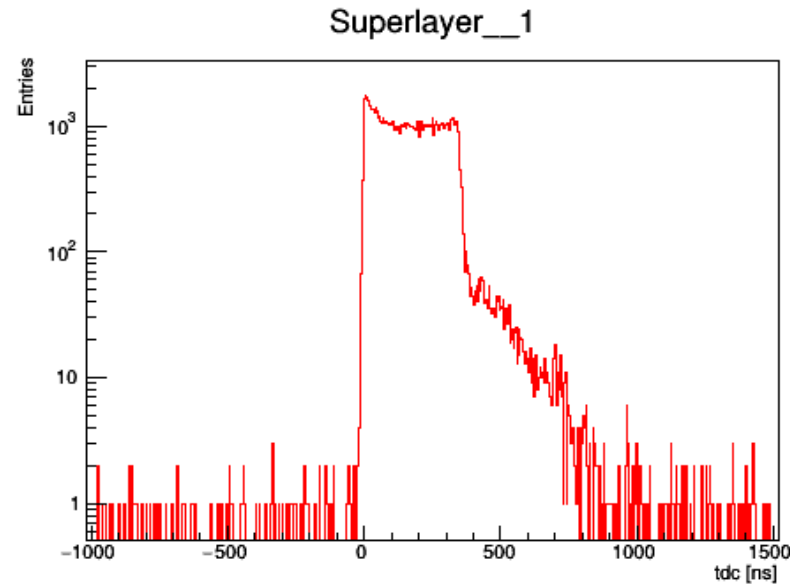
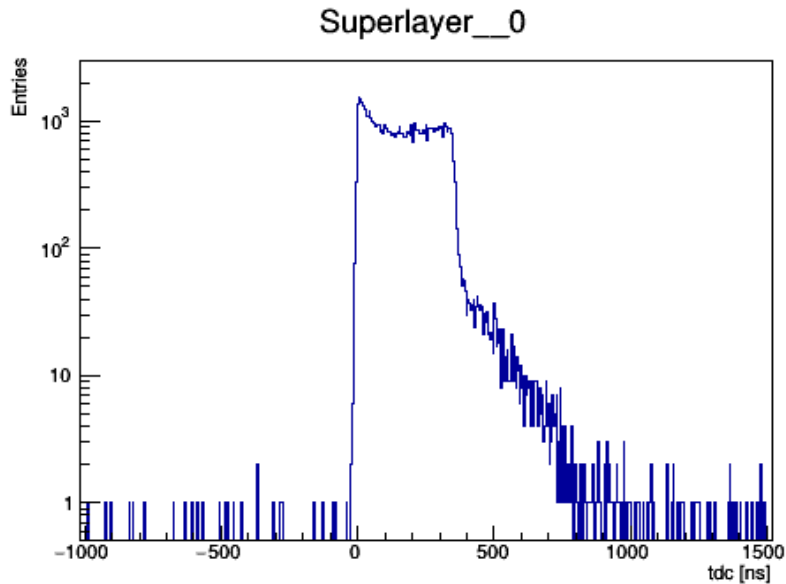
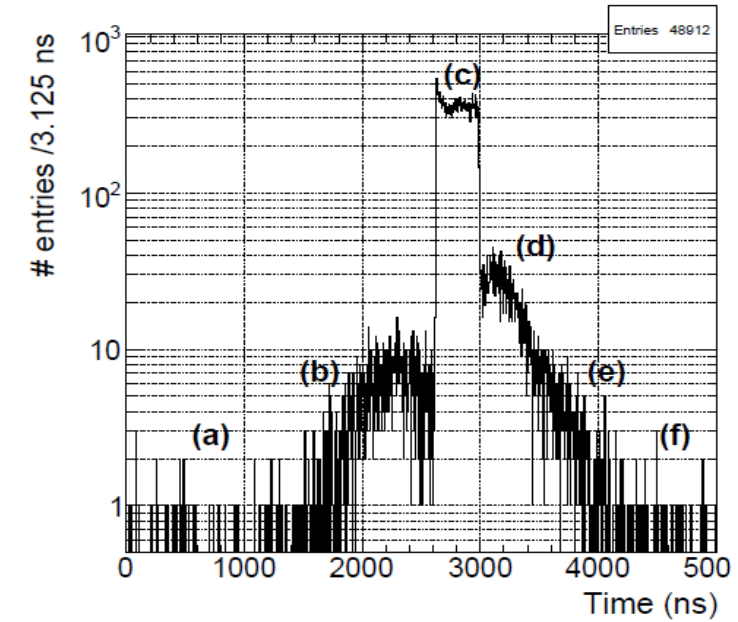
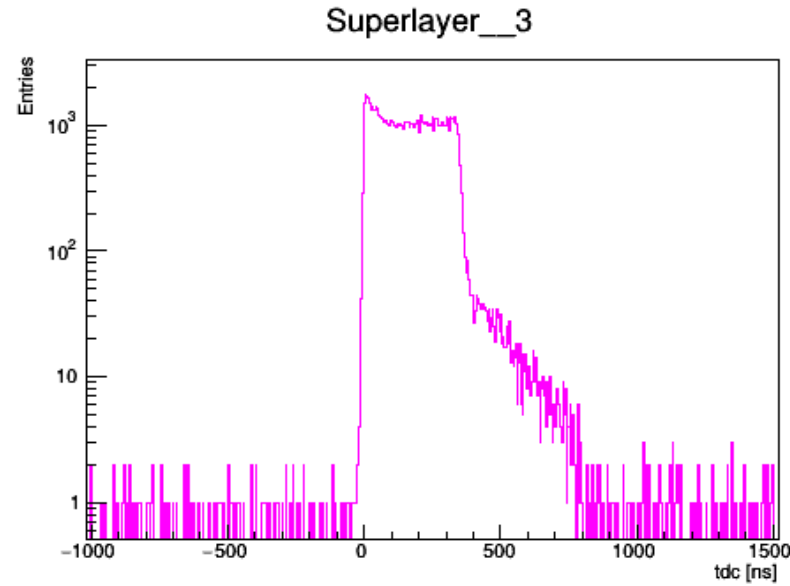
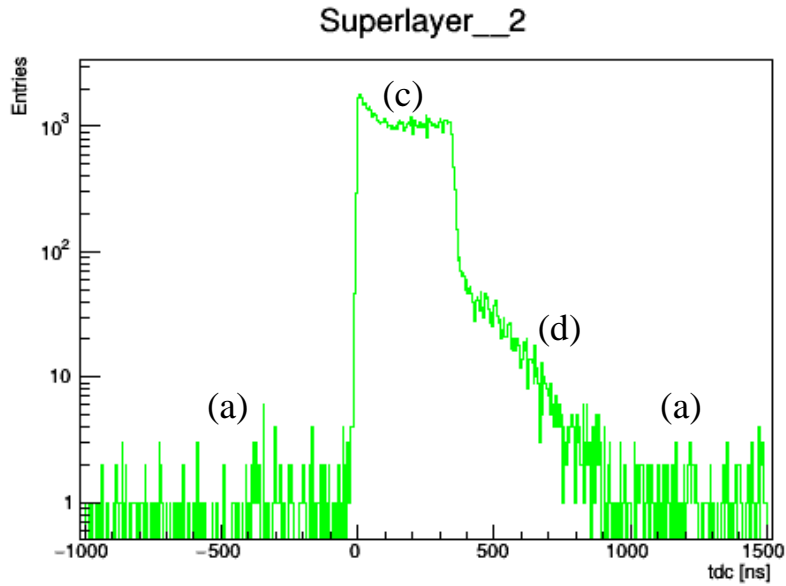


Runs with scintillator trigger

24/06/2019

TimeBox → Run 617

CMS NOTE -2010 /004
(DT Test beam 2010)

