

# Data taking other than 200 GeV p+p?

- PHENIX highest priority: record 25 pb<sup>-1</sup> 200 GeV p+p at 60% polarization  
Requires delivered integrated luminosity of 75 pb<sup>-1</sup>
- We REALLY want the data!  
A week of degraded performance represents a significant risk to PHENIX  
We must get the 200 GeV data now in order to keep on schedule with the overall program
- Does quality of Run-9 to date indicate advisability of giving up on this run?

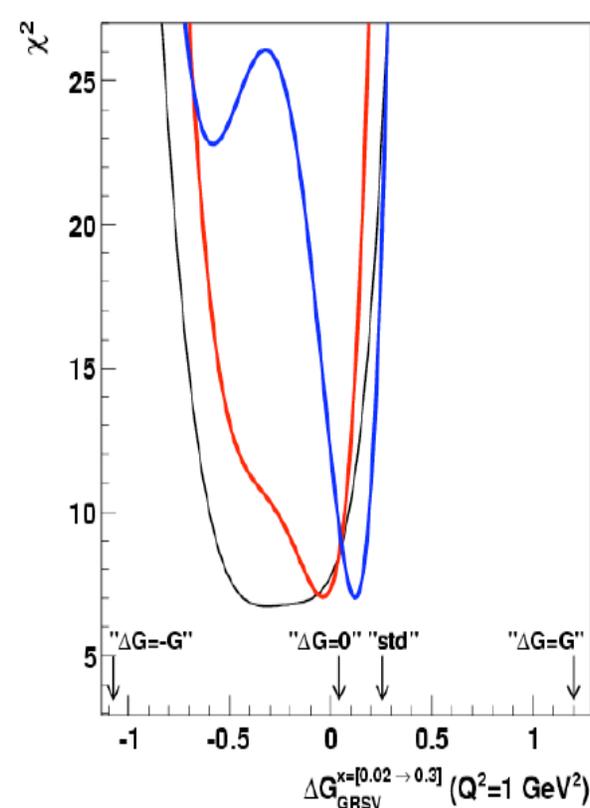
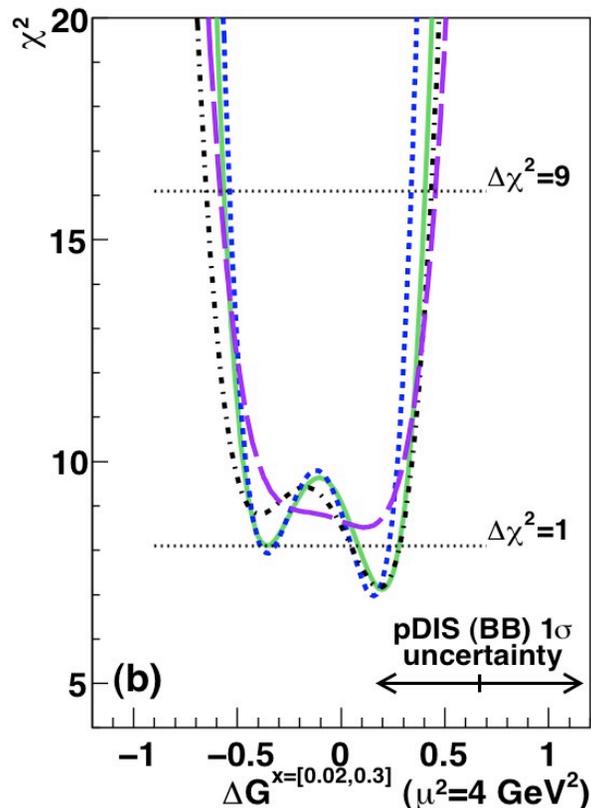
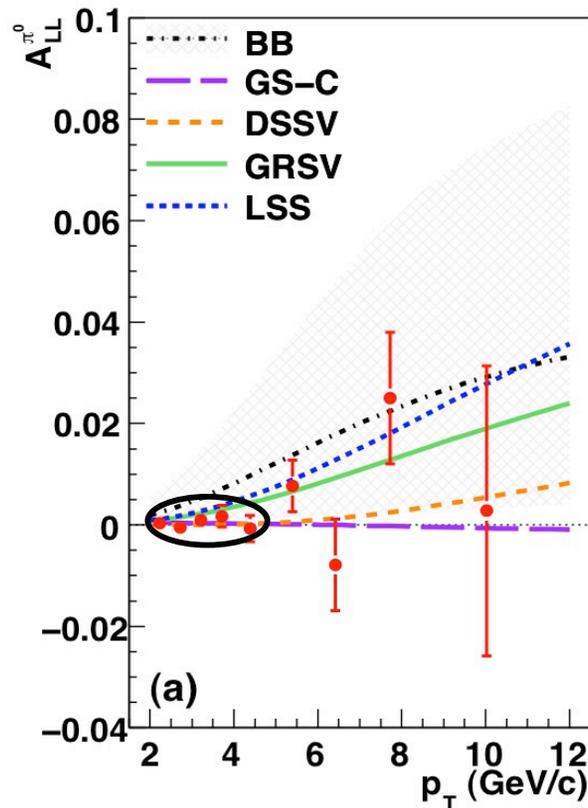


