Check of CandChop and CandCamFitTrack on Near and Far MC files

Compared with R1.18

Checkplots are found below. Red is R1.18, black is with CandChop and CamFitTrack replacing the current slicer and track fitter.

Major Points of Interest:

Page 3: # events/slice much lower in ND with CandChop. IE, many 'empty' slices are created. Expected, probably OK.

Page 12: Track Fit Chi2 lower on CamFit. This is likely do to recent change in Chi2 definition in production fitter. This needs to get propagated to CamFit

Page 14: Fraction of track failures substantially less with CamFit.

Page 16: Track Fitter CPU Time reduced by another factor of 10

Page 18: Time Fit Chi2 not being calculated by CamFit

Page 21: Track Completeness ~ 1% higher with new code

Page 23: No FD slicing

Page 24: Track MIP change??? Should track this down.

Page 31: Shower Completeness improvement at several percent level in both ND and FD

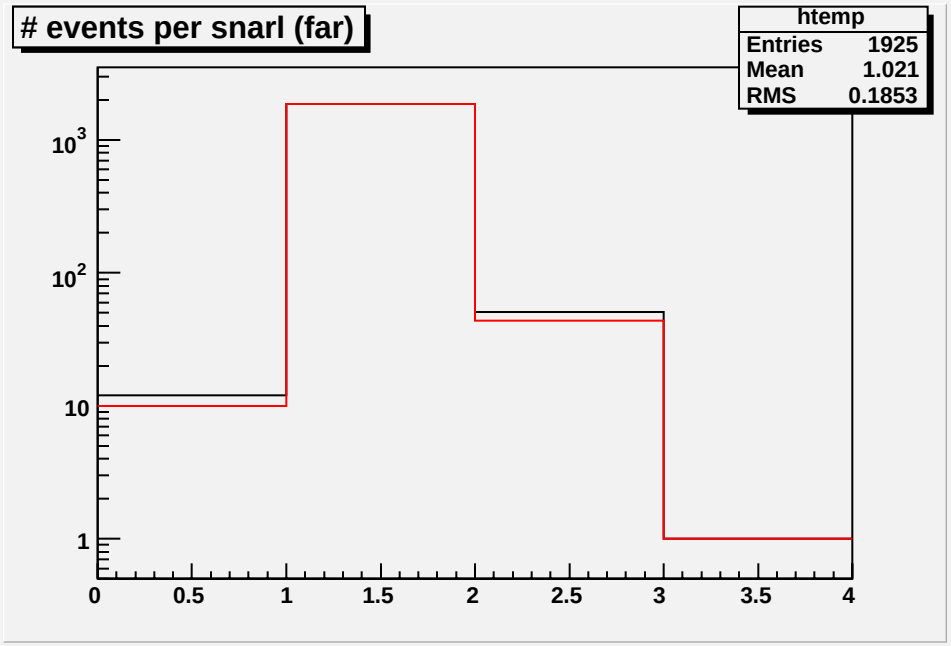
Page 36: Some degradation of event vertex accuracy

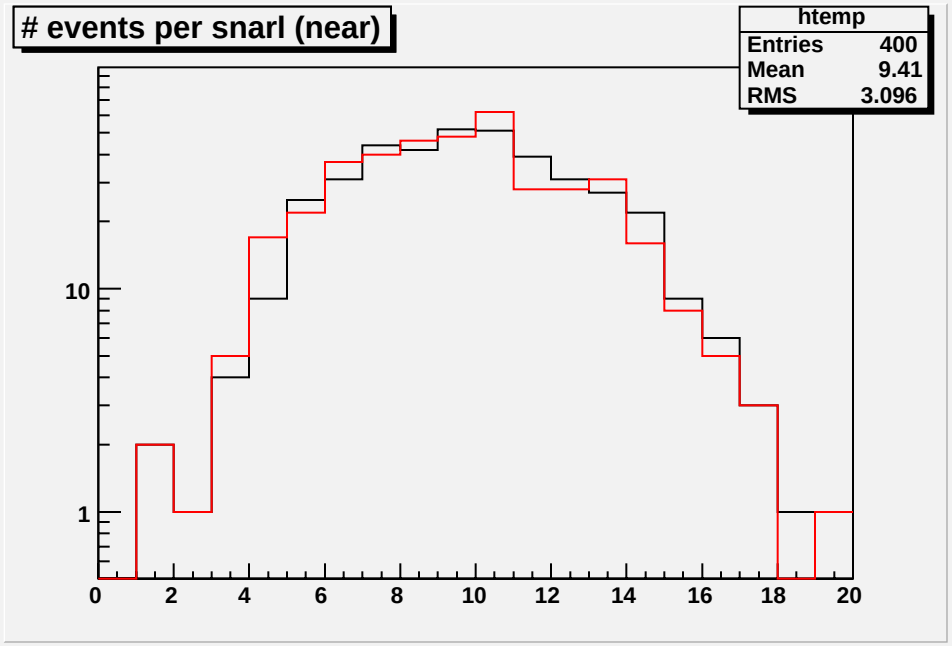
Page 39,40: Additional offset in dP/P in CamFit. Probably because post-fit 'tweak' to fit momentum not made in CamFit. Need to add this.

Action Items:

1: Validate on real data, particularly large CR set.

2: Fixes to CamFit needed.
    Calculate TimeFitChi2
    Track down track MIP difference
    Put post fit tweak of fit momentum in CamFit.





 # Events/Snarl (Far Detector)

 # Entries 1925 / 1910

Mean 1.021299 / 1.020419

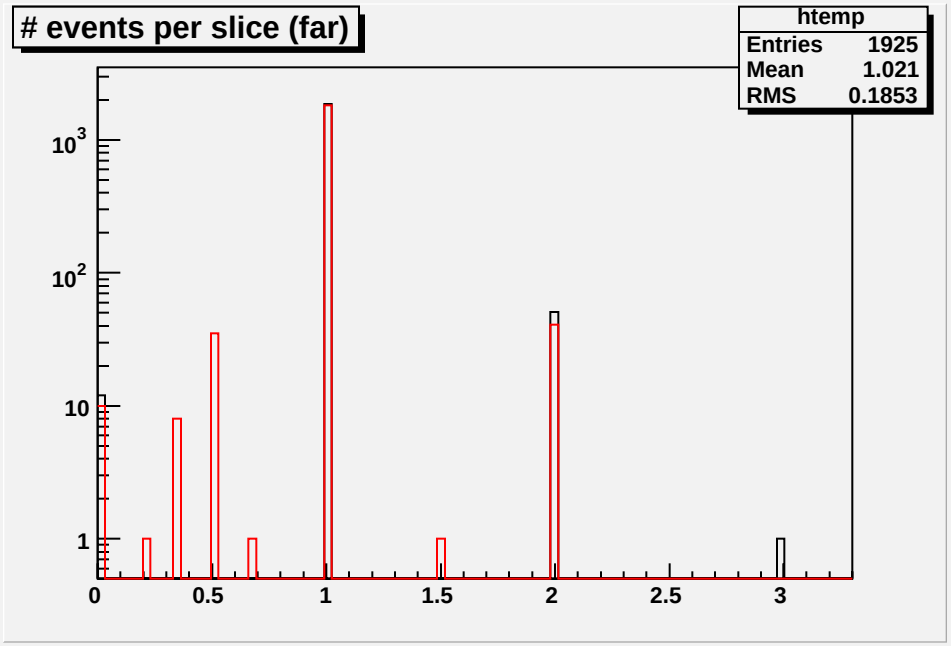
RMS 0.185342 / 0.186176

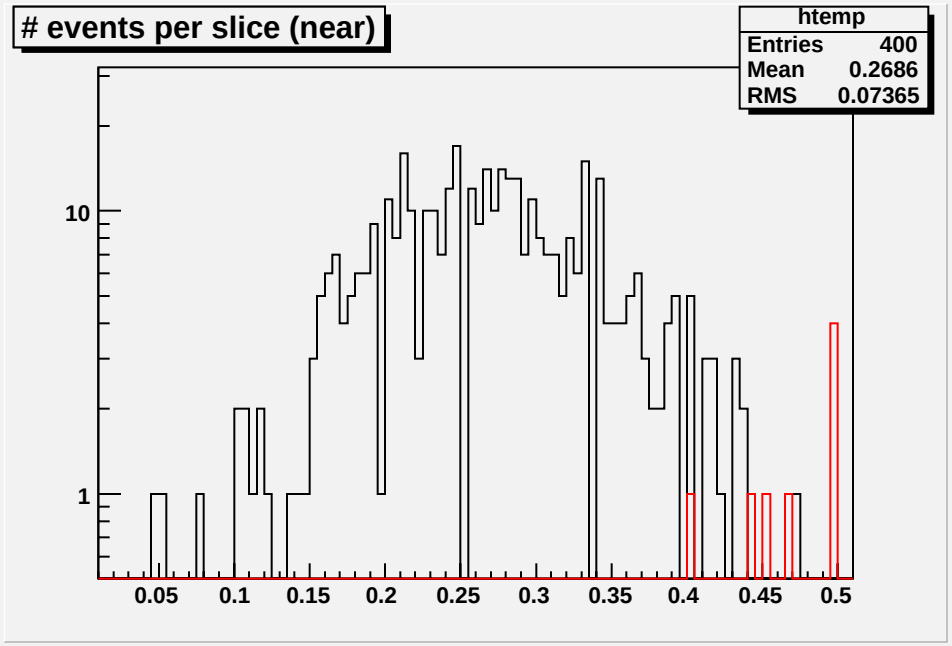
 # Events/Snarl (Near Detector)

 # Entries 400 / 400

Mean 9.410000 / 9.150000

RMS 3.086665 / 0.000000





 # Events/Slice (Far Detector)

 # Entries 1925 / 1910

Mean 1.021299 / 1.005515

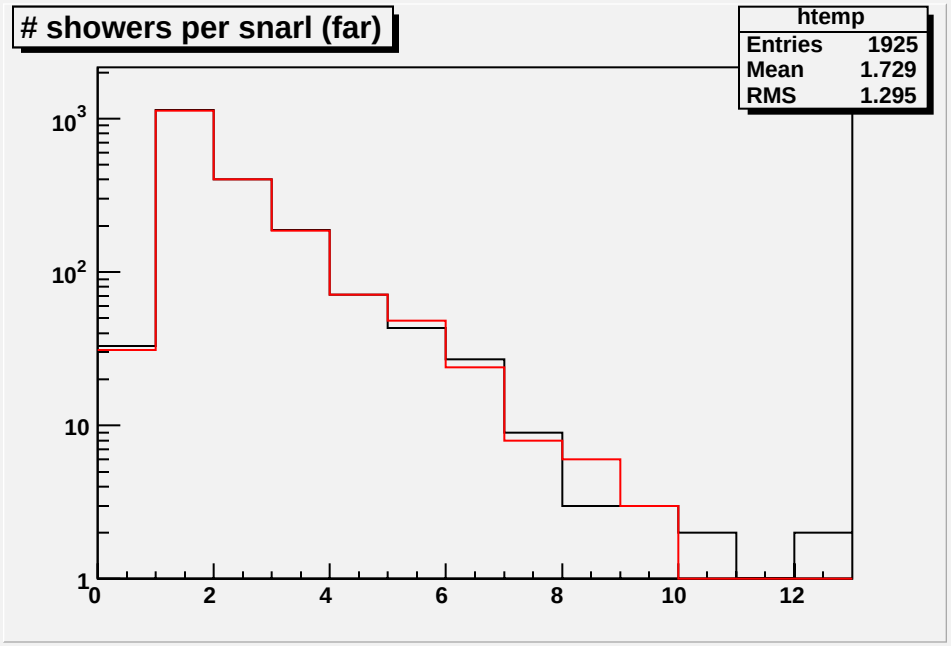
RMS 0.185342 / 0.195832

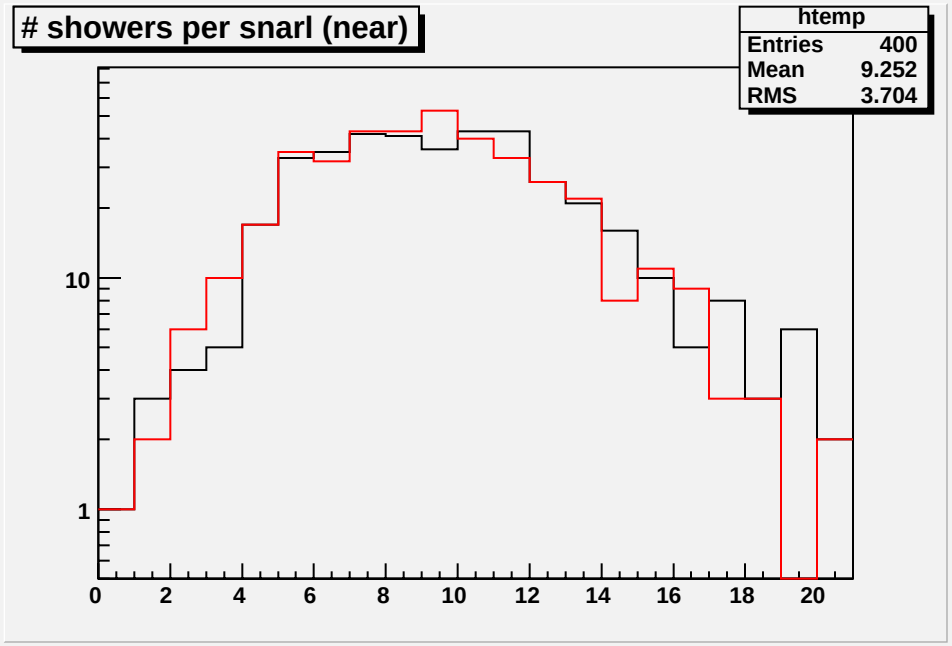
 # Events/Slice (Near Detector)

 # Entries 400 / 400

Mean 0.268550 / 0.842907

RMS 0.073654 / 0.144608





 # Showers/Snarl (Far Detector)

 # Entries 1925 / 1910

Mean 1.728831 / 1.733508

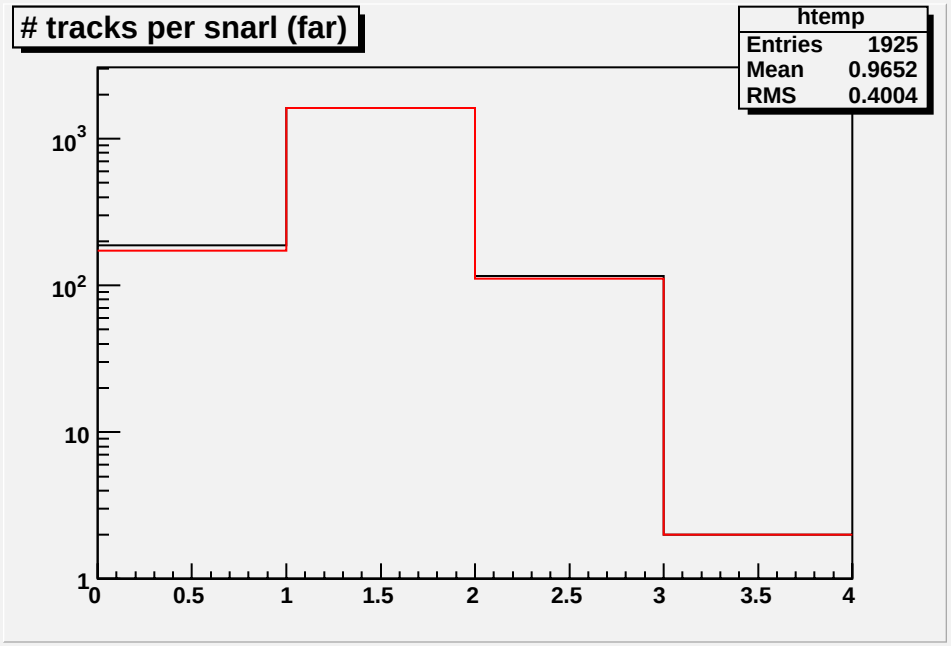
RMS 1.295437 / 1.280411

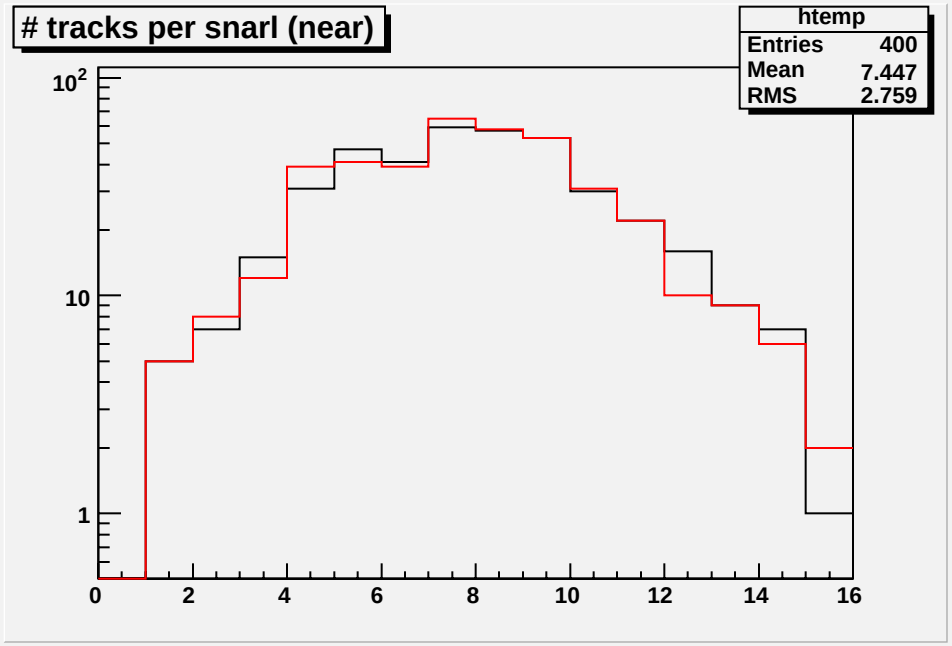
 # Showers/Snarl (Near Detector)

 # Entries 400 / 400

Mean 9.252500 / 8.872500

RMS 3.703882 / 3.521540





 # Tracks/Snarl (Far Detector)

 # Entries 1925 / 1910

Mean 0.965195 / 0.969634

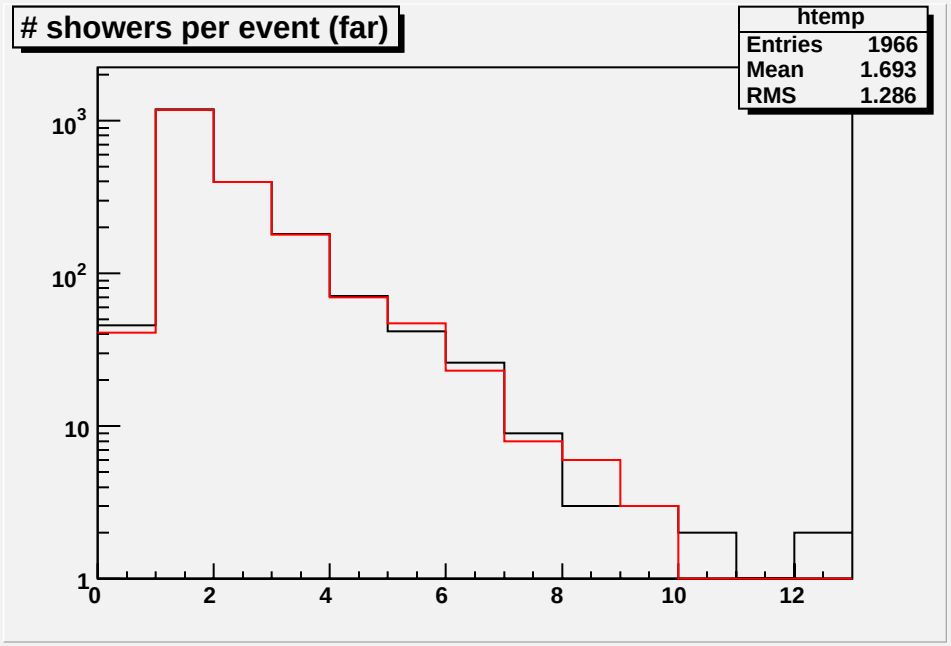
RMS 0.400434 / 0.389817

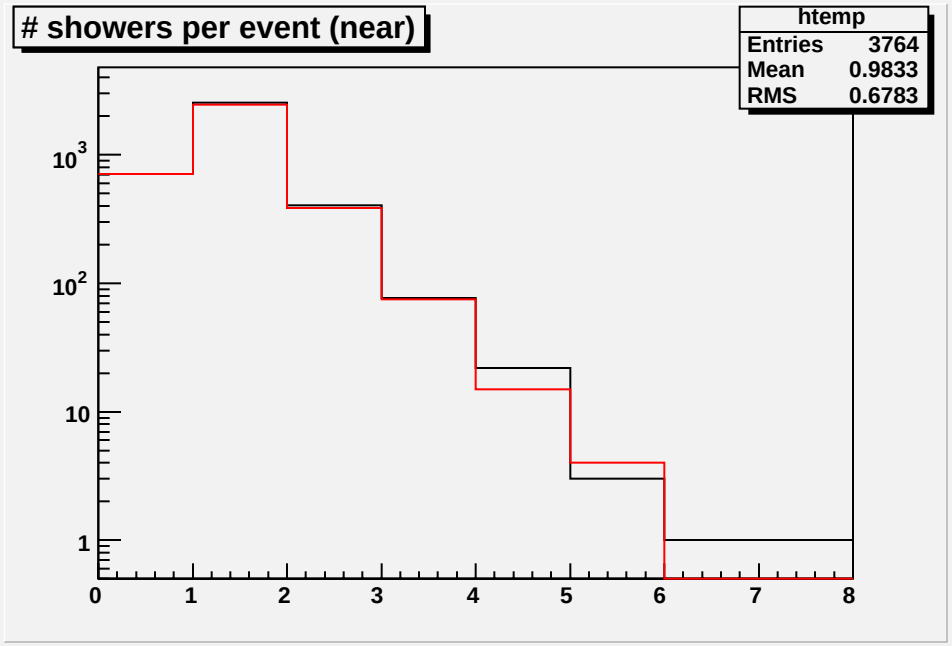
 # Tracks/Snarl (Near Detector)

 # Entries 400 / 400

Mean 7.447500 / 7.377500

RMS 2.759029 / 2.723049





 # Showers/Event (Far Detector)

 # Entries 1966 / 1949

Mean 1.692777 / 1.698820

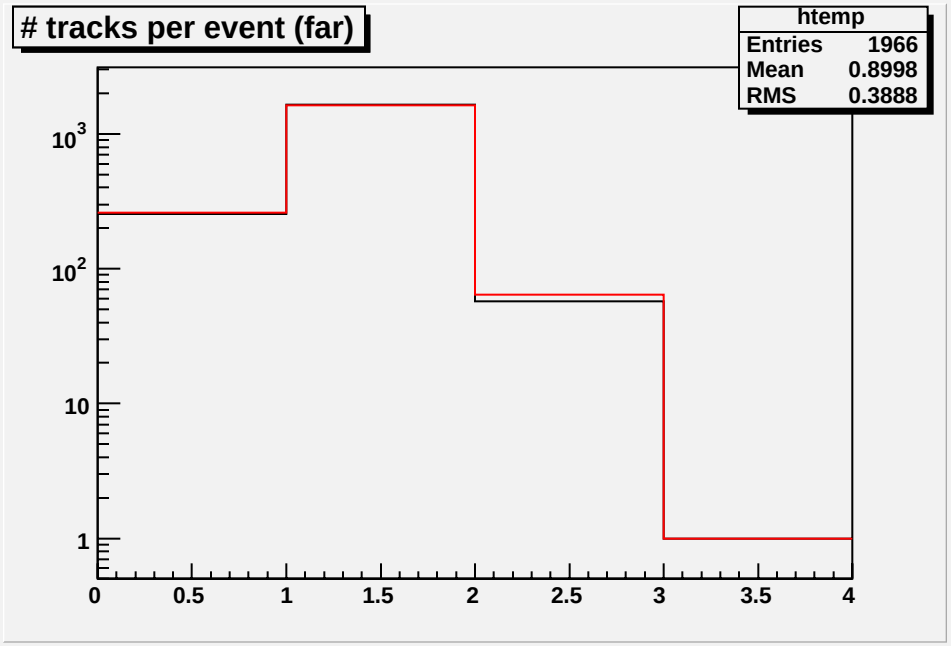
RMS 1.285817 / 1.268922

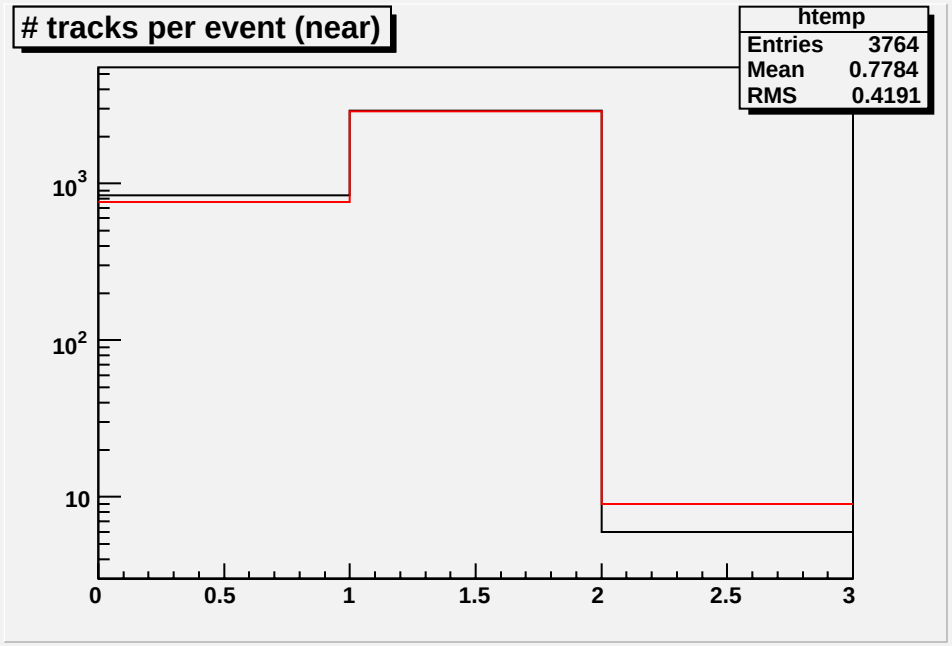
 # Showers/Event (Near Detector)

 # Entries 3764 / 3660

Mean 0.983262 / 0.969672

RMS 0.678332 / 0.659449





 # Tracks/Event (Far Detector)

 # Entries 1966 / 1949

Mean 0.899797 / 0.899949

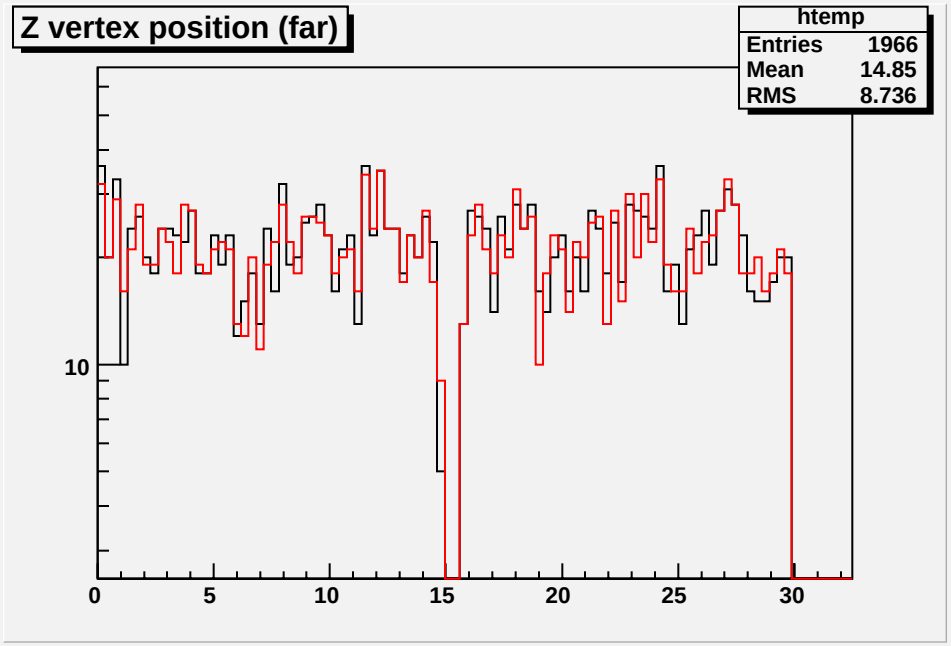
RMS 0.388845 / 0.398490

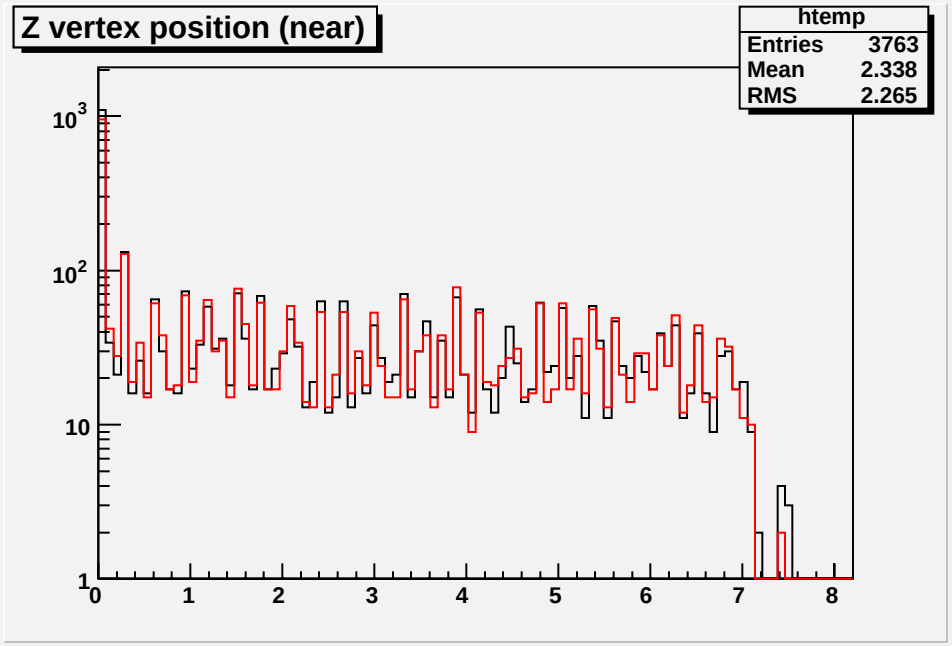
 # Tracks/Event (Near Detector)

