Update on 2 view vs 3 view (vs other 3 view vs other 3 view) truth studies

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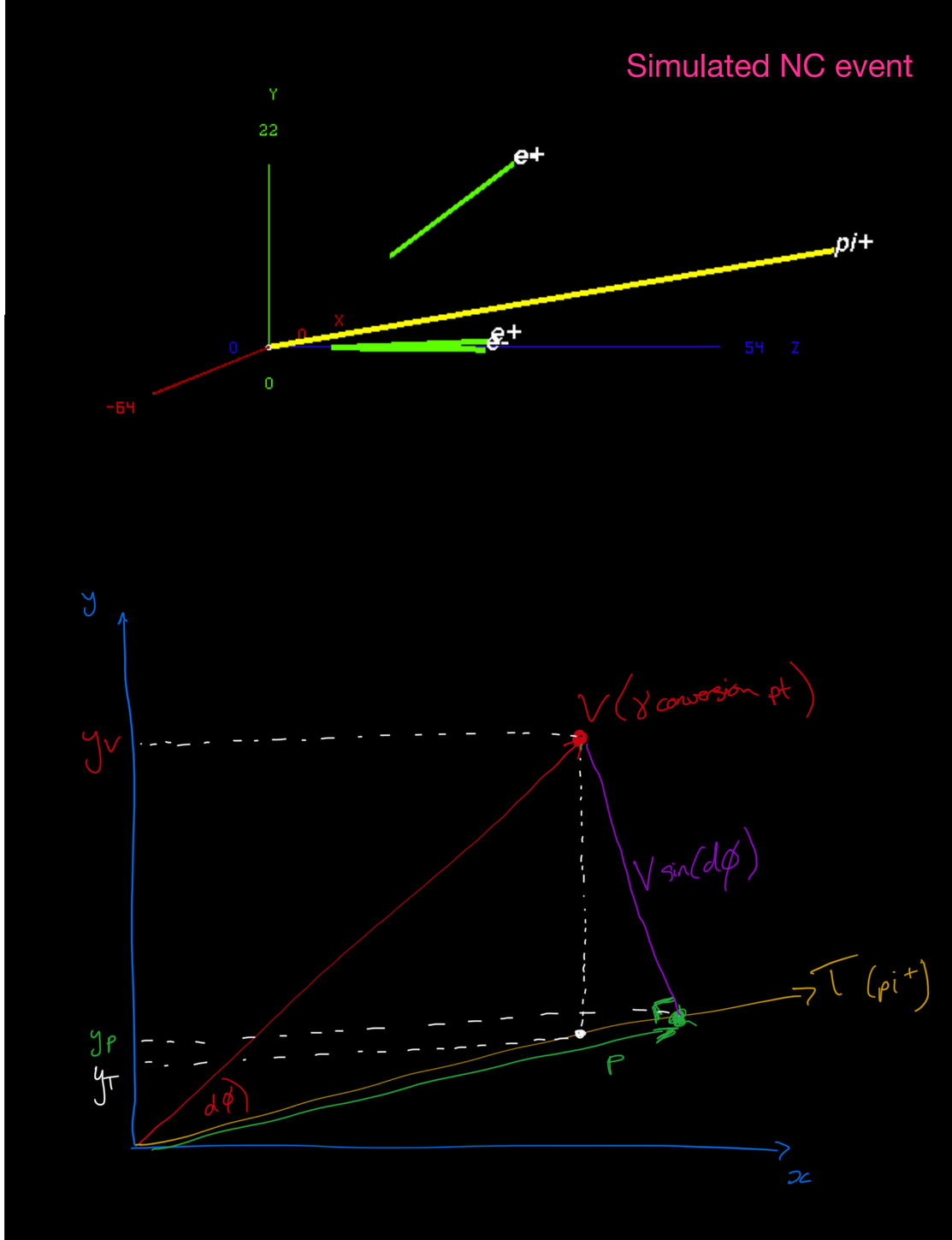
Intro

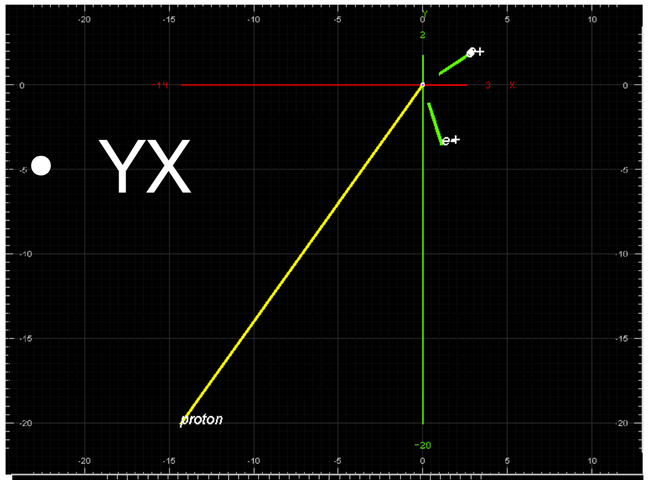
- In this study we're looking at 3 GeV NC events with pi0-> yy -> 4e
- Aim is to identify and quantify events that have a charged particle track overlapping a gamma conversion, in which case we may misreconstruct the event
- For each gamma conversion we look at the vertical, orthogonal, and angular distance between the conversion and any PV tracks, in the xy, yz, yu and yv planes
- Definitions:
  - dphi: angular distance between y and track
  - dy: y_V - y_T in image
  - orthogonal distance: purple line in image
- Potentially problematic events:
  - dy (or d_orthog) < 1cm
    &&
  - dphi < 20 degrees

