



ΔE -TOF report @GSI2021

R. Zarrella for the ΔE -TOF group

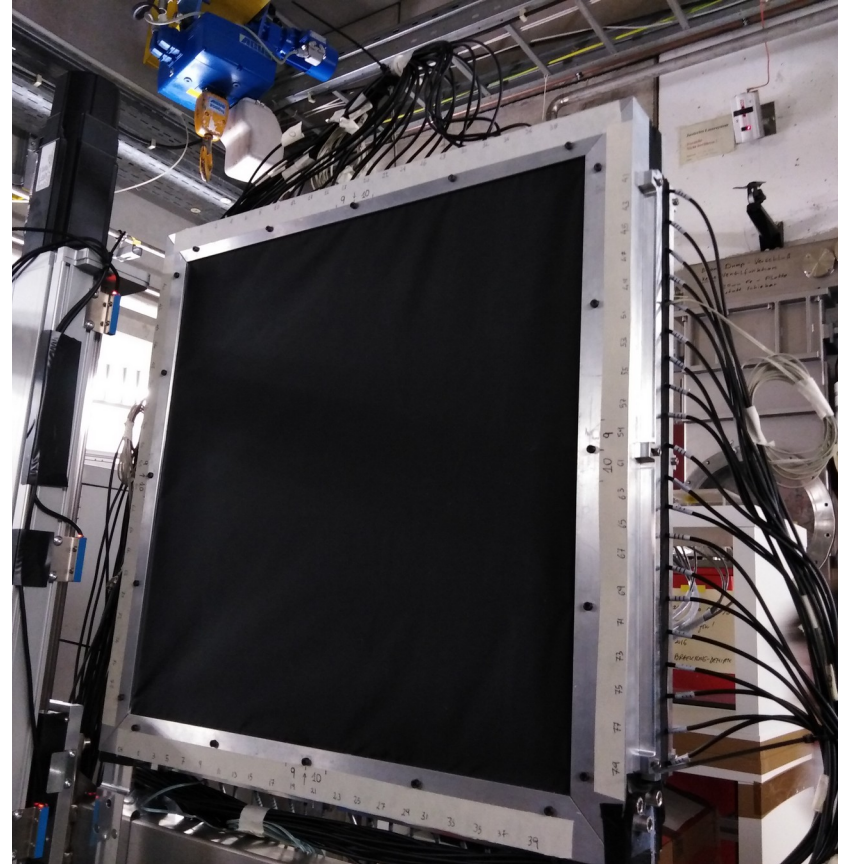
28/07/2021



TOF-Wall upgrades

- SiPMs optical coupling re-done from scratch
- Improved detector darkening
- New frame and mechanics
 - Improved stability (frame & positioning)
 - Remote tuning of position $\sim 1\text{mm}$ accuracy
 - “Easy” detachment from mechanics (**many thanks to our big guys!!**)

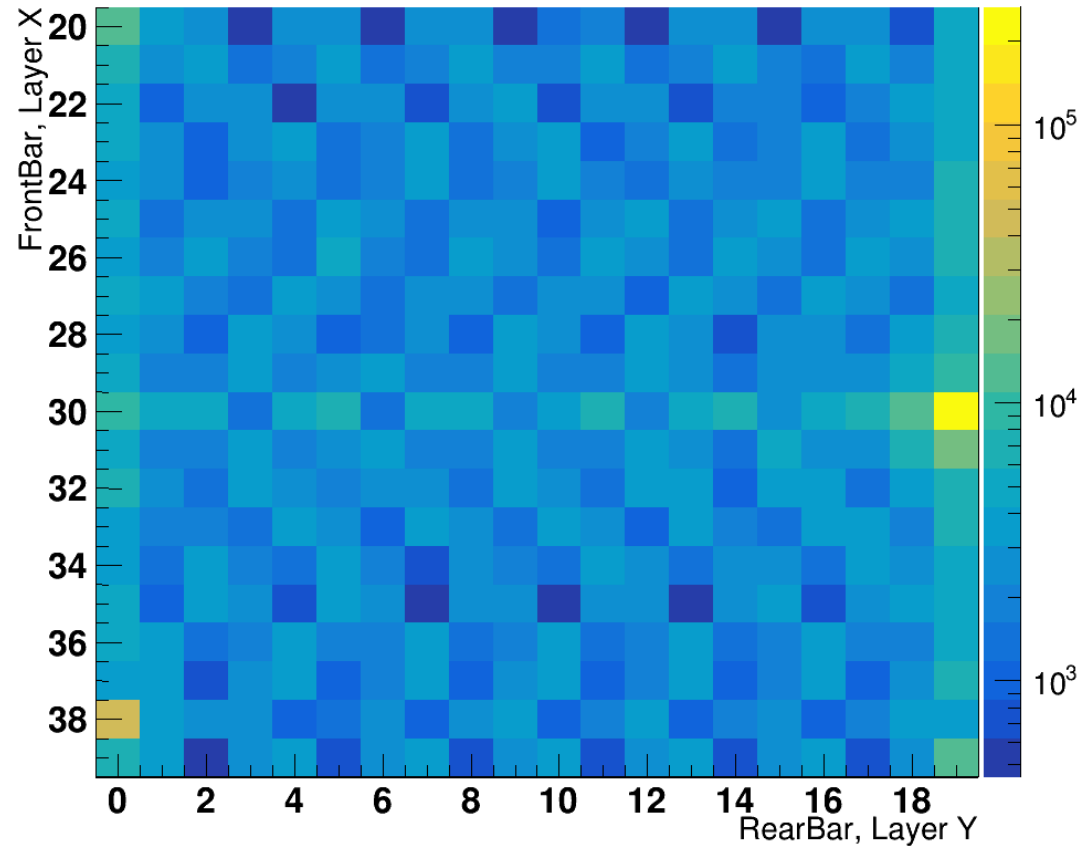
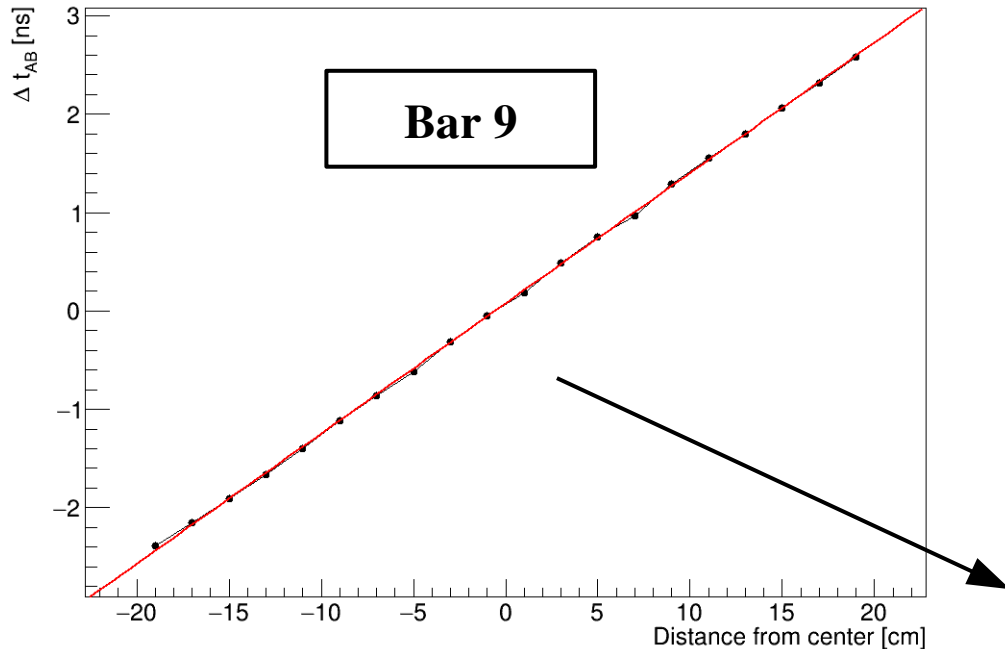
First test after complete dismount!





