GRAN SASSO SCIENCE INSTITUTE
CENTER FOR ADVANCED STUDIES INFN

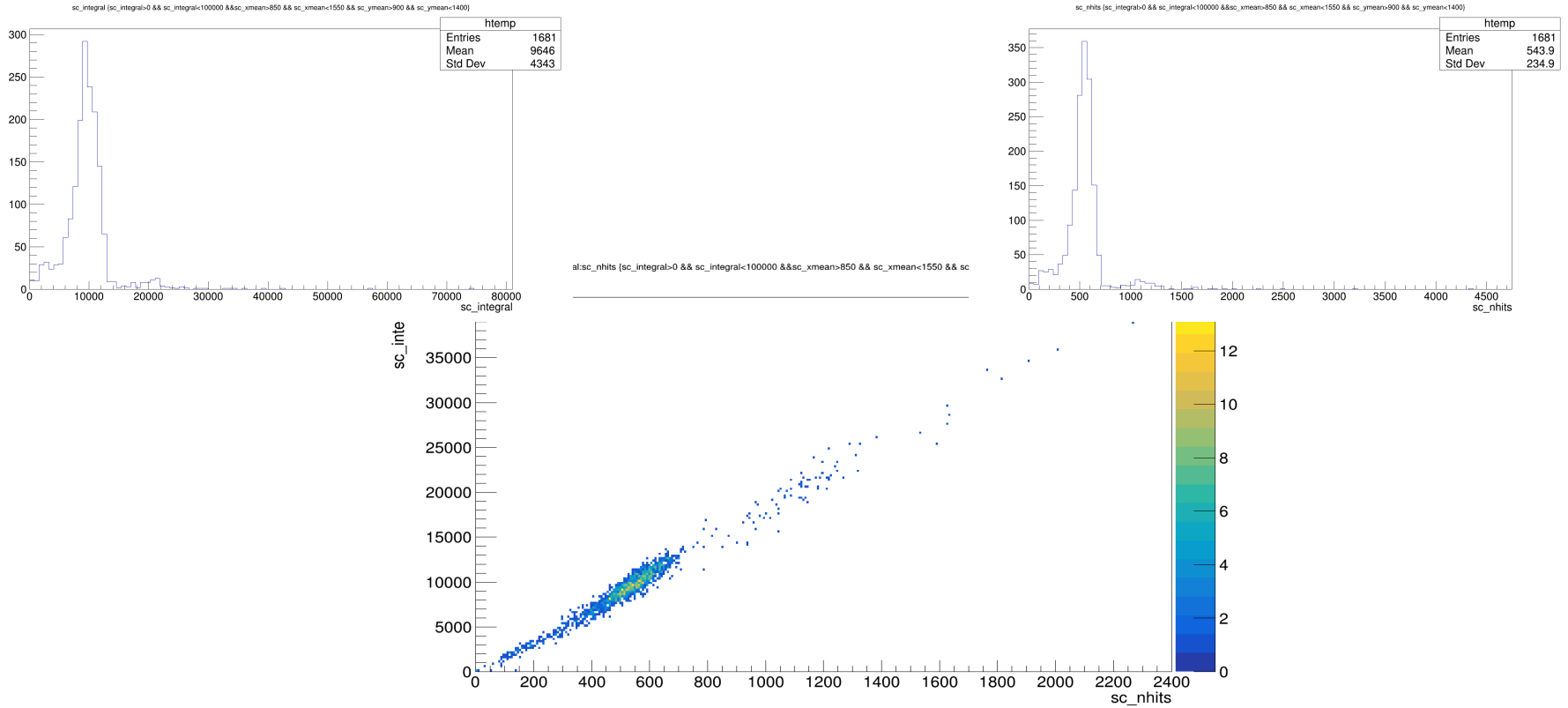
CYGNO Experiment

Spot Analysis Highlights

G. Dho, E. Baracchini

Struggles to Calculate Spot Size

- The first try to estimate the radius from the nhits seems to make the dimension strongly dependent on the energy

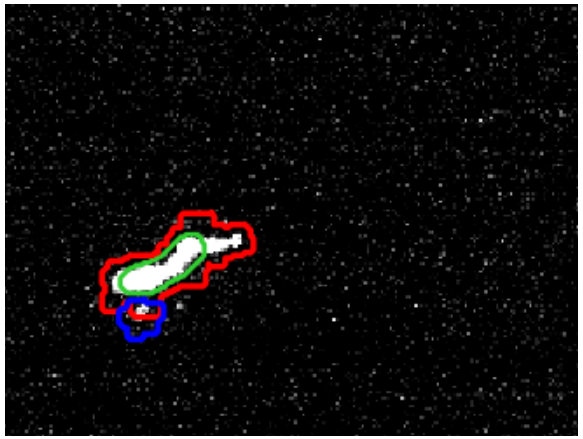


Struggles to Calculate Spot Size

- Estimating it from the variables length and width also seems to be dependent on the code in use

