

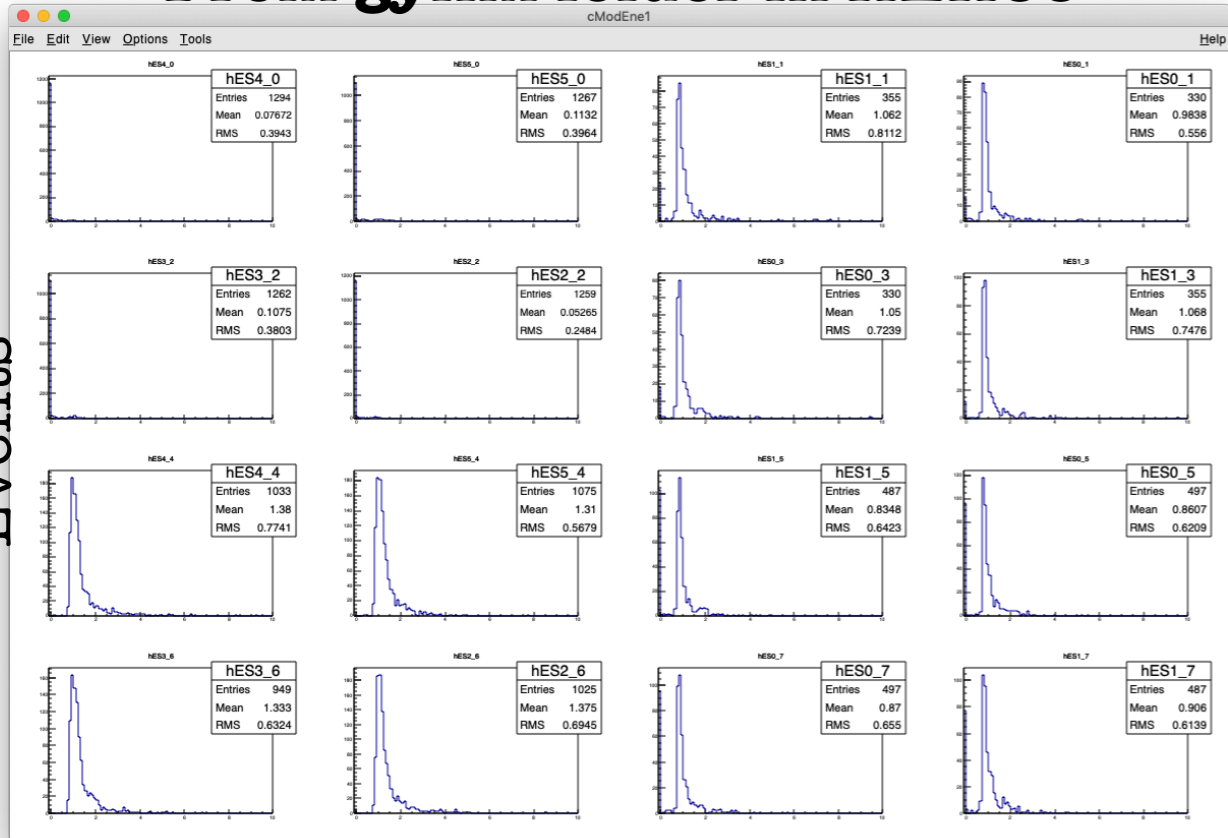
MC of Cosmic ray(2)

2 October, 2019
HongMin KIM

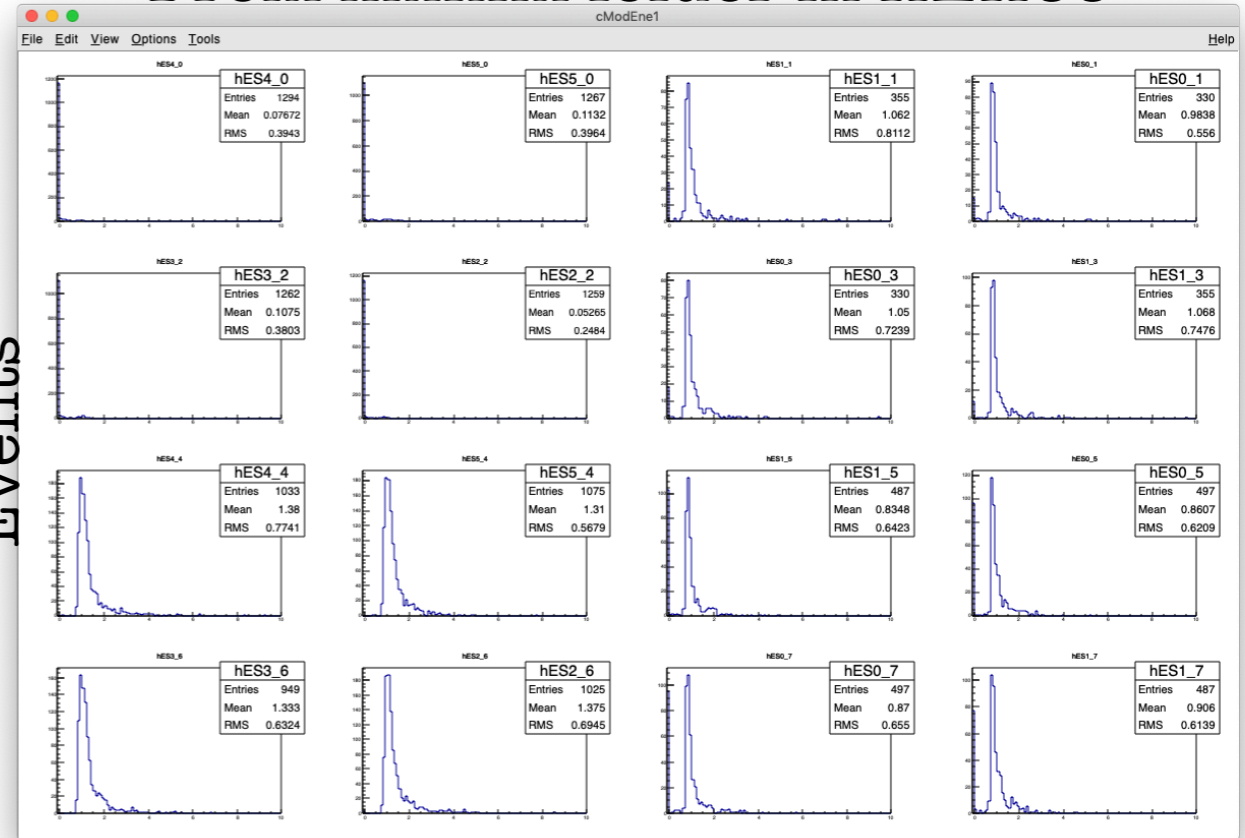
Compile Error?

- There is no difference between each run files.
- There is no difference the 'dcv_calib.C' between my local folder and gelid folder.
- To compile the 'dcv_calib.C' in my local PC, I used the command like `“g++ -o dcv_calib dcv_calib.C `root-config --cflags --glibs`”`
- To compile the same file in the KEKCC, I used the 'Makefile' which including command is `“g++ -o dcv_calib dcv_calib.C -I$(E14_TOP_DIR)/include -L$(E14_TOP_DIR)/lib/so -lGsimData -lEG `root-config --cflags` `root-config --libs`”`
- I try to compile using `“g++ -o dcv_calib dcv_calib.C `root-config --cflags --glibs`”` in KEKCC.

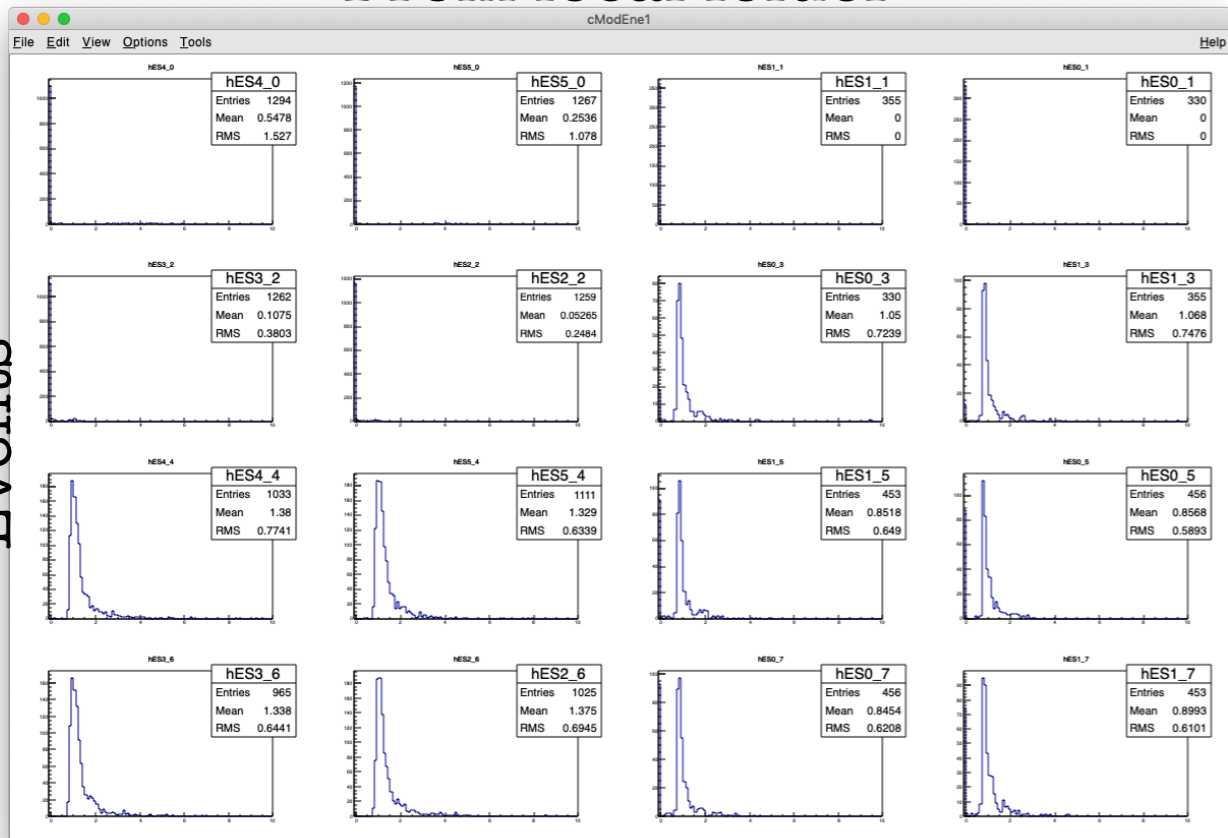
From gylim folder in KEKCC



From hmkim folder in KEKCC

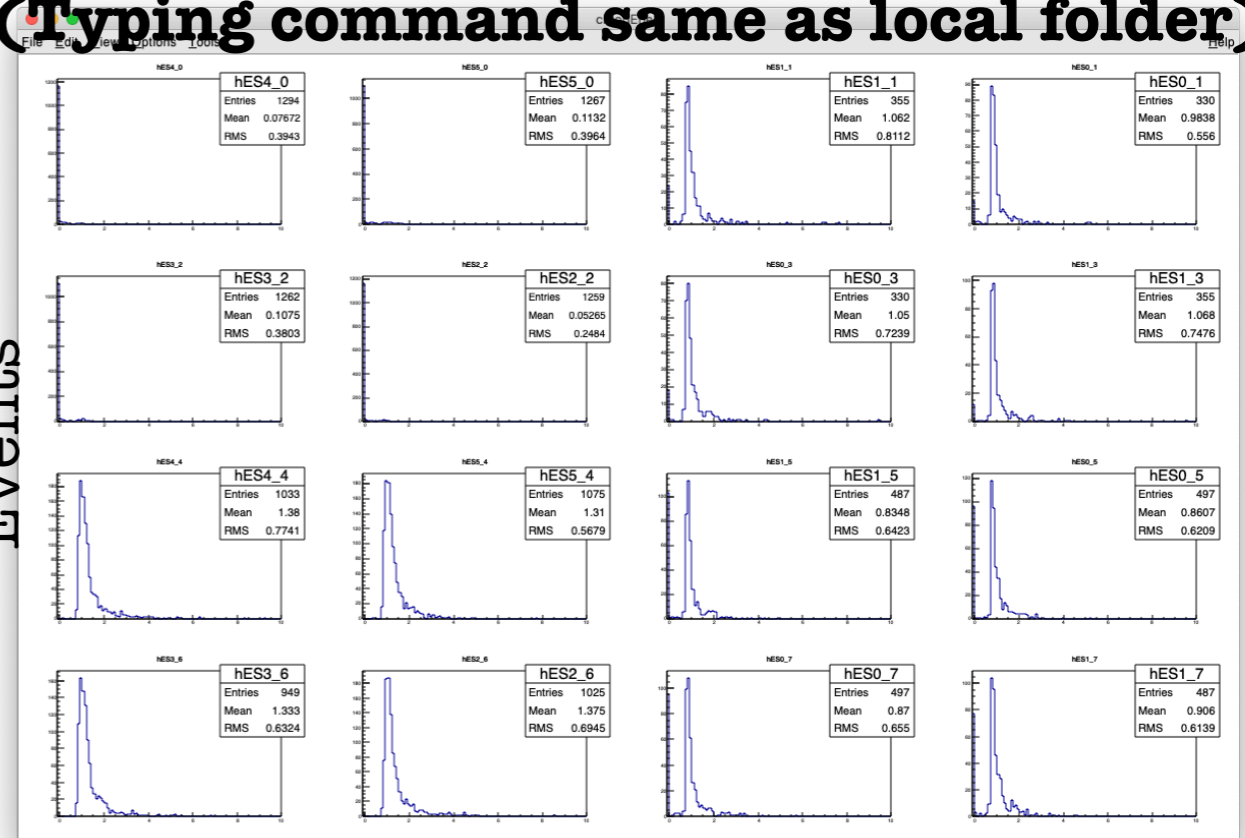


From local folder

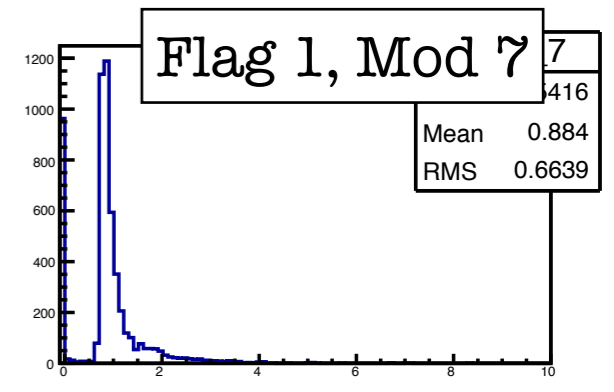
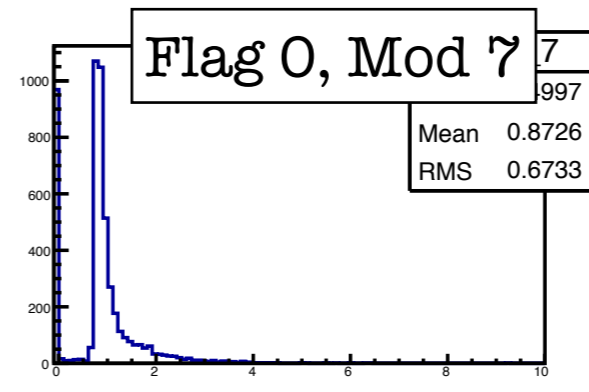
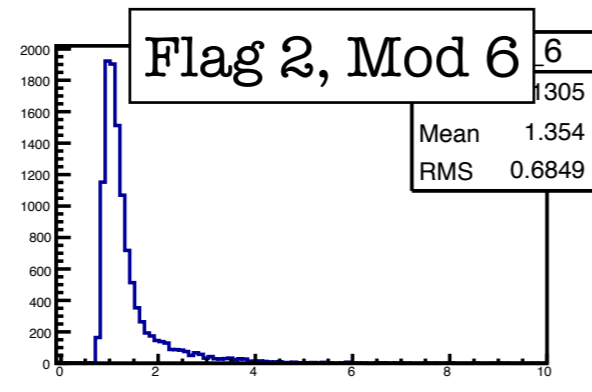
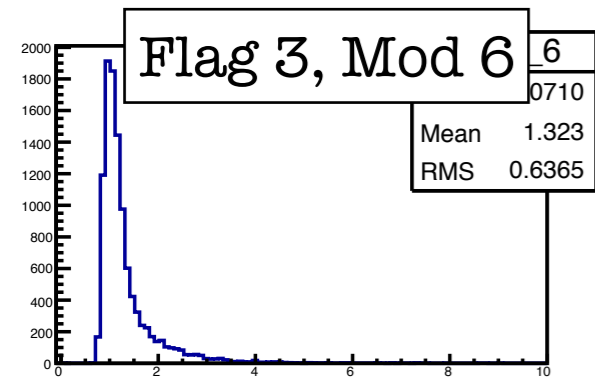
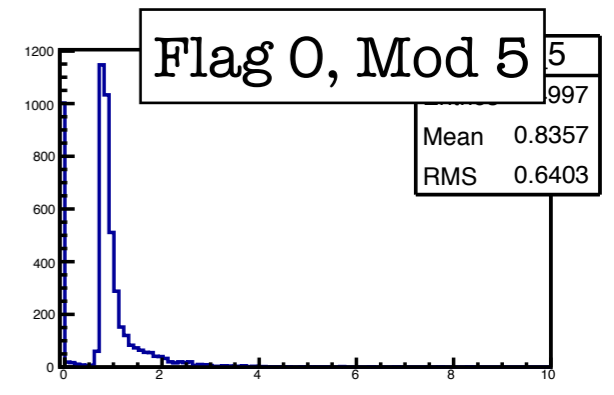
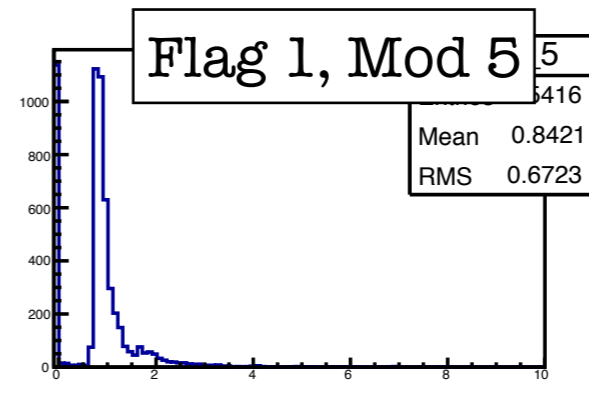
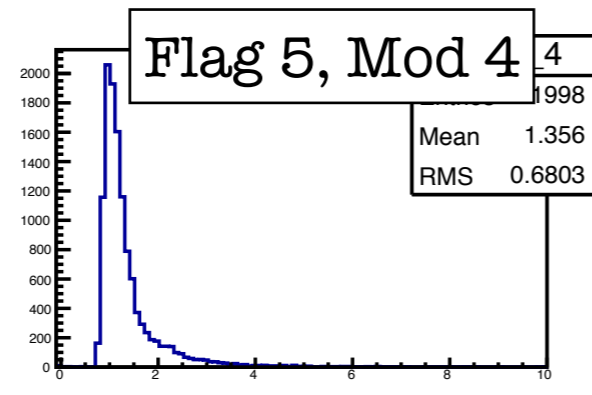
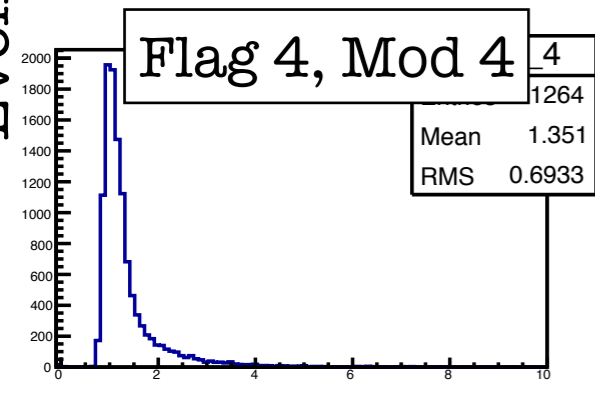
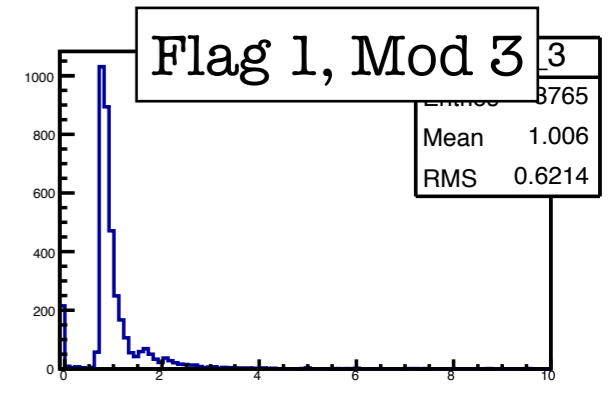
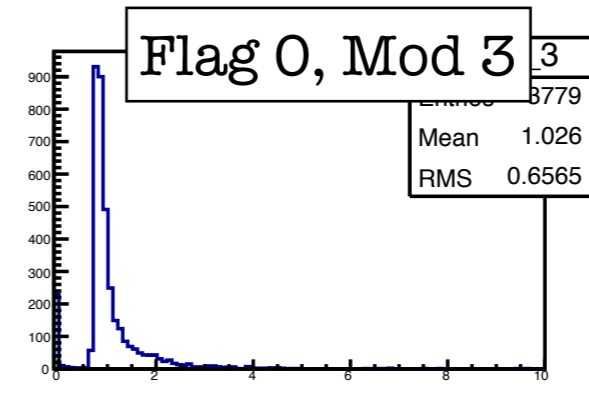
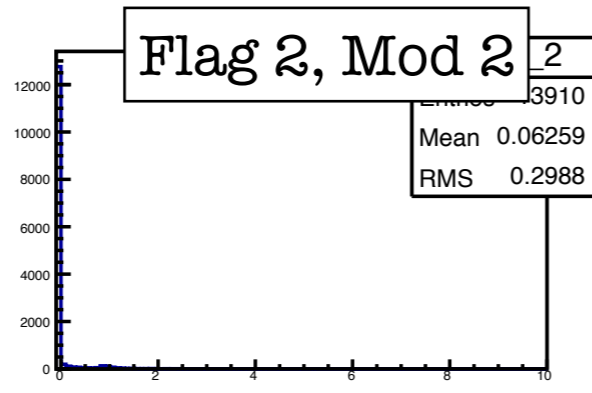
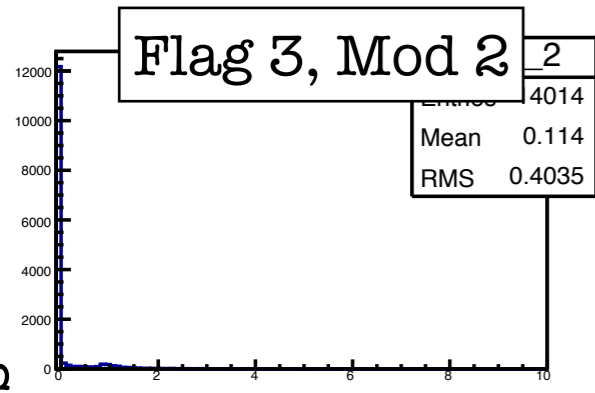
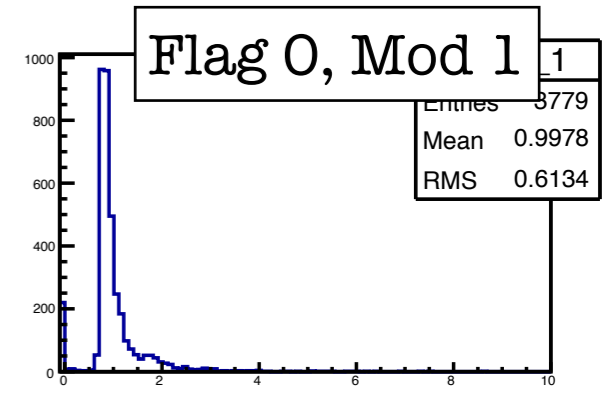
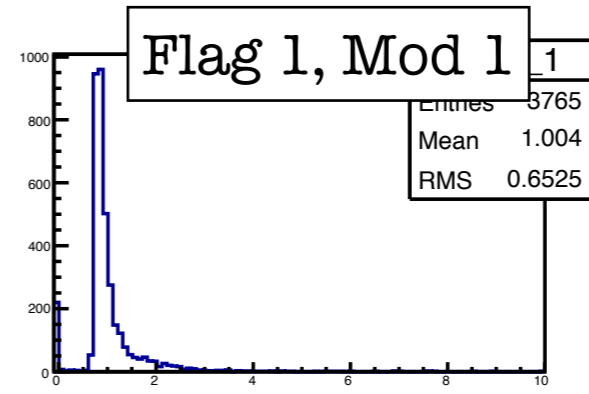
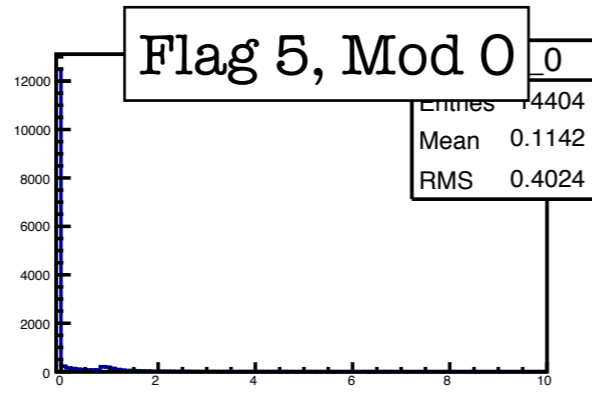
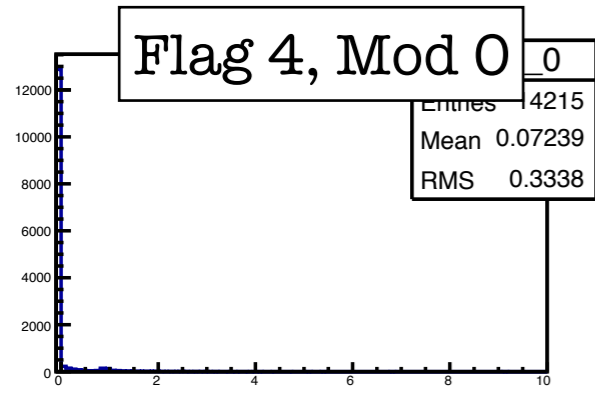


From hmkim folder in KEKCC

(Typing command same as local folder)



DCVene Distribution at each flag number

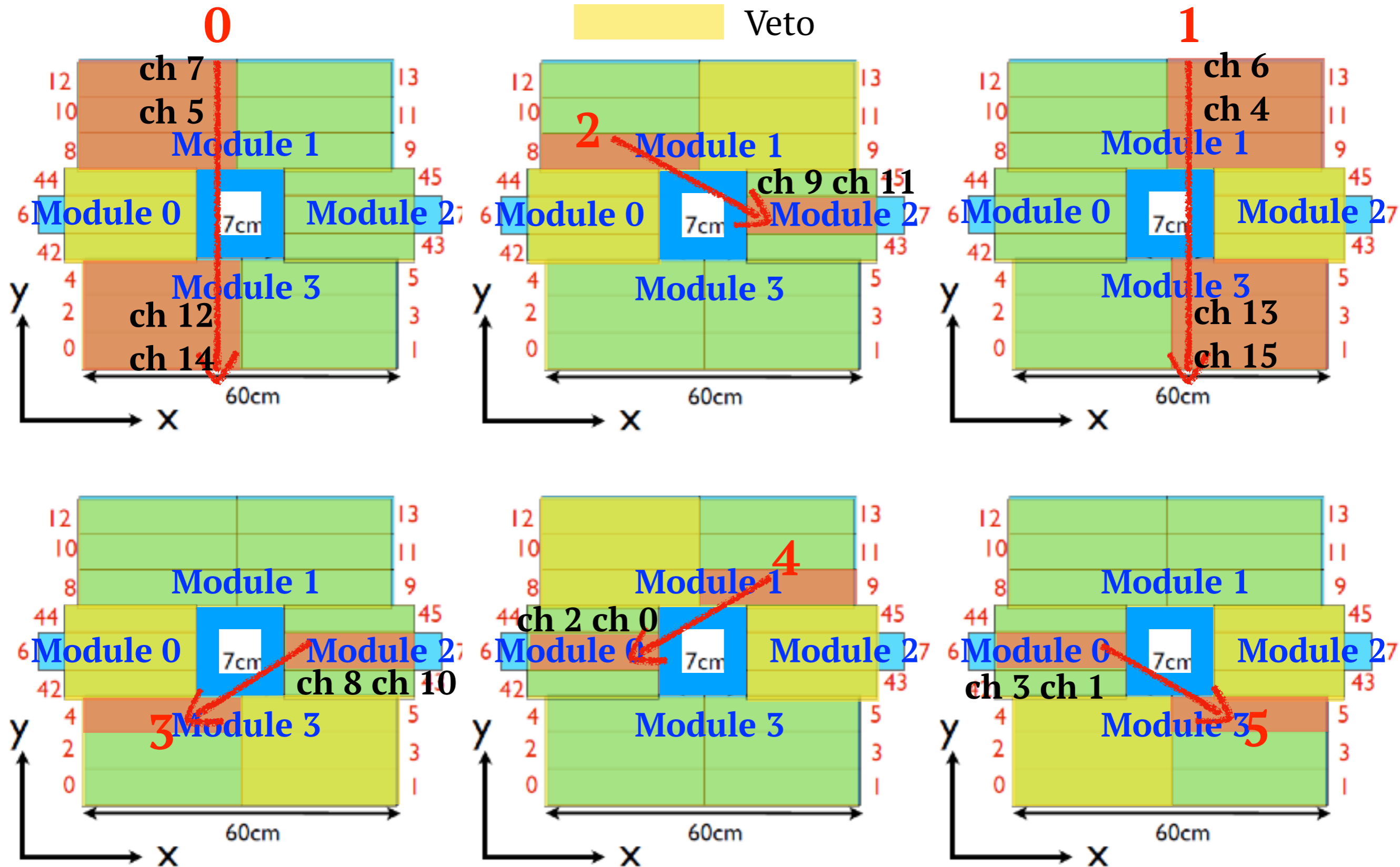


Energy[MeV]

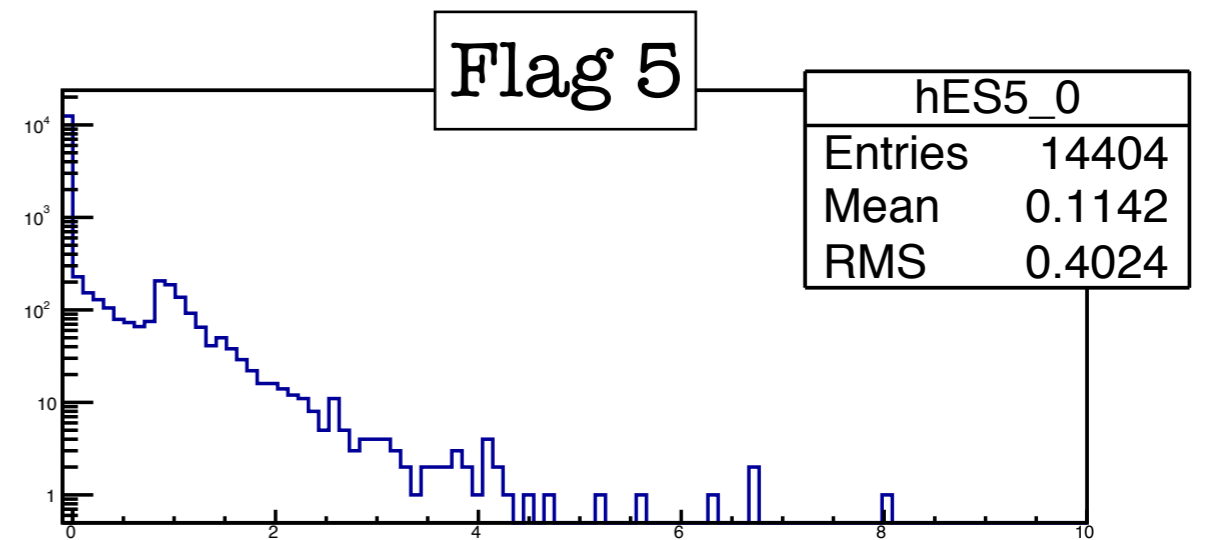
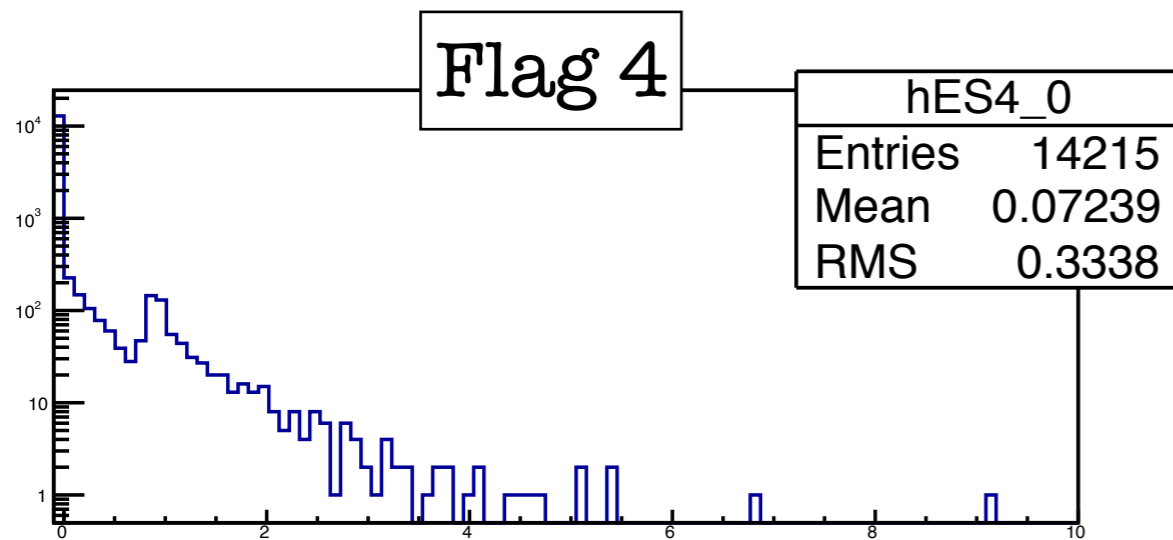
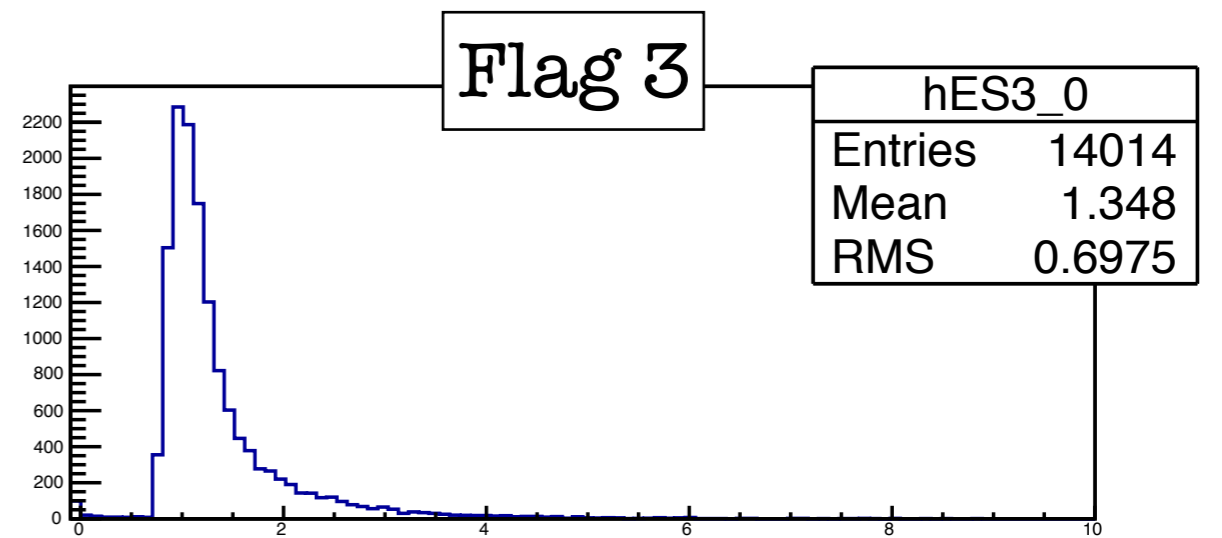
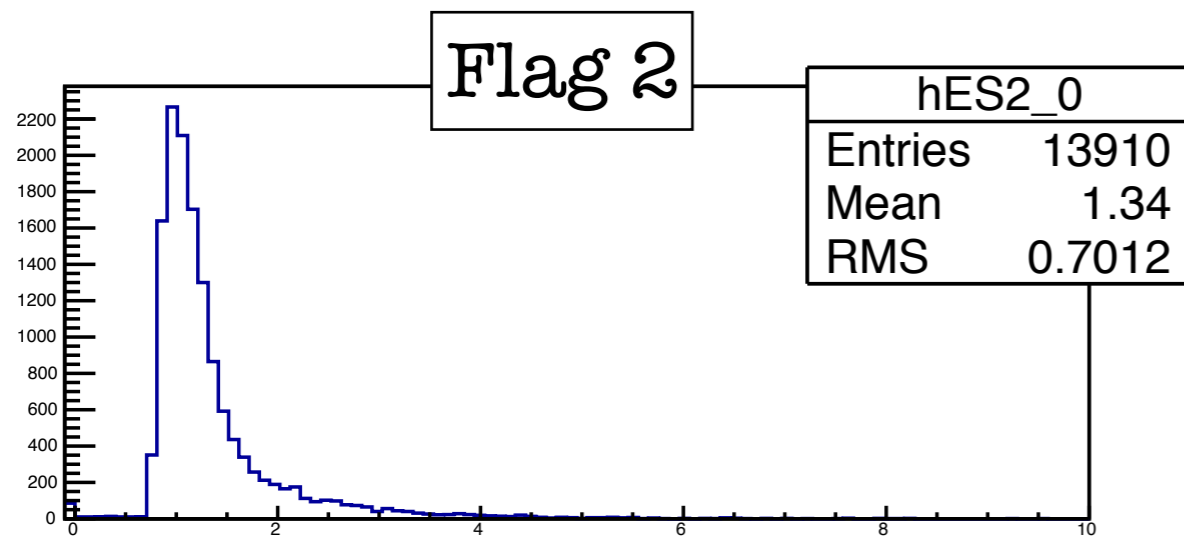
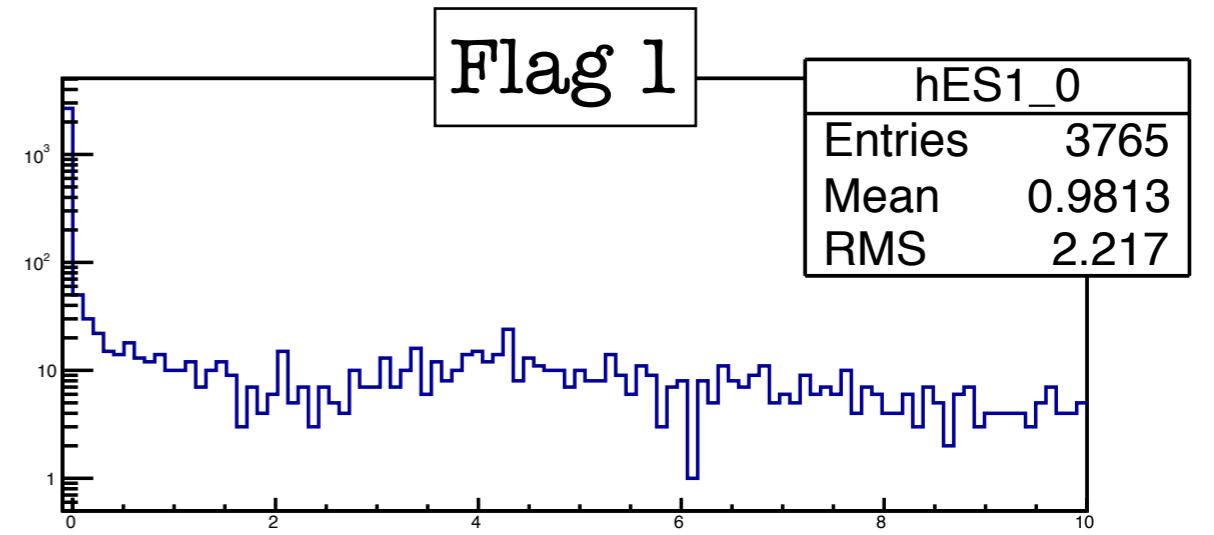
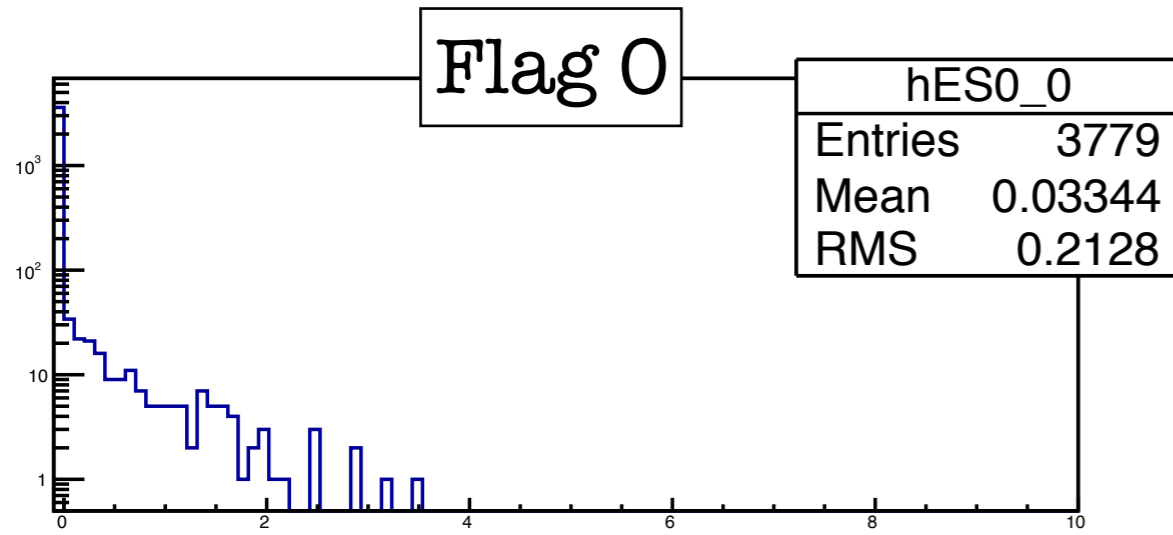
Module 0? Module 2?

Cosmicray tracking by using CC04

Hit
Veto

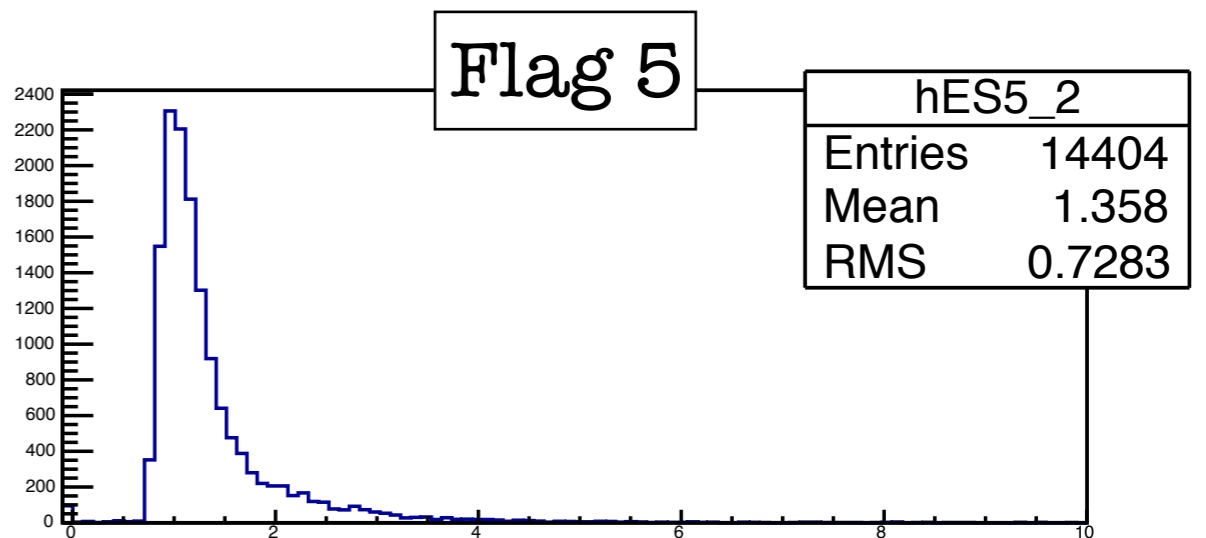
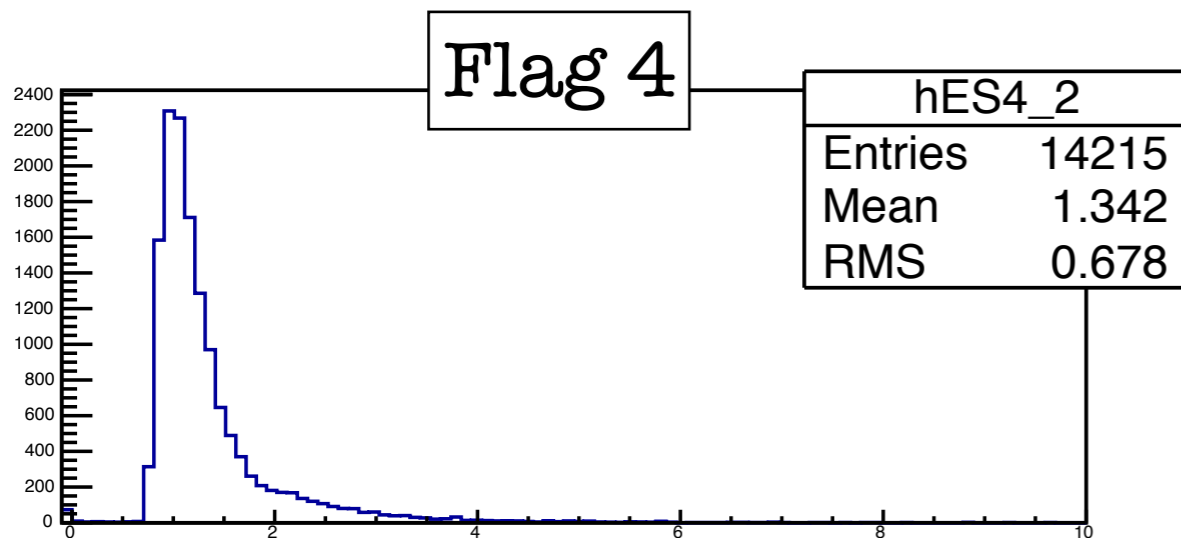
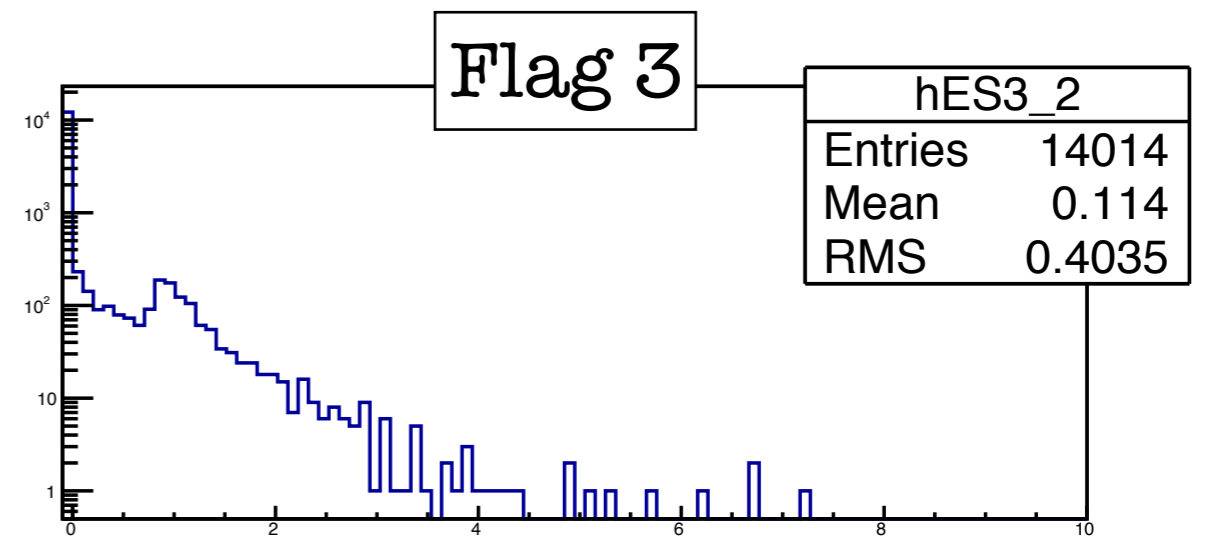
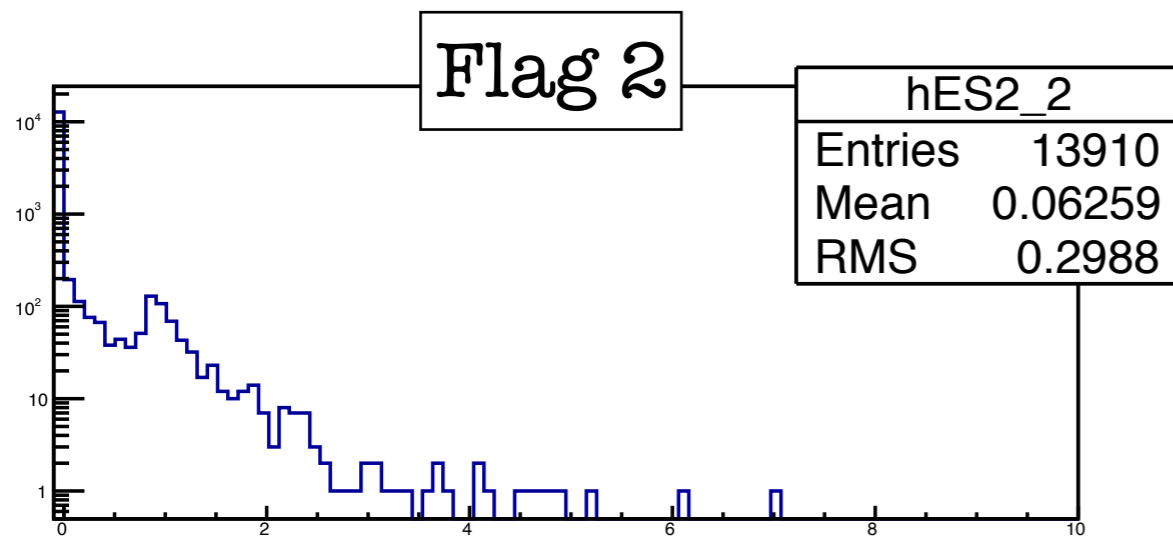
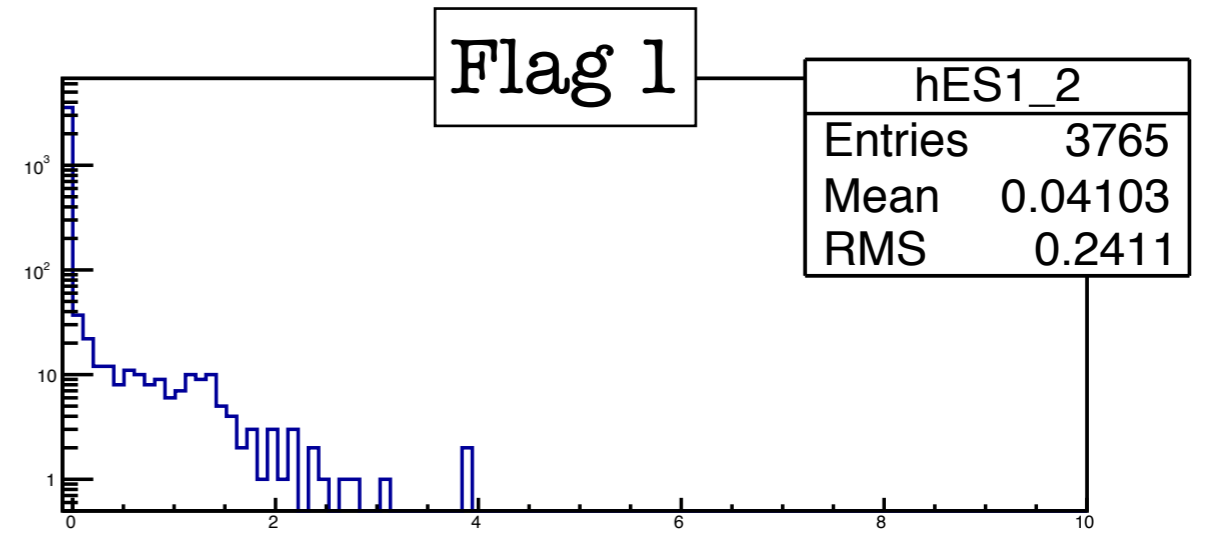
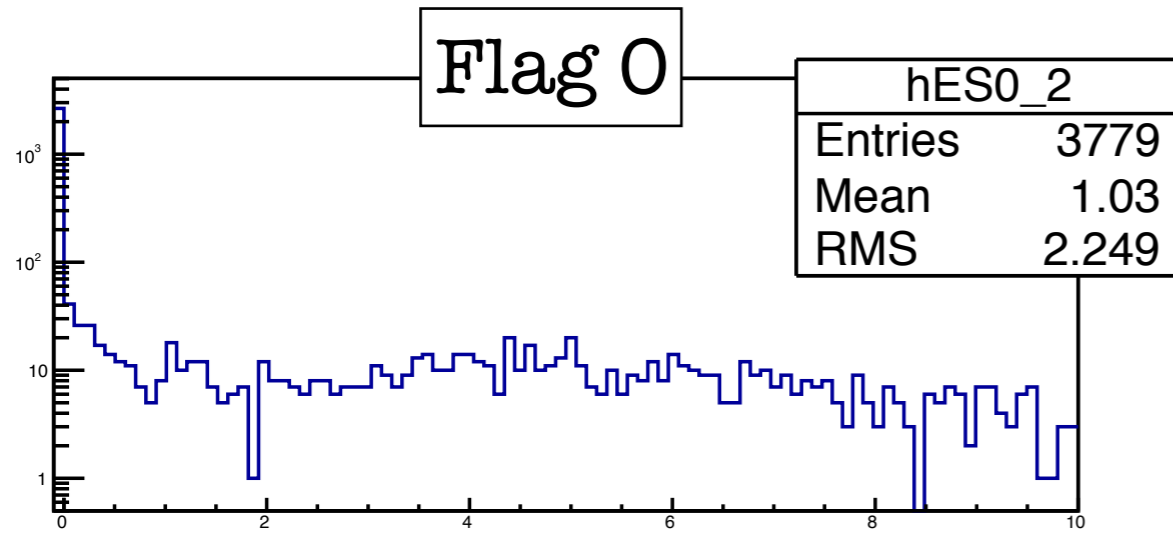


DCVEne Distribution(Module 0)



Energy[MeV]

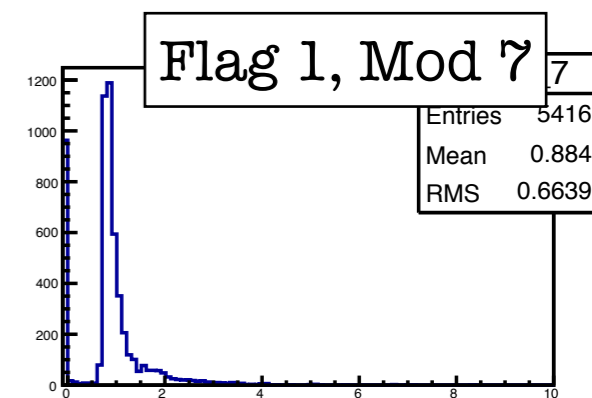
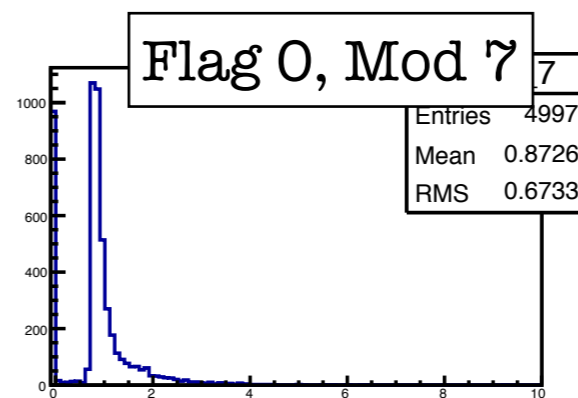
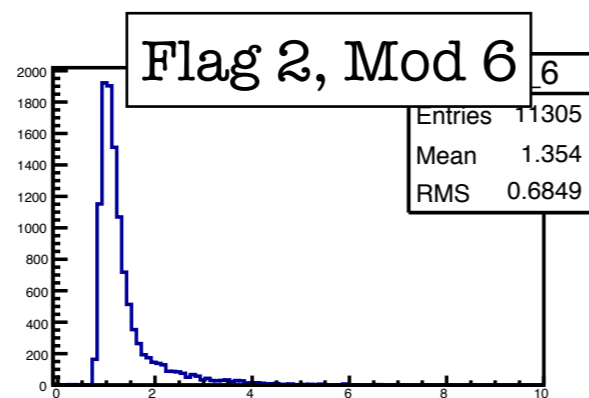
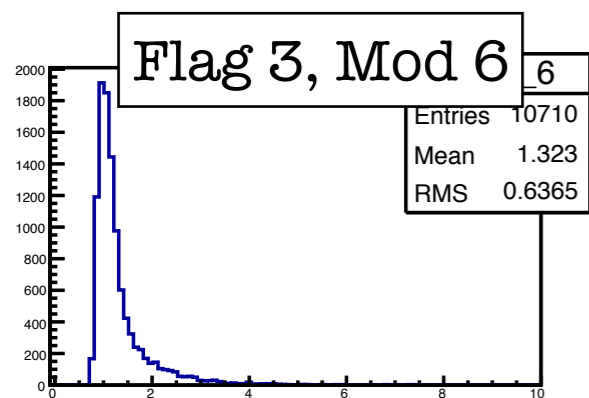
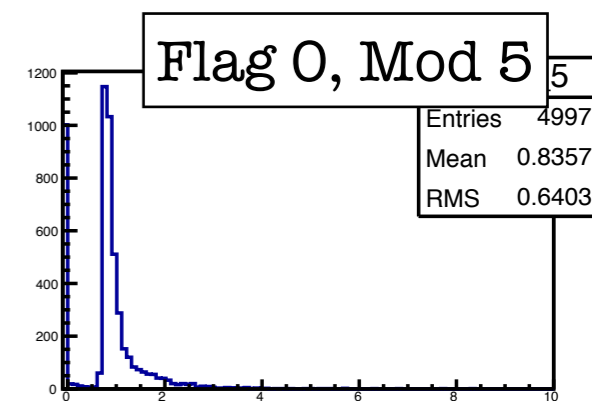
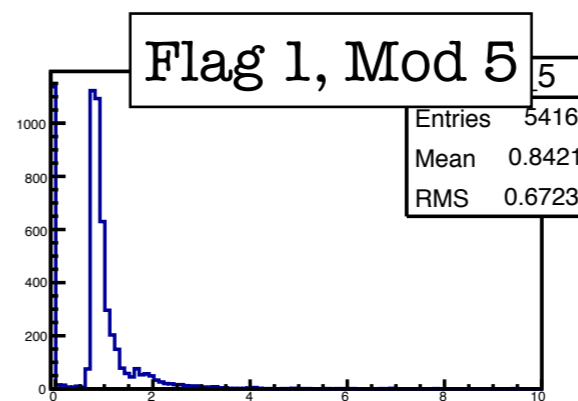
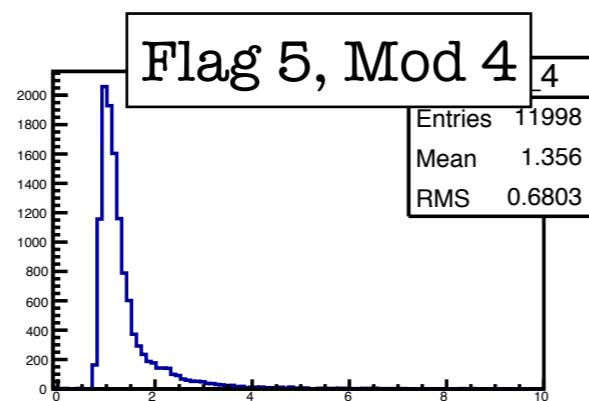
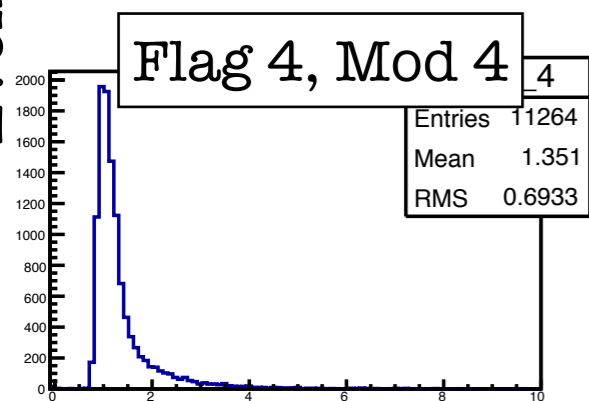
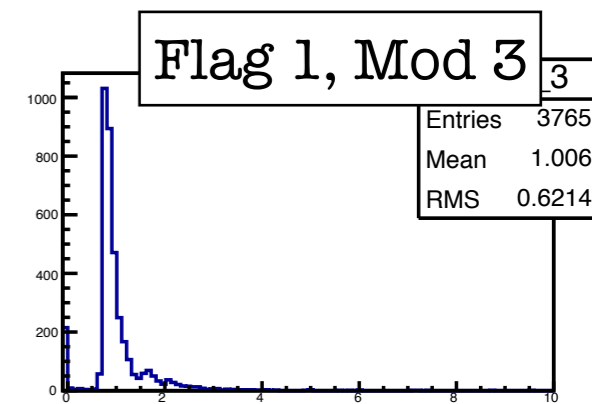
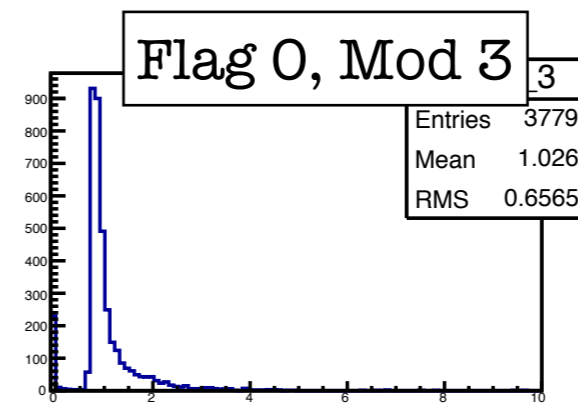
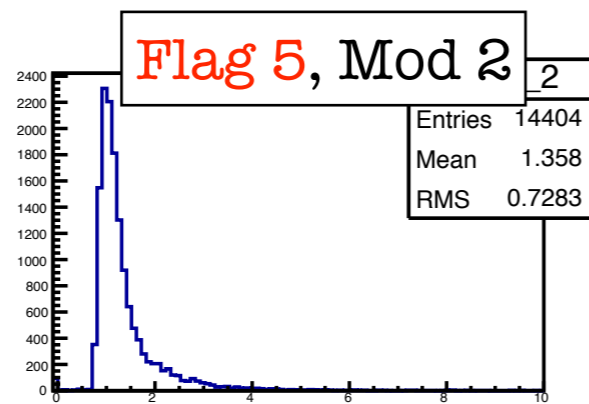
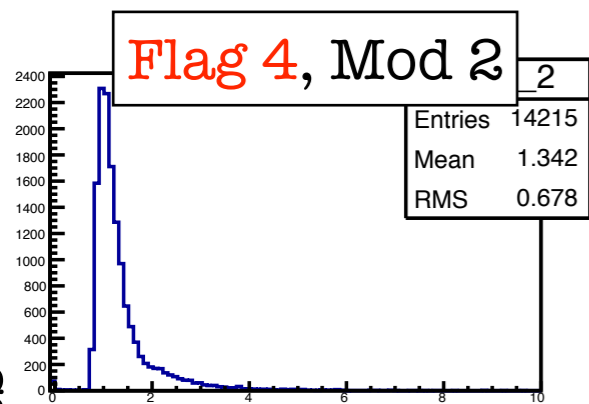
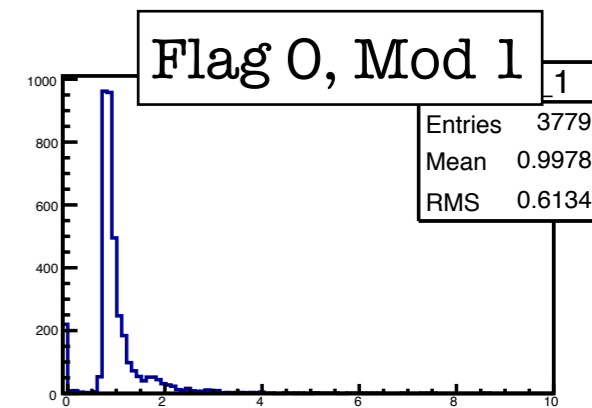
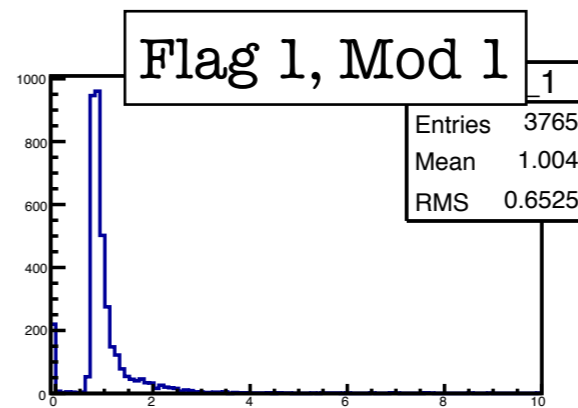
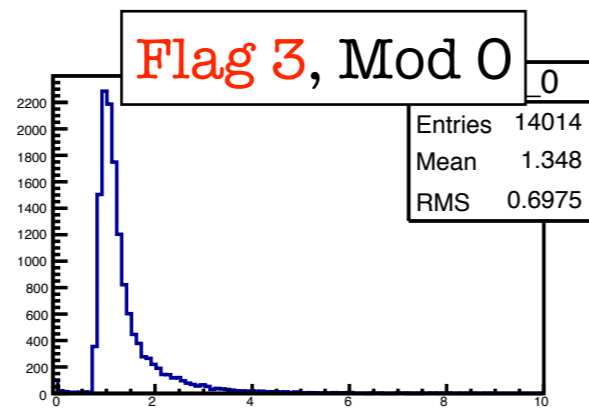
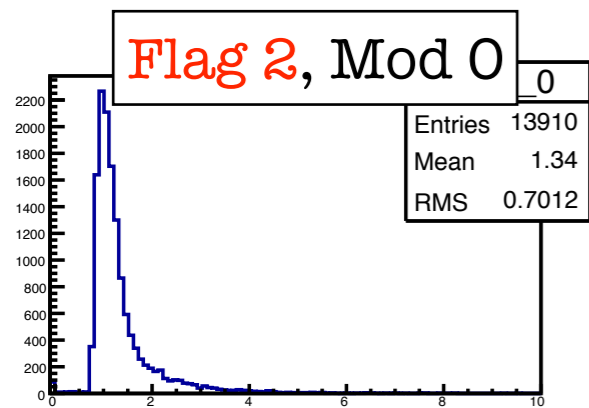
DCVEne Distribution(Module 2)



- Module0 and Module2 seem to have changed their x-position.