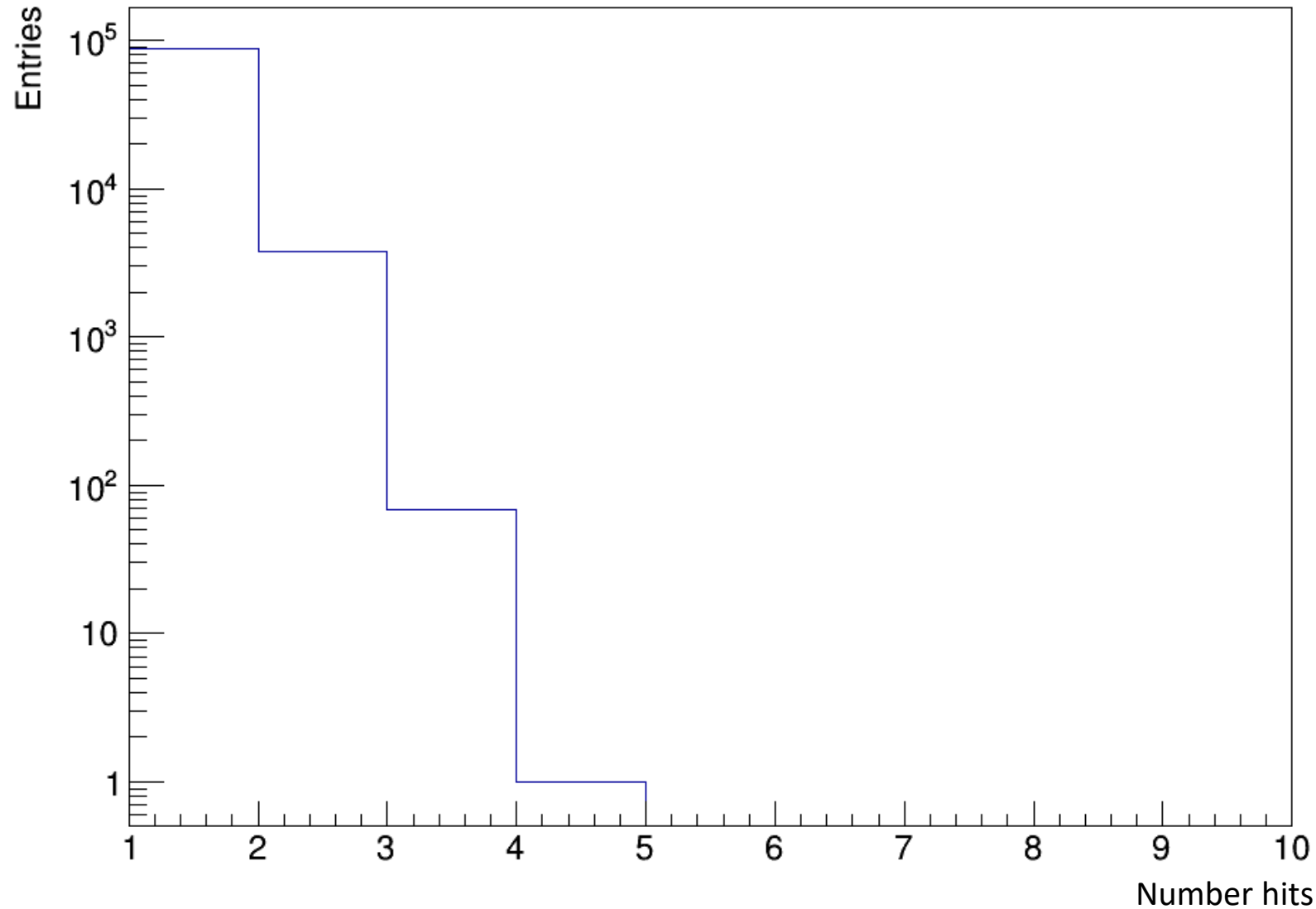


(c) → «in-time» hits from the signal
(a) → random noise
(d) → after-pulses and other secondary hits

On average the noise is small

Distribution of the number of in-time hits per cell

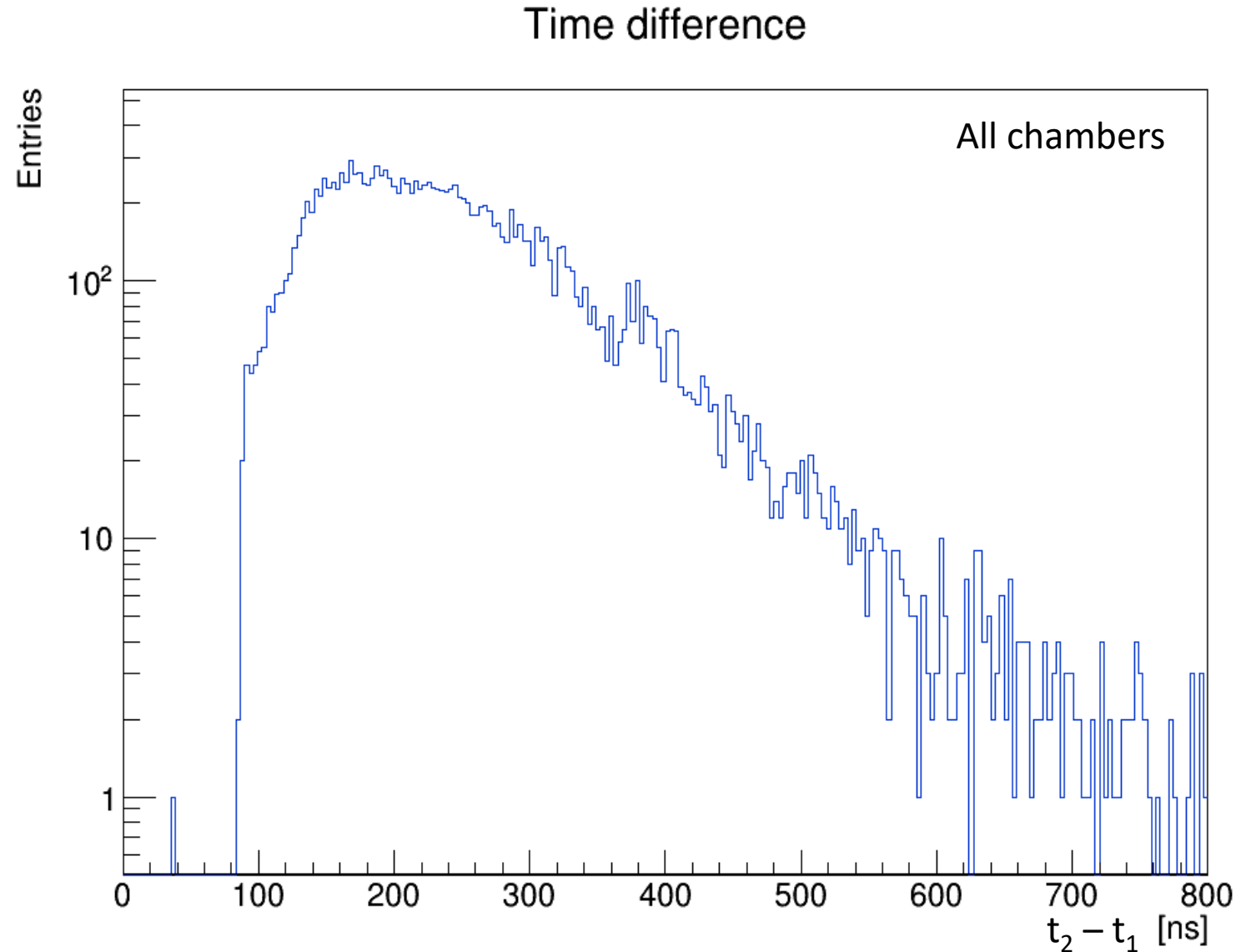
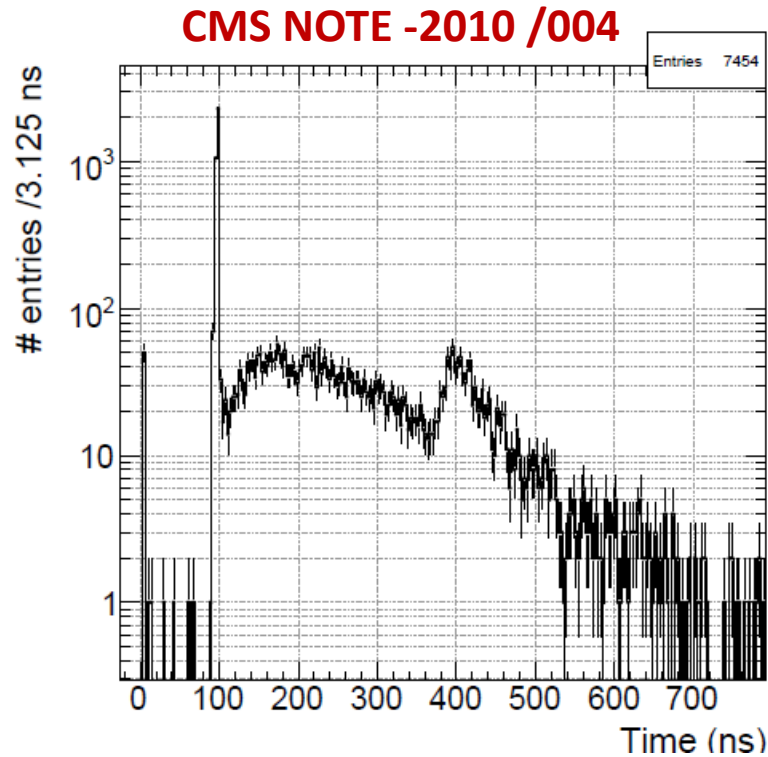
Superlayer__3



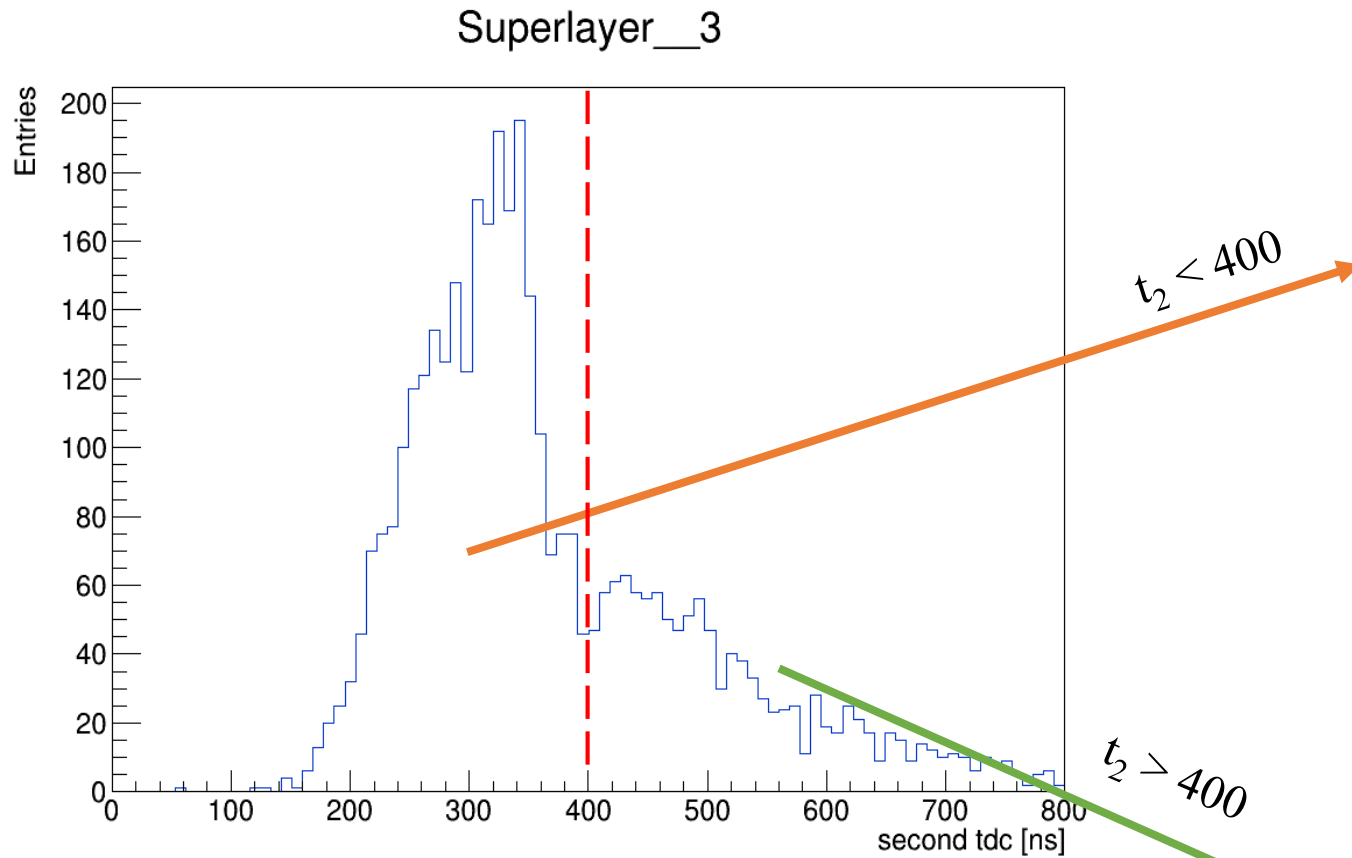
Taking into account hits between
-5 ns and 380 ns after calibration