GAC:
– Stable

– Cuts pieces of tracks

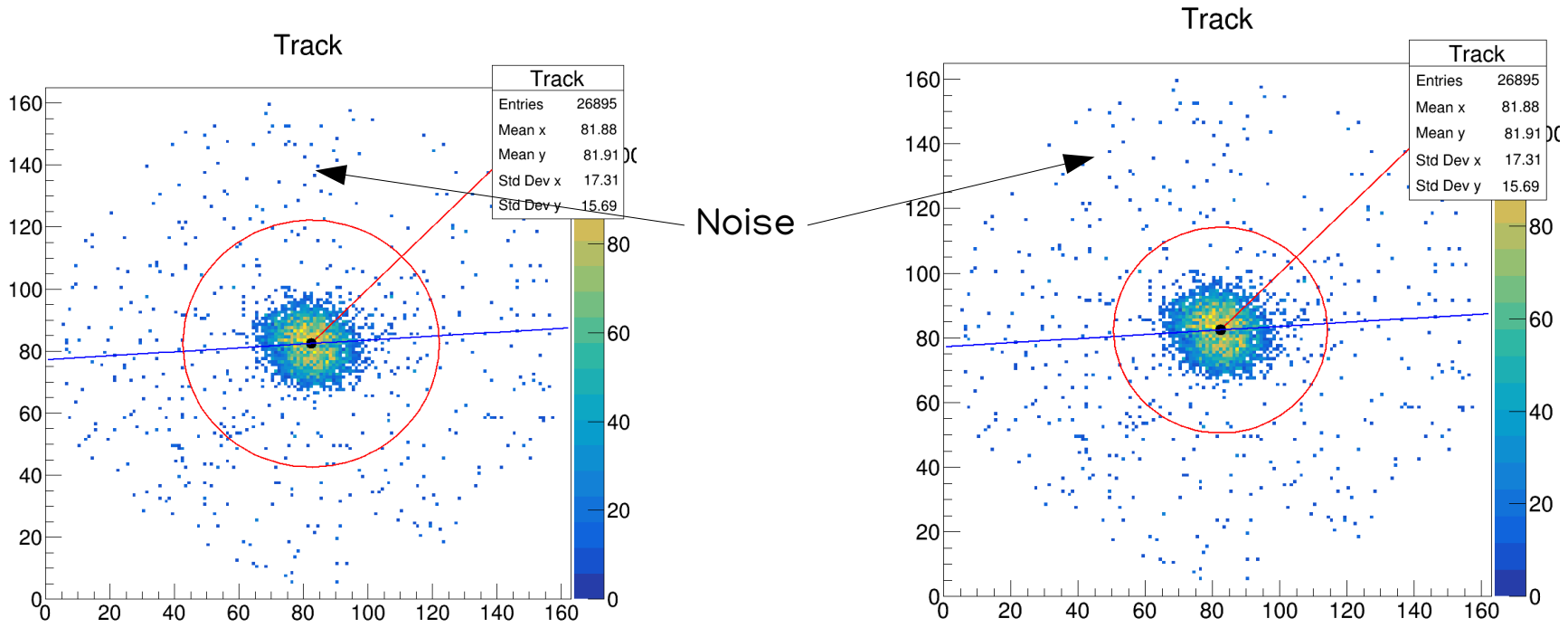


Chanvese:
– More parameters to play with

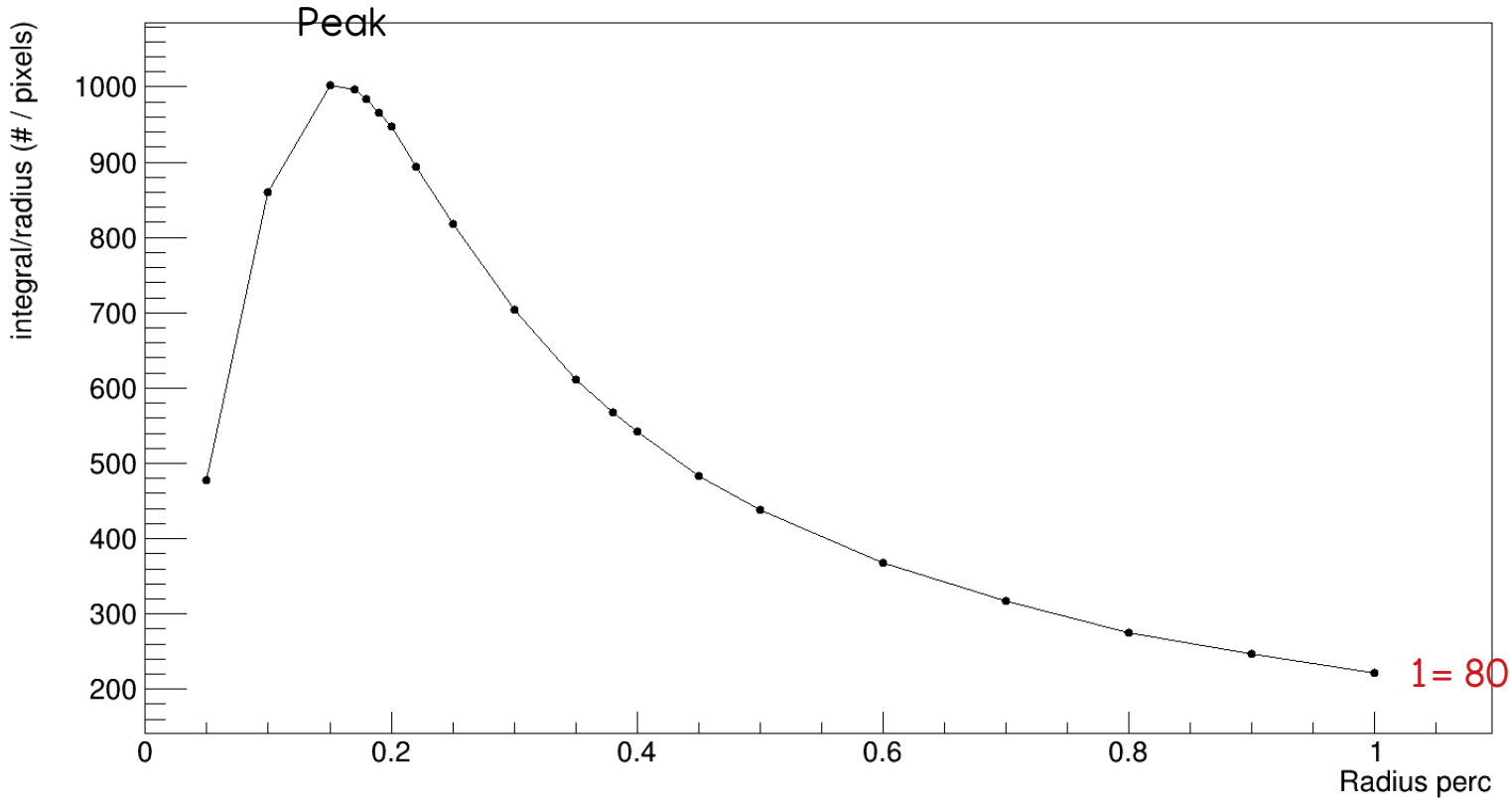
– Tends not to cut tracks

Studies on Big Supercusters

- I analysed some data with very loose parameters and got huge iron spots
- Then studied different parameters as a function of the concentric radii



