

TOF Update

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Outline

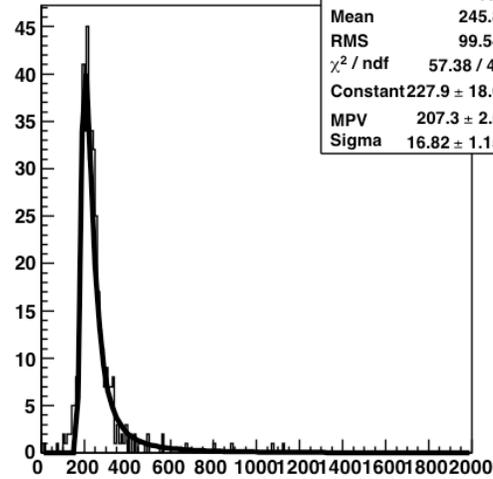
- TOF ADC response
- TOF MC
- Attenuation Length

Selection requirements

- Runs 17090-17240 (58 GeV, Uranium)
- interaction vtx (≥ 2 outgoing trks)
- $p_{\text{tot}} > 3 \text{ GeV}$
- single track match with TOF bar
- no adjacent hits
- ADC (top & bot) > 10

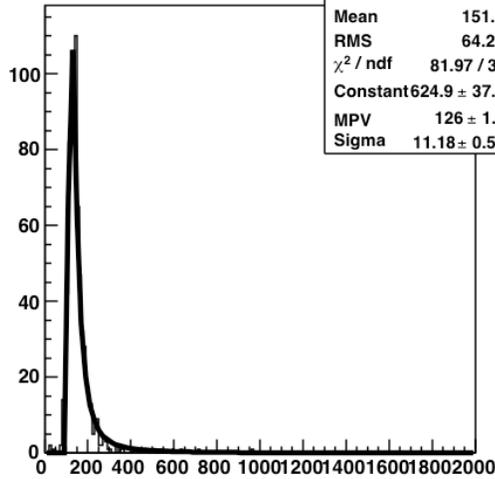
TOF ADC Distributions

ADC Top 308



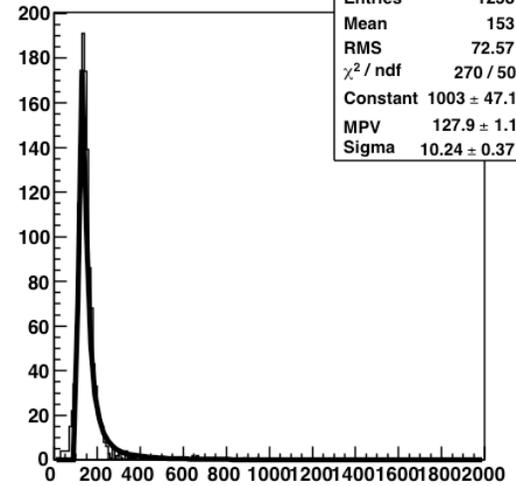
pmtadc_t308	
Entries	411
Mean	245.8
RMS	99.54
χ^2 / ndf	57.38 / 41
Constant	227.9 ± 18.6
MPV	207.3 ± 2.0
Sigma	16.82 ± 1.15

ADC Top 312



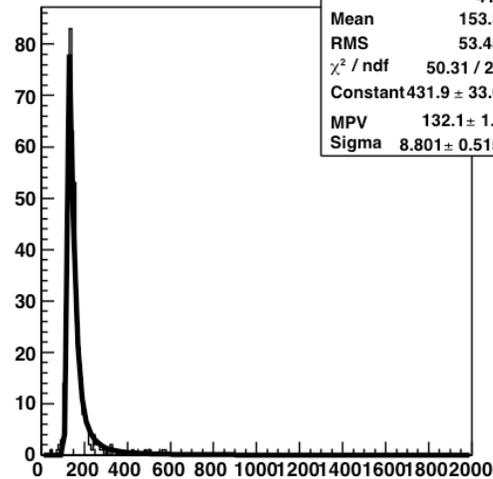
pmtadc_t312	
Entries	743
Mean	151.7
RMS	64.23
χ^2 / ndf	81.97 / 35
Constant	624.9 ± 37.2
MPV	126 ± 1.0
Sigma	11.18 ± 0.54

ADC Top 316



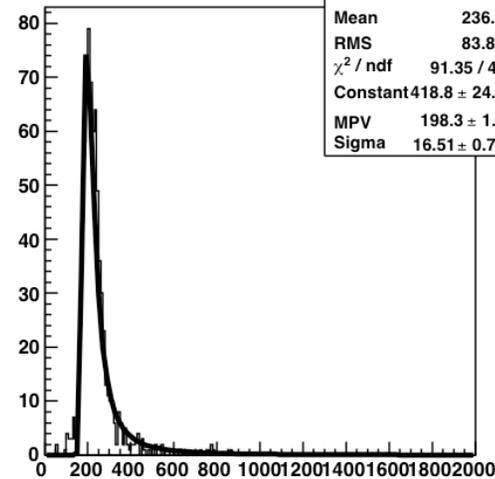
pmtadc_t316	
Entries	1258
Mean	153
RMS	72.57
χ^2 / ndf	270 / 50
Constant	1003 ± 47.1
MPV	127.9 ± 1.1
Sigma	10.24 ± 0.37

