ECAL Test Beam Results: Trigger and Energy Calibration

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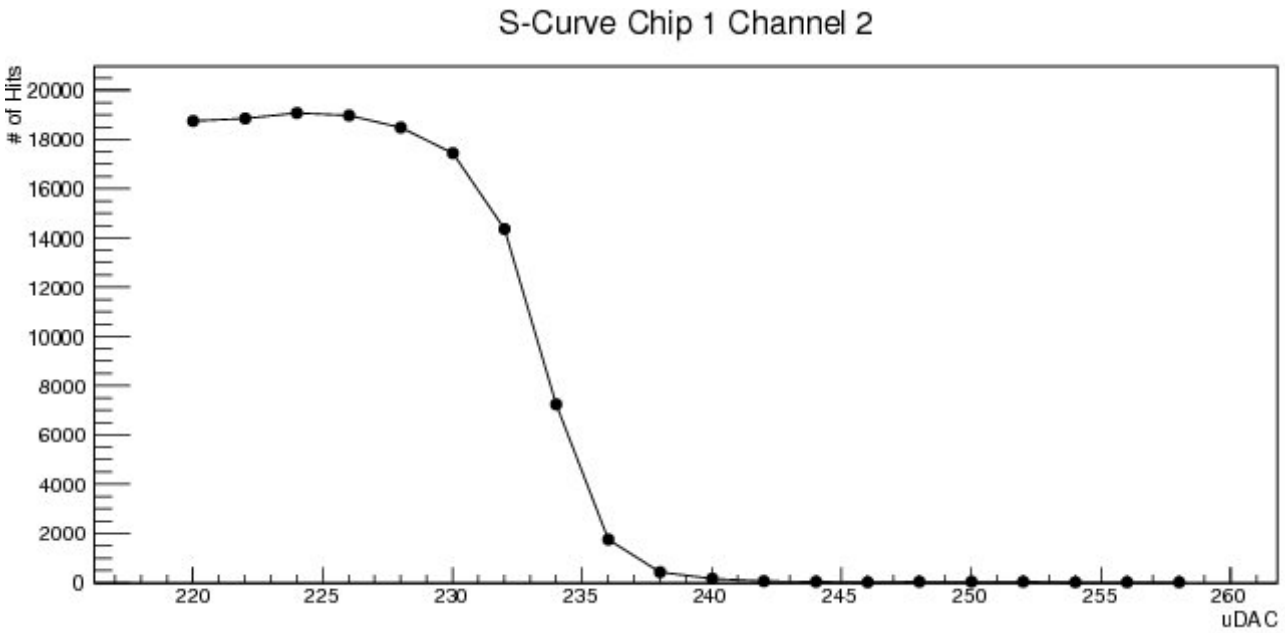
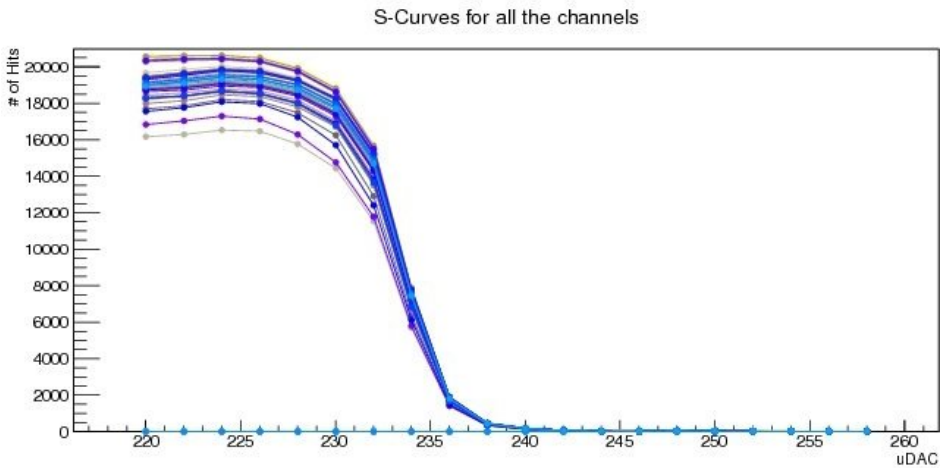
Outline

S-Curves



1. To start the data taking we should set the trigger threshold just above the noise.
2. To choose the good DAC value link to this threshold we plot S-Curves.
3. We choose the DAC value in order to not trigger on the noise.

