

28-11-2018

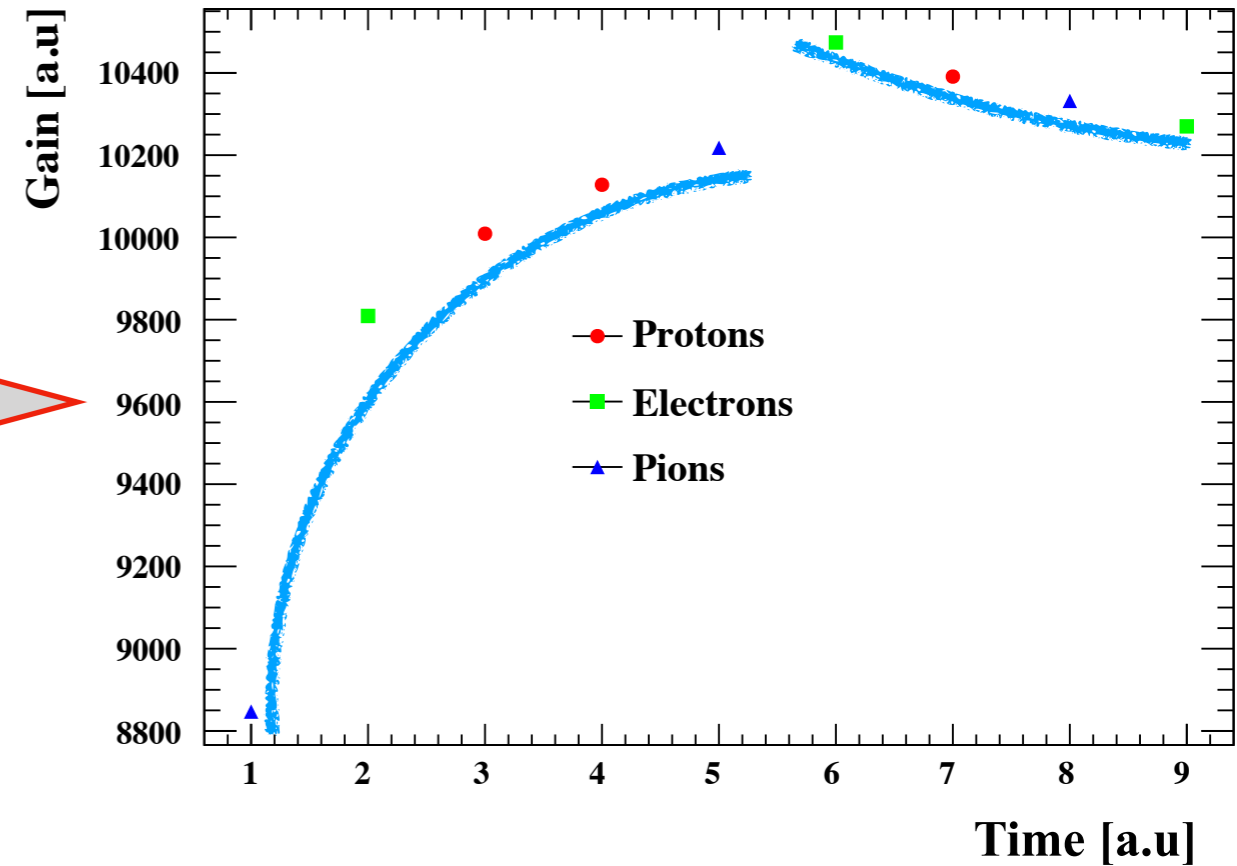
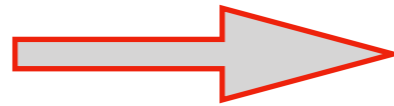
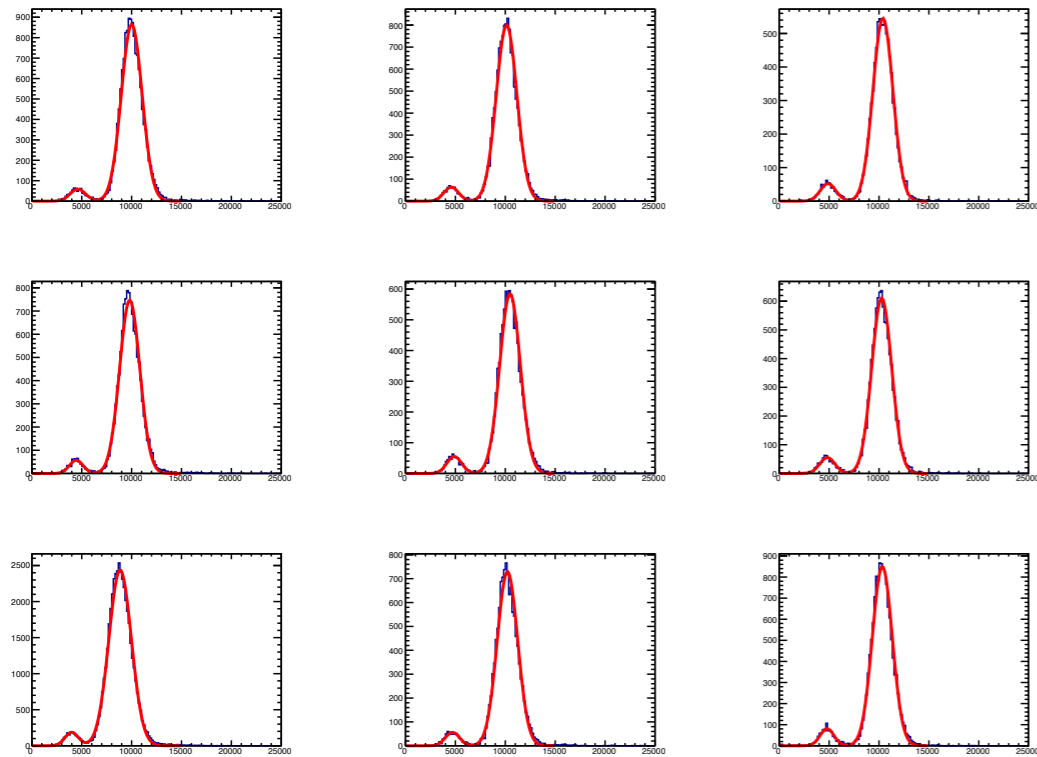
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# ND280-Up beam test data analysis

Resistivity, drift velocity and electron attenuation studies.

