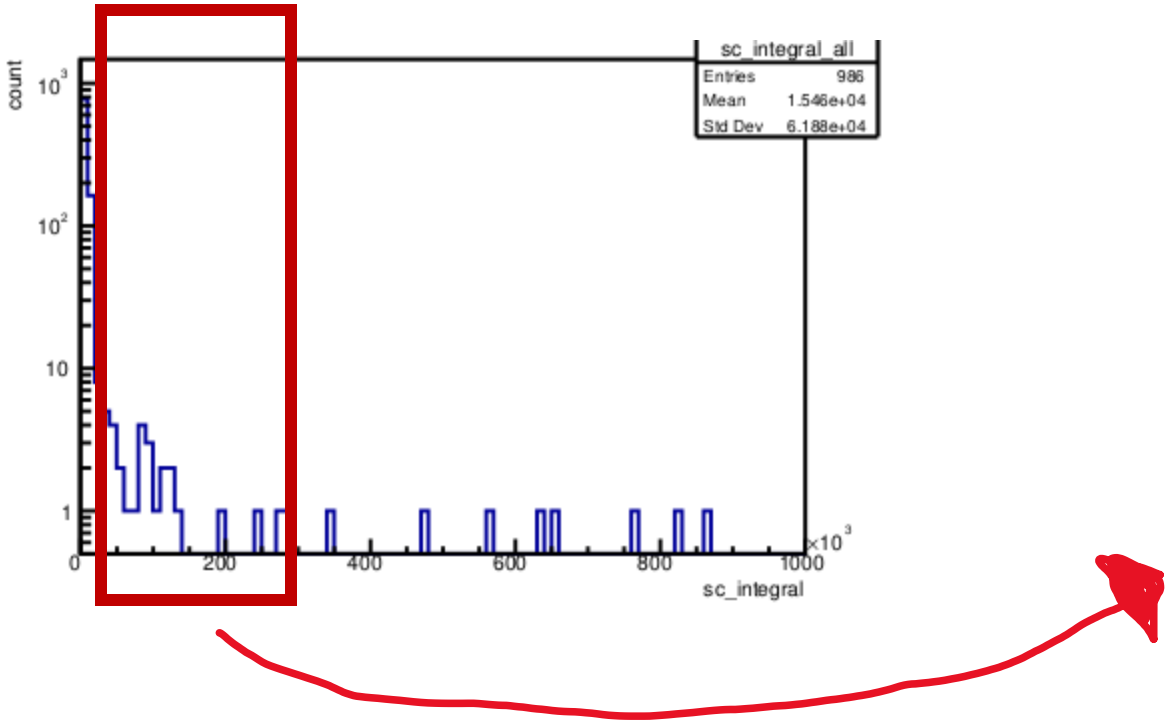
Final result on LY 30

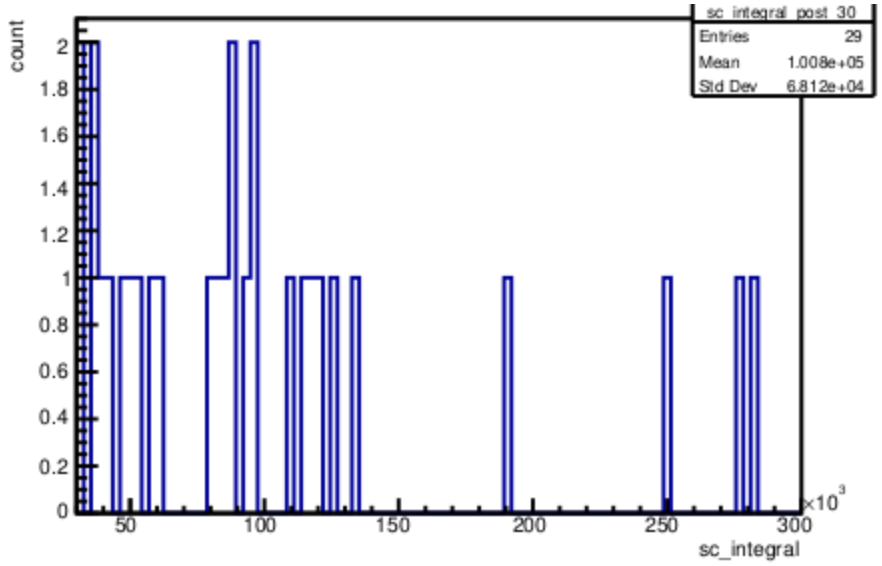
Various factors such as gas impurity, changing pressure, etc. can affect stability.

Goal -> to equalize all the run

The **LY30** variable has been defined as the average light yeald of the tracks with light between 30k and 300k
The LY30 has been evaluated for each run, with and without the iron source

Example: run 17999 (Run3)



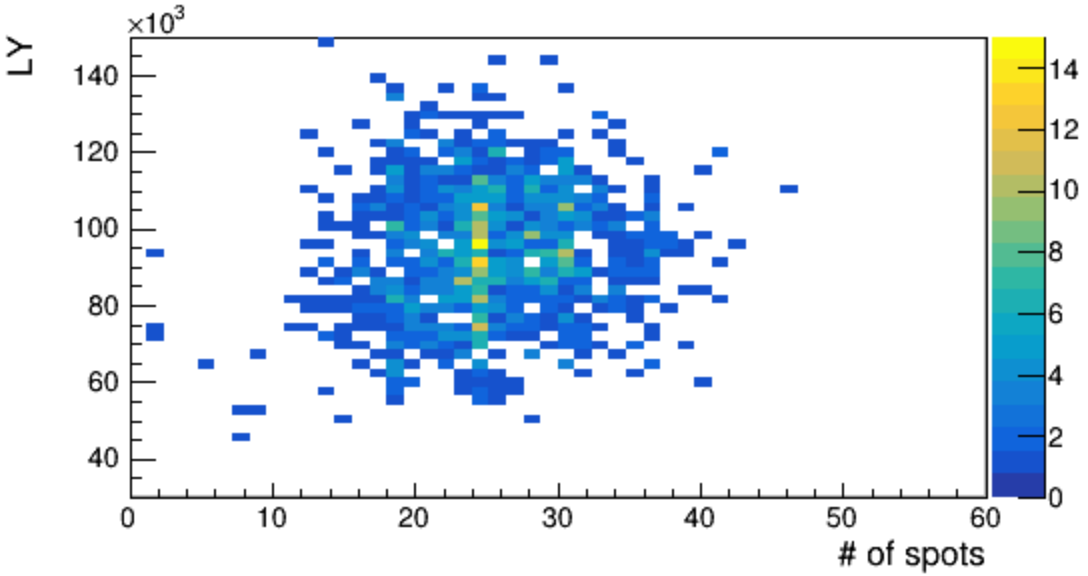


Various factors such as gas impurity, changing pressure, etc. can

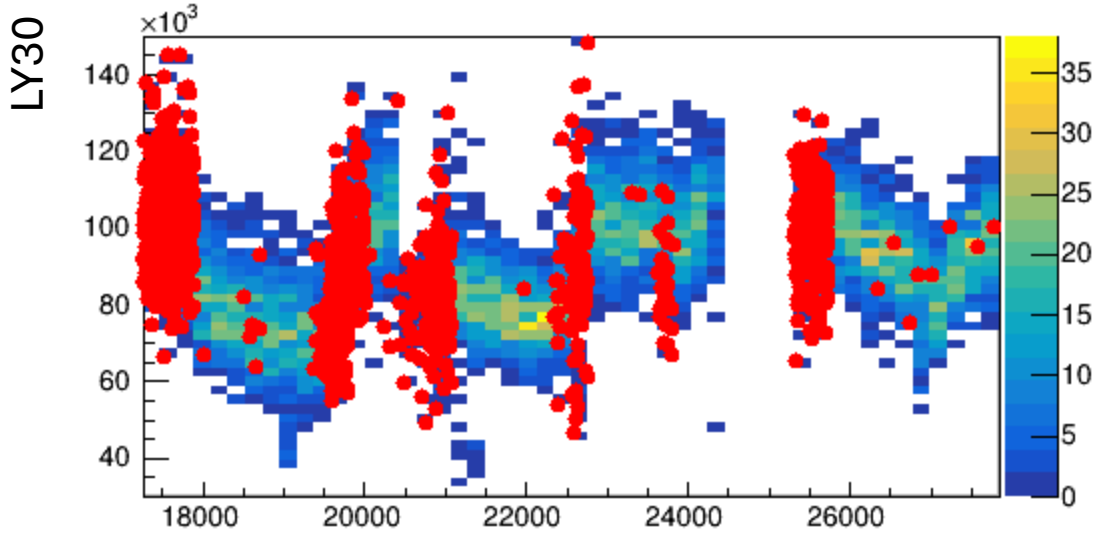
Goal -> to equali

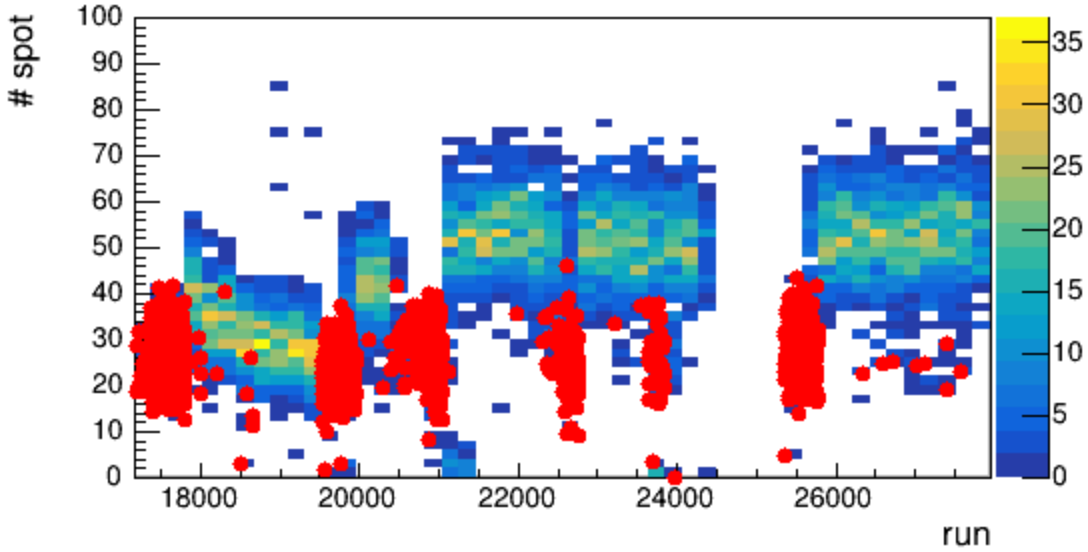
The **LY3**
The LY3

From the MC simulation, do we have some information about the events at "high" energies?
Did we simulate them?



