

Azimuthal correlations with identified strange trigger particles in Cu+Cu collisions at $\sqrt{s_{NN}} = 200$ GeV at RHIC



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APS April Meeting, 15 April 2007, Jacksonville, Florida

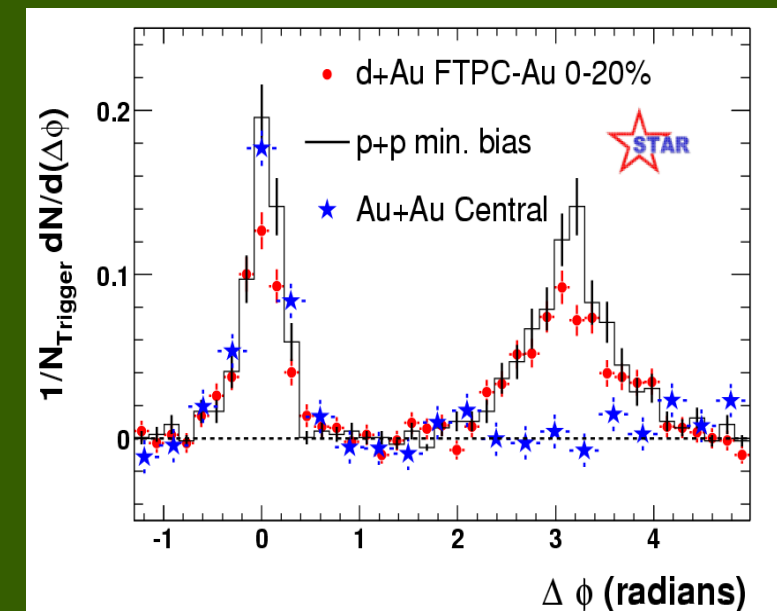
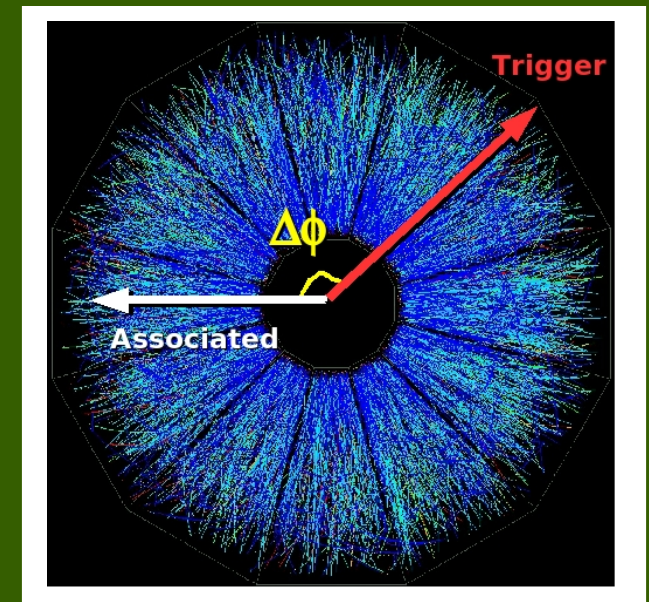


Outline

- Motivation
- Analysis technique
- Results
- Conclusions

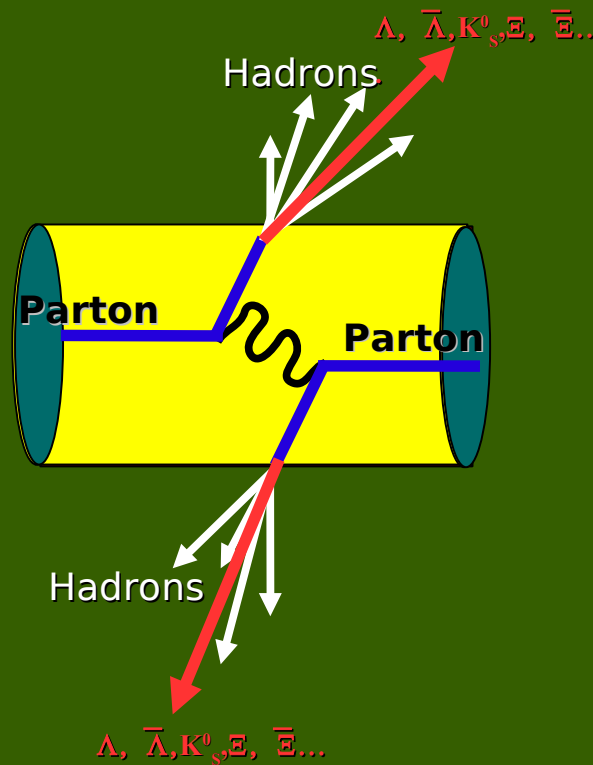
Motivation - Jets as probes of the medium

- Hard parton scattering => back-to-back jets
 - Good probes of medium produced at RHIC
- High multiplicity in A+A events
 - Individual jets cannot be identified
 - Studied using azimuthal correlations
- Modification of away side seen in Au+Au relative to p+p and d+Au



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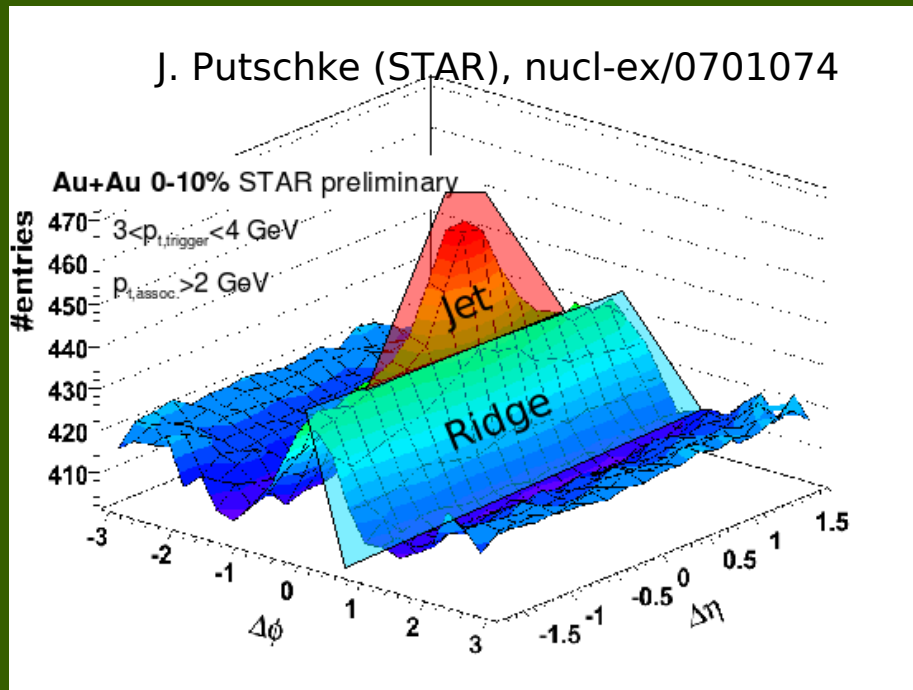
Motivation - particle identification in jets



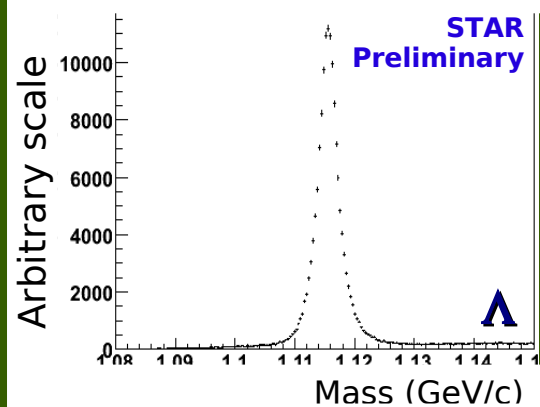
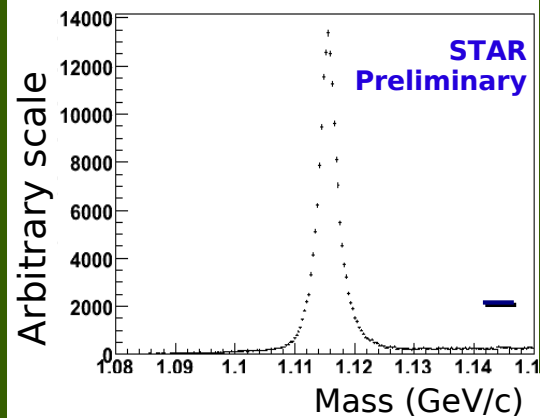
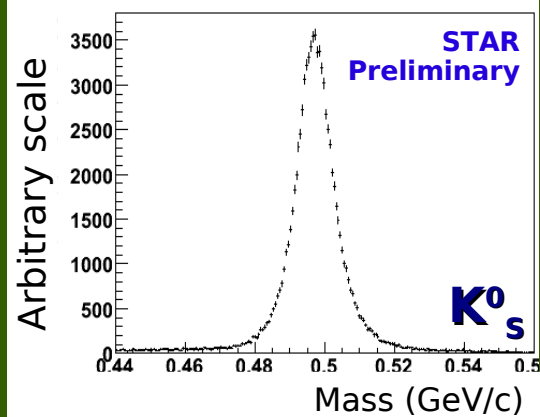
- Particle/antiparticle differences
 - Quark vs gluon jets
- Meson/baryon differences
 - Coalescence/ recombination mechanisms
 - Consistent with particle ratios
 - Testable with identified particle correlations?