The purpose of this study is to investigate the gain evolution during the TPC Beam Test.

<sup>55</sup>Fe spectrum:



Using iron source the gain of the different runs we are working with can be analyzed.

Only the larger maximum has been considered.

Although it has not been done, it will be easy to compute errors.

Colors ( Beam types) are included for future discussion.

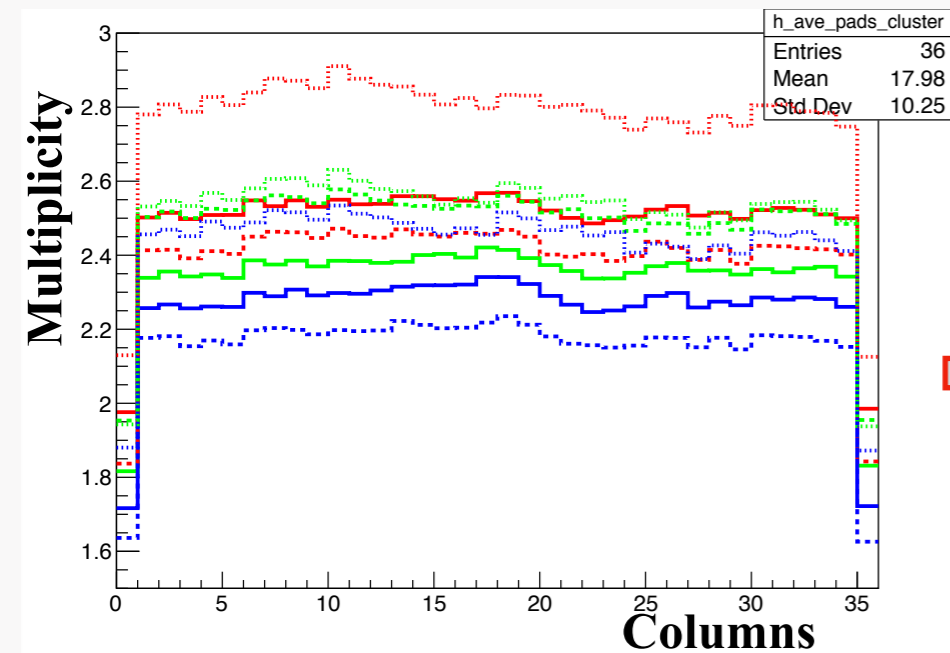
Two different 'epochs' highlighted in blue.

Change happens between run00380 and run00381, equivalently between measurements of pions and electrons at 30 cm.

# Resistivity studies

The purpose of this study is to investigate the resistivity of the read out plane across its rows and columns.

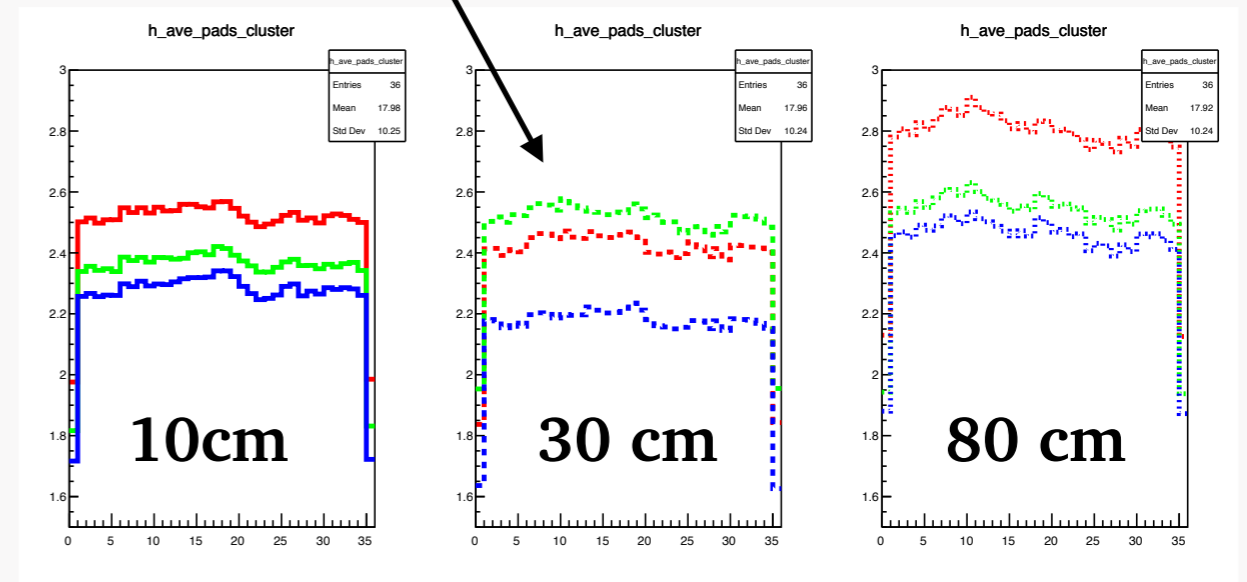
## BEAM:



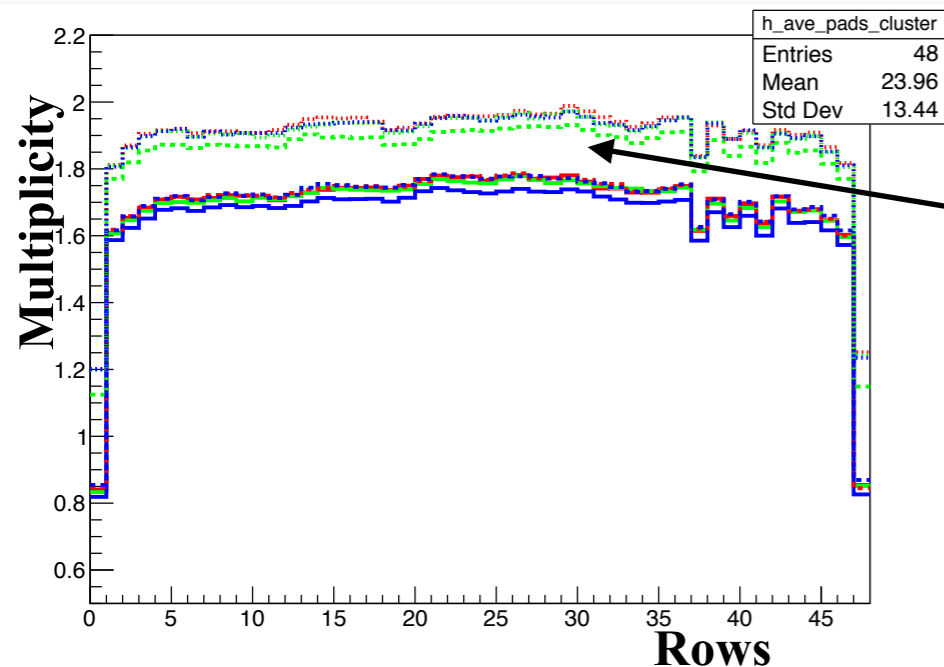
seen like this is very difficult to discuss:



There is a “change of tendency” for Electrons at 30cm!



## COSMICS:



There are 2 groups, well separated in time. Suddenly multiplicity goes up between pions and electrons at 30cm.

**Remark:**  
Correlation between results on gain and multiplicity between runs 00380 and 00381

**Remark:**  
It seems to be a ‘resistive’ pattern in the multiplicity both for rows and columns.

# Resistivity studies

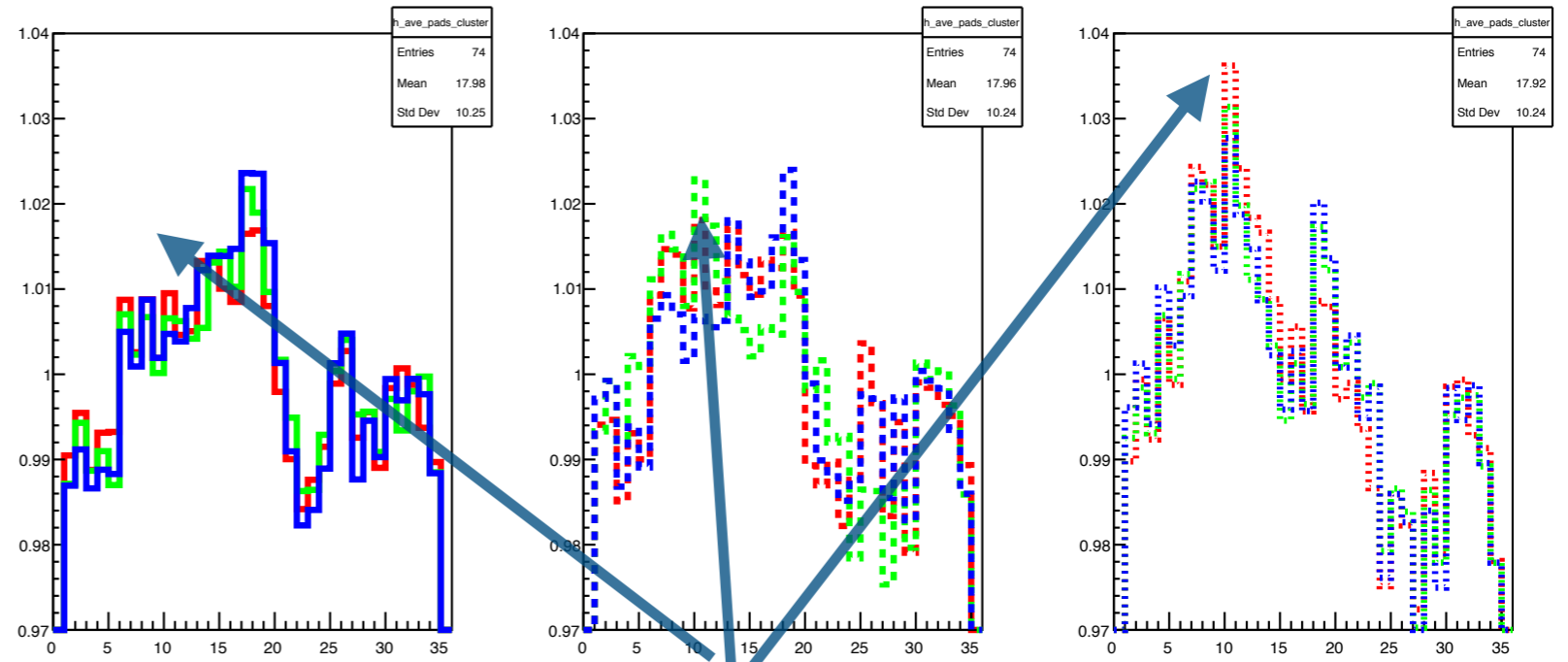
Let's focus on the resistive pattern. In order to do it, data is 'normalized' (first and last entries not considered to avoid bias due to border effects).

