On the way to reach high resolution spectra with FINUDA

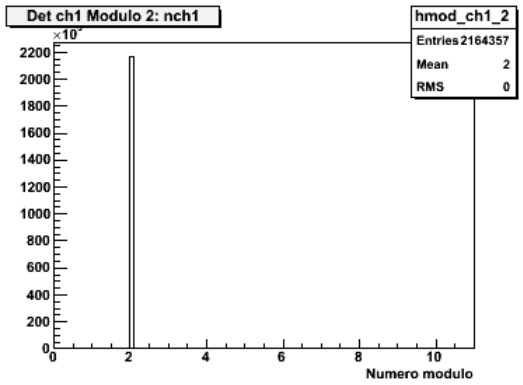
S. Piano

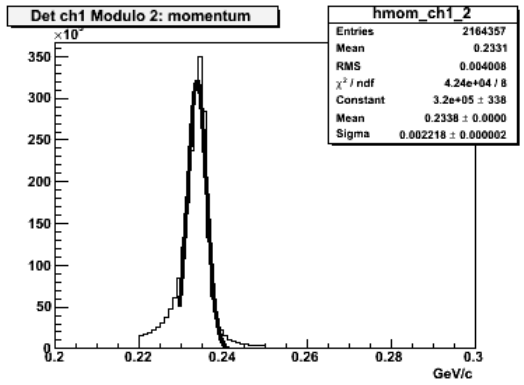
Finuda TRIESTE

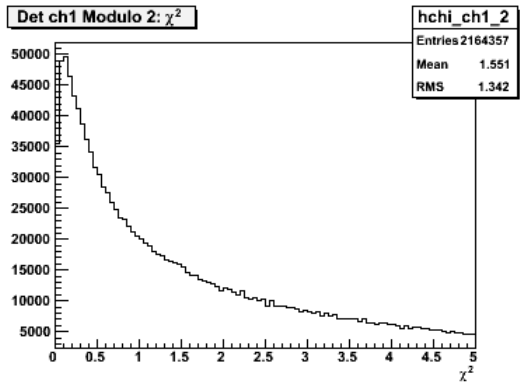
Calibration and Alignment

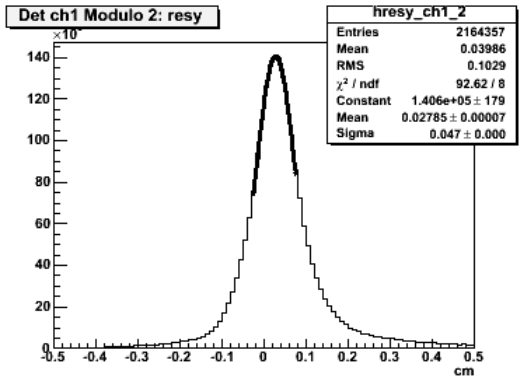
- VDET aligned (looking at V60504)
- DCH1 and DCH2:
  - Different behavior of negative and positive tracks
  - Residual distributions depend on anodic wire
    - Z few centimeters
    - Φ few millimeters
- STRAW:
  - Waiting for reliable 2003-2004 Cosmic Rays Calibration Table on FINUDA Data Base (the basis of the global alignment…)

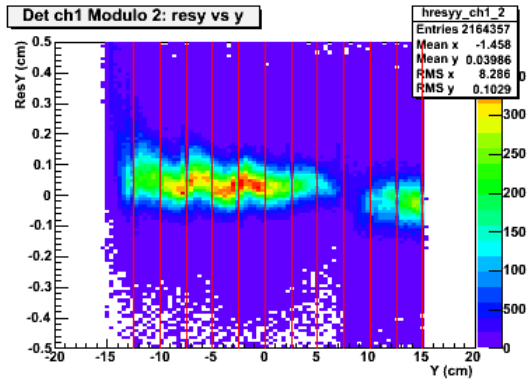
Drift Chamber Residual Distros (Germano)

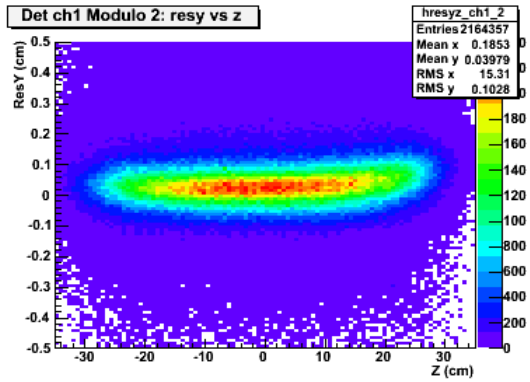


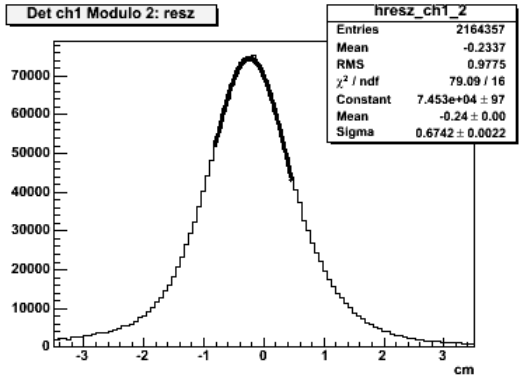


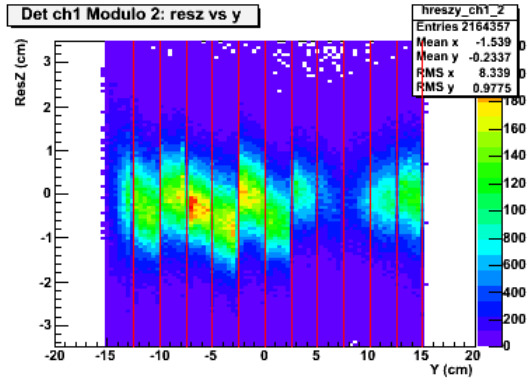


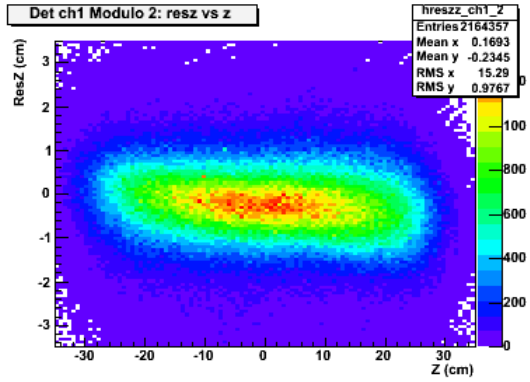




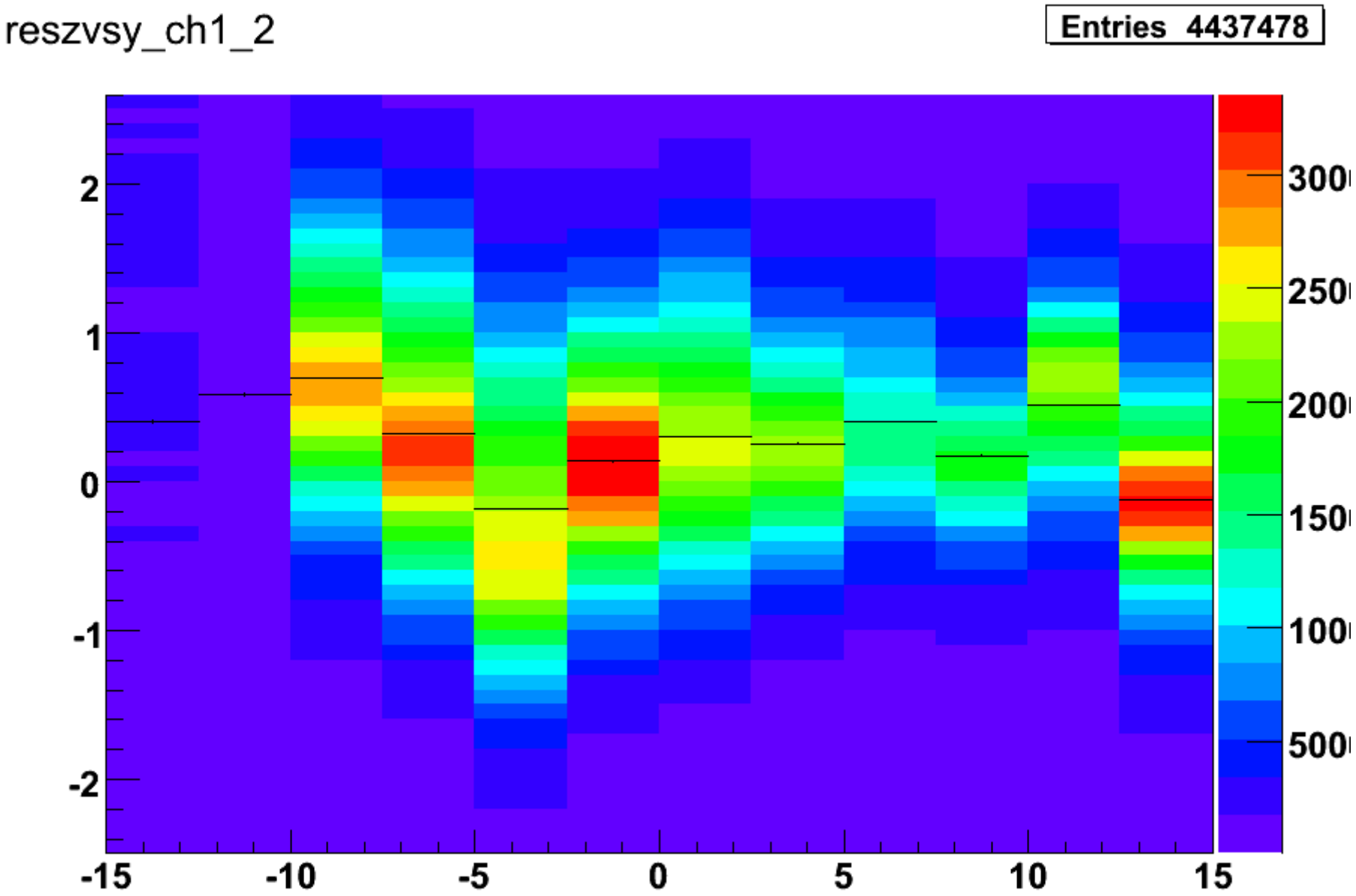


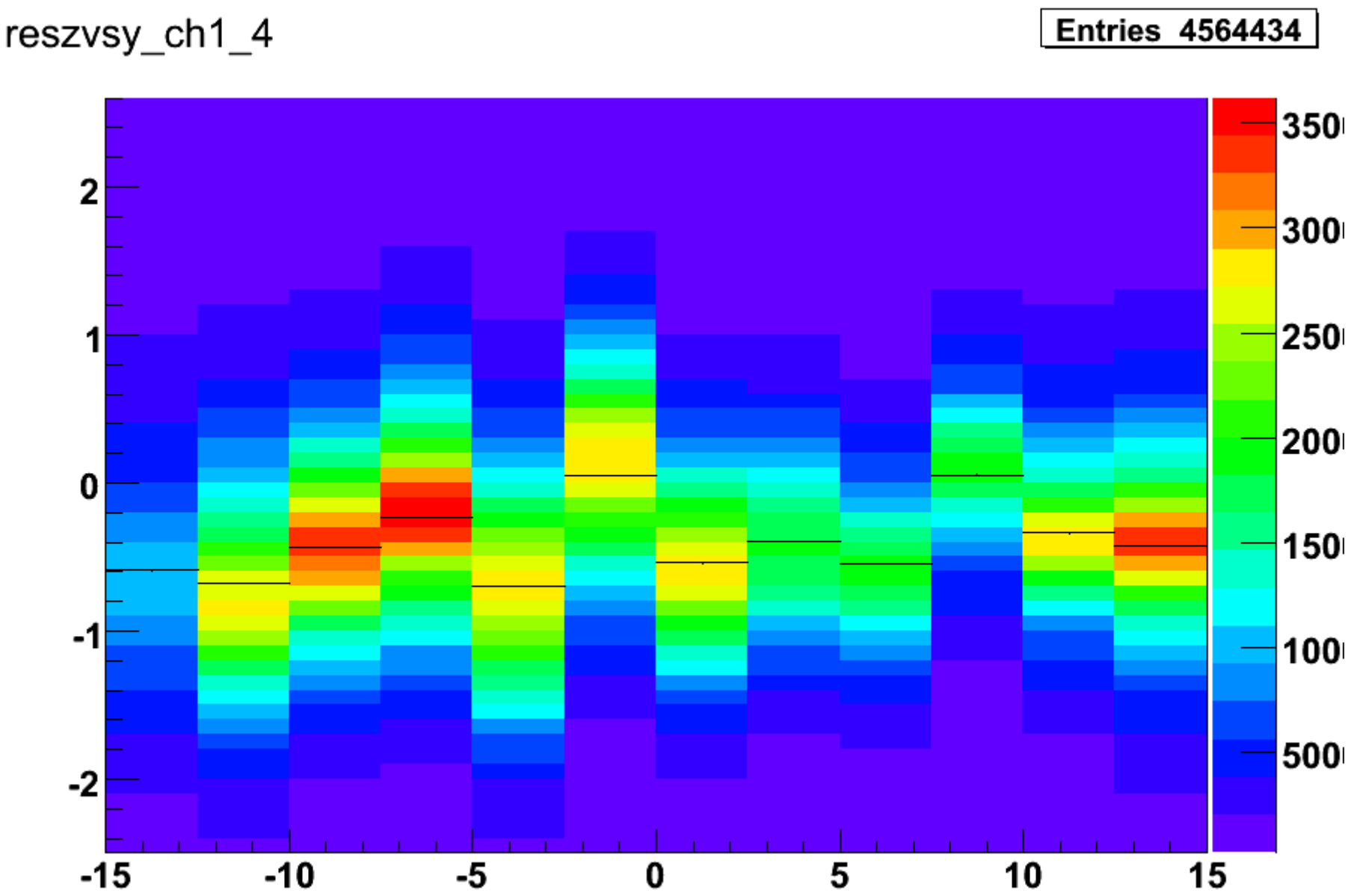


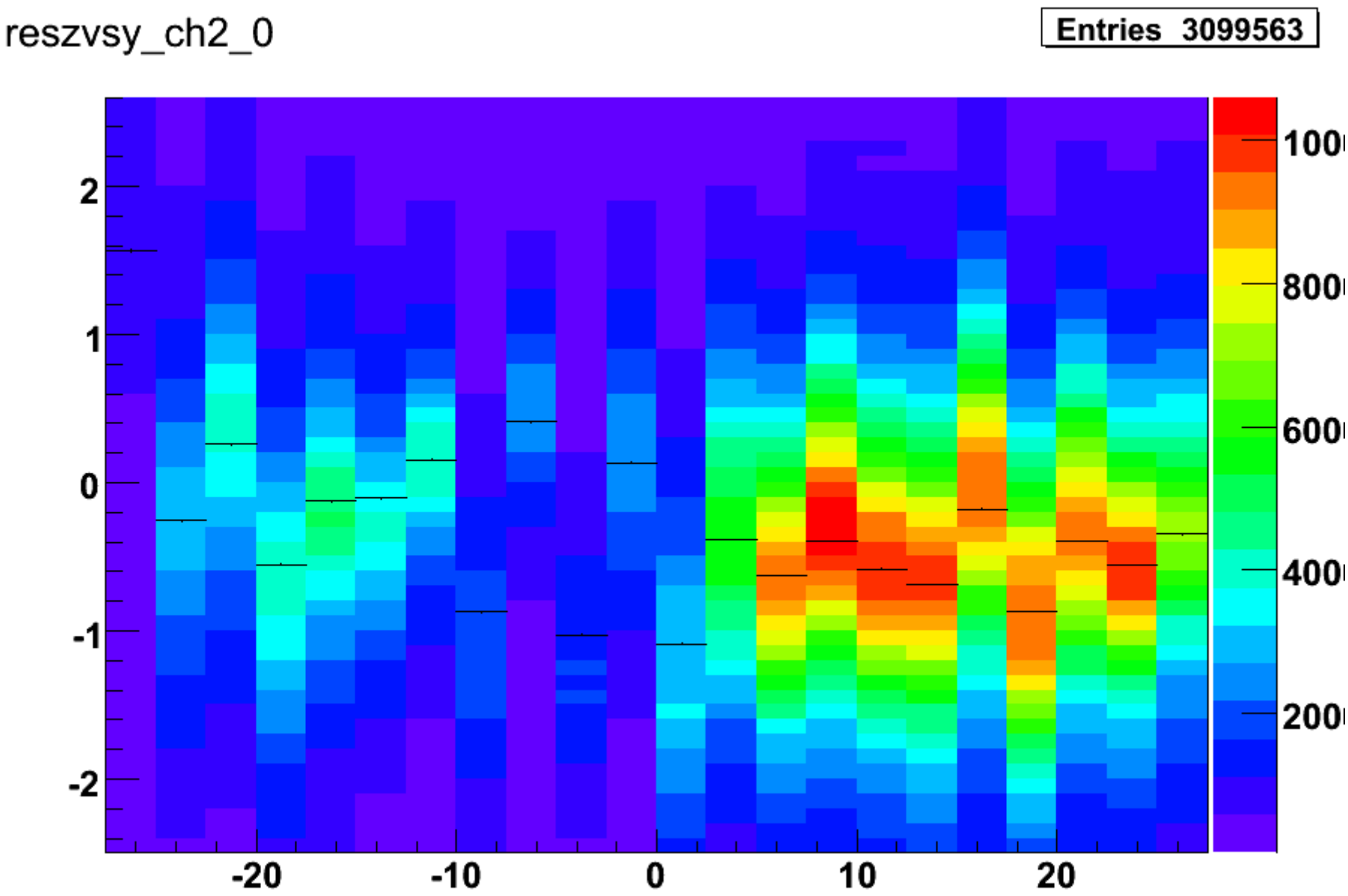


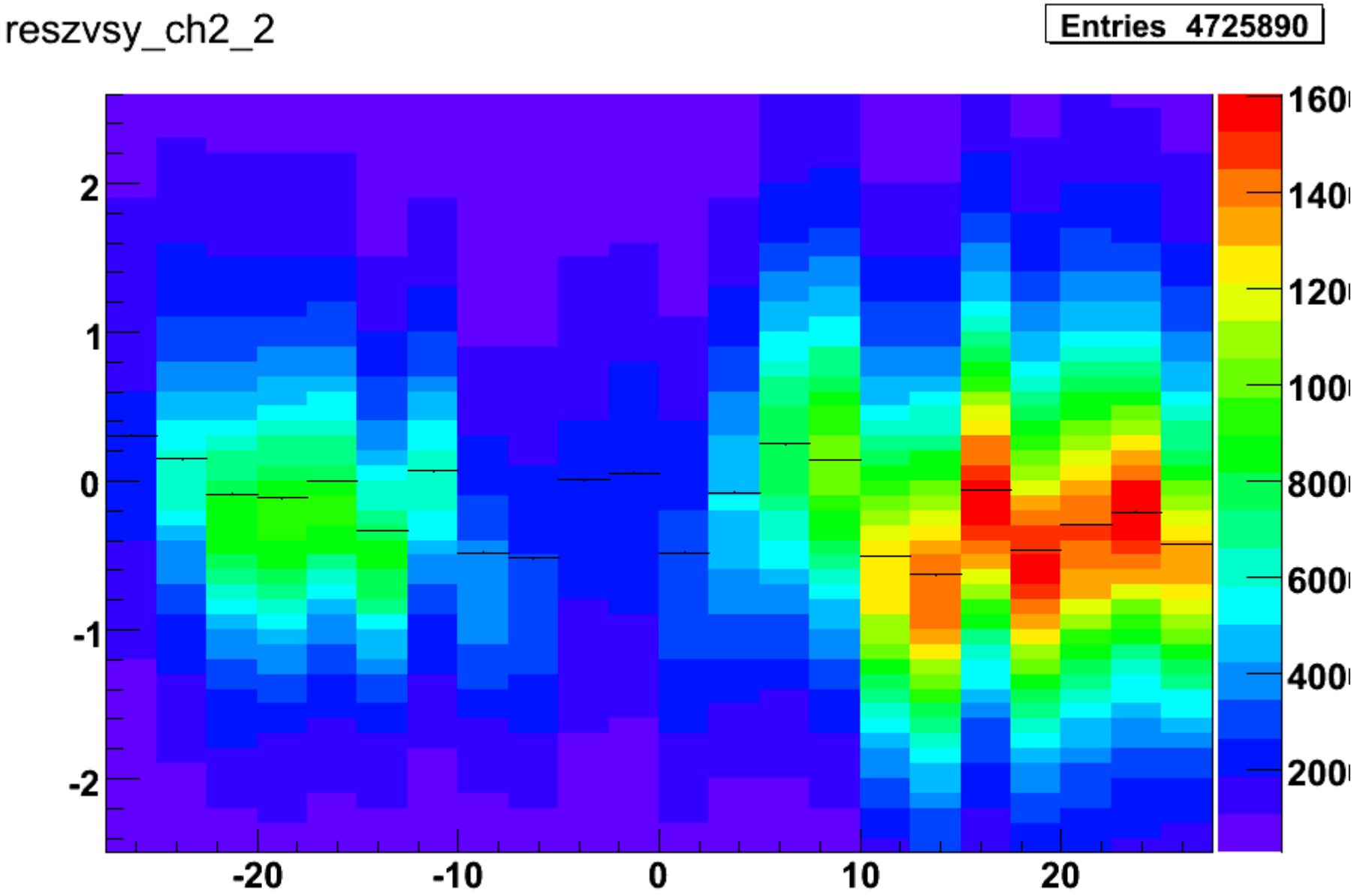


Z Side Residuals vs Anodic Wire



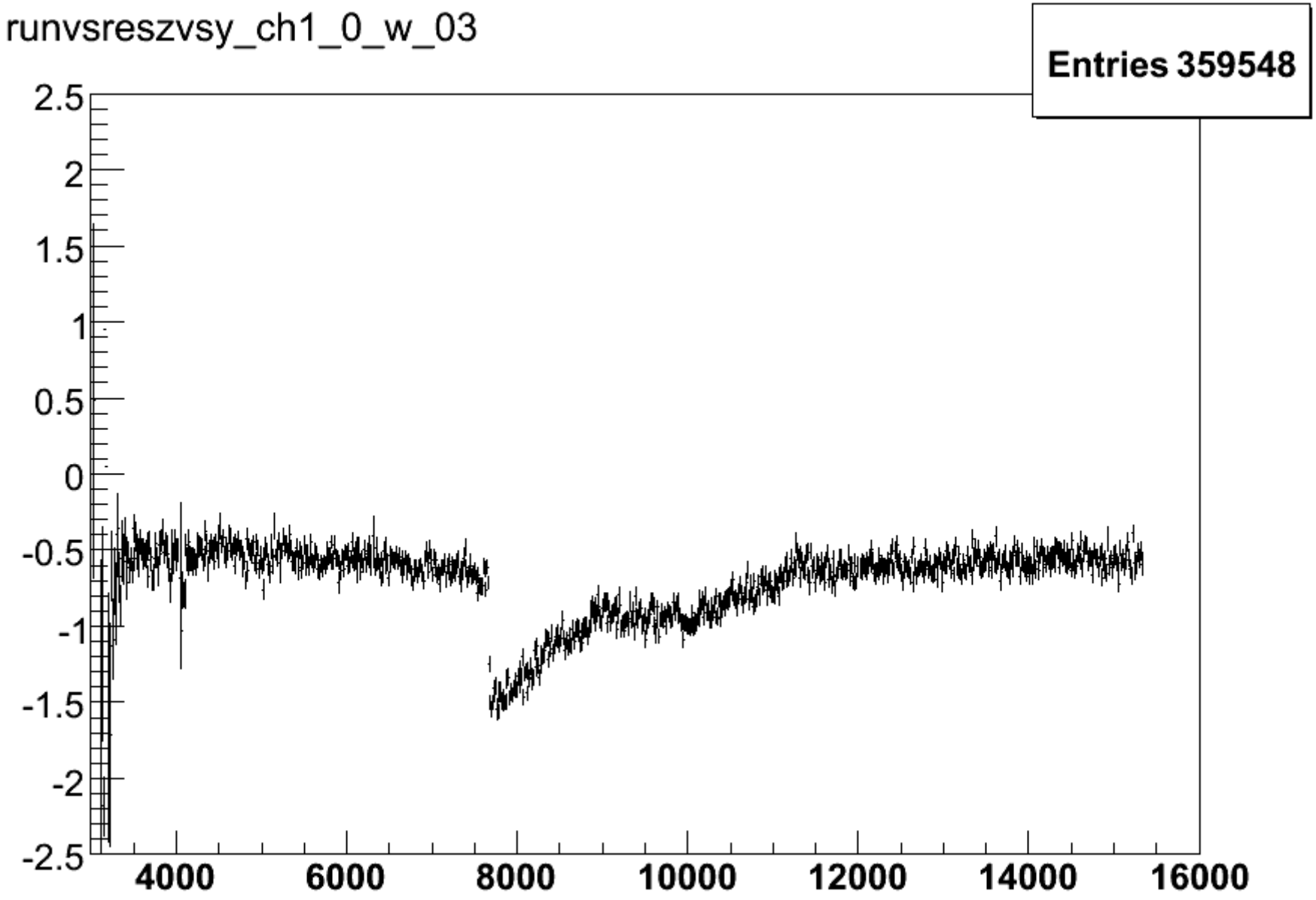

reszvsy_ch1_4
Entries 4564434
2
1
0
-1
-2
-15
-10
-5
0
5
10
15
350
300
250
200
150
100
500

