Pure CsI Test Beam Update

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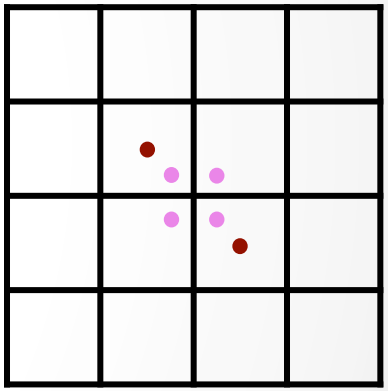
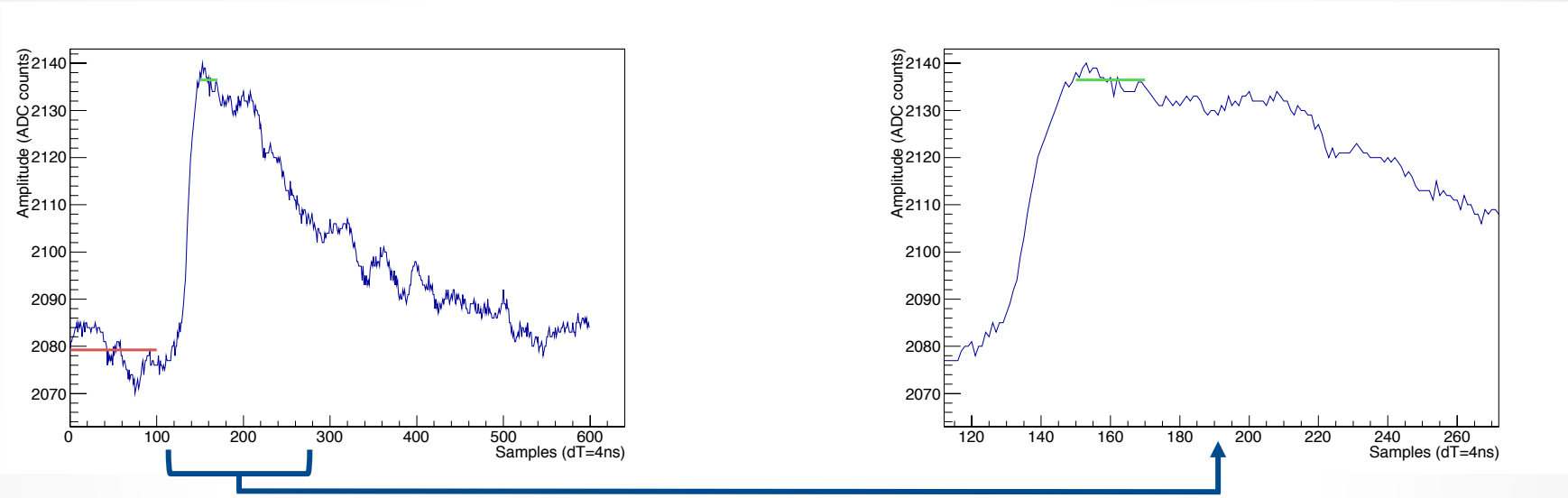
Data acquisition configurations

- We acquired 5 different energies for each run
  - Trigger : 5 different tagger in OR
  - The 5 tagger signals used in the trigger are acquired for offline separation of the energies
- Three different trigger configuration:
  - **Calibration: 289MeV – 350MeV – 422MeV – 480MeV – 550MeV**
    - **One run at the center of each crystal**
  - **Low Energy: 50MeV – 76MeV – 99MeV – 151MeV – 201MeV**
    - **1 run at the center of two internal crystals (red dots)**
    - **4 runs at each points which maximize the containment according to MC (pink dots)**
  - **High Energy: 301MeV – 400MeV – 501MeV – 651MeV – 780MeV**
    - **1 run at the center of two internal crystals (red dots)**
    - **4 runs at each points which maximize the containment according to MC (pink dots)**

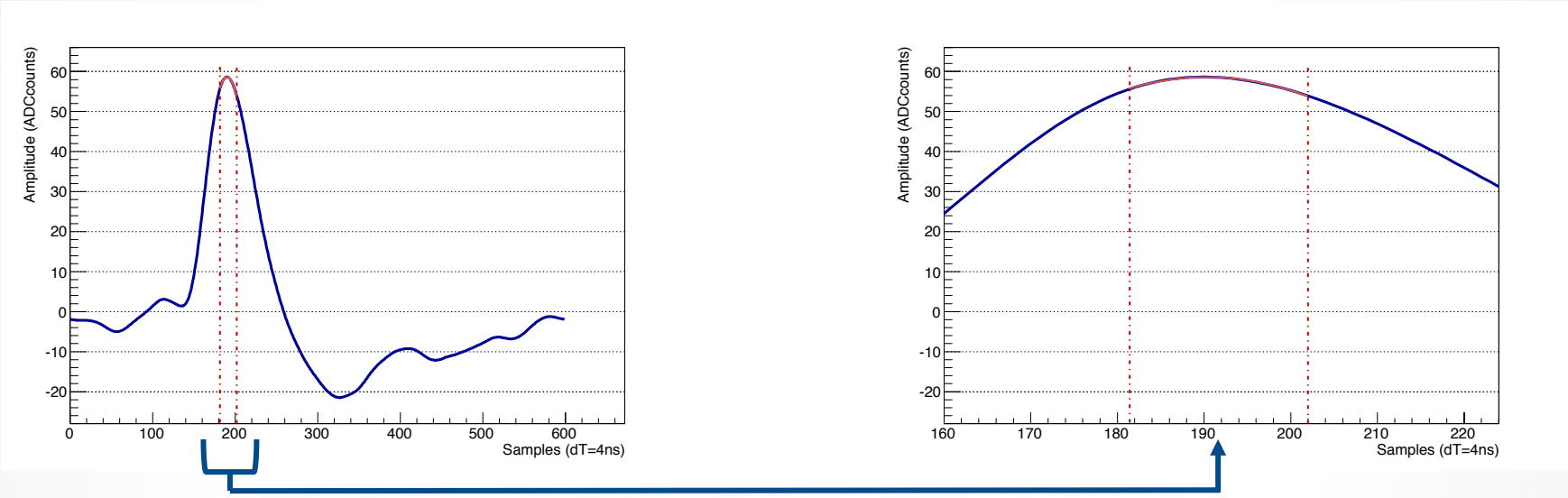


Amplitude Extraction



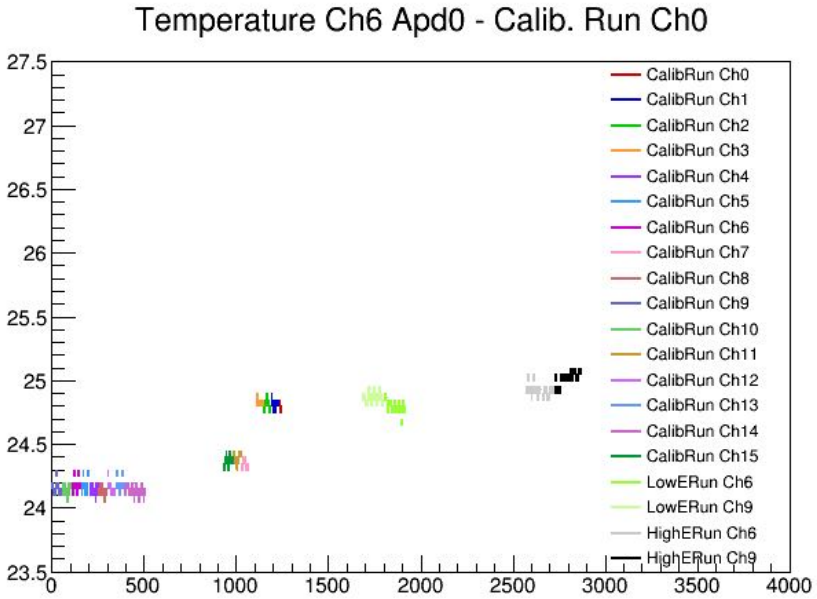
- Pedestal : first 100 samples mean
- Signal : Mean between fixed windows (20samples)
- Amplitude : Signal - Pedestal

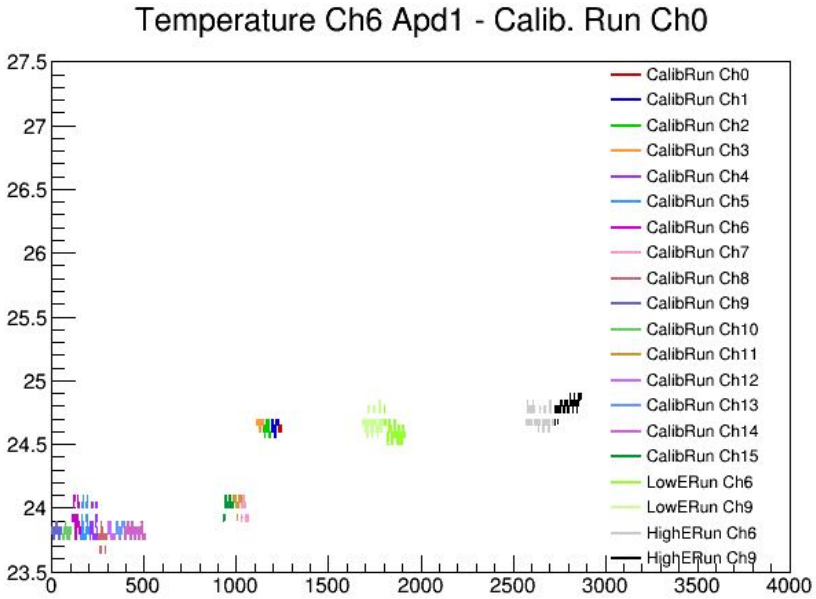
Amplitude Extraction (shaping)