Motivation - Long-range pseudorapidity correlations

- Long-range pseudorapidity (η) correlations observed by STAR in Au+Au
- Near side jet peak sits on plateau (Ridge)
 - Significant contribution to the near-side yield in central Au+Au
- Look for particle and system size dependencies which might reveal information about production mechanism

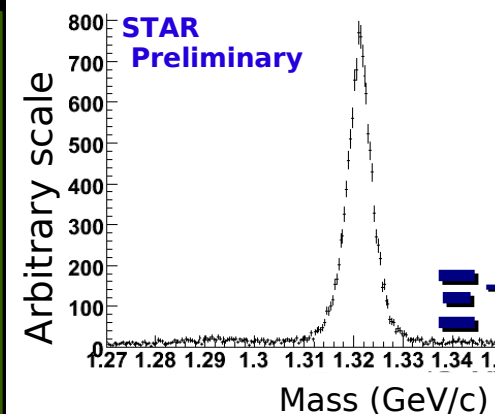
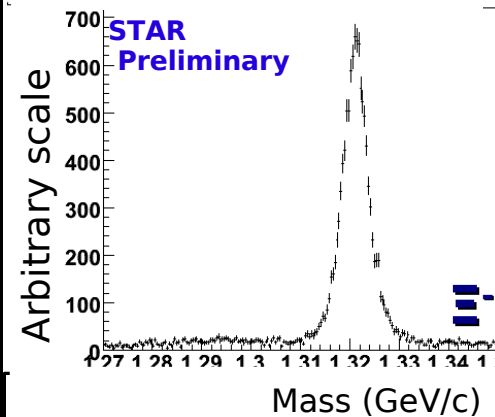
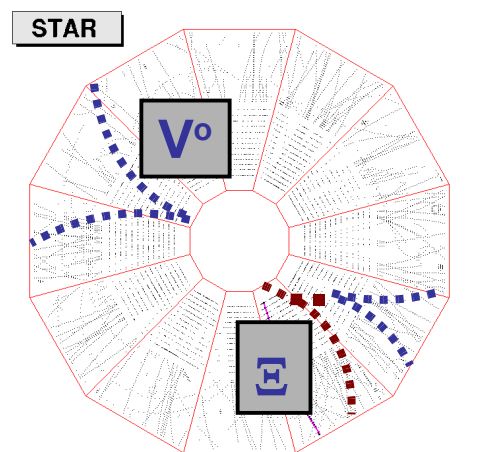


Identification of strange particles in Cu+Cu



2.0 GeV < p_T < 2.5 GeV
0-10%

- K_S^0 , $\bar{\Lambda}$ and Ξ identification
 - Reconstruction (secondary) decay vertices
 - Identification out to high p_T
 - Pure samples
- Identified particles used for triggers

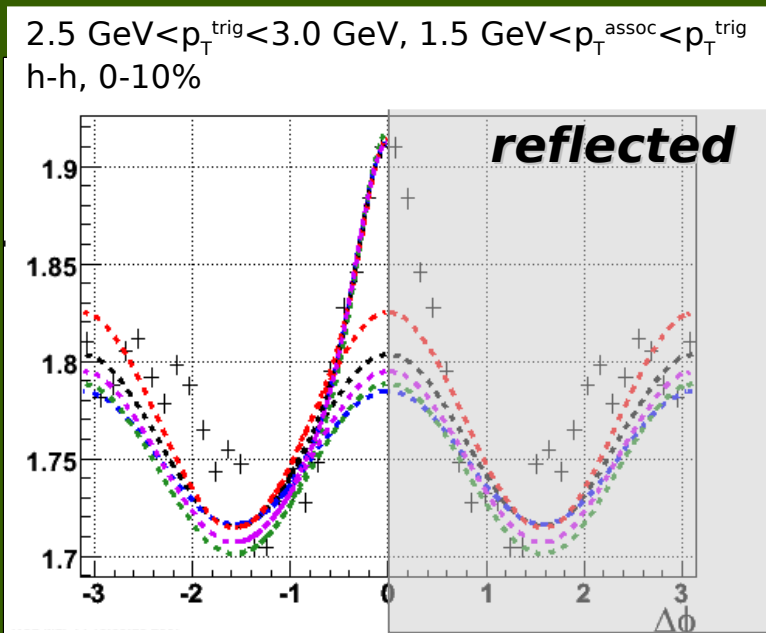


2.0 GeV < p_T < 2.5 GeV
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Determination of yields and errors

- Background: $B(1+2 v_2^{\text{trig}} v_2^{\text{assoc}} \cos(2\Delta\Phi))$
- Different fit methods for determination of B



- fit with ZYAM with 3 points, best v_2
- - - - - - fit with ZYAM with 3 points, high v_2
- fit with ZYAM with 3 points, low v_2
- - · - · - fit with ZYAM with 1 point
- - - - - - fit with background as free parameter

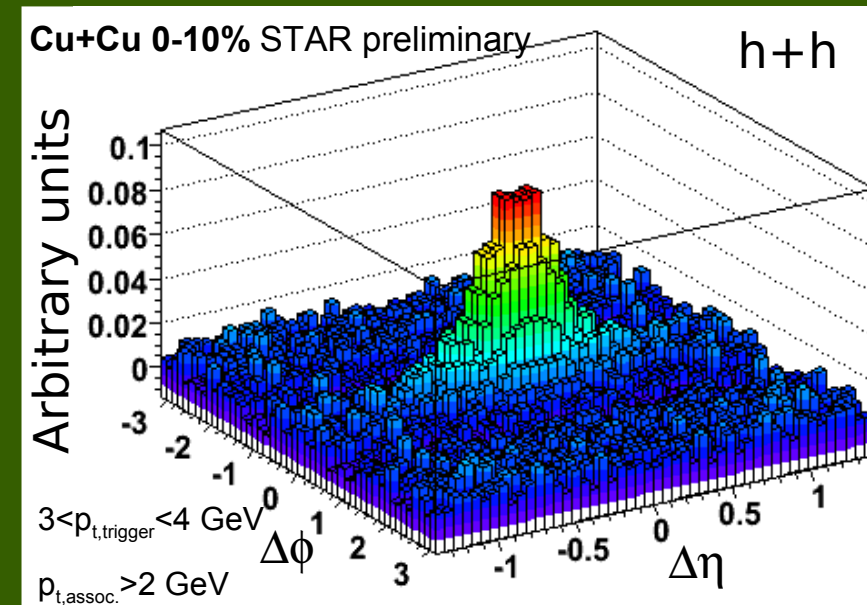
- Zero Yield At Minimum (ZYAM)
- 1 point, 3 points (used as best guess)
- B as Free parameter
 - used to determine errors on yield from B

- v_2 error

- v_2 measurements in progress
- $\Lambda, \bar{\Lambda}, K_S^0, \Xi^-, \Xi^+ v_2$ not measured
 - Assume quark scaling of h v_2 in Cu+Cu

