Summary Data_Qual checking for E08014 : D2

There are 3 Kinematic setting

Kin	Po	Angle	Run#	type
Kin3.1	2.905	21	3681, 3682, 3683	Production
Kin5.1	2.795	25	3642, 3643, 3644 3645, 3646, 3648	Production
Kin5.0				Boiling target

What will be check for Data_qual?

1. SPE location for each run
2. E/P main peak for each run
3. Tracking efficiency for each run
4. Time Live for each run

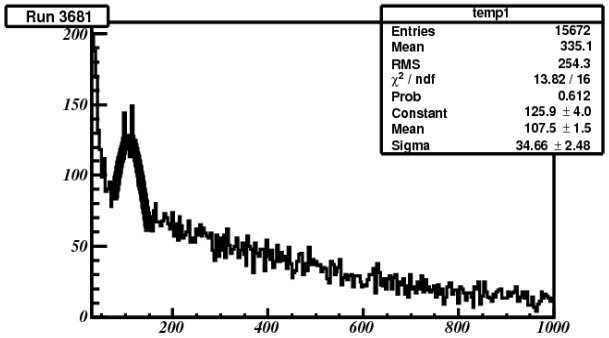
This just first check to make sure nothing go wrong in data. But later when we go to extract physics we will have more test for Yield and Cross section

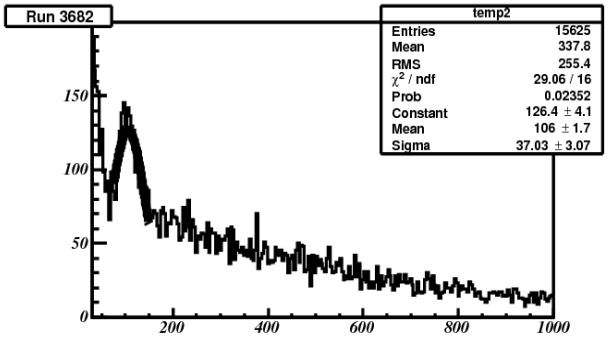
First Check: SPE location for Cer for Production run.

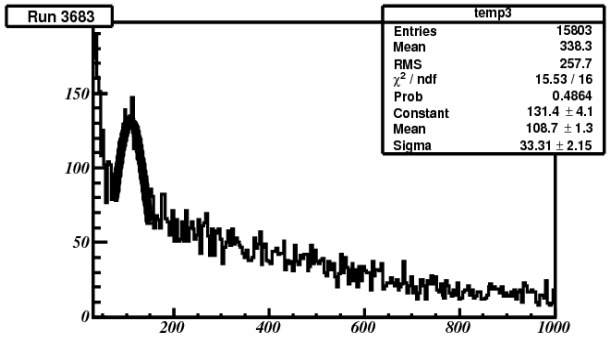
For Cer Calibration we want to adjust the SPE at channel 100

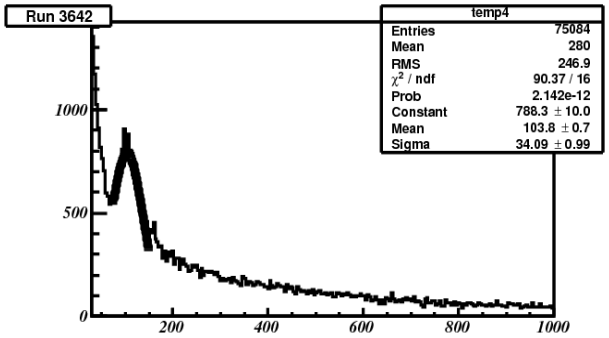
-Take the existing calibrated rootfiles for D2 production and do plot the L.cer.sum for every run and see the SPE location