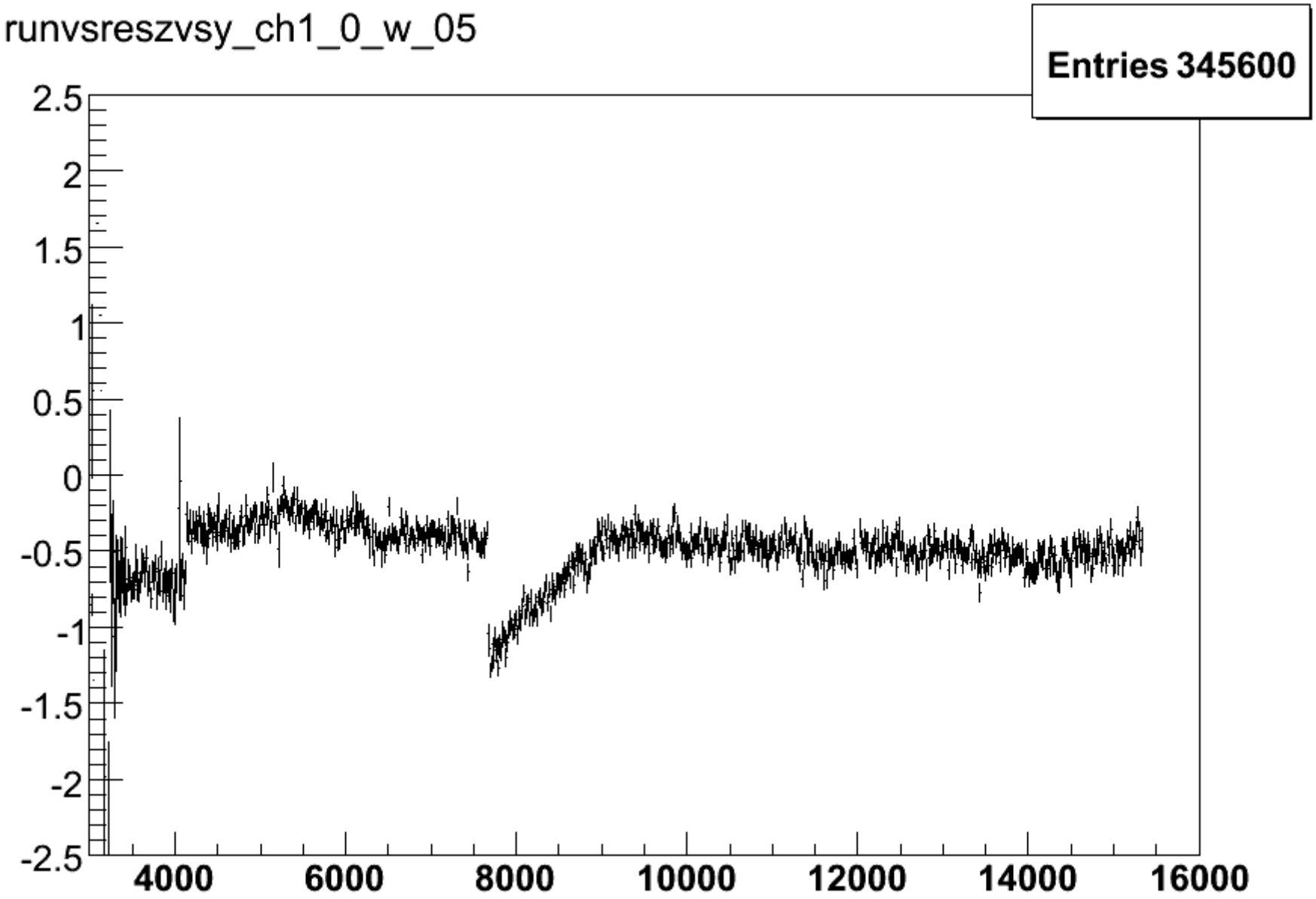

reszvsy_ch2_0
Entries 3099563
2
1
0
-1
-2
-20
-10
0
10
20
100
800
600
400
200

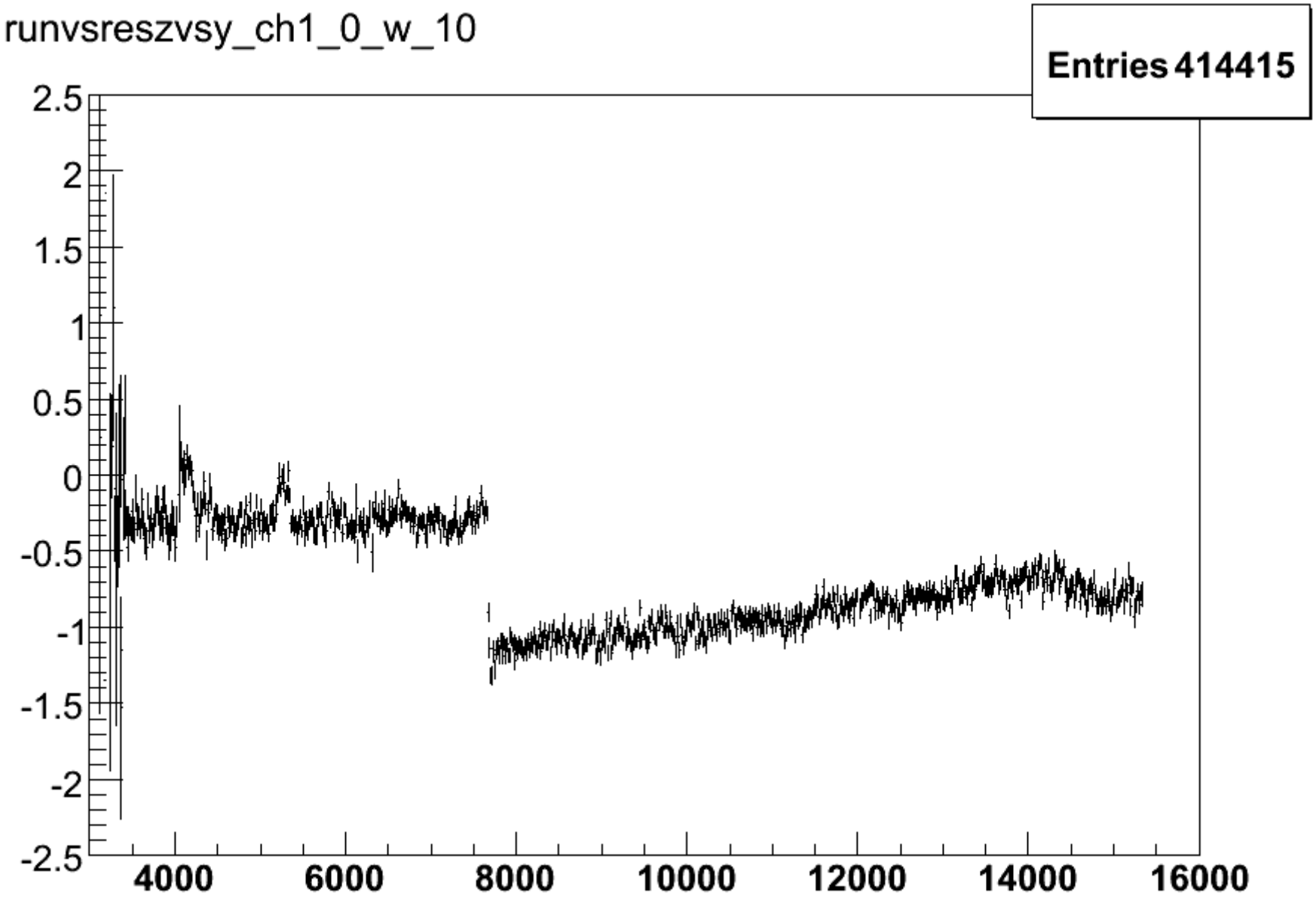

reszvsy_ch2_2
Entries 4725890
2
1
0
-1
-2
-20
-10
0
10
20
160
140
120
100
800
600
400
200

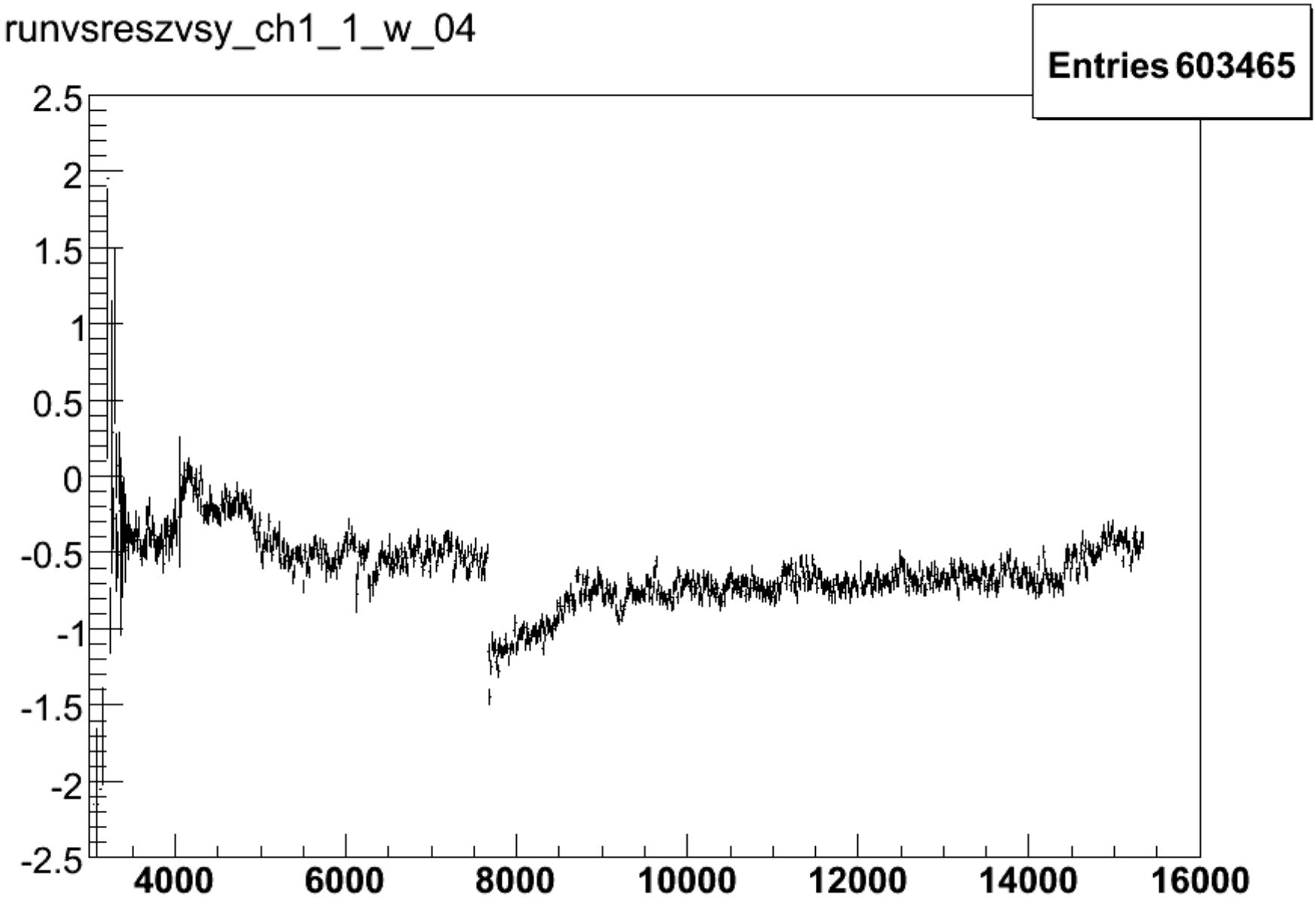
Calibration and Alignment

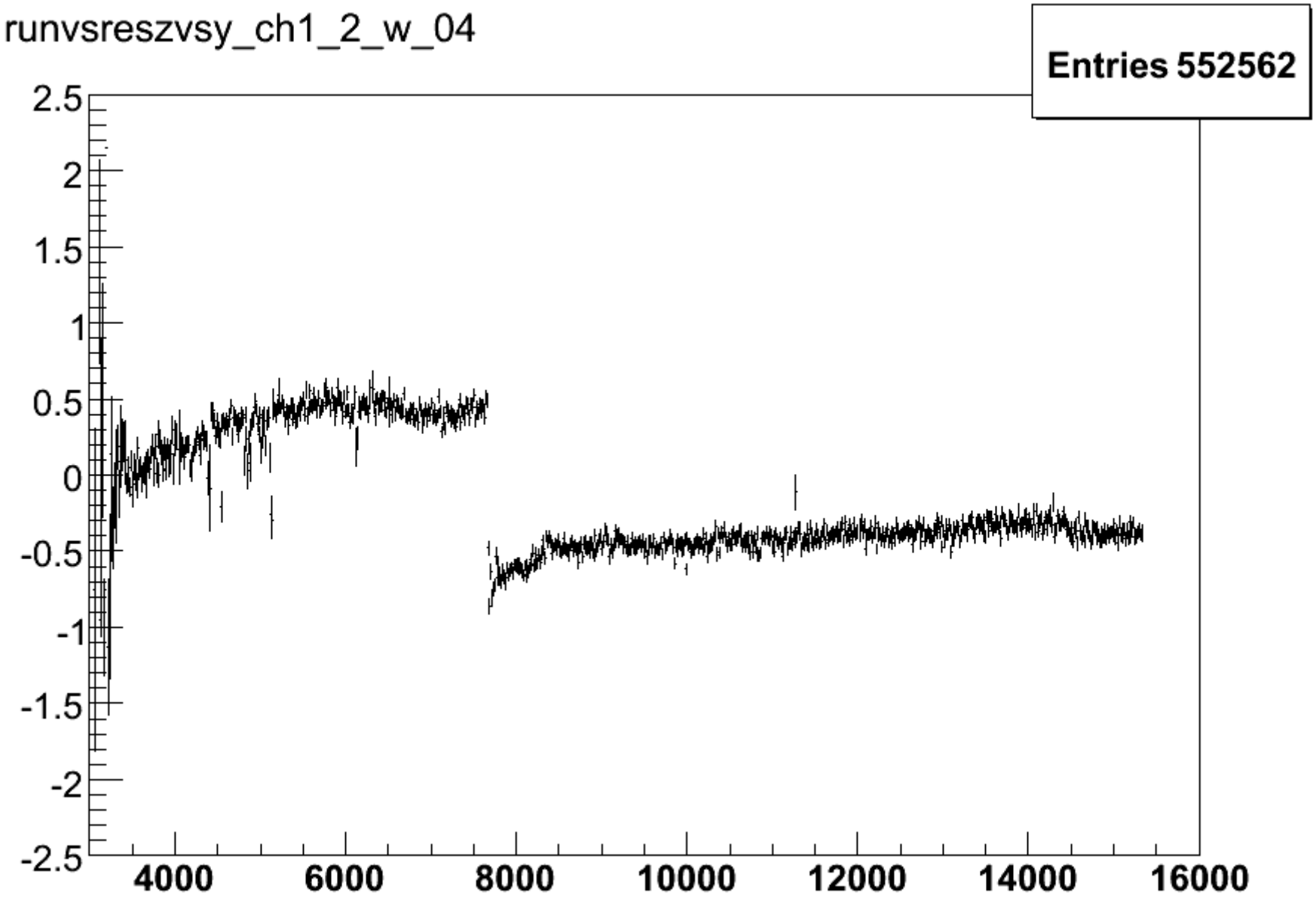
- VDET aligned (looking at V60504)
- DCH1 and DCH2:
  - Different behavior of negative and positive tracks
  - Residual distributions depend on anodic wire and on **TIME** !!!
    - Z few centimeters
    - Φ few millimeters
- STRAW:
  - Waiting for reliable 2003-2004 Cosmic Rays Calibration Table on FINUDA Data Base (the basis of the global alignment…)

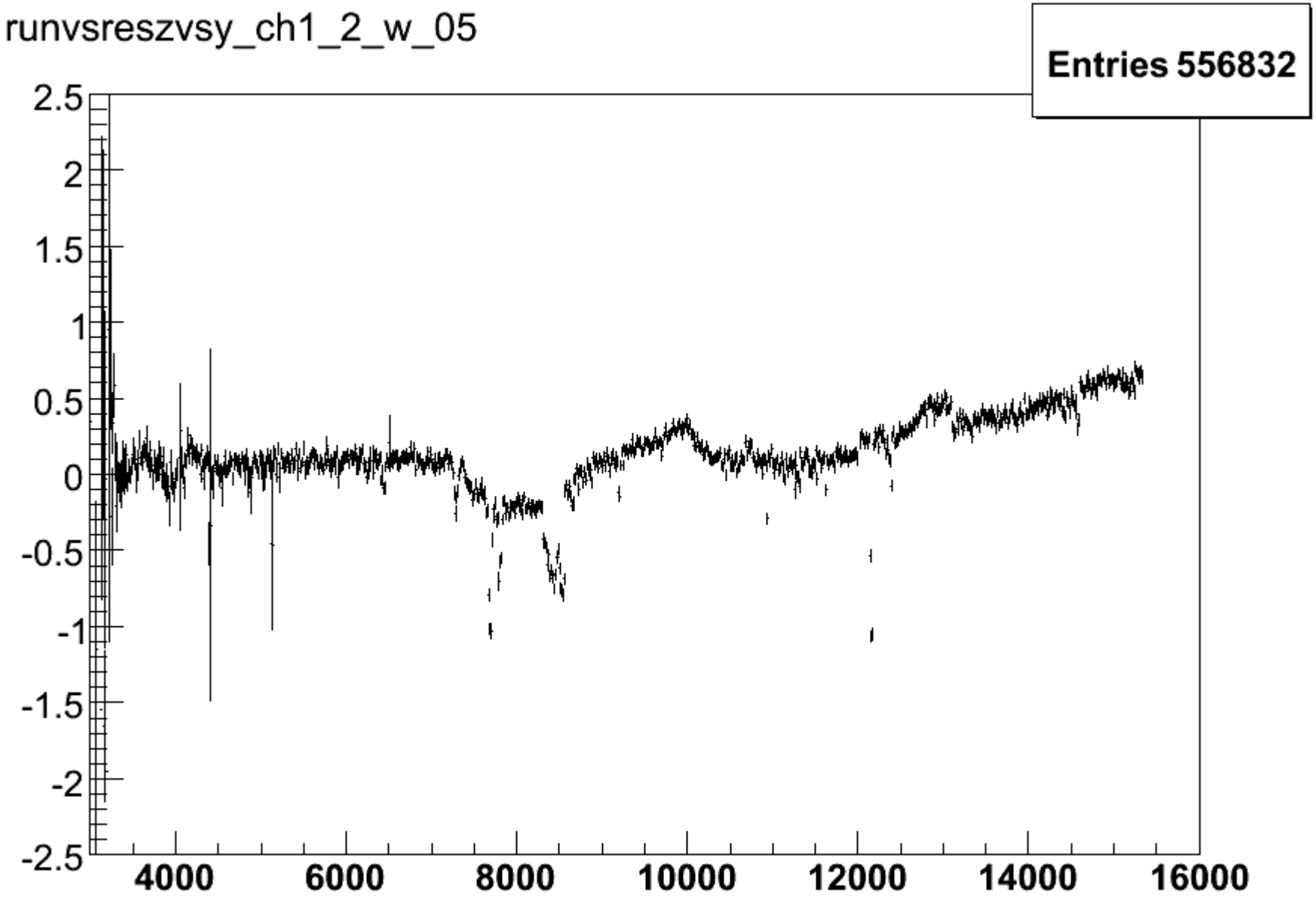

runvsreszvsy_ch1_0_w_03
Entries 359548
2.5
2
1.5
1
0.5
0
-0.5
-1
-1.5
-2
-2.5
4000
6000
8000
10000
12000
14000
16000