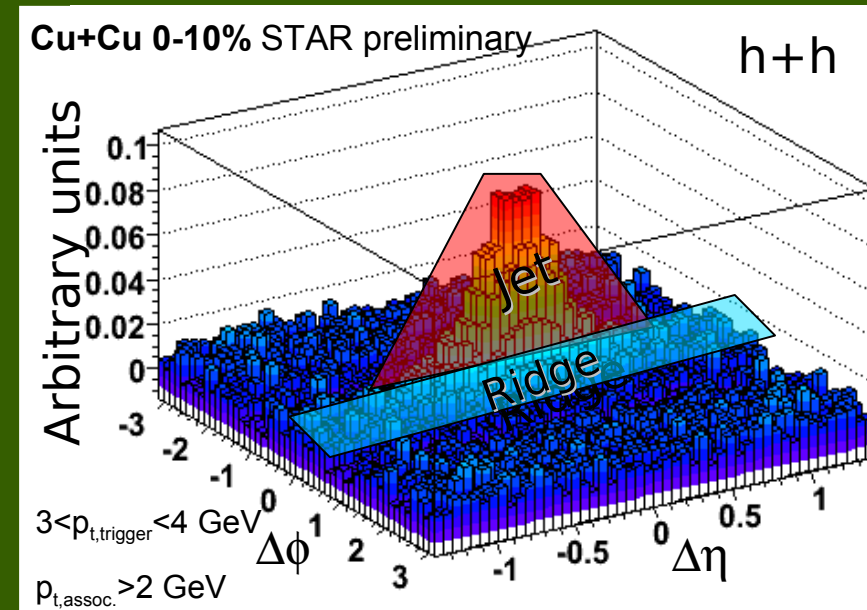
$\Delta\Phi$ - $\Delta\eta$ Correlations

- Consistent with N_{part} dependence
 - Ridge contribution smaller in Cu+Cu than in Au+Au at same centrality
 - Ridge previously observed to be flat in $\Delta\eta$
- To determine relative contributions, find yields for near-side, take $\Delta\phi$ projections in
 - $-0.7 < \Delta\eta < 0.7$ (gives Jet + Ridge yield)
 - $0.7 < |\Delta\eta| < 1.4$ (gives Ridge yield)
 - Jet yield = (Jet+Ridge yield) – Ridge yield
- Flow contributions to jet cancel out
- \overline{E} , \overline{E} statistics not high enough to conclusively see ridge but can apply the same method



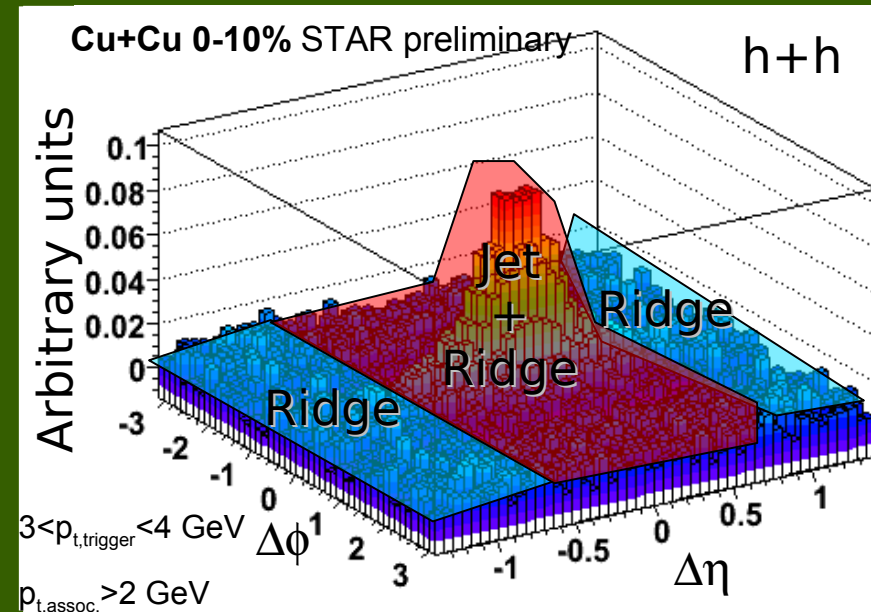
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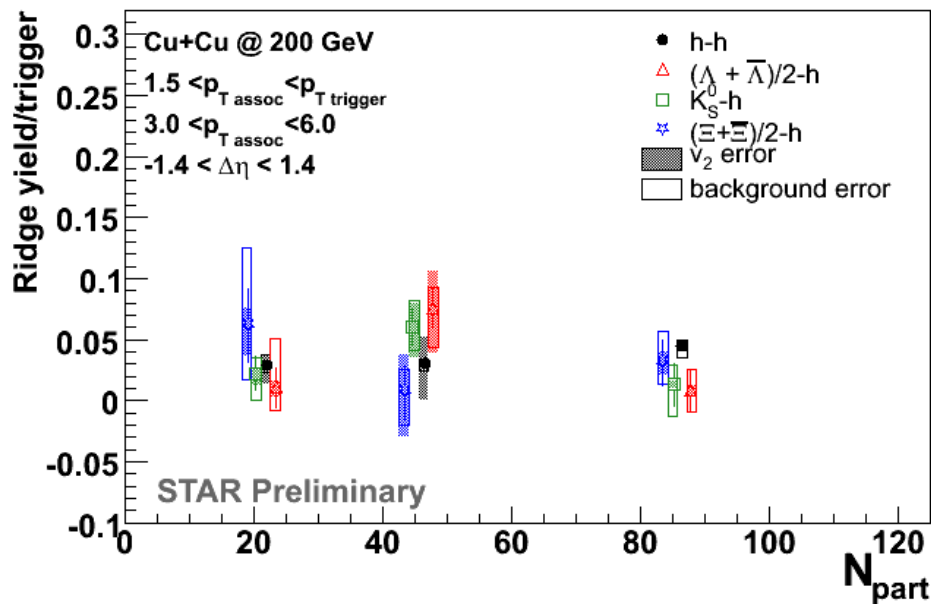
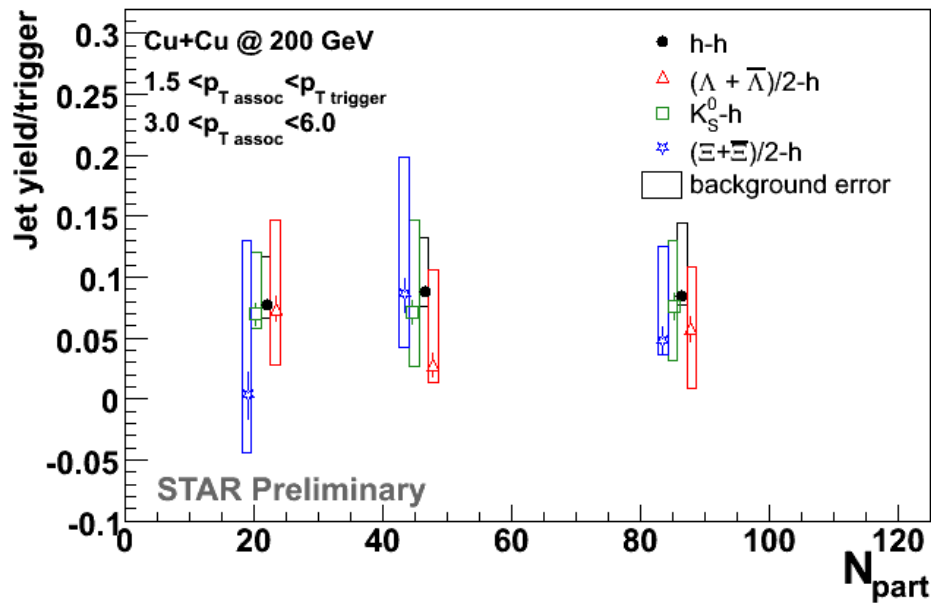


