Update on PMTs

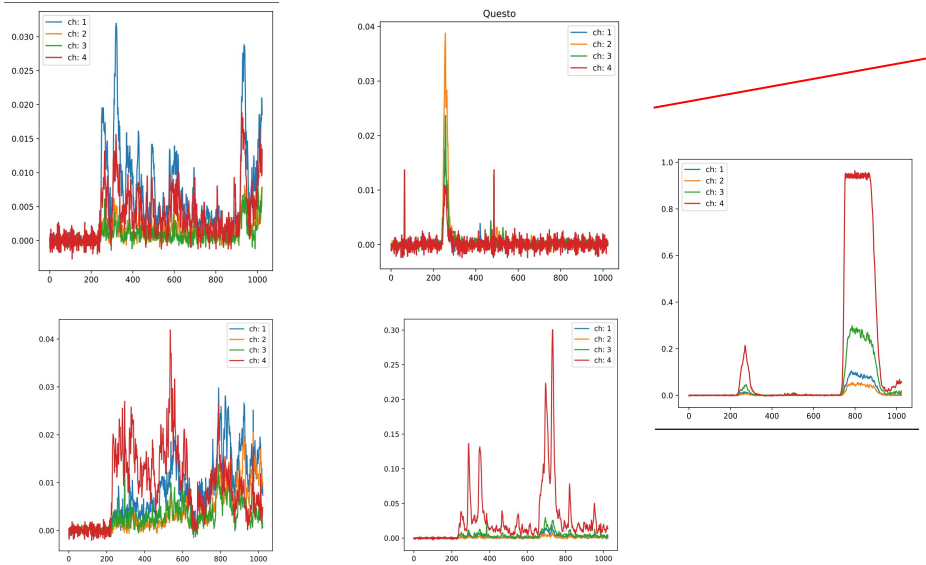
Reconstruction & analysis meeting

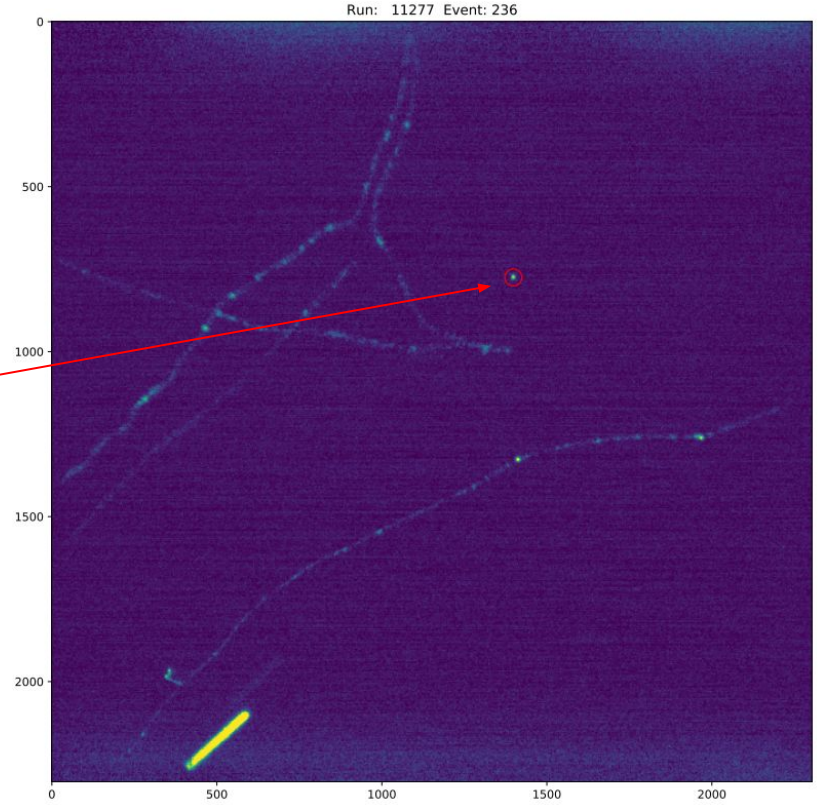
2023/04/27

A clean dataset

Goal:

Creation of a dataset of spotlike events for which there is a one to one association with the relative waveform