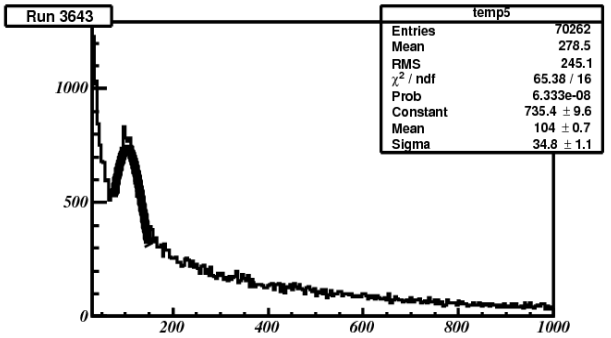
- Using cuts: Trigger4 not Trigger3

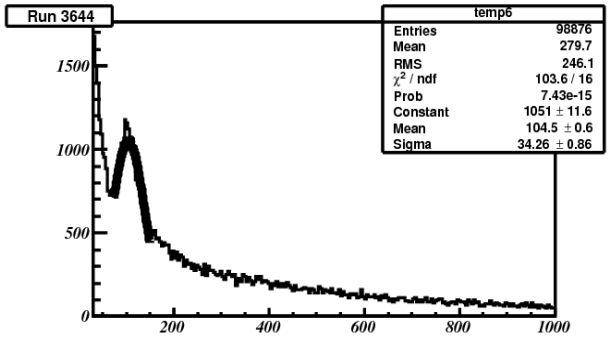


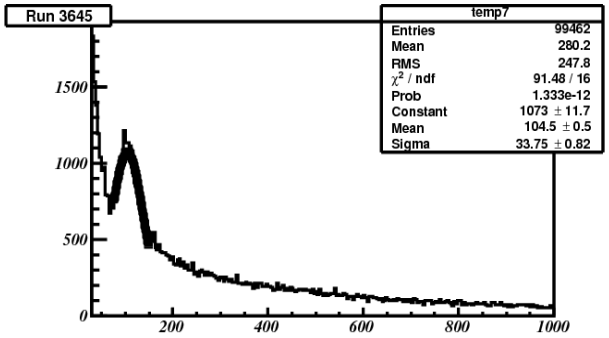


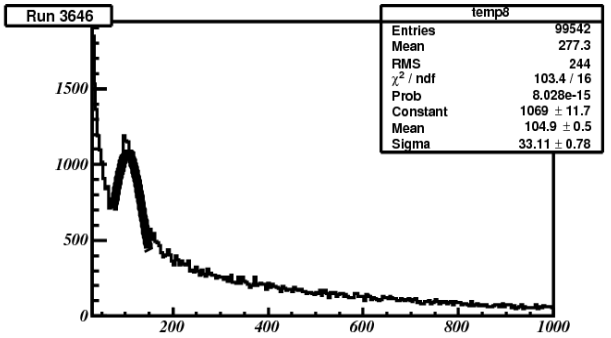


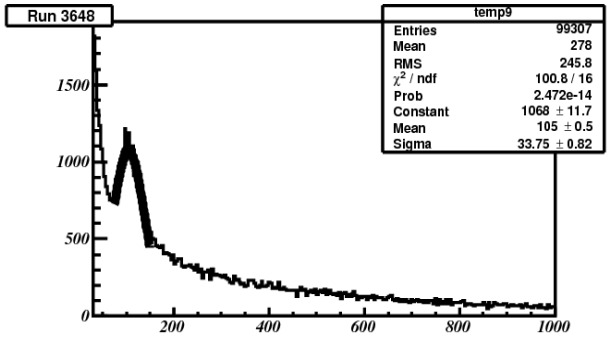




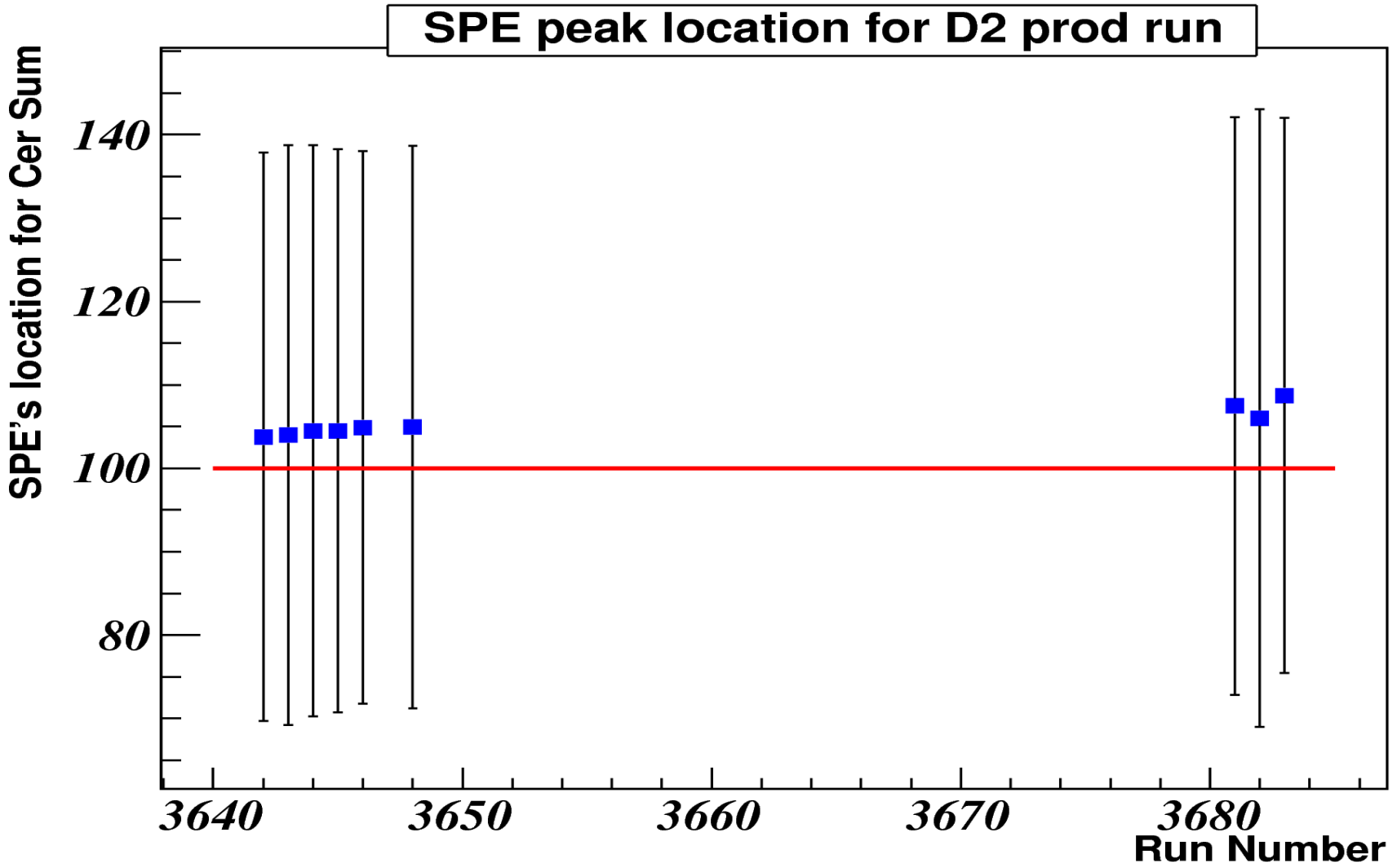






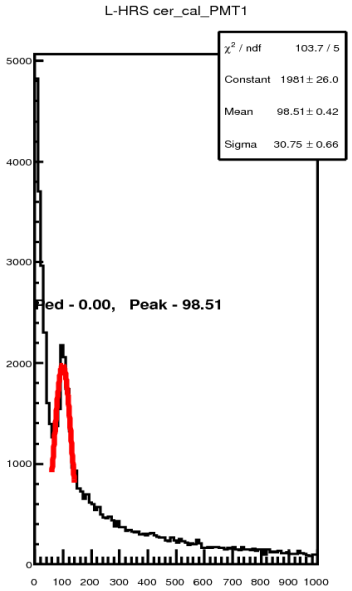


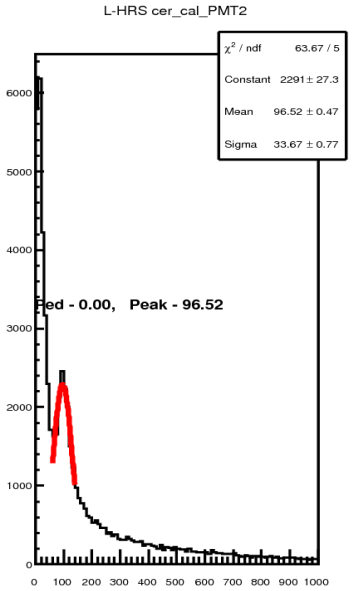
For Cer Sum. Location of SPE

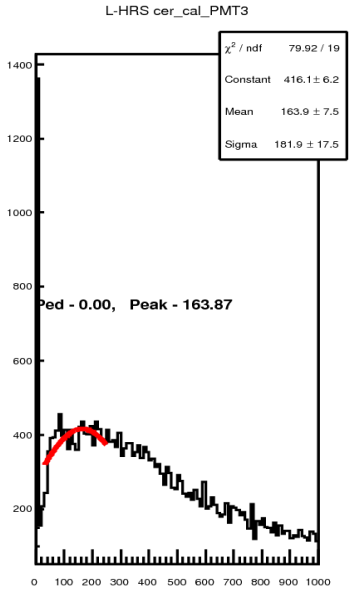


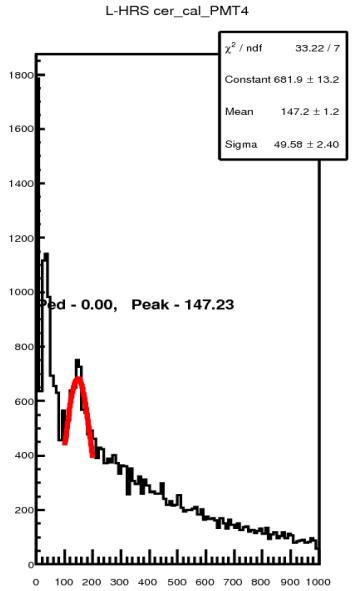
This is SPE from cer_sum so it is reasonale to have shift from channel 100. But to make sure how much they really shift and what we see is reasonale we need to see the SPE for each PMTs on Cer.

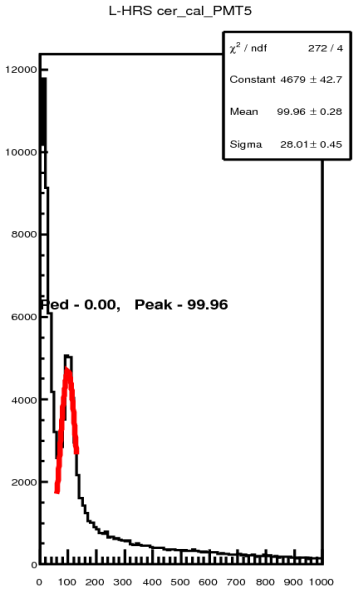
Kin5.1 have more pion so it is easier to see SPE in each PMT. So use this existing data to check SPE for each PMTs. Add old rootfile for this kin and use the same cuts