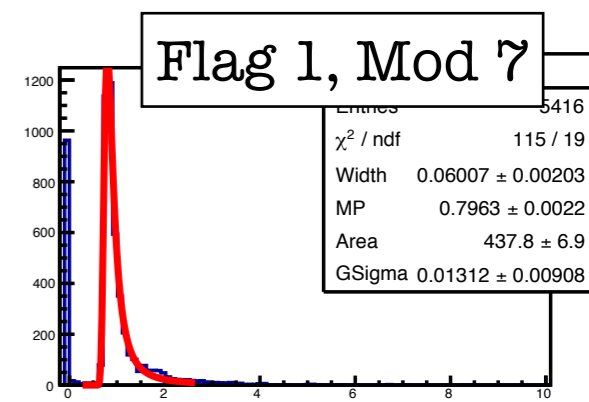
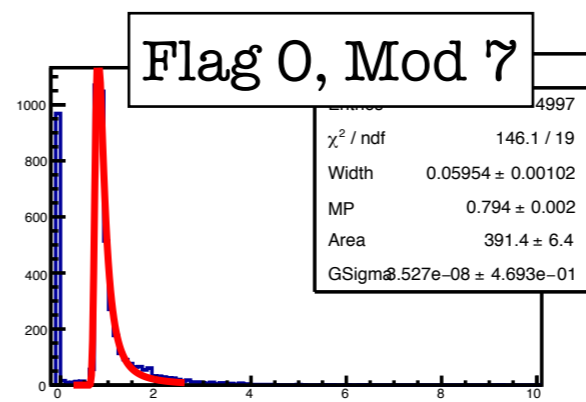
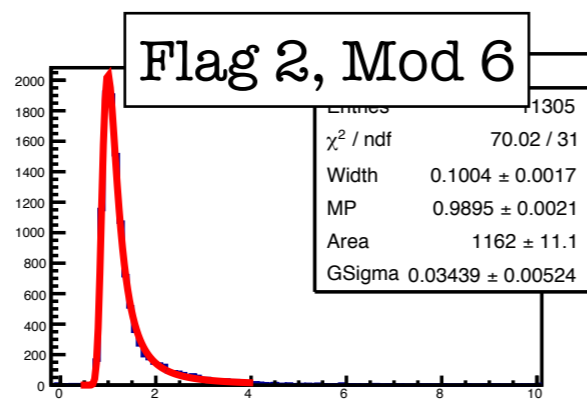
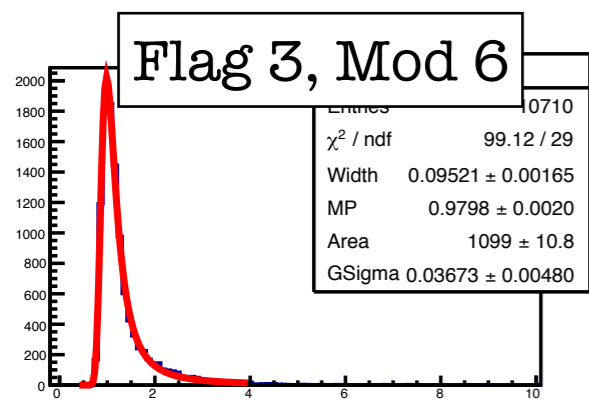
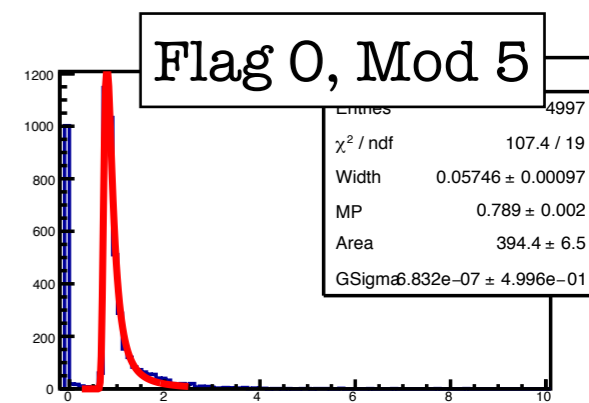
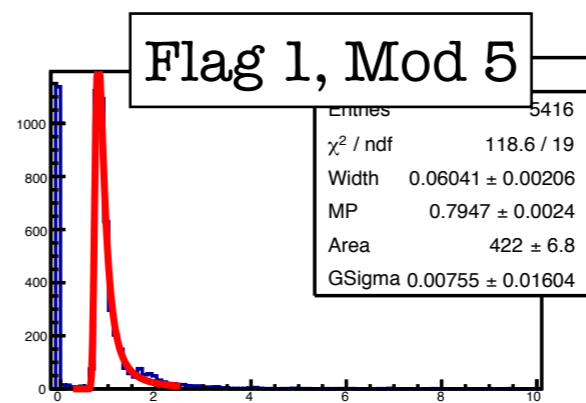
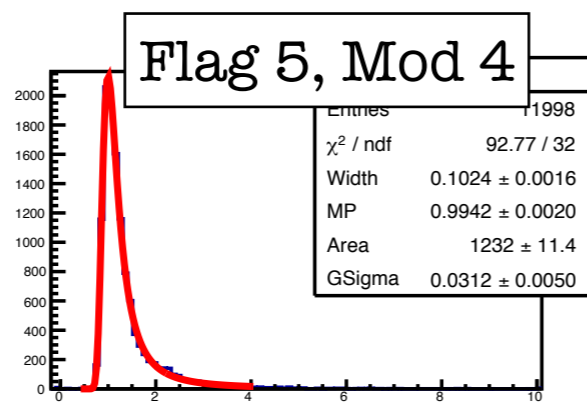
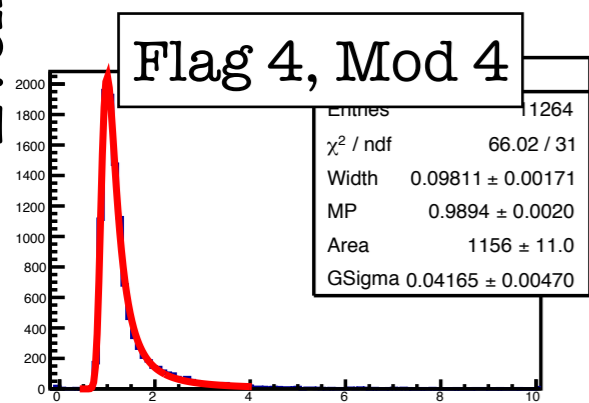
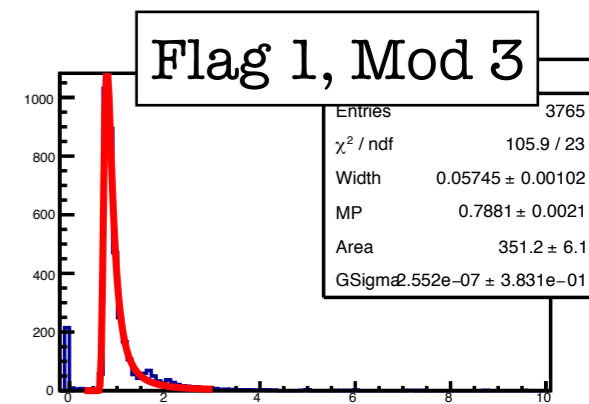
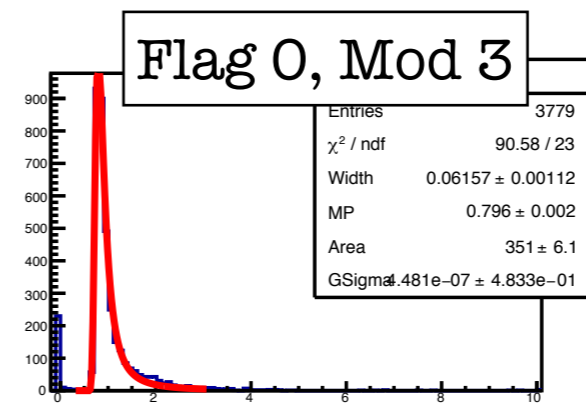
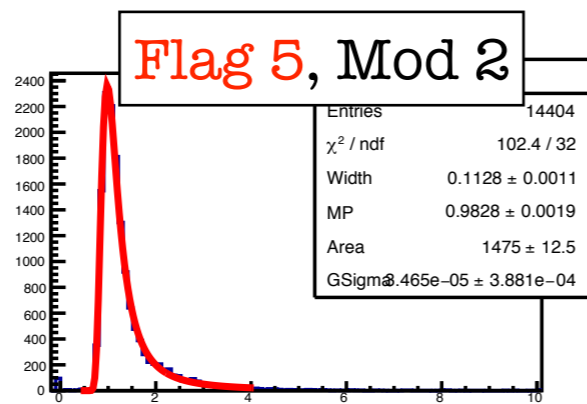
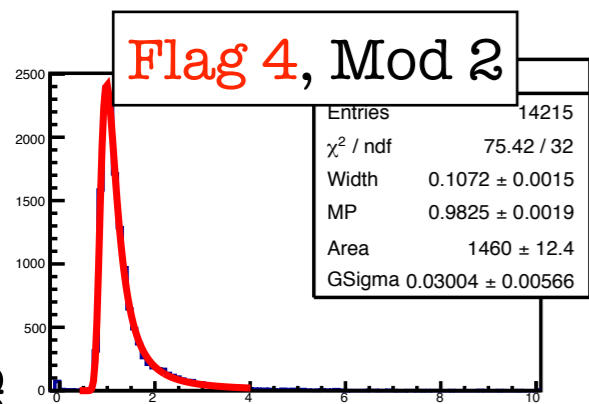
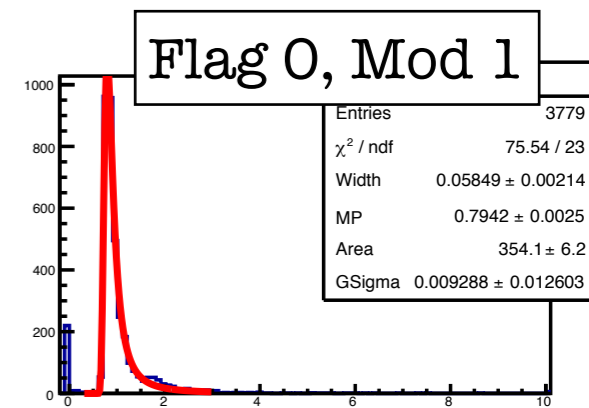
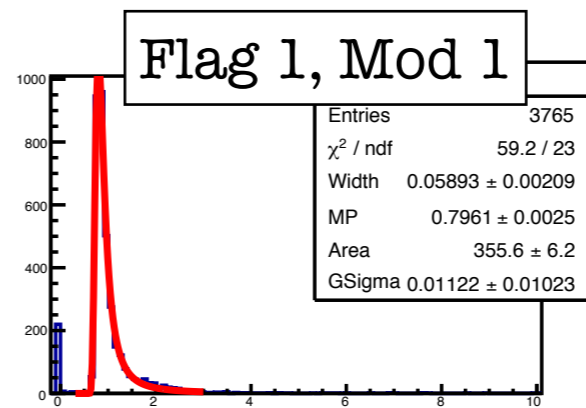
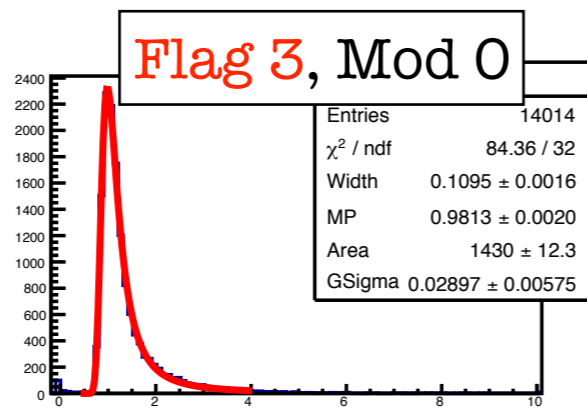
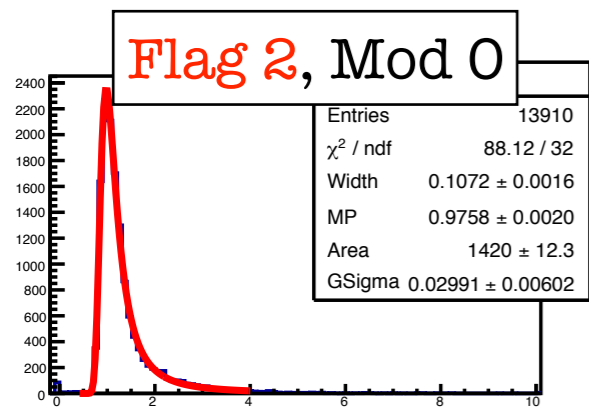
Energy[MeV]

DCVene Distribution at each **changed** flag number



Energy[MeV]

Fitting by Landau convoluted with Gaussian function



Energy[MeV]

MP Value from fitting

Flag : 2, Mod : 0 0.9758	Flag : 3, Mod : 0 0.9813	Flag : 1, Mod : 1 0.7961	Flag : 0, Mod : 1 0.7942
Flag : 4, Mod : 2 0.9825	Flag : 5, Mod : 2 0.9828	Flag : 0, Mod : 3 0.796	Flag : 1, Mod : 3 0.7881
Flag : 4, Mod : 4 0.9894	Flag : 5, Mod : 4 0.9942	Flag : 1, Mod : 5 0.7947	Flag : 0, Mod : 5 0.789
Flag : 3, Mod : 6 0.9798	Flag : 2, Mod : 6 0.9895	Flag : 0, Mod : 7 0.794	Flag : 1, Mod : 7 0.7963

DCV1	0.9806	0.7936
DCV2	0.9882	0.7935

What does the MP value mean?

DCV1

DCV2

Flag 2, 3, 4, 5 Flag 0, 1

Flag 2, 3, 4, 5 Flag 0, 1



0.9806

0.7936

0.9882

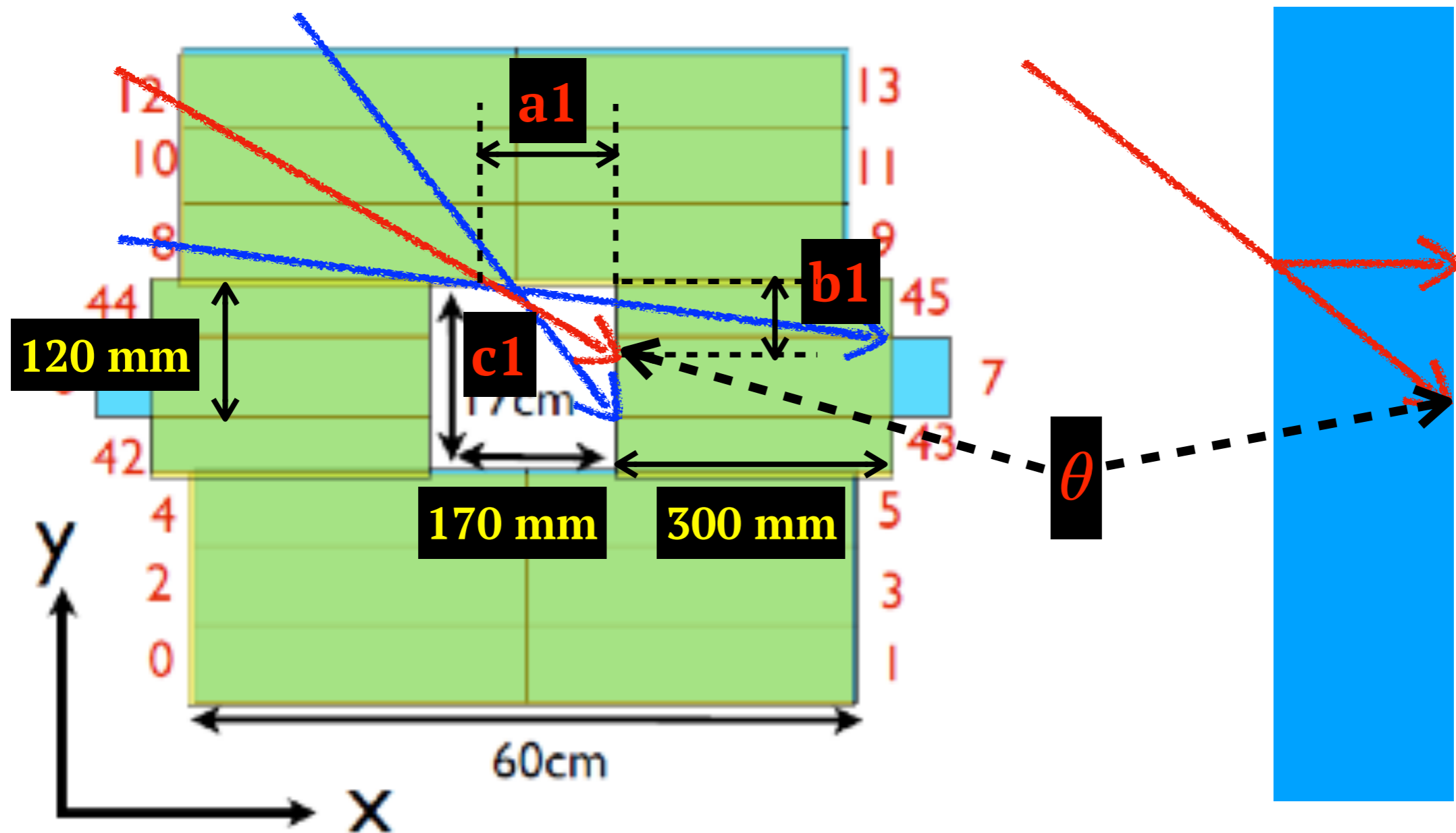
0.7935

Path length Correction Factor

$$\begin{aligned} &0.7936 / 0.9806 \\ &= 0.8093 \end{aligned}$$

$$\begin{aligned} &0.7935 / 0.9882 \\ &= 0.8030 \end{aligned}$$

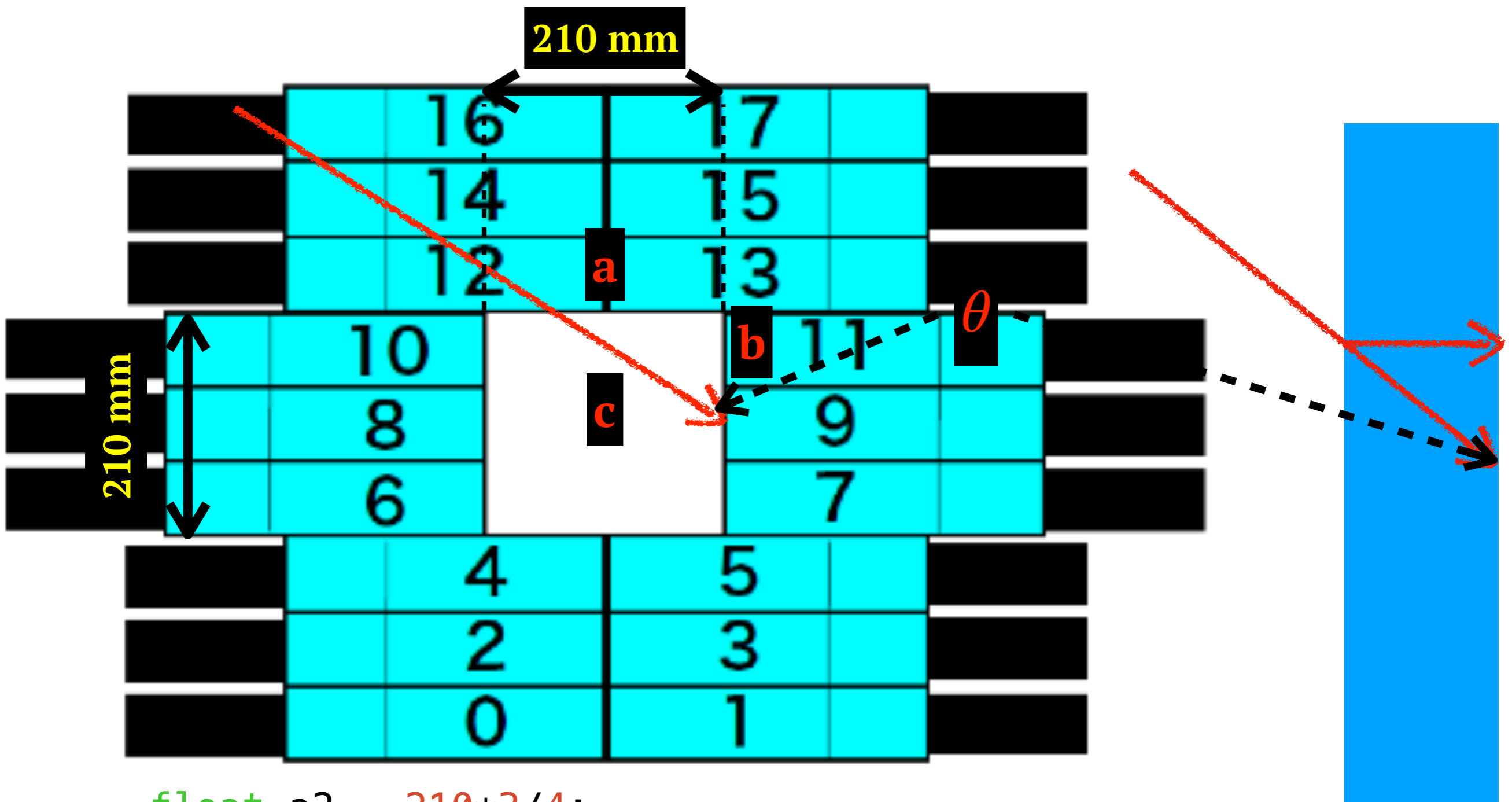
Path length(DCV1)



```
float a1 = 170*3/4;  
float x = 5*17/317;  
float b1 = (x+120)/2;  
float c1 = sqrt((a1*a1)+(b1*b1));  
float sin1 = a1/c1;
```

sin1 : 0.904172

Path length(DCV2)



```
float a2 = 210*3/4;  
float b2 = 210/2;  
float c2 = sqrt((a2*a2)+(b2*b2));  
  
float sin2 = a2/c2;
```

sin2 : 0.831235

Path length correction factor

	Calculation from tracking angle	Calculation from MC simulation result
DCV1	0.904172	0.8093
DCV2	0.831235	0.8030

```
float a1 = 170*3/4;  
float x = 5*17/317;  
float b1 = (x+120)/2;  
float c1 = sqrt((a1*a1)+(b1*b1));  
float sin1 = a1/c1;  
  
float a2 = 210*3/4;  
float b2 = 210/2;  
float c2 = sqrt((a2*a2)+(b2*b2));  
float sin2 = a2/c2;  
  
float path_length[32] = {sin1, sin1, sin1, sin1,  
                        1., 1., 1., 1.,  
                        sin1, sin1, sin1, sin1,  
                        1., 1., 1., 1.,  
                        sin2, sin2, sin2, sin2,  
                        1., 1., 1., 1.,  
                        sin2, sin2, sin2, sin2,  
                        1., 1., 1., 1. };
```



```
float plcf1 = 0.8093;  
// plcf1 = path length correction factor for dcv1  
float plcf2 = 0.8030;  
// plcf2 = path length correction factor for dcv2  
  
float path_length[32] = {plcf1, plcf1, plcf1, plcf1,  
                        1., 1., 1., 1.,  
                        plcf1, plcf1, plcf1, plcf1,  
                        1., 1., 1., 1.,  
                        plcf2, plcf2, plcf2, plcf2,  
                        1., 1., 1., 1.,  
                        plcf2, plcf2, plcf2, plcf2,  
                        1., 1., 1., 1. };
```

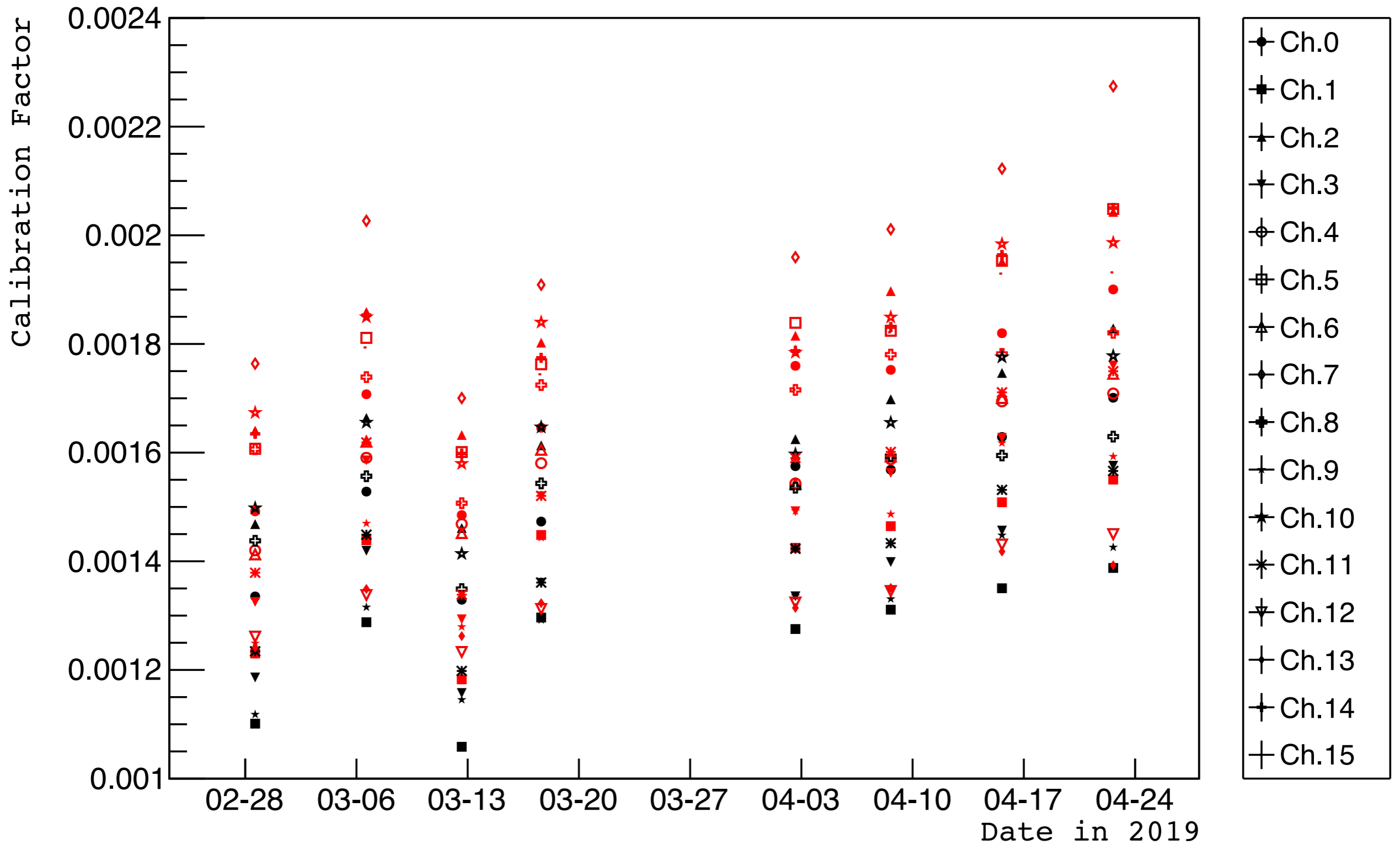
Calibration Factor for Period 0

```
*****
*   Row   * Instance * Calib_Fac *
*****
*       0 *         0 * 0.0013352 *
*       0 *         1 * 0.0011011 *
*       0 *         2 * 0.0014684 *
*       0 *         3 * 0.0011861 *
*       0 *         4 * 0.0014200 *
*       0 *         5 * 0.0016070 *
*       0 *         6 * 0.0014127 *
*       0 *         7 * 0.0017637 *
*       0 *         8 * 0.0014377 *
*       0 *         9 * 0.0011181 *
*       0 *        10 * 0.0014979 *
*       0 *        11 * 0.0012342 *
*       0 *        12 * 0.0012611 *
*       0 *        13 * 0.0012409 *
*       0 *        14 * 0.0016345 *
*       0 *        15 * 0.0015002 *
*       0 *        16 * 0.0020180 *
*       0 *        17 * 0.0016997 *
*       0 *        18 * 0.0018840 *
*       0 *        19 * 0.0017819 *
*       0 *        20 * 0.0019283 *
*       0 *        21 * 0.0020901 *
*       0 *        22 * 0.0022004 *
*       0 *        23 * 0.0021319 *
*       0 *        24 * 0.0019019 *
*       0 *        25 * 0.0023170 *
*       0 *        26 * 0.0022051 *
*       0 *        27 * 0.0023429 *
*       0 *        28 * 0.0018788 *
*       0 *        29 * 0.0018878 *
*       0 *        30 * 0.0022456 *
*       0 *        31 * 0.0021066 *
*****
```



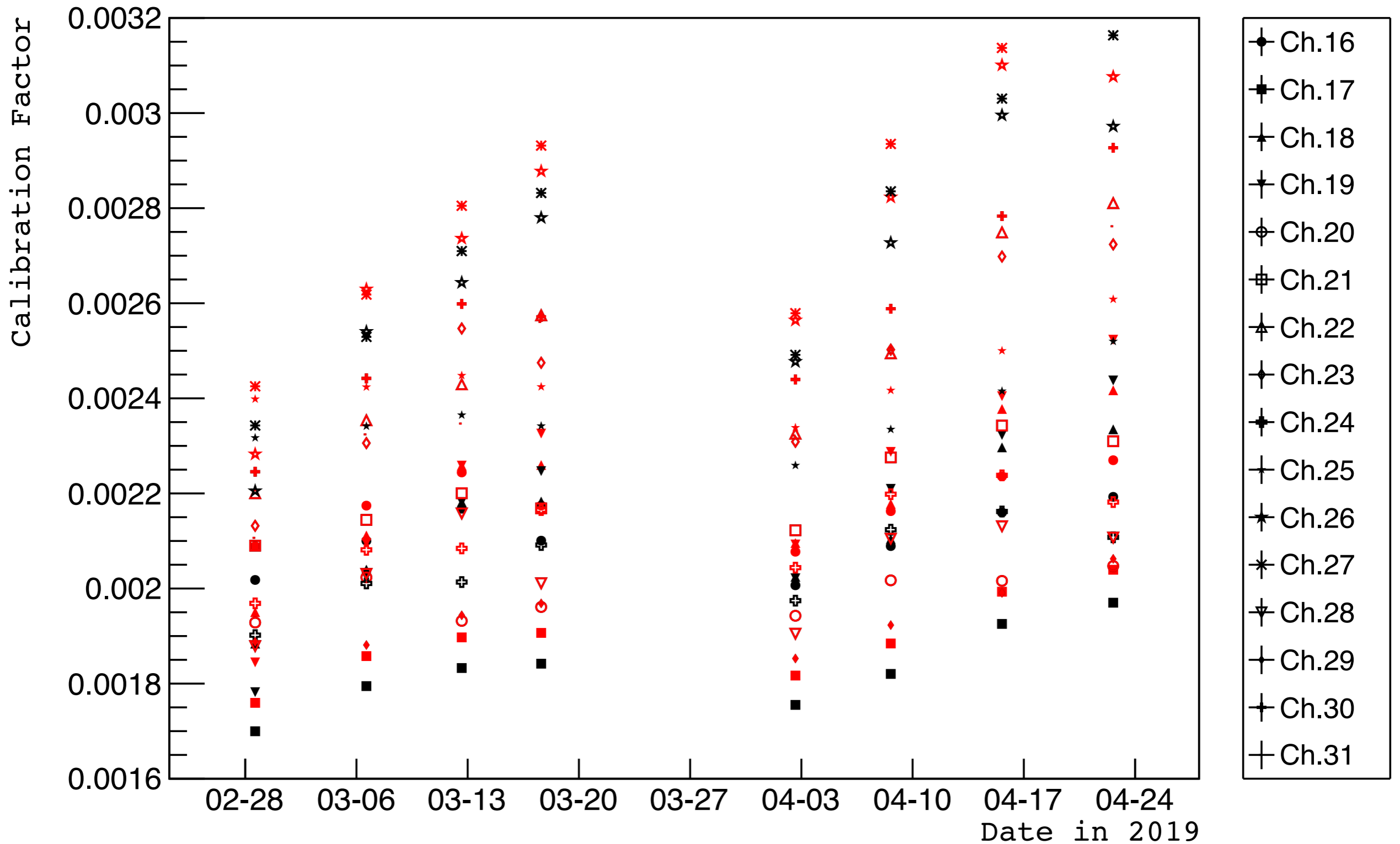
```
*****
*   Row   * Instance * Calib_Fac *
*****
*       0 *         0 * 0.0014918 *
*       0 *         1 * 0.0012302 *
*       0 *         2 * 0.0016405 *
*       0 *         3 * 0.0013251 *
*       0 *         4 * 0.0014200 *
*       0 *         5 * 0.0016070 *
*       0 *         6 * 0.0014127 *
*       0 *         7 * 0.0017637 *
*       0 *         8 * 0.0016062 *
*       0 *         9 * 0.0012491 *
*       0 *        10 * 0.0016735 *
*       0 *        11 * 0.0013789 *
*       0 *        12 * 0.0012611 *
*       0 *        13 * 0.0012409 *
*       0 *        14 * 0.0016345 *
*       0 *        15 * 0.0015002 *
*       0 *        16 * 0.0020889 *
*       0 *        17 * 0.0017595 *
*       0 *        18 * 0.0019503 *
*       0 *        19 * 0.0018446 *
*       0 *        20 * 0.0019283 *
*       0 *        21 * 0.0020901 *
*       0 *        22 * 0.0022004 *
*       0 *        23 * 0.0021319 *
*       0 *        24 * 0.0019687 *
*       0 *        25 * 0.0023985 *
*       0 *        26 * 0.0022826 *
*       0 *        27 * 0.0024253 *
*       0 *        28 * 0.0018788 *
*       0 *        29 * 0.0018878 *
*       0 *        30 * 0.0022456 *
*       0 *        31 * 0.0021066 *
*****
```

Calibration Factor by date time for DCV1



Black : Previous factor, Red : Applied the MC result

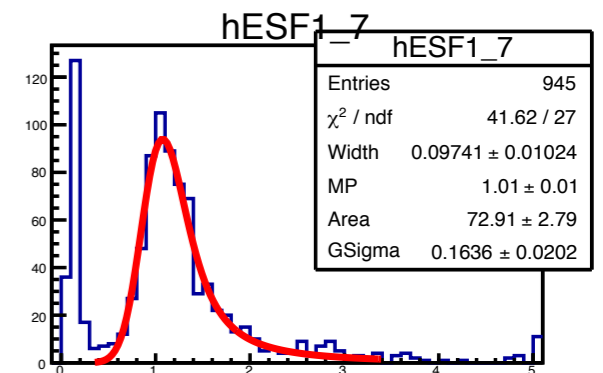
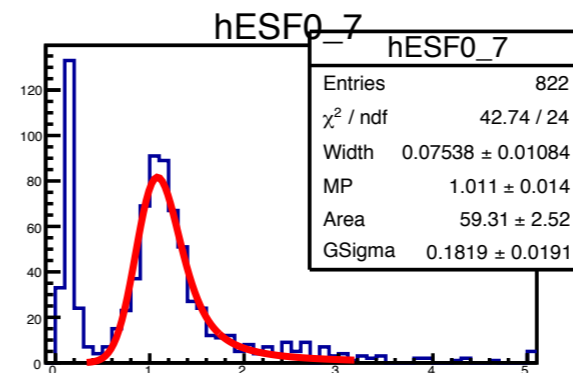
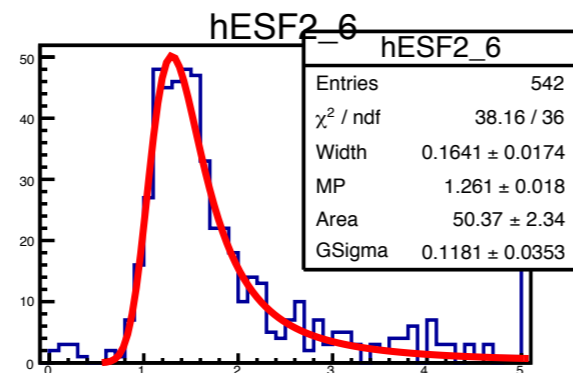
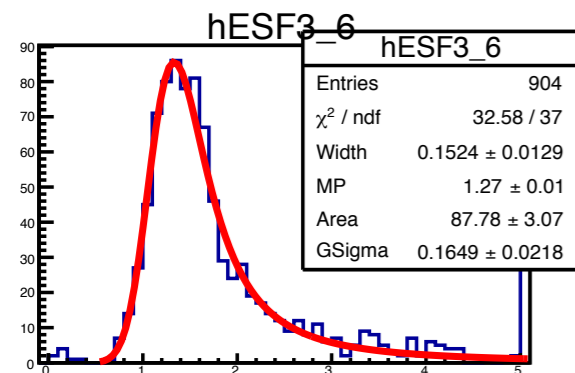
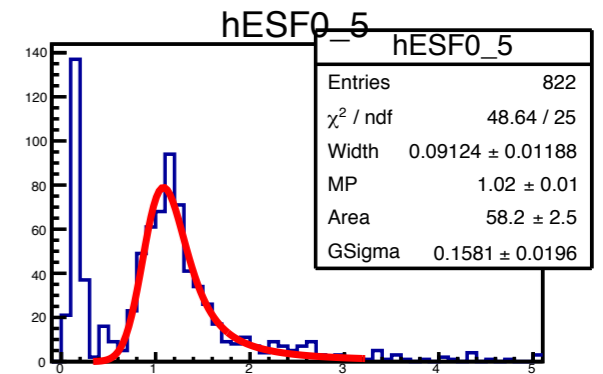
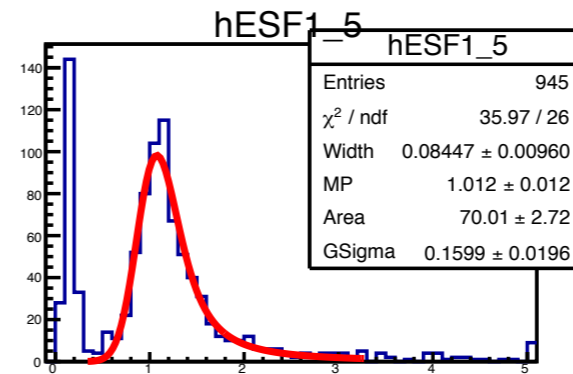
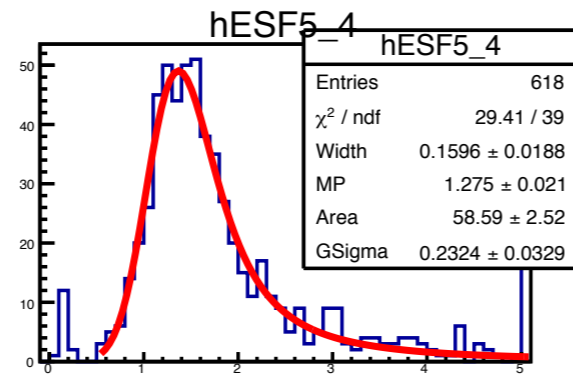
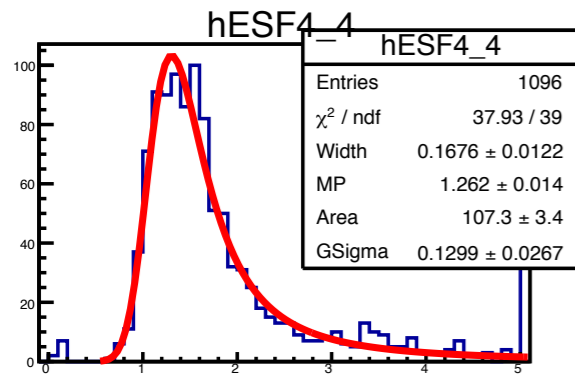
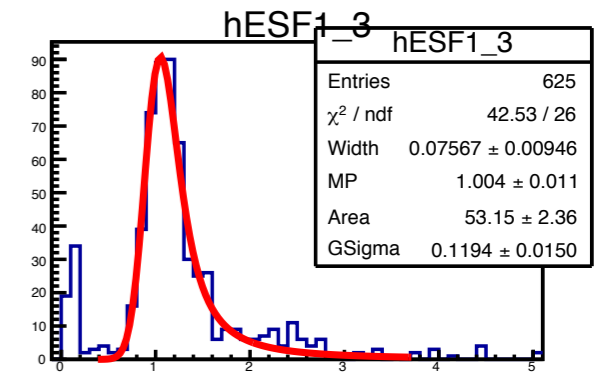
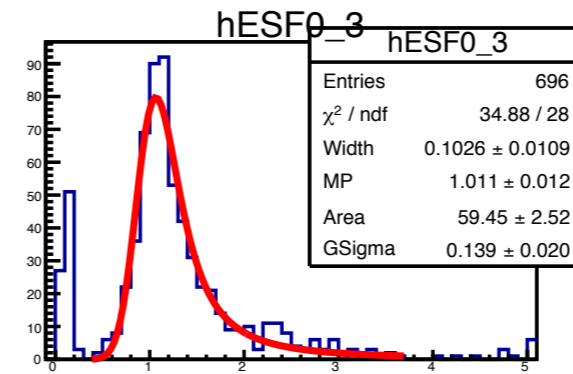
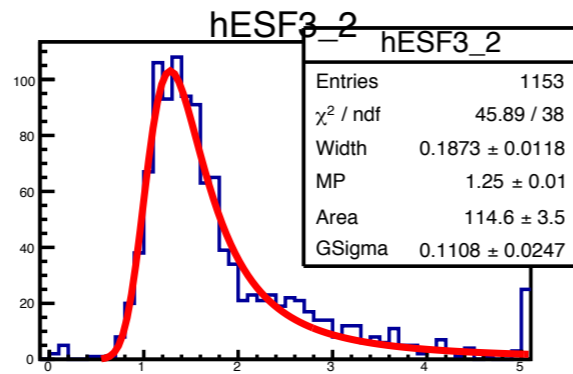
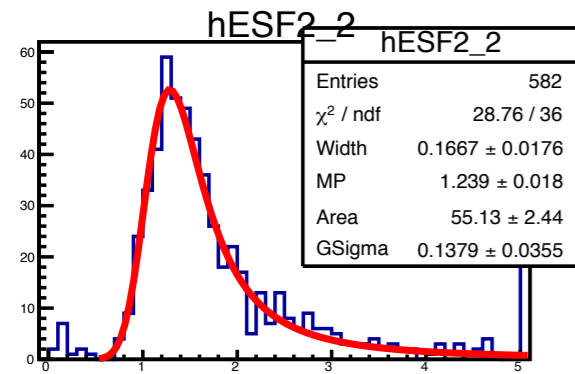
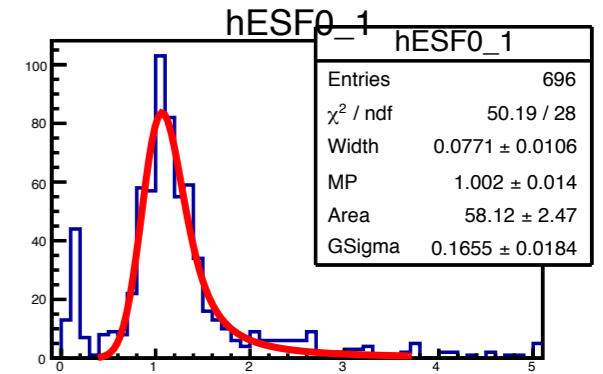
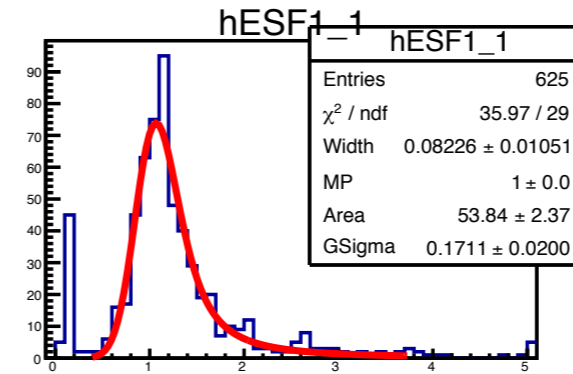
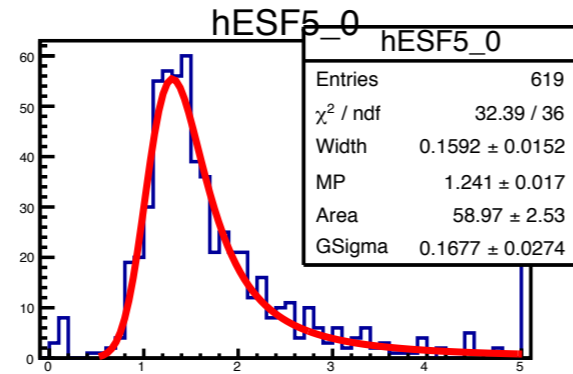
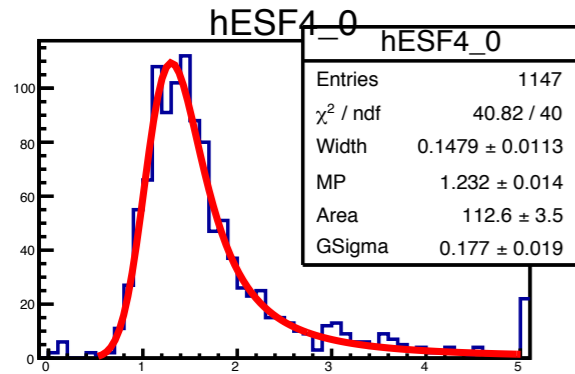
Calibration Factor by date time for DCV2



Black : Previous factor, Red : Applied the MC result

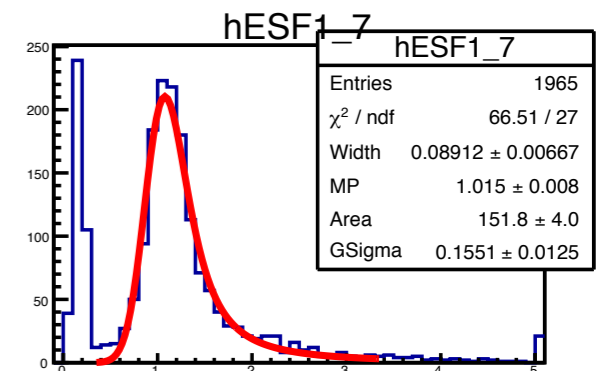
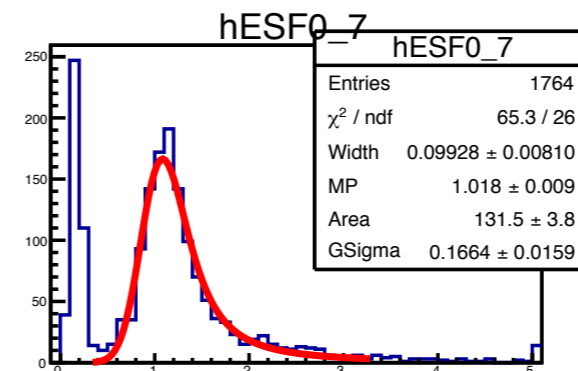
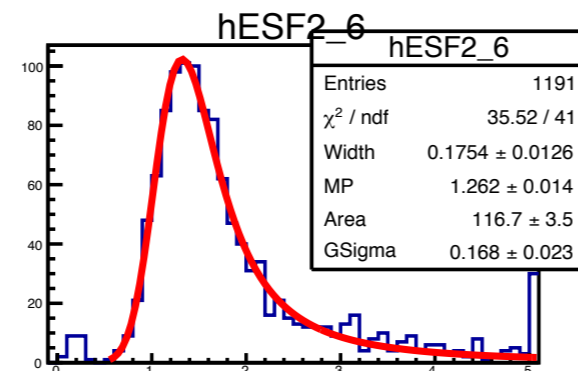
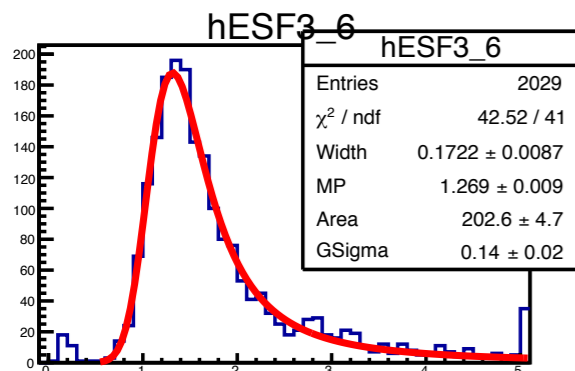
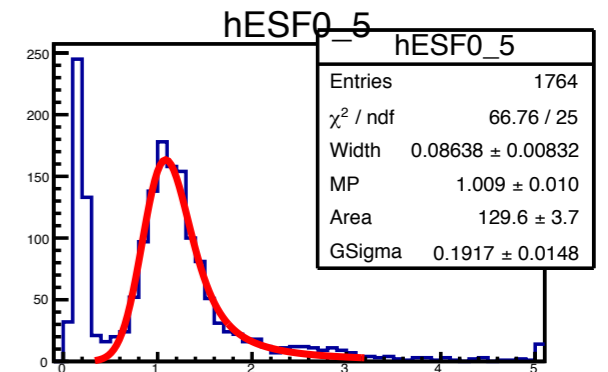
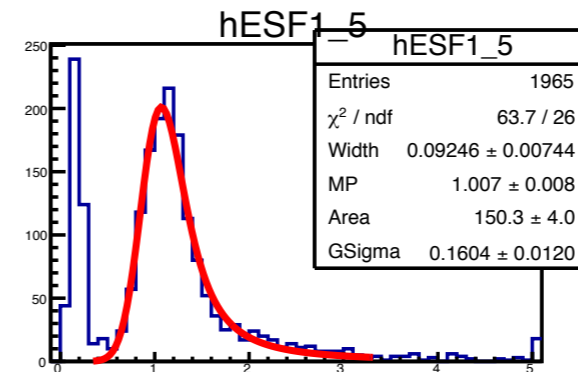
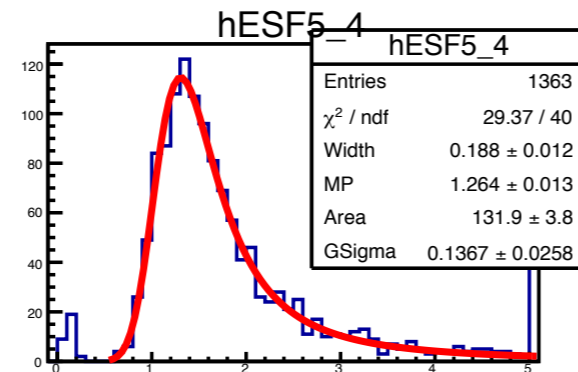
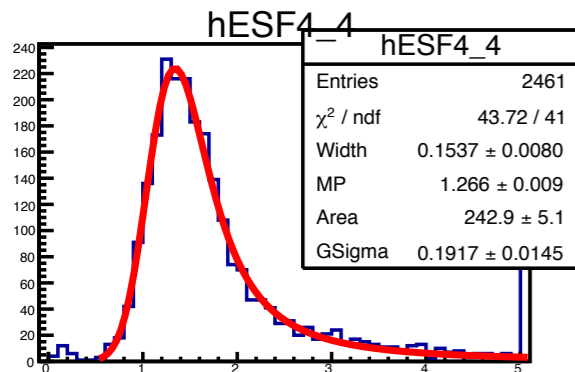
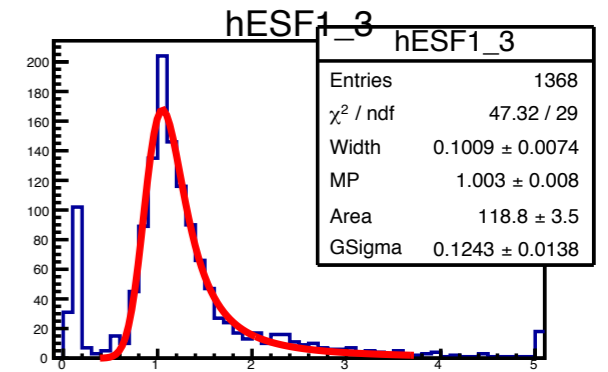
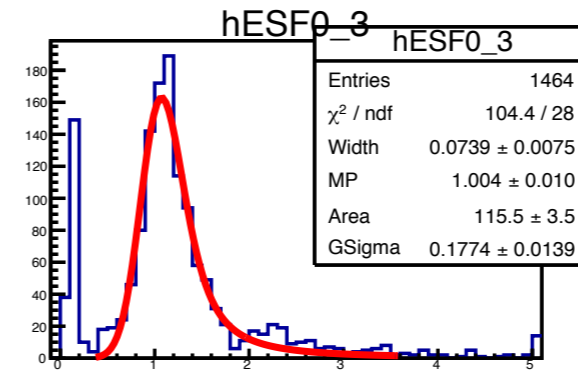
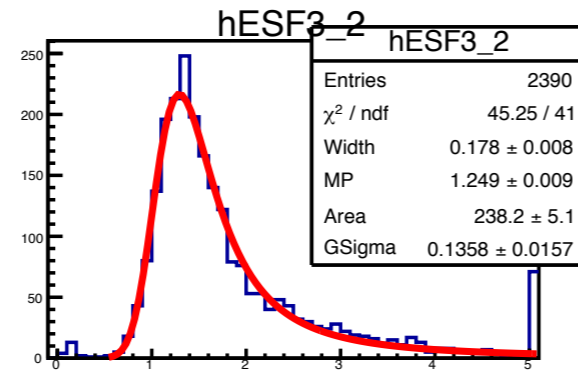
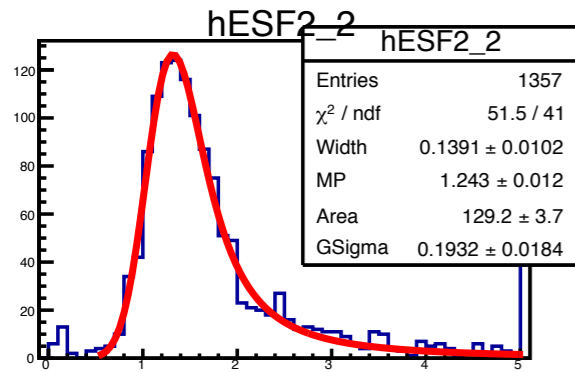
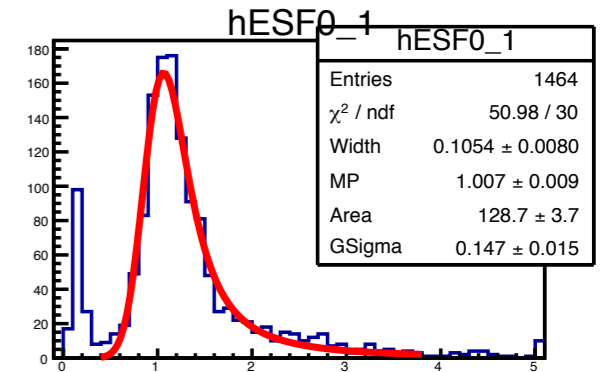
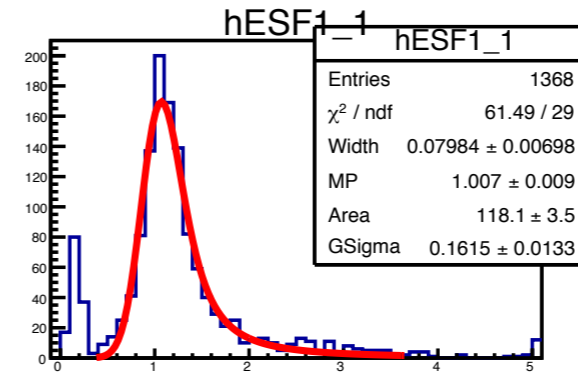
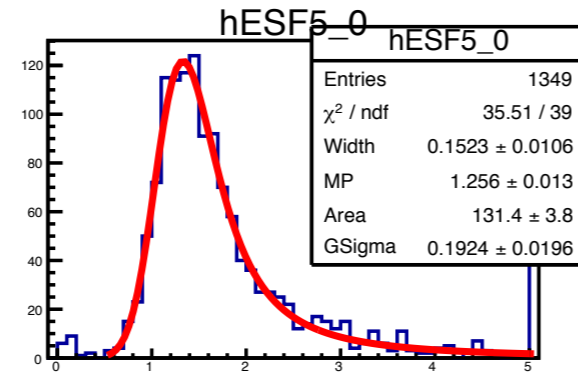
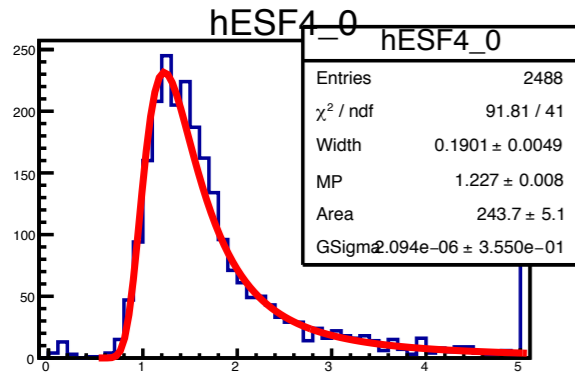
Final Fitting after applying new calibration factor.

Period 0



Final Fitting after applying new calibration factor.