ADC Bot 308



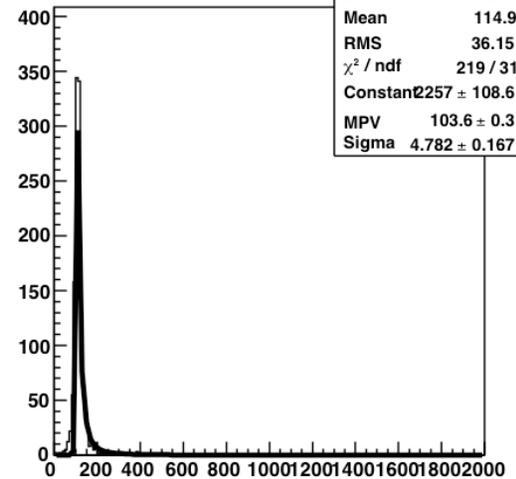
pmtadc_b308	
Entries	411
Mean	153.5
RMS	53.45
χ^2 / ndf	50.31 / 28
Constant	431.9 ± 33.0
MPV	132.1 ± 1.1
Sigma	8.801 ± 0.515

ADC Bot 312



pmtadc_b312	
Entries	743
Mean	236.3
RMS	83.86
χ^2 / ndf	91.35 / 48
Constant	418.8 ± 24.6
MPV	198.3 ± 1.5
Sigma	16.51 ± 0.77

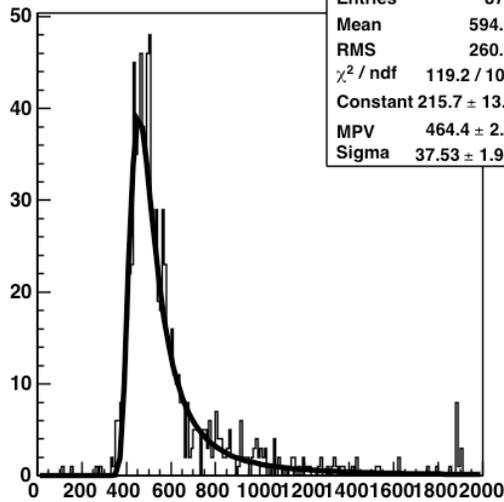
ADC Bot 316



pmtadc_b316	
Entries	1258
Mean	114.9
RMS	36.15
χ^2 / ndf	219 / 31
Constant	2257 ± 108.6
MPV	103.6 ± 0.3
Sigma	4.782 ± 0.167

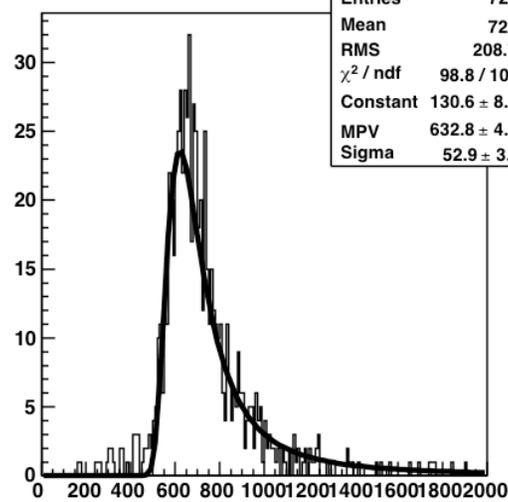
TOF ADC Distributions (contd.)

ADC Top 320



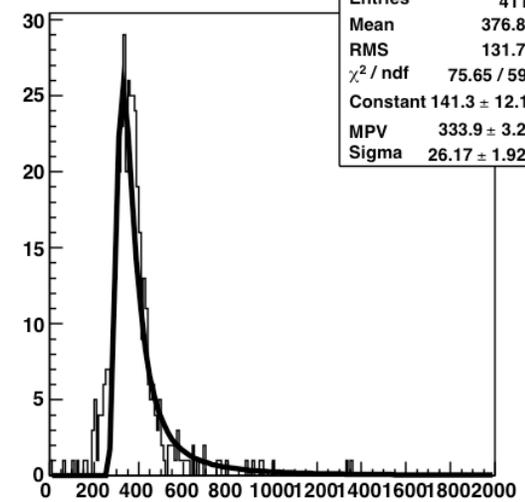
pmtadc_t320	
Entries	876
Mean	594.2
RMS	260.8
χ^2 / ndf	119.2 / 100
Constant	215.7 ± 13.1
MPV	464.4 ± 2.9
Sigma	37.53 ± 1.98

