

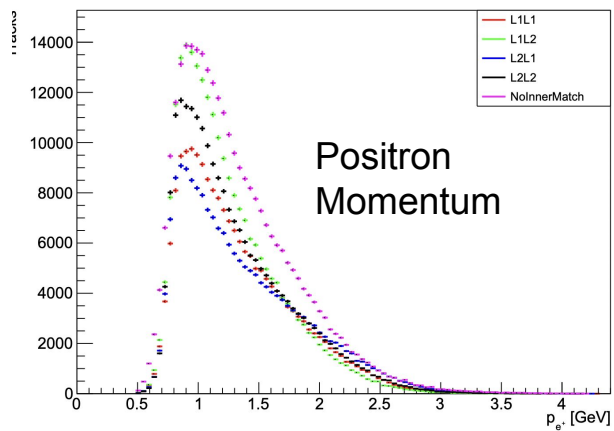
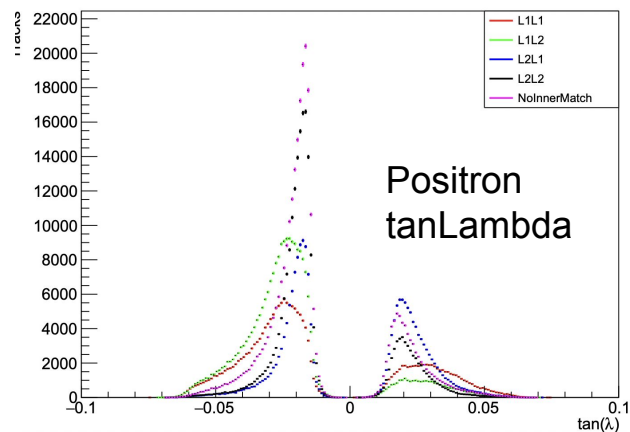
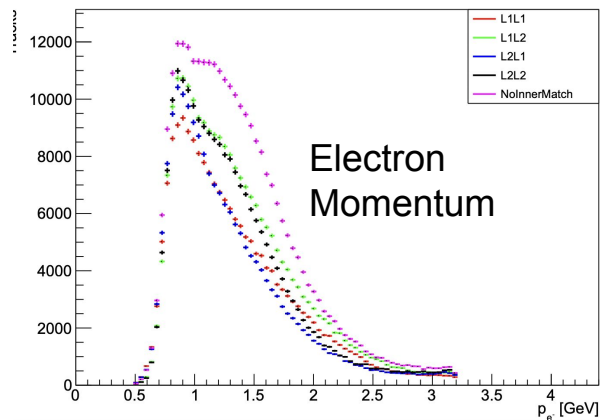
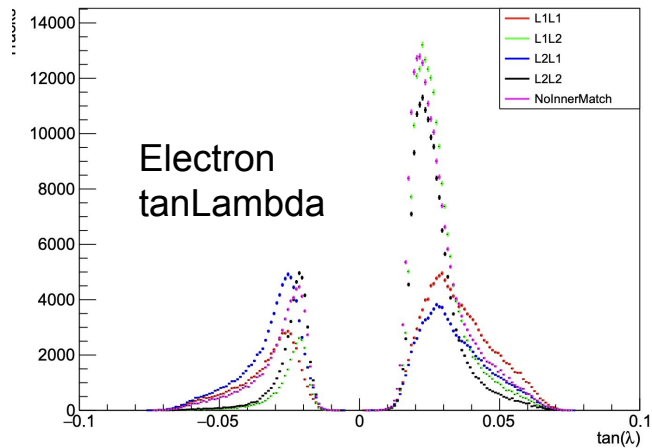
# Layer and Cluster Combos for V0s in 2021 Data

