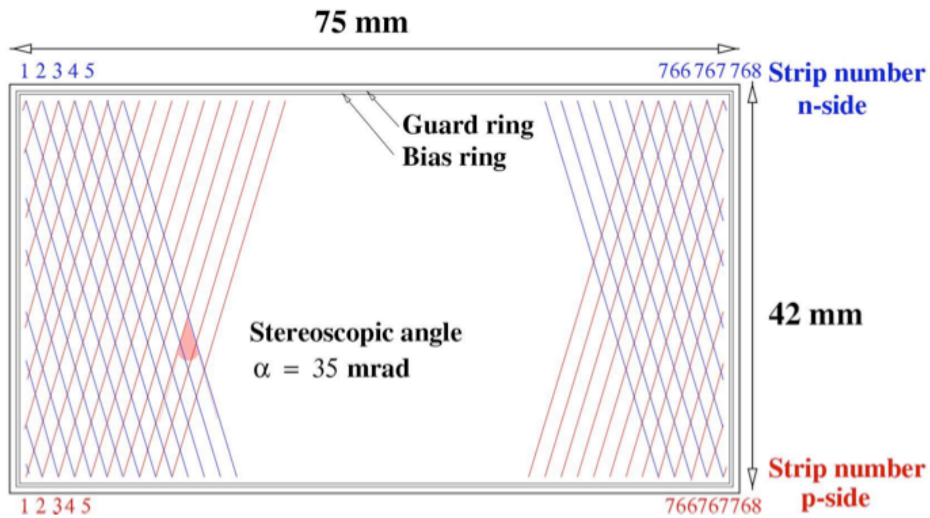
Ssd calibration
Tasks to be done for the next run

- List of tasks from Lilian (Januar 31th)
  http://www.star.bnl.gov/~lmartin/ToDoList.html
- Gain calibration
- Pedestal calibration
- Alignment

Gain calibration

- Since SSD wafers are double sided silicon detectors, slights differences of the signal to noise ratio and clusters pulse heights are observed.
- Causes :
  - the n-side wafer exhibit a higher noise than the p-side
  - Different power supply/ biasing system (wafer, ladder)
  - Read-out chain

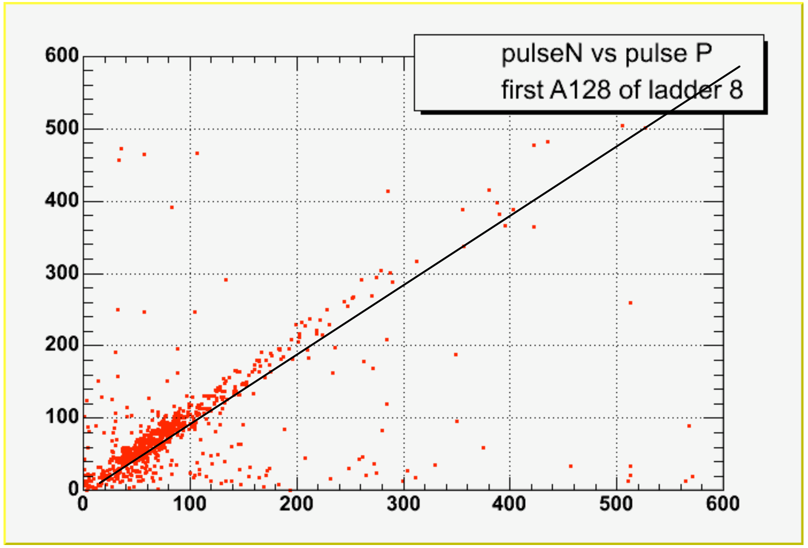
- The angle between the strips on P and N side is a compromise between the spatial resolution and the efficiency of hits reconstruction but it leads to ambiguous hits too.
- Then the matching of the signal amplitude on both side of each wafer is used to solve ambiguous hits [1]
- But for using the matching, the correlation between signal of the p-side and the n-side is needed first