Time difference Between 2nd and 1st hit

- **Dead time ≈ 80 ns** \rightarrow hardware dead-time or cut in FW?
- Afterpulse peak around 400 ns barely visible (gas quality?)

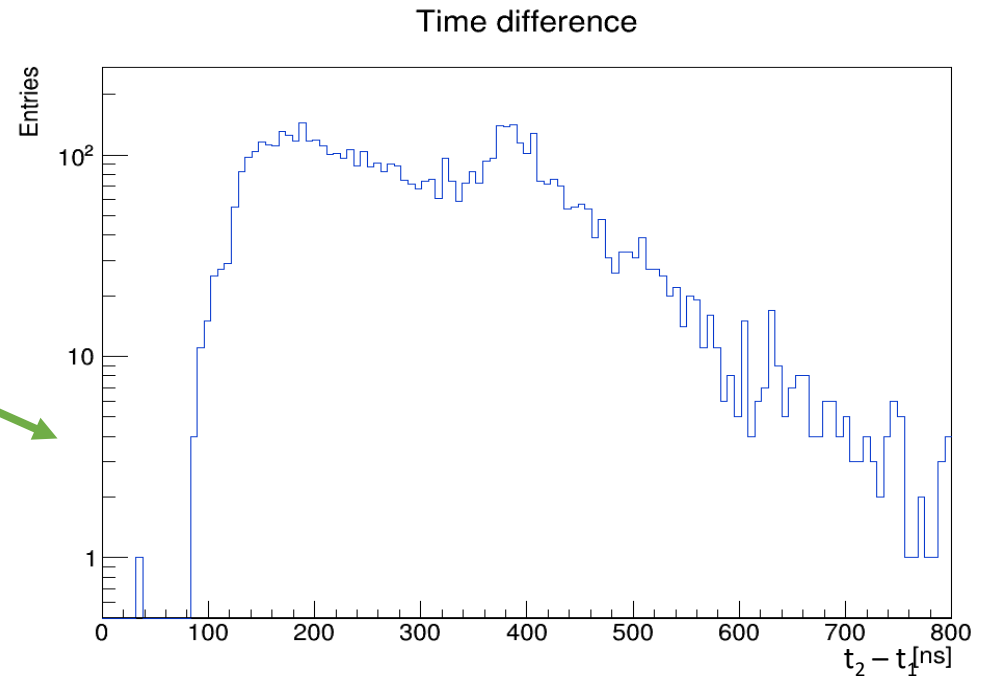
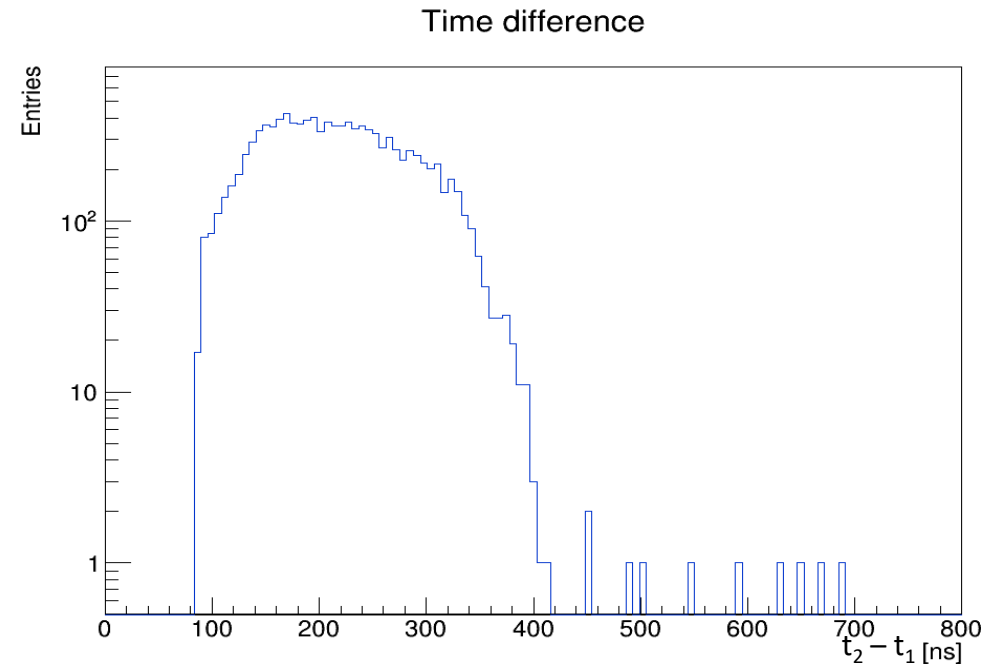


2nd hit tdc distribution



Apparently 2 different populations:

- $t_2 < 400$: mainly secondaries (delta rays)
- $t_2 > 400$: afterpulses (+?)



Residuals

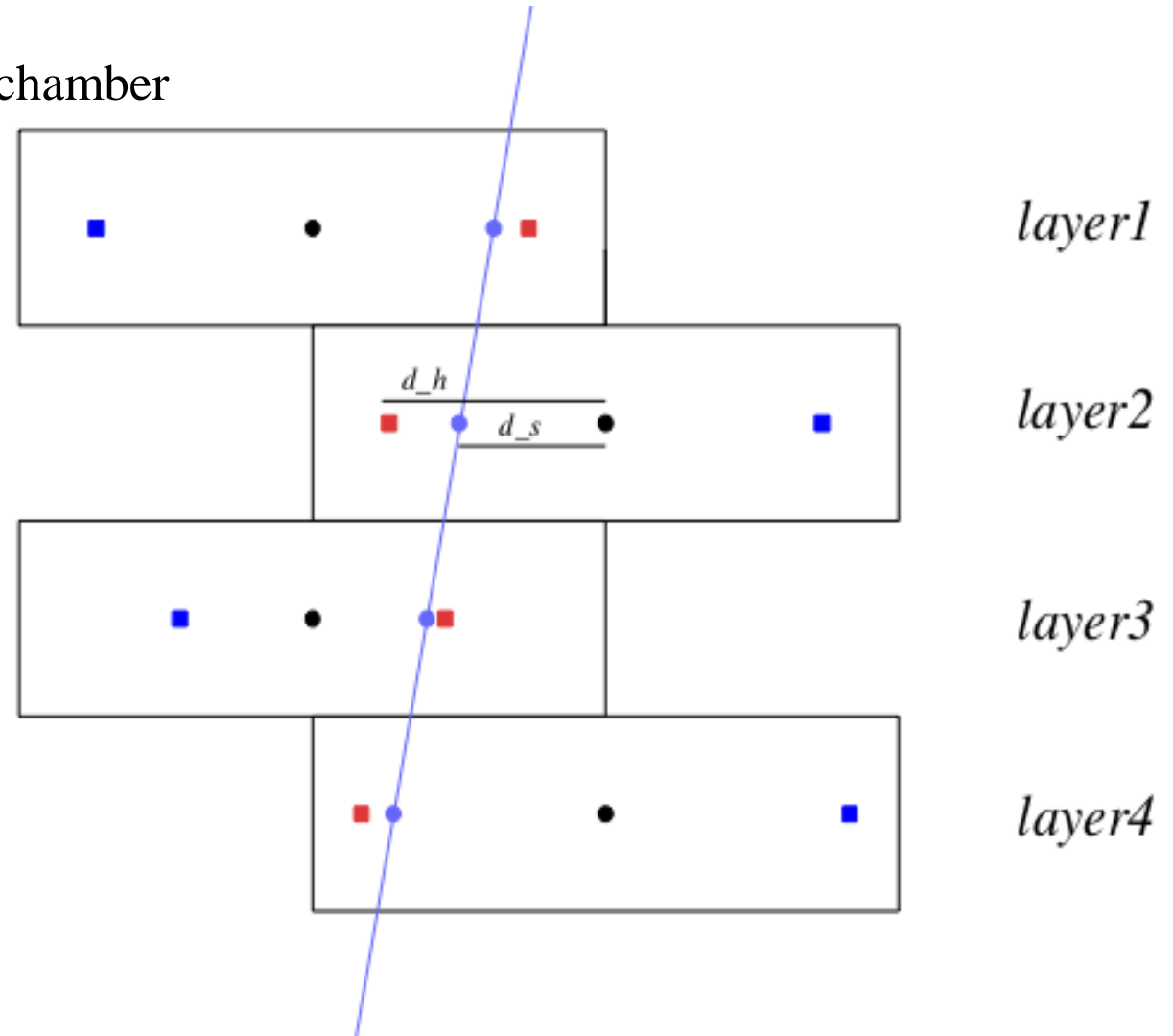
- Implemented segment reconstruction with 4/4 hits (in order to measure residuals correctly)
- $\theta < 45^\circ$ to reduce combinatorial
- Uncertainties: $\sigma_x = 0.5$ mm and $\sigma_z = 0.1$ mm
- Consider only the segment with best χ^2 in each chamber
- Selection: $\chi^2 < 16$