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HPS Analysis Workshop  
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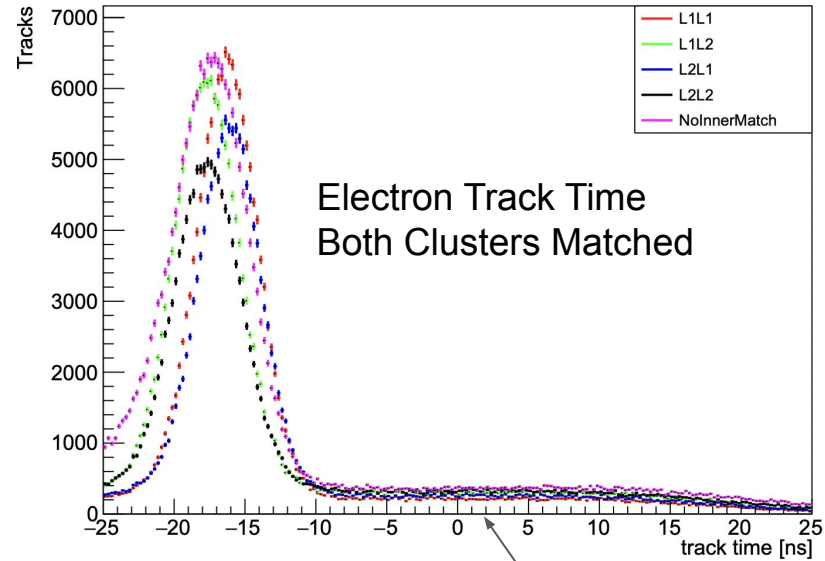
# Preliminaries...

- Using 2021 pass0(b) data in hpstr, runs 14540-14550 (209 files total)
- Using KF tracks for everything
- Looking at V0s with minimal cuts:
  - Singles 2 trigger (I should include singles 3 too, right?)
  - For each track, NHits  $\geq 9$  and  $\chi^2 < 250$  (yes, 250)
  - Both tracks  $P > 500\text{MeV}$  and  $P(\text{ele}) < 3.2\text{ GeV}$
  - Unconstrained vertex  $\chi^2 < 5000$  (yes 5000)
  - $1\text{GeV} < V0\text{ momentum (fitted)} < 5\text{GeV}$
- Look at the data in two different dimensions:
  - First layer hit: L1posL1ele, L1L2, L2L1, L2L2, NoInnerLayers
    - These definitions are same as old, seedtracker one...so L1 requires hits in **both axial and stereo sensors!** Need to change this but it becomes a lot of combos
    - So, a track that has only 1 sensor hit in module 1 and 1 sensor hit in module 2 would be in the “NoInnerLayers” category...which is misleading at best
  - Cluster Matched: Both, Pos-NoEle, NoPos-Ele, Neither matched

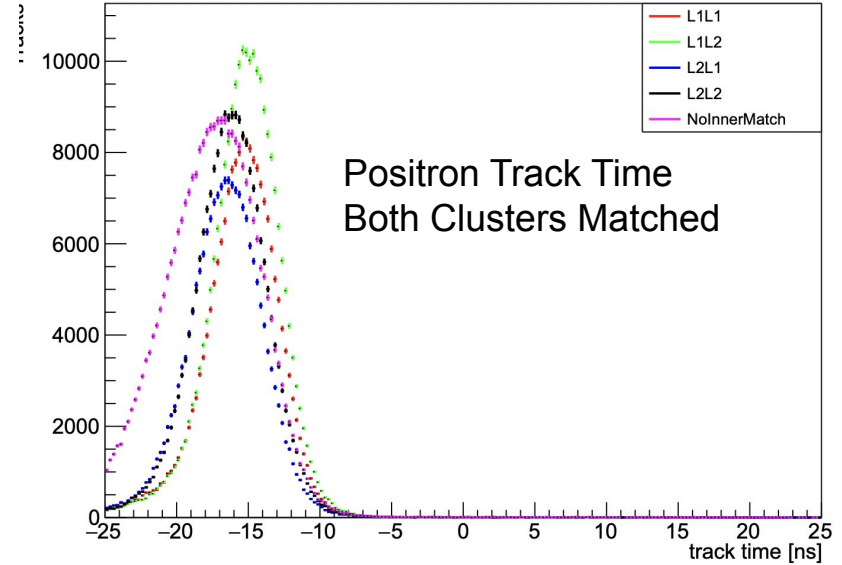
# Both Electron & Positron Matched to Clusters



