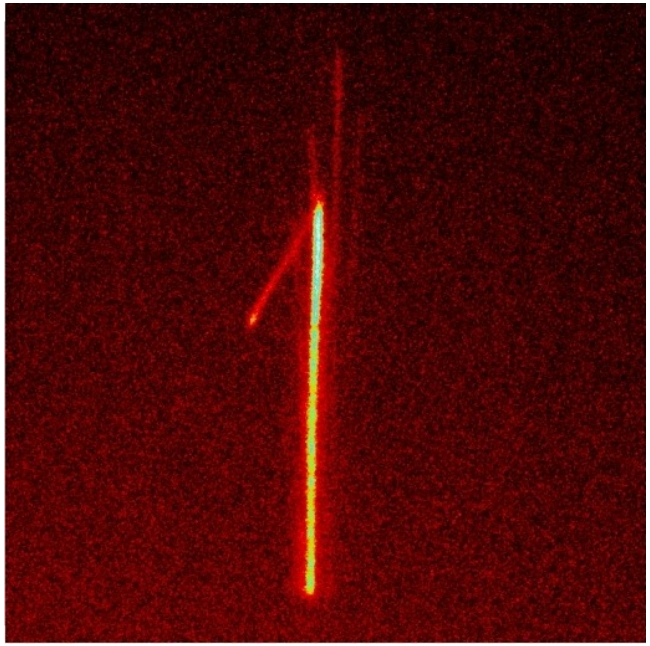




Optical Time-Projection Chamber

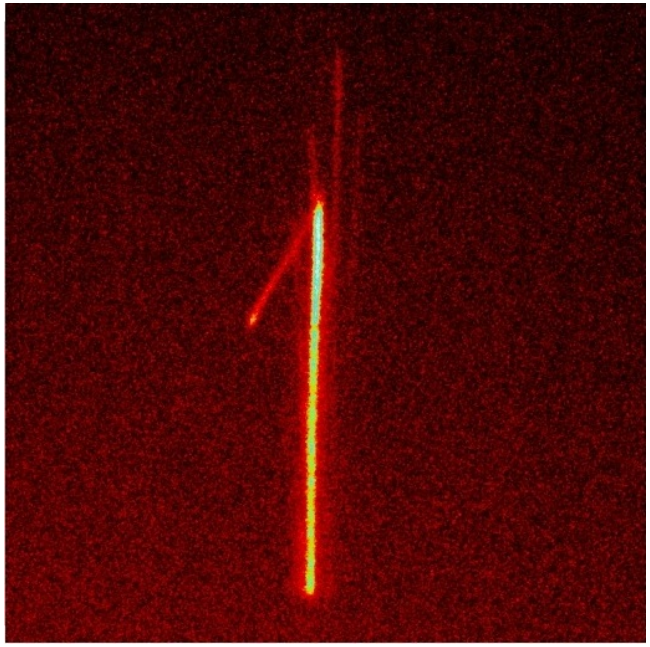


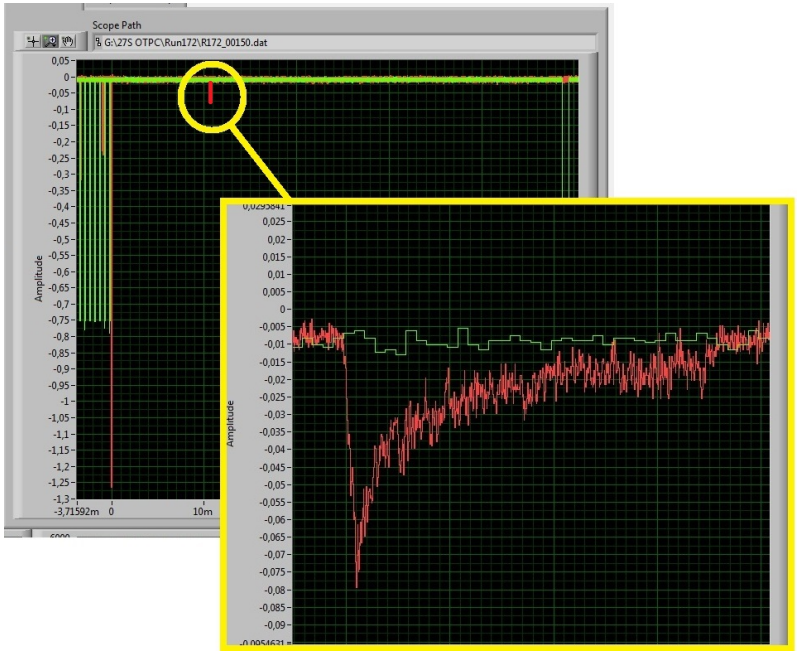
Charge-CoupledDevice Camera, PhotonMultiplierTube



