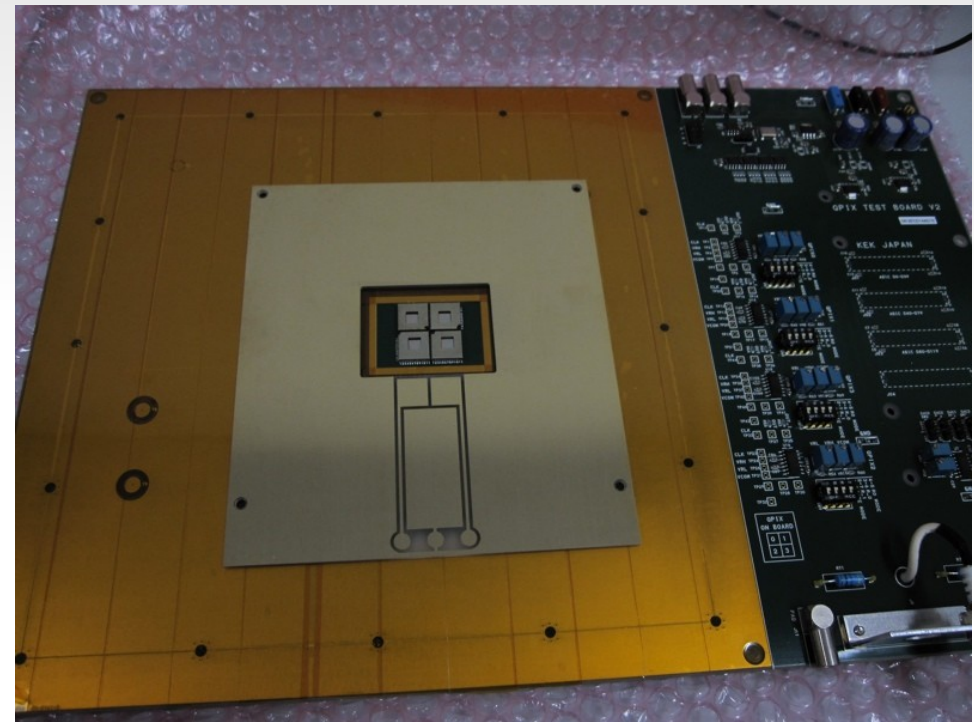


QPIX: new readout pixel device for gas detector

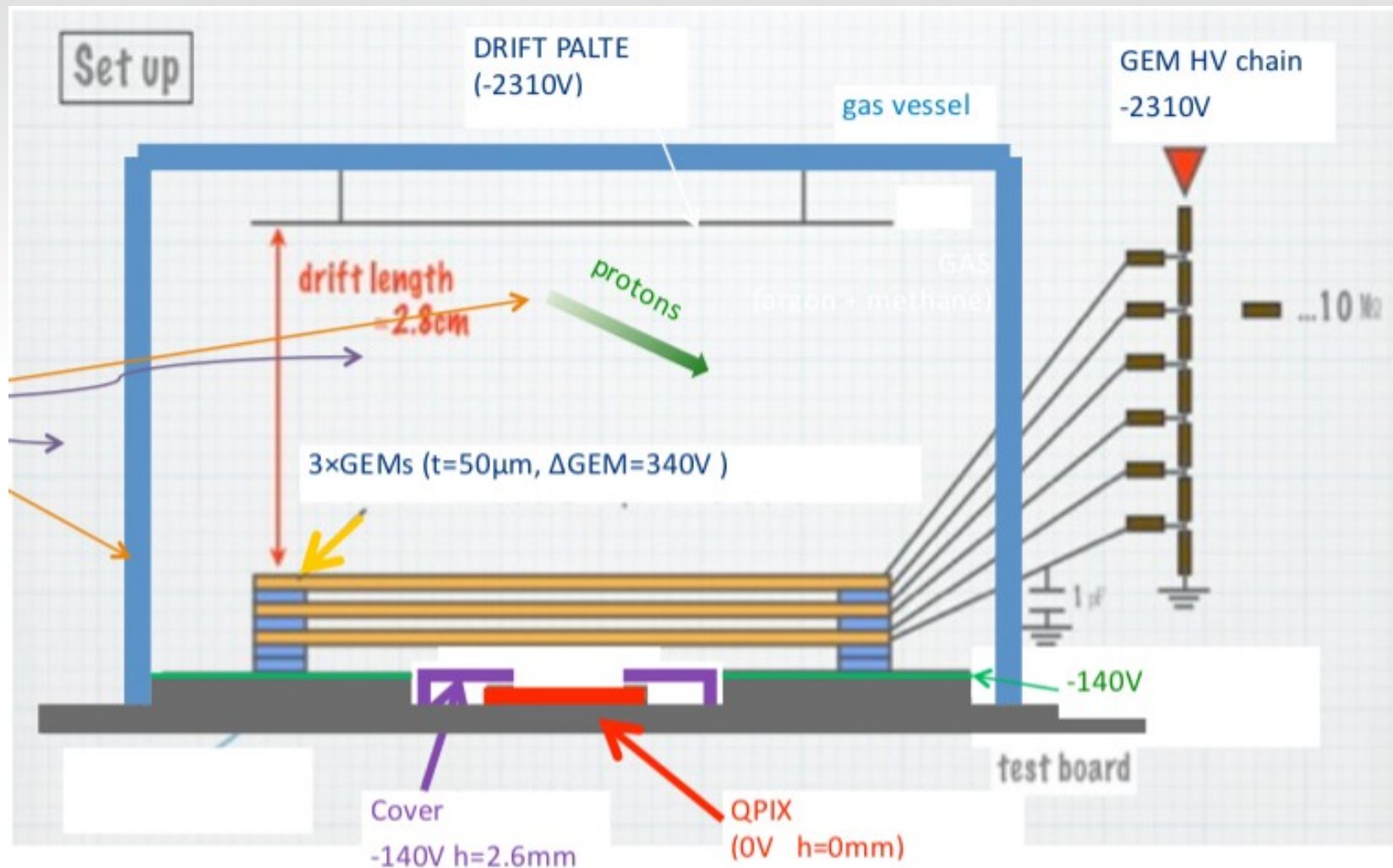
- Short description of QPIX v1 and test beam setup
- Test beam results
 - Clustering
 - Tracking
- Conclusions

QPIX V1

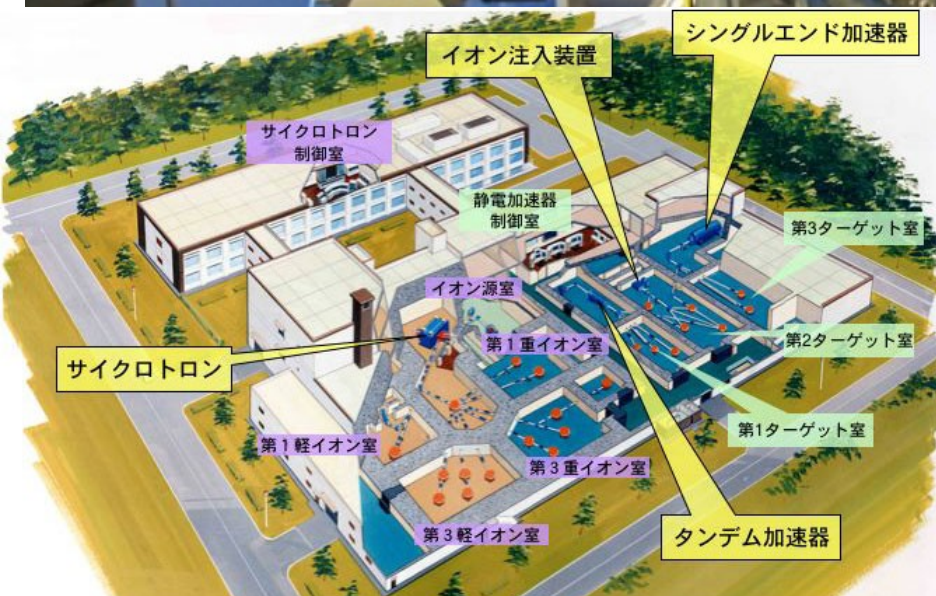
	QPIX ver1
Dimensions	$200 \times 200 \mu\text{m}^2$
channels	20×20/chip
ADC LSB/MSB	1.5fC/1.5pC
Readout information	TOF 14bit
	TOT 8bit
	ADC 10bit 10Msps
Readout	serial/parallel