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Near-side Yield vs N_{part}

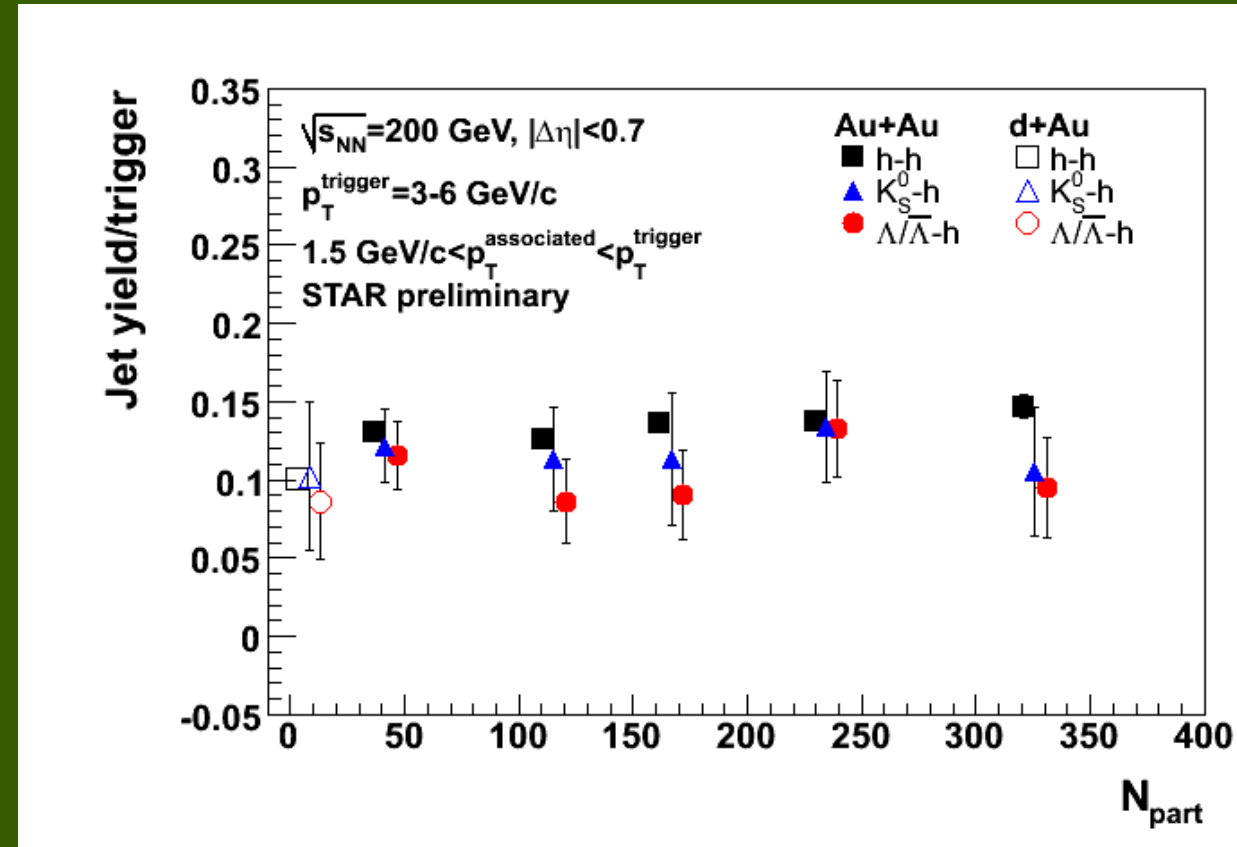


- Jet Yield flat with N_{part}
- Ridge yield flat with N_{part} within errors
- Ridge yield very small
- No trigger particle type dependence

Ridge yield in $0.7 < |\Delta\eta| < 1.4$ region scaled to give ridge yield in $-1.4 < \Delta\eta < 1.4$
 Data points at same N_{part} offset for visibility

