Status of Downstream Charged Veto

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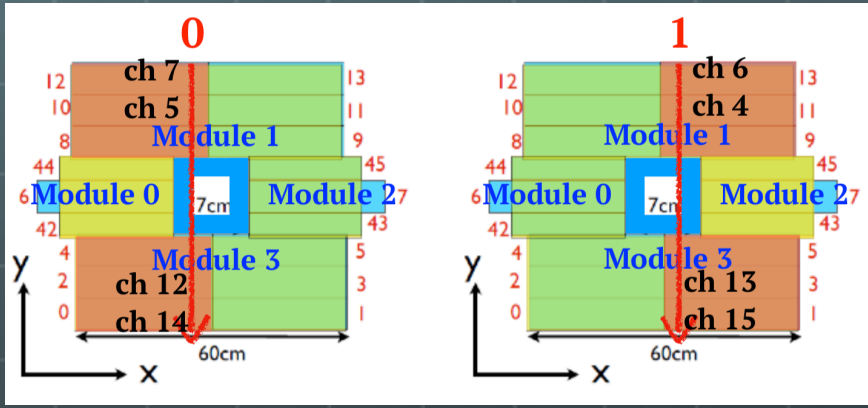
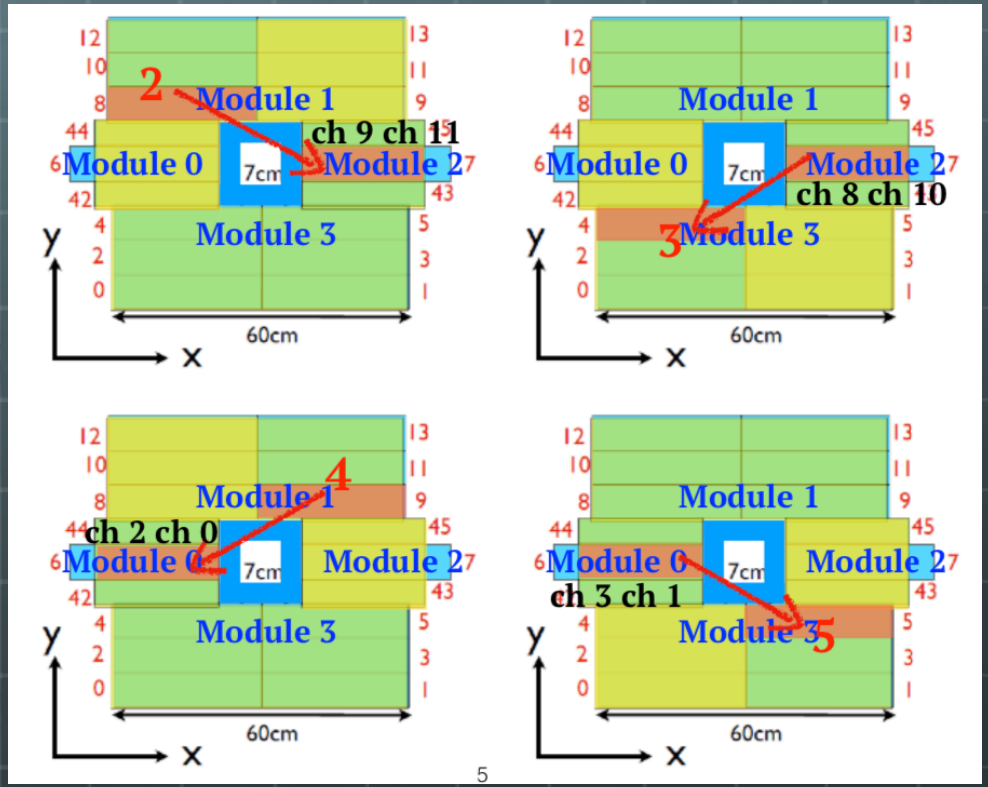
IPNS/KEK

Jum @ 24 May, 2019

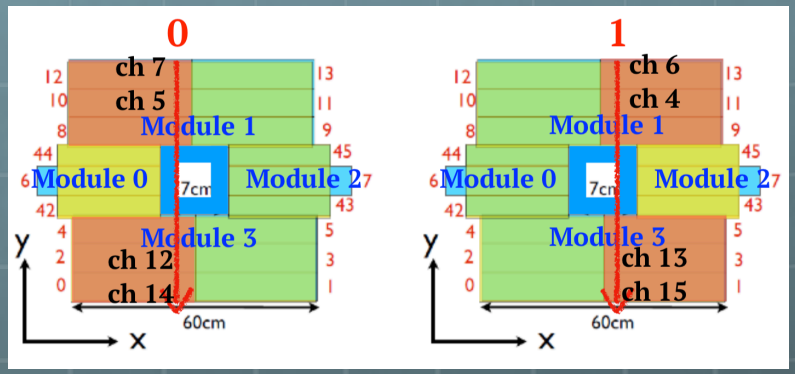
Energy Calibration

Cosmic rays triggered by CC04/CC05





Peak distribution for track 0



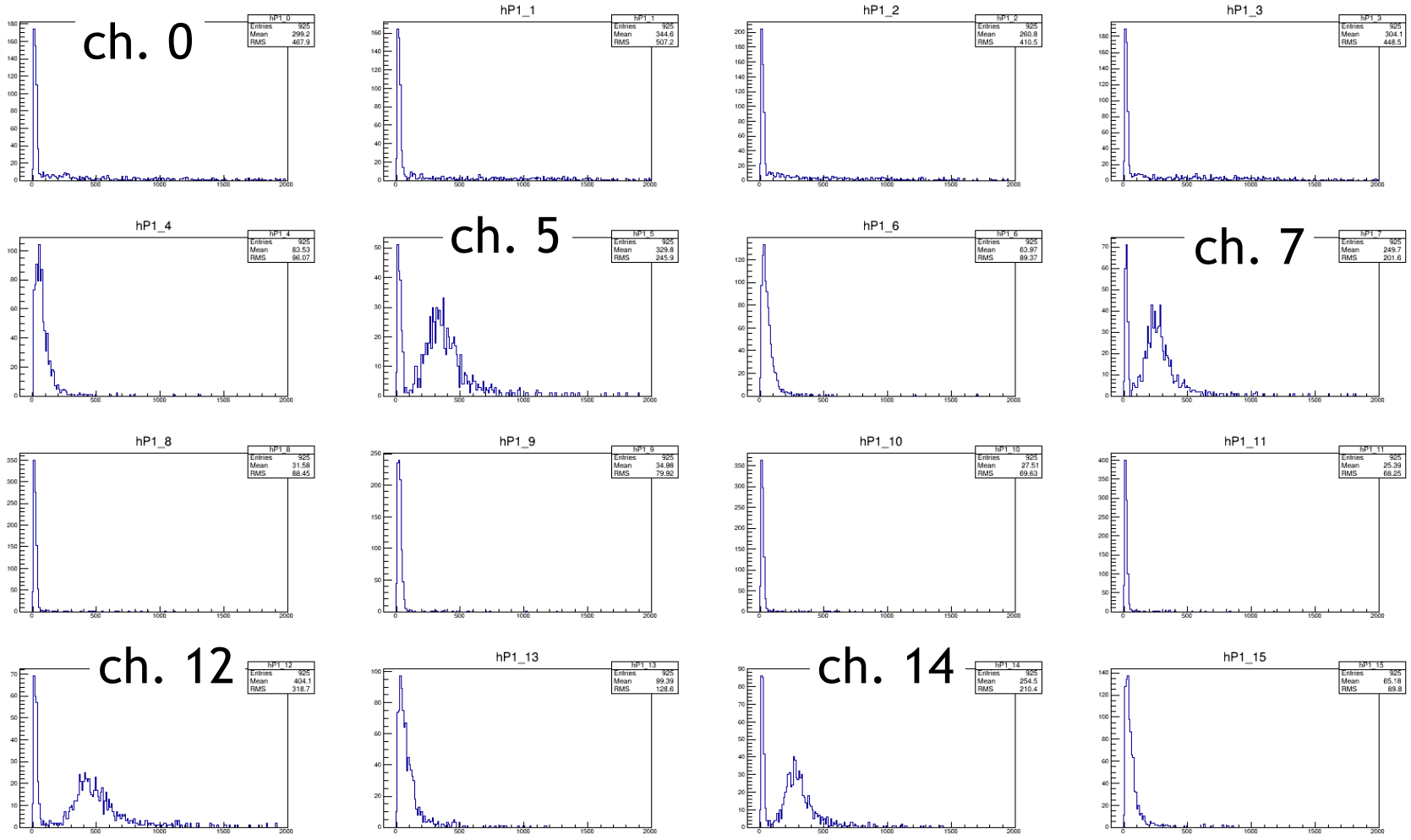
module

0

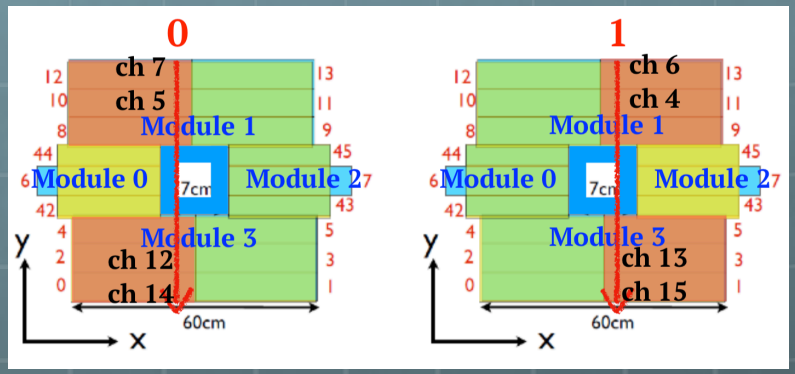
1

2

3



Peak distribution for track 1



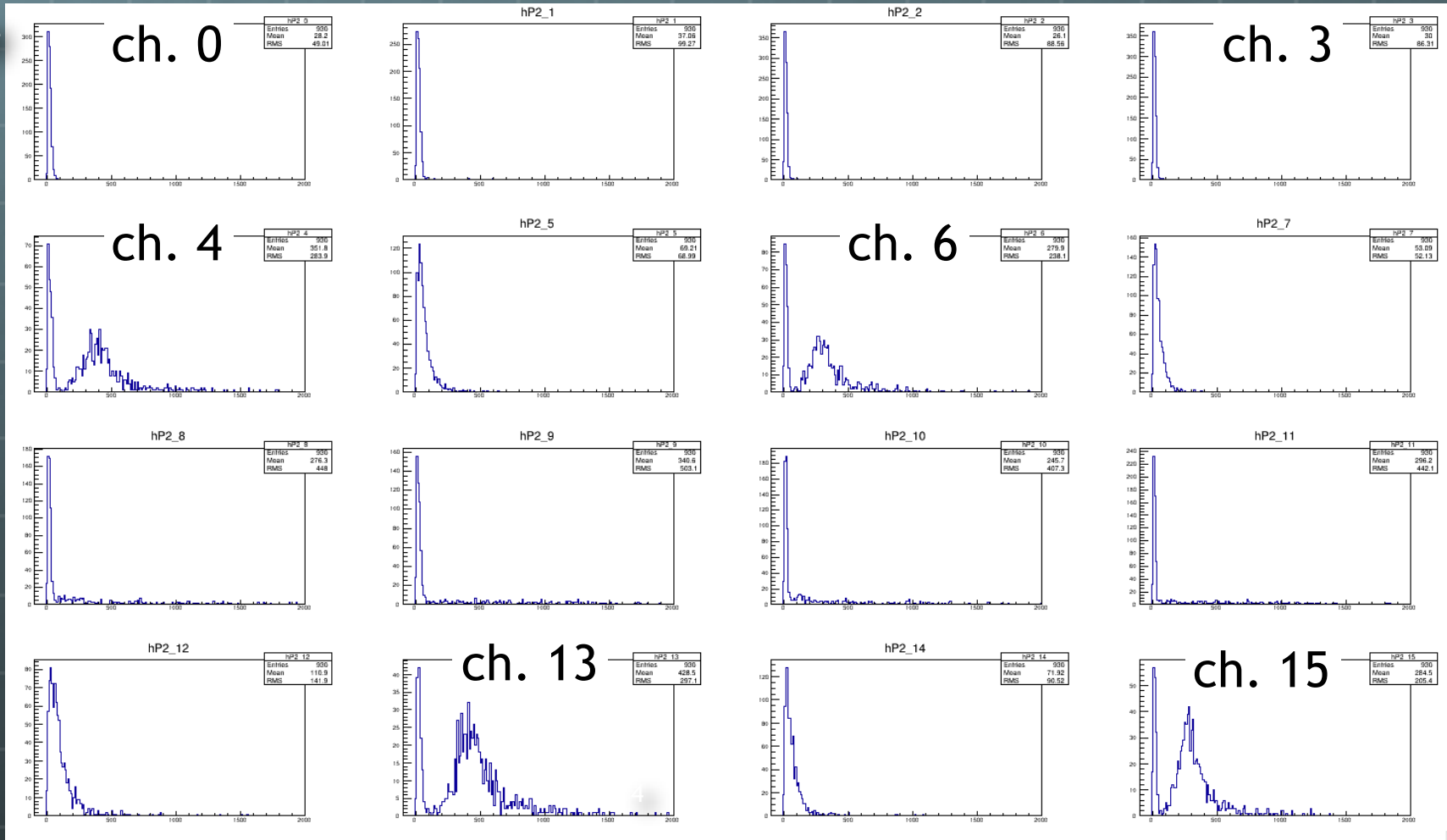
module

0

1

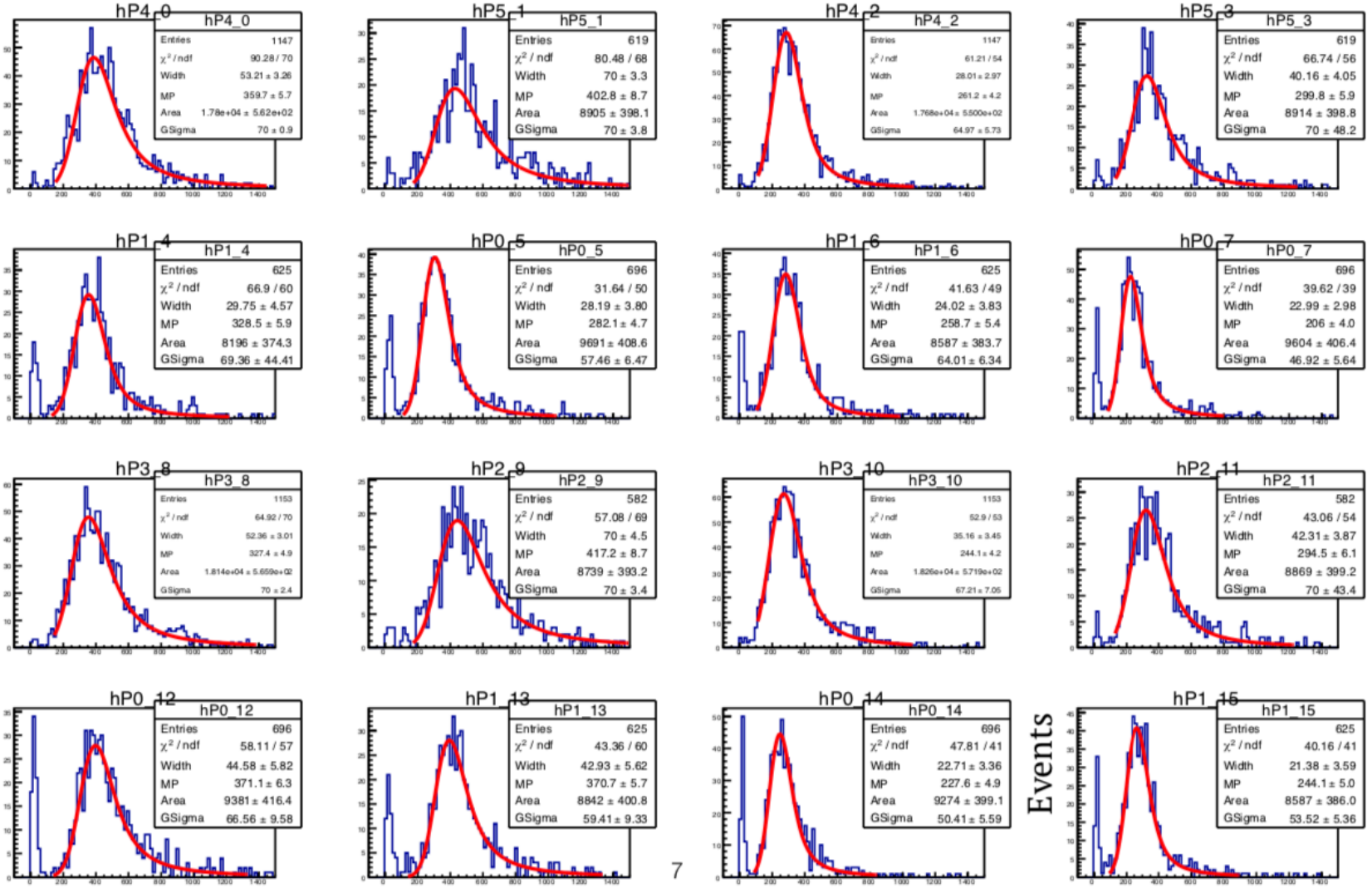
2

3



DCVPeak distribution, hP(FlagNumber)_(DCV ch)

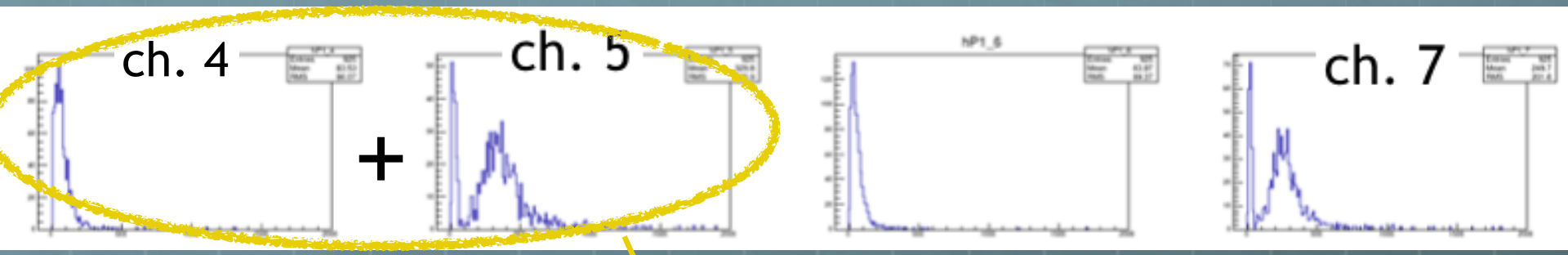
Convoluted Landau + Gauss Fit → Get the MP value