Residuals defined as:

$$\text{residual} = \mathbf{d_h} - \mathbf{d_s}$$

$\mathbf{d_h}$ \rightarrow distance hit and wire

$\mathbf{d_s}$ \rightarrow distance segment hit and wire



Results of calibration

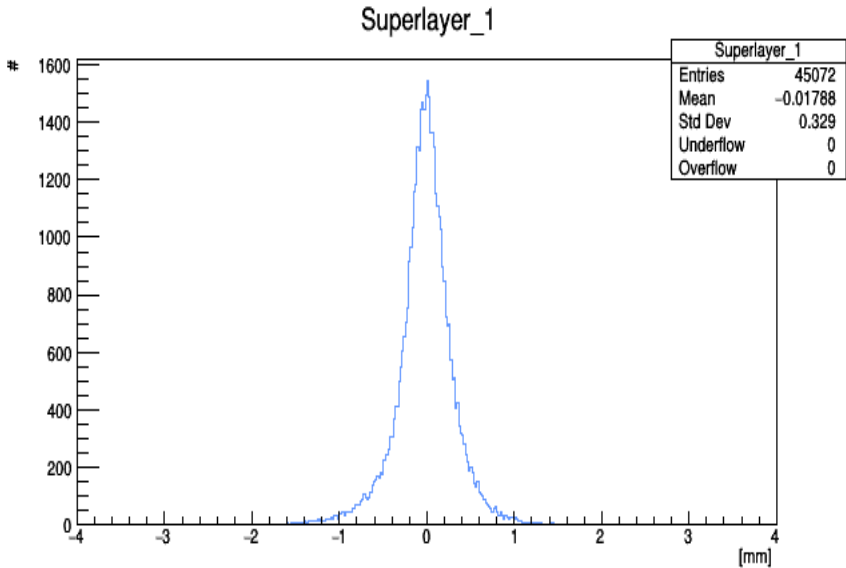
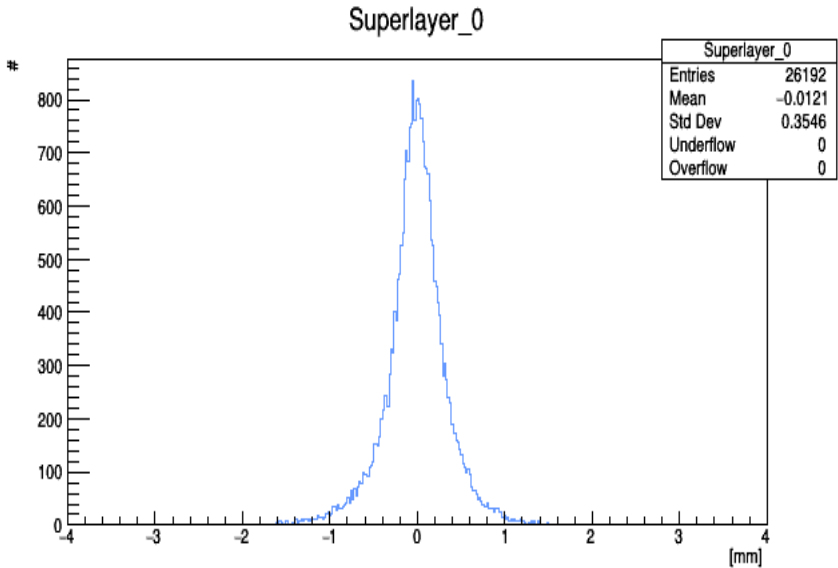
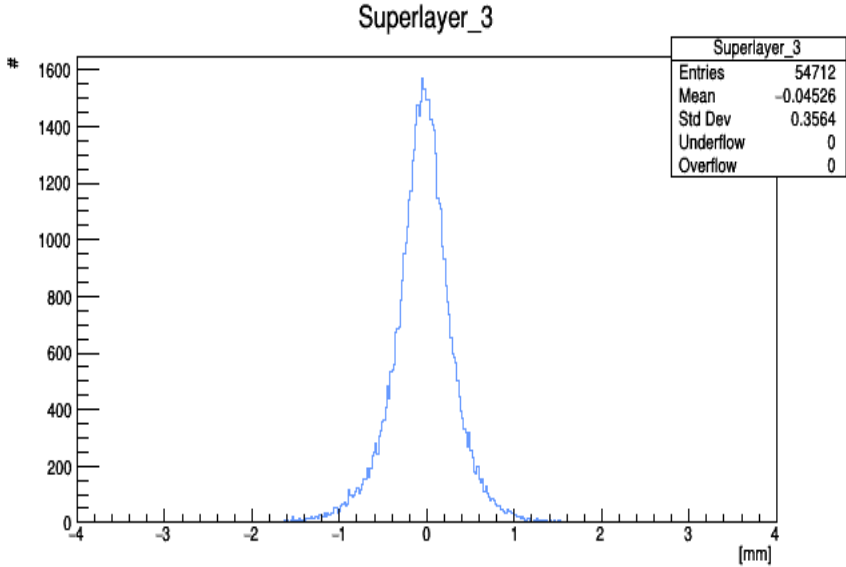
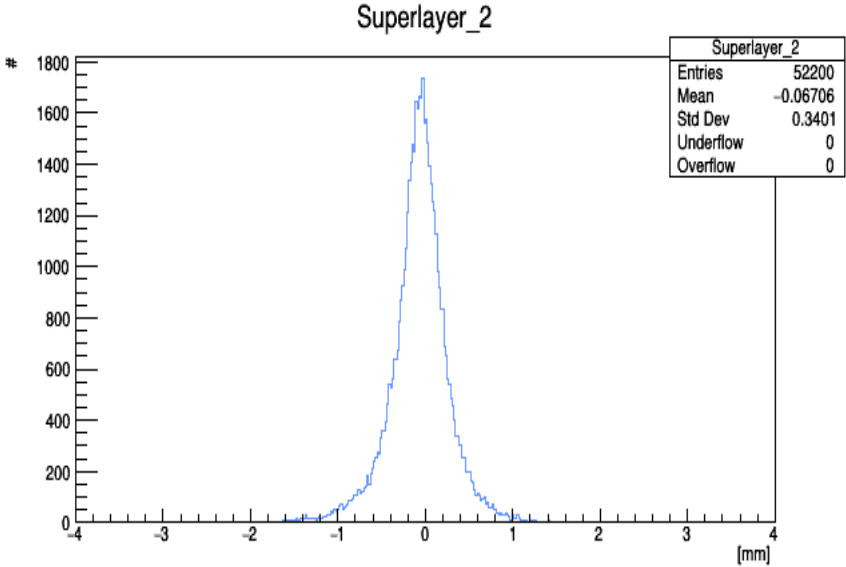
Assuming constant drift velocity = ***0,05385 mm/ns***

Values of 1st (initial processing) and 2nd calibration:

| Superlayer | Used in processing [ns] | Additional calibration [ns] |
|------------|-------------------------|-----------------------------|
| 0 | 111 | 16 |
| 1 | 111 | 17 |
| 2 | 106 | 16 |
| 3 | 106 | 16 |

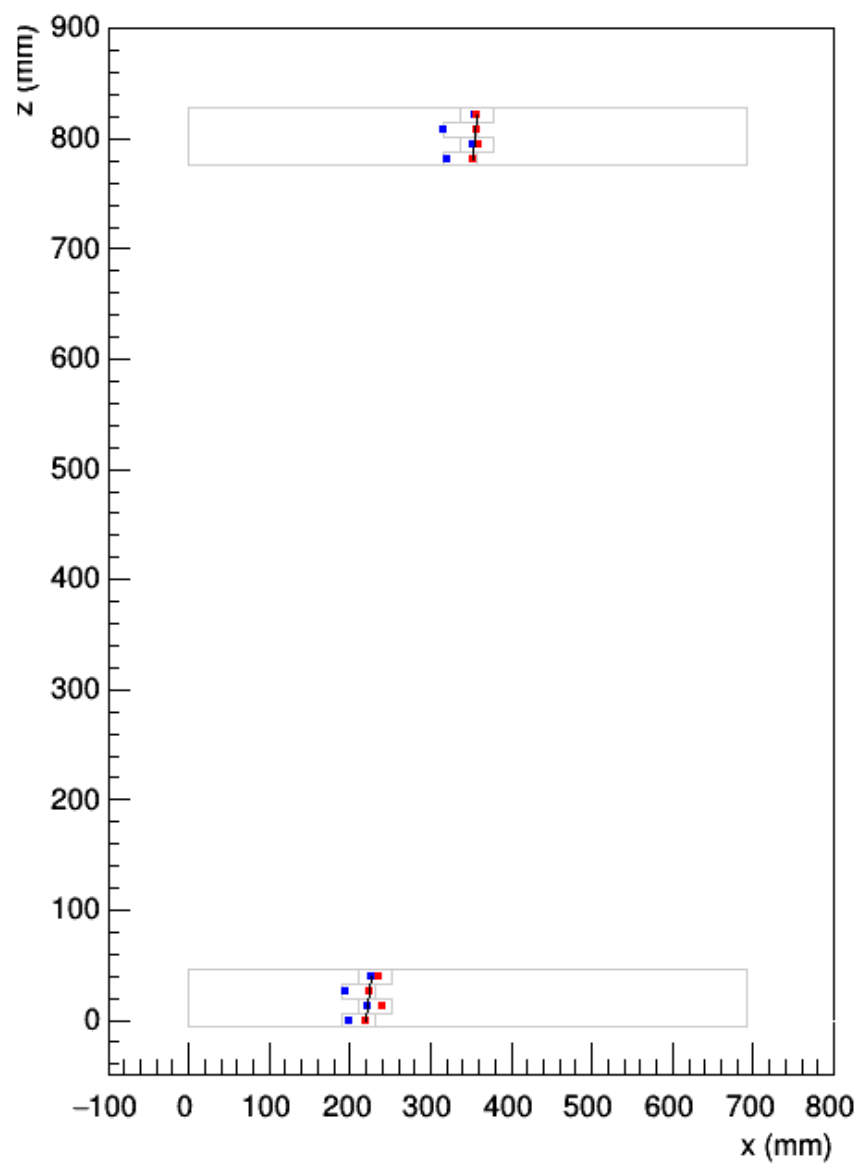
Distribution of residuals after calibration

| Superlayer | RMS [μm] |
|------------|-----------------------|
| 0 | 350 |
| 1 | 330 |
| 2 | 340 |
| 3 | 360 |