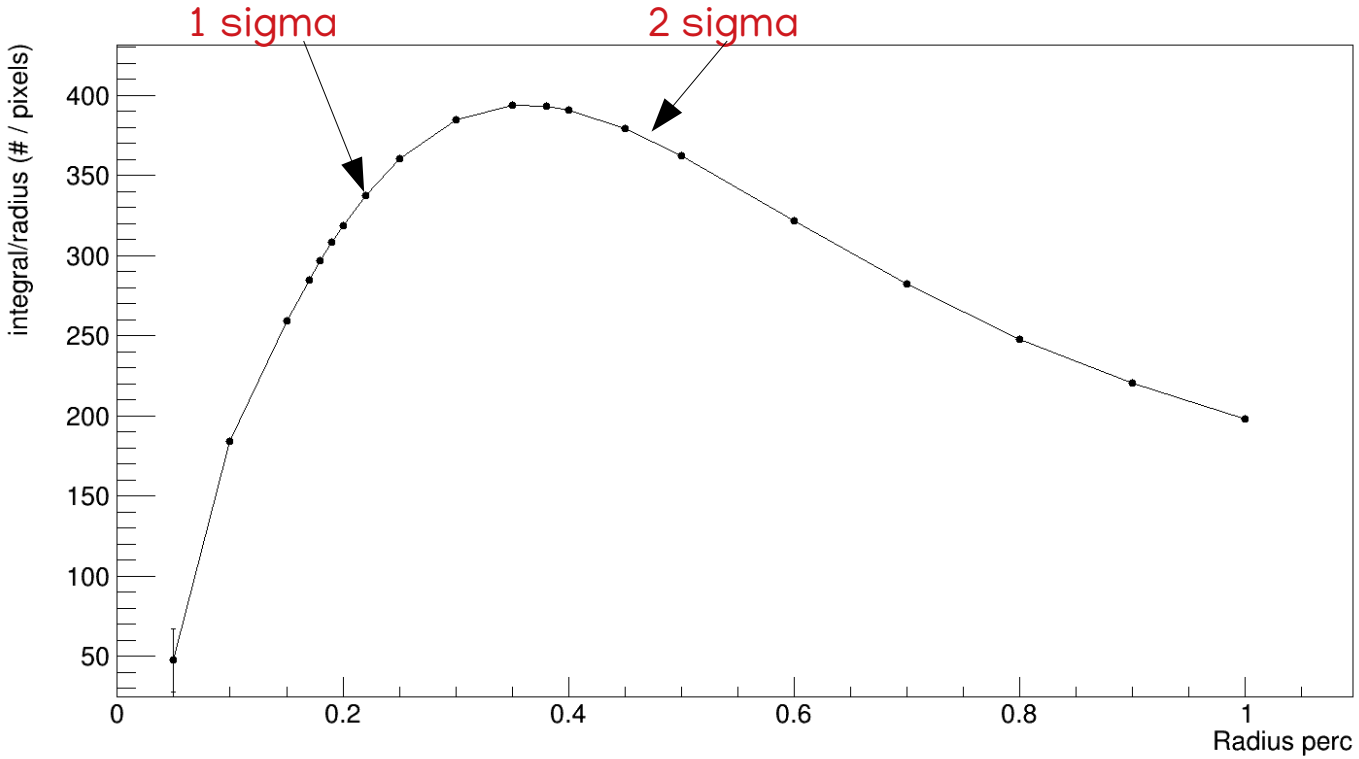
- What about the intearal inside the circle over the radius in pixels?



