Prad Calibration Update

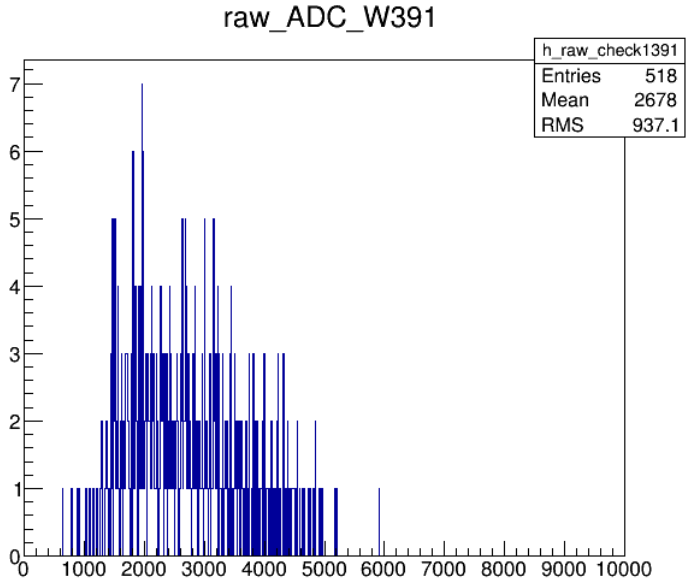
PRad weekly meeting

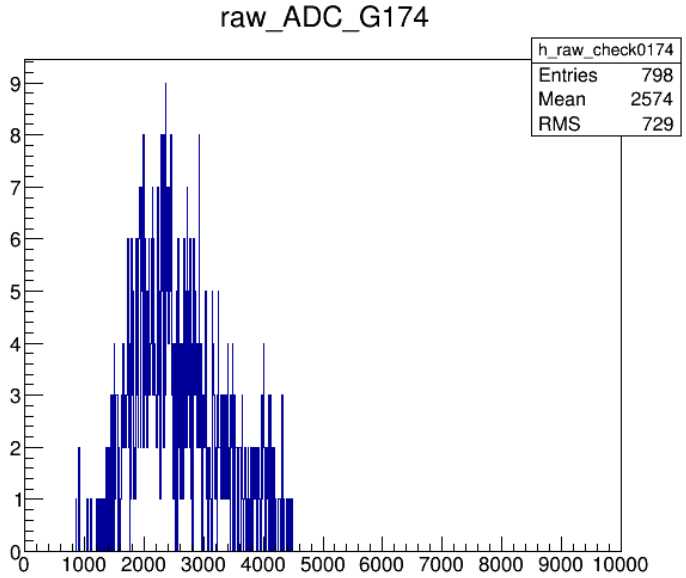
Li Ye

Mississippi State University

2016-09-09

Raw ADC Check

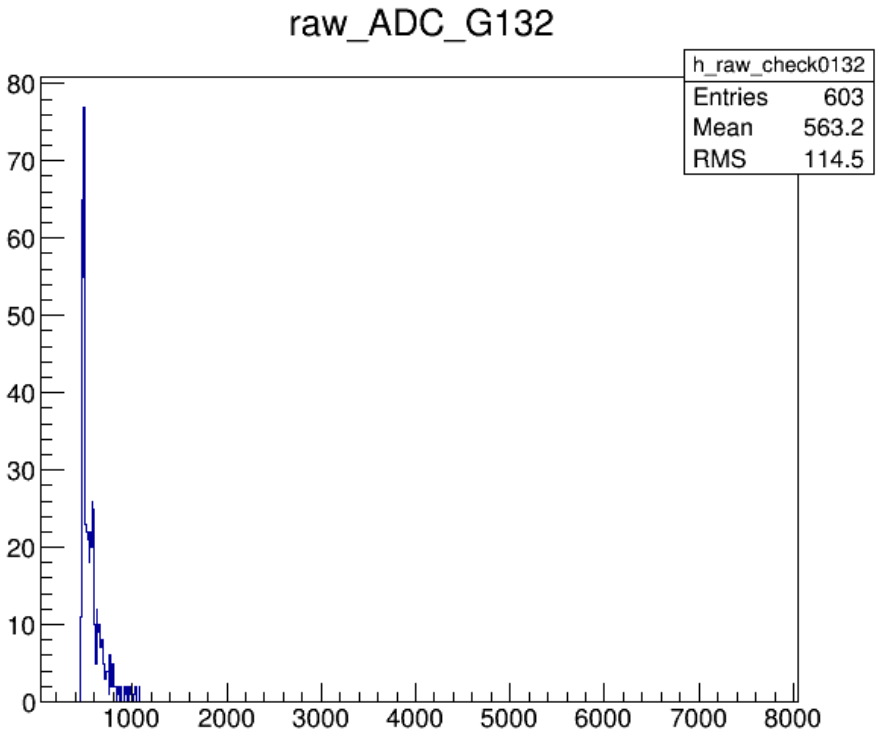


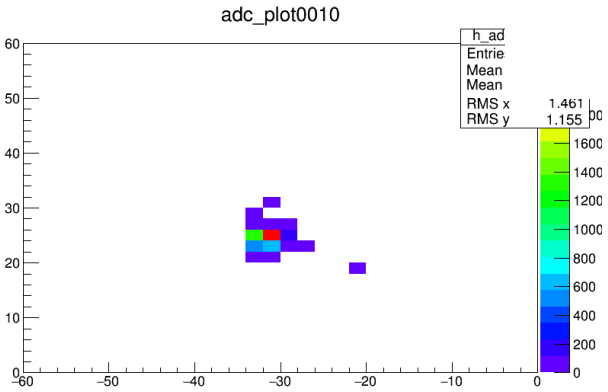


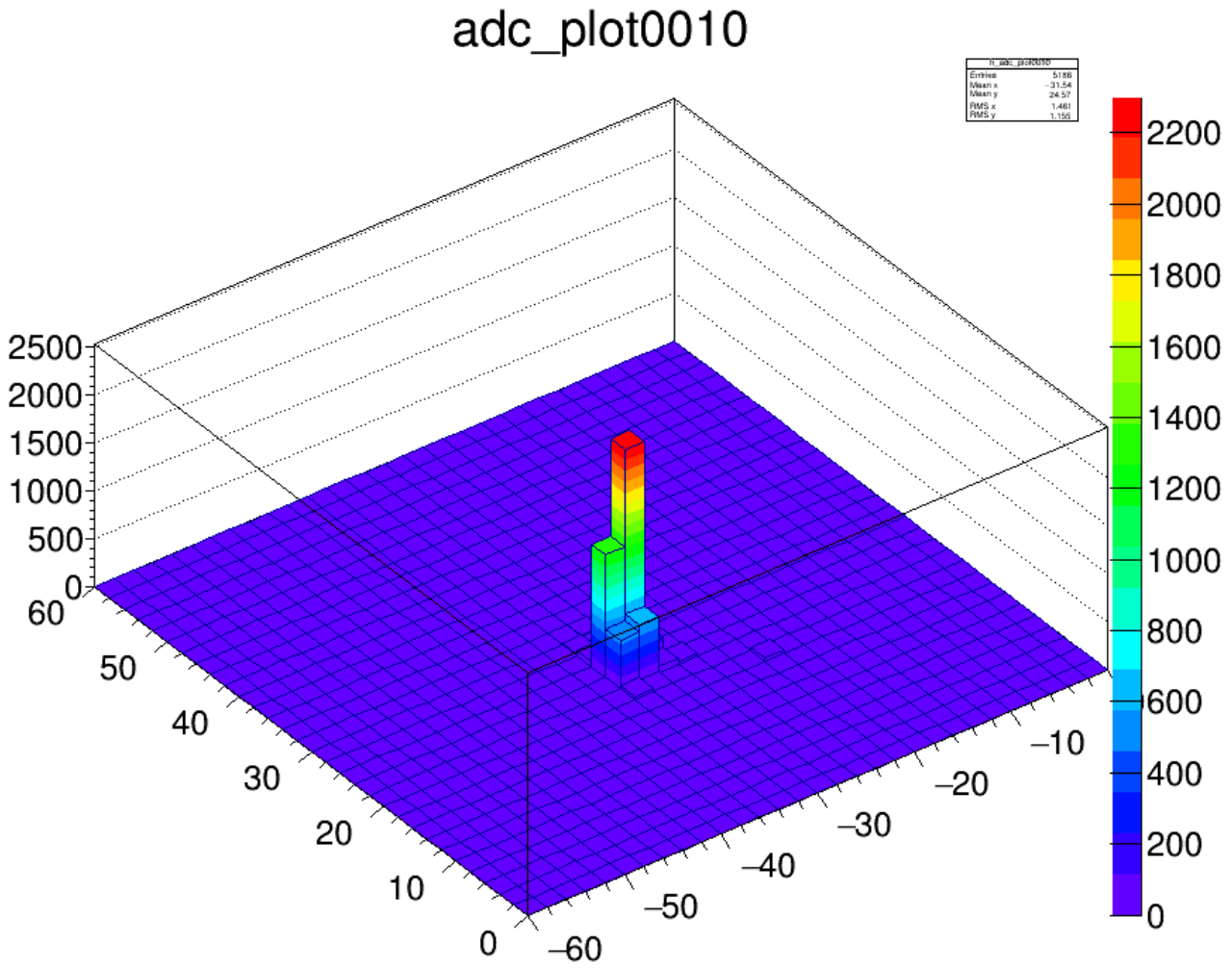
12 channels have abnormal ADC distribution (low gain ?)

