Sim-Analysis Meeting

LogBook

October 14, 2019

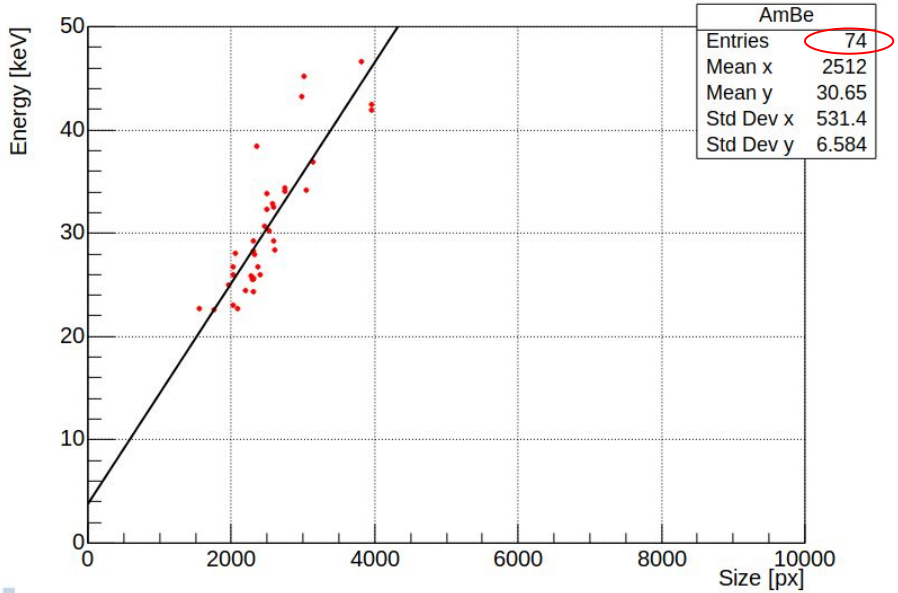
Summary of the previous presentation

- I2DBSCAN seems to work fine for Orange;
- The energy scale in Orange now is correct: 0,00059 keV/ph;
- The algorithm to calculate the length is not optimized;
- Until this has been fixed we will use Energy Vs Size plot;
- The size is calculated as the number of pixels belonging to the cluster that has 2 photons above the pedestal.