Normalisation:

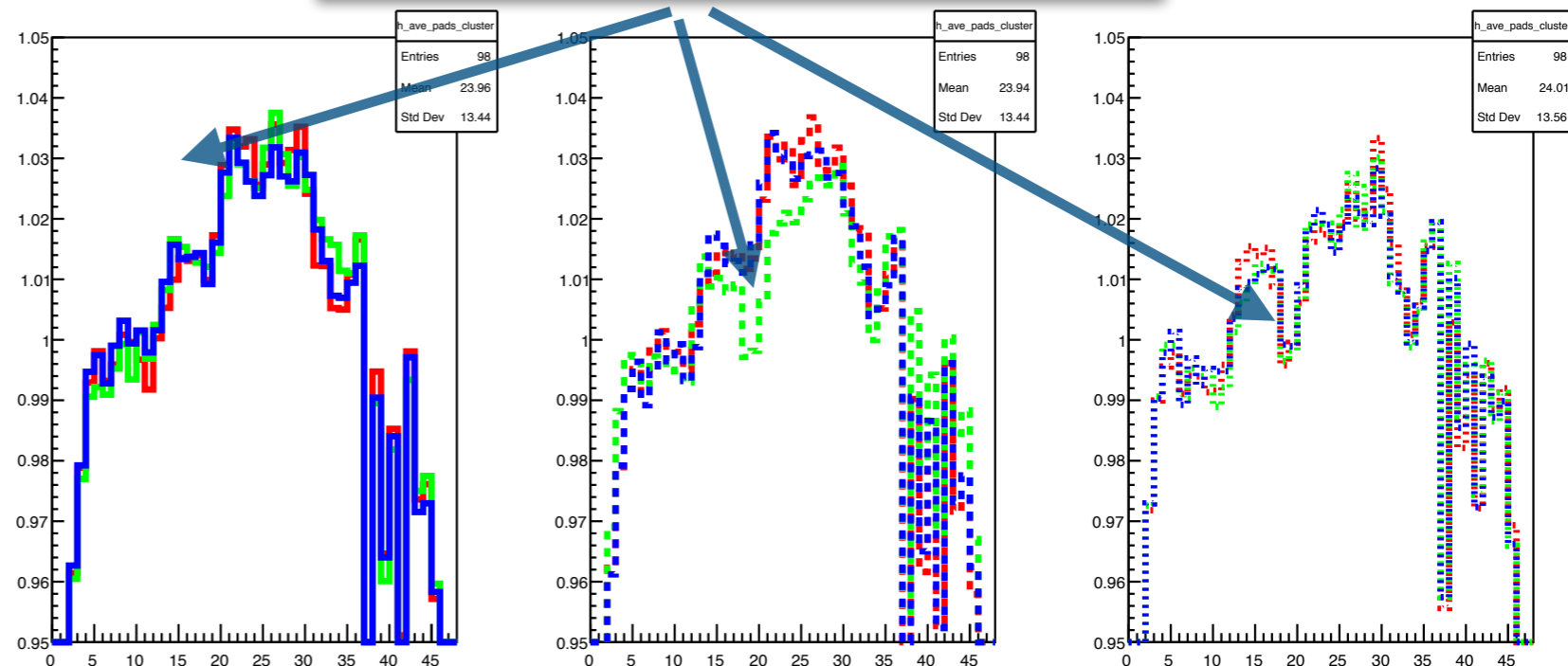
$$x_i^{norm} = \frac{x_i \cdot (N - 2)}{\sum_{n=1}^{N-1} x_i}$$

where  $x_i$  is each bin,  $N = 36$  for beam and 42 for cosmics.

This is the **third** confirmation that something occurred between Electron and Pion runs at 30cm



The pattern changes clearly between runs 00380 and 381. The 'resistive' pattern is not due to (at least not only) inhomogeneities in the resistive foil.

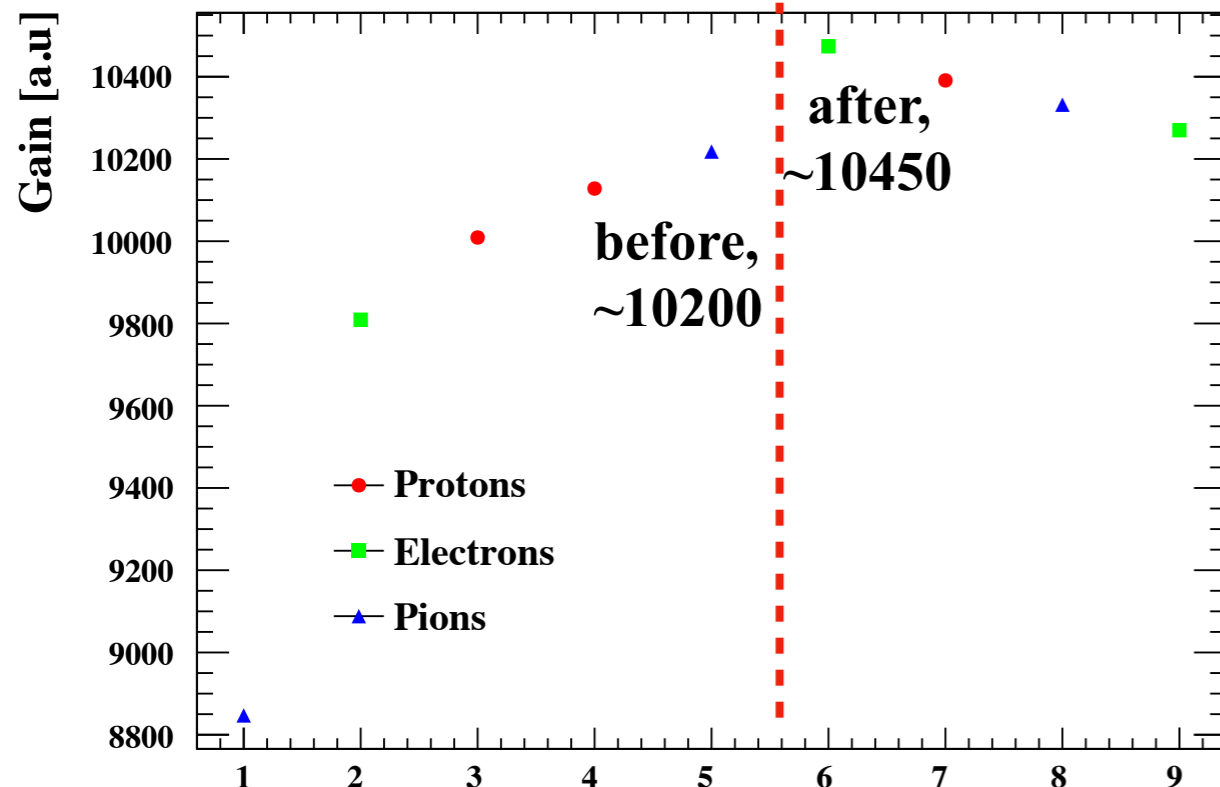


# Resistivity studies

So far I had no access to Elog. However, I looked for a possible explanation into google spreadsheet used to summarize TPC Test Beam runs. I found this:

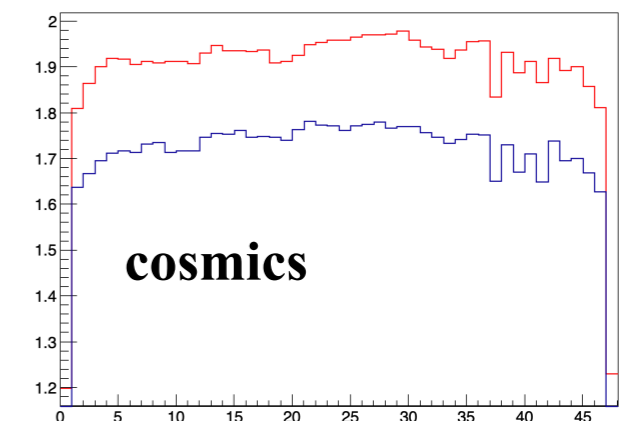
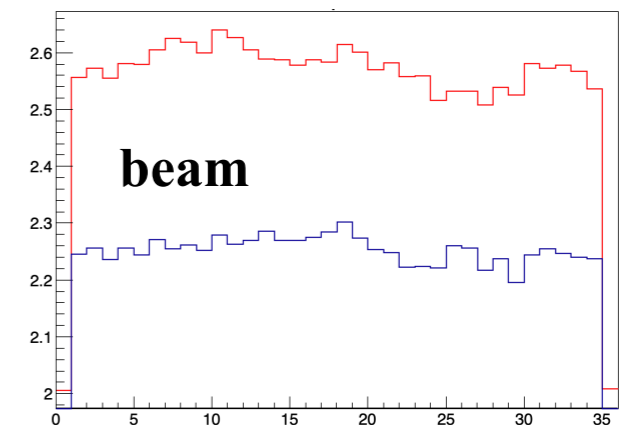
40	380	10:02	10:49	+0.8	pion, CR	13.3k	
41	381	10:49	11:56	+0.8	e, CR	20k	
42	382-383	12:20					pedestal run
43	384	12:30		+0.8	e, CR	80k	
44	385	17:20	17:24	+0.8	p	485	moved MM closer to beam

In case the 'problem' is coming from the change in pedestal run, the differences must arise in run381 vs run384. Notice that 80% of Electrons at 30cm were taken with new pedestals run.



Computed for each run before and after of pedestals run.

run 381:  
Gain [a.u] = 10225  
run 384:  
Gain [a.u] = 10558

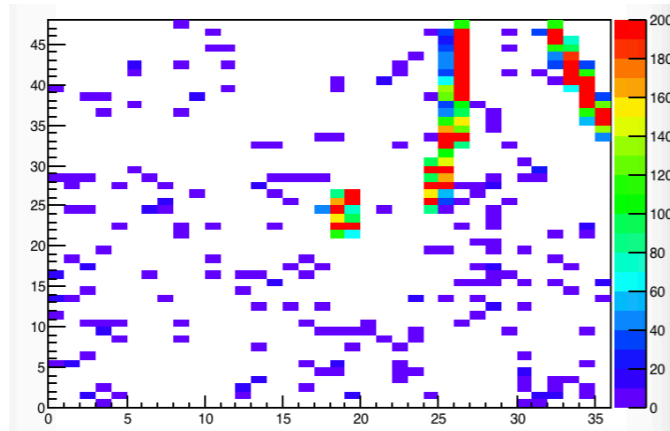


# Drift velocity

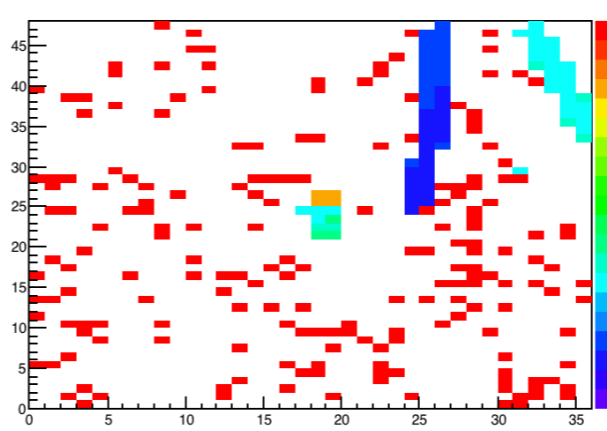
The purpose of this study is to investigate the drift velocity along the Beam Test data acquisition.

A dedicated selection has been developed to select tracks crossing the anode or the cathode.