# Track timing and backgrounds

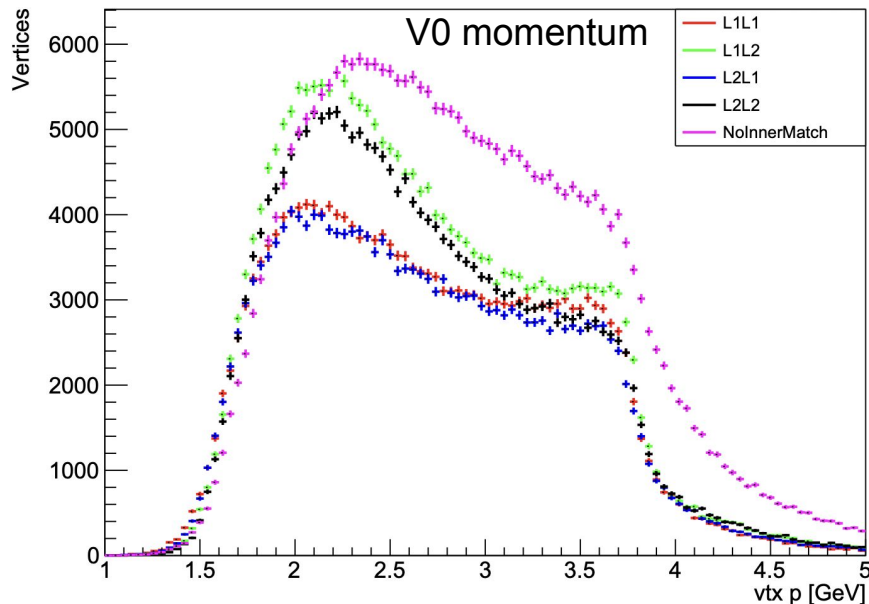


Some level of bkg...not too bad.



Cluster-matched positrons are  
super clean

# **Both** Electron & Positron Matched to Clusters



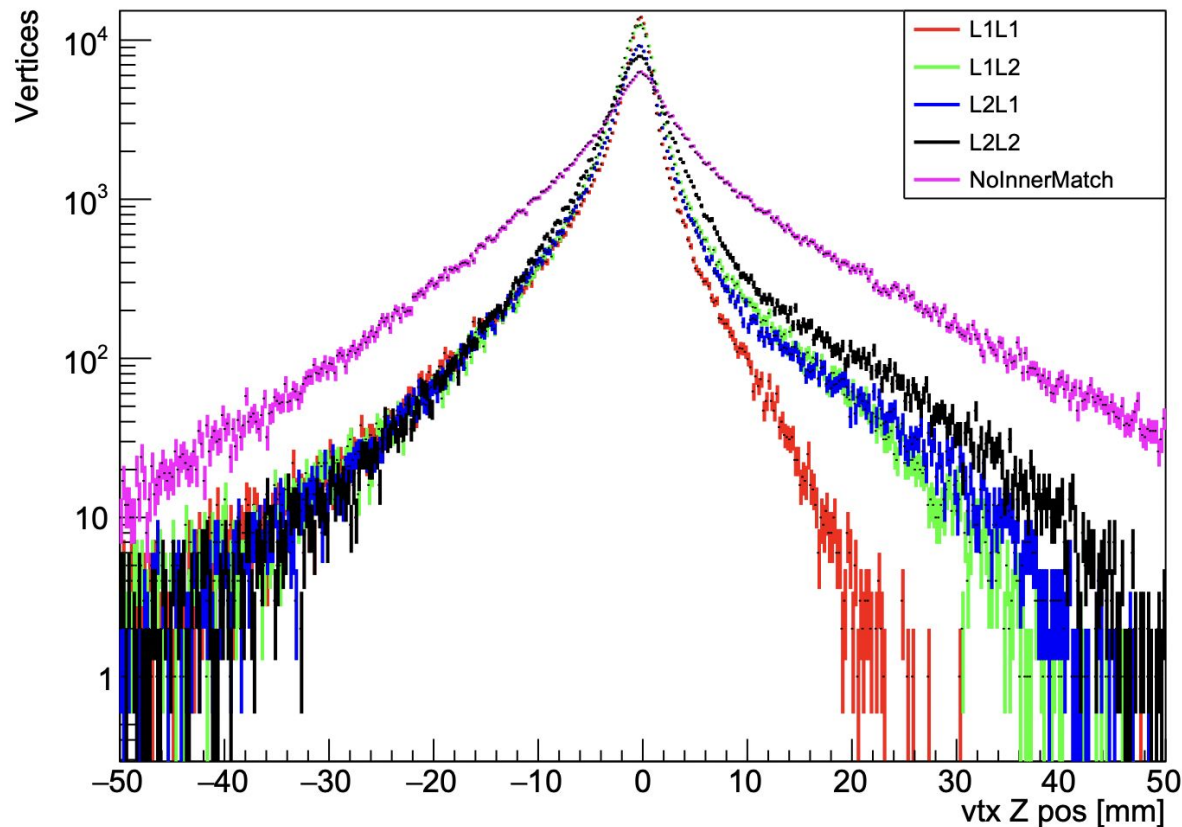
...recall for 2016 analysis we required both tracks were matched to clusters and either L1L1 or (L1L2||L2L1) (for the vertexing analysis)

