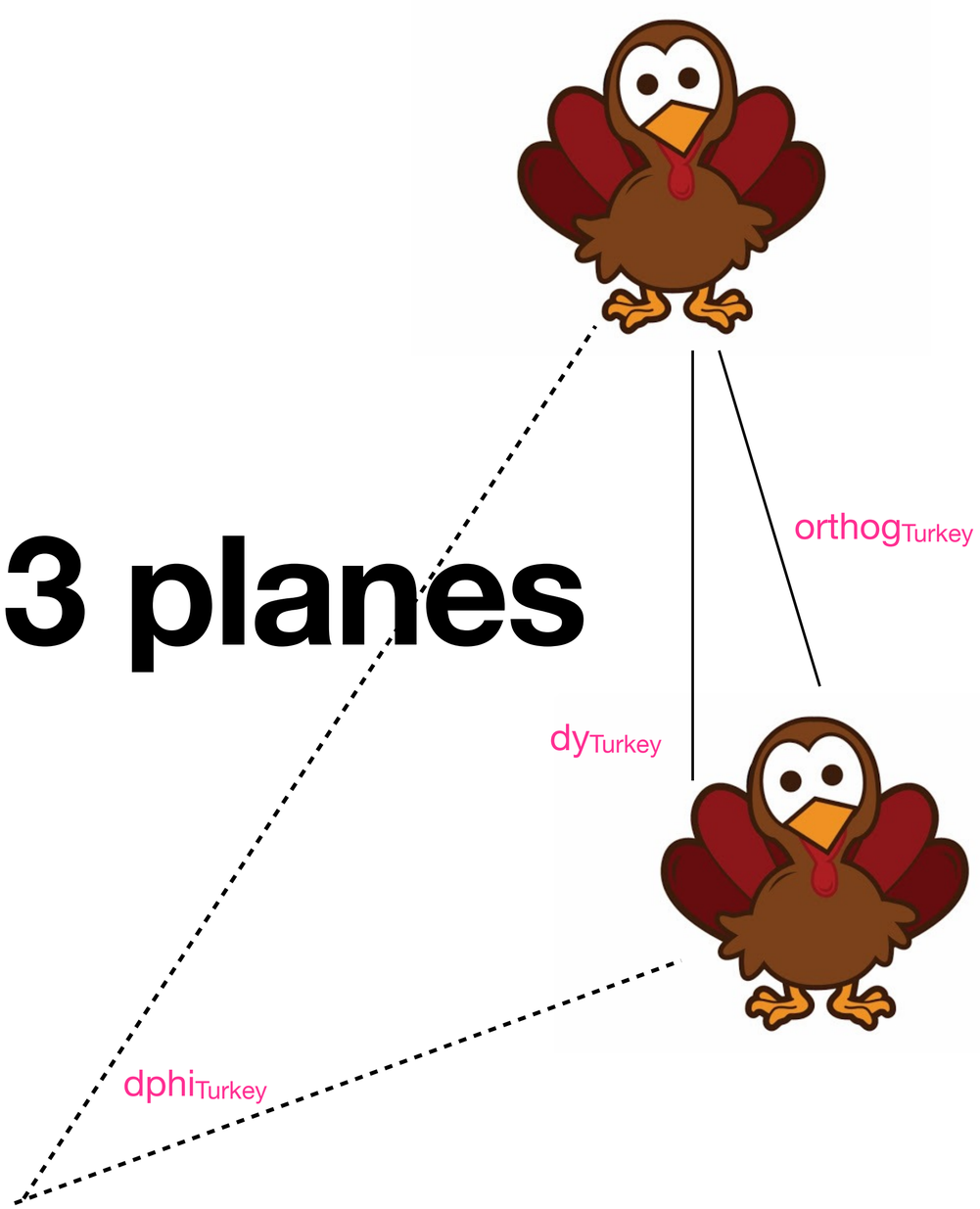
Vertical Drift in 2 vs 3 planes

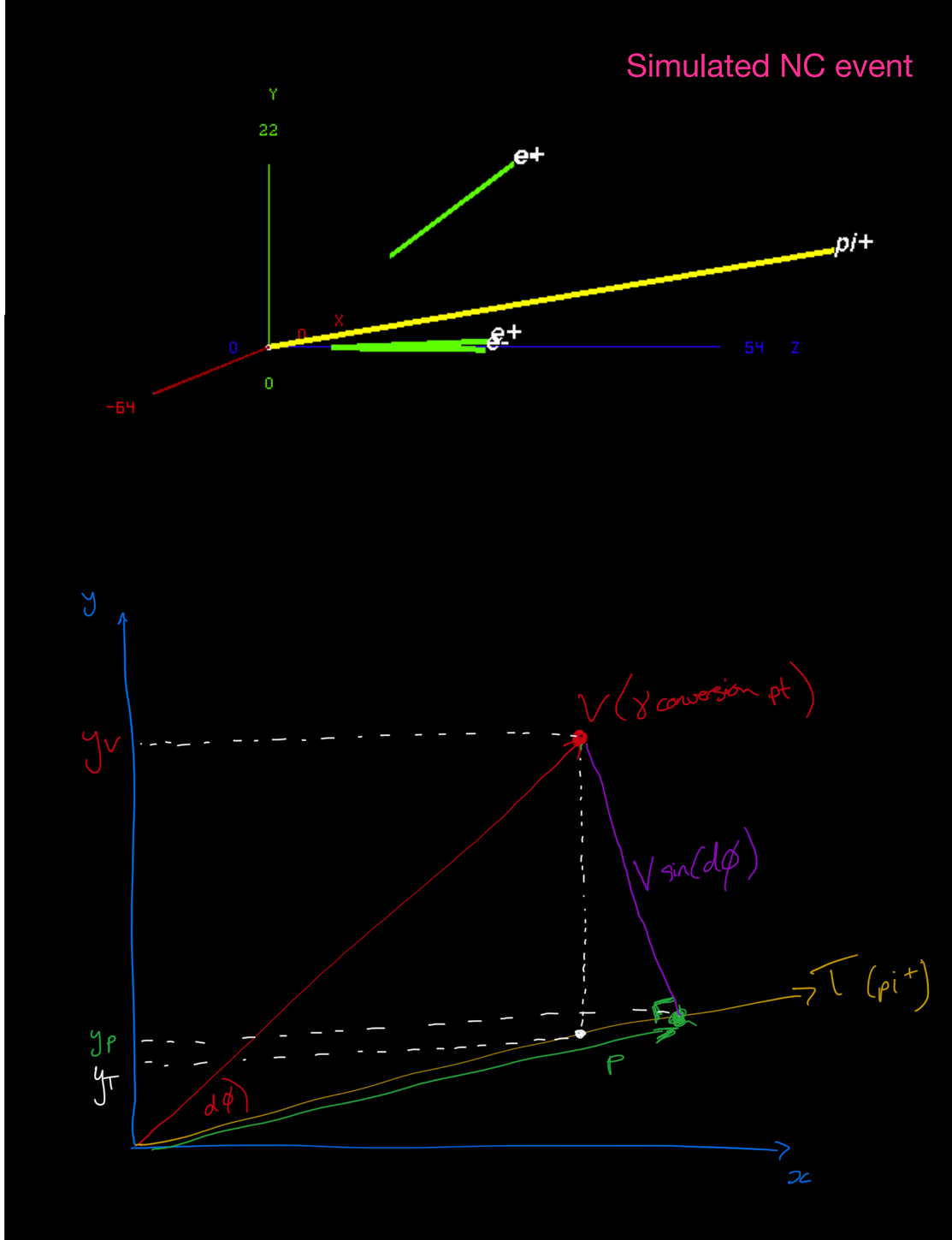
Study on truth samples



Sandro, Umut, Paola & Claire 26 Nov 2020

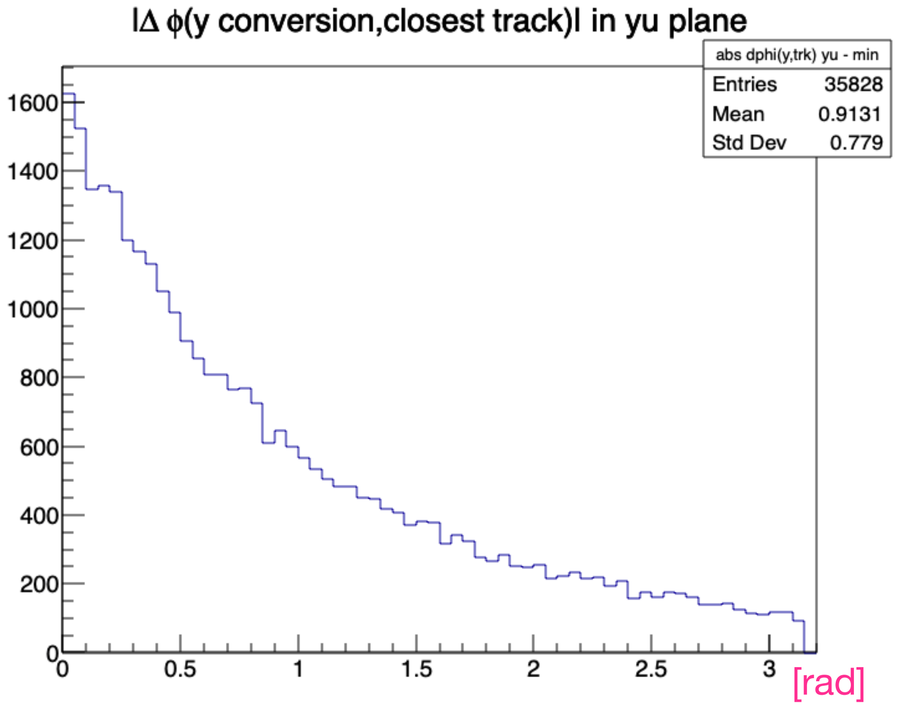
Introduction

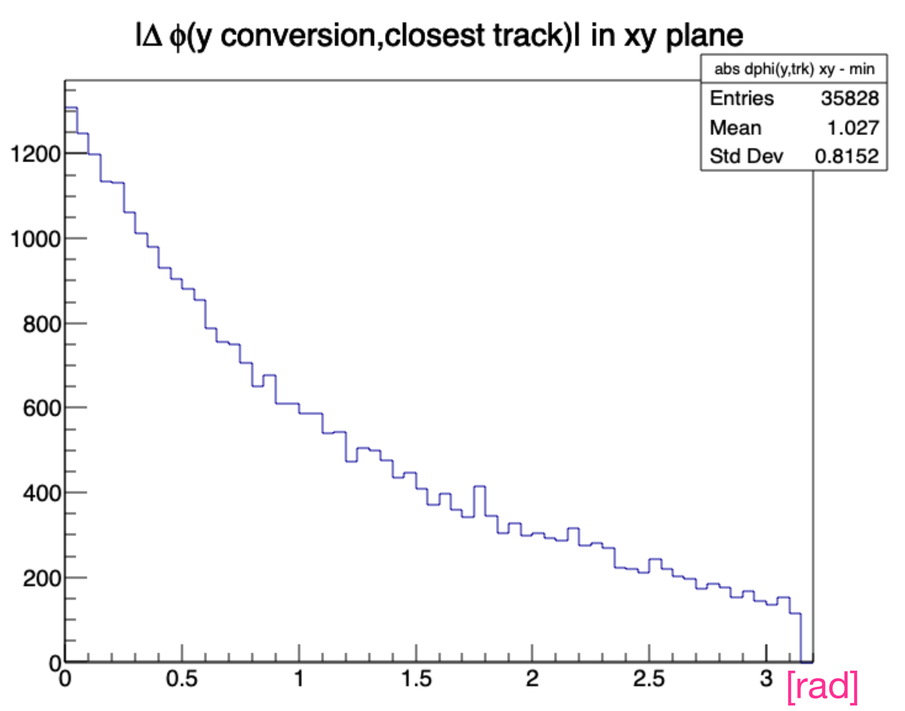
- In this particular study we're looking at 3 GeV NC events with pi0 -> yy -> 4e
- Aim is to identify and quantify events that have a charged particle track overlapping a gamma conversion, in which case we may misreconstruct the event
- For each gamma conversion we look at the vertical, orthogonal, and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