A clean dataset

Status

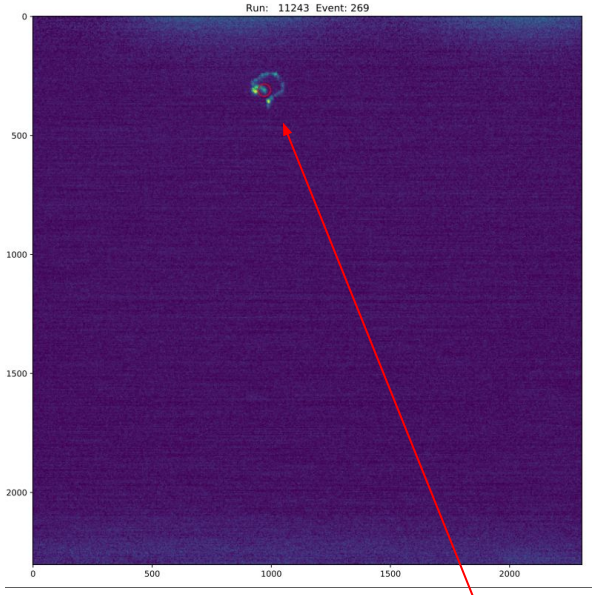
From now on we have a dataset of 530 events but it is constantly updated.

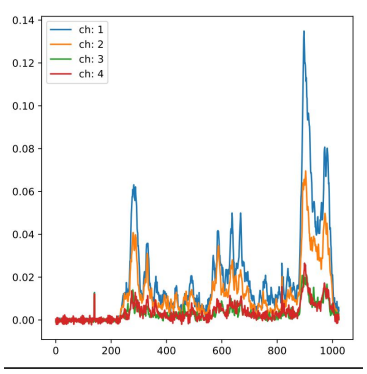
We have a rate of 3/4 clean events for run and a performance of ~95%

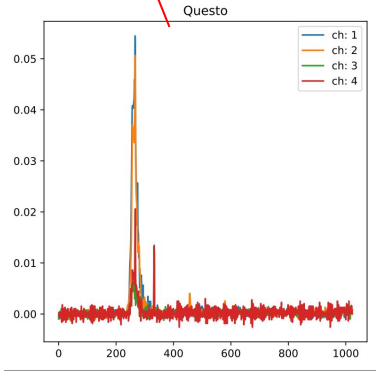
It means that the association fails for the ~5% of the points.

Next steps:

Increase the dataset and improve the performance of the association

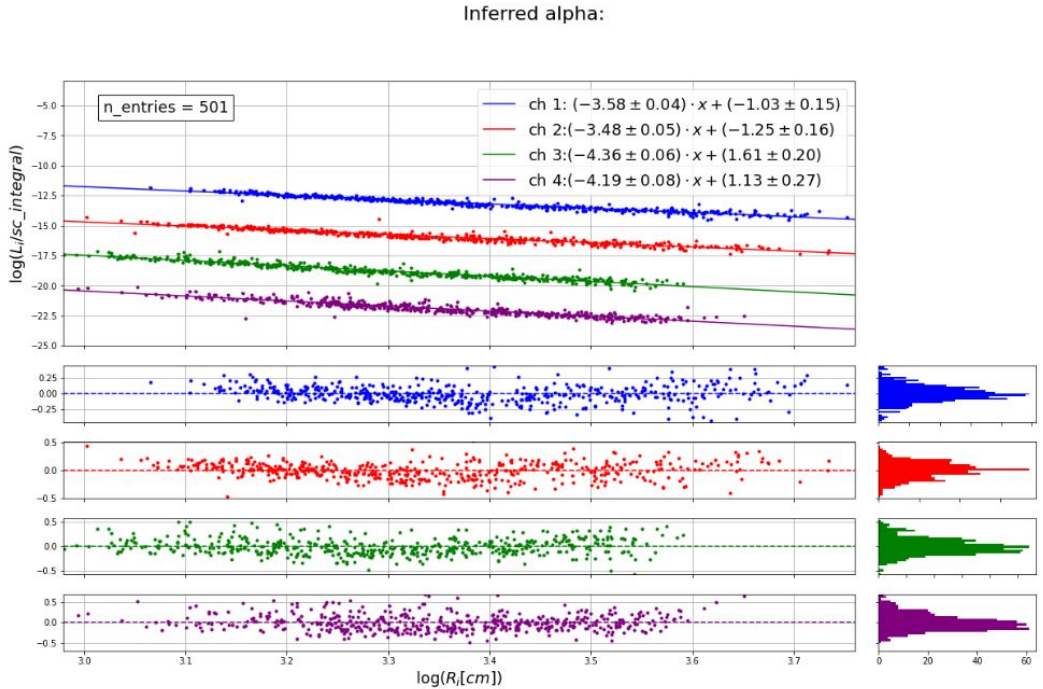






Analysis on the clean dataset

Once we can uniquely associate the position with the integral of the waveform (hence the charge), we are able to infer the power law used in the pmt reconstruction