/home/had/hmkim/work/hmkim/run81/final_cal/dcv1_calib0.C → dcv1_output0.root

DCVPeak

8 hours cosmic data >500 events



/home/had/hmkim/work/hmkim/run81/final_cal/dcv1_calib2.C

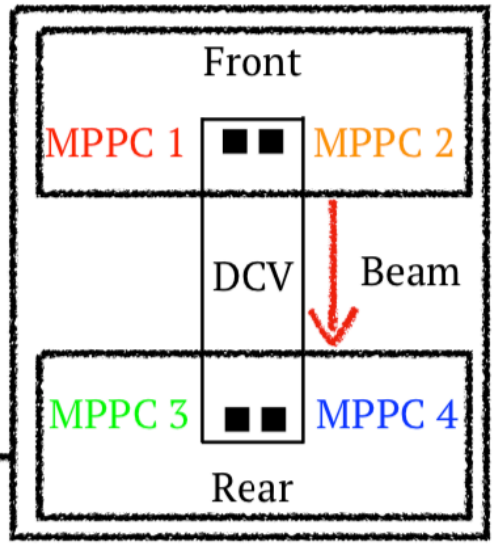
gain(MP value from hP)			
359.7	402.8	261.2	299.8
328.5	282.1	258.7	206
327.4	417.2	244.1	294.5
371.1	370.7	227.6	244.1

norm(MP value from hE)			
1.291	1.349	1.273	1.325
1.179	1.202	1.185	1.181
1.316	1.324	1.334	1.338
1.178	1.195	1.167	1.182

DCVcalib = DCVPeak / (gain*norm)

(Define 'DCVcalib' for calculating the DCVEne)

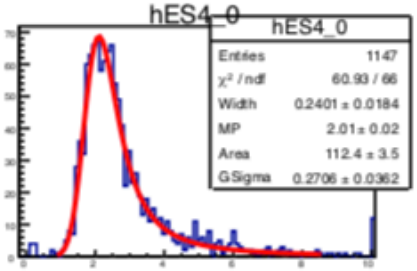
hES(FlagNumber)_(PlotNumber)
→ Fill(DCVcalib[4*ch] + DCVcalib[4*ch+1]
+DCVcalib[4*ch+2]+DCVcalib[4*ch+3])

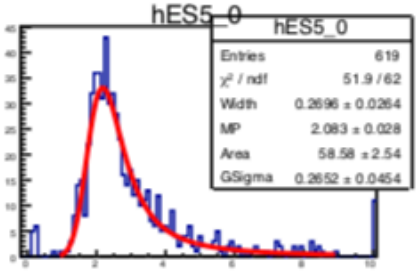


- DCVPeak is normalized to DCVcalib by being divided gain and norm factor.
- For the energy deposit of one cosmic ray, 4 MPPCs are shared the light.
- Second, I summed the 4 MPPCs in the same module.

DCVcalib distribution, hES(FlagNumber)_(PlotNumber)

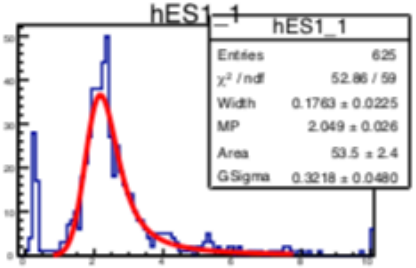
ch 0+1+2+3

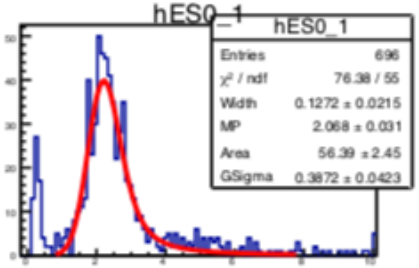




ch 0+1+2+3

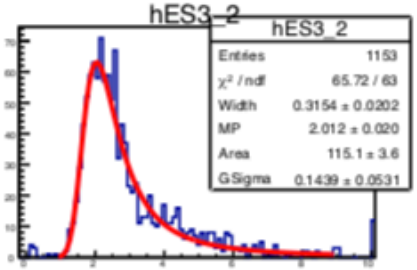
ch 4+5+6+7

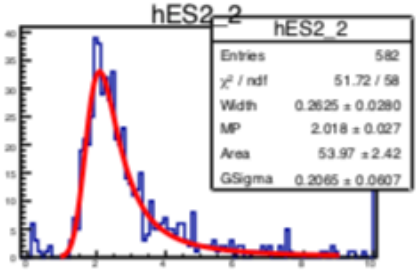




ch 4+5+6+7

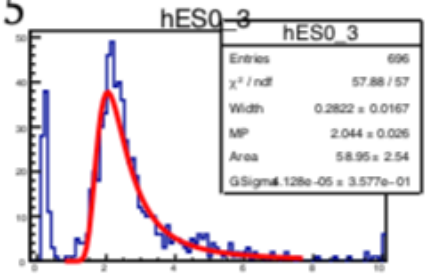
ch 8+9+10+11

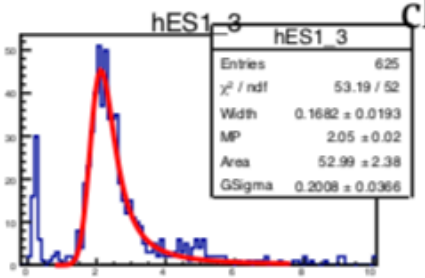




ch 8+9+10+11

ch 12+13+14+15





ch 12+13+14+15

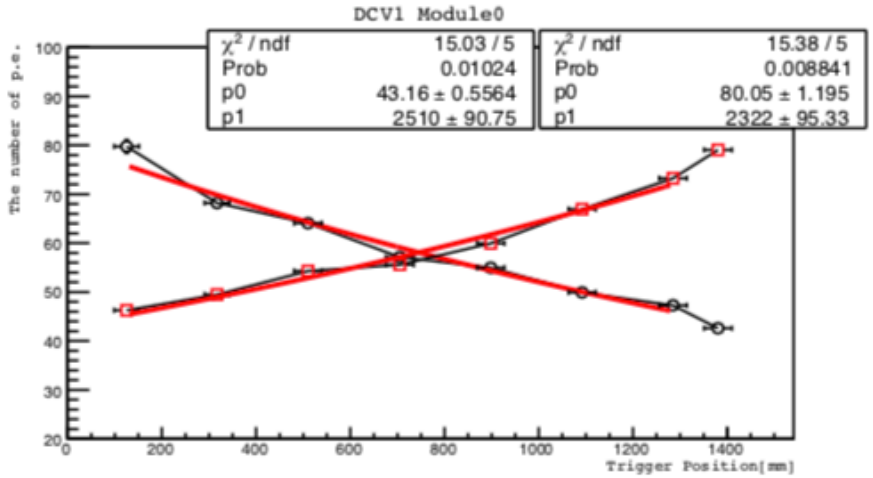
Events

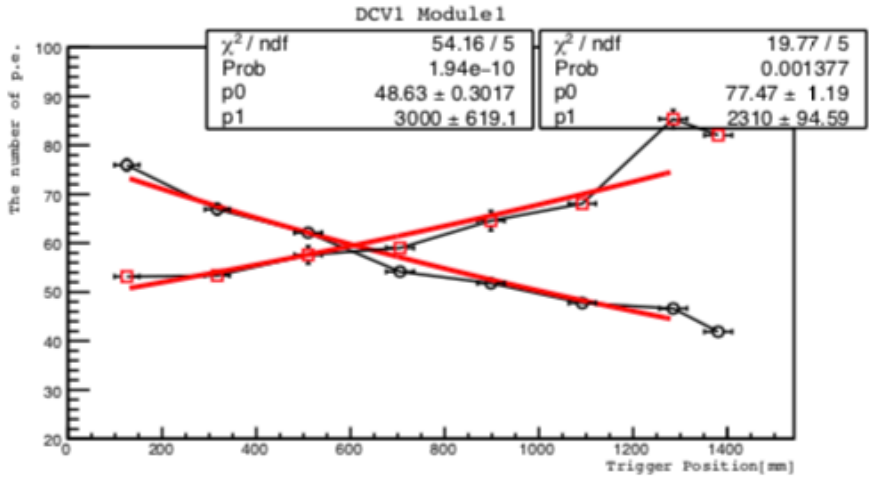
DCVcalib[MeV]

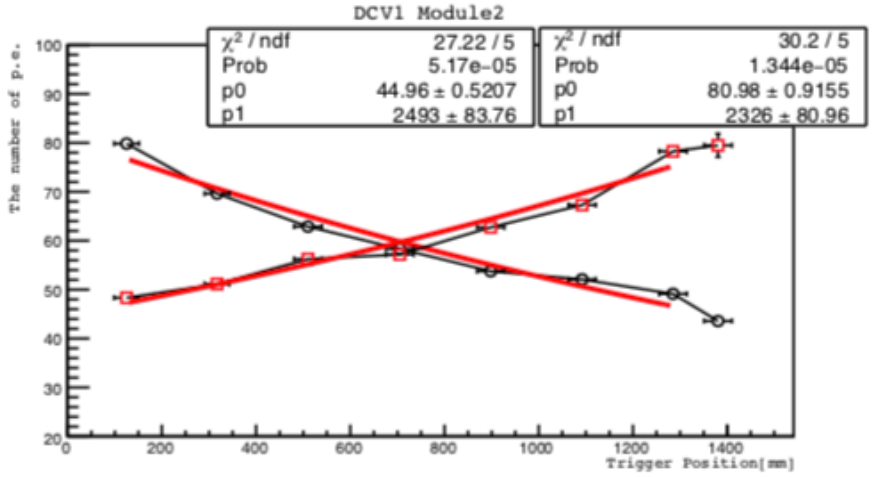
/home/had/hmkim/work/hmkim/run81/final_cal/dcv1_calib2.C → dcv1_output2.root

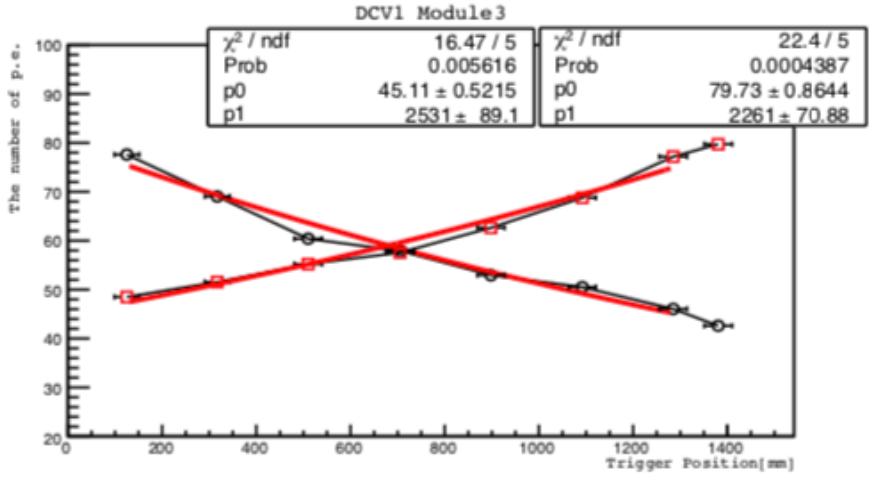
Attenuation effect

- fitting function = [0] * exp (±x / [1])
- fitting range 128 mm ~ 1285 mm



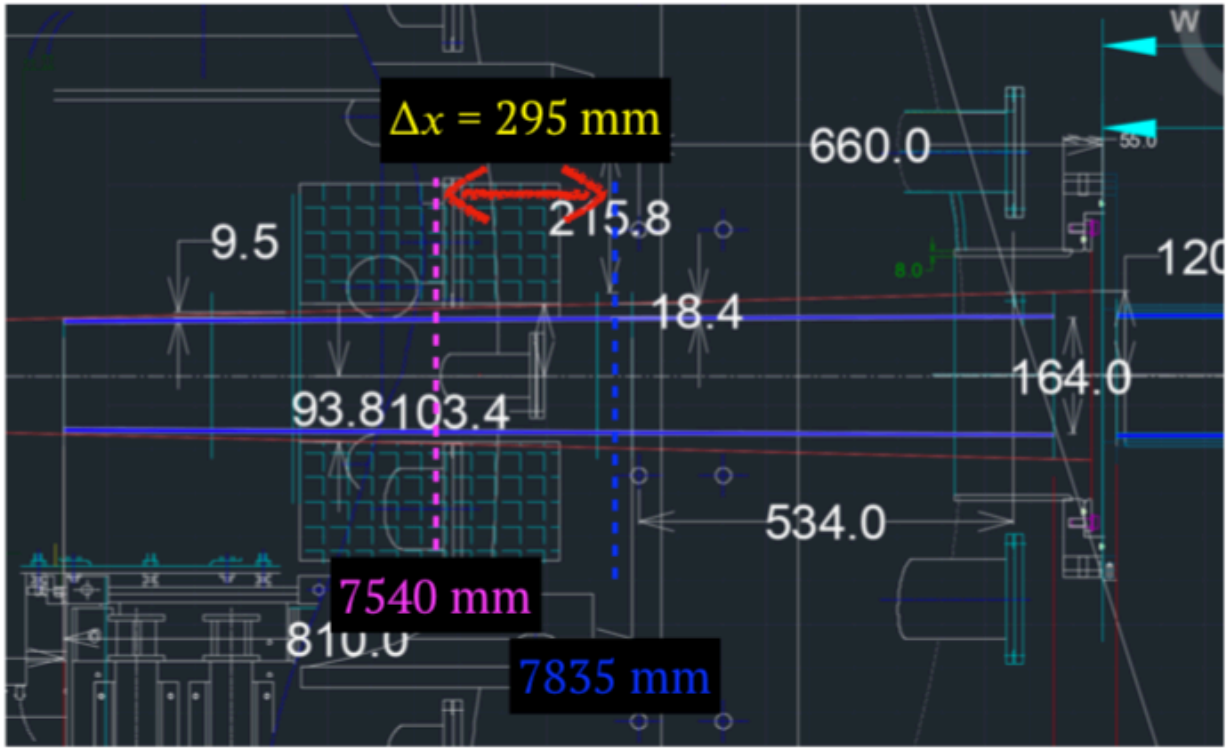


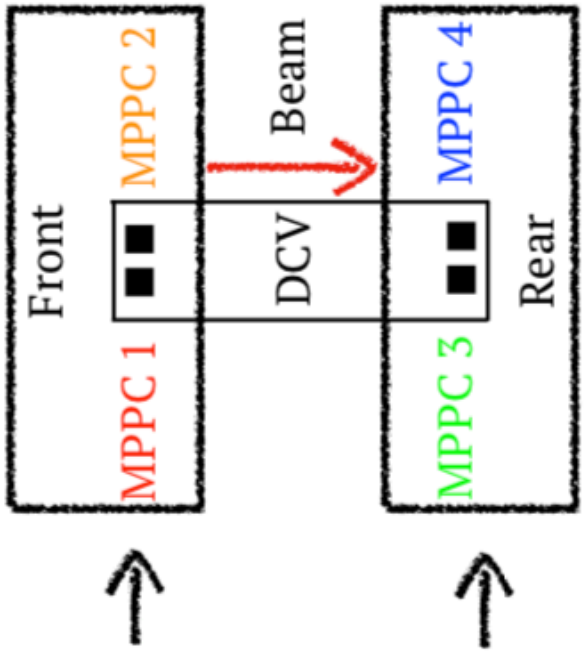




Attenuation Length λ_{avg} = **2469 mm**

Calculation of attenuation factor



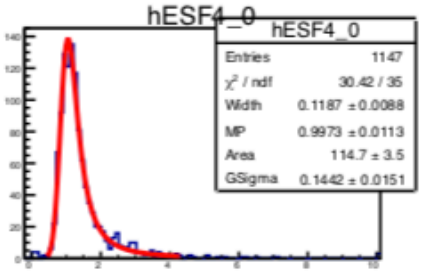


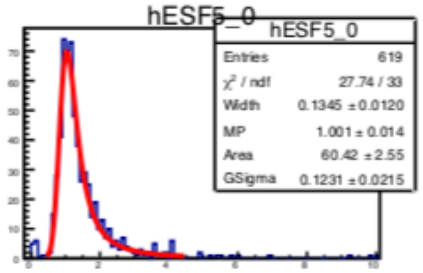

```
lambda_dcv1 = 2469; // Attenuation Length of DCV1
pos_DCV1 = 7835; // Center position of DCV1
pos_CC04 = 7540; // Center position of CC04

att1_f = exp((pos_DCV1 - pos_CC04)/lambda_dcv1);
att1_r = exp(-(pos_DCV1 - pos_CC04)/lambda_dcv1);
```

DCVcalib distribution including att. effect, hESF(FlagNum)_(PlotNum)

