

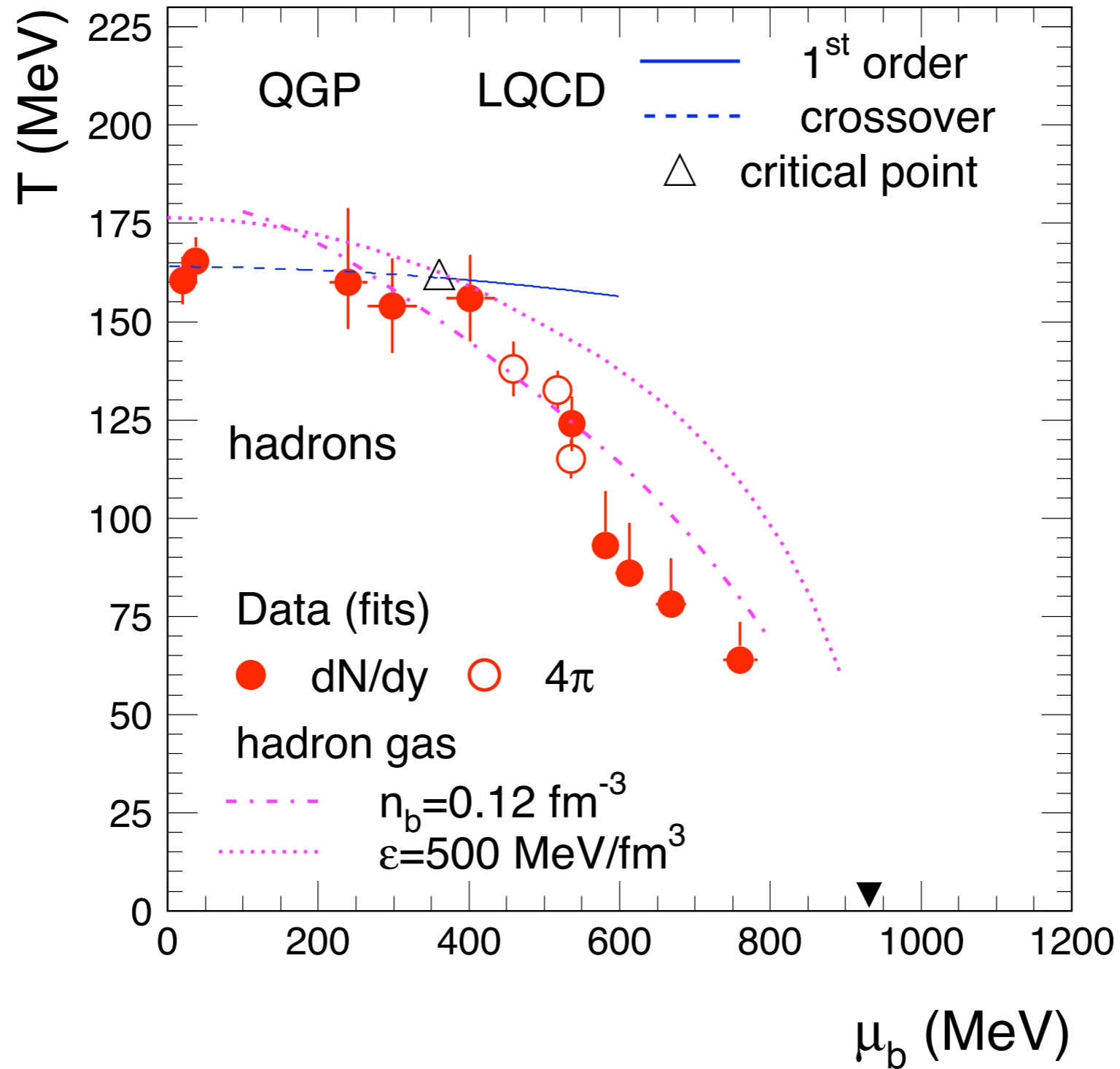
v_2 and R_{AA} of non-photon single electrons:

Which restriction do the current measurements pose
on the production of charm, beauty and Drell-Yan ?

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The Promised Land



A. Andronic, P. Braun-Munzinger, J. Stachel nucl-th/0511071

Calibrating our Probes: (using $p+p$ collisions)

Measure Charm+Beauty production (non-photonic e spectra)

Measure Charm Production (hadronic D-Meson decays)