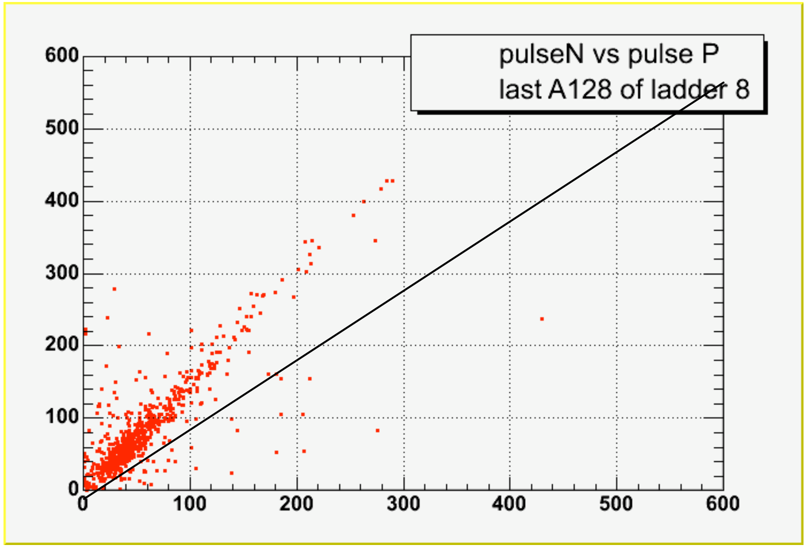
[1] *starnote 0421*

Exemple

The 2 plots represent the pulseHeight on N side vs pulseHeight on P side for 2 chips of the same wafer.



