

TB analysis update

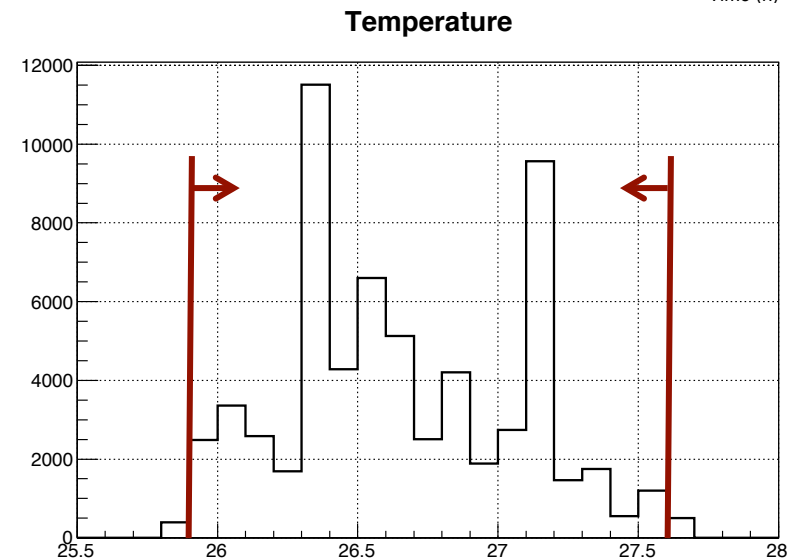
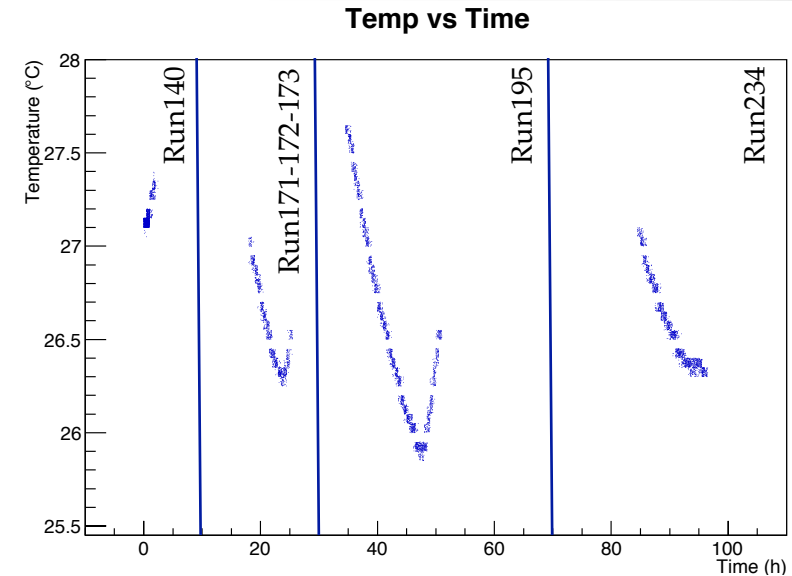
A. Rossi, C. Cecchi, E. Manoni

Calibration

- OLD Method
 - Request that cosmic went through one single column of the matrix
 - Fit with Langau (Landau convoluted with gaussian) to extract signal amplitude
 - No temperature correction
- NEW Method
 - Extract from data the temperature dependency for each APDs
 - Correct event by event for T dependency
 - Request that cosmic went through one single column of the matrix
 - Fit with Langau (Landau convoluted with gaussian) to extract signal amplitude