TOF-Wall scan → calibration

- Scan w/ ^{16}O @ 400 MeV/u
- TW movement worked fine (~25 min. total)
- Fine time calibration between positions (to be performed)



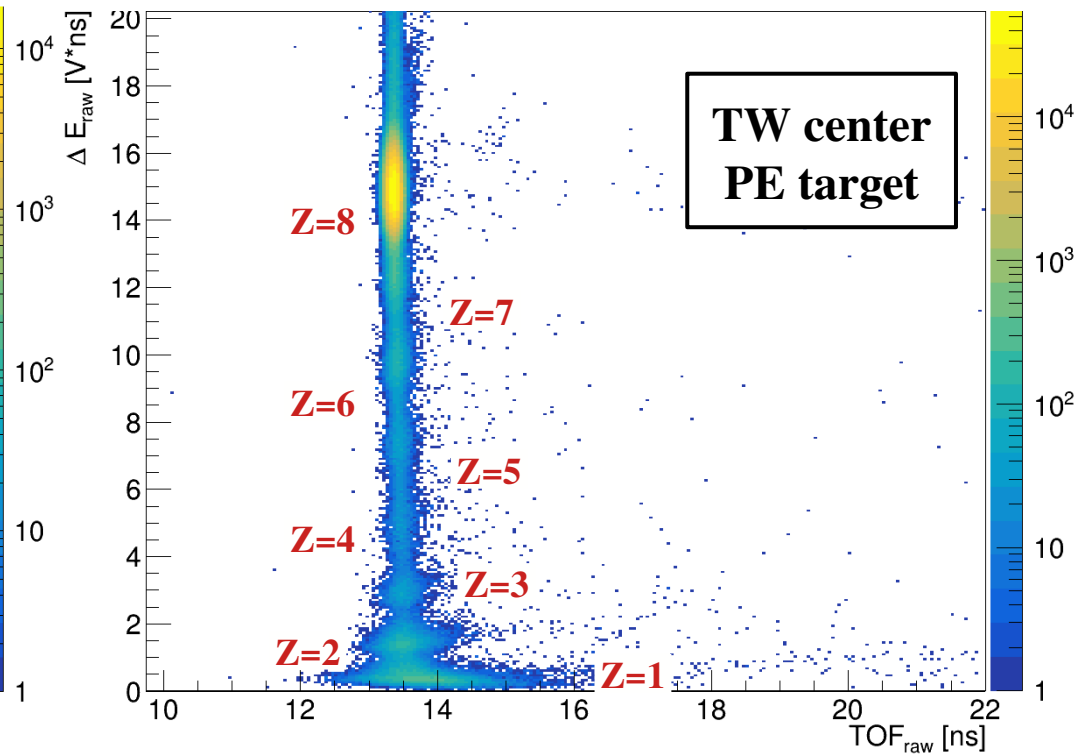
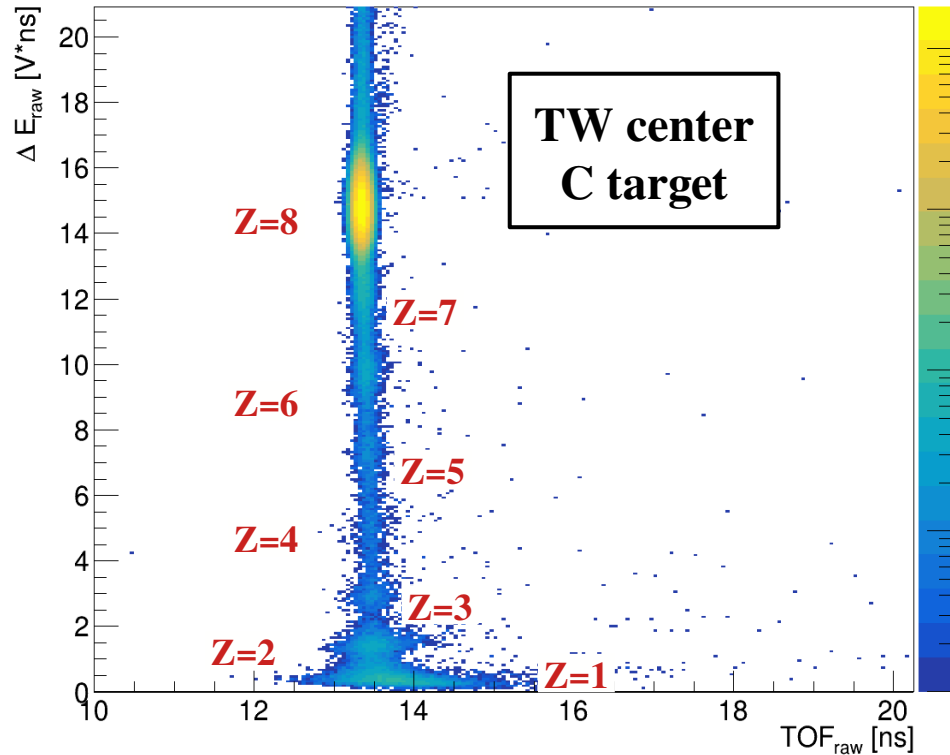
Time difference between sides linear w/ position