- trajectory of the particle
- intensity of the signal

Charge-CoupledDevice Camera, PhotonMultiplierTube

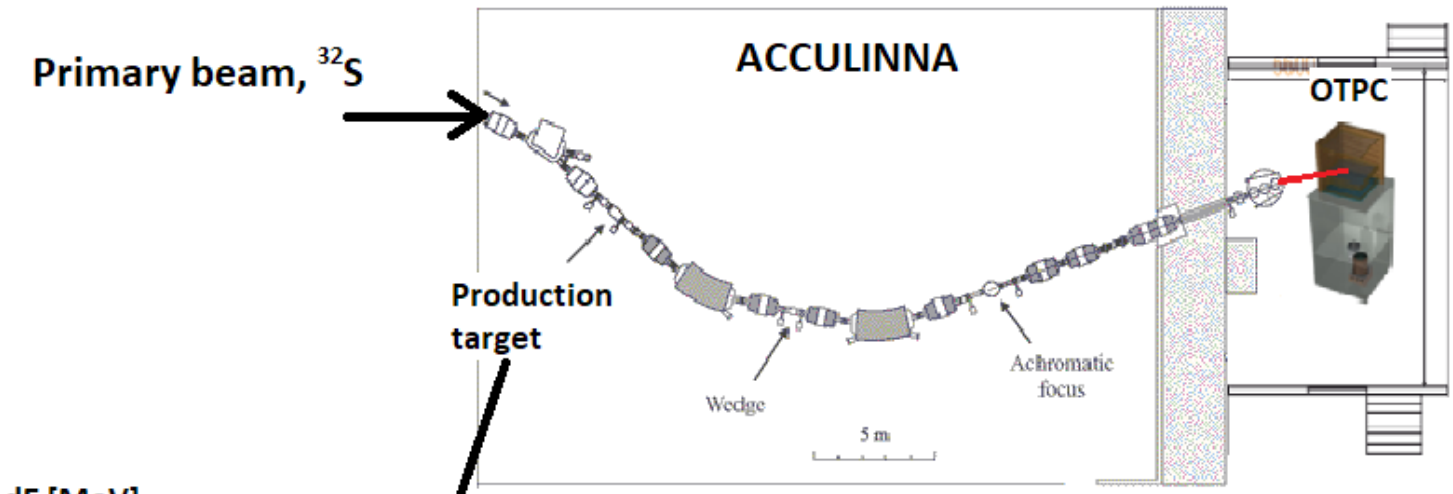


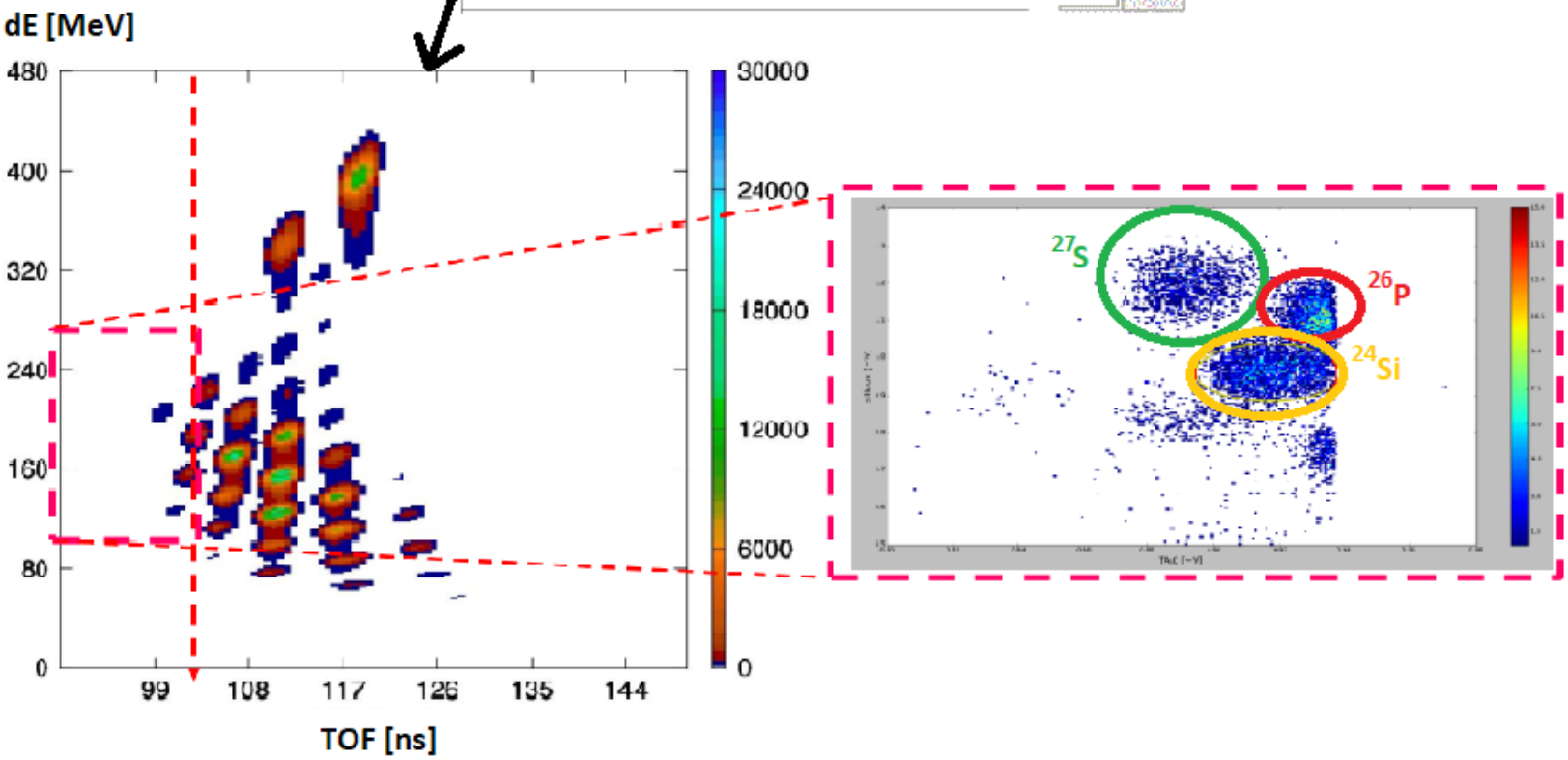


- trajectory of the particle