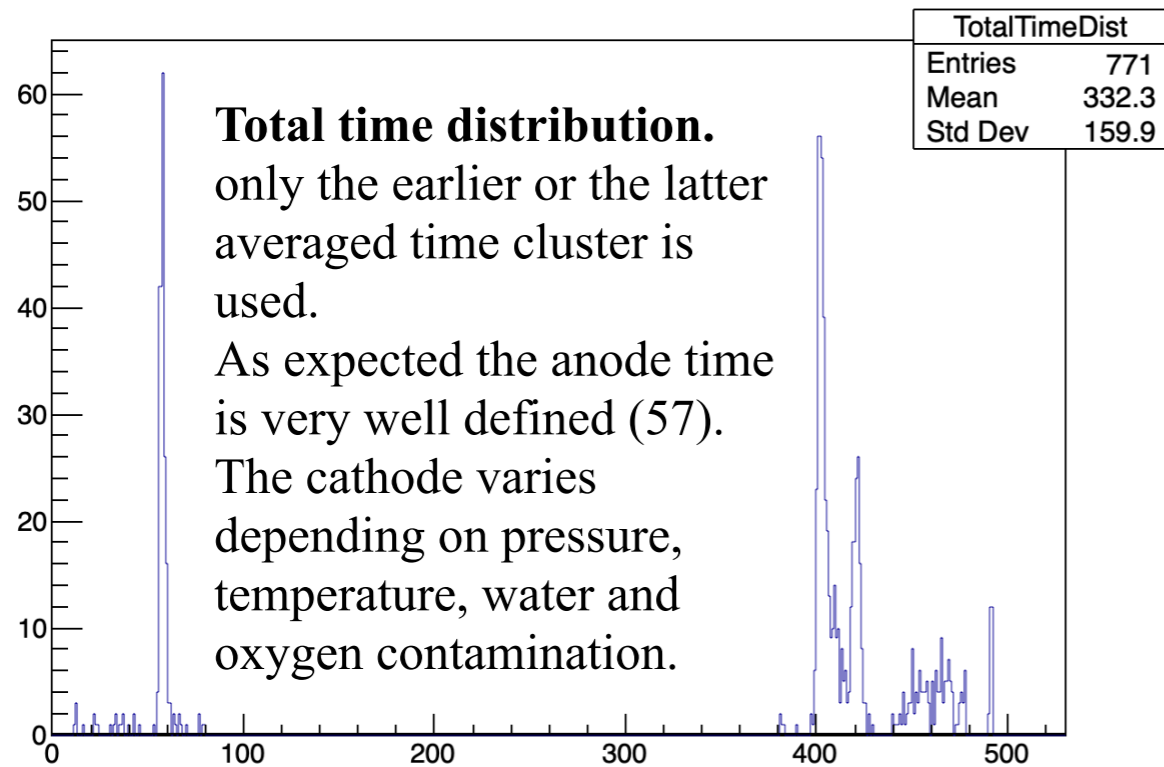
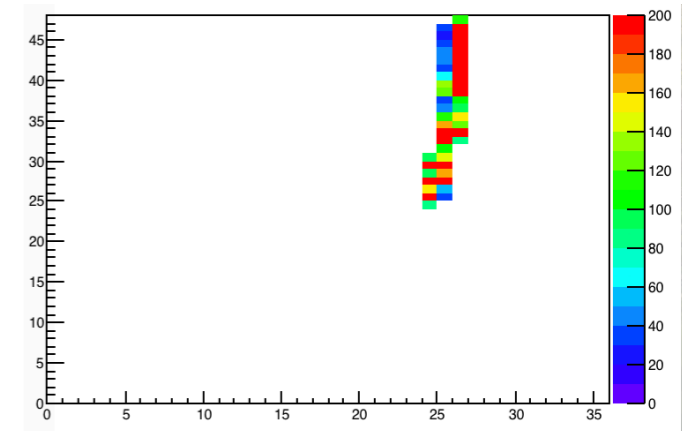
Original Charge Event