ΔE -TOF performance \rightarrow 400 MeV/u ^{16}O

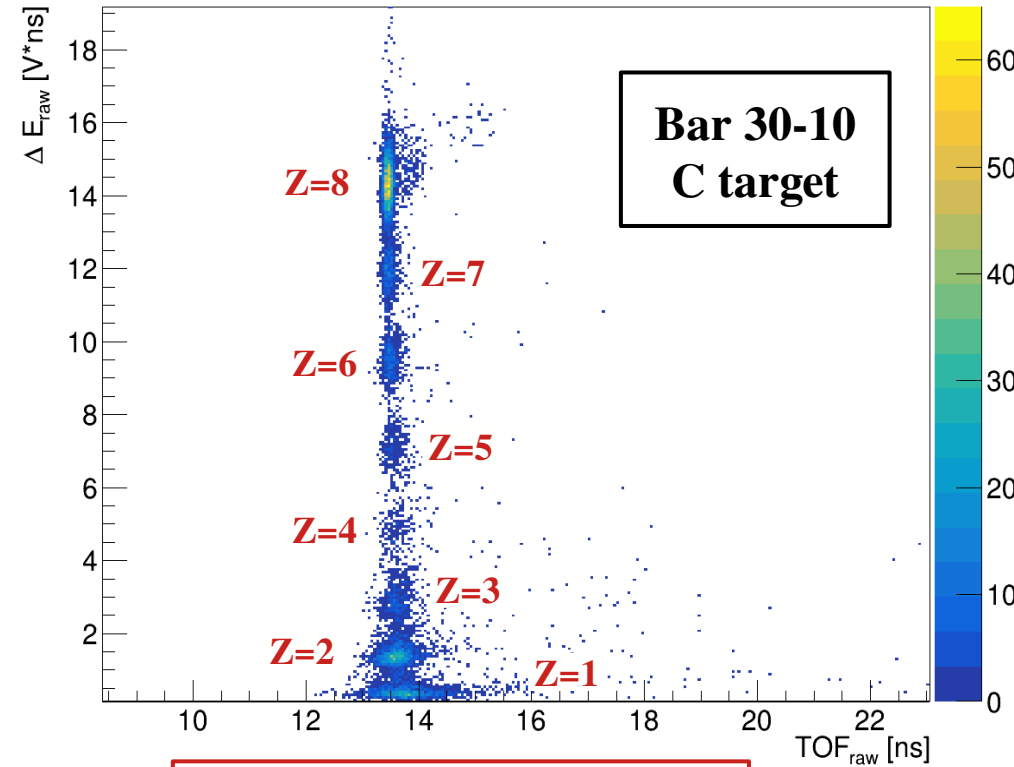
- Charge separation already noticeable
- Some background to be studied

Protons!!