S-Curves



1. We plot the S-Curve for all the channel.
2. The criteria to choose the DAC value was:
   $N(uDAC) < 1\,\% \times N(220)$
3. Like the channel by channel adjustment is to small we had to choose one DAC value by ASIC.

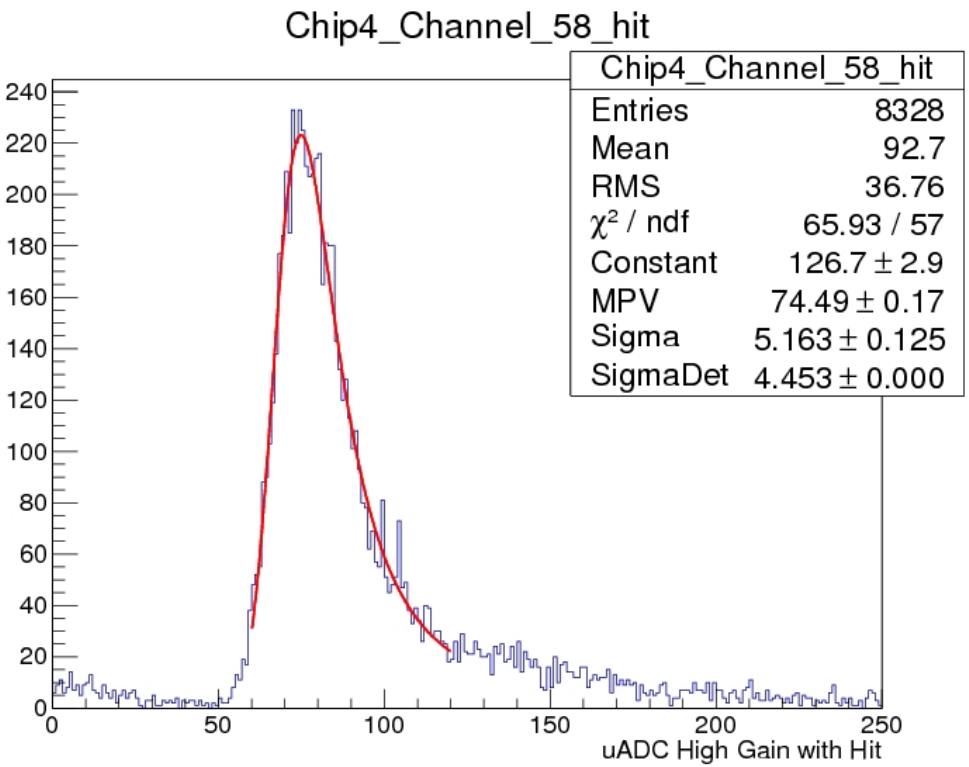
The MIP Calibration

Goals of the MIP Calibration

The calibration process goal is to equalize the response of all the pads.

