K^0_S Analysis

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Friday August 1st, 2008

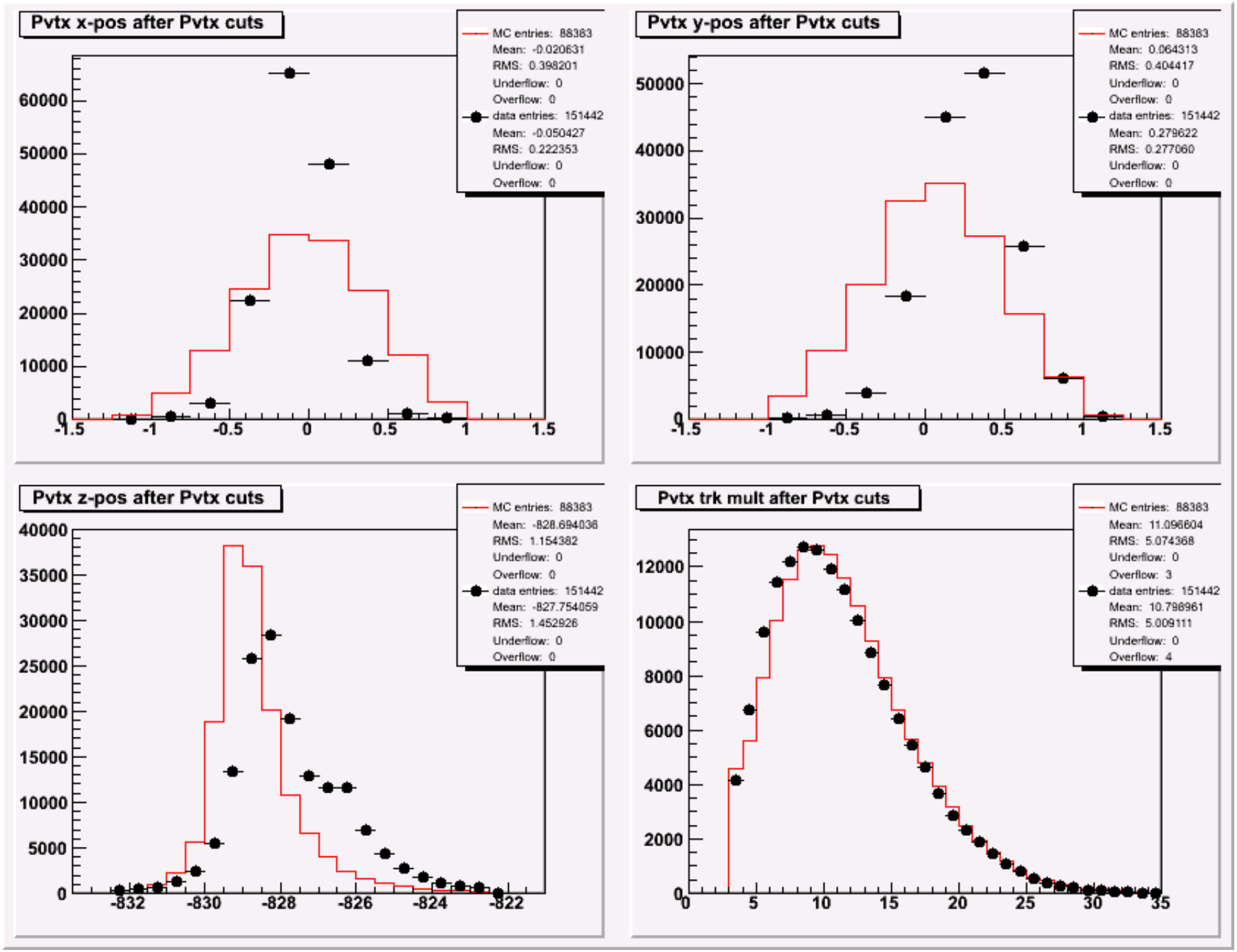
C 2% 120

		Data	MC
2	events with 1 bmtrk	331355	119767
3	Pvtx # trks >= 3	182624	99459
4	Pvtx at least 3 trks gof >= 0.05	164238	93604
5	|dxTgt| <= 1, |dyTgt - 0.22| <= 1	161238	89367
6	-4 <= dzTgt <= 6	151442	88383

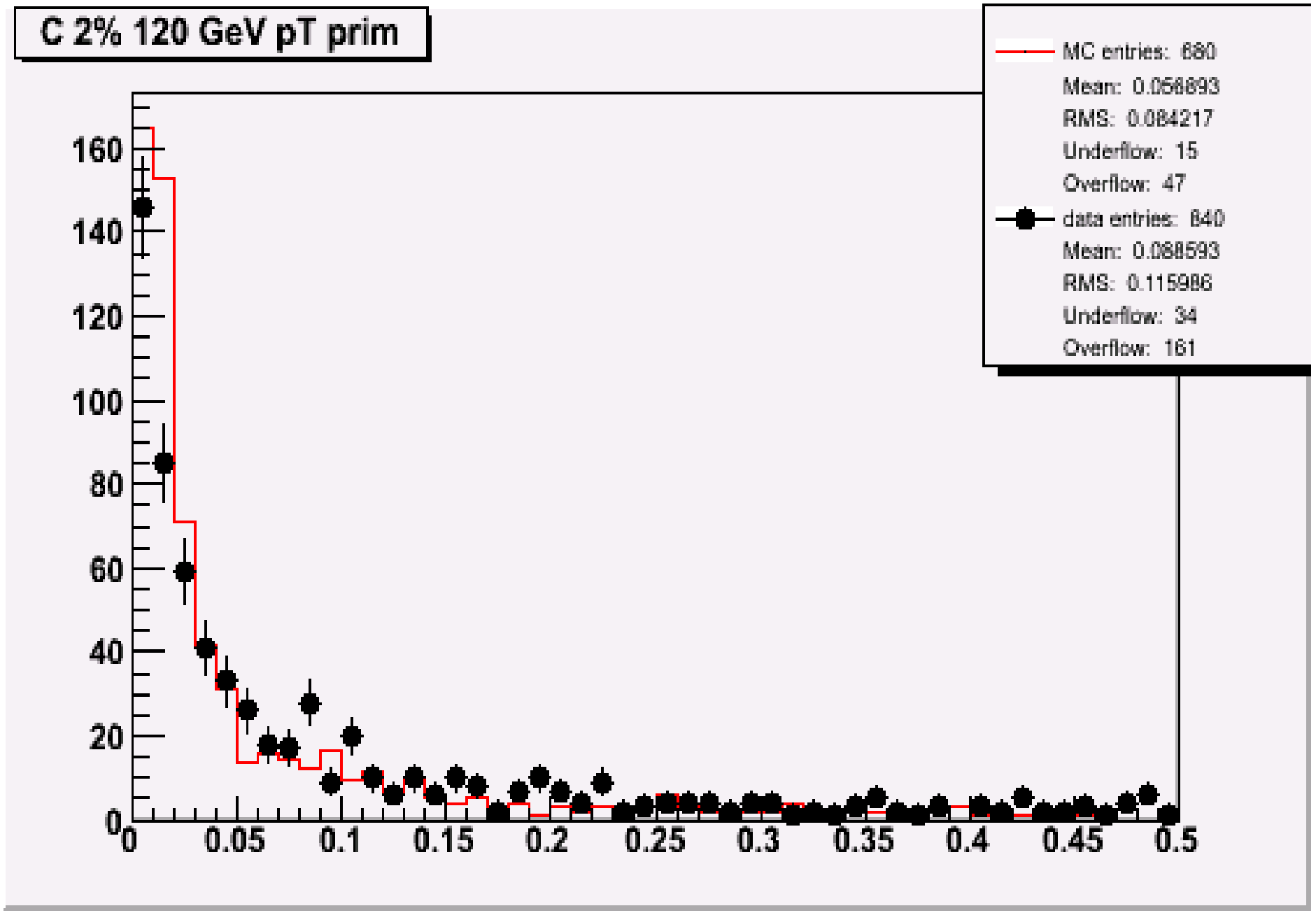
Secondary vertex loop:

7	Svtx 2 trks	20440	6488
8	Svtx downstream of Pvtx	18765	5773
9	Svtx neutral	8895	3079
10	Svtx trks gof > 0.01	840	680
11	pT prim < 0.15	548	568
12	|sec vtx mom| > 0.8 GeV	207	187
# of incident particles on target		484133	119767
# of generated MC K^0_S			32766

