PPG 011 Update Some Ohio U Previous Work

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Previous High Pt Eta Meson Invmass for DNP - Dataset Details

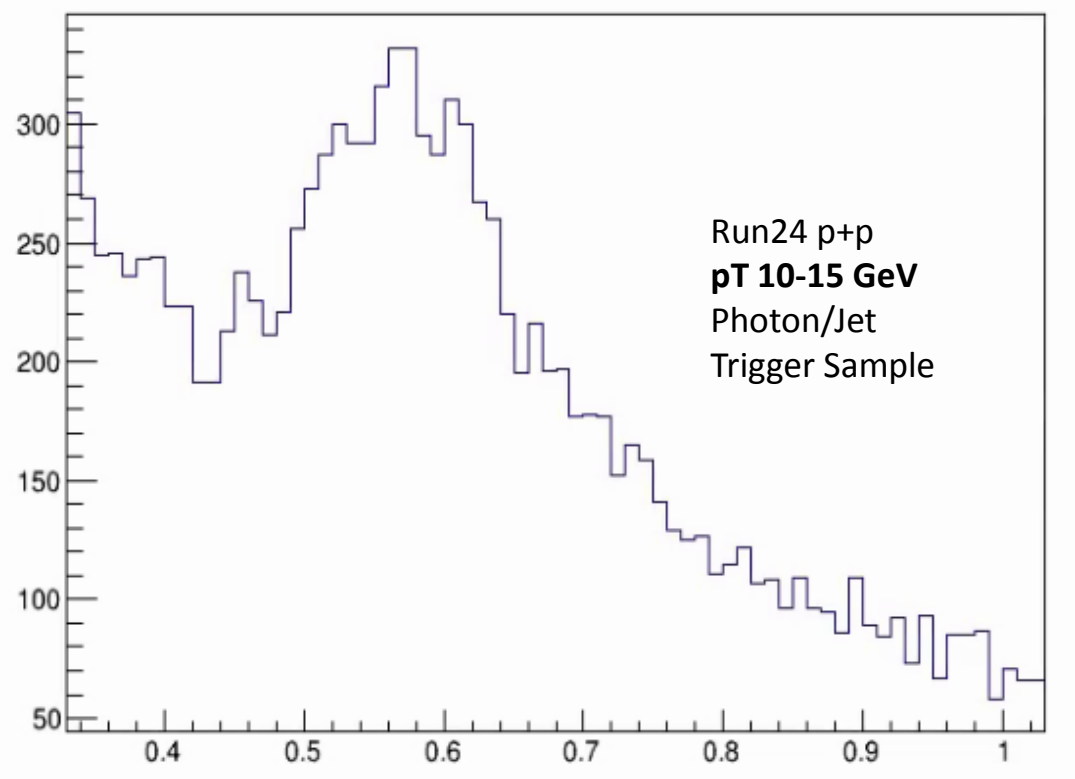
- Used ~all available p+p Production an430_p0007 files ~circa Sept 10th
  - Used CaloStatusTower module
  - Did not apply CaloCalibTower module because there was a node named TOWERINFO_CALIB
    - Did small check that olders build using CaloTowerCalib gave same results for random file checks as using p007 w/ _CALIB node.
- Runs 48234- Run 52331
- Zvertex cuts of |zvtx| < 40, < 60, < 80 looked into
- All trigger Scaled Trigger Bits for triggers >= (Scaled) trigger bit 17 (jet and photon triggers, all mixed together)
  - We have ability to quickly select any other single trigger bit/ or combo of trigger bits
- 1.1 Billion Recorded Events Run over. Still trying to calculate effective pb^{-1} ~15 pb^{-1} ???