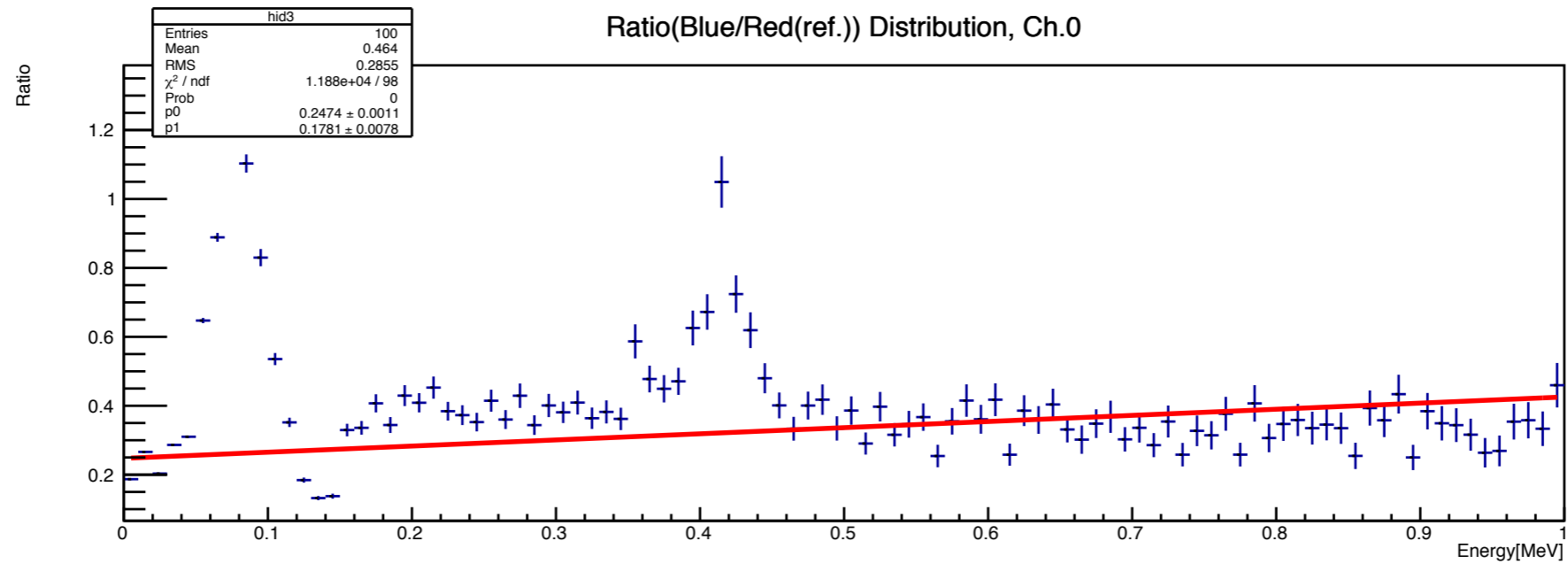
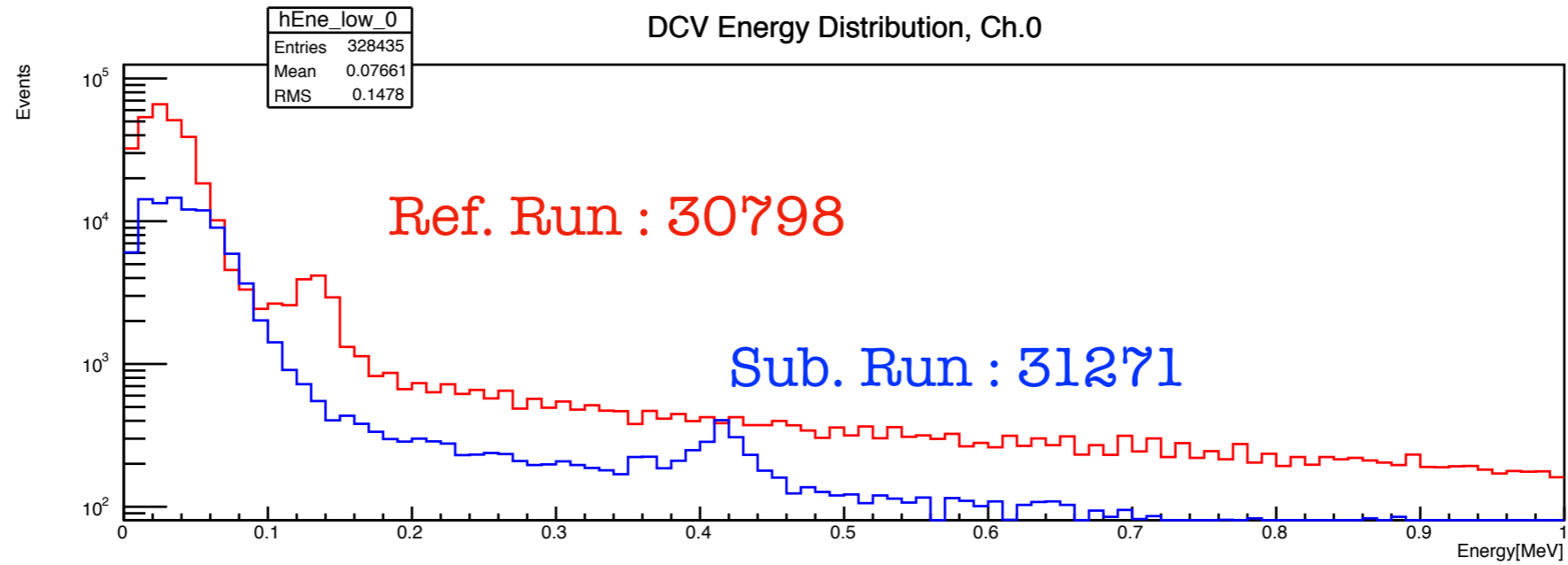
Period 6



Pulse Shape

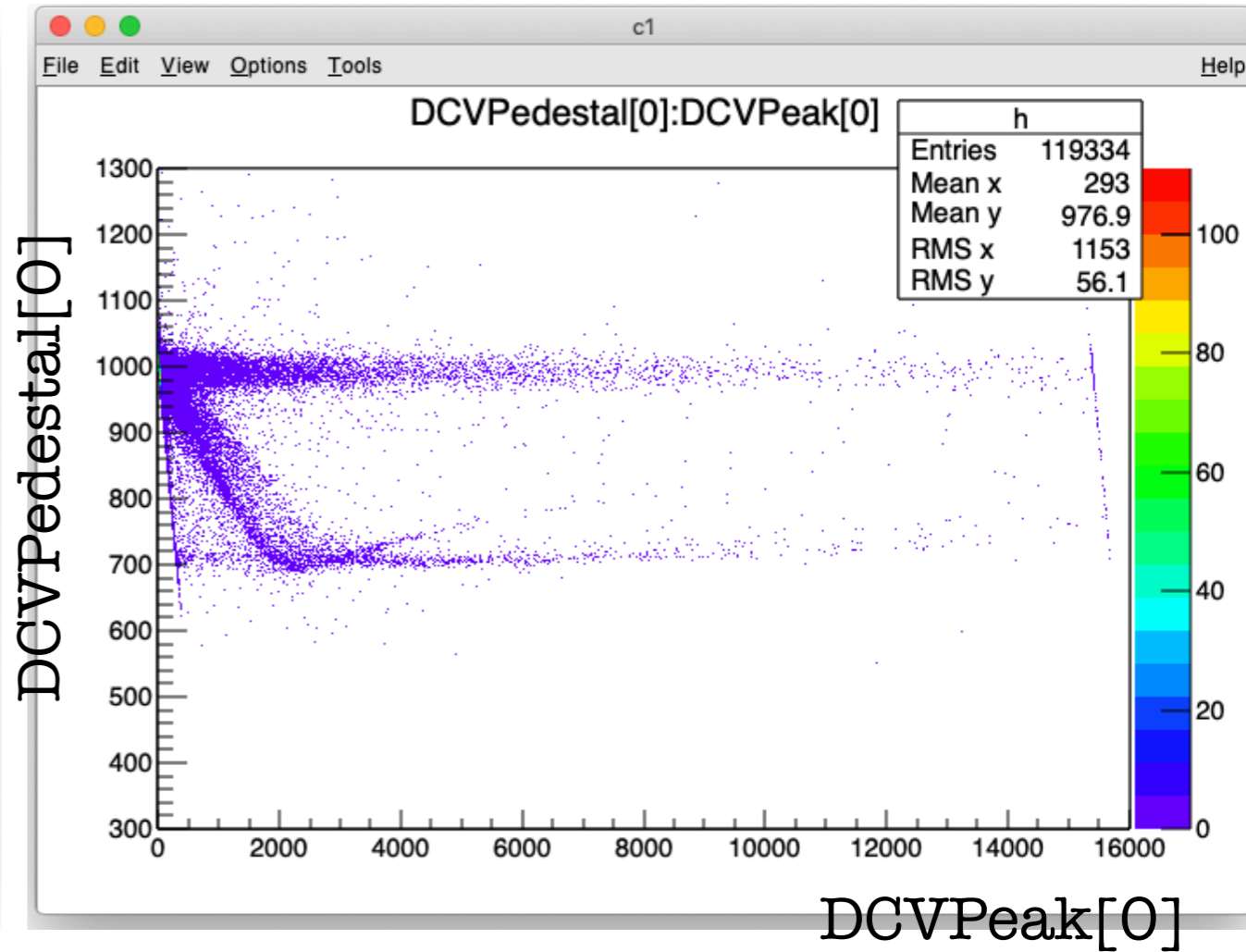
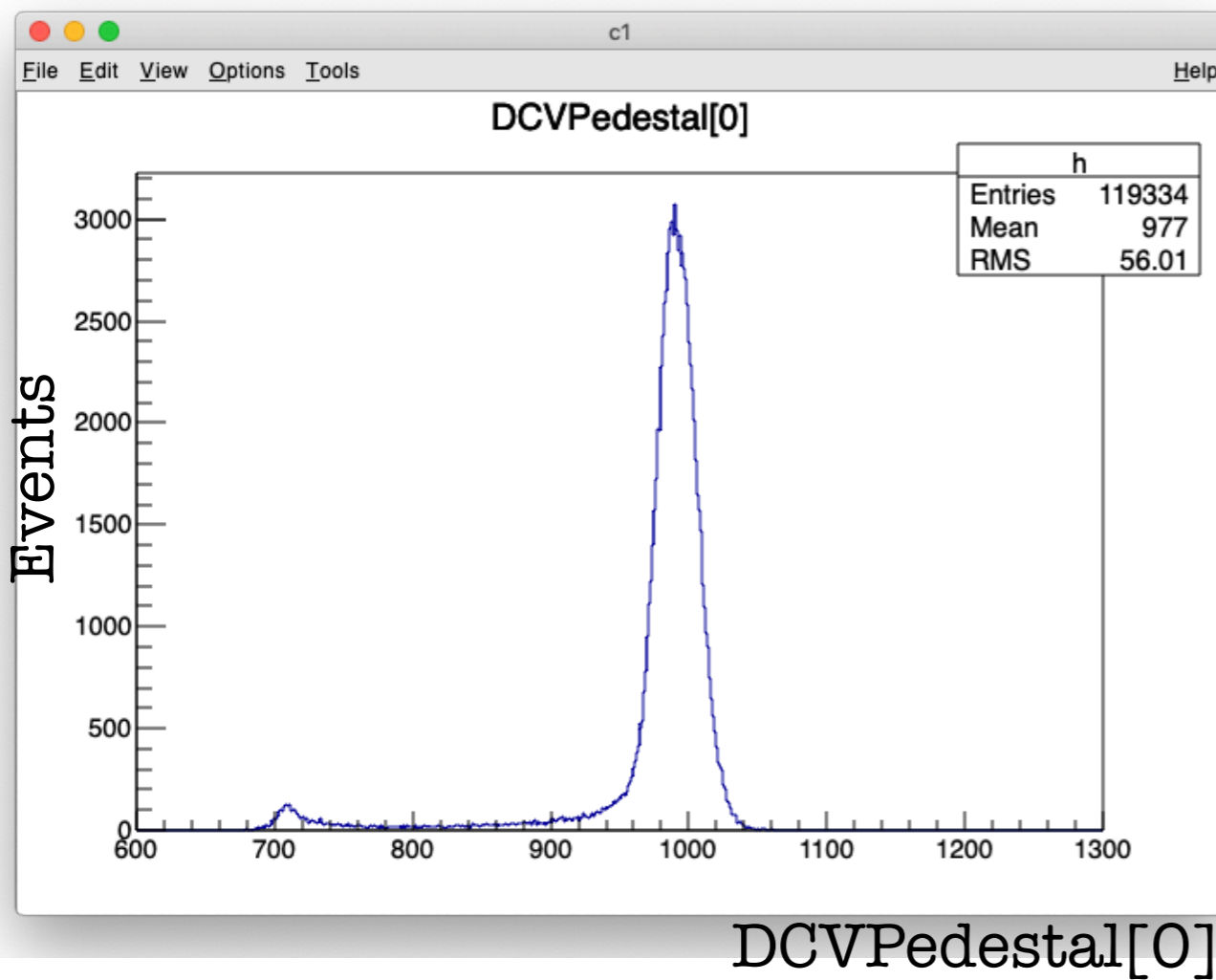
2 October, 2019
HongMin KIM

Comparing DCV Energy Distribution(DCV1,Ch.0)

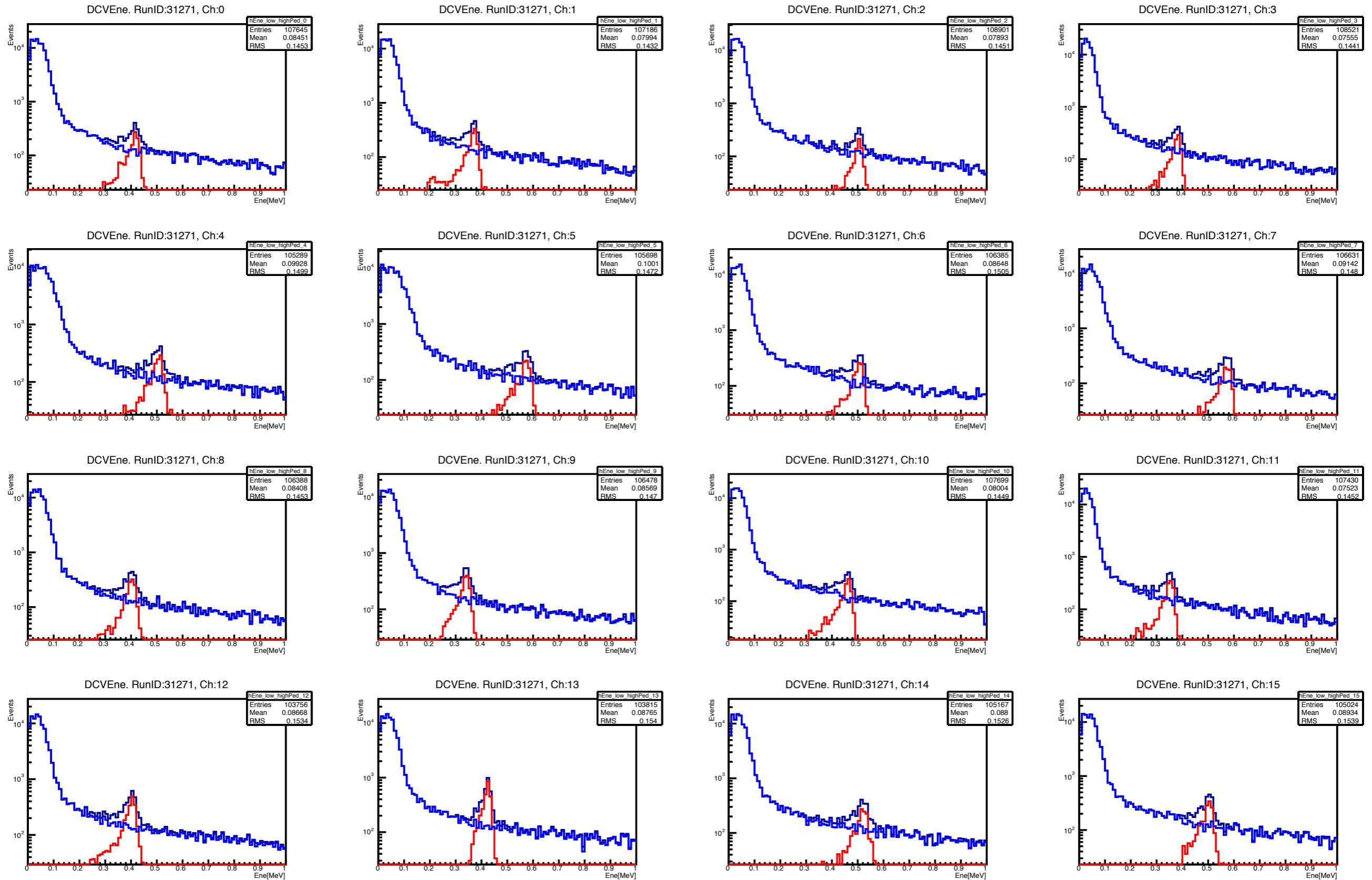


DCVPedestal Distribution

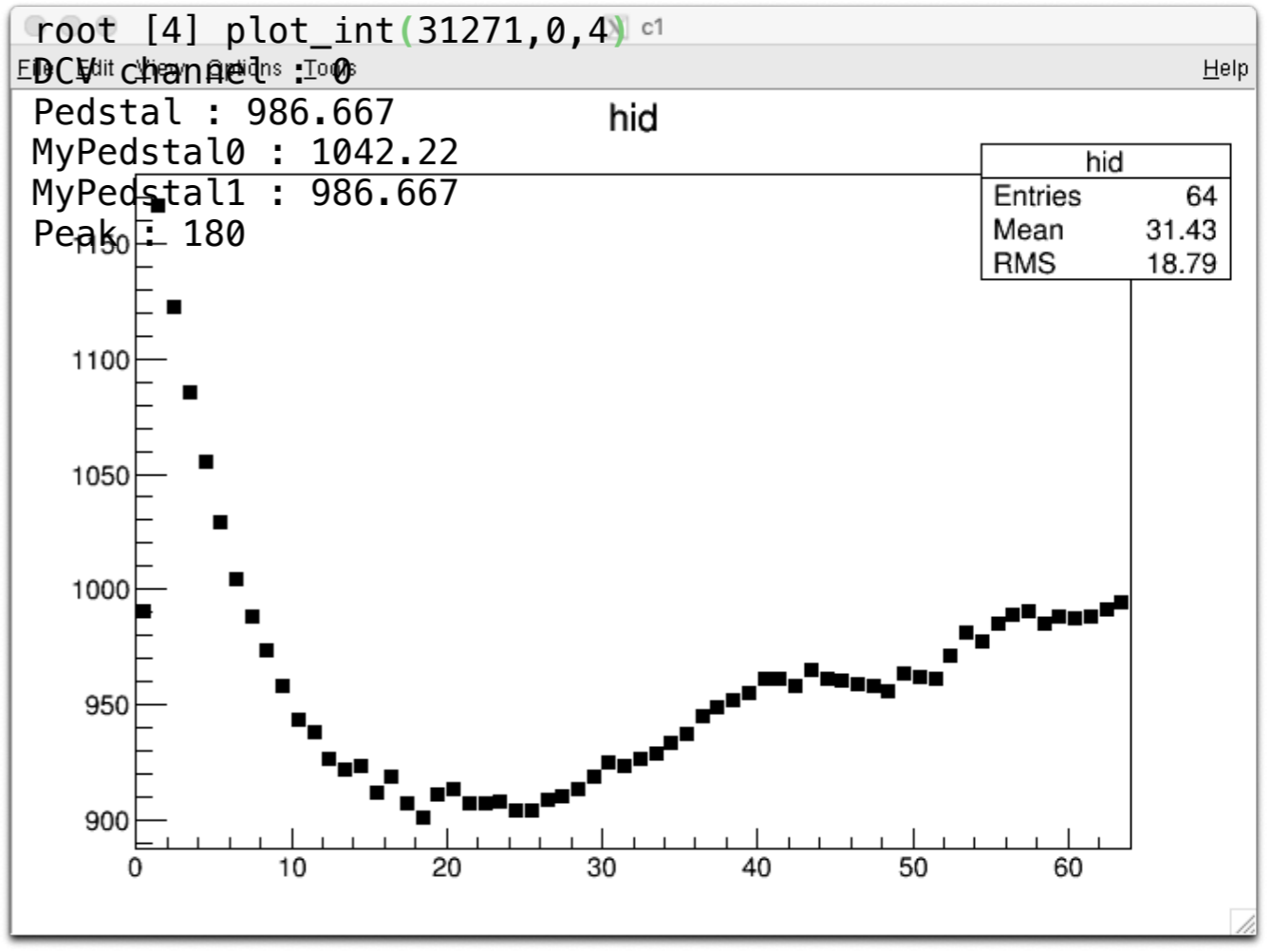
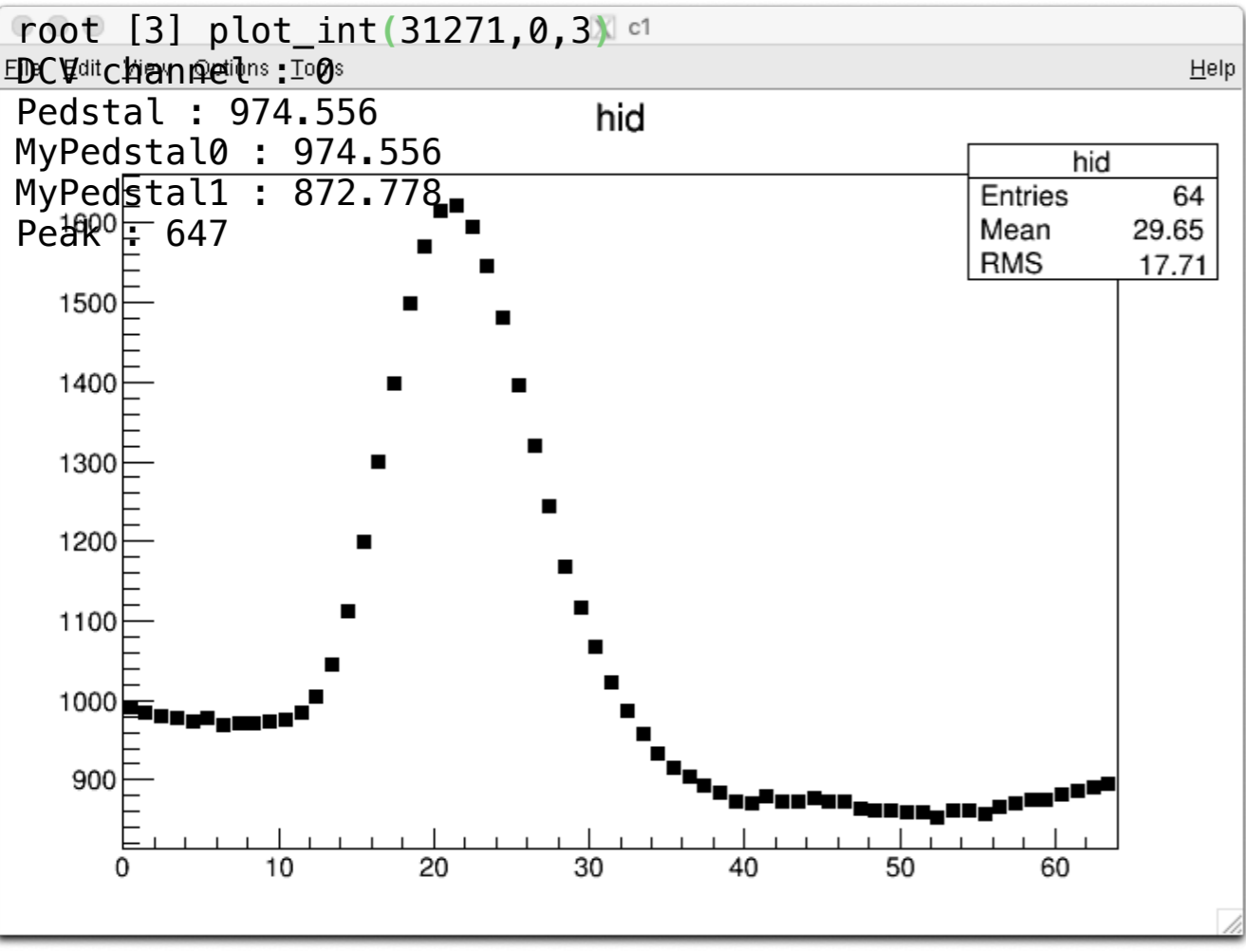
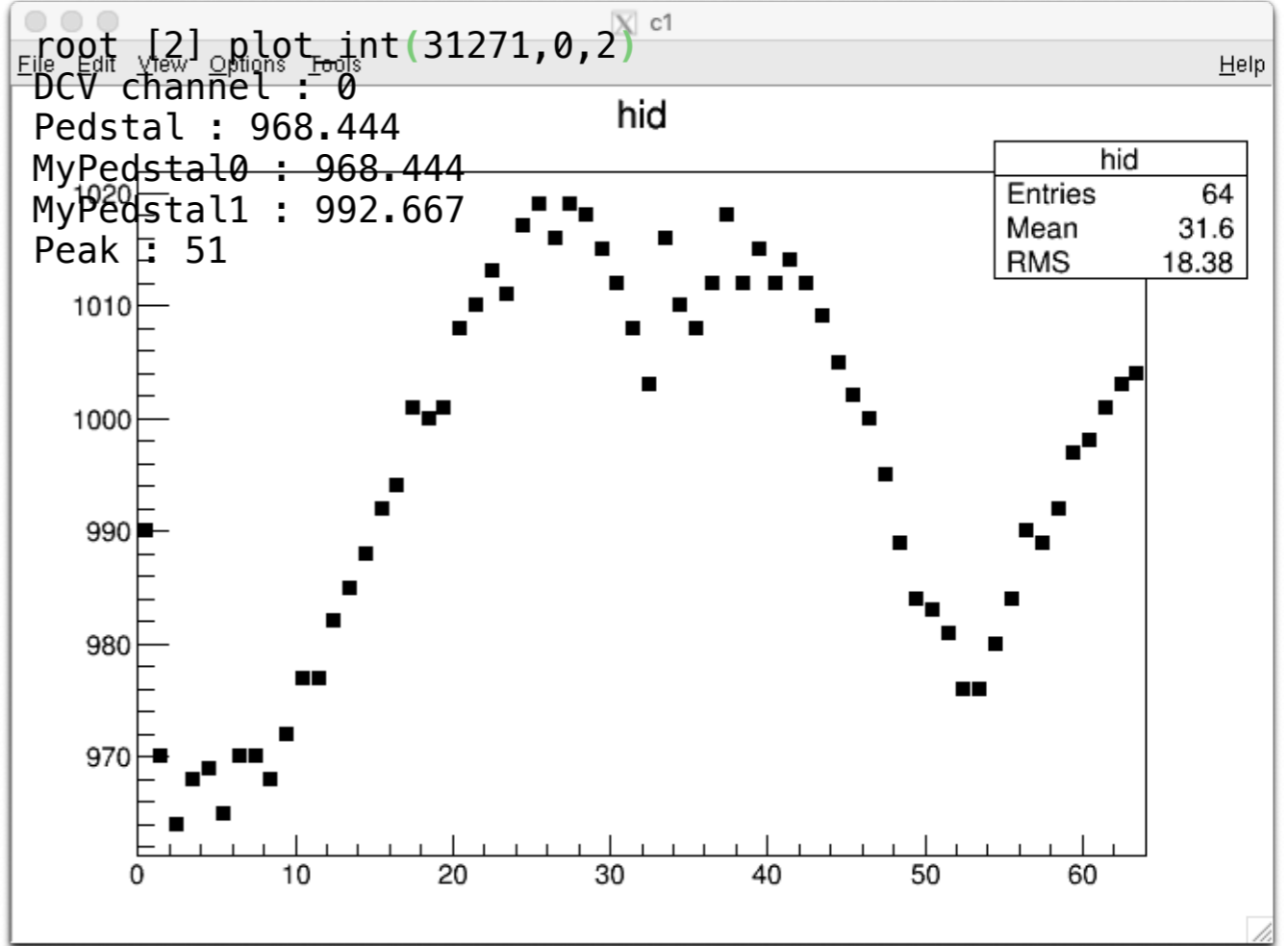
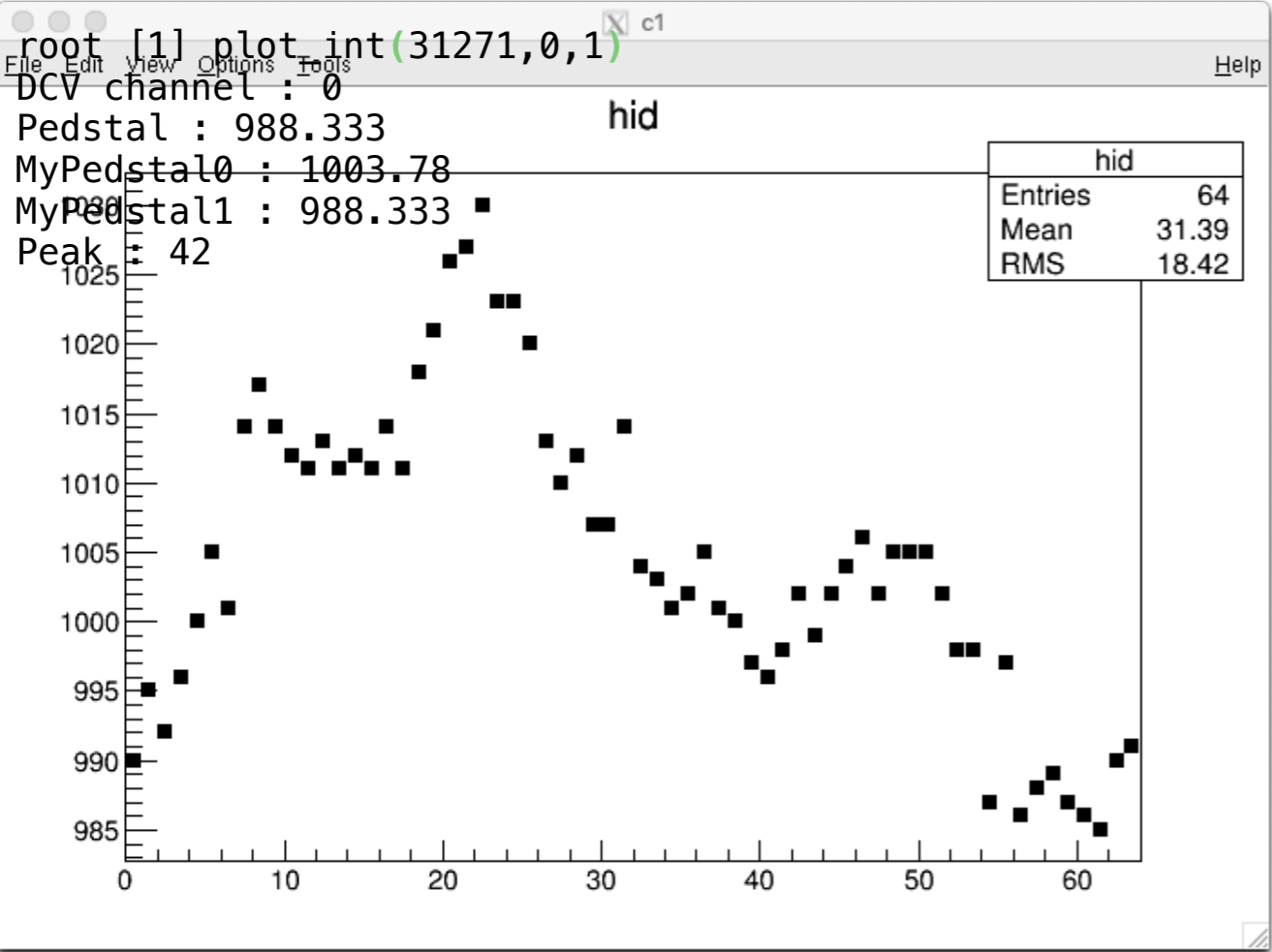
RunNumber : 31271
MPPC Ch. : 0

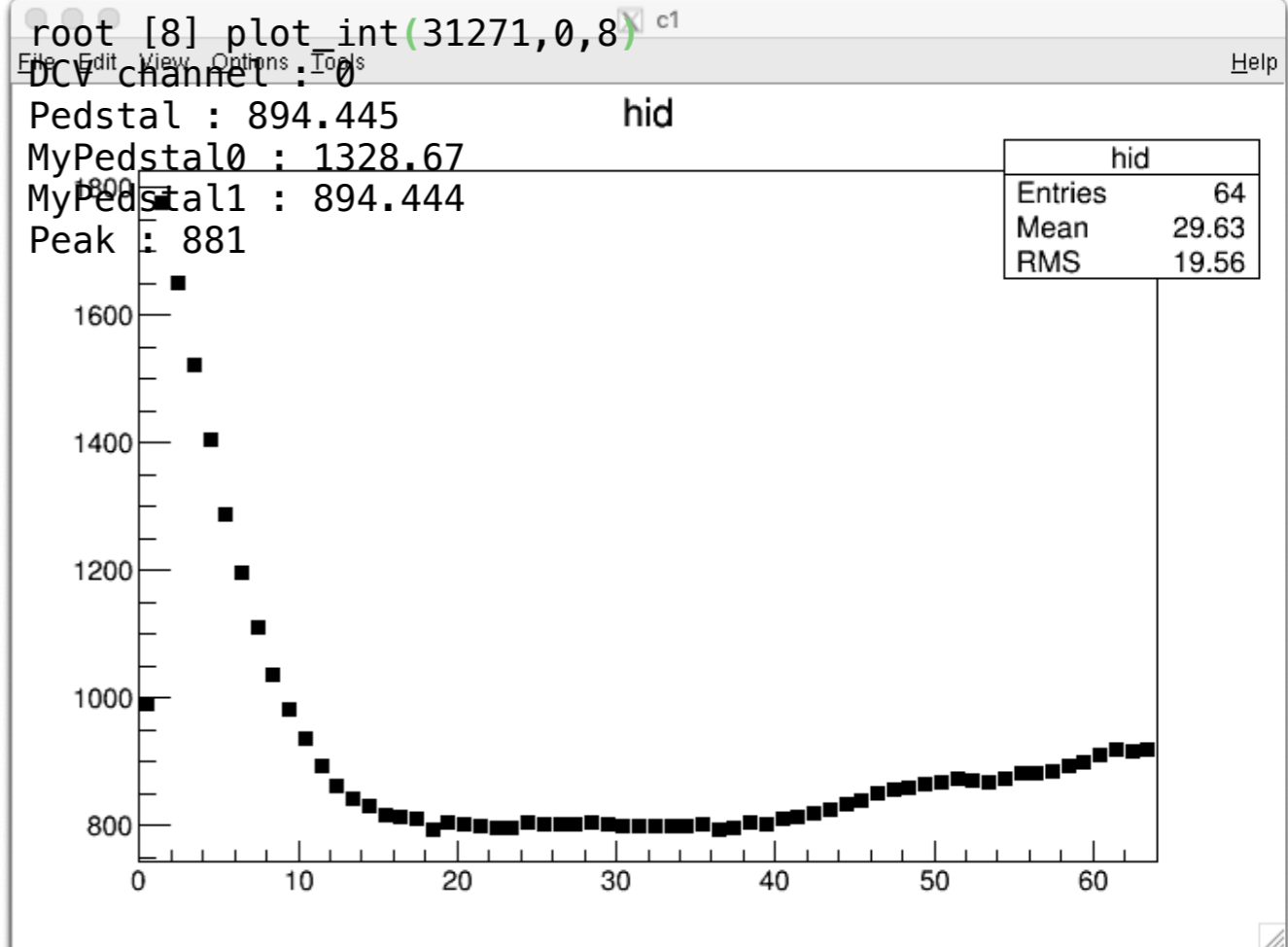
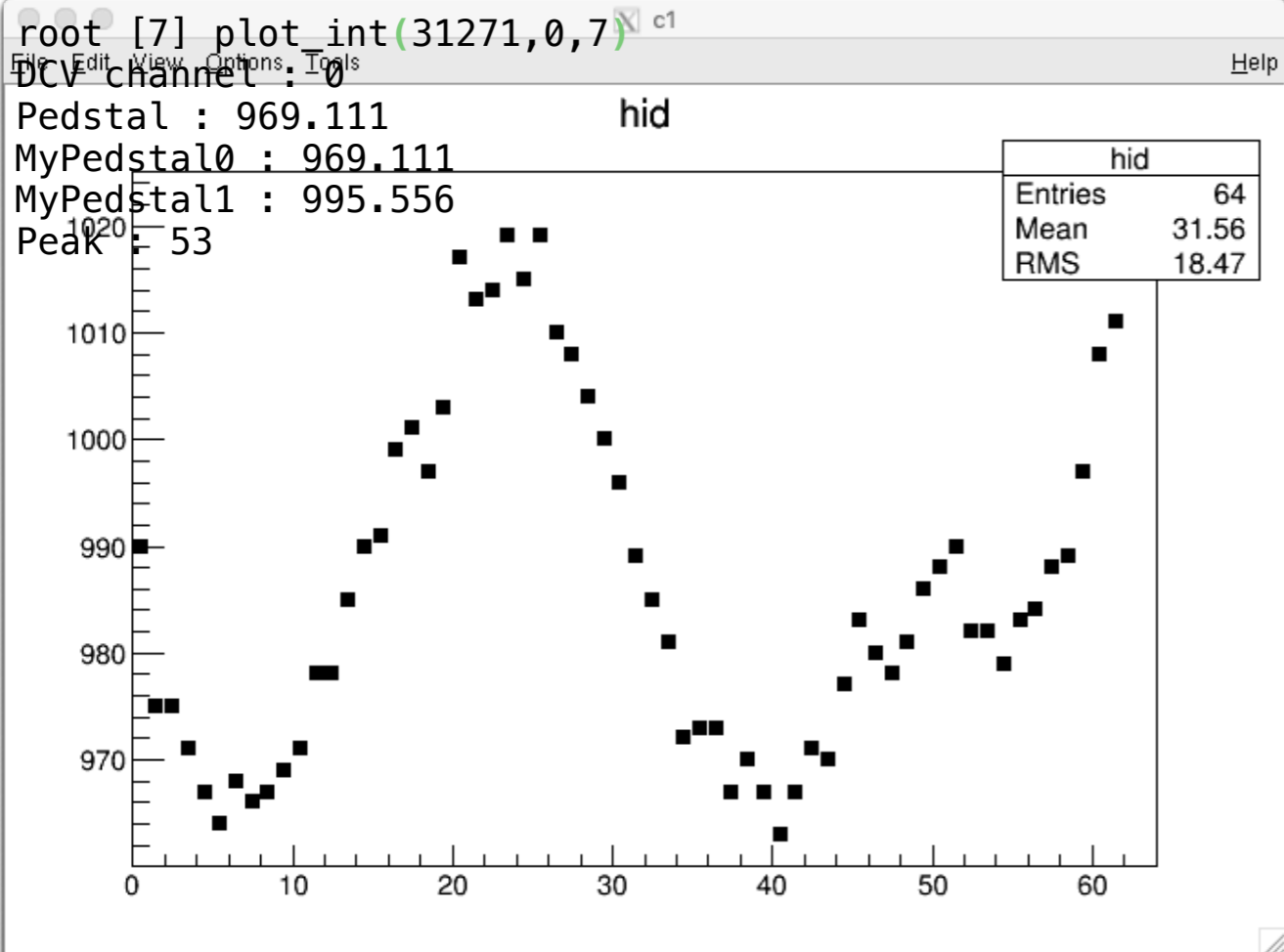
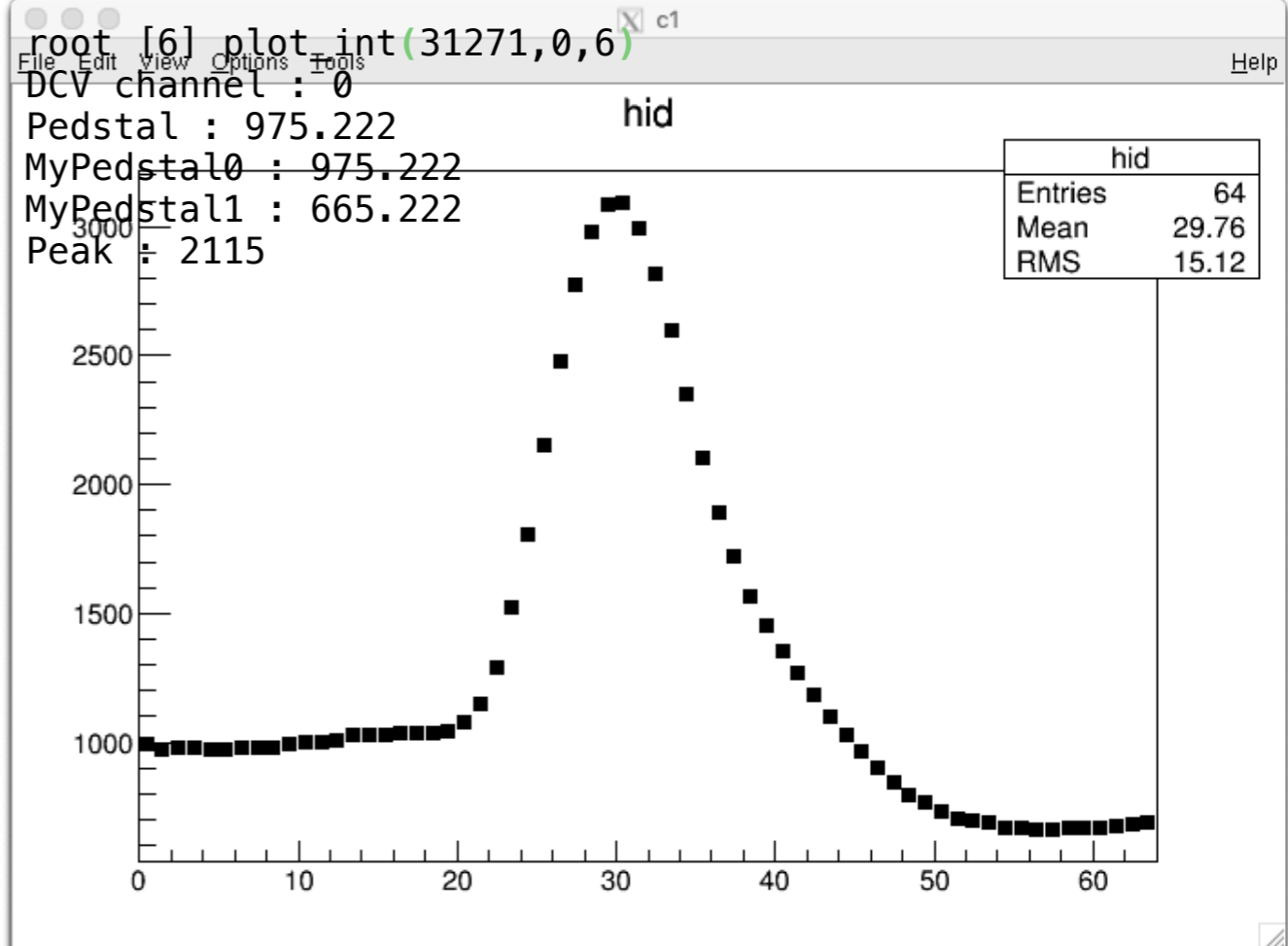
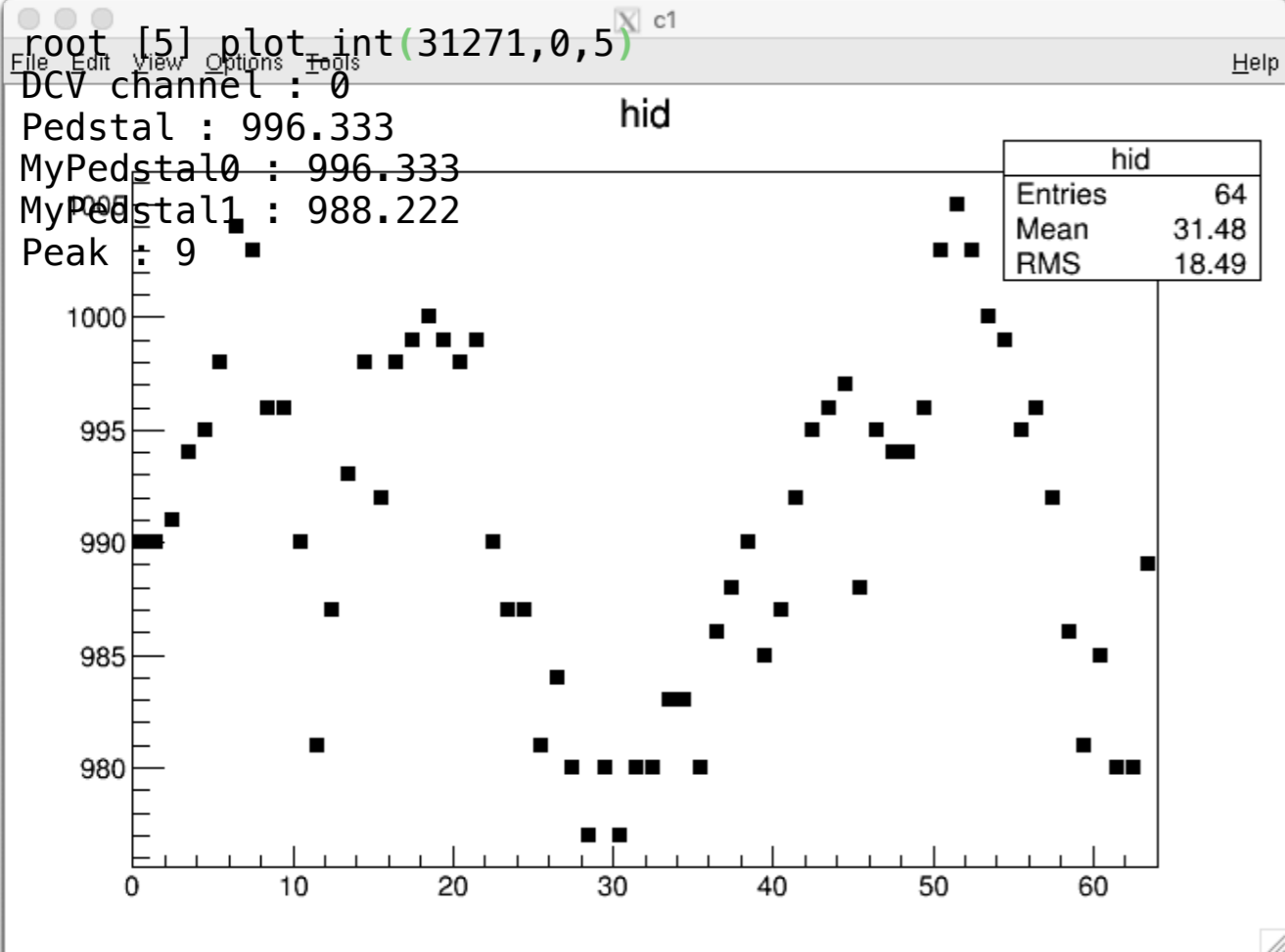


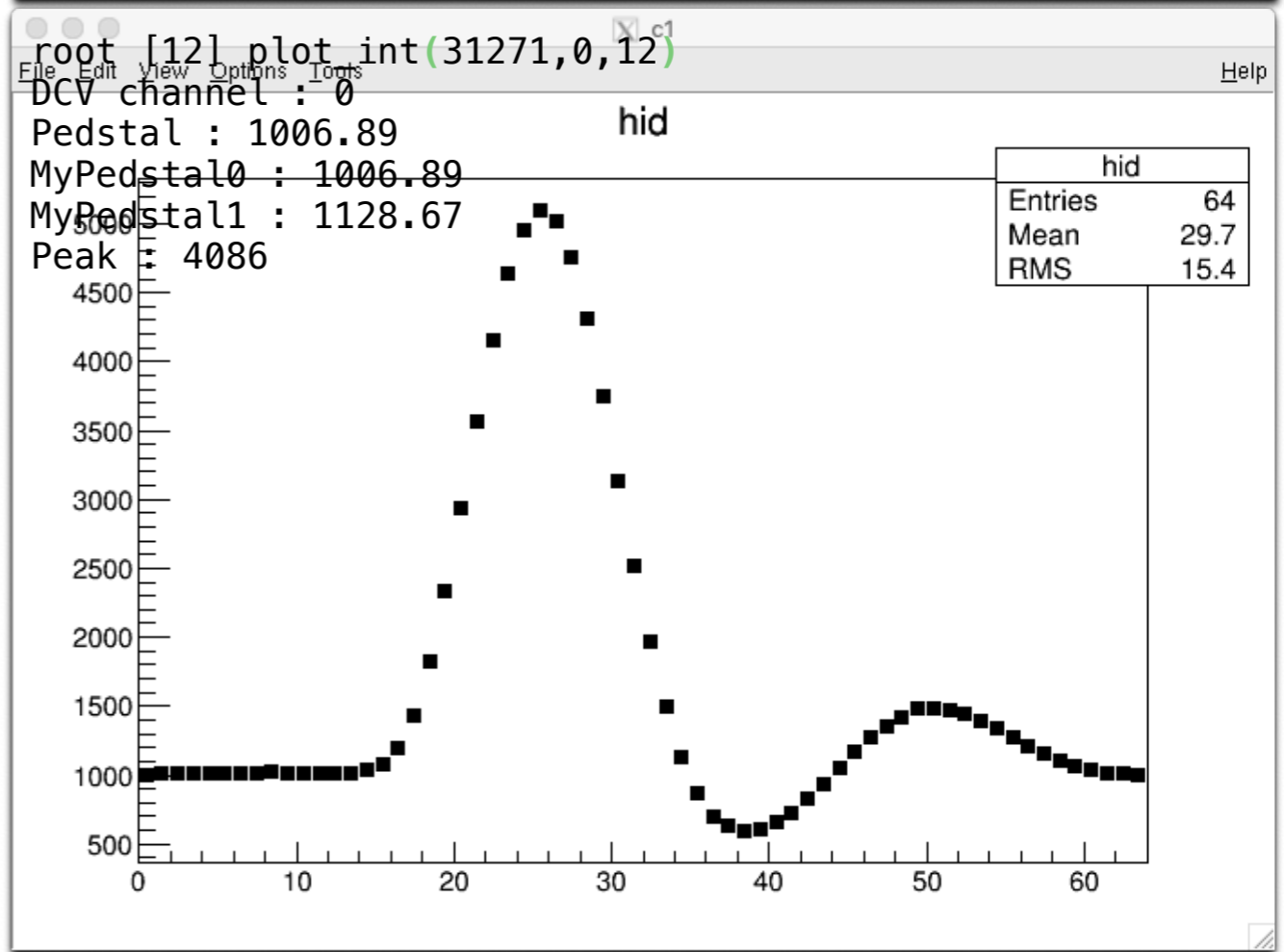
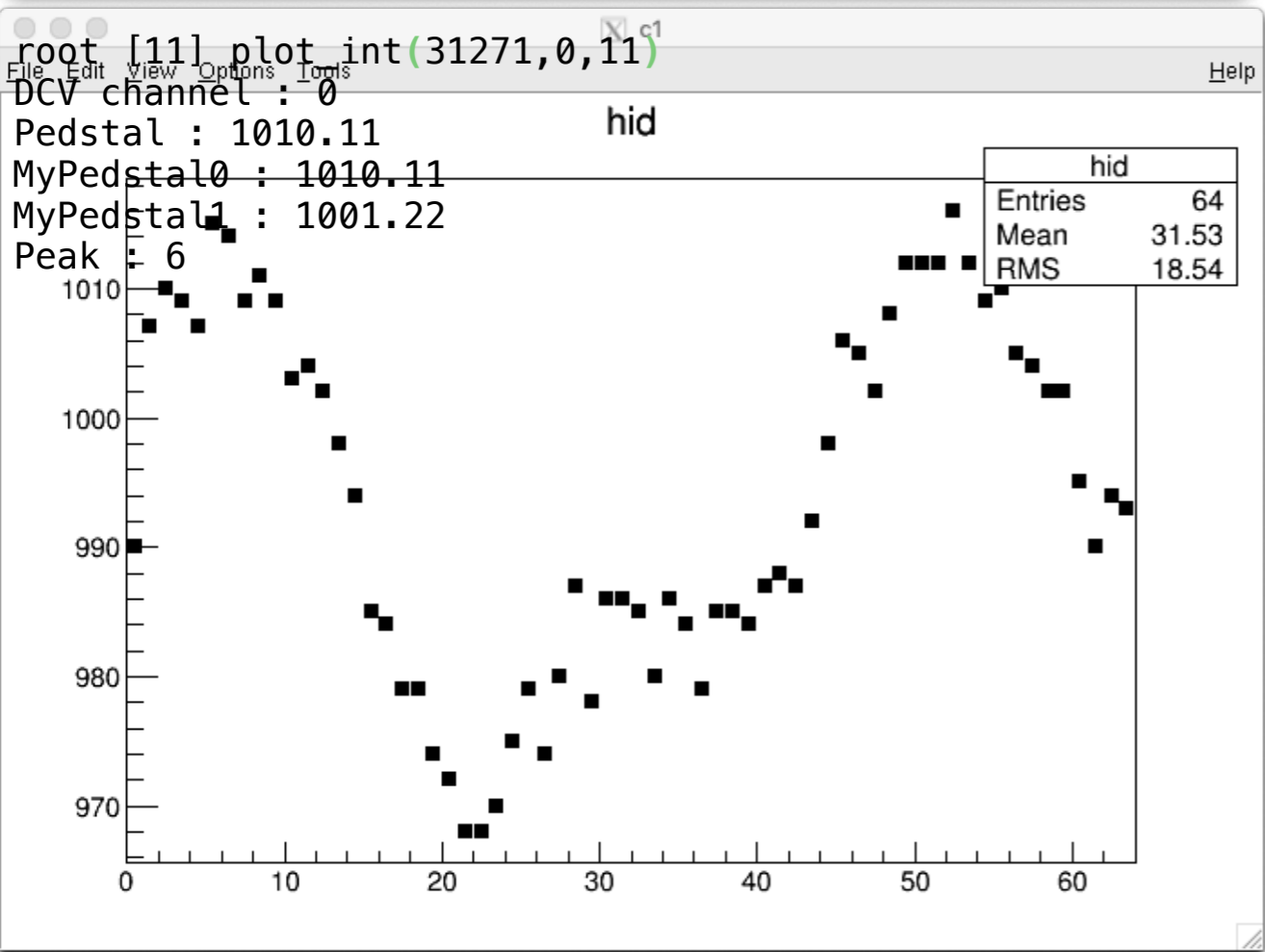
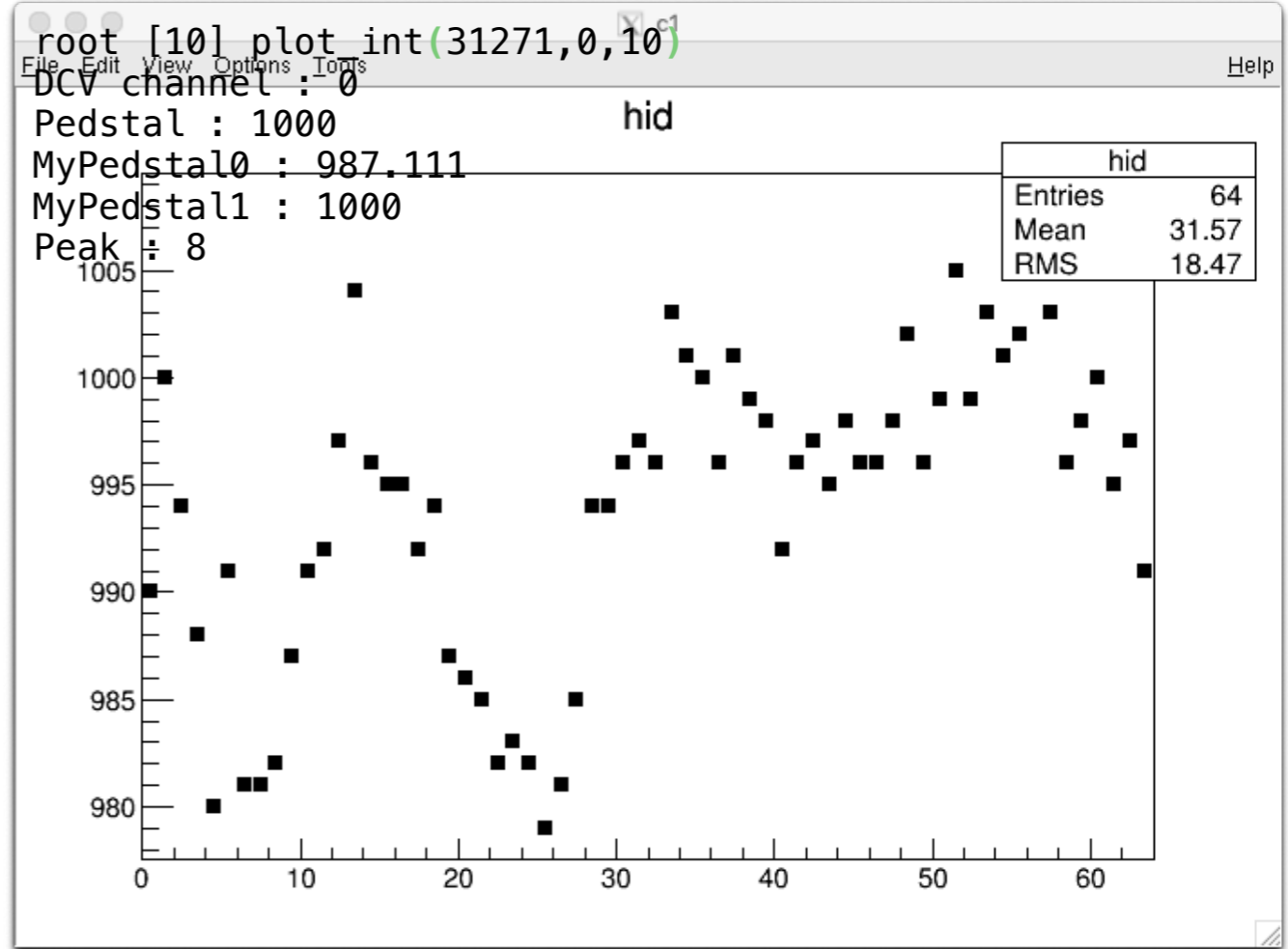
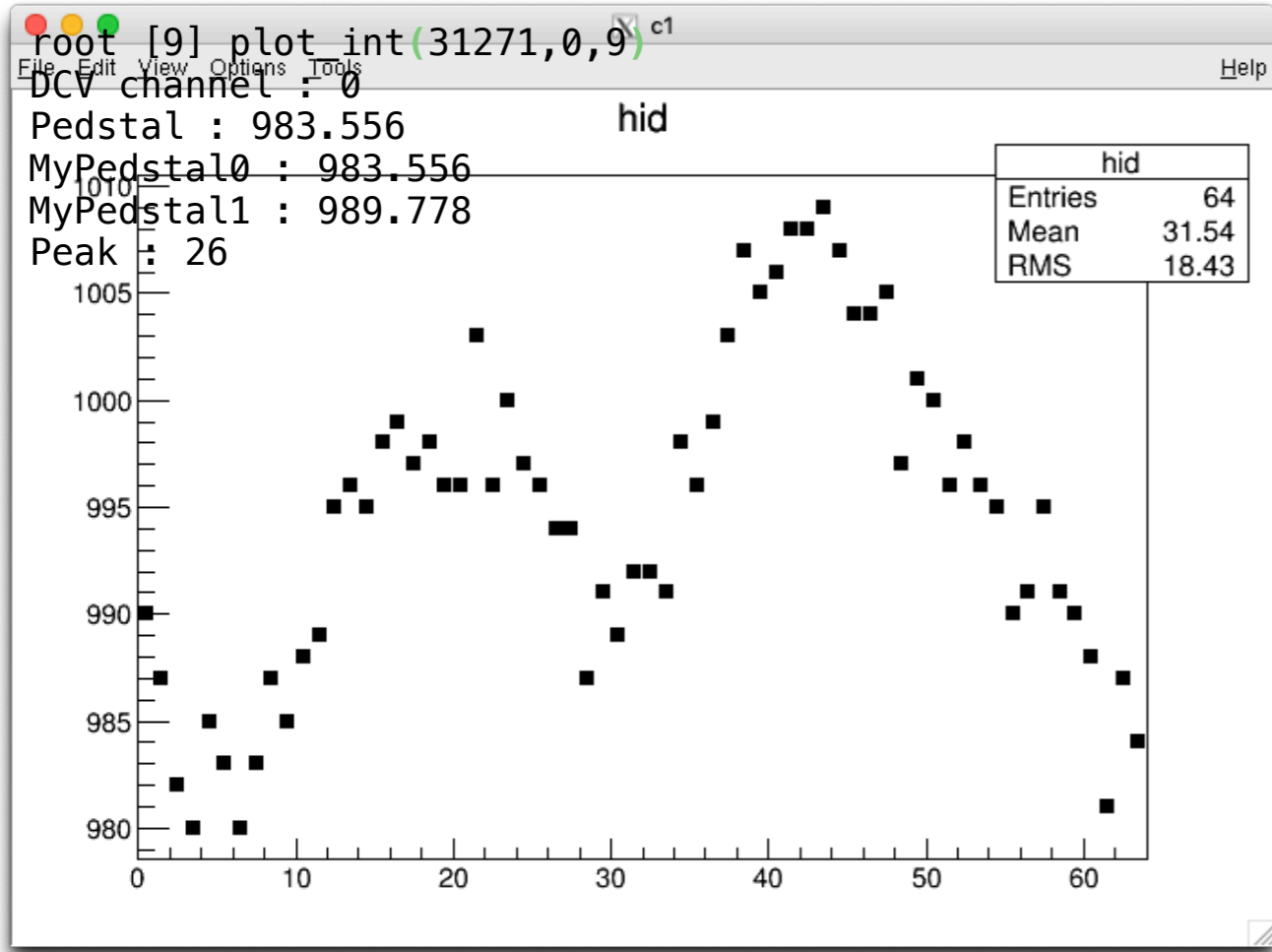
DCVEnergy Distribution(Run31271, DCV1)