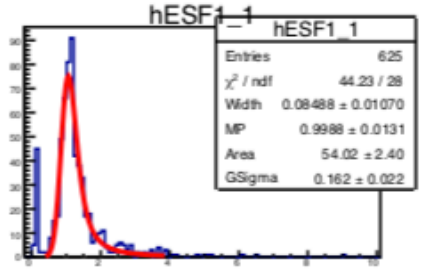
ch 0+1+2+3

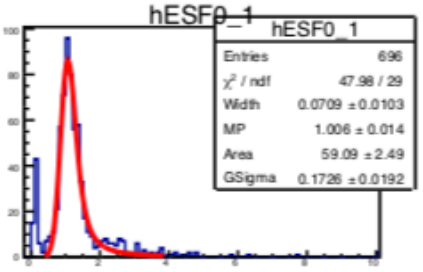




ch 0+1+2+3

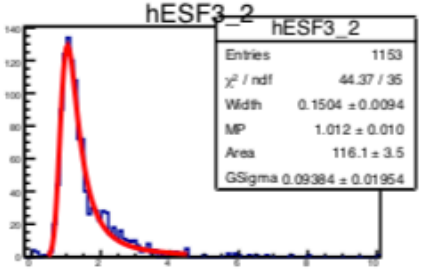
ch 4+5+6+7

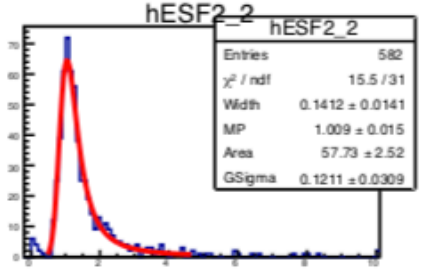




ch 4+5+6+7

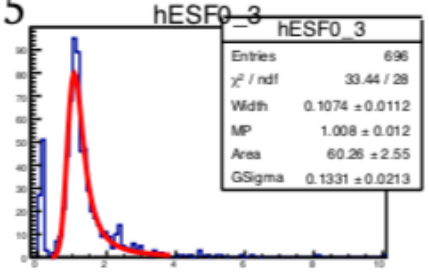
ch 8+9+10+11

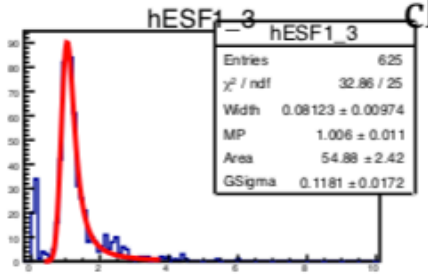




ch 8+9+10+11

ch 12+13+14+15





ch 12+13+14+15

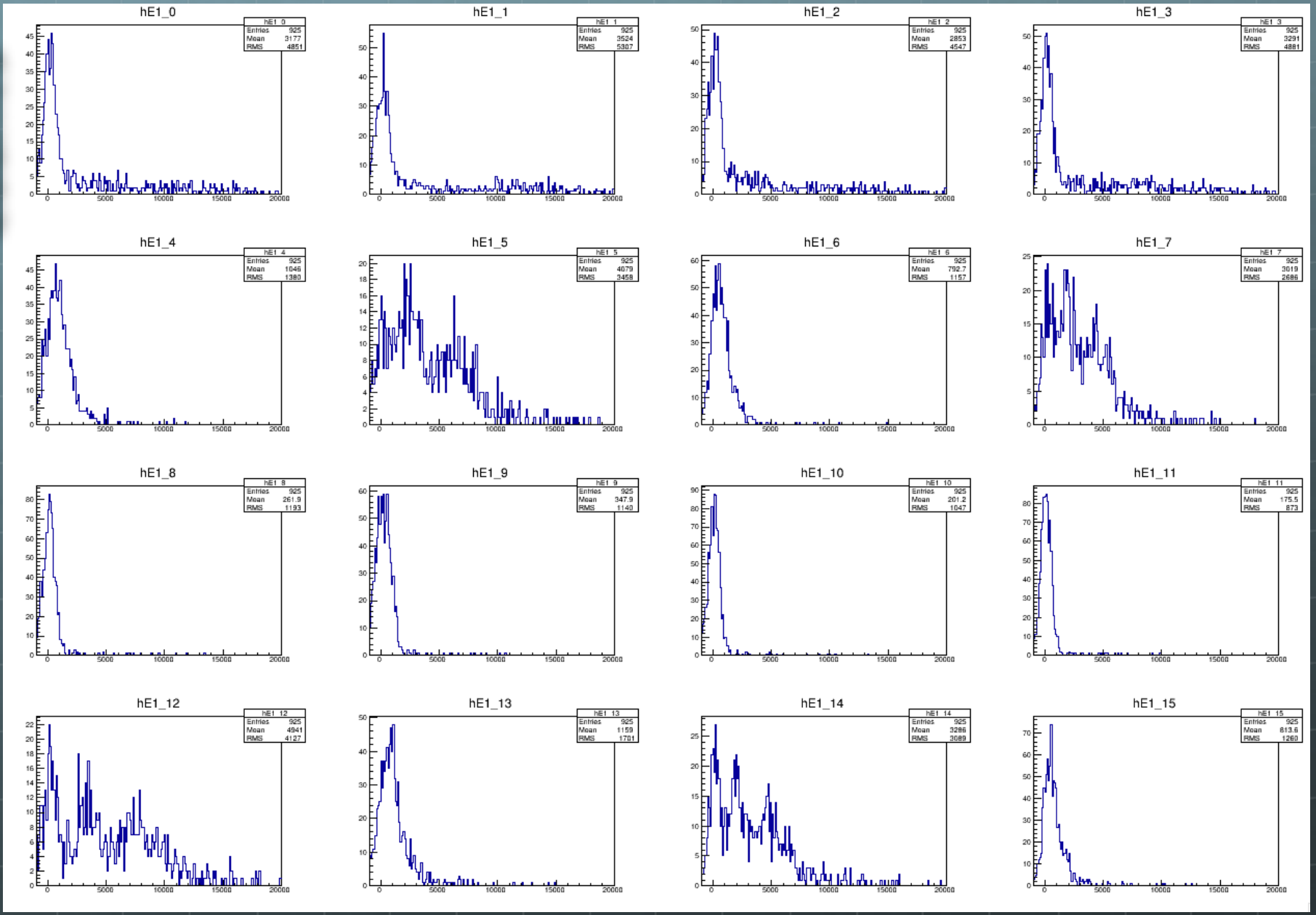
Events

DCVcalib_att[MeV]

/home/had/hmkim/work/hmkim/run81/final_cal/dcv1_calib3.C → dcv1_output3.root

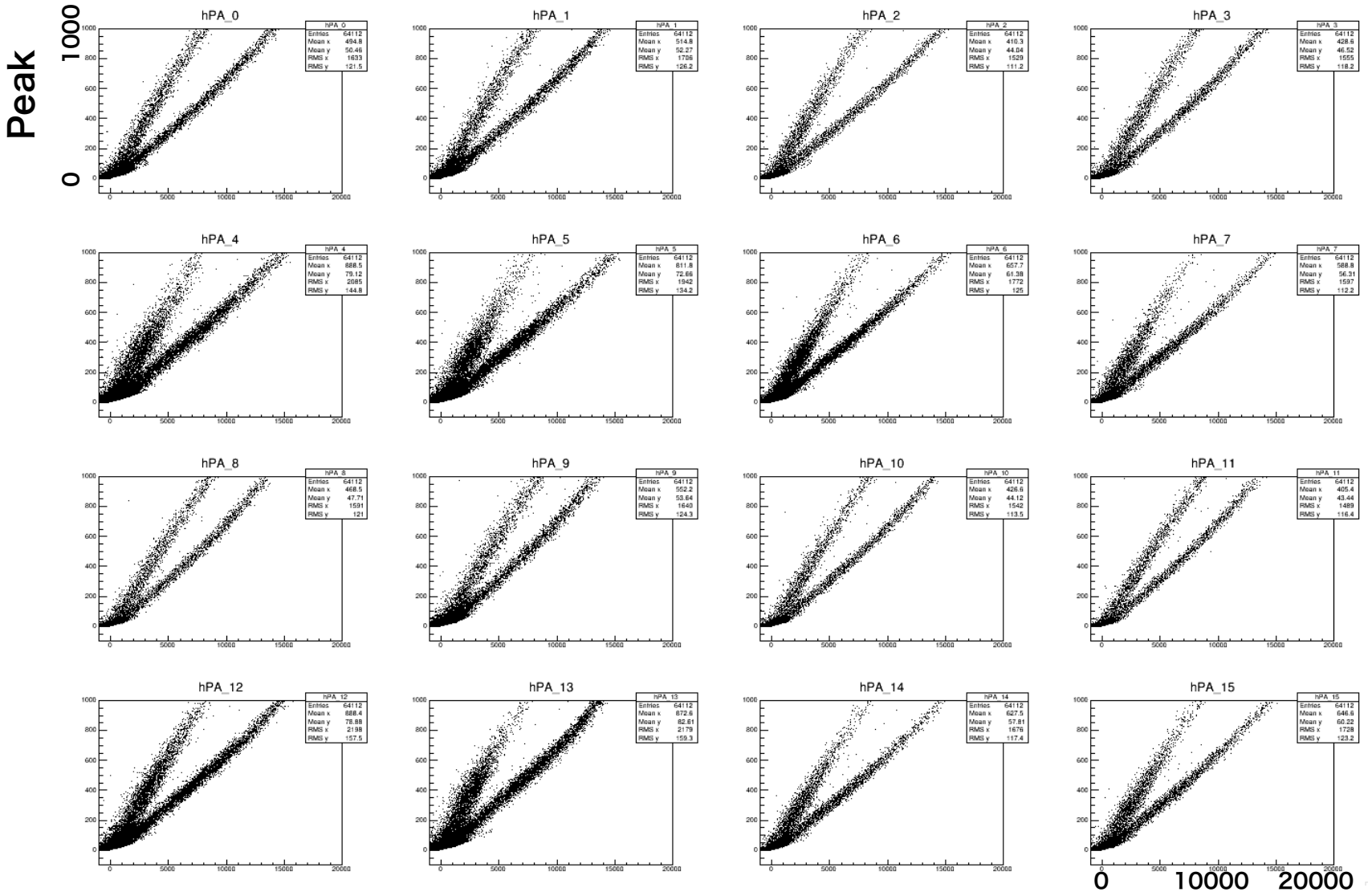
Using PEAK for calibration instead Integrated ADC

Counts



Integrated ADC

Peak V.S. IntegratedADC



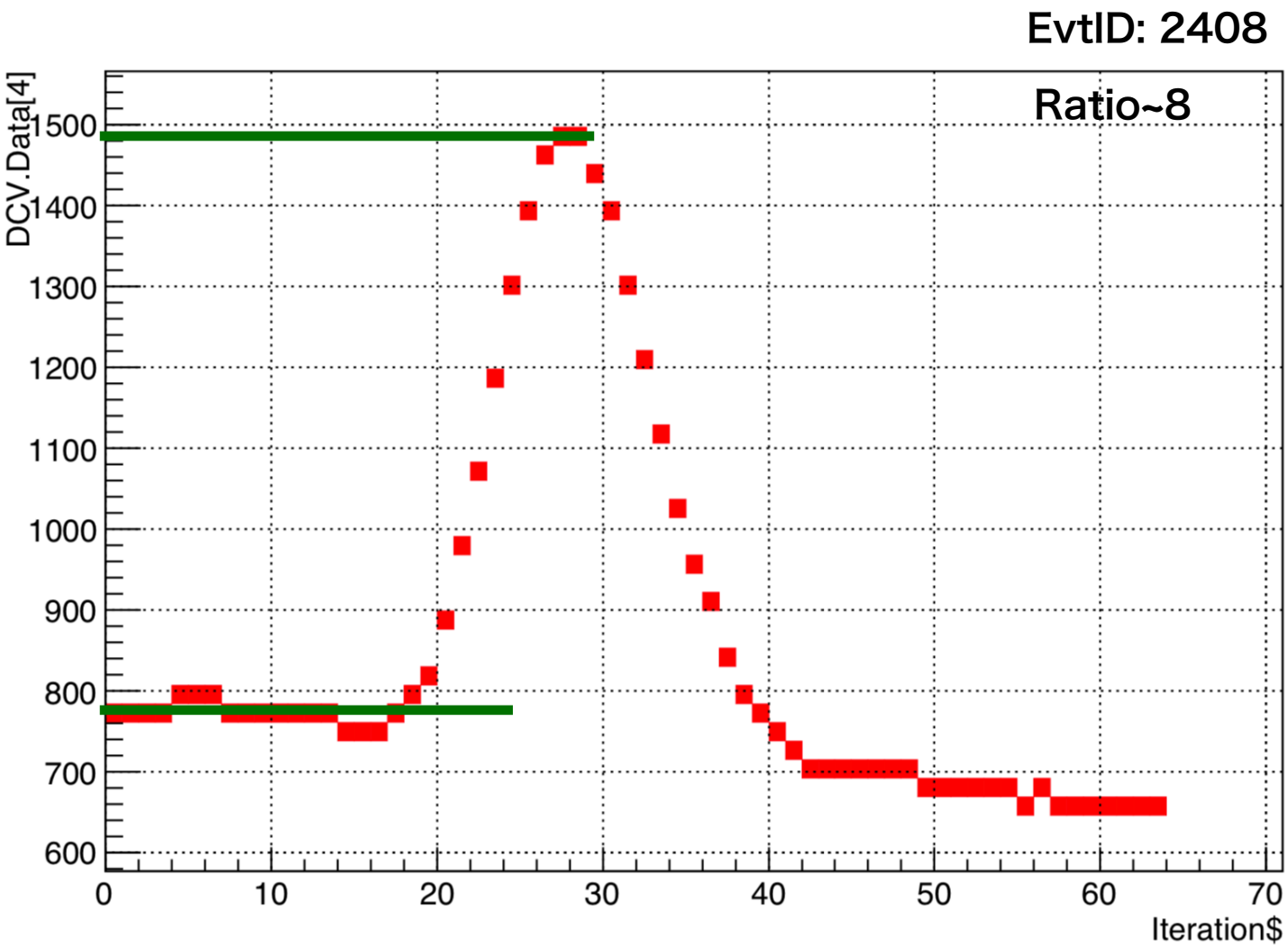
IntegratedADC/Peak~8

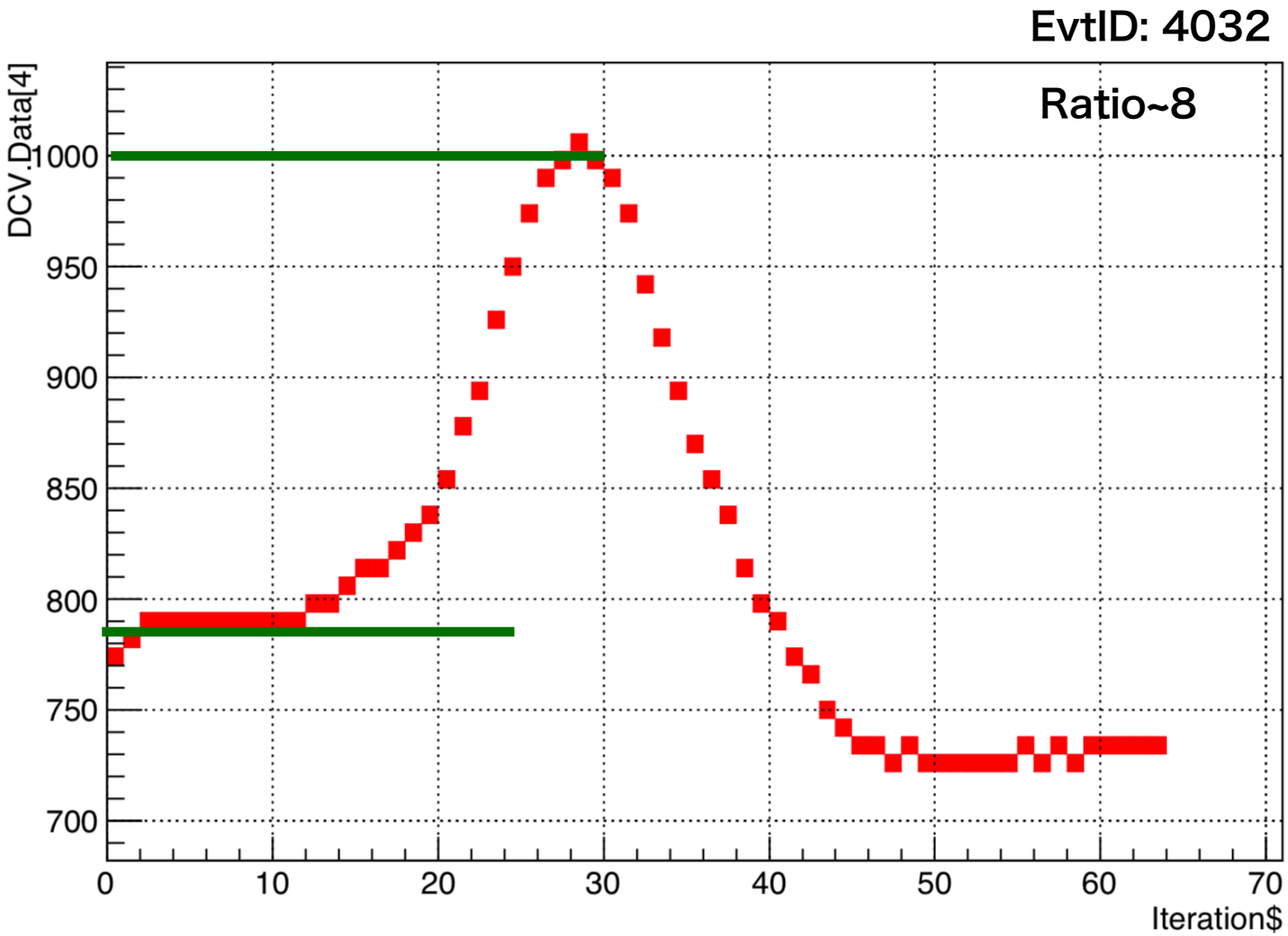
```
EventID: 2408 ID: 4  Ped: 781.333 Time: 27.425  Peak: 705  ADC: 4962.66
EventID: 4032 ID: 4  Ped: 787.556 Time: 27.8636  Peak: 219  ADC: 1577.44
EventID: 5124 ID: 4  Ped: 765.444 Time: 27.0079  Peak: 1117  ADC: 8745.56
EventID: 9289 ID: 4  Ped: 772.667 Time: 28.2895  Peak: 115  ADC: 916.336
EventID: 10029 ID: 4  Ped: 754.333 Time: 28.0197  Peak: 654  ADC: 5436.66
EventID: 16941 ID: 4  Ped: 769.778 Time: 29.3  Peak: 102  ADC: 808.222
EventID: 19821 ID: 4  Ped: 784.333 Time: 27.0758  Peak: 161  ADC: 1128.66
EventID: 20160 ID: 4  Ped: 781.222 Time: 27.8312  Peak: 687  ADC: 4816.78
EventID: 23670 ID: 4  Ped: 757.111 Time: 28.7537  Peak: 602  ADC: 5022.88
EventID: 27818 ID: 4  Ped: 803.444 Time: 27.6014  Peak: 1394  ADC: 10828.6
EventID: 32348 ID: 4  Ped: 773 Time: 27.6724  Peak: 1209  ADC: 9647
EventID: 37156 ID: 4  Ped: 790.778 Time: 27.9964  Peak: 1296  ADC: 9785.24
```

