Investigation of the high-p_T strange baryon anomalies at RHIC

Matthew A. C. Lamont
Yale University

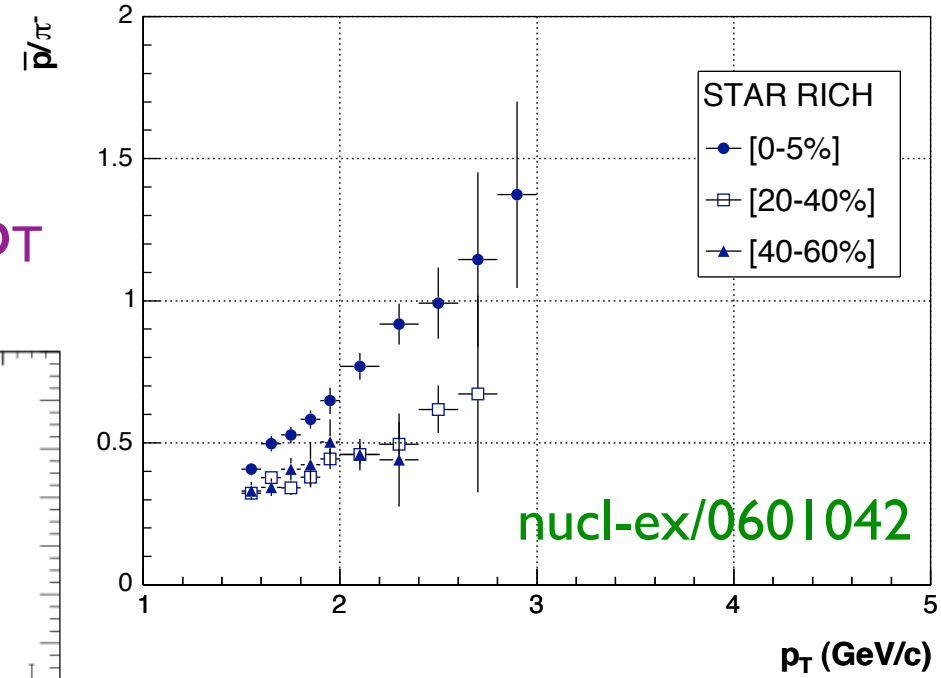
for the STAR Collaboration

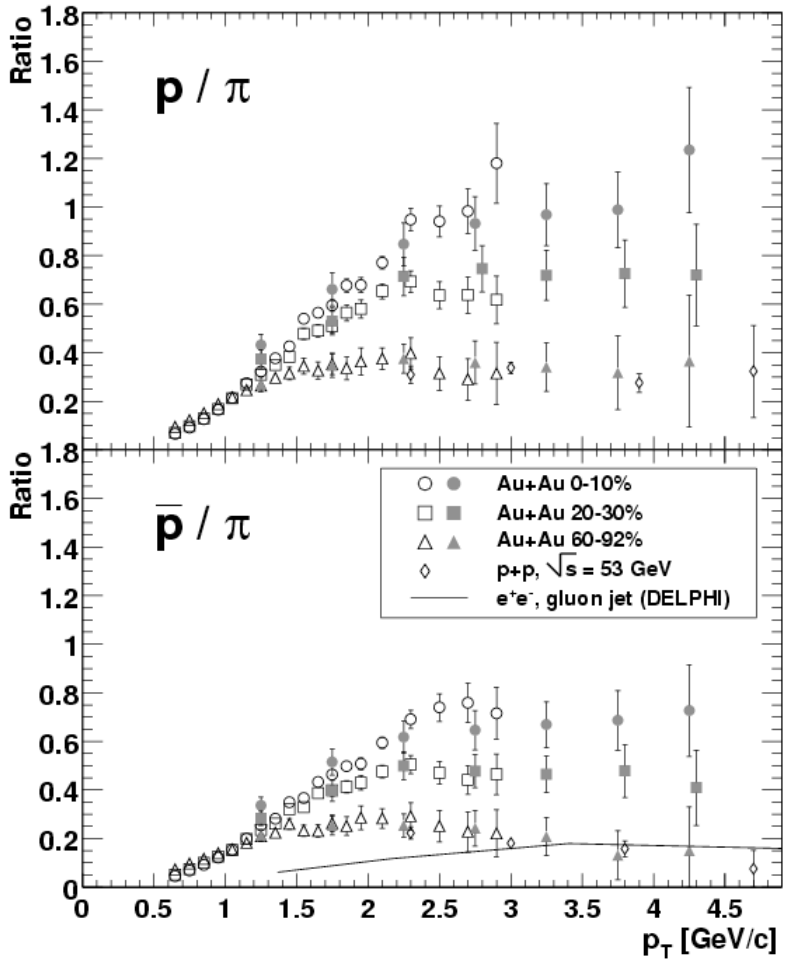
Talk Outline

- Motivation
- Year 2 Data (low statistics Au+Au @ 200 GeV)
  - Data
  - Model Comparison
- Year 4 Data (large statistics Au+Au @ 200 GeV)
  - Data
- Comparison to SPS data

Motivation - why strange baryons?

- Measured p/π ratios showed a linear increase with increasing p_T





PHENIX: PRC 69, 034909 (2004)

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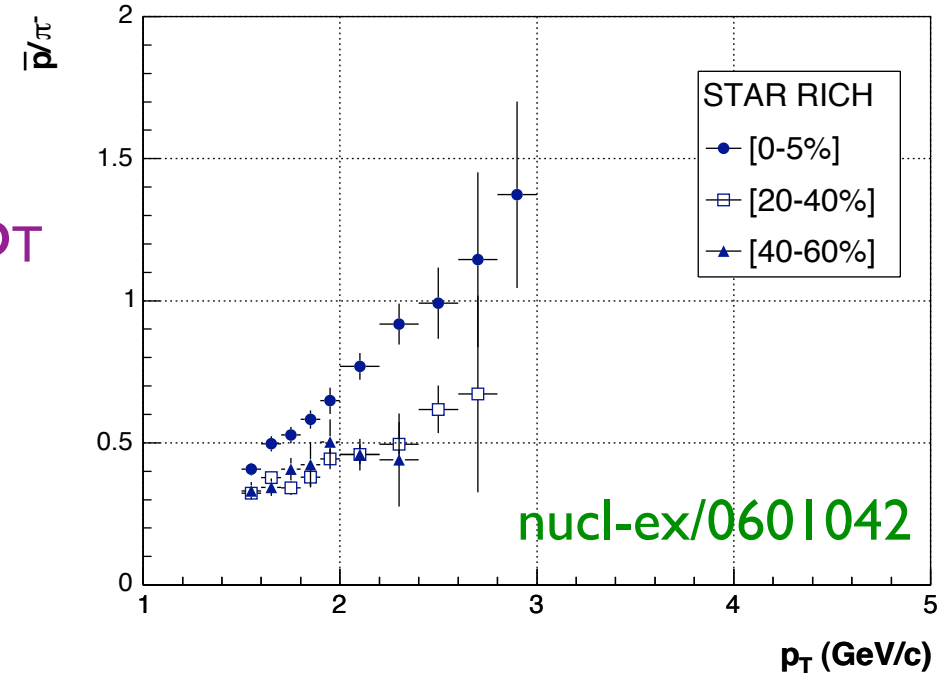

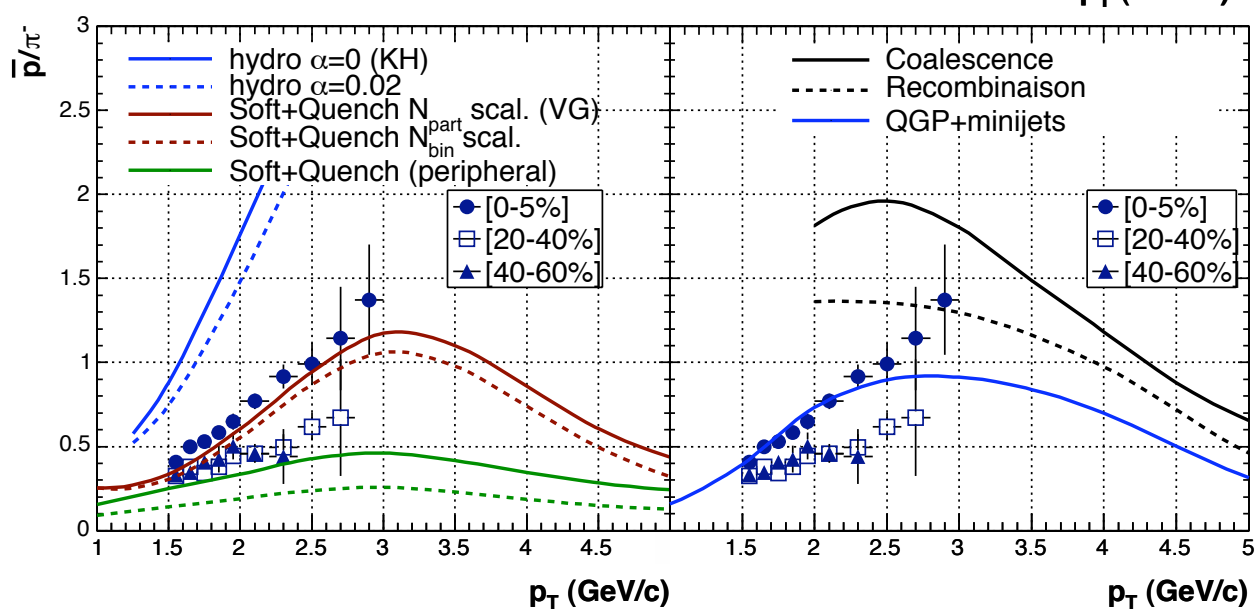

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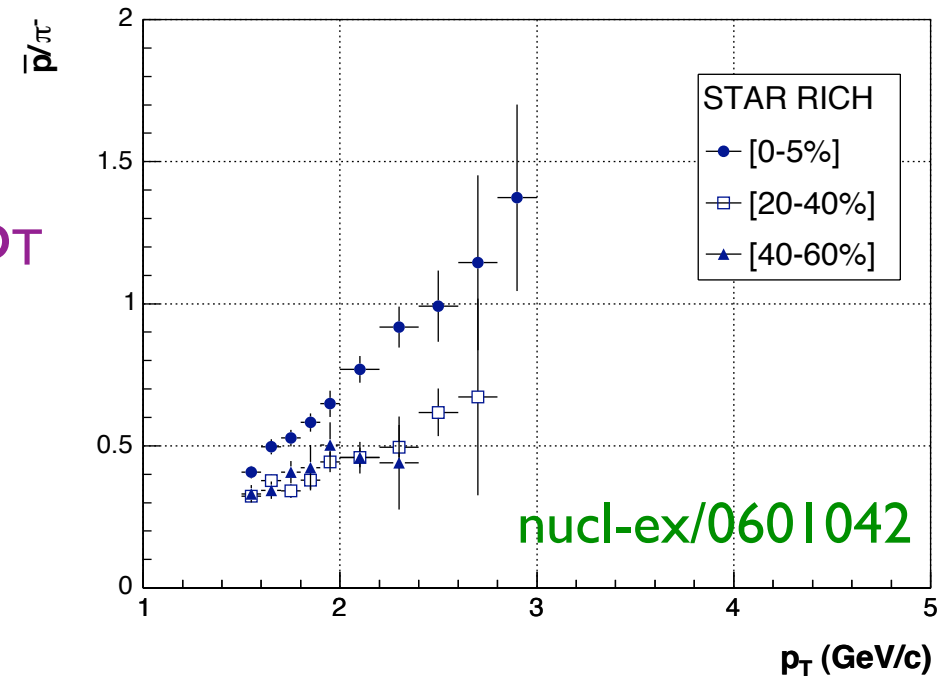
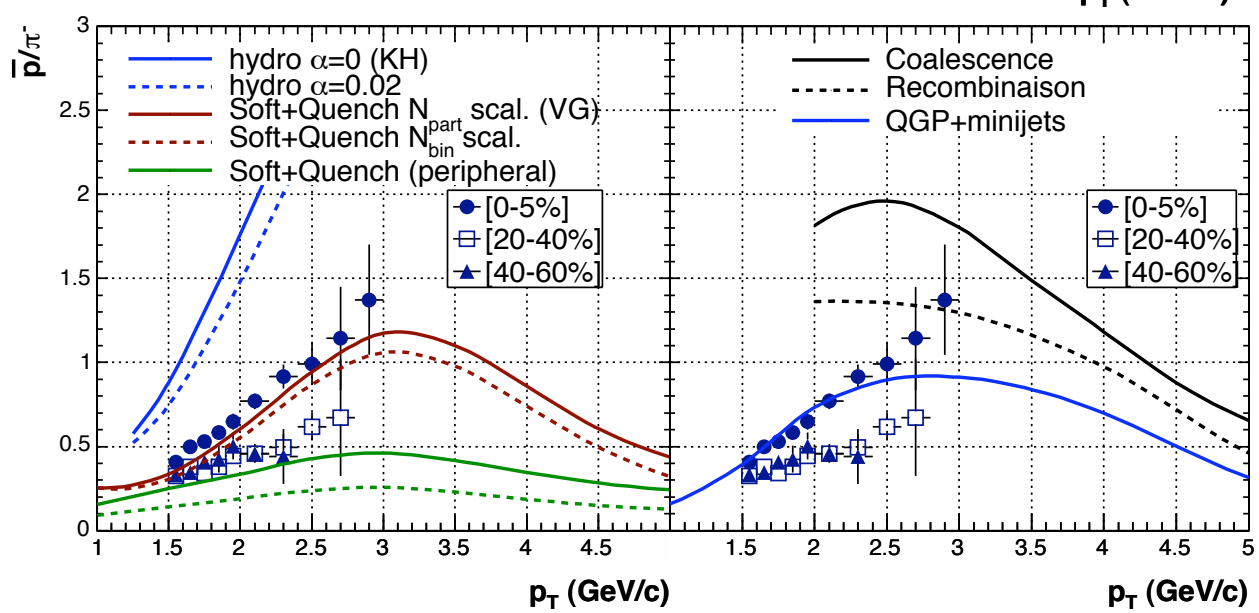
- Strange baryons → enhanced p_T coverage