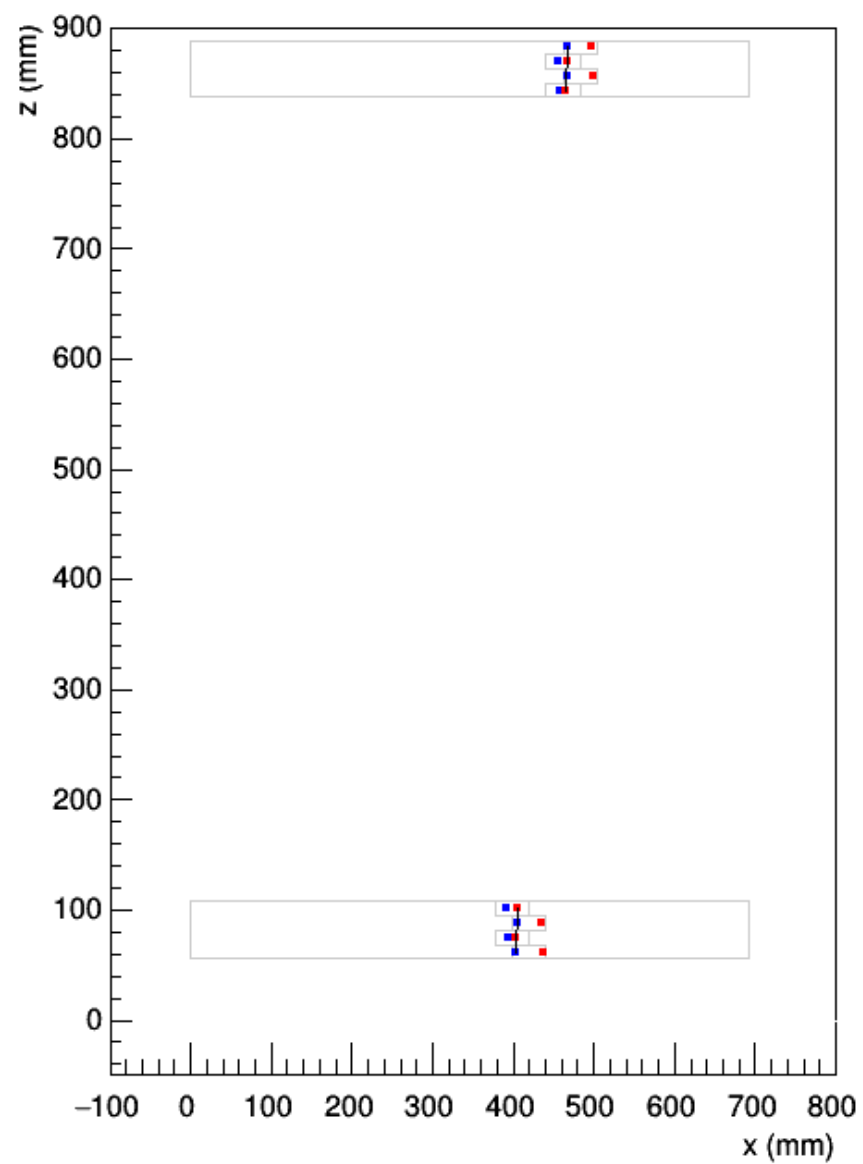


A few events

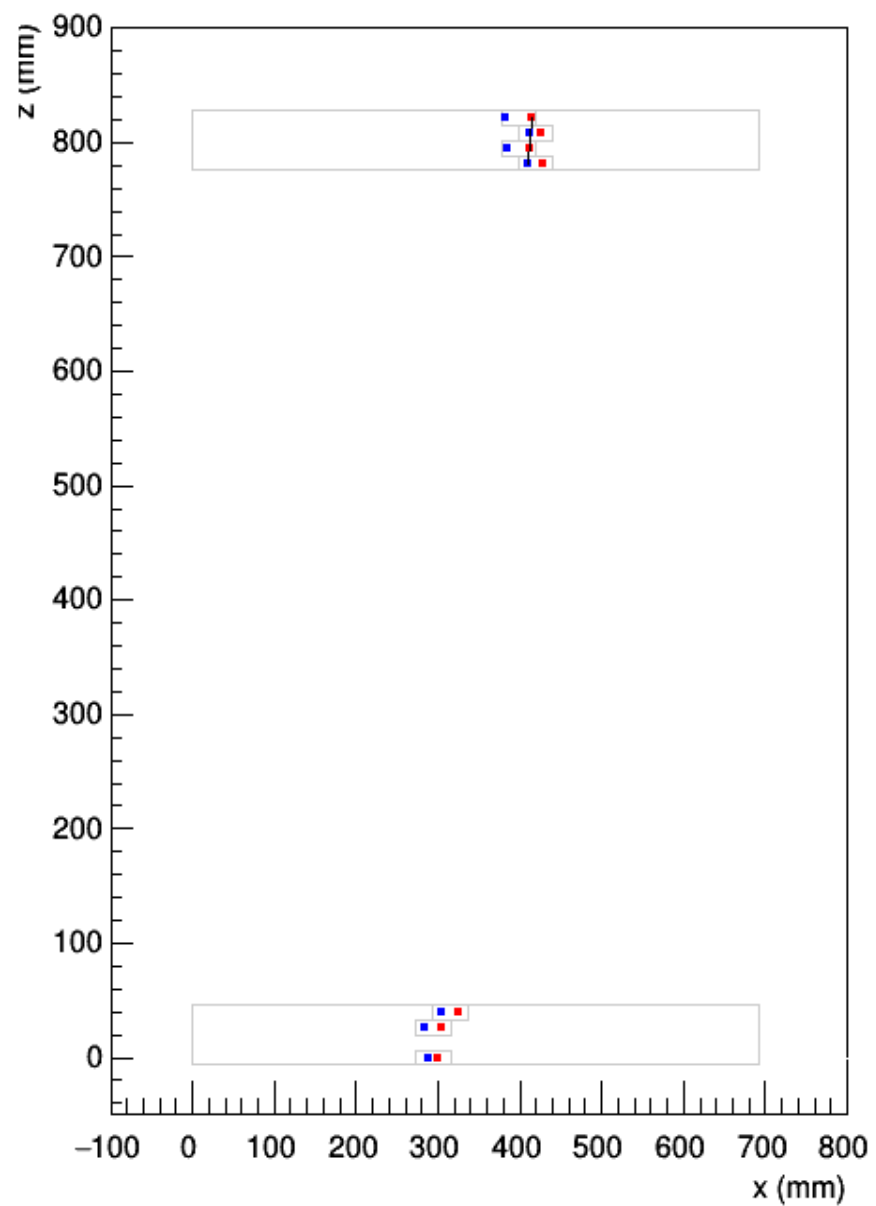
Event 3 - ch0,2



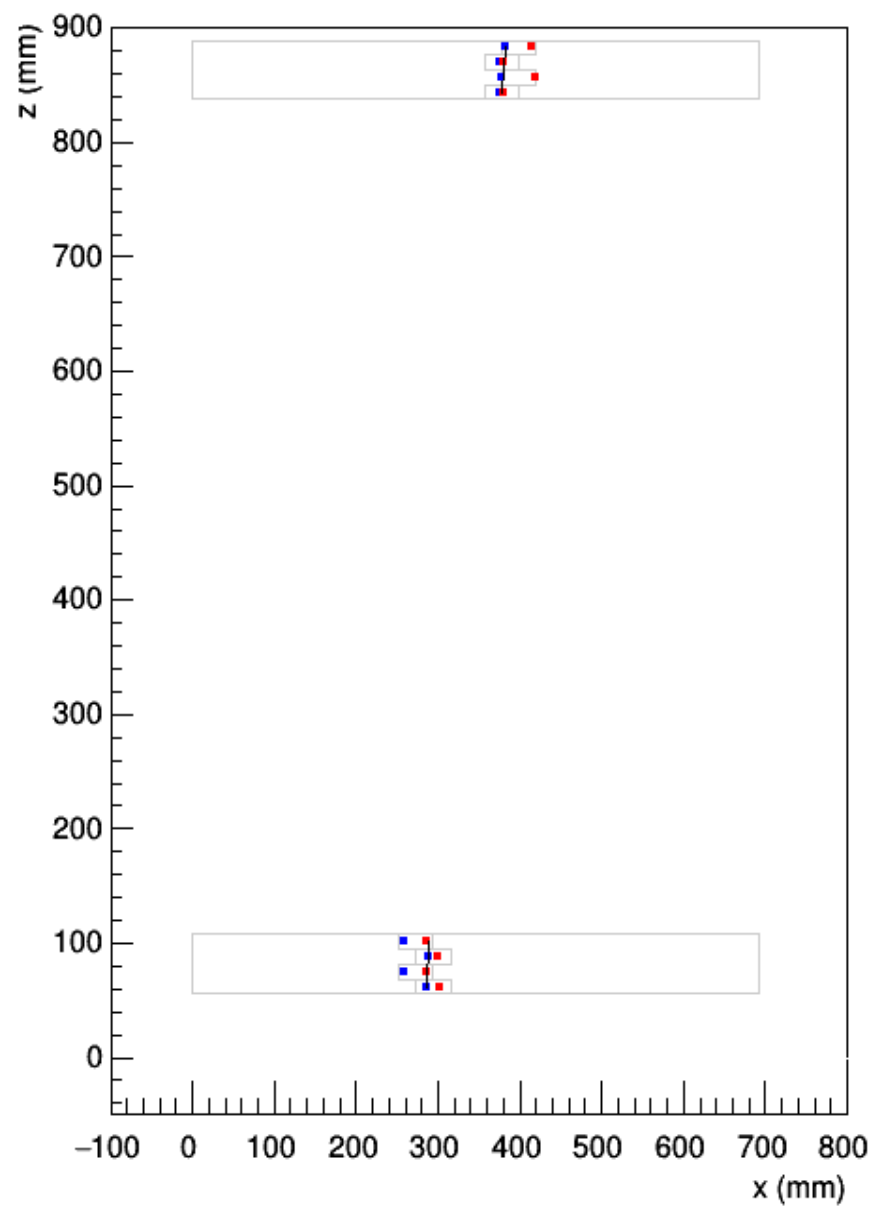
ch 1,3



Event 32 - ch0,2



ch 1,3



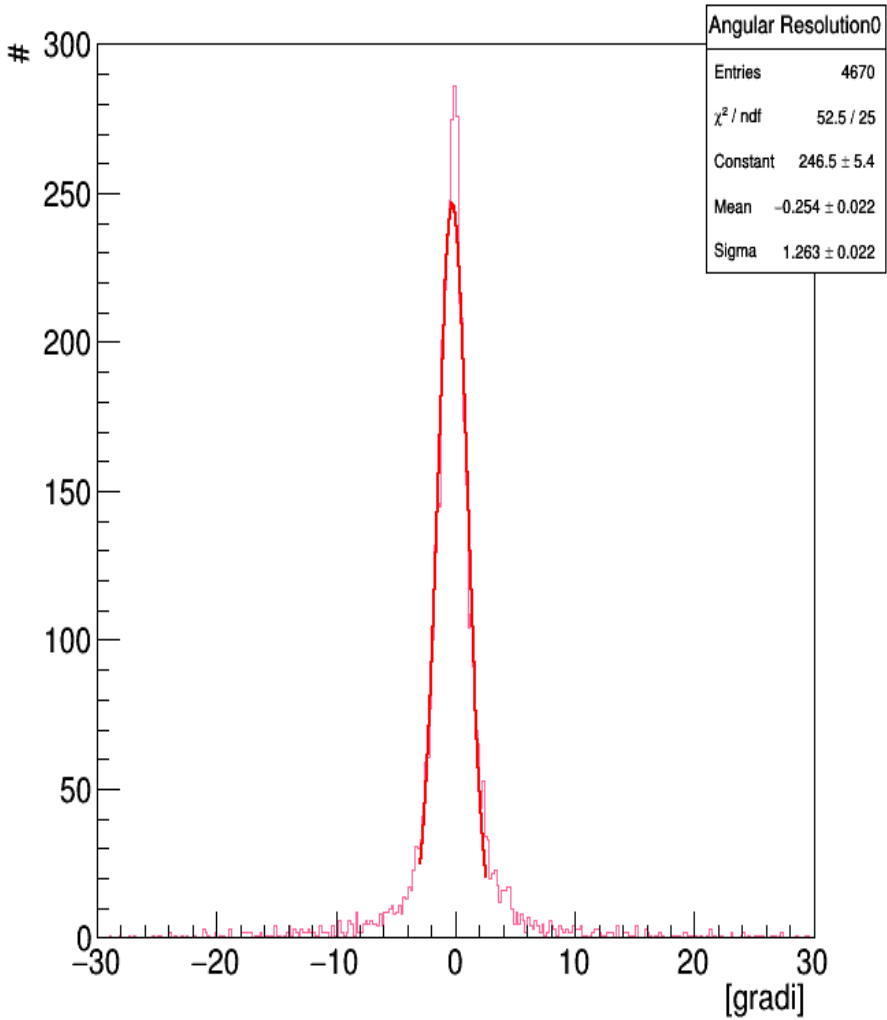
Several dead cells in SL 0...

Angular resolution

