

Applying correction factors to BTF data

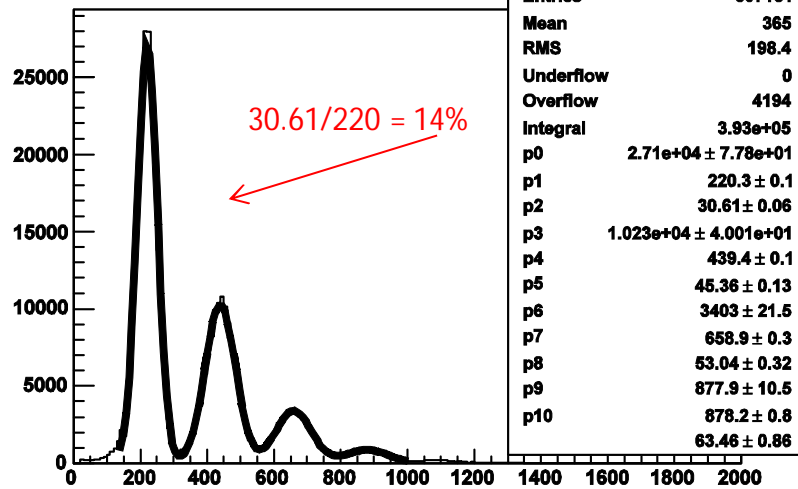
Linearity and resolution of
calorimeter “down”

Correcting BTF data

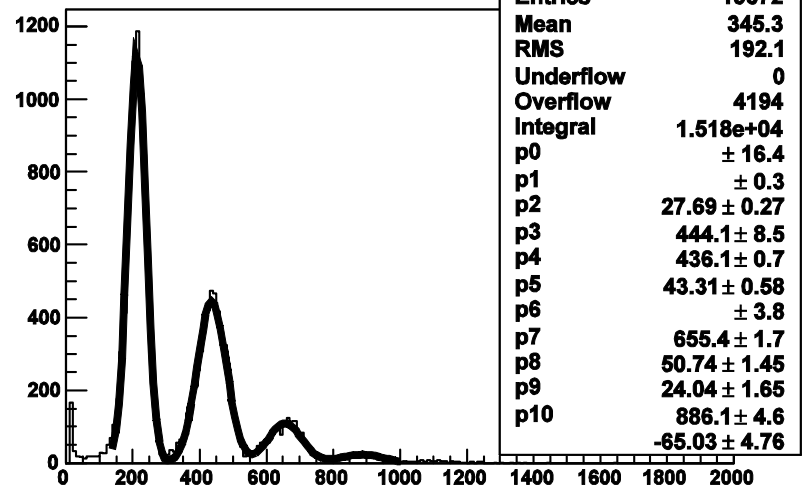
- Runs analyzed: 4 (1.4 kV) 14 and 22 (1.45 kV)
- Compute from cosmic data a set of correction factors
- Read back the BTF data applying individual factors to the 8 channels
- Recompute the sums "Left", "Right" and "All".

Run 4, 450 MeV, uncorrected data

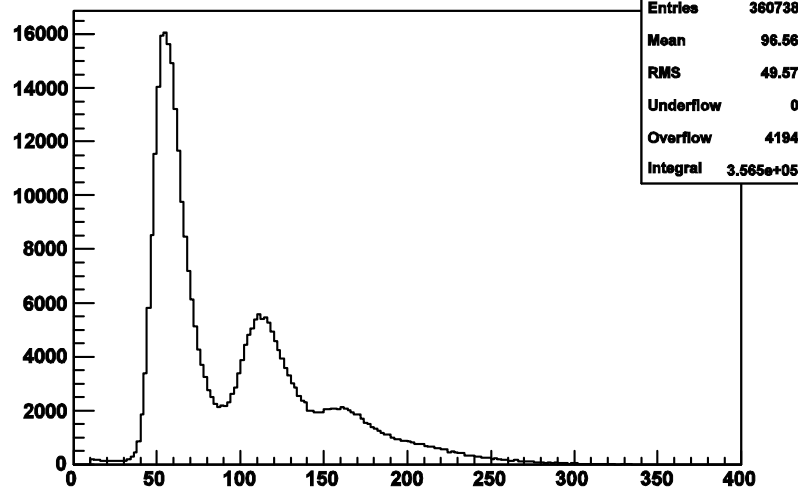
Q8 all events(pC)