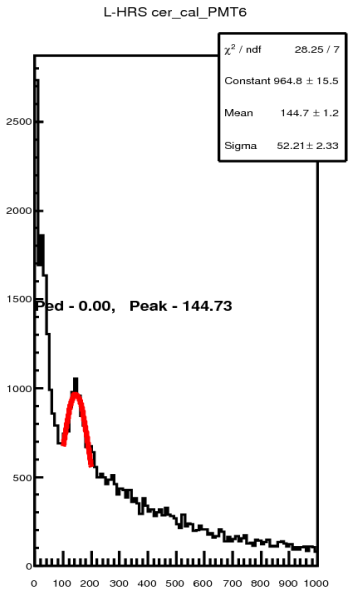


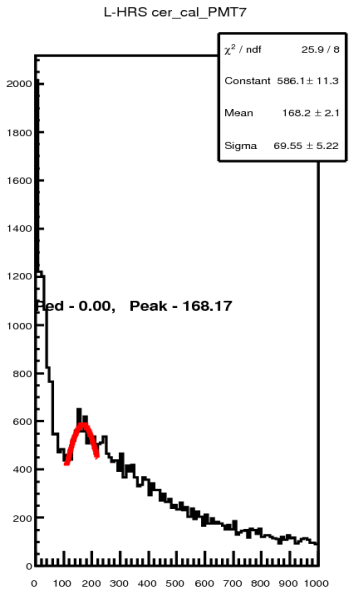


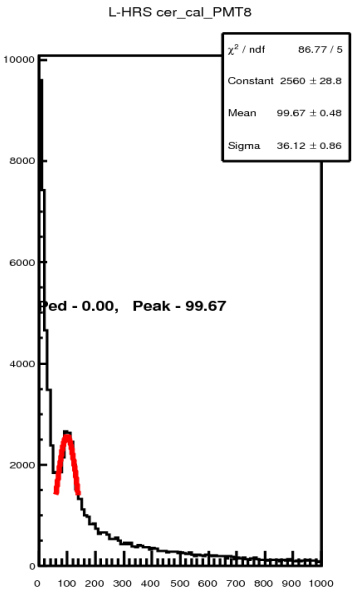


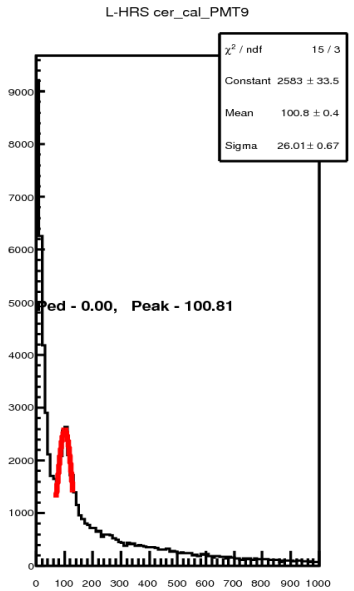


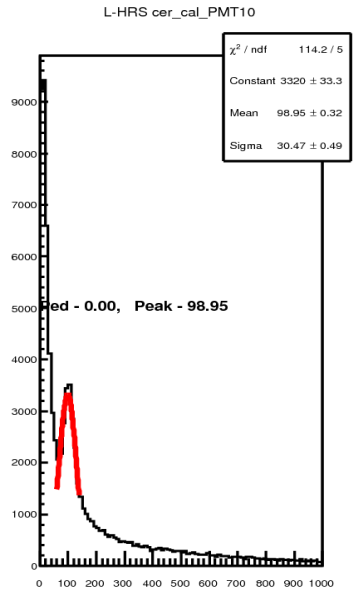




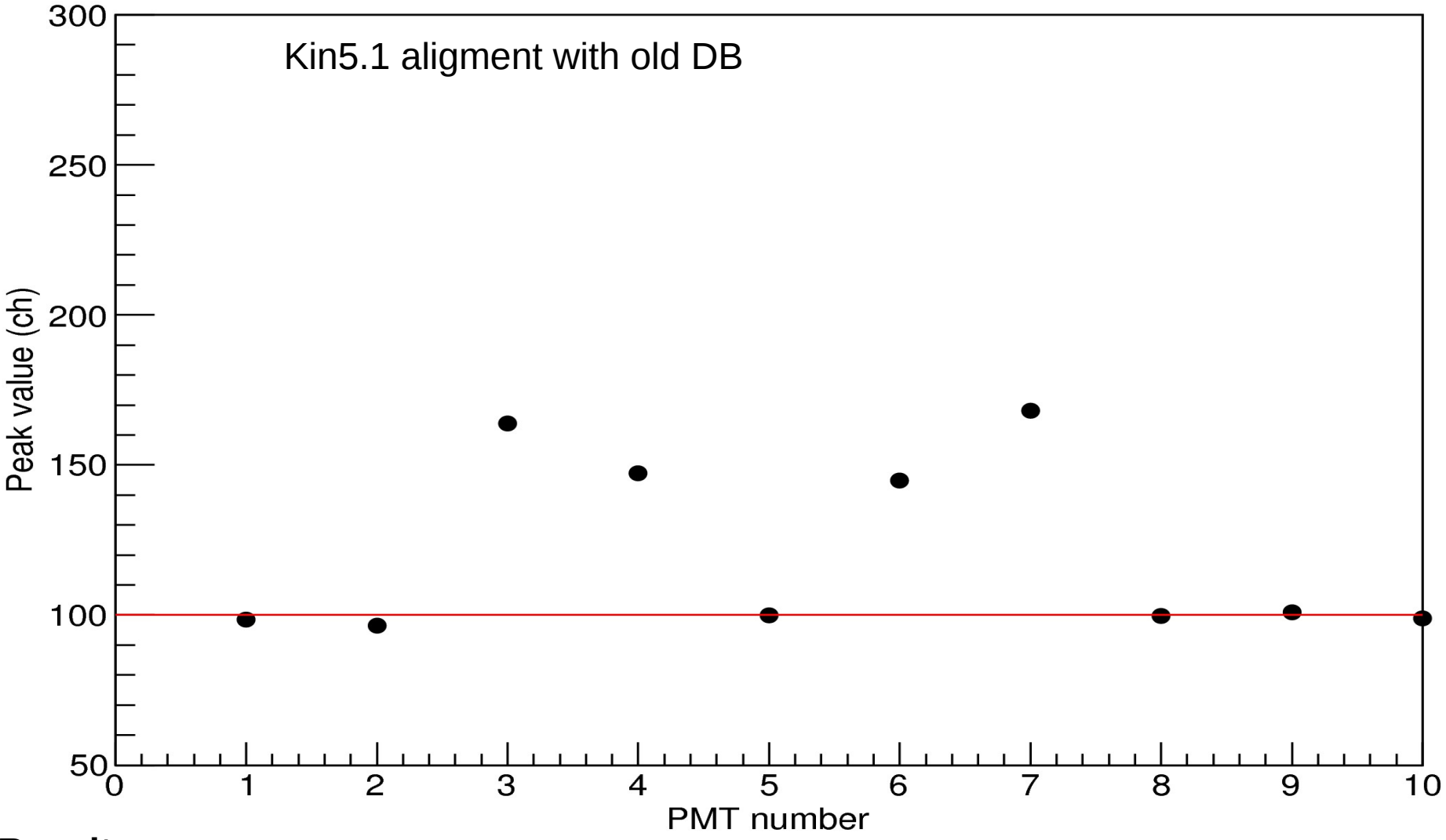








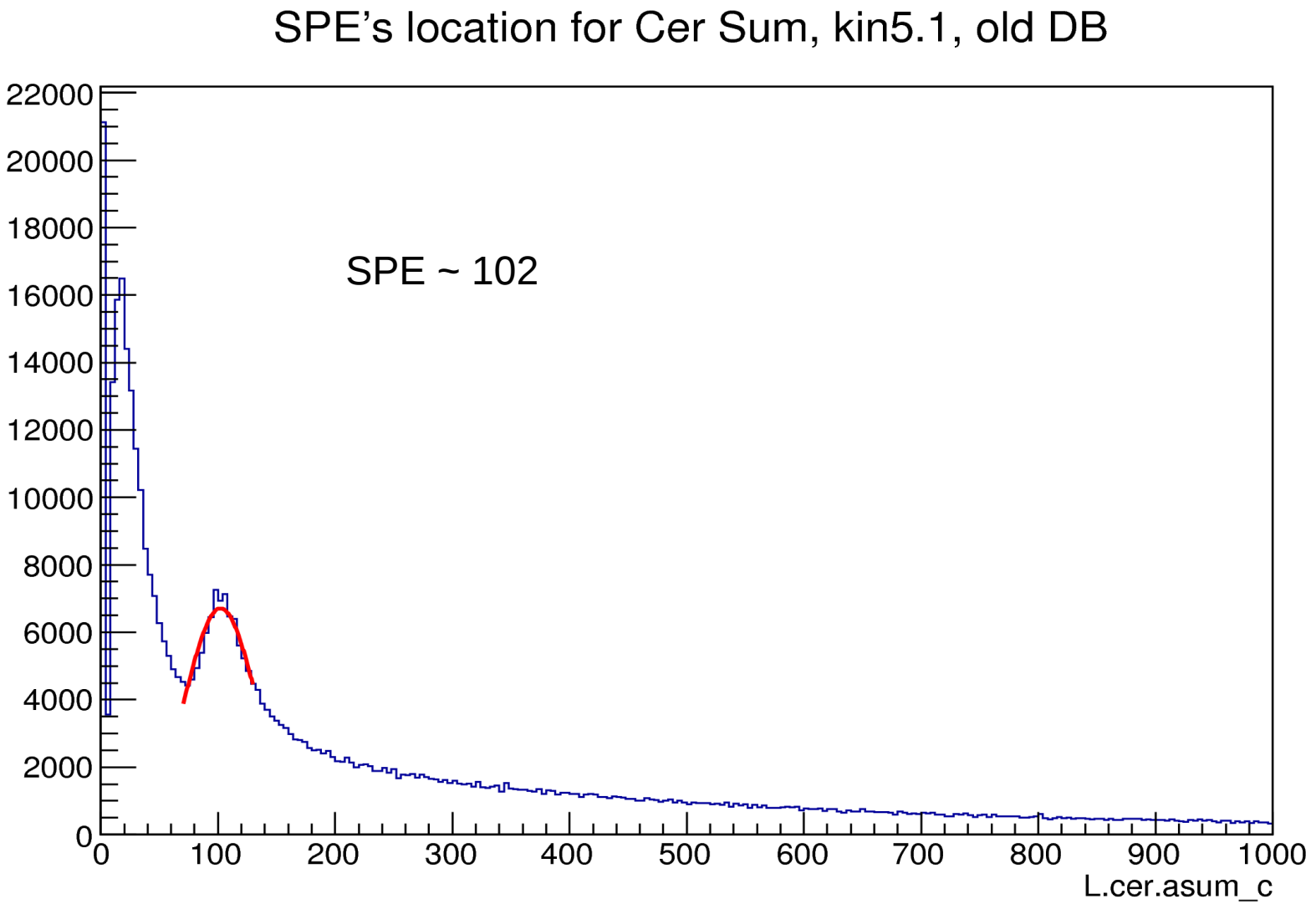
Do plot for SPE's location Vs number of PMT



Results:

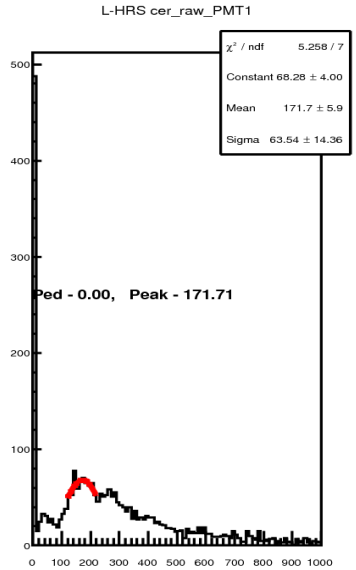
- only 6 in 10 PMTs got align
- PMT3: seem have very wide peak. Hard to say it is SPE or not?
- PMT4, PMT6, PMT7: SPE is not as clear as other

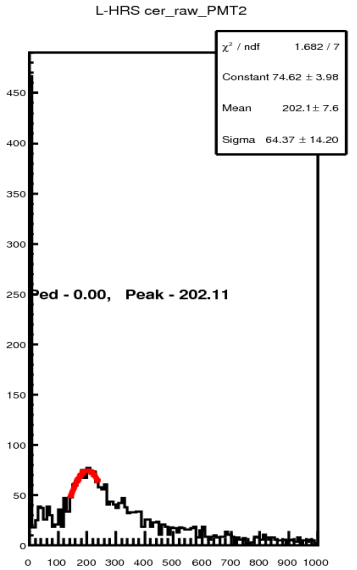
Want to see with this alignment where SPE of cer sum

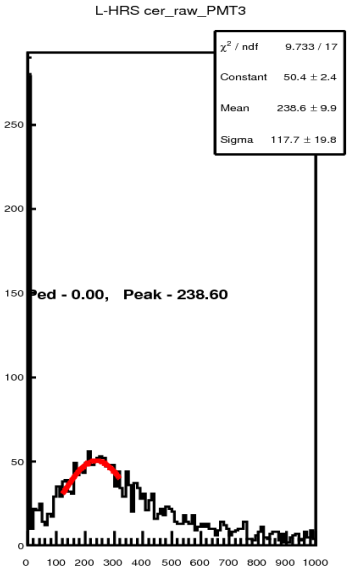


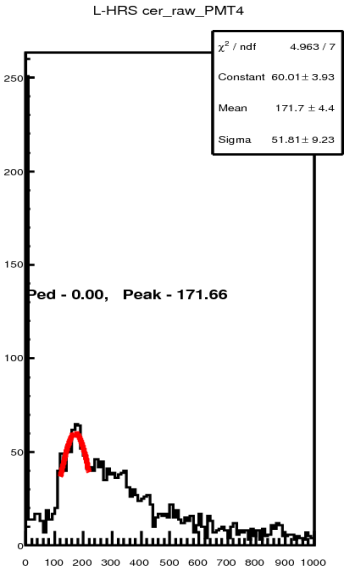
Try Cosmic runs to see SPE better to do alignment again and see if we can improve this alignment.

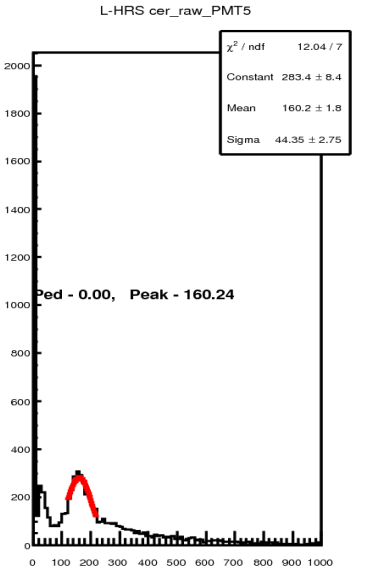
Cosmic Run: 3657, 3658, 3659,3690 with Existing Data Base.