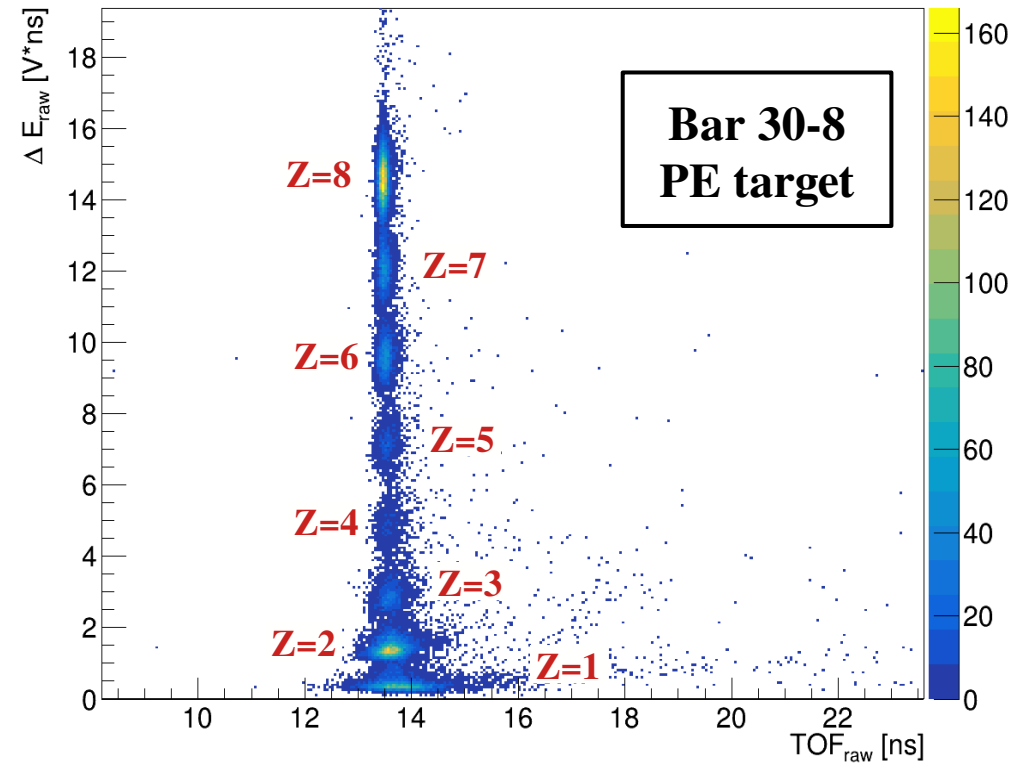




ΔE -TOF performance \rightarrow 400 MeV/u ^{16}O



**Very good charge
separation out of center**



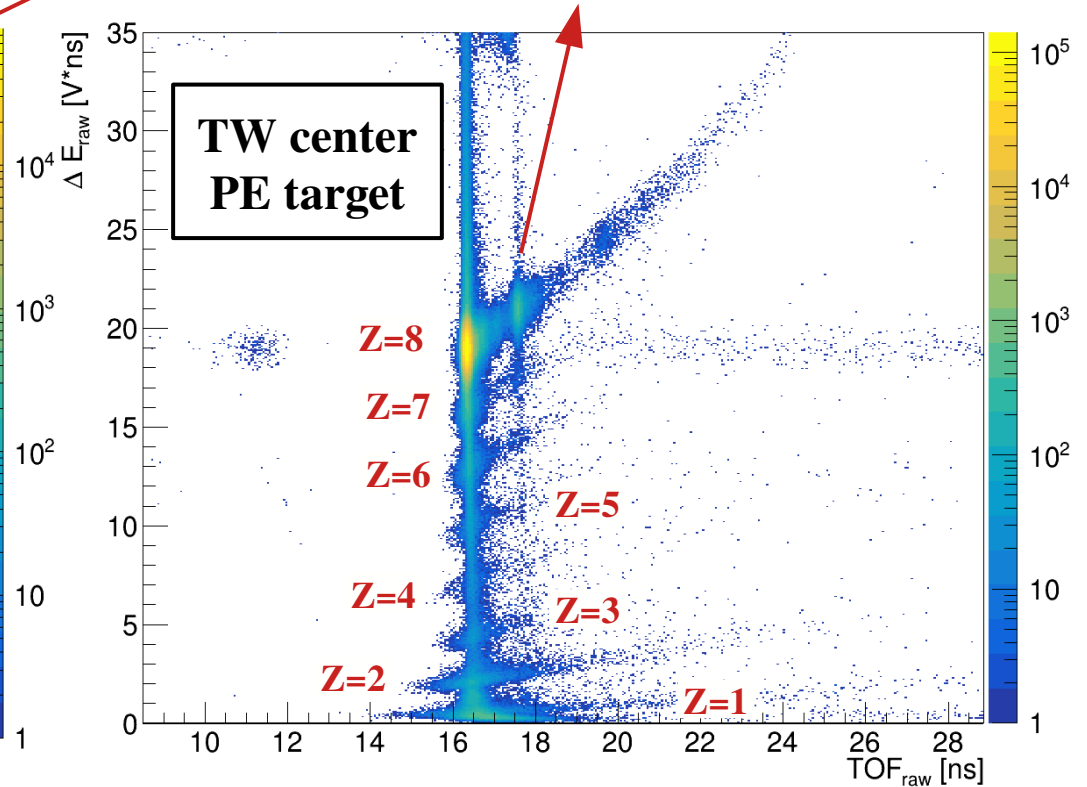
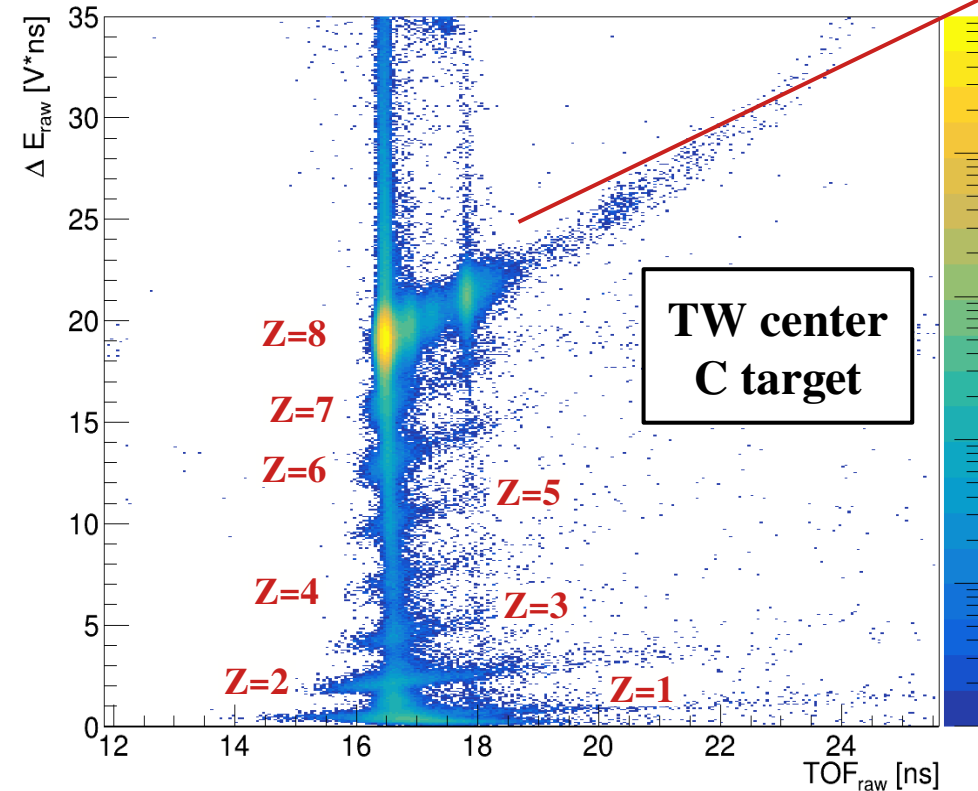
- Finally some good statistics!
- Background @ center \rightarrow ZS? Fragmentation?



