Effect of Multi-Hadron Triggers on Yields in d+Au and Au+Au

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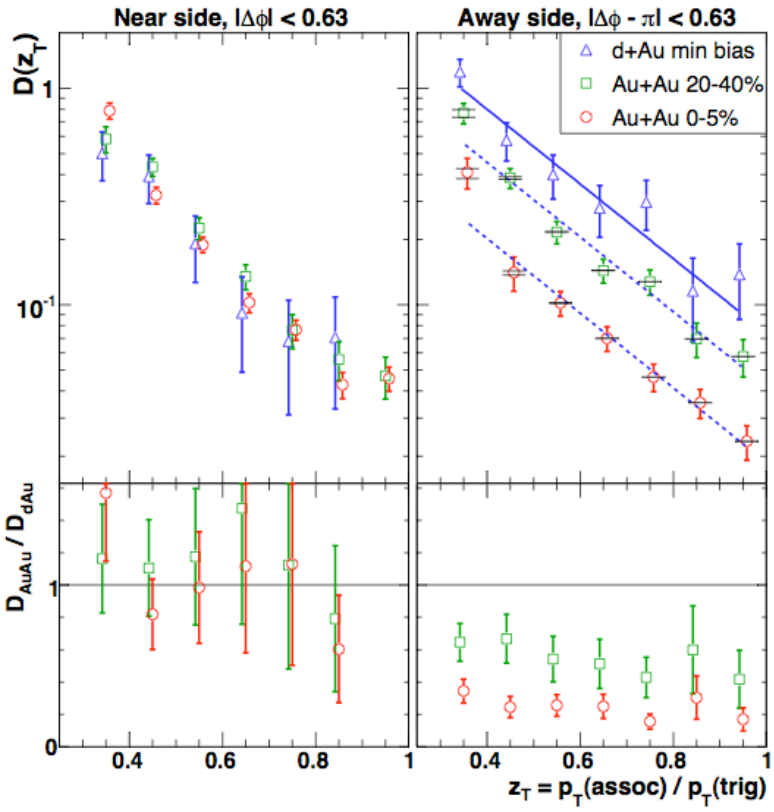
Introduction

- Fragmentation function D(z) depends on z defined as $p_T/E_{T,jet}$
- Current method of dihadron triggers is insensitive to true fragmentation functions (PHENIX PRD74, 072002)
- Try multi-hadron (cluster) trigger
  - Gain statistics
  - Better constrain parton energy?



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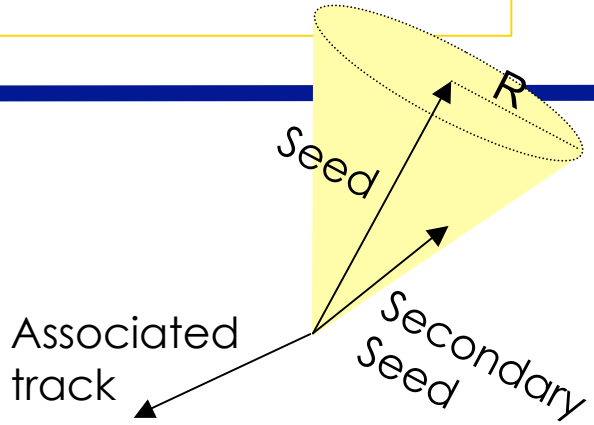
Analysis Technique

- Collect arrays of seed and associated tracks with a minimum seed p_T cut (5.0 GeV) and a minimum associated p_T cut
- Define a cone radius (R=0.3)
  - p_T trigger = p_T sum of all the associated tracks (secondary seeds) in that cone
- Plot $\Delta\phi$ between the highest p_T seed in the cone and associated tracks
  - Subtract flat background for Au+Au
  - Extract Yields:

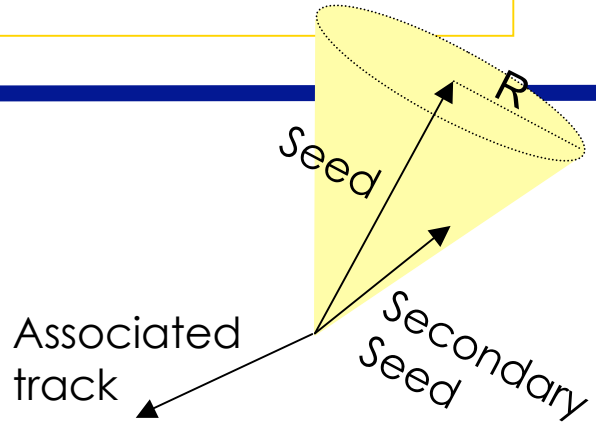
  p_T (trigger) = 8 to 10 GeV & 10 to 12 GeV & 12 to 15 GeV