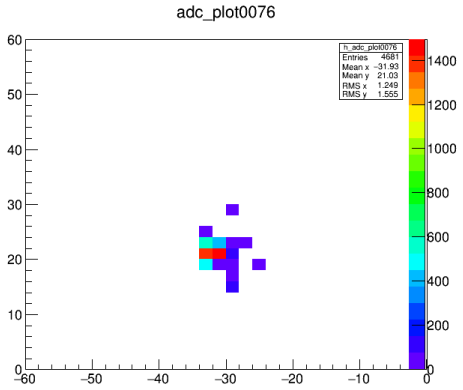
G130 G131 G132 G133 G134 G135 G171 G572 G732

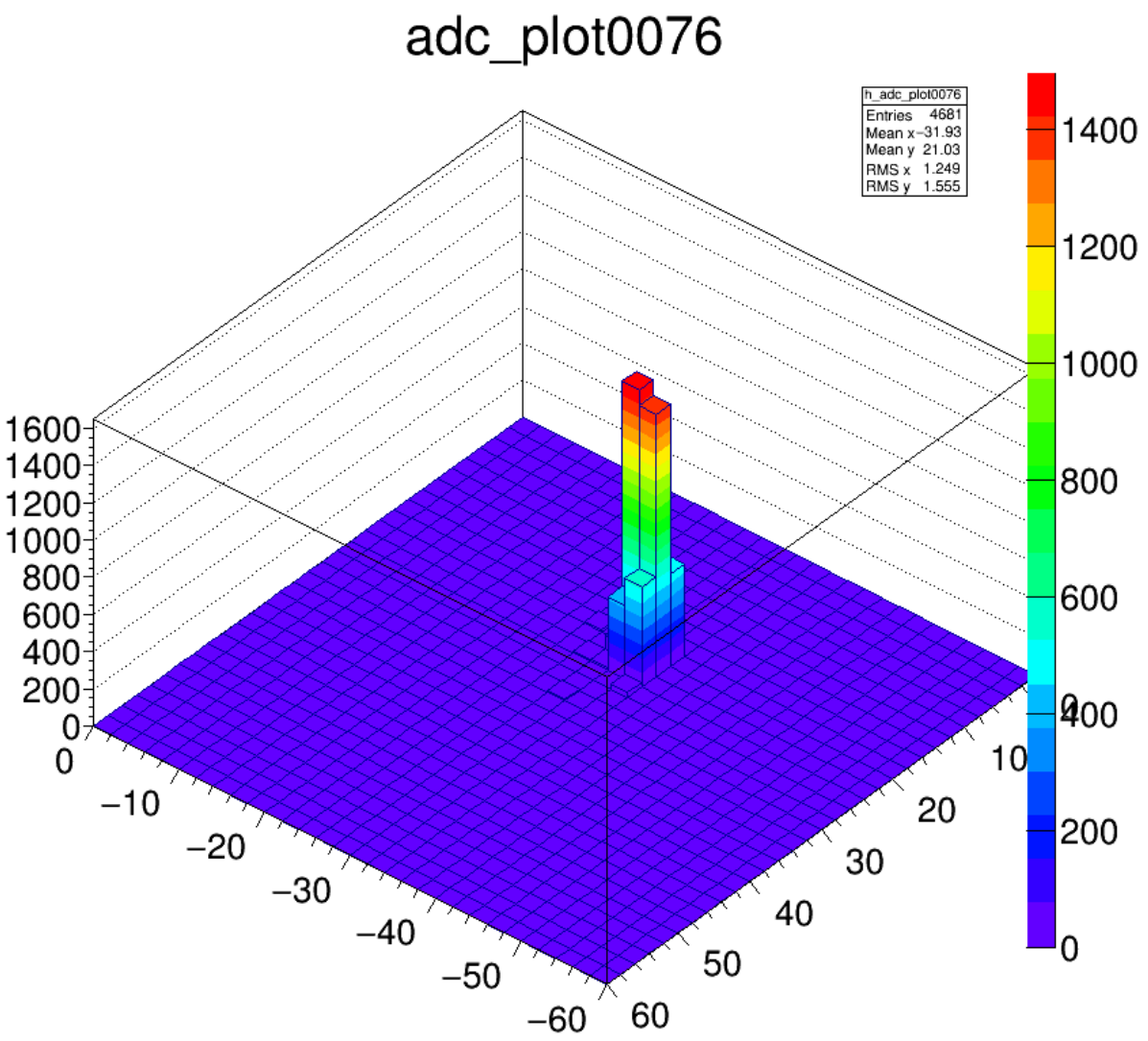
W528 W630 W891




adc_plot0010
h_ad
Entrie
Mean
Mean
RMS x 1.461
RMS y 1.155


adc_plot0010
h_adc_plot0010
Entries 5186
Mean x -31.54
Mean y 24.57
RMS x 1.461
RMS y 1.155


adc_plot0076
h_adc_plot0076
Entries 4681
Mean x −31.93
Mean y 21.03
RMS x 1.249
RMS y 1.555