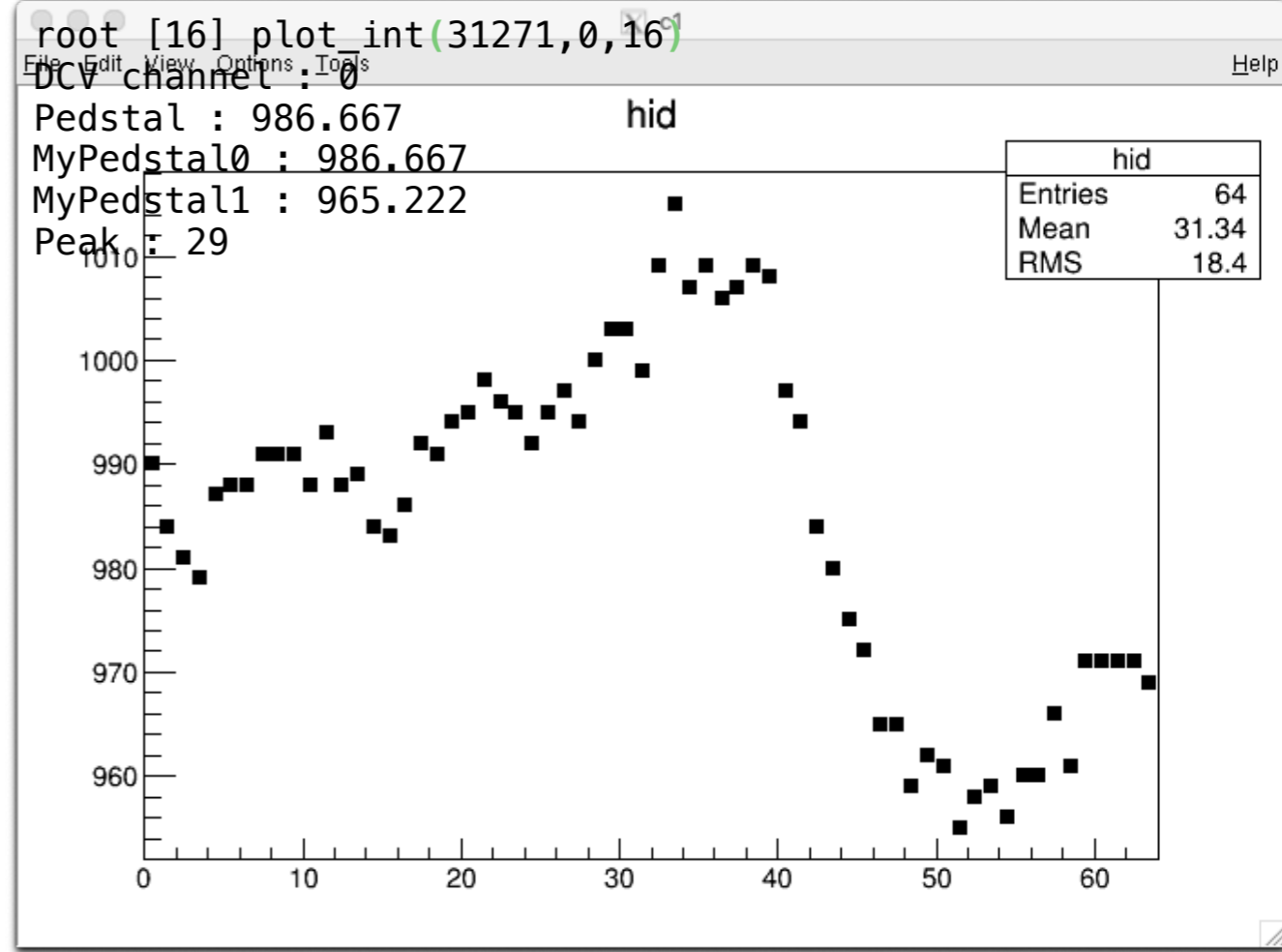
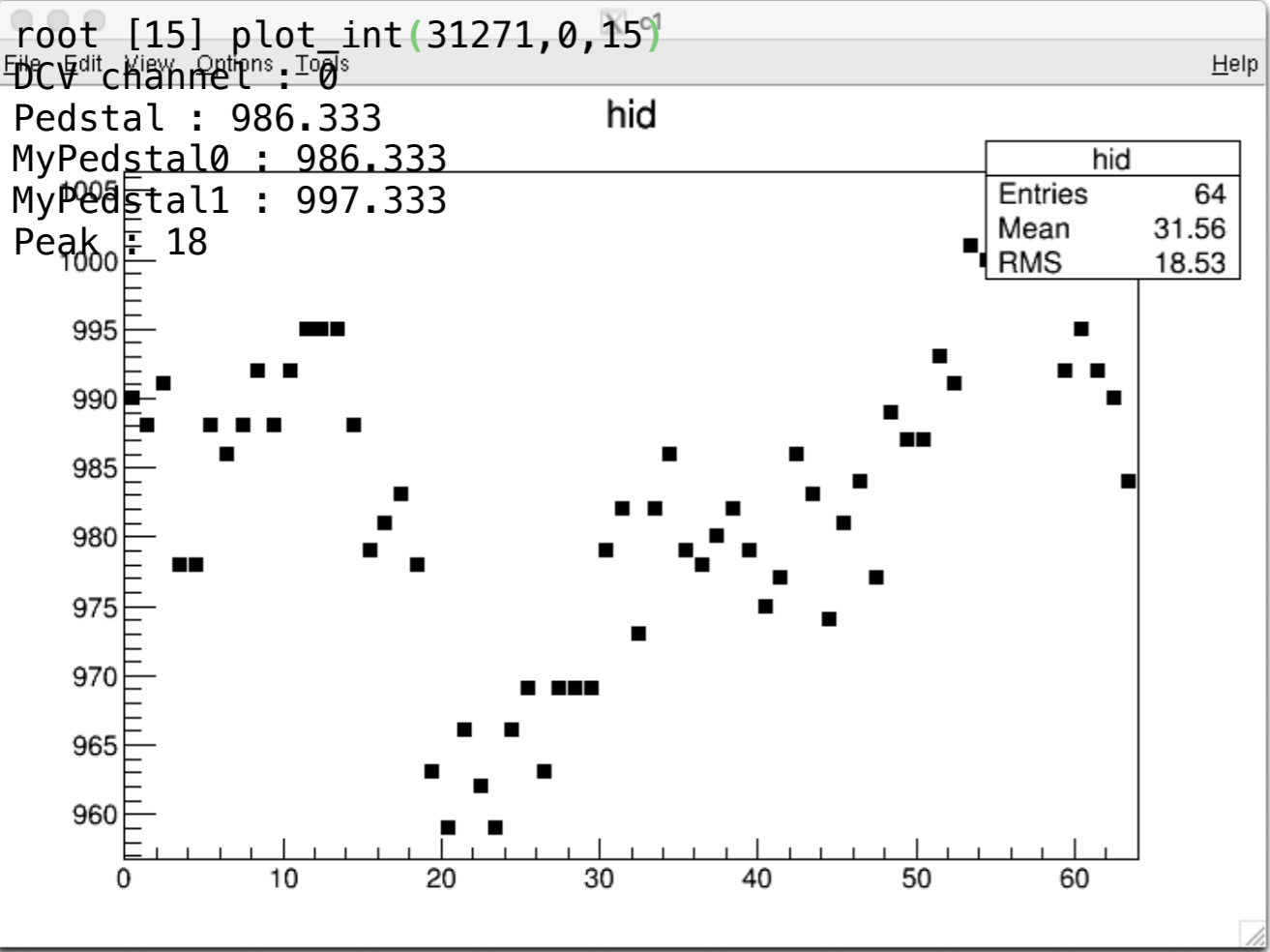
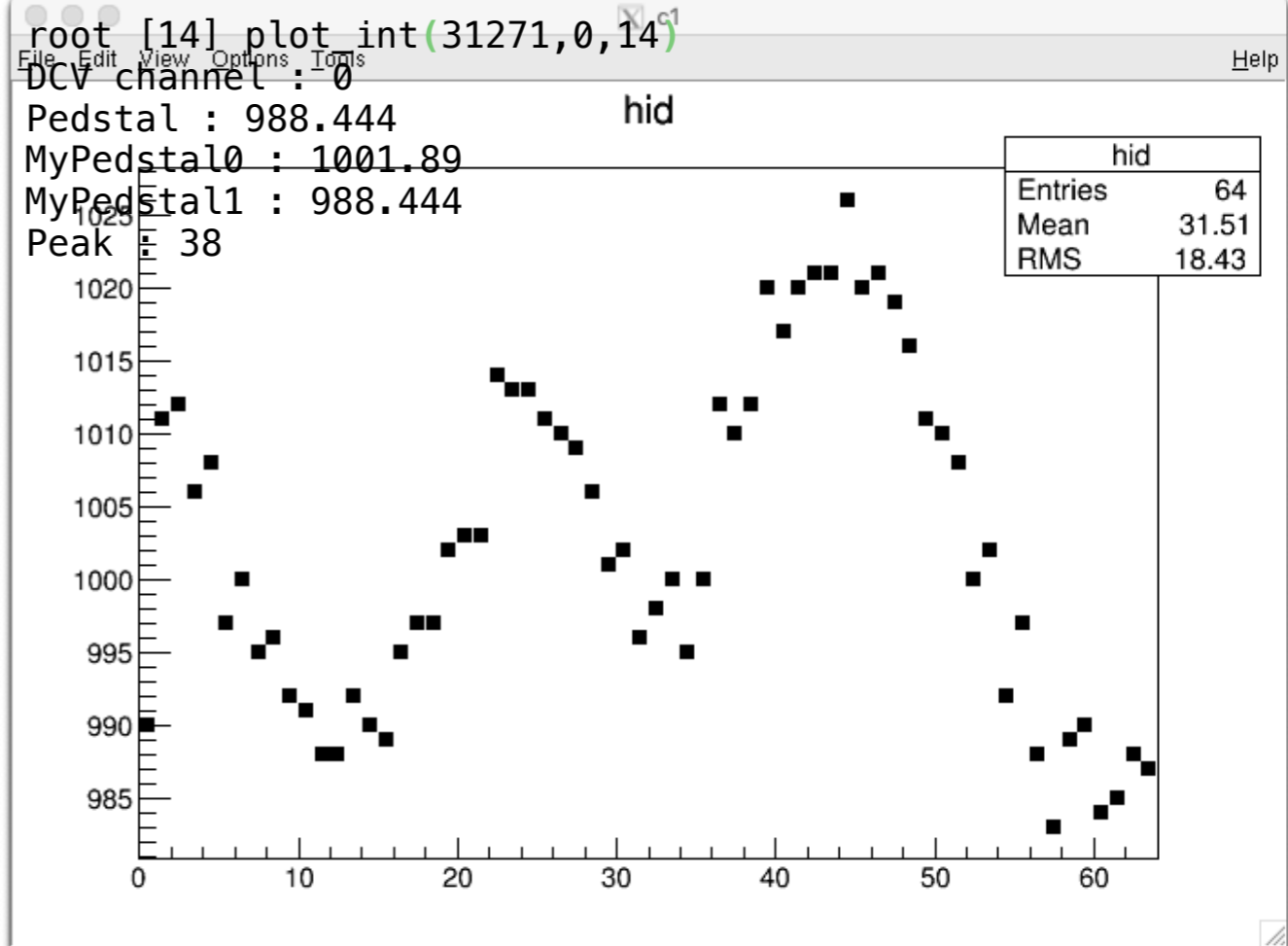
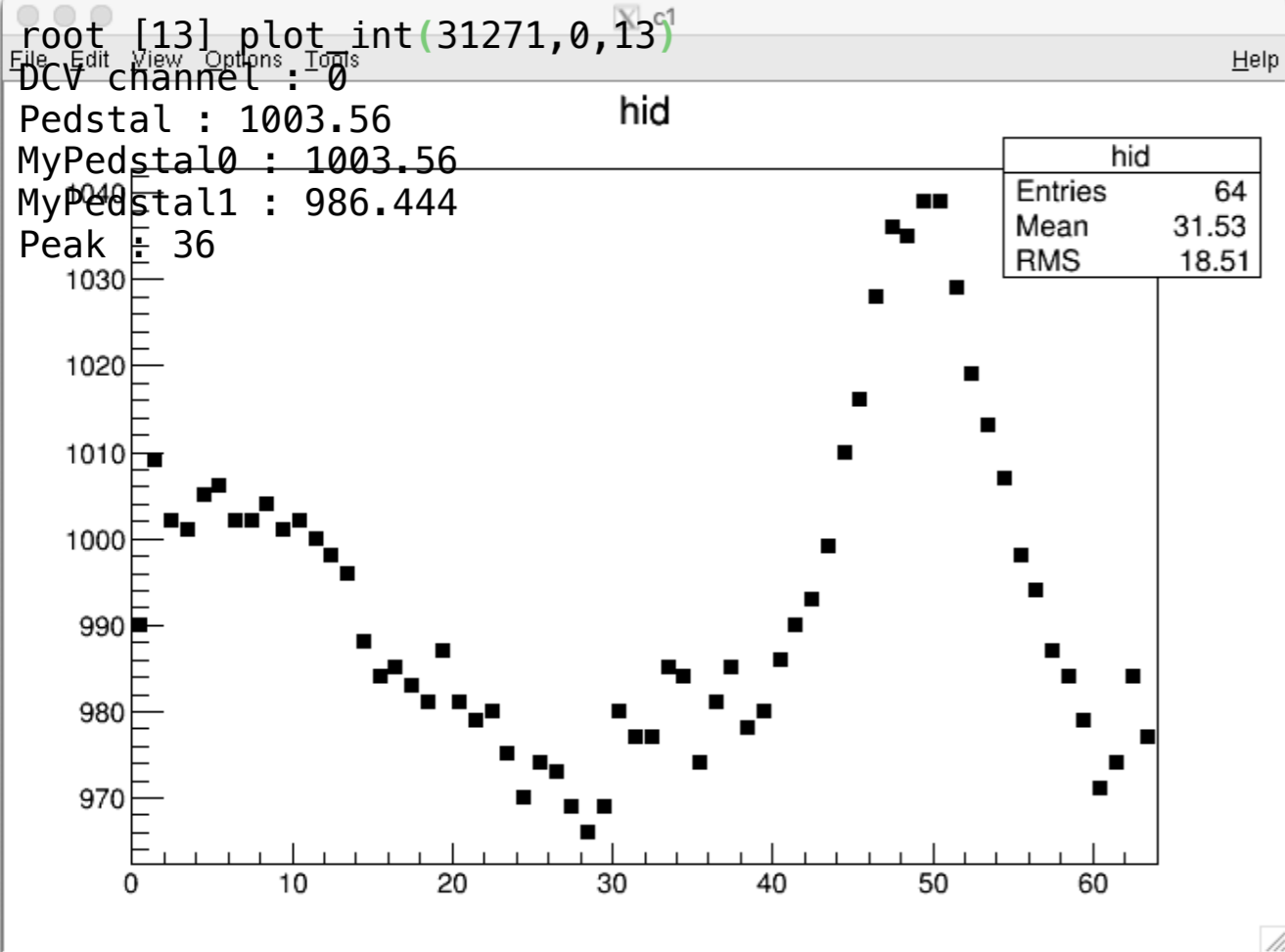


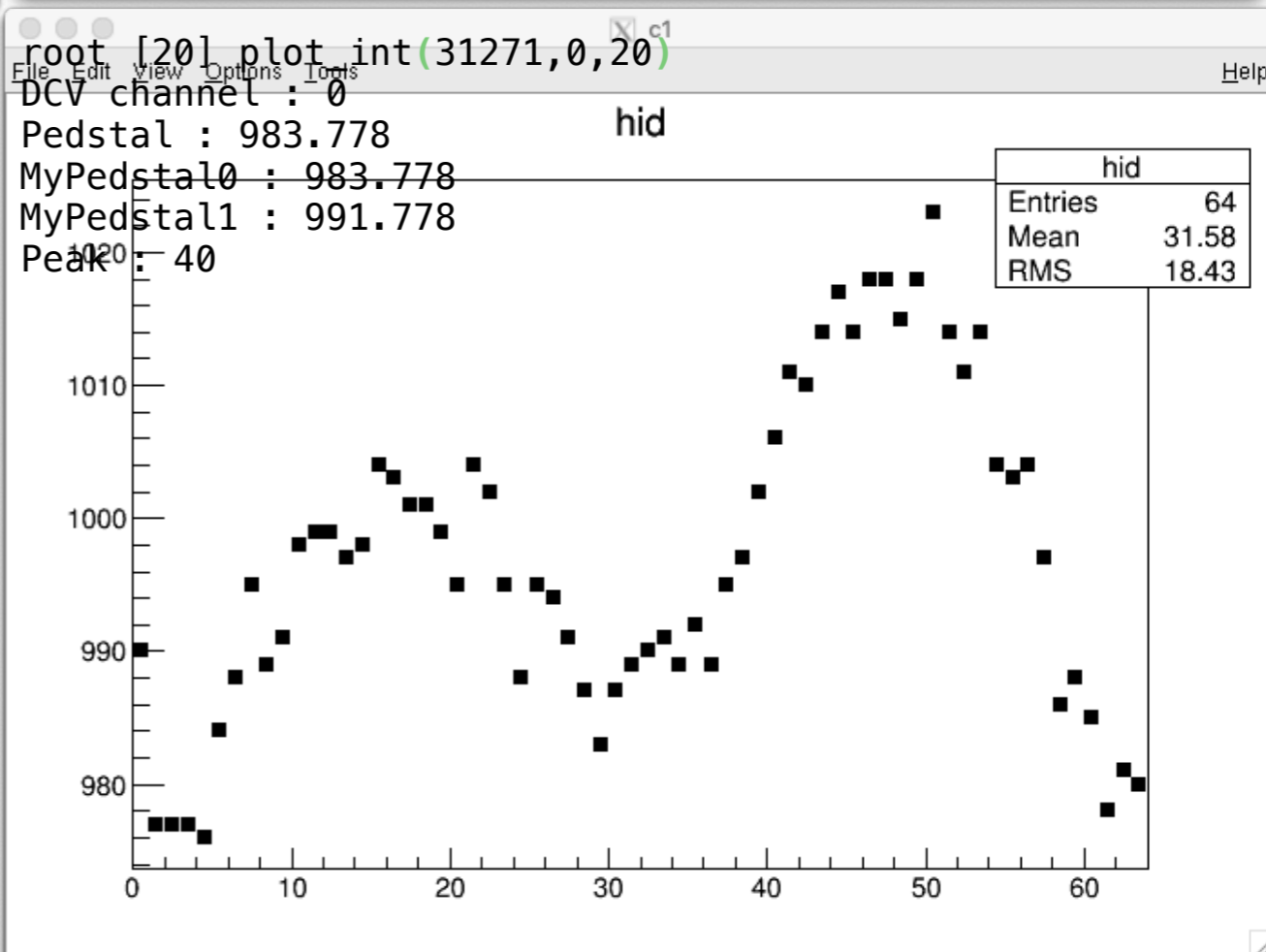
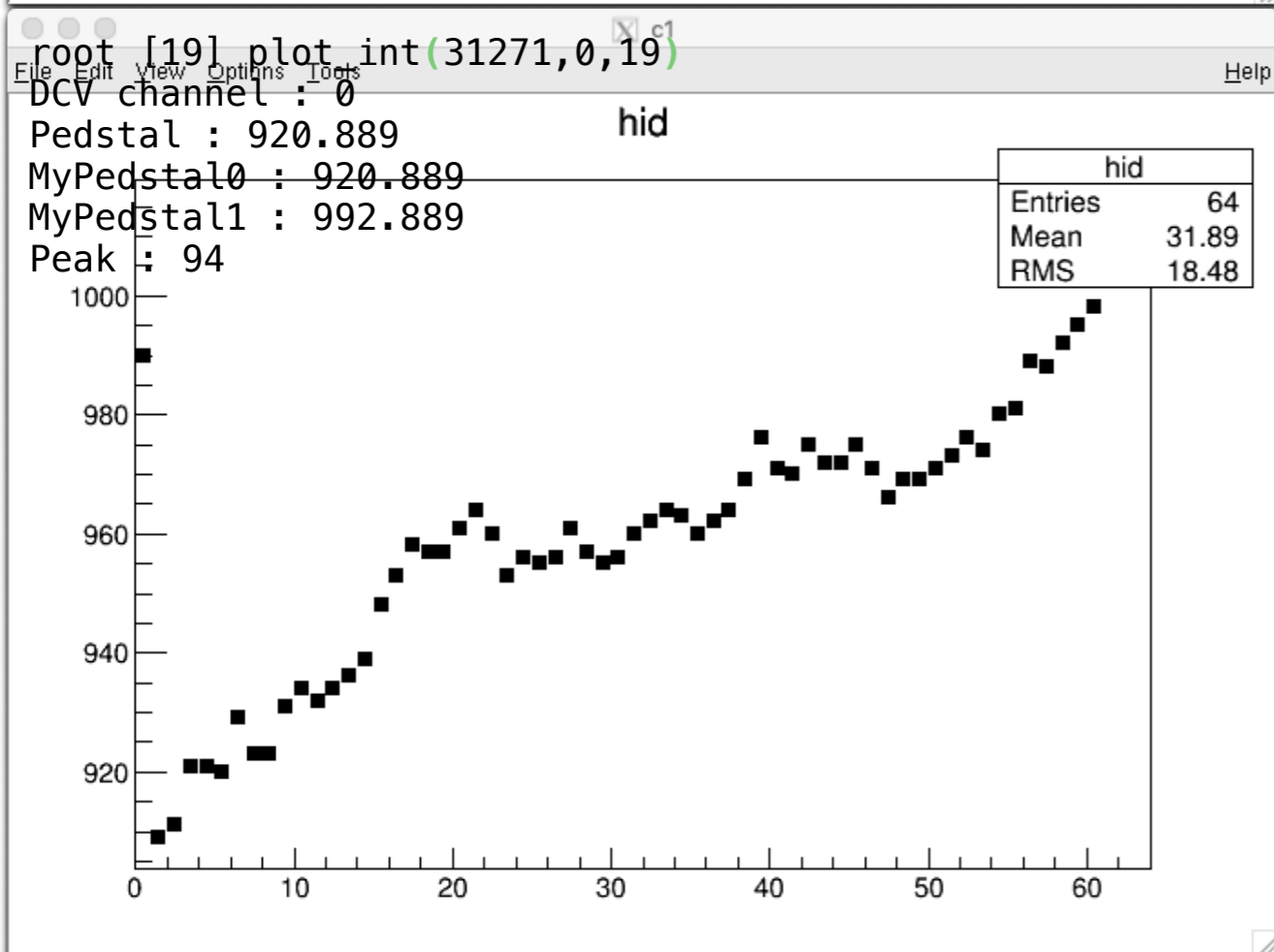
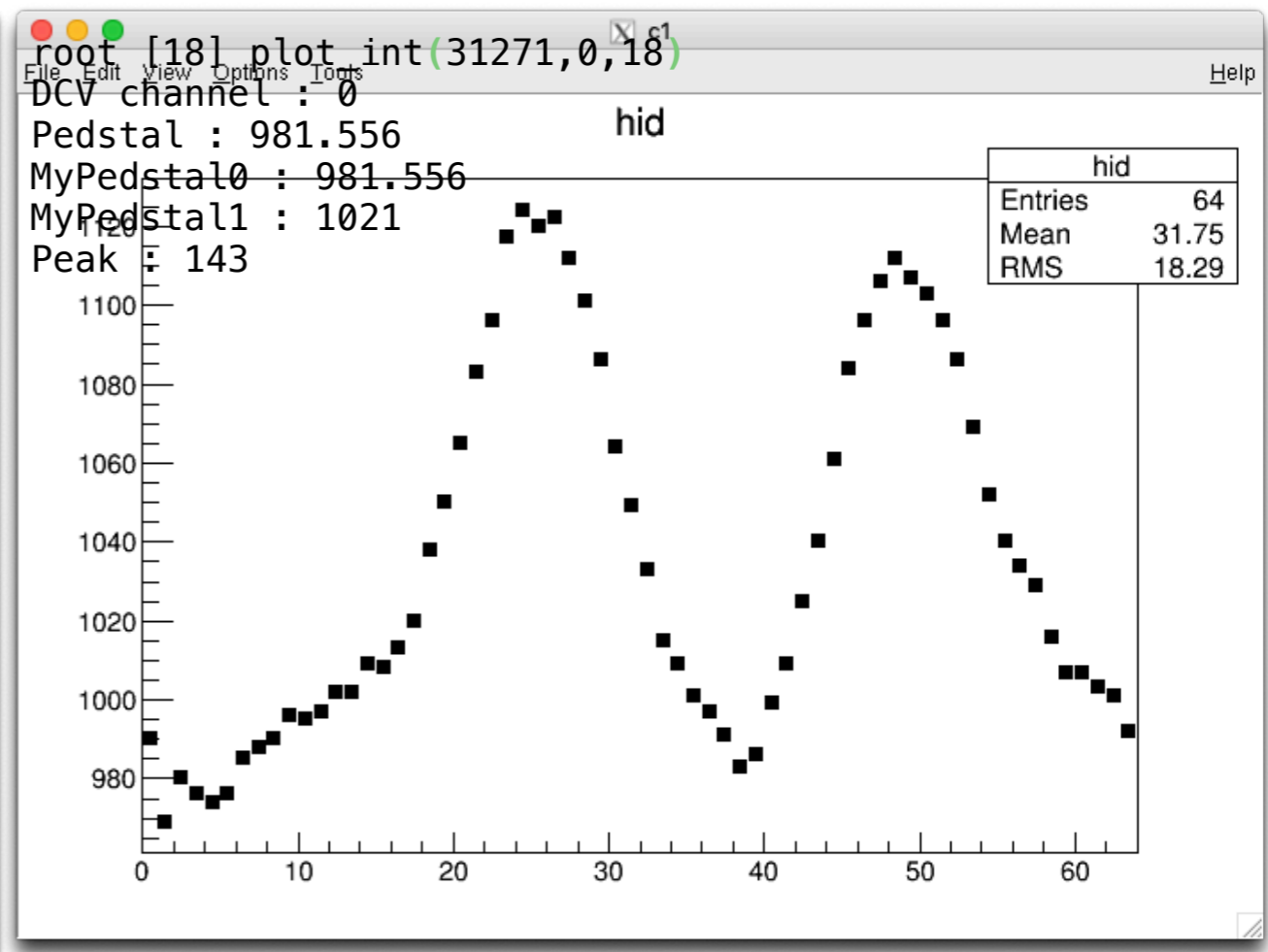
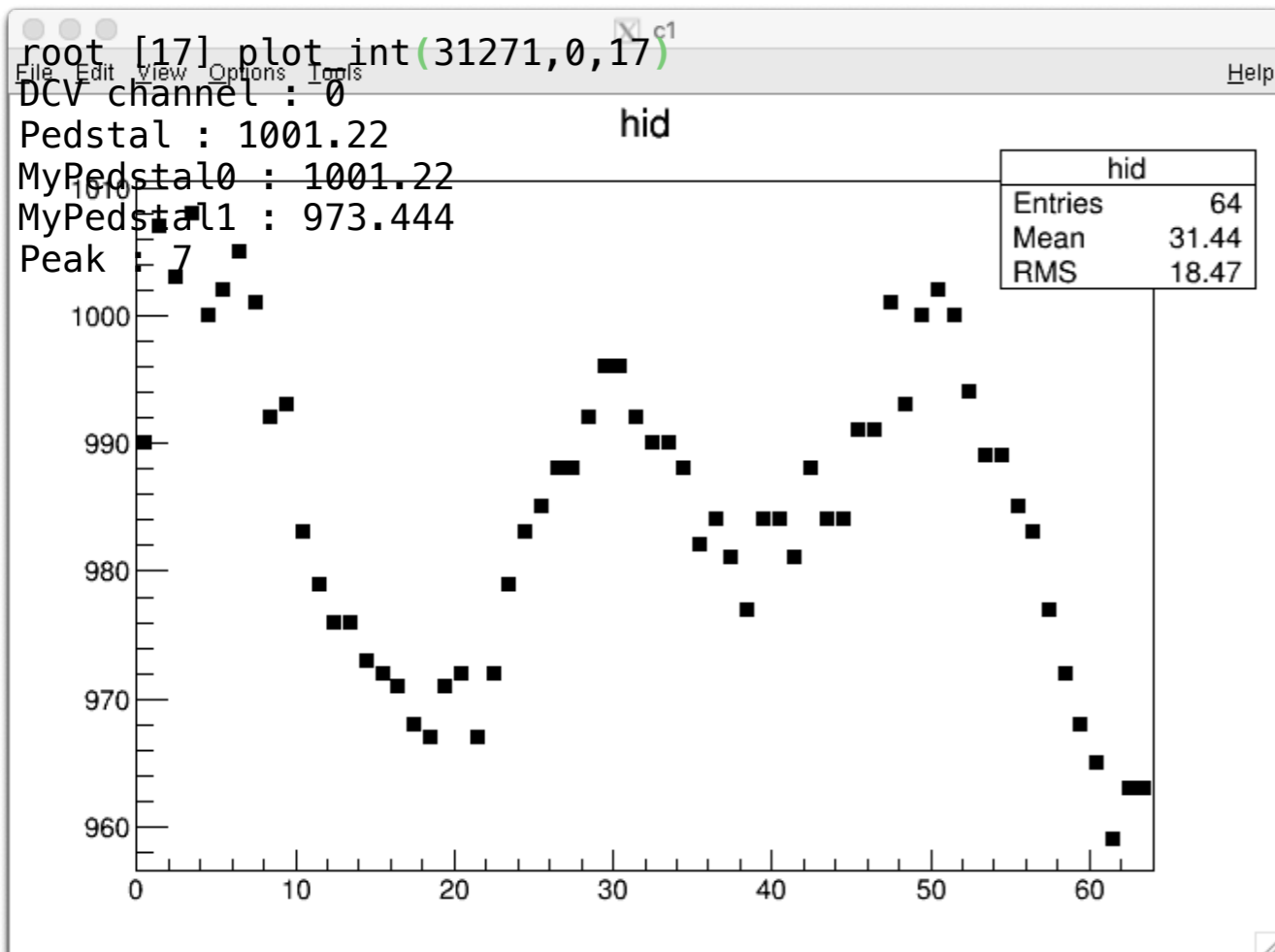
Red : DCVPedestal < 800, Blue : DCVPedestal > 800

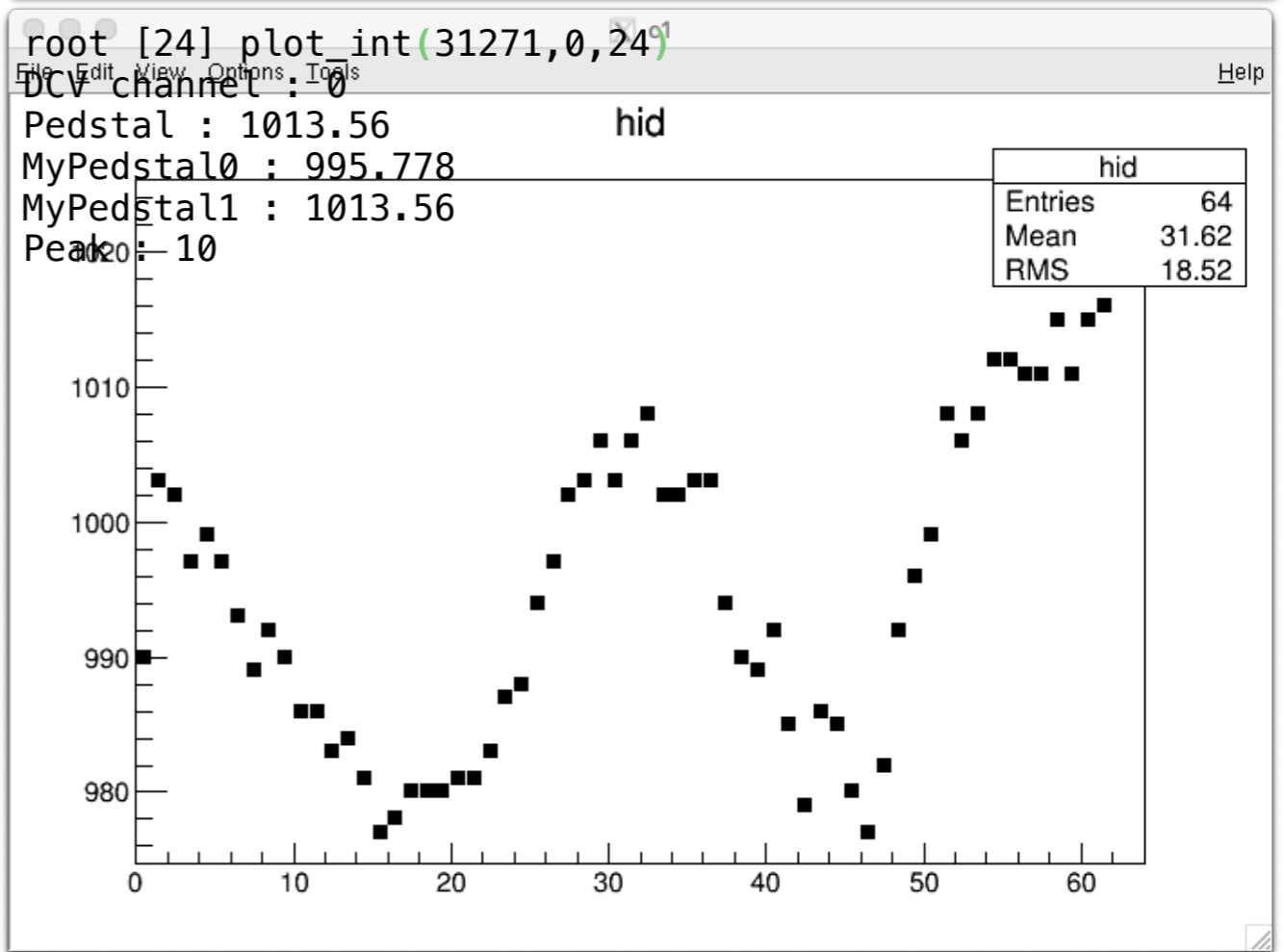
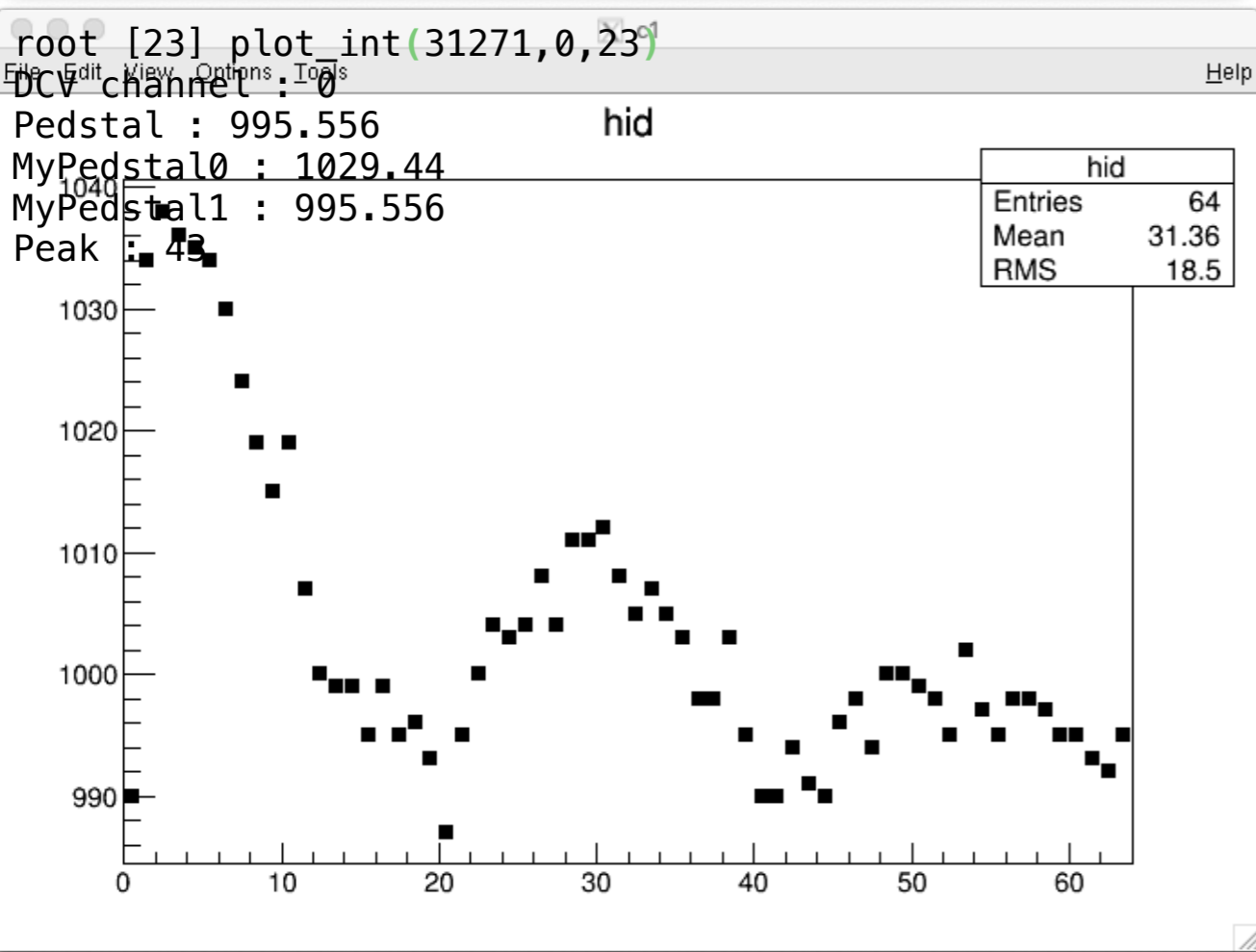
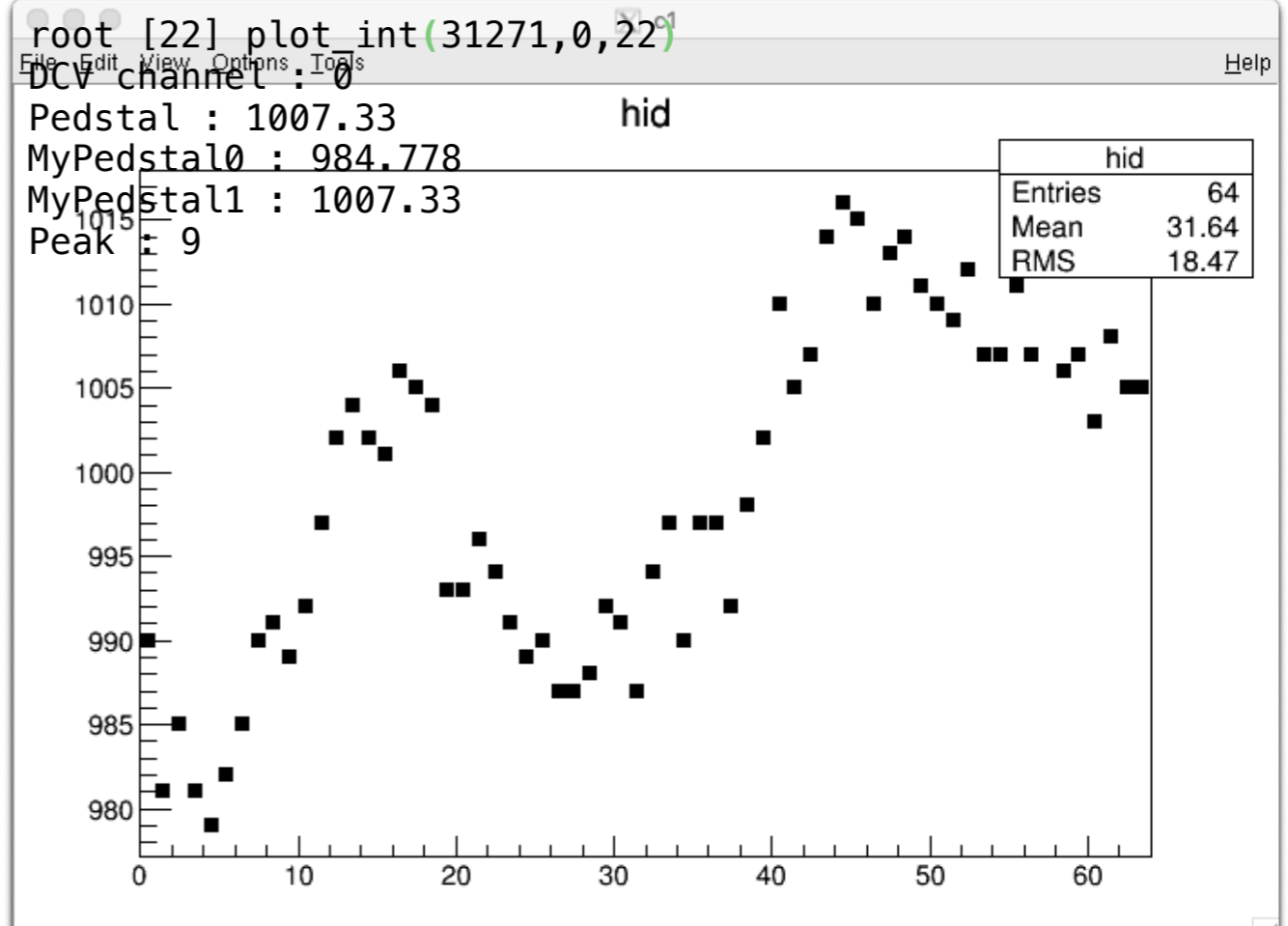
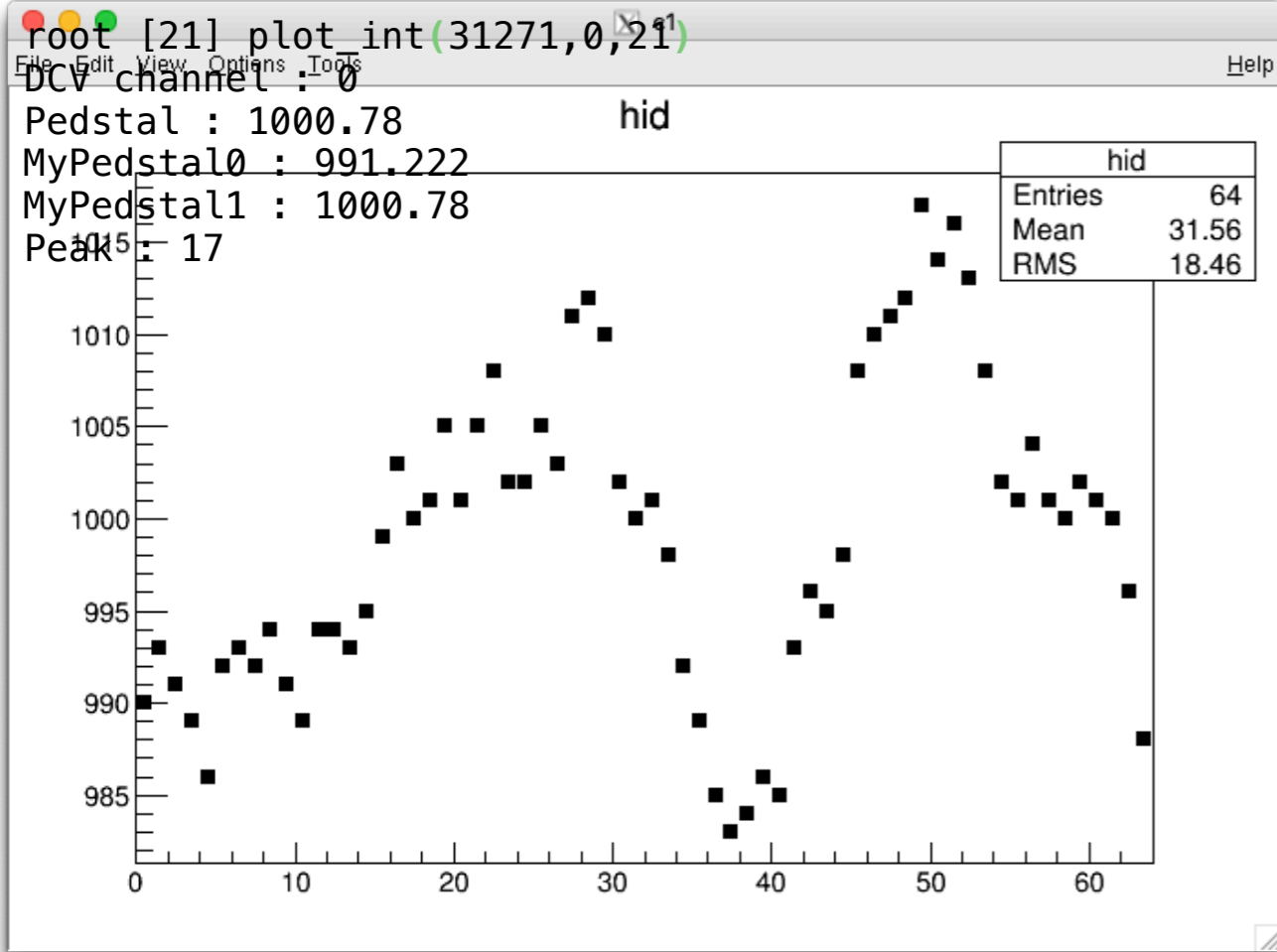


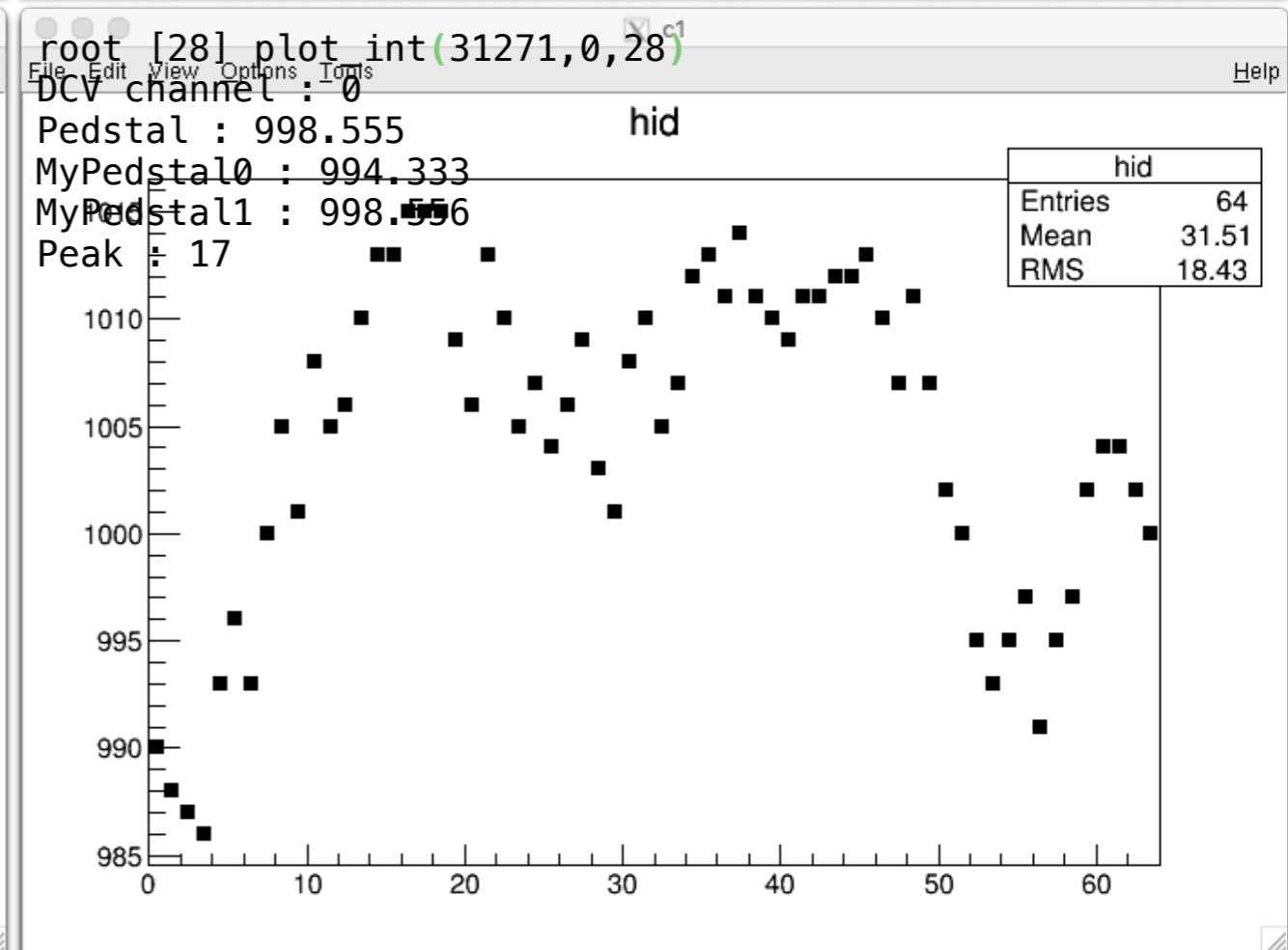
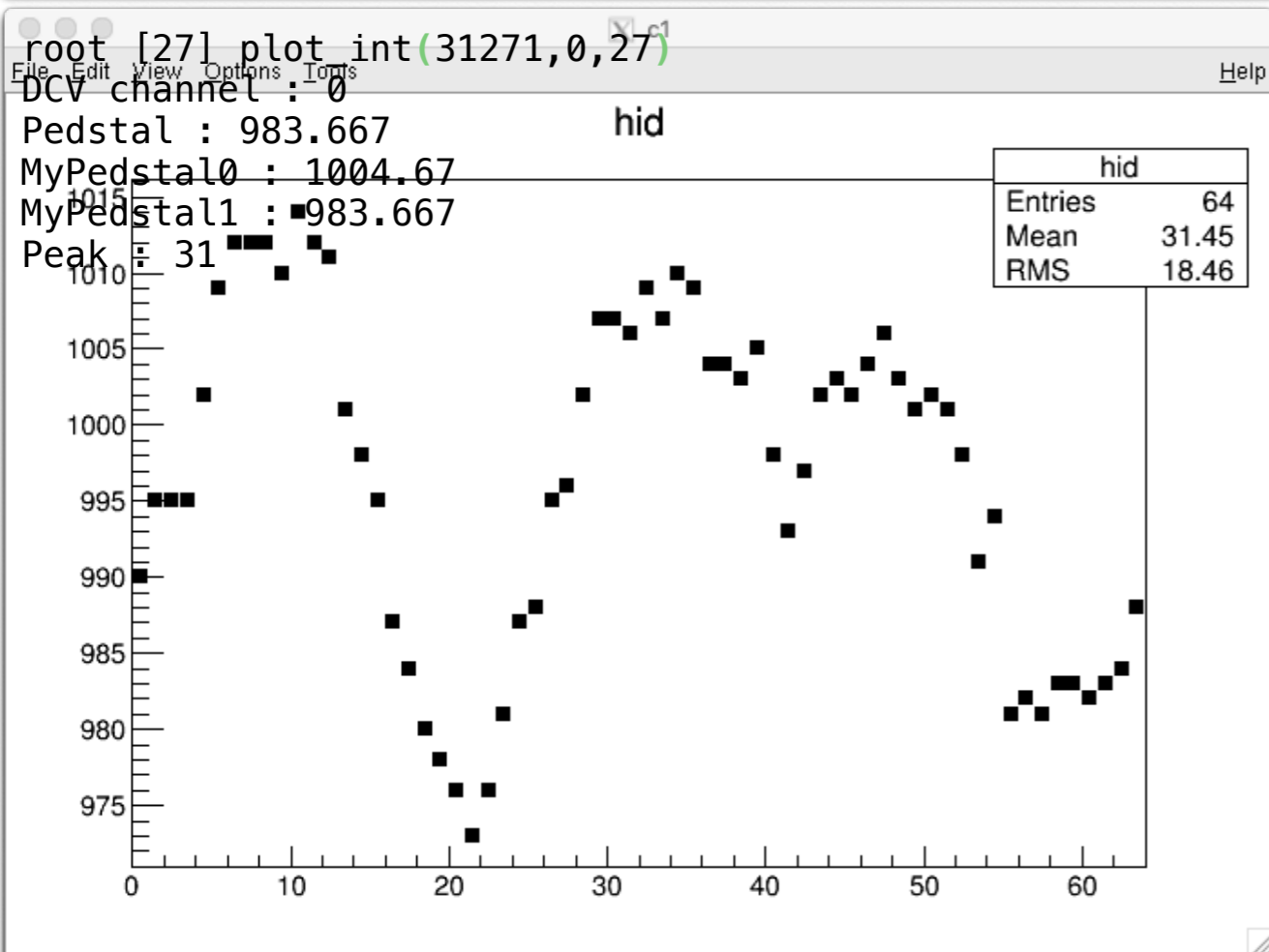
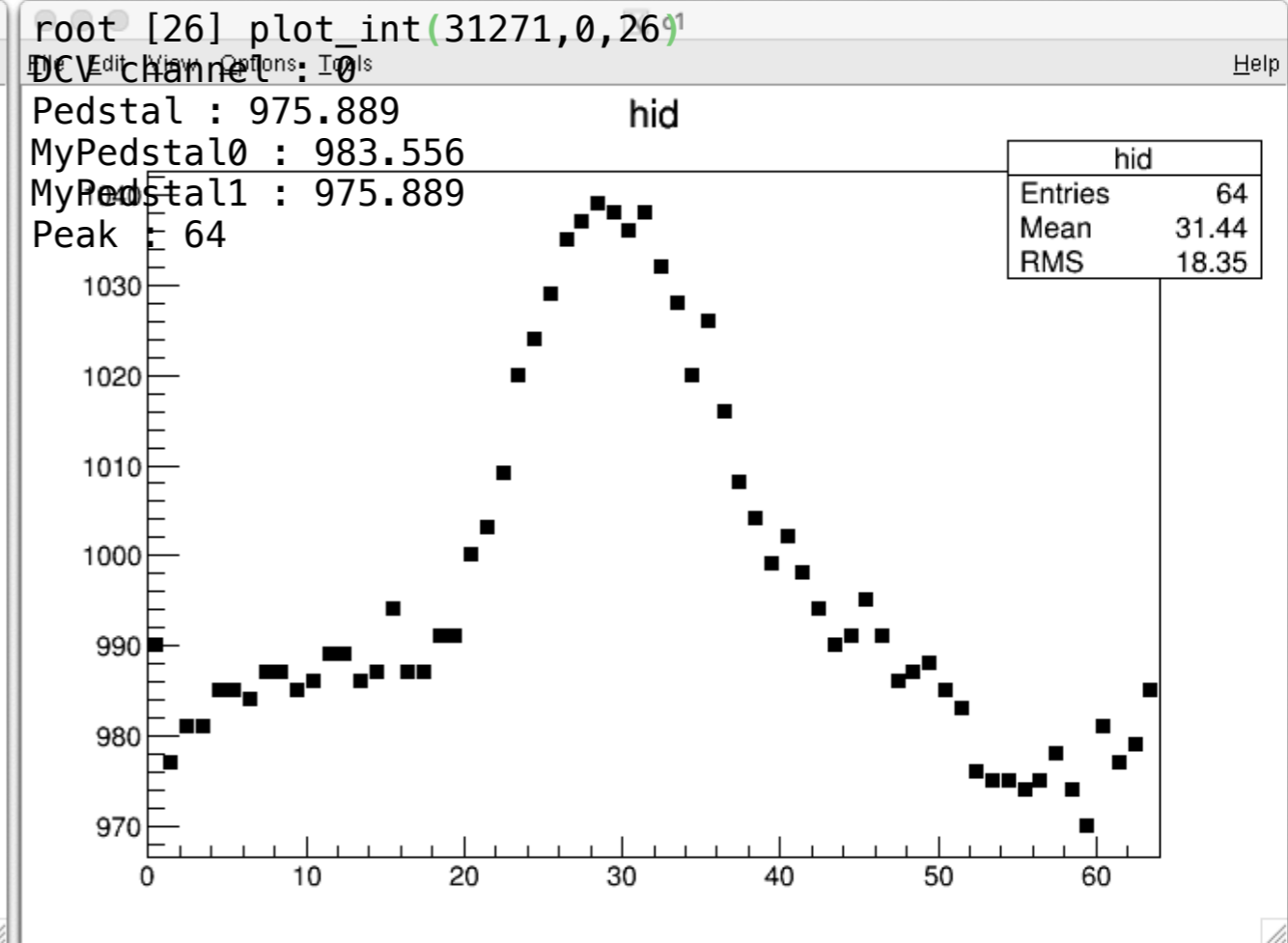
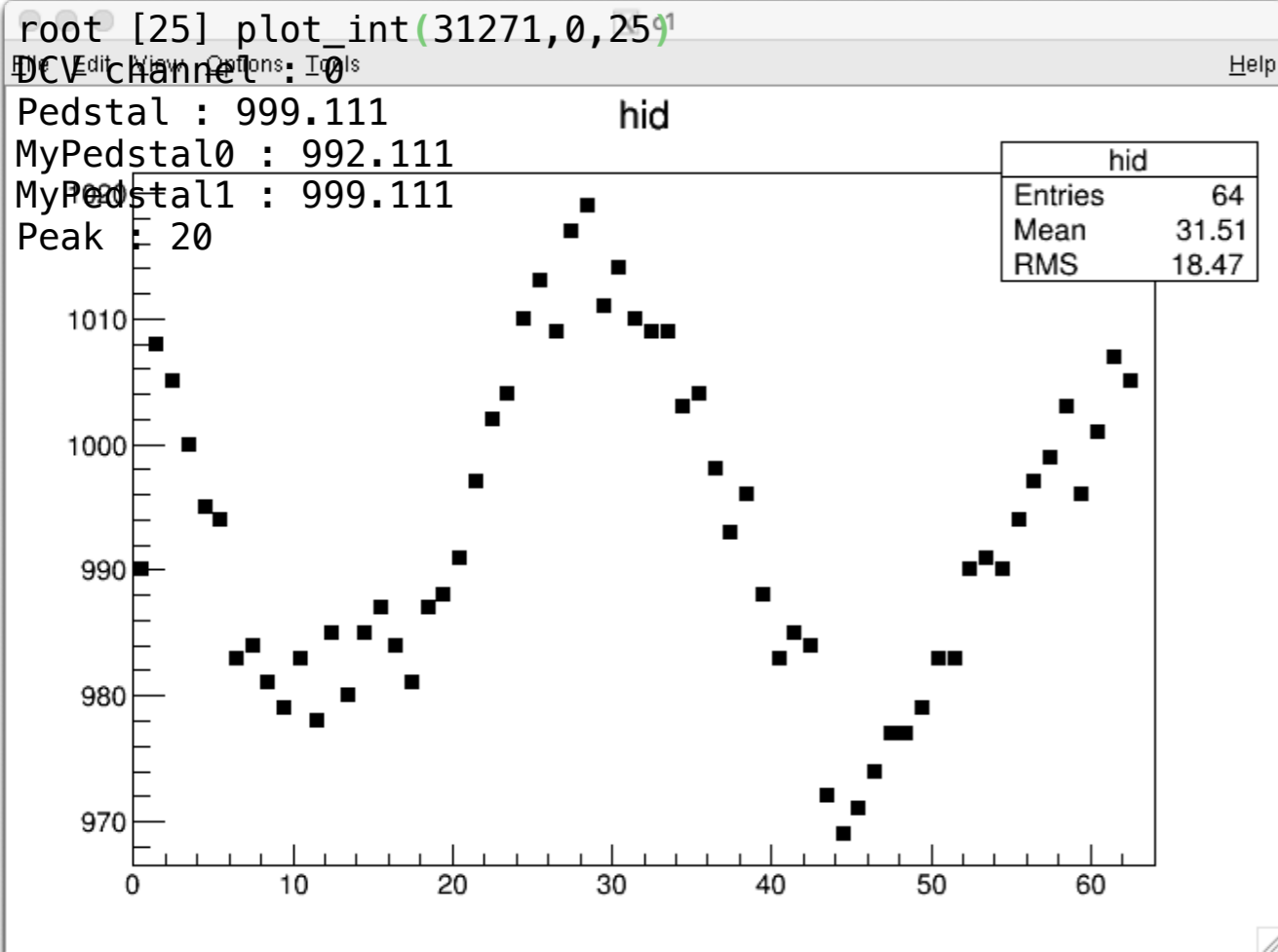