Near-side Yield vs N_{part} Cu+Cu vs Au+Au

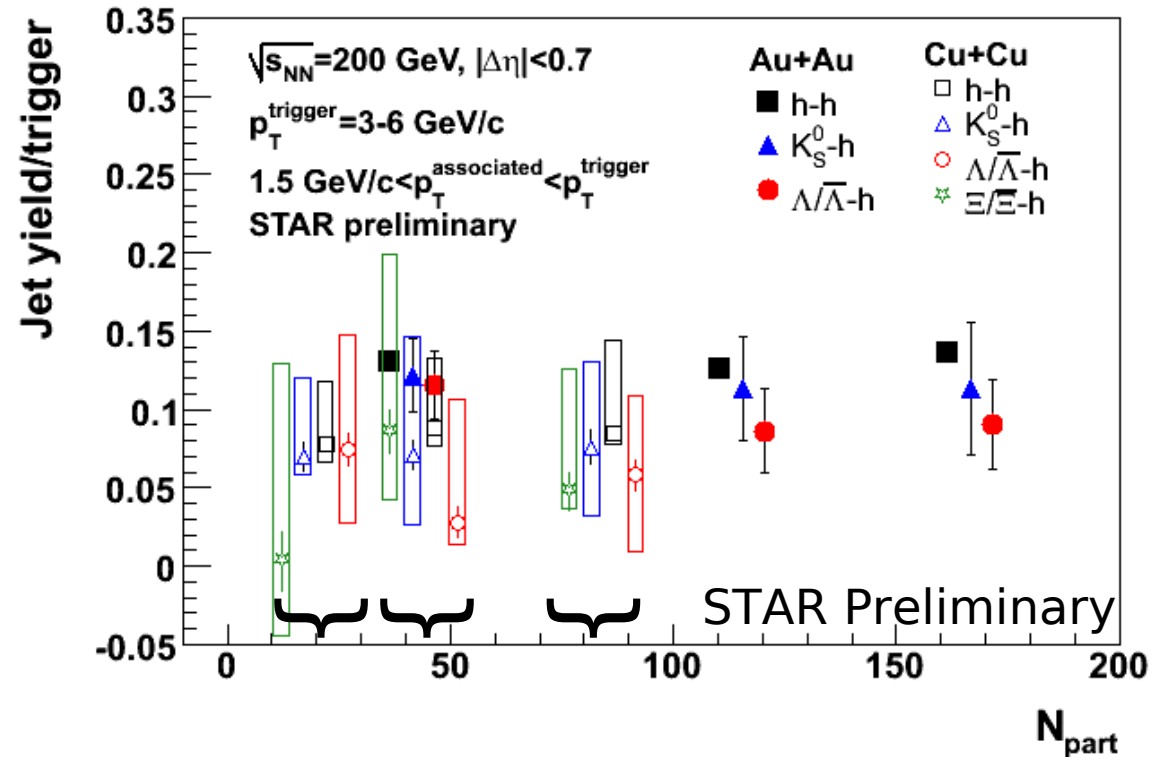
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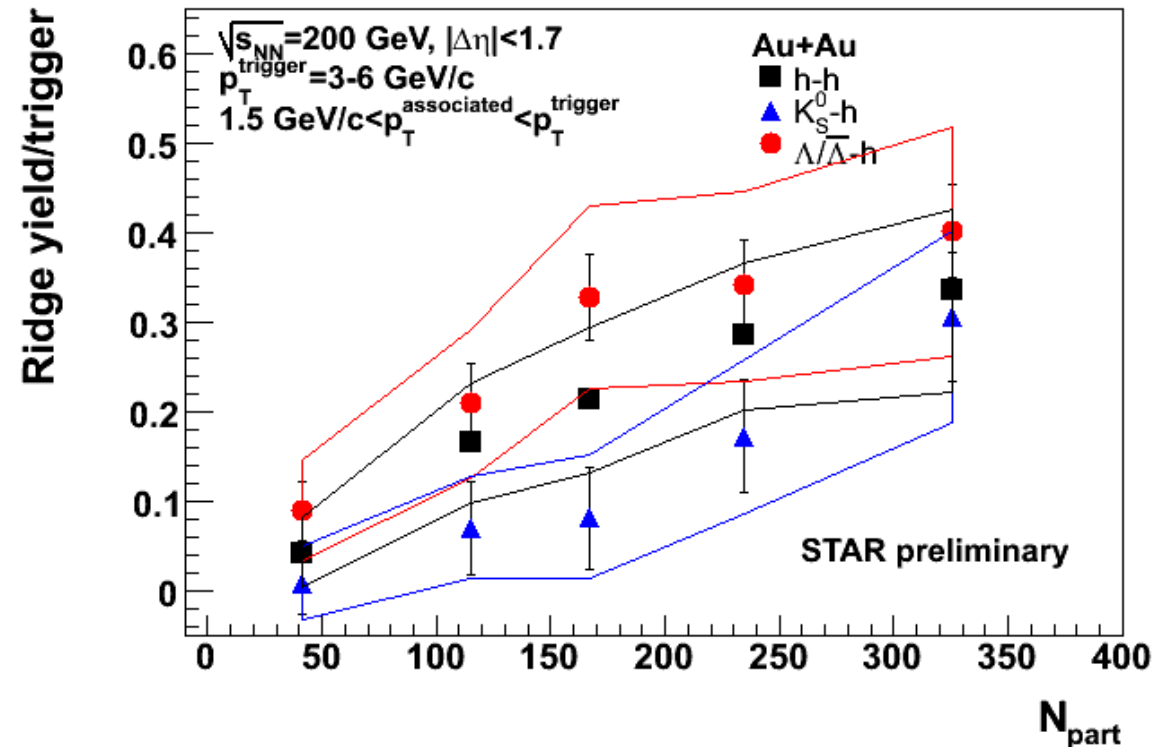
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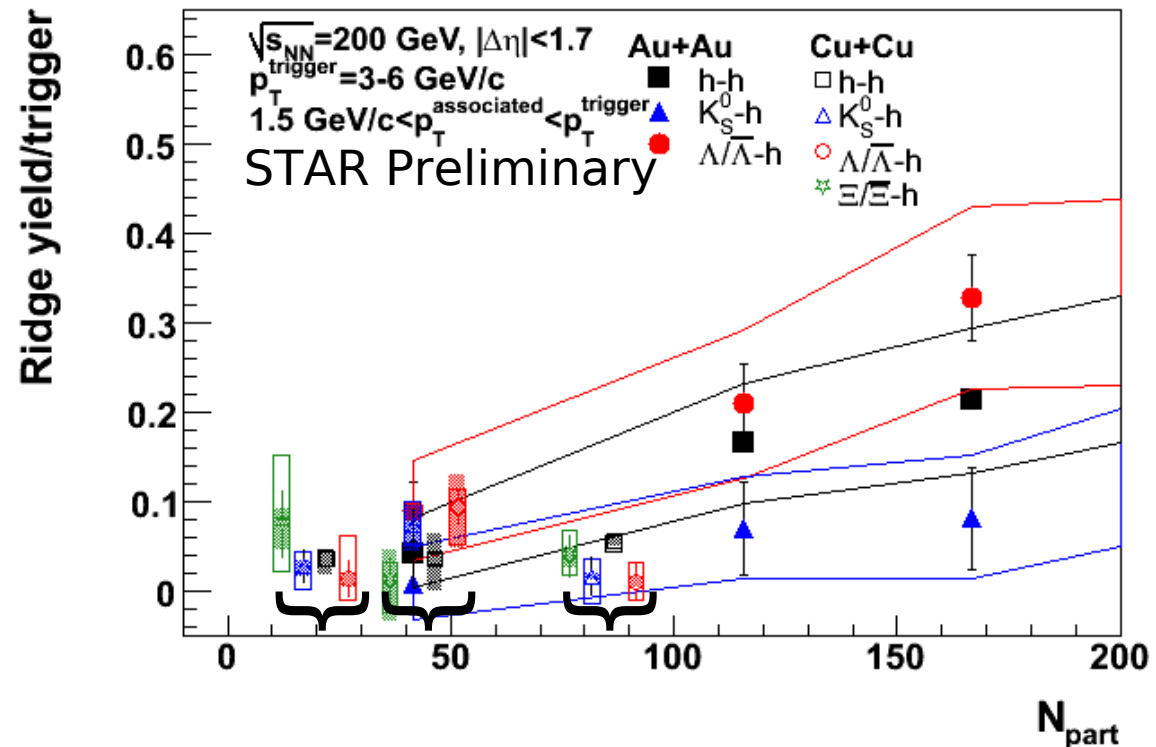
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Ridge yield in $0.7<|\Delta\eta|<1.4$ region in Cu+Cu data scaled to give ridge yield in $-1.7<\Delta\eta<1.7$ for comparison with Au+Au data
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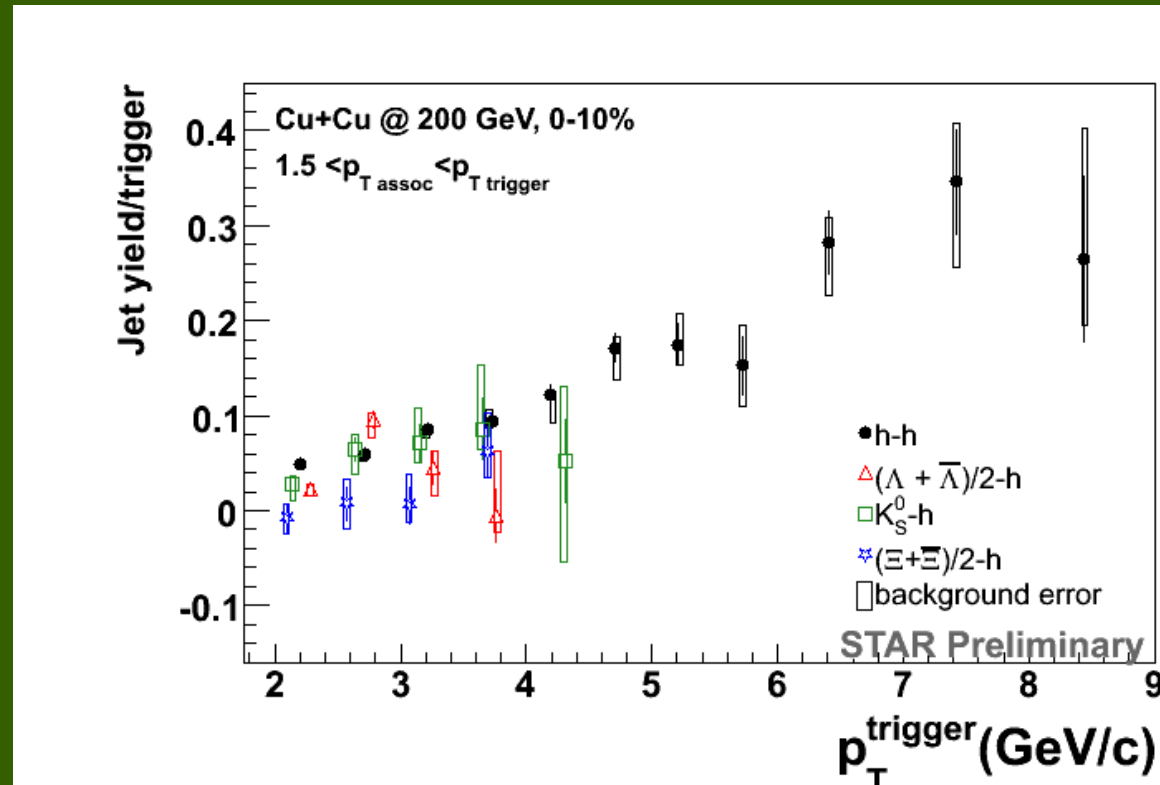
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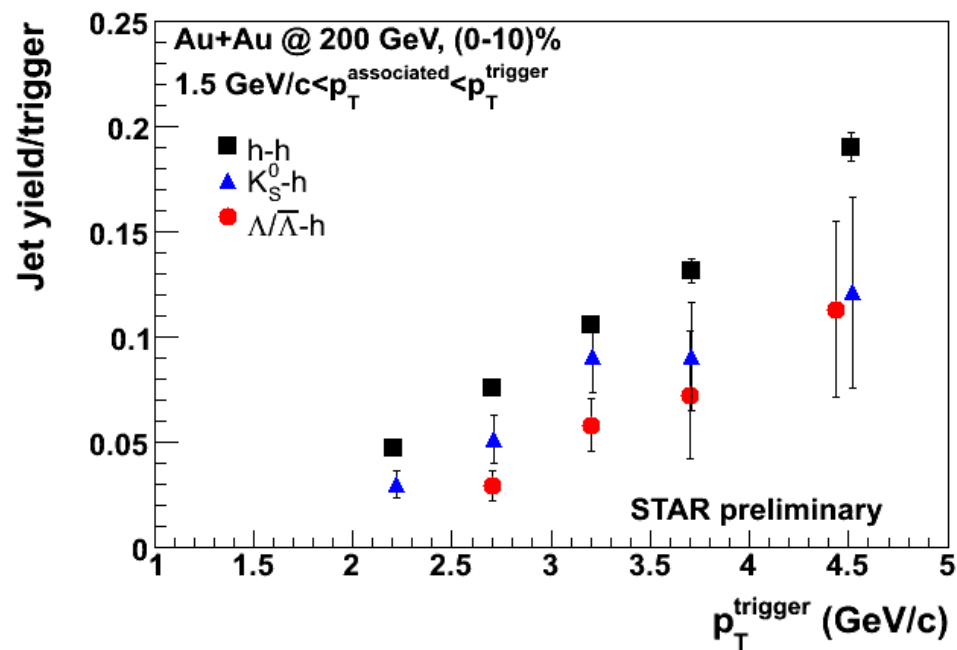
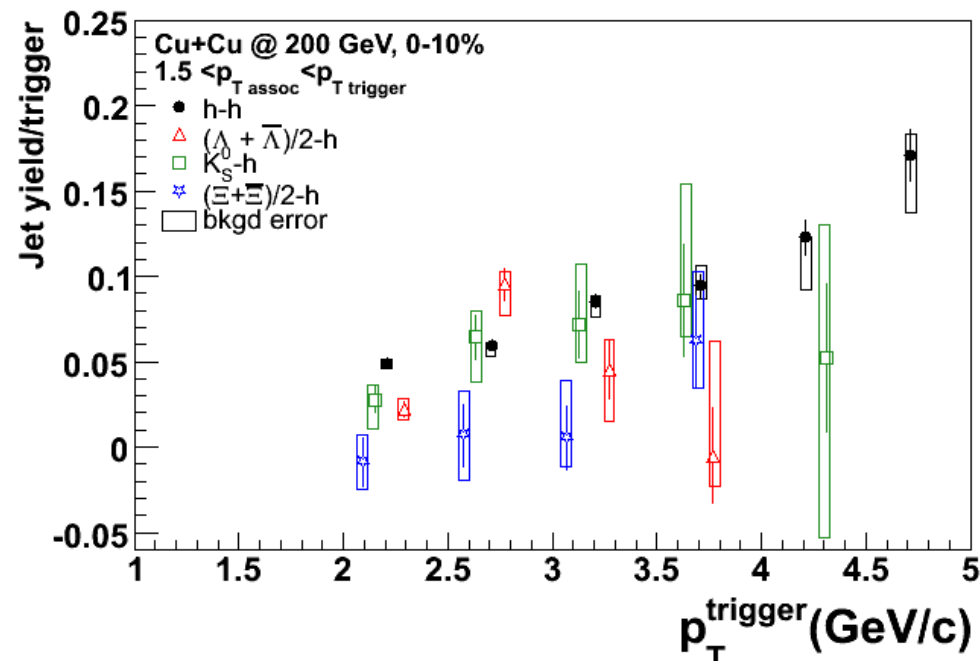
Near-side yield vs p_T^{trigger}