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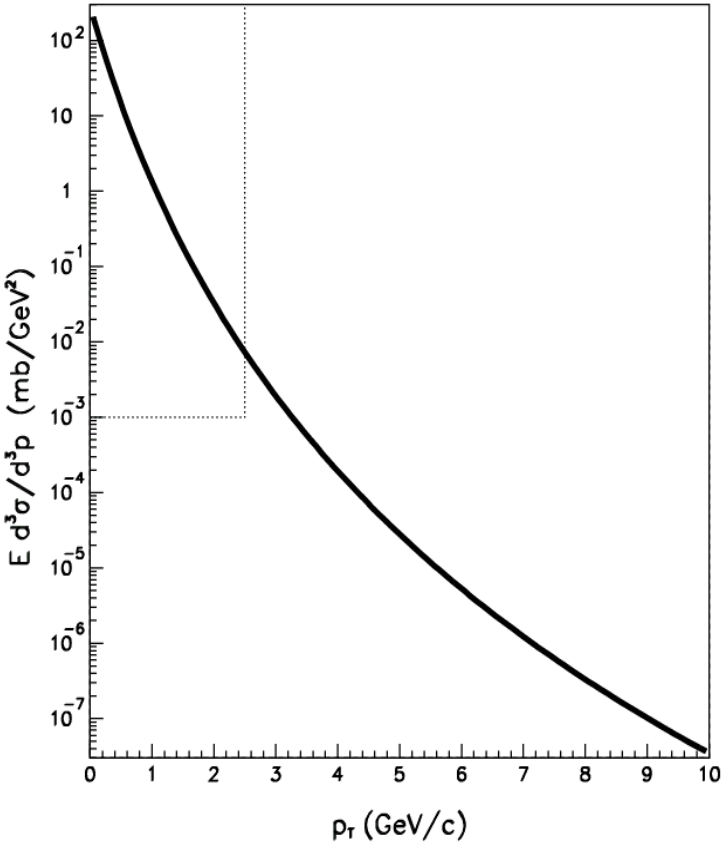

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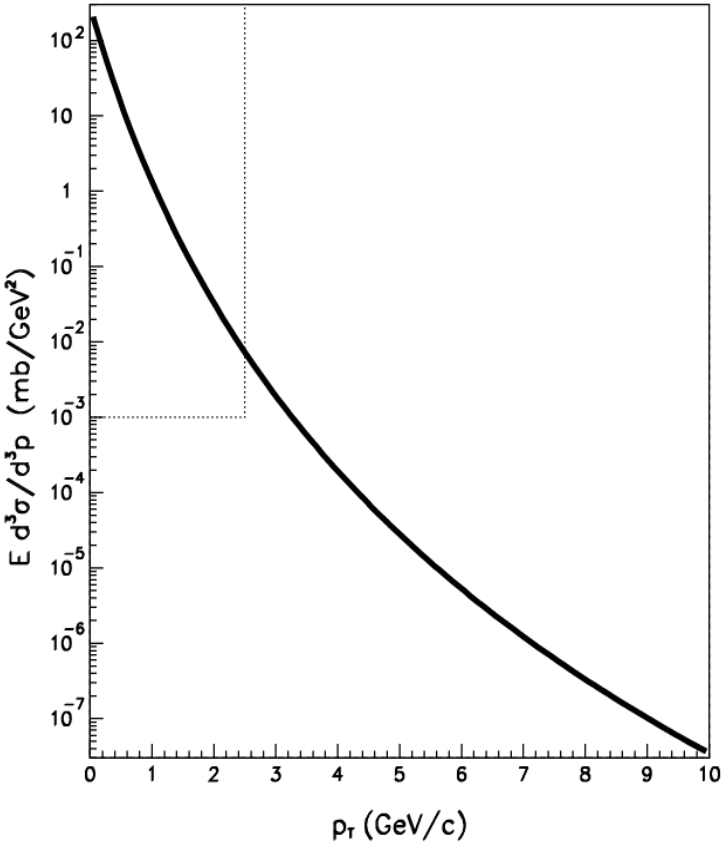

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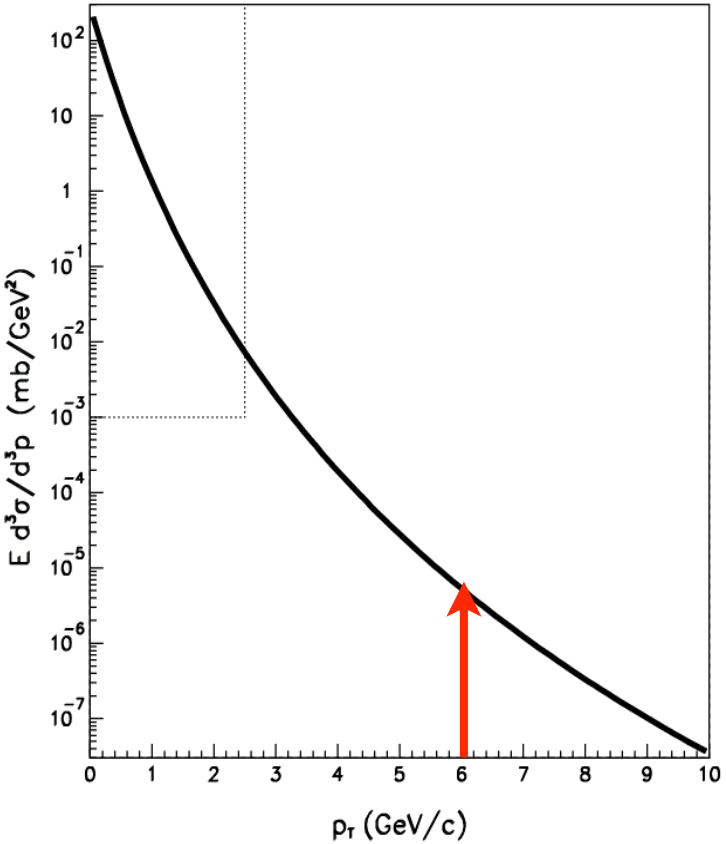

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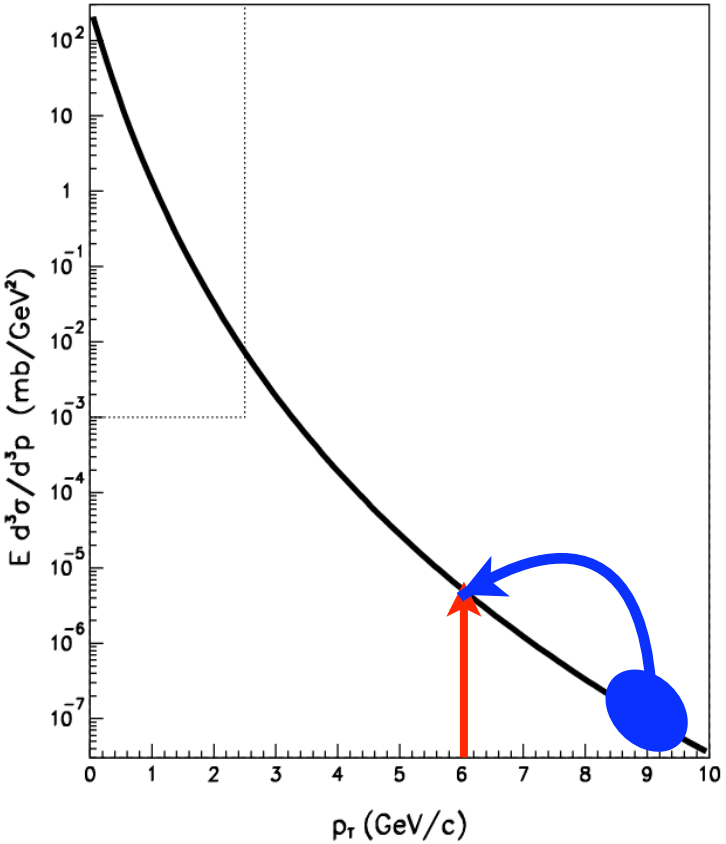

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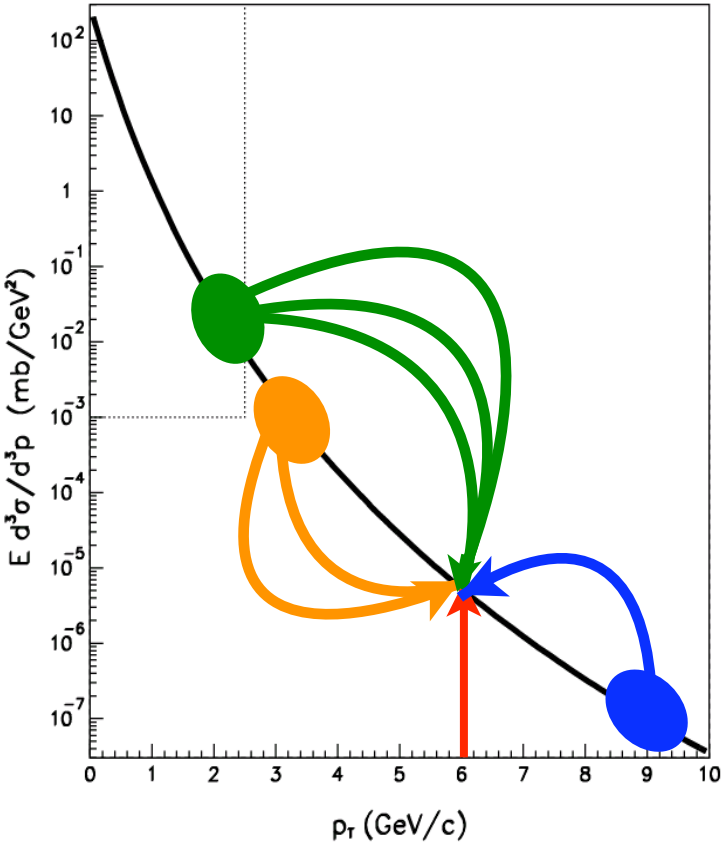

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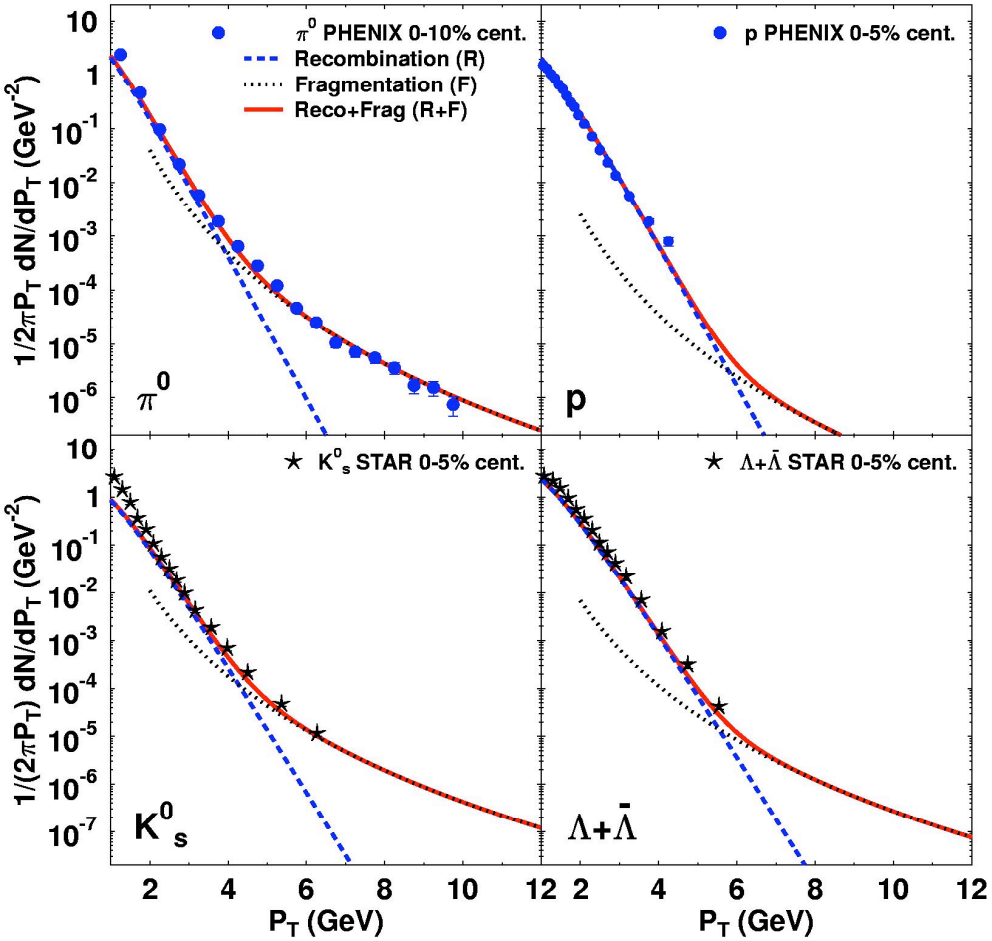