1= 80 pixels = 3,92 mm

Studies on Big Supercusters

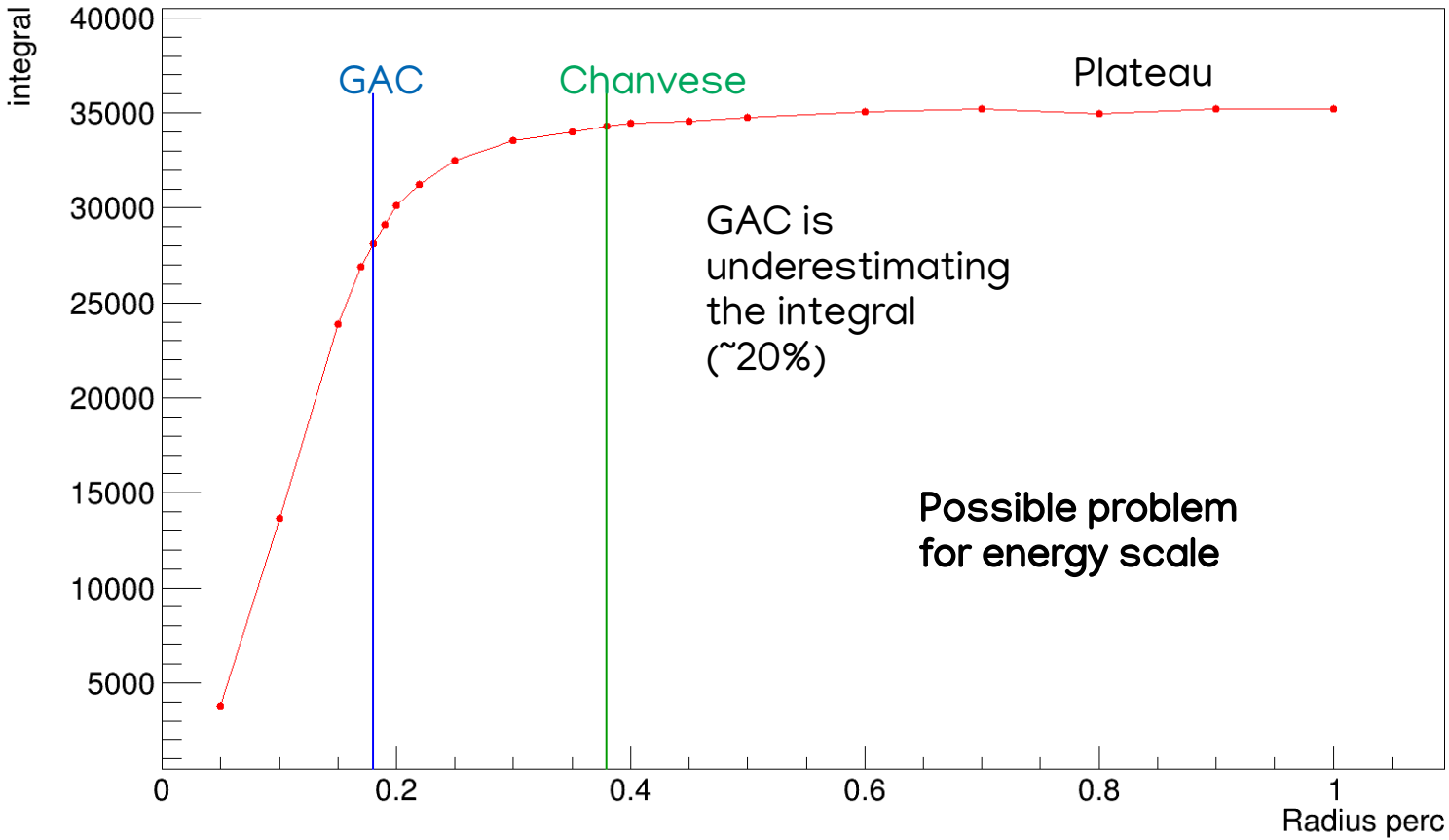
- Replacing the iron data with the sampling of a 2D gaussian distribution and repeating the analysis



– Clearly iron is not a perfect gaussian

– That peak has not a clear meaning for what concerns spot dimension

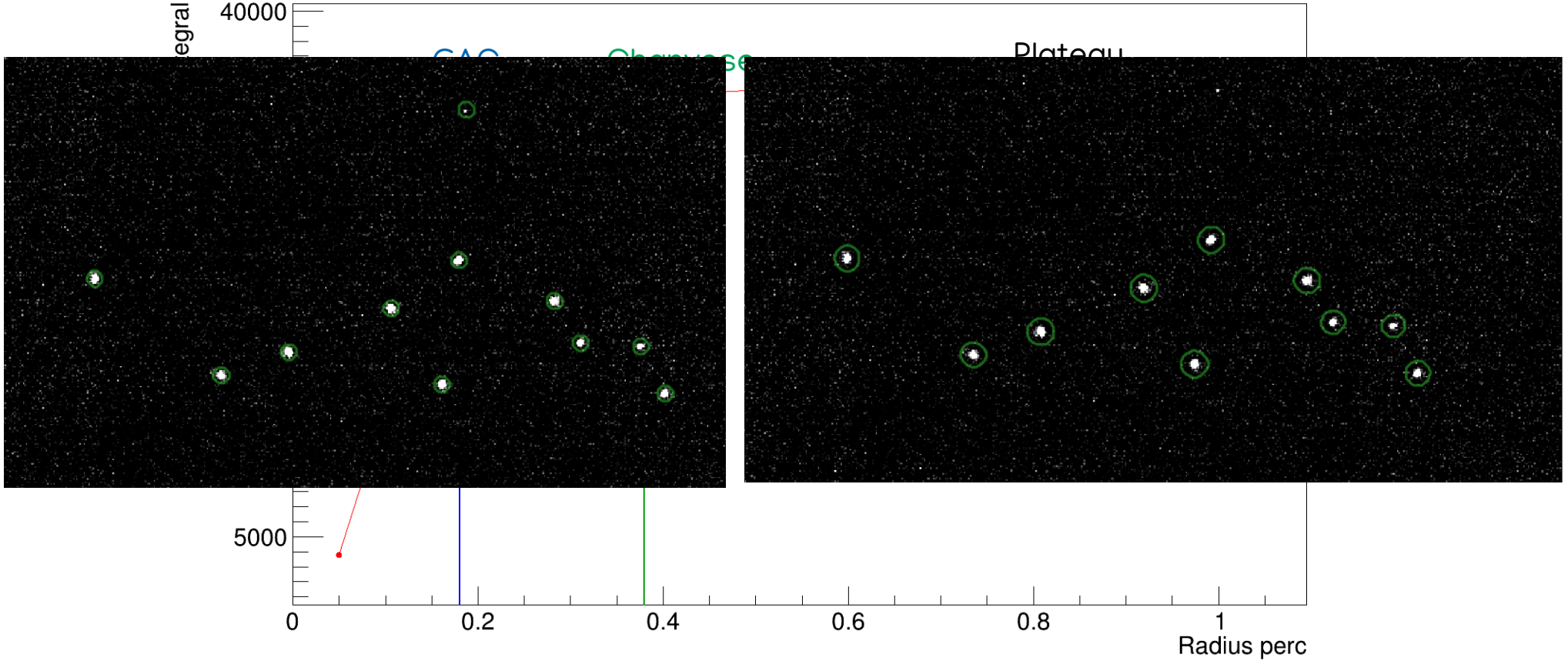
- Then I just calculated the integral vs radius