  p_T (assoc) = 3 to 4, 4 to 5, 5 to 6, 6 to 7 GeV

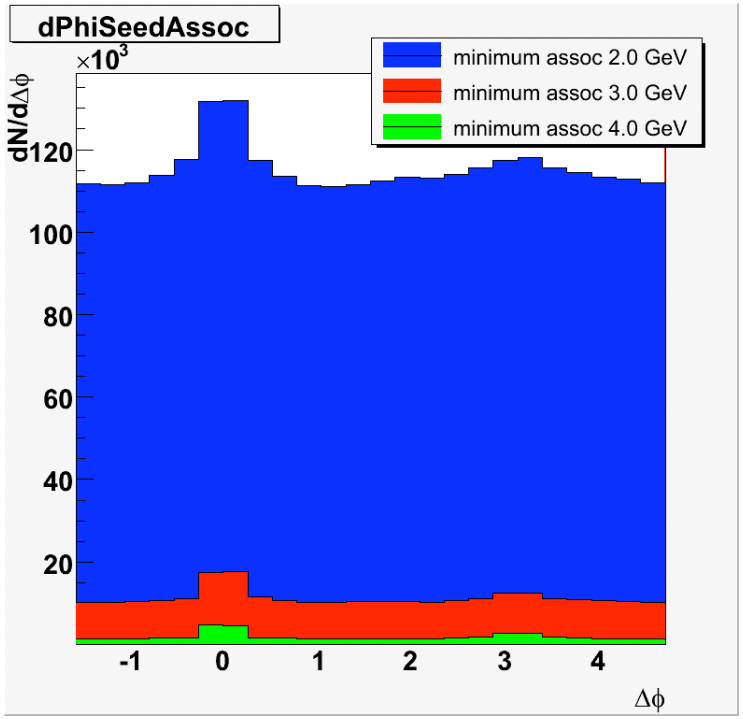


* Clusters include cases with 0 secondary seeds

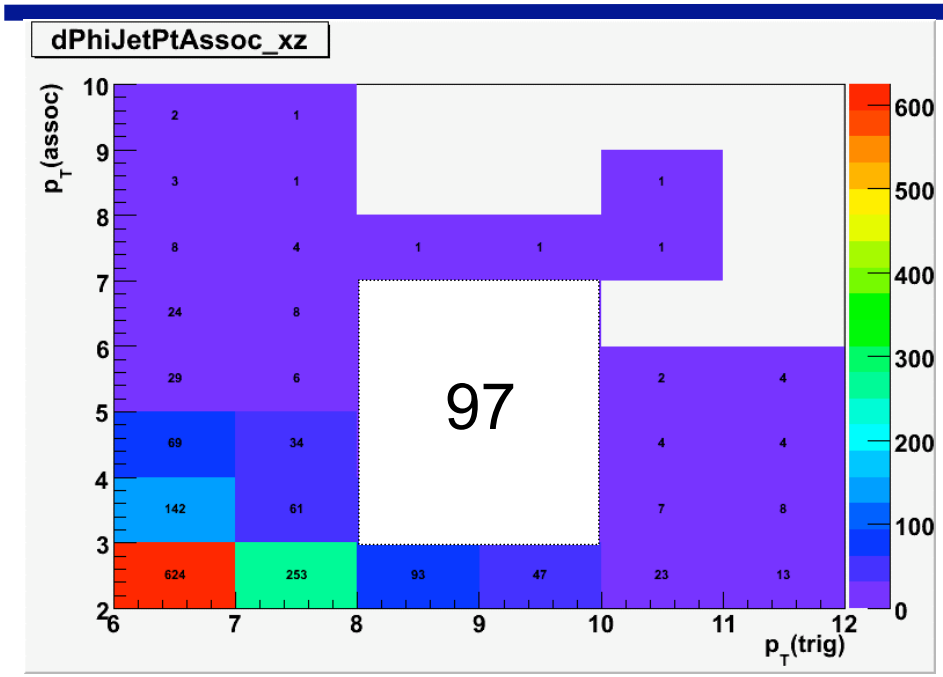
Analysis Technique



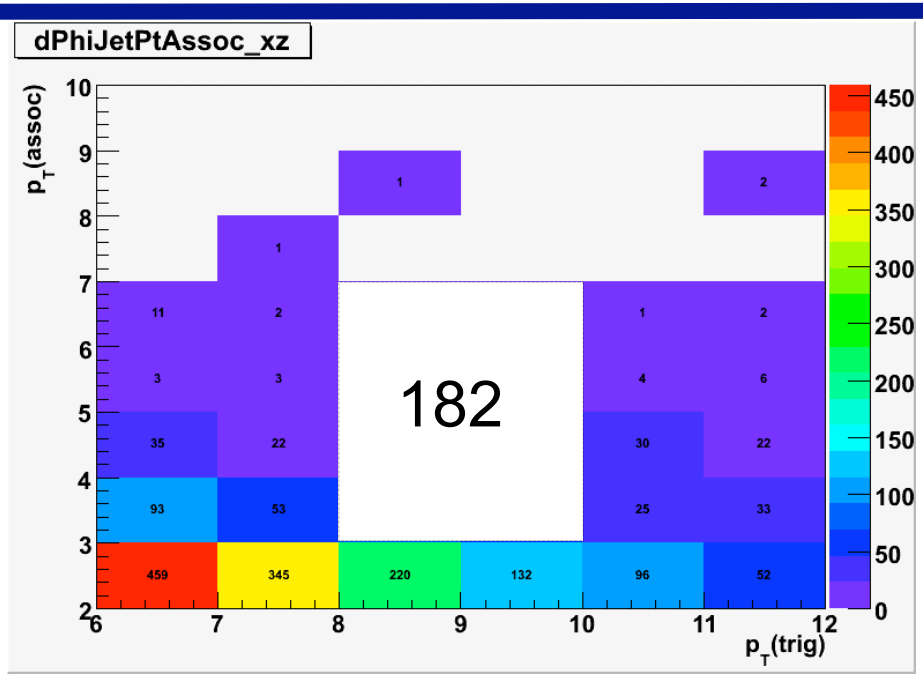
- p_T seed > 5.0 GeV
  - Vary minimum secondary seed p_T to test effect of combinatorial background in AuAu
    - 2.0 GeV
    - 3.0 GeV
    - 4.0 GeV



