

## PHENIX Priorities for Runs 11

### Charge from Steve Vigdor:

- State your prioritized physics goals, given what's been done to date
- Consider that we may have to end Run-11 in 4 weeks
- How critical to expose VTX to Au+Au in this run?
- If commissioning is complete with 2 weeks of pp remaining - switch immediately to Au-Au, even if only for 1-2 weeks?
- Or is accomplishing pp goals more important?

*Barbara Jacak for the PHENIX Collaboration*

# PHENIX priorities

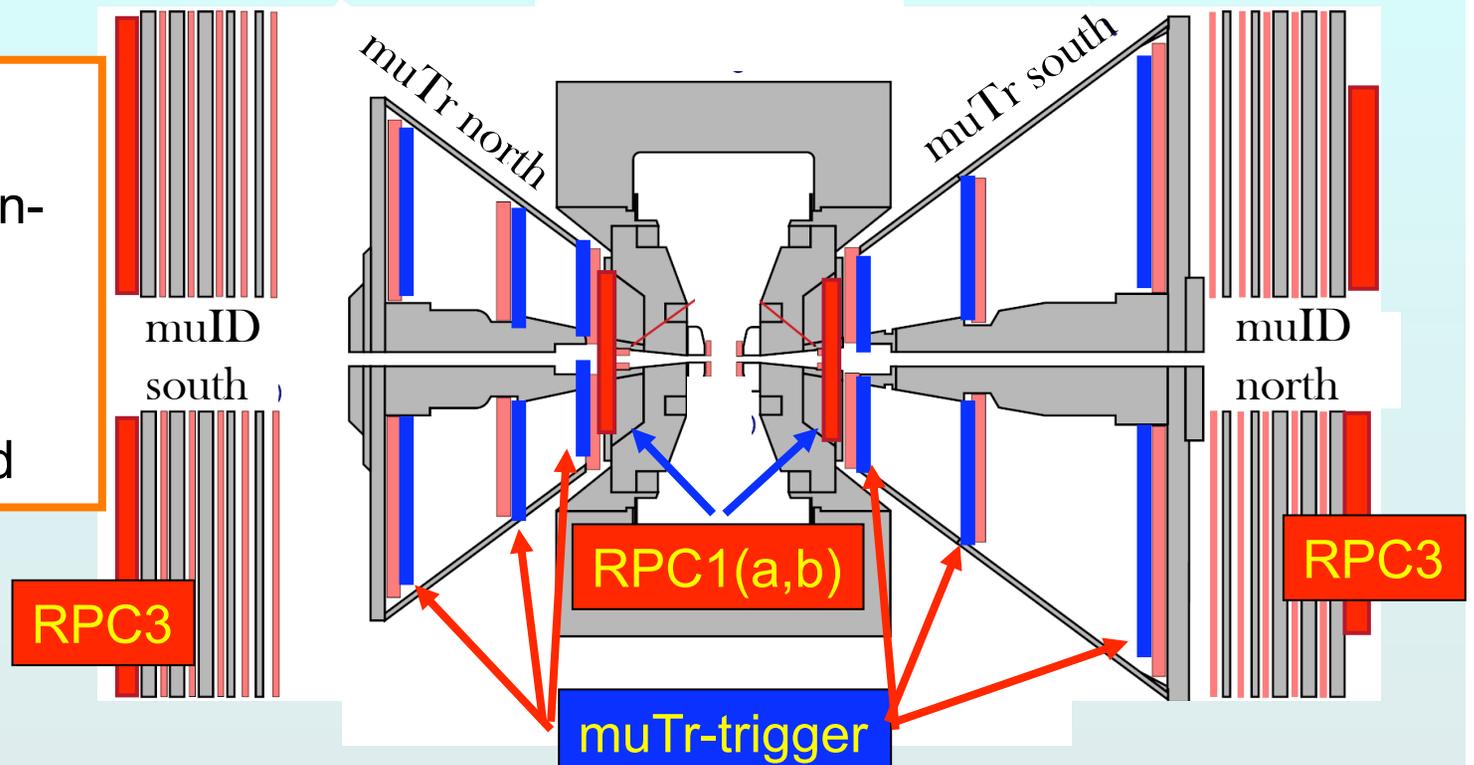
- **Acquire  $\geq 1$  set of publishable data**  
**2 commissioning runs only is not desirable**
- **If only 4 more cryo weeks: stay with 500 GeV p+p**  
**Minimize changes**  
**Sample 20 pb<sup>-1</sup> with muon trigger systems**  
**Complete VTX commissioning**  
**Use p+p data to demonstrate VTX performance**
- **Run flat out to accumulate luminosity**  
**Don't add features or performance studies**
- **If > 4 cryo weeks remain thereafter**  
**move on to Au+Au**

