

# RUN 11 RHIC MACHINE/EXPERIMENTS MEETING

31 May 2011

Agenda:

- $\sqrt{s} = 200$  GeV AuAu progress
- Update on 250 GeV integrated Lumi

## Run 11 Plan based on PAC recommendation/ALD Guidance and available funds 5/31/10 update

- 3 Jan, Begin cool-down to 4.5K
- 8 Jan, Cool-down to 4.5K complete in both rings, preliminary setup begins
- 24 Jan, 1 week Ramp-up with 8 hr/night beam to experiments
- **11 Feb (machine and ~experiments), begin ~10 week physics run ( $\sqrt{s} = 500$  GeV pp)**
- 7 Mar, cryo troubles, extended maintenance, 0900 hrs till 2000 hrs 14 Mar – lost 7.5 days
- 17 Mar, power distribution problem, extended maintenance, 1930 hrs till 0315 hrs 20 Mar – lost 2.3 days
- **18 Apr, end 9.4 week physics run at  $\sqrt{s} = 500$  GeV**
- 18 Apr jet target polarization measurement at injection (<5%)
- 19 Apr, short maintenance followed by setup for  $\sqrt{s} = 18$  GeV AuAu
- **23 Apr, begin ~1 week physics run ( $\sqrt{s} = 19.6$  AuAu)**
- **2 May 08:00, end 1.3 week physics run at  $\sqrt{s} = 19.6$  GeV**
- 2 May, begin setup for  $\sqrt{s} = 200$  AuAu
- 5 May, begin 2 day Ramp-up with 8 hr/night beam to experiments
- **6 May 11:37, begin ~8 week physics run at ( $\sqrt{s} = 200$  GeV/n AuAu)**
  
- **31 May- TODAY**
- **29 June, end 7.7 wk AuAu physics run at  $\sqrt{s} = 200$  GeV/n , begin warm-up**
- **30 June, cryo warm-up ~ complete, end 25.4 weeks cryo operation**

### What's missing :

- **Run into July?**
- Uranium test/physics run
- **Low energy test run**

~2 days – PREP TIME REQ'D, NEED DECISION SOON!



# **$\sqrt{s} = 200 \text{ GeV/n AuAu}$ luminosity goals (24 May efficiencies)**

## **STAR**

2000  $\mu\text{b}^{-1}$  sampled / 60% = 3300  $\mu\text{b}^{-1}$  delivered

## **PHENIX**

700  $\mu\text{b}^{-1}$  sampled / 14% = 5000  $\mu\text{b}^{-1}$  delivered

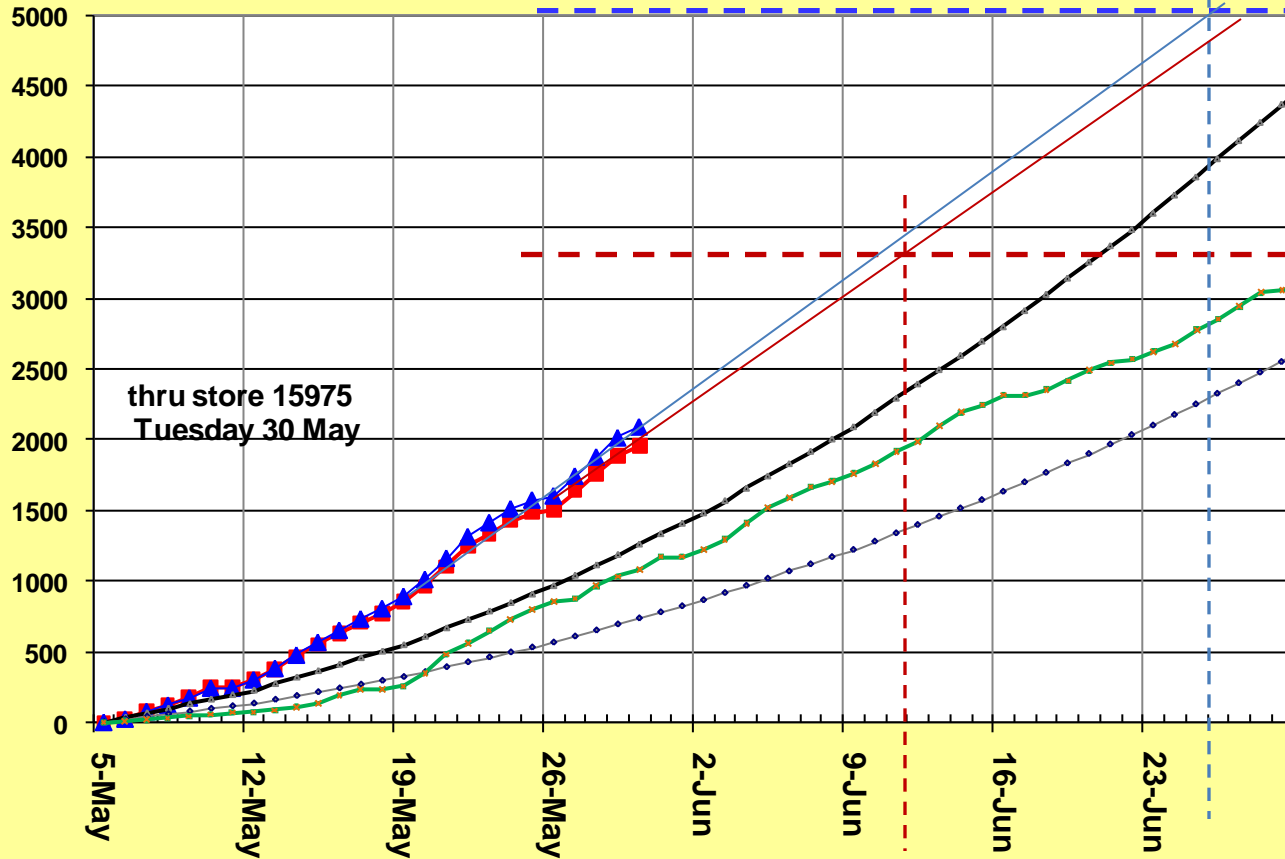
Estimate from PHENIX Beam Use Proposal – 15.8%

