Intermediate p_T Di-hadron Correlations in 200 GeV *AuAu* Collisions

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for the STAR Collaboration

PANIC 05
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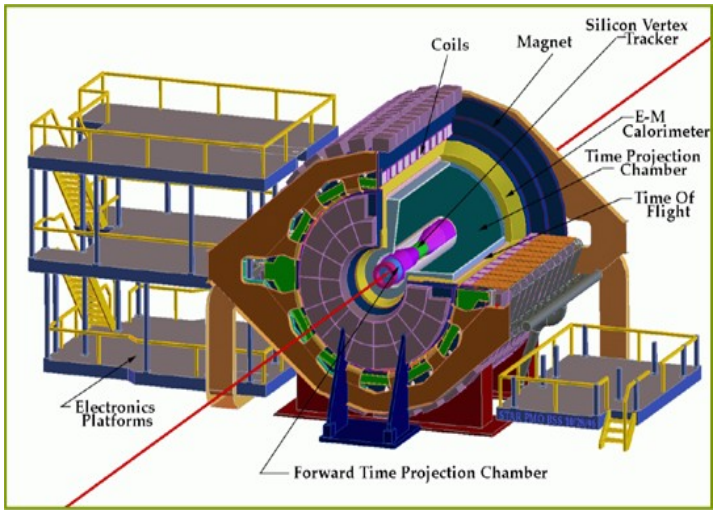


Run IV

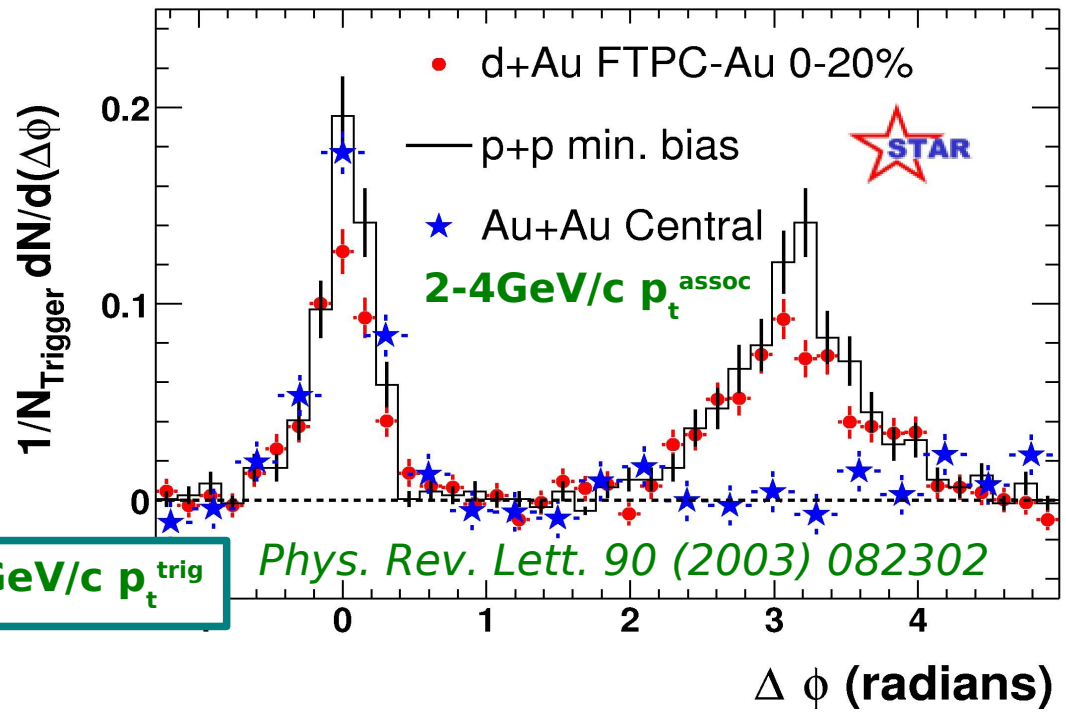
- 7M Central events
- 6M MinBias events

TPC
primary detector used

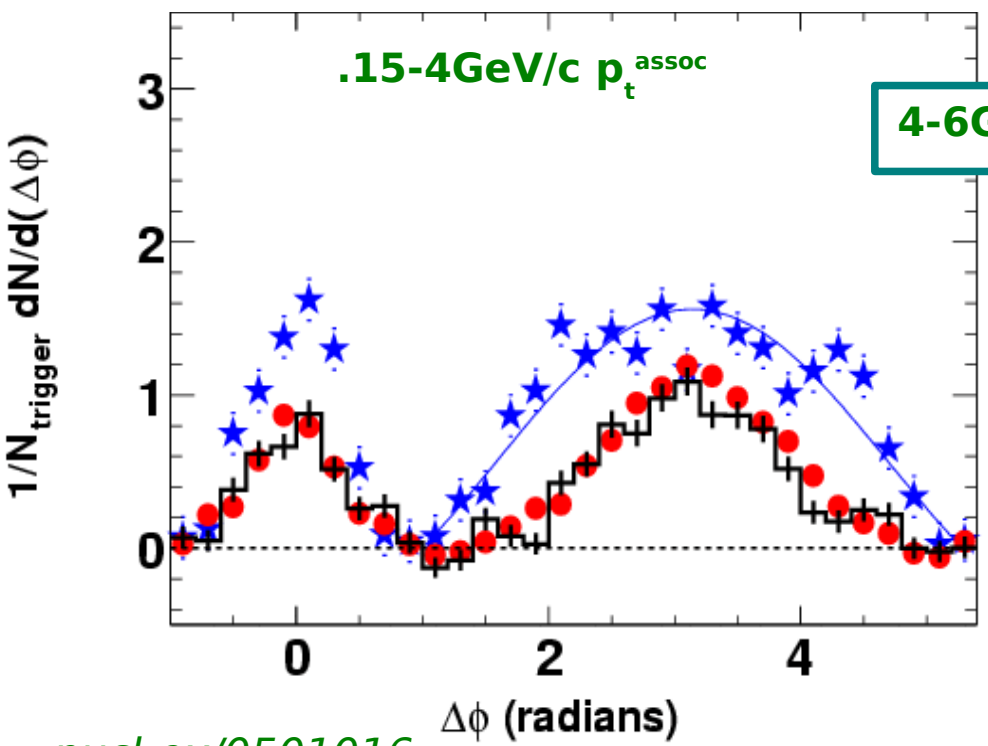
Di-Hadron Correlations as a Medium Probe

- Away-side hard-scattering partner interacts strongly with the final state
- Lowering assoc. p_T resurrects correlated yield
- Study correlated yield to infer medium properties

Correlated away-side yields softened



Phys. Rev. Lett. 90 (2003) 082302



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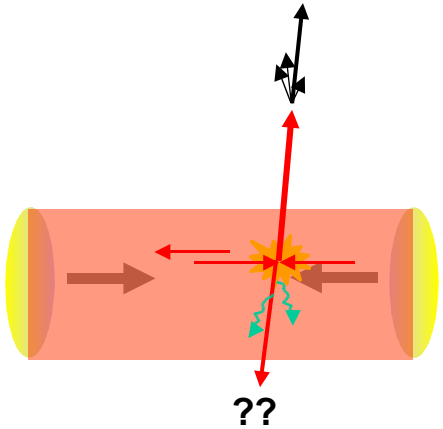
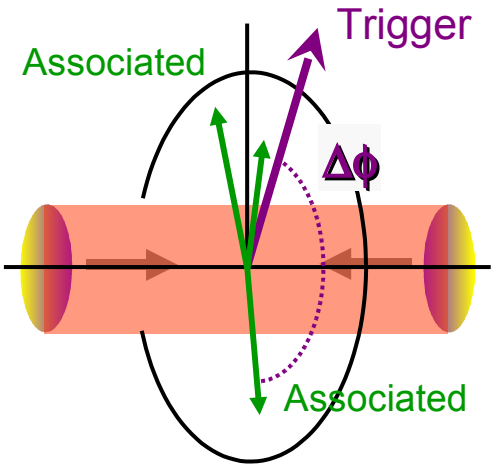
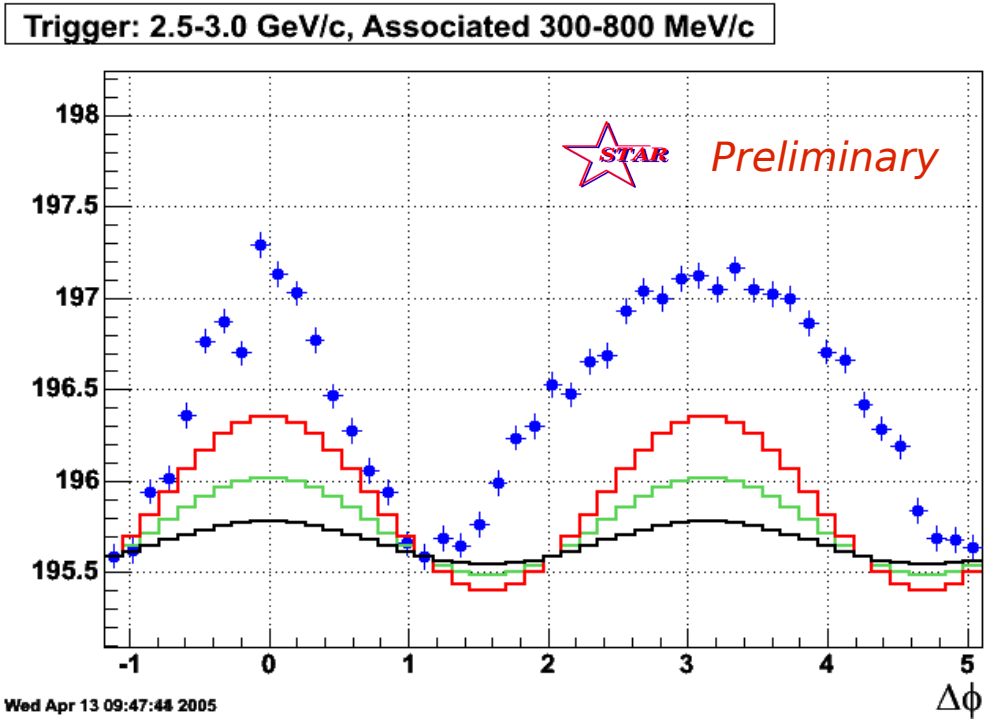