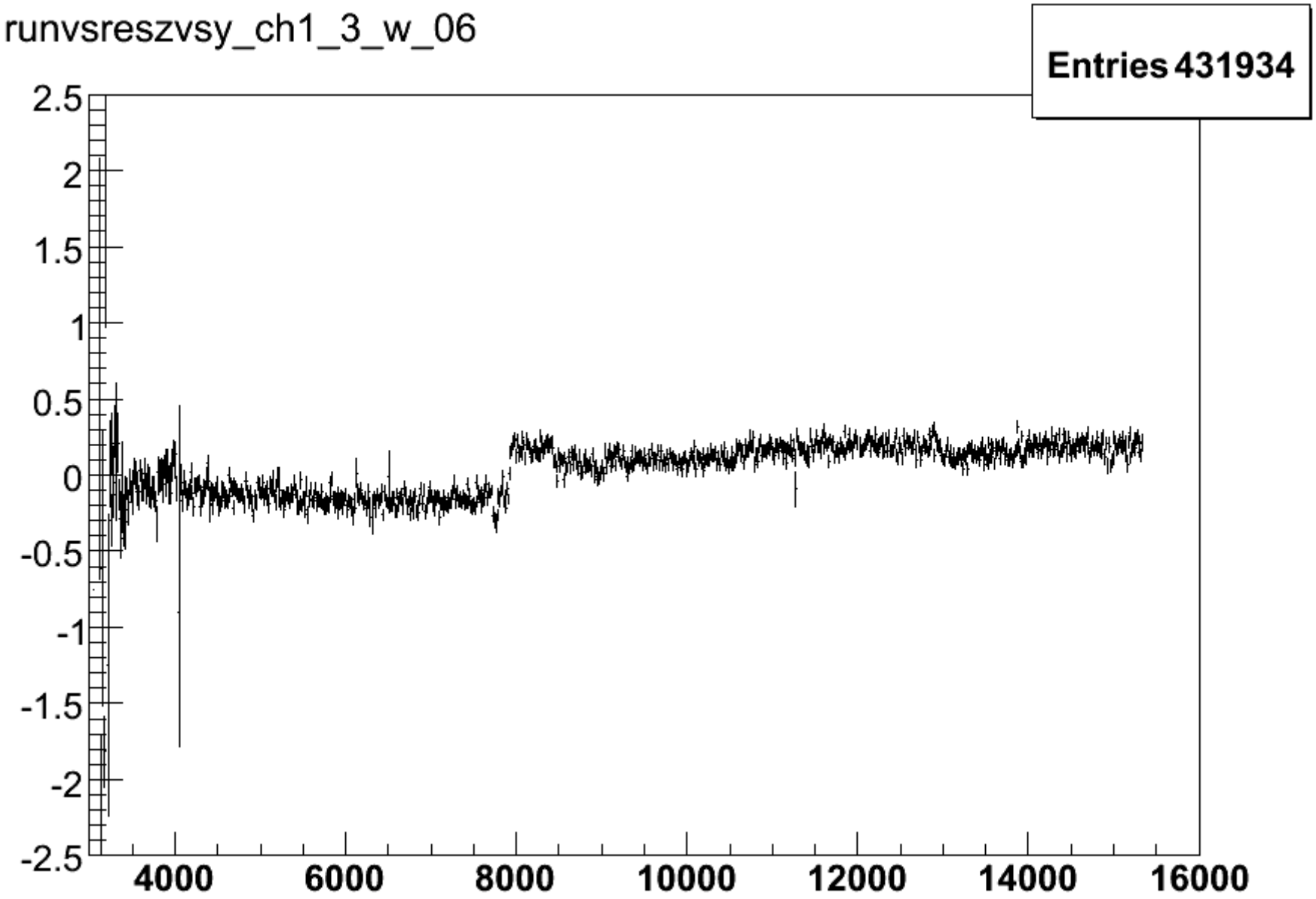

runvsreszvsy_ch1_0_w_05
Entries 345600
2.5
2
1.5
1
0.5
0
-0.5
-1
-1.5
-2
-2.5
4000
6000
8000
10000
12000
14000
16000

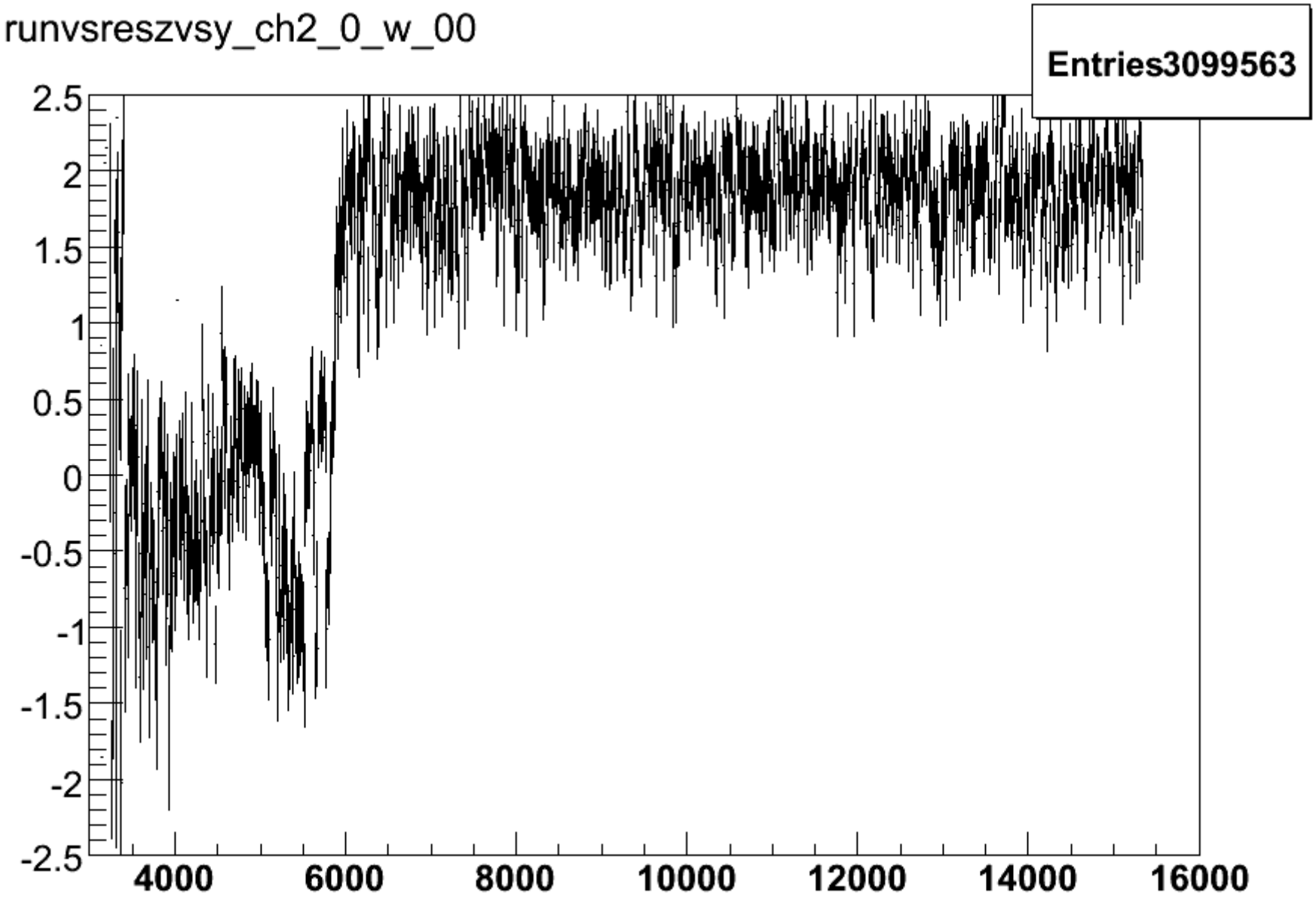

runvsreszvsy_ch1_0_w_10
Entries 414415
2.5
2
1.5
1
0.5
0
-0.5
-1
-1.5
-2
-2.5
4000
6000
8000
10000
12000
14000
16000

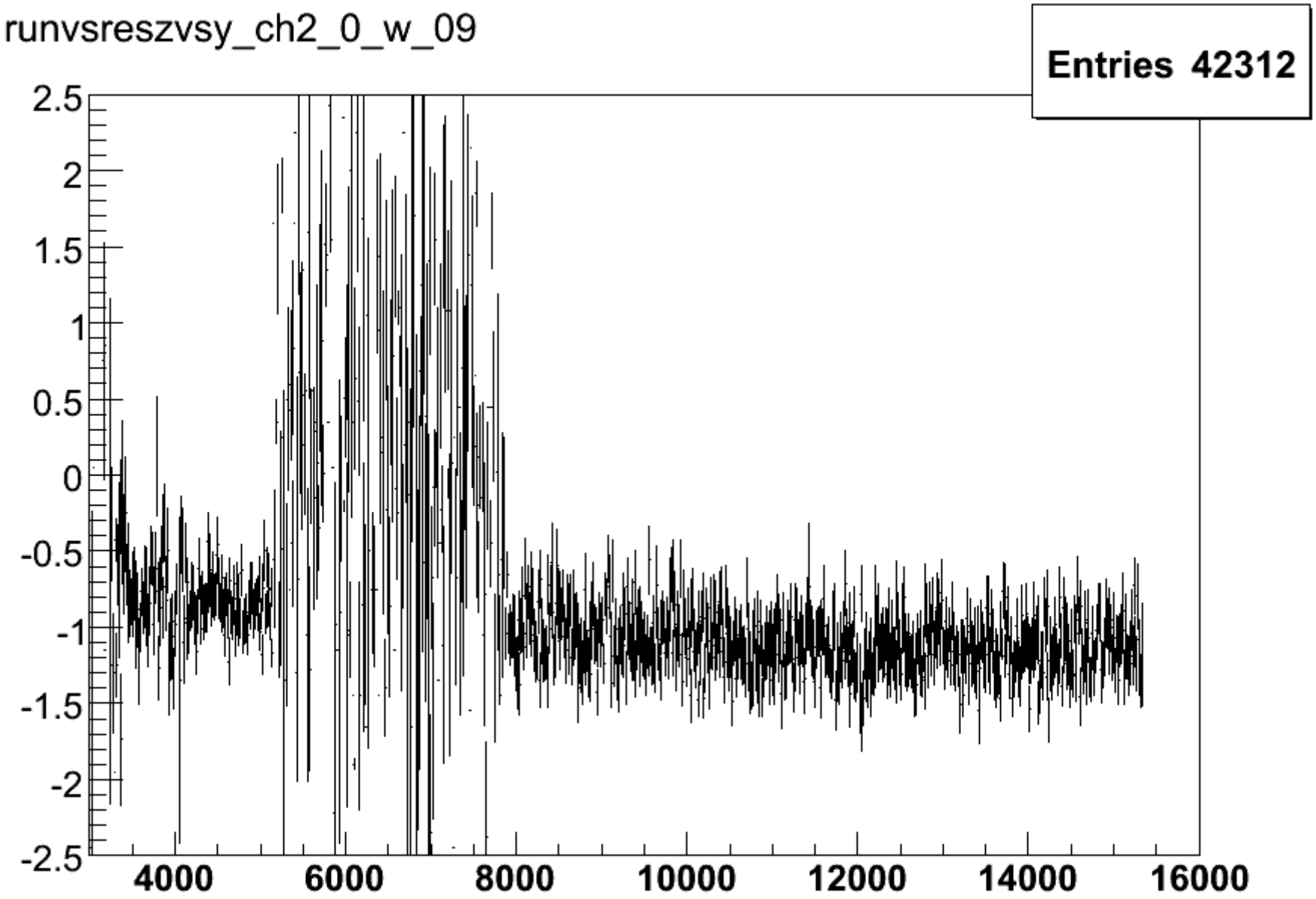

runvsreszvsy_ch1_1_w_04
Entries 603465
2.5
2
1.5
1
0.5
0
-0.5
-1
-1.5
-2
-2.5
4000
6000
8000
10000
12000
14000
16000

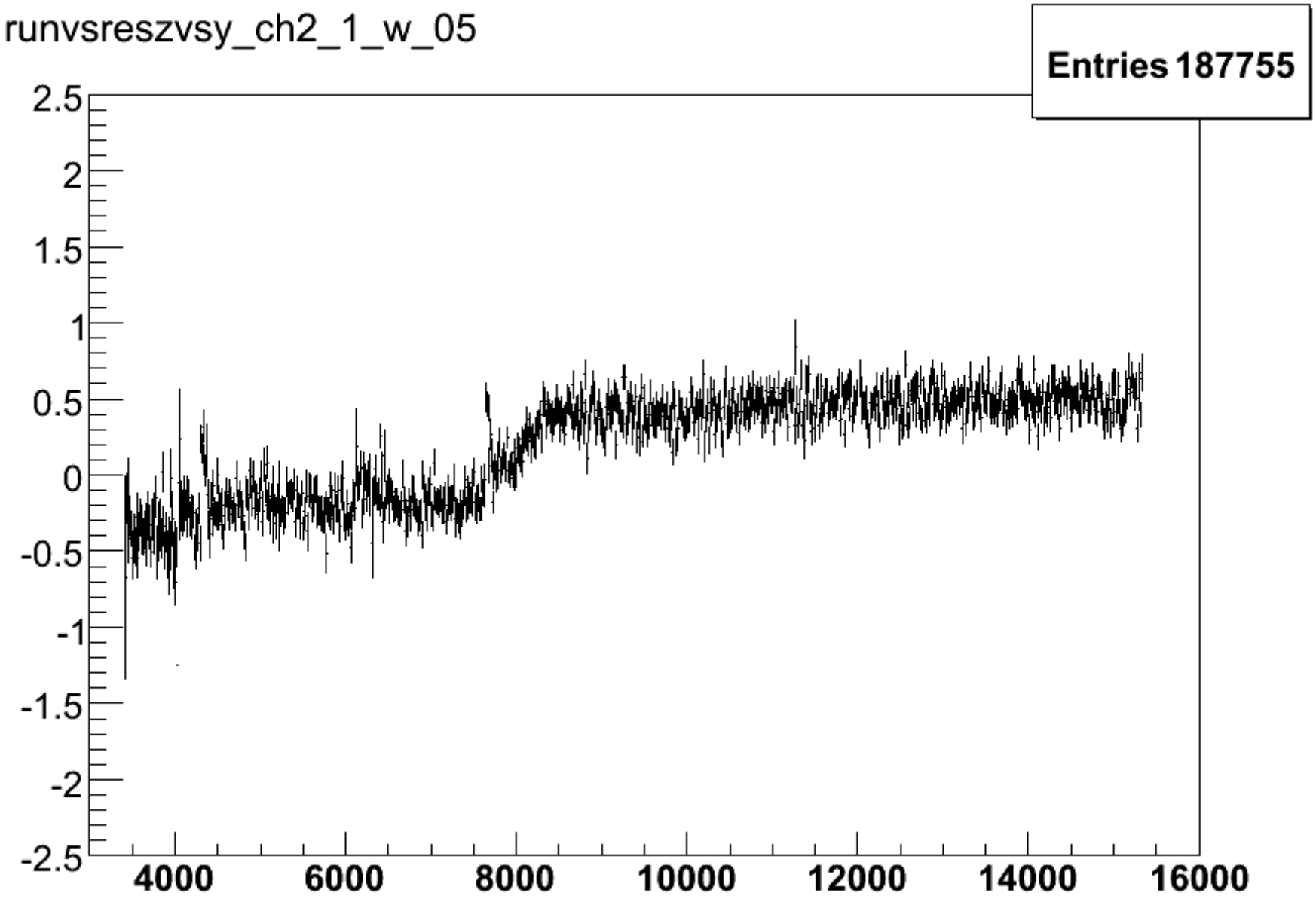

runvsreszvsy_ch1_2_w_04
Entries 552562
2.5
2
1.5
1
0.5
0
-0.5
-1
-1.5
-2
-2.5
4000
6000
8000
10000
12000
14000
16000

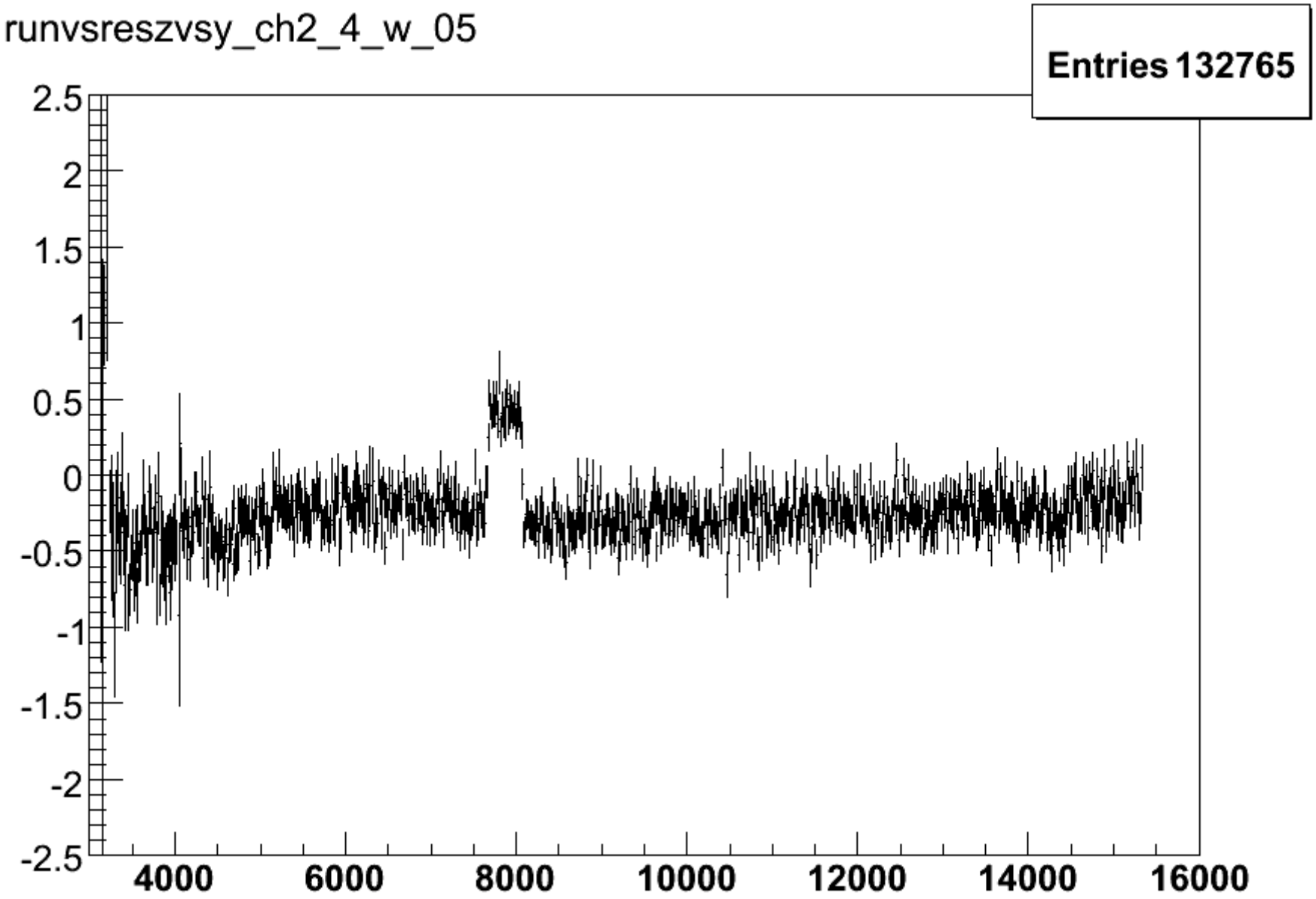

runvsreszvsy_ch1_2_w_05
Entries 556832
2.5
2
1.5
1
0.5
0
-0.5
-1
-1.5
-2
-2.5
4000
6000
8000
10000
12000
14000
16000


runvsreszvsy_ch1_3_w_06
Entries 431934
2.5
2
1.5
1
0.5
0
-0.5
-1
-1.5
-2
-2.5
4000
6000
8000
10000
12000
14000
16000


runvsreszvsy_ch2_0_w_00
Entries3099563
2.5
2
1.5
1
0.5
0
-0.5
-1
-1.5
-2
-2.5
4000
6000
8000
10000
12000
14000
16000

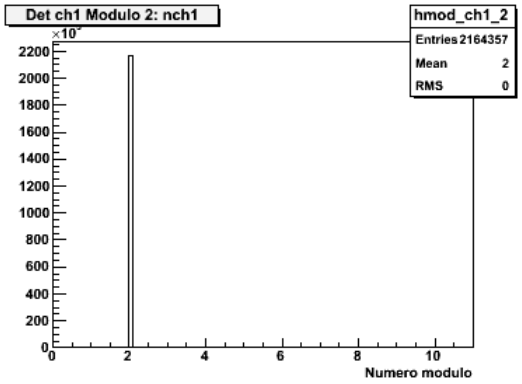

runvsreszvsy_ch2_0_w_09
Entries 42312
2.5
2
1.5
1
0.5
0
-0.5
-1
-1.5
-2
-2.5
4000
6000
8000
10000
12000
14000
16000

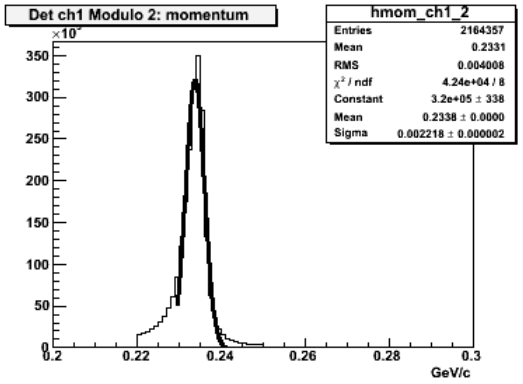

runvsreszvsy_ch2_1_w_05
Entries 187755
2.5
2
1.5
1
0.5
0
-0.5
-1
-1.5
-2
-2.5
4000
6000
8000
10000
12000
14000
16000