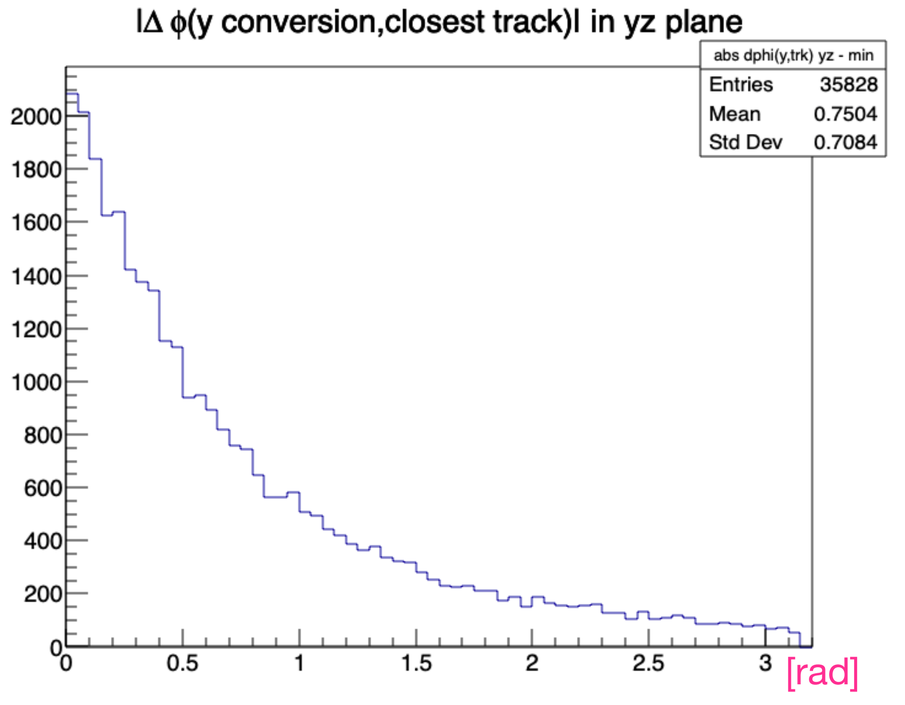


Min dphi in each plane

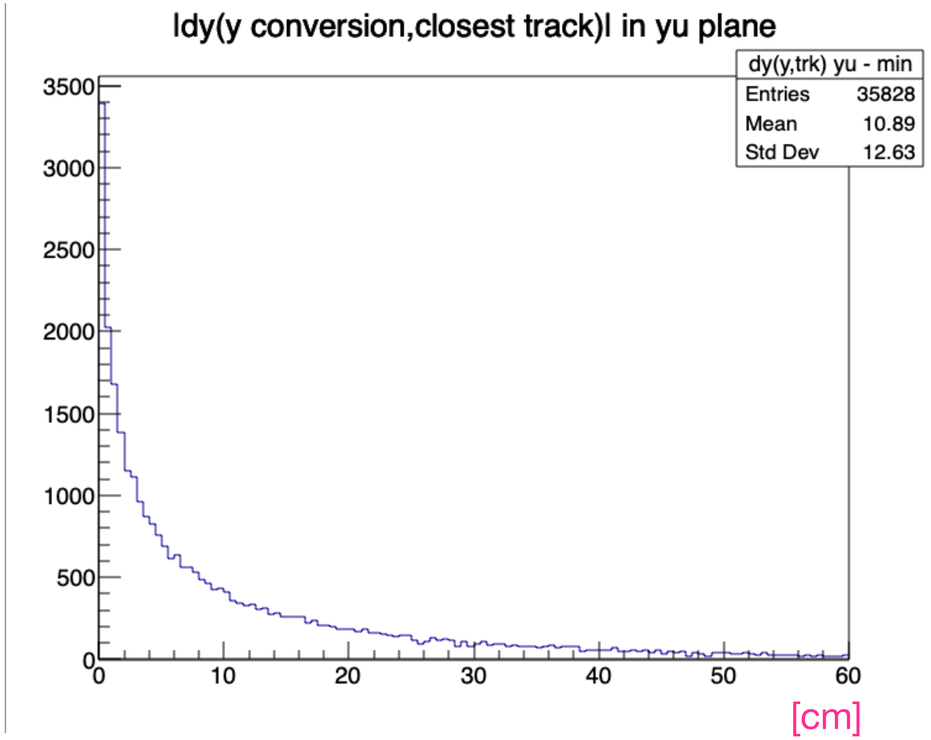
- Note: the angle is always called phi in the 2D plane, but the planes are different :-)
- Sample of 100k nu NU interactions at 3 GeV

