Cronin and Shadowing in *pA*

(PRC80 014903 2009; PRC85, 024903, 2012)

Gergely Gábor Barnaföldi, J. Barrette, M. Gyulassy,

Sz. Harangozó, P. Lévai, G. Papp, V. Topor Pop

Wigner RCP RMI of the HAS, Eötvös Loránd University,

Columbia University, Mc Gill University

O U T L I N E

- Motivation for *pA/dAu* collisions
    - pA/dAu collisions from 30 AGeV to 5 ATeV
    - How latest results fit into the picture.
    - What phenomenology have we leart by the 'Cronin effect' so far?

- Nuclear shadowing
    - Suppression at low-x
    - High-p_T nuclear effects @ midrapidity & large y

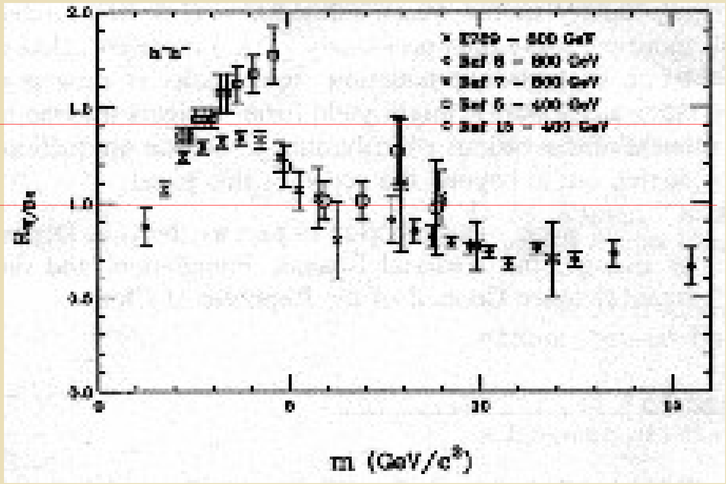
- Cronin effect
    - Enhancement in pA
    - Saturated Glauber picture and the Cronin effect

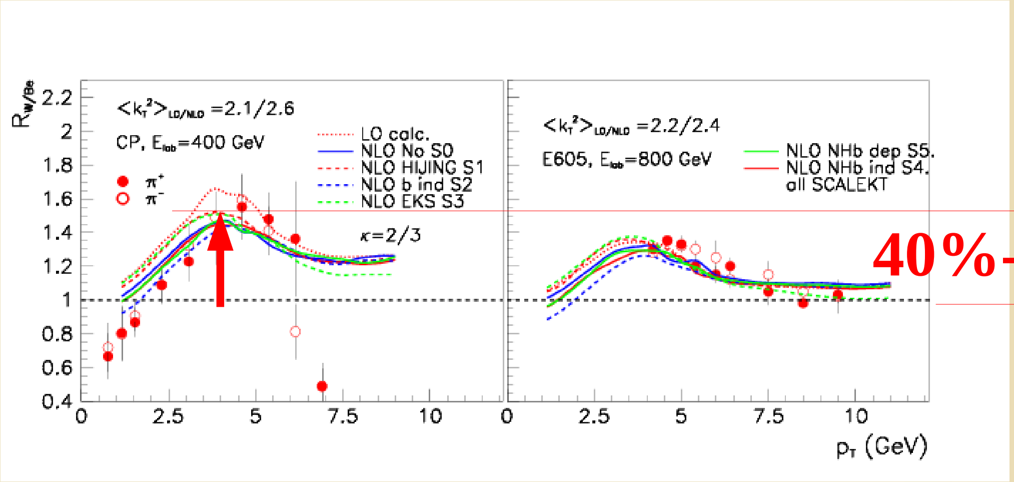
M O T I V A T I O N

- Cronin effect at SPS energies

Brown et al: PRD11 (1975) 3105, Ric.Sci.Edu.Perm Suppl. 122 (2003) 541

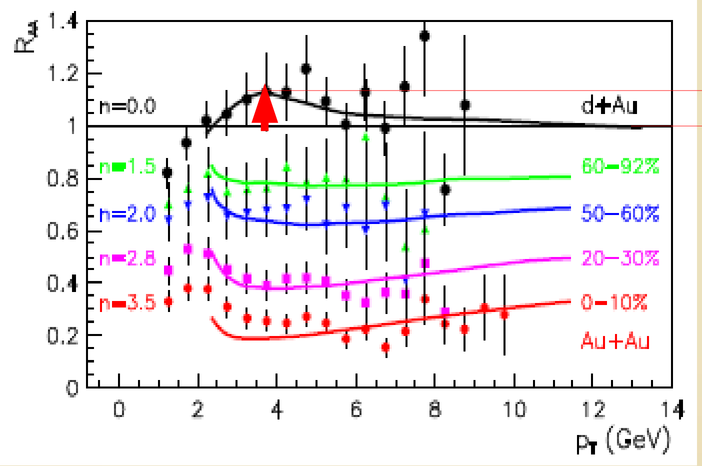
40%



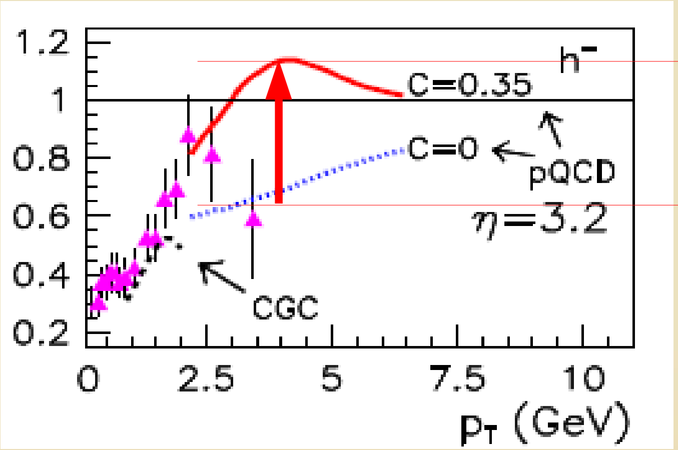


40%-50%

- RHIC analysis on dAu and AuAu



10%



????

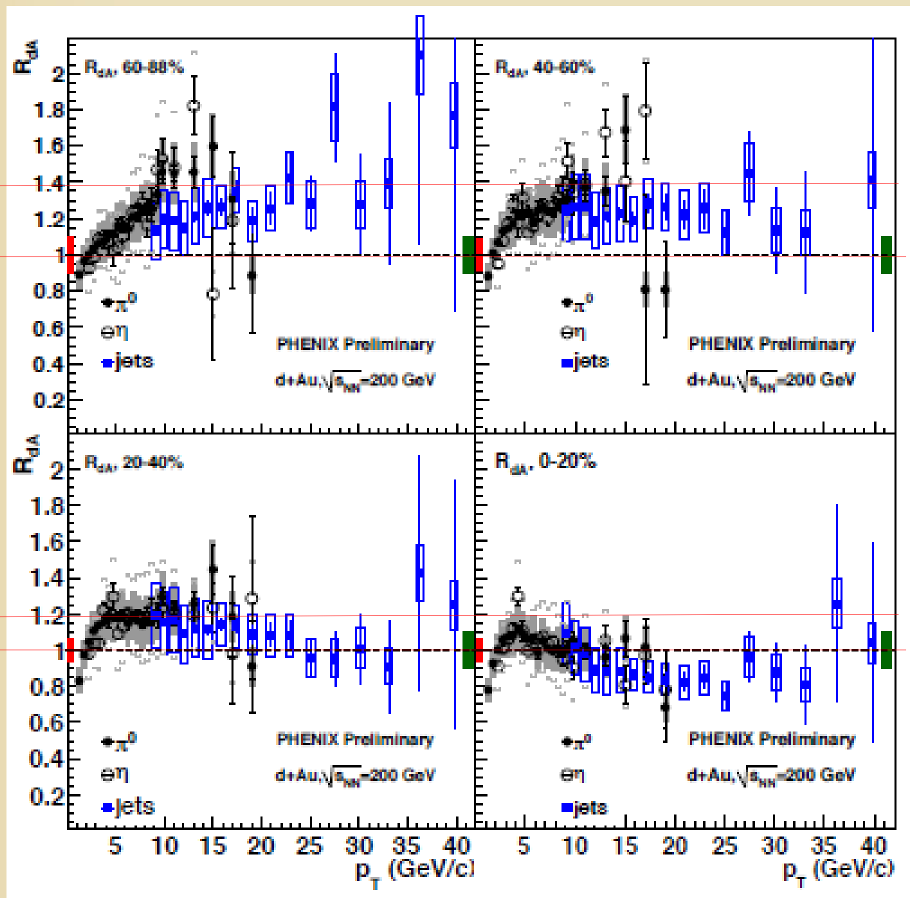
MOTIVATION

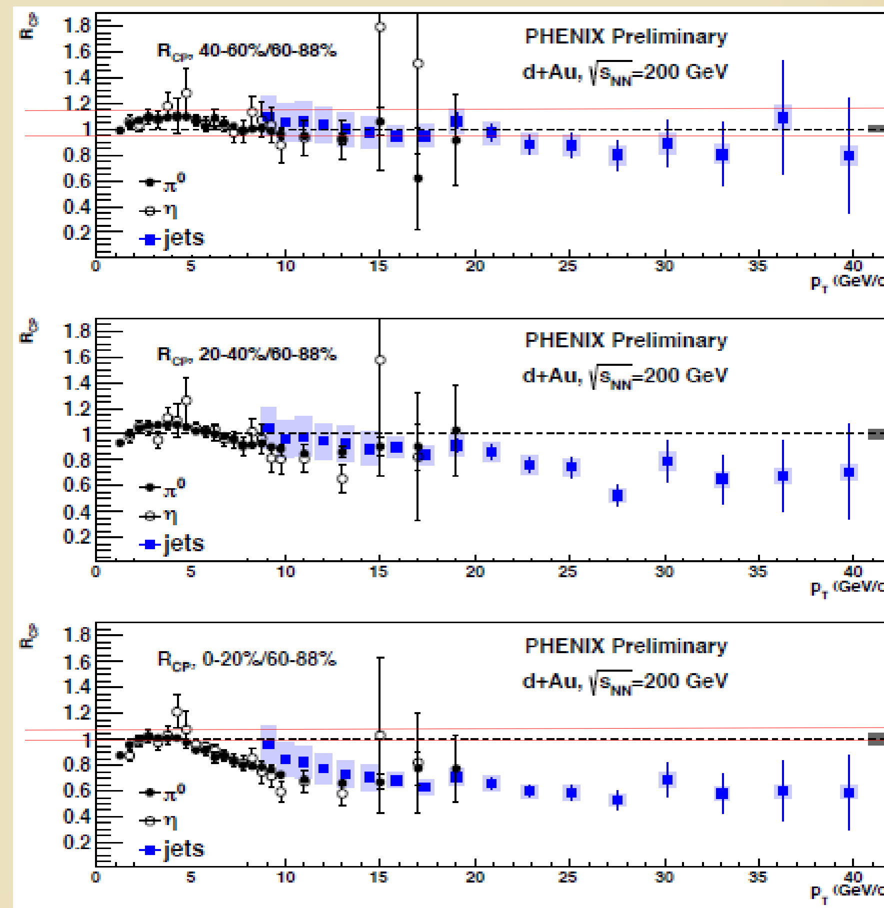
- Motivation for *pPb/dAu* collisions

  Preliminary dAu data from PHENIX@QM12 (B. Sahlmueller)

40%

20%





10%

5%

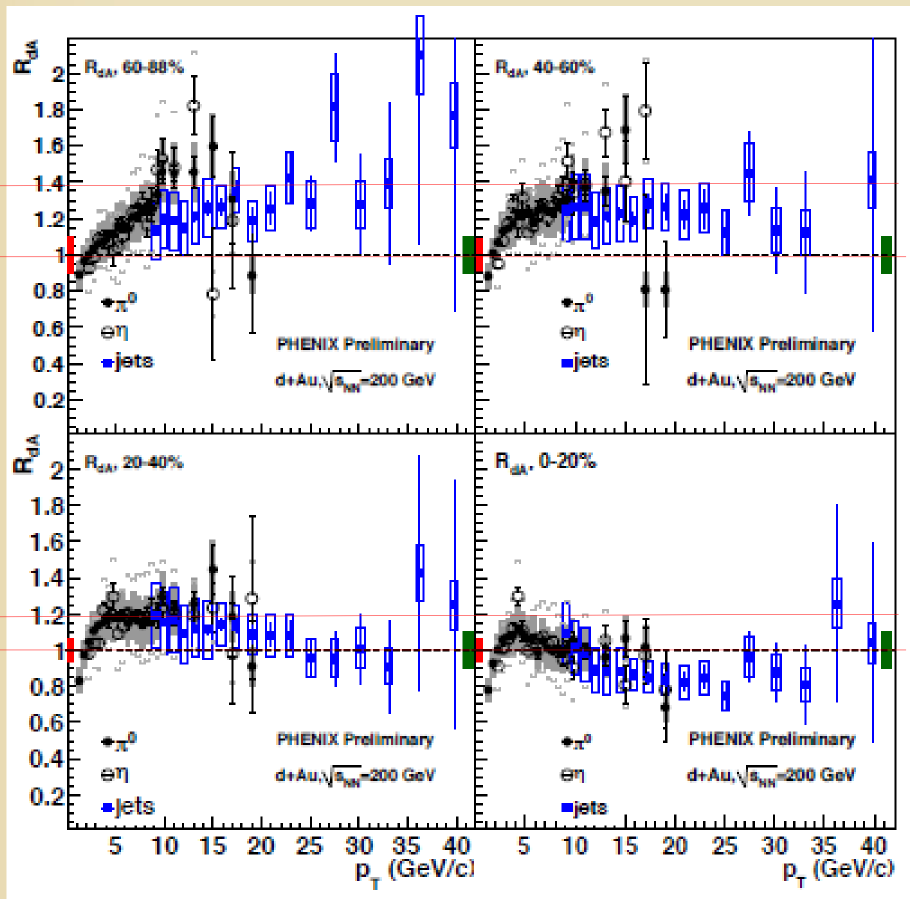
M O T I V A T I O N

- Motivation for *pPb/dAu* collisions

R_{dAu} (y=0, p_T) > R_{CP} (y=0, p_T), seems OK, but strong...

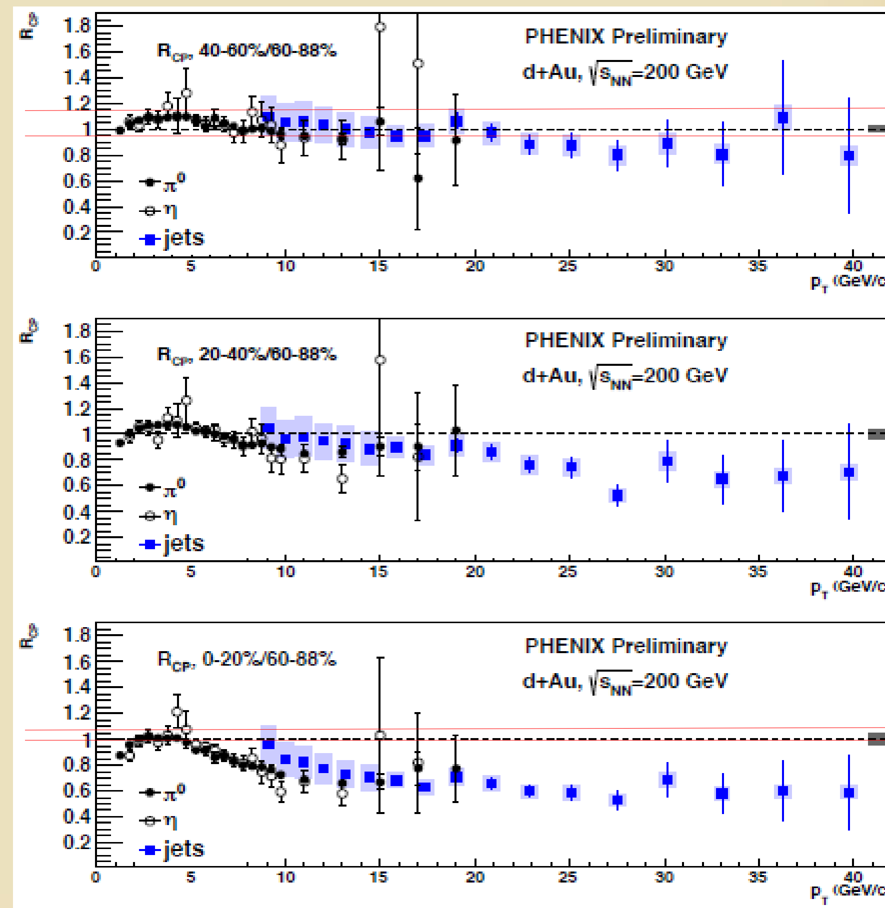
40%

20%



10%

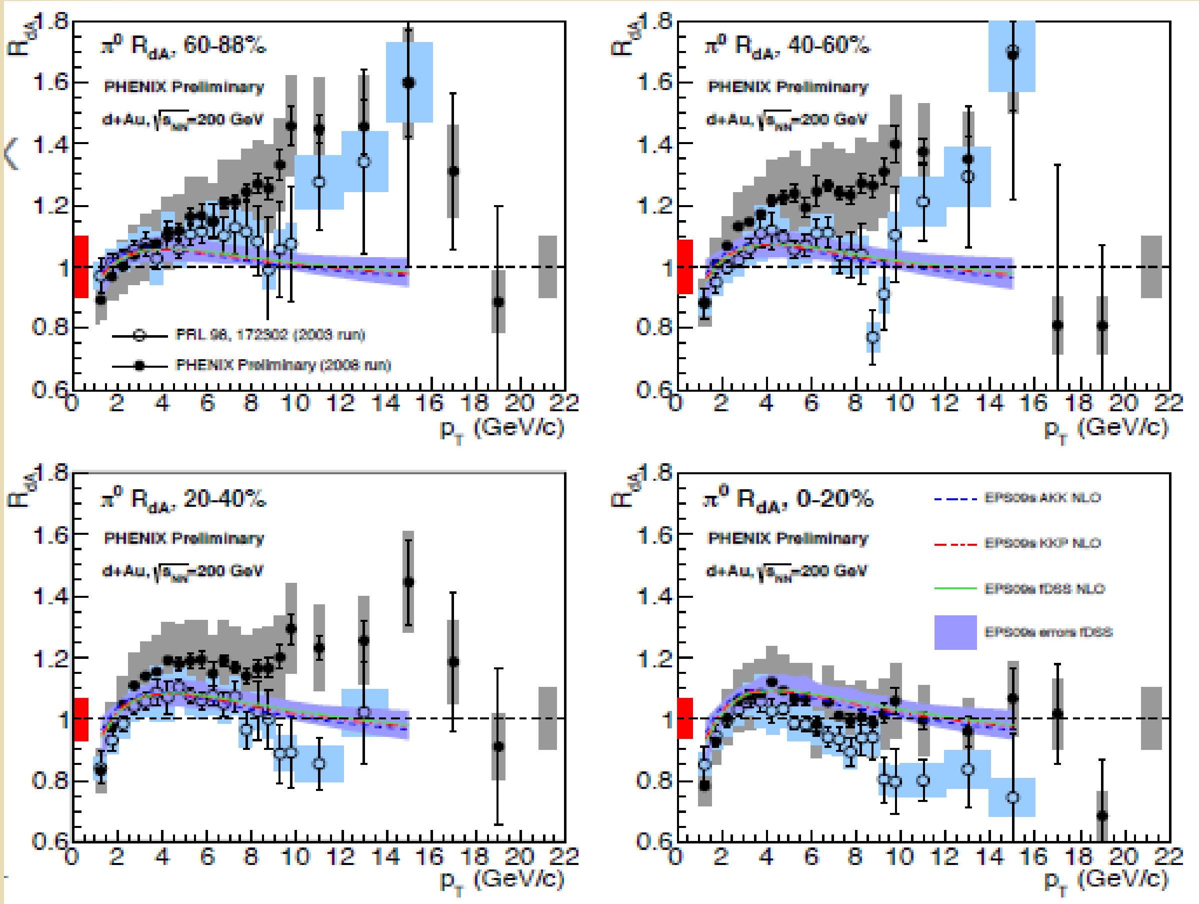
5%



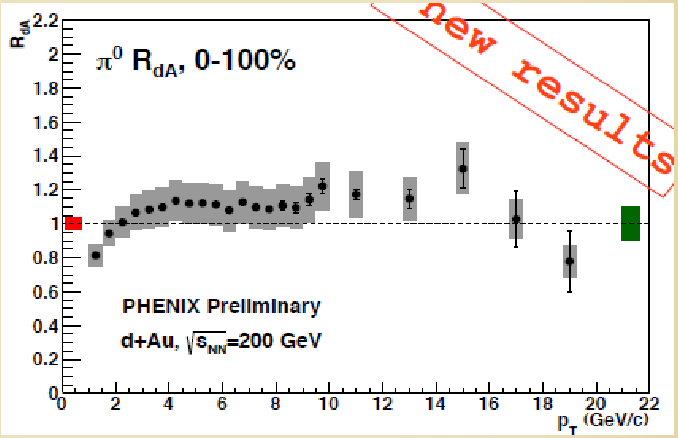
MOTIVATION

- Motivation for *pPb/dAu* collisions

  Preliminary dAu data from PHENIX@QM12 (B. Sahlmueller)



