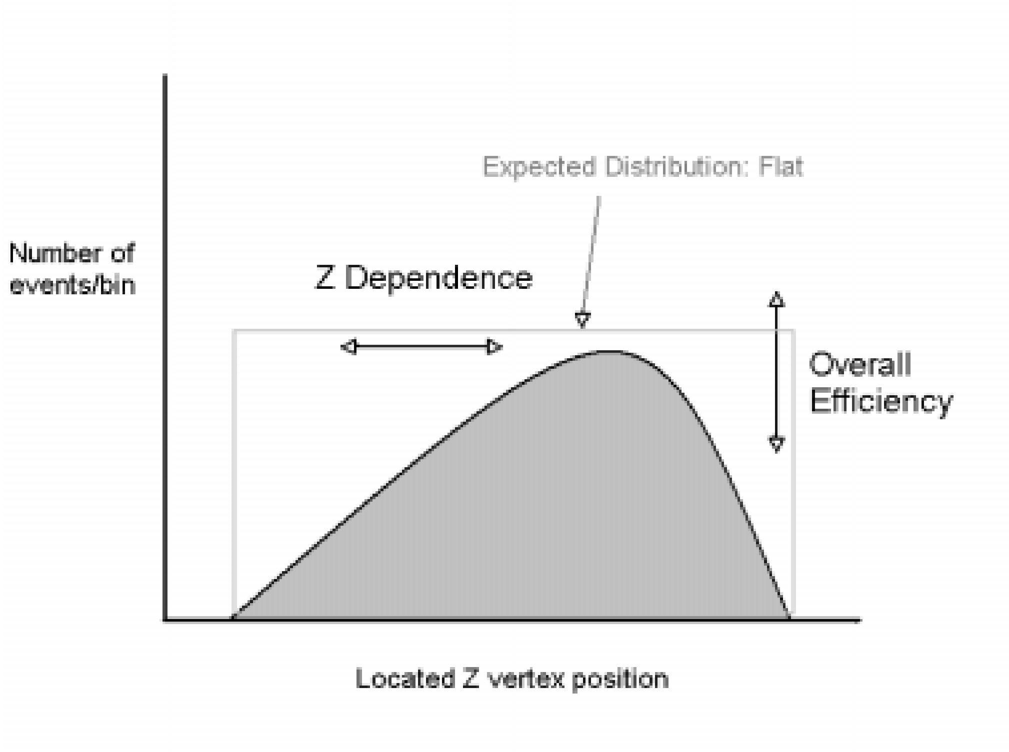
Event Location Efficiency Study-III

This time I'll be looking at the Z ***independent*** overall efficiency…



→ **<u>From last week:</u>** The Z dependence of the location efficiency can be factorized into two parts:

1) Spectrometer prediction efficiency(shape)
2) Emulsion Scan efficiency

The Z dependent efficiency –
70±8% (correcting for spectrometer predictions -75±8%)

• *I'm assuming that the Z independent inefficiency is due solely to the event multiplicity cut required for (net)scanning.*

• First I looked at the data (175 events)…..

1) Figure 1 contains plots of located event 1^{ry} charged multiplicities. Top plot – no cuts, middle plot - no 1 segment tracks, bottom plot – number of 1 segment tracks per event

2) Figure 2 contains plots of projected emulsion track angles (U,V) for located events. Top plots – no cuts, middle plots - no 1 segment tracks, bottom plots – only 1 segment tracks

3) Figure 3 contains plots of total emulsion track angles. Top plots – no cuts, middle plots - no 1 segment tracks, bottom plots – only 1 segment tracks

4) Figure 4 again contains plots of located event 1^{ry} charged multiplicities but with a 200mr total angle cut (top plot), 200mr total angle cut + ***no*** 1 segment emulsion tracks(bottom plot). Why I generated these distributions will become clear….

• Now I tried to compare to the MC distribution…

→ I generated 1,000 events with the following parameters:

ratio of $\nu_e / \nu_\mu / \nu_\tau$**:** 0.43/0.52/0.05
ratio of cc/nc interactions: 0.67/0.33
ratio of neutrino/anti-neutrinos: 0.5/0.5
fraction of nonprompt ν**'s:** 0.20

→These events were then processed through trigger, nustrip and Reinhard's cat3 strip code. Only events passing above cuts were used in the following analysis.