- Live Time = 97%
- Uptime = 65%
- +/- 10 cm vertex = 25%

# Run11 RHIC AuAu Integrated Luminosity for Physics ( $v_s = 200 \text{ GeV/n}$ )

■ STAR ▲ PHENIX — Lmax — Lmin — PHENIX Run10

Integrated Luminosity [ $\mu\text{b}^{-1}$ ]



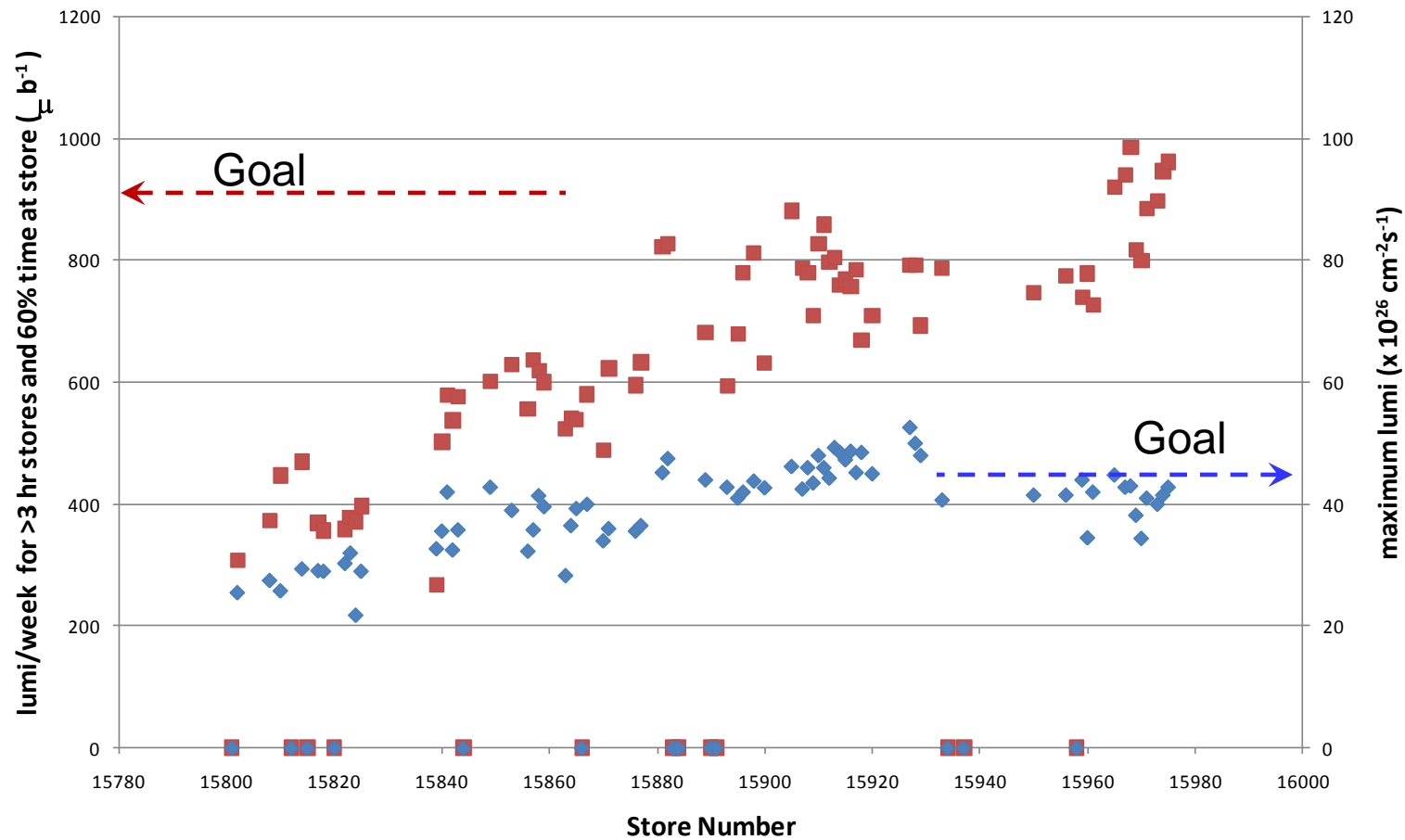