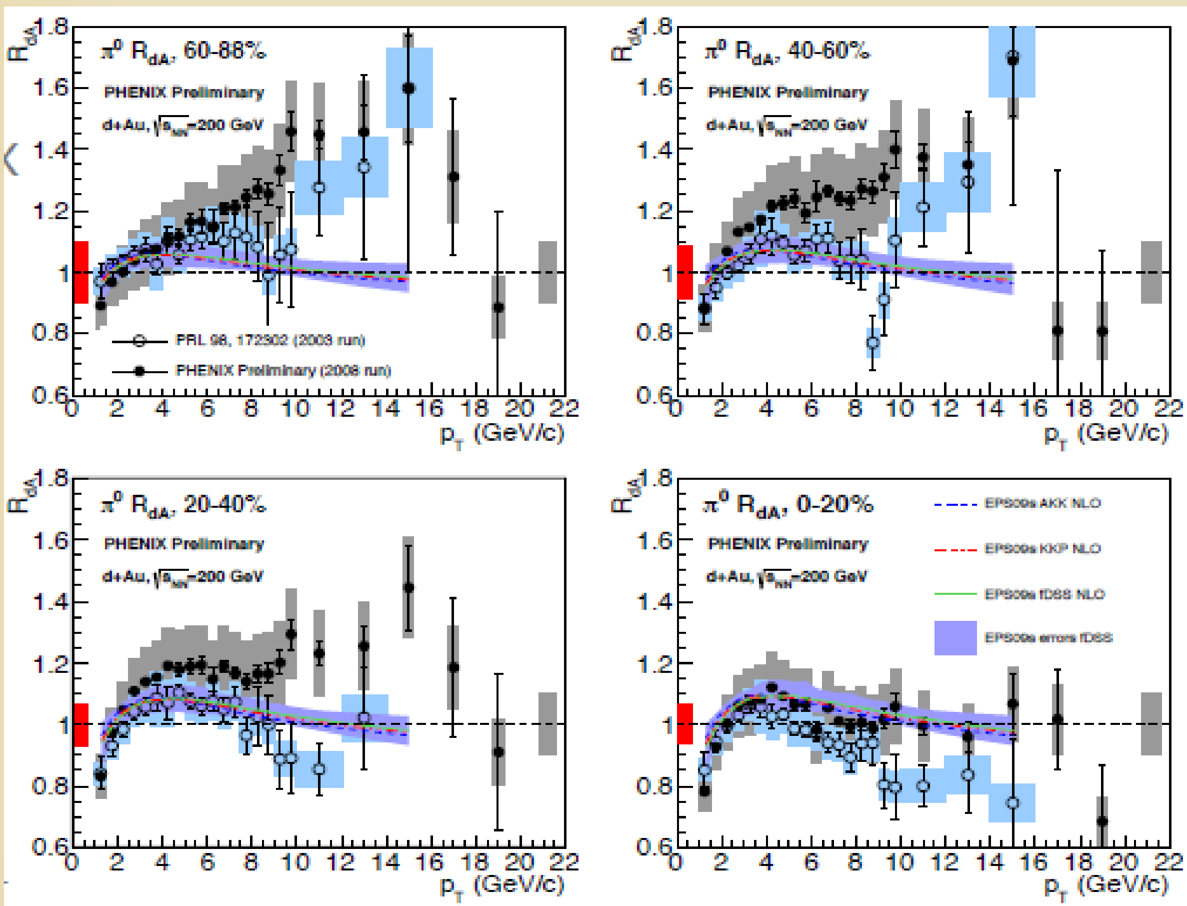
2008 data is not final, but differ at p_T>6 GeV/c in all centralities from data taken in 2003

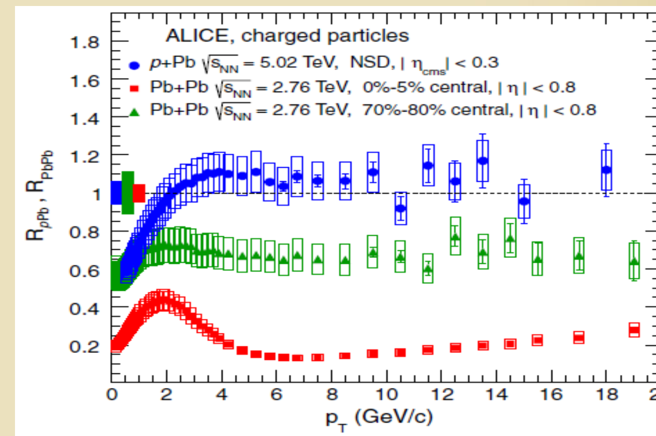


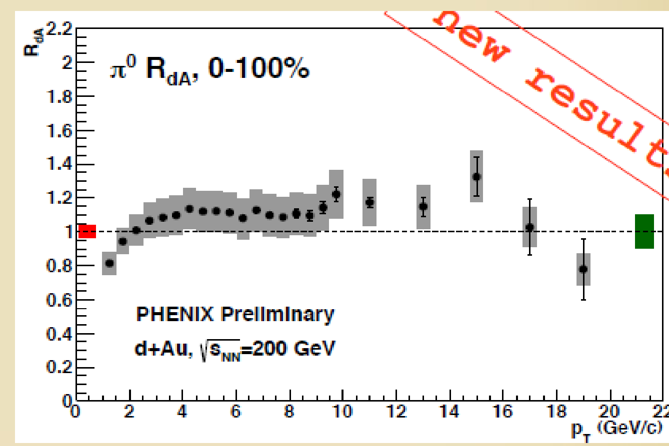
M O T I V A T I O N

- Motivation for *pPb/dAu* collisions

The RHIC MB is similar to the ALICE LHC MB data







What have we learnt about Cronin so far?

- Overall properties of MB case:

  CM energy dependence: Higher the sqrt(s) lower the peak

  No relevant change in the place of the peak

  Shape is similar, but hard to say anything on width

C.M. Energy [GeV]	Peak' s place p_T [GeV/c]	Max effect. [%]	Type
27.4	4	50%	pW/pBe
38.8	4	40%	pW/pBe
200	4	10-15%	dAu/pp
5020	4	10%	pPb/pp

- Centrality & Rapidity dependence

  Anomalous increase in pheripheral collisions

  Suppression of the peak in forward (y>0): less or no peak

  No measurement in the backward (y<0): ????

What have we learnt about Cronin so far?

- Overall properties of MB case:

  CM energy dependence: Higher the sqrt(s) lower the peak

  No relevant change in the place of the peak

  Shape is similar, but hard to say anything on width

C.M. Energy [GeV]	Peak' s place p_T [GeV/c]	Max effect. [%]	Type	Peak in x
27.4	4	50%	pW/pBe	0.3
38.8	4	40%	pW/pBe	0.2
200	4	10-15%	dAu/pp	0.04
5020	4	10%	pPb/pp	0.002

Shadowing

- Centrality & Rapidity dependence

  Anomalous increase in pheripheral collisions

  Suppression of the peak in forward (y>0): less or no peak

  No measurement in the backward (y<0): ????

What have we learnt about Cronin so far?

- Overall properties of MB case:

  CM energy dependence: Higher the sqrt(s) lower the peak

  No relevant change in the place of the peak

  Shape is similar, but hard to say anything on width

C.M. Energy [GeV]	Peak' s place p_T [GeV/c]	Max effect. [%]	Type	Peak in x
27.4	4	50%	pW/pBe	0.3
38.8	4	40%	pW/pBe	0.2
200	4	10-15%	dAu/pp	0.04
5020	4	10%	pPb/pp	0.002

Geometry & Multiple & Scattering

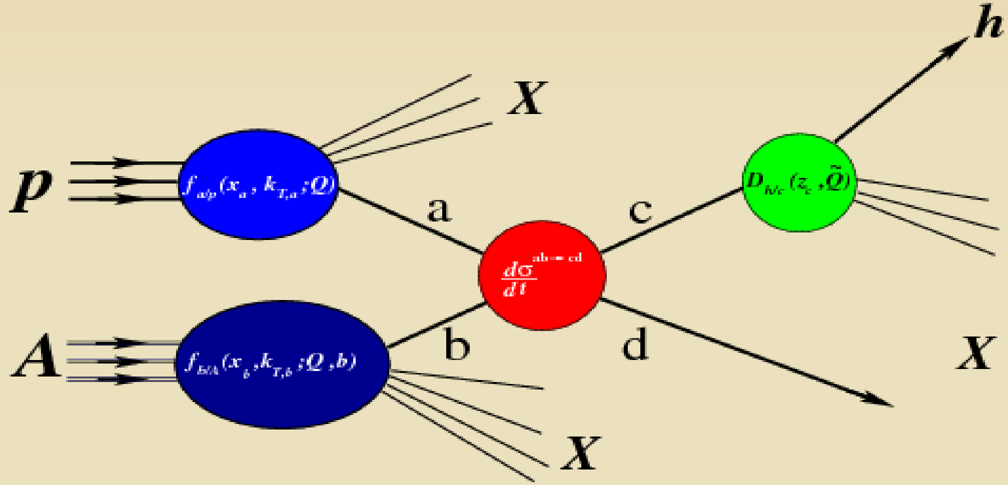
- Centrality & Rapidity dependence

  Anomalous increase in pheripheral collisions

  Suppression of the peak in forward (y>0): less or no peak

  No measurement in the backward (y<0): ????

Models & Parameters



HIJING B/B 2.0

PRC83 024902, PRC84 022002 (2010)

Modified version of HIJING 2.0

Minijet cutoff: p_0=3.1 GeV/c

$$p_0(s,A) = 0.416\ \sqrt{s}^{0.191}\ A^{0.128}\ \mathrm{GeV}/c$$

String tension: κ =2.9 GeV/fm

$$\kappa(s,A) = \kappa_0\ (s/s0)^{0.06}\ A^{0.167}\ \mathrm{GeV/fm}.$$

PDF: GRV+ HIJING shadowing

FF: PYTHIA + minijet

kTpQCD_v2.0

PRC65 (2002)034903

NLO pQCD based parton model with intrinsic-k_T, k_T-broadening, and various shadowing parametrization.

$$E_\pi \frac{\mathrm{d}\sigma_\pi^{dAu}}{\mathrm{d}^3 p_\pi} = f_{a/d}(x_a, Q^2; \mathbf{k}_{Ta}) \otimes f_{b/Au}(x_b, Q^2; \mathbf{k}_{Tb}) \otimes \otimes \frac{\mathrm{d}\sigma^{ab\to cd}}{\mathrm{d}\hat{t}} \otimes \frac{D_{\pi/c}(z_c, \hat{Q}^2)}{\pi z_c^2}, \quad (1)$$

PDF:GRV/MRST+Shad, FF:KKP

on the Shadowing

aka suppression

Multiple Scattering in kTpQCD_v2.0

- What experiment gives... :
  - No relevant change in the place of the peak
  - Shape is similar, but hard to say anything on width
  - Anomalous increase in pheripheral collisions
  - Suppression of the peak in forward (y>0): less or no peak
  - No measurement in the backward (y<0): ????

- you just take into account in a theory...
  - Peak does not move or very slowly: assume no or log(s) dependence, and not follows x.
  - MB agrees with models: integrated values are constraints
  - Geometry matters: shadowing, nuclear size/density, rapidity, asymmetry, correlations, etc

The Spectra and $R_{pPb}(p_T)$ for $|\eta|<0.35$ & 0.3

Predictions by kTpQCD_2.0 @ 5.02 ATeV & 0.2 AGeV

Shadowing:

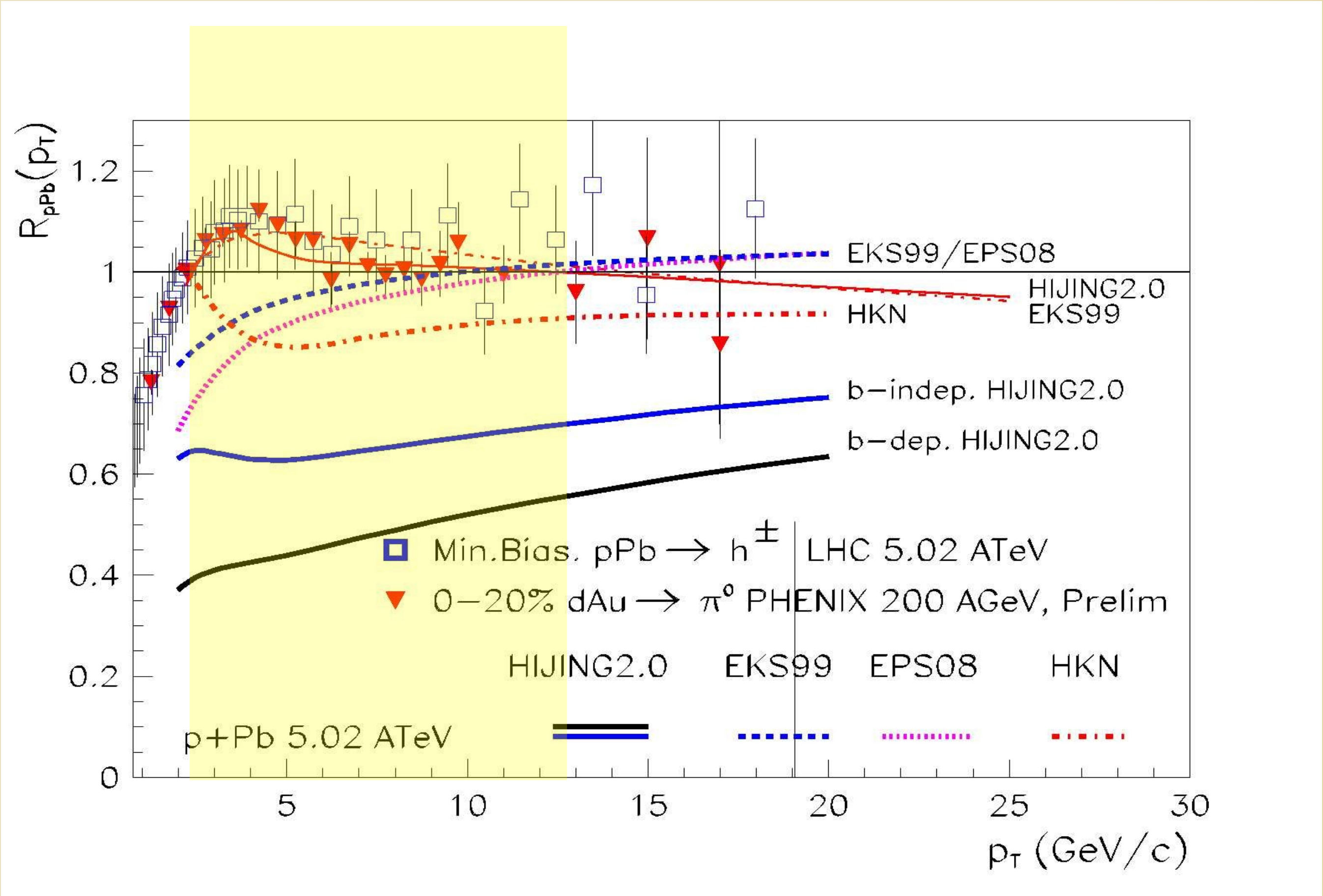
$$f_{a/A}(x,Q^2) = S_{a/A}(x,Q^2) f_{a/N}(x,Q^2)$$

b-dependent part

$$s_a(b) = s_a \frac{5}{3}\left(1 - \frac{b^2}{R_A^2}\right)$$

with

$$R_A = 1.12 A^{1/3}$$



GGB, J. Barrette, M. Gyulassy, P. Lévai, V. Topor Pop: PRC 024903 (2012), arXiv:1211.2256, Int. Mod. Phys E22 1330007 (2013)

The Spectra and $R_{pPb}(p_T)$ for $|\eta|<0.35$ & 0.3

Predictions by kTpQCD_2.0 @ 5.02 ATeV

Shadowing:

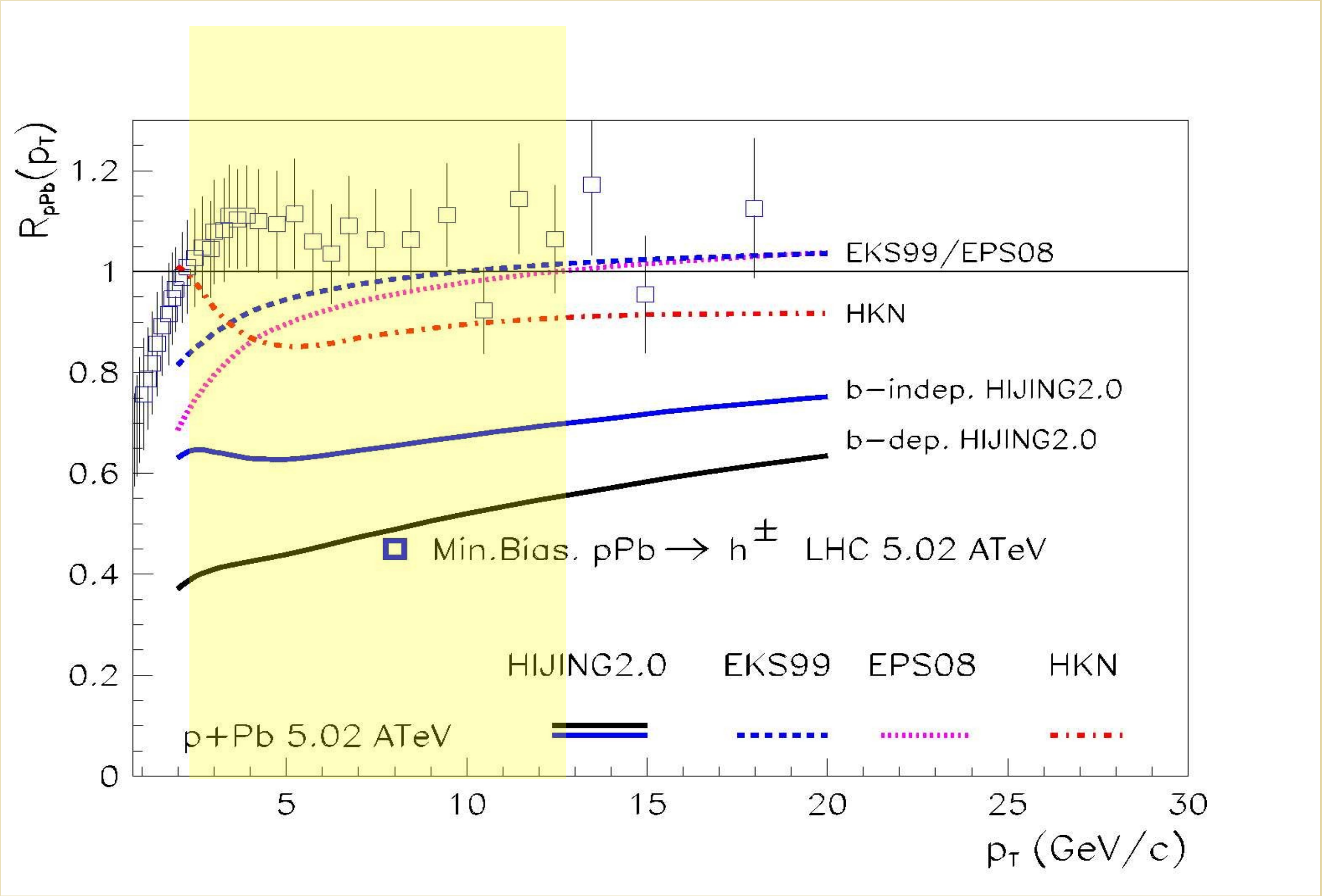
$$f_{a/A}(x,Q^2) = S_{a/A}(x,Q^2) f_{a/N}(x,Q^2)$$

b-dependent part

$$s_a(b) = s_a \frac{5}{3}\left(1 - \frac{b^2}{R_A^2}\right)$$

with

$$R_A = 1.12 A^{1/3}$$

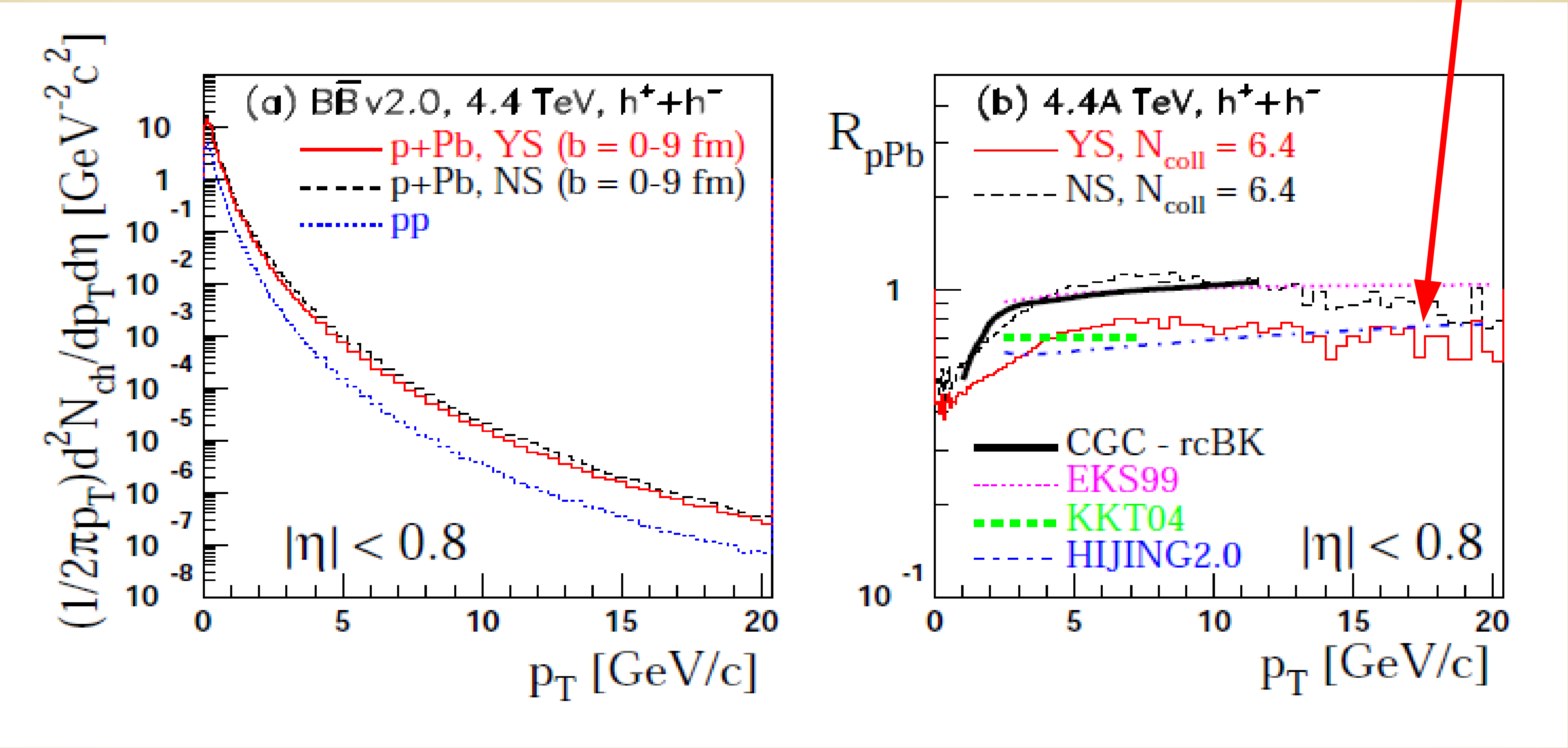


GGB, J. Barrette, M. Gyulassy, P. Lévai, V. Topor Pop: PRC 024903 (2012), arXiv:1211.2256, Int. Mod. Phys E22 1330007 (2013)

The Spectra and $R_{pPb}(p_T)$ for $|\eta|<0.8$

Charged hadron production with HIJING 2.0 @ 4.4 ATeV

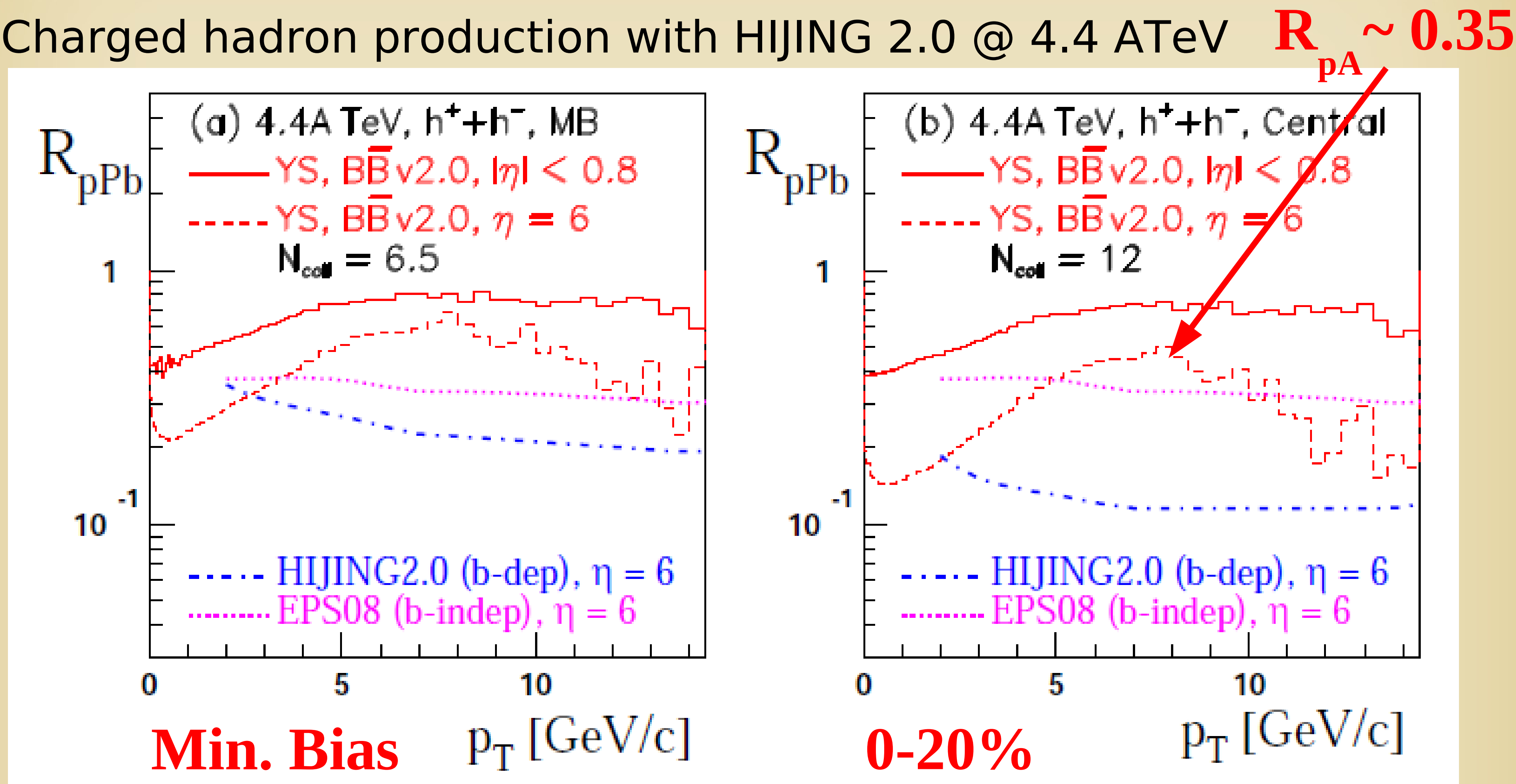
$R_{pA} \sim 0.7$



GGB, J. Barrette, M. Gyulassy, P. Lévai, V. Topor Pop PRC85 024903 (2012)

Forward $R_{pPb}(p_T)$ at $|\eta|< 0.8$ & $\eta=6.0$

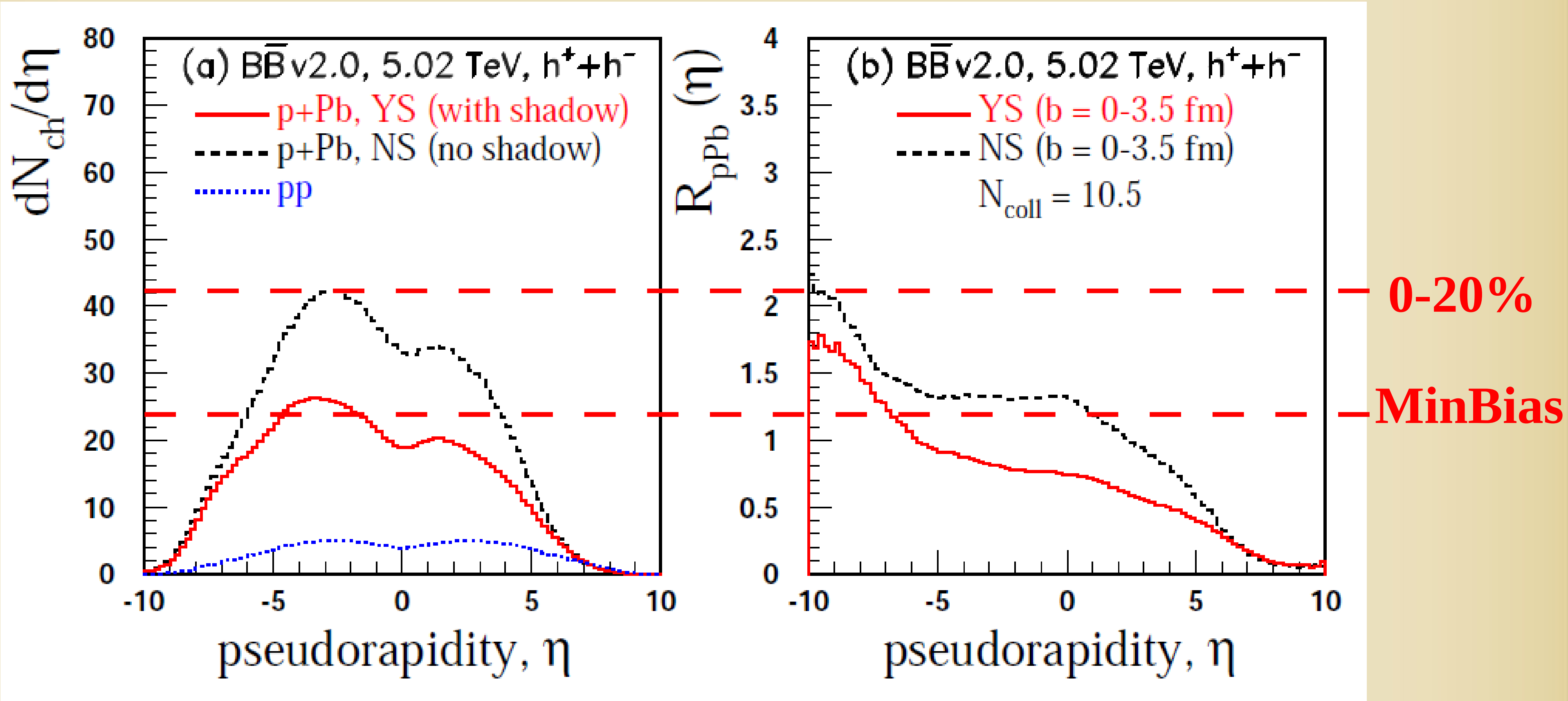
Charged hadron production with HIJING 2.0 @ 4.4 ATeV



GGB, J. Barrette, M. Gyulassy, P. Lévai, V. Topor Pop PRC85 024903 (2012)

HIJINGB/B 2.0: Rapidity distribution for pp & pPb

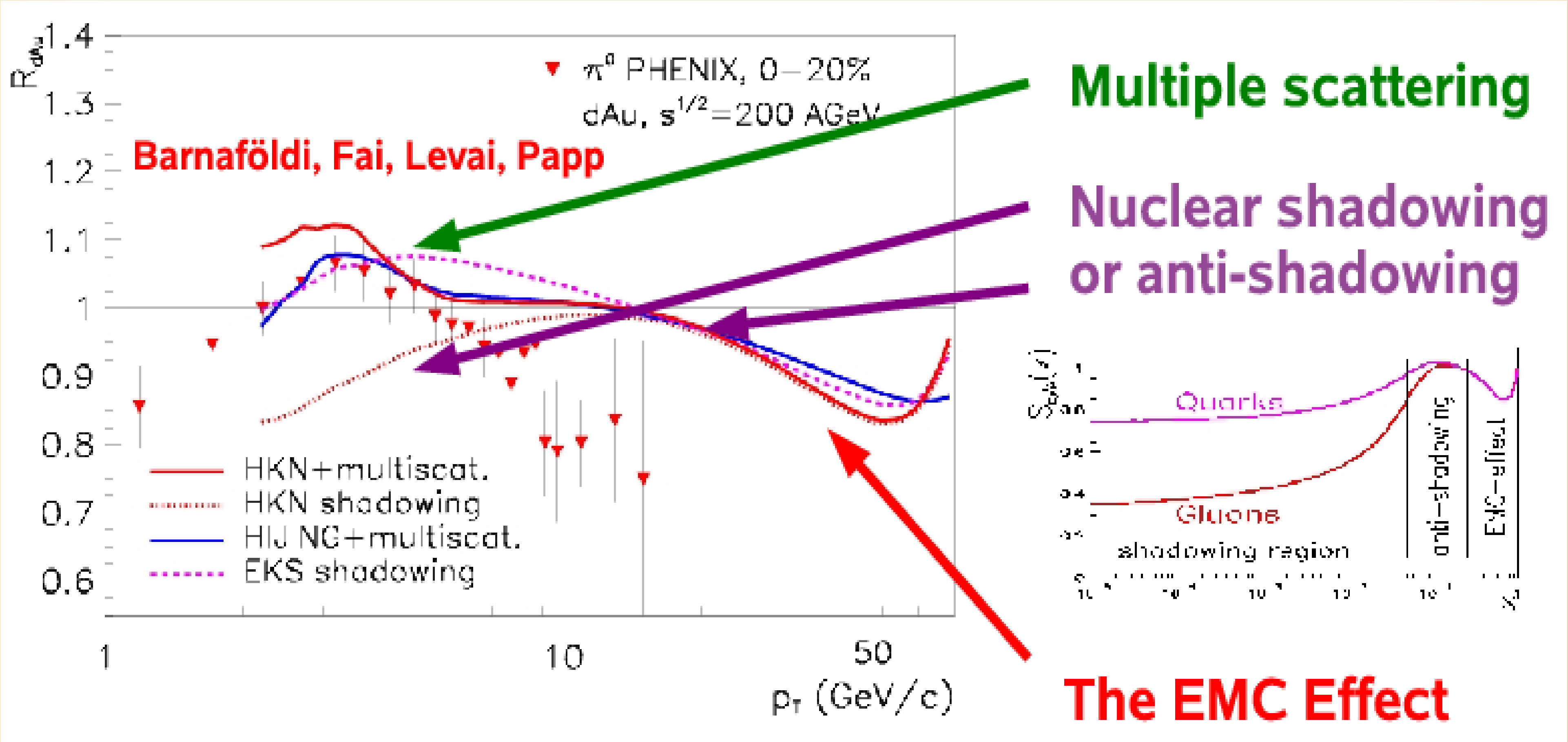
Charged hadron production with HIJING 2.0 @ 5.02 ATeV (0-20%)



GGB, J. Barret, M. Gyulassy, P. Lévai, V. Topor Pop (in preparation 2012)

