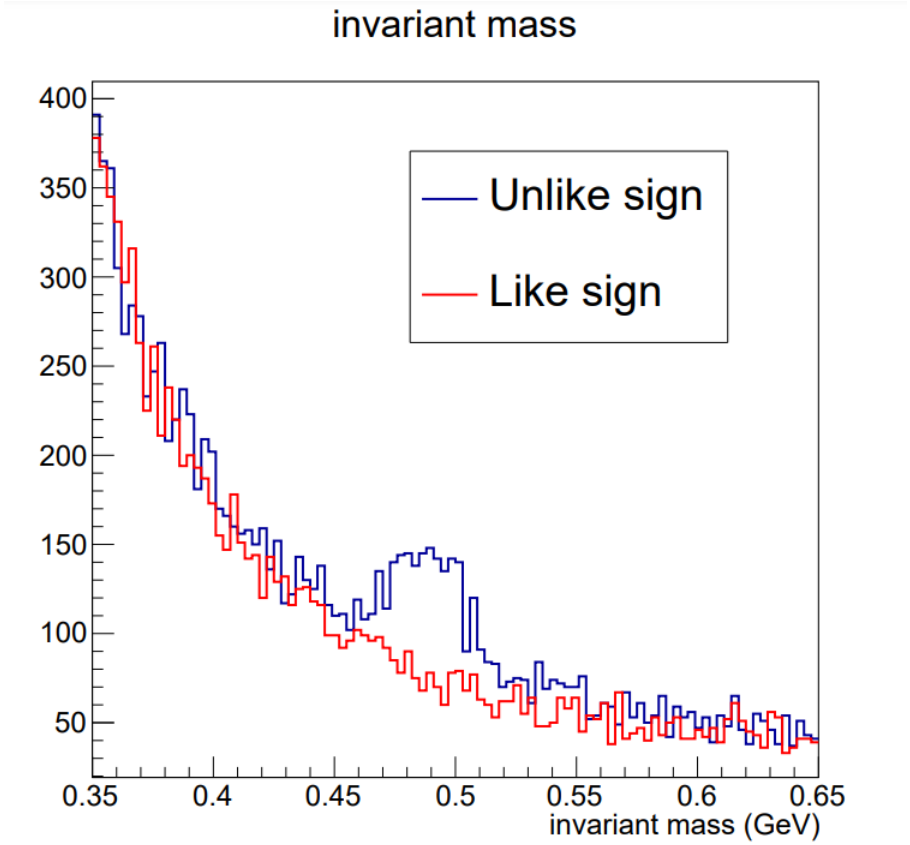
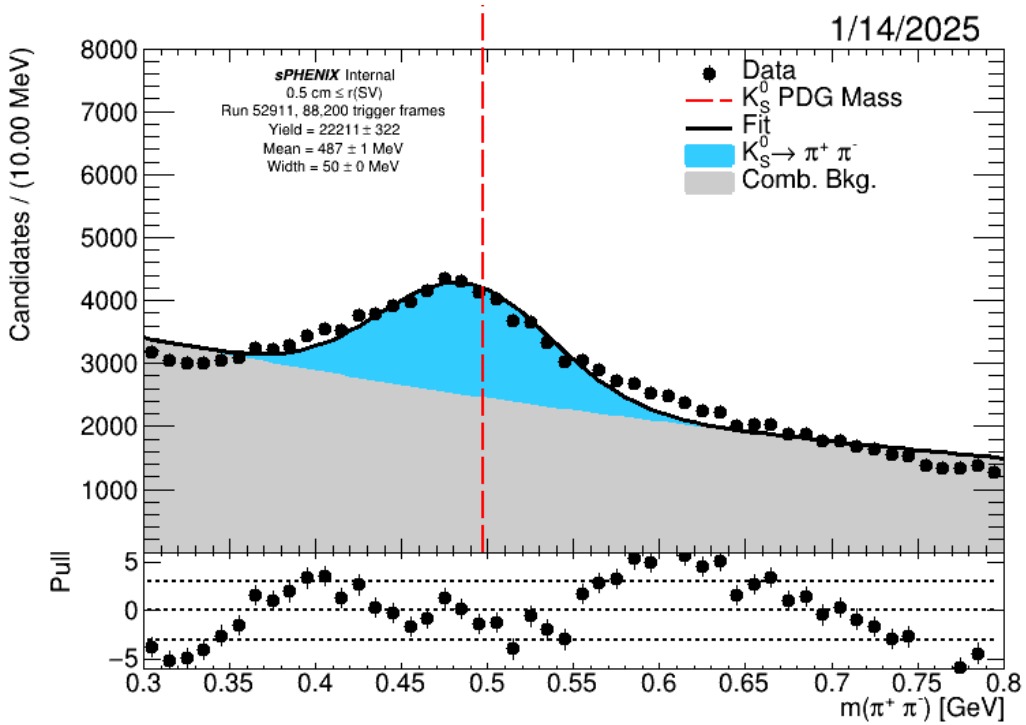
K_Short Update