- intensity of the signal

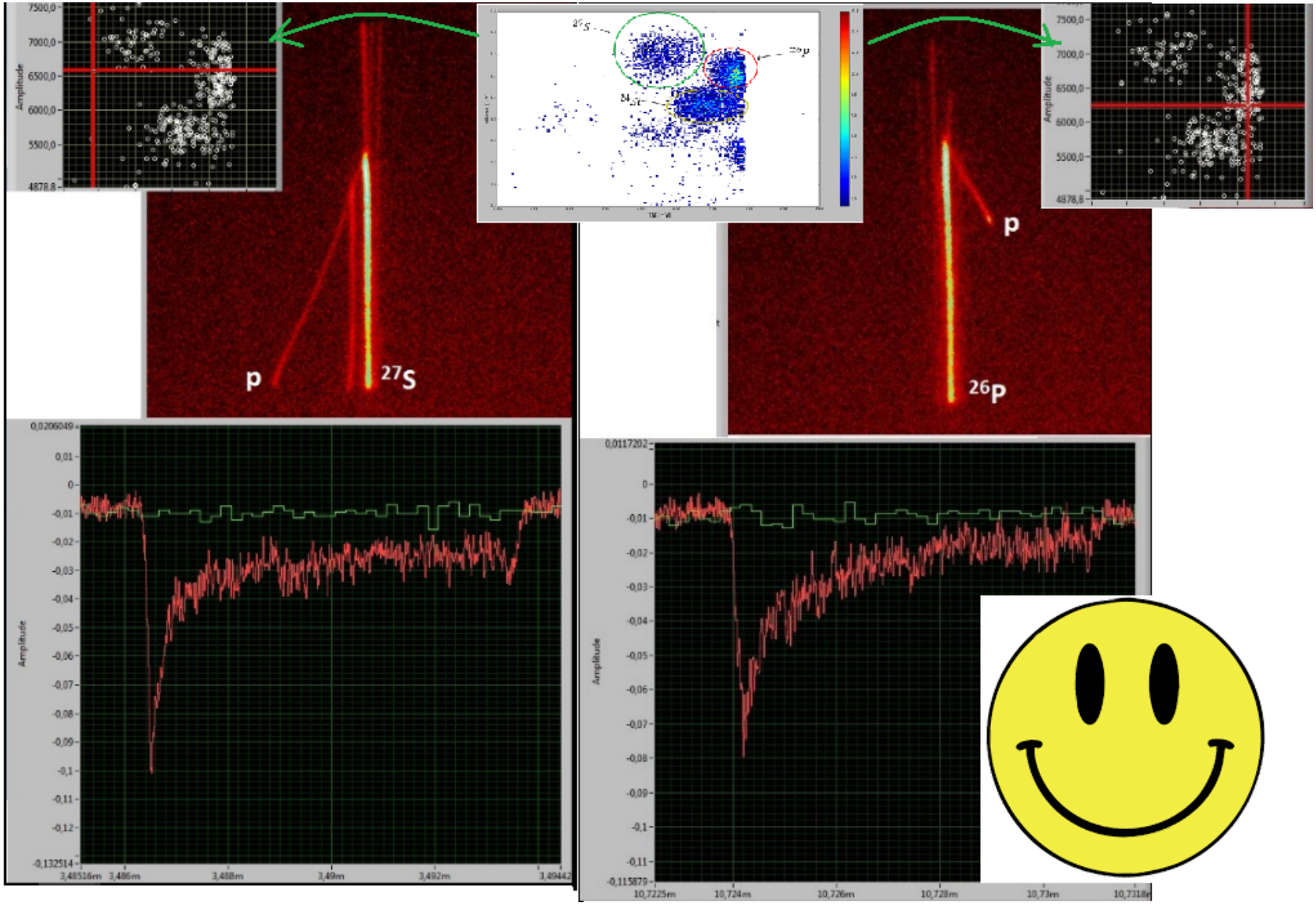
- information about energy (by the shape of the PMT signal (Bragg, Gauss) $\longrightarrow$ type of particle)
- number of decay particles and events