T Dependency

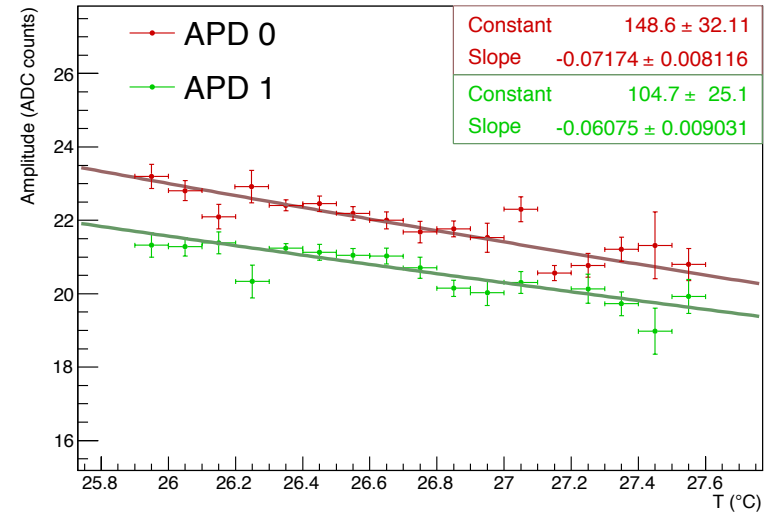
- Divide the T range $[25.9, 27.6]^{\circ}\text{C}$ in 17 different regions ($dT=0.1^{\circ}\text{C}$)
- For each region perform a fit to the energy deposit
- From the plots T vs Amplitude extract the Gain dependency



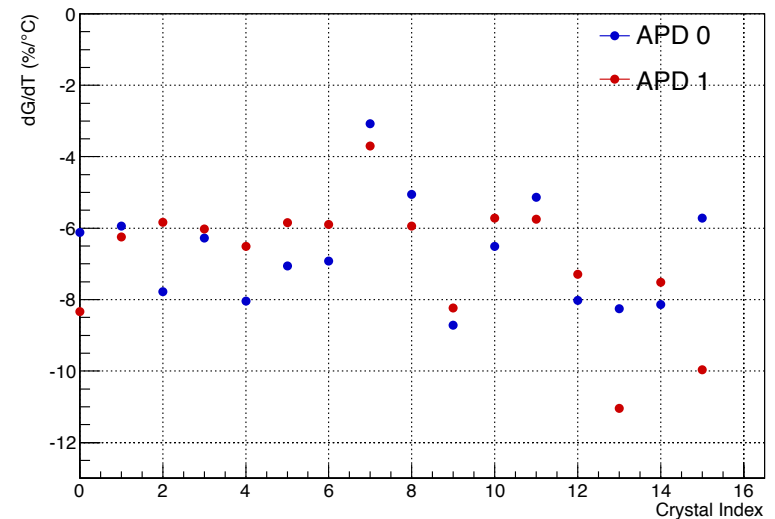
T Dependency - Results

- Fit to the T dependency with an exponential function
- Store functions parameters for correction
- Max dependency
Xtal13apd1 $\rightarrow -11\%/^{\circ}\text{C}$
- Min dependency
Xtal7apd0 $\rightarrow -3.1\%/^{\circ}\text{C}$