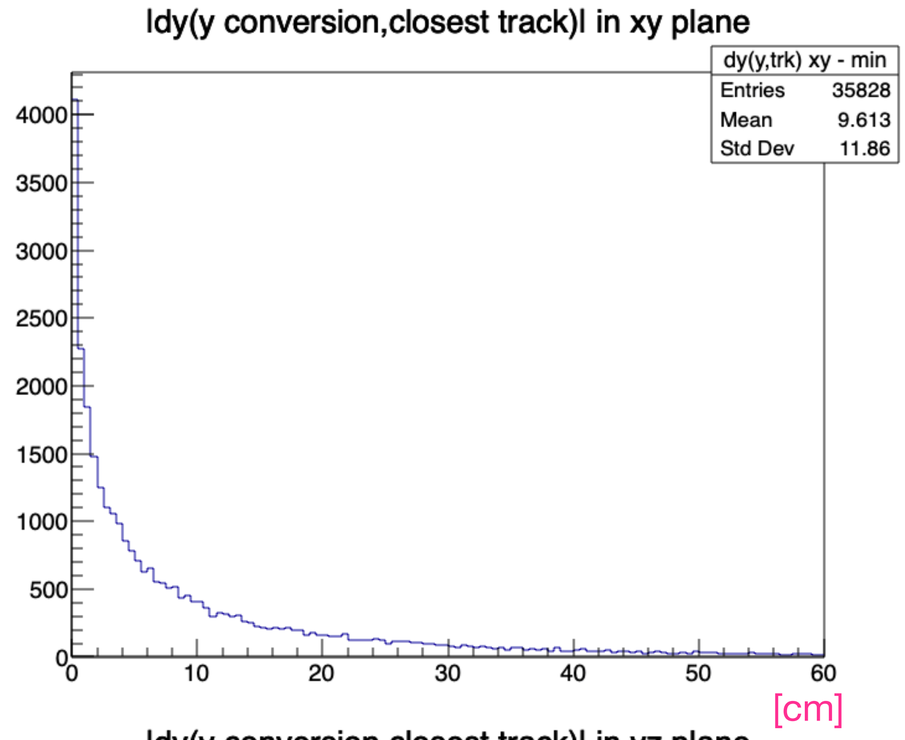


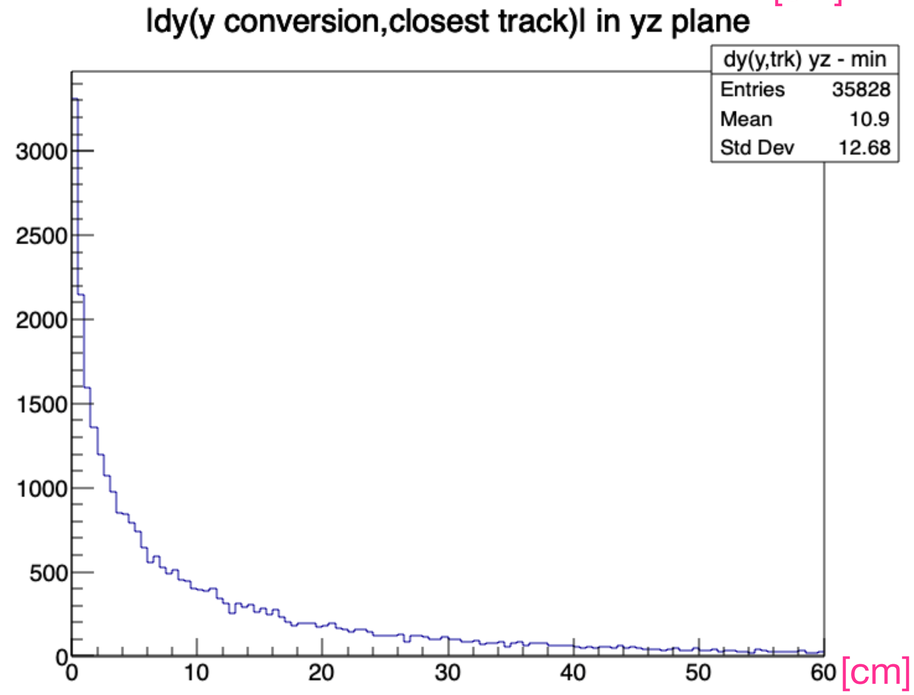




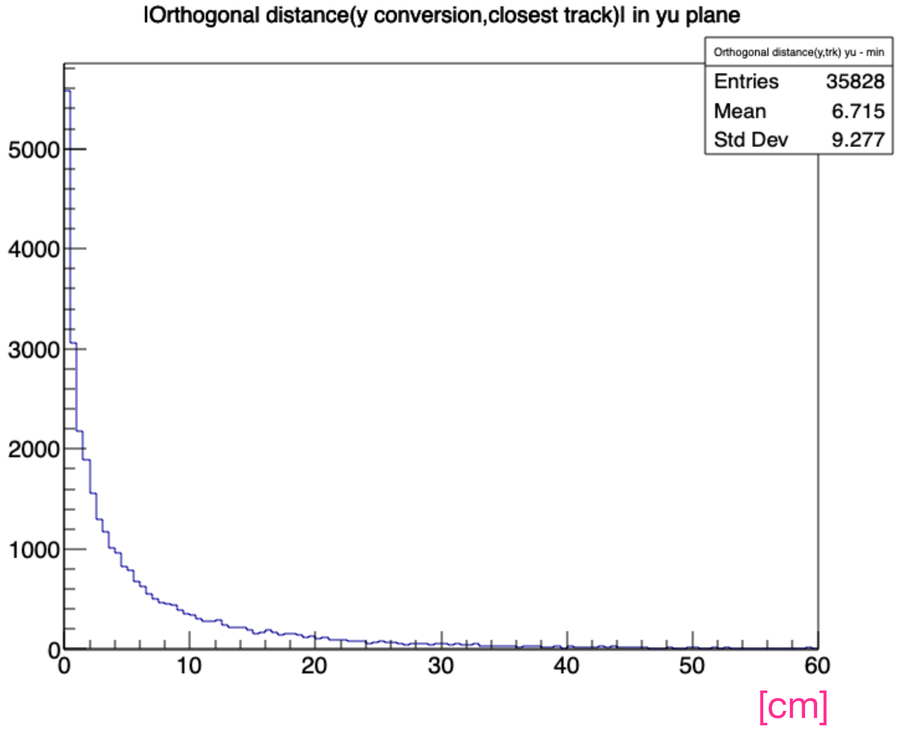
Min dy in each plane

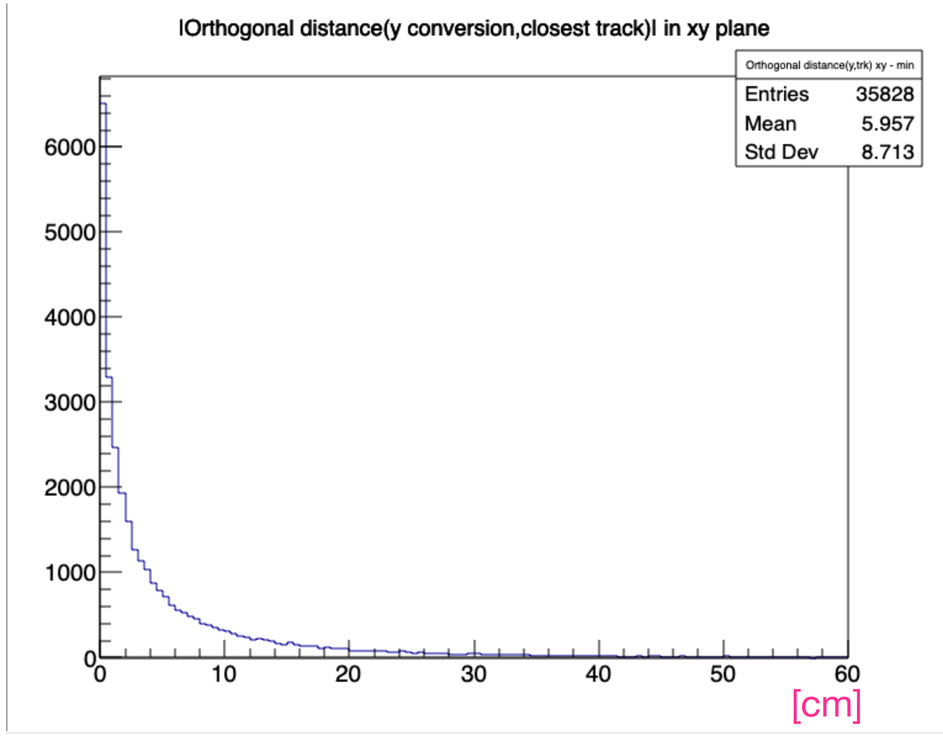


