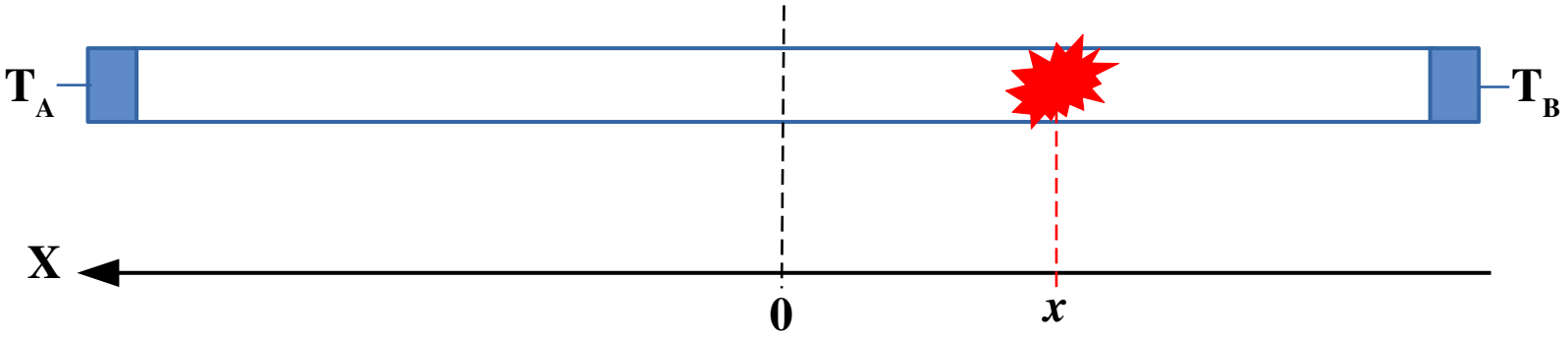
Update on TW position calibration

R. Zarrella

Position calibration

Retrieve the hit position (in TW local reference frame) of particles from time measurements