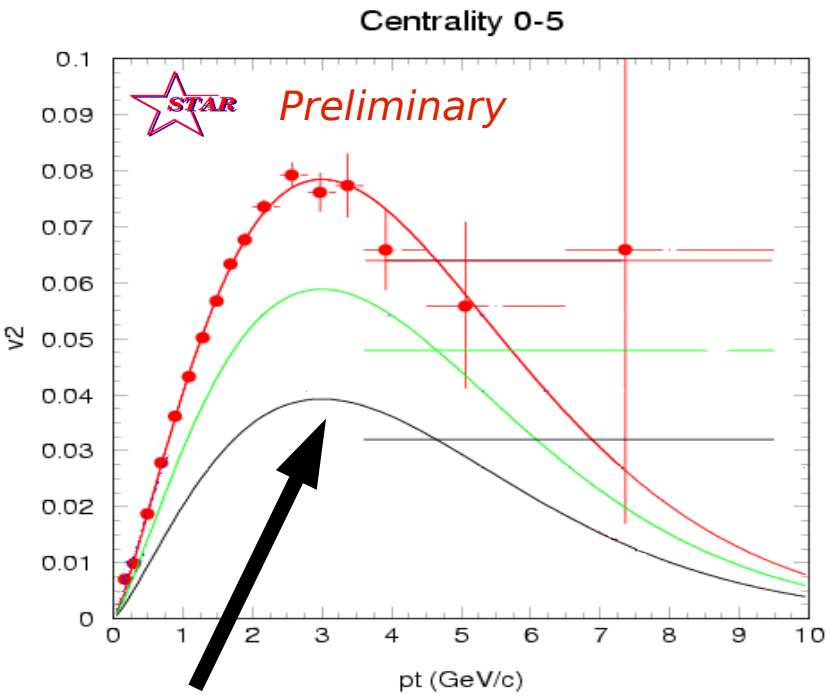


Signal Extraction

- Raw correlations include uncorrelated background with v_2
- Normalise to valley and use mean of RP and $v_2\{4\}$ values
- Systematic uncertainty from RP and $v_2\{4\}$ values



v_2 modulated background removed



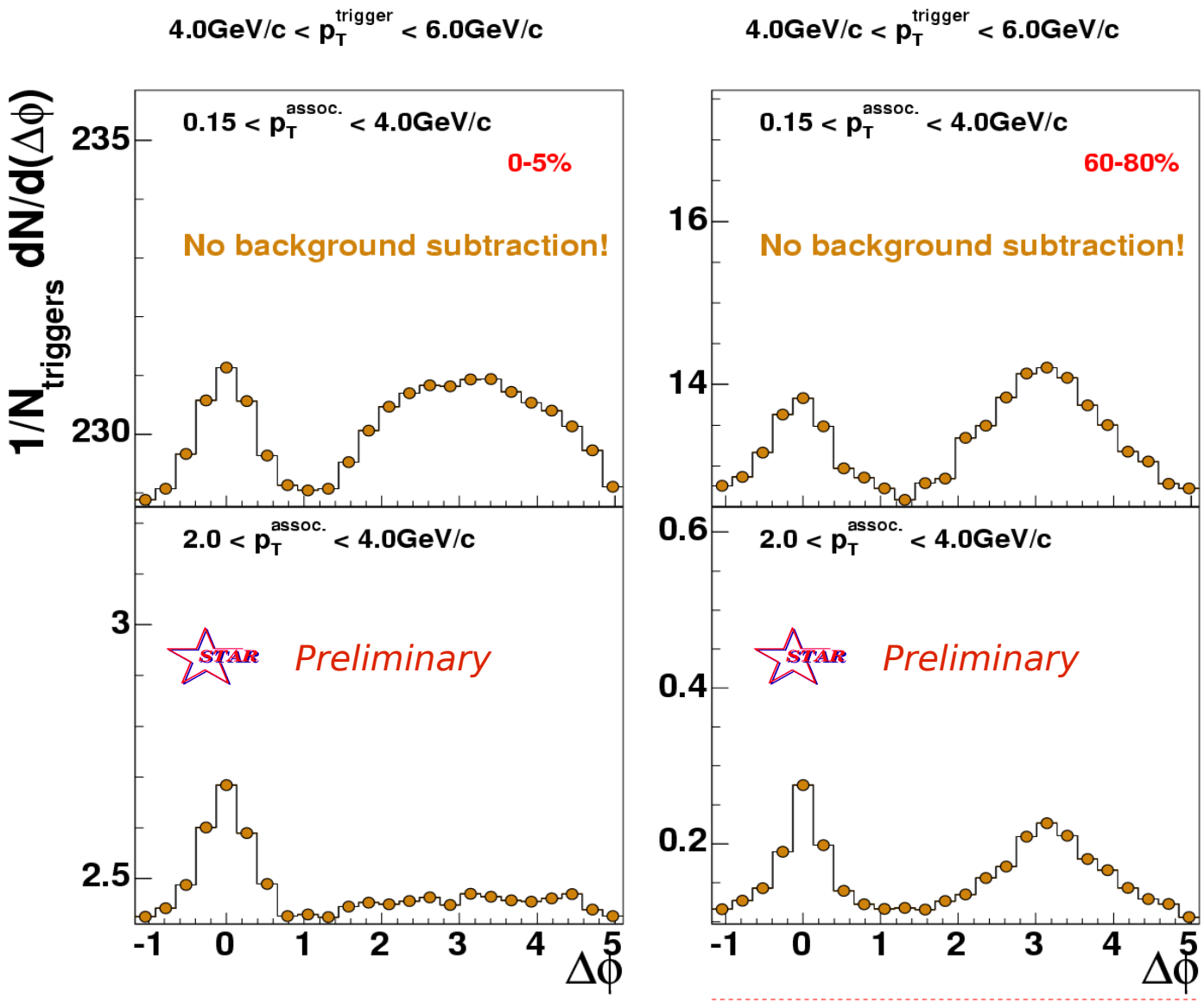
- Extrapolated results to get a $v_2\{4\}$ for 0-5% central collisions
- Detailed v_2 descriptions:

Phys. Rev. C 72 (2005) 014904

Centrality Dependence of Raw

No obvious evolution in bulk

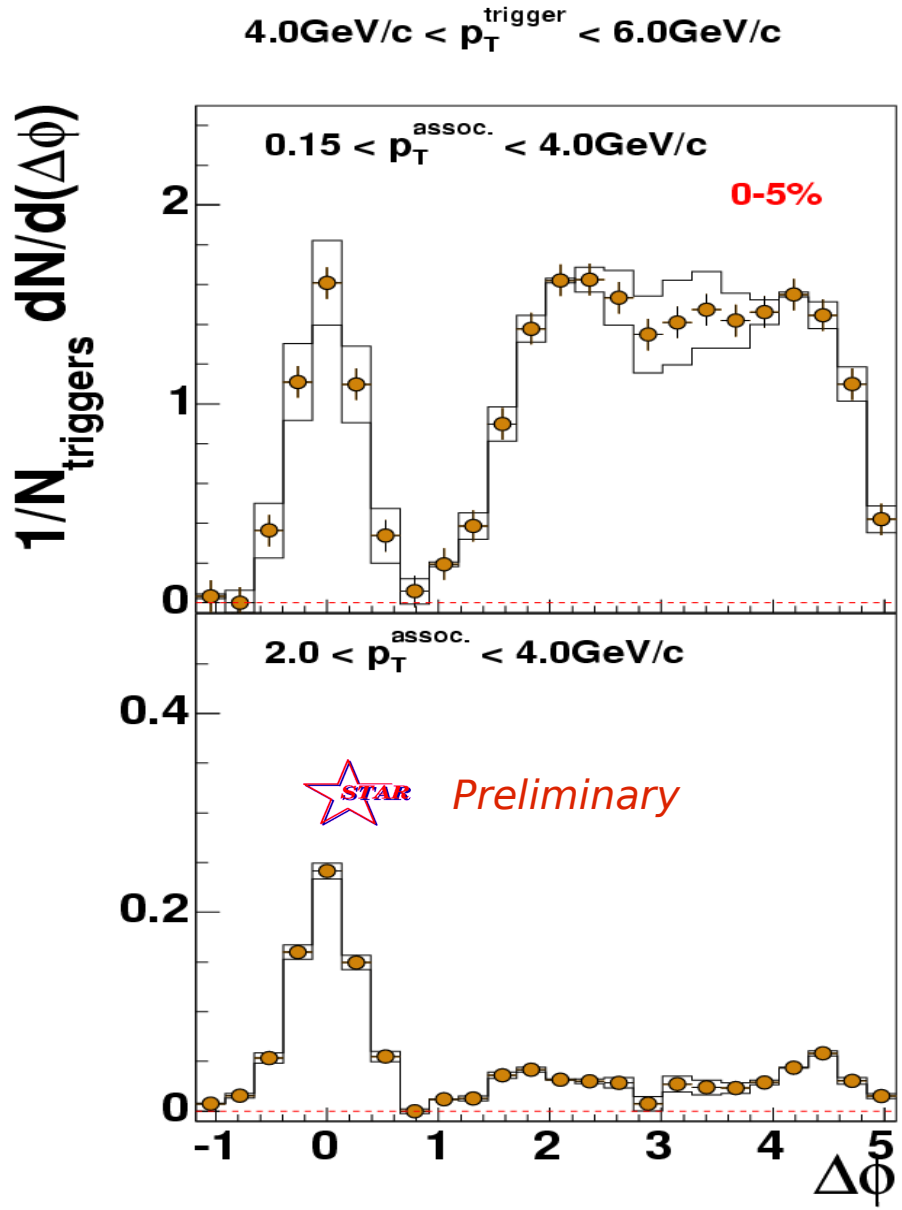
- Vary centrality for two canonical raw di-hadron correlations
- Bulk (150MeV/c - 4.0 GeV/c) shape similar for all centrality
- Away-side structure evolves from plateau to peak for 2.0-4.0GeV/c assoc.



