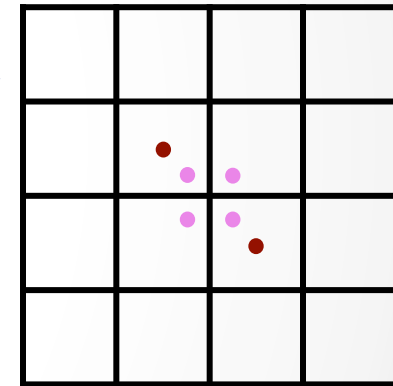


Pure CsI Test Beam Update

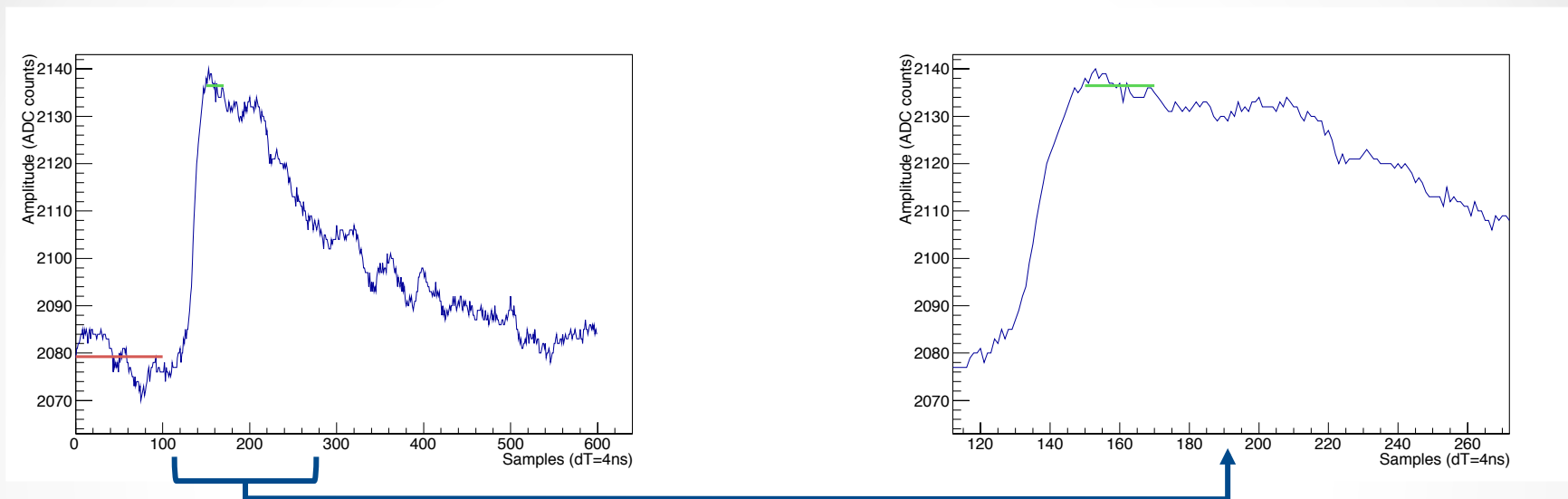
A. Rossi, C. Cecchi, E. Manoni

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)

