Strange Baryon Production in RHIC Beam Energy Scan Program

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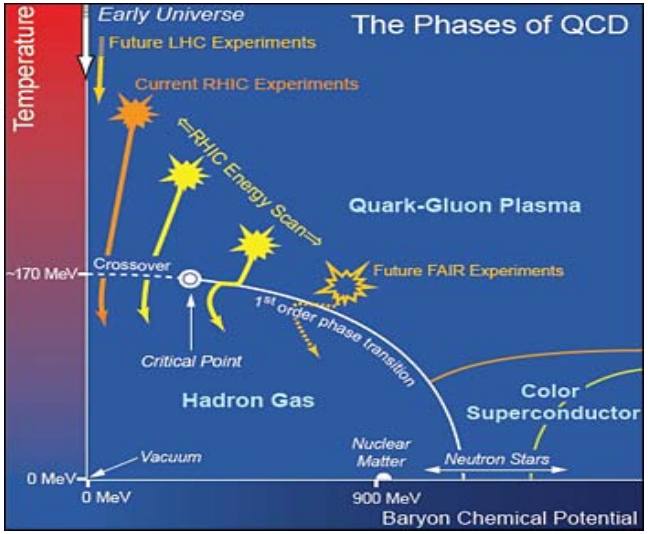
For the STAR Collaboration

Outline

- Physics Motivation
- STAR Detector
- Data Set and Signal Reconstruction
- p_T Spectra and R_{cp} results
- Summary

1. Physics Motivation



- BES Program:

1) Study the phase boundary;

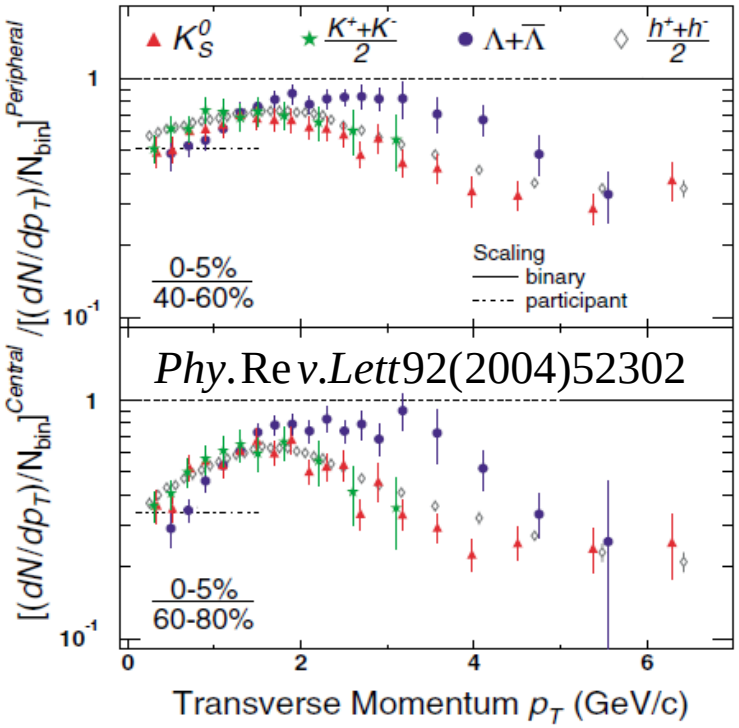
2) Search for the possible QCD critical point

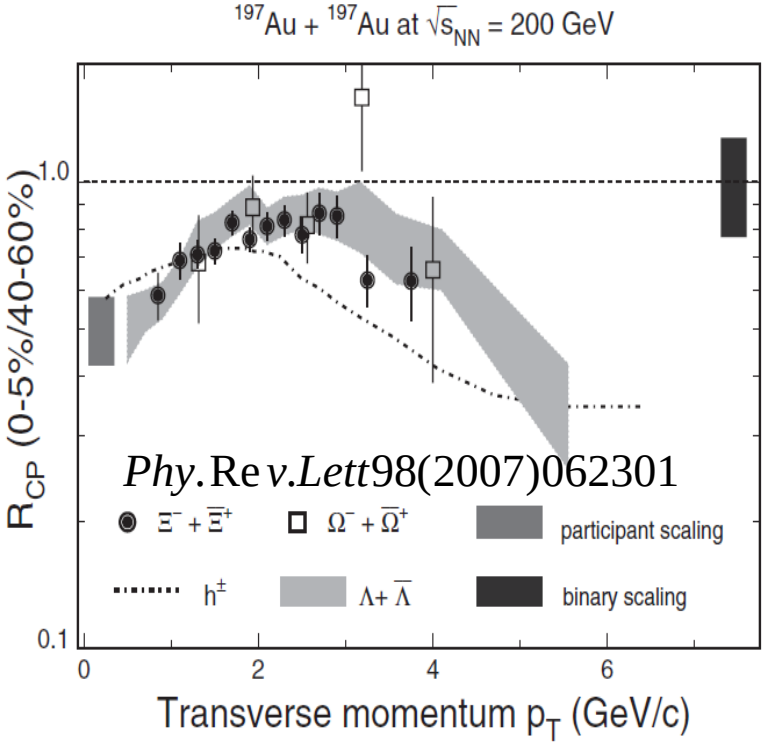
http://drupal.star.bnl.gov/STAR/starnotes/public/sn0493 arXiv: 1007.2613

- Strangeness is sensitive to the dynamics of deconfined quark-gluon matter created in heavy ion collisions.