 # Entries 3764 / 3660

Mean 0.778427 / 0.793989

RMS 0.419126 / 0.410473





Track Vertex Z (Far Detector)

 # Entries 1966 / 1949

Mean 14.851173 / 14.896900

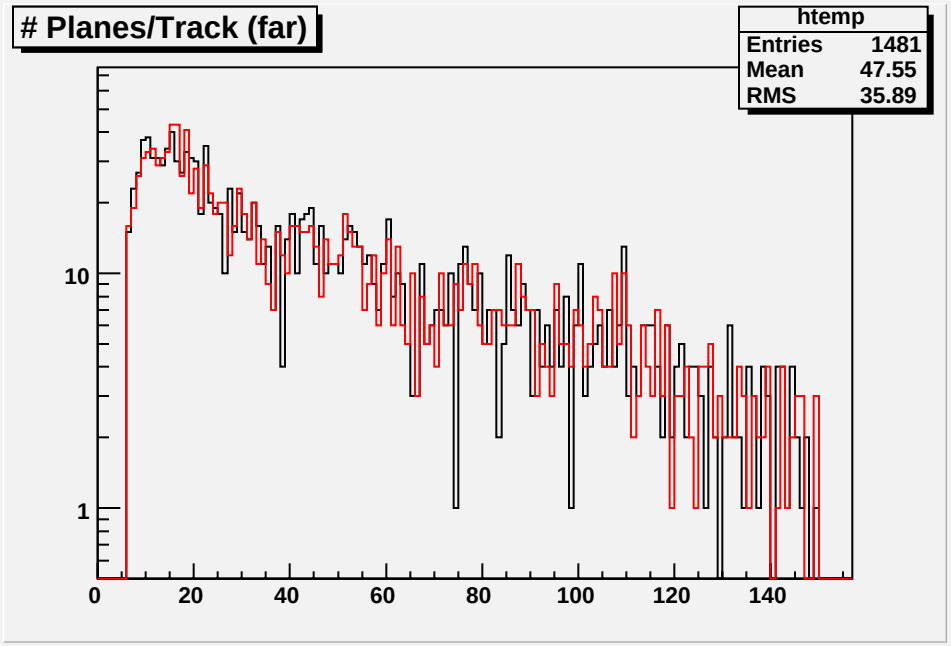
RMS 8.735555 / 8.745636

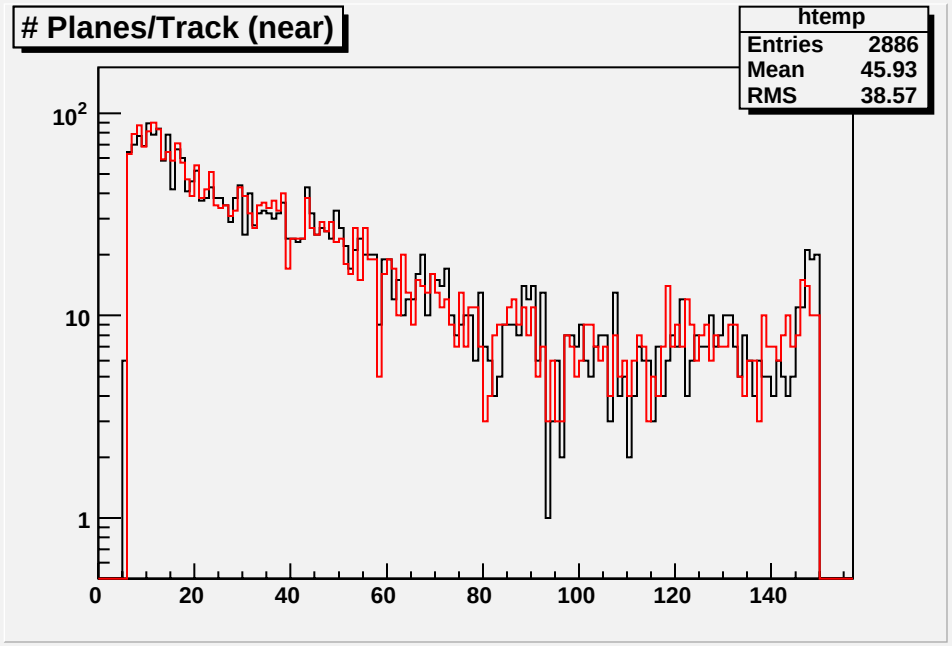
Track Vertex Z (Near Detector)

 # Entries 3763 / 3652

Mean 2.337836 / 2.423507

RMS 2.264917 / 2.266080





 # Planes/Track(Far Detector)

 # Entries 1481 / 1466

Mean 47.546928 / 47.460437

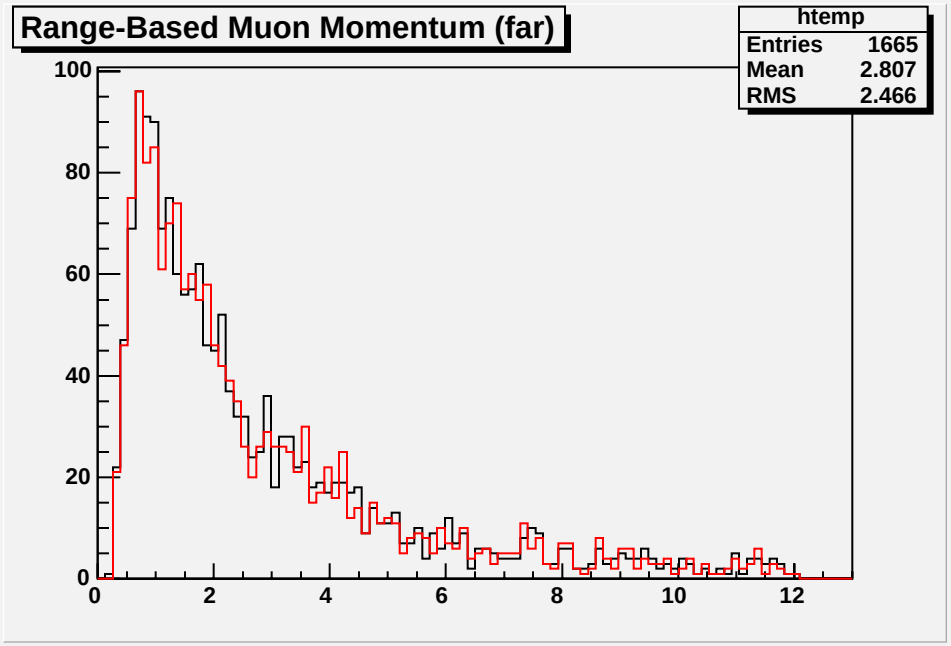
RMS 35.888632 / 35.819867

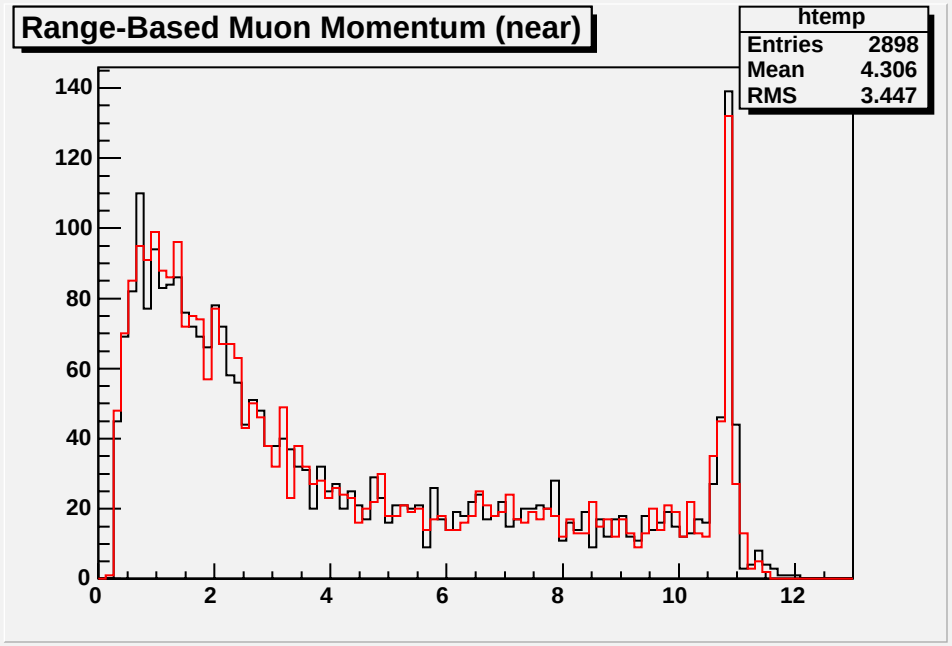
 # Planes/Track (Near Detector)

 # Entries 2886 / 2891

Mean 45.925502 / 45.276721

RMS 38.566262 / 38.327706





Range-based Momentum (Far Detector)

 # Entries 1665 / 1640

Mean 2.807018 / 2.788029

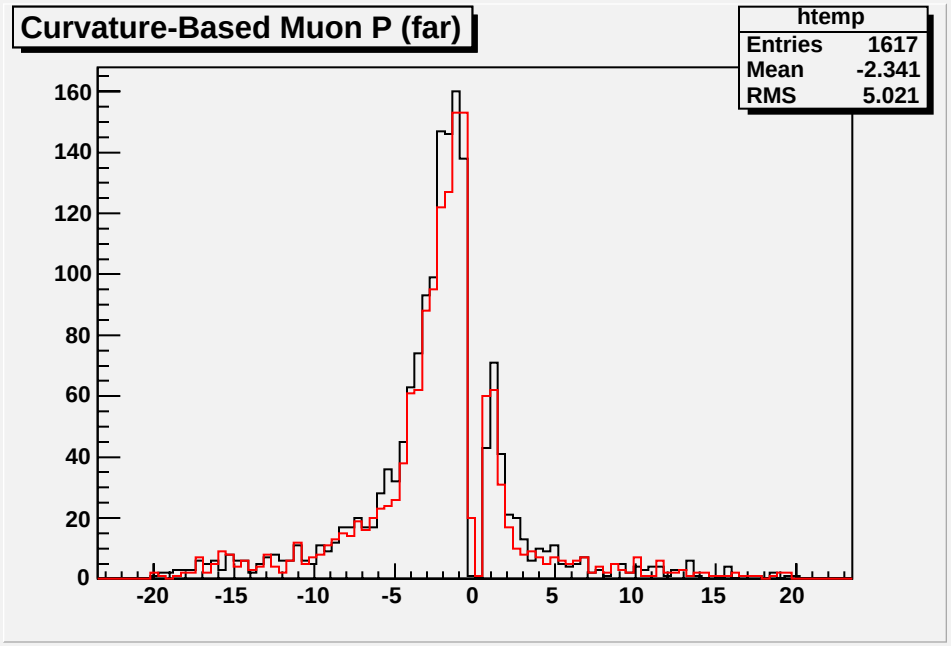
RMS 2.466433 / 2.438590

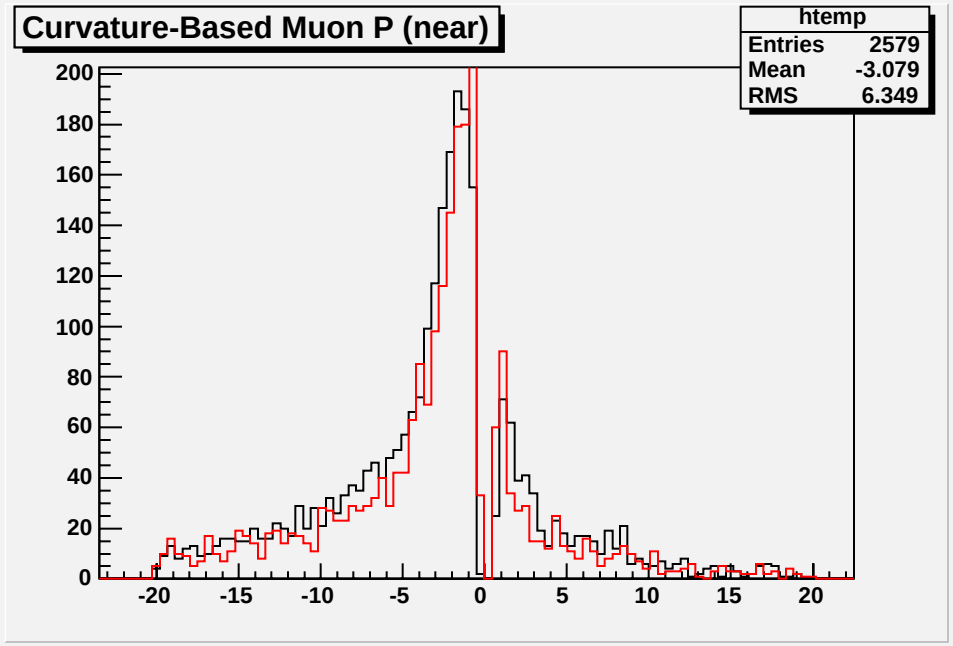
Range-based momentum (Near Detector)

 # Entries 2898 / 2890

Mean 4.306301 / 4.223226

RMS 3.447177 / 3.421223





Curvature-based momentum (Far Detector)

 # Entries 1617 / 1507

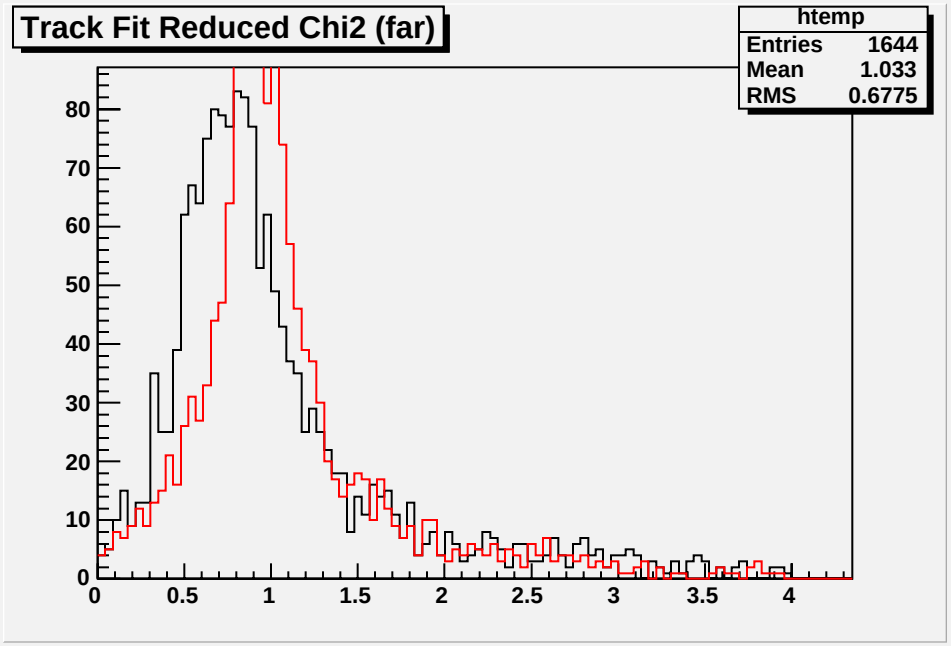
Mean -2.340514 / -2.235979

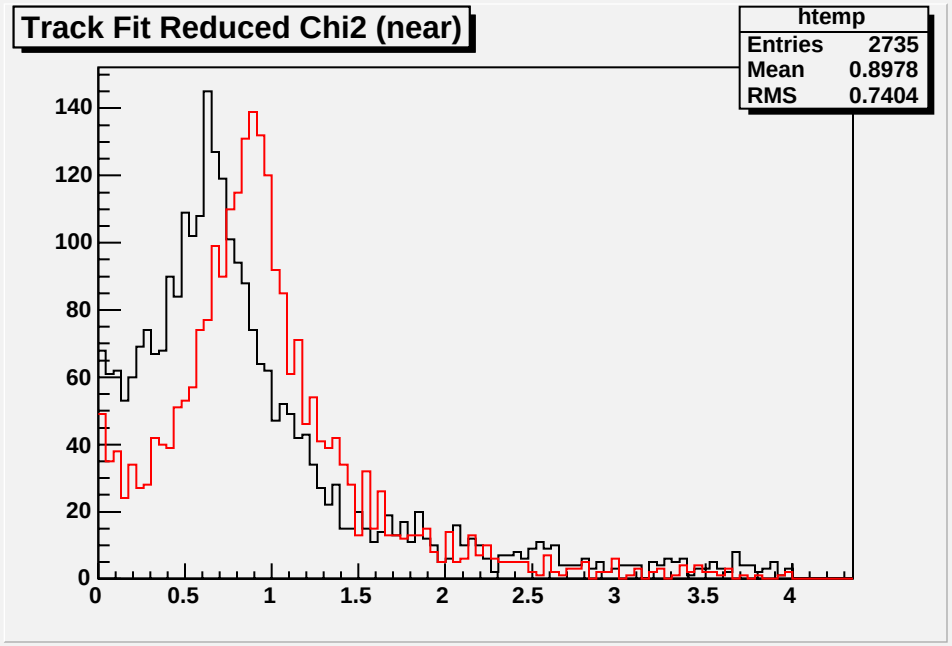
RMS 5.020563 / 4.995701

 # Entries 2579 / 2310

Mean -3.079372 / -2.934357

RMS 6.348714 / 6.228839





Track Fit Reduced Chi2 (Far Detector)

 # Entries 1644 / 1561

Mean 1.033230 / 1.078140

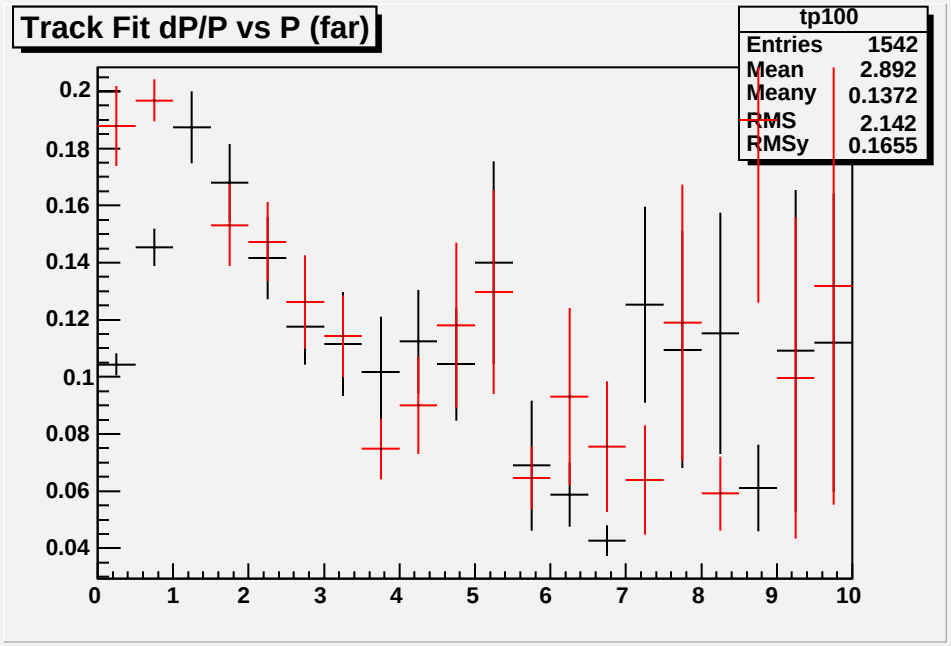
RMS 0.677493 / 0.581217

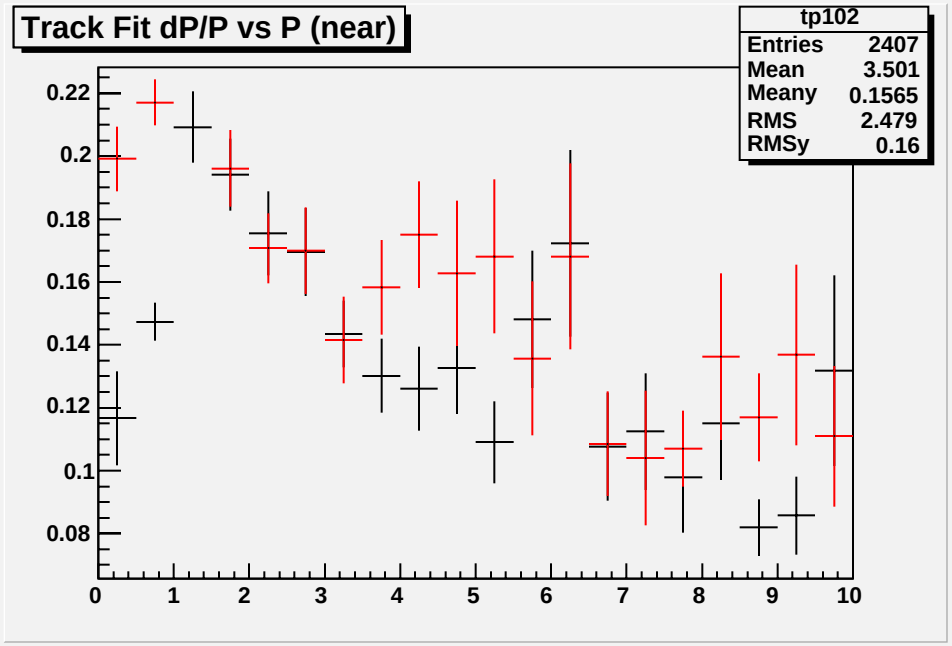
Track Fit Reduced Chi2 (Near Detector)

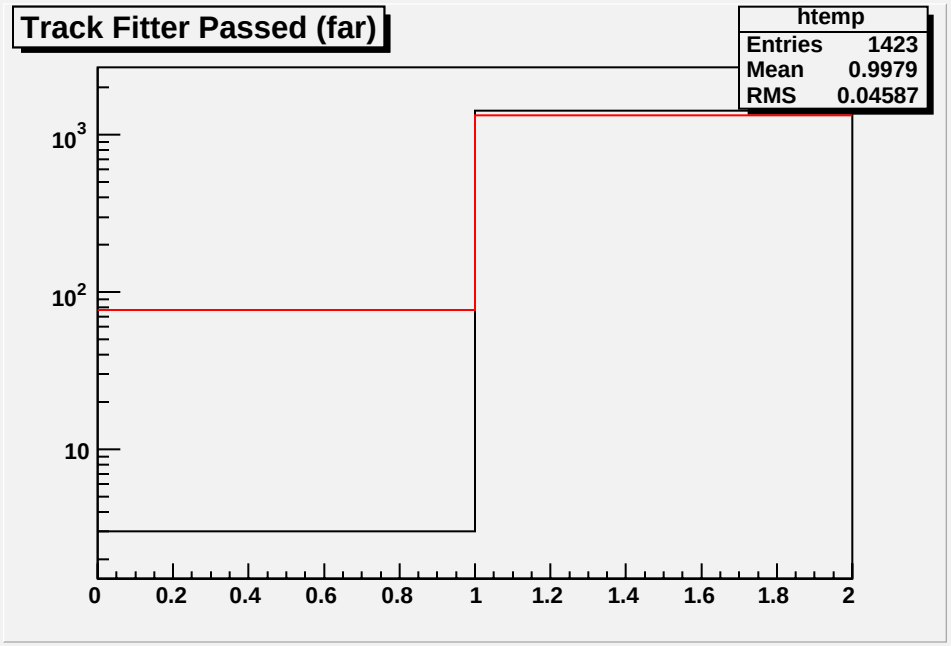
 # Entries 2735 / 2523

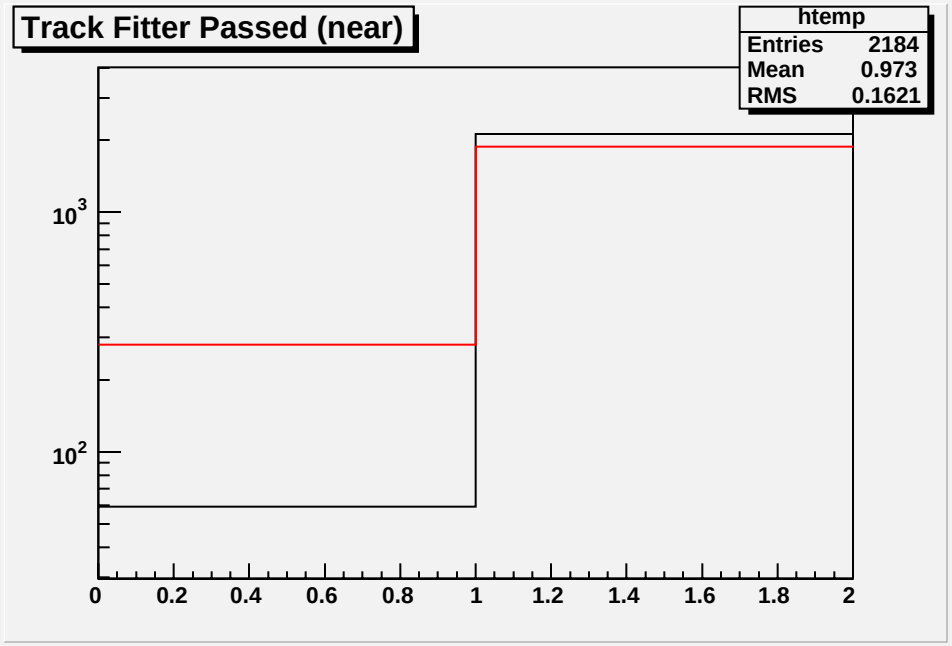
Mean 0.897838 / 0.962100

RMS 0.740449 / 0.585394


Track Fit dP/P vs P (far)
tp100
Entries 1542
Mean 2.892
Meany 0.1372
RMS 2.142
RMSy 0.1655
0.2
0.18
0.16
0.14
0.12
0.1
0.08
0.06
0.04
0 1 2 3 4 5 6 7 8 9 10


Track Fit dP/P vs P (near)
tp102
Entries 2407
Mean 3.501
Meany 0.1565
RMS 2.479
RMSy 0.16
0.22
0.2
0.18
0.16
0.14
0.12
0.1
0.08
0 1 2 3 4 5 6 7 8 9 10





Track Fitter Passed (Far Detector)