Comparison of single vs. cluster trigger statistics - d+Au



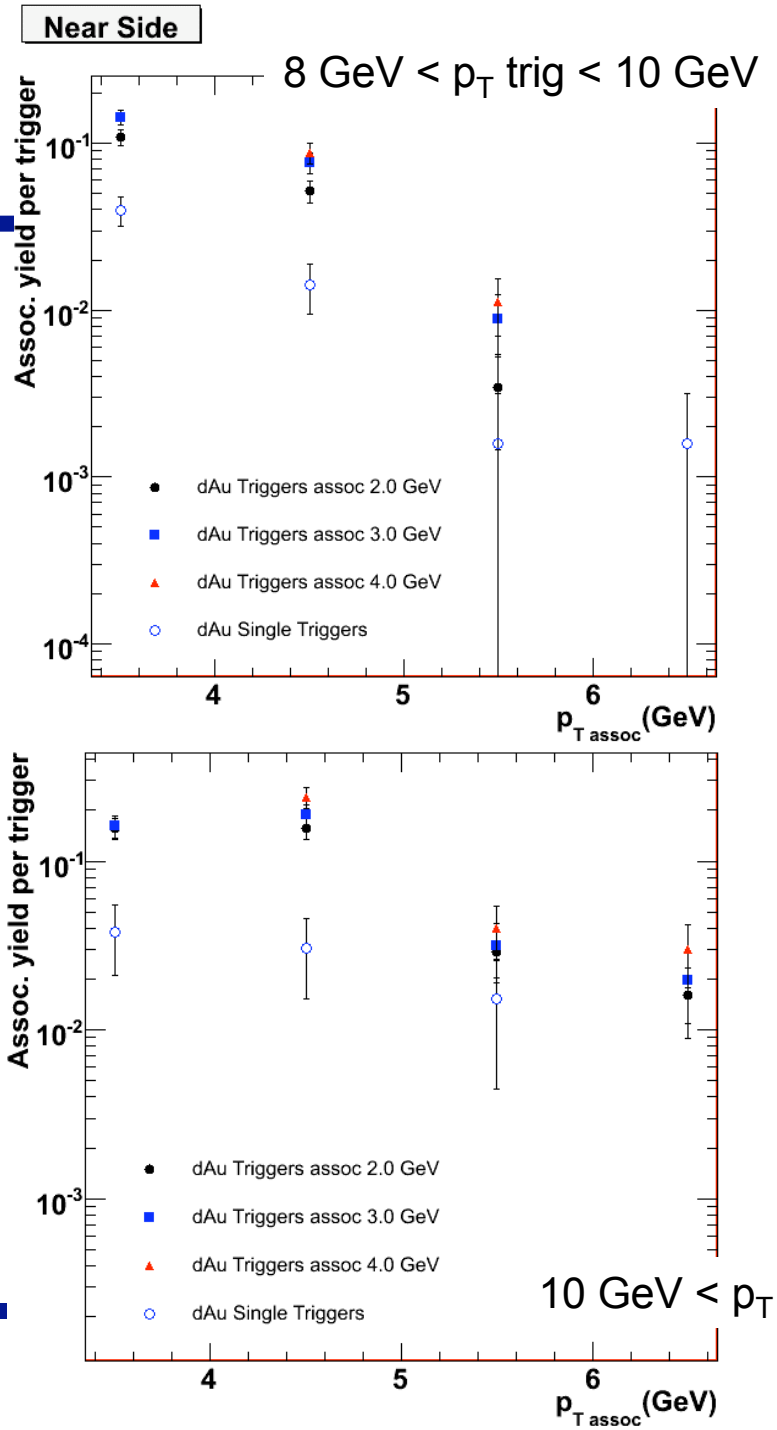
Single triggers



Cluster triggers

- gain statistics by allowing clusters to add up to p_T(trig), not just requiring a single particle to carry p_T(trig)

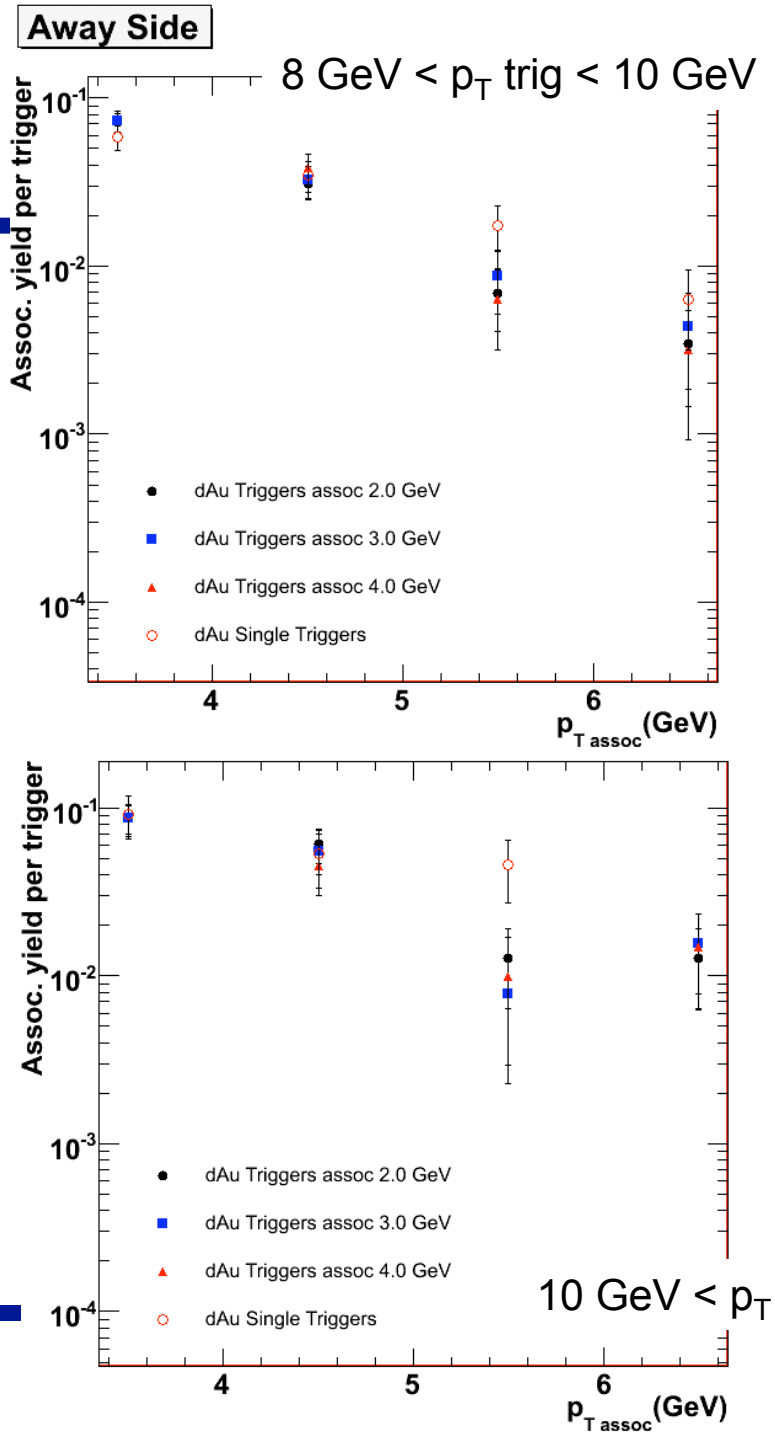
Near side yields - dAu



- for p_T assoc < 5 GeV large enhancement of yield with cluster triggers
- slope difference in cluster versus single triggers?
- Clearly run out of statistics for higher p_T assoc

Dominant effect - cluster trigger bias (auto-correlation)?