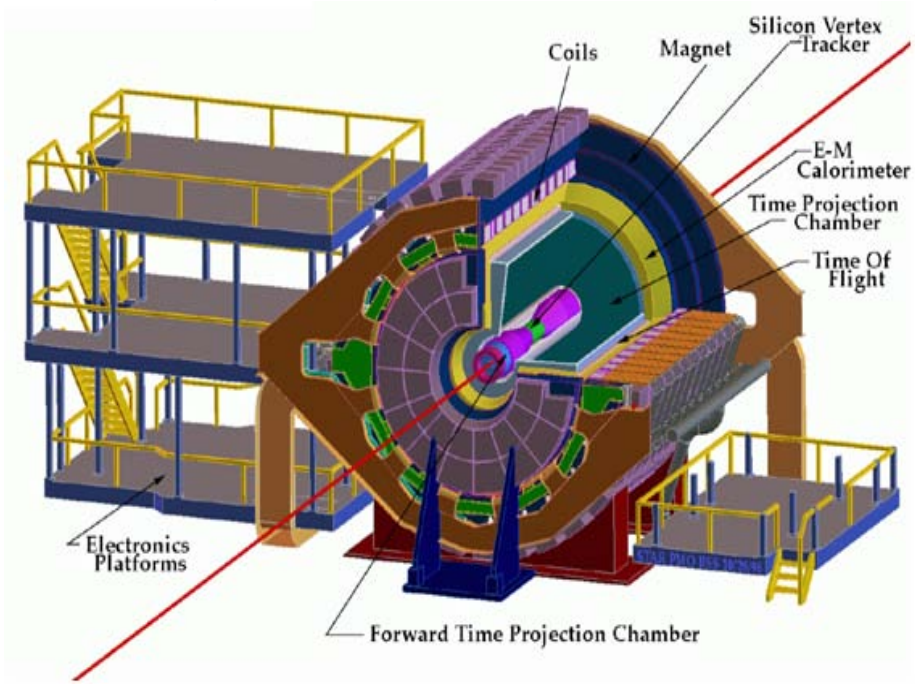
Physics Motivation

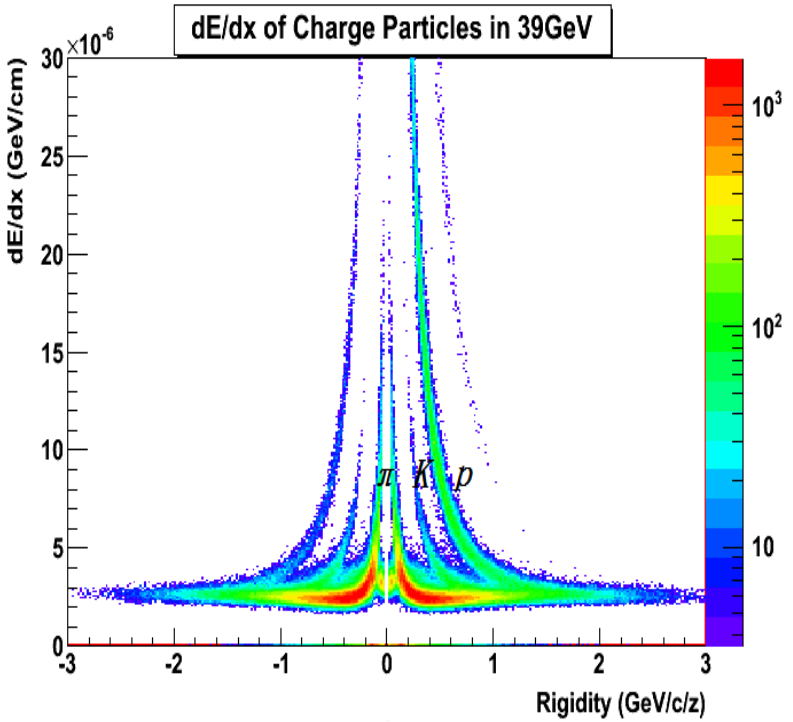
- In 62.4GeV and 200GeV AuAu collisions, Rcp of baryons and mesons follow different trends, which may be attributed to the quark coalescence. How about in low energy?





2. STAR Detector





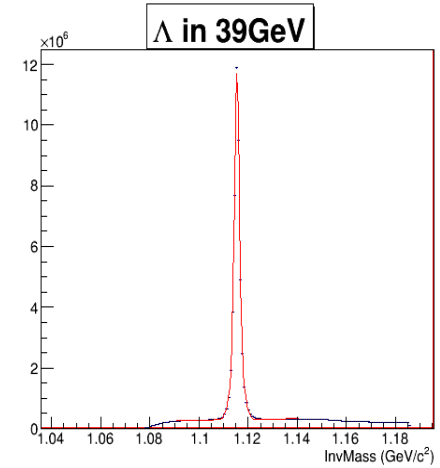
- Time Projection Chamber is used for particle identification.

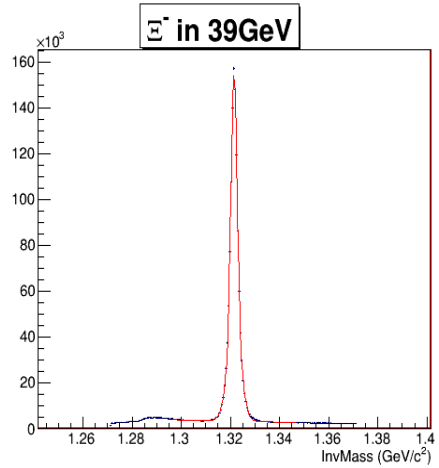
3.1 Data Set

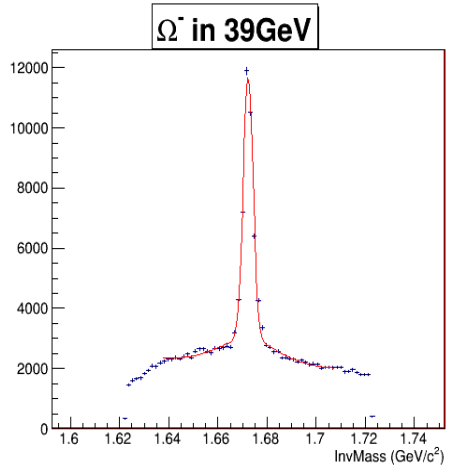
Year	Energy	Number of Events
2010	7.7 GeV	5 million
2010	11.5 GeV	12.4 million
2010	39 GeV	136 million
2011	19.6GeV	~25 million
2011	27GeV	~40 million

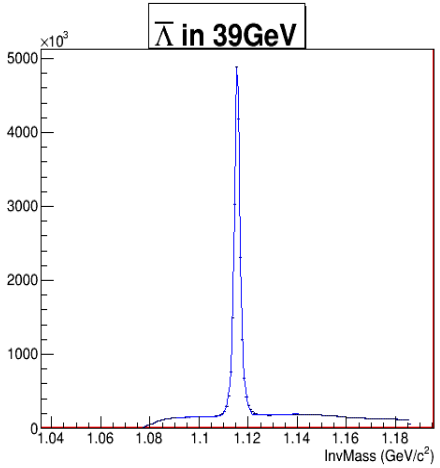
- Run10 Data are used in the presentation.
- Run11 Data analysis is on the way.