- Signal : Gaussian fit on fixed windows (20samples)
- No pedestal subtraction
  - With software shaping baseline always at zero

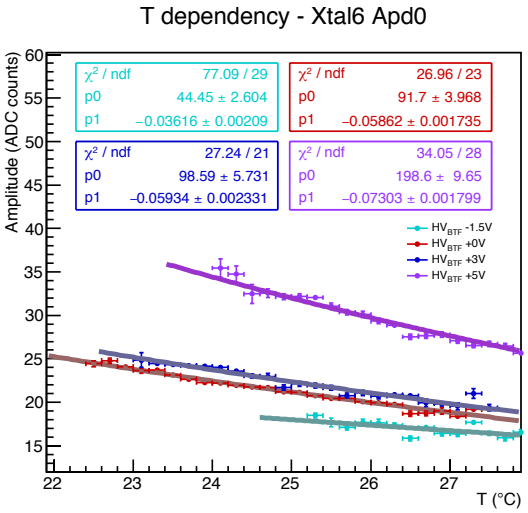
Temperature

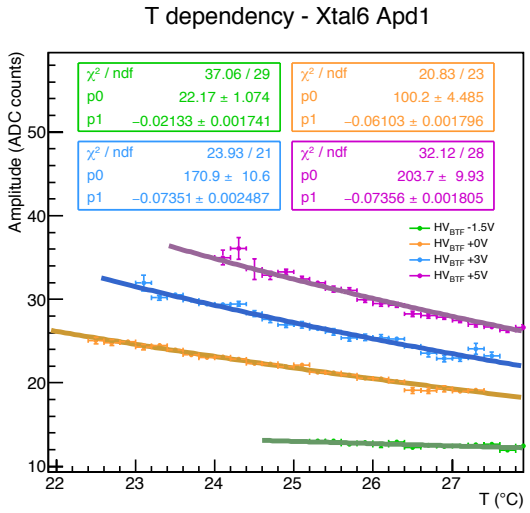




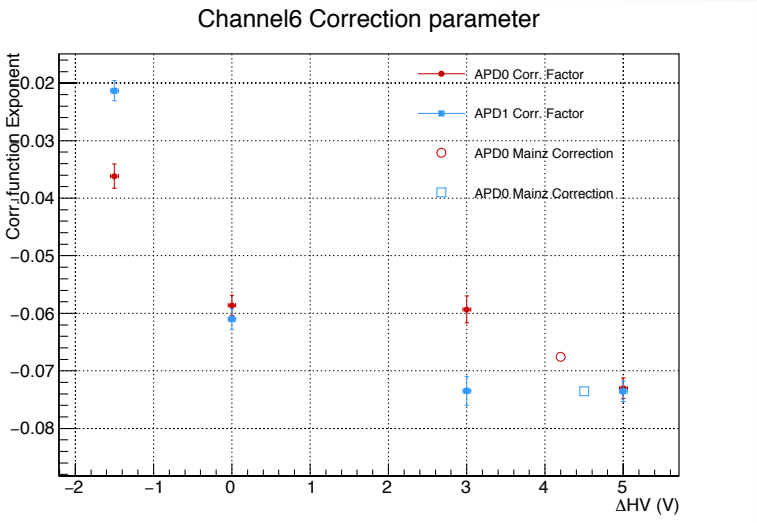
- Alcuni hanno uno aumento di temperatura netto alla fine dei run di calibrazione (max dT=1°C)
  - Canali 3,6,7, 10, 11, 15
  - Il canale 8 ha una diminuizione di T

T correction



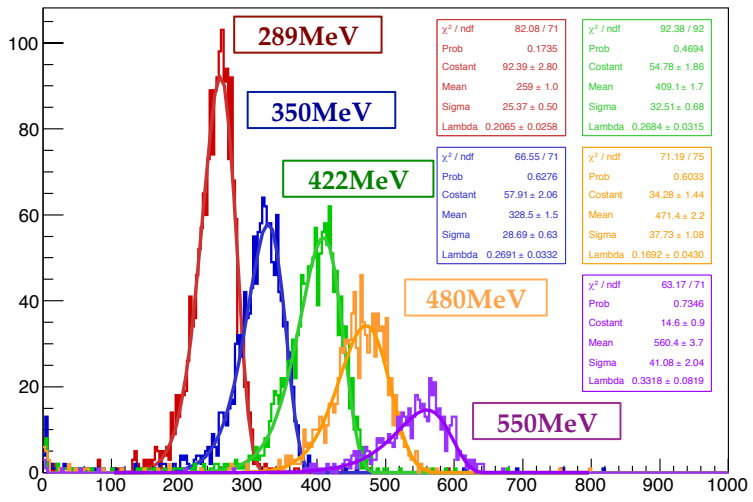


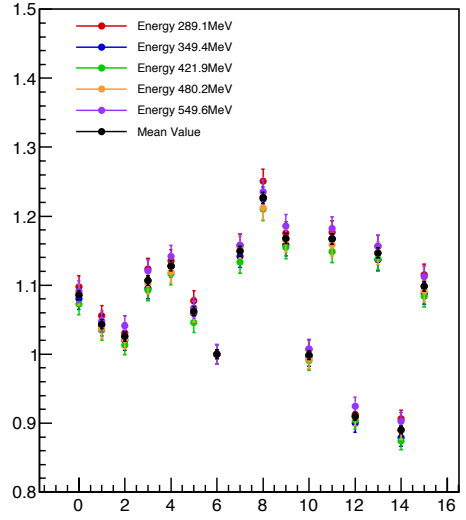
- T dependecy at Mainz HV extracted with linear interpolation

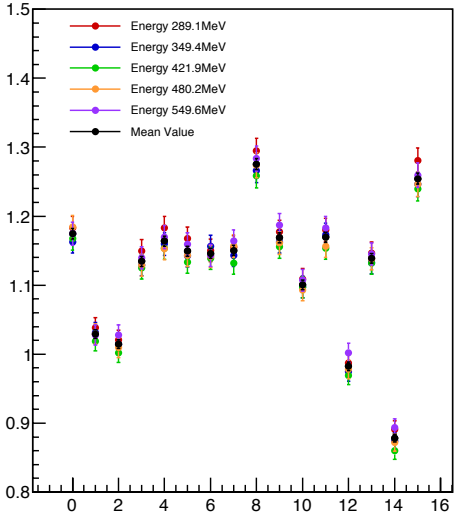


Calibration

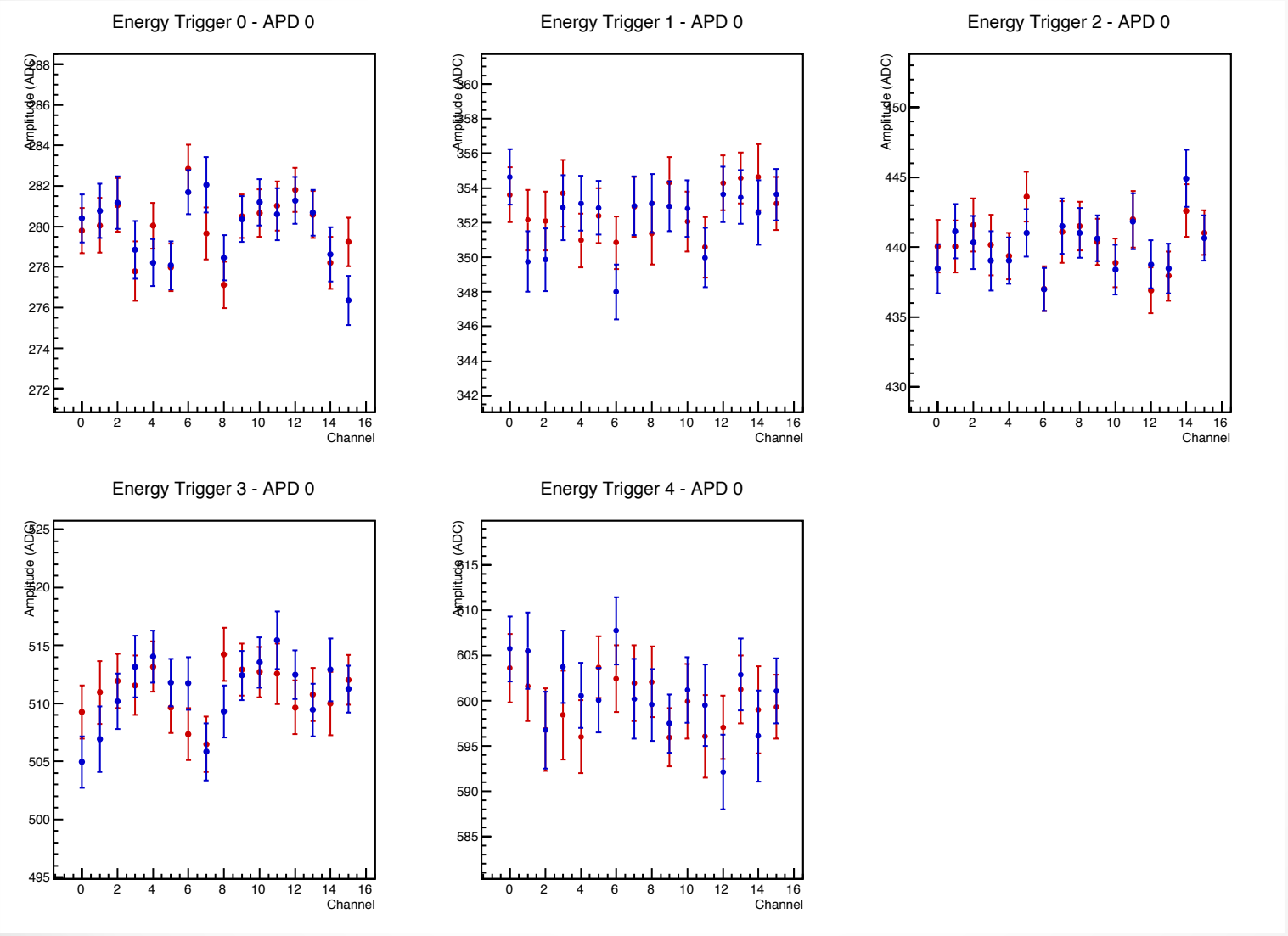
- Fit the deposited energy distribution for each APD for each energy with Novosibirsk function
  - Only the deposited energy on the crystal in which the beam is directed
- Using the Mean value to intercalibrate the 32Chs
- We have 5 different constants (one for each energy) for each channel
  - **Final constants as the mean value**