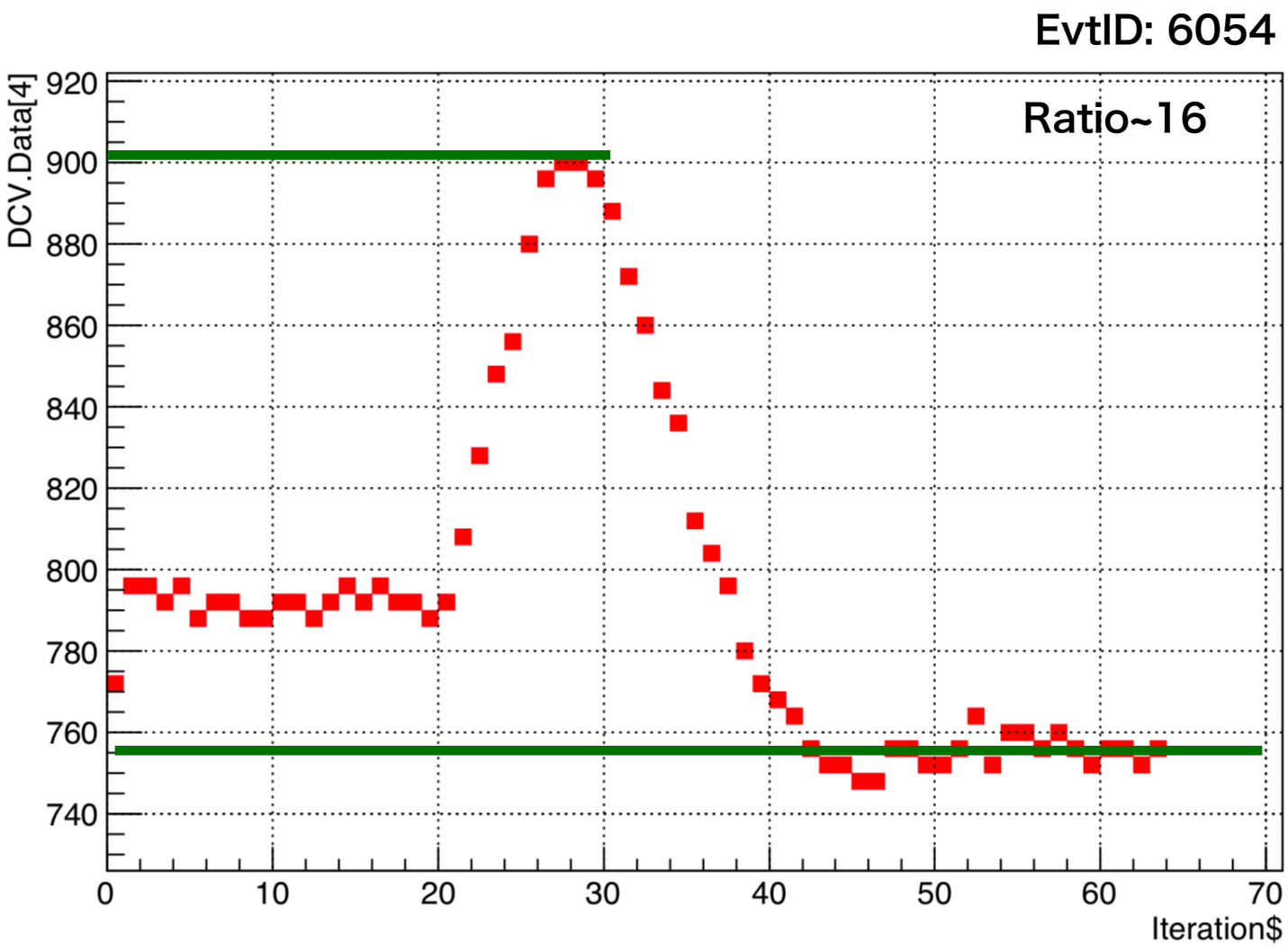
IntegratedADC/Peak~16

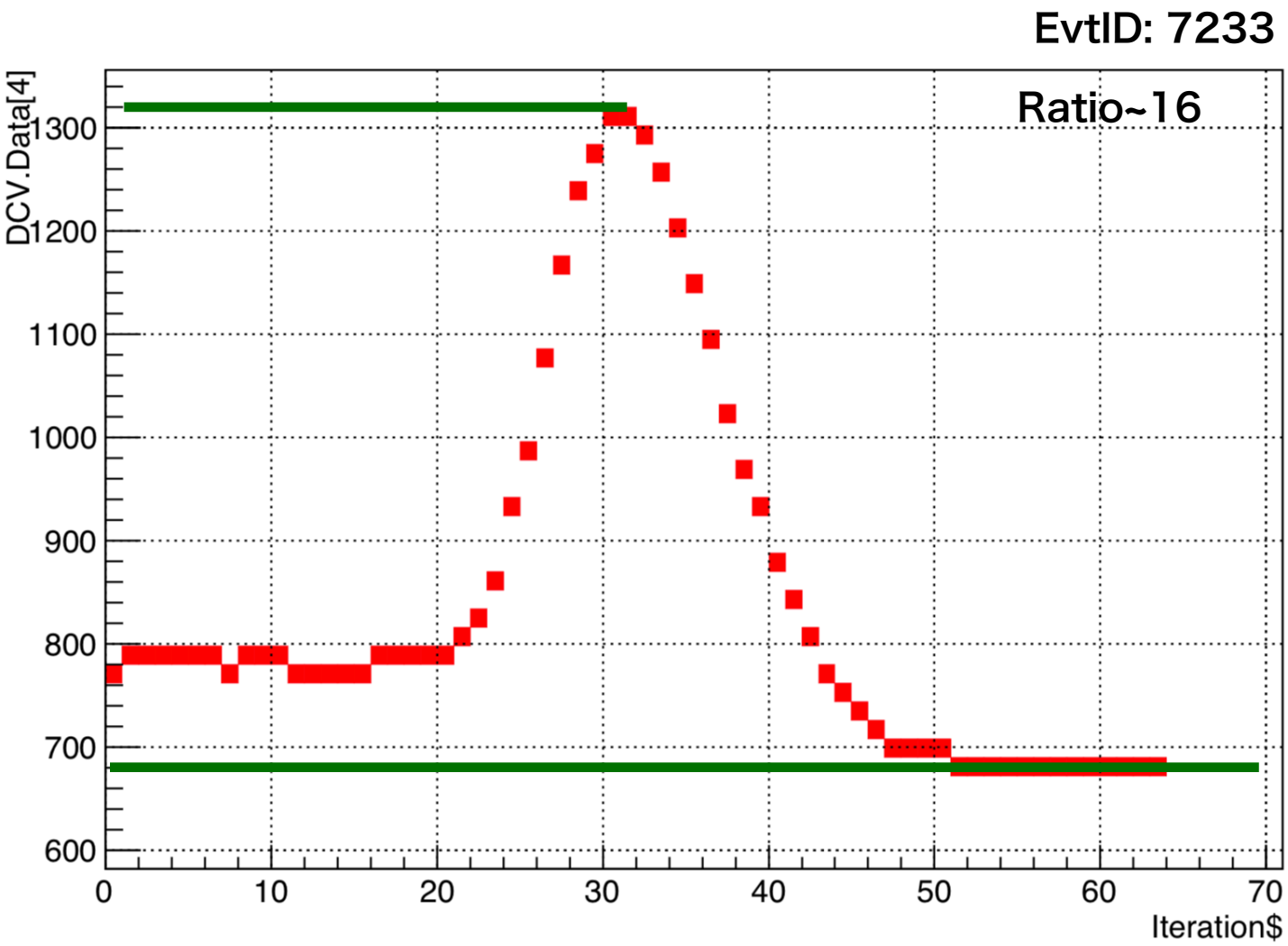
```
EventID: 6054 ID: 4  Ped: 755.778 Time: 27.7667  Peak: 146  ADC: 2434.22
EventID: 7233 ID: 4  Ped: 678.444 Time: 30.7991  Peak: 641  ADC: 10793.6
EventID: 8045 ID: 4  Ped: 701.667 Time: 27.9526  Peak: 513  ADC: 7950.34
EventID: 11299 ID: 4  Ped: 663.667 Time: 28.3217  Peak: 757  ADC: 12139.3
EventID: 12683 ID: 4  Ped: 738.778 Time: 28.7157  Peak: 264  ADC: 4323.22
EventID: 13913 ID: 4  Ped: 699.111 Time: 30.2778  Peak: 428  ADC: 6671.88
EventID: 14003 ID: 4  Ped: 704.333 Time: 27.9643  Peak: 469  ADC: 7196.66
EventID: 16011 ID: 4  Ped: 711.778 Time: 28.4079  Peak: 460  ADC: 6966.22
EventID: 16247 ID: 4  Ped: 700.111 Time: 28.225  Peak: 446  ADC: 7083.9
EventID: 19495 ID: 4  Ped: 700 Time: 27.8293  Peak: 460  ADC: 7224
EventID: 20898 ID: 4  Ped: 736.889 Time: 30.0455  Peak: 253  ADC: 4259.12
EventID: 22710 ID: 4  Ped: 660.444 Time: 27.1983  Peak: 910  ADC: 13724.6
EventID: 22784 ID: 4  Ped: 724.778 Time: 27.8793  Peak: 315  ADC: 4990.22
EventID: 27618 ID: 4  Ped: 746.333 Time: 27.55  Peak: 238  ADC: 3969.67
EventID: 30002 ID: 4  Ped: 707.556 Time: 28.6481  Peak: 446  ADC: 7375.44
EventID: 34576 ID: 4  Ped: 710.333 Time: 27.9881  Peak: 436  ADC: 6636.66
EventID: 34953 ID: 4  Ped: 661.667 Time: 27.1918  Peak: 778  ADC: 11754.3
```

/home/had/shiomi/work/production/run81/pro0/work/fiber_out/dst_data/node019/**run00030776_node019_file0.root**




EvtID: 4032
Ratio~8
DCV.Data[4]
1000
950
900
850
800
750
700
0
10
20
30
40
50
60
70
Iteration$

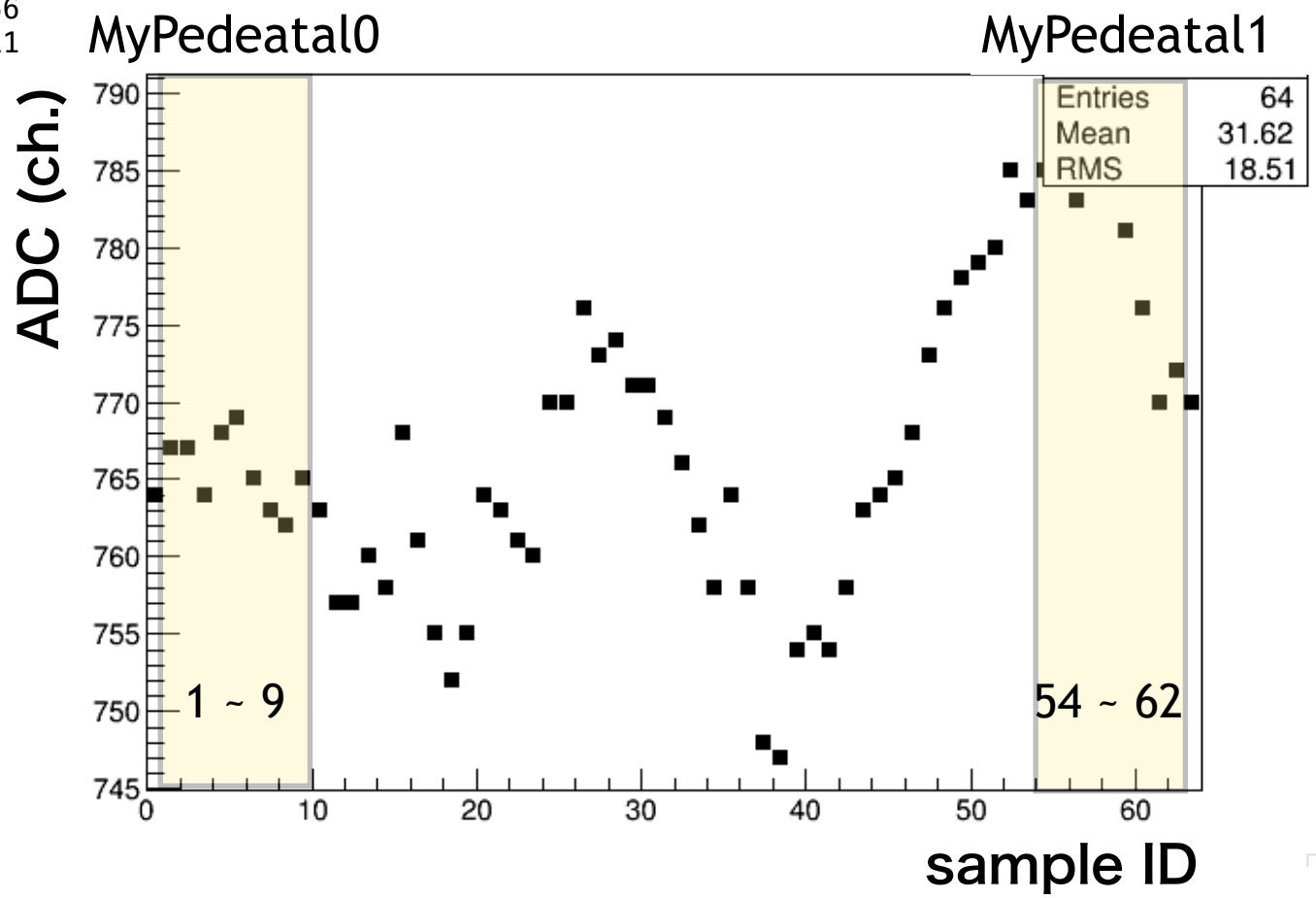

EvtID: 6054
Ratio~16
DCV.Data[4]
920
900
880
860
840
820
800
780
760
740
0
10
20
30
40
50
60
70
Iteration$


EvtID: 7233
Ratio~16
DCV.Data[4]
1300
1200
1100
1000
900
800
700
600
0
10
20
30
40
50
60
70
Iteration$

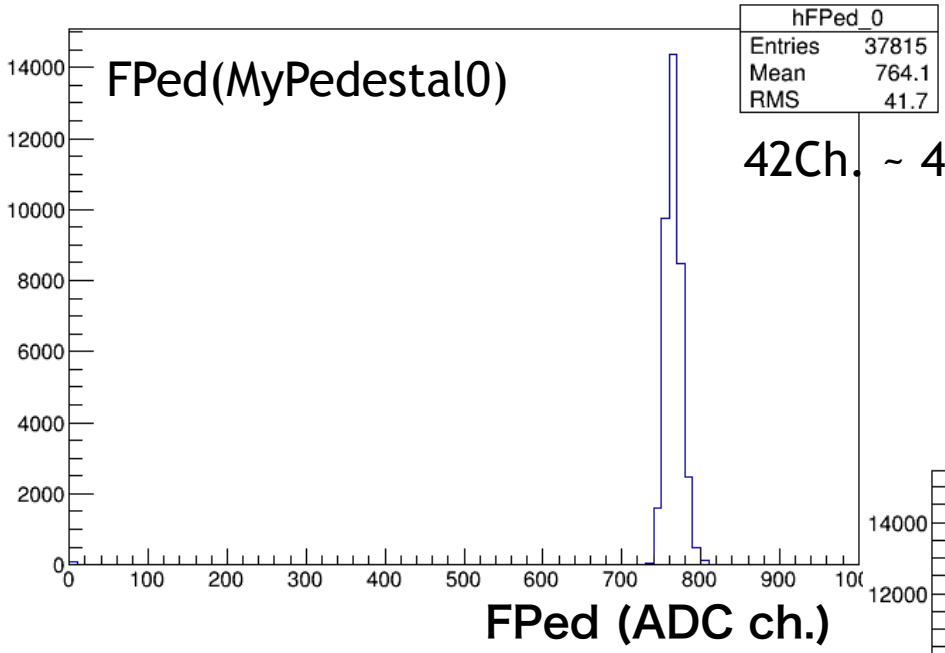
Pulse shape analysis

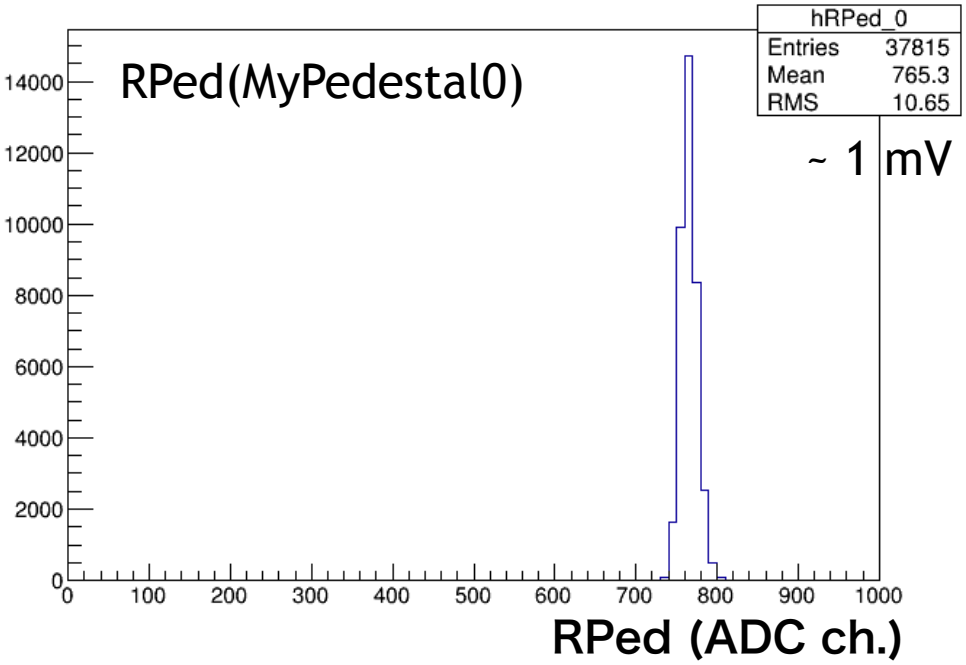
Pulse shape

```
root [0] .L plot_int.C
root [1] plot_int(30776,0,1)
DCV channel : 0
Pedstal : 765.556
MyPedstal0 : 765.556
MyPedstal1 : 781.111
Peak : 24
```