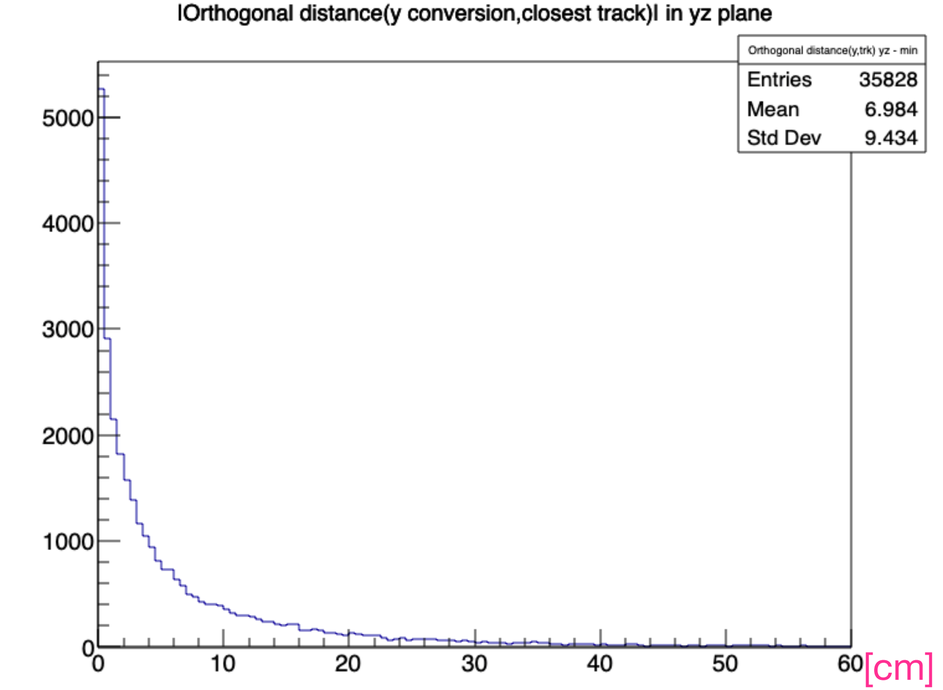




Min orthogonal distance in each plane

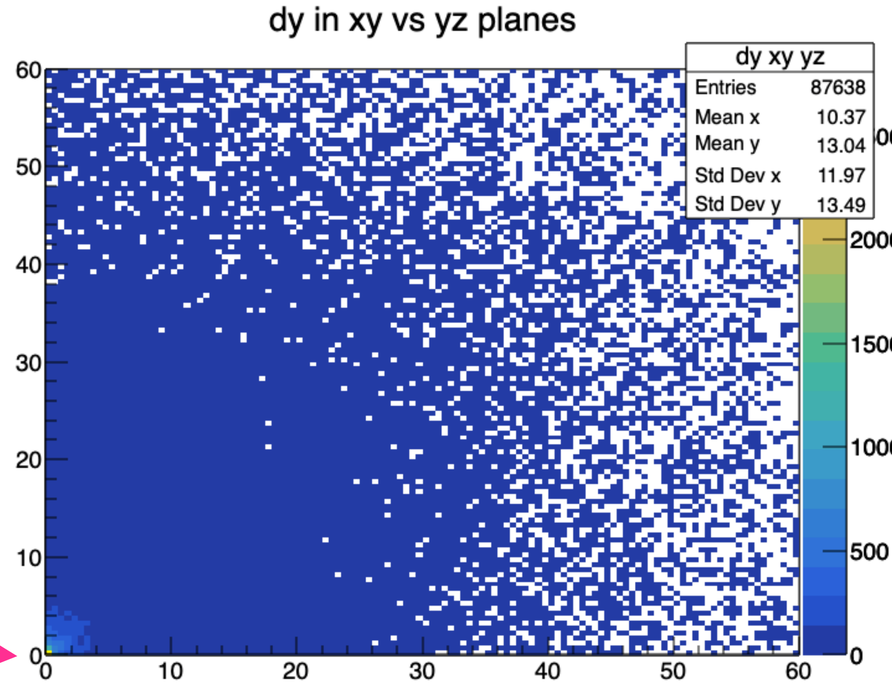


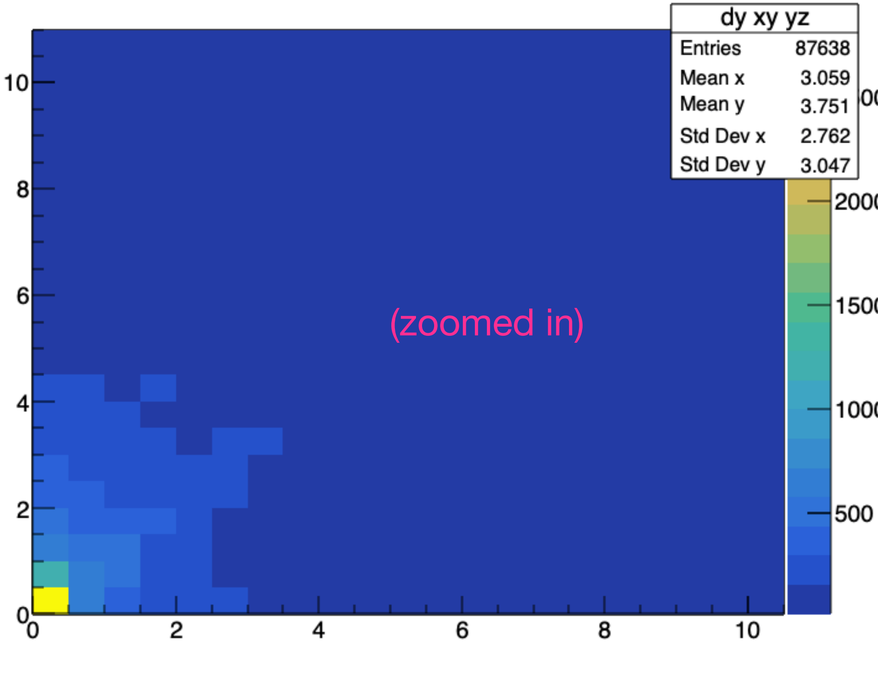




“Problematic” events

- For a first look at potentially problematic events, I’ve selected events with:
  - dy < 1cm in both xy and yz planes
    - &&
  - dphi < 20 degrees in both xy and yz planes

