

Recent Results on Identified Particle Jet Correlations from @ Intermediate p_T from PHENIX

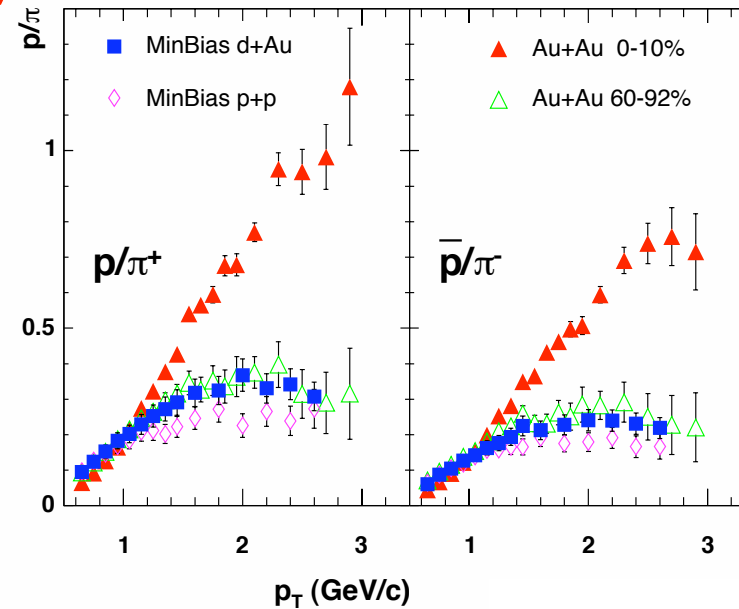
Anne Sickles
for the PHENIX Collaboration
Brookhaven National Laboratory

November 22, 2006

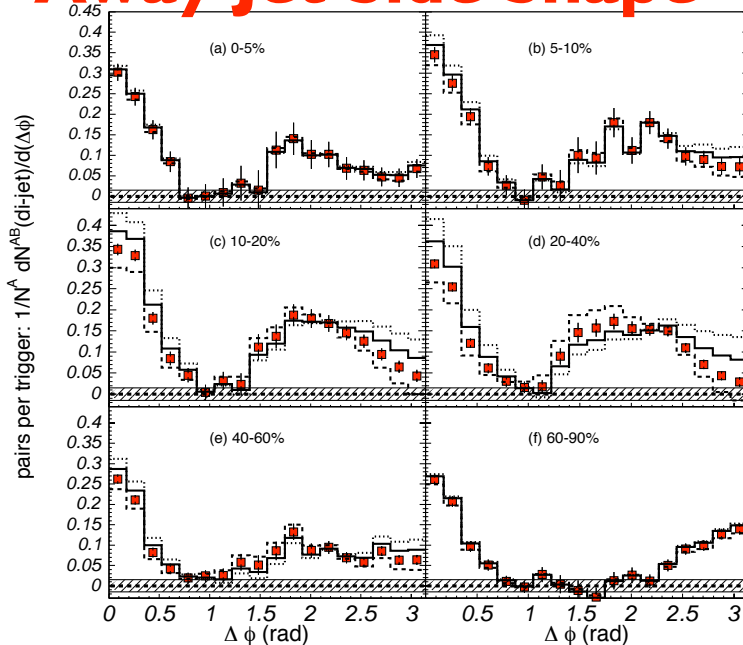
Why Intermediate p_T ?

Enhanced Baryon Production

PRL 91 172901 (2003)
PRC 74 024904 (2006)

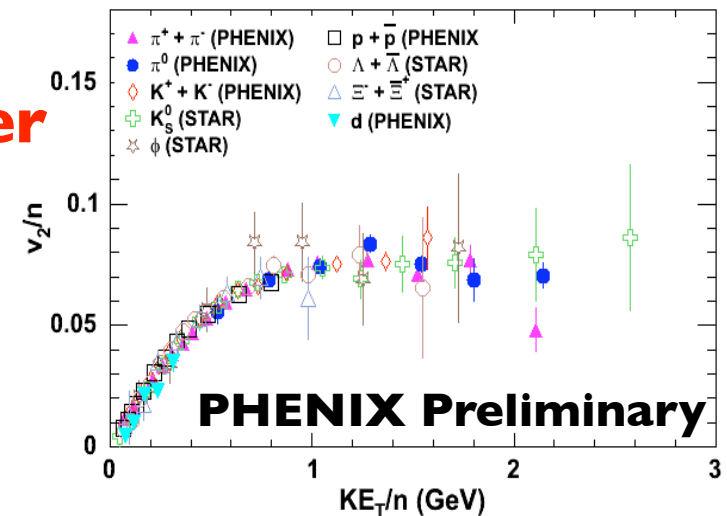


Strong Modifications to Away Jet Side Shape

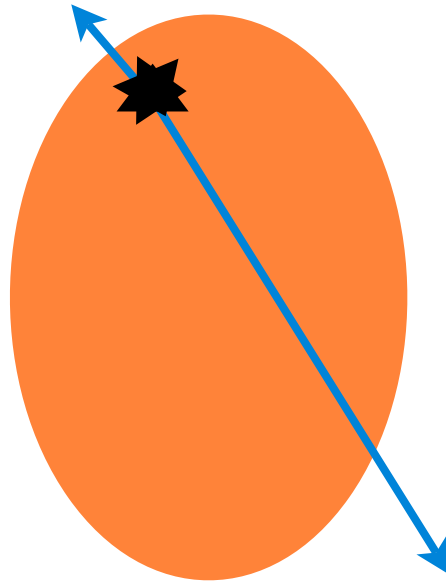


PRL 97 052301 (2006)

Quark Number Scaling of v_2



The Jet Picture



The Jet Picture

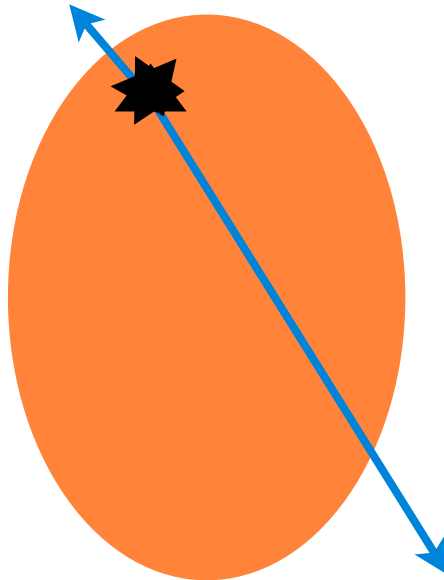
THE NEAR SIDE

defined by “high” p_T
particle: surface bias

recombination?

surface emission?

how do jet-like
correlations change
with centrality?



The Jet Picture

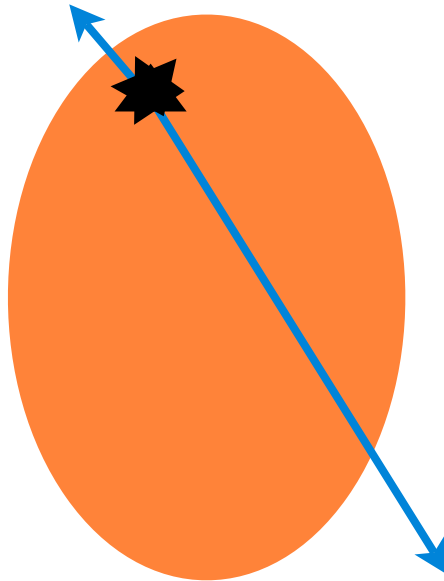
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THE AWAY SIDE

longer medium path
length

collective medium
response?

what can we learn from
the centrality
dependence?

The Jet Picture

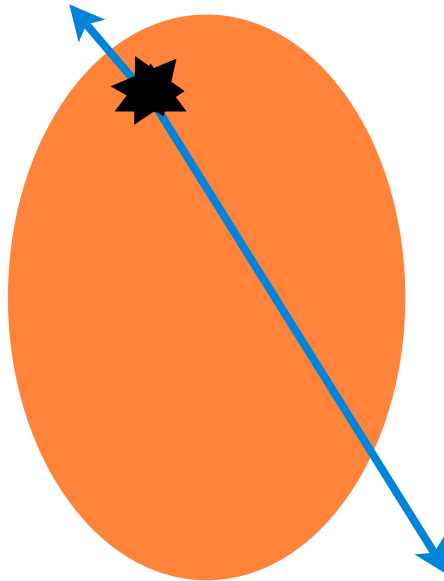
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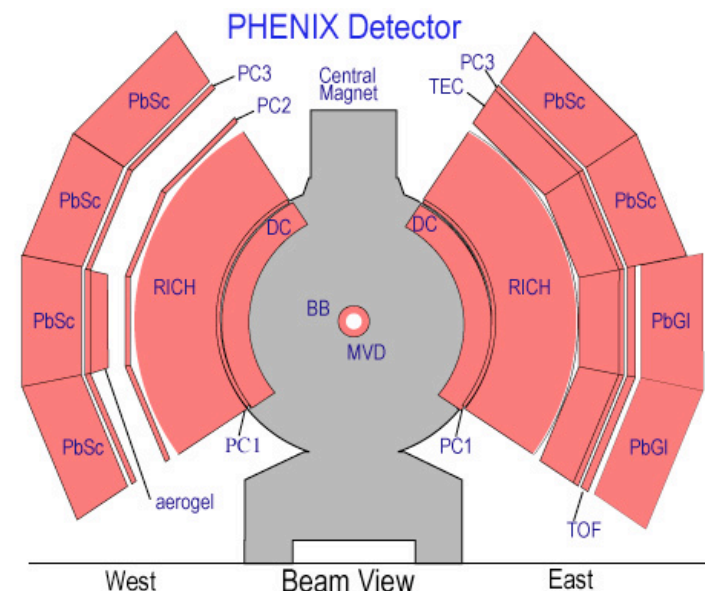
collective medium
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what can we learn from
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in light of the baryon/meson differences at intermediate p_T all jet questions should be addressed separately for baryons and mesons