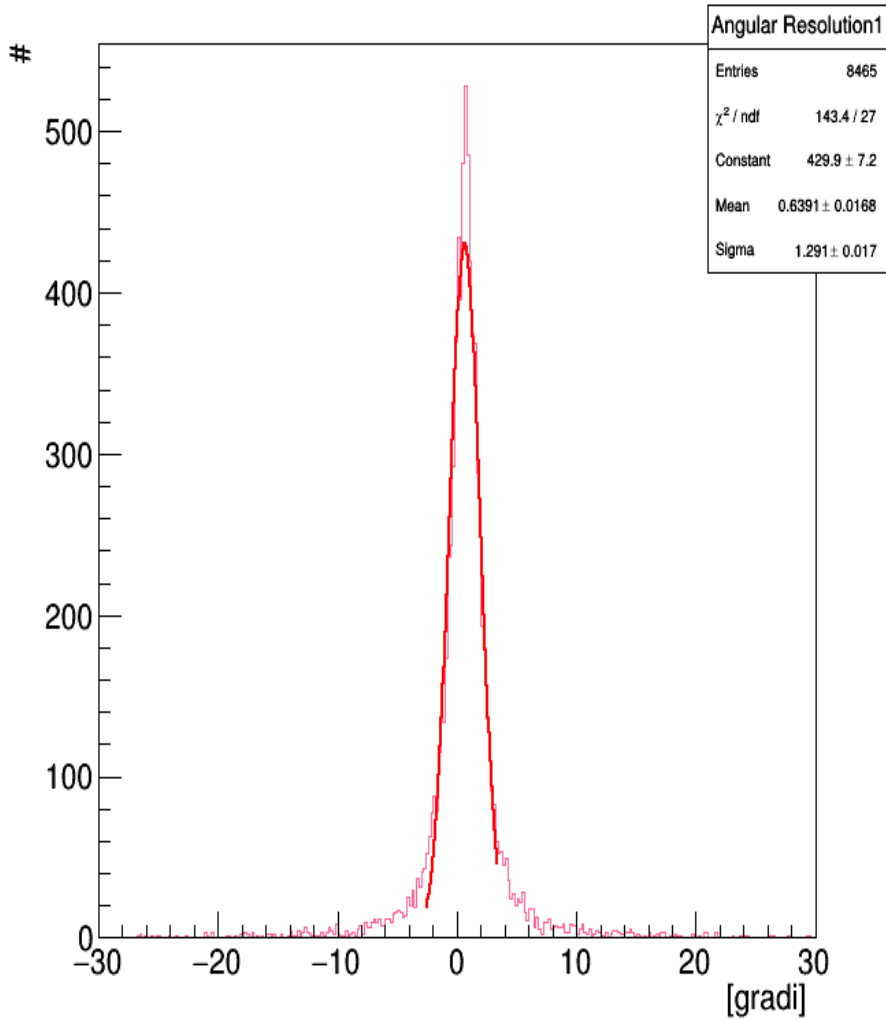
| Superlayer | Resolution [degrees] |
|------------|----------------------------|
| 0 and 2 | $1.3/\sqrt{2} \approx 1.0$ |
| 1 and 3 | $1.3/\sqrt{2} \approx 1.0$ |

| Superlayer | Mean [degrees] |
|------------|----------------|
| 0 and 2 | -0.25 |
| 1 and 3 | 0.54 |