Power law:

$$L_i = \frac{L}{R_i^{\alpha}}$$

Plot of the law in double log scale with the relative best fit performed by *scipy.optimize*

N.B: these are not the normalized residues but just the distances from the best fit

Analysis on the clean dataset

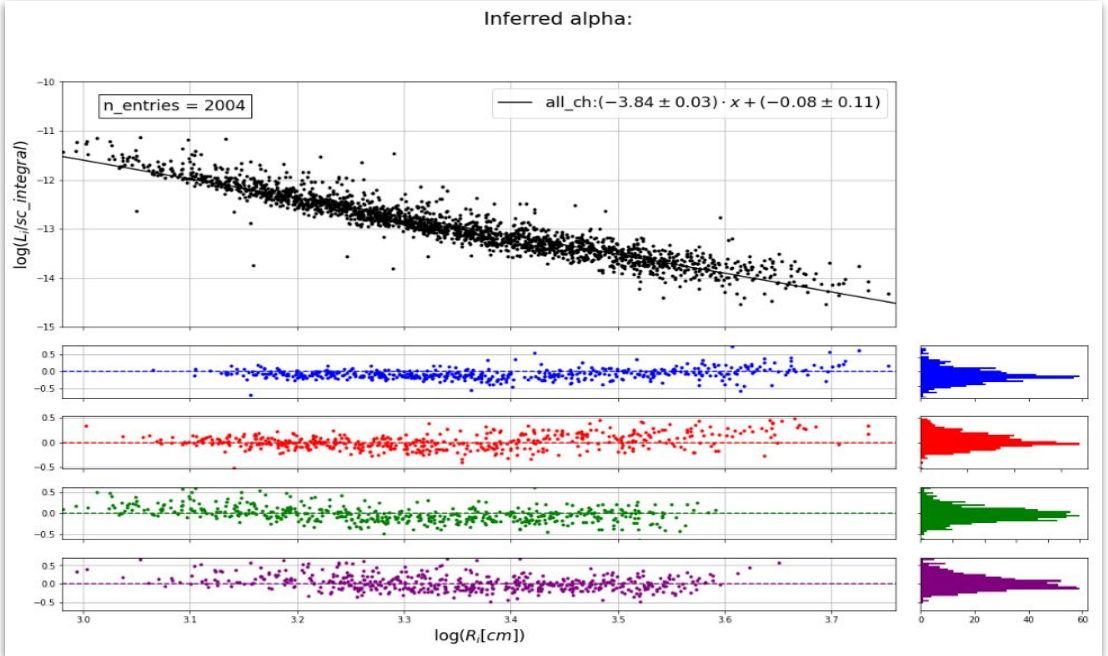
The problems of the previous fit are due to the wrong transformation of coordinates from the camera system to the PMTs one:

$$x_{pmt} = a \cdot x_{cam} + x_0$$

Is it just a linear transformation?

How much is the offset?

Using the pmt reconstruction algorithm we will be able to say much more about this.



Analysis on the clean dataset

Now possible to develop a supervised ML algorithm for the regression of the position and energy associated to the light signal