Triple GEM Amplification

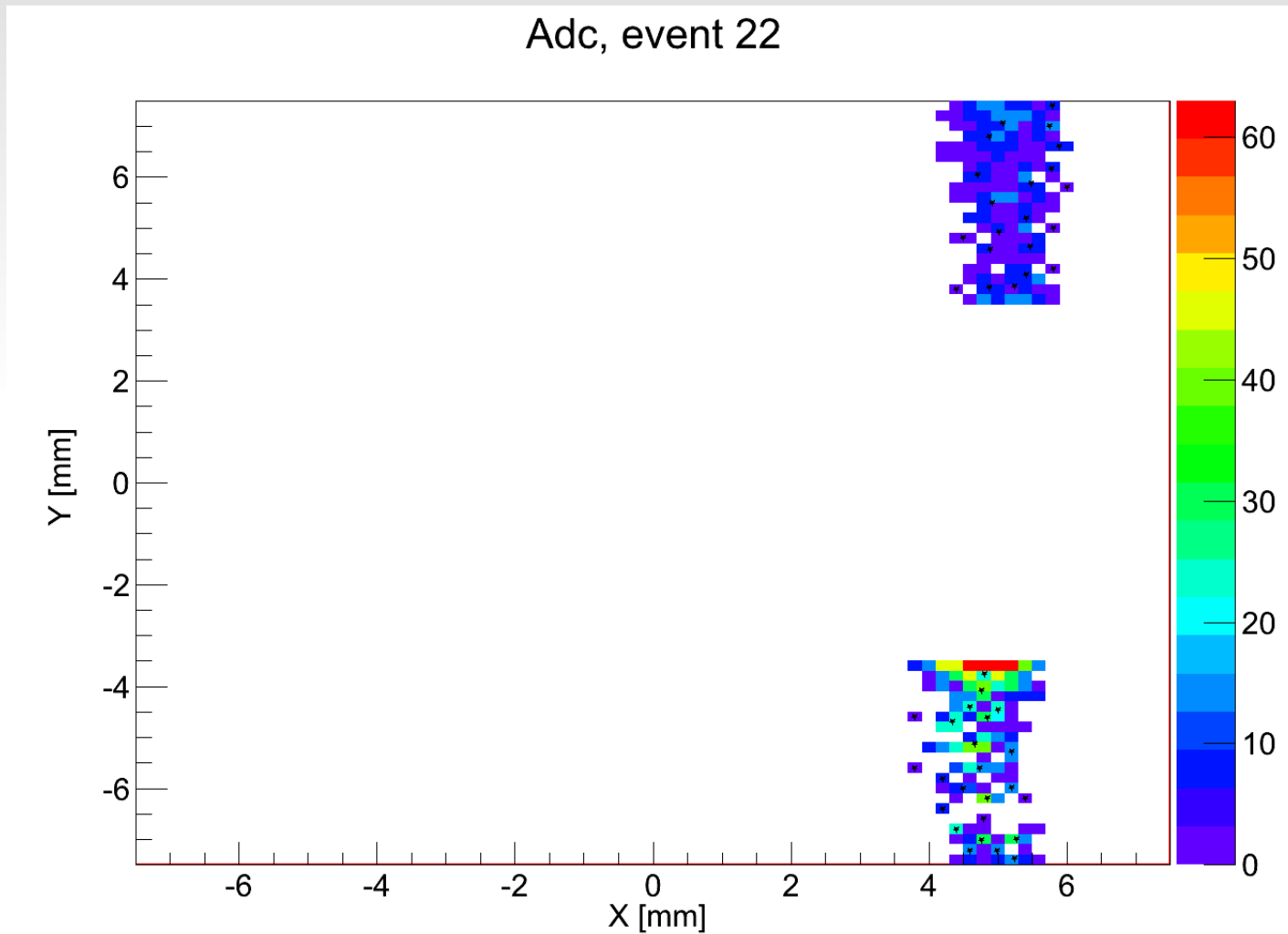


Test Beam Configuration

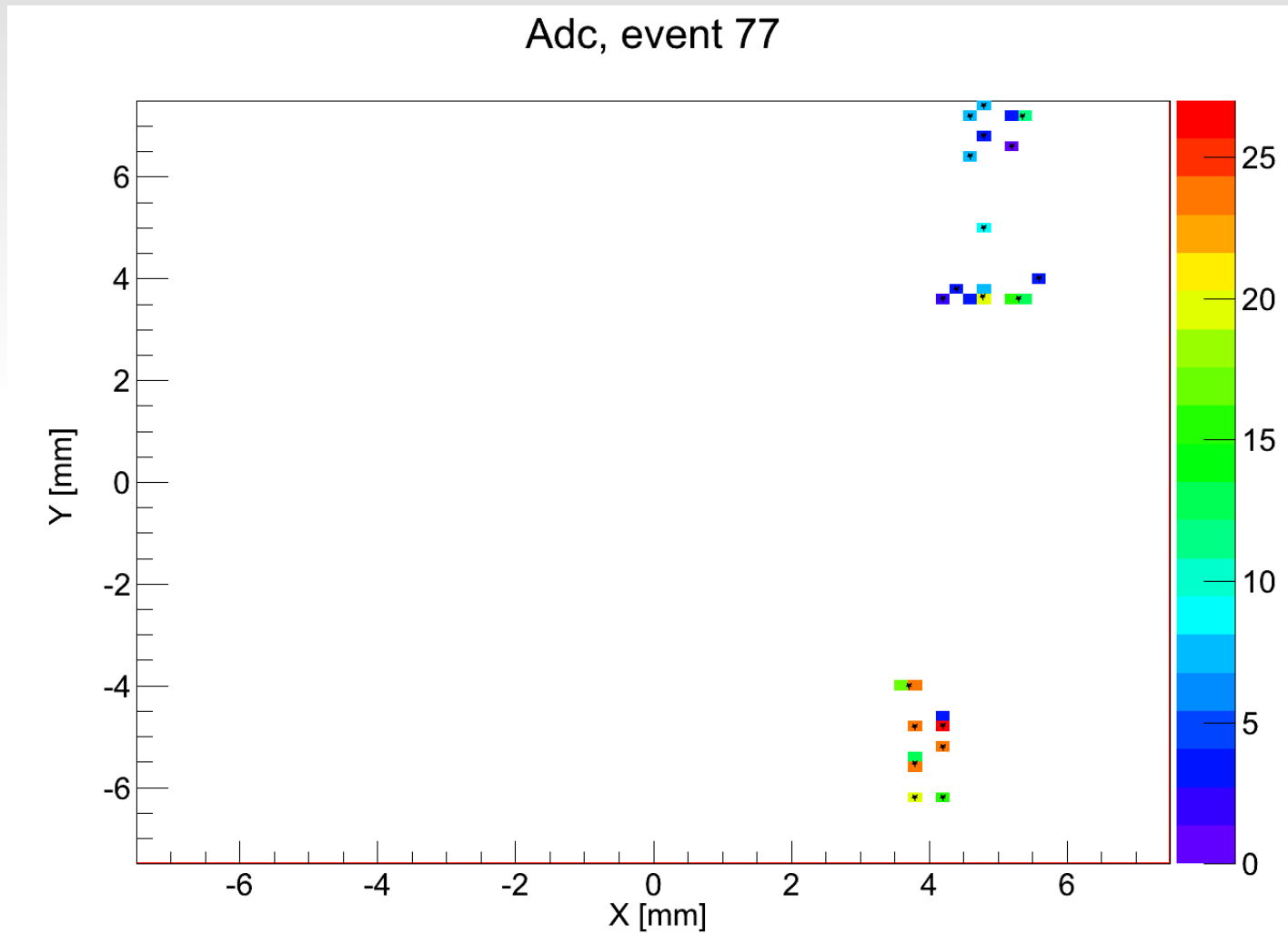


250MeV Ne^{7+} at the TIARA
accelerator near Saga

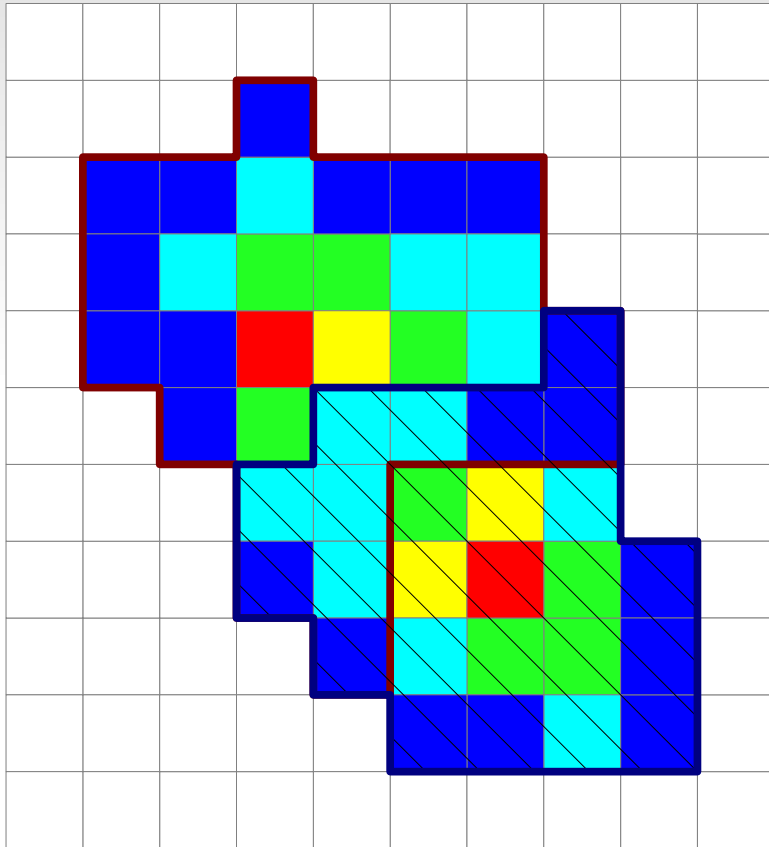
Qpix Event display large dE/dx track



Qpix Event display low dE/dx track