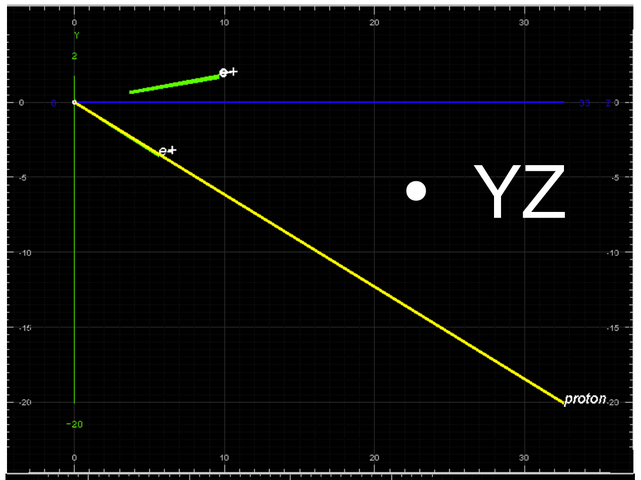
for the same track/ gamma in all planes

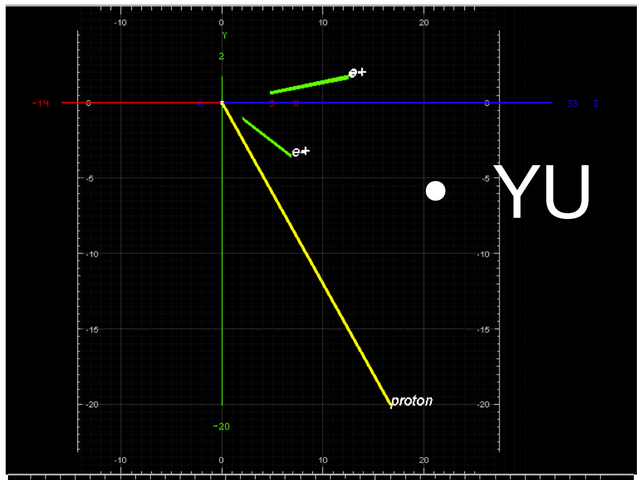


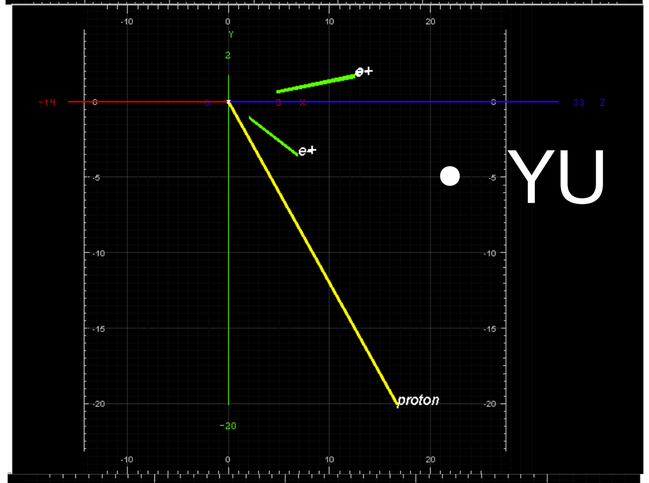
Event 99813 flagged as problematic

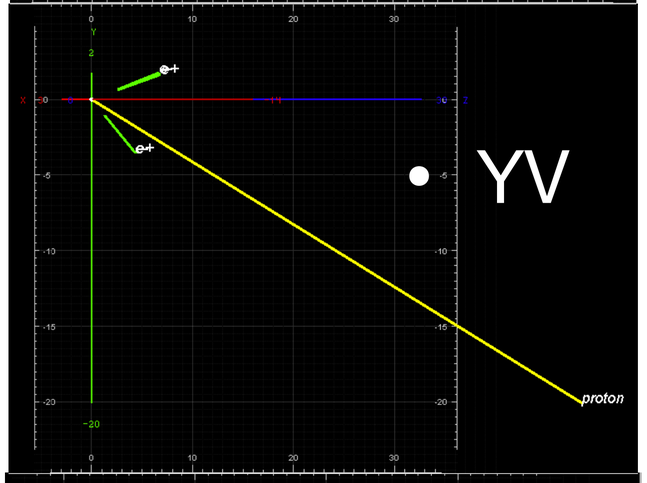
- (0, 90, -48)
- (-48, 48, 90)
- (-30, 30, 90)