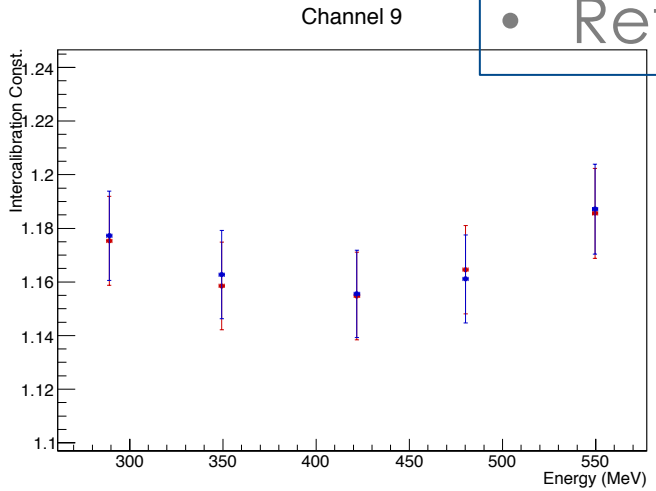


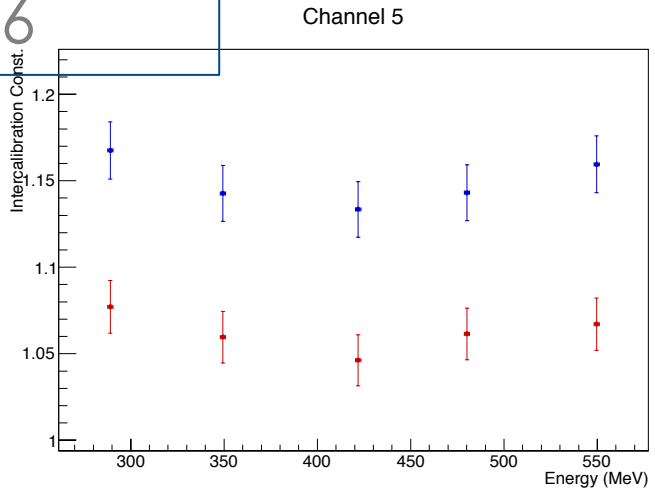


Calib cross check

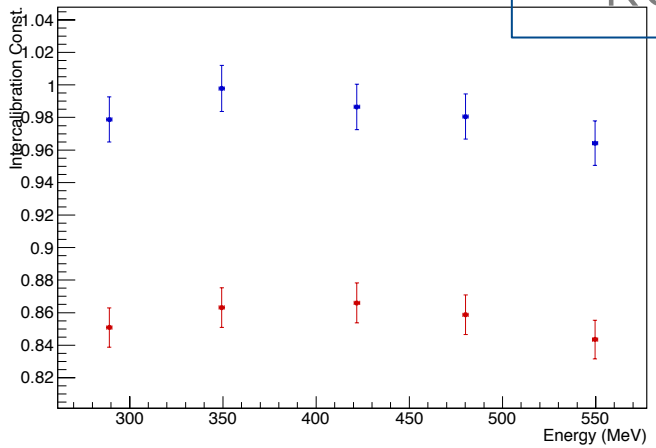


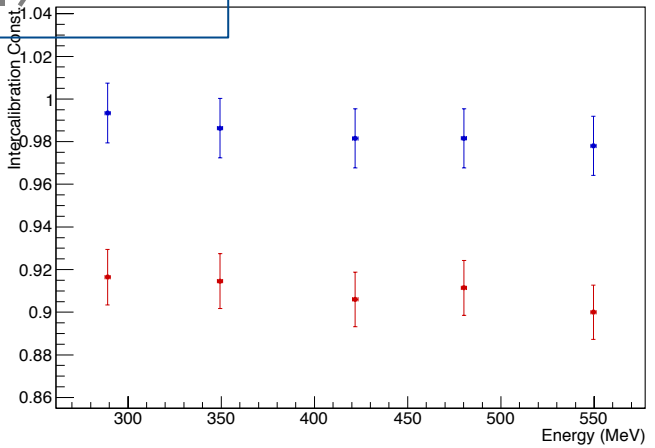
- Ref. Channel6



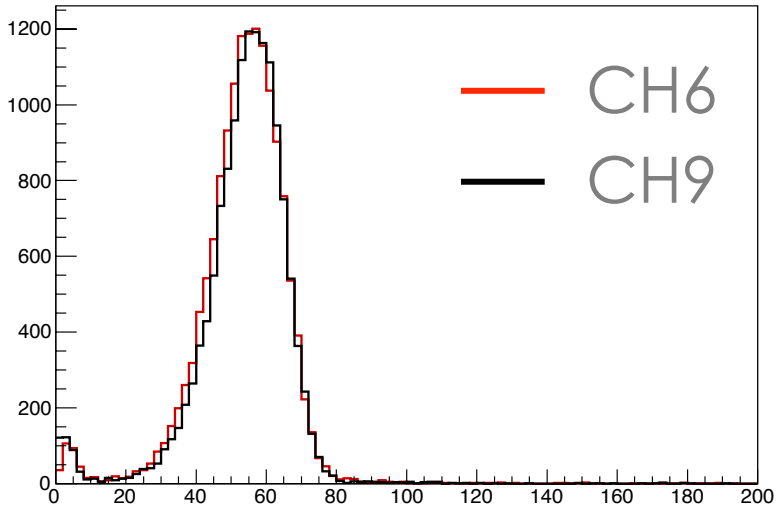


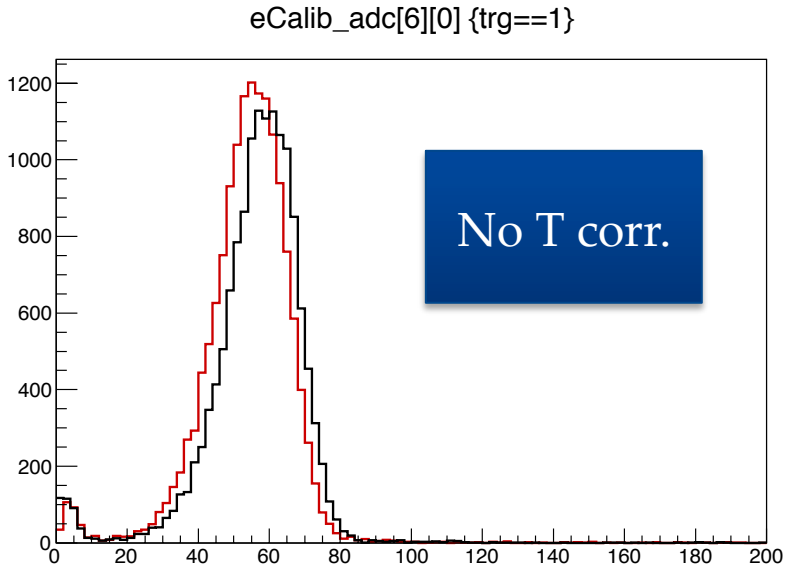
- Ref. Channel9

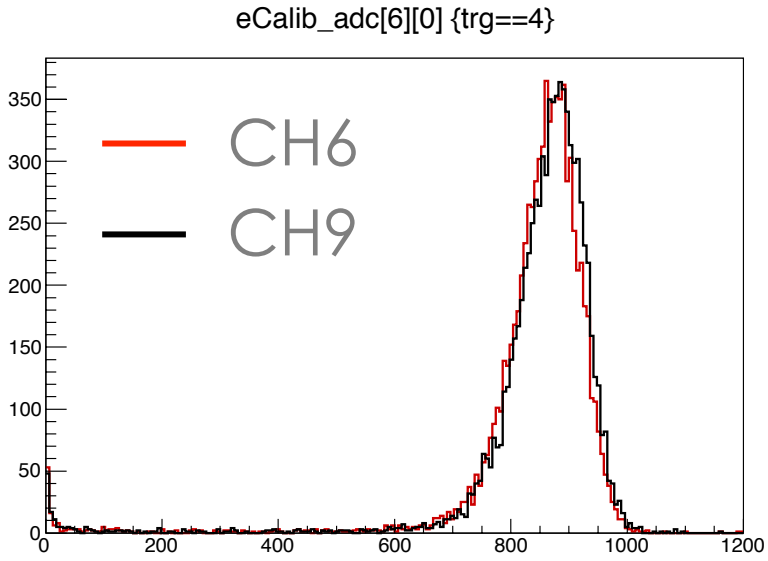




Check calibration

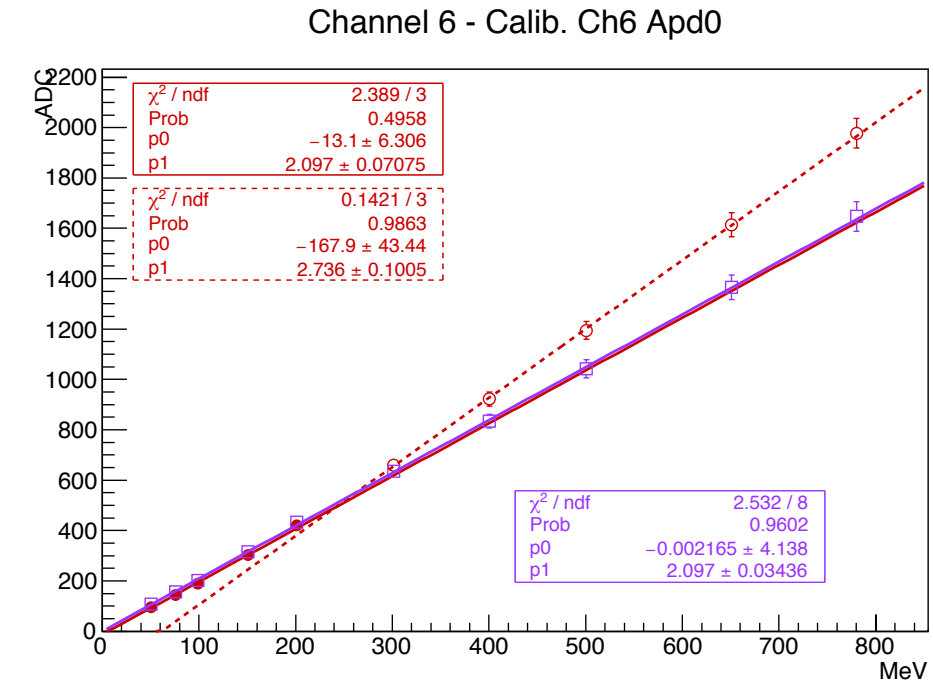






- Comparison at 75MeV and 780MeV between Ch6 and Ch9 (APD0)

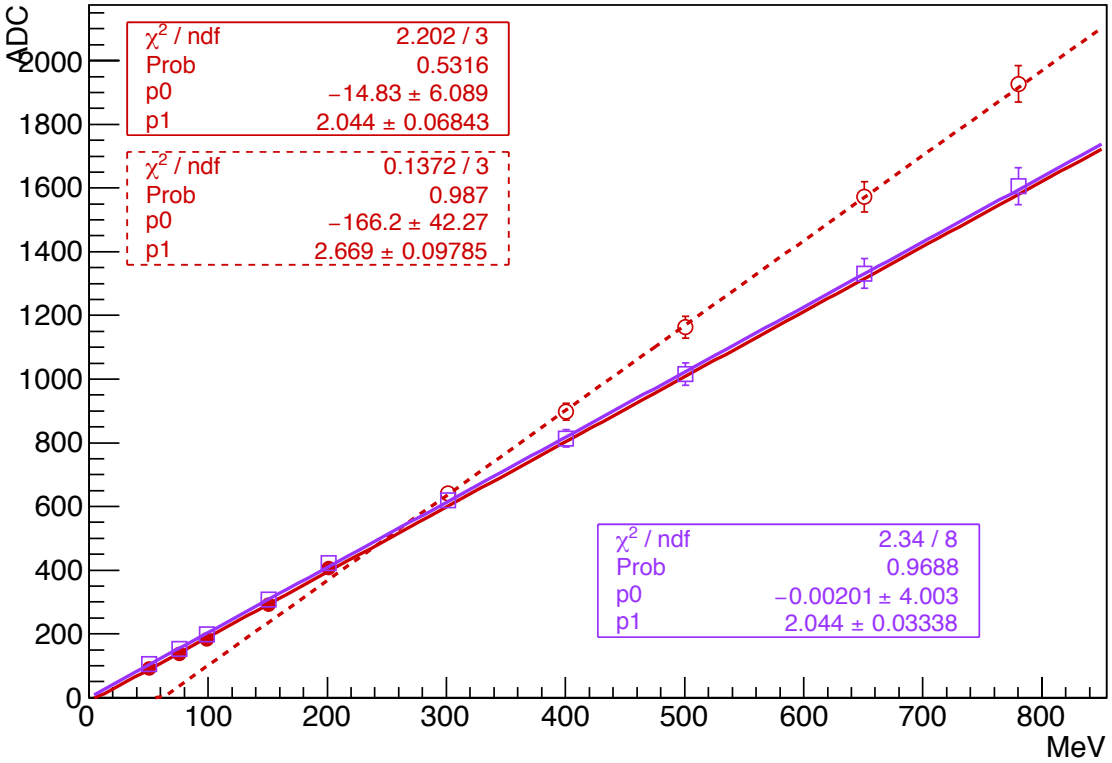
Linearity



- Non linearity observed