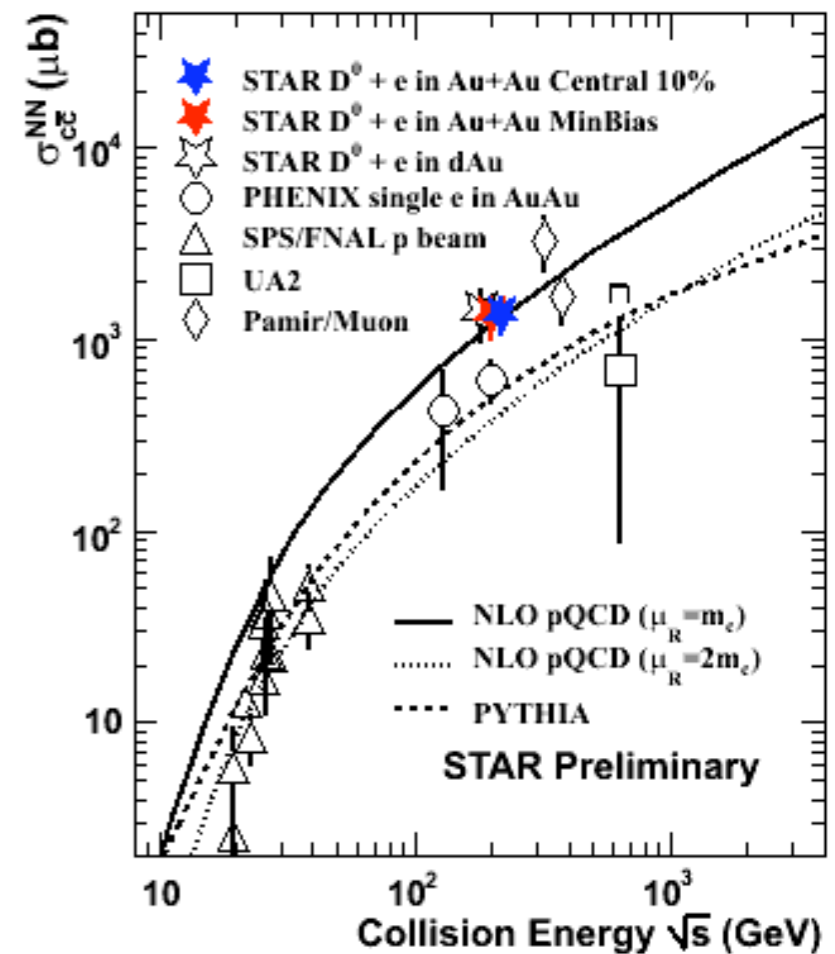
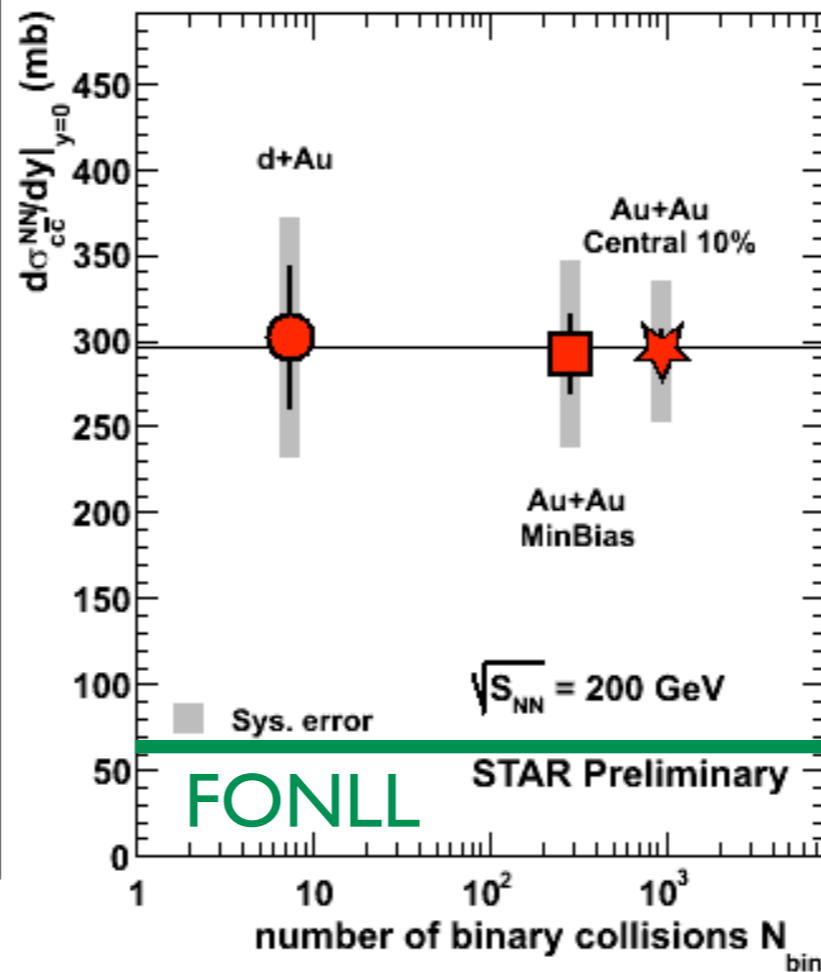
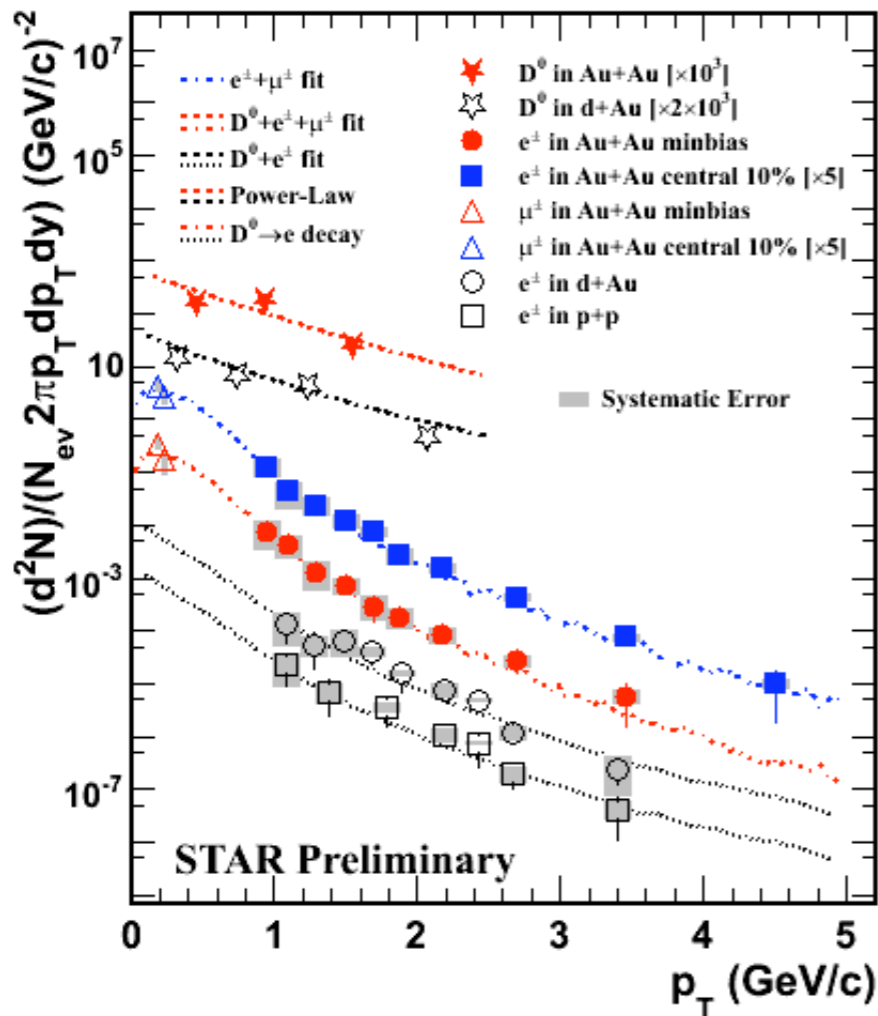
Beauty

Done !

Charm production



Haibin Zhang, SQM 2006

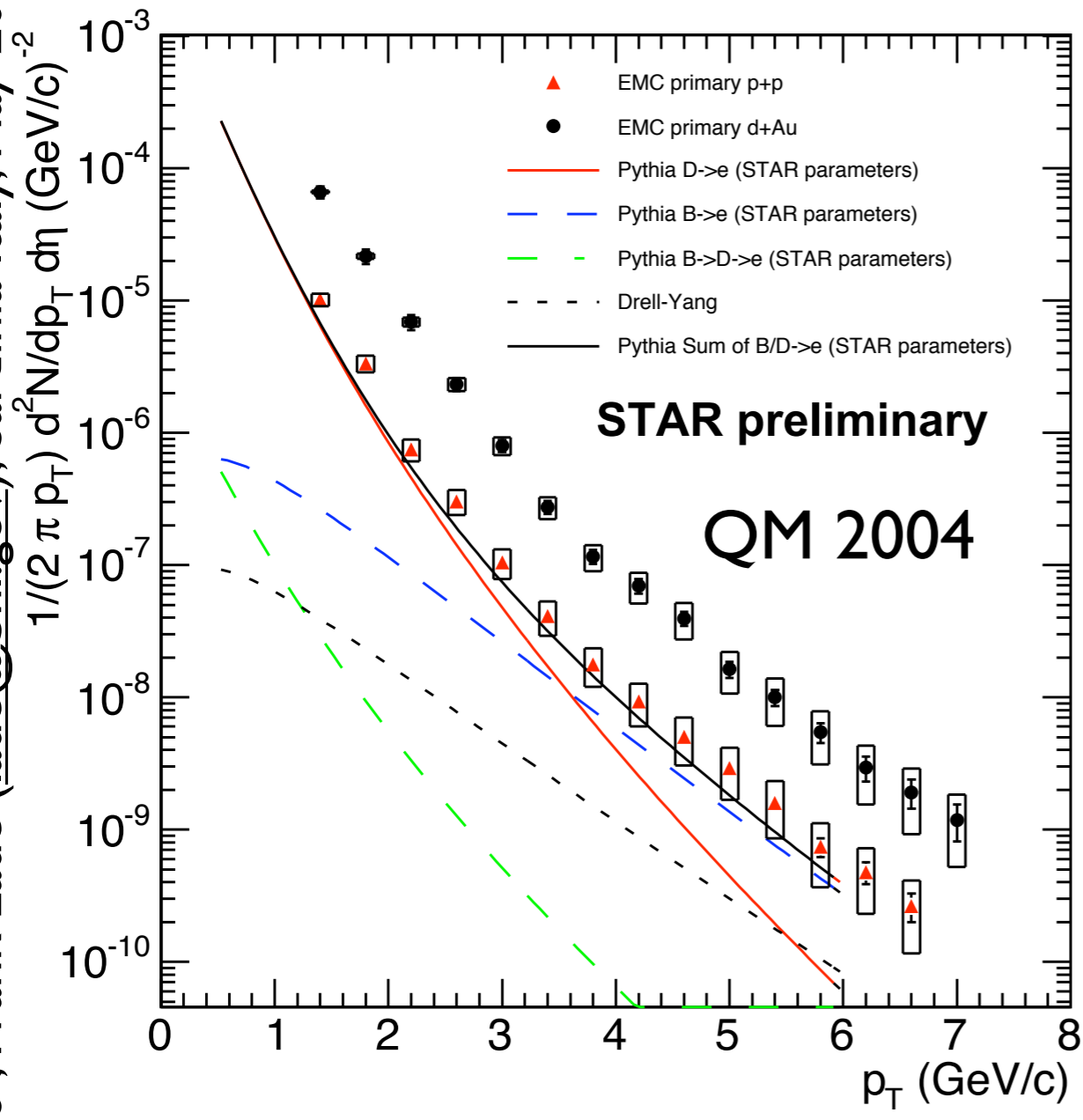


- Power-law charm decay
- D0 + e fit in d+Au collisions.
- D0 + μ + e fit in minbias Au+Au collisions*.
- μ + e fit in central Au+Au collisions.
- *sensitive to 95% of x-section