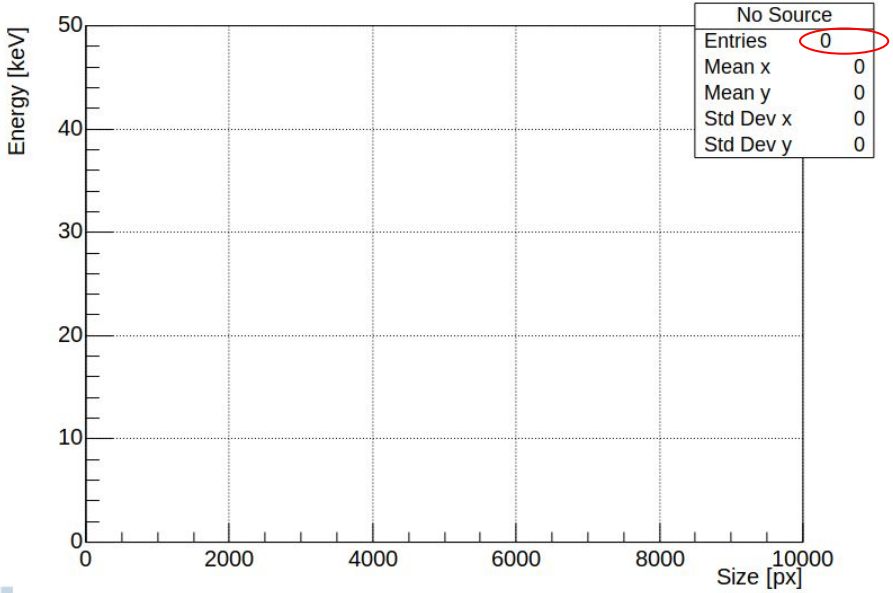
Energy vs Size plot for Orange

Energy vs Size plot for iteration 1

Source

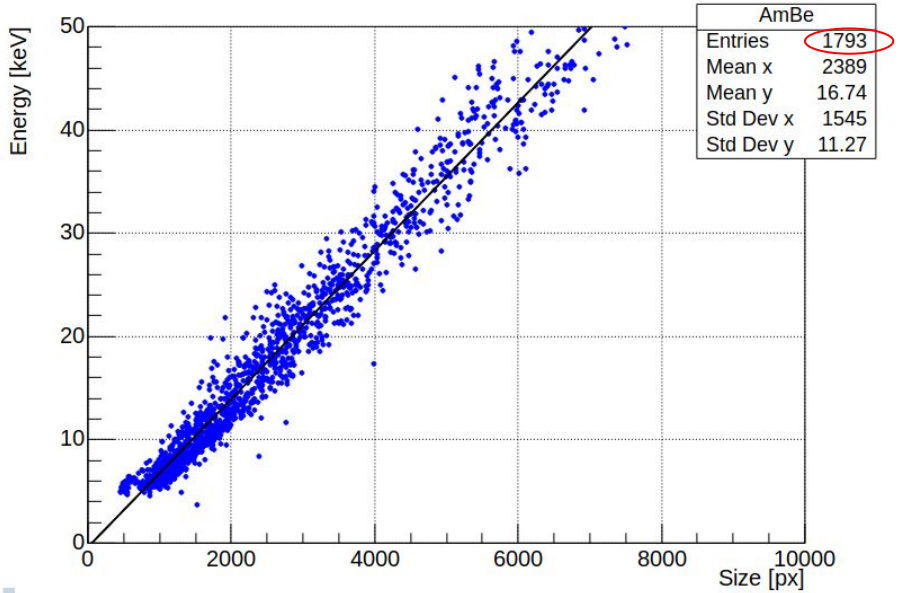


No Source

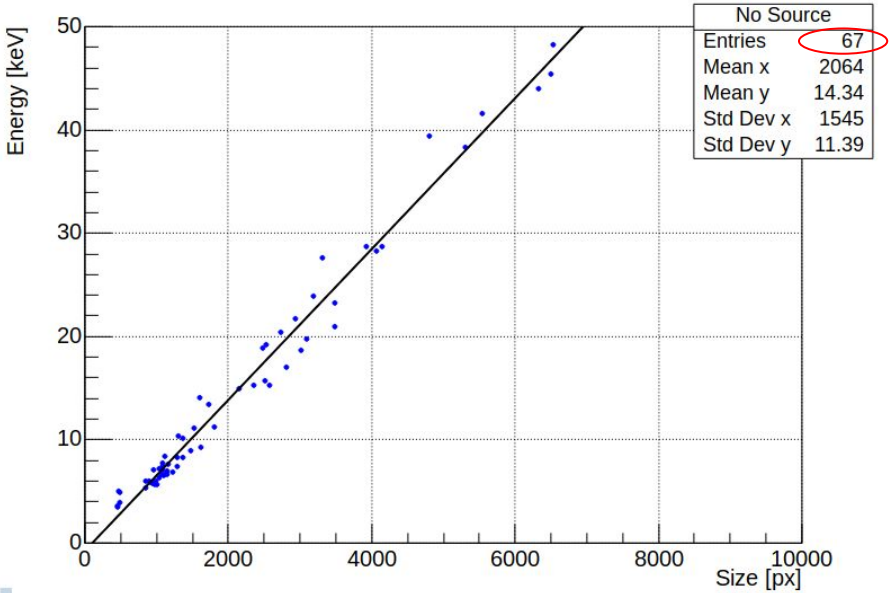


Energy vs Size plot for iteration 2

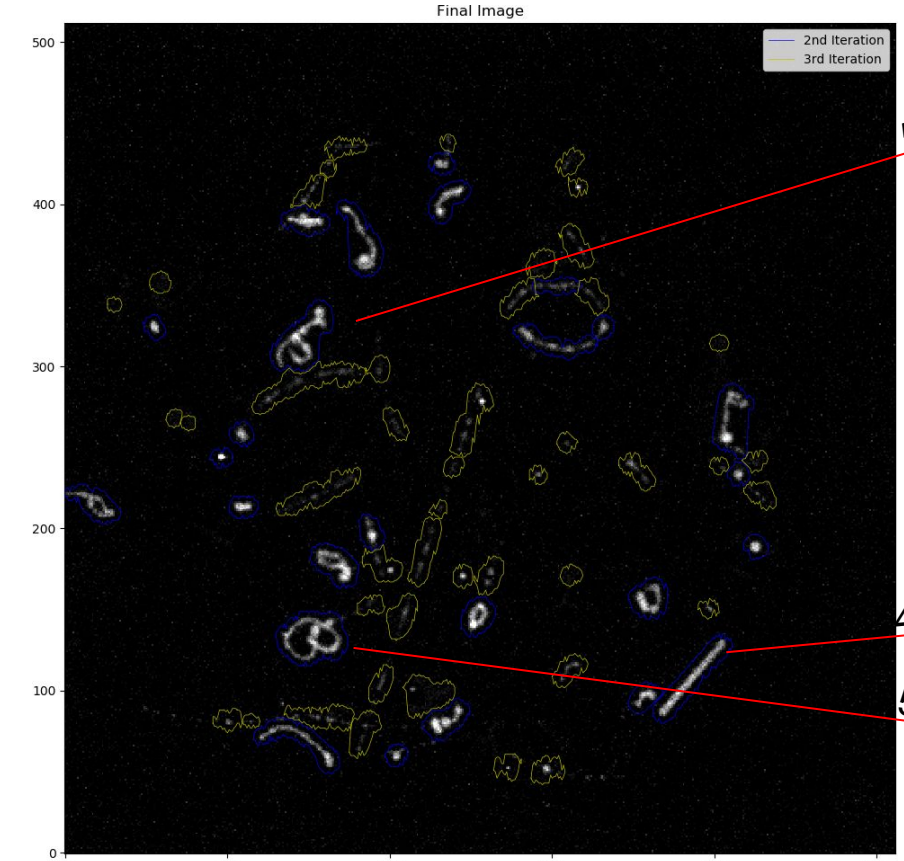
Source



No Source



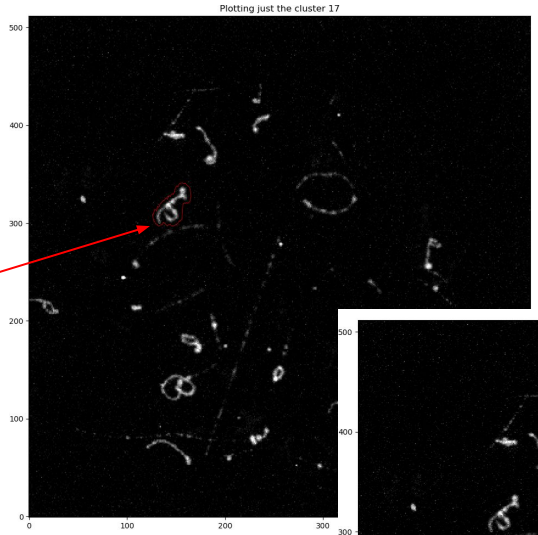
Examples of 60 keV tracks

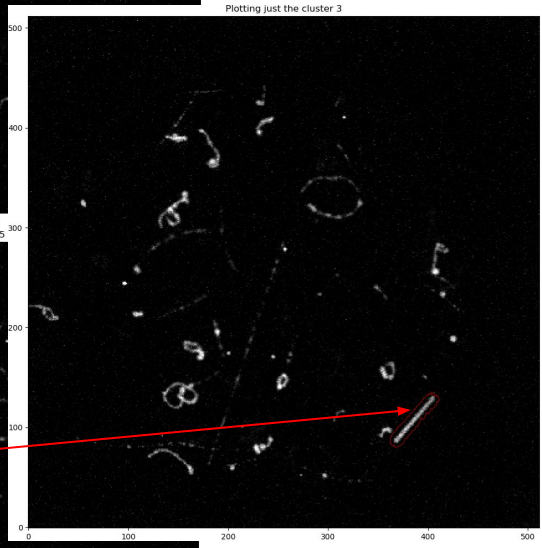


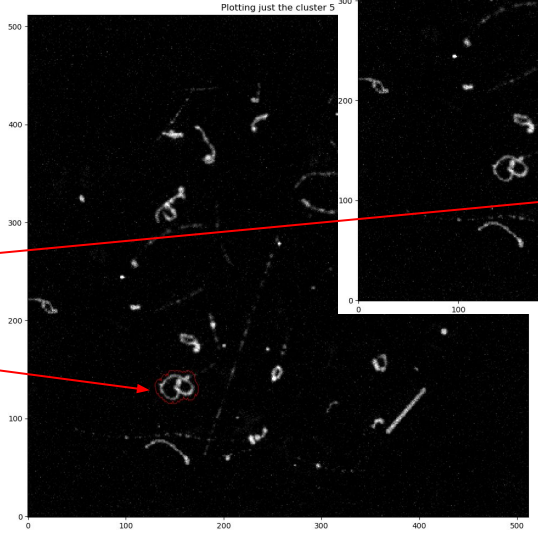
51 keV

44 keV

56 keV

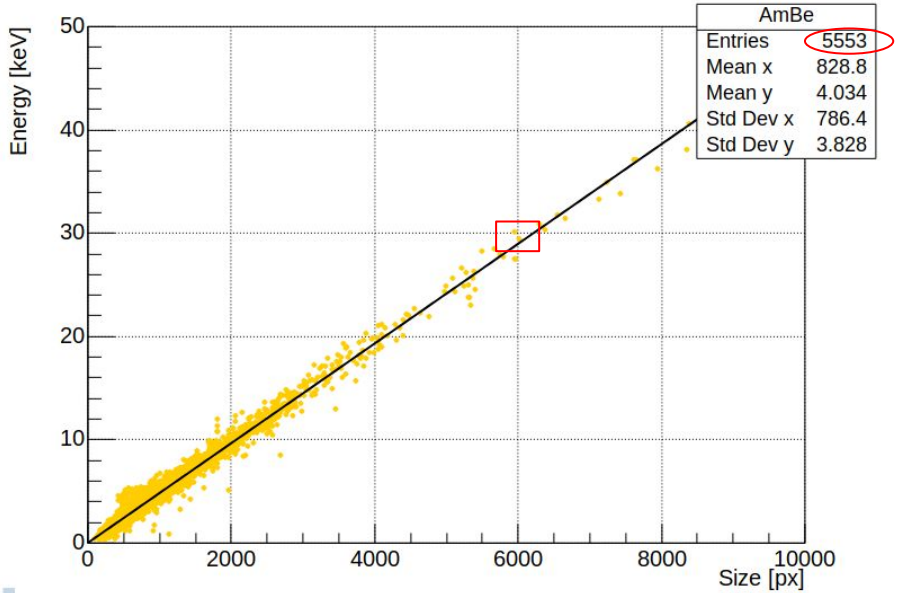




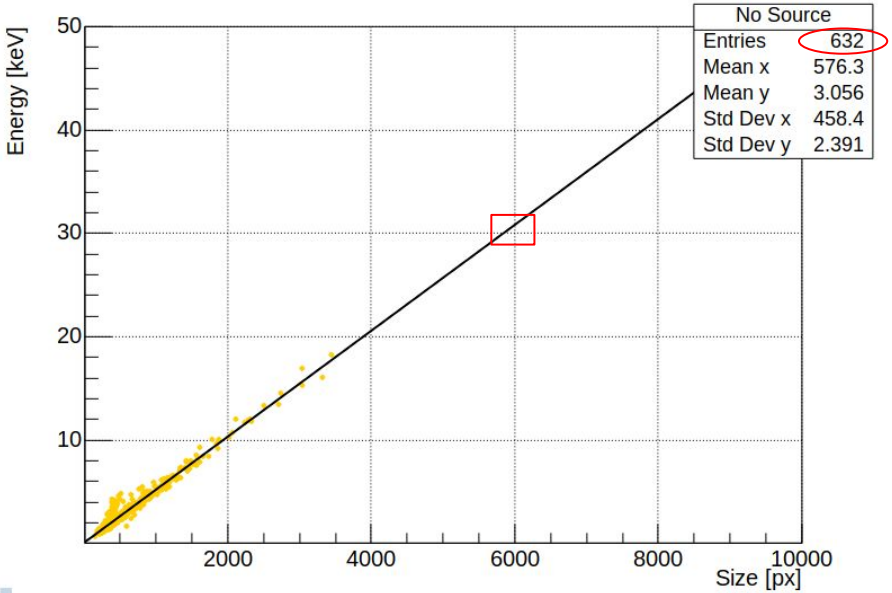


Energy vs Size plot for iteration 3

Source

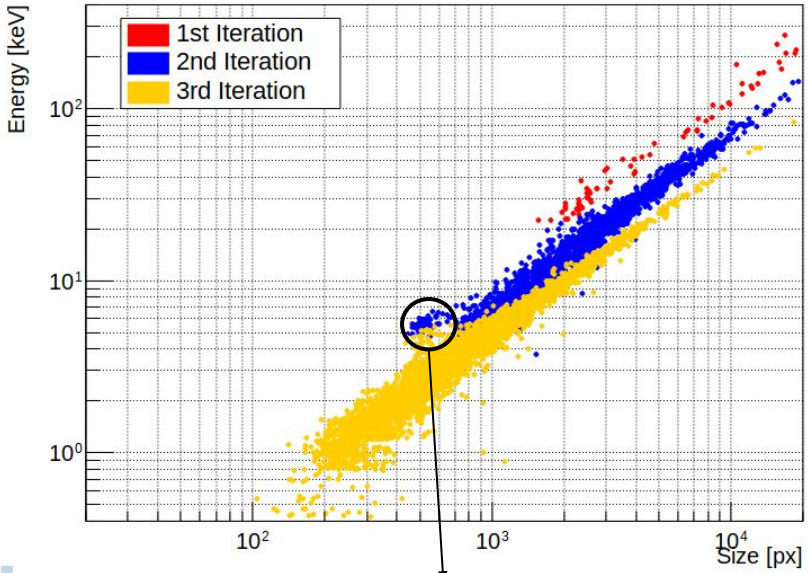


No Source



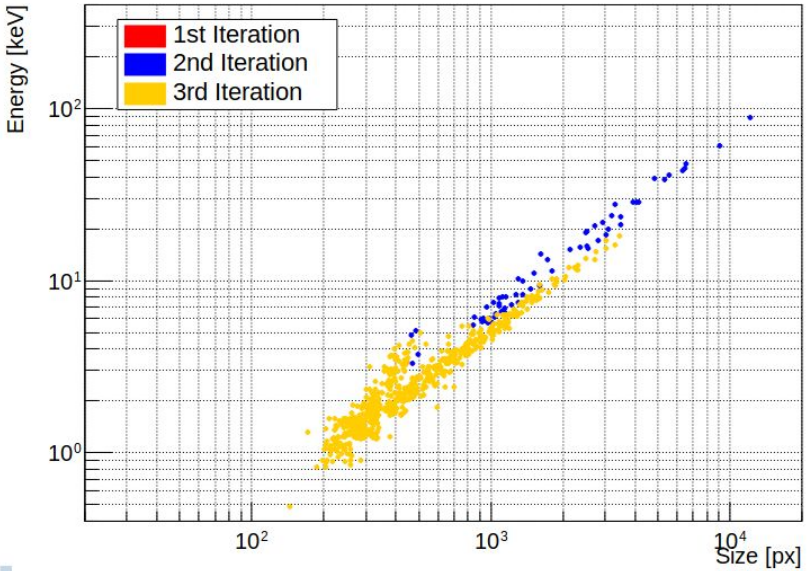
Energy vs Size plot for all iterations - Log-Log

Source



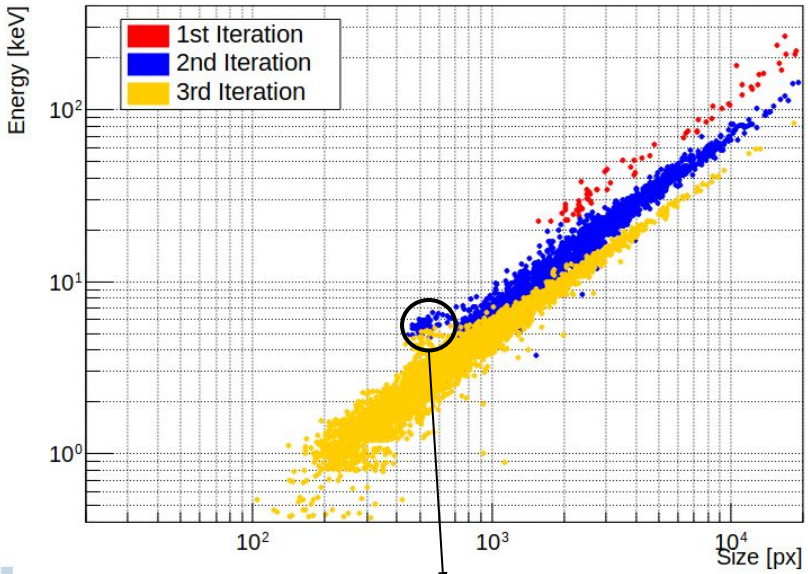
Around 6 keV and 500 px

No Source



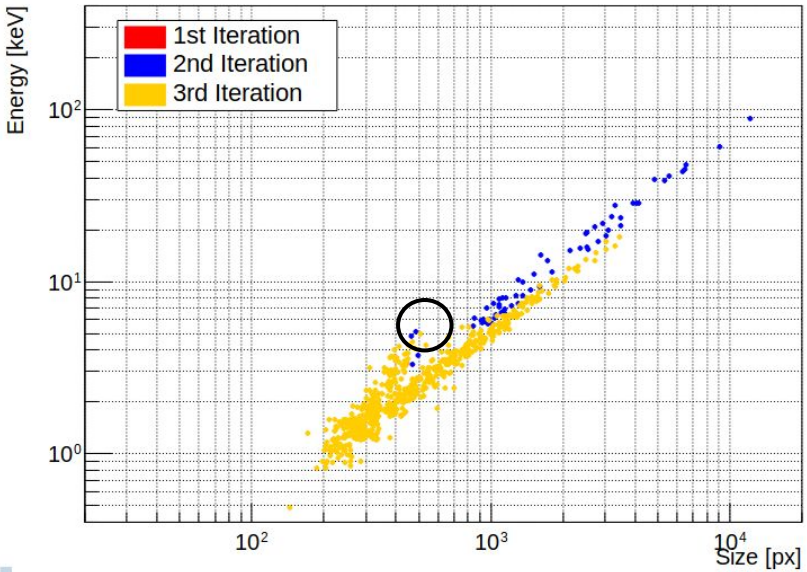
Energy vs Size plot for all iterations - Log-Log