Biggest single group is “NoInnerMatch” but remember caveats on 2nd slide.

It's interesting and maybe concerning that all of these categories have ~same number of events.

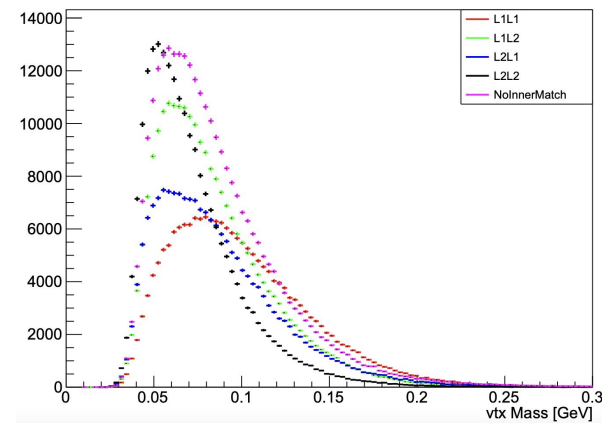
Hopefully better alignment helps get more hits-on-track for inner layers.

# **Both** Electron & Positron Matched to Clusters

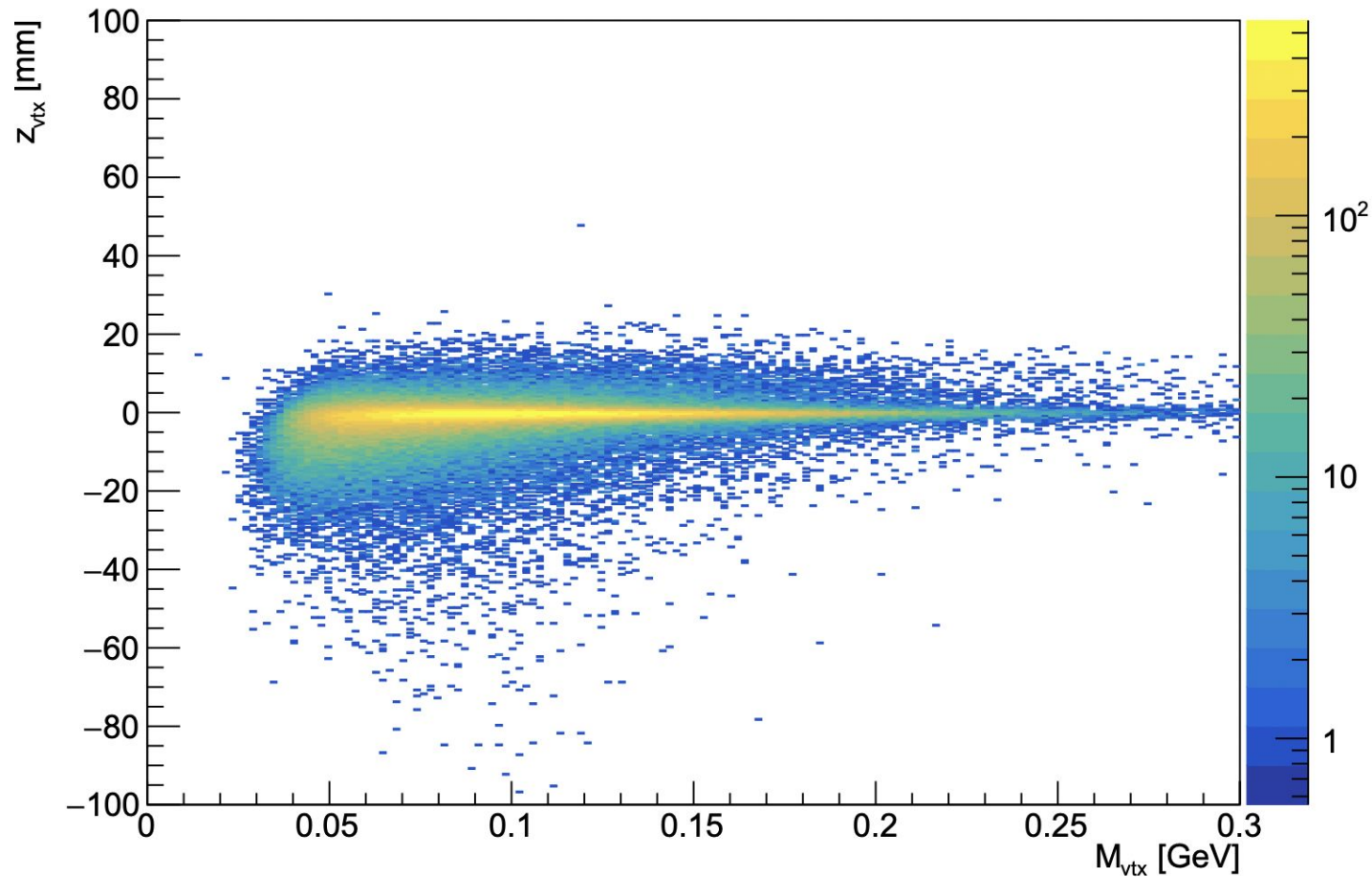


...but the LXLY categories tell us something.

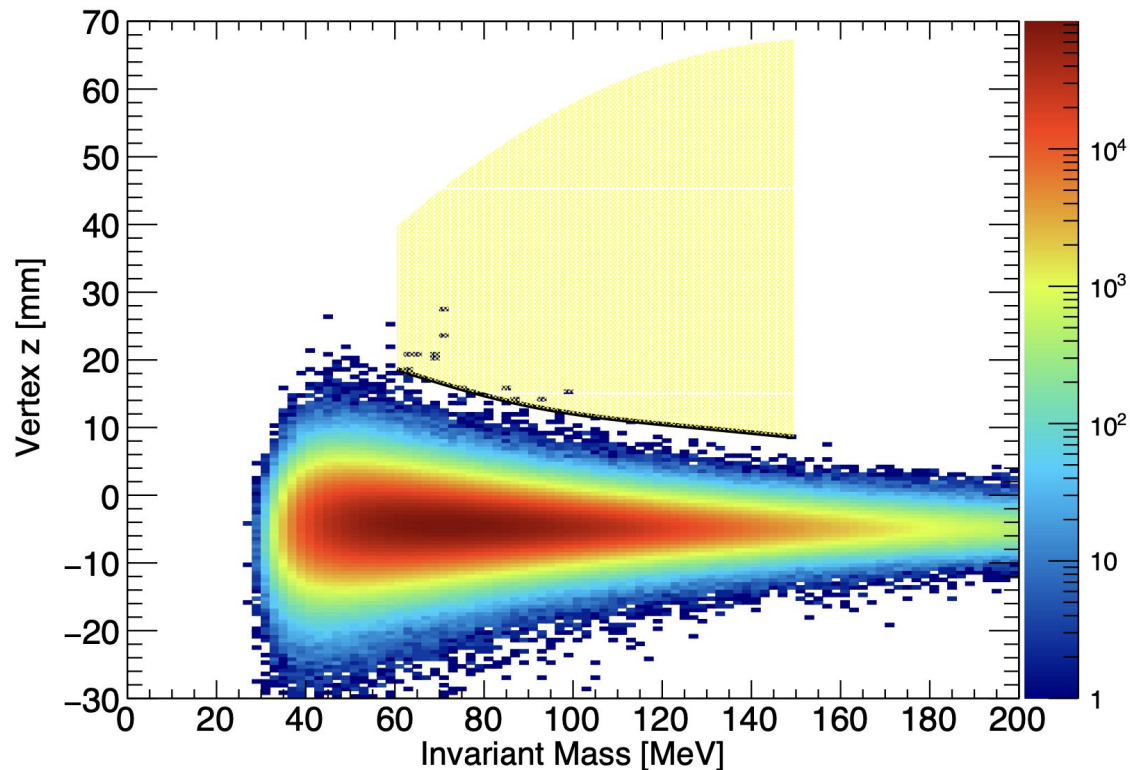
“No Inner Match” has much larger vtxZ tails...which makes sense...