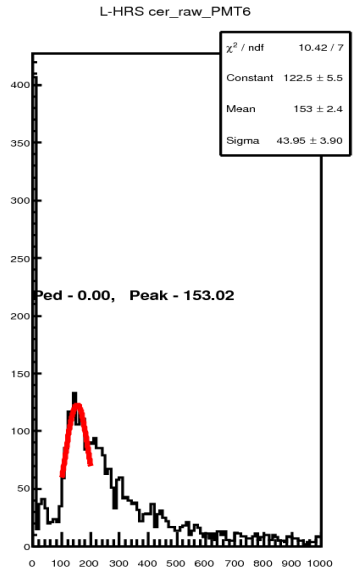


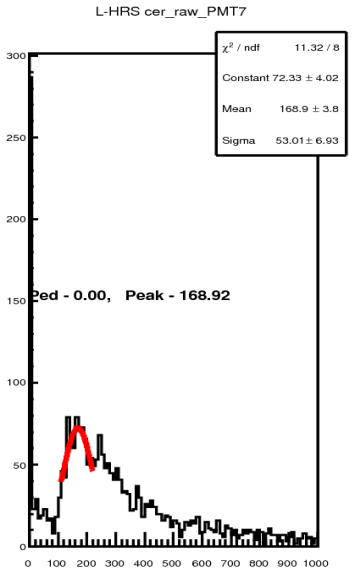


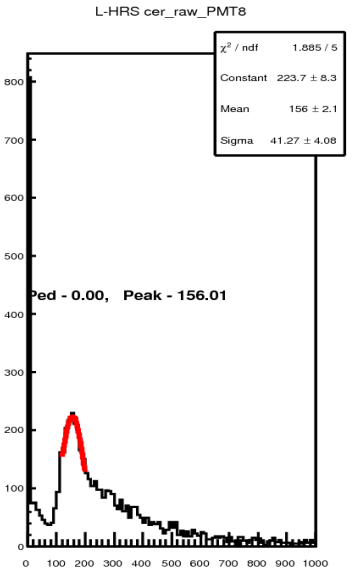


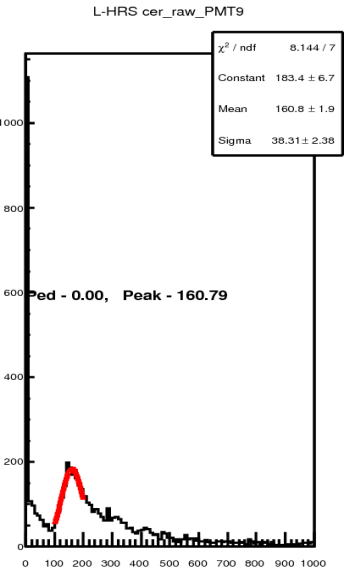


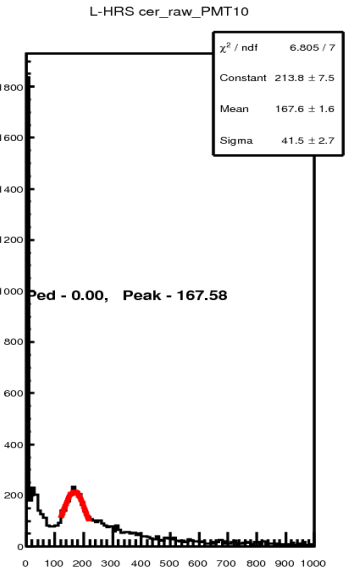




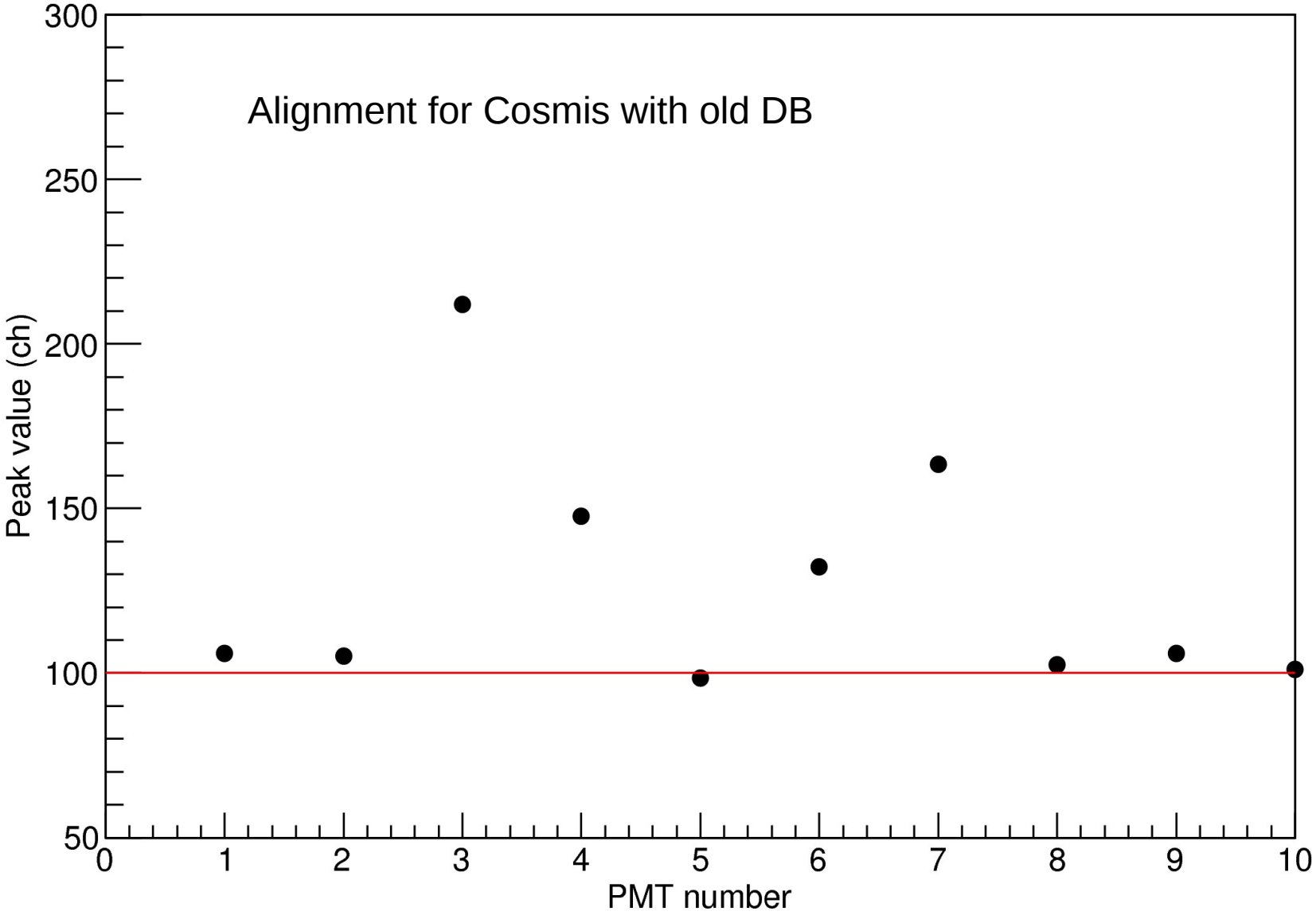






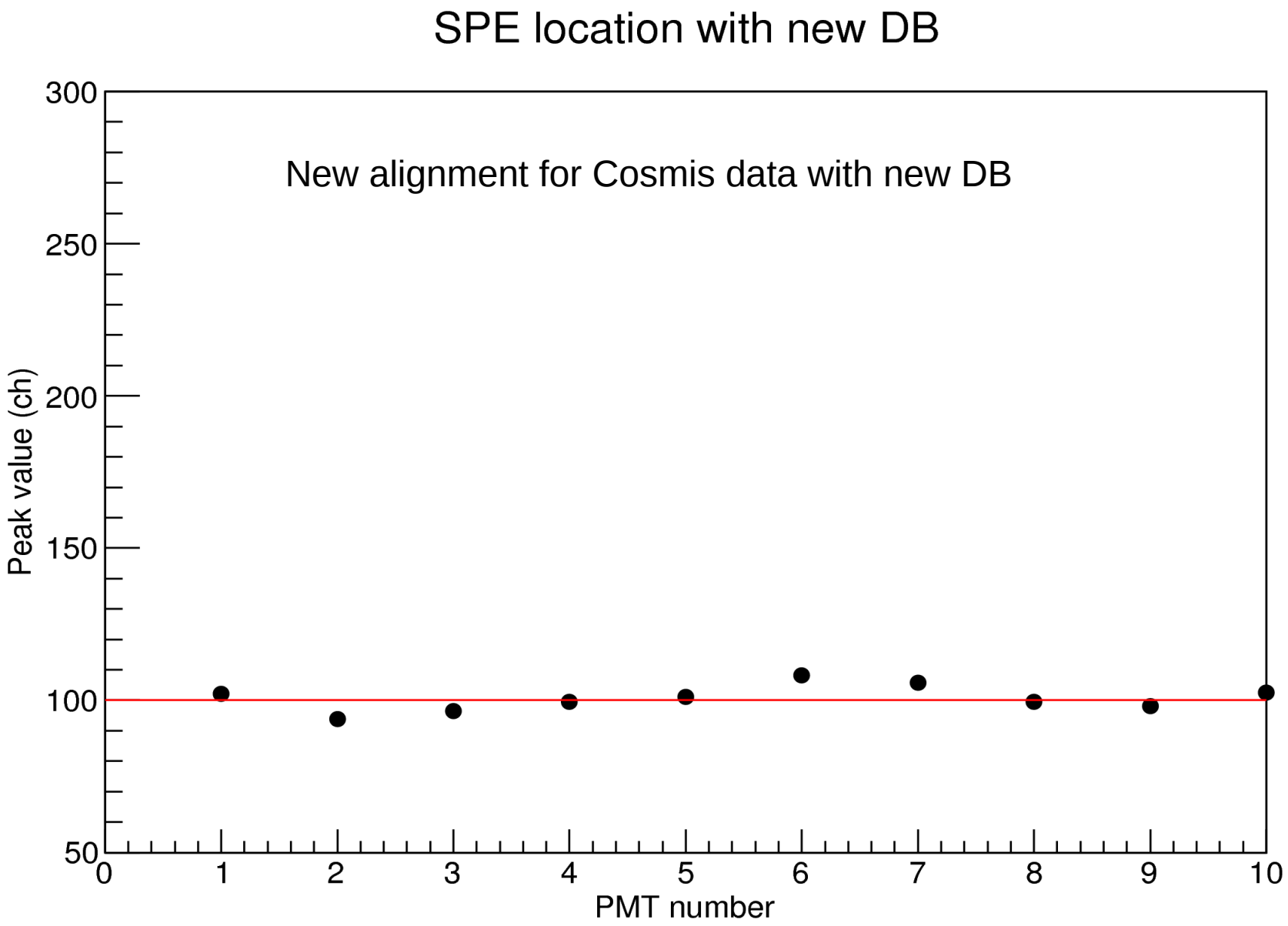


With that existing Data Base : this is how Cosmic data alignment have the same problem with production run with existing DB



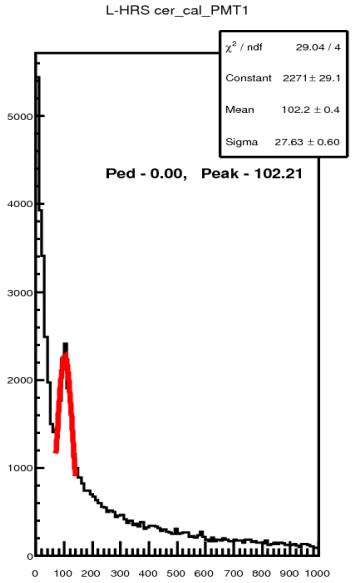
Want to do the alignment again and update DB to see any improvement

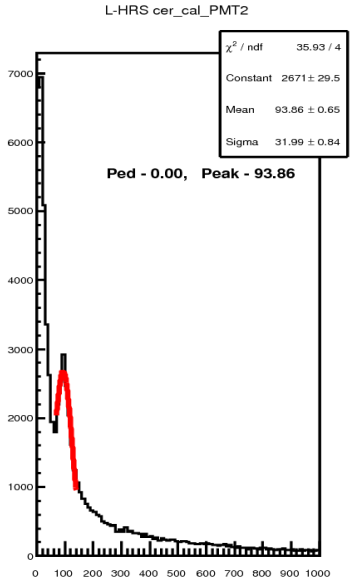
Old DB:	0.57	0.51	0.89	0.86	0.62	0.86	0.95	0.64	0.63	0.59
New DB	0.58	0.49	0.42	0.58	0.62	0.65	0.59	0.64	0.62	0.60

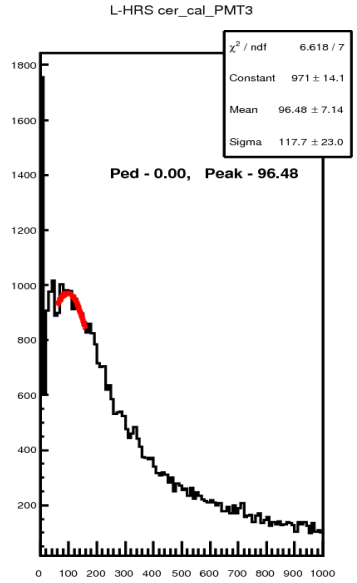


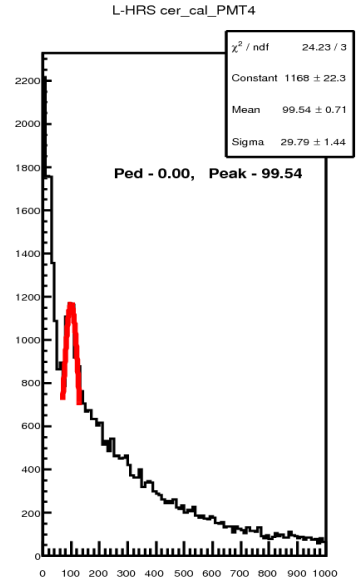
Now I use the new DB to replay again and check the alignment for production run

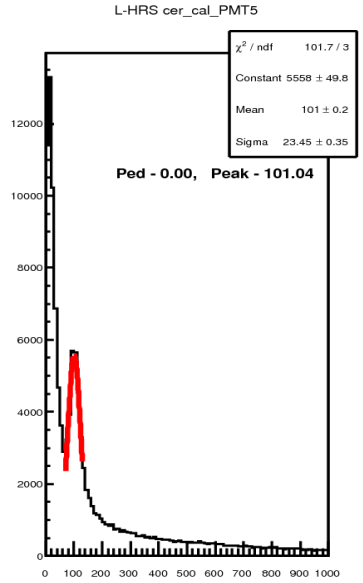
Kin5.1.