$$x = \delta x - \frac{v_l \Delta T_{AB}}{2}$$

v_l is the speed of light in the bar

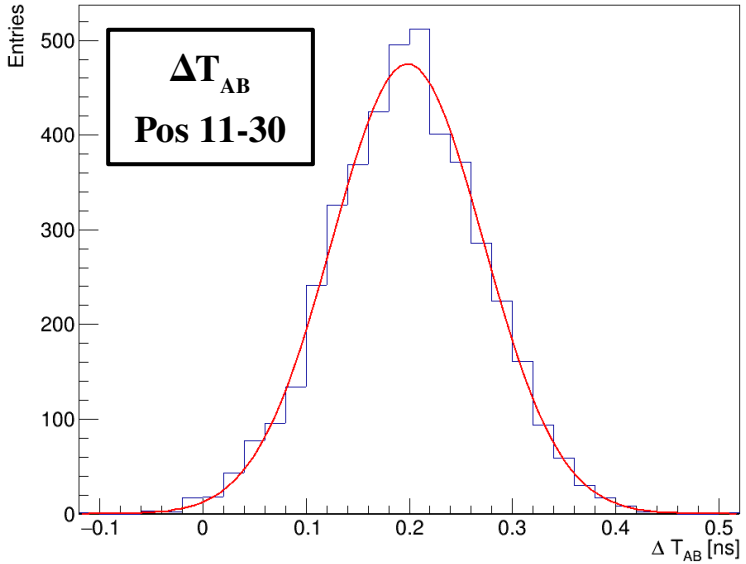
$\Delta T_{AB} = T_A - T_B$

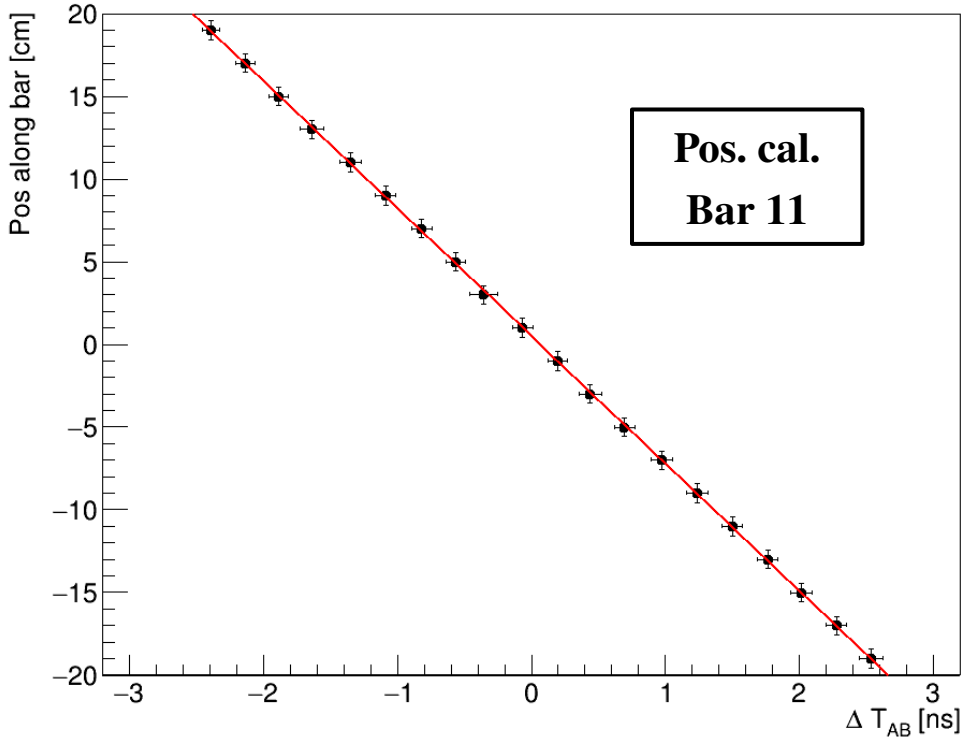
δx is an offset given by cables

The same applies to vertical bars (x→y)

Position calibration

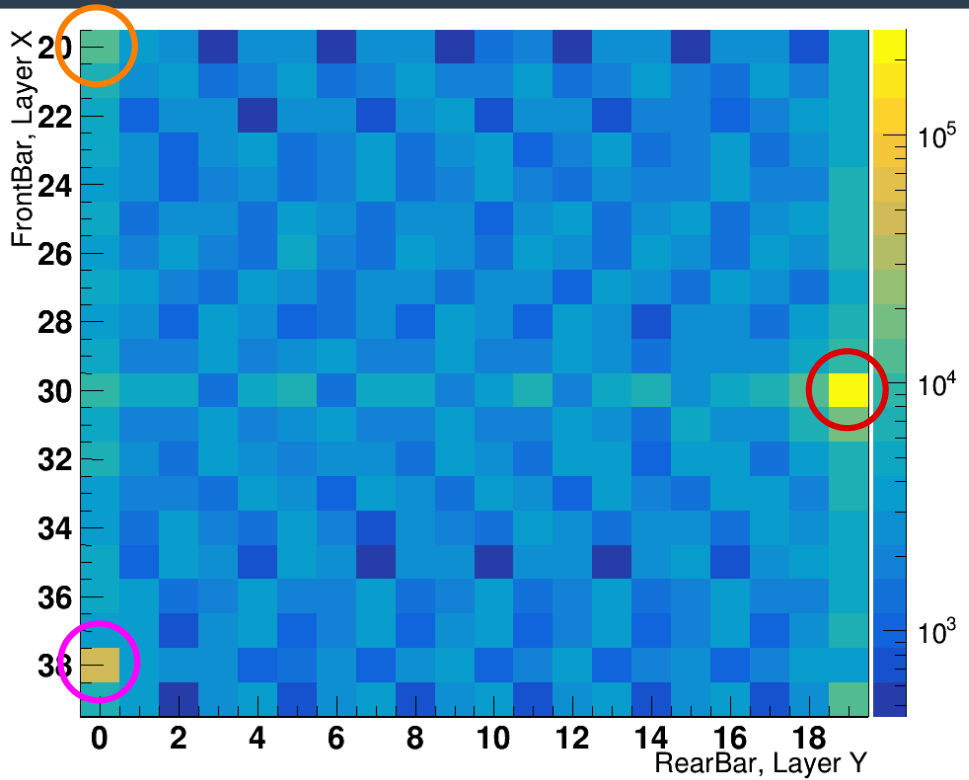
- Look at clean events (1 crossing)
- Calculate ΔT_{AB} of each bar
- Associate to TW position w/ crossing
- Fit all ΔT_{AB} histograms
- Perform linear fit of ΔT_{AB} vs Pos for each bar