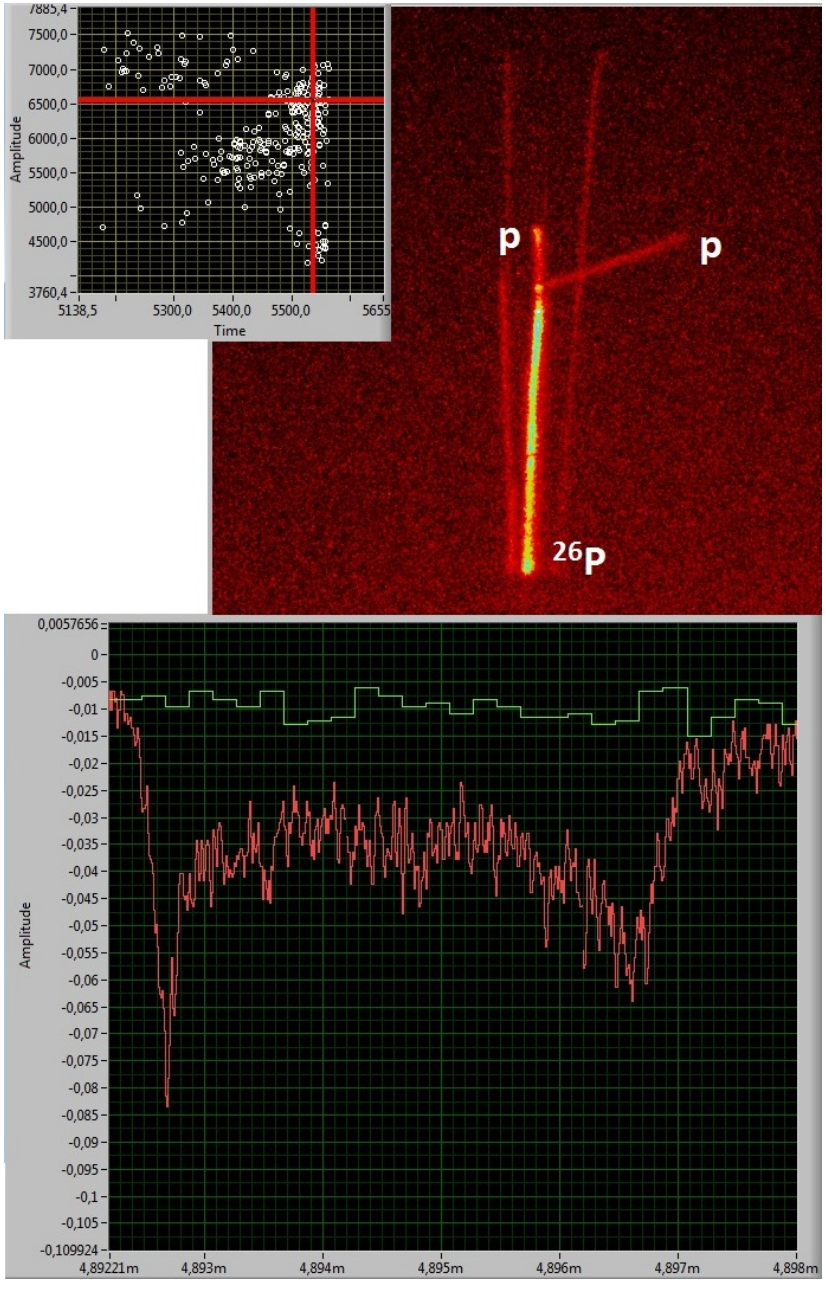
Origin of the beam in our experiment



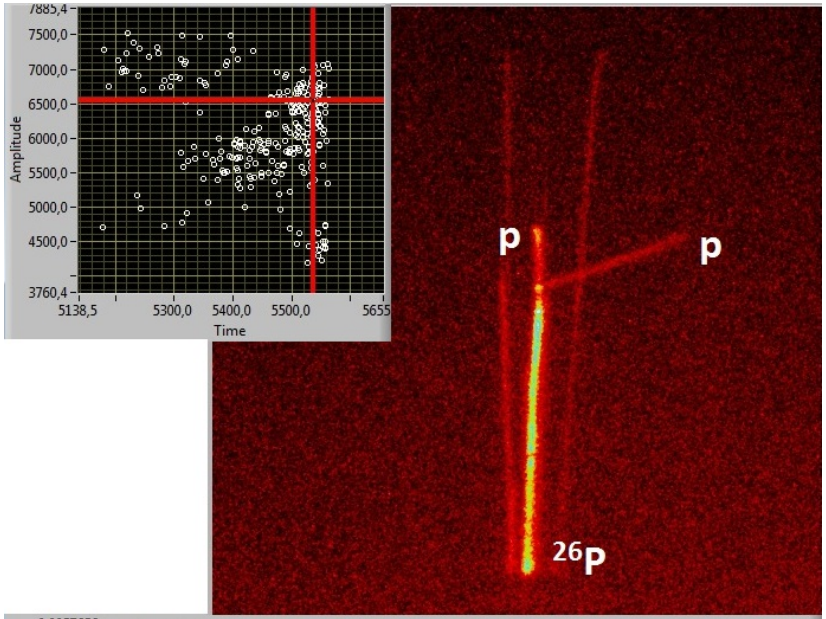


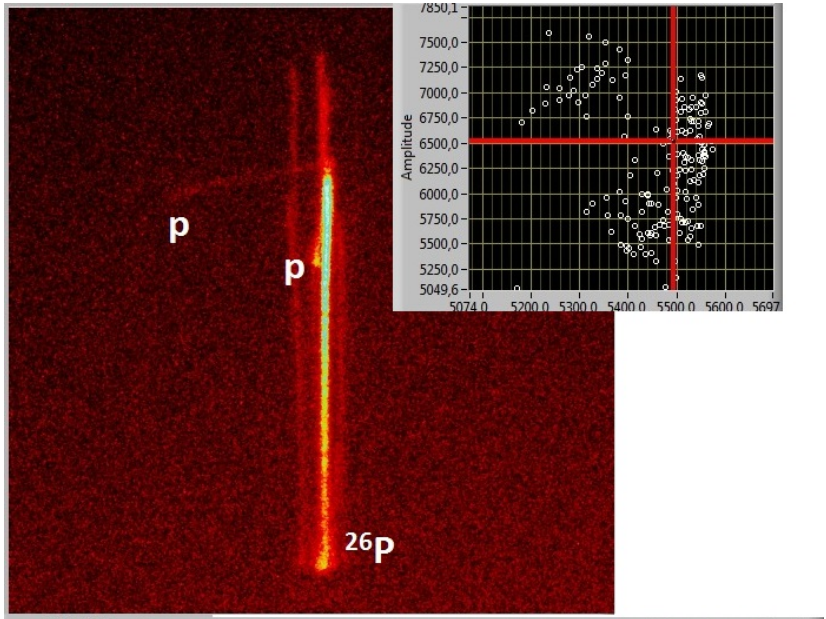
Analysis


p
27S
26P
Amplitude
3,48516m
3,486m
3,488m
3,49m
3,492m
10,7225m
10,724m
10,726m
10,728m
10,73m