Shadowing effects on $R_{dAu}(p_T)$ for $|\eta| < 0.35$

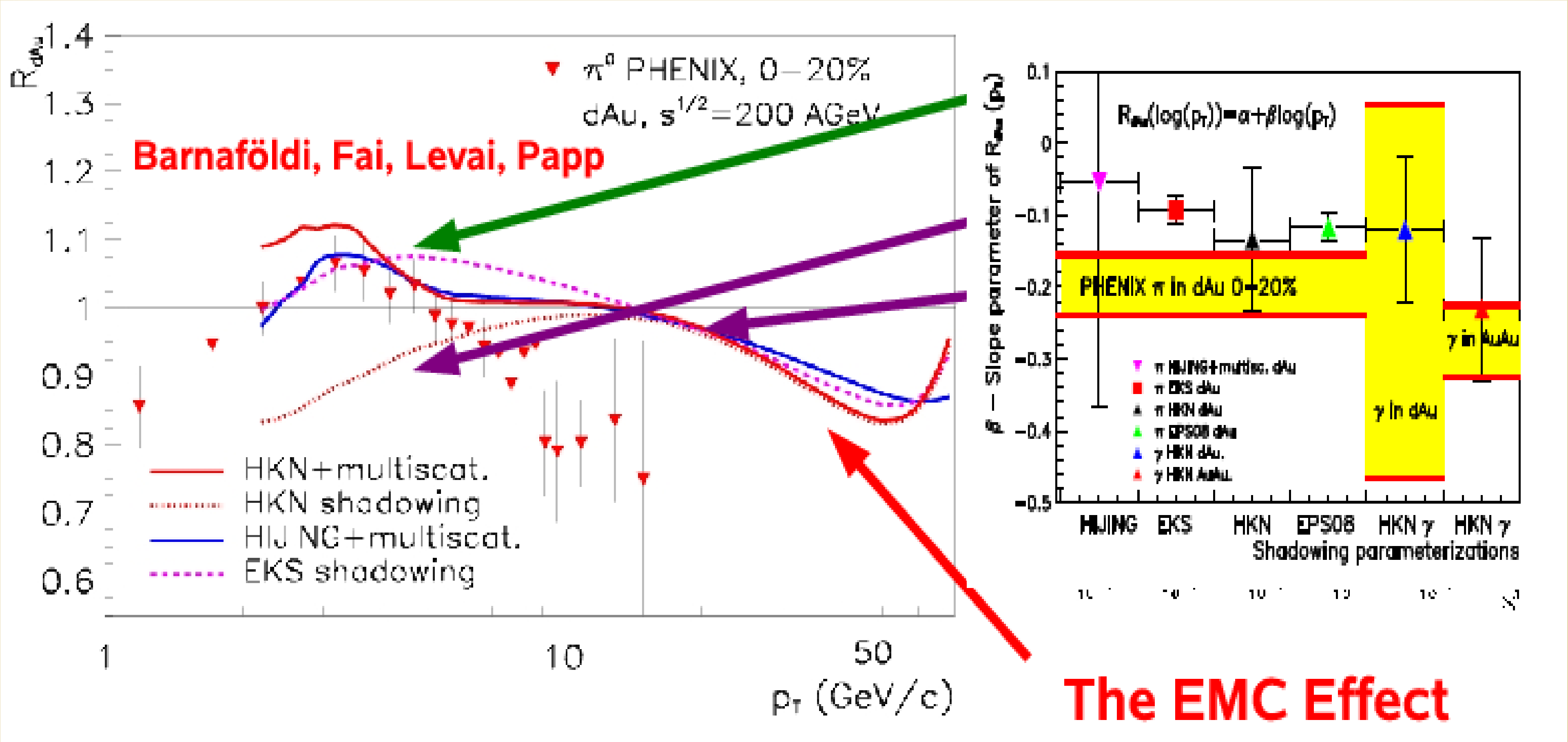
Extreme high-p_T Pion production with kTpQCD @ 200 AGeV



BA Cole, GGB, G. Fai, P. Lévai, G. Papp, arXiv:08073384 (2007)

Shadowing effects on $R_{dAu}(p_T)$ for $|\eta| < 0.35$

Slopes & values are OK with new dAu 0-20% data @ 200 AGeV



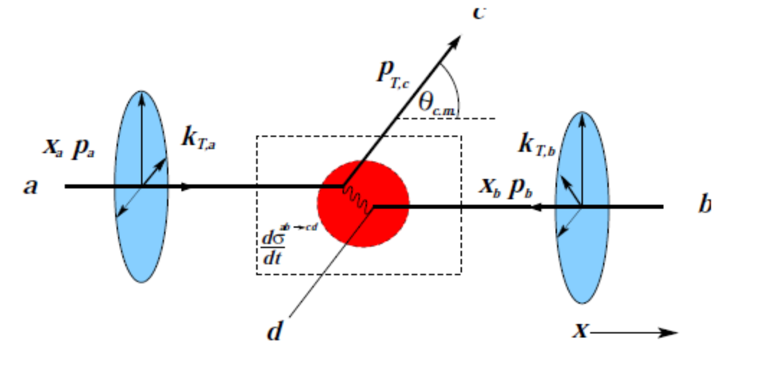
BA Cole, GGB, G. Fai, P. Lévai, G. Papp, arXiv:08073384 (2007)

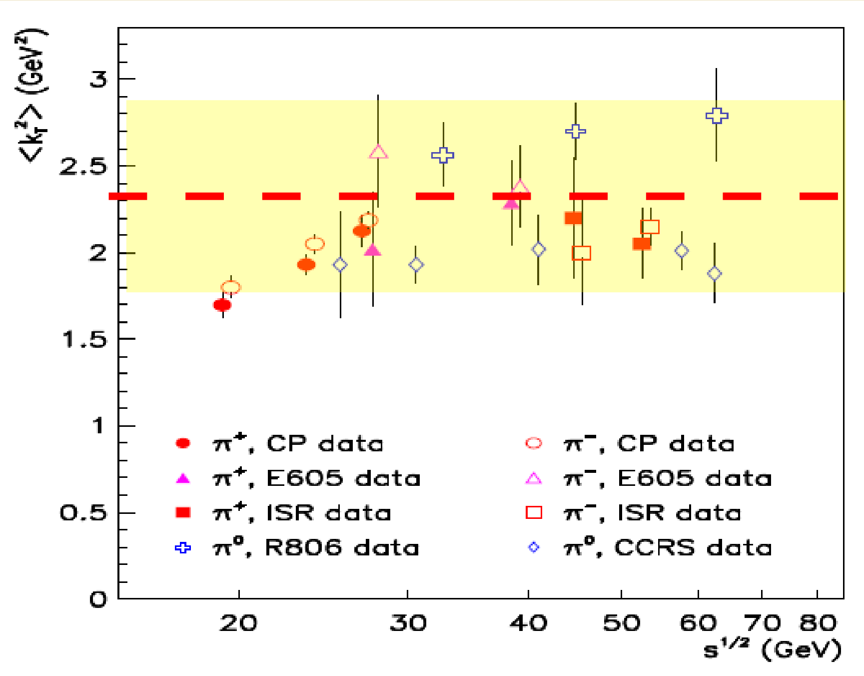
on the Multiple Scattering

aka the enhacement

Multiple Scattering in kTpQCD_v2.0

Intrinsic k_T from theory & pp experiments





k_T-broadening:

$$f_{a/p}(x_a, \mathrm{k}_{Ta}, Q^2) \;=\; f_{a/p}(x_a, Q^2)\cdot g_{a/p}(\mathrm{k}_{Ta})$$

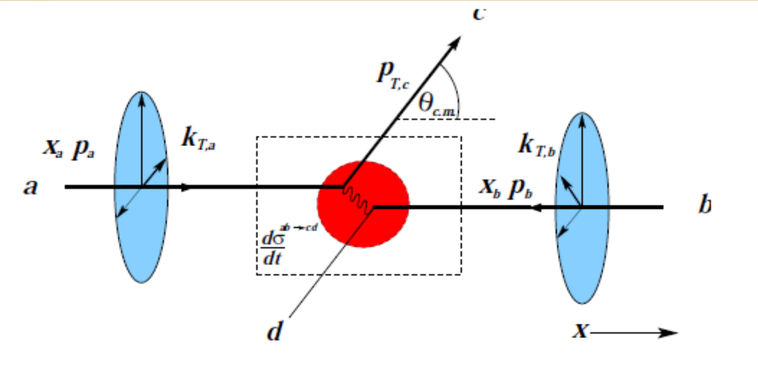
$$g_{a/n}(\mathrm{k}_T) \;:=\; \frac{1}{\pi\langle k_T^2\rangle} e^{-\mathrm{k}_T^2/\langle k_T^2\rangle}$$

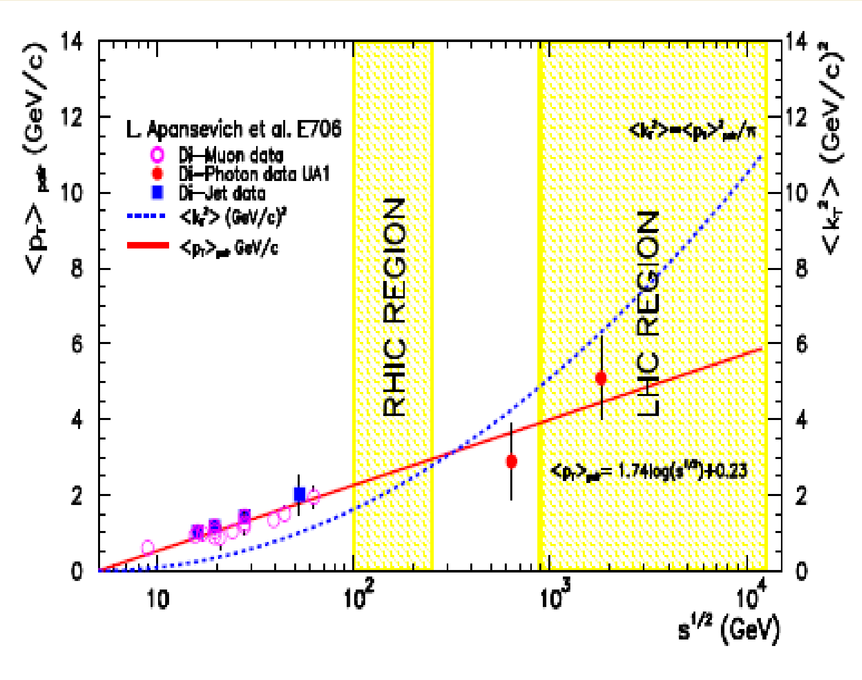
$$\langle k_T^2\rangle_{pp} = \langle p_T\rangle_{pair}^2/\pi$$

Y. Zhang, GGB, G. Fai, P. Lévai, G. Papp, PRC65 034903 (2002)

Multiple Scattering in kTpQCD_v2.0

Intrinsic k_T from theory & pp experiments





k_T-broadening:

$$f_{a/p}(x_a, \mathrm{k}_{Ta}, Q^2) \ = \ f_{a/p}(x_a, Q^2) \cdot g_{a/p}(\mathrm{k}_{Ta})$$

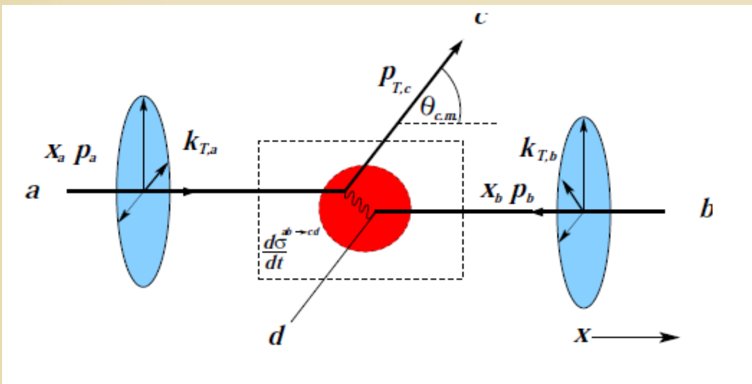
$$g_{a/n}(\mathrm{k}_T) \ := \frac{1}{\pi \langle k_T^2 \rangle} e^{-\mathrm{k}_T^2/\langle k_T^2 \rangle}$$

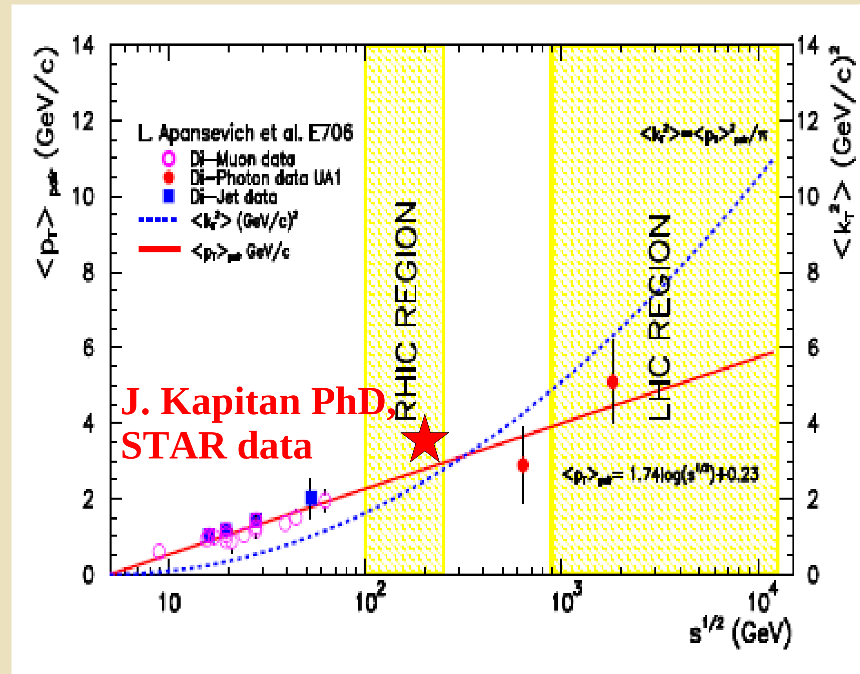
$$\langle k_T^2 \rangle_{pp} = \langle p_T \rangle^2_{pair}/\pi$$

BA Cole, GGB, G. Fai, P. Lévai, G. Papp, arXiv:08073384 (2007)

Multiple Scattering in kTpQCD_v2.0

Intrinsic k_T from theory & pp experiments





k_T-broadening:

$$f_{a/p}(x_a, \mathrm{k}_{Ta}, Q^2) \;=\; f_{a/p}(x_a, Q^2)\cdot g_{a/p}(\mathrm{k}_{Ta})$$

$$g_{a/n}(\mathrm{k}_T) \;:=\; \frac{1}{\pi\langle k_T^2\rangle} e^{-\mathrm{k}_T^2/\langle k_T^2\rangle}$$

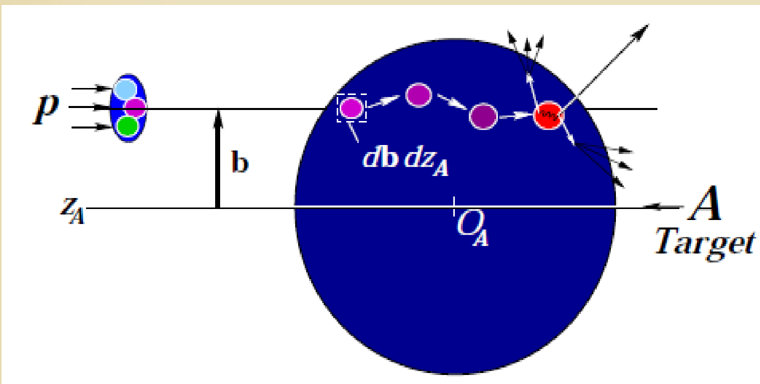
$$\langle k_T^2\rangle_{pp} = \langle p_T\rangle^2_{pair}/\pi$$

BA Cole, GGB, G. Fai, P. Lévai, G. Papp, arXiv:08073384 (2007)

J. Kapitan, PhD Thesis, 2011

Multiple Scattering in kTpQCD_v2.0

Glauber model



$$\int_0^{\mathbf{b}_{max}} t_A(\mathbf{b})\,\mathrm{d}^2\mathbf{b} \;=\; \int_0^{\mathbf{b}_{max}} \mathrm{d}^2\mathbf{b} \int \mathrm{d}z\,\rho(\mathbf{b},z) \;=\; A$$

with nuclear density:

$$\rho(r) \;=\; \frac{\rho_0}{1+\mathrm{e}^{\frac{r-r_0}{c}}}$$

There must be 1 hard and, further semi-hard collisions (number of NN collisions):

$$\nu_A(b) = \sigma_{NN}^{in} \cdot t_A(b)$$

NN-like collisions followed by enhancement of intrinsic k_T

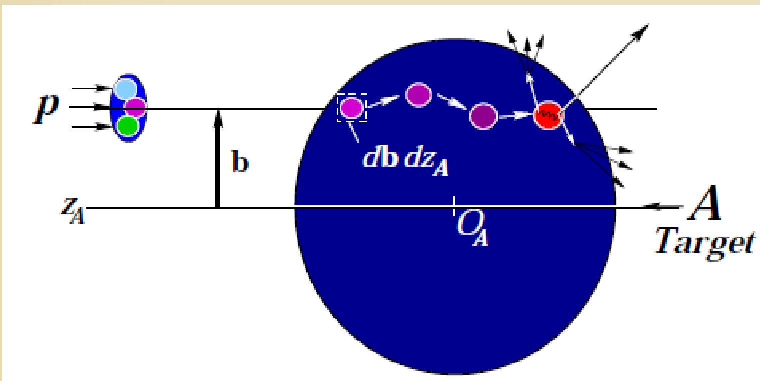
PA: Gaussian broadening

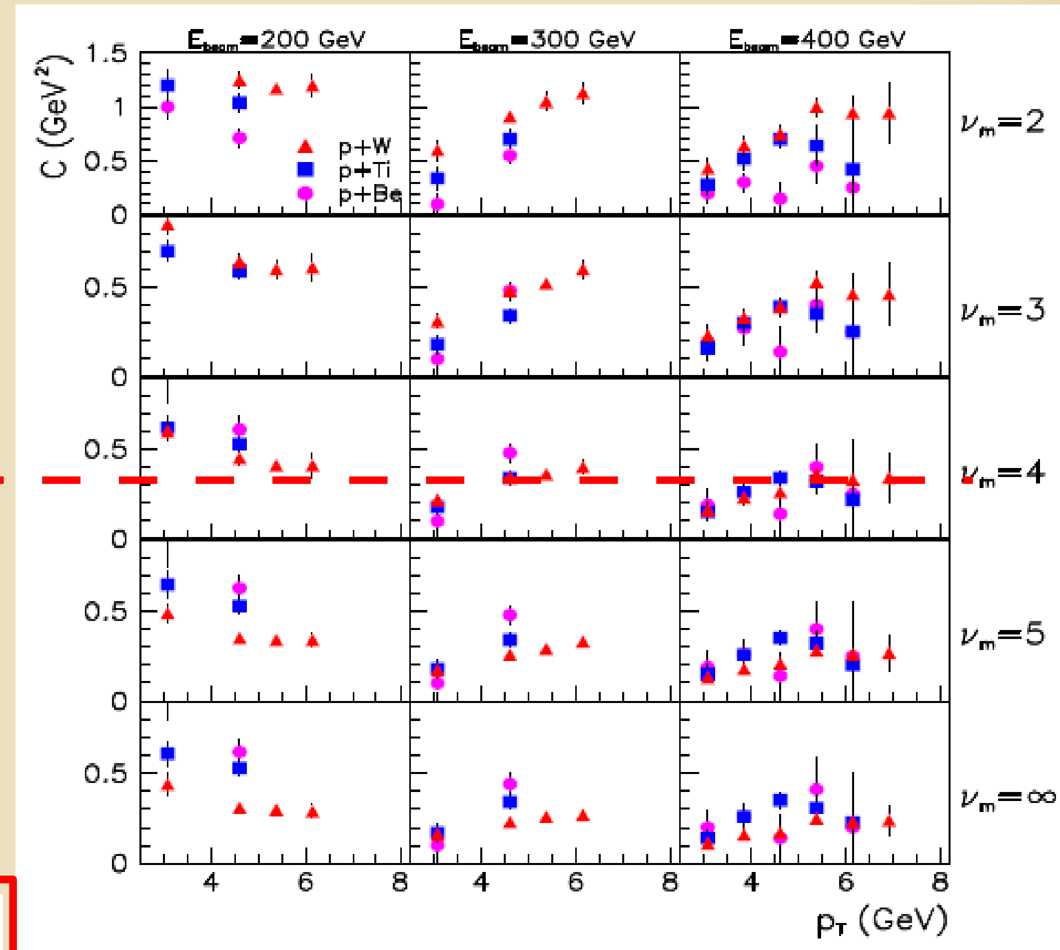
$$g_{a/p}\left(\mathrm{k}_{T,a}, b\right) := \frac{1}{\pi \left\langle k^2_{Ta}(b)\right\rangle_{pA}}\, \mathrm{e}^{-\frac{\mathbf{k}^2_{T,a}}{\left\langle k^2_{T,a}(b)\right\rangle_{pA}}}$$