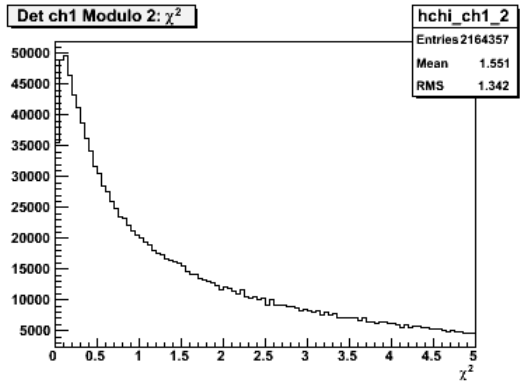

runvsreszvsy_ch2_4_w_05
Entries 132765
2.5
2
1.5
1
0.5
0
-0.5
-1
-1.5
-2
-2.5
4000
6000
8000
10000
12000
14000
16000

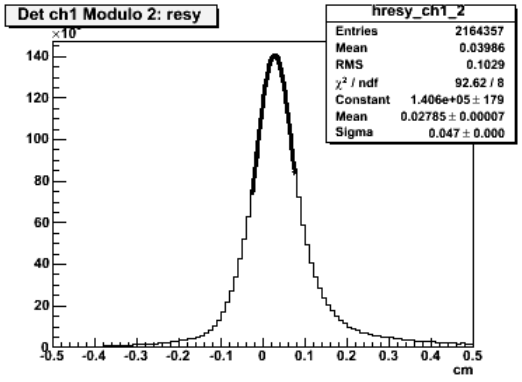
Drift Chamber Z Side … the ADC SIDE of the moon

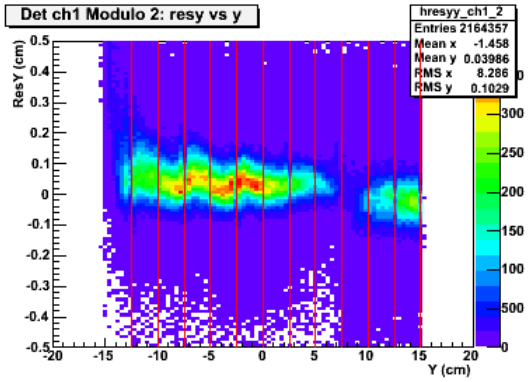
- Residual mean values of few centimeters
- Strong dependence on Time
- Existing ADC calibrations are not good enough to get acceptable resolution on long and short tracks
- Please, check the ADC calibrations run-by-run

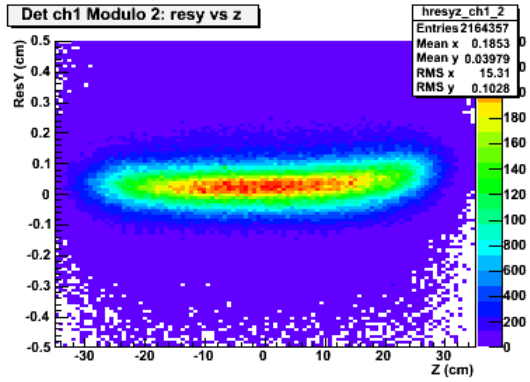

Det ch1 Modulo 2: nch1
hmod_ch1_2
Entries 2164357
Mean 2
RMS 0
Numero modulo

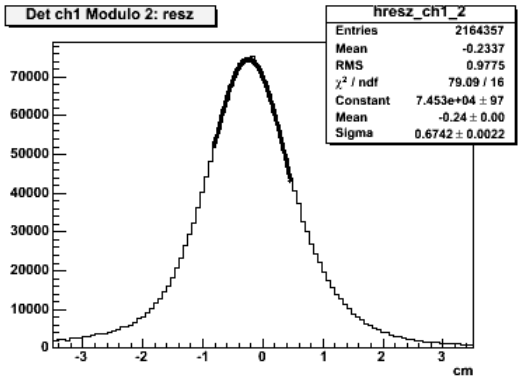

Det ch1 Modulo 2: momentum
hmom_ch1_2
Entries 2164357
Mean 0.2331
RMS 0.004008
χ² / ndf 4.24e+04 / 8
Constant 3.2e+05 ± 338
Mean 0.2338 ± 0.0000
Sigma 0.002218 ± 0.000002
GeV/c

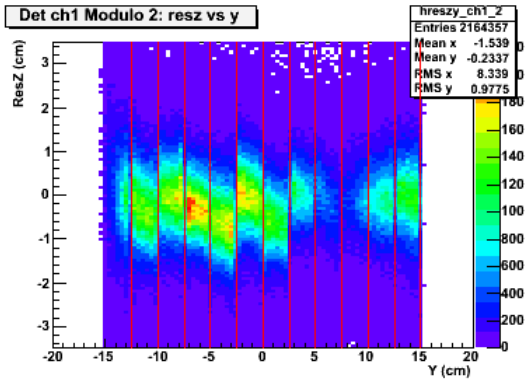

Det ch1 Modulo 2: χ²
hchi_ch1_2
Entries 2164357
Mean 1.551
RMS 1.342
χ²

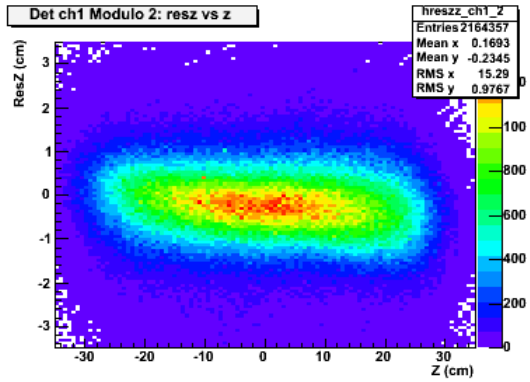

Det ch1 Modulo 2: resy
hresy_ch1_2
Entries 2164357
Mean 0.03986
RMS 0.1029
χ² / ndf 92.62 / 8
Constant 1.406e+05 ± 179
Mean 0.02785 ± 0.00007
Sigma 0.047 ± 0.000
cm


Det ch1 Modulo 2: resy vs y
hresyy_ch1_2
Entries 2164357
Mean x -1.458
Mean y 0.03986
RMS x 8.286
RMS y 0.1029
ResY (cm)
Y (cm)

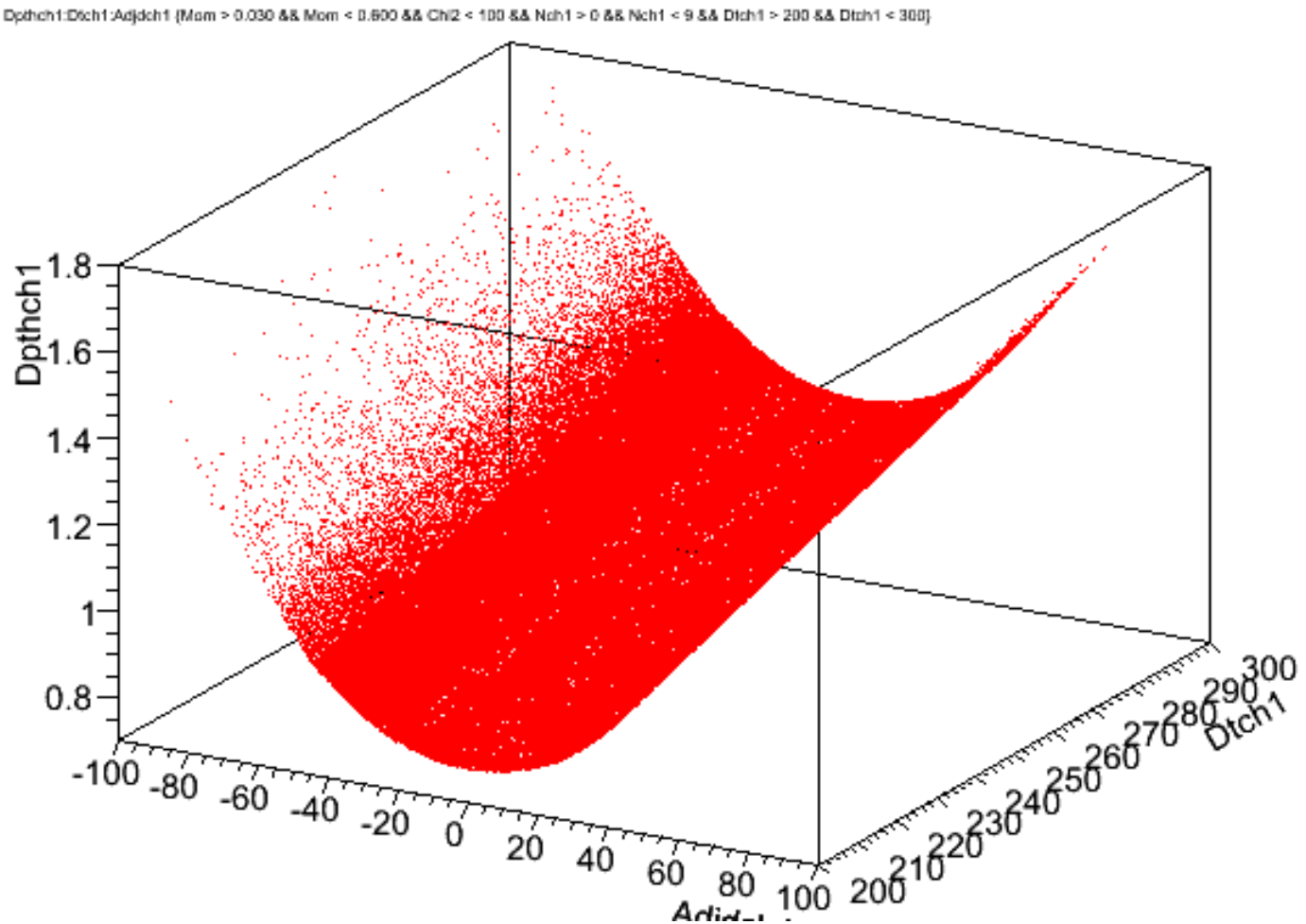

Det ch1 Modulo 2: resy vs z
hresyz_ch1_2
Entries 2164357
Mean x 0.1853
Mean y 0.03979
RMS x 15.31
RMS y 0.1028
ResY (cm)
Z (cm)


Det ch1 Modulo 2: resz
hresz_ch1_2
Entries 2164357
Mean -0.2337
RMS 0.9775
χ² / ndf 79.09 / 16
Constant 7.453e+04 ± 97
Mean -0.24 ± 0.00
Sigma 0.6742 ± 0.0022
cm

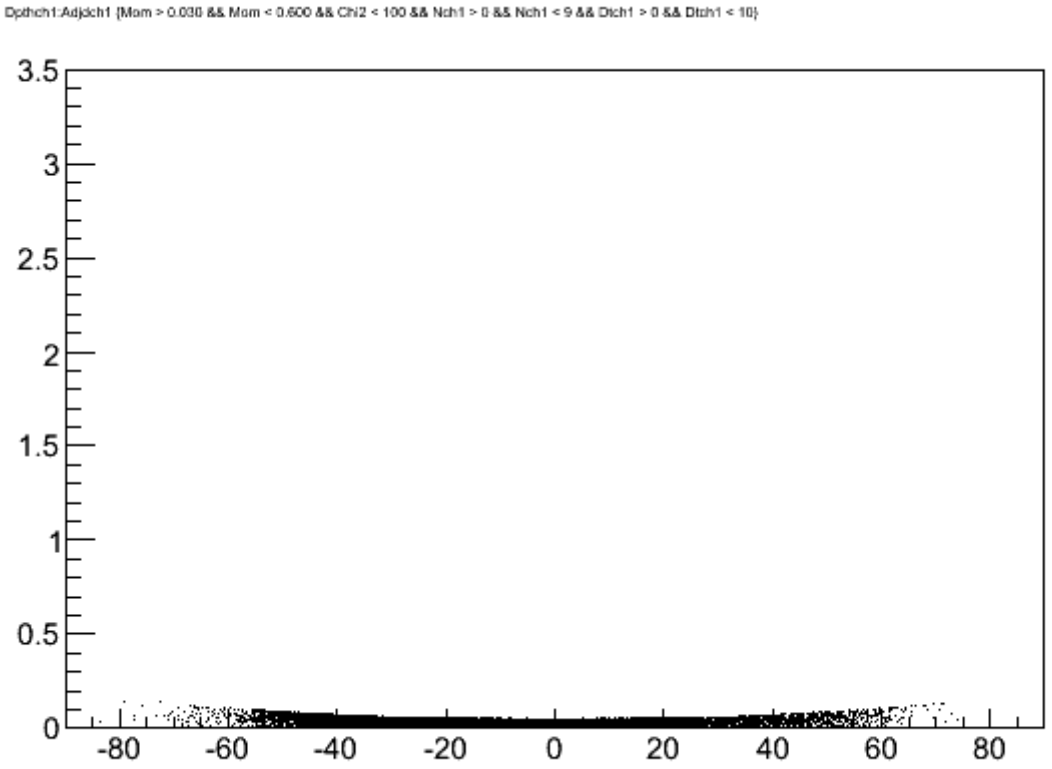

Det ch1 Modulo 2: resz vs y
hreszy_ch1_2
Entries 2164357
Mean x -1.539
Mean y -0.2337
RMS x 8.339
RMS y 0.9775
ResZ (cm)
Y (cm)


Det ch1 Modulo 2: resz vs z
hreszz_ch1_2
Entries 2164357
Mean x 0.1693
Mean y -0.2345
RMS x 15.29
RMS y 0.9767
ResZ (cm)
Z (cm)

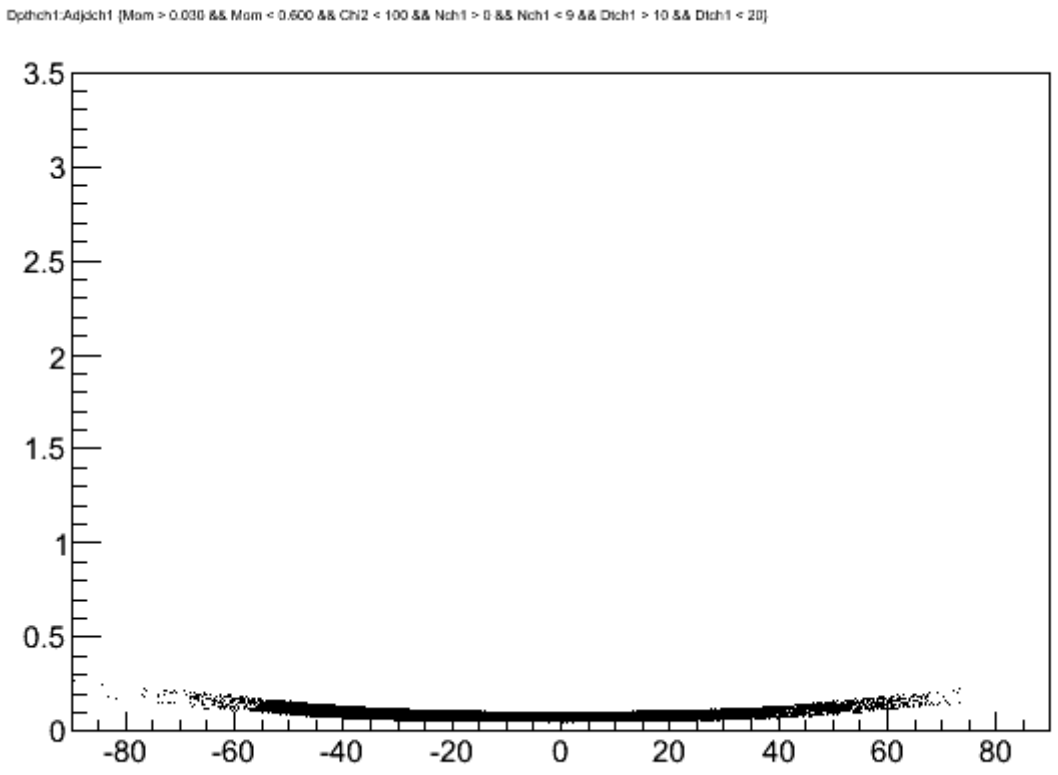
Φ Side: Garfield Correction vs Drift Time and vs Attach Angle



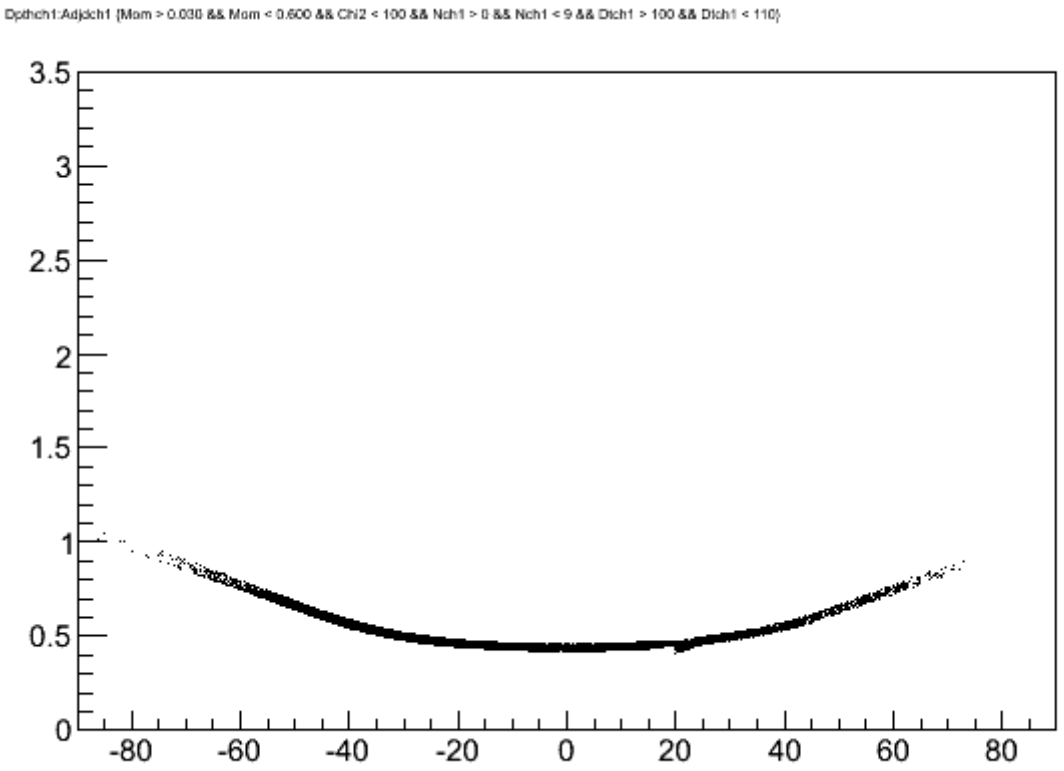
Garfield Correction vs Attach Angle with 0 ns < Drift Time < 10 ns



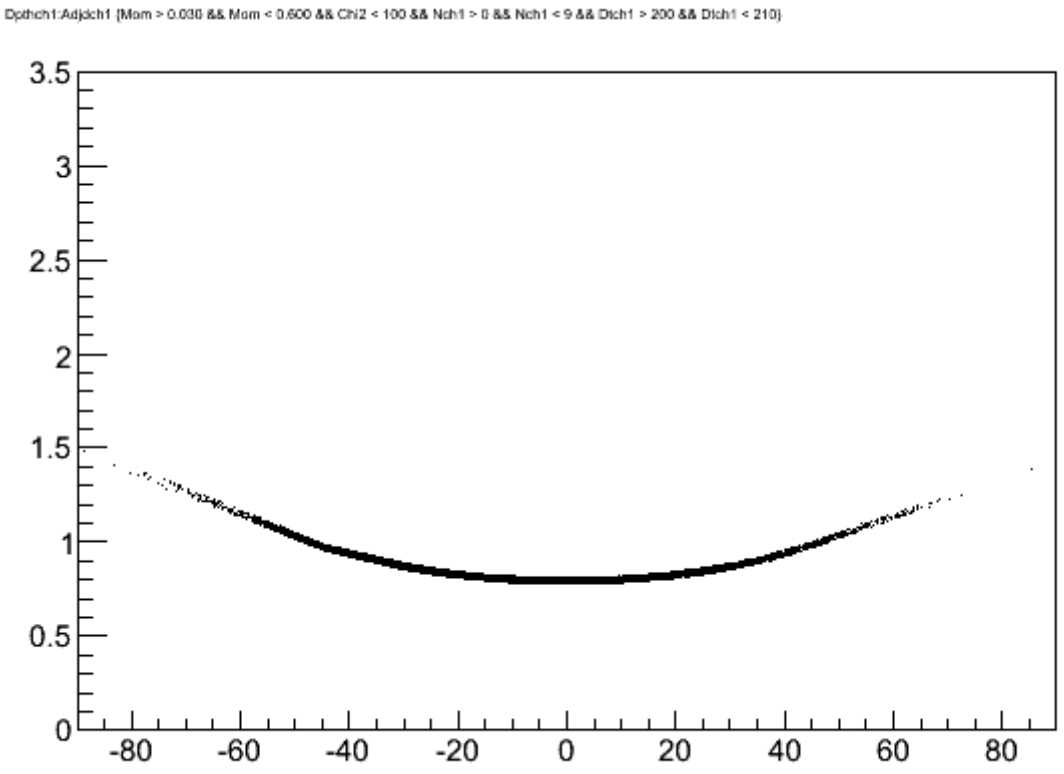
Garfield Correction vs Attach Angle with 10 ns < Drift Time < 20 ns



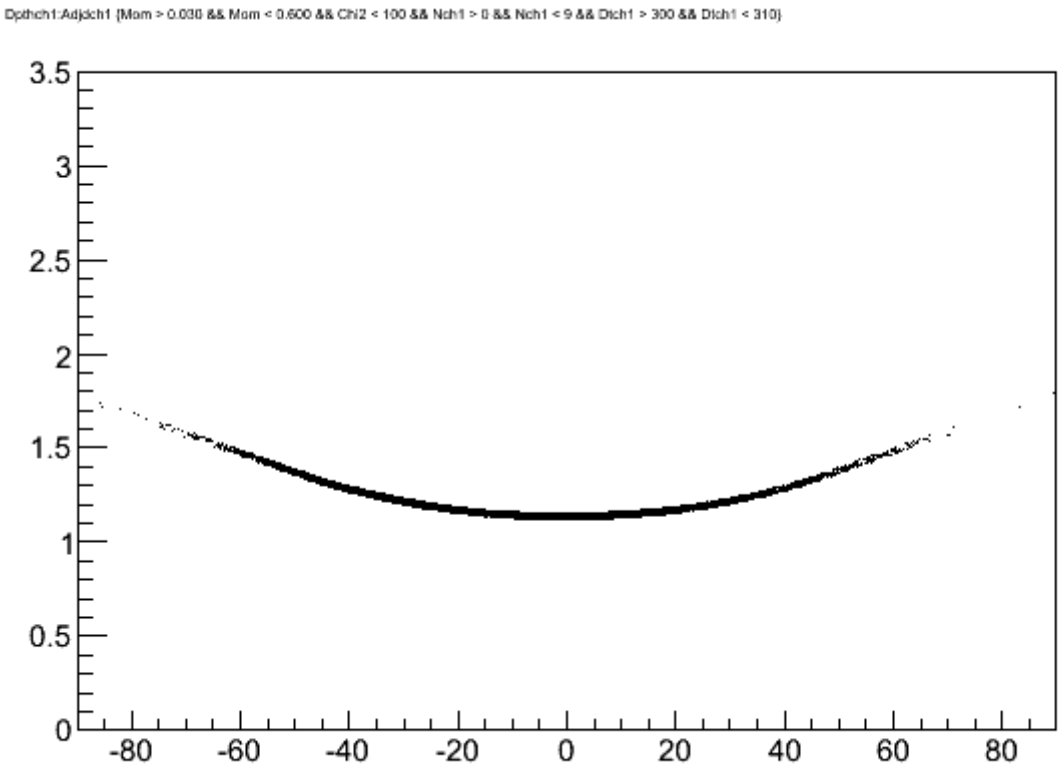
Garfield Correction vs Attach Angle with 100 ns < Drift Time < 110 ns