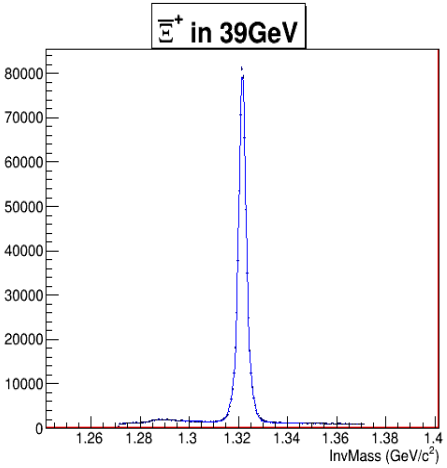
3.2 Signal Reconstruction

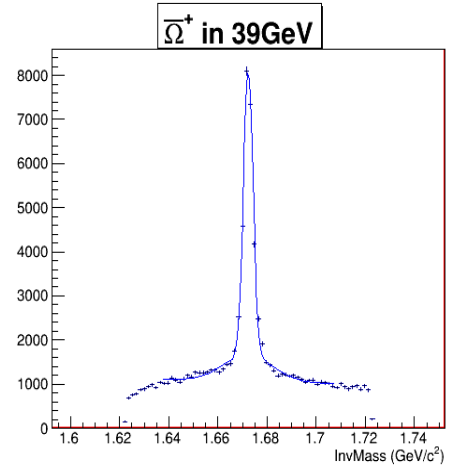




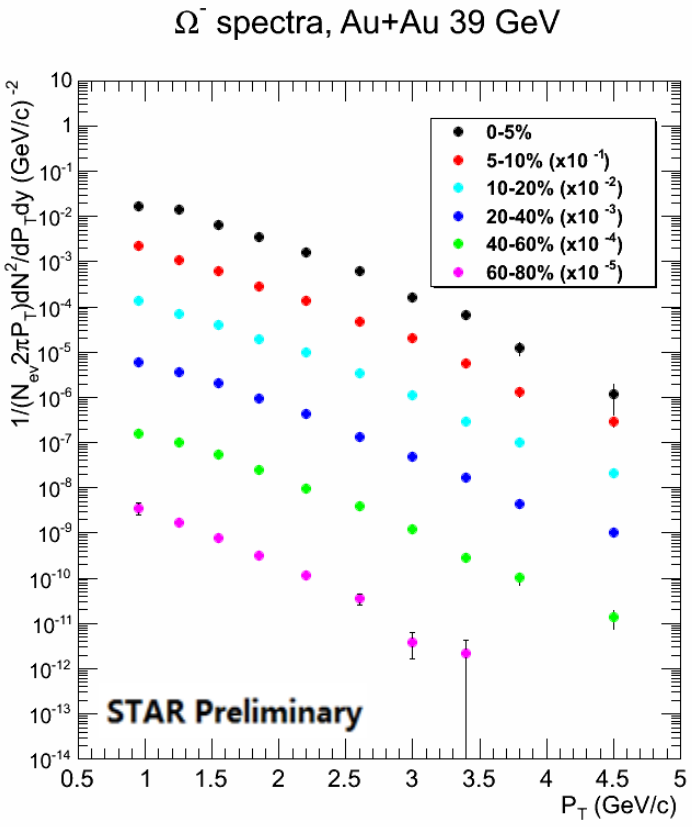


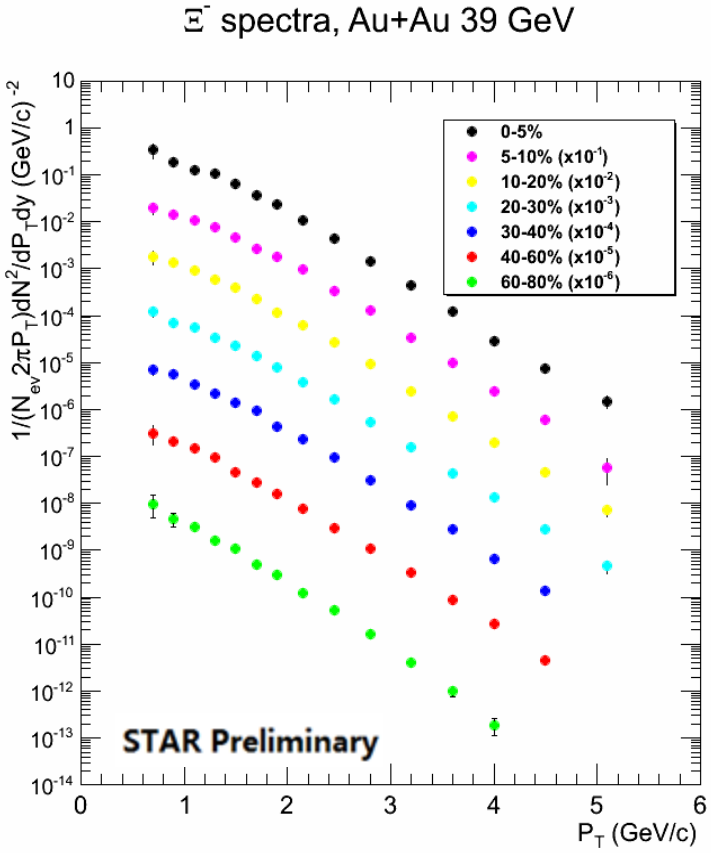






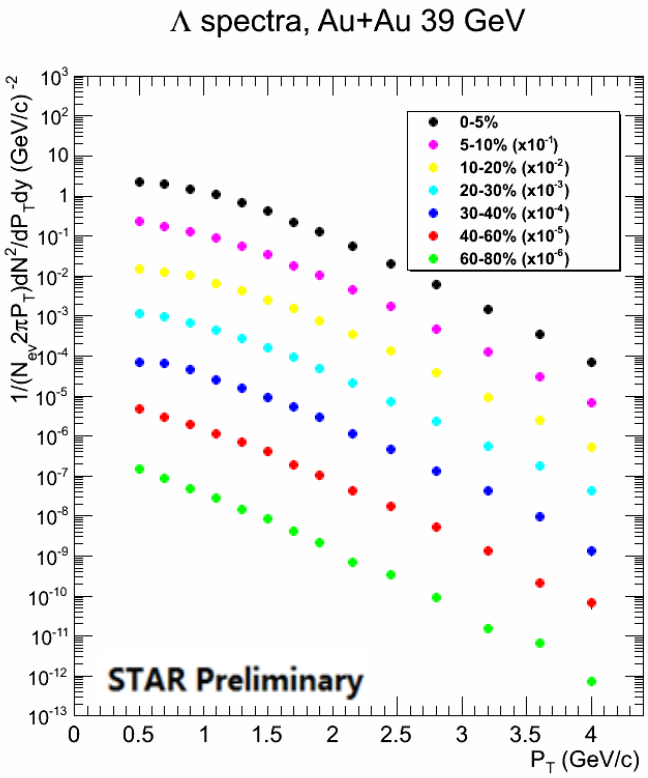
4. pT Spectra & Rcp analysis

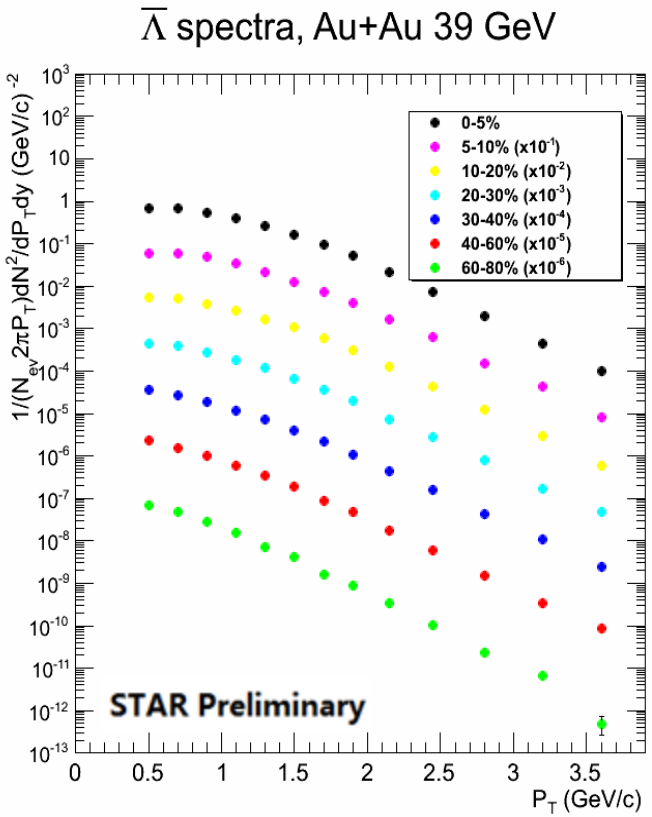




