

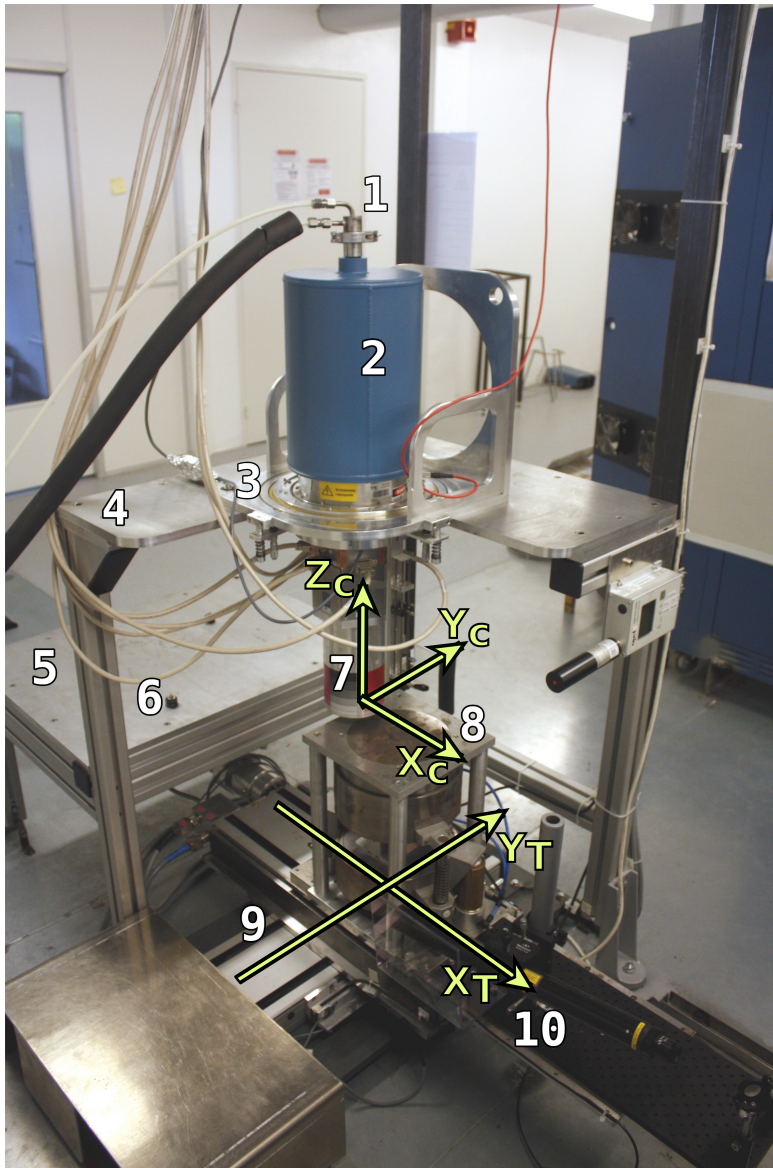
# 2D scans of the S001 detector and identification of a trapping anomaly

AGATA Week – 11th February 2021

# Summary

- 2D scan with  $^{137}\text{Cs}$  source on S001 detector unit
- The characterization showed an unusual result

# The IPHC scanning table

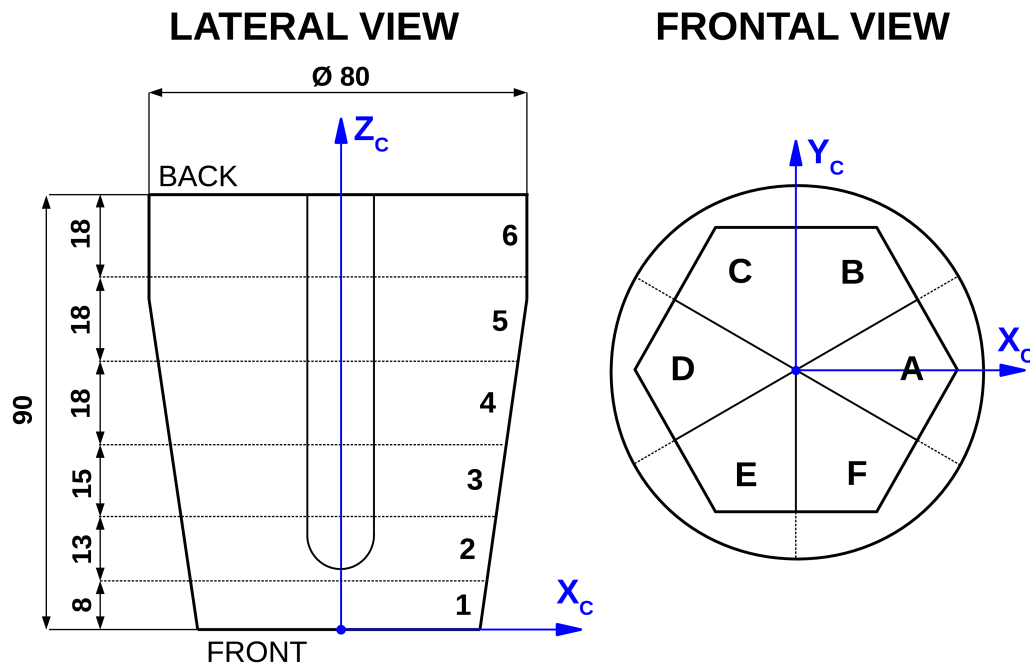


- (1) LN2 pipes
- (2) test-cryostat Dewar
- (3) adjustment frame
- (4) holding plate for vertical positioning
- (5) holding plate for horizontal positioning
- (6) fixing studs
- (7) end cap of the detector
- (8) collimator ( $\varnothing$  1.0mm 0.5mm 0.2mm)
- (9) scanning table motorized axes
- (10) alignment laser

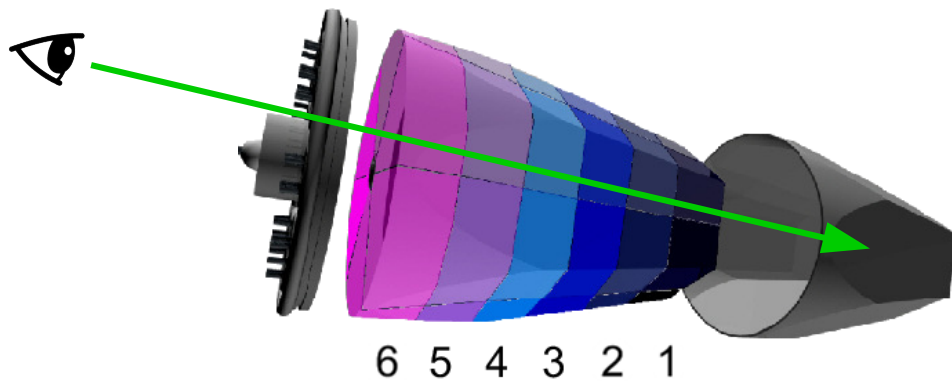
**SOURCES:**  $^{241}\text{Am}$  [1.5 GBq],  $^{137}\text{Cs}$  [1.85 GBq],  $^{152}\text{Eu}$  [0.74 GBq]