Two particle correlations

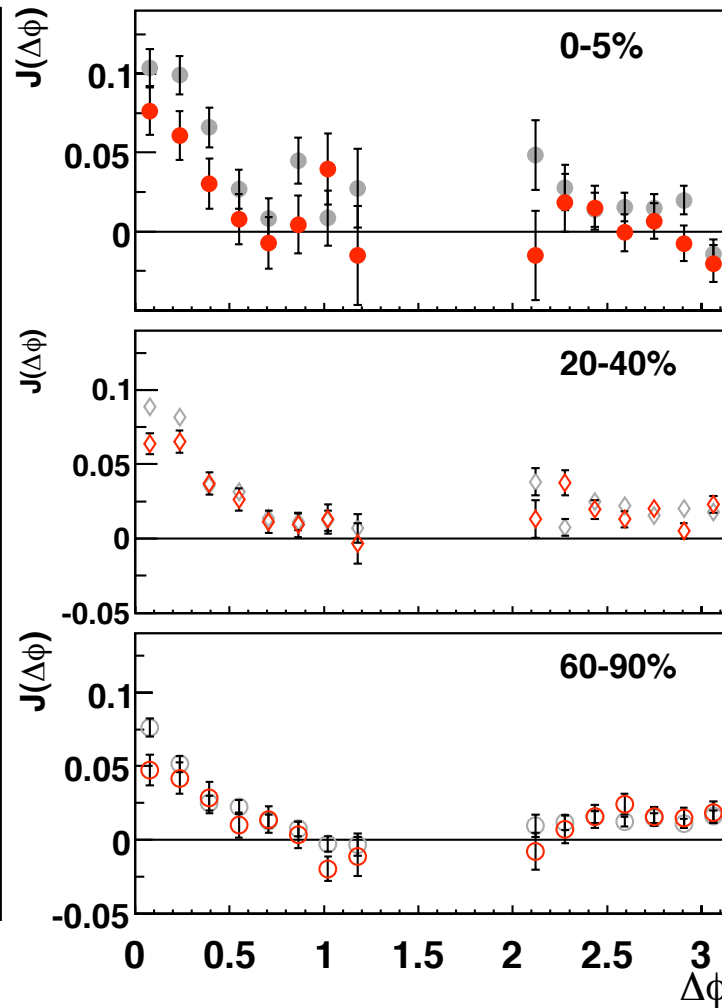
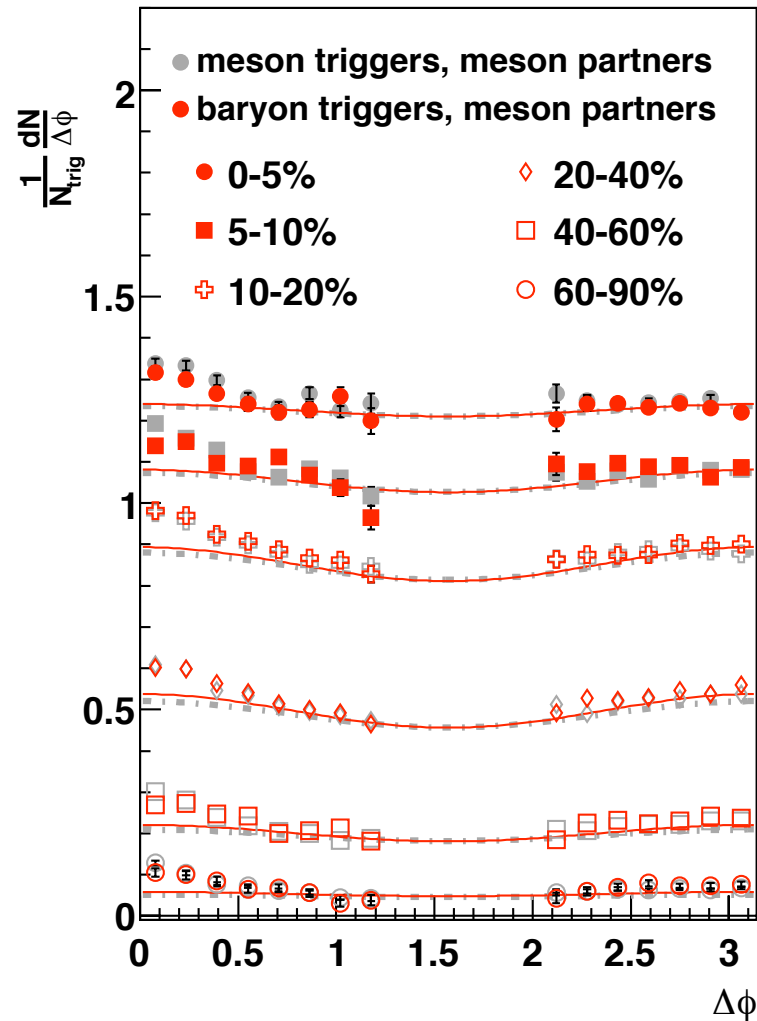
- trigger: higher p_T
- associated particles: lower p_T
- *not average jets: two fairly high z particles*
- two particle correlations great for studying jets as a function of particle type
 - in the comparisons between particle types the jet biases are the same
 - baseline established in small system (per.Au+Au or p+p)
- PHENIX has charged particle PID over entire azimuthal acceptance
 - TOF $\Delta\phi=\pi/4$ K/p separation $\sim 4\text{GeV}/c$
 - PbSc EMCal $\Delta\phi=3\pi/4$ K/p separation $\sim 2.5\text{GeV}/c$
 - correct for non-uniform azimuthal acceptance with event mixing



Baryon and Meson Triggered Jets



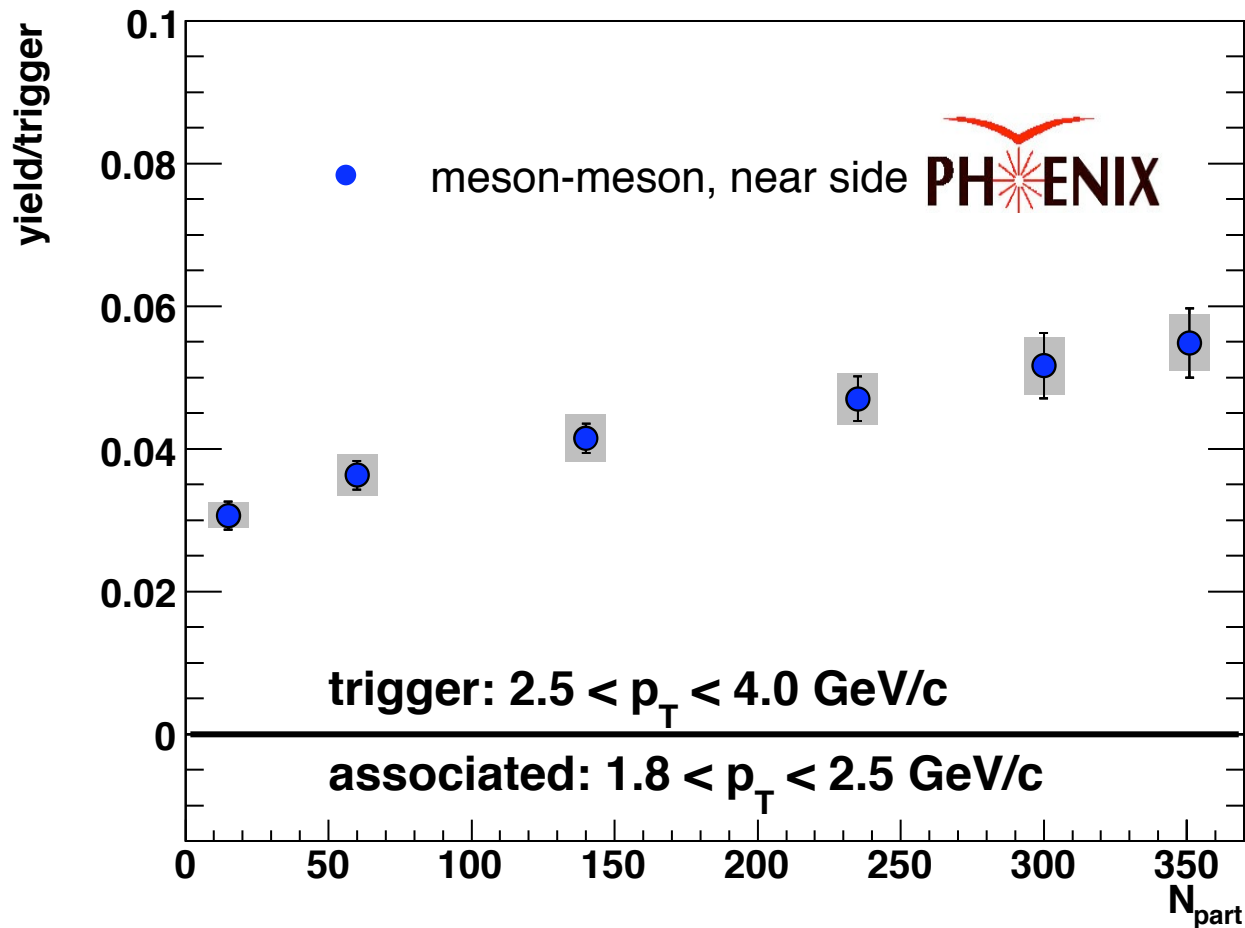
Jet Functions



trigger: $2.5 < p_T < 4.0 \text{ GeV}/c$
partner: $1.8 < p_T < 2.5 \text{ GeV}/c$