PHENIX Goal

STAR Goal

# Run 11 100 x 100 GeV/n Au-Au (Phenix)

thru fill 15975

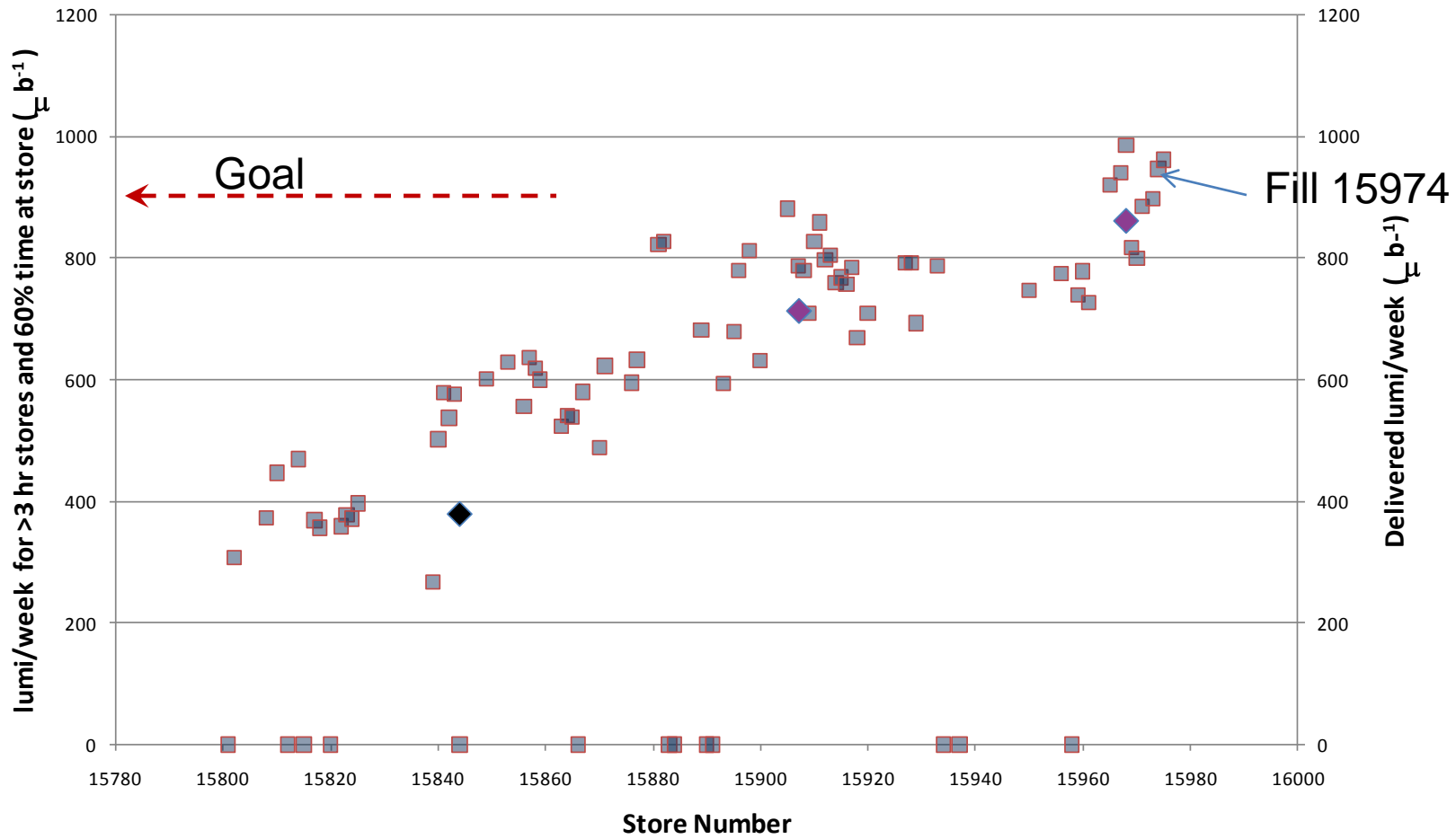
■ Integrated Physics    ◆ Maximum Luminosity

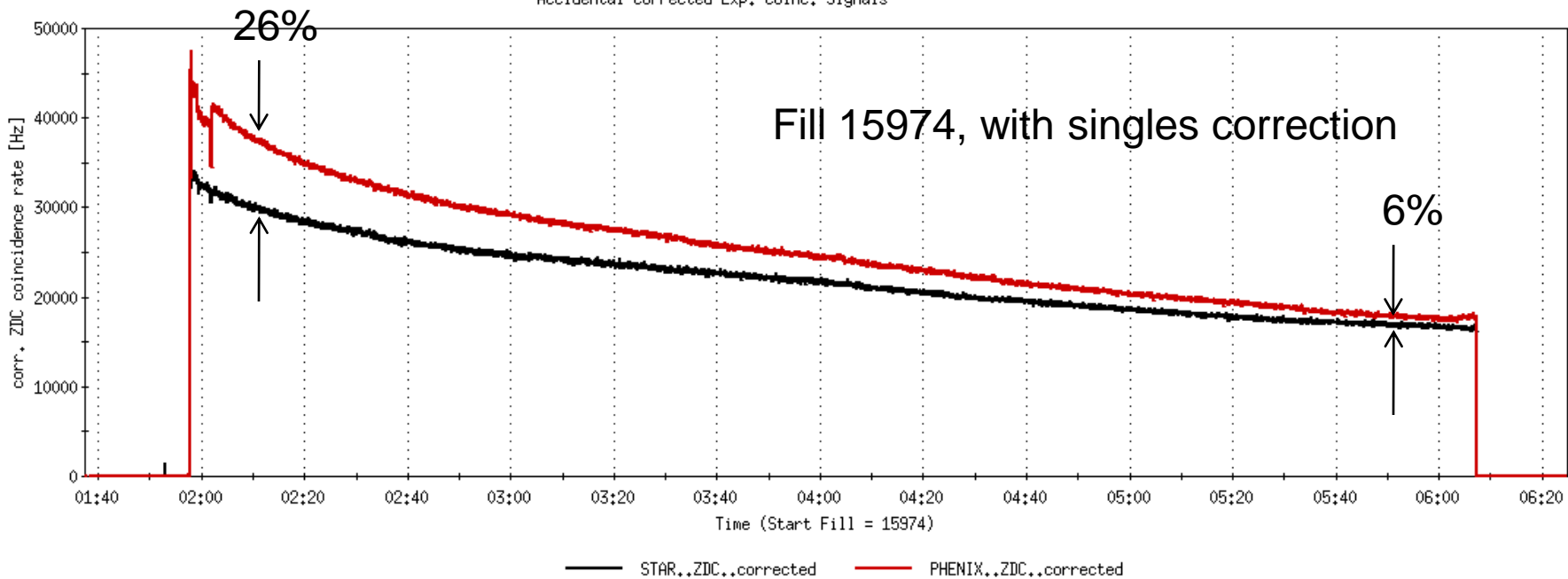
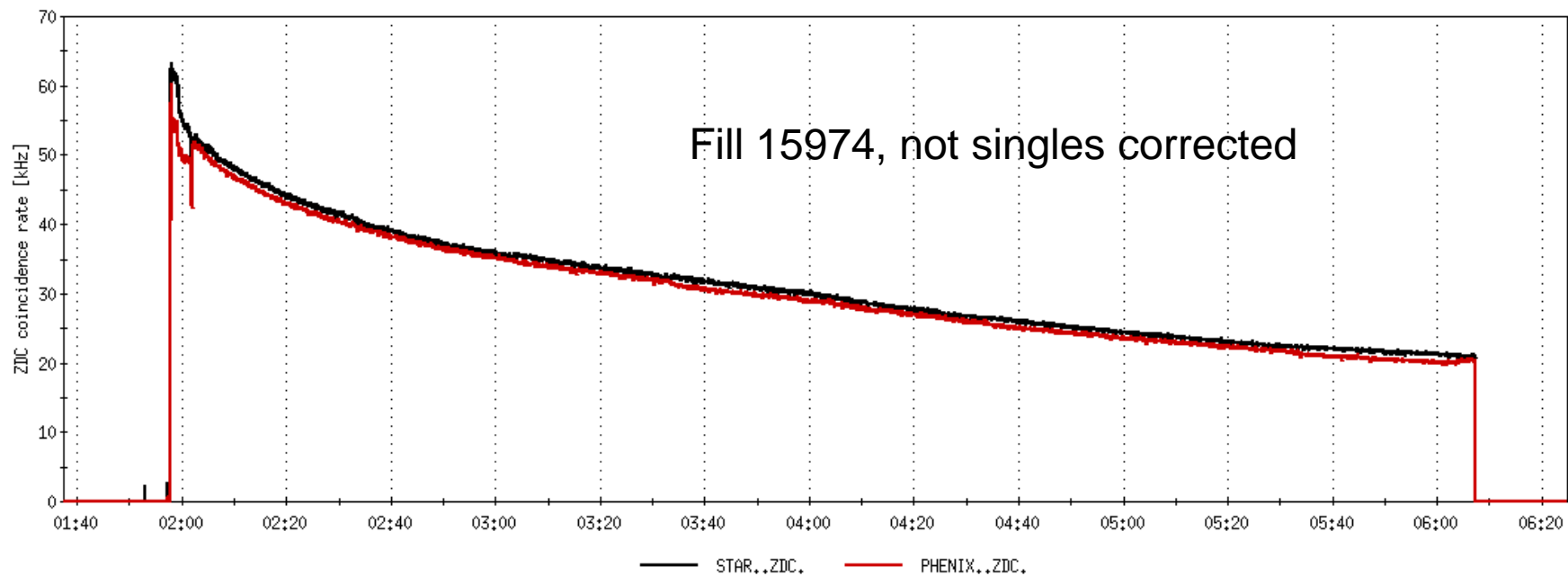