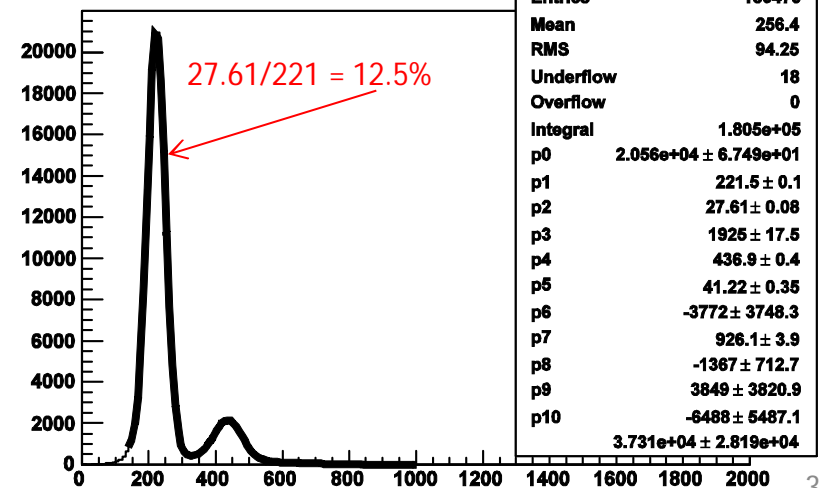
Q8 cut left=right(pC)



Q pisellino(pC)

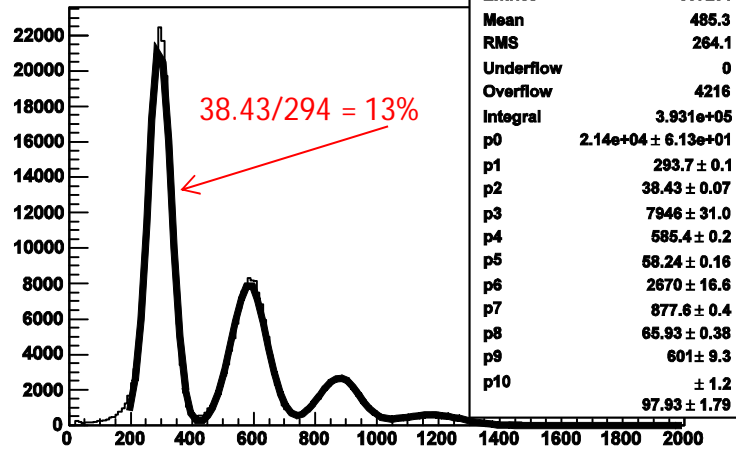


Q8 cut pisellino 1p(pC)

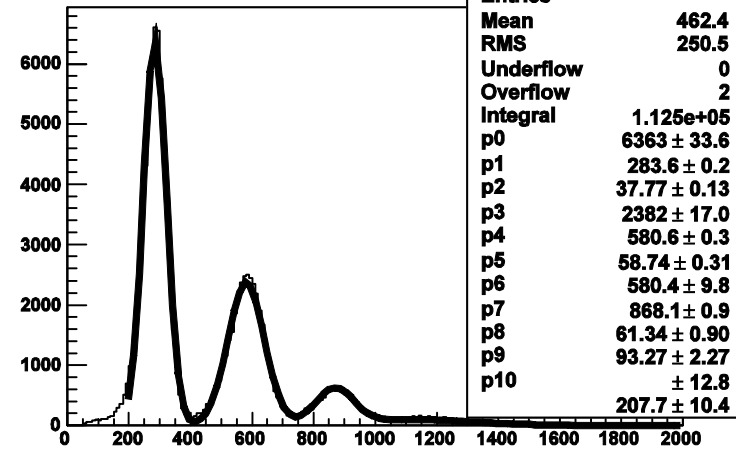


Run 4, 450 MeV, corrected data

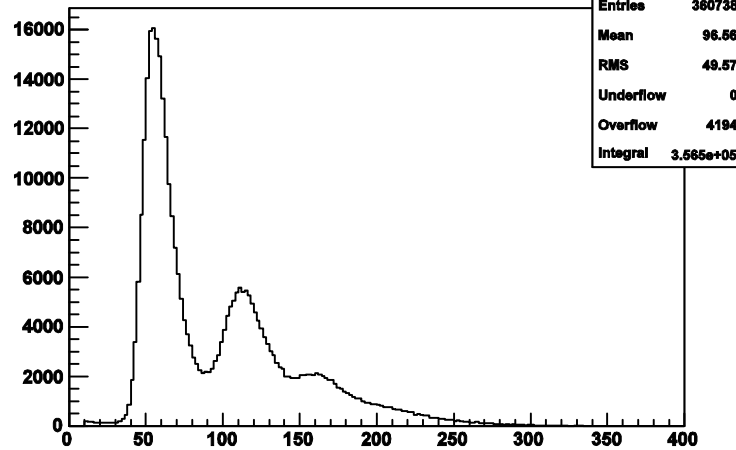
Q8 all events(pC)



