Multi-hadron Triggered Azimuthal Correlations in Au+Au Collisions at $\sqrt{s_{NN}}$ = 200 GeV from STAR

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Outline

- Introduction / Analysis Technique
  - Motivation for multi-hadron triggers
  - Explanation of a multi-hadron trigger
- Results
  - Away side yields for different p_T trigger bins,
    - 8 to 10 GeV and 12 to 15 GeV
  - Ratios of Cluster triggers to di-hadron triggers
- Conclusions and Outlook

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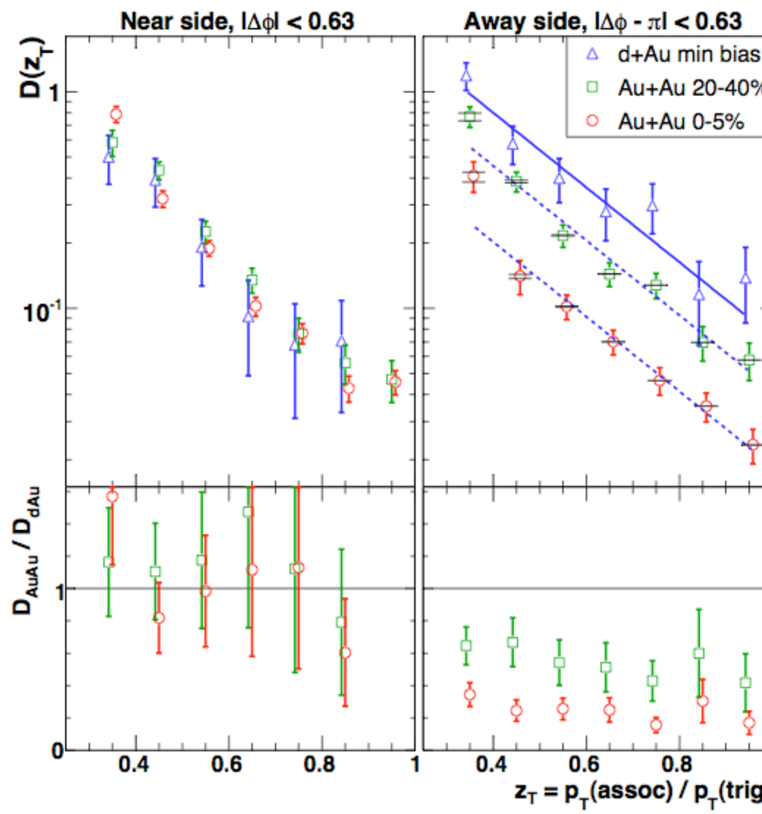
Introduction

- 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?