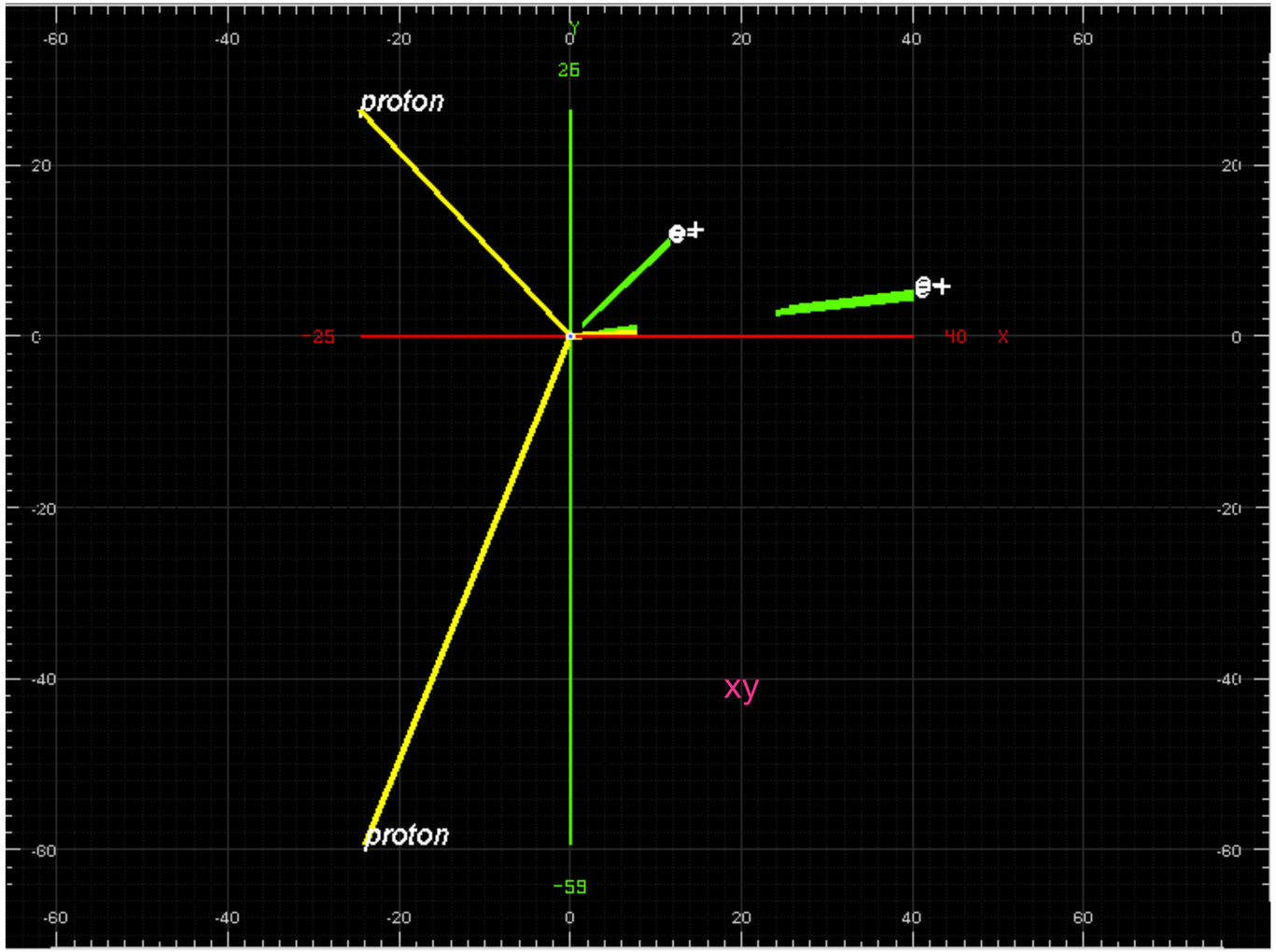




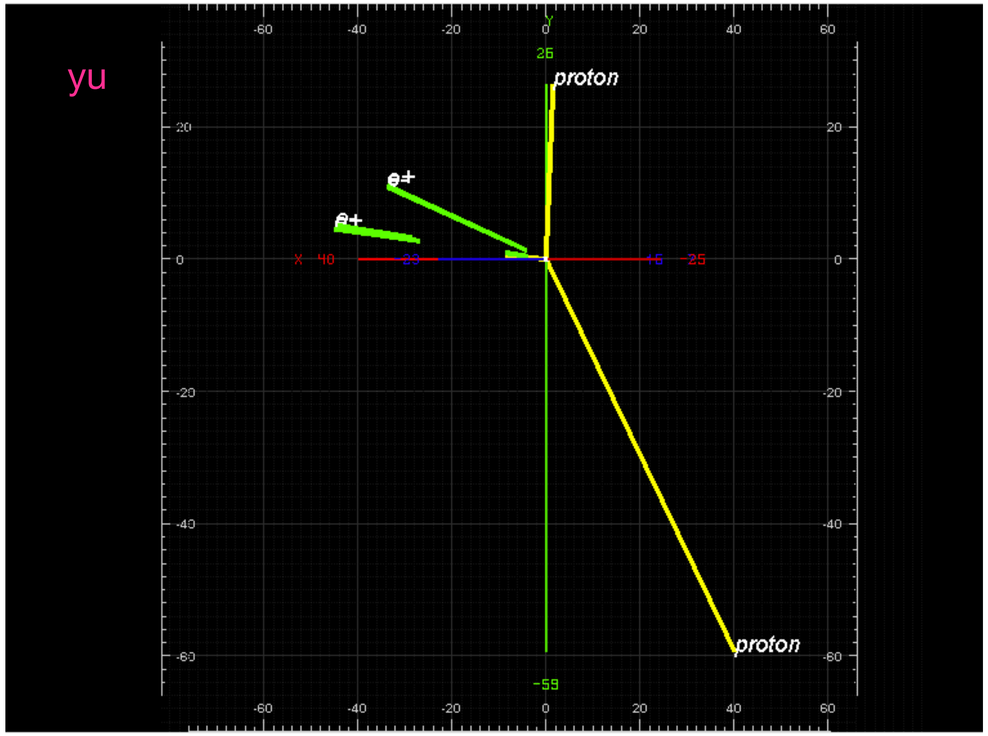
View of a “problematic event”

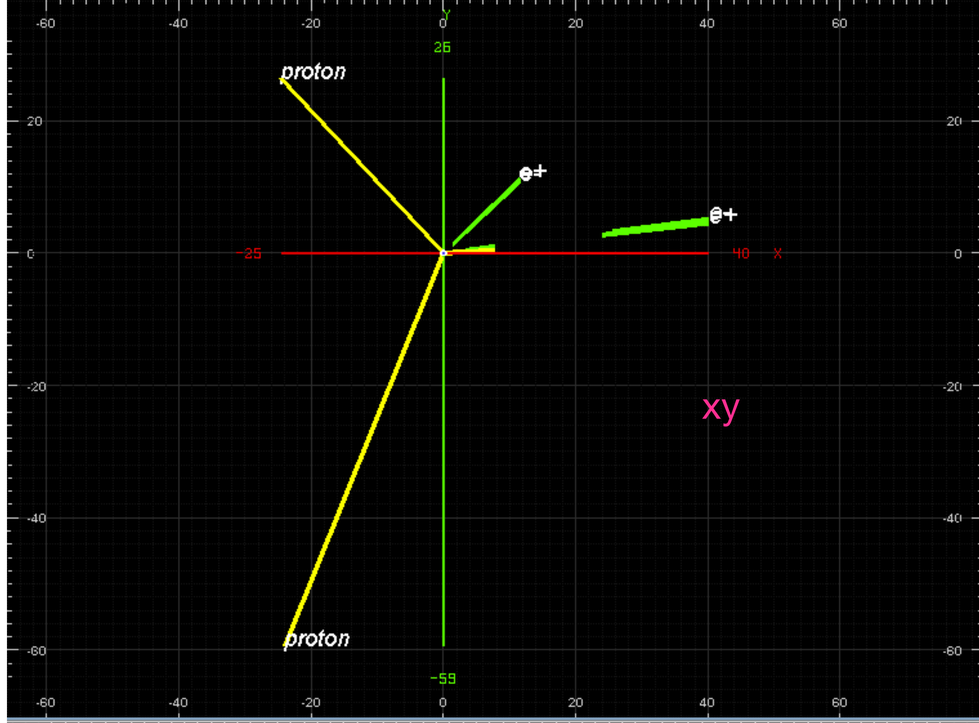
- Found problematic event number: 138
- Gamma vertex xy: (3.28136,0.390437)
- Track vertex xy: (3.28136,0.167205)
- dy xy: 0.223232
- dphi xy: 0.0674294
- Gamma vertex zy: (-0.425189,0.390437)
- Track vertex zy: (-0.425189,-0.517732)
- dy zy: 0.908169
- dphi yz: 0.314212
- Gamma vertex uy: (-2.60998,0.390437)
- Track vertex uy: (-2.60998,-3.2795)
- dy uy: 3.66994
- dphi uy: 0.0833685