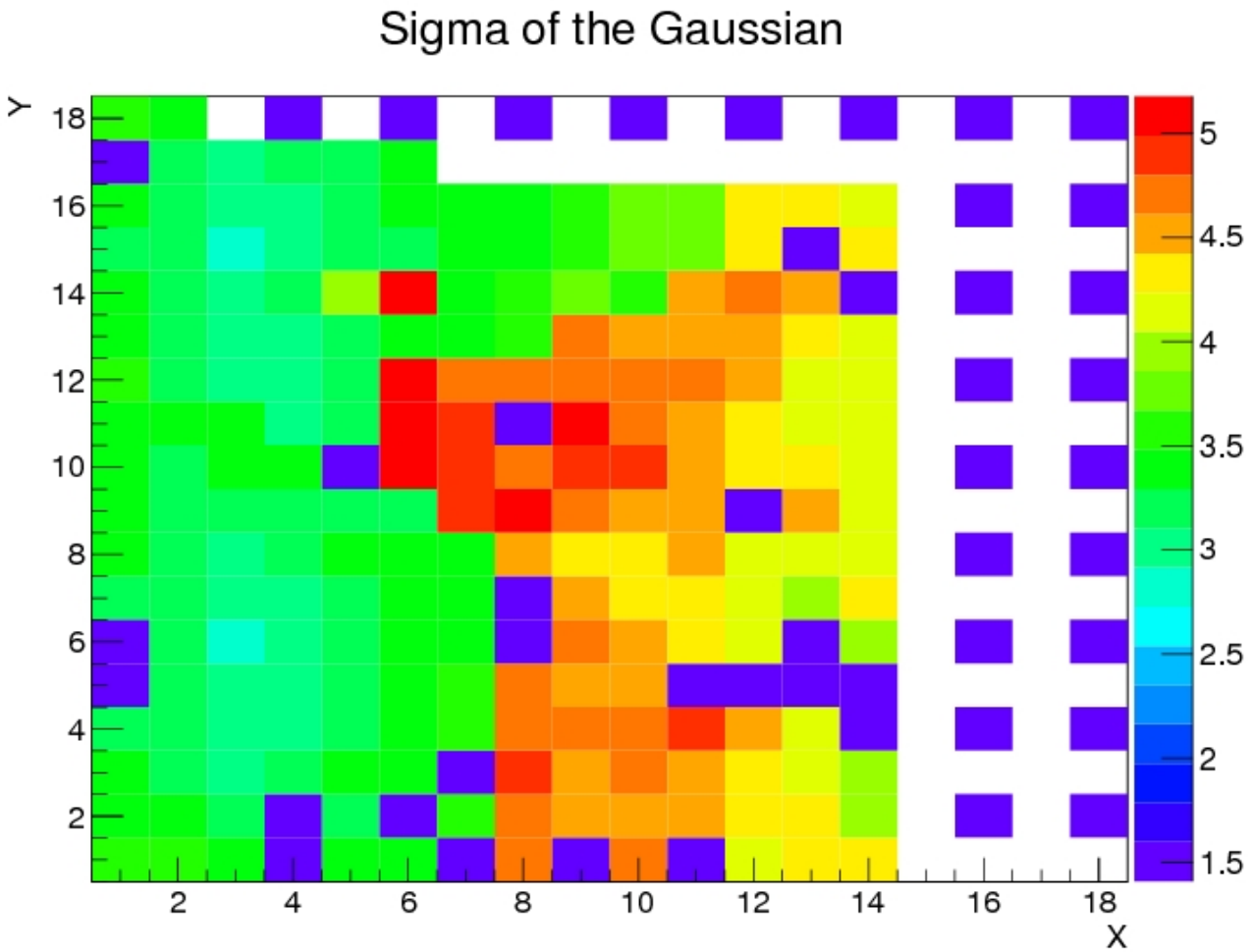
1. For that we want to find the relation:
   electronic signal (ADC units)$\Longleftrightarrow$ energy units (MIP units).
2. First the pedestal is subtracted from the results to have the actual signal value.
3. We can take all the events because at the test beam energy electrons act like MIP particles.