submitted to PLB, nucl-ex/0611016

baryons: $2.5 < p_T < 4.0 \text{ GeV}/c$

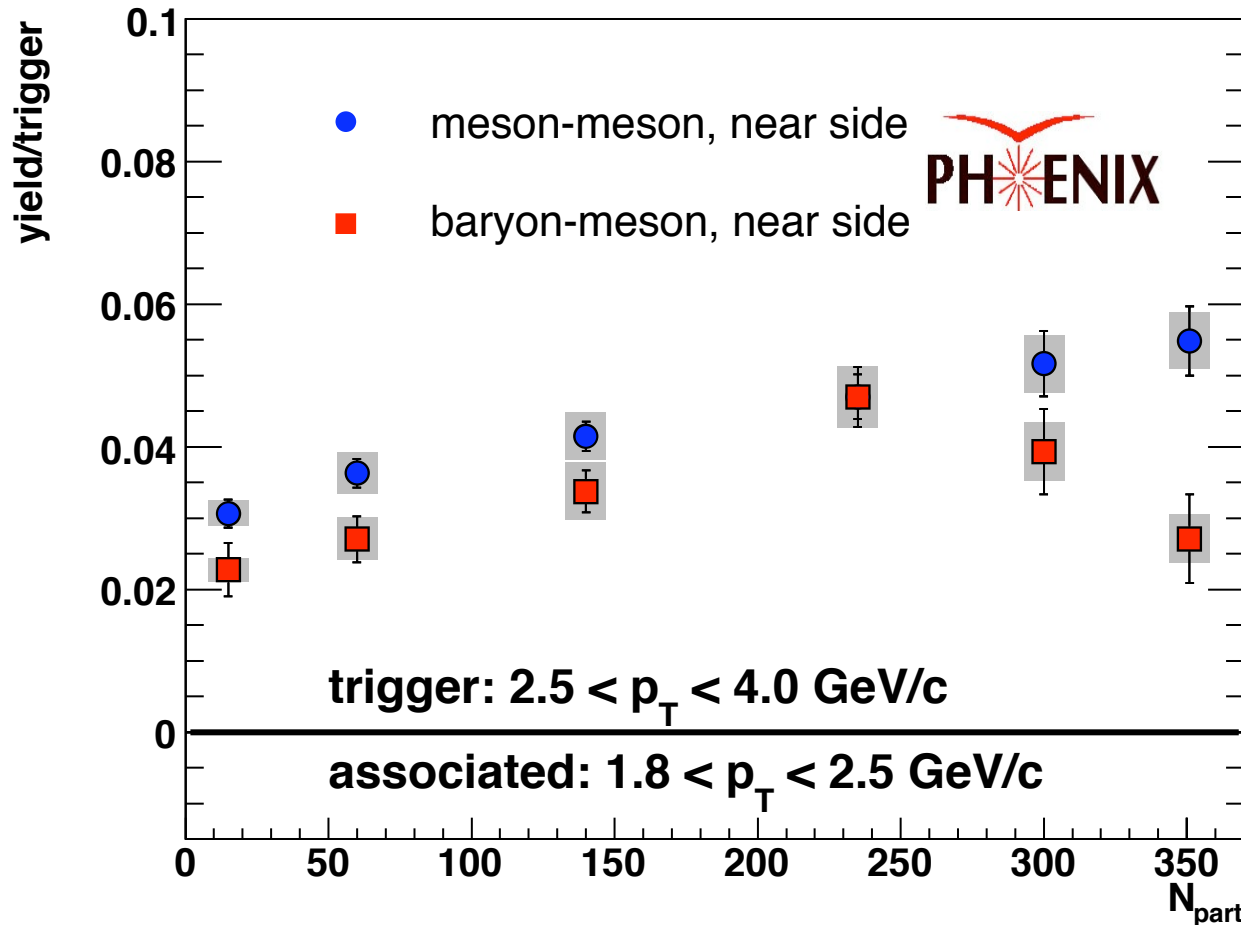


**meson-meson:
steady increase**

submitted to PLB, nucl-ex/0611016

baryons: $2.5 < p_T < 4.0 \text{ GeV}/c$

trigger baryons are correlated with mesons, but the centrality dependence different than for mesons!



**meson-meson:
steady increase**

**baryon-meson:
increase, then decrease**

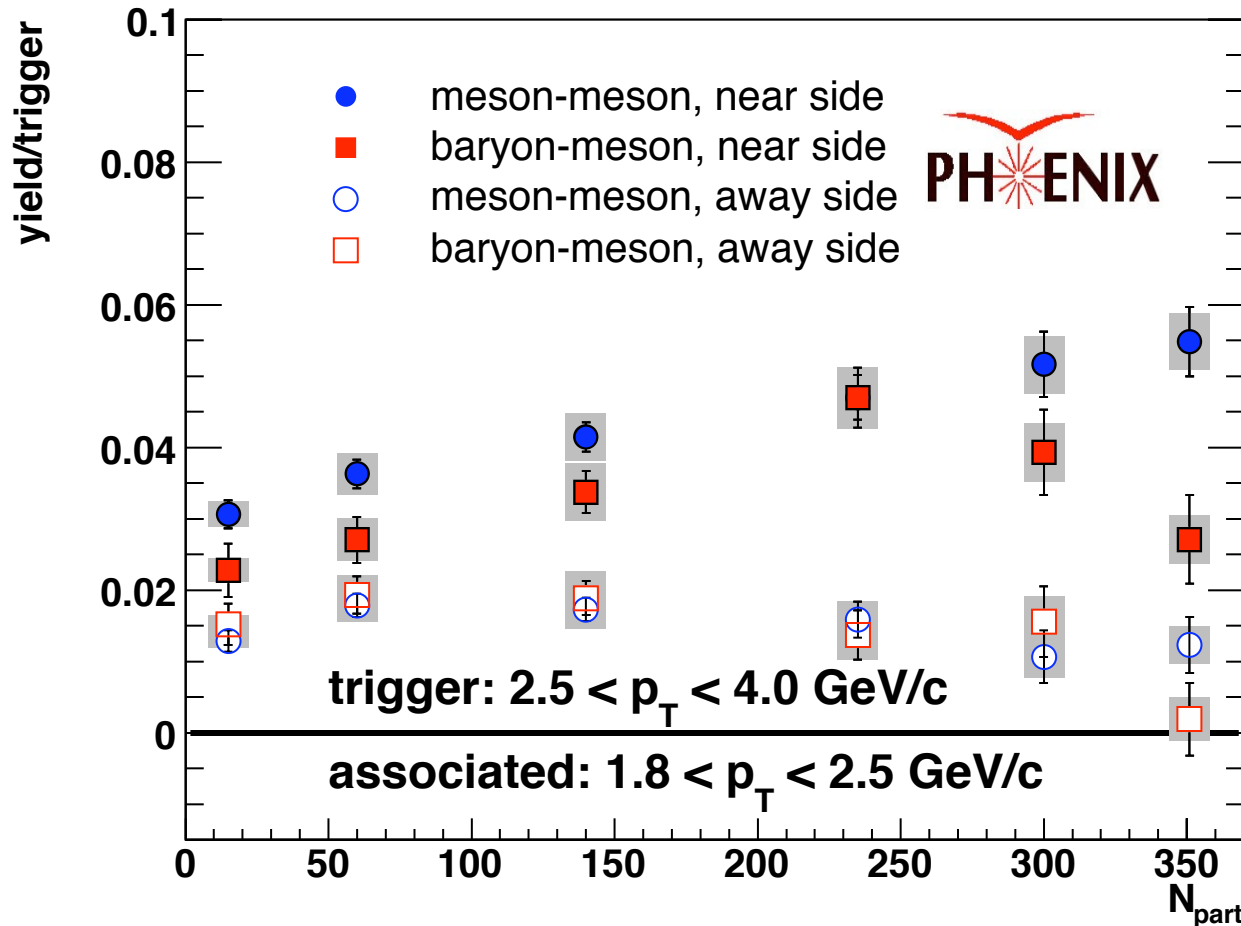
$\bar{p}/\pi = 0.25$

$\bar{p}/\pi = 0.8$

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**meson-meson:
steady increase**

