

Update on pp2pp Scintillator Slewing/Offset Corrections

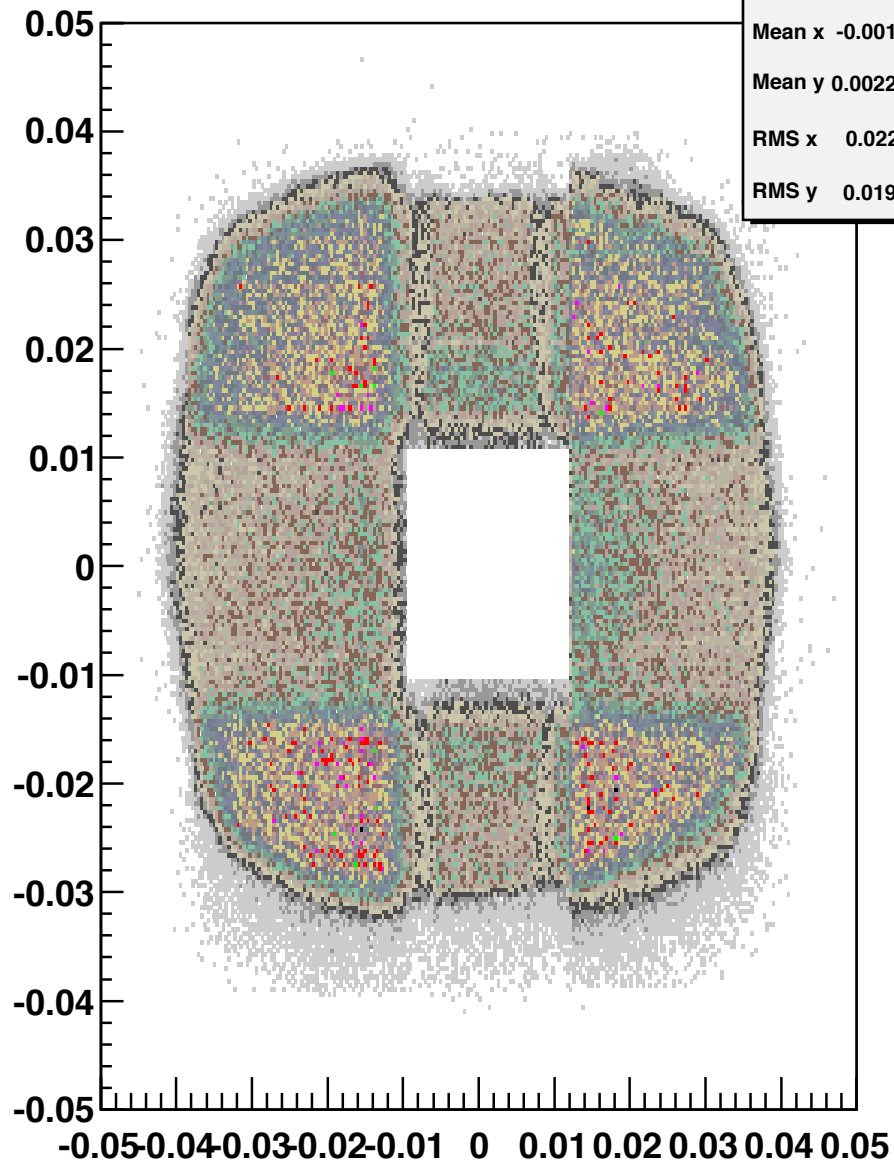
*W.J. Llope, Rice University
pp2pp meeting, Jan 14, 2010*

1. Start with root trees produced by Kin....
Runs 10183035, 10183037
2. Run these through a translation code ("cluk") producing new TTree....
collect scintillator info into simple arrays for golden events
also can write TTree with same form filled with simulated data
3. Run this (data or simulated) TTree through calibration code ("calclu")

```
Total no. of file evts           : 2417953
Total no. of evts with >0 clusters : 2417953
Total no. of evts in good Si bunches : 2415012
Total no. of triggered evts       : 1359635
Total no. of golden evts          : 1052688
Total no. of golden colinear evts : 998721
  golden evts/file evts           : 0.435363
  golden & colinear evts/file evts : 0.413044
  golden evts/triggered evts      : 0.774243
  golden & colinear evts/triggered evts : 0.734551
```

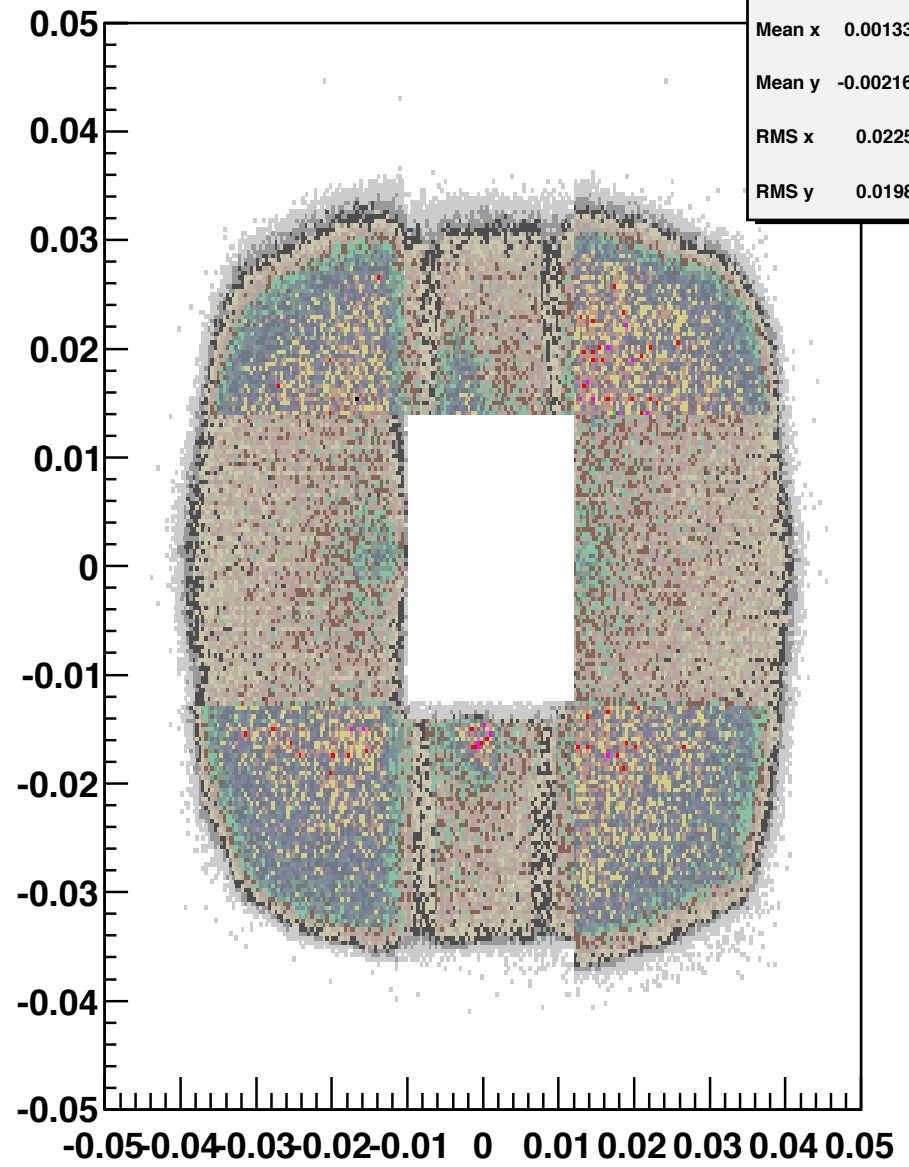
← plenty for now...