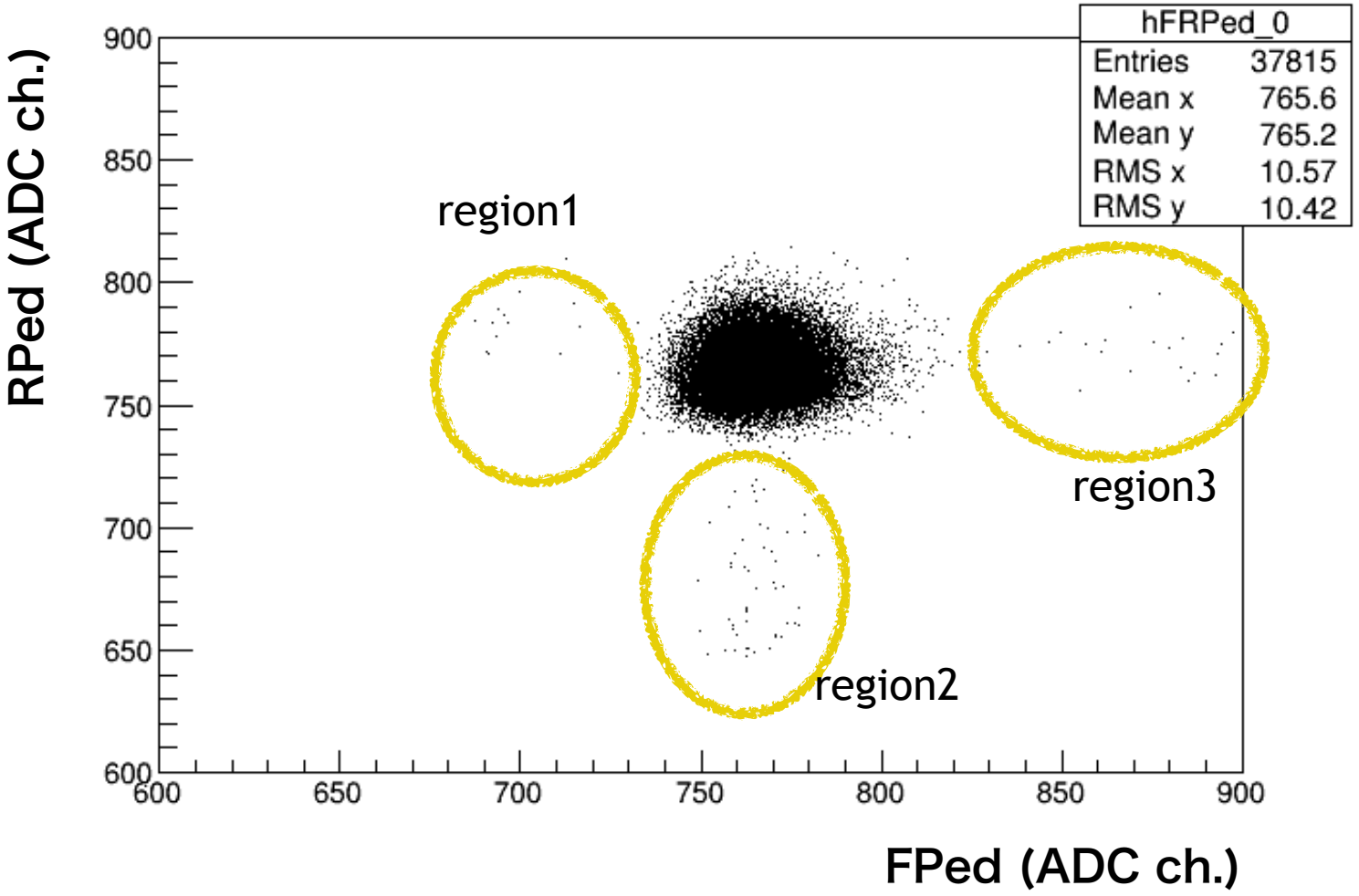
Pedestal Distribution(Run30776)



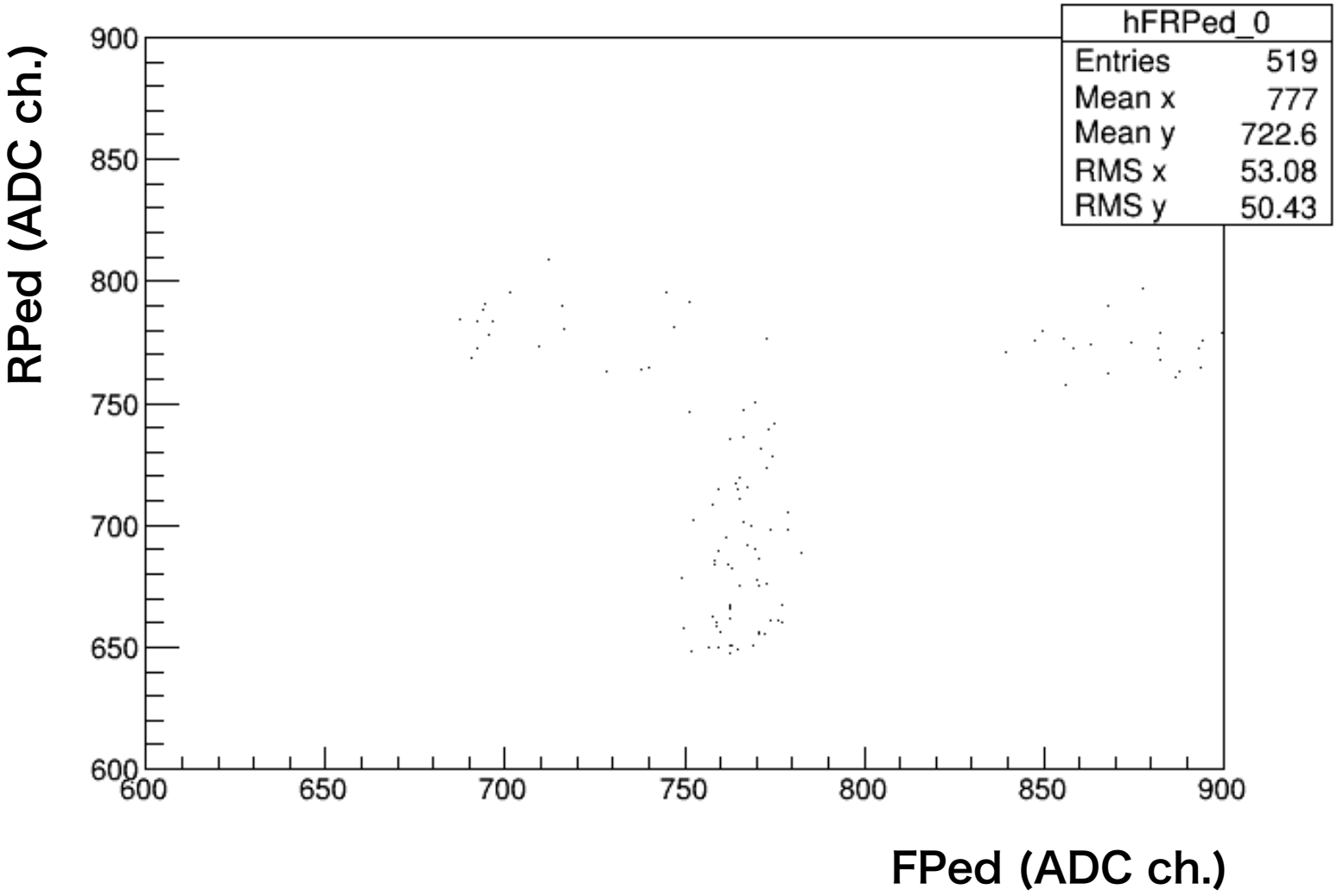


FrontPedstal has 4 times larger RMS than the RearPedestal has.

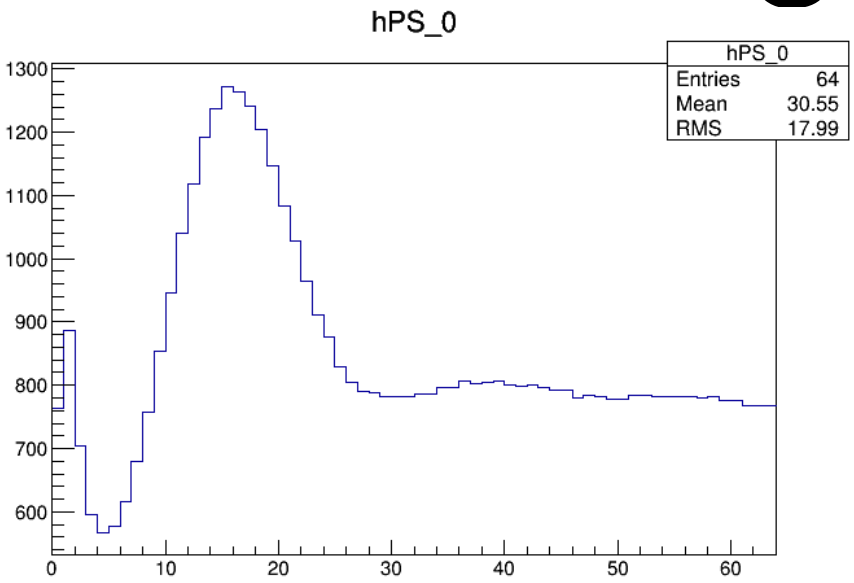
Pedestal Distribution(Run30776)

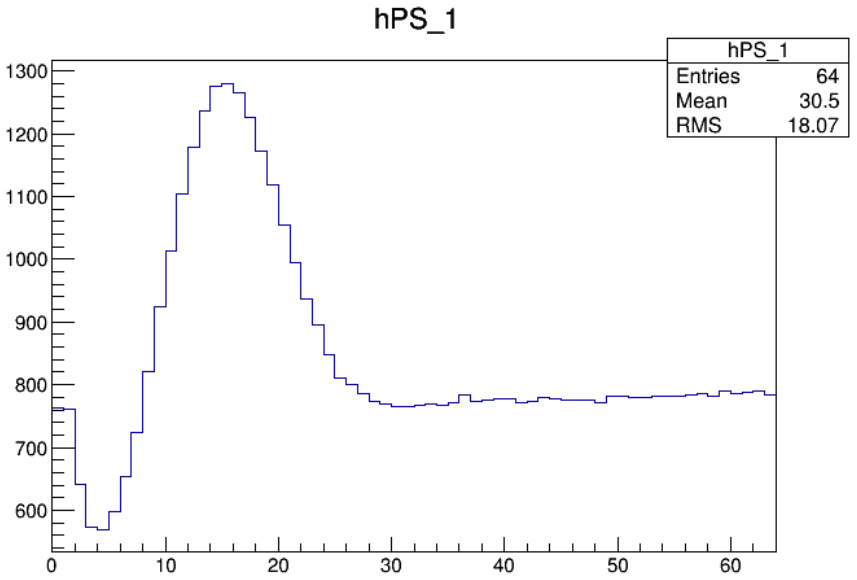


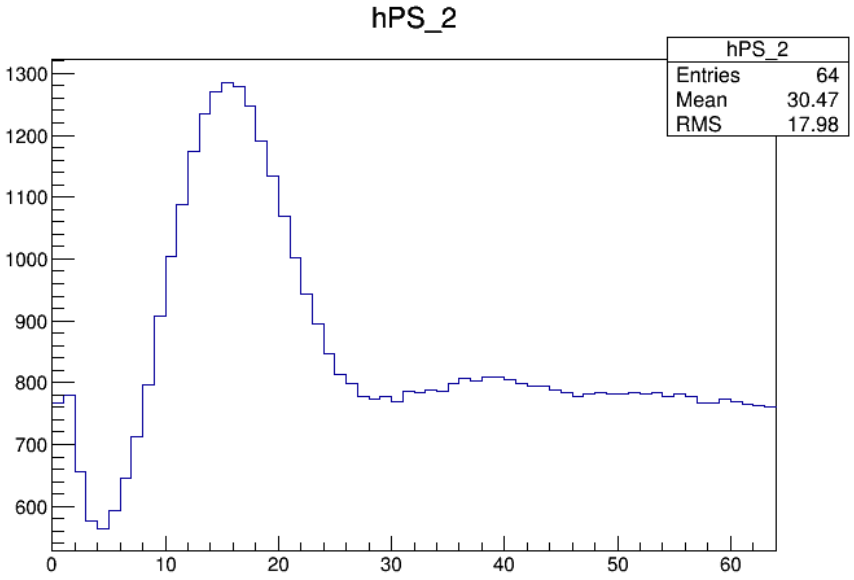
For Peak >150 ch.