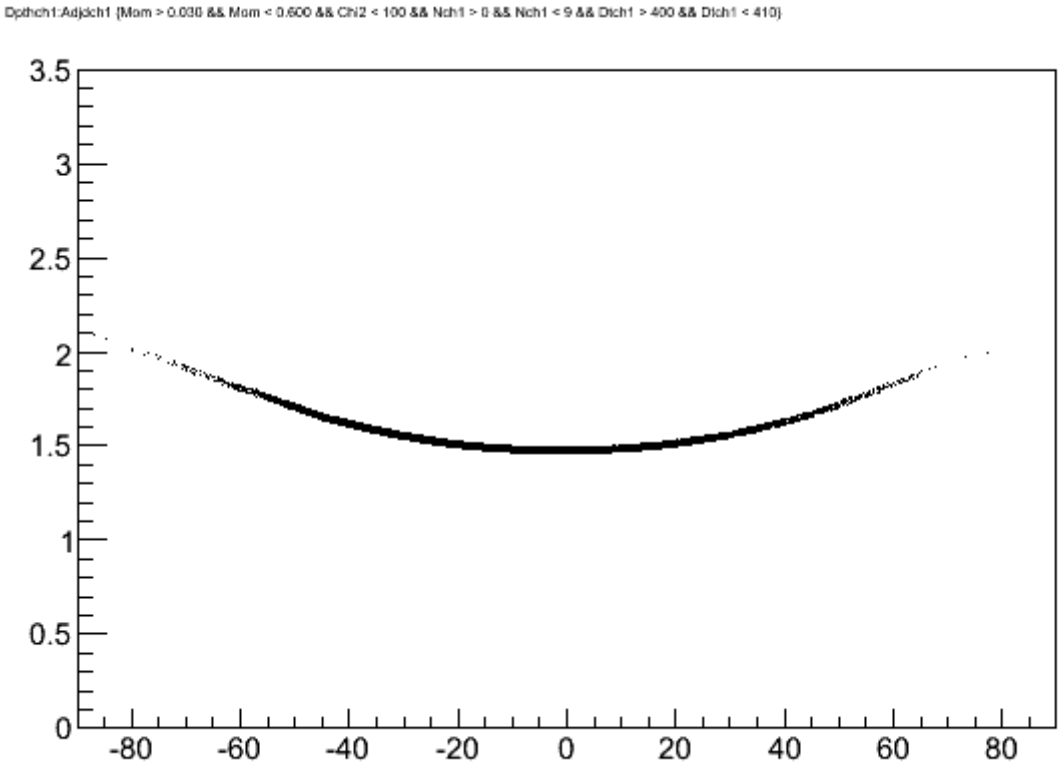
Garfield Correction vs Attach Angle with 200 ns < Drift Time < 210 ns



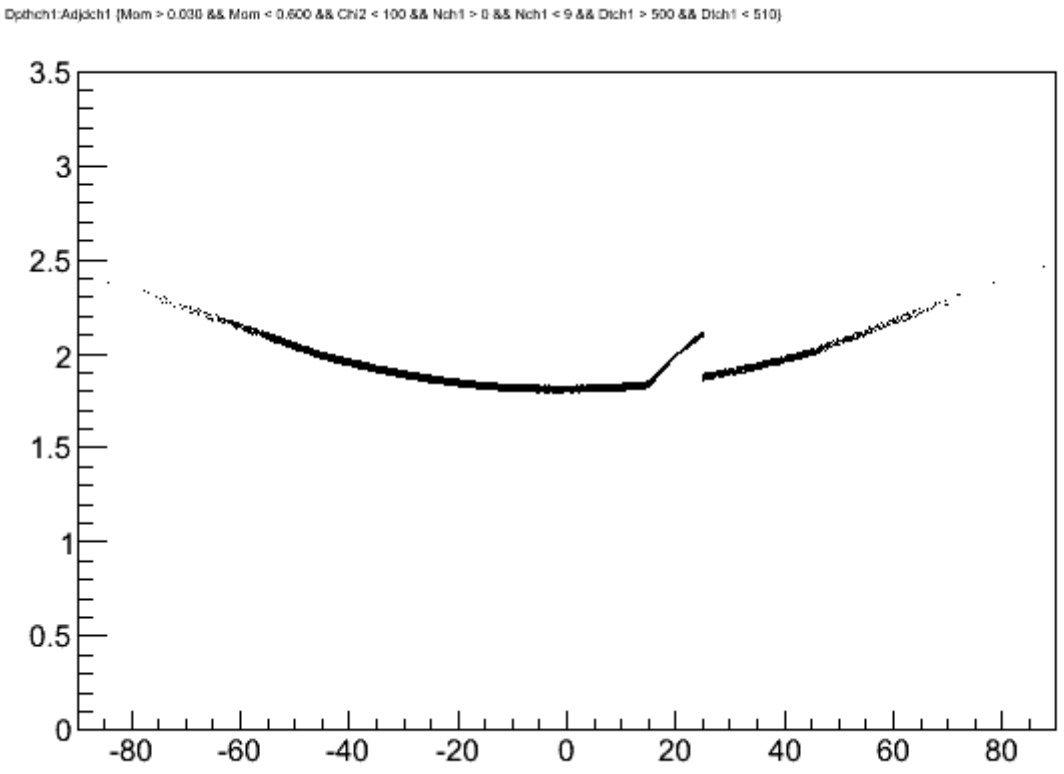
Garfield Correction vs Attach Angle with 300 ns < Drift Time < 310 ns



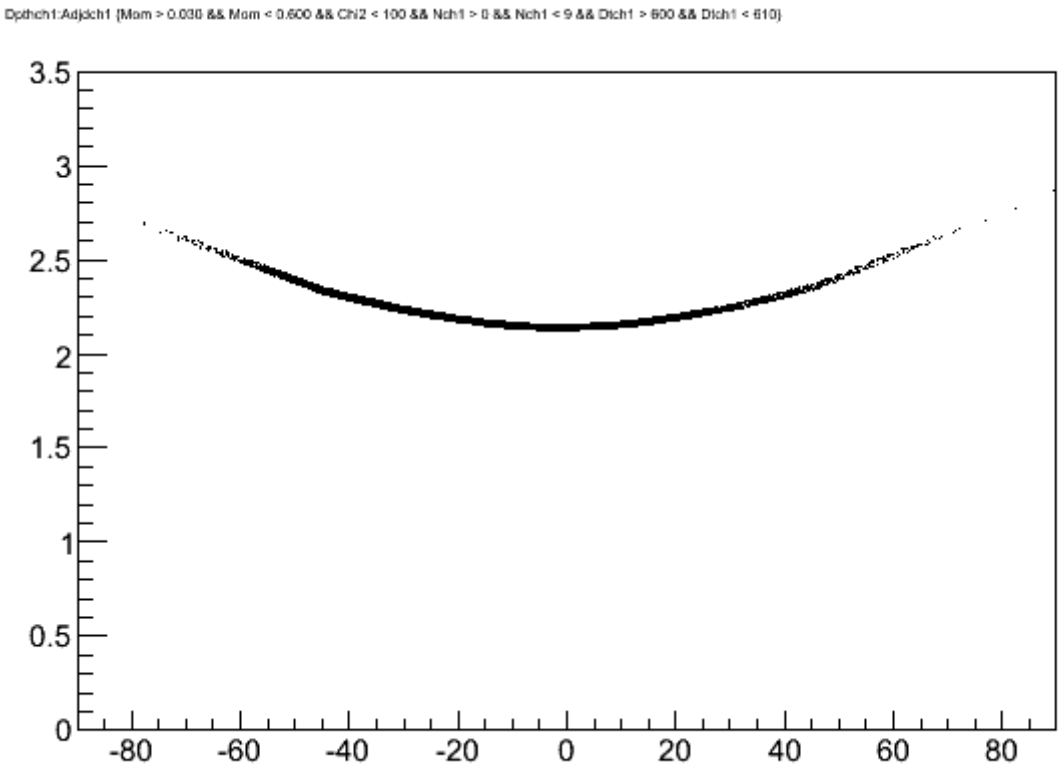
Garfield Correction vs Attach Angle with 400 ns < Drift Time < 410 ns



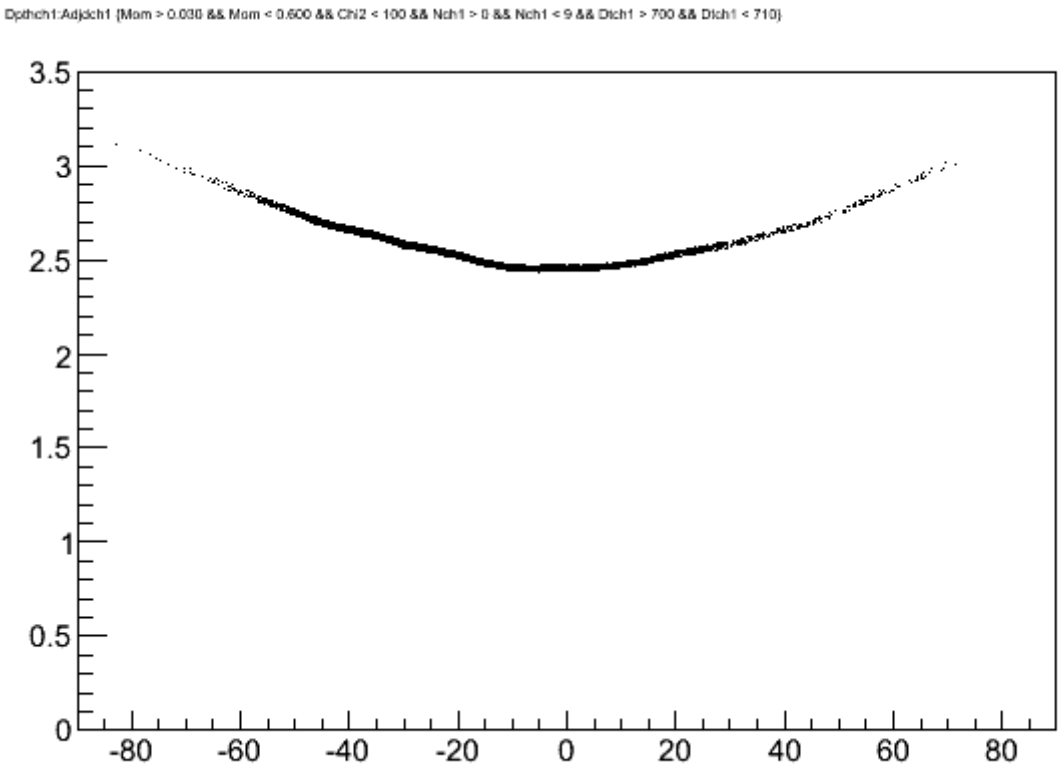
Garfield Correction vs Attach Angle with 500 ns < Drift Time < 510 ns

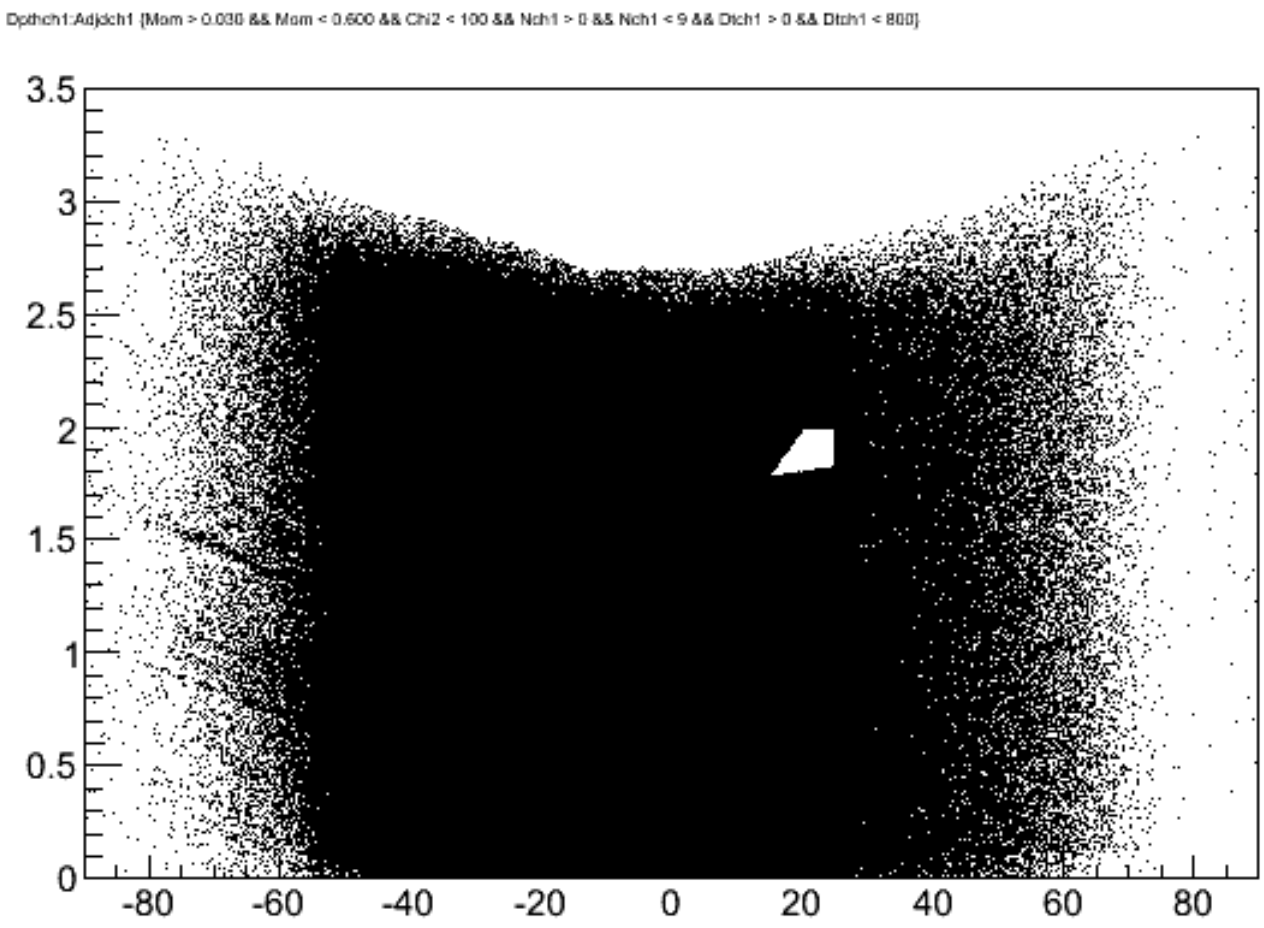


Garfield Correction vs Attach Angle with 600 ns < Drift Time < 610 ns

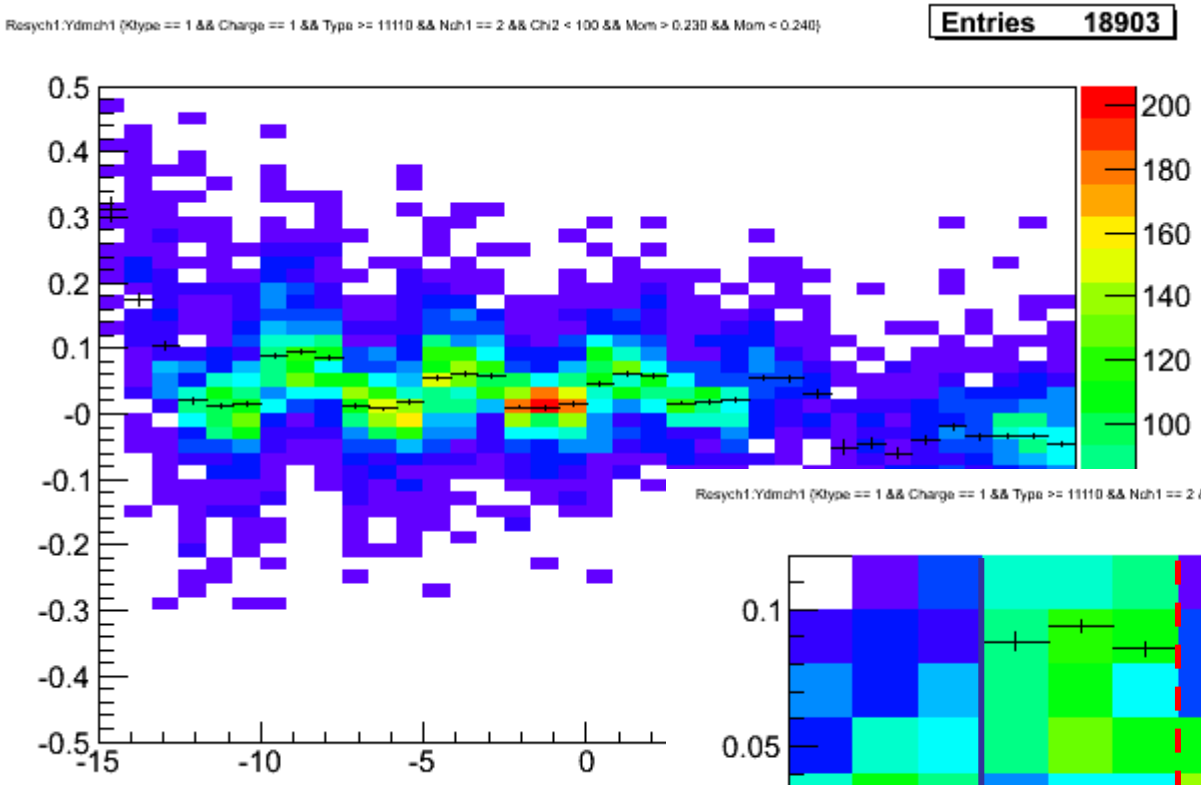


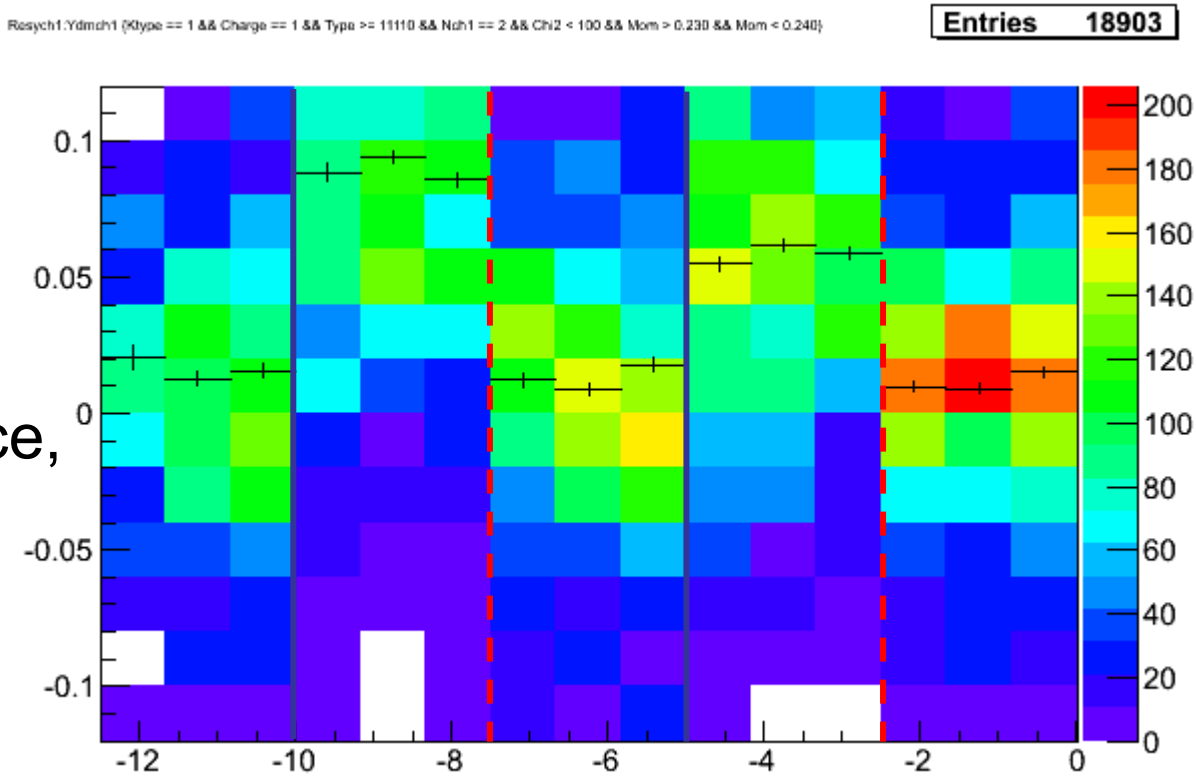
Garfield Correction vs Attach Angle with 700 ns < Drift Time < 710 ns