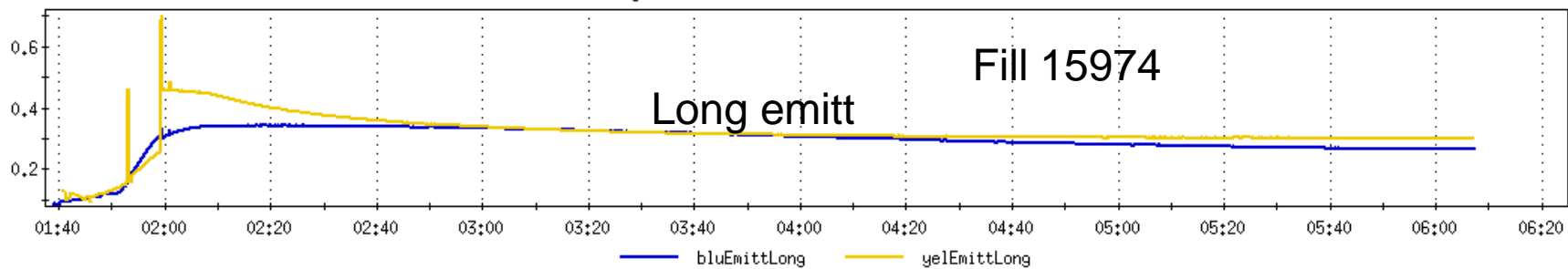
# Run 11 100 x 100 GeV/n Au-Au (Phenix)

thru fill 15975

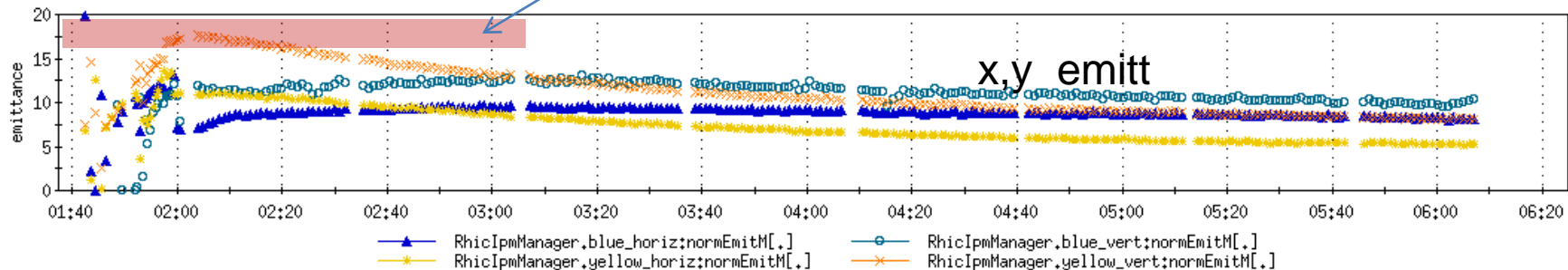
■ 60% time at store Integrated lumi    ◆ Delivered Integrated Lumi/week (Physics)