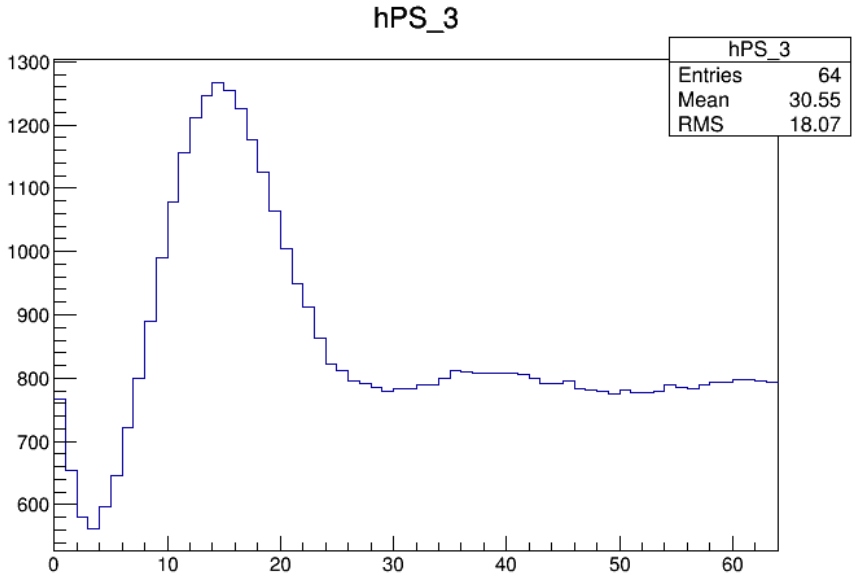


Region 1

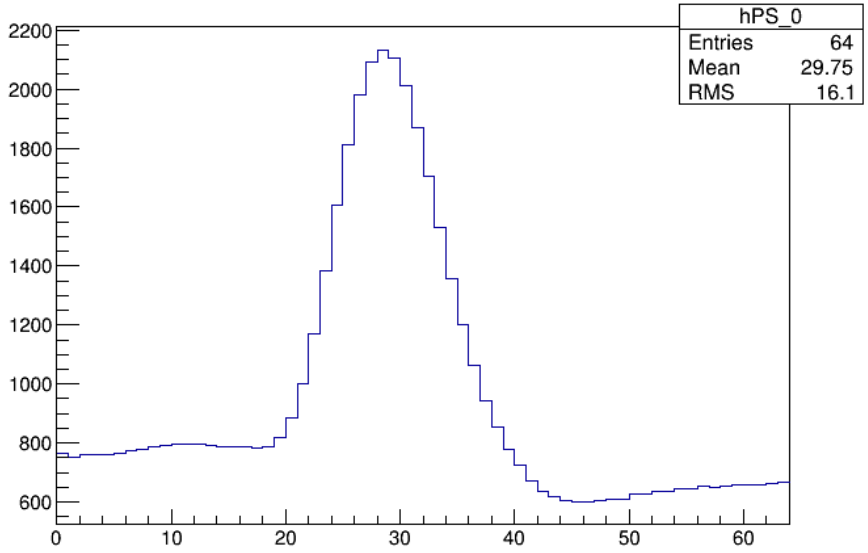

hPS_0
hPS_0
Entries 64
Mean 30.55
RMS 17.99

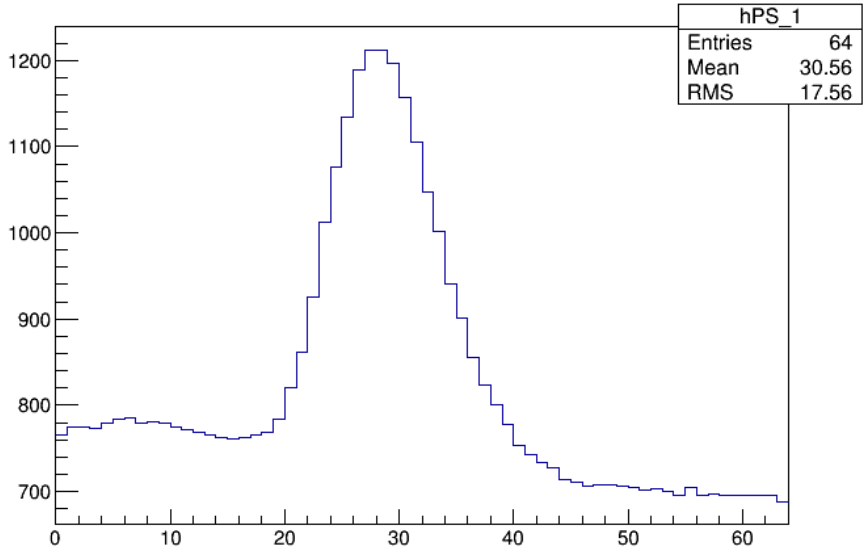

hPS_1
hPS_1
Entries 64
Mean 30.5
RMS 18.07

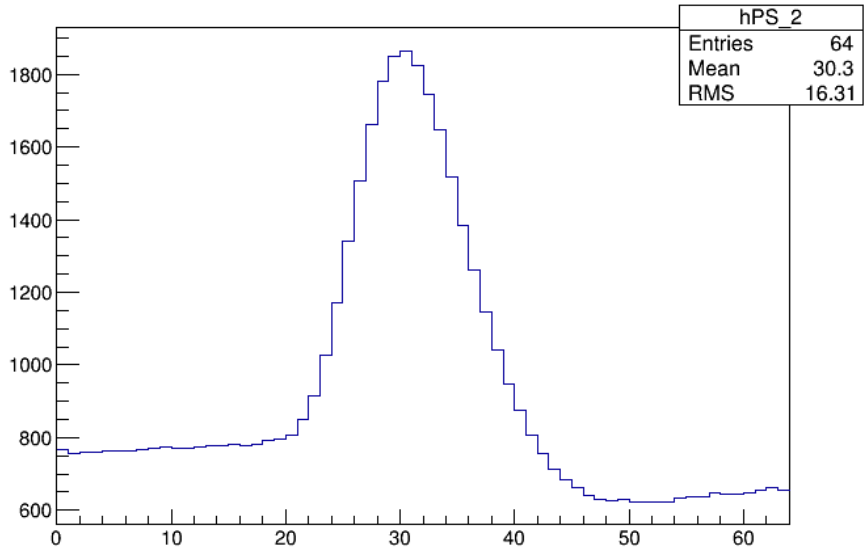

hPS_2
hPS_2
Entries 64
Mean 30.47
RMS 17.98

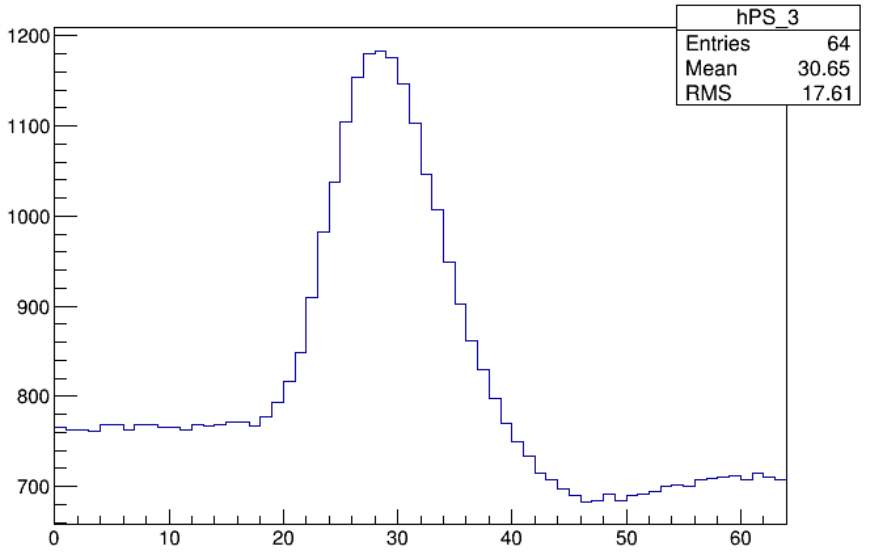

hPS_3
hPS_3
Entries 64
Mean 30.55
RMS 18.07

Region 2

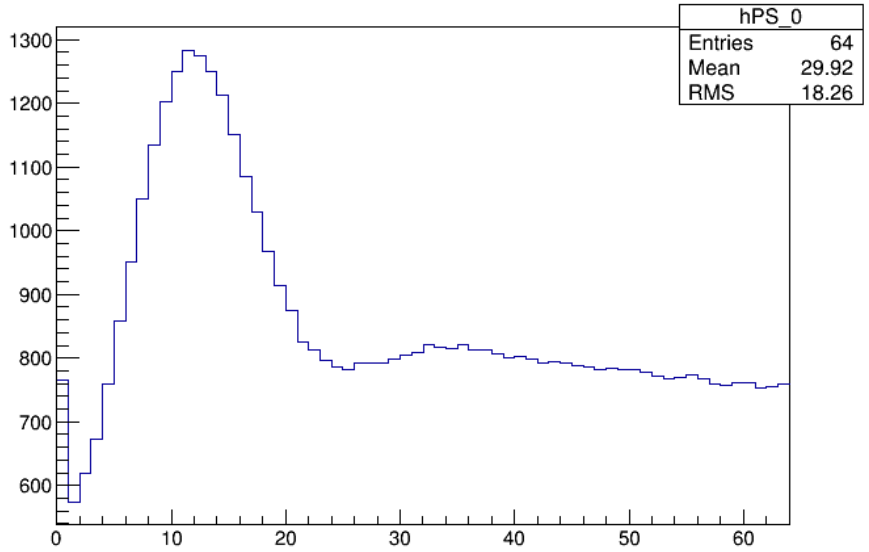

hPS_0
Entries 64
Mean 29.75
RMS 16.1

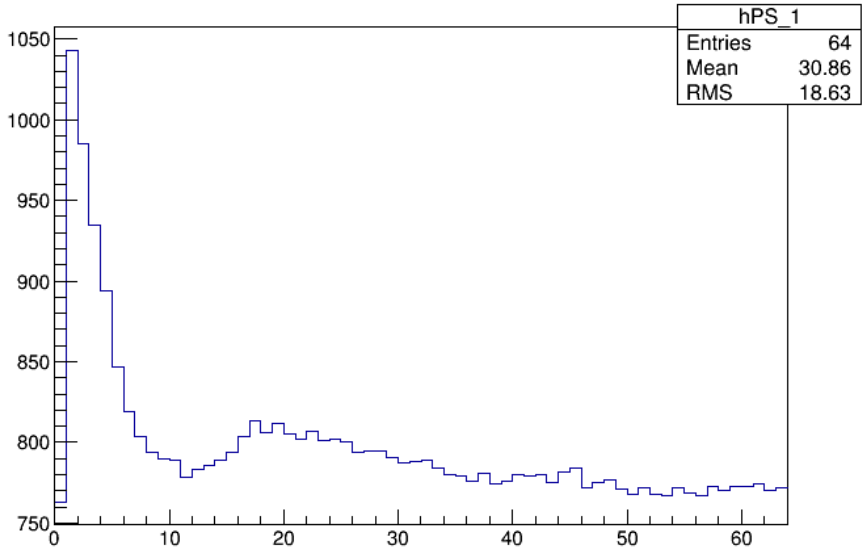

hPS_1
Entries 64
Mean 30.56
RMS 17.56


hPS_2
Entries 64
Mean 30.3
RMS 16.31


hPS_3
Entries 64
Mean 30.65
RMS 17.61

Region 3


hPS_0
Entries 64
Mean 29.92
RMS 18.26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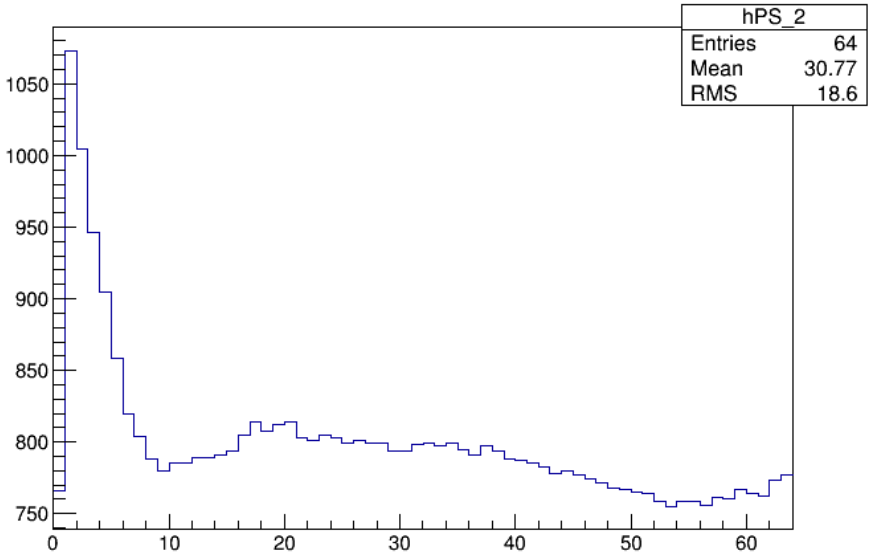
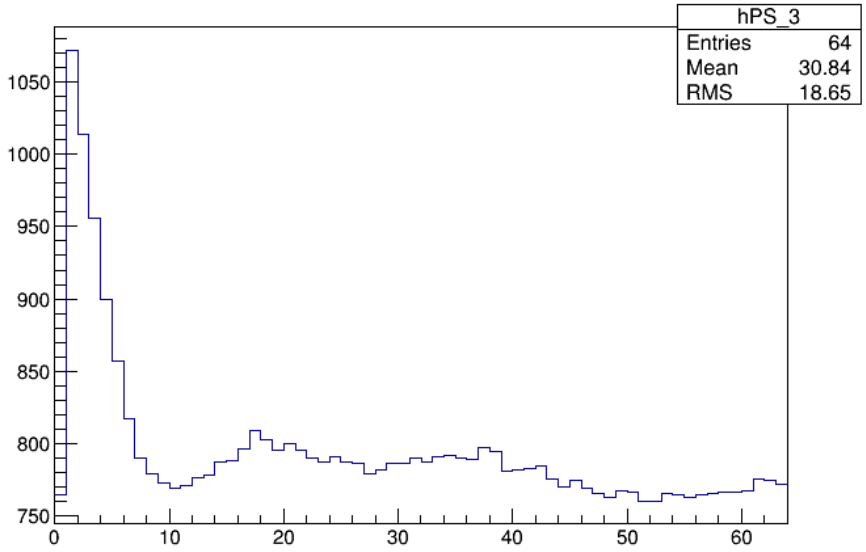
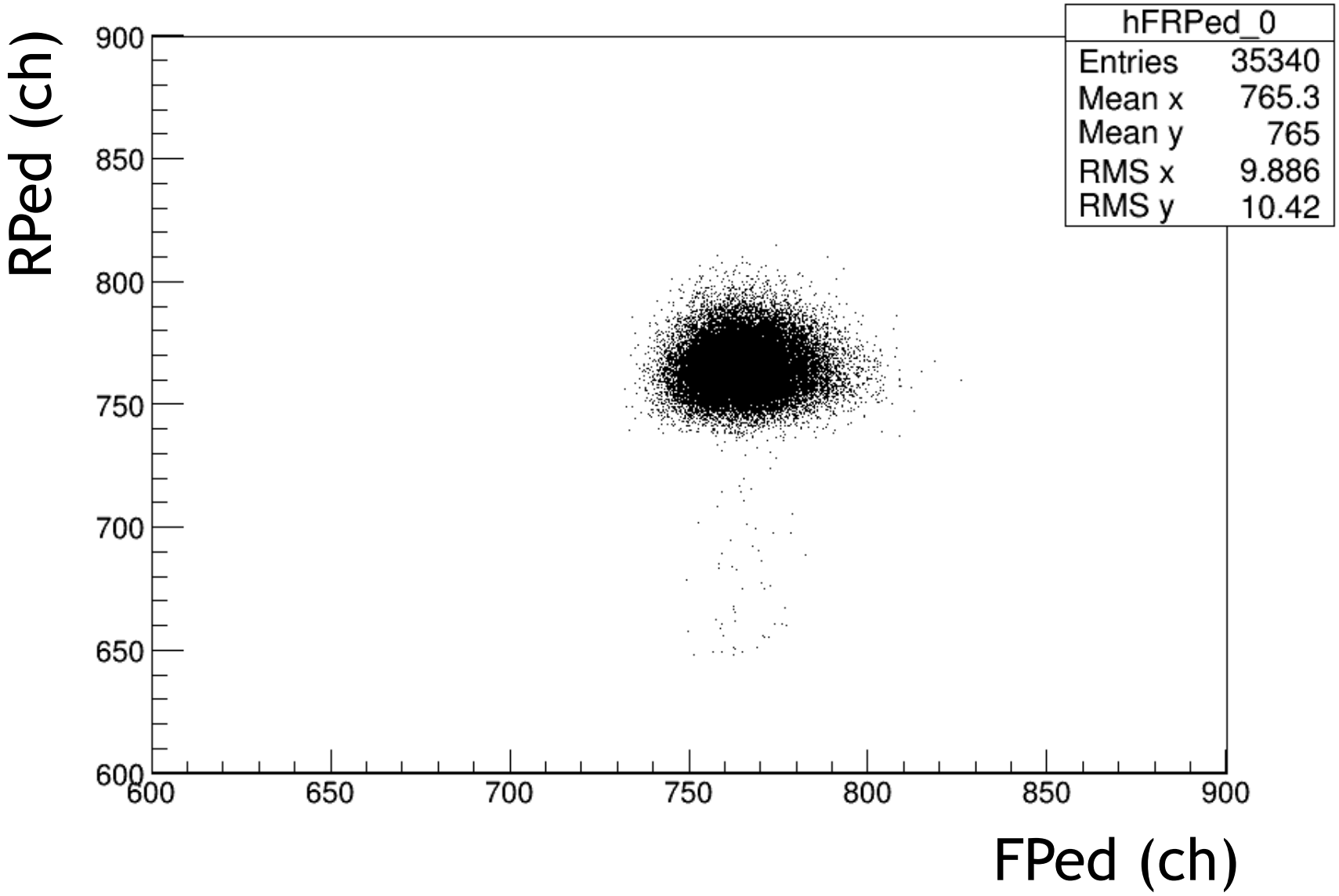
Entries 64
Mean 30.86
RMS 18.63