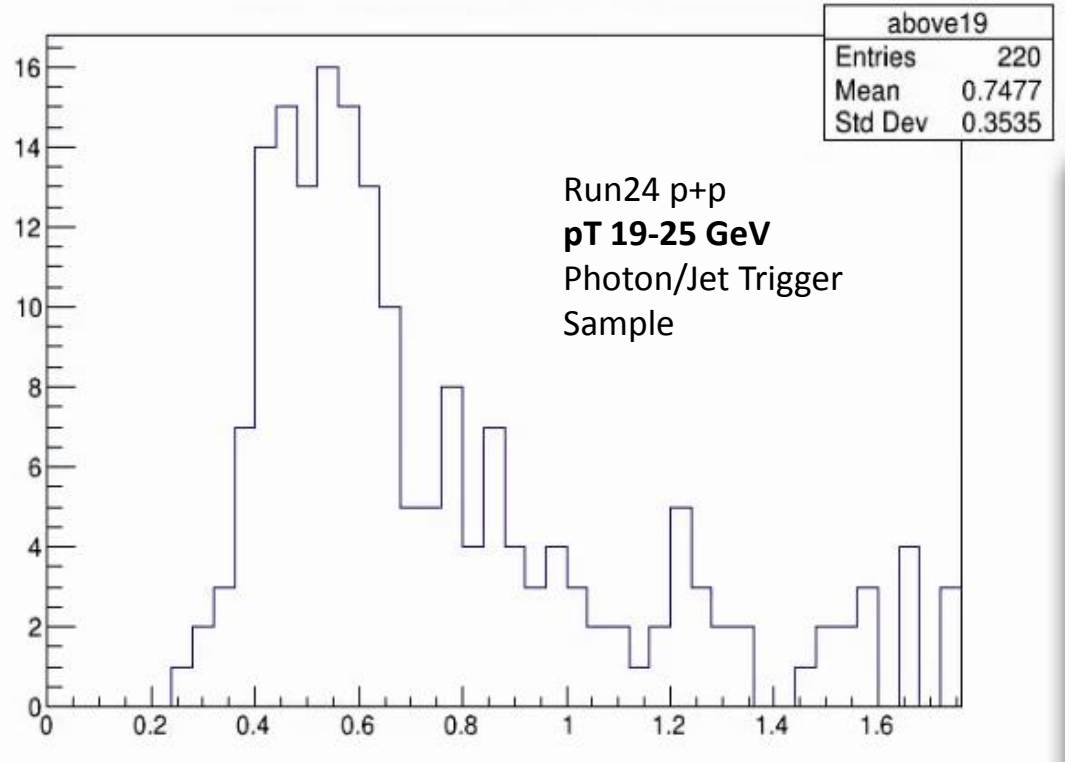
Cuts

- We are applying pretty standard pi0/eta meson 2->gamma and cluster cuts:
- An energy asymmetry alpha cut < ~0.5 – 0.7 on the 2 daughters
  - For what follows I did even try various different cuts including anti-cuts (alpha GREATER THAN ~0.4) with no big apparent different effects
  - At really high pt there probably isn't a good argument for wanting symmetry other than some low-ish (2-4 GeV) minimum cut on both clusters
  - Something to think about generally
- Min cluster pT > 2.5 GeV (for either photon)
- Cluster Chi2 cut < 4.0 but also tried tighter cuts with no big effects
- big 2-gamma Delta R cut sometimes (DR < 0.8) shouldn't make any difference except at very high invmass > ~1 GeV.