ADC Top 325



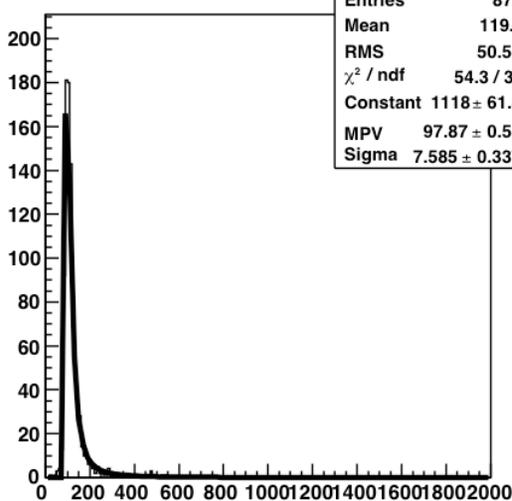
pmtadc_t325	
Entries	723
Mean	724
RMS	208.7
χ^2 / ndf	98.8 / 104
Constant	130.6 ± 8.6
MPV	632.8 ± 4.5
Sigma	52.9 ± 3.1

ADC Top 330



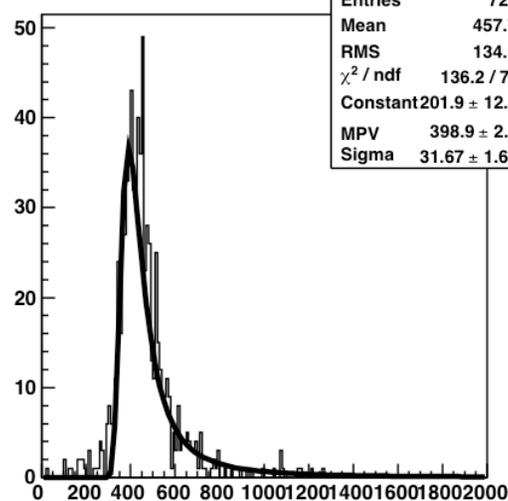
pmtadc_t330	
Entries	411
Mean	376.8
RMS	131.7
χ^2 / ndf	75.65 / 59
Constant	141.3 ± 12.1
MPV	333.9 ± 3.2
Sigma	26.17 ± 1.92

ADC Bot 320



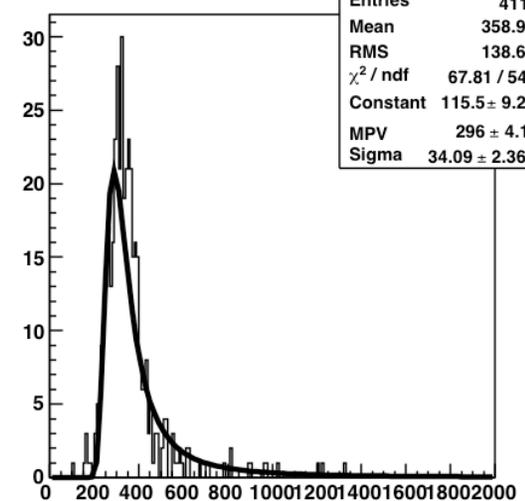
pmtadc_b320	
Entries	876
Mean	119.6
RMS	50.54
χ^2 / ndf	54.3 / 34
Constant	1118 ± 61.8
MPV	97.87 ± 0.58
Sigma	7.585 ± 0.337

ADC Bot 325



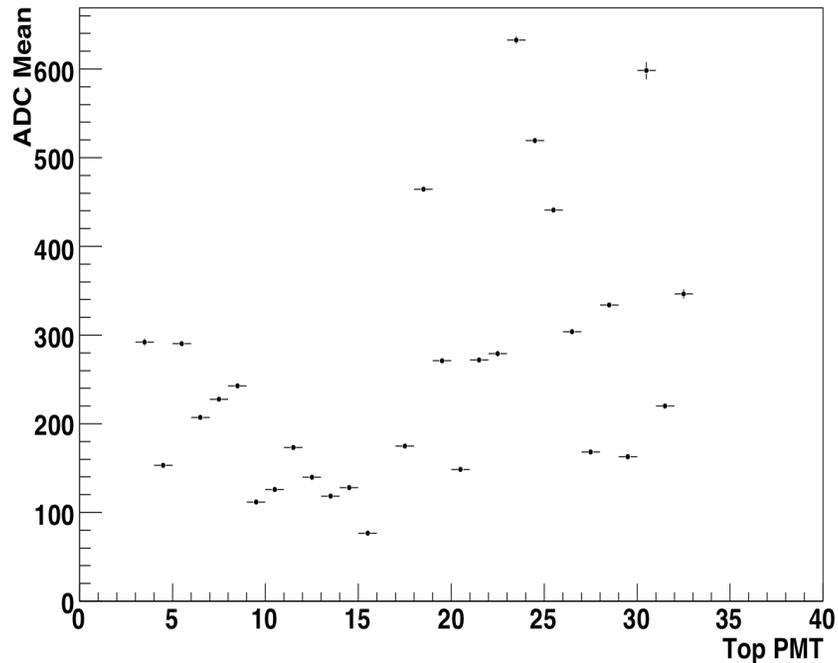
pmtadc_b325	
Entries	723
Mean	457.7
RMS	134.2
χ^2 / ndf	136.2 / 74
Constant	201.9 ± 12.6
MPV	398.9 ± 2.9
Sigma	31.67 ± 1.63