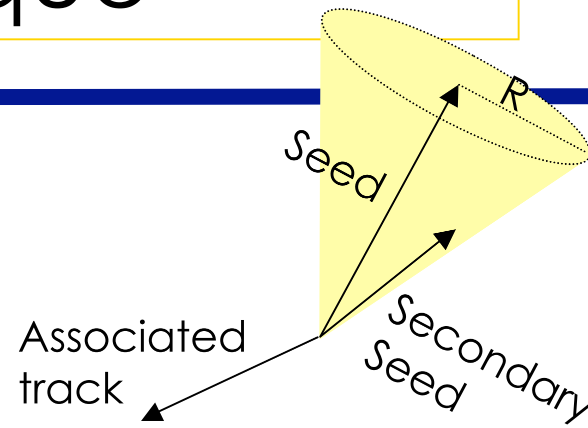
STAR, Phys. Rev. Let. 97 (2006),162301

Analysis Technique

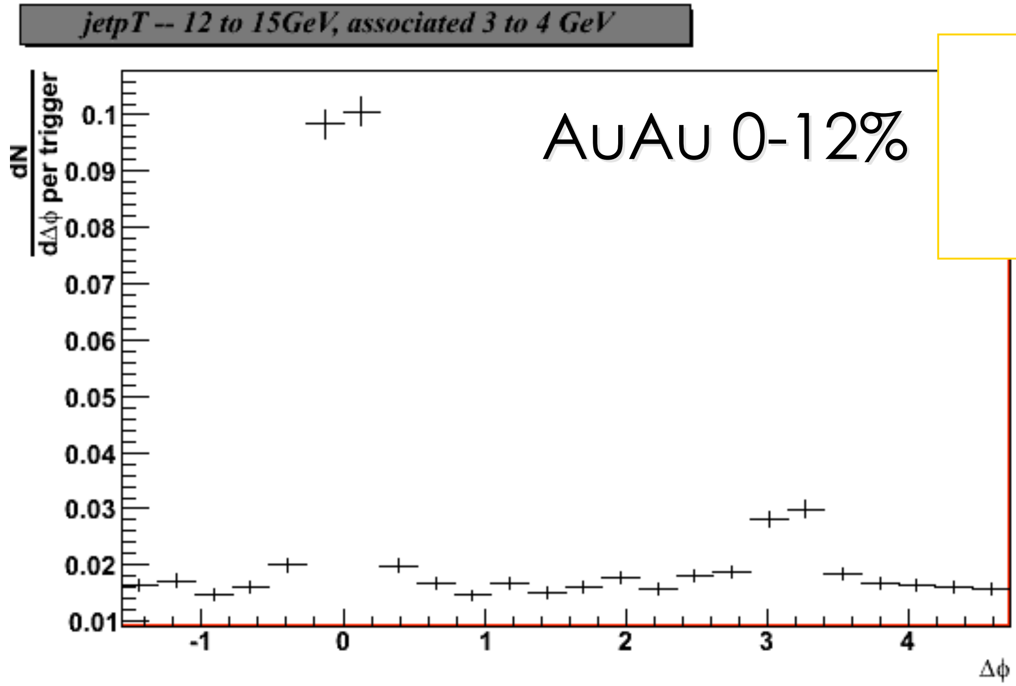
- Collect arrays of seed and associated tracks with a minimum seed p_T cut (5.0 GeV) and a minimum associated p_T cut
- Define a cone radius (R=0.3)
  – p_T trigger = p_T sum of all the associated tracks (secondary seeds) in that cone
- Plot $\Delta\phi$ between the highest p_T seed in the cone and associated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

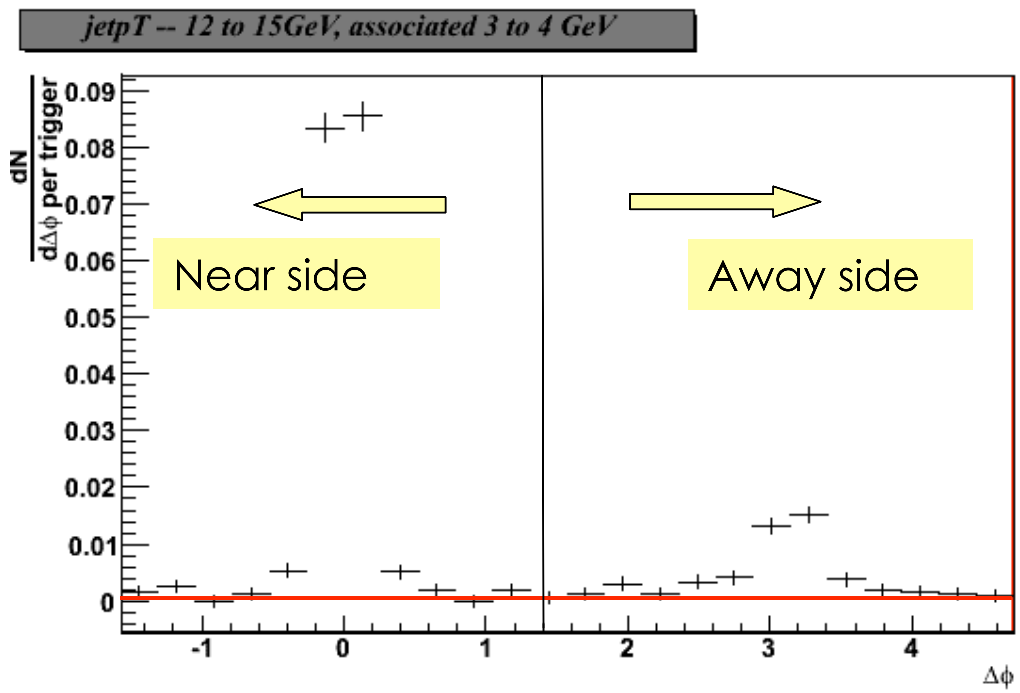
p_T (trigger) = 8 to 10 GeV & 12 to 15 GeV