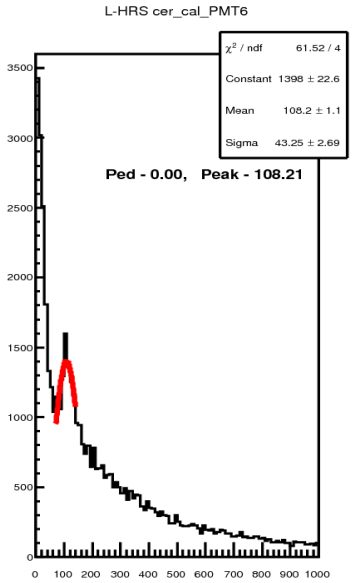


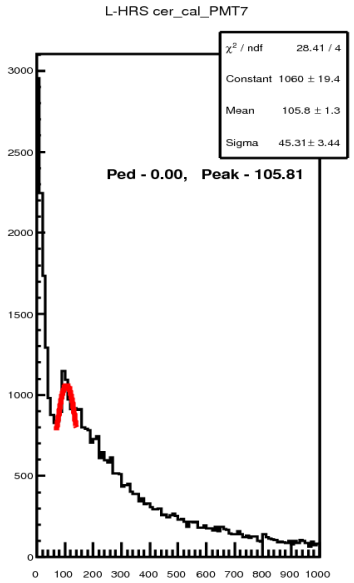


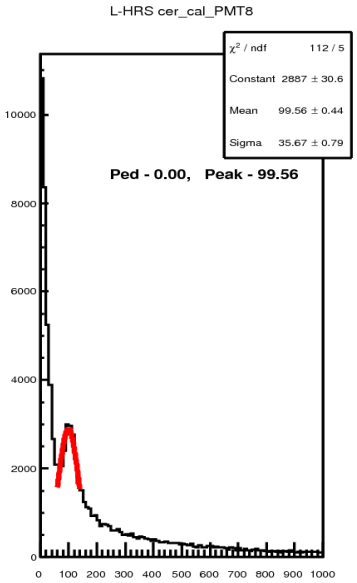


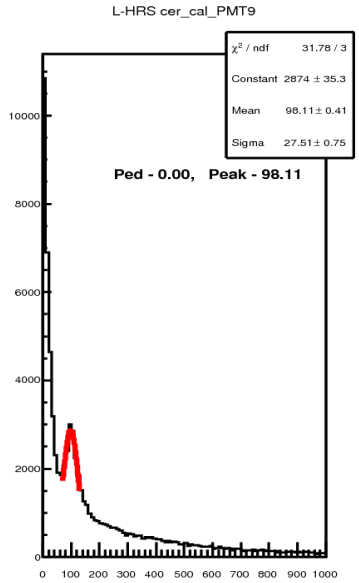


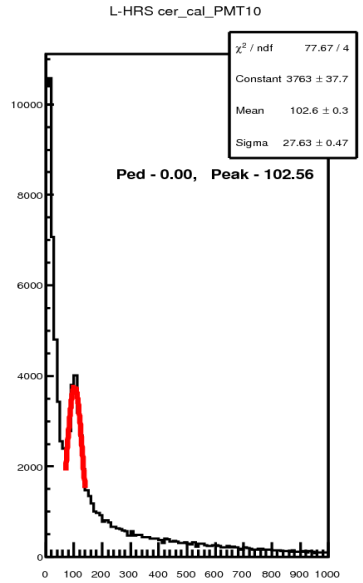


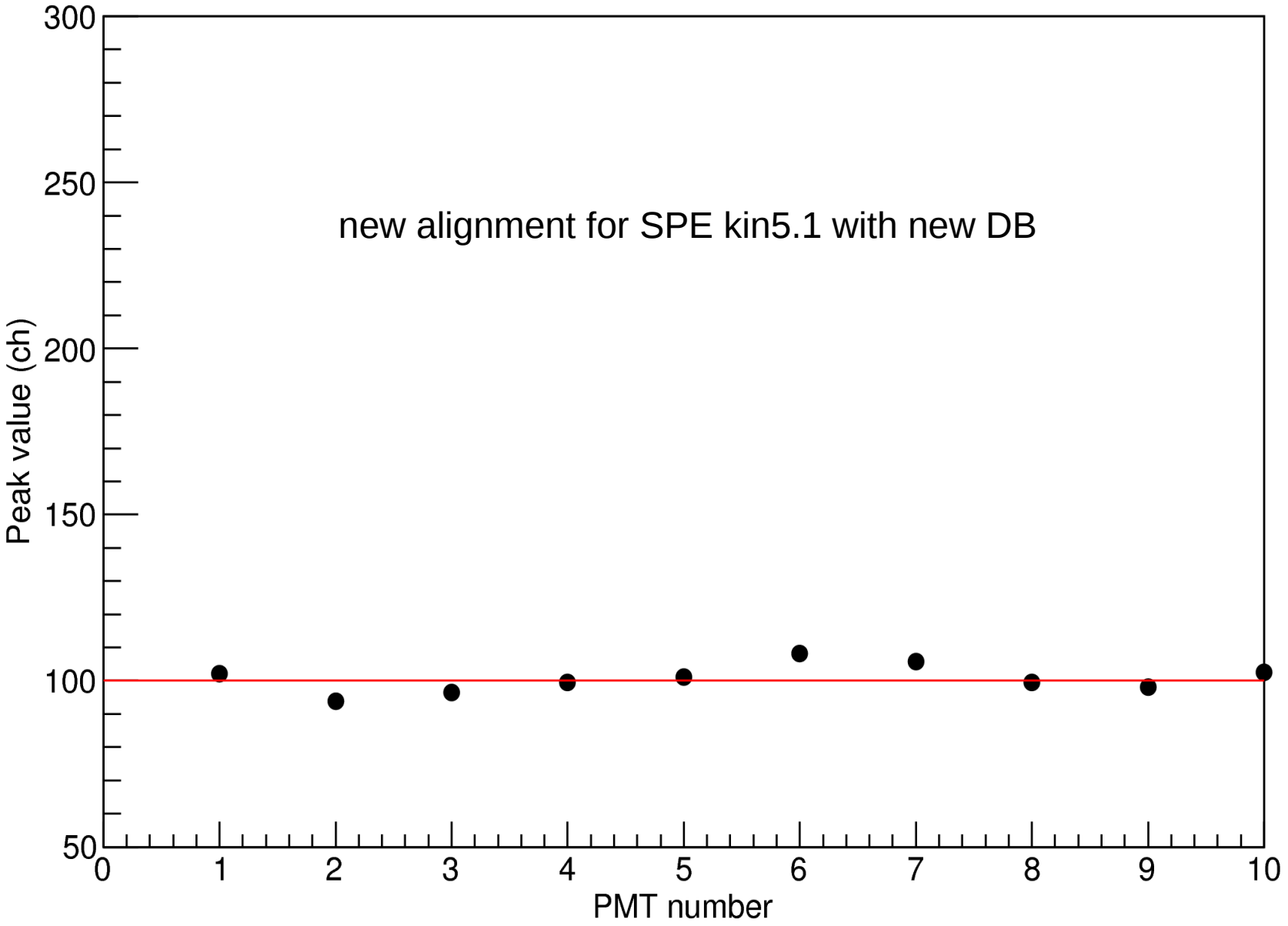




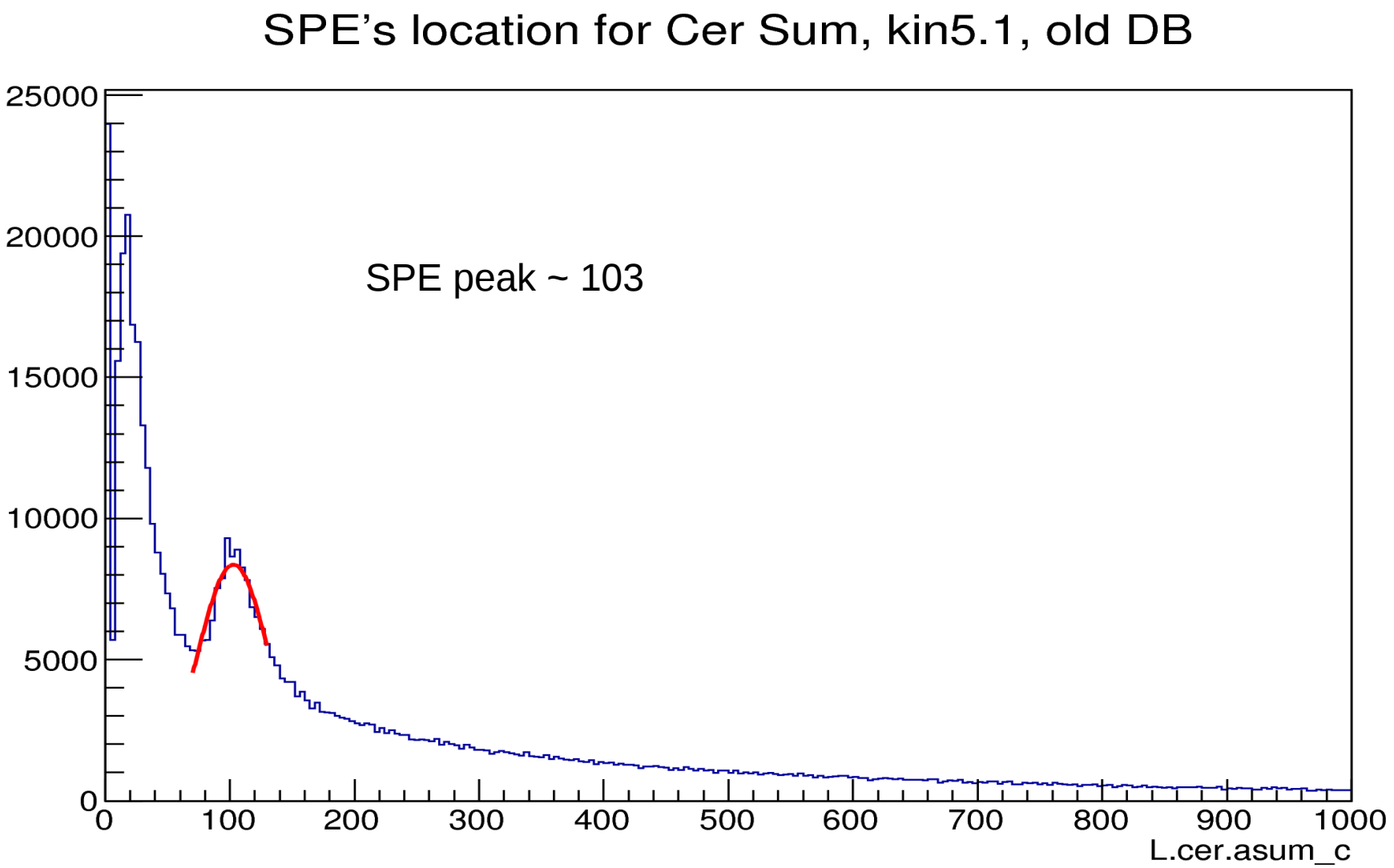







SPE location with new DB
new alignment for SPE kin5.1 with new DB
Peak value (ch)
PMT number
300
250
200
150
100
50
0
1
2
3
4
5
6
7
8
9
10

How about the SPE for Cer Sum with new Alignment



Conclusion :

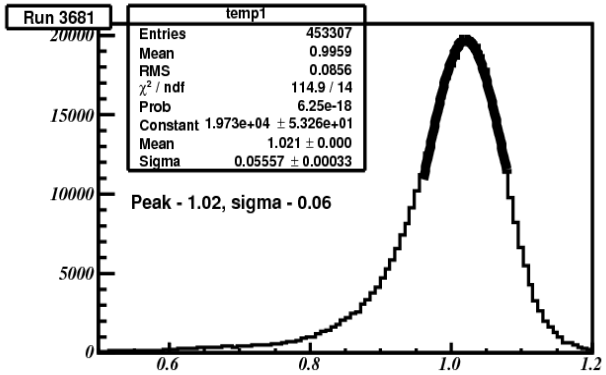
- New Aligment seems to have better alignment for every single PMT SPE's peak

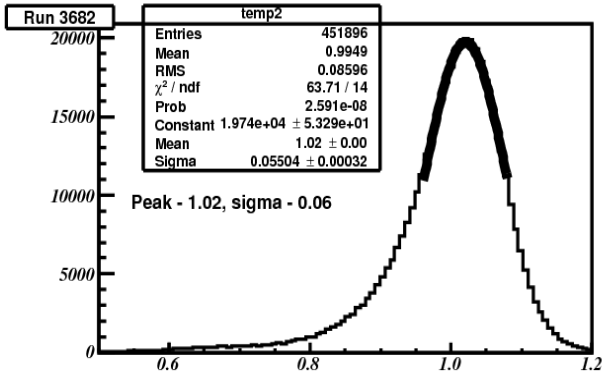
- But Not improve the SPE's for Cer Sum.