# Muon Trigger Upgrade

## Trigger idea:

Reject low momentum muons

Cut out-of-time beam background



## Upgrade:

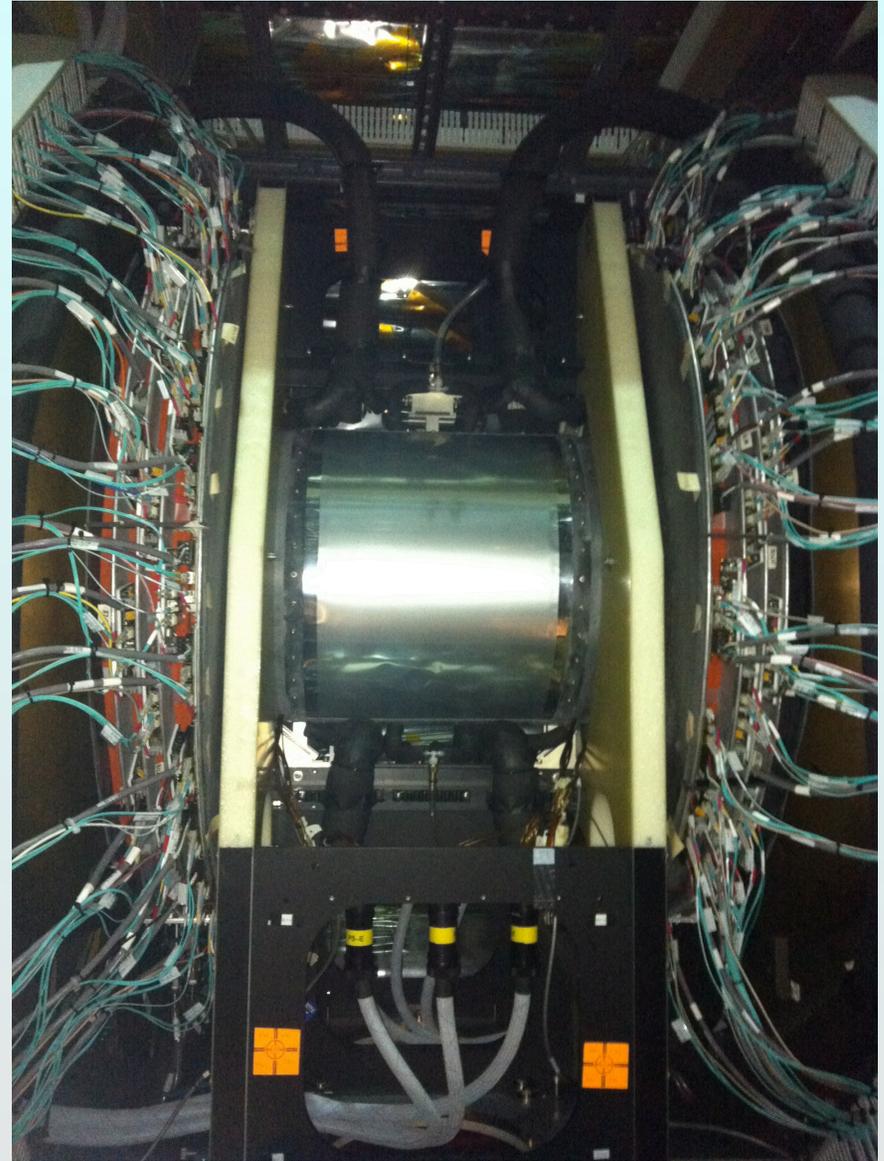
o muTr trigger electronics: muTr 1-3 → send tracking info to level-1 trigger

o RPC stations: RPC 1+3 → tracking + timing info to level-1 trigger

note: RPC1 has larger acceptance than RPC3 at large radii,  
RPC1+ RPC3 give best coverage for timing needed for background rejection.

# VTX is now closed around beam pipe

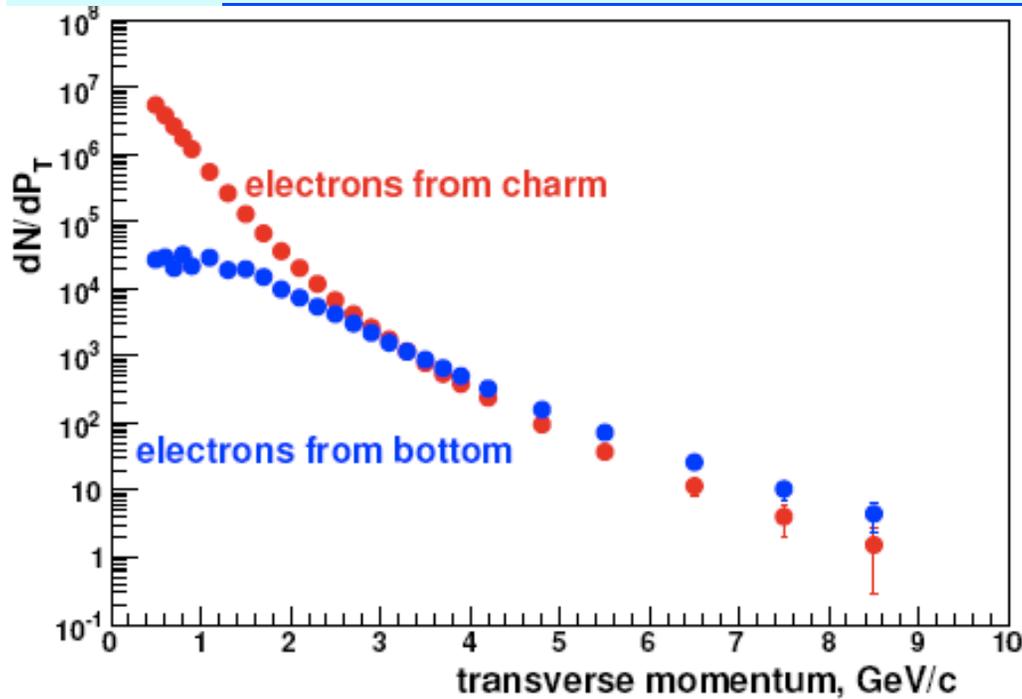
- No longer need to access ladders
- Commissioning with beam partly complete
- Integration into PHENIX datastream underway
- Timing optimization requires beam