T dependency - Xtal6

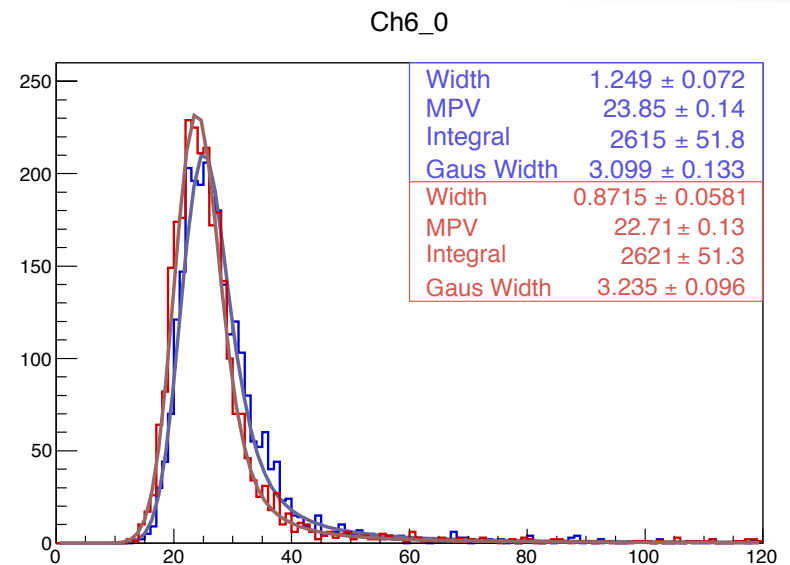


T dependency



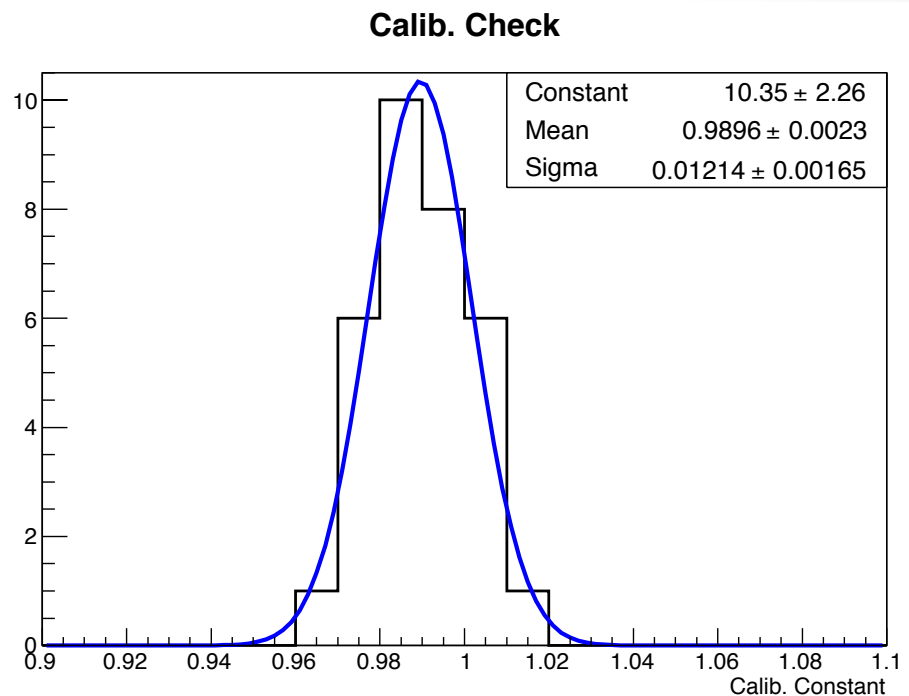
Calibration

- Run234 not used for Calib constant extraction
 - It will be used as check
- Each event is corrected for the temperature
 - Correction Factor: $\text{Exp}(26)/\text{Exp}(\text{temperature})$
- Selected cosmic event which pass through one matrix column
- Fit and MPV extraction



Calibration Check

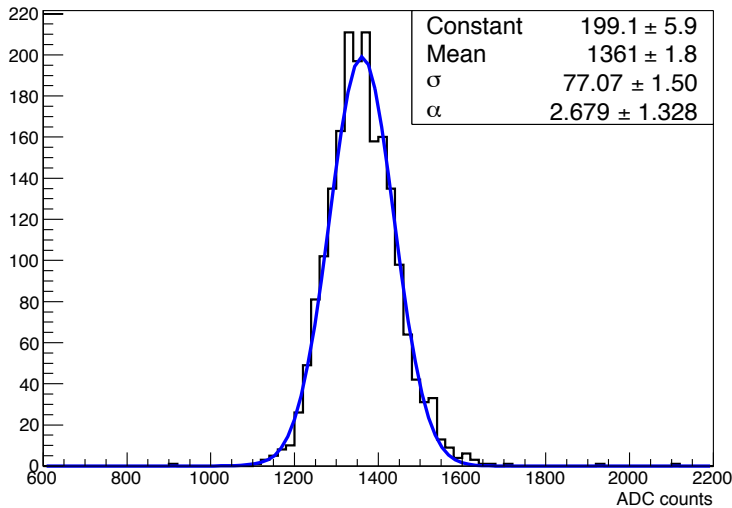
- Using calibration constant to calibrate Run234
- Repeat the calibration procedure for Run234
 - Expected results: all calib equal to 1
- Small bias $\sim -1\%$
 - To understand
- Sigma 1.2%