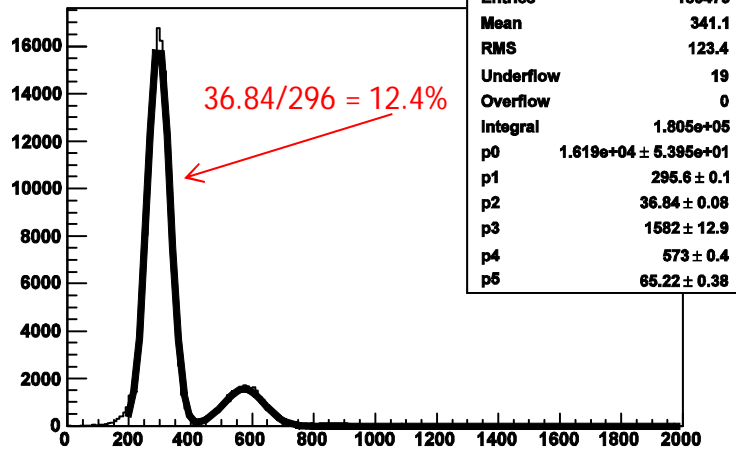
Q8 cut left=right



Q pisellino(pC)



Q8 cut pisellino 1p

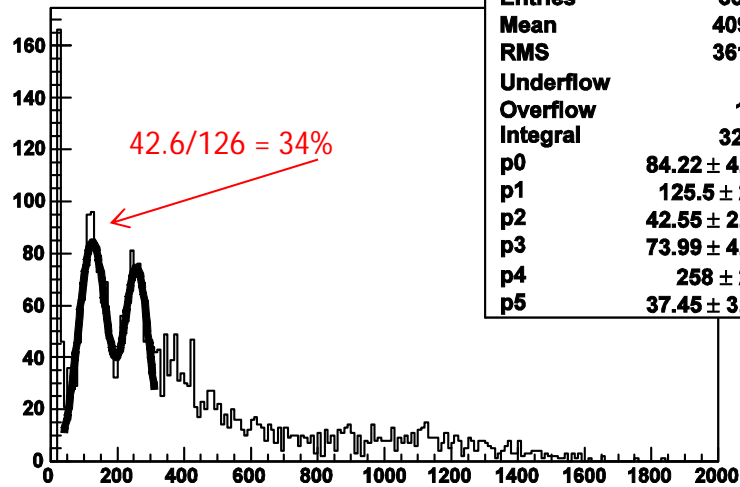


Absolute scale

- According to Montecarlo a 450 MeV electron leaves $0.12 * 450 = 54$ MeV of energy in the scintillator
- If the absolute scale from cosmics is right, we should see $54 * 5.5 = 297$ pC
-and we do! Perfect!
- What about other energies?

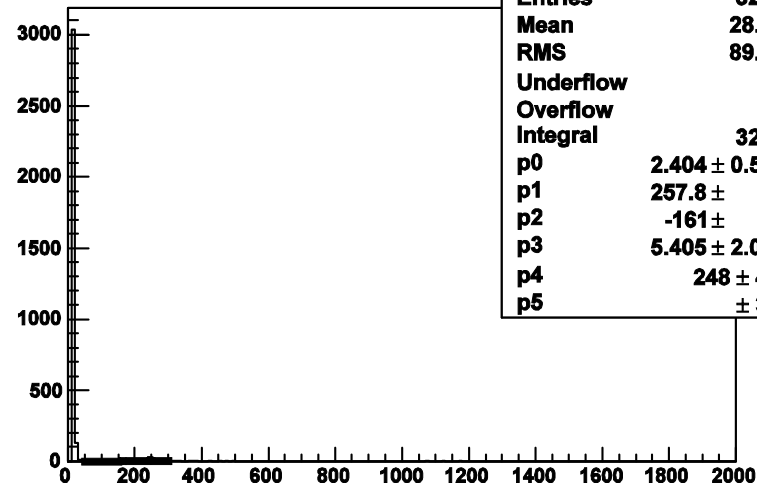
Run 14, 197 MeV, corrected data

Q8 all events(pC)