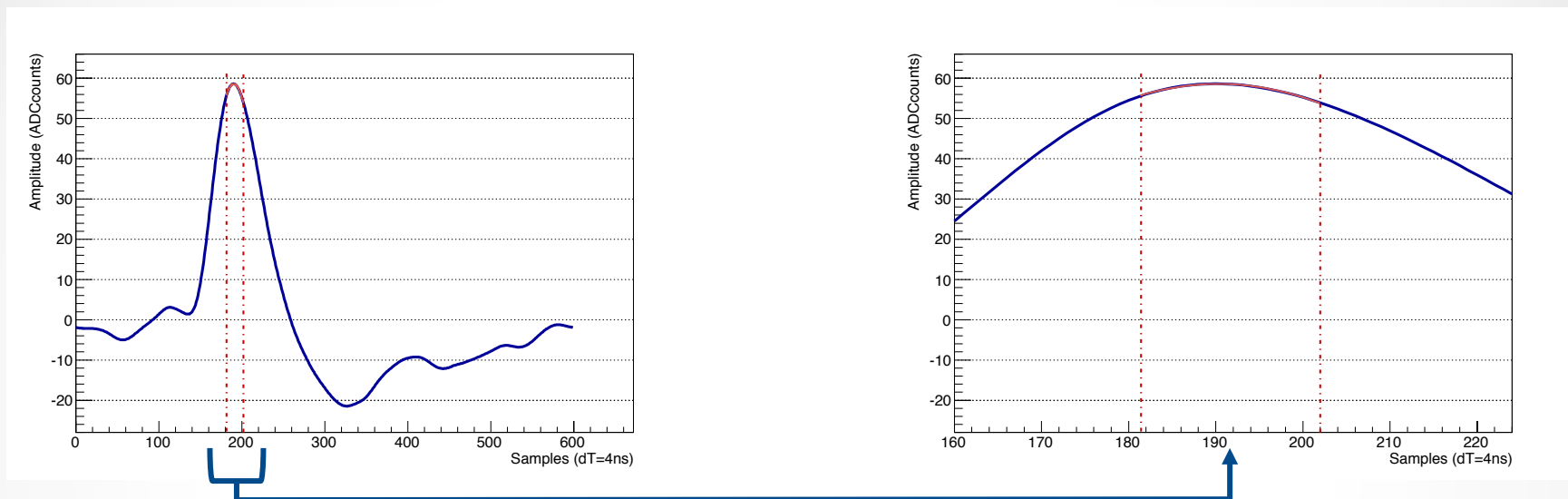


Amplitude Extraction



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

Amplitude Extraction (shaping)

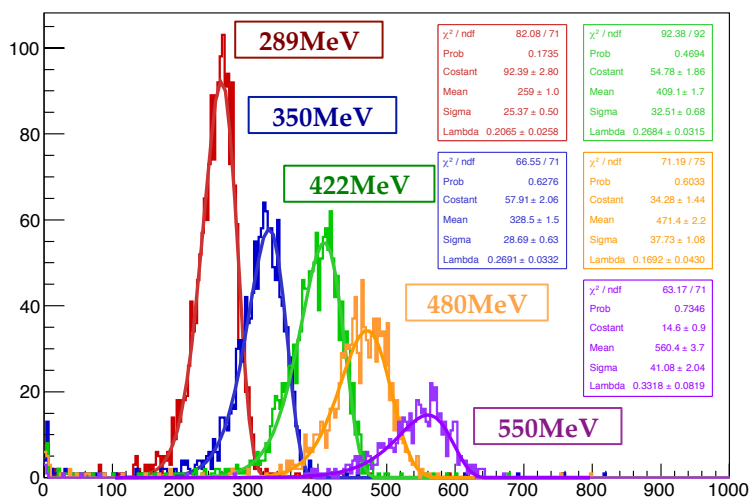


- Signal : Gaussian fit on fixed windows (20samples)
- No pedestal subtraction
 - With software shaping baseline always at zero