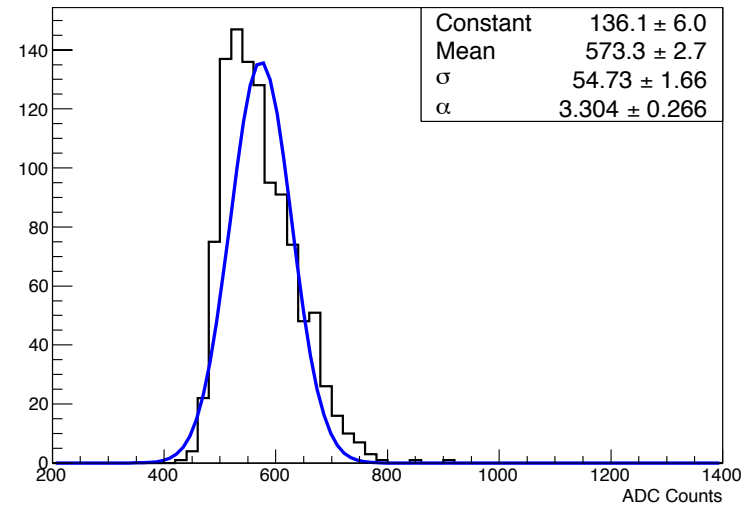
Energy Resolution

- Repeat the same analysis as the previous but with new calib constant and event by event temperature correction