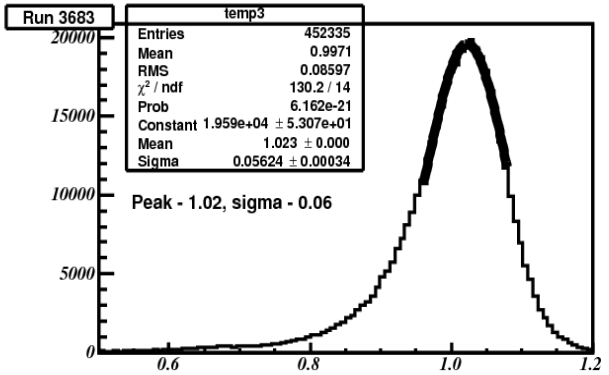
- When we do the PID the variable need to use is the Cer Sum. So the old alignment seem is okay for this espect.

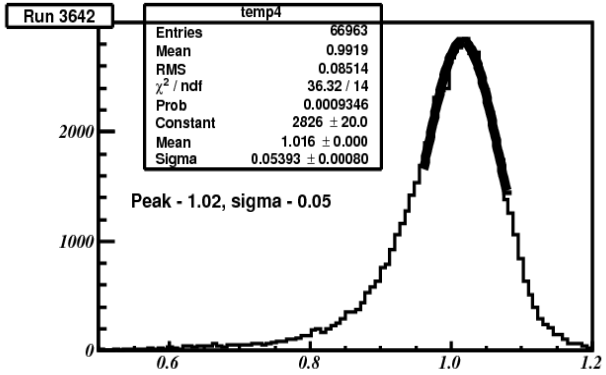
Plot E/p : here E = total energy deposist on Pre and Shower, P is setup momentum

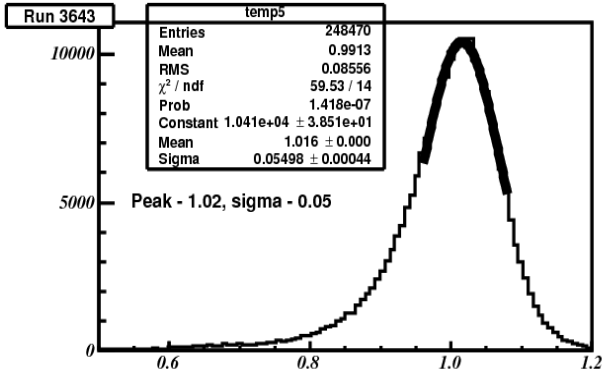
Last report

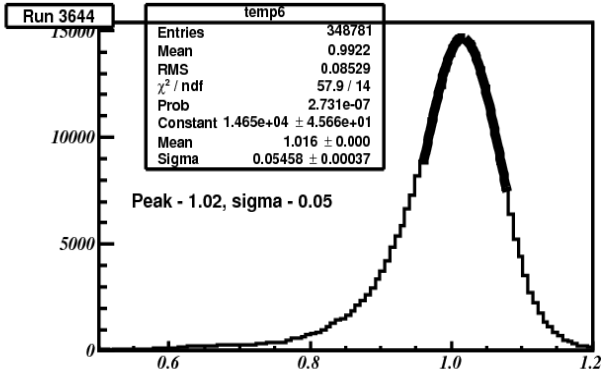


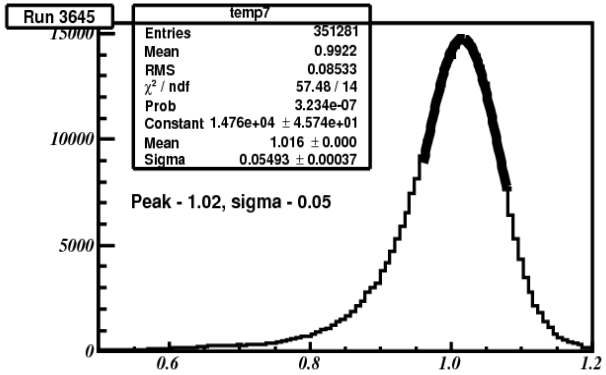


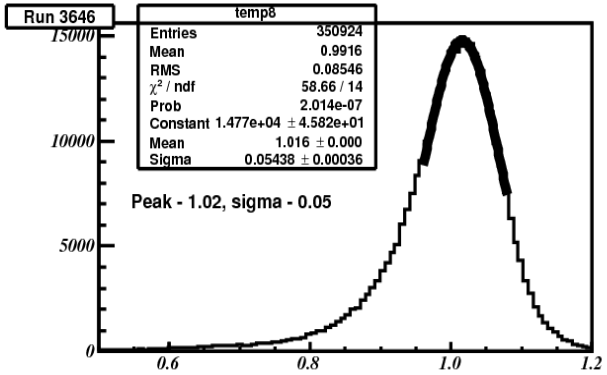


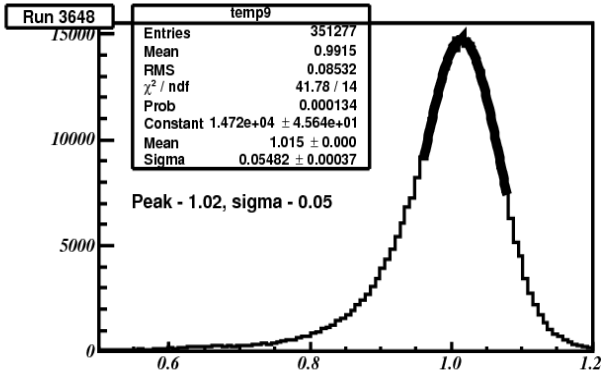




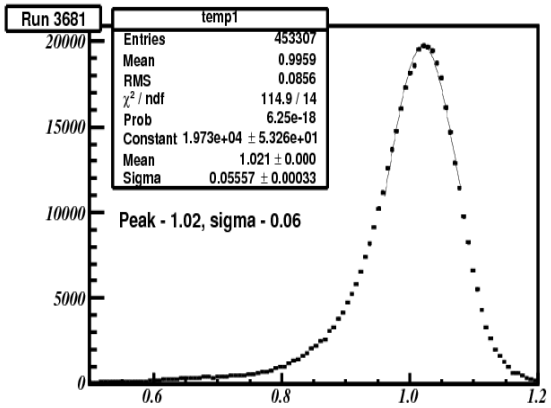


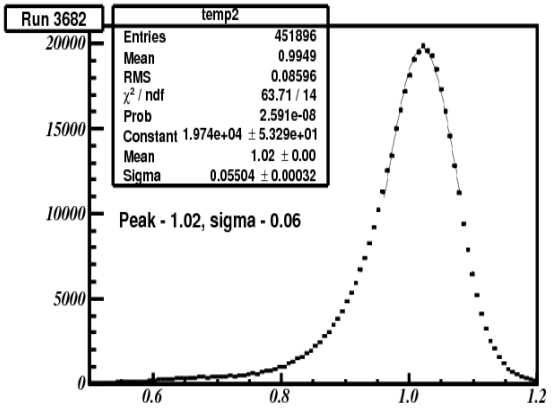


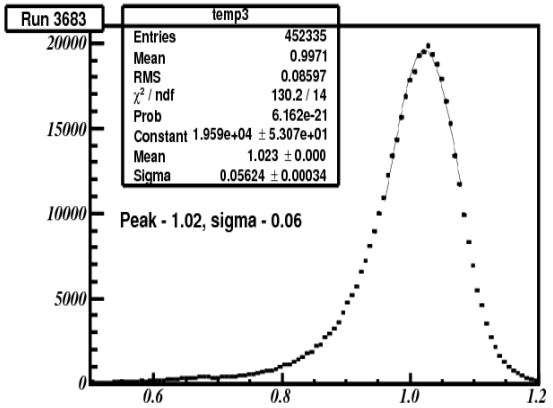


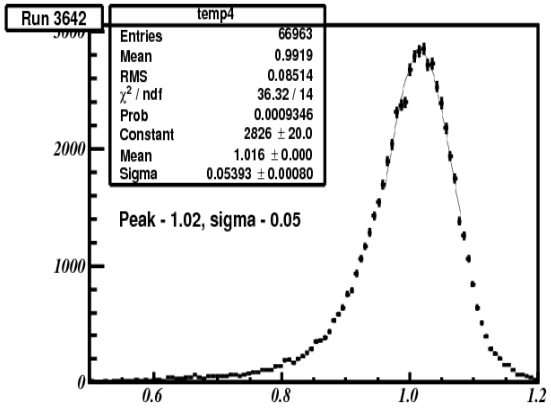


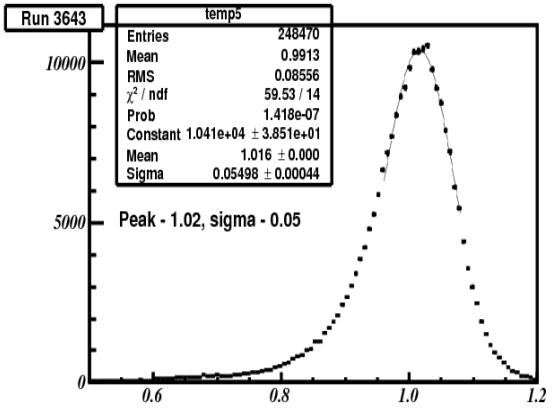
Do the plots again with error plot just for visible fit