- Difference between the two different run (high/ low energy)
- Source still unknow

- Correction applied to linearize the response
  - Shift on high energy points → worsening the resolution (conservative approach)

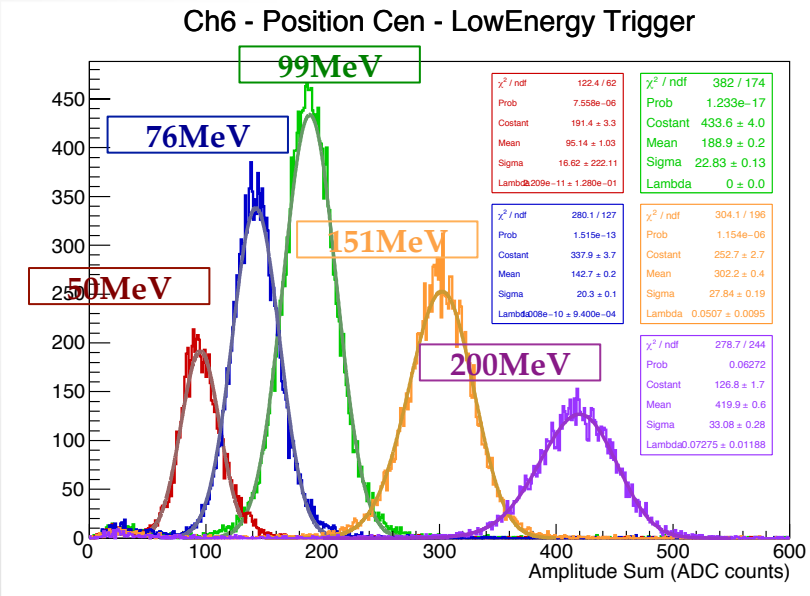
Linearity (SHP)

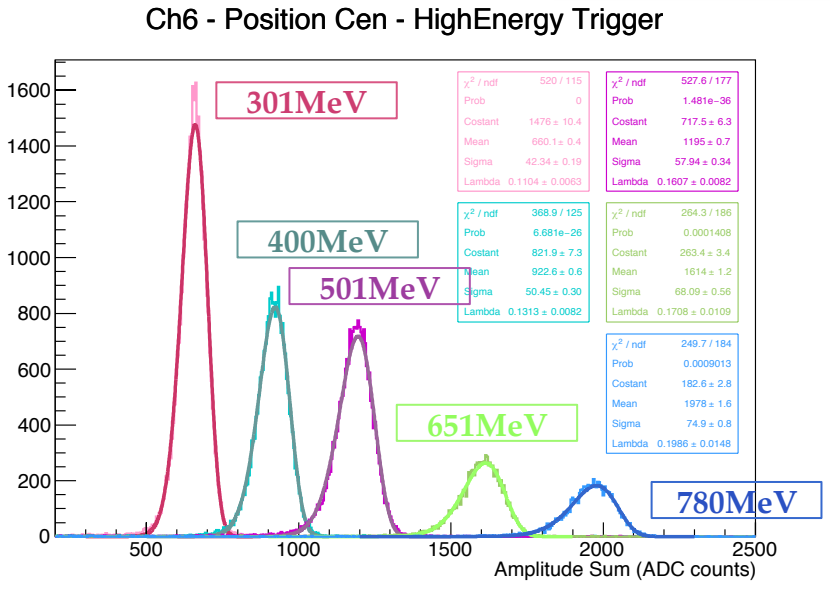


- Same strategy also for shaped data

Energy Distributions

- Sum all the channels with Signal greater than 0 together
  - Intercalibration parameters applied
- Stable temperature during all the test period
  - No T correction needed