Centrality Dependence

- Vary centrality for background subtracted di-hadron correlations
- Smooth evolution from plateaued away-side to jet-like peak
- Near-side yield decreases
- Away-side yield decreases for .15 - 4 GeV/c assoc. p_T
- Away-side yield increases slightly for 2 - 4 GeV/c assoc. p_T

Smooth evolution as a function of centrality



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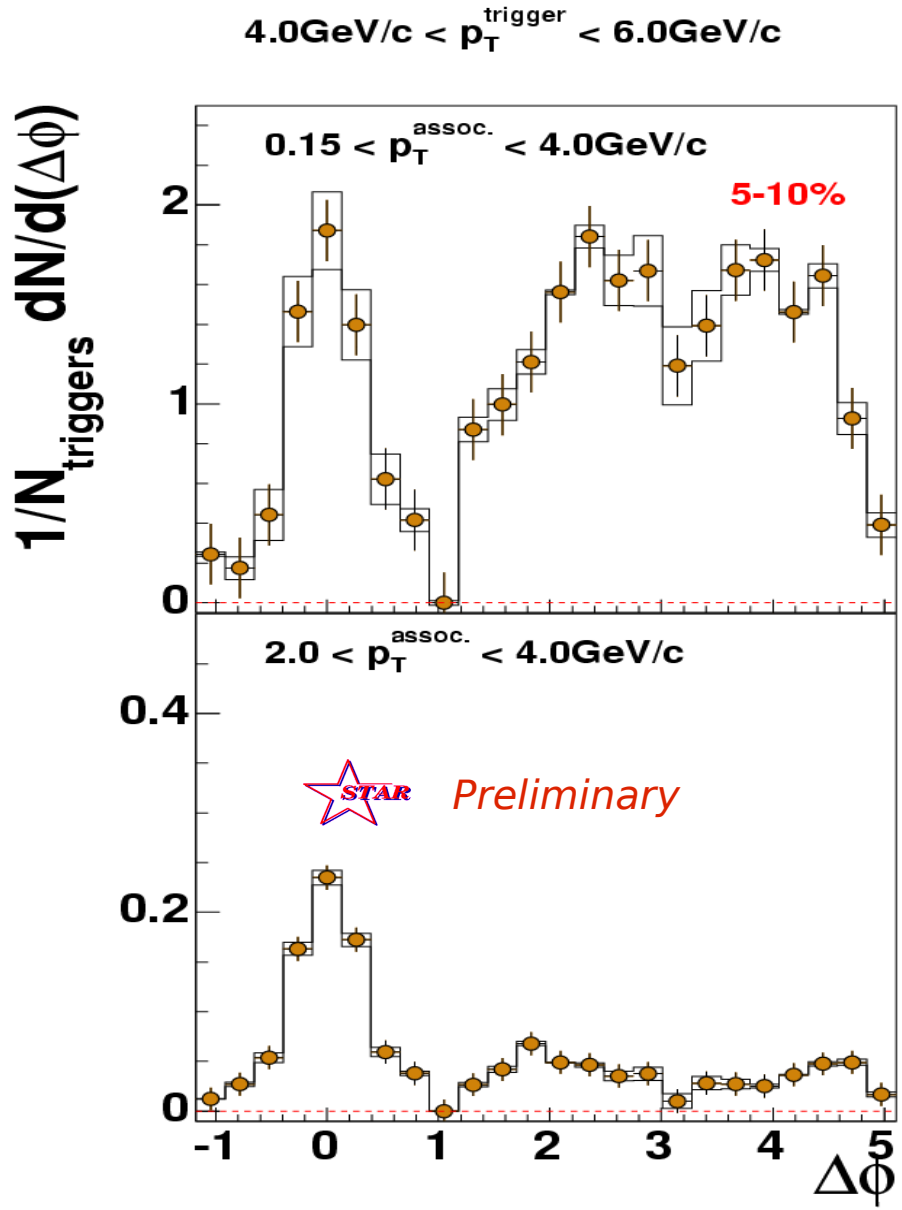

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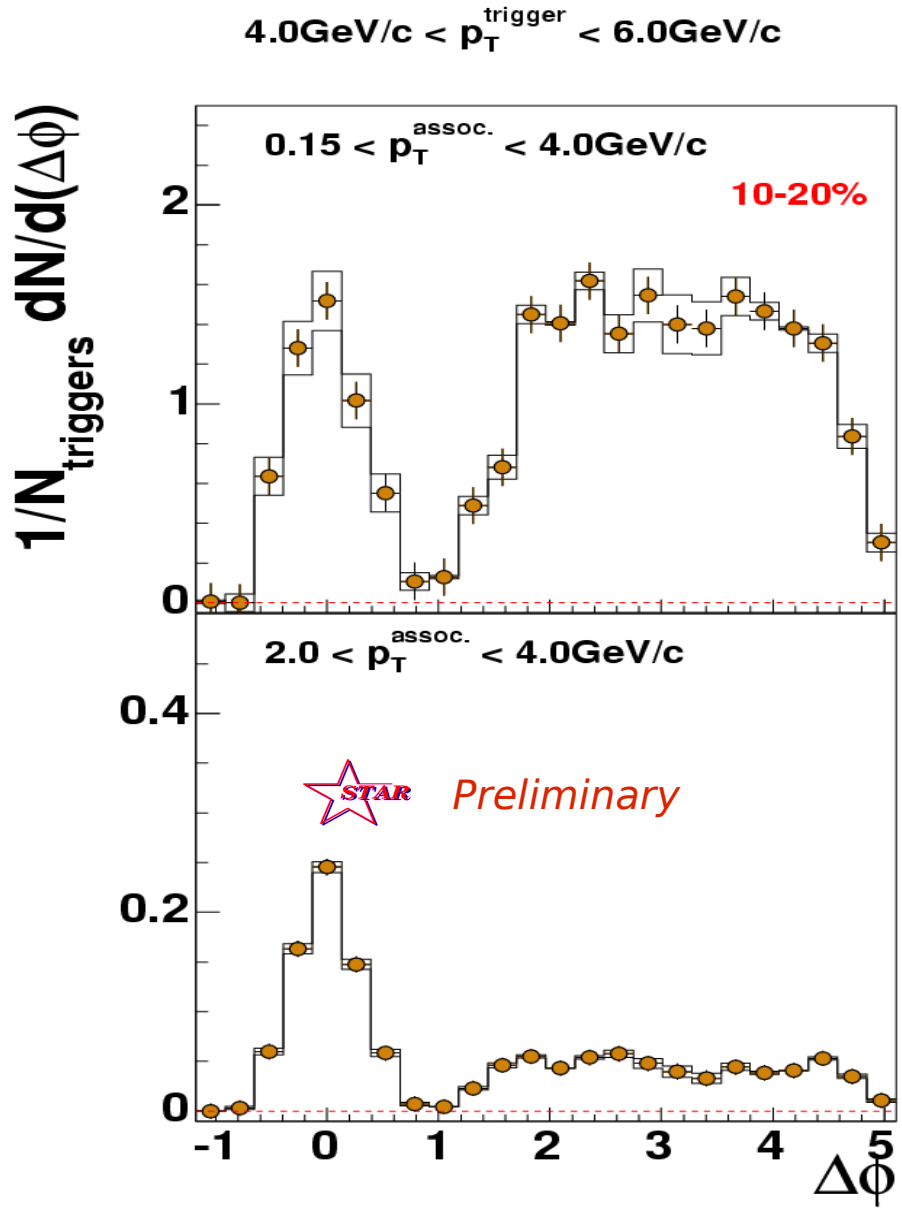

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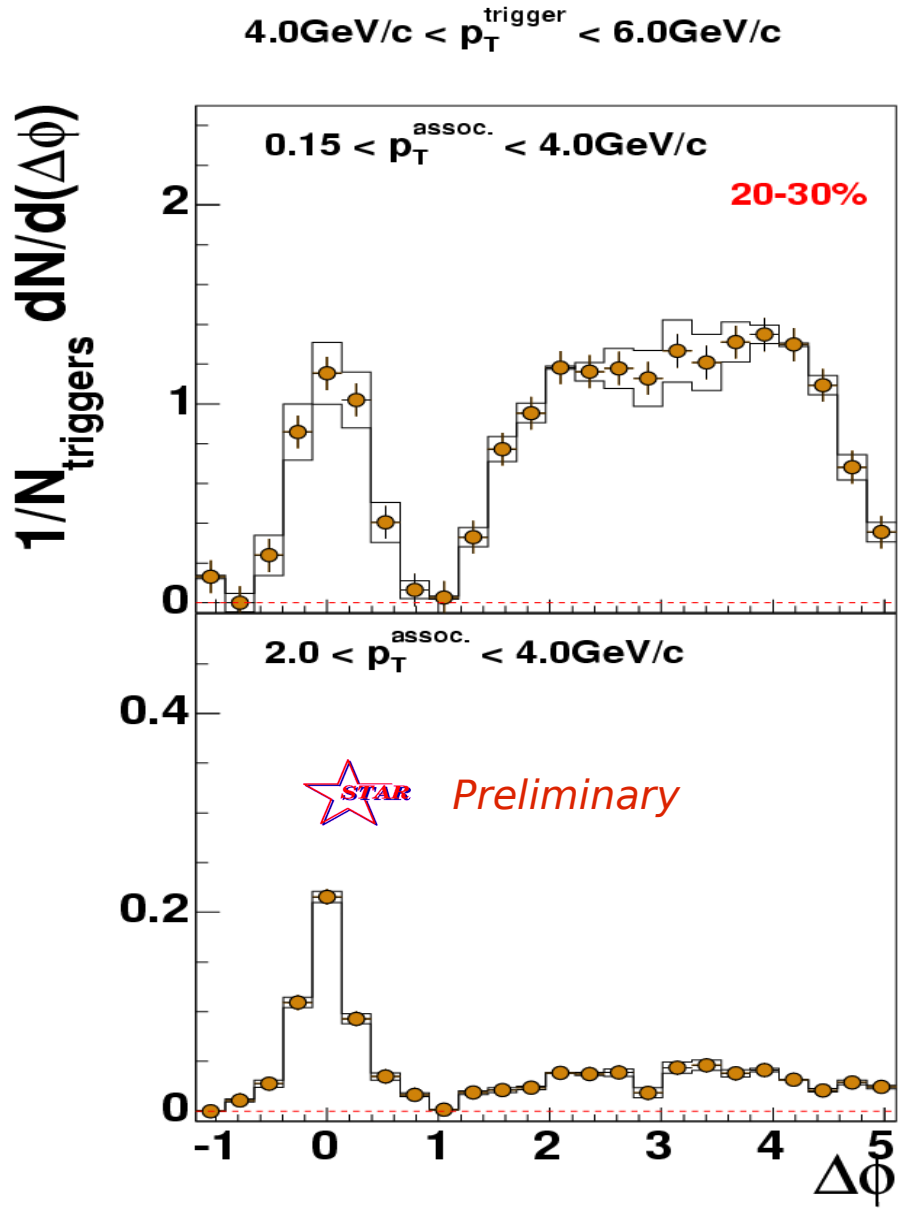