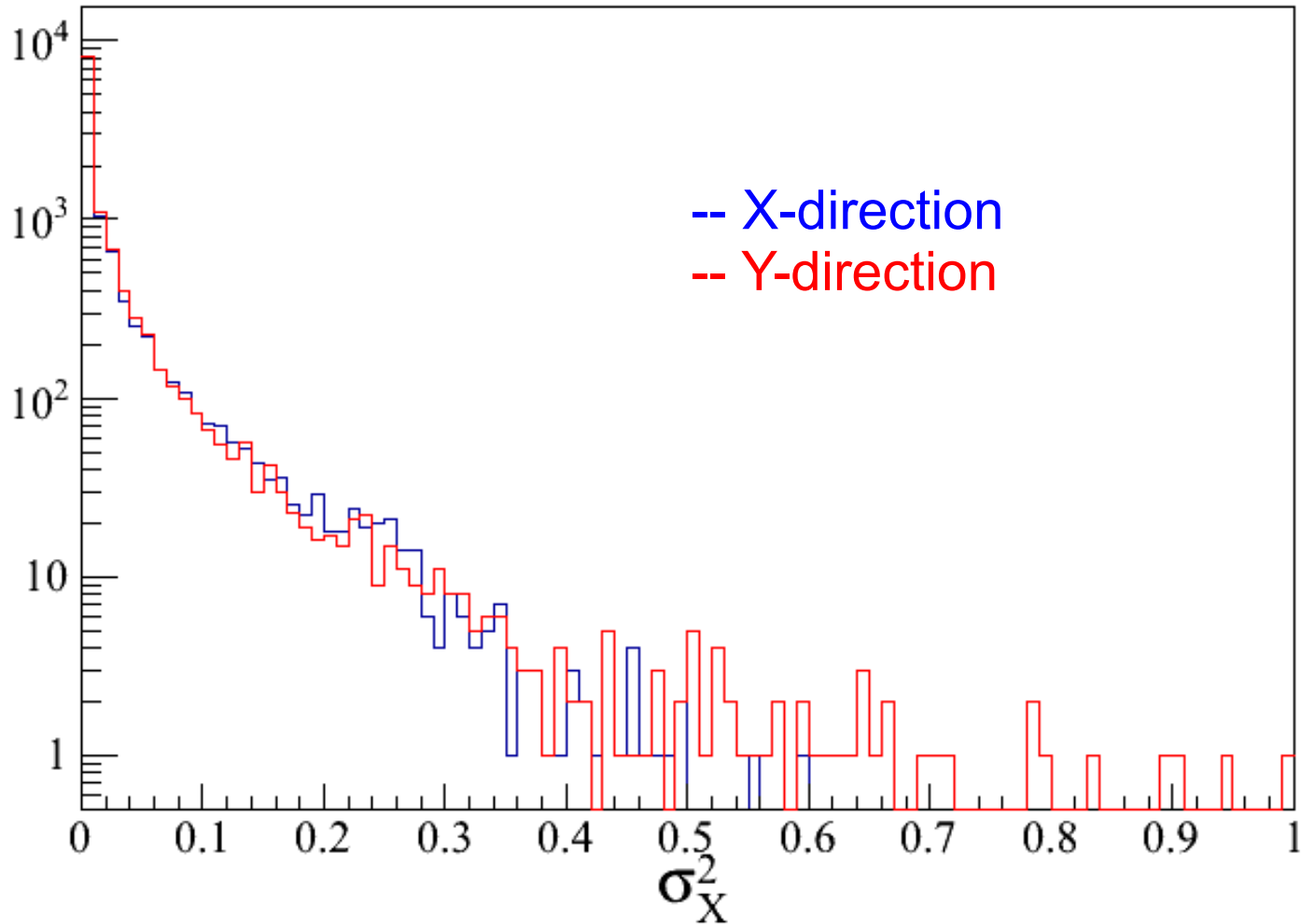
Clustering



2 types of clustering

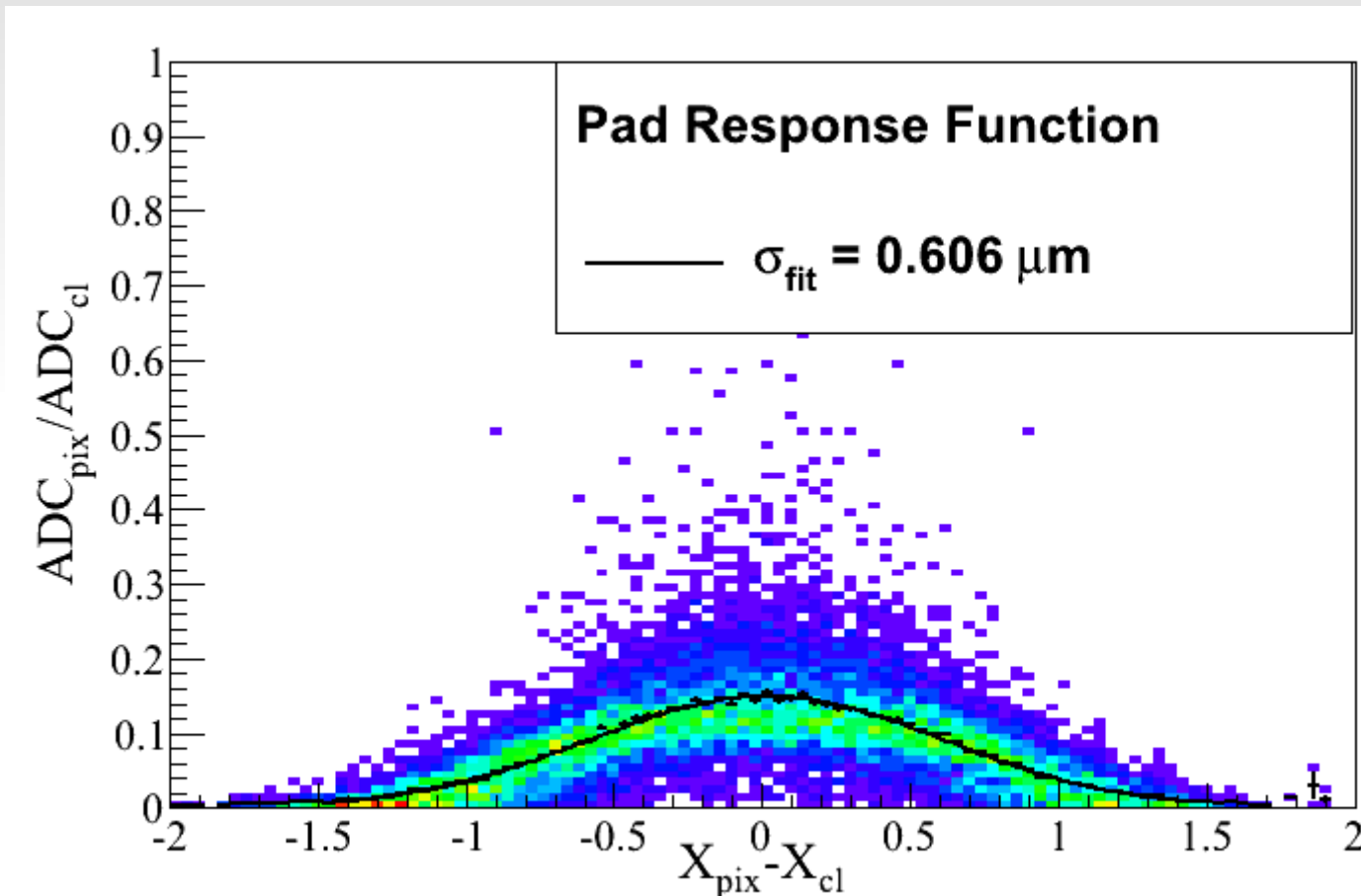
- 1D, perpendicular to track direction
- Simple 2D:
 - Every pixel with ADC down from maximum
 - Shared pixel weighed according to total ADC of the cluster

Cluster size (rms)