p_T (assoc) = 3 to 4, … ,10 to 11 GeV



dN/dΔφ - jet p_T, 12 to 15 GeV, associated p_T, 3 to 4 GeV





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

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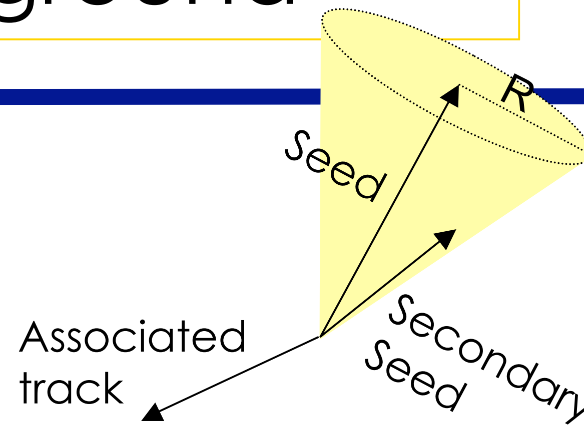
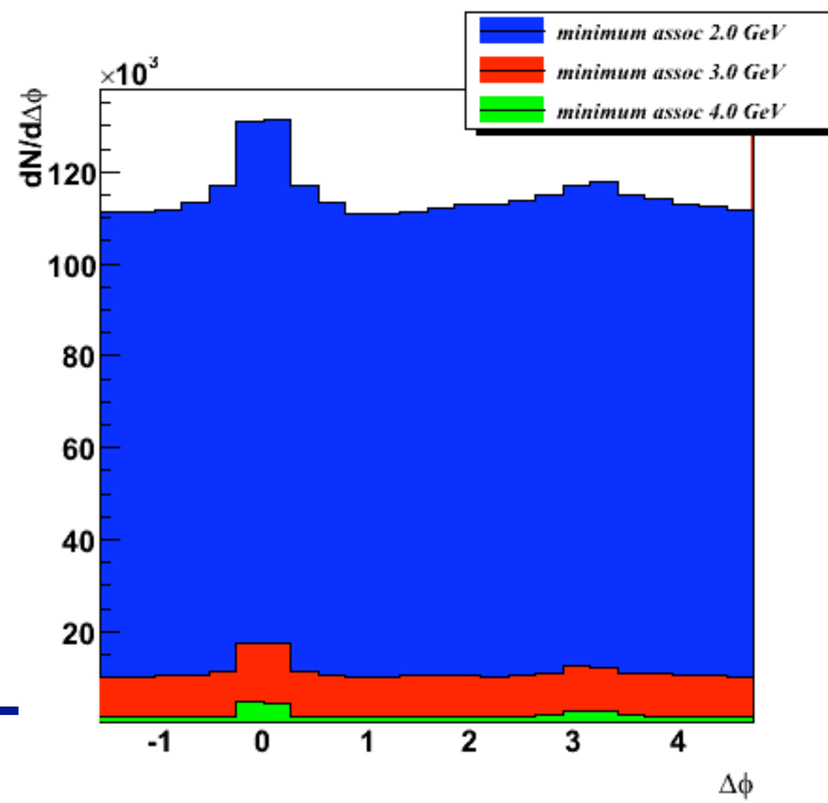
Combinatorial Background

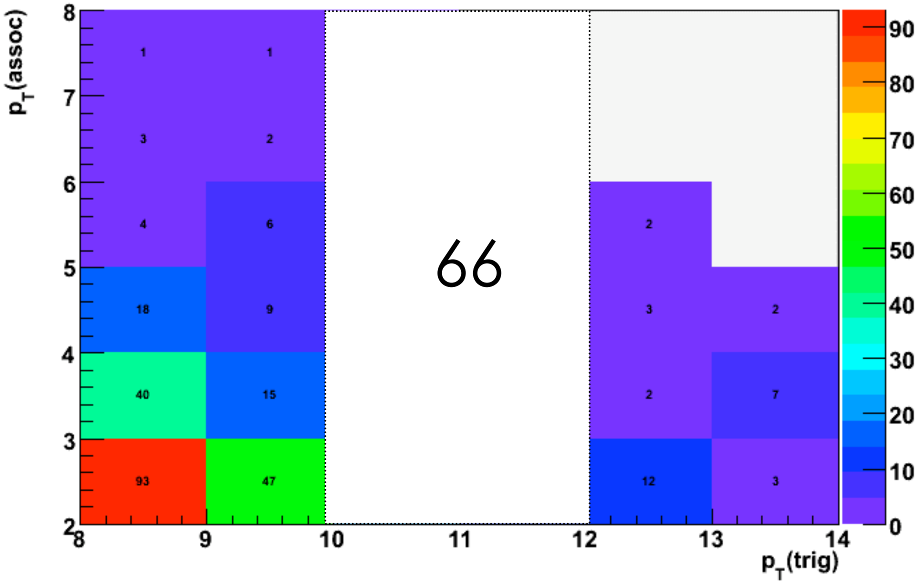
- p_T seed > 5.0 GeV
  - Vary minimum secondary seed p_T to test effect of combinatorial background in AuAu
    - 2.0 GeV
    - 3.0 GeV
    - 4.0 GeV