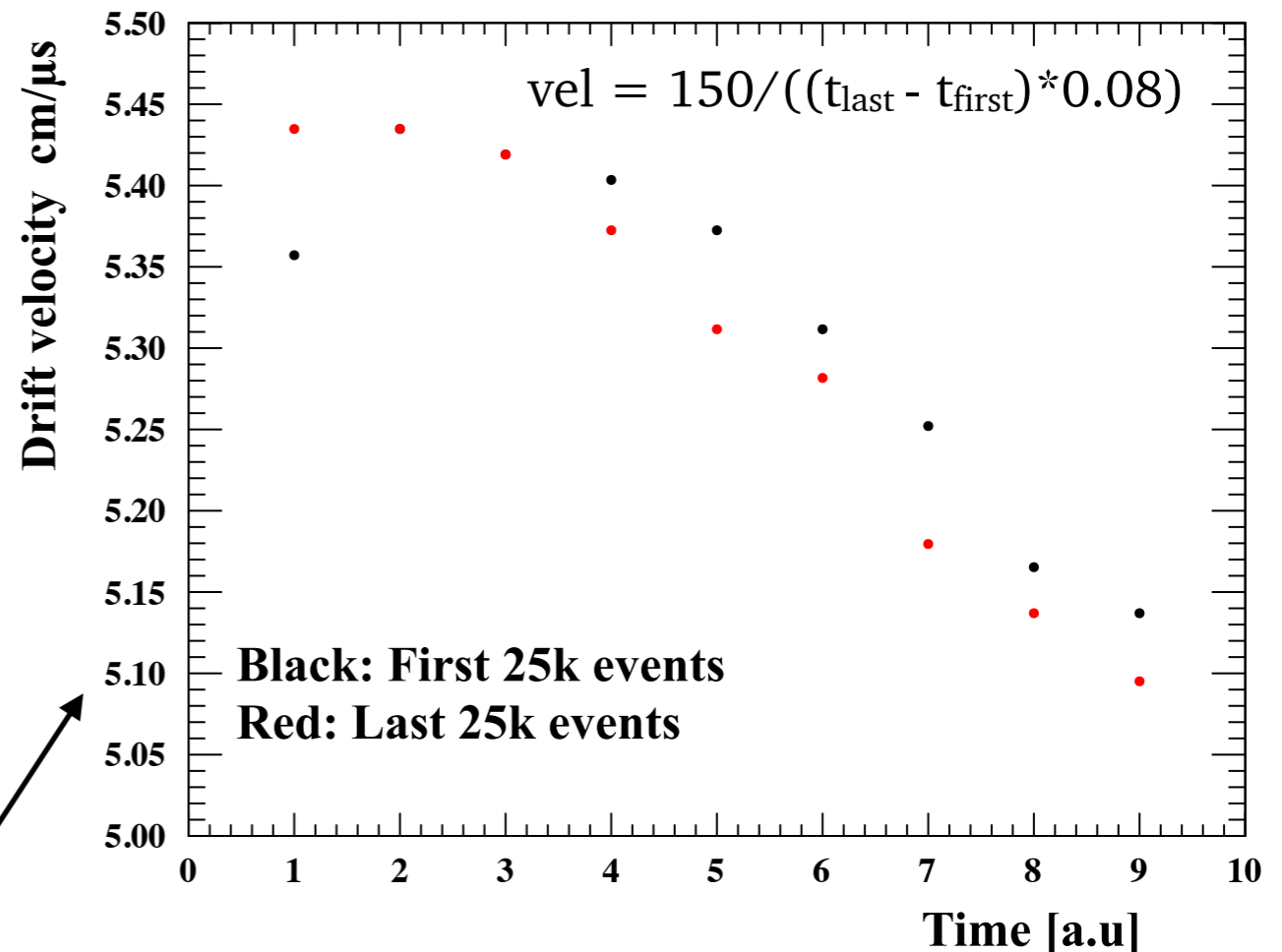
Original Time Event



Selected Charge Event (same time as original)



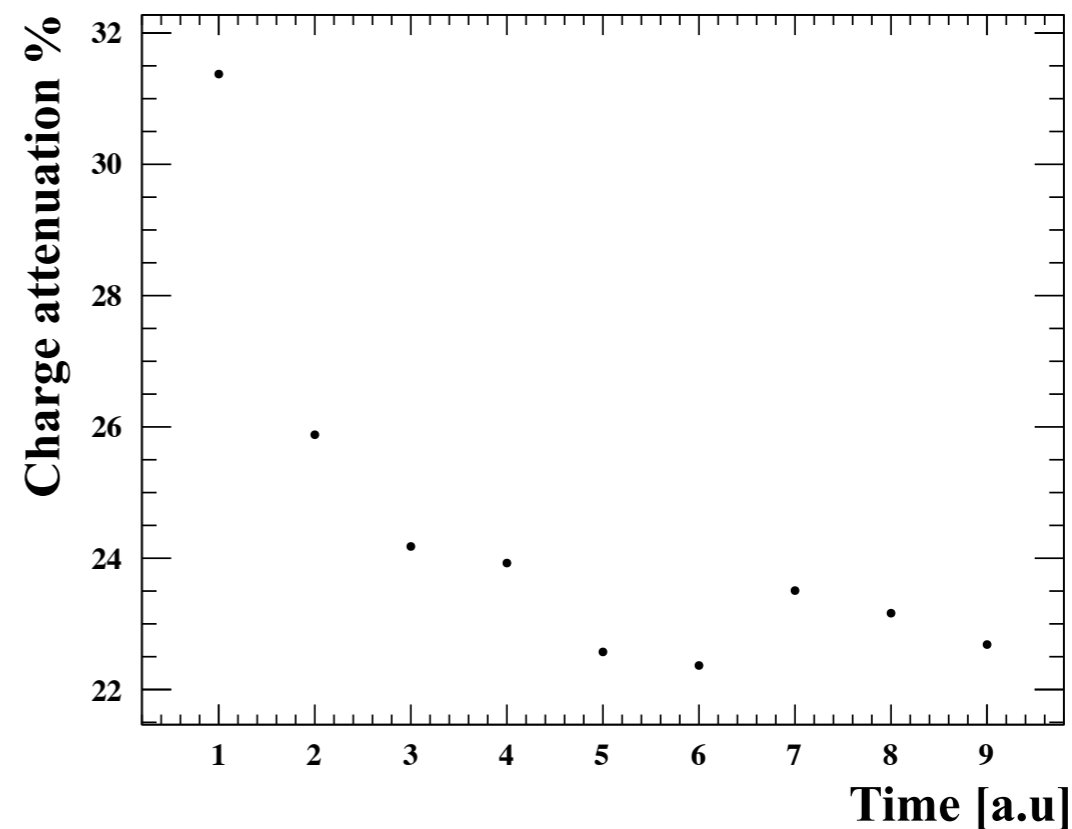
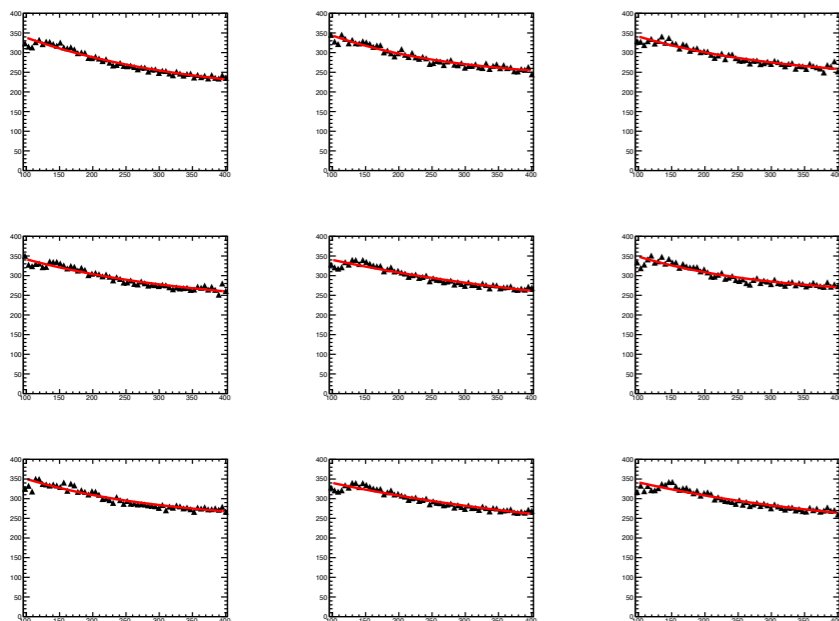
drift velocity has been computed every 25k events in each data-sample. It shows a trend.