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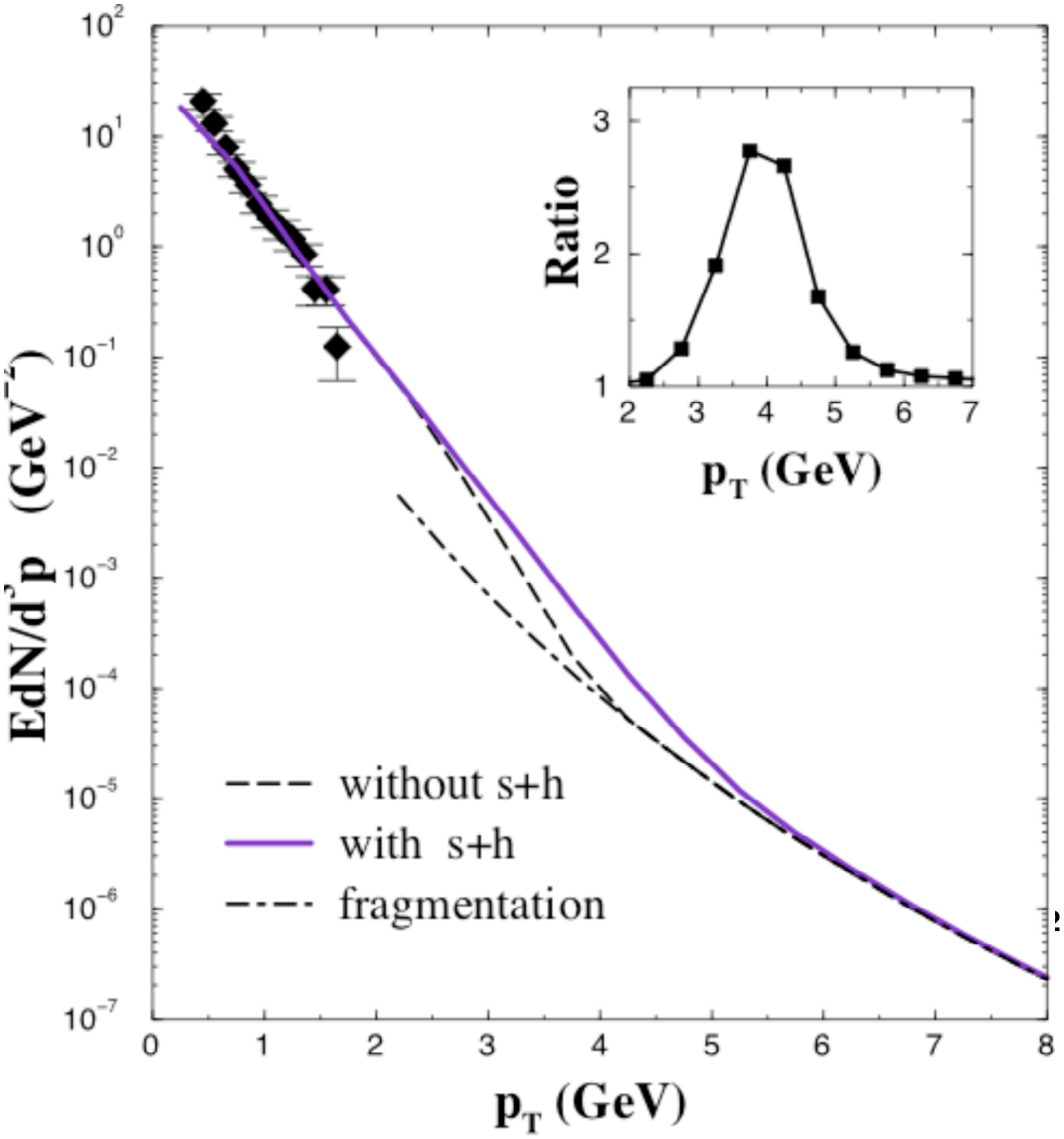
- Some models allow the recombination of soft and hard partons



What do we know from Year 2?

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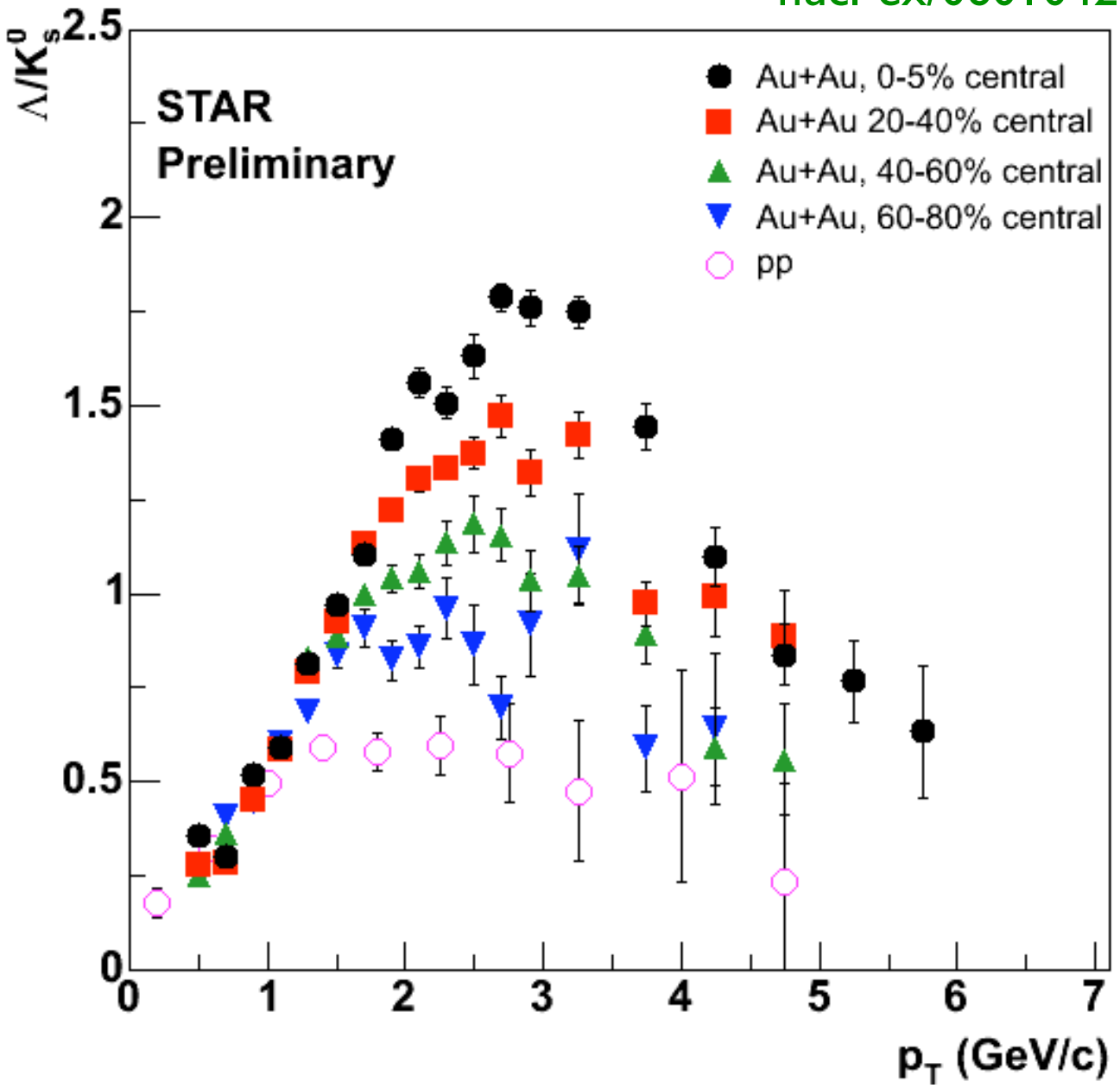
nucl-ex/0601042

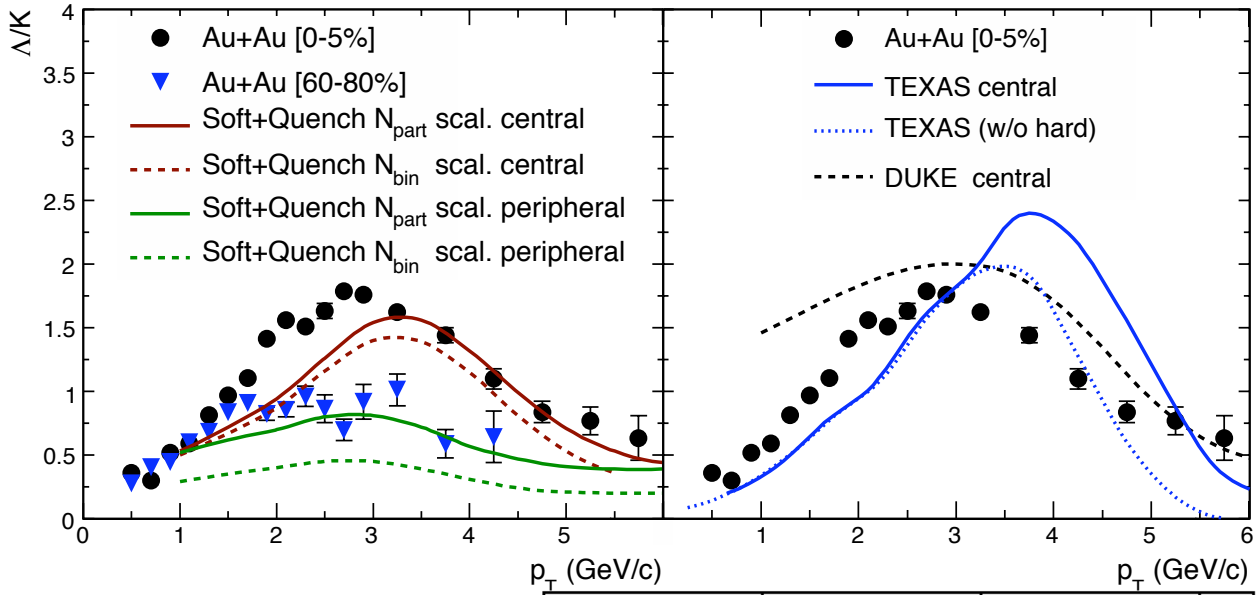
- Good statistics for all centralities
  - Data extend out to 6 GeV/c in the most central bin
- Λ/K^0_S ratio shows baryon dominance in the region $2 < p_T < 5$ GeV/c
- Ratio decreases at higher p_T
  - Data appears to come together for all centralities

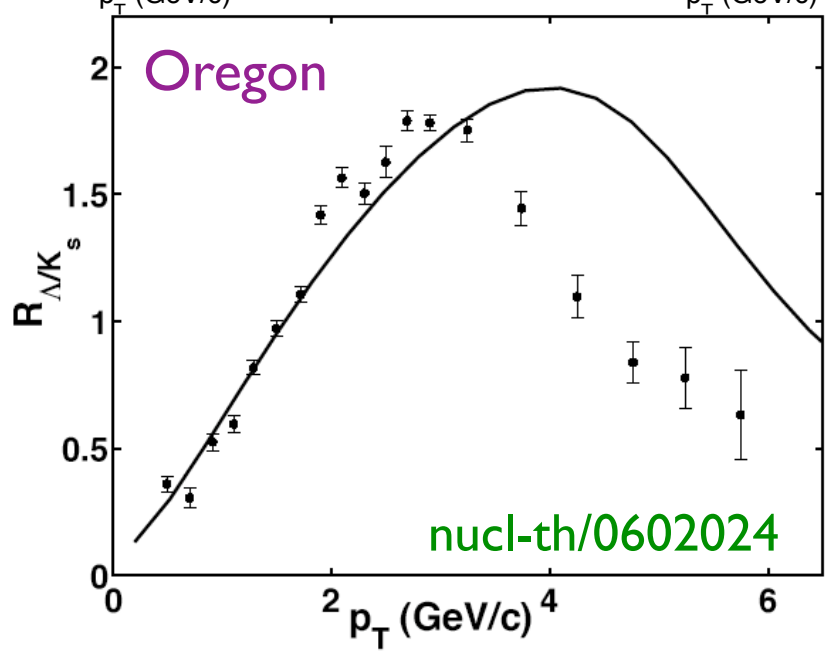


Comparison to Theory

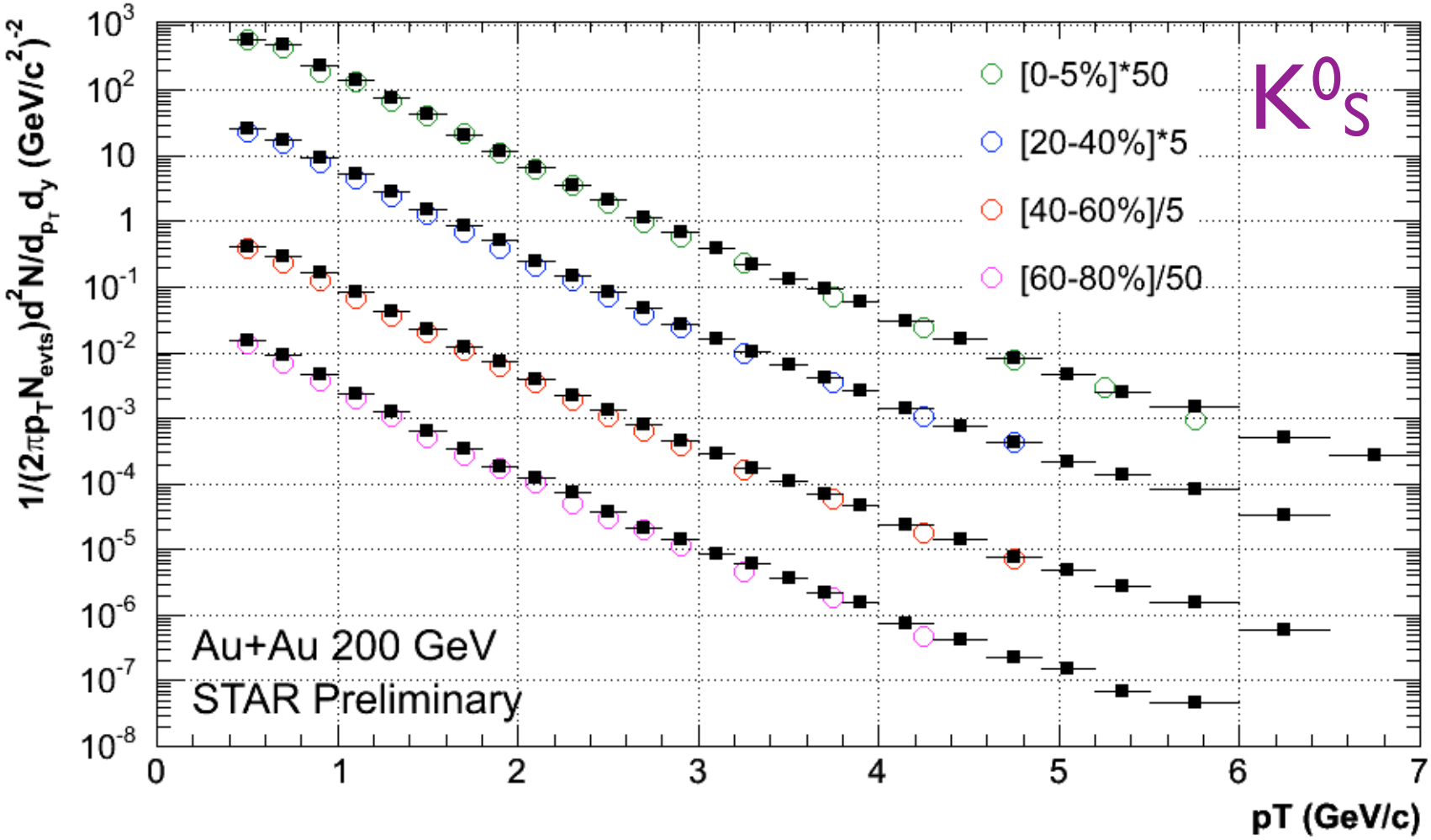
nucl-ex/0601042

- Ratio well described quantitatively by both Soft+Quench model and coalescence models
- Models which include extra soft +hard mechanisms overshoot the data