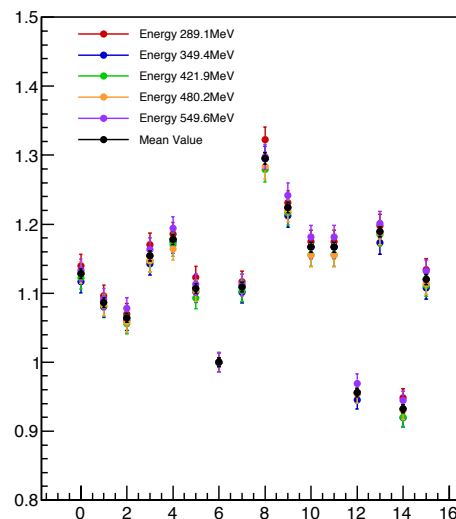
Calibration

- 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**

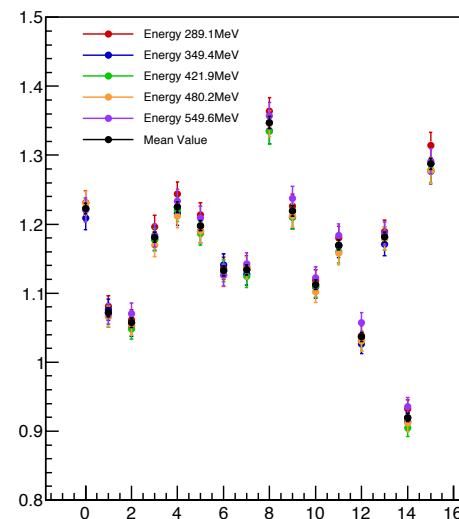
Ch0 APD0 - Calibration



Calibration Constants - APD0

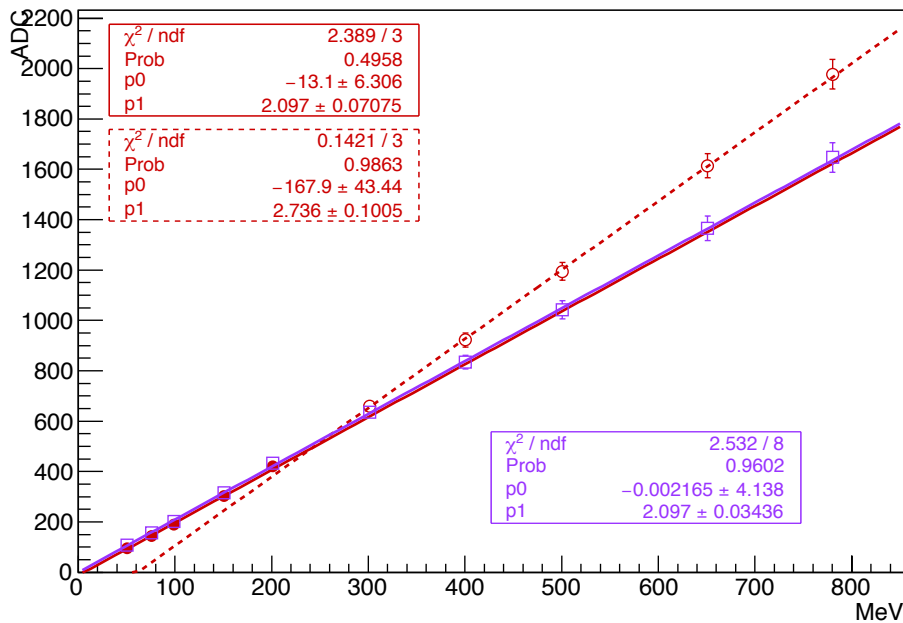


Calibration Constants - APD1



Linearity

Channel 6 - Calib. Ch6 Apd0

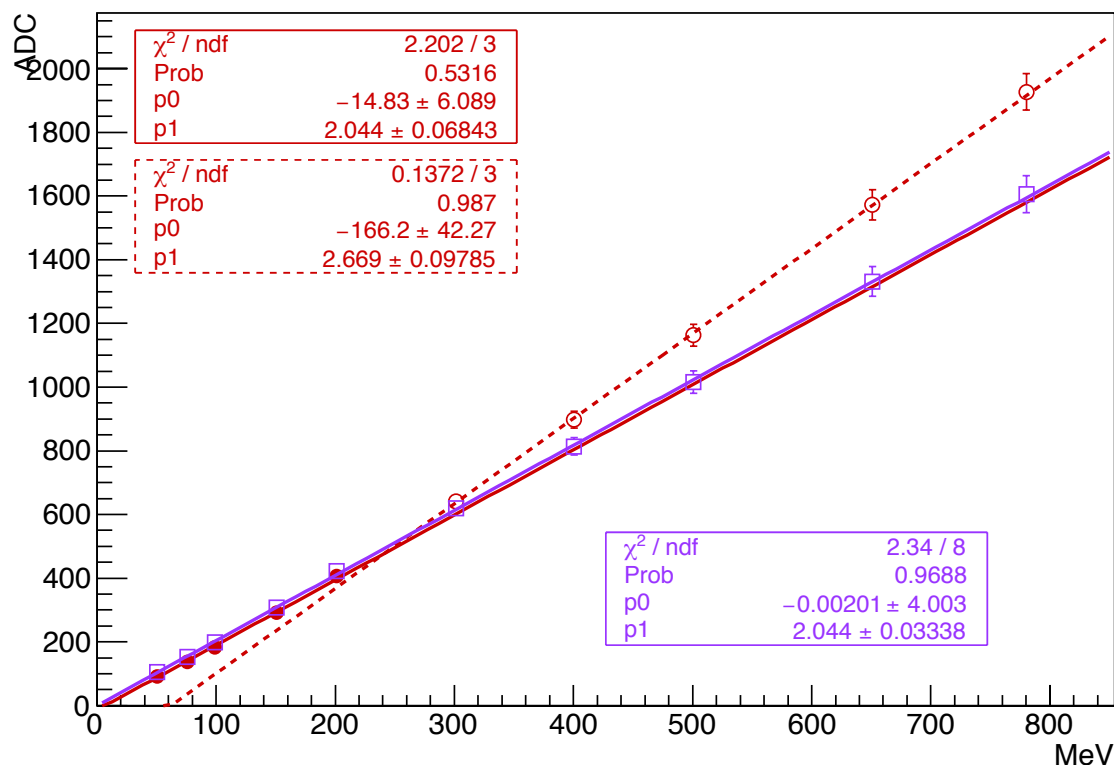


- Non linearity observed
- Difference between the two different run (high/low energy)
- Source still unknown

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

Linearity (SHP)