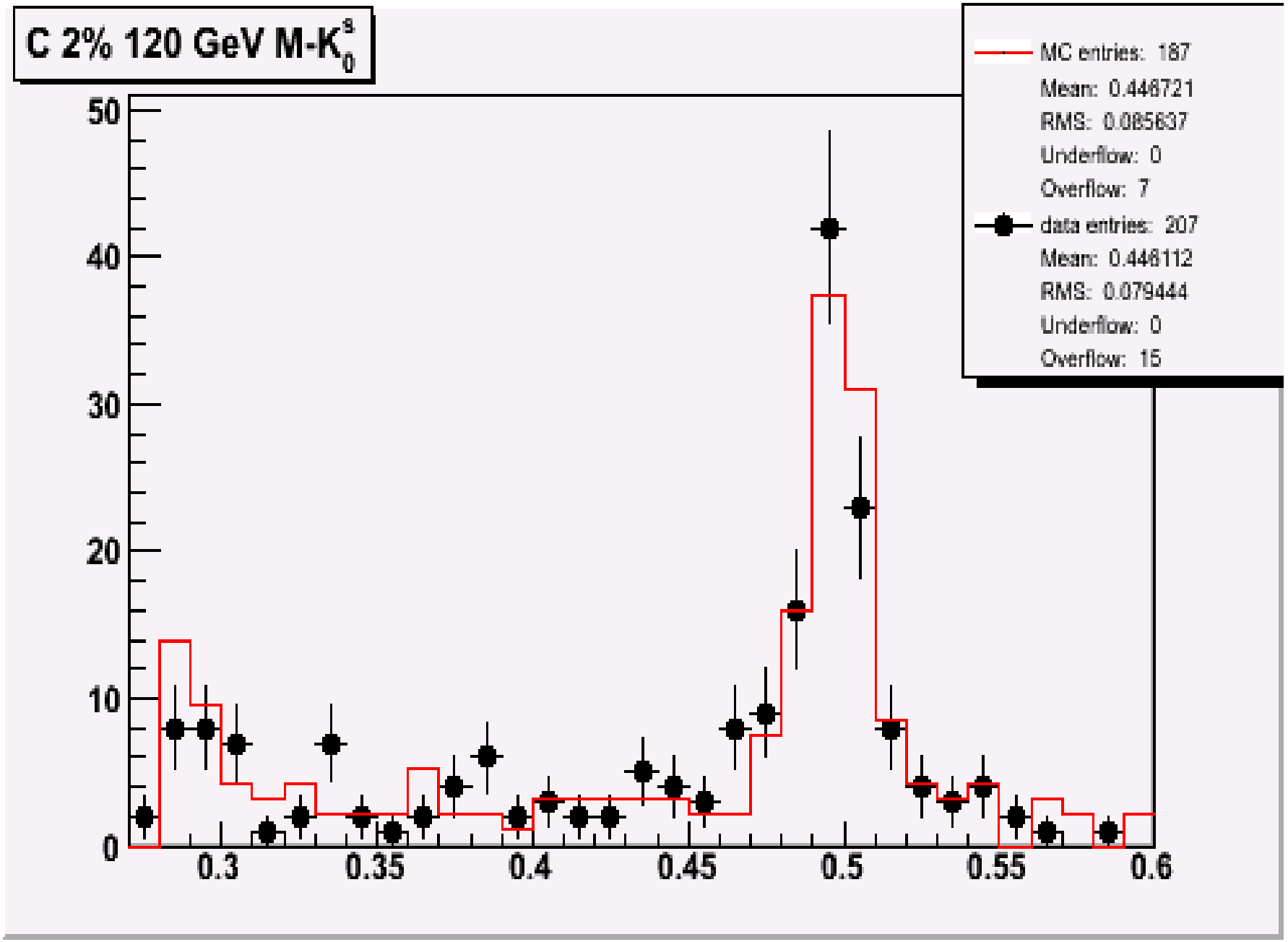
Cut Variable Plots
C 2% 120



C 2% 120


C 2% 120 GeV pT prim
MC entries: 880
Mean: 0.058893
RMS: 0.084217
Underflow: 15
Overflow: 47
data entries: 840
Mean: 0.088593
RMS: 0.115986
Underflow: 34
Overflow: 161
0
20
40
60
80
100
120
140
160
0
0.05
0.1
0.15
0.2
0.25
0.3
0.35
0.4
0.45
0.5

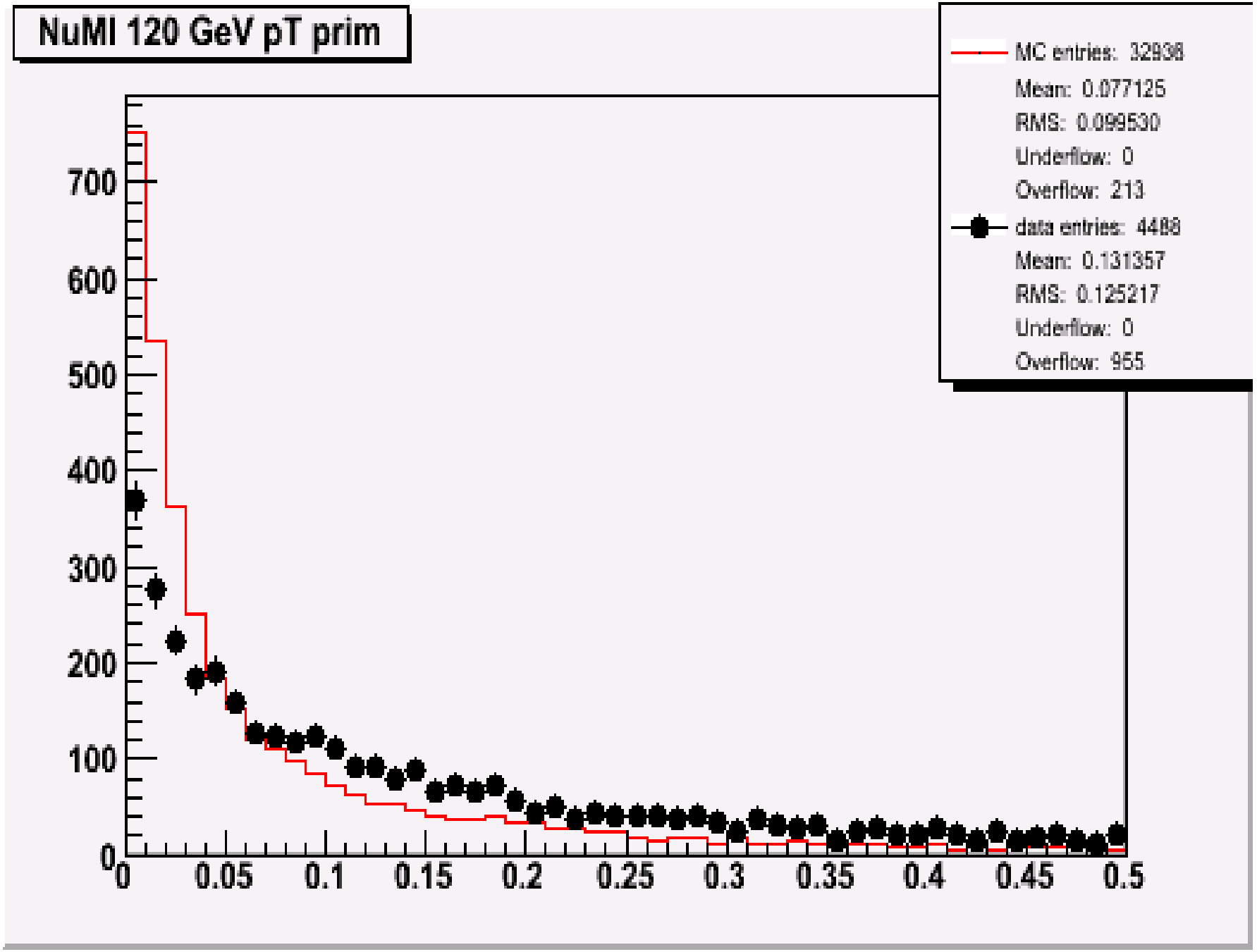
(after all cuts)
C 2% 120



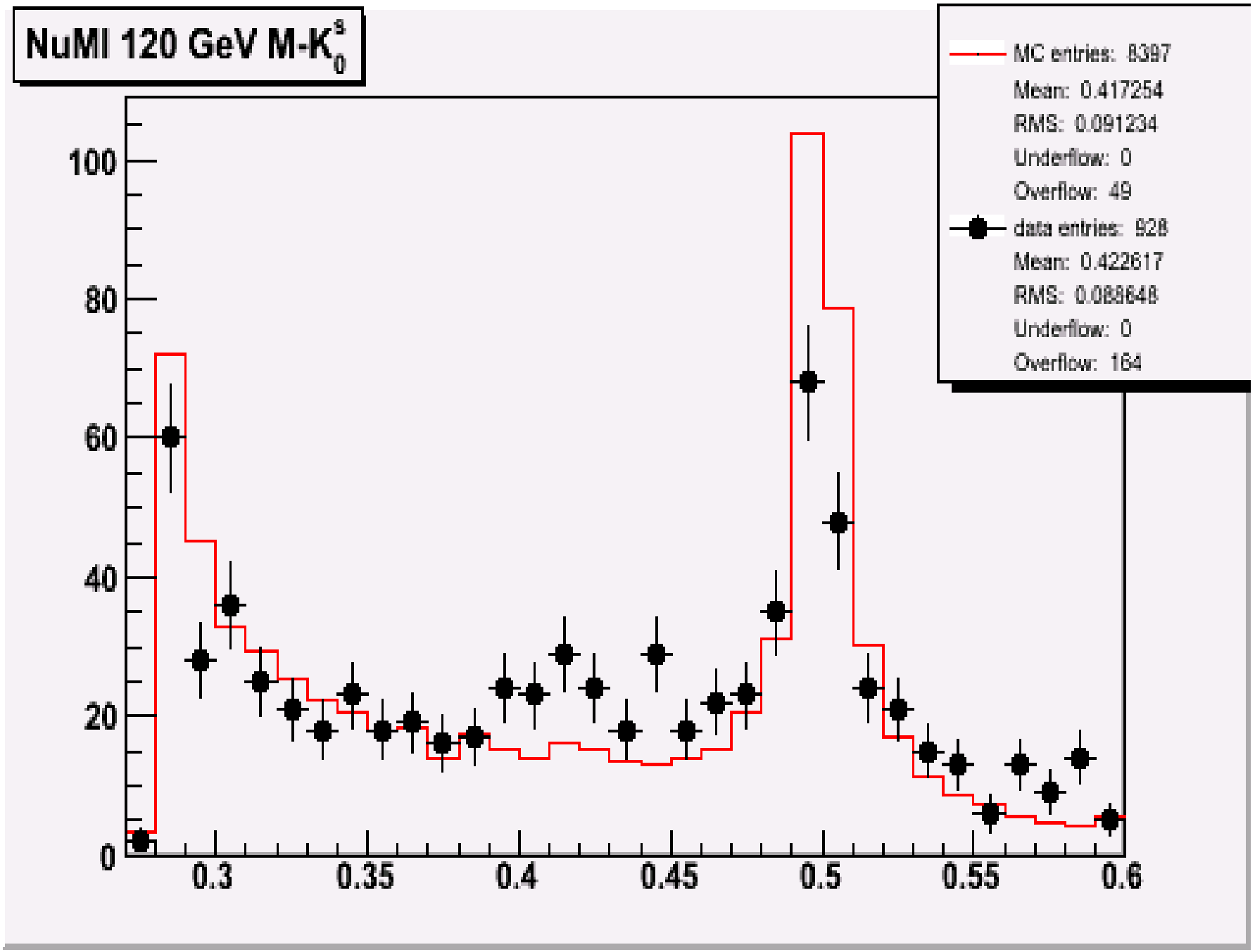
NuMI 120

		data	MC
2	events with 1 bmtrk:	570571	3913907
3	Pvtx # trks >= 3	820271	4192509
4	Pvtx at least 3 trks gof >= 0.05	564739	3522841
5	[(x-pos)^2 + (y-pos)^2] <= 1.0	480491	3329770
6	Pvtx z-pos within -940 to -830	468897	3275545
Secondary vertex loop:			
7	Svtx 2 trks	229860	1105516
8	Svtx downstream of Pvtx	194946	875997
9	Svtx within z-bounds of TPC	101787	336238
9	Svtx neutral	44250	175453
10	Svtx trks gof > 0.01	4488	32936
11	pT prim < 0.15	2352	25947
12	|sec vtx mom| > 0.8 GeV	928	8397
# of incident particles on target:		626737	3913927
# of generated K^0_s			1359393