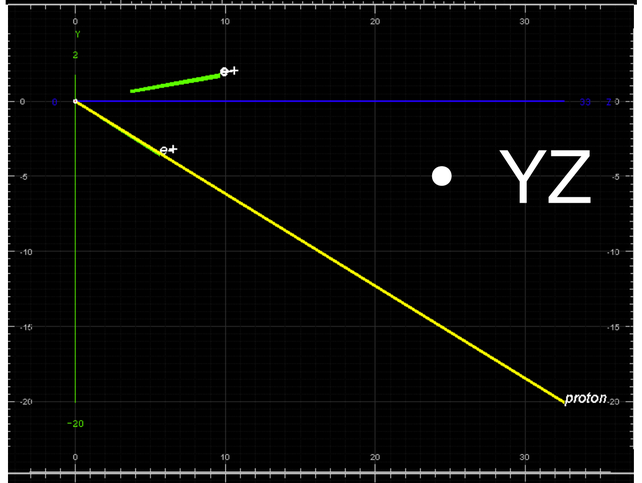


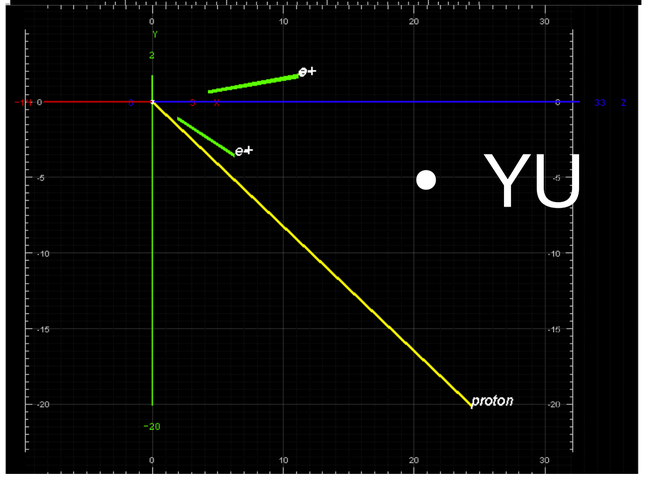


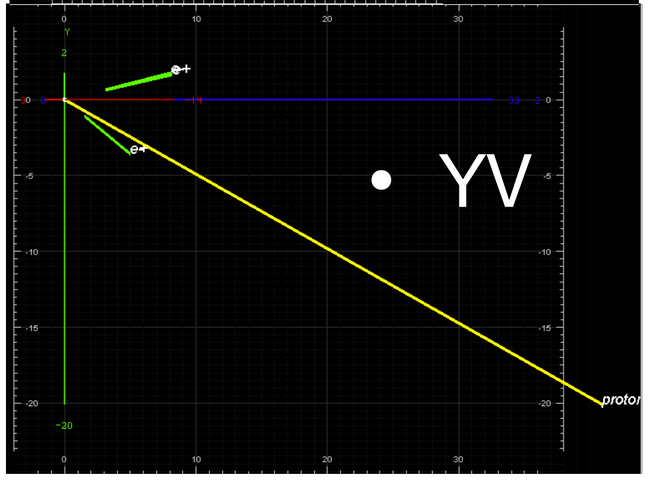


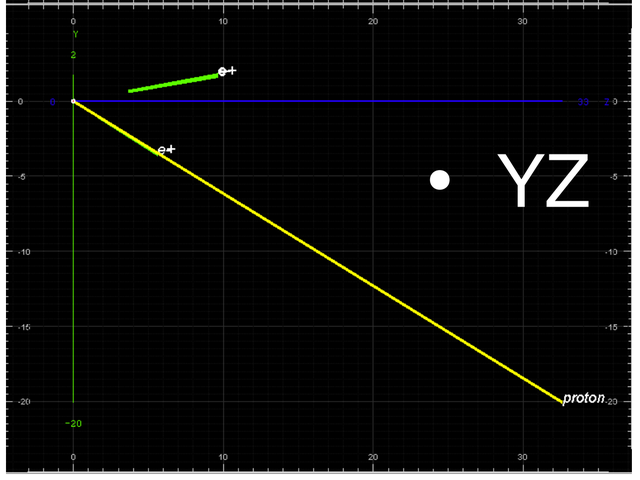












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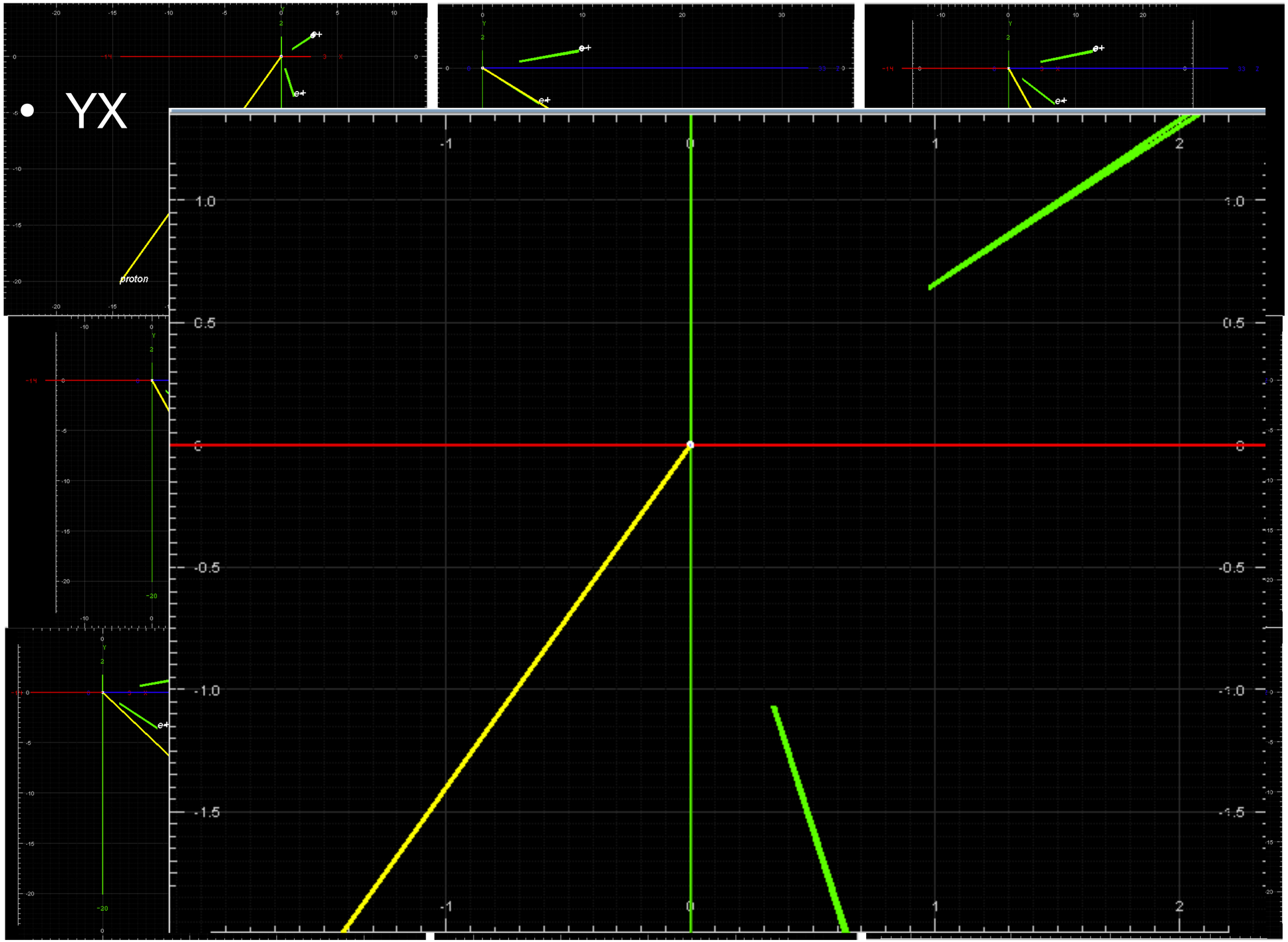
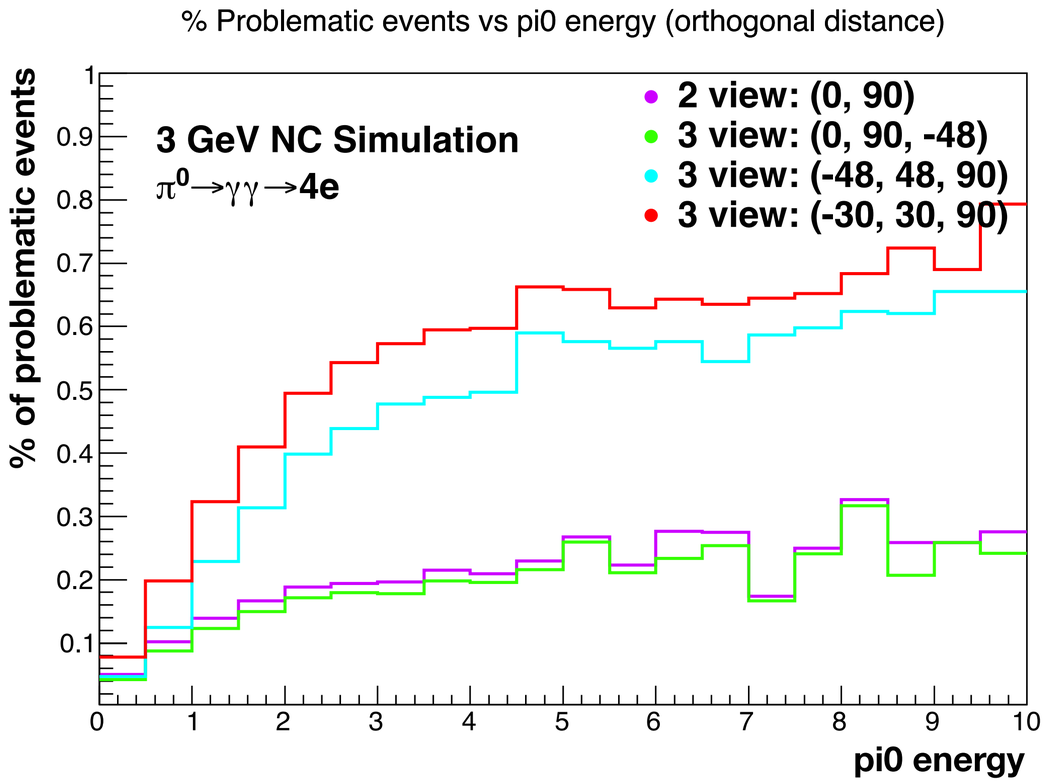
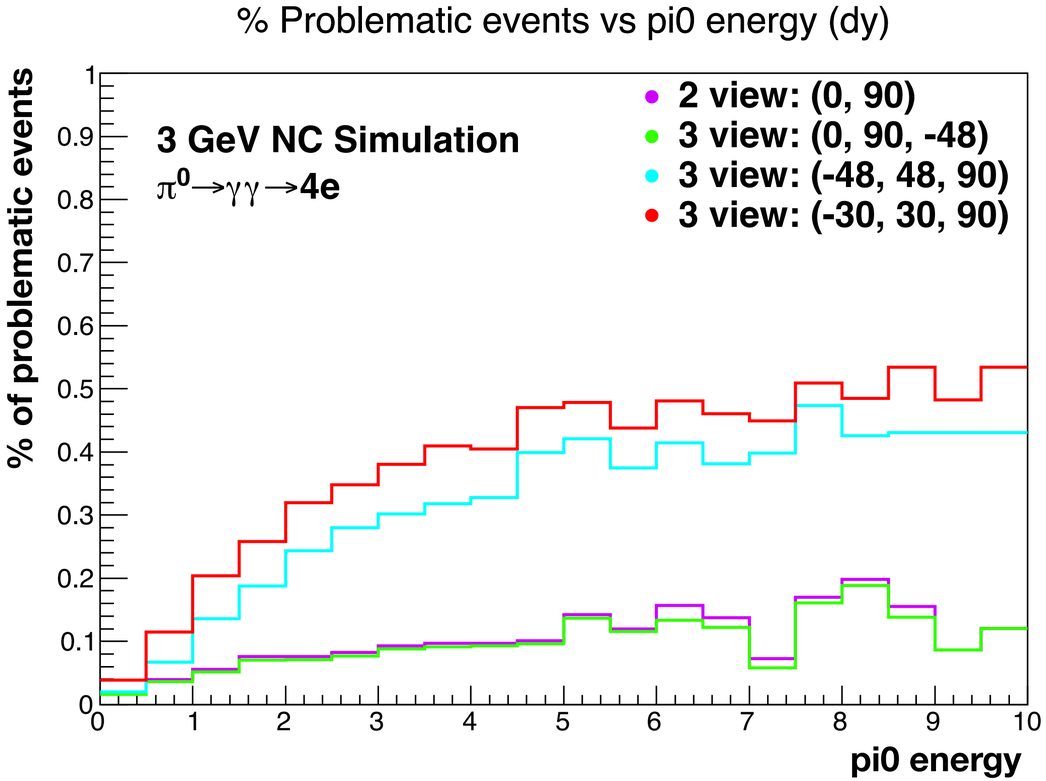


- 500000 truth events with 84840 pi0->yy->4e:



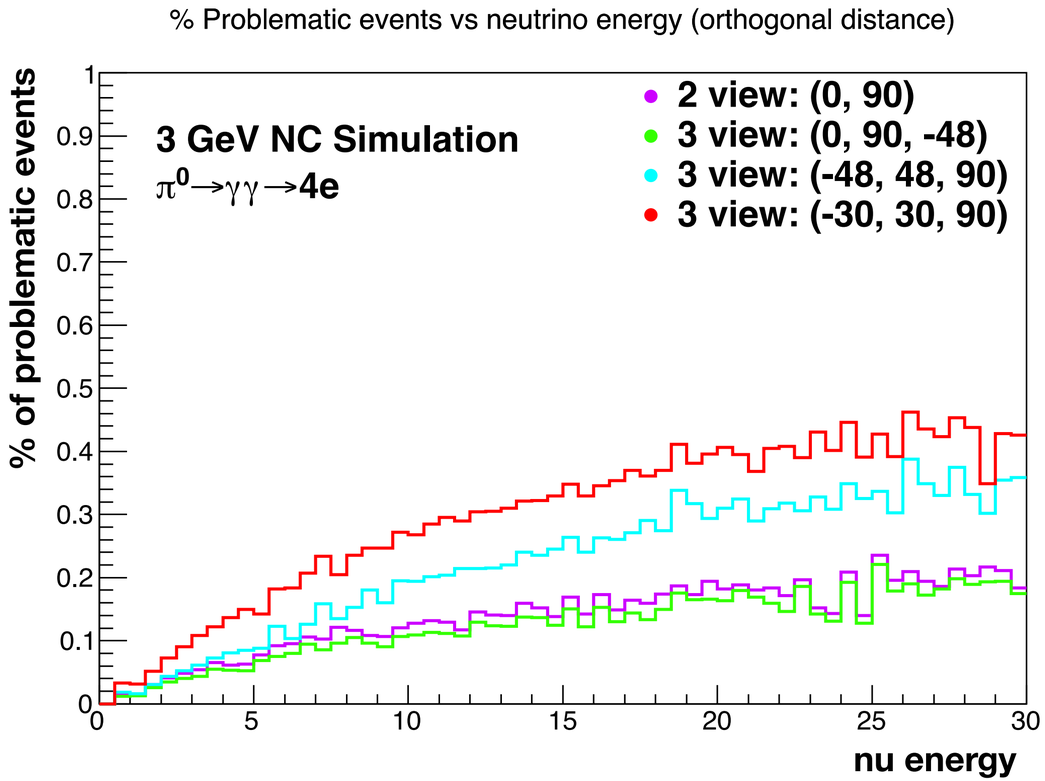


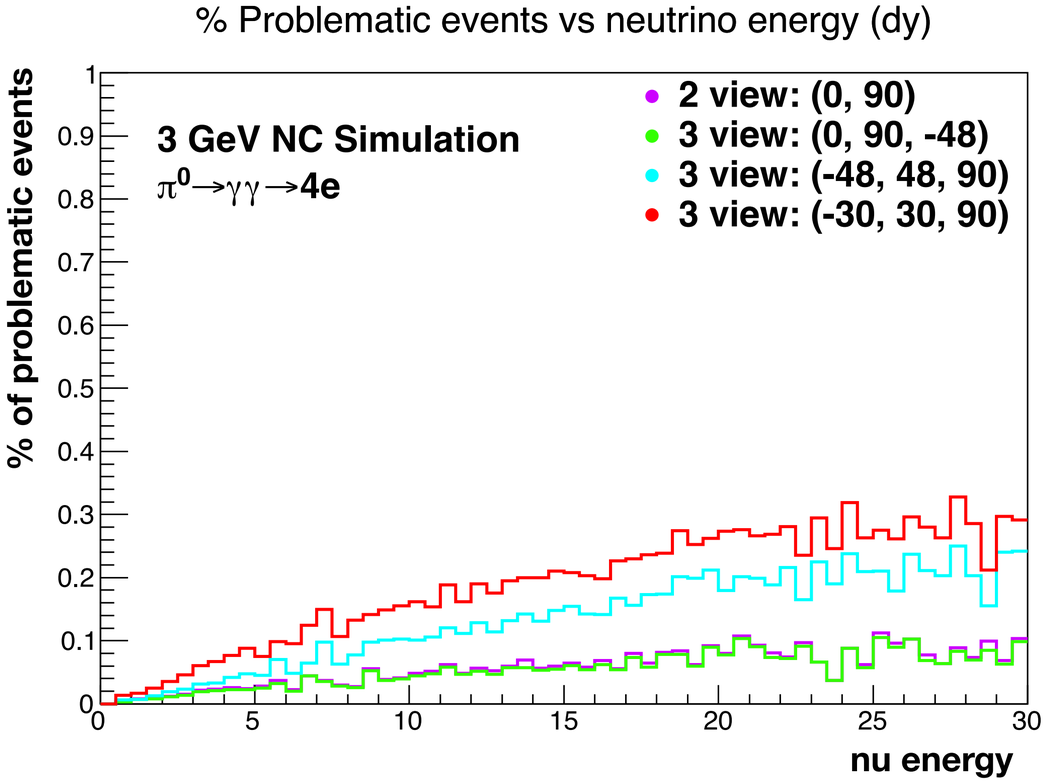
- 7997 total (0, 90)
- 6992 total (0, 90, -48)
- 11855 total (-48, 48, 90)
- 16779 total (-30, 30, 90)

- 3183 total (0, 90)
- 2939 total (0, 90, -48)
- 6772 total (-48, 48, 90)
- 10125 total (-30, 30, 90)

- 2 view (0, 90) is better than any 3 views without the 0^o plane.

- 500000 truth events with 84840 pi0->yy->4e:





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- 3183 total (0, 90)
- 2939 total (0, 90, -48)
- 6772 total (-48, 48, 90)
- 10125 total (-30, 30, 90)

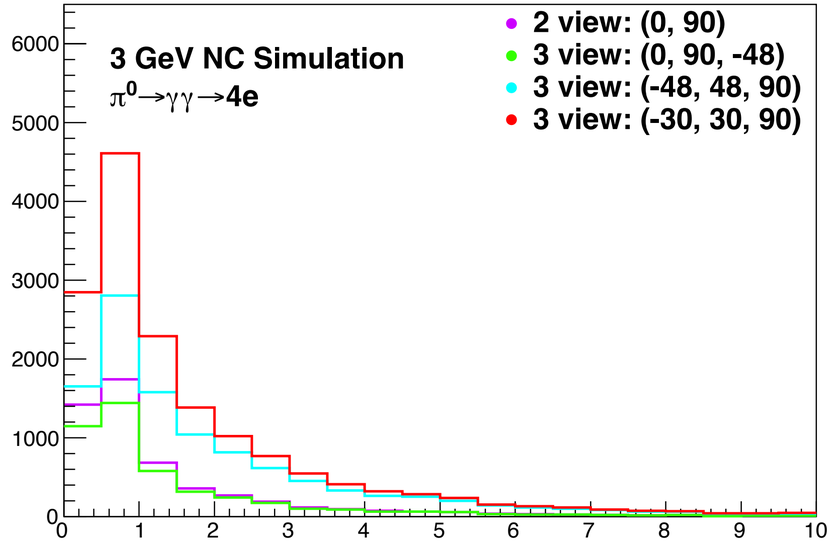
Backup

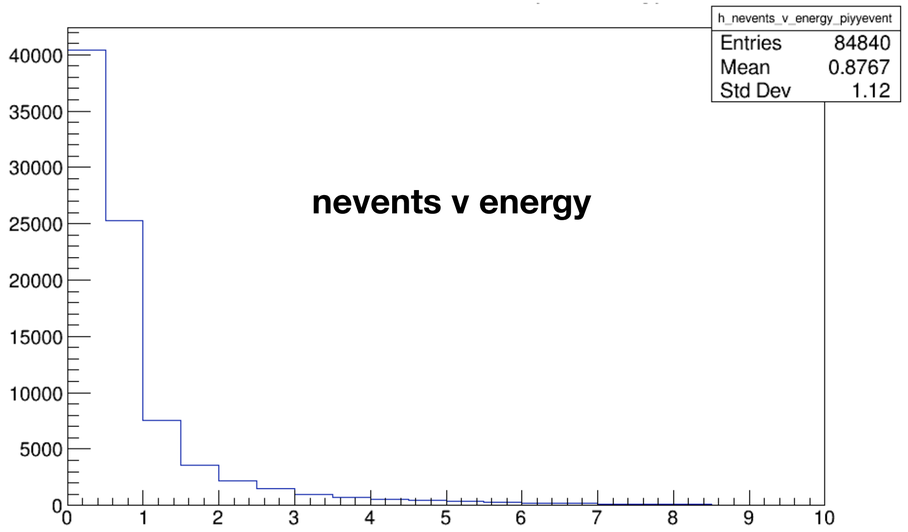
- 500000 truth events with 84840 pi0->yy->4e:

- Using orthogonal distance:
- Problematic events yx yz (0, 90): 7997
- Problematic events yx yz yu (0, 90, -48): 6992
- Problematic events yz yu yv (90, -48, 48): 11855
- Problematic events yz yu yv (90, -30, 30): 16779
- All 3 problematic events: 5269
- UVZ only problematic events: 6472

- Using dy:
- Problematic events yx yz (0, 90): 3183
- Problematic events yx yz yu (0, 90, -48): 2939
- Problematic events yz yu yv (90, -48, 48): 6772
- Problematic events yz yu yv (90, -30, 30): 10125
- All 3 problematic events: 1838
- UVZ only problematic events: 4903

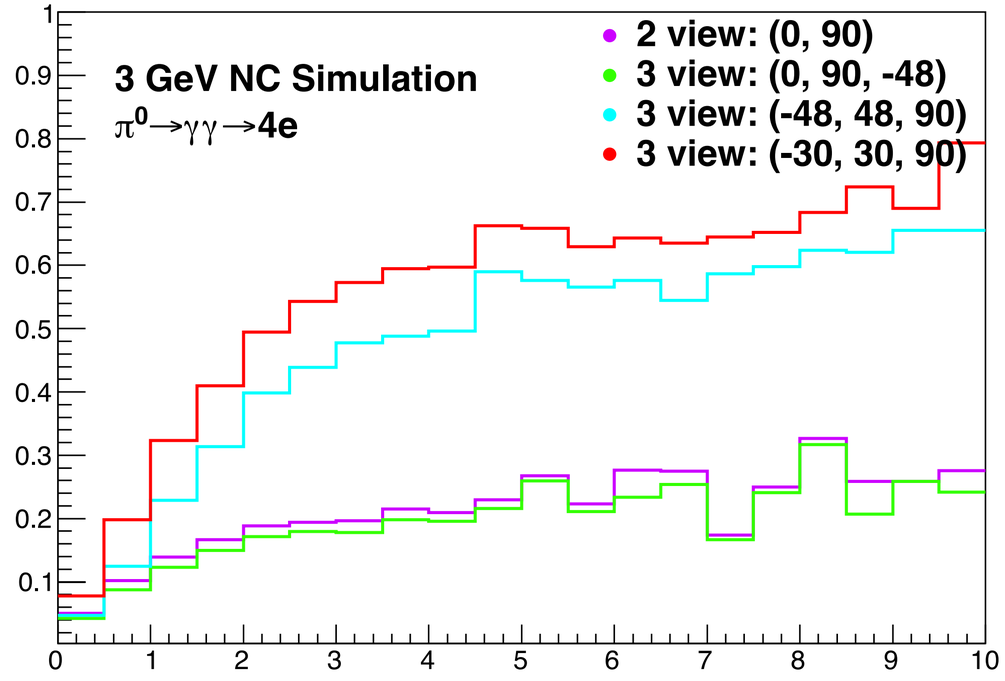
Problematic Events (orthog)



