

# dAu Minimum Bias High $p_T$ Results from PHENIX

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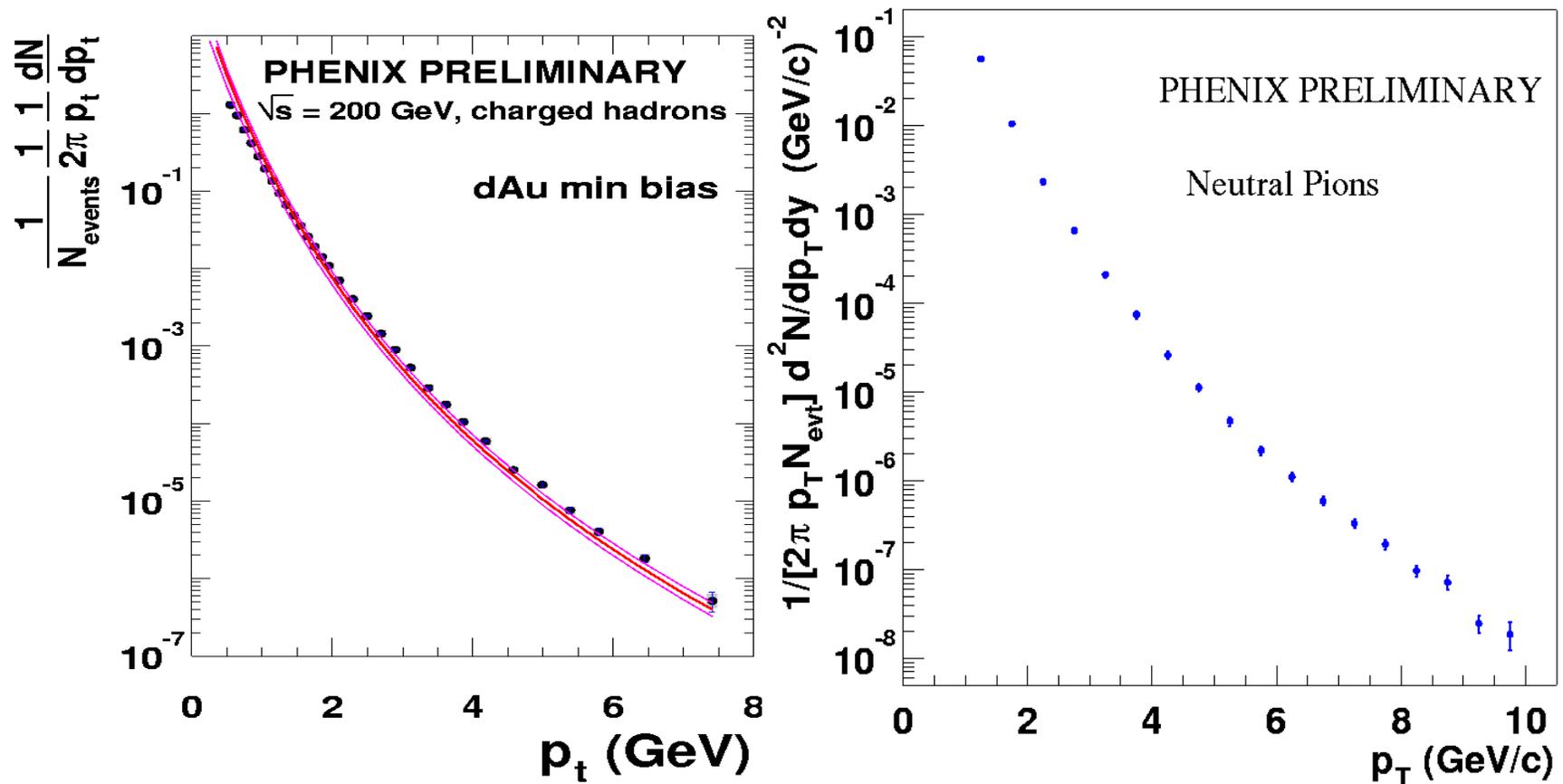
## Why Study dAu at RHIC?

- In earlier AuAu collisions at RHIC, a strong suppression of high  $p_T$  particles has been observed.
- dAu collisions provide an opportunity to test whether the suppression in AuAu is an initial state effect or a final state effect.
- Models which explain the suppression in AuAu by jet quenching predict that in dAu the Cronin effect (increase in  $\langle k_T \rangle$  in pA collisions compared to pp collisions) should be observed (Wang PRC 61(064910), Vitev & Gyulassy PRL 89(252301)).