Source

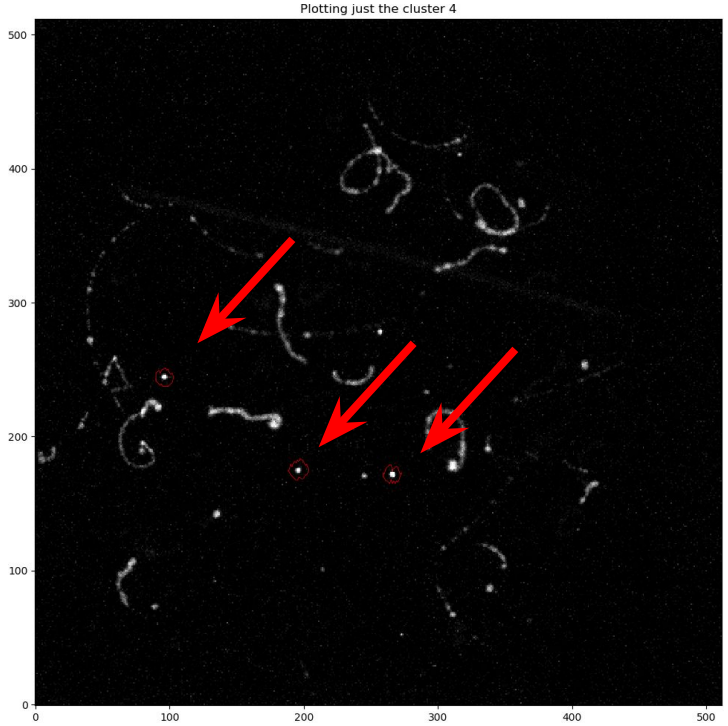


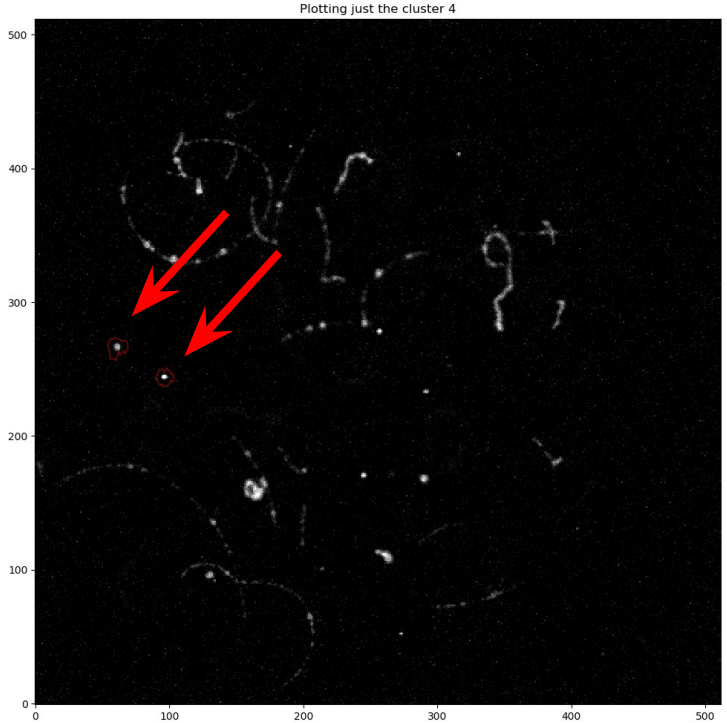
Around 6 keV and 500 px

No Source



Population around 6 keV and 500 px





It seems to be Fe55 tracks

LEMOn Analysis

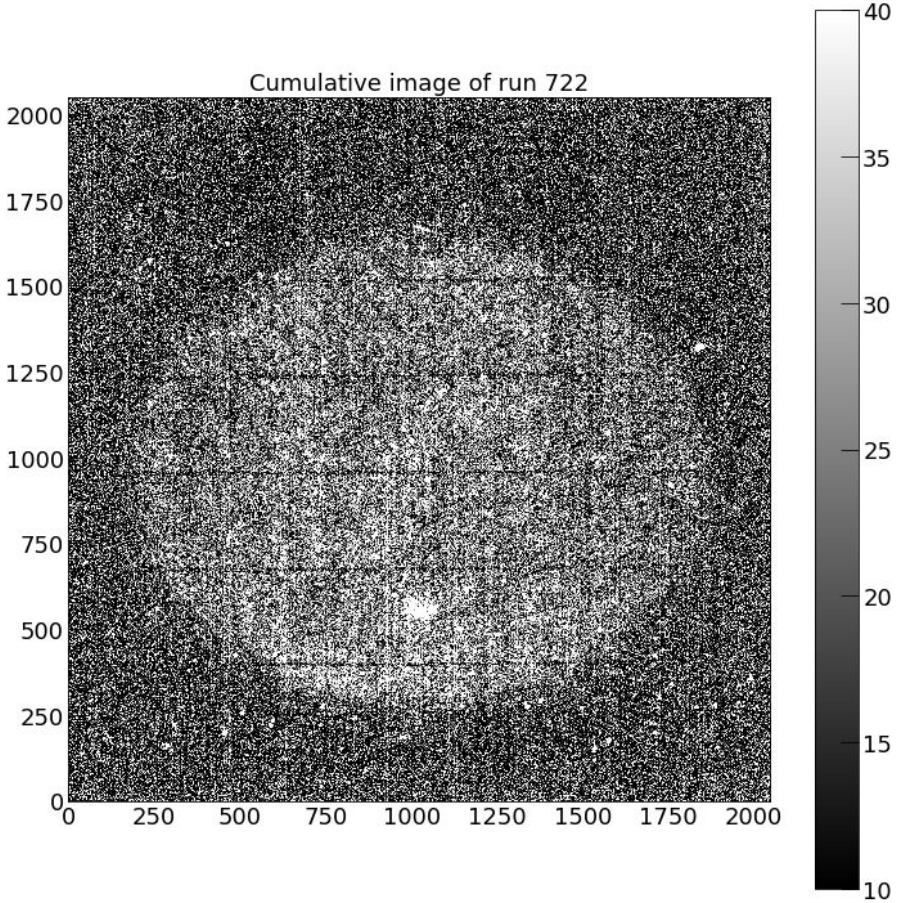
Summary

- Analyse the runs with and without CO60;
  - GEM **440V** and Exposure time **0.5s**;
  - Cumulative image;
  - Energy vs Size plot for each run
  - And the comparative between them.
- Analyse the AmBe + Fe55 run;
  - GEM **440V** and Exposure time **0.1s**;
  - Energy vs Size plot;
  - Examples of tracks for each iteration
- And finally the comparison between **No Source**, **Co60** and **AmBe+Fe55**.

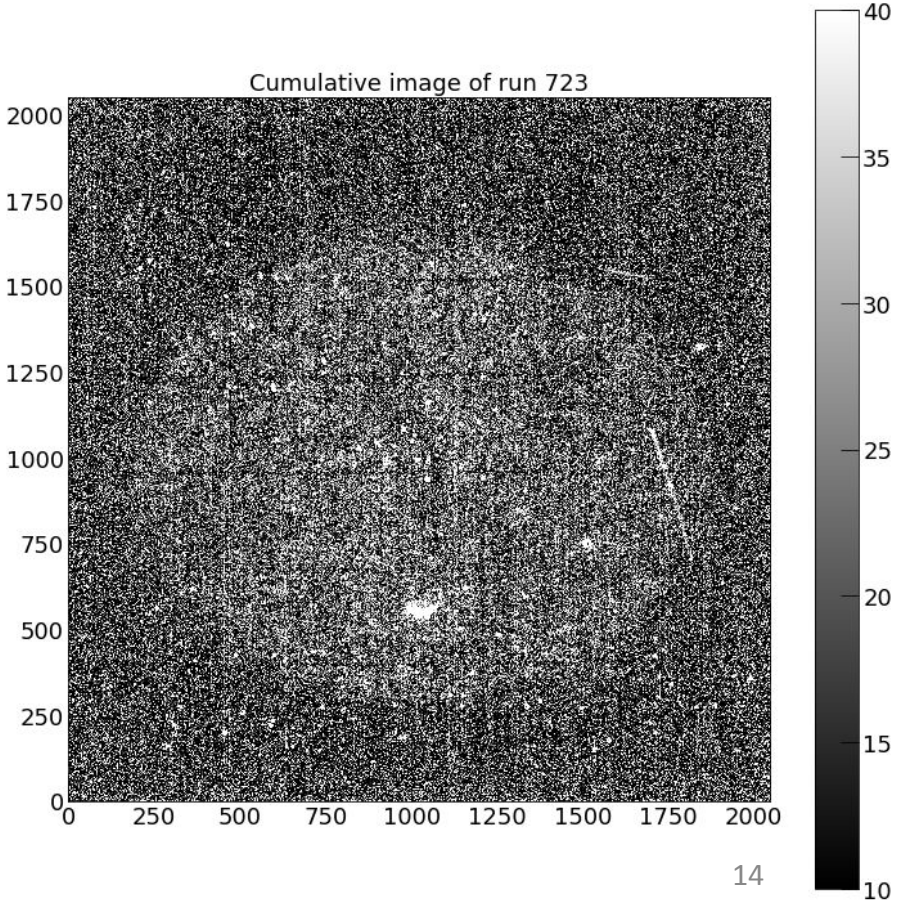
No Source and CO60

Cumulative made by summing the values (pedestal subtracted) of the light in each picture for each pixel.

Run722 - with CO60



Run723 - without CO60

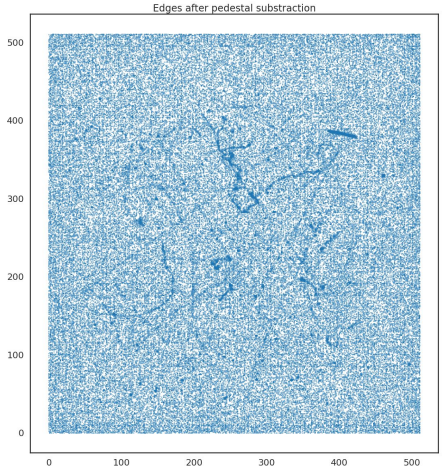


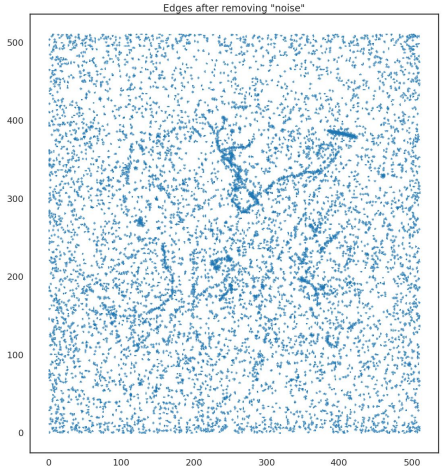
I2DBSCAN over Run 723 - No Source

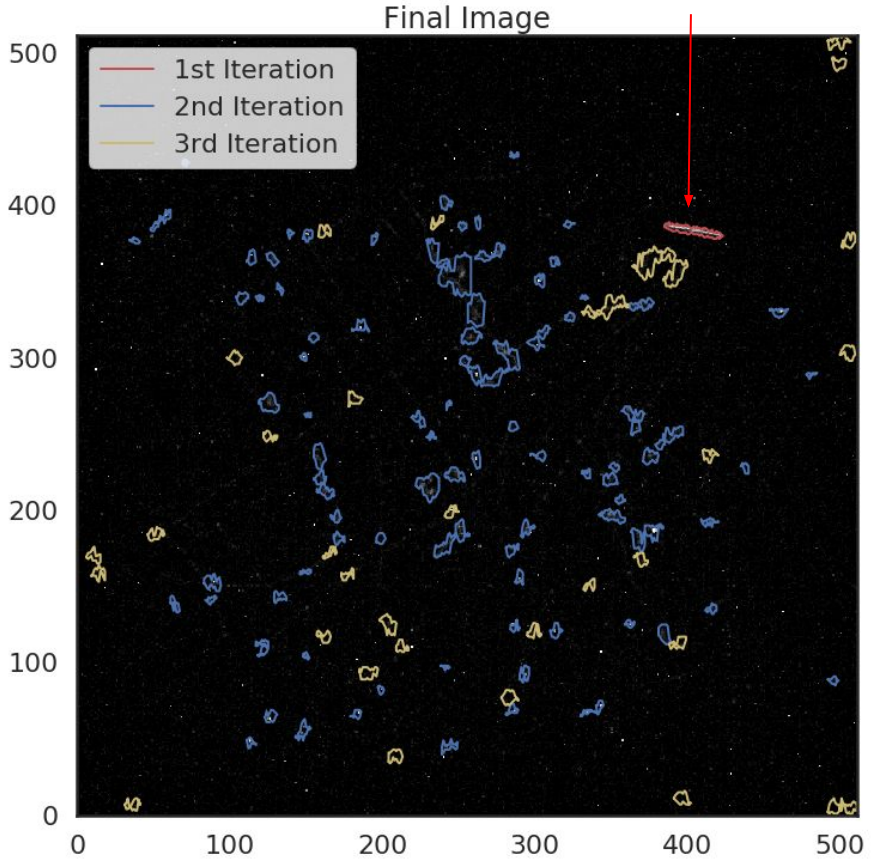
A track looking like a proton on a **no source** run.

The parameters 0th parameter was changed and the others were rescaled.

```
if tip == '3D':
    vector_eps          =  [ 1,   2,  3.2,  5]
    vector_min_samples  =  [5, 100, 40, 50]
```