NuMI 120

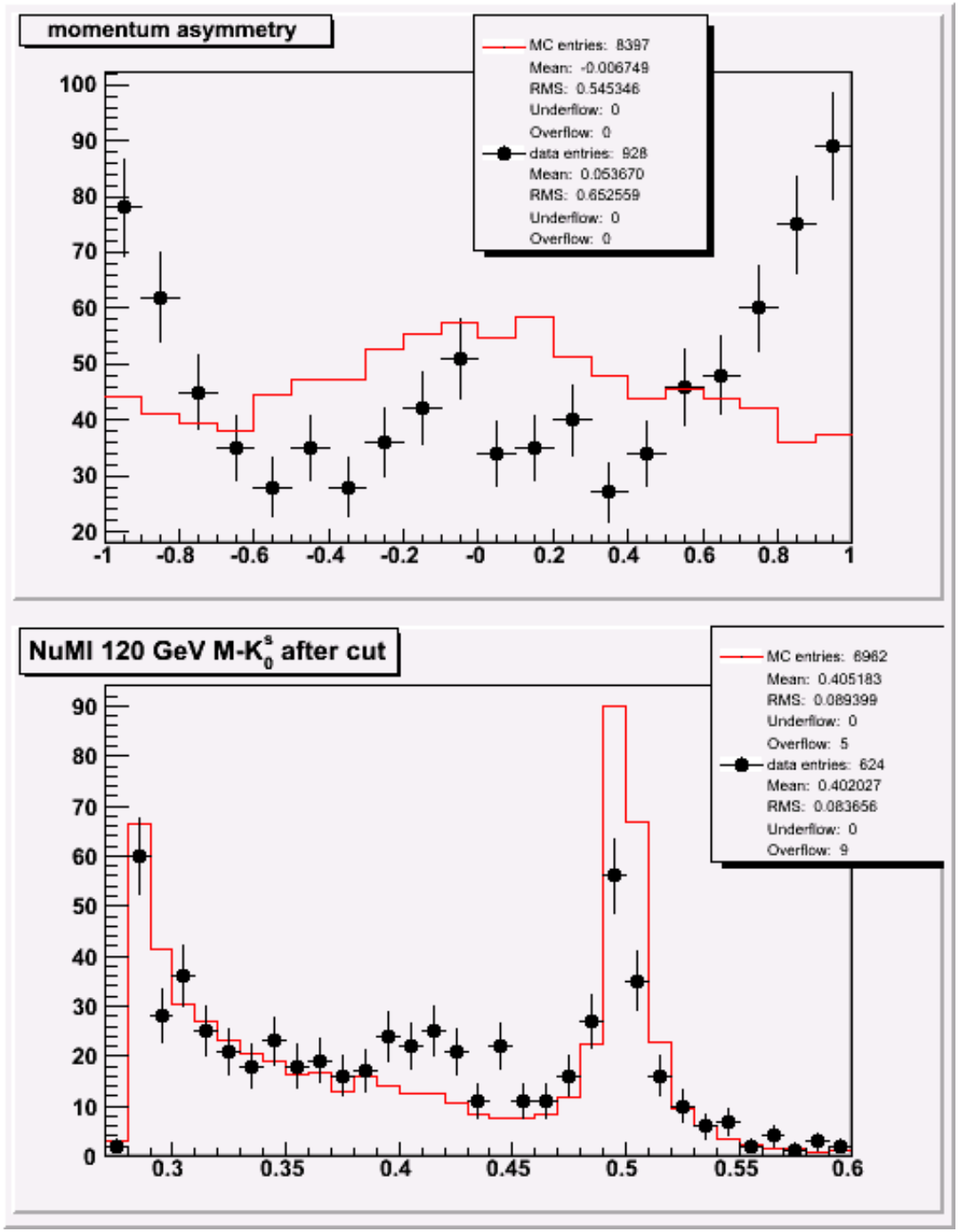

NuMI 120 GeV pT prim
MC entries: 32938
Mean: 0.077125
RMS: 0.099530
Underflow: 0
Overflow: 213
data entries: 4488
Mean: 0.131357
RMS: 0.125217
Underflow: 0
Overflow: 955
0
100
200
300
400
500
600
700
0
0.05
0.1
0.15
0.2
0.25
0.3
0.35
0.4
0.45
0.5

NuMI 120


NuMI 120 GeV M-K^s_0
MC entries: 8397
Mean: 0.417254
RMS: 0.091234
Underflow: 0
Overflow: 49
data entries: 928
Mean: 0.422617
RMS: 0.088648
Underflow: 0
Overflow: 164
100
80
60
40
20
0
0.3
0.35
0.4
0.45
0.5
0.55
0.6

NuMI 120

|pasym| < 0.8



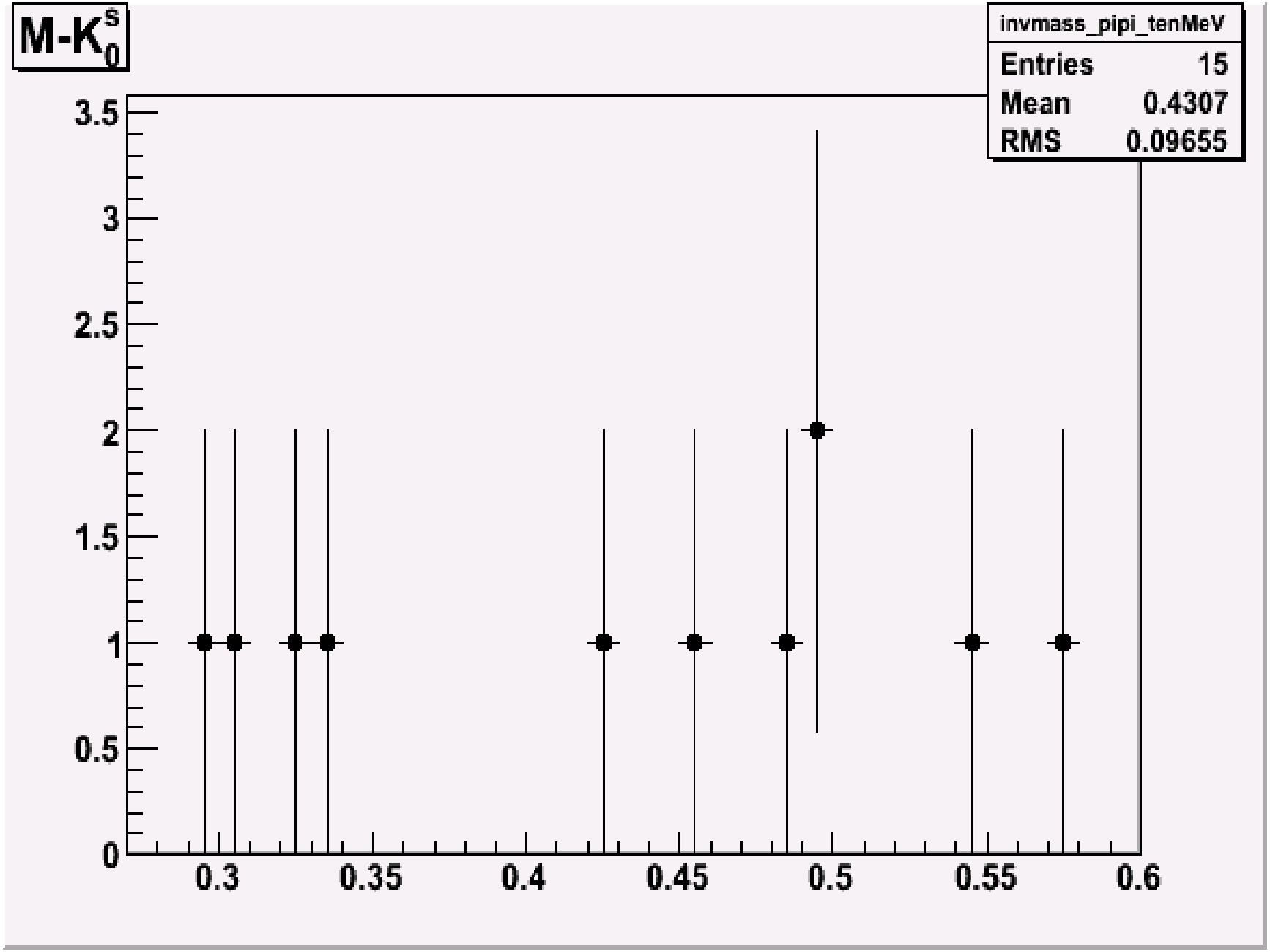
Empty 120

		data
2	events with 1 bmtrk:	190369
3	Pvtx # trks >= 3	70179
4	Pvtx at least 3 trks gof >= 0.05	55421
5	[(x-pos)^2 + (y-pos)^2] <= 1.0	51306
6	Pvtx z-pos within -940 to -830	7645

Secondary vertex loop:

7	Svtx 2 trks	2087
8	Svtx downstream of Pvtx	1932
9	Svtx within z-bounds of TPC	1179
9	Svtx neutral	564
10	Svtx trks gof > 0.01	53
11	pT prim < 0.15	41
12	|sec vtx mom| > 0.8 GeV	15
# of incident particles on target:		299448