 # Entries 1423 / 1410

Mean 0.997892 / 0.945390

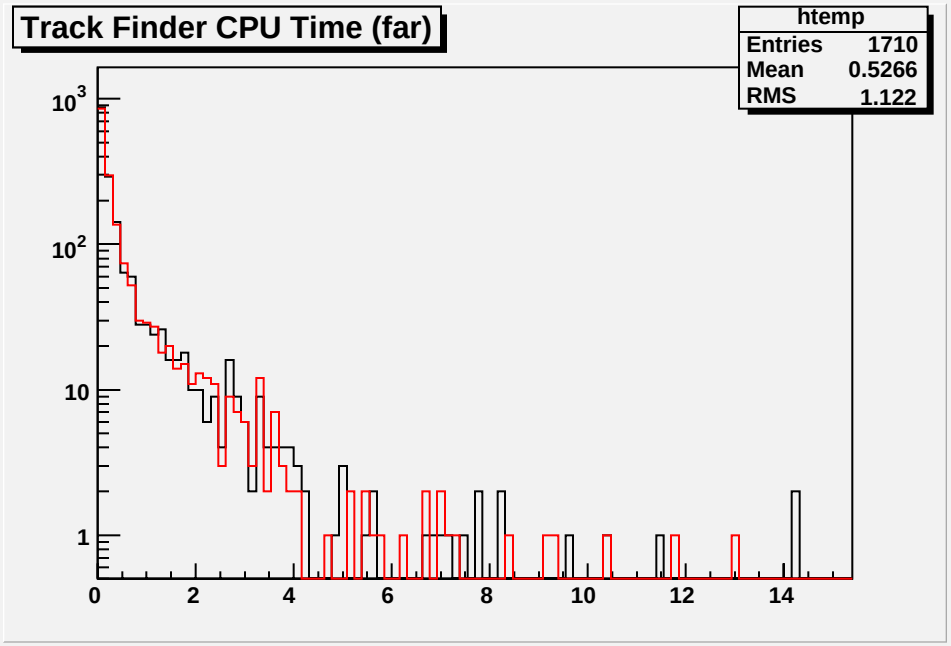
RMS 0.045867 / 0.227217

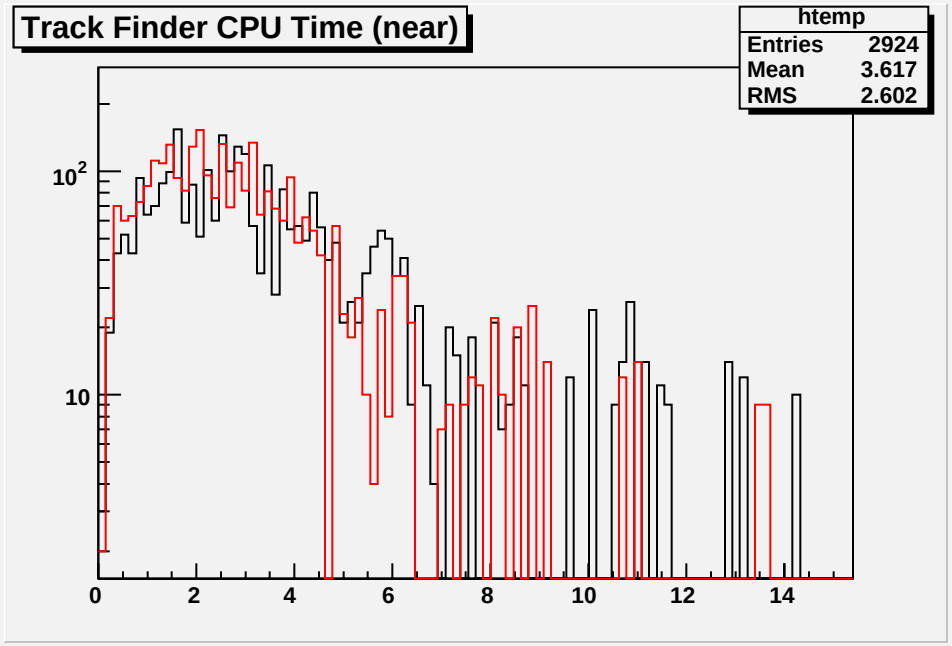
Track Fitter Passed (Near Detector)

 # Entries 2184 / 2156

Mean 0.972985 / 0.870130

RMS 0.162126 / 0.336160





Track Finder CPU Time (Far)

 # Entries 1710 / 2156

Mean 0.526561 / 0.514846

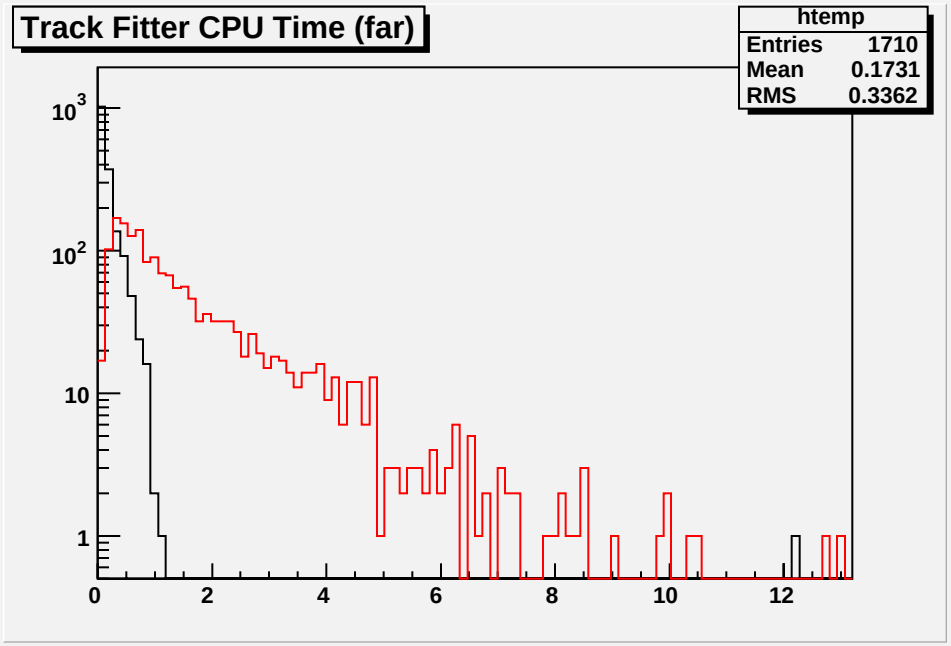
RMS 1.121779 / 1.053677

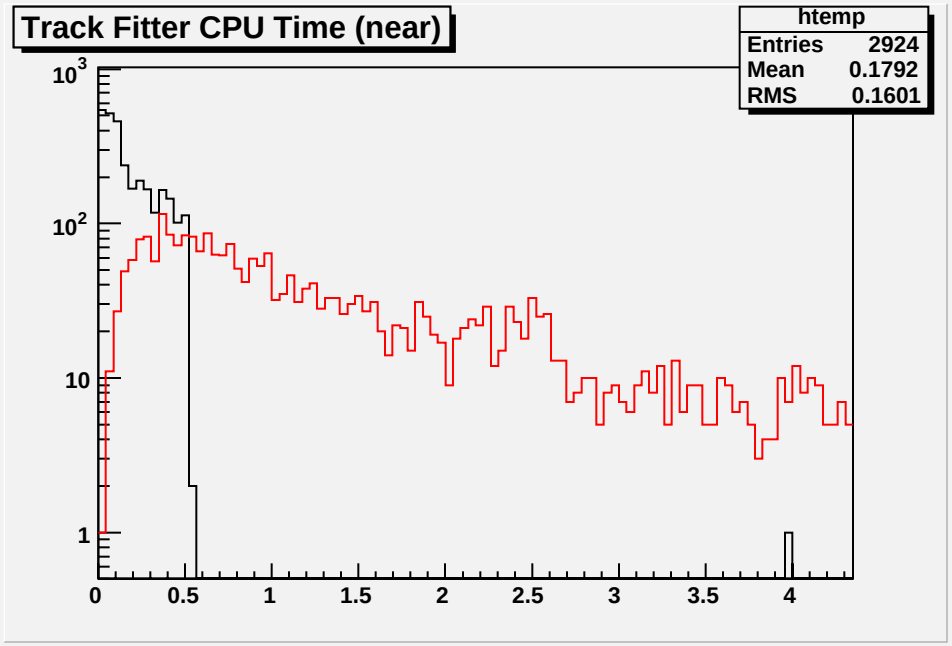
Track Finder CPU Time (Near)

 # Entries 2924 / 2184

Mean 3.617175 / 0.972985

RMS 2.601808 / 0.162126





Track Fitter CPU Time (Far)

 # Entries 1710 / 1688

Mean 0.173129 / 1.619876

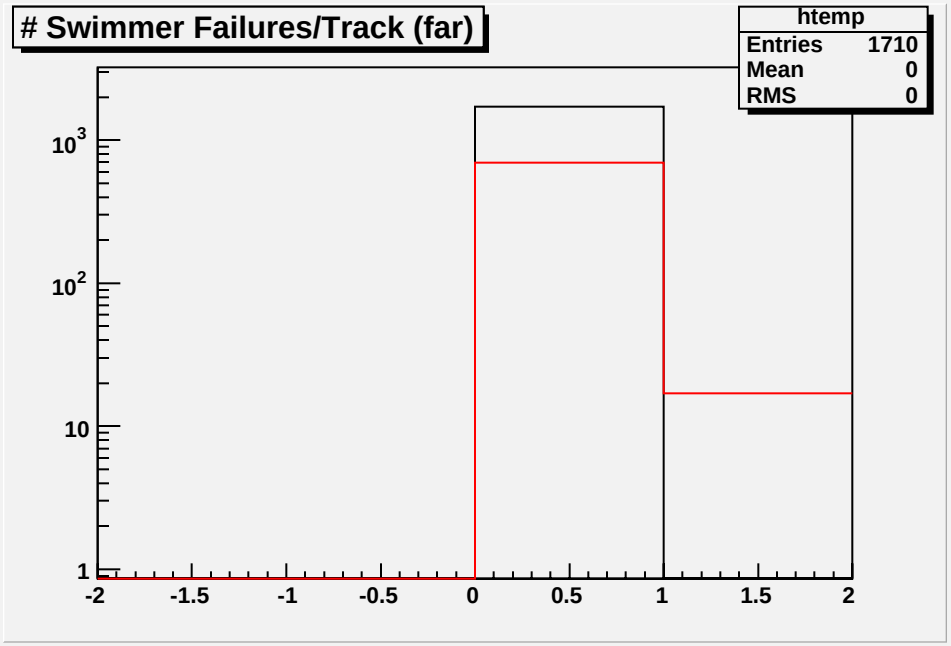
RMS 0.336227 / 2.141719

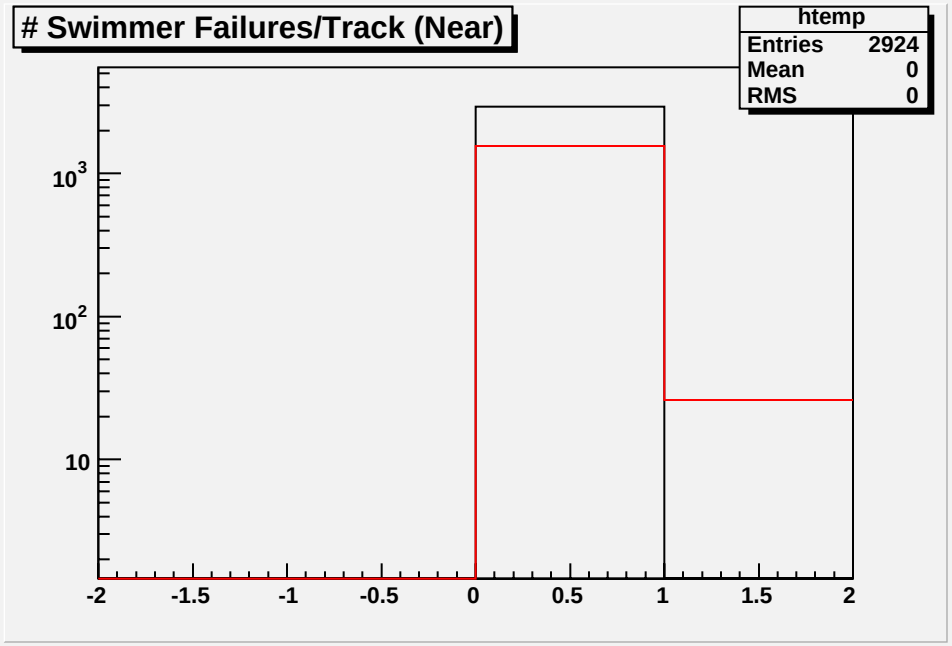
Track Fitter CPU Time (Near)

 # Entries 2924 / 2897

Mean 0.179227 / 1.759071

RMS 0.160063 / 2.325801





 # Swimmer Failures (Far)

 # Entries 1710 / 1581

Mean 0.000000 / 7.806452

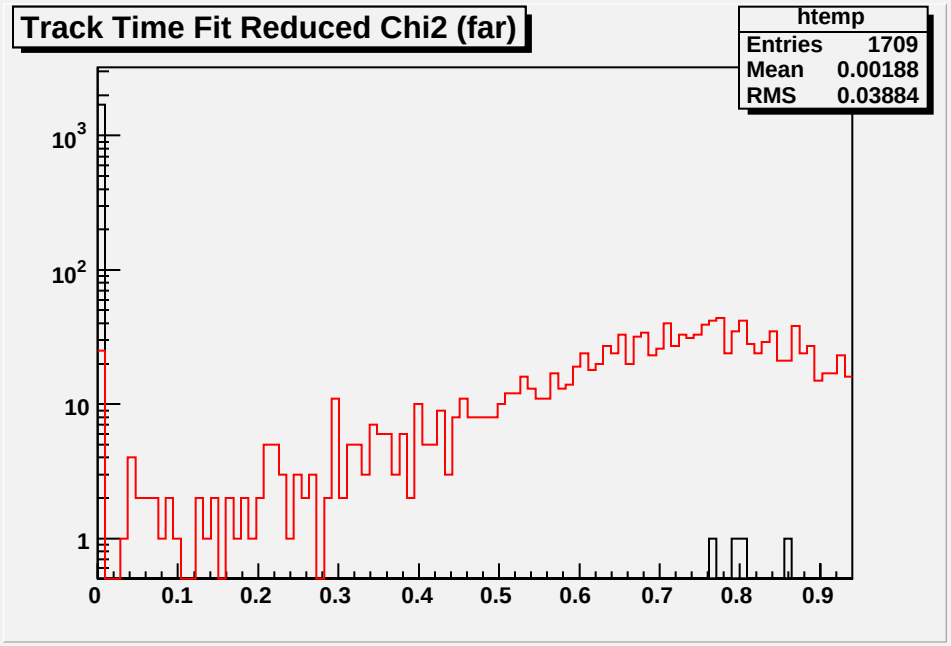
RMS 0.000000 / 10.866995

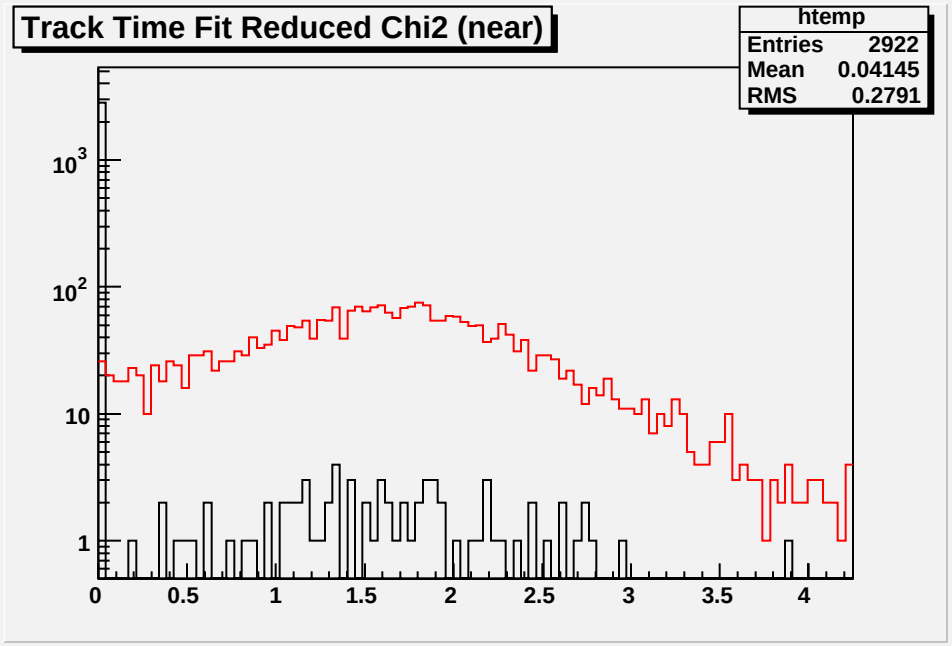
 # Swimmer Failures (Near)

 # Entries 2924 / 2782

Mean 0.000000 / 5.730769

RMS 0.000000 / 9.683291





Time Fit Reduced Chi2 (Far Detector)

 # Entries 1709 / 1688

Mean 0.001880 / 0.768708

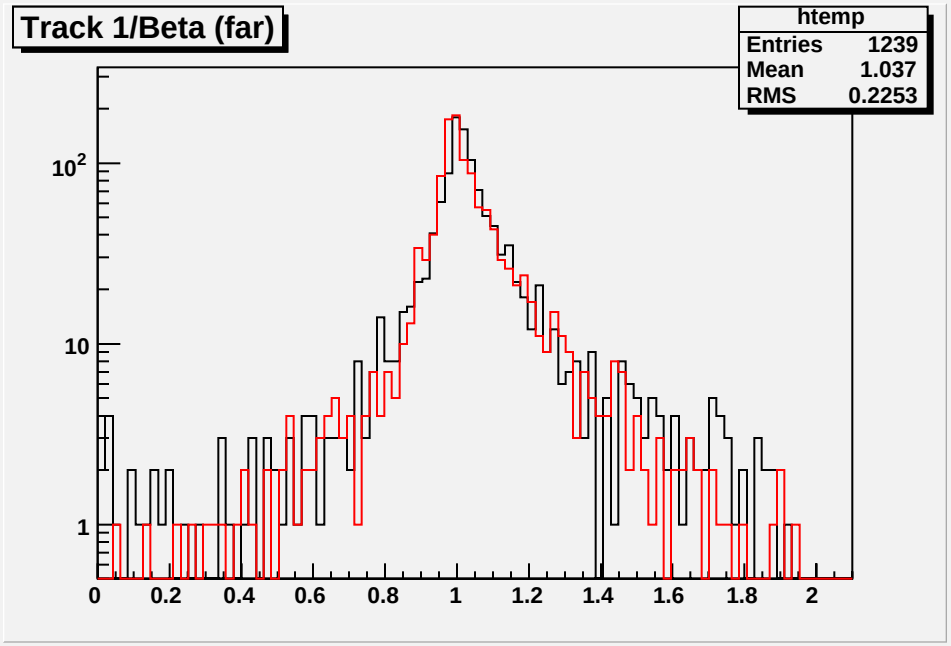
RMS 0.038845 / 0.319703

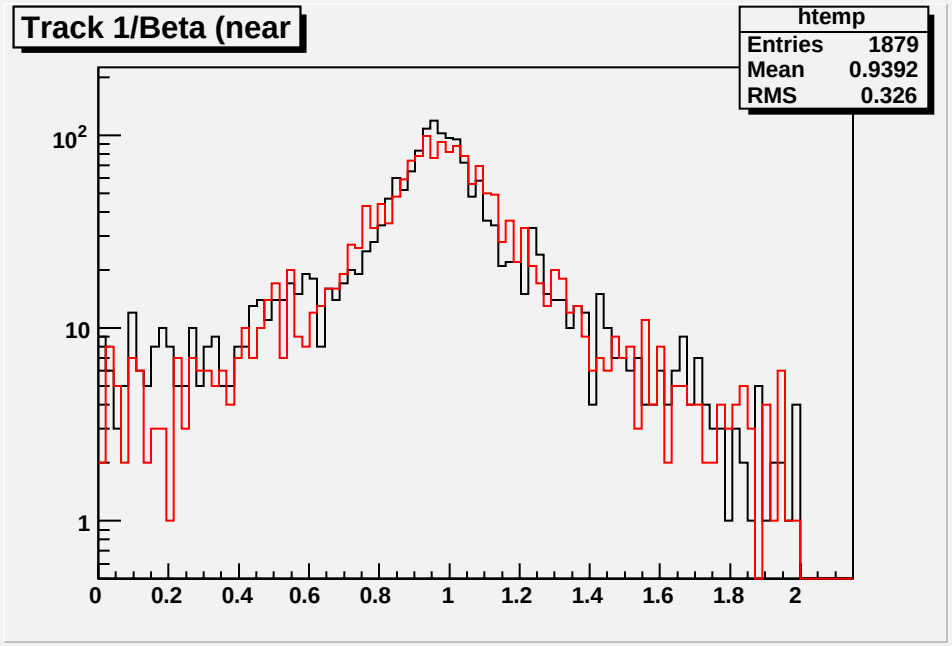
Time Fit Reduced Chi2 (Near Detector)

 # Entries 2922 / 2886

Mean 0.041447 / 1.712226

RMS 0.279087 / 0.988455





1/beta (Far Detector)

 # Entries 1239 / 1227

Mean 1.036835 / 1.032315

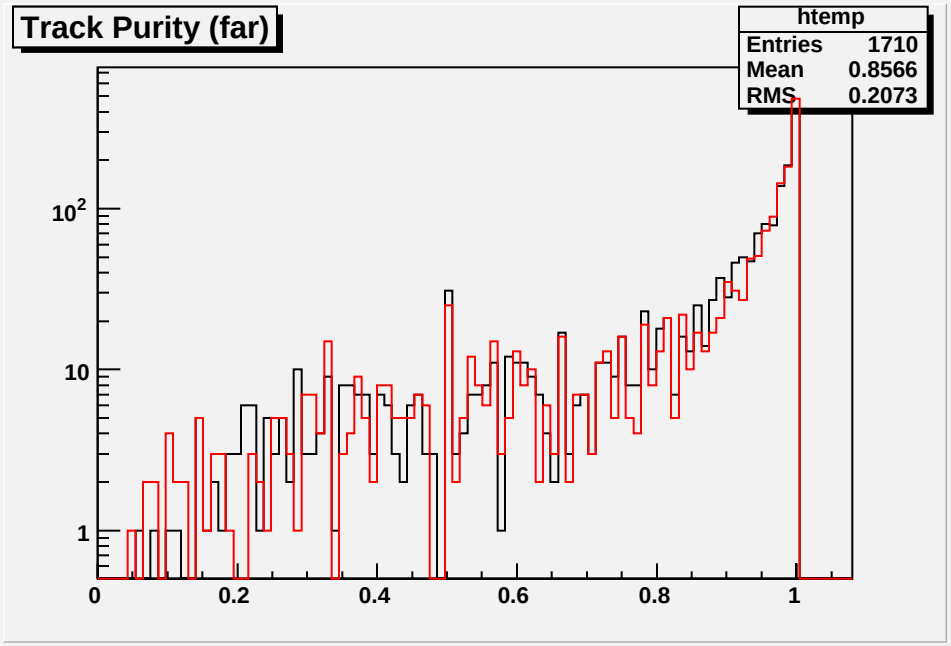
RMS 0.225279 / 0.179710

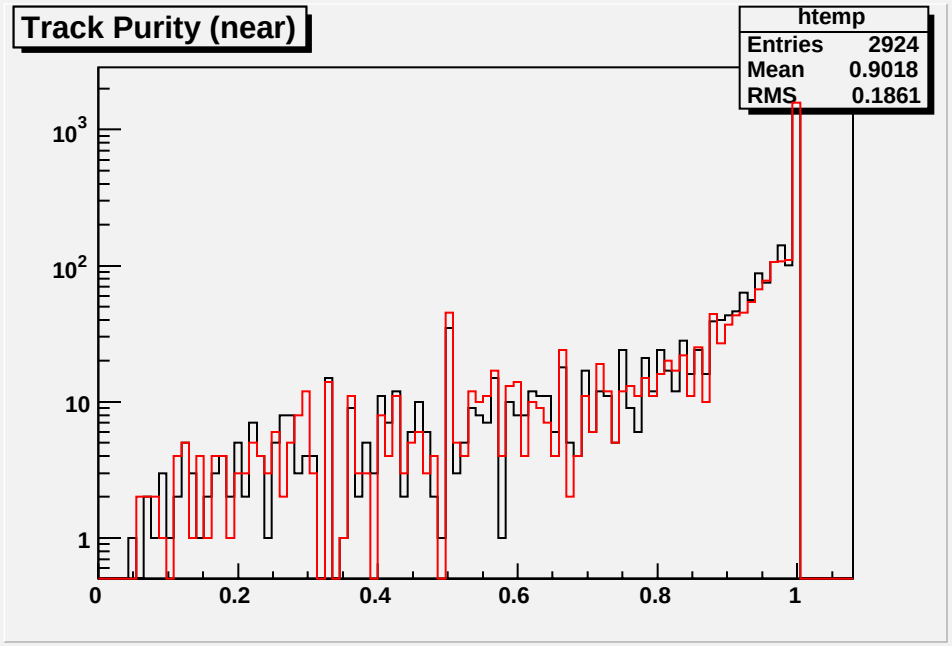
1/beta (Near Detector)

 # Entries 1879 / 1841

Mean 0.939232 / 0.962179

RMS 0.326024 / 0.306758





Track Purity (Far Detector)

 # Entries 1710 / 1688

Mean 0.856635 / 0.863289

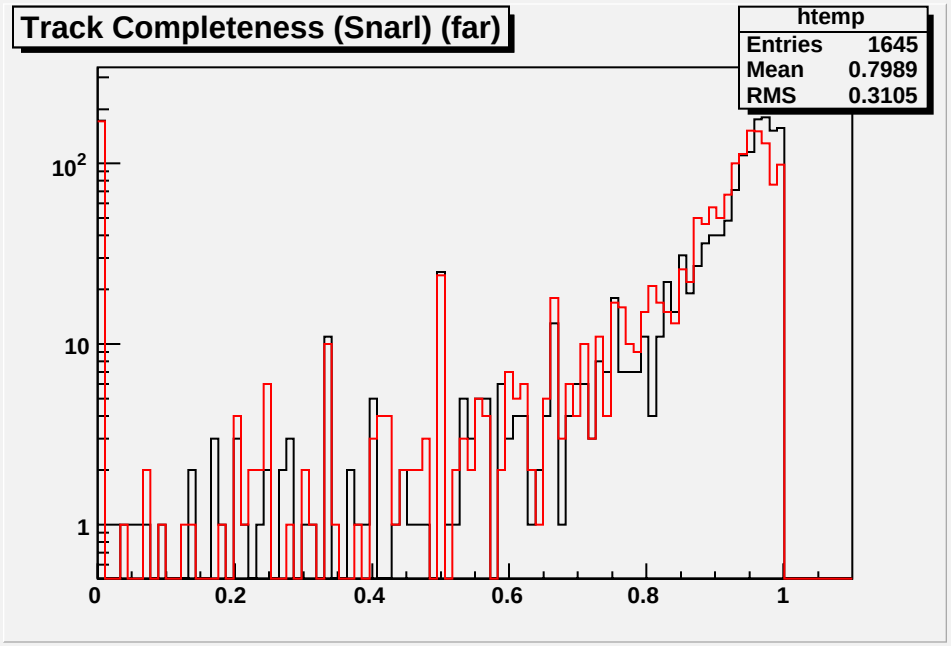
RMS 0.207337 / 0.210367

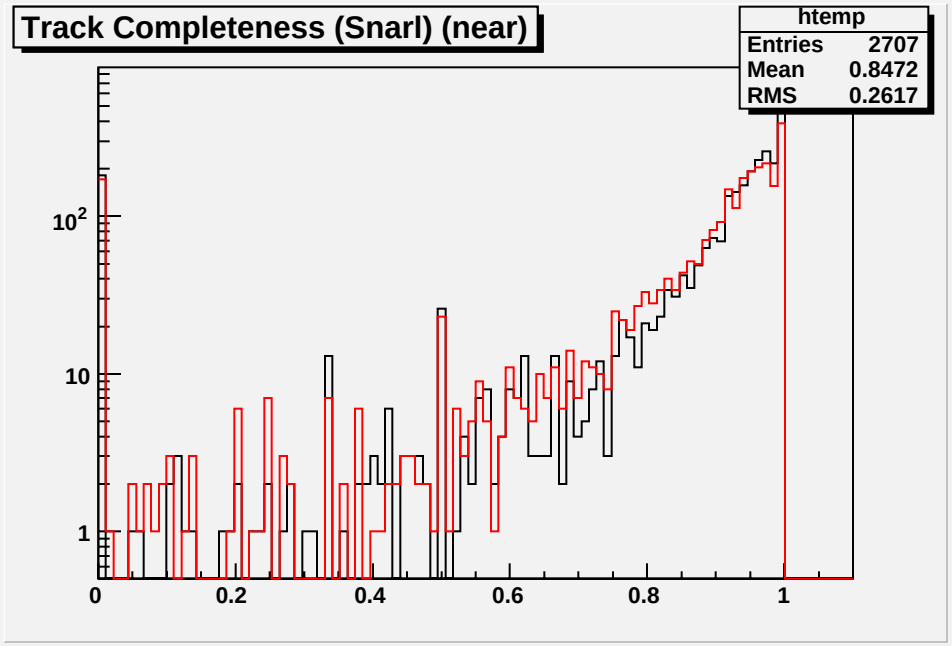
Track Purity (Near Detector)

 # Entries 2924 / 2897

Mean 0.901786 / 0.902345

RMS 0.186082 / 0.188311





Track Completeness (Far Detector)