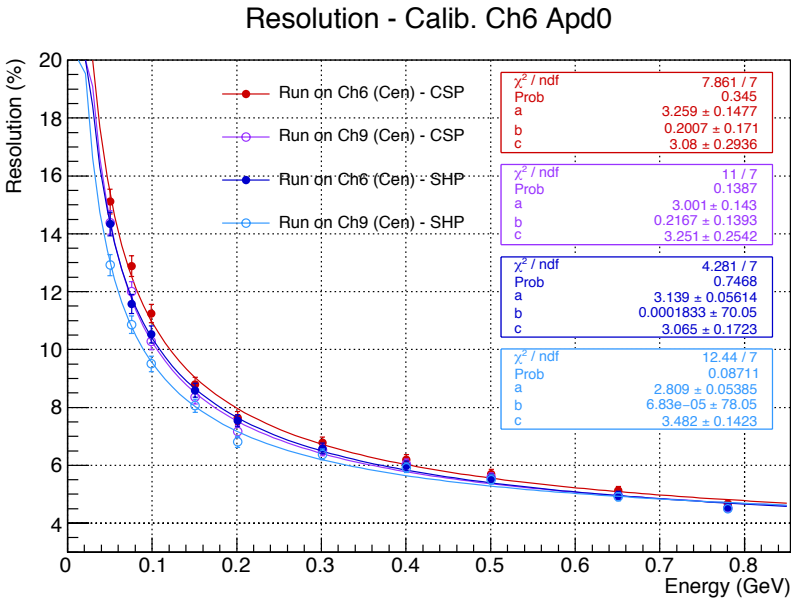


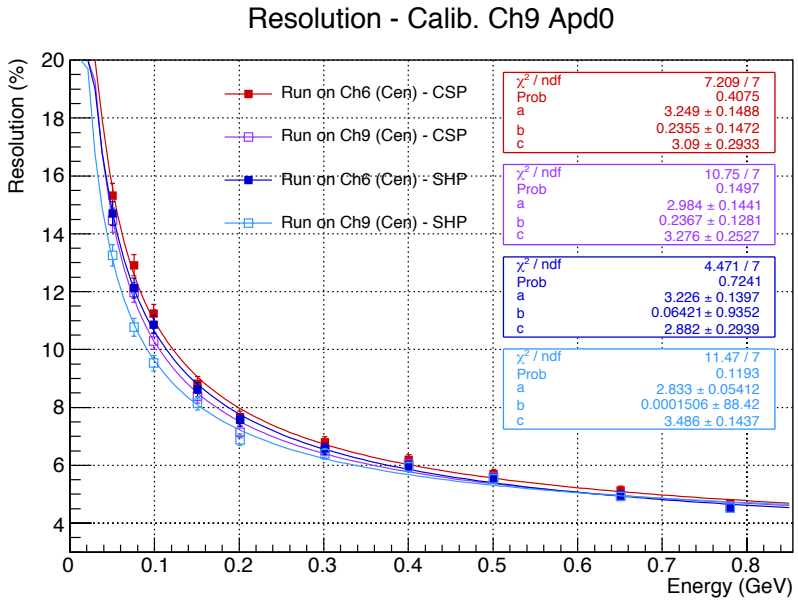


Resolution

- Crystal Center

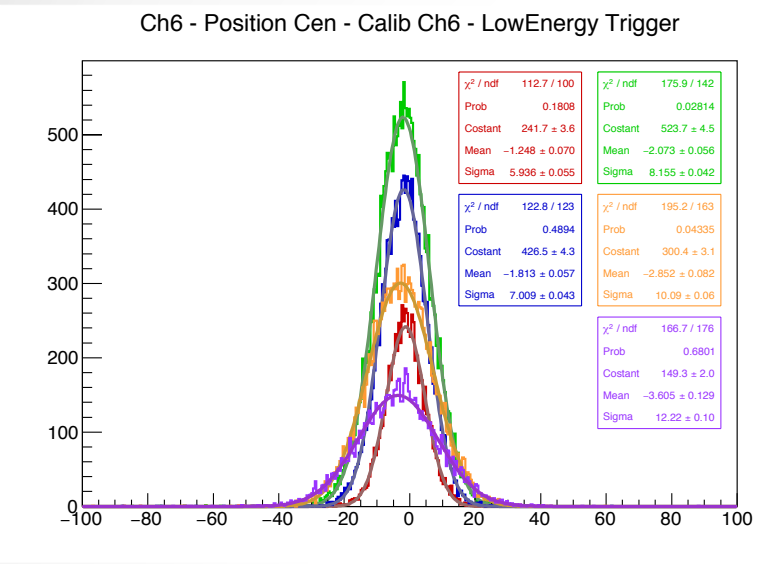
Fit function : $\sigma(E)/E = \frac{a}{\sqrt{E}} \oplus \frac{b}{E} \oplus c$