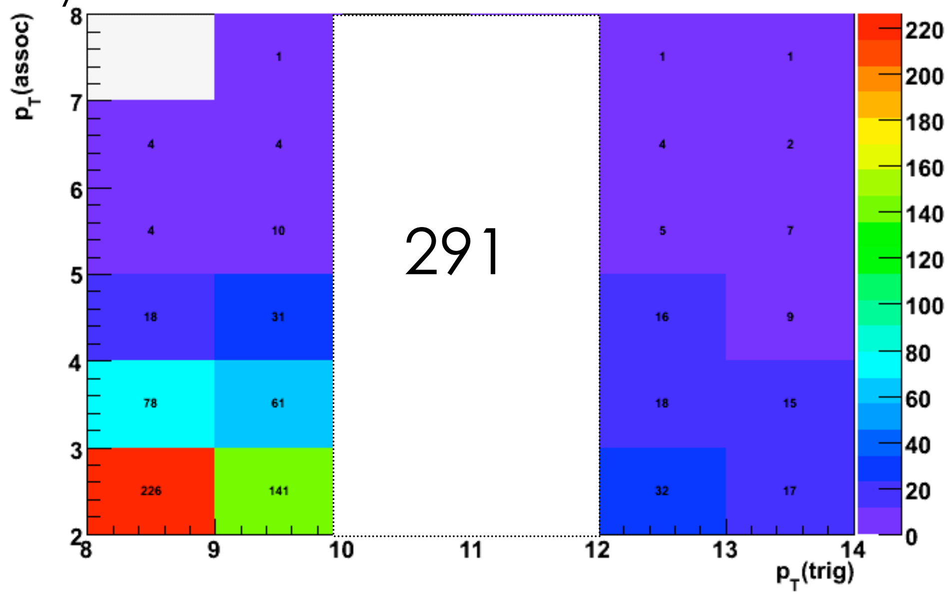


Comparison of single vs. cluster trigger statistics - d+Au

Minimum secondary seed cut = 2.0 GeV



Di-hadron triggers

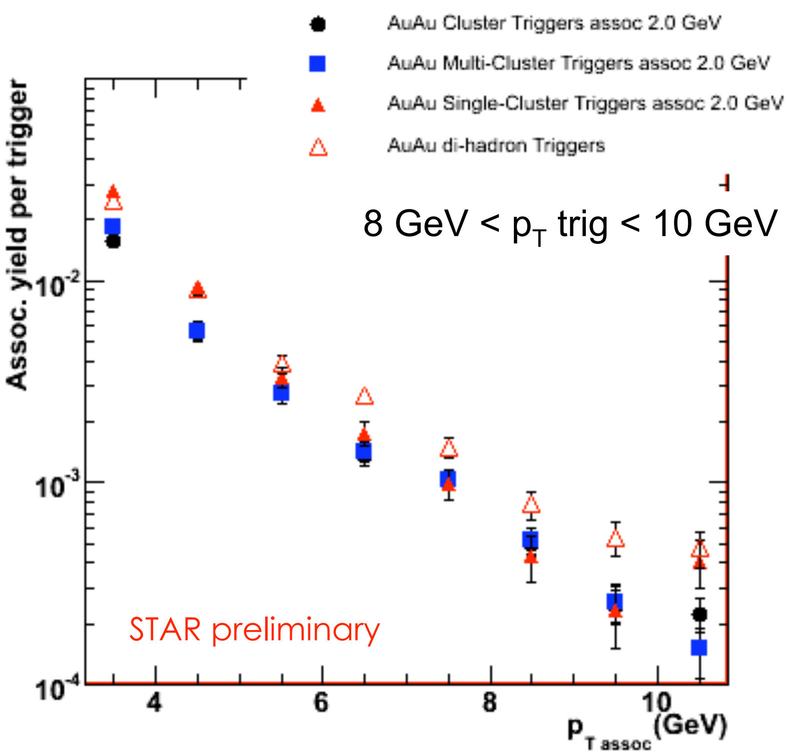


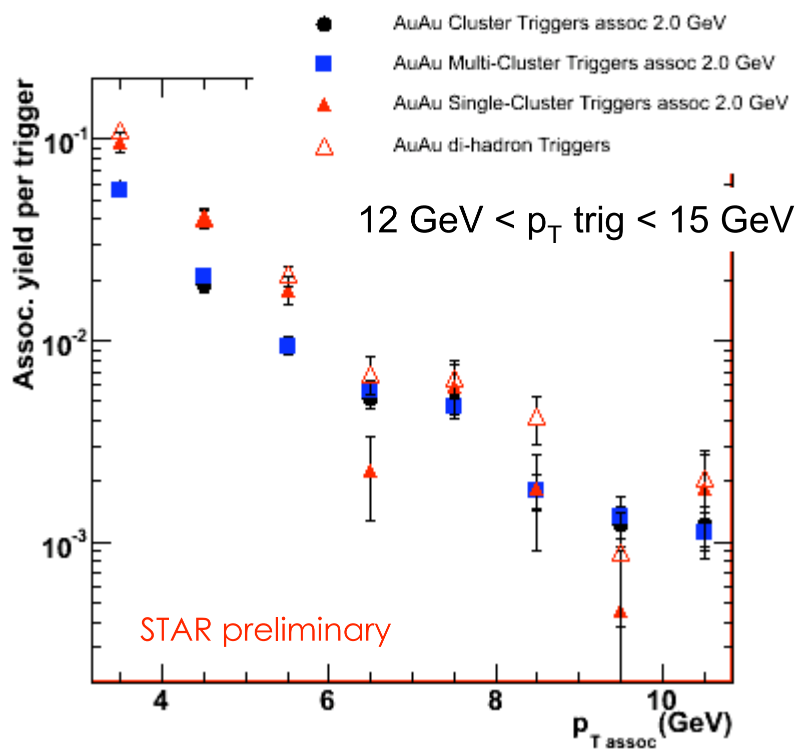