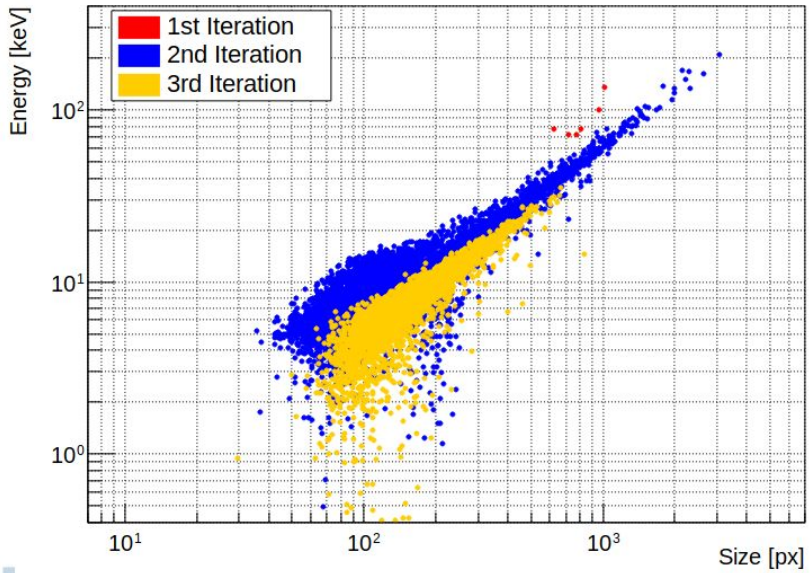




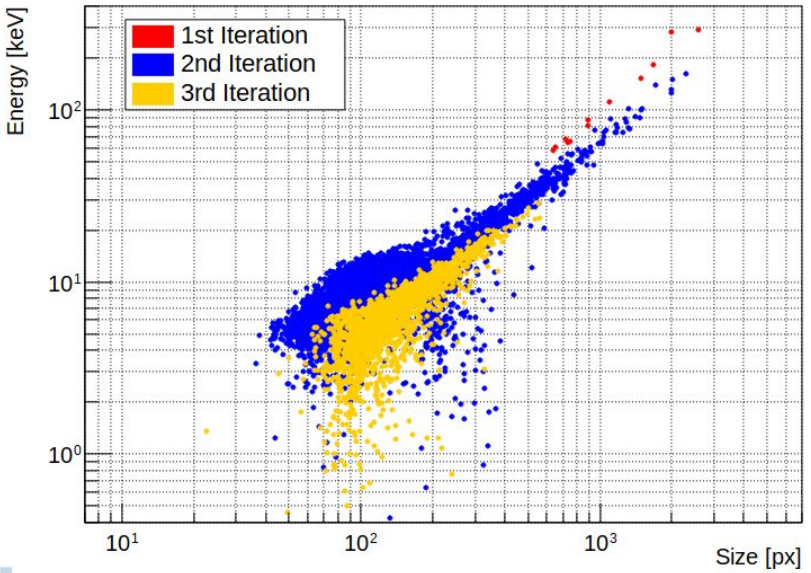
Energy vs Size plot

Energy vs Size plot for all iterations

Source

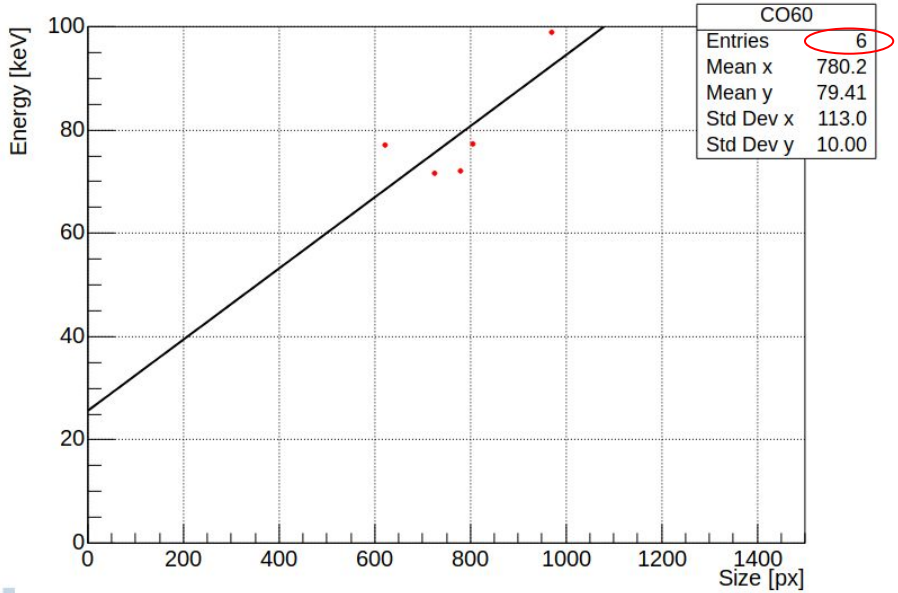


No Source

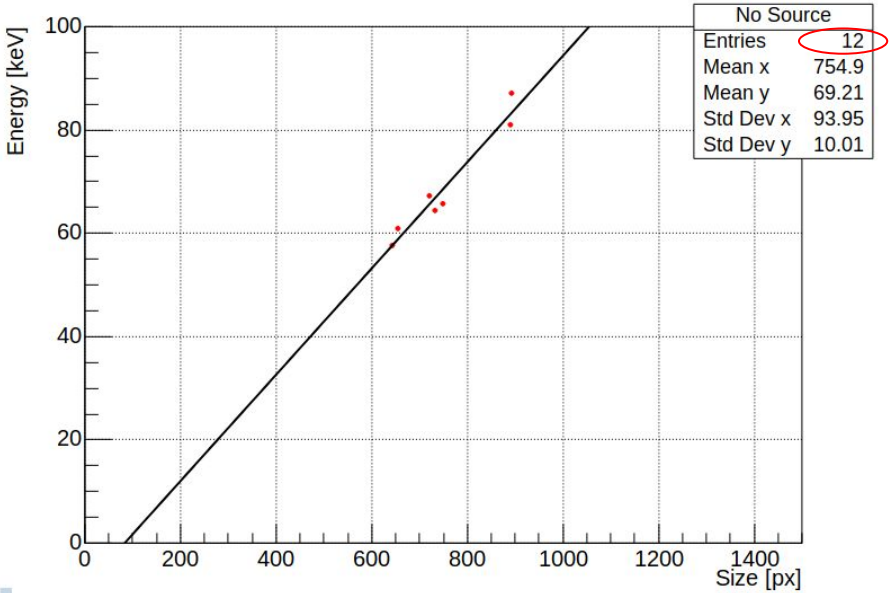


Energy vs Size plot for iteration 1

Source

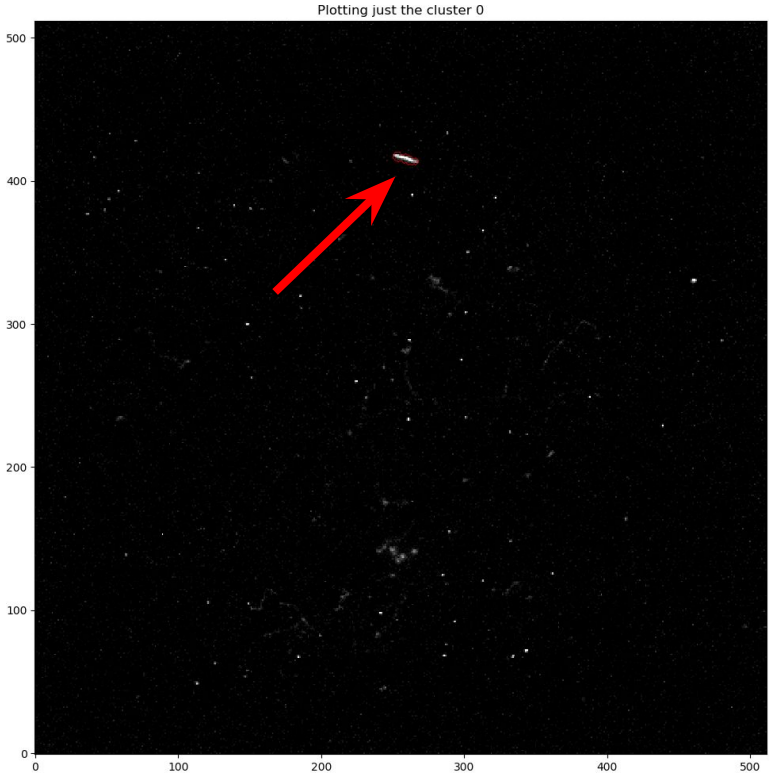


No Source

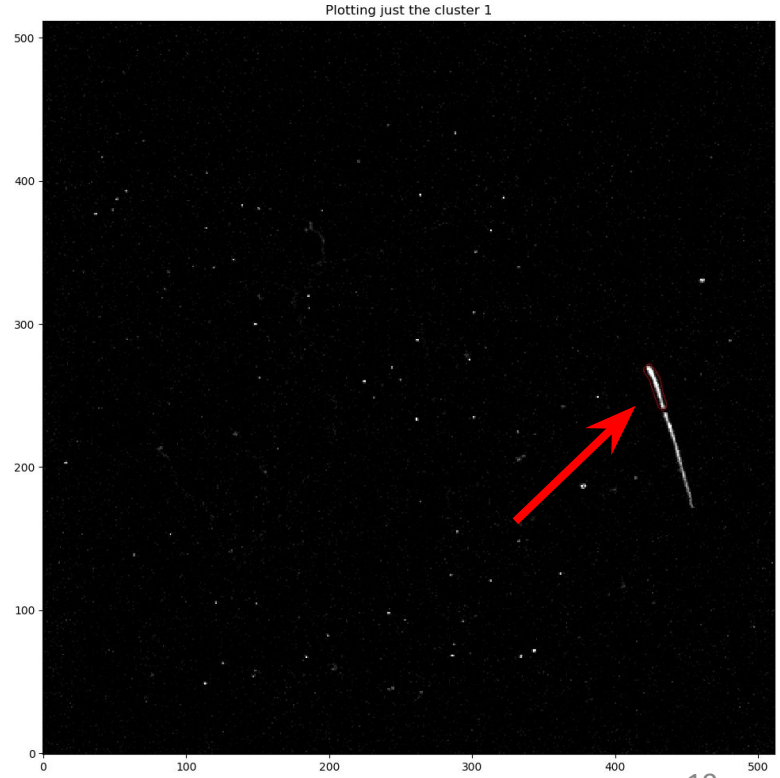


Examples of tracks from iteration 1

Source

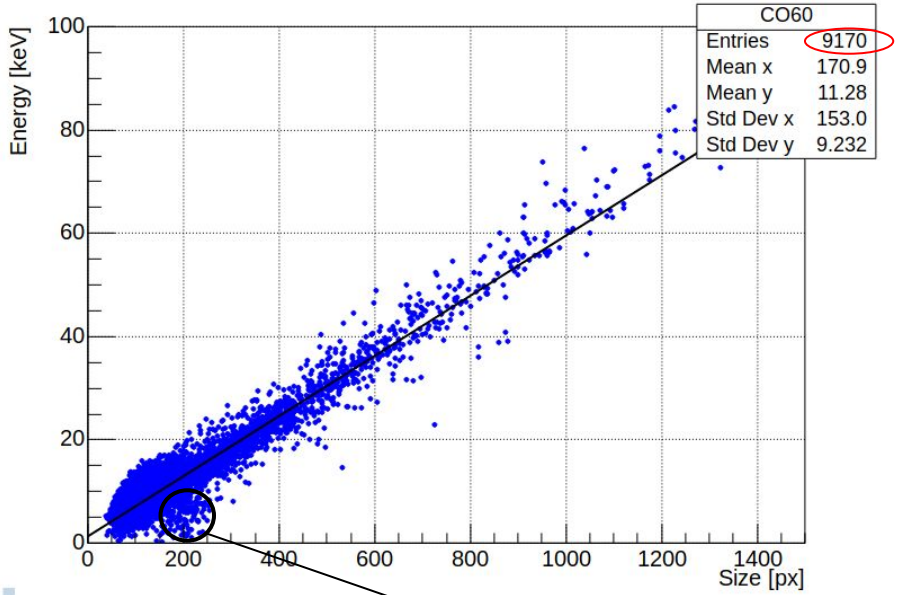


No Source

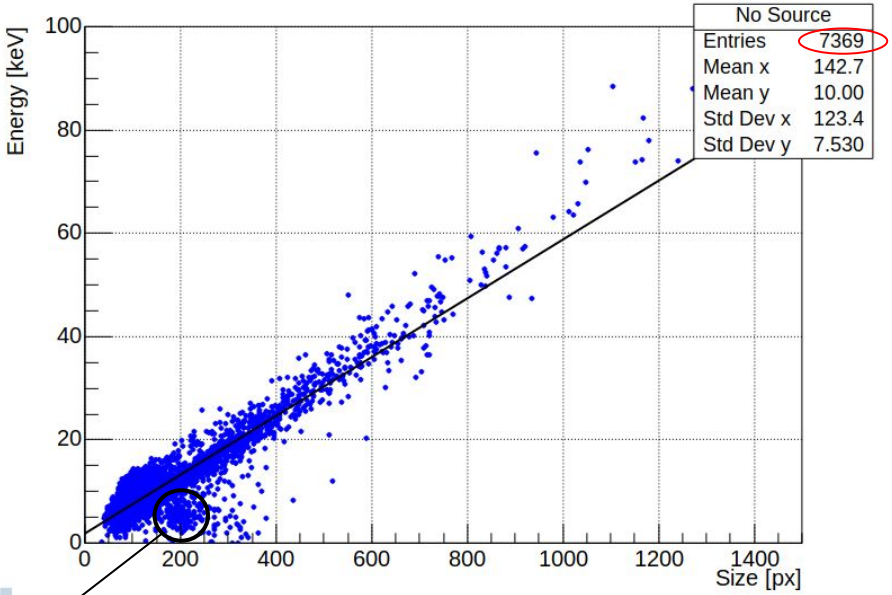


Energy vs Size plot for iteration 2

Source



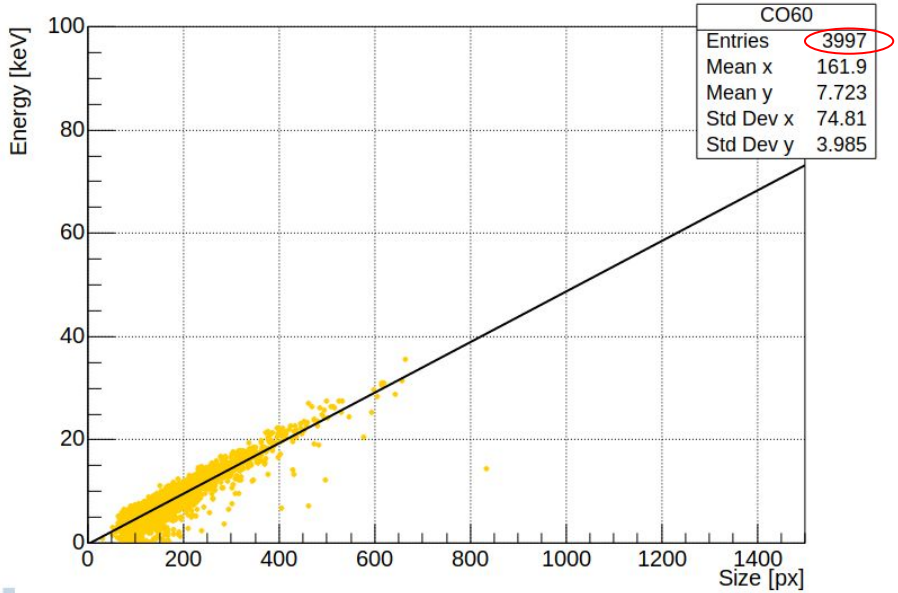
No Source



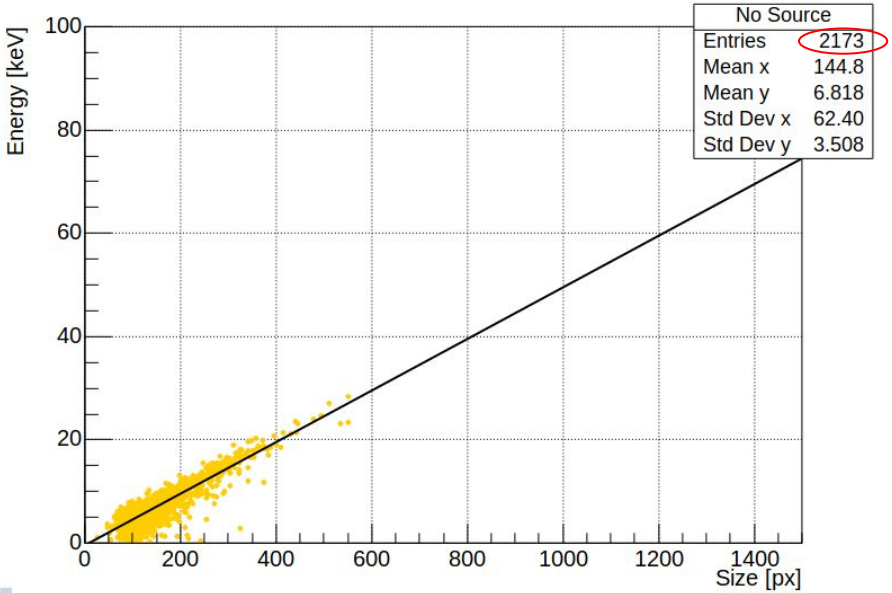
Less than 10 keV and around 200 px

Energy vs Size plot for iteration 3

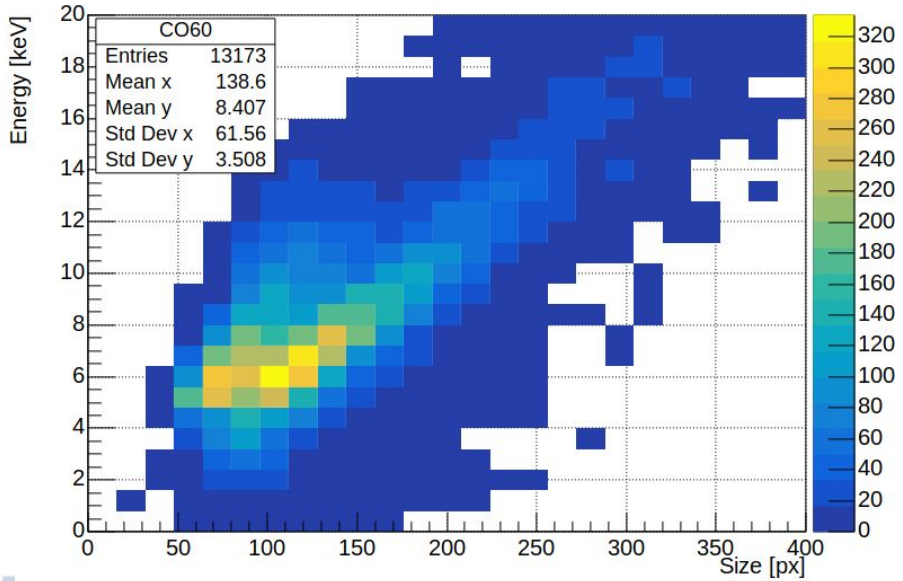