Correlated Bkg at high pt in Run 24 p+p

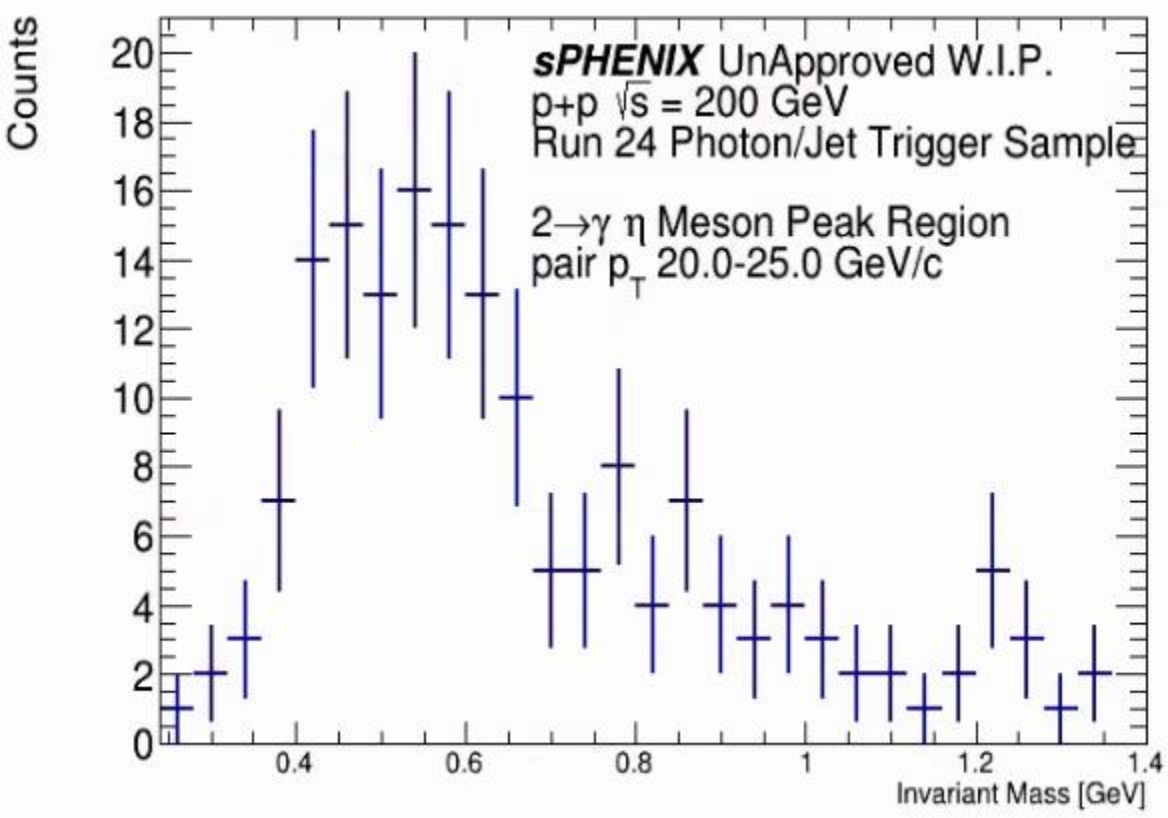
- These are just foreground no bkg subtraction
- Above about 19 GeV, the peak is either too wide or there is correlated bkg under the peak.

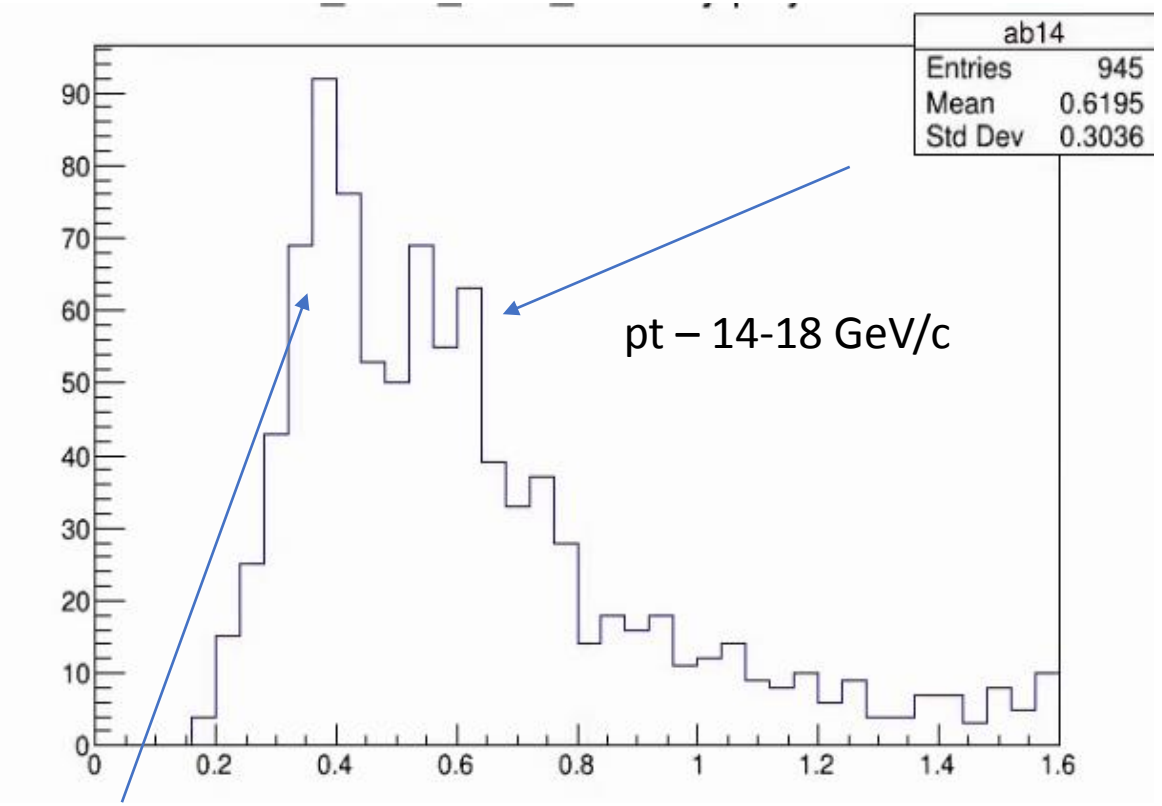




In Between and Other Pts

- Pi0 peak (merged pi0 remnants) or just Bkg peak (kine cut) starts moving to the right into the eta peak area