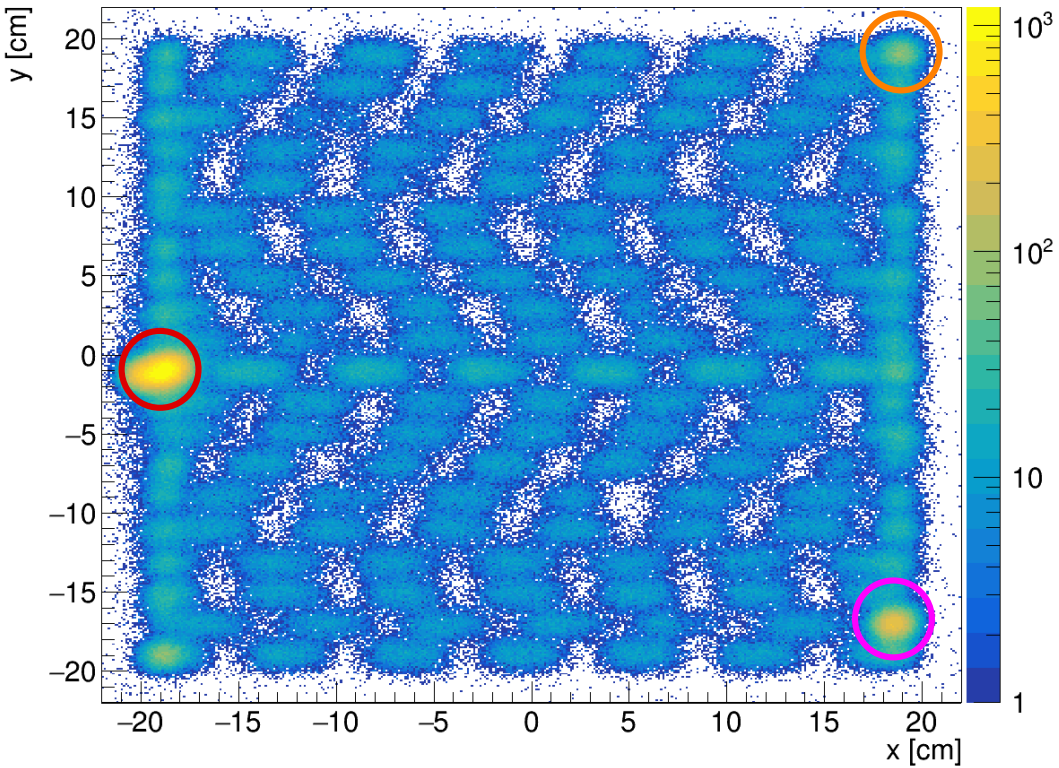




All bars calibrated!!