ΔE -TOF performance \rightarrow 200 MeV/u ^{16}O

- Good charge separation
- Center background still there

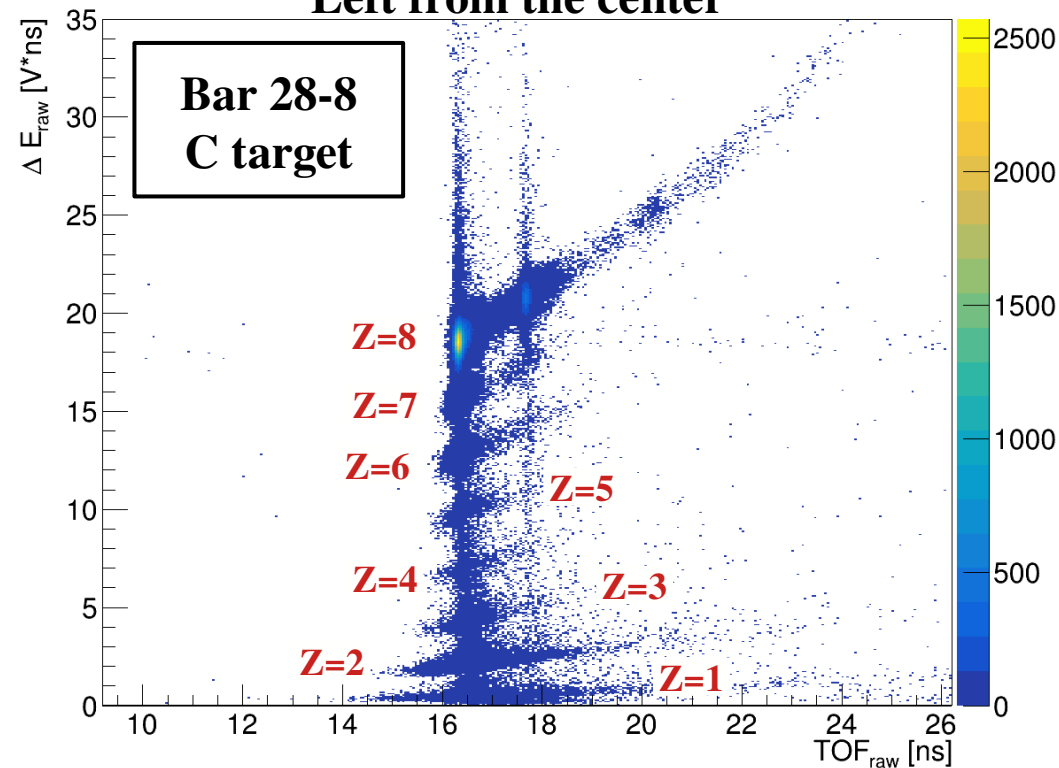
Weird clusters of slower particles... why??