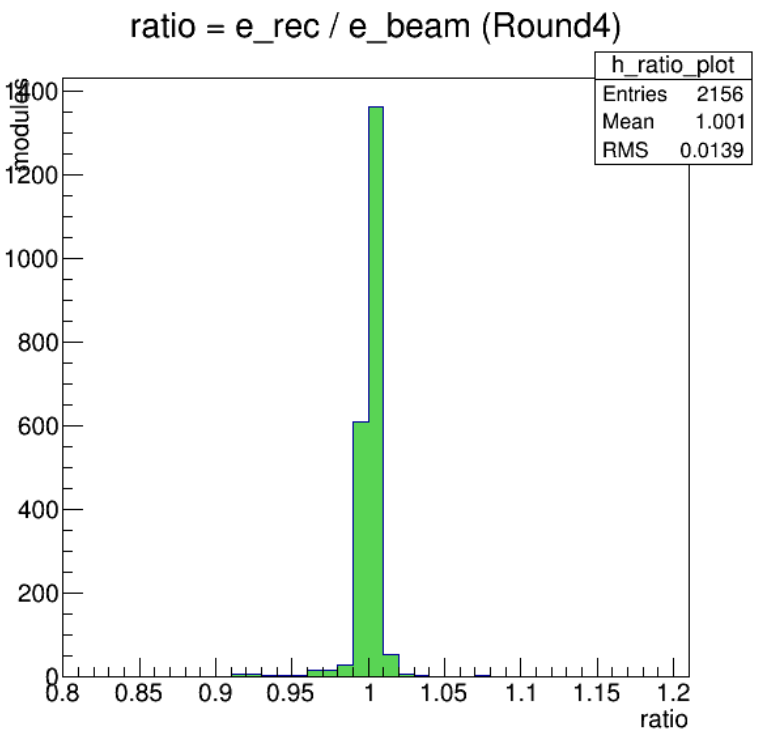

adc_plot0076
h_adc_plot0076
Entries 4681
Mean x −31.93
Mean y 21.03
RMS x 1.249
RMS y 1.555

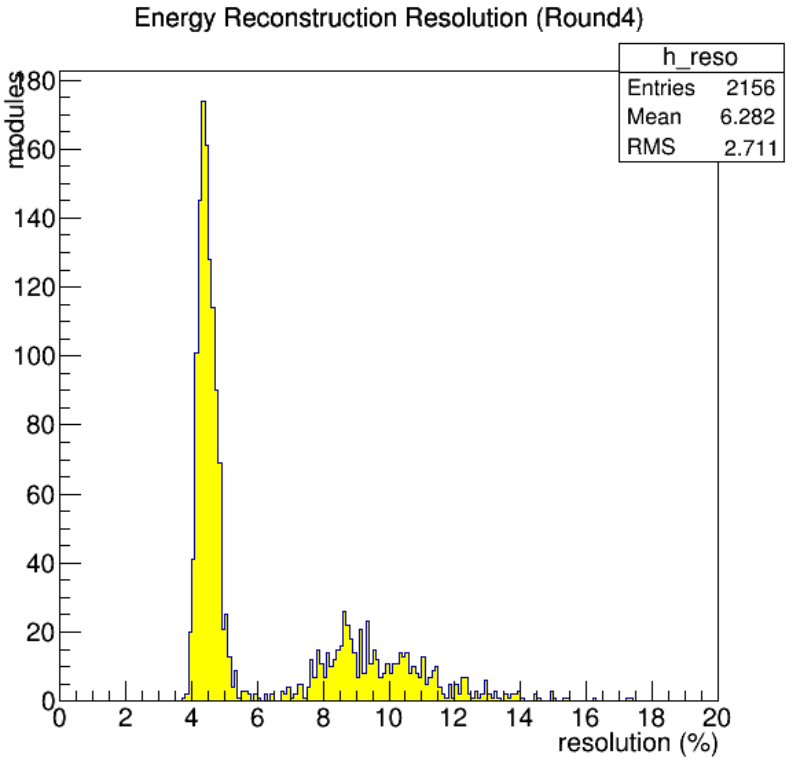
Find mean value of ratio for each module:

ratio_val[i], where i=module.id

new_gain[i] = old_gain[i]/ratio_val[i].

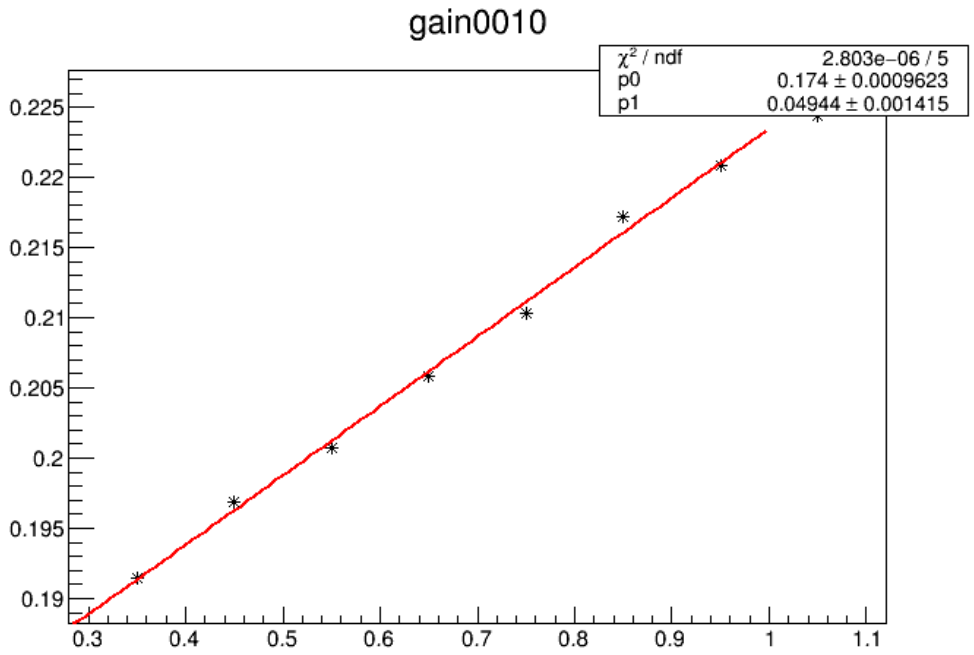
Then next round …



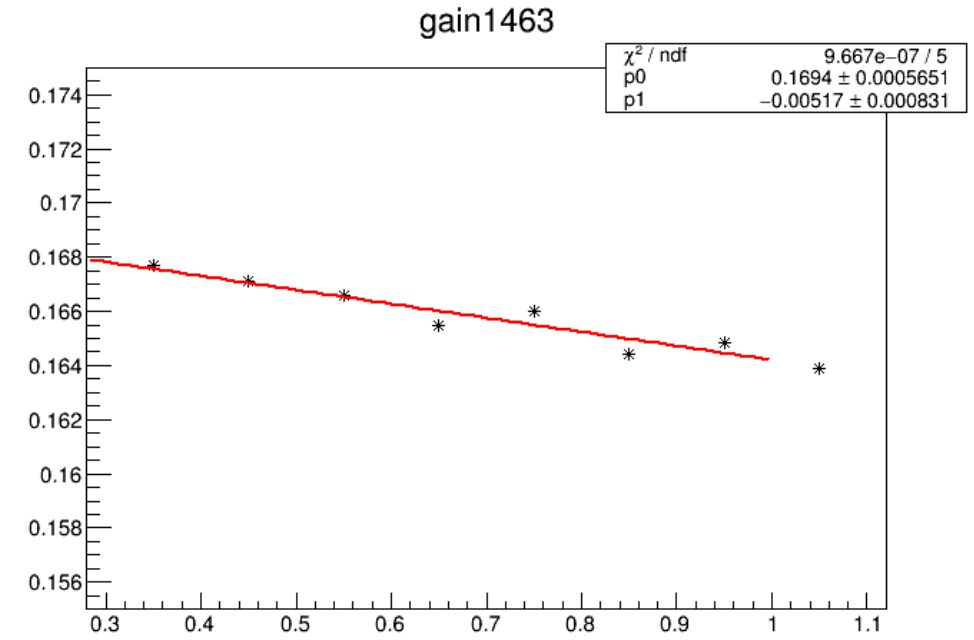


Till good enough then do different energy bins get :