Source

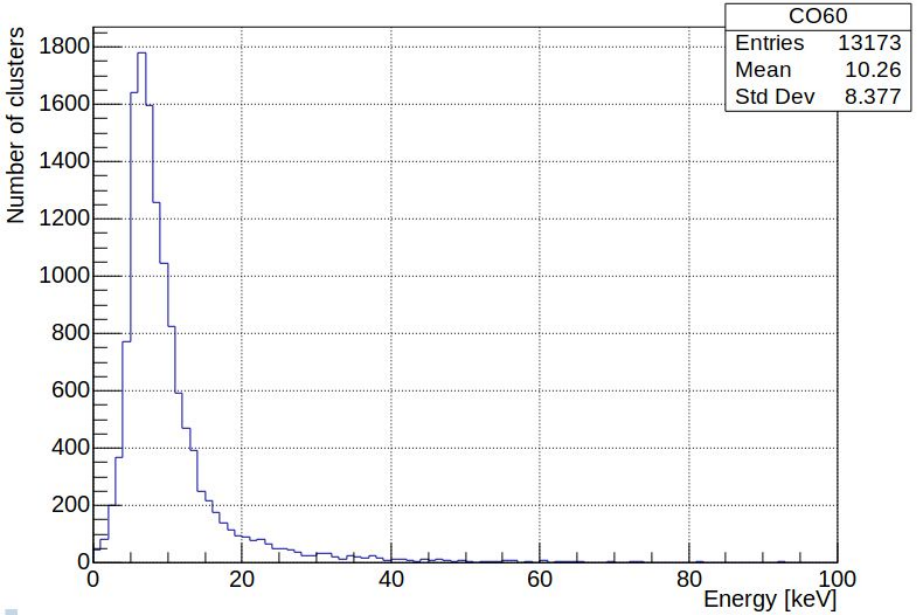


No Source

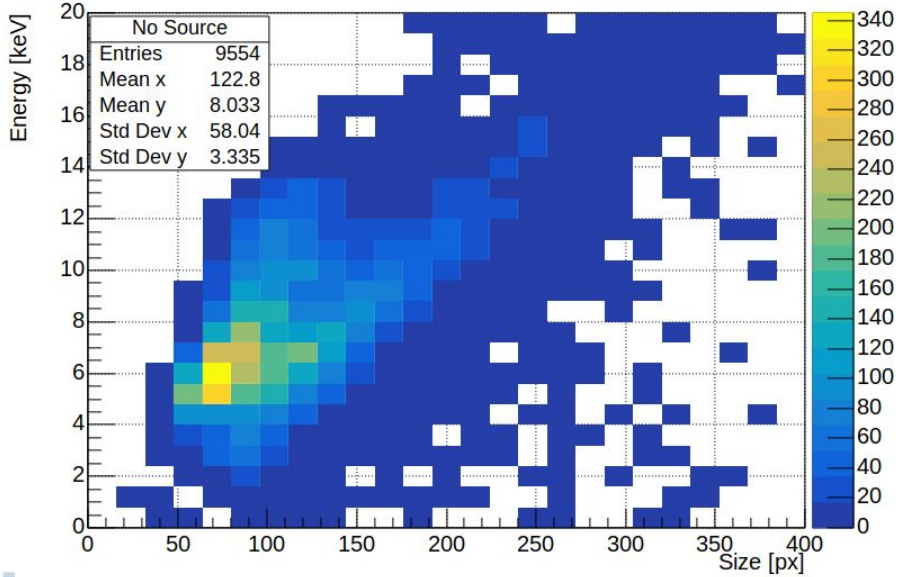


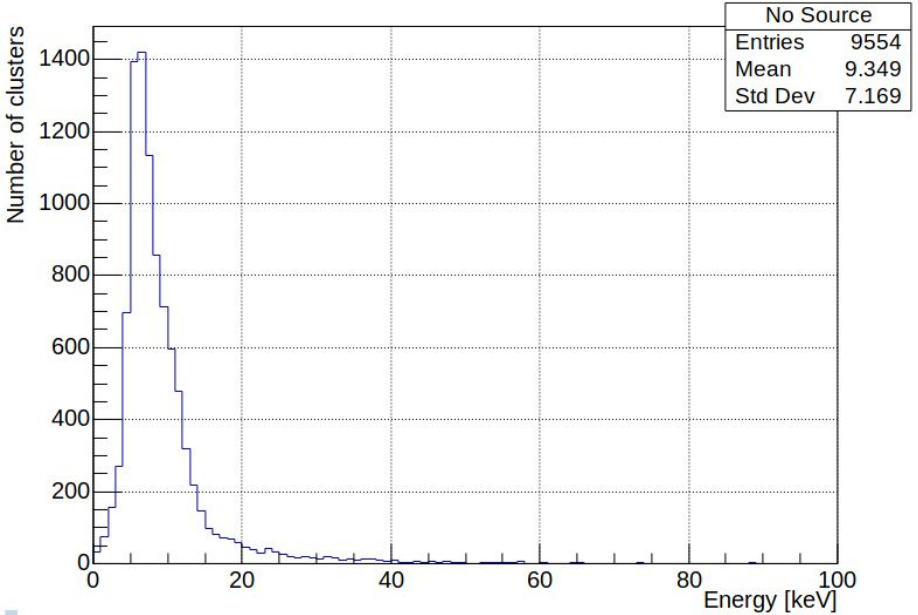
Energy spectra for all iterations - CO60





Energy spectra for all iterations - No Source





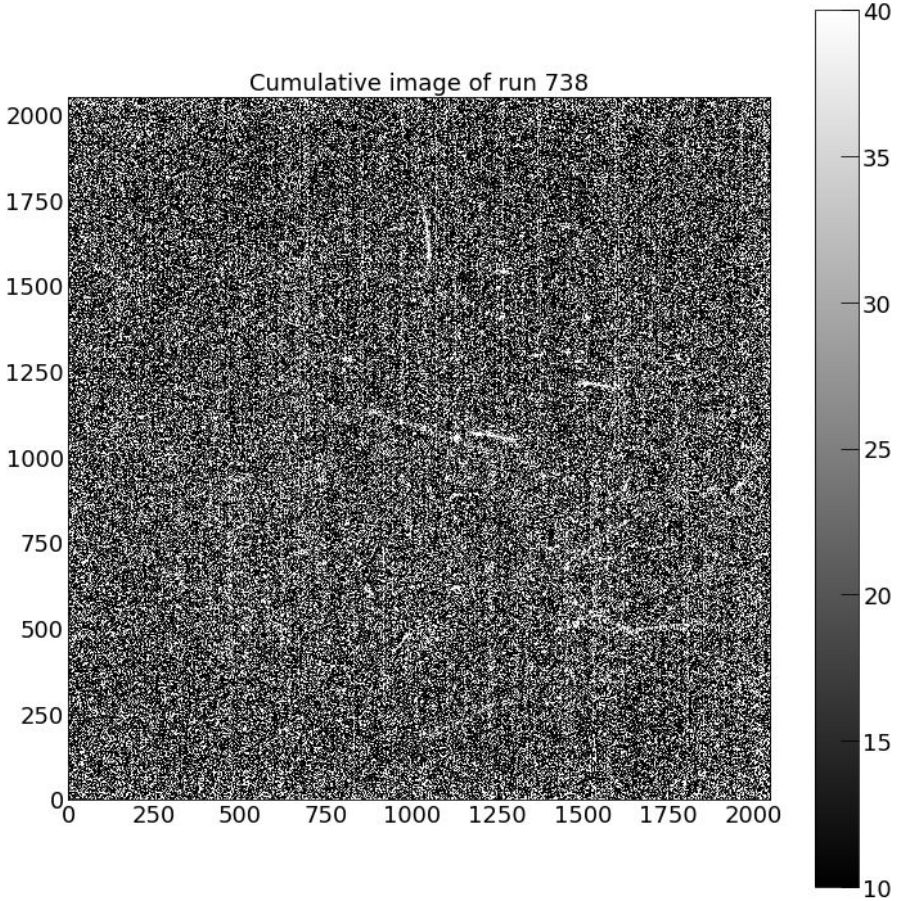
AmBe + Fe55

Source

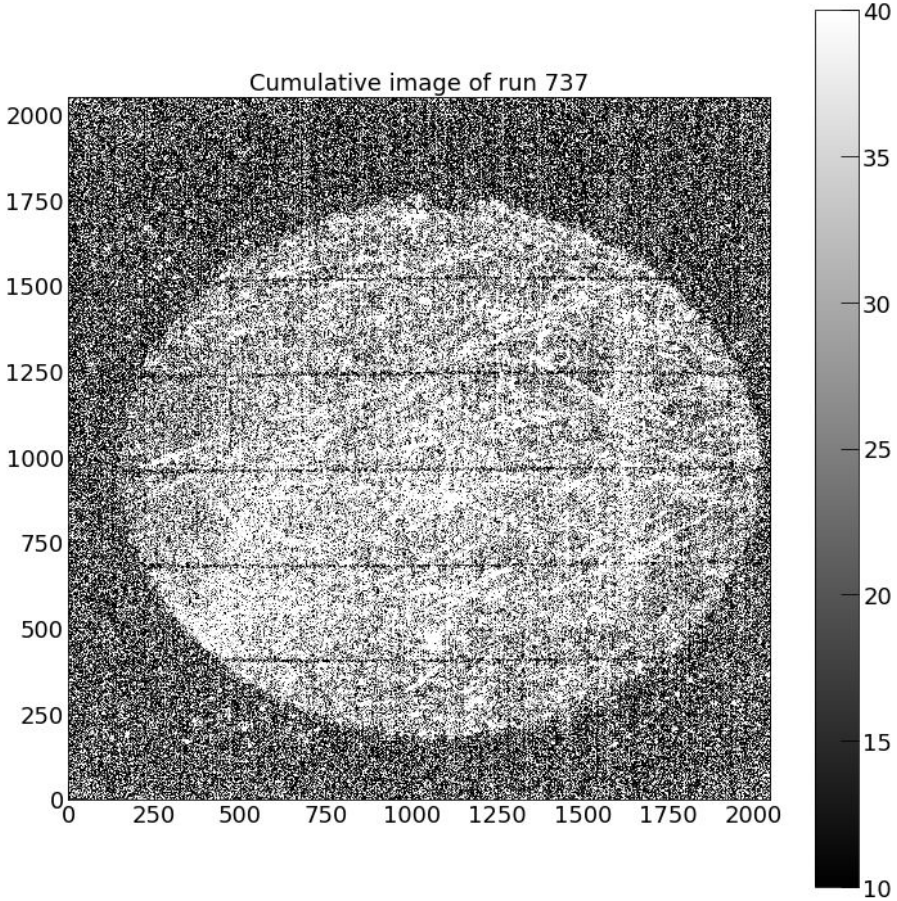
AmBe+Fe55

Cumulative made by summing the values (pedestal subtracted) of the light in each picture for each pixel.

Run738 - with 0.1s



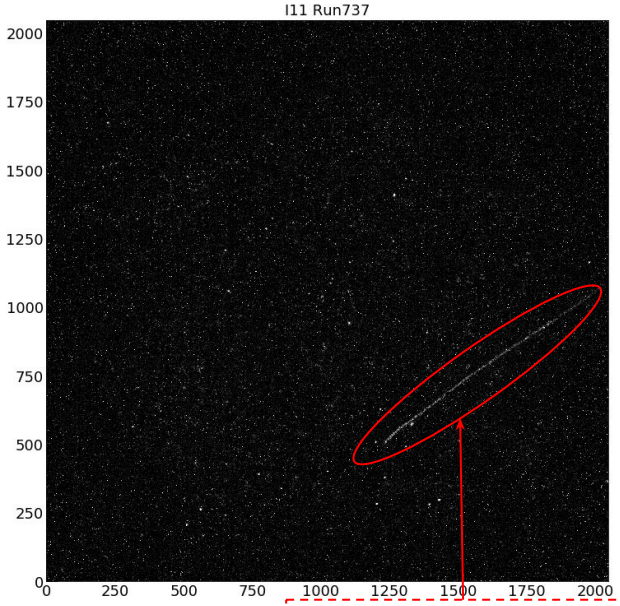
Run737 - with 1s



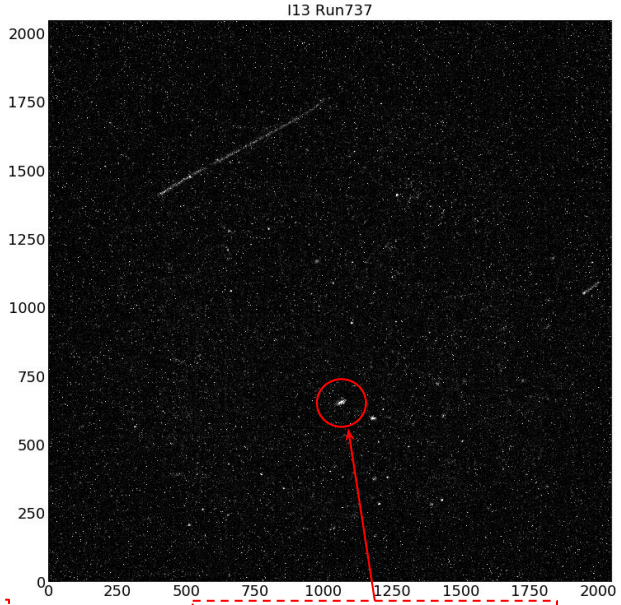
Example of Ambe and Fe55 (1s) using LEMOn

Using **AmBe** and **LEMOn** we can also expected protons coming from the box due to the interaction with the plastic box.

