

First look at TB data

A. Rossi

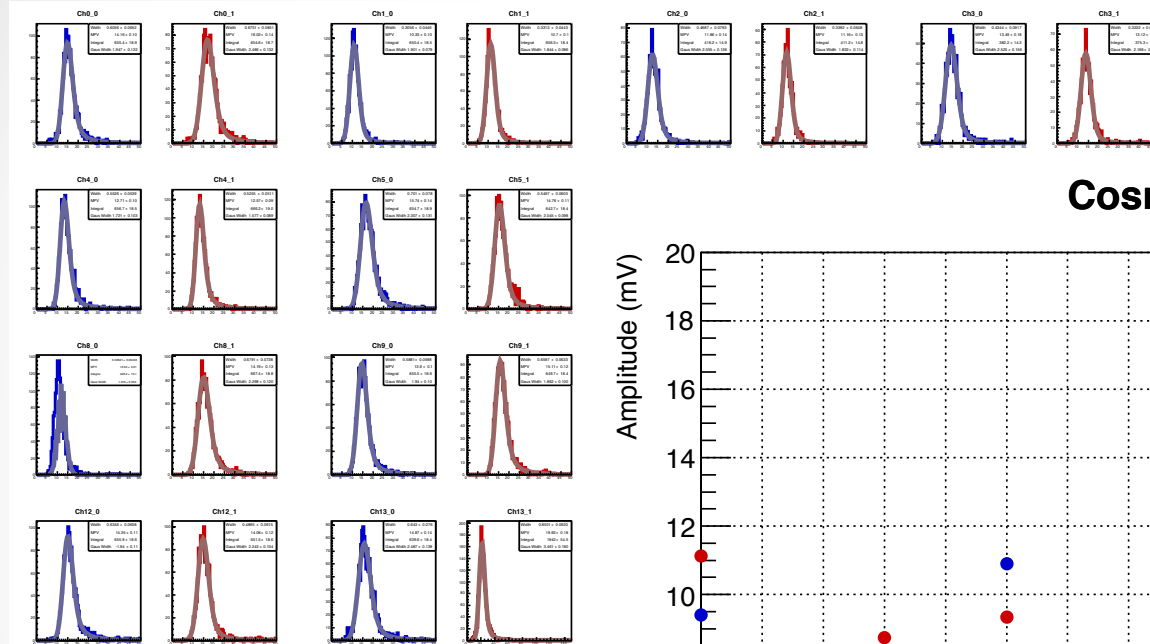
Used data

- Calibration
 - All cosmic run after “equalization” of HV
 - 140,171,172,173,195,234
 - **Total events 64409**
- Resolution
 - All run with beam on Crystal6 without magnetic field after beampipe
 - **Run166 -> 450MeV**
 - **Run167 -> 400MeV**
 - **Run168 -> 300MeV**
 - **Run169 -> 200MeV**
 - **Run170 -> 100MeV**

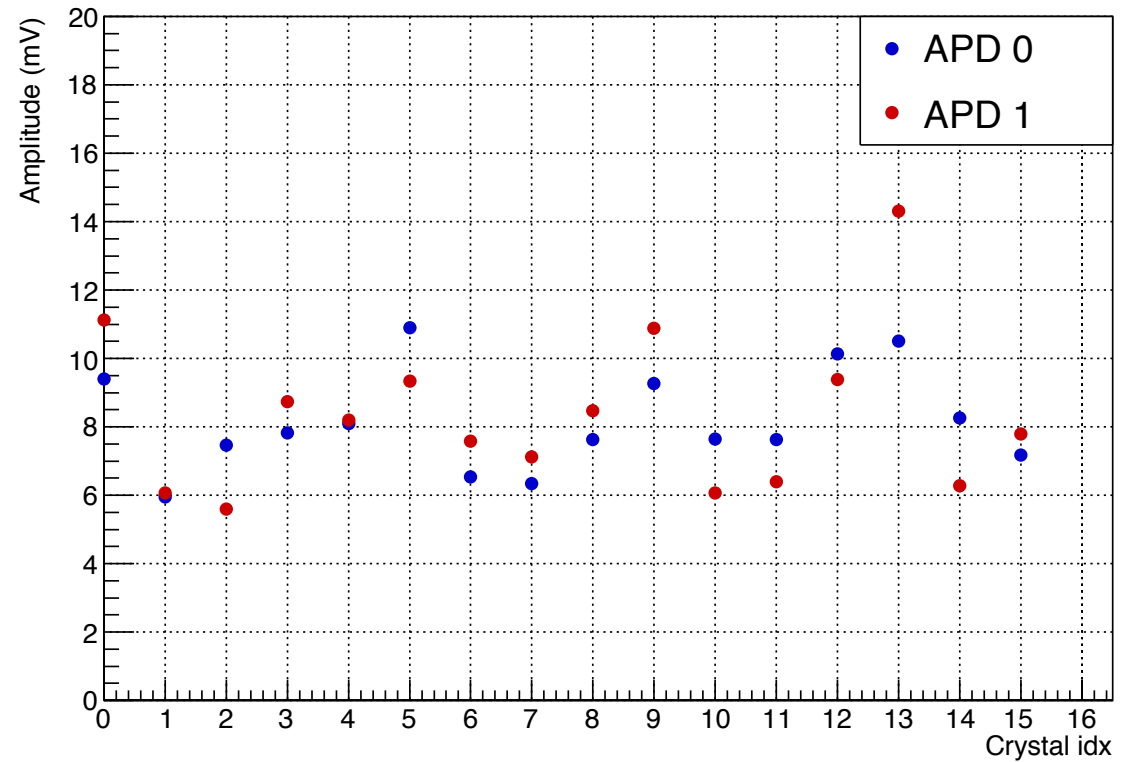
Calibration

- Request that cosmic went through one single column of the matrix and no signal over the rest of the crystal
- Fit with Langau (Landau convoluted with gaussian) to extract signal amplitude
- Noise extracted reversing the request of the signal
 - No signal in the entire column
- Reference for calibration chosen as the mean value between the two APDs of crystal 5