- With|y|<0.5
- Statistical error only

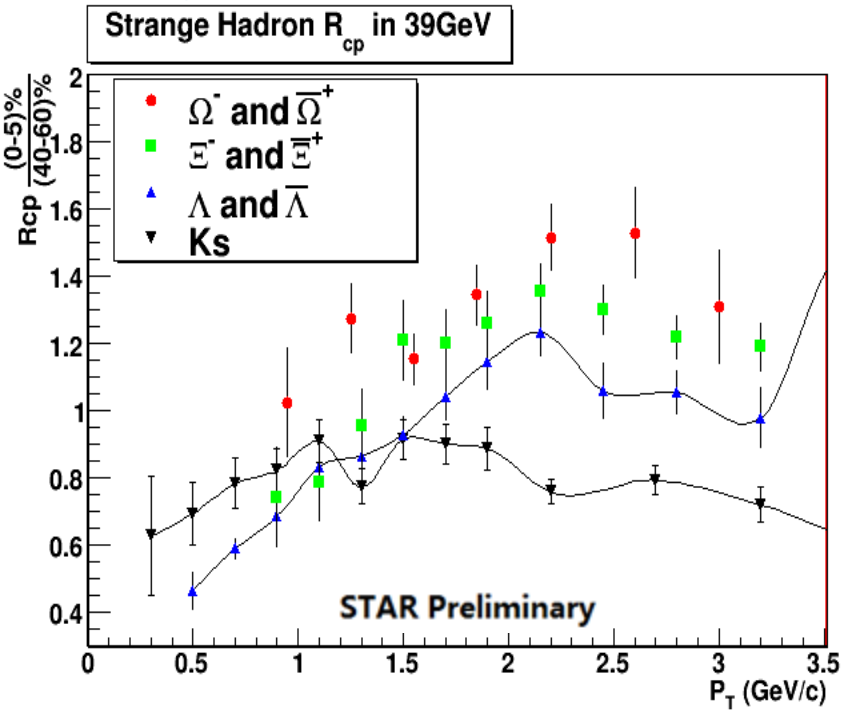
Lambda pT Spectra

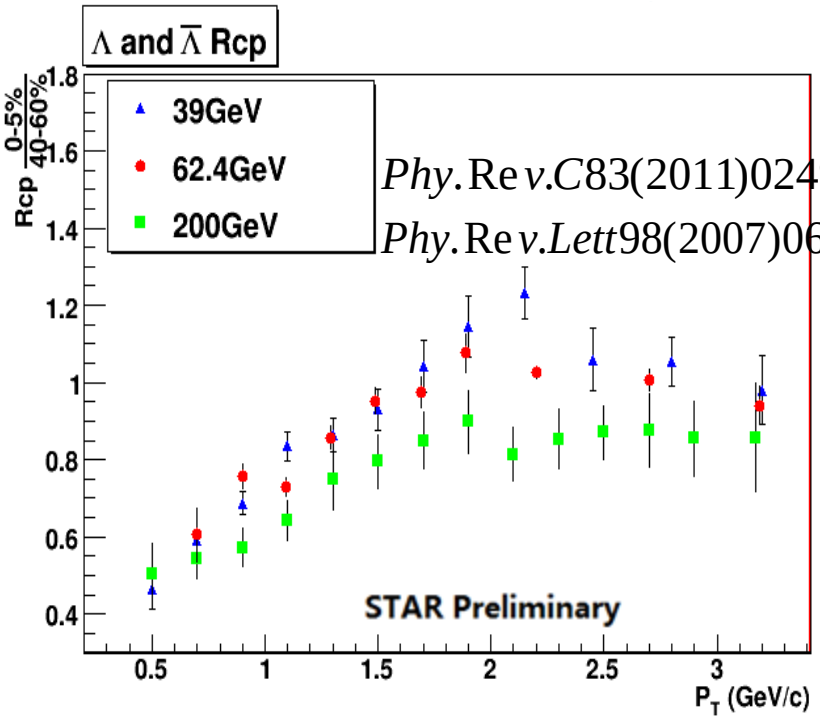




- With $|y|<0.5$
- Corrected Feed-down contribution from Ξ & Ξ^0
- Statistical error only

Particle Rcp in 39GeV



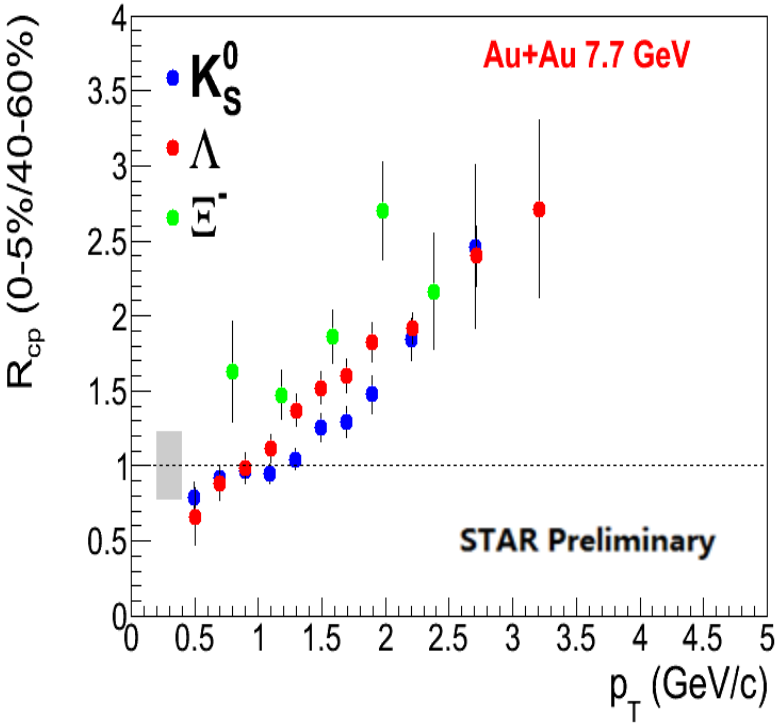


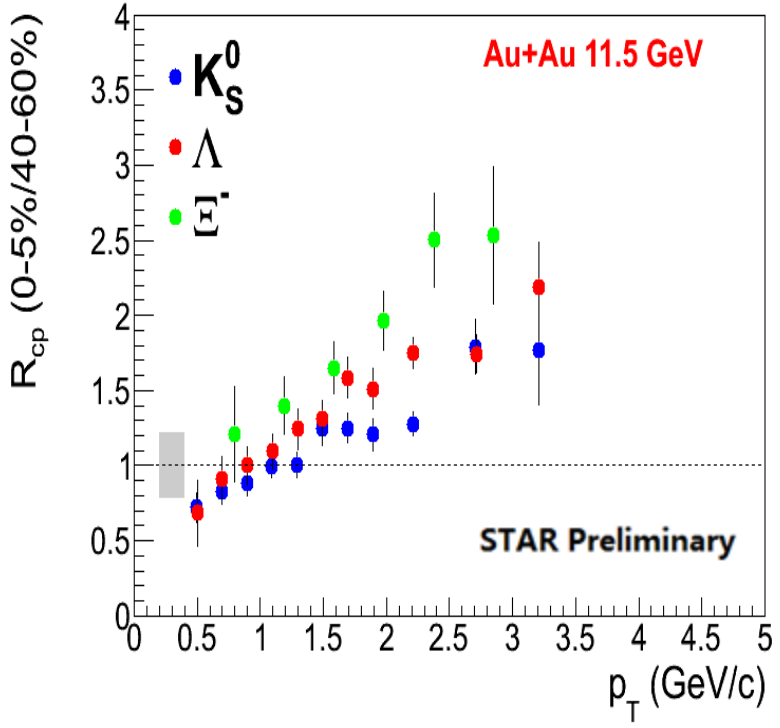
Phy.Rev.C83(2011)024901

Phy.Rev.Lett98(2007)062301

- Lambda R_{cp} is different from Ks R_{cp}; Xi and Omega R_{cp} have the same trend with Lambda R_{cp}.
- Omega R_{cp} > Xi R_{cp} > Lambda R_{cp}, which may be due to the difference of γ_s in central and peripheral collisions.
- Statistical error only.