Away side yields - dAu



Difference in cluster versus single trigger small.

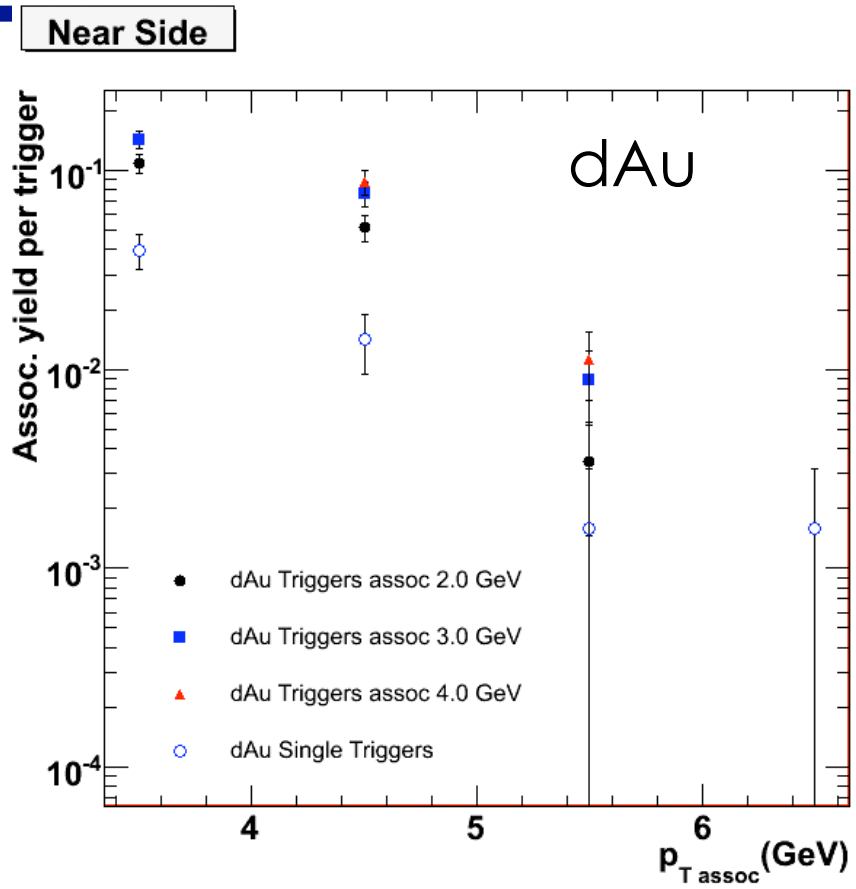
- clusters select similar parton energies as singles?

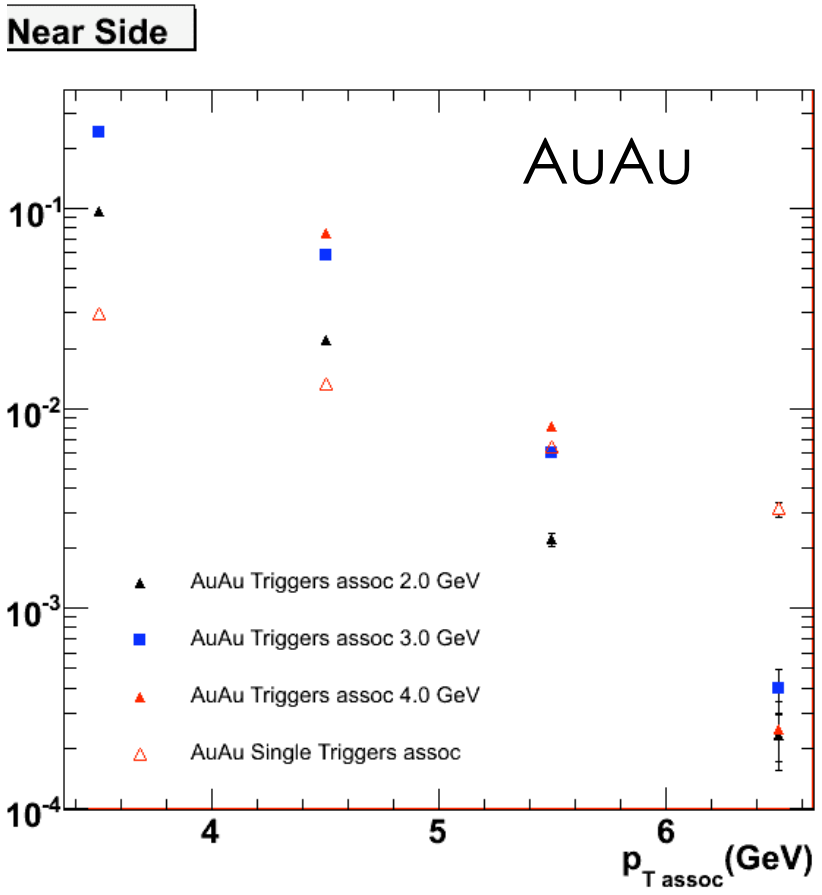
- small difference at large pT assoc: better handle on parton energy?