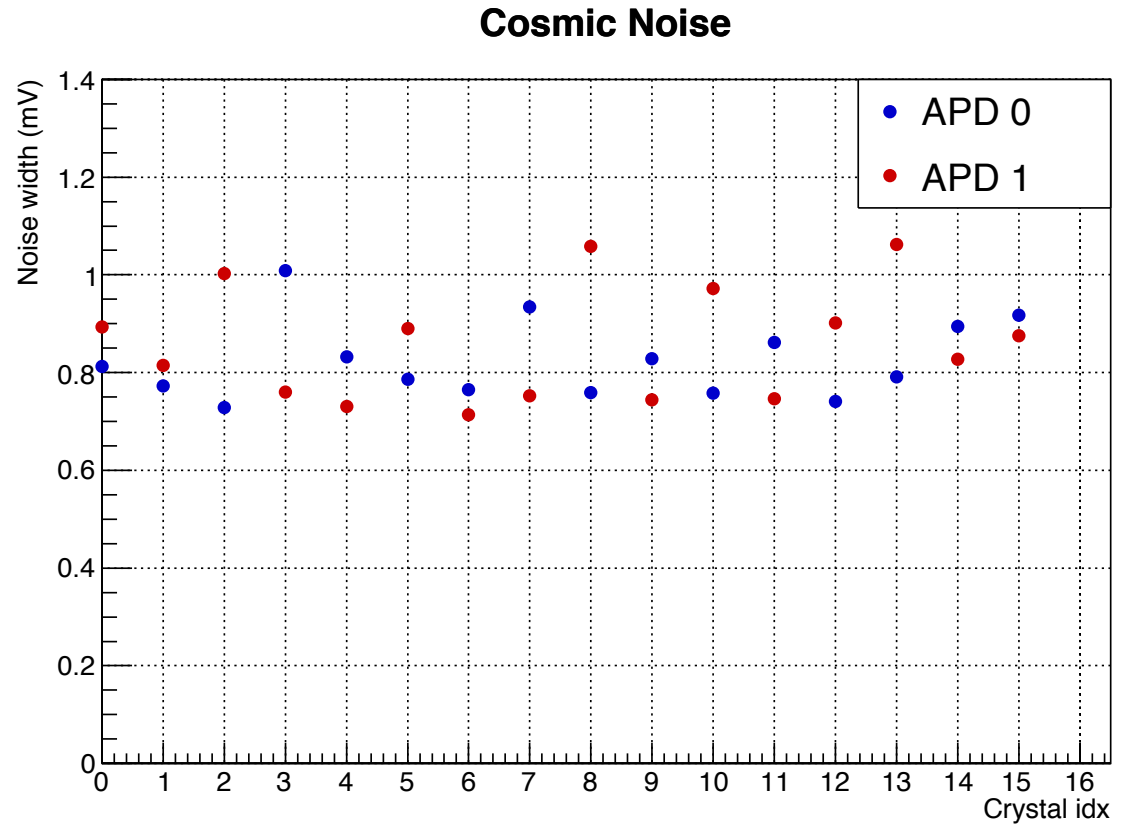
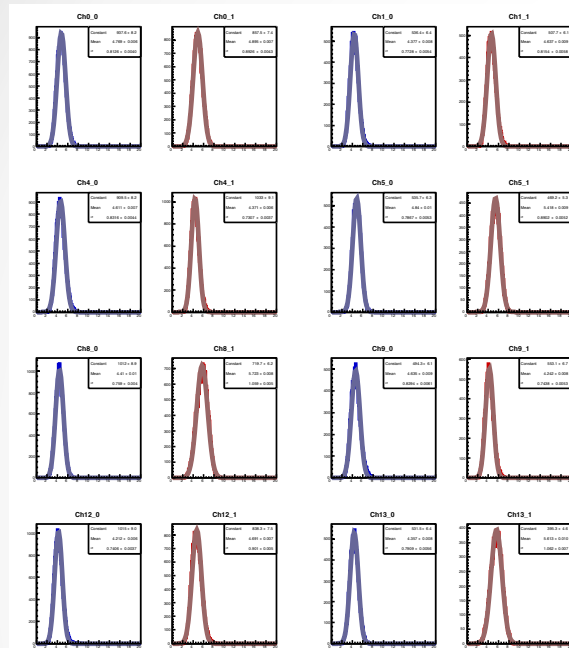
Calibration – Signal



Cosmic Signal

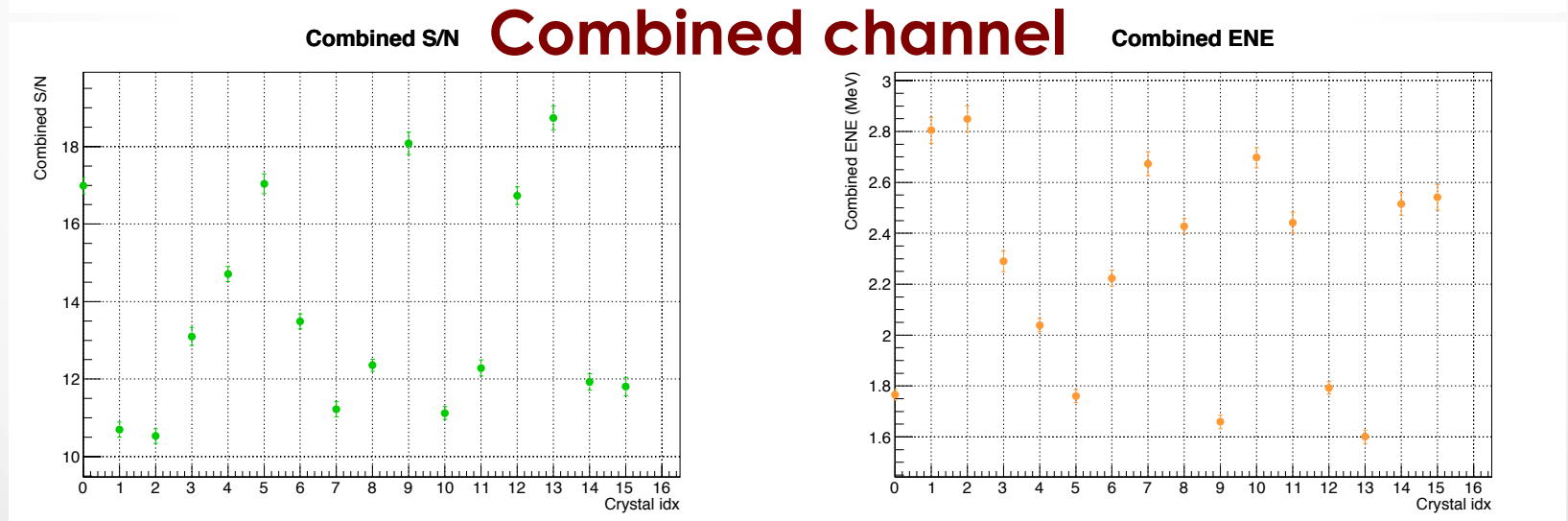
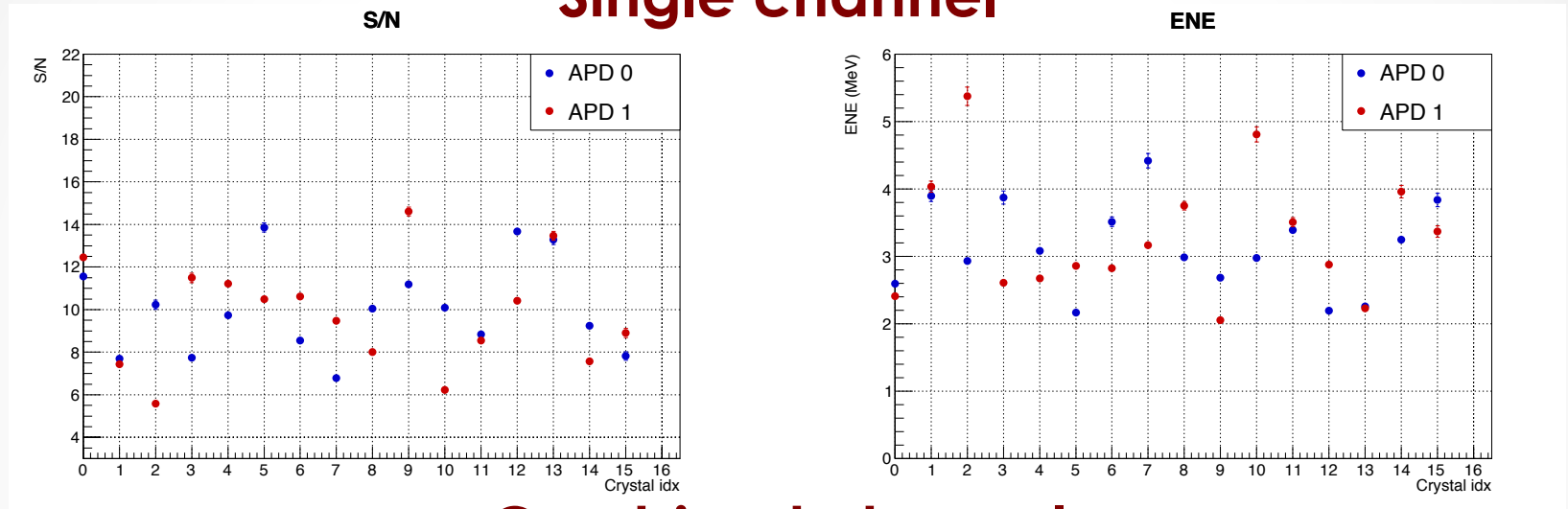