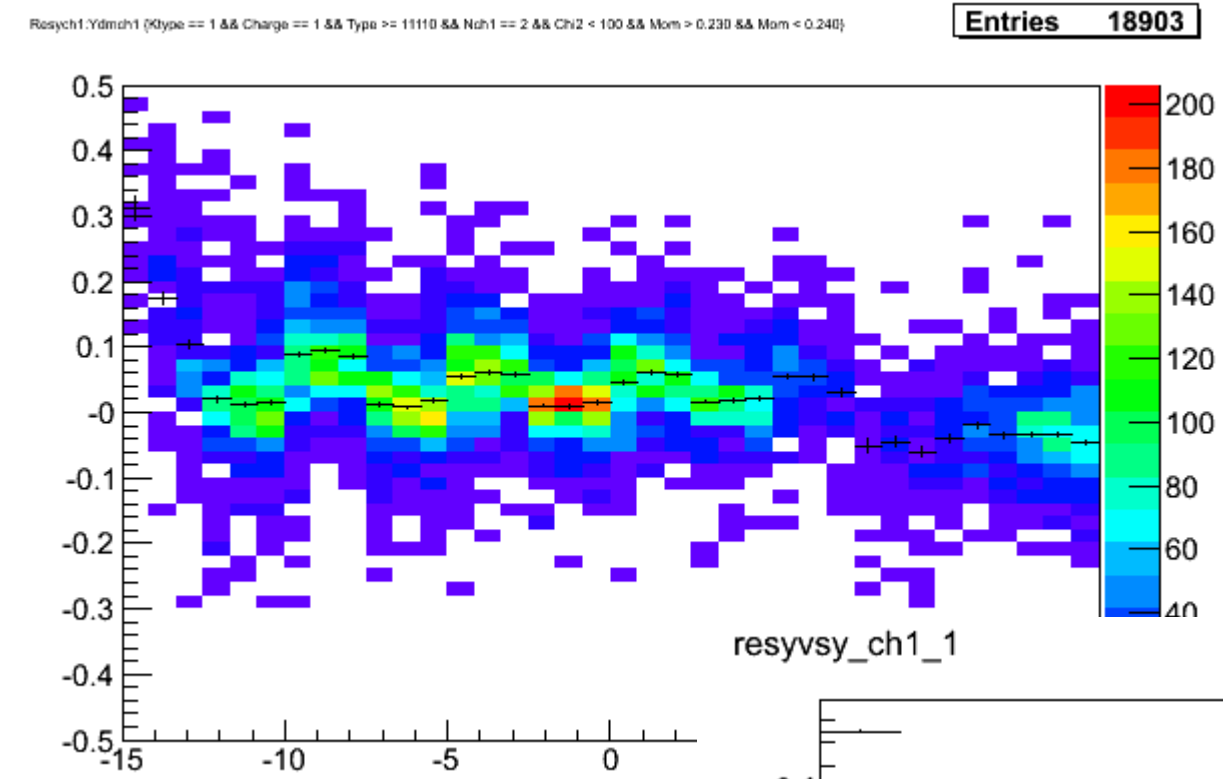

Dpthch1:Adjdch1 {Mom > 0.030 && Mom < 0.600 && Chi2 < 100 && Nch1 > 0 && Nch1 < 9 && Dtch1 > 0 && Dtch1 < 800}
3.5
3
2.5
2
1.5
1
0.5
0
-80
-60
-40
-20
0
20
40
60
80

Φ residual vs anodic wire

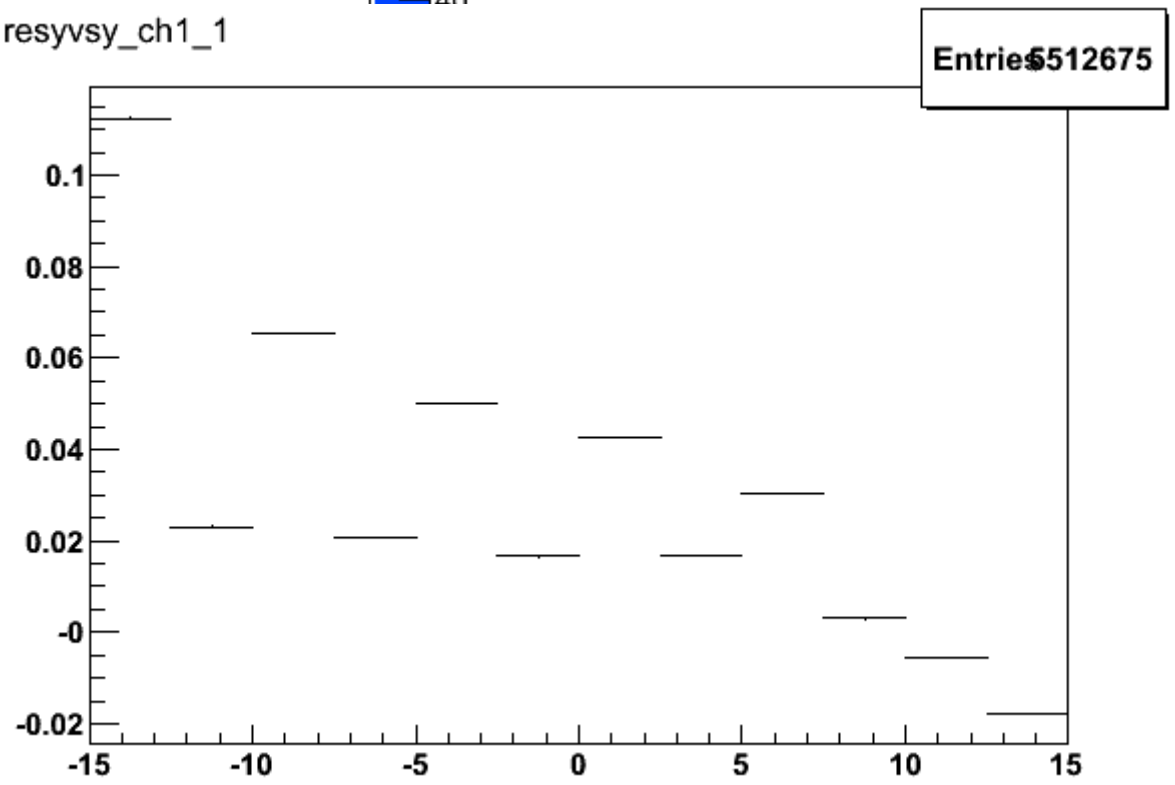


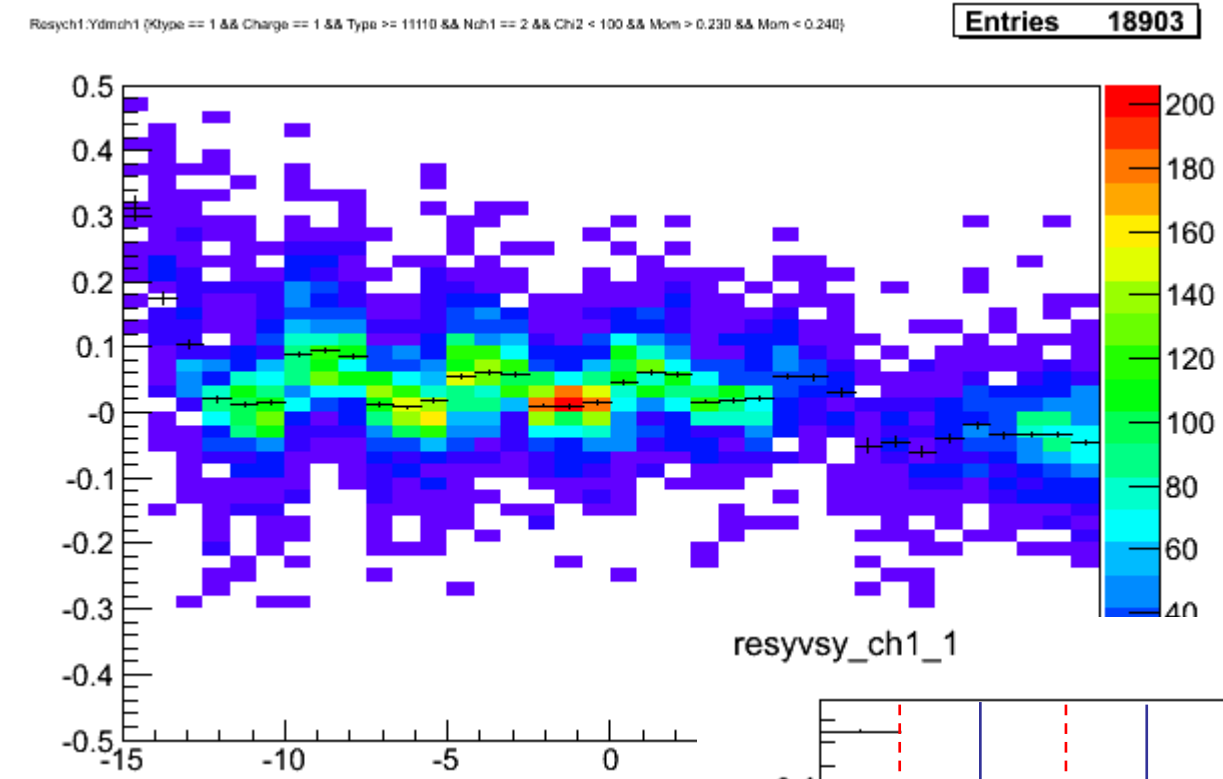


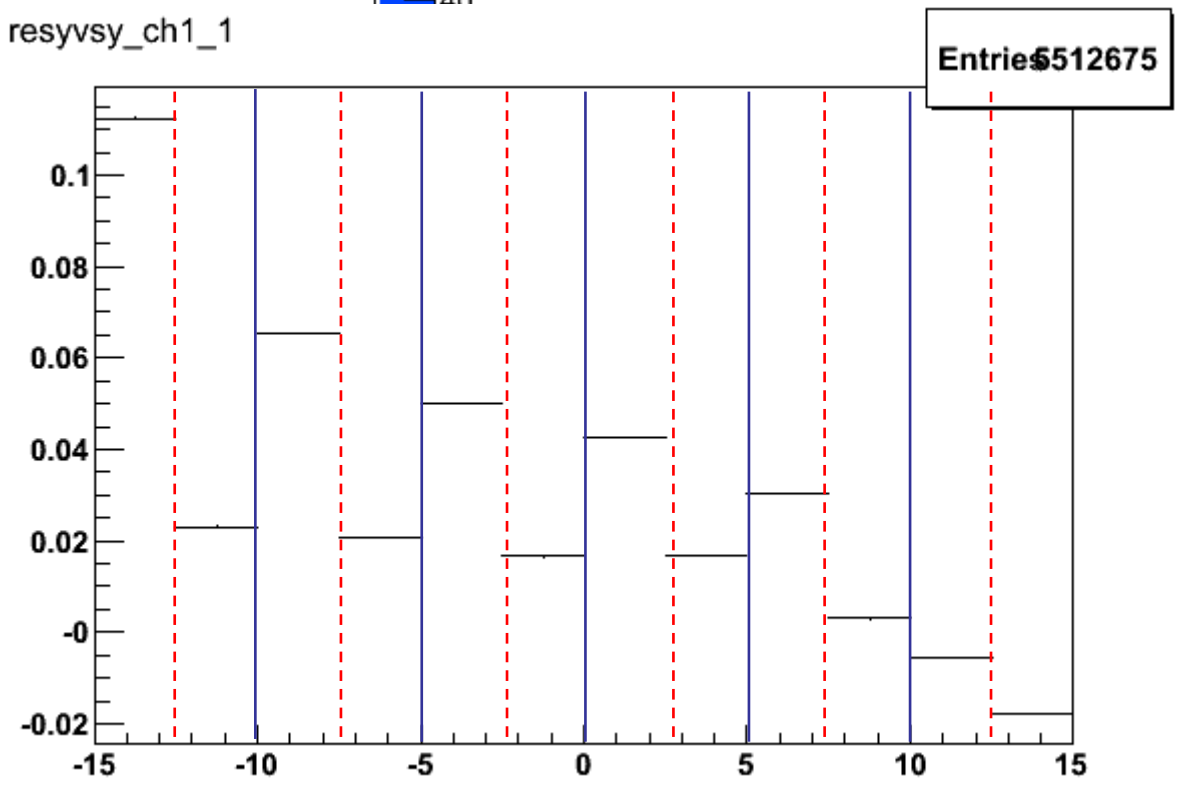
Cell–by-cell dependence, enough uniform inside the cell

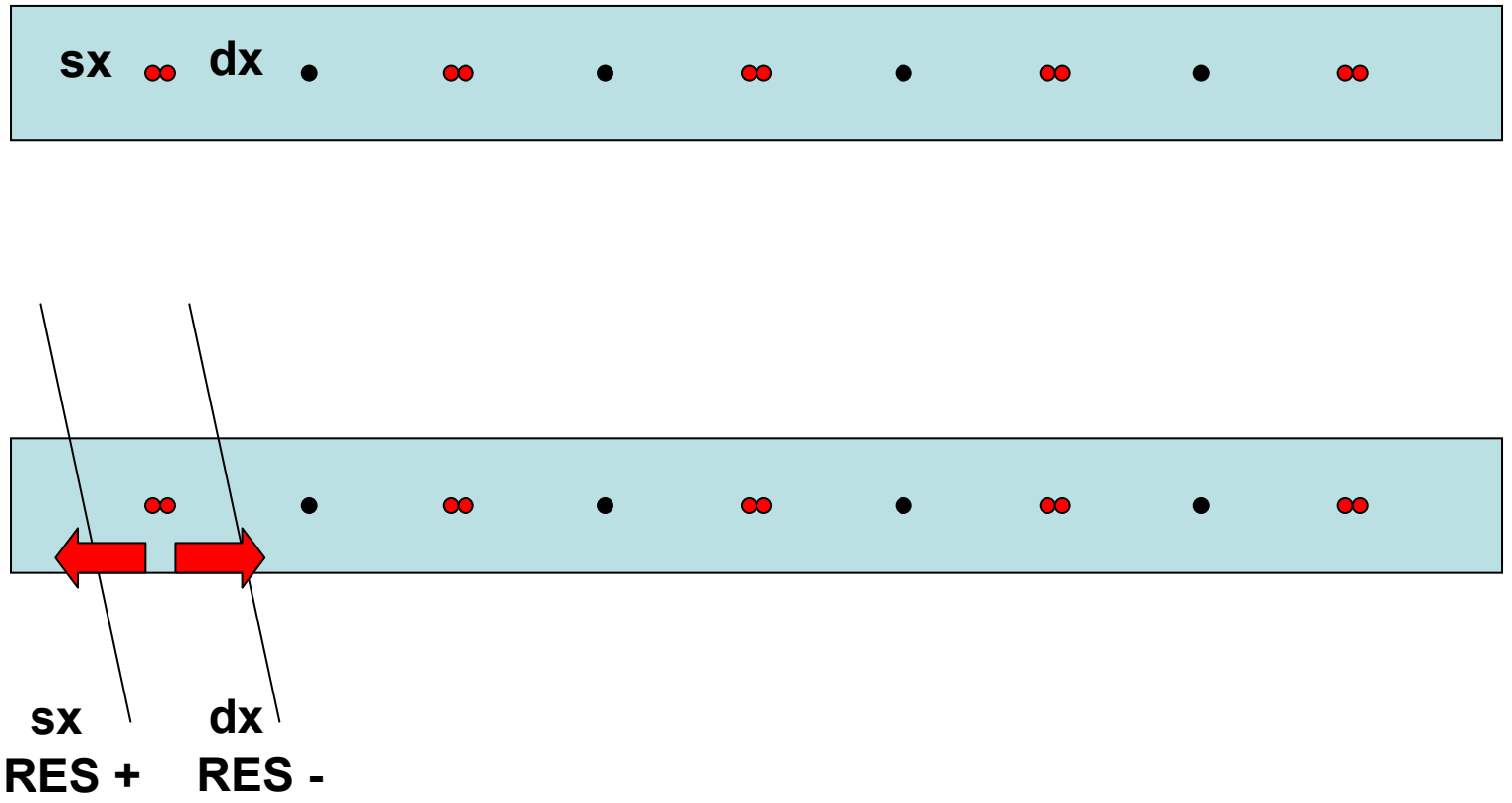


resyvsy_ch1_1

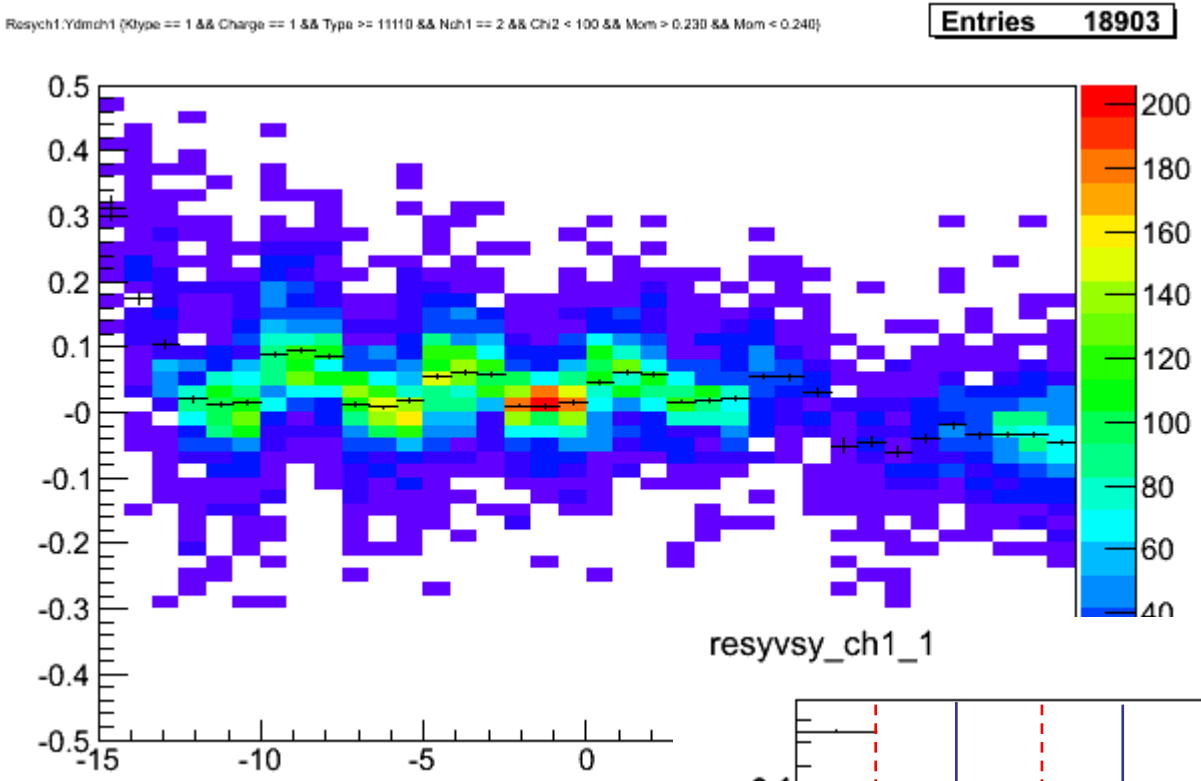


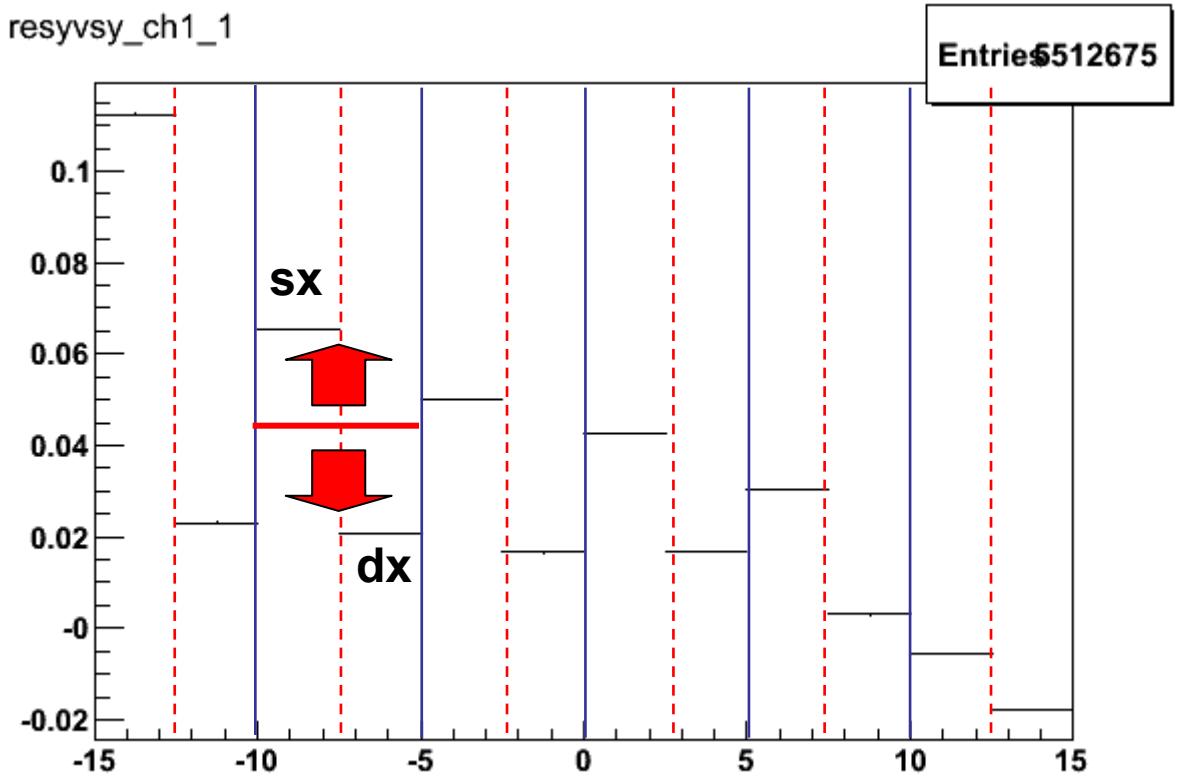

Resych1:Ydmch1 (Ktype == 1 && Charge == 1 && Type >= 11110 && Nch1 == 2 && Chi2 < 100 && Mom > 0.230 && Mom < 0.240)
Entries 18903
0.5
0.4
0.3
0.2
0.1
-0
-0.1
-0.2
-0.3
-0.4
-0.5
-15
-10
-5
0
200
180
160
140
120
100
80
60
40


resyvsy_ch1_1
Entries 512675
0.1
0.08
0.06
0.04
0.02
-0
-0.02
-15
-10
-5
0
5
10
15