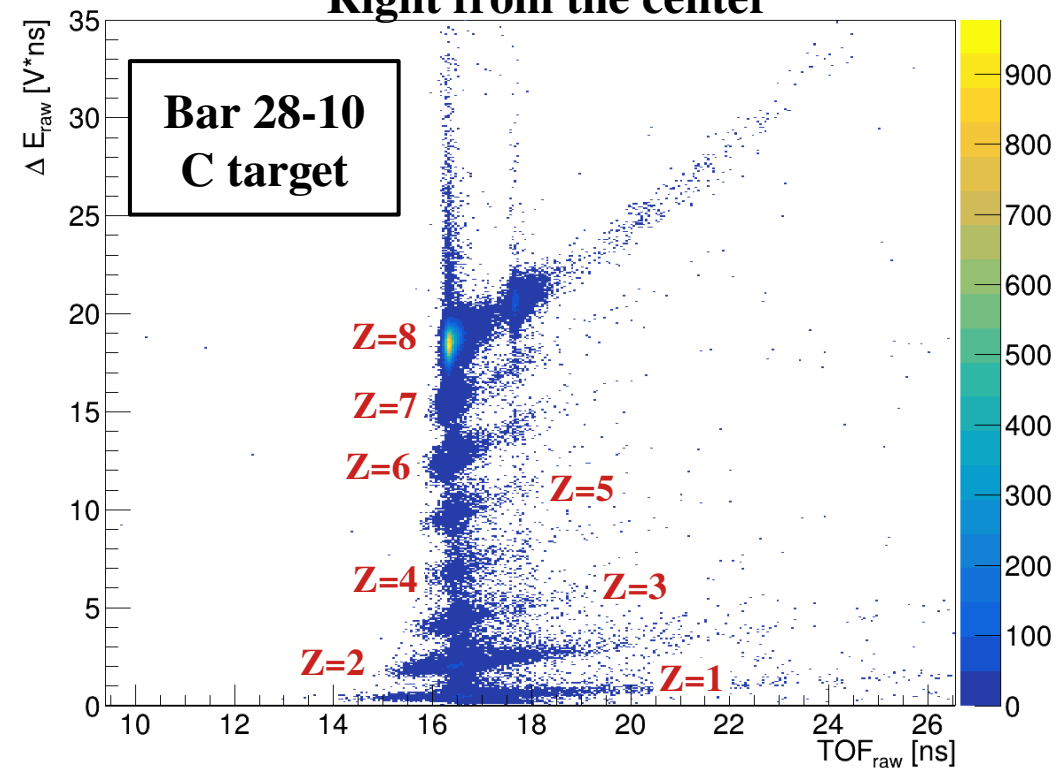
ΔE -TOF performance \rightarrow 200 MeV/u ^{16}O