Calibration – Noise



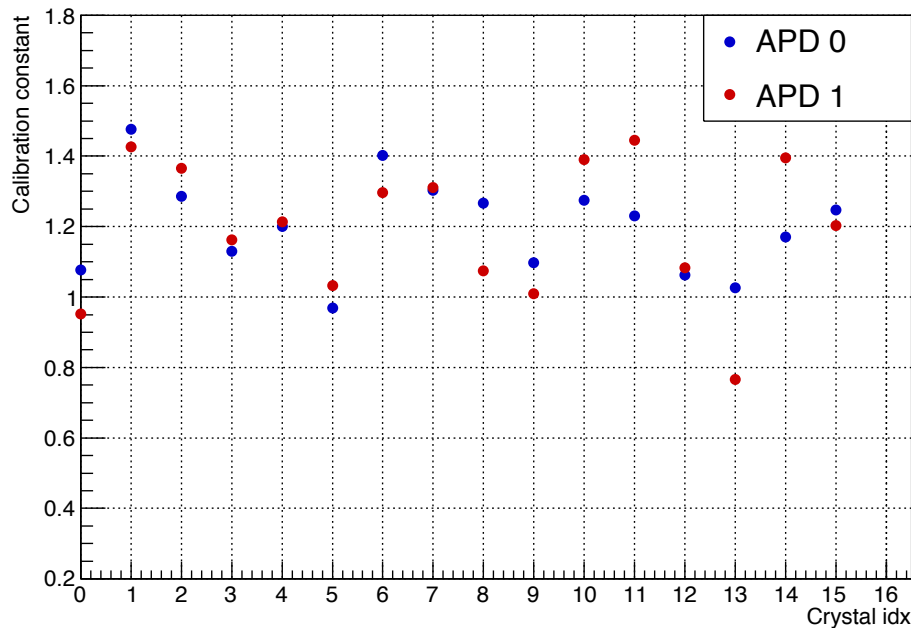
Calibration – S/N and ENE

Single channel



Calibration constant

Calibration



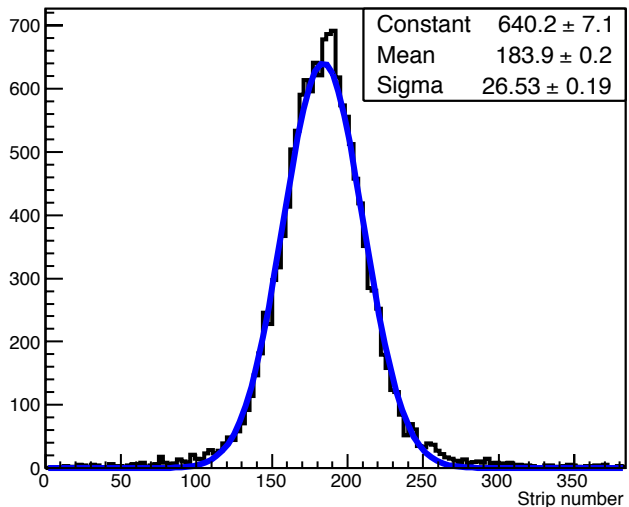
No temperature correction applied

Crystal	APD0	APD1
0	1.077	0.952
1	1.476	1.426
2	1.286	1.366
3	1.130	1.163
4	1.200	1.213
5	0.969	1.033
6	1.402	1.297
7	1.303	1.311
8	1.267	1.074
9	1.097	1.009
10	1.275	1.390
11	1.230	1.445
12	1.063	1.083
13	1.026	0.766
14	1.171	1.395
15	1.247	1.203

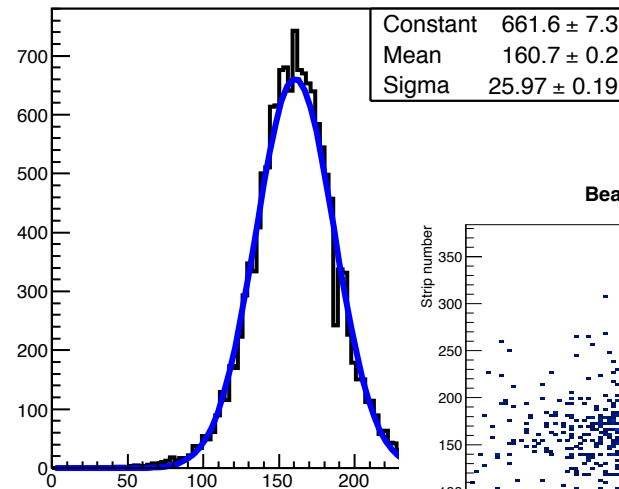
Selection for Energy resolution

- For each run three cuts are applied:
 - Only 1 cluster reconstructed on each plane
 - Position selection of $\frac{1}{2} \sigma$ around the mean value
 - Mean value change slightly between different run
 - Only crystal with maximum value greater then 3 times the baseline RMS
 - Baseline RMS evaluated from random trigger run112