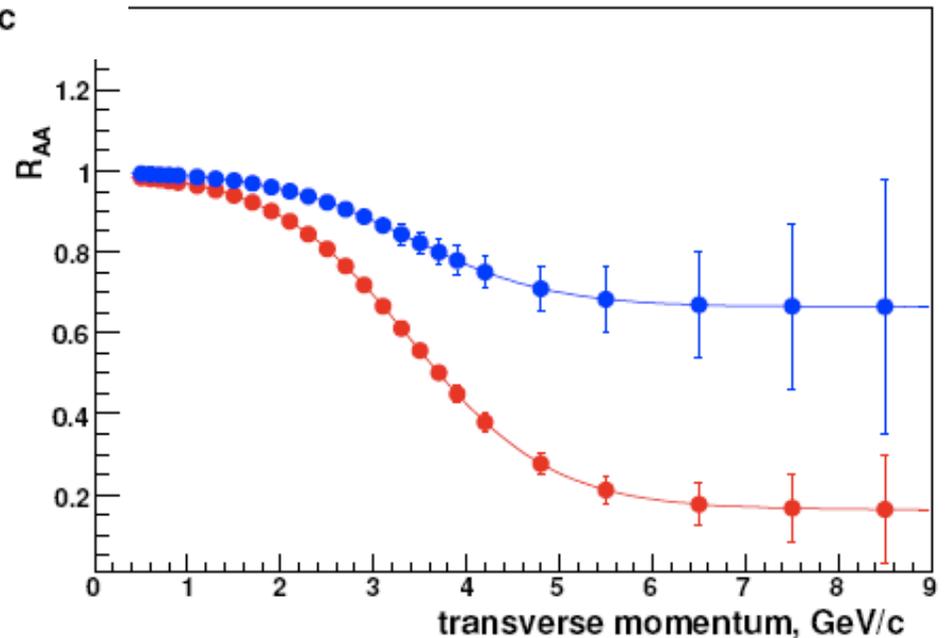
## So how about Au+Au?

- Highest priority Au+Au is 200 GeV  
For VTX physics
- What does this require?
  - 2 weeks switchover pp -> AuAu
  - ≥ 1.5 – 2 weeks VTX commissioning with Au+Au  
zero suppression
  - data integration at high multiplicity
  - Then data taking at reasonably high luminosity  
(10cm vertex cut)
- Answer: > 4 weeks of Au+Au needed for a physics result

# With 8 weeks Au+Au at $\sqrt{s} = 200$ GeV



Assumption here:  
Full 8 weeks used  
for data taking



● backup slides

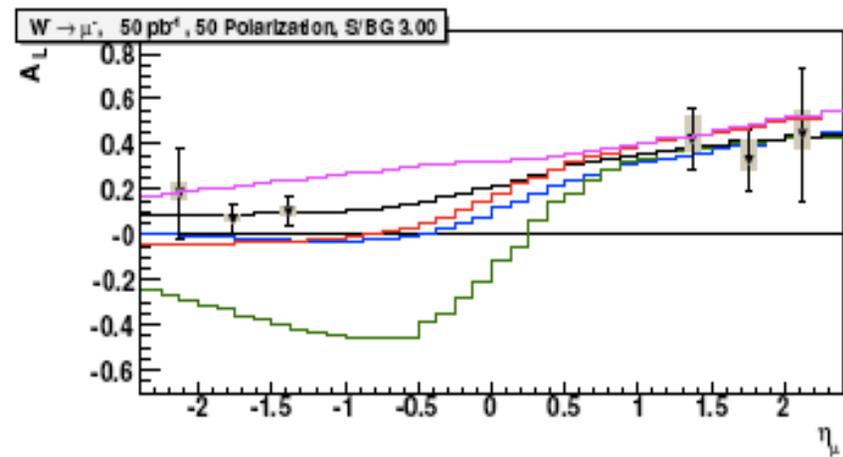
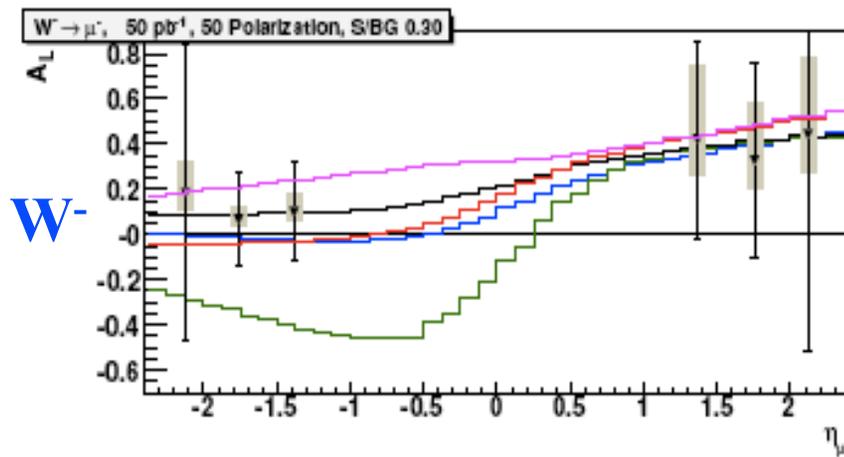
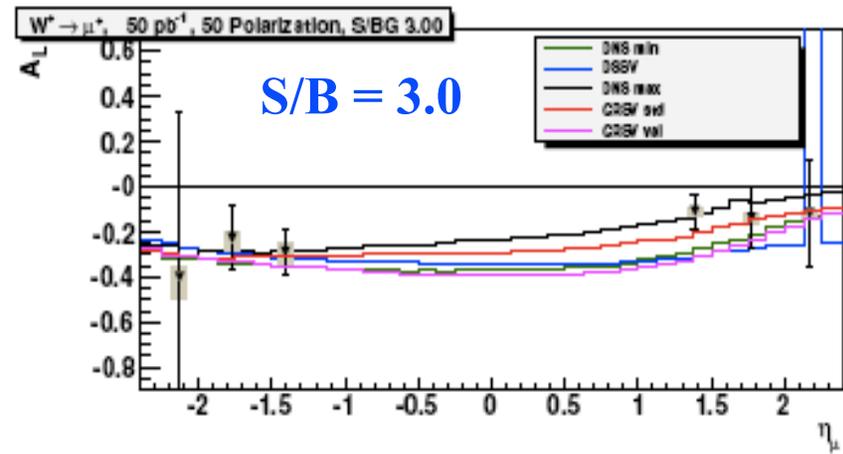
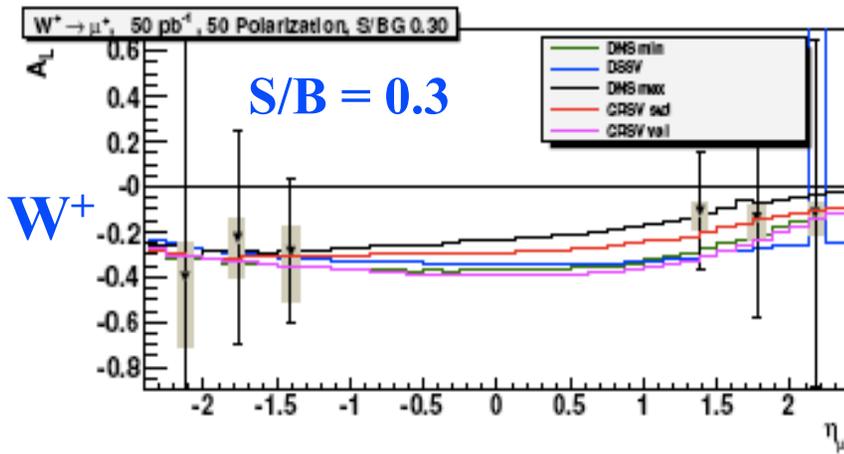
# PHENIX beam use proposal