**baryon-meson:
increase, then decrease**

**away side:
no trigger dependence**

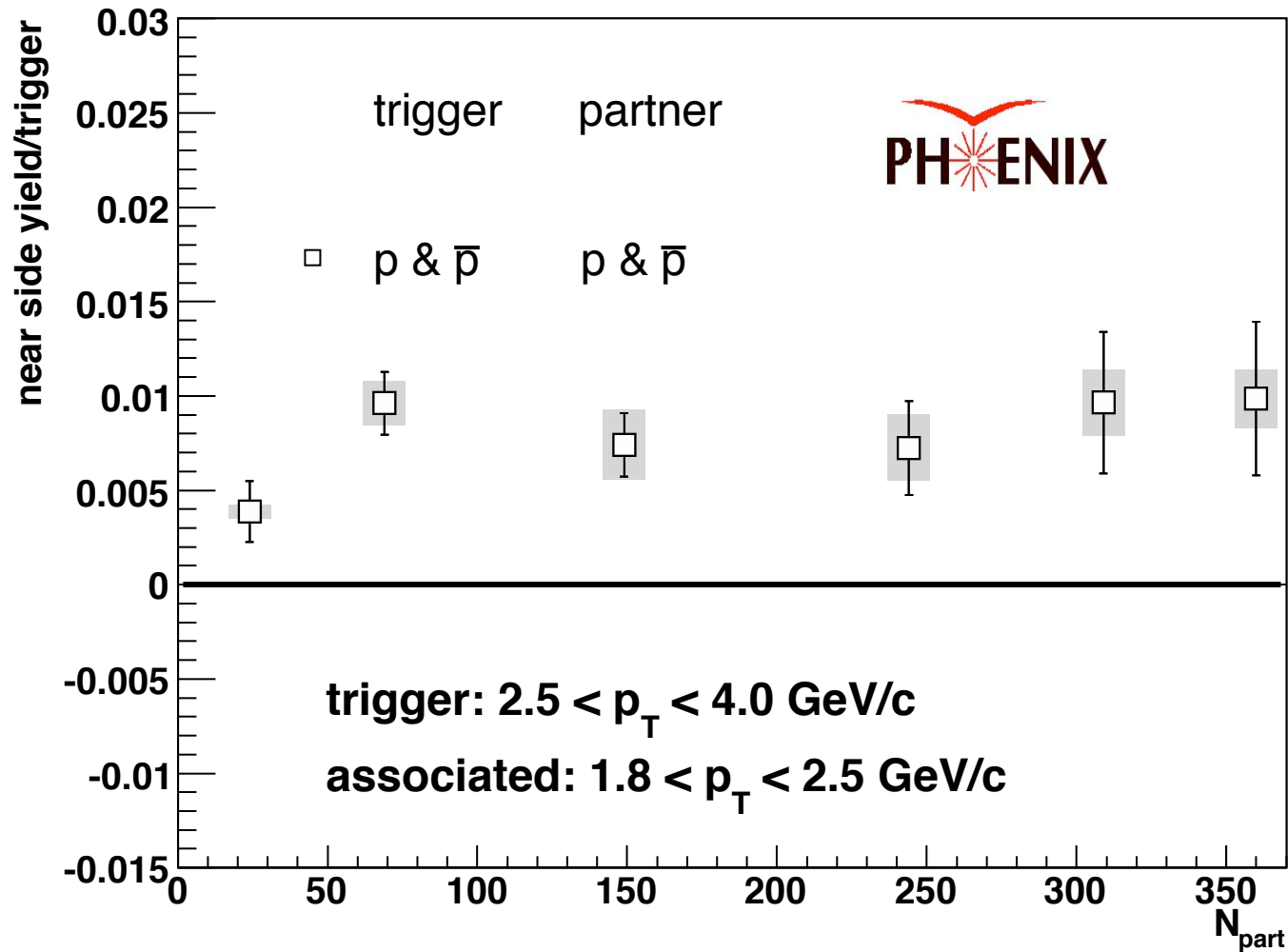
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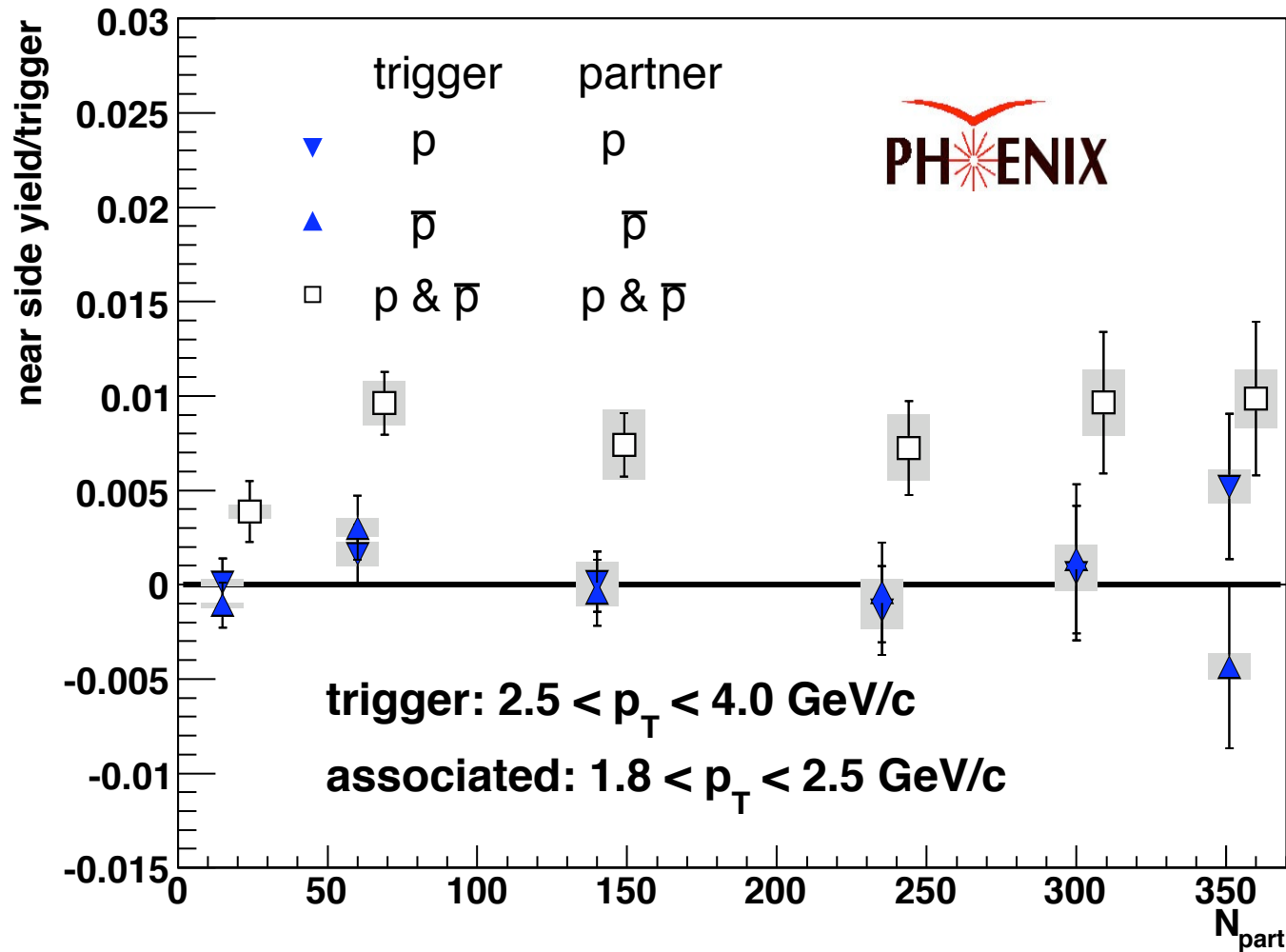
p & \bar{p} Correlations