Year 4 - Spectra



- Much greater statistics → more detailed binning and higher reach in p_T

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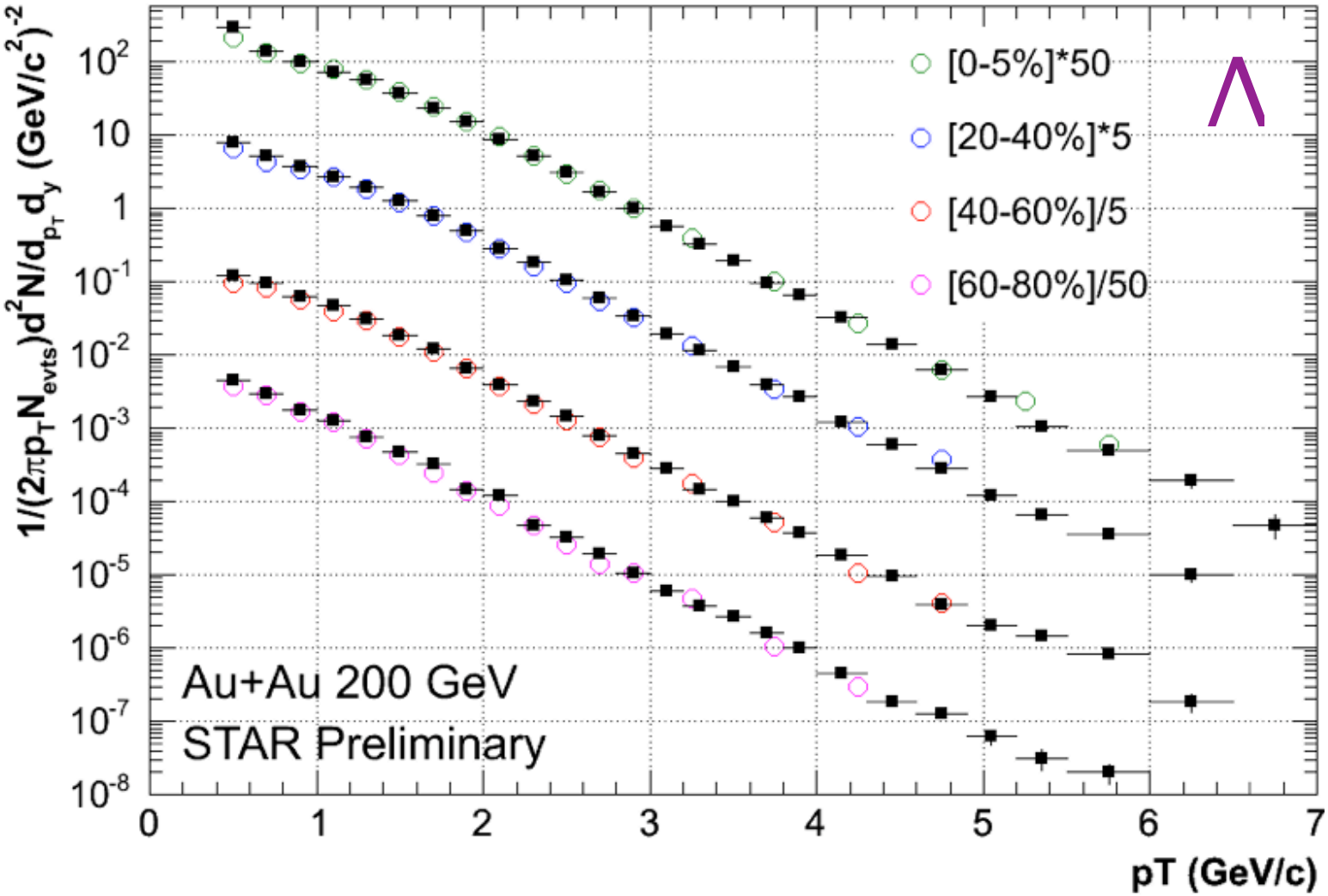

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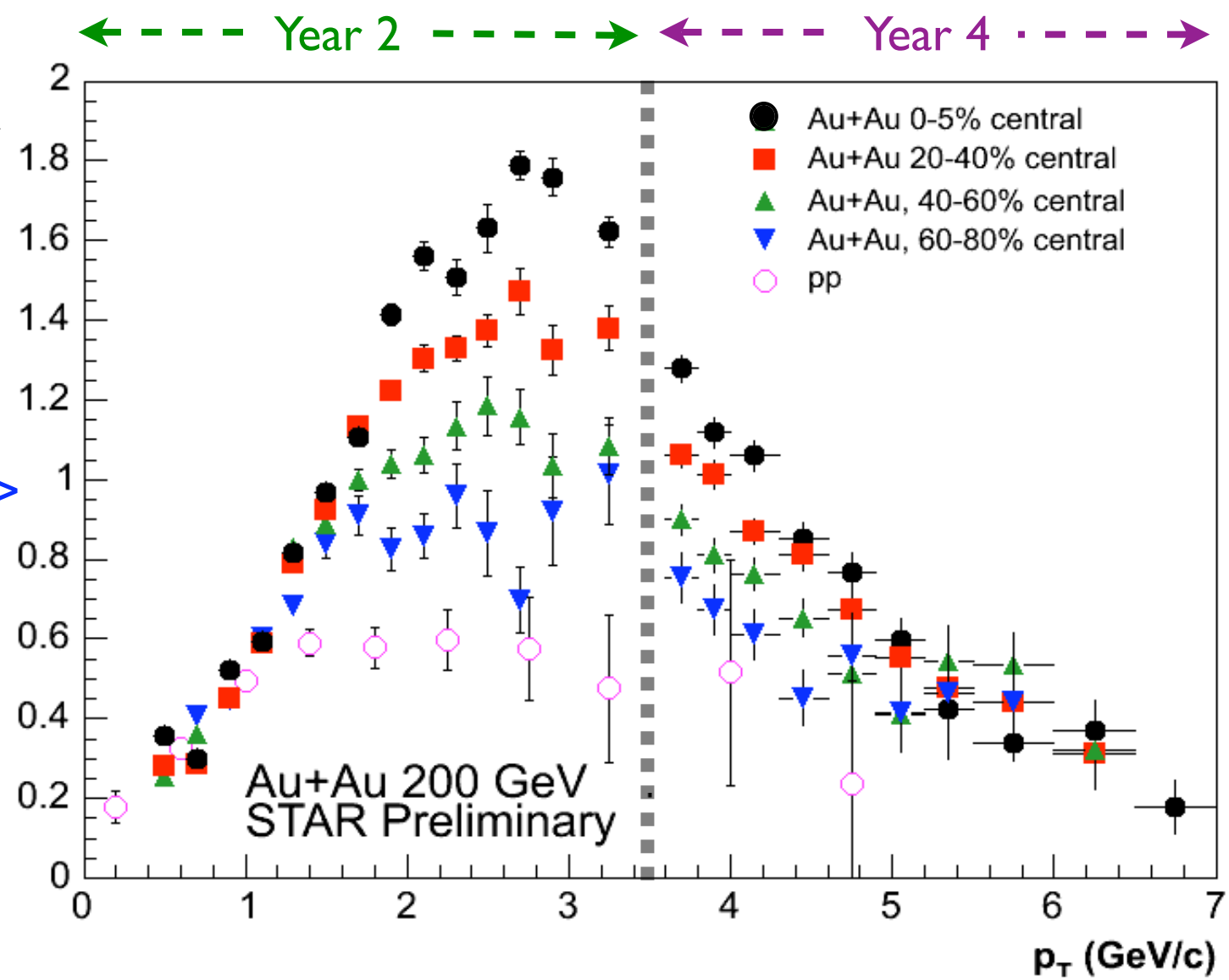
Λ/K^0_S: the New Data

- New data greatly extends the coverage to higher p_T
- The Λ/K^0_S ratio tends to the same value for all centralities for p_T > 5 GeV/c
- Consistent with values in p+p at higher p_T



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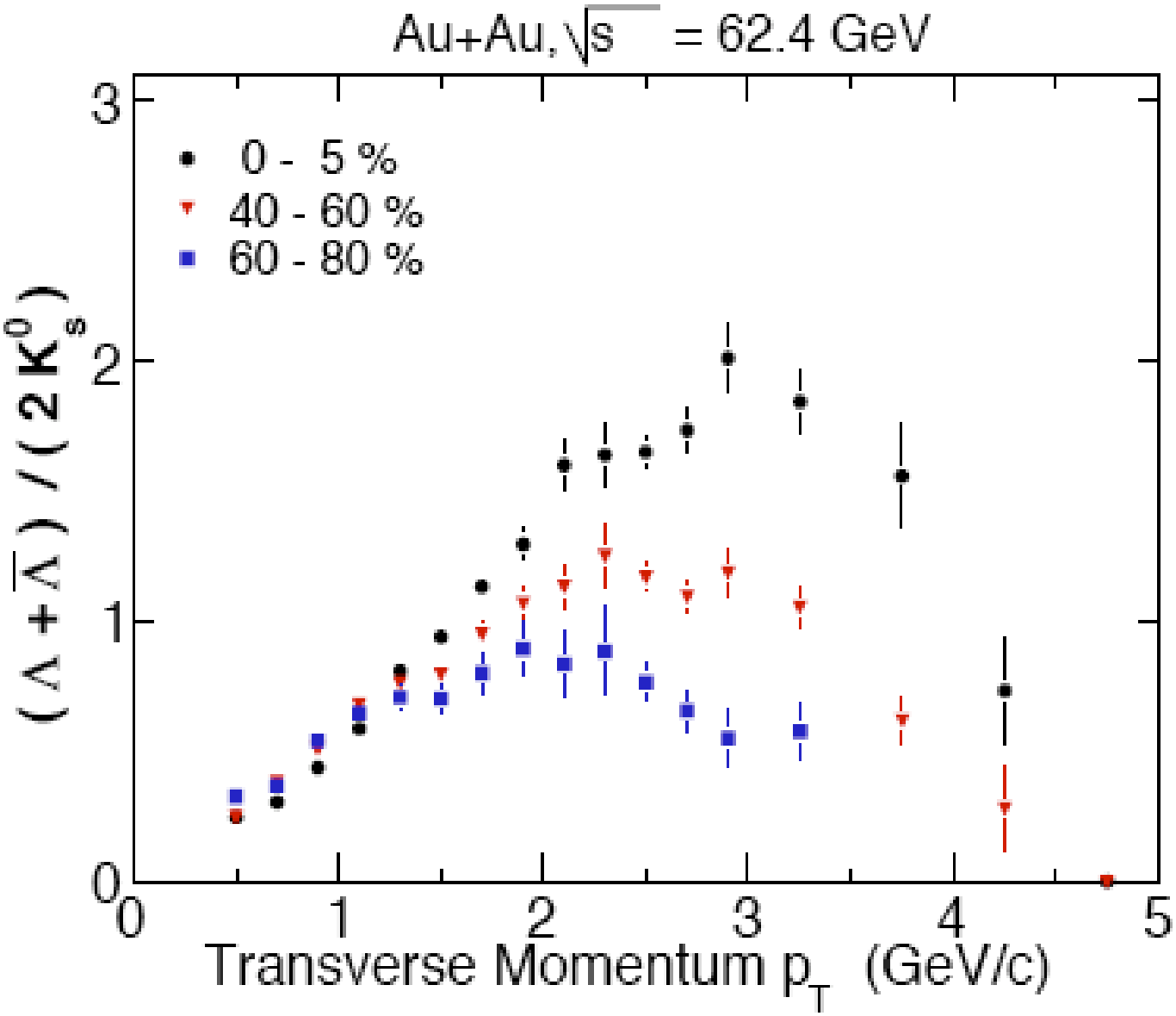
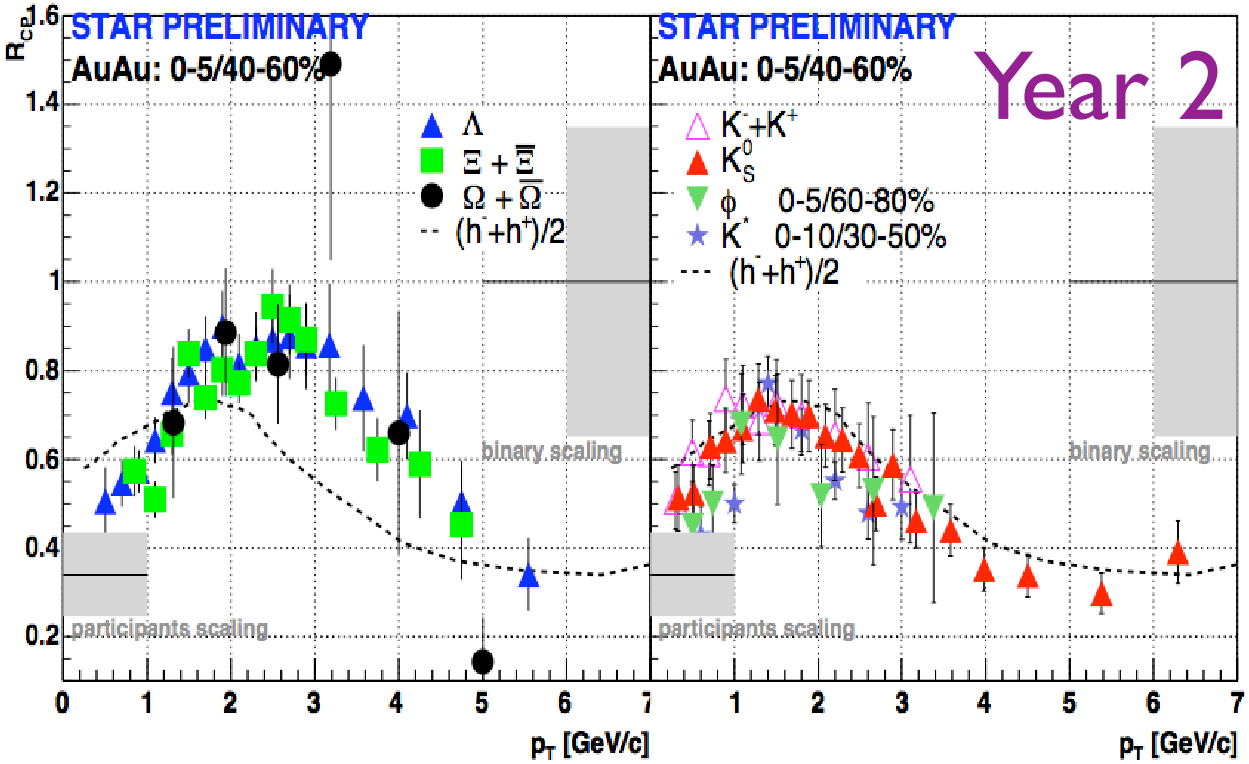
- Less statistics but same behaviour is seen for 62 GeV data



