Two particle azimuthal correlations in 
Cu+Cu collisions at $\sqrt{s_{NN}} = 200$ GeV at 
RHIC

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Outline

- Motivation
- Analysis technique
- Results
- Conclusions
Motivation –
Jets as a probe 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
- Jets have been studied using azimuthal correlations

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Motivation – particle identification in jets

- Particle identification:
  - Particle/antiparticle differences
  - Quark vs gluon jets
  - Meson/baryon differences
  - Coalescence/recombination mechanisms

- Observed in particle ratios
- Testable with identified particle correlations?
Motivation -

Long-range pseudorapidity correlations

- Long-range pseudorapidity (\( \eta \)) correlations observed by STAR in Au+Au
- Near side jet peak sits on plateau (Ridge)
- Significant contribution to the near-side yield
- Look for particle, system size dependencies which might reveal production mechanism
Identification of strange particles

V⁰ identification
- Reconstruction decay vertices
- Identification out to high p_T
- Pure samples
- V⁰s used for trigger

K⁰_s: m_{K⁰_s} = 0.498 GeV, cτ = 2.68 cm
K⁰_s \rightarrow π^+ + π^- (~69%)
Λ: m_Λ = 1.116 GeV, cτ = 7.89 cm
Λ \rightarrow π^- + p (~64%)
Λ: \bar{m}_Λ = 1.116 GeV, cτ = 7.89 cm
Λ ~ \rightarrow π^+ + \bar{p} (~64%)
Results

- Within errors, no significant difference between
  - Meson and baryon
  - Particle and antiparticle

\[ Cu+Cu \at \sqrt{s_{NN}} = 200 \text{ GeV} \]

\[ 3.0 < p_T^{\text{trigger}} < 6.0 \]
\[ 1.5 < p_T^{\text{assoc}} < p_T^{\text{trigger}} \]
\[ -1 < \eta < 1 \]
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Cu+Cu @ $\sqrt{s_{NN}} = 200$ GeV
3.0 < $p_{T\,\text{trigger}}$ < 6.0
1.5 < $p_{T\,\text{assoc}}$ < $p_{T\,\text{trigger}}$
-1 < $\eta$ < 1
Background (combinatorial + flow)
\[ B(1+2v_{2\text{trigger}} v_{2\text{assoc}} \cos(2 \Delta \phi)) \]

Sources of systematic error:

- Different methods:
  - Fit
  - Assume zero yield at minimum (ZYAM)
    - Use one bin for minimum
    - Use a few bins for minimum
  - Error in \( v_2 \)
    - Used \( v_2 \{\text{CuCu-pp}\} \)
    - Systematic and random errors in \( v_2 \)
    - \( v_2 \) larger in peripheral collisions
- 20-30% systematic error in near-side yields

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![Graph](STAR Preliminary)

\(\Lambda-h, 20-30\%\)
\(\text{Cu+Cu @ 200 GeV}\)
\(3.5 < p_T^{\text{trigger}} < 4.0\)
\(1.5 < p_T^{\text{assoc}} < p_T^{\text{trigger}}\)
\(-1.0 < \eta < 1.0\)
Results – Near-side yields

- ZYAM (3 points) used
- No strong particle type dependence
- Systematic errors may be particle type dependent
- Yield rises with $p_T$ trigger
Results -

Comparison to Au+Au

- Cu+Cu similar to Au+Au
- Yield increases with $p_T$ trigger
- No significant particle type dependence
- Significant ridge yield in Au+Au
- Investigations of Ridge vs Jet yield in Cu+Cu necessary
Results - Comparison to Au+Au

- Yields in Cu+Cu consistent with Au+Au at similar $N_{part}$
- Cu+Cu can be used for studying jet and ridge yield at low $N_{part}$
Conclusions

Near-side yield trends similar to Au+Au

- Yield rises with $p_{T \text{ trigger}}$
- Yield is dependent on $N_{\text{part}}$
- No significant difference between Meson /baryon triggers
- Particle /antiparticle triggers

- Ridge is a major contribution to near-side yield in Au+Au
- Ridge contribution in Cu+Cu needs to be investigated
Work to come...

- $\Delta \phi - \Delta \eta$ correlations in Cu+Cu
- Jet vs Ridge yield comparisons
- $\nu^0$ associated particles (unidentified triggers) in Cu+Cu
- Study composition of ridge
- Multistrange trigger particles ($\Xi^+, \Xi^-, \Omega^+, \Omega^-$) in Cu+Cu
- Test recombination model

See Jana Bielcikova and Jörn Putschke's talks at Quark Matter!
Backup slides
"Large acceptance hadronic detector"