

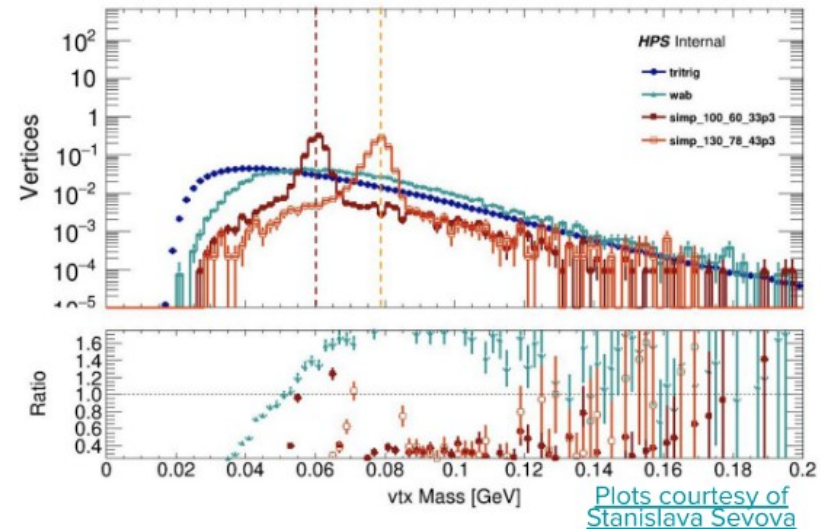
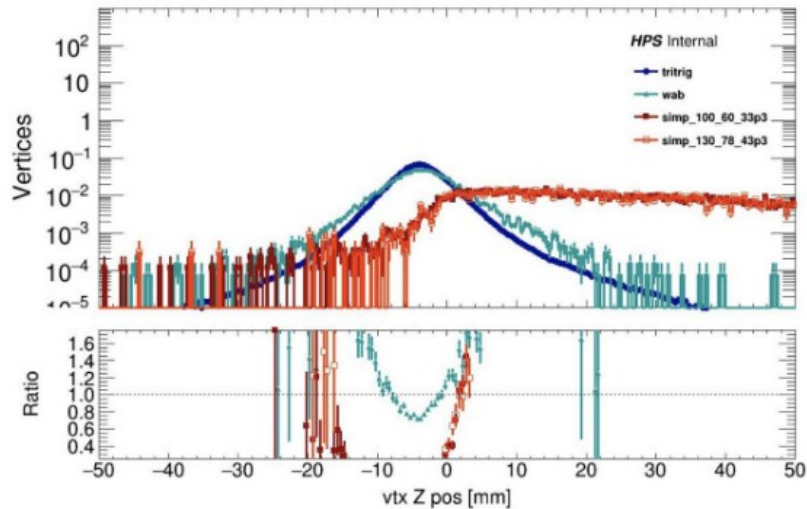
HPS Collaboration Meeting, November 16, 2021

Kalman Filter Tracking with 2016 Data

Cameron Bravo (SLAC)

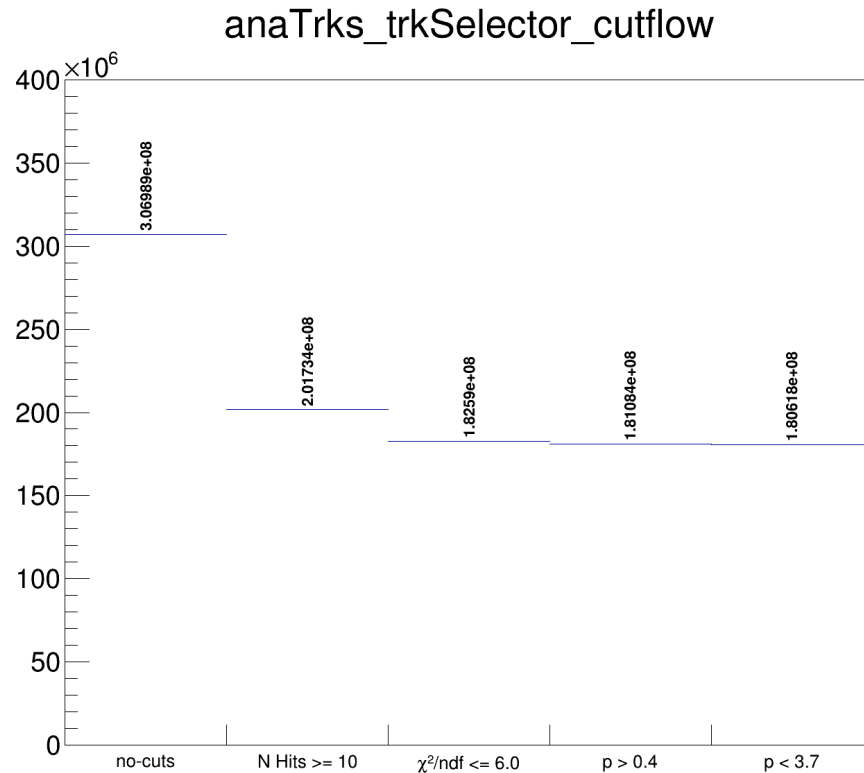
- SIMP analysis of 2016 data
 - Possibly sensitive to unsearched parameter space
 - Lower momentum sum signal
 - Planning to use KF tracking
- Run full reco with KF on full run 7800
 - Current master branch of hps-java
 - Same geometry used for paper analyses
- What needs to be done before running 100% of 2016 with KF?
- Studying 2016 with KF tracks can help us better understand KF
 - This will be a great test bed for improvements we develop for 2019 and 2021 analyses beyond KF