• I really don't know how to deal with one segment emulsion tracks. Therefore I cut on the total angle of the primary tracks, requiring them to be less than 200mr. From figure 3 the "contamination" in the data from one segment tracks reduces to ~10%.

→ Figures 5 and 6 compare the MC charged primary multiplicity (*e's*, μ's, τ's, π's, *k*'s, and protons only) result (with angle cut) to the multiplicity distributions generated in figure 4 (same angle cut).
(Note on MC normalization: The MC distribution was normalized to the data by counting the number of events with greater than 3 charged primary tracks.

→ From the difference in number of events between MC and data in figures 5 and 6, the efficiency resulting from the multiplicity cuts is: 80±7% (only 200mr angle cut on the data) ***or*** 88±7% (200mr cut and no one segment emulsion tracks). ← I will include this difference as a systematic

• Including the Z dependent efficiency result from last week(70±8%), the total event location efficiency I obtain is:

56%±11%(stat.)+6%(sys.)

Figure 1

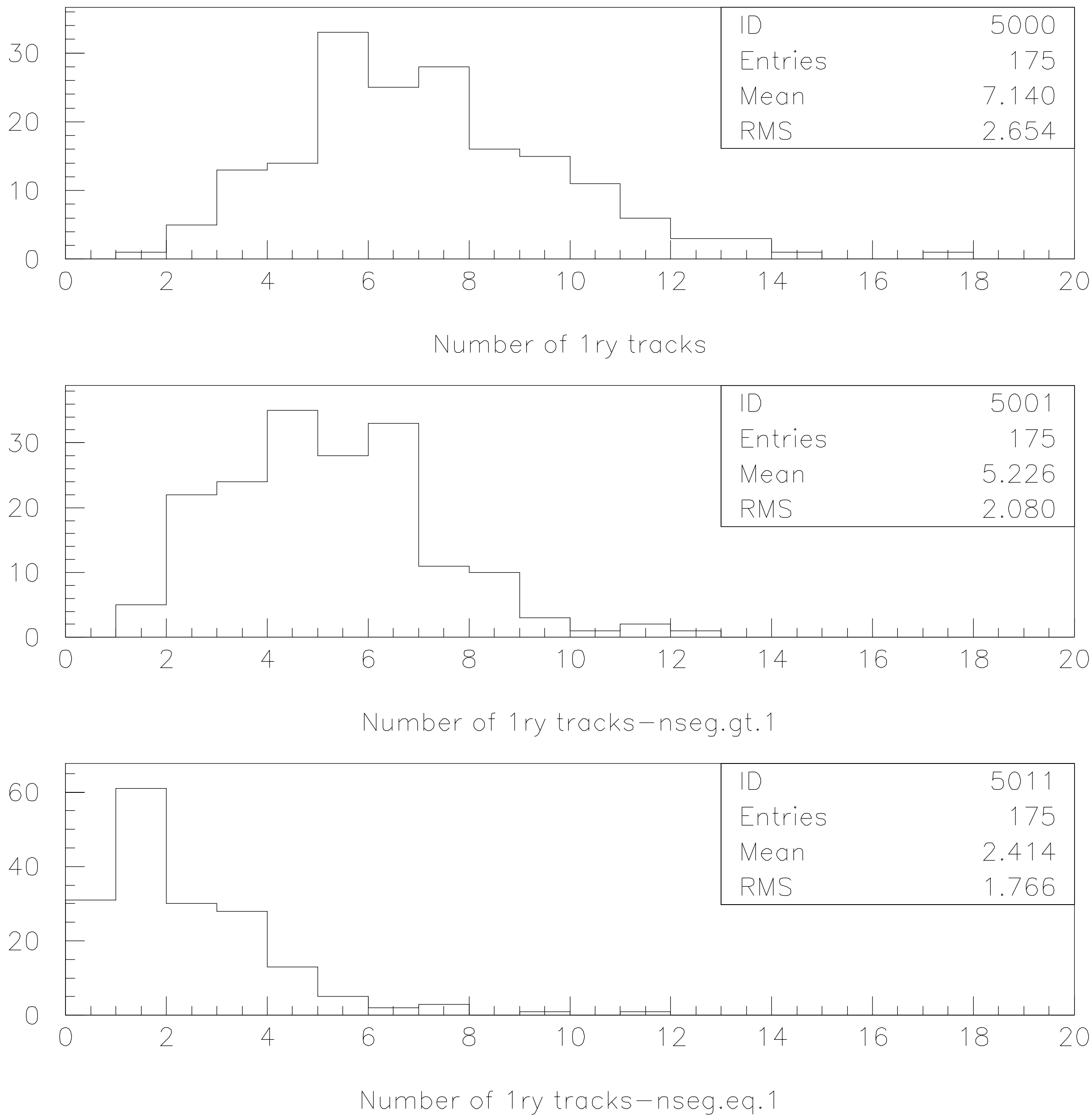
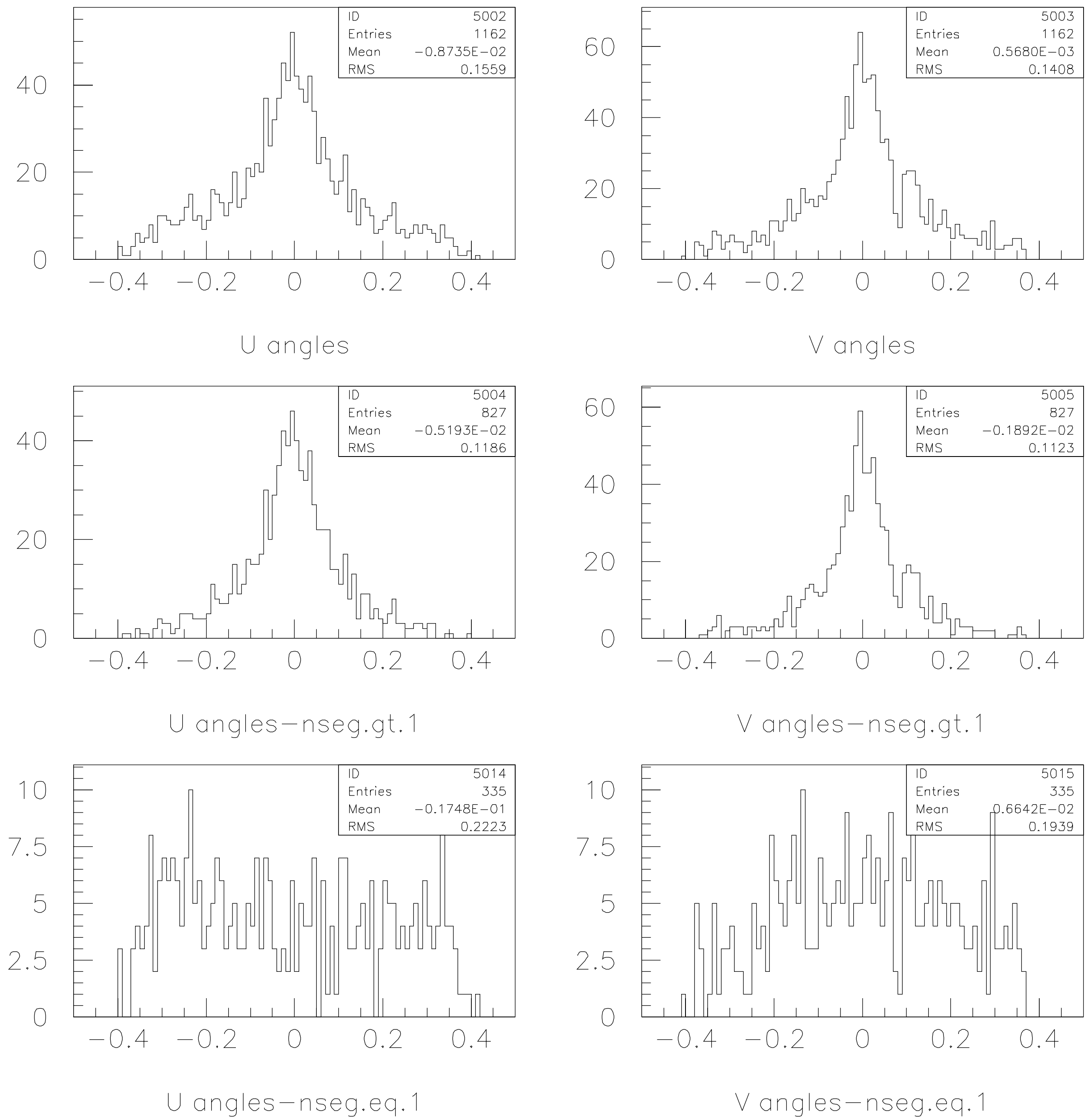
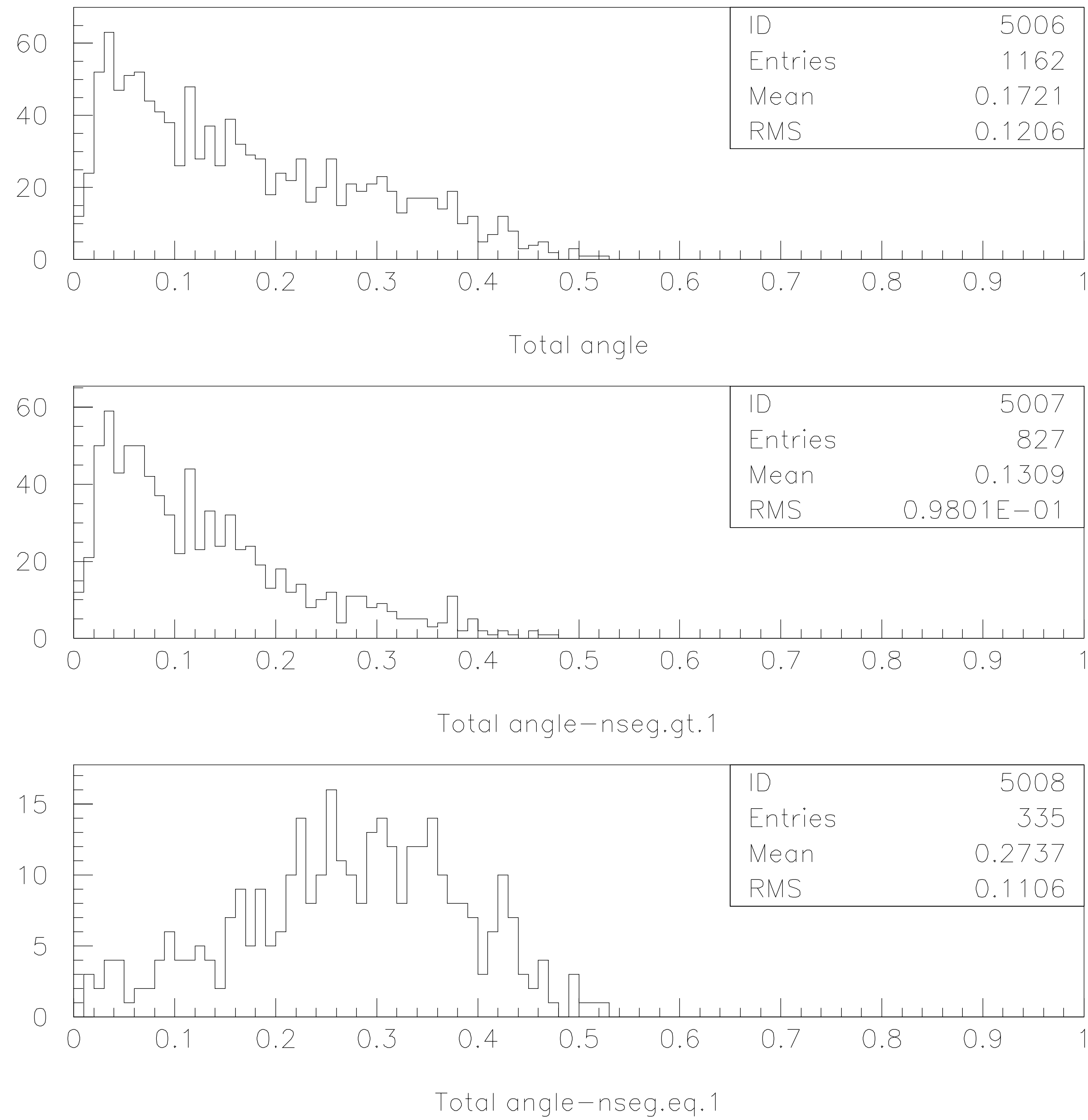