MIP Calibration Algorithm



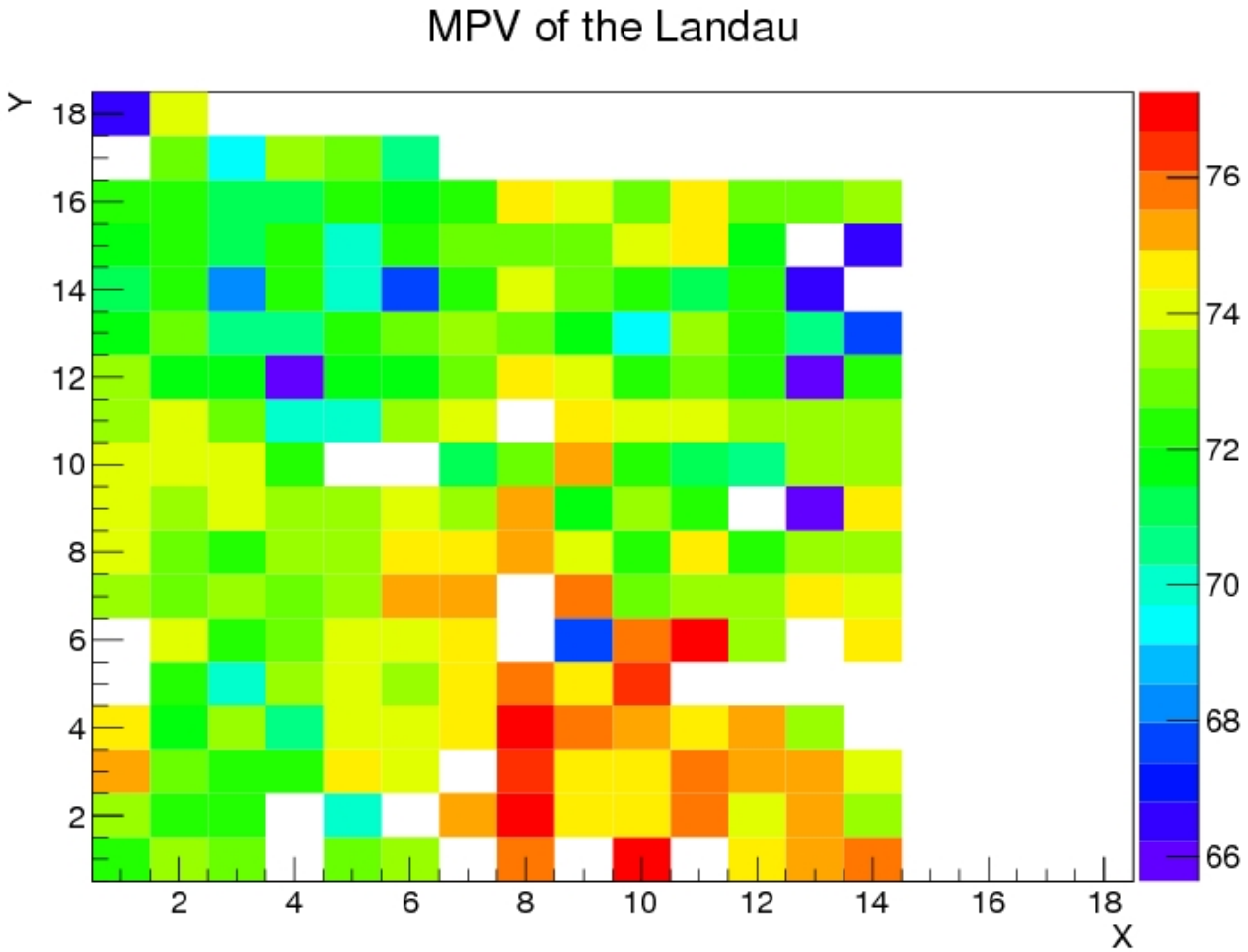
1. Each pad is fitted by a convolution of a Landau with a Gaussian.
2. The MPV of the Landau defines the calibration constant.
3. For each pad the pedestal value is subtracted. The sigma of the pedestal defines the signal noise.