*PHENIX feels it is too early to give up!*

*We need integrated luminosity at both 200 & 500 GeV to meet the 2013 ΔG milestone!*

# Driving the FOM:

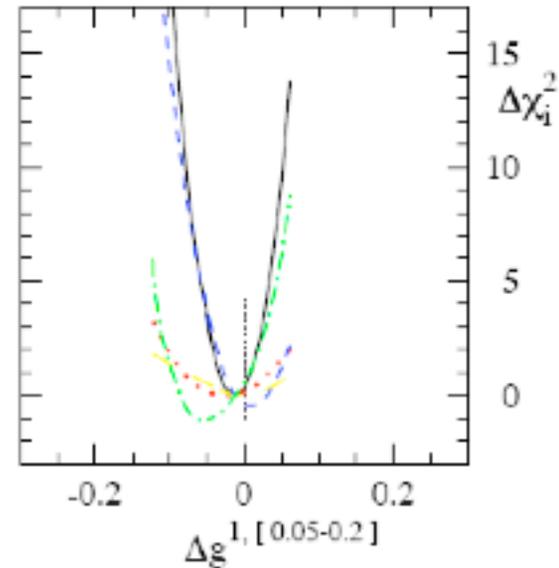
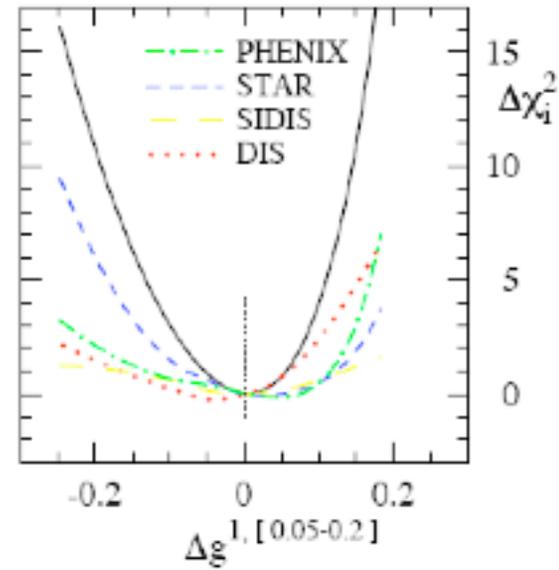
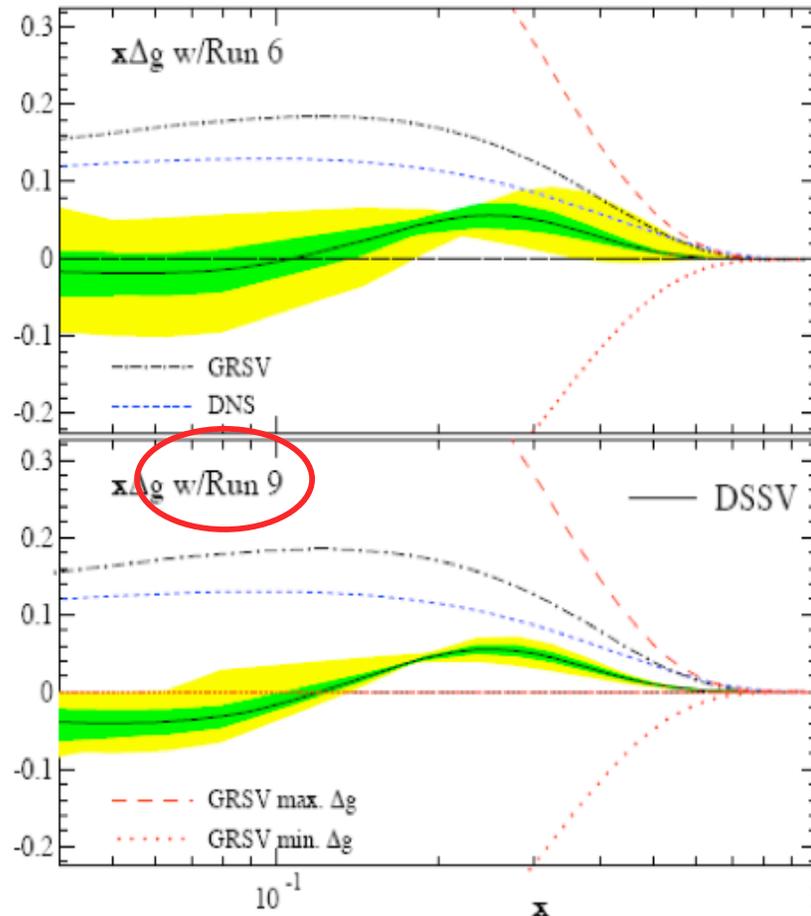
Run-5 + Run-6: arXiv:0810.0694