And, as we can see, the pixel resolution here is lower than in **ORANGE**.

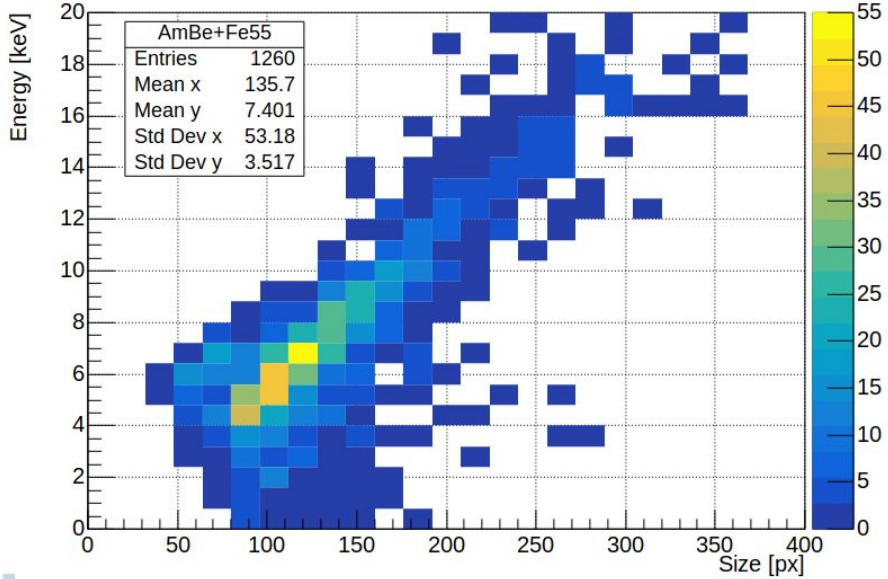


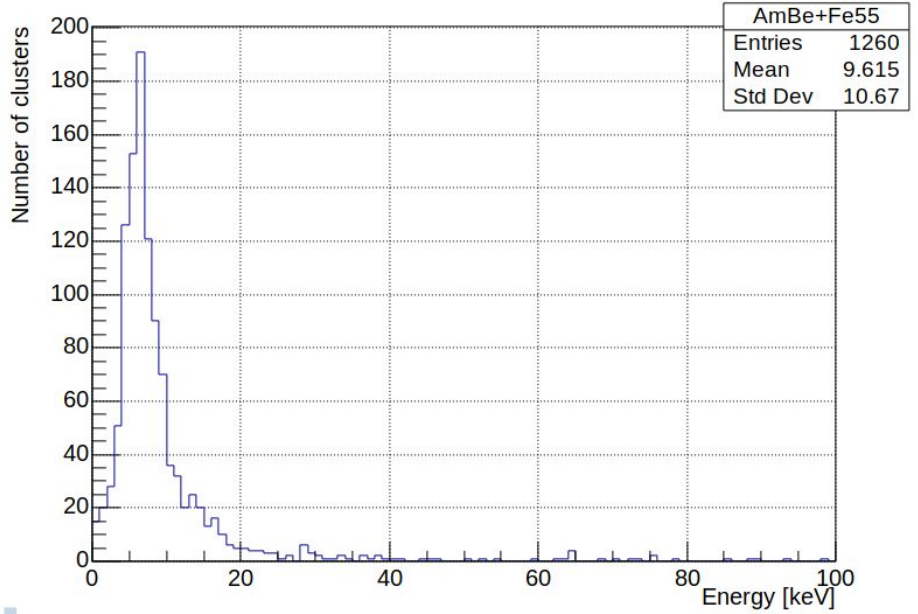
Protons, slim, less bright and starting from the box.



Alphas, thick, more bright and starting from the gas.

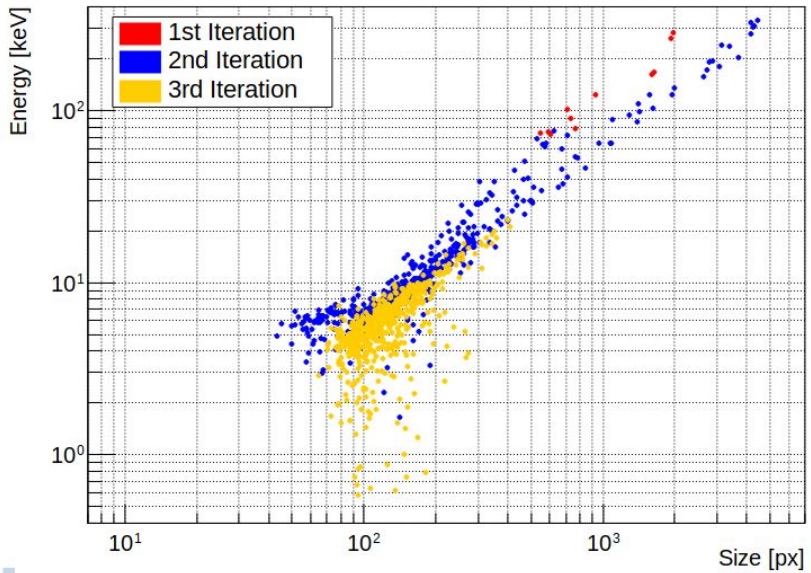
Energy spectra for all iterations - AmBe+Fe55