hPS_2
Entries 64
Mean 30.77
RMS 18.6

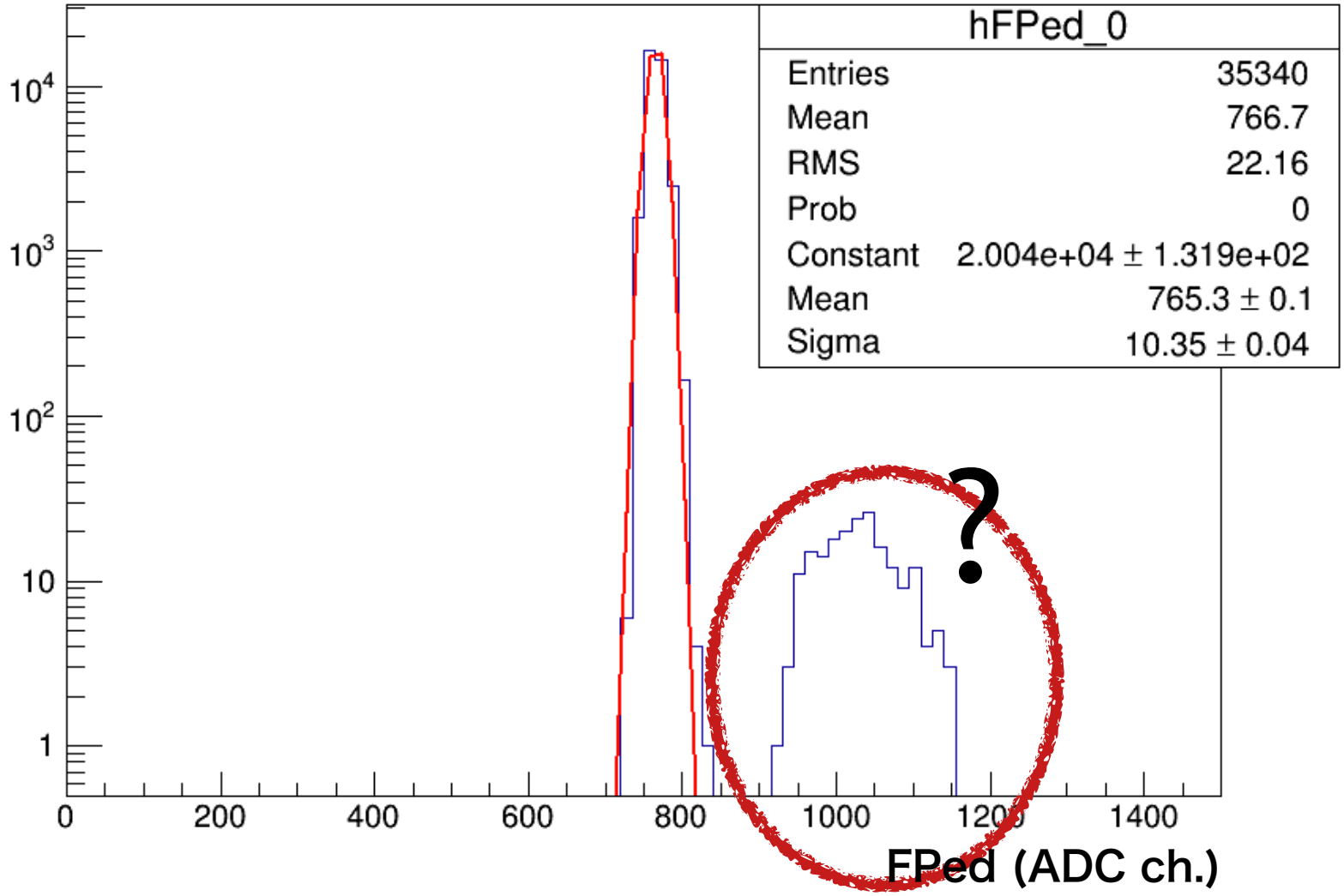

hPS_3
Entries 64
Mean 30.84
RMS 18.65

ScaledTrigBit != 2

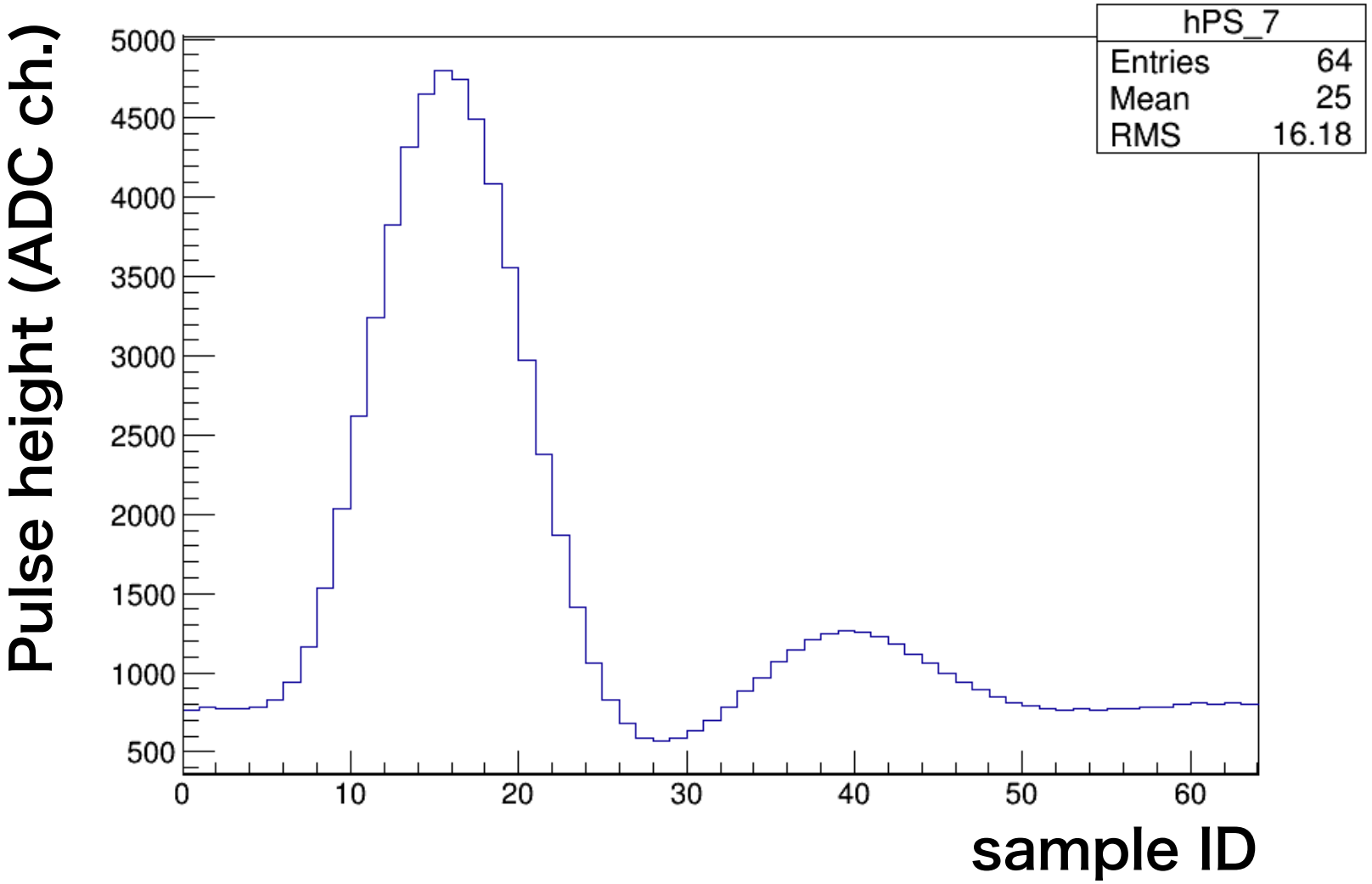
TRIGGERTAGIntegratedADC[1]<1000



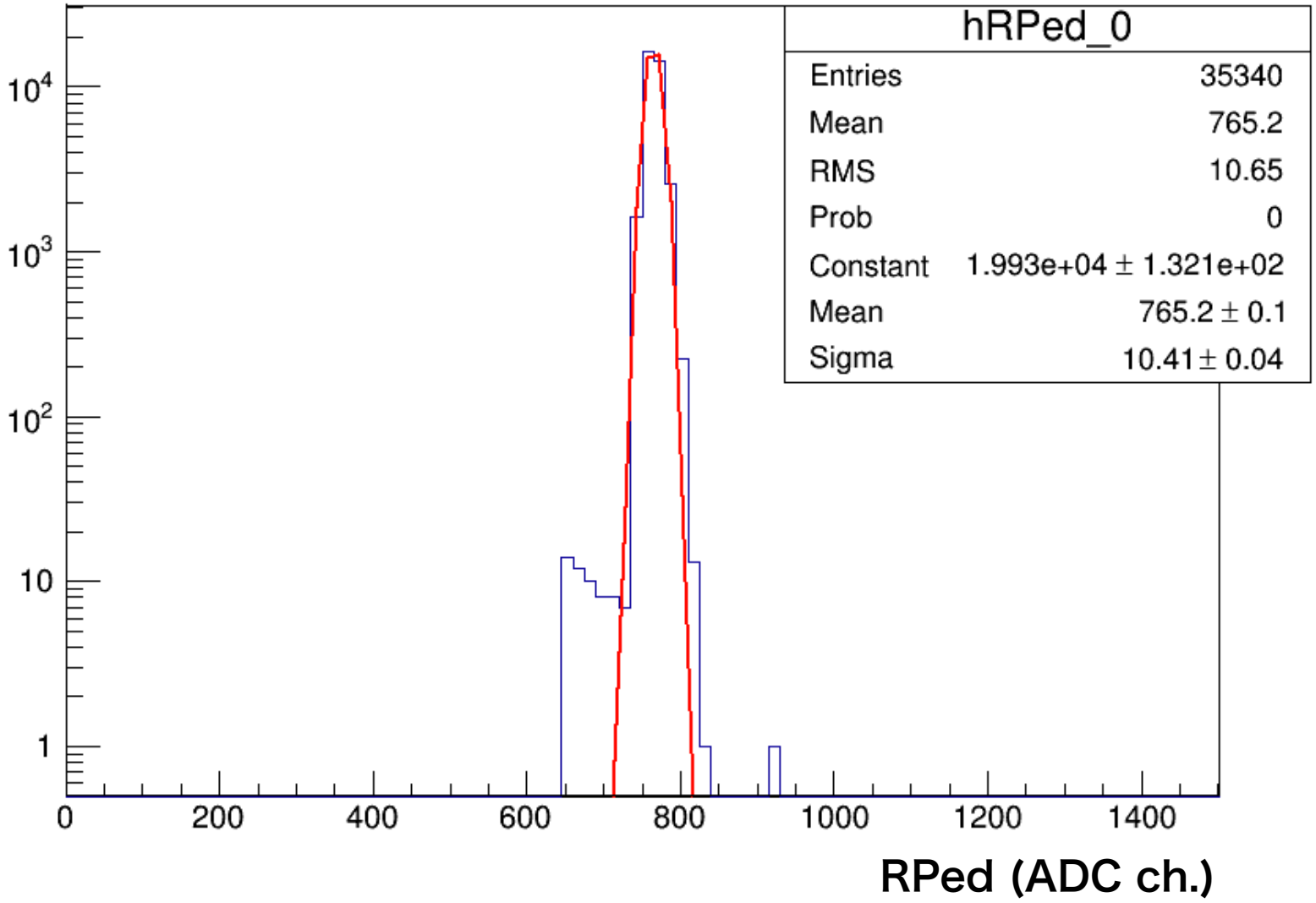
ScaledTrigBit != 2
TRIGGERTAGIntegratedADC[1]<1000



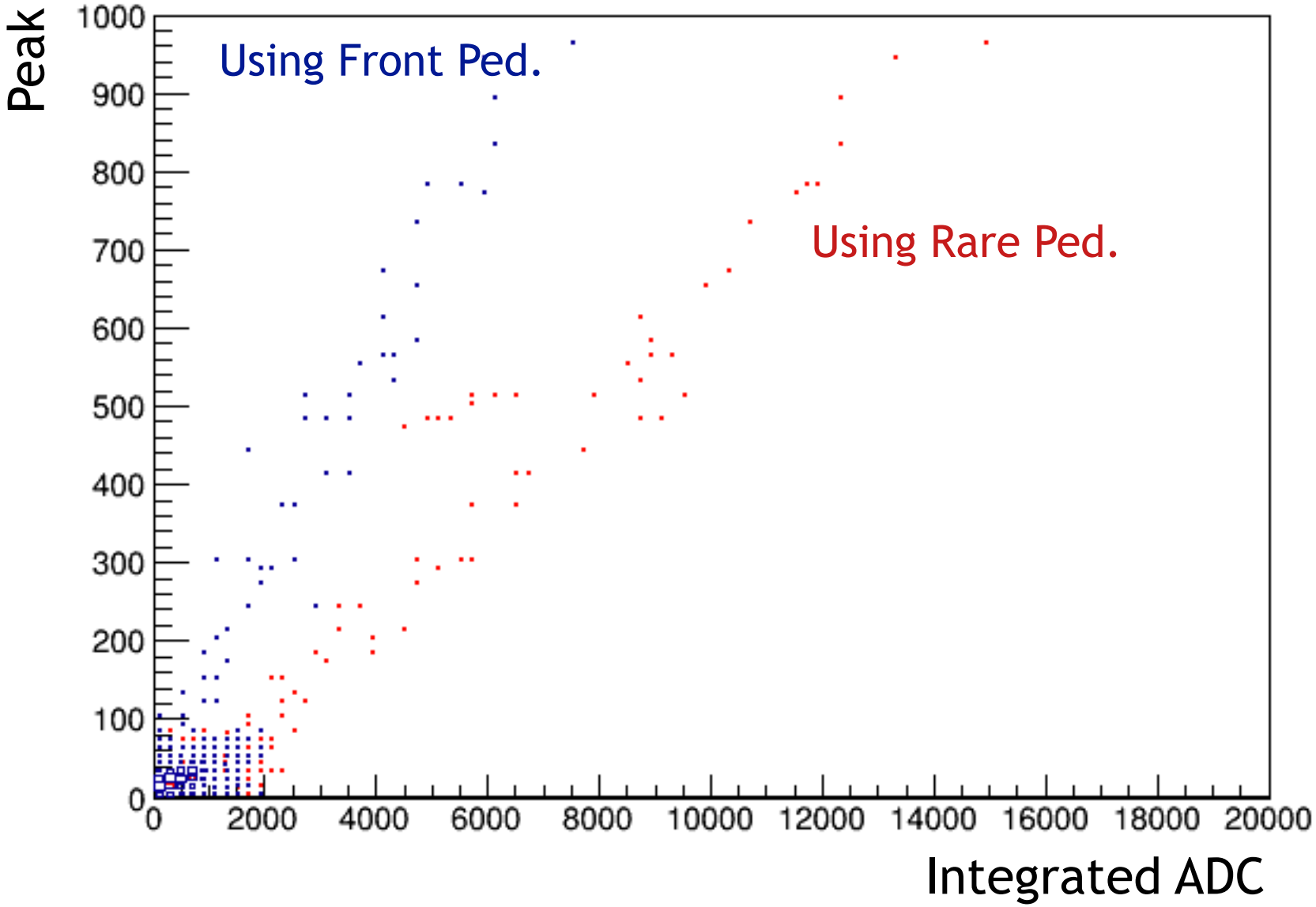
Test Pulse output ?



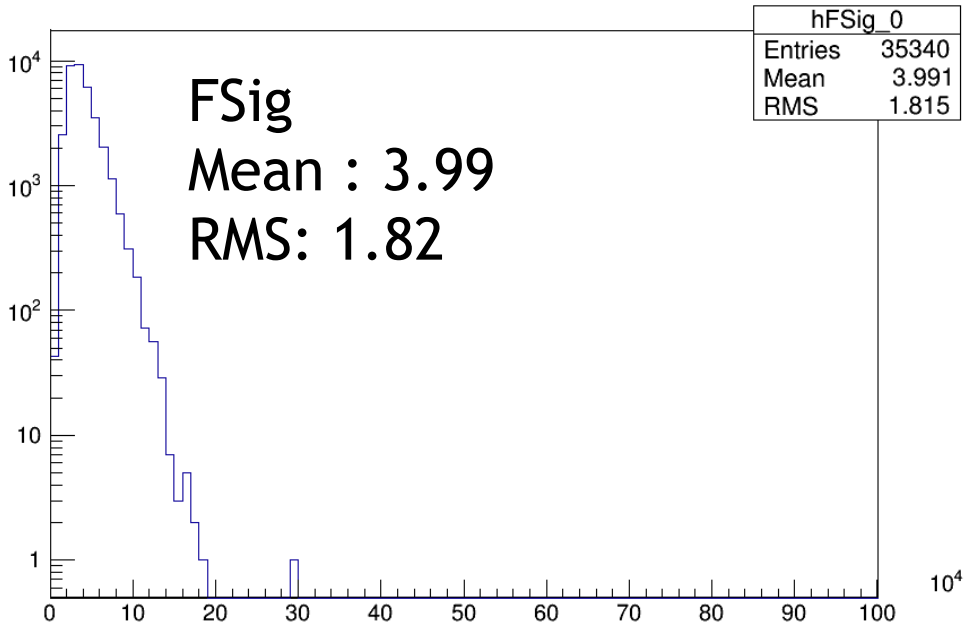
ScaledTrigBit != 2
TRIGGERTAGIntegratedADC[1]>1000

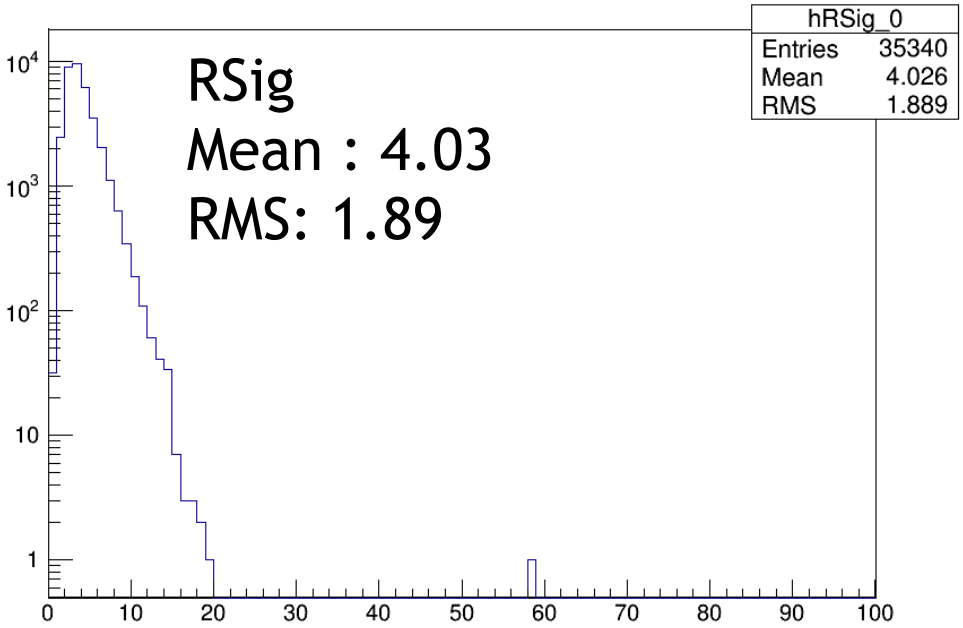


Confirm the two peaks

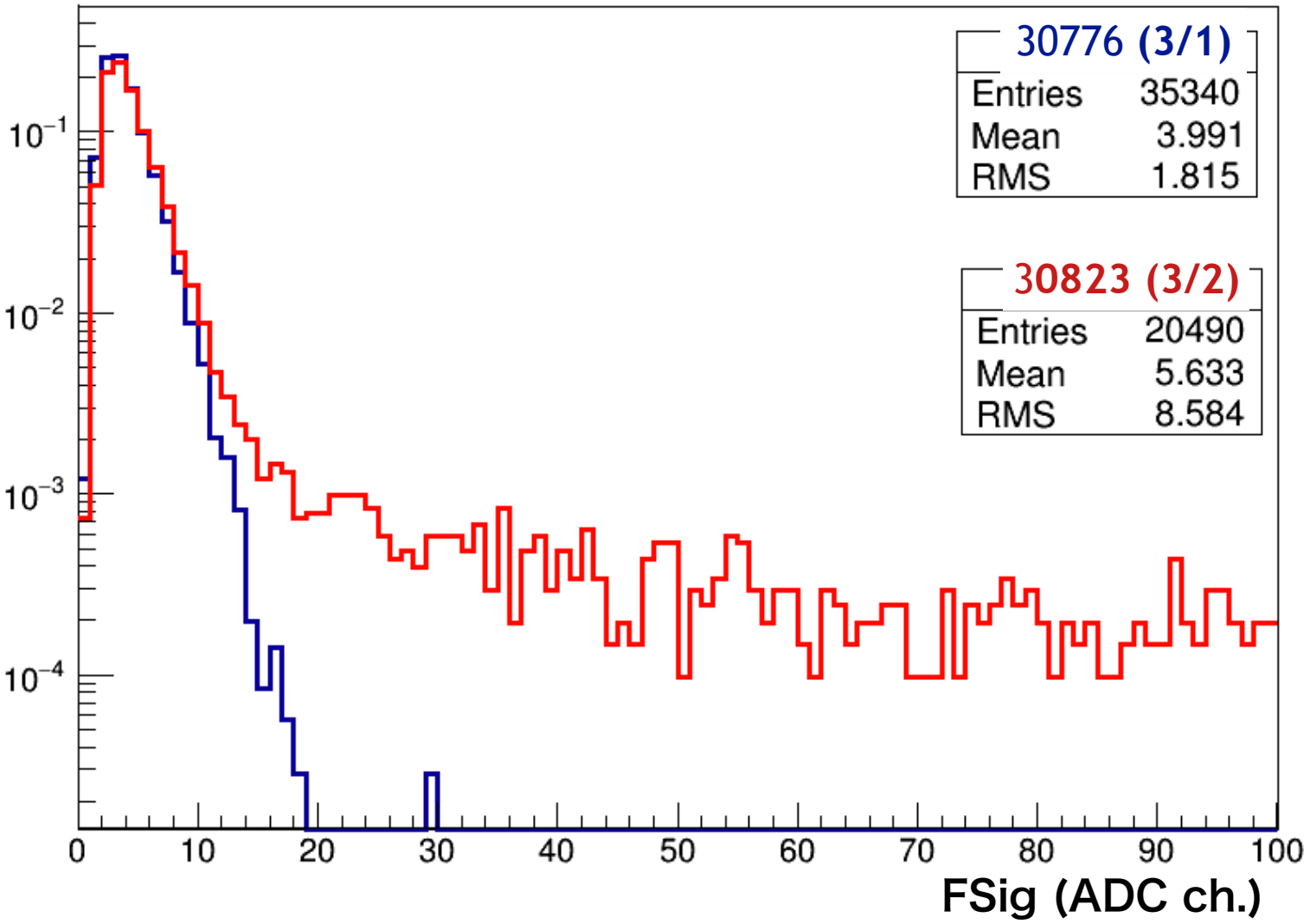


Sigma of pedestal (Run30776)