hgloposxyE

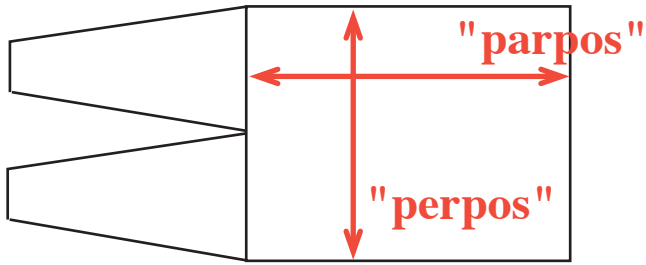


hgloposxyE	
Entries	1552110
Mean x	-0.00117
Mean y	0.002203
RMS x	0.02241
RMS y	0.01968

hgloposxyW



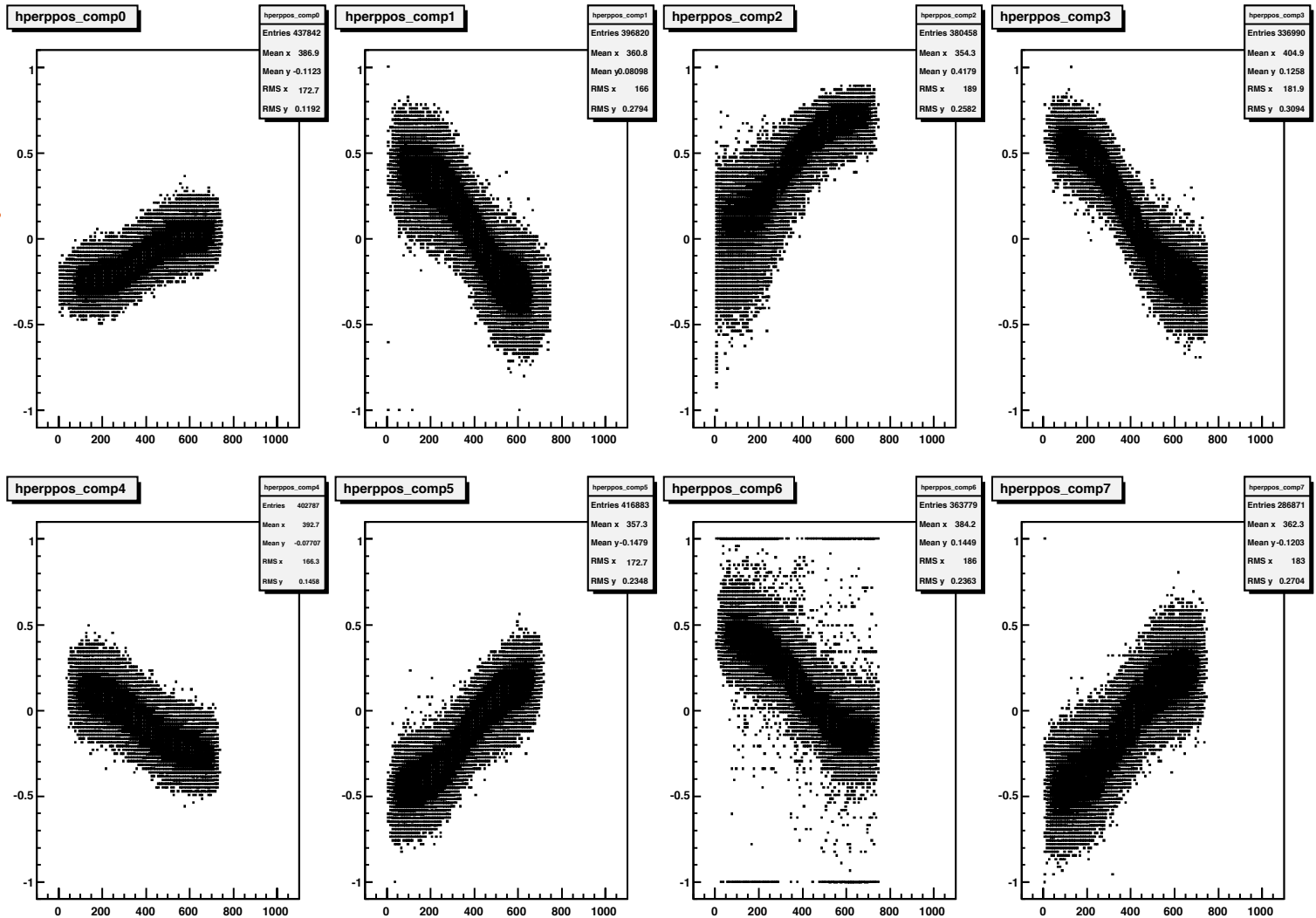
hgloposxyW	
Entries	1470320
Mean x	0.001332
Mean y	-0.002165
RMS x	0.02254
RMS y	0.01983



define position variables w.r.t. orientation of scint
(i.e. not the STAR coordinate system)

- perpos: signal sharing btw 2 PMTs
- parpos: distance from R/O end (propagation delay)

Perpos from
Scint ADC vs
posn from Si...