Channel 6 - Calib. Ch6 Apd0

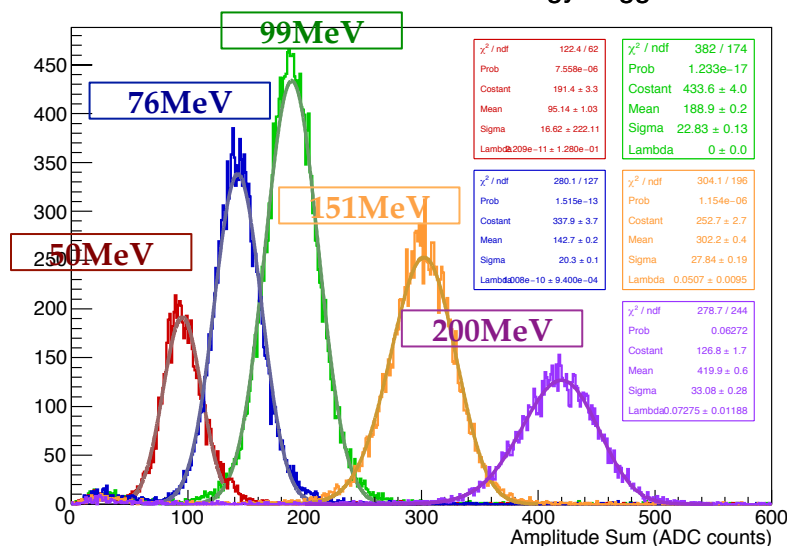


- Same strategy also for shaped data

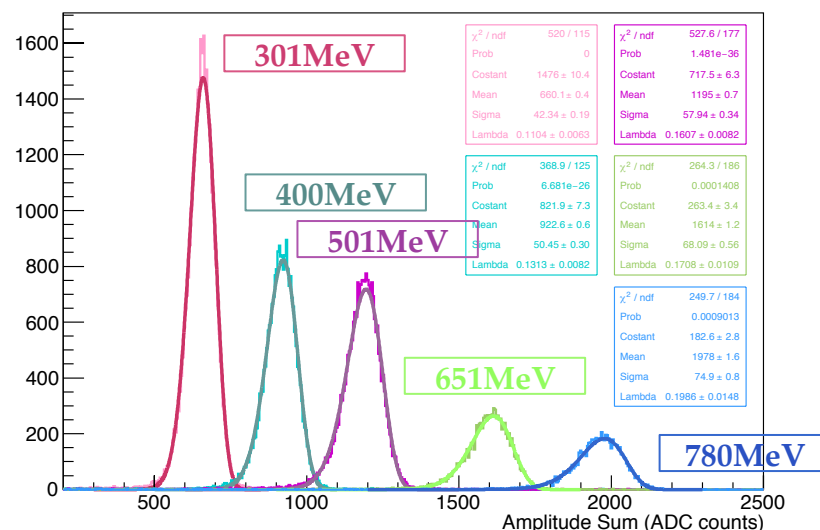
Energy Distributions

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

Ch6 - Position Cen - LowEnergy Trigger



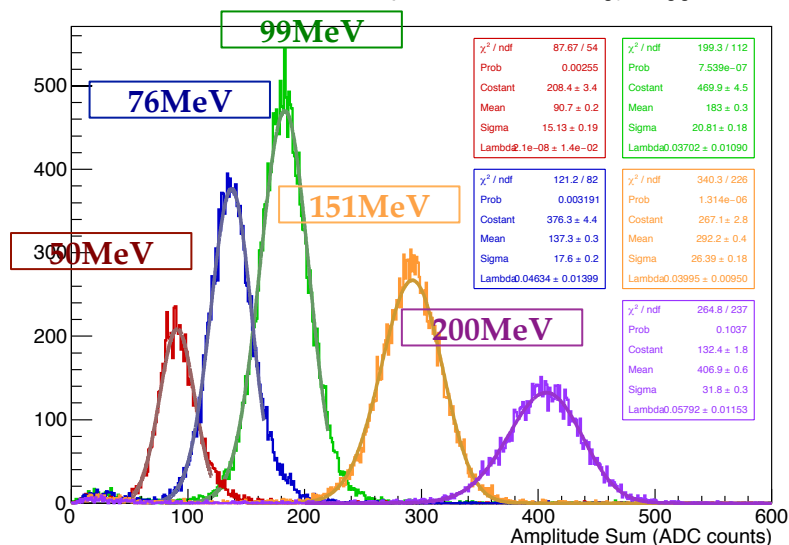
Ch6 - Position Cen - HighEnergy Trigger



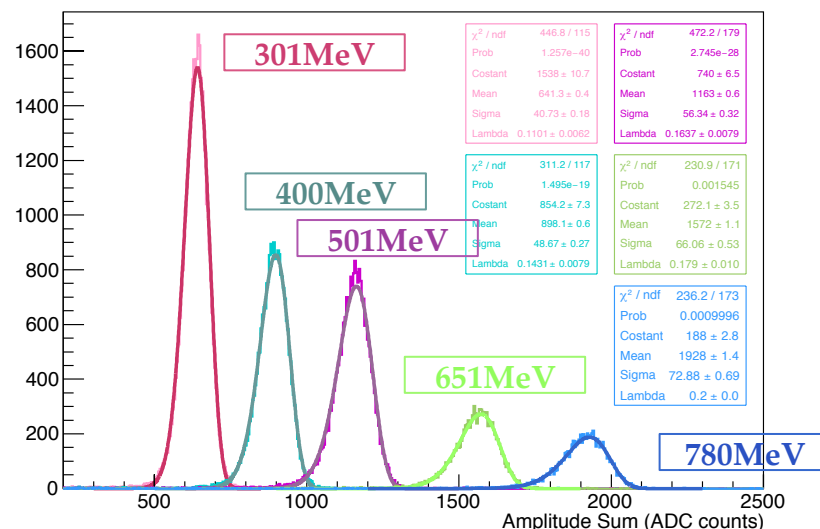