sx
dx
sx
RES +
dx
RES -

Evaluation of Garfield correction effect on residual distribution



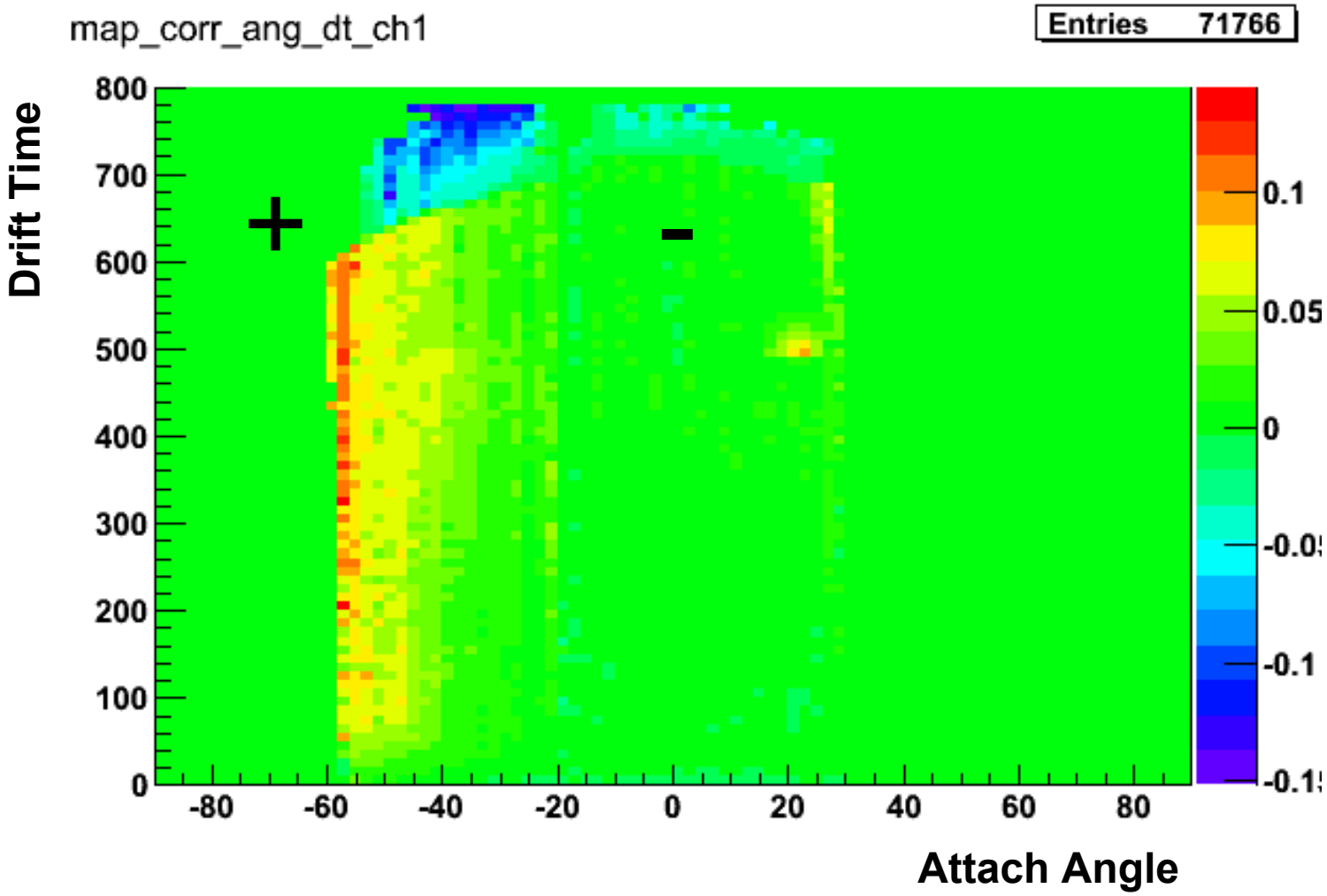


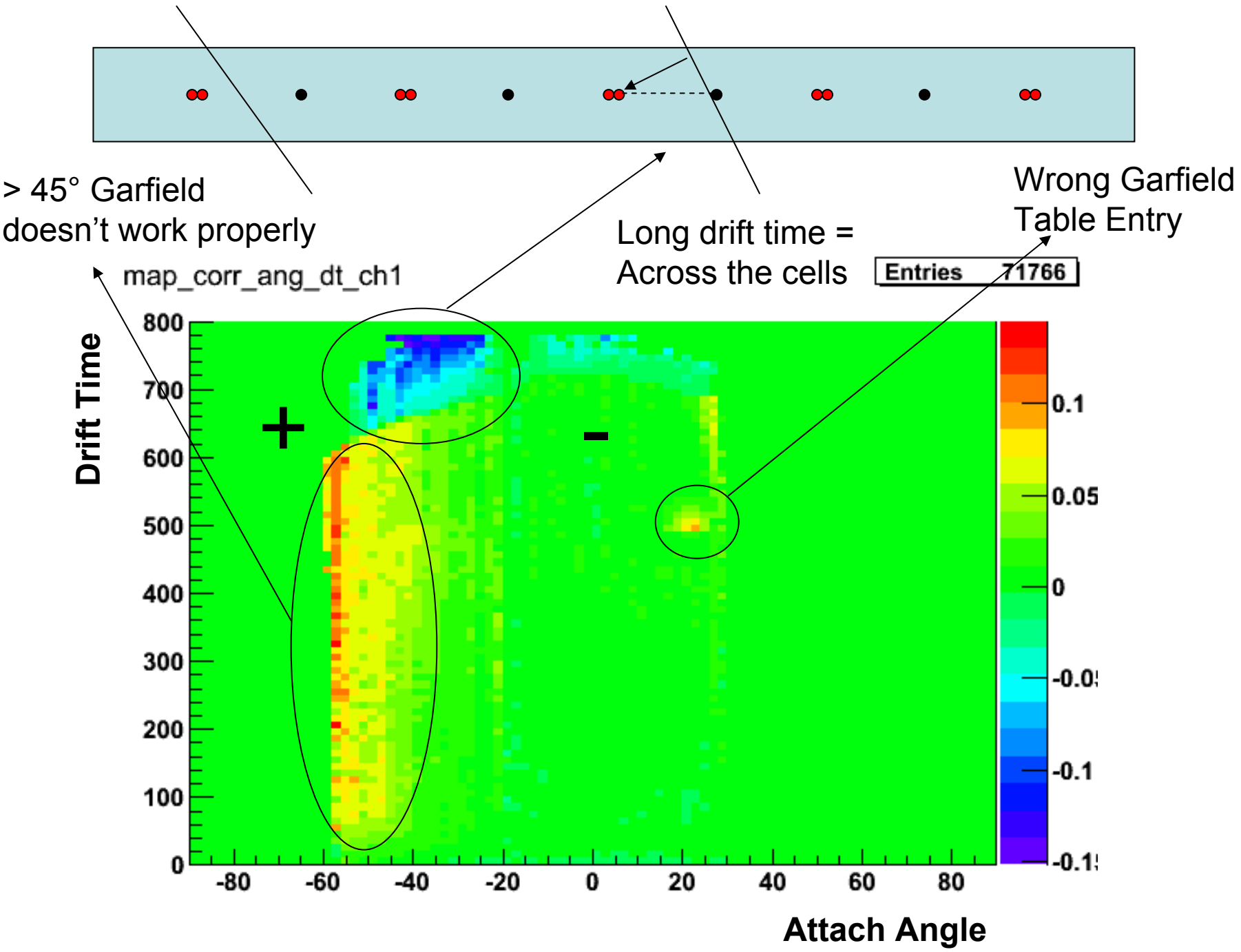
Garfield correction effect on residual distribution

$$\frac{\text{RES(SX)} - \text{RES(DX)}}{2}$$

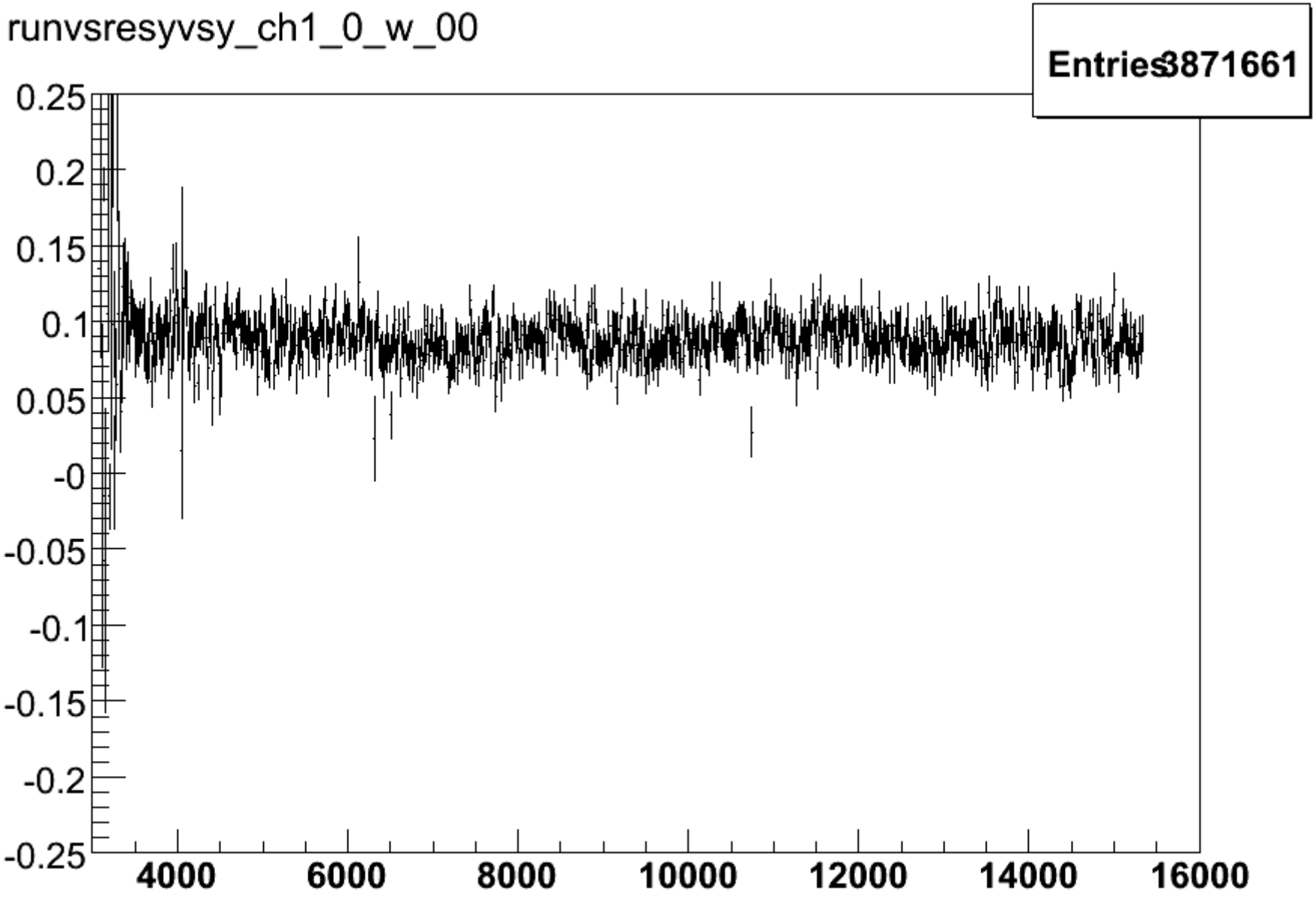
VS Drift Time and VS Attach Angle For all Chambers

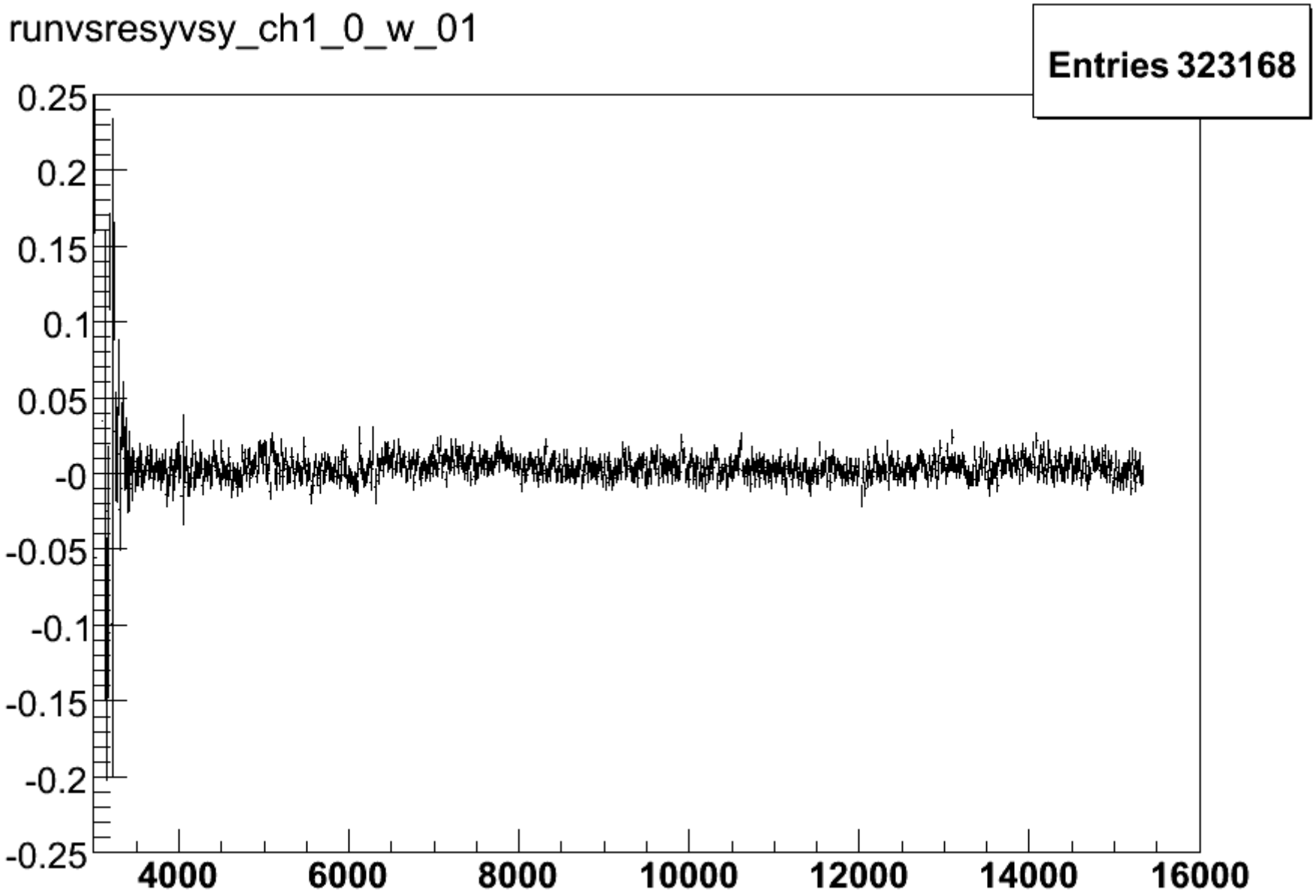
Map of Garfield correction effect on residual distribution vs Attach Angle vs Drift Time

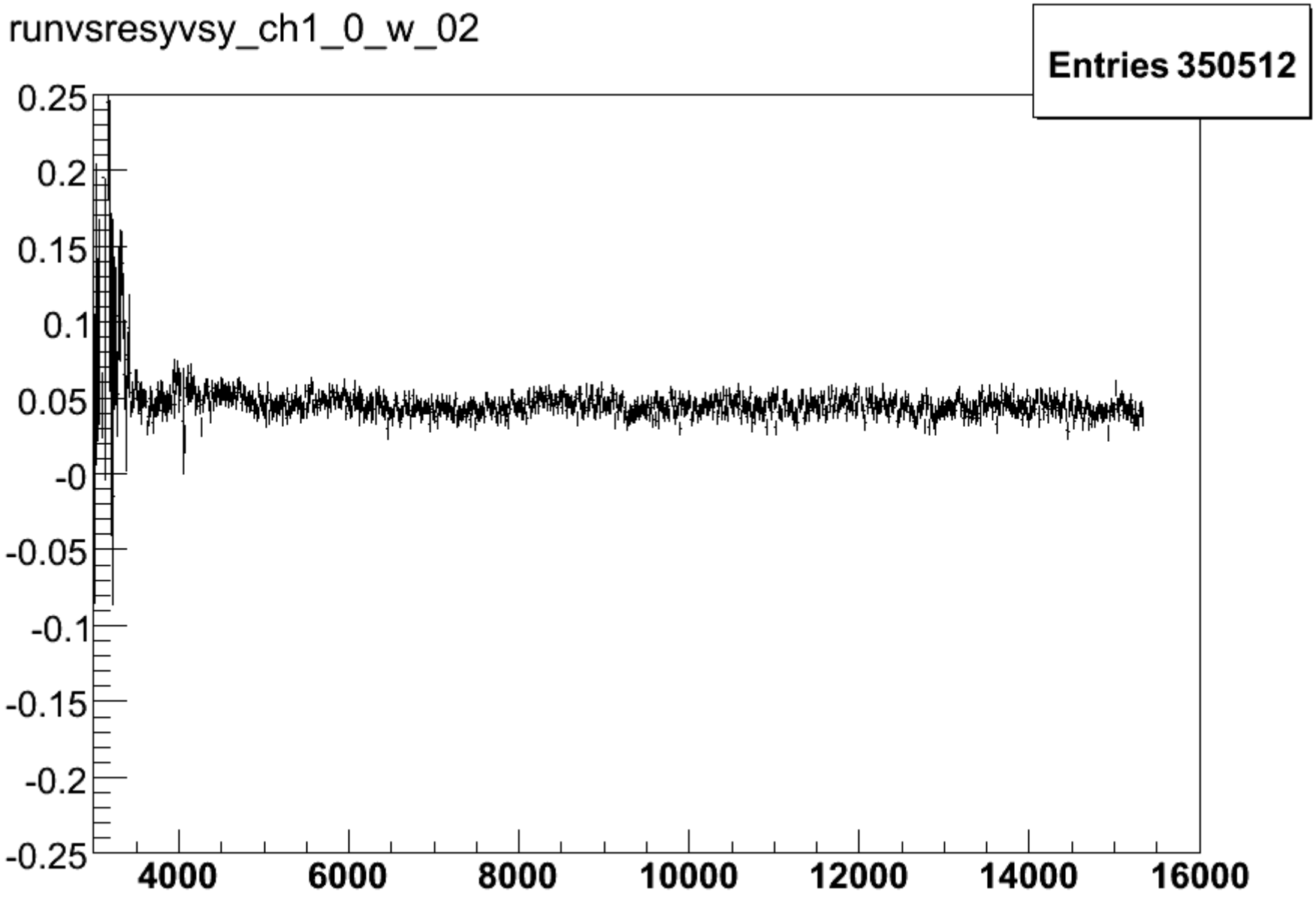


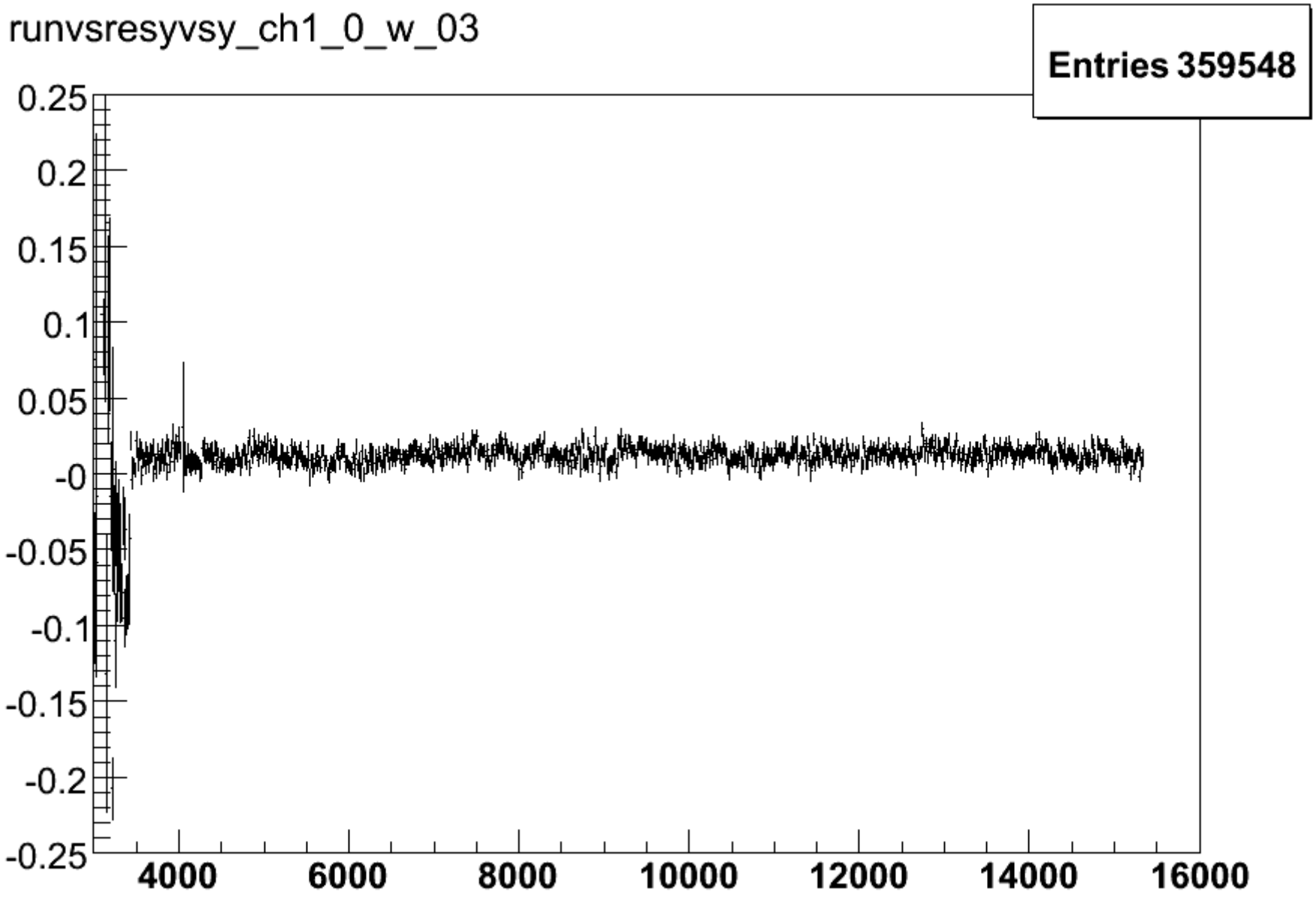

> 45° Garfield
doesn't work properly
Long drift time =
Across the cells
Wrong Garfield
Table Entry
map_corr_ang_dt_ch1
Entries 71766
Drift Time
800
700
600
500
400
300
200
100
0
+
-
0.1
0.05
0
-0.1
-80
-60
-40
-20
0
20
40
60
80
Attach Angle