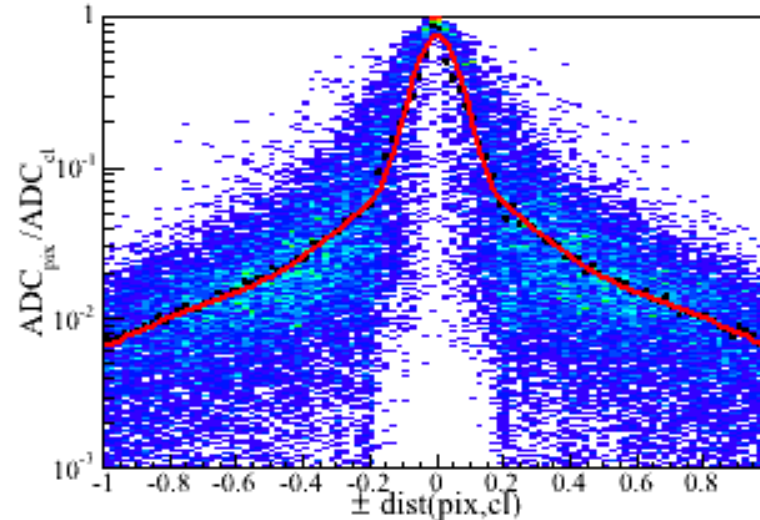
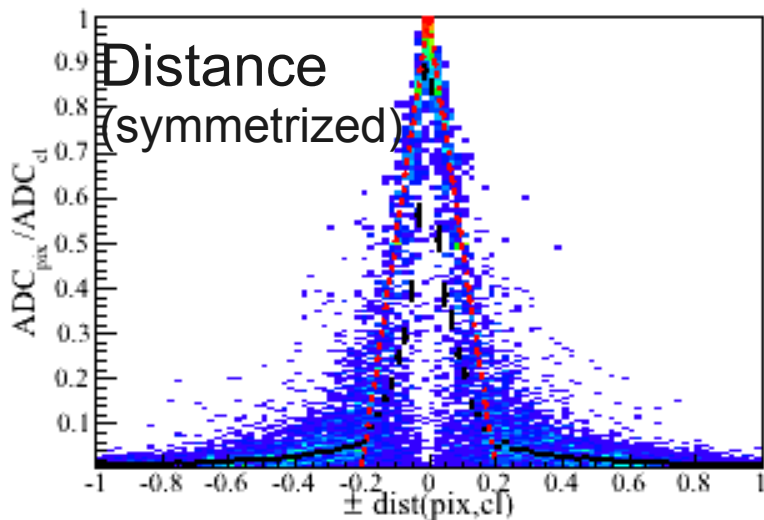
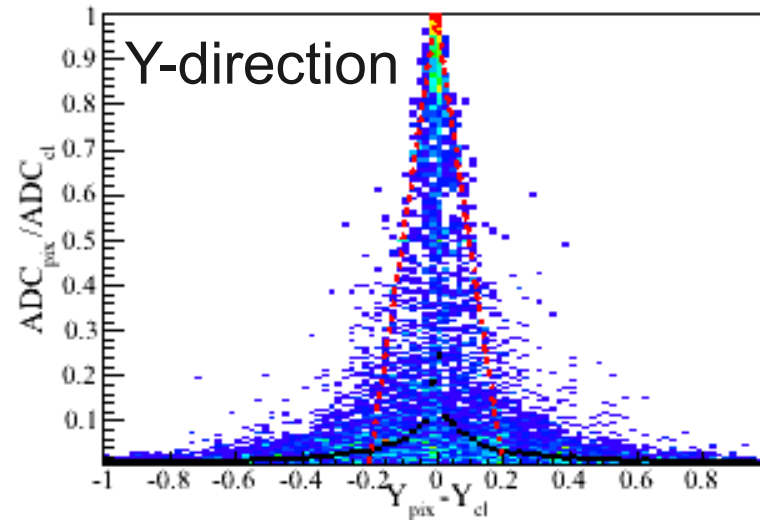
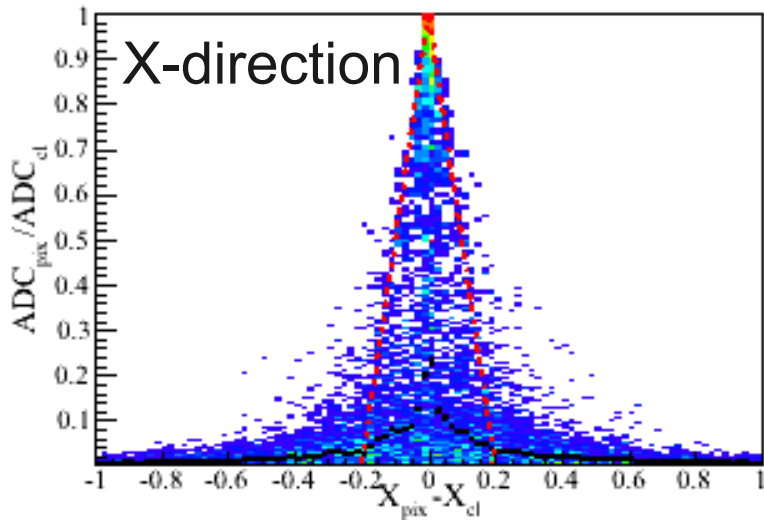
Same distribution parallel and perpendicular to the track!

Pad Response Function 1D clustering



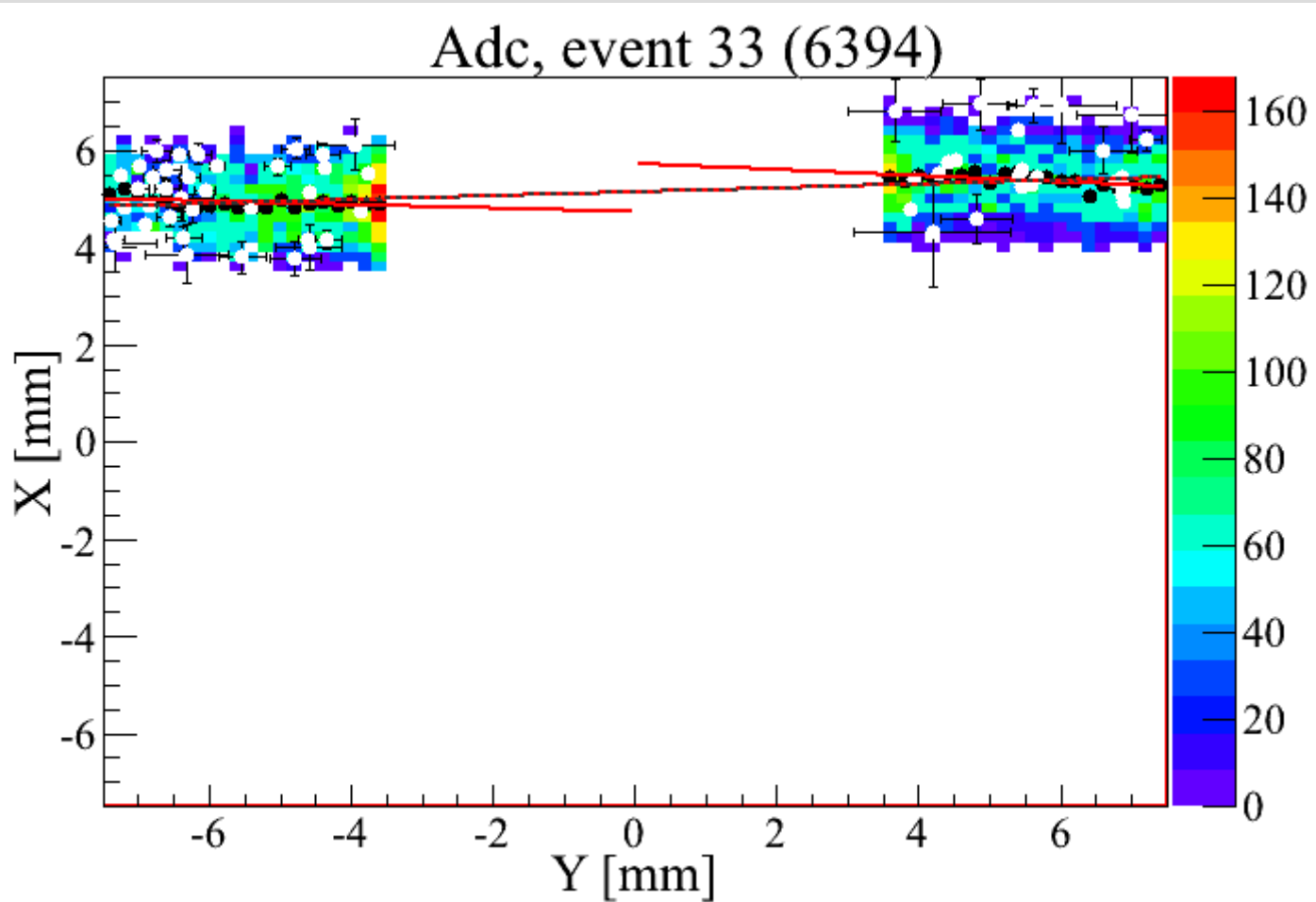
The width is of the order of the expected diffusion

