

Random thoughts on forward puzzles

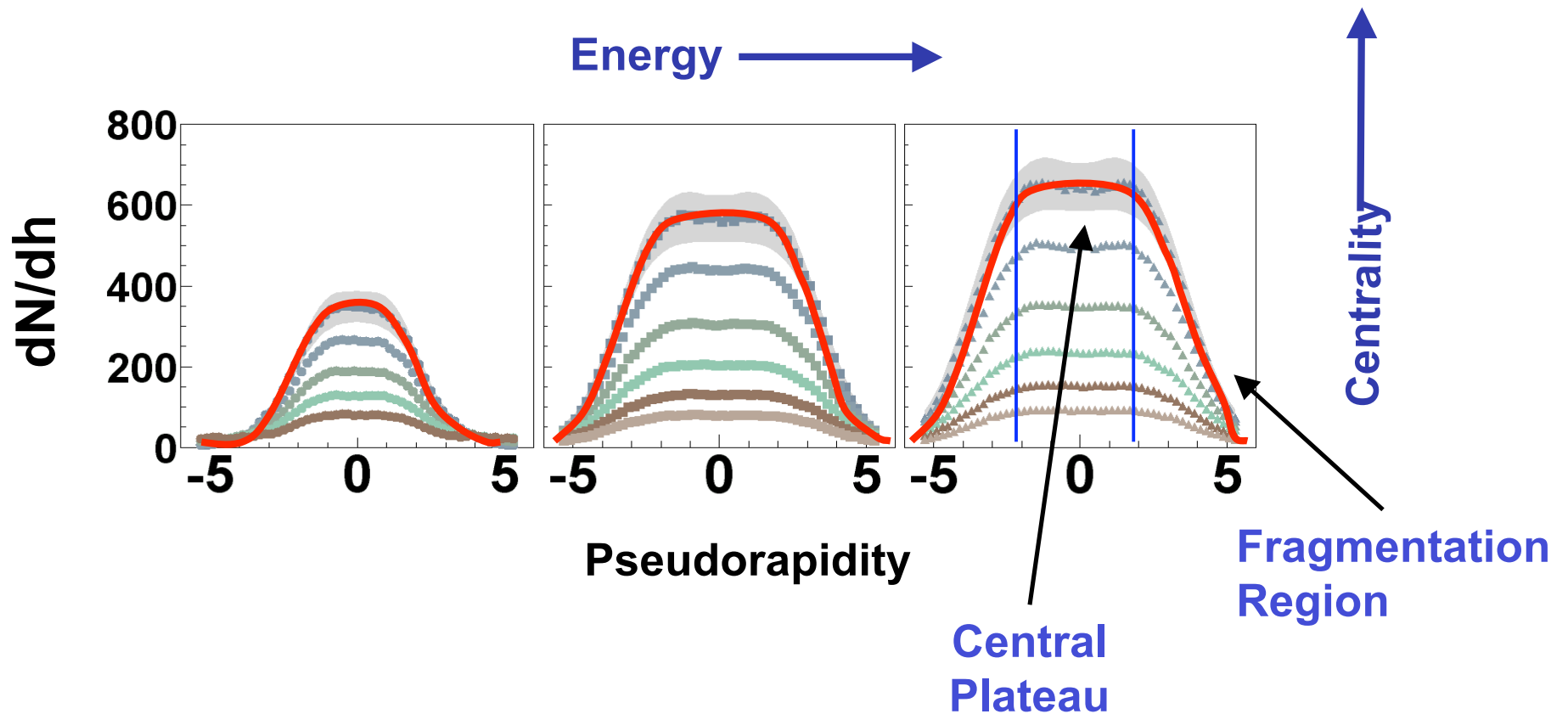
Gunther Roland



RHIC II Physics and Perspectives for a New Comprehensive Detector

April 16 & 17, 2004 - Yale University

Where is the forward region?



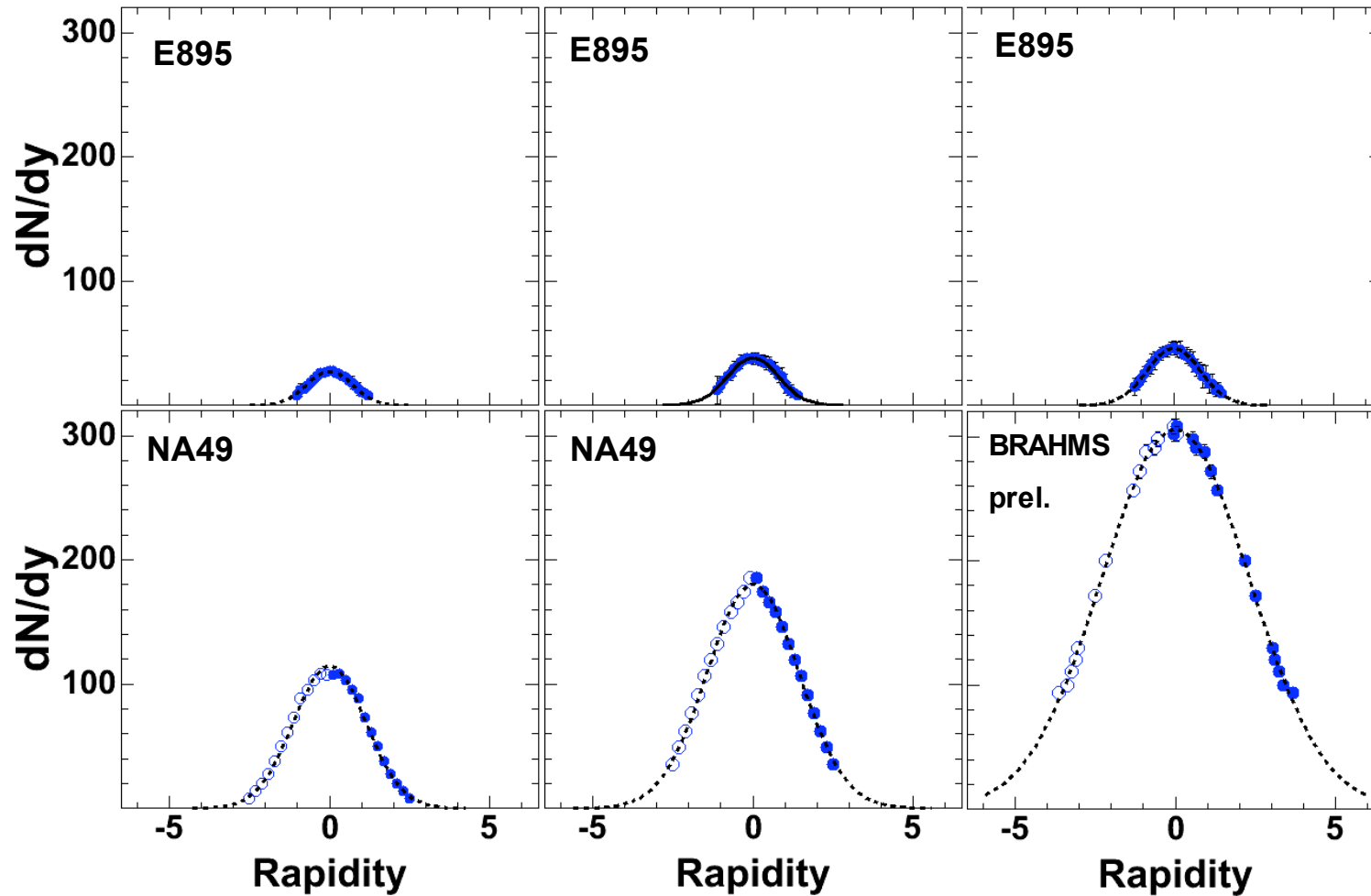
Forward Questions

- How are central and forward region connected/disconnected?
 - to which extent is the central high-density region different?
 - to which extent is the final state controlled by long-range correlations?
- A (very selective) look at present data
- Wish list for RHIC II



Boost-invariance?