## Experimental Details

- The results presented are for d-Au collisions as measured in the central arms of PHENIX.
- Results are presented for both  $\pi^0$ s and inclusive charged particles.
- For the charged particles, 12 million minimum bias events are analyzed.
- Charged particle momenta are measured in the drift chambers; a match to the outer pad chamber is also required to reject background.
- $\pi^0$ s are measured in both PHENIX electromagnetic calorimeters (Pb-glass and Pb-scintillator). Results shown are an average of the two independent measurements.

# Measured Spectra



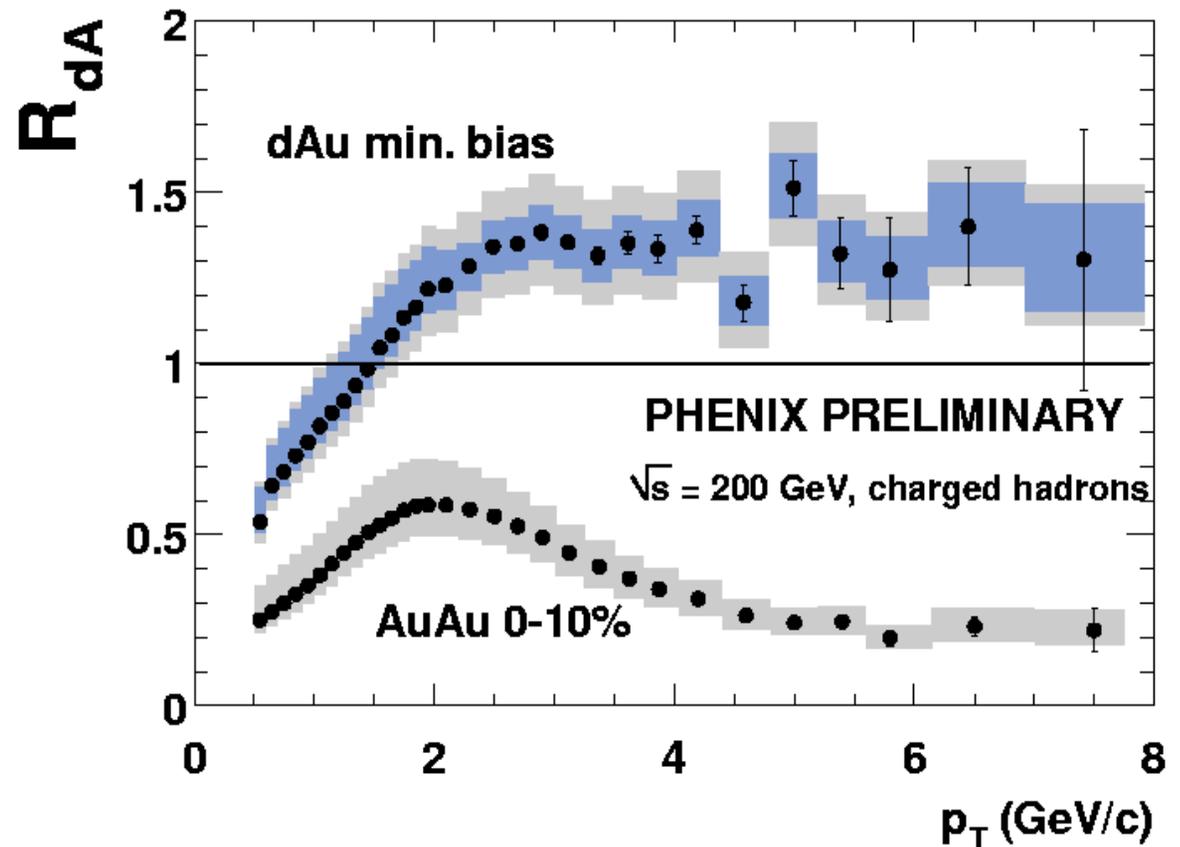
## The Making of $R_{dA}$

$$R_{dA} = \frac{(1/N_{dA}^{evt})d^2N_{dA}/dydp_T}{\langle N_{coll} \rangle (1/N_{pp}^{evt})d^2N_{pp}/dydp_T}$$

- $\langle N_{coll} \rangle = 8.5 \pm 0.7$  for minimum bias
- The pp-reference spectrum comes from the PHENIX  $\pi^0$  data, for the inclusive charged analysis it is scaled up by the measured  $h/\pi$  ratio.