Alex Patton – January 17th, 2025

Status of K_Short Reconstruction

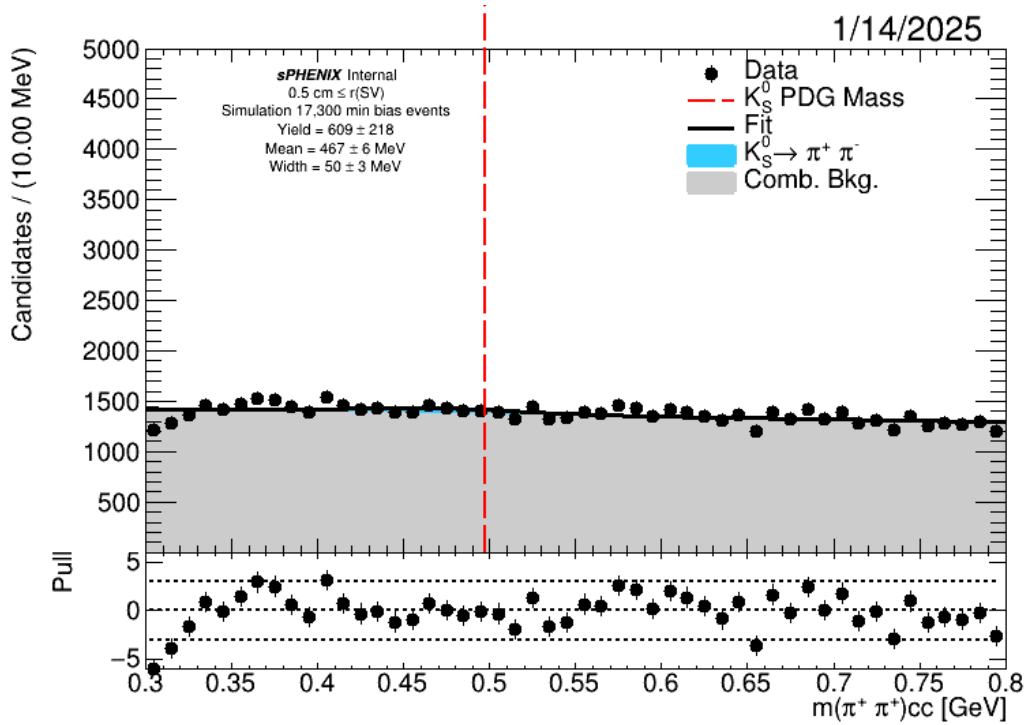
- K_Short's reconstructed in KFParticle are on right, and left is using KshortReconstruction module on the right to confirm the results also shows a peak

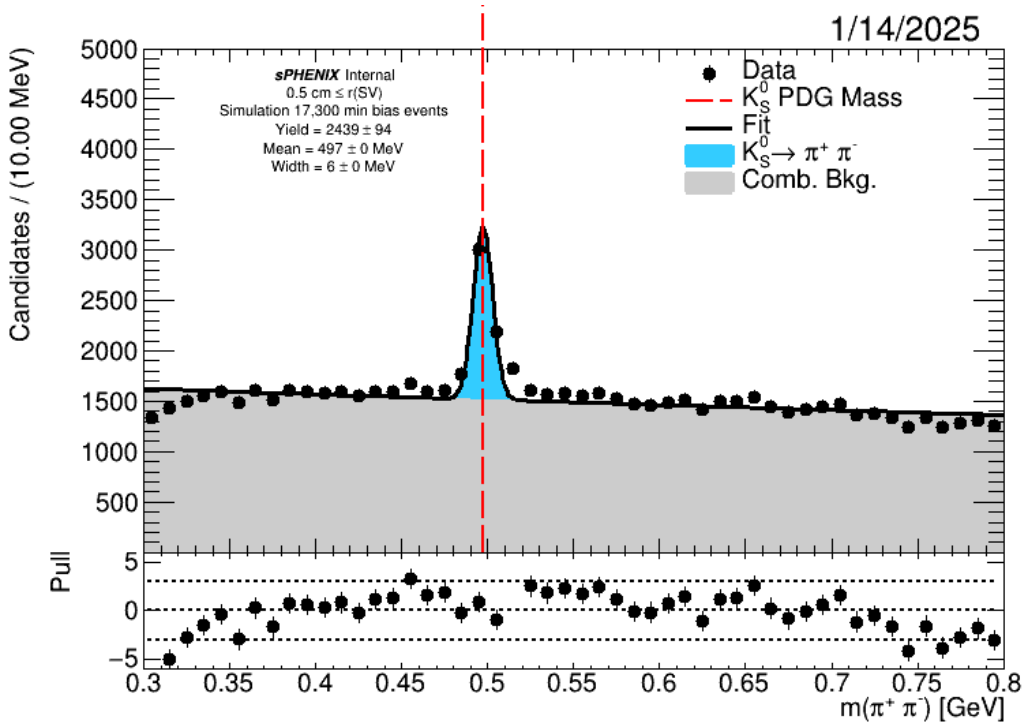




Simulation KFParticle

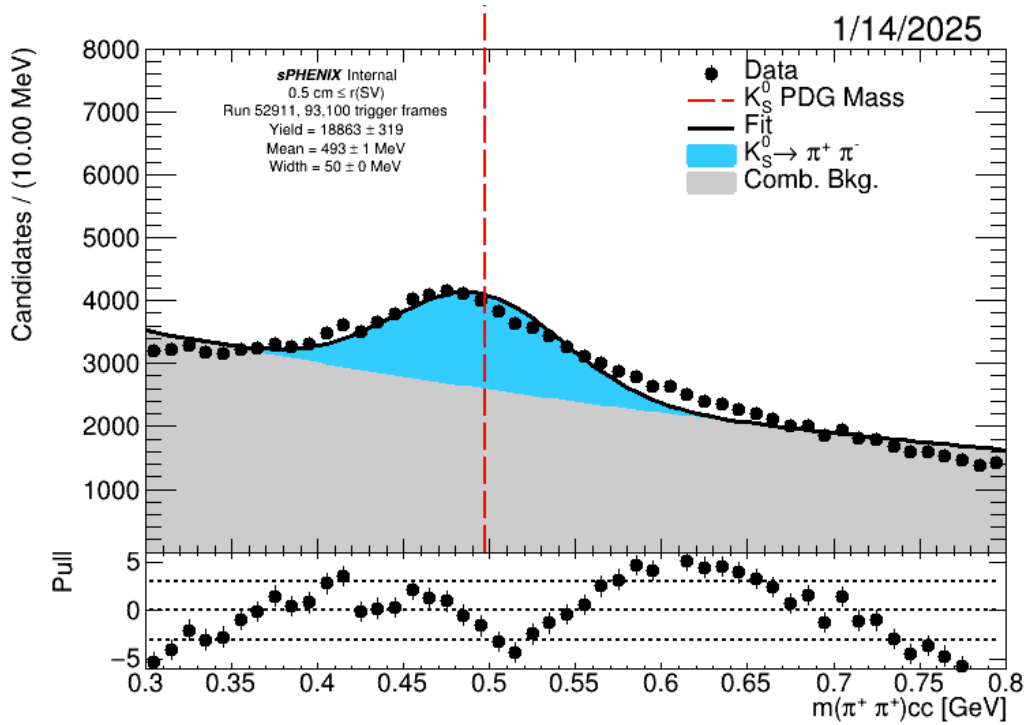
- Running KFParticle over minbias simulation data for K_Short reconstruction shows a clear difference between like sign decays and unlike sign decays where we only see the peak in unlike sign decays as expected