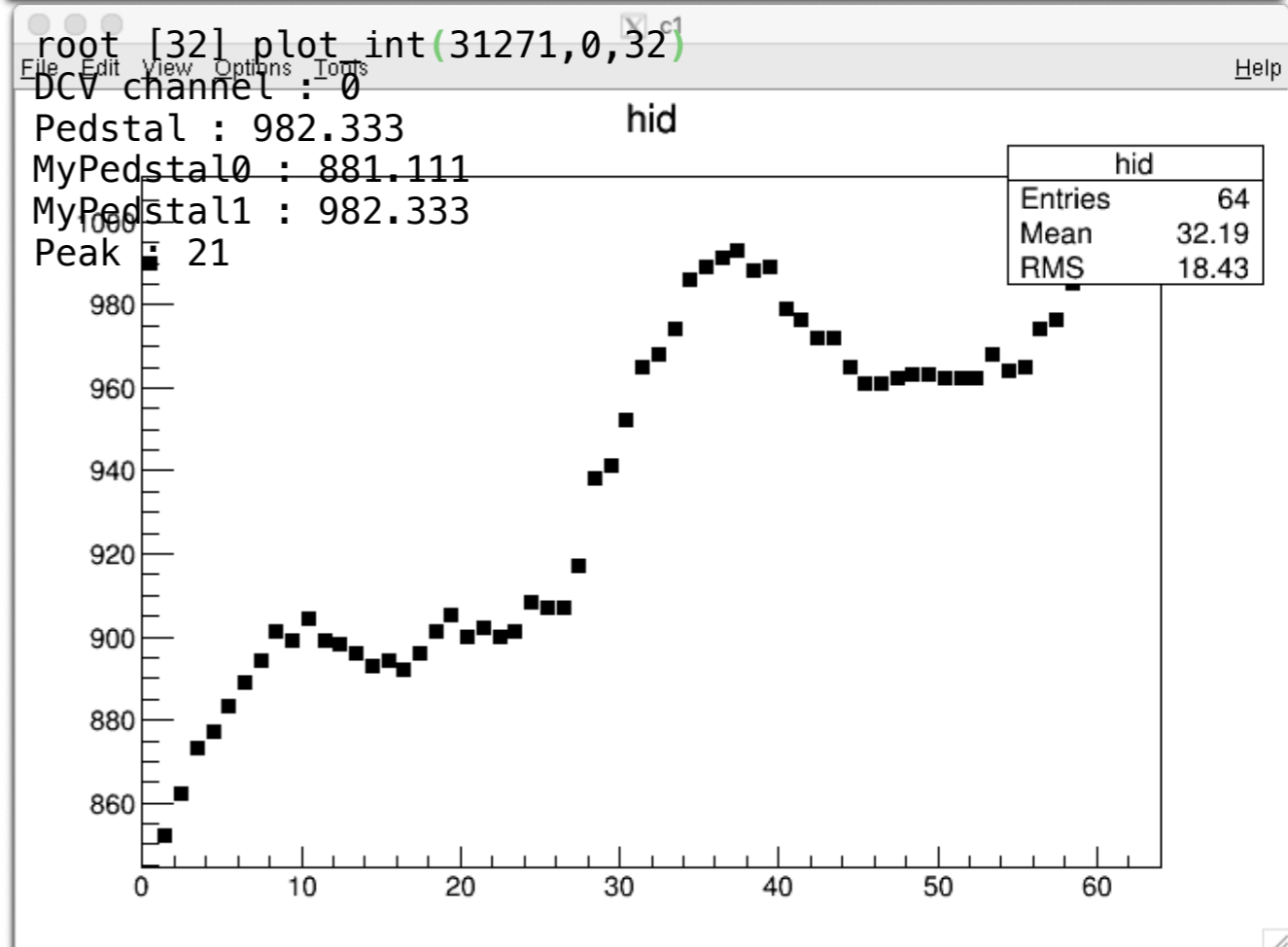
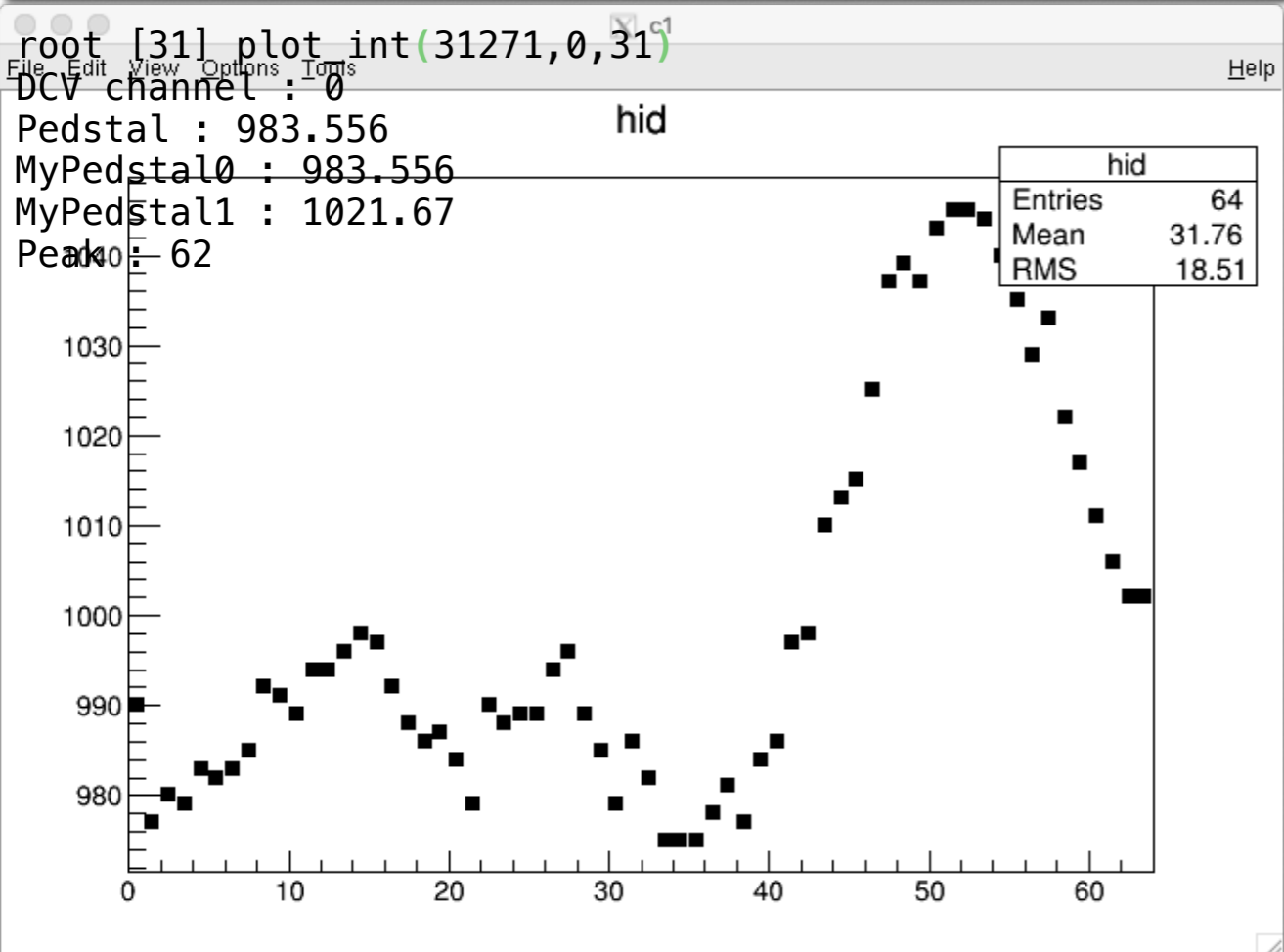
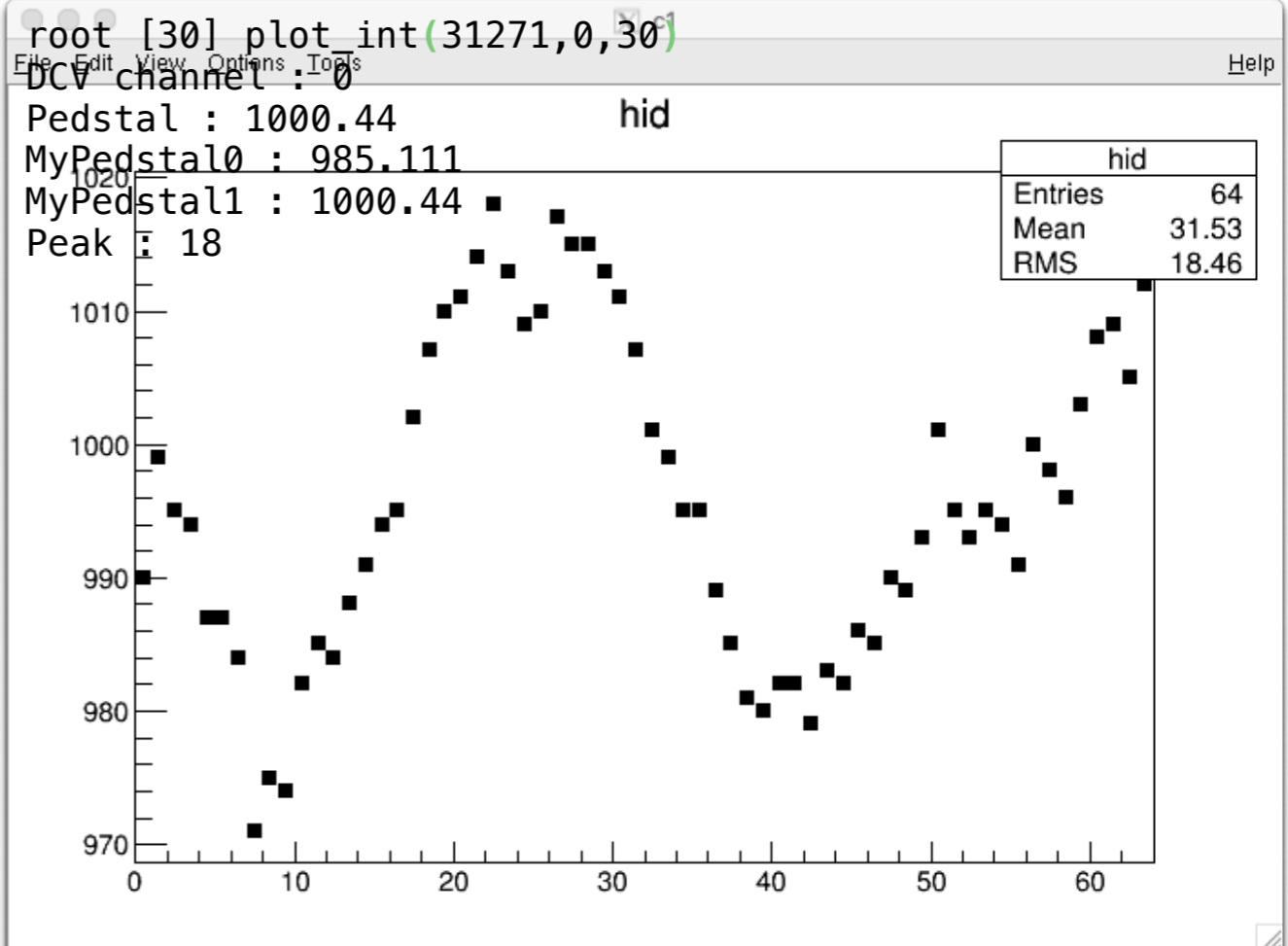
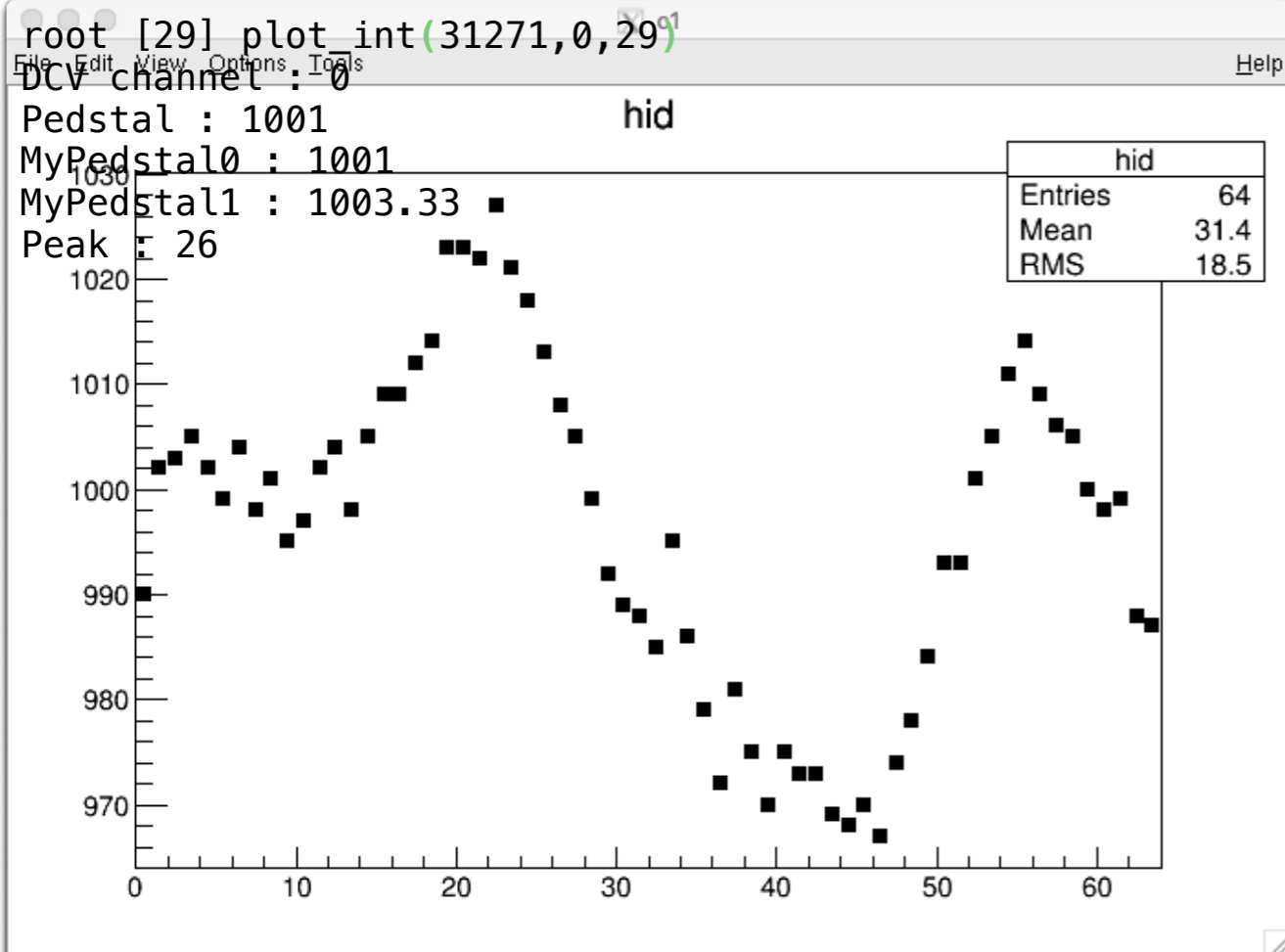


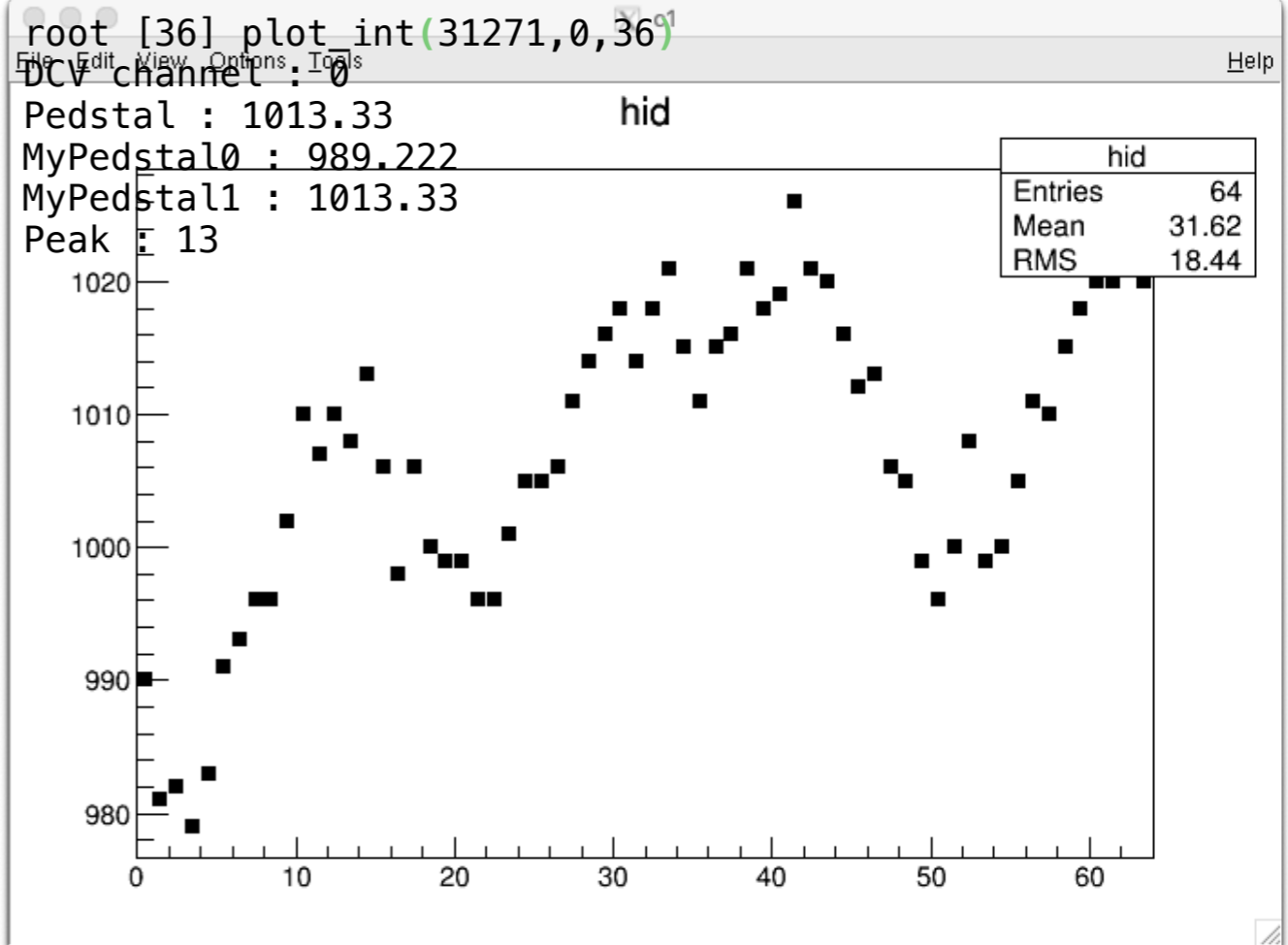
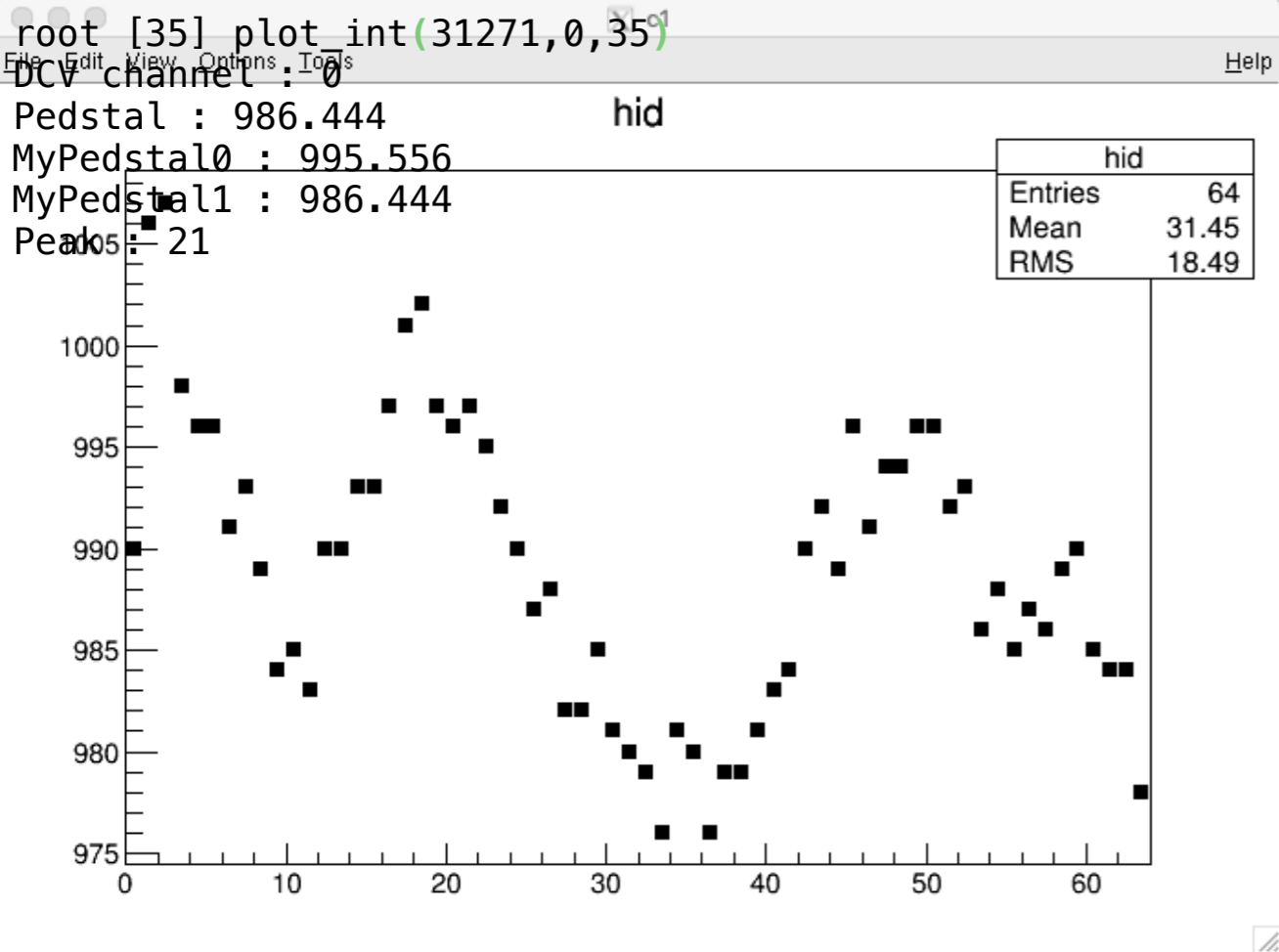
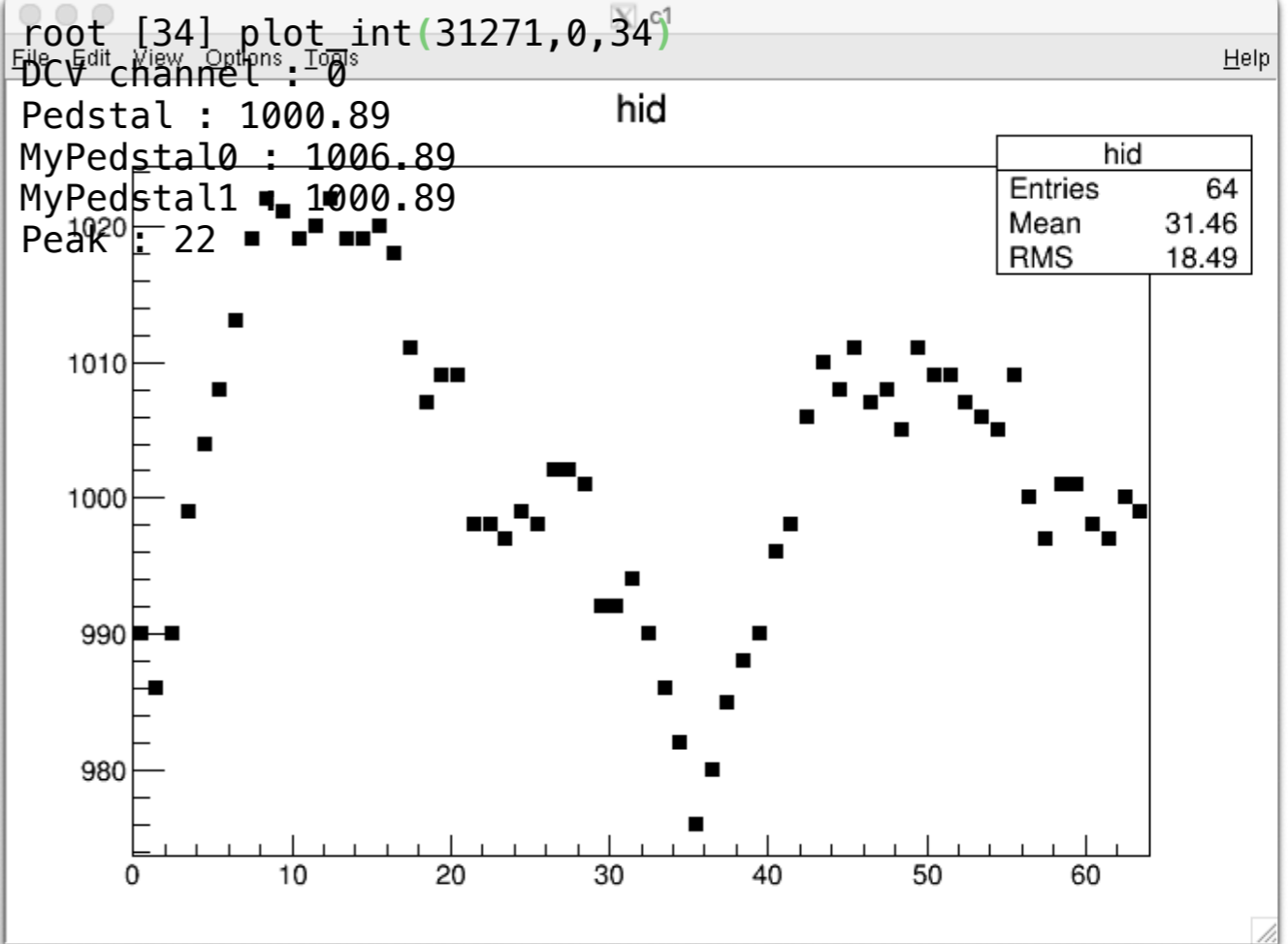
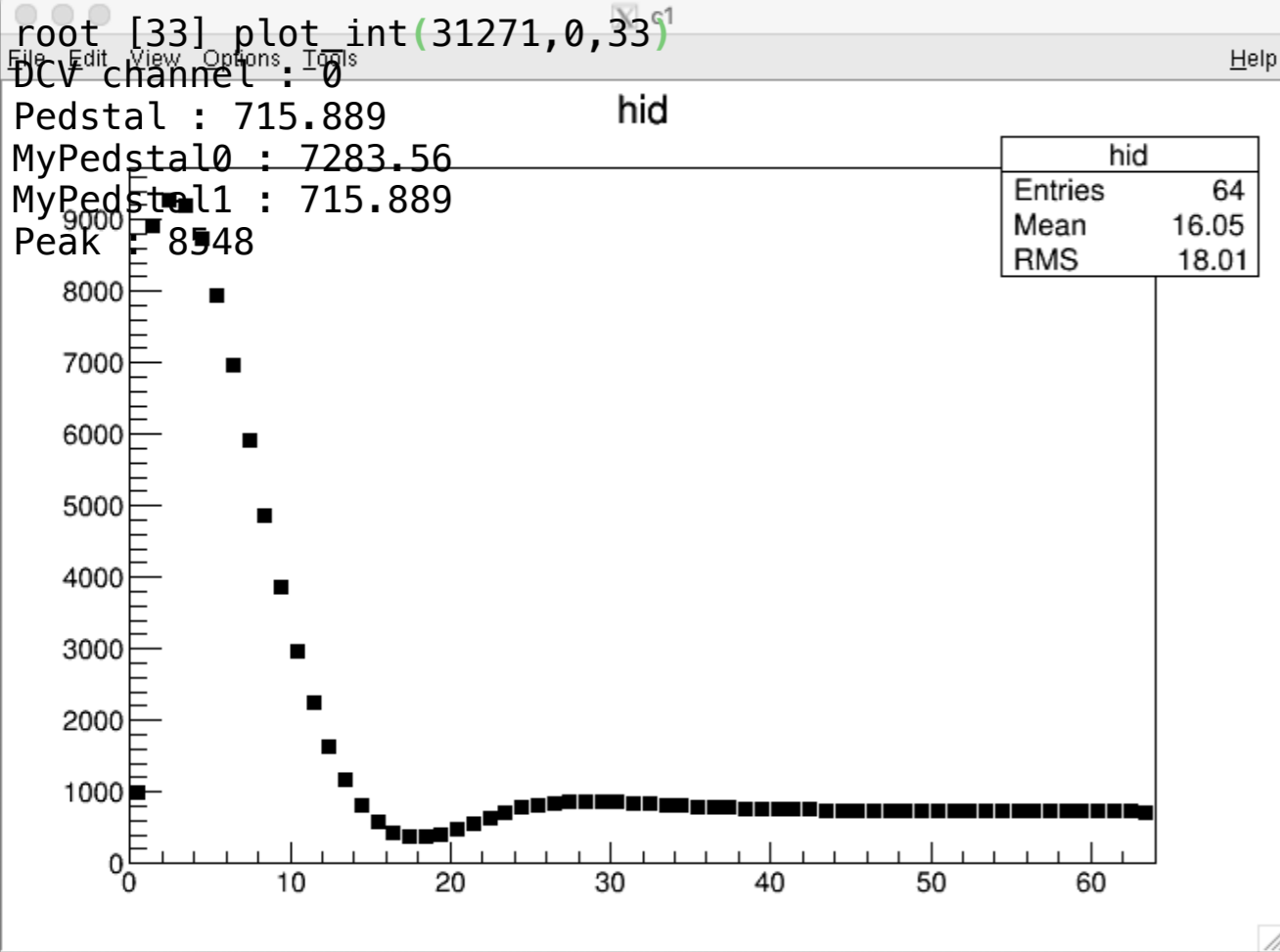


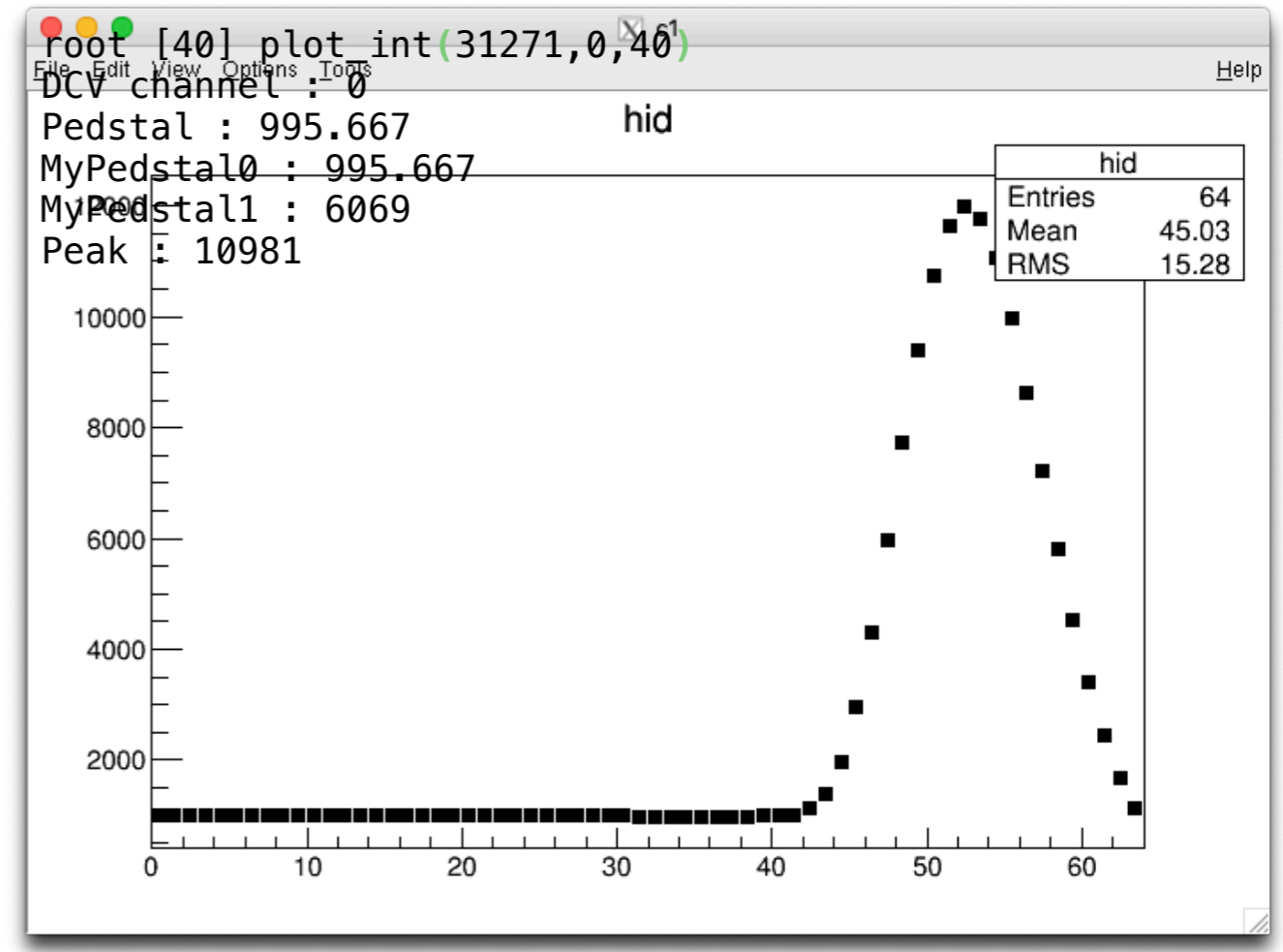
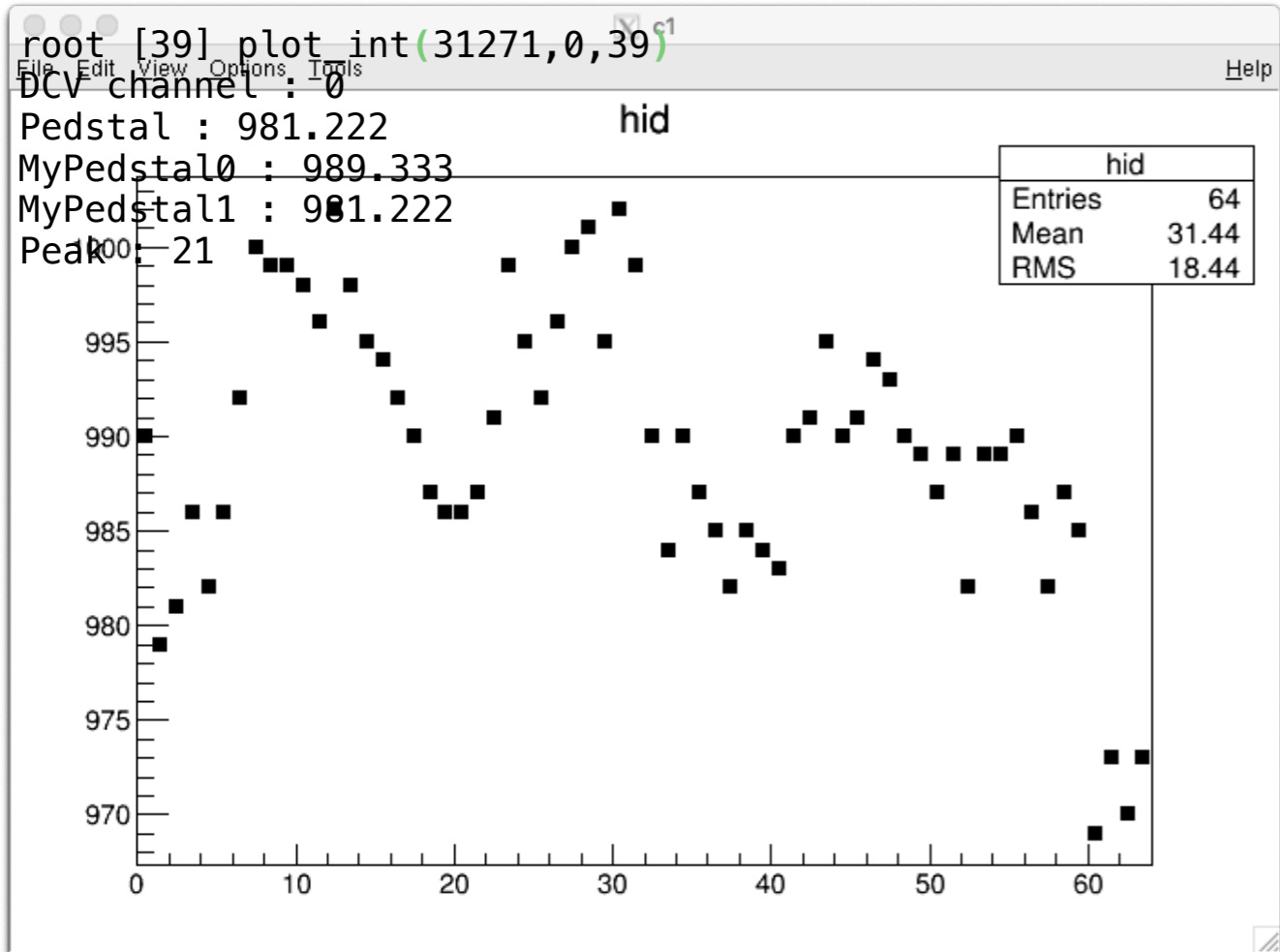
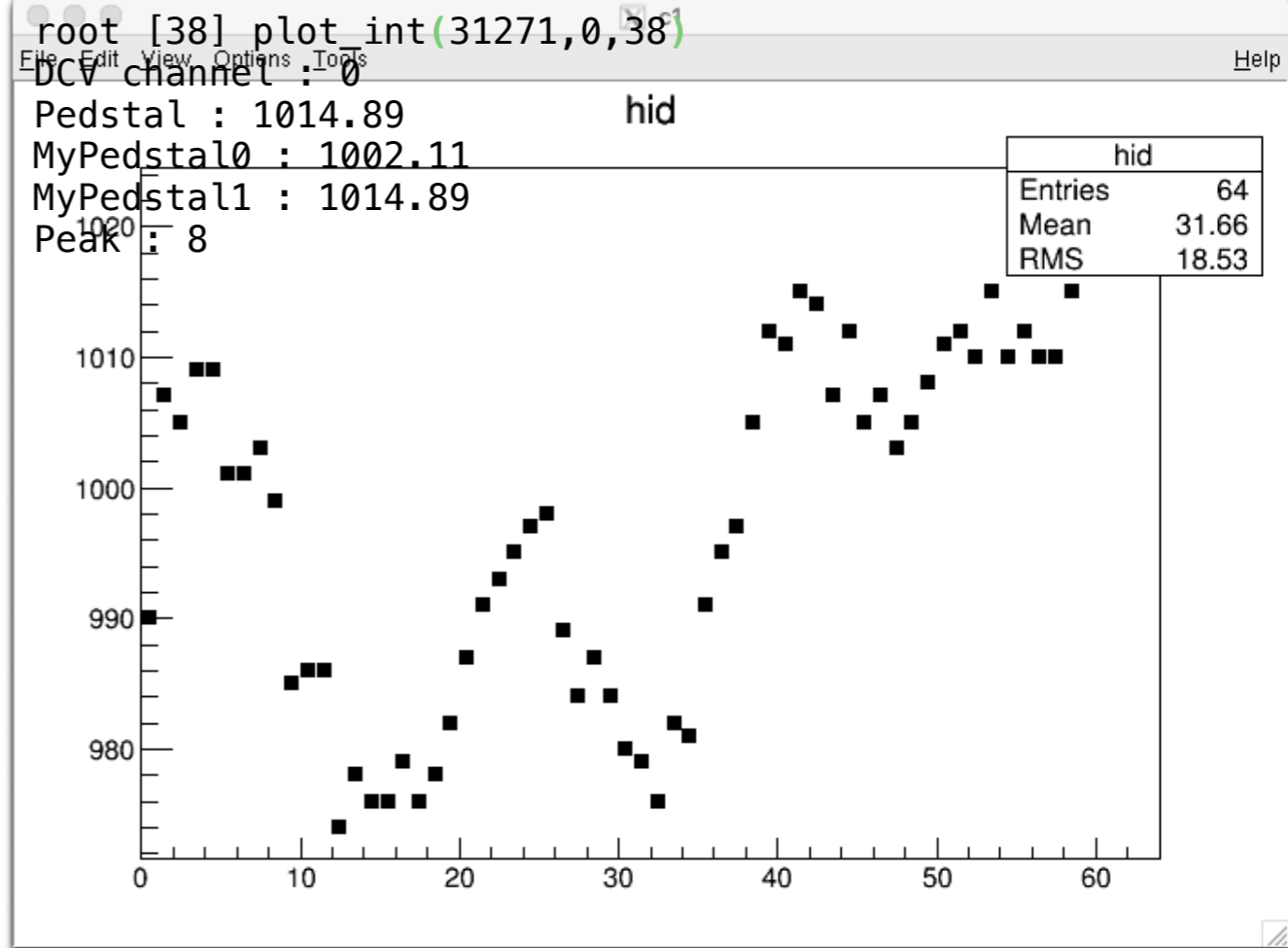
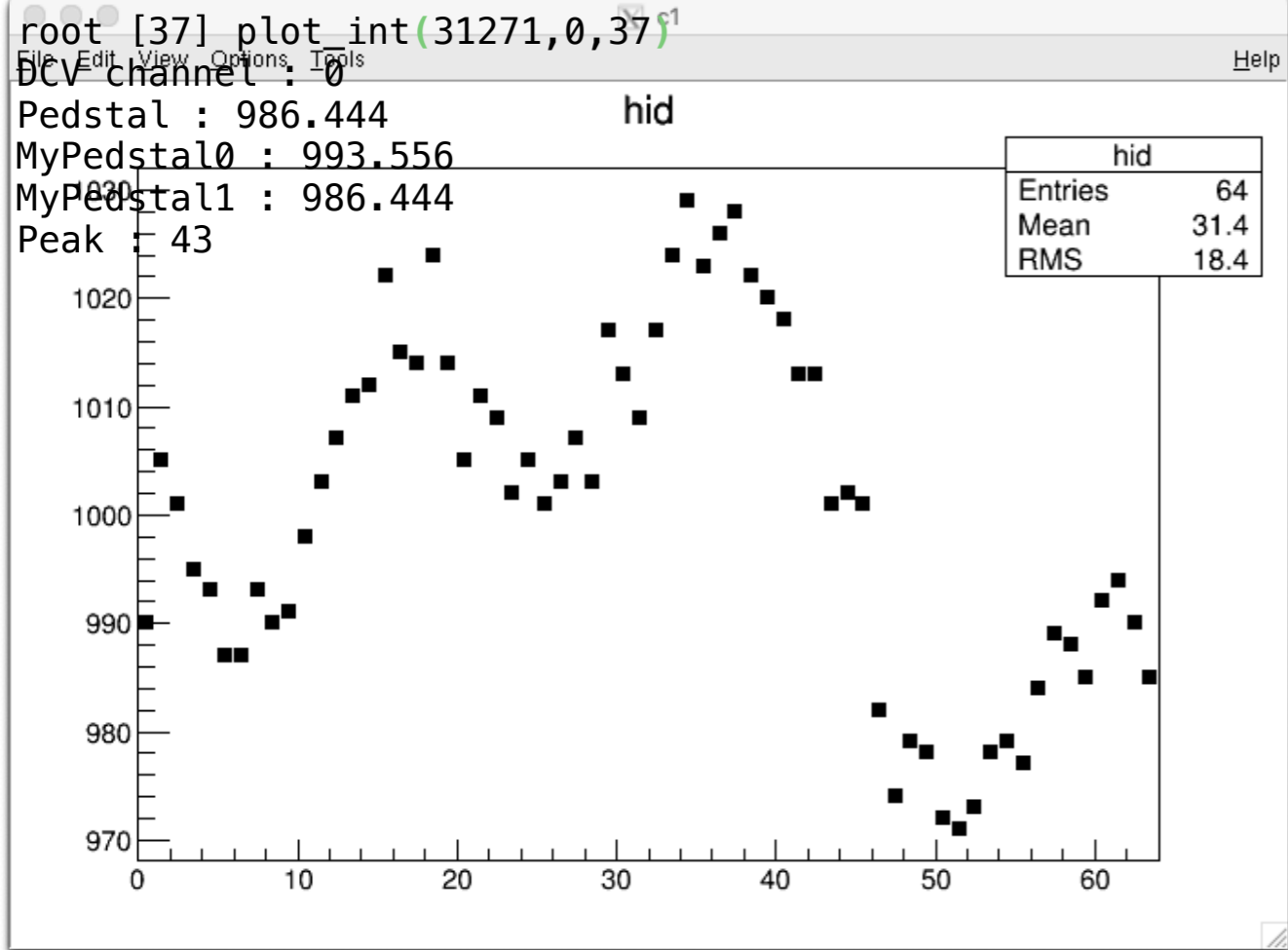


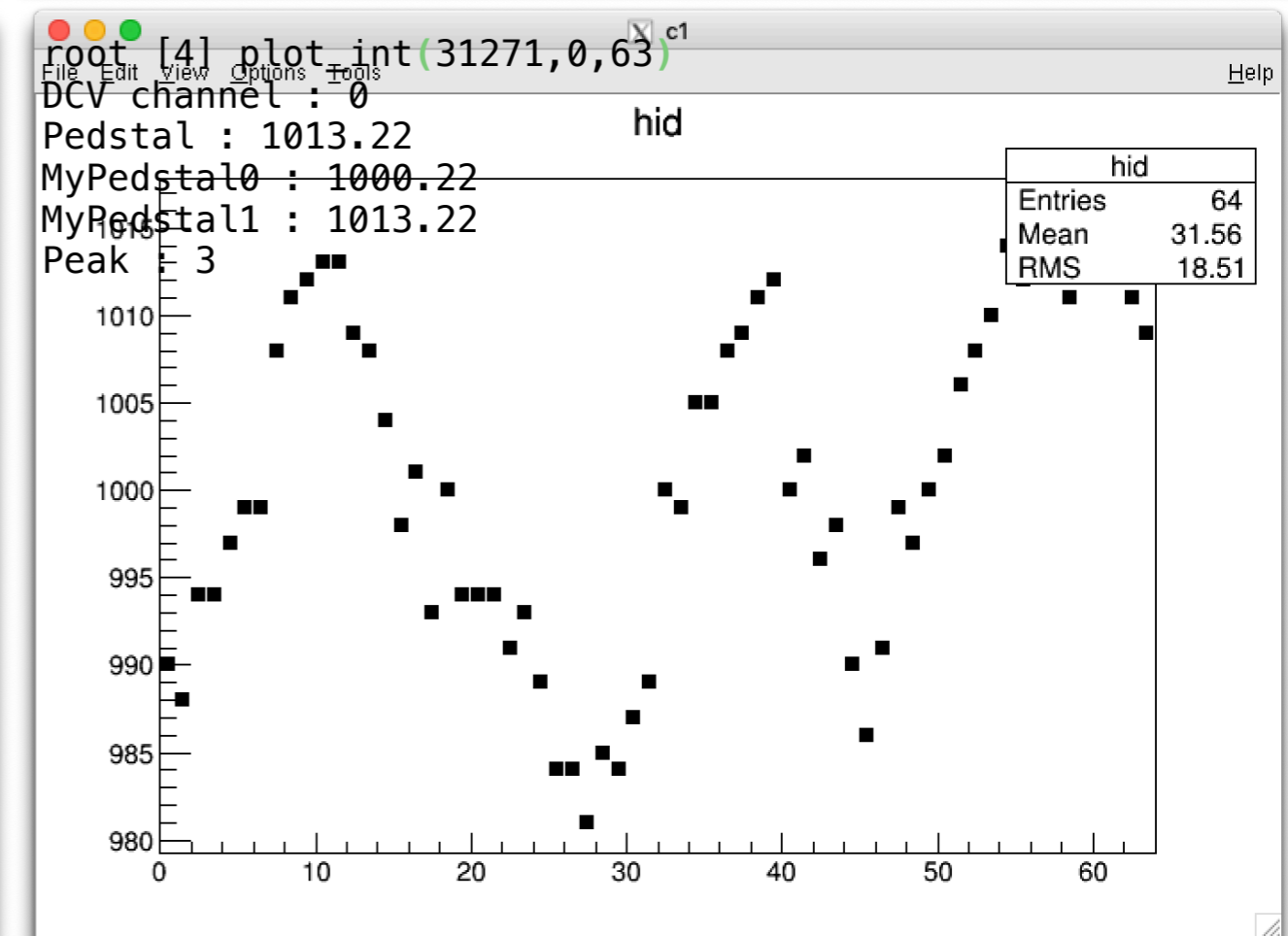
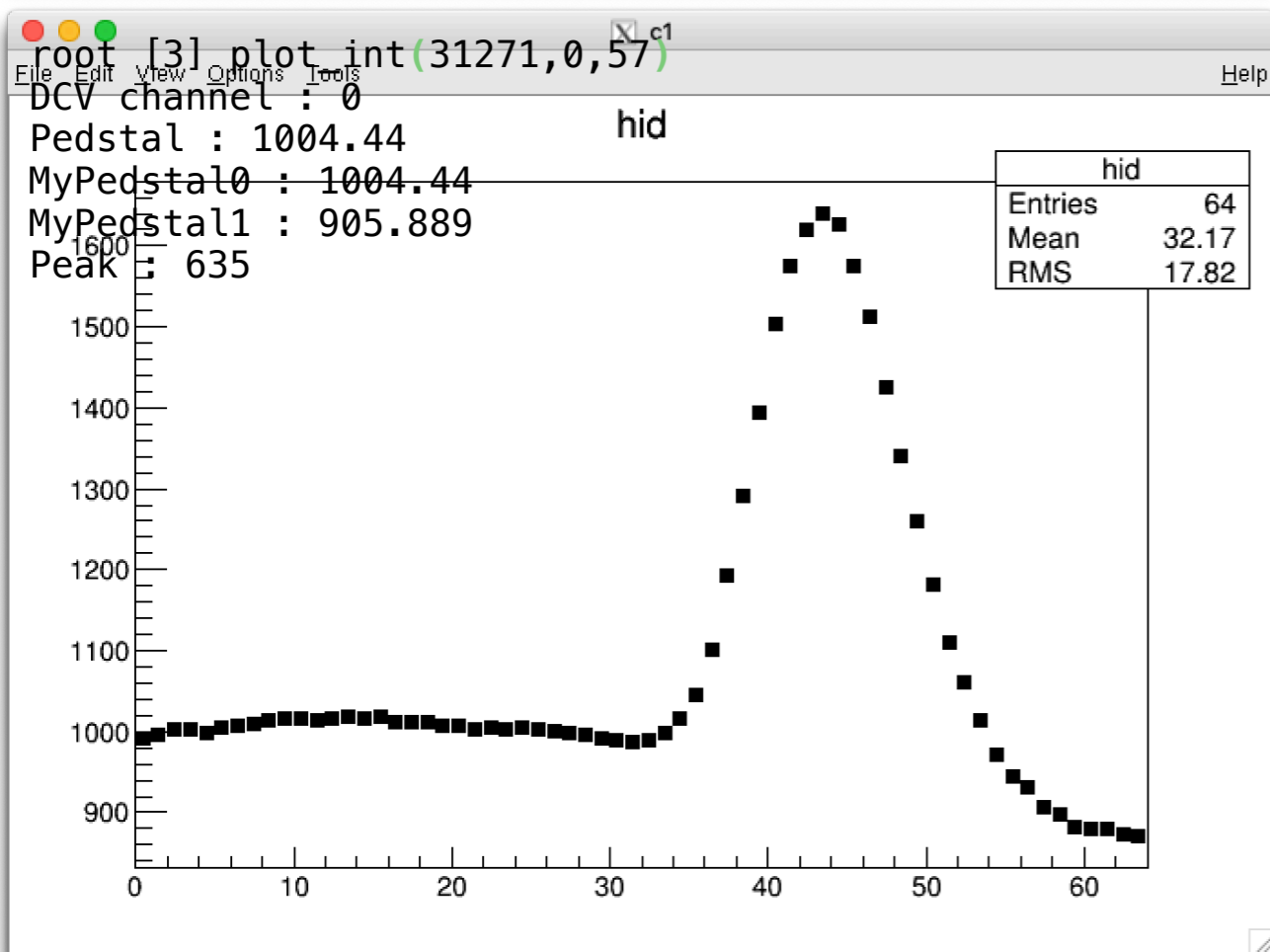
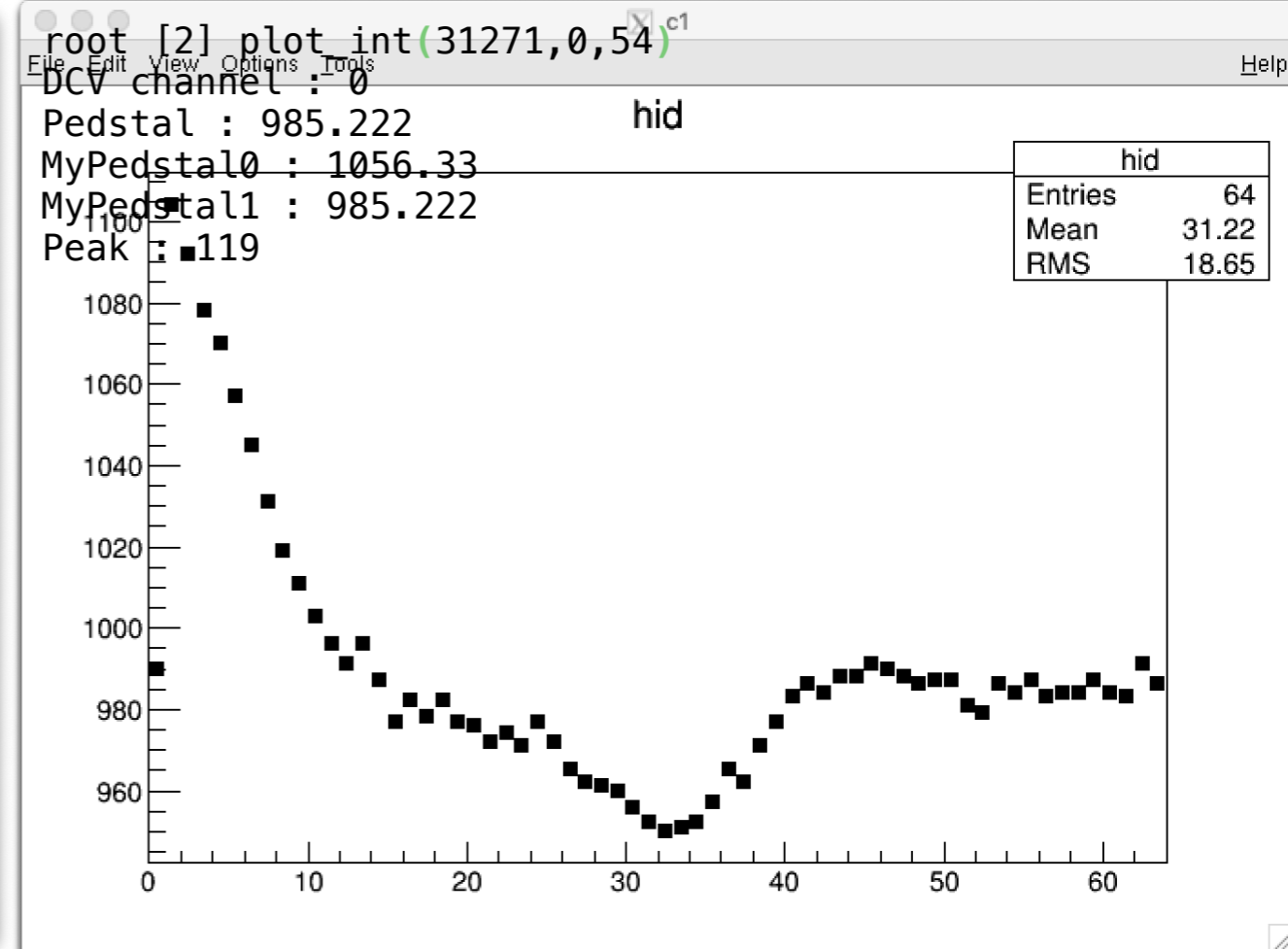
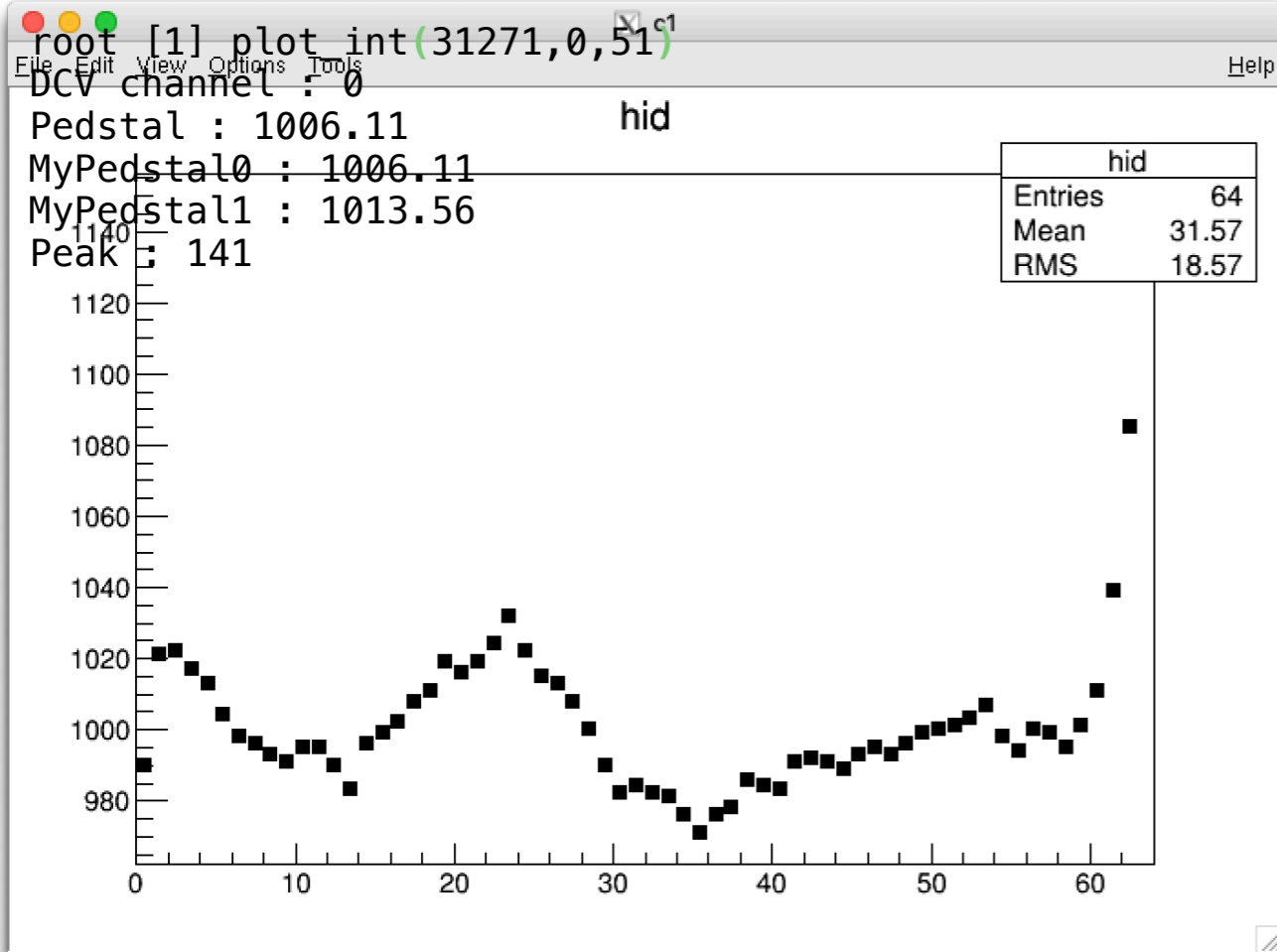


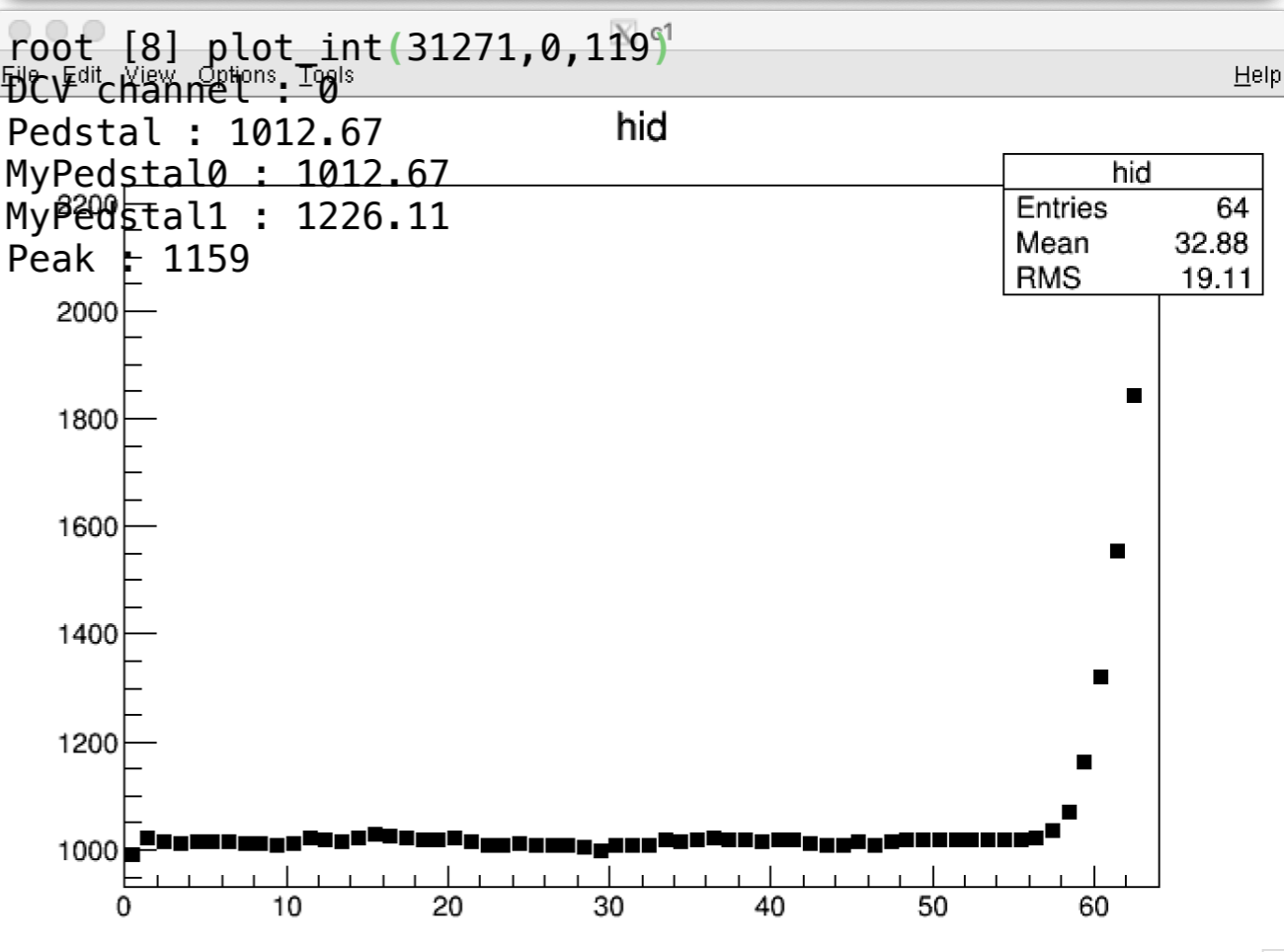
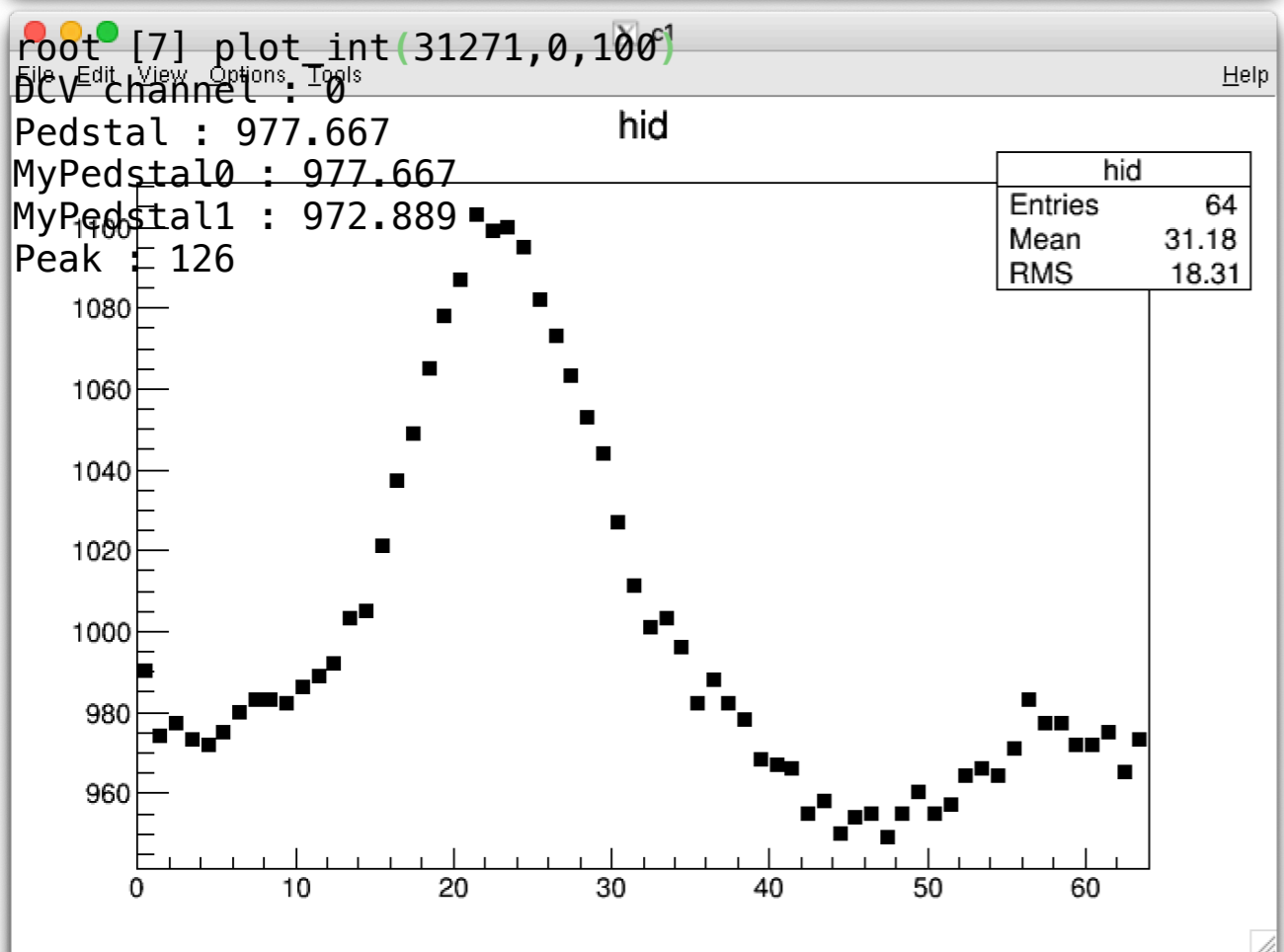
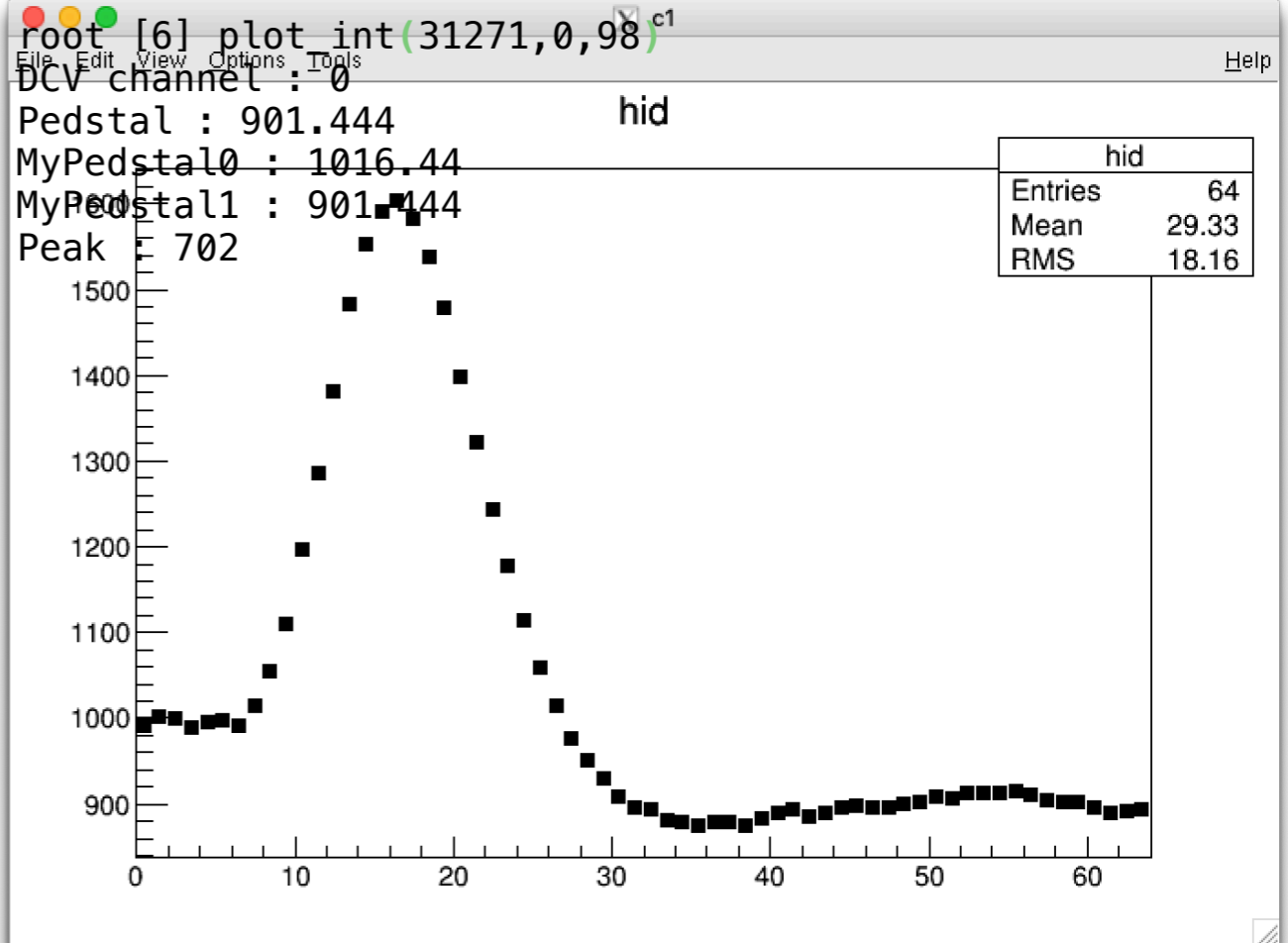
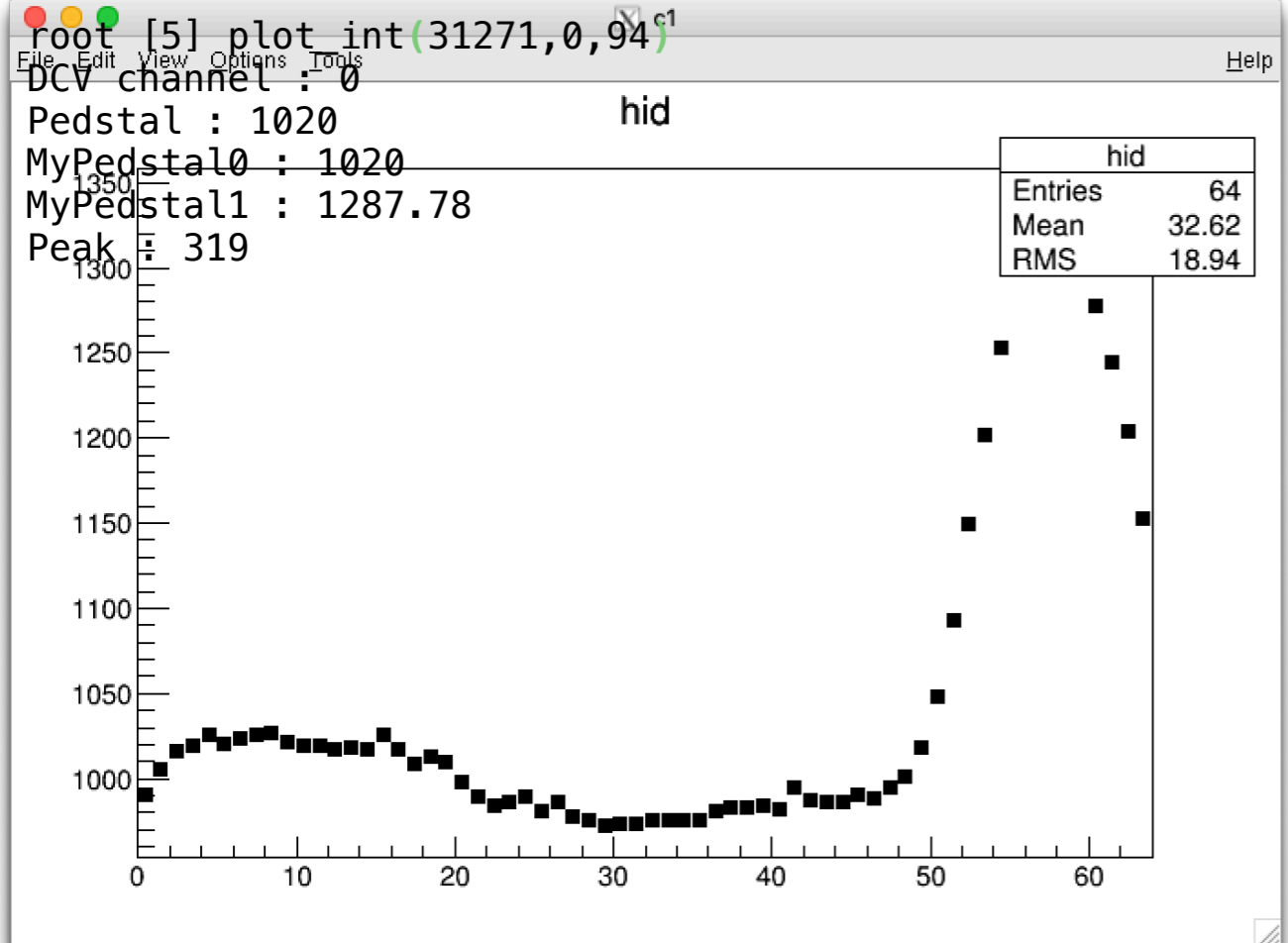