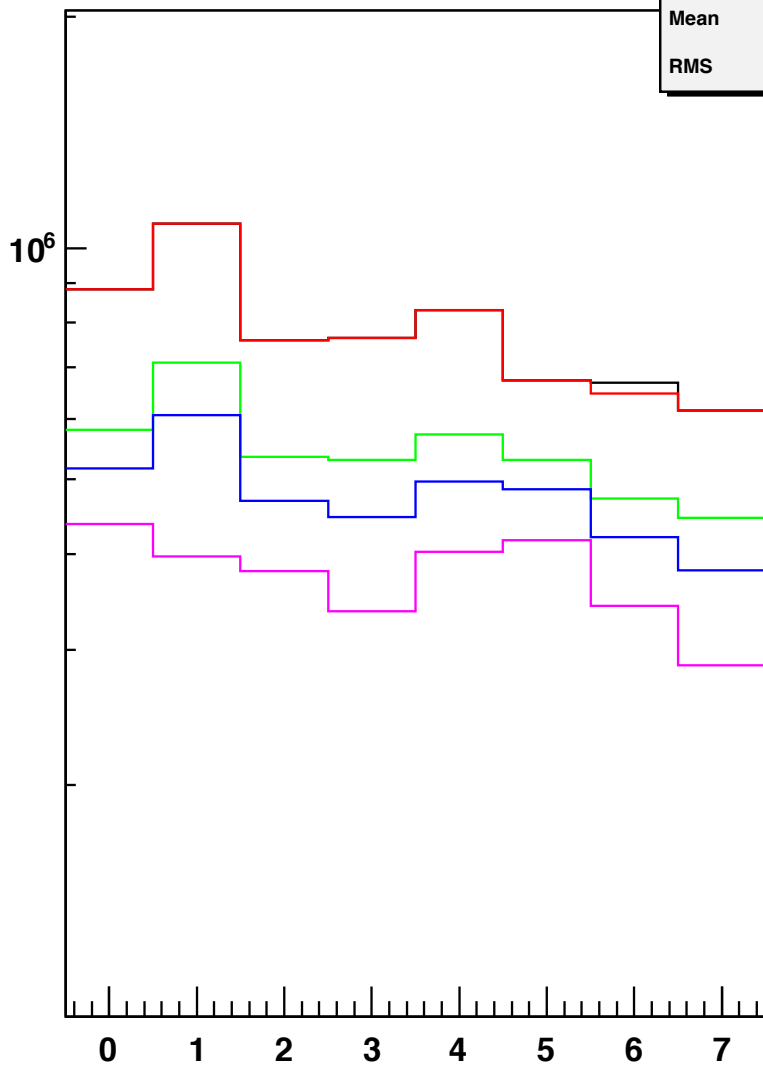


Golden Track Hit patterns

hcnts_adc

hcnts_clus

Entries	3000807
Mean	3.308
RMS	2.263

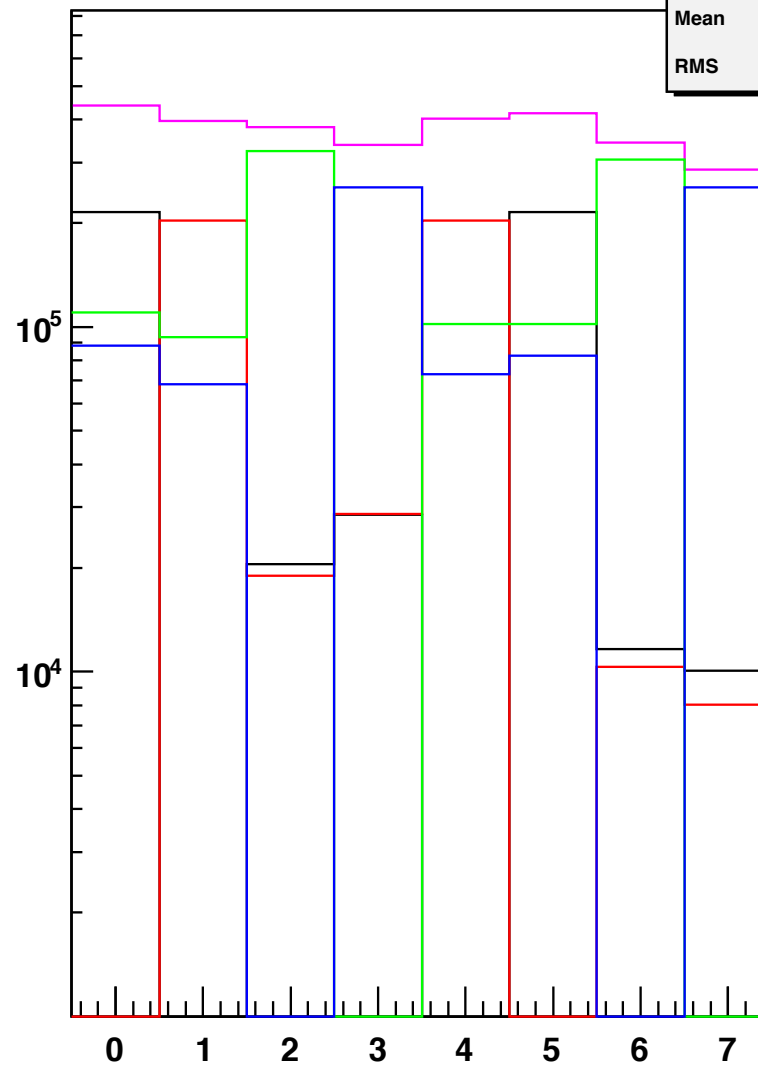


kCollinearPairID = 0
 = 1
 = 2
 = 3

hcnts_clus

hcnts_clus

Entries	3000807
Mean	3.308
RMS	2.263



pots 0,5 EHI+WHO
 pots 1,4 EHO+WHI
 pots 2,6 EVU+WVD
 pots 3,7 EVD+WVU

Basic Algorithm.....

for each kCollinearPairID separately...

4 PMTs "A, B, C, D", so we have:

4 ADC values (slewing metric and ADC posn)

4 TAC values (what we're trying to correct!)

4 perpos values (S_i)

4 parpos values (S_i)

start by forming two "start times"

$ts1 = TAC(k1) + TAC(k2)$

$ts2 = TAC(k3) + TAC(k4)$

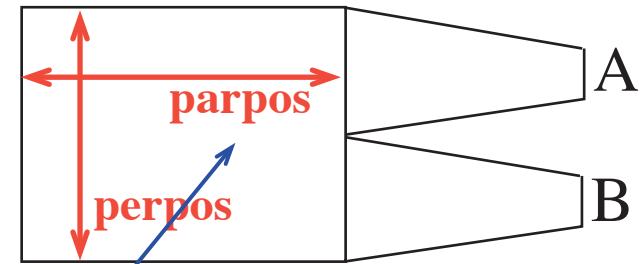
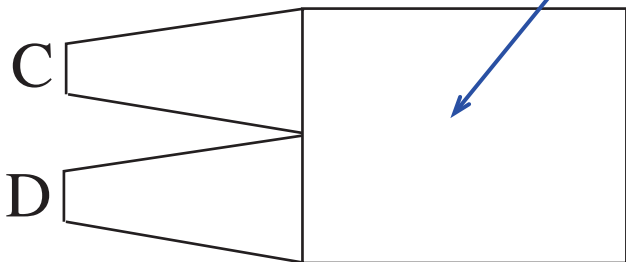
"standard candle" qty of interest

is then $\Delta ts = ts1 - ts2$

in the absence of slewing/offsets

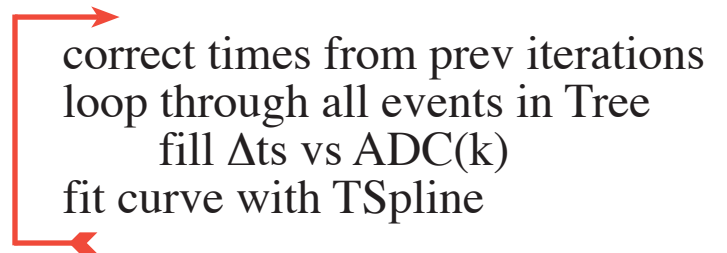
$\Delta ts = ts1 - ts2 = 0$.

Of course, it is not zero. The point is to **make it zero for all pot pairs**.



How to make $ts1 - ts2$ zero?

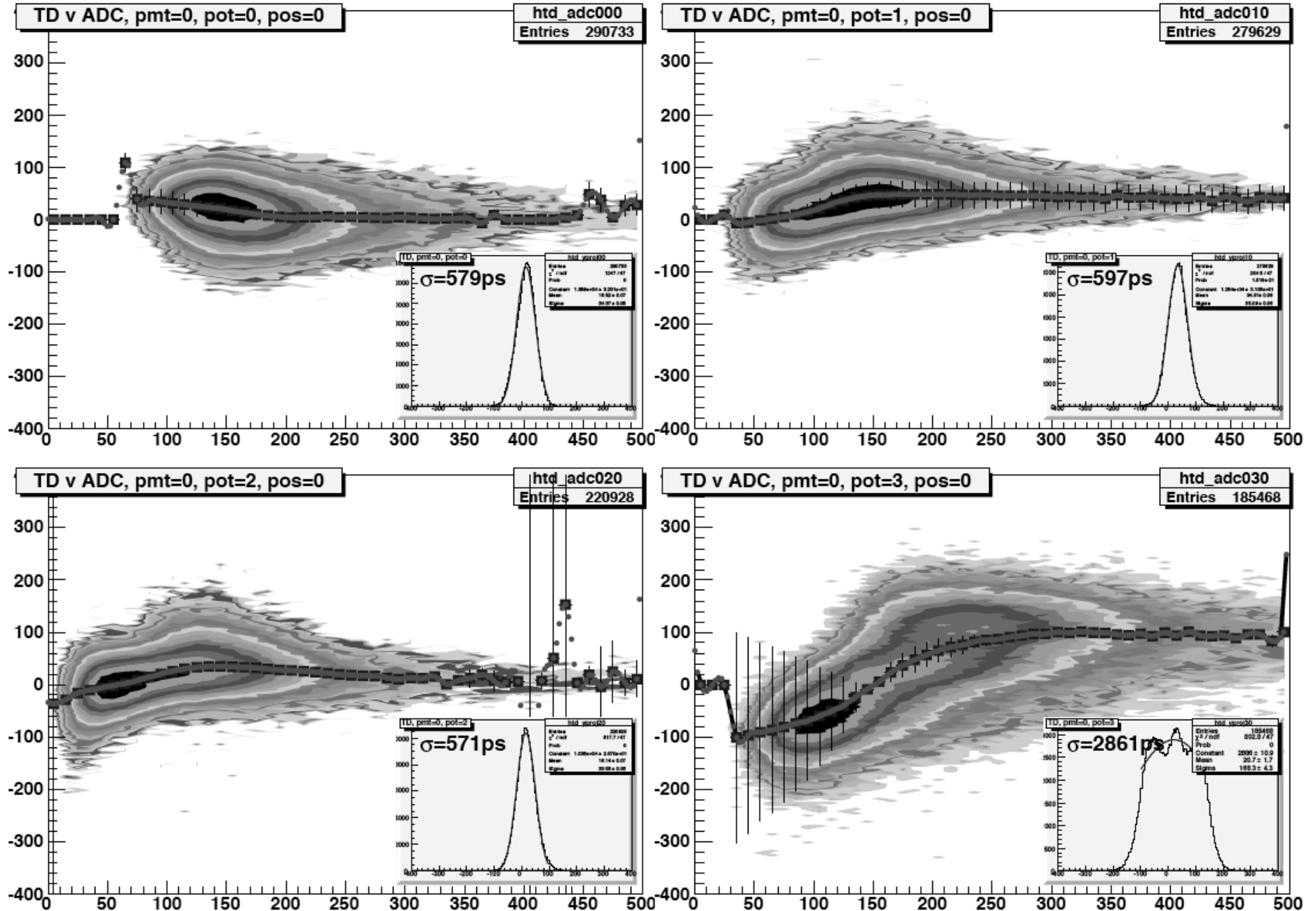
many passes through the data.