Pad Response Function 2D clustering



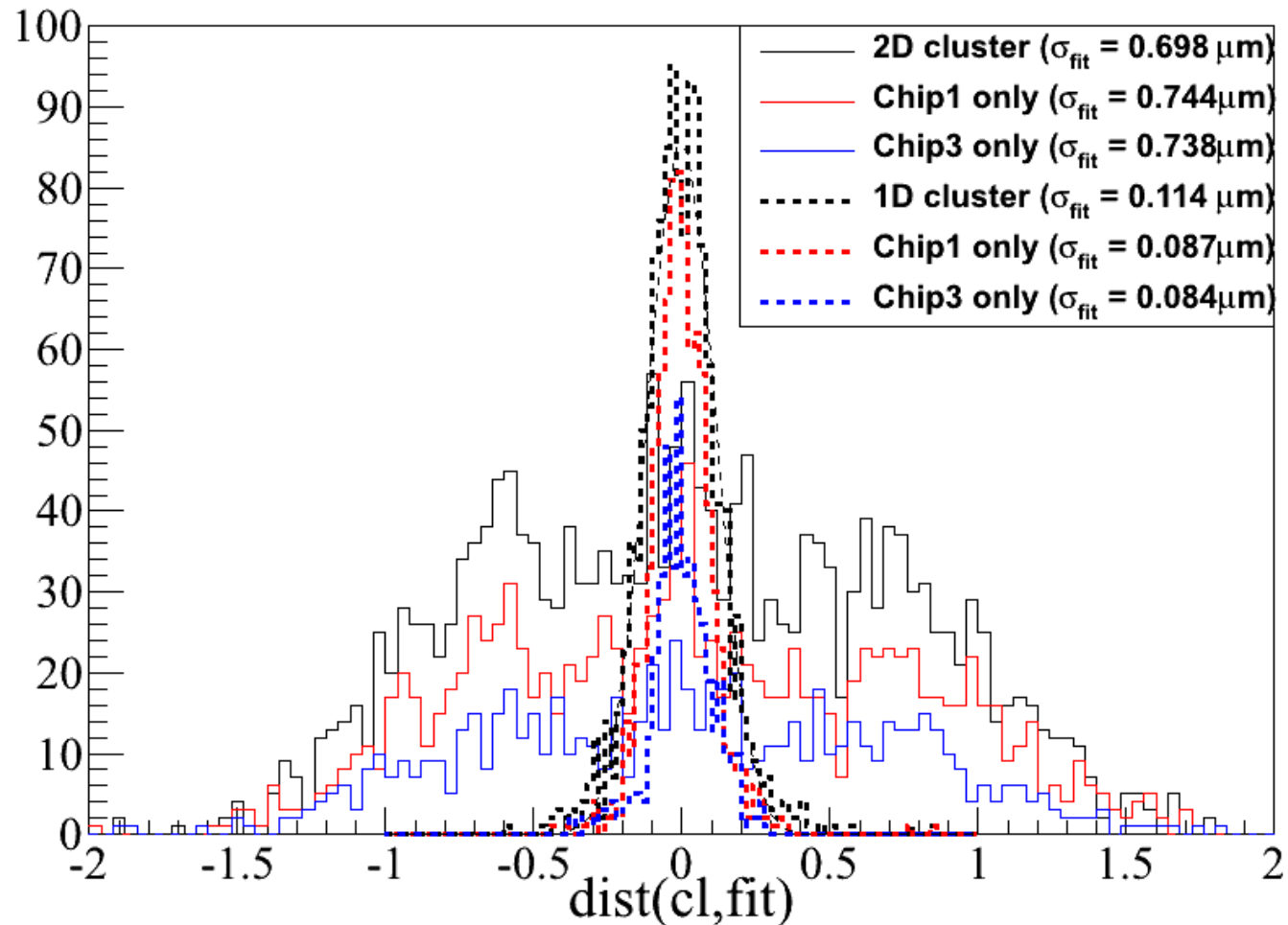
3-Gaussian fit
 $\sigma = 58 \mu\text{m}$
 $\sigma = 190 \mu\text{m}$
 $\sigma = 617 \mu\text{m}$

Track fitting



Clean data => no tracking, fitting whole event
Cluster weighted with $1/\sqrt{\text{ADC}}$

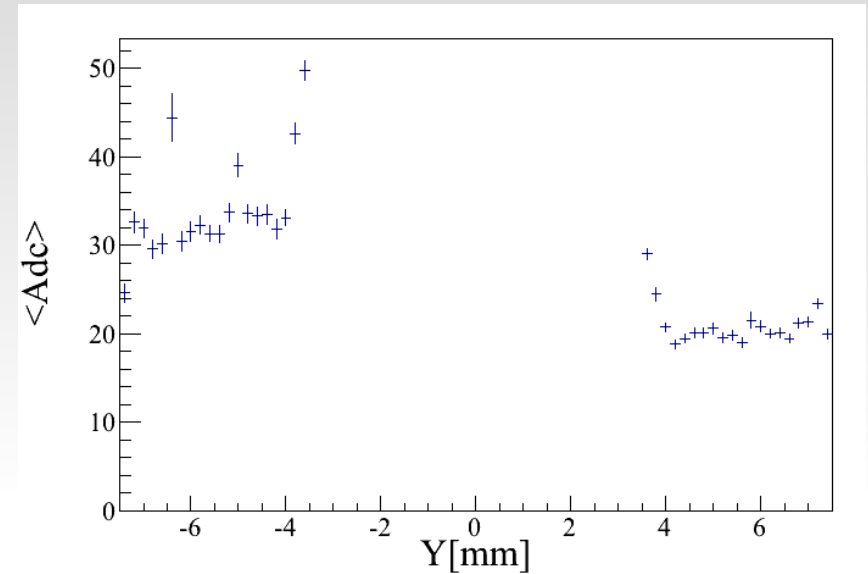
Residuals



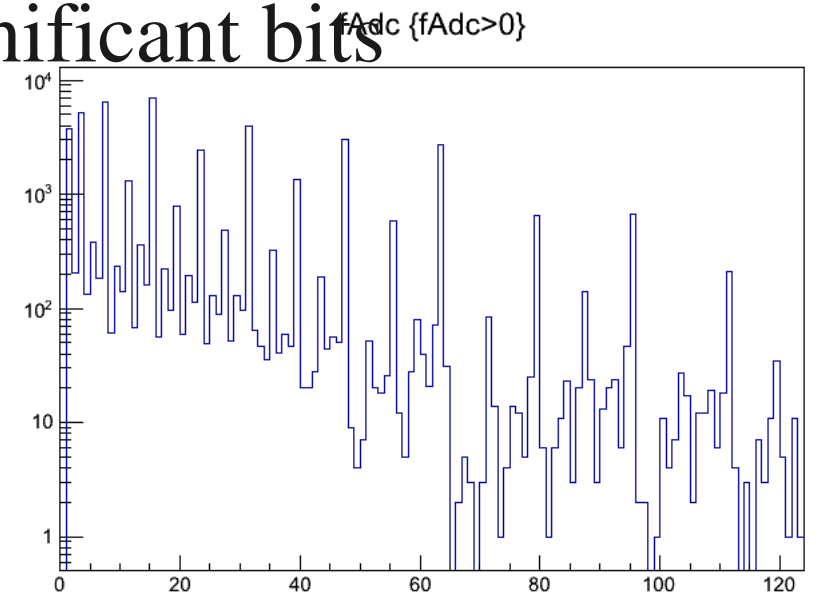
With 2D clustering, the residuals are not a good indication of the tracking resolution