Next step:

Look at cases with 1 or more secondary seeds separately

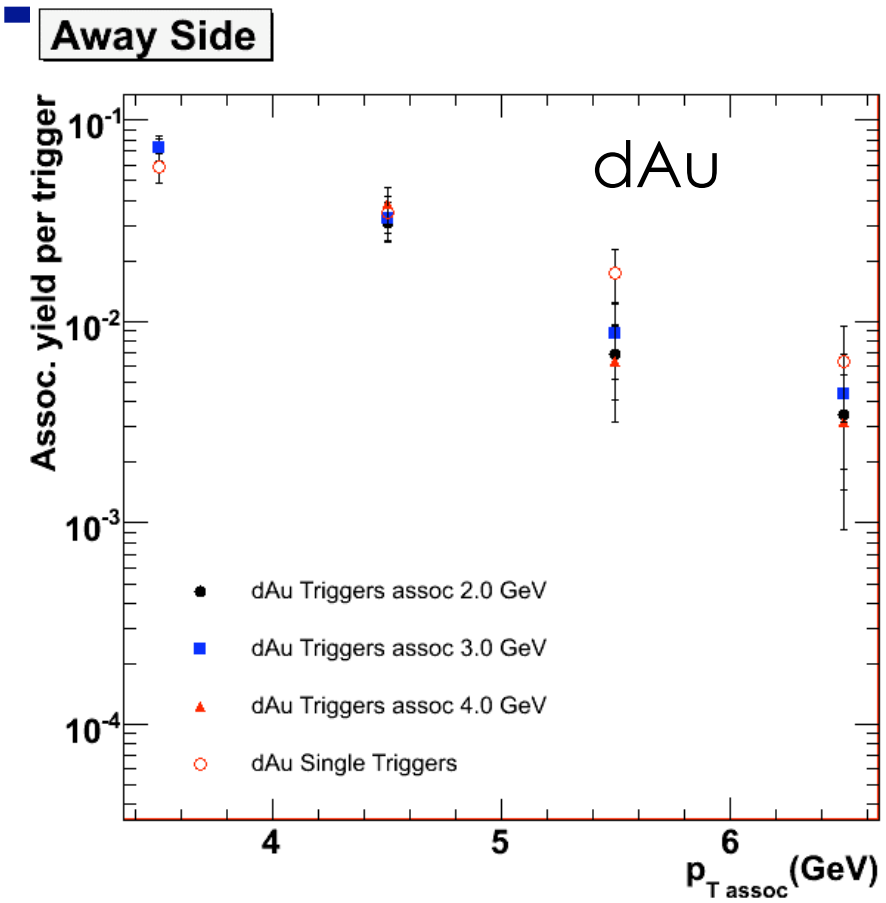
Near side cluster yields
8 GeV < p_T trig < 10 GeV

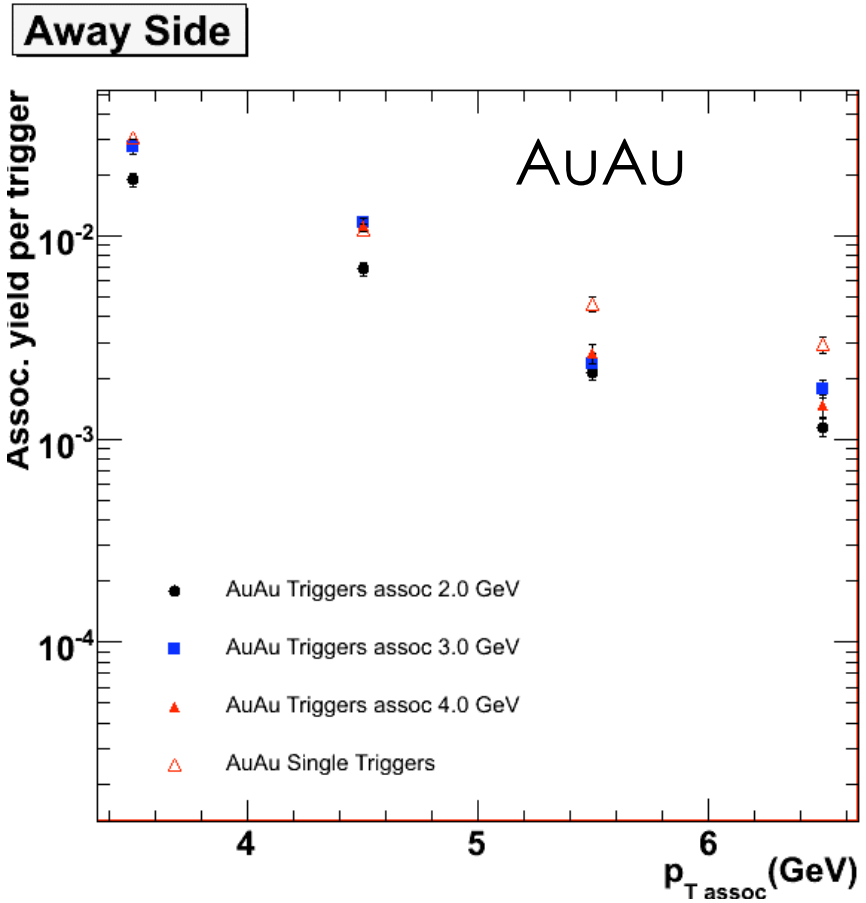




- Assoc p_T slopes clearly different for cluster and singles in AuAu
- Larger dependence on secondary seed cut in AuAu than dAu - larger combinatoric background
- For secondary seed cut > 4.0 GeV dAu & AuAu result similar - small background contribution