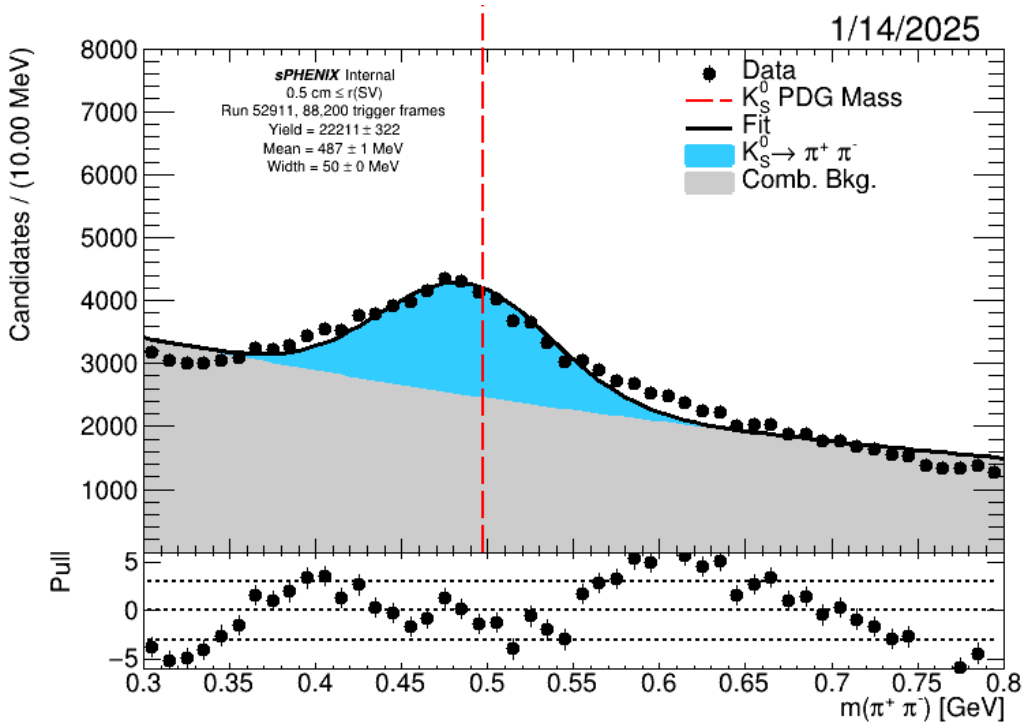




Data for KFParticle

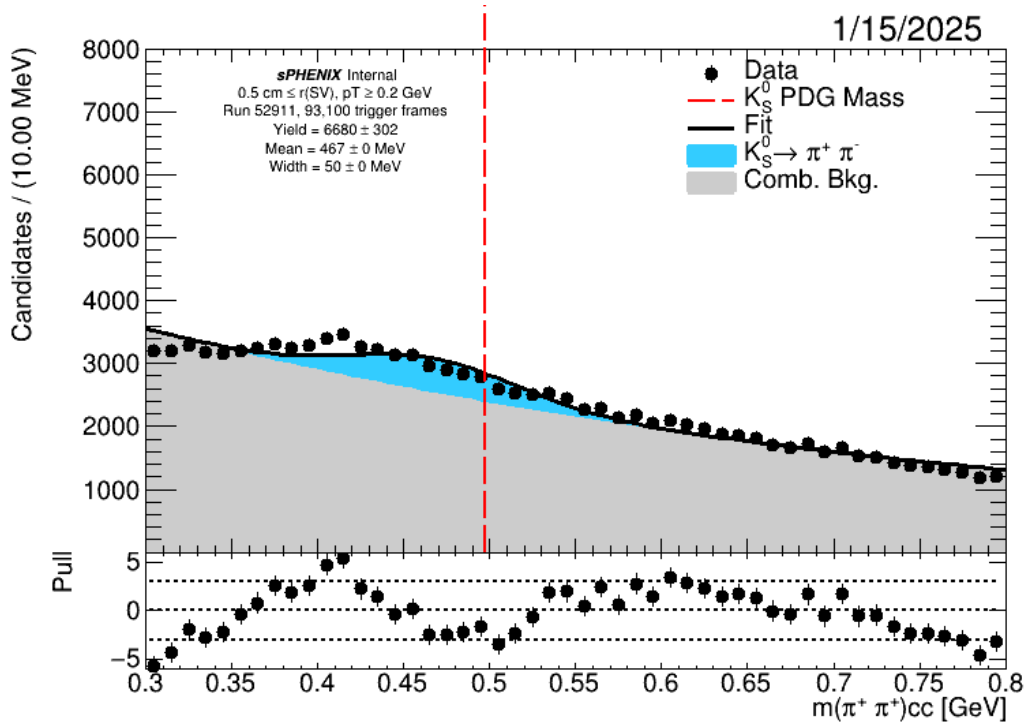
- The problem arises when running over data, when doing a like sign check we see that it is very similar to unlike sign. This issue only pops up in KFParticle and not KshortReconstruction