Some unsolved issues

- Field distortion on edges



- Problem with ADC least significant bits



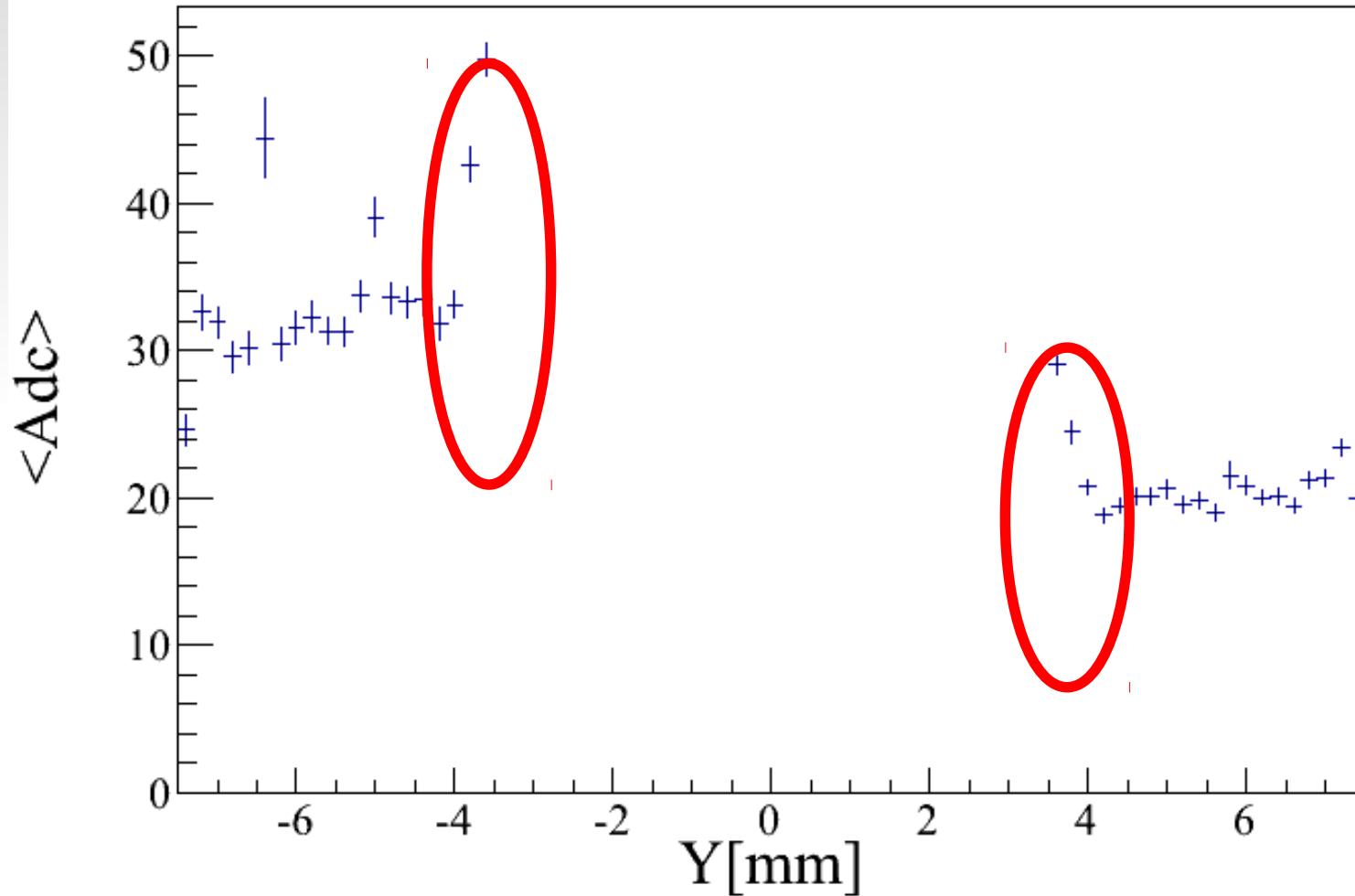
Conclusions

- Interesting Qpix test with Ion beam
- Proper clustering required
- Some issues with the data have to be solved for future tests

- Similar results using TOT instead of ADC
 - Different test needed to measure the benefit of having both