Status of SIMP Analysis



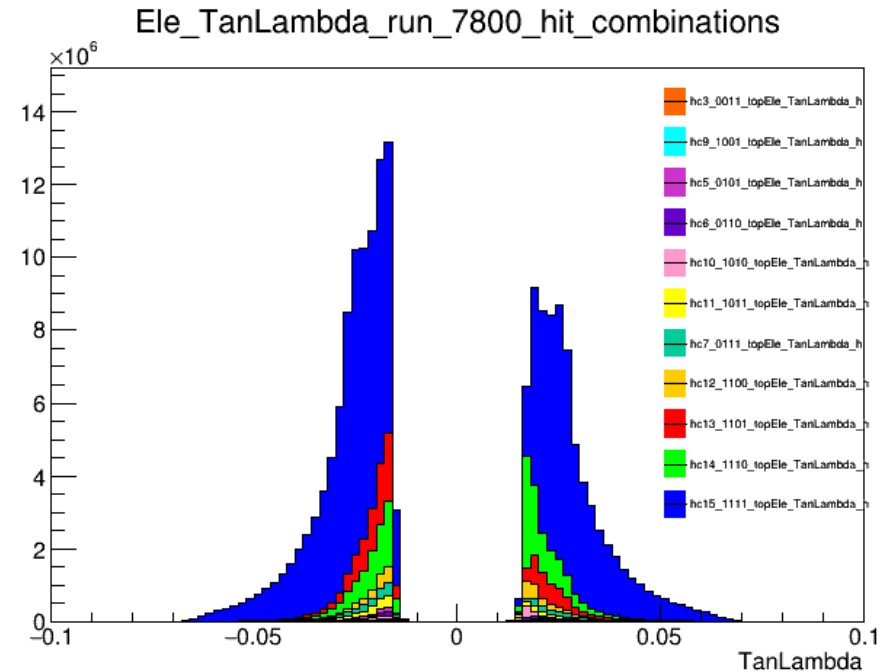
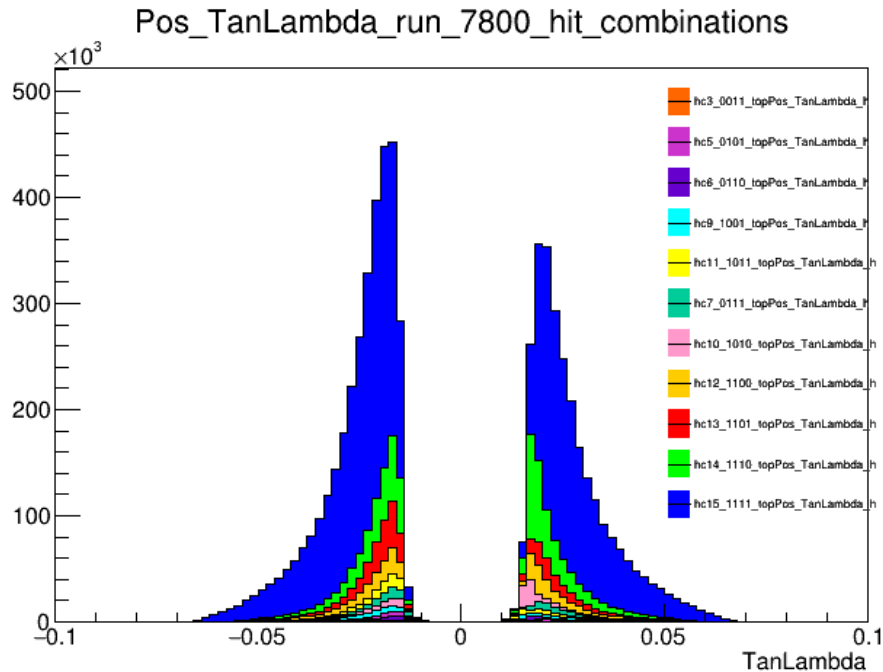
- First round of signal MC made by Veronica Pratt
 - 66 MeV up to 250 MeV mass of resonance
 - Initial looks show no serious issues with samples
- Reconstructing background MC should be on our radar
 - Can start studying selection after this is done
- Need to understand how to calculate signal rates

Run 7800 KF Tracks



- Analyzed a total of ~141.3 million events
- Bin tracks based on charge, volume and hits in first four layers of Si (hit code)
- Just looking at tracks for now, hasn't been looked at yet
 - Are we still happy with calibrations in the light of KF tracks?