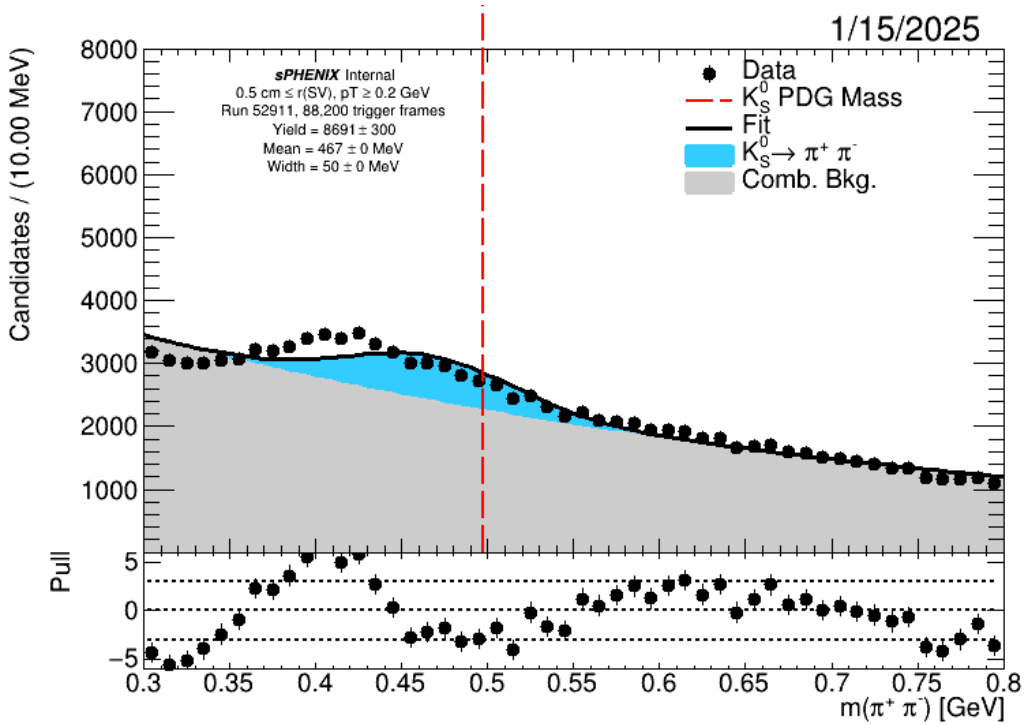




pT cuts

- When we add a cut of pT > 0.2, which Tony's version has, our signal disapears

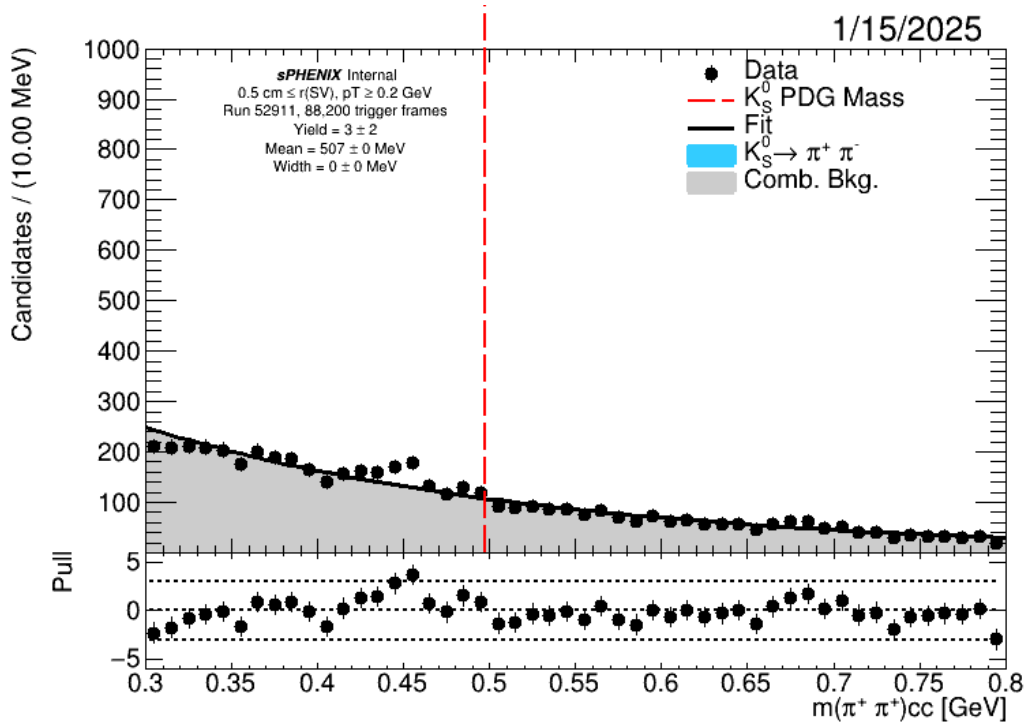


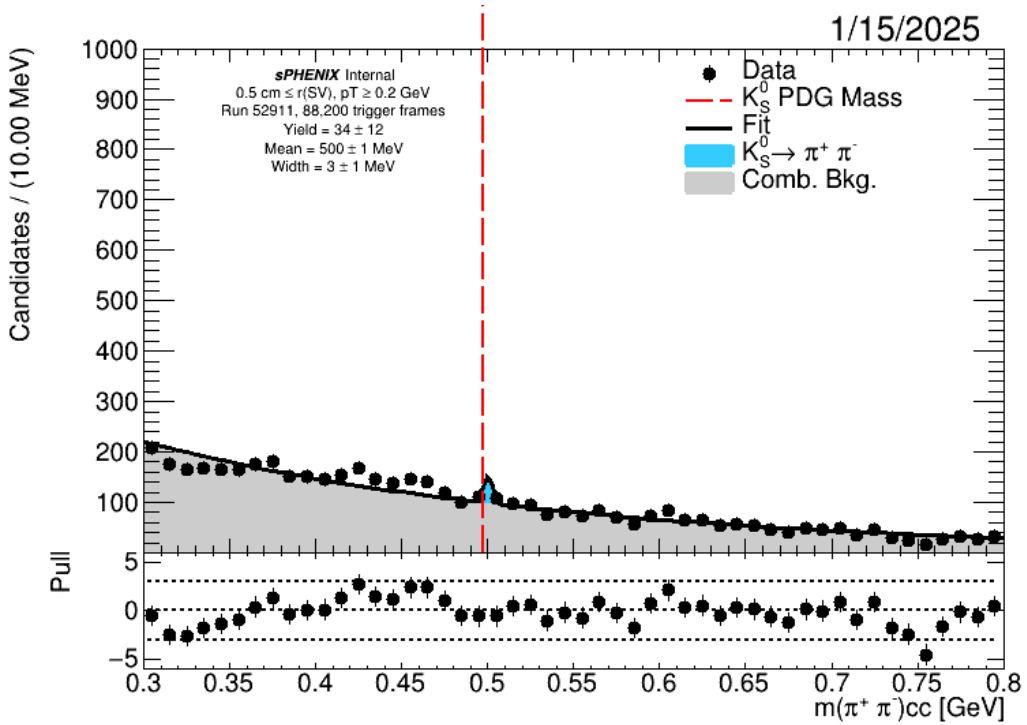


More cuts