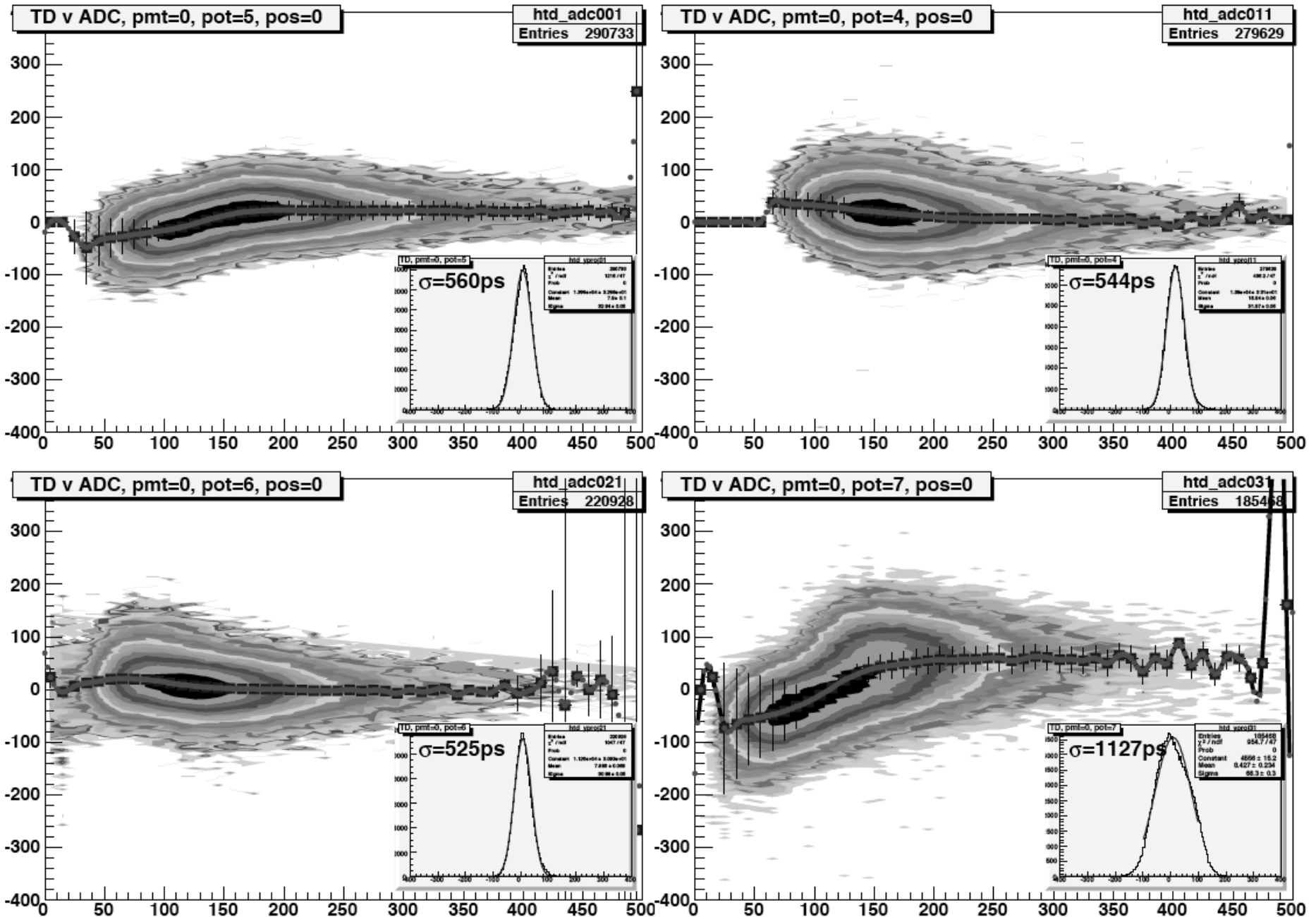
In different "sets" of 4 iterations
change which PMTs are in
the $ts1$ and $ts2$ qtys...
change slew fit ordering....

Turn the crank....

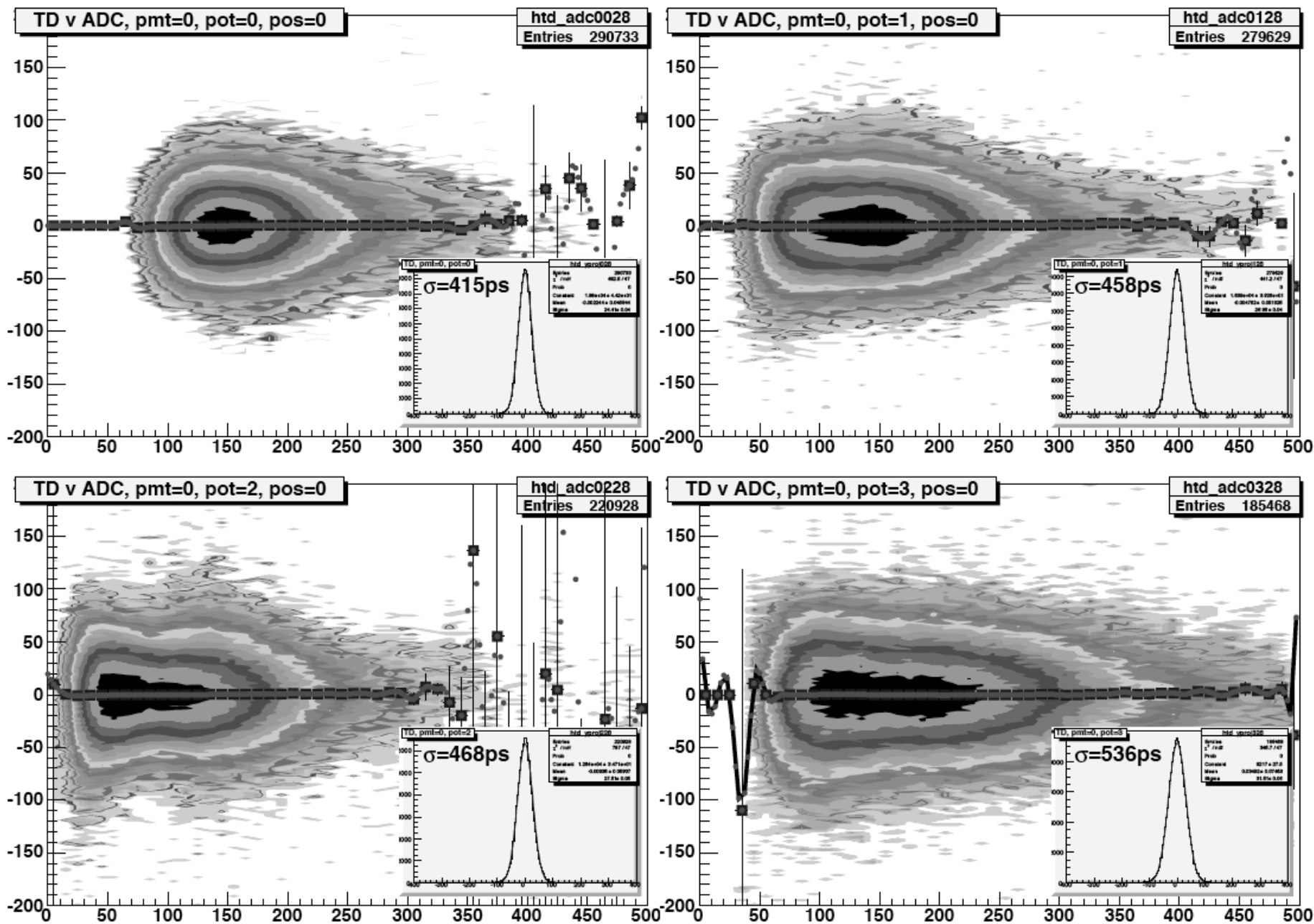
after first pass through the data... (PMT=0 of 4 East Pots)