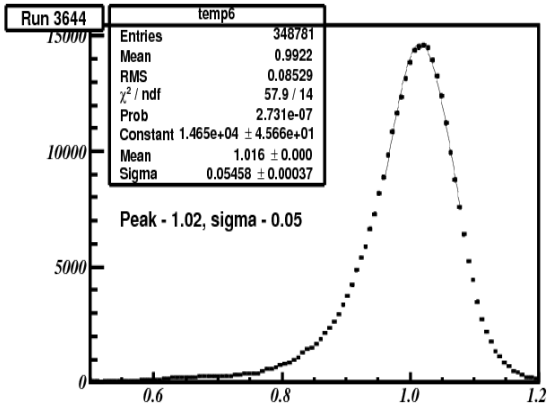


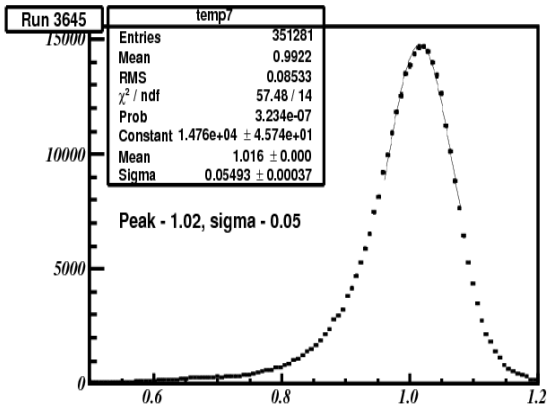


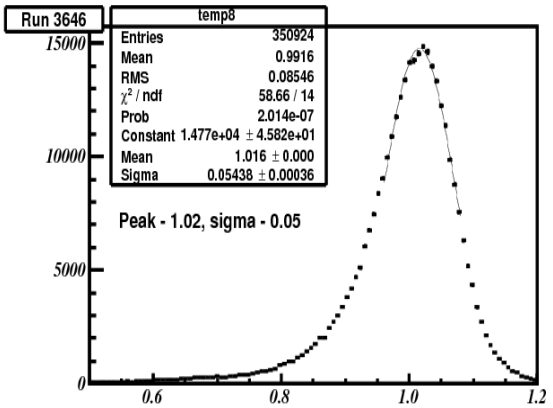


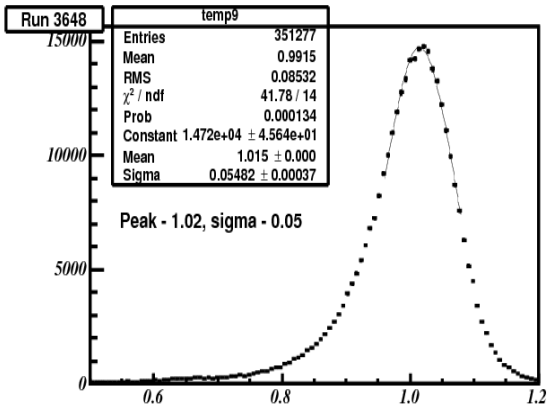




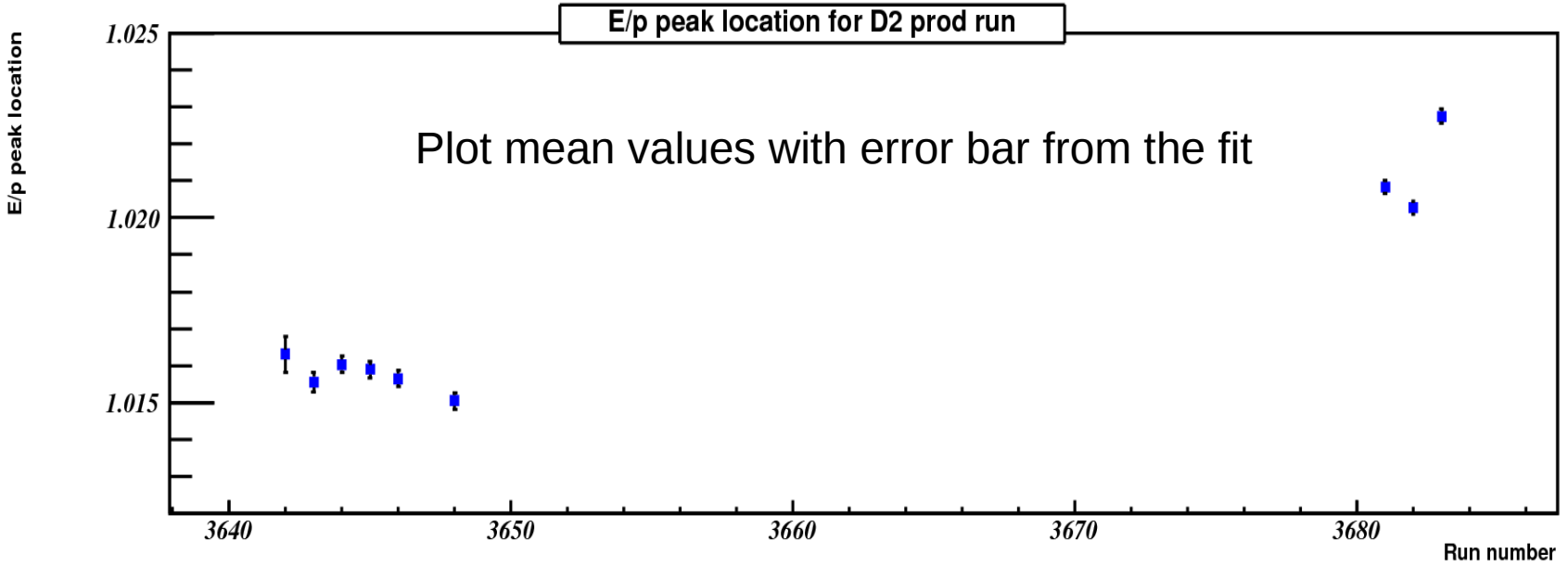


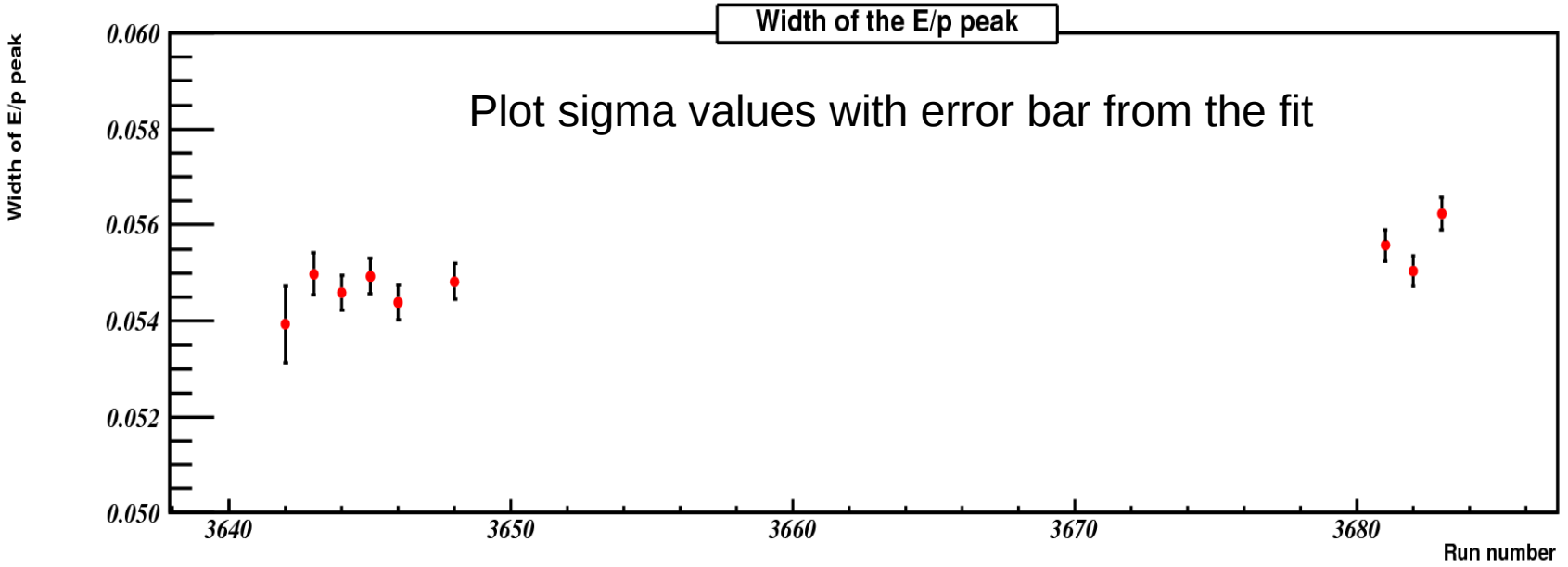




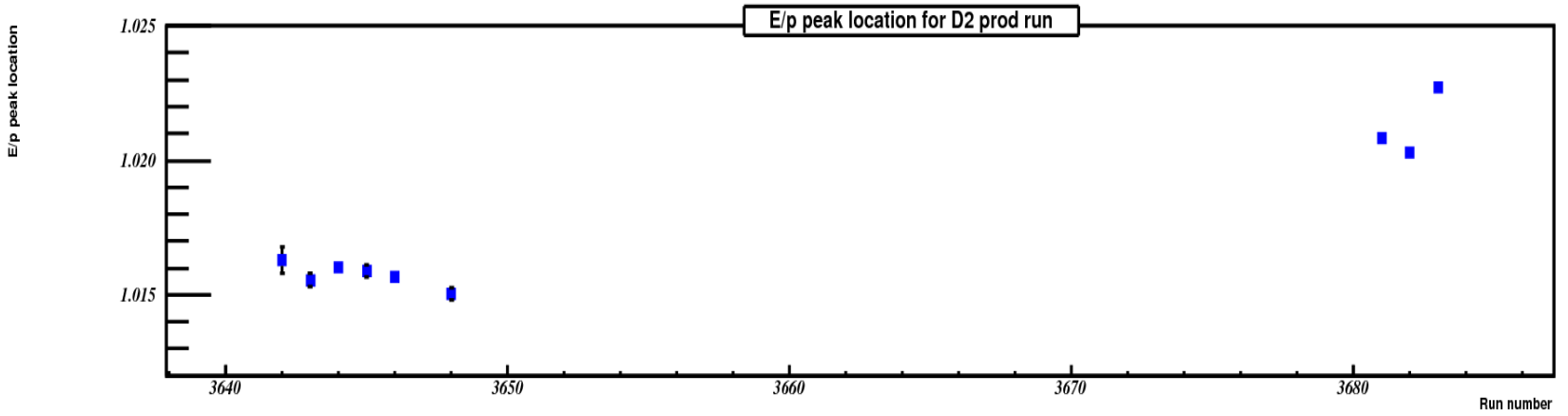


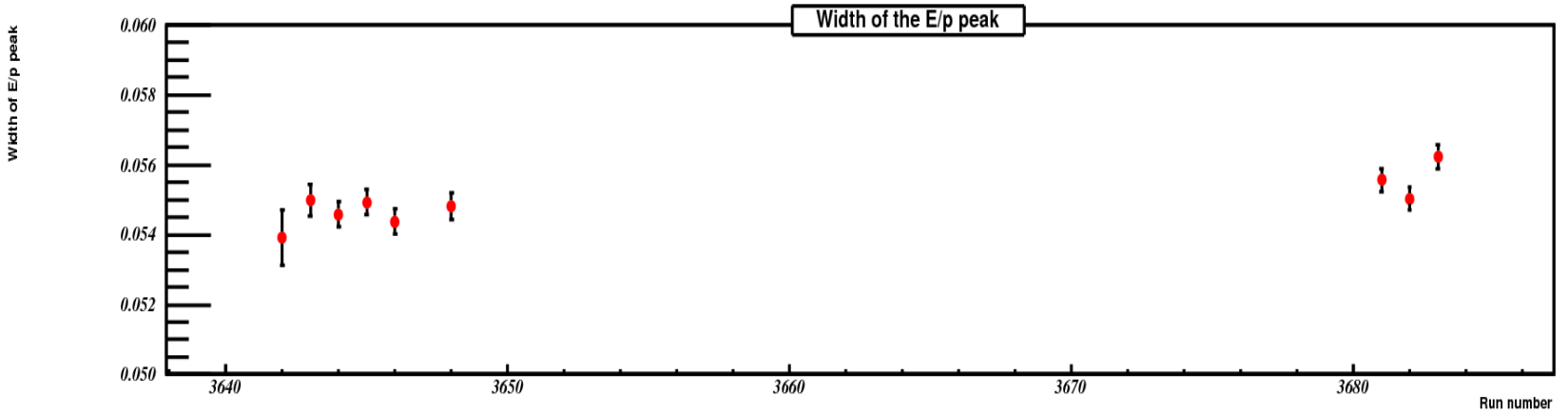
Results of E/p fitting:

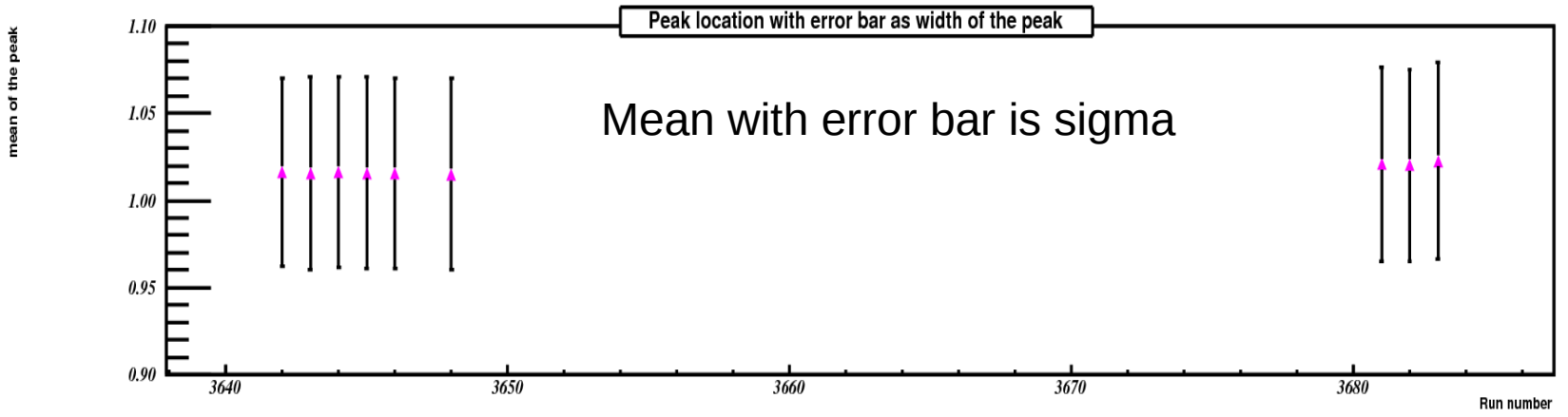




Plot the mean and sigma together for D2 runs







Third check: tracking efficiency

What is tracking efficiency in my understanding:

Tracking efficiency is the fraction of good events (mean event pass PID cuts on cer and cal) have successful rescontraction track.

How did I do this:

Step1 : select the sample of good events by PID cuts on Cer and Cal

Base on my PID study I know which Cer sum and Cal cut to keep ~99% of electrons

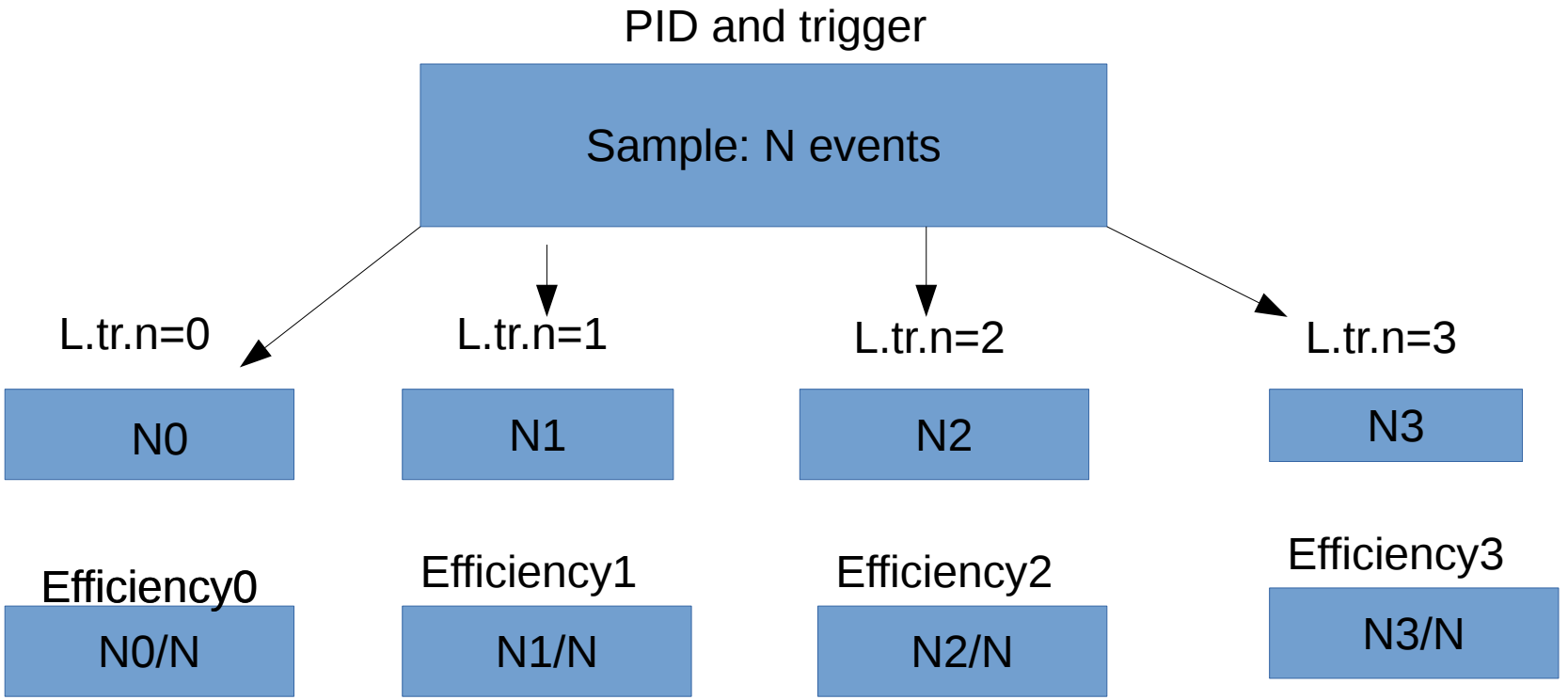
PID cut = "L.cer.asum_c>200.&&L.cer.asum_c<800 && (L.prl1.e+L.prl2.e)>2250"

Needed trigger cut for production trigger to select event from L or R

Trigger cut for L = "((DBB.evtypebits>>3)&1)"

Step2: Now we apply the cuts on tracking number on the sample we selected above to see how many event in each tracking number

See summary steps next slice



Results fpr tracking efficiency for L arm, every (runs of D2)

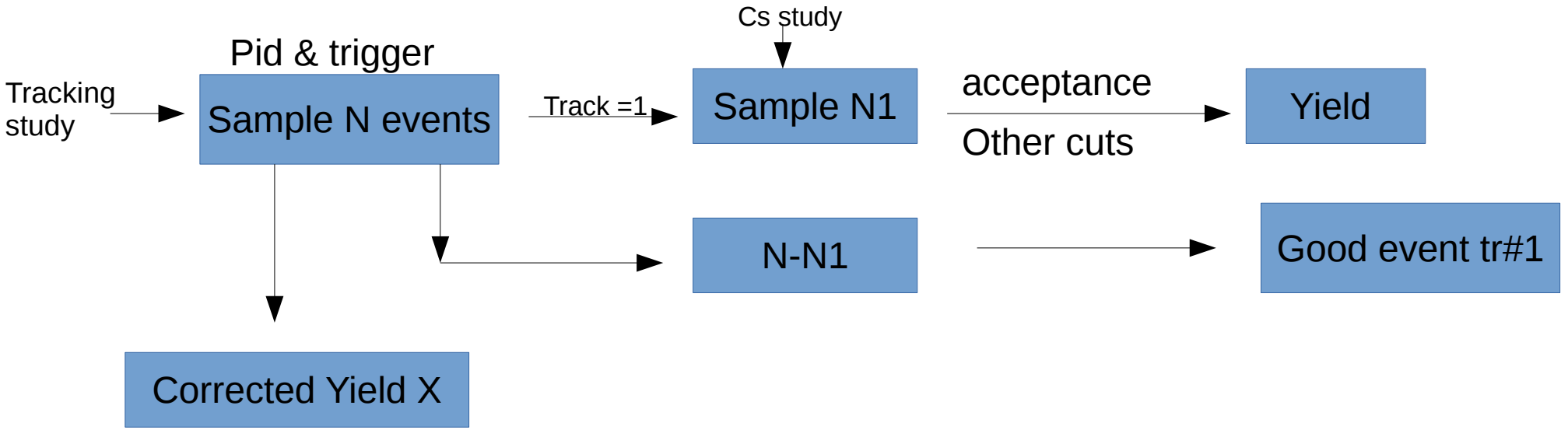
run: 3681 eff0: 0.0389736 eff1: 97.7585 eff2: 1.79508 eff3: 0.322269
run: 3682 eff0: 0.0290247 eff1: 97.7668 eff2: 1.80587 eff3: 0.314934
run: 3683 eff0: 0.0468309 eff1: 97.7256 eff2: 1.83197 eff3: 0.311769
run: 3642 eff0: 0.0184945 eff1: 98.4506 eff2: 1.33983 eff3: 0.164396
run: 3643 eff0: 0.0295802 eff1: 98.411 eff2: 1.37408 eff3: 0.160179
run: 3644 eff0: 0.0311067 eff1: 98.4494 eff2: 1.339 eff3: 0.160718
run: 3645 eff0: 0.0246606 eff1: 98.4096 eff2: 1.37035 eff3: 0.169239
run: 3646 eff0: 0.0235738 eff1: 98.4371 eff2: 1.33852 eff3: 0.17586
run: 3648 eff0: 0.0353685 eff1: 98.4315 eff2: 1.35155 eff3: 0.155621

Similarly we do the same things to the Right arm and here are results:

run: 3681 eff0: 0.0541082 eff1: 97.9829 eff2: 1.58744 eff3: 0.28566
run: 3682 eff0: 0.0571551 eff1: 98.0409 eff2: 1.50985 eff3: 0.298477
run: 3683 eff0: 0.0559681 eff1: 98.0309 eff2: 1.51587 eff3: 0.302701
run: 3642 eff0: 0.0580653 eff1: 98.589 eff2: 1.16131 eff3: 0.168389
run: 3643 eff0: 0.0438064 eff1: 98.5915 eff2: 1.17772 eff3: 0.149953
run: 3644 eff0: 0.0396612 eff1: 98.5757 eff2: 1.16067 eff3: 0.187808
run: 3645 eff0: 0.0525308 eff1: 98.5653 eff2: 1.18136 eff3: 0.171601
run: 3646 eff0: 0.0430528 eff1: 98.5595 eff2: 1.2113 eff3: 0.15243
run: 3648 eff0: 0.0439789 eff1: 98.6123 eff2: 1.13188 eff3: 0.173601

In CS analysis we just use the event with track ==1.

How will this tracking efficiency apply to correct the yield back ans what assumption need to be use to be able to apply the correction in that way?



Now question is that what is the corrected Yield in sample N corecspond to total charge?

Assumption:

The corrected Yield in sample N is X. and the fraction of Yield in N1 and (N-N1) are the same

$$\frac{X}{N} = \frac{Yield}{N1} = \frac{good\,event\,track \neq 1}{N - N1}$$

=>Corrected yield X= yield/ eff1

Can we believe in this assumption? If not what else we need to check
and do to get bettet tracking efficiency?