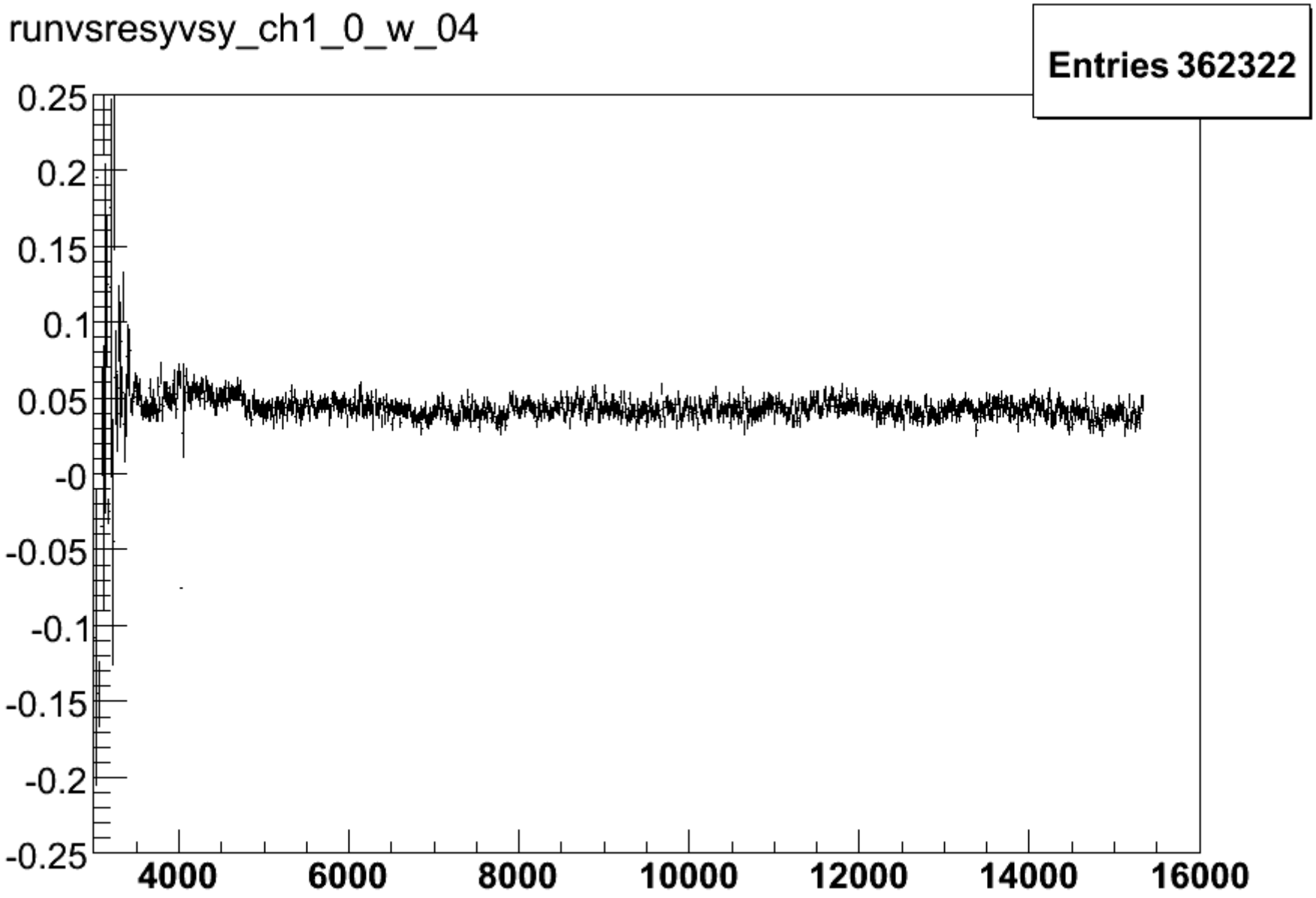
Time dependence of Φ residual wire by wire




runvsresyvsy_ch1_0_w_01
Entries 323168
0.25
0.2
0.15
0.1
0.05
0
-0.05
-0.1
-0.15
-0.2
-0.25
4000
6000
8000
10000
12000
14000
16000

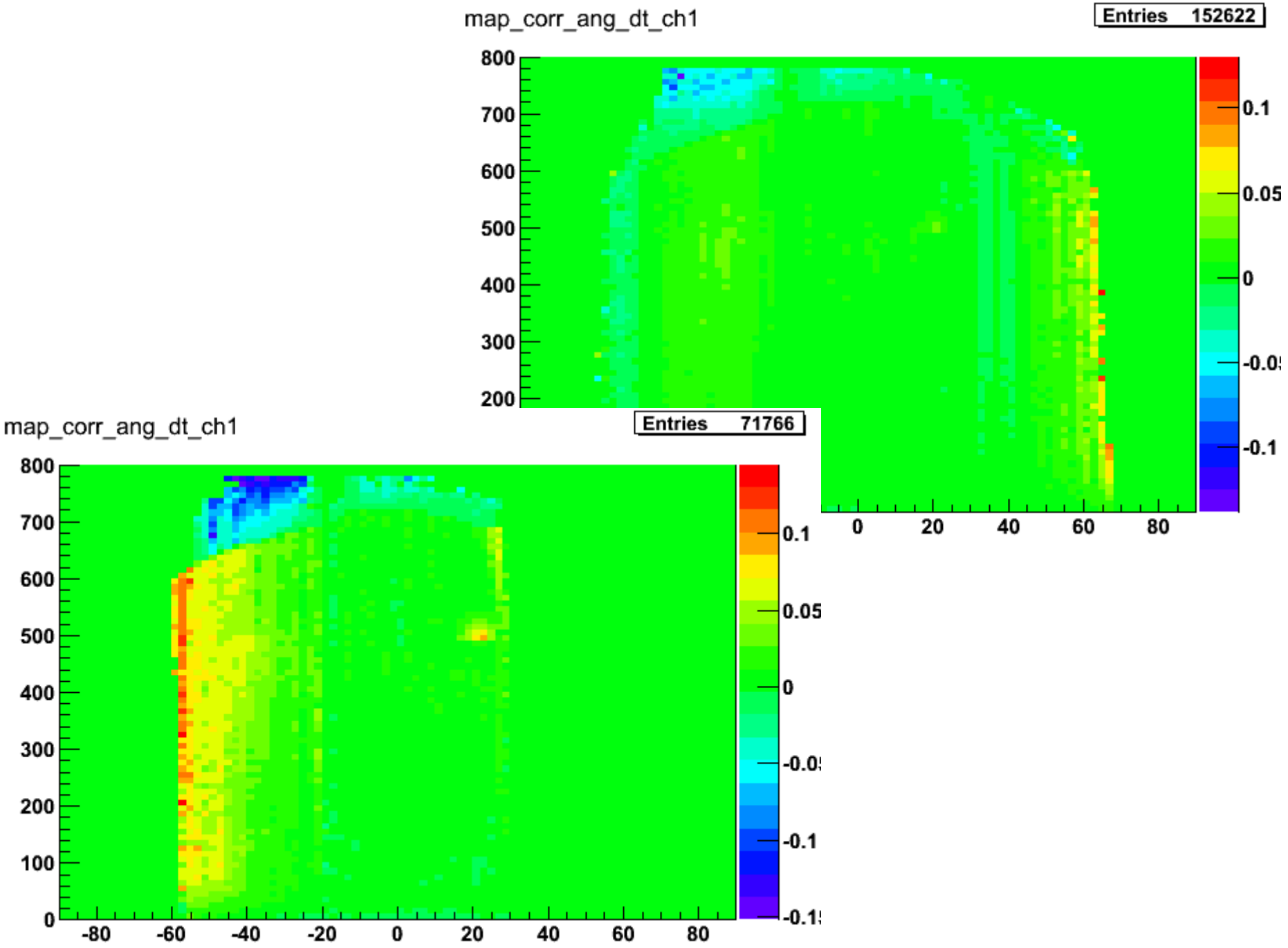

runvsresyvsy_ch1_0_w_02
Entries 350512
0.25
0.2
0.15
0.1
0.05
-0
-0.05
-0.1
-0.15
-0.2
-0.25
4000
6000
8000
10000
12000
14000
16000

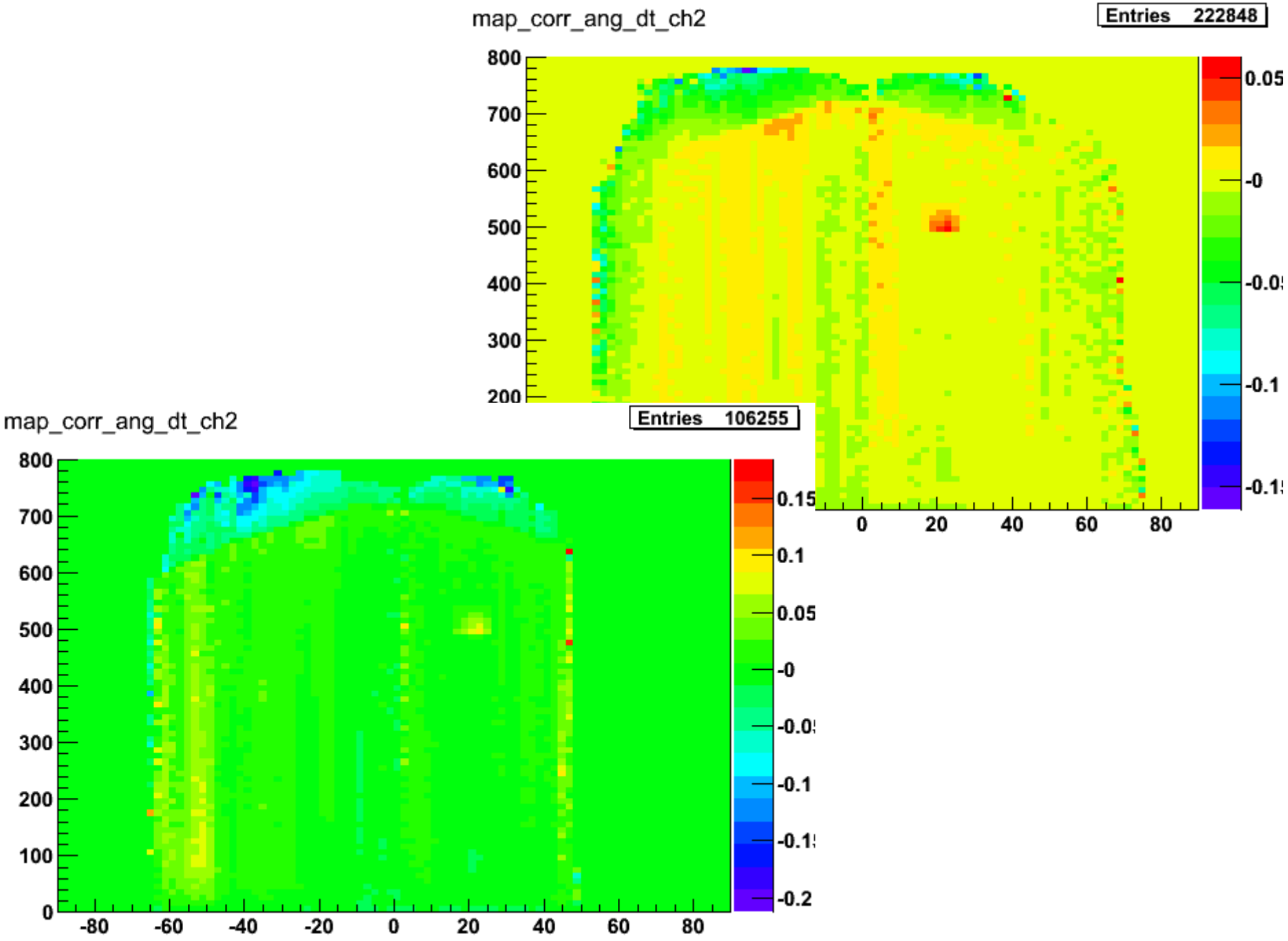

runvsresyvsy_ch1_0_w_03
Entries 359548
0.25
0.2
0.15
0.1
0.05
-0
-0.05
-0.1
-0.15
-0.2
-0.25
4000
6000
8000
10000
12000
14000
16000

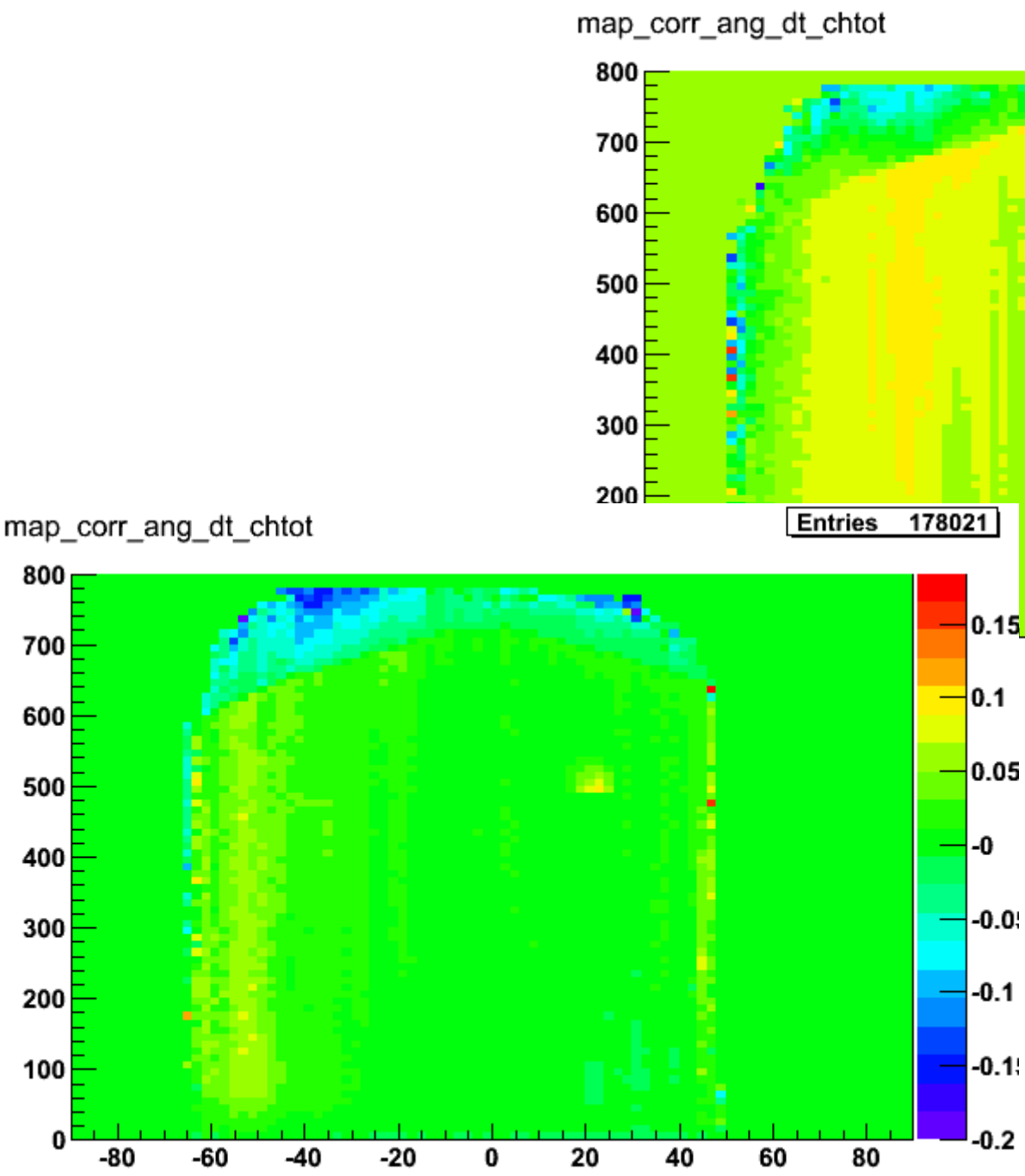

runvsresyvsy_ch1_0_w_04
Entries 362322
0.25
0.2
0.15
0.1
0.05
-0
-0.05
-0.1
-0.15
-0.2
-0.25
4000
6000
8000
10000
12000
14000
16000

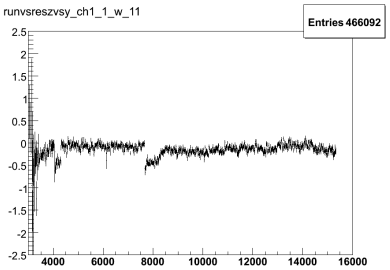
Drift Chamber Φ Side … the TDC SIDE of the moon

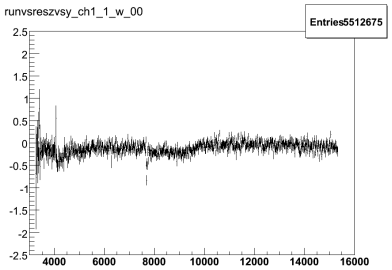
- Garfield doesn't work properly for attach angle >45° (but now we have a correction map to add to Garfield !!!)
- No cluster on hit chamber reconstruction:
  - Wrong evaluation of Φ coordinate when the track crosses two cells (long drift time)
- Residual are stable in time but they are different from zero (500 μm – 1 mm)
  - Calibrations
  - Alignment

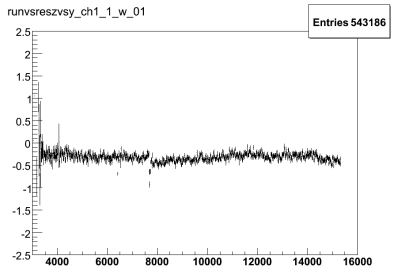

map_corr_ang_dt_ch1
Entries 152622
800
700
600
500
400
300
200
0.1
0.05
0
-0.1
0
20
40
60
80
map_corr_ang_dt_ch1
Entries 71766
800
700
600
500
400
300
200
100
0
0.1
0.05
0
-0.1
-80
-60
-40
-20
0
20
40
60
80

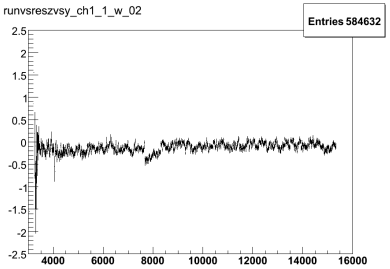

map_corr_ang_dt_ch2
Entries 222848
800
700
600
500
400
300
200
0.05
-0
-0.1
0
20
40
60
80
map_corr_ang_dt_ch2
Entries 106255
800
700
600
500
400
300
200
100
0
0.15
0.1
0.05
-0
-0.1
-0.2
-80
-60
-40
-20
0
20
40
60
80

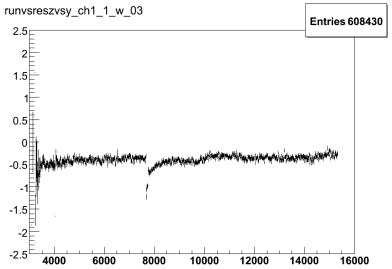

map_corr_ang_dt_chtot
Entries 375470
800
700
600
500
400
300
200
0.04
0.02
0
-0.02
-0.04
-0.06
-0.08
-0.1
0
20
40
60
80
map_corr_ang_dt_chtot
Entries 178021
800
700
600
500
400
300
200
100
0
0.15
0.1
0.05
-0
-0.05
-0.1
-0.15
-0.2
-80
-60
-40
-20
0
20
40
60
80

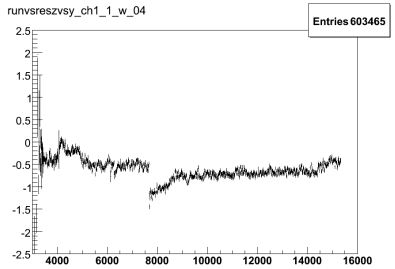

runvsreszvsy_ch1_1_w_11
Entries 466092

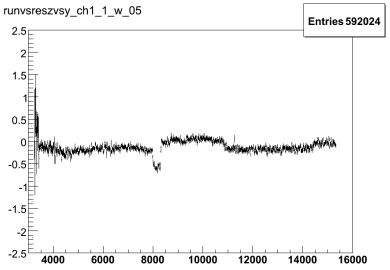

runvsreszvsy_ch1_1_w_00
Entries5512675

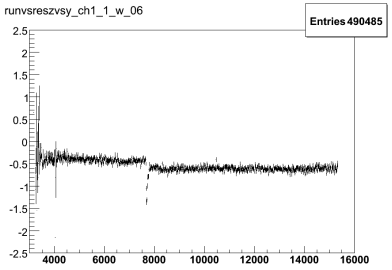

runvsreszvsy_ch1_1_w_01
Entries 543186

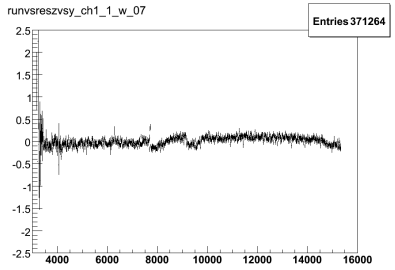

runvsreszvsy_ch1_1_w_02
Entries 584632

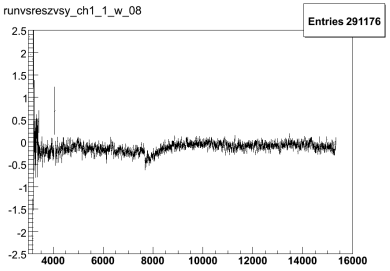

runvsreszvsy_ch1_1_w_03
Entries 608430

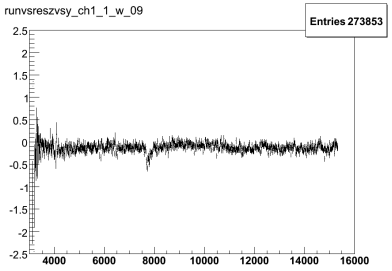

runvsreszvsy_ch1_1_w_04
Entries 603465

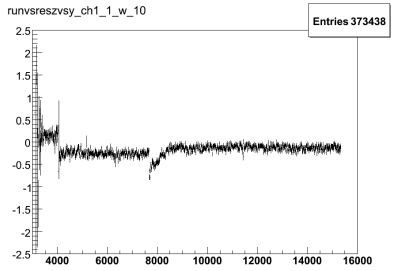

runvsreszvsy_ch1_1_w_05
Entries 592024


runvsreszvsy_ch1_1_w_06
Entries 490485


runvsreszvsy_ch1_1_w_07
Entries 371264


runvsreszvsy_ch1_1_w_08
Entries 291176


runvsreszvsy_ch1_1_w_09
Entries 273853


runvsreszvsy_ch1_1_w_10
Entries 373438