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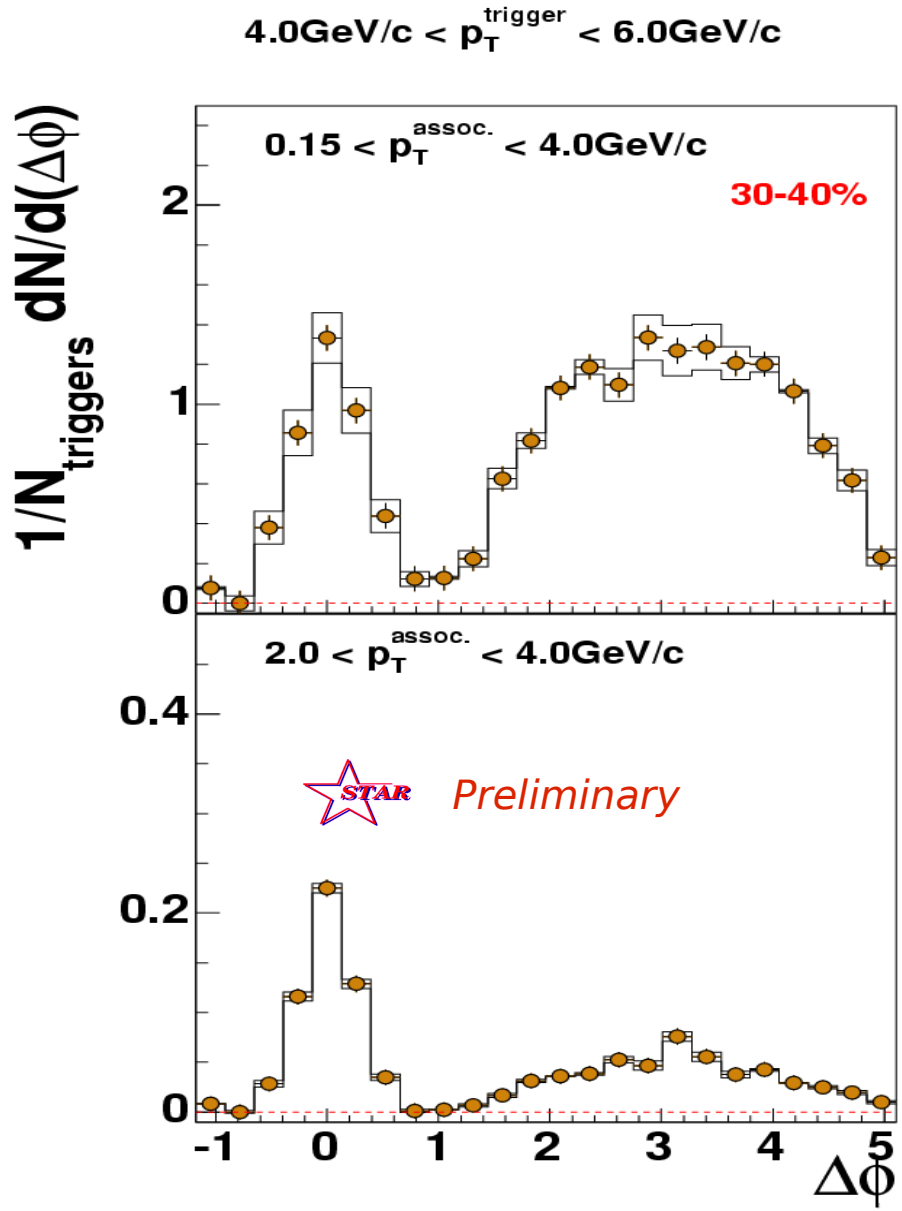

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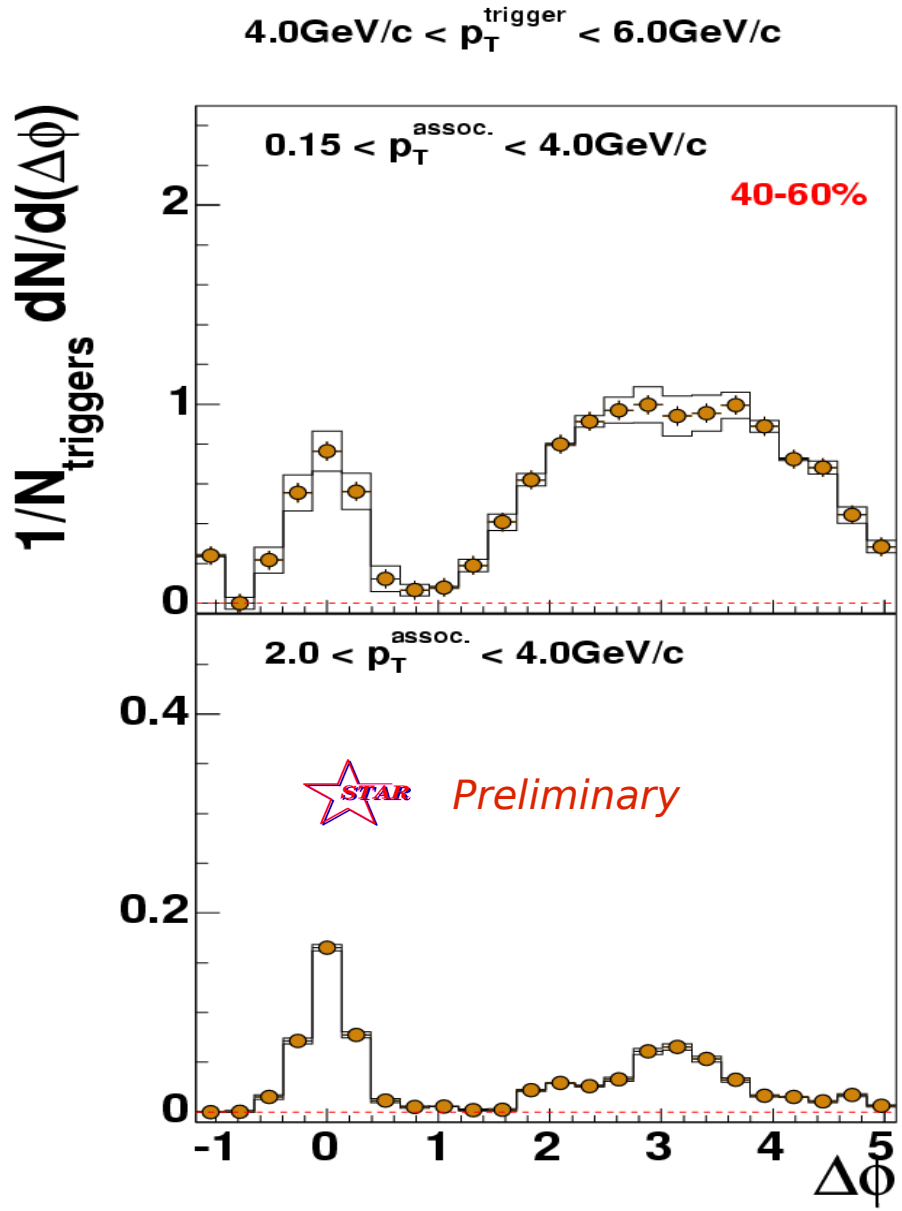