RUN	SPECIES	$\sqrt{s_{NN}}$ (GeV)	PHYSICS WEEKS	$\int \mathcal{L} dt$ (recorded)	p+p Equivalent	Polarization
11	p+p	500	10	50 pb <sup>-1</sup>	50 pb <sup>-1</sup>	50%
	Au+Au	200	8	0.7 nb <sup>-1</sup>	28 pb <sup>-1</sup>	
	Au+Au	27	1	35M events		
	Au+Au	18	1.5	37M events		
	U+U	192.8	1.5	150-200M events		
12	p+p	500	8	100 pb <sup>-1</sup>	100 pb <sup>-1</sup>	50%
	Au+Au	200	7	0.7-0.9 nb <sup>-1</sup>	28-36 pb <sup>-1</sup>	
	p+p	62.4, 22.4	2.5	1.0, 0.01 pb <sup>-1</sup>		0%

## If less than 30 cryo weeks:

- Shorten U+U from 1.5 weeks to 0.5 weeks
- Shorten 500 GeV p+p from 10 weeks to 8.5 weeks
- Remove Au+Au at 18 GeV.
- Shorten 200 GeV Au+Au from 8 weeks to 7 weeks.

# 150 pb<sup>-1</sup>\* 500 GeV p+p, 50% polarization

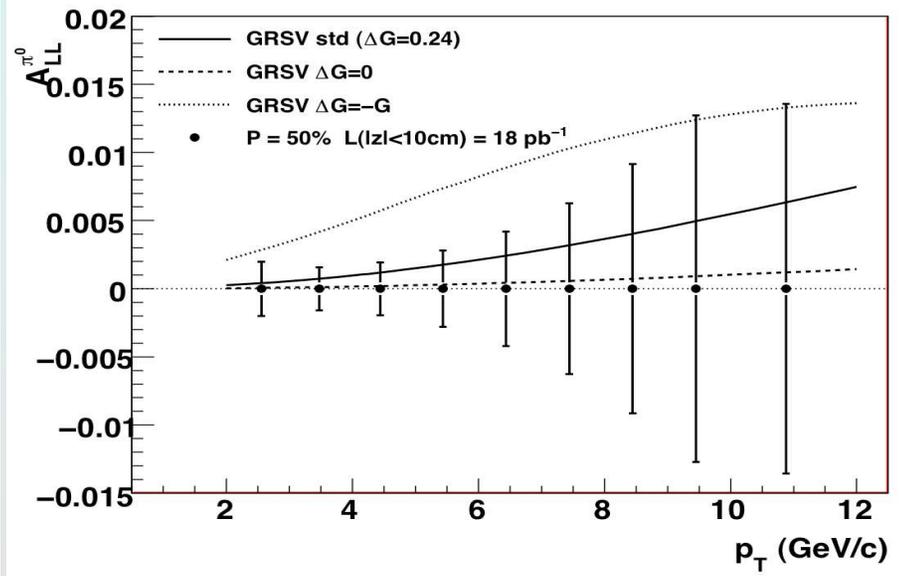
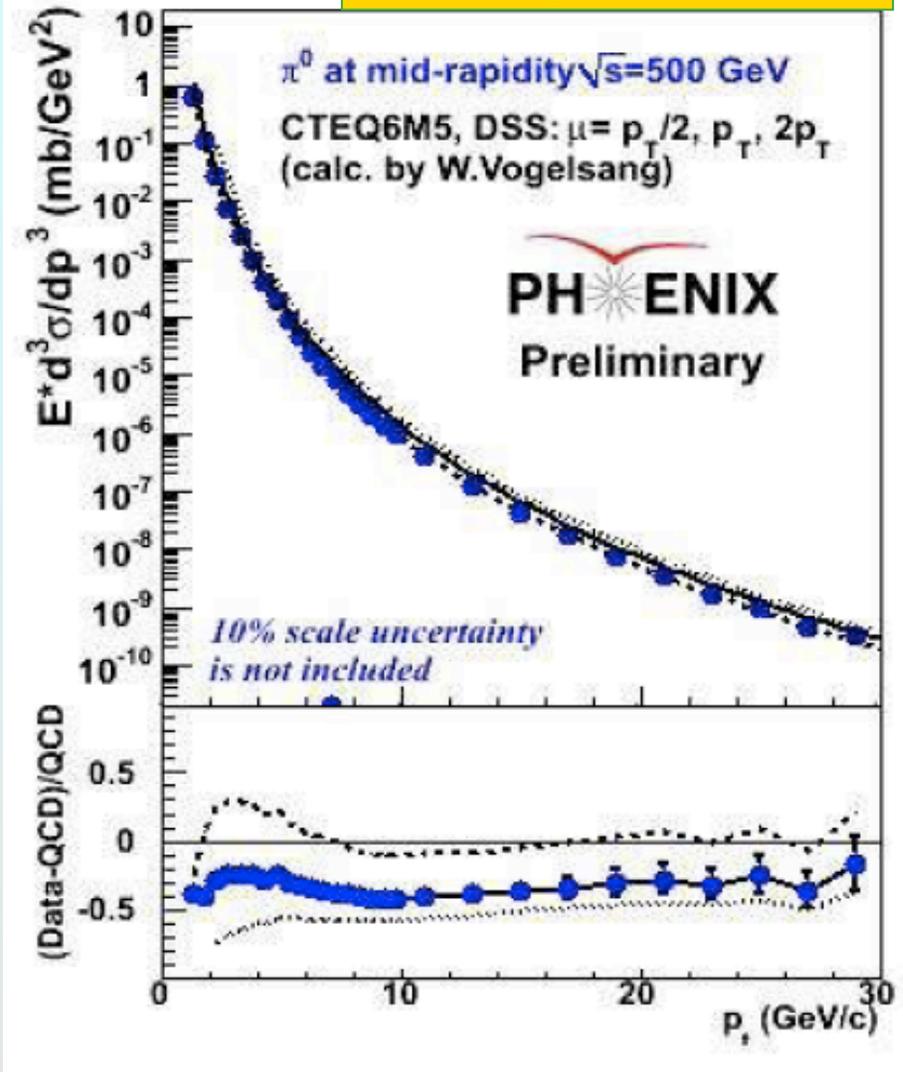
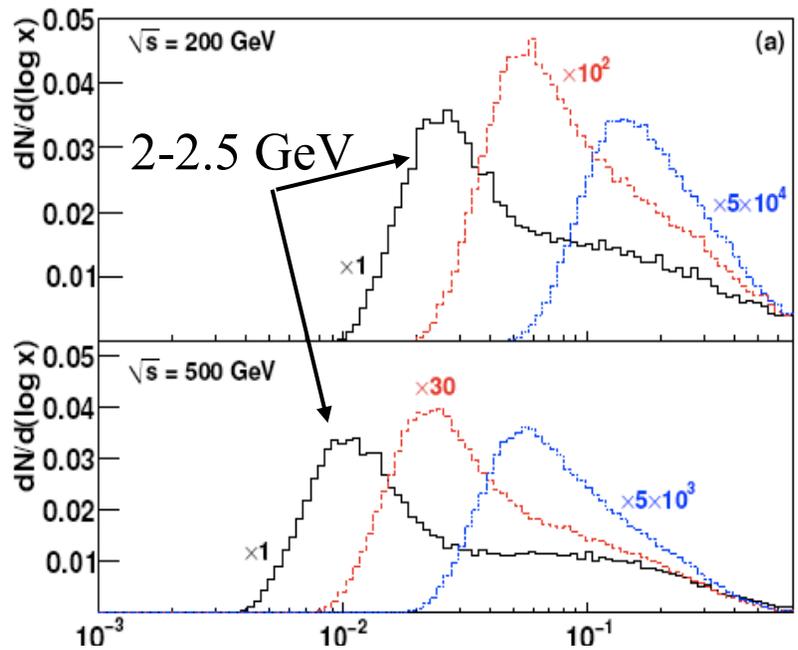