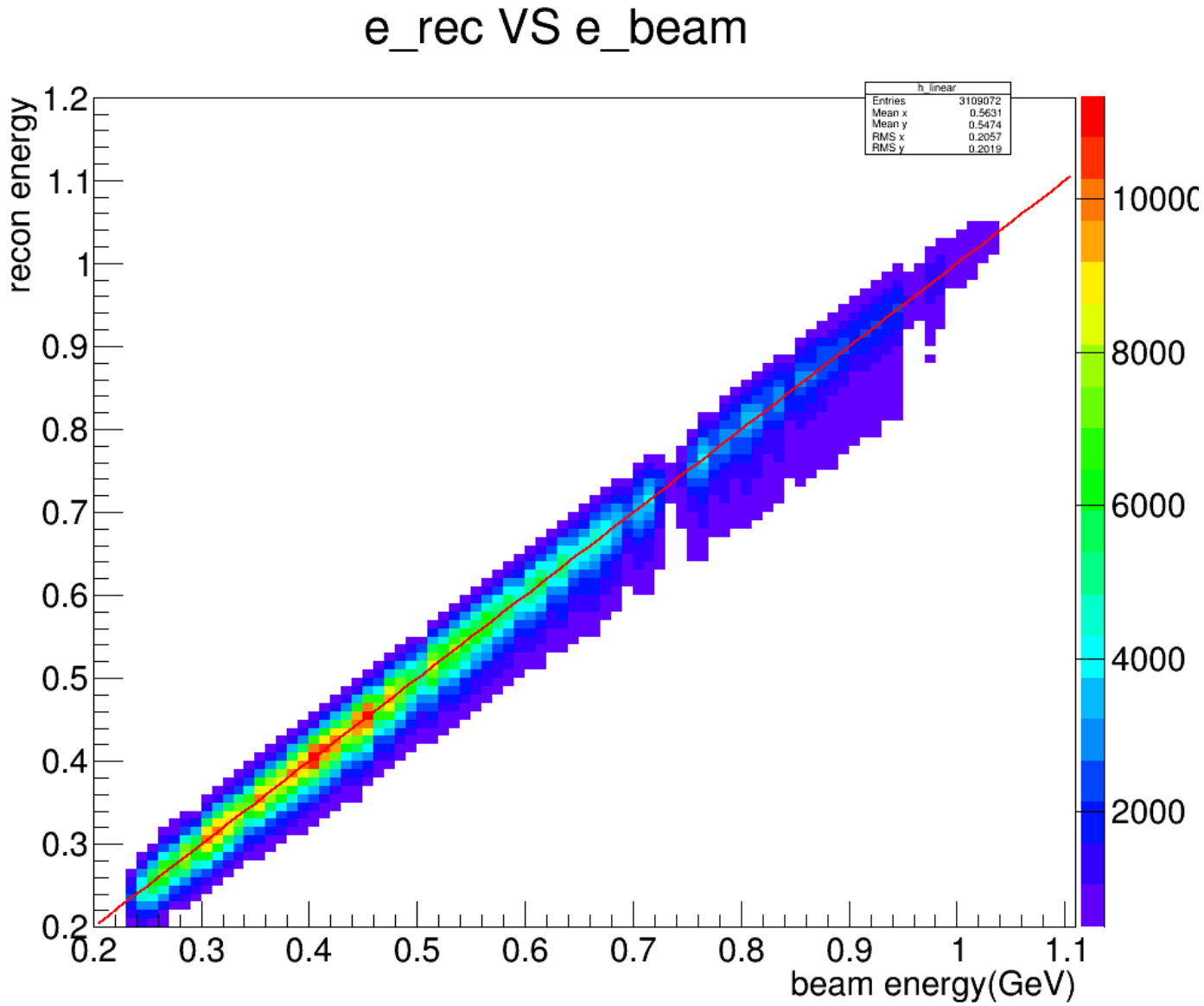
ratio[ebin][i] → new_gain[ebin][i] → fit → gain function (gain[e] = p0+ p1*e)

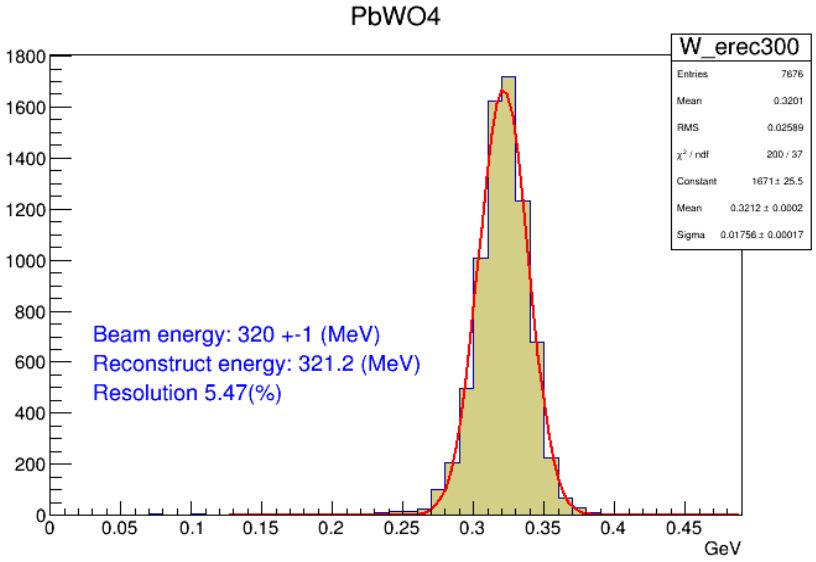


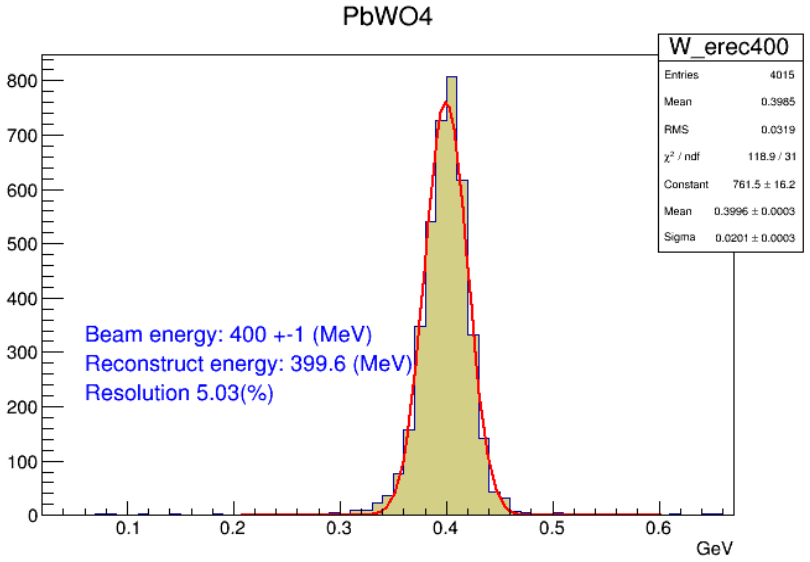
Example of Lead Glass (G10)