# L1L1 Both Clusters Matched vertex Z vs Mass



From the 2016 paper....

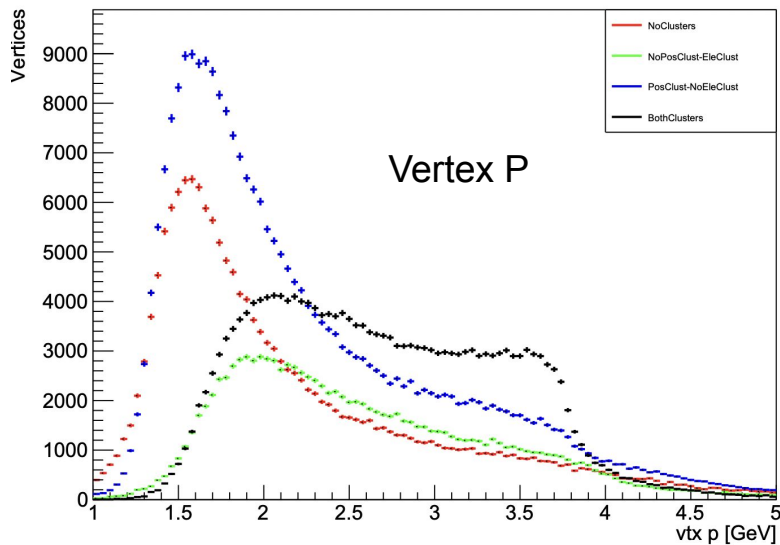


...ok, this is an unfair comparison...for 2021 I'm using all pSum, have extremely loose cuts etc...on the other hand, 2021 has L1 at ~5cm vs 10cm for 2016

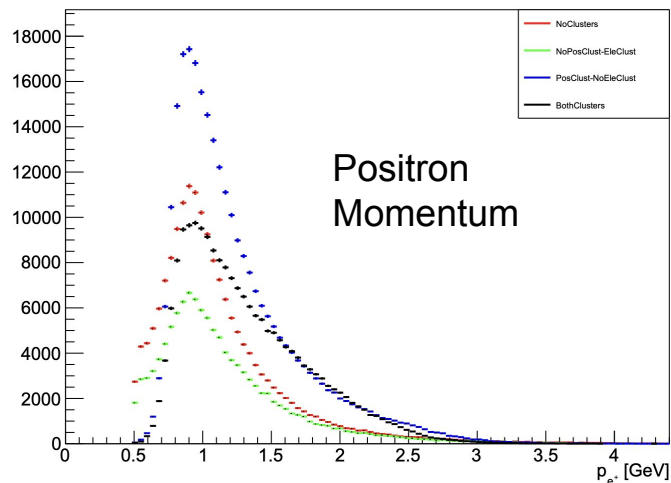
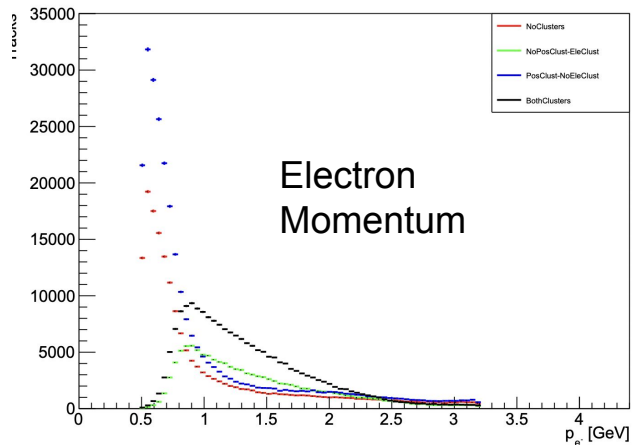
...we have the handles to get background in Z down but there is some work to do.