The Sigma Detector map



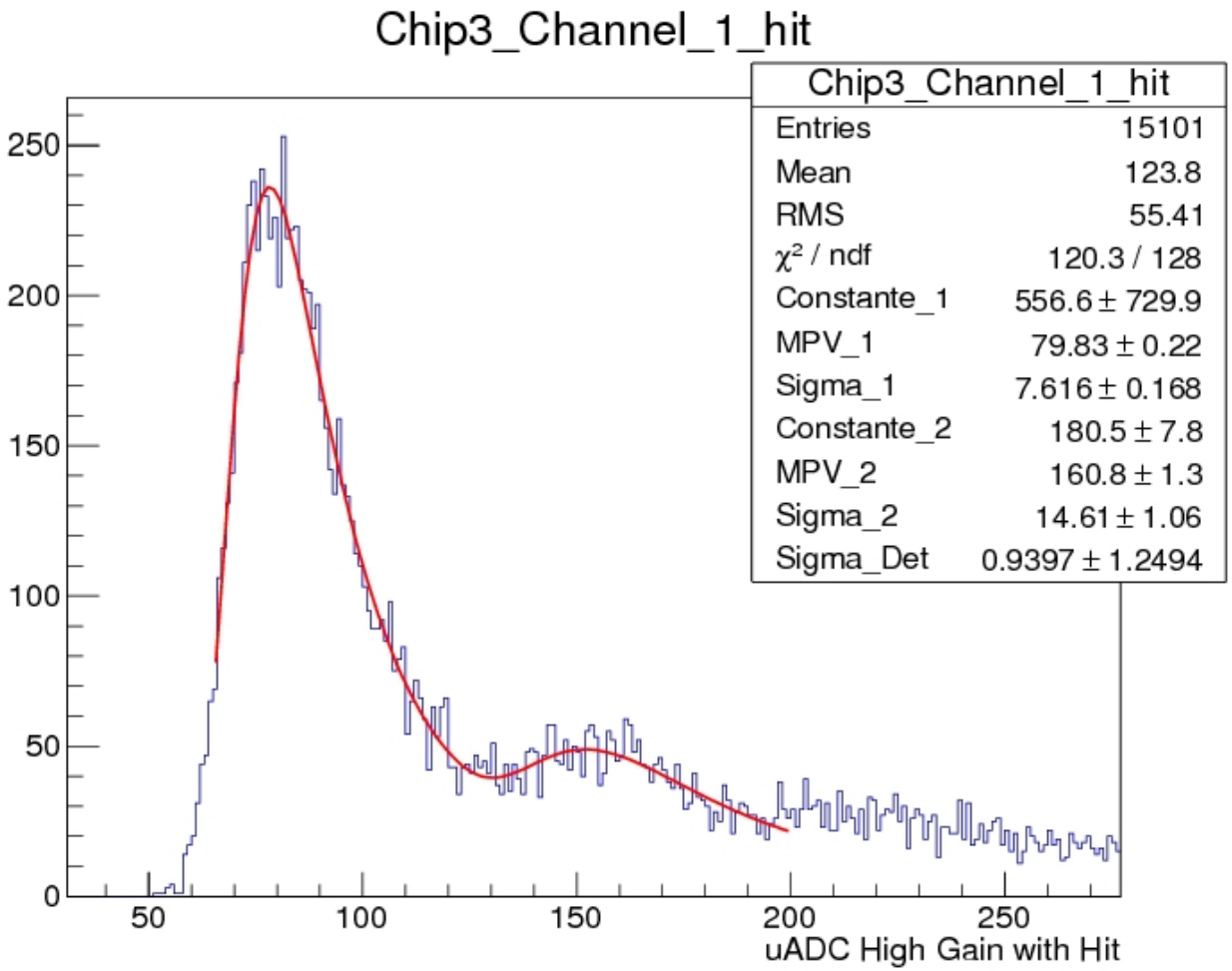
The mean Sigma of the detector for the dif0 is $3.8 \pm 1(25\%)\ uADC$.