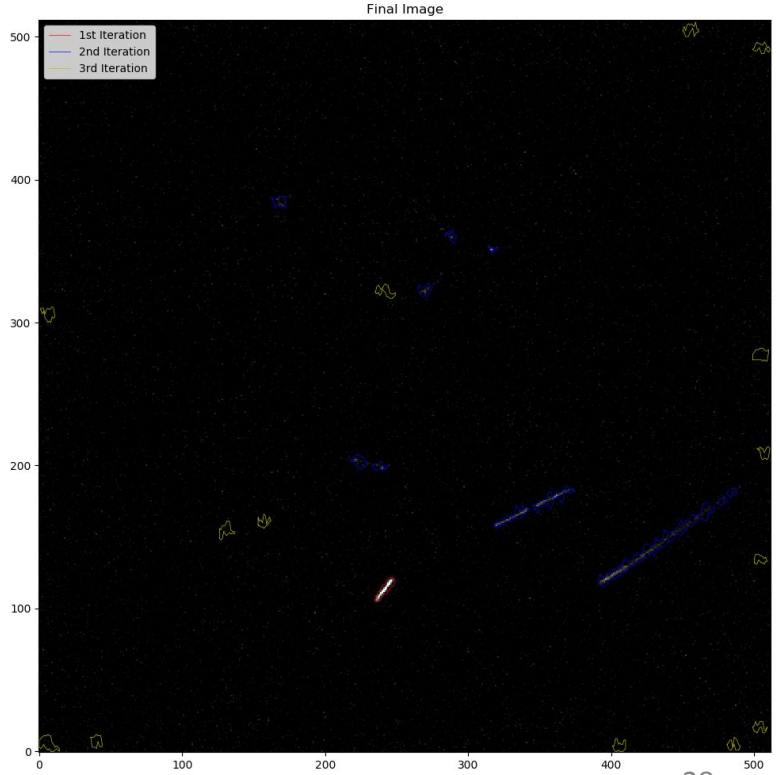


Energy vs Size plot for all iterations

Source

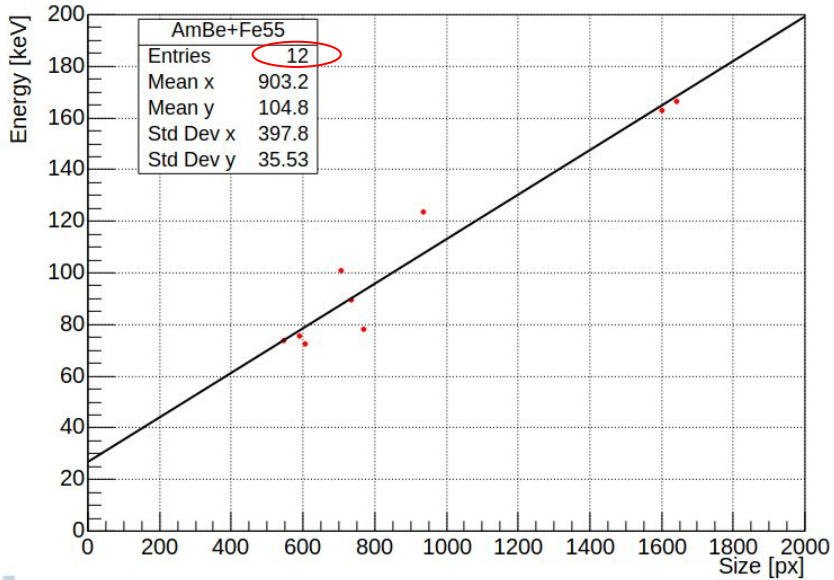


Example of the algorithm working on AmBe

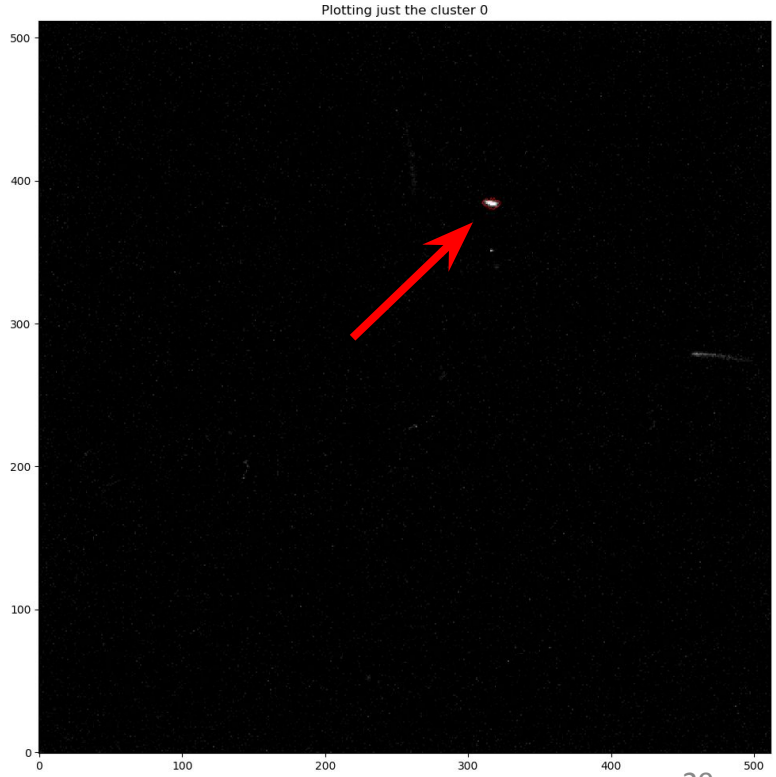


Energy vs Size plot for iteration 1

Source

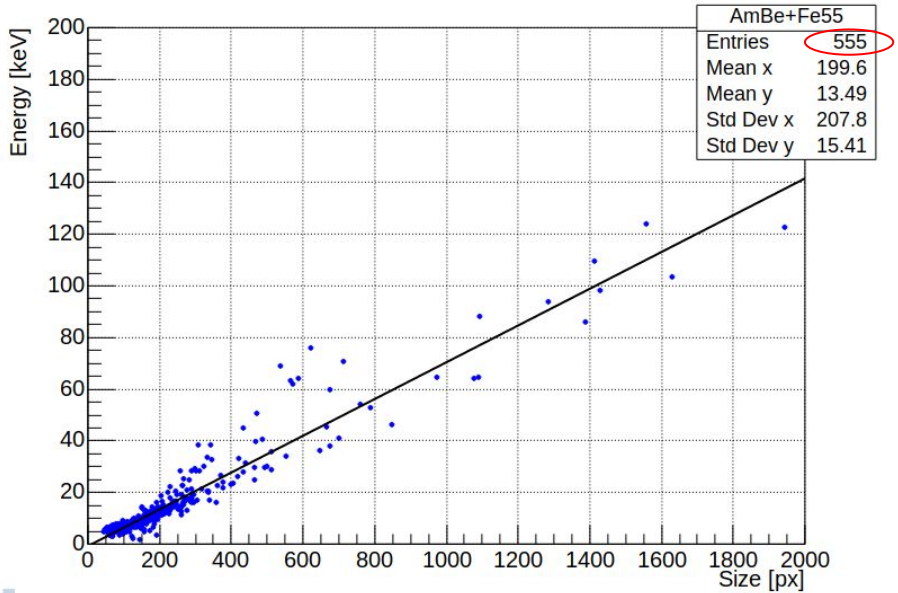


Example of the algorithm working on AmBe

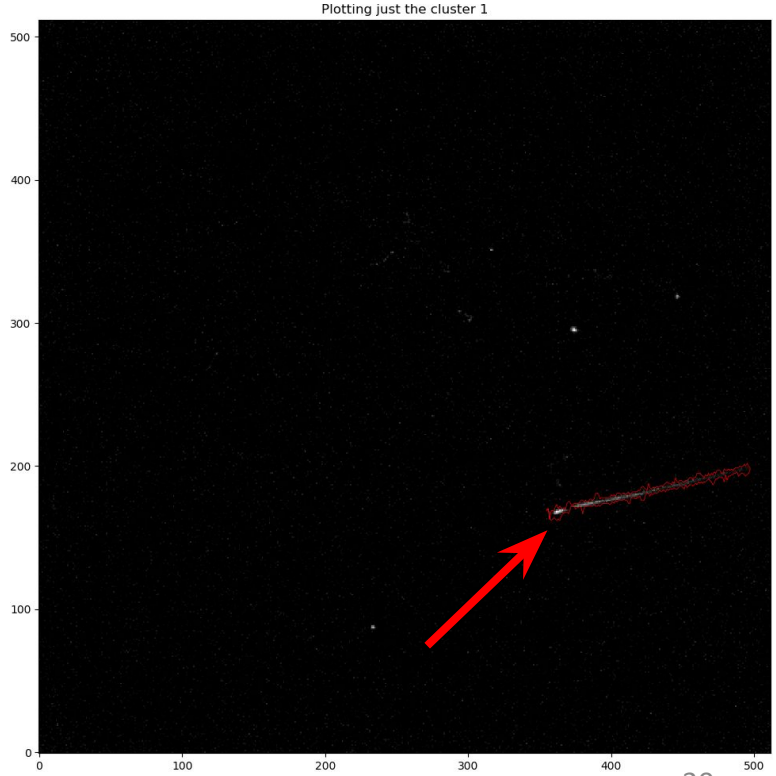


Energy vs Size plot for iteration 2

Source

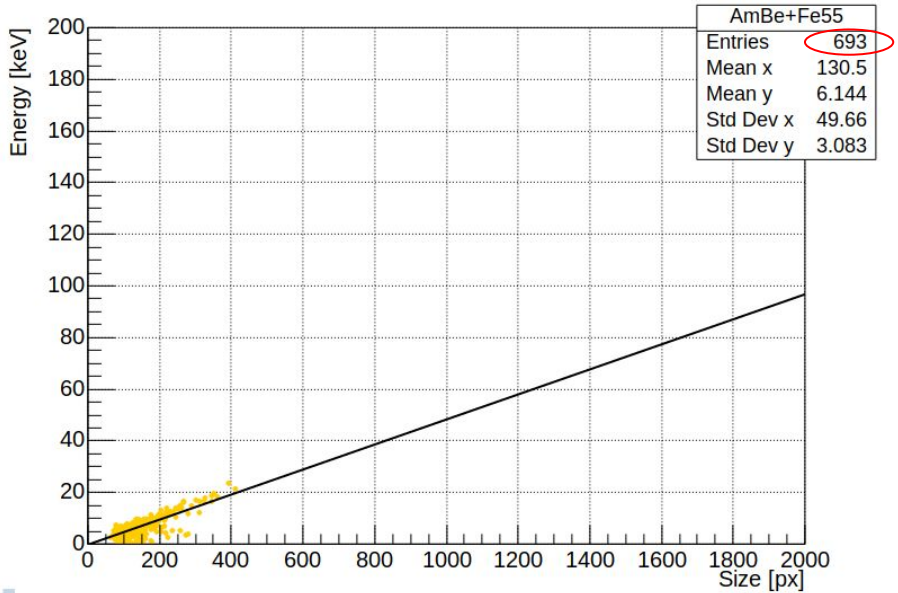


Example of the track with ~330 keV found by iteration 2

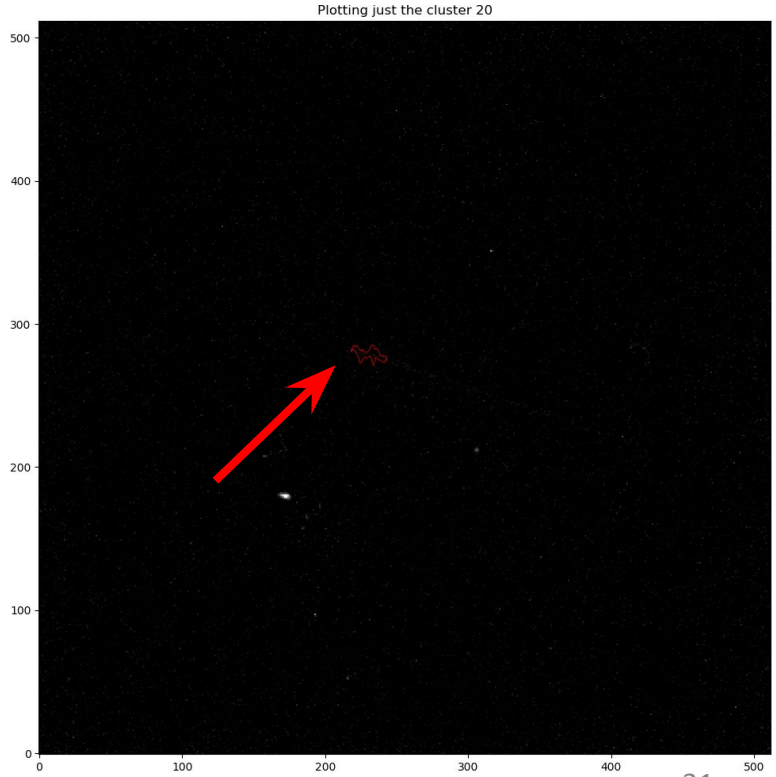


Energy vs Size plot for iteration 3

Source

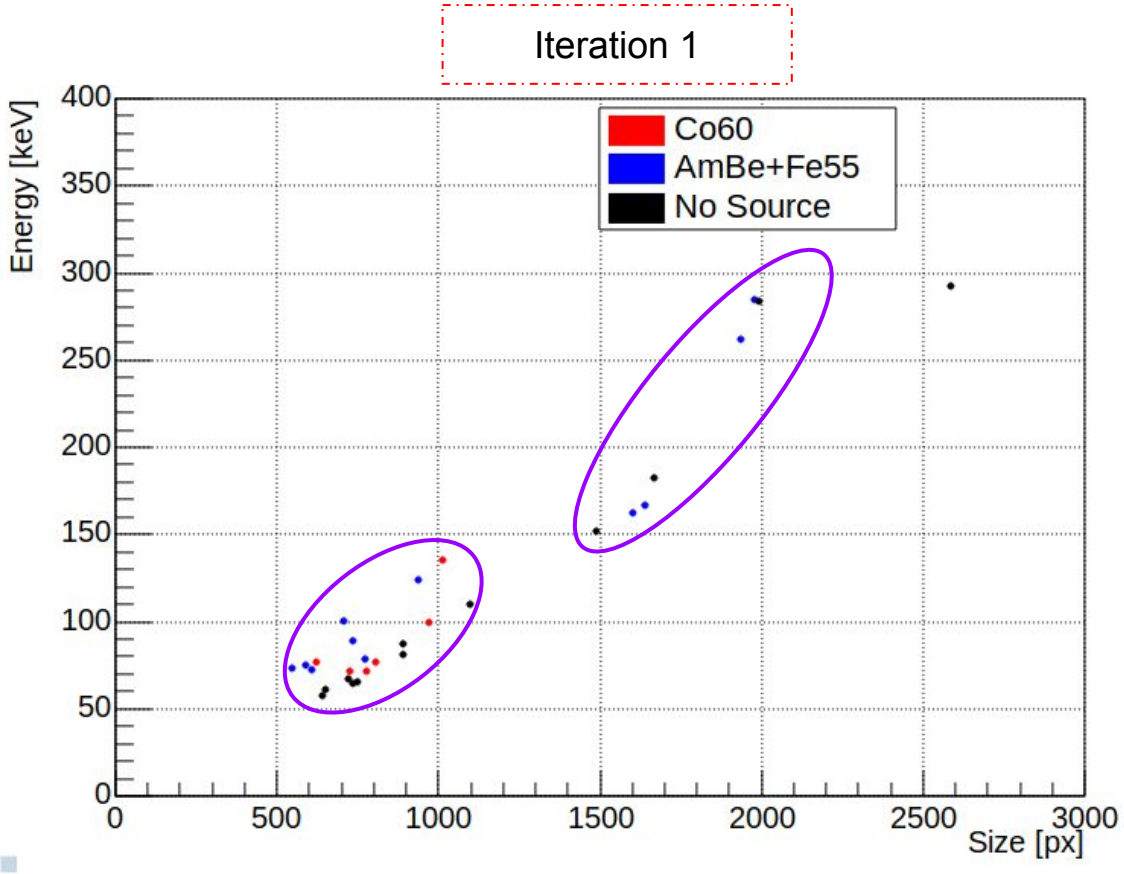


Example of the algorithm working on AmBe

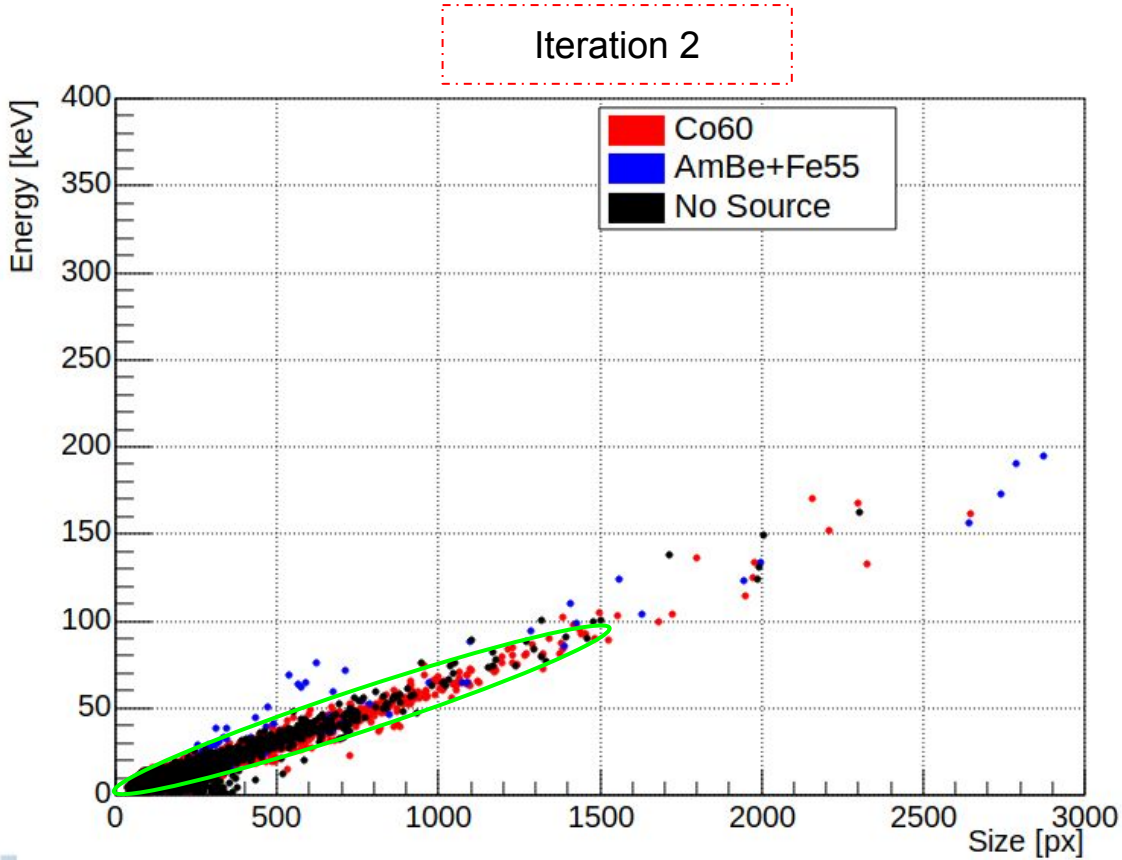


Comparison between No Source, CO60 and AmBe+Fe55

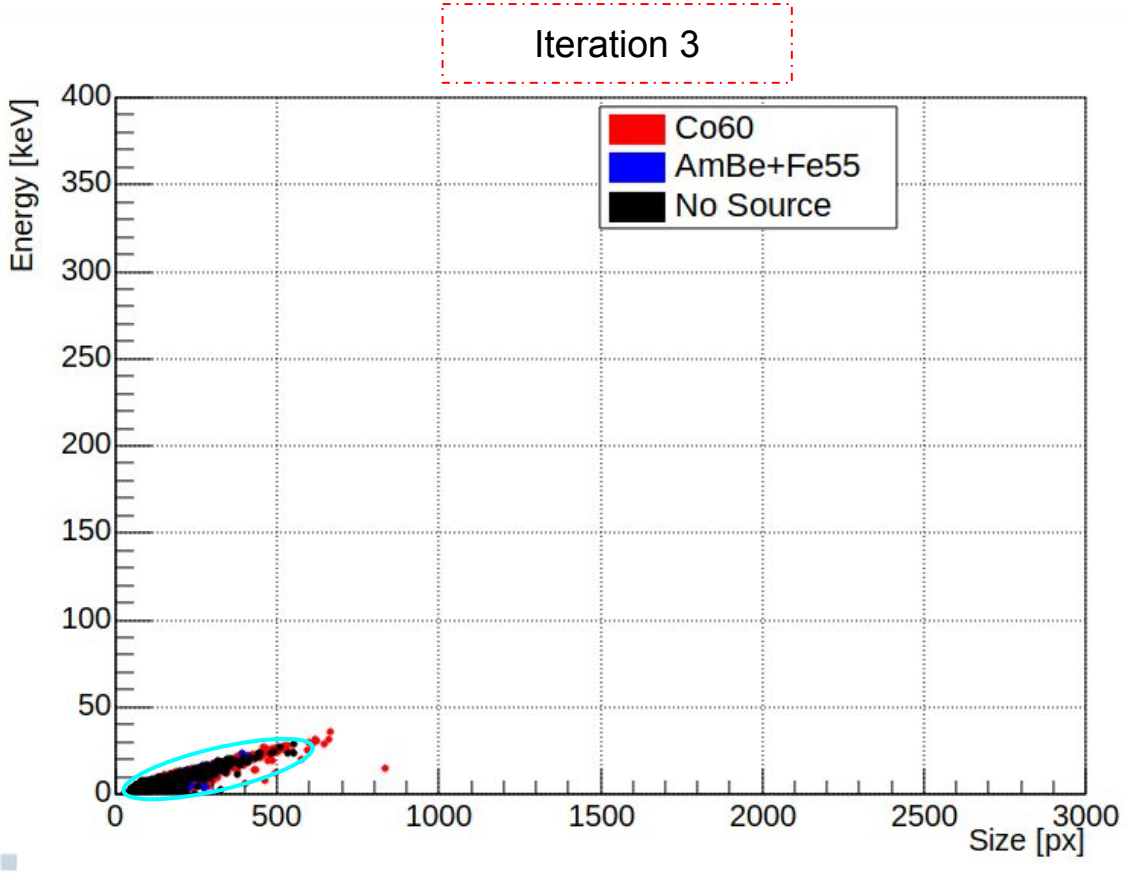
Comparison between No Source, CO60 and AmBe+Fe55