submitted to PLB, nucl-ex/0611016



ρ & $\bar{\rho}$ Correlations

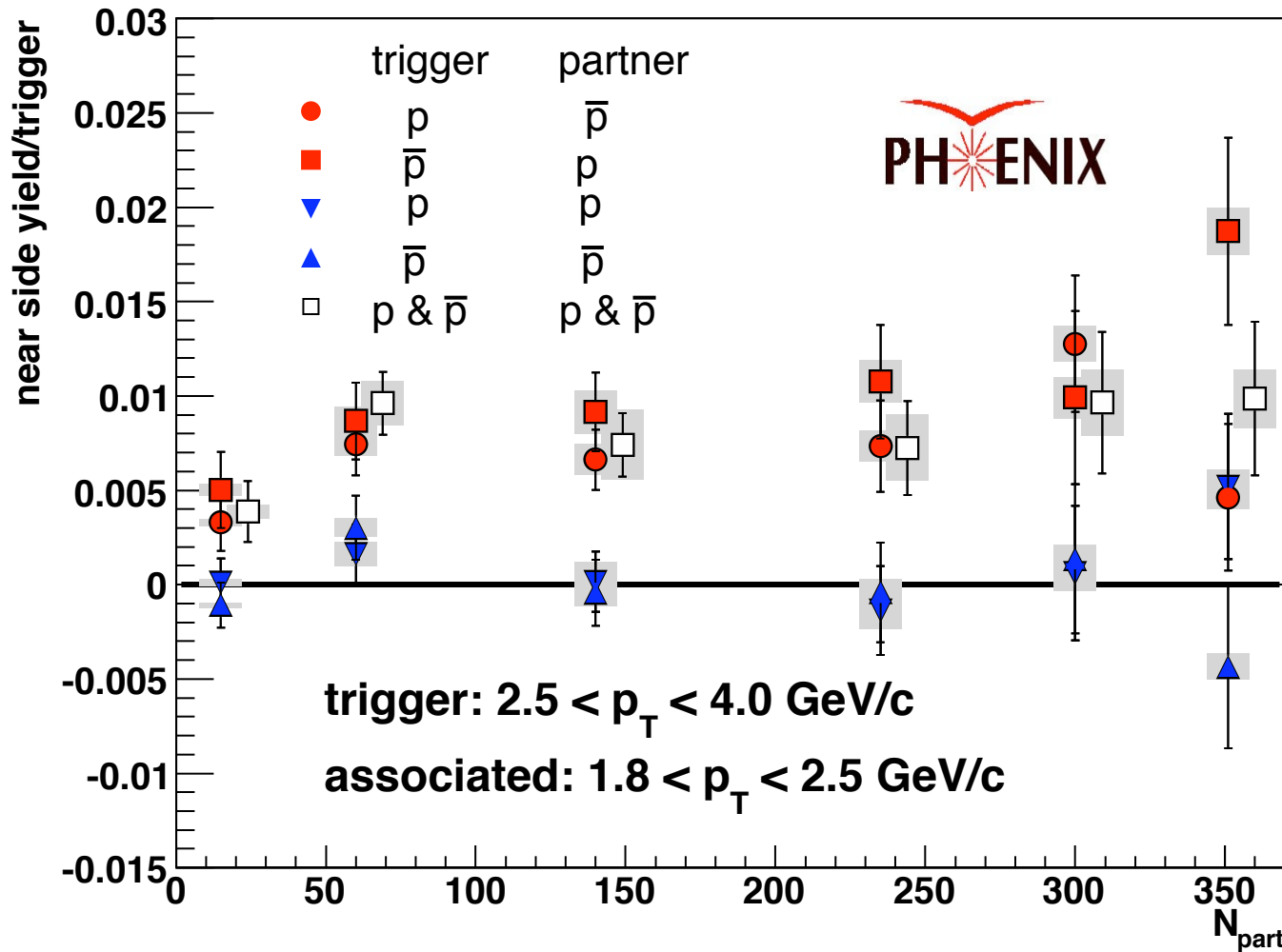
submitted to PLB, nucl-ex/0611016



same sign pairs:
NO CORRELATION

ρ & $\bar{\rho}$ Correlations

submitted to PLB, nucl-ex/0611016



**opposite sign pairs:
CORRELATED**

**same sign pairs:
NO CORRELATION**

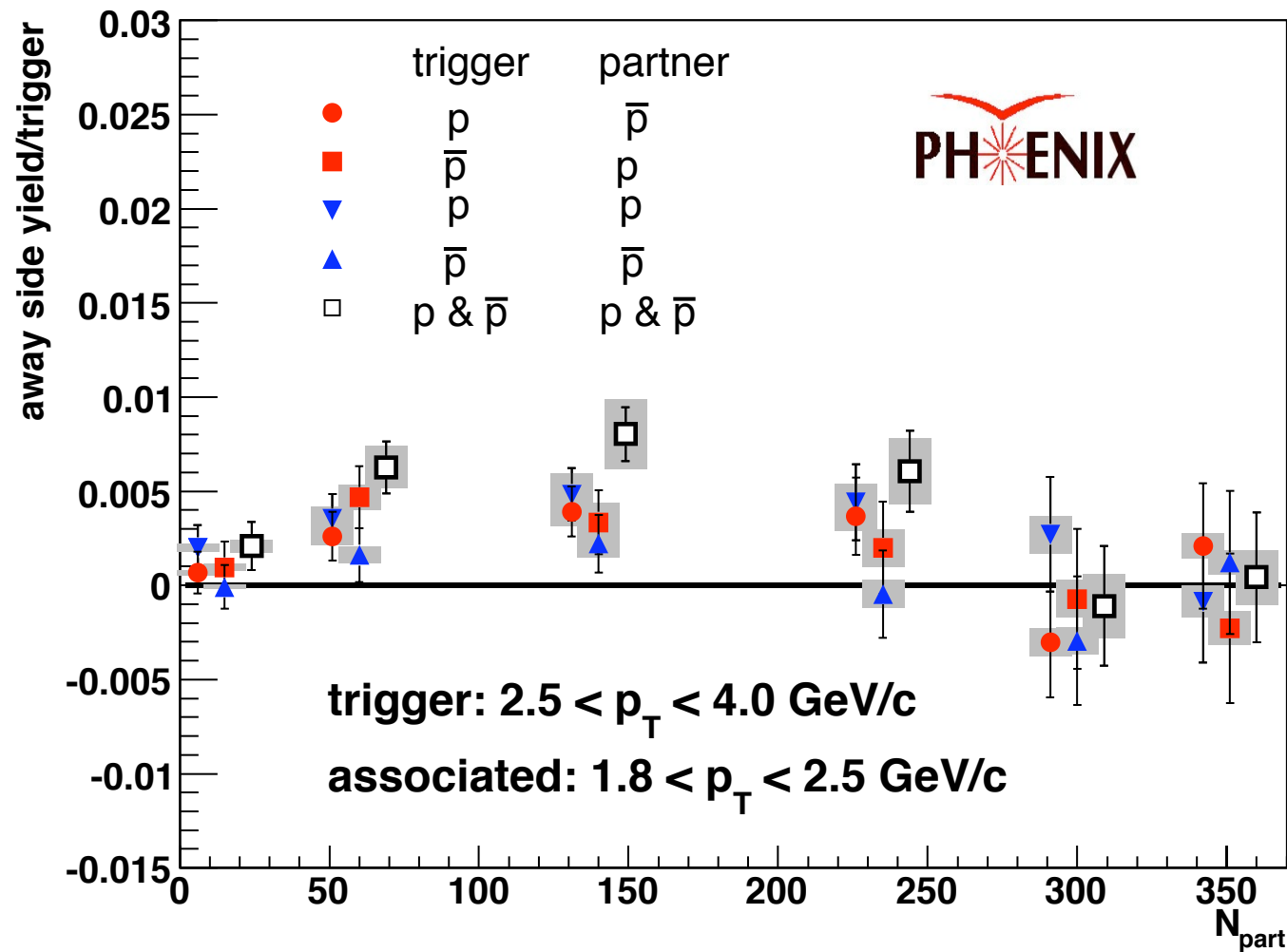
$\bar{p}/\pi=0.25$

$\bar{p}/\pi=0.8$

p - \bar{p} pair correlations nearly independent of baryon excess

Away Side p - \bar{p} Correlations

submitted to PLB, nucl-ex/0611016



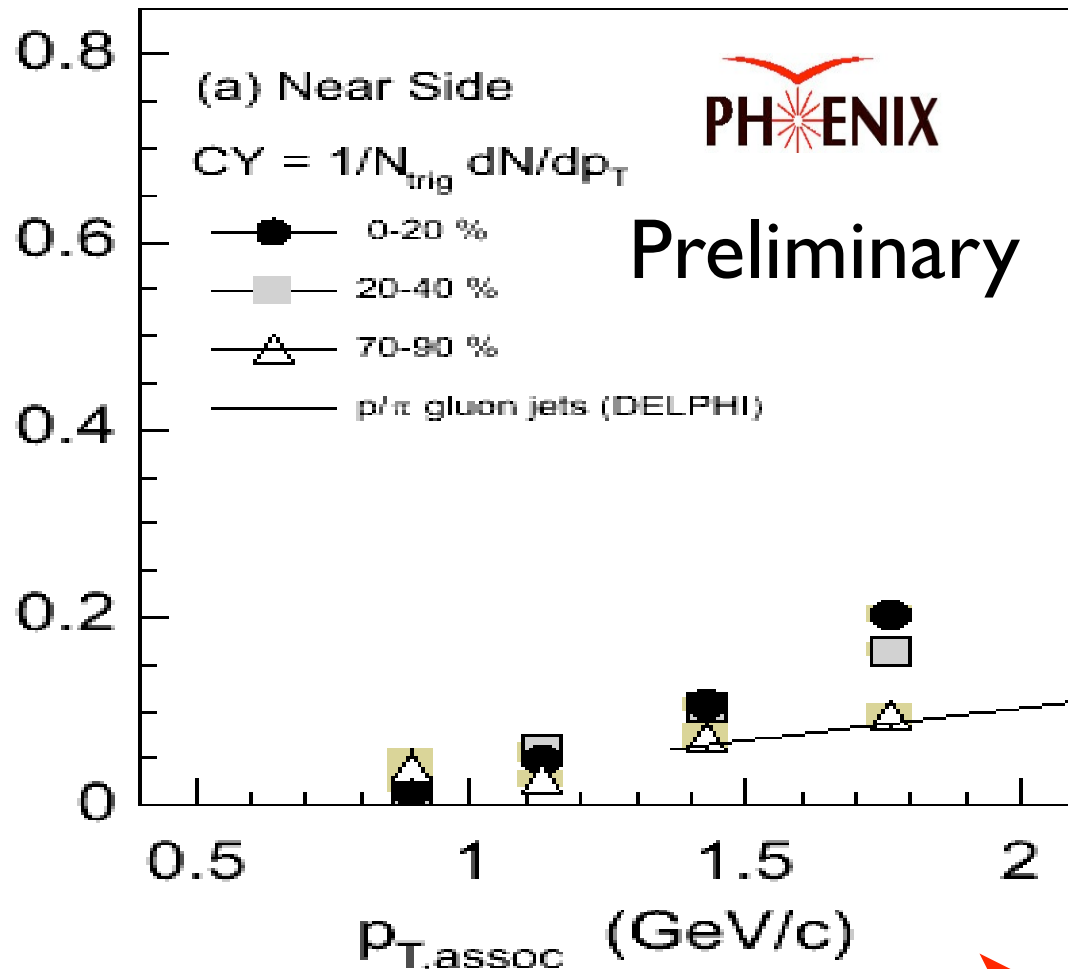
no charge dependence on the away side!

A Closer Look at the Associated Particles...

Near Side: Baryons vs Mesons

hadron trigger

assoc. baryons/assoc. mesons



trigger: $2.5 < p_T < 4.0 \text{ GeV}/c$

increasing
centrality

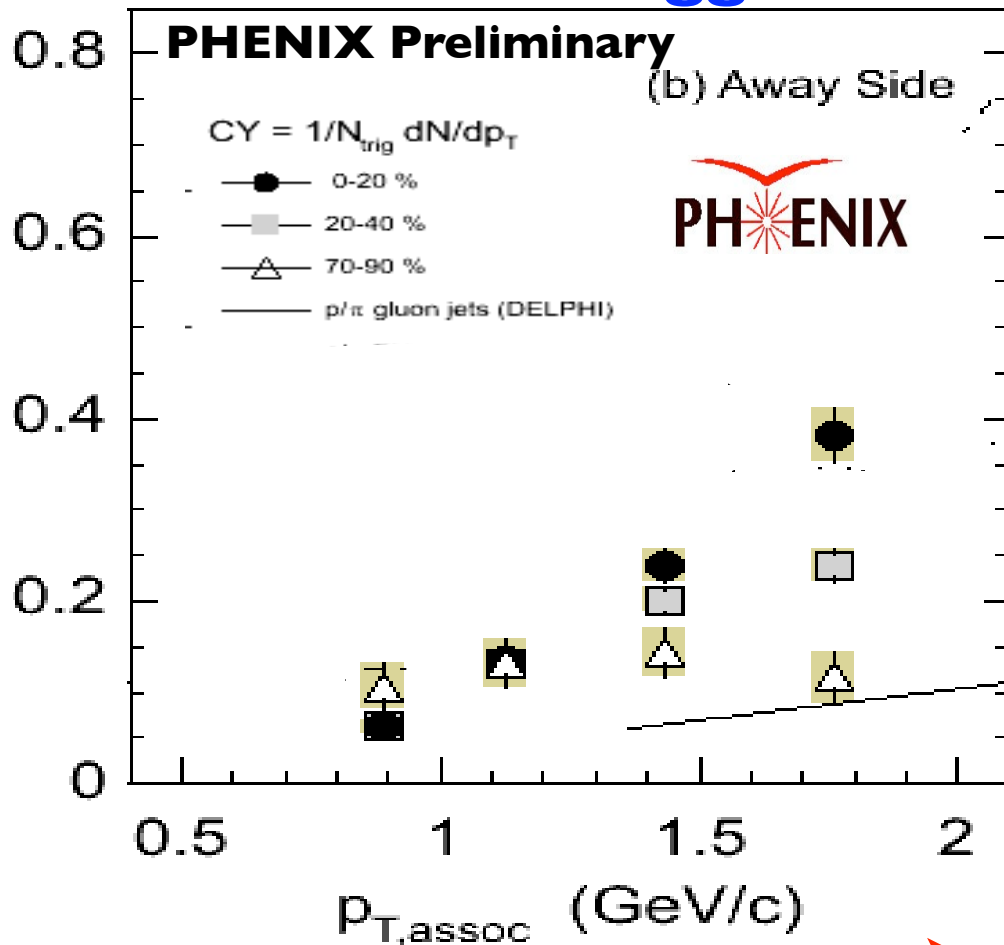
increasing p/π- ratio

extra baryons in near side correlations!