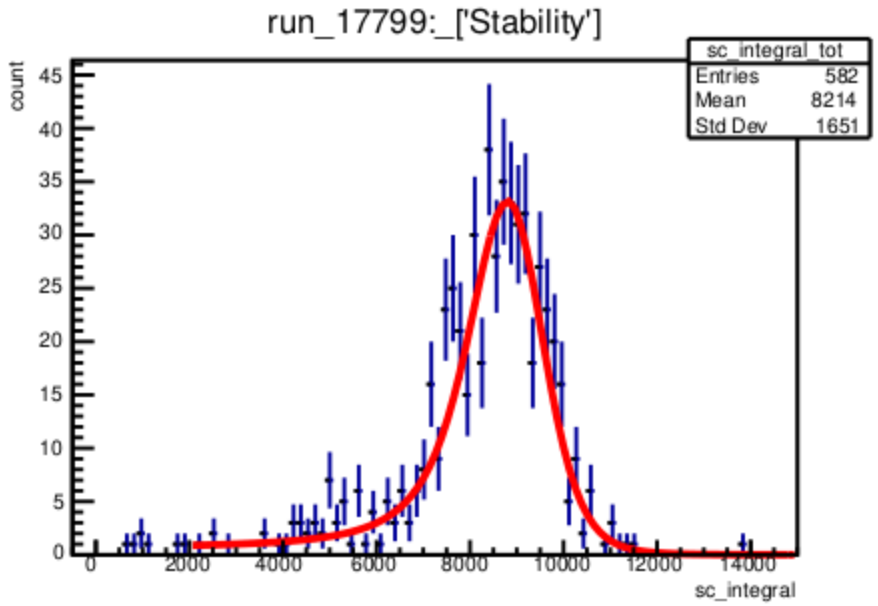
The number of spot which contribute to the evaluation of the LY30 is less when there is the iron source.
While the value of LY30 is indipendent from the the presence or not of the source.



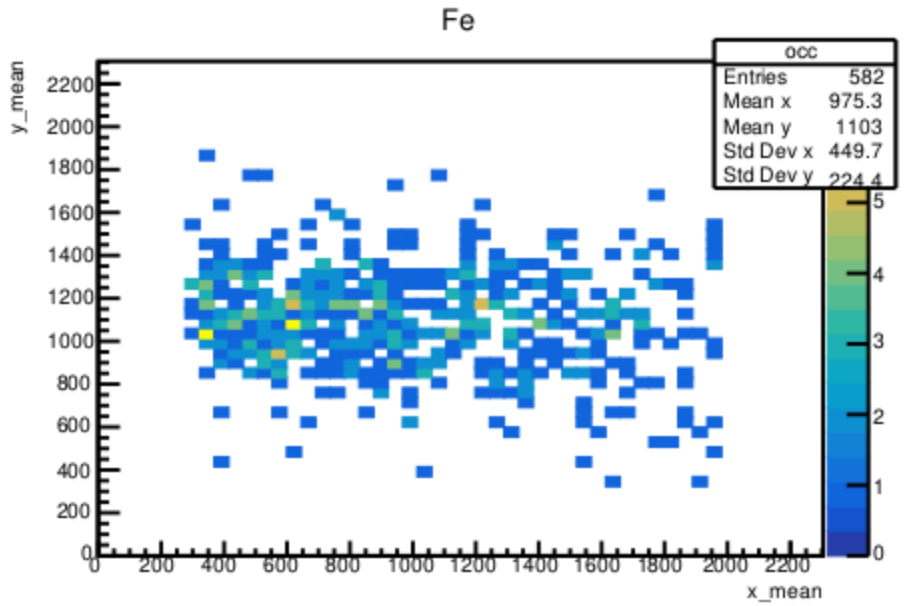


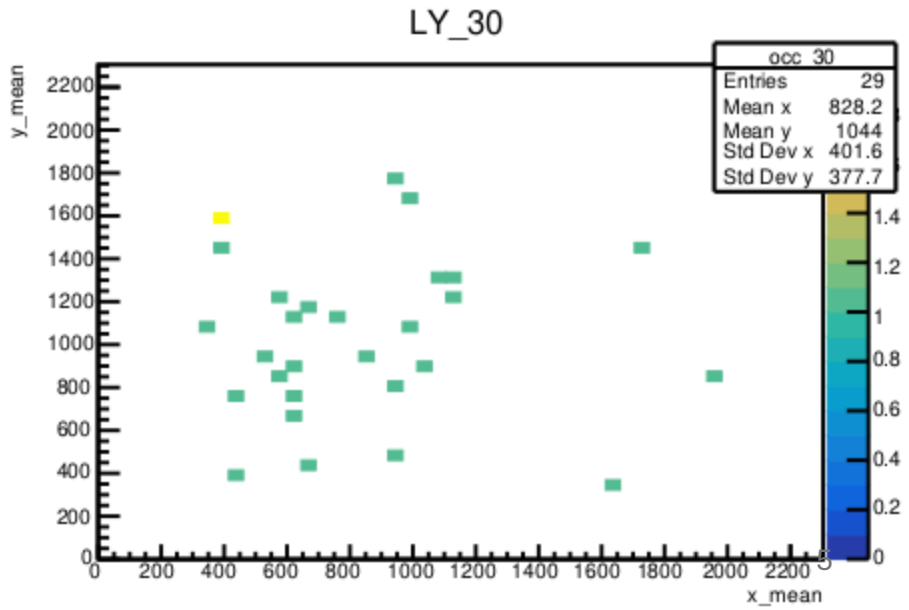
In red the runs where the iron source is at step3

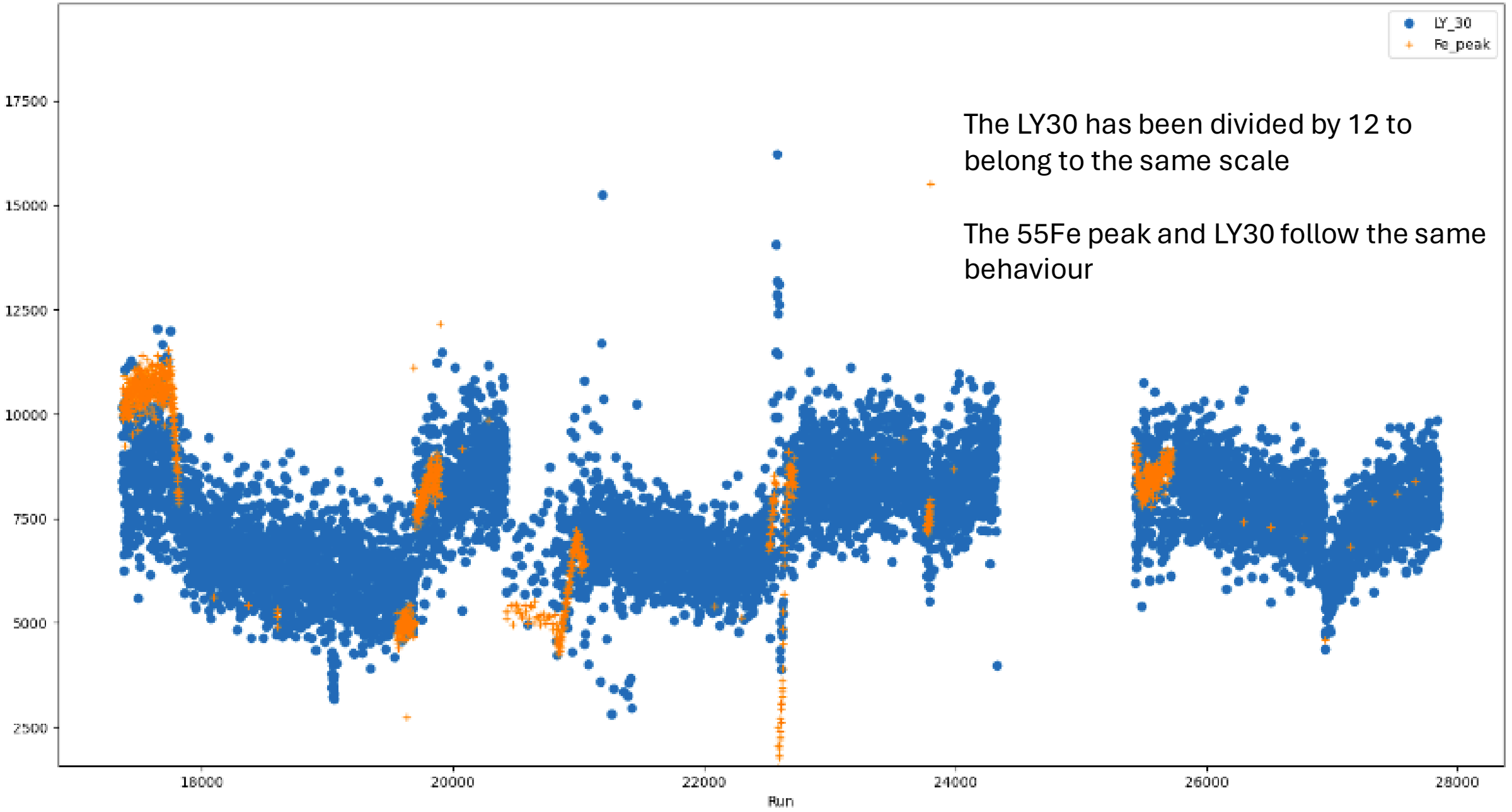
For each run where the iron source is placed at step 3, the ^{55}Fe peak has been evaluated fitting the sc_integral distribution with the Cruijff function