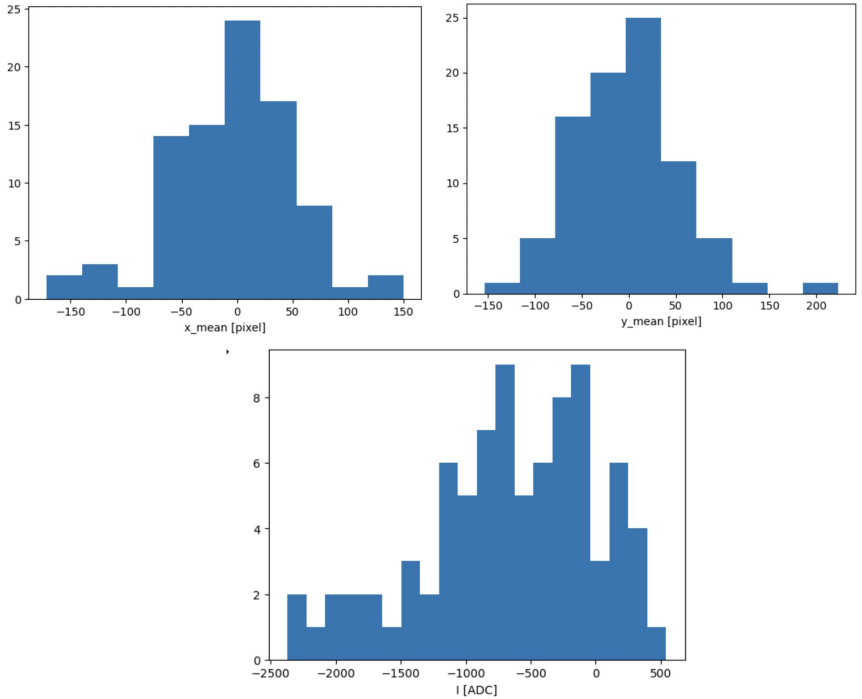
Preliminary network:

Layer (type)	Output Shape	Param #
dense_6 (Dense)	(None, 16)	80
dense_7 (Dense)	(None, 8)	136
dense_8 (Dense)	(None, 16)	144
dense_9 (Dense)	(None, 3)	51

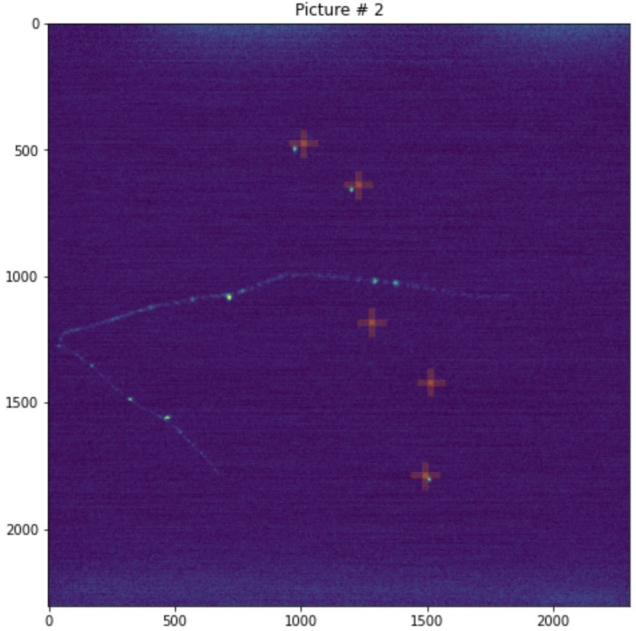
Total params: 411
Trainable params: 411
Non-trainable params: 0

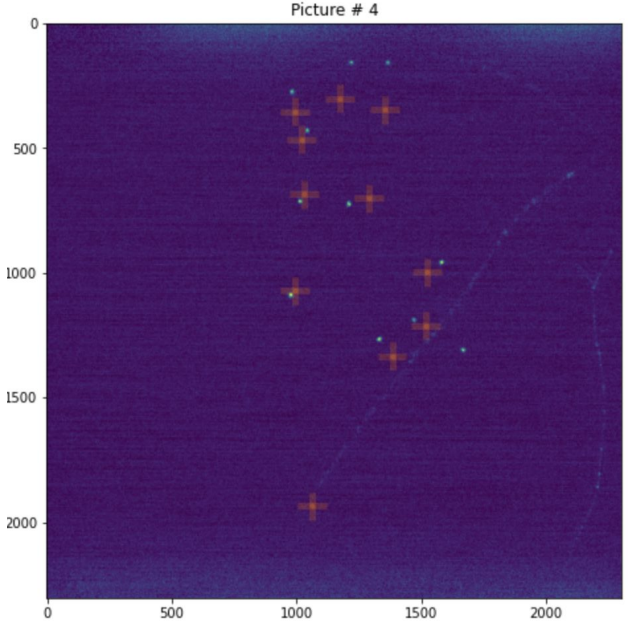
Training dataset: 440 points
Test dataset: 90 points

Performance on the test dataset



Analysis on the clean dataset





reconstructed
“shower”