Empty 120

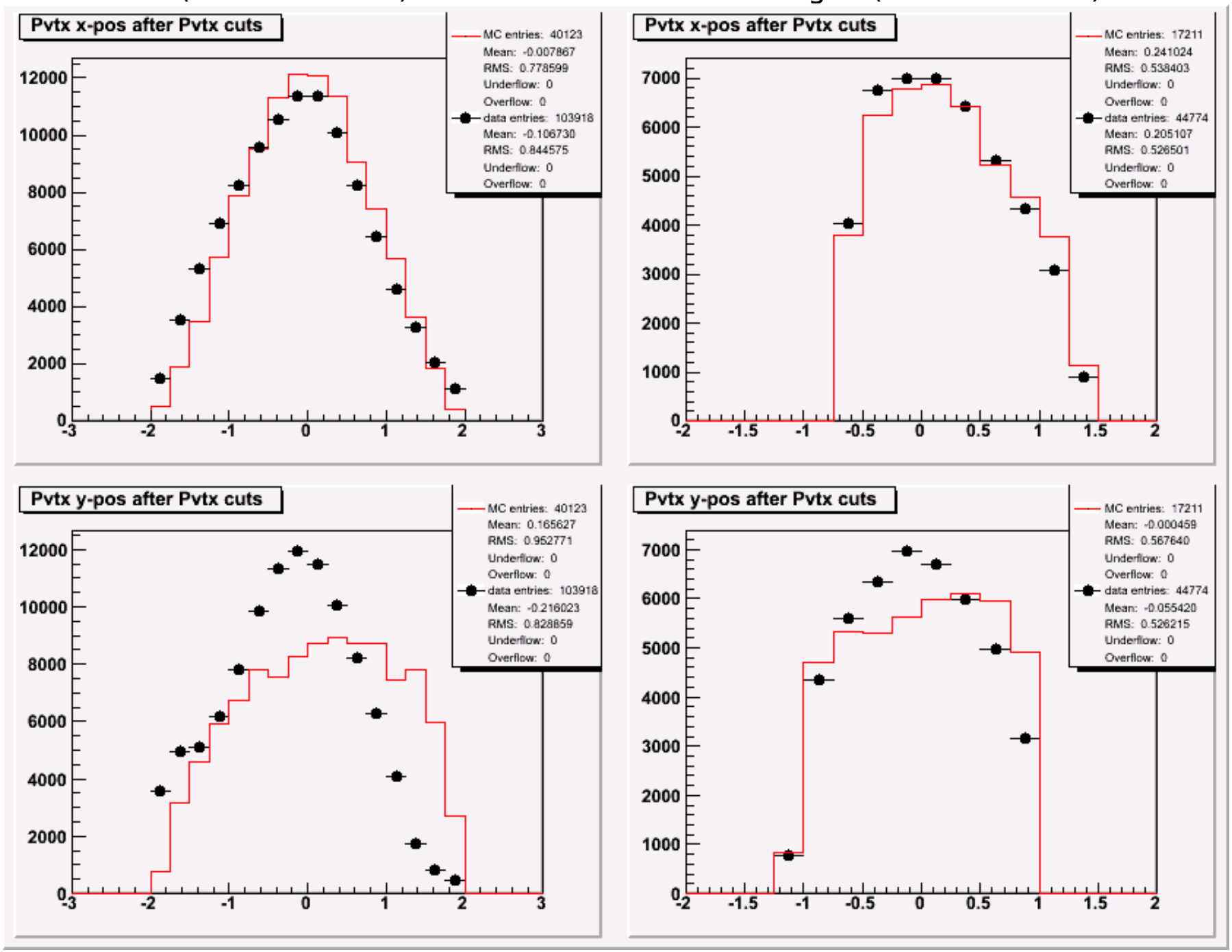

M-K$^s_0$
invmass_pipi_tenMeV
Entries 15
Mean 0.4307
RMS 0.09655
3.5
3
2.5
2
1.5
1
0.5
0
0.3
0.35
0.4
0.45
0.5
0.55
0.6

LH2 58 (Turgun's cuts)

		Std		Turgun	
		Data	MC	Data	MC
2	events with 1 bmtrk	439753	49179	439753	49179
3	Pvtx # trks >= 3	213801	45318	213801	45318
4	Pvtx at least 3 trks gof >= 0.05	175379	40878	175379	40878
5	|dxTgt - 0.32| <= 1, |dyTgt| <= 1	132633	40505	54977	17804
std cut 5: [(x-pos)^2 + (y-pos)^2] < 4					
6	-8 <= dzTgt <= 8	103918	40123	44774	17211
std cut 6: z-pos within -843 and -823					
Secondary vertex loop:					
7	Svtx 2 trks	22660	1612	9196	703
8	Svtx downstream of Pvtx	18919	1492	7711	652
9	Svtx neutral	9922	927	4019	401
10	Svtx trks gof > 0.01	1227	267	486	122
11	pT prim < 0.15	242	225	102	99
12	|sec vtx mom| > 0.8 GeV	82	93	35	40
# of incident particles on target		828373	49179	828373	49179
# of generated K_shorts:			16903		16903

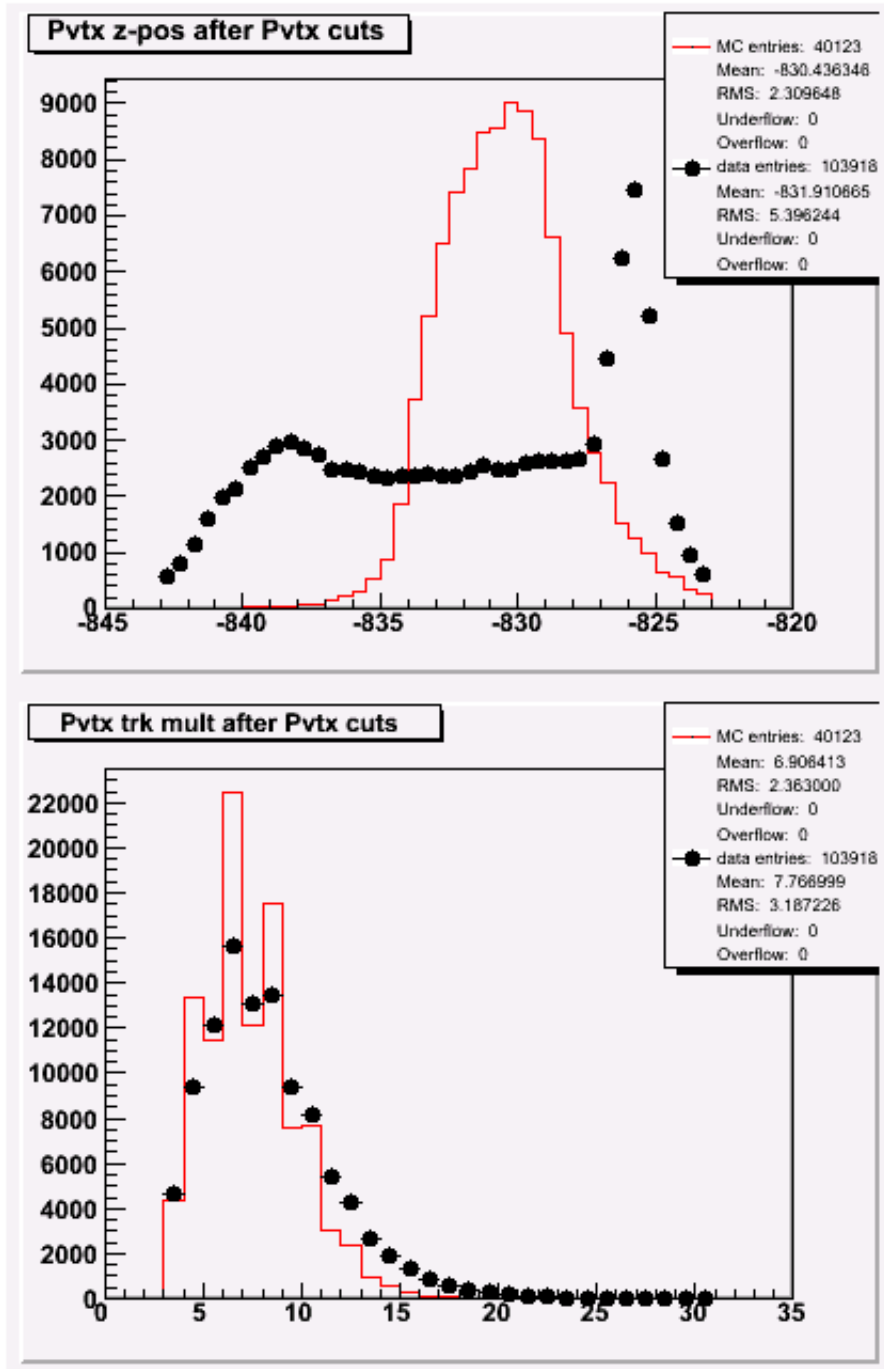
LH2 58

std (after Pvtx cuts) | Turgun (after Pvtx cuts)

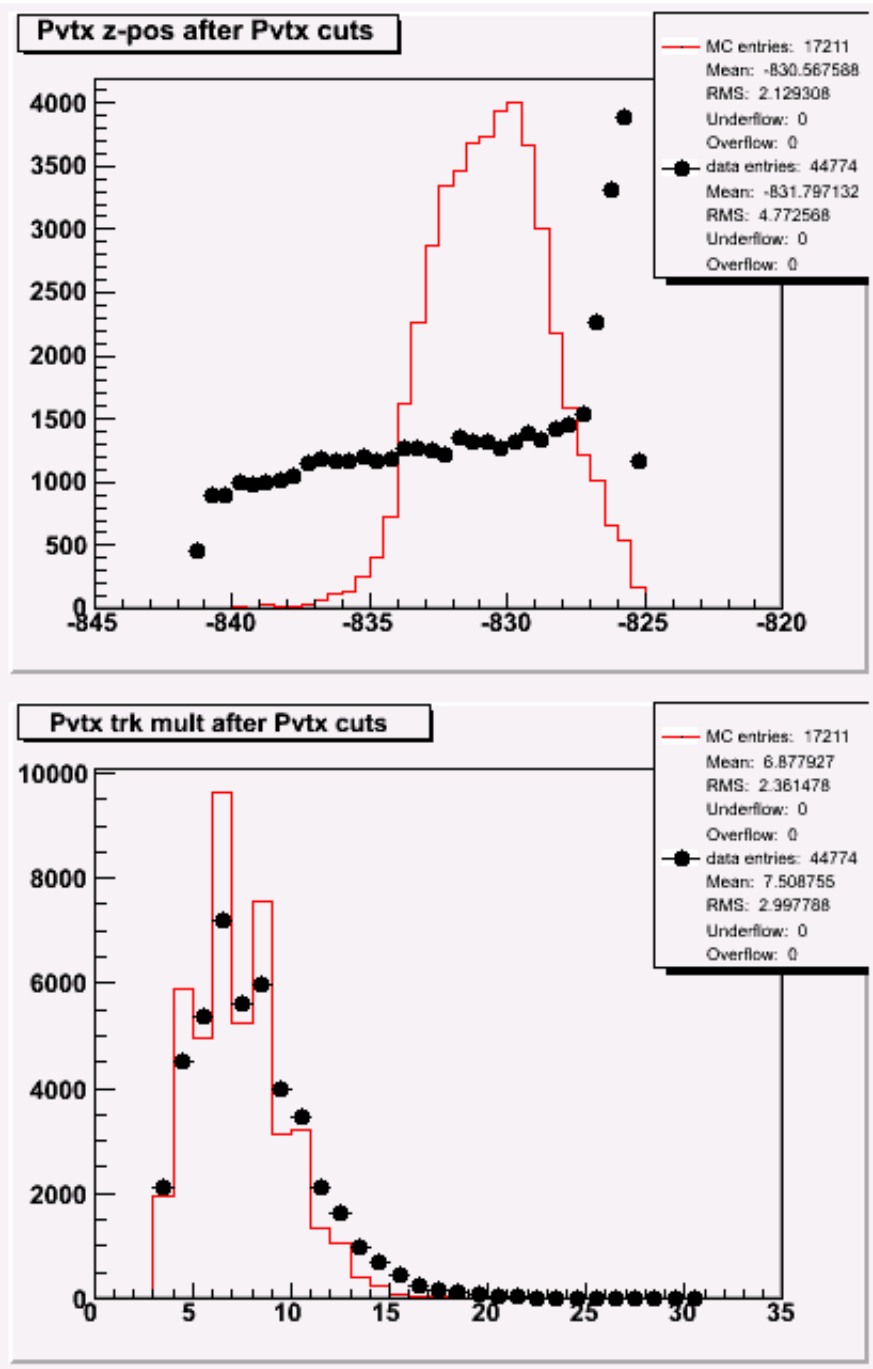


LH2 58

std (after Pvtx cuts)