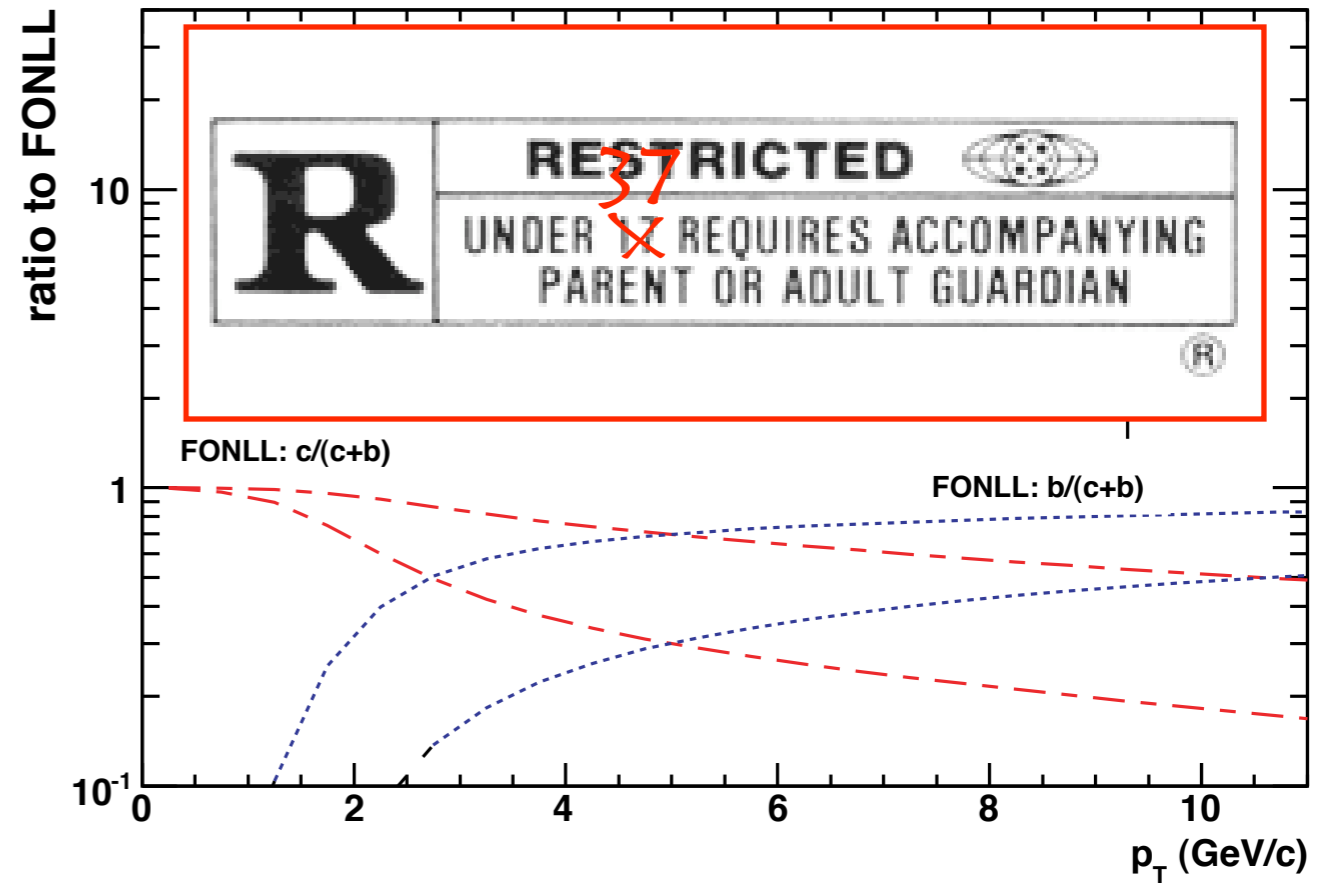
Low p_T μ constrains charm cross section.
 The sys. errors can be reduced by a factor of 2.
 The number of binary collisions scaling observed!



Extracting Beauty Yields



[M. Cacciari, P. Nason, R. Vogt](#)
PRL 95(2005)122001



Charm and beauty are scaled up by a common factor of 5.7

Beauty extremely important, dominating above $p_T=4$ GeV/c !!!

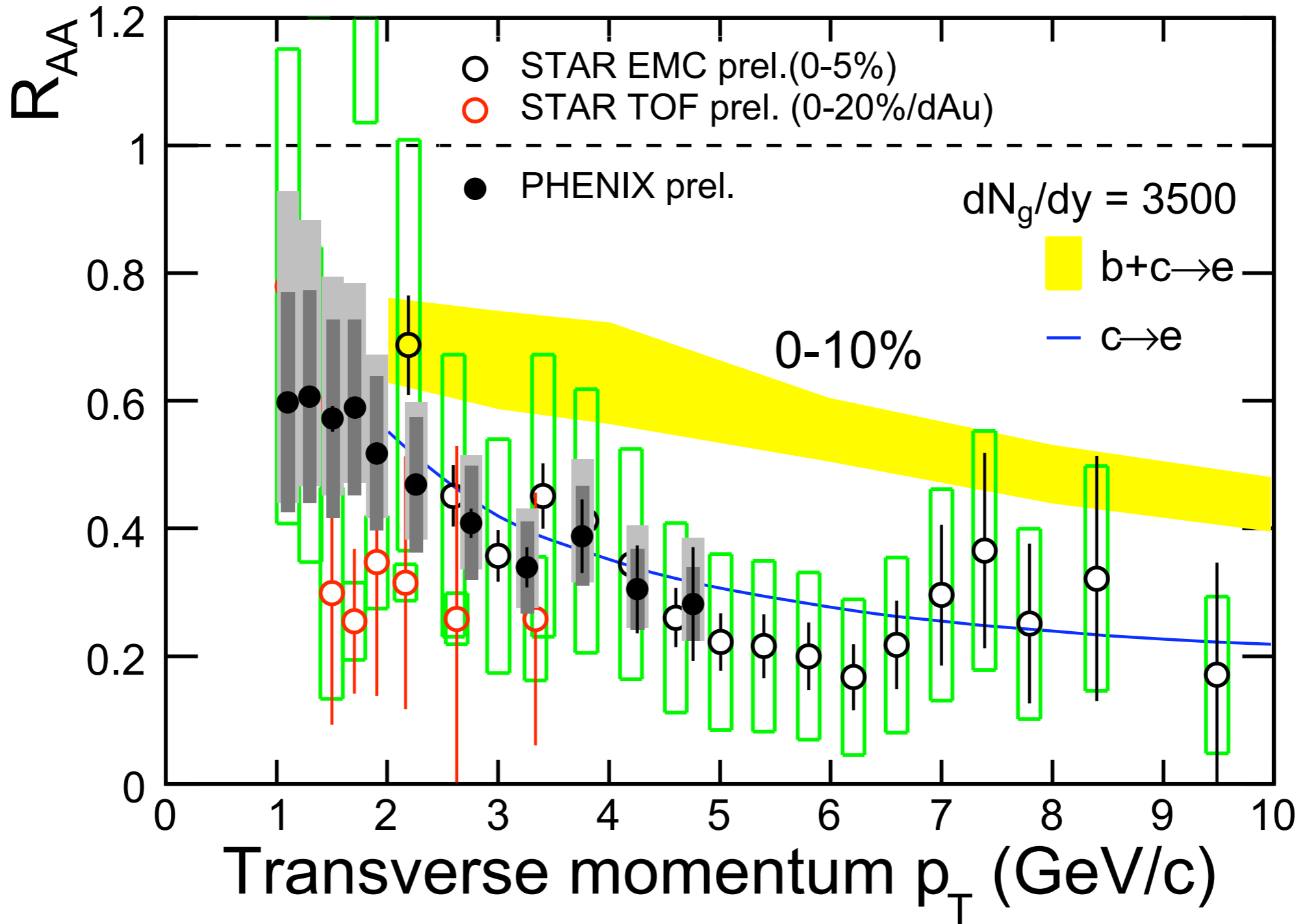
x-raying the medium

Now that we have a calibrated probe, let's shoot it through the medium.