Cluster triggers

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

Away side yields

Minimum secondary seed cut = 2.0 GeV





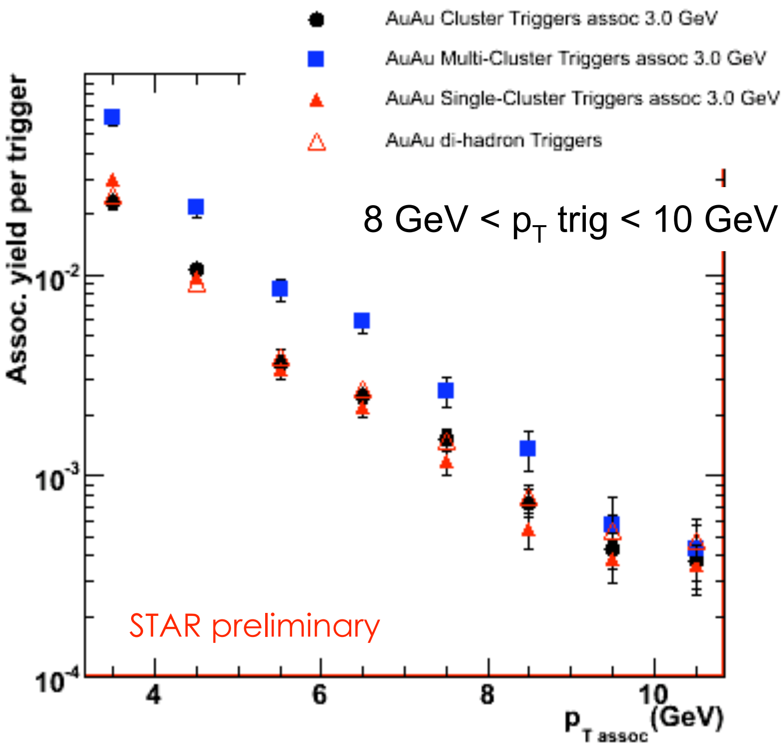
Fraction of Multi-Hadron Clusters to all Clusters = 0.81