$A_L(\text{forward } W^- \rightarrow \mu^-) \approx \Delta d/d$ .  $A_L(\text{backward } W^- \rightarrow \mu^-) \approx \Delta \bar{u}/\bar{u}$ .

\* (PHENIXlive = 0.97) × (PHENIXup = 0.65) × (vertex = 0.55) = 0.35%

# Q5: what's $\Delta G$ ? ( $\pi^0$ $A_{LL}$ at 500 GeV)

Run-9 preliminary



# $\Delta G$ not large: sea quarks polarized? d vs. u?

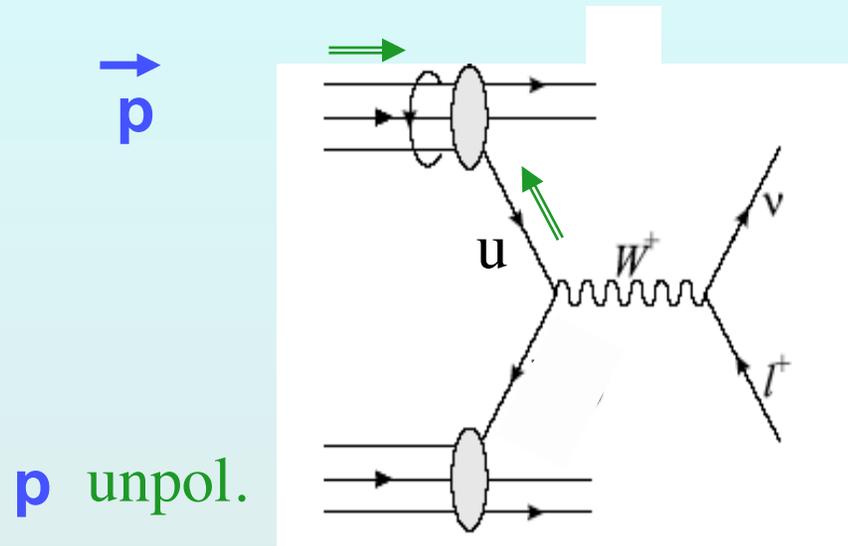
## Probe $\Delta\bar{q}-\Delta q$ via $W$ production