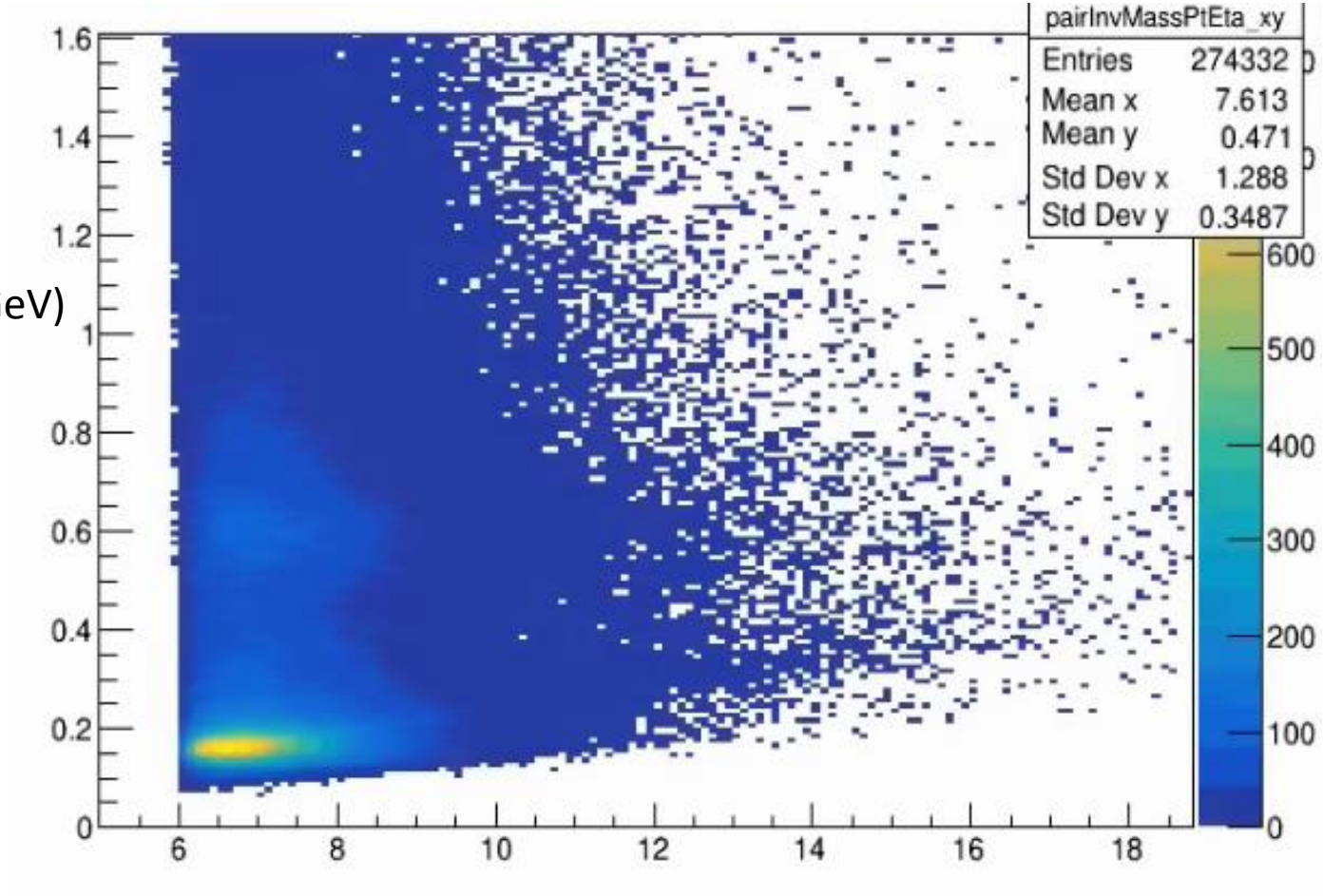




Other peak (pi0 related?)