Occupancy



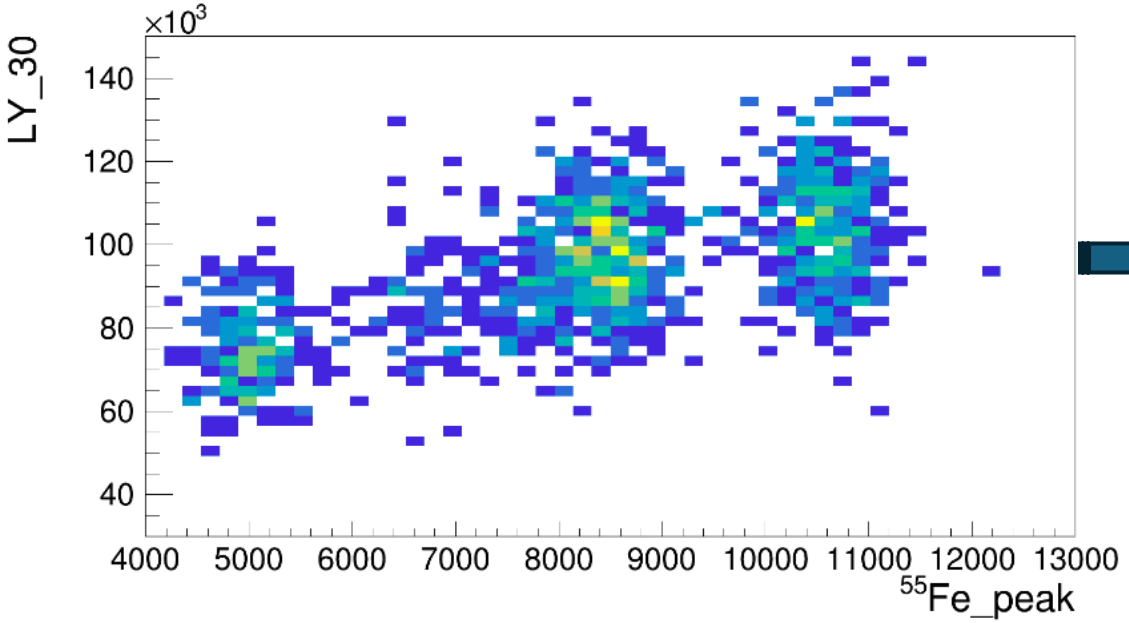




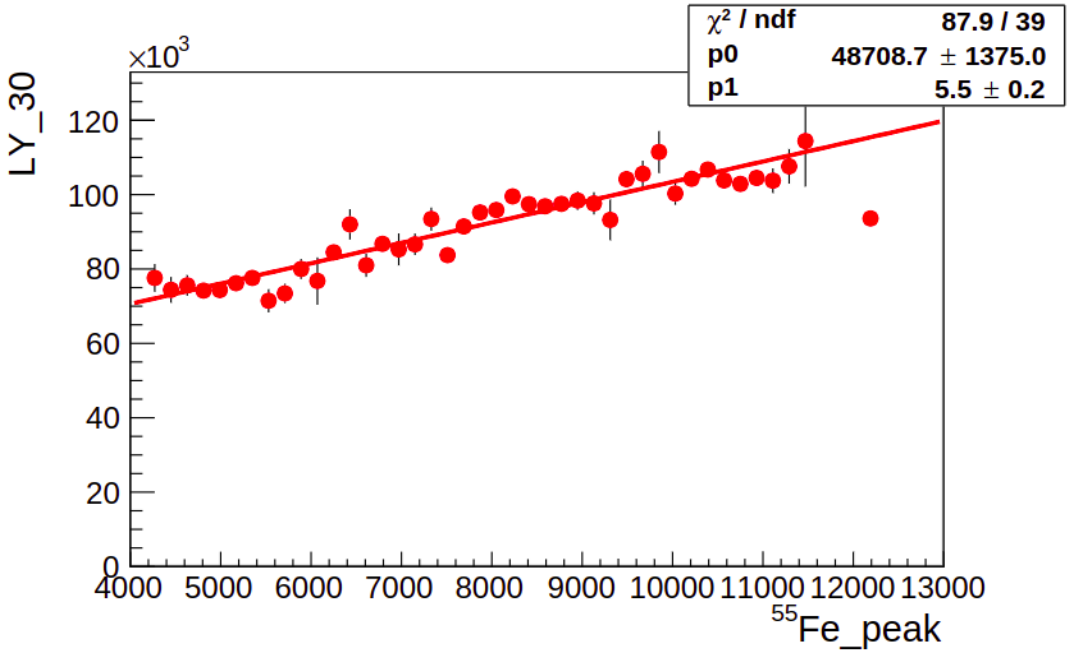
The LY30 has been divided by 12 to belong to the same scale

The 55Fe peak and LY30 follow the same behaviour

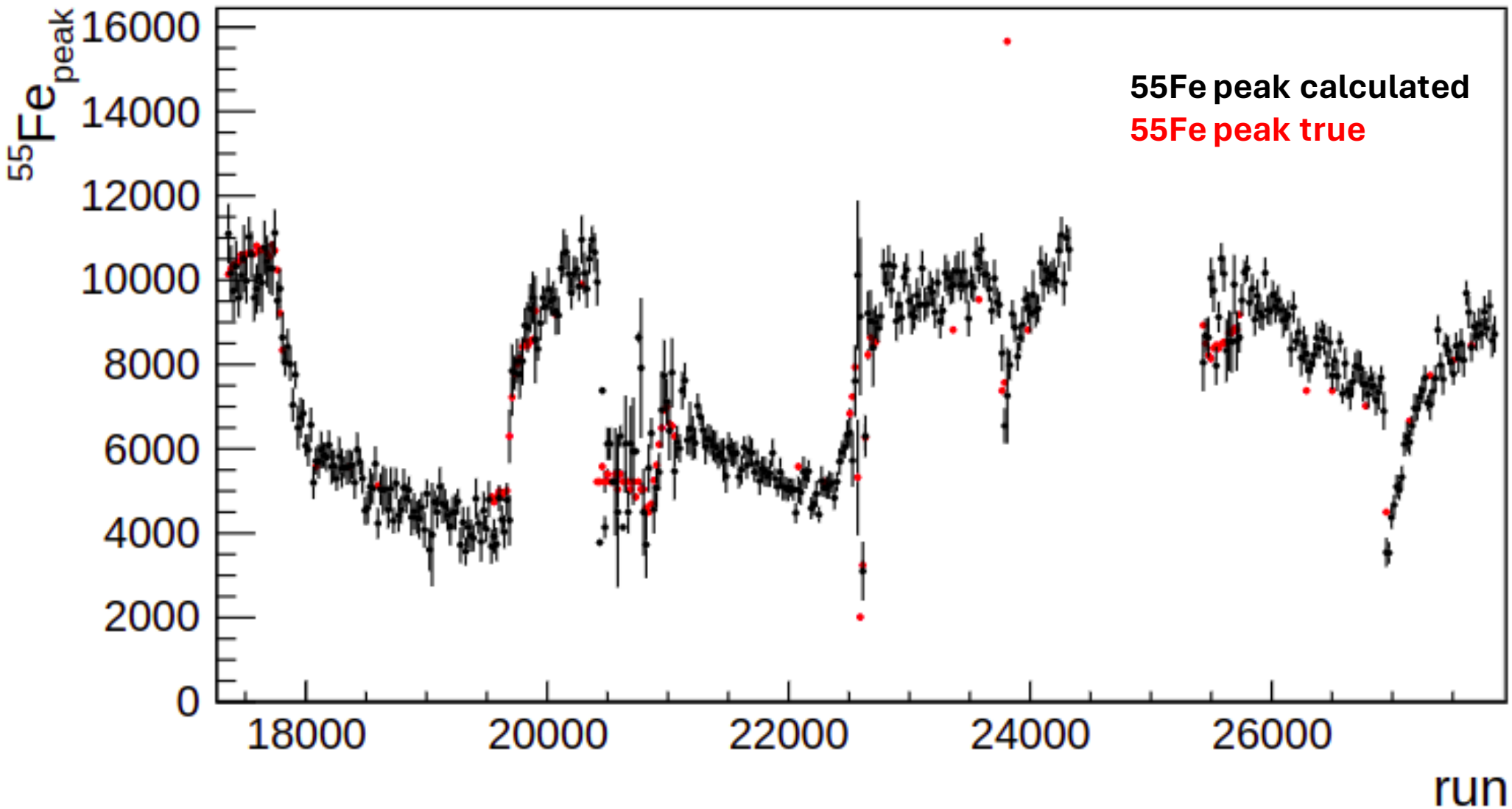
LY30 versus the 55Fe peak for the runs where the iron source is placed at step 3 has been plotted.