$$\Delta d + \bar{u} \rightarrow W^-$$

$$\Delta\bar{u} + d \rightarrow W^-$$

$$\Delta\bar{d} + u \rightarrow W^+$$

$$\Delta u + \bar{d} \rightarrow W^+$$

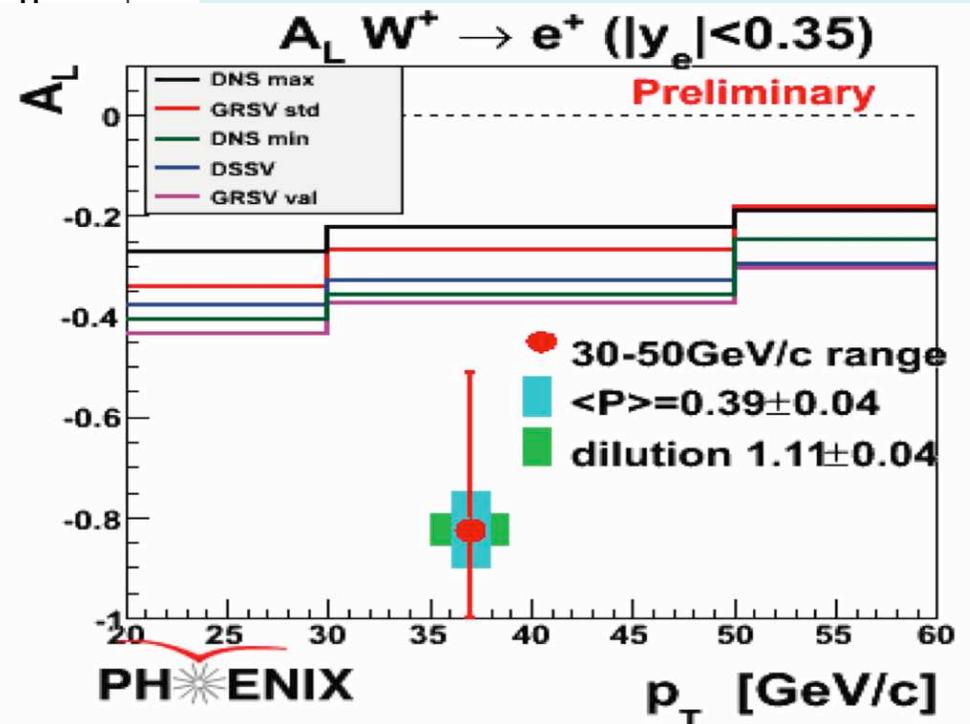
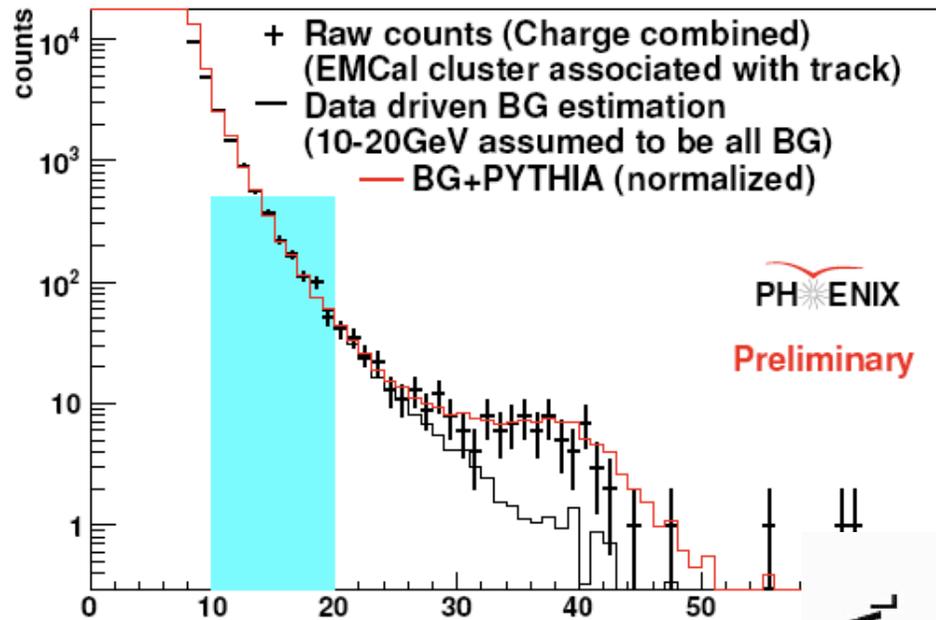