x-raying the medium

M. Djordjevic, et. al. nucl-th/0507019

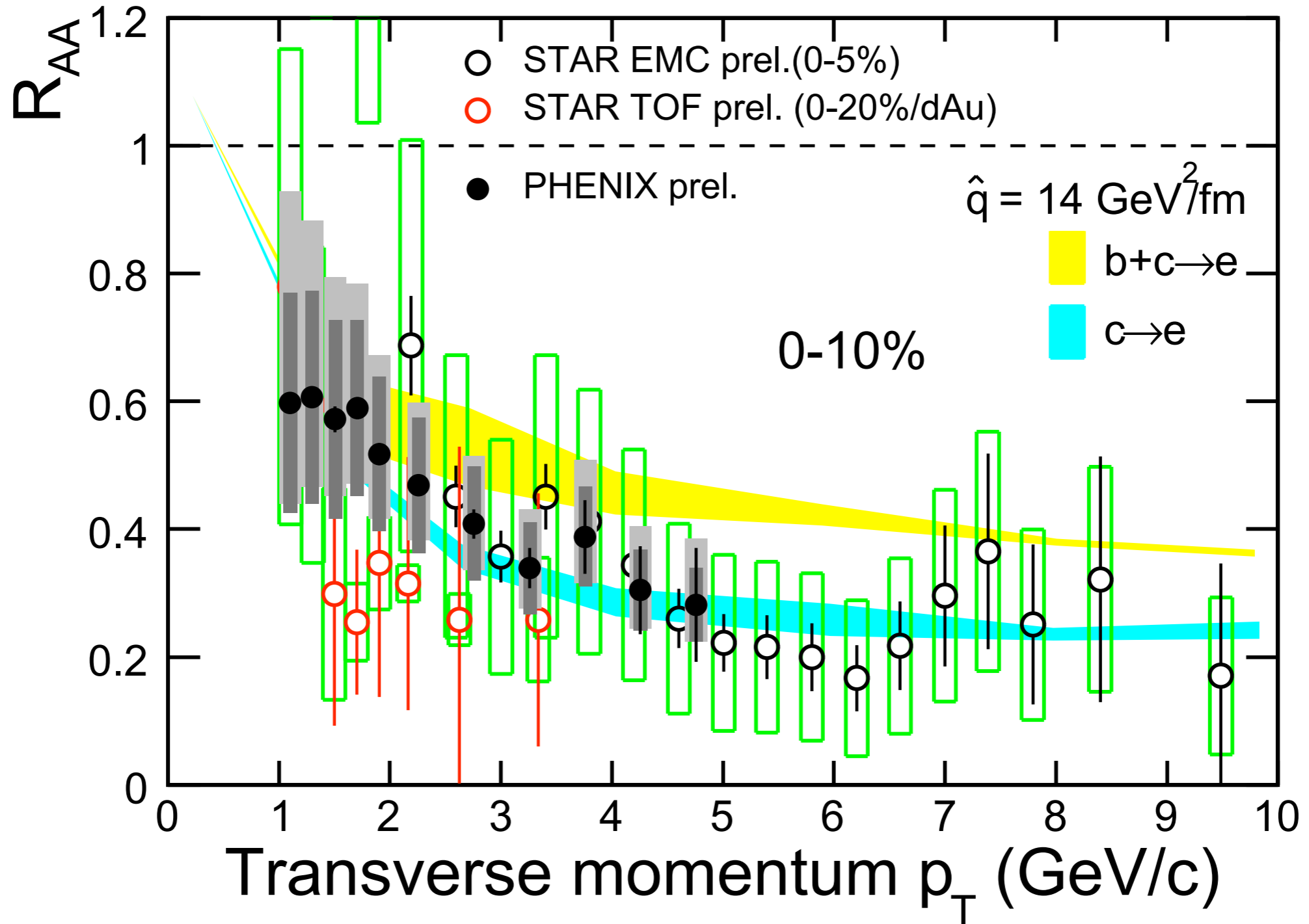


No room for beauty at all. dN_g/dy about a factor 3 higher than expected. With $dN_g/dy=1000$ suppression should be even weaker.



x-raying the medium

N.Armento. QM2006



Again no room for beauty. The “canonical” $q=4 \text{ GeV}^2/\text{fm}$ value should produce even less suppression



‘Beauty is no quality in things themselves: It exists merely in the mind which contemplates them.’

David Hume (Scottish philosopher)

Well now, if this is true, then can I can calculate the beauty yields myself.