- When adding in cuts from earlier to cut out background along with this pT cut, we don't really see any signal in either case

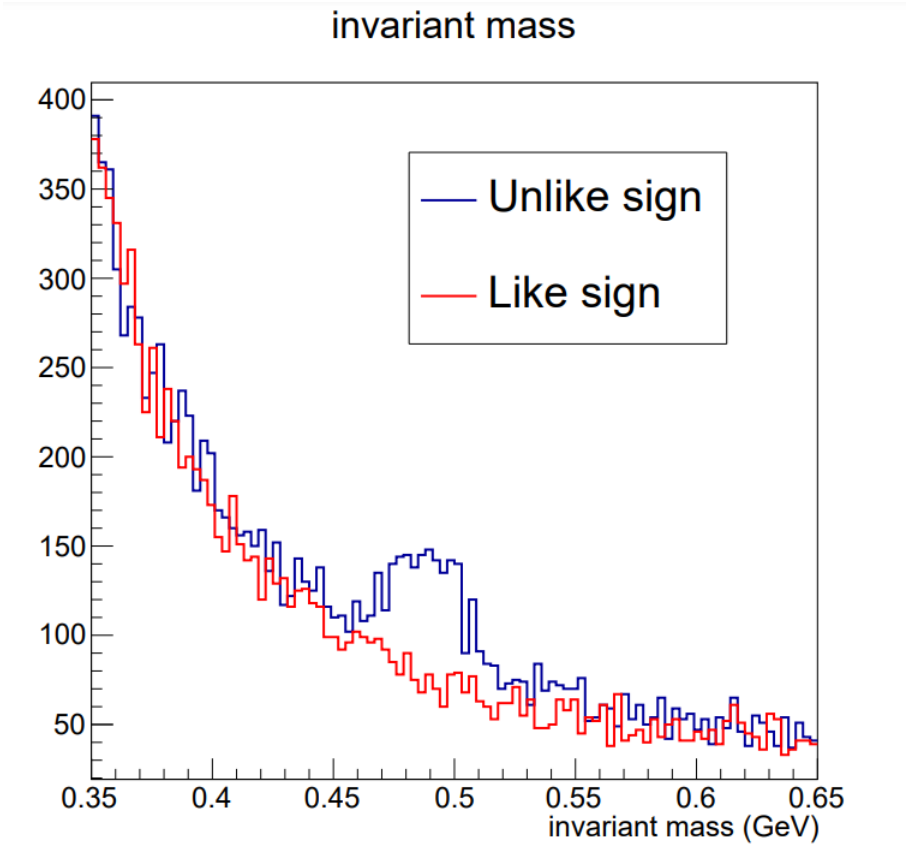
- 2 <= K_S0_decayLength && K_S0_decayLength <= 10 && K_S0_DIRA >= 0.7 && min(abs(track_1_IP_xy), abs(track_2_IP_xy)) >= 0.7