Away Side: Baryons vs Mesons

assoc. baryons/assoc. mesons

hadron trigger



trigger: $2.5 < p_T < 4.0 \text{ GeV}/c$



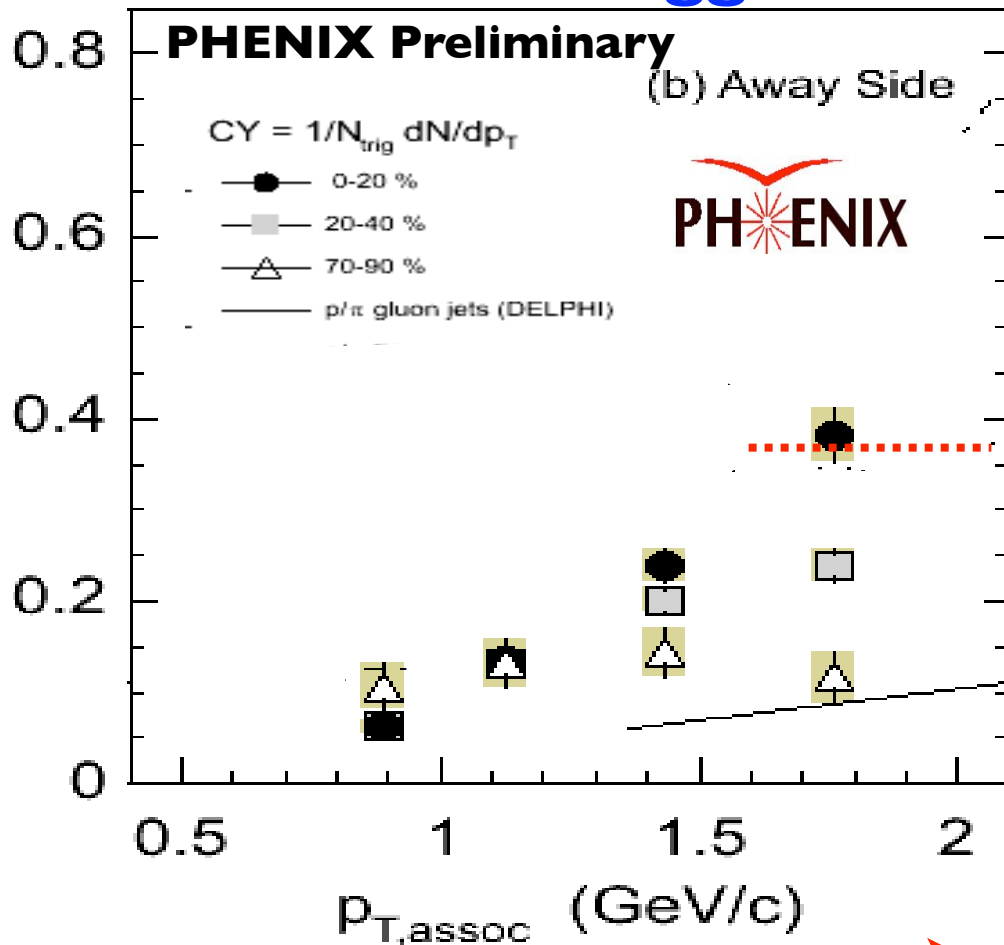
increasing centrality

increasing p/π- ratio

Away Side: Baryons vs Mesons

assoc. baryons/assoc. mesons

hadron trigger



trigger: $2.5 < p_T < 4.0 \text{ GeV}/c$

baryon/meson ratio single particles
central Au+Au 1.85 GeV/c
PHENIX (PRC 69 034909 (2004))



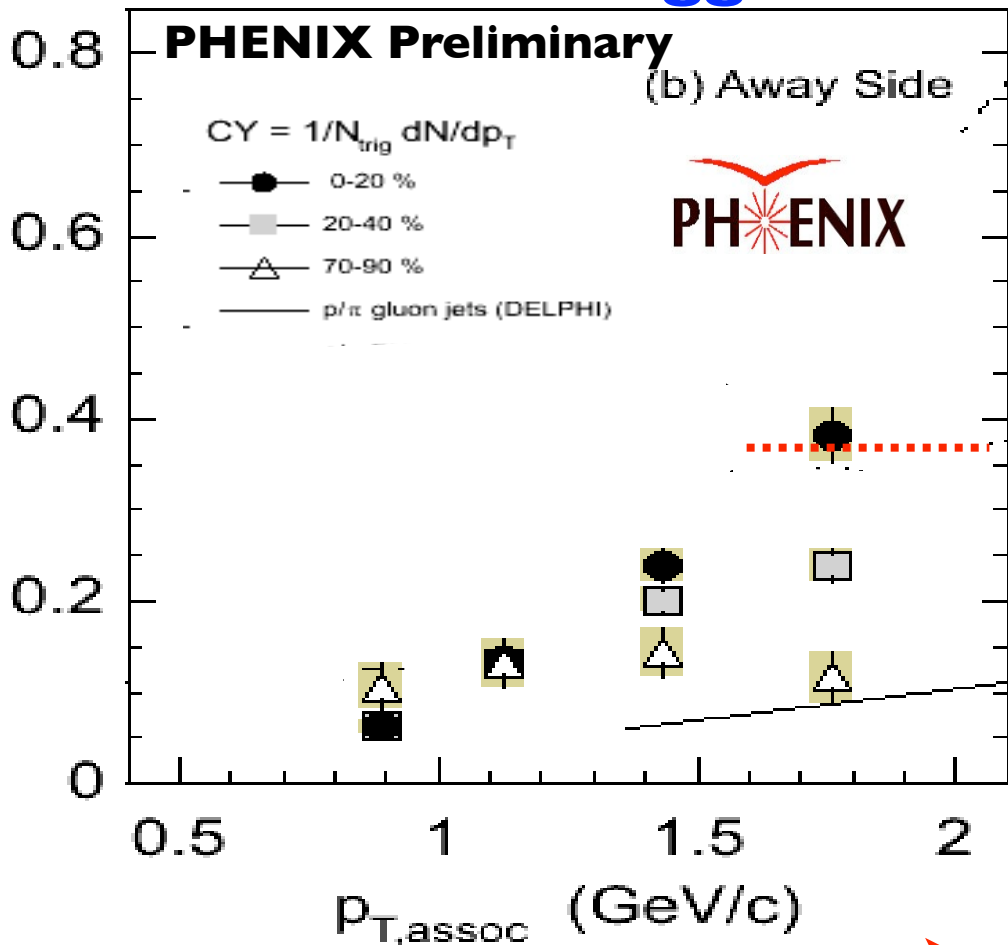
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increasing
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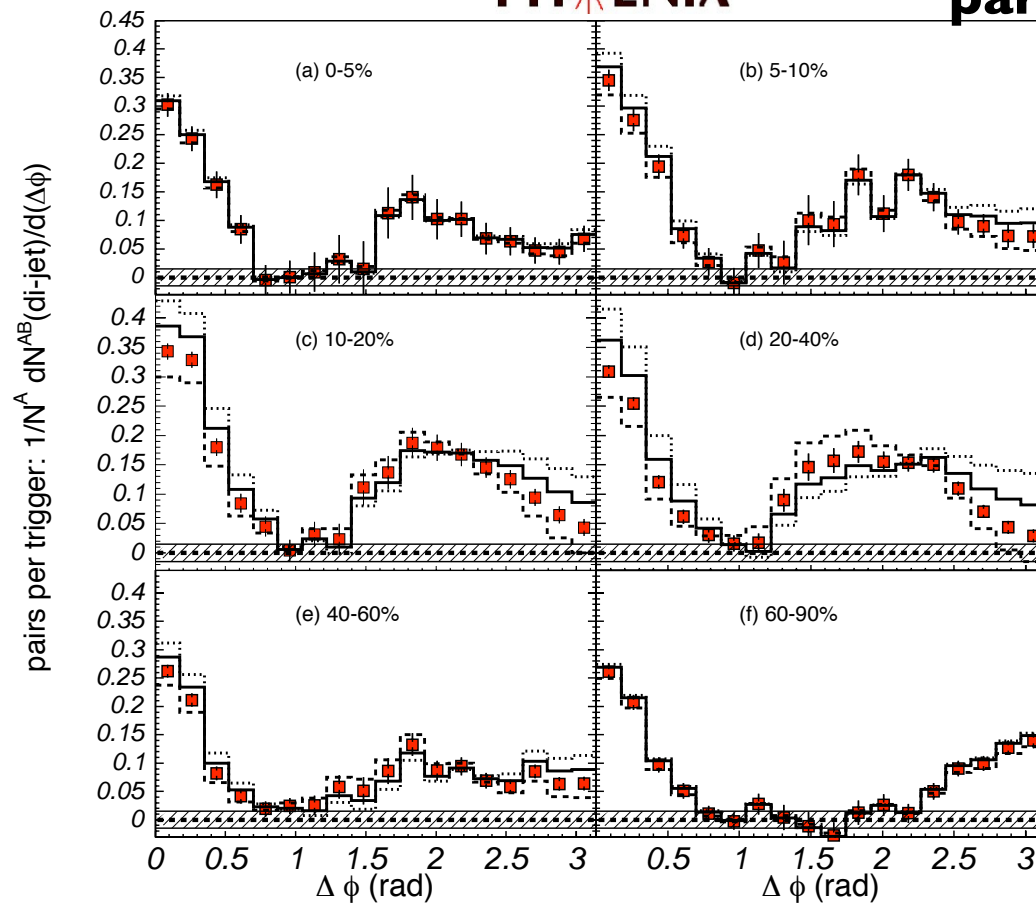
stronger centrality dependence than near side, similar to single particles

Away Side Shape Modifications

PRL 97 052301 (2006)



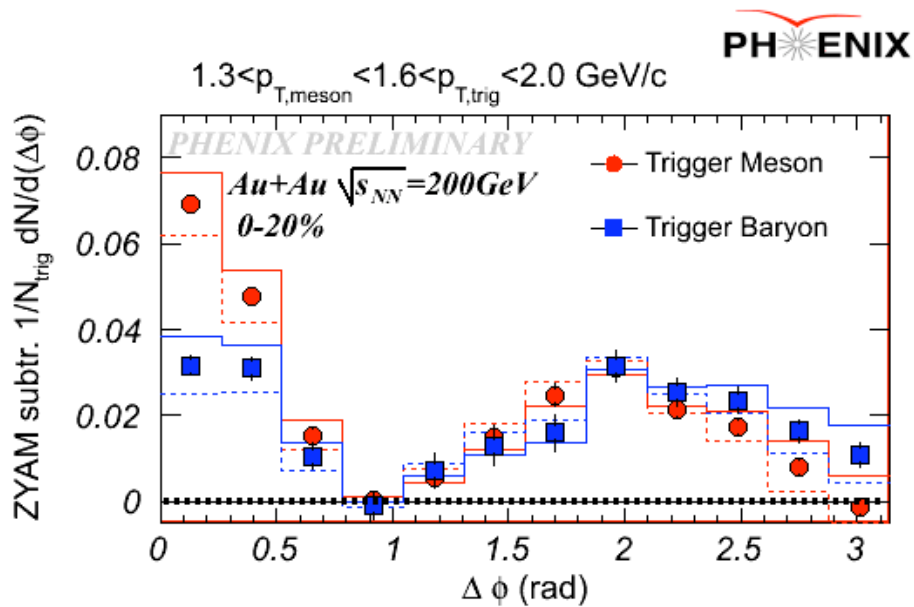
trigger: $2.5 < p_T < 4.0 \text{ GeV}/c$
partner: $1.0 < p_T < 2.5 \text{ GeV}/c$



Is this shape different for baryons and mesons?