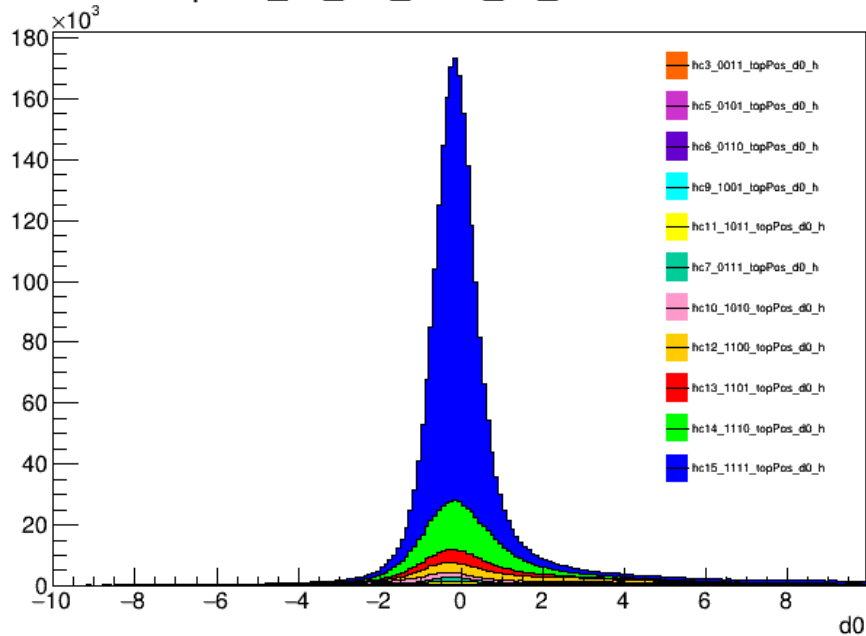
Clean Track $\text{Tan}(\lambda)$



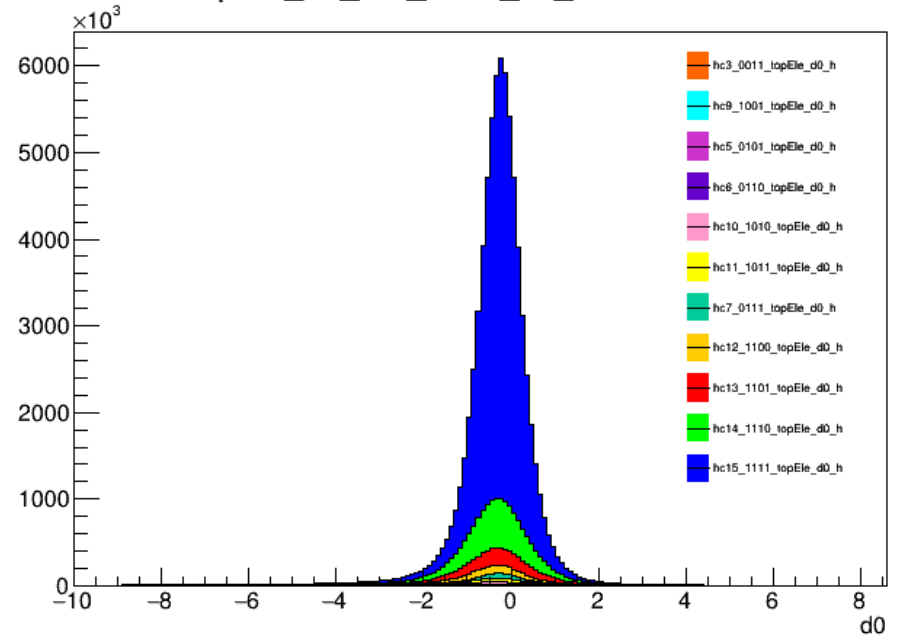
- Breaking up L1L2 tracks into more focused categories
- Top electron shape peaks less at low tan lambda
 - Did we see this in the seed tracker analysis?

Top d_0

topPos_d0_run_7800_hit_combinations



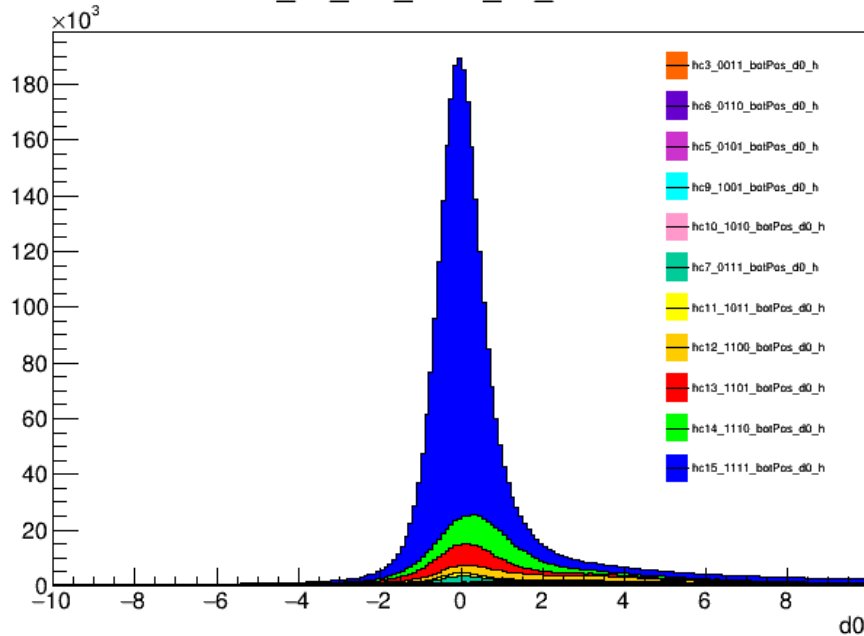
topEle_d0_run_7800_hit_combinations



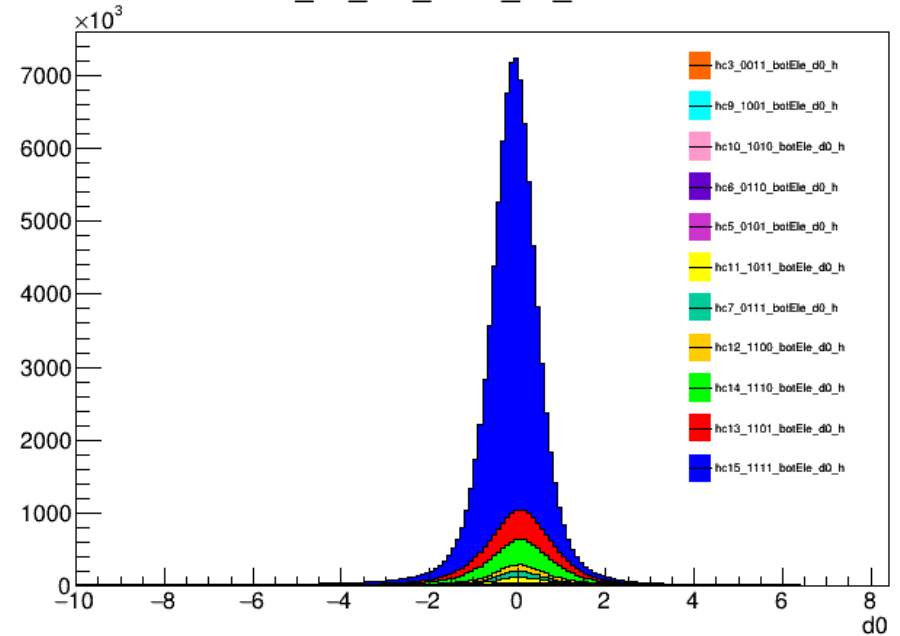
- A bit of an asymmetry in positron tracks