Shaped Signal Analysis

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

Ch6 - Position Cen - Shp 100ns - LowEnergy Trigger

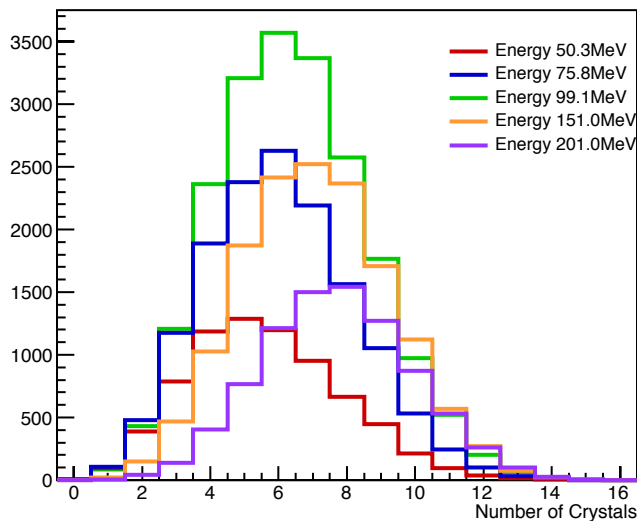


Ch6 - Position Cen - Shp 100ns - HighEnergy Trigger

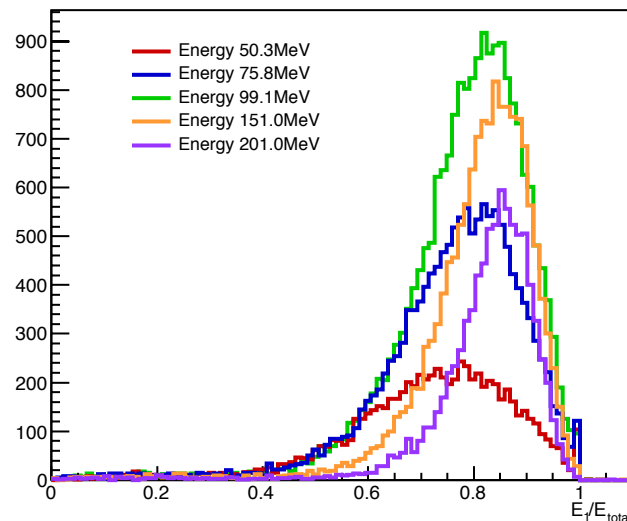


Cluster Size

Ch9 - Position Cen - Cluster Size

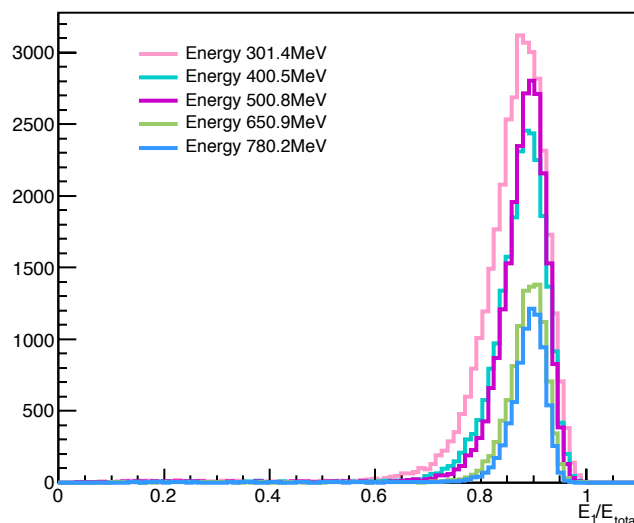
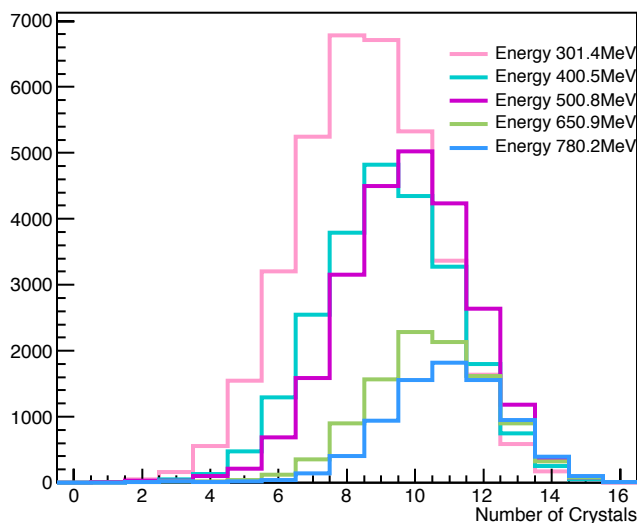