**25 pb<sup>-1</sup> @ 60%: improve  $\sigma_{\text{stat}}$  by factor of 2.3  
measure  $\Delta G=0.2$  to  $4\sigma$  or  $0.1$  to  $2\sigma$**

# The world expects:

Global fits, DSSV arXiv:0804.0422



goal:  
RHIC  
rules!!

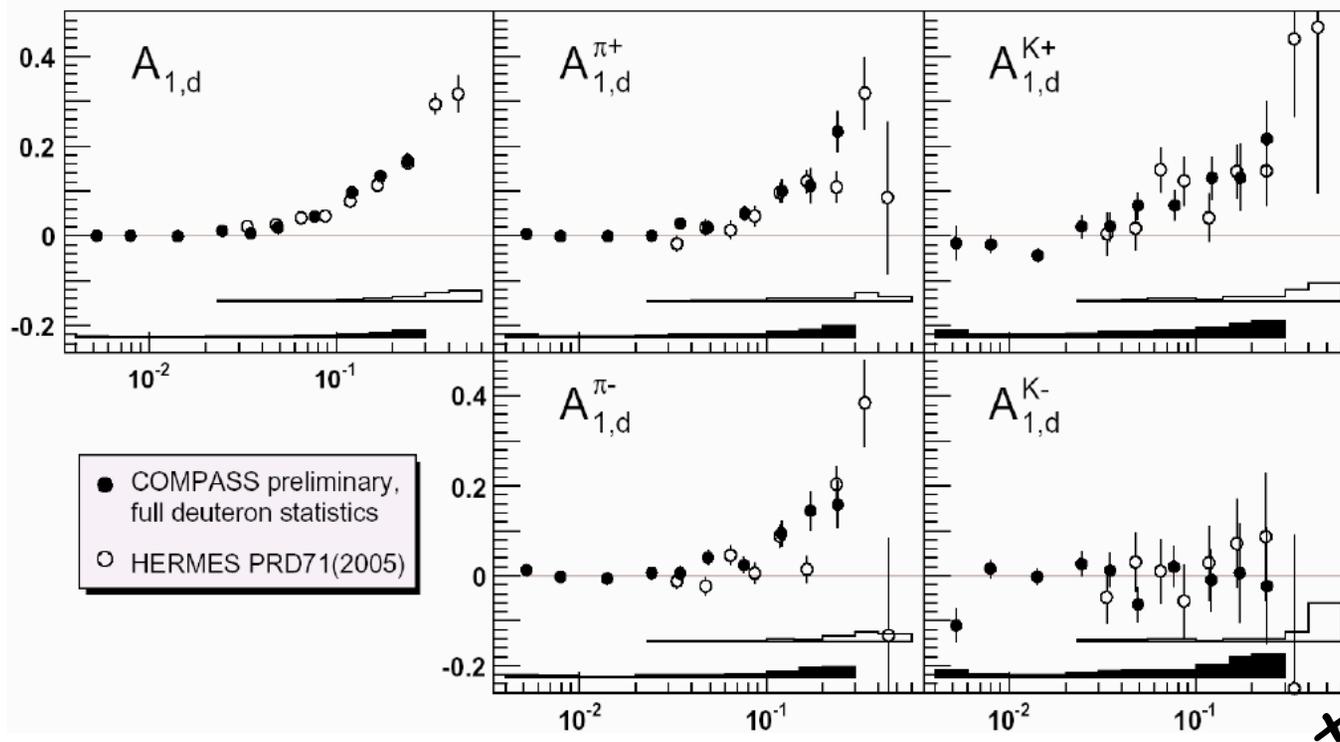


←→ RHIC Constraint