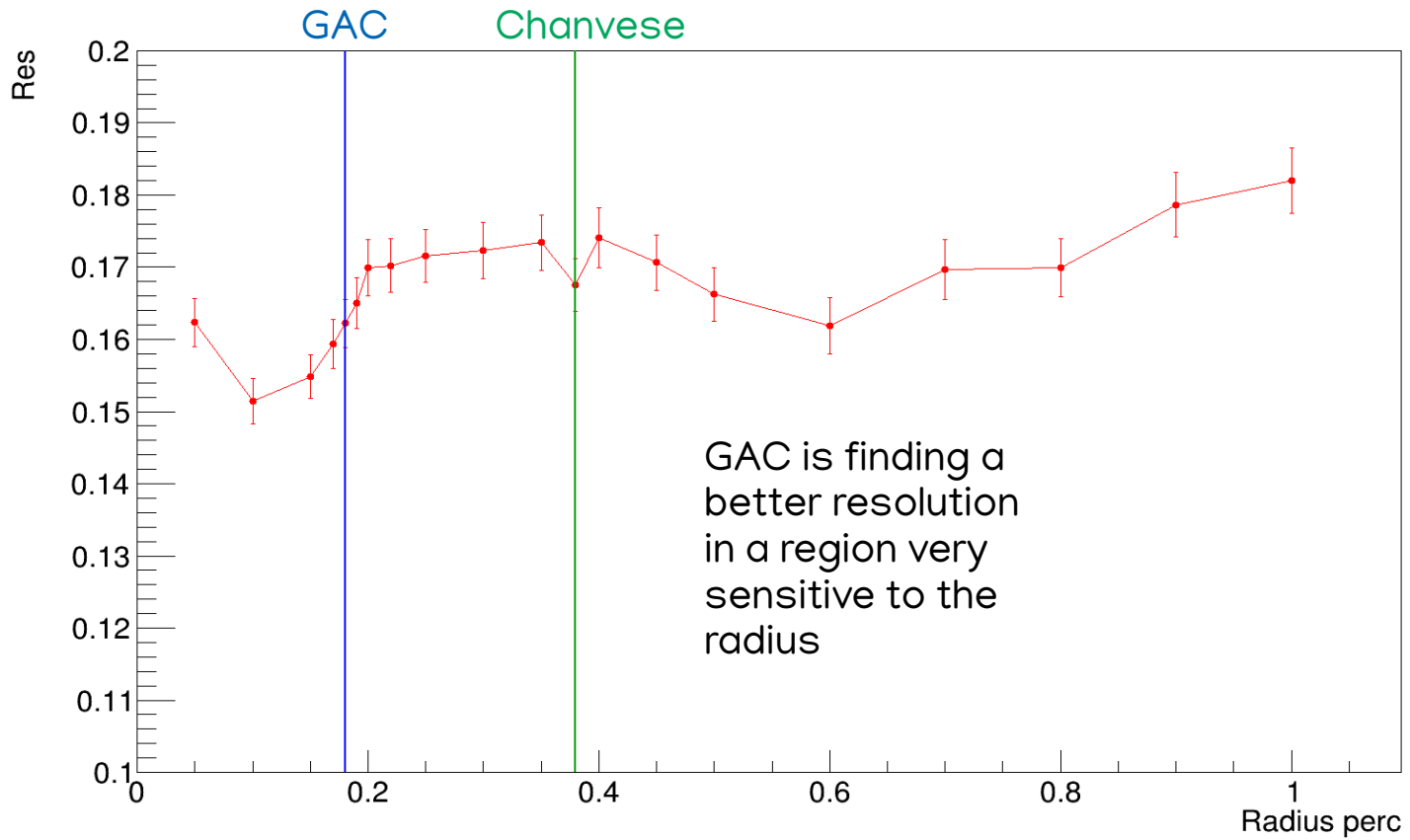
Hard to determine easily the radius from here

Studies on Big Supercusters

- Then I just calculated the integral vs radius



- Looking at the energy resolution



Hard to determine easily the radius from here

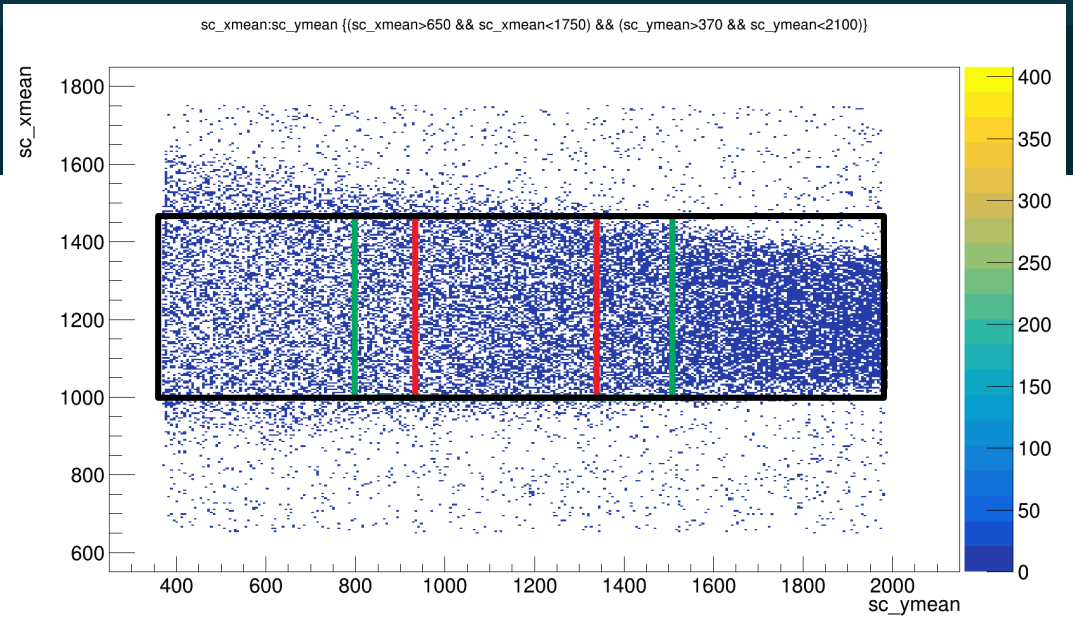
Dependence on geometry

- Indeed it seems GAC is more sensitive on the resolution

Energy resolution of new code using run 677-686 and 778-787 (verycentre= 1000<x<1300 centre= 800<x<1500 all= 0<x<2304)