Ch9 - Position Cen - E_1/E_{total}



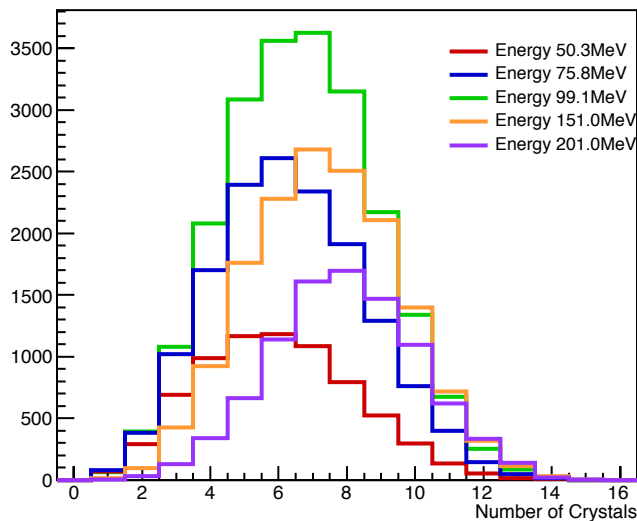
- E_1/E_{tot} ratio lower at lower energies

- Is it as expected?
- Higher contribution from low energy photons?

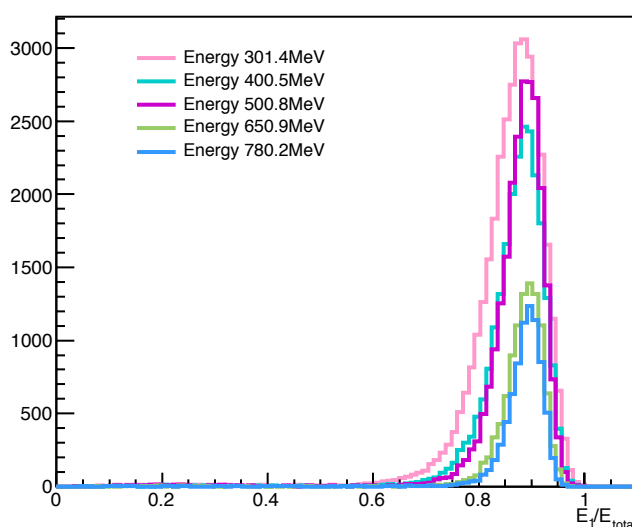
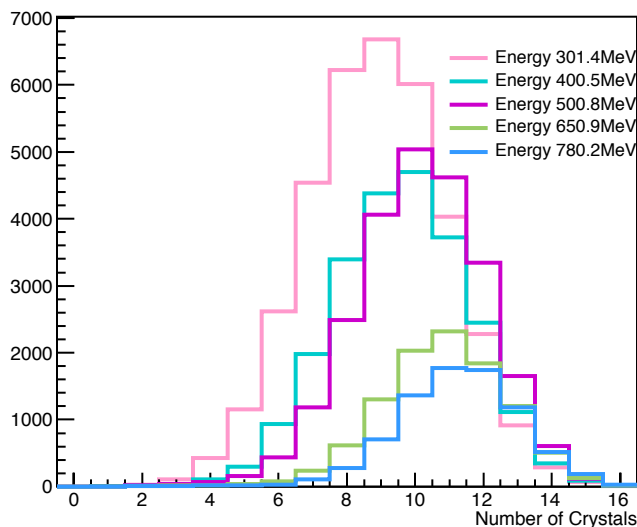
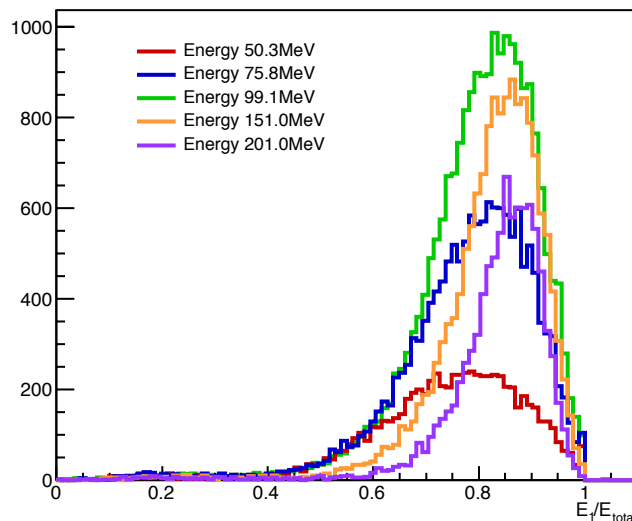