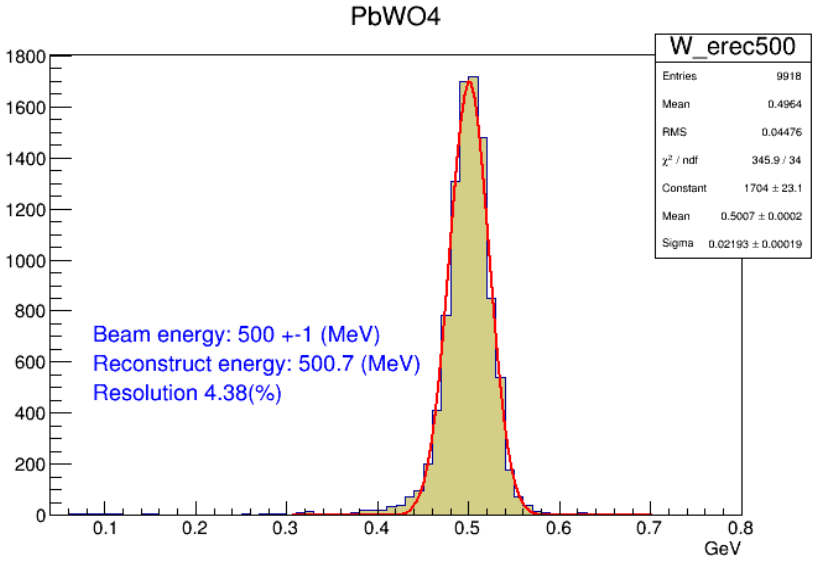


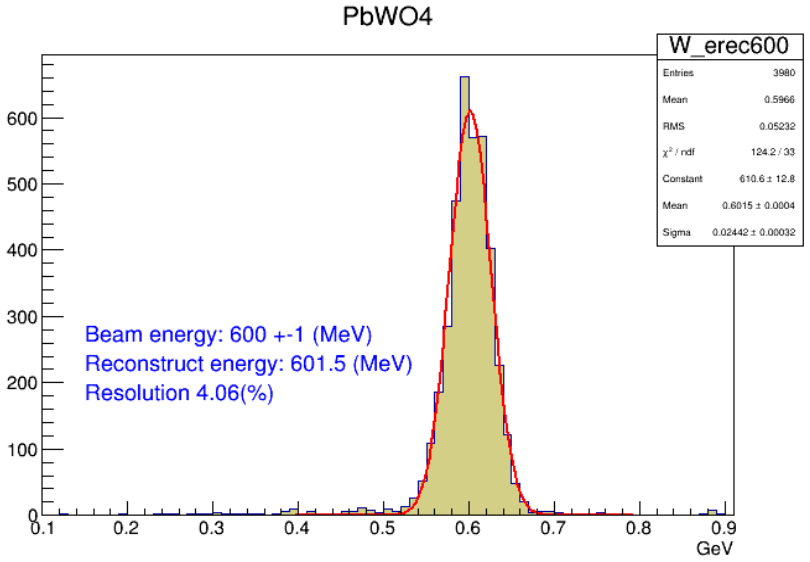
Example of PbWO4 (W463)

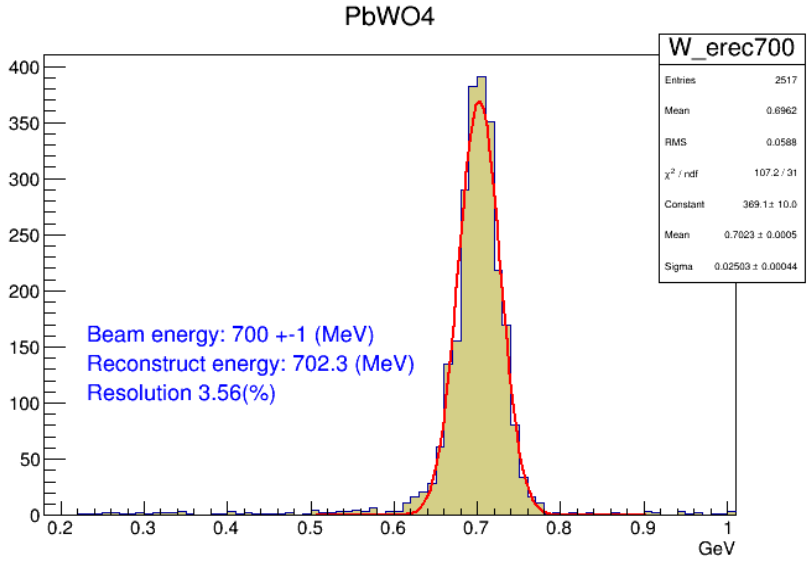

e_rec VS e_beam
h_linear
Entries 3109072
Mean x 0.5631
Mean y 0.5474
RMS x 0.2057
RMS y 0.2019
recon energy
beam energy(GeV)
1.2
1.1
1
0.9
0.8
0.7
0.6
0.5
0.4
0.3
0.2
0.2
0.3
0.4
0.5
0.6
0.7
0.8
0.9
1
1.1
10000
8000
6000
4000
2000

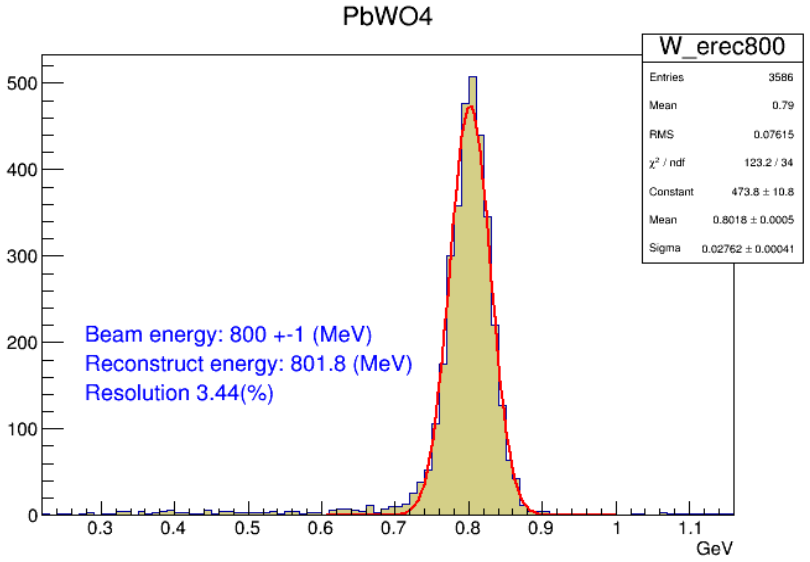

PbWO4
W_erec300
Entries 7676
Mean 0.3201
RMS 0.02589
χ² / ndf 200 / 37
Constant 1671 ± 25.5
Mean 0.3212 ± 0.0002
Sigma 0.01756 ± 0.00017
Beam energy: 320 +-1 (MeV)
Reconstruct energy: 321.2 (MeV)
Resolution 5.47(%)
GeV