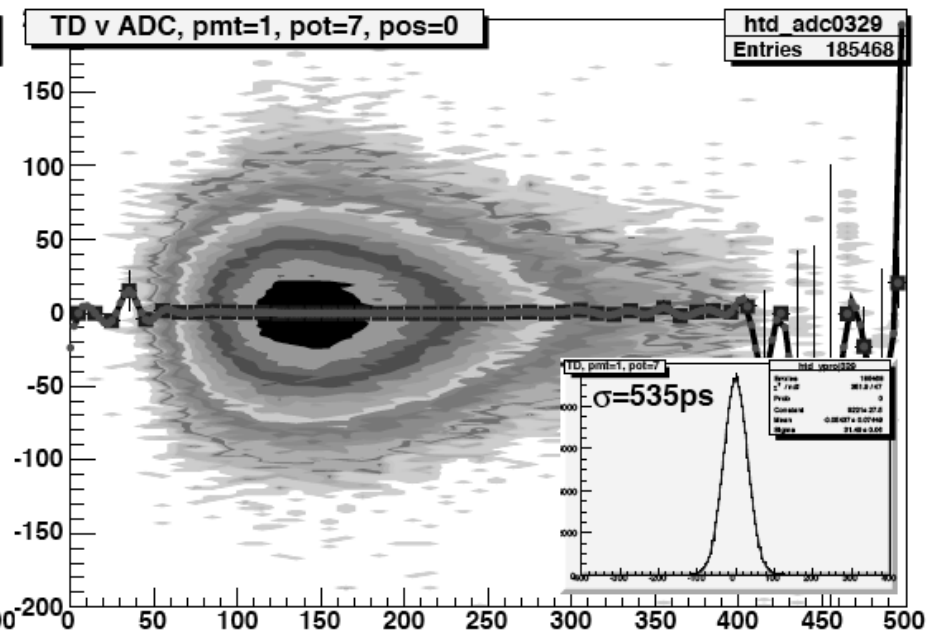
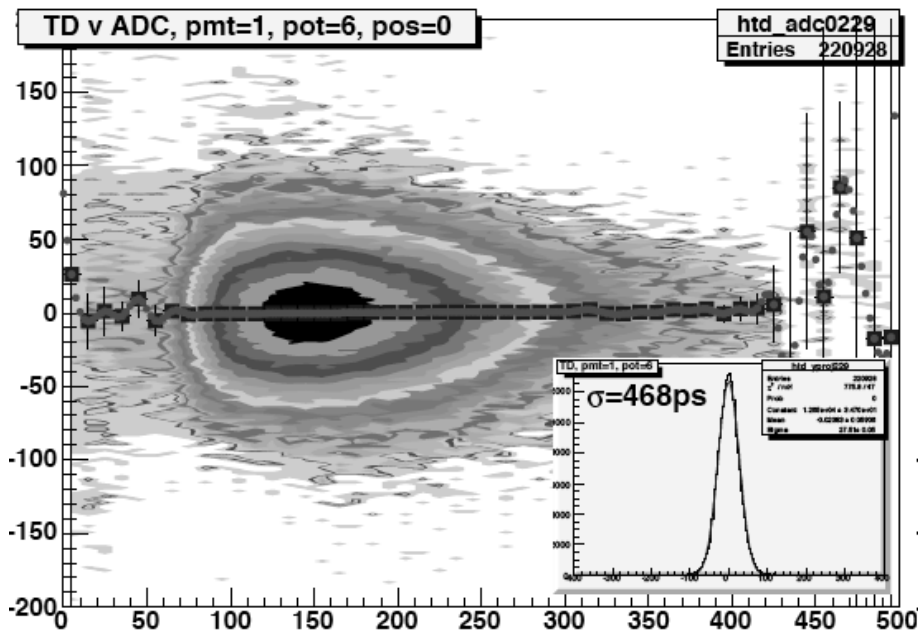
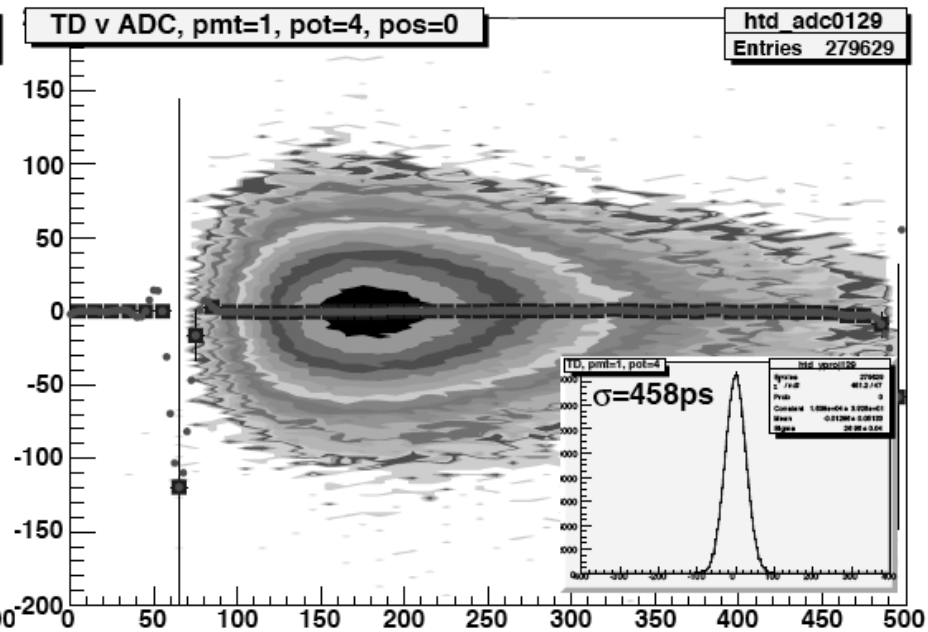
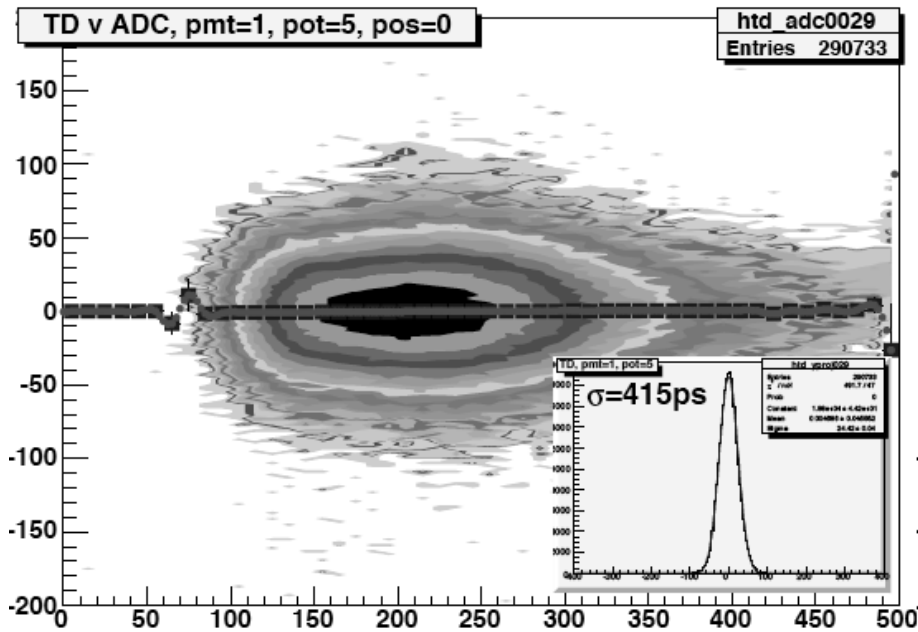


after second pass through the data... (PMT=0 of 4 West Pots)
 then PMT=1 of 4 East Pots, then PMT=1 of 4 West Pots, then shuffle IDs & repeat.....