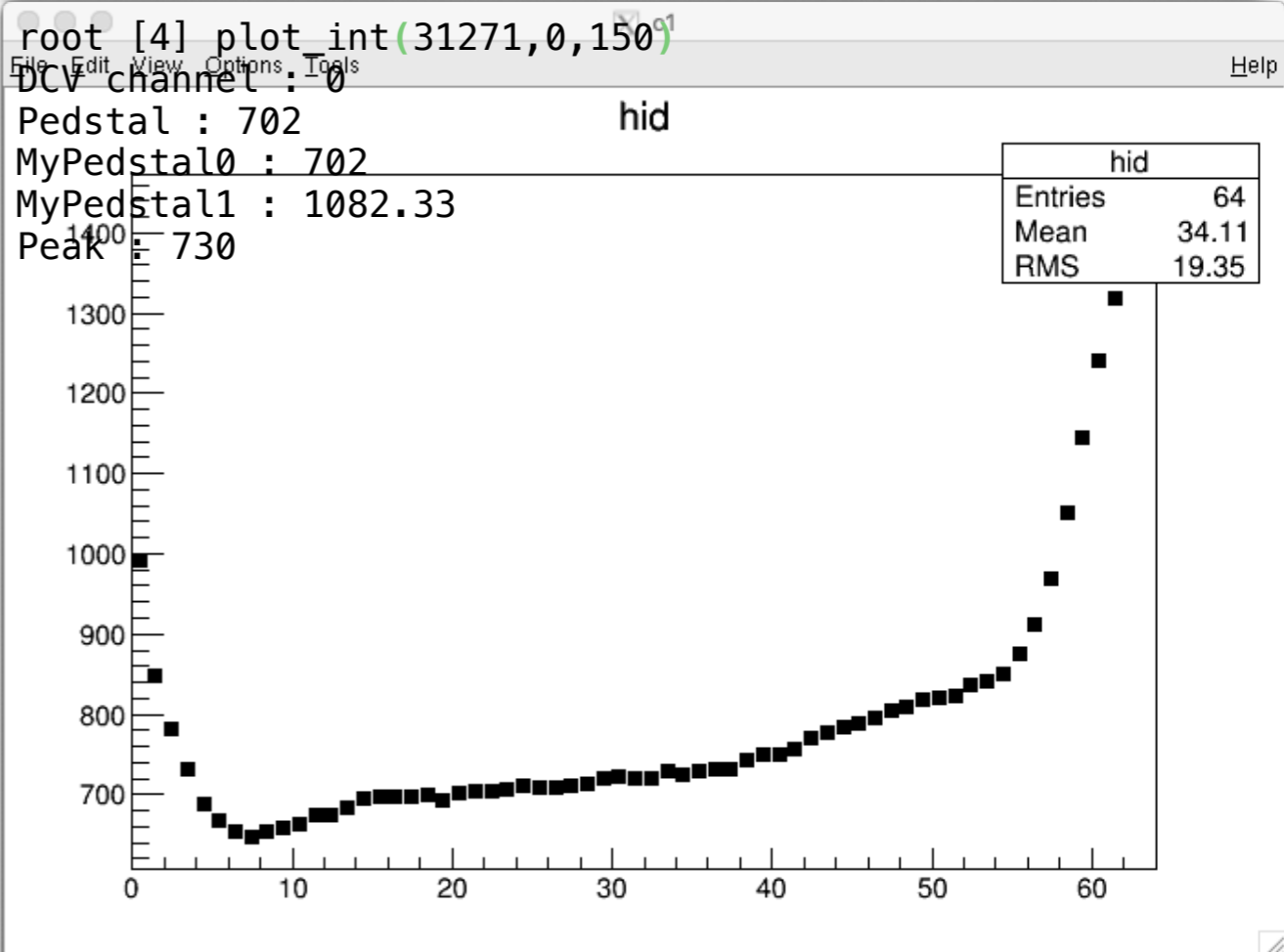
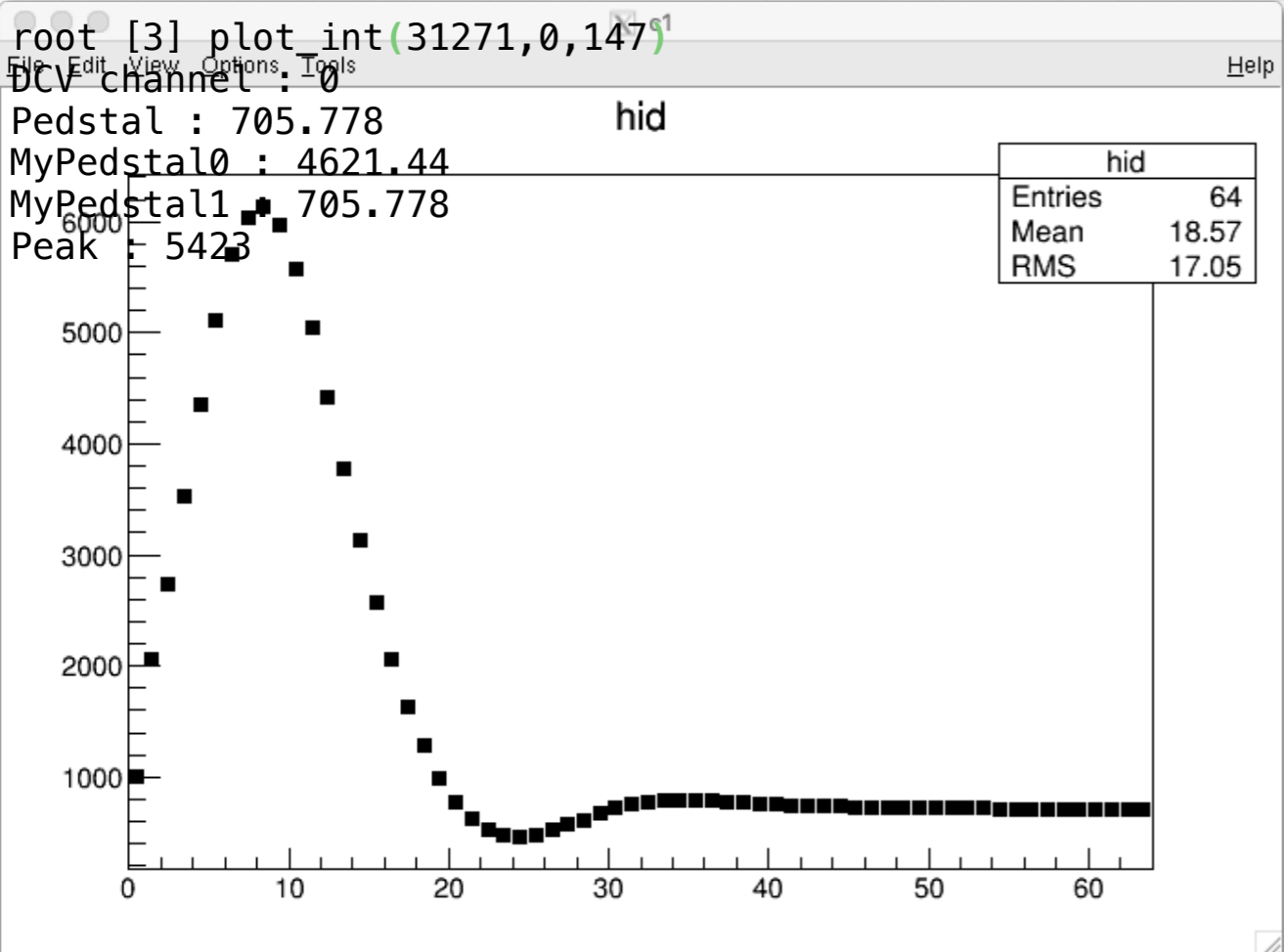
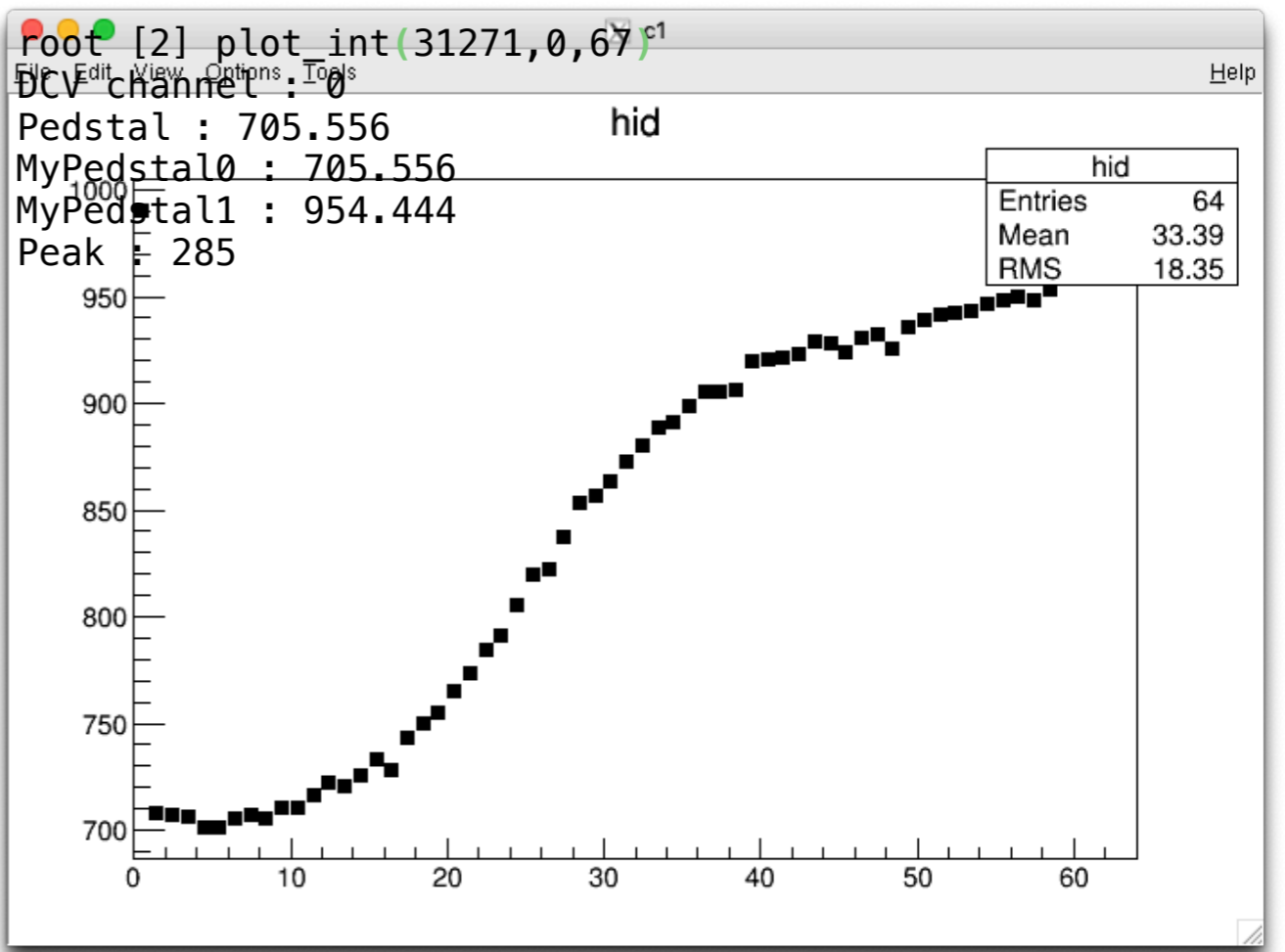
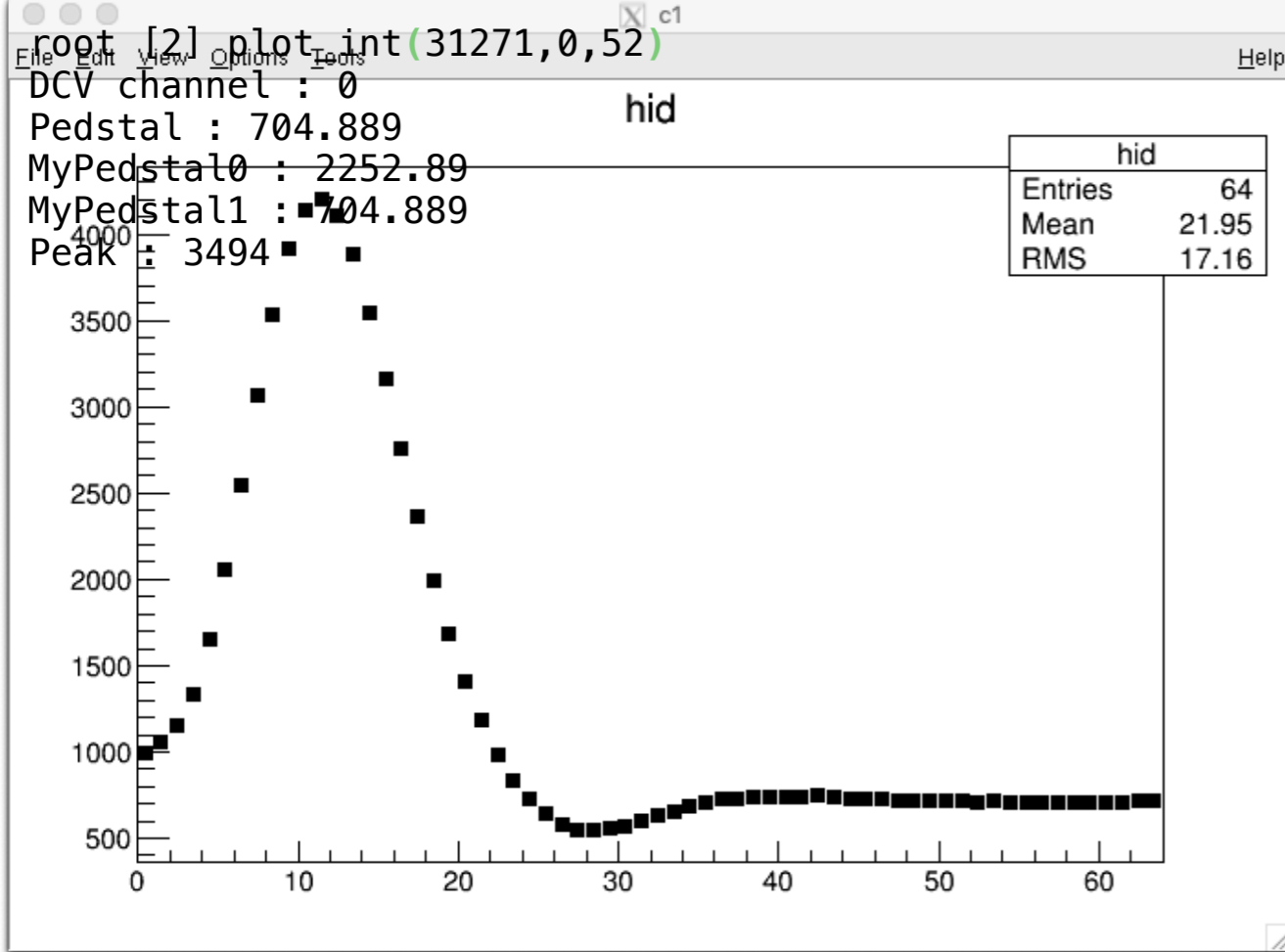


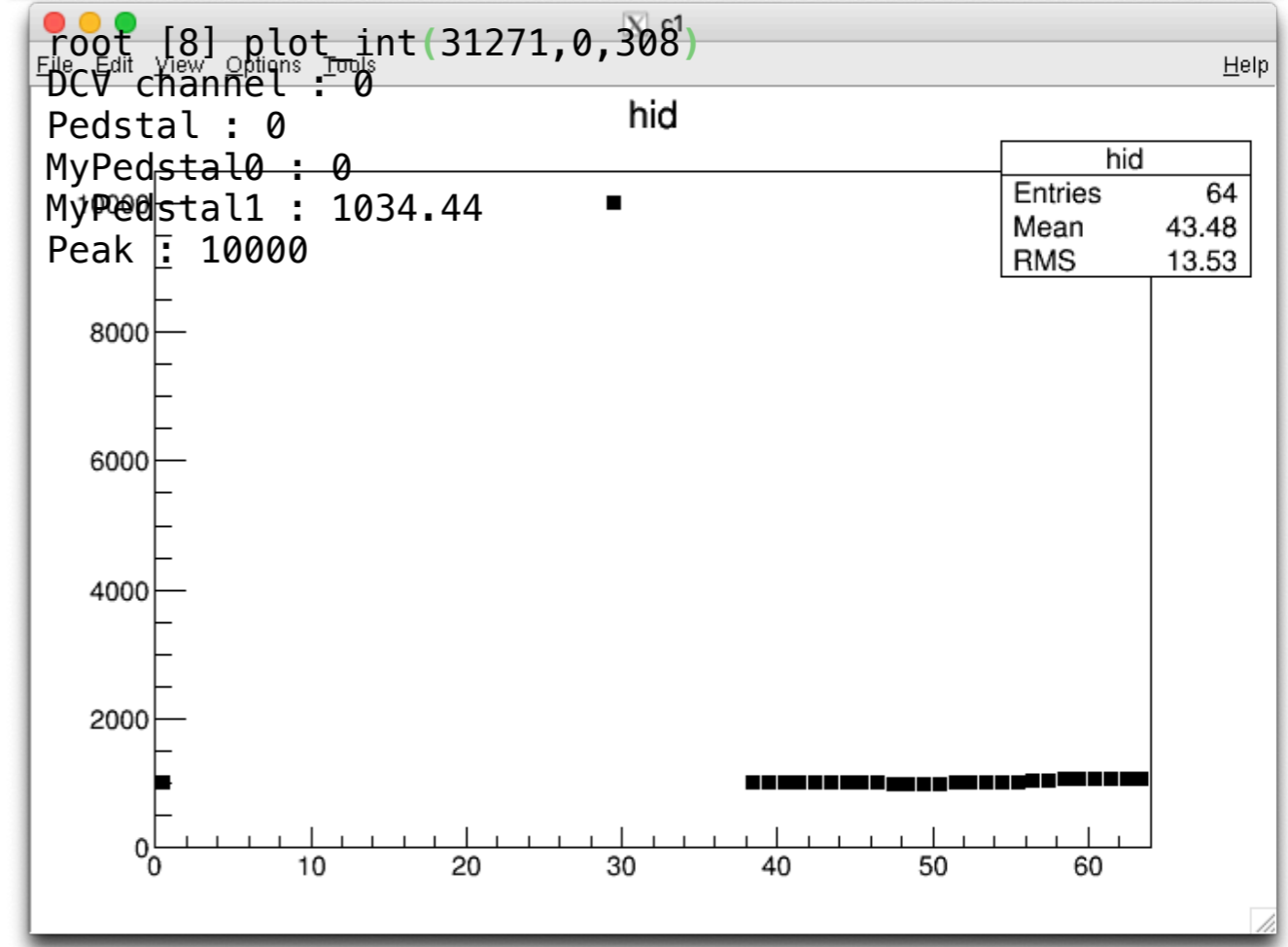
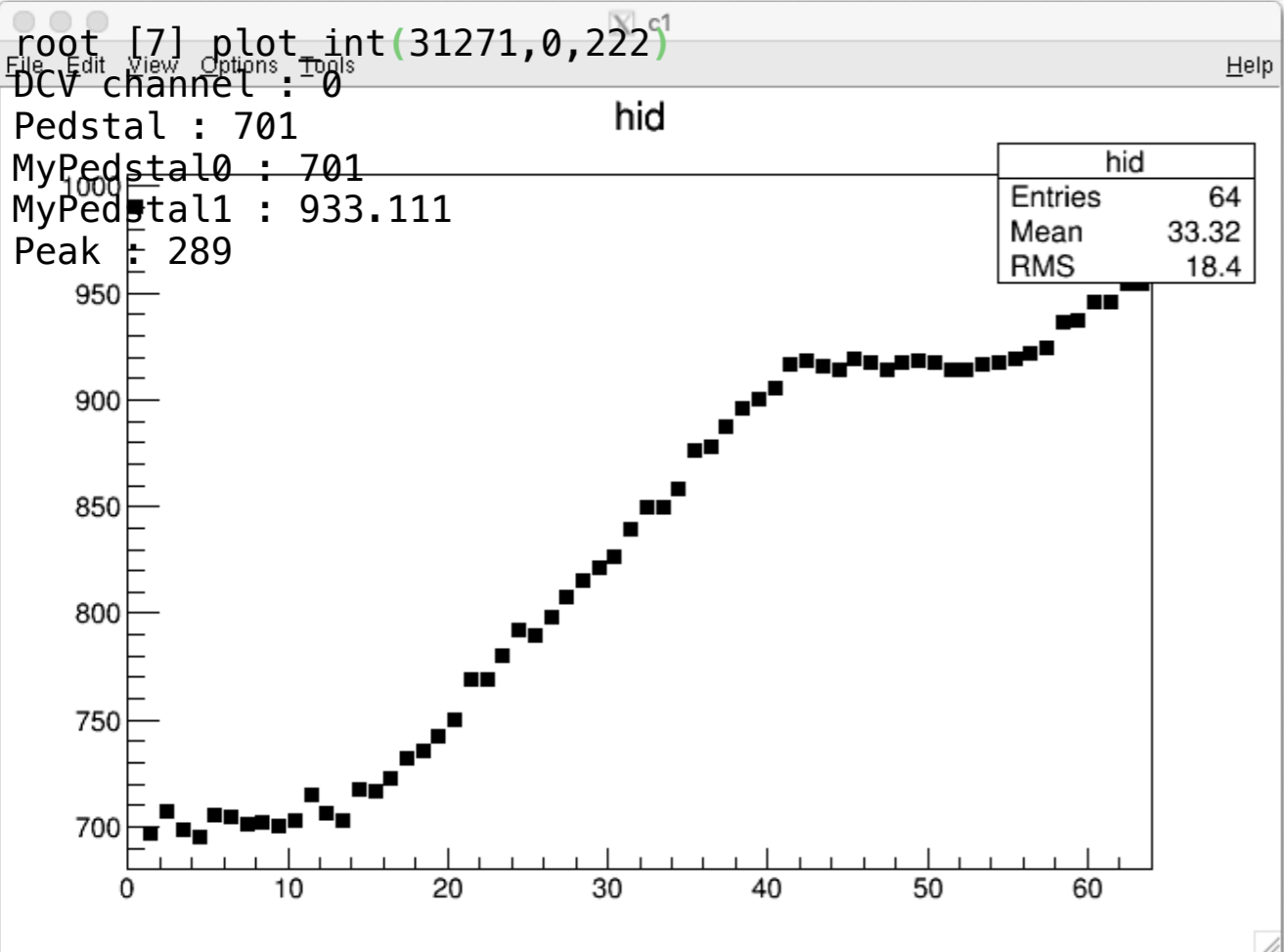
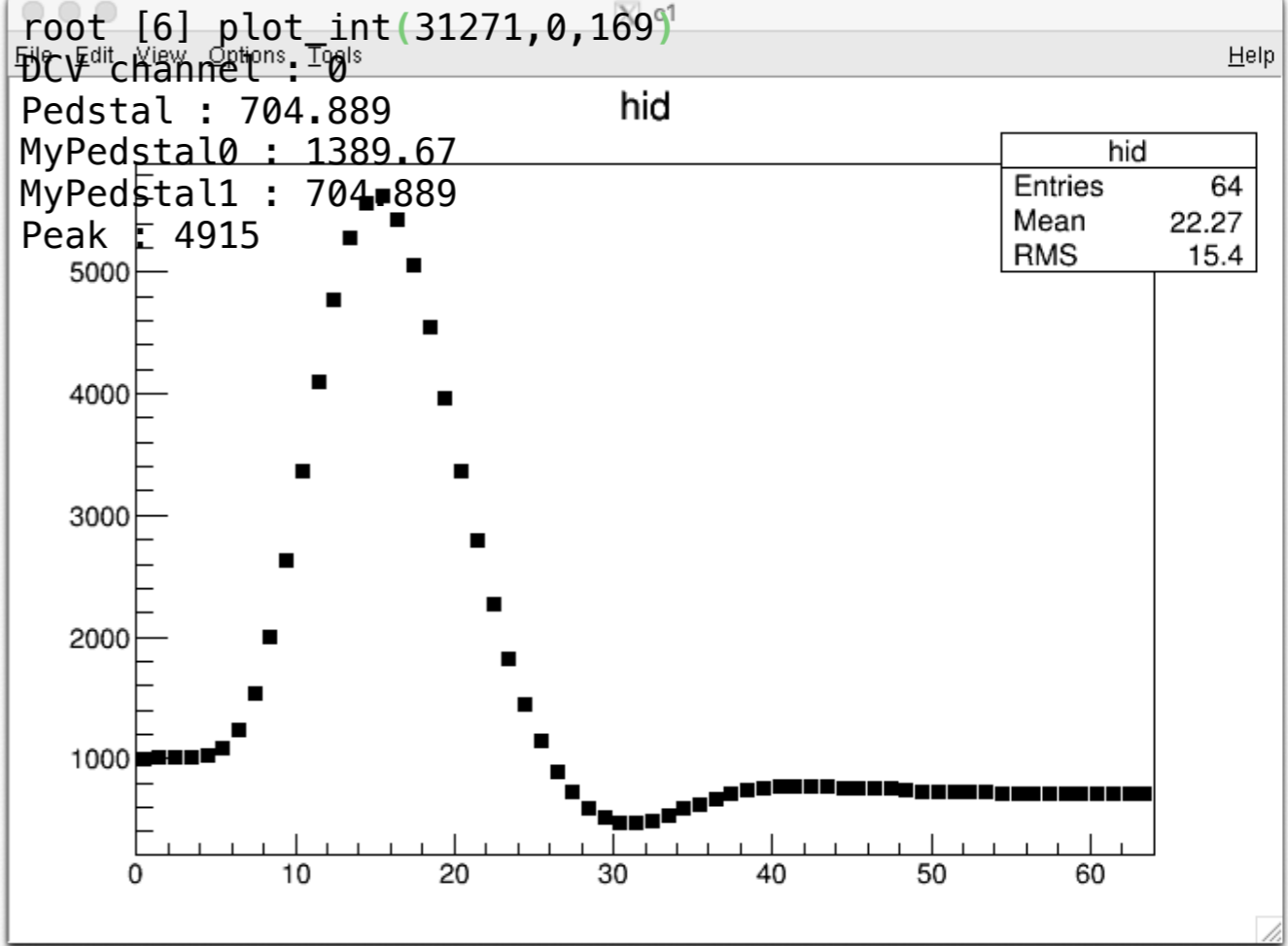
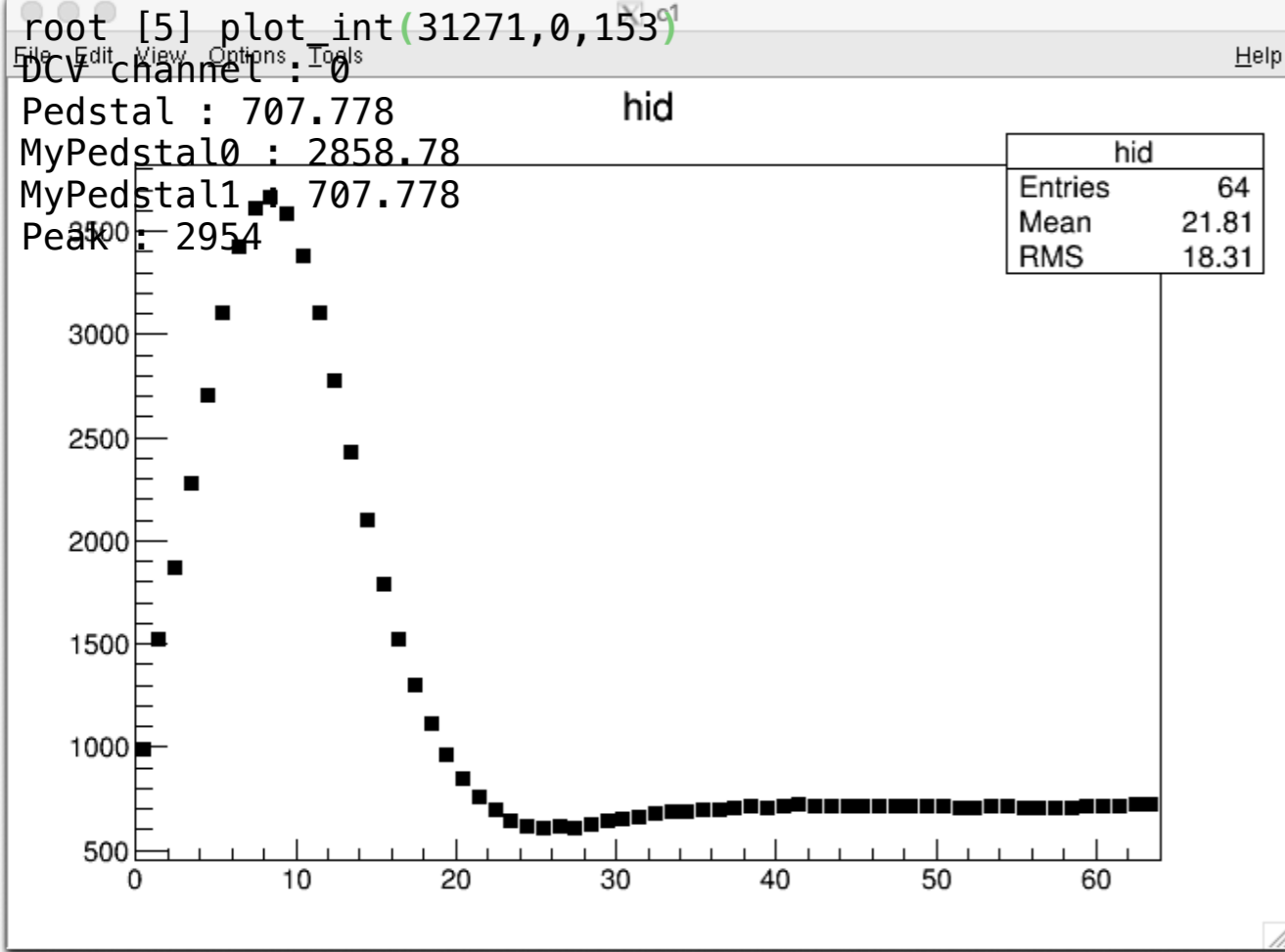


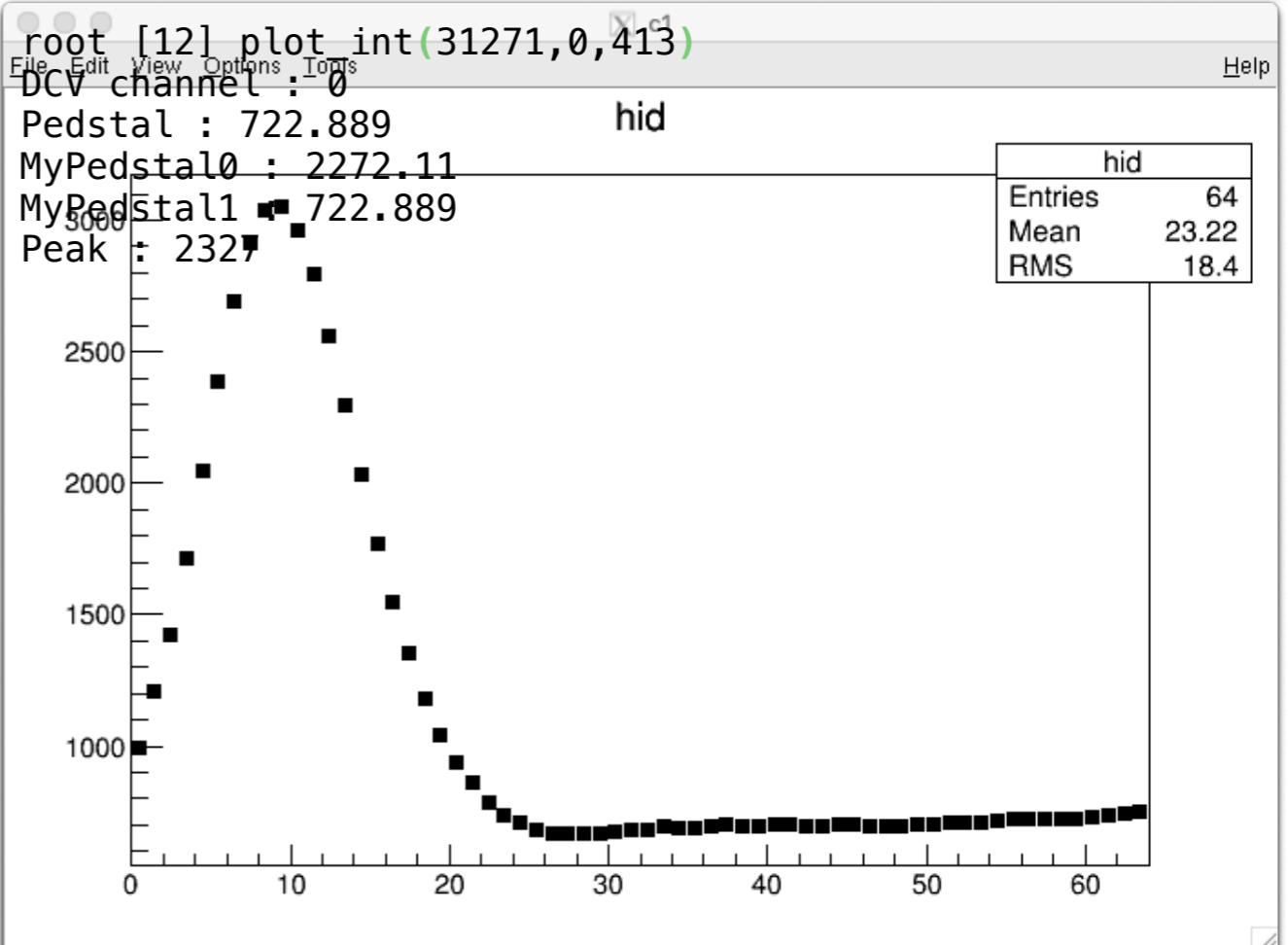
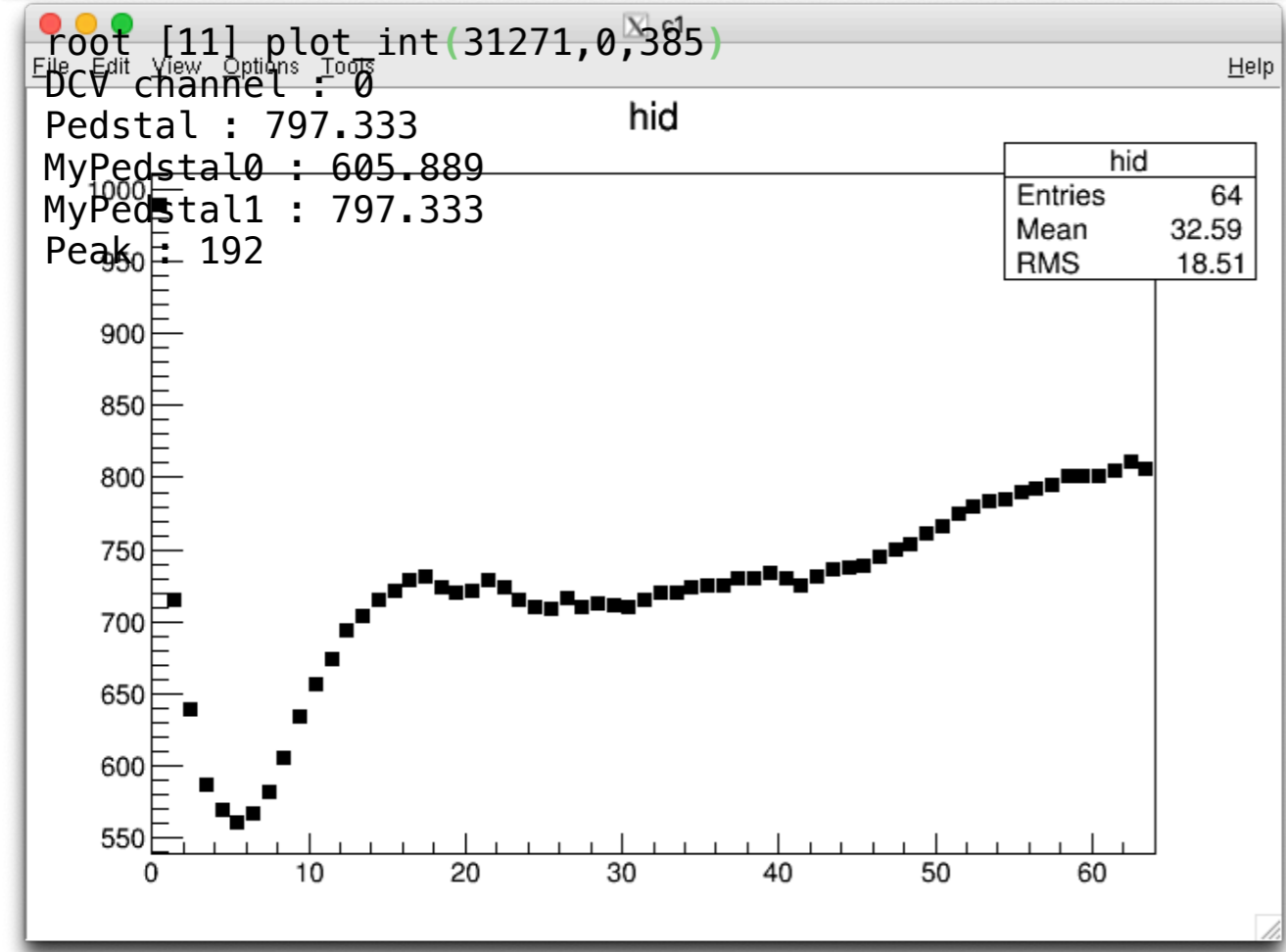
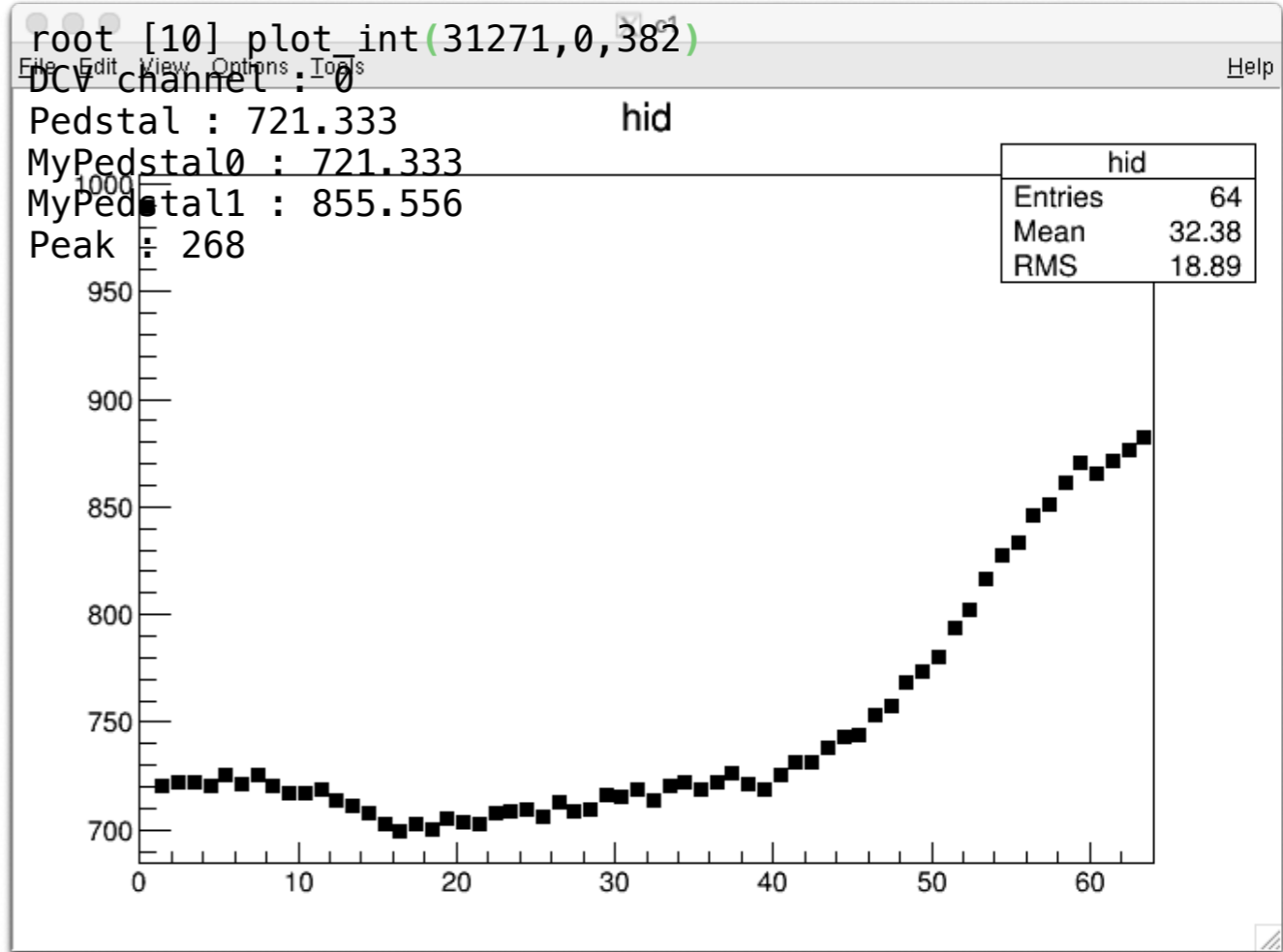
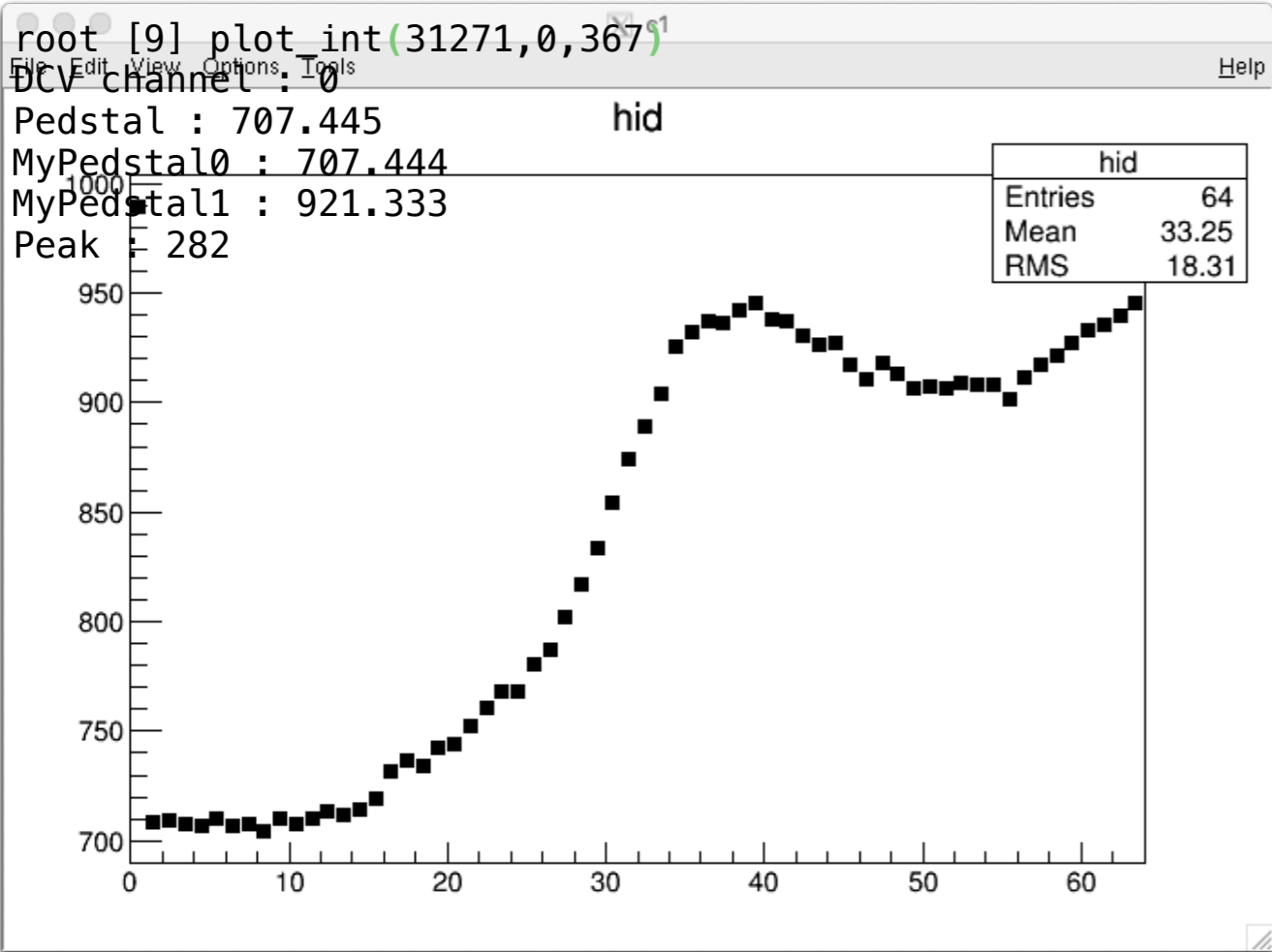
How about some events of low pedestal?

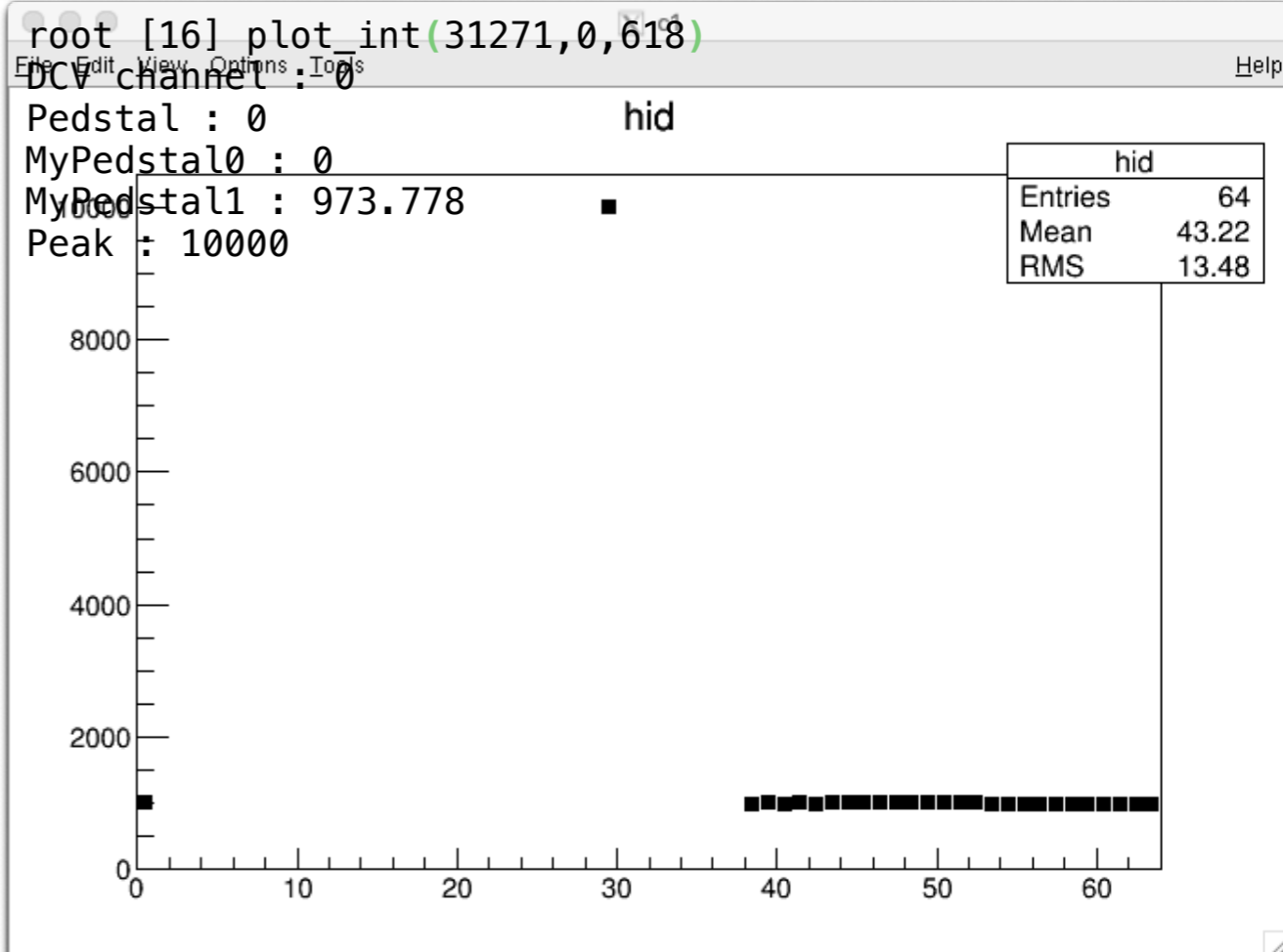
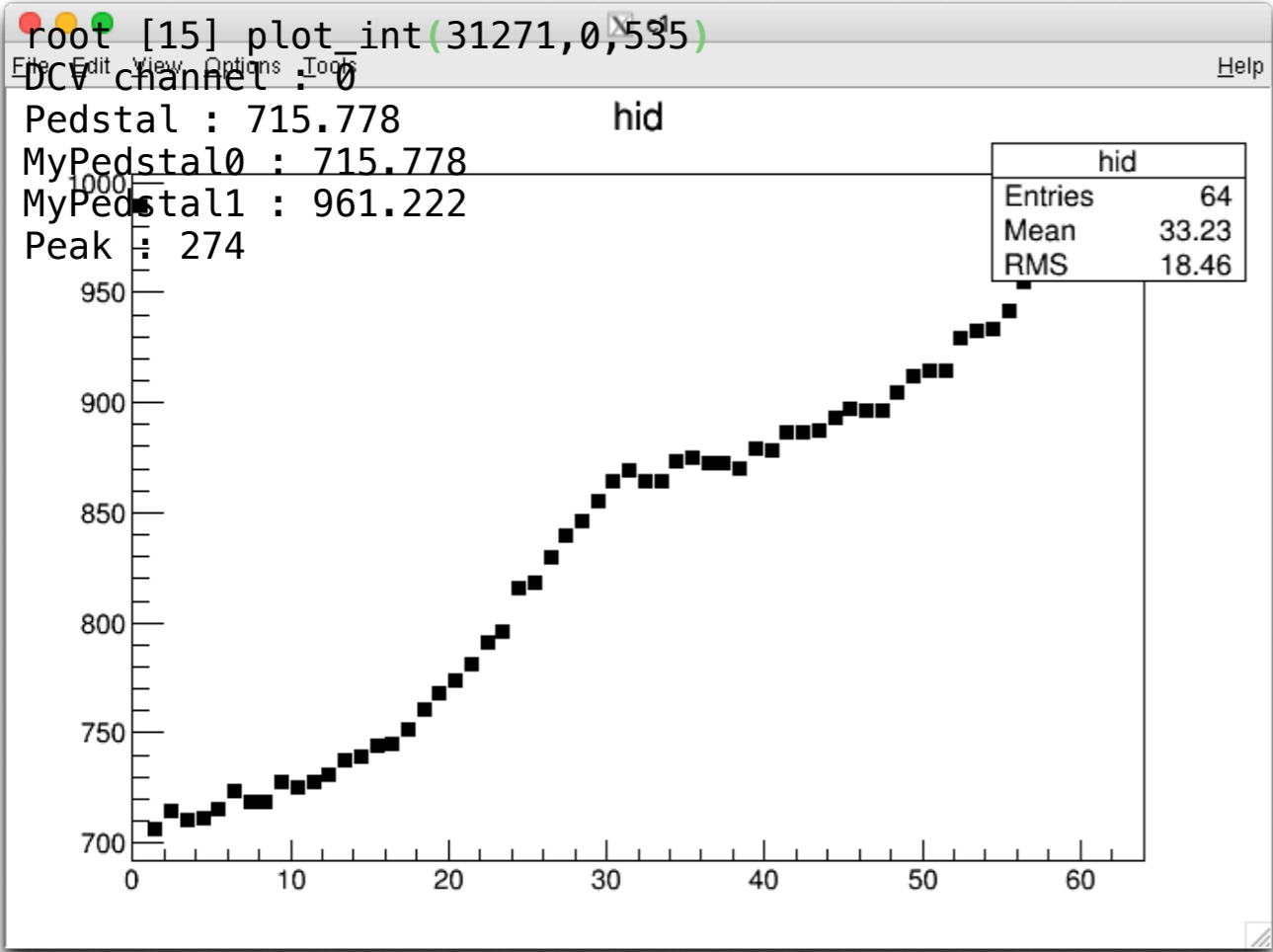
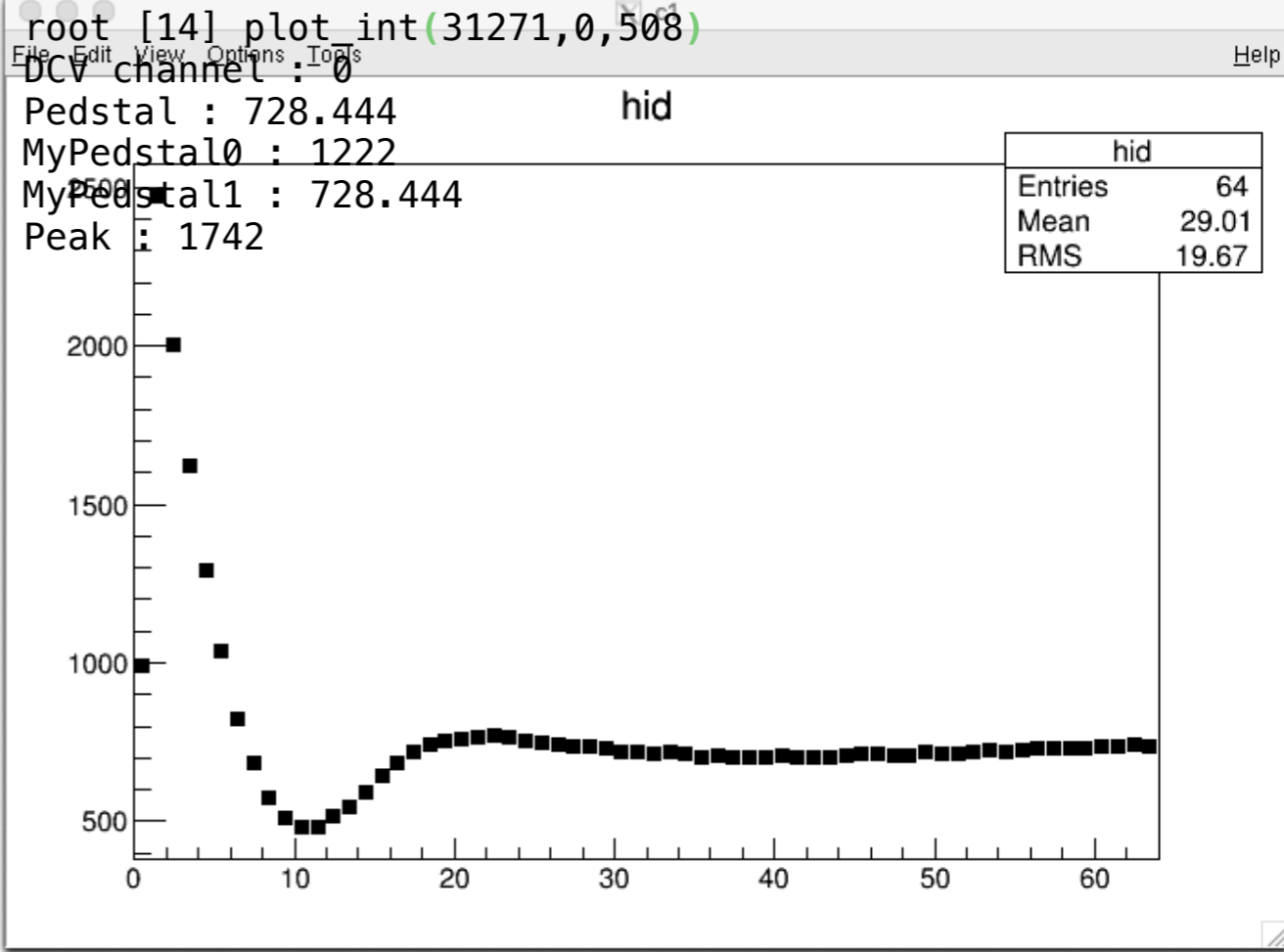
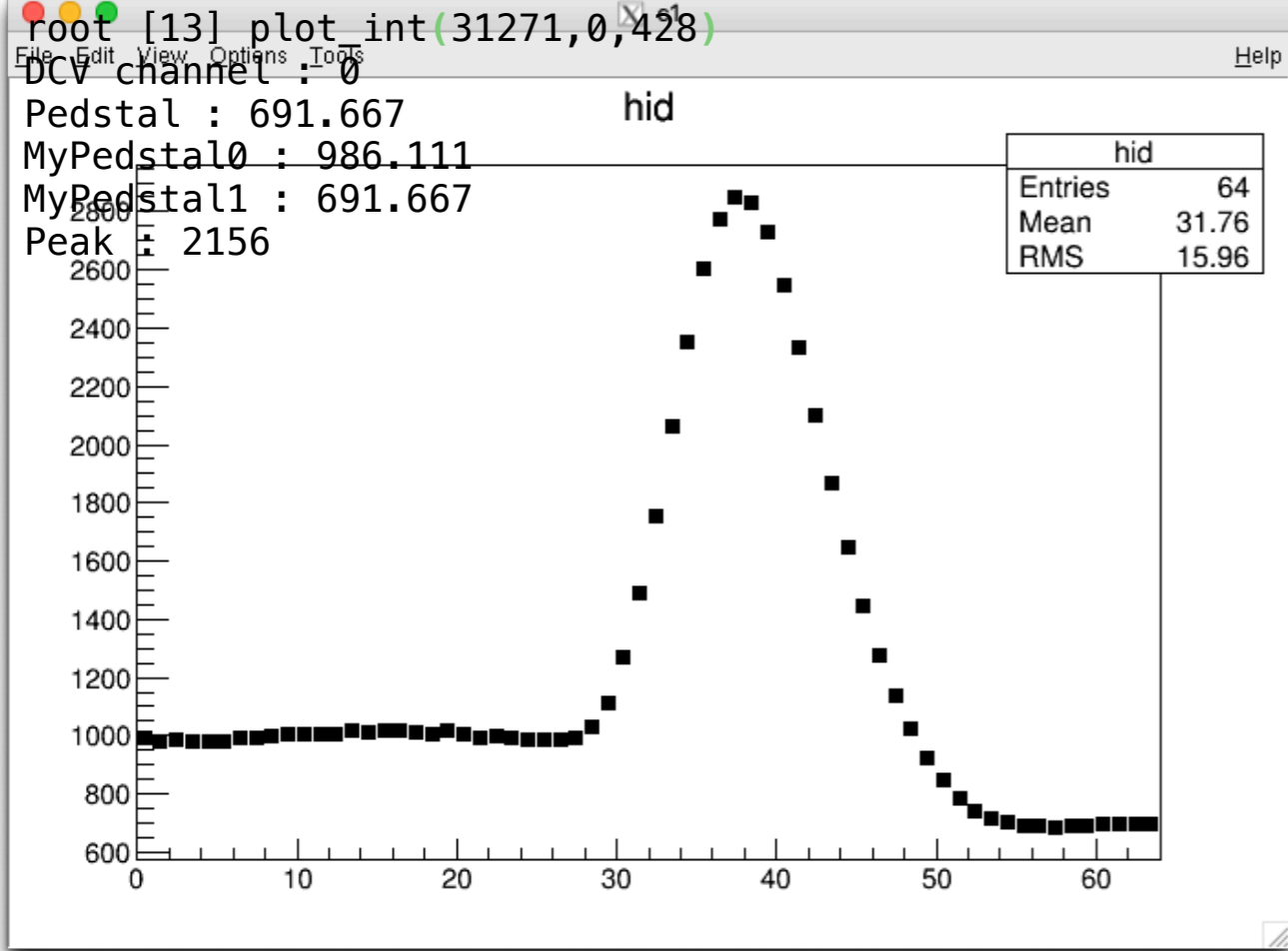
```
root [5] tout->Scan("DCVPedestal[0]:DCVPeak[0]", "DCVPedestal[0] < 800")
```