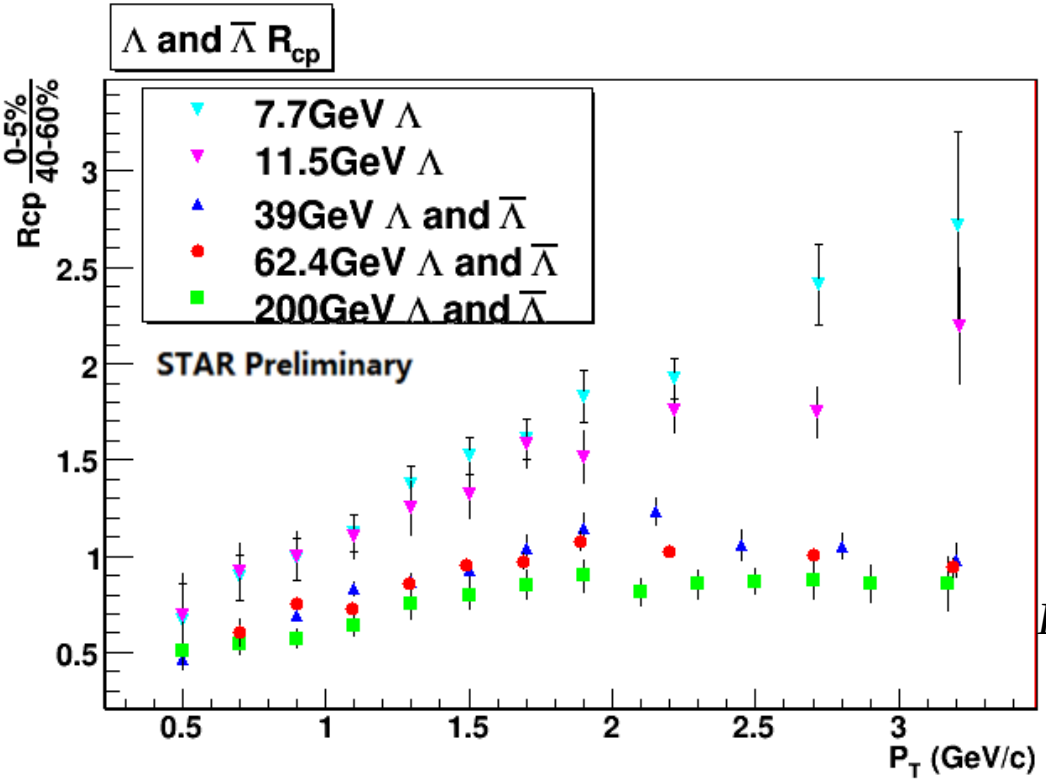
Particle Rcp in 11.5 &7.7GeV





- Statistical error only

Lambda Rcp



*Phy.Rev.Lett*98(2007)062301

*Phy.Rev.C*83(2011)024901

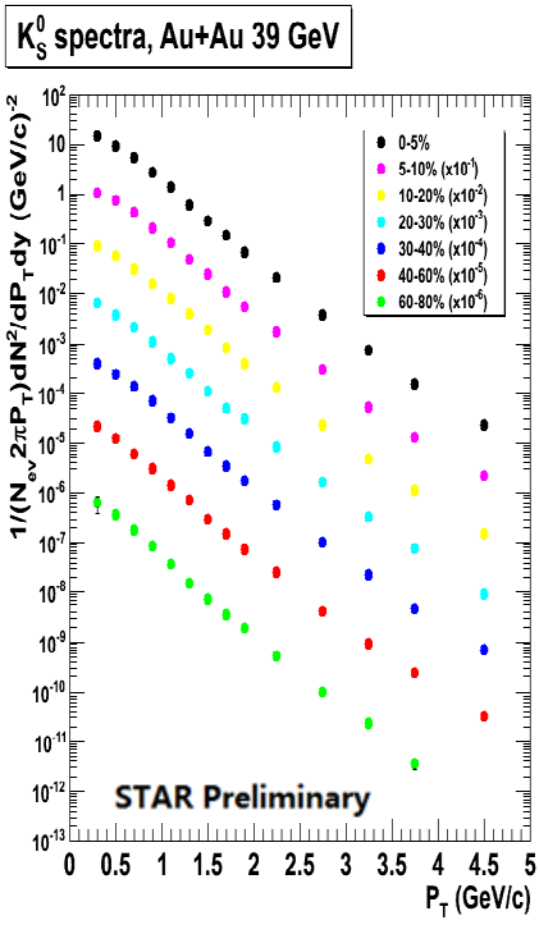
- R_{cp} in 39GeV is similar with the results in 62.4GeV and 200GeV, but different from R_{cp} in lower energies.
- Statistical error only