**TNT2 cards:** Digitizer (100MHz, 14bits) + Preprocess

# S001 detector unit

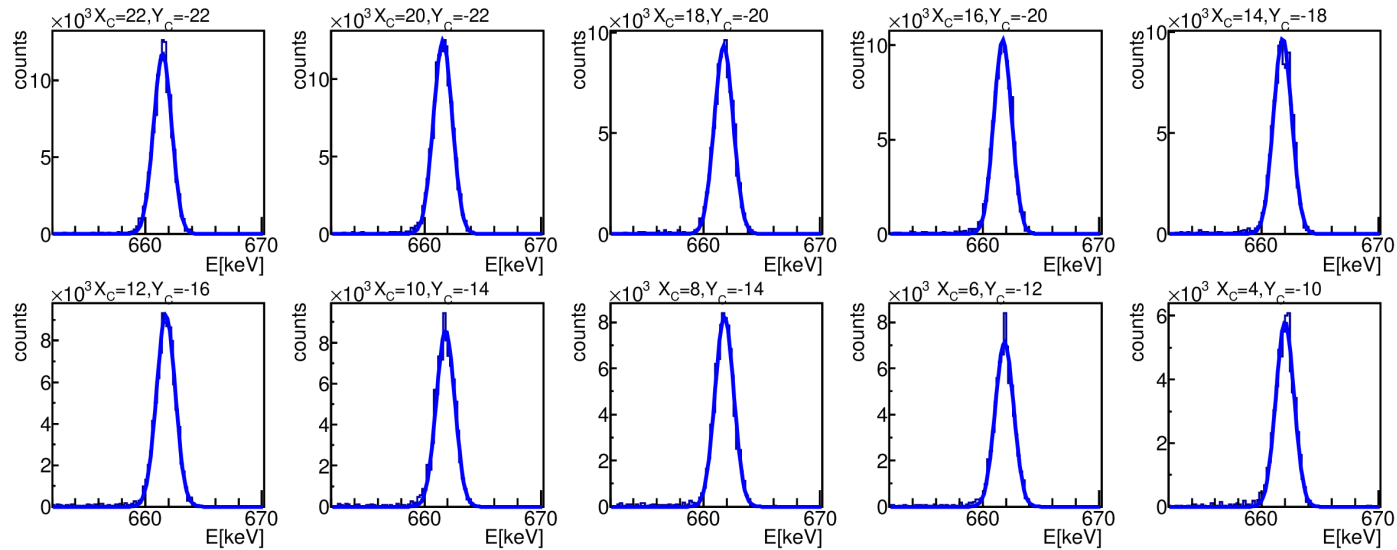


2 mm pitch –  $\varnothing_{\text{coll}}$  1.0 mm



# 2D S001 Scans: measured quantities

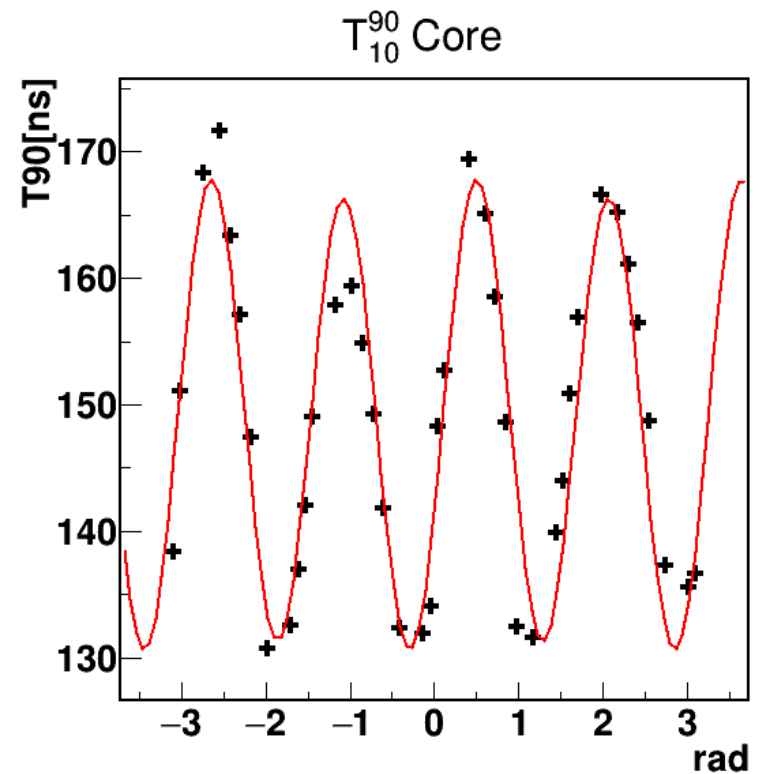
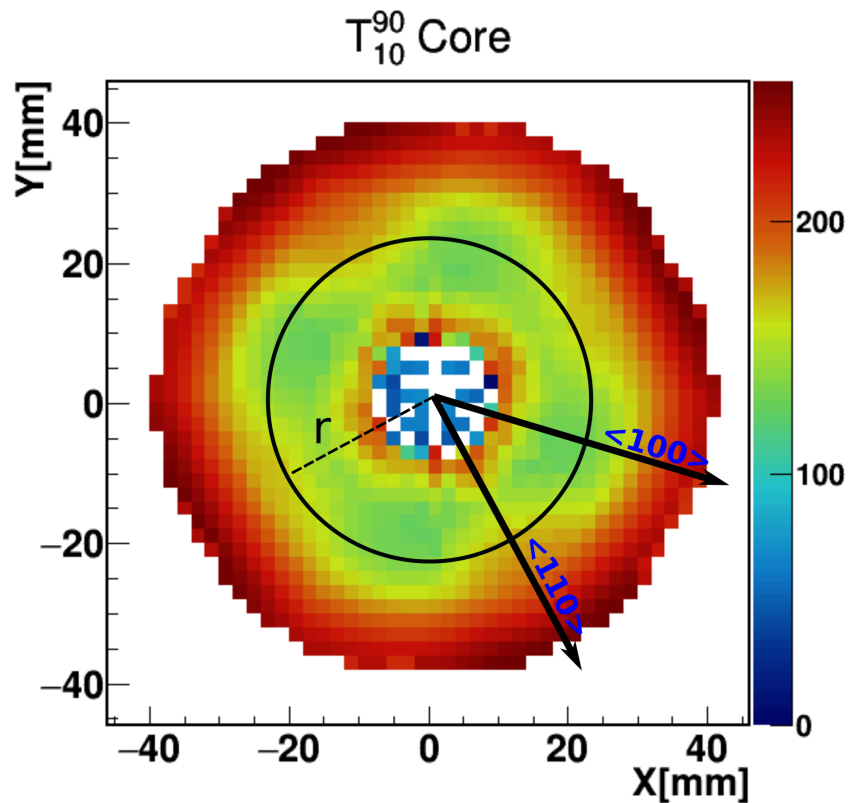
- For each position, the normalized spectrum is built and the pulse shapes are registered



- Photopeak area, photopeak centroid and FWHM
- $T_{10}^{90}$  is calculated as the average of all the pulses associated with each spectrum