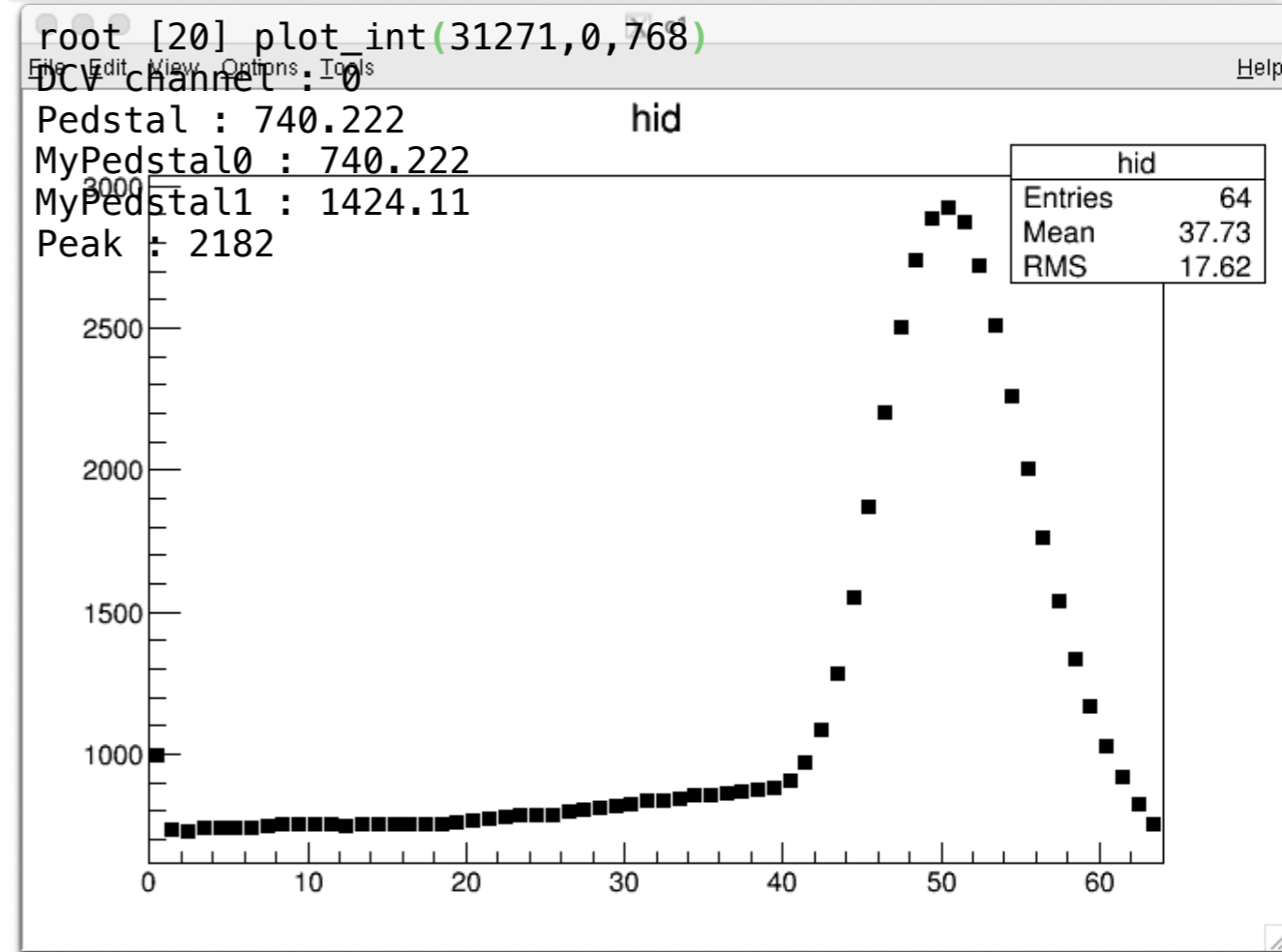
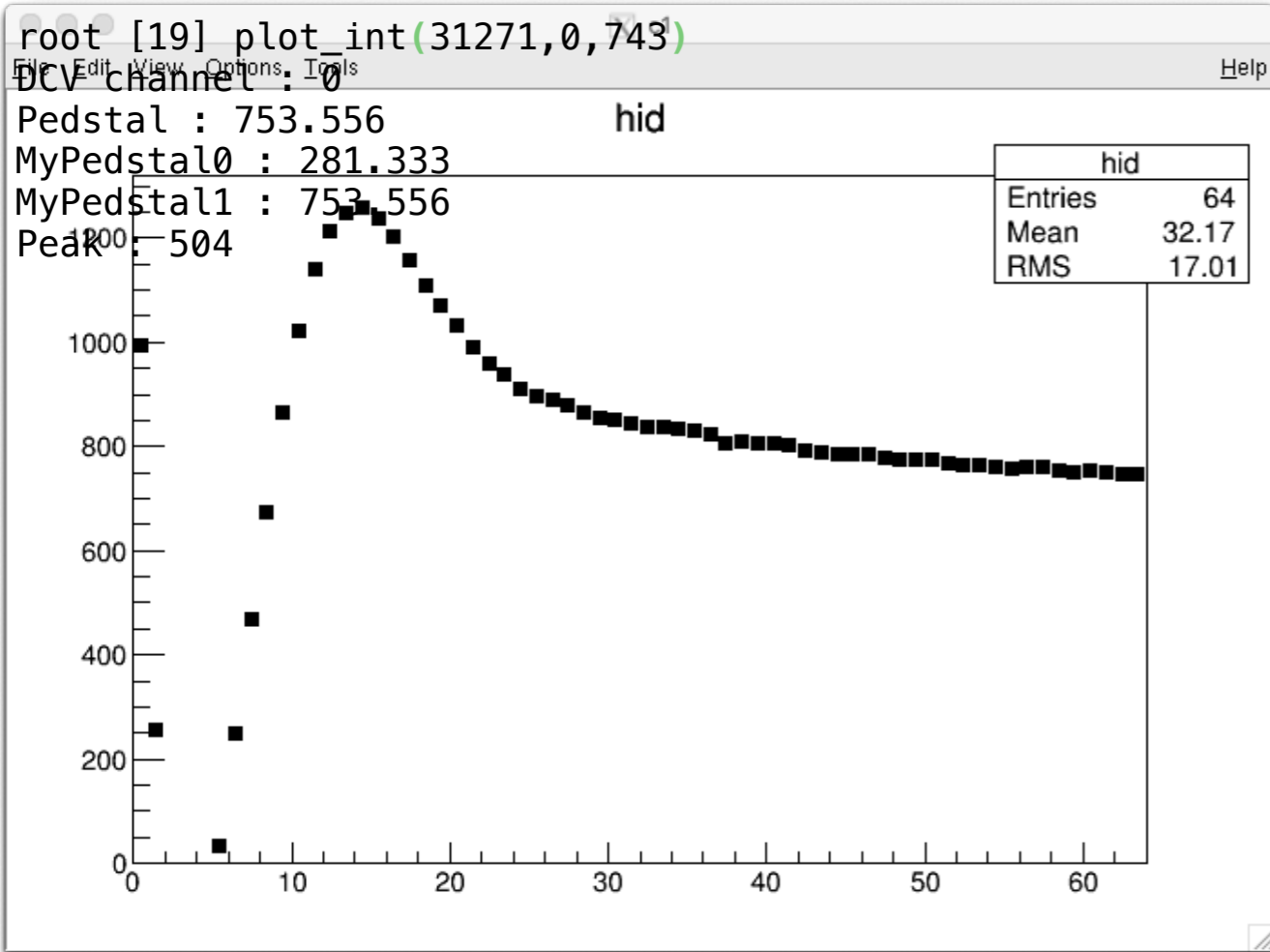
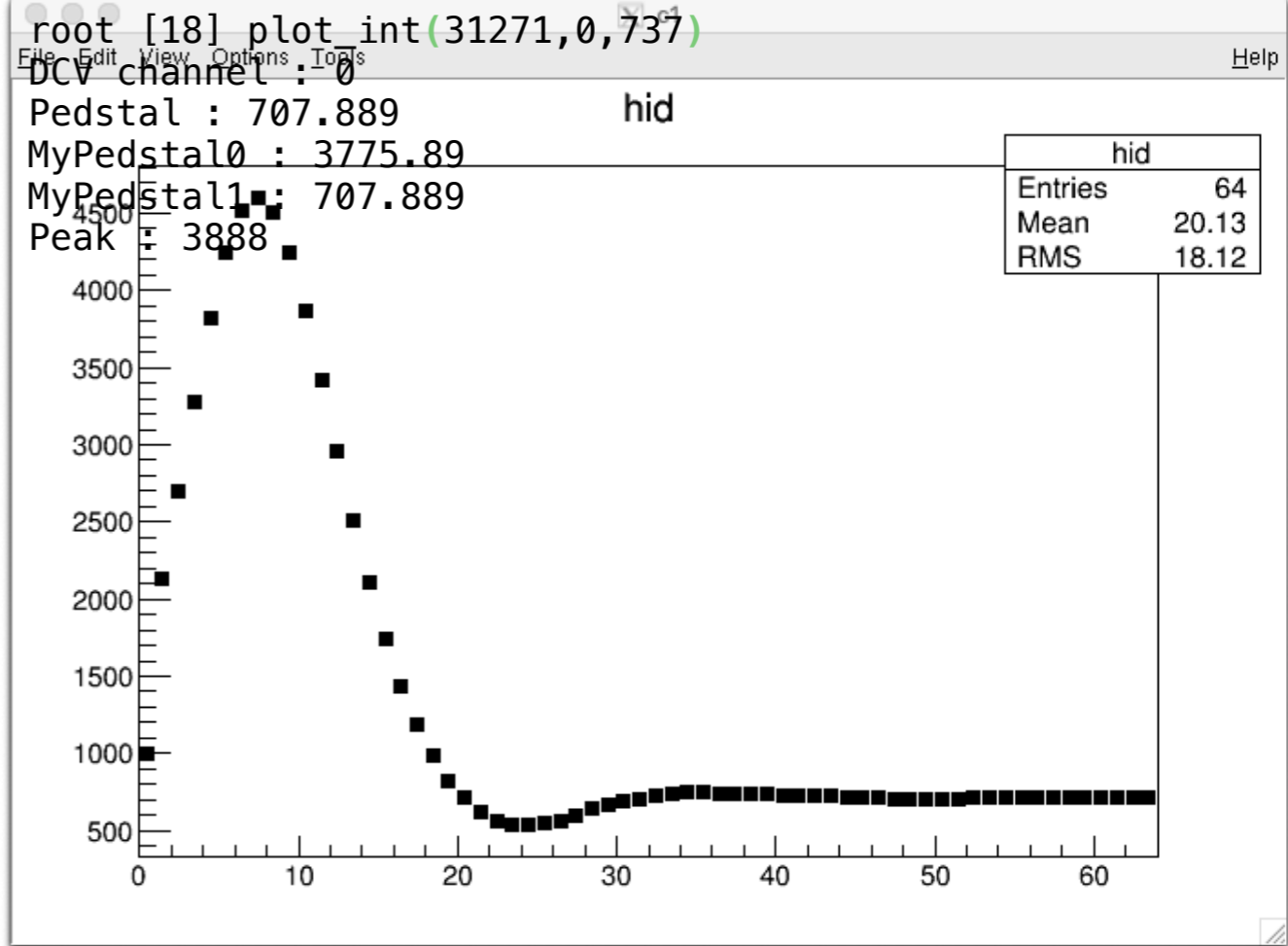
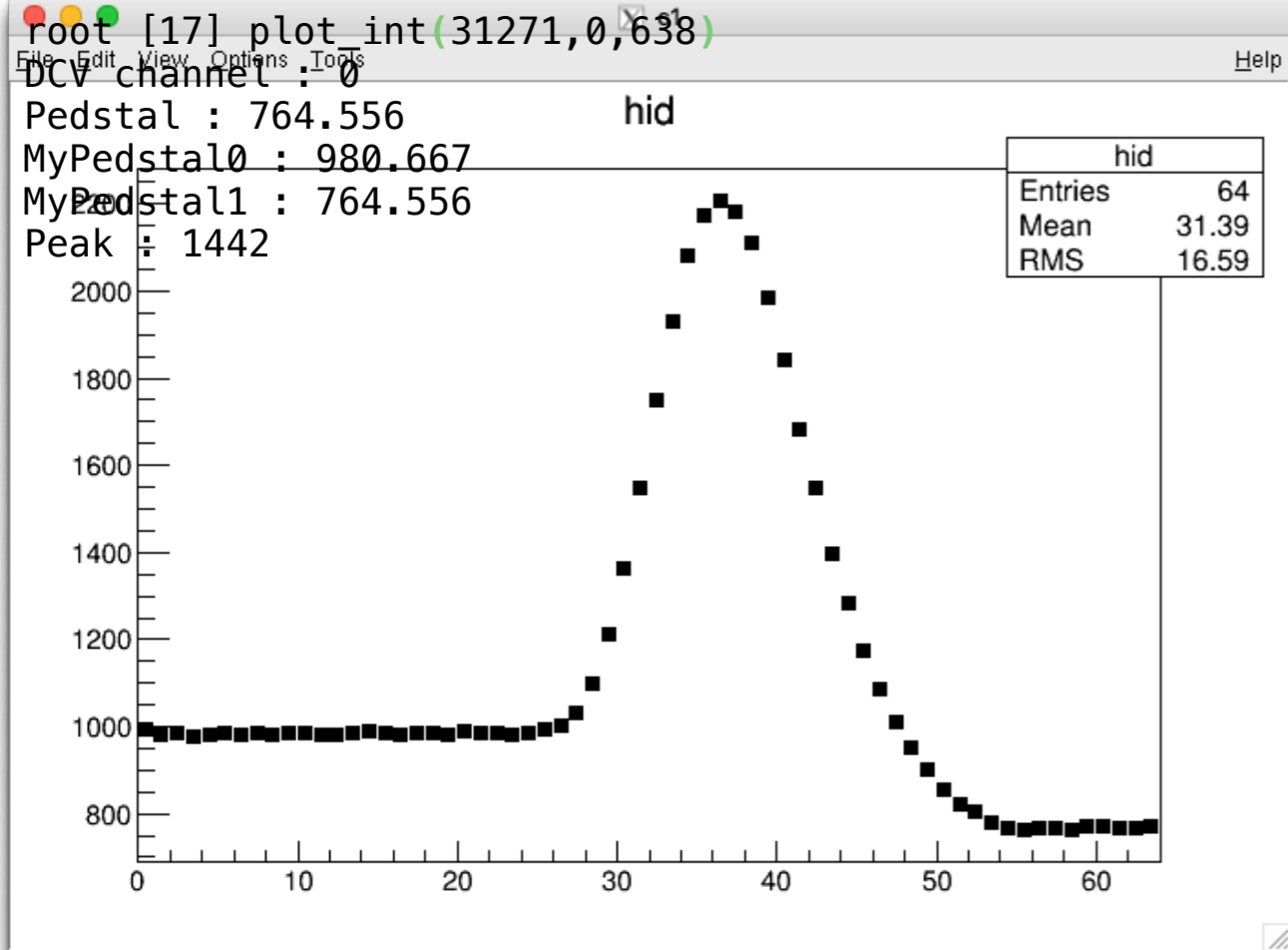
Row	DCVPedest	DCVPeak[0]		
0	0	10000	1320	739.22229
33	715.88885	8548	1322	708.77783
52	704.88891	3494	1425	706.11114
67	705.55554	285	1459	659.33331
147	705.77771	5423	1517	709
150	702	730	1547	0
153	707.77777	2954	1566	697.33331
169	704.88885	4915	1586	711.66668
222	701	289	1658	750.88885
308	0	10000	1689	715.33331
367	707.44451	282	1734	732.33331
382	721.33337	268	1736	726.11114
385	797.33325	192	1857	0
413	722.88891	2327	1941	722.22222
428	691.66668	2156	1965	704.22222
508	728.44445	1742	1973	790.55560
535	715.77777	274	1973	790.55560
618	0	10000	1979	697.22222
638	764.55554	1442	2062	743.66668
737	707.88891	3888	2116	727.55554
743	753.55554	504	2158	0
768	740.22222	2182	2206	739.77777
848	723.44439	7343	2217	777.88885
926	0	10000	2238	720.66674
929	691.22222	2657	2244	707.11114
986	719.33331	274	2264	720.66668
1042	715.44445	1145	2267	732.33337
1063	757.77777	1666	2312	702.33337
1072	722.88891	271	2382	767.55560
1161	707.55560	4123	2388	707.33337
1168	762.88891	231	2410	735.66668
1225	739.22216	1656	2468	0
1238	0	10000	2473	774.66662
1245	745.22222	12551	2479	783.88885
1255	783.77777	209	2502	709.55560
1256	719	2293	2543	698
1289	679.33331	312	2547	709
1314	730.88891	261	2554	749.66668
			2563	768.55560
			2592	759.44445
			2619	702.33337
			2630	722.33337

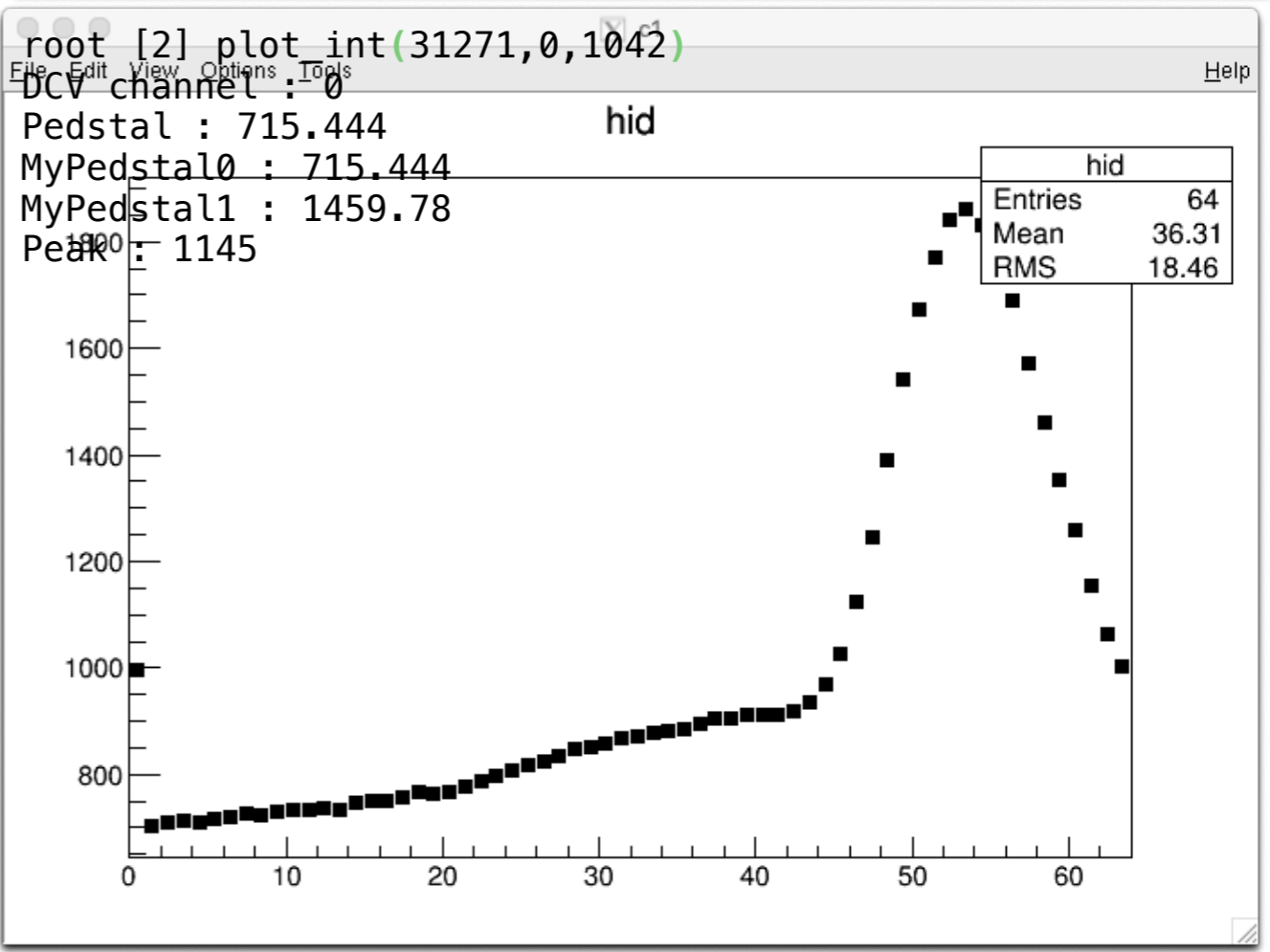
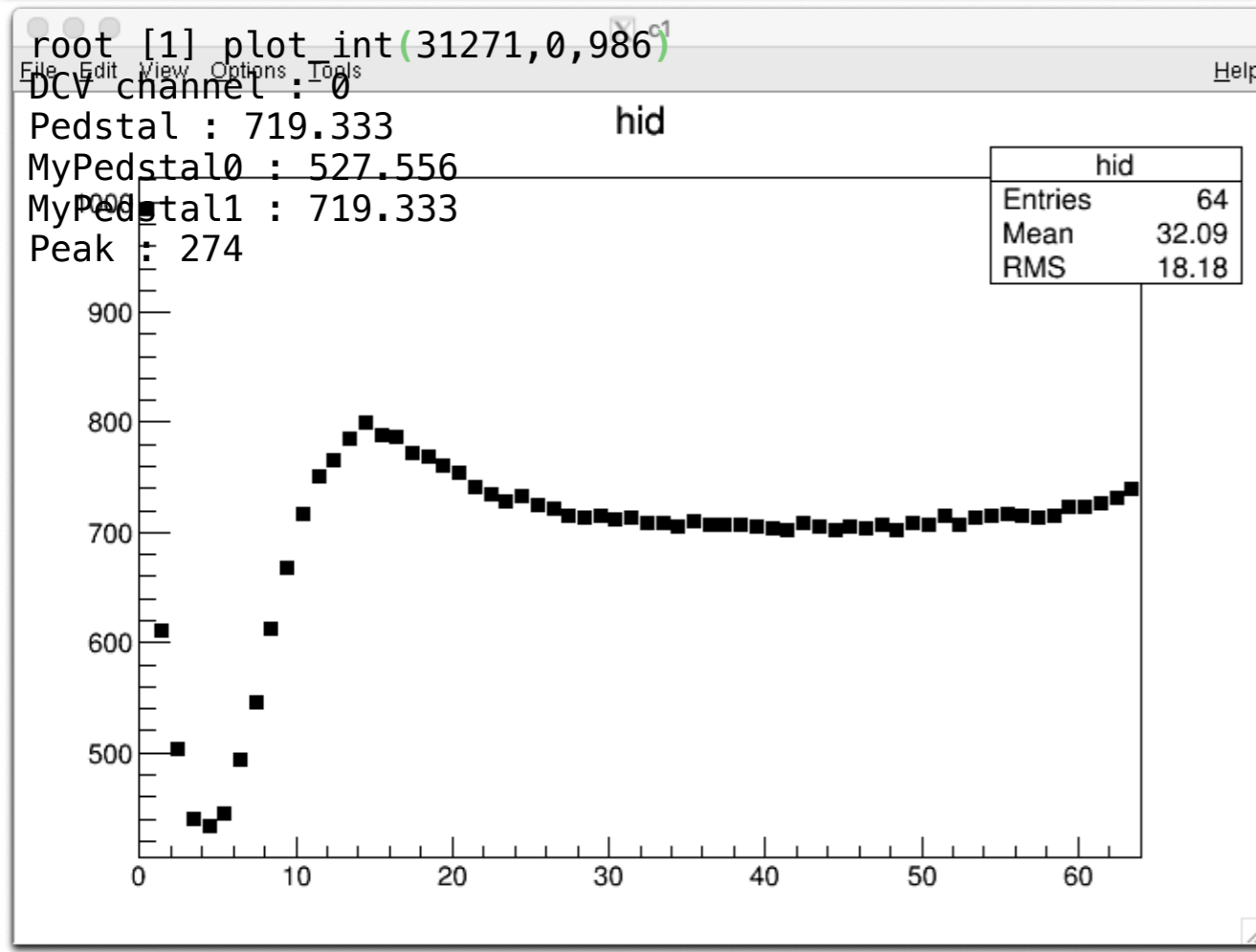
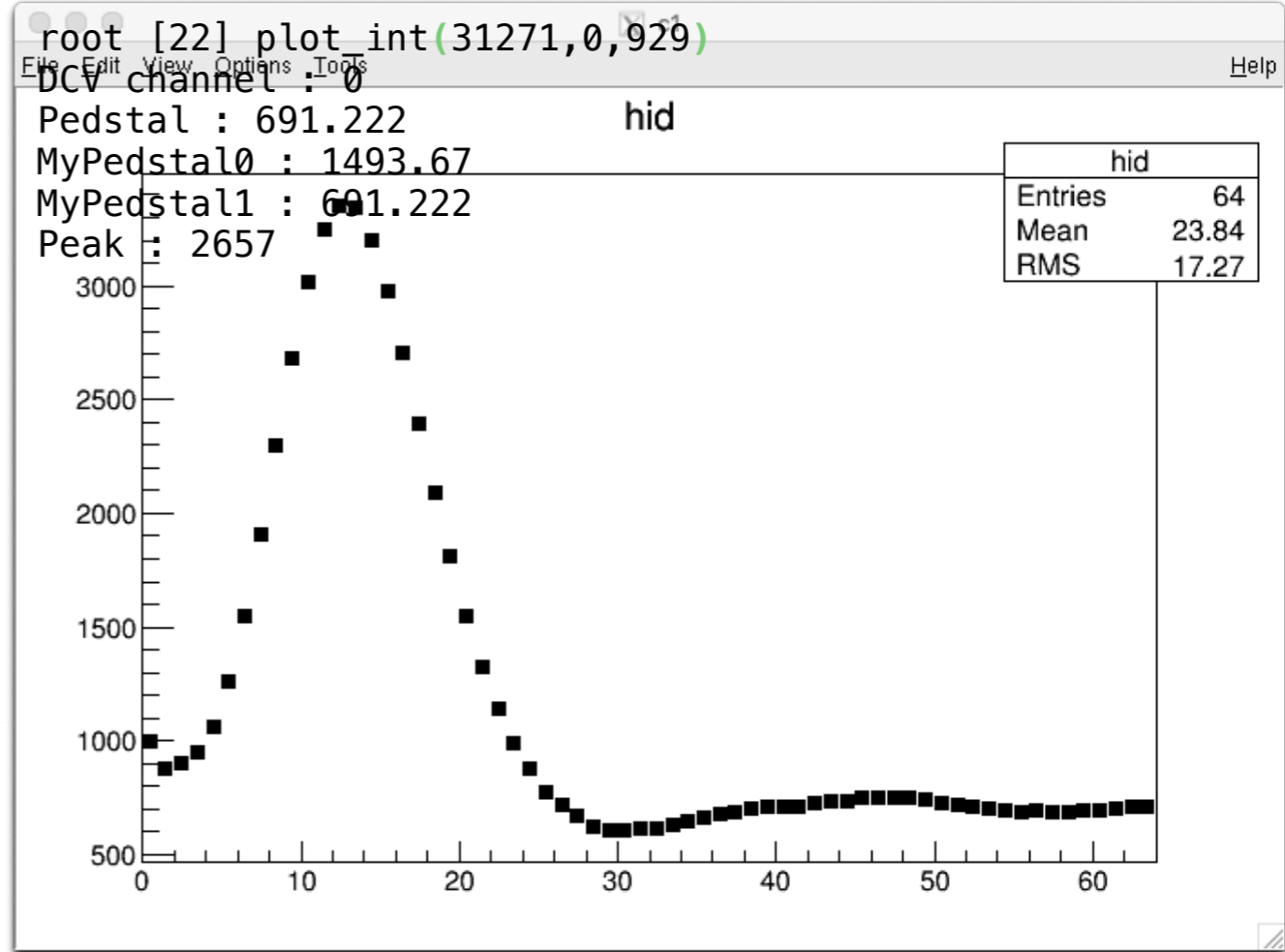
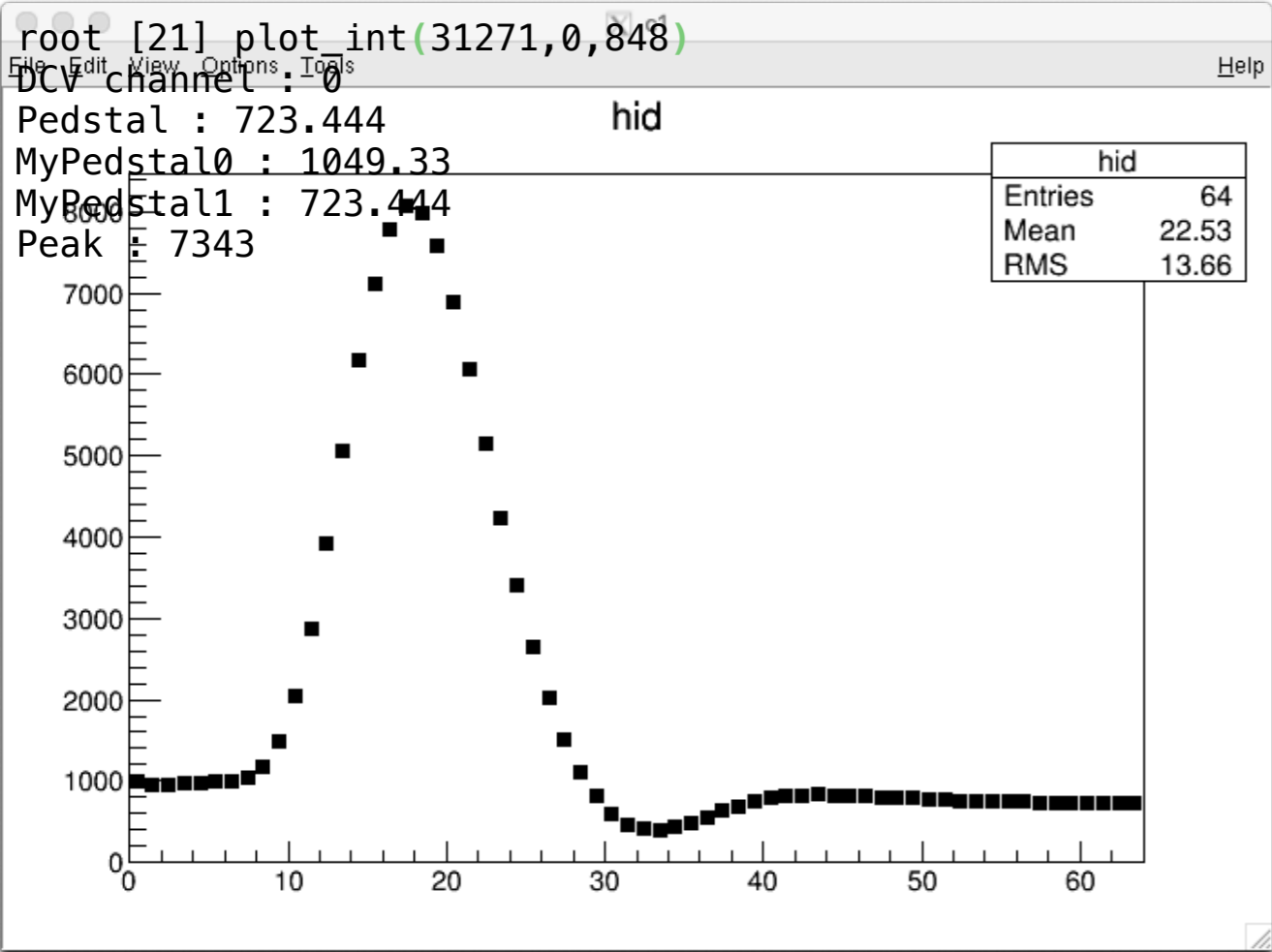












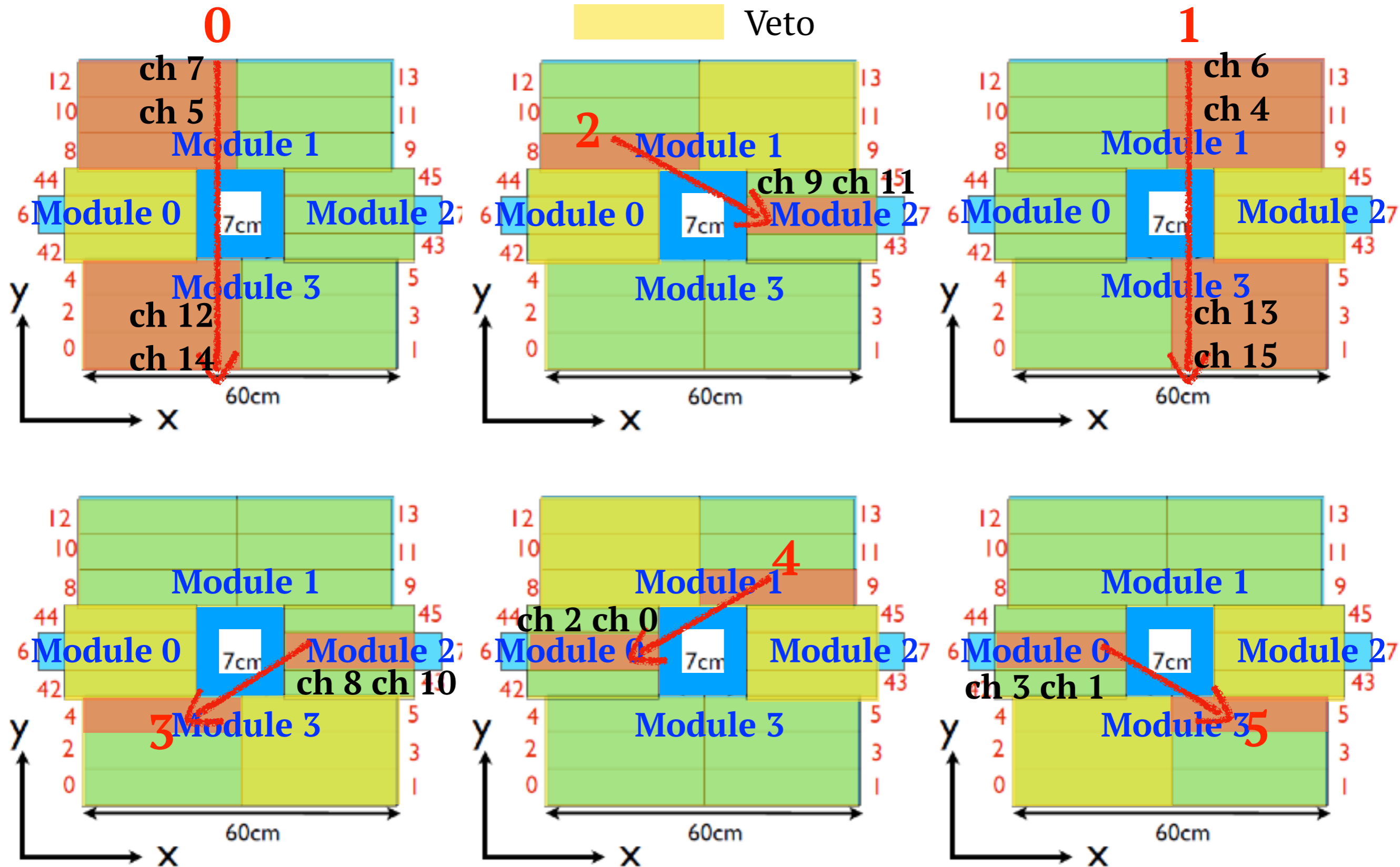
tout->Scan("DCVPedestal[0]:DCVPeak[0]","DCVPedestal[0] < 800 && ScaledTrigBit == 4")

```
*****
*   Row   * DCVPedest * DCVPeak[0 *
*****
*     508 * 728.44445 *     1742 *
*    1245 * 745.22222 *    12551 *
*    1255 * 783.77777 *     209 *
*    1289 * 679.33331 *     312 *
*    1566 * 697.33331 *    2004 *
*    2630 * 722.33337 *    1814 *
*    2999 * 726.44439 *    1705 *
*    3034 * 707.77777 *     284 *
*    3052 * 708.66662 *    4033 *
*    3171 *      717 *     934 *
*    3309 * 722.55554 *    1827 *
*    3647 * 723.77777 *    1674 *
*    3690 * 740.22222 *    4307 *
*    3889 * 735.66674 *    2031 *
*    3901 * 733.11114 *     262 *
*    4192 * 700.88891 *    2213 *
*    4280 * 726.66668 *     265 *
*    4655 * 761.11108 *    1625 *
*    5158 *      748 *     246 *
*    5784 * 774.77777 *    1322 *
*    6011 * 768.99993 *     227 *
*    6640 * 750.44445 *    4538 *
*    6835 * 712.88891 *    3265 *
*    7333 * 690.44439 *     303 *
*    7788 * 709.33331 *    1842 *
*    8101 * 744.55554 *    4269 *
*    8697 * 750.11108 *    3479 *
*    8777 * 712.88885 *     280 *
*    9605 * 699.66662 *    2193 *
*   10129 * 715.33337 *     276 *
*   10628 * 795.22222 *     196 *
*   10811 * 759.77777 *    1425 *
*   11312 * 762.33331 *    1552 *
*   11790 * 711.00006 *    2483 *
*   12995 * 706.55554 *     285 *
*   13255 * 753.11108 *     239 *
*   13357 * 797.11108 *     965 *
*   13478 * 716.22222 *    2029 *
*   14253 * 748.55554 *     242 *
*   14965 * 717.22222 *     280 *
*****
```

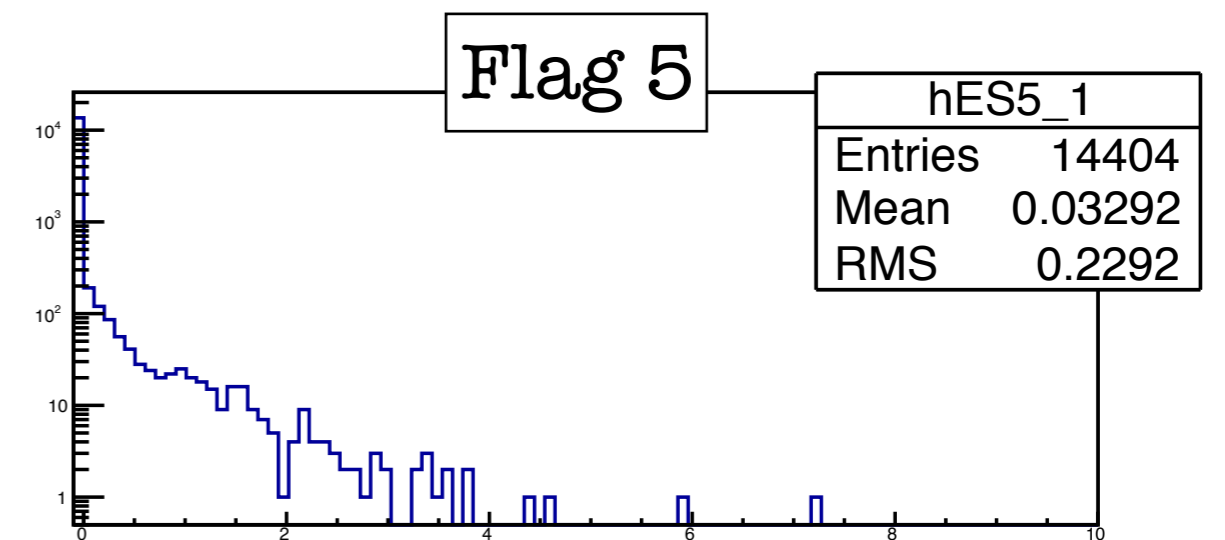
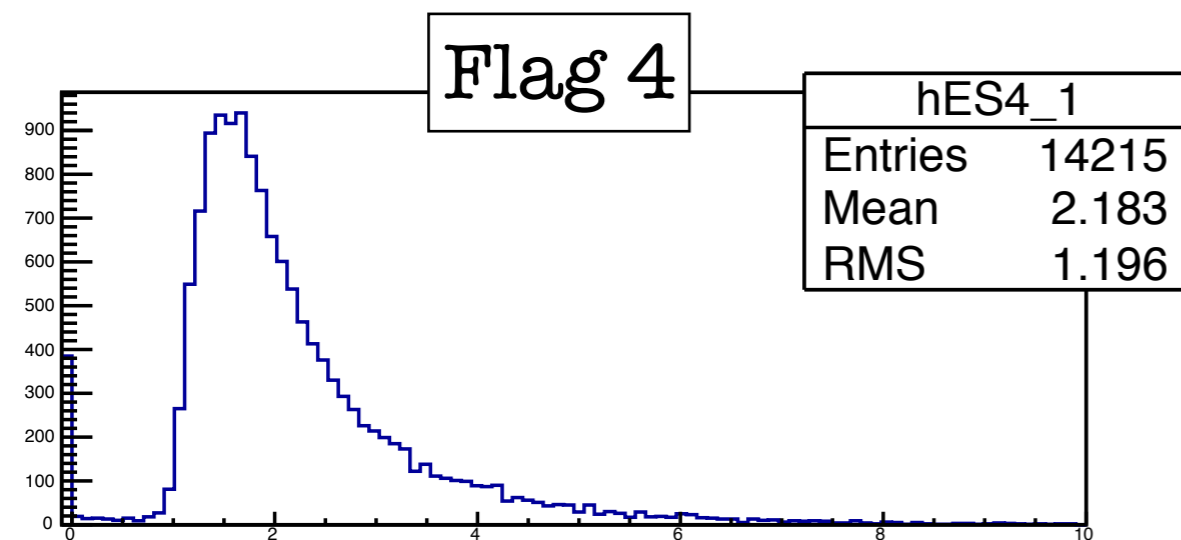
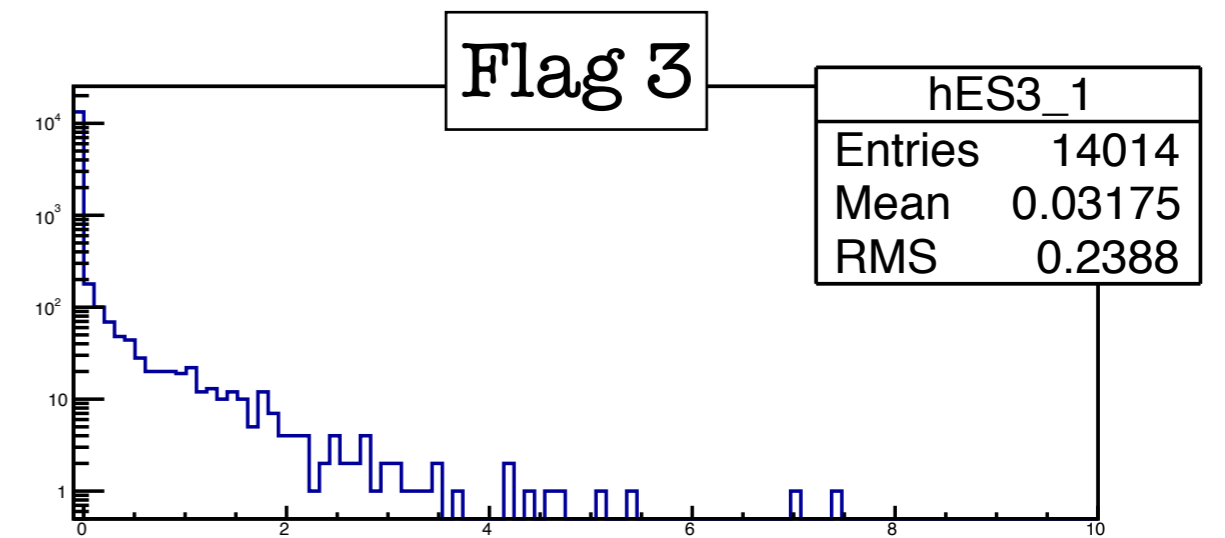
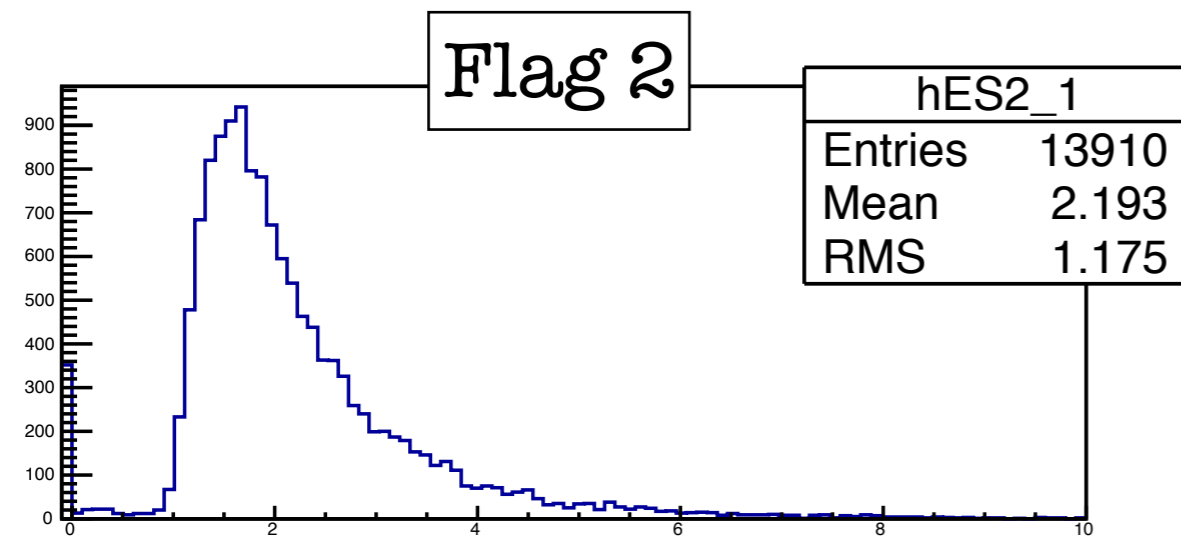
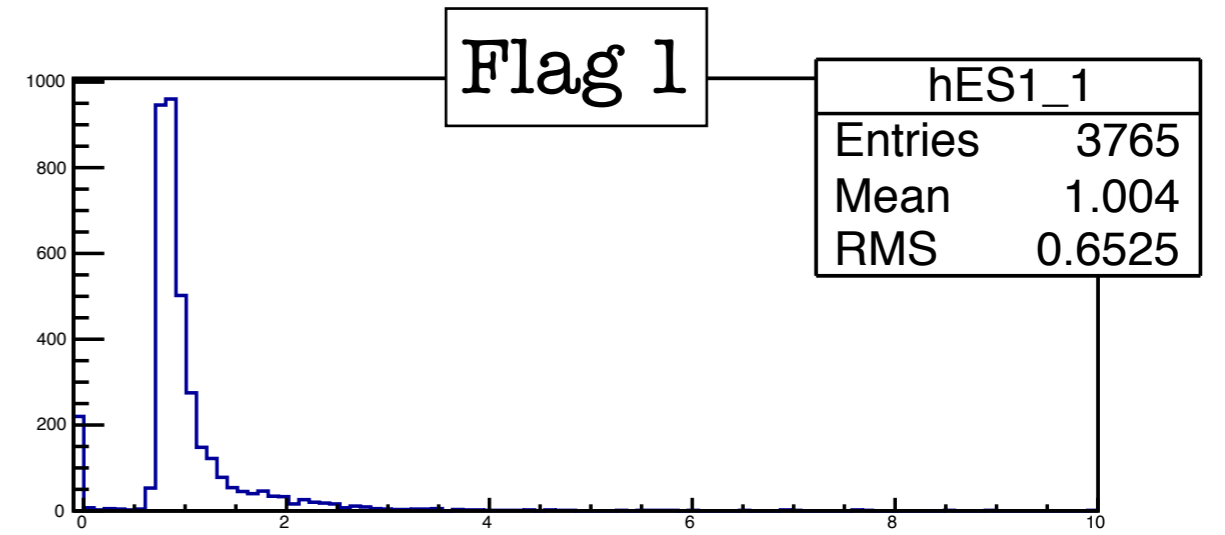
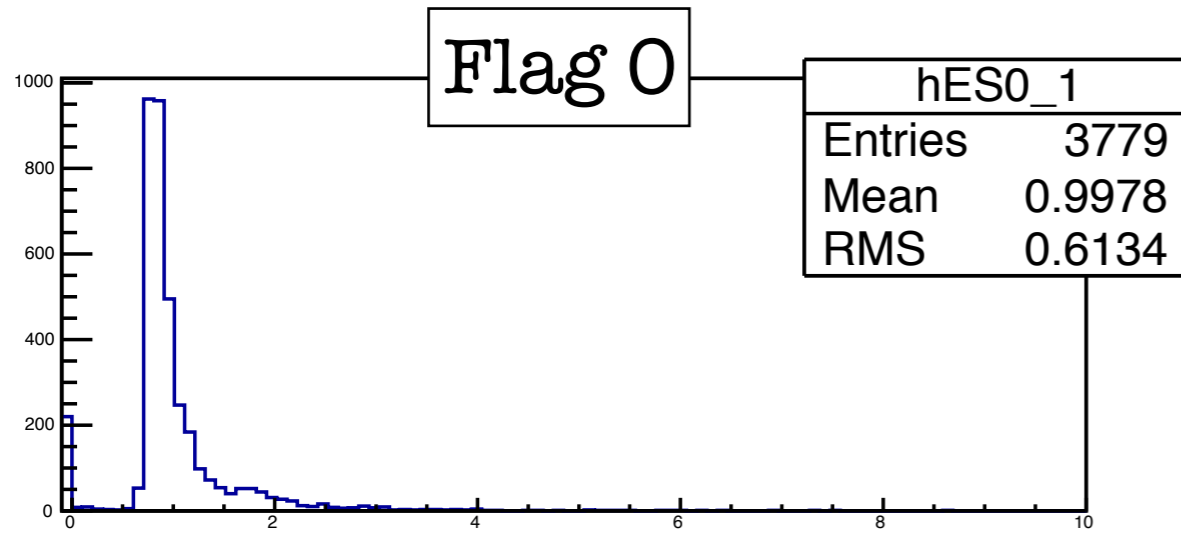
BACK UP

Cosmicray tracking by using CC04

Hit
Veto

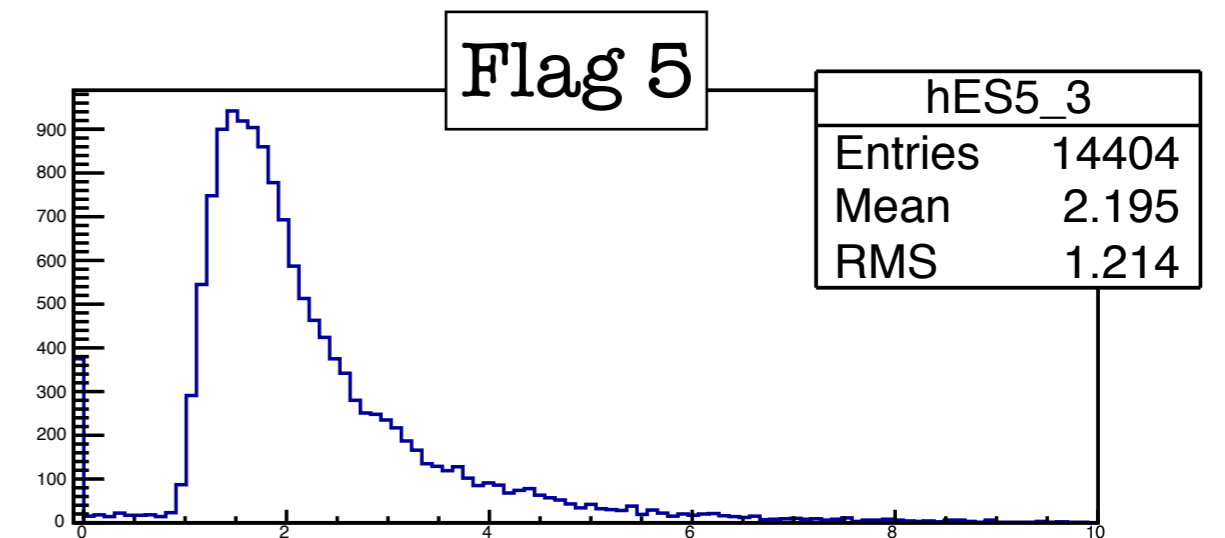
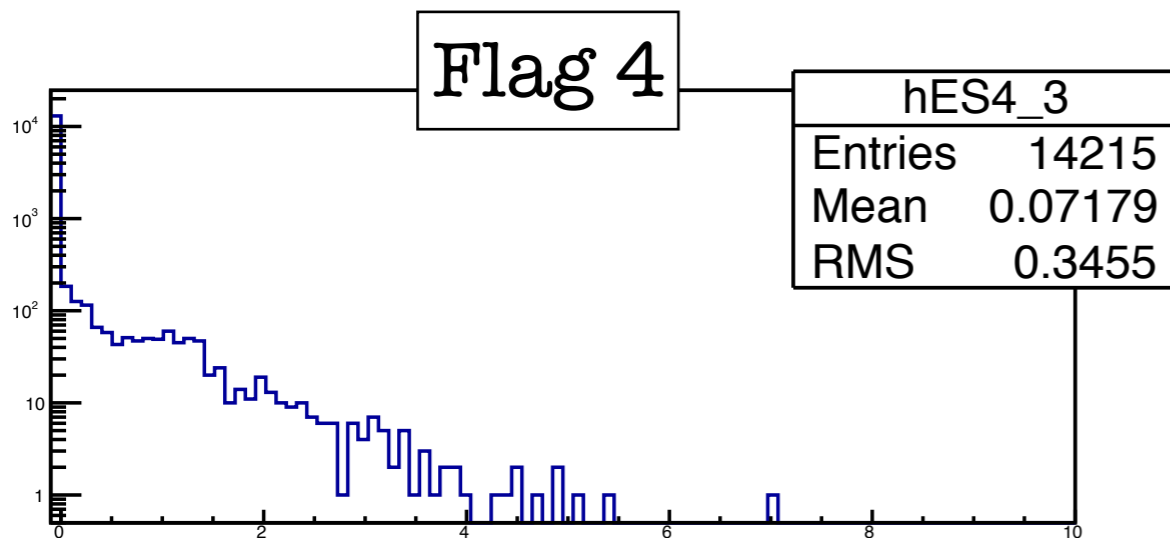
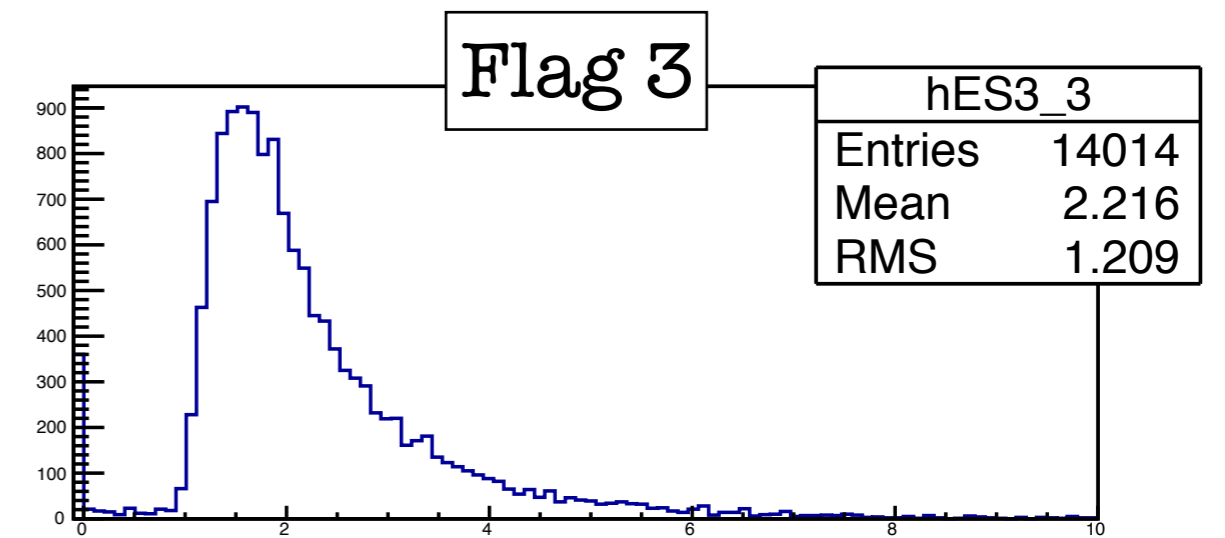
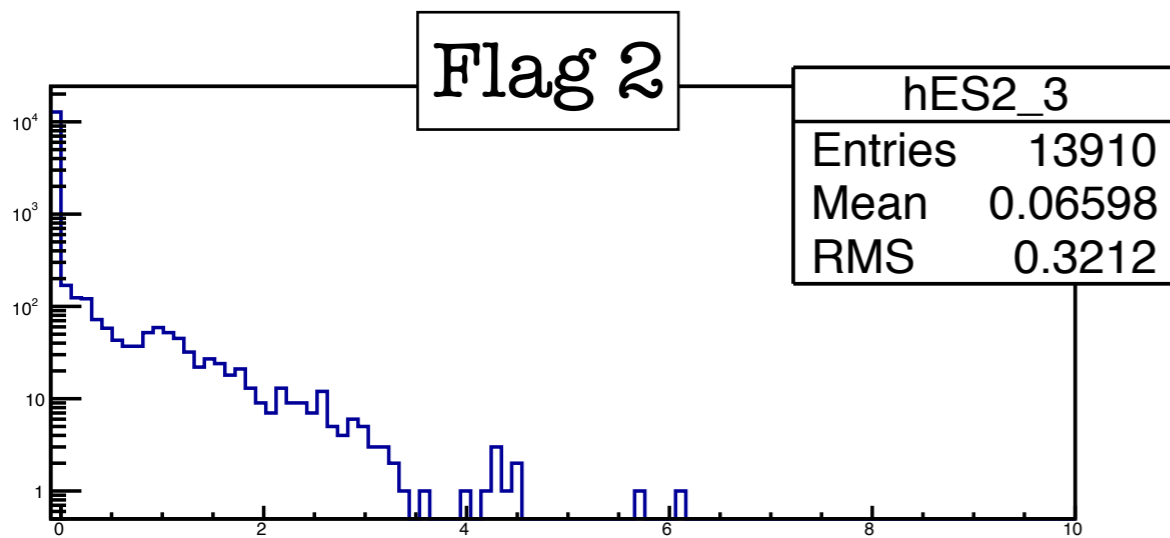
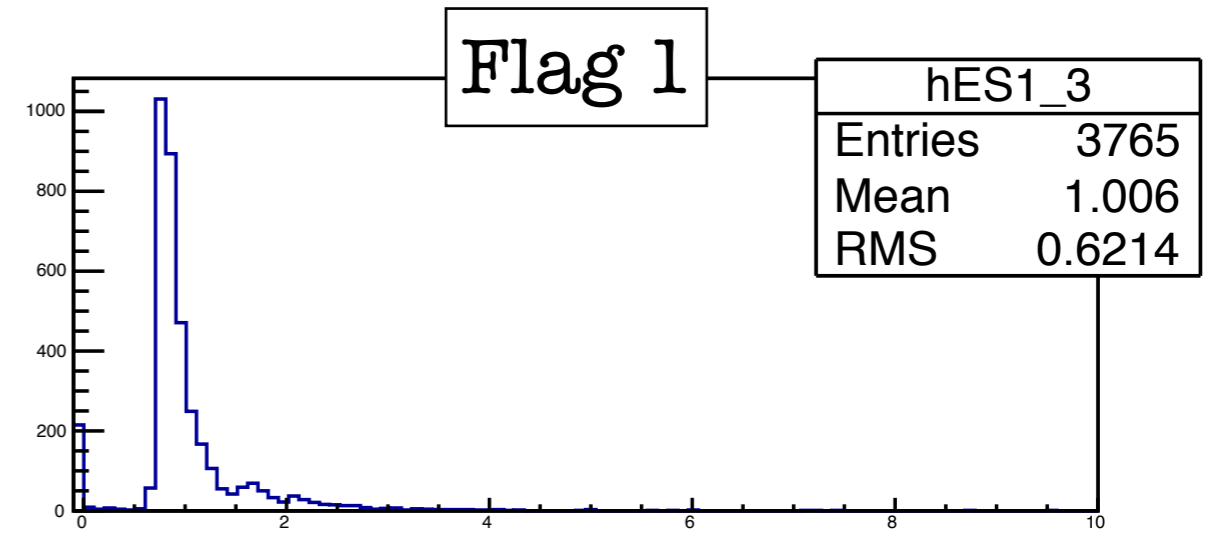
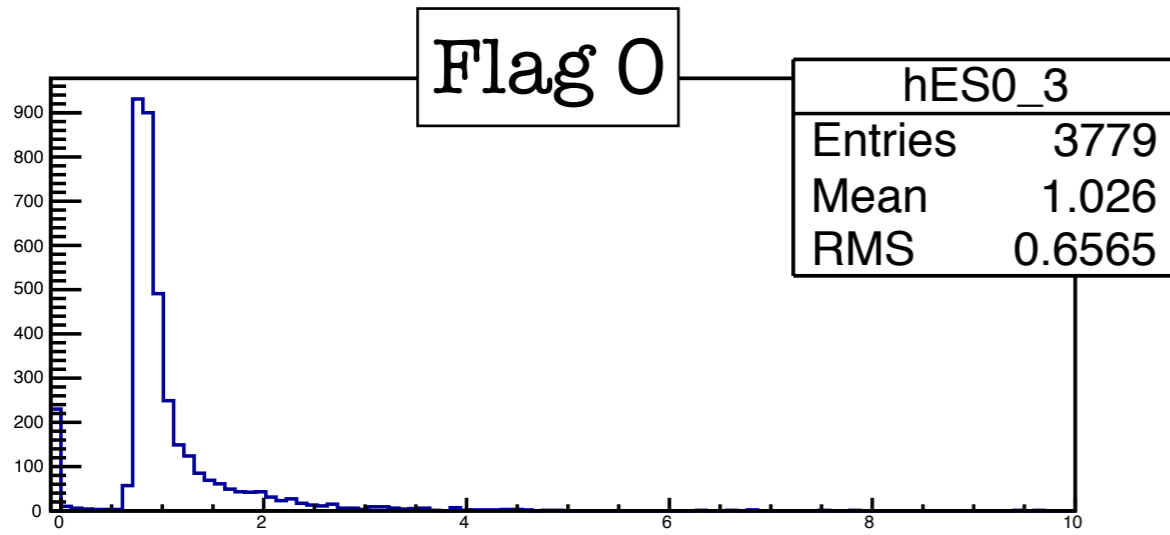