Cluster Size (SHP)

Ch6 - Position Cen - Cluster Size



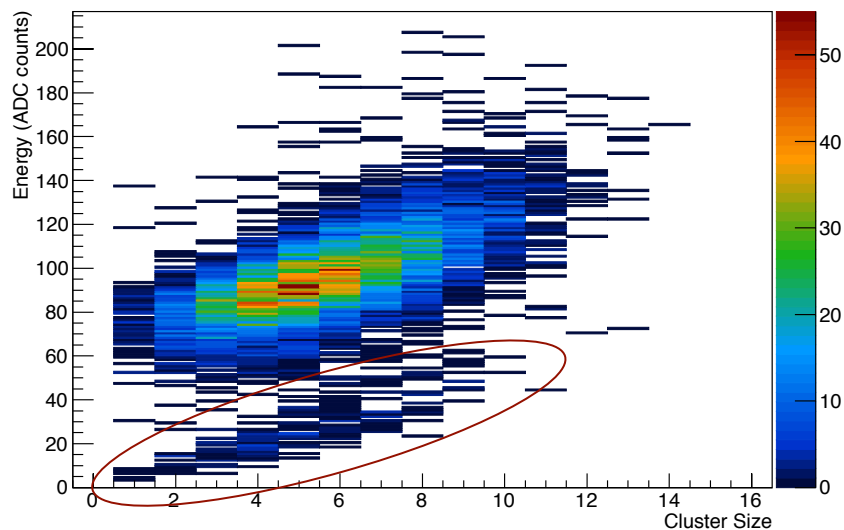
Ch6 - Position Cen - E_1/E_{total}



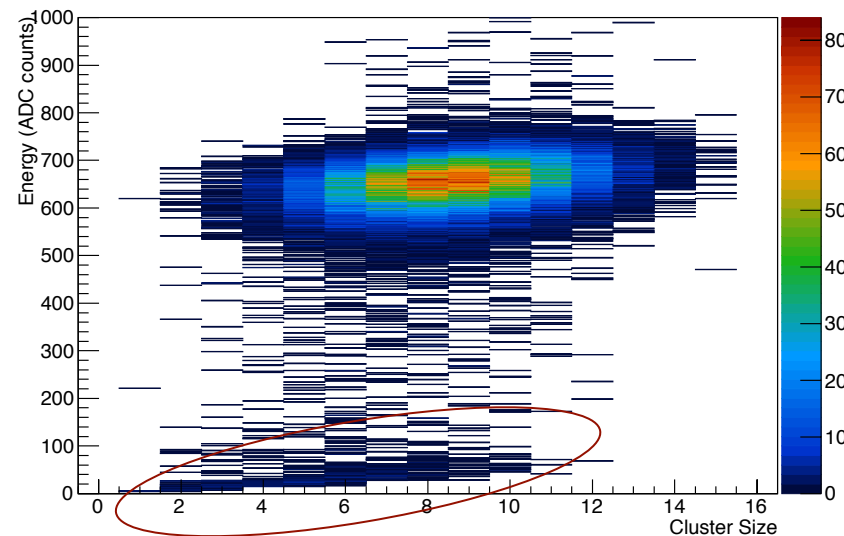
- Cluster Size slightly bigger wrt CSP
 - ~0.3 crystals
- E_1/E_{tot} has same behavior as before shaping