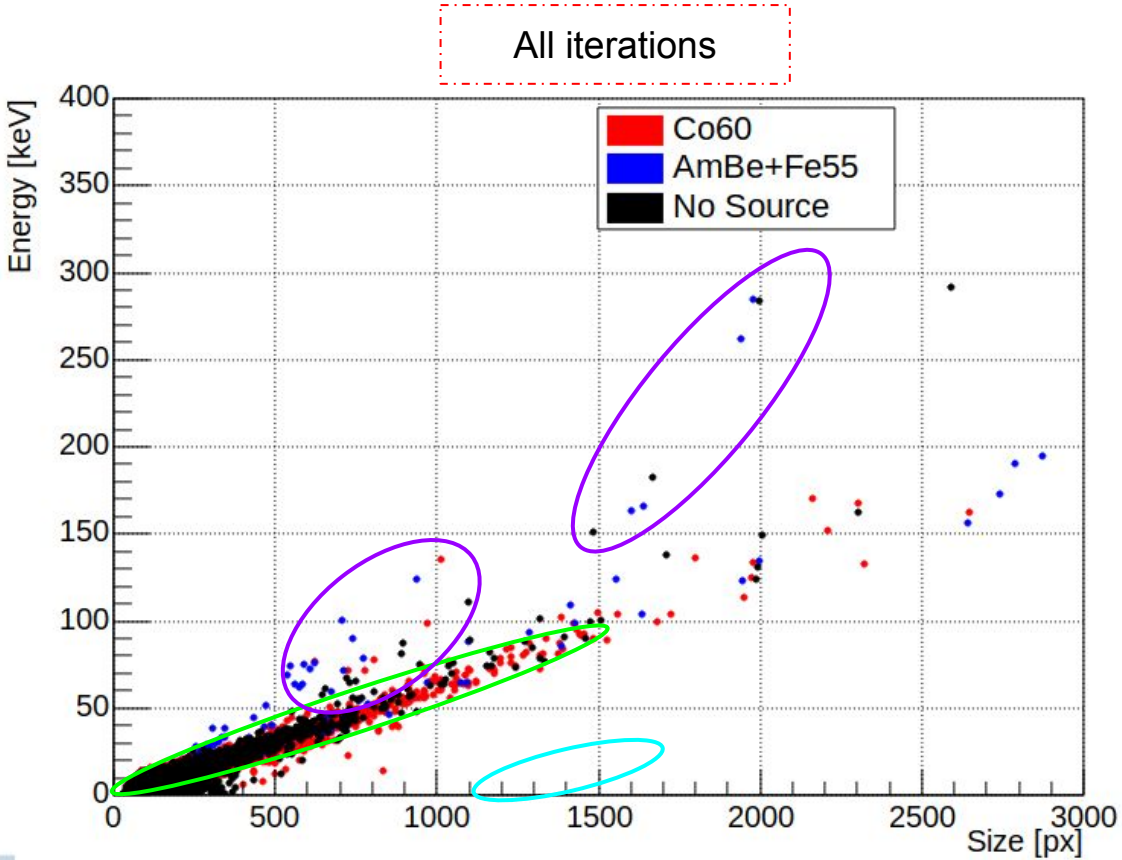
Comparison between No Source, CO60 and AmBe+Fe55



Comparison between No Source, CO60 and AmBe+Fe55



Comparison between No Source, CO60 and AmBe+Fe55



Total number of clusters found:

CO60	=	13173
AmBe+Fe55	=	1260
No Source	=	9554
Total	=	23987

Found clusters on iteration 1:

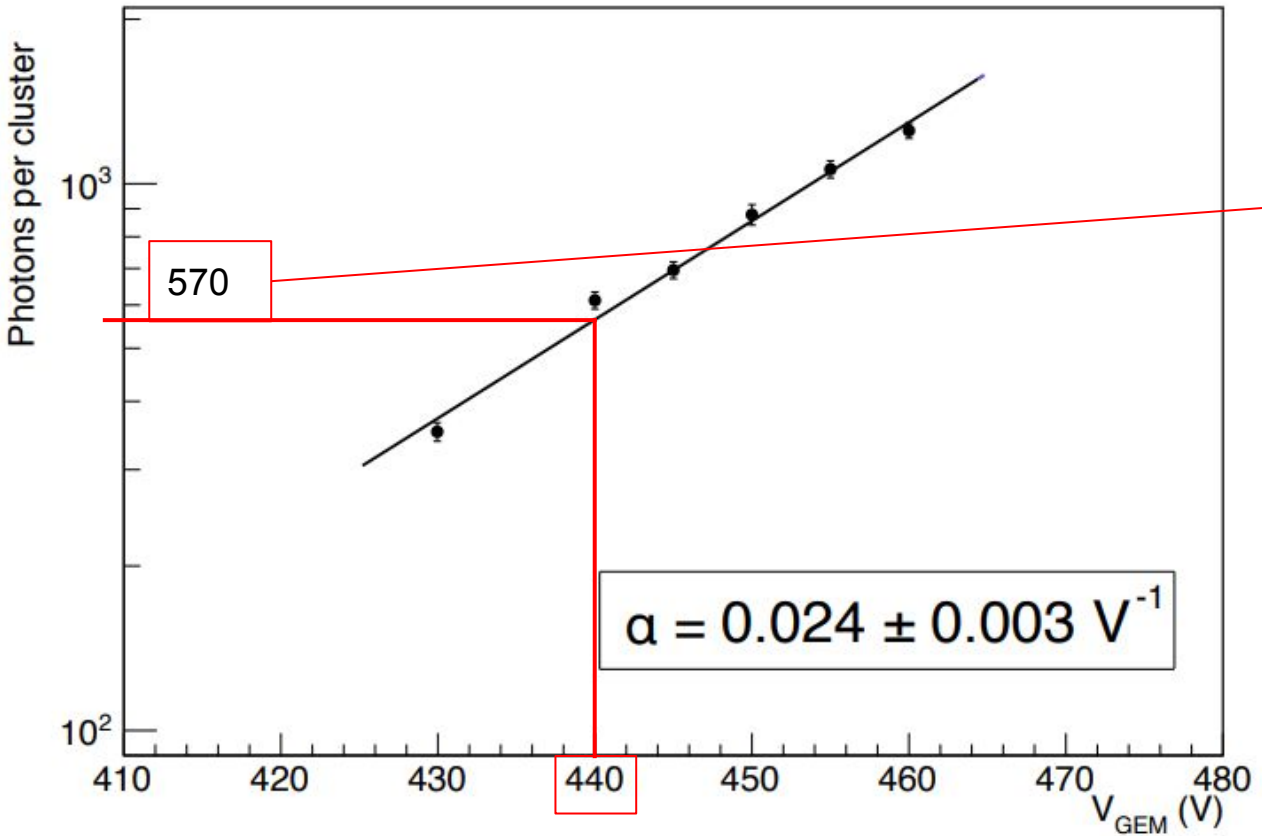
CO60	=	6
AmBe+Fe55	=	12
No Source	=	12
Total	=	30

Next Steps

- ❏ Develop a method for following the worms and measuring the length;
- ❏ Do the same analysis on the 450V runs;

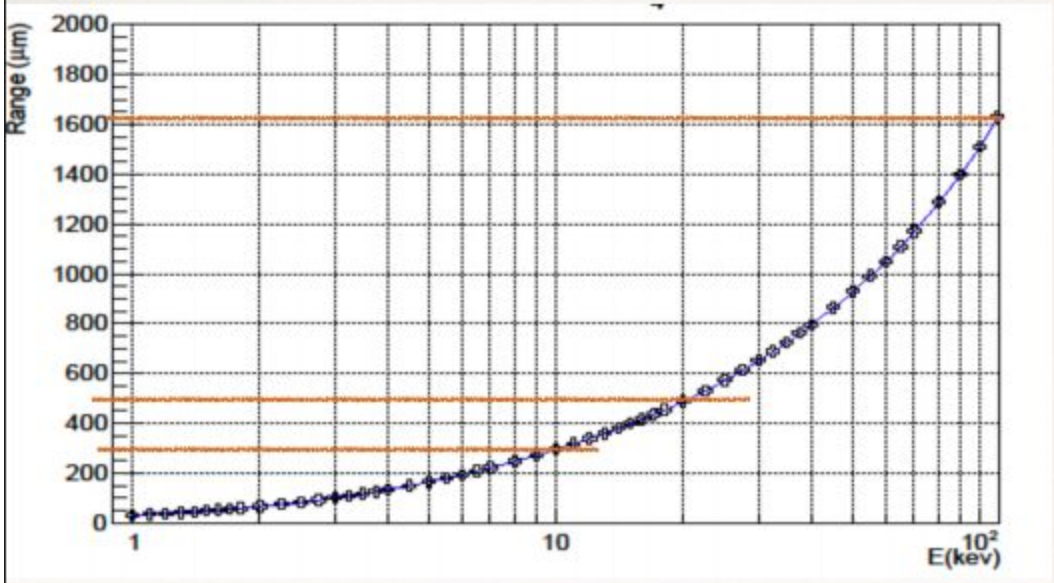
Backup

Calibration using the Fe55 paper



5.9keV/570 photons

Range of protons in 60/40

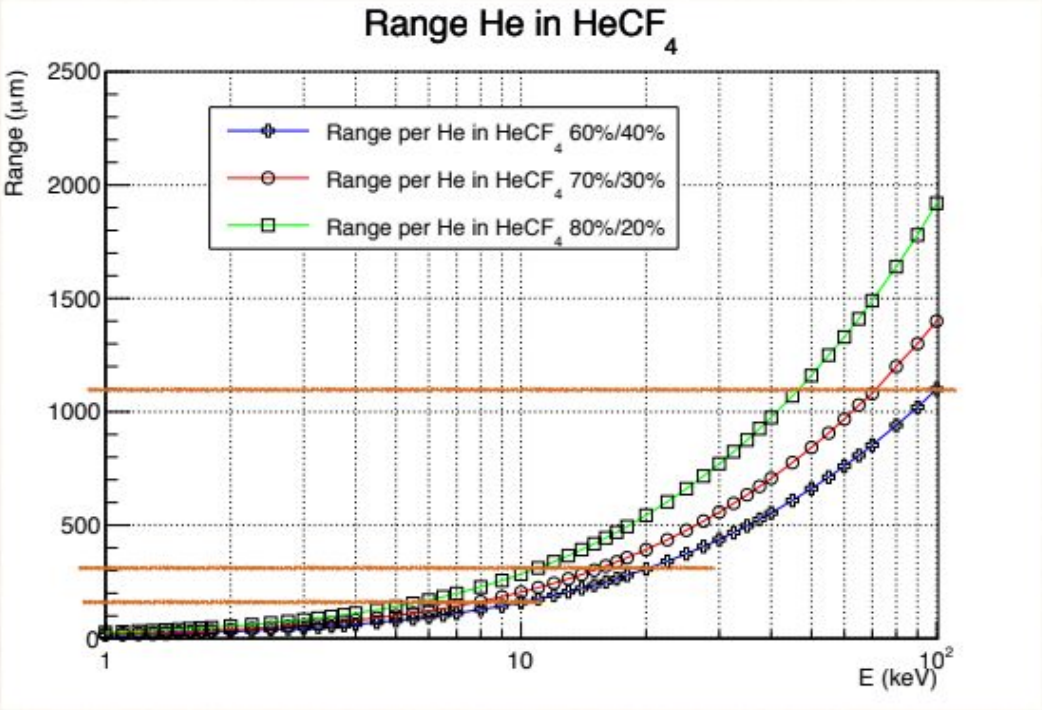


DISCLAIM: protons are not relevant for our Physics case, but we discovered a lot of proton tracks in FNG data.

This plot can be used to check if the experimental "Energy vs Length (Ev[i]L)" plot behaves as expected;

10 keV, 20 keV and 100 keV protons have a range of 300 µm, 500 µm and 1.6 mm;

Range of Helium nuclei



In particular, 10 keV, 20 keV and 100 keV He nuclei have a range of 170 μm, 300 μm and 1.1 mm in 60/40 (almost the double in 80/20).

Data taken with LEMOn- CO60 Source vs No Source

5.9keV/800ph = **0,0074 keV/ph**