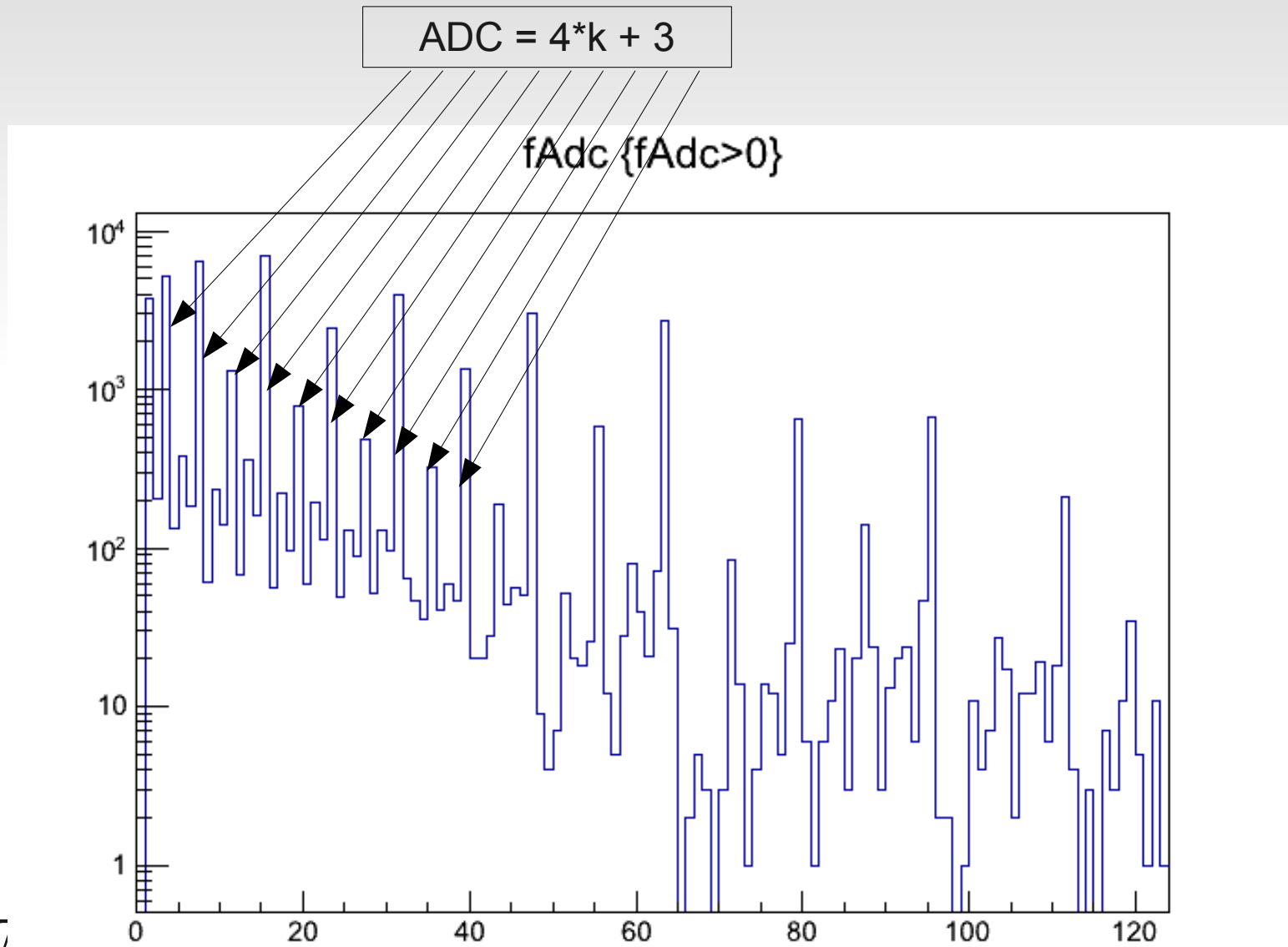
Back up

Issues: Edge effect

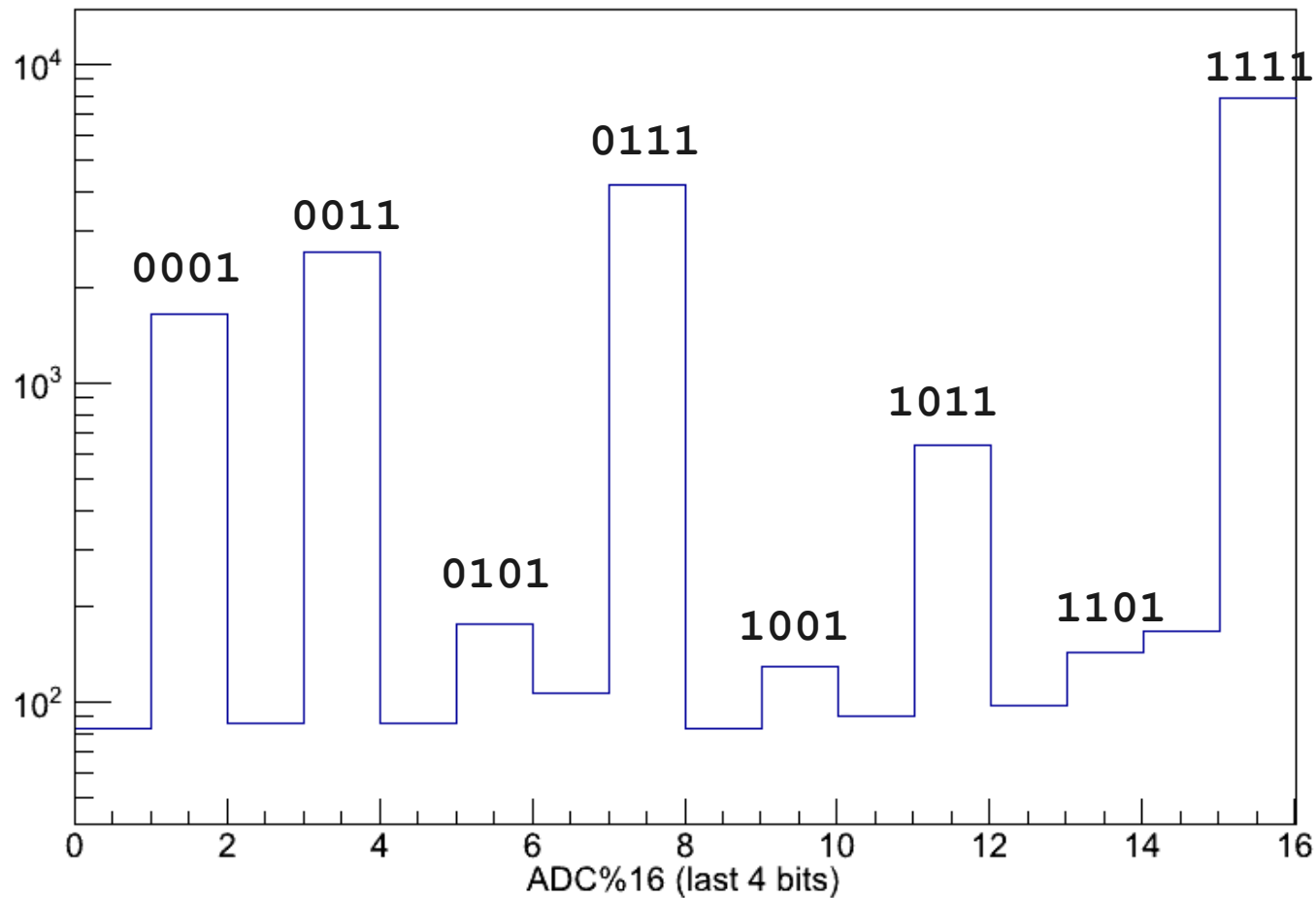


Pixel signal increases at the edge (and also the number of pixels)

Issues: digitalisation?



Last 4 bits of the signal



12/03/27

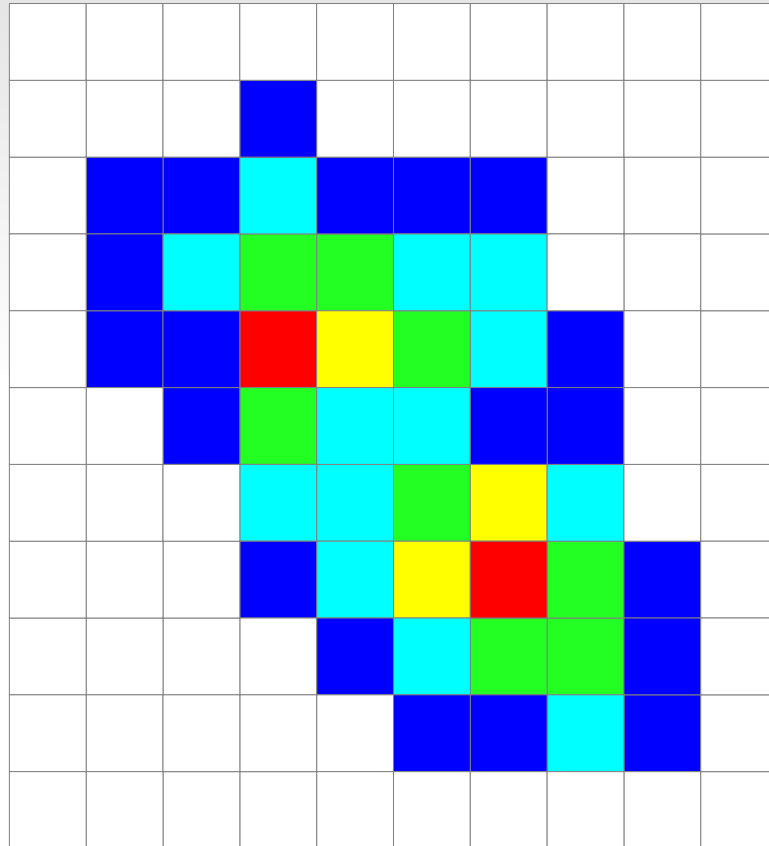
Signals ending with 111 largely dominate the spectrum

QPIX: new readout pixel device for gas detector

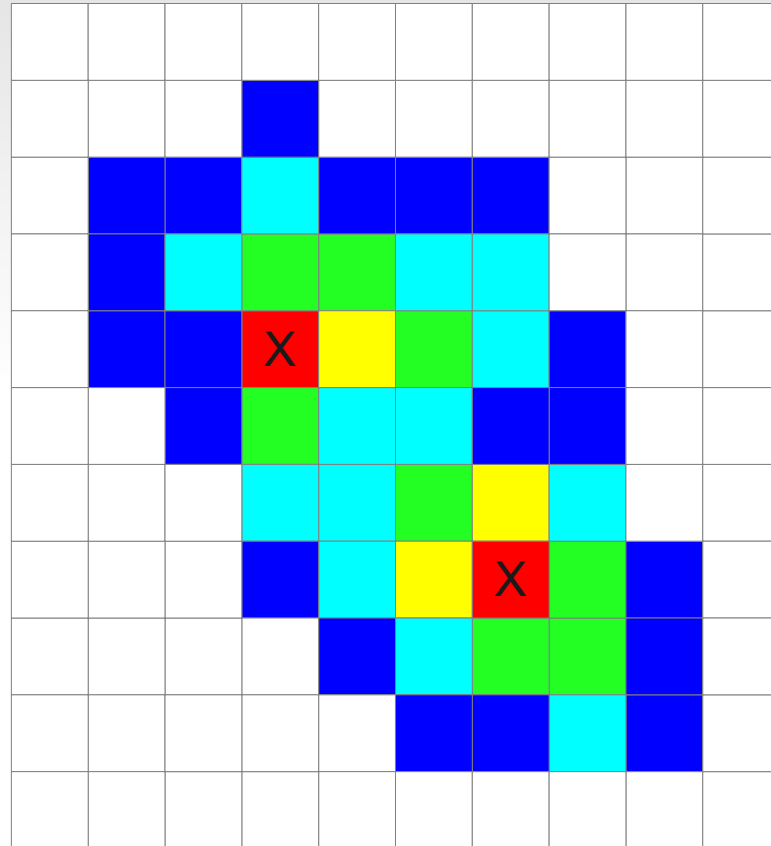
Philippe Gros, Saga University

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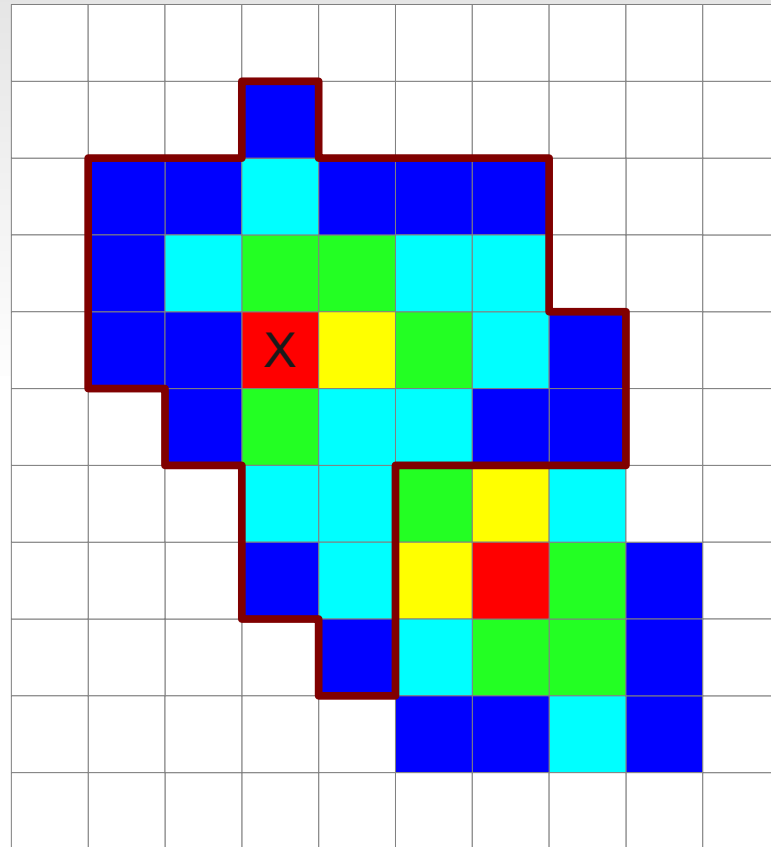
Clustering