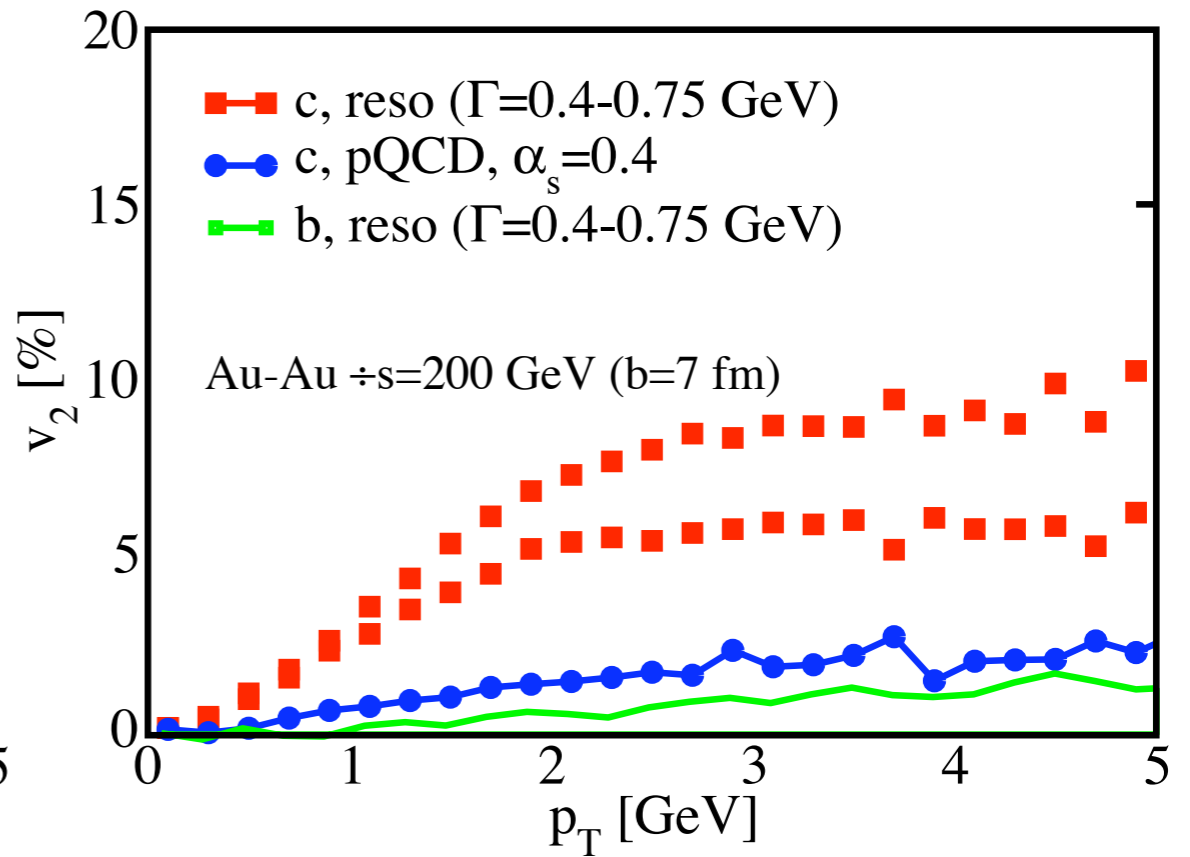
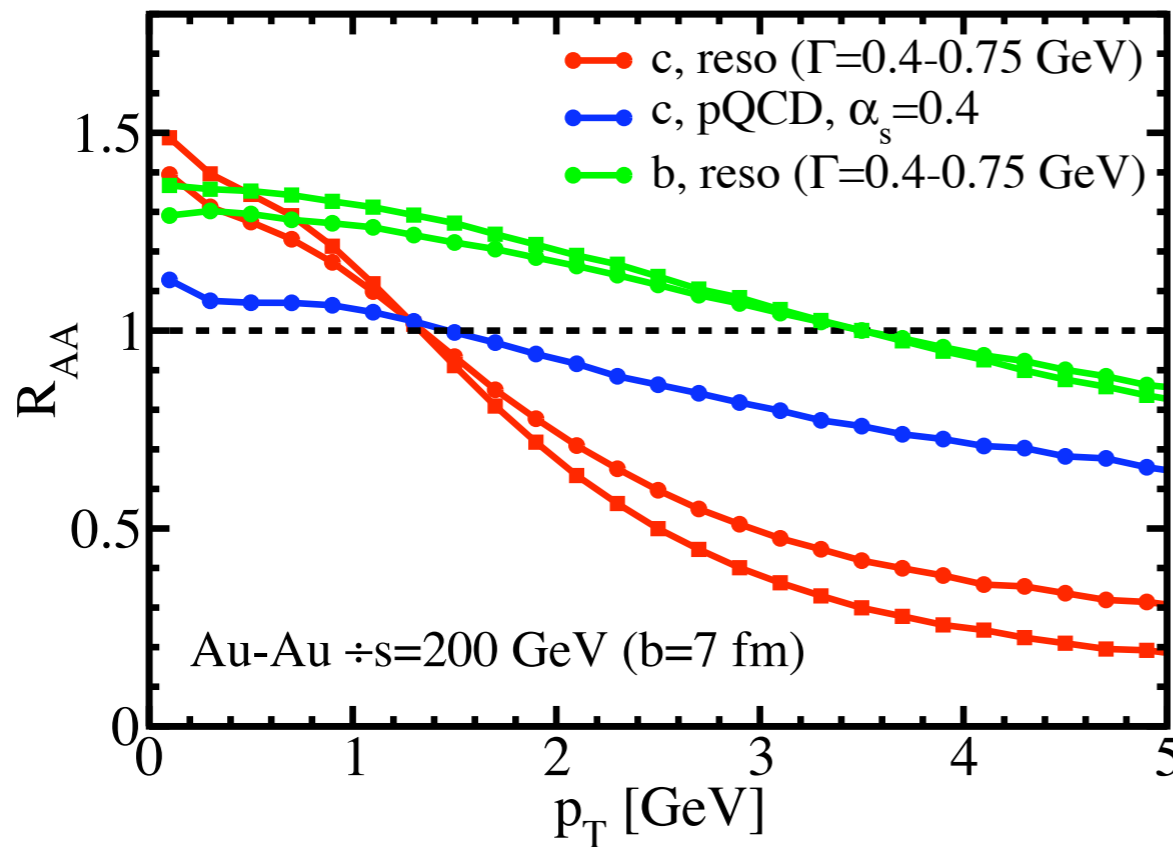


Calculating the beauty x-section

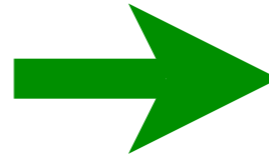
R_{AA} VS v_2



Hees, Greco, Rapp, PRC 73, 034913 (2006)



Charm could pick up elliptic flow from the medium

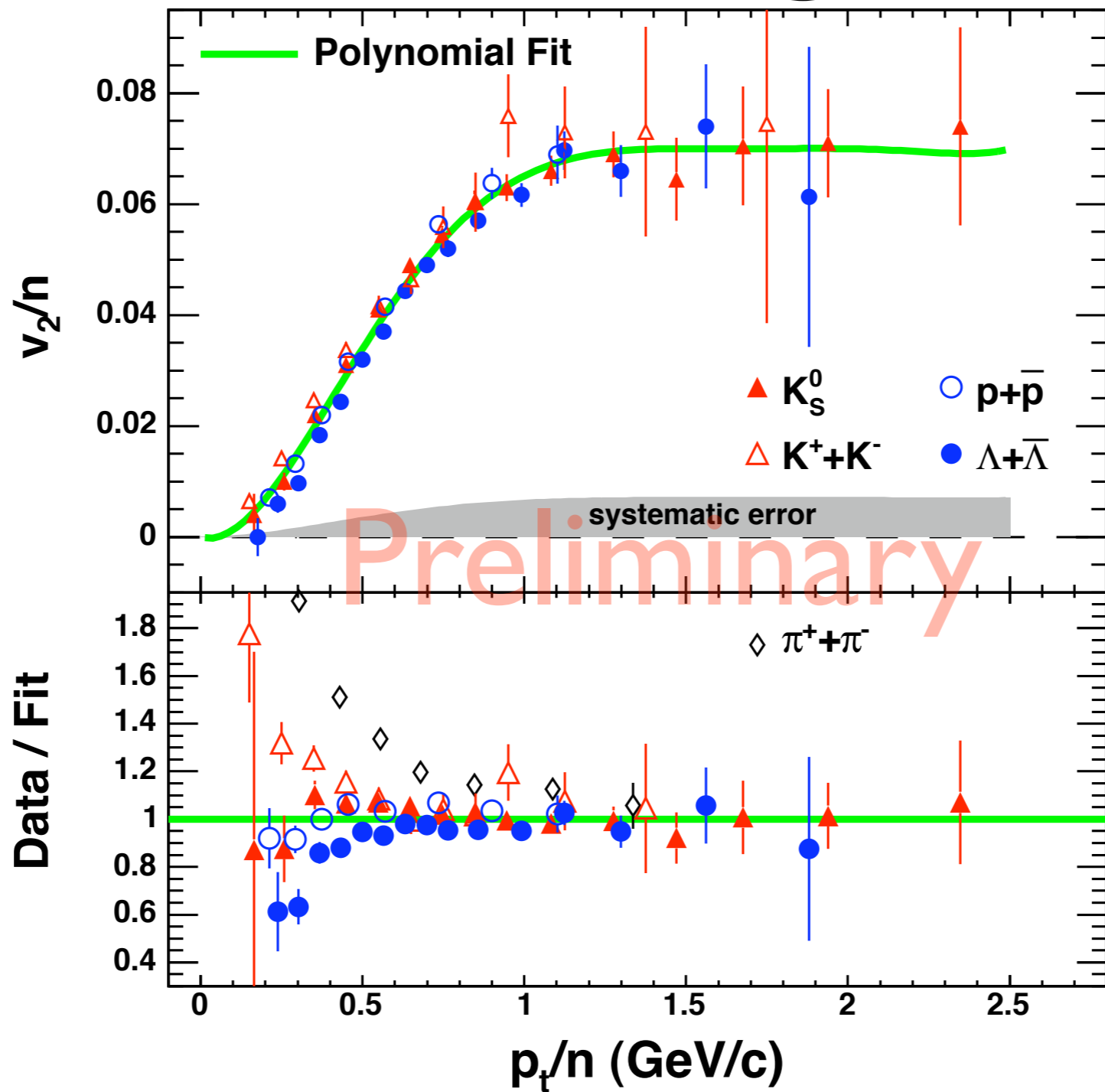


Measurements of charm p_T spectra and elliptic flow may give us hint that the partonic matter might be thermalized

Charm R_{AA} goes hand in hand with charm v_2
(we saw charm suppression)

Beauty is not flowing, no matter what !