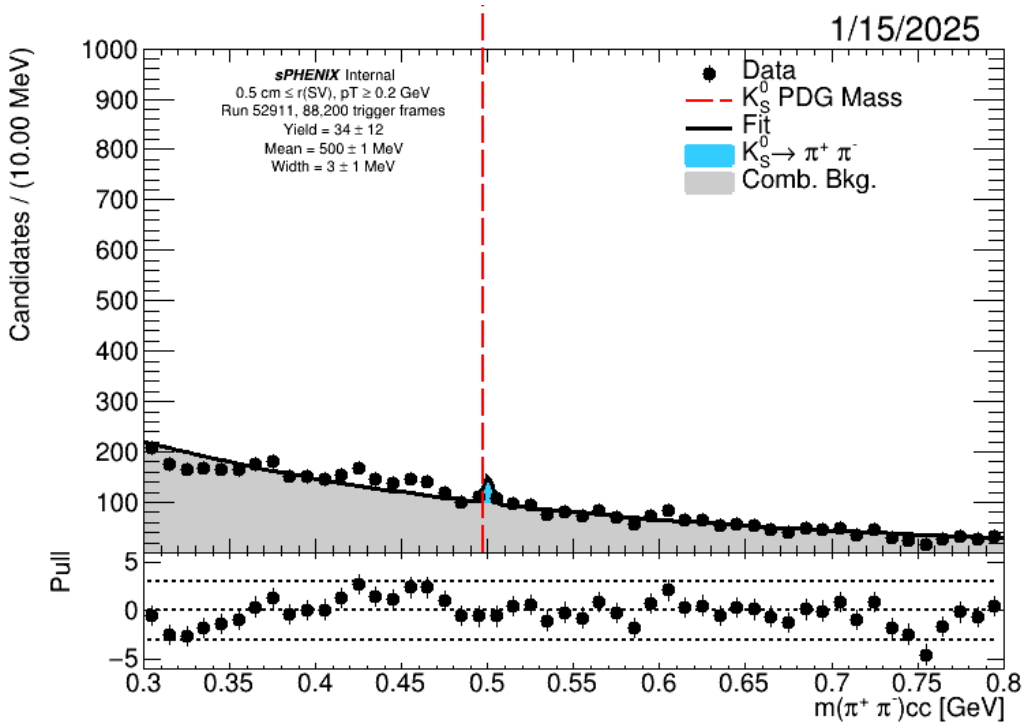




Next Steps

- Running 2.5 million trigger frames like what Tony did here along with a 0.2 pT cut to make surer both methods agree in that circumstance (running now). These results will tell us if KFParticle like-sign issues are just from low pT background, but also that our yield is lower than expected.



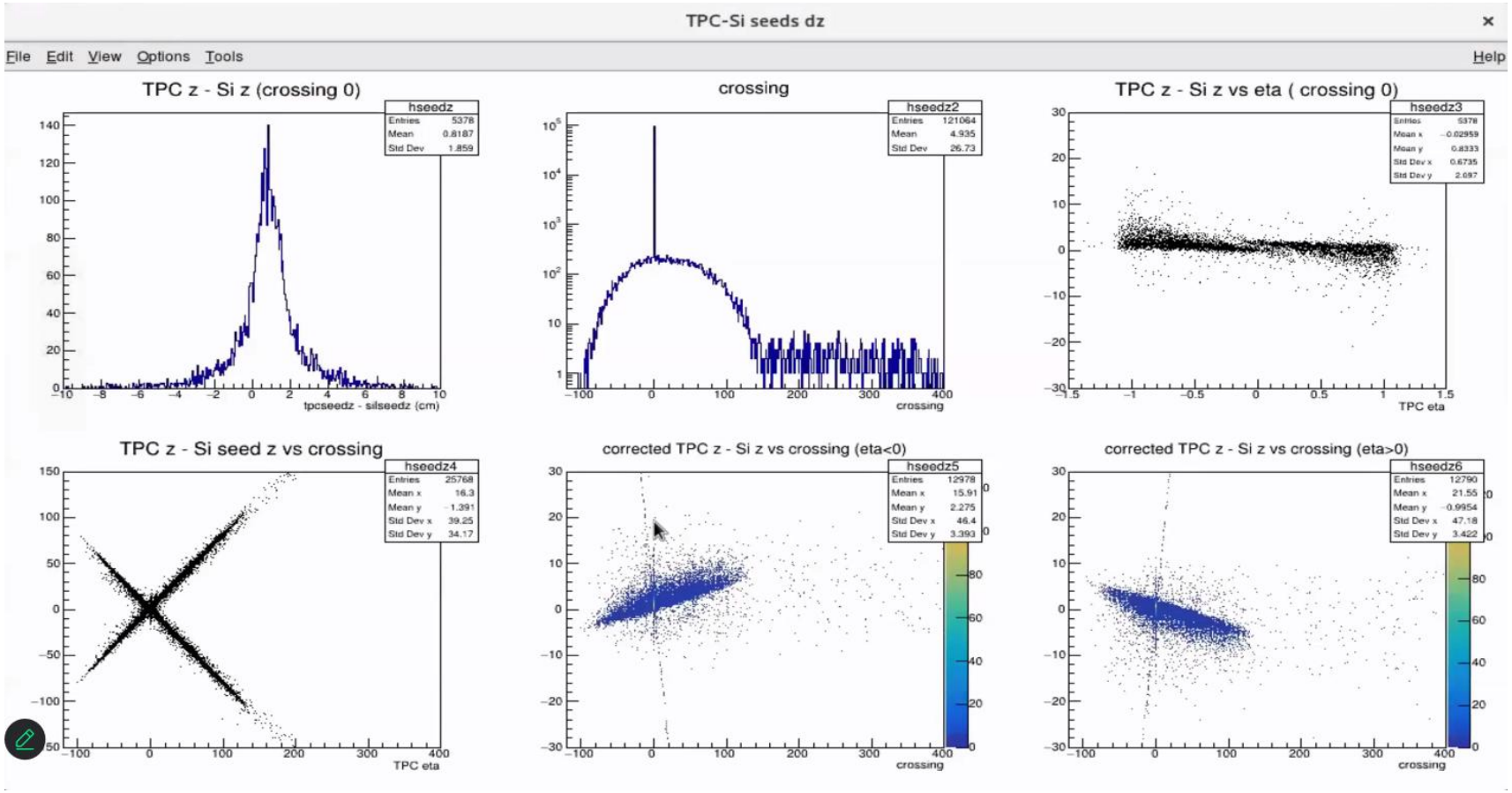


Production Update

- New production has started some runs, things are sped up and data amounts that took a week before are being done in hours
- Production is planned to go to clusters, but Joe has agreed to produce TrackSeed dsts as this makes looking for K_Shorts much faster rather than having to run the seeding every time
  - This is important when needing to run multiple times to compare differences in KFParticle and KshortReconstruction modules for finding bugs
- Seeding is still under heavy development, so these TrackSeeds will need to be produced at various times as development goes on
- Memory Leak in TPC unpacker has been fixed, will have to wait for rest of production until this goes through tomorrow
- File format is changed to have 39 files, one for each FELIX card
- Zero Field Runs are ready now