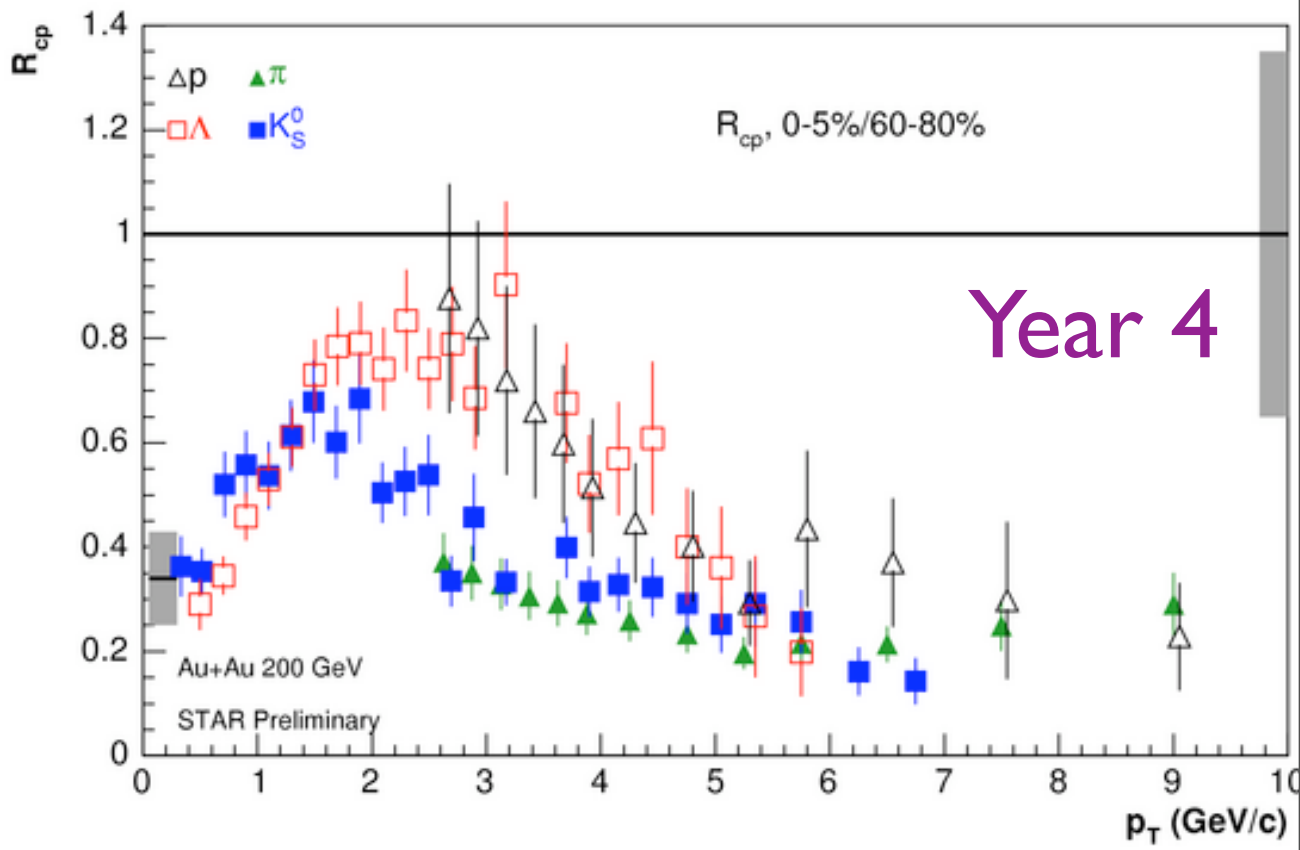
Another View: R_{CP}

- Year 2 R_{CP} data shows the splitting between baryons and mesons

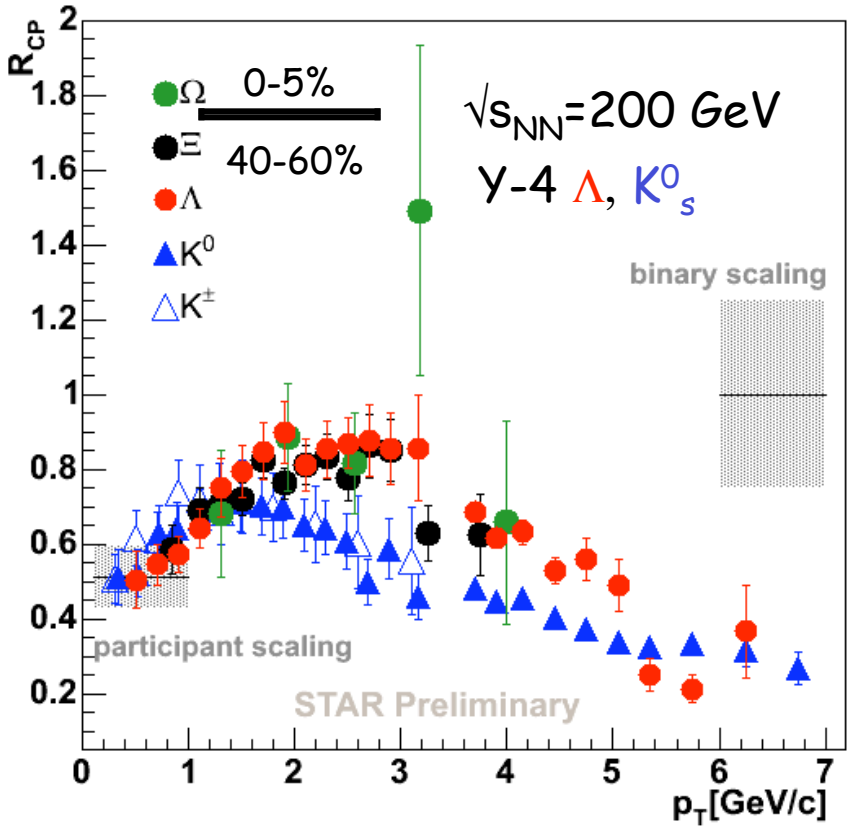


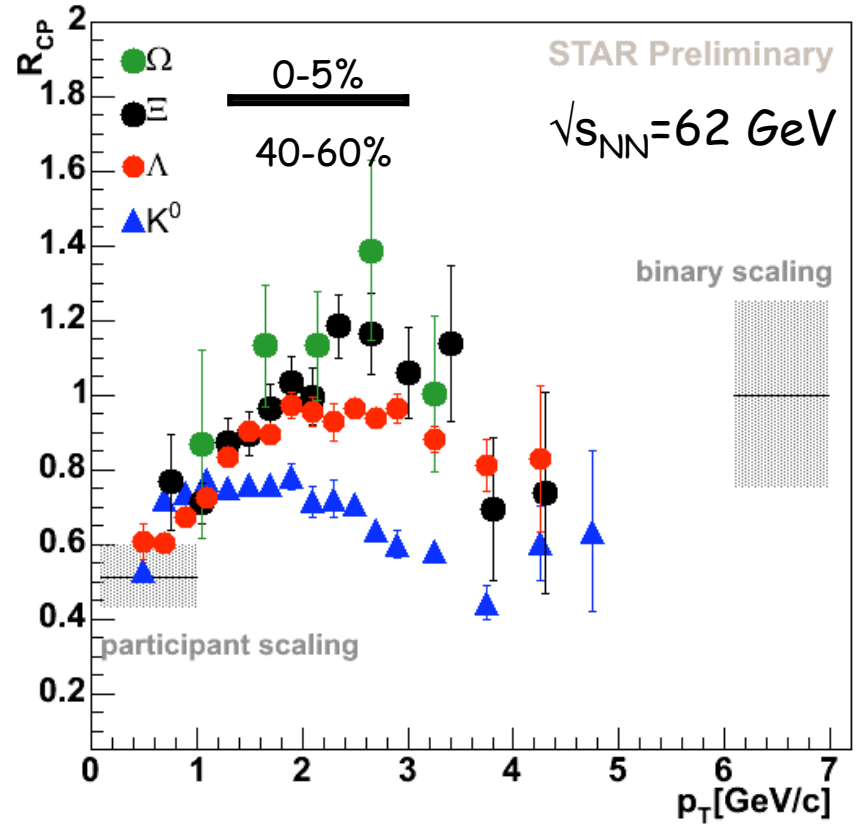
Another View: R_{CP}

- Year 2 R_{CP} data shows the splitting between baryons and mesons
- The Year 4 data extend out in p_T far enough to show that the baryons and mesons exhibit a similar suppression for $p_T > 5$ GeV/c
- Good agreement between strange and non-strange ($\Lambda \sim p$, $K^0_S \sim \pi$)



R_{CP} - energy comparison





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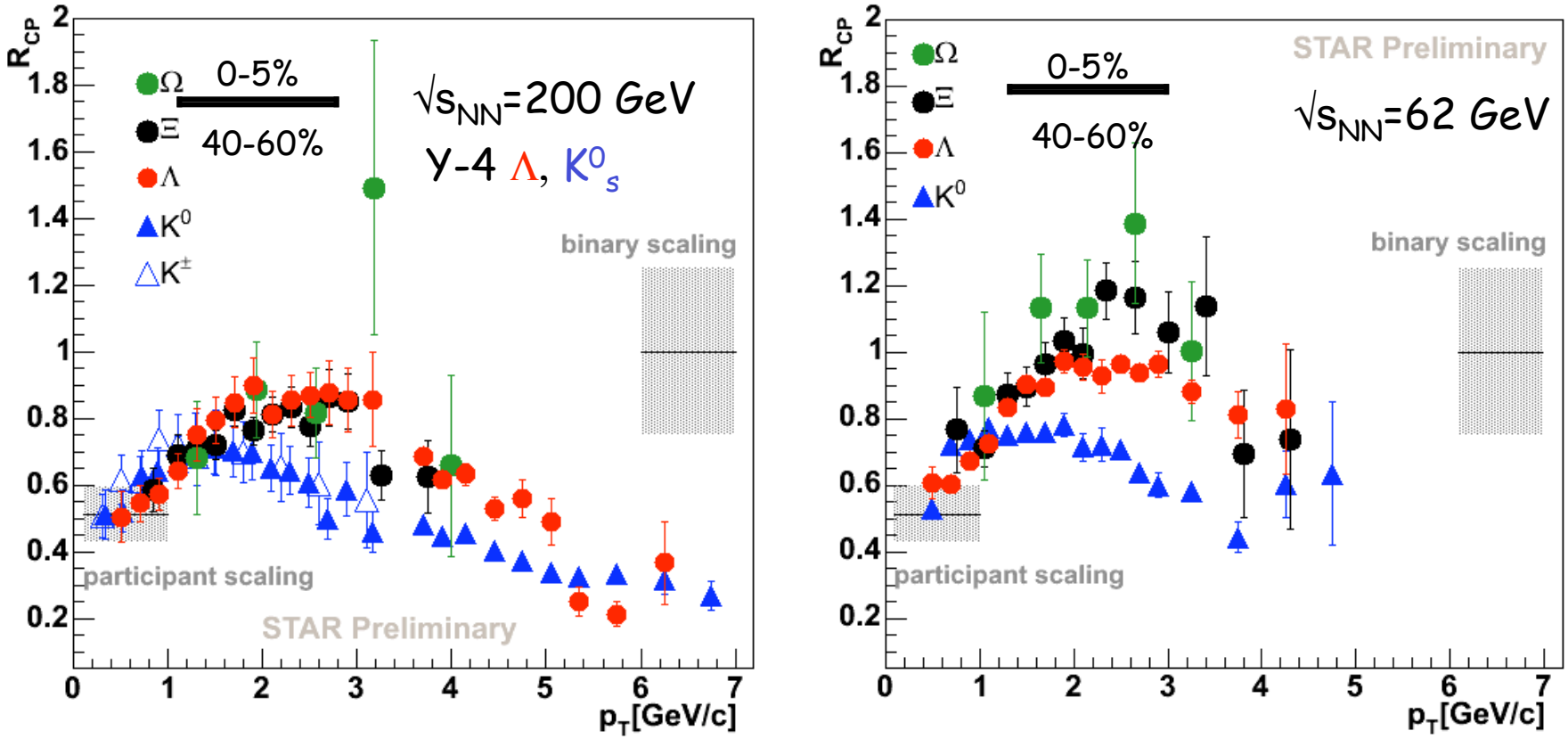