Bottom d_0

botPos_d0_run_7800_hit_combinations



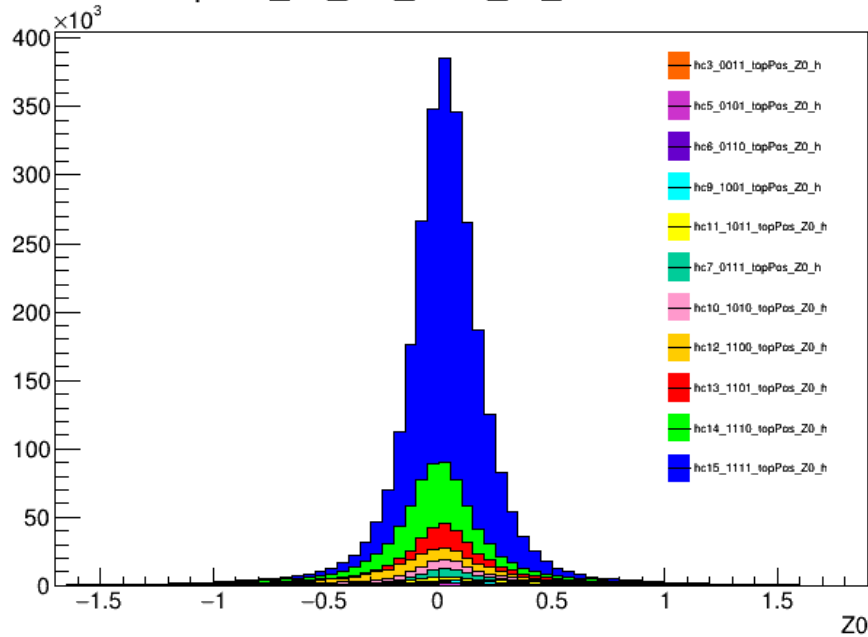
botEle_d0_run_7800_hit_combinations



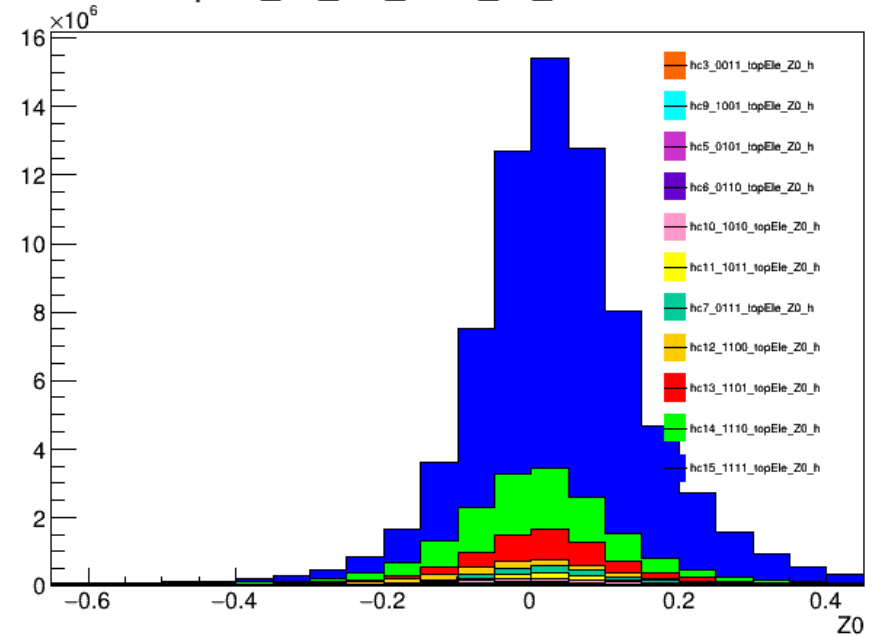
- A bit more of an asymmetry in positron tracks
- Higher fraction of tracks in hc15_1111 compared to top