BA Cole, GGB, G. Fai, P. Lévai, G. Papp, arXiv:08073384 (2007)

Multiple Scattering in kTpQCD_v2.0

Phenomenological determination of the broadening





k_T-broadening:

$$g_{a/p}(\mathbf{k}_{T,a}, b) := \frac{1}{\pi \langle k^2_{Ta}(b)\rangle_{pA}} \, e^{-\frac{\mathbf{k}^2_{T,a}}{\langle k^2_{T,a}(b)\rangle_{pA}}}$$

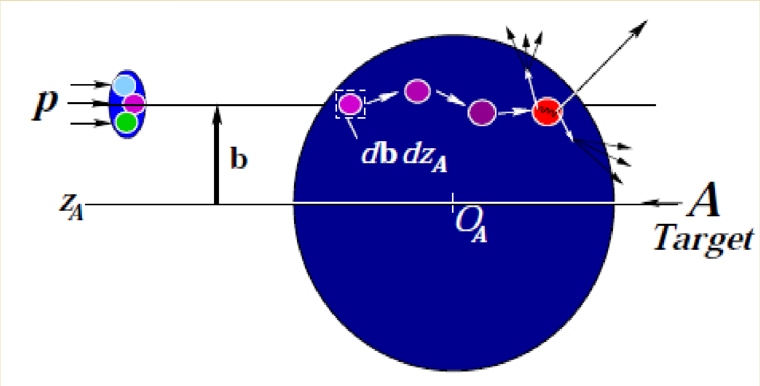
$$\langle k_T^2(b)\rangle_{pA} := \langle k_T^2\rangle_{pp} + C^{sat}_{pA} \cdot h^{sat}_{pA}(b)$$

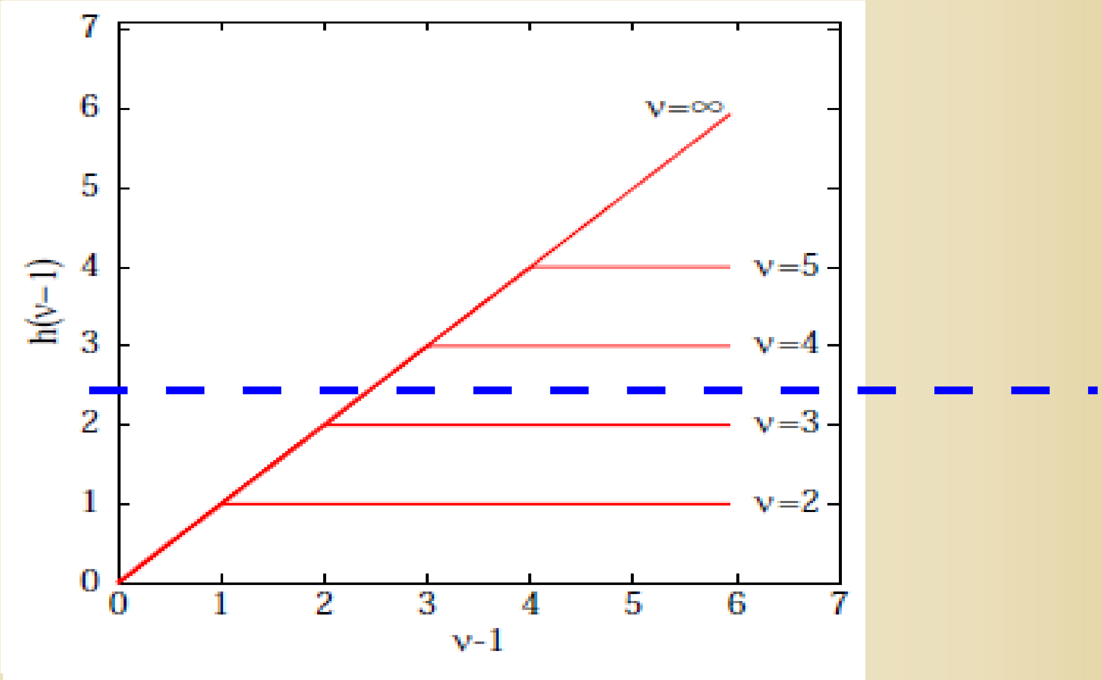
$$C^{sat}_{pA} \approx 0.35 \pm 0,05 \ \mathrm{GeV}^2 \qquad \nu_{max} = 3 - 4$$

BA Cole, GGB, G. Fai, P. Lévai, G. Papp, arXiv:08073384 (2007)

Multiple Scattering in kTpQCD_v2.0

Intrinsic k_T from theory & pA experiment





k_T-broadening:

$$g_{a/p}(\mathbf{k}_{T,a}, b) := \frac{1}{\pi \langle k^2_{Ta}(b)\rangle_{pA}} \, e^{-\frac{\mathbf{k}^2_{T,a}}{\langle k^2_{T,a}(b)\rangle_{pA}}}$$

$$\langle k_T^2(b)\rangle_{pA} := \langle k_T^2\rangle_{pp} + C^{sat}_{pA} \cdot h^{sat}_{pA}(b)$$

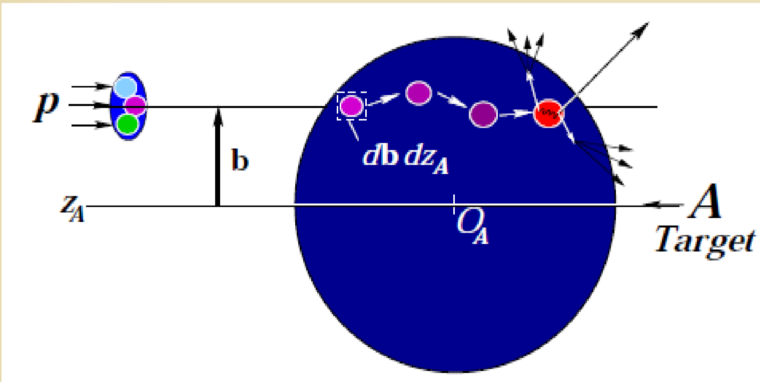
Staurated Glauber model:

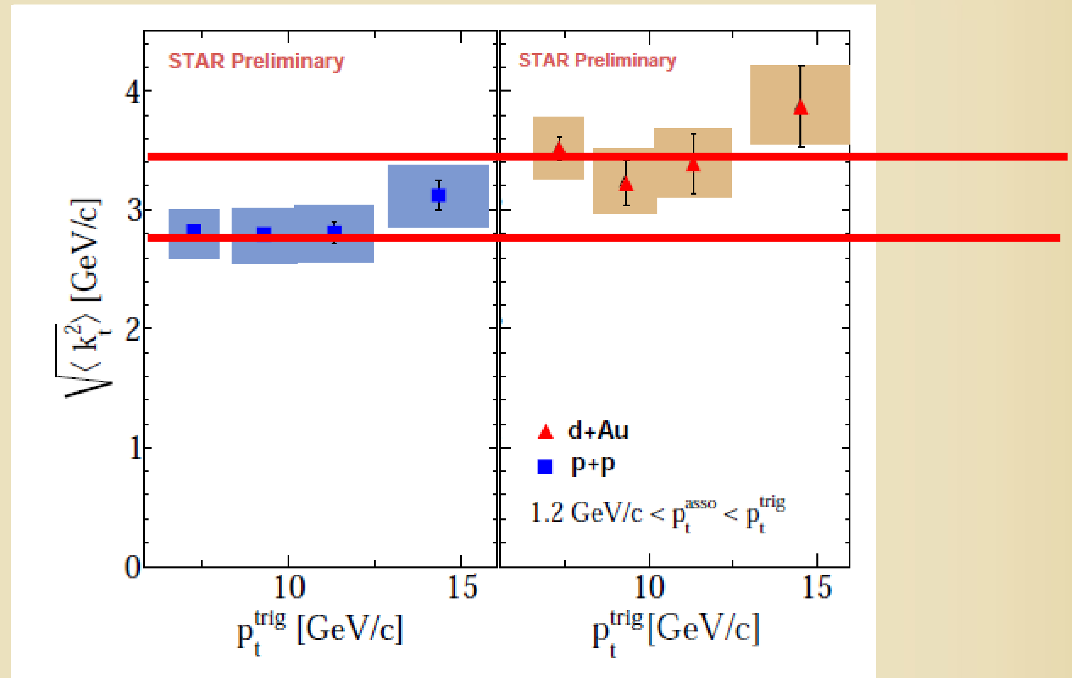
$$h^{sat}_{pA}(b) = \begin{cases} 0 & \text{ha} \quad \nu_A(b) < 1 \\ \nu_A(b) - 1 & \text{ha} \quad 1 \le \nu_A(b) < 4 \\ 3 & \text{ha} \quad \nu_A(b) \ge 4 \end{cases}$$

BA Cole, GGB, G. Fai, P. Lévai, G. Papp, arXiv:08073384 (2007)

Multiple Scattering in kTpQCD_v2.0

Intrinsic k_T from theory & pp/dAu experiments





k_T-broadening:

$$g_{a/p}(\mathbf{k}_{T,a}, b) := \frac{1}{\pi \langle k^2_{Ta}(b)\rangle_{pA}} \, \mathrm{e}^{-\frac{\mathbf{k}^2_{T,a}}{\langle k^2_{T,a}(b)\rangle_{pA}}}$$

$$\langle k_T^2(b)\rangle_{pA} := \langle k_T^2\rangle_{pp} + C^{sat}_{pA} \cdot h^{sat}_{pA}(b)$$

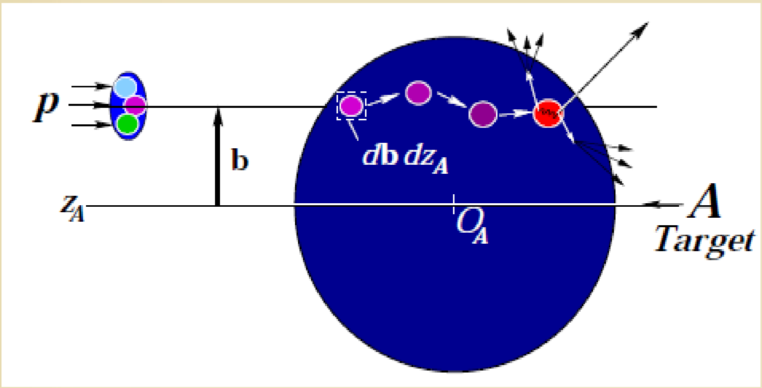
$$\langle k_T^2\rangle_{pp} = \langle p_T\rangle^2_{pair}/\pi$$

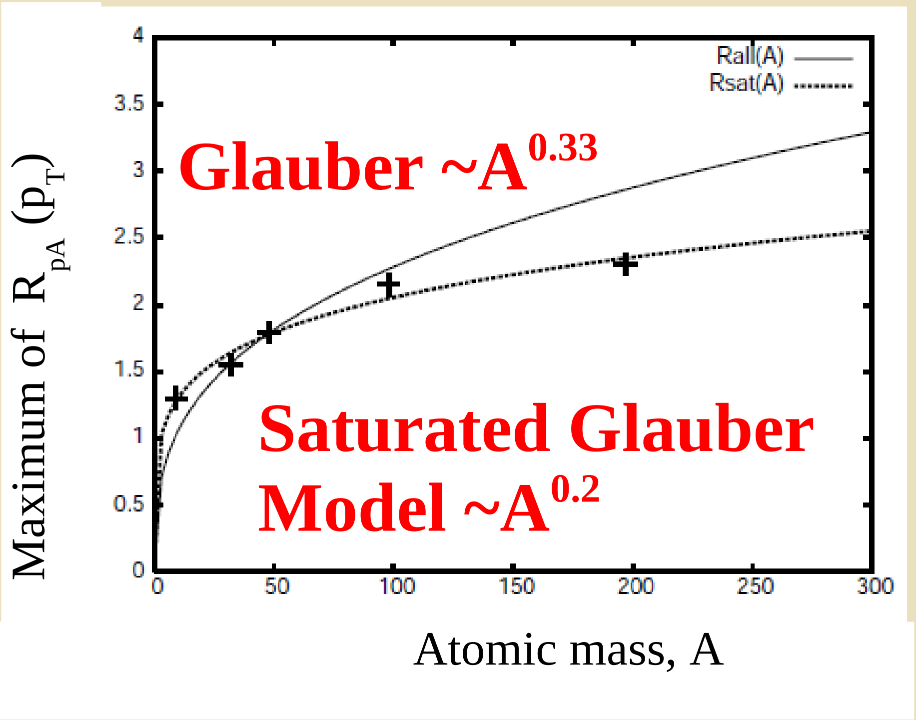
- p+p collisions: $\sigma_{kT,raw} = 2.80 \pm 0.05(\mathrm{stat.})^{+0.17}_{-0.29}(\mathrm{syst.})\ \mathrm{GeV}/c$
- 0-20% d+Au col.: $\sigma_{kT,raw} = 3.00 \pm 0.07(\mathrm{stat.})^{+0.18}_{-0.15}(\mathrm{syst.})\ \mathrm{GeV}/c$

BA Cole, GGB, G. Fai, P. Lévai, G. Papp, arXiv:08073384 (2007)

Multiple Scattering in kTpQCD_v2.0

A proposed effect of saturated Cronin effect on NMF





NMF as we know:

$$R^h_{pA}(p_T) := \frac{1}{\langle N_{bin}\rangle_A} \cdot \frac{\mathrm{d}^3\sigma^h_{pA}/\,\mathrm{d}^3p_T}{\mathrm{d}^3\sigma^h_{pp}/\,\mathrm{d}^3p_T}$$

As it was in the beginning, for MB (see e.g. W. Busza's talk)

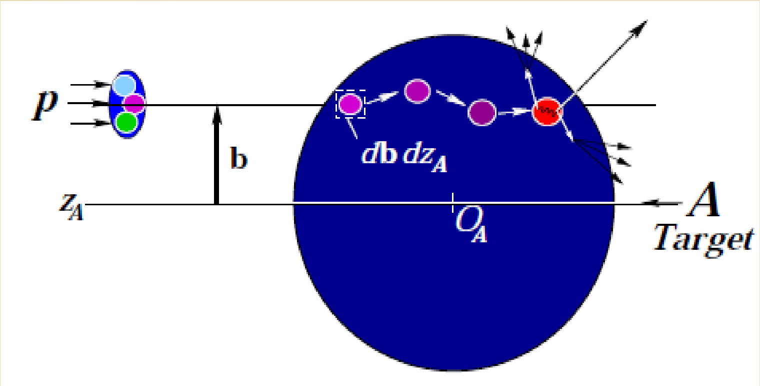
$$\frac{\mathrm{d}^3\sigma^h_{pA}/\,\mathrm{d}^3p_T}{\mathrm{d}^3\sigma^h_{pp}/\,\mathrm{d}^3p_T} \sim A^{\alpha(p_T)} \longrightarrow R^h_{pA} \sim A^{\alpha(p_T)-1}$$

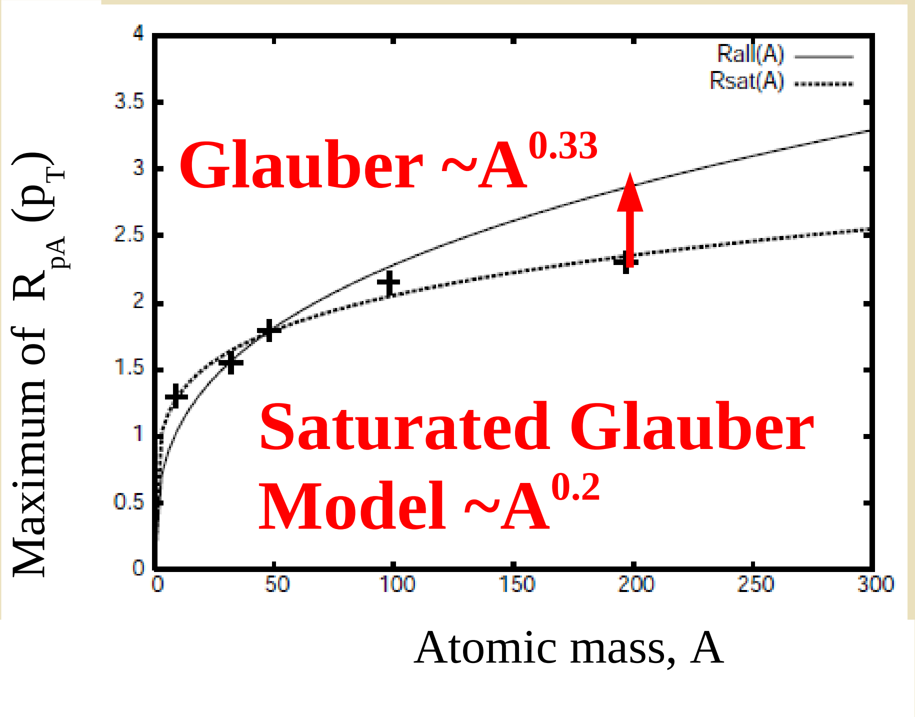
G. Fai, P. Lévai, G. Papp, PRC61 (2000) 021902,

GGB PhD Thesis, 2006

Multiple Scattering in kTpQCD_v2.0

A proposed effect of saturated Cronin effect on NMF





NMF as we know:

$$R^h_{pA}(p_T) := \frac{1}{\langle N_{bin}\rangle_A} \cdot \frac{\mathrm{d}^3\sigma^h_{pA}/\,\mathrm{d}^3p_T}{\mathrm{d}^3\sigma^h_{pp}/\,\mathrm{d}^3p_T}$$

As it was in the beginning, for MB (see e.g. W. Busza's talk)

$$\frac{\mathrm{d}^3\sigma^h_{pA}/\,\mathrm{d}^3p_T}{\mathrm{d}^3\sigma^h_{pp}/\,\mathrm{d}^3p_T} \sim A^{\alpha(p_T)} \longrightarrow R^h_{pA} \sim A^{\alpha(p_T)-1}$$

20% effect for large A

G. Fai, P. Lévai, G. Papp, PRC61 (2000) 021902,

GGB PhD Thesis, 2006

Suggestion for take away...