Shape Modifications: Low p_T

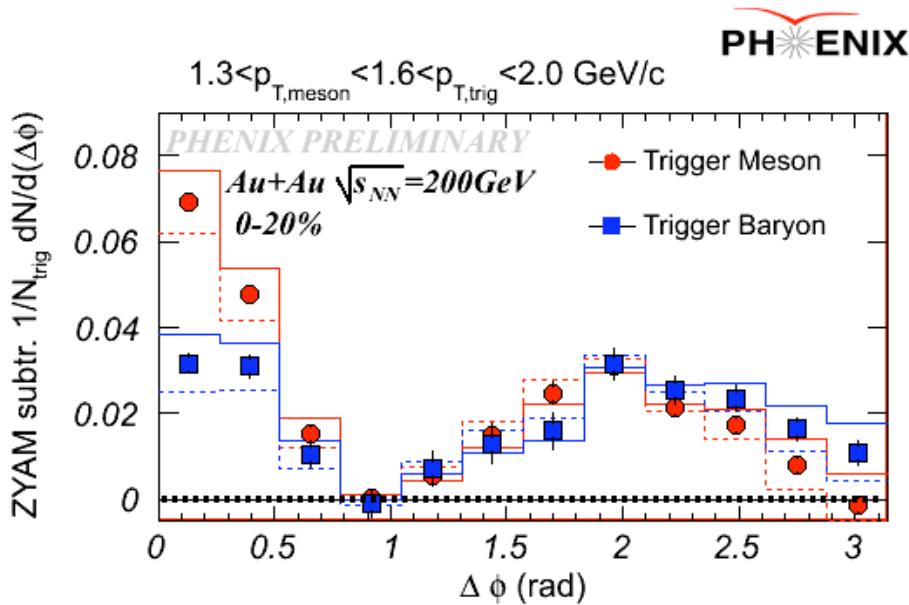
trigger: $1.6 < p_T < 2.0 \text{ GeV}/c$
 partner: $1.3 < p_T < 1.6 \text{ GeV}/c$



Displaced peak about the same place as at higher p_T

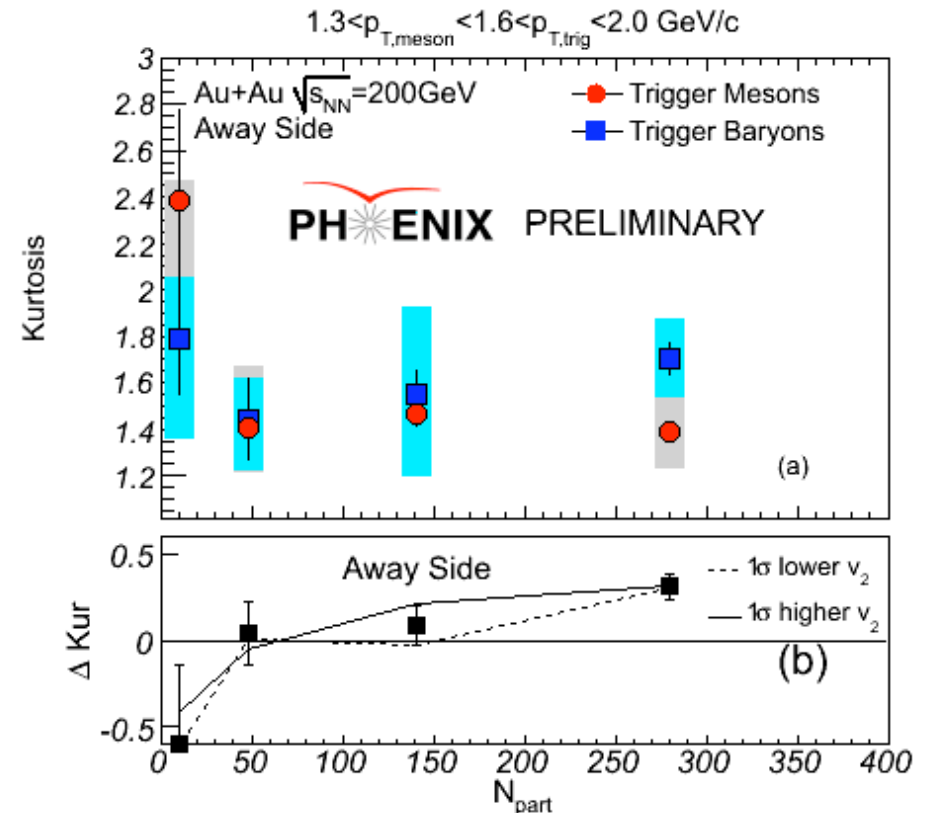
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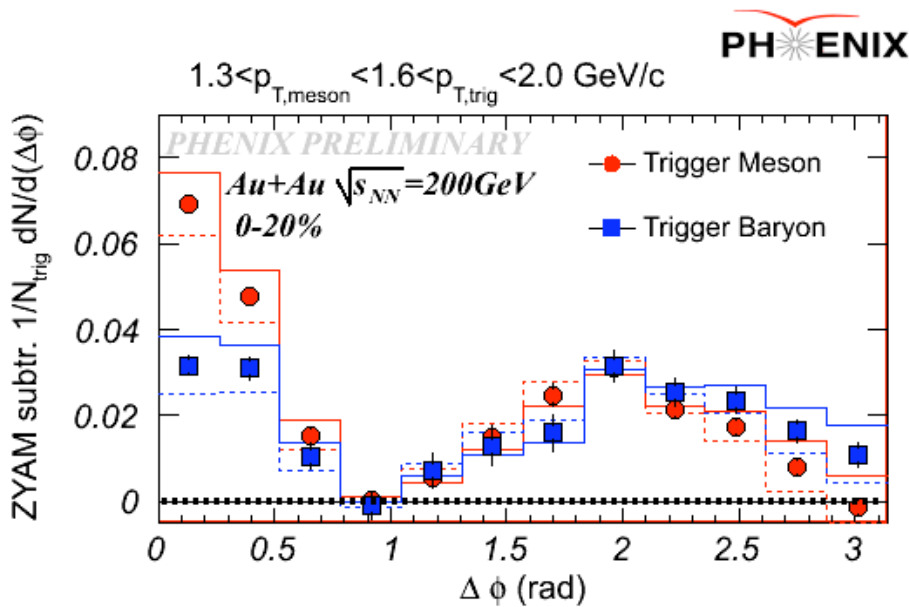
Displaced peak about the same place as at higher p_T

Kurtosis (μ_4/μ_2^2)



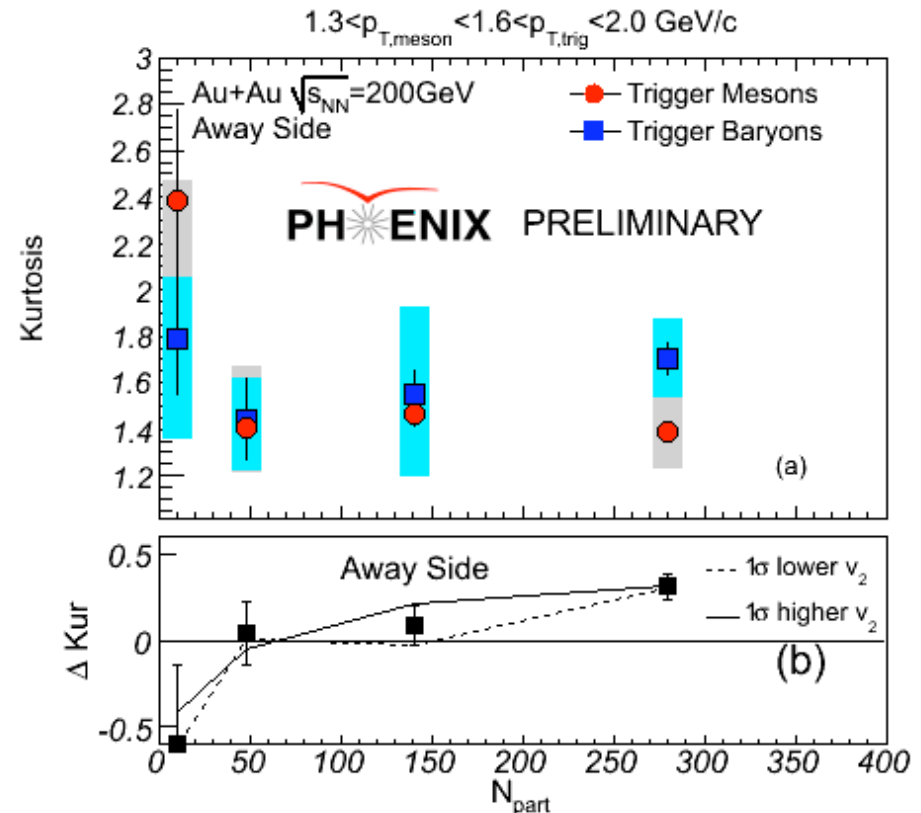
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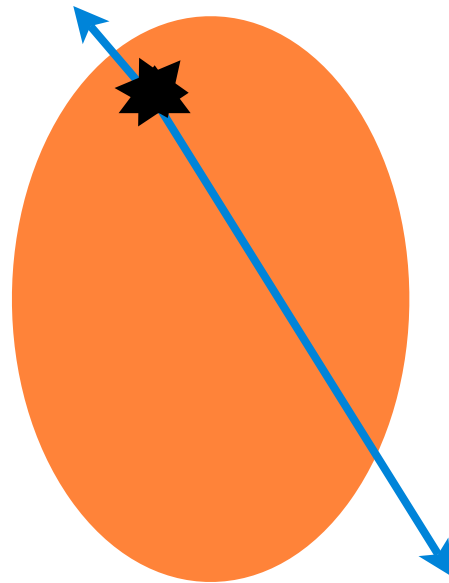
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Kurtosis (μ_4/μ_2^2)