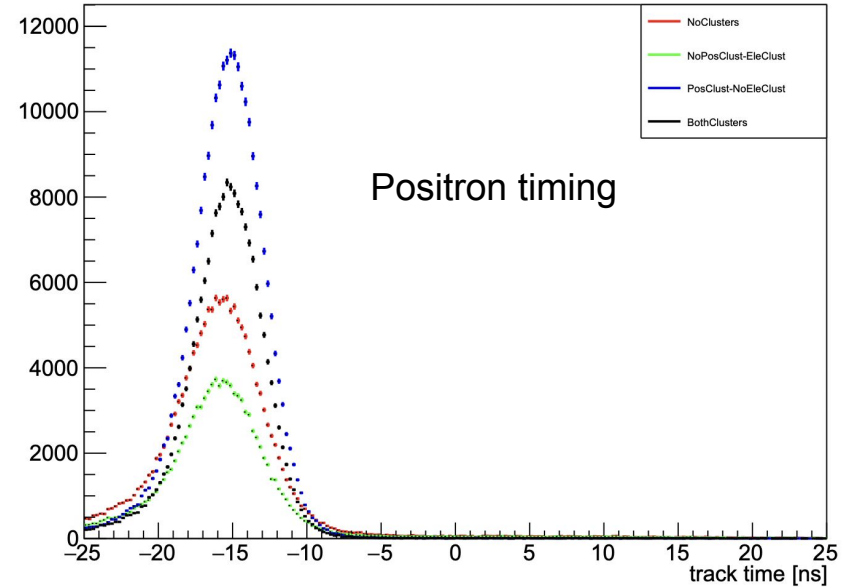
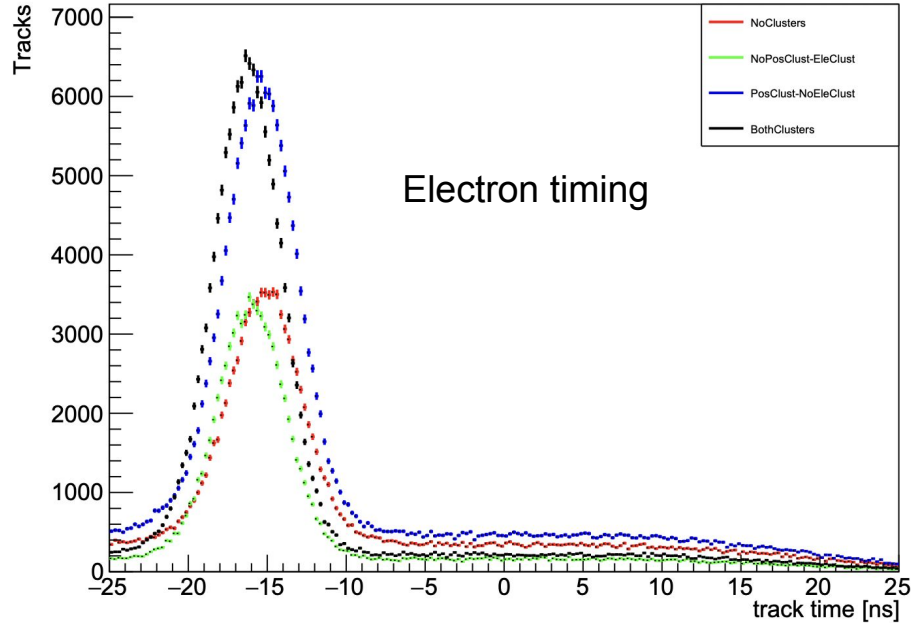
# L1L1 with CIMatch Combos



Not requiring electron cluster to match adds a lot of low momentum electrons—>generally low pSum; We don't see much change in positron spectrum when not requiring cluster match...probably because of trigger requirements. Still...how come so many unmatched positrons?