Proof of concept→ GSI2021 TW scan





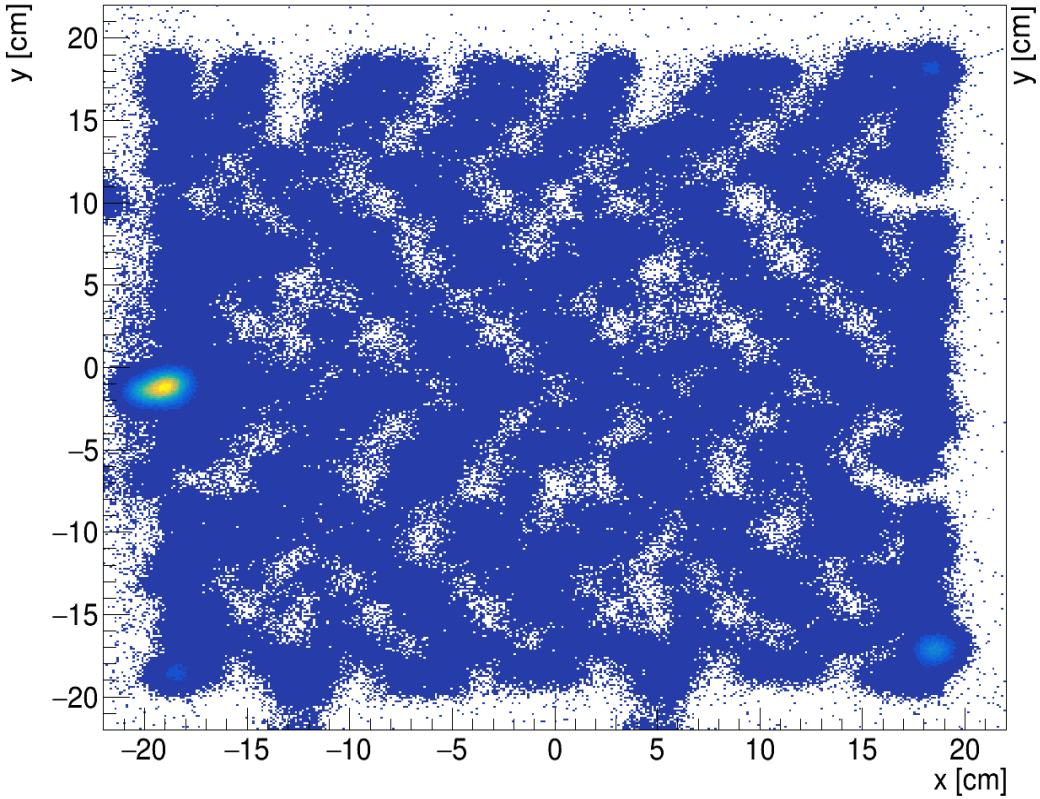
- Position linearity w/ ΔT_{AB}!
- Recognizable spots (start, stop, block)