The MPV map



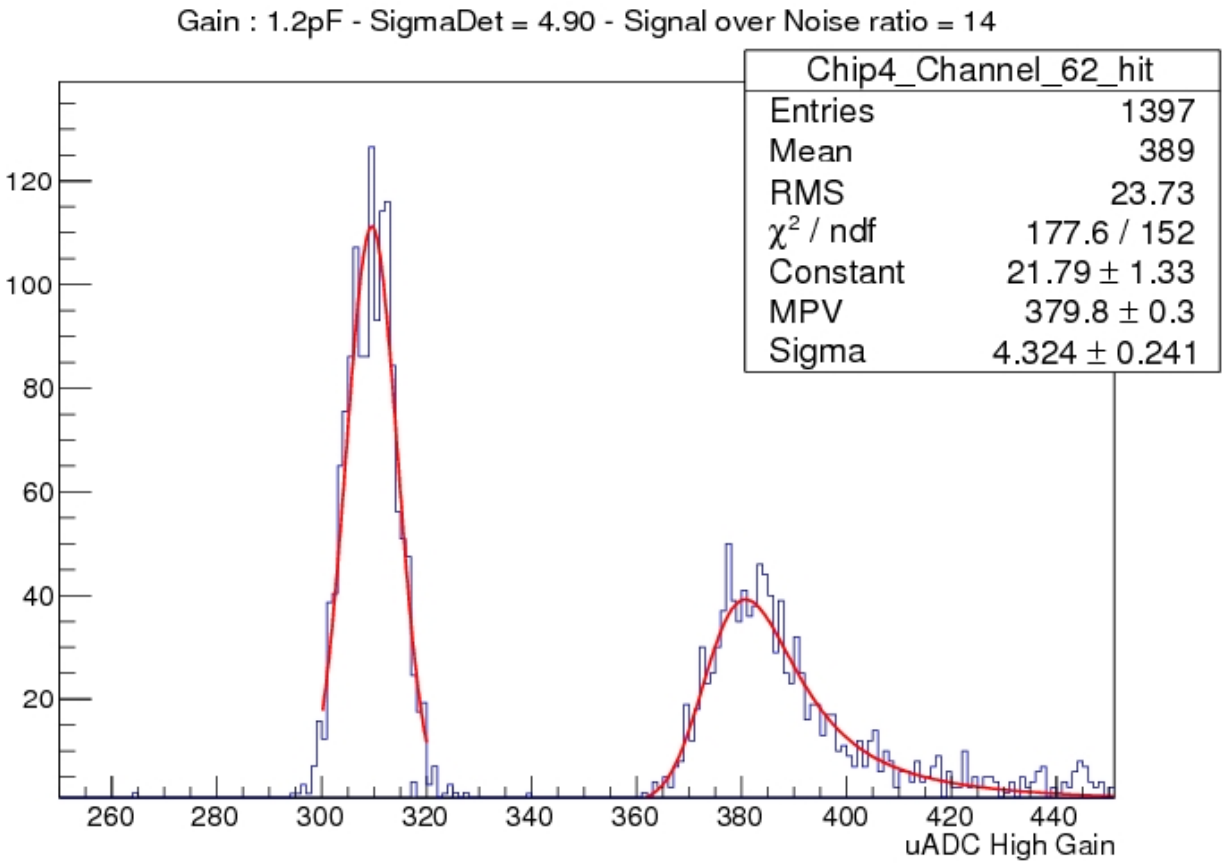
The mean MPV for the dif0 is $73 \pm 3(4\%)\ uADC$. From the simulation $1\ MIP = 0.095\ MeV$.