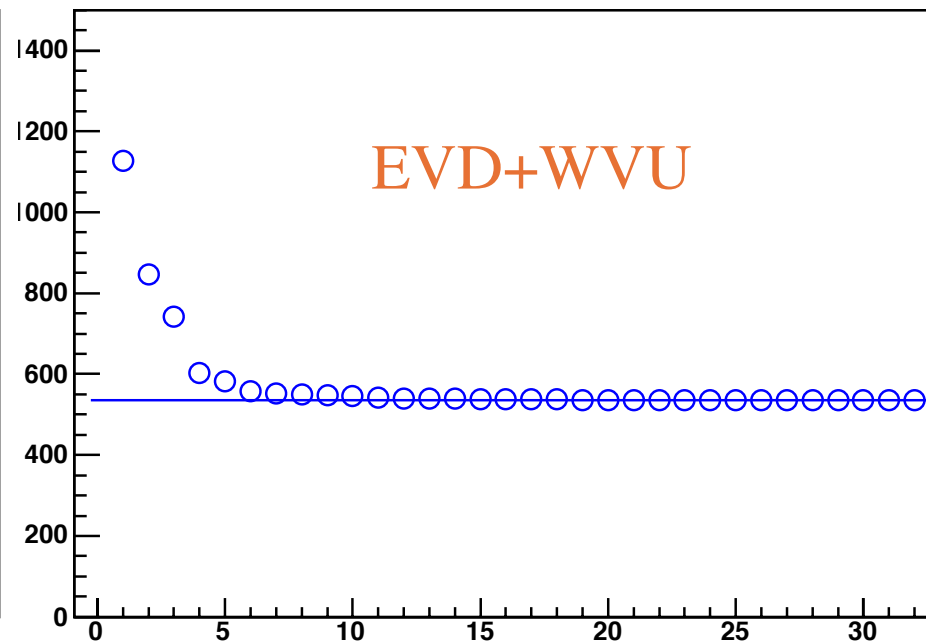
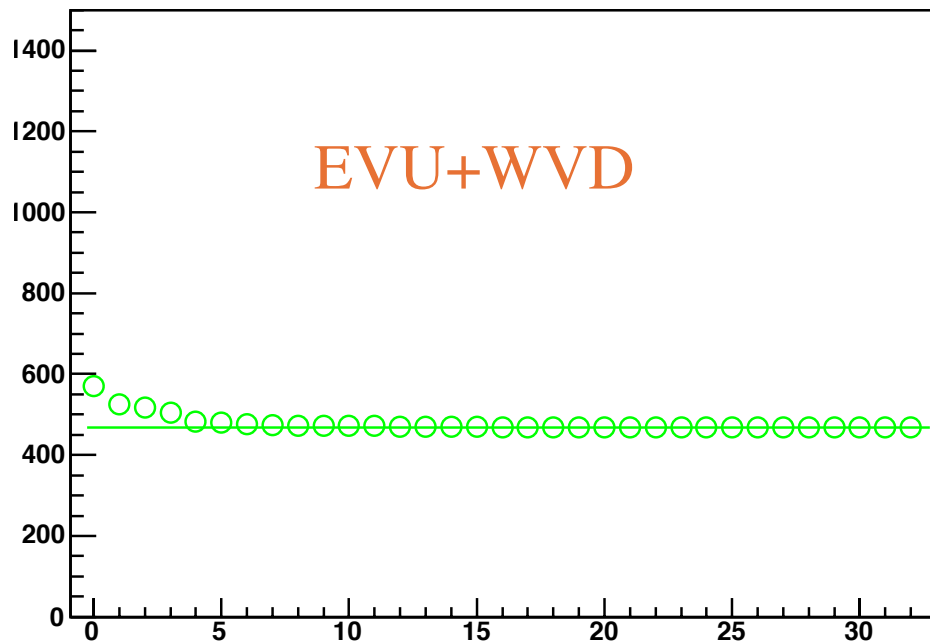
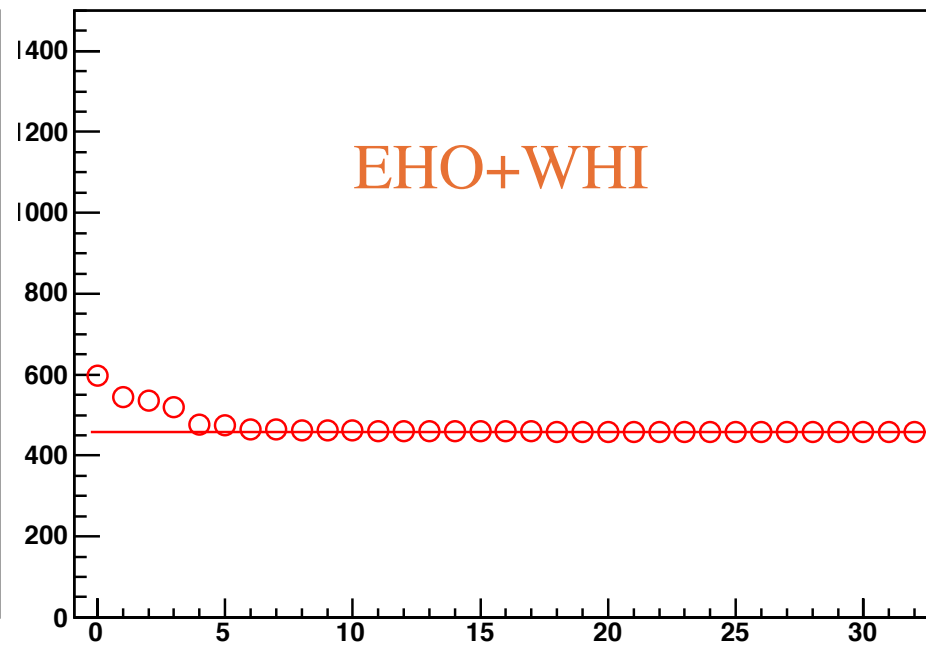
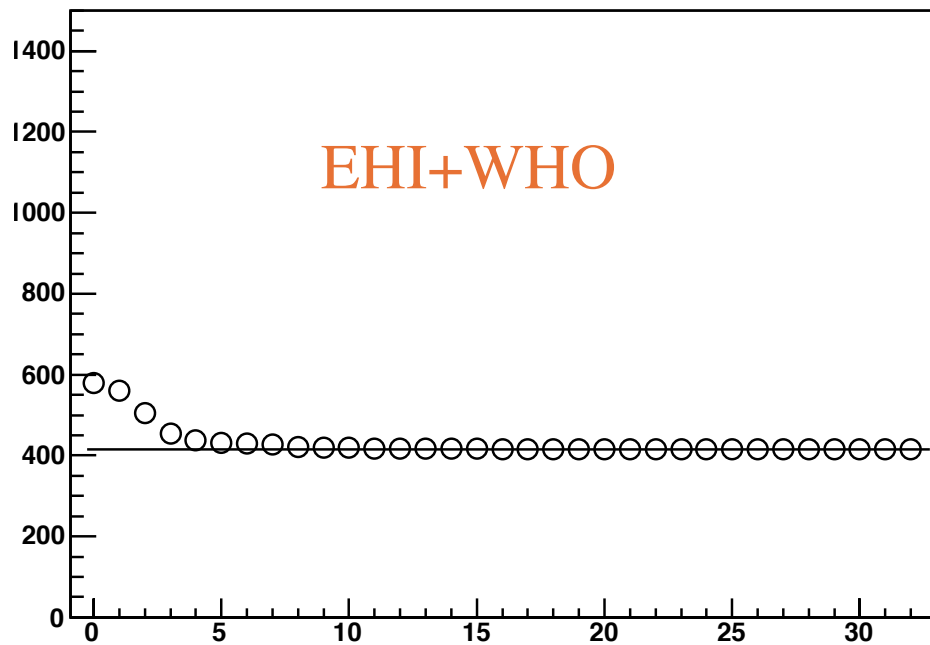
30 passes later.....