ID 5000
Entries 175
Mean 7.140
RMS 2.654
Number of 1ry tracks
ID 5001
Entries 175
Mean 5.226
RMS 2.080
Number of 1ry tracks—nseg.gt.1
ID 5011
Entries 175
Mean 2.414
RMS 1.766
Number of 1ry tracks—nseg.eq.1

Figure 2



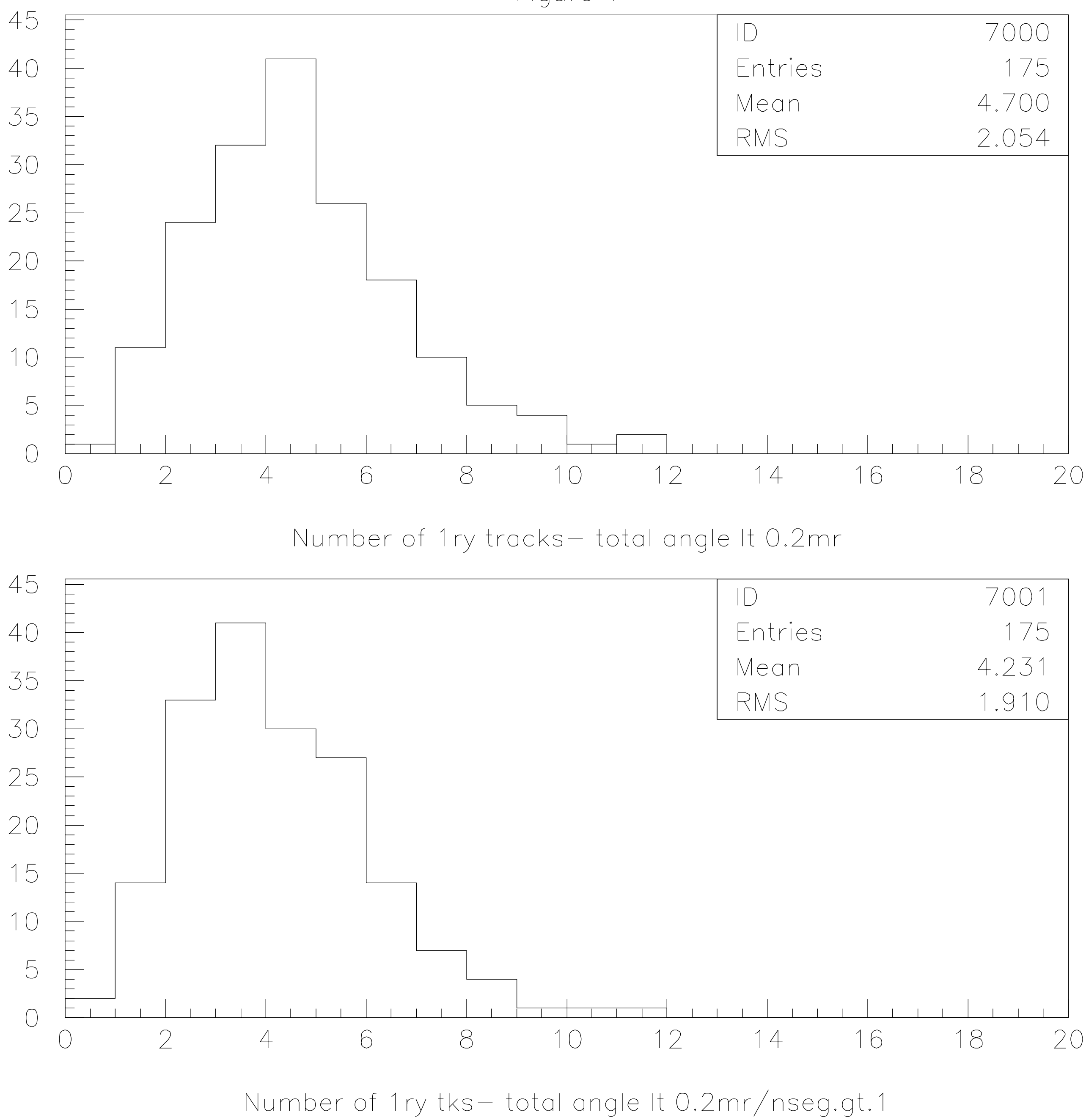
ID 5002
Entries 1162
Mean −0.8735E−02
RMS 0.1559
U angles
ID 5003
Entries 1162
Mean 0.5680E−03
RMS 0.1408
V angles
ID 5004
Entries 827
Mean −0.5193E−02
RMS 0.1186
U angles−nseg.gt.1
ID 5005
Entries 827
Mean −0.1892E−02
RMS 0.1123
V angles−nseg.gt.1
ID 5014
Entries 335
Mean −0.1748E−01
RMS 0.2223
U angles−nseg.eq.1
ID 5015
Entries 335
Mean 0.6642E−02
RMS 0.1939
V angles−nseg.eq.1