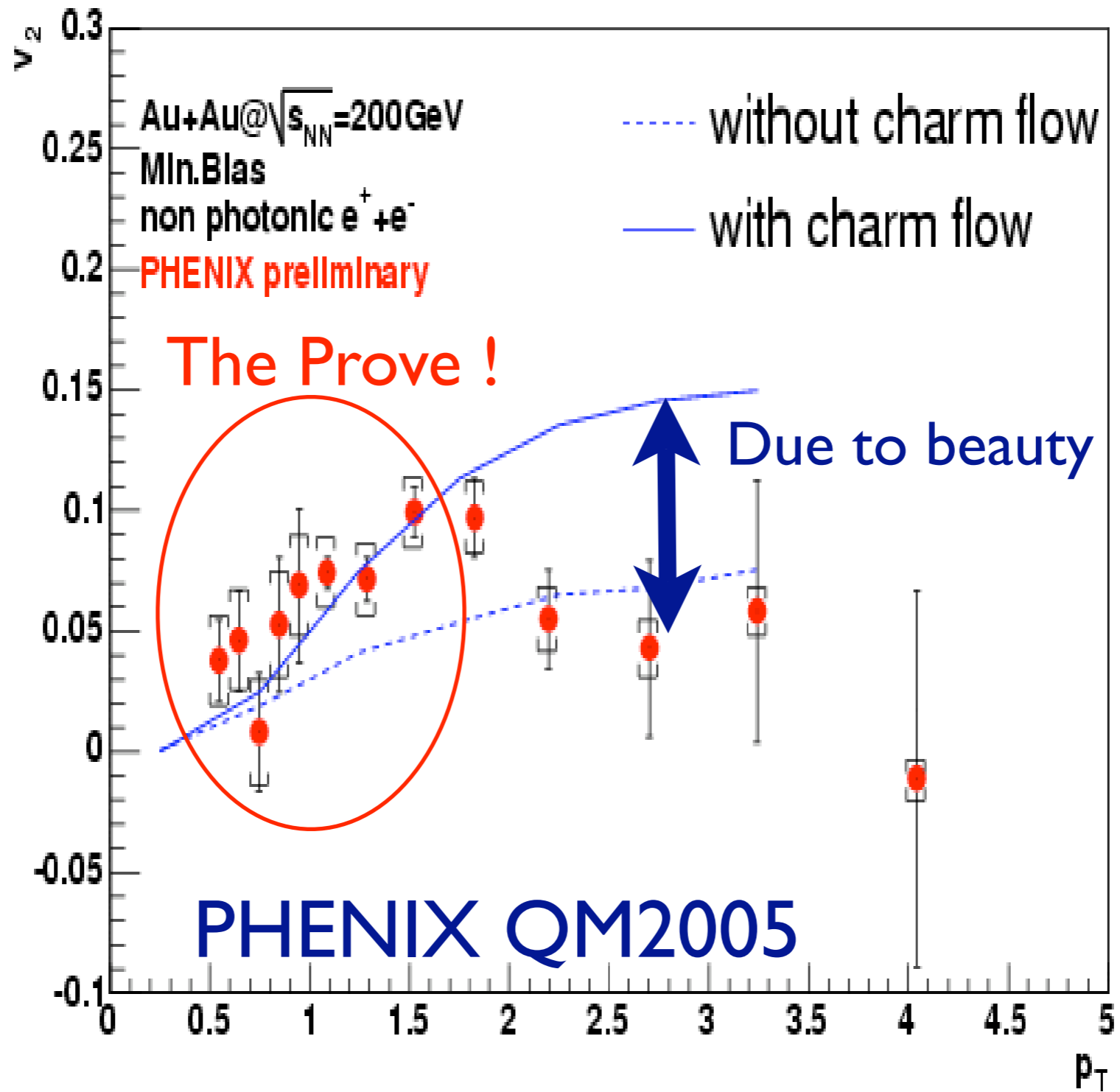
NCCQ Scaling for v_2



STAR SQM2006

Assume: Charm flows just like the light hadrons

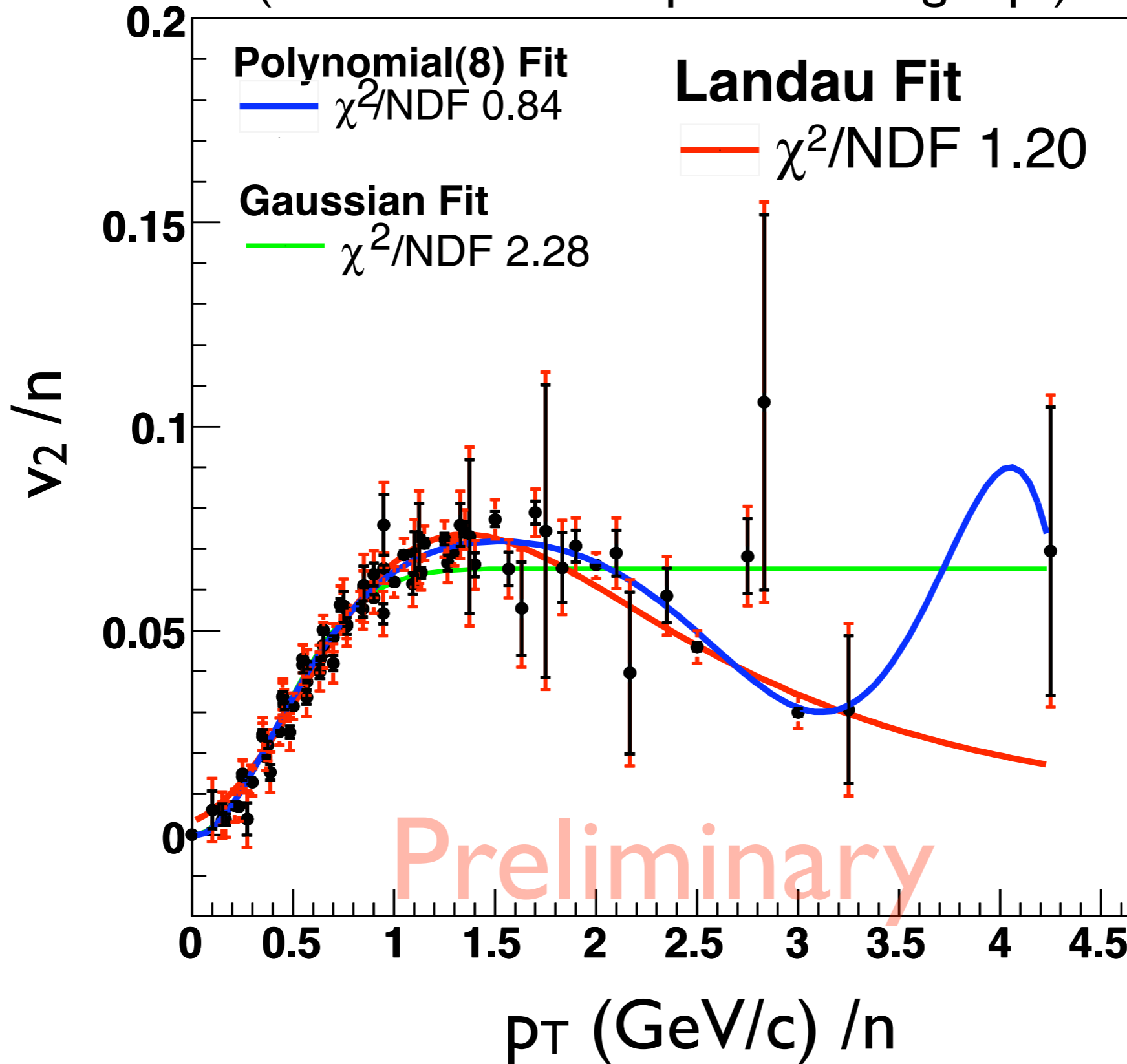