Fitting the MIPs



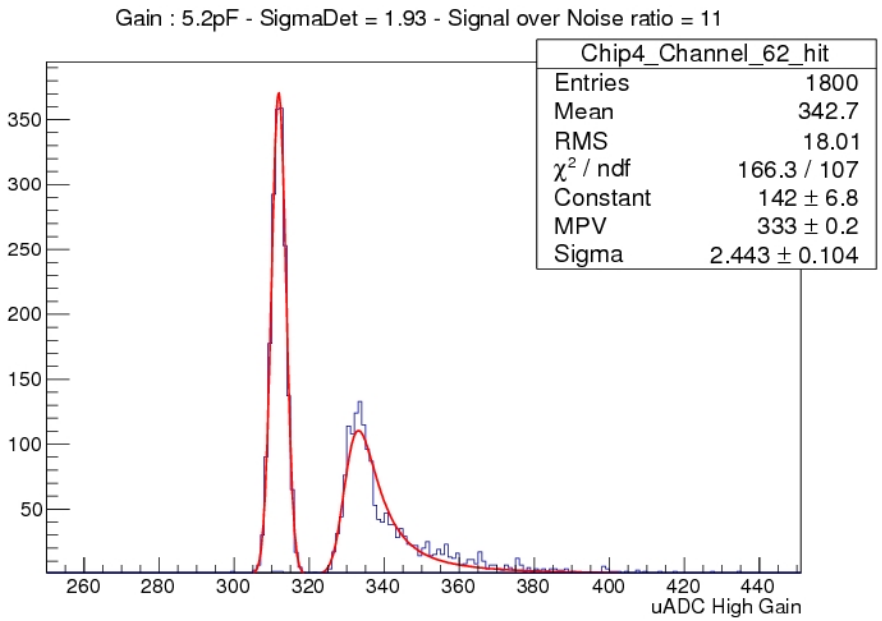
We also fit the second MIP pic, but calculate the convolution of two Landaus is very long ...

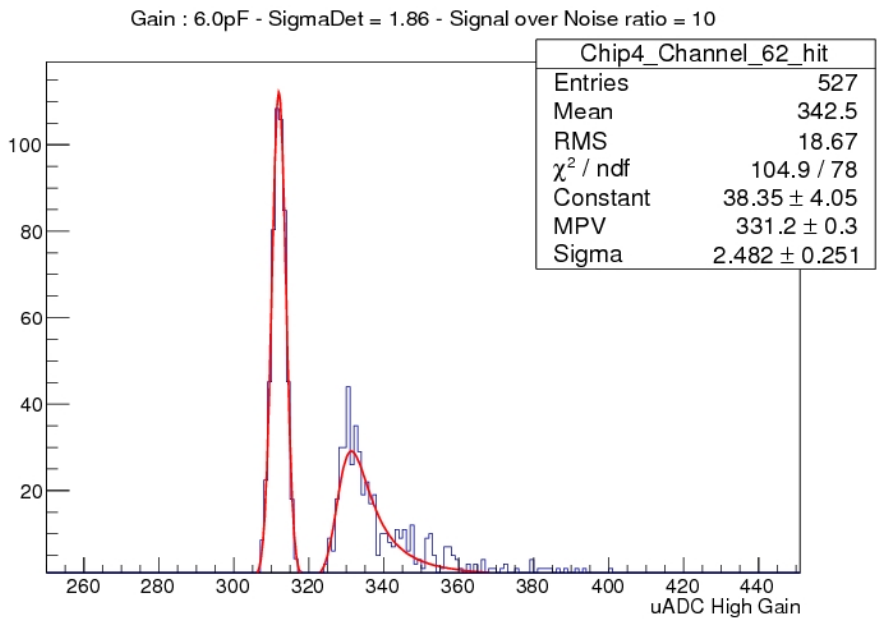
S/N for gain :1.2 pF



Reminder: the goal is S/N = 10. Here S/N = 14 but for a gain higher than the nominal one.

S/N for lower gain





For nominal gain ($6\,pF$) S/N = 10

The Signal over Noise ratio is still higher than 10 for the gain use to have the nominal dynamic range.

Conclusion

1. We have test the calibration method of the SiW-ECAL technological prototype.
2. The results for the signal over noise ratio are very good ($S/N \geq 10$).
3. We need now to produce the S/N ratio map over all the channels to check this results.
4. The trigger calibration should be improve with the channel by channel DAC adjustment.