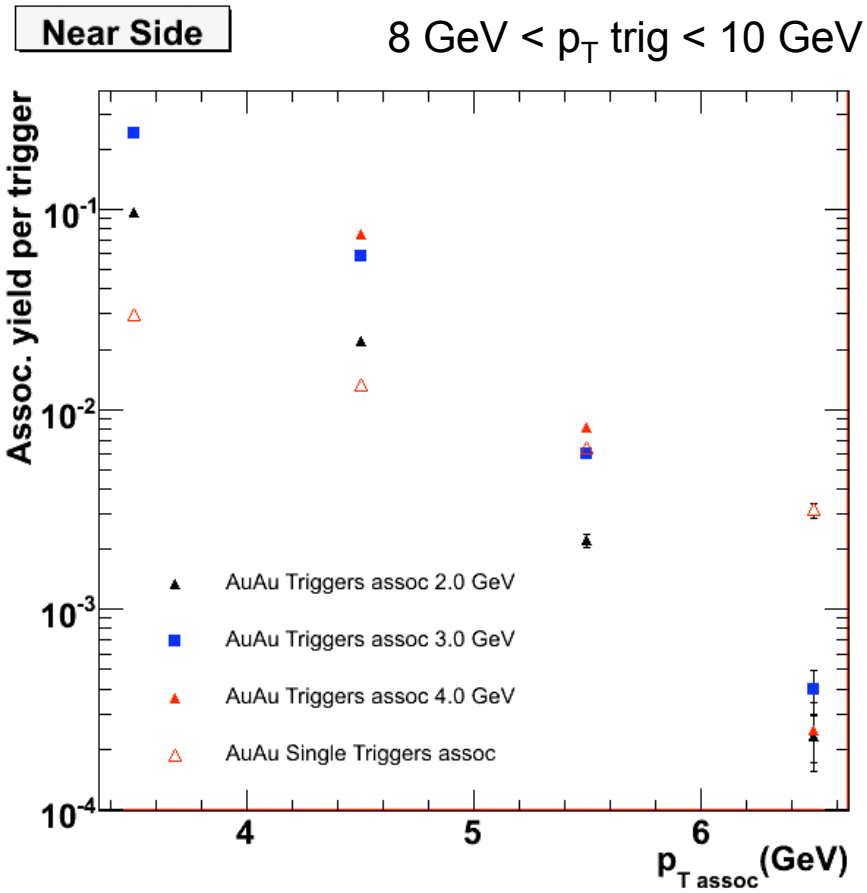
Away side cluster yields
8 GeV < p_T trig < 10 GeV

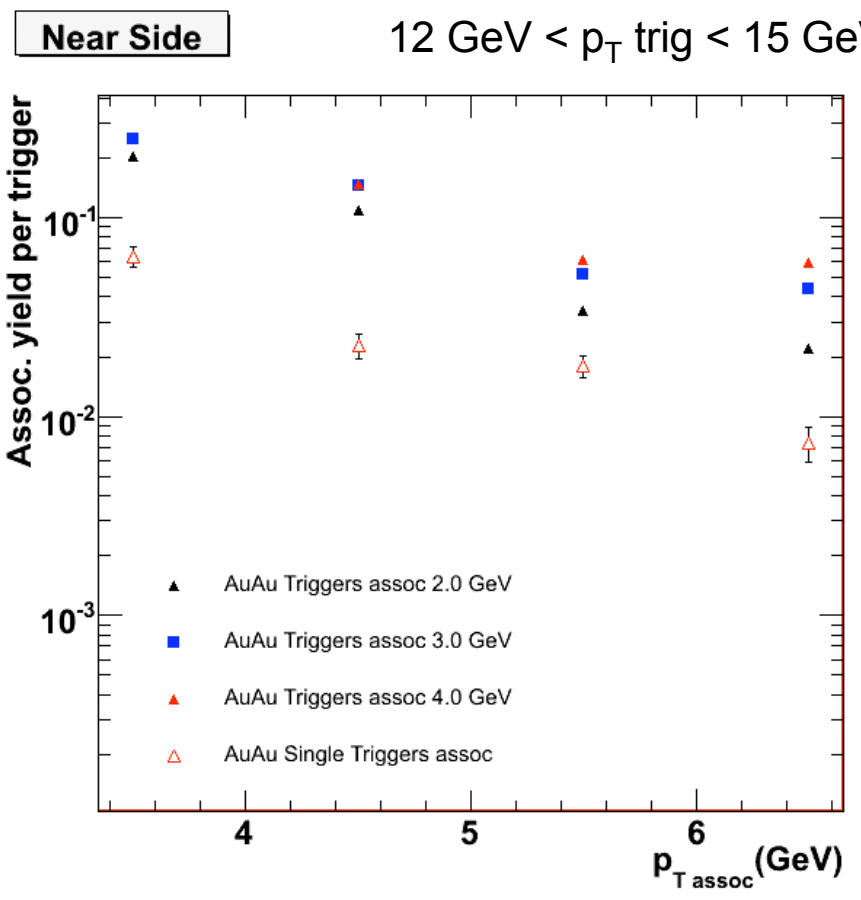




- Smaller dependence on secondary seed cut than on near side
- For secondary seed cut > 3.0 GeV dAu & AuAu result similar - small background contribution
- Statistically significant difference between single and cluster triggers in AuAu

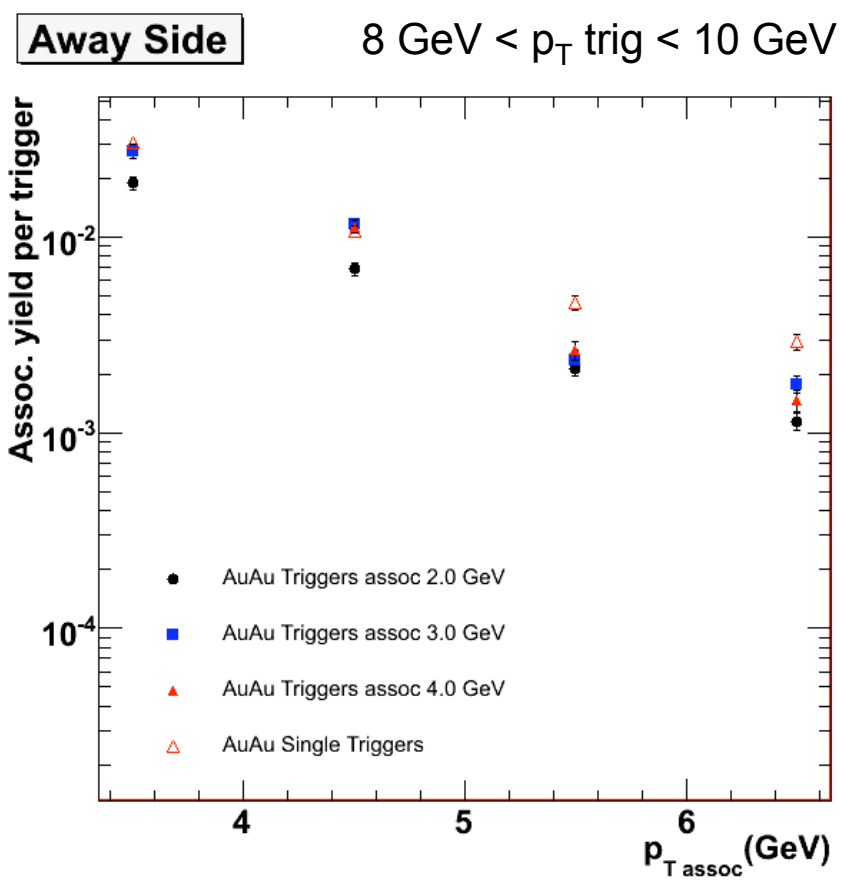
Near side cluster yields
12 GeV < p_T trig < 15 GeV