# 2D S001 Scans: crystal orientation

$^{137}\text{Cs}$  (662 keV),  $\varnothing_{\text{coll}}$  1.0mm, 2 mm pitch

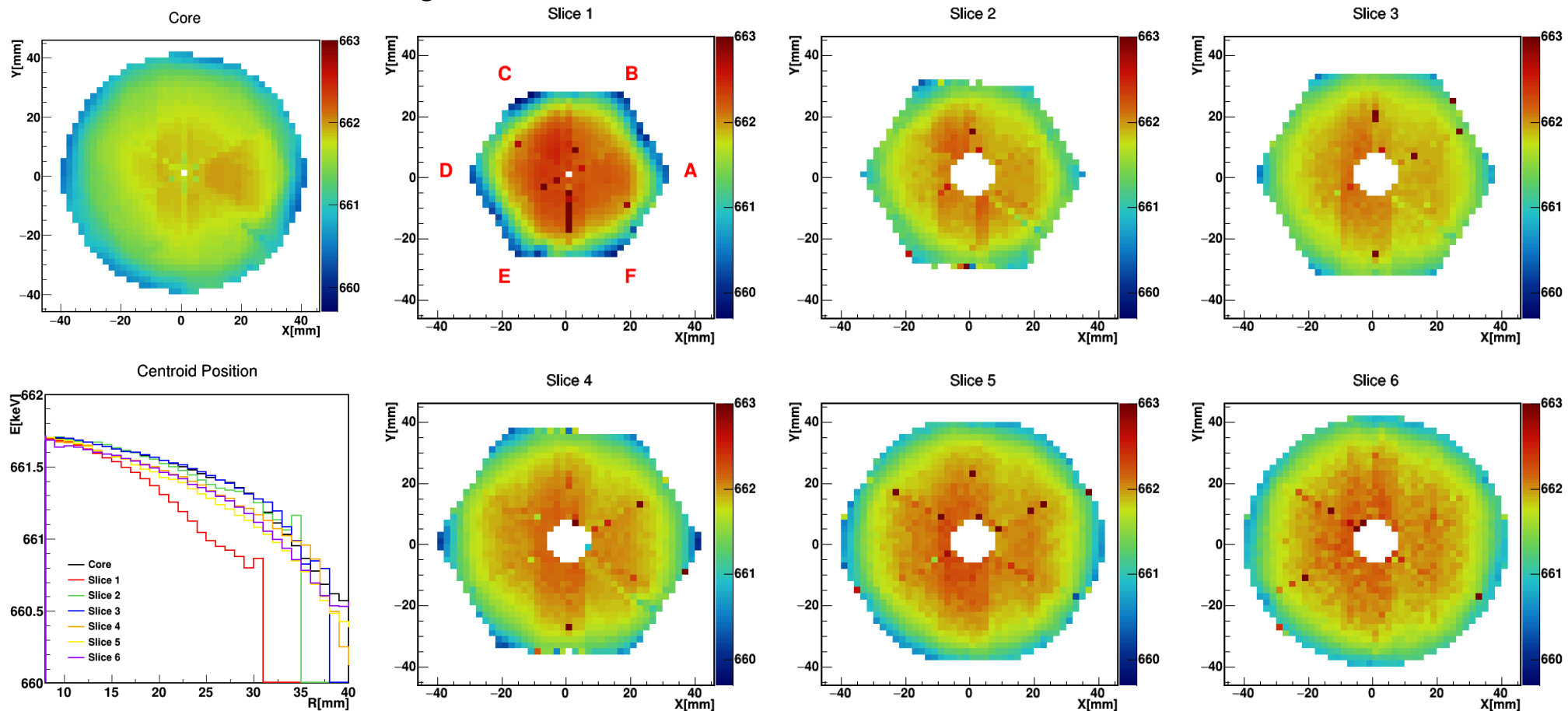


$$\theta_{\langle 100 \rangle} = 16\text{deg}$$

# 2D S001 Scans: core photopeak centroid shift

$^{137}\text{Cs}$  (662 keV),  $\varnothing_{\text{coll}}$  1.0mm, 2 mm pitch

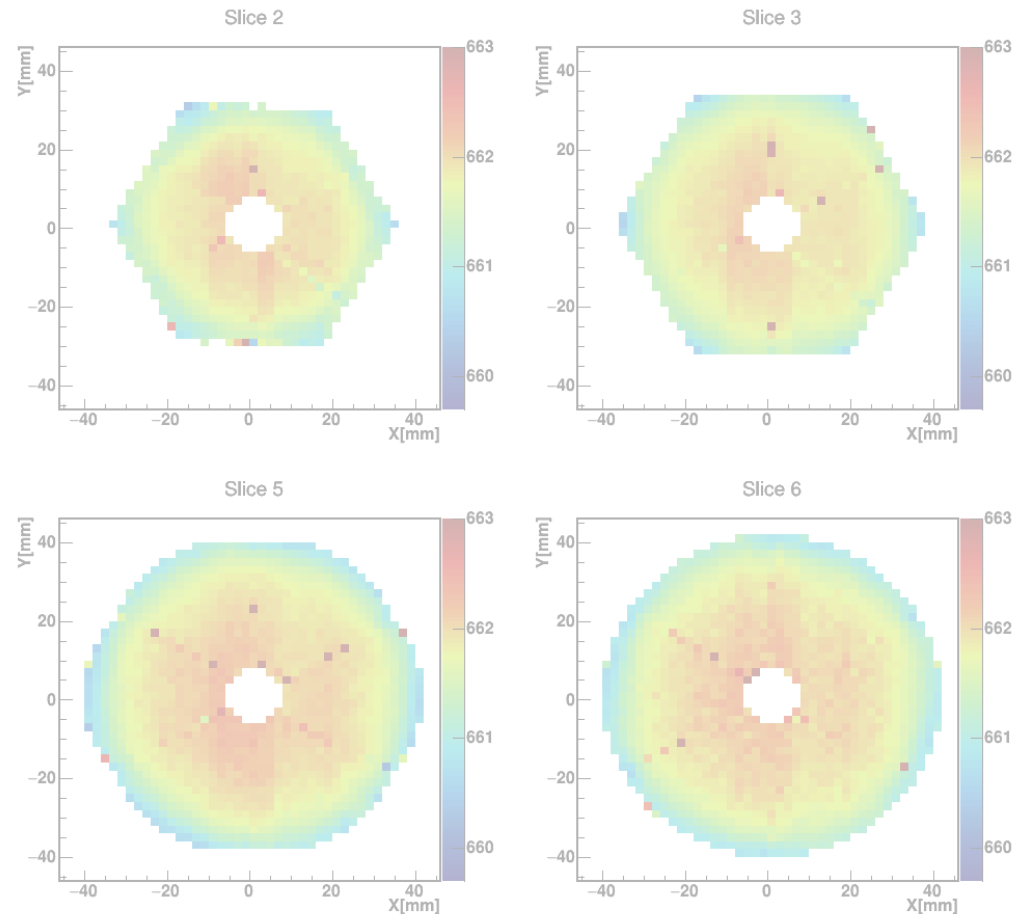
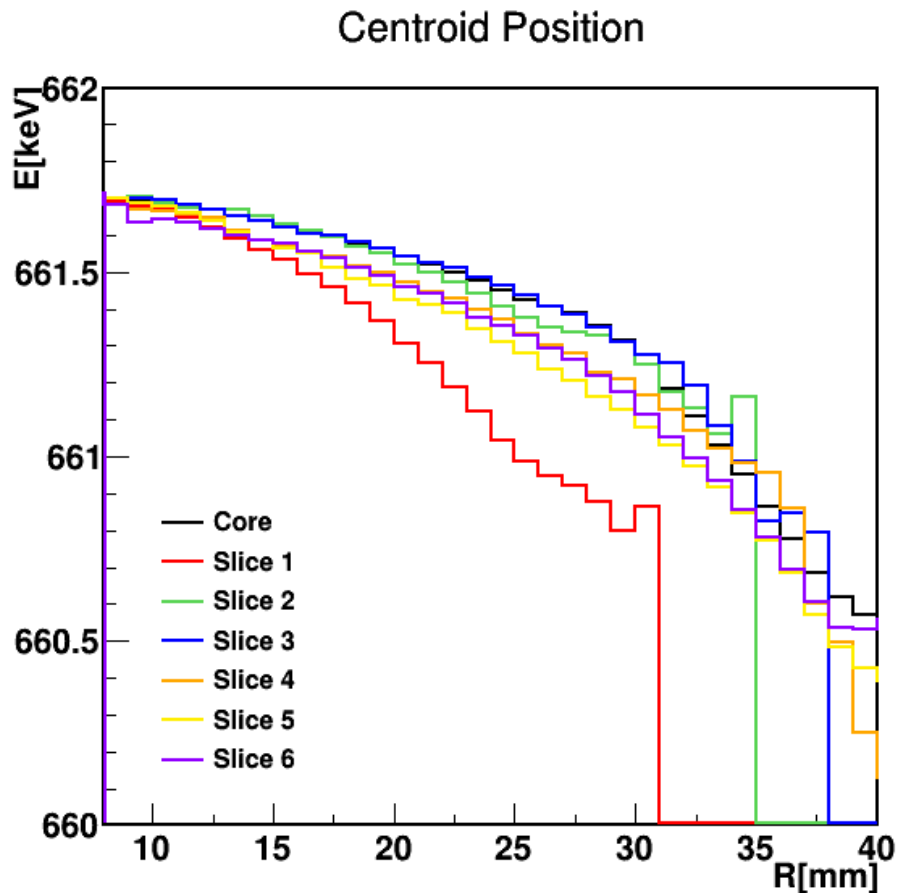
- Probing the charge carriers collection with the local photopeak centroid position distributions
- Core spectra folded on each segment
- Electrons are the main charges