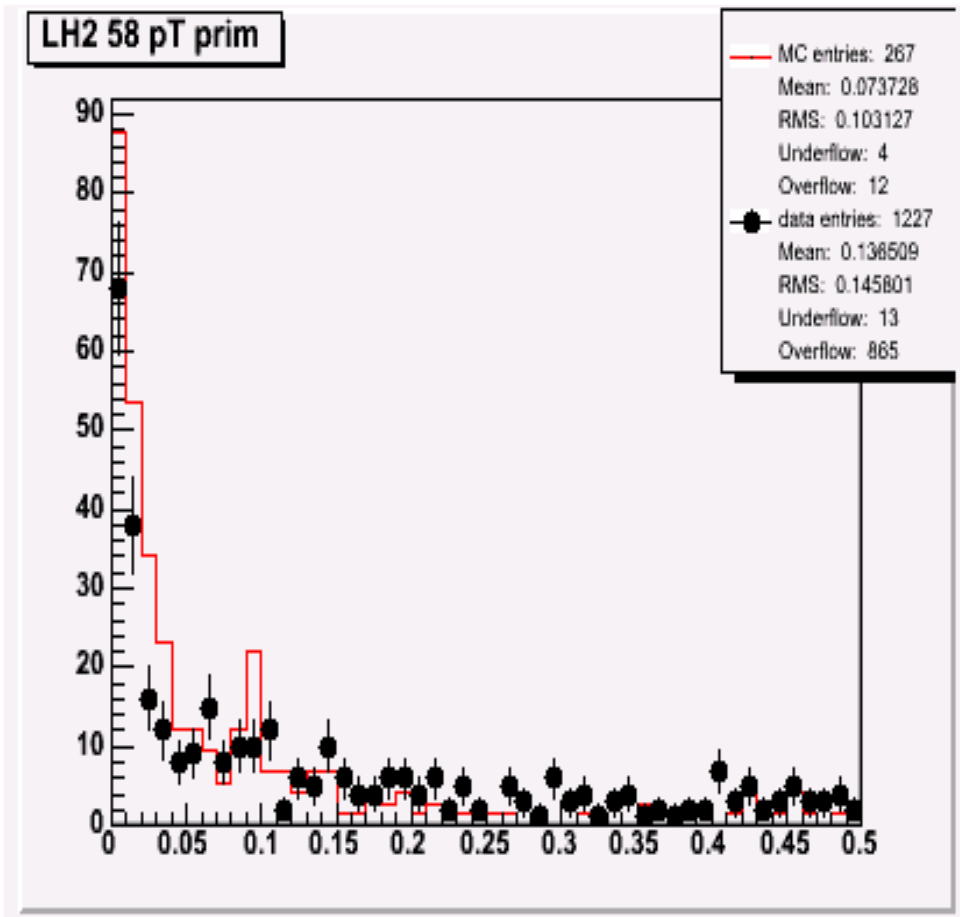


Turgun (after Pvtx cuts)

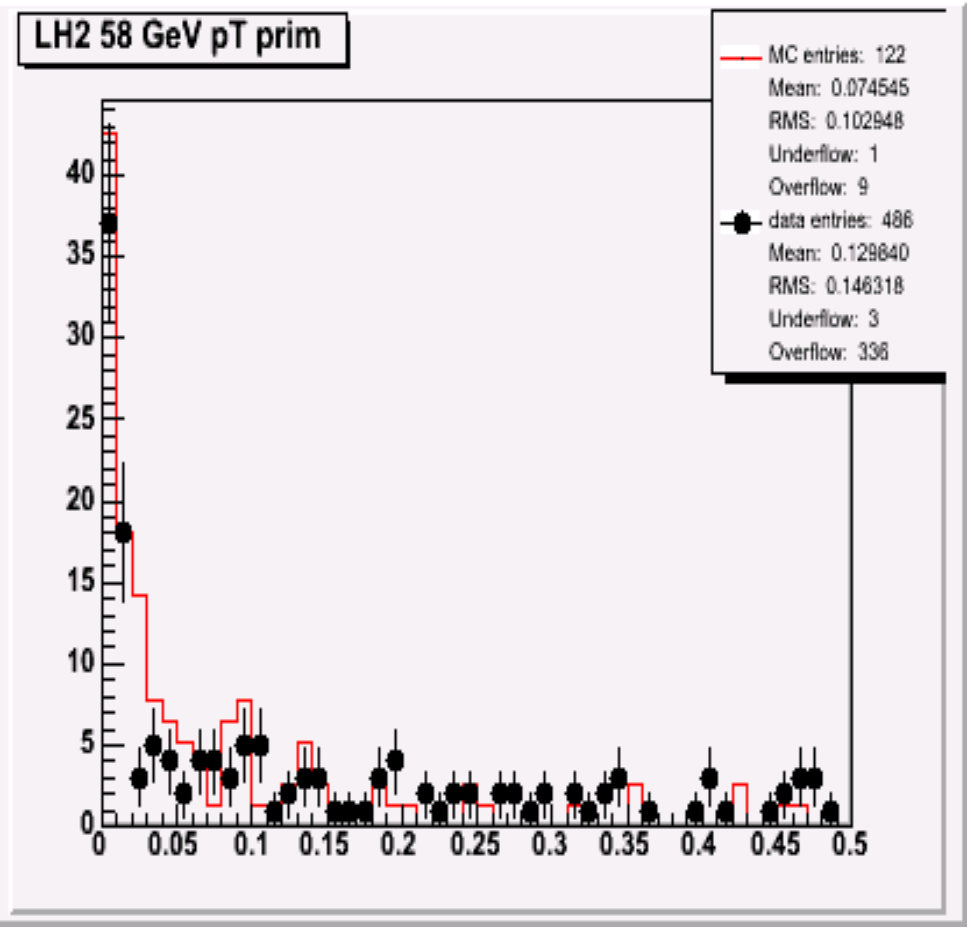


LH2 58

std (before pT prim cut)

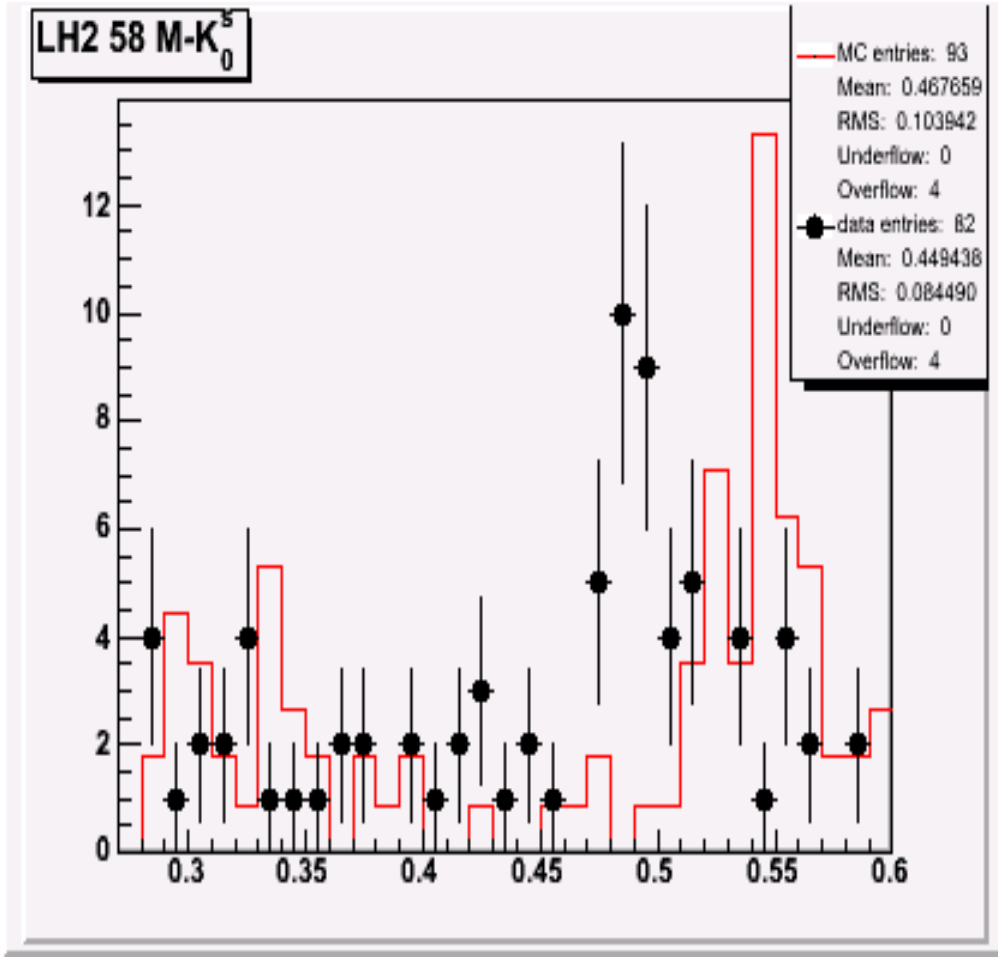


Turgun (before pT prim cut)