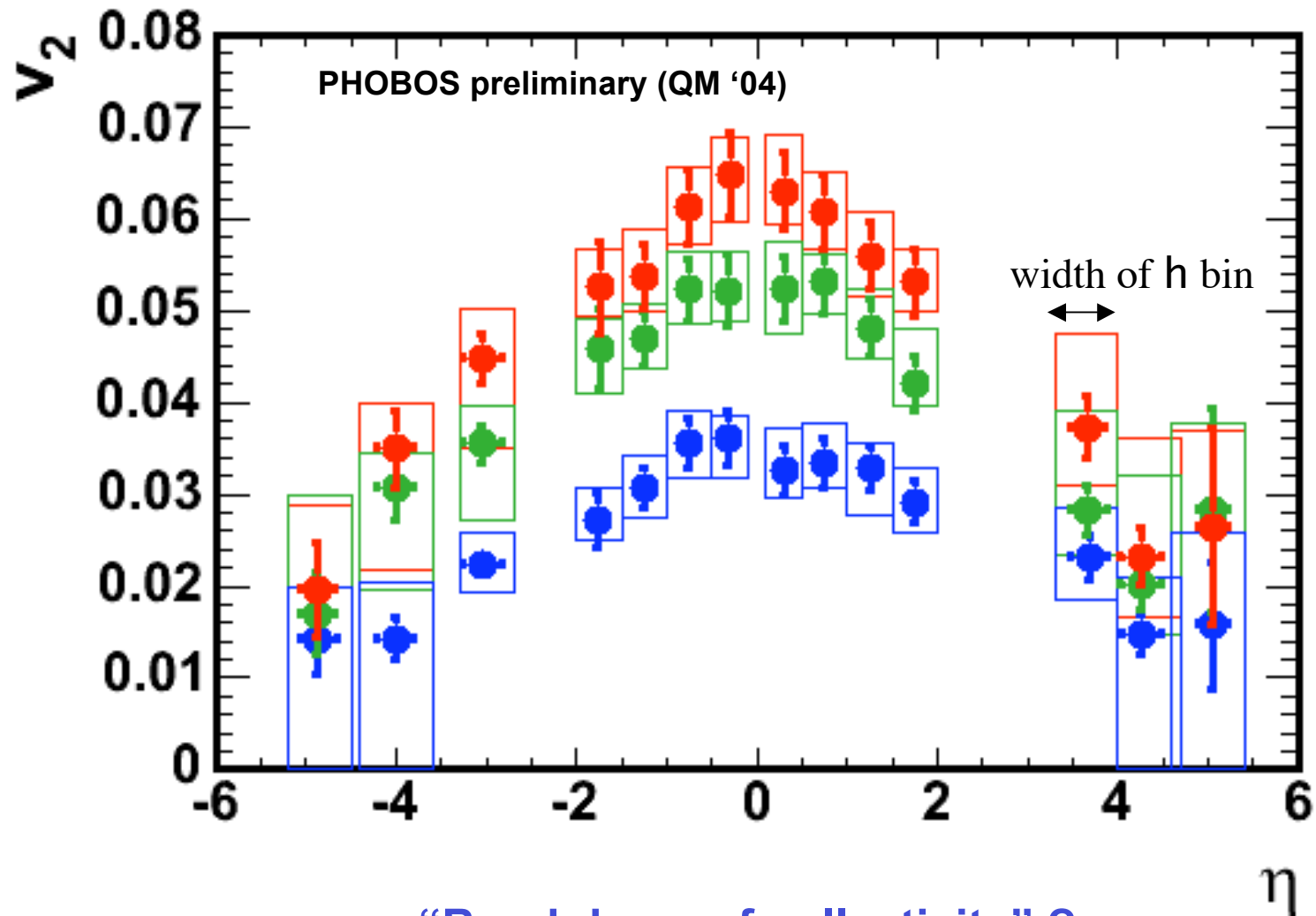
p^+ dN/dy spectra



Single Gaussian fits from 2 to 200 GeV

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Boost-Invariance?



“Breakdown of collectivity” ?



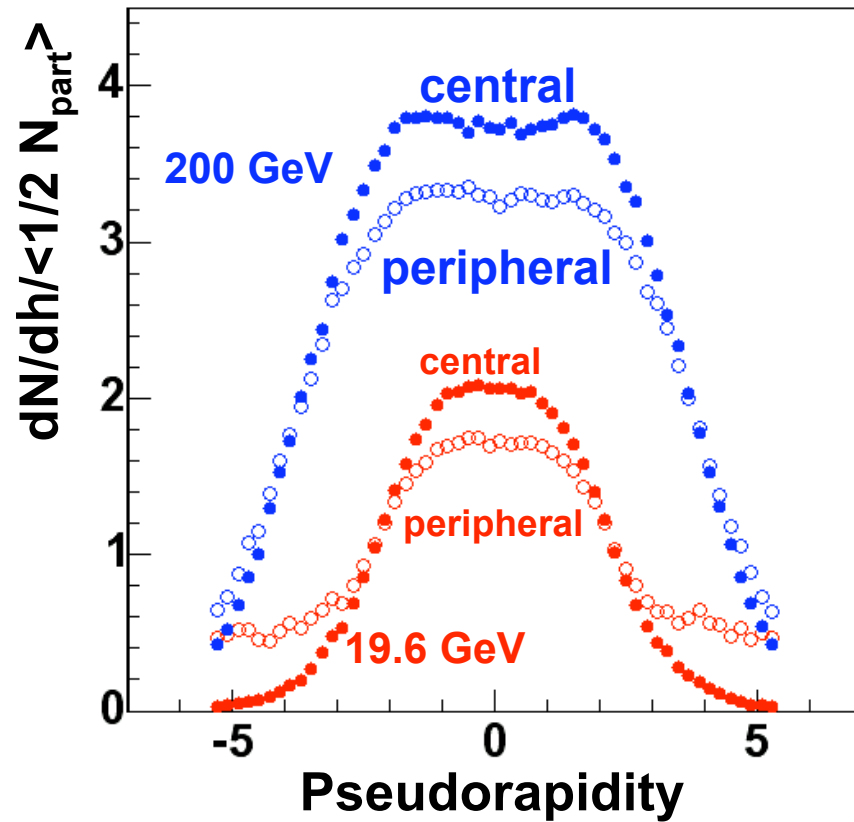
Questions/Puzzles

- **Bulk Properties show no clear distinction between “central” and “forward” region**

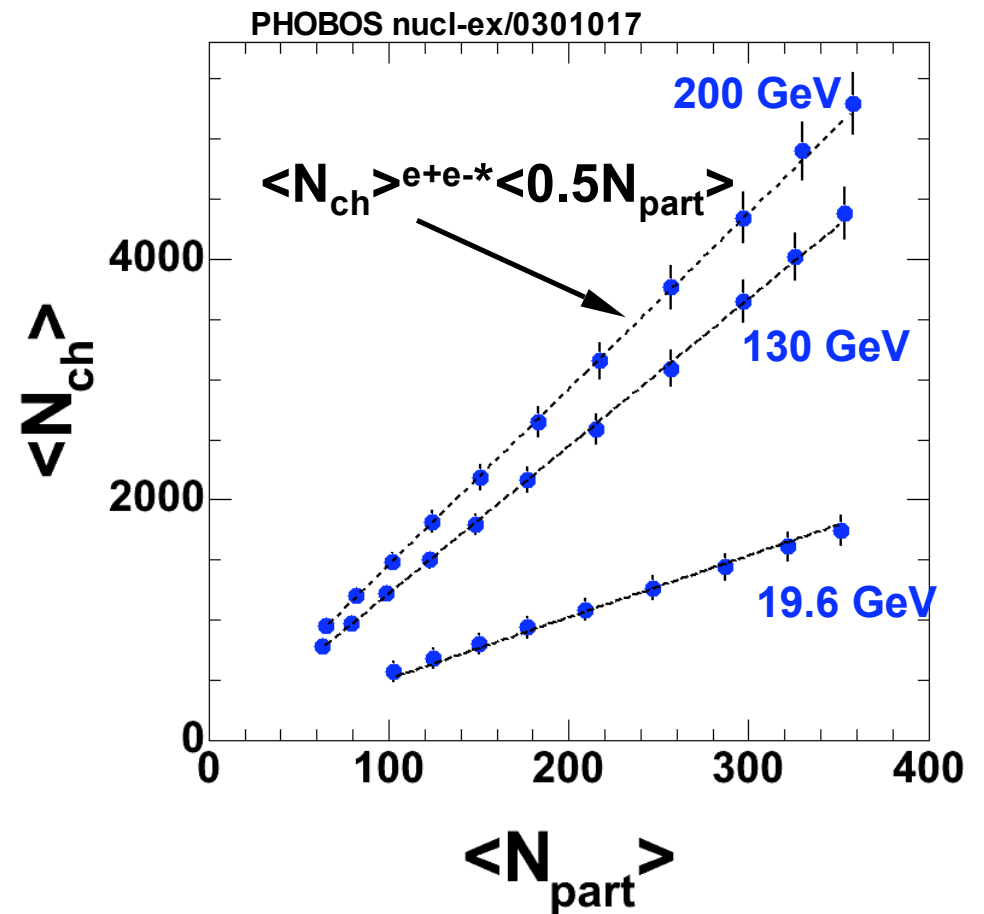
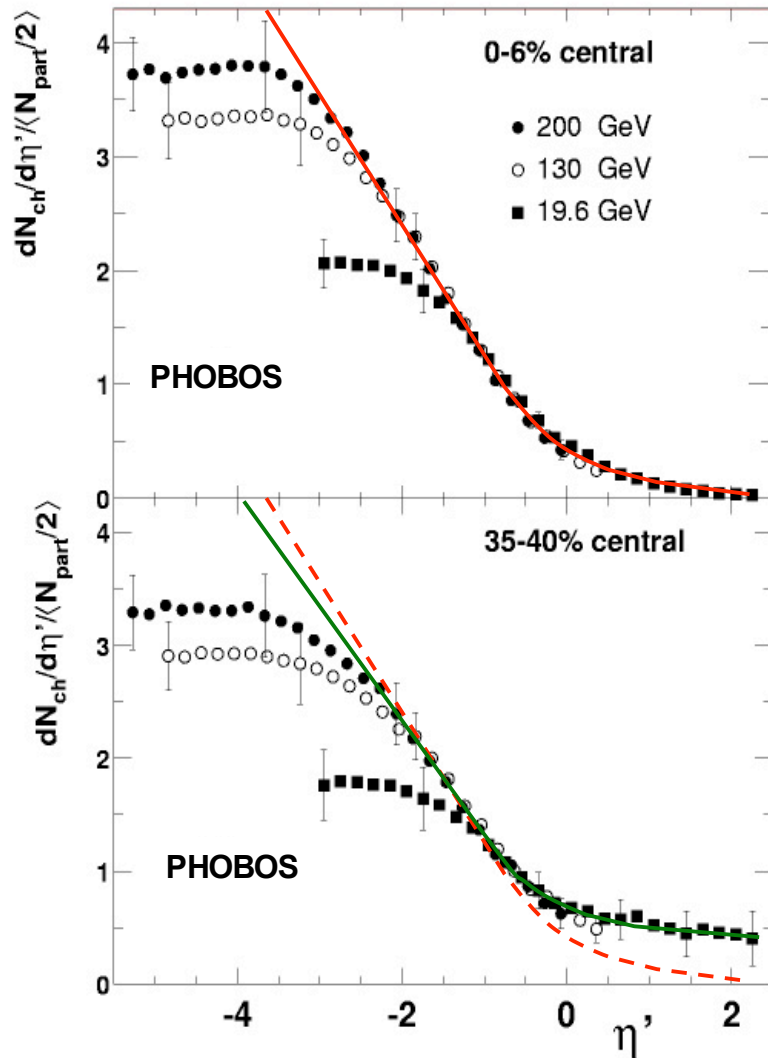


$\langle N_{ch} \rangle$ vs N_{part} in Au+Au

PHOBOS PRL91,052303 (2003)



$\langle N_{ch} \rangle$ vs N_{part} in Au+Au



Long-range correlation
in particle production?