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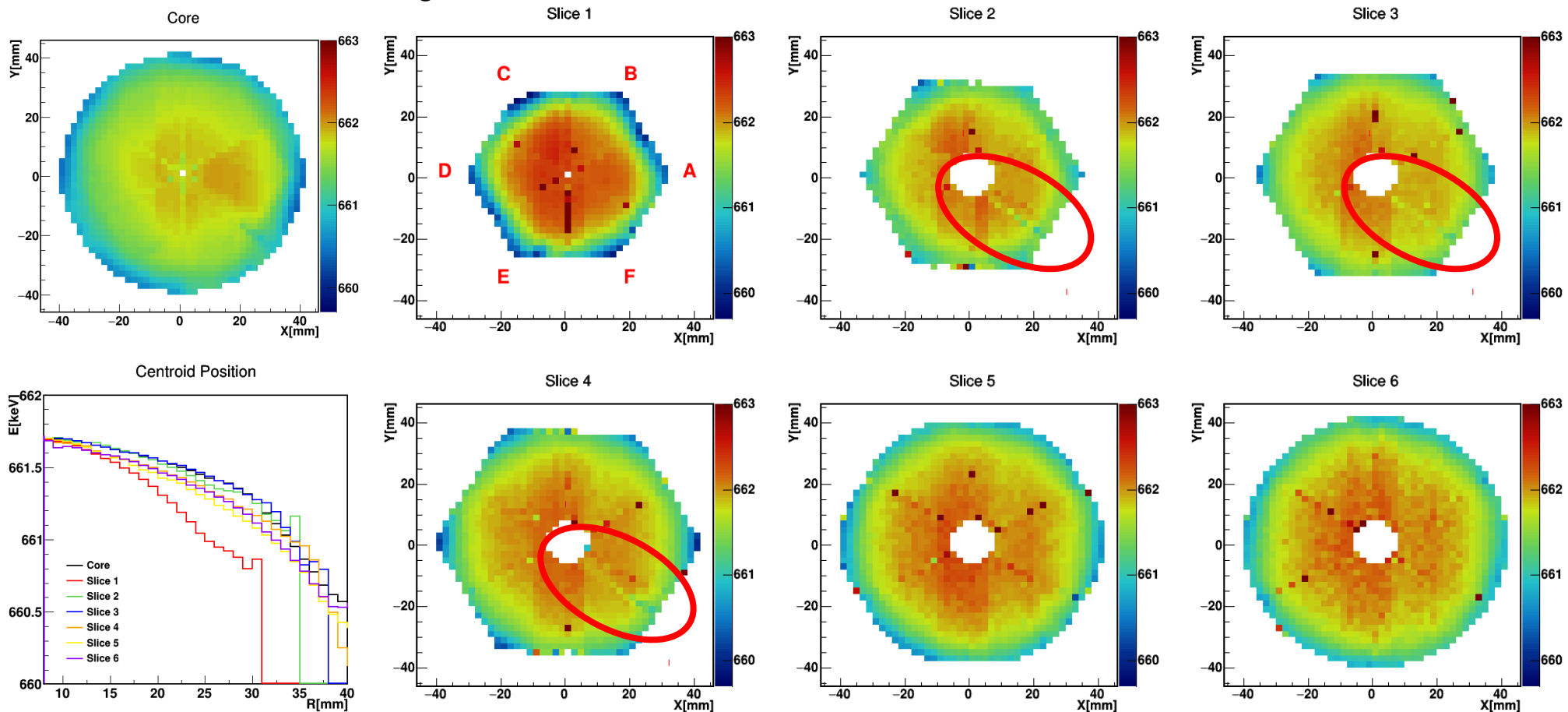




# 2D S001 Scans: photopeak centroid shift

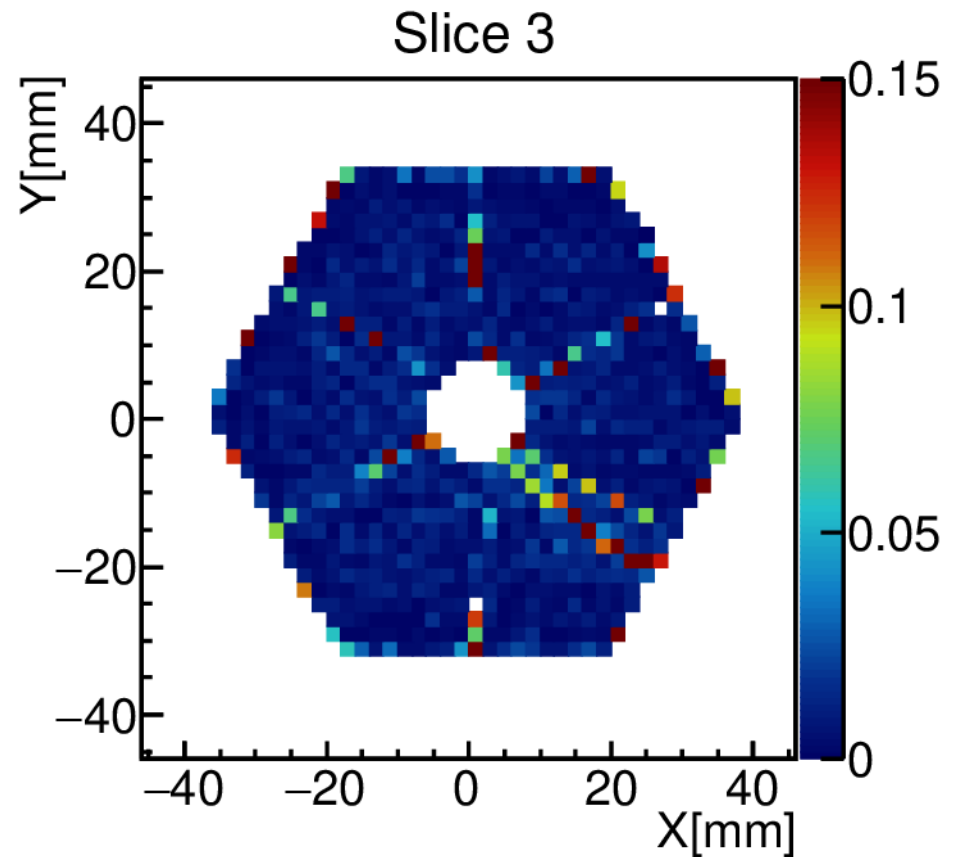
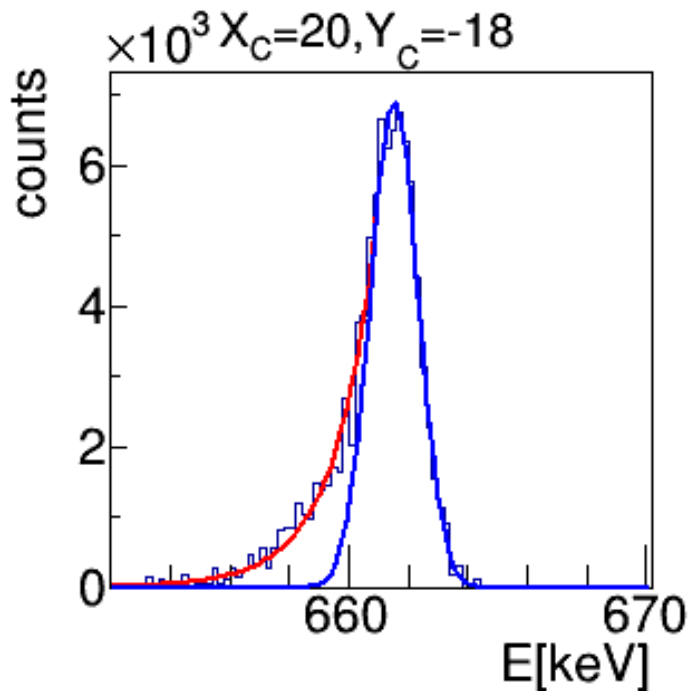
$^{137}\text{Cs}$  (662 keV),  $\varnothing_{\text{coll}}$  1.0mm, 2 mm pitch