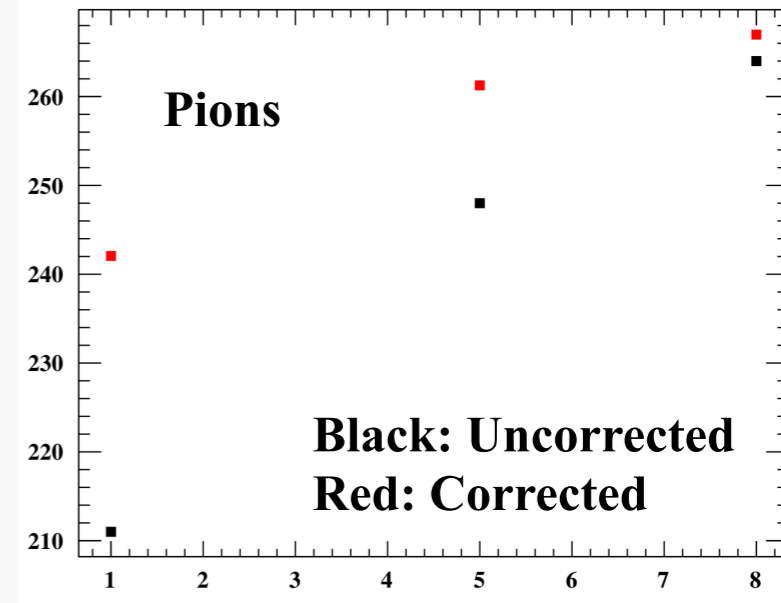
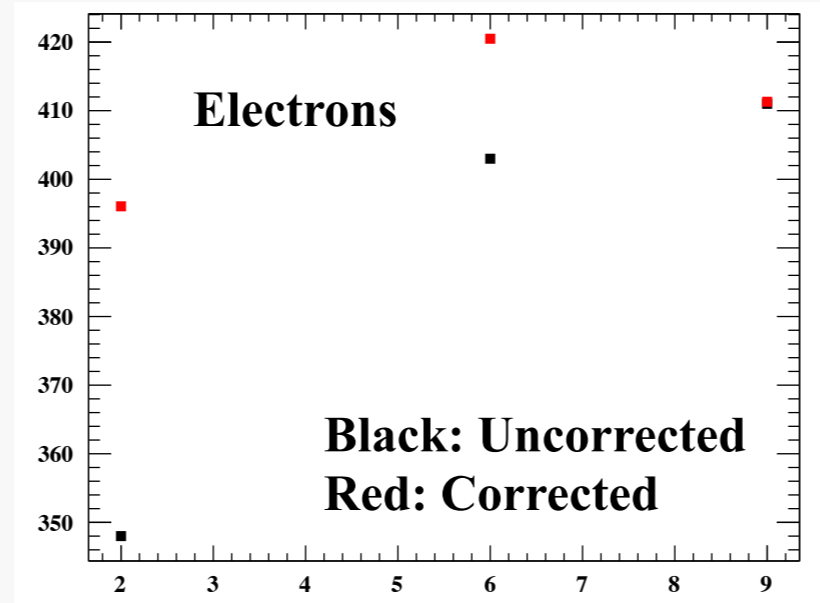
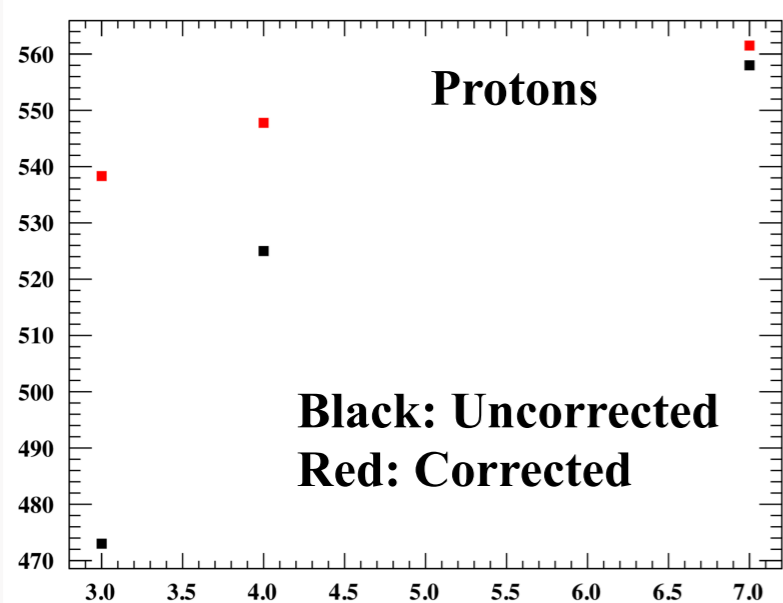
# Electron attenuation

The purpose of this study is to investigate the electron attenuation (oxygen contamination) vs distance to MM.

Average charge per cluster vs distance for all datasets:



Preliminary results:



## Conclusions

- The experimental conditions were significantly different for the first dataset (pions at 80cm).
- In general a common trend in drift velocity (reduction) and electron attenuation (reduction) is observed, pointing out a continuous improvement of the experimental conditions.
- It is possible to observe a clear change in the gain of the MM from run00381 and run00384, apparently, due to some activities related with a pedestals run ( **$5\sigma$  to  $4.5\sigma$  or  $4\sigma$** ). It is necessary to search for more information in Elog. (**Ongoing**)
  - Wouldn't be better to use only run00384 for Electrons at 30cm?
  - We used  $\sim 150$  events for pedestal runs. Not enough statistics?

## To Do:

- Correct  $dE/dx$ .
- Study diffusion.
- Compute spatial resolution with corrected Electron's run.
- What plots do we want to present?  $\longrightarrow$  Replace arbitrary units with true units.
  
- Move back to spatial resolution and waveform studies?
- Analyze muon's datasets. Compare cosmics and beam results.
- Suggestions?