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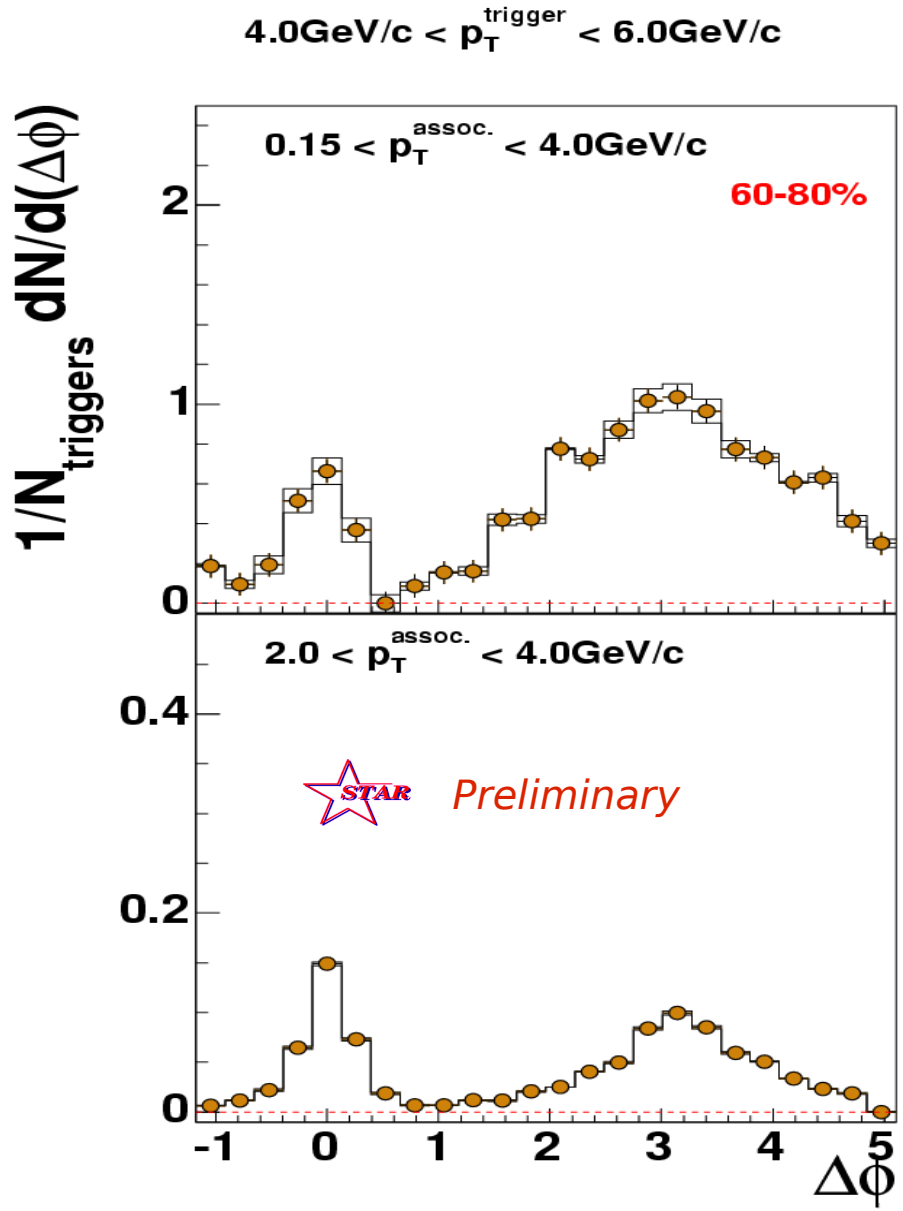
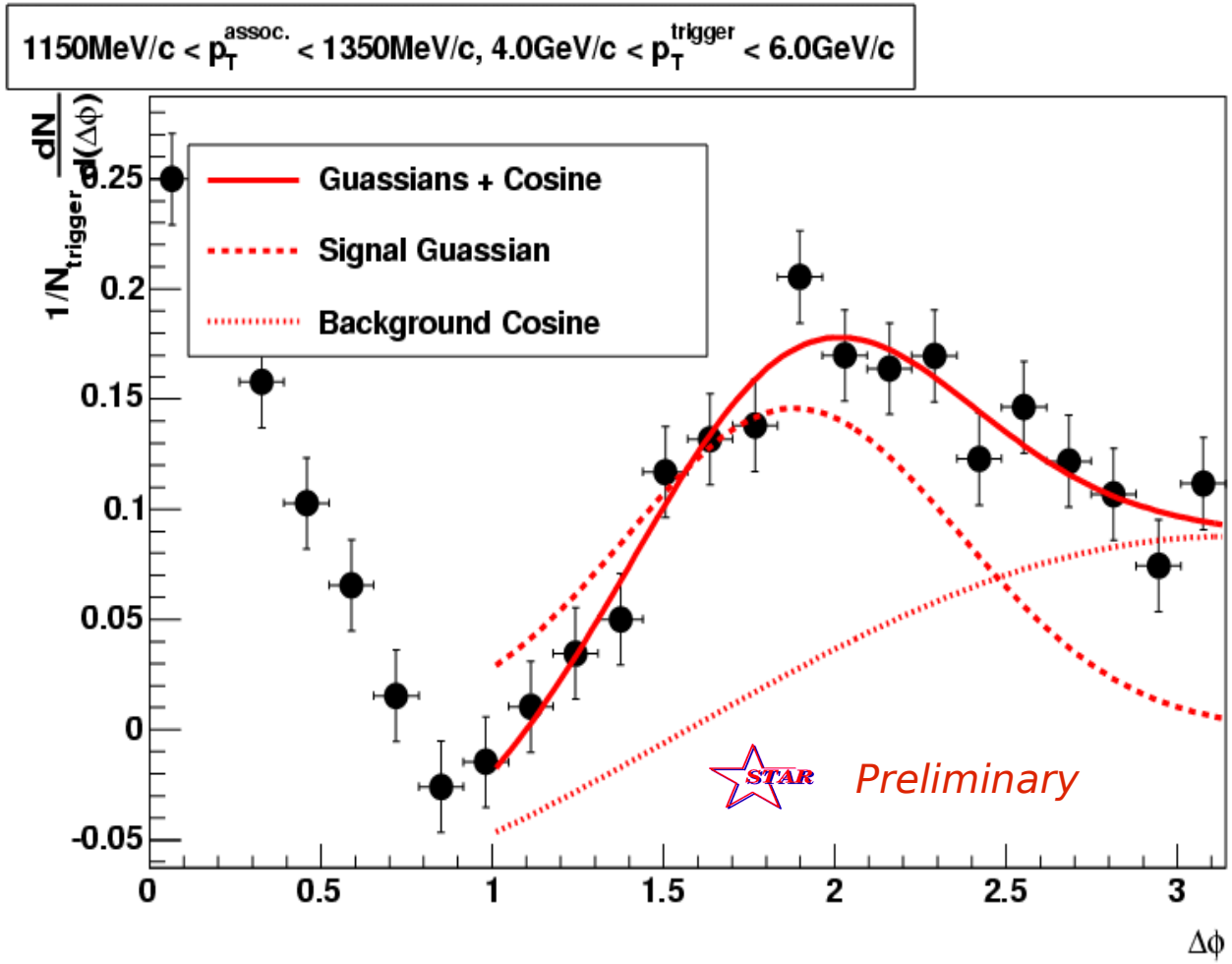


Fit of Away-side Structure

3 general fit types attempted

- 3 Fit cases
  - cos(Δϕ) centred at π + Gaussian
  - Gaussian centred at π + Gaussian
  - 2 identical Gaussian symmetric about π
- Dashed line is "signal" part
- Dotted line is "background".



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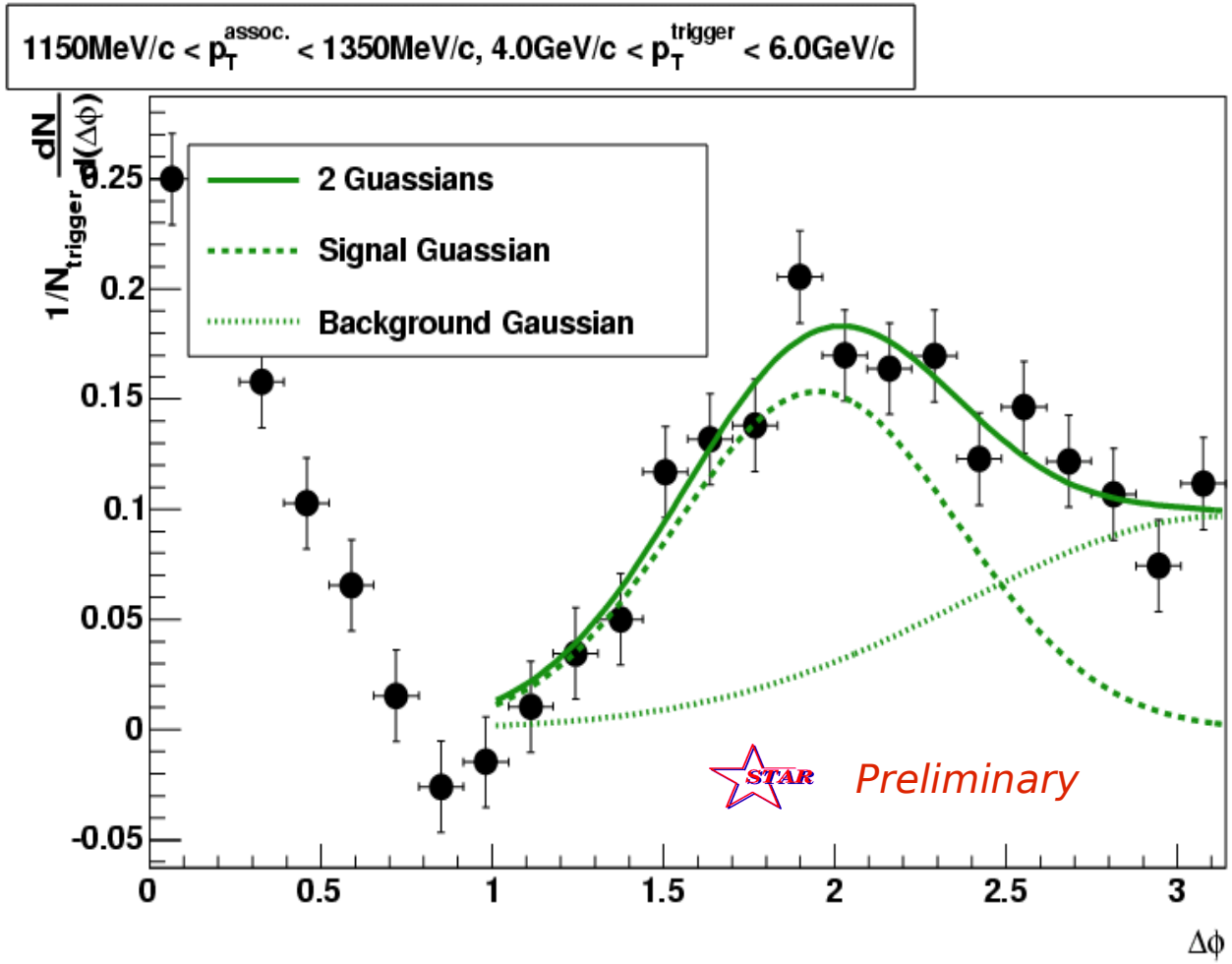