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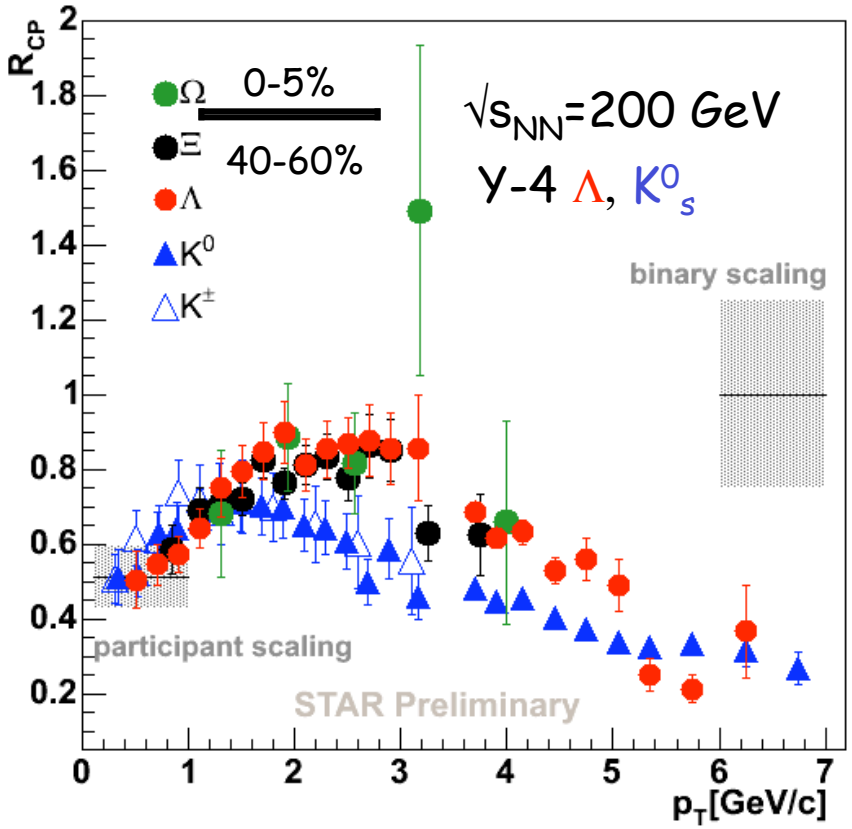
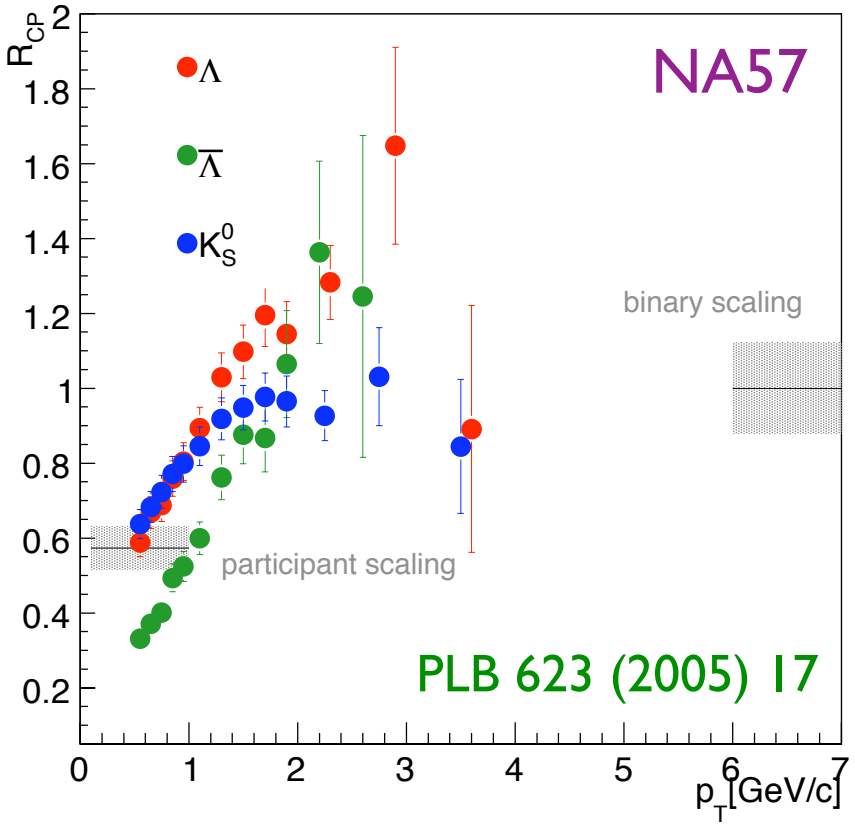
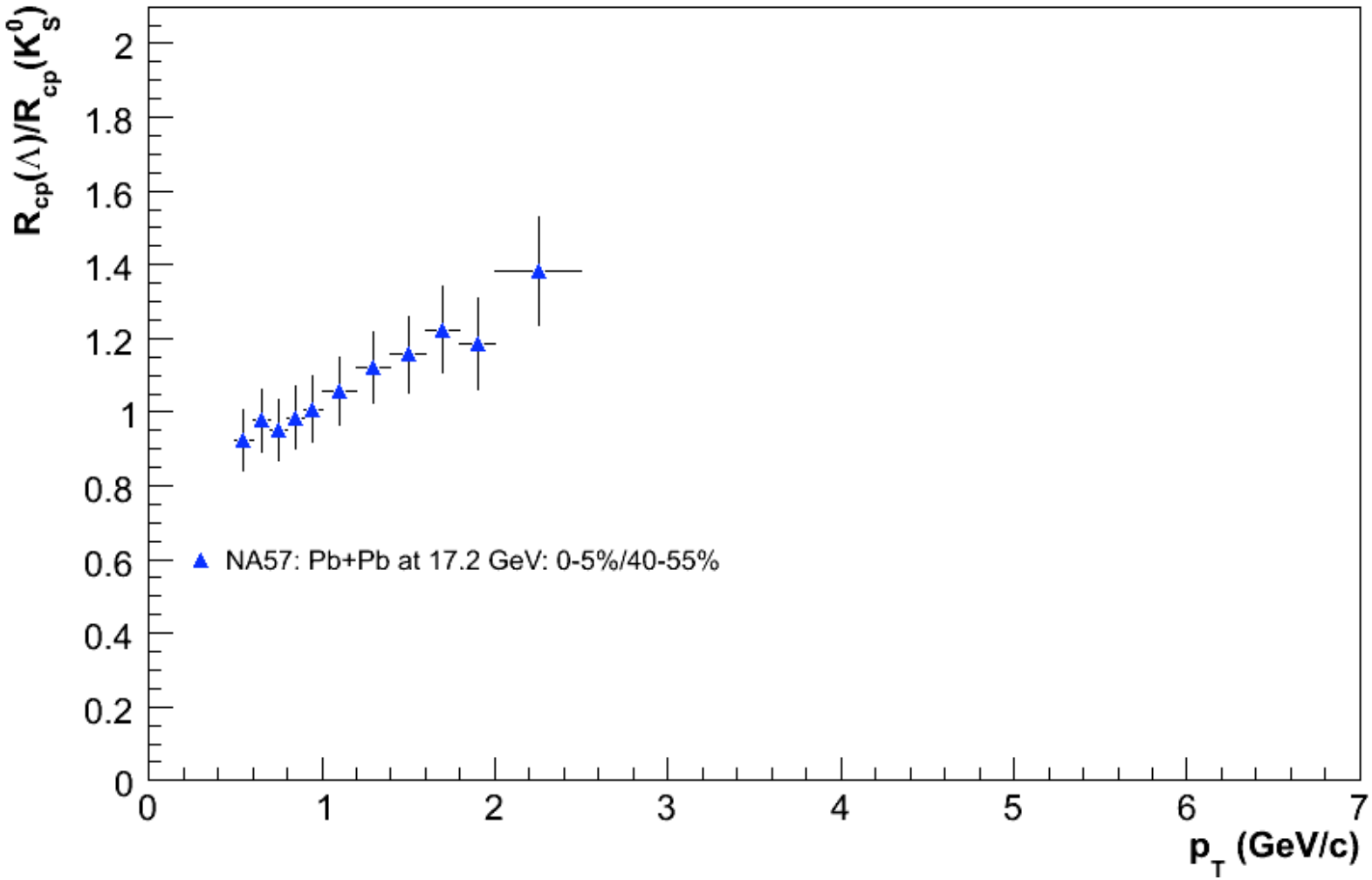




- 200 GeV and 62 GeV data both show the baryon-meson splitting
- Is the splitting also seen at the SPS ???
- Ratios higher with decreasing energy - Cronin ??

RHIC - SPS Comparison

NA57: G. Bruno, A. Dainese: nucl-ex/0511020



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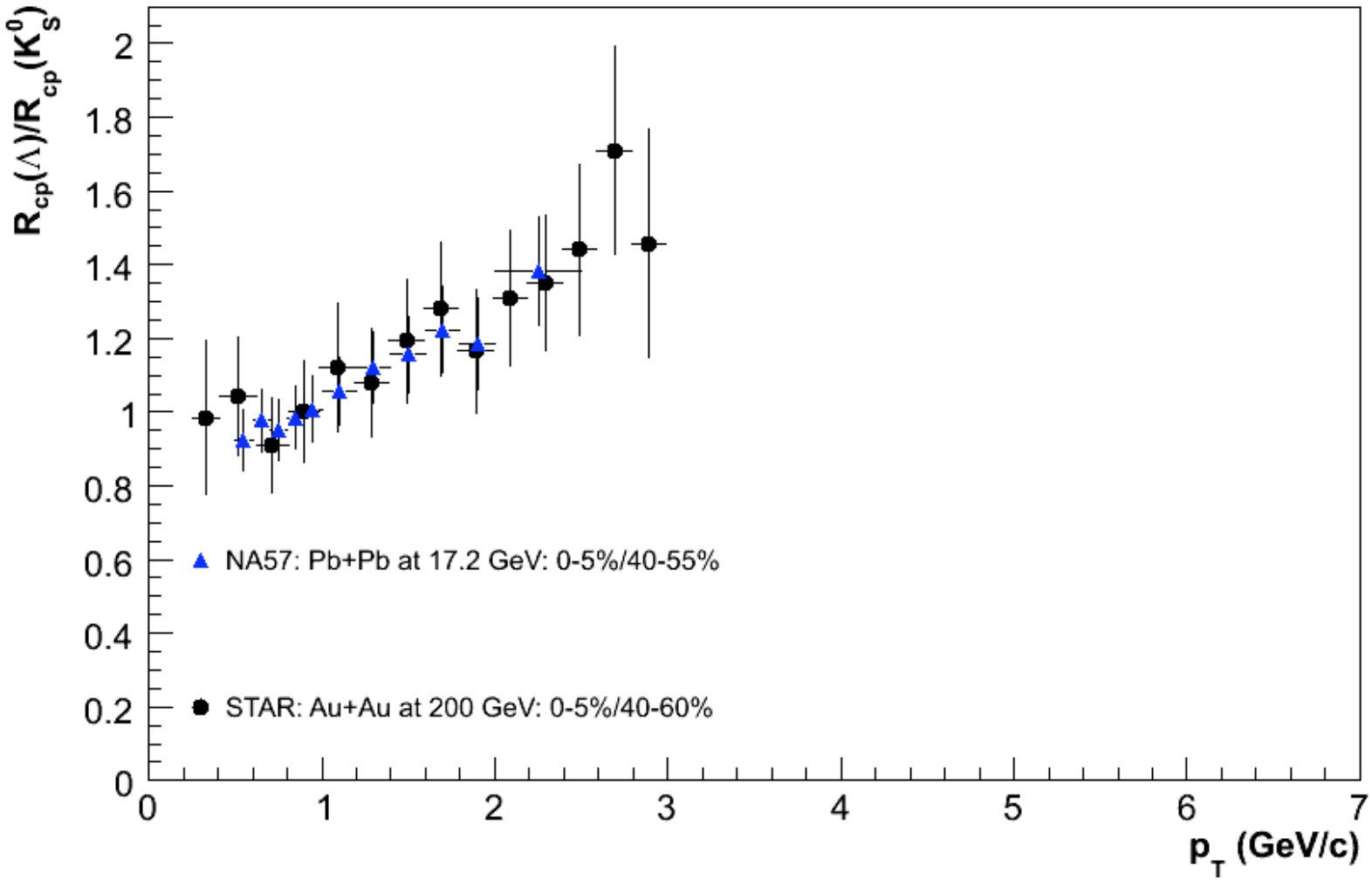
The top SPS and top RHIC energy data are consistent



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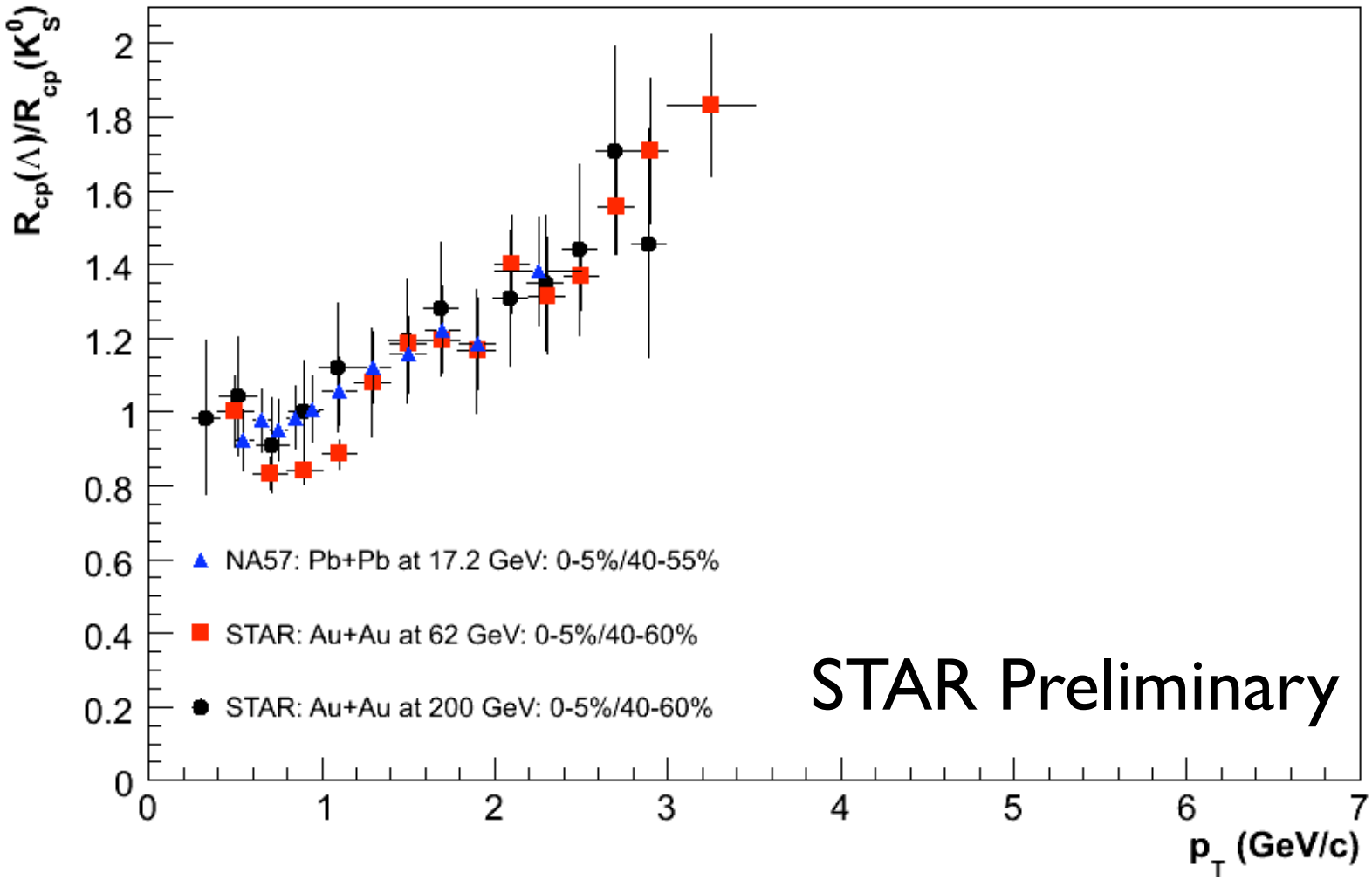