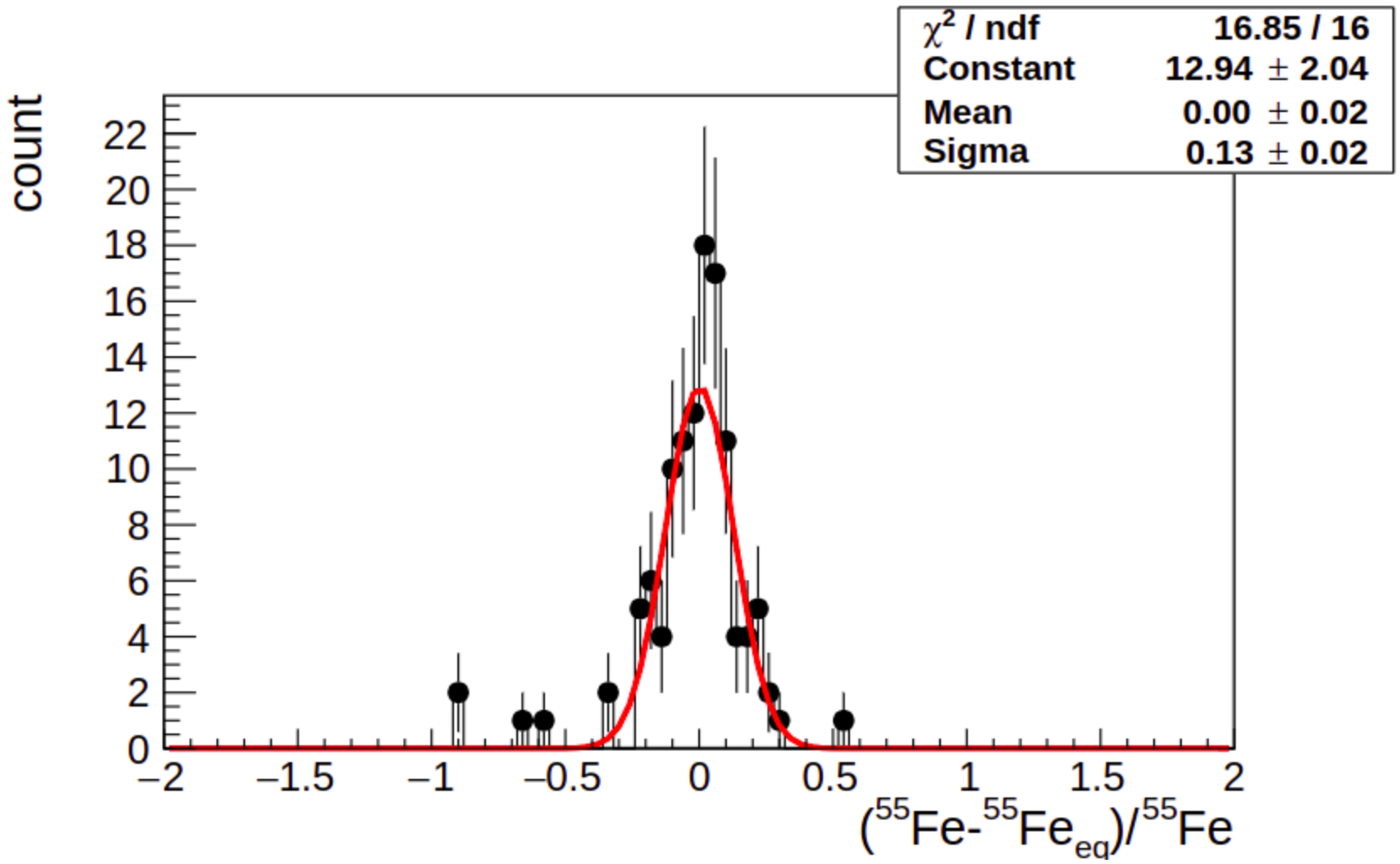
The profile and a linear fit have been performed in order to evaluate the parameter to calculate the 55Fe peak starting from the LY30



For each run the 55Fe peak ha been calculated from the LY30

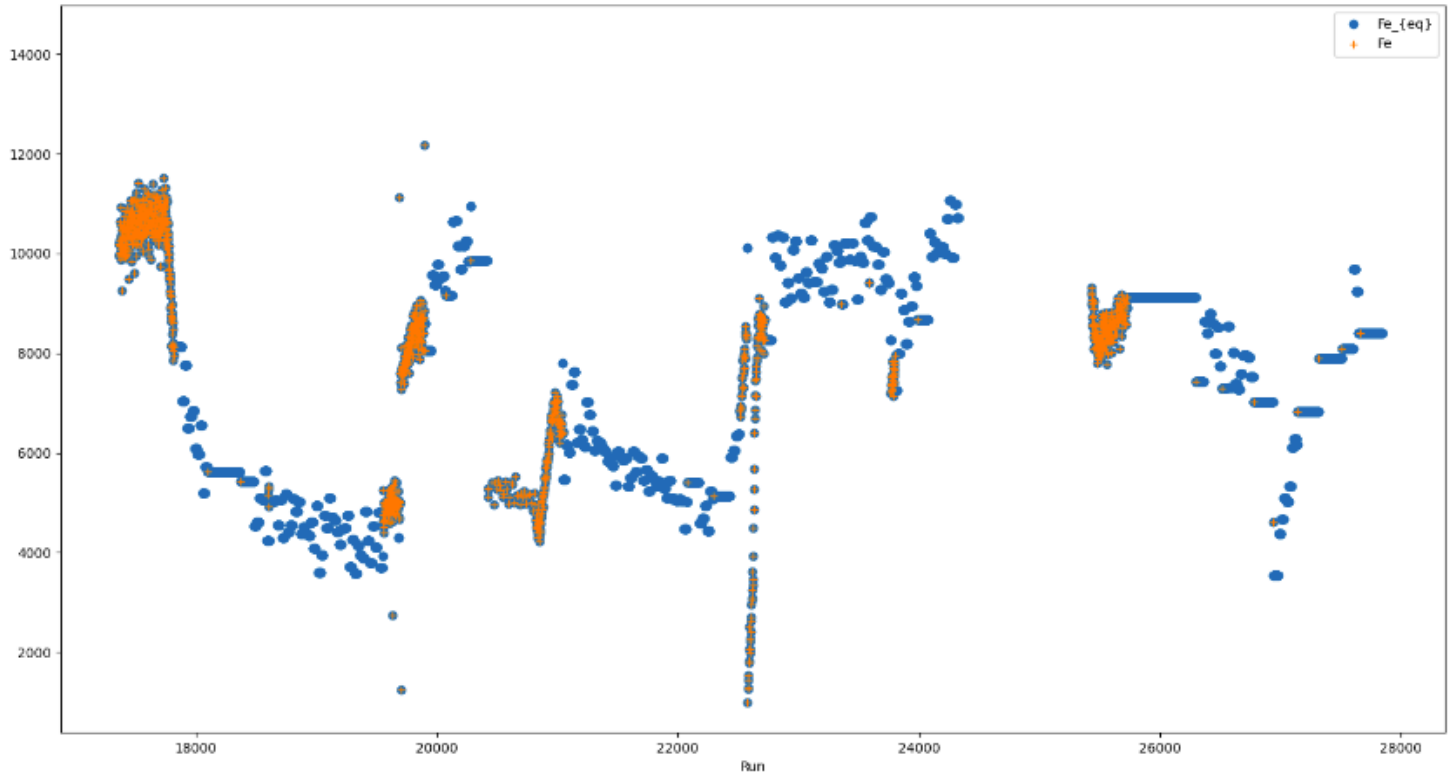


To evaluate the dispersion, the difference between the calculated ($55Fe_{eq}$) and the true divided by the true 55Fe peak has been evaluated --> finding a null offset and 13% dispersion



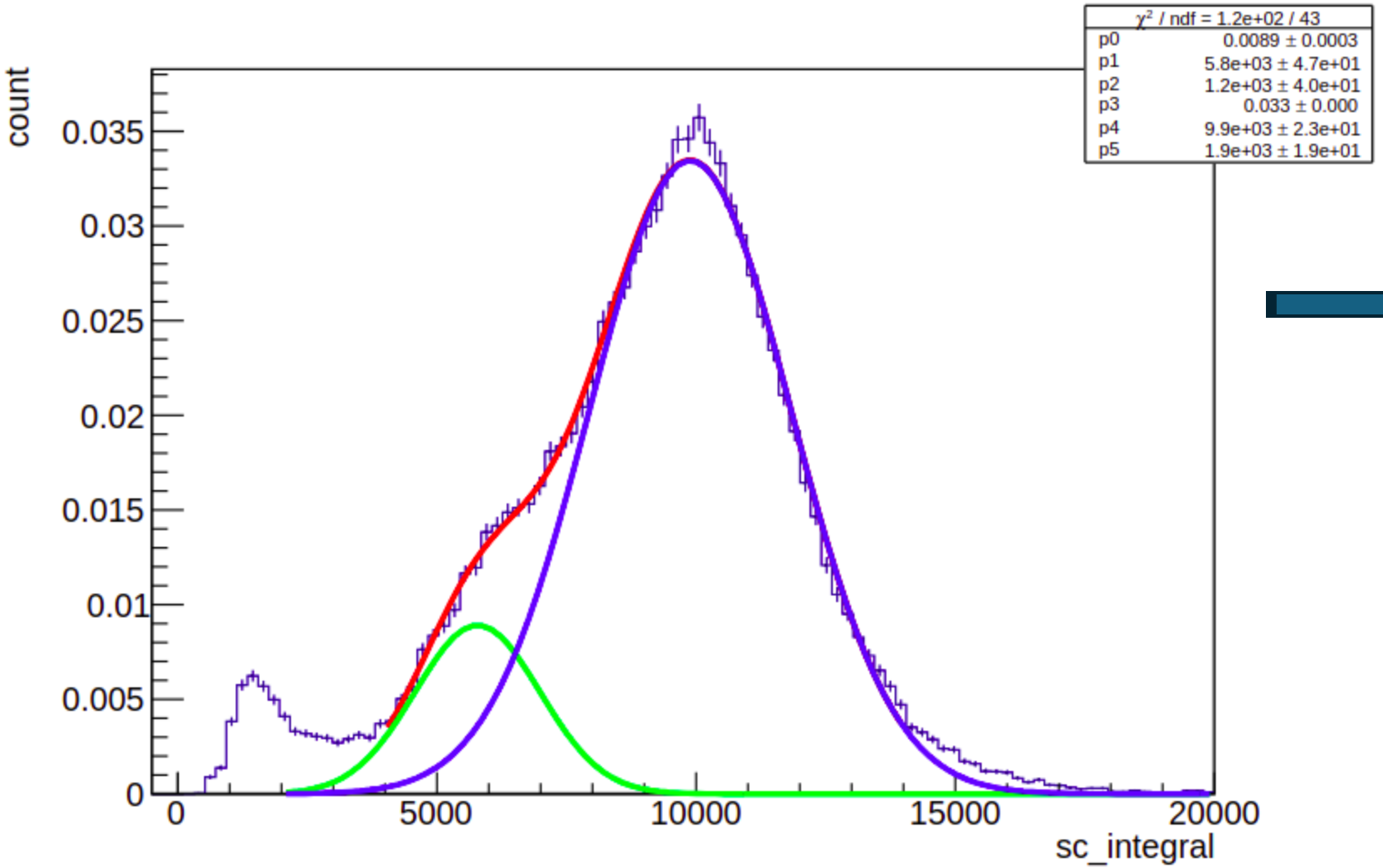
In order to equalize all the runs, the corrected iron peak is evaluated for each one as follows:

- if the iron source is placed 25 cm far from the GEMs, the measured ^{55}Fe is reported;
- if the iron source is not present, the last calibration run is used and:
  - if the ^{55}Fe$_{eq}$ differs less than 13 %, the last ^{55}Fe is reported;
  - if the ^{55}Fe$_{eq}$ differs more than 13 %, the averaged ^{55}Fe$_{eq}$ is reported until the next calibration.