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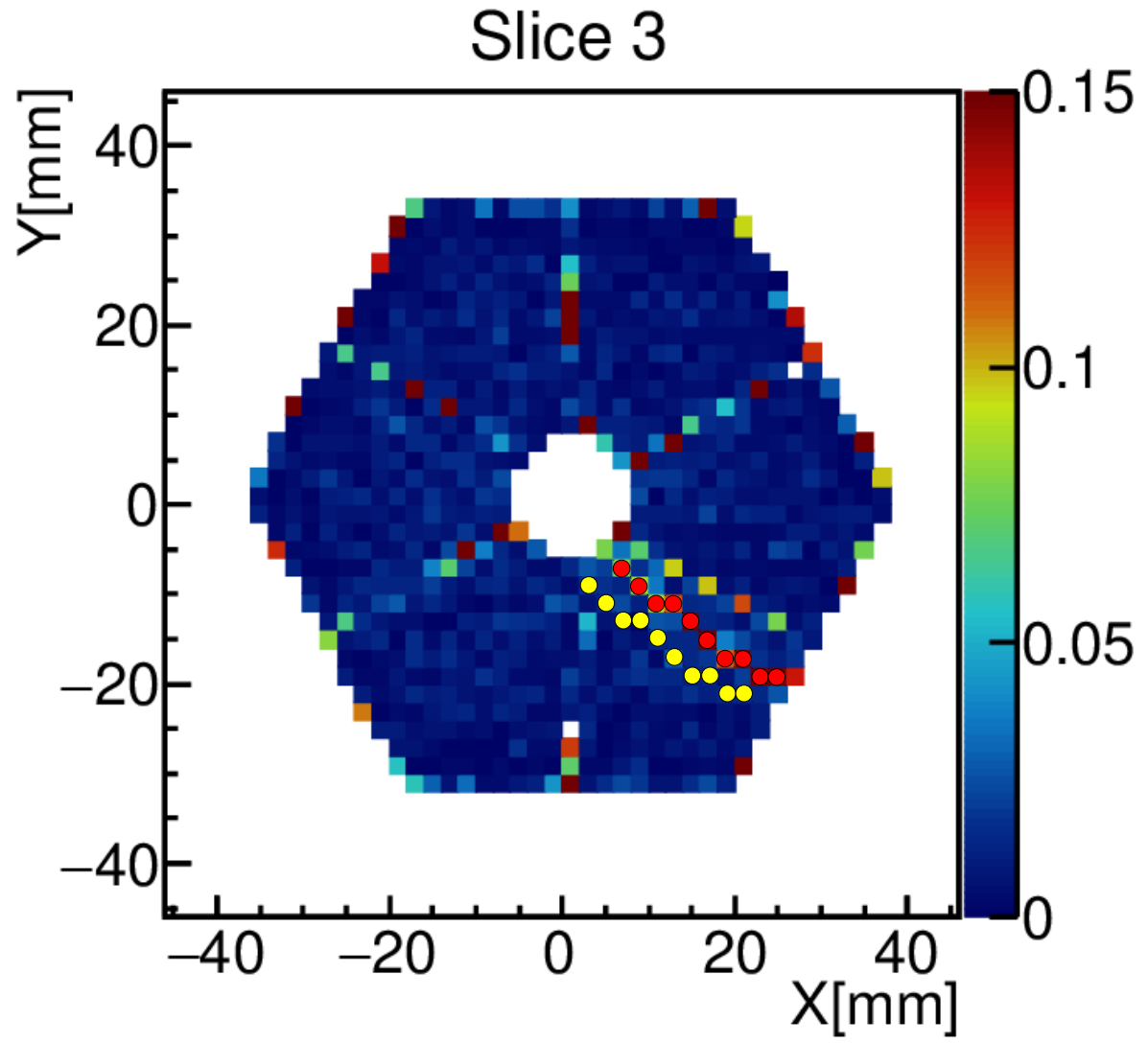
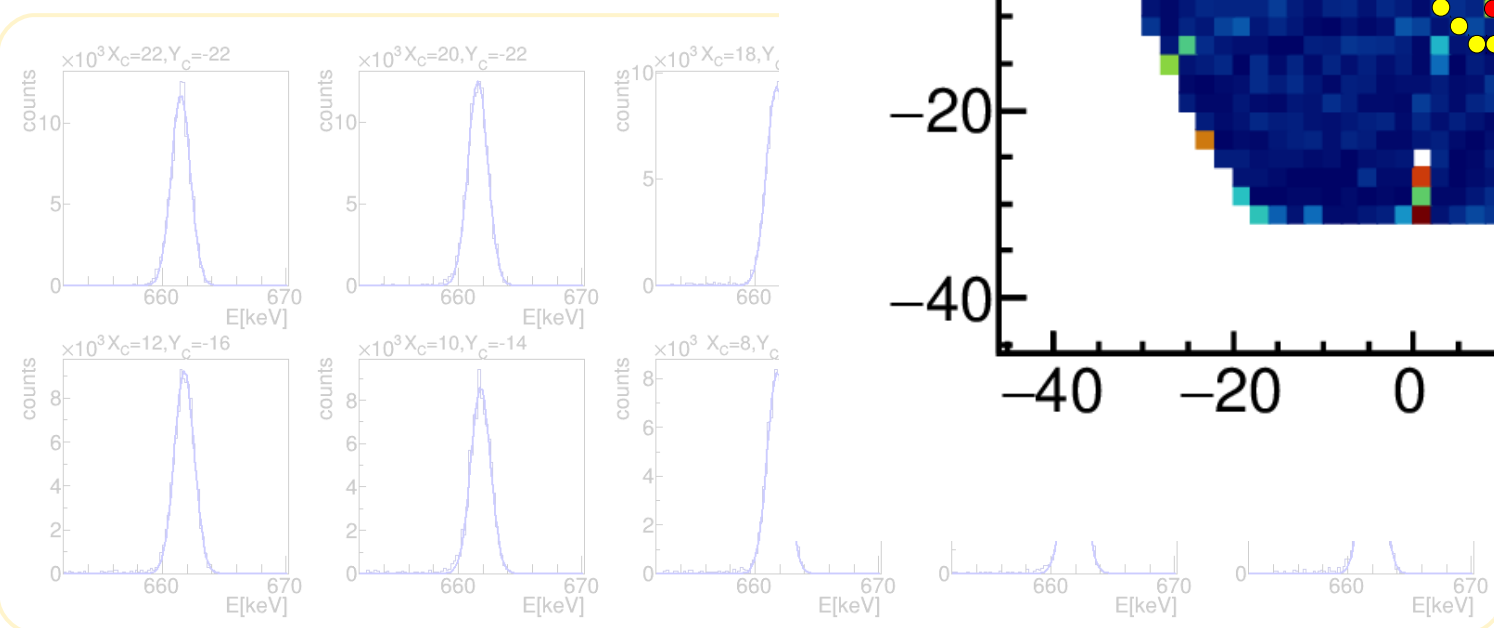
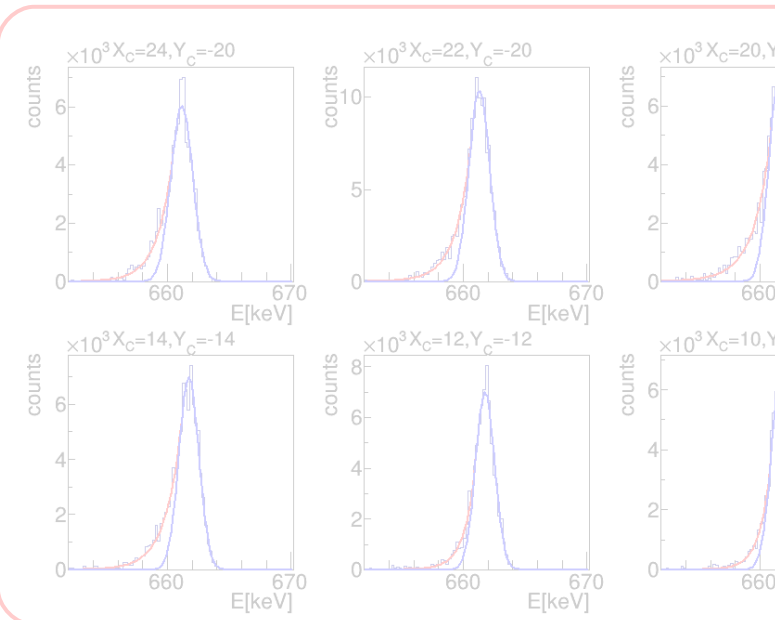