 # Entries 1645 / 1627

Mean 0.798902 / 0.784048

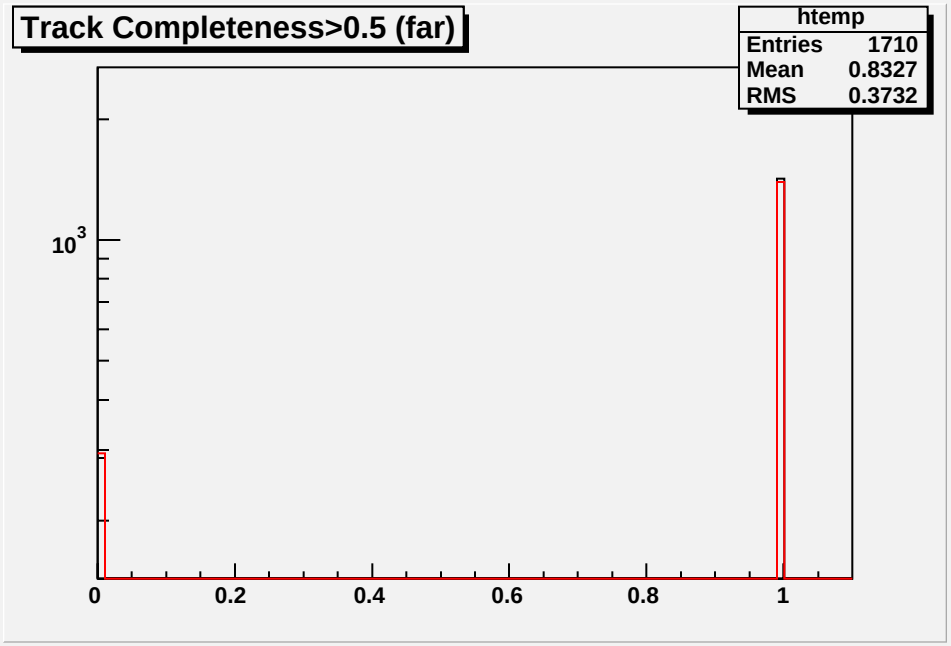
RMS 0.310505 / 0.306819

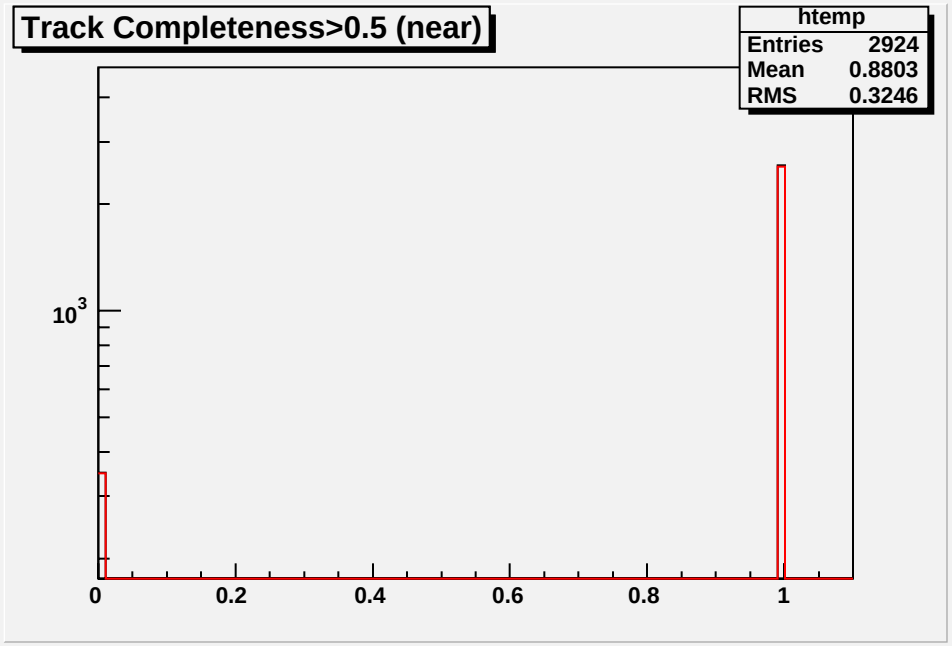
Track Completeness (Near Detector)

 # Entries 2707 / 2668

Mean 0.847229 / 0.834771

RMS 0.261700 / 0.260364





Track Completeness>0.5

 # Entries 1710 / 1688

Mean 0.832749 / 0.825829

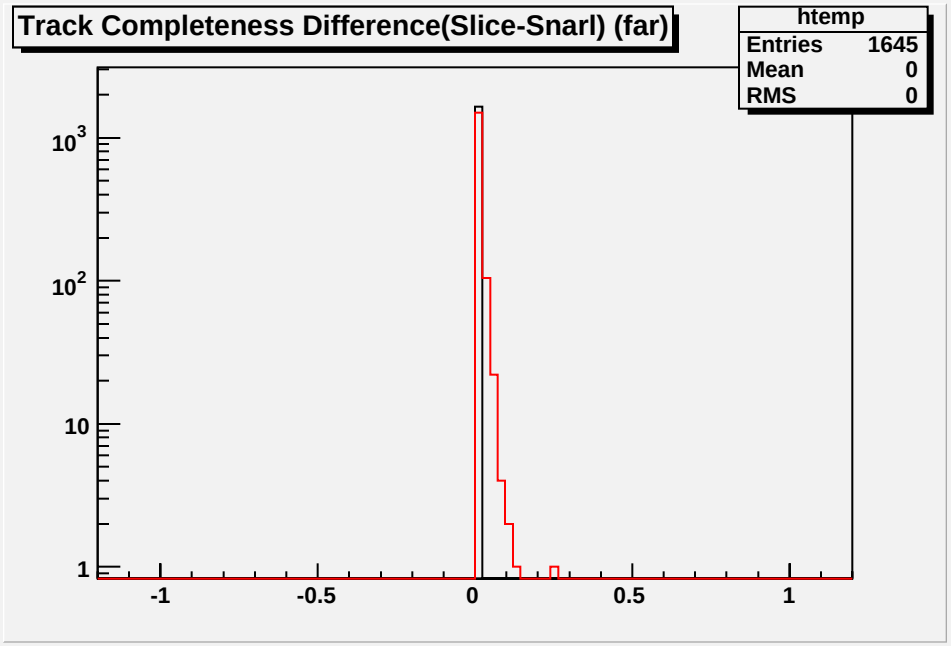
RMS 0.373200 / 0.379256

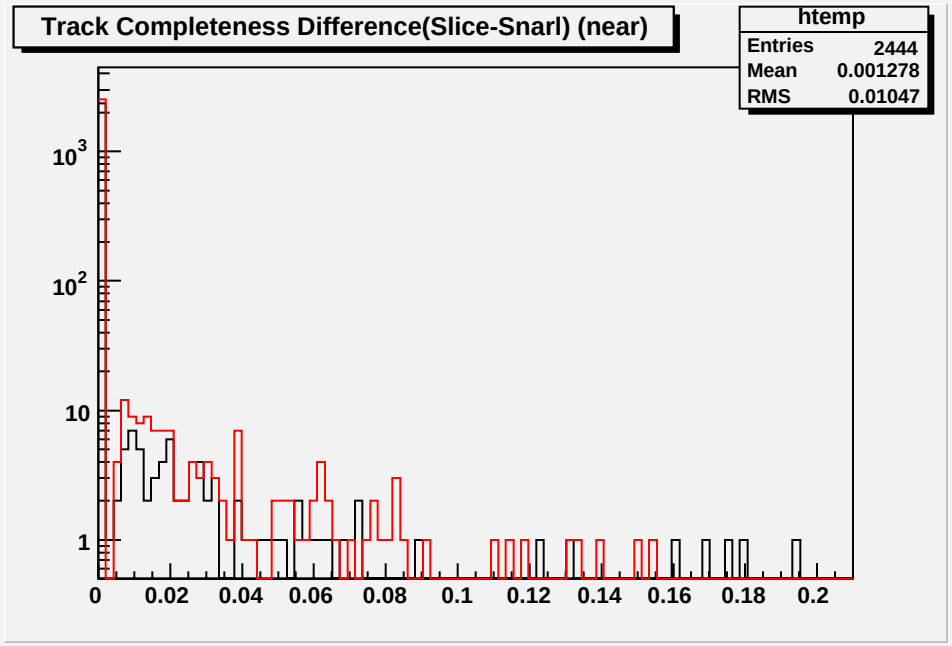
Track Completeness>0.5 (Near Detector)

 # Entries 2924 / 2897

Mean 0.880301 / 0.879876

RMS 0.324609 / 0.325107





Track Compl. (Slice-Snarl) (Far Detector)

 # Entries 1645 / 1627

Mean 0.000000 / 0.006862

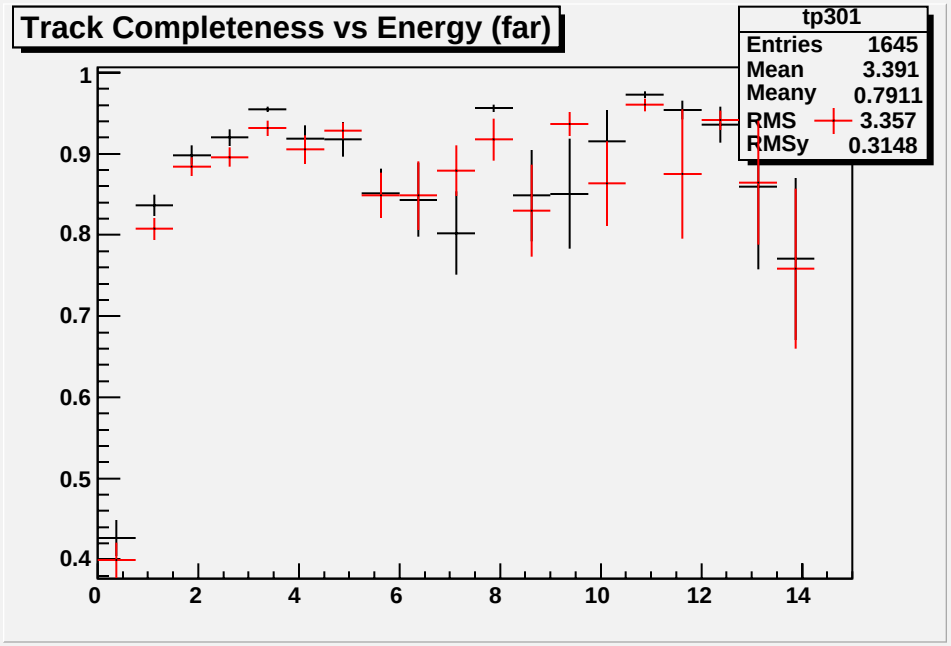
RMS 0.000000 / 0.014187

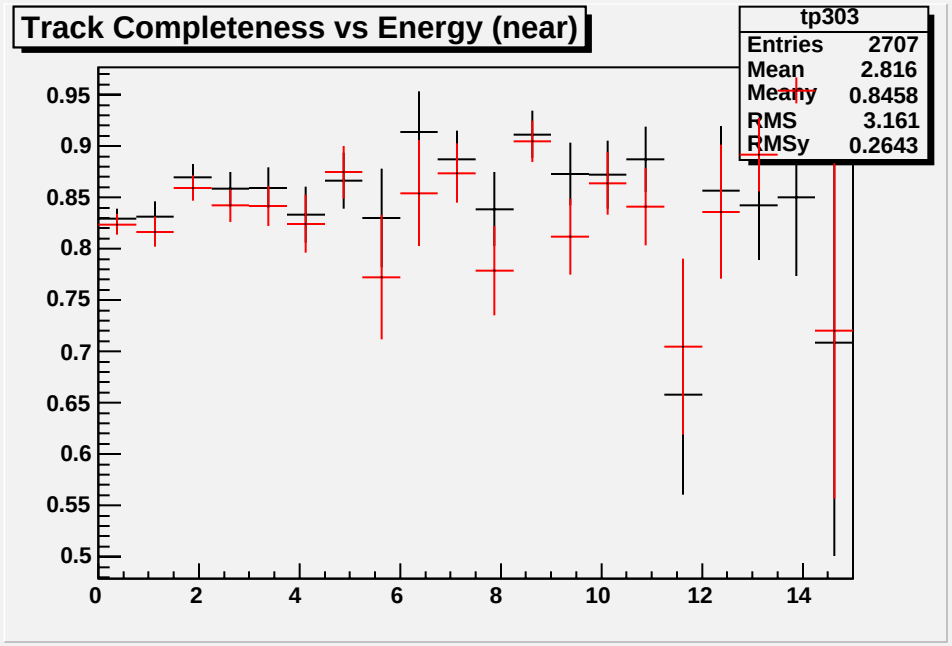
Track Compl Diff(Slice-Snarl) (Near Detector)

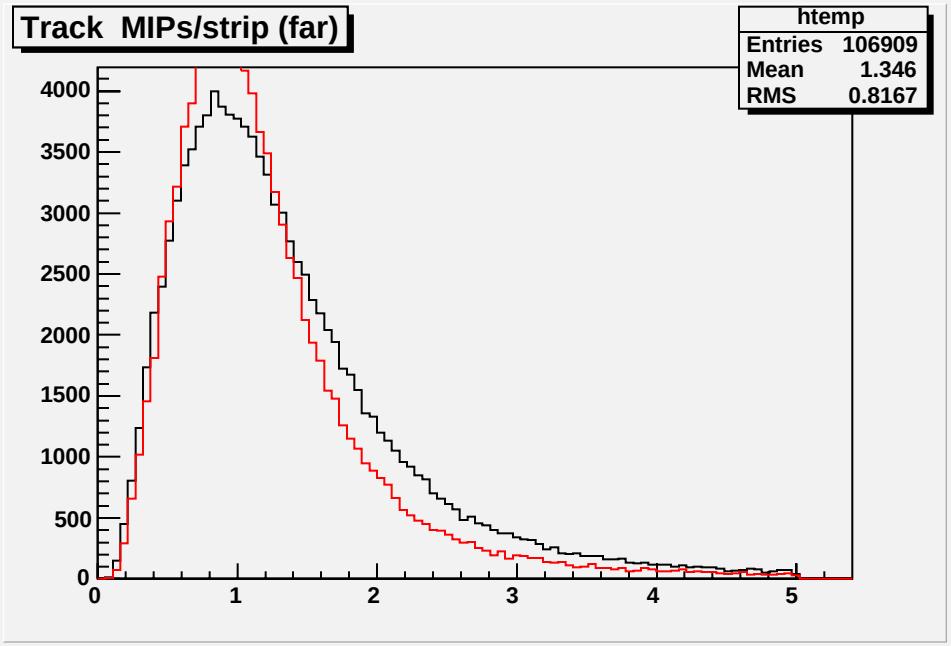
 # Entries 2444 / 2668

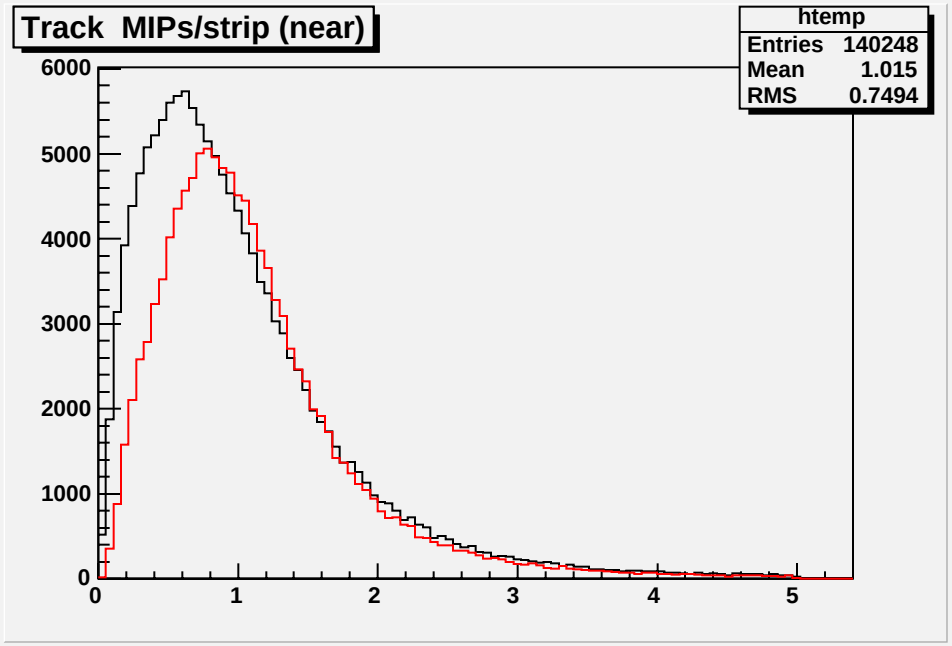
Mean 0.001278 / 0.003261

RMS 0.010467 / 0.027311


Track Completeness vs Energy (far)
tp301
Entries 1645
Mean 3.391
Meany 0.7911
RMS 3.357
RMSy 0.3148
1
0.9
0.8
0.7
0.6
0.5
0.4
0
2
4
6
8
10
12
14


Track Completeness vs Energy (near)
tp303
Entries 2707
Mean 2.816
Meany 0.8458
RMS 3.161
RMSy 0.2643
0.95
0.9
0.85
0.8
0.75
0.7
0.65
0.6
0.55
0.5
0
2
4
6
8
10
12
14





Track MIPS/strip (Far Detector)

 # Entries 106909 / 99545

Mean 1.345994 / 1.203396

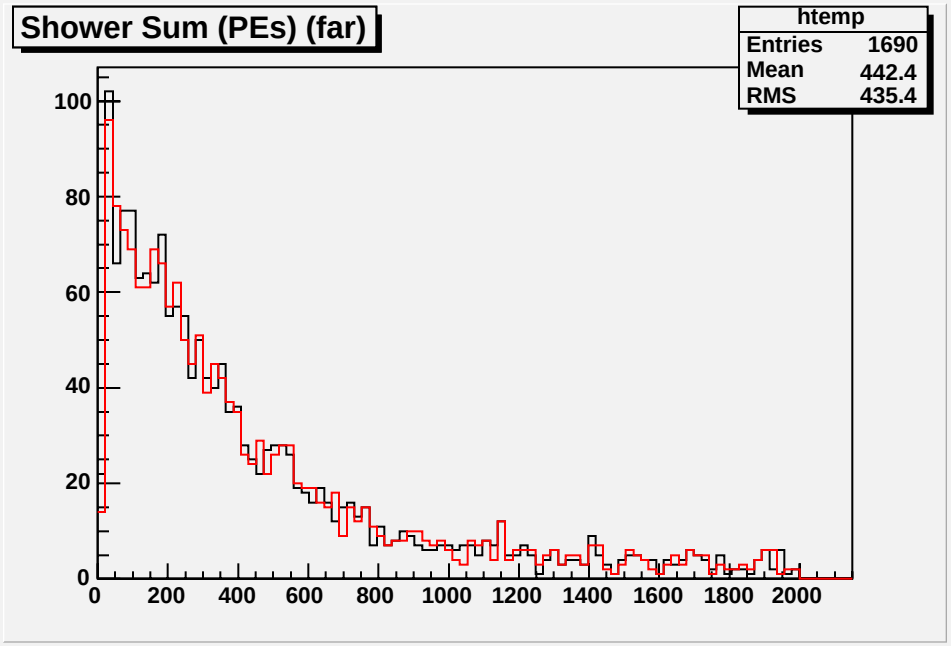
RMS 0.816652 / 0.702791

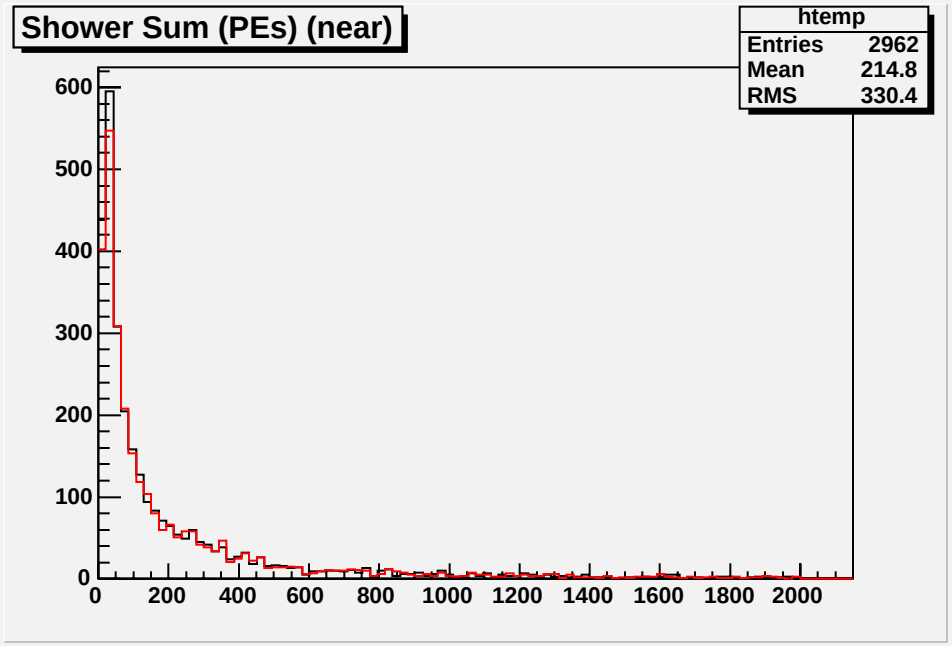
Track MIPs/Strip (Near Detector)

 # Entries 140248 / 117442

Mean 1.015070 / 1.106200

RMS 0.749410 / 0.695381





Shower Sum (PEs) (Far Detector)

 # Entries 1690 / 1680

Mean 442.406899 / 446.562421

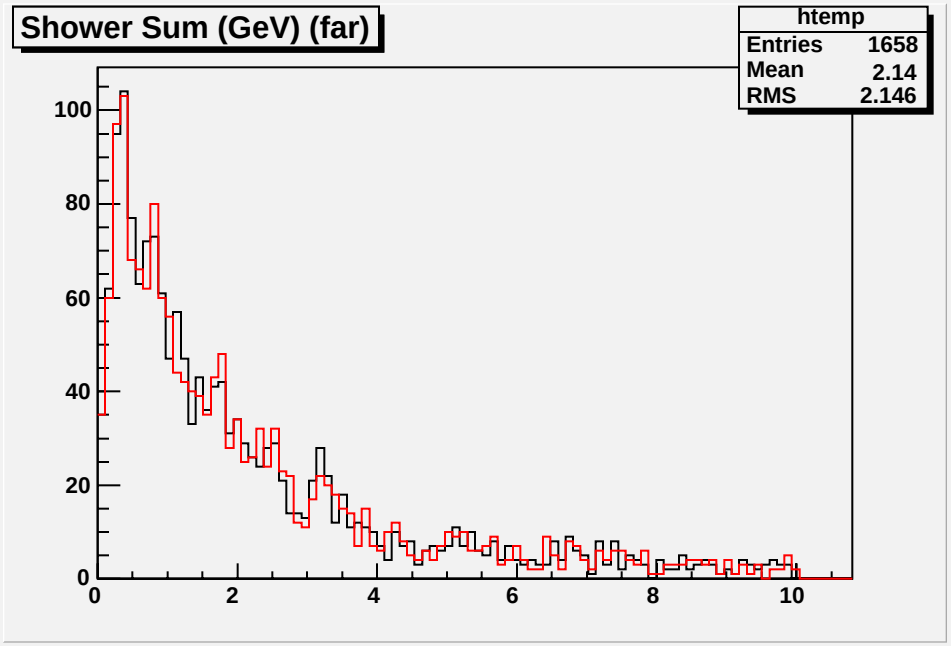
RMS 435.433489 / 436.125298

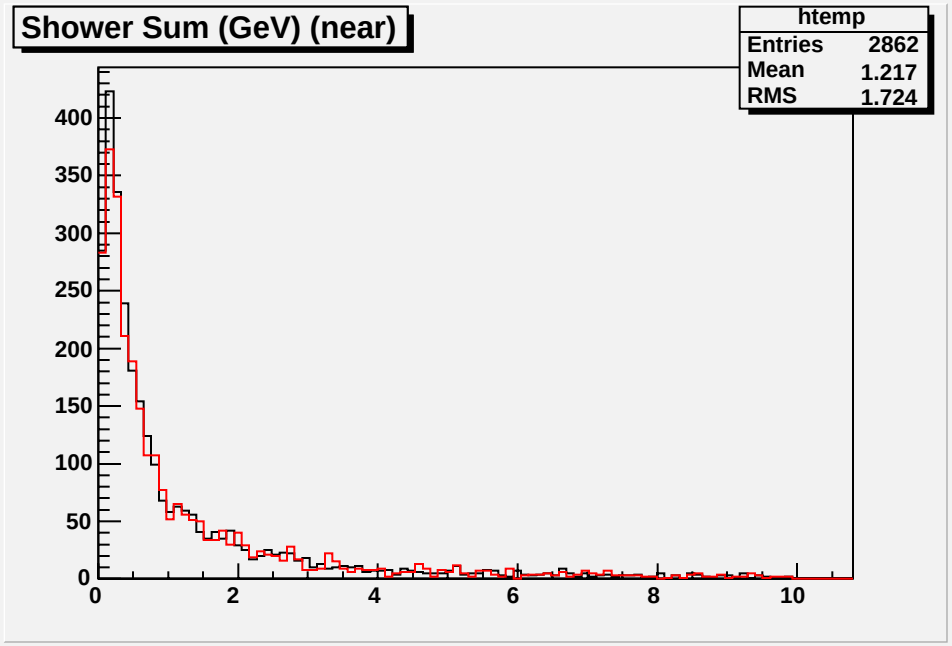
Shower Sum (PEs) (Near Detector)

 # Entries 2962 / 2866

Mean 214.831334 / 221.714253

RMS 330.374925 / 337.378854





Shower Sum GeV (Far Detector)

 # Entries 1658 / 1645

Mean 2.140125 / 2.164119

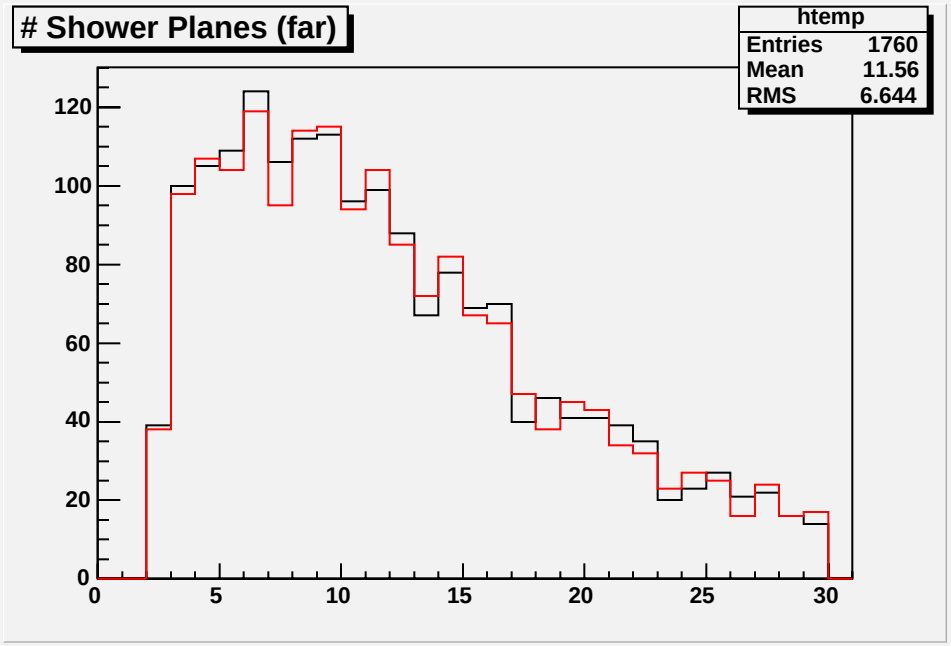
RMS 2.146433 / 2.148078

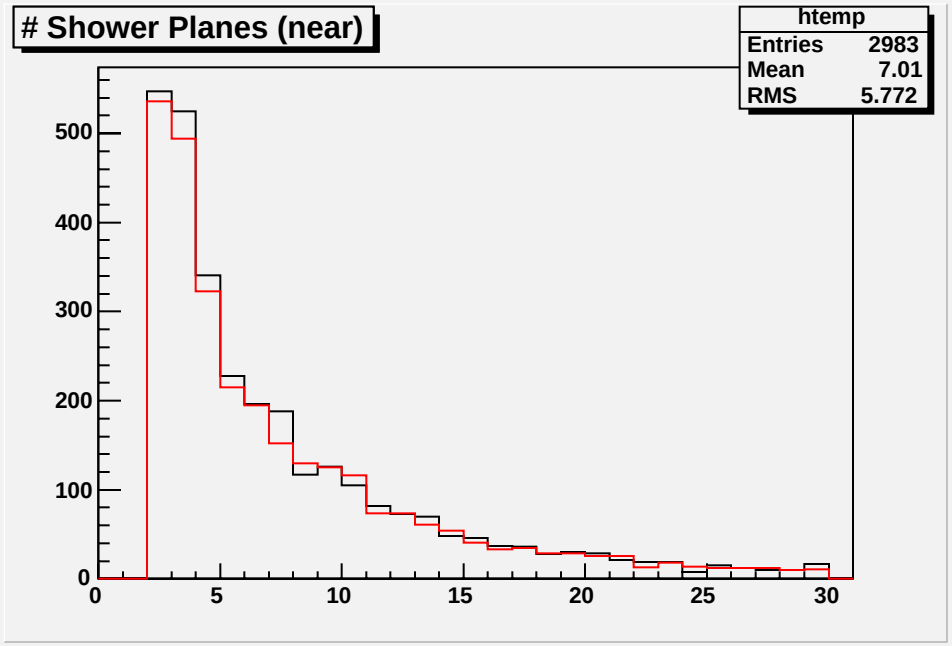
Shower Sum (GeV) (Near Detector)