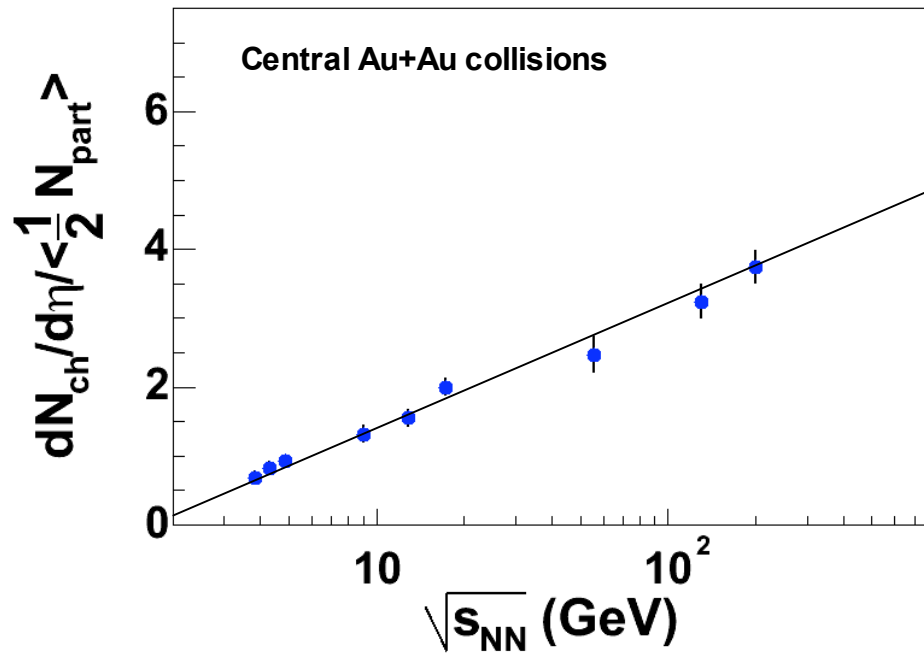


Questions/Puzzles

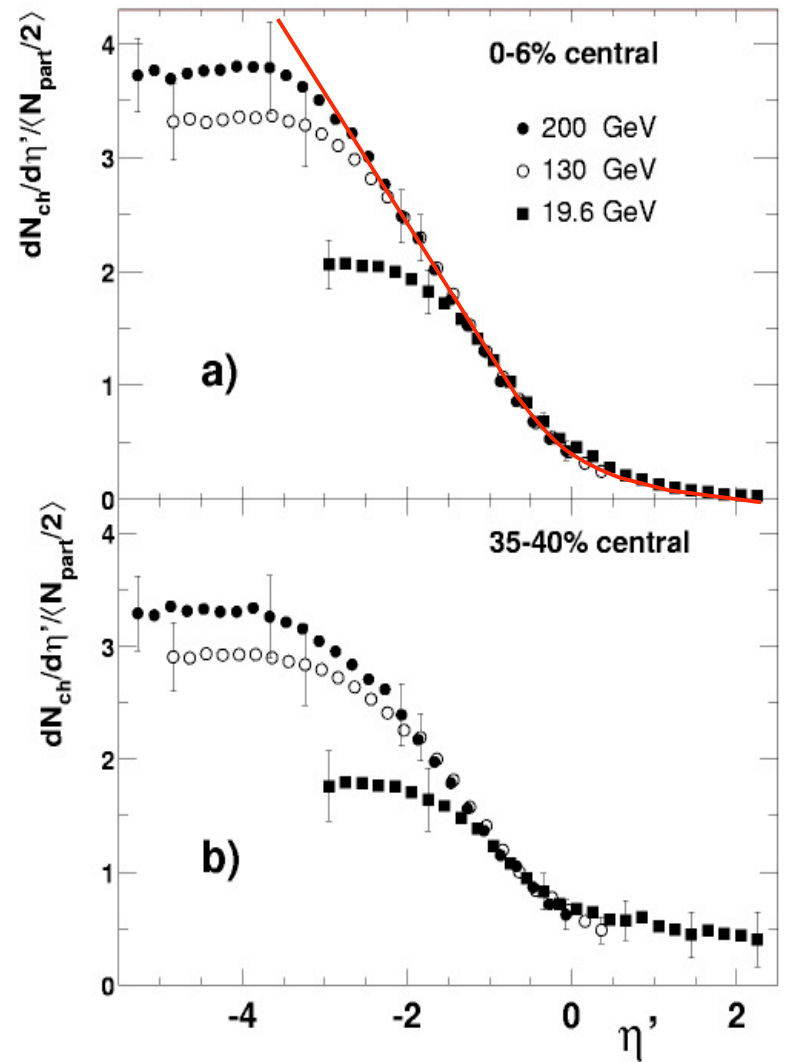
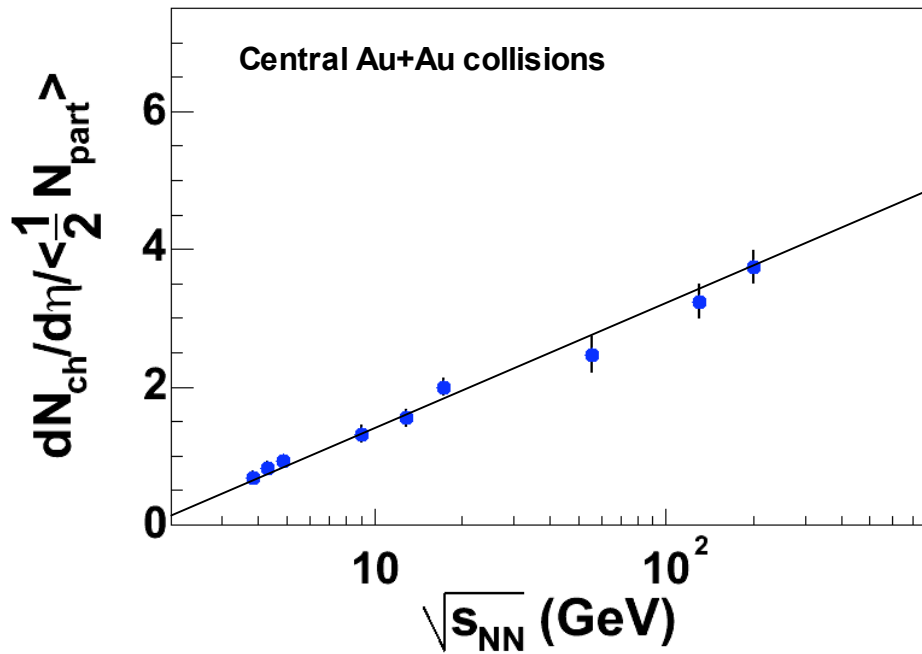
- Bulk Properties show no clear distinction between “central” and “forward” region
- N_{part} scaling of **total** $\langle N_{\text{ch}} \rangle$
 - connection between central and forward particle production via geometry