- Beam spills are clearly visible
- Everything in [-20,20] for x|y

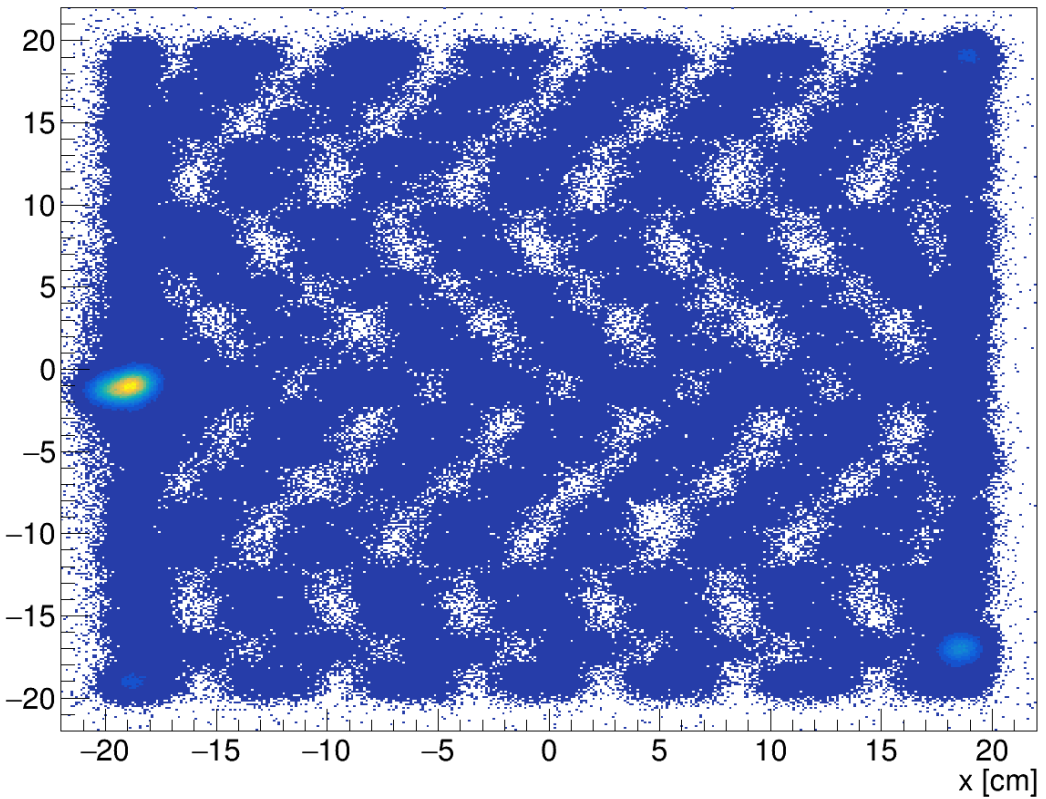
GSI2021 TW scan

v_{light} = 15 cm/ns
offset = 0 cm

Non-calibrated



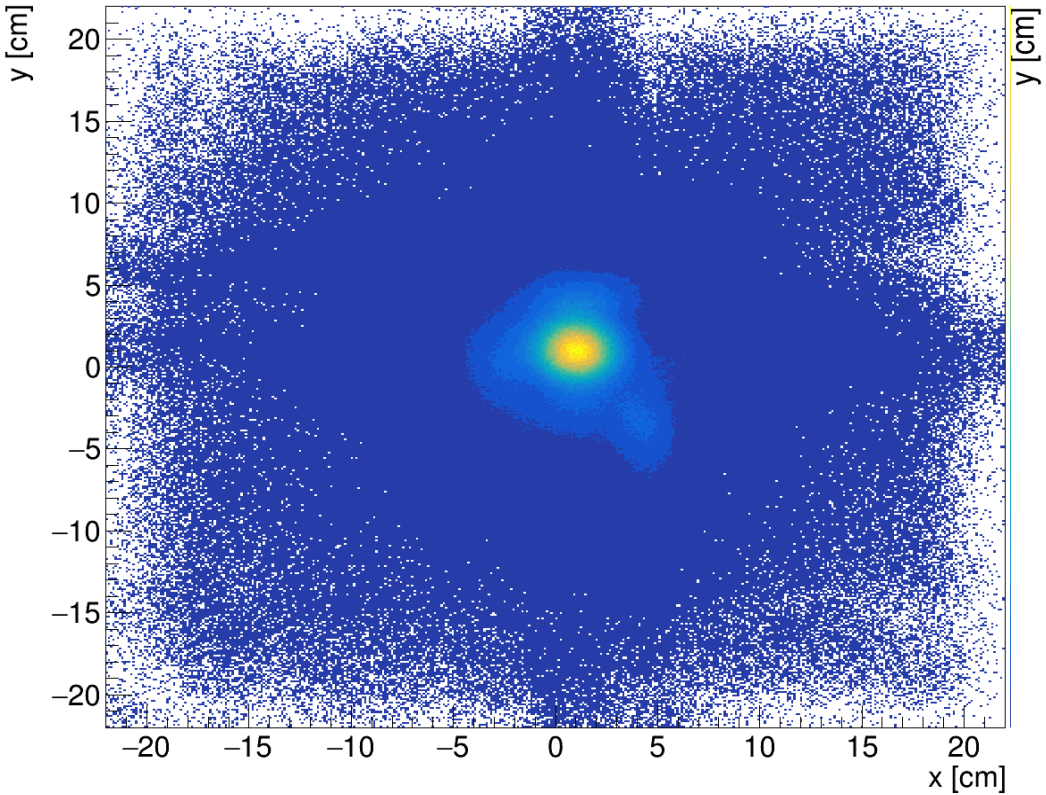
Calibrated



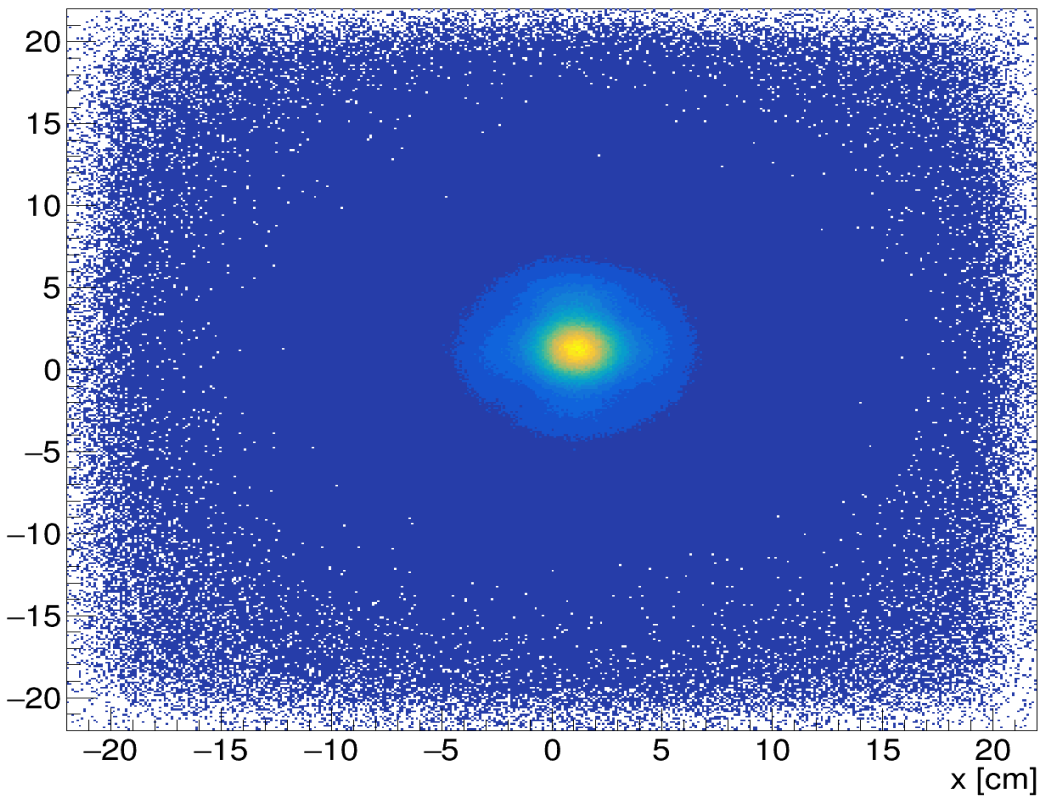
HIT2022 – He 100 MeV/u on 5mm C