Charges matches



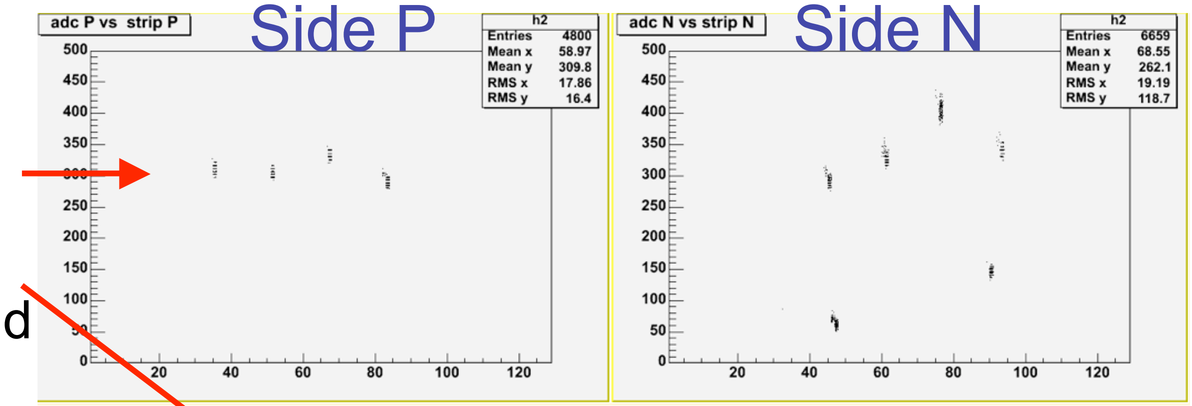
Charges don't match

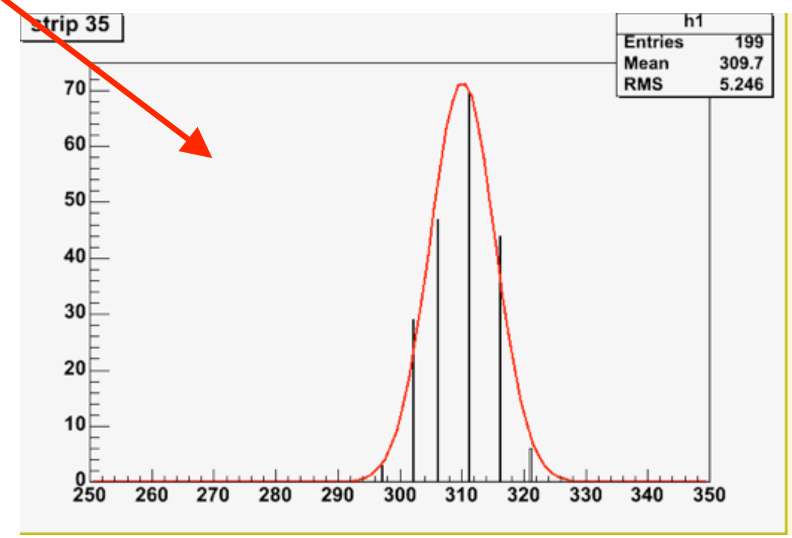
→ Chips need a gain calibration

Calibration with pulser

We did the gain calibration with pulser run : it is a suitable signal injected via the internal generator integrated in the ALICE128c chip

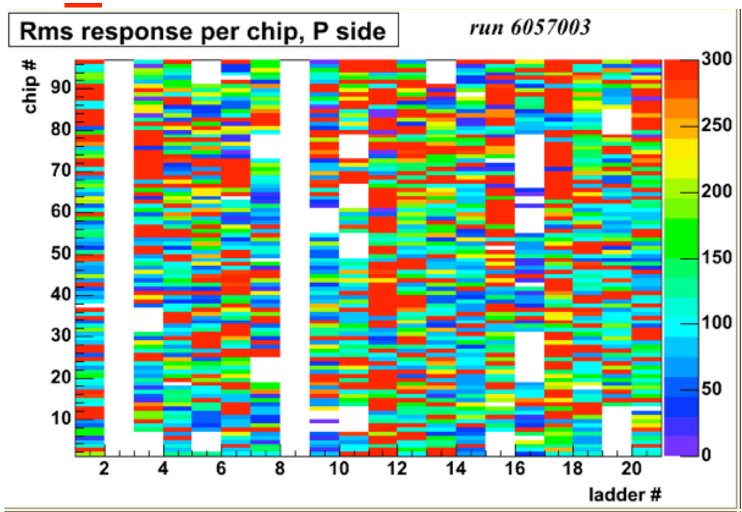
- **Method** :
  - For each a128, we have 4 strips fired by the pulses.
  - Gaussian fit for each strips separately in each a128 and for each side.
  - « Tot_adcP/N »= Sum of the mean of the fit for the 4 strips.
  - Ratio=Tot_adcN/Tot_adcP
  - 20 ladders*16 wafersx*6 chips = 3840 ratios to calculate