 # Entries 2862 / 2783

Mean 1.216705 / 1.265066

RMS 1.723949 / 1.777630





 # Planes/Shower (Far Detector)

 # Entries 1760 / 1746

Mean 11.557955 / 11.626575

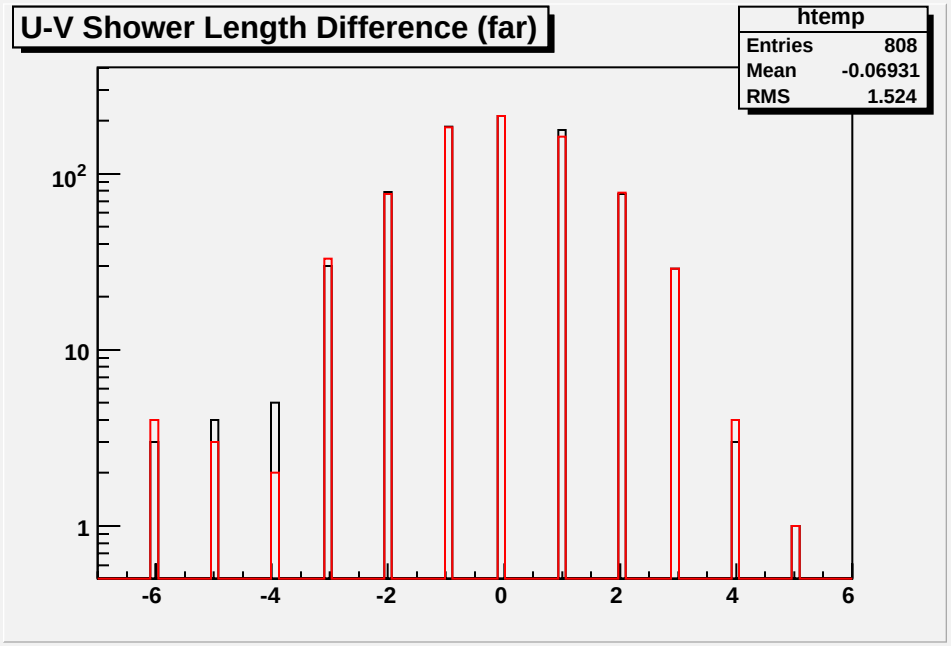
RMS 6.644123 / 6.656974

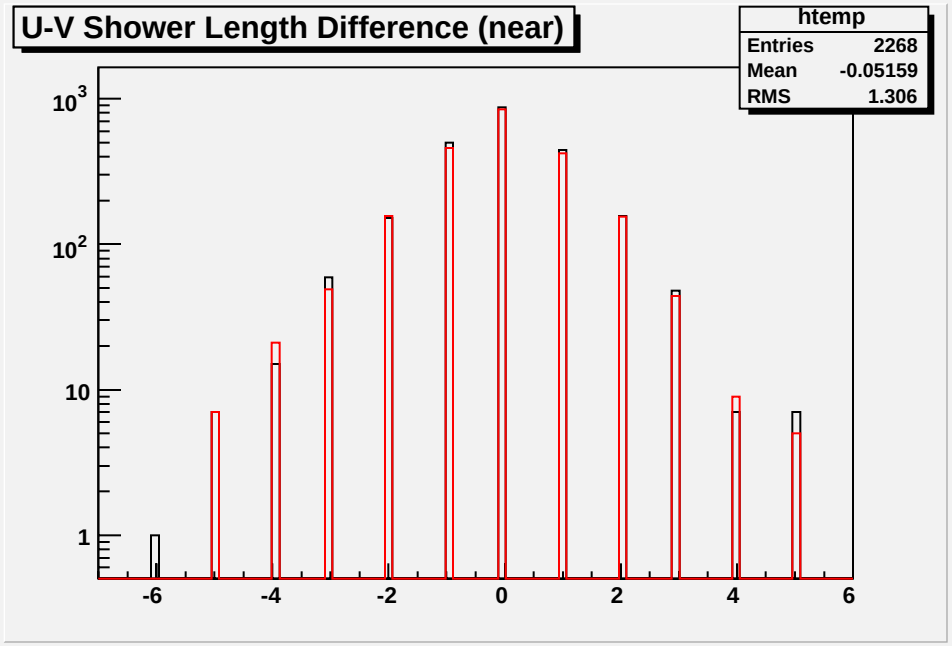
 # Shower Planes (Near Detector)

 # Entries 2983 / 2870

Mean 7.010057 / 7.031010

RMS 5.771771 / 5.756930





U-V Shower Length Diff. (Far Detector)

 # Entries 808 / 790

Mean -0.069307 / -0.070886

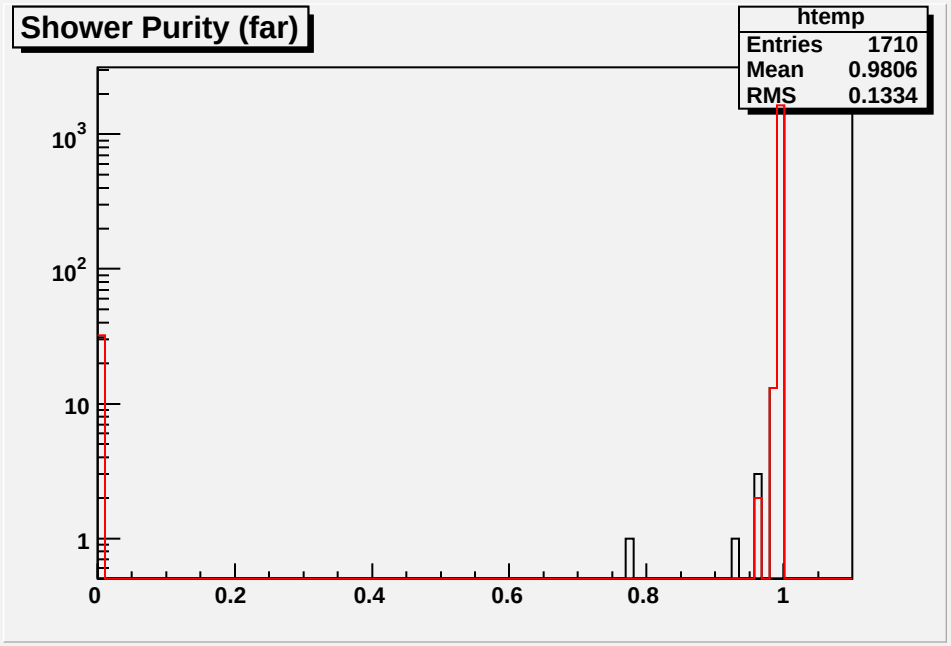
RMS 1.523788 / 1.534428

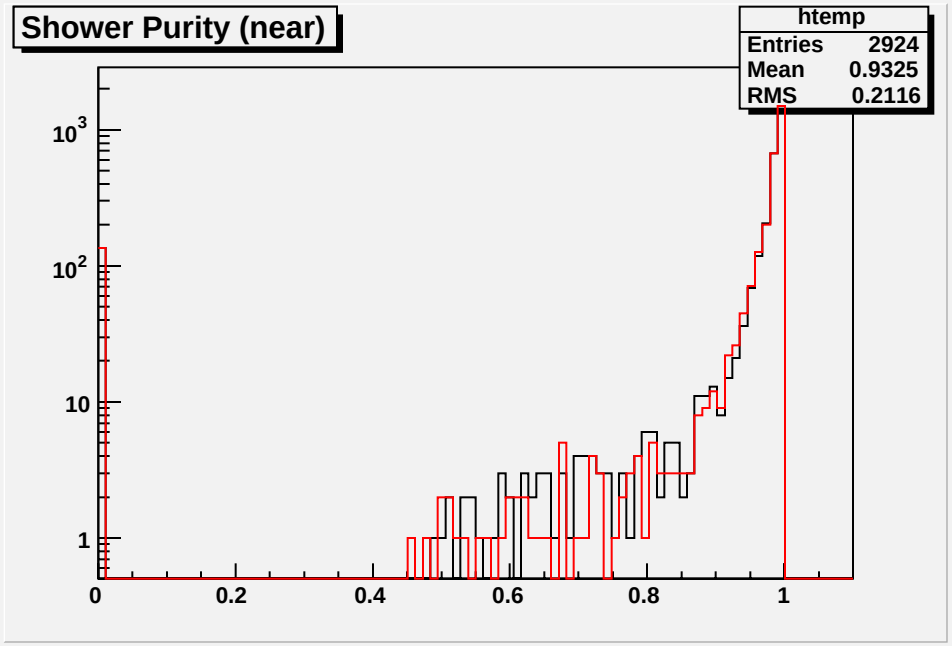
U-V Shower Length Diff (Near Detector)

 # Entries 2268 / 2170

Mean -0.051587 / -0.052535

RMS 1.306098 / 1.312122





Shower Purity (Far Detector)

 # Entries 1710 / 1688

Mean 0.980577 / 0.979970

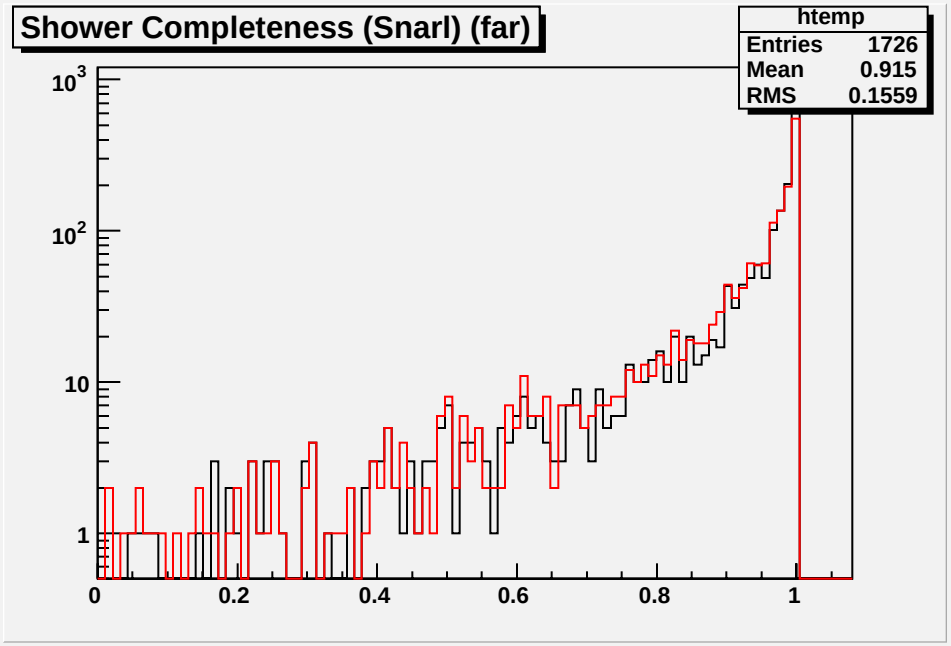
RMS 0.133381 / 0.136240

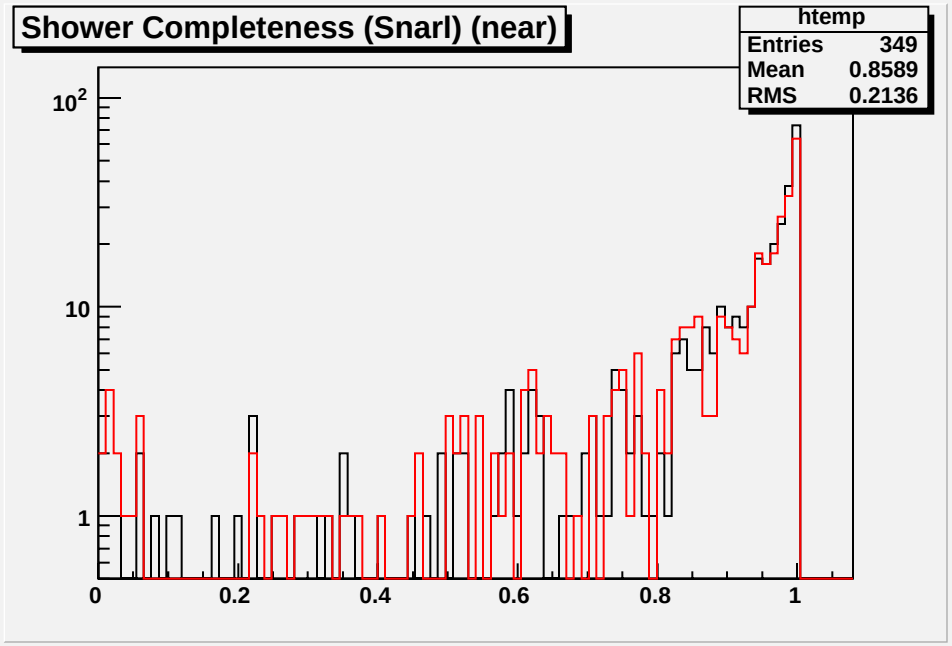
Shower Purity (Near Detector)

 # Entries 2924 / 2268

Mean 0.932473 / -0.051587

RMS 0.211602 / 1.306098





Shower Completeness (Far Detector)

 # Entries 1726 / 1782

Mean 0.914964 / 0.874118

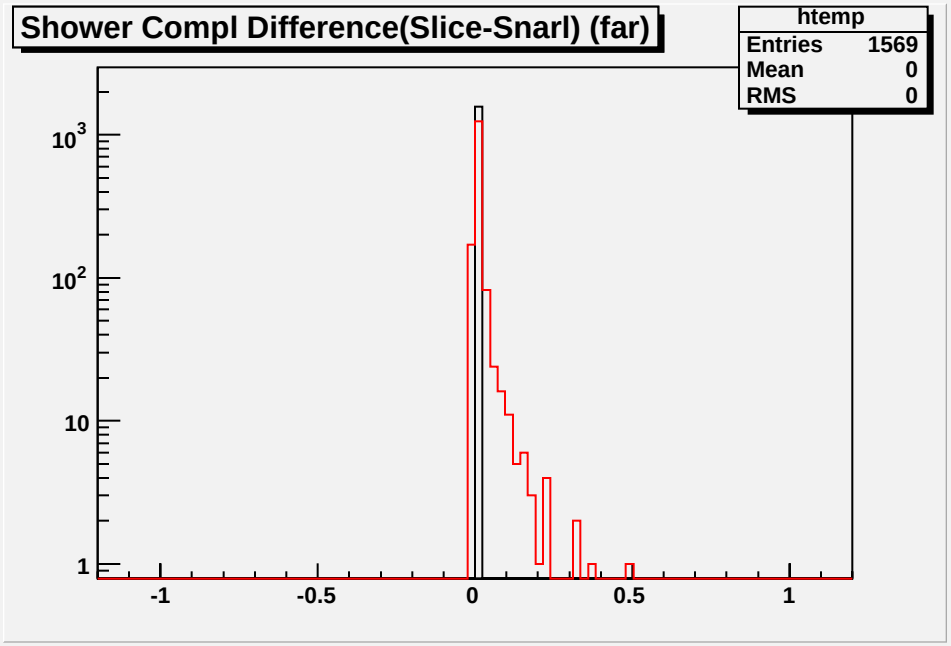
RMS 0.155897 / 0.230650

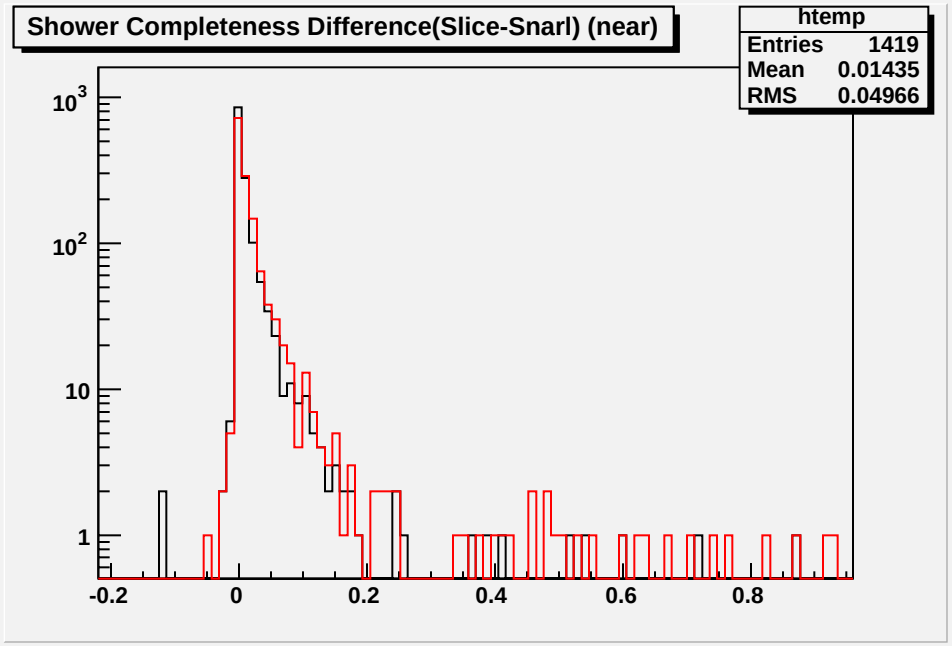
Shower Completeness (Near Detector)

 # Entries 349 / 350

Mean 0.858894 / 0.834247

RMS 0.213555 / 0.235166





Shower Compl. (Slice-Snarl) (Far Detector)

 # Entries 1569 / 1573

Mean 0.000000 / 0.009532

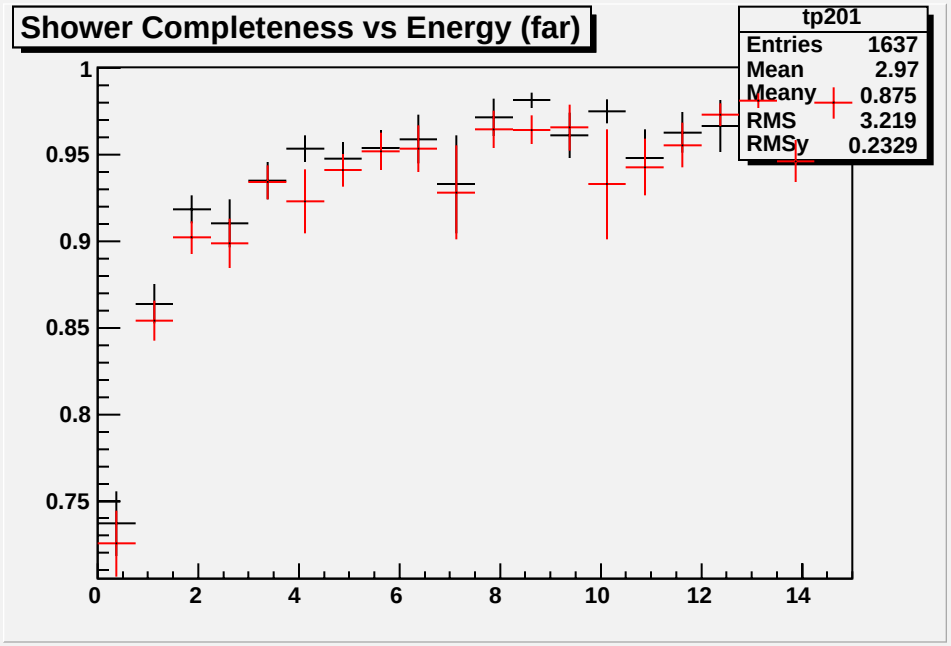
RMS 0.000000 / 0.030869

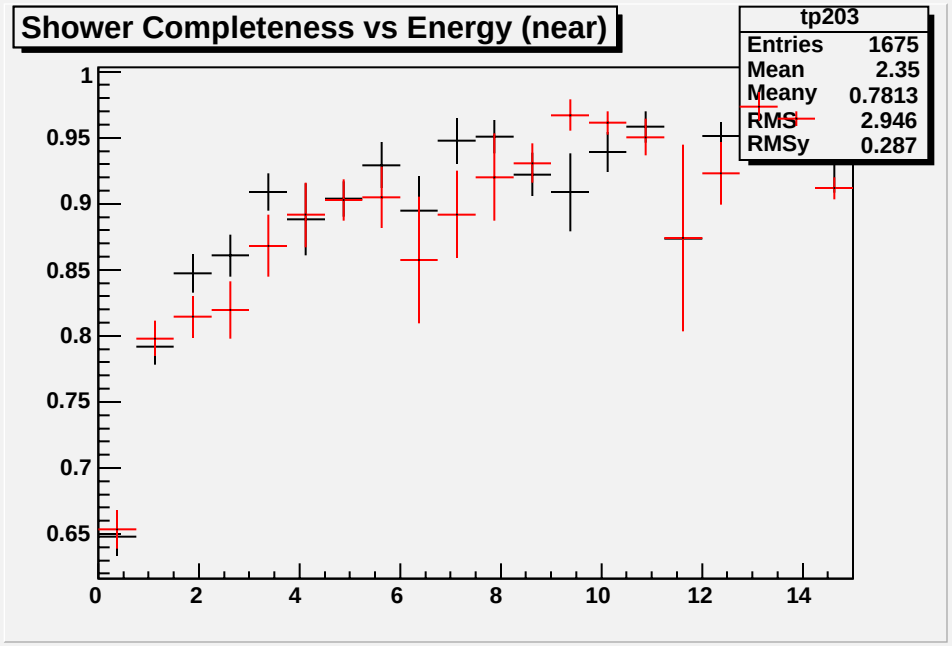
Shower Compl Diff (Slice-Snarl)(Near)

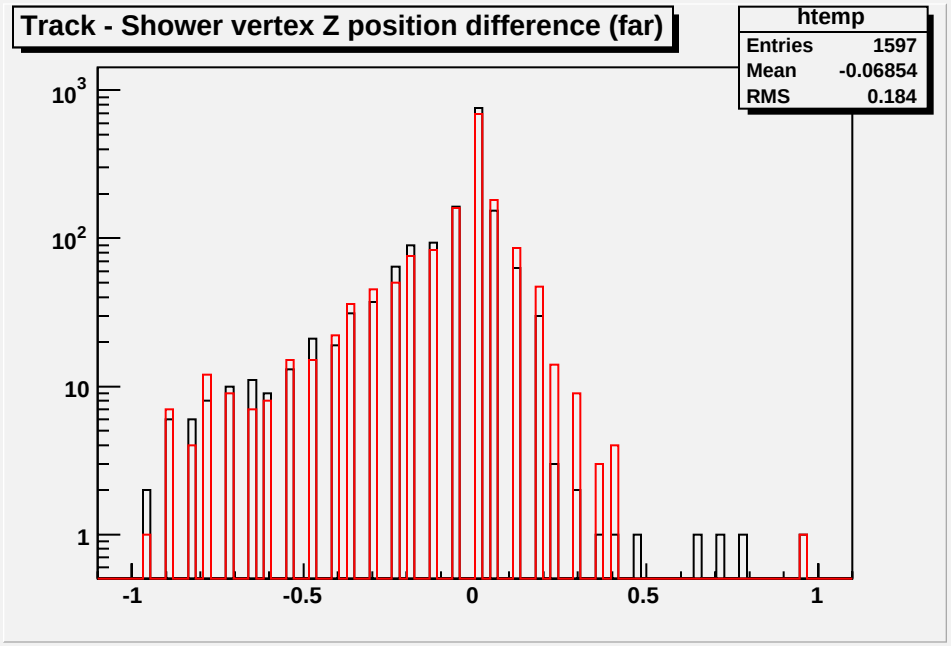
 # Entries 1569 / 1409

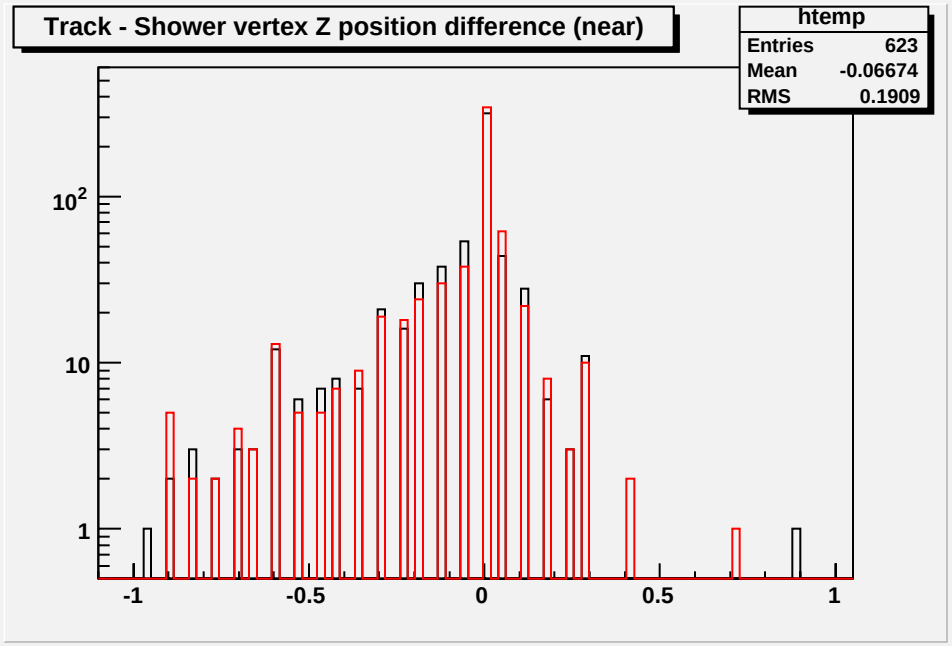
Mean 0.000000 / 0.026117

RMS 0.000000 / 0.092519


Shower Completeness vs Energy (far)
tp201
Entries 1637
Mean 2.97
Meany 0.875
RMS 3.219
RMSy 0.2329
1
0.95
0.9
0.85
0.8
0.75
0
2
4
6
8
10
12
14


Shower Completeness vs Energy (near)
tp203
Entries 1675
Mean 2.35
Meany 0.7813
RMS 2.946
RMSy 0.287
1
0.95
0.9
0.85
0.8
0.75
0.7
0.65
0
2
4
6
8
10
12
14





Track-Shower vertex Z diff. (Far Detector)

 # Entries 1597 / 1588

Mean -0.068541 / -0.057881

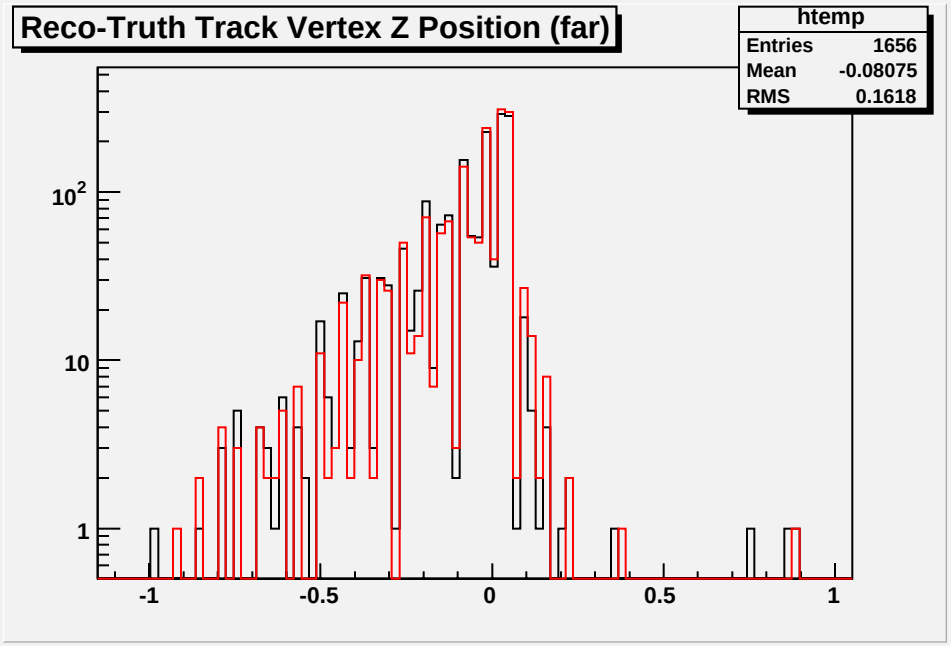
RMS 0.183971 / 0.186887

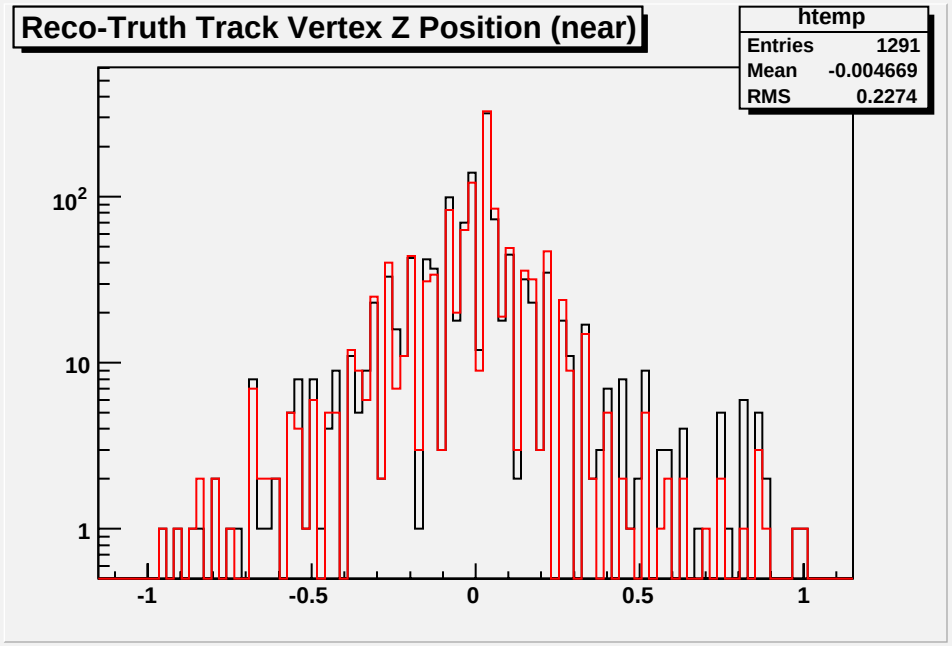
Track - Shower Vertex Z diff. (Near Detector)