**100% Parity-violating:** 
$$-A_L = \frac{\sigma_+ - \sigma_-}{\sigma_+ + \sigma_-}$$

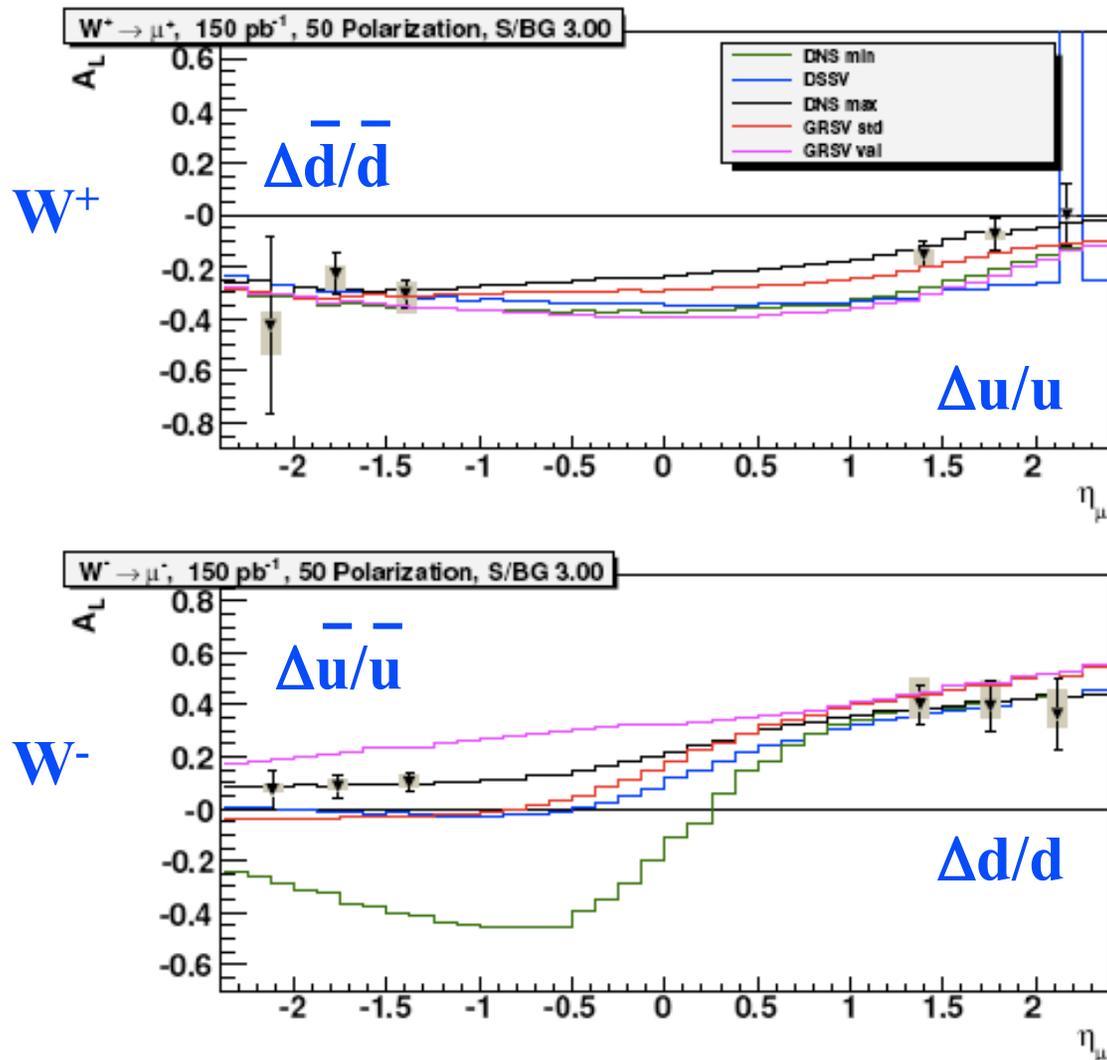
Start: 2009(tests)/2010(trigger) with 500 GeV p+p