It is high time to understand the Cronin effect!

- High precision experimental data are available!
  - Handle with care
  - Make consistent physical picture (10 AGeV to 10 ATeV)
  - We have tools to test it (energy, geometry, etc.)
  - Universal description requires solid baseline :-)
  - Suggest a pA study experiment....

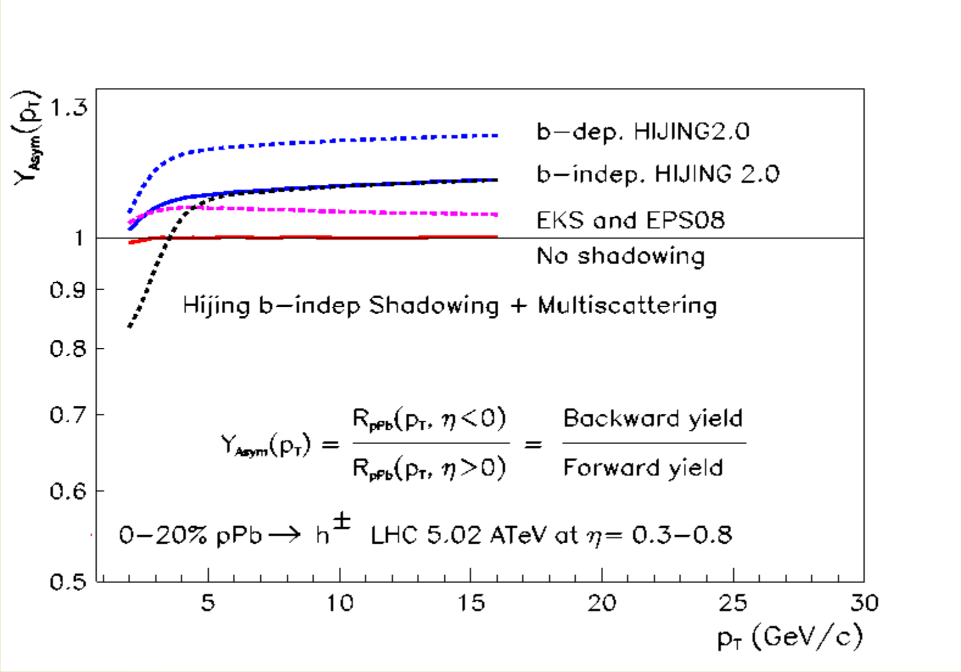
- Can we test the Saturated Glauber picture?
  - Test of geometry and scalings.
  - Large rapidities (forward & backward)
  - Correlations

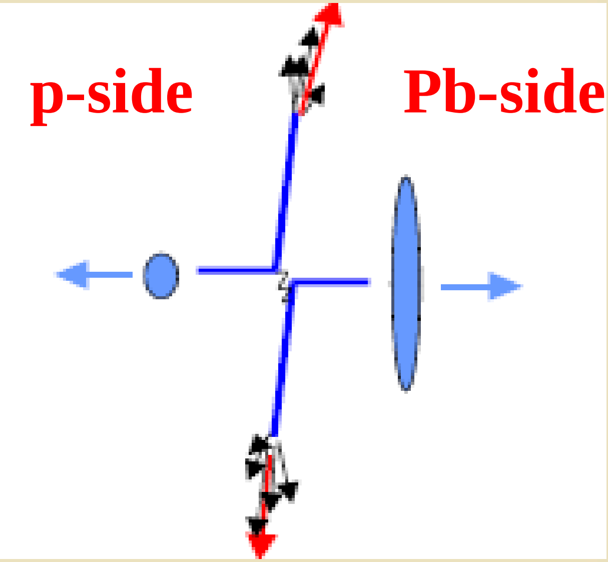
BACKUP

Rapidity asymmetry for *pBe* at FNAL

Pion production with kTpQCD for pPb@ 5.02 ATeV |η| [0.3:0.8]

$$Y^h_{Asym}(p_T) = E_h \frac{d^3\sigma^h_{AB}}{d^3 p_T}\bigg|_{\eta<0} \bigg/ E_h \frac{d^3\sigma^h_{AB}}{d^3 p_T}\bigg|_{\eta>0}$$



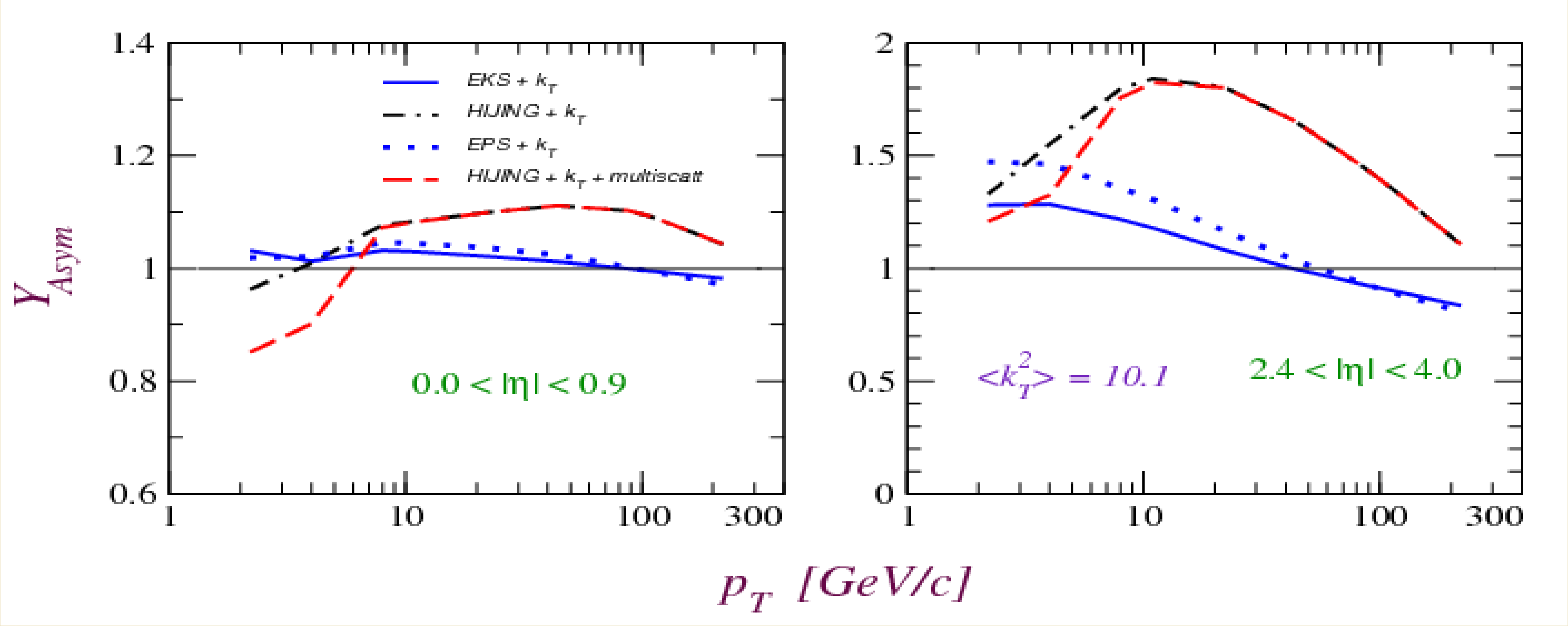


GGB, J. Barret, M. Gyulassy, P. Lévai, V. Topor Pop (in preparation 2012)

Rapidity asymmetry for *dPb* at LHC

Pion production with kTpQCD @ 8.8 ATeV

$$Y^h_{Asym}(p_T) = E_h \frac{\mathrm{d}^3\sigma^h_{AB}}{\mathrm{d}^3 p_T}\Big|_{\eta<0} \Big/ E_h \frac{\mathrm{d}^3\sigma^h_{AB}}{\mathrm{d}^3 p_T}\Big|_{\eta>0}$$



A. Adeluy, GGB, G. Fai, P. Lévai, PRC80 (2009) 014903

Rapidity asymmetry for *dAu* at RHIC

Pion production with kTpQCD @ 200 AGeV

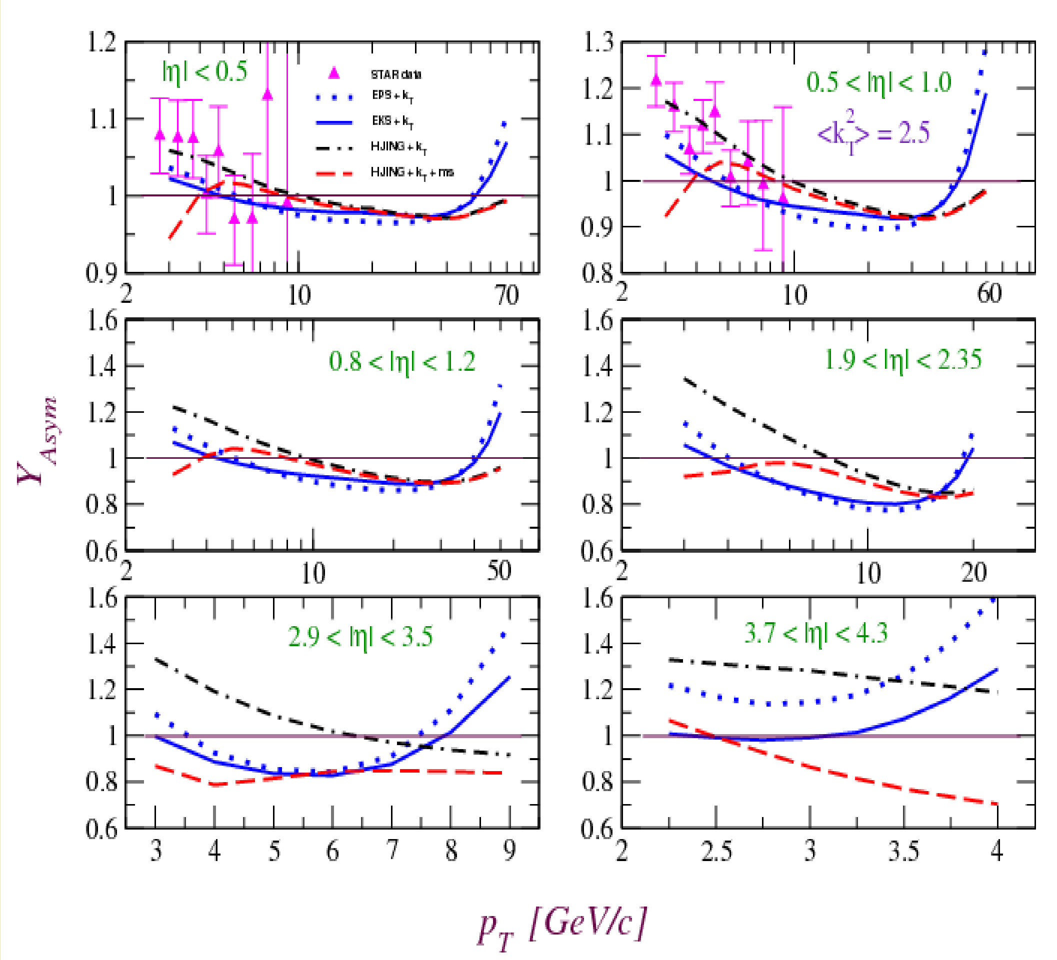
Rapidity asymmatry

$$Y^h_{Asym}(p_T) = E_h \frac{d^3\sigma^h_{AB}}{d^3 p_T}\Big|_{\eta<0} \Big/ E_h \frac{d^3\sigma^h_{AB}}{d^3 p_T}\Big|_{\eta>0}$$

Relation to NMF

$$Y^h_{Asym}(p_T) = R^h_\eta(p_T) = \frac{R^h_{dAu}(p_T, \eta < 0)}{R^h_{dAu}(p_T, \eta > 0)}$$

X-scaling is OK,
Multiscattering changes *Y(η)*

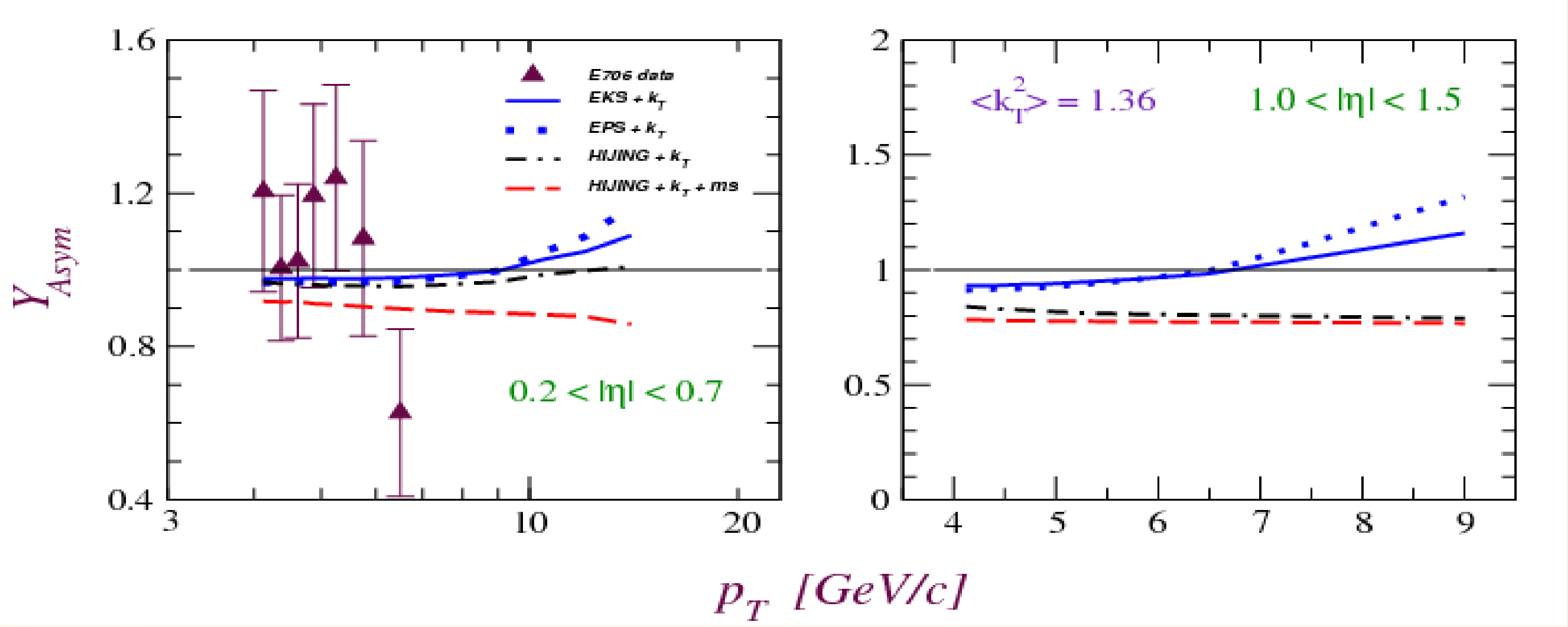


A. Adeluy, GGB, G. Fai, P. Lévai, PRC80 (2009) 014903

Rapidity asymmetry for *pBe* at FNAL

Pion production with kTpQCD @ 30.7 GeV

$$Y^h_{Asym}(p_T) = E_h \frac{d^3\sigma^h_{AB}}{d^3p_T}\bigg|_{\eta<0} \bigg/ E_h \frac{d^3\sigma^h_{AB}}{d^3p_T}\bigg|_{\eta>0}$$



A. Adeluy, GGB, G. Fai, P. Lévai, PRC80 (2009) 014903

Midrapidity $R_{dA}(x_T)$ for $|\eta|< 0.35$

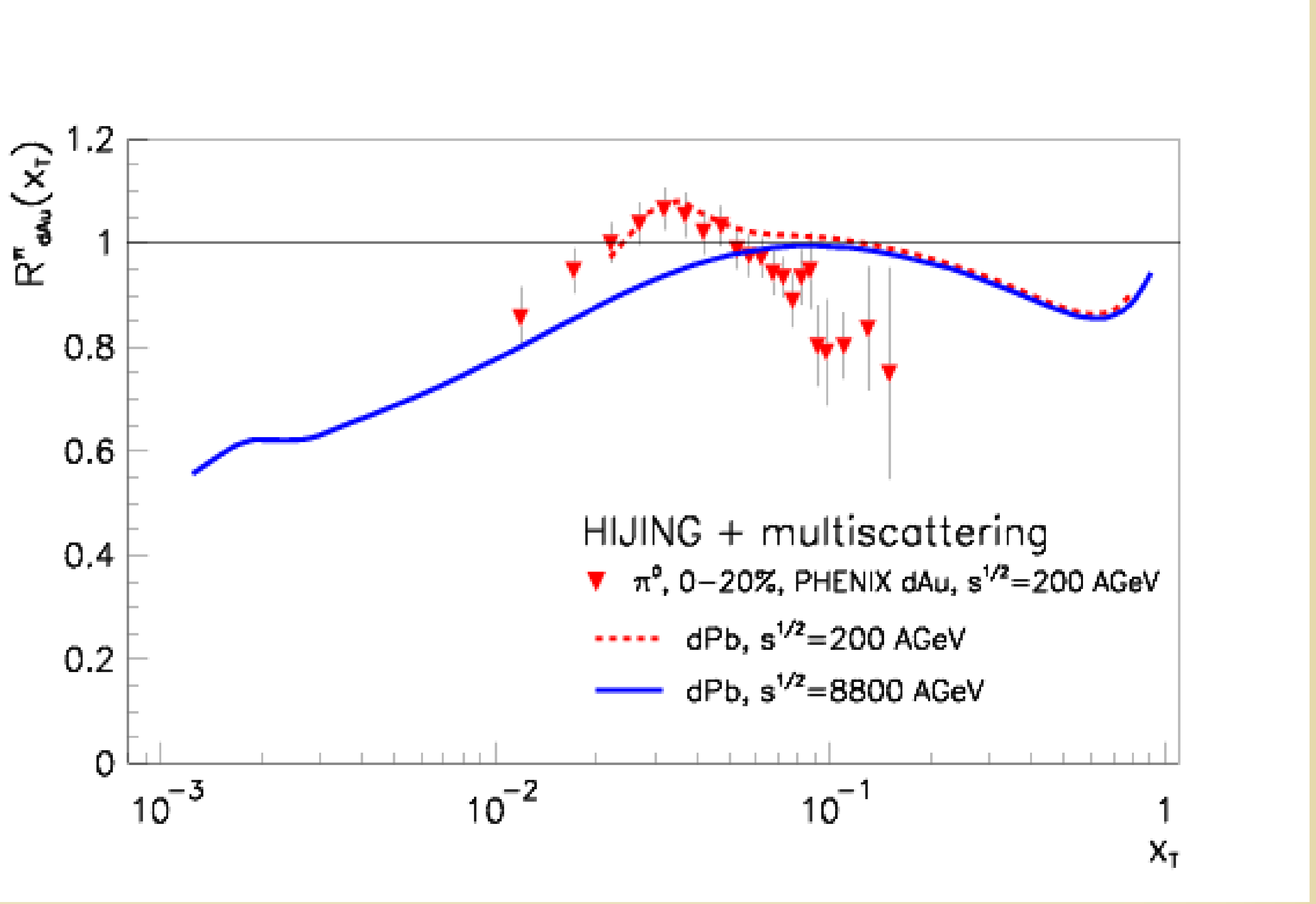
Pion production with HIJING shadowing kTpQCD @ 0.2 & 8.8 ATeV