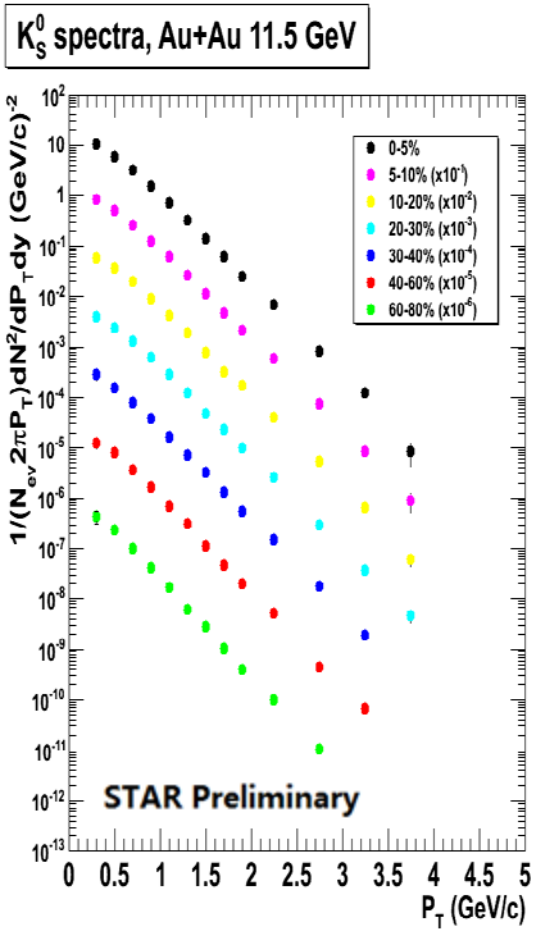
Summary

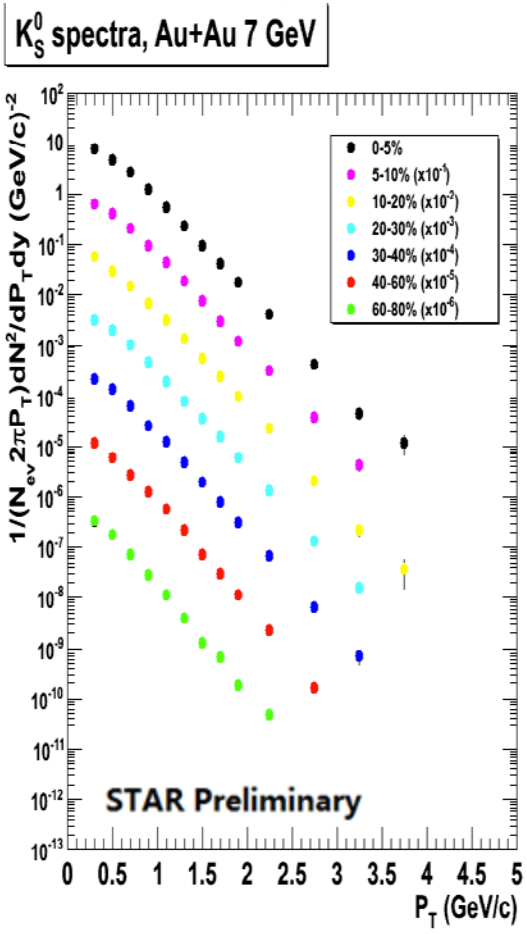
- We have reported the STAR measurement of strange hadron production in RHIC beam energy scan program.
- Strange particle R_{cp} analysis is presented.
- The R_{cp} vs. p_T trend in 39GeV is similar with that in higher energy.
- The R_{cp} vs. p_T for Ks, Λ and Ξ show a similar trend up to about 3GeV/c at 11.5GeV and 7.7GeV, and the values are larger than 1.

Back Up

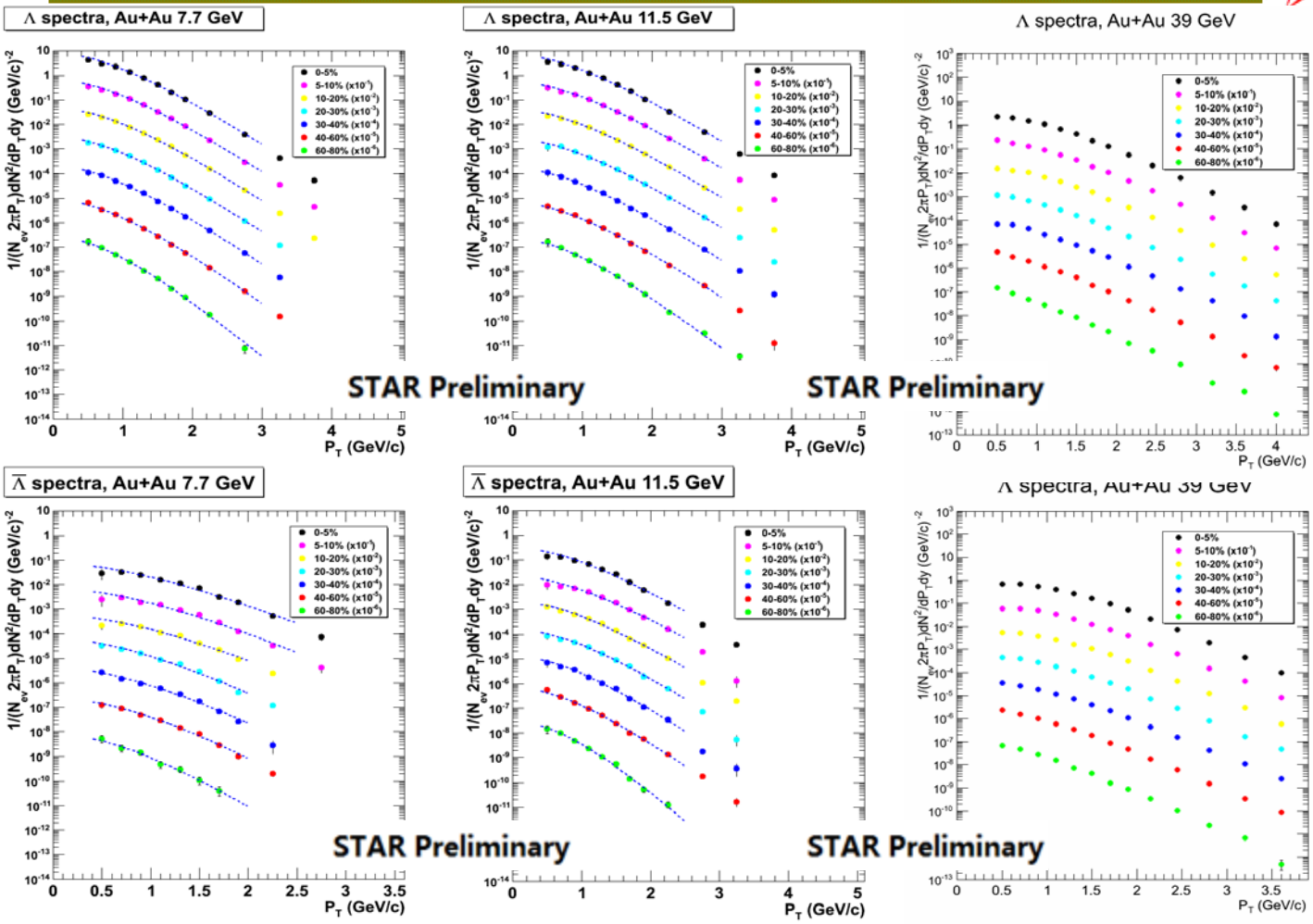
Ks Spectra


K^0_S spectra, Au+Au 39 GeV
$1/(N_{ev}2\pi P_T)dN^2/dP_T dy$ (GeV/c)$^{-2}$
0-5%
5-10% (x10^{-1})
10-20% (x10^{-2})
20-30% (x10^{-3})
30-40% (x10^{-4})
40-60% (x10^{-5})
60-80% (x10^{-6})
STAR Preliminary
P_T (GeV/c)