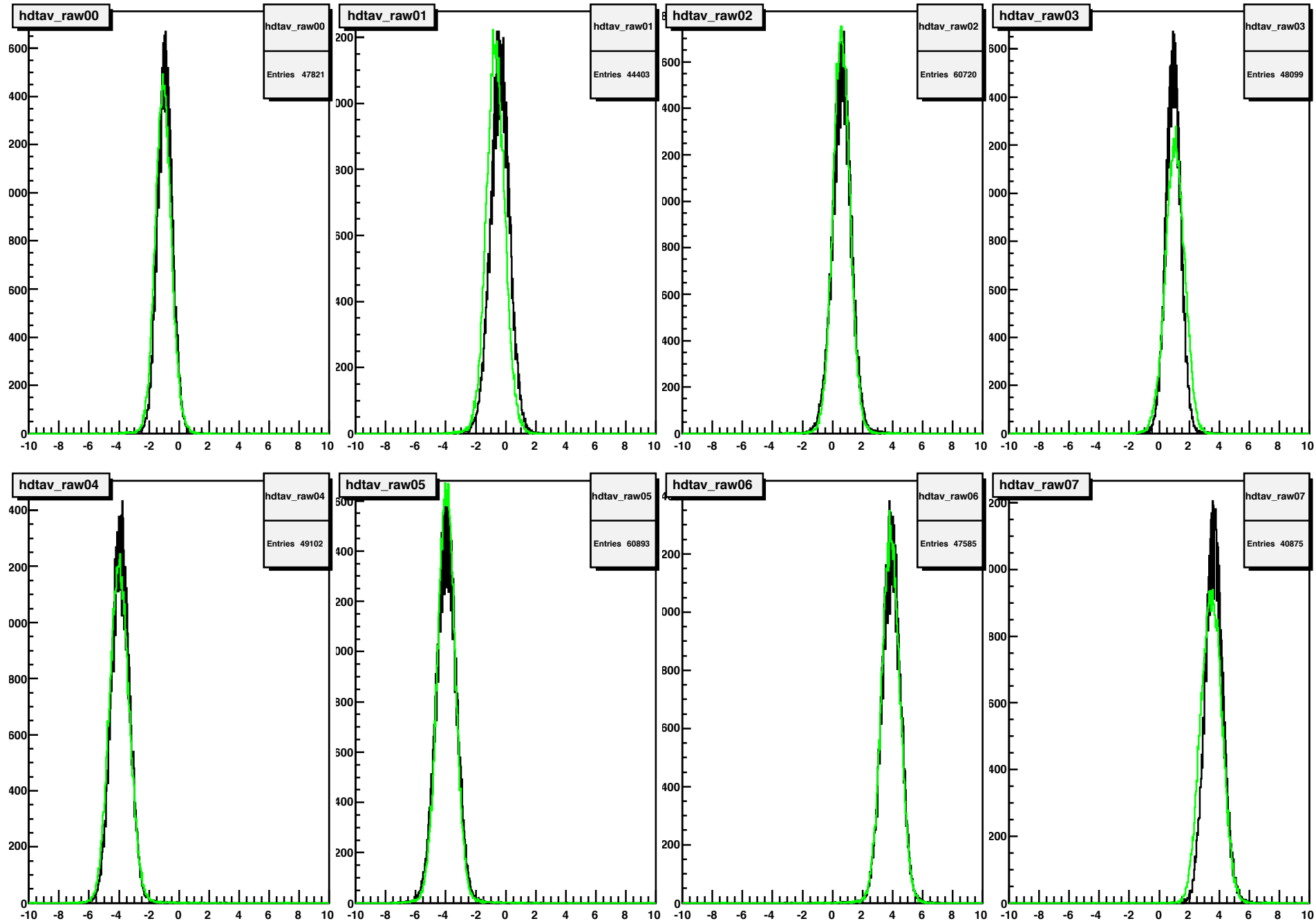


Δ st resolution vs pass number.....

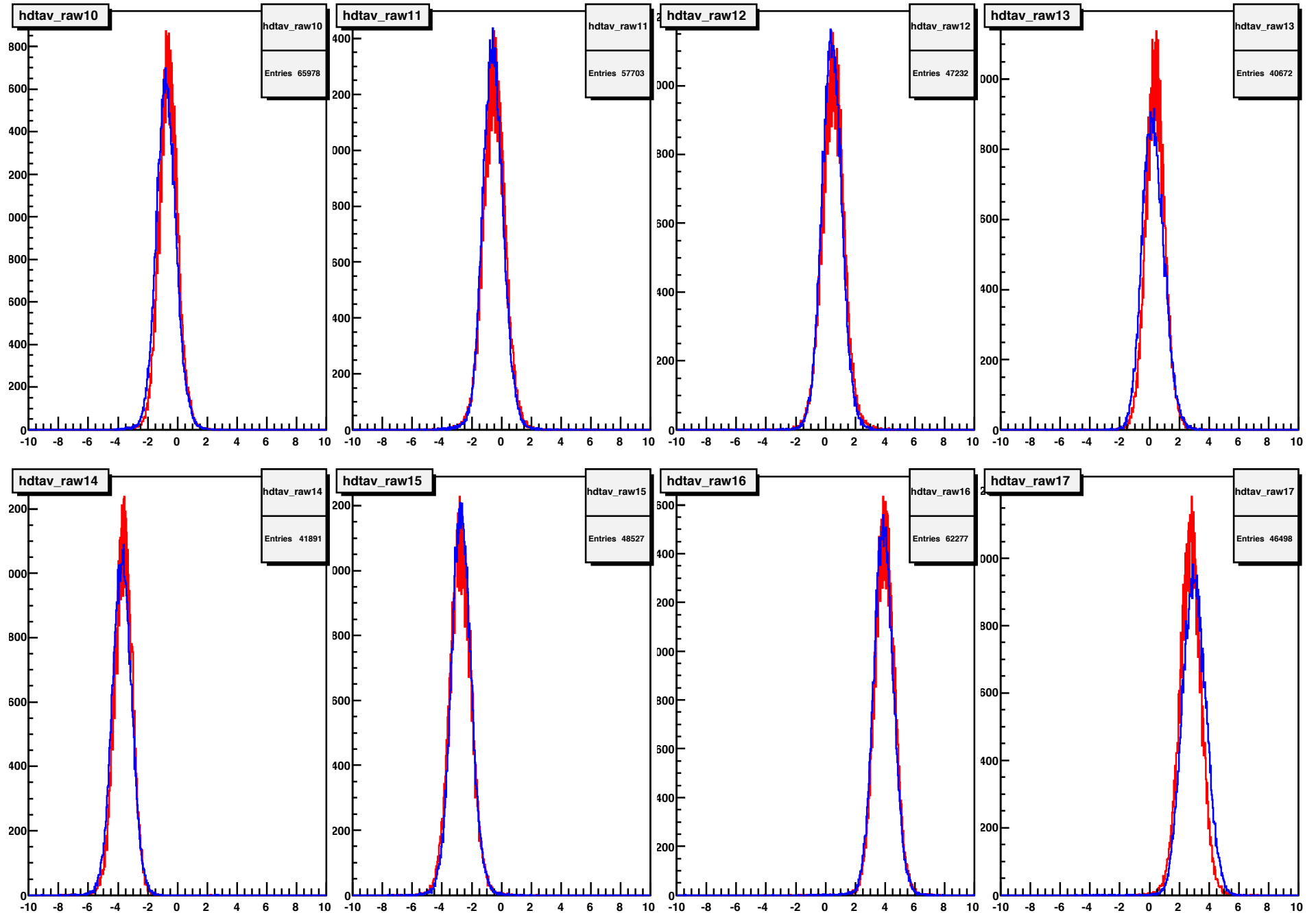
($\sigma \sim 400$ - 500 ps)



time difference for 2 pots/side coincidences (before and after)



time difference for 2 pots/side coincidences (before and after)



Simulated Data....

- make a simulated data Tree & run it through same `calclu` code.....
- check basic sanity of the calibration code!