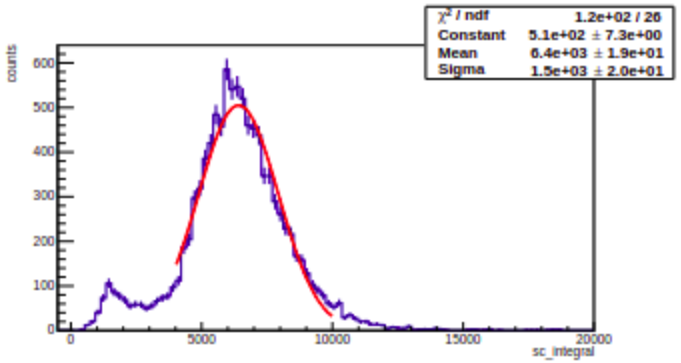


The corrected iron peak has been used to evaluate the factor to scale the light of each spot so that if the iron peak is at step 3, the light integral is 10k

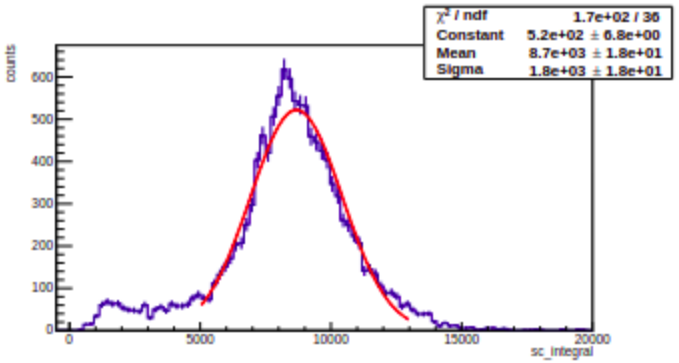
All the runs where there is the iron source have been equalized and the sc_integral distribution built.
Two contributions are visible --> a double gaussian fit is performed
The green gaussian is associated to the contribution due to the step1
The blue gaussian to the other steps.



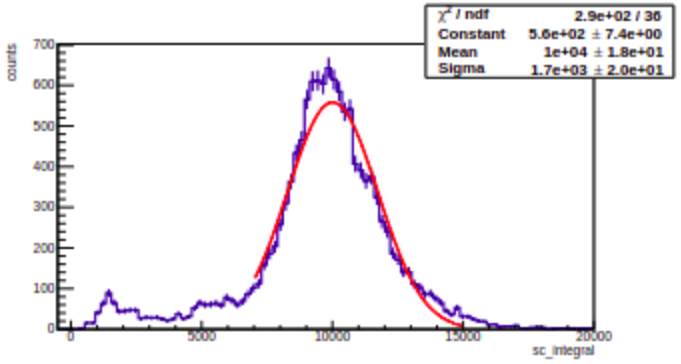
I simulated this distribution



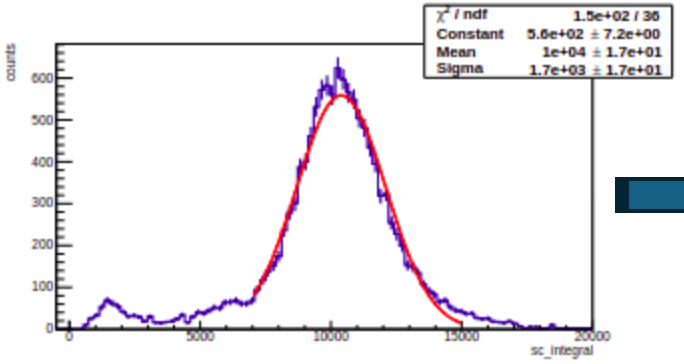
(a) step 1



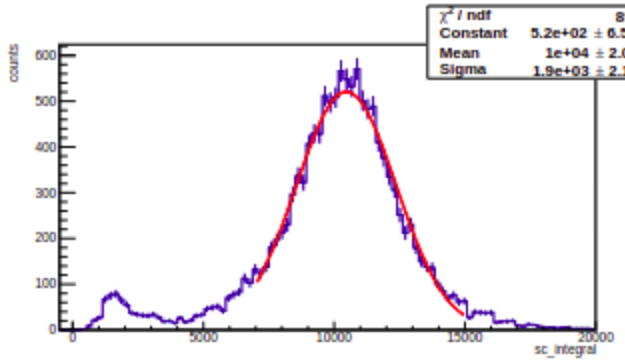
(b) step 2



(c) step 3



(d) step 4



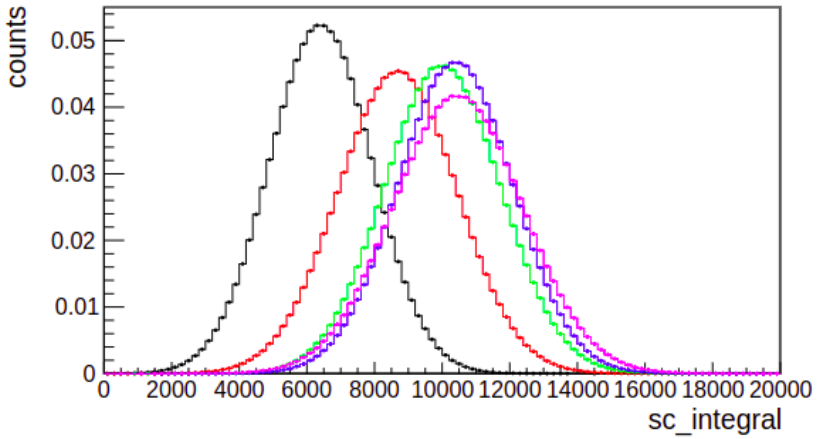
(e) step 5

The sc_integral distribution of the 5 calibration step given by the sum of the equalised runs for each configuration.

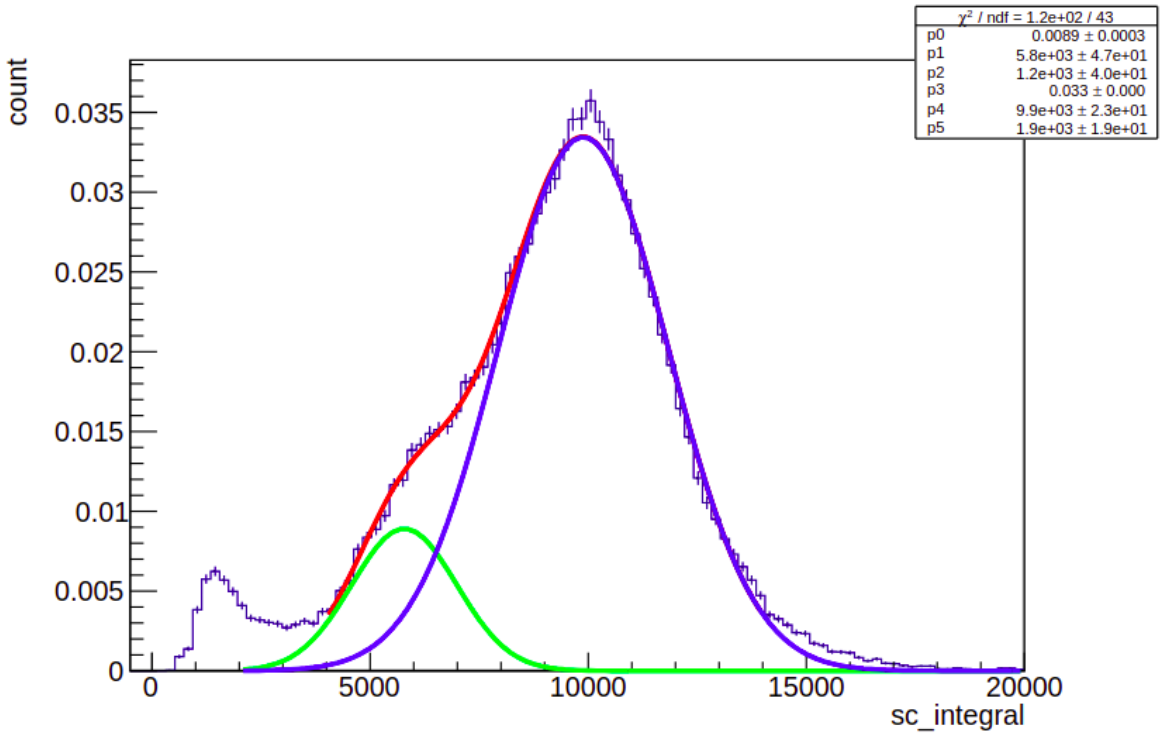
A gaussian fit is performed.