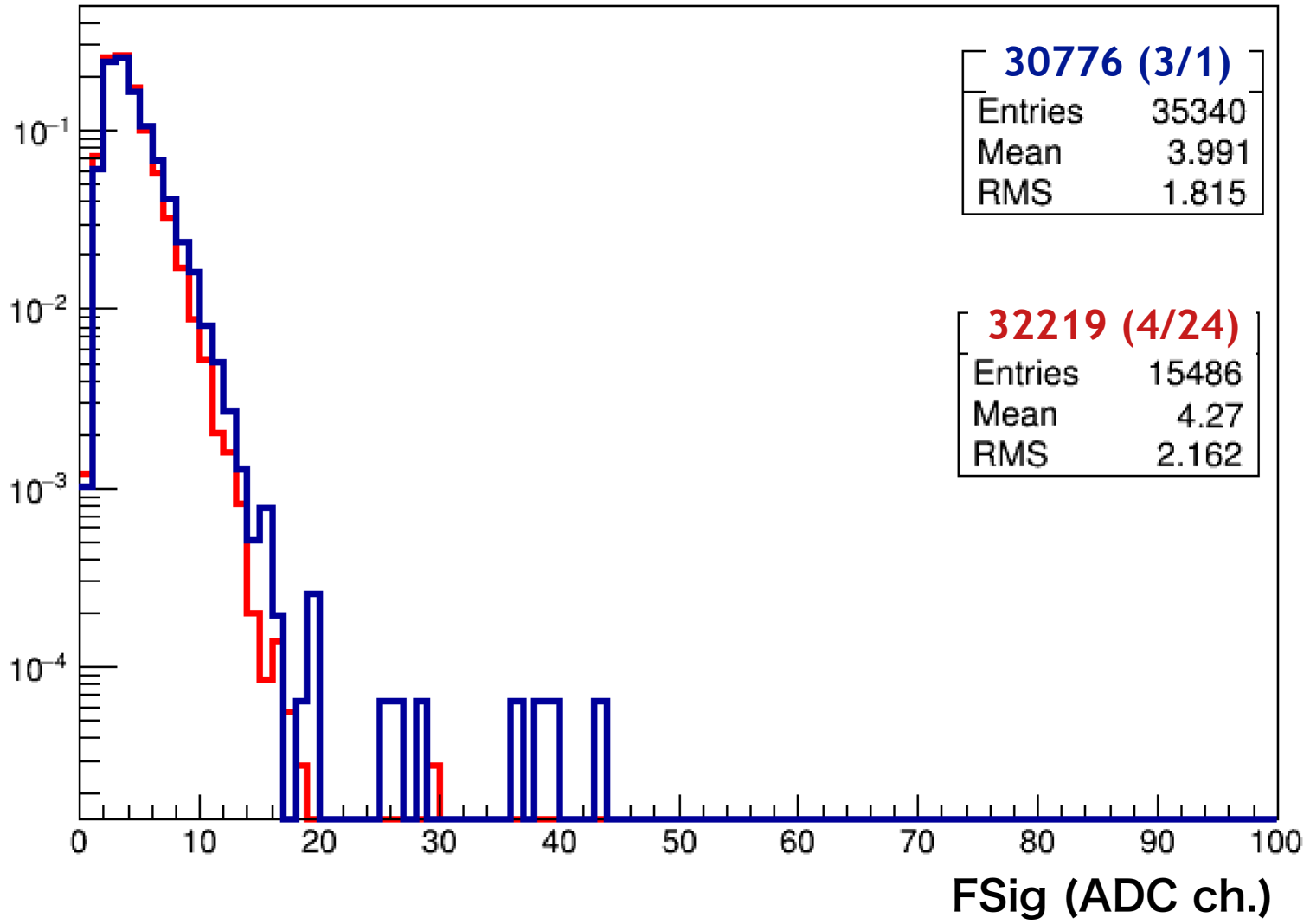




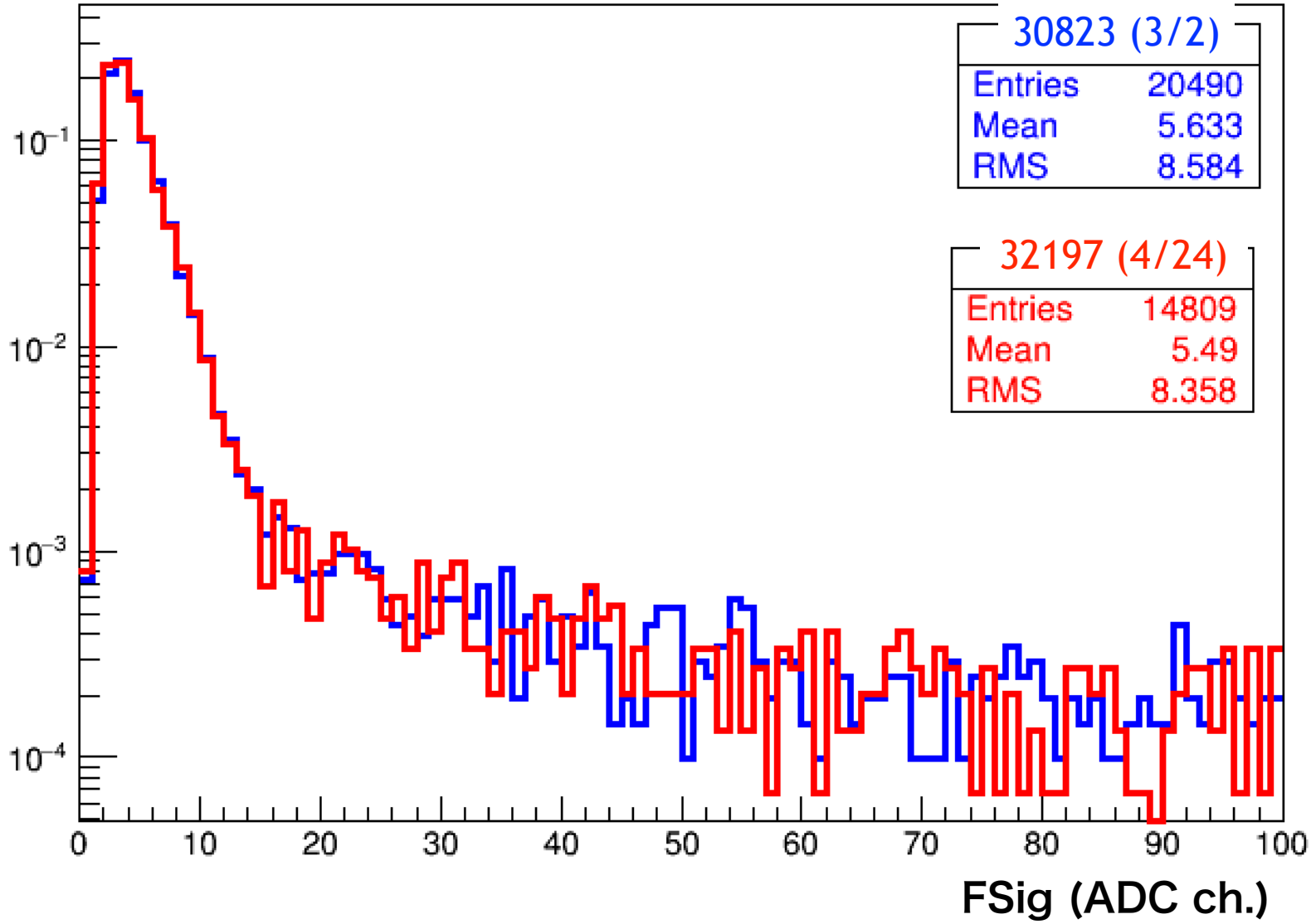
Cosmic V.S. Beam



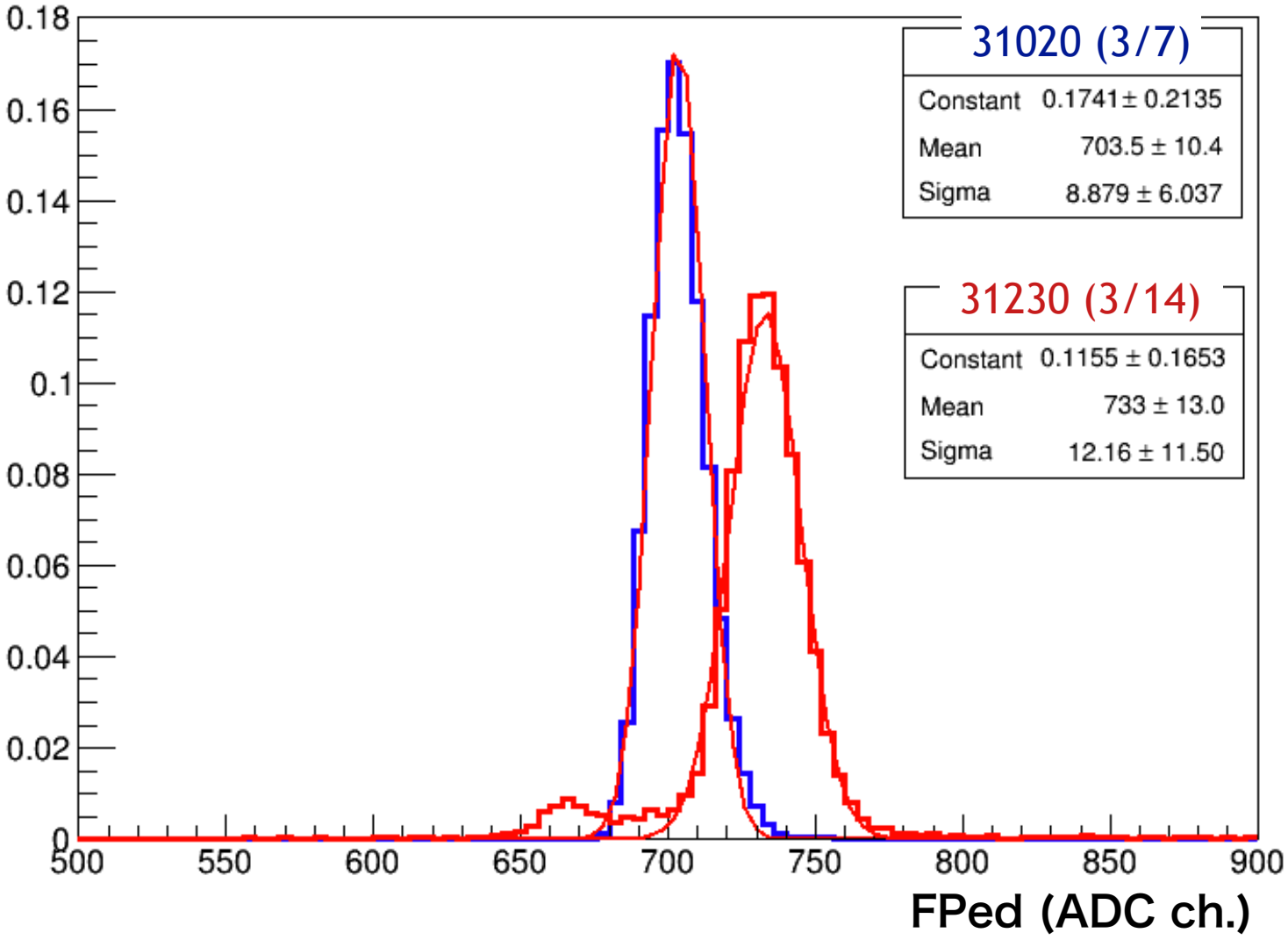
As time goes by (Cosmic)



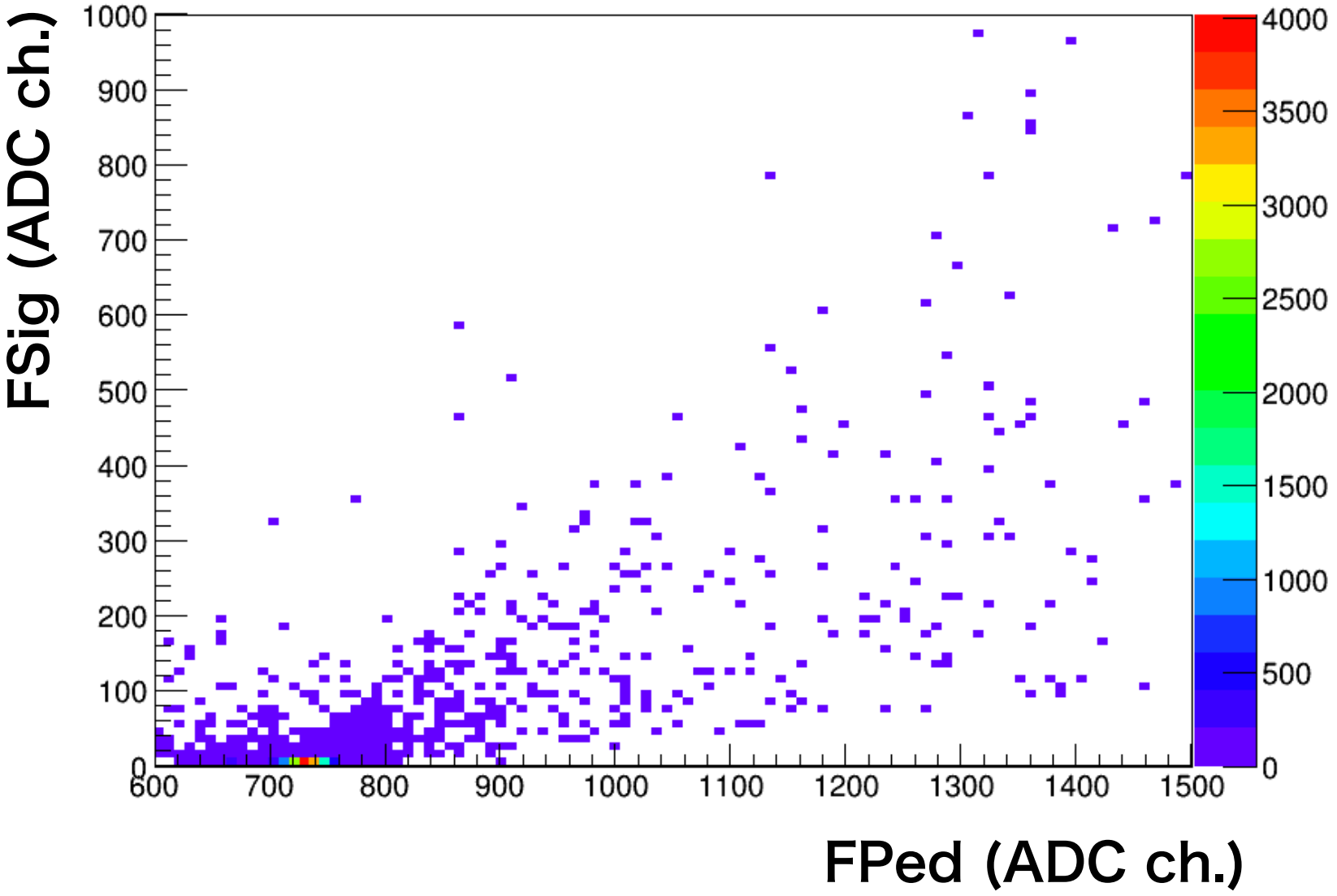
As time goes by (Beam)



Cosmic V.S. Beam



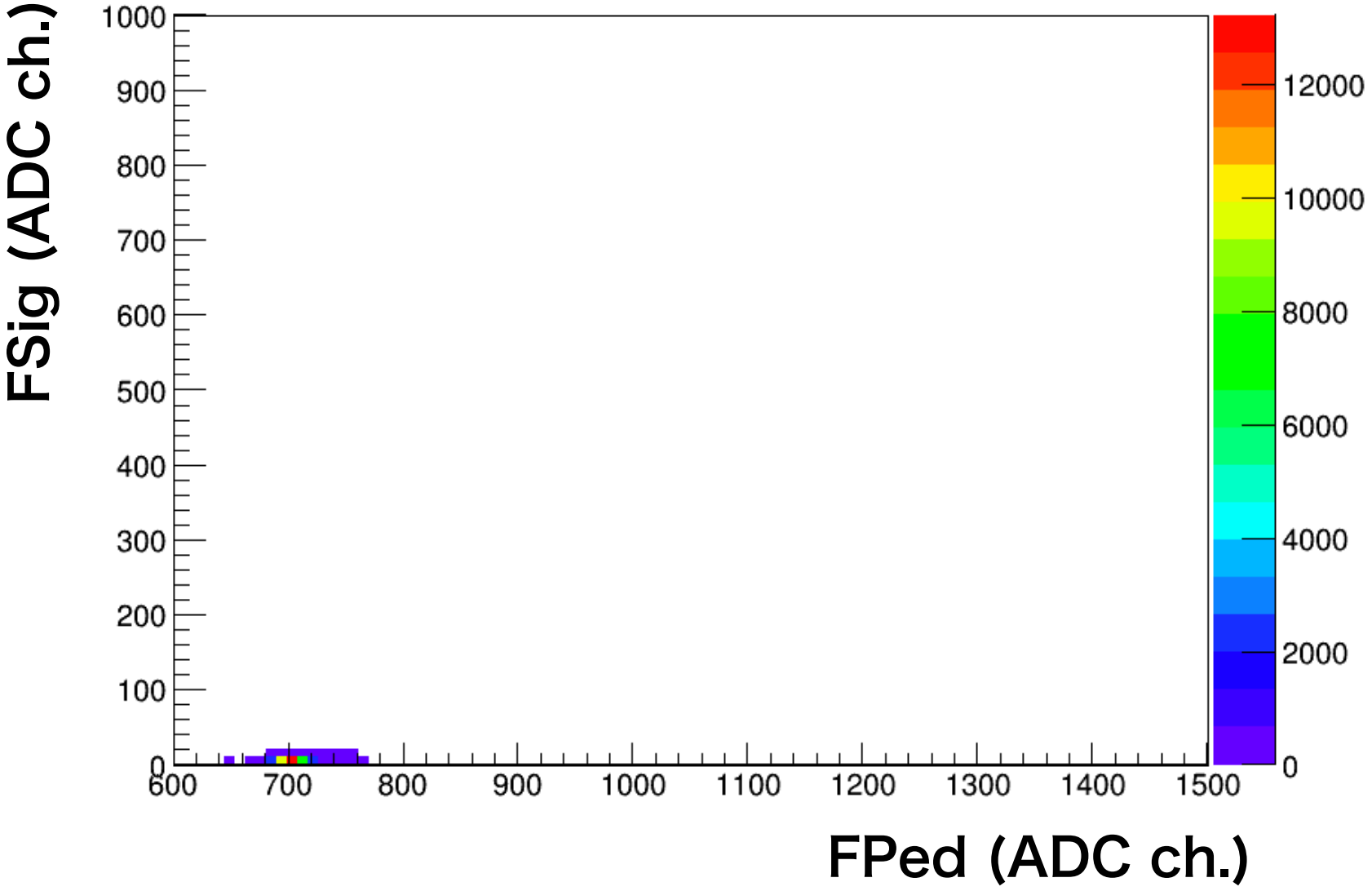
Beam (31230)


FSig (ADC ch.)
1000
900
800
700
600
500
400
300
200
100
0
600
700
800
900
1000
1100
1200
1300
1400
1500
4000
3500
3000
2500
2000
1500
1000
500
0
FPed (ADC ch.)

Summary

- Sorry for this delayed analysis.
- DCV calibration method is developed.
  - Pulse height (PEAK) based calibration.
- Pulse shape study
  - Confirmation of pedestal decision dependency
  - Pedestal fluctuation is less than 0.1 MeV deposit.
  - Study on beam activity

Cosmic (31020)



Effect of Pedestal selection