- Jet yield rises with p_T^{trigger}
- No particle type dependence
- Au+Au and Cu+Cu jet yields as a function of p_T^{trigger} consistent



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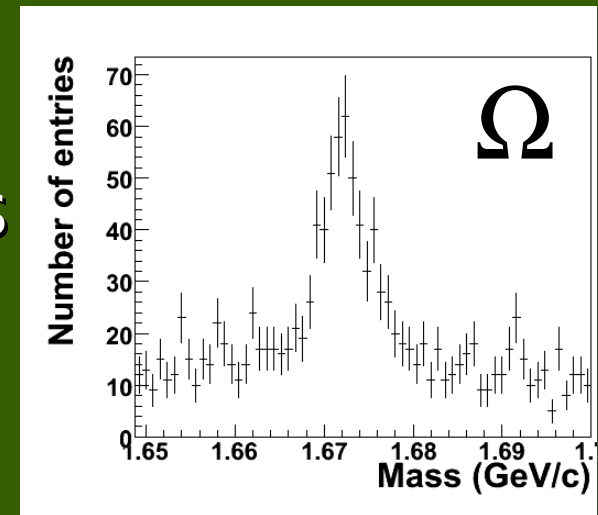



Conclusions

- No trigger particle type dependence
 - including non-strange, and singly and doubly strange triggers
- Cu+Cu Jet, Ridge yields consistent with Au+Au Jet, Ridge yields at the same N_{part}
 - ridge yield in Cu+Cu very small
- In both systems Jet yield rises with $p_{\text{T trigger}}$
- Jet yields the same for the same $p_{\text{T trigger}}$ in different systems in the most central data (Cu+Cu $N_{\text{part}} = 98$, Au+Au $N_{\text{part}} = 325$)

Future work

- Systematics
 - More checks on v_2
 - Identified particle v_2
 - Refine background level determination
- Coming soon
 - Identified associated particles
 - Ω triggers
 - Away-side yields
 - Energy dependence of Jet and Ridge components





The End

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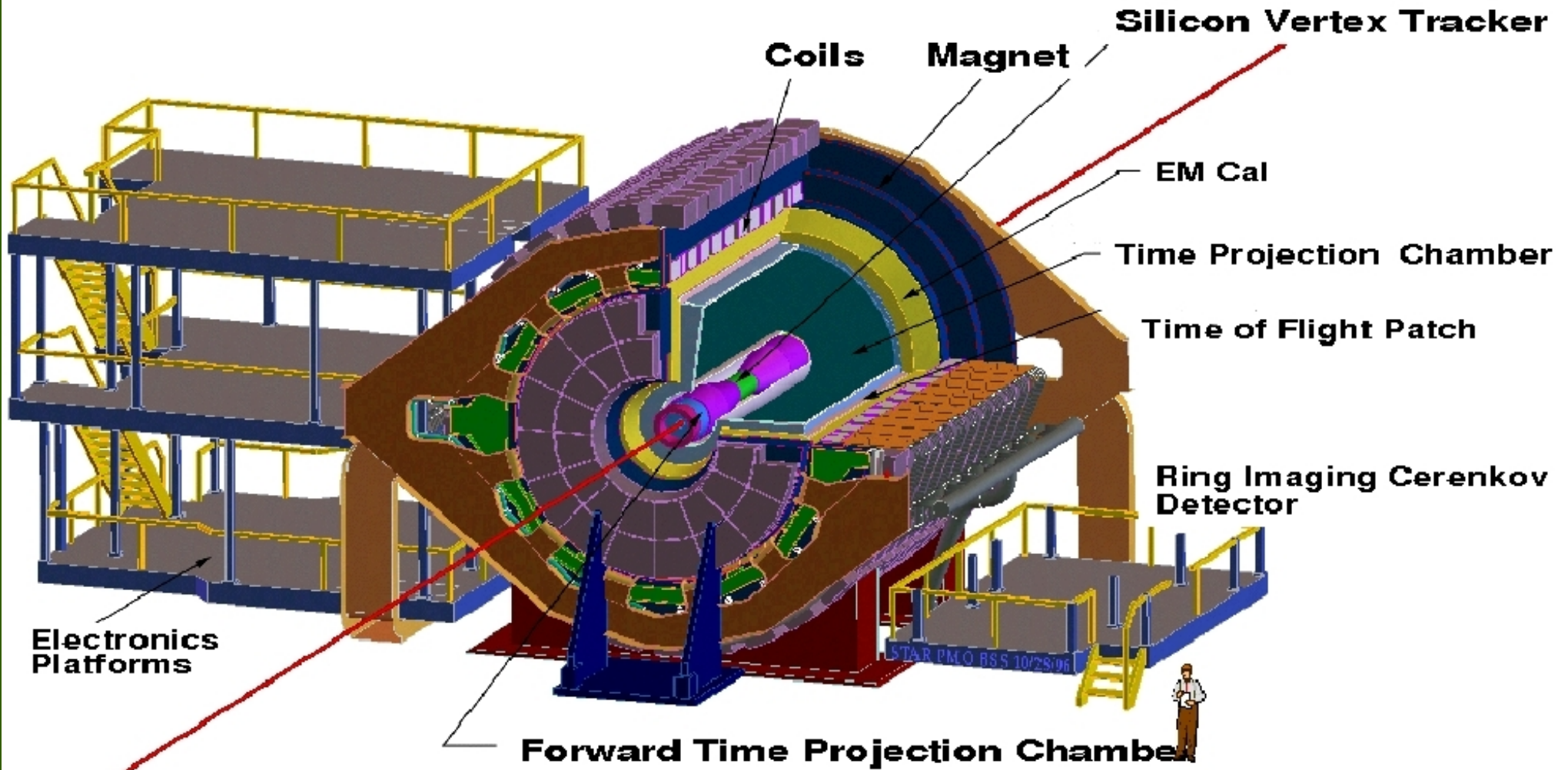