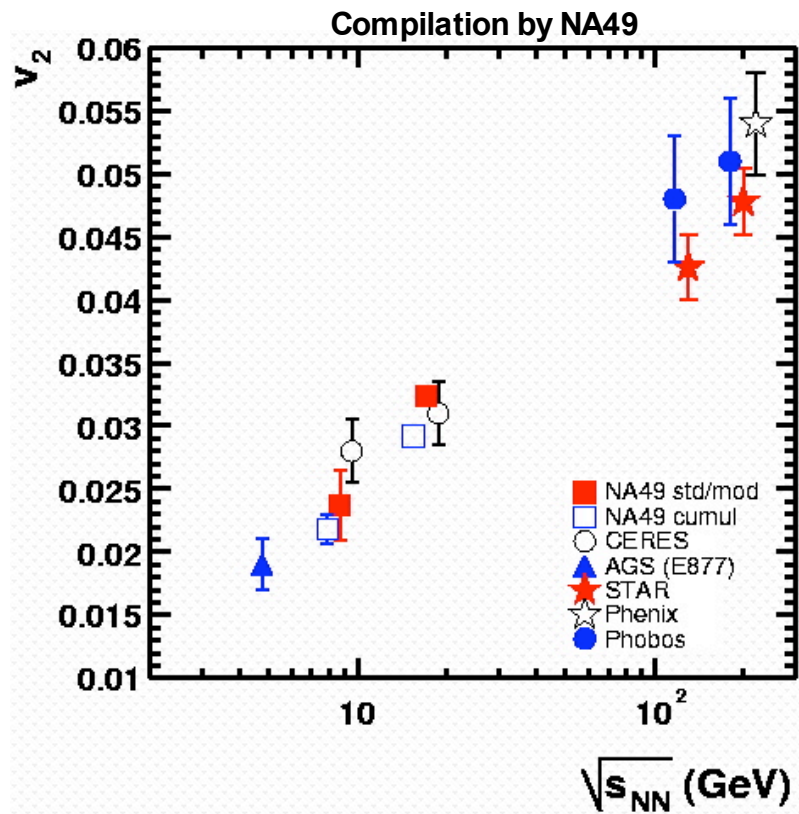
Logarithmic growth of dN/dh with energy



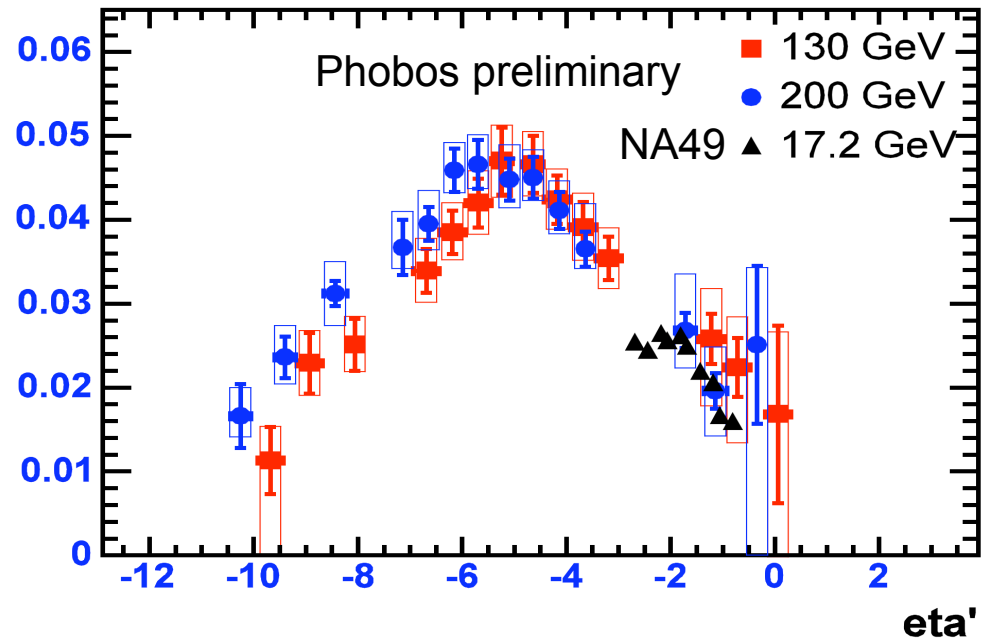
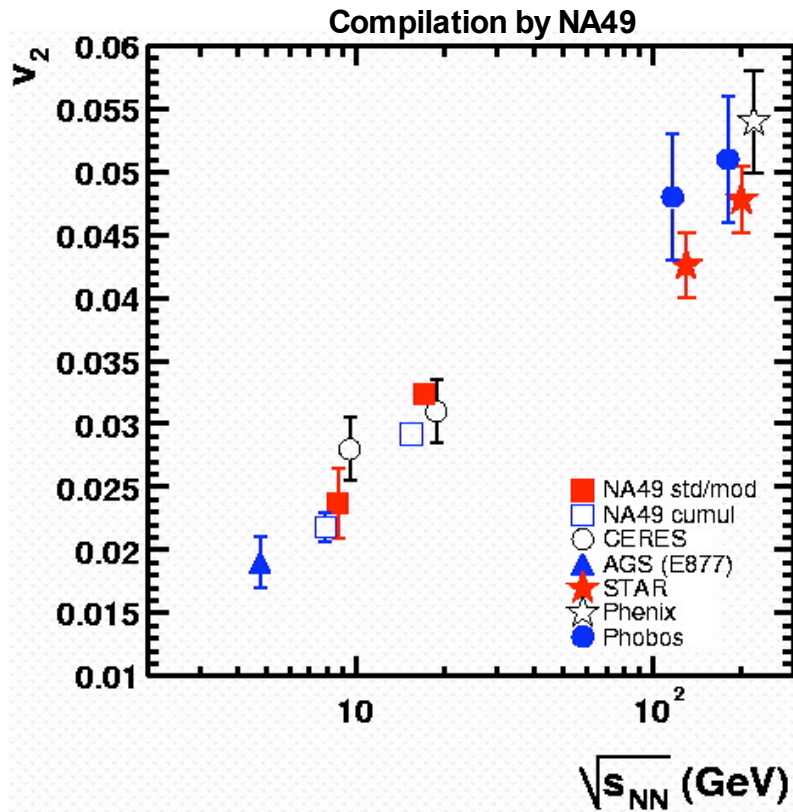
Logarithmic growth of dN/dh with energy



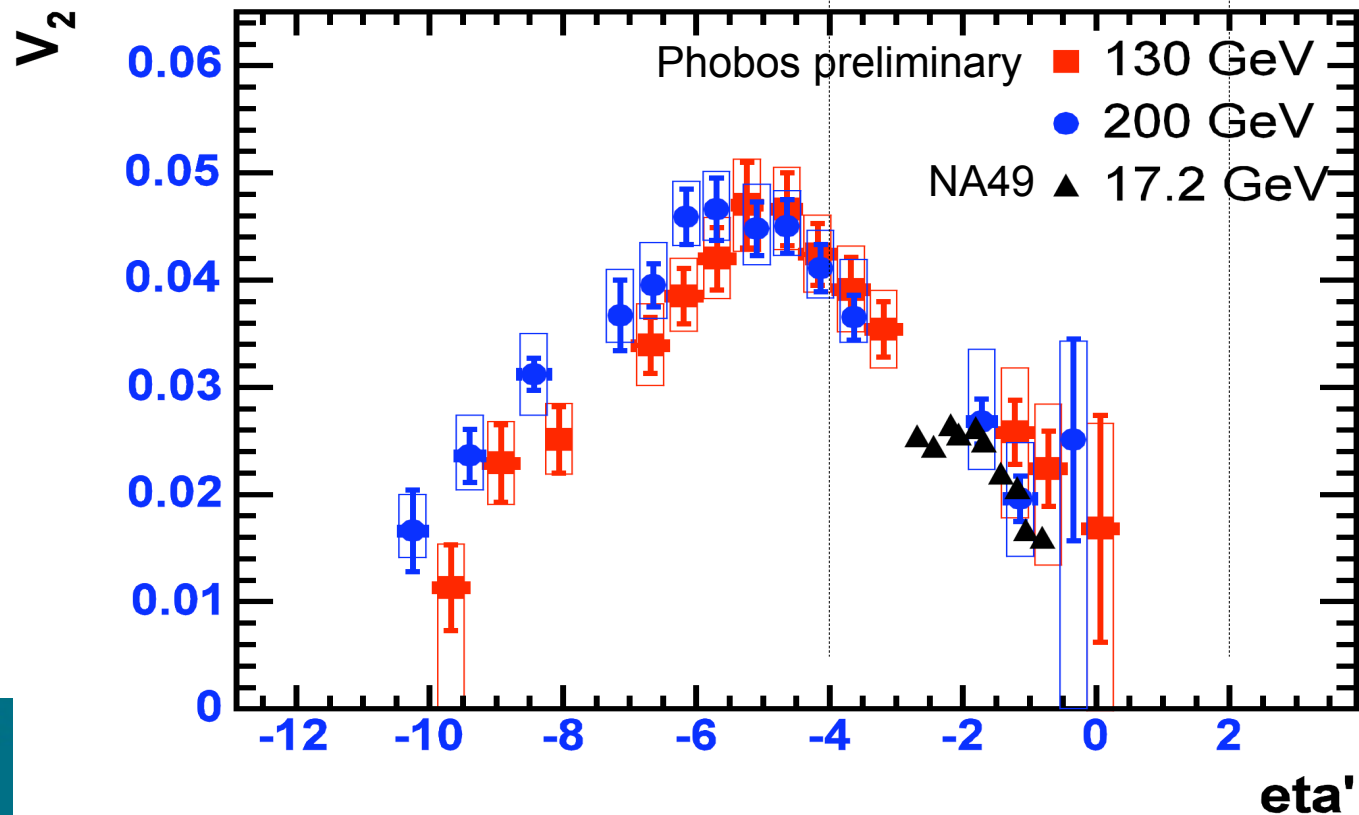
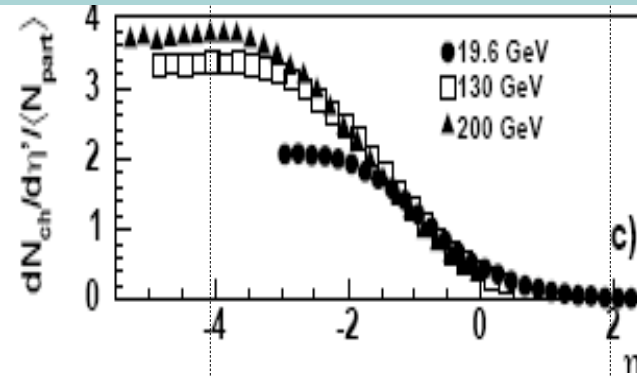
Bulk properties: Elliptic flow



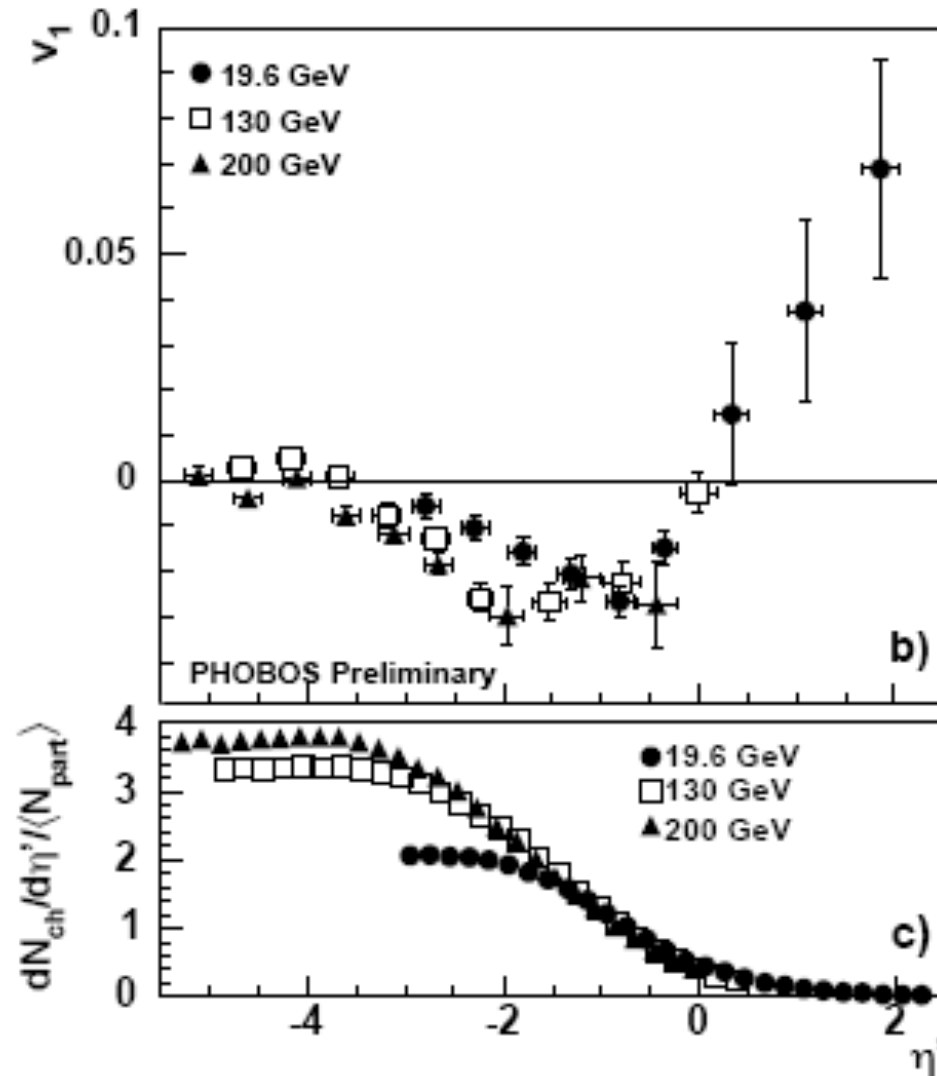
Limiting Fragmentation for elliptic flow?