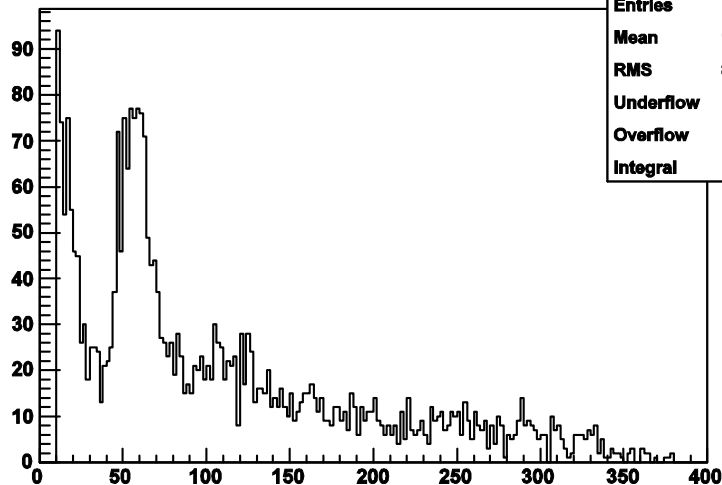
QAII	
Entries	3397
Mean	409.3
RMS	361.7
Underflow	0
Overflow	151
Integral	3246
p0	84.22 ± 4.18
p1	125.5 ± 2.5
p2	42.55 ± 2.78
p3	73.99 ± 4.15
p4	258 ± 2.6
p5	37.45 ± 3.46

Q8 cut left=right(pC)



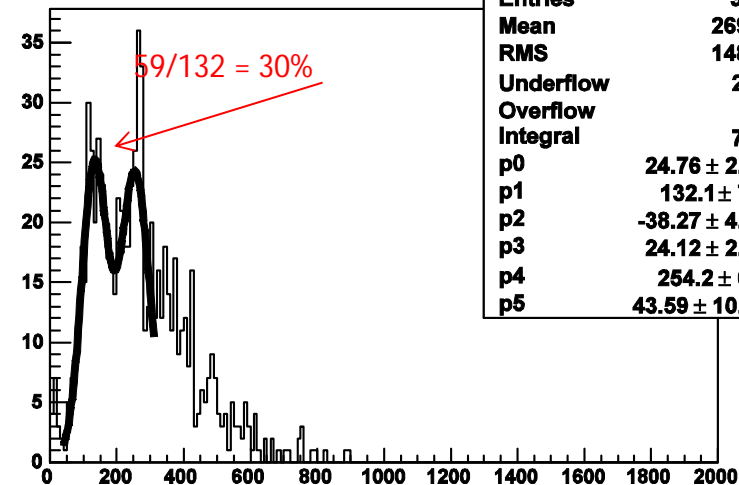
QAIC	
Entries	3295
Mean	28.17
RMS	89.54
Underflow	0
Overflow	0
Integral	3295
p0	2.404 ± 0.595
p1	257.8 ±
p2	-161 ±
p3	5.405 ± 2.057
p4	248 ± 4.9
p5	± 3.9

Q pisellino(pC)



QPis	
Entries	3245
Mean	108.6
RMS	86.59
Underflow	0
Overflow	151
Integral	3094

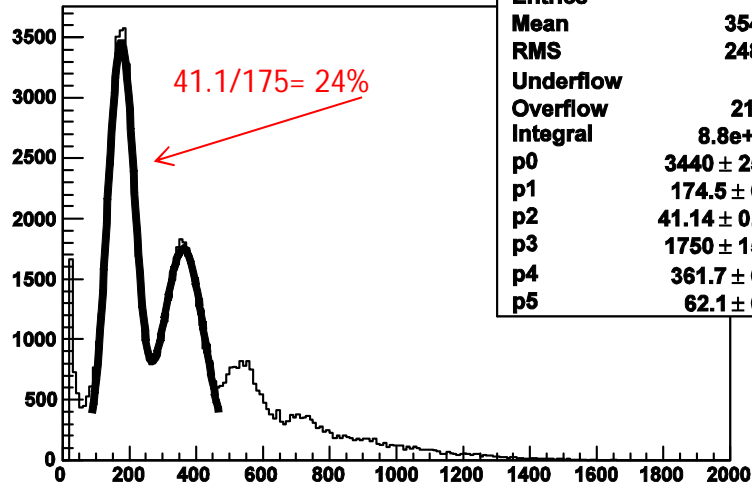
Q8 cut pisellino 1p(pC)