Top Z_0

topPos_Z0_run_7800_hit_combinations



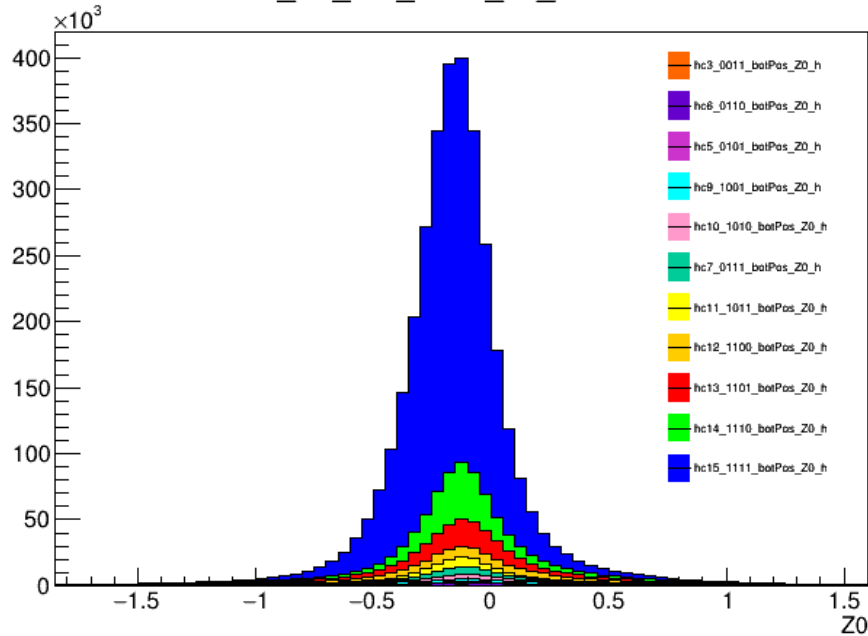
topEle_Z0_run_7800_hit_combinations



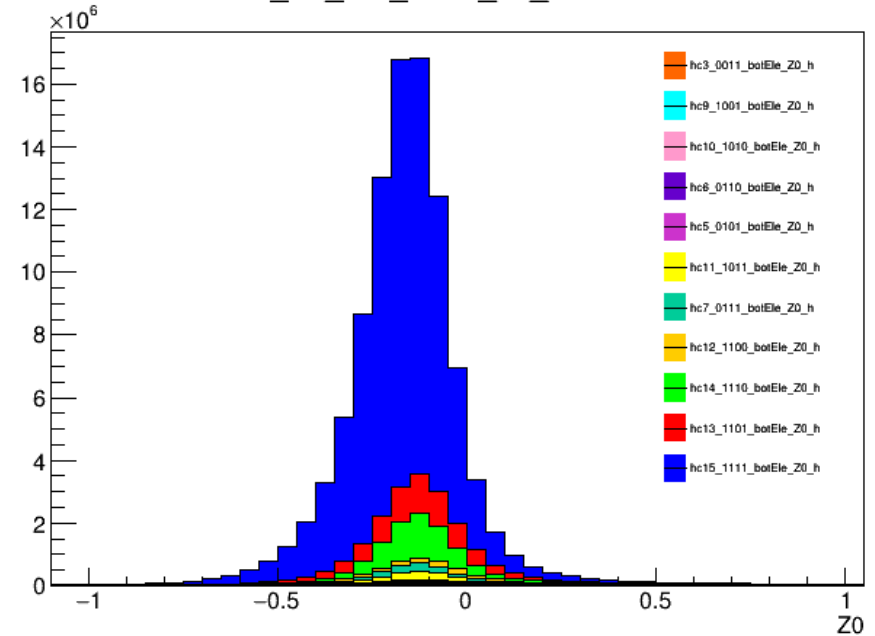
- There is an ever so slight asymmetry in the electrons

Bottom Z_0

botPos_Z0_run_7800_hit_combinations



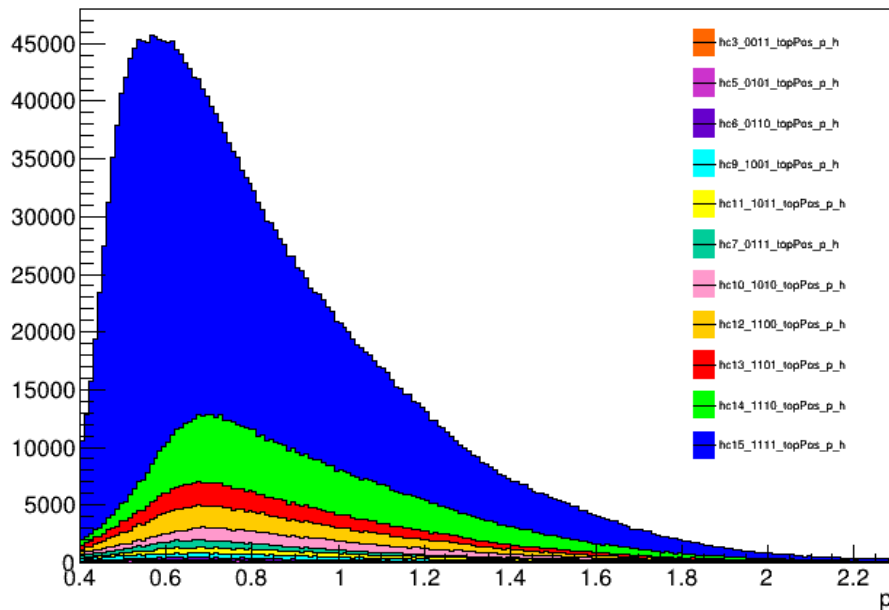
botEle_Z0_run_7800_hit_combinations



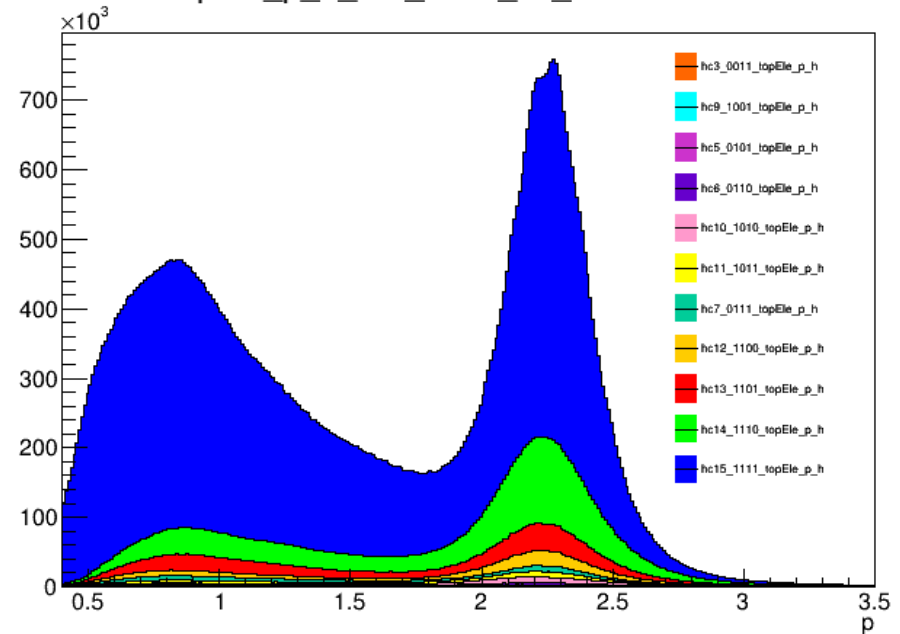
- Asymmetry in electrons goes opposite direction in the bottom