Non-photonic $e^{+/-}$ v_2



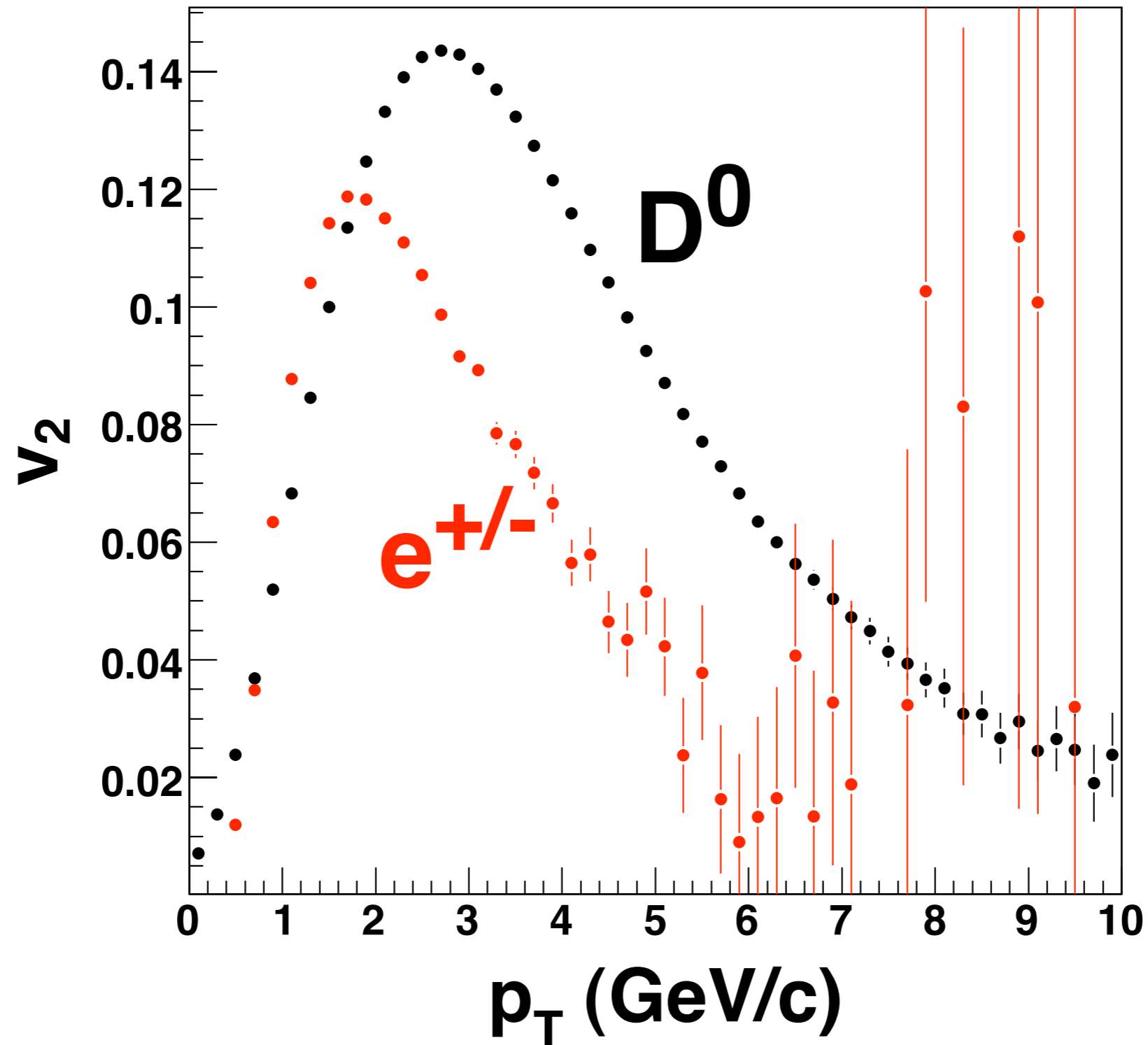


Modeling v_2

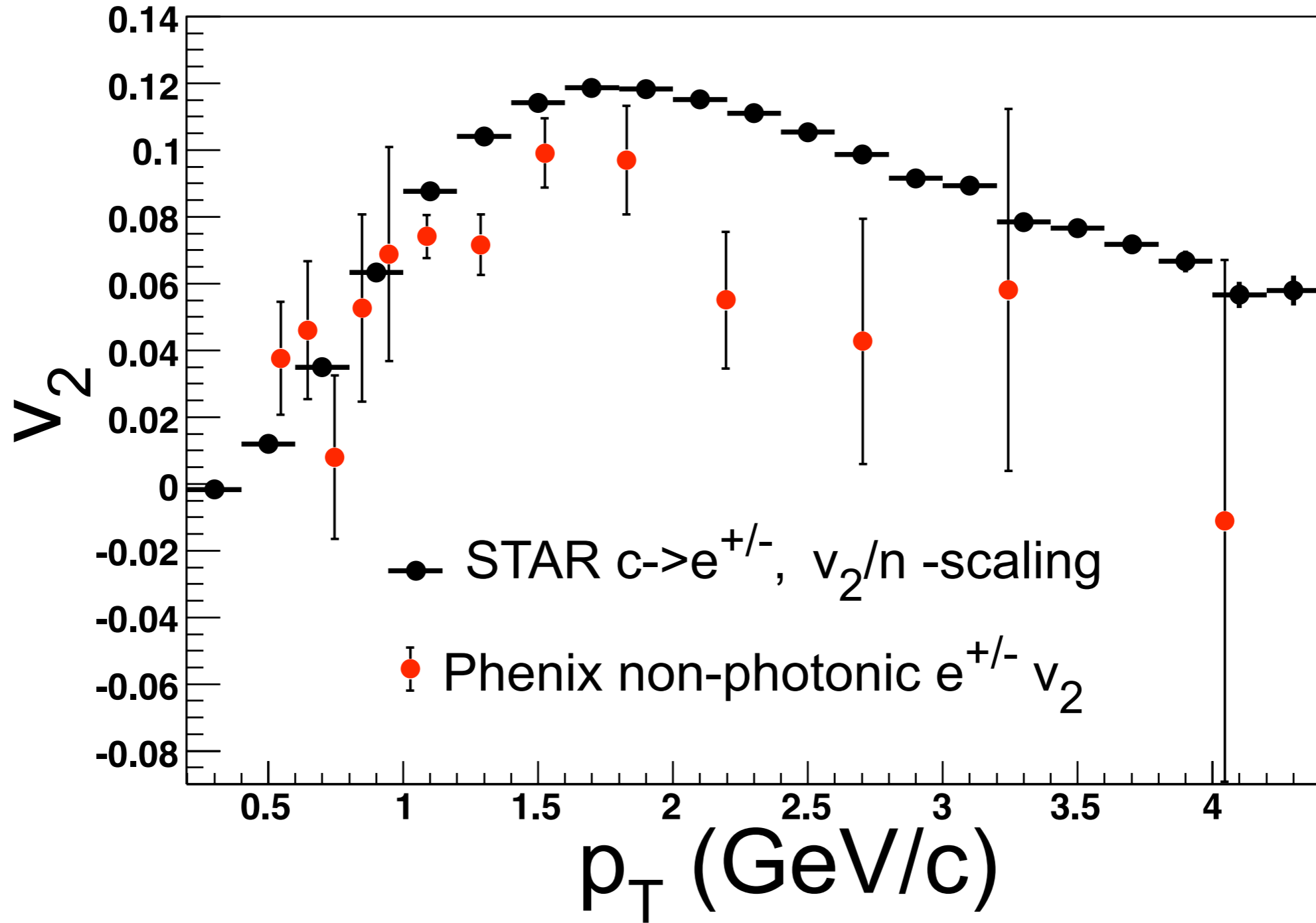
(the need to extrapolate to high pt)