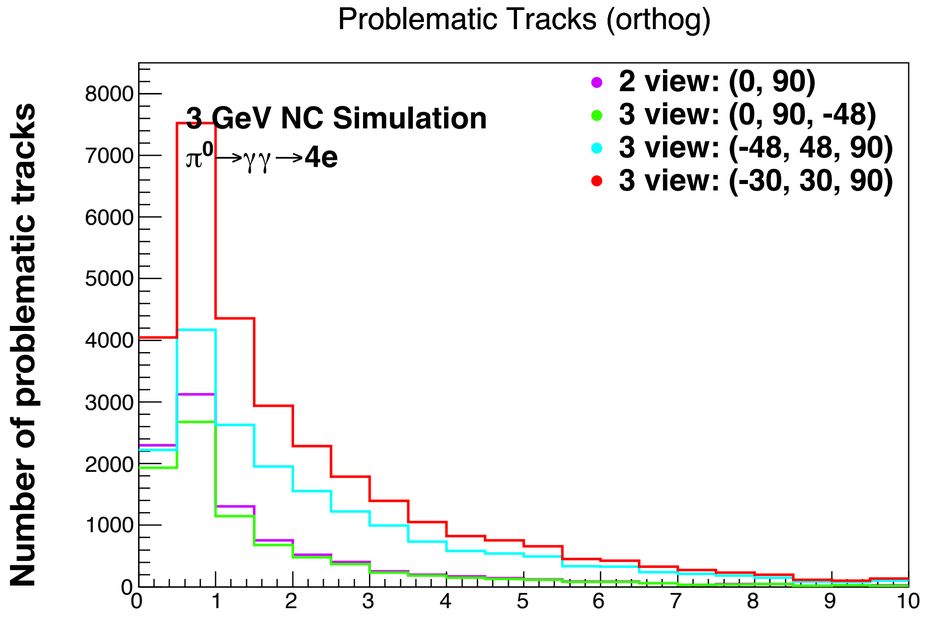


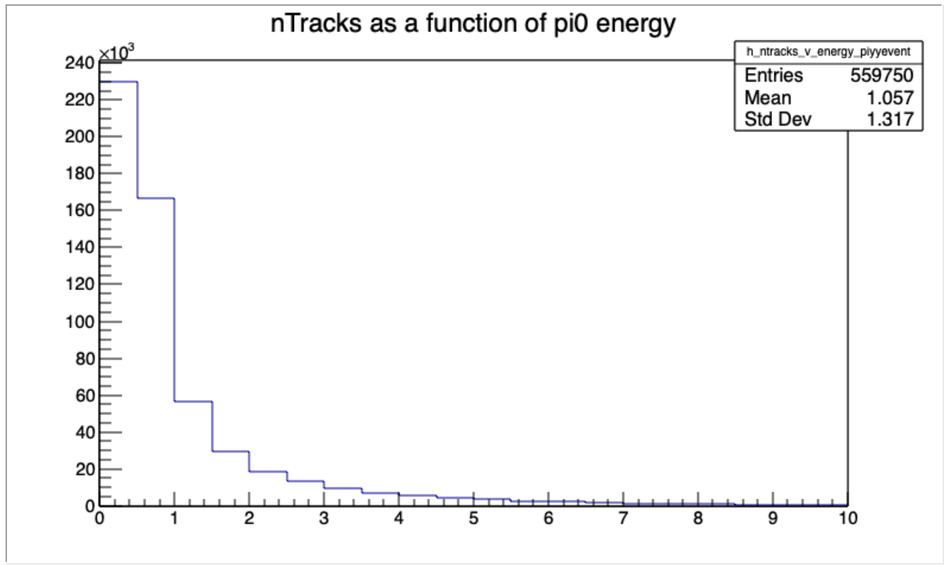
pi0 energy

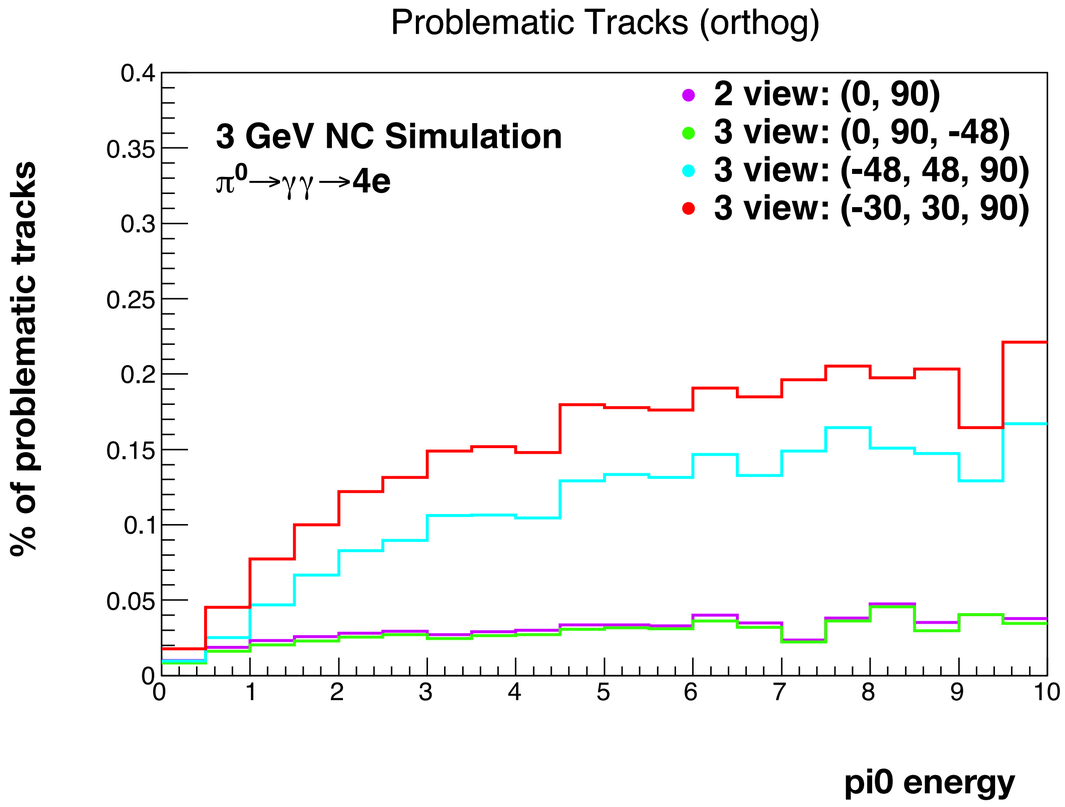
% Problematic events vs pi0 energy (orthogonal distance)



pi0 energy

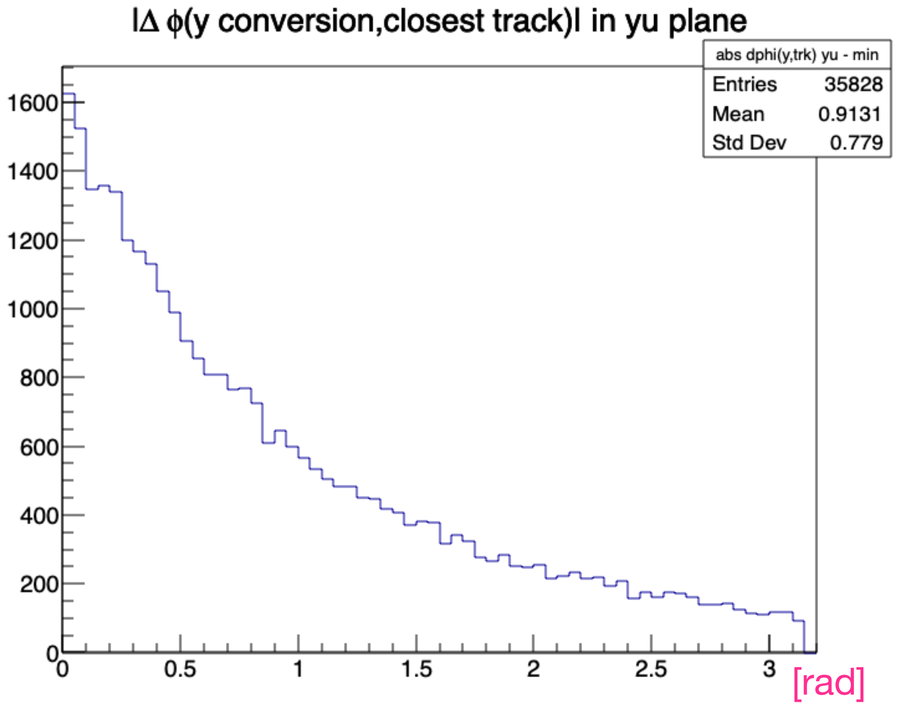

Problematic Tracks (orthog)
Number of problematic tracks
3 GeV NC Simulation
$\pi^0 \rightarrow \gamma\gamma \rightarrow 4e$
2 view: (0, 90)
3 view: (0, 90, -48)
3 view: (-48, 48, 90)
3 view: (-30, 30, 90)
0
1000
2000
3000
4000
5000
6000
7000
8000
0
1
2
3
4
5
6
7
8
9
10

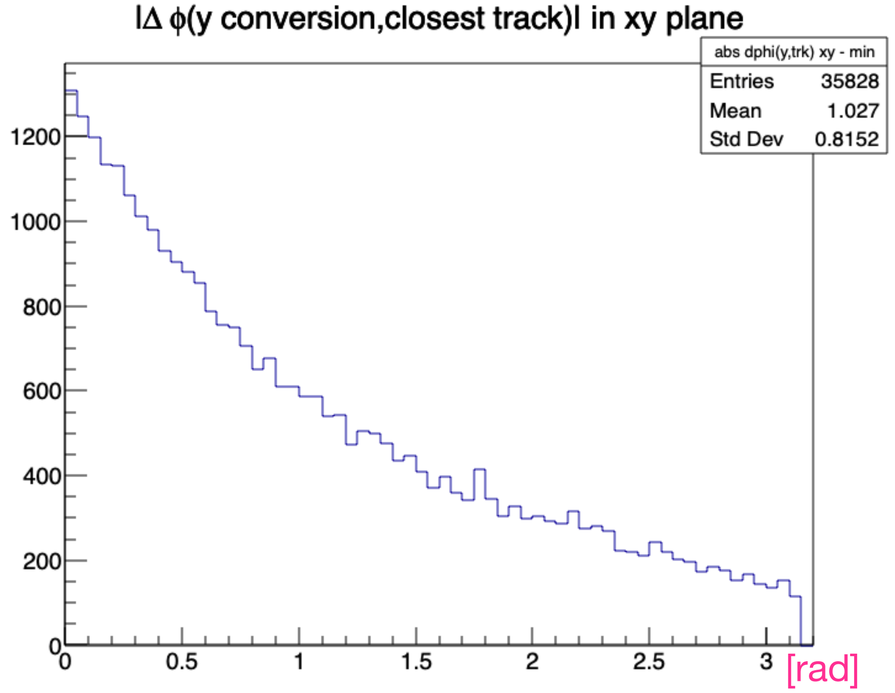

nTracks as a function of pi0 energy
h_ntracks_v_energy_piyevent
Entries 559750
Mean 1.057
Std Dev 1.317
×10³
0
20
40
60
80
100
120
140
160
180
200
220
240
0
1
2
3
4
5
6
7
8
9
10
pi0 energy

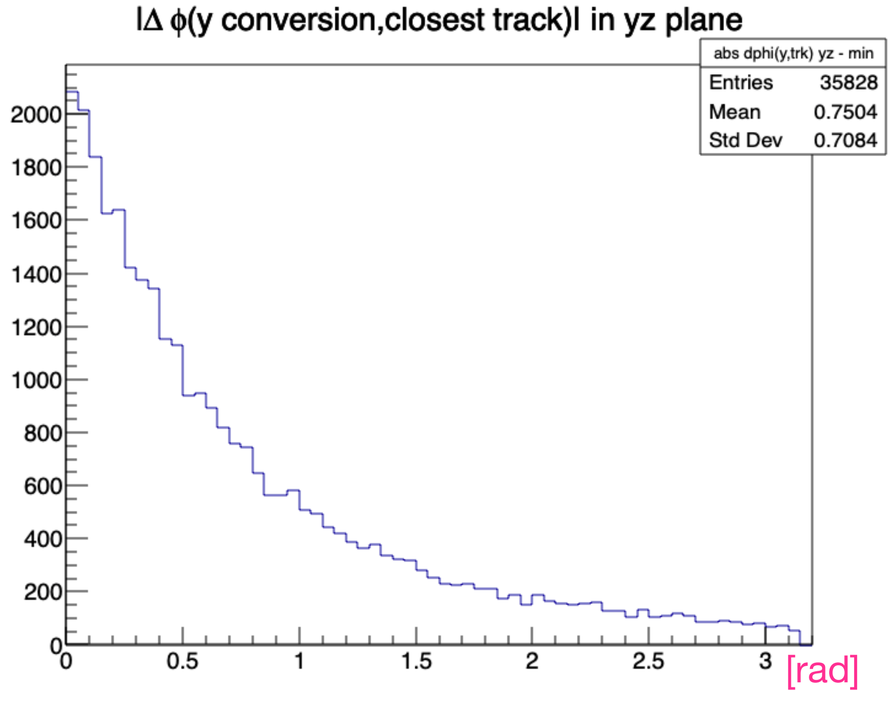

Problematic Tracks (orthog)
% of problematic tracks
3 GeV NC Simulation
$\pi^0 \rightarrow \gamma\gamma \rightarrow 4e$
2 view: (0, 90)
3 view: (0, 90, -48)
3 view: (-48, 48, 90)
3 view: (-30, 30, 90)
0
0.05
0.1
0.15
0.2
0.25
0.3
0.35
0.4
0
1
2
3
4
5
6
7
8
9
10
pi0 energy