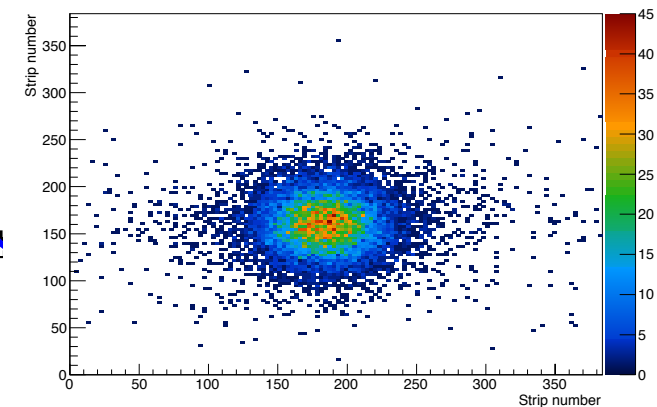
Beam X Profile Run166 - 450MeV



Beam Y Profile Run166 - 450MeV



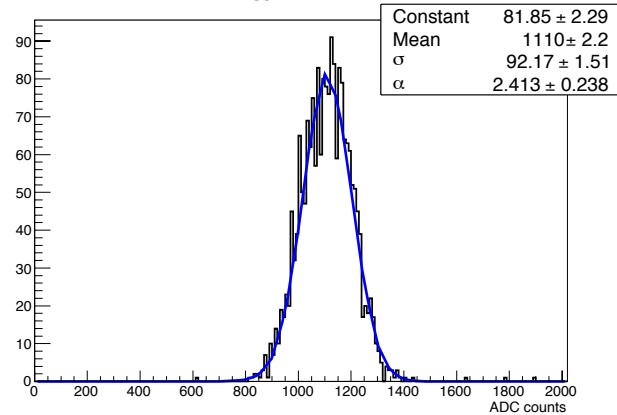
Beam Profile Run166 - 450MeV



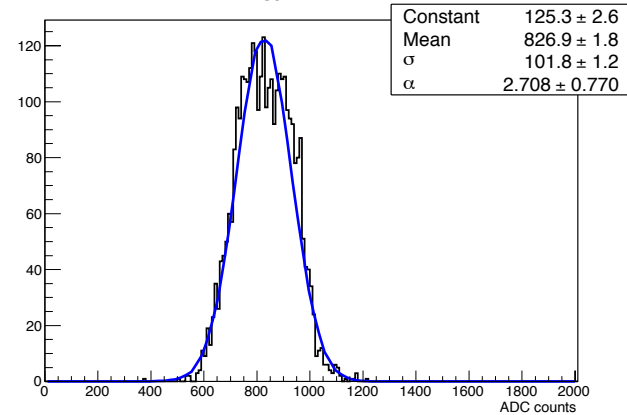
Some distribution

- Fit with Crystal Ball function
 - Parameter n (exponential tail index) fixed to 20

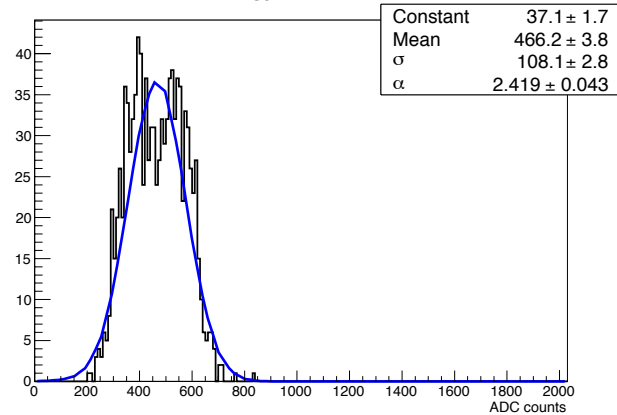
Total Energy Run166 - 450MeV



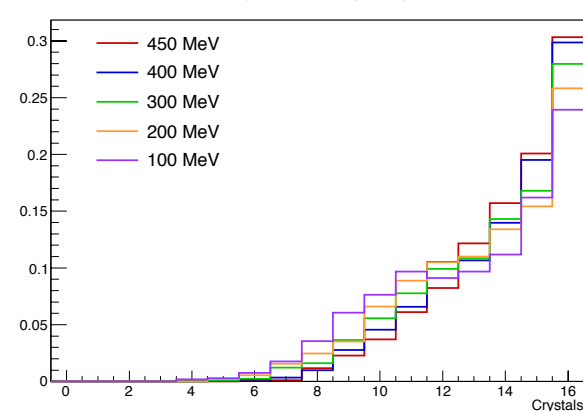
Total Energy Run168 - 300MeV



Total Energy Run170 - 100MeV

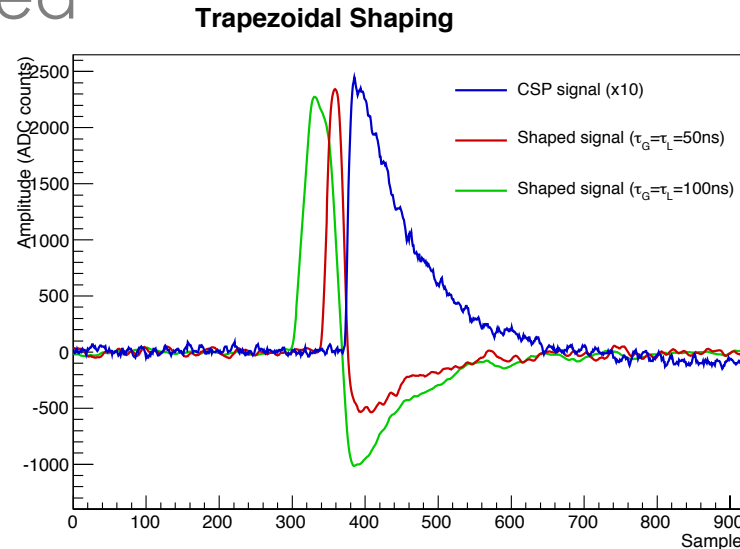


Crystals Multiplicity



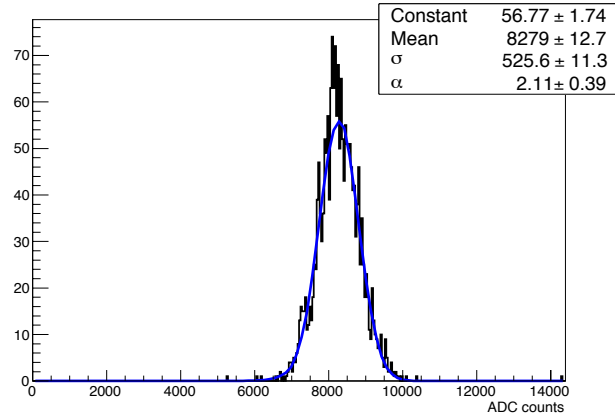
Shaping

- Trapezoidal shaping
- Same calibration constants evaluated w/o shaping
- Two configuration tested
 - $\tau_G = \tau_L = 50\text{ns}$
 - $\tau_G = \tau_L = 100\text{ns}$