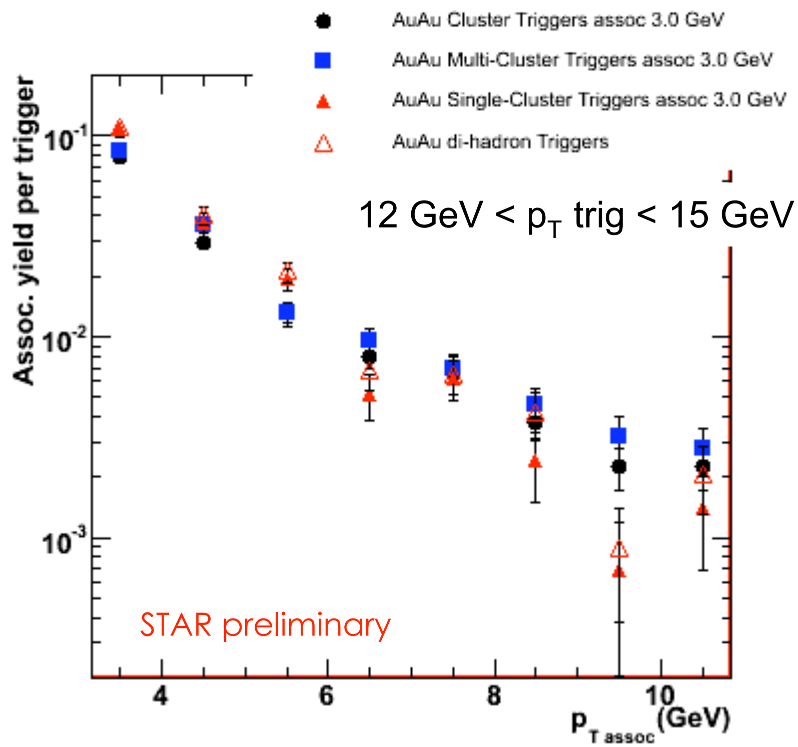
Fraction of Multi-hadron Clusters to all Clusters = 0.88

- Difference in Multi-hadron Cluster vs. di-hadron triggers small
- Associated yield lower for Multi-hadron clusters than for di-hadrons
- Total clusters dominated by multi-hadrons → indication of random clusters

Away side yields

Minimum secondary seed cut = 3.0 GeV





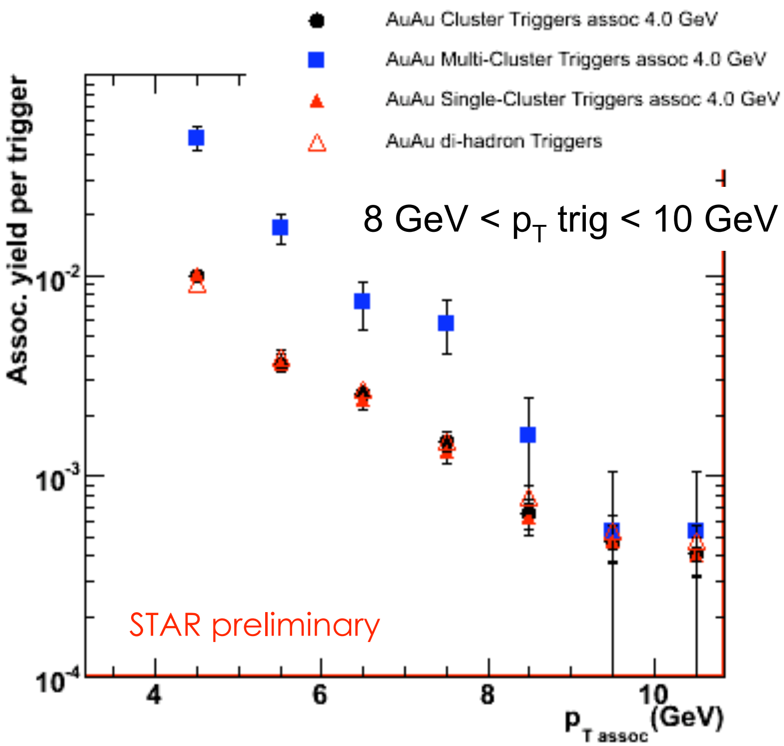
Fraction of Multi-Hadron Clusters to all Clusters = 0.65