# There's competition on the horizon...

## Compass: Deuterium-Data:



New semi-inclusive data



large  $x$ -range  $0.005 < x < 0.2$

Proton data still to come

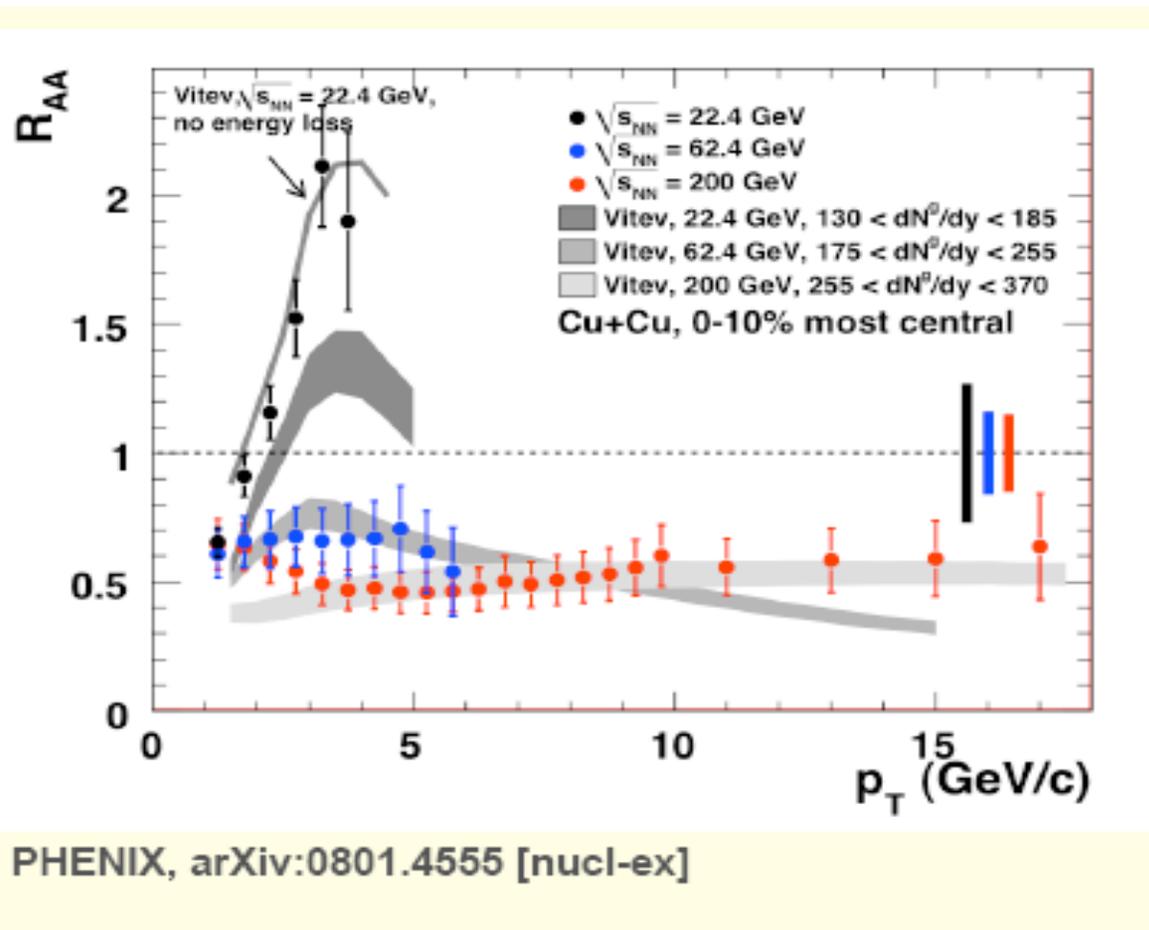
Will the RHIC W-data really be competitive ??  
 $x$ -range and statistics ( $300 \text{ pb}^{-1}$  polarization: 0.7)  
but no FF-knowledge required