Top Momentum

topPos_p_h_run_7800_hit_combinations



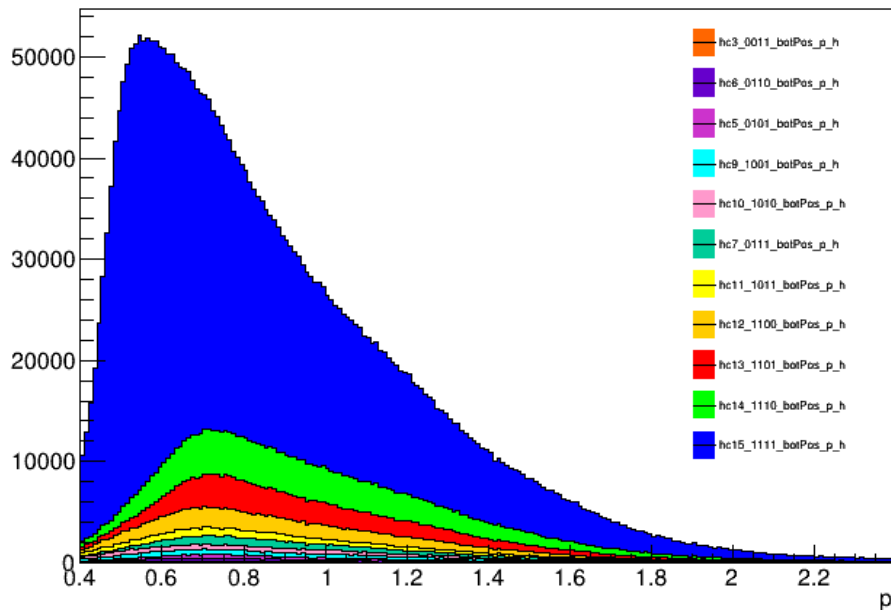
topEle_p_h_run_7800_hit_combinations



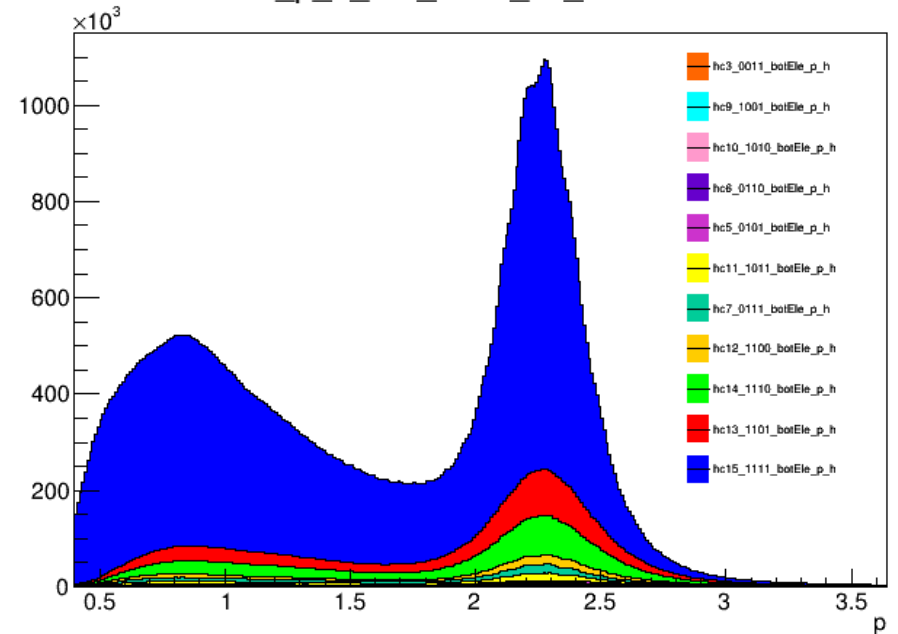
- FEE peak has a funny double peak shape
 - Could this be because this is requiring 10/12 hits on track
 - More on this shortly