DCVEne Distribution(Module 1)



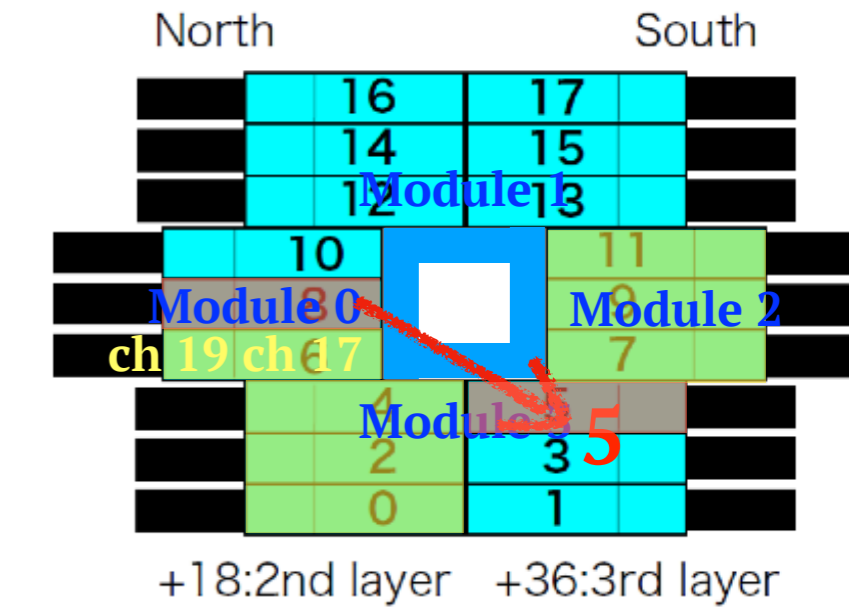
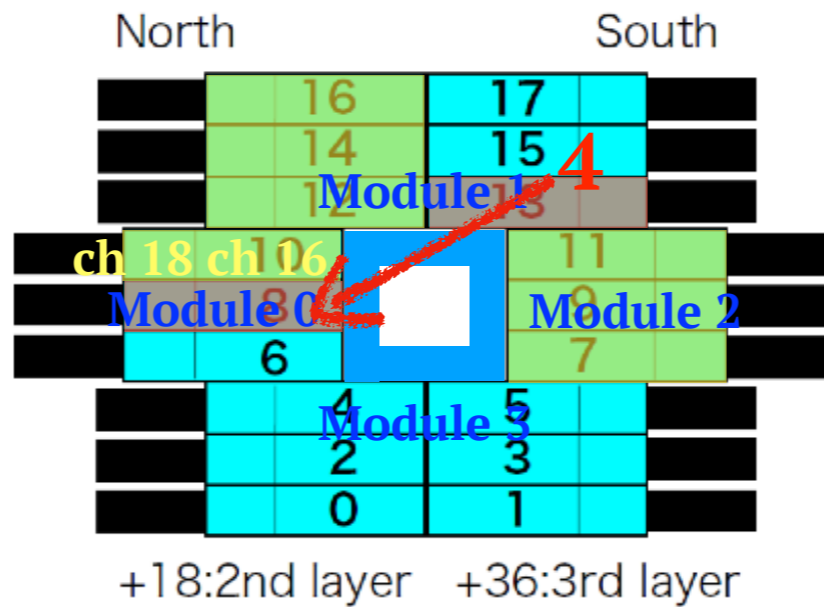
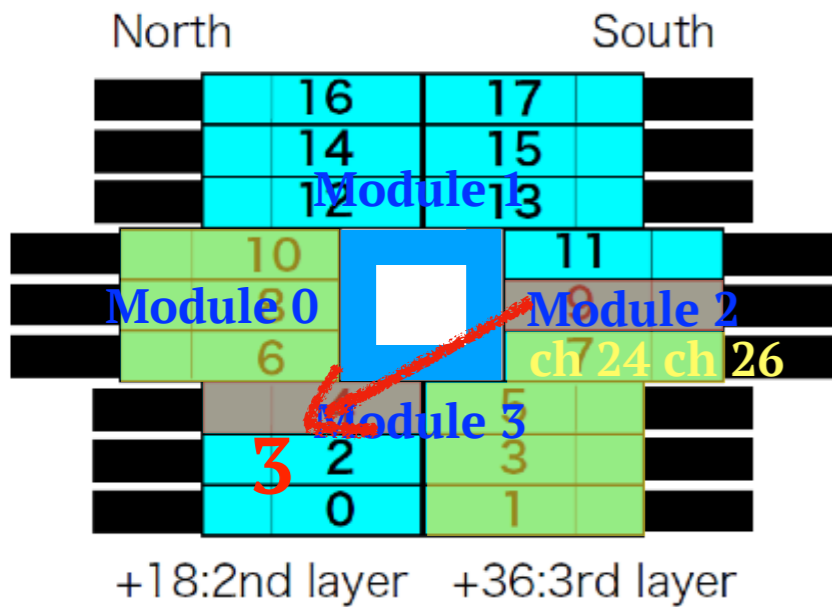
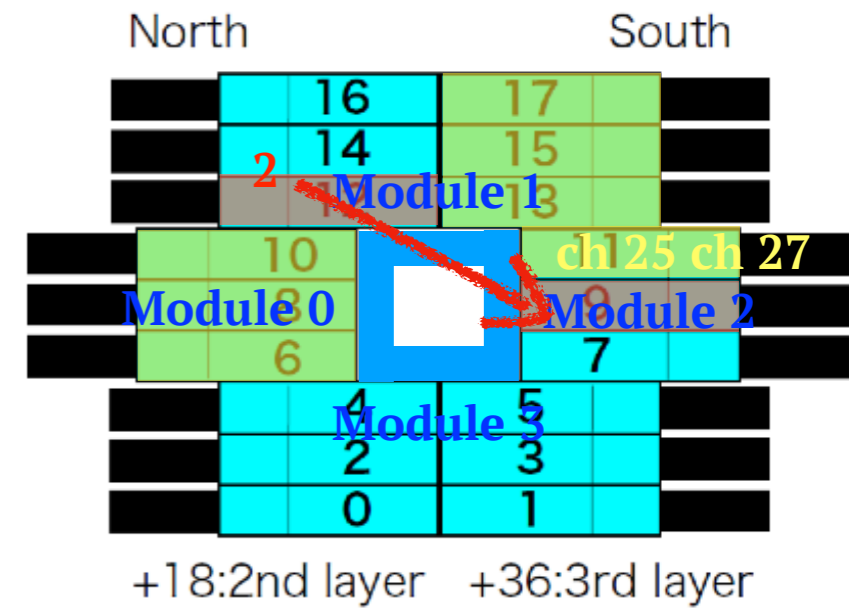
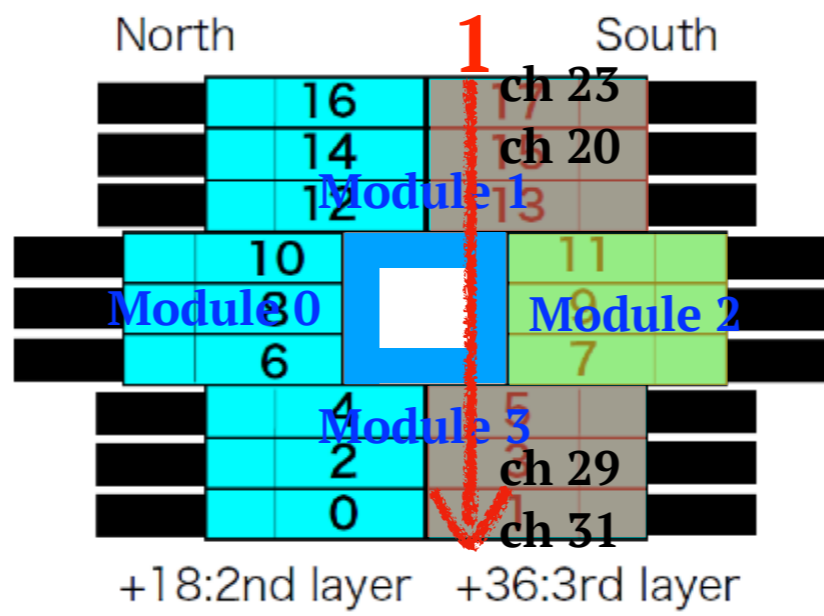
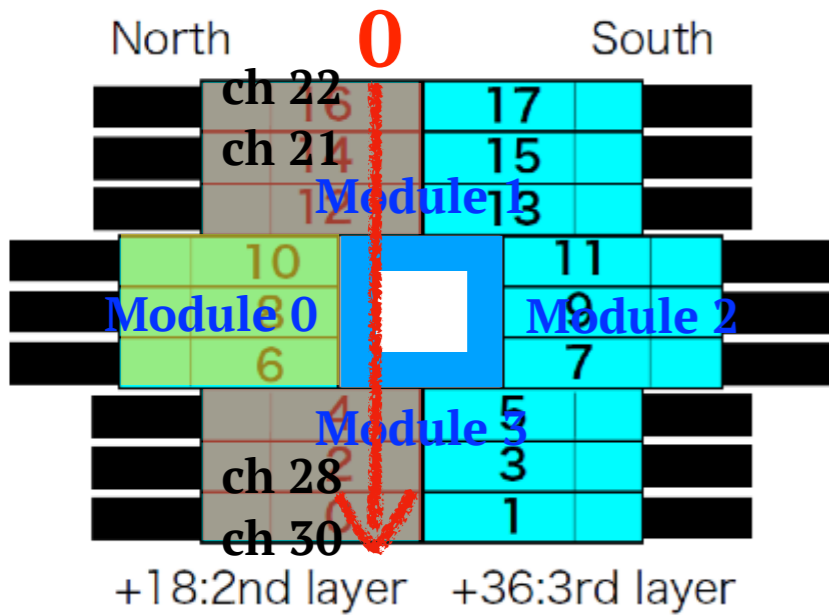
Energy[MeV]

DCVEne Distribution(Module 3)

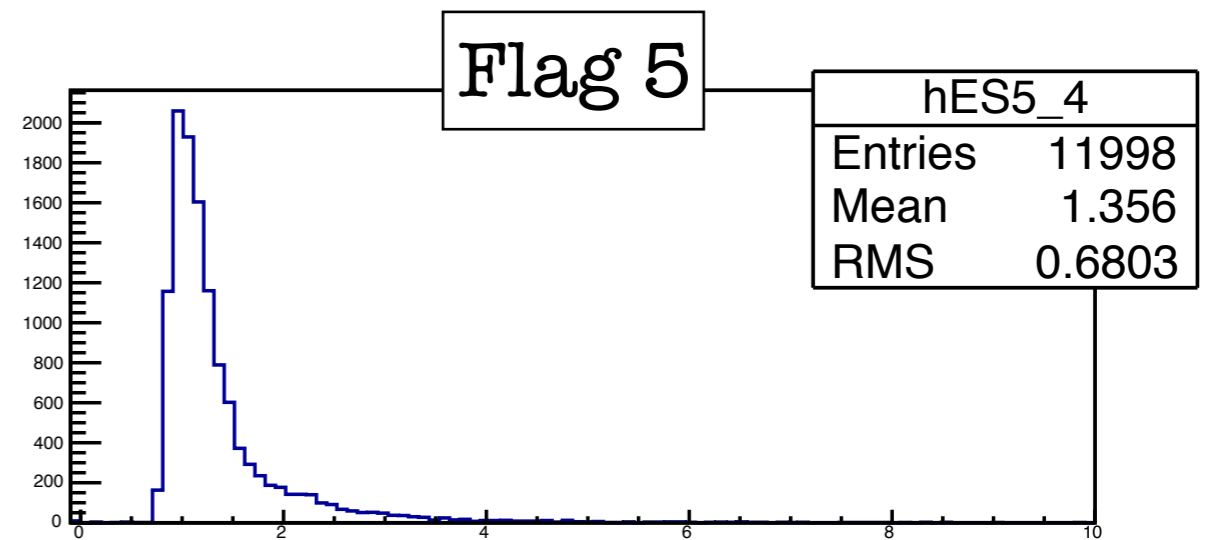
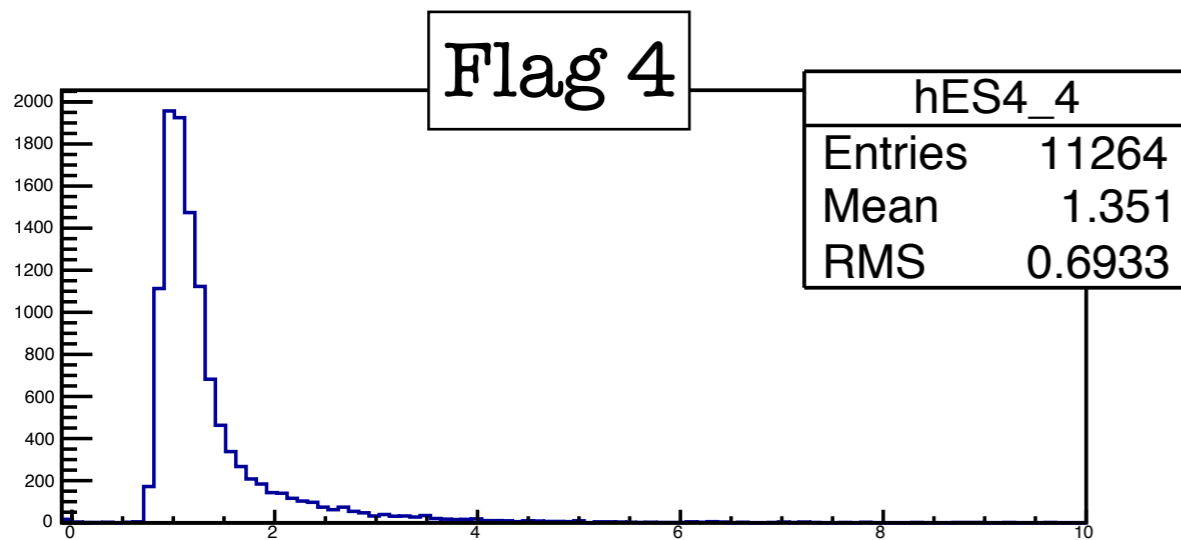
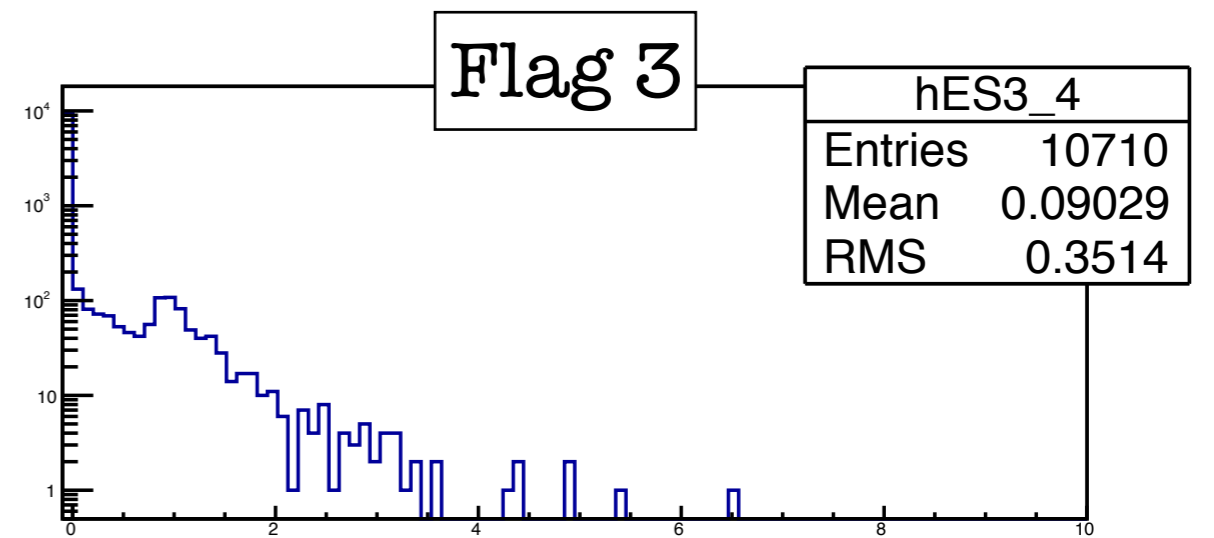
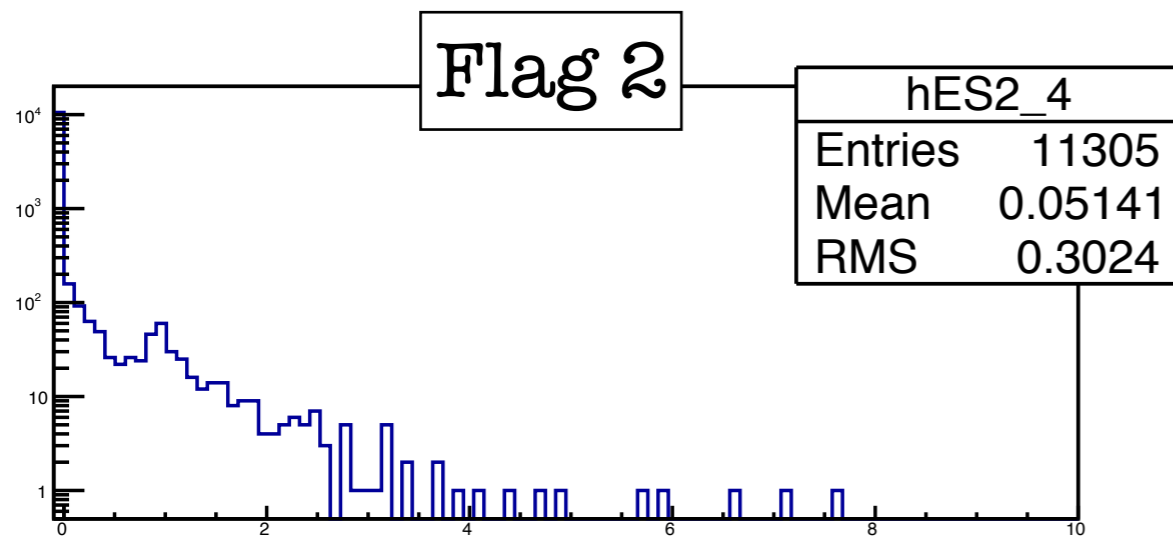
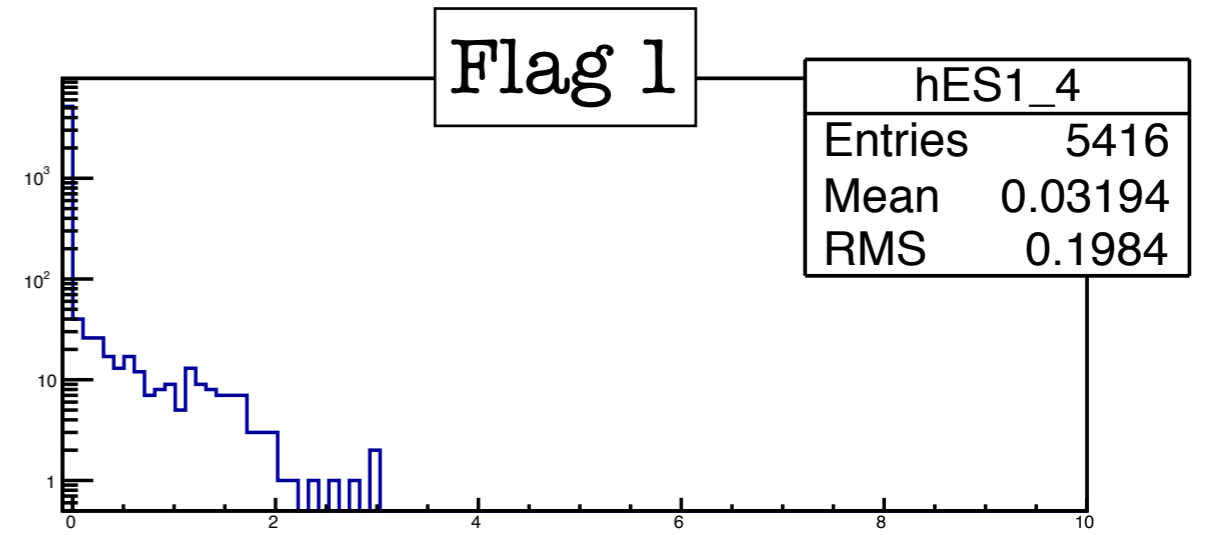
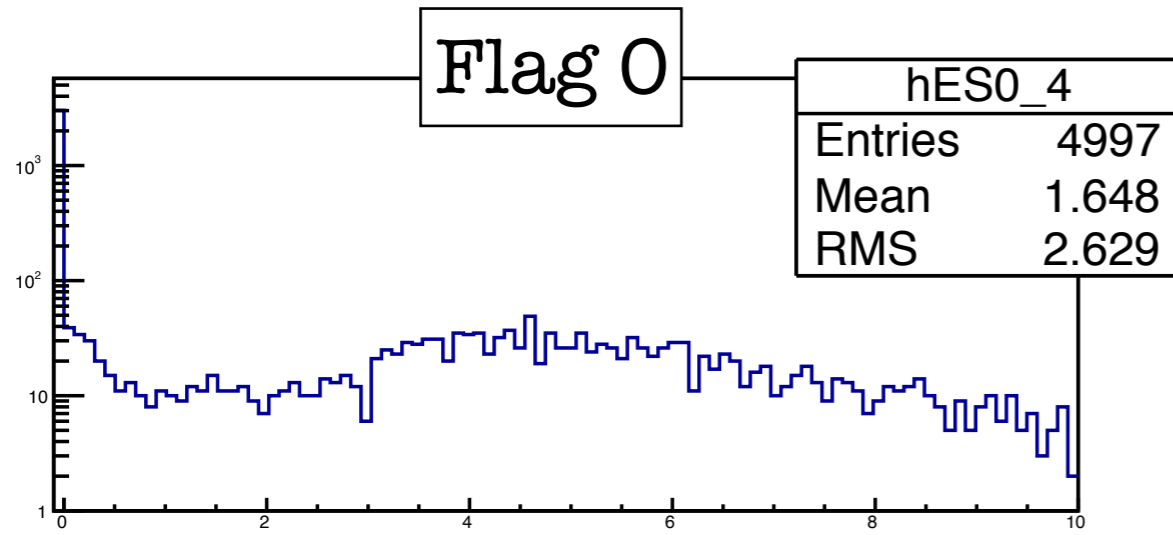


Energy[MeV]

Cosmicray tracking by using CC05

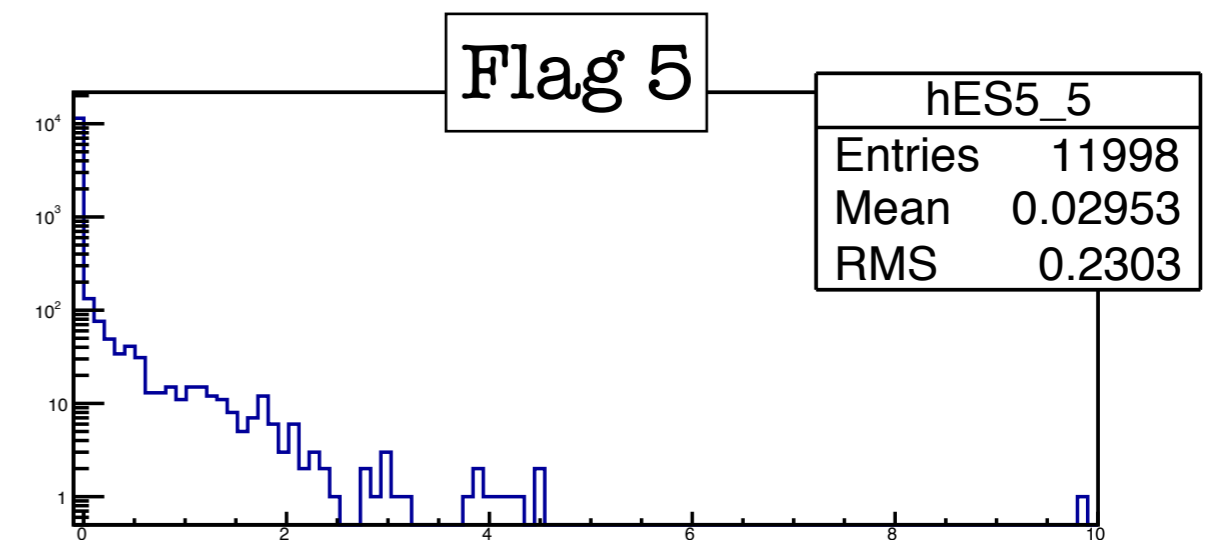
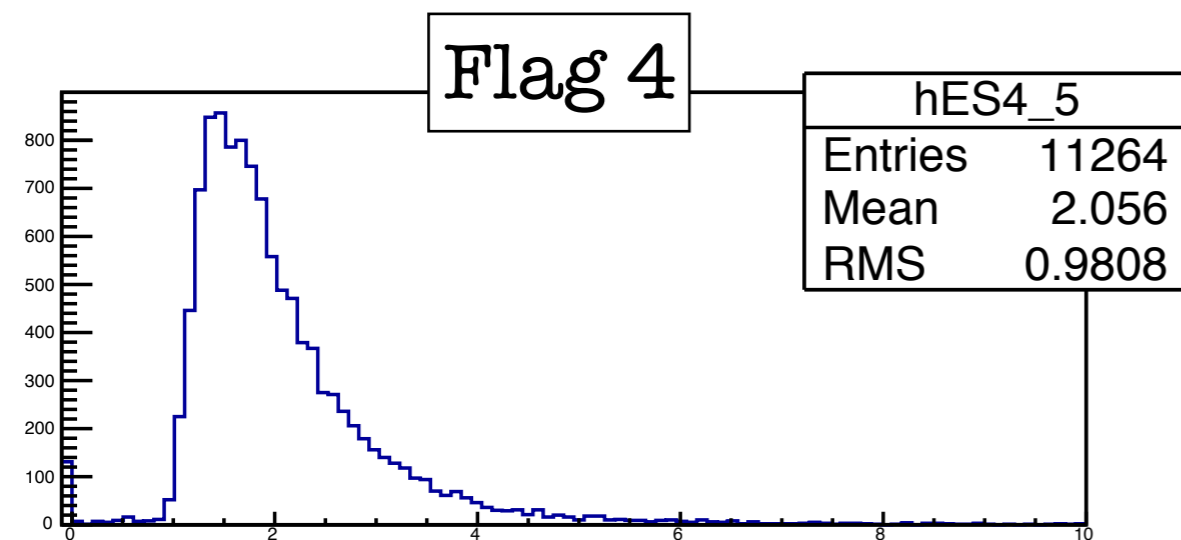
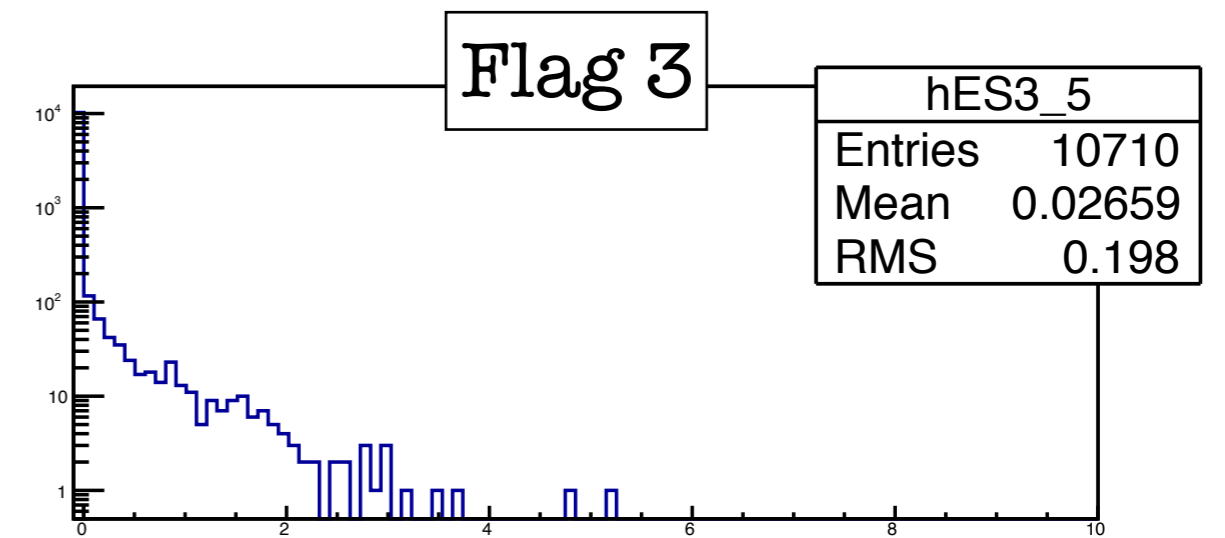
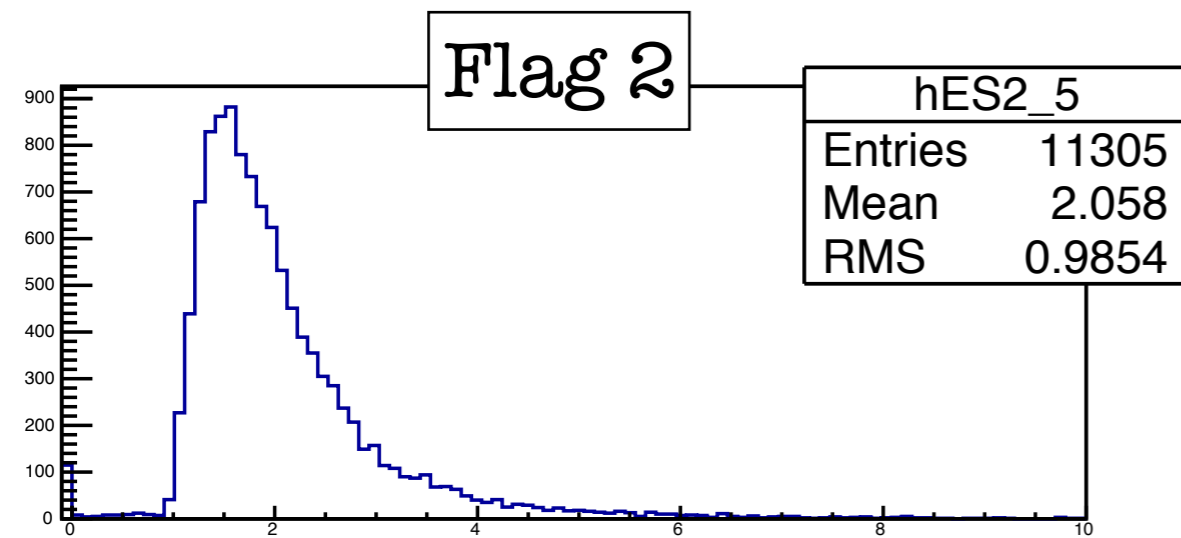
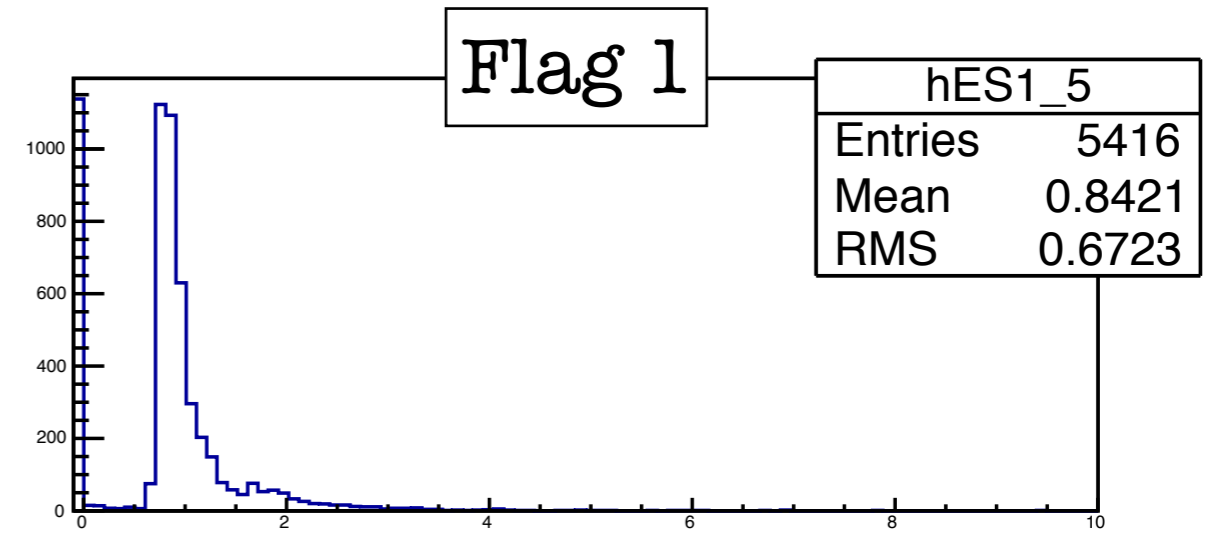
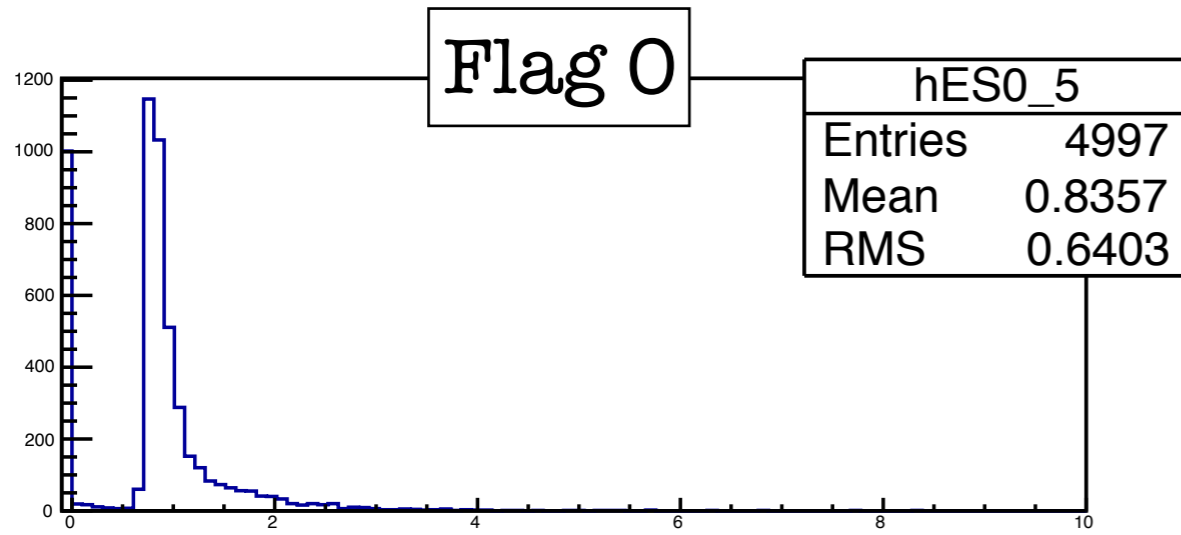


DCVEne Distribution(Module 4)



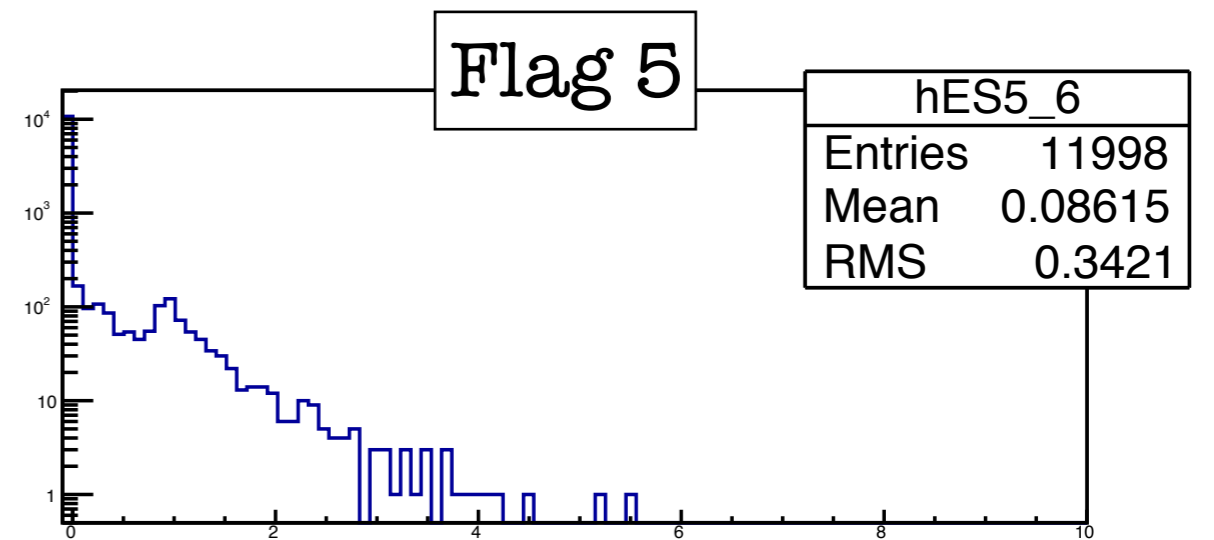
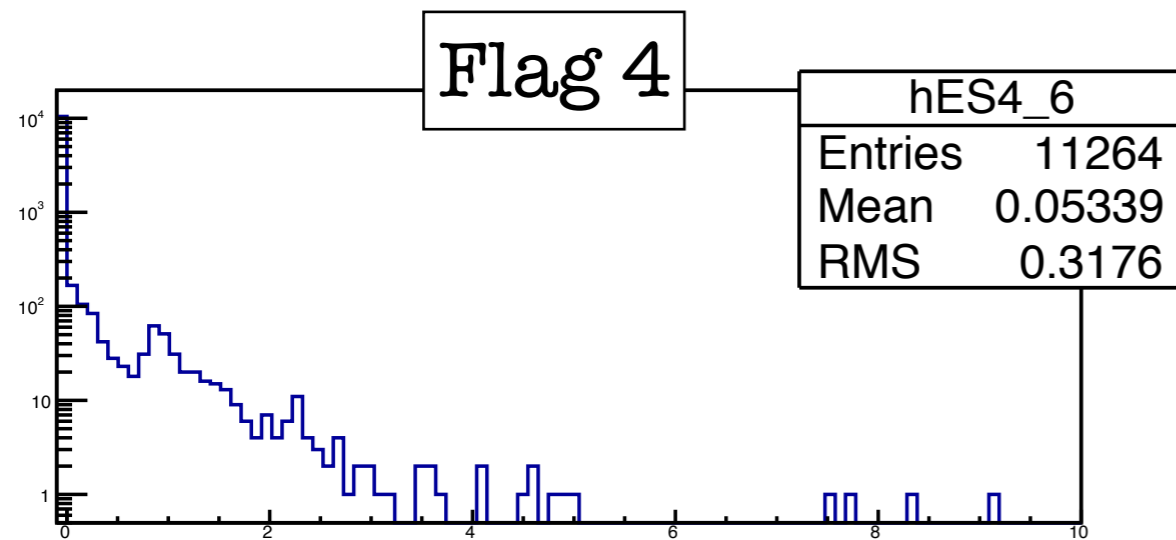
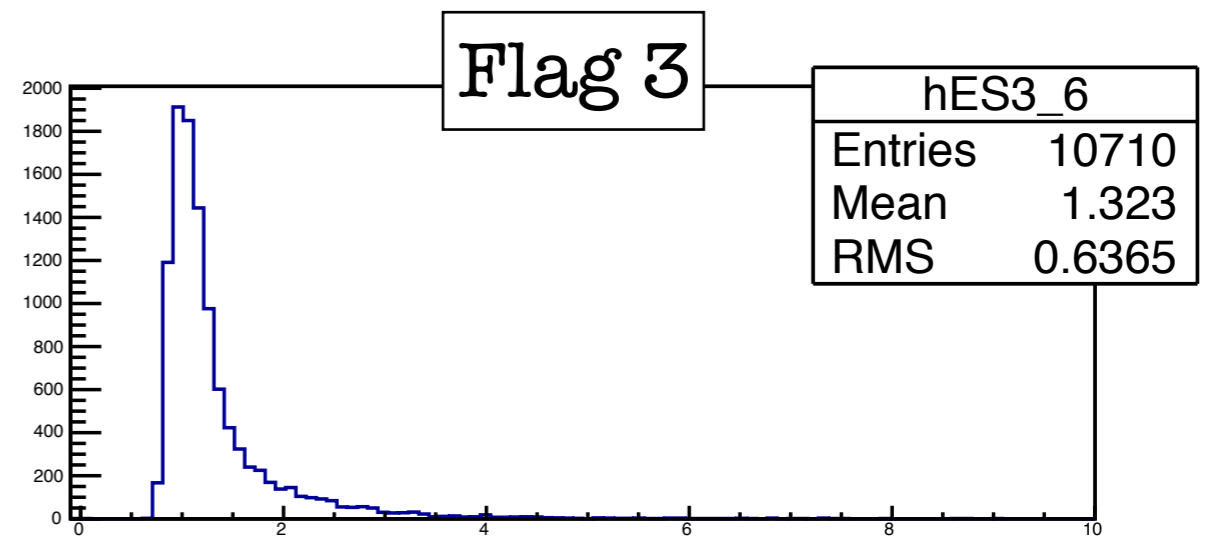
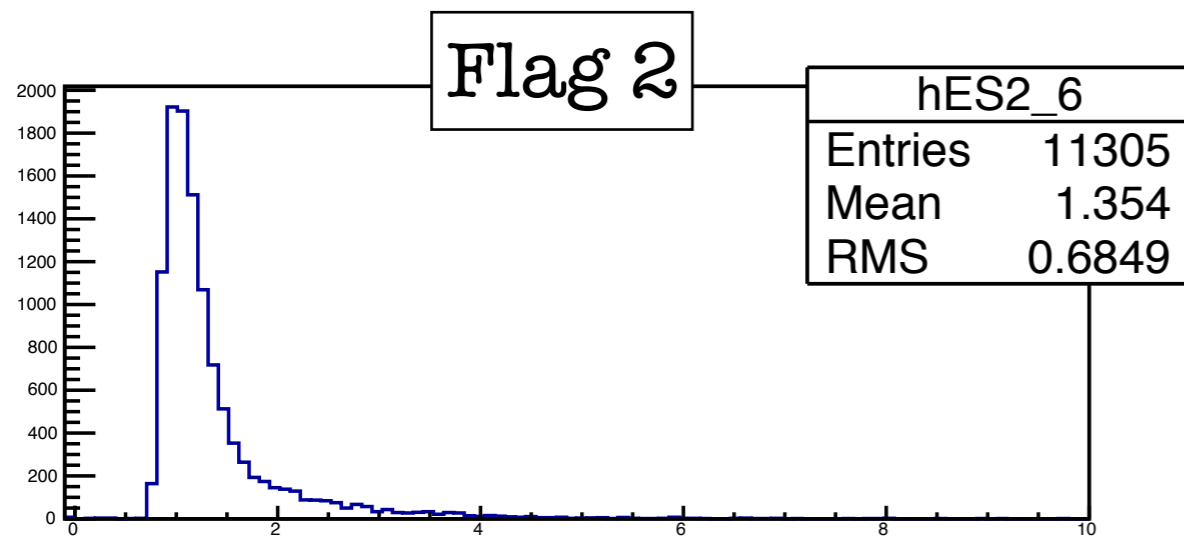
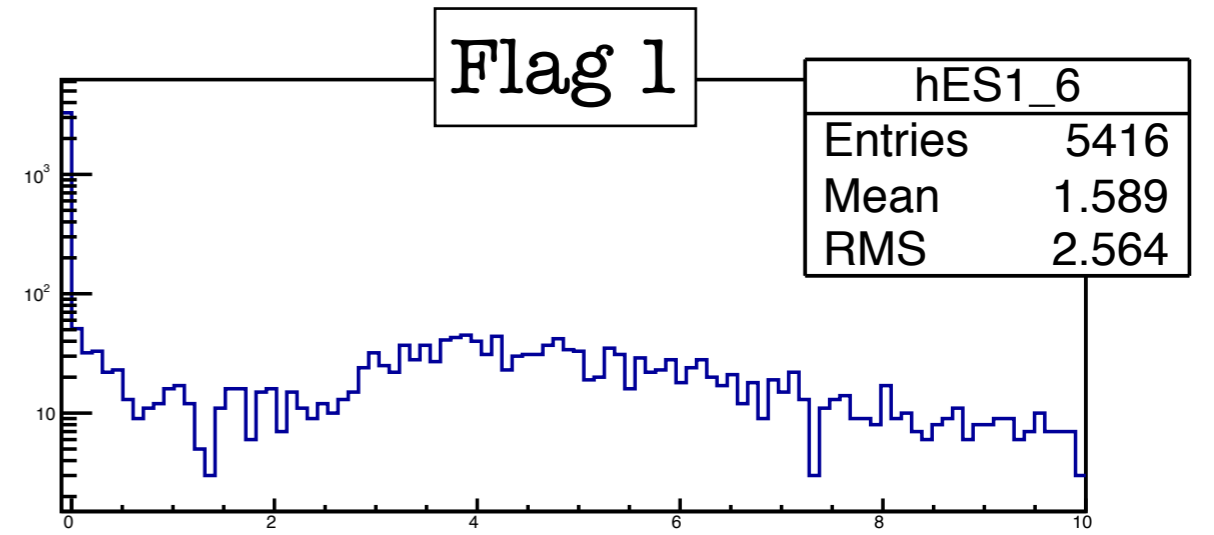
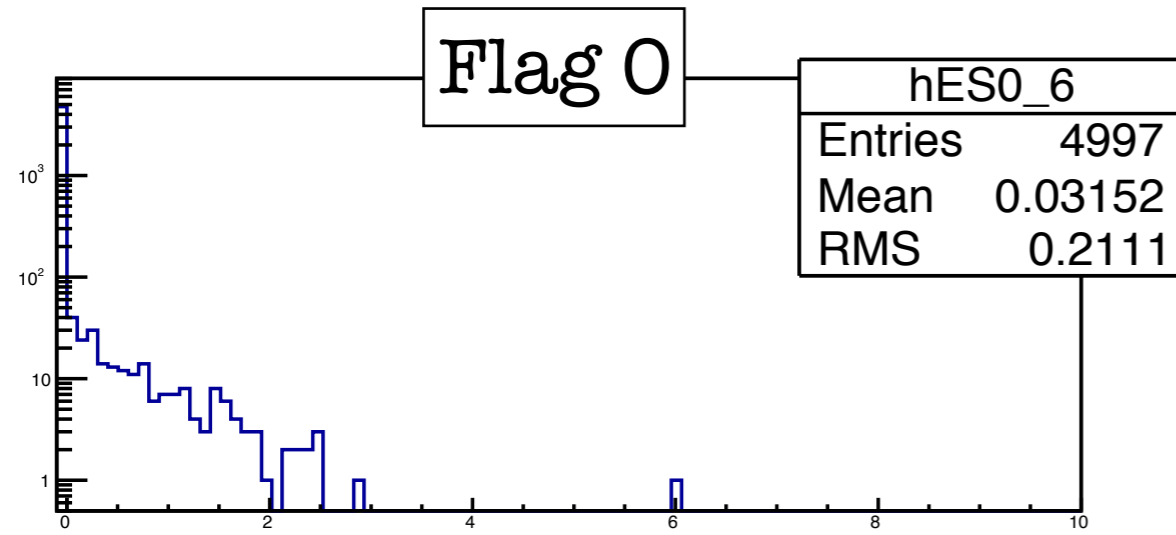
Energy[MeV]

DCVEne Distribution(Module 5)



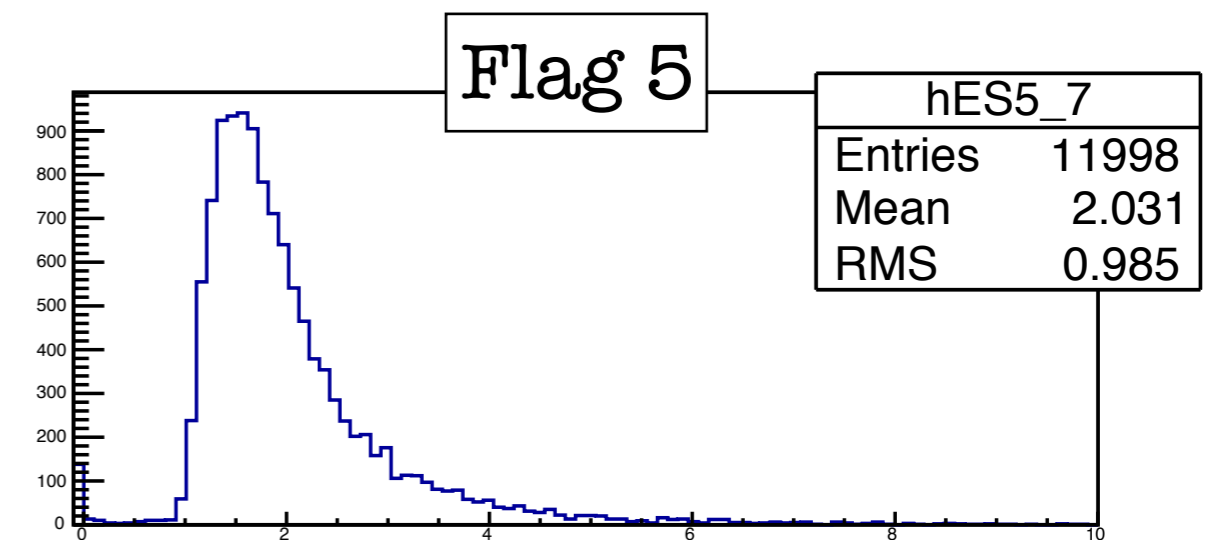
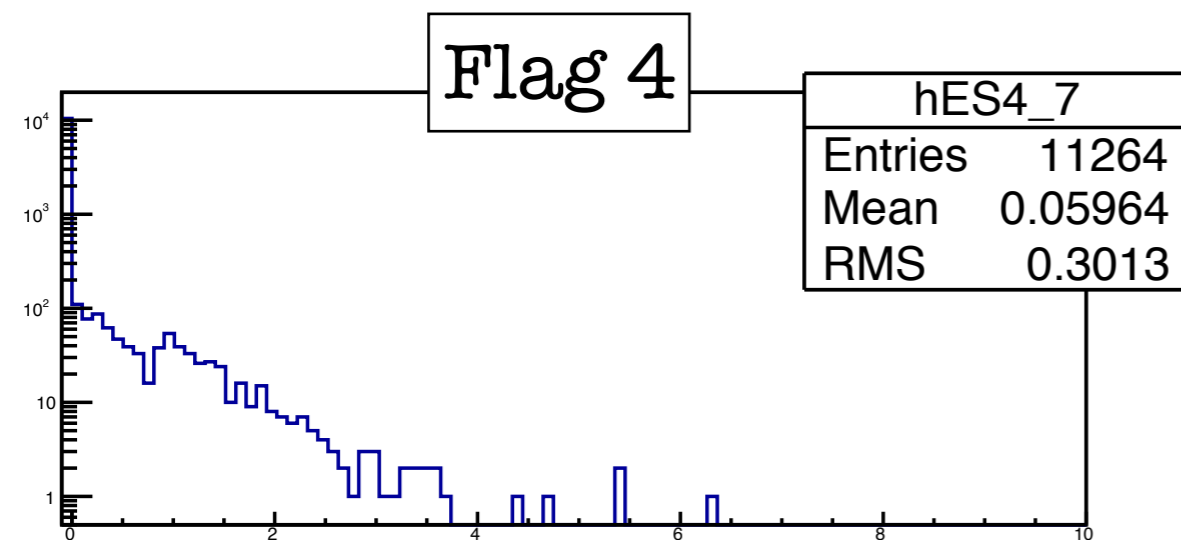
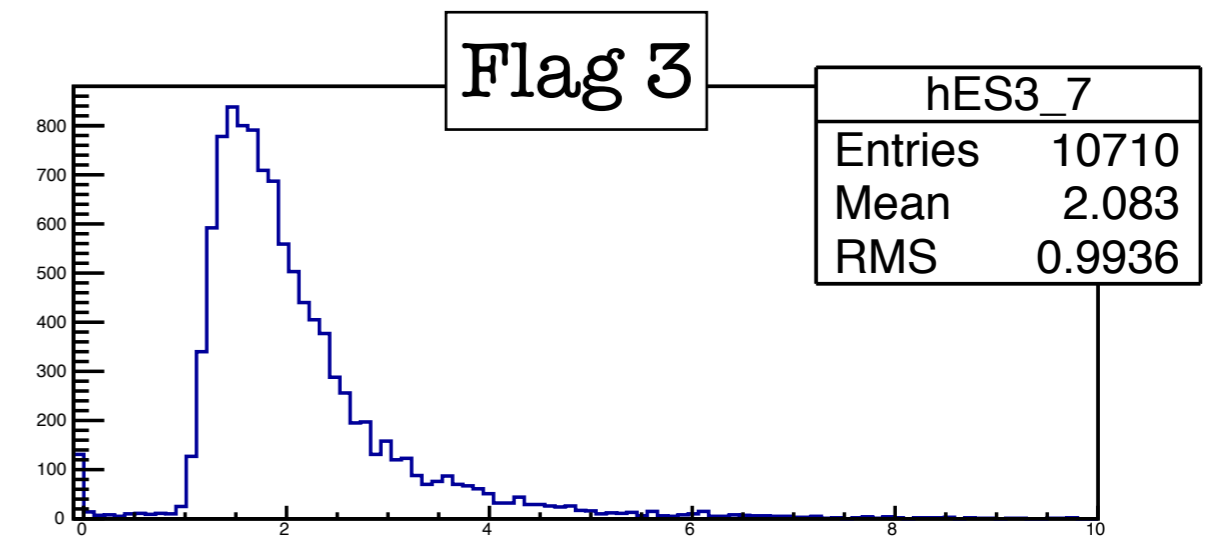
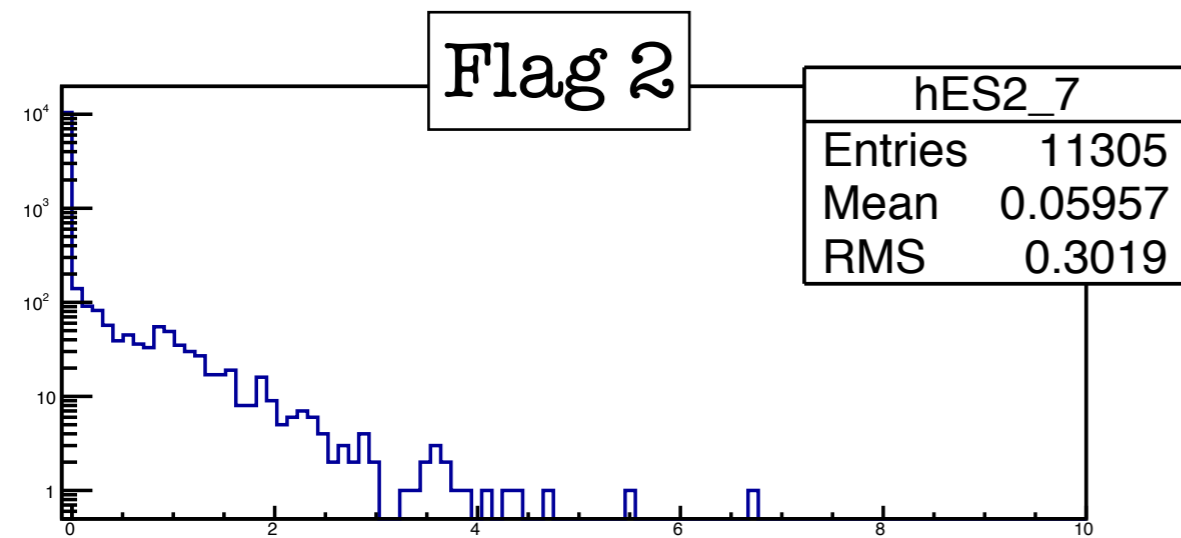
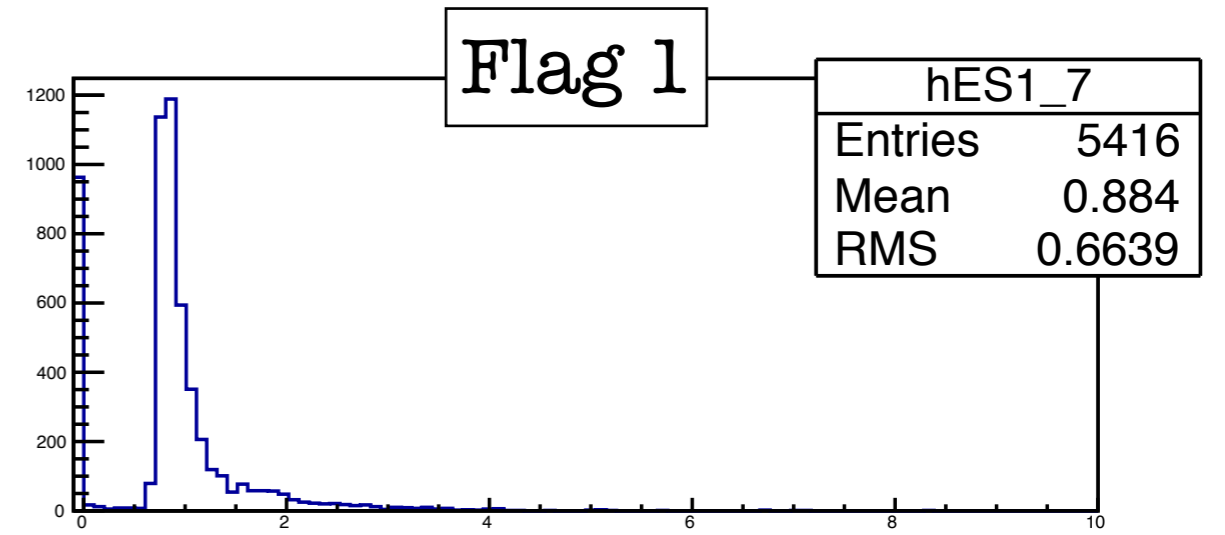
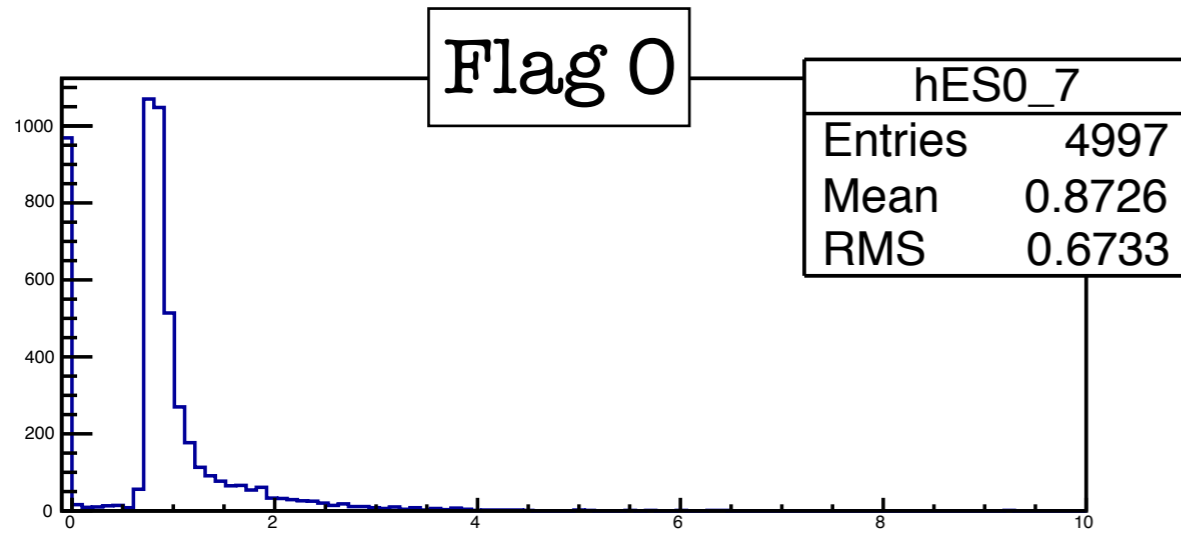
Energy[MeV]

DCVEne Distribution(Module 6)



Energy[MeV]

DCVEne Distribution(Module 7)



Energy[MeV]