The mean and the sigma has been used to simulate 10^4 events with a gaussian distribution for each step

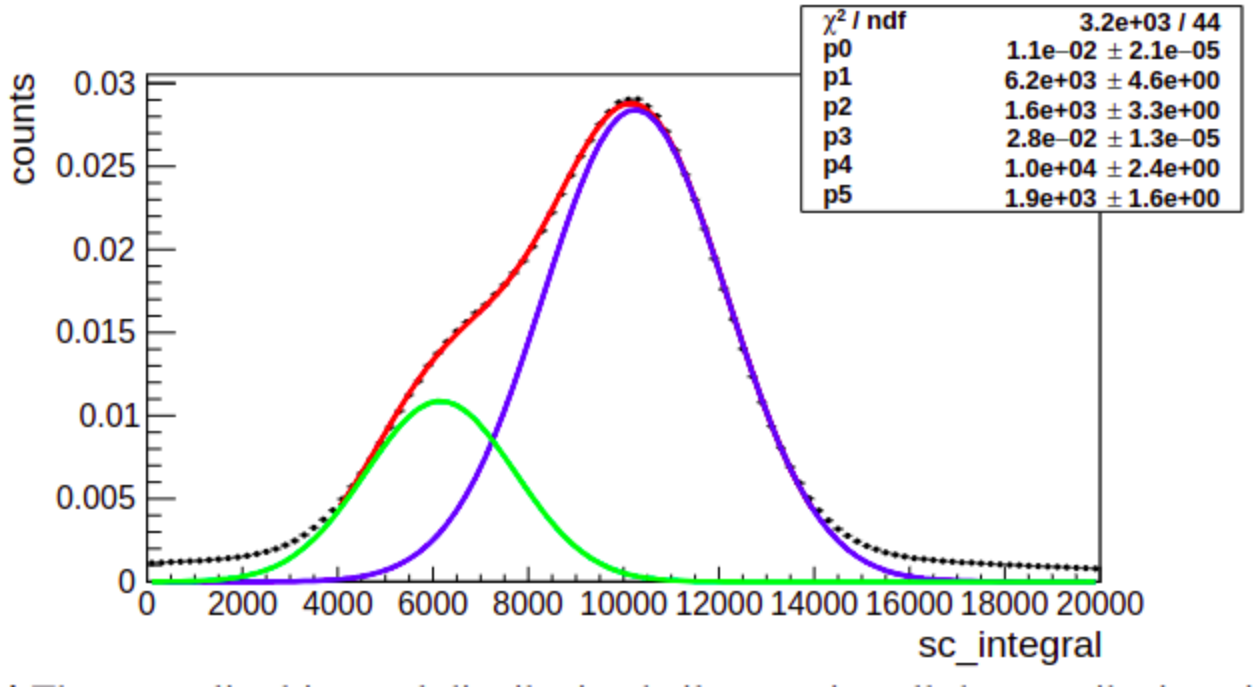
The 5 sc_integral distribution:

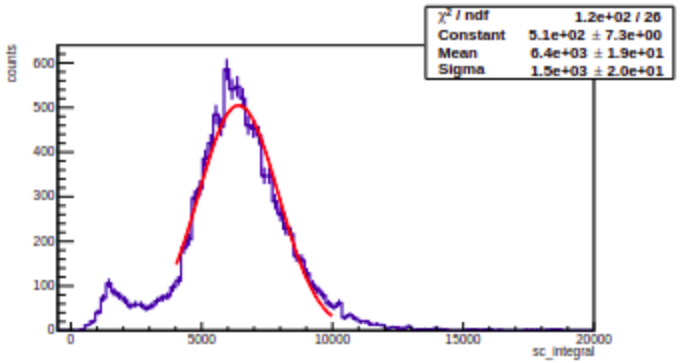


Real data

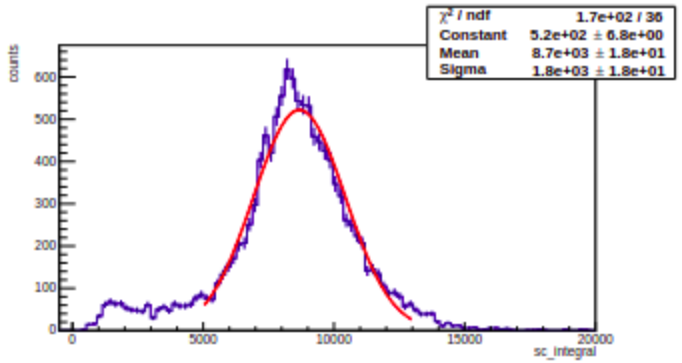


Simulated data

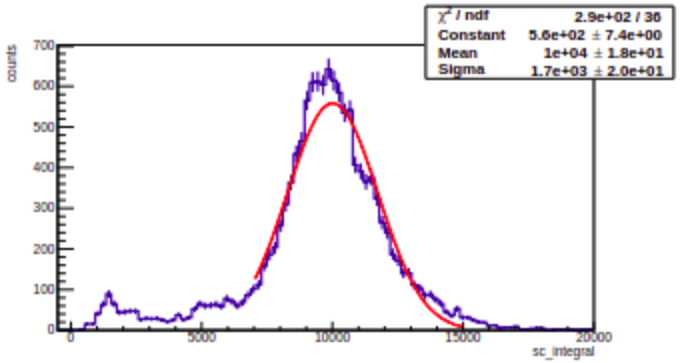




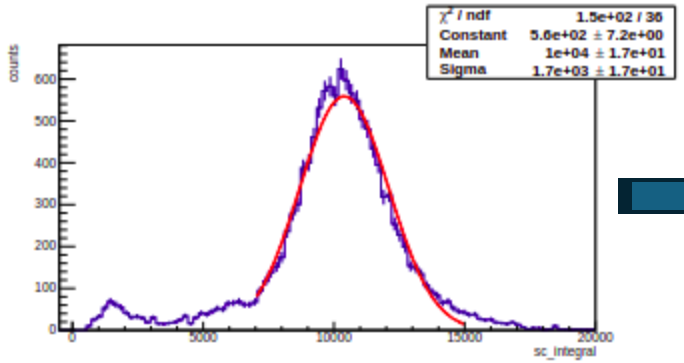
(a) step 1



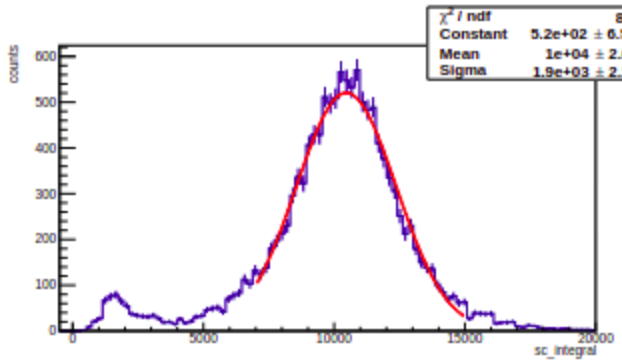
(b) step 2



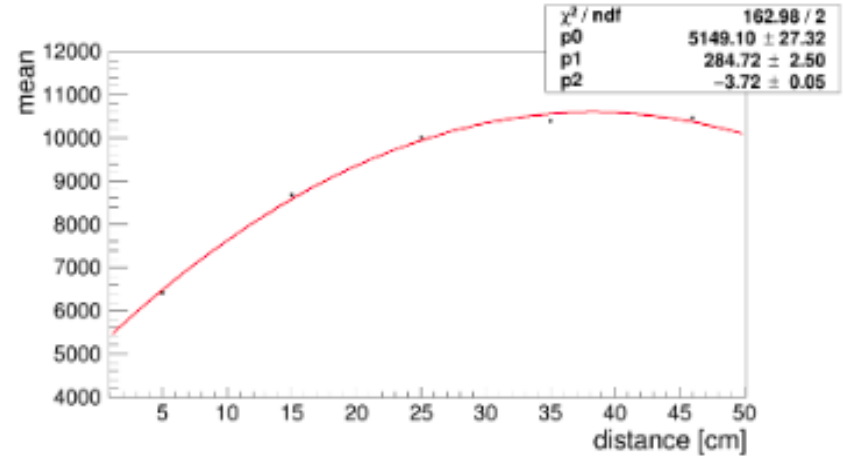
(c) step 3

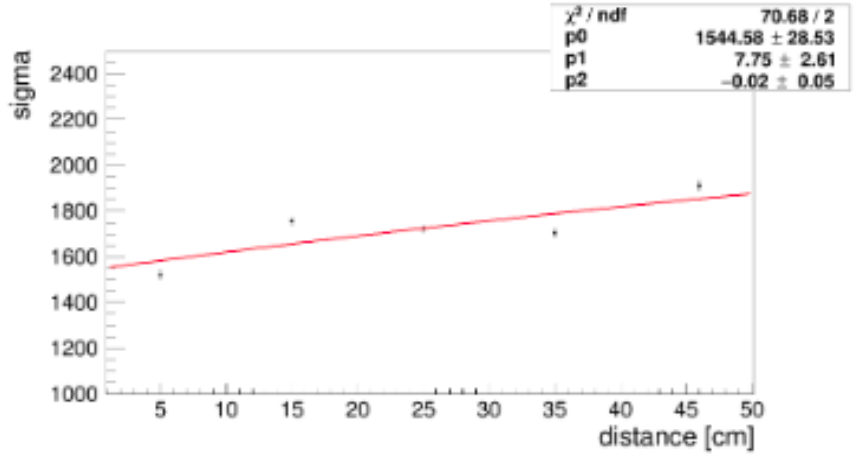


(d) step 4



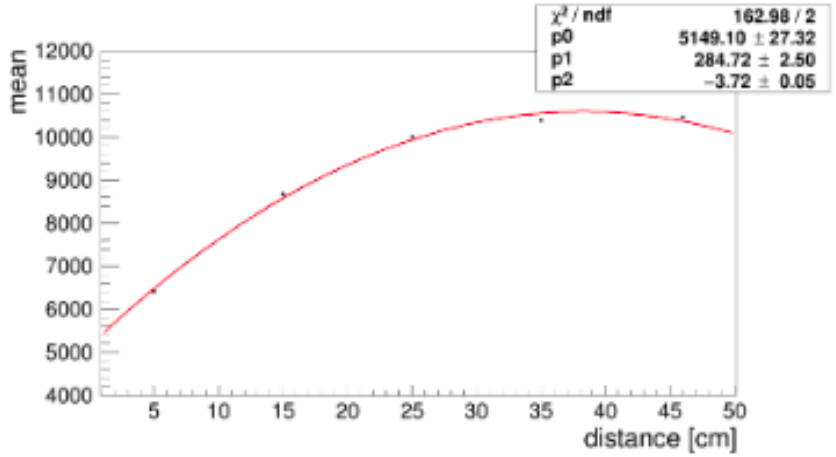
(e) step 5

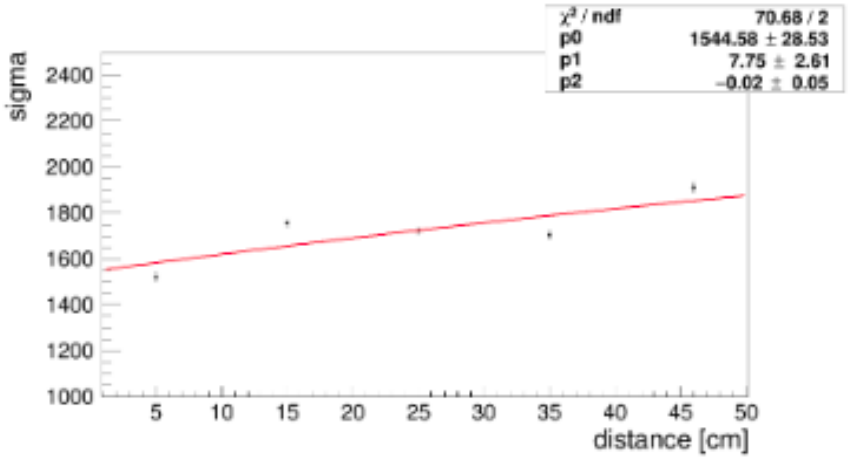


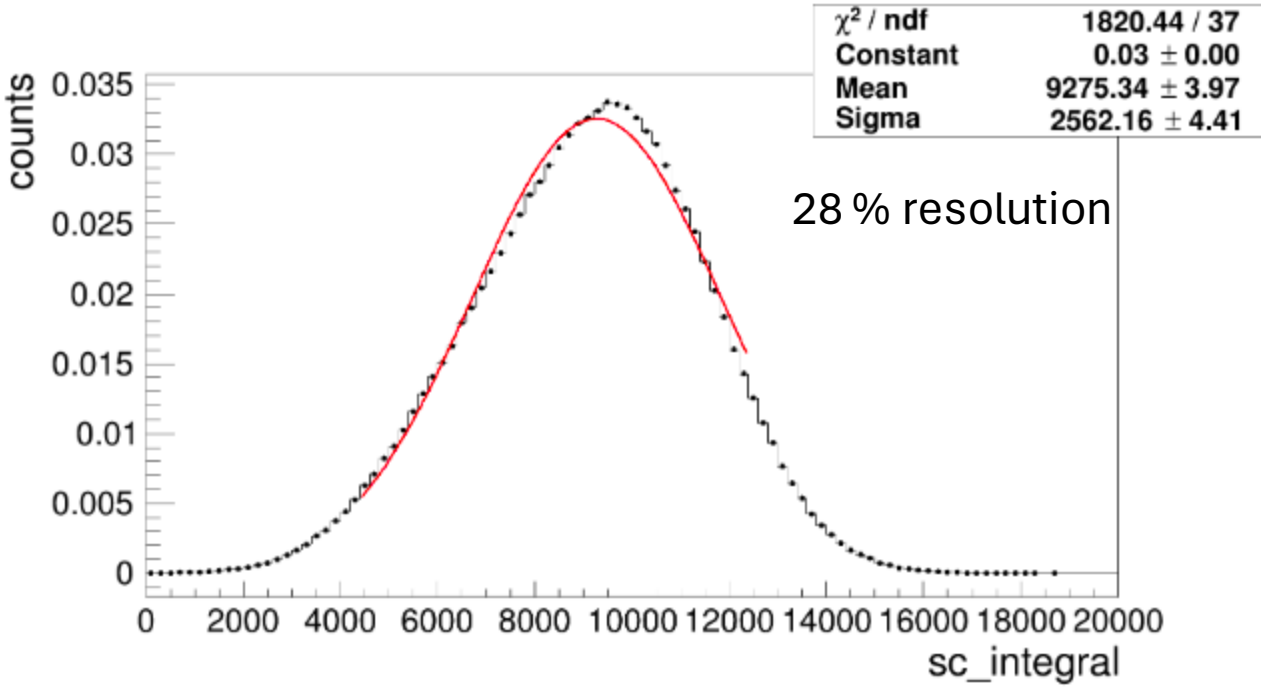


To remove the position dependence, 10^5 points are uniformly extracted between 0 and 46, named z (which represent the distance from the GEMs).
For each z the μ and σ values have been evaluated by the fit on the mean and sigma plot.

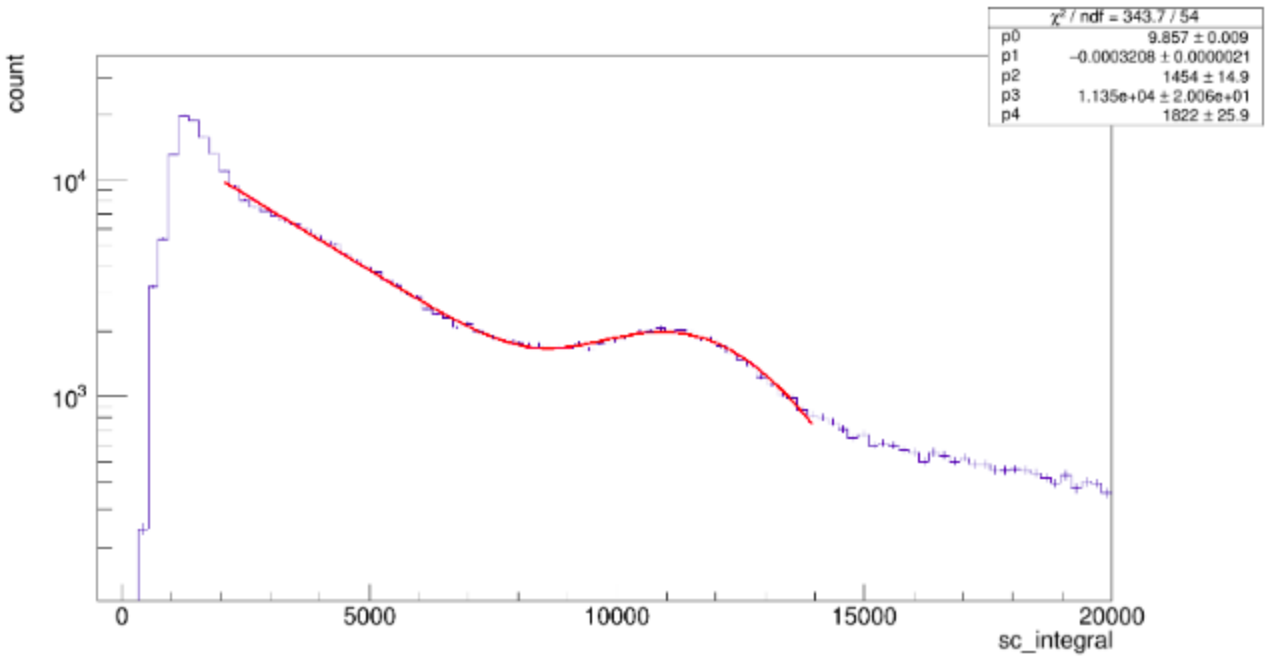
The μ and σ values are used to extract the light integral of the spots for each z using a
gaussian distribution







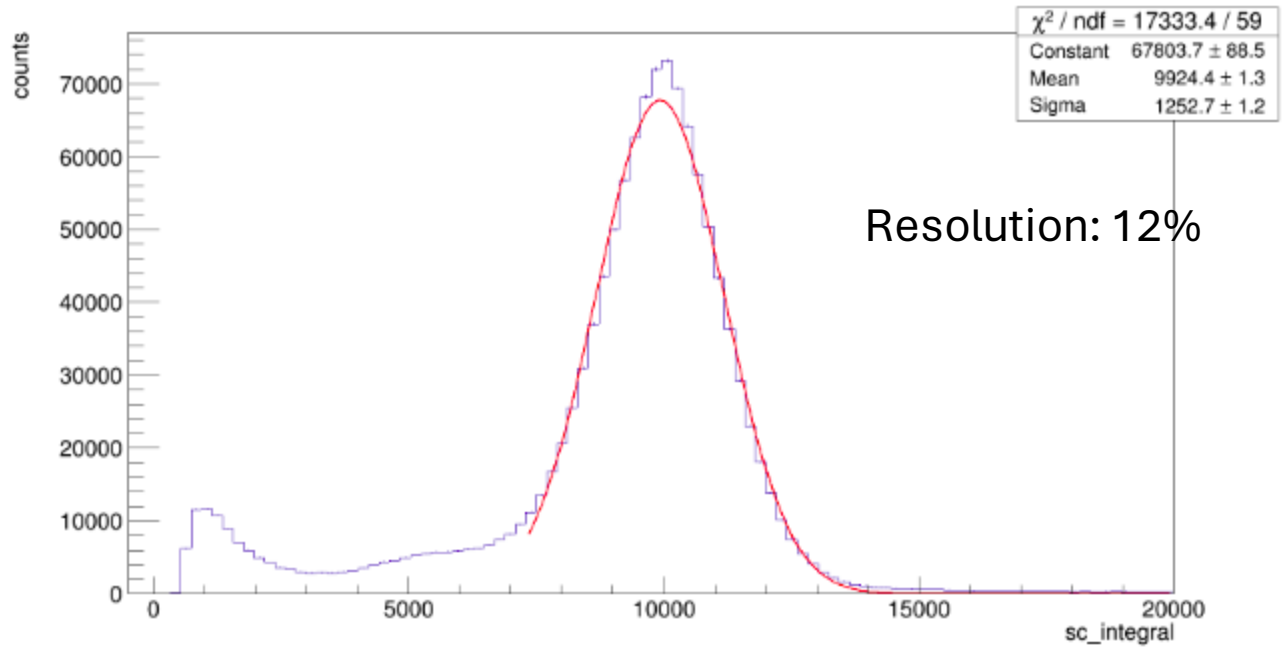
Equalizing and summing all the runs where there is not the iron source, the sc_integral distribution has been built.
A peak is found.
An exponential+gaussian fit has been performed