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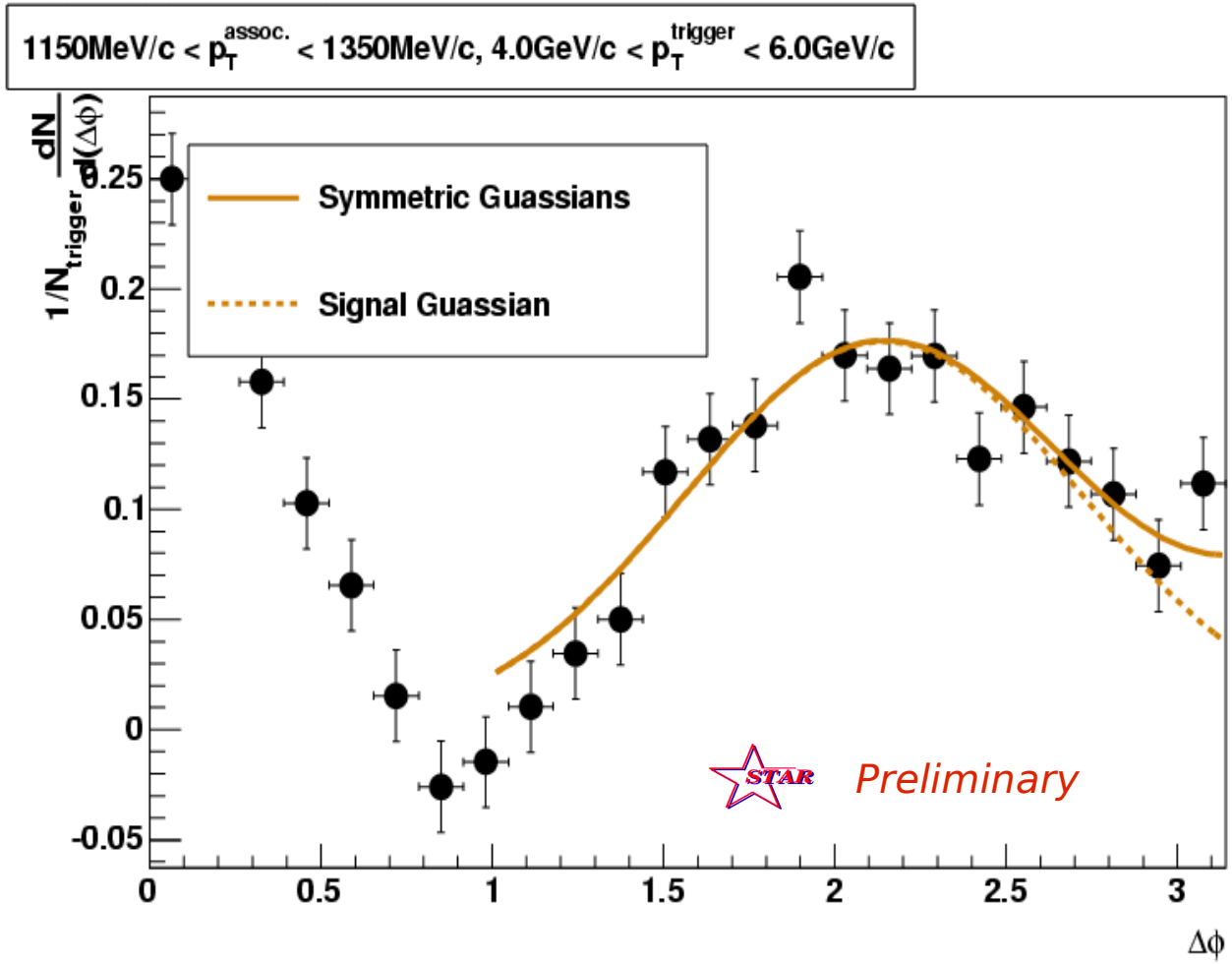

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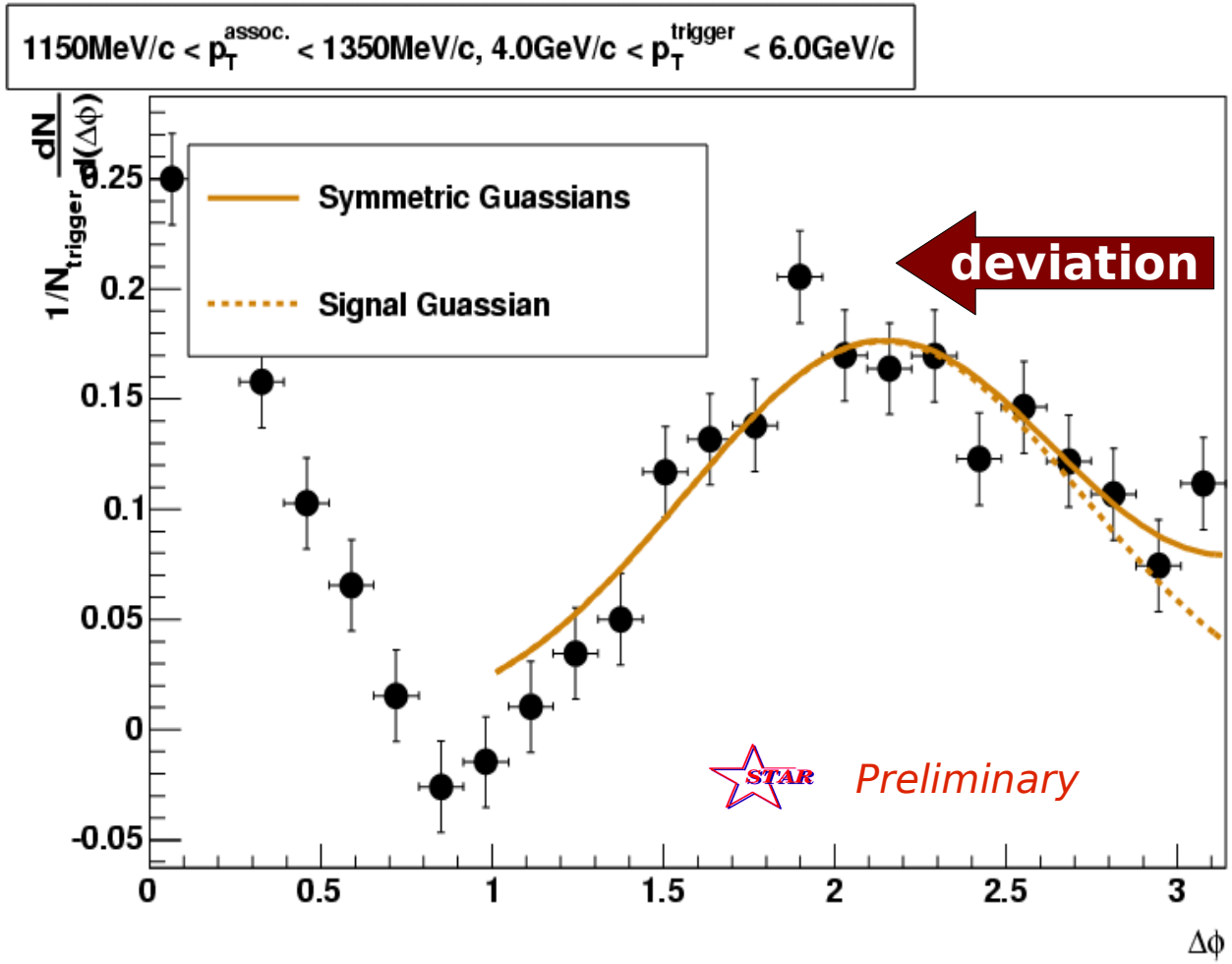
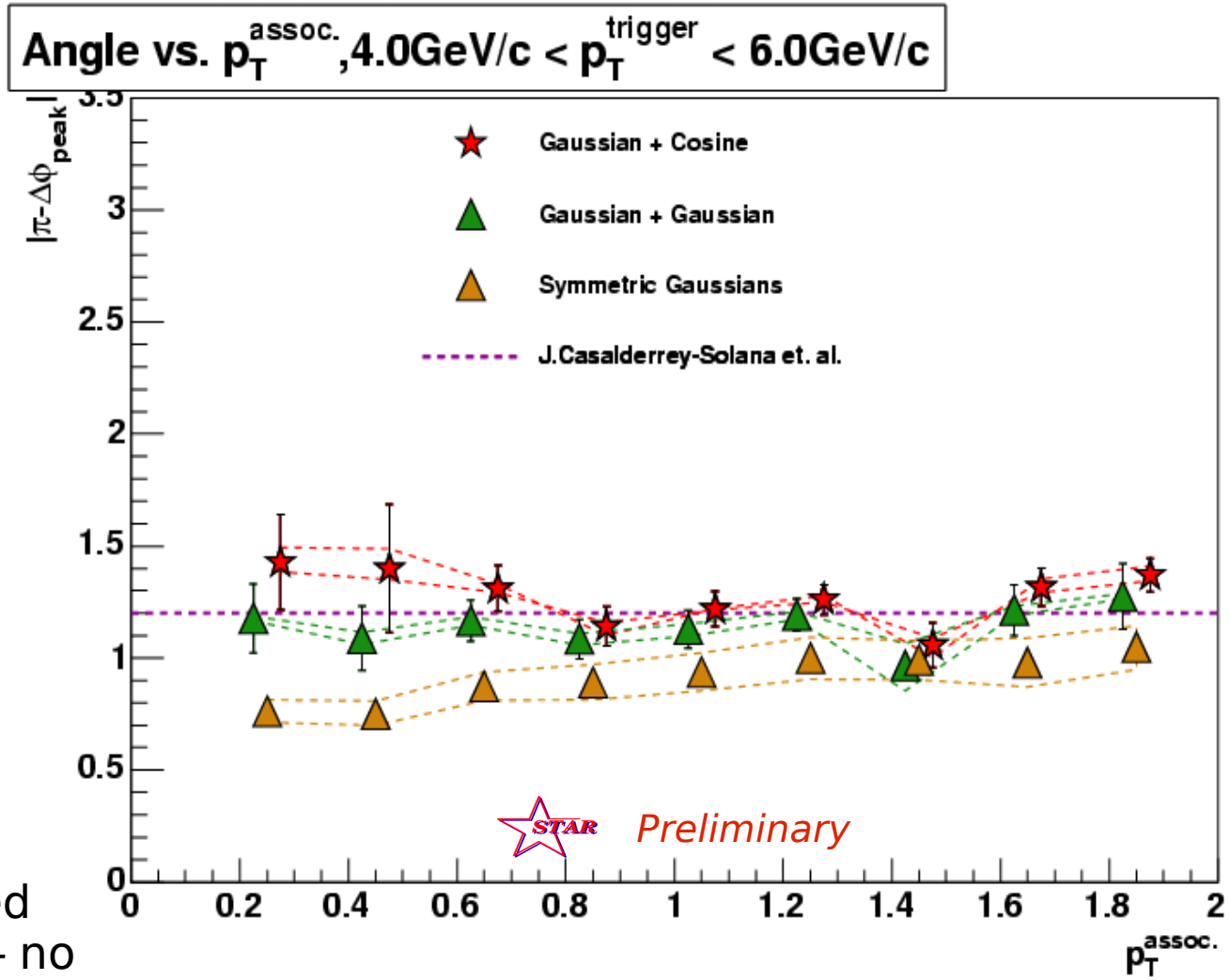


Location of Signal Peak

Signal location consistent but distribution broad

- Summarise by plotting signal peak distance from π vs. assoc. p_T
- Results consistent with ~1 radian distance
- Fraction of away-side yield in signal peak increases with pt assoc.