450MeV

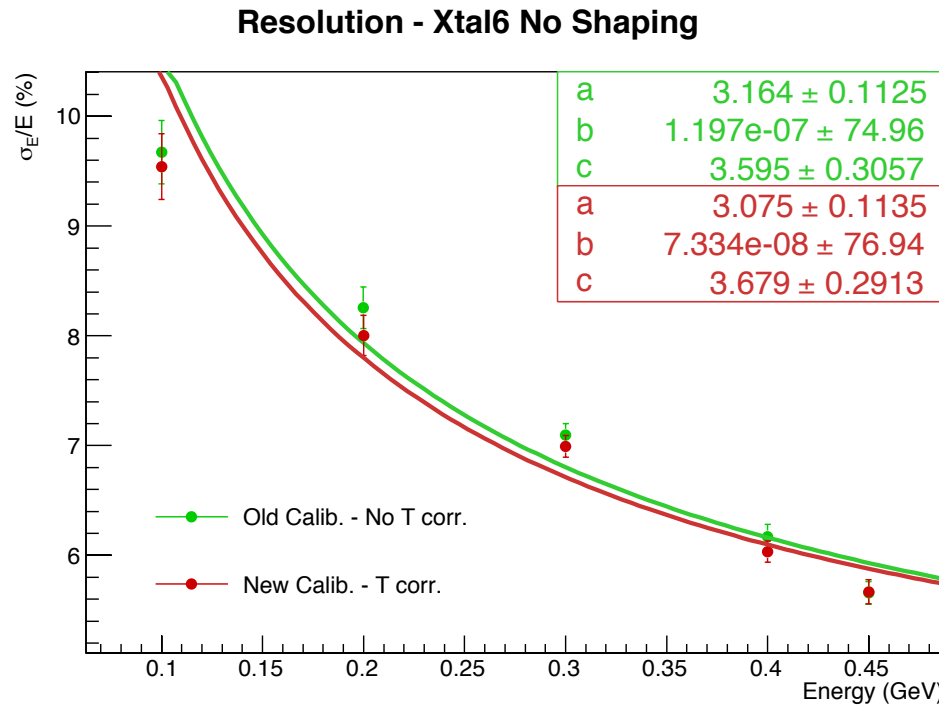


100Mev



- Still problems at low energies

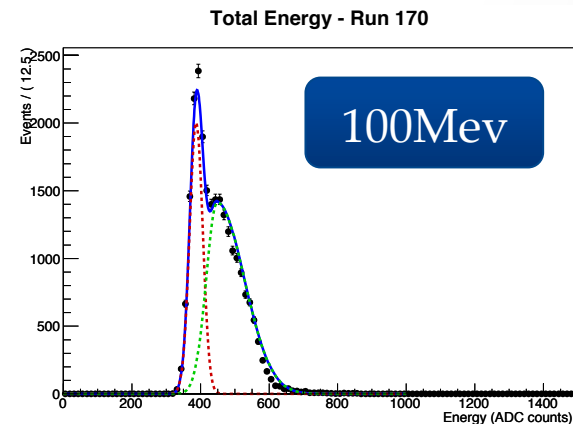
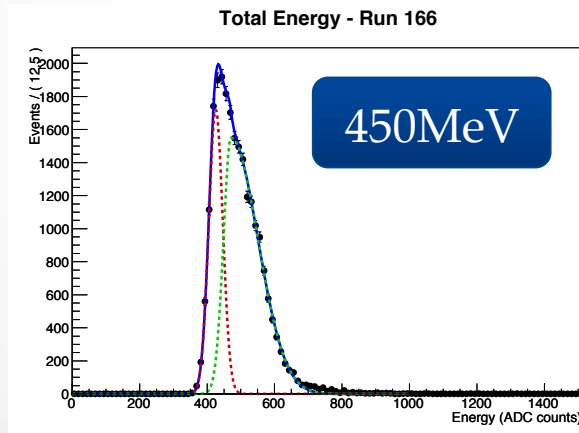
Energy Resolution



- Small differences between old calibration and the new one

Test: Photon Bkg extraction

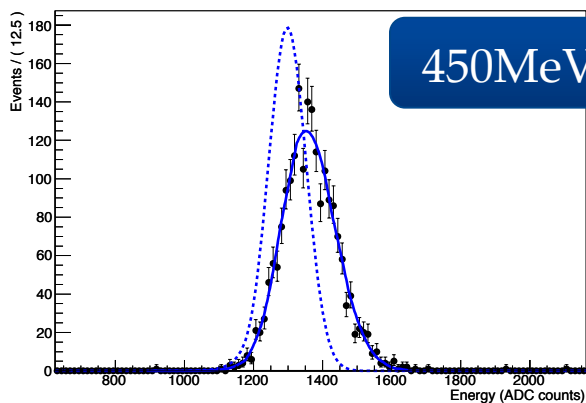
- Basic idea:
 - Extract the photons distribution with a fit to the “pedestal” (when there are no hits on silicon)
 - Fit the energy distribution with a Crystal Ball convoluted with the Photons distribution
- Background Extraction
 - One Gaussian for the pedestal plus one Bifurcated Gaussian for the photons
 - Bifurcated Gaussian: Gaussian with different sigma on left and right side



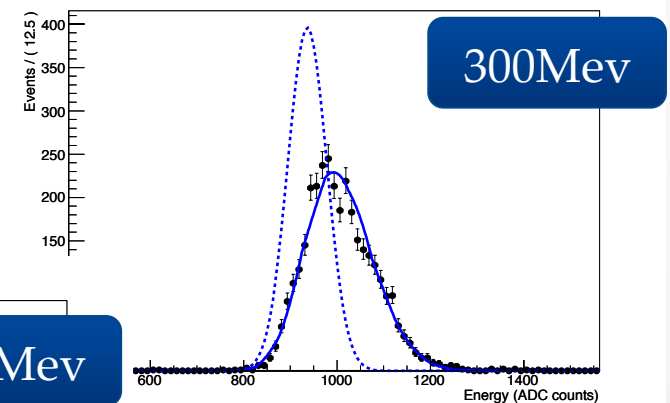
Convolved Fit

- From previous fit we have the Photons bkg shape for each run
- The photon shape is fixed and convoluted with a Crystal Ball
- Still problems at low energies