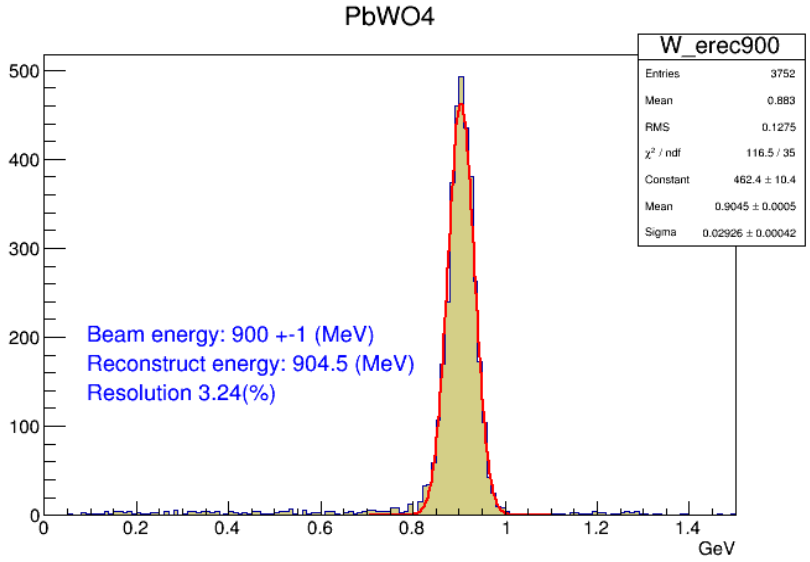

PbWO4
W_erec400
Entries 4015
Mean 0.3985
RMS 0.0319
χ² / ndf 118.9 / 31
Constant 761.5 ± 16.2
Mean 0.3996 ± 0.0003
Sigma 0.0201 ± 0.0003
Beam energy: 400 +-1 (MeV)
Reconstruct energy: 399.6 (MeV)
Resolution 5.03(%)
GeV

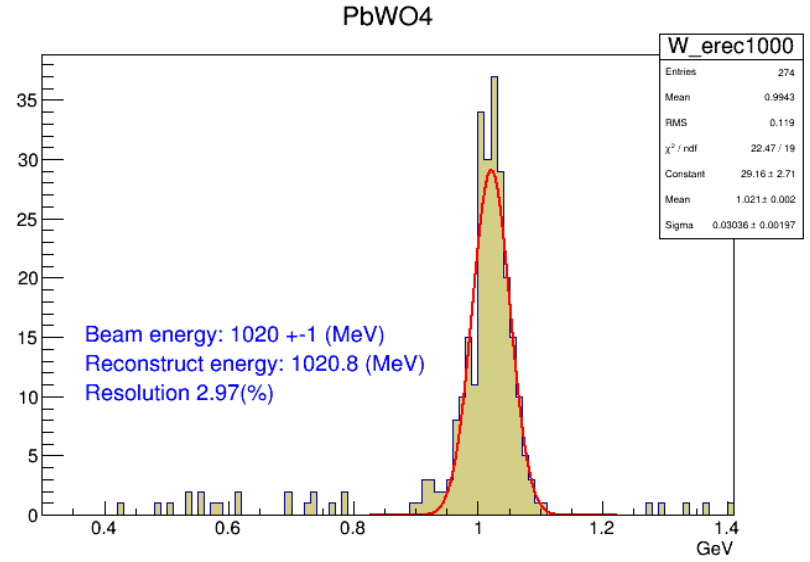

PbWO4
W_erec500
Entries 9918
Mean 0.4964
RMS 0.04476
χ² / ndf 345.9 / 34
Constant 1704 ± 23.1
Mean 0.5007 ± 0.0002
Sigma 0.02193 ± 0.00019
Beam energy: 500 +-1 (MeV)
Reconstruct energy: 500.7 (MeV)
Resolution 4.38(%)
GeV

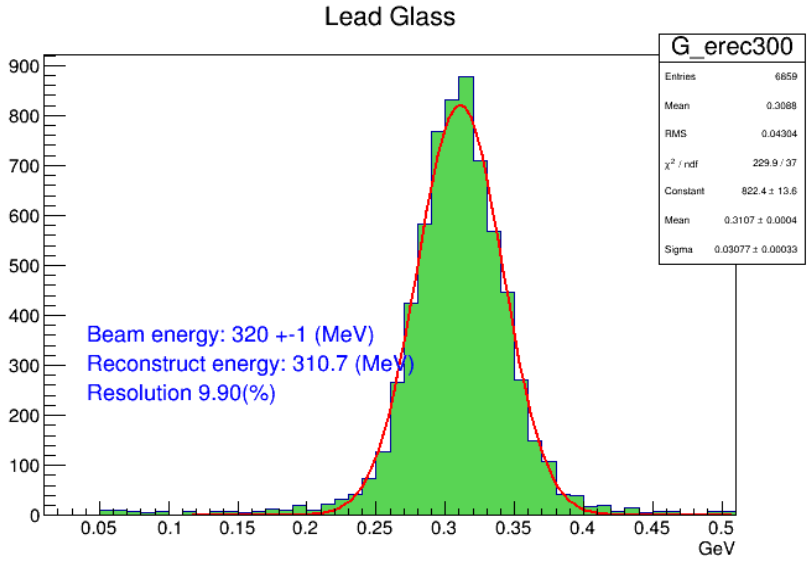

PbWO4
W_erec600
Entries 3980
Mean 0.5966
RMS 0.05232
χ² / ndf 124.2 / 33
Constant 610.6 ± 12.8
Mean 0.6015 ± 0.0004
Sigma 0.02442 ± 0.00032
Beam energy: 600 +-1 (MeV)
Reconstruct energy: 601.5 (MeV)
Resolution 4.06(%)
GeV