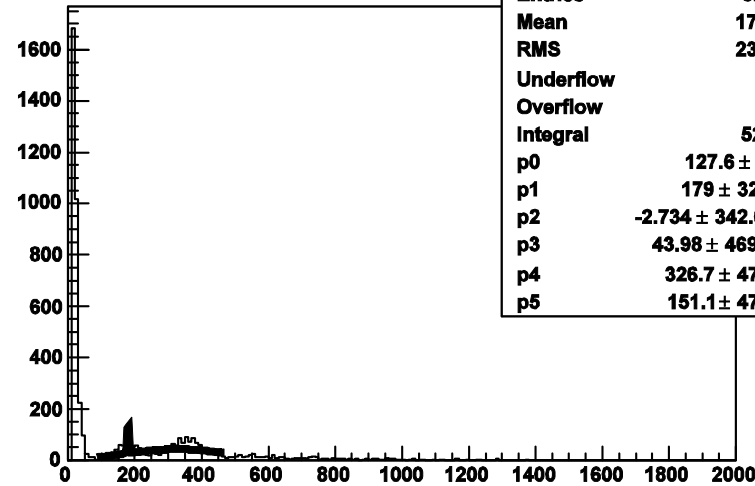
QAIf	
Entries	990
Mean	269.4
RMS	148.7
Underflow	220
Overflow	0
Integral	770
p0	24.76 ± 2.38
p1	132.1 ± 7.5
p2	-38.27 ± 4.67
p3	24.12 ± 2.50
p4	254.2 ± 6.4
p5	43.59 ± 10.72

Run 22, 297 MeV, corrected data

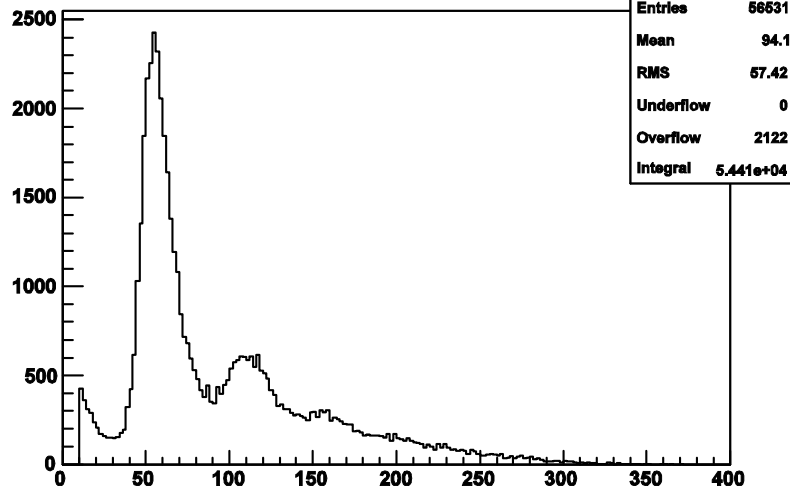
Q8 all events(pC)



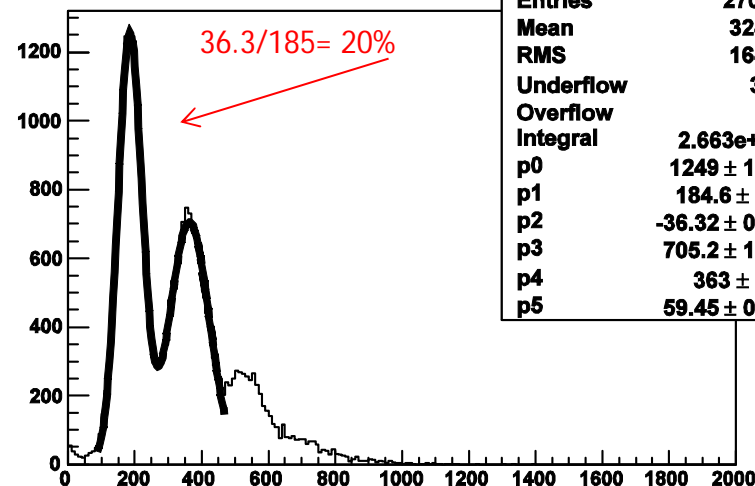
Q8 cut left=right(pC)