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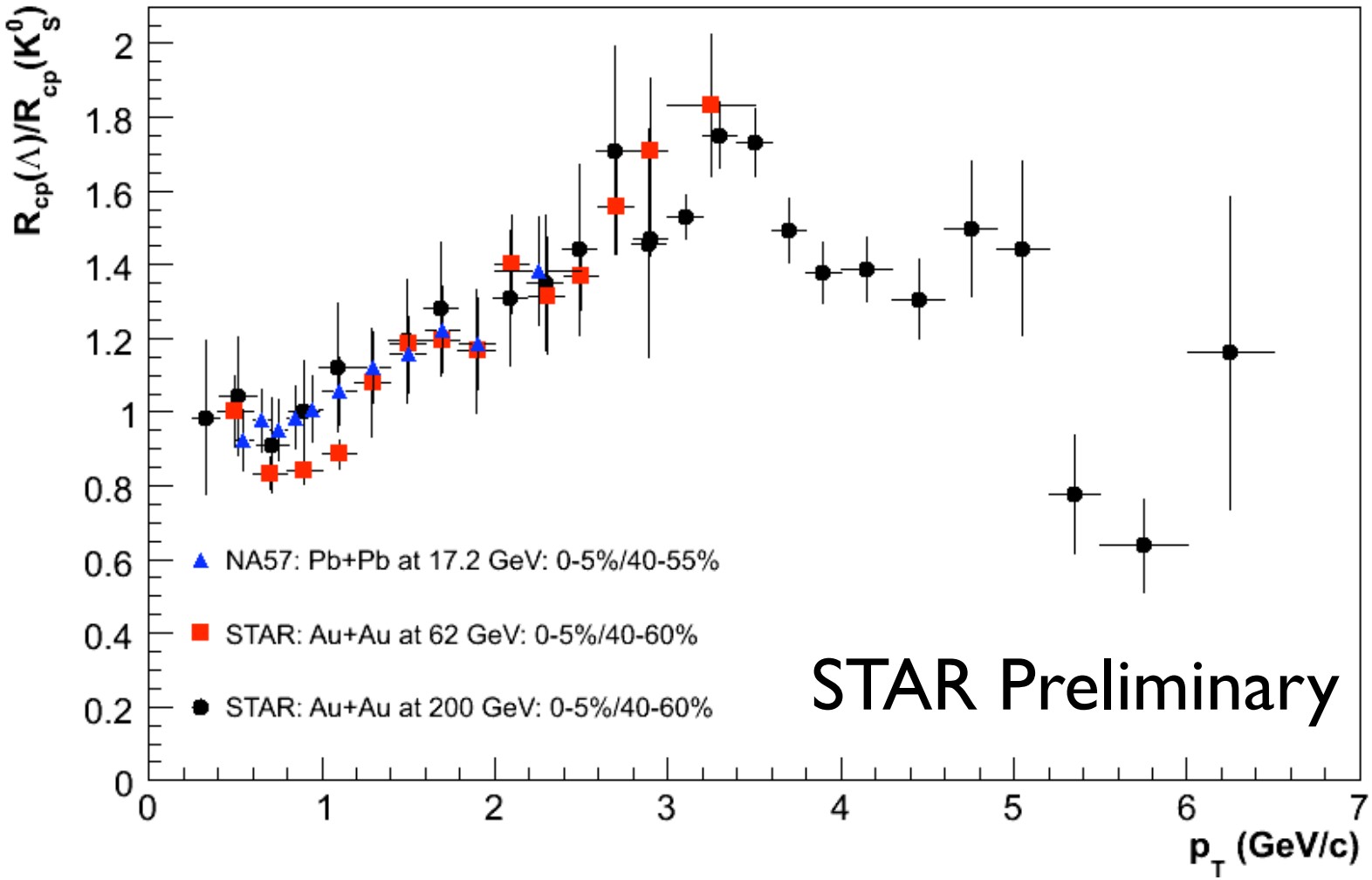

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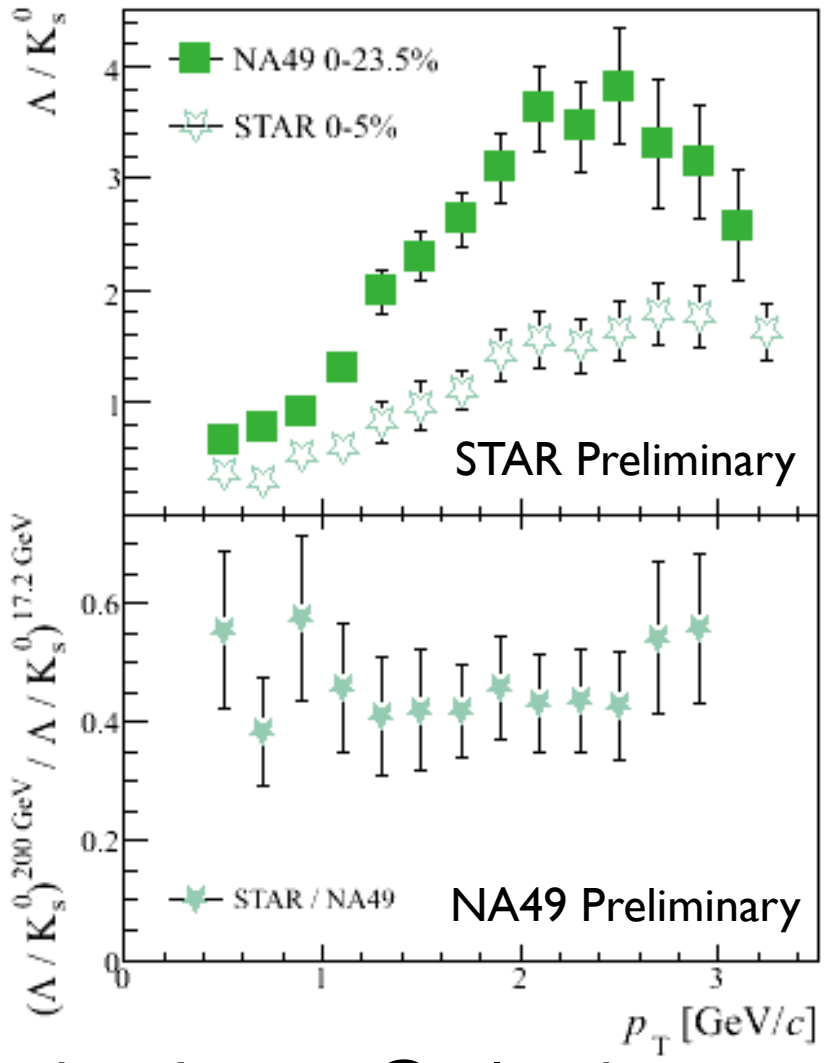

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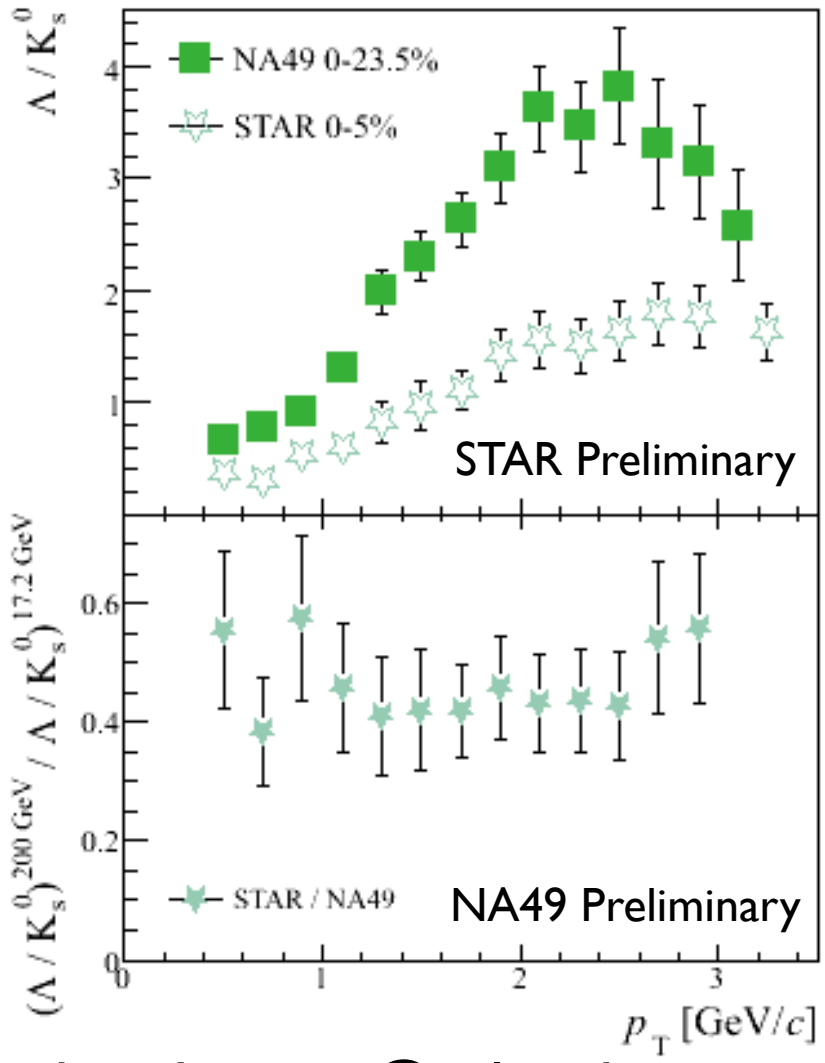

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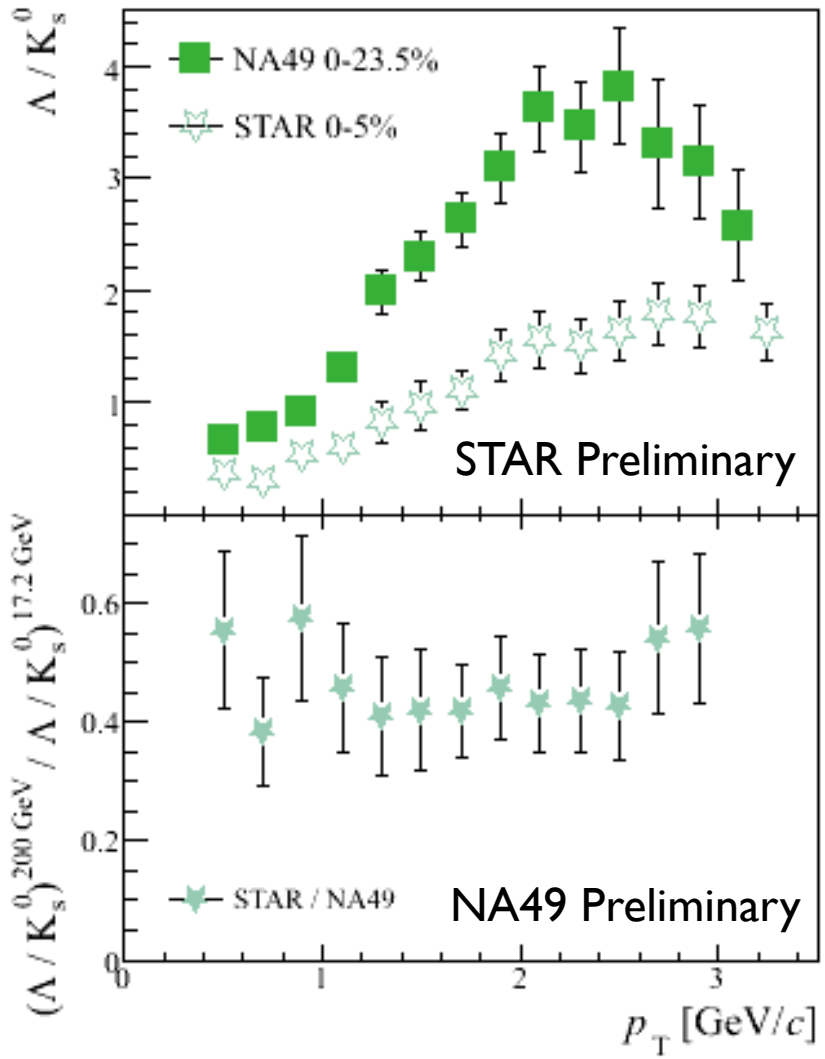
Is coalescence present in all systems?