 # Entries 623 / 635

Mean -0.066742 / -0.060522

RMS 0.190882 / 0.193317





Reco-Truth Track Vertex Z diff (Far Detector)

 # Entries 1656 / 1646

Mean -0.080752 / -0.069207

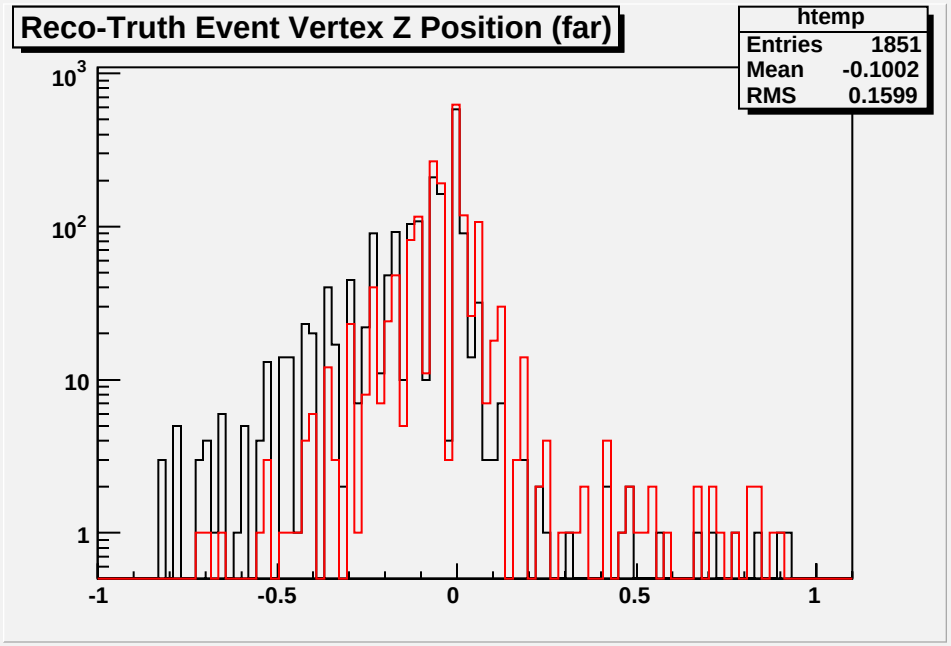
RMS 0.161805 / 0.155766

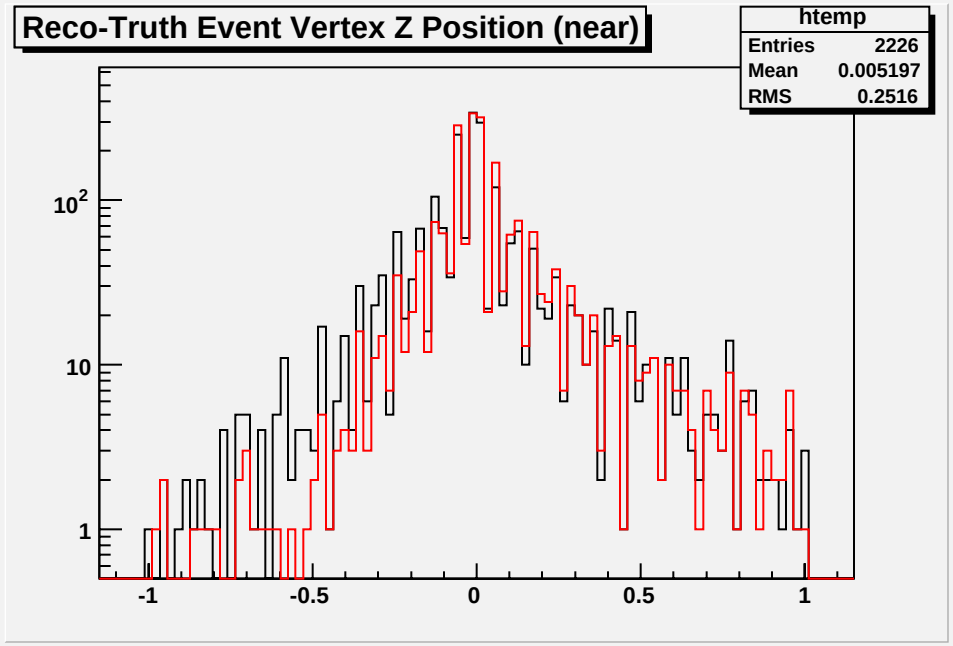
Reco-Truth Track Vtx Z (Near Detector)

 # Entries 1656 / 1251

Mean -0.080752 / -0.010791

RMS 0.161805 / 0.205349





Reco-Truth Event Vertex Z diff (Far Detector)

 # Entries 1851 / 1845

Mean -0.100197 / -0.034668

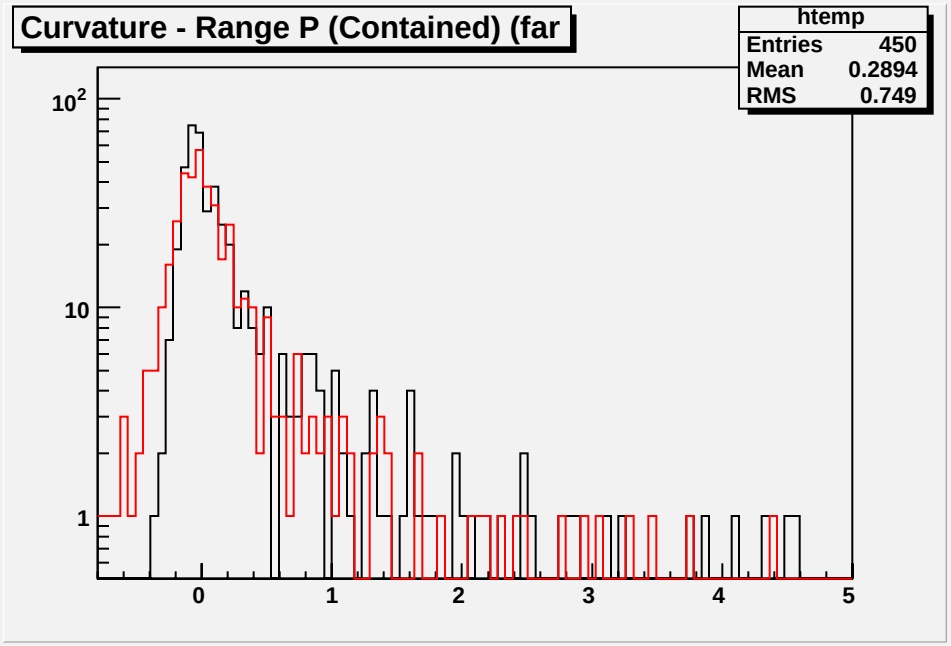
RMS 0.159917 / 0.125594

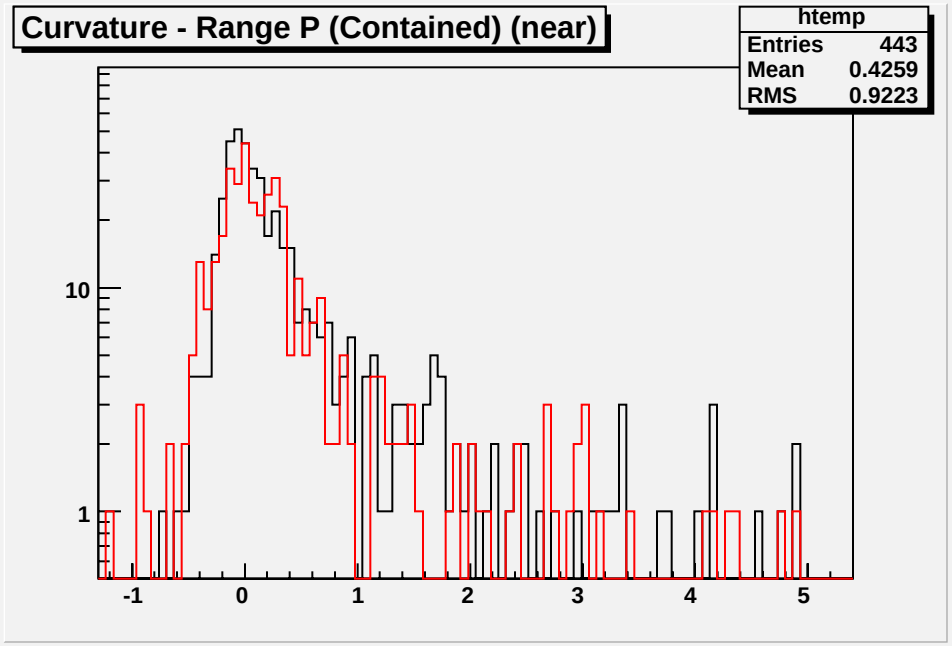
Reco-Truth Ev Vtx Z (Near Detector)

 # Entries 2226 / 2153

Mean 0.005197 / 0.039006

RMS 0.251638 / 0.220984





Curvature - Range P (Far Detector)

 # Entries 450 / 422

Mean 0.289366 / 0.159965

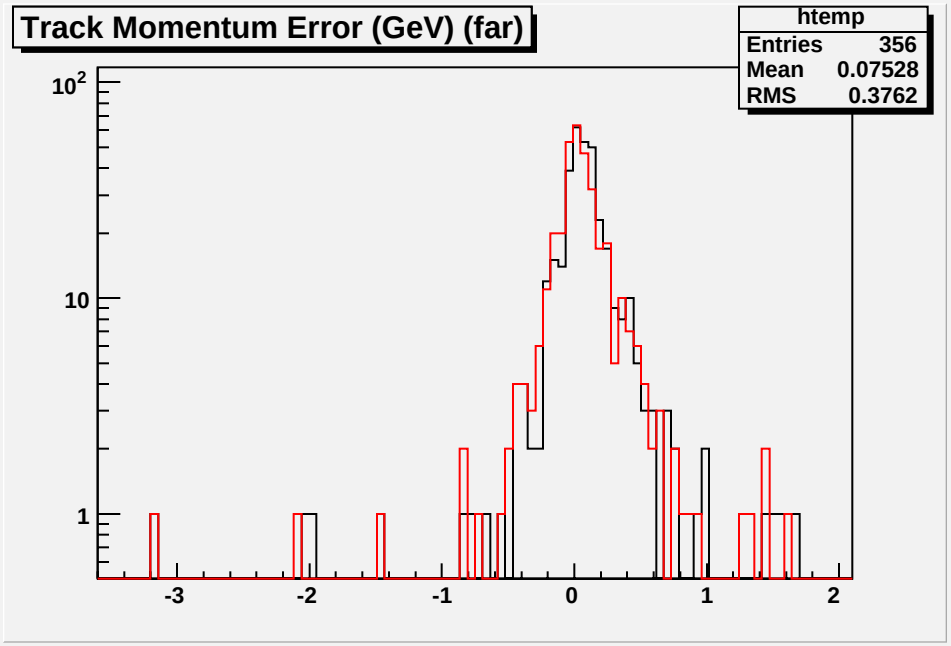
RMS 0.749025 / 0.648260

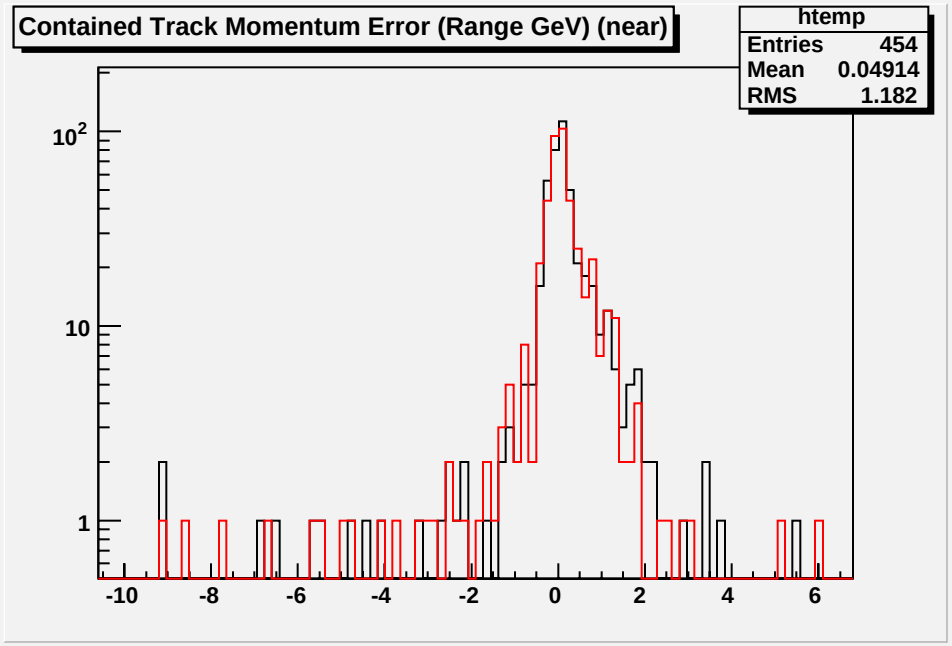
Curvature - Range P (Near Detector)

 # Entries 443 / 392

Mean 0.425935 / 0.332539

RMS 0.922325 / 0.869177





Track Momentum Error (GeV) (Far Detector)

 # Entries 356 / 355

Mean 0.075280 / 0.024195

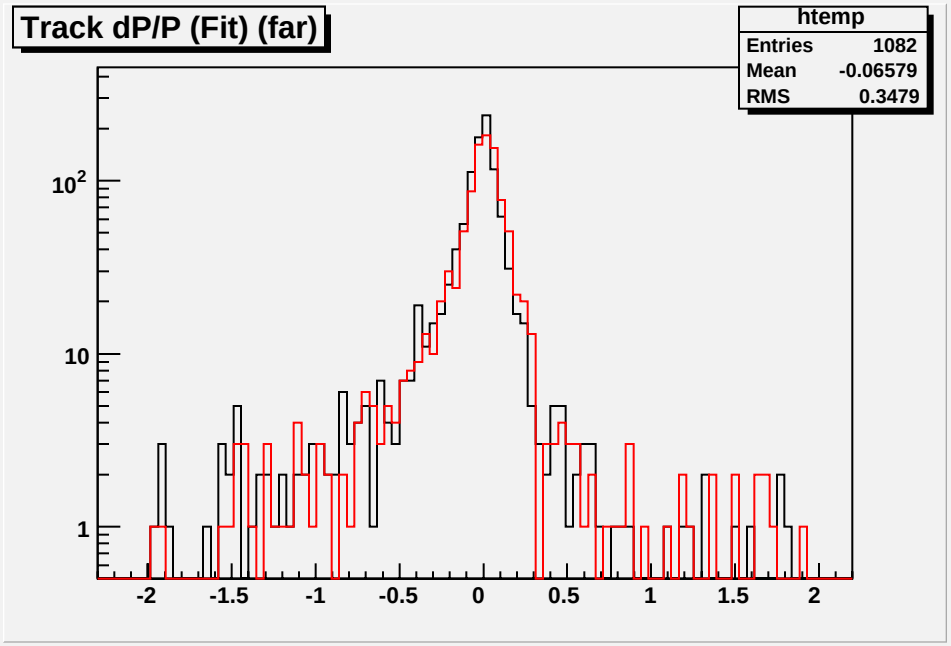
RMS 0.376188 / 0.629296

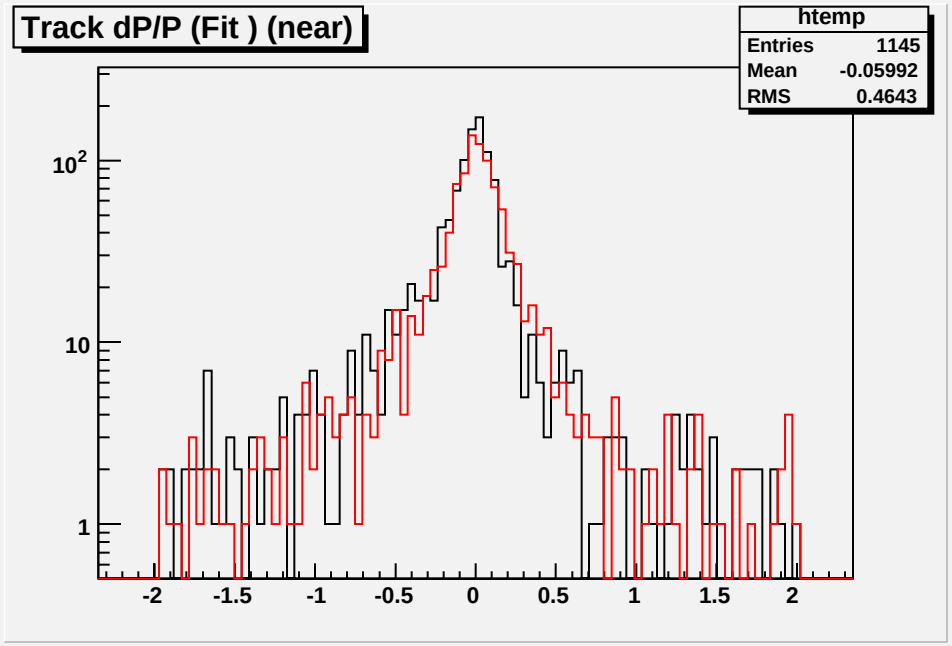
Track Momentum Error (GeV) (Near Detector)

 # Entries 454 / 453

Mean 0.049141 / -0.000344

RMS 1.181840 / 1.218879





Track dP/P (Fit) (Far Detector)

 # Entries 1082 / 1040

Mean -0.065789 / -0.027623

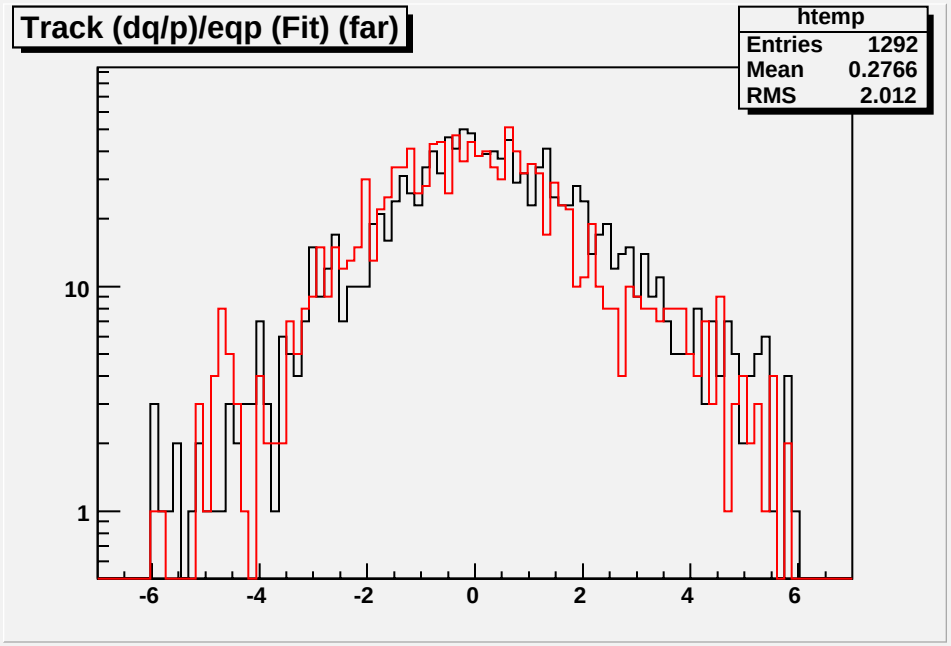
RMS 0.347937 / 0.338611

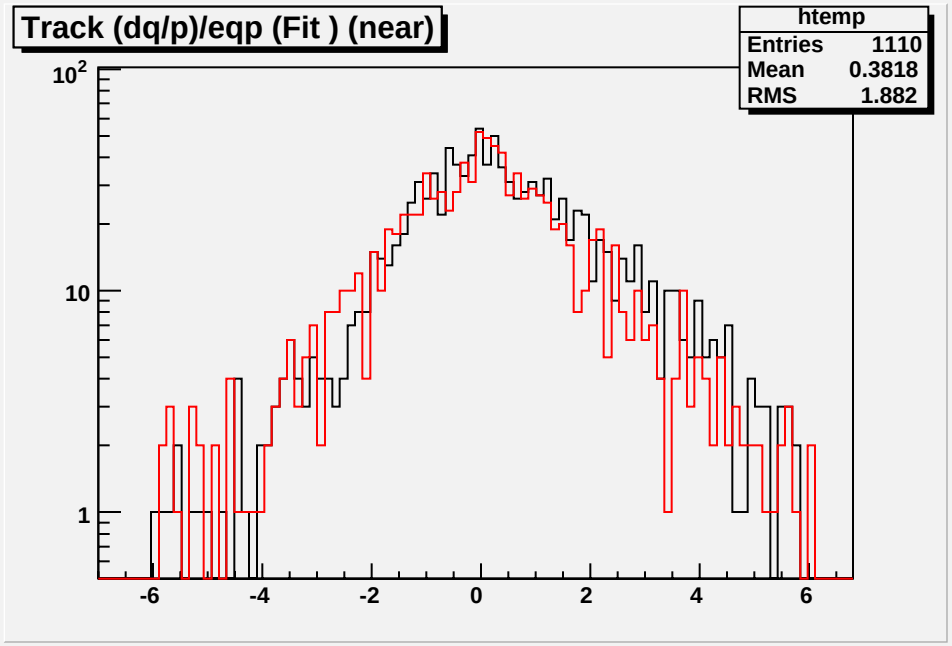
Track dP/P (fit) (Near Detector)

 # Entries 1145 / 1054

Mean -0.059924 / -0.016184

RMS 0.464339 / 0.448265





Track (Dp/p)/eqp (Far Detector)

 # Entries 1292 / 1245

Mean 0.276584 / 0.021325

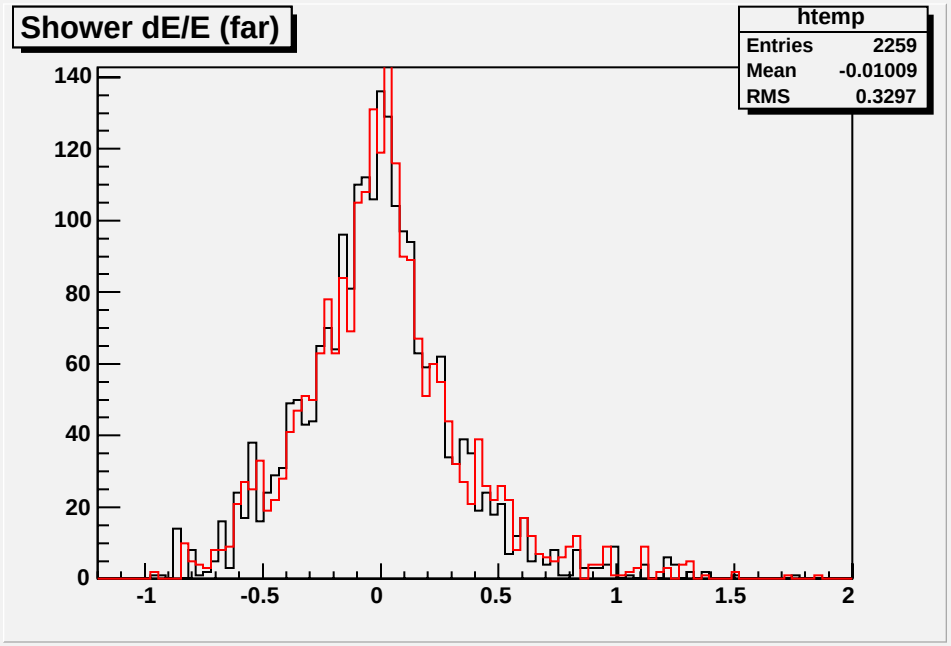
RMS 2.011612 / 1.946544

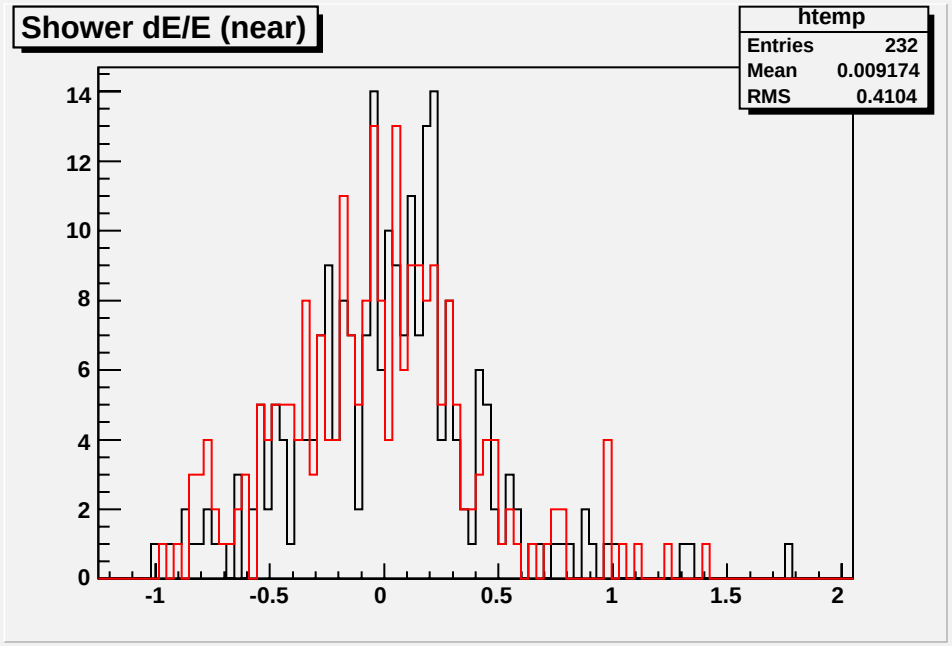
Track (dq/p)/eqp (Near Detector)

 # Entries 1110 / 1023

Mean 0.381757 / 0.122102

RMS 1.881511 / 1.883257





Shower dE/E (Far Detector)

 # Entries 2259 / 2297

Mean -0.010091 / 0.009488

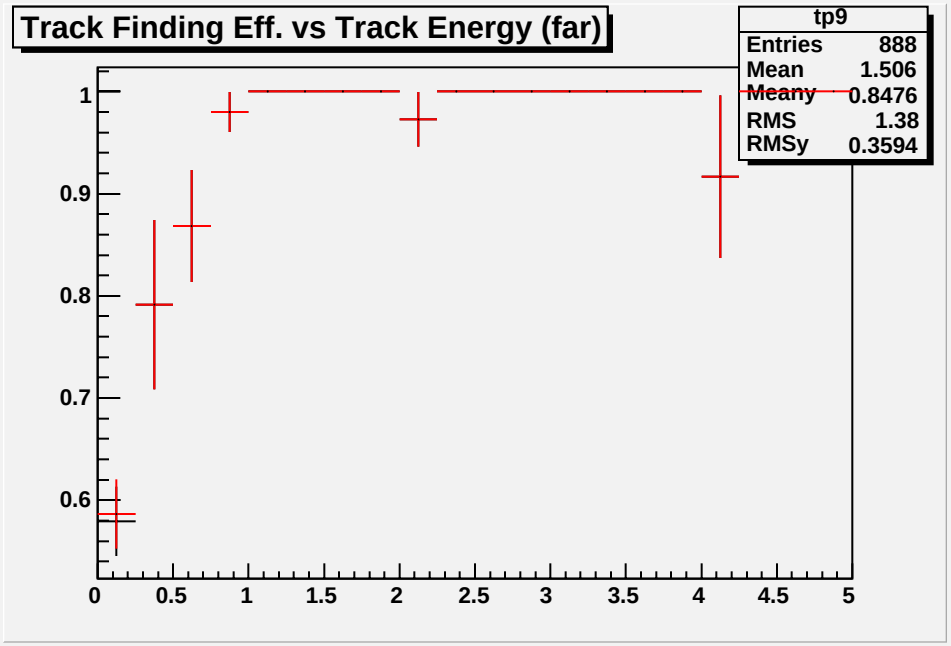
RMS 0.329724 / 0.347427

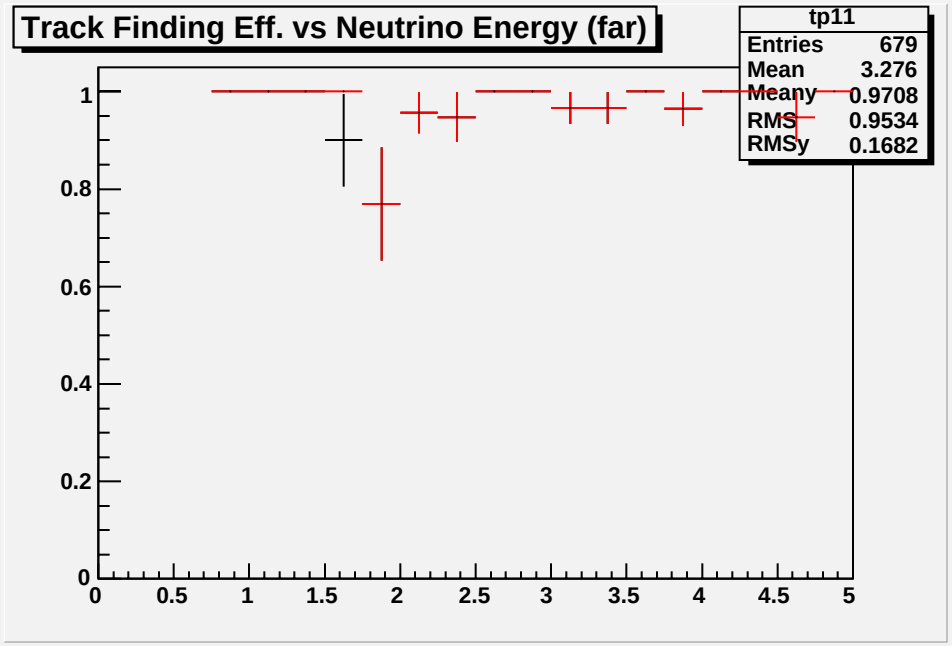
Shower dE/E (Near Detector)