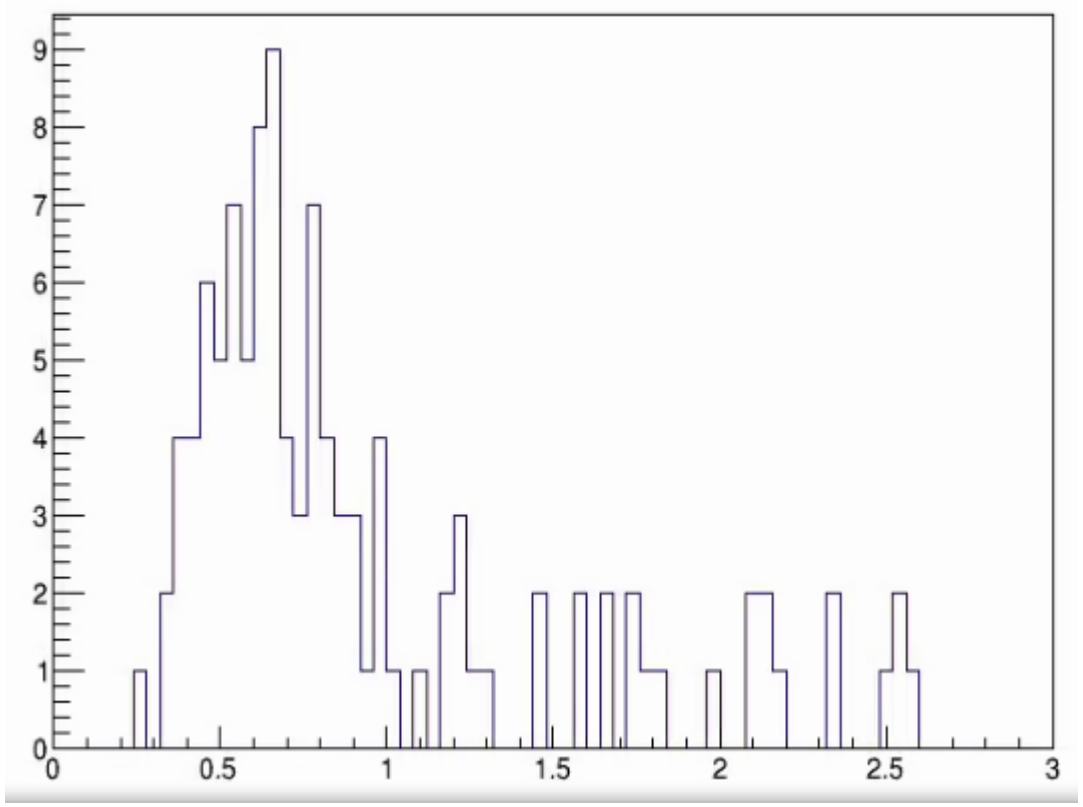
2D Plot

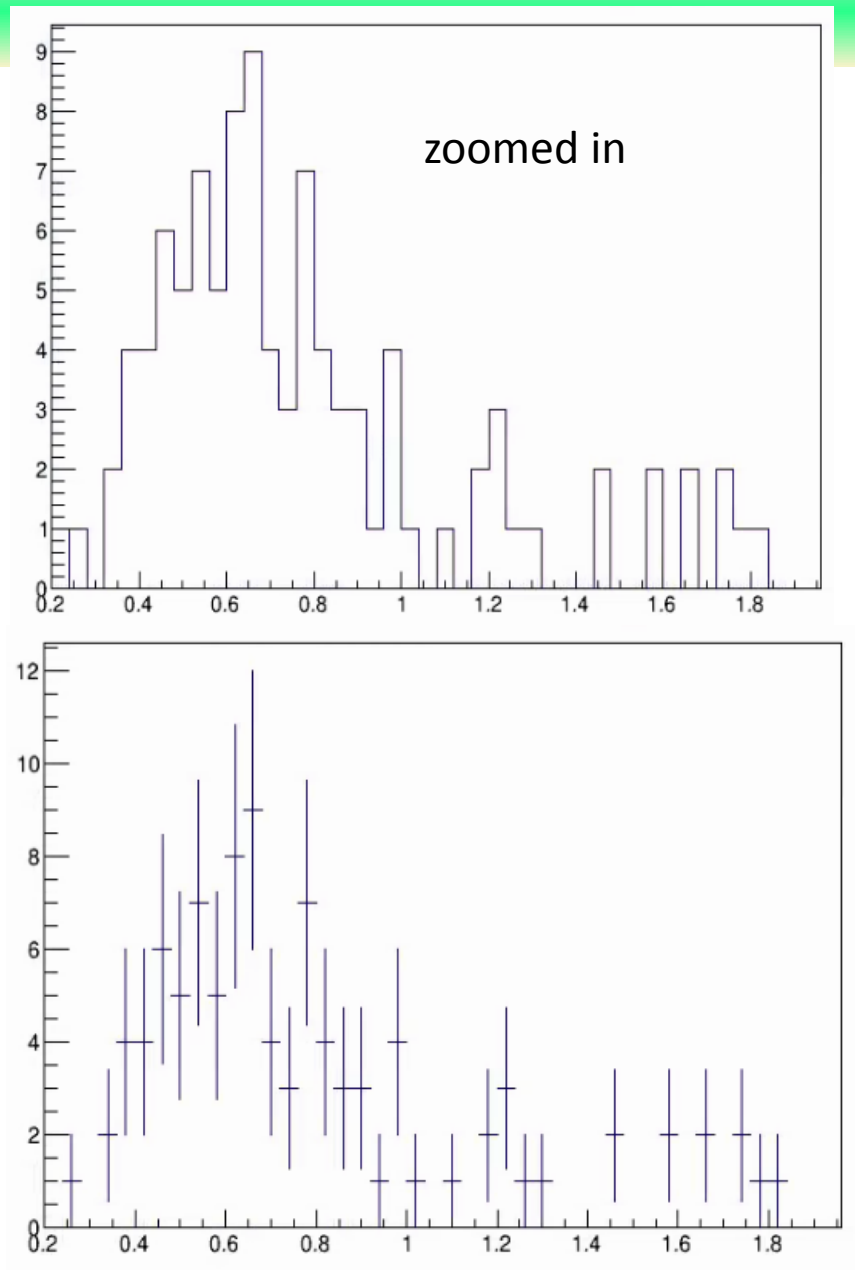
- 2D Plot pretty much confirms – but could be illusion possible another meson contribution Kshort and Other Eta Decays fill that region.