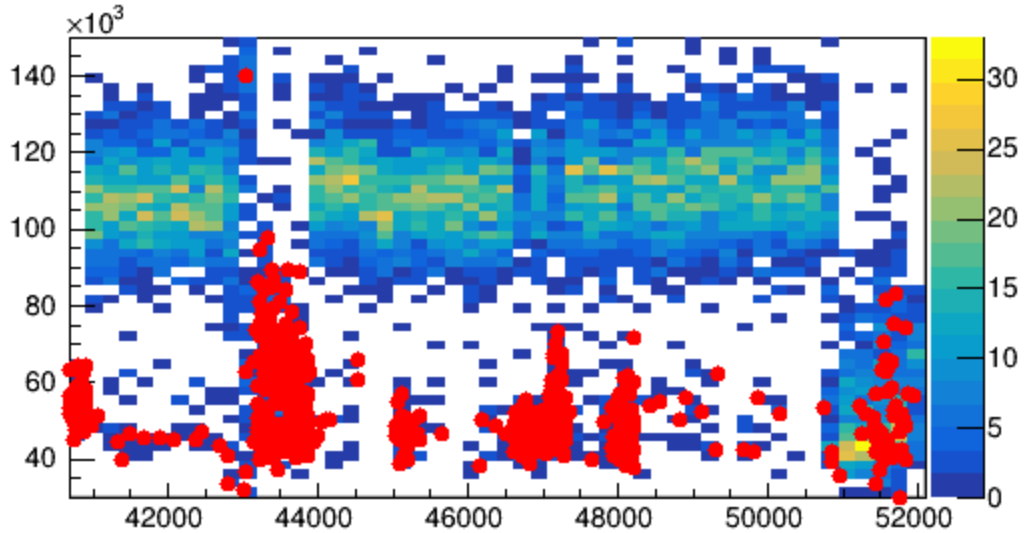


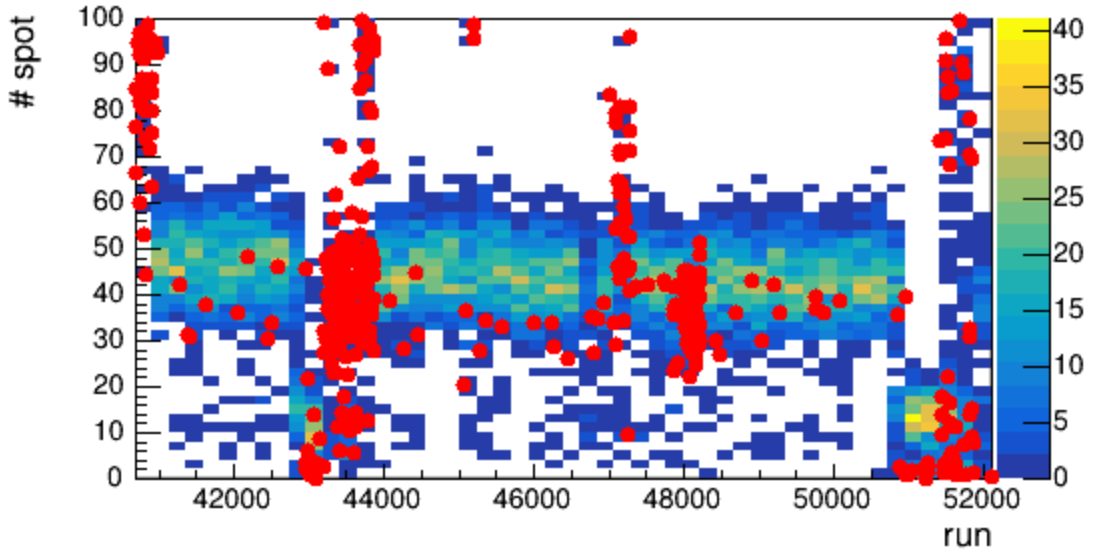
16 % resolution.
Knowing from the generated distribution that 9275 count corresponds to 5.9 KeV, the energy is
found to be 7.2 keV, which can be associated with copper.

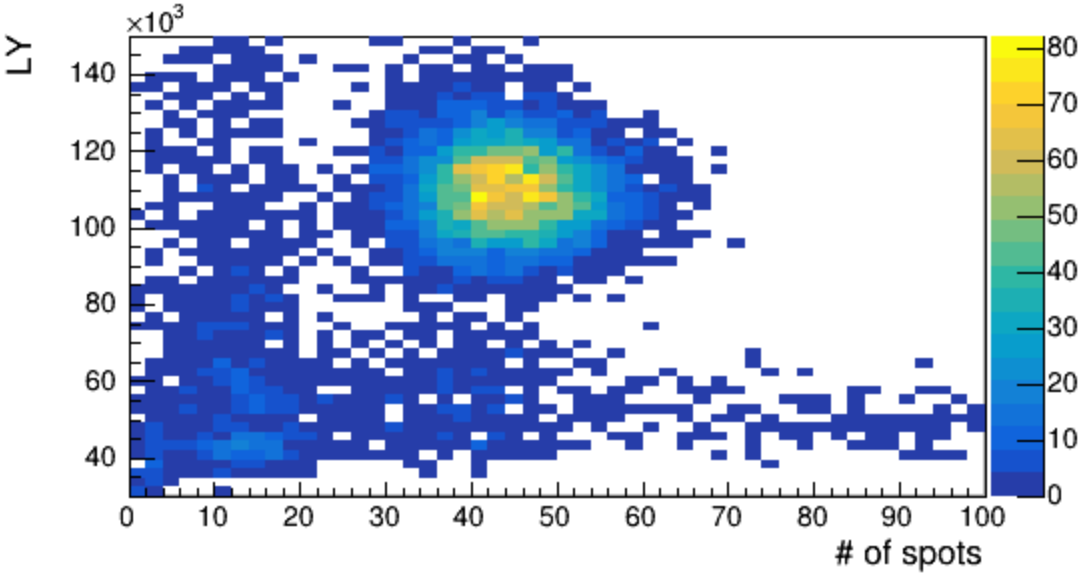
The corrected iron peak has been evaluated for the Run1 and Run2.

All the runs which belong to the Run1, Run2 and Run3 where the iron source is placed at step3 have been equalised and the sc_integral distribution built:







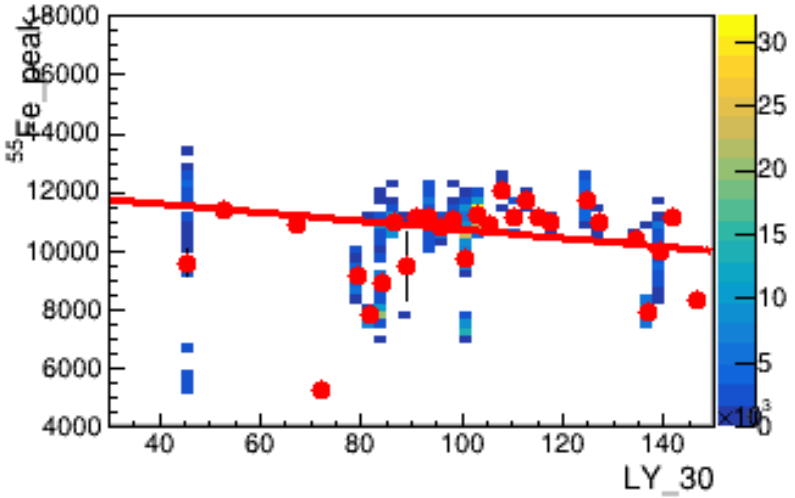


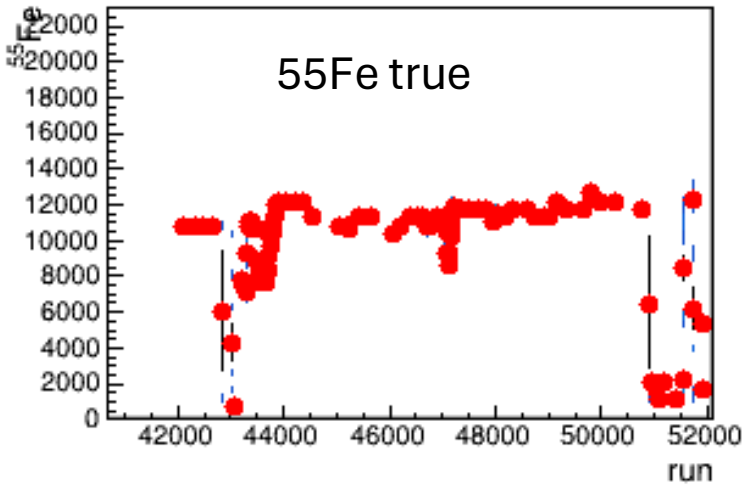
In Run4, the iron source is less collimated. When there is the iron source, the number of spots associated to LY30 and the LY30 value is less than the run without the source.

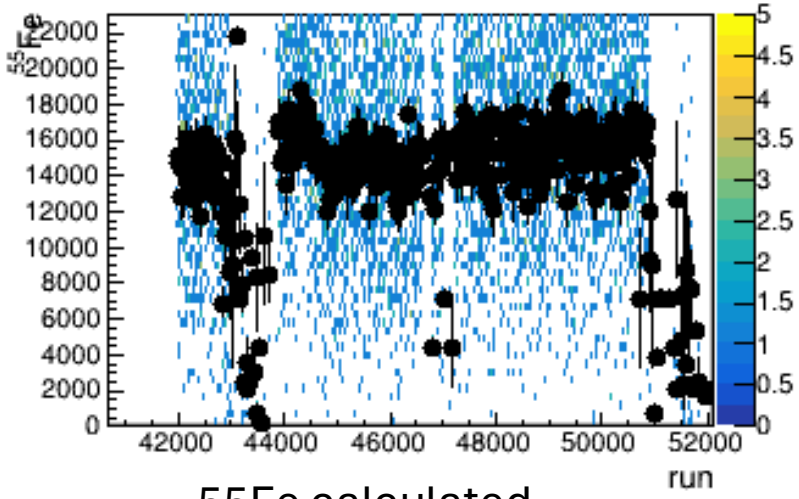
In red the run with the source at step 3

--> The same procedure used for the previus Run doesn't work for Run4

Even if I try to associate to the run with the iron source the LY30 of the nearest run without the source.







55Fe calculated