Bottom Momentum

botPos_p_h_run_7800_hit_combinations

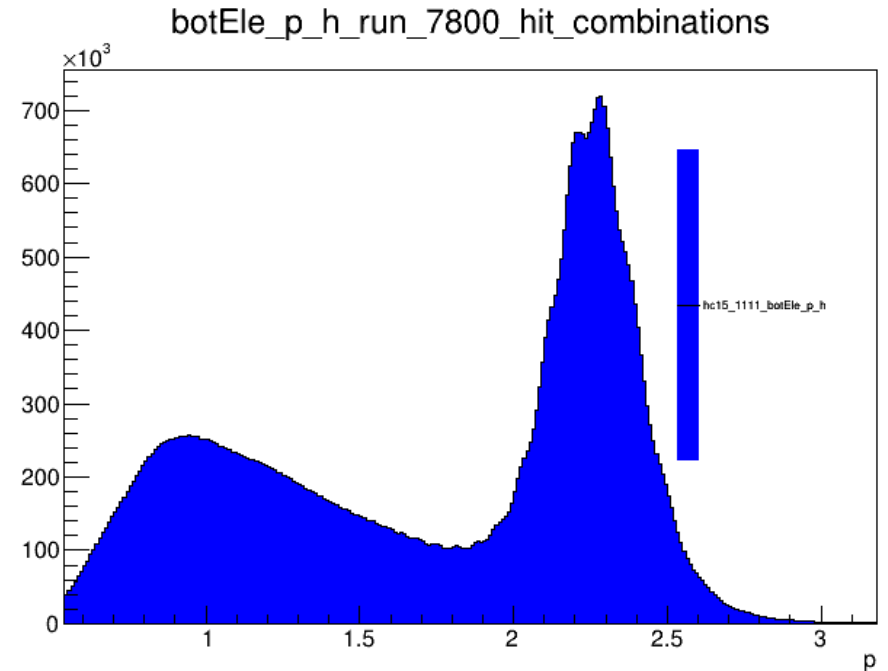
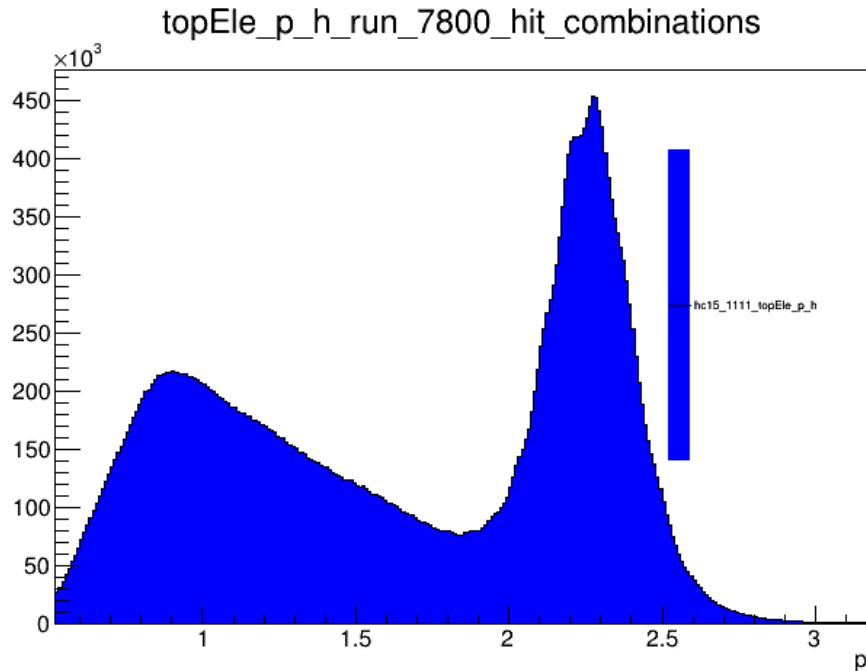


botEle_p_h_run_7800_hit_combinations



- Similar double peak structure in FEEs bottom

Track momenta with 12 Hits on Track



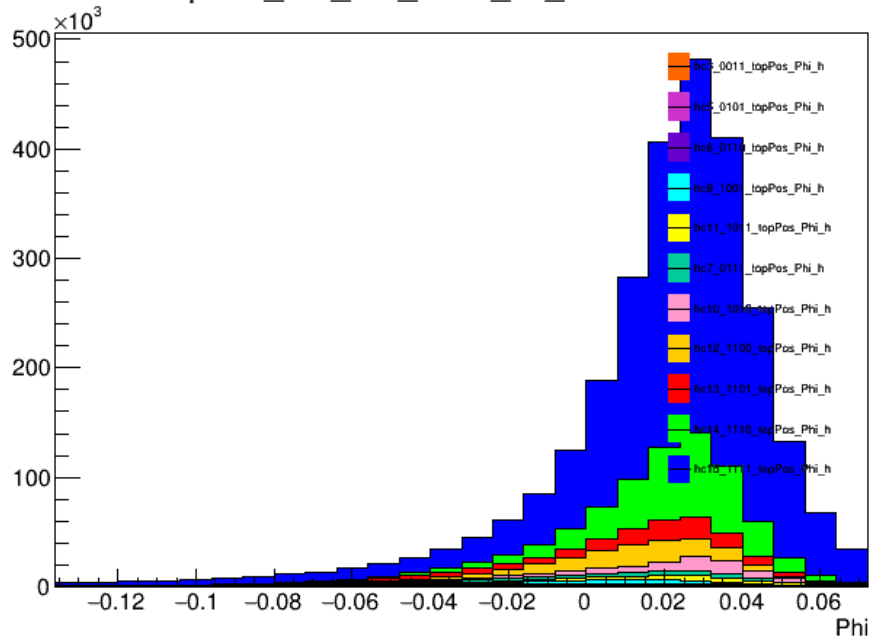
- Double peak structure still there
- What could this be coming from?
- Strange structure is only present in hc15_1111 case with at least 10 hits
- A lot more of these “perfect” FEE tracks in top compared to bottom