Min dphi in each plane

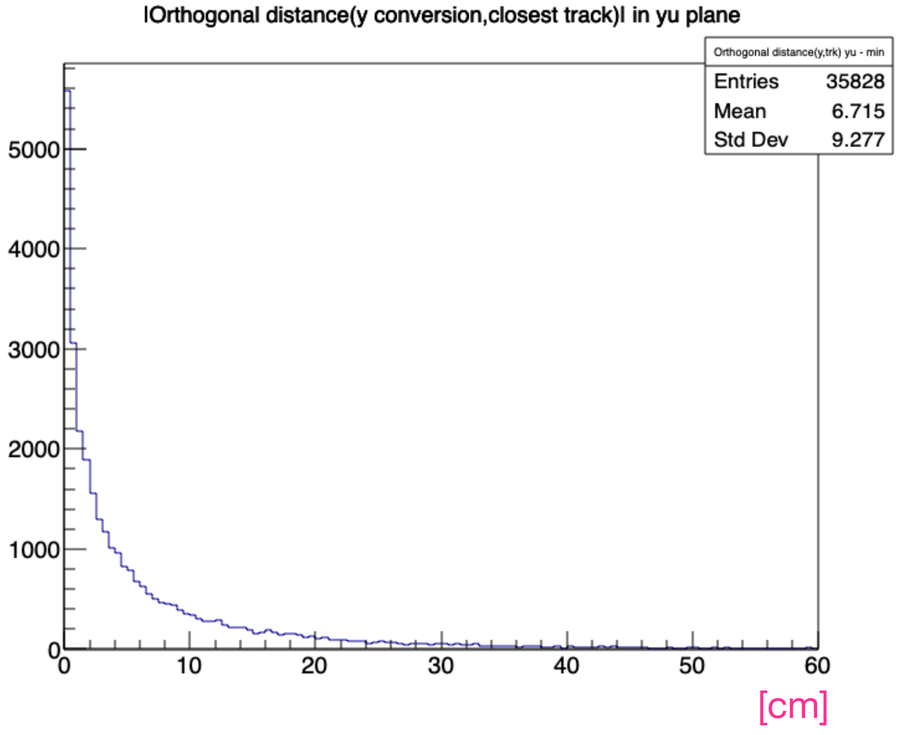
- Note: the angle is always called phi in the 2D plane, but the planes are different :-)
- Sample of 100k nu NU interactions at 3 GeV