Q pisellino(pC)



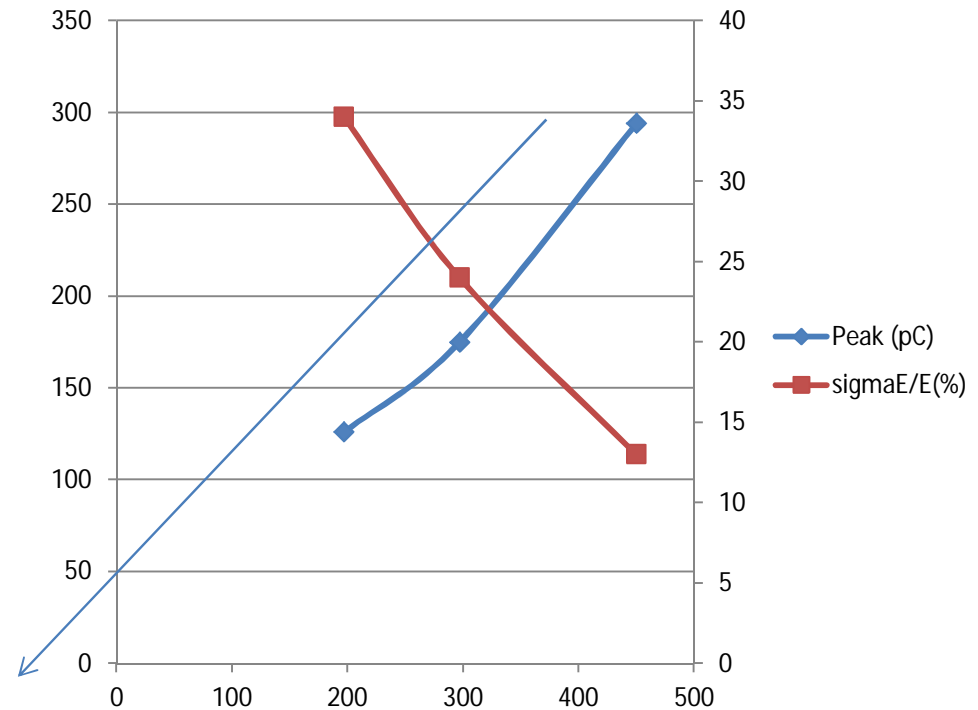
Q8 cut pisellino 1p(pC)



Linearity and resolution

HV (V)	E (MeV/c ²)	Peak (pC)	SigmaE/E(%)
1450	197	126	34
1450	297	175	24
1400	450	294	13

Problems
here....poor
linearity, resolution
falls down too
sharply



Number of photoelectrons

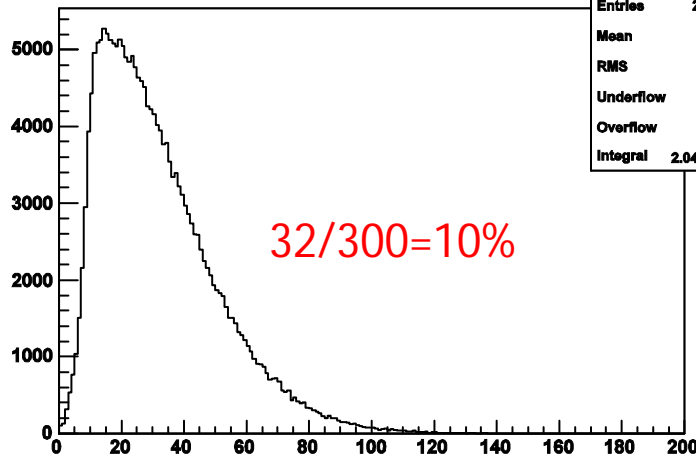
- Assuming a PM gain $\approx 1.4 \cdot 10^6$, the number of photoelectrons at 450 MeV is:

$$N_{pe} = \frac{300 \cdot 10^{-12}}{1.6 \cdot 10^{-19} \cdot 1.4 \cdot 10^6} = 1400$$

- According to MC ($12\% \cdot 450 = 54$ MeV deposited in the scintillator) this means 26 photoelectrons per MeV (24 in cosmics)
- How are these divided among the strata?