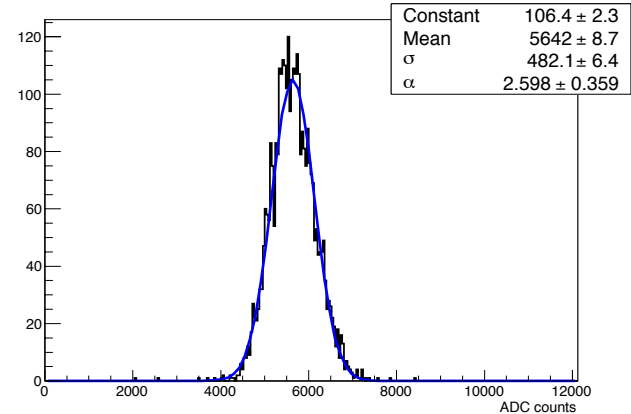


After Shaping 100ns

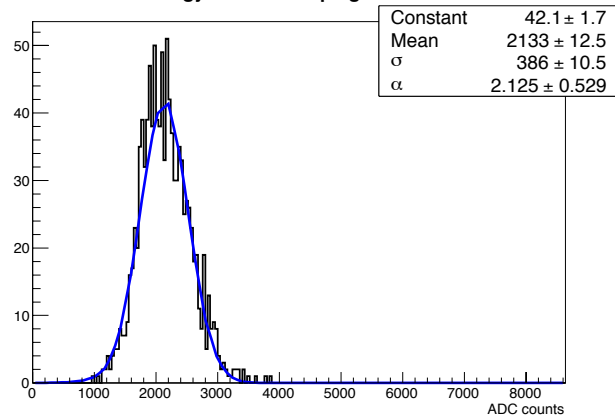
Total Energy Run166 Shaping 100ns - 450MeV



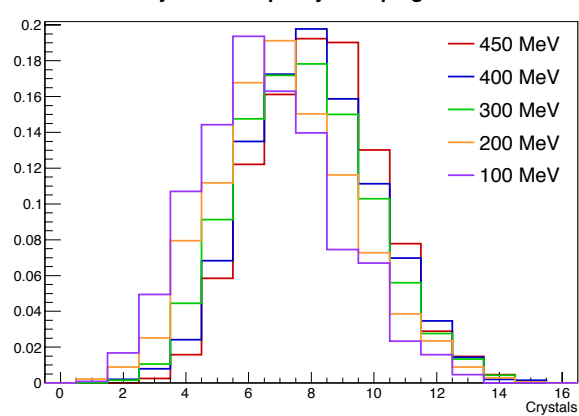
Total Energy Run168 Shaping 100ns - 300MeV



Total Energy Run170 Shaping 100ns - 100MeV



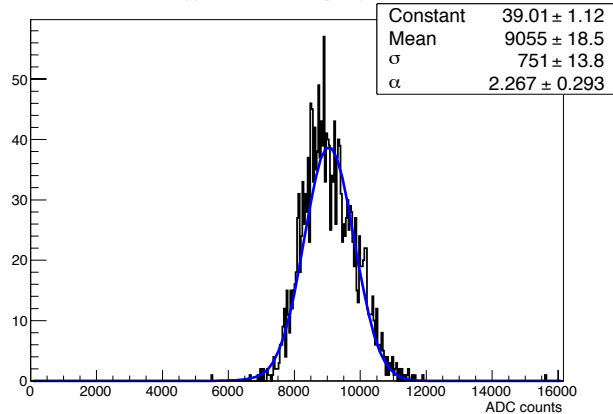
Crystals Multiplicity - Shaping 100ns



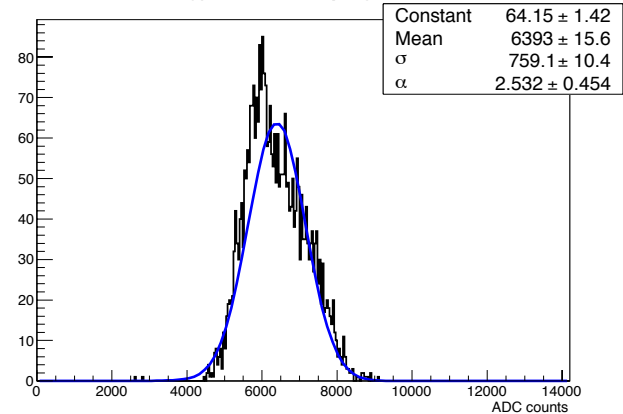
- Big changes on crystals multiplicity

After Shaping 100ns

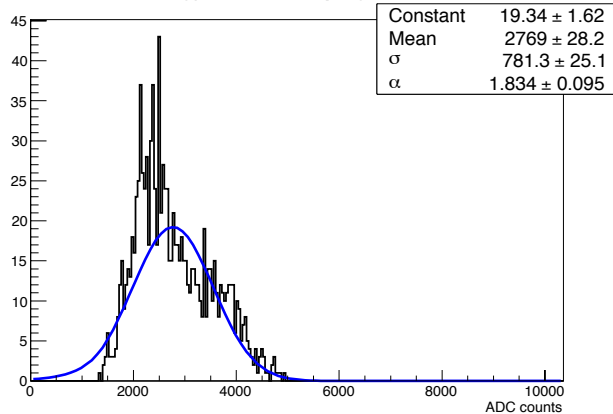
Total Energy Run166 Shaping 50ns - 450MeV



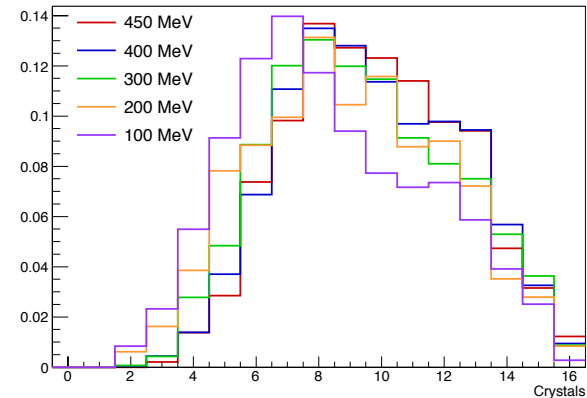
Total Energy Run168 Shaping 50ns - 300MeV