More on Cluster Size

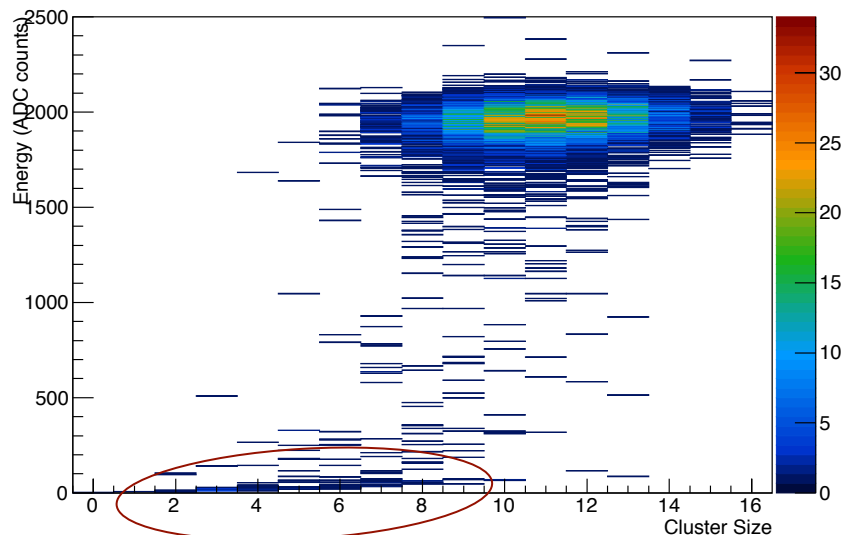
Run on Ch6 - Energy 50.3MeV



Run on Ch6 - Energy 300MeV



Run on Ch6 - Energy 780MeV



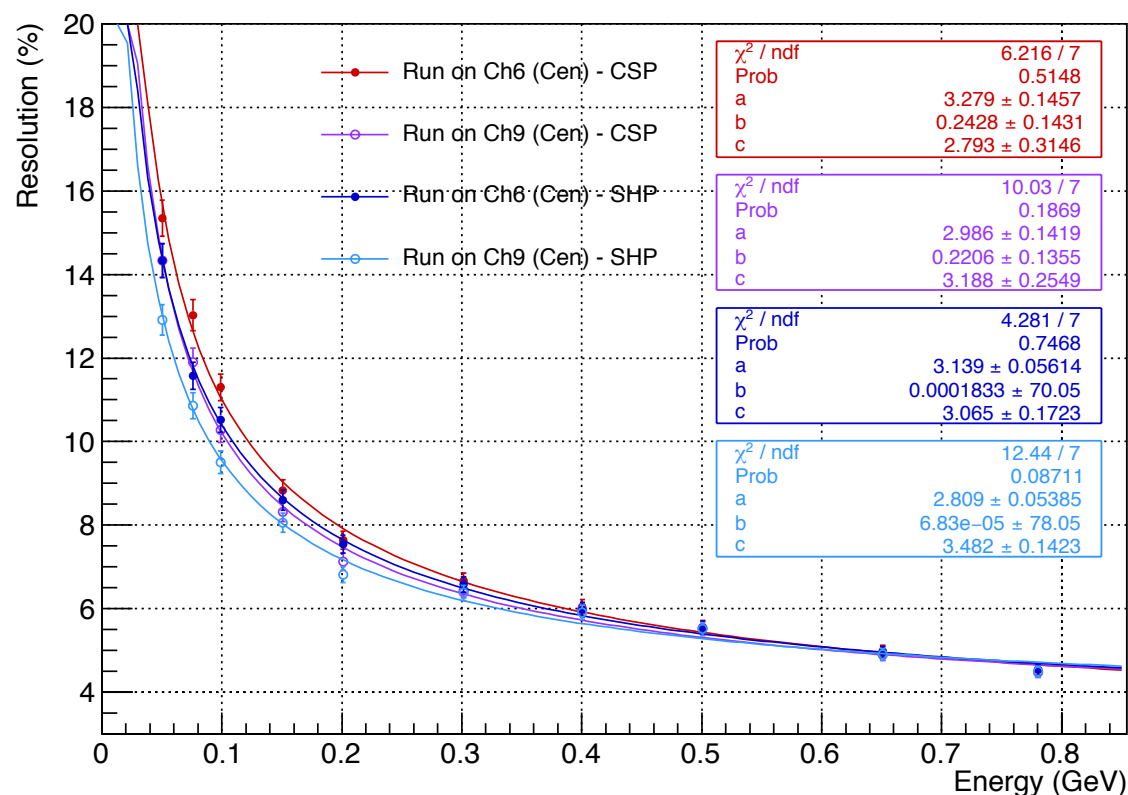
- Total E has a dependency with the cluster size
 - Decreases with increasing energy
- Also empty events have the same dependency
- Low energy (<40MeV) photons pileup?

Resolution

- Crystal Center

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

Resolution - Calib. Ch6 Apd0



- Small difference between the two crystals
- Small gain with shaping
 - Only at lower energies