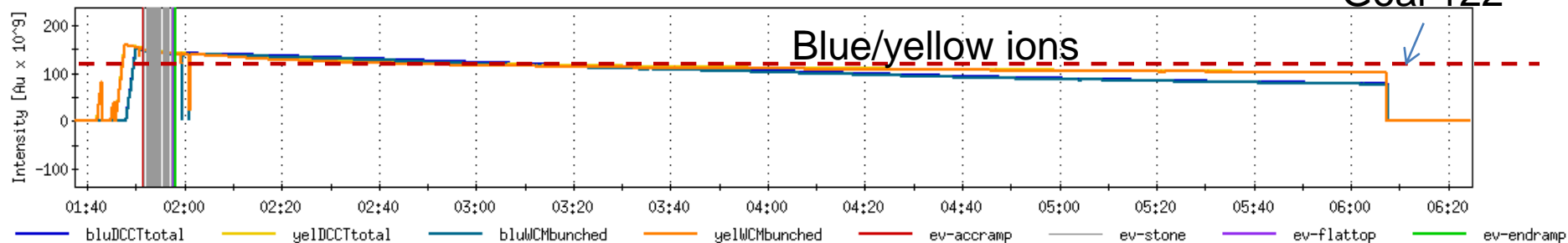




Goal 17-20

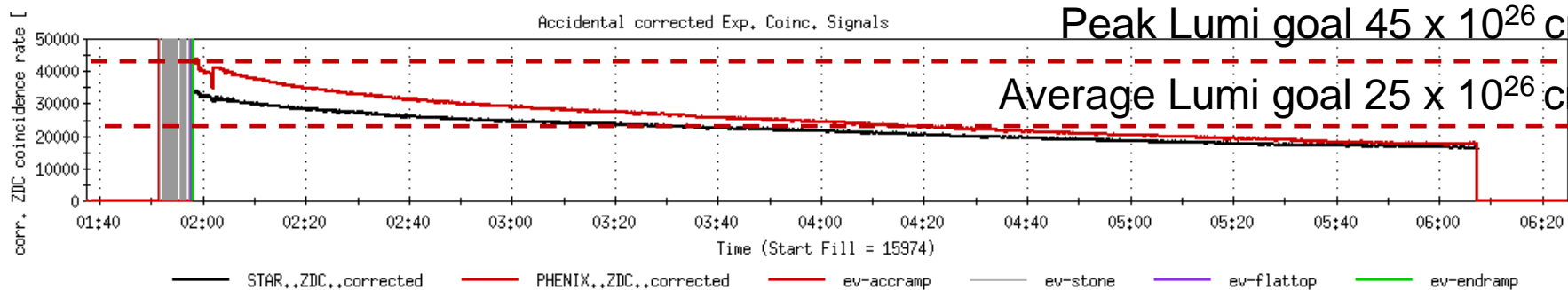


Goal 122



Peak Lumi goal  $45 \times 10^{26} \text{ cm}^{-2}\text{s}^{-1}$

Average Lumi goal  $25 \times 10^{26} \text{ cm}^{-2}\text{s}^{-1}$