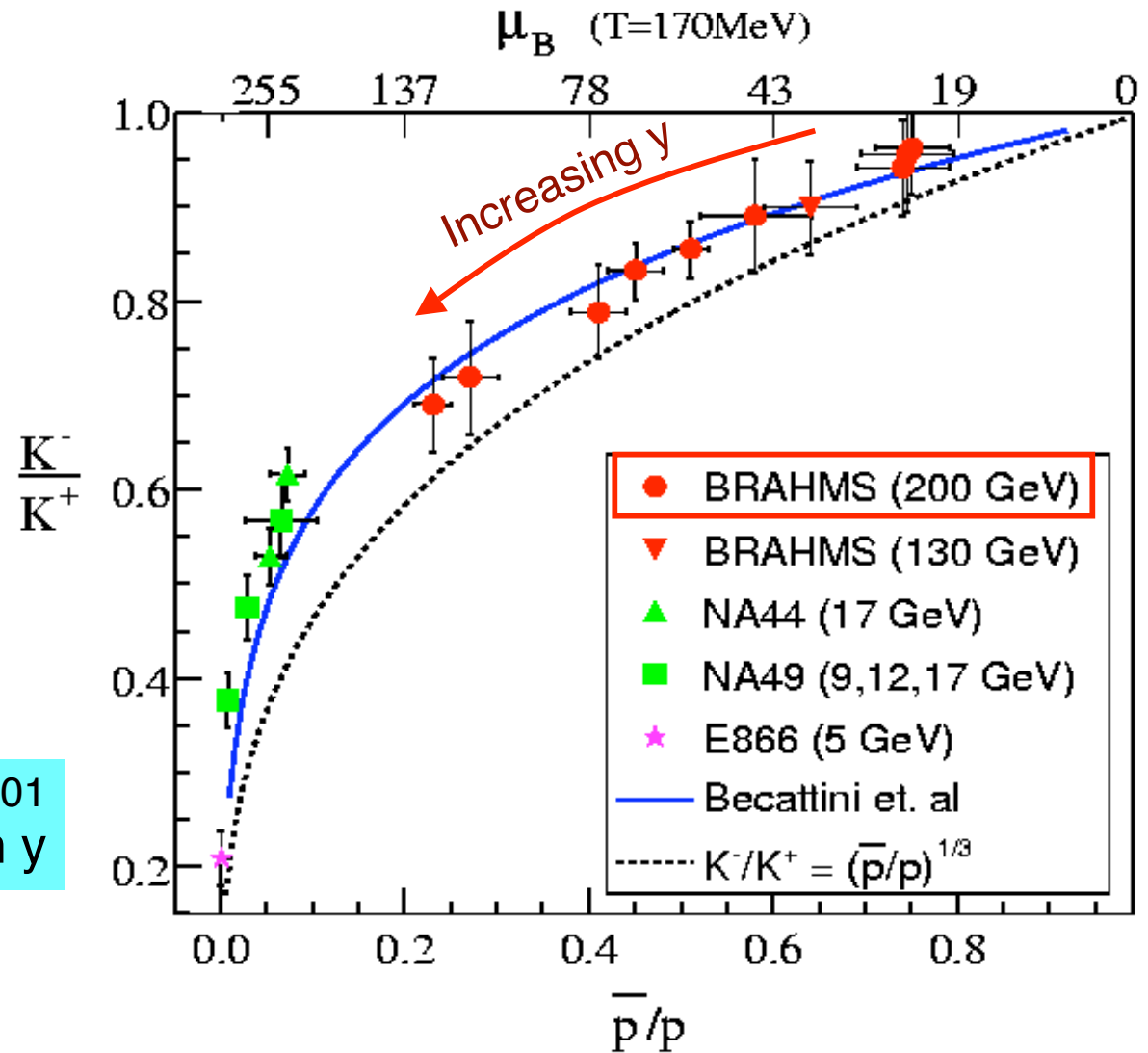
Limiting Fragmentation for elliptic flow?



Limiting Fragmentation for directed flow?



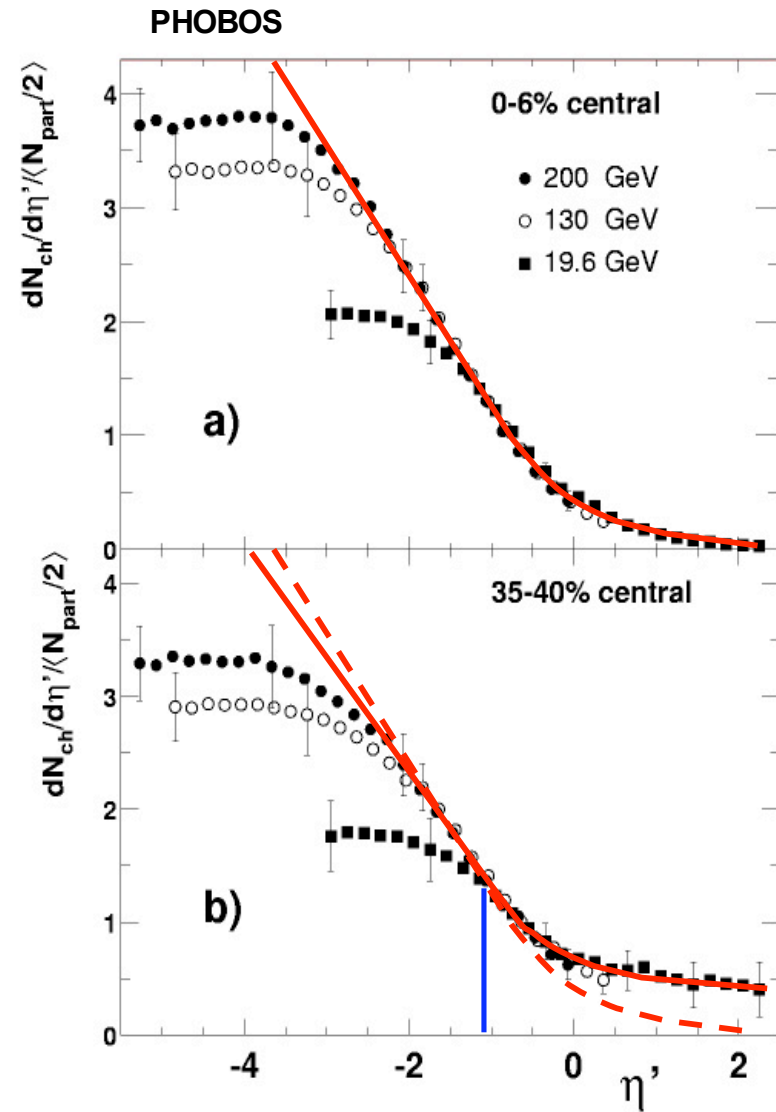
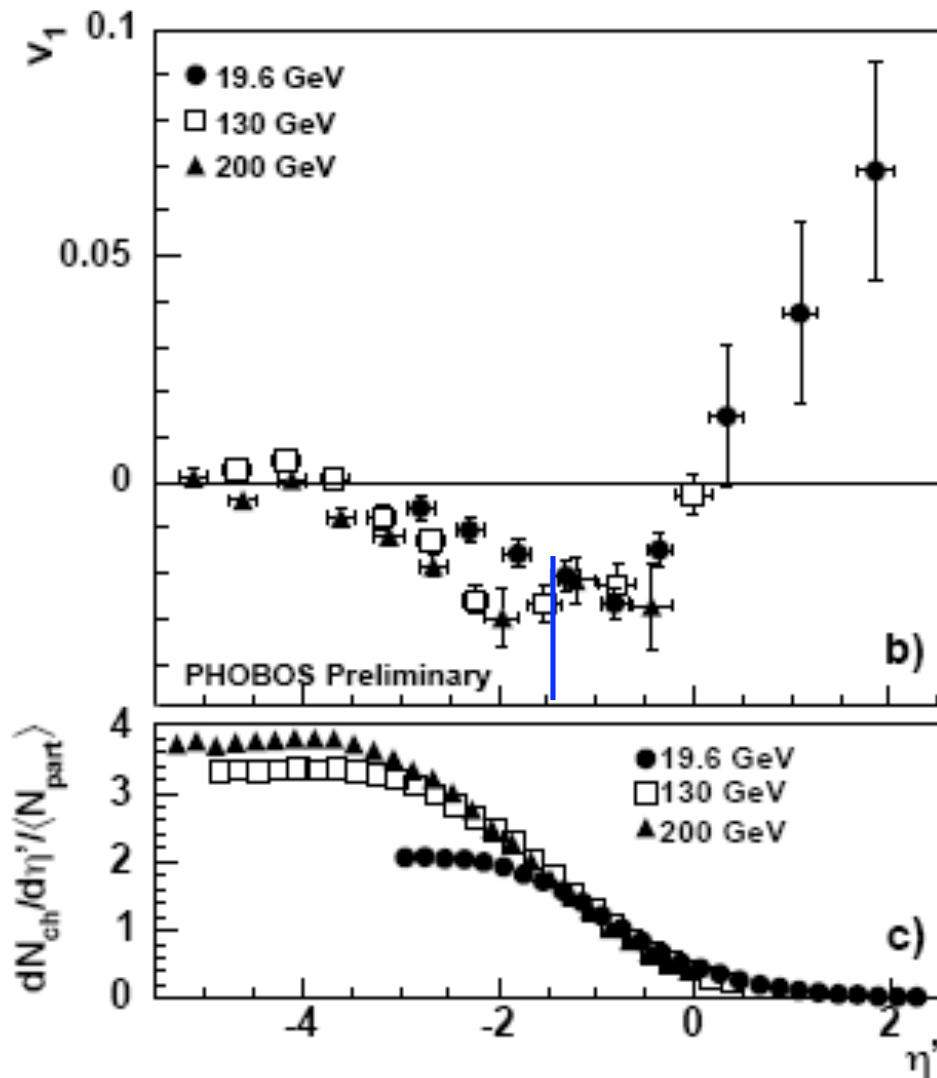
Scanning baryon density