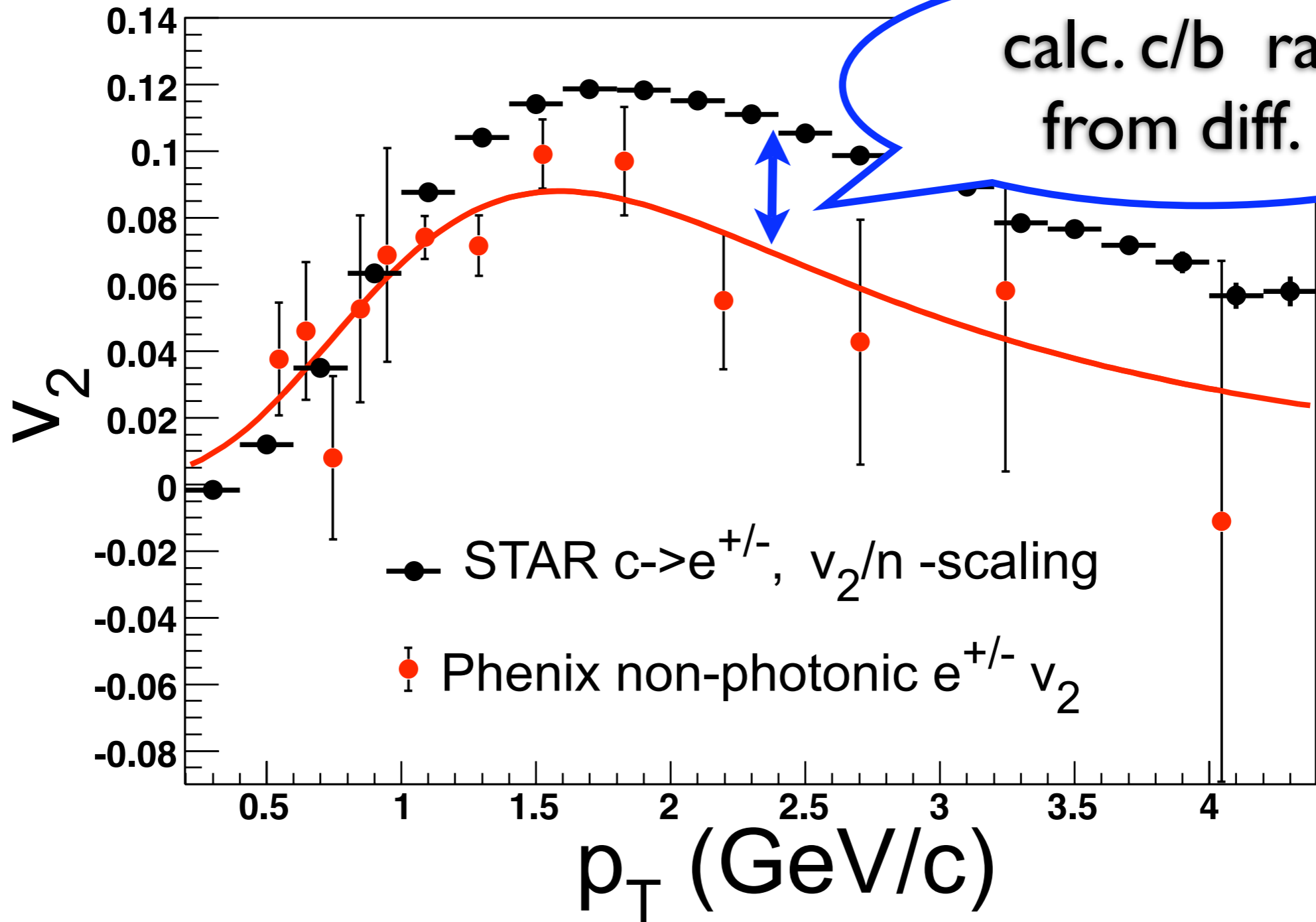
Expected non-photonic v_2 distribution from flowing charm



Comparison Data/Charm v_2 Hypothesis

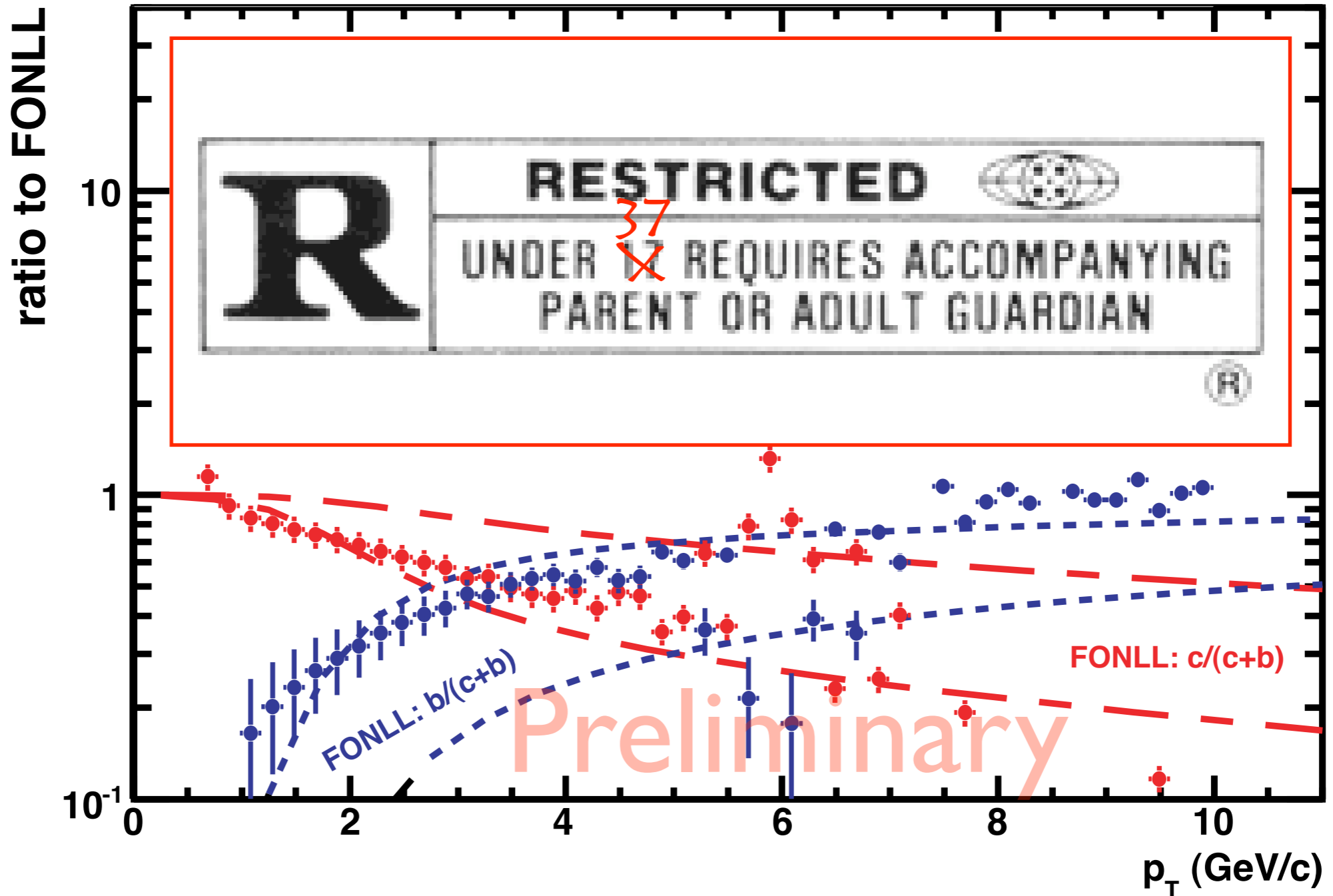


Comparison Data/Charm v_2 Hypothesis



$$v_2^{c,b} = \frac{v_2^c \times n_c + v_2^b \times n_b}{n_c + n_b}$$

Constraints on Electron Production from Semi-leptonic Charm and Beauty Decays



M. Cacciari, P. Nason, R. Vogt
PRL 95(2005)122001

Multiply with your favorite non-photonic electron spectrum to obtain $b \rightarrow e$ spectrum and hence b yields. 18

Beauty Yields from the non-photonic electron v_2 analysis



sorry next time

Summary

Neither the production of heavy flavor ($p+p$), nor its energy loss in the medium is understood.

We do not have the well calibrated probe we were wishing for.

Assuming NCQ scaling for v_2 , and attributing the difference between the measured non-photonic electron v_2 and the its expectation from semileptonic charm decay to beauty, we obtain c/b ratios roughly in expectation with FONLL calculations.