Figure 3



ID 5006
Entries 1162
Mean 0.1721
RMS 0.1206
Total angle
ID 5007
Entries 827
Mean 0.1309
RMS 0.9801E-01
Total angle-nseg.gt.1
ID 5008
Entries 335
Mean 0.2737
RMS 0.1106
Total angle-nseg.eq.1

Figure 4


ID 7000
Entries 175
Mean 4.700
RMS 2.054
Number of 1ry tracks— total angle lt 0.2mr
ID 7001
Entries 175
Mean 4.231
RMS 1.910
Number of 1ry tks— total angle lt 0.2mr/nseg.gt.1

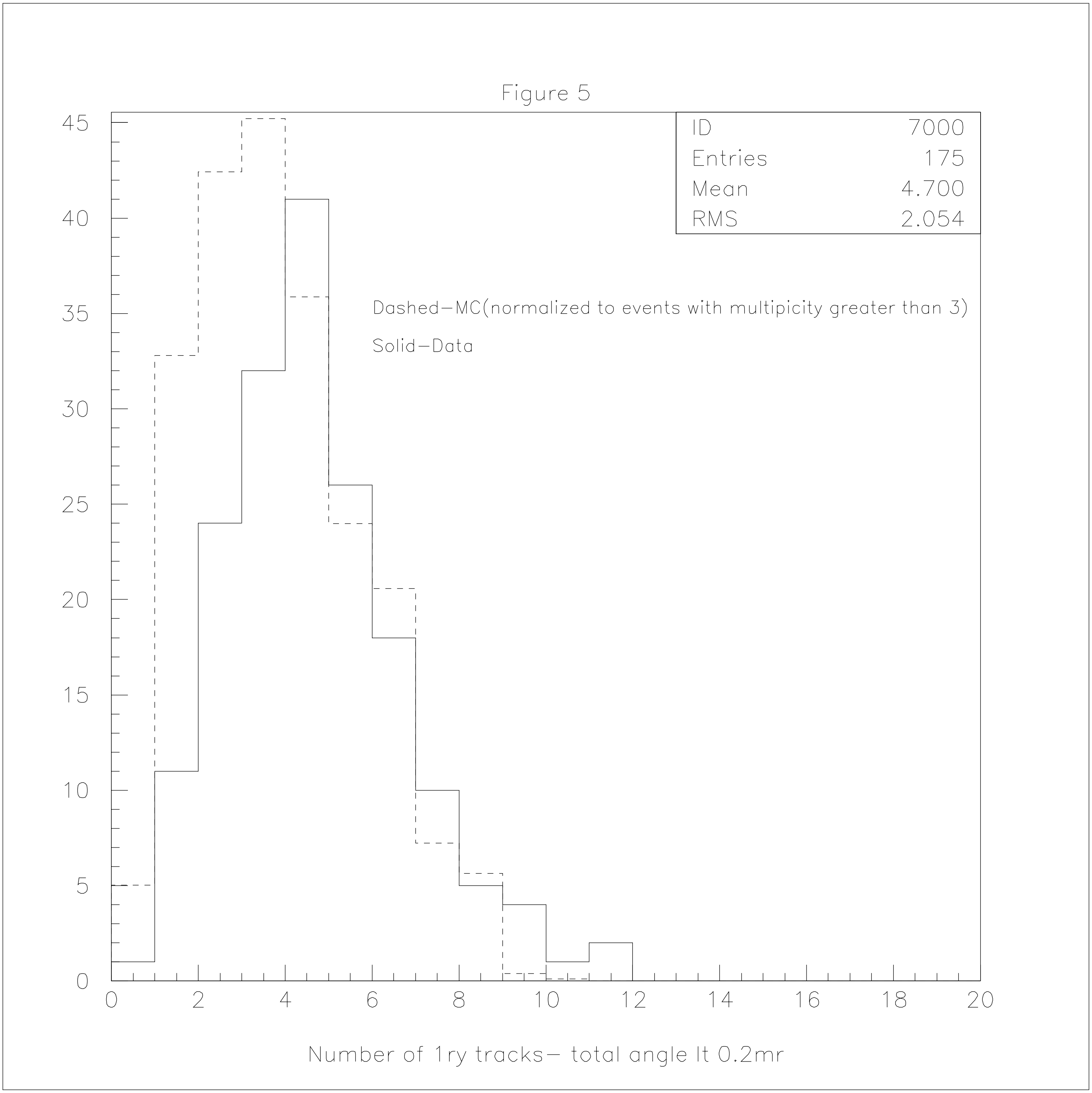


Figure 5
ID 7000
Entries 175
Mean 4.700
RMS 2.054
Dashed–MC(normalized to events with multipicity greater than 3)
Solid–Data
Number of 1ry tracks– total angle lt 0.2mr