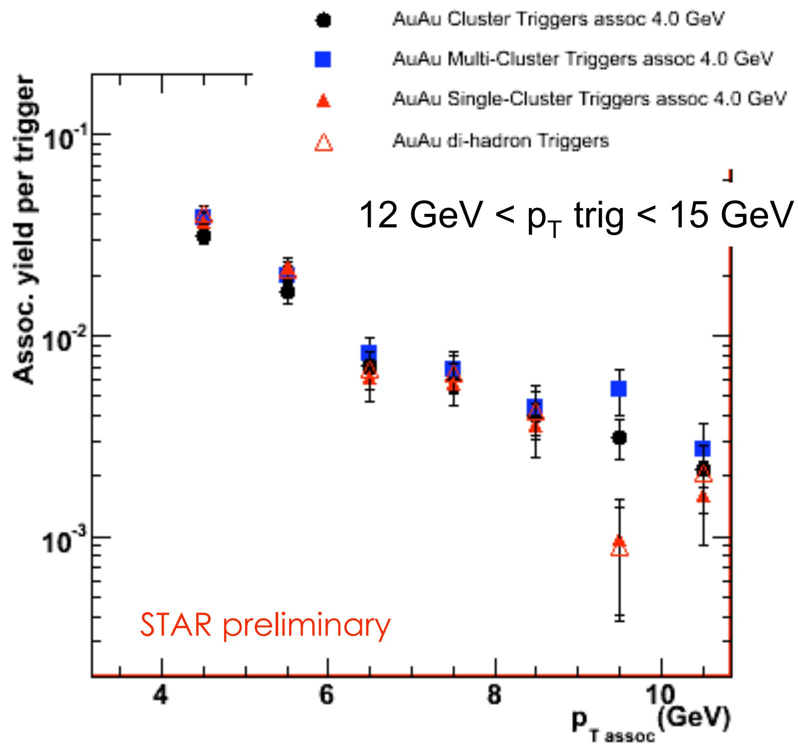
Fraction of Multi-hadron Clusters to all Clusters = 0.80

- Associated yield for Multi-hadron Clusters larger than for di-hadrons in 8 to 10 GeV p_T trigger case, but not in 12-15 GeV p_T trigger case.
- Total clusters and di-hadrons very close for 8 to 10 GeV jet p_T → number of multi-cluster triggers lower than for 12 to 15 GeV jet p_T.