v_{light} = 15 cm/ns
offset = 0 cm

Non-calibrated



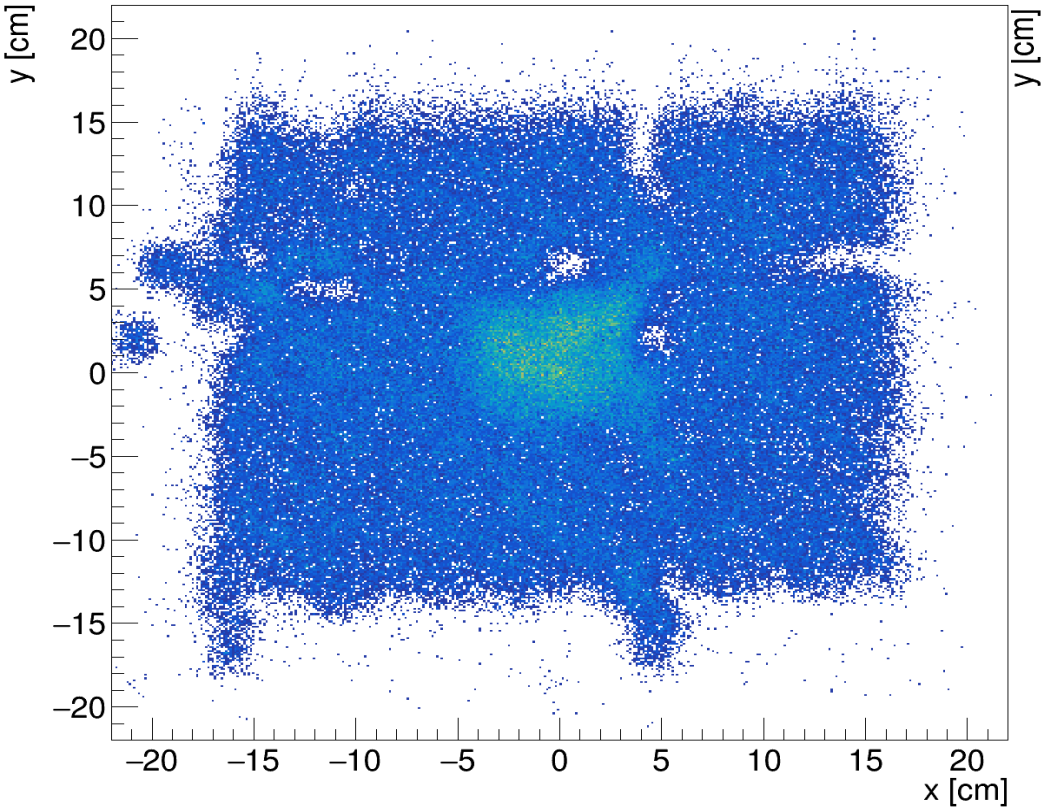
Calibrated



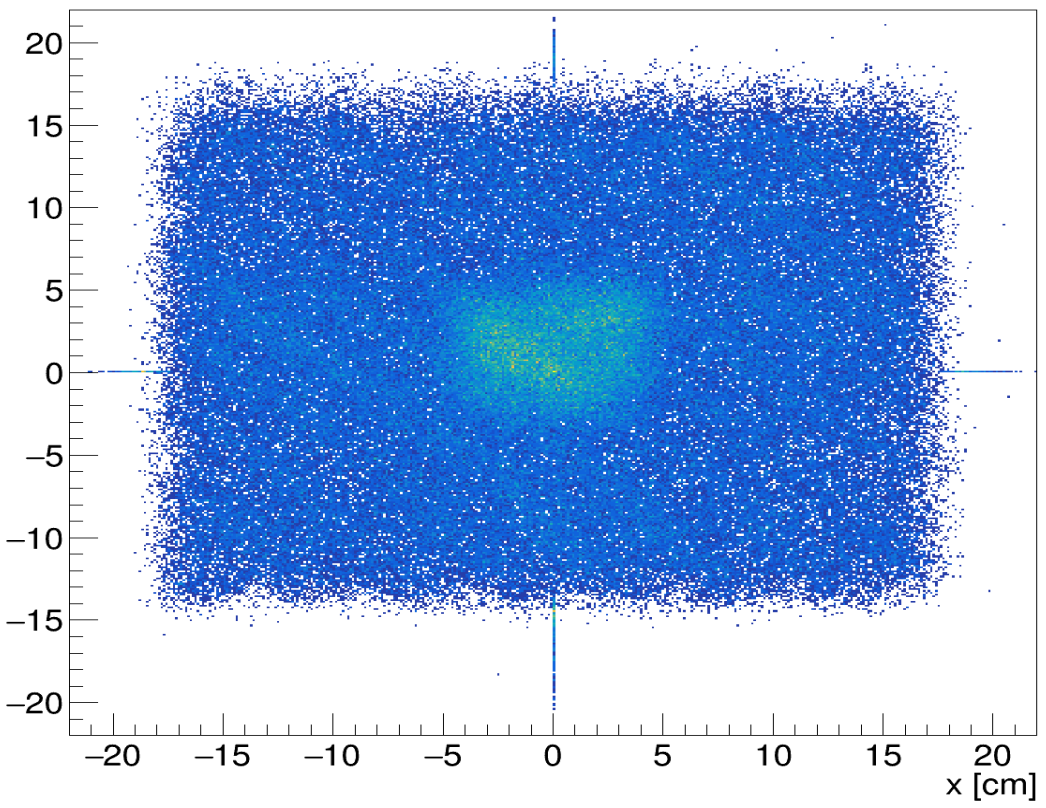
CNAO2022 – screensaver C 115 MeV/u

v_{light} = 15 cm/ns
offset = 0 cm

Non-calibrated



Calibrated



Conclusions

- **Position calibration done**
  - Independent of MC
  - Independent of sample considered (physics, calibration, screensaver, etc.)
  - Independent of geometry (only TW)
  - Only dependent on connections to DAQ

- Implemented in SLIPPER, **can be performed in real time**

- **Calibration finally in SHOE!**