SL 0 and 2

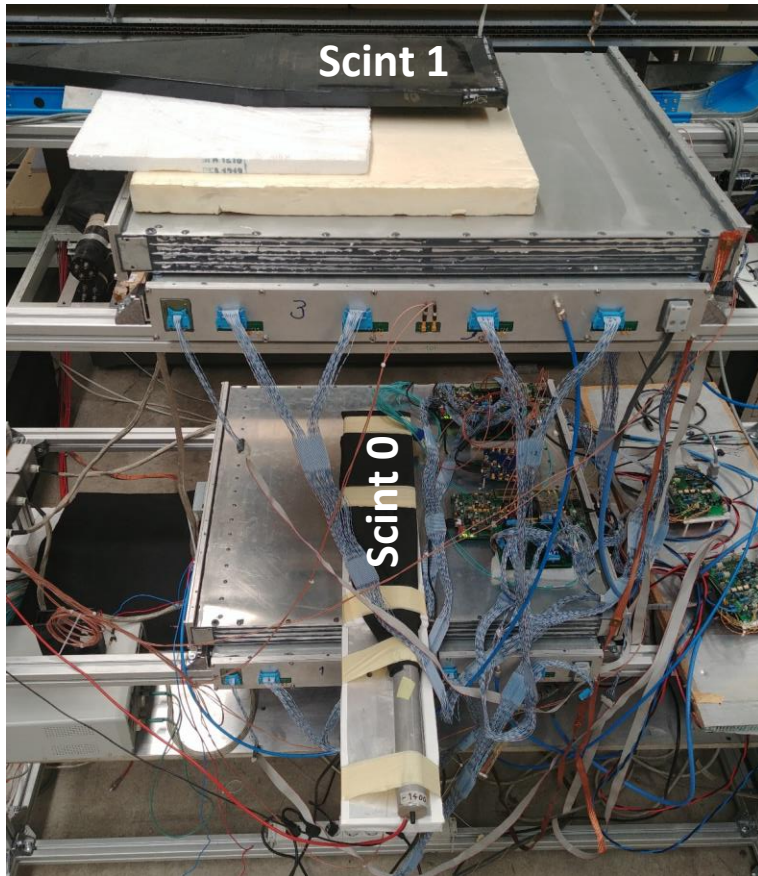


SL 1 and 3

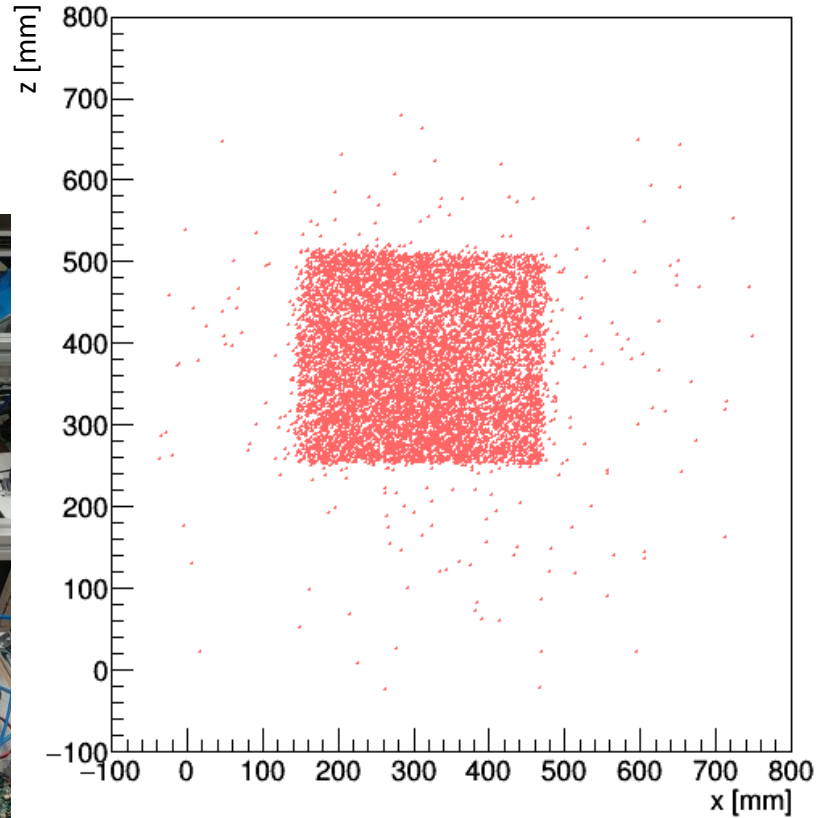


Scintillator «radiography»

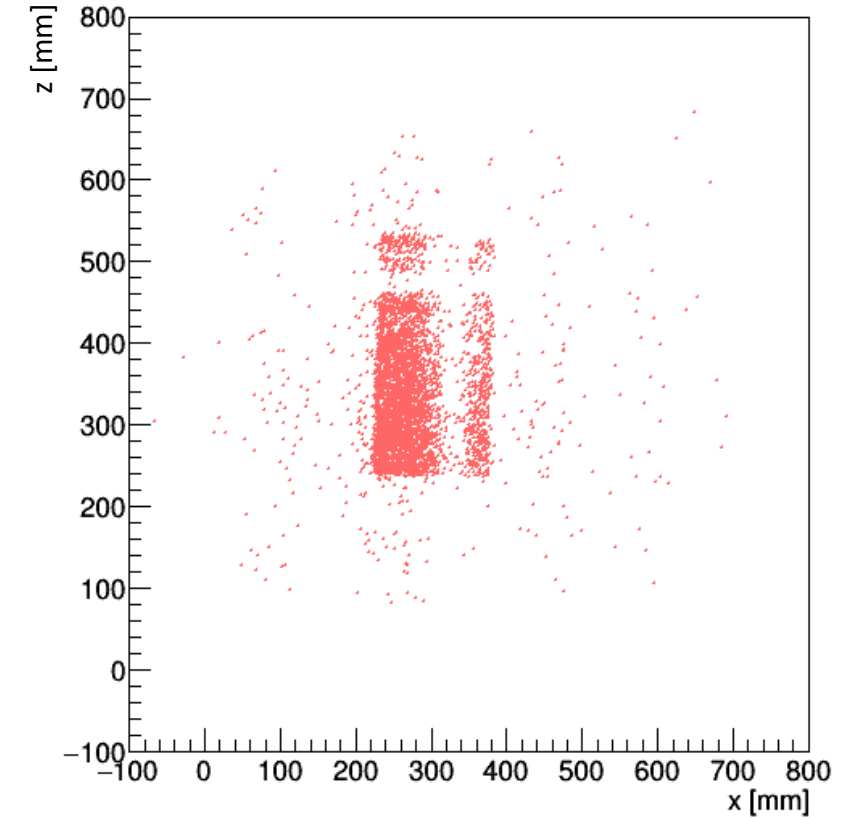
Run 617



Scint 1 (from ch2, 3)

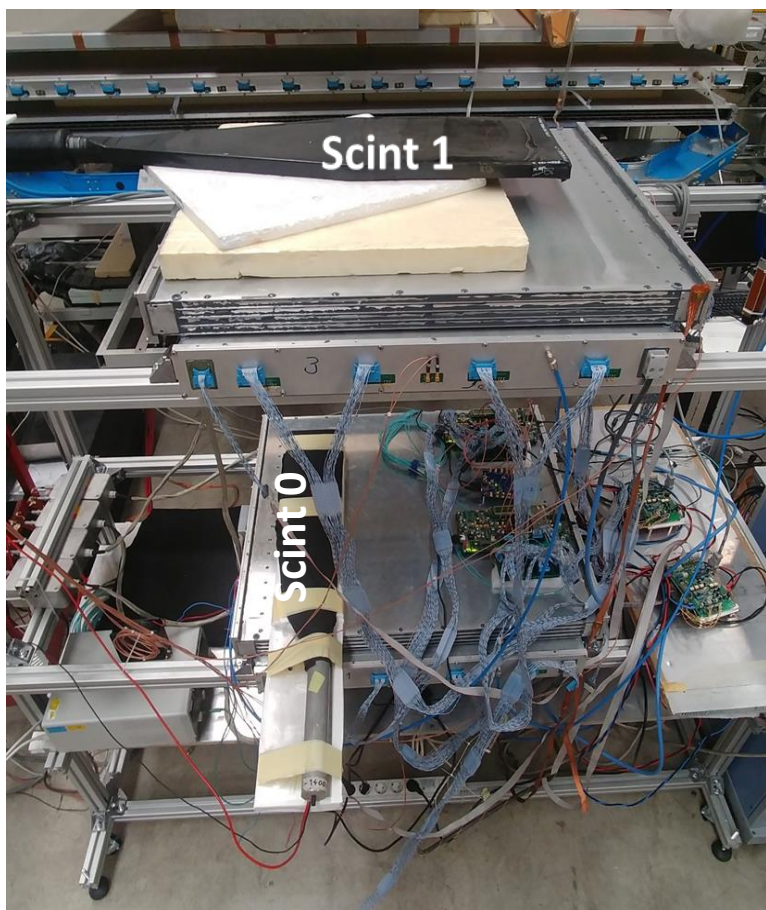


Scint 0 (from ch0, 1)

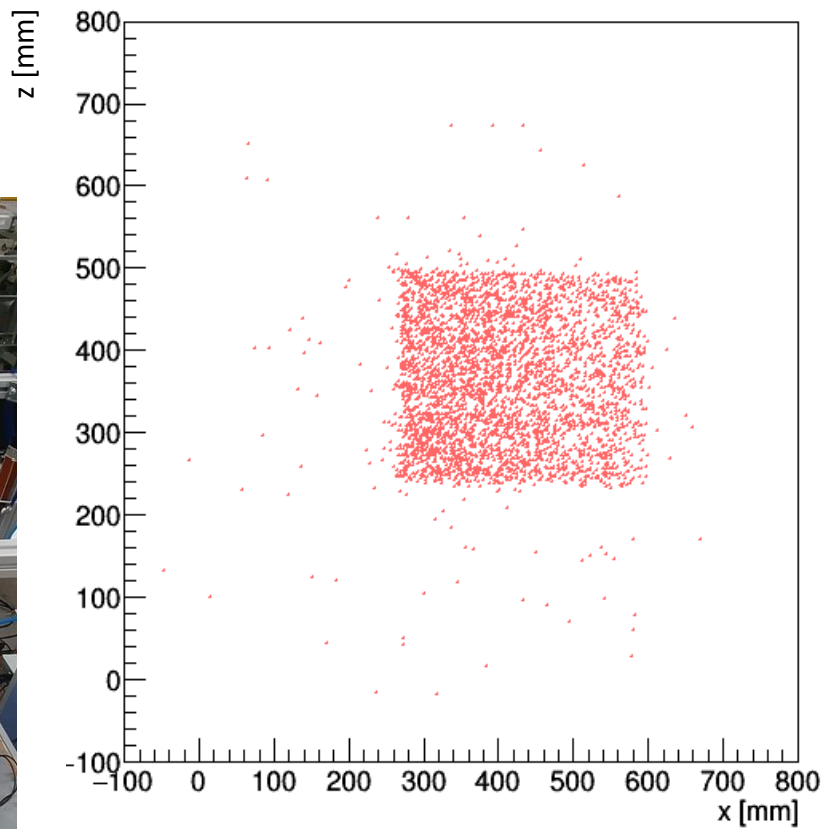


Dead cells in ch0 and 1
are visible (?)