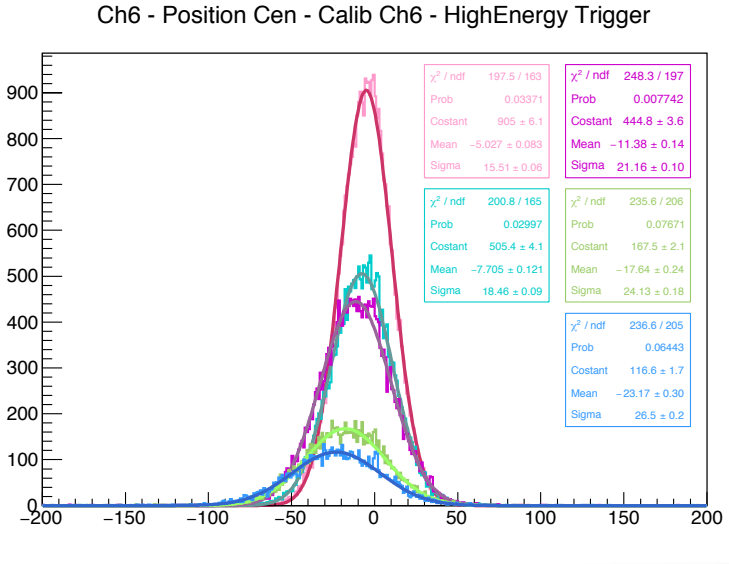


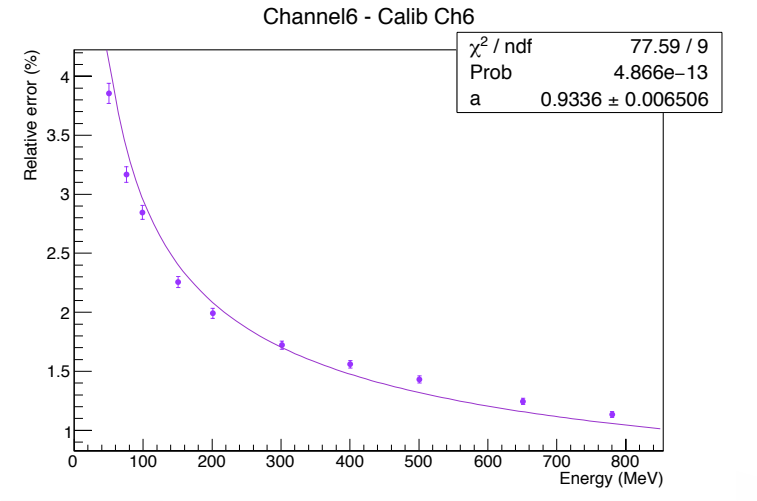


- Resolution after shaping not updated

Photostatistics





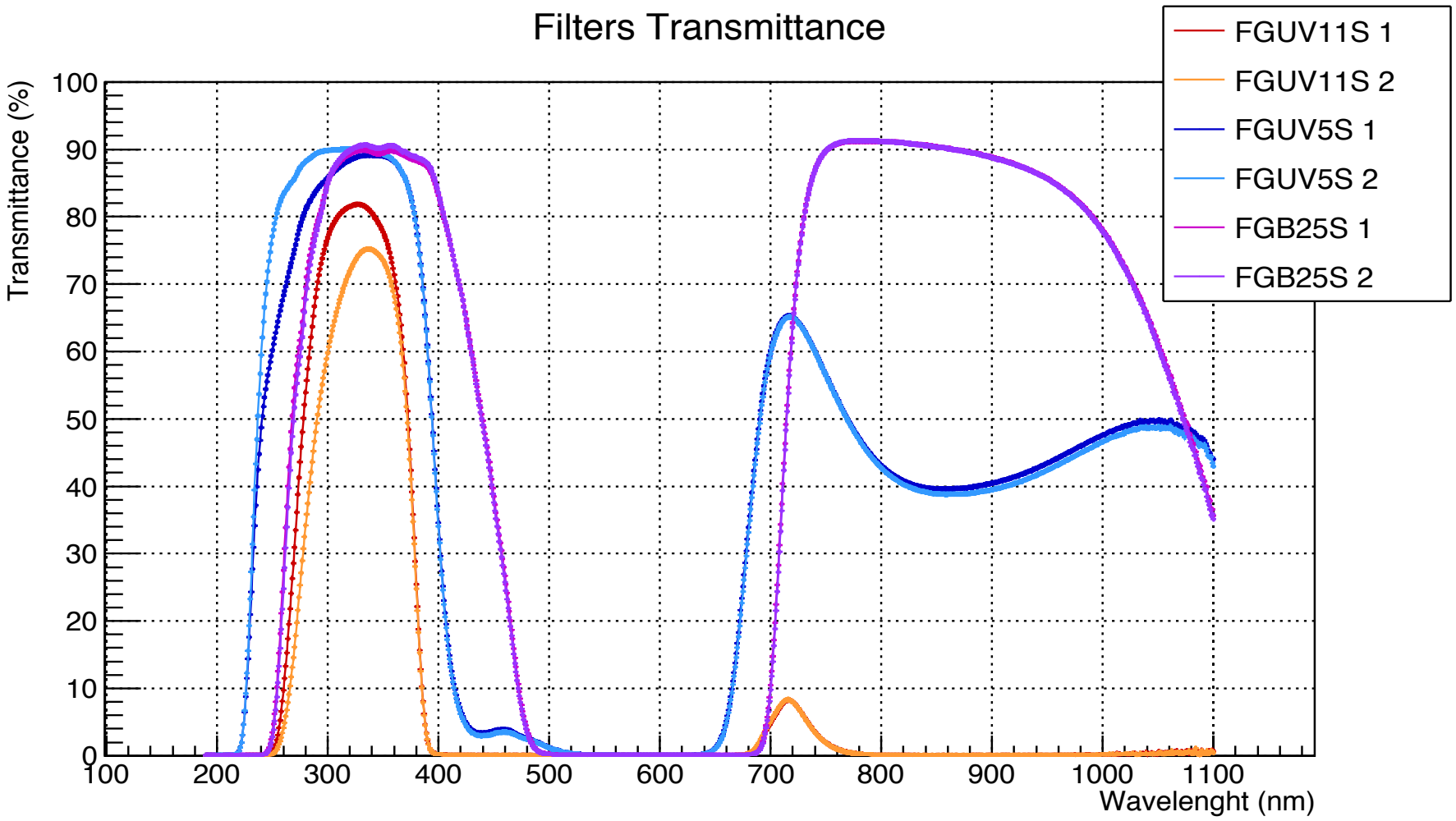


- a/sqrt(E) evaluated with total deposited energy in the matrix
  - To be updated with the deposited energy on the single channel??

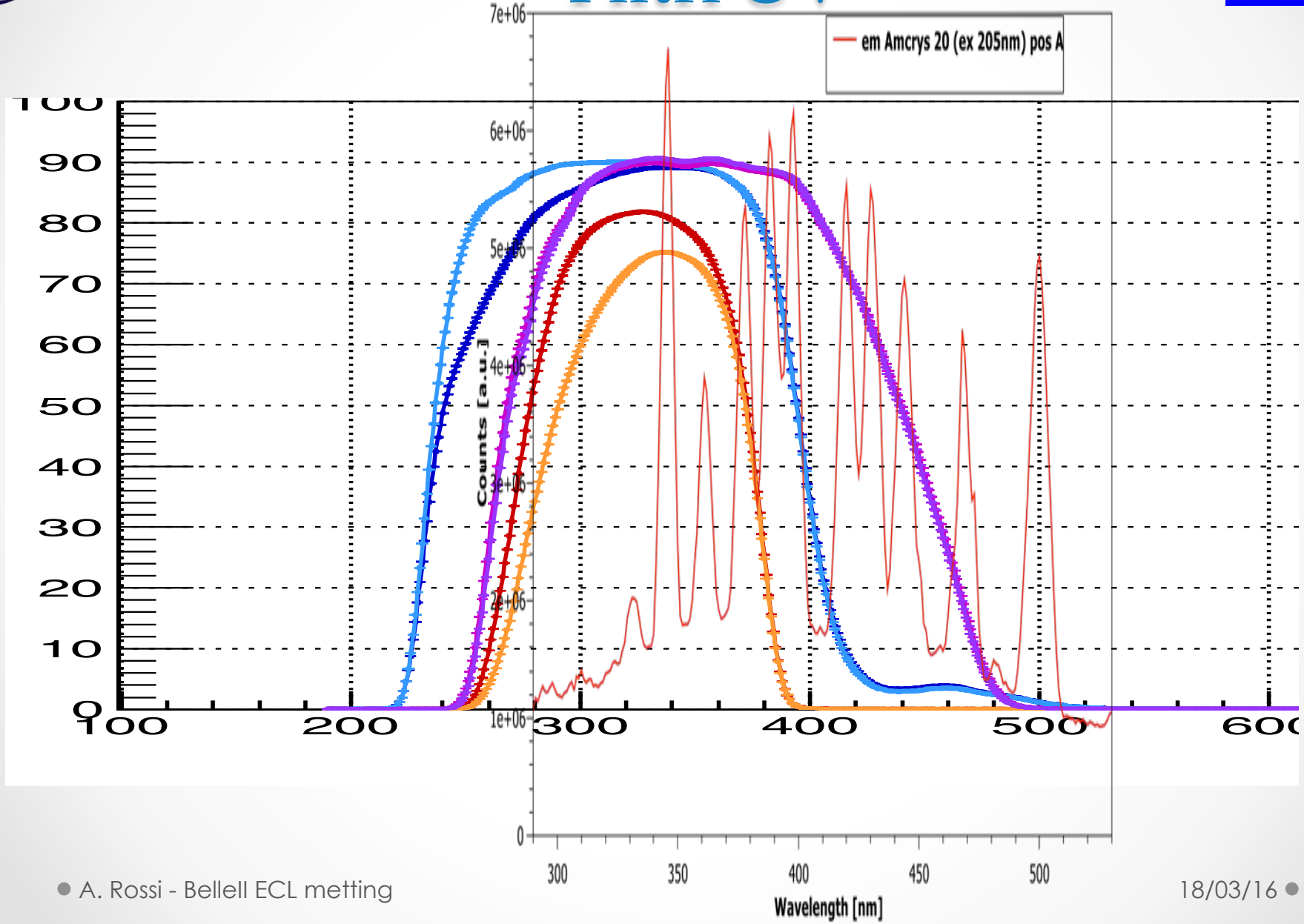
Todo

- CoG vs Energy
- CoG vs Time
- Update Shaped data analysis

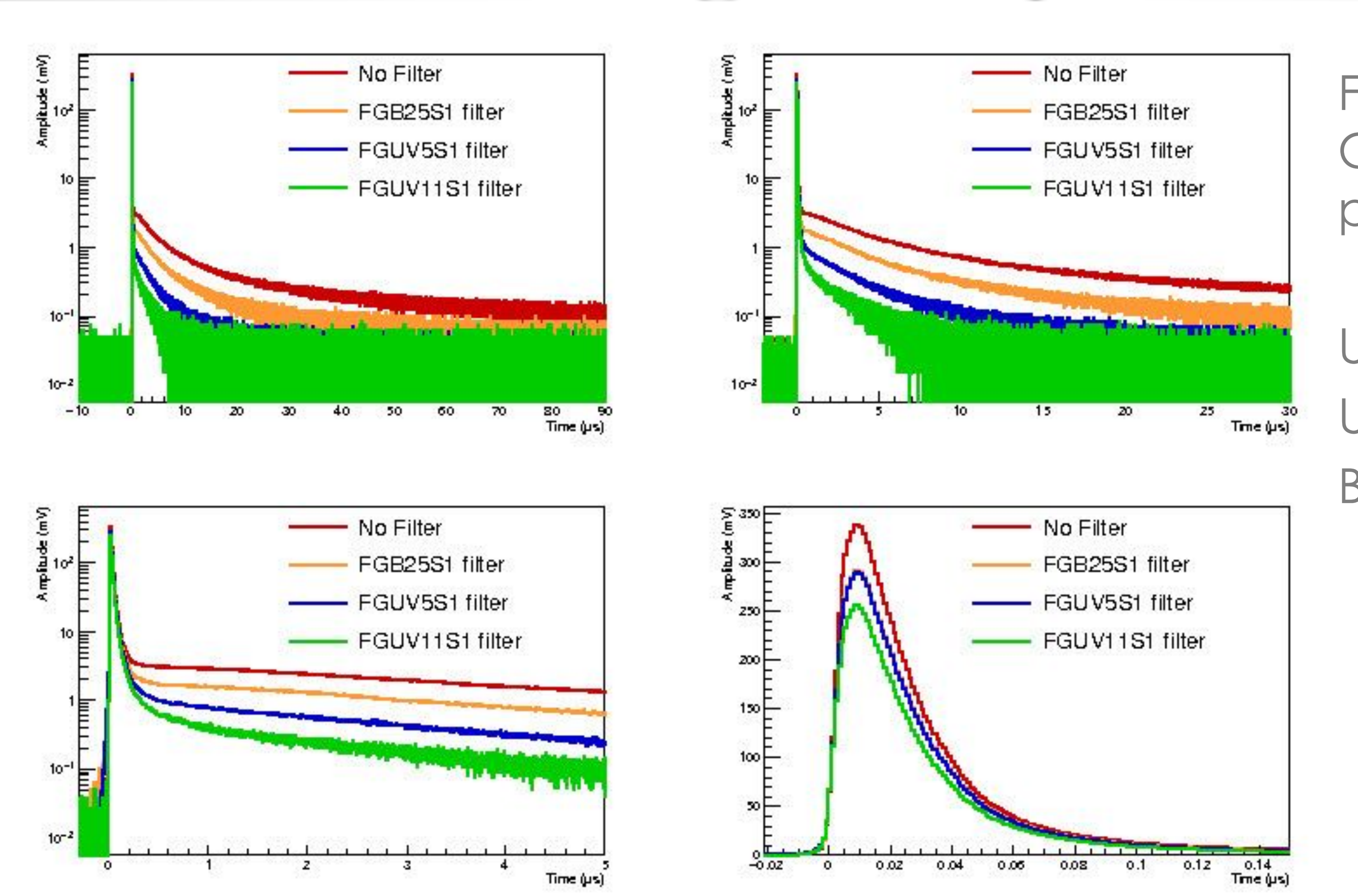
Filtri UV


Filters Transmittance
FGUV11S 1
FGUV11S 2
FGUV5S 1
FGUV5S 2
FGB25S 1
FGB25S 2
Transmittance (%)
Wavelenght (nm)
0
10
20
30
40
50
60
70
80
90
100
100
200
300
400
500
600
700
800
900
1000
1100