Run	Resold	Resnew
677-verycentre	15.7	18.8
677-centre	17.0	19.0
677-all	21.1	19.5
778-verycentre	12.5	14.4
778-centre	13.6	15.2
778-all	18.1	15.7

GAC resolution varies much more even for the vignetting

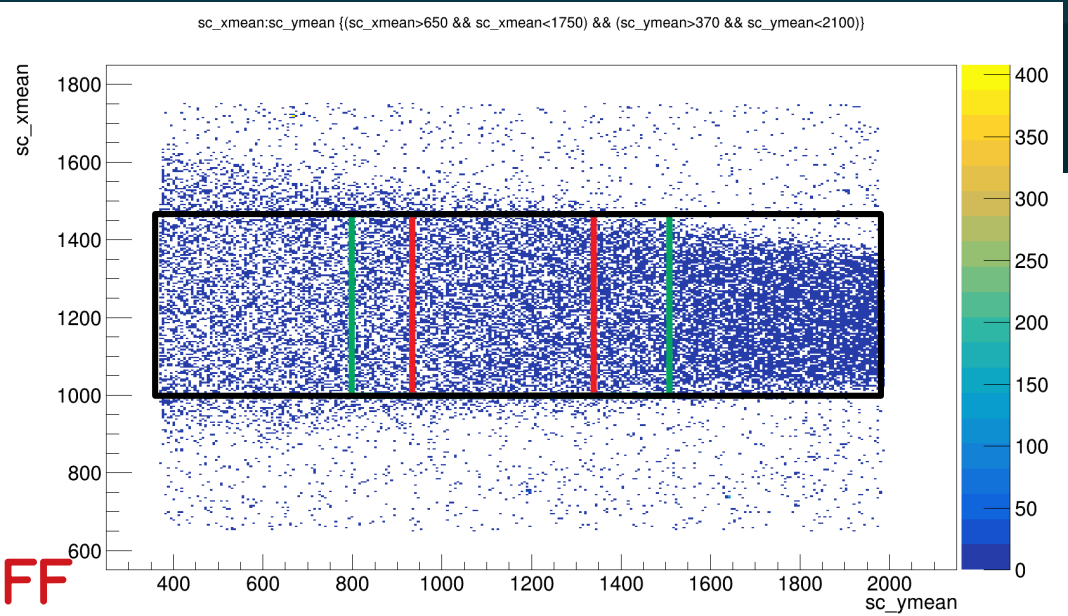


Dependence on geometry

- Indeed it seems GAC is more sensitive on the resolution

Energy resolution of new code using run 677-686 and 778-787 (verycentre= 1000<x<1300 centre= 800<x<1500 all= 0<x<2304)

Run	Resold	Resnew
677-verycentre	15.7	18.8
677-centre	17.0	19.0
677-all	21.1	19.5
778-verycentre	12.5	14.4
778-centre	13.6	15.2
778-all	18.1	15.7

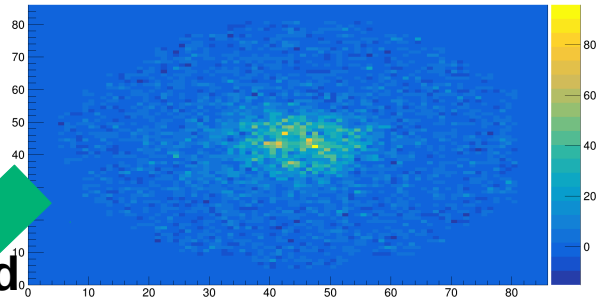


GAC resolution varies much more even for the vignetting

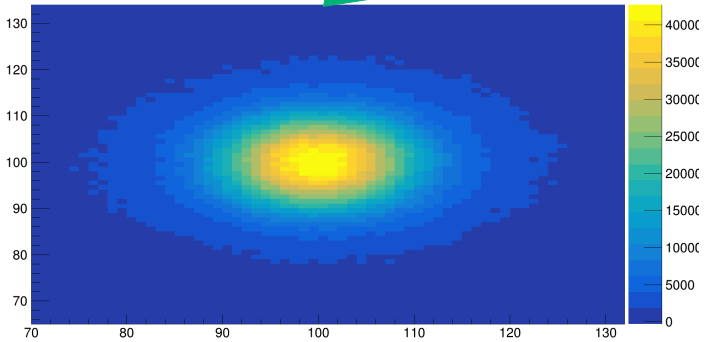
SOMETHING IS OFF

New Method

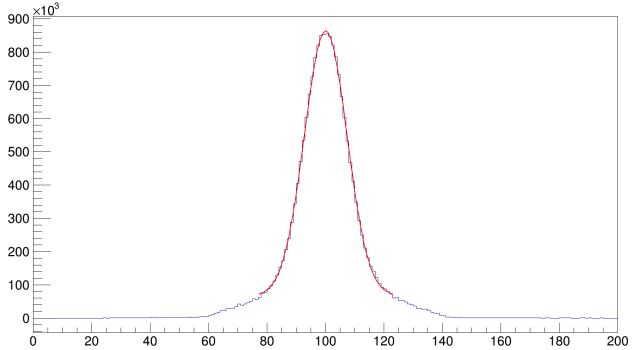
- To quantify the dimension of the spots, trying to be independent from the light output, all the spots are centred and summed and the sigma of the shape is fitted with a gaussian