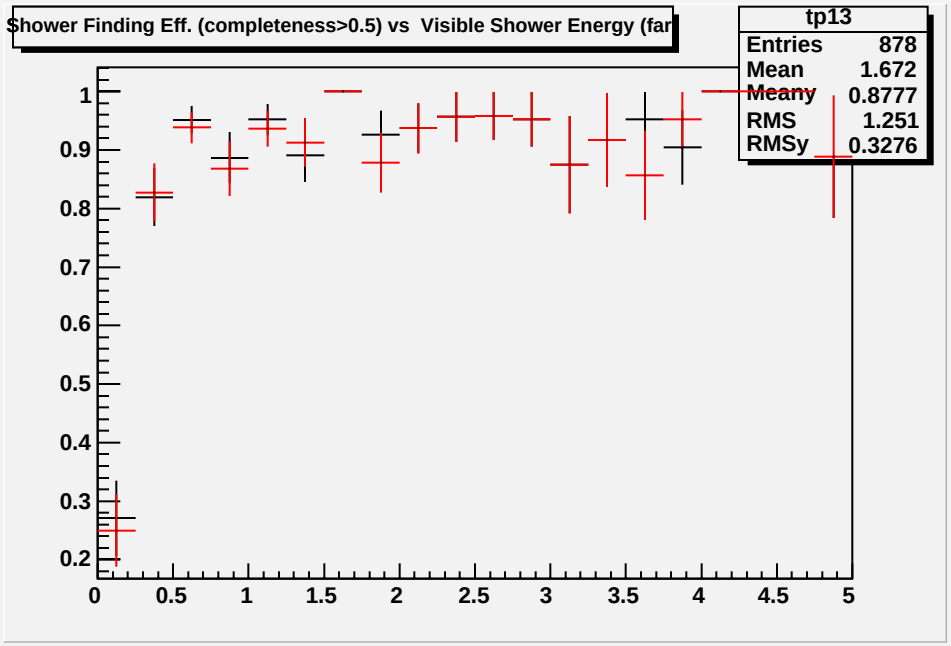
 # Entries 232 / 236

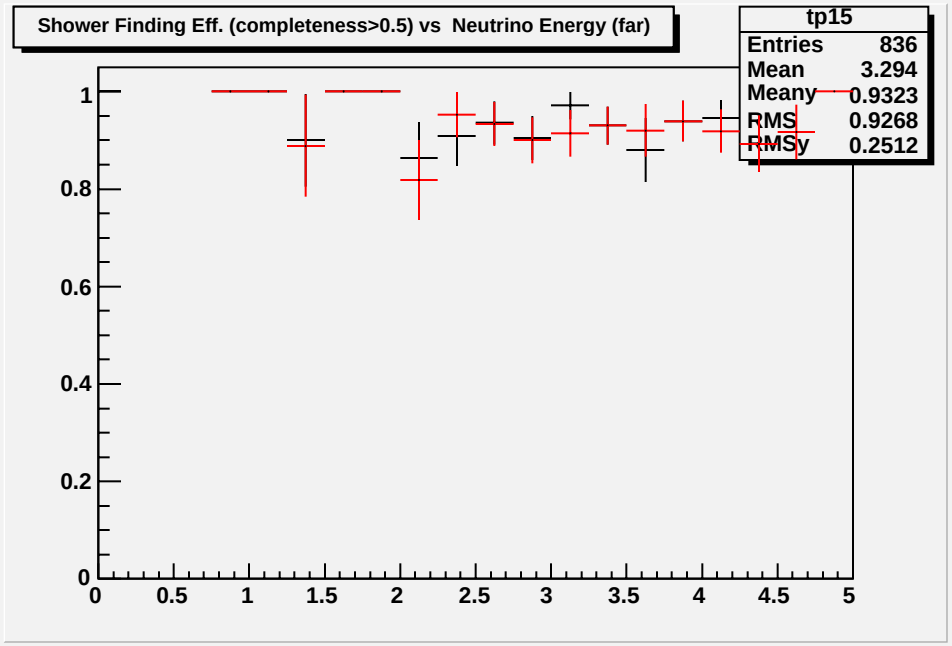
Mean 0.009174 / -0.029726

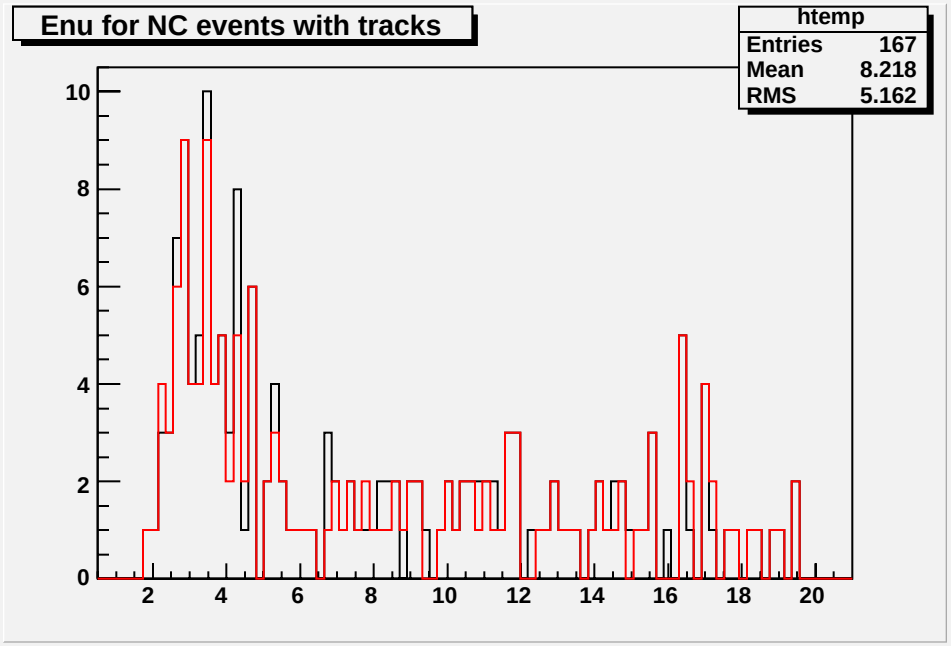
RMS 0.410403 / 0.412368

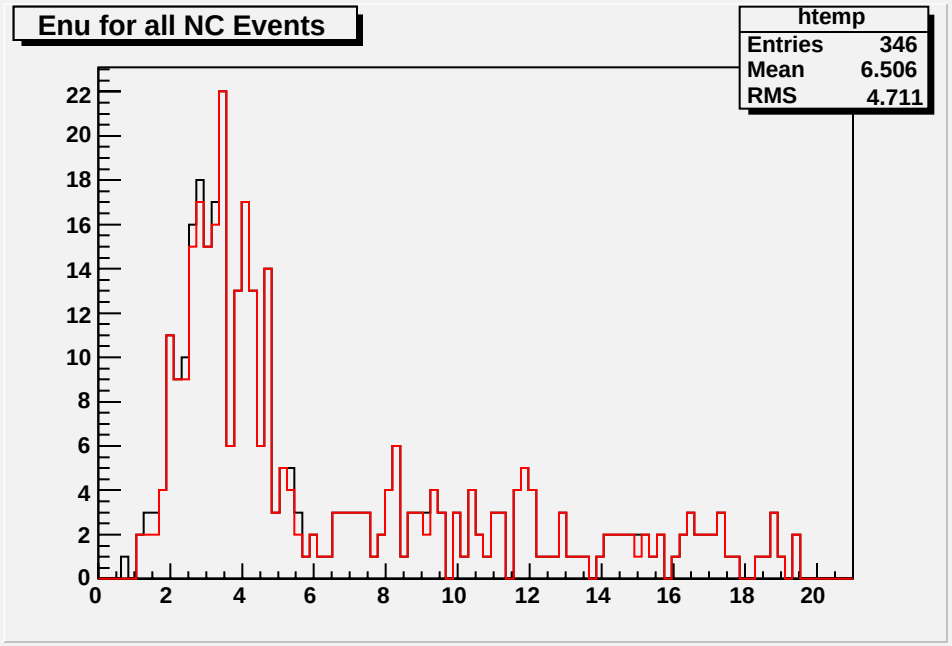

Track Finding Eff. vs Track Energy (far)
tp9
Entries 888
Mean 1.506
Meany 0.8476
RMS 1.38
RMSy 0.3594
1
0.9
0.8
0.7
0.6
0
0.5
1
1.5
2
2.5
3
3.5
4
4.5
5


Track Finding Eff. vs Neutrino Energy (far)
tp11
Entries 679
Mean 3.276
Meany 0.9708
RMS 0.9534
RMSy 0.1682
1
0.8
0.6
0.4
0.2
0
0
0.5
1
1.5
2
2.5
3
3.5
4
4.5
5


Shower Finding Eff. (completeness>0.5) vs Visible Shower Energy (far
tp13
Entries 878
Mean 1.672
Meany 0.8777
RMS 1.251
RMSy 0.3276


Shower Finding Eff. (completeness>0.5) vs Neutrino Energy (far)
tp15
Entries 836
Mean 3.294
Meany 0.9323
RMS 0.9268
RMSy 0.2512





Enu for NC events with tracks (Far Detector)

 # Entries 167 / 154

Mean 8.217708 / 8.299169

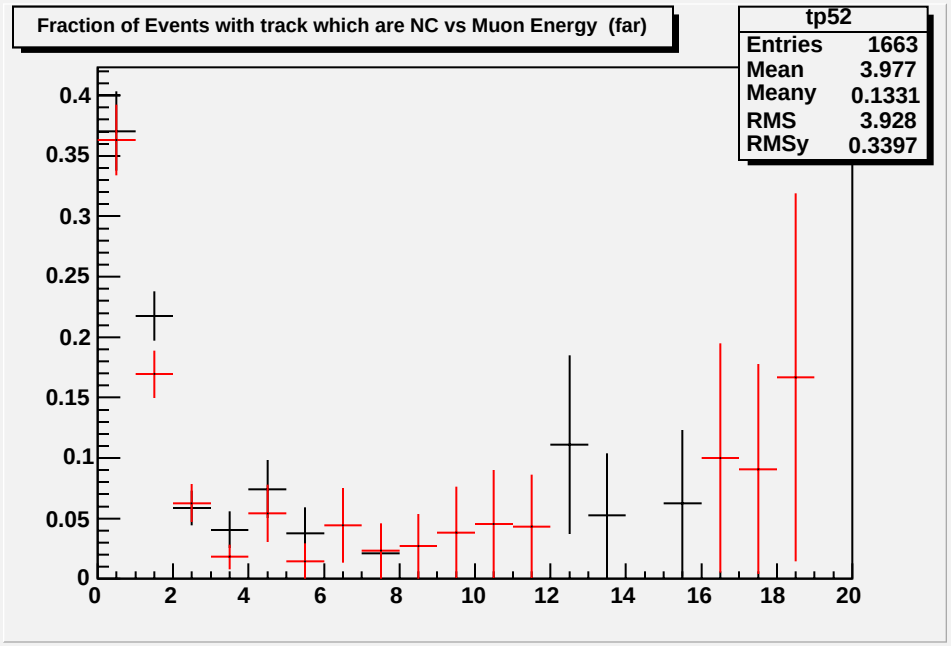
RMS 5.162275 / 5.296632

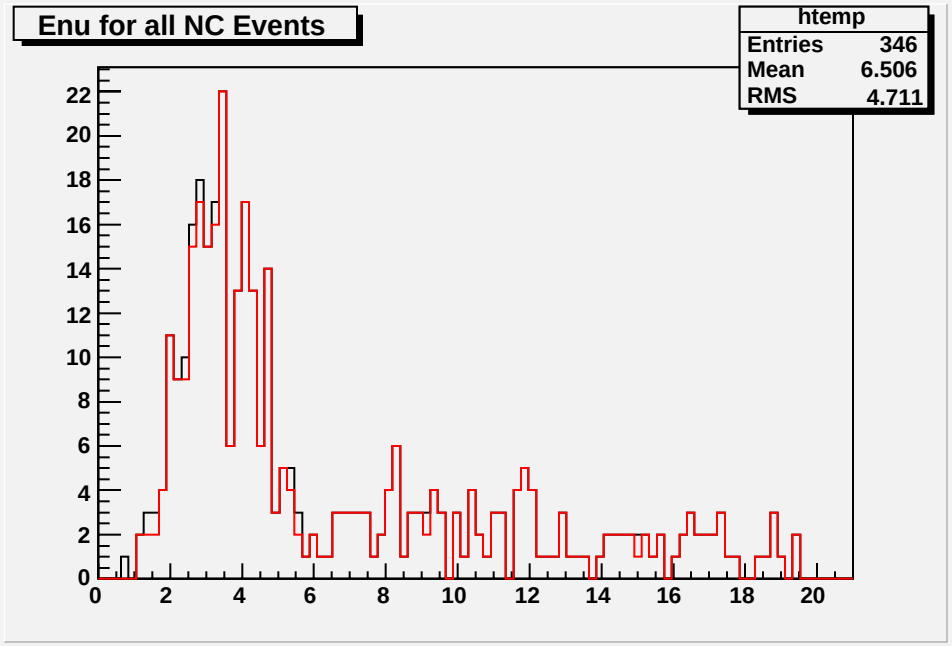
Enu for all NC Events (Far Detector)

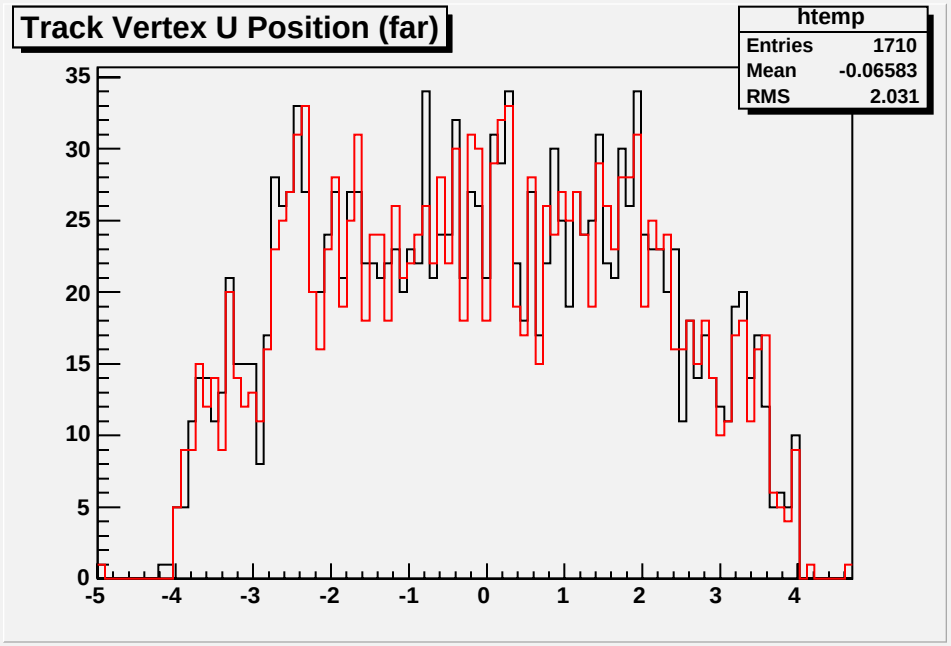
 # Entries 346 / 335

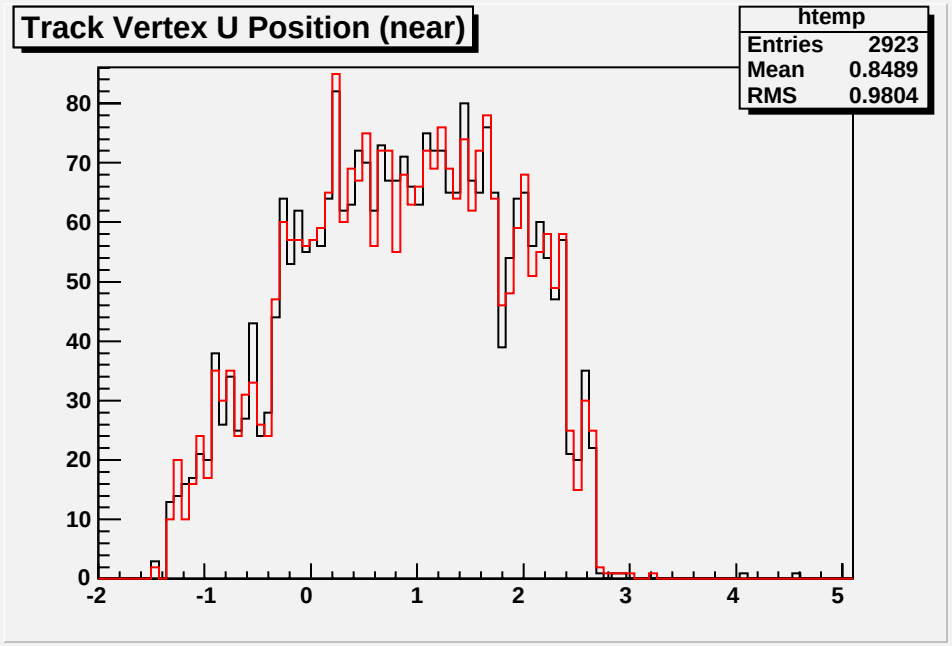
Mean 6.505772 / 6.570008

RMS 4.711371 / 4.718021


Fraction of Events with track which are NC vs Muon Energy (far)
tp52
Entries 1663
Mean 3.977
Meany 0.1331
RMS 3.928
RMSy 0.3397
0.4
0.35
0.3
0.25
0.2
0.15
0.1
0.05
0
0 2 4 6 8 10 12 14 16 18 20


Enu for all NC Events
htemp
Entries 346
Mean 6.506
RMS 4.711
22
20
18
16
14
12
10
8
6
4
2
0
0 2 4 6 8 10 12 14 16 18 20





Track Vertex U (Far Detector)

 # Entries 1710 / 1687

Mean -0.065830 / -0.052923

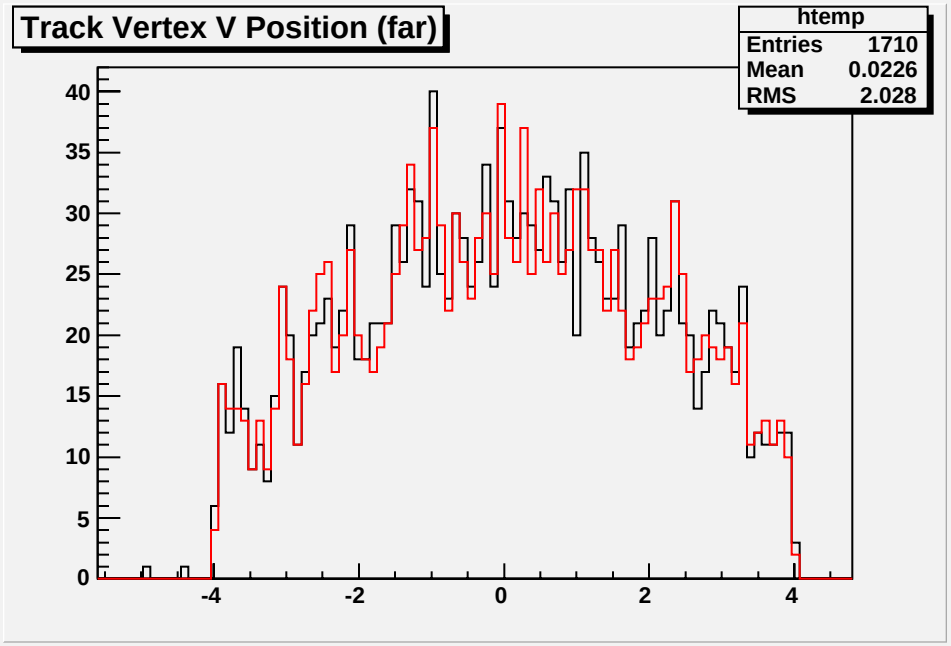
RMS 2.031327 / 2.027665

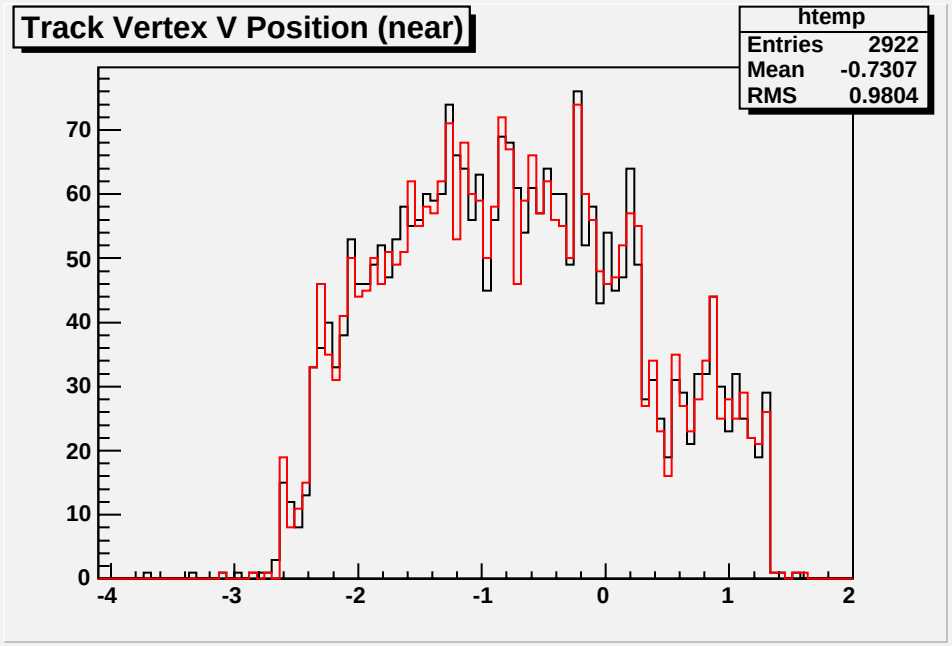
Track Vertex U (Near Detector)

 # Entries 2923 / 2897

Mean 0.848919 / 0.851415

RMS 0.980437 / 0.976014





Track Vertex V (Far Detector)

 # Entries 1710 / 1688

Mean 0.022604 / 0.030989

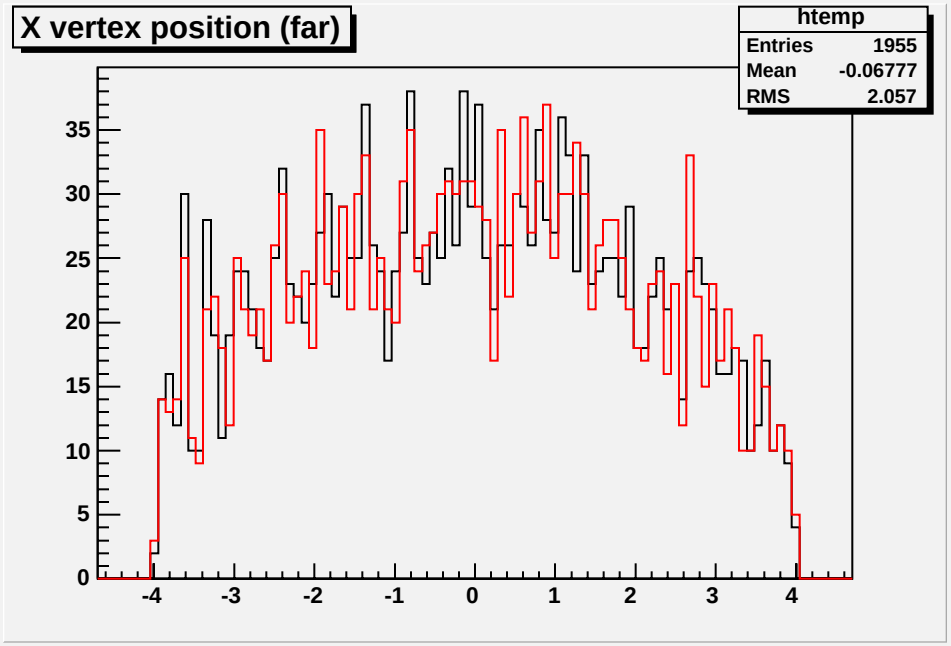
RMS 2.027613 / 2.015795

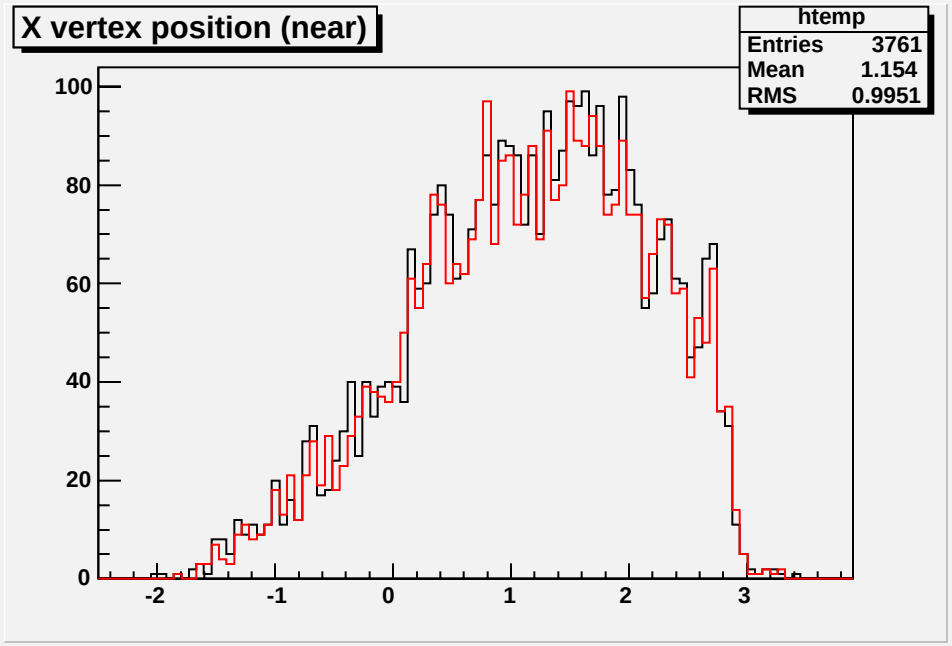
Track Vertex V (Near Detector)

 # Entries 2922 / 2897

Mean -0.730684 / -0.726244

RMS 0.980391 / 0.979010





Track Vertex X (Far Detector)