Total Energy Run170 Shaping 50ns - 100MeV



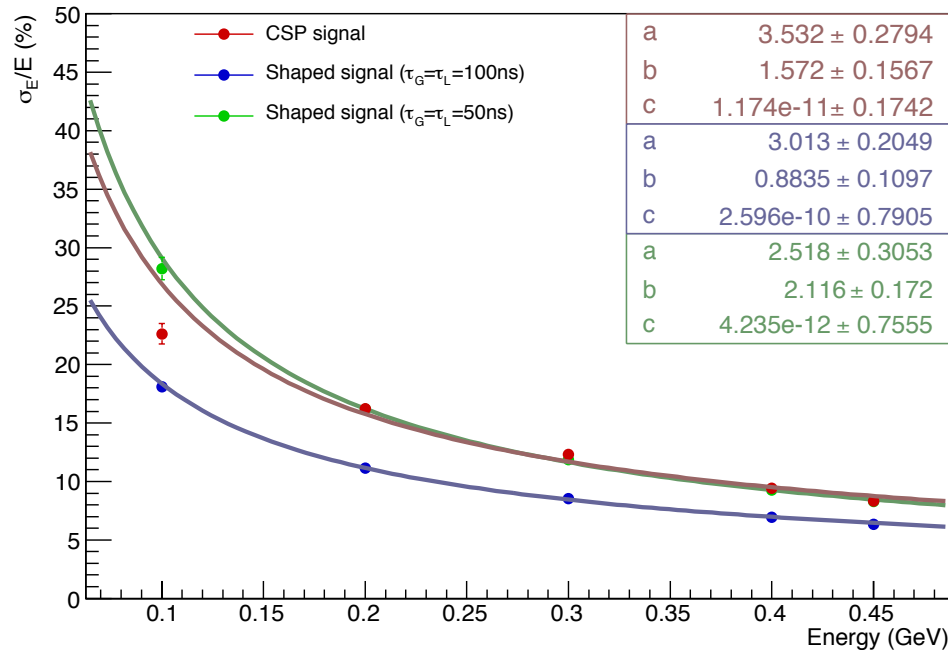
Crystals Multiplicity - Shaping 50ns



- Energy distribution distortion -> calibration problem?

Resolution

Resolution

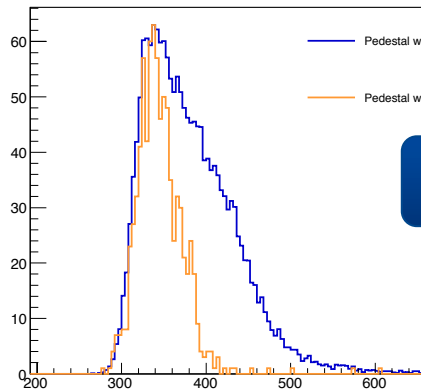


- Results not so good...
- Photons background to be study (see next slide)
 - How much can this background affect resolution?

Photons background

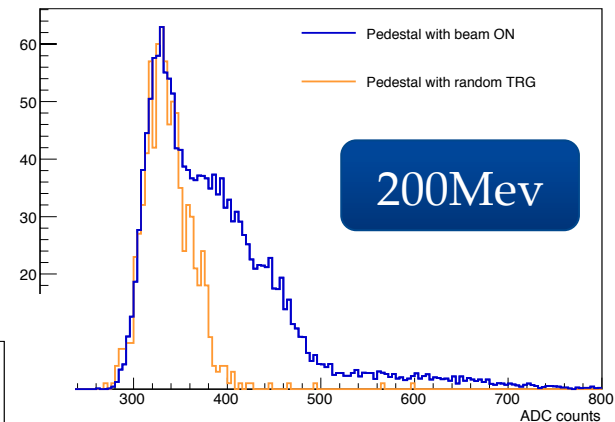
- Not constant
- Depends on primary beam multiplicity on target