# Q.4: $W$ cross section & asymmetry?

Run-9 preliminary



# Run-11 + Run-12: 150 pb<sup>-1</sup> sampled



**Significant improvement on sea quark polarizations!**

# VTX to tag displaced vertex

- **Commission and take first data in Run-11!**

- **Commissioning plan**

Run p+p first, commission with low multiplicity

Longest running period → max time to study VTX

Then switch to full energy Au+Au

Respect CA-D guidance of max energy first

Commission at high multiplicity & data rate

Collect data at 200 GeV Au+Au

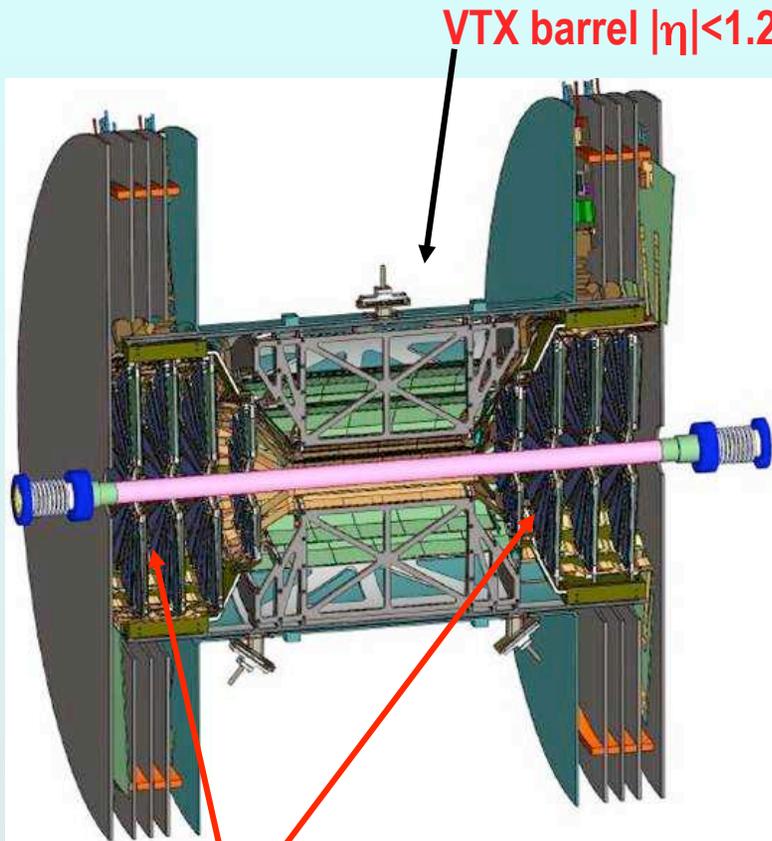
serves both commissioning & physics

- **Physics goals**

Demonstrate the electrons are from heavy flavor

First direct look at separated b and c in Au+Au

# Silicon Vertex (VTX & FVTX)



VTX barrel  $|\eta| < 1.2$

FVTX endcaps  
 $1.2 < |\eta| < 2.7$   
mini strips

**VTX: silicon Vertex barrel tracker**

**Fine granularity, low occupancy**

50 $\mu\text{m}$   $\times$  425 $\mu\text{m}$  pixels for L1 and L2

R1=2.5cm and R2=5cm

**Stripixel detector for L3 and L4**

80 $\mu\text{m}$   $\times$  1000 $\mu\text{m}$  pixel pitch

R3=10cm and R4=14cm

**Large acceptance**

$|\eta| < 1.2$ , almost  $2\pi$  in  $\phi$  plane

**Standalone tracking**

***Install for Run-11***

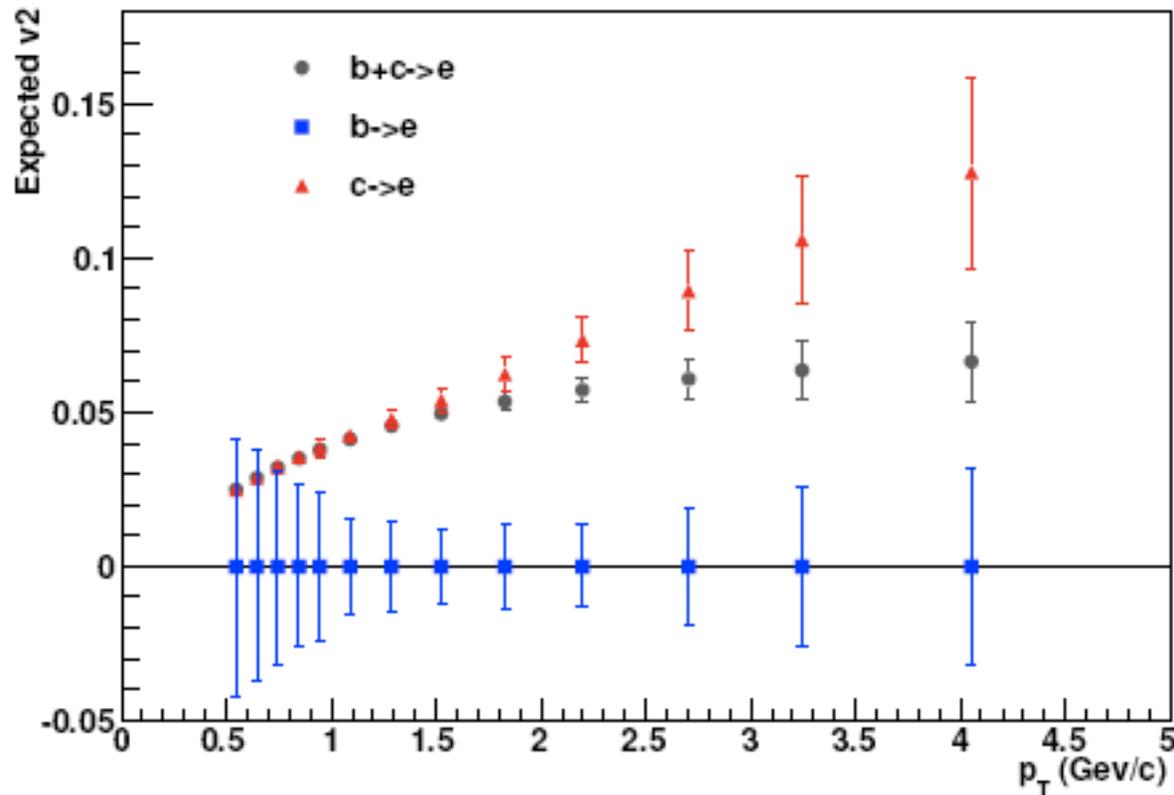
**FVTX: Forward silicon VerTeX tracker**

2 endcaps with 4 disks each

pixel pad structure (75 $\mu\text{m}$   $\times$  2.8 to 11.2 mm)

***Install for Run-12***

# Heavy quark flow in Run-11

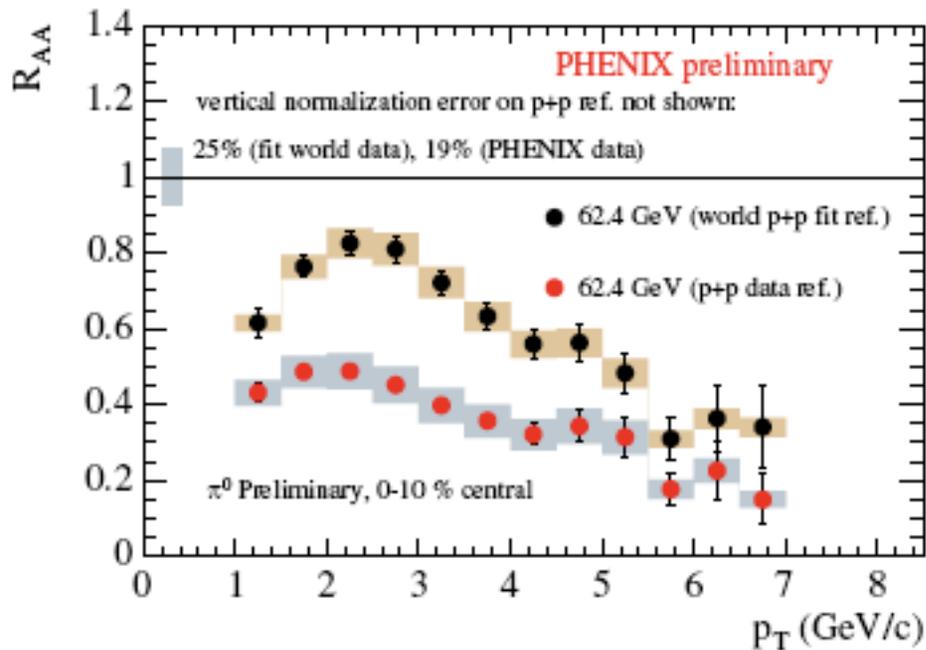


**Assumption:**  
**Full 8 weeks**  
**data taking**

**NB: simulated**  
**limited  $p_T$**   
**range.**

**Good sensitivity for  $v_2$  decrease at high  $p_T$**

# Low energy p+p comparison running



Measurement way better than fit!

But, p+p data run out at 7 GeV/c  $p_T$  so we request new run

*Arleo & d'Enterria, Phys.Rev.D78:094004,2008*

- Key: p+p data at  $\sqrt{s} = 22.4$  GeV
- For Cu+Cu statistics, require  $0.01 \text{ pb}^{-1}$  i.e. 6 days + changeover