 # Entries 1955 / 1946

Mean -0.067767 / -0.041844

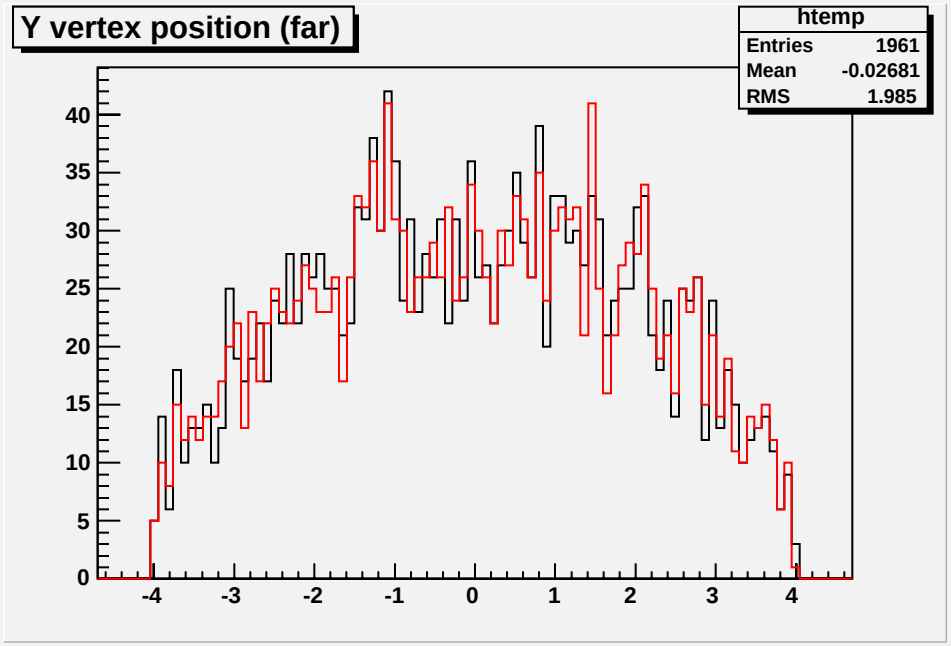
RMS 2.056685 / 2.048417

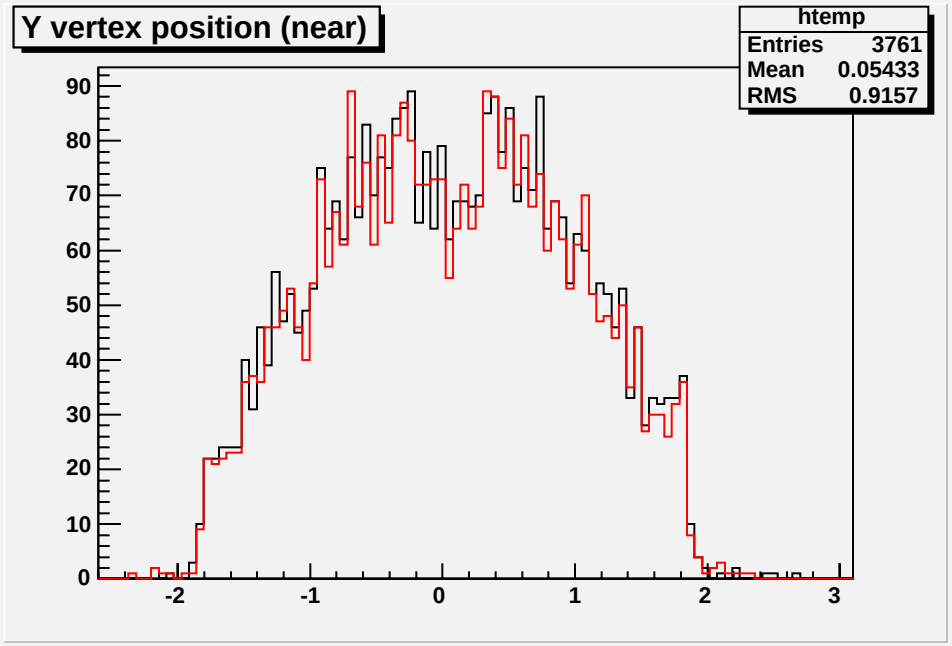
Tracks Vertex X (Near Detector)

 # Entries 3761 / 3660

Mean 1.154346 / 1.154852

RMS 0.995101 / 0.987756





Track Vertex Y (Far Detector)

 # Entries 1961 / 1945

Mean -0.026805 / -0.017043

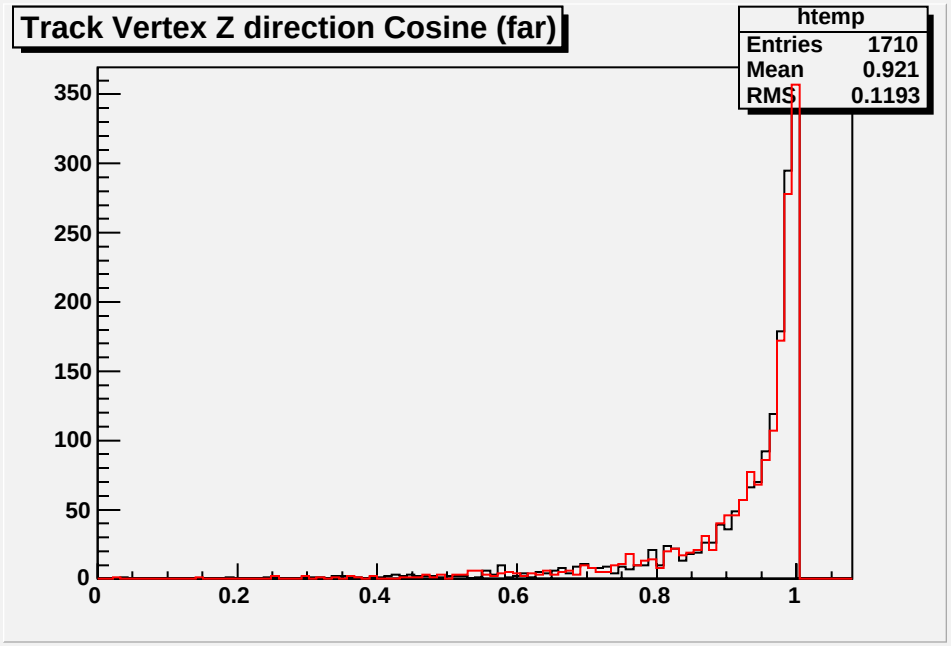
RMS 1.984580 / 1.987655

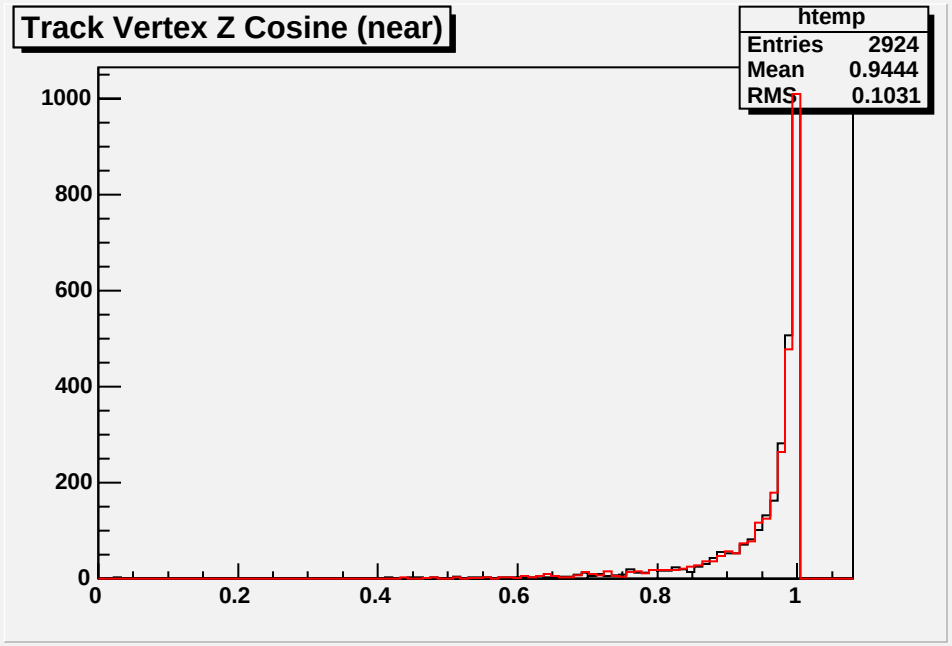
Track Vertex Y (Near Detector)

 # Entries 3761 / 3660

Mean 0.054327 / 0.052437

RMS 0.915731 / 0.912082





Track Vertex Z Cosine(Far Detector)

 # Entries 1710 / 1688

Mean 0.920976 / 0.921258

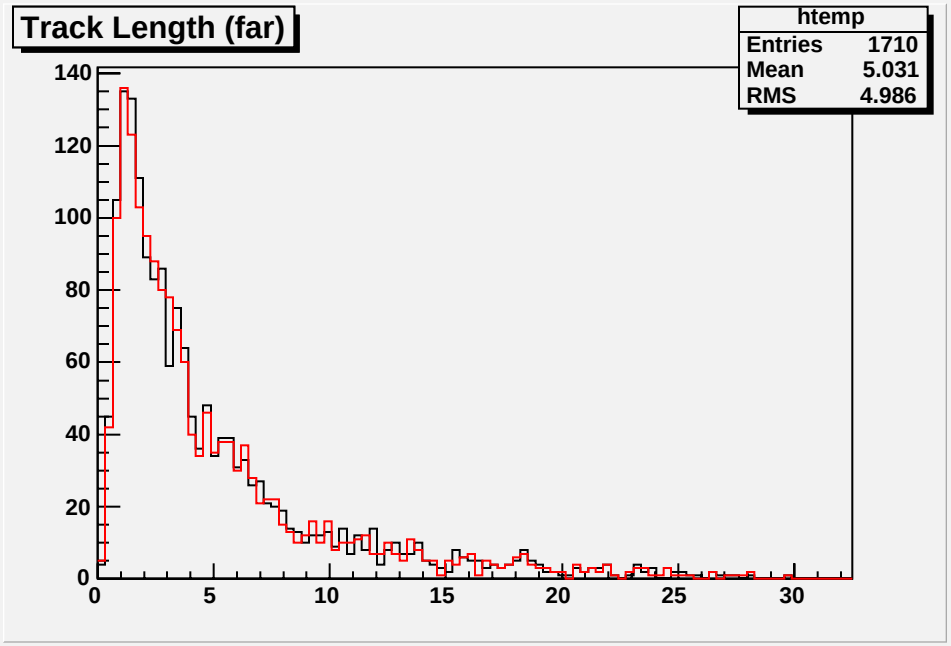
RMS 0.119281 / 0.116150

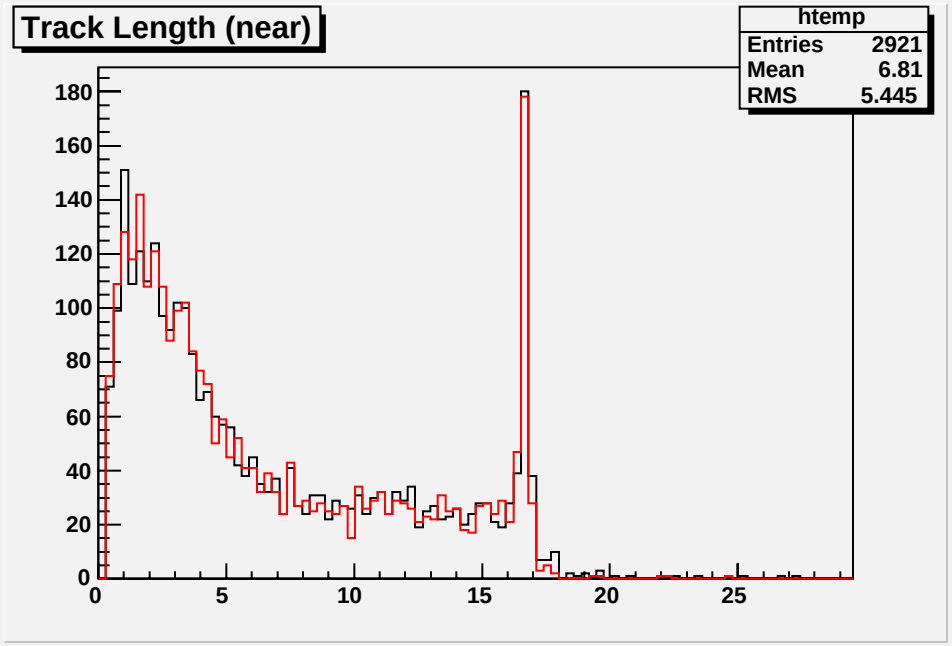
Track Vertex Z Cosine (Near)

 # Entries 2924 / 2897

Mean 0.944379 / 0.945774

RMS 0.103130 / 0.092785





Track Length (Far Detector)

 # Entries 1710 / 1685

Mean 5.031011 / 5.042101

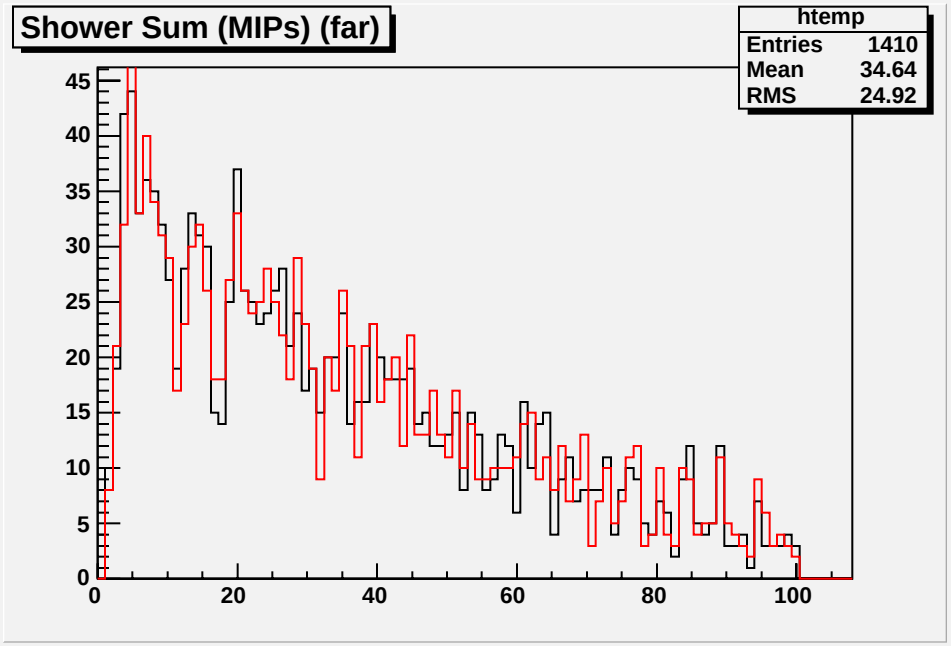
RMS 4.986443 / 5.002010

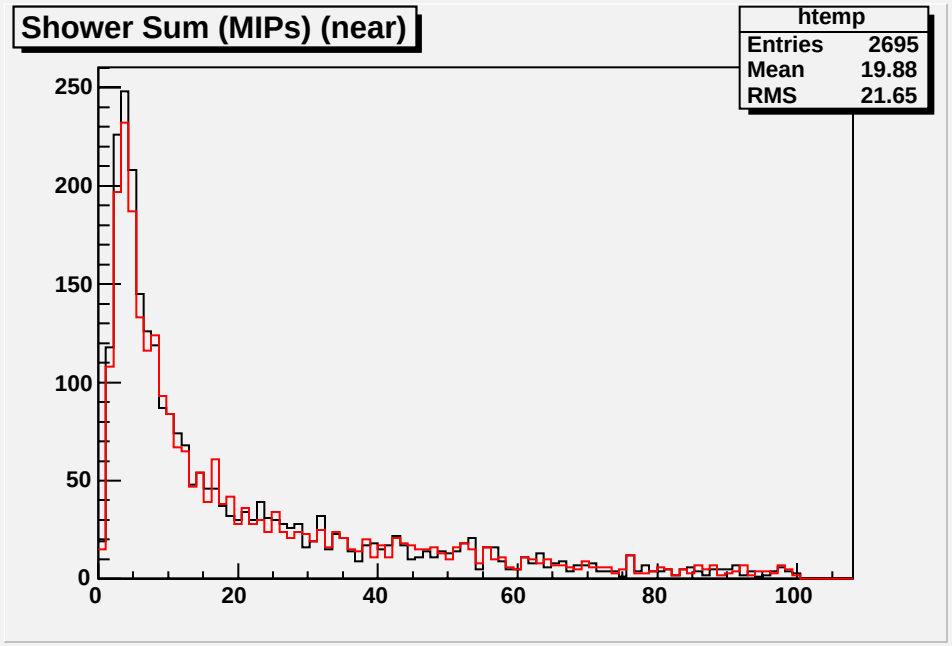
Track Length (Near Detector)

 # Entries 2921 / 2897

Mean 6.810326 / 6.610823

RMS 5.445323 / 5.334941





Shower Sum MIPs (Far)

 # Entries 1410 / 1403

Mean 34.643970 / 35.176596

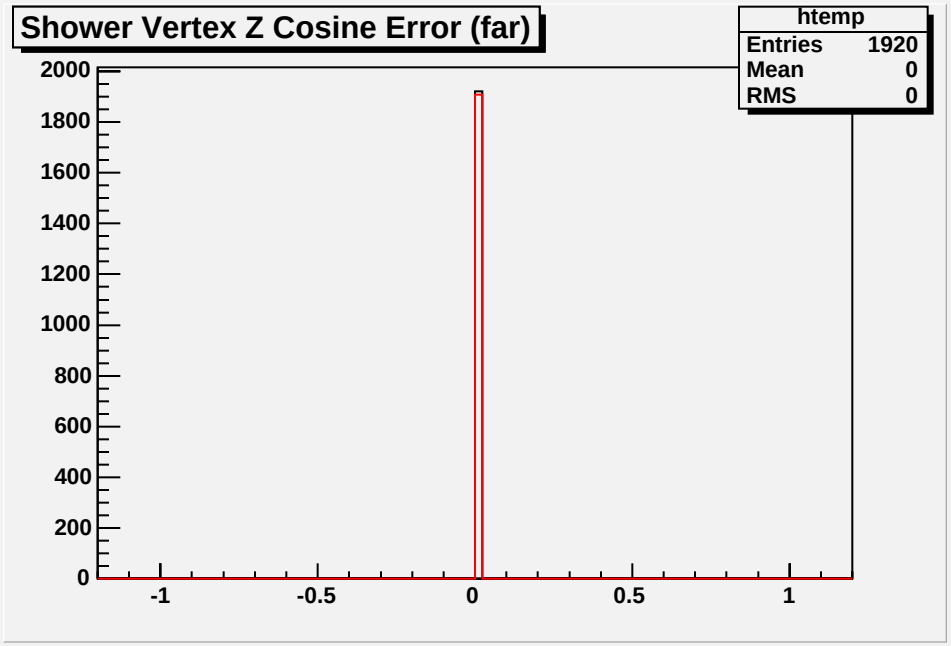
RMS 24.922415 / 25.057853

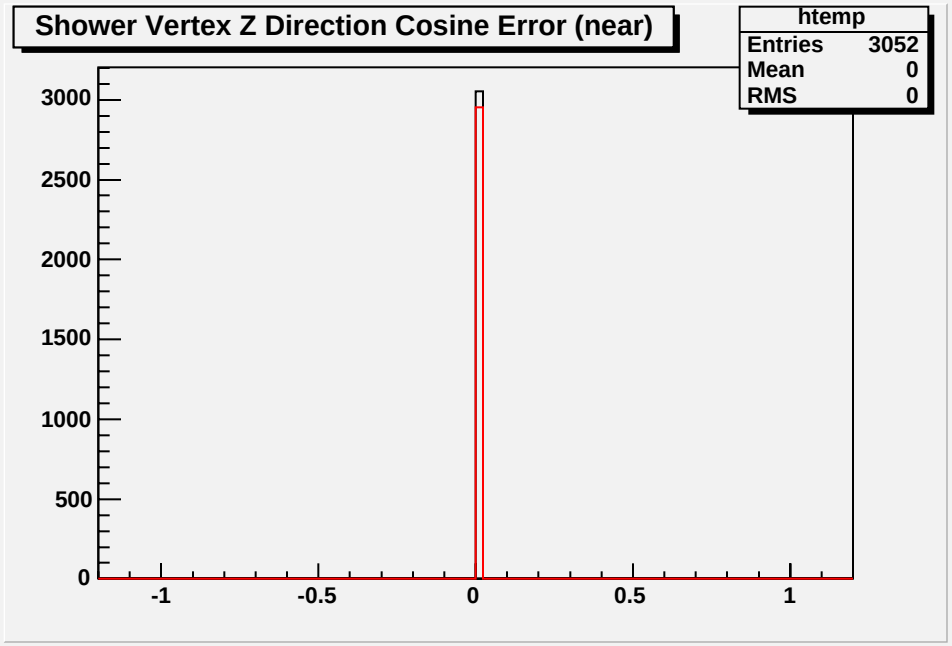
Shower Sum MIPs (Near)

 # Entries 2695 / 2601

Mean 19.882274 / 20.663854

RMS 21.652155 / 22.097566





Entries 1920 / 1908

Mean 0.000000 / 0.000000

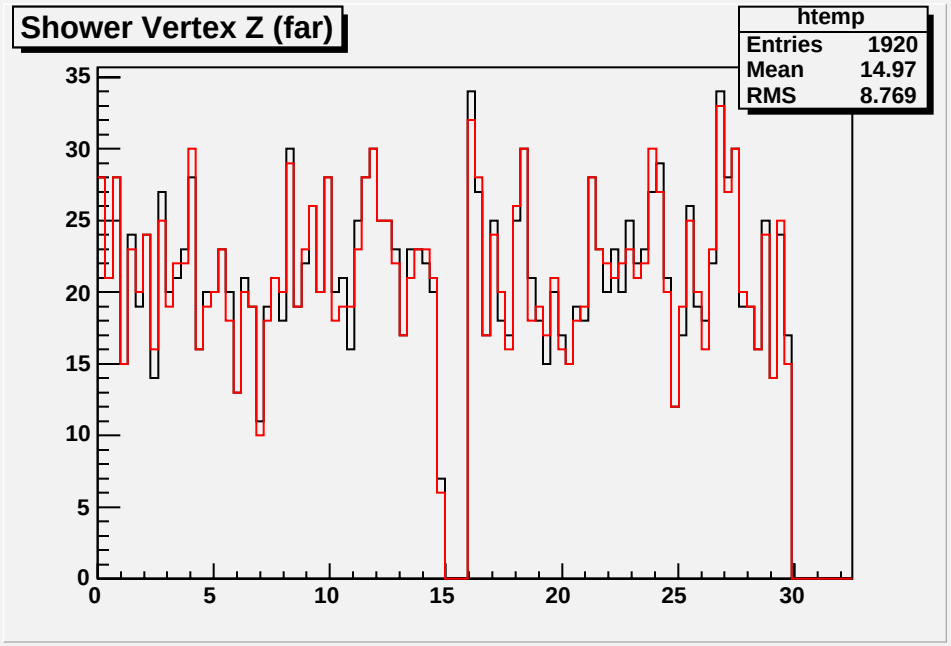
RMS 0.000000 / 0.000000

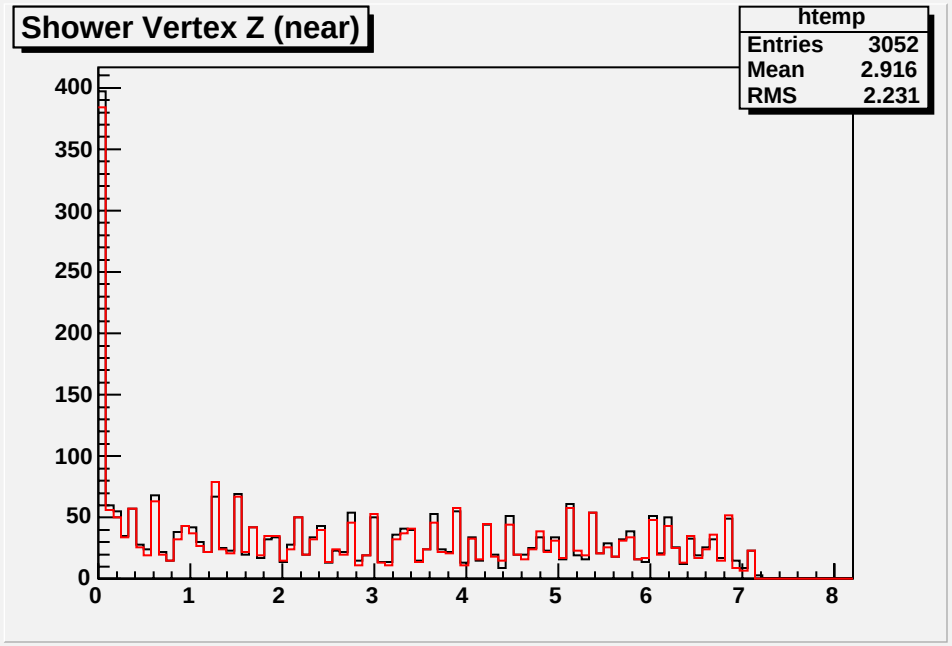
Shower Vertex Z Cosine Error (Near)

Entries 3052 / 2951

Mean 0.000000 / 0.000000

RMS 0.000000 / 0.000000





Shower Vertex Z (Far Detector)

 # Entries 1920 / 1920

Mean 14.965381 / 0.000000

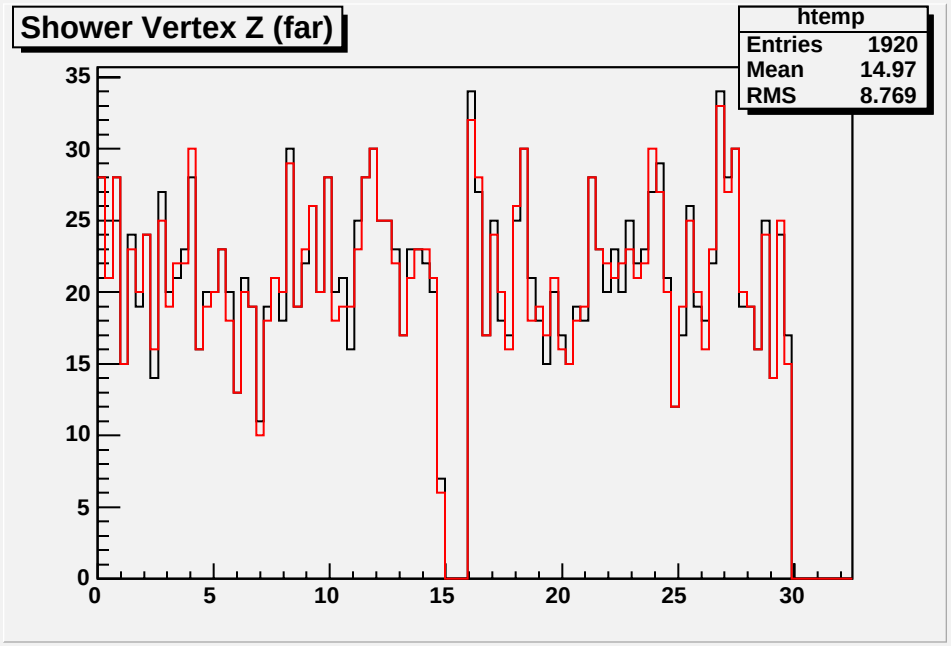
RMS 8.769293 / 0.000000

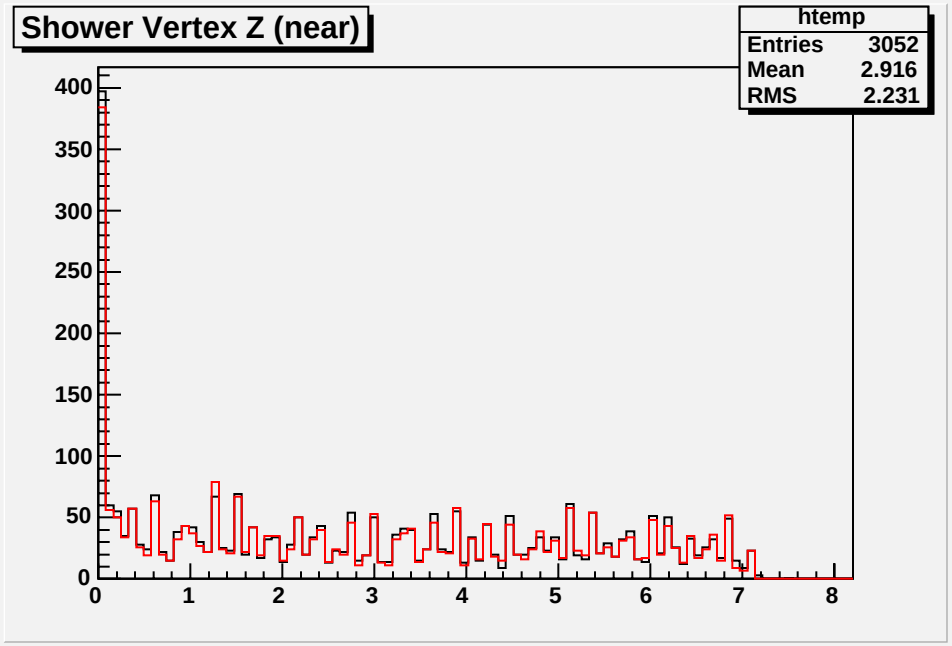
Shower Vertex Z(Near Detector)

 # Entries 1920 / 2951

Mean 14.965381 / 2.919789

RMS 8.769293 / 2.224070





Shower Vertex Z (Far Detector)

 # Entries 1920 / 1920

Mean 14.965381 / 0.000000

RMS 8.769293 / 0.000000

Shower Vertex Z(Near Detector)

 # Entries 1920 / 2951

Mean 14.965381 / 2.919789

RMS 8.769293 / 2.224070