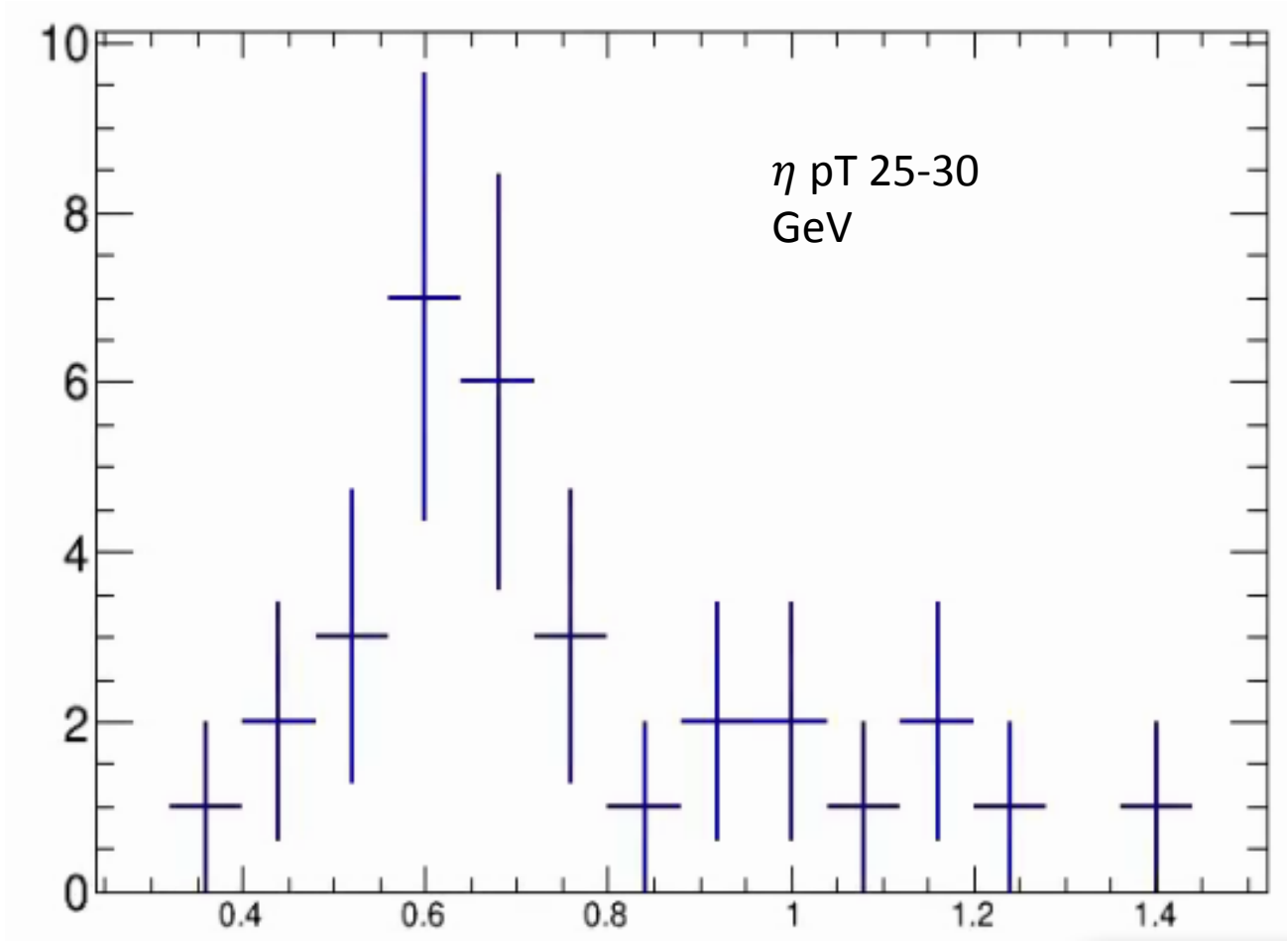
Invmass -20-25

- Slightly tighter Chi2 cut (<2) and |zvtx| < 40
- New 20-25 GeV





Same thing but 25-30 GeV bin



Gone away by 25 GeV?

Still to do

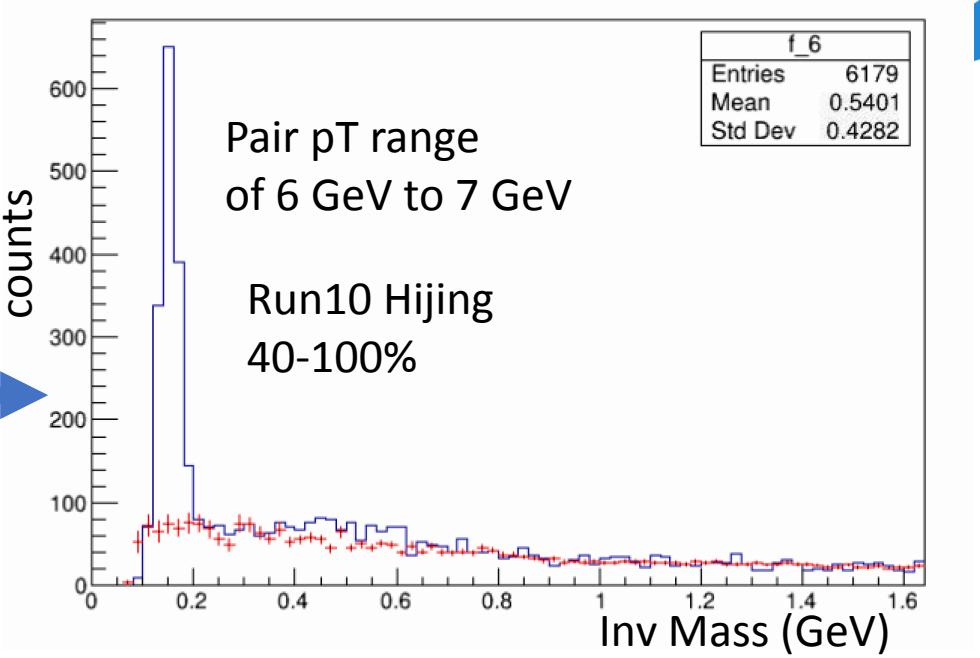
- Make sure these aren't just hot towers
- or Bad Runs – but doesn't show run dependence so far