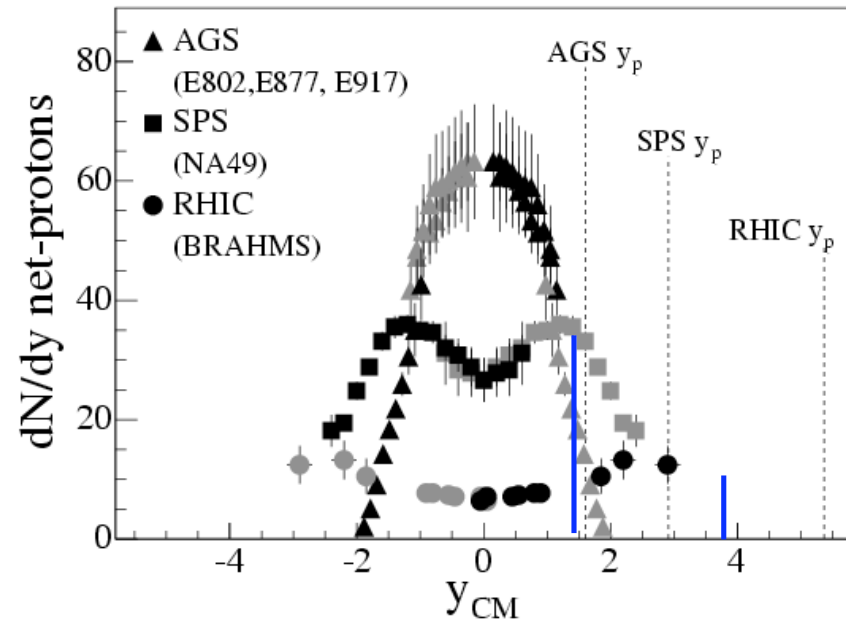
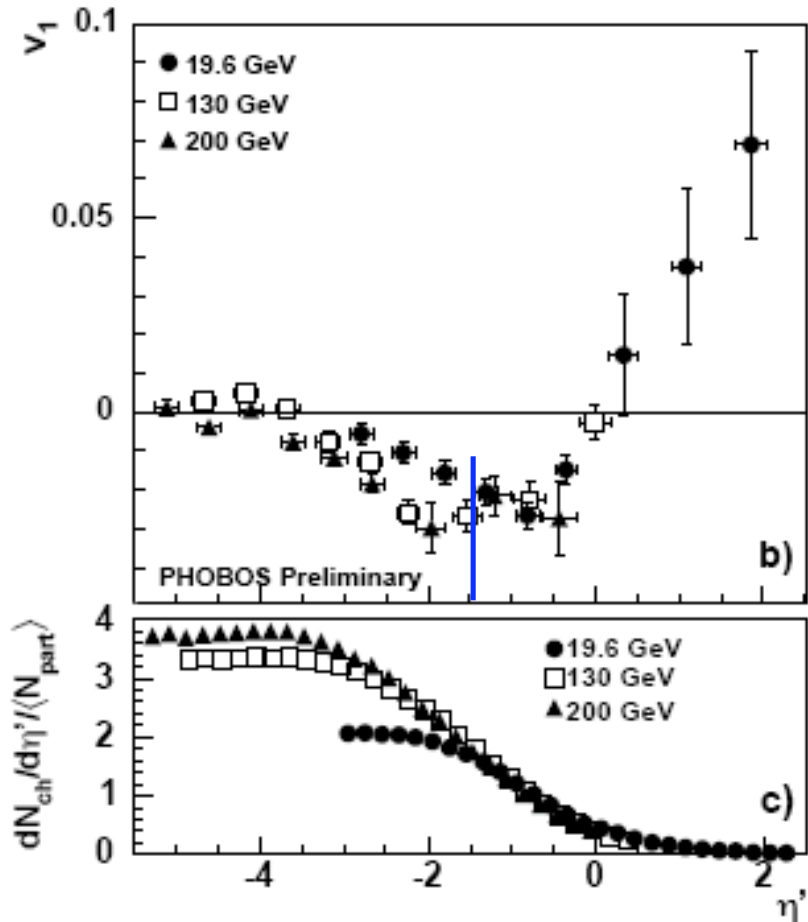
BRAHMS, PRL90 (2003) 102301
 $T \sim \text{constant}$, μ_B varies with y



What's special about η' of -1.5?



What's special about h' of -1.5?



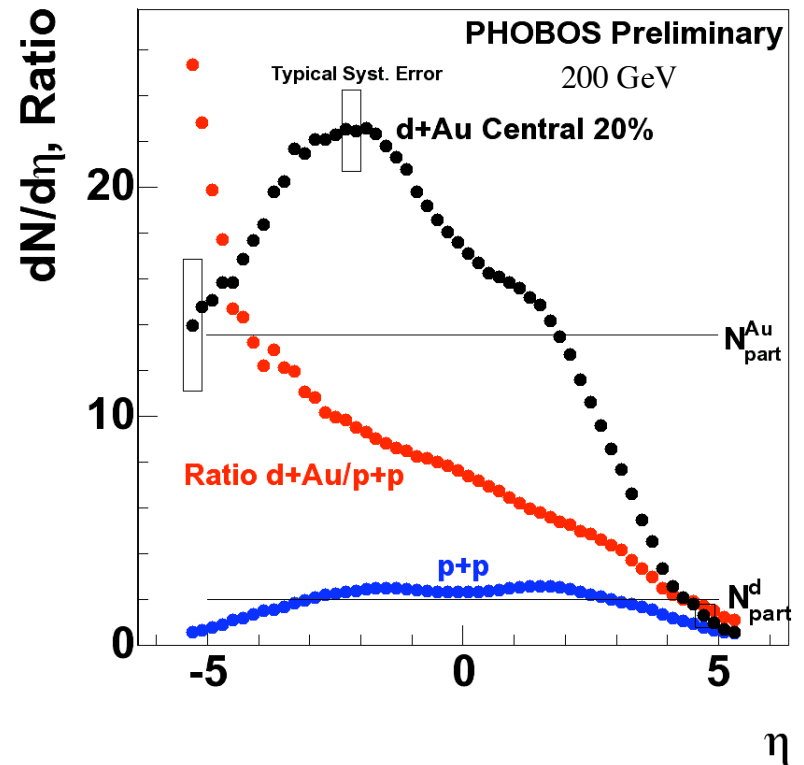
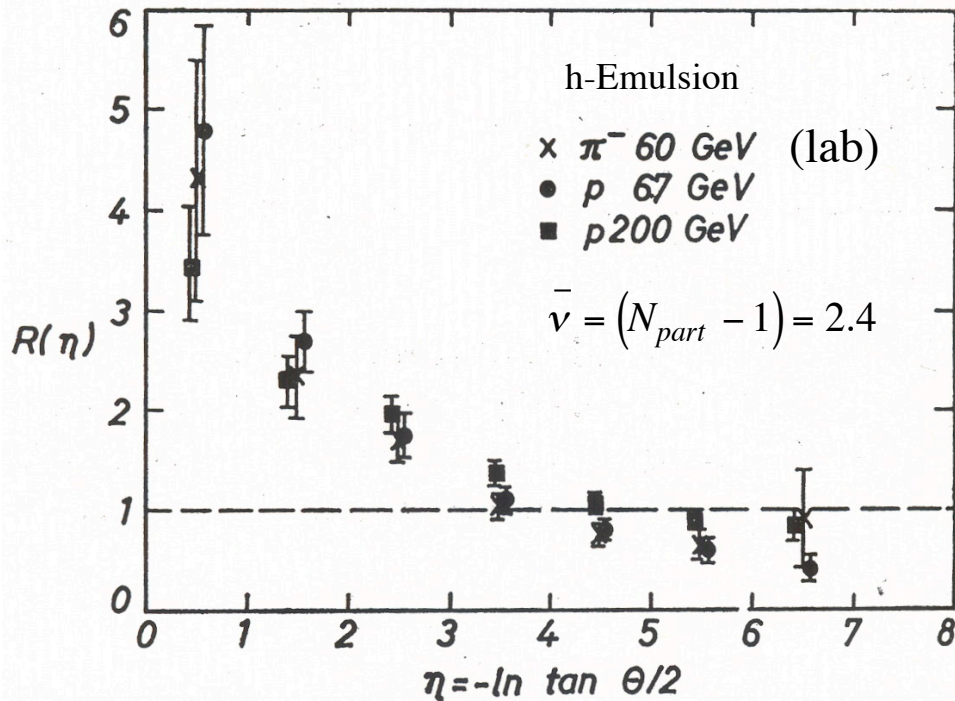
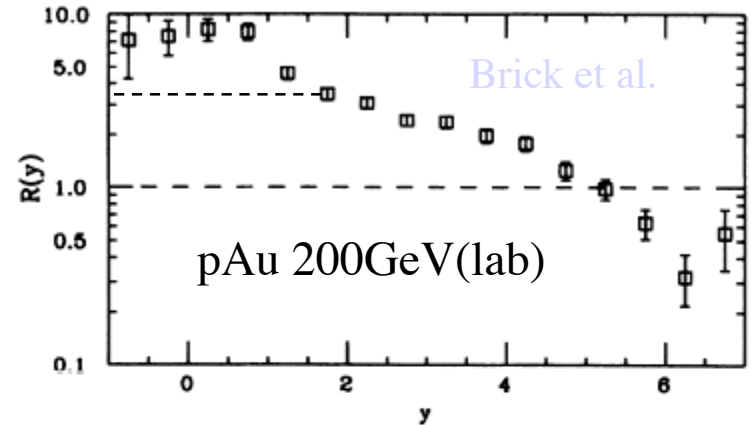
Questions/Puzzles