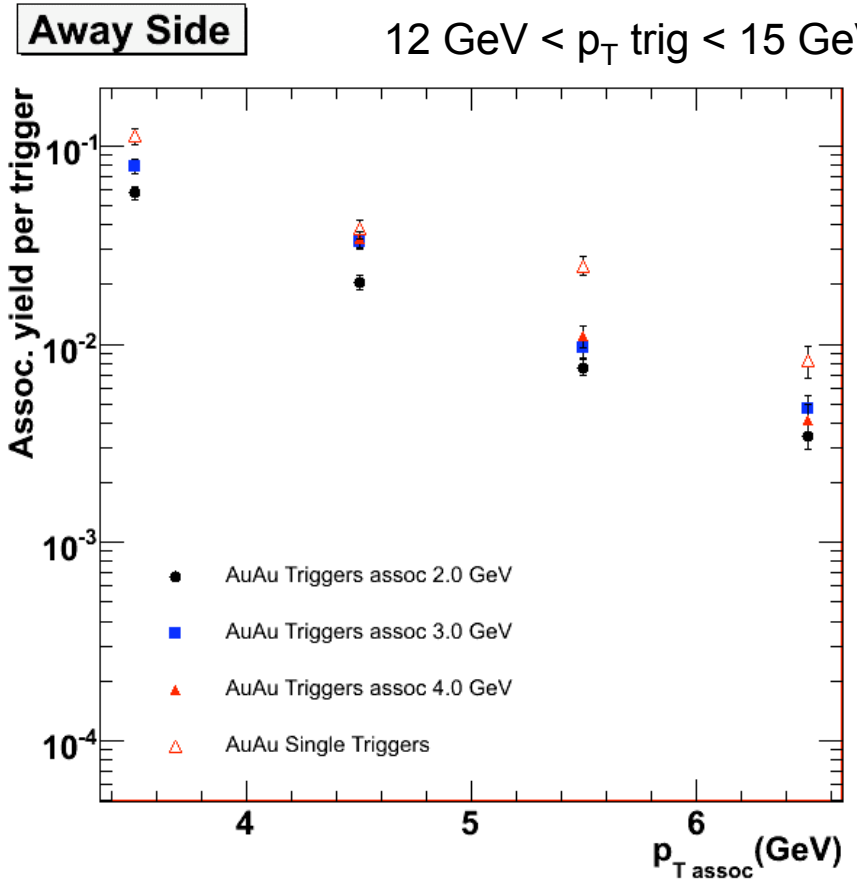




- Looking into higher p_T
  - Move away from p_T seed + p_T secondary seed, (e.g. 5+4, 5+3)
  - Good statistics in AuAu
- Overall trends similar to lower p_T trig

Away side cluster yields
12 GeV < p_T trig < 15 GeV





- Overall trends similar to lower p_T trig - slopes still differ for single and cluster

Conclusions and Outlook

- Investigated differences between single hadron and multi-hadron (cluster) triggers
  - Near side large effect observed, likely from auto correlation bias
  - Away side no large effect

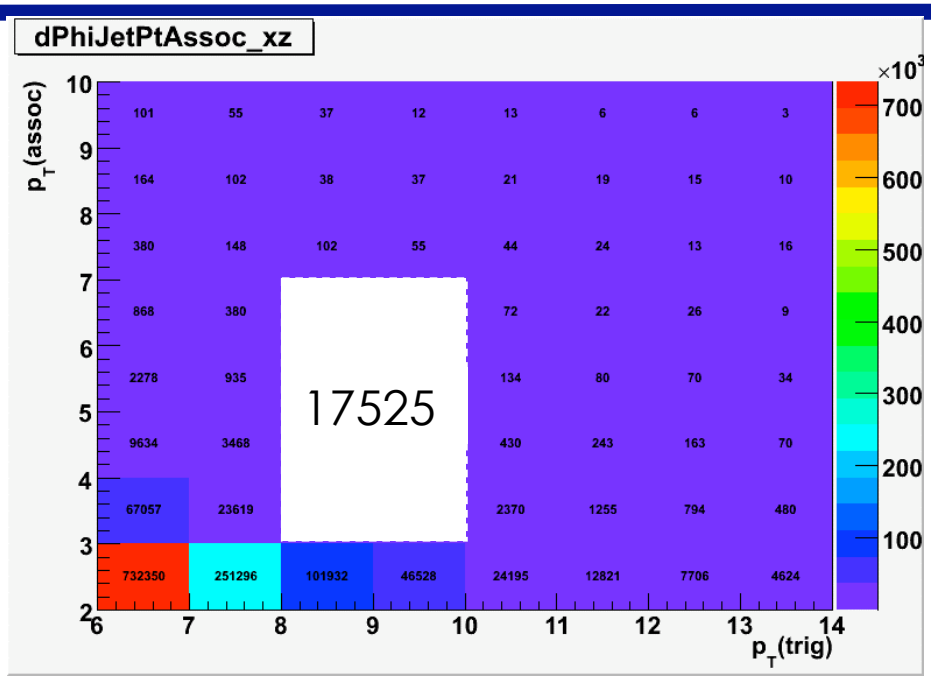
Reference data dAu inconclusive due to statistics

Next Steps:

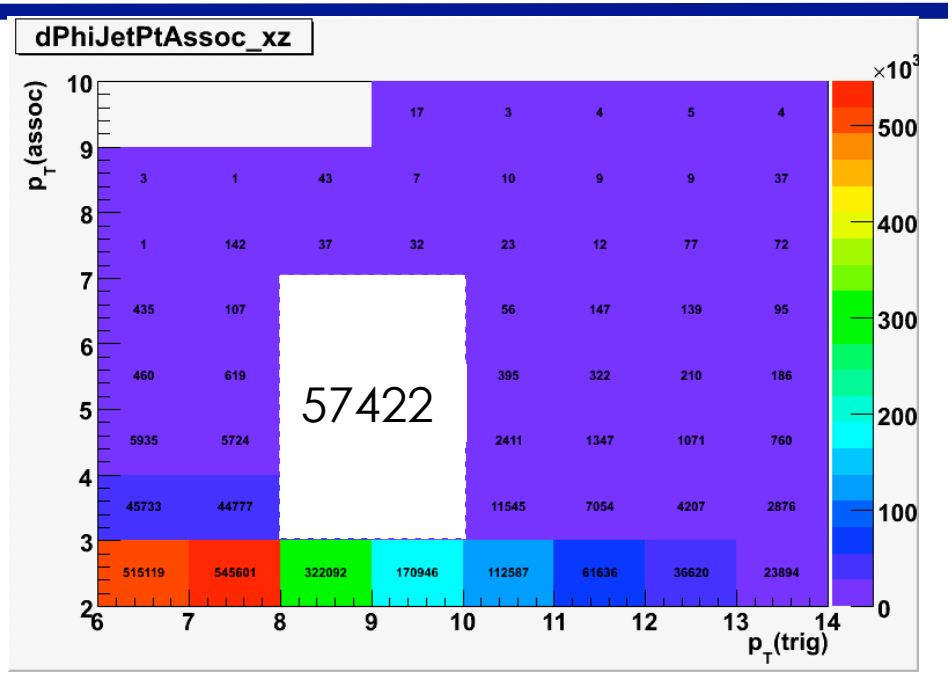
- Look at pure singles from multi-hadron clusters
  - Try to better understand auto correlations and combinatoric backgrounds
- Pythia simulations to understand expectations of cluster trigger yields
- Closer look at highest p_T trigger

Backup Slides

Comparison of single vs. cluster trigger statistics - Au+Au,



Single triggers



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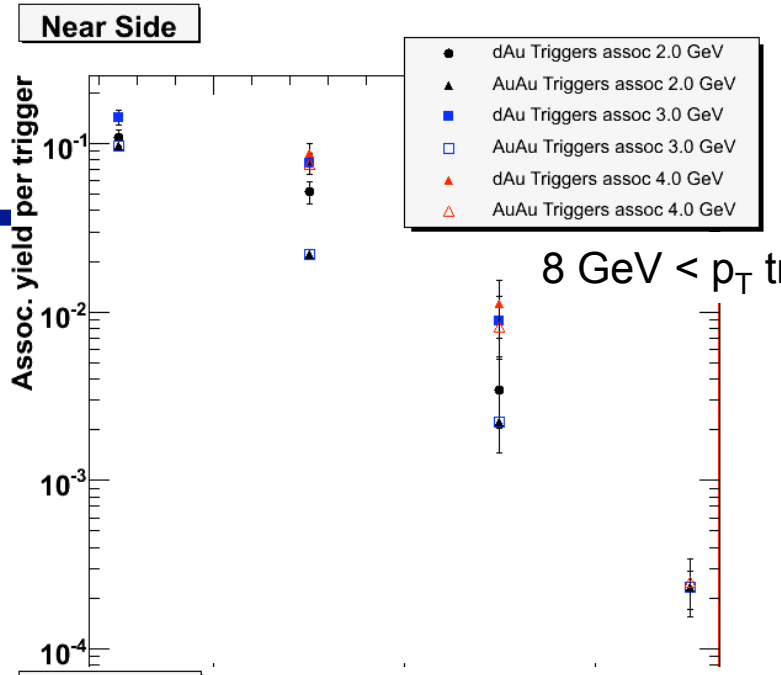
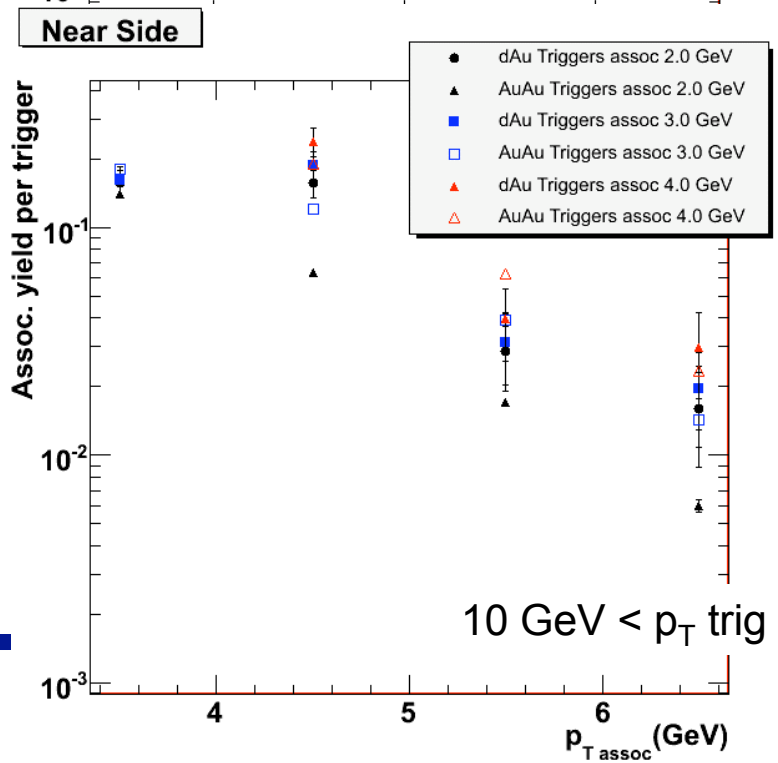
Near side cluster yields - dAu & AuAu



8 GeV < p_T trig < 10 GeV



10 GeV < p_T trig < 12 GeV