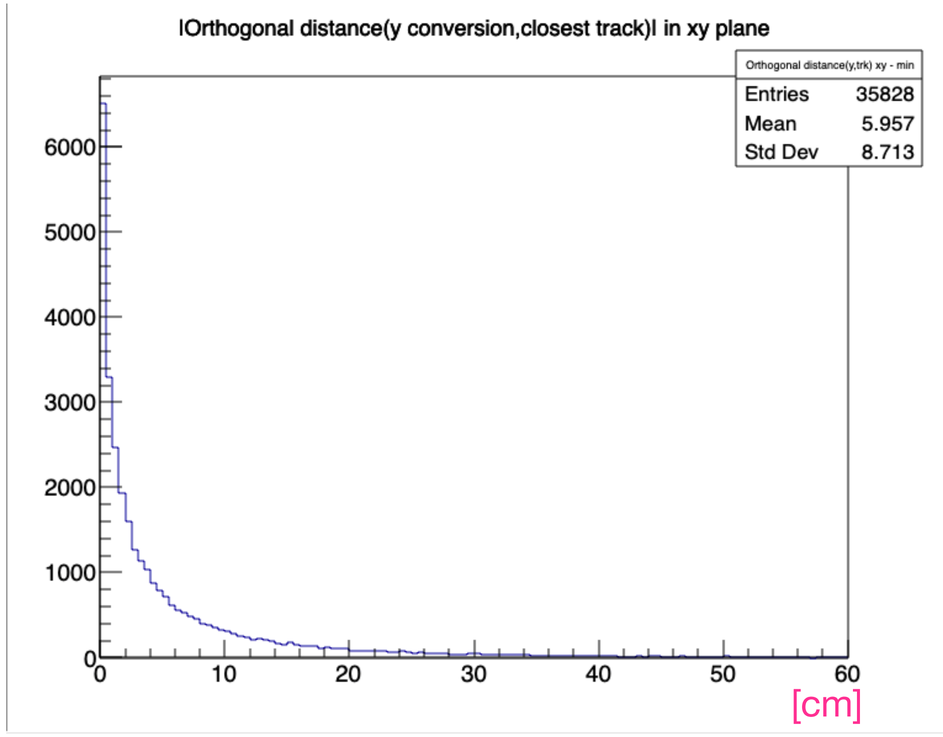


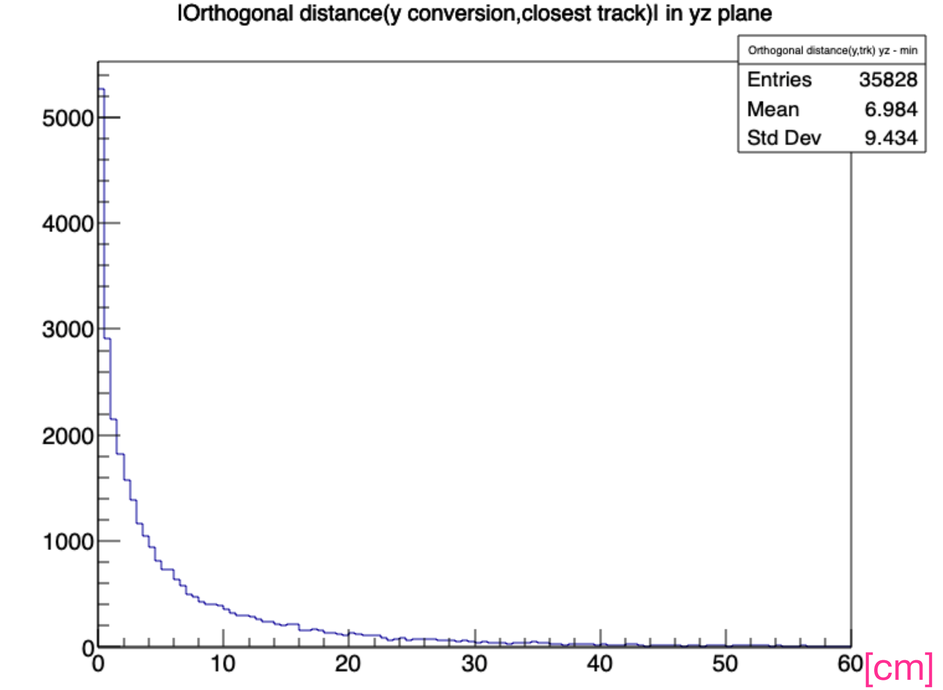




Min orthogonal distance in each plane

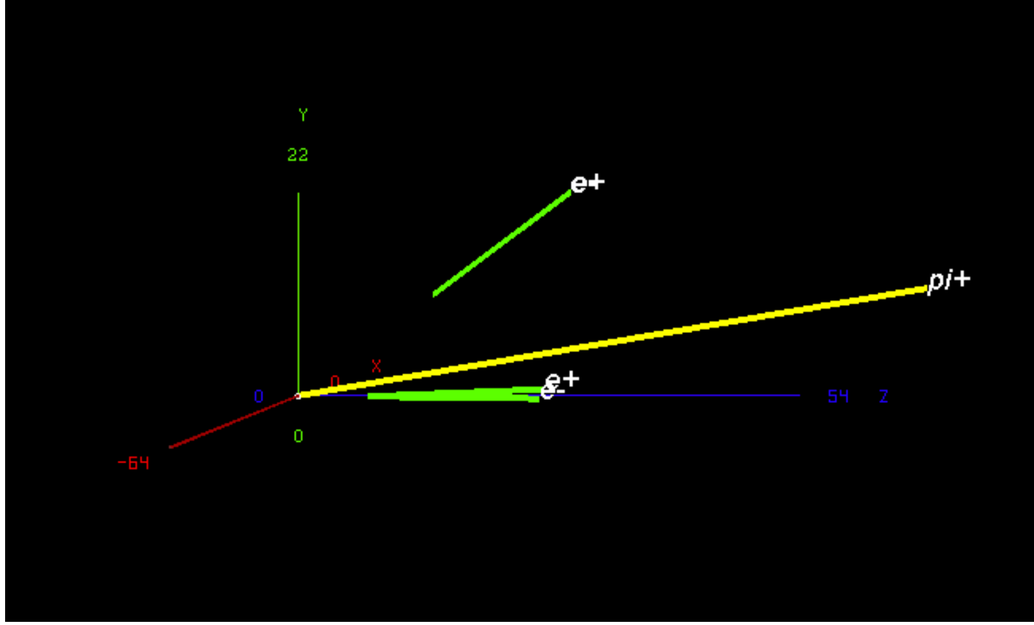


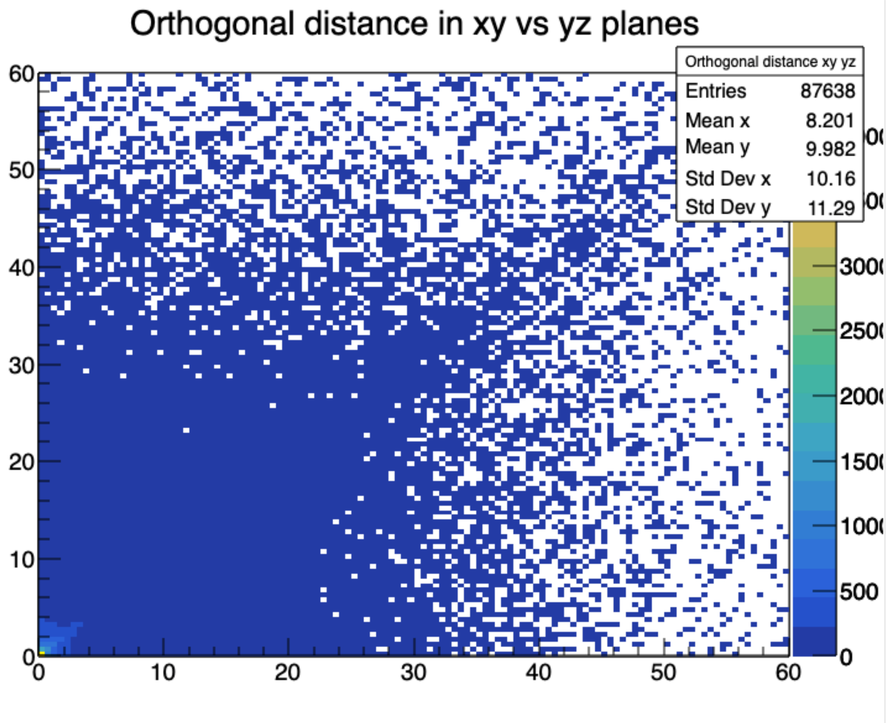




Potentially problematic events:

- d_orthog < 1cm in all planes
  - &&
- dphi < 20 degrees in all planes



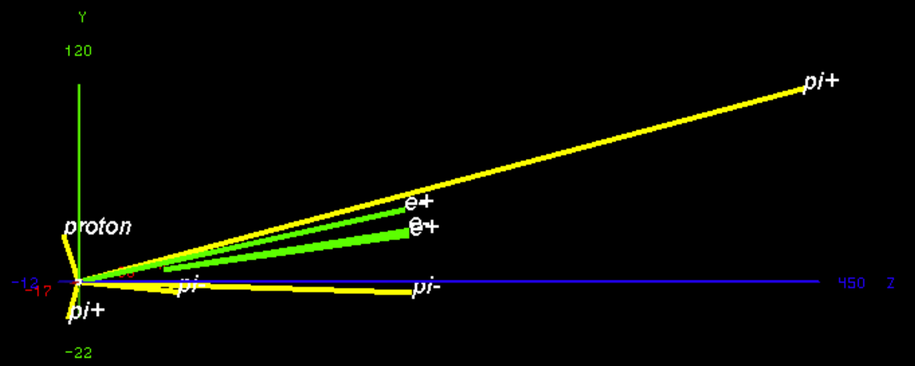
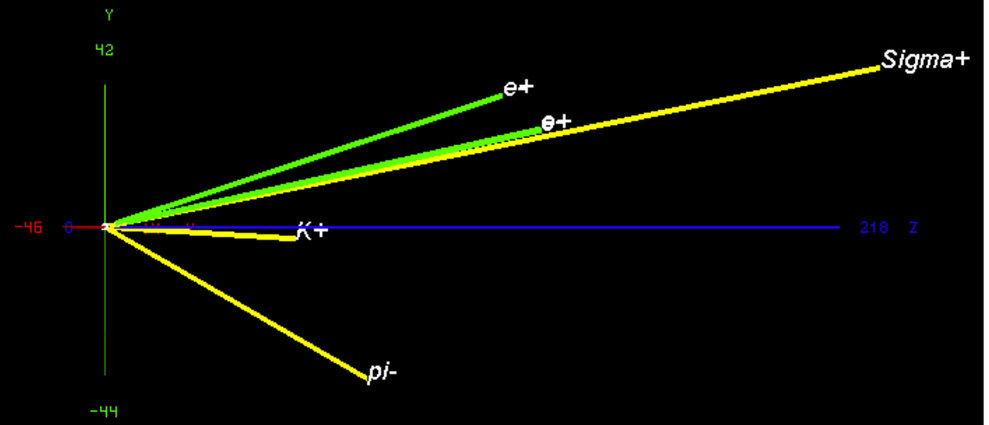


Problematic events in Strips_nc_spec001_Out.root

(first 1000 events)

- **(-48, 48, 90) problematic event: 51**
- (-48, 48, 90) problematic event: 58
- (-48, 48, 90) problematic event: 87
- (-48, 48, 90) problematic event: 147
- (-48, 48, 90) problematic event: 157
- (-48, 48, 90) problematic event: 208
- (-48, 48, 90) problematic event: 213
- (-48, 48, 90) problematic event: 233
- (-48, 48, 90) problematic event: 235
- (0, 90, -48) problematic event: 264
- (-48, 48, 90) problematic event: 276
- (-48, 48, 90) problematic event: 277
- **(0, 90, -48) problematic event: 287**
- (-48, 48, 90) problematic event: 287
- (-48, 48, 90) problematic event: 301
- (-48, 48, 90) problematic event: 326
- (-48, 48, 90) problematic event: 380
- (0, 90, -48) problematic event: 393
- (-48, 48, 90) problematic event: 393
- (-48, 48, 90) problematic event: 477
- (-48, 48, 90) problematic event: 615
- (0, 90, -48) problematic event: 618
- (-48, 48, 90) problematic event: 618
- (-48, 48, 90) problematic event: 658
- (0, 90, -48) problematic event: 681
- (-48, 48, 90) problematic event: 704
- (-48, 48, 90) problematic event: 759
- (0, 90, -48) problematic event: 872
- (-48, 48, 90) problematic event: 872

- **(-48, 48, 90) problematic event: 51**



- **(0, 90, -48) problematic event: 287**