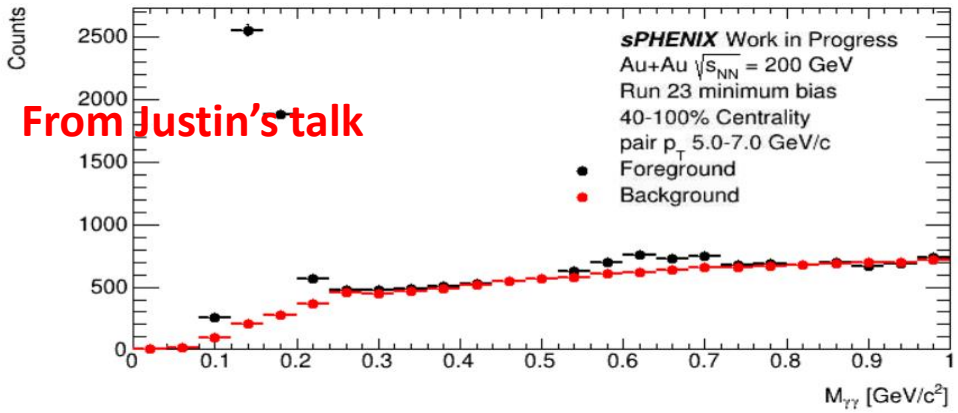
- Proposal: regardless of whether this turns out to be something that is an actual challenge or is just something we can easily avoid with some set of cuts etc, it will be useful to look at different sources of the correlated background as a function of invmass and pt. So that should be included on the priority list.
- Based on JaeBeom's check he mentioned in this meeting, using the PYTHIA jet sample is the thing we should look at for this and is something we are already looking at
  - Some previous work in this direction we did, but with sphenix HIJING samples

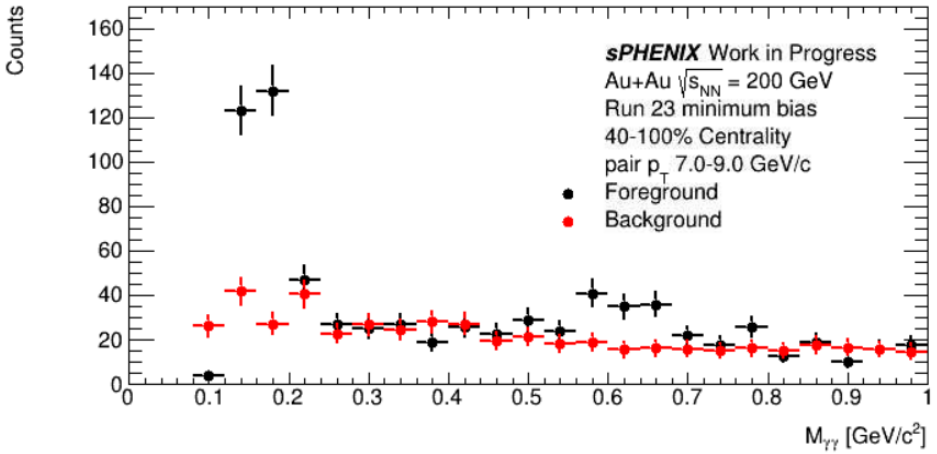
Tests of Weighting Method

- Weighted bkg method still under development
- Tested in HIJING (show a HIJING plot here
- Appears to work well in Run 23 AuAu result
- More quantitiative tests underway

also in words advertise Justin's talk right after yoursJustin's plot







Method: Weight Mixed Bkg Based on Opening Angle

- Idea: Two-photon peaks in inv-mass correspond to specific opening angles (as function of pairpT & pT1/pT2) between 2-photons.
  - Integrating over p_{T1} : "Thinly" peaked distributions in inv mass or opening angle $\Delta\theta_{12}$
  - Correlated background e.g. η -> $\pi^0\gamma$, Kshort→$2\pi^0$ → **BROAD** in opening angle & inv-mass
  - Instead of $\Delta\theta_{12}$ we use $\Delta R_{12} = \sqrt{(\Delta\phi^2 + \Delta\eta^2)}$ -→ "delR"
- Derive pair by pair weighting that FORCES mixed bkg opening angle distributions to match fg (signal) OUTSIDE X->2γ peak areas. (e.g. for match for white areas in below plot)…
- Apply this weighting to the pair-by-pair Inv. Mass c