# An unexpected behavior

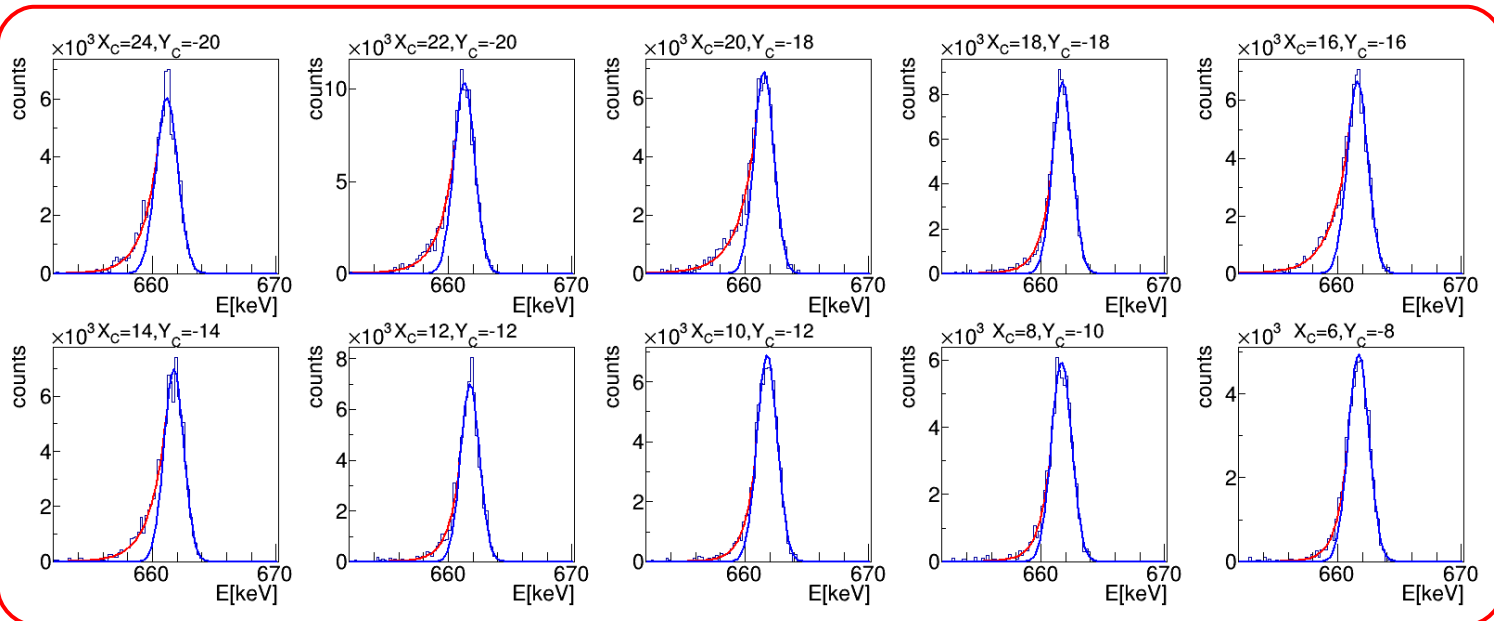
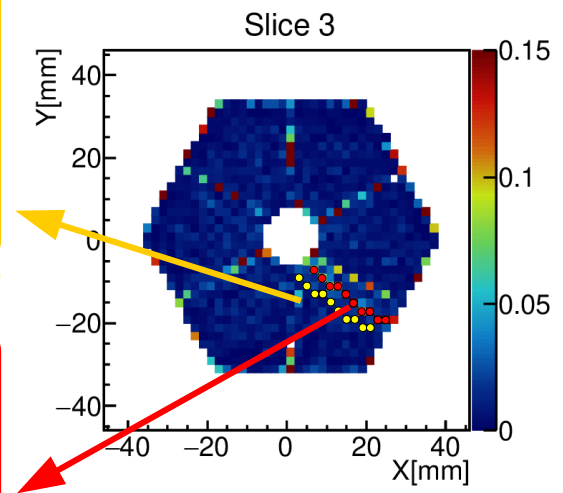
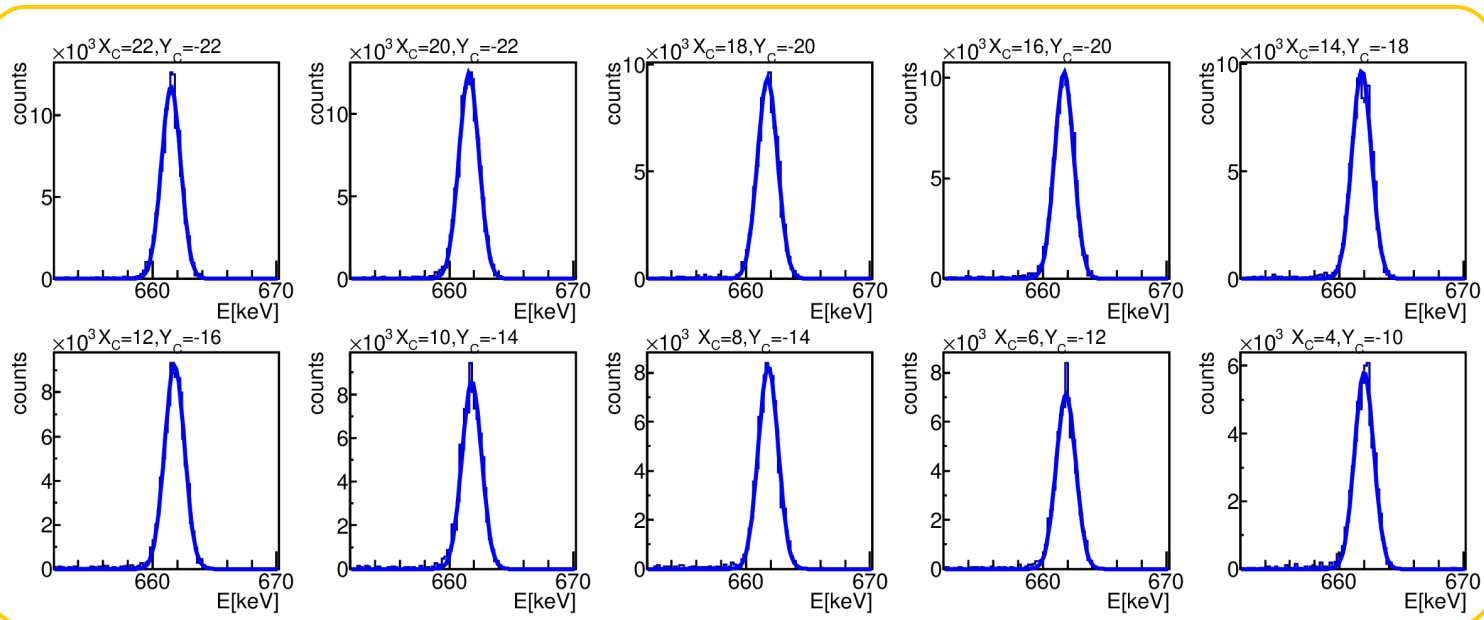
Photopeak fitted with a Cristal Ball function  
(Gaussian + exponential tail)