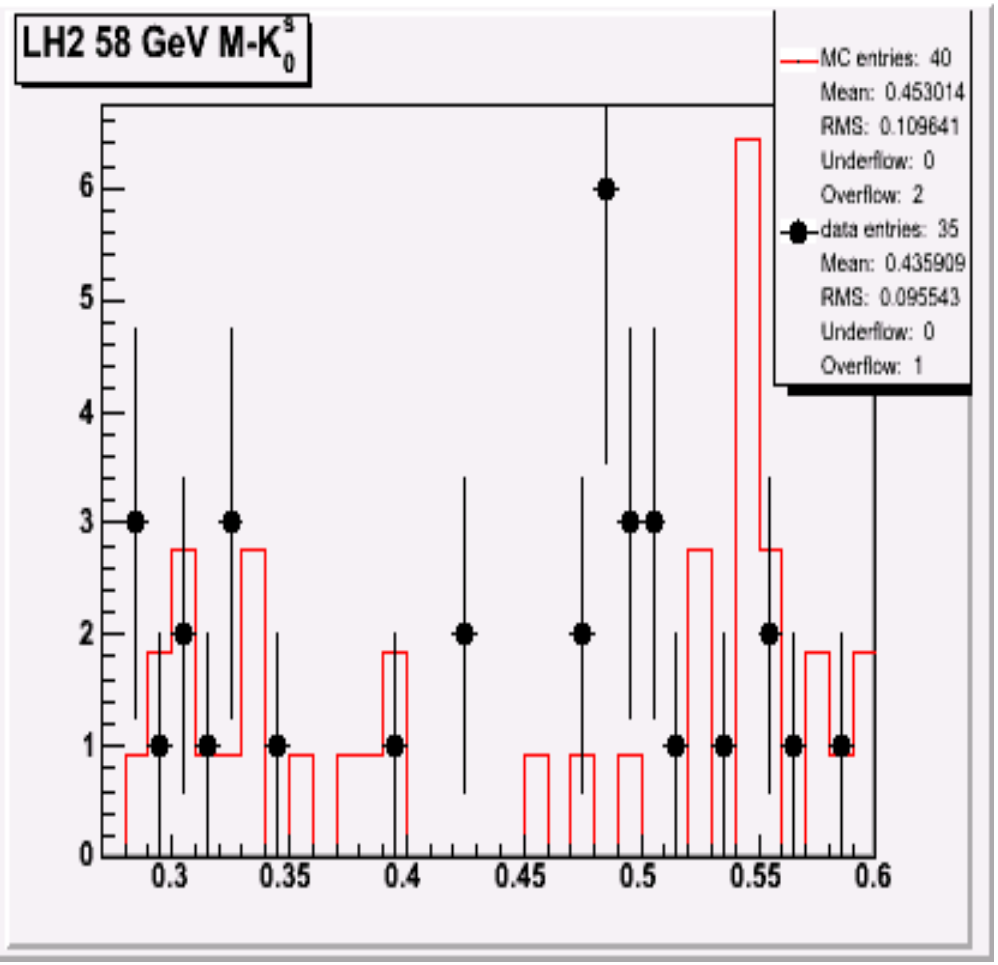


LH2 58

std



Turgun



LH2 84 data/85 MC (Turgun's cuts)

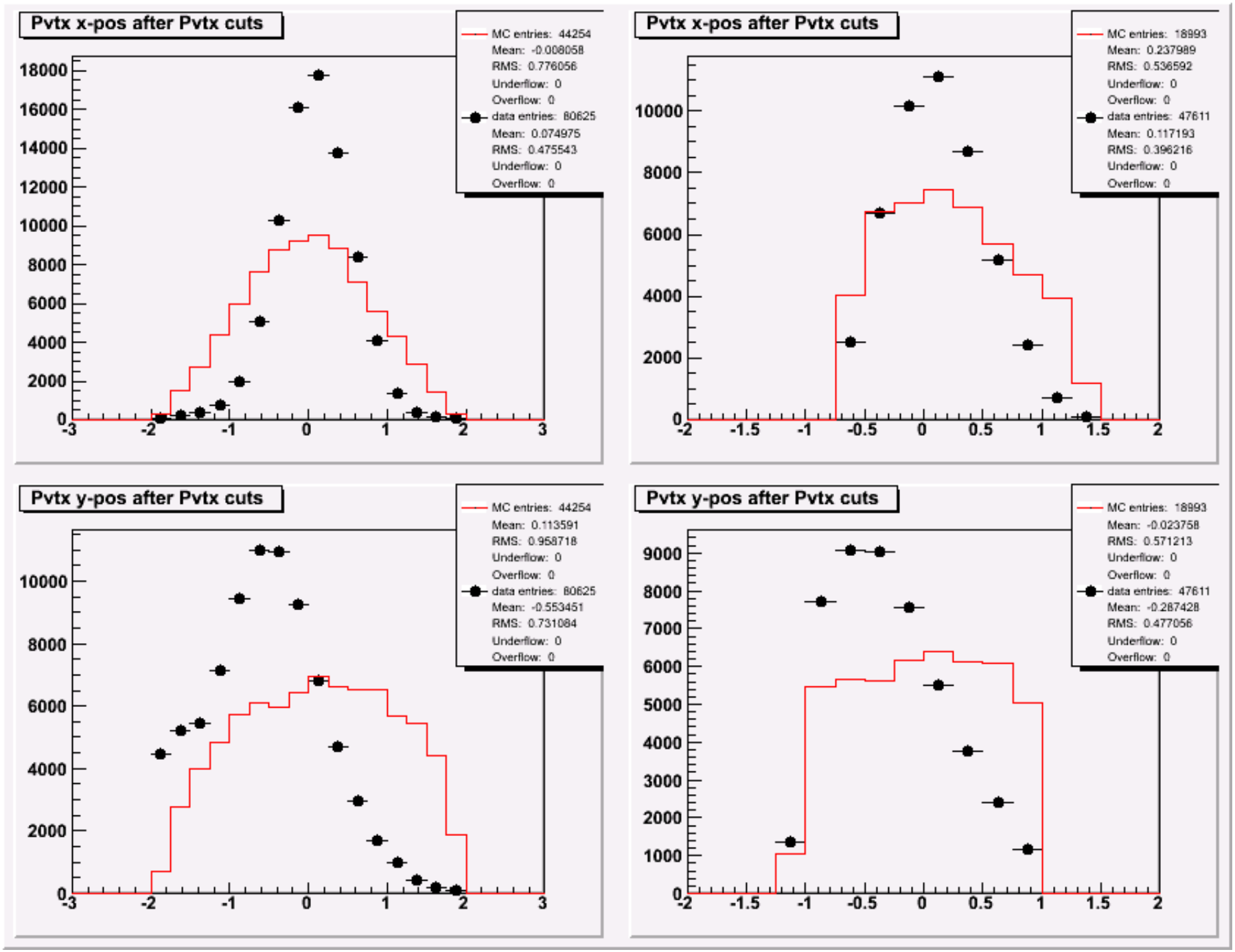
		Std		Turgun	
		Data	MC	Data	MC
2	events with 1 bmtrk	359723	54044	359723	54044
3	Pvtx # trks >= 3	162910	50628	162910	50628
4	Pvtx at least 3 trks gof >= 0.05	130864	45165	130864	45165
5	|dxTgt - 0.32| <= 1, |dyTgt| <= 1	101814	44772	61988	19755
std cut 5: [(x-pos)^2 + (y-pos)^2] < 4					
6	-8 <= dzTgt <= 8	80625	44254	47611	18993
std cut 6: z-pos within -843 and -823					

Secondary vertex loop:

7	Svtx 2 trks	15893	1948	8938	856
8	Svtx downstream of Pvtx	13390	1808	7547	795
9	Svtx neutral	6708	1068	3798	472
10	Svtx trks gof > 0.01	721	257	413	110
11	pT prim < 0.15	195	213	107	95
12	|sec vtx mom| > 0.8 GeV	78	87	42	44
# of incident particles on target		578101	54044	578101	54044
# of generated K_shorts:			19091		19091

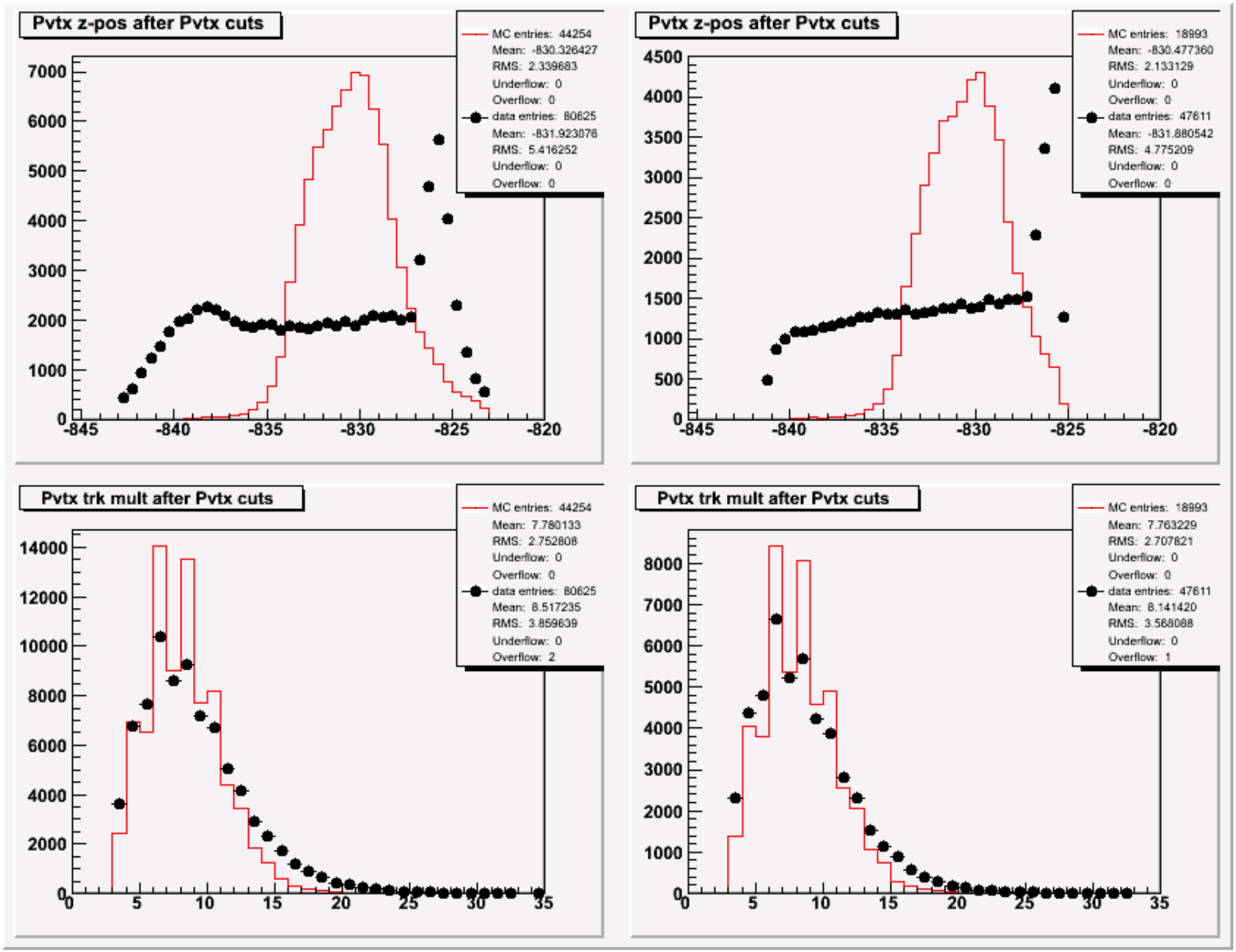
LH2 data 84/MC 85

std (after Pvtx cuts) | Turgun (after Pvtx cuts)