Left from the center



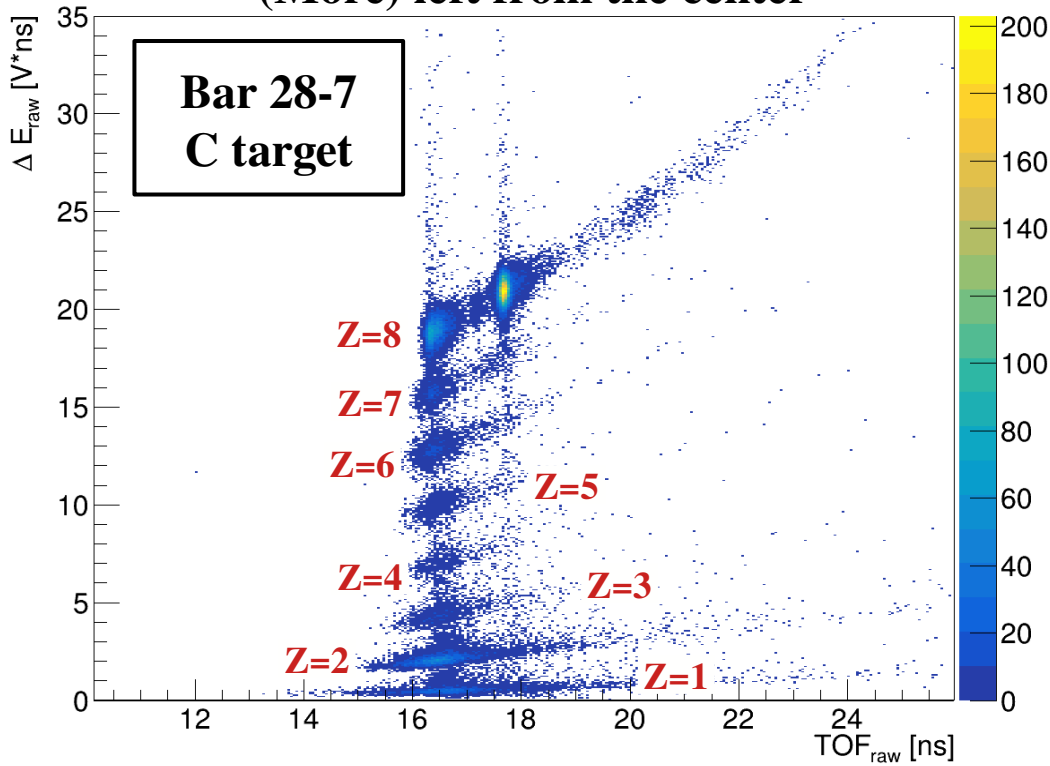
Right from the center



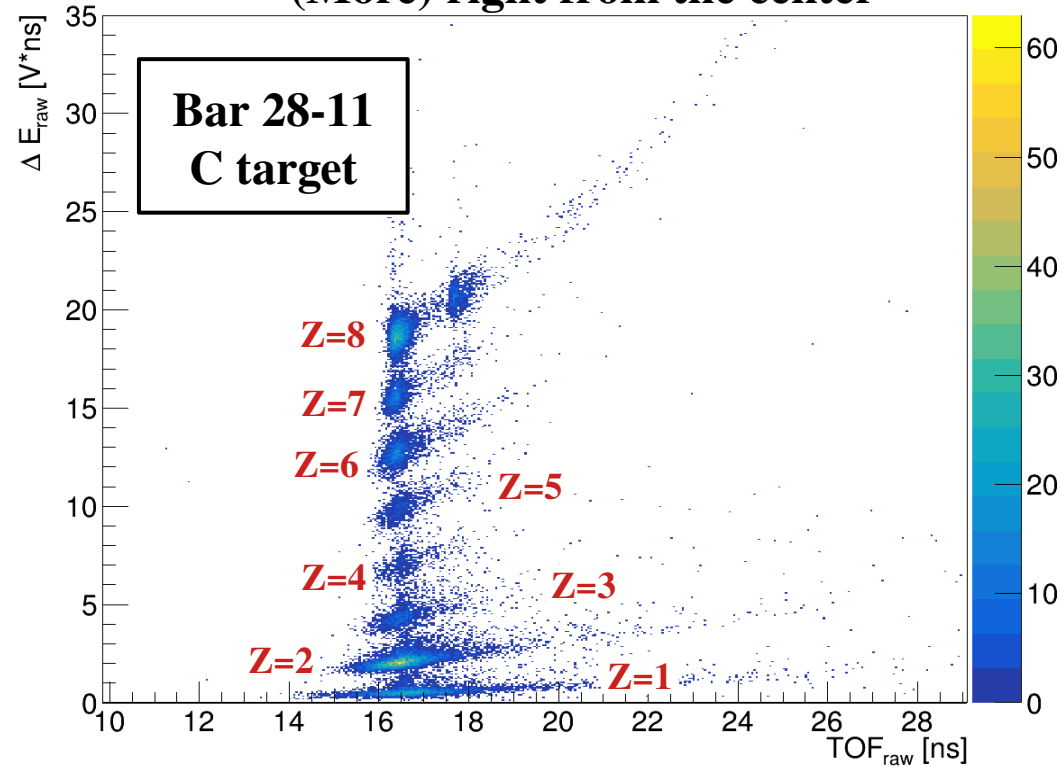


ΔE -TOF performance \rightarrow 200 MeV/u ^{16}O

(More) left from the center



(More) right from the center



Problem visible on both sides but more relevant on the left



ΔE -TOF performance \rightarrow 200 MeV/u ^{16}O

So... what happened?

Nuclear fusion \rightarrow we created Fluorine!!

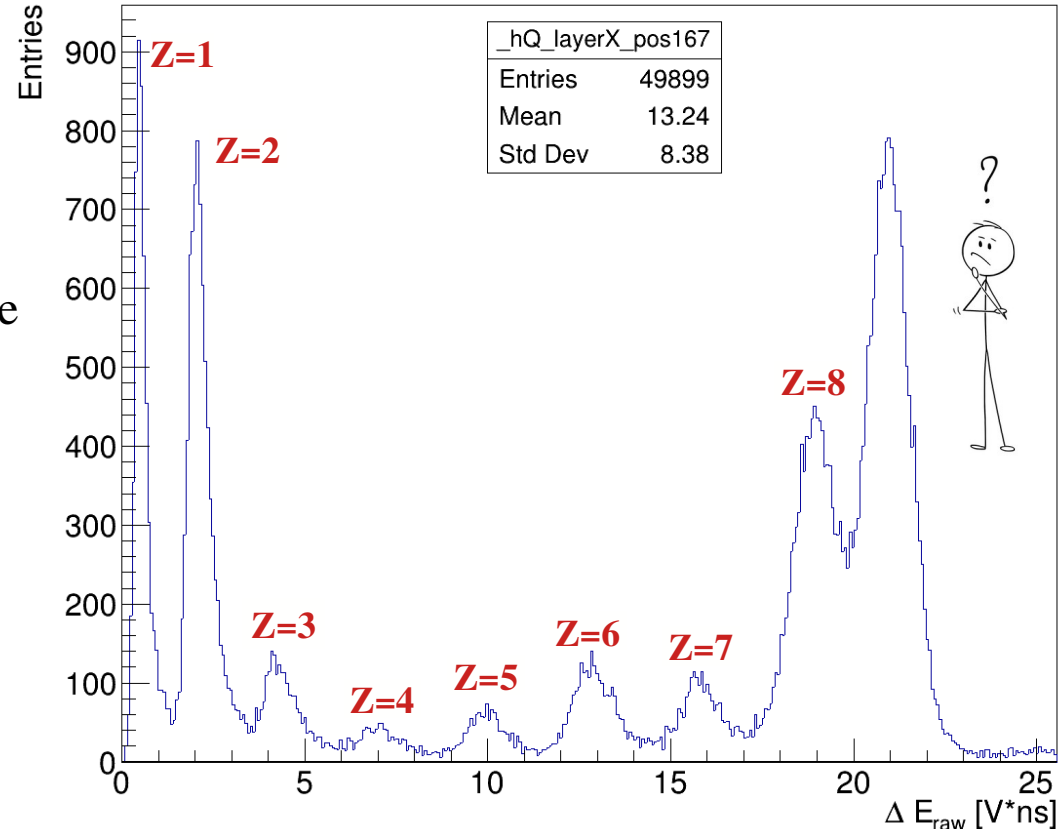
(but jokes aside....)

- There is a well-defined ΔE peak
- It comes from actually slower particles
- Only present @ 200 MeV/u \rightarrow larger beam size



- \rightarrow The last peak comes from primaries
- \rightarrow Likely some material on the beam line

Raw $\Delta E \rightarrow$ Bar 28-7, C target



Conclusions



- TOF-Wall mechanics worked really good
- First irradiation with 200 MeV/u Oxygen
- “Quasi-online” monitoring proved to be a very useful tool
- TW scan successful → very valuable for detector calibration
- Preliminary results suggest very good performances
 - Left-right (up-down) channel time difference linear with hit position
 - Clear charge separation → good resolution (to be carefully evaluated)
 - Protons visible @ both energy → efficiency to be evaluated
 - Slower particles can probably be identified w/ info from tracking system



Lots of work to do!!