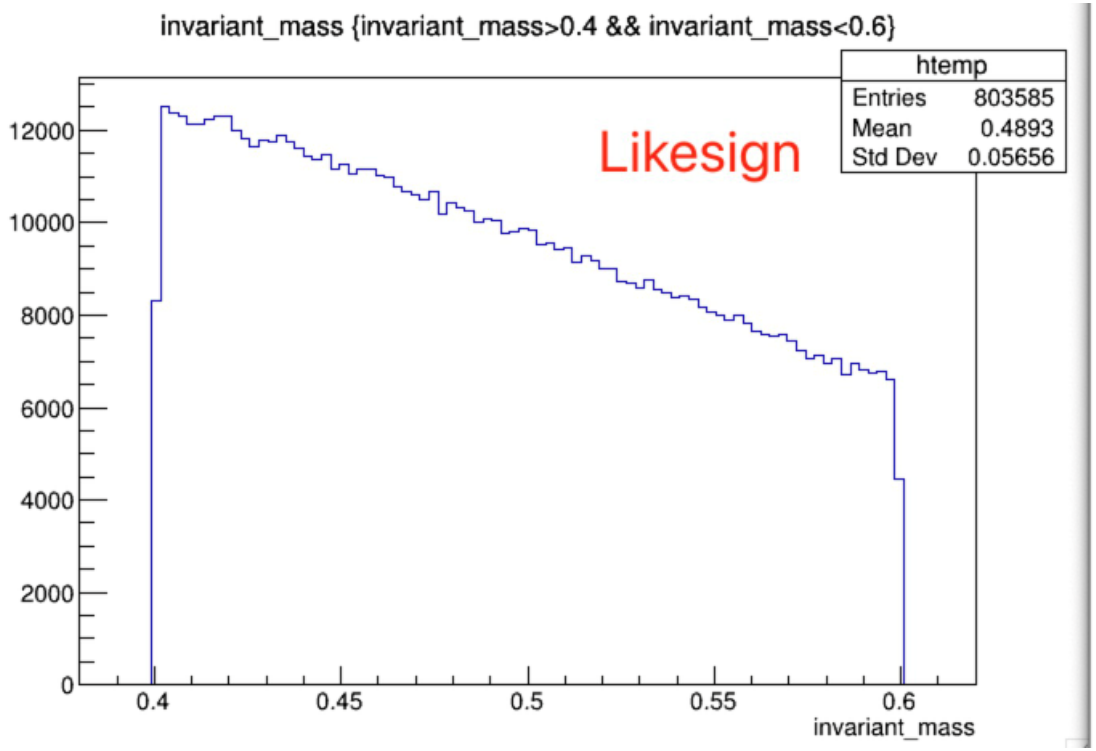
Crossing

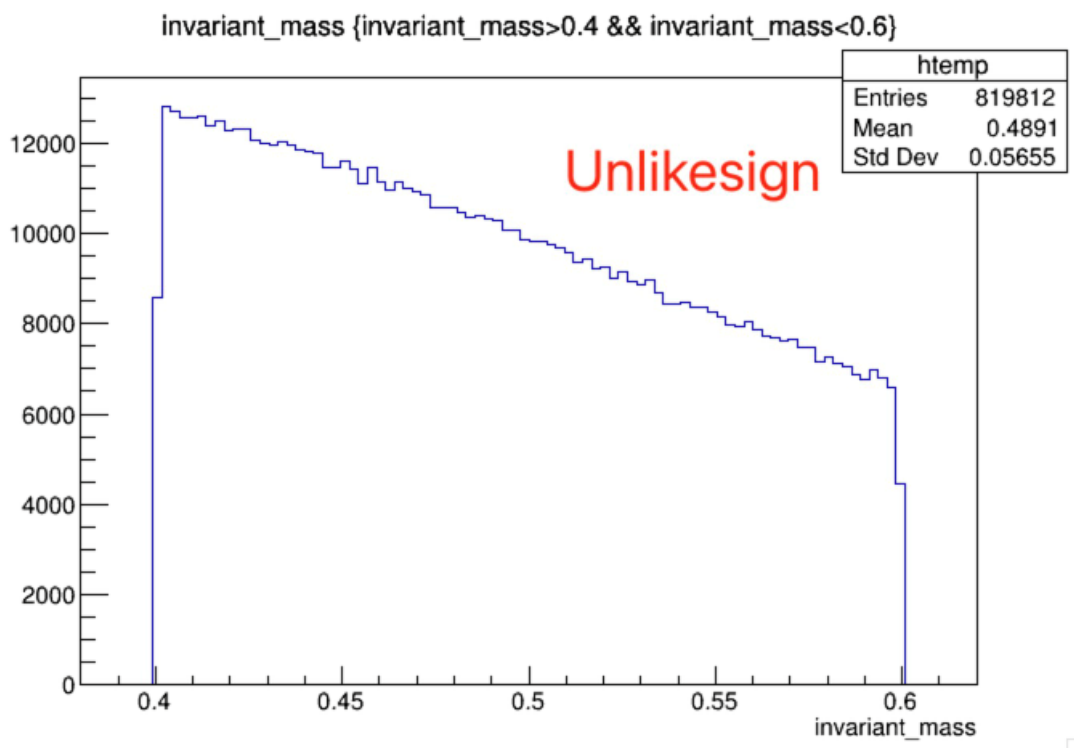
- Z position is proportional to crossing
- Bottom middle has TPC position corrected for crossing number using drift velocity in database
- Crossing correction works, drift velocity isn't quite right
- Matching of large crossing numbers is getting dropped, should go out past 300 crossing