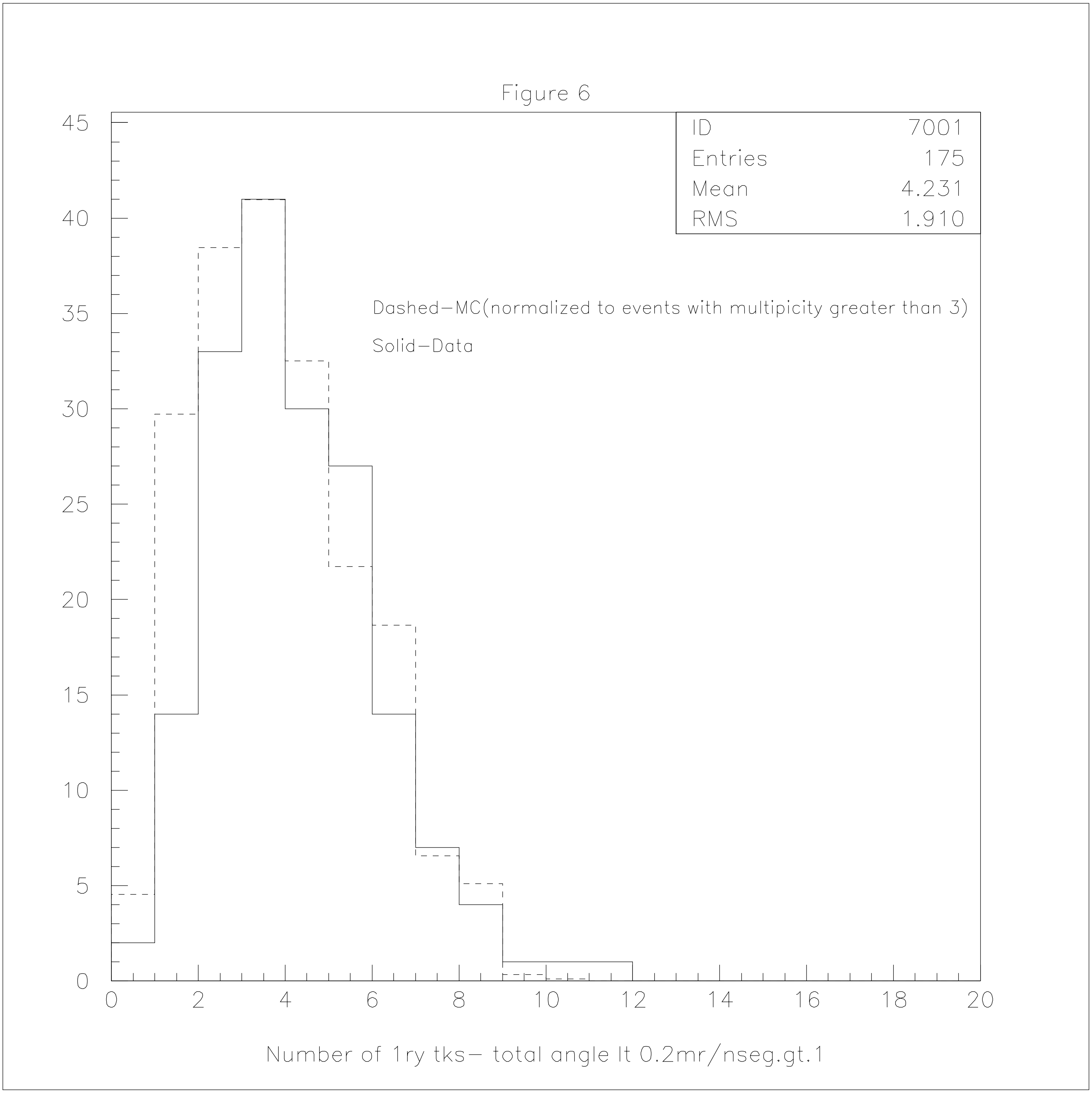
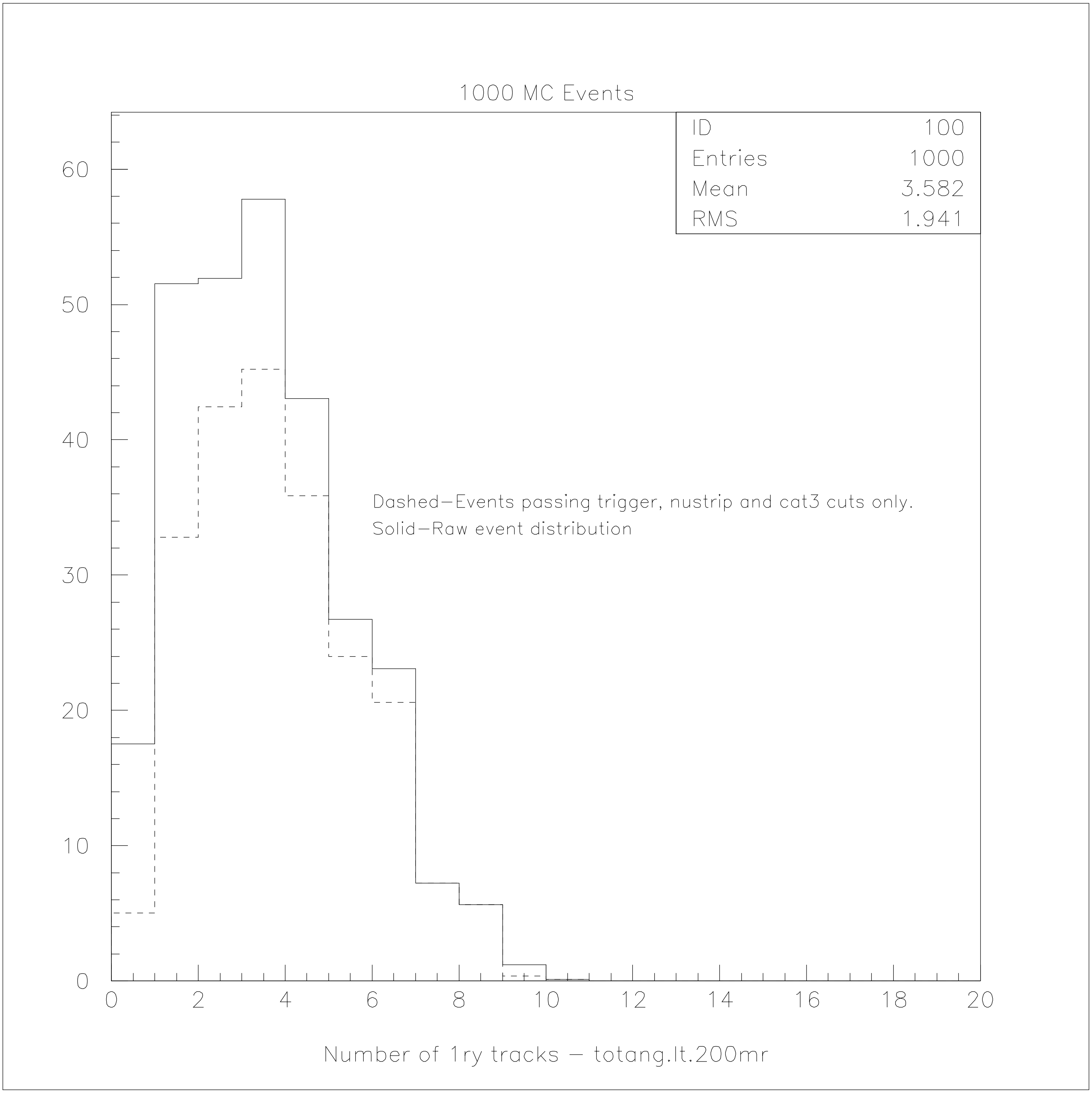


Figure 6
ID 7001
Entries 175
Mean 4.231
RMS 1.910
Dashed–MC(normalized to events with multipicity greater than 3)
Solid–Data
0
5
10
15
20
25
30
35
40
45
0
2
4
6
8
10
12
14
16
18
20
Number of 1ry tks– total angle lt 0.2mr/nseg.gt.1


1000 MC Events
ID 100
Entries 1000
Mean 3.582
RMS 1.941
60
50
40
30
20
10
0
0 2 4 6 8 10 12 14 16 18 20
Dashed—Events passing trigger, nustrip and cat3 cuts only.
Solid—Raw event distribution
Number of 1ry tracks — totang.lt.200mr