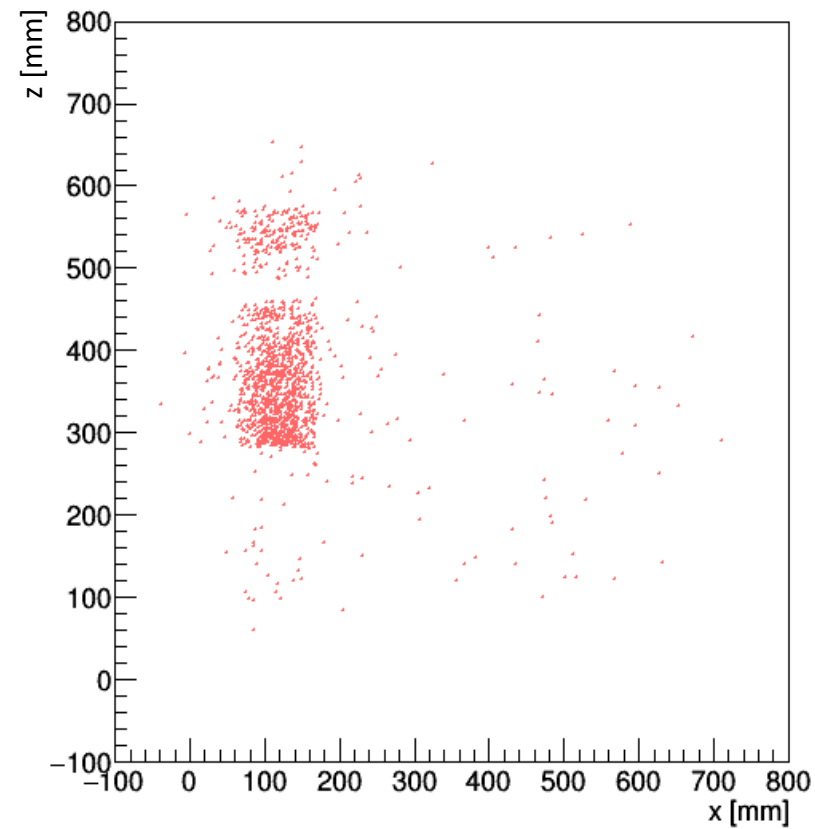
Run 618



Scint 1 (from ch 3, 2)



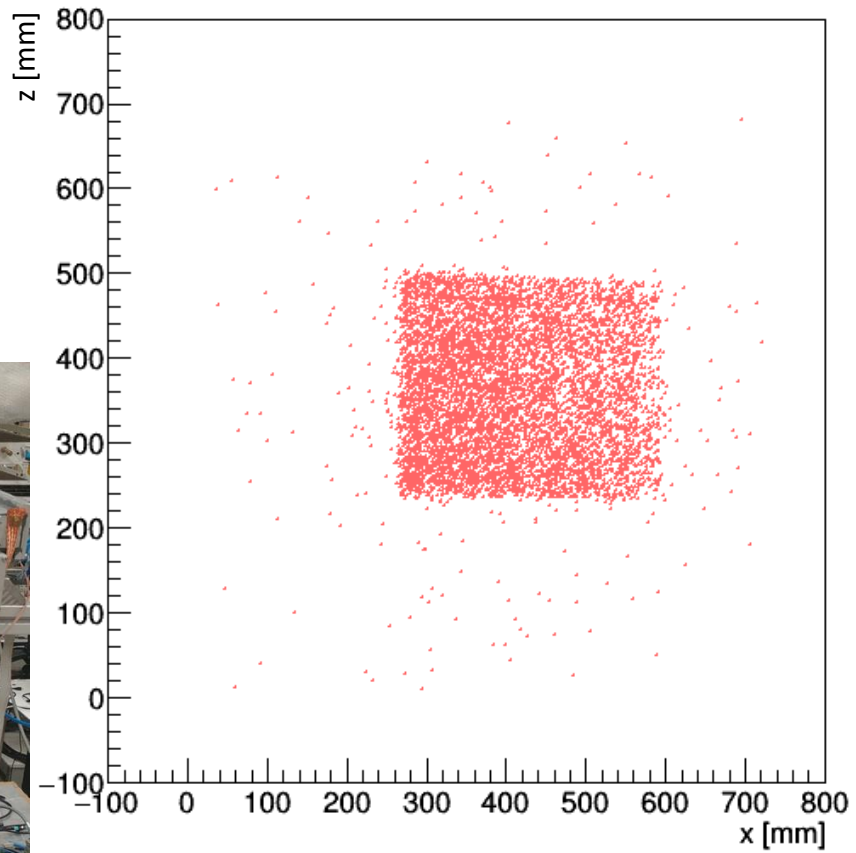
Scint 0 (from ch 0, 1)



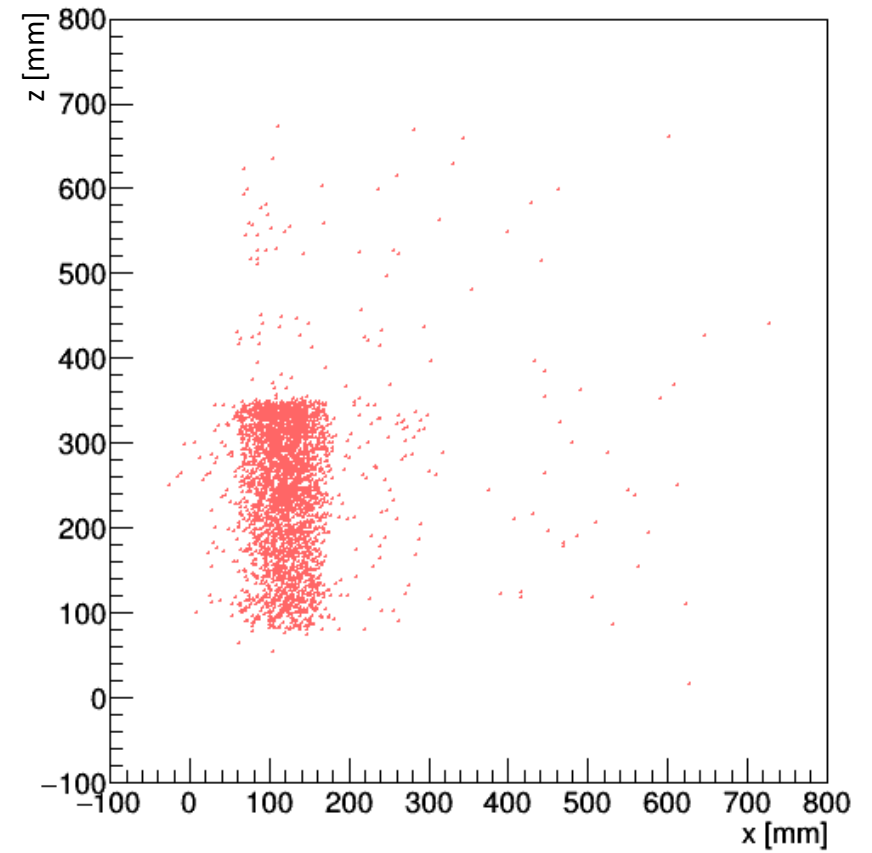
Dead cells in ch0 and 1
are visible (?)

Run 619

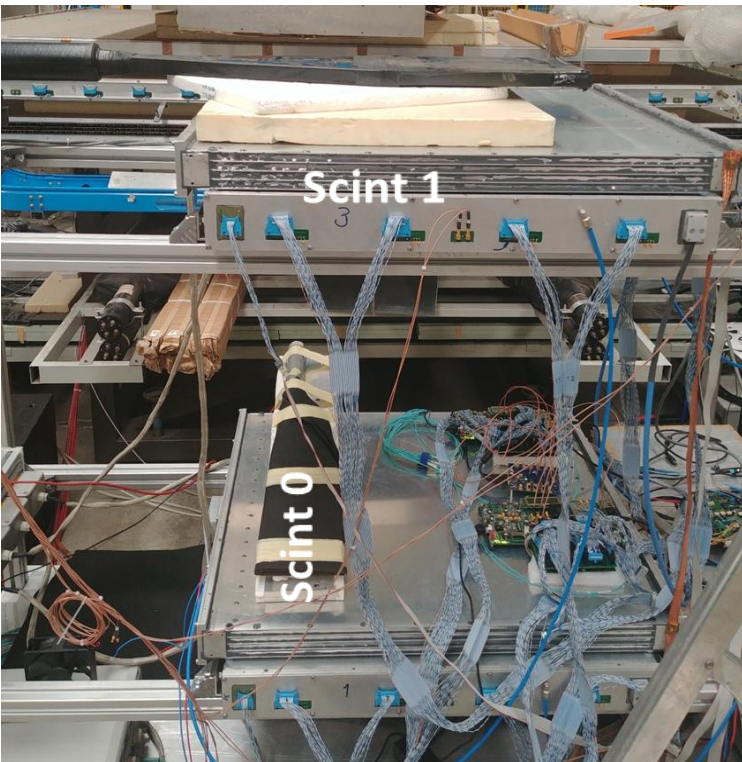
Scint 1 (from ch 3, 2)



Scint 0 (from ch 0, 1)



Dead cells in ch0 and 1
are visible (?)



Efficiency

For segments with 4/4 hits given segment in neighbouring chamber

| Run | ch3 ch2 | ch2 ch3 |
|-----|-----------|-----------|
| 617 | 0.76 | 0.73 |
| 618 | 0.77 | 0.78 |
| 619 | 0.78 | 0.78 |

Loss of efficiency w.r.t. Nicola's numbers appears to be due to

- 4/4 requirement (~ -10% absolute)
- Bad alignment of one of the 4 hits, likely because of delta rays (~ -10% absolute)

Important to handle this case...