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- backup slides



# Why reference p+p at $\sqrt{s} = 22.4$ GeV?

- Beat down error bars on 22.4 GeV Cu+Cu  $R_{AA}$
- Benchmark the pp interpolation needed for  $22.4 < \sqrt{s} < 62.4$  GeV Au+Au

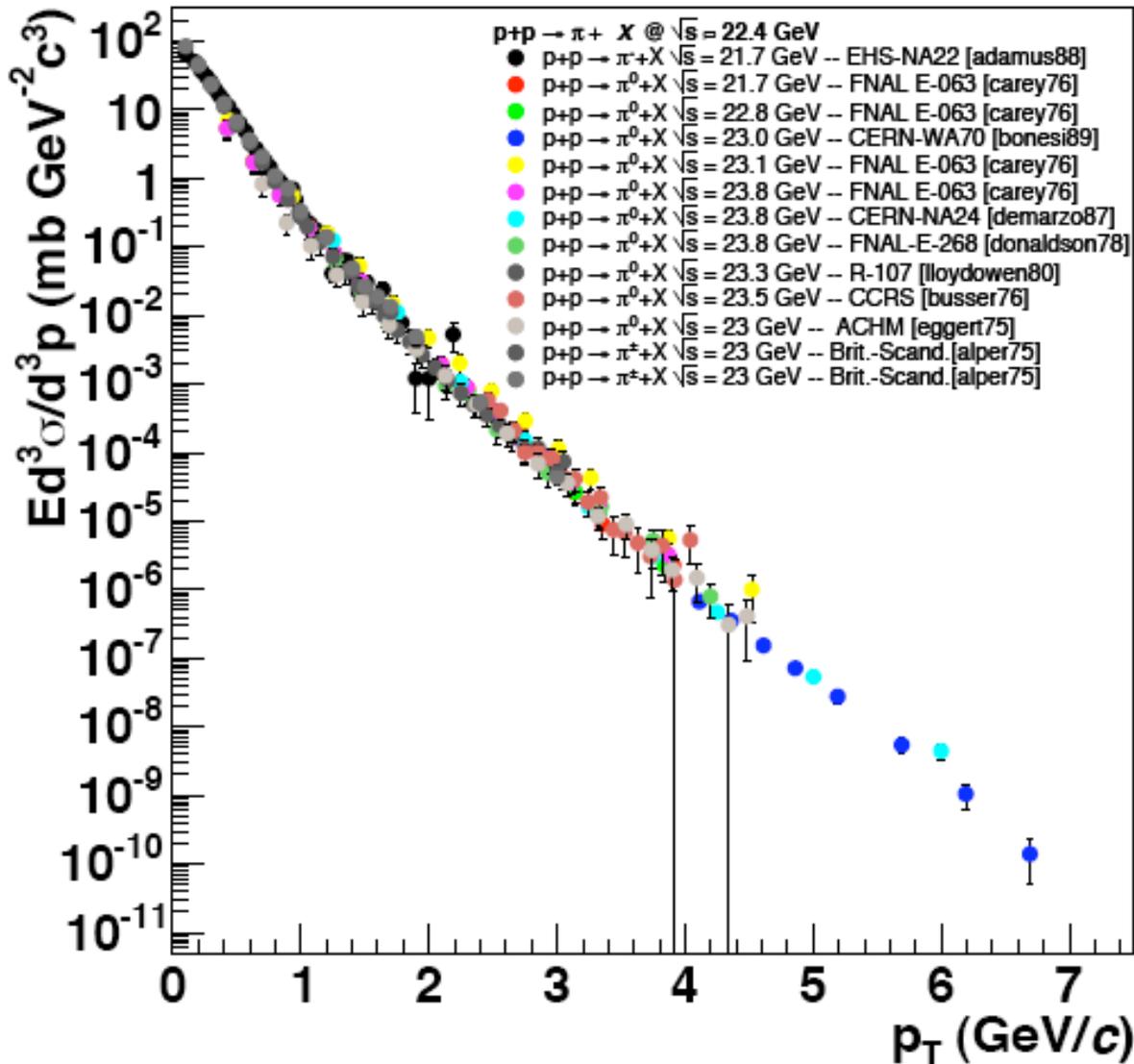


Major goal for Run-10: search for onset of jet quenching!

But needs p+p reference



# Current data on $p+p \rightarrow \pi$ at $\sqrt{s} \sim 20$ GeV



Compilation &  
fits: F. Arleo &  
D. d'Enterria  
Phys.Rev.D78:09  
4004,2008  
arXiv:0807.1252



# Fit the $p_T$ spectra

$$f(p_T, \{p_i\}_{i=0,3}) = p_0 \cdot [1 + (p_T/p_1)]^{p_2} \cdot [1 - (p_T/p_T^{\max})]$$