Away side yields

Minimum secondary seed cut = 4.0 GeV



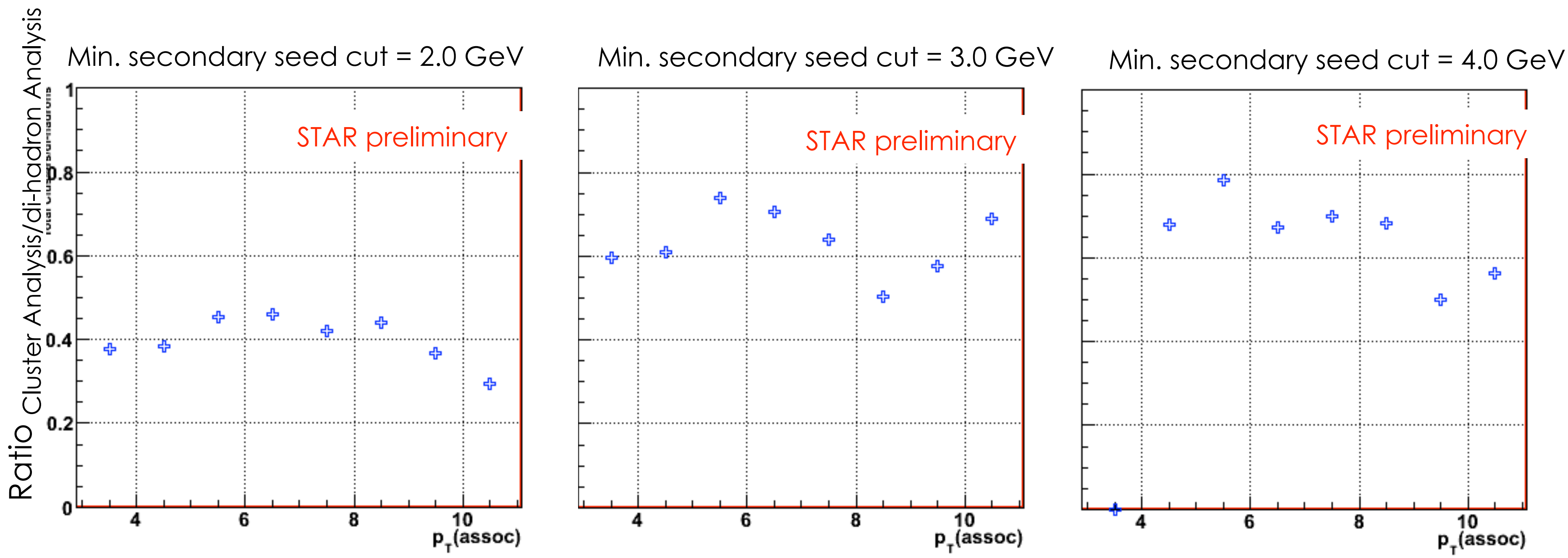


Fraction of Multi-Hadron Clusters to all Clusters = 0.48

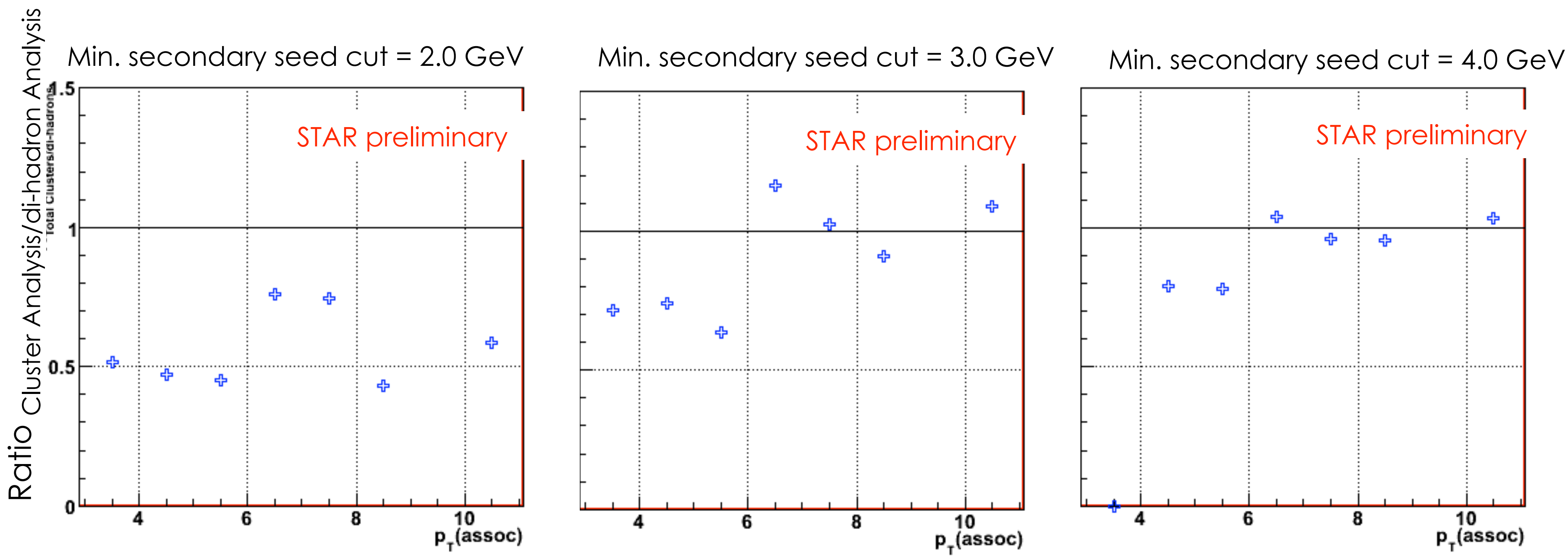
Fraction of Multi-hadron Clusters to all Clusters = 0.85

- Associated yield for Multi-hadron clusters is even larger than for di-hadrons in 8 to 10 GeV p_T trigger case, still very close in 12 to 15 GeV p_T trigger case.
- In both cases, all clusters and di-hadrons are very close - number of Multi-hadron cluster triggers not large.

Ratios: Total Clusters to di-hadrons - 8 GeV < p_T trig < 10 GeV -



Ratios: Total Clusters to di-hadrons - 12 GeV < p_T trig < 15 GeV -



Conclusions and Outlook

- Investigated differences between di-hadron triggers and Multi-hadron Cluster triggers
  - Away side yields for Multi-hadron clusters show variation in different p_T trigger regions
    - Suggestive of random clusters
  - First look at ratios of Cluster trigger yields to di-hadron yields

Next Steps:

- Pythia simulations to understand expectations for cluster trigger yields
- Study yields for different jet cone radii
- Look at higher p_T trigger > 15 GeV