Plans before Running on 100% of 2016

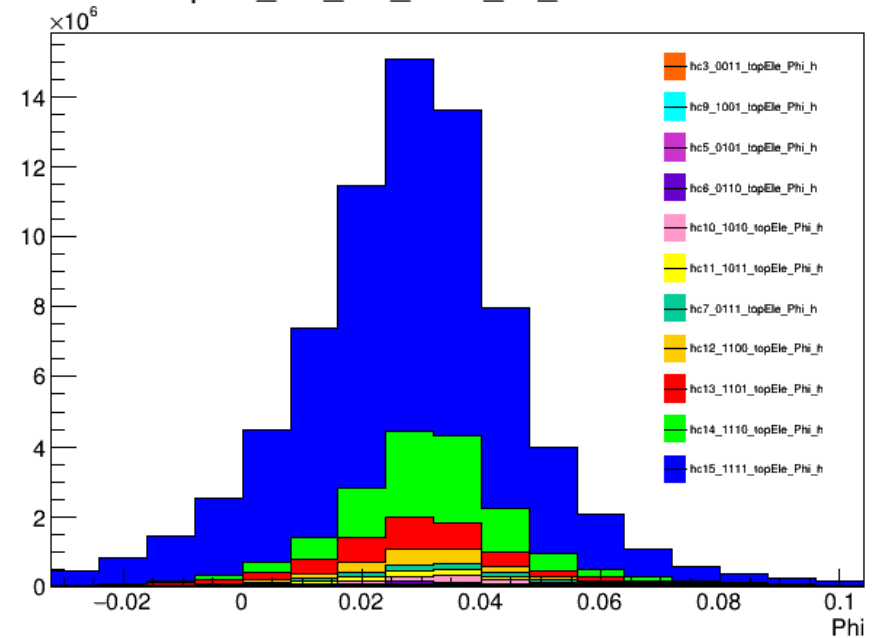
- Starting to dig into SVT hit reconstruction
 - 2016 is a great test bed for these studies
 - Should wait to reco after these studies/improvements
- Would like to understand double peak structure in FEEs
 - PF has time to run an iteration of alignment on 2016?
 - Could be related to some hit reco issue?
 - Interesting that similar structure is in top and bottom
 - Seen in seed tracker analysis?
- Start checking vertex level plots soon
- Anything specific people would like to see?

Top Phi

topPos_Phi_run_7800_hit_combinations



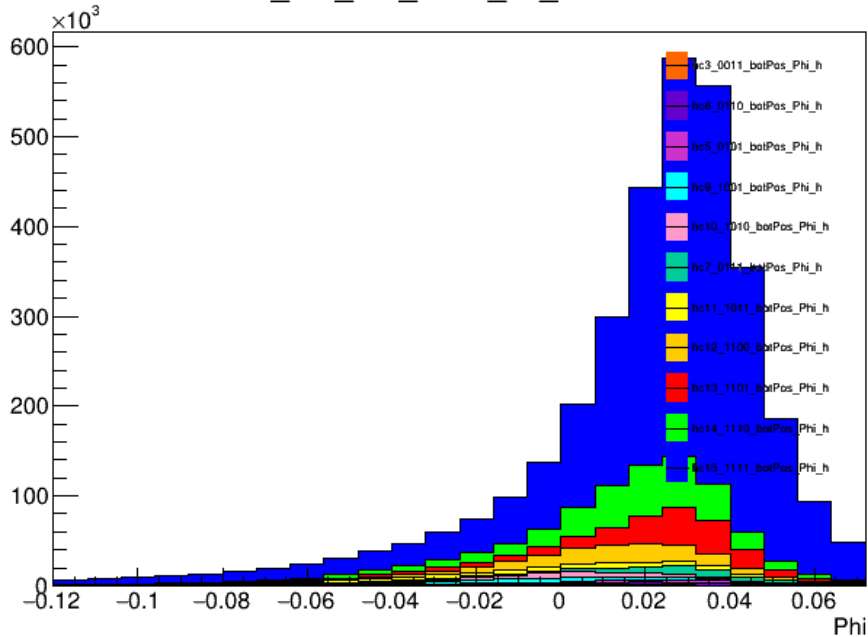
topEle_Phi_run_7800_hit_combinations



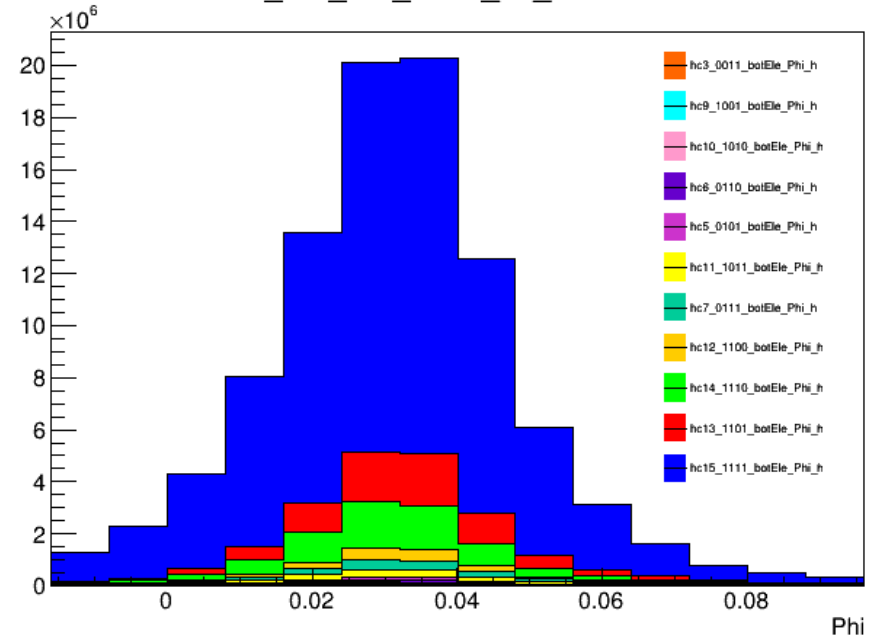
- A bit of an asymmetry in positron tracks

Bottom Phi

botPos_Phi_run_7800_hit_combinations



botEle_Phi_run_7800_hit_combinations



- A bit more of an asymmetry in positron tracks
- Higher fraction of tracks in hc15_1111 compared to top