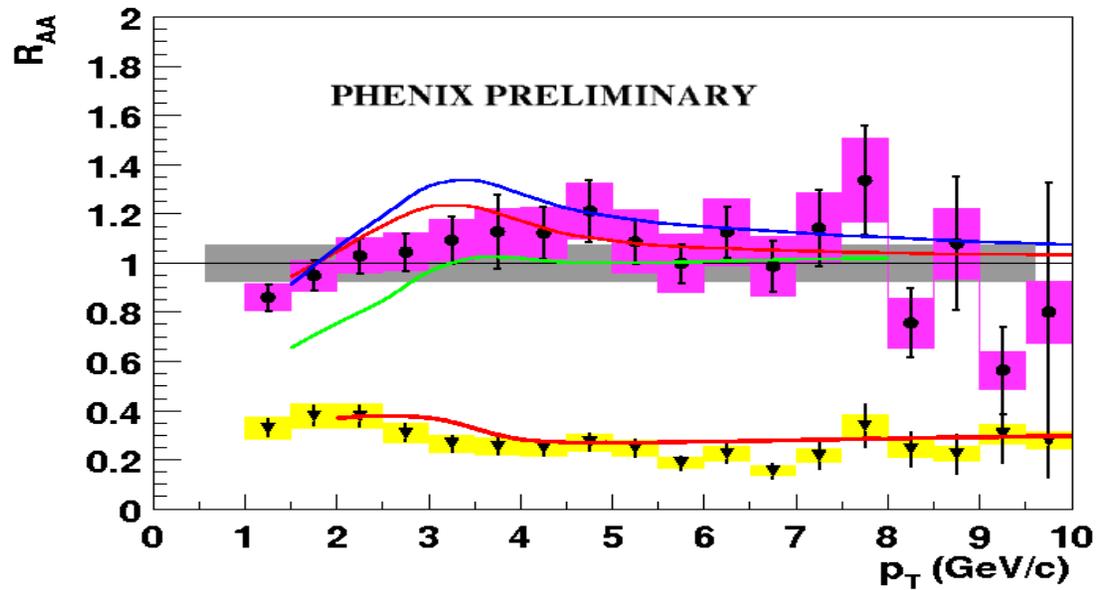
## Inclusive Charged Results

- No suppression observed.
- Blue boxes are systematic errors which could change the shape. Grey boxes are the total systematic errors. Error bars are the statistical errors. All errors are  $1\sigma$ .



# $\pi^0$ Results

- Again, no suppression observed.
- Grey band is the  $p_T$  independent systematic error. Pink boxes are the systematic errors which can change the shape. All errors are  $1\sigma$ .
- Points with yellow errors are AuAu 0-10% central (PHENIX nucl-ex/0403022).



Solid Lines:

blue: with antishadowing (EKS parameterization)