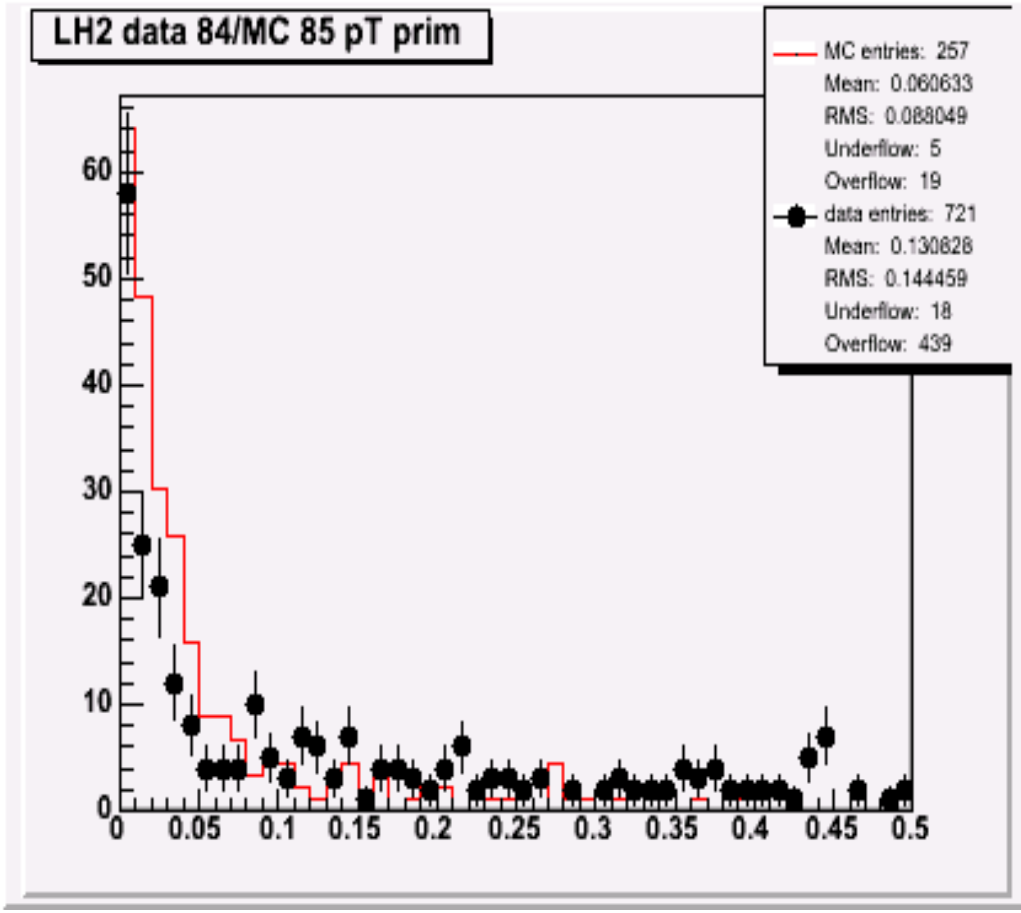
LH2 data 84/MC 85

std (after Pvtx cuts) Turgun (after Pvtx cuts)

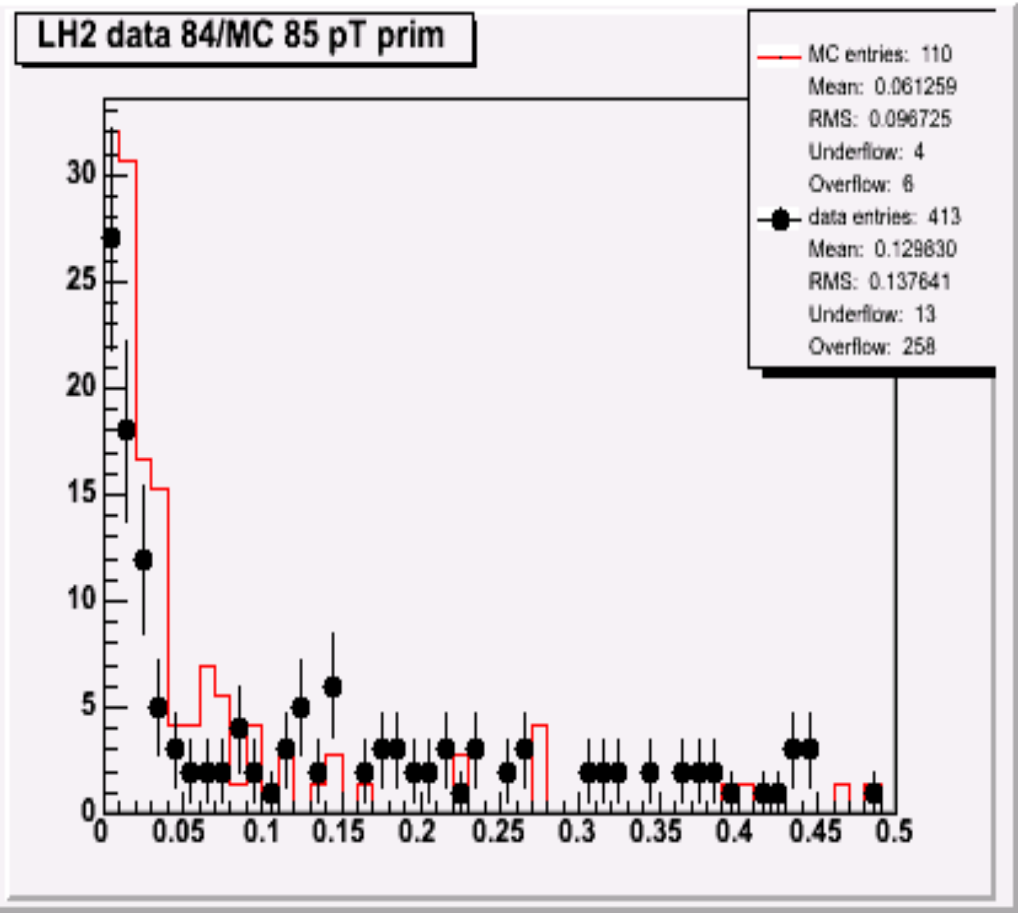


LH2 data 84/MC 85

std (before pT prim cut)

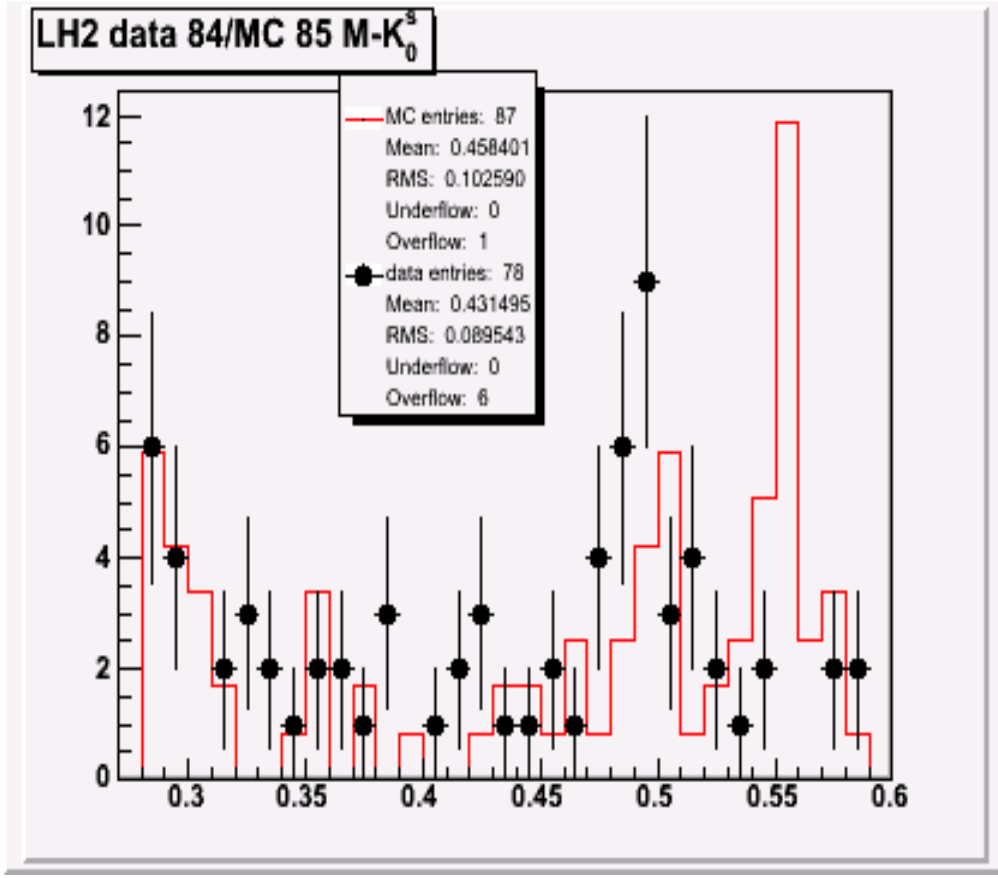


Turgun (before pT prim cut)