Backup slides

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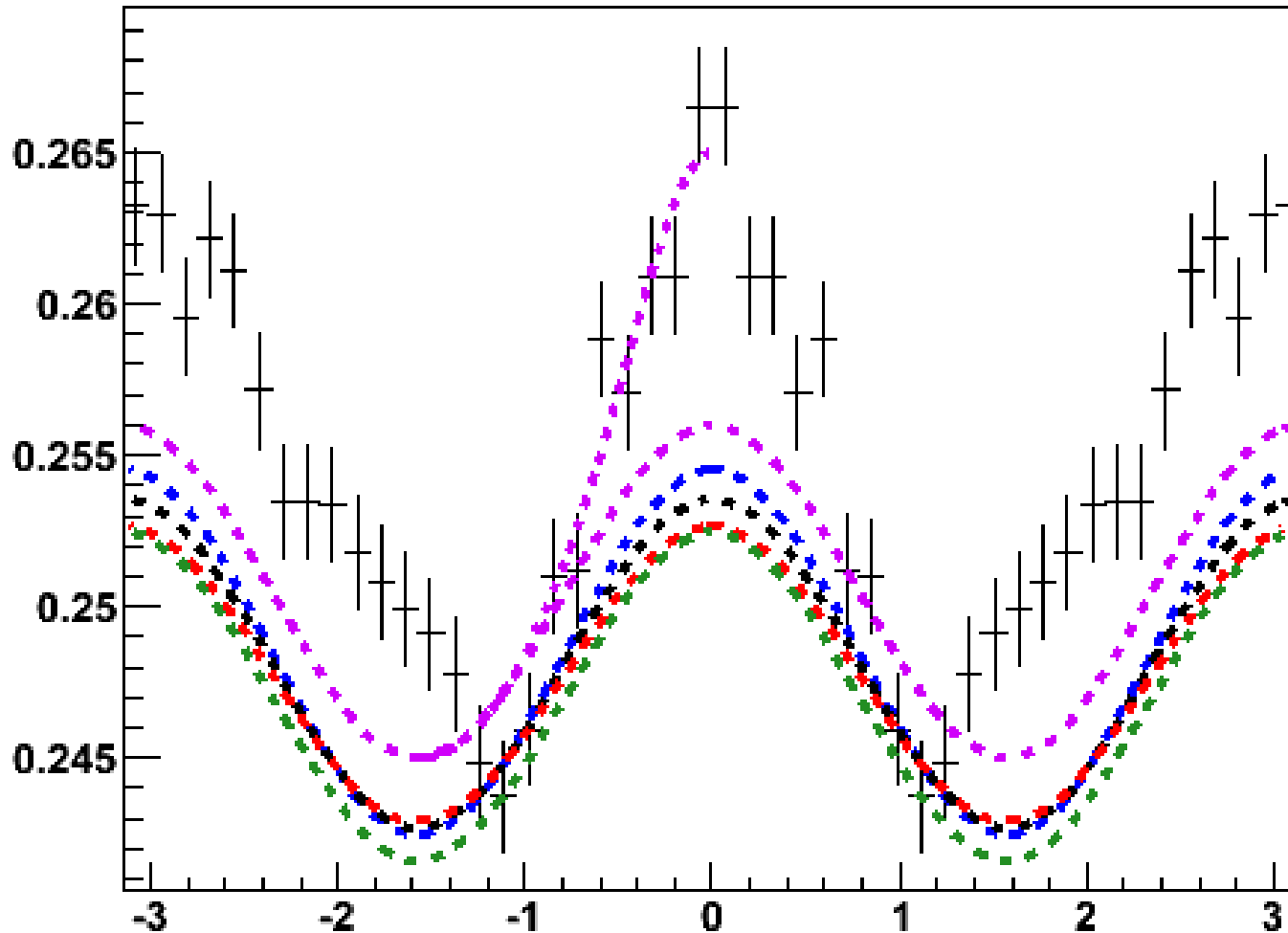
"Large acceptance hadronic detector"



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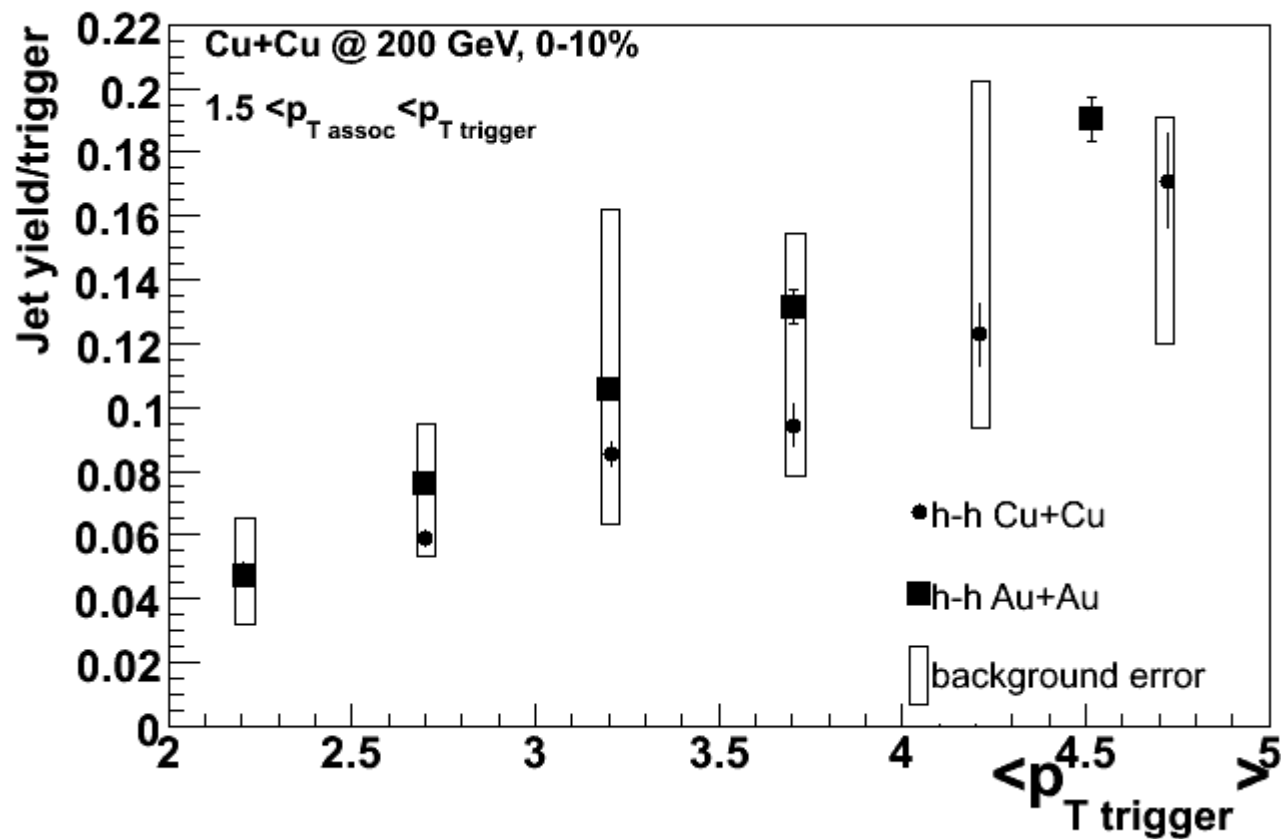
Ridge projections

$\Delta\eta-\Delta\phi$, h trigger $3.0 < p_T < 4.0$, h associated $2.0 < p_T < p_{T \text{ trigger}}$, 0-10% centrality