HIJING Shadowing

x-scaling

DGLAP evolution

Need for additional multiple scattering



GGB, G. Fai, P. Lévai, BA Cole, G. Papp, Indian J.Phys. 84 (2010) 1721-1725

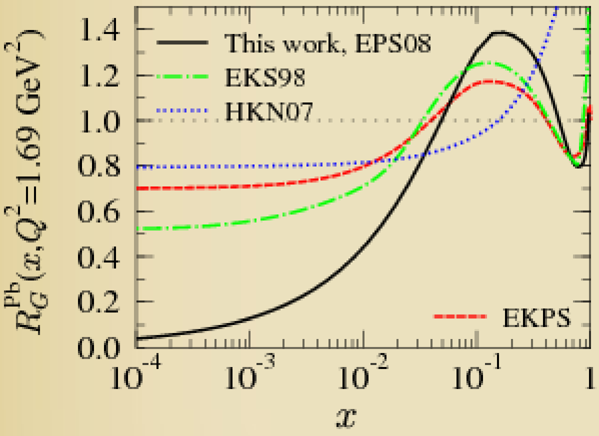
Midrapidity $R_{dA}(x_T)$ for $|\eta|< 0.35$

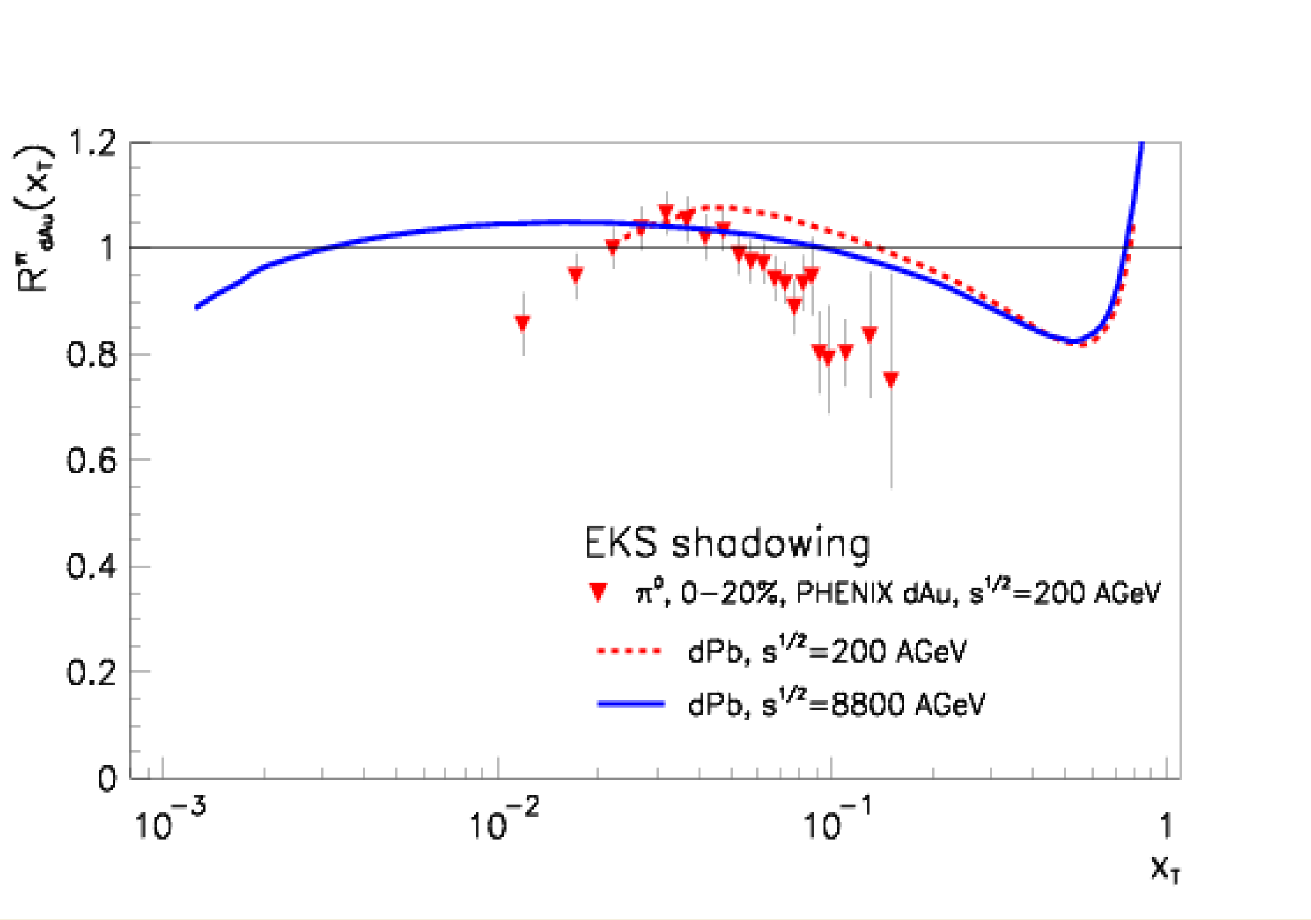
Pion production with EKS shadowing kTpQCD @ 0.2 & 8.8 ATeV

EKS Shadowing

x-scaling

DGLAP evolution





GGB, G. Fai, P. Lévai, BA Cole, G. Papp, Indian J.Phys. 84 (2010) 1721-1725

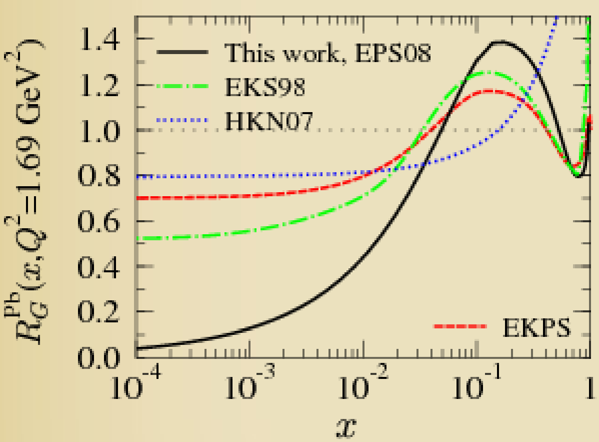
Midrapidity $R_{dA}(x_T)$ for $|\eta|< 0.35$

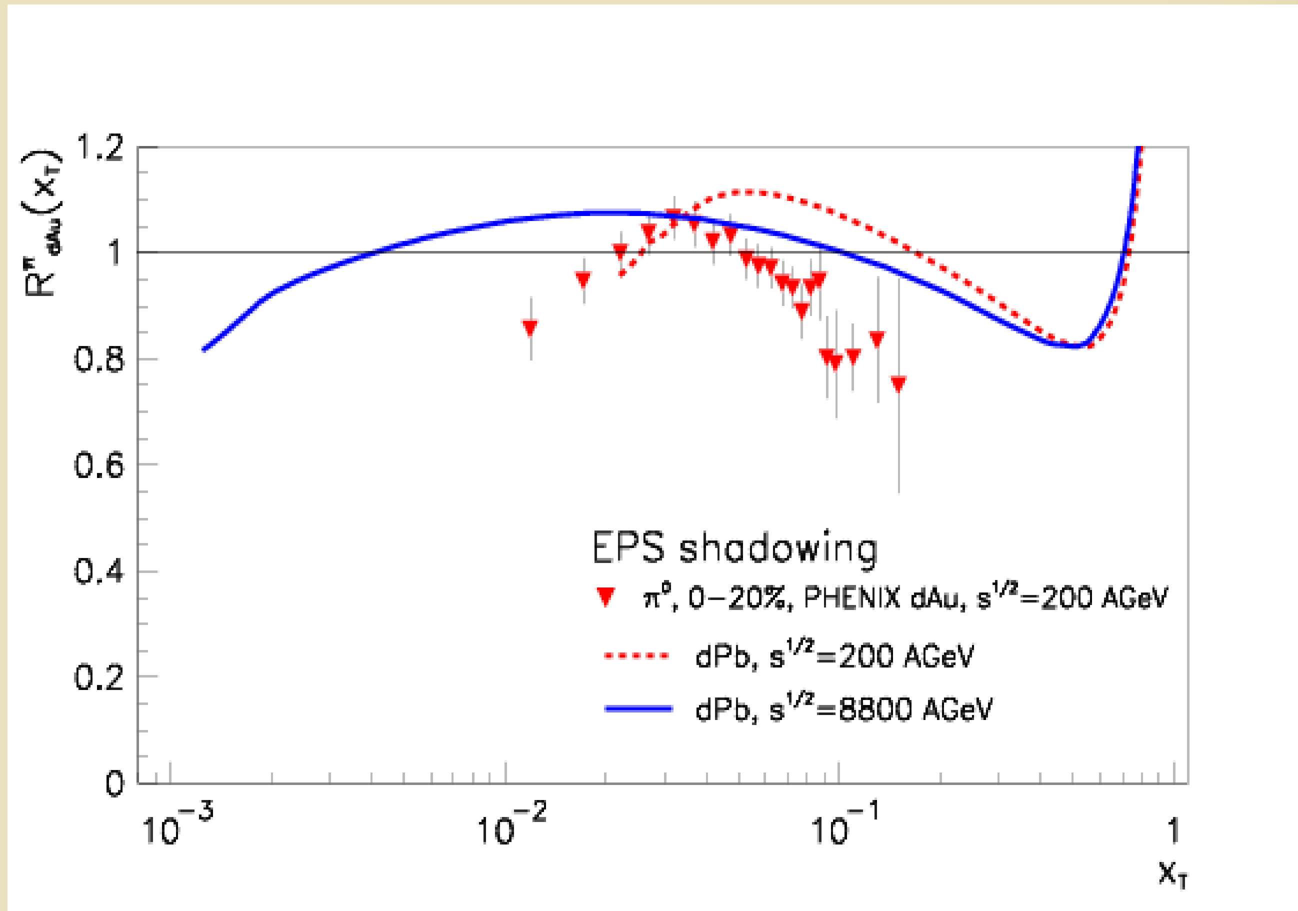
Pion production with EPS shadowing kTpQCD @ 0.2 & 8.8 ATeV

EPS Shadowing

x-scaling

DGLAP evolution





GGB, G. Fai, P. Lévai, BA Cole, G. Papp, Indian J.Phys. 84 (2010) 1721-1725

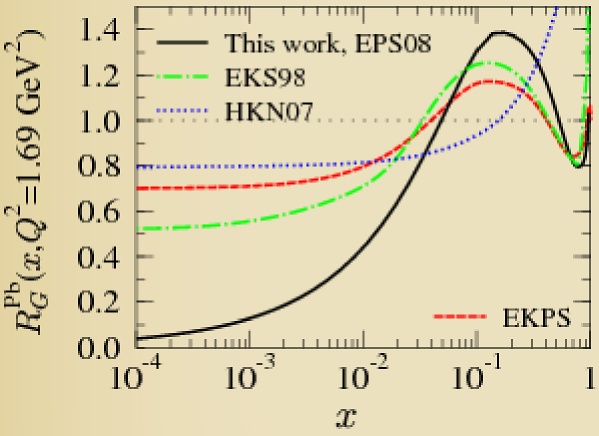
Midrapidity $R_{dA}(x_T)$ for $|\eta|< 0.35$

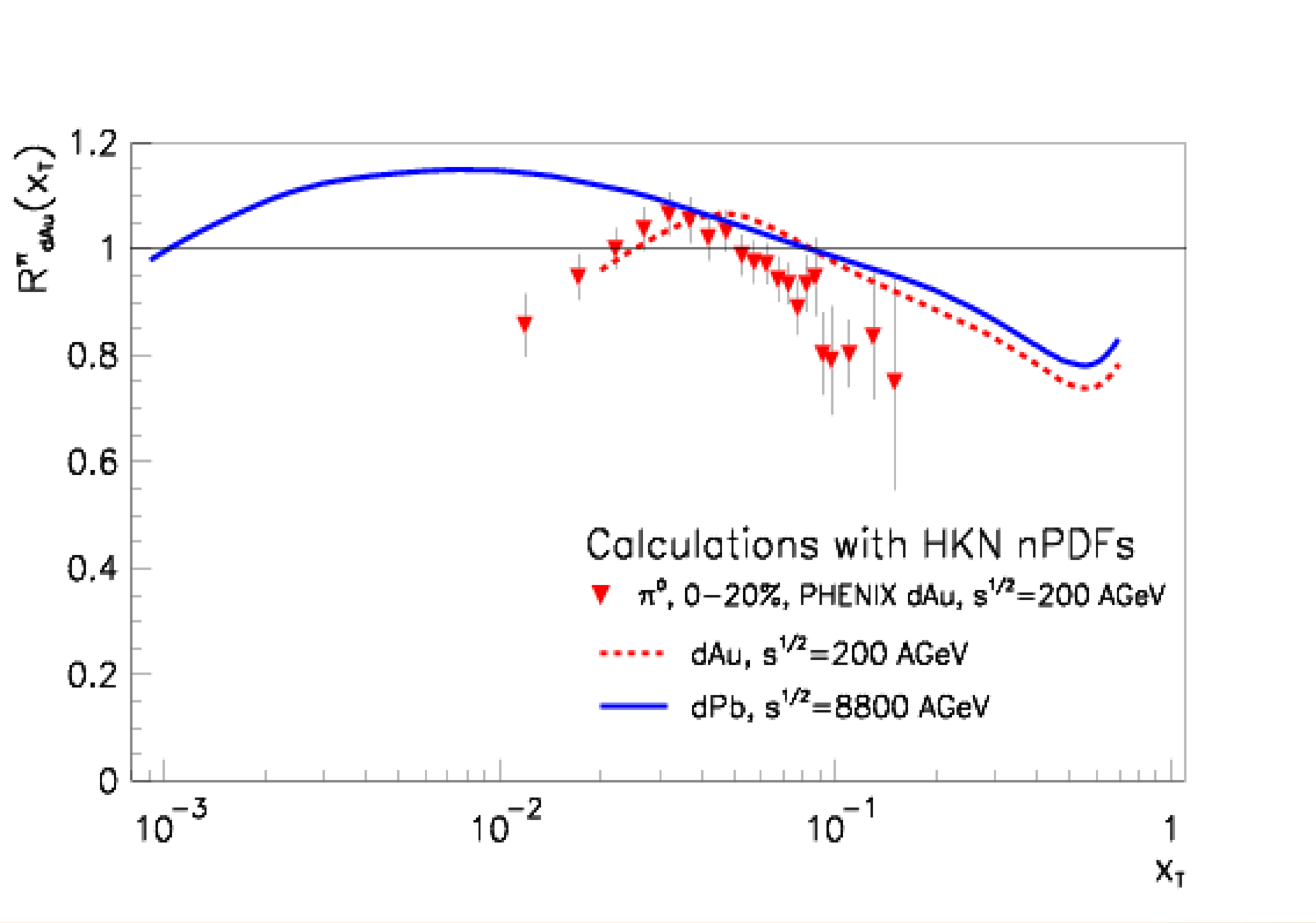
Pion production with HKN shadowing kTpQCD @ 0.2 & 8.8 ATeV

HKN Shadowing

x-scaling

DGLAP evolution





BA Cole, GGB, G. Fai, P. Lévai, G. Papp, arXiv:08073384 (2007)

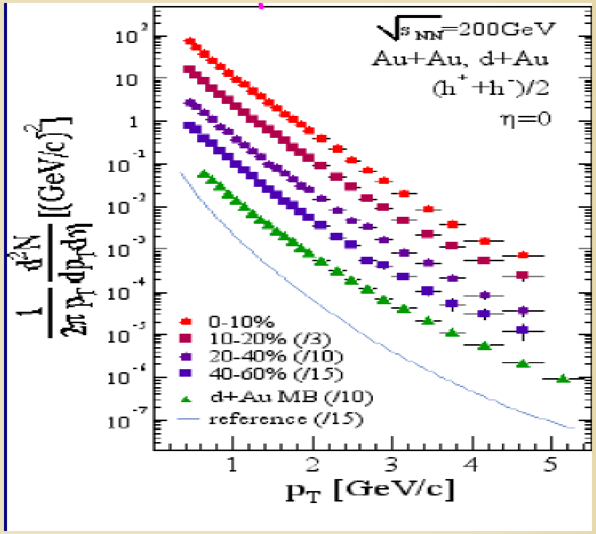
The Nuclear Modification Factor, R_{pA}

- Measuring nuclear effects 'precisely'

  ratio of the hadron spectra

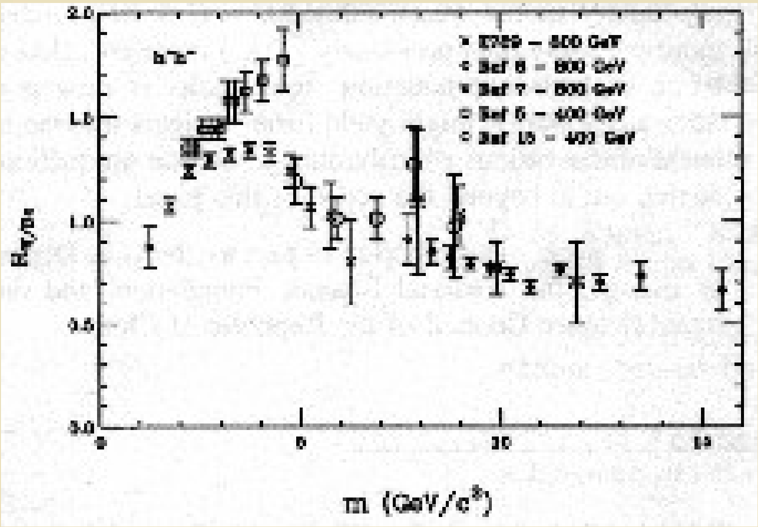
$$R_{d\mathrm{Au}} \equiv \frac{1}{\langle N_{coll} \rangle} \frac{d^2N^{d+\mathrm{Au}}/dp_T d\eta}{d^2N^{p+p}_{inel}/dp_T d\eta}.$$

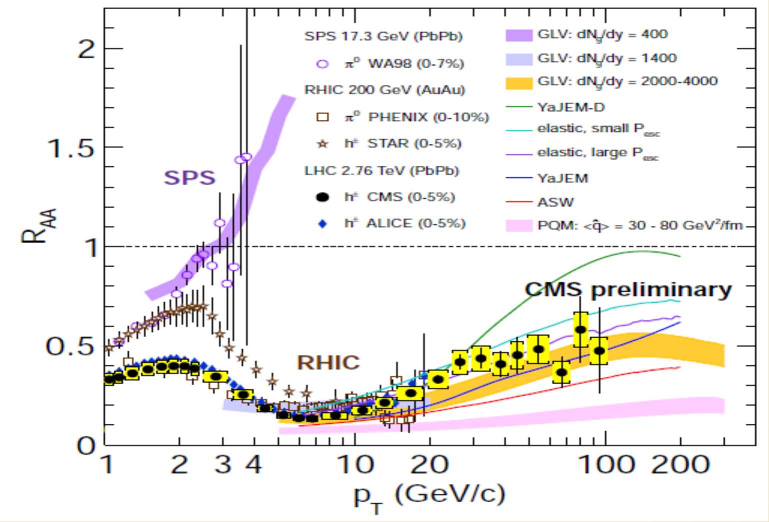
$$R_{\mathrm{AA}}(p_{\mathrm{T}}) = \frac{d^2N^{\mathrm{AA}}_{\mathrm{ch}}/dp_{\mathrm{T}}d\eta}{\langle T_{\mathrm{AA}} \rangle \, d^2\sigma^{\mathrm{NN}}_{\mathrm{ch}}/dp_{\mathrm{T}}d\eta},$$