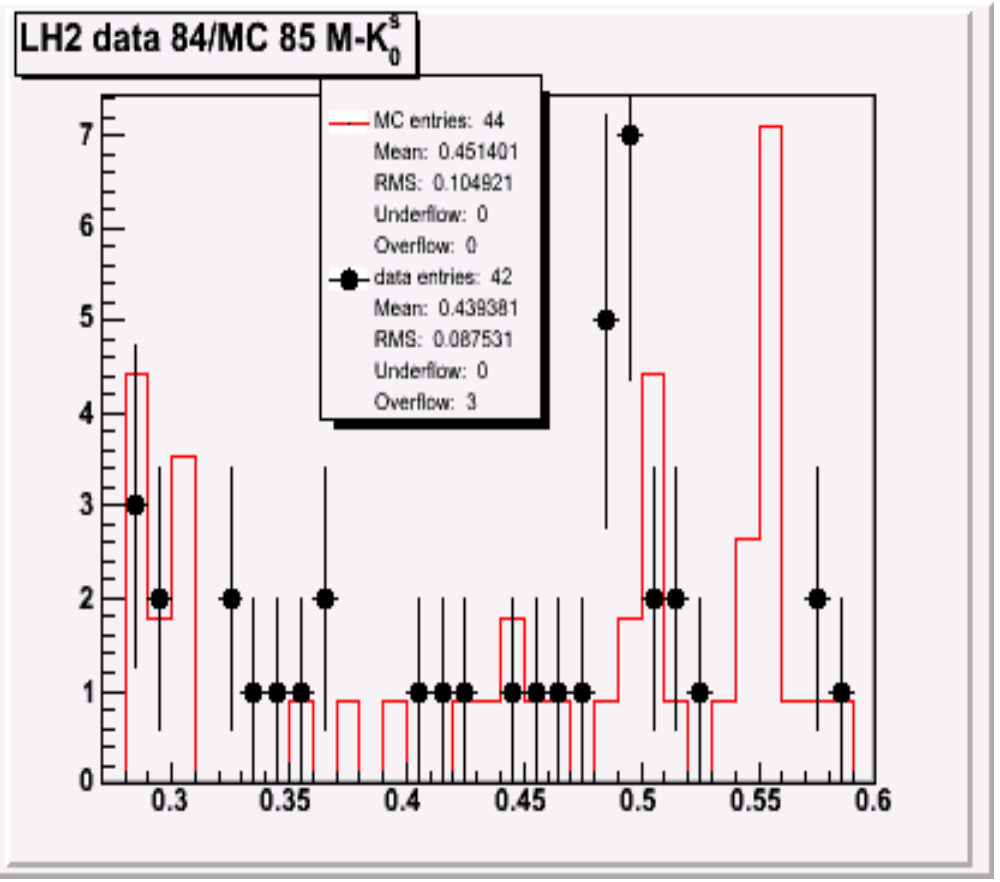


LH2 data 84/MC 85

std



Turgun



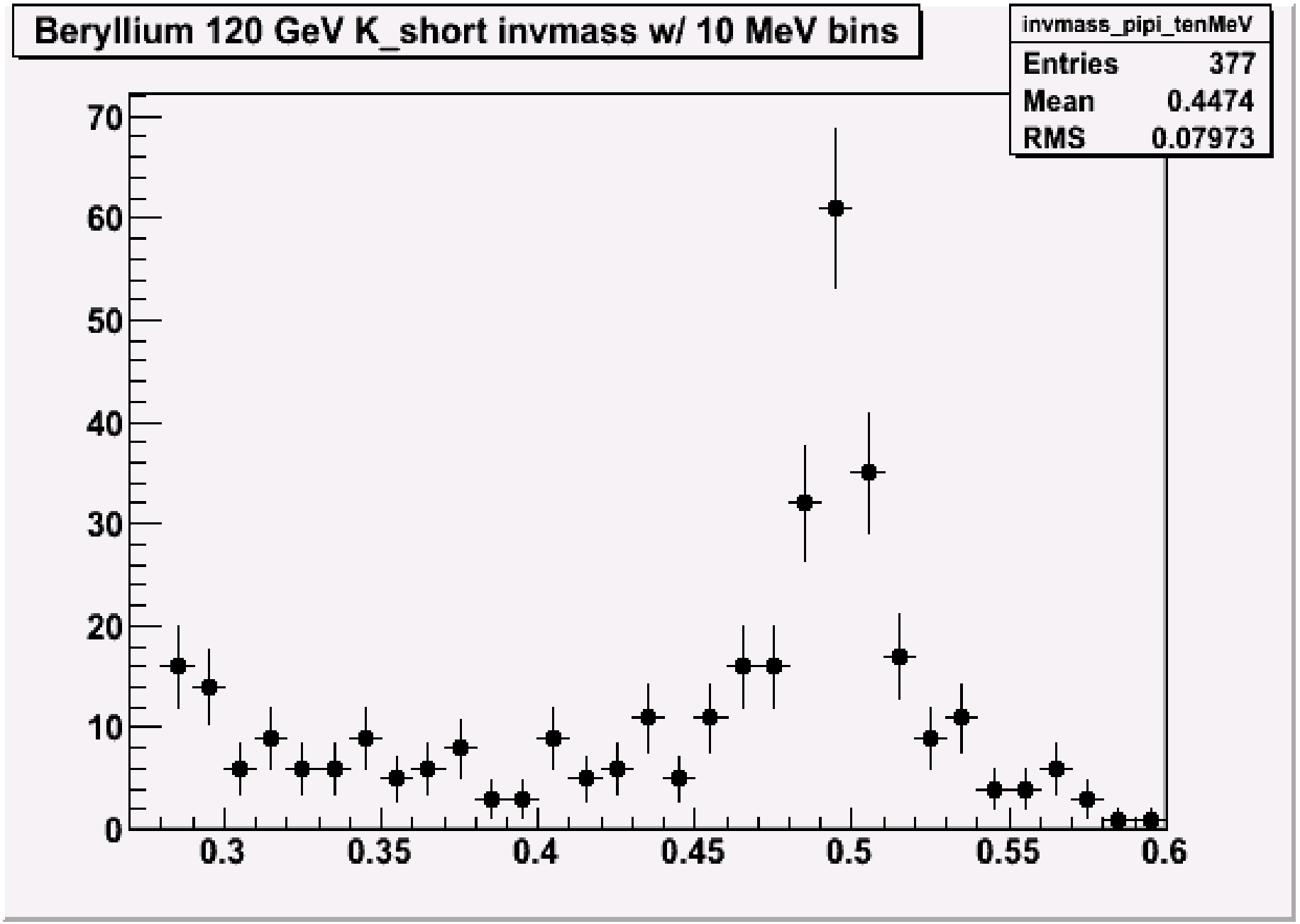
Beryllium 120 (data only)

		Data
0	total events	1102495
1	events with tracks	1035913
2	events with 1 bmtrk	805373
3	[(x-pos)^2 + (y-pos)^2] < 4.0	795946
4	Pvtx # trks >= 3	381273
5	Pvtx at least 3 trks gof >= 0.05	337888
6	Pvtx z-pos within -831 to -820	304451

Secondary vertex loop:

7	Svtx 2 trks	38768
8	Svtx downstream of Pvtx	35618
9	Svtx neutral	17224
10	Svtx trks gof > 0.01	1607
11	pT prim < 0.15	1056
12	|sec vtx mom| > 0.8 GeV	377
# of incident particles on target		1247431

Beryllium 120



Back-up Slides

The method that involves MC generated K^0_S:

First, we get the variables I need:

```
MIPPMCSummary* mcevt = new MIPPMCSummary;
MIPPMCTrackSummary* mctrk = new MIPPMCTrackSummary;
```

Which allows us to get the events from MCTruth:

```
evtTree->SetBranchAddress("fMCTruth.", &mcevt);
```

Then we loop over all mctrks from mcevt->GetTrk(). If the pid_pdg is 310 (the number for K^0_S), we plot the energy.

Cut 1: (evt->NTrk() != 0 || evt->NBTrk() != 0)
Events without vertex tracks are cut.

Cut 2: (evt->NBTrk() == 1)
Events with 0 or more than 1 beam track are cut.

At this point, I choose the vertex in the event with the most associated tracks to be the Pvtx, but for Turgun's editions, I choose my Pvtx as vtx->vtxtype ==1.

Cut 3: (Pvtx->ntrk >= 3)
Events that have primary vertices with less than three associated tracks are cut.

Cut 4: (trk->gof >= 0.05) for 3 or more tracks
Events that have at least one primary vertex track that has a goodness of fit less than 0.05 are cut.

Cut 5: (Pvtx->x[0]*Pvtx->x[0] + Pvtx->x[1]*Pvtx->x[1]) <= 4.0
Events with primary vertices on the boundary of or outside of a circle of the given radius in the xy-plane centered on the z-axis are cut. Each event's single primary vertex is selected by choosing the vertex from that event with the most associated tracks.

Cut 6: Pvtx->x[2] >= -830 && Pvtx->x[2] <= -825
Events with the z-position of its primary vertex falling outside the given range are cut.

Now we begin to cut on secondary vertices within an event:

Cut 7: (Svtx->ntrk ==2)
Secondary vertices with less than or more than 2 tracks are cut.

Cut 8: (Svtx->x[2] > Pvtx->x[2])
Secondary vertices that are not downstream of the primary vertex are cut.

Cut 9: (Sum of Svtx_trk->q == 0)
Secondary vertices that are not neutral are cut.

Cut 10: (postrk->gof > 0.01 && negtrk->gof > 0.01)
Secondary vertices that have at least one track with a goodness of fit less than 0.01 are cut.

Cut 11: if(|axis_angle| < pi/2) pT_prim = Svtx->ptot * |sin(axis_angle)|;
(pT_prim < 0.15)
Secondary vertices with a transverse momentum with respect to the primordial axis greater than or equal to the given transverse momentum are cut.

Cut 12: (Svtx->ptot > 0.8)
Secondary vertices with a momentum magnitude less than or equal to 0.8 GeV/c are cut.

(for NuMI) Cut 9:

```
(vtx->x[2] >= -821.033 &&
vtx->x[2] <= -658.193)
```

Secondary vertices with z-position outside of the TPC z-bounds are cut.

(for NuMI) Cut 14:

```
mom_asym = (postrk->ptot – negtrk->ptot)/
(postrk->ptot + negtrk->ptot);
(fabs(mom_asym) < 0.8))
```

Secondary vertices with a momentum asymmetry magnitude greater than or equal to 0.8 GeV/c are cut.