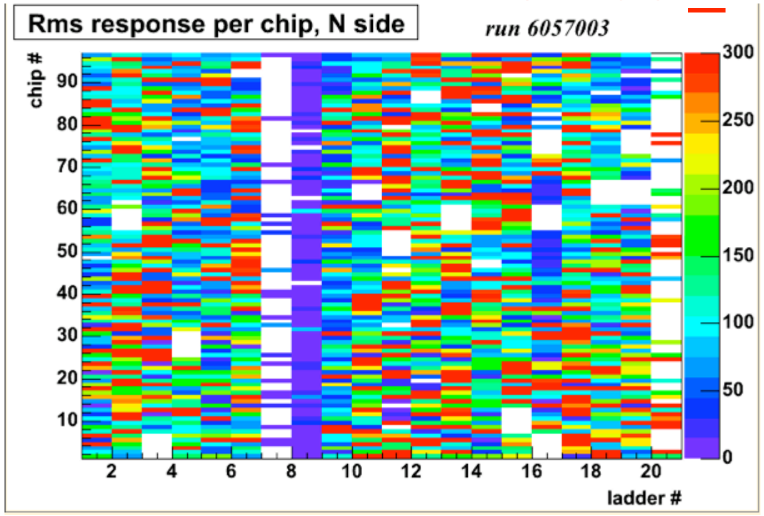


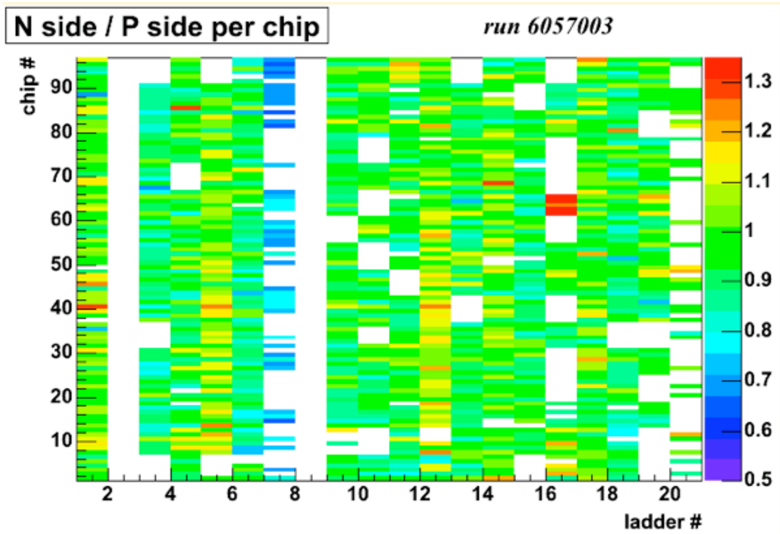
Results

TotAdc _P



TotAdc _N





Ratio

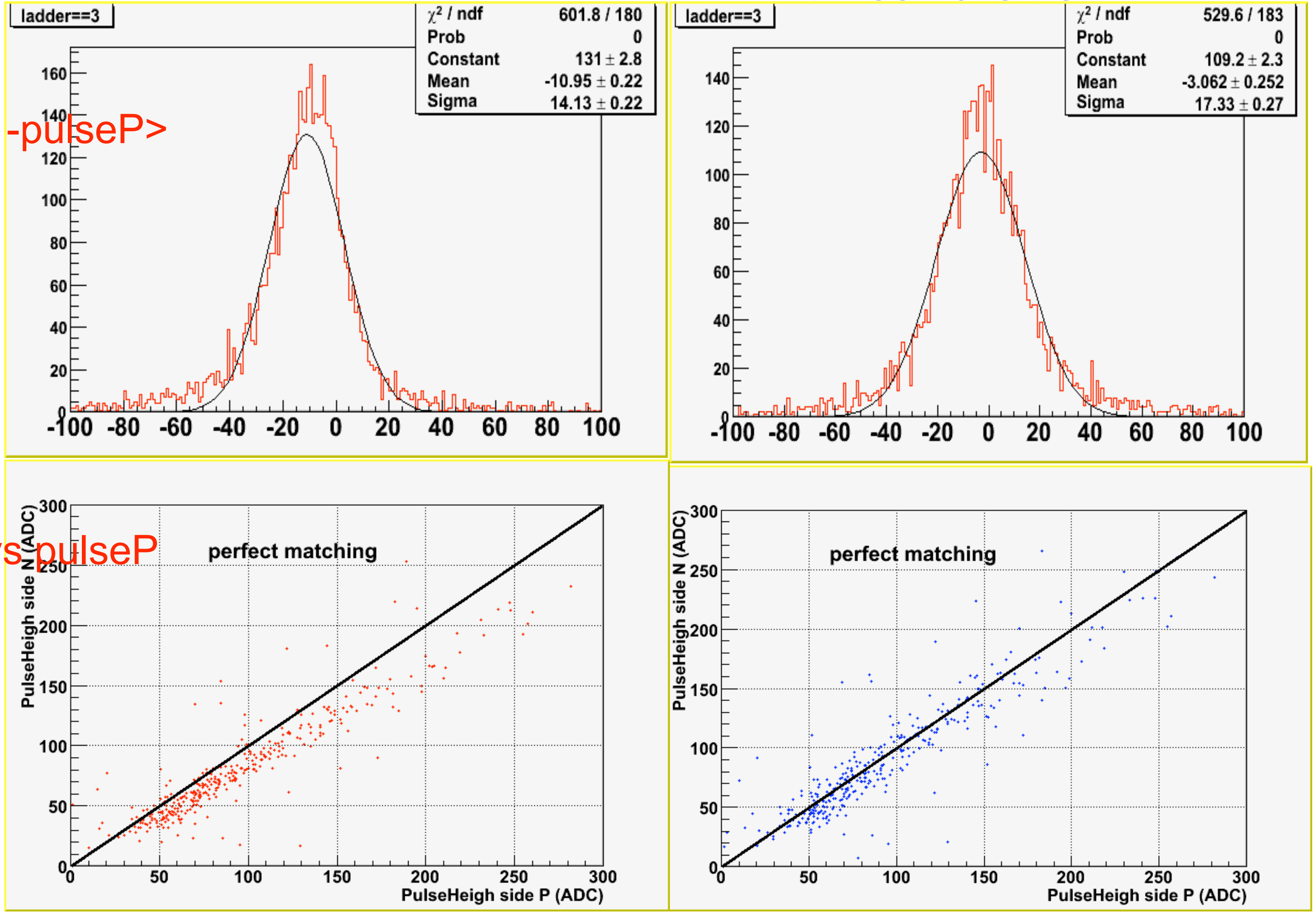
- Ratio ~ 1
- Stable vs time
- Work of Jerome Baudot : http://www.star.bnl.gov/~baudot/ssdWork_main.html