ADC Bot 330

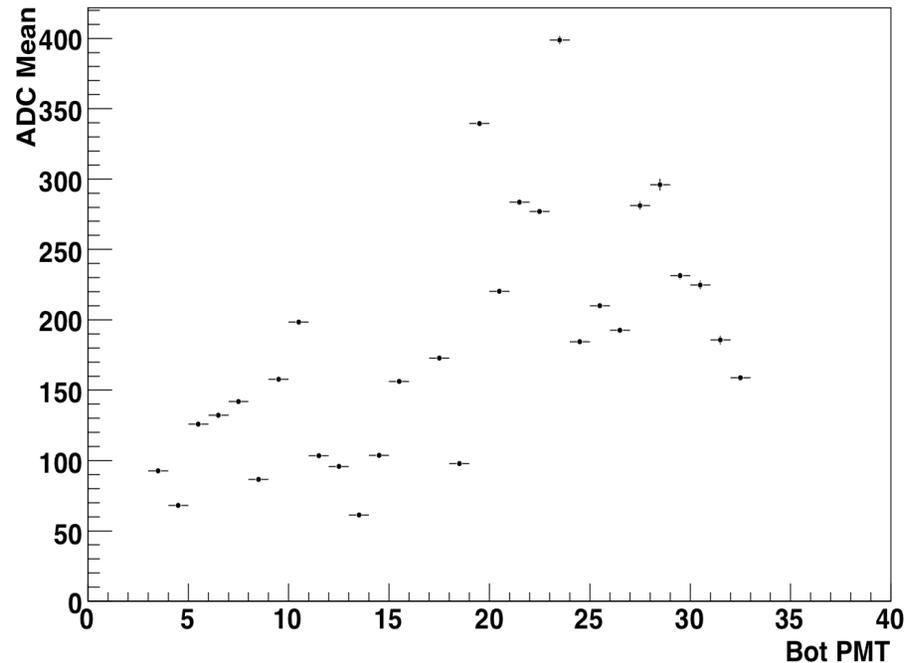


pmtadc_b330	
Entries	411
Mean	358.9
RMS	138.6
χ^2 / ndf	67.81 / 54
Constant	115.5 ± 9.2
MPV	296 ± 4.1
Sigma	34.09 ± 2.36