Filtri UV


em Amcrys 20 (ex 205nm) pos A
Counts [a.u.]
Wavelength [nm]
7e+06
6e+06
5e+06
4e+06
3e+06
2e+06
1e+06
0
300
350
400
450
500
100
90
80
70
60
50
40
30
20
10
0
100
200
300
400
500

Signal Shape



Fast Component peak ratio

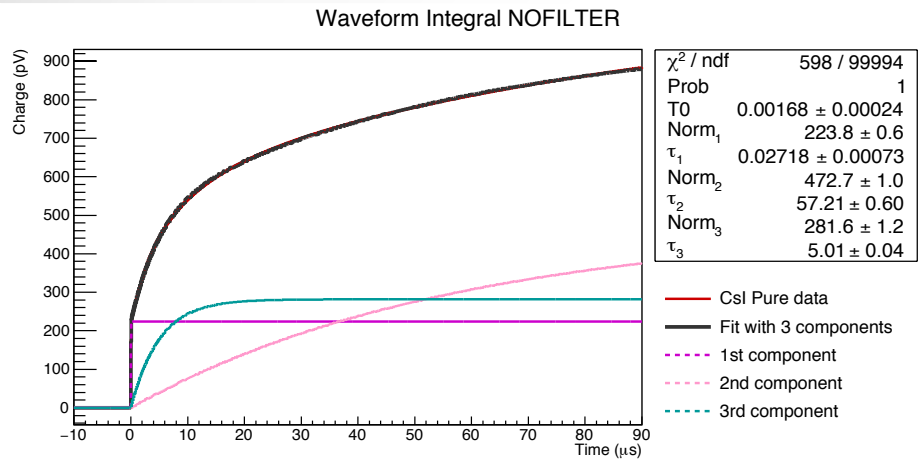
UV11~76%

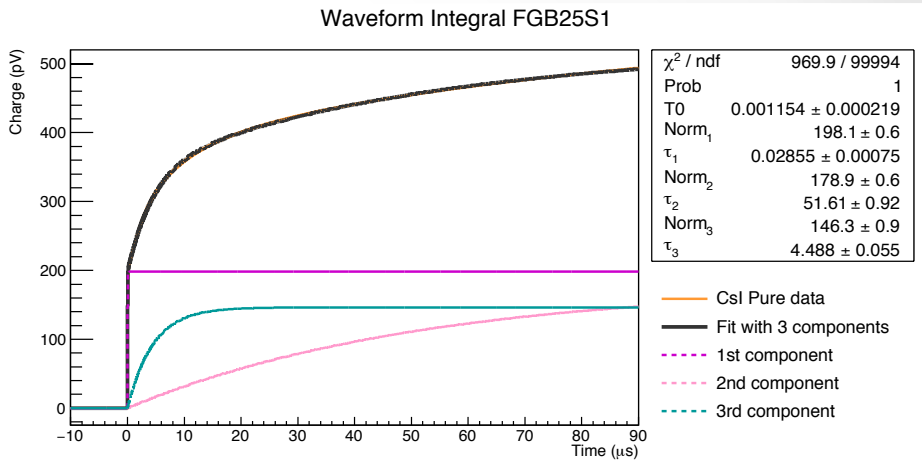
UV5~86%

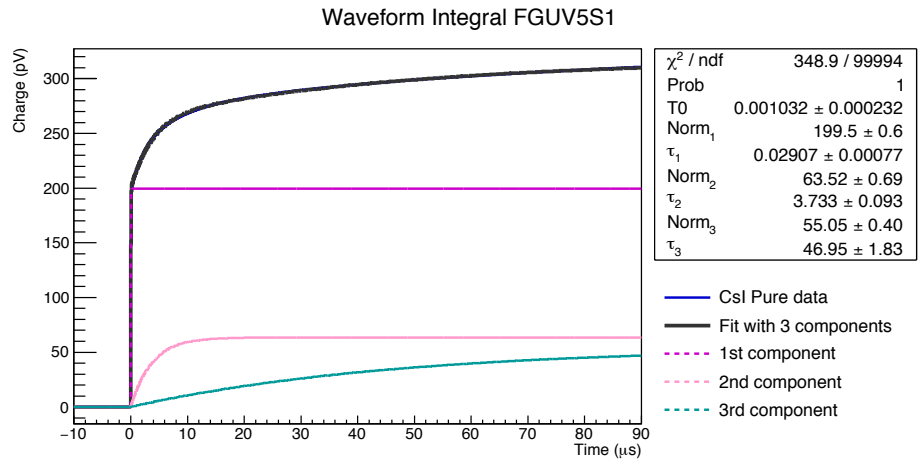
B25~86%

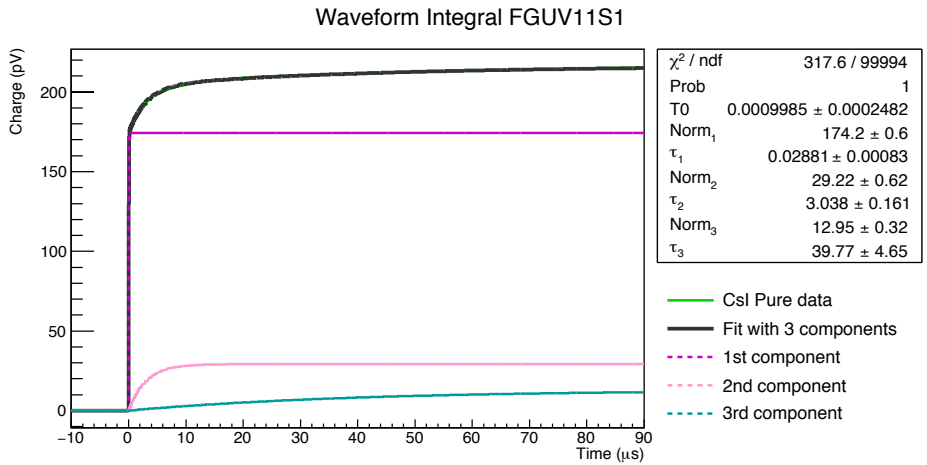
- Slow component cutted (almost) by FGUV11S filter

Integral fit







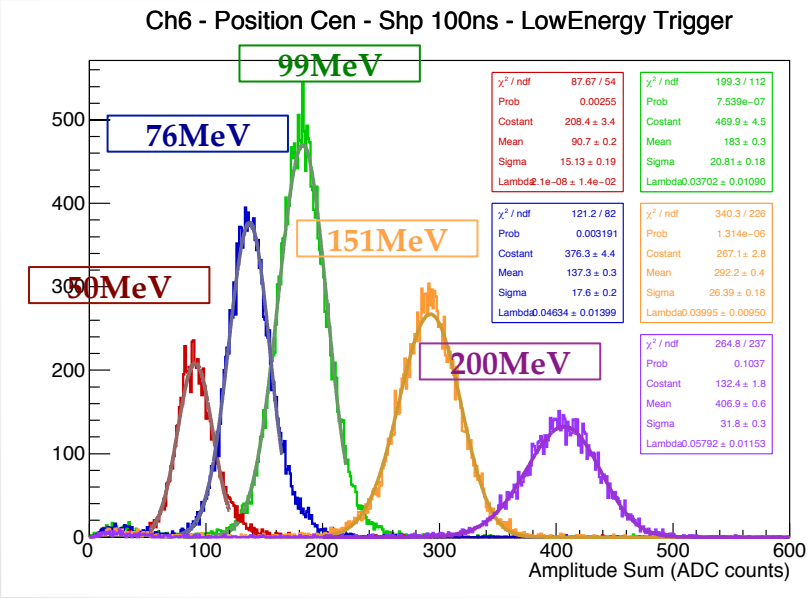


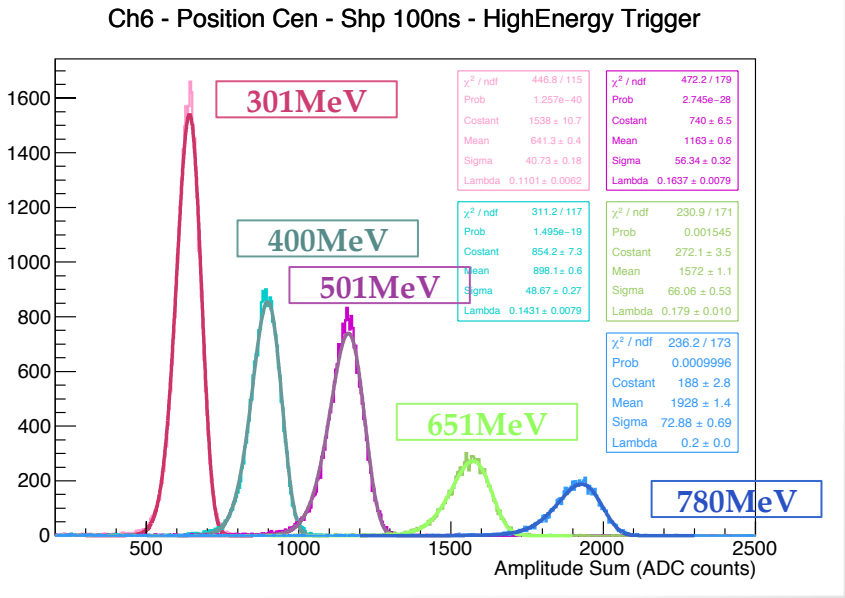
- Fast component: FGUV11~78% - FGUV5~89% - FGUV25~88.5%