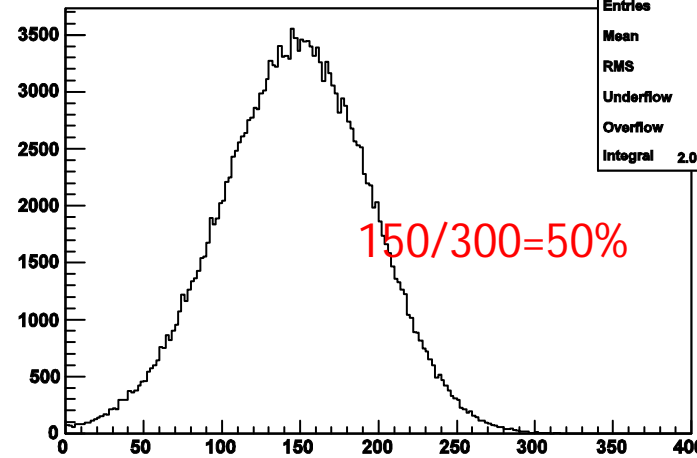
Run 4 at 450 MeV, 1.4 kV

QLeft1+Right1(pC)



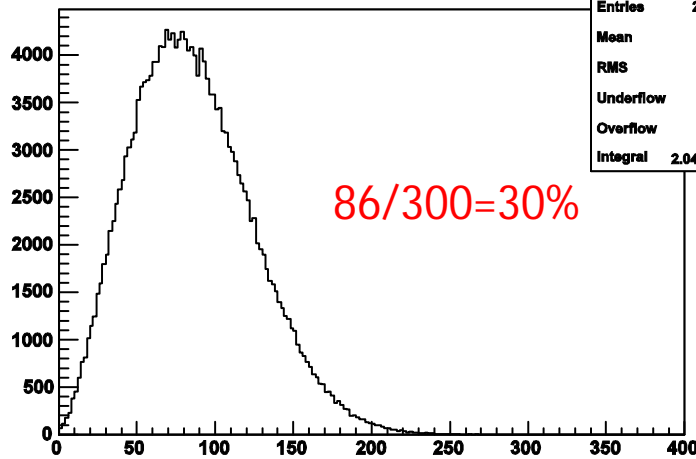
hQLpR1	
Entries	204913
Mean	31.96
RMS	18.9
Underflow	72
Overflow	1
Integral	2.048e+05

QLeft2+Right2(pC)



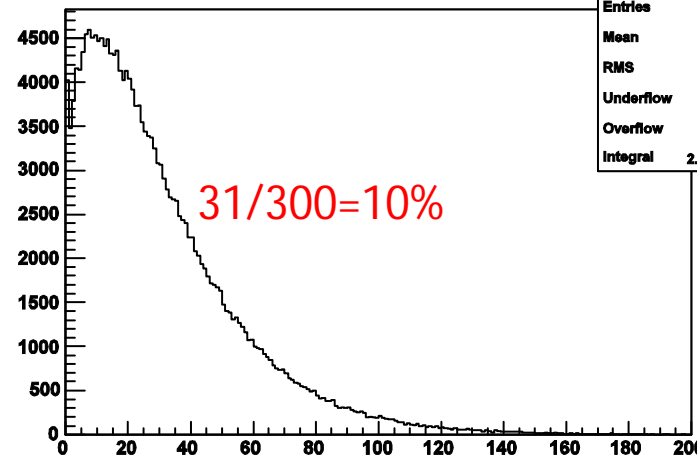
hQLpR2	
Entries	204913
Mean	148.3
RMS	47.41
Underflow	58
Overflow	0
Integral	2.049e+05

QLeft3+Right3(pC)



hQLpR3	
Entries	204913
Mean	85.66
RMS	38.58
Underflow	6
Overflow	0
Integral	2.049e+05

QLeft4+Right4(pC)



hQLpR4	
Entries	204913
Mean	30.69
RMS	25.24
Underflow	1873
Overflow	18
Integral	2.03e+05

Expected resolution

- In absence of fluctuations of the primary energy deposit (shower development) we would expect $\sigma_E/E = 1/\sqrt{N_{pe}} = 8\%$ in the first PM (160 photoelectrons), 3.5%, 4.6%, 8% in the others.
- We find much more!
- The primary sources of these errors are shower and PM fluctuations, not “counting statistics”.