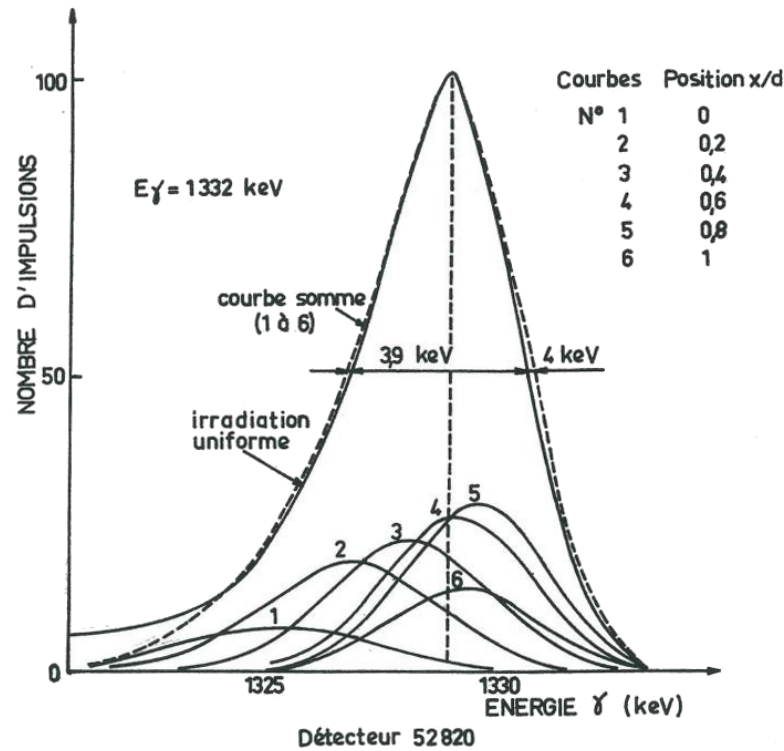
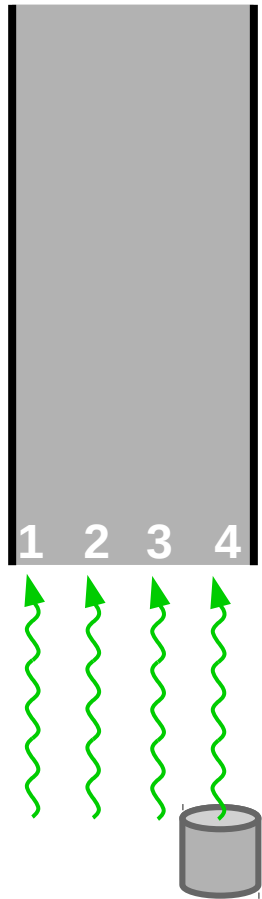
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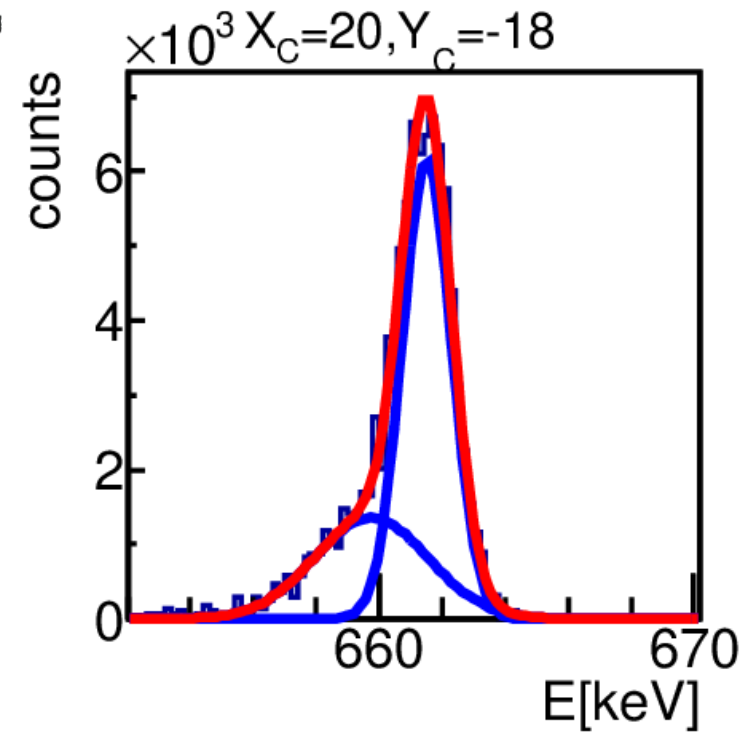
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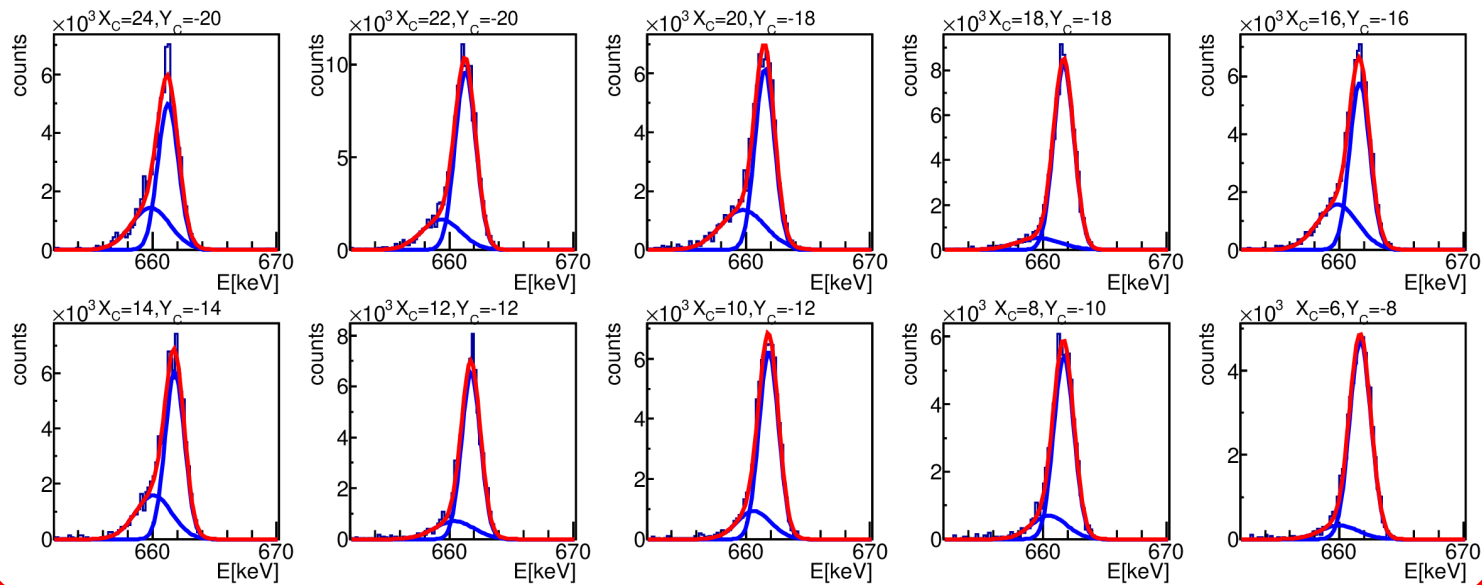
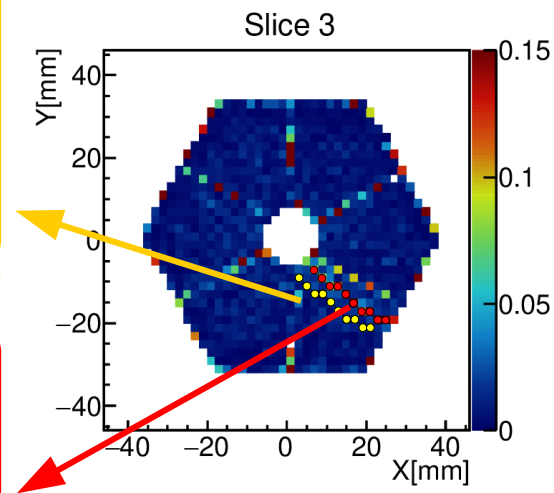
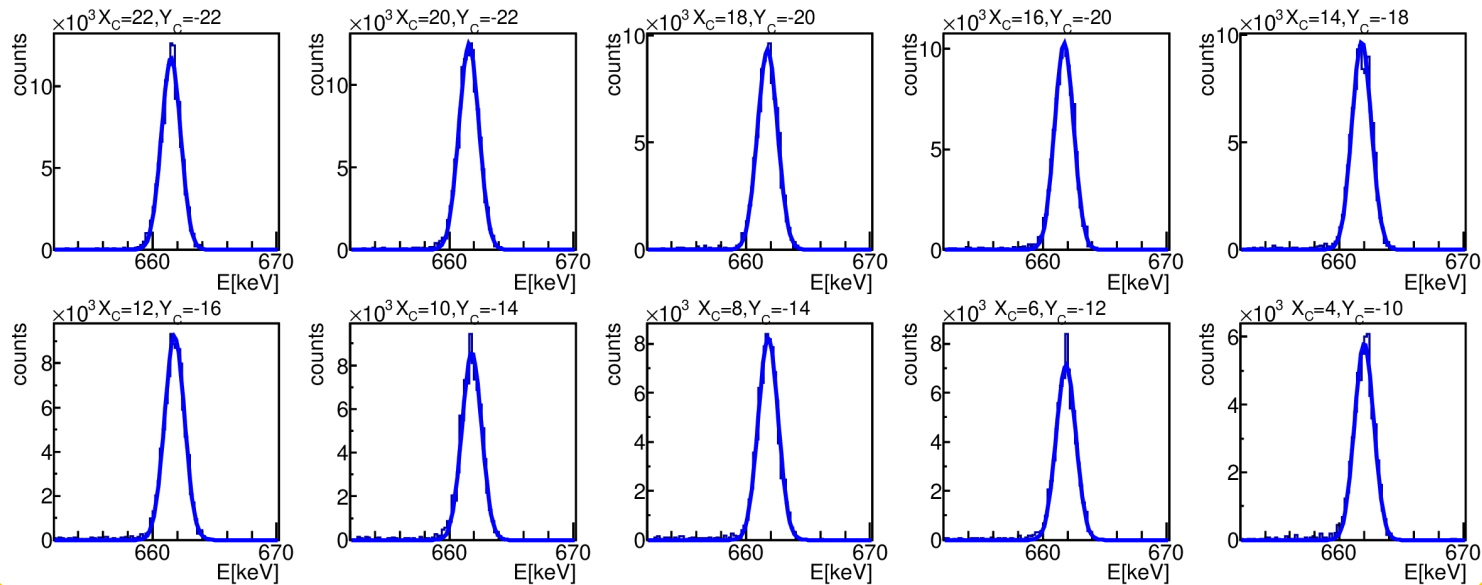
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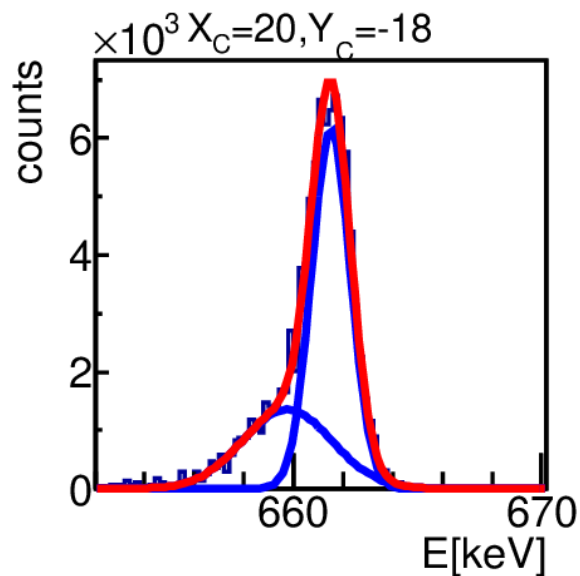
Gutknecht PhD Thesis (1971)