- Collisions:

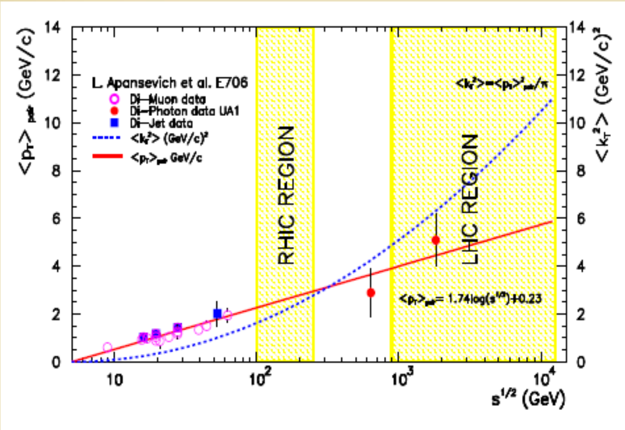
  proton-nucleus (pA) or nucleus-nucleus (AA, AA')

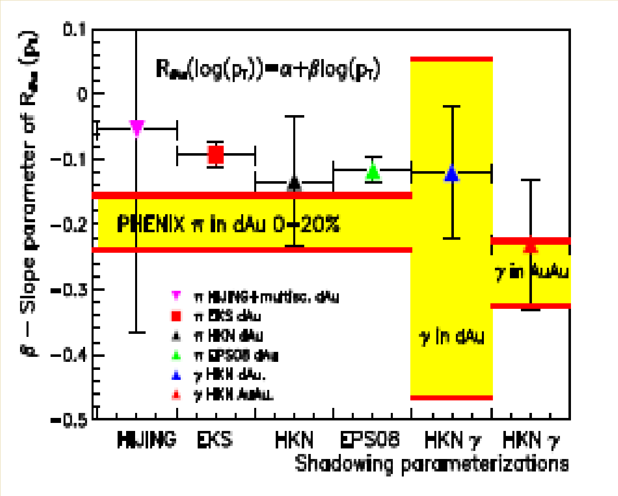


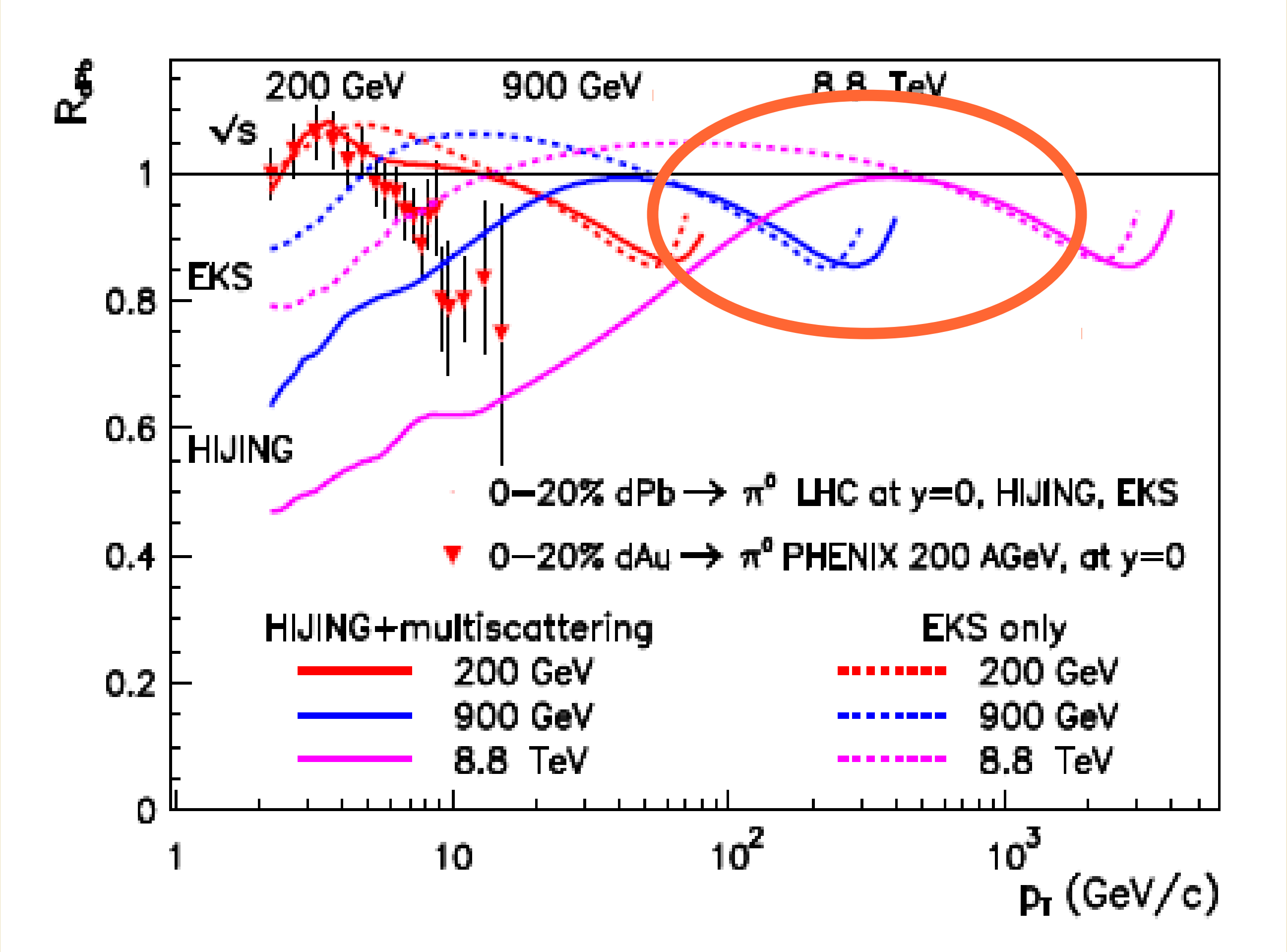


Midrapidity $R_{dA}(p_T)$ fot LHC – Summary

Extreme high-p_T Pion production kTpQCD @ 0.2, 0.9, & 8.8 ATeV





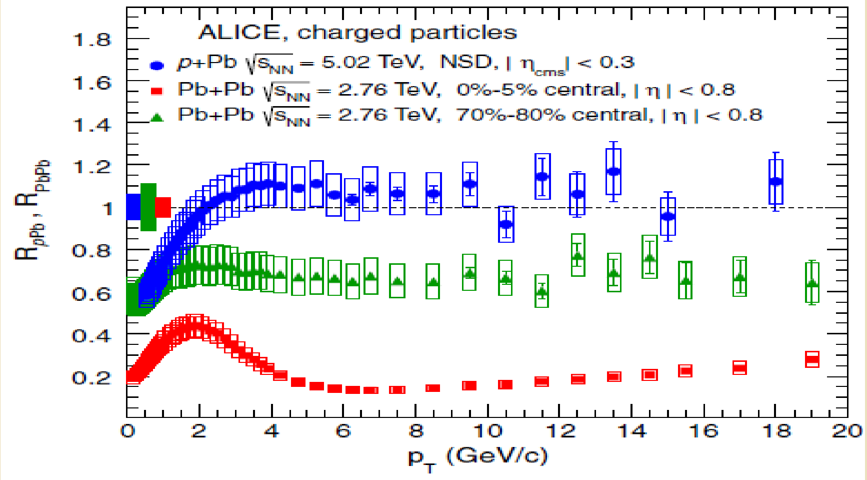


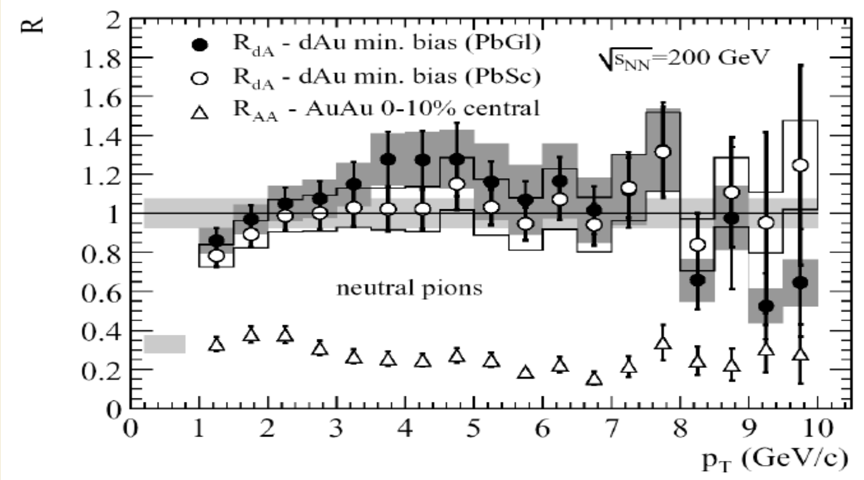
BA Cole, GGB, G. Fai, P. Lévai, G. Papp, arXiv:08073384 (2007)

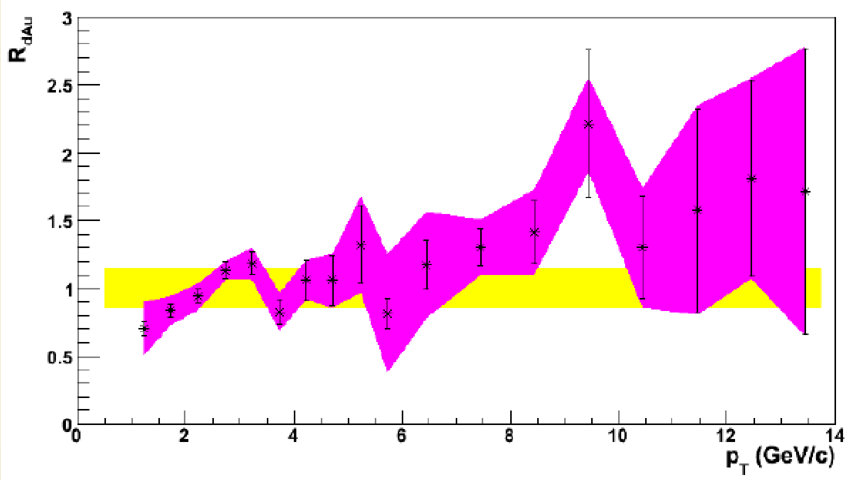
M O T I V A T I O N

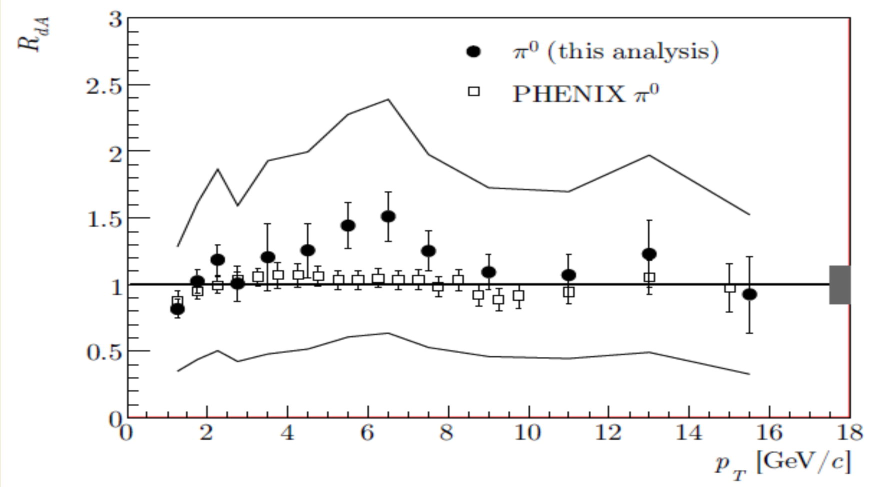
- Motivation for *pPb/dAu* collisions

  Preliminary dAu data from PHENIX@QM12 (B. Sahlmueller)



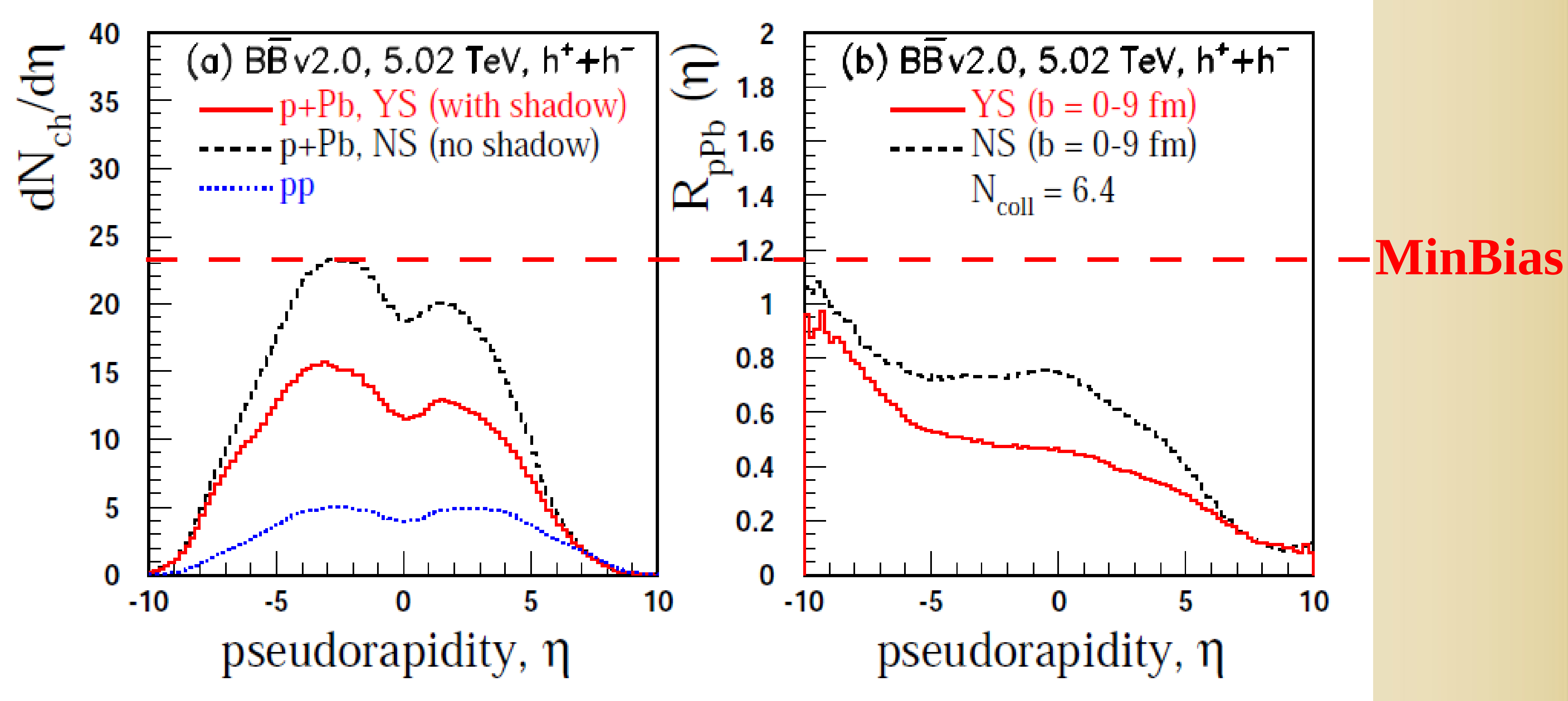






HIJINGB/B 2.0: Rapidity distribution for pp & pPb

Charged hadron production with HIJING 2.0 @ 5.02 ATeV MinBias



GGB, J. Barret, M. Gyulassy, P. Lévai, V. Topor Pop (in preparation 2012)

The Collection of pA/dAu Data

CP [23, 24]	p	d, Be, Ti, W	$19,4;\ 23,7;\ 27,4$	≈ 0	$[0,77; 6,91]$	$\pi^\pm, K^\pm, p^\pm, d^\pm$
ITA [115]	p	C, W	$p_{inc} = 50 - 275$	$[0,7; 1,0]$	$[0,2; 2,35]$	$\pi^\pm, K^\pm, p^\pm$
FNAL [119]	n	Be, Al, C, Sn, Pb	$27,4$	$[4,0; 8,0]$	$[0,1; 1,7]$	$h^\pm, \pi^+, p$
FNAL [116]	p	Be, W	$19,4;\ 23,7;\ 27,4$	≈ 0	$[0,2; 4,5]$	$\pi^\pm, K^\pm, p^\pm, h^\pm$
CP [118]	π^-	p, Be, Cu, W	$19,4;\ 23,7$	≈ 0	$[0,8; 5,78]$	$\pi^\pm, K^\pm, p^\pm$
E577/E672 [117]	p	p, Be, C, Al, Cu, Pb	$38,8$	$[-0,75; 0,75]$	$[0,6; 11,5]$	$h^\pm$
E605/E789 [114]	p	Be, W	$38,8$	≈ 0	$[0,5; 11,5]$	$h^\pm$
E605 [69, 70]	p	d, Be, W	$38,8$	≈ 0	$[0,5; 11,0]$	$\pi^\pm, K^\pm, p^\pm$
E706 [59]	p	Be	$31,6;\ 38,8$	$[-0,75; 0,75]$	$[1,0; 12,0]$	π^0, η
E706 [113]	p, π^-	Be, Cu	$30,7$	$[-0,7; 0,7]$	$[3,5; 10,0]$	π^0, γ
WA80 [144]	S	S, Au	$19,4$	$[2,1; 2,9]$	$[0,3; 3,9]$	π^0, γ
WA98 [140]	Pb	Pb, Nb	$17,3$	$[2,3; 4,4]$	$[0,3; 3,7]$	π^0, γ
CERES [126]	Pb	Au	$17,3$	$[2,1; 2,6]$	$[1,5; 3,3]$	$\pi^\pm$
PHENIX [122, 123]	p, Au	p, d, Au	$130, 200$	$\lvert\eta\rvert \leq 0,35; 2,0$	$[0,5; 10,0]$	$\pi^0, h^\pm, \gamma$
BRAHMS [127, 128]	p, Au	p, d, Au	$130, 200$	$0,0;\ 1,0;\ 2,2;\ 3,2$	$[0,5; 6,0]$	$\pi^0, h^\pm$
STAR [129, 130]	p, Au	p, d, Au	$130, 200$	$\lvert\eta\rvert \leq 0,5; 2,0$	$[0,2; 5,5]$	$\pi^0, h^\pm, \Lambda, K, \gamma$
PHOBOS [132, 133]	p, Au	p, d, Au	$62,4;\ 130;\ 200$	$0,4;\ 0,8;\ 1,2$	$[0,5; 3,5]$	$K^\pm, p^\pm \pi^0, h^\pm$