Algorithm....

pick `kCollinearPairID` randomly [0,3]
set local X and Y positions of hits randomly
set ADC value randomly from flat distribution

Sample `Zvtx` randomly from Gaussian parent distribution w/ $\sigma = 1$ m

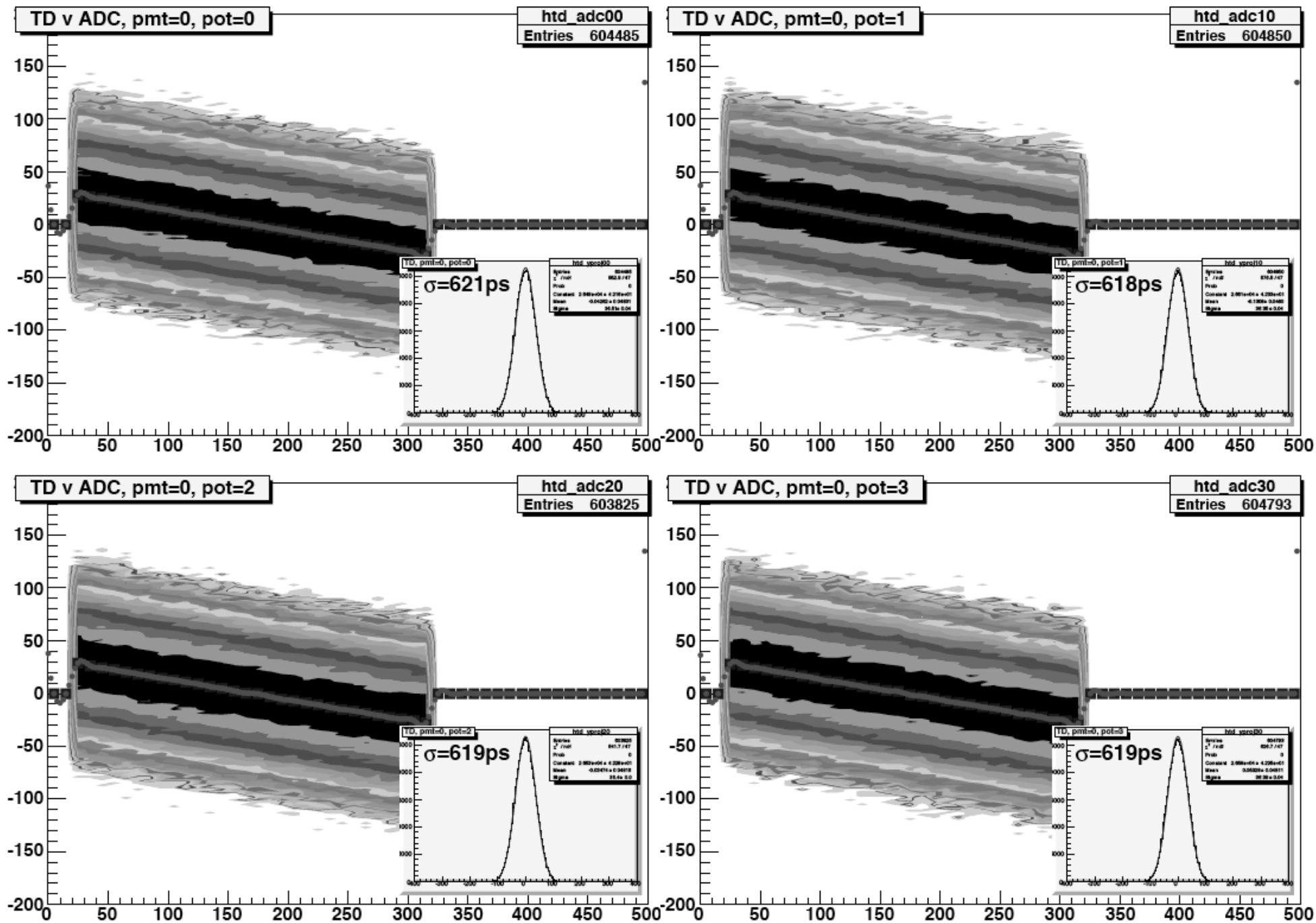
Set times for each pot using `Zvtx`, `Zpot` (55 or 58 meters) and $v=c$.

Add slewing to each PMT based on ADC value of that PMT
Smear also with single detector resn (200 ps)

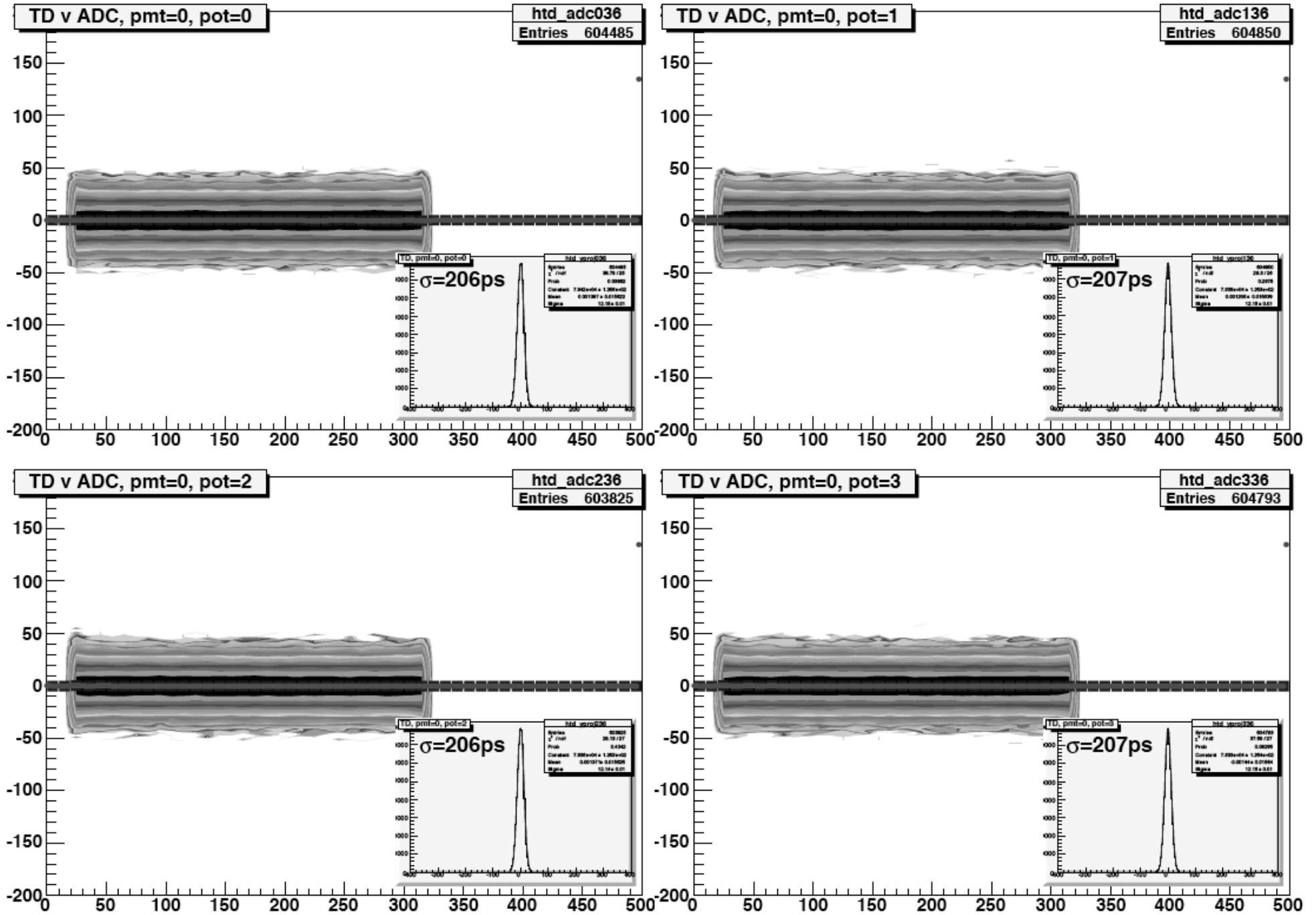
convert time to TAC bins and fill tree with the ADC and TAC values so obtained....

see http://www4.rcf.bnl.gov/~llope/files/calclu_sim_A.pdf for all iterations....

first iteration....



Last iteration....



Resn vs iteration ($\sigma = 200\text{ps}$, exactly as smeared initially)