Backup

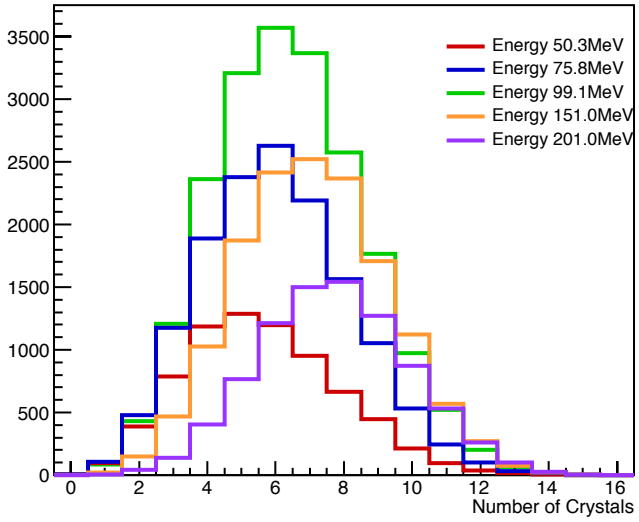
Shaped Signal Analysis

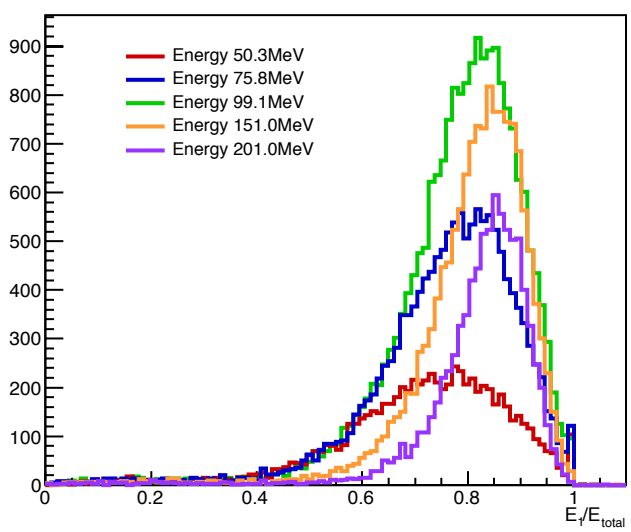
- Same analysis applied also to shaped (100ns) signals

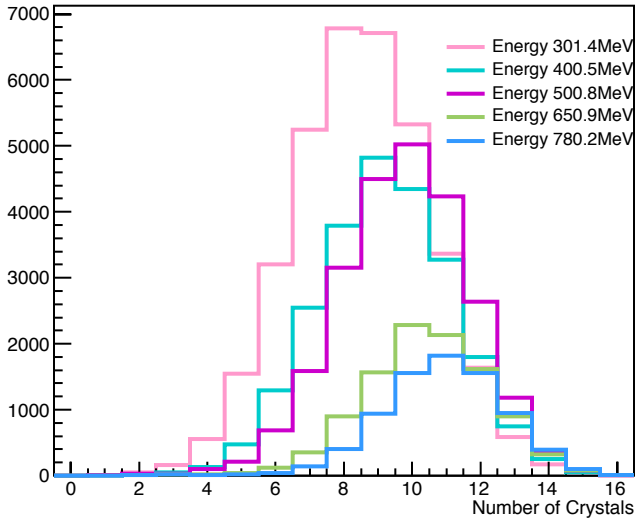


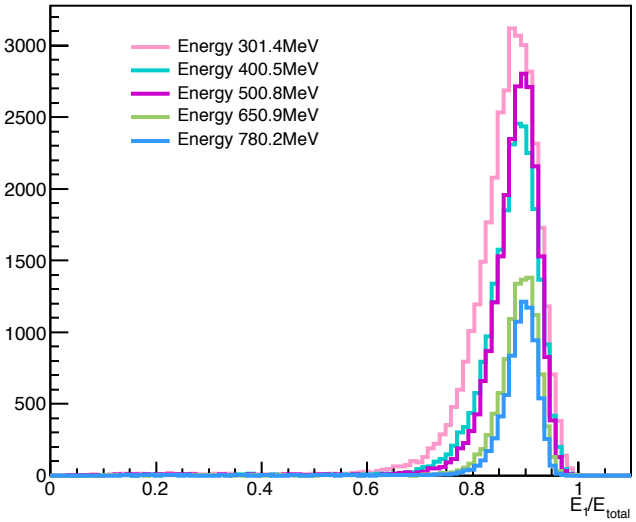


Cluster Size



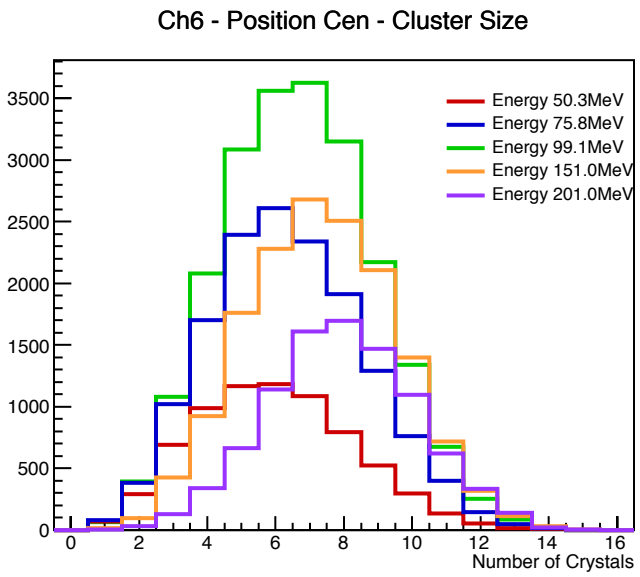


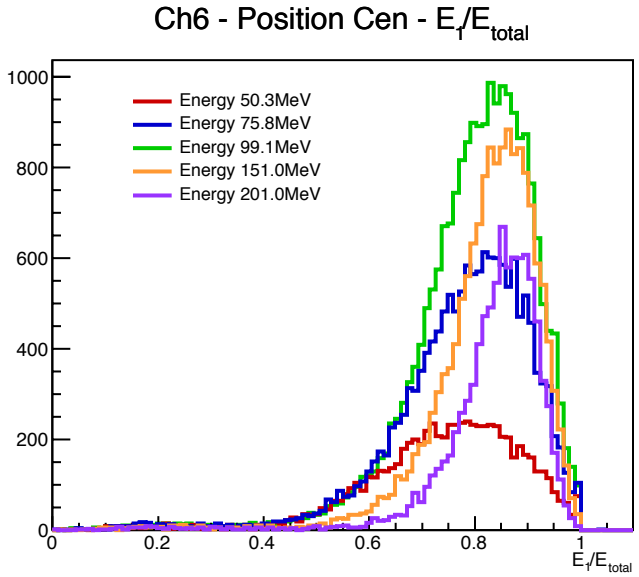


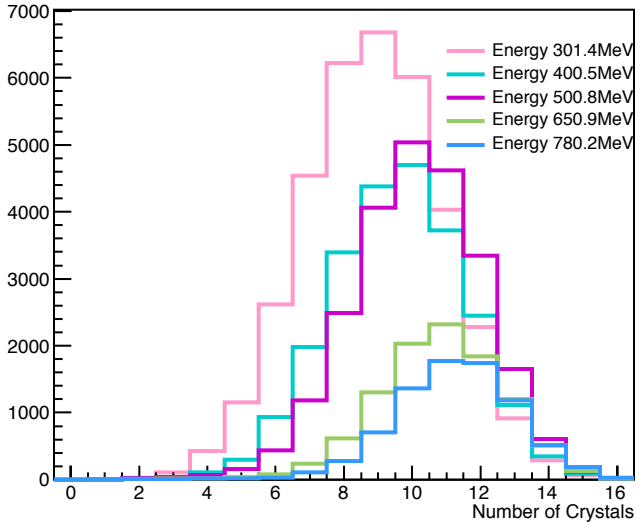


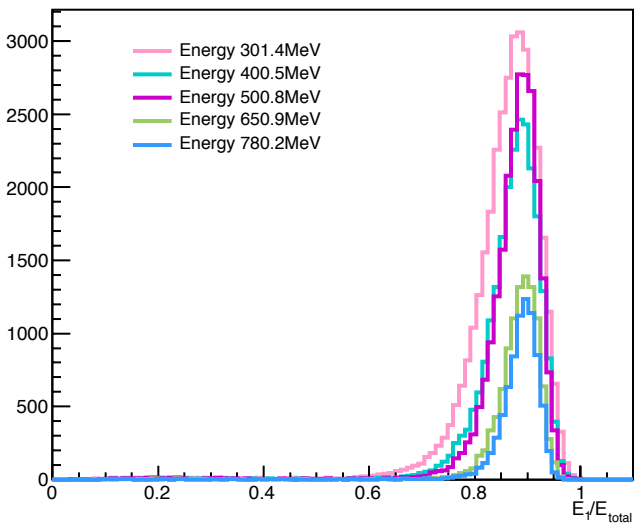
- E1/Etot ratio lower at lower energies
  - Is it as expected?
  - Higher contribution from low energy photons?

Cluster Size (SHP)









- Cluster Size slightly bigger wrt CSP
  - ~0.3 crystals
- E1/Etot has same behavior as before shaping