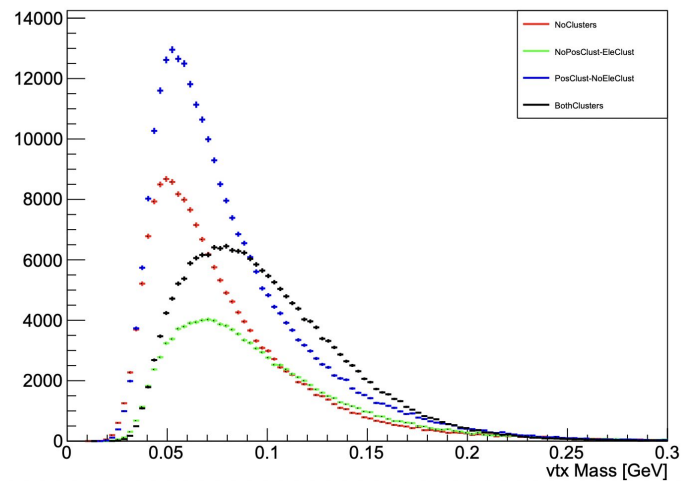
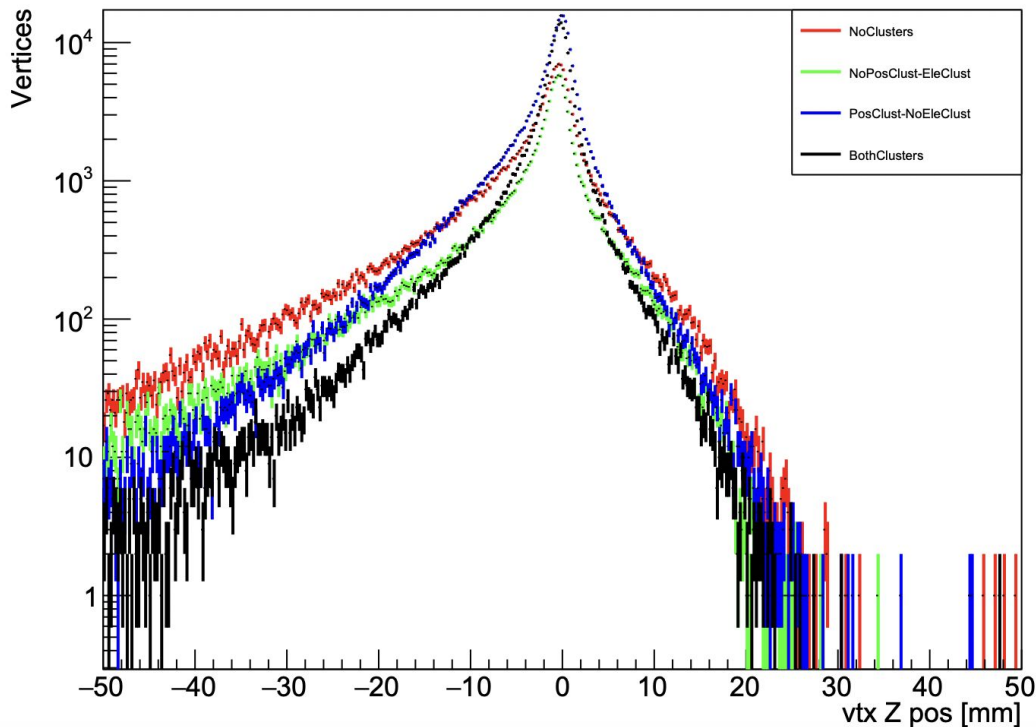


# Track timing for cluster matching combos



Somewhat more B/S for non-matched electrons....positrons are still clean.

# L1L1 Vertex resolution & tails for cluster match combos



See a bit large tails when lose cluster match but also looking at pretty different mass distributions

# Summary

- This is just a quick first look for me.
- I do want to compare these rates to MC...though I'm afraid of what we will see. I will probably wait until pass 0 for this
- My next step is to get my (non-converted) WAB analysis back up and start looking at track efficiency with WABs and 2-prongs and 3-prongs
  - Basically, Norman has already done this stuff but I want to get it in hpstr