Top PMT ADC Means



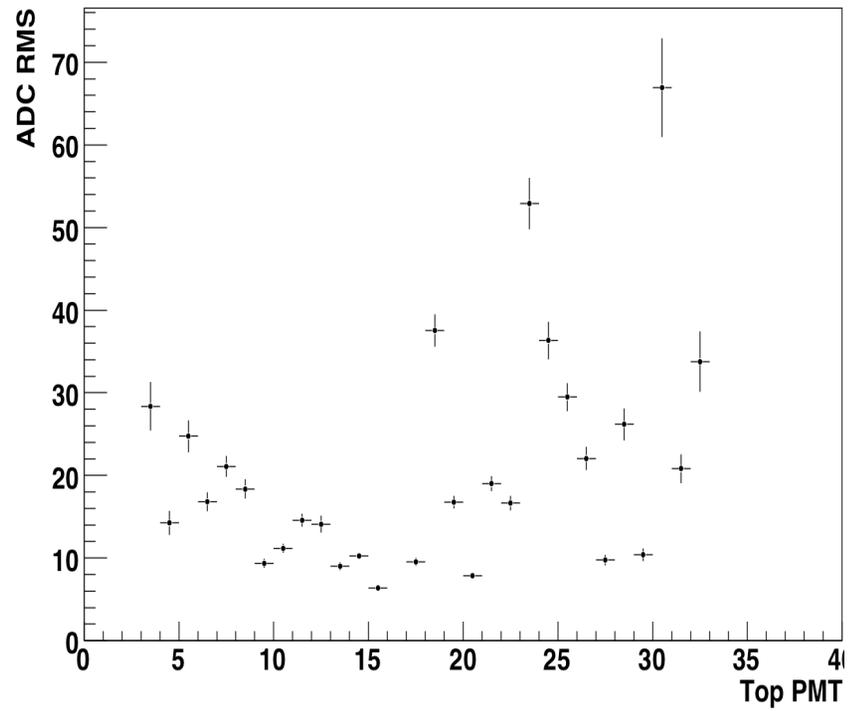
Bot PMT ADC Means



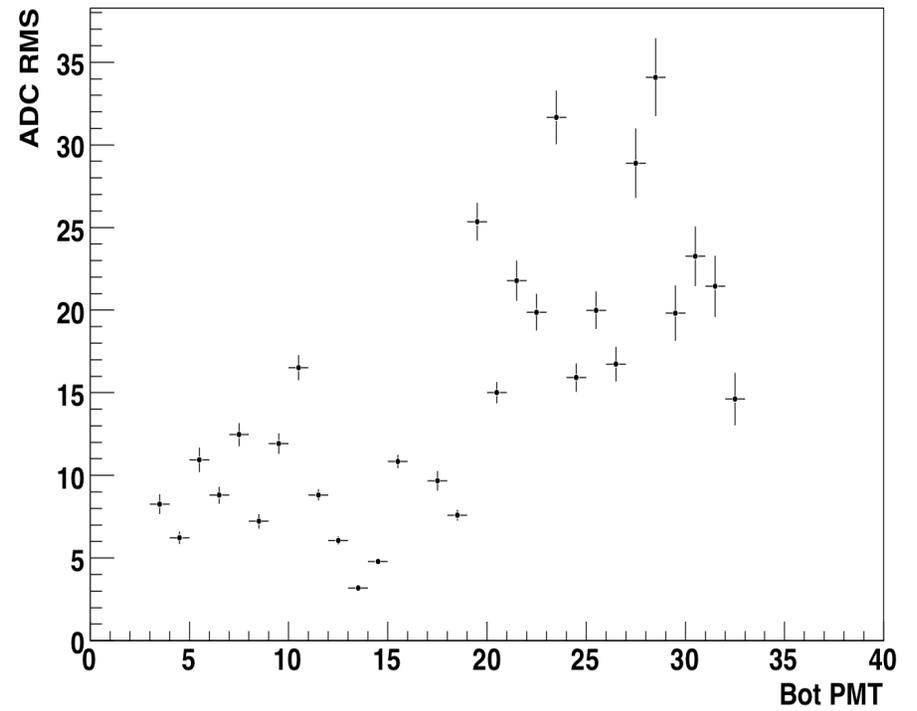
- Wide variation in gains
 - means are MPVs from Landau fits to data
 - systematically higher gains for PMTs > 20 (west side)??
They are also wider (see next page)
- Using these to get PMT-by-PMT scales for MC

ADC rms

Top PMT ADC RMS



Bot PMT ADC RMS



MC Digitization

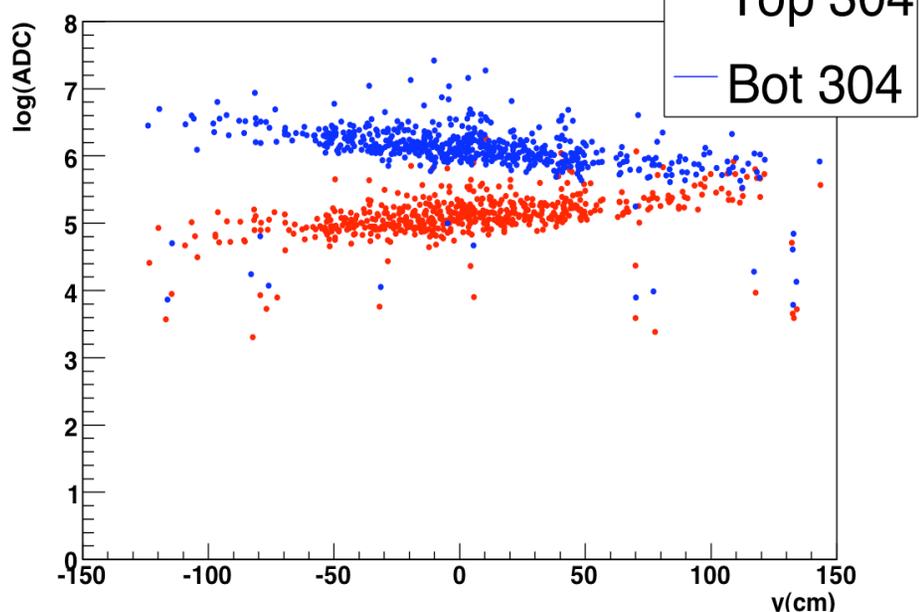
- TOF TDC digitization is fixed (have not checked the T0 counters' digitization yet)
- For the ADCs, the MC currently:
 - converts EDep to ADC using a single scale factor ($2e4$ -- too high based on comparison with data) for the entire TOF and adds pedestals
 - *EDep*Gain....GaussianSmear....add Peds*
 - I can't find a number for the TOF PMT gains, and the tubes are not balanced
- Modified:
 - Get gain/calibration from fits to data
 - PMT-by-PMT gains and widths
 - *EDep → #Photoelectrons...PoissonSmear....
.....x(MIP_Photoelectrons/MIPEDep)....xGain...+Peds*
- To-do:
 - ADC attenuation (later slides)
 - Slewing corrections
 - Read Peds and other parameters from DB