Centering and summing tracks



Projections

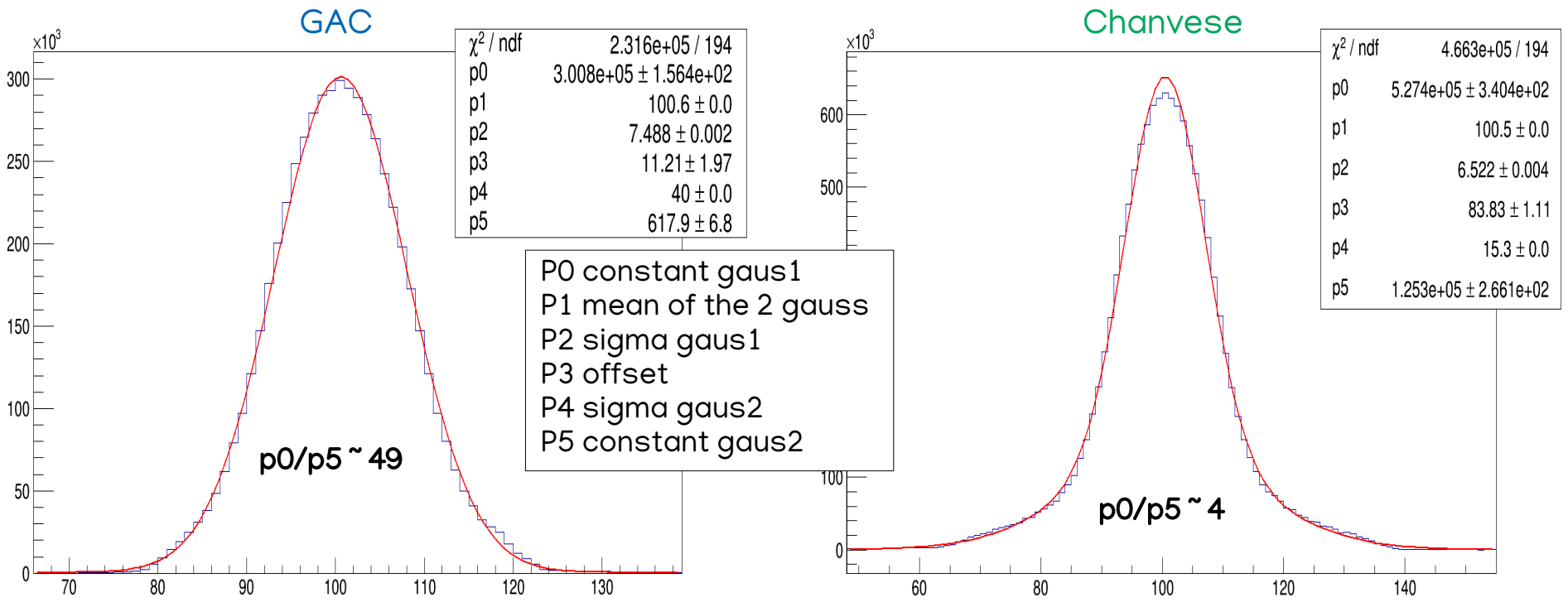


Inspired by Davide

The sigma should depend only the shape

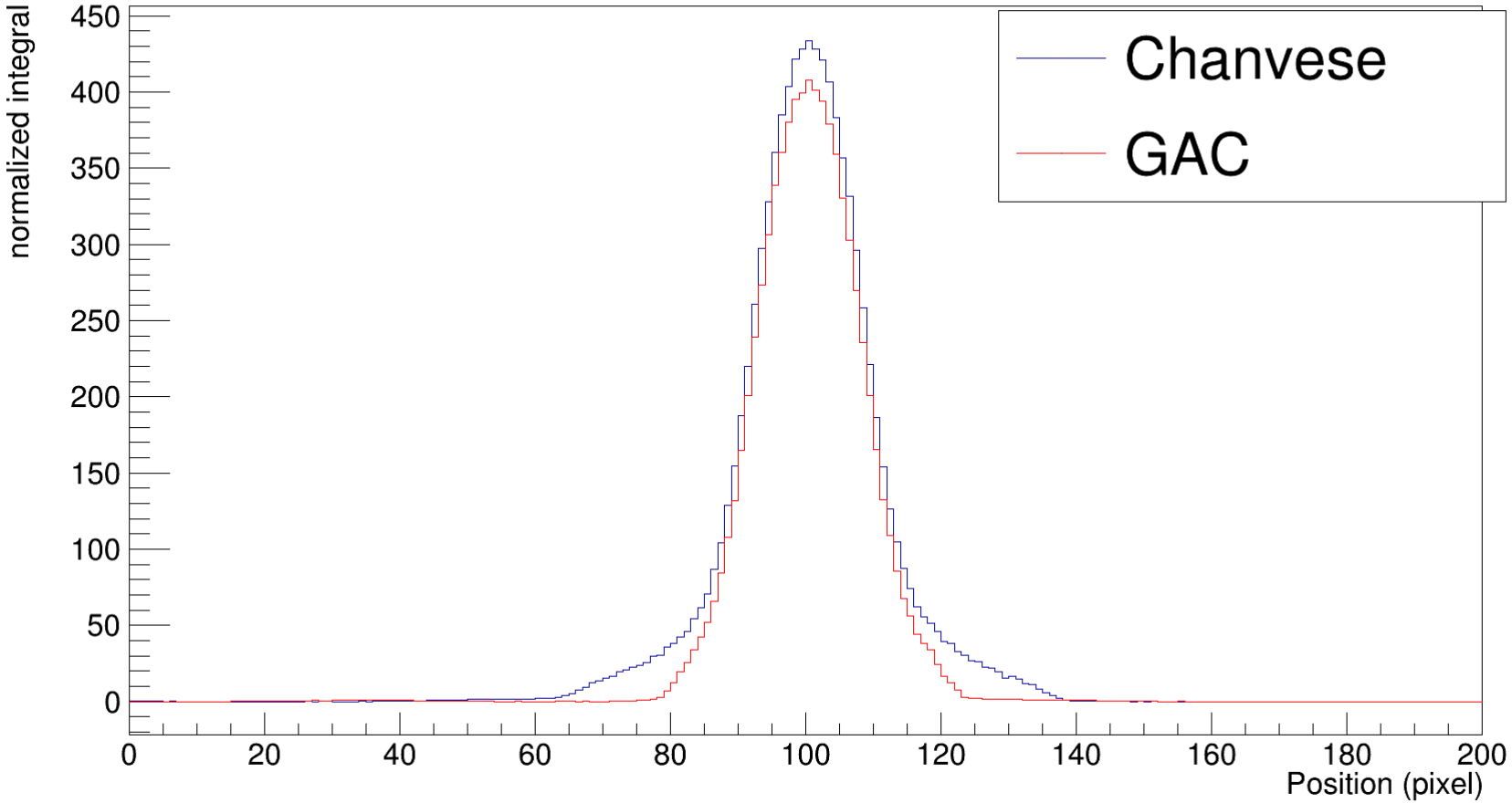
Chanvese or GAC

- I repeated the algorithm on the same data after having saved the pixels from GAC and Chanvese



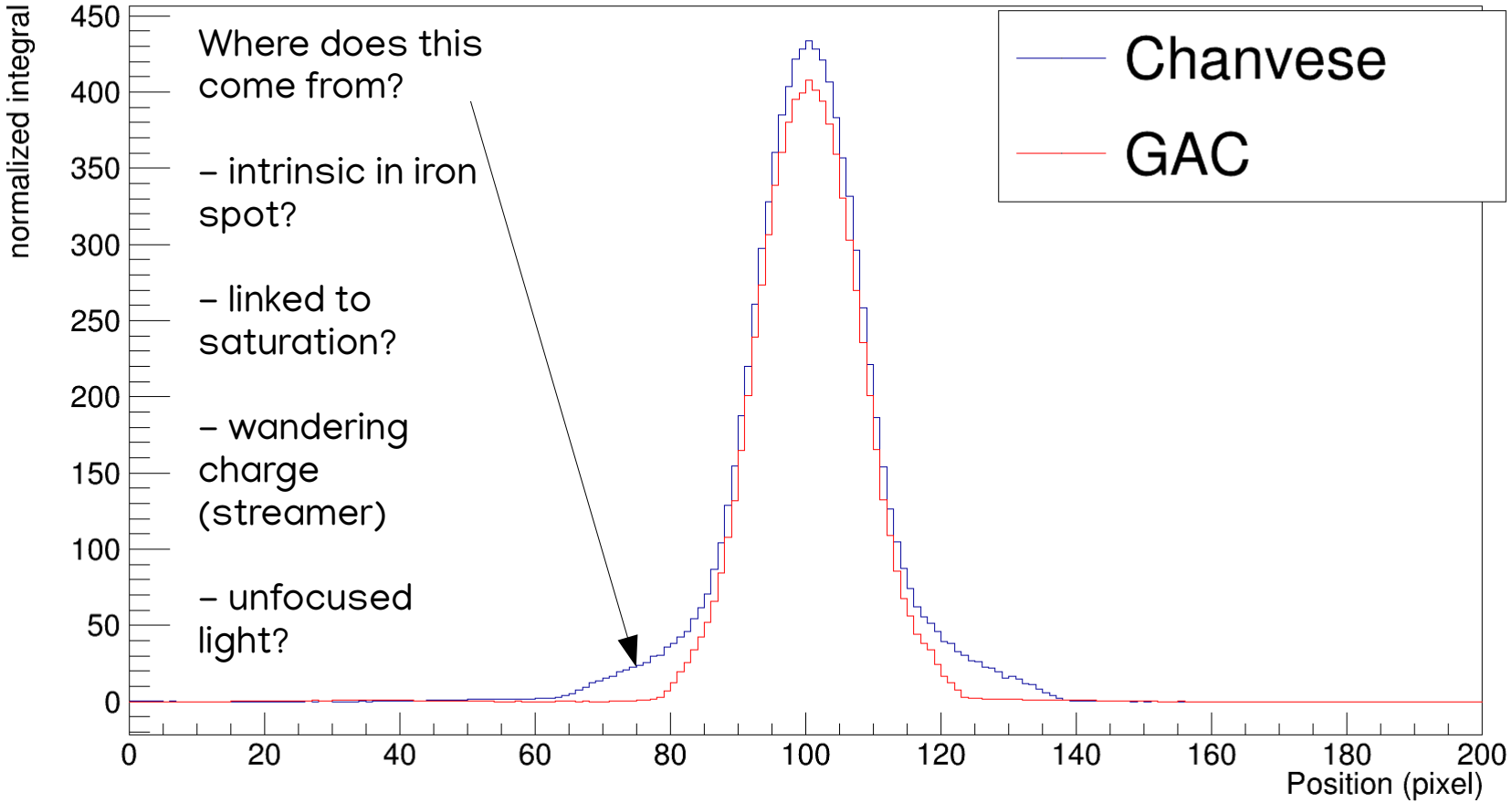
One Example of Result

- It looks like GAC is cutting a part of the signal



One Example of Result

- It looks like GAC is cutting a part of the signal



Under Study

- The missing tail in GAC and the shape could explain most of the previous plots:
  - Less overall light of GAC
  - Better energy resolution of GAC
  - The peak position in the integral over radius study
- The best way to find the center of the spot is still under further study:
  - Baricentre
  - Gaussian fit

Under Study

- The missing tail in GAC and the shape could explain most of the previous plots:
  - Less overall light of GAC
  - Better energy resolution of GAC
  - The peak position in the integral over radius study
- The best way to find the center of the spot is still under further study:
  - Baricentre
  - Gaussian fit