Pedestal distribution



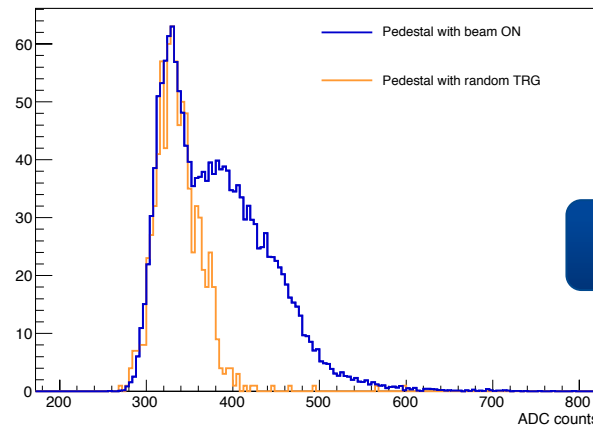
450Mev

Pedestal distribution



200Mev

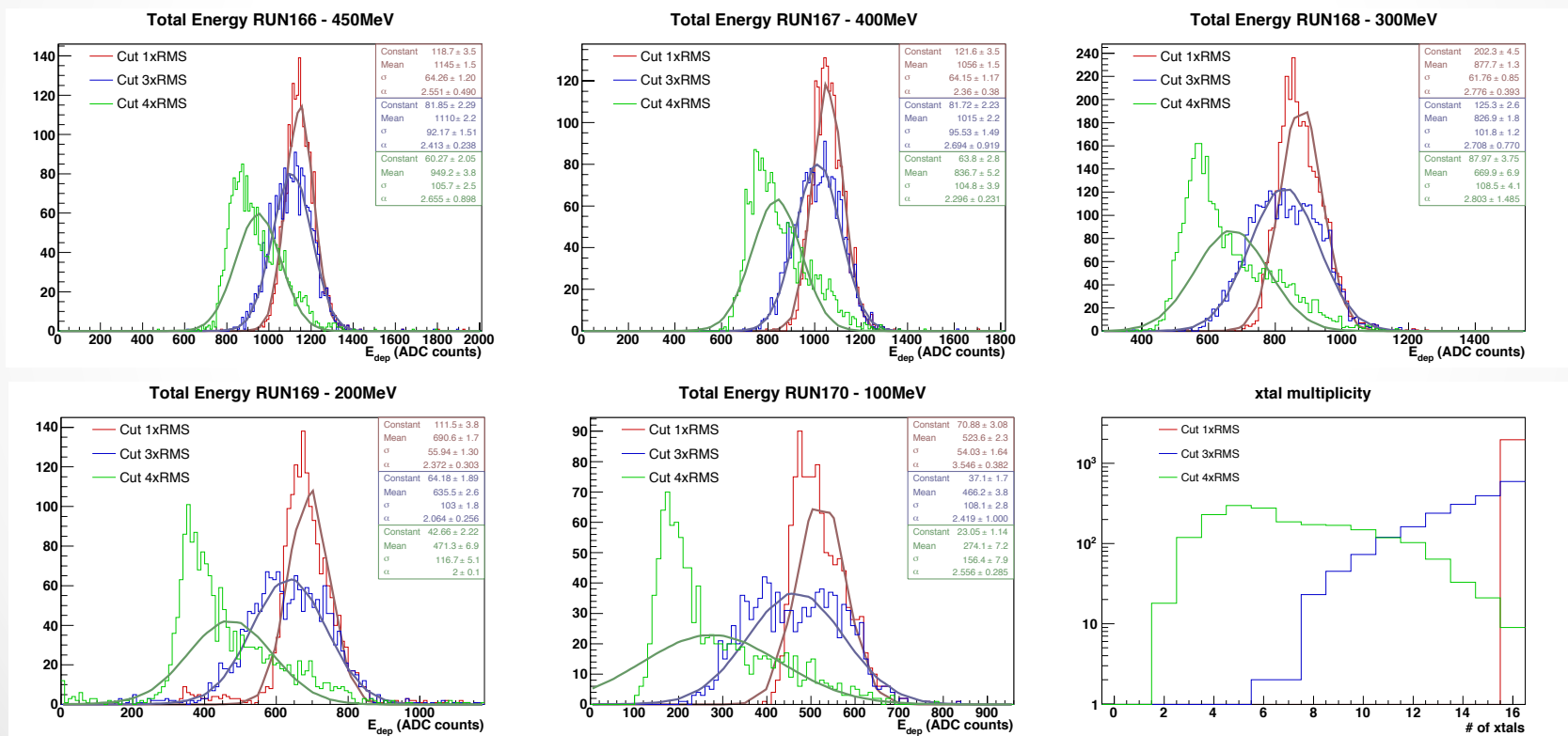
Pedestal distribution



100Mev

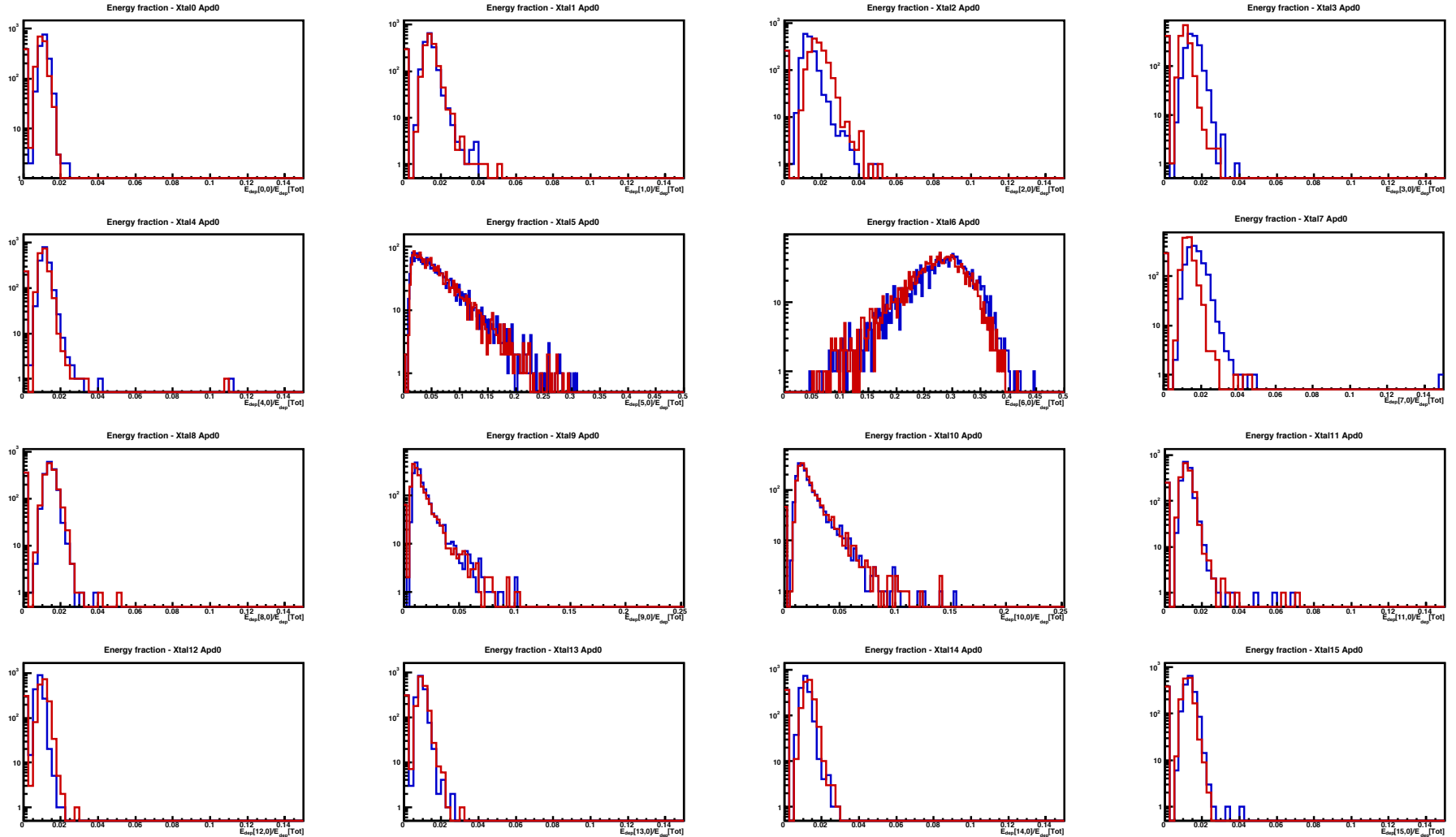
Scan Cut on energy