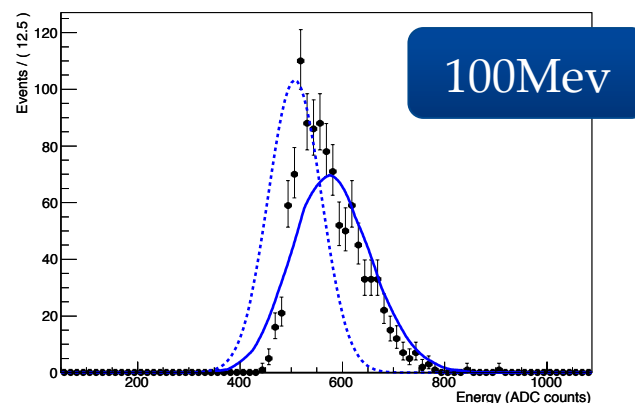
Total Energy - Run 166



Total Energy - Run 168

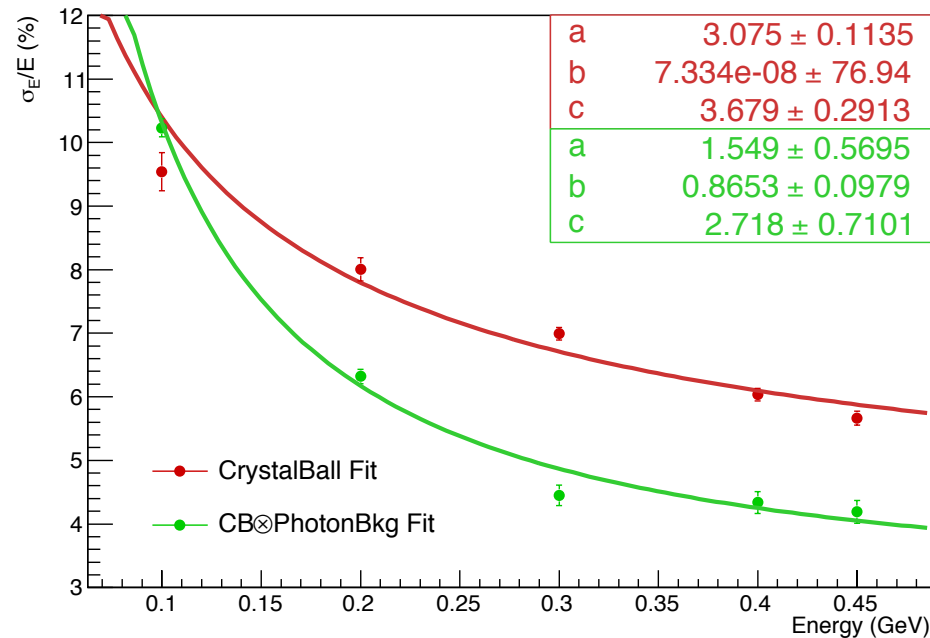


Total Energy - Run 170



Energy Resolution

Resolution - Xtal6 - No Shaping



- Better results with the convoluted function fit
 - Not true at 100MeV (?)

Conclusions

- More accurate calibration and temperature correction seem to have only a small effect
- Tested a method to take into account photons background
 - Convoluted function fit : Crystal Ball X BKG shape
- Better results with these method
 - Not true at 100MeV → Why??
- To Do list:
 - Check convoluted fit stability
 - Perform the same analysis on crystal9 and on shaped signal
 - Amplitude extraction with fit (BelleII like)