- Bulk Properties show no clear distinction between “central” and “forward” region
- N_{part} scaling of **total** $\langle N_{\text{ch}} \rangle$
 - connection between central and forward particle production via geometry
- Scaling of ‘bulk’ properties with rapidity
 - Is matter at the same y' the same at all \sqrt{s} ?
- Tracking/PID at $y' < 2$ at RHIC should provide answers
- Will scaling hold at LHC?

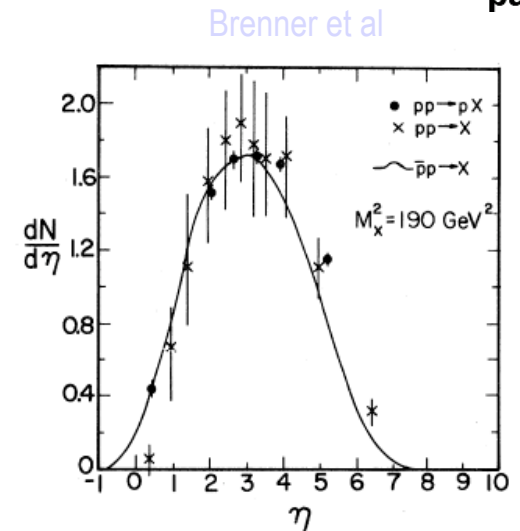
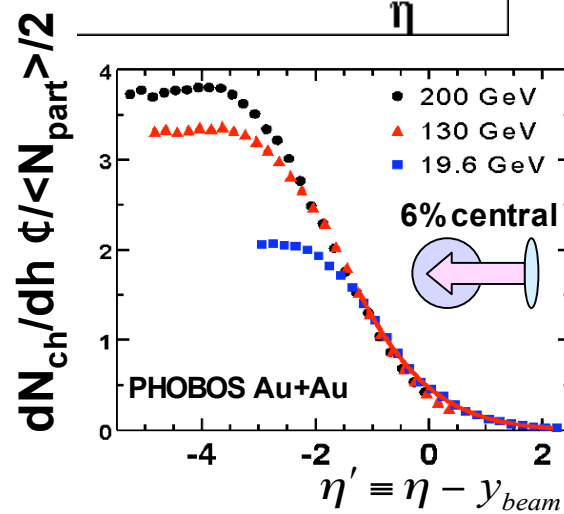
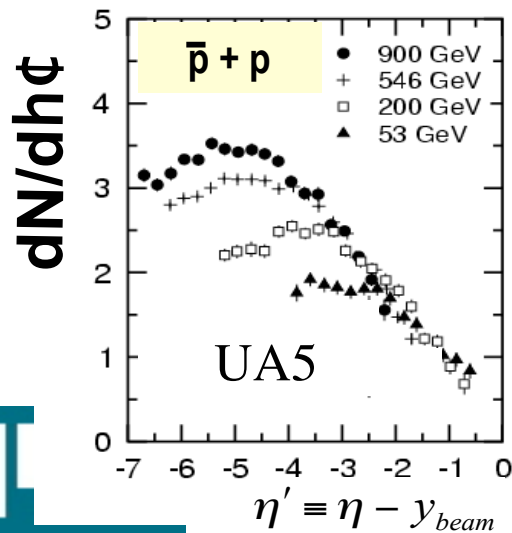
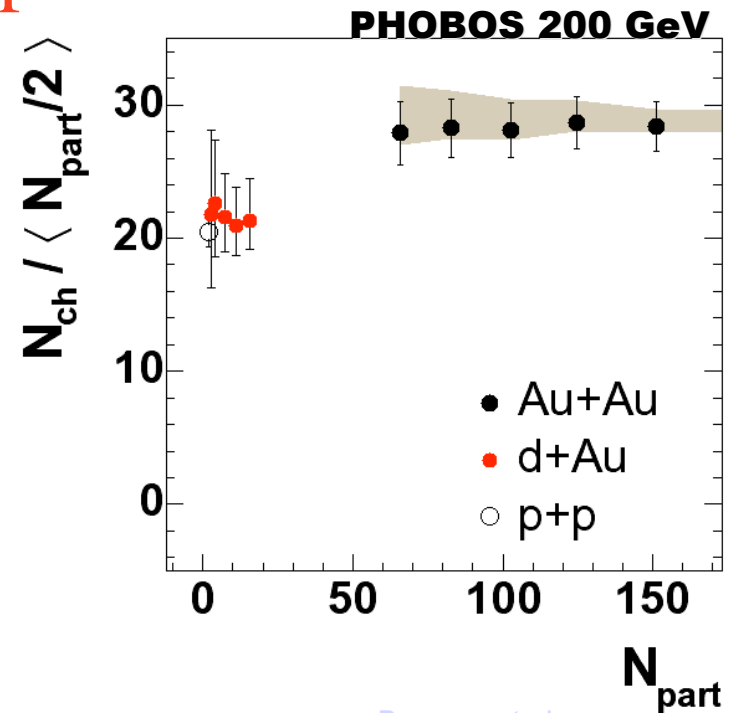
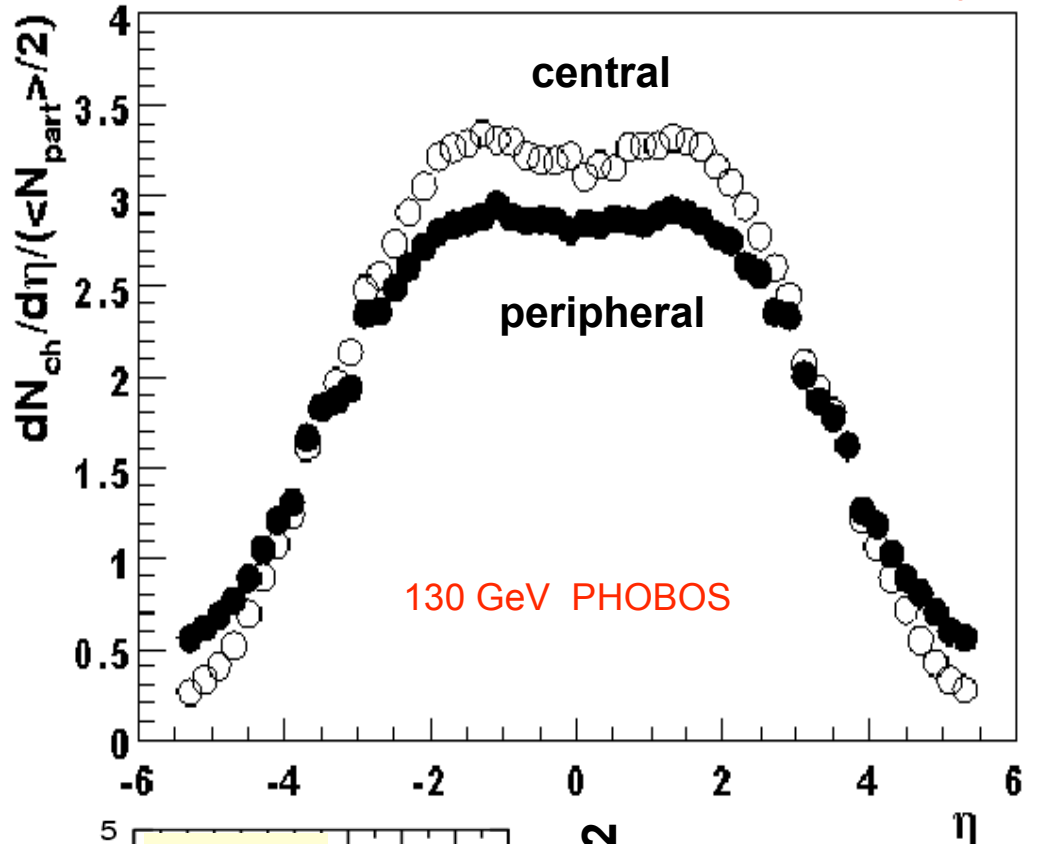


Unexpected long range correlations

$$R(\eta) \equiv \frac{\frac{dn}{d\eta}(pA \text{ or } dA)}{\frac{dn}{d\eta}(pp)}$$