- This is what I get when I apply the ratios obtained by Jérome.
- It represents the mean difference of the signal between the 2 sides and the correlation between
- Until now, I put all the ratios in a text file and add the correction at the strip level ,eg for each strip on the N side, instead of writing its adc, I write adc_N = adc_N / ratio

Without calibration | With calibration

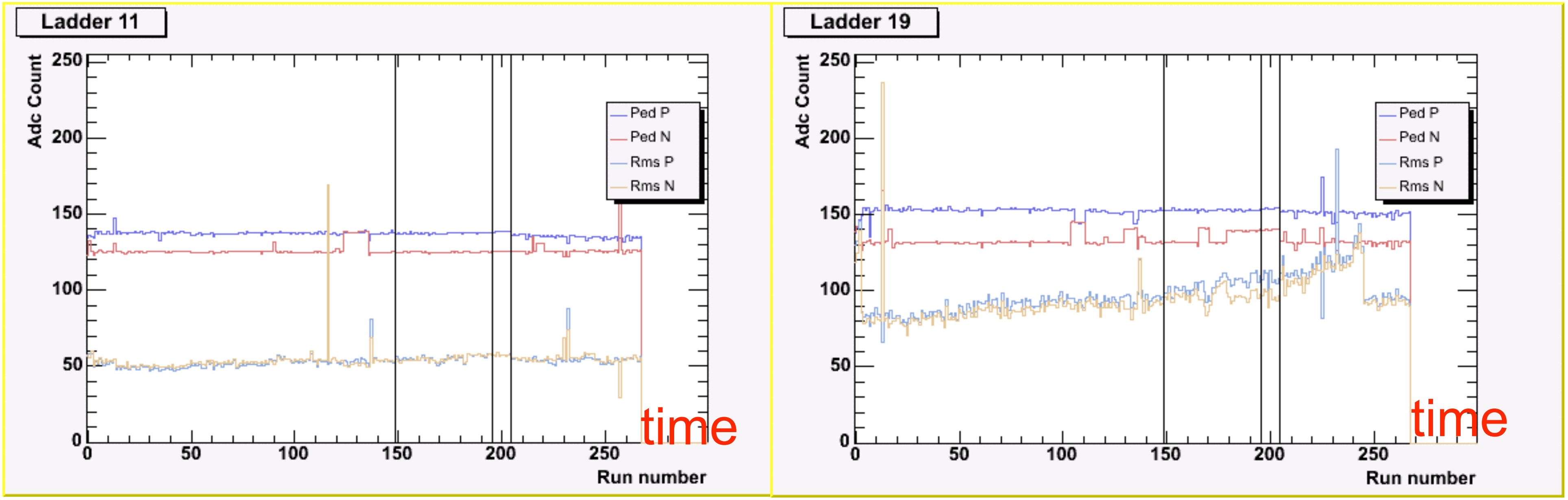
<pulseN -pulseP>

pulseN vs pulseP



Pedestal Calibration

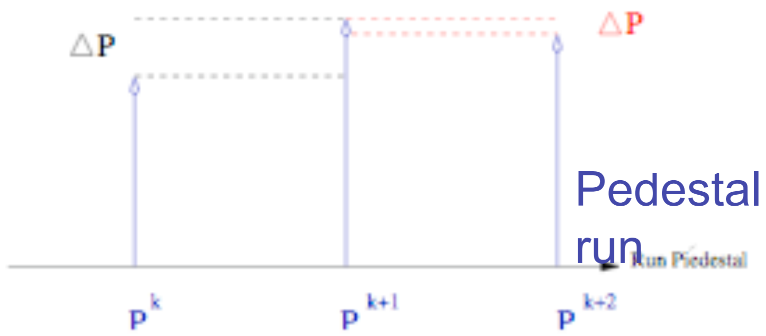
The 2 plots represent the noise and pedestal vs time for the P-side and N-side for 2 ladders.
Each point represent the mean pedestal of the strips on each side. (run V)



- We can see different behaviours : the noise of ladder 11 is quite stable during the time whereas the one for ladder 19 is increasing.