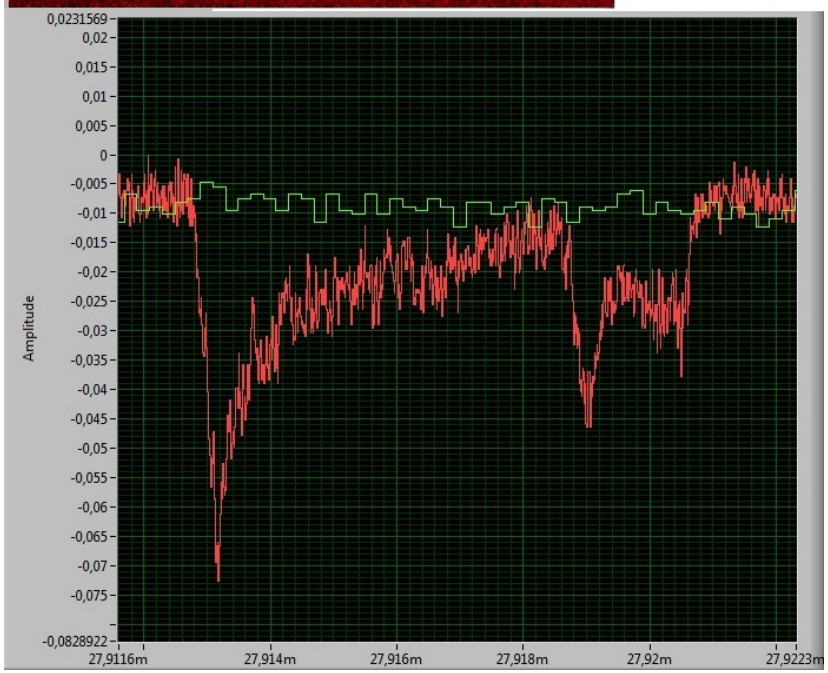

Amplitude
Time
p
p
26P
Amplitude

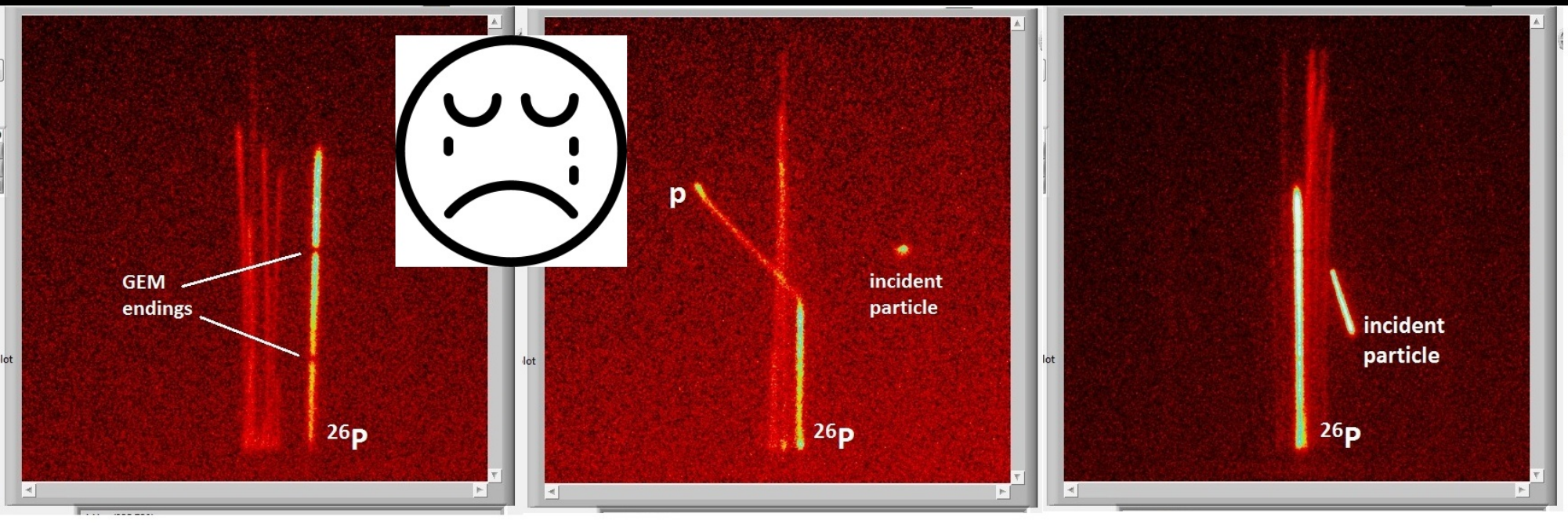
2p


Amplitude
Time
p
p
26P


Amplitude
p
p
26P

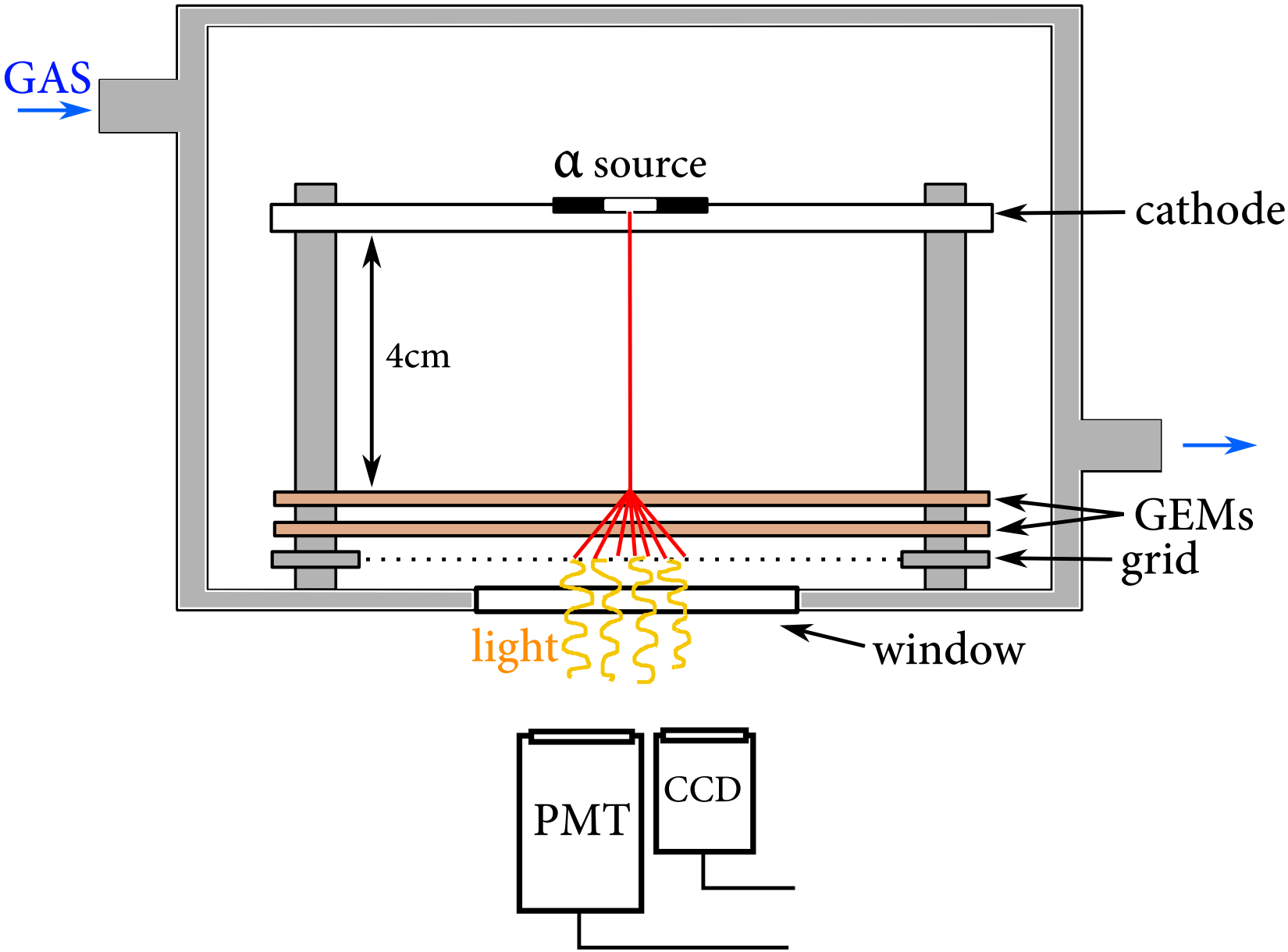

Amplitude
4,89221m
4,893m
4,894m
4,895m
4,896m
4,897m
4,898m