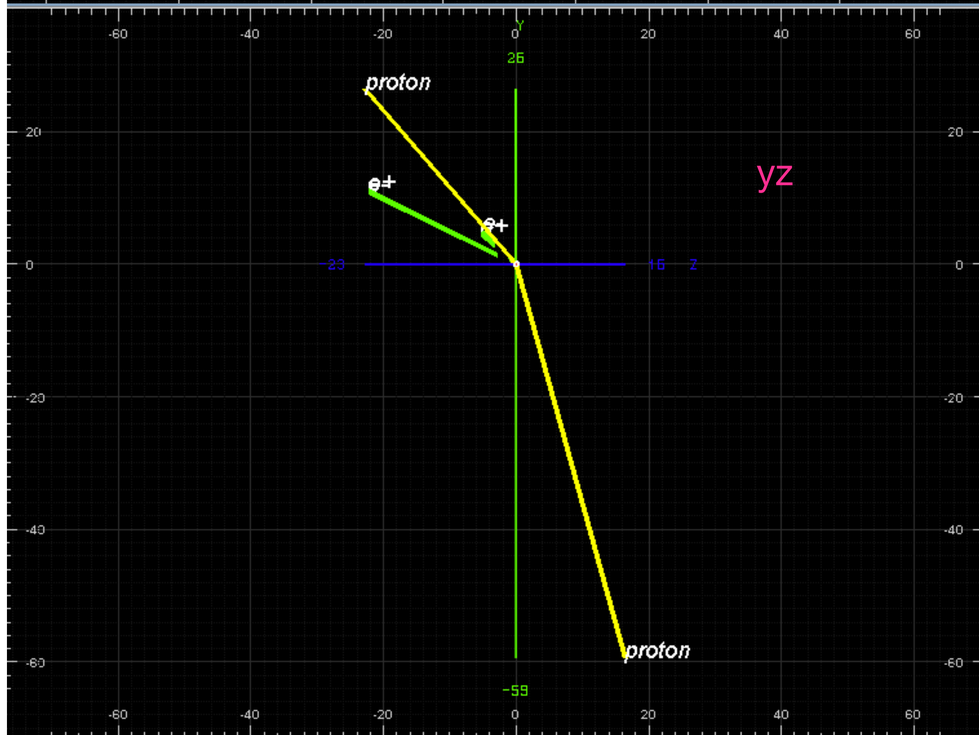
“track vertex” = track y coordinate at x/z/u of the gamma conversion vertex



View of a problematic event

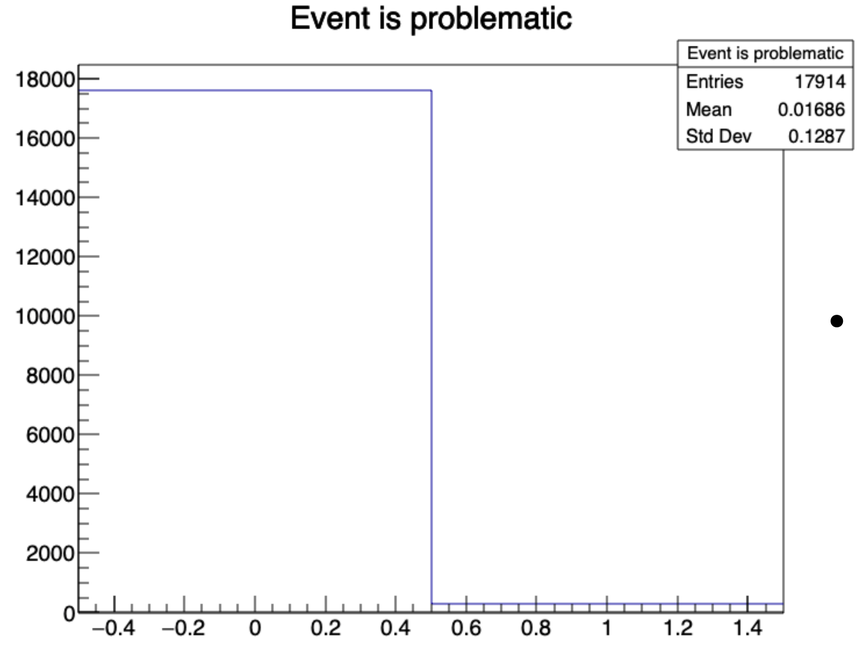






“Problematic” events

- For all problematic events, I plotted the dy and dphi in the yu plane,
  - Peaks in low dy, dphi, so for many of these events a 3rd view would probably not resolve this problem



- And just to get an idea of the numbers, of the 18k pi0->yy->4e events, we have 322 problematic ones as defined above (~2%)