J. Casalderrey-Solana et. al. hep-ph/0411315



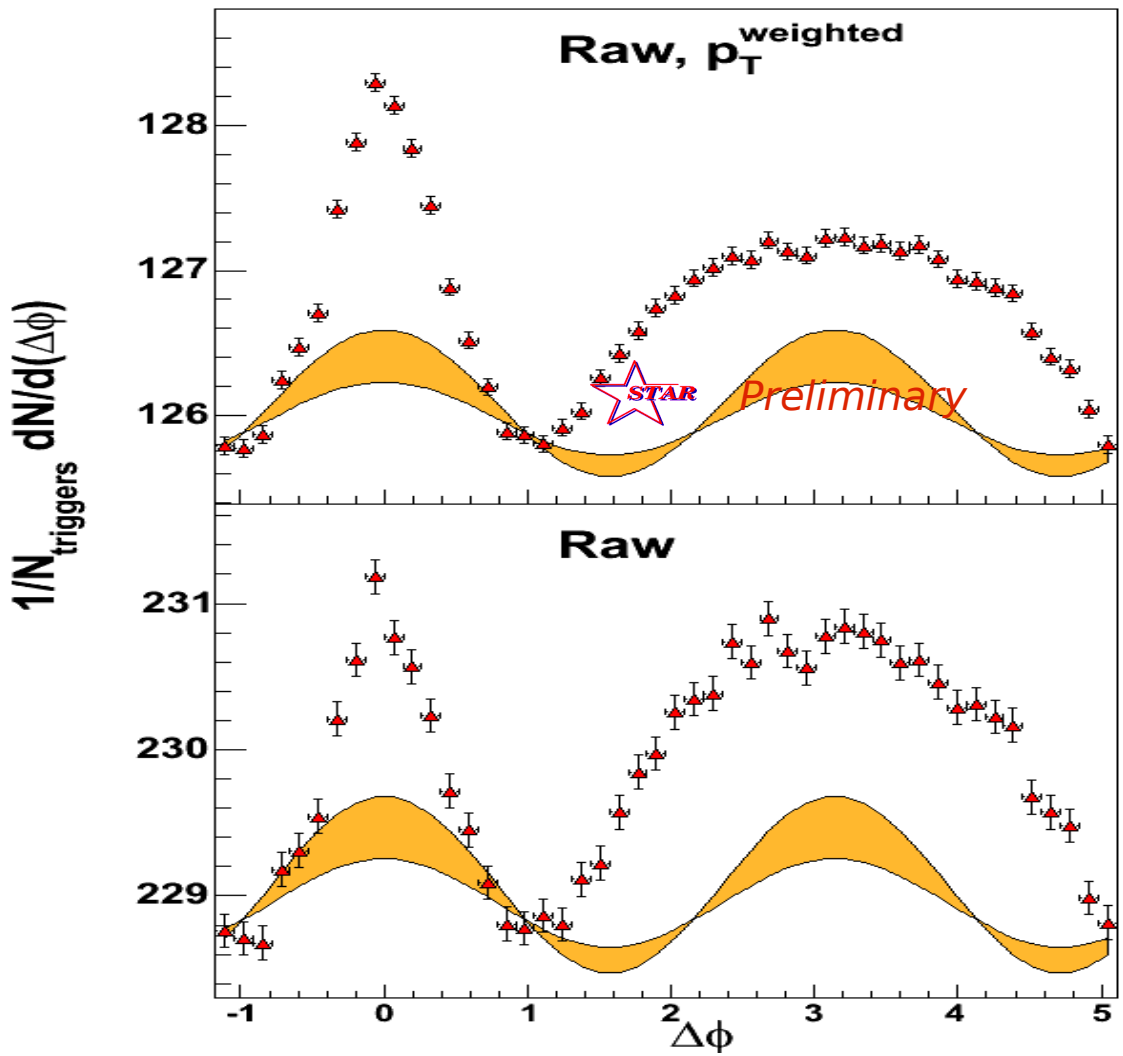
nucl-th/0507063

Cherenkov gluons are emitted at smaller angles at higher p_T – no decrease in angle with p_T assoc.

Bulk $<p_T>$ vs. $\Delta\phi$

Hardest trigger differs on near-side

- Azimuthal bulk $<p_T>$ peaks at π
- Not sensitive to trigger dependence
- Common $<p_T>$ used to normalise background for all trigger classes



Ratio

Bulk $<p_T>$ vs. $\Delta\phi$

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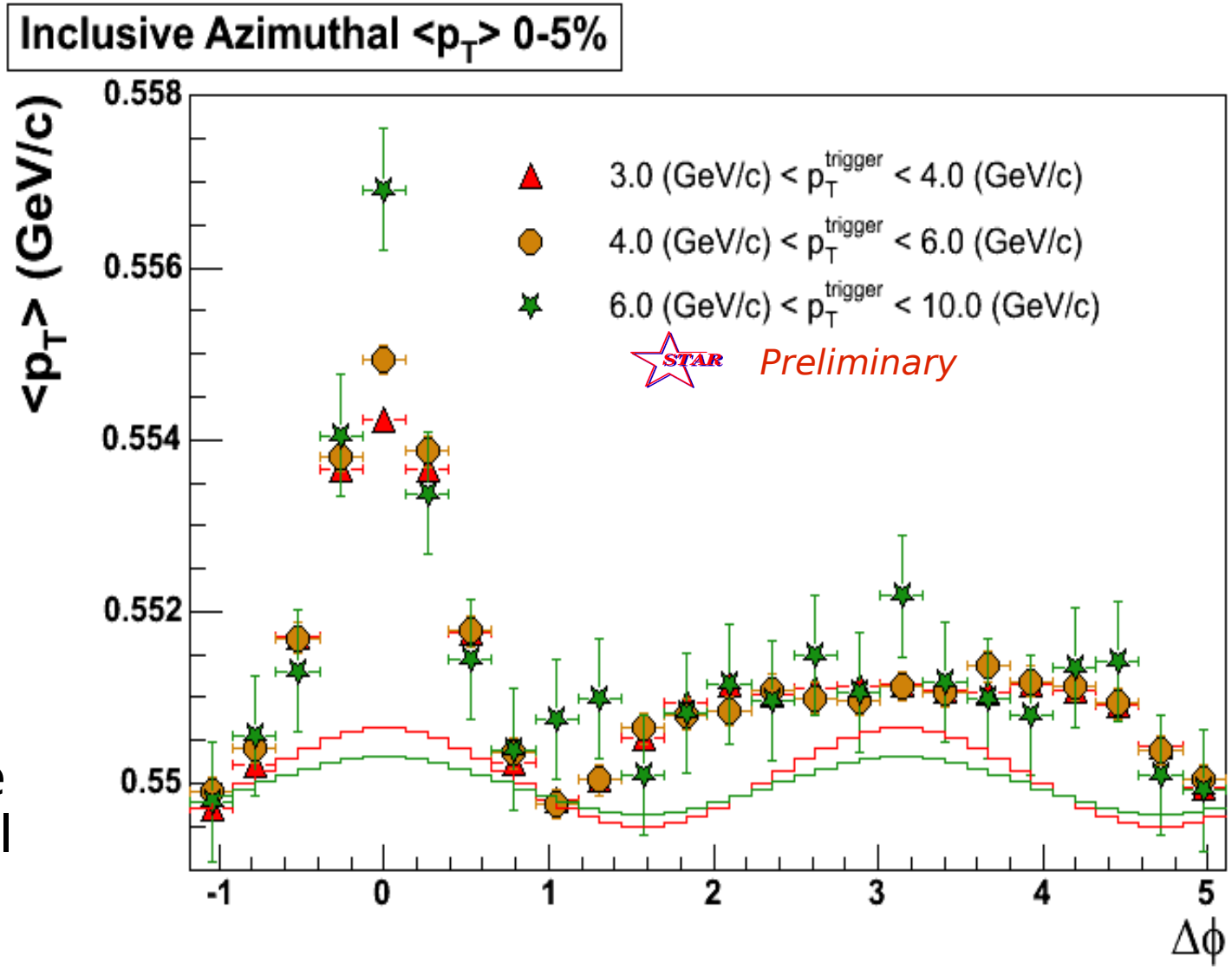
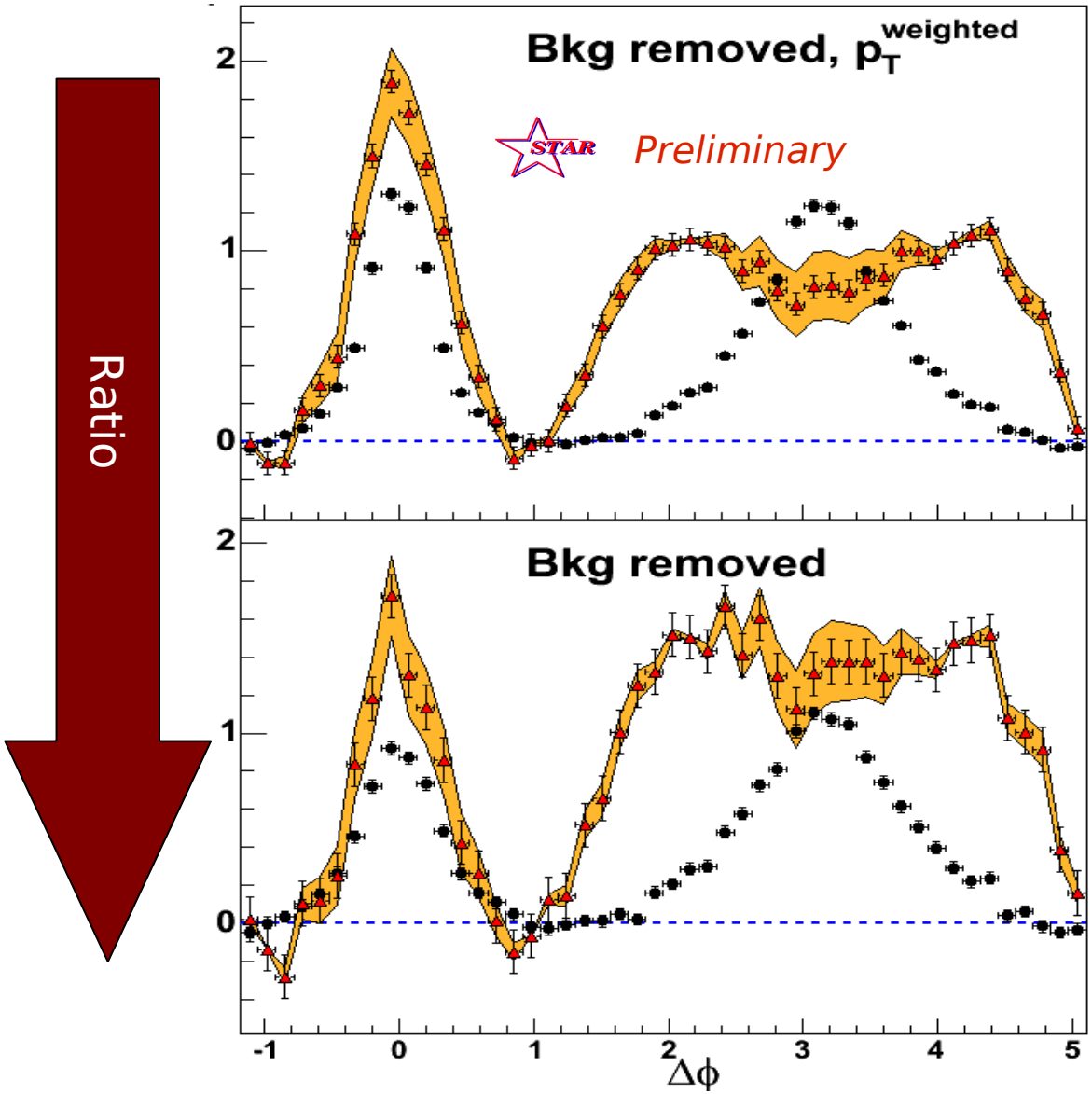