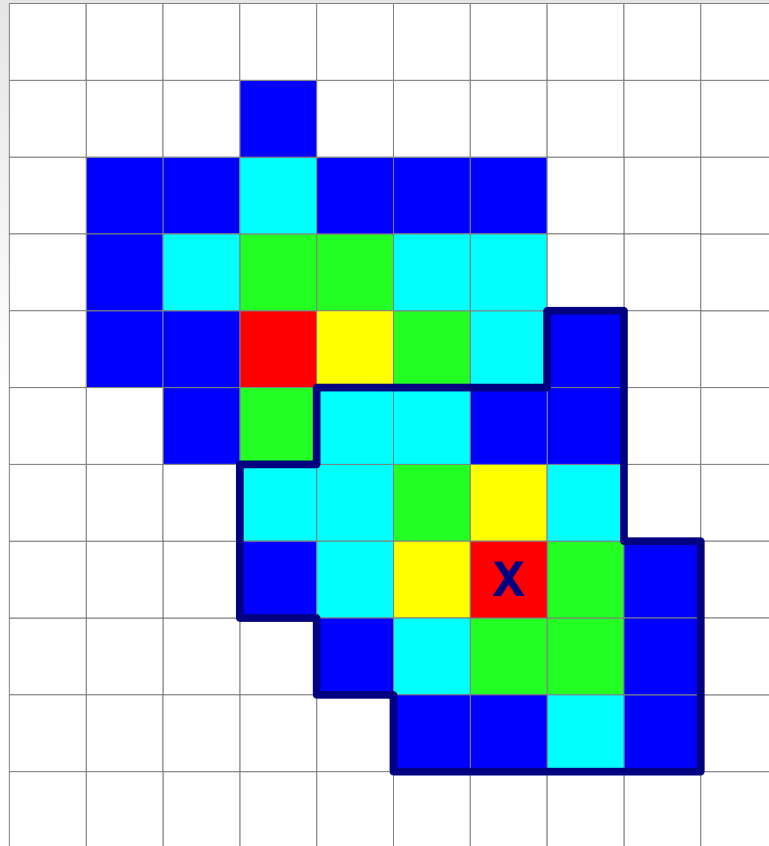
Clustering



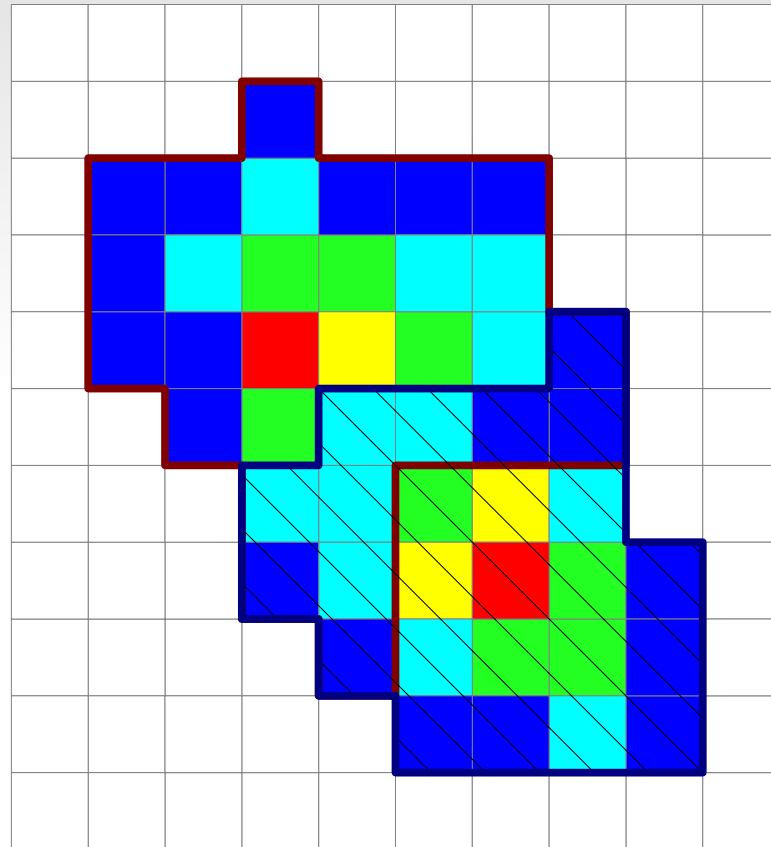
Clustering



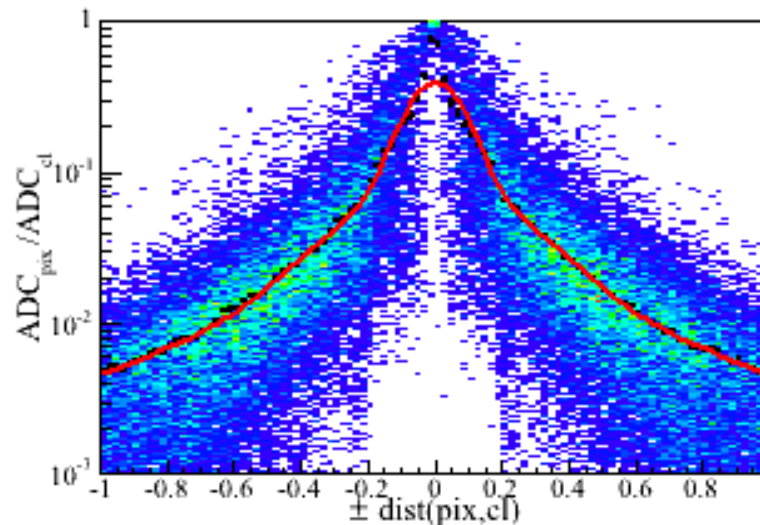
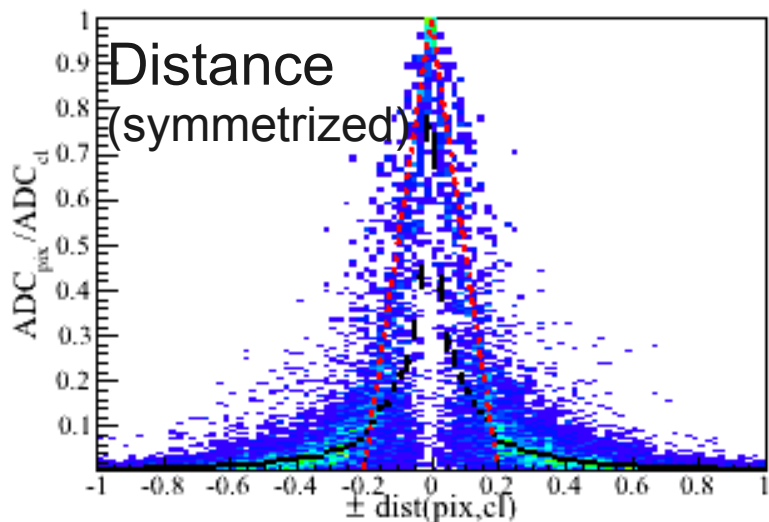
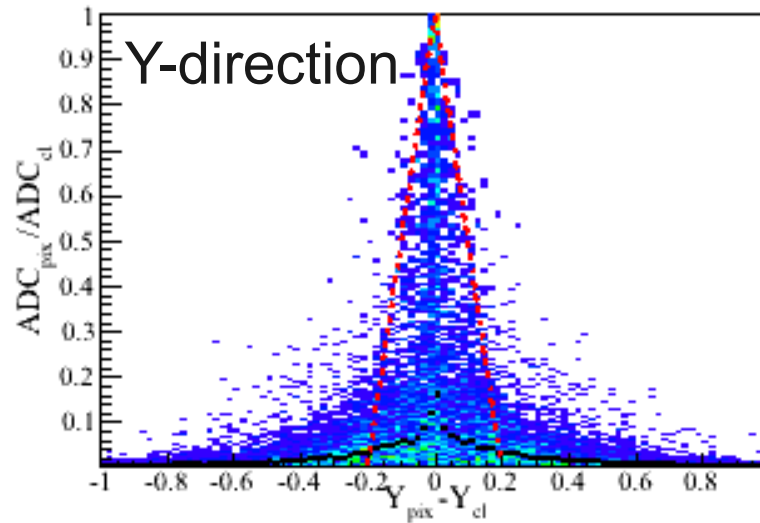
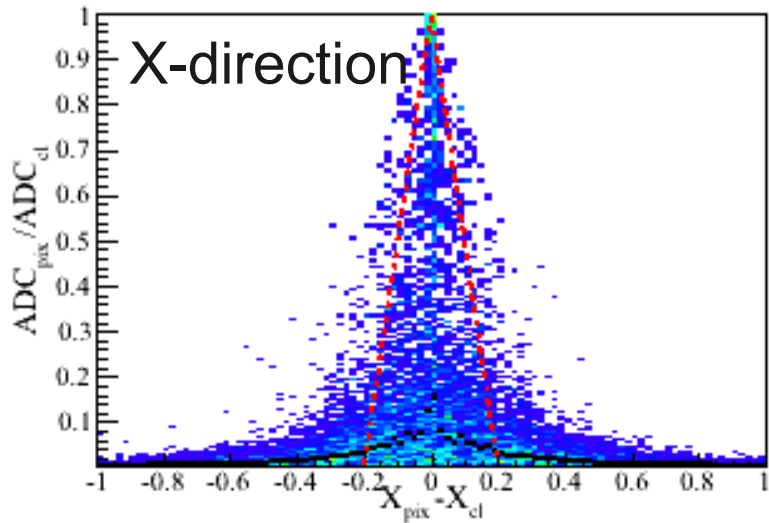
Clustering



Clustering



Pad response function iterated clustering



3-Gaussian fit
 $\sigma = 81 \mu\text{m}$
 $\sigma = 235 \mu\text{m}$
 $\sigma = 660 \mu\text{m}$