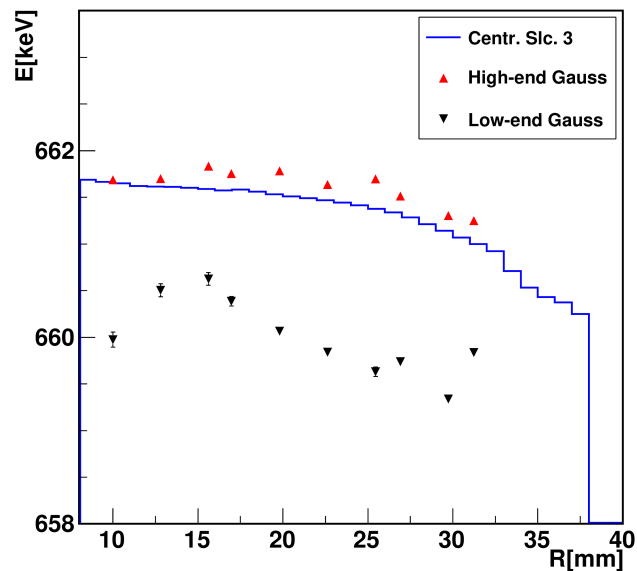
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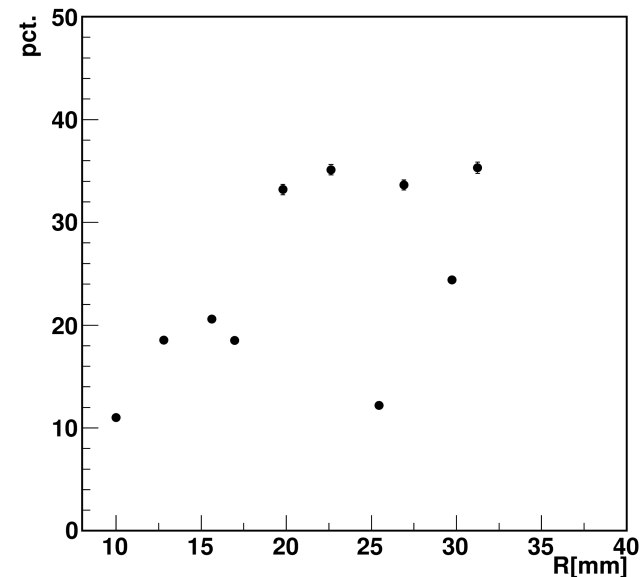
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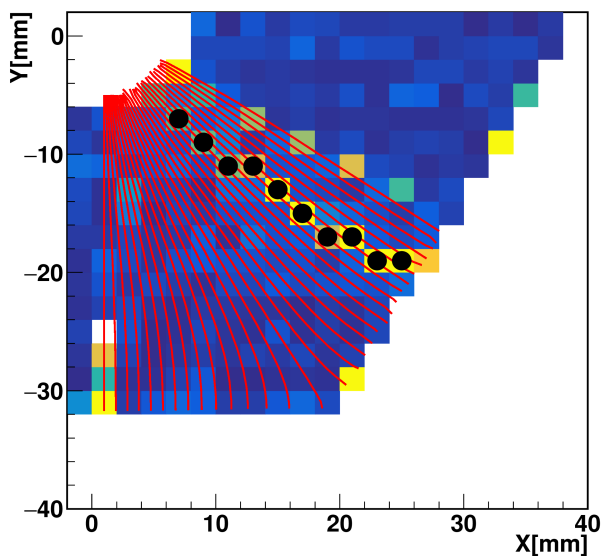
Centroid Position Comparison



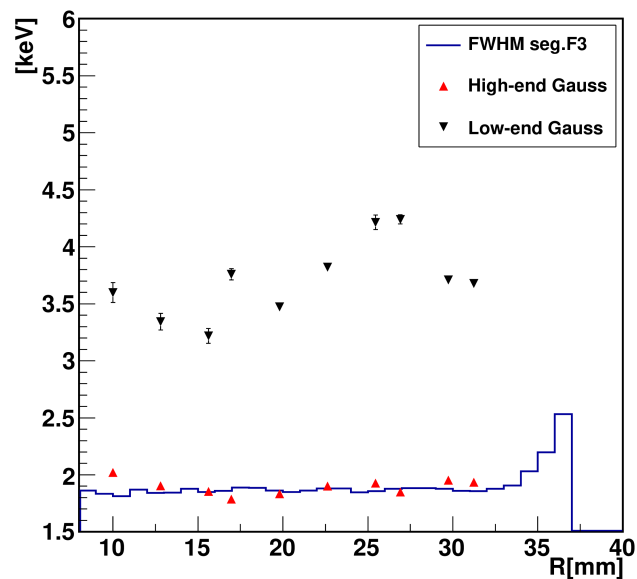
Ratio of Photopeak Areas



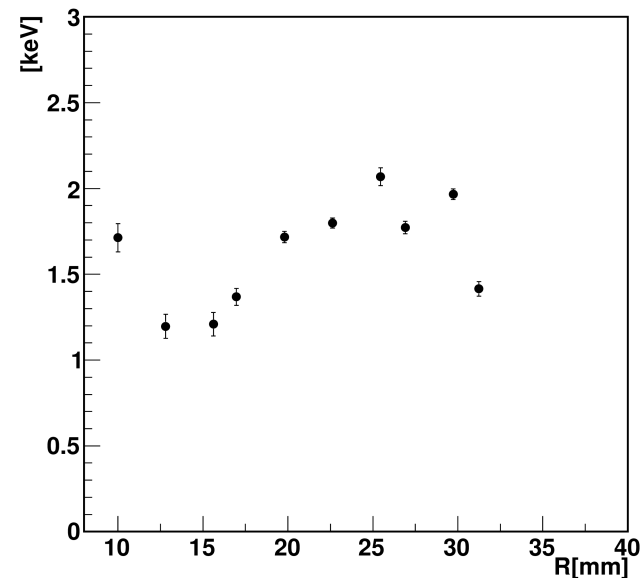
Segment F3



FWHM Comparison



Centroids distance



# Conclusions

- 2D analysis allowed several measurements and showed the versatility of the scanning table.
- Charge carriers collection can be further studied with the scanning table (what happens in the segmentation surfaces?)
- Still trying to give an explanation to the observed phenomenon
- Paper on this result is in preparation