Amplitude
27,9116m
27,914m
27,916m
27,918m
27,92m
27,9223m

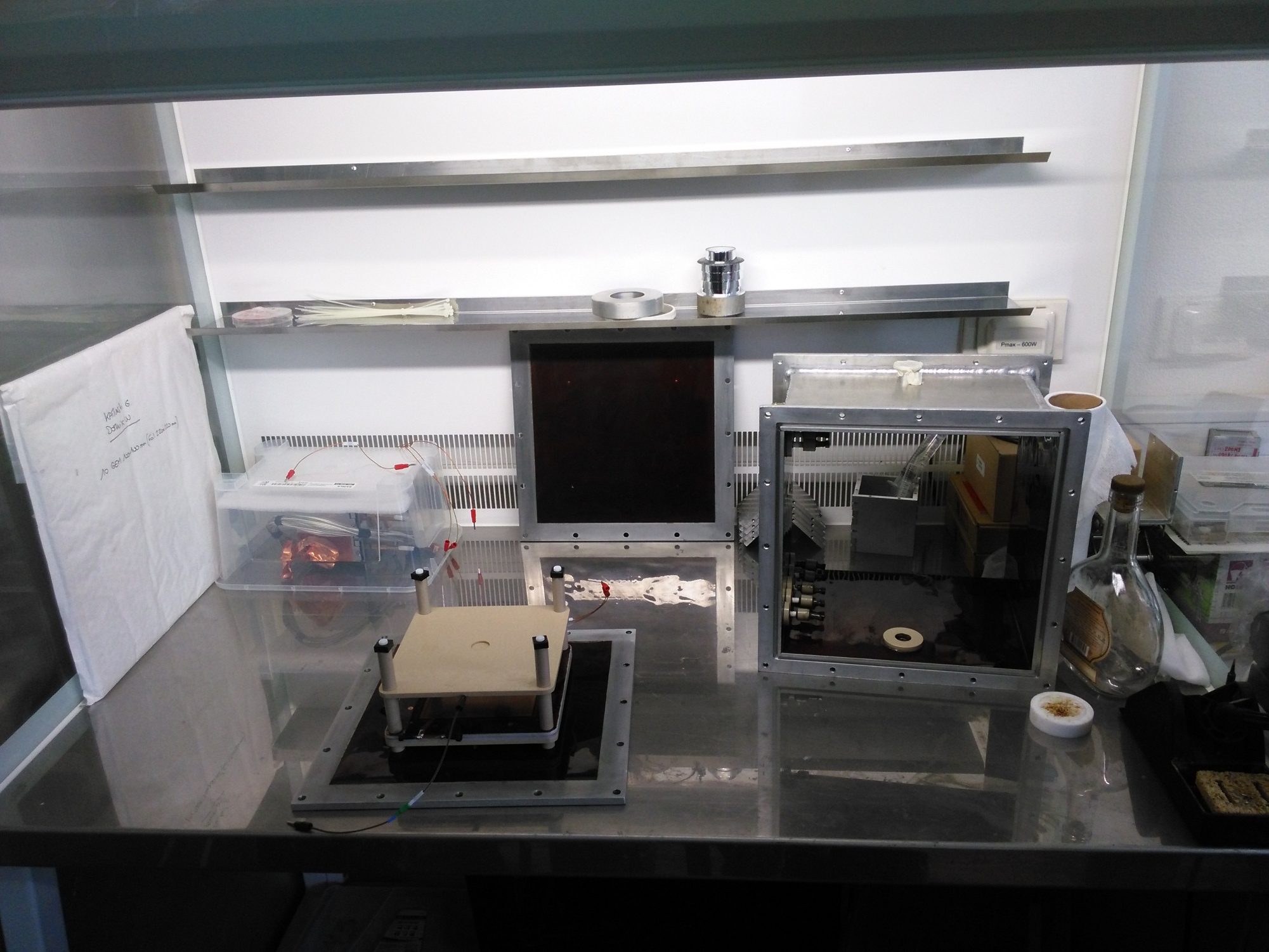

GEM
endings
^{26}P
p
incident
particle
^{26}P
incident
particle
^{26}P

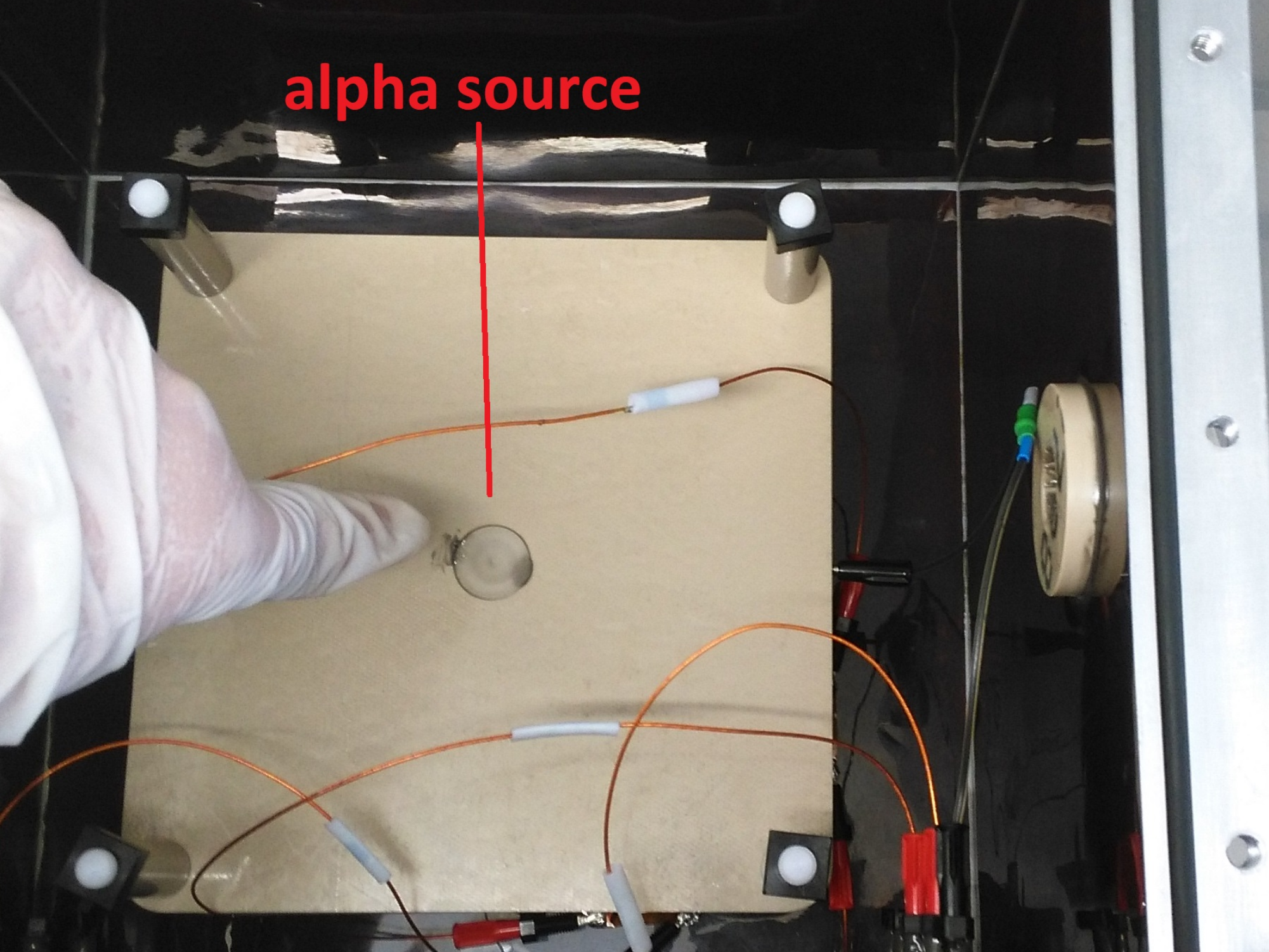
Mounting of a testing device

Principle of work