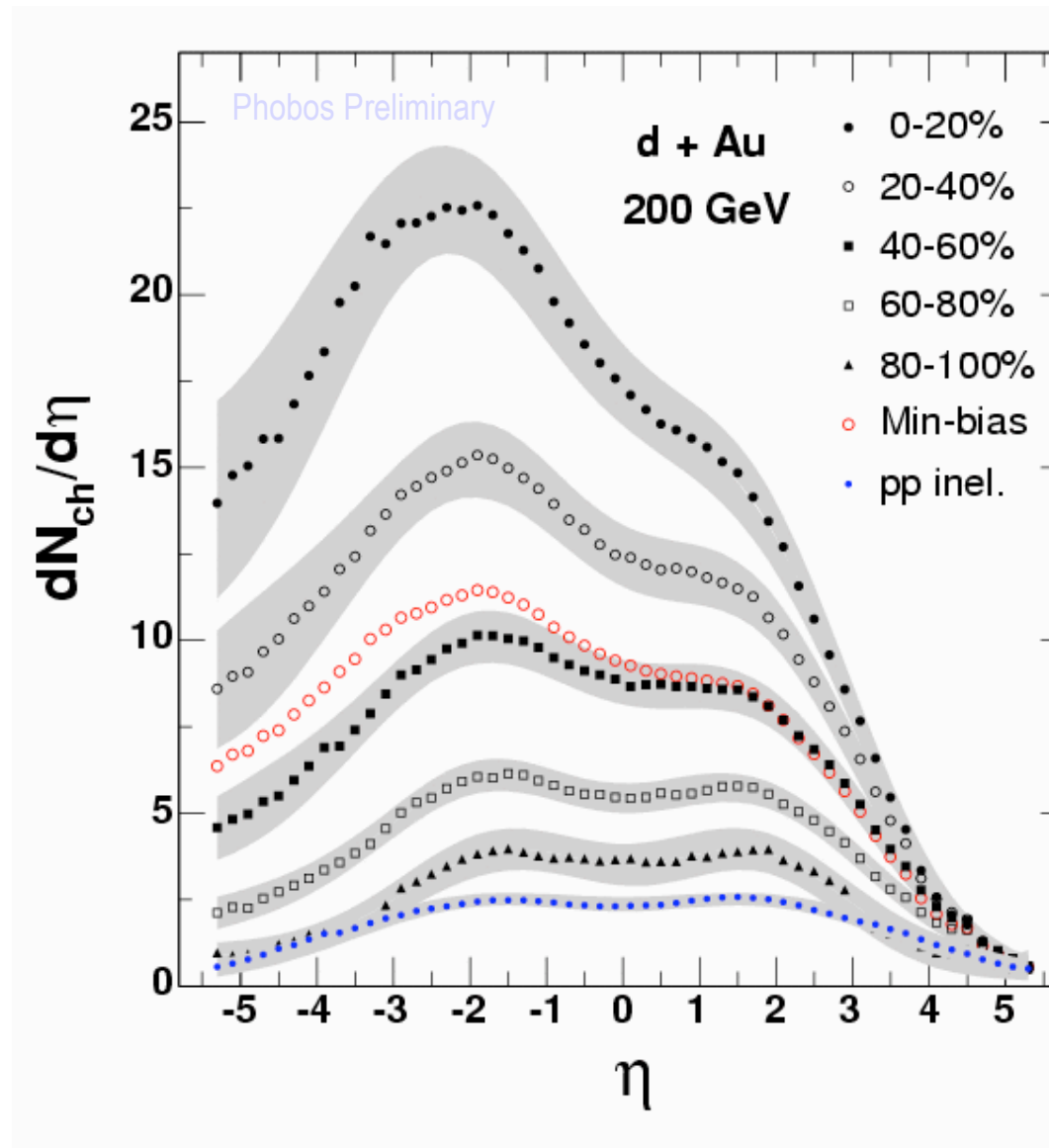
Another look at centrality dependence



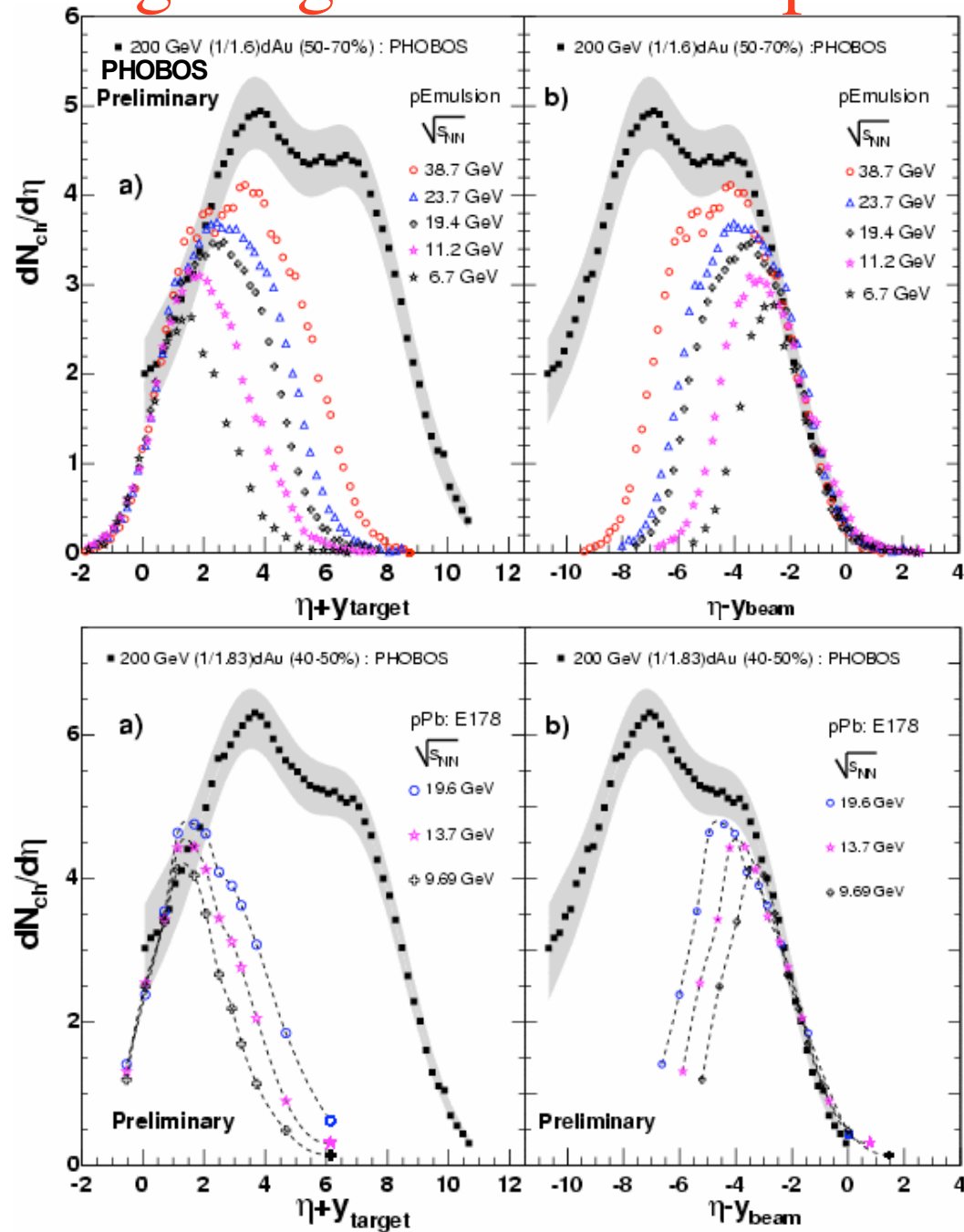
$pp \rightarrow pX \equiv \bar{p}p \rightarrow X$ provided M_x^2 is the same

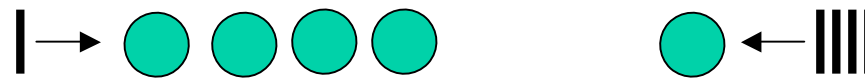
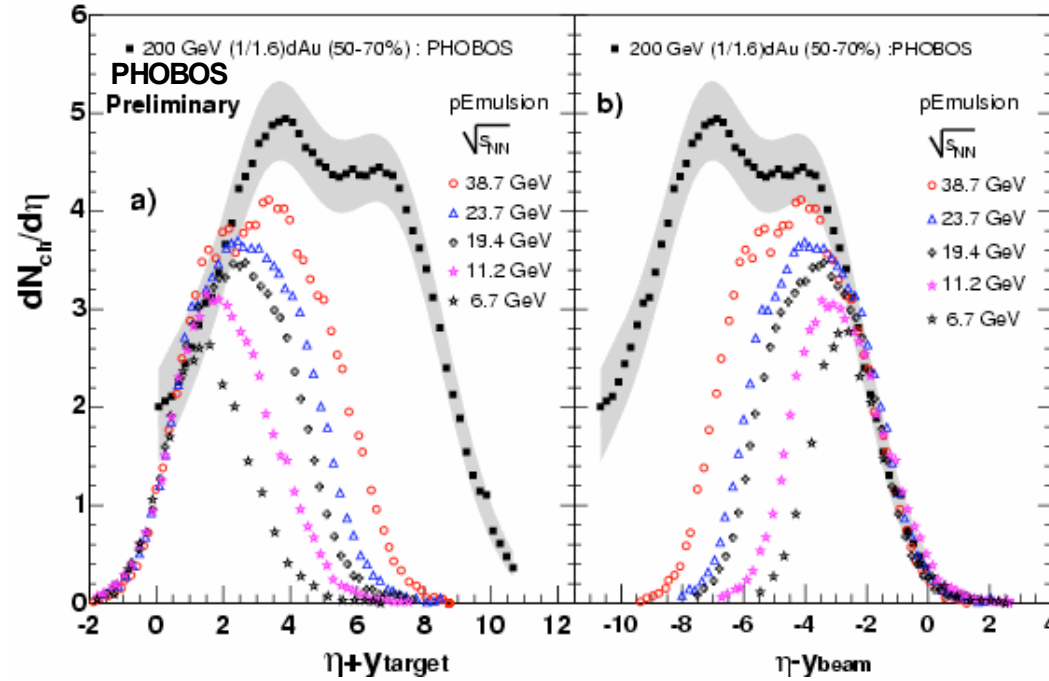
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Surprising pseudorapidity distribution in dAu at RHIC



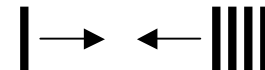
“Limiting Fragmentation” in pA and dA





Why overlap region grows with energy?

Is it evidence of saturation?



On the other hand can CGC be relevant at 6.7 GeV?