hints of shape differences between baryon and meson triggers in central Au+Au

The Jet Picture @ Intermediate p_T



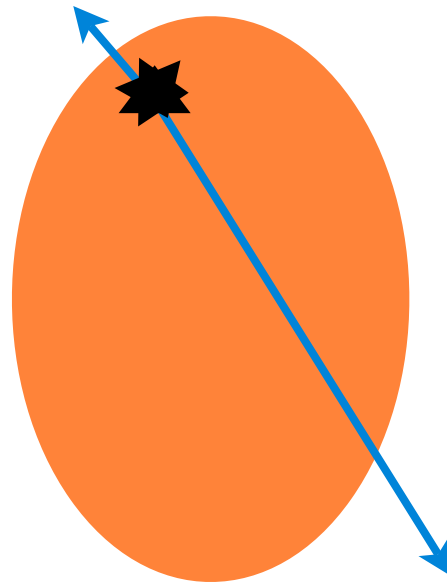
The Jet Picture @ Intermediate p_T

THE NEAR SIDE

correlated p & \bar{p}
at all centrality

increase in jet pairs/
trigger
with centrality

increase in assoc.
baryon/meson ratio
in central Au+Au



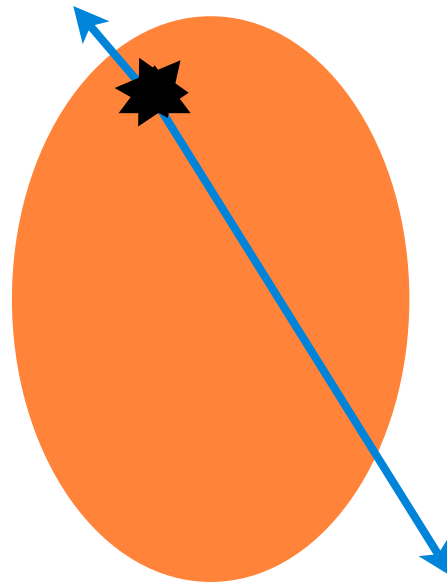
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THE AWAY SIDE

away side assoc.
baryon/meson ratio
similar to single
particles

hints of trigger type
dependence of away
side jet shape @ low
 p_T

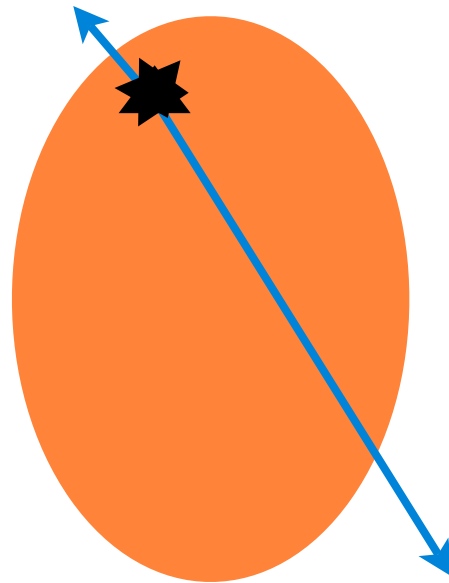
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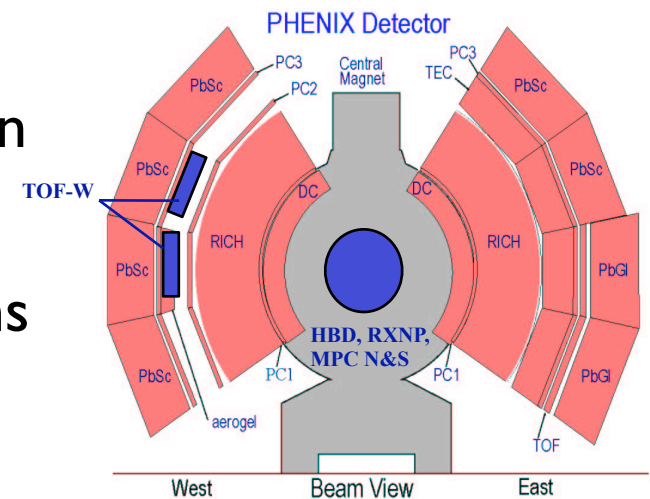
away side assoc.
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hints of trigger type
dependence of away
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 p_T

Many connections between jets and baryon excess seen on both the near and away side

Where Next?

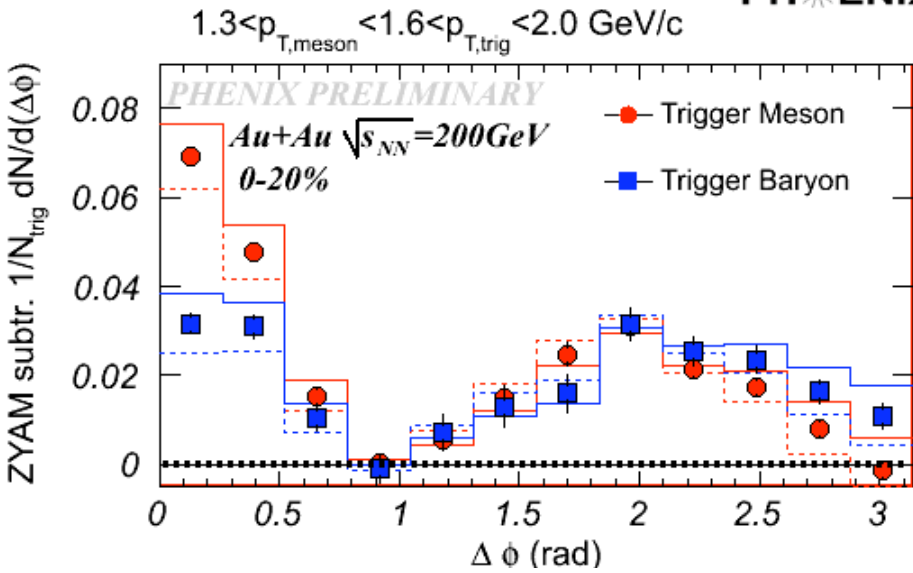
- systematically explore p_T dependence
- how are baryon triggered jets different than meson triggered jets
- quantify associated away side baryon/meson ratio compared to single particles
- away side shape for assoc. baryon & mesons
- PHENIX upgrade: TOF.W ($\sigma \approx 100\text{ps}$)
- installed for Run 7 & doubles high p_T ($>2.5\text{GeV}/c$) PID acceptance
- placement helps measurements of PID dependence of away side jet shape



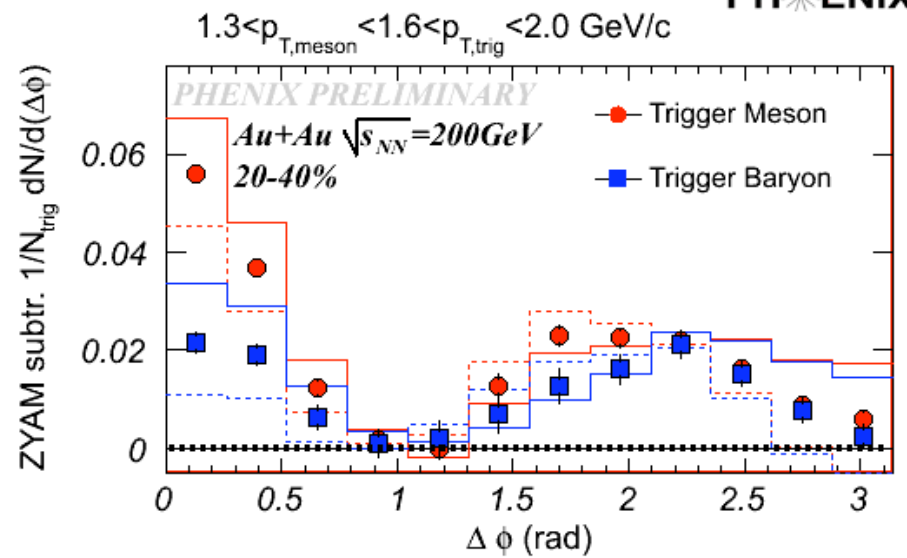
Backups

Low p_T Jet Shapes

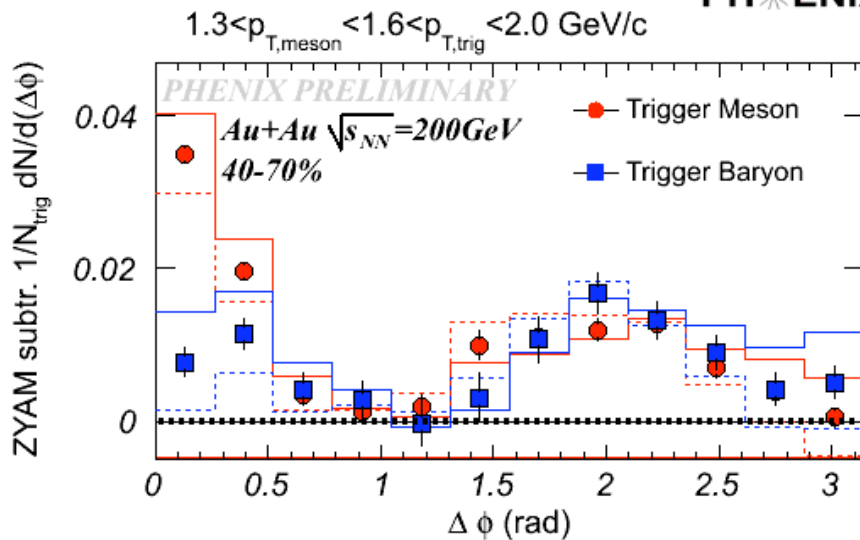
PHENIX



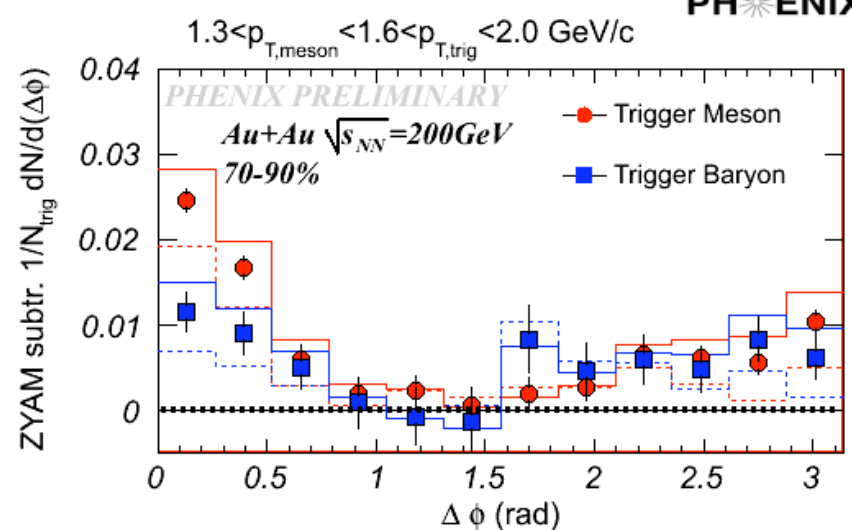
PHENIX



PHENIX



PHENIX



Away Side RMS

trigger: $1.6 < p_T < 2.0 \text{ GeV}/c$
 partner: $1.3 < p_T < 1.6 \text{ GeV}/c$