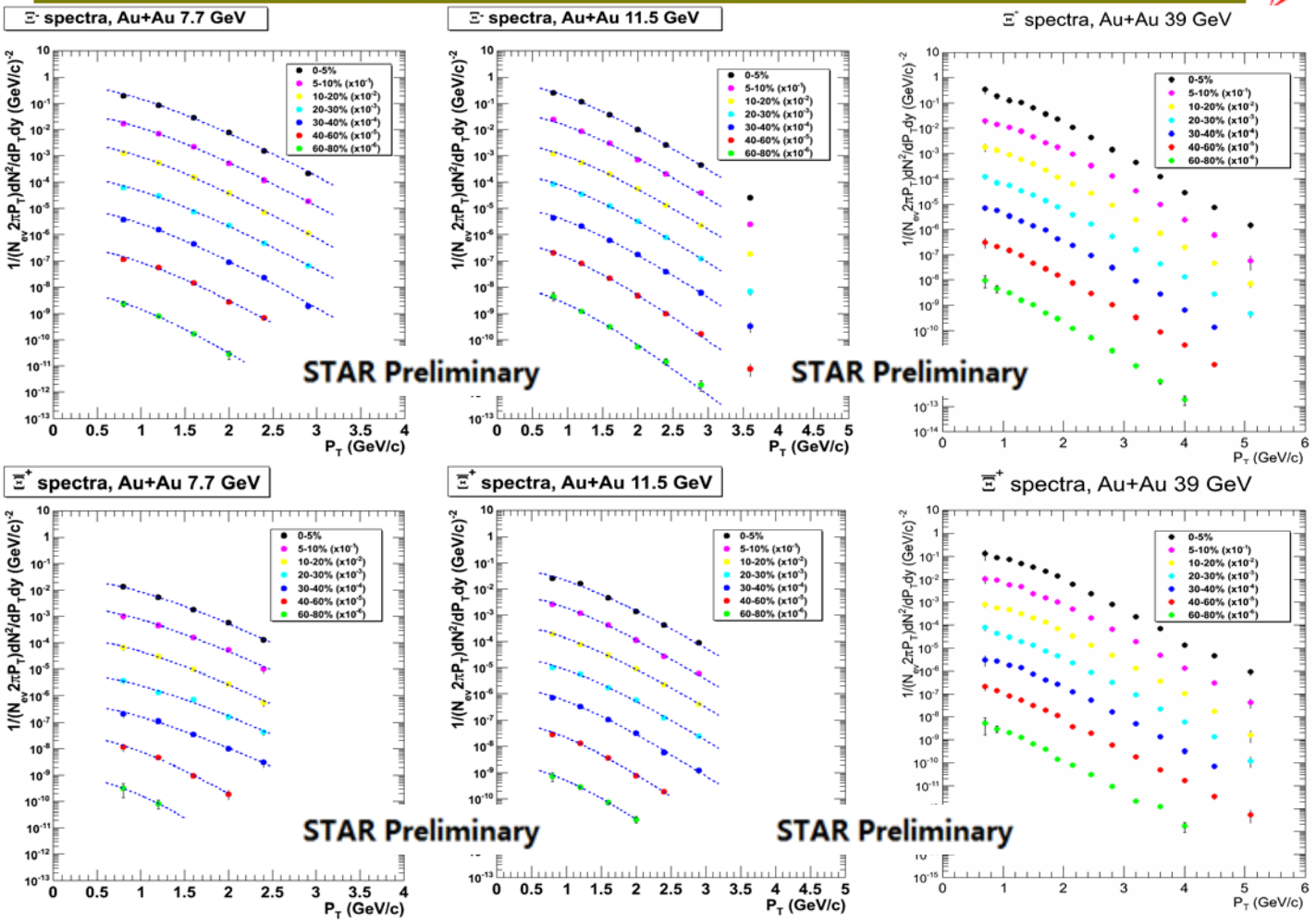

K^0_S spectra, Au+Au 11.5 GeV
$1/(N_{ev}2\pi P_T)dN^2/dP_T dy$ (GeV/c)$^{-2}$
0-5%
5-10% (x10^{-1})
10-20% (x10^{-2})
20-30% (x10^{-3})
30-40% (x10^{-4})
40-60% (x10^{-5})
60-80% (x10^{-6})
STAR Preliminary
P_T (GeV/c)


K^0_S spectra, Au+Au 7 GeV
$1/(N_{ev}2\pi P_T)dN^2/dP_T dy$ (GeV/c)$^{-2}$
0-5%
5-10% (x10^{-1})
10-20% (x10^{-2})
20-30% (x10^{-3})
30-40% (x10^{-4})
40-60% (x10^{-5})
60-80% (x10^{-6})
STAR Preliminary
P_T (GeV/c)

Lambda Spectra



Xi Spectra


Ξ⁻ spectra, Au+Au 7.7 GeV
Ξ⁻ spectra, Au+Au 11.5 GeV
Ξ⁻ spectra, Au+Au 39 GeV
Ξ̄⁺ spectra, Au+Au 7.7 GeV
Ξ̄⁺ spectra, Au+Au 11.5 GeV
Ξ̄⁺ spectra, Au+Au 39 GeV
0-5%
5-10% (x10⁻¹)
10-20% (x10⁻²)
20-30% (x10⁻³)
30-40% (x10⁻⁴)
40-60% (x10⁻⁵)
60-80% (x10⁻⁶)
STAR Preliminary
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STAR Preliminary
STAR Preliminary
P_T (GeV/c)

Omega Spectra