New change and background

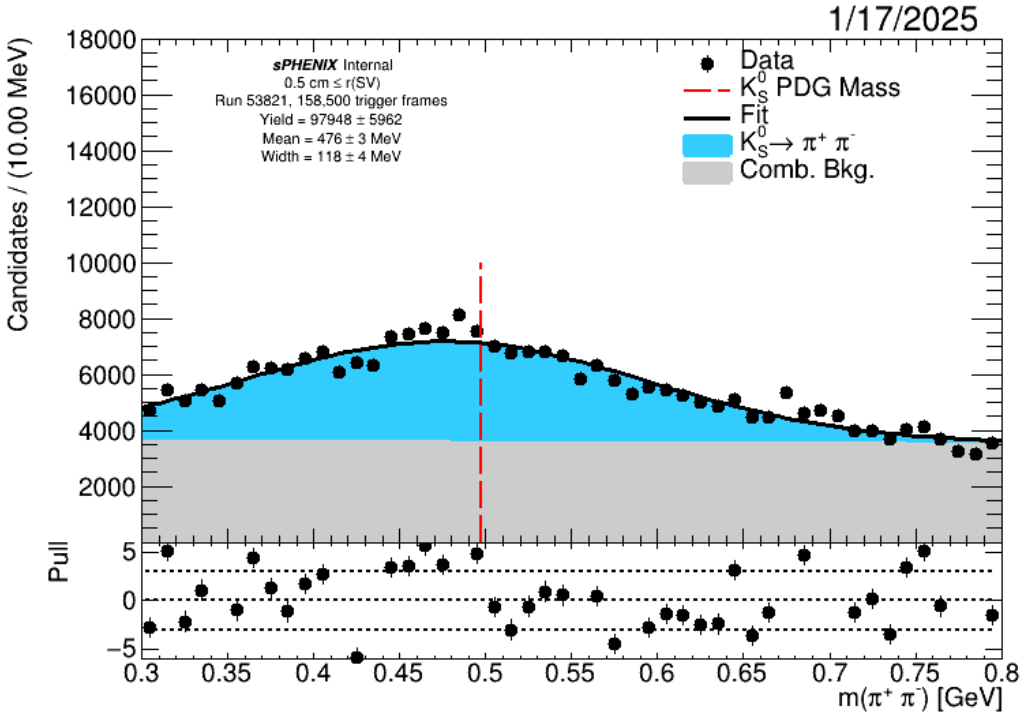
- A fix to get better crossing by using run's drift velocity in calculation has been put in, but we now have higher background than before

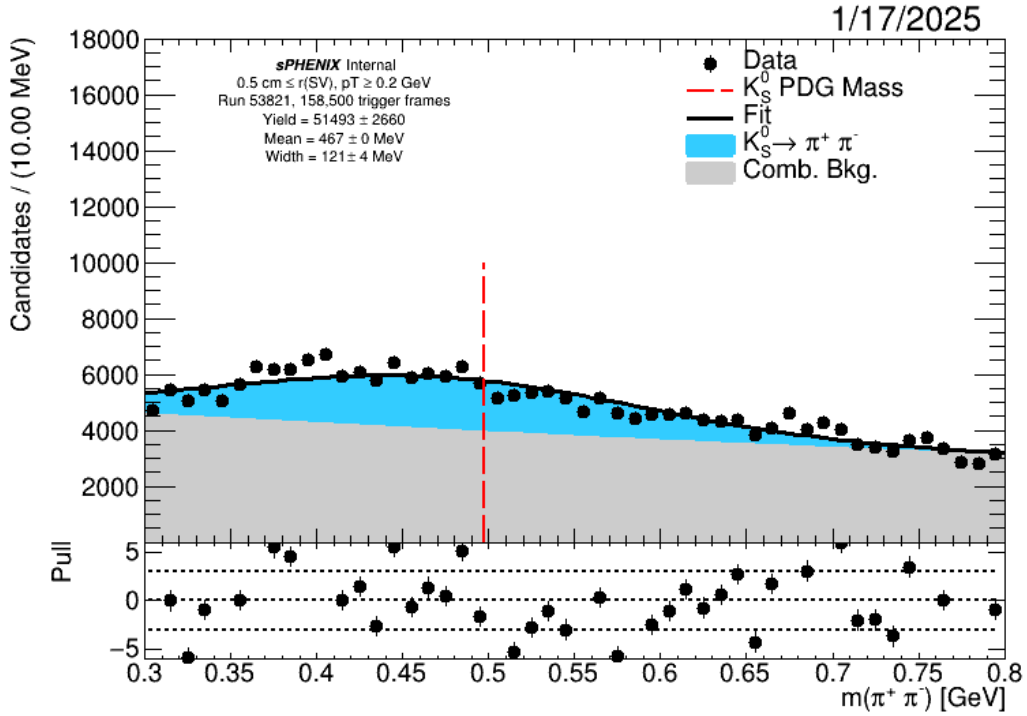




New change and background

- This is most recent clustering and seeding, and while the background is higher, less candidates go away from the pT cut which is a good sign





TPC Only

- When Running over TPC only, we see some different results, there is so much background that it makes the width cover everything