- The poor performances and stability seen for some ladders in terme of noise level come from the specs of the decoupling capacitance on the ADC board were overestimated.

Stability of the pedestals/noise

- For the run V we only stored in Database 4 pedestal run over ~250 pedestal runs .
- It represents (4 * 500000 entries)
- The others are in /star/data06/SSD/pedestal_calibration/run5/
- We cannot store all these files in Db.
- Idea : see how the noise and pedestal evolve in order to update only the strips that have to.
- What I tried to do first is a selection of the pedestal runs that are significant (high fluctuation of the pedestal of the strips).



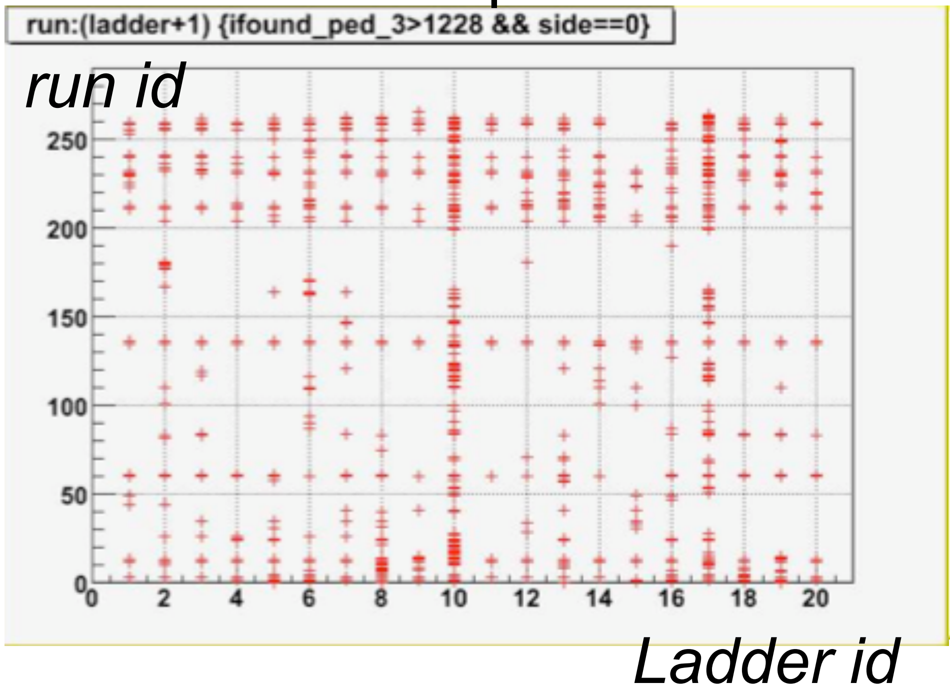
$\Delta P = (Pedestal^{k}_{j} - Pedestal^{k+1}_{j})$
j : strips in ladder
k : run pedestal