$$p_0 = 176.3 \pm 69.7 \text{ [mb GeV}^{-2} \text{c}^3]$$

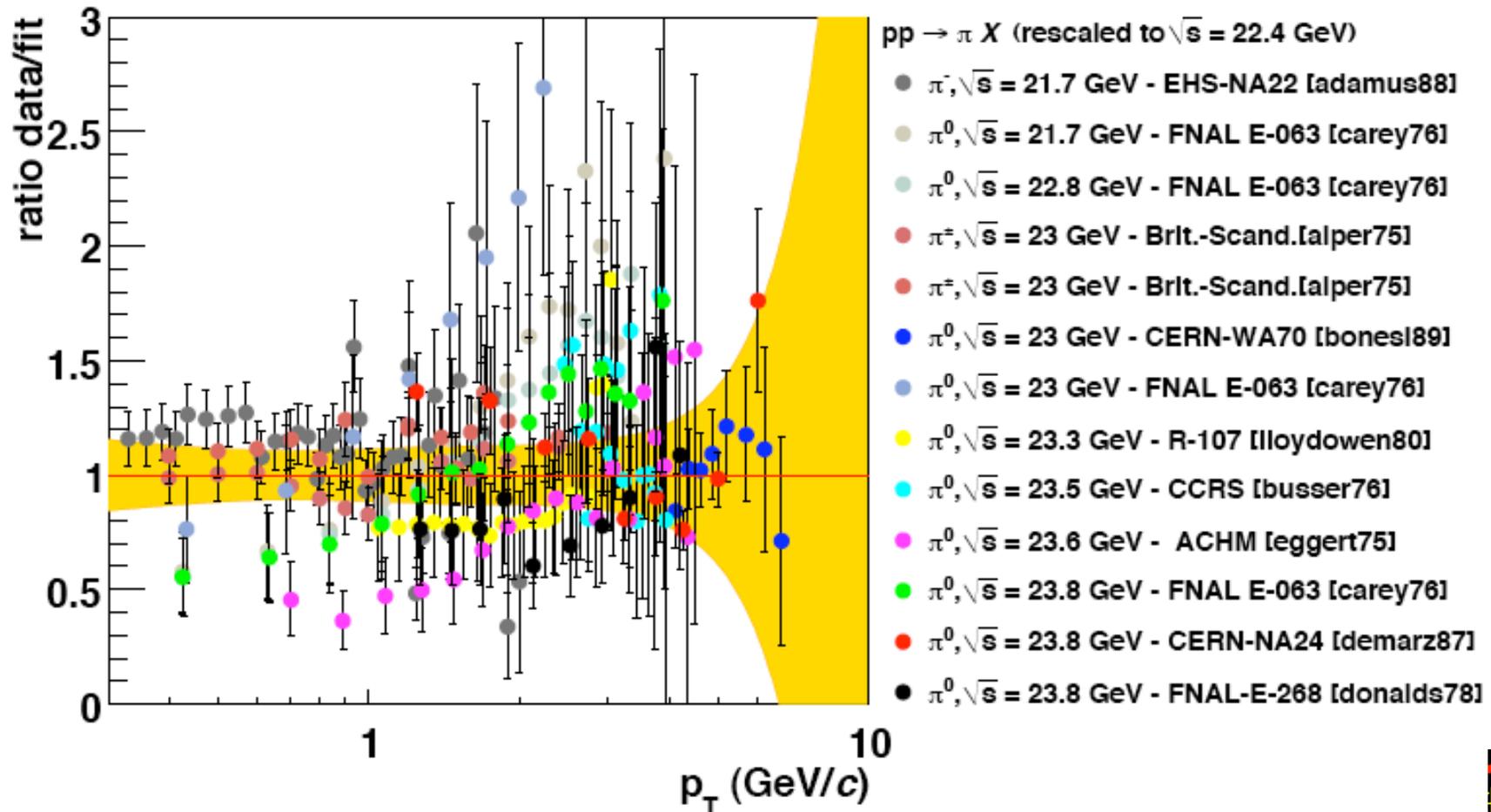
$$p_1 = 2.38 \pm 1.19 \text{ [GeV/c]}$$

$$p_2 = -16.13 \pm 7.21$$

$$p_3 = 6.94 \pm 5.64$$

$$\chi^2/\text{ndf} = 208.2/190$$

*Uncertainty: 15%, 25%, 40% at  $p_T \sim 2, 4, 5 \text{ GeV/c}$*



## and $\sqrt{s}$ dependence

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$$E \frac{d^3\sigma(pp \rightarrow \pi X)}{d^3p}(\sqrt{s}) \propto \left(\frac{1}{\sqrt{s}}\right)^4 F(x_T),$$

and

$$F(x_T) = (22.4 \text{ GeV})^4 f(x_T \times [11.2 \text{ GeV}])$$

- Assumed invariant cross section is a scaling function of  $x_T$
- Works pretty well in small  $\sqrt{s}$  range ( $\sim 10\%$  error)
- Need quality 22.4 GeV data to reach higher  $p_T$  & allow parameterization of  $\sqrt{s}$  dependence over larger range

*Estimate: 1-2B events in one week*



# From 2008 PAC report

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**polarization asymmetries already observed in the forward direction, and a strong proposal to run the pp2pp experiment at STAR for a short period during the 200 GeV run. The PAC finds these directions of compelling physics interest, but emphasizes that the *allocation of beam time to these pursuits should not hinder completion of the  $\Delta G$  and  $\Delta q$  milestones.***