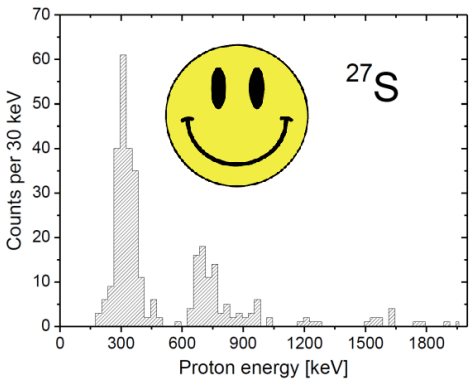

LAMSYSTEMS

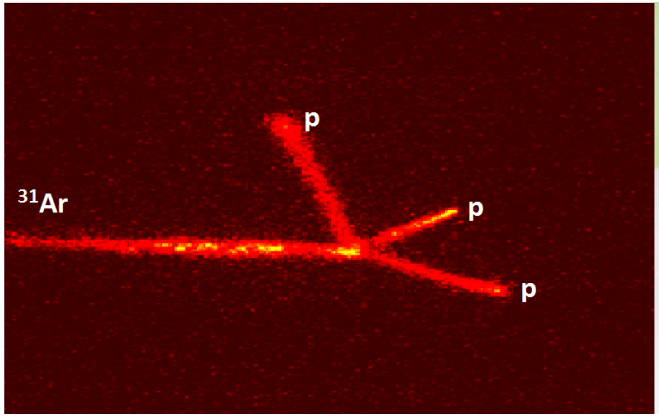

Pmax – 600W


alpha source

Summary

- OTPC is a type of proportional chamber with optical readout dedicated to studies of exotic and rare nuclear decays
- OTPC is a perfect instrumentation tool for separators (for example ACCULINNA, ACCULINNA-2, etc.)
- OTPC allows us to reconstruct energy spectra of the beam and branching ratios
- with a different experimental beam, it is possible to observe a 3p decay





Thank you for your attention!