- Default use 3 times the RMS of the baseline
 - Tested 1xRMS and 4xRMS

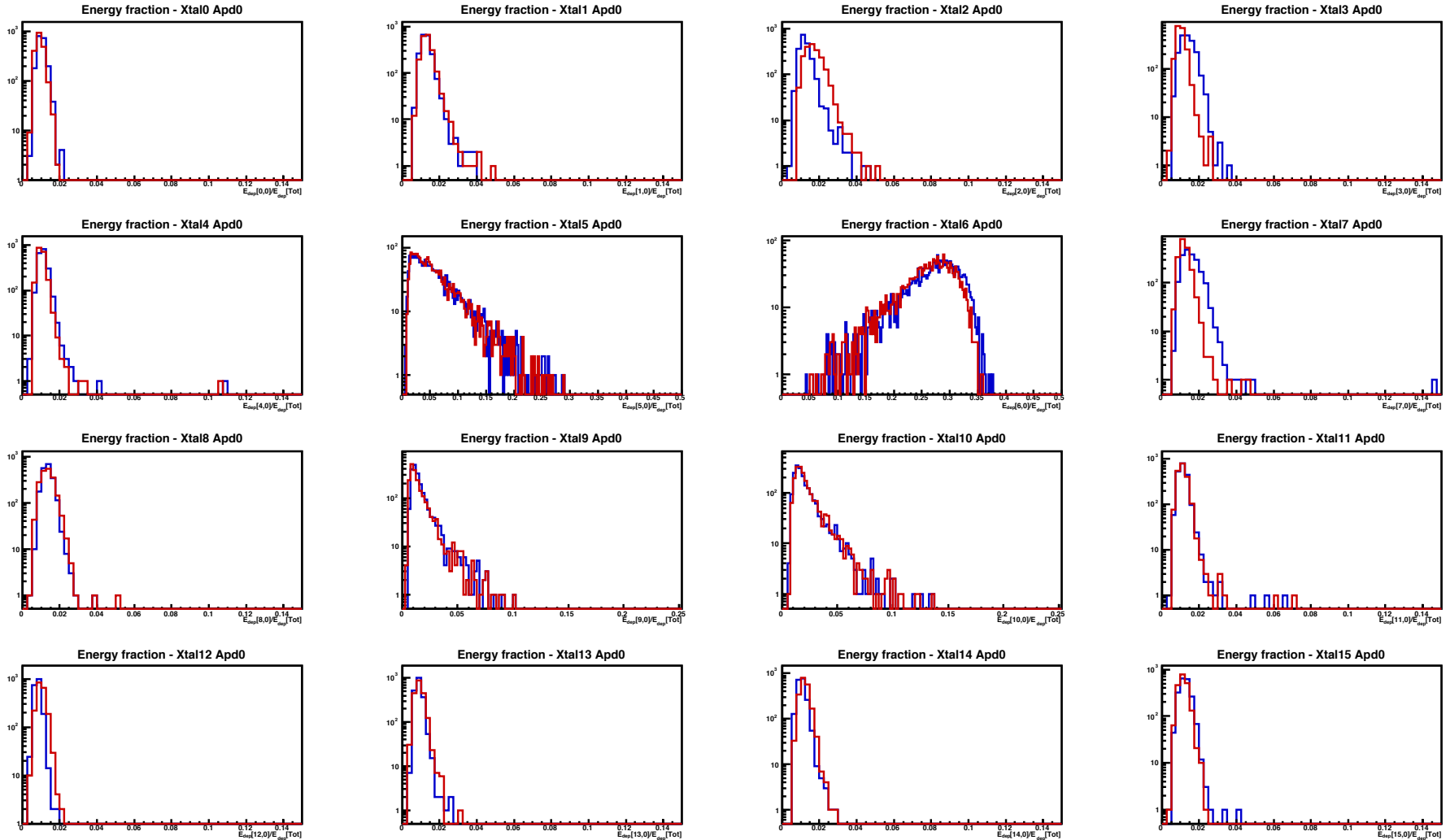


**Better results
with 1xRMS cut**

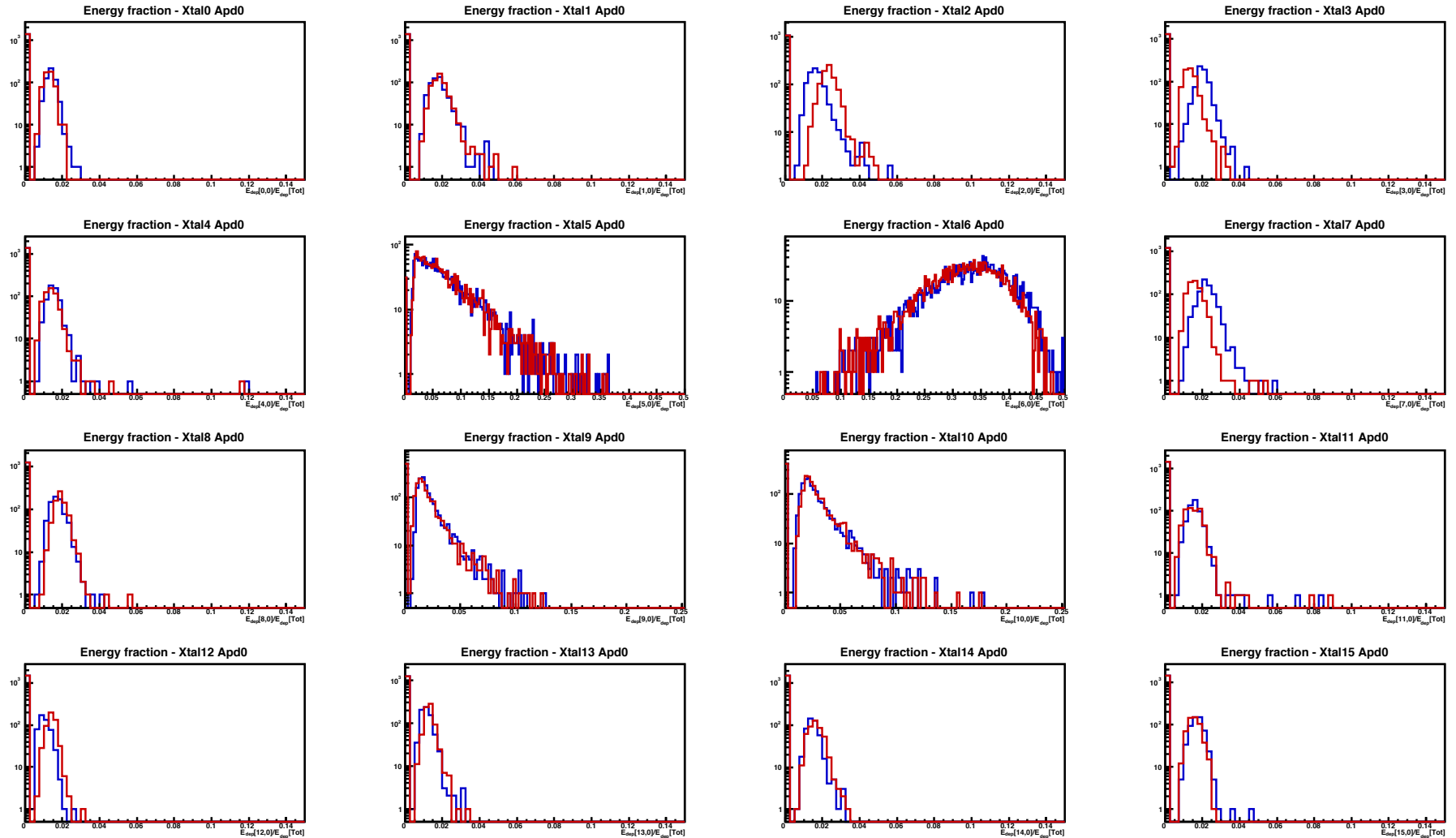
Energy Fraction 3xRMS



Energy Fraction 1xRMS



Energy Fraction 4xRMS



Resolution