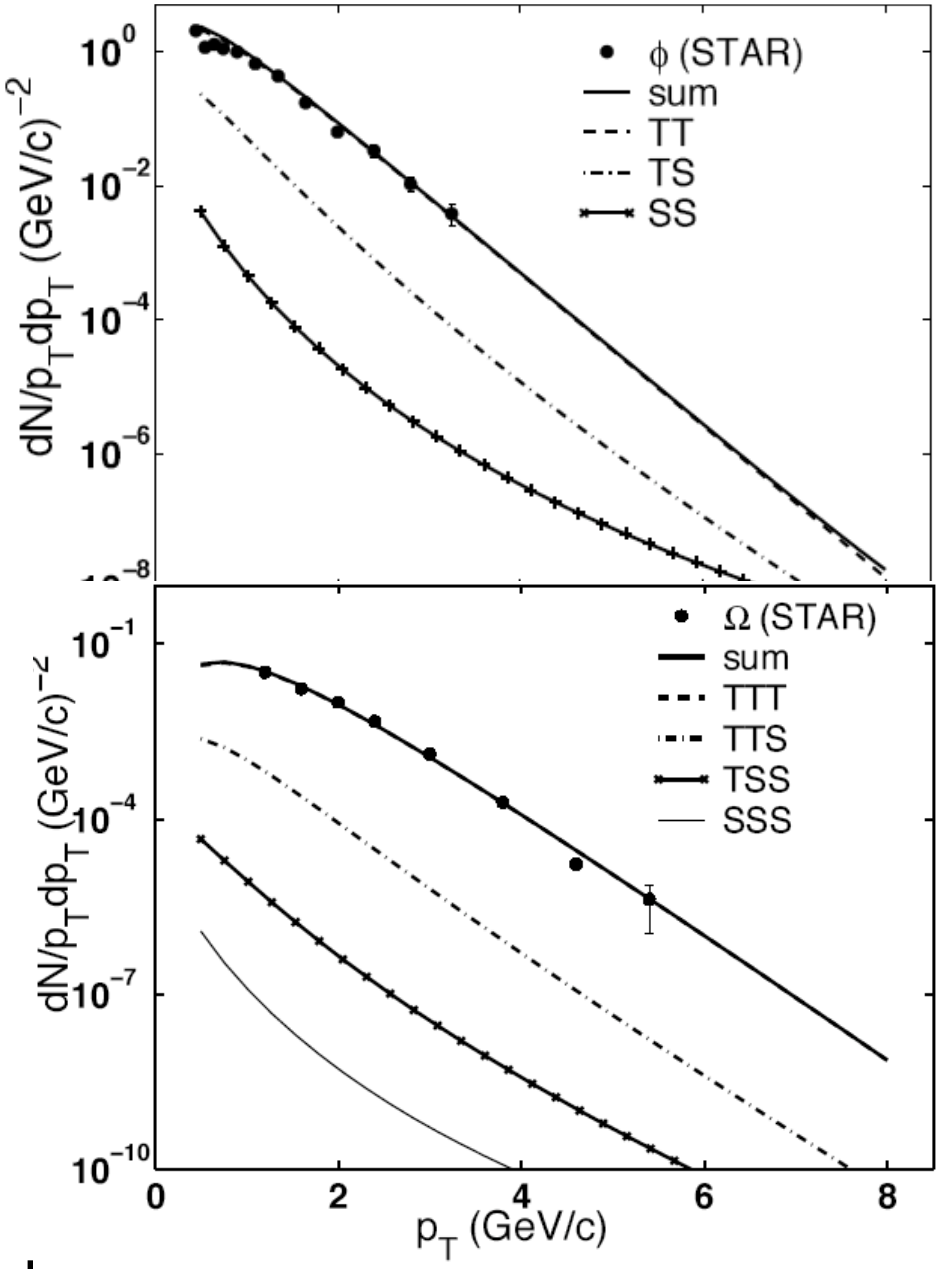
Will soon be able to test with Cu+Cu data at 200 and 62 GeV



Recent ReCo Predictions

Premise:

The production of Φ and Ω particles is almost exclusively from thermal s quarks even out to 8 GeV/c



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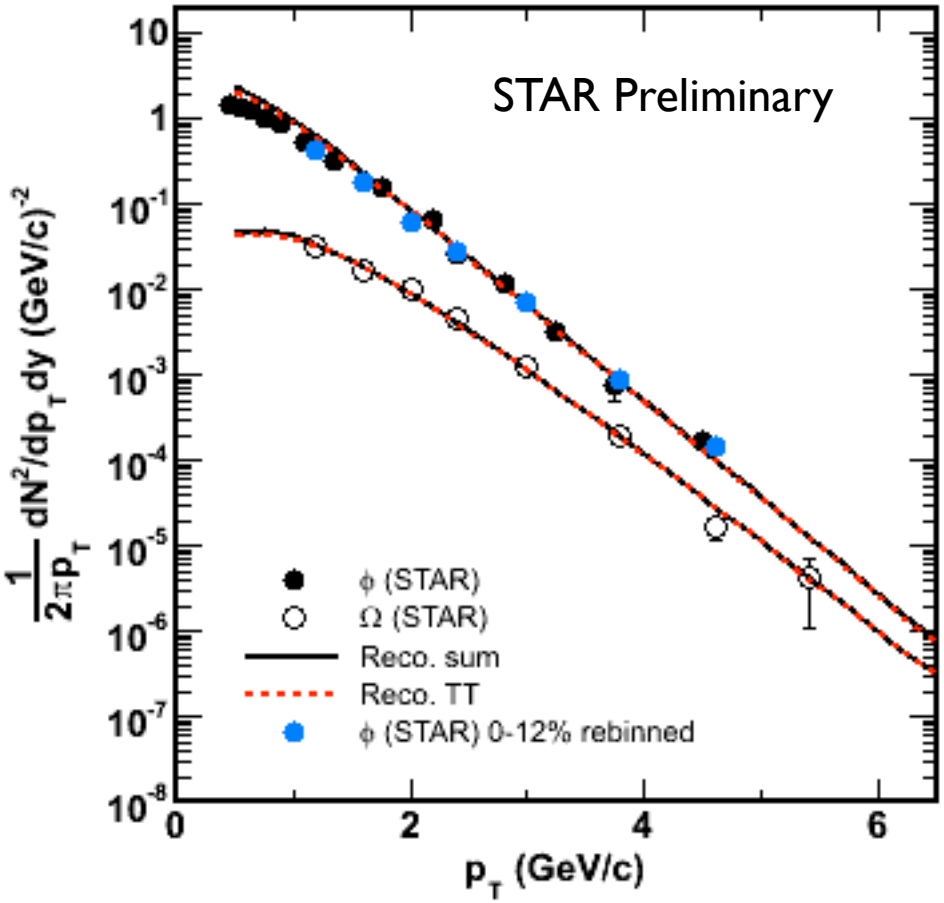

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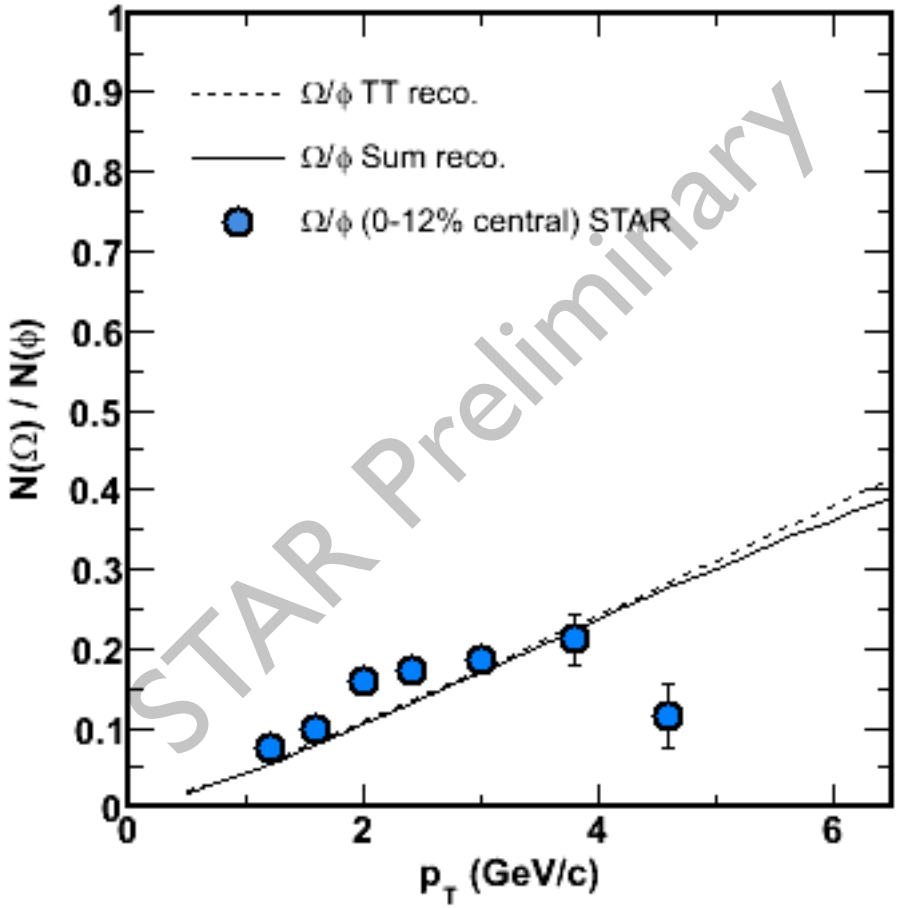

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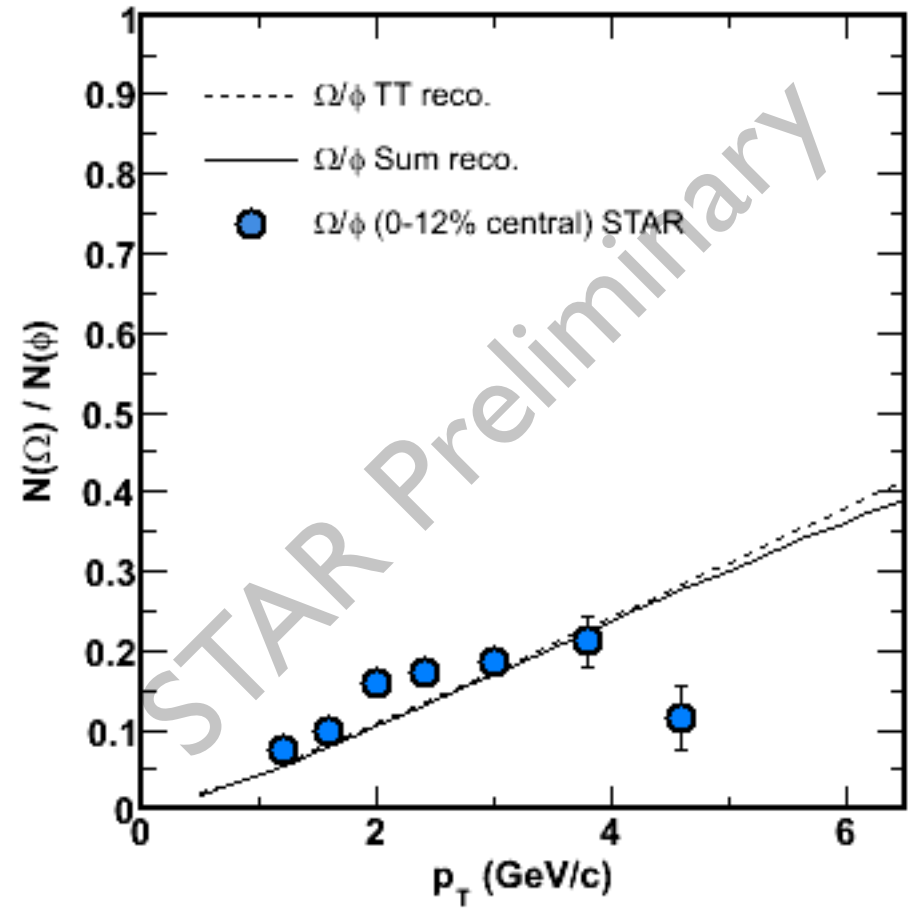

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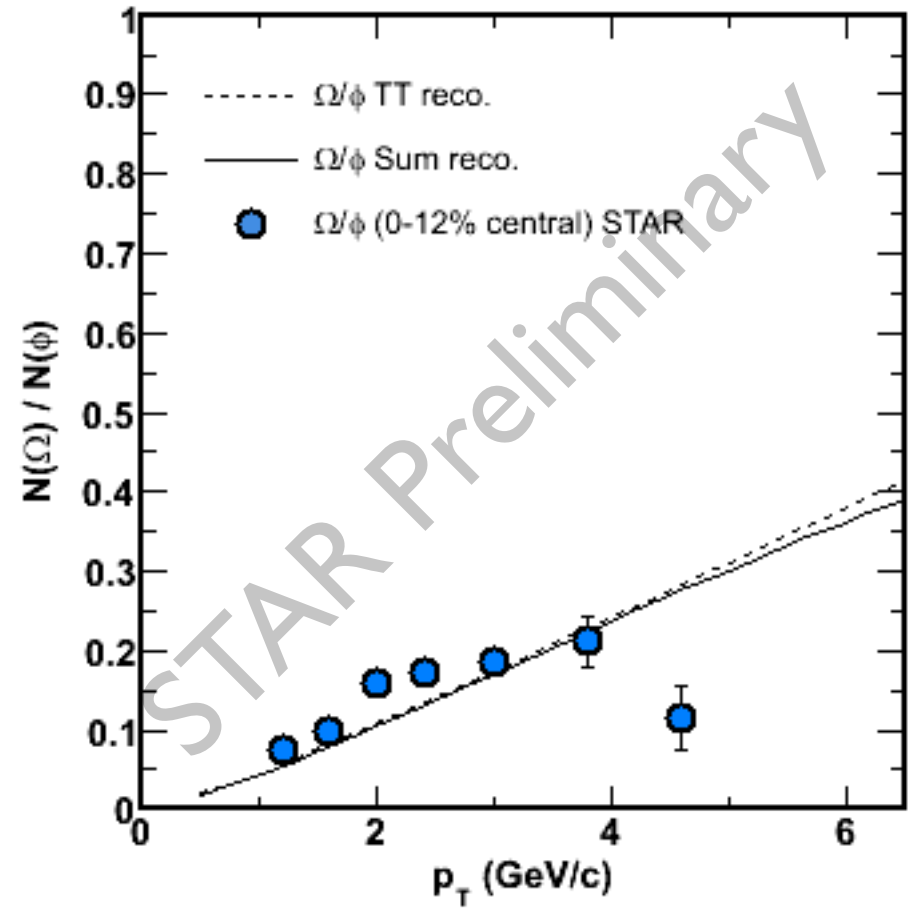

Being actively studied, but no results are available as yet

Summary

- Low statistics Au+Au @ 200 GeV data set shows baryon-meson splitting
  - Λ/K^0_S ratio shows a turnover at $p_T \sim 3$ GeV/c and then a fall.
  - Data shows strong centrality dependence
- High statistics data set shows that all centralities have a common Λ/K^0_S ratio for $p_T > 5$ GeV/c
  - Consistent with R_{CP} ratios for both strange and non-strange
- SPS data shows similar behaviour but to a limited p_T
  - Cu+Cu data will allow us to investigate this further !!
- Ω/Φ ratio shows deviation from prediction for $p_T > 4$ GeV/c

The End ...

Data-sets analysed

- Two Au+Au runs at $\sqrt{s_{NN}}$ = 200 GeV:

	Minbias Events	Central Events
Year 2	~1.5 x 10^6	~1.6 x 10^6
Year 4	~ 1.9 x 10^7	~ 2.0 x 10^7

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