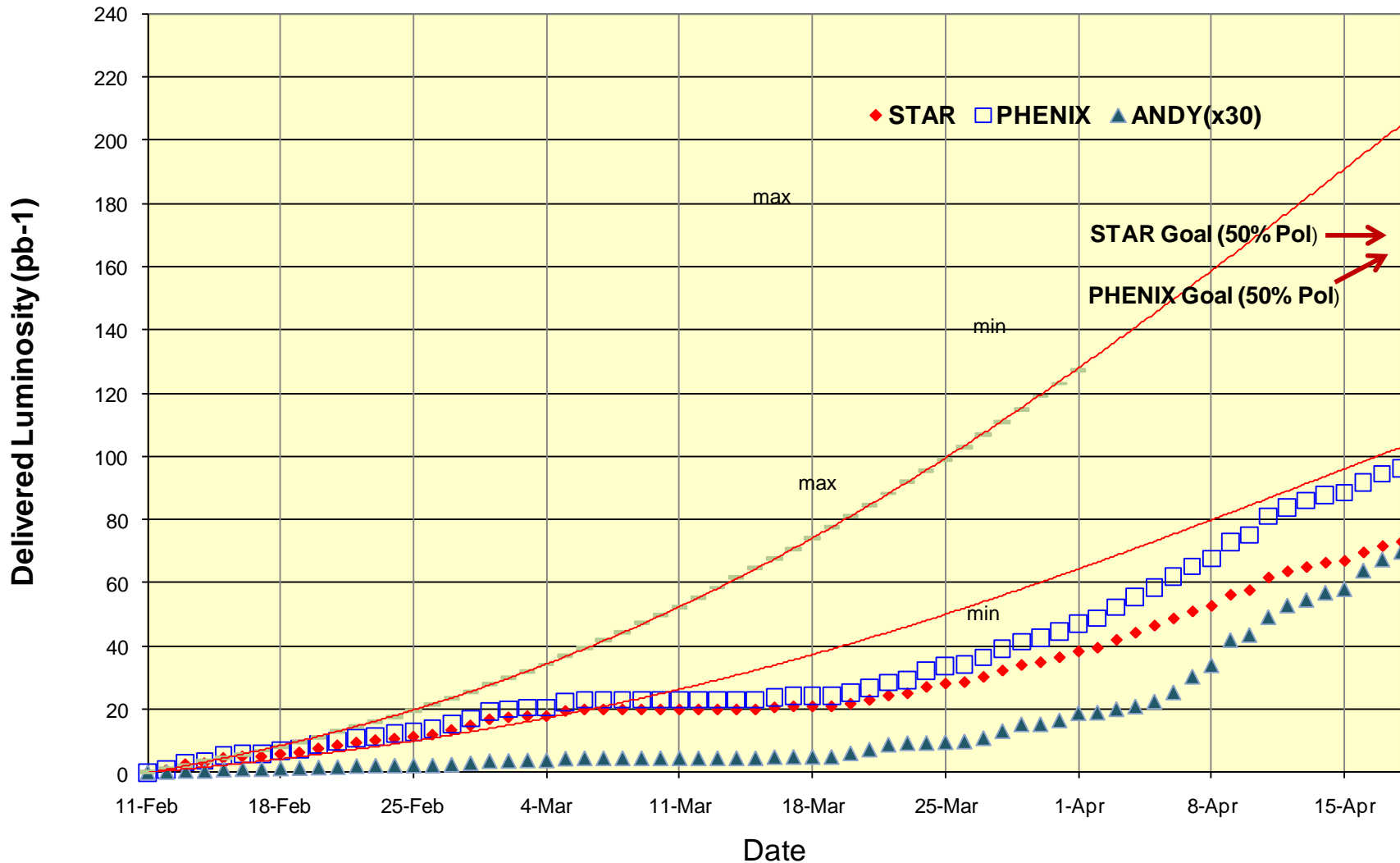




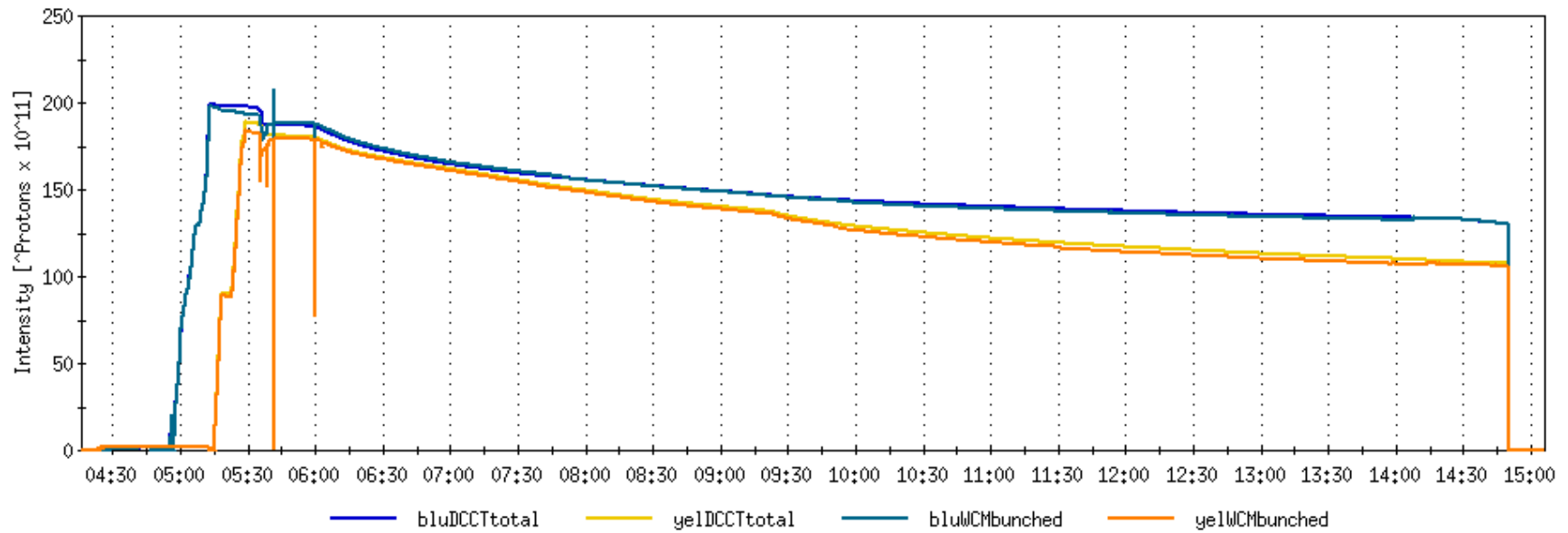
### Run 11 250 x 250 GeV pp, Luminosity

thru final fill 15472, 18 Apr

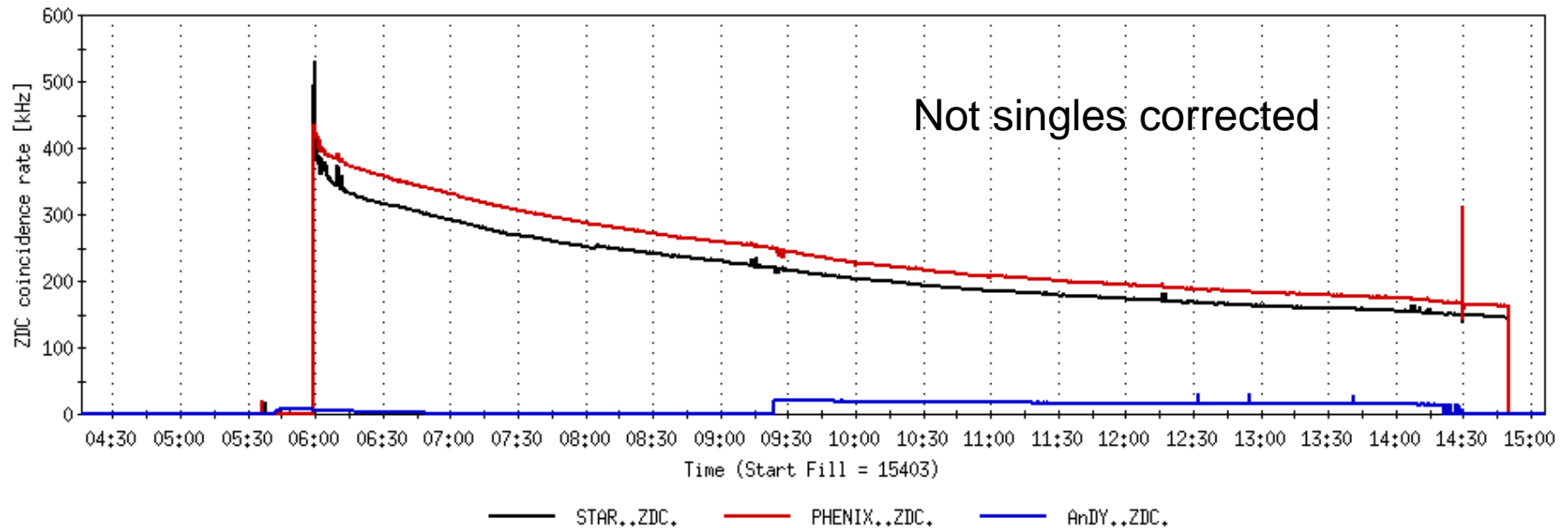
2.9 mb STAR, 2.7 mb PHENIX, 0.95 mb AnDY