Cut on ΔP > 1, 2, 3, 5, 10 ADC

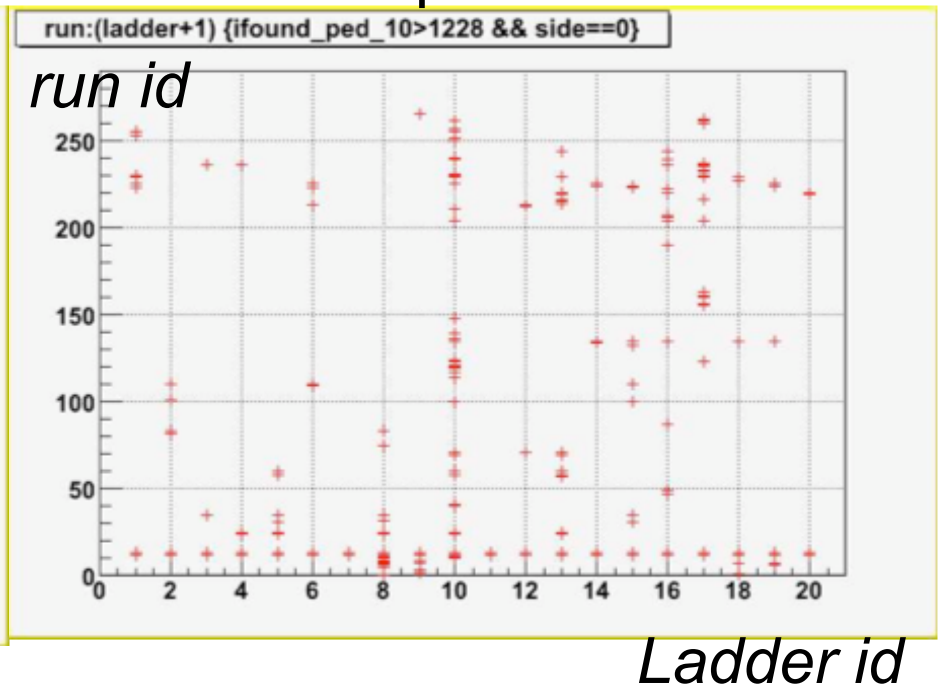
I plot then the run Id vs ladder where a certain percentage of strips per ladder (N) satisfy this condition

Example : N =10 % Δp = 3 ADC : each cross in this plot represents a ladder where 1288 strips or more (10% of the strips per ladder) which their pedestal fluctuated by a value of 10 adc between 2 consecutives runs.

N =10 % Δp = 3 ADC



N =10 % Δp = 10 ADC



❖The value of the cut on adc, fraction of strips that we ‘allow’ to fluctuate are still to be defined .

Alignment

- The alignment of the SSD has been studied using real data taken during the run V.
- Tracks in the TPC (and SVT) and hits in the SSD have been reconstructed. A Maker (copied from a SVT Maker) has been developed to determine geometrical shifts based on the hit to track residual distributions.
- From that study, one has found that the SSD in Run V is shifted by about 4 mm in X, 200 microns in Y and 1 mm along the beam axis with respect to the geometrical center reconstructed offline. The SSD is also rotated around the beam axis by about 1 dgr.
- Global alignment has been performed on Cu+Cu 62 GeV data using TPC(+SVT) ITTF tracks.
- Global misalignments (translations and rotations) have been introduced for the barrel and the sectors as well as individual misalignments for ladders and wafers.
- Technique: Plot residuals in x, y against phi, z
- Residual dx = x_local(track) - x_local(hit)
- Residual in x (drift direction), y (along the beam axis) are expected to be distributed around zero.
- Survey data have been compiled and introduced in the alignment procedure

Summary

- Alignment procedure has to be done
- As the gain calibration hasn't been used for the cucu data, we have to do it again with the data of the run 7.
  - Fast : only need a pulser run, the procedure that calculates the ratios uses a dedicated maker
  - Frequency ? The stability was only studied for runs that were separated of fews days.
- Pedestal calibration has not been done for run 5
  - As in run 7 full data set with SSD will be used (I think), then the pedestal calibration has to be envisaged.