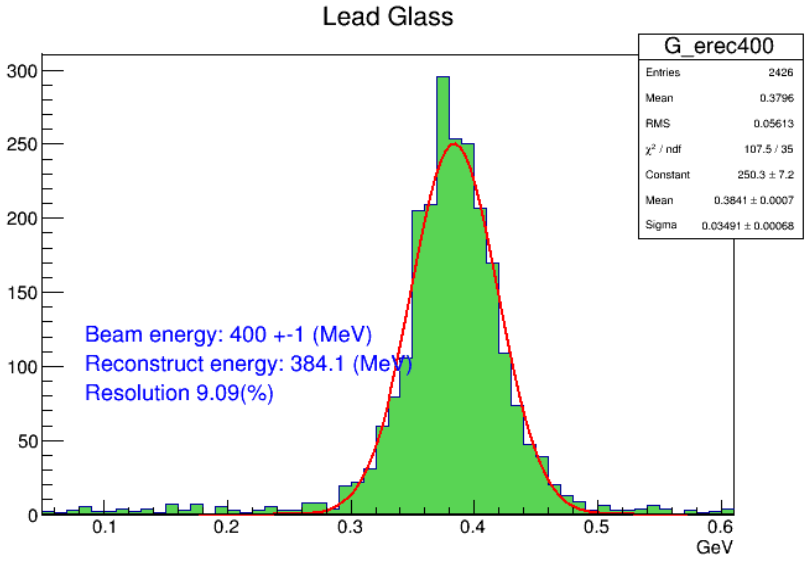

PbWO4
W_erec700
Entries 2517
Mean 0.6962
RMS 0.0588
χ² / ndf 107.2 / 31
Constant 369.1 ± 10.0
Mean 0.7023 ± 0.0005
Sigma 0.02503 ± 0.00044
Beam energy: 700 +-1 (MeV)
Reconstruct energy: 702.3 (MeV)
Resolution 3.56(%)
GeV

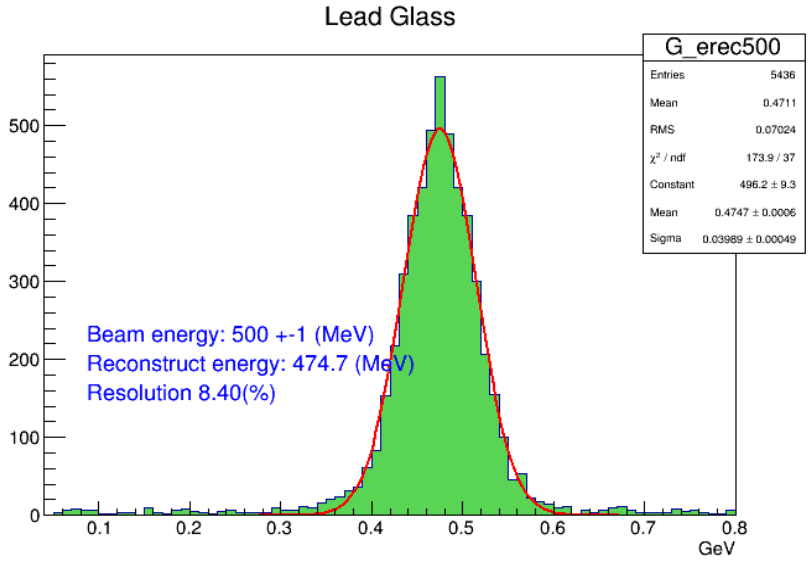

PbWO4
W_erec800
Entries 3586
Mean 0.79
RMS 0.07615
χ² / ndf 123.2 / 34
Constant 473.8 ± 10.8
Mean 0.8018 ± 0.0005
Sigma 0.02762 ± 0.00041
Beam energy: 800 +-1 (MeV)
Reconstruct energy: 801.8 (MeV)
Resolution 3.44(%)
GeV

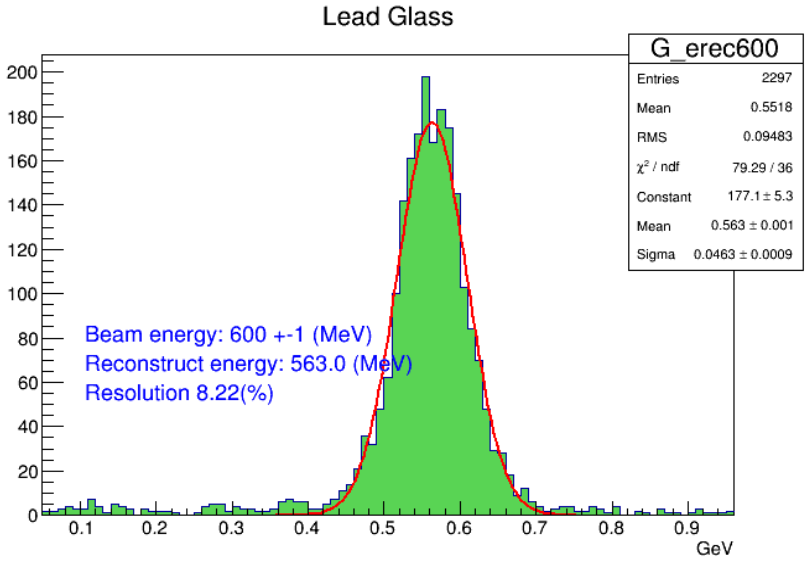

PbWO4
W_erec900
Entries 3752
Mean 0.883
RMS 0.1275
χ² / ndf 116.5 / 35
Constant 462.4 ± 10.4
Mean 0.9045 ± 0.0005
Sigma 0.02926 ± 0.00042
Beam energy: 900 +-1 (MeV)
Reconstruct energy: 904.5 (MeV)
Resolution 3.24(%)
GeV

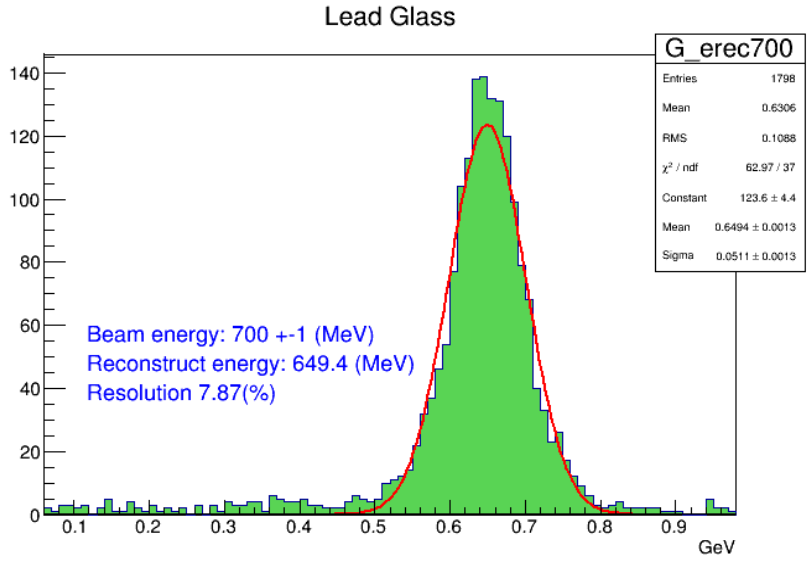

PbWO4
W_erec1000
Entries 274
Mean 0.9943
RMS 0.119
χ² / ndf 22.47 / 19
Constant 29.16 ± 2.71
Mean 1.021 ± 0.002
Sigma 0.03036 ± 0.00197
Beam energy: 1020 +-1 (MeV)
Reconstruct energy: 1020.8 (MeV)
Resolution 2.97(%)
GeV