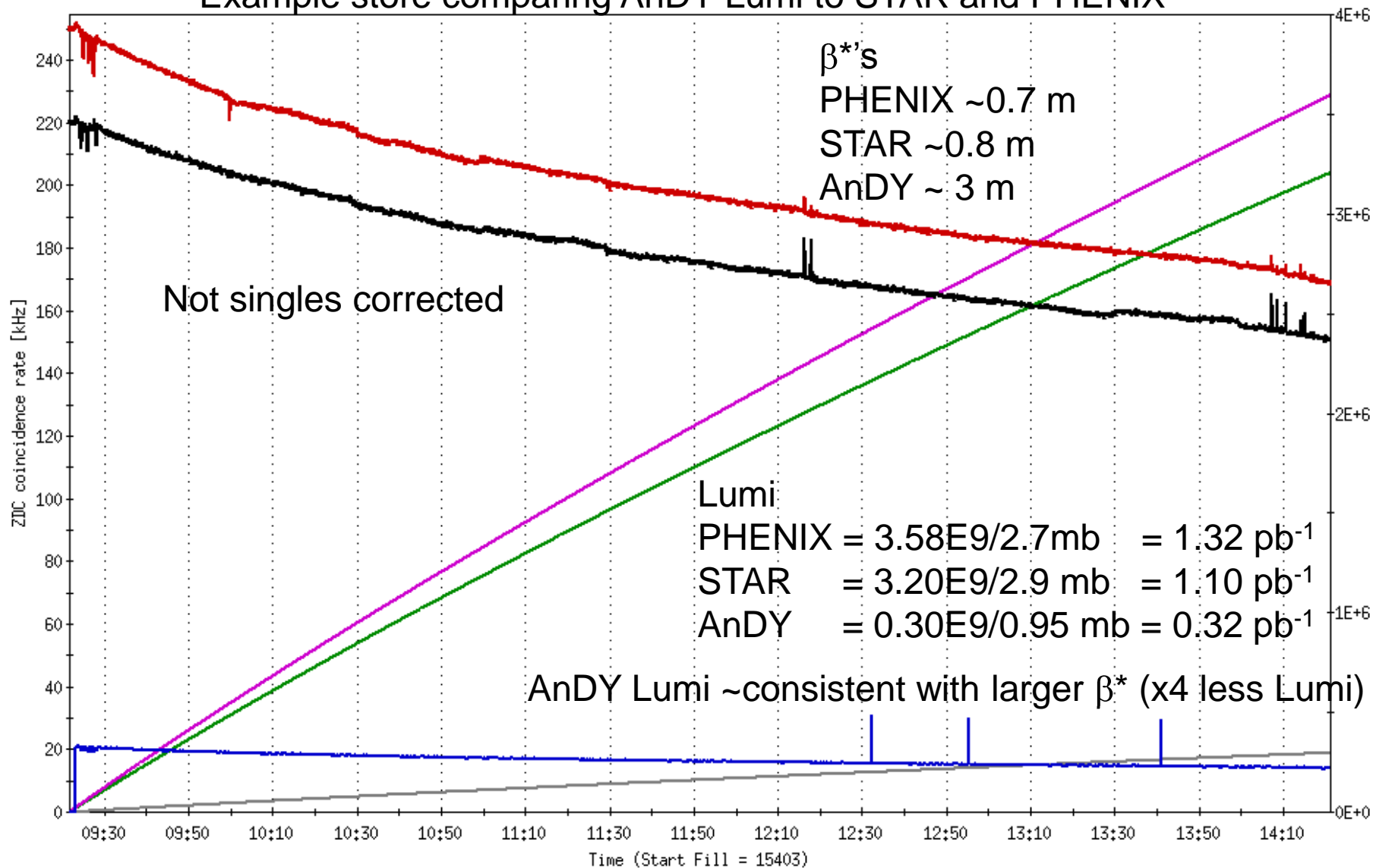
# Example store comparing AnDY Lumi to STAR and PHENIX