Attenuation Length

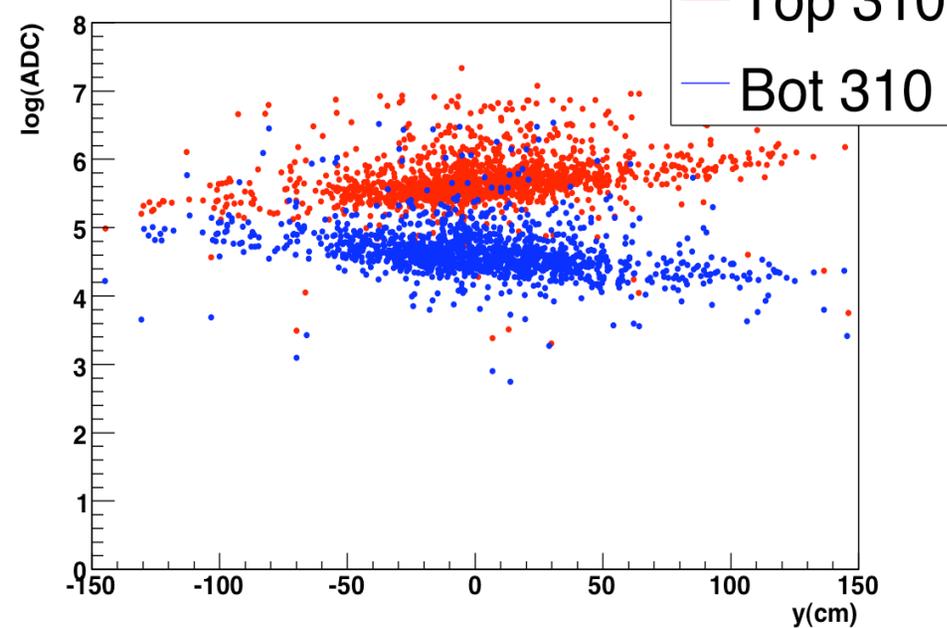
- Looked at y -dependence of ADC to measure the attenuation length of the bars
- $Q_{top} = Q_0 e^{-(L/2 - y)/\lambda}$, $Q_{bot} = Q_0 e^{-(L/2 + y)/\lambda}$,
where $\lambda = \text{attenuation length}$, $y = \text{track-}y$
- Extract attenuation length from
$$\log(Q_{top}/Q_{bot}) = 2y/\lambda$$