Thank you



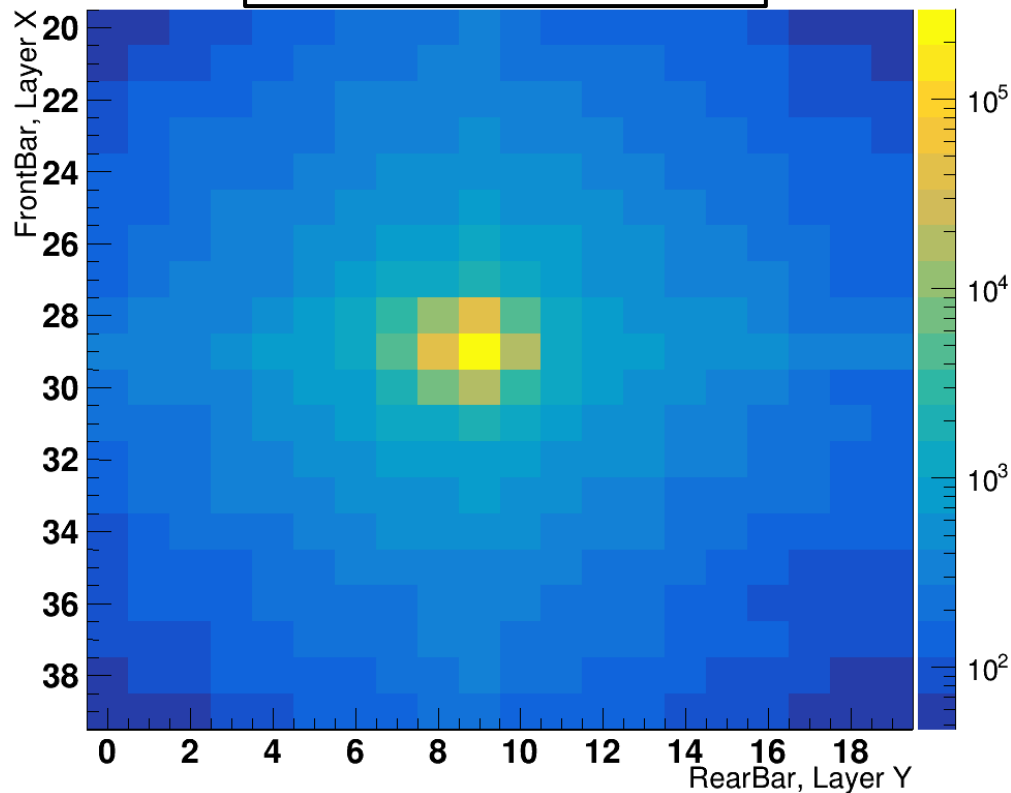


Backup slides

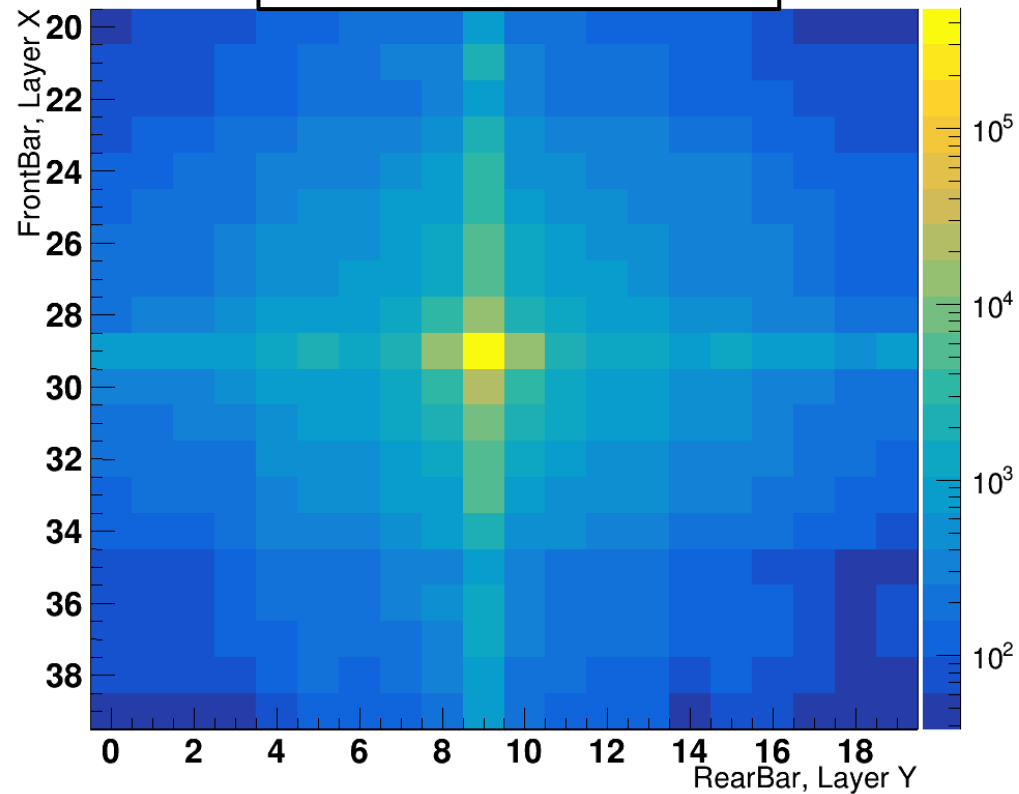
HitMaps



200 MeV/u, PE5 target



400 MeV/u, PE5 target



TW position tuning



200 MeV/u, run 4217

5mm movement

200 MeV/u, run 4218