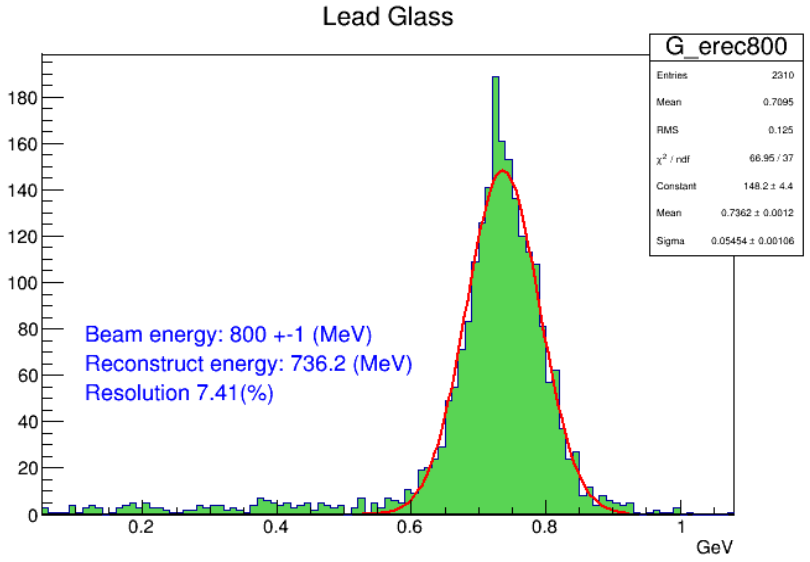

Lead Glass
G_erec300
Entries 6859
Mean 0.3088
RMS 0.04304
χ² / ndf 229.9 / 37
Constant 822.4 ± 13.6
Mean 0.3107 ± 0.0004
Sigma 0.03077 ± 0.00033
Beam energy: 320 +-1 (MeV)
Reconstruct energy: 310.7 (MeV)
Resolution 9.90(%)
GeV

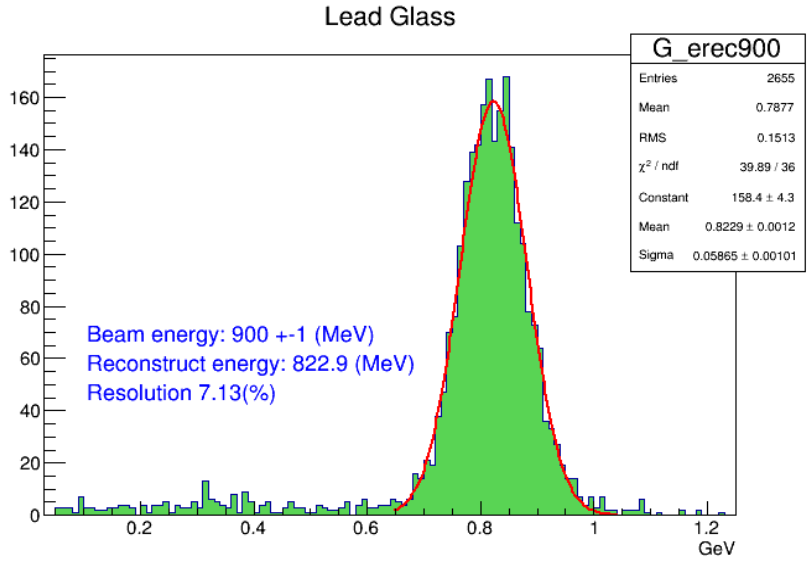

Lead Glass
G_erec400
Entries 2426
Mean 0.3796
RMS 0.05613
χ² / ndf 107.5 / 35
Constant 250.3 ± 7.2
Mean 0.3841 ± 0.0007
Sigma 0.03491 ± 0.00068
Beam energy: 400 +-1 (MeV)
Reconstruct energy: 384.1 (MeV)
Resolution 9.09(%)
GeV

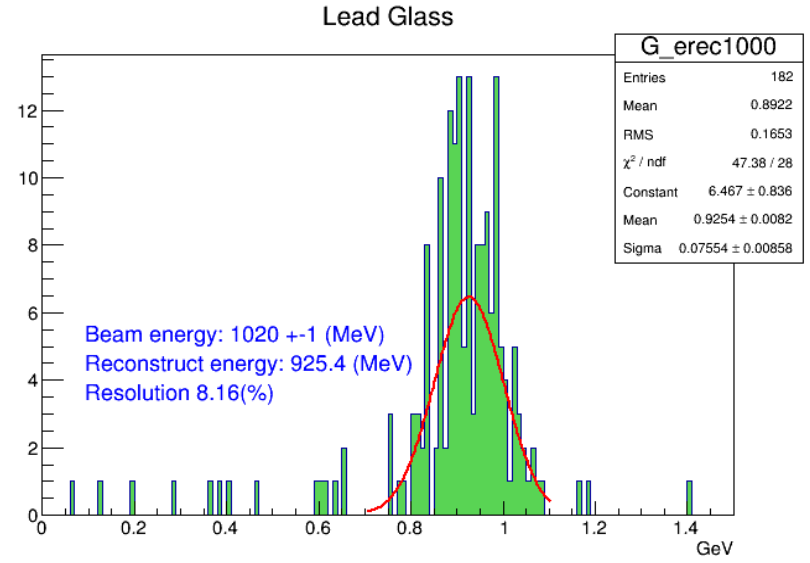

Lead Glass
G_erec500
Entries 5436
Mean 0.4711
RMS 0.07024
χ² / ndf 173.9 / 37
Constant 496.2 ± 9.3
Mean 0.4747 ± 0.0006
Sigma 0.03989 ± 0.00049
Beam energy: 500 +-1 (MeV)
Reconstruct energy: 474.7 (MeV)
Resolution 8.40(%)
GeV


Lead Glass
G_erec600
Entries 2297
Mean 0.5518
RMS 0.09483
χ² / ndf 79.29 / 36
Constant 177.1 ± 5.3
Mean 0.563 ± 0.001
Sigma 0.0463 ± 0.0009
Beam energy: 600 +-1 (MeV)
Reconstruct energy: 563.0 (MeV)
Resolution 8.22(%)
GeV


Lead Glass
G_erec700
Entries 1798
Mean 0.6306
RMS 0.1088
χ² / ndf 62.97 / 37
Constant 123.6 ± 4.4
Mean 0.6494 ± 0.0013
Sigma 0.0511 ± 0.0013
Beam energy: 700 +-1 (MeV)
Reconstruct energy: 649.4 (MeV)
Resolution 7.87(%)
GeV


Lead Glass
G_erec800
Entries 2310
Mean 0.7095
RMS 0.125
χ² / ndf 66.95 / 37
Constant 148.2 ± 4.4
Mean 0.7362 ± 0.0012
Sigma 0.05454 ± 0.00106
Beam energy: 800 +-1 (MeV)
Reconstruct energy: 736.2 (MeV)
Resolution 7.41(%)
GeV


Lead Glass
G_erec900
Entries 2655
Mean 0.7877
RMS 0.1513
χ² / ndf 39.89 / 36
Constant 158.4 ± 4.3
Mean 0.8229 ± 0.0012
Sigma 0.05865 ± 0.00101
Beam energy: 900 +-1 (MeV)
Reconstruct energy: 822.9 (MeV)
Resolution 7.13(%)
GeV


Lead Glass
G_erec1000
Entries 182
Mean 0.8922
RMS 0.1653
χ² / ndf 47.38 / 28
Constant 6.467 ± 0.836
Mean 0.9254 ± 0.0082
Sigma 0.07554 ± 0.00858
Beam energy: 1020 +-1 (MeV)
Reconstruct energy: 925.4 (MeV)
Resolution 8.16(%)
GeV

Next

Keep tunning for different bins.

Special treatment for ‘low gain’ channels.

Minimize the fluctuation of gain[bin].

Final tunning with production run.