$<p_T>$ vs. $\Delta\phi$

Response consistent for all triggers

- Azimuthal $<p_T>$ shows smooth variation with $\Delta\phi$
- 6-10 GeV/c consistent with flat and dipped
- Systematic bands from varying:
  - v_2
  - normalisation:
    - vertically
    - horizontally



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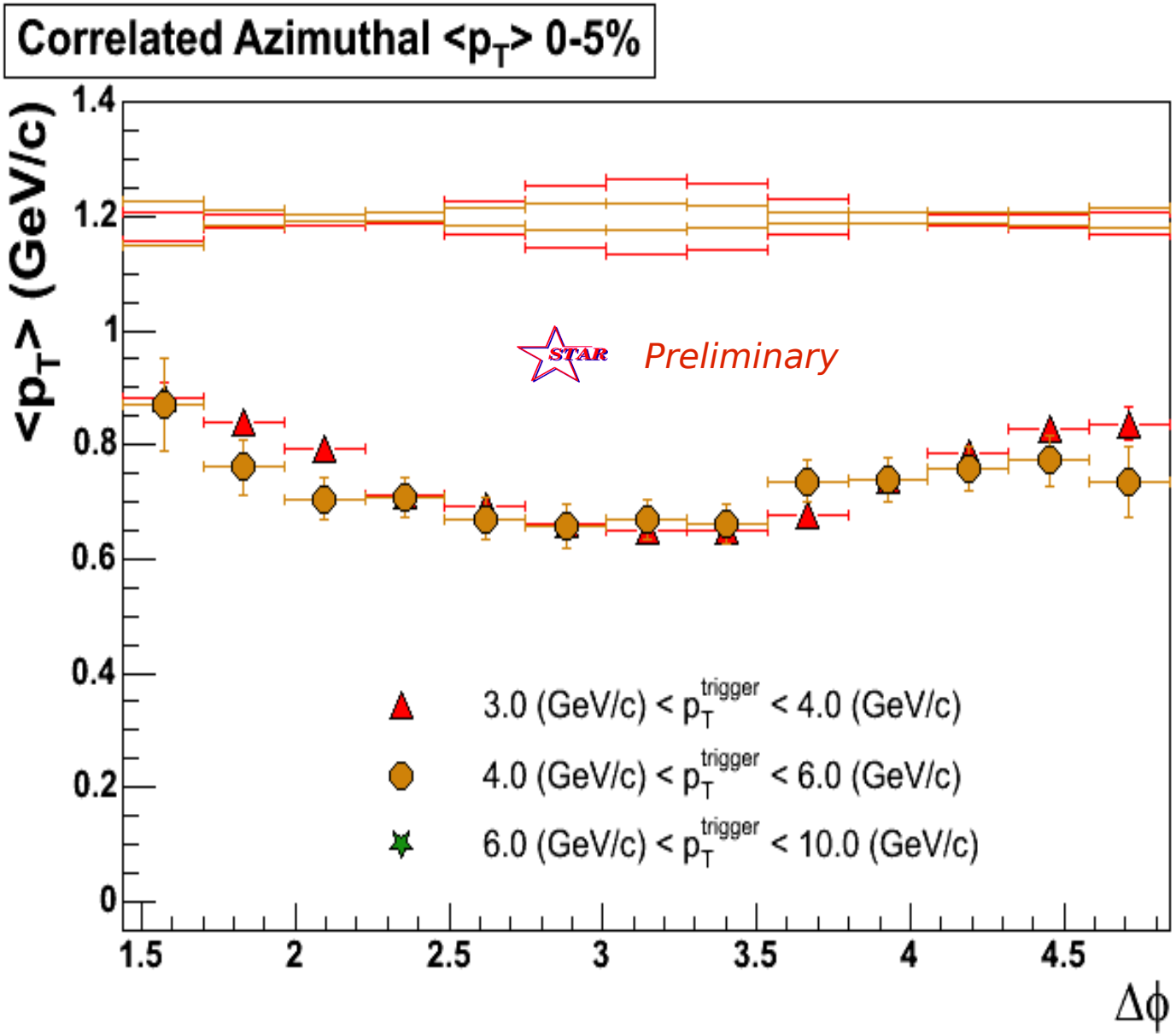

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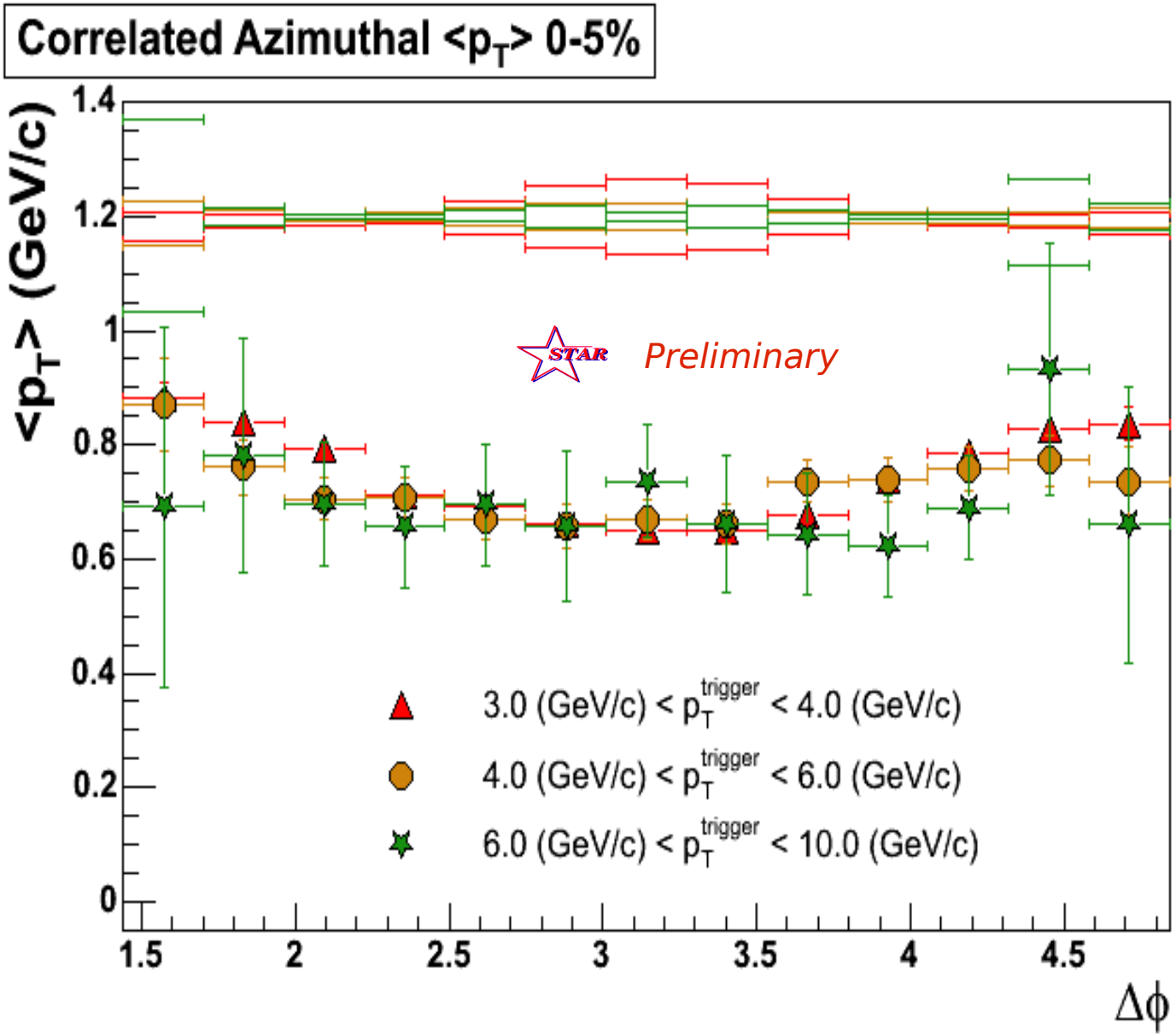

Conclusions and Questions

Observations:

- Near-side yield increases with centrality
- Fits show consistent fractional yield away from π
- $\langle p_T \rangle$ for softer triggers is dipped on away-side

Explanations (?):

- Energy loss k_T kicks
- gluon radiation
- conical flow
- cherenkov gluons

What to measure to deconvolute it all?

Experimental insight limited by backgrounds

END