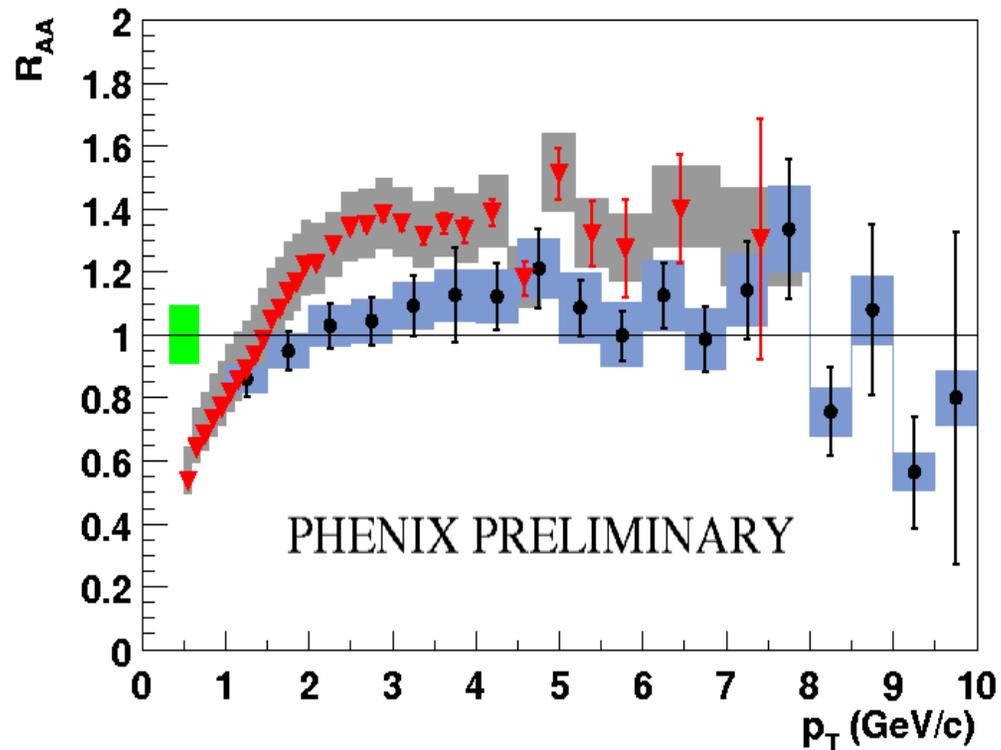
red: no (anti)shadowing

green: strong shadowing

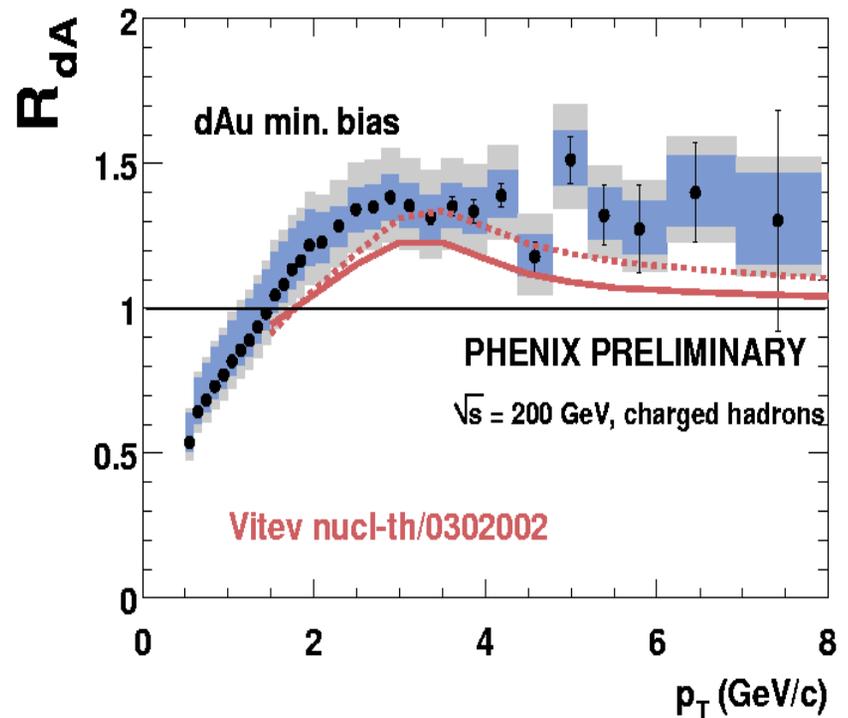
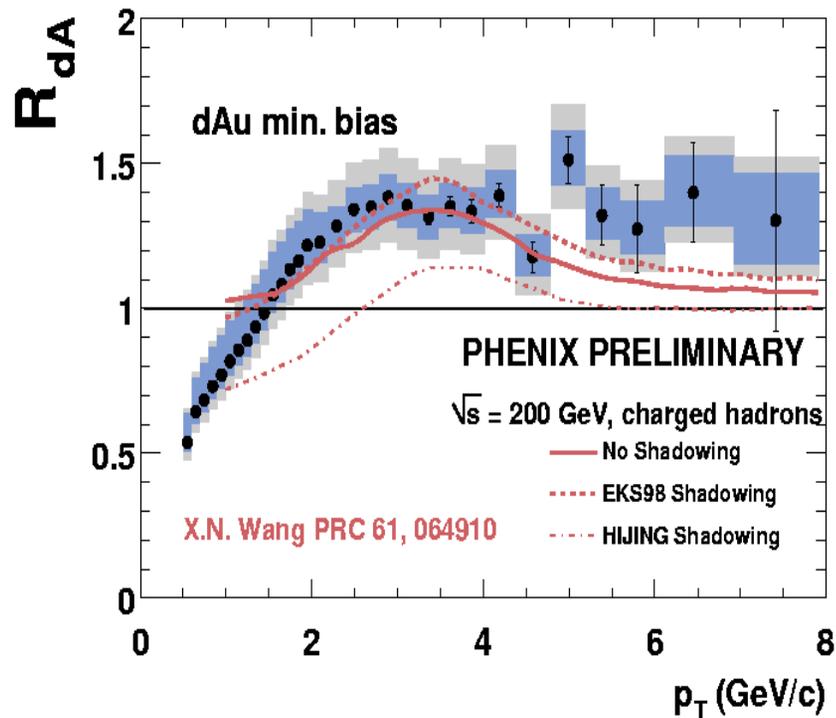
I. Vitev, nucl-th/0302002 and private communication

# Comparison of Charged and $\pi^0$ Results

- Red points are the inclusive charged values.
- Black points are the  $\pi^0$  values.
- Systematic errors which are common between the two analysis (e.g. error on  $\langle N_{coll} \rangle$ ) are shown as the green band.



# Theoretical Comparisons for Inclusive Charged



# Conclusions

- $R_{dA}$  is greater than 1 for the inclusive charged hadrons.
- $R_{dA}$  looks flat from about 3-8 GeV/c. Above 8 GeV/c  $R_{dA}$  may decrease.
- The maximum value for  $R_{dA}$  allowed within the error is about 1.5 for inclusive charged and 1.3 for  $\pi^0$ .
- Within the  $1\sigma$  systematic errors  $R_{dA}$  of inclusive charged seems to be greater than  $R_{dA}$  for  $\pi^0$ s.