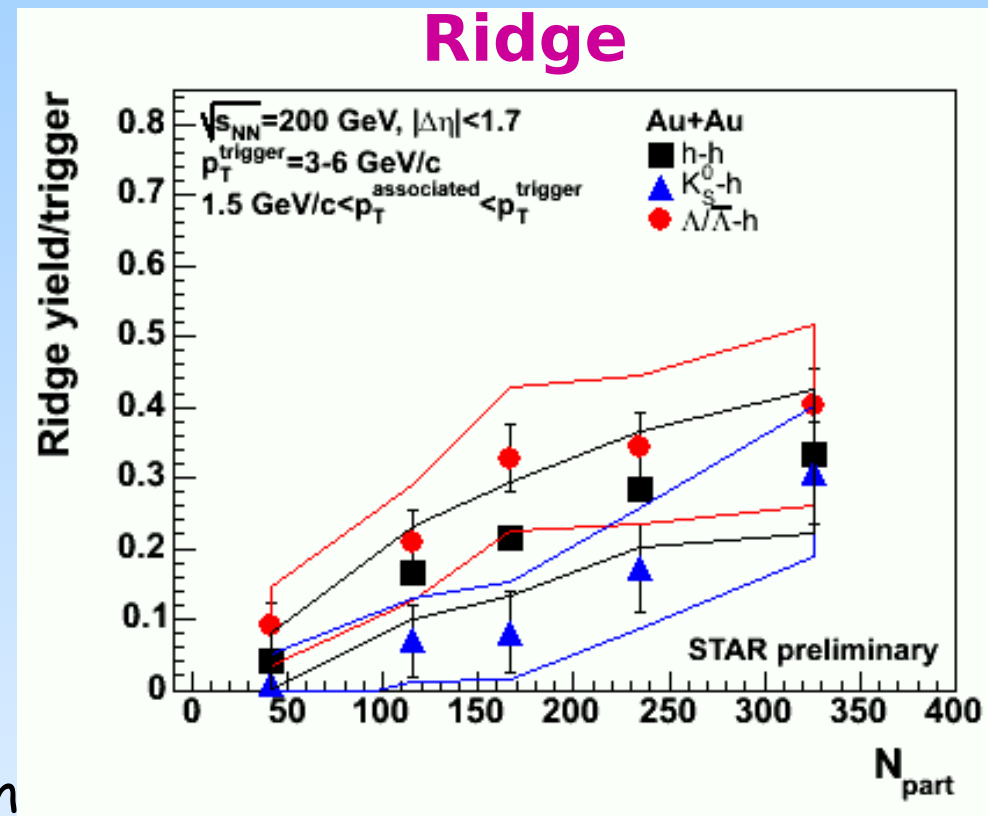
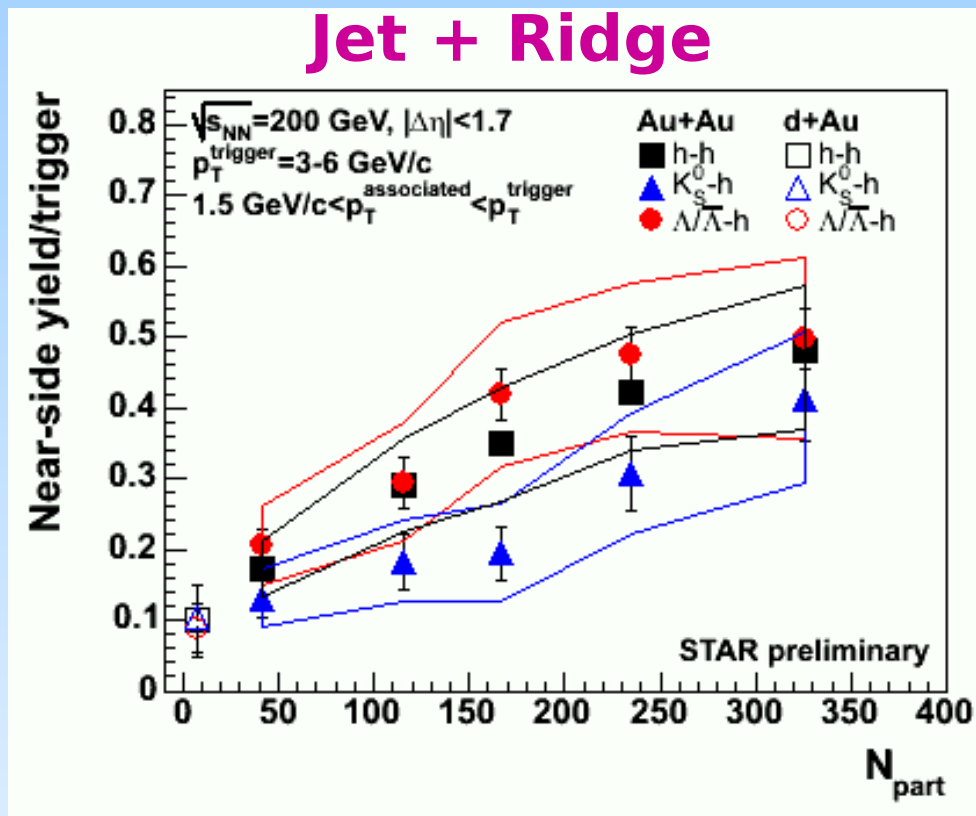


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Centrality dependence of near-side associated yield in Au+Au and d+Au

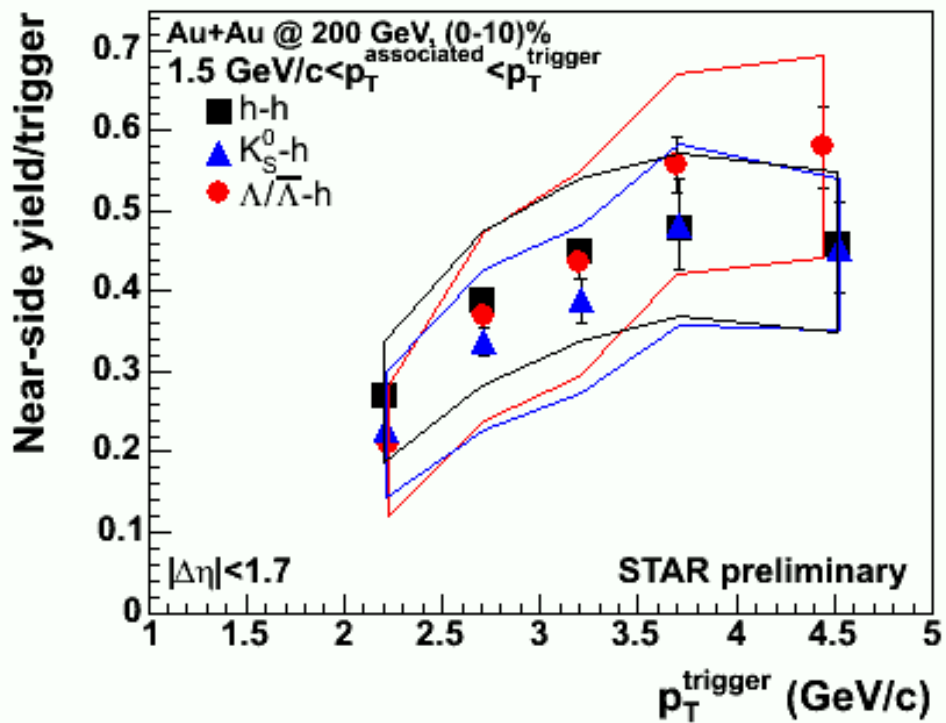


- ratio of yields in central Au+Au/d+Au $\sim 4-5$
 - > "ridge" yield increases with centrality
 - > "jet" yield independent on centrality and agrees with d+Au (effects of merged tracks under study)

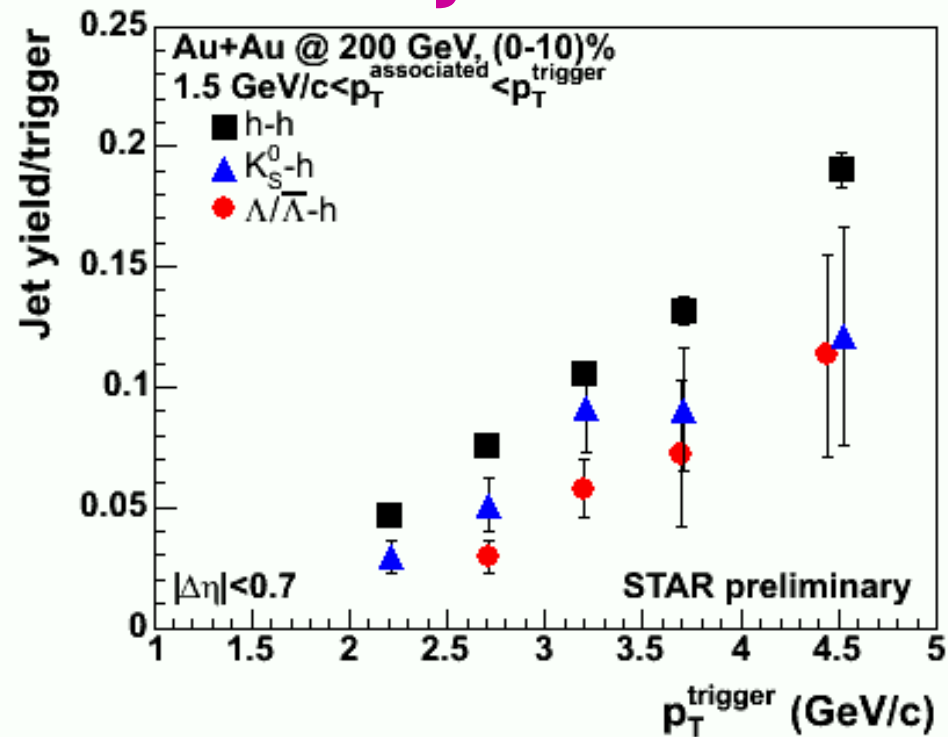


p_T^{trigger} dependence of jet and ridge yields

Jet + Ridge



Jet



- near-side associated yield is ridge dominated at intermediate p_T
- jet yield:
 - increases steeply with p_T^{trigger}
 - smaller for Λ -triggers than for K_S^0 -triggers?
 - baryon jet is wider than meson jet
 - effects of merged tracks under study
- jet/ridge ratio increases with p_T^{trigger}