ADC response along the bar

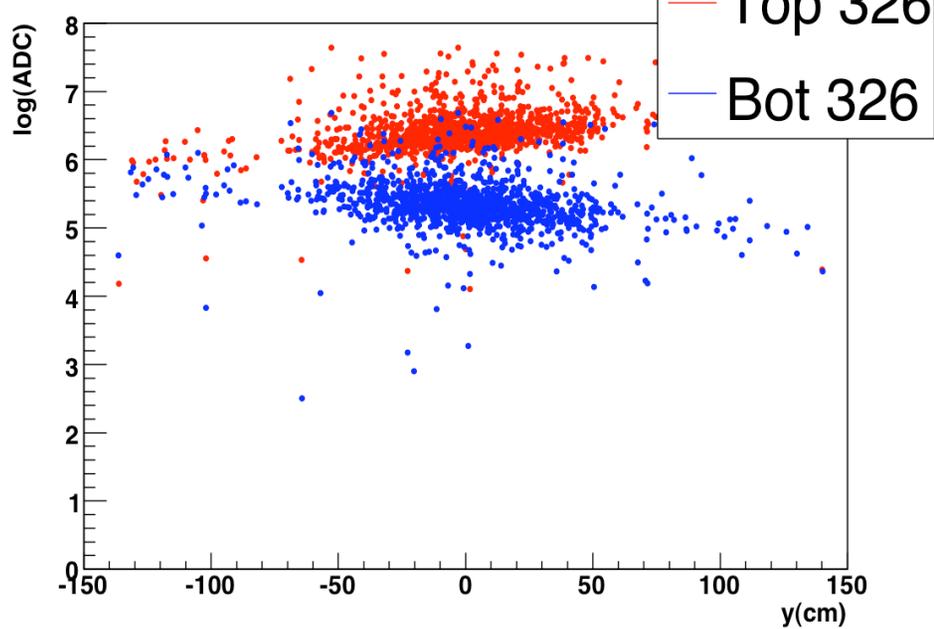
log(ADC) vs y Top 304



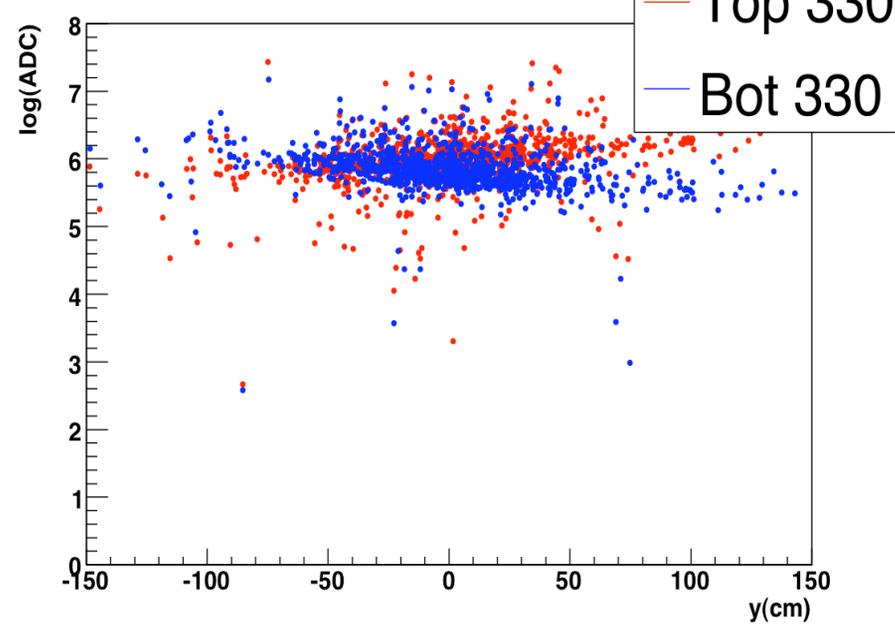
log(ADC) vs y Top 310

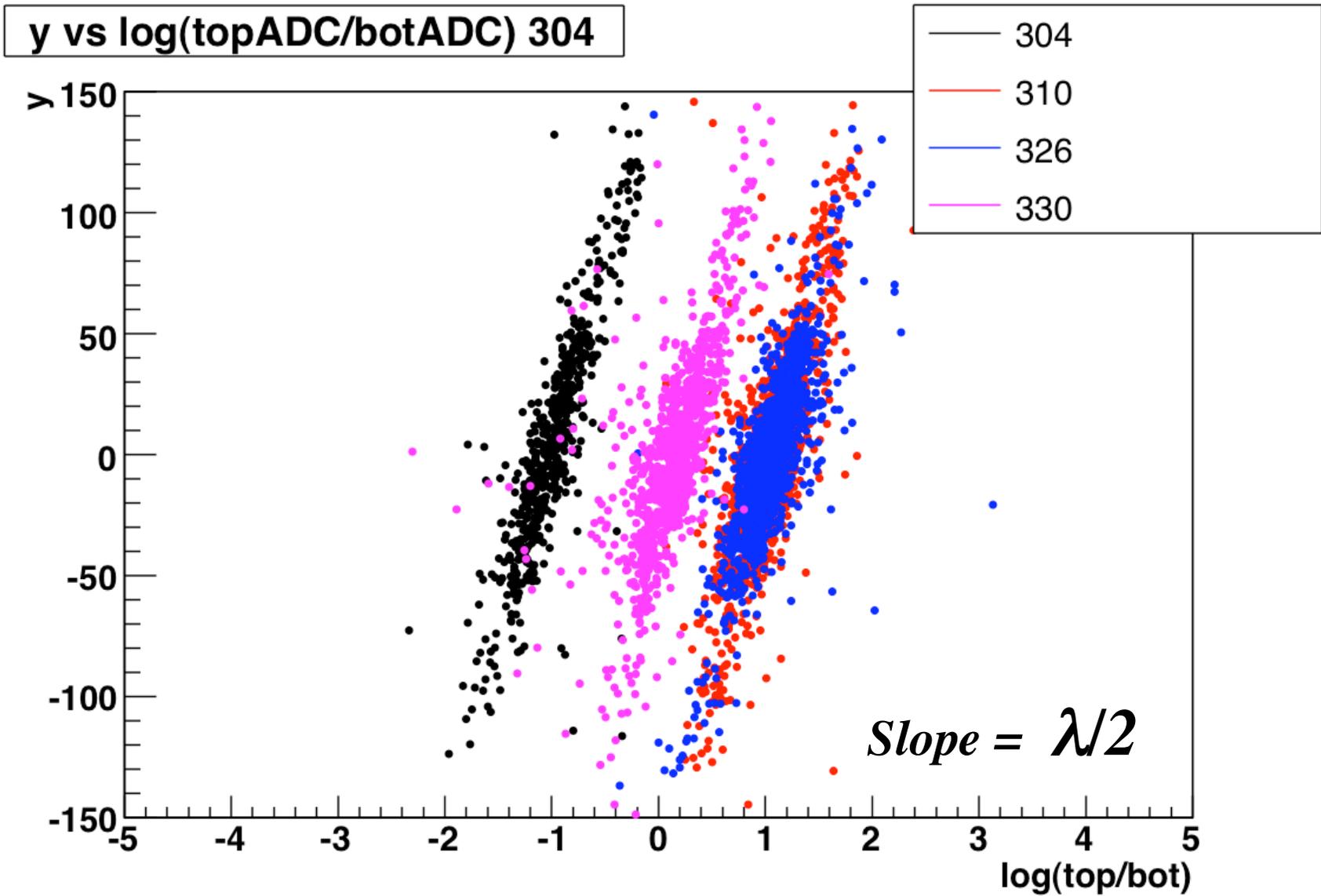


log(ADC) vs y Top 326



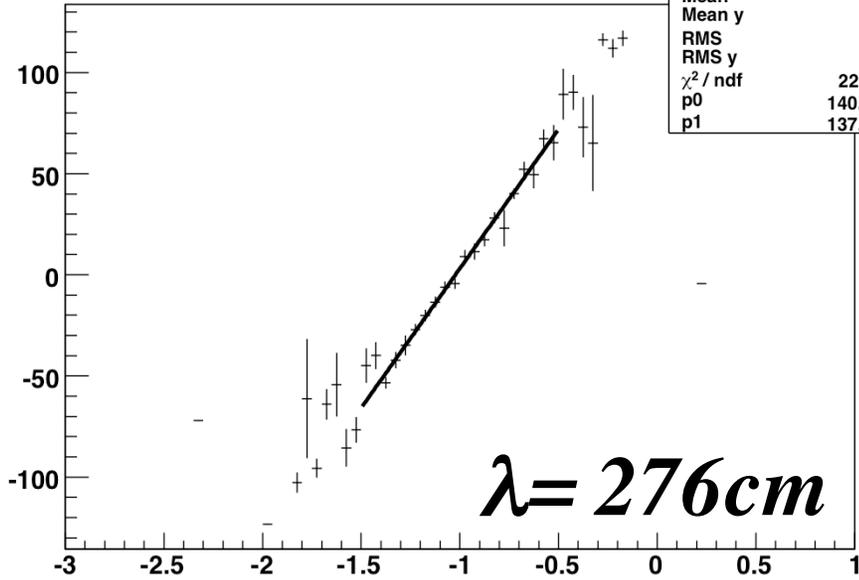
log(ADC) vs y Top 330





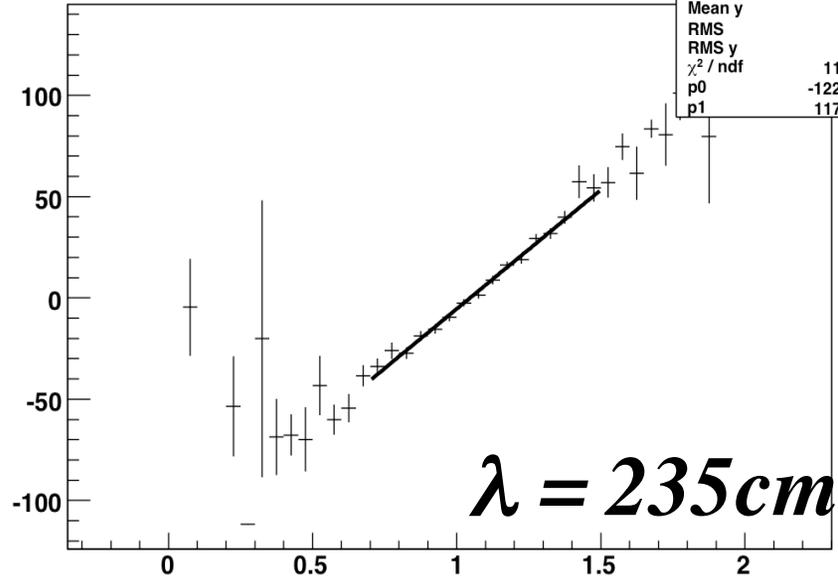
Offsets are significantly different but trends appear to be the same for most tubes

y vs log(topADC/botADC) 304



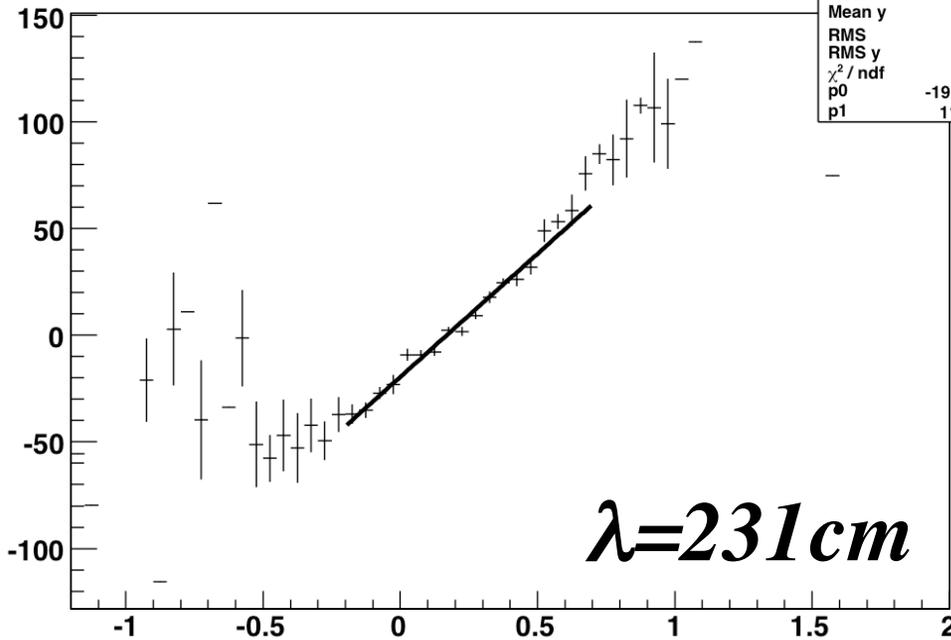
y_vs_logqp304	
Entries	580
Mean	-0.9857
Mean y	4.941
RMS	0.3259
RMS y	47.52
χ^2 / ndf	22.42 / 18
p0	140.9 \pm 3.5
p1	137.8 \pm 3.4

y vs log(topADC/botADC) 310



y_vs_logqp310	
Entries	1402
Mean	1.051
Mean y	1.716
RMS	0.2739
RMS y	40.73
χ^2 / ndf	11.65 / 14
p0	-122.9 \pm 4.0
p1	117.5 \pm 3.6

y vs log(topADC/botADC) 330



y_vs_logqp330	
Entries	1043
Mean	0.143
Mean y	0.3643
RMS	0.2945
RMS y	39.06
χ^2 / ndf	32.7 / 16
p0	-19.57 \pm 0.97
p1	115.4 \pm 3.5

Once I fit all the bars, will populate DB and use in the ADC digitization