## Experimental Coincidence Signals

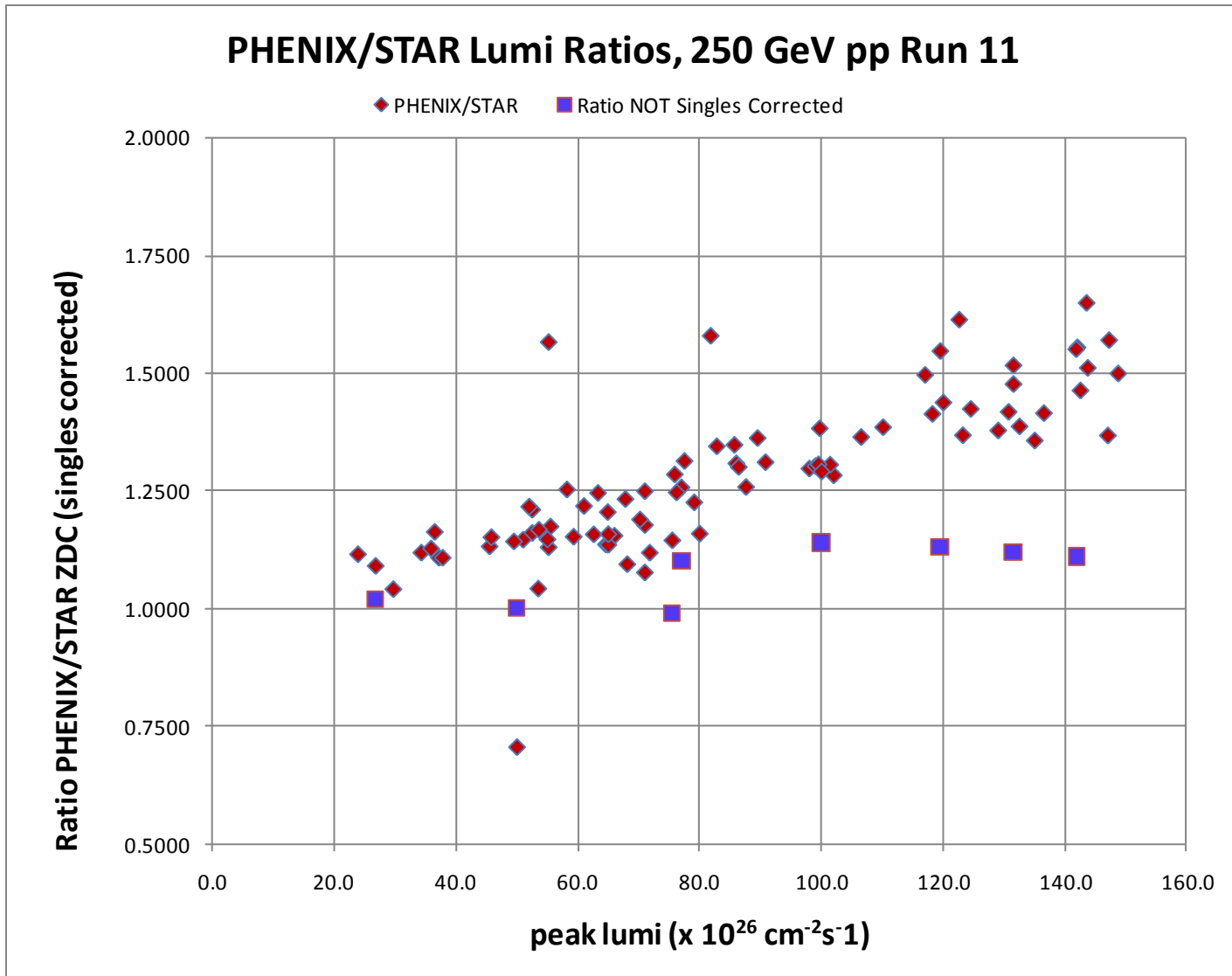


# Example store comparing AnDY Lumi to STAR and PHENIX



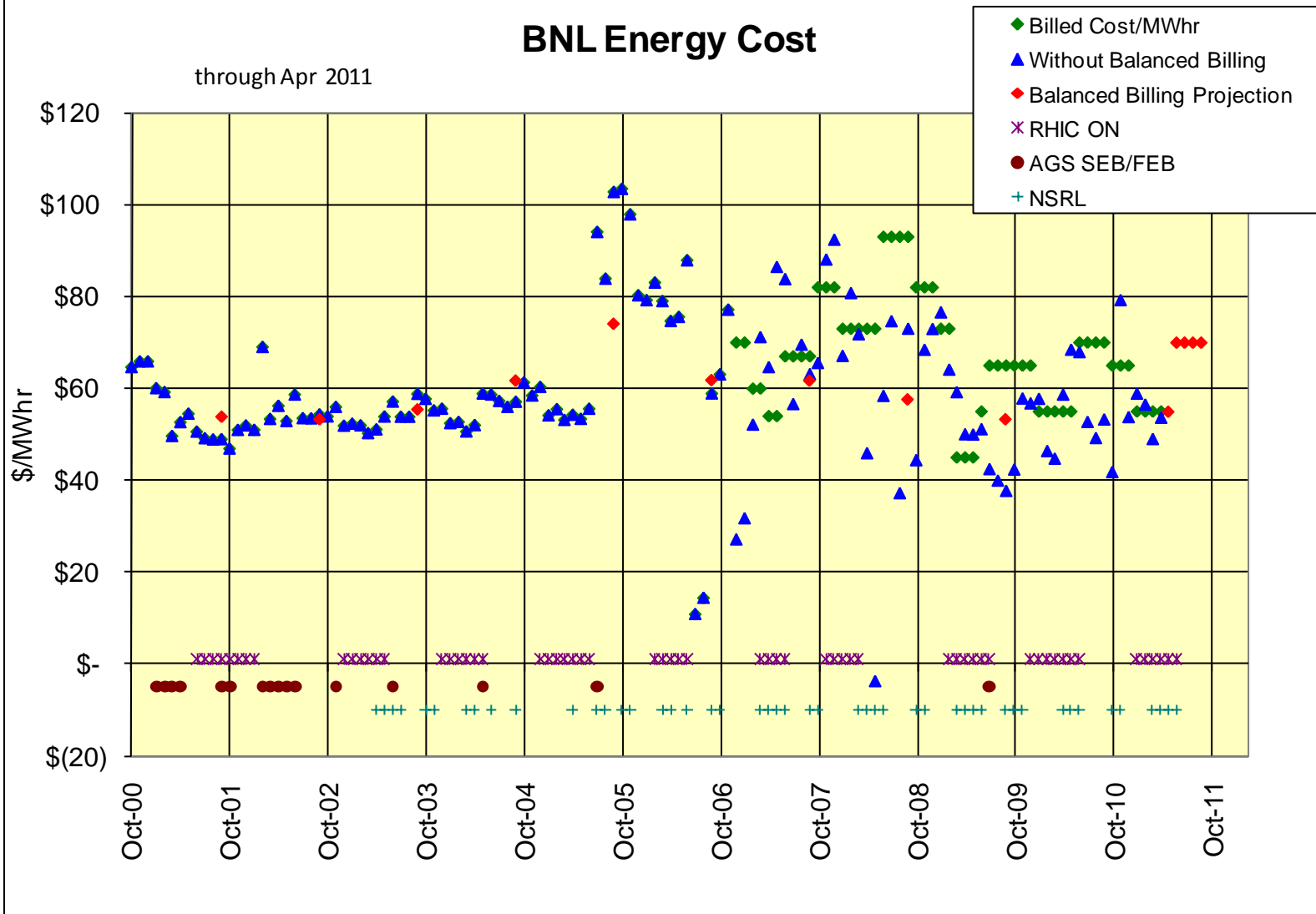
- STAR..ZDC. (Y1)
- PHENIX..ZDC. (Y1)
- AnDY..ZDC. (Y1)
- STAR..ZDC.\_sum (Y2)
- PHENIX..ZDC.\_sum (Y2)
- AnDY..ZDC.\_sum (Y2)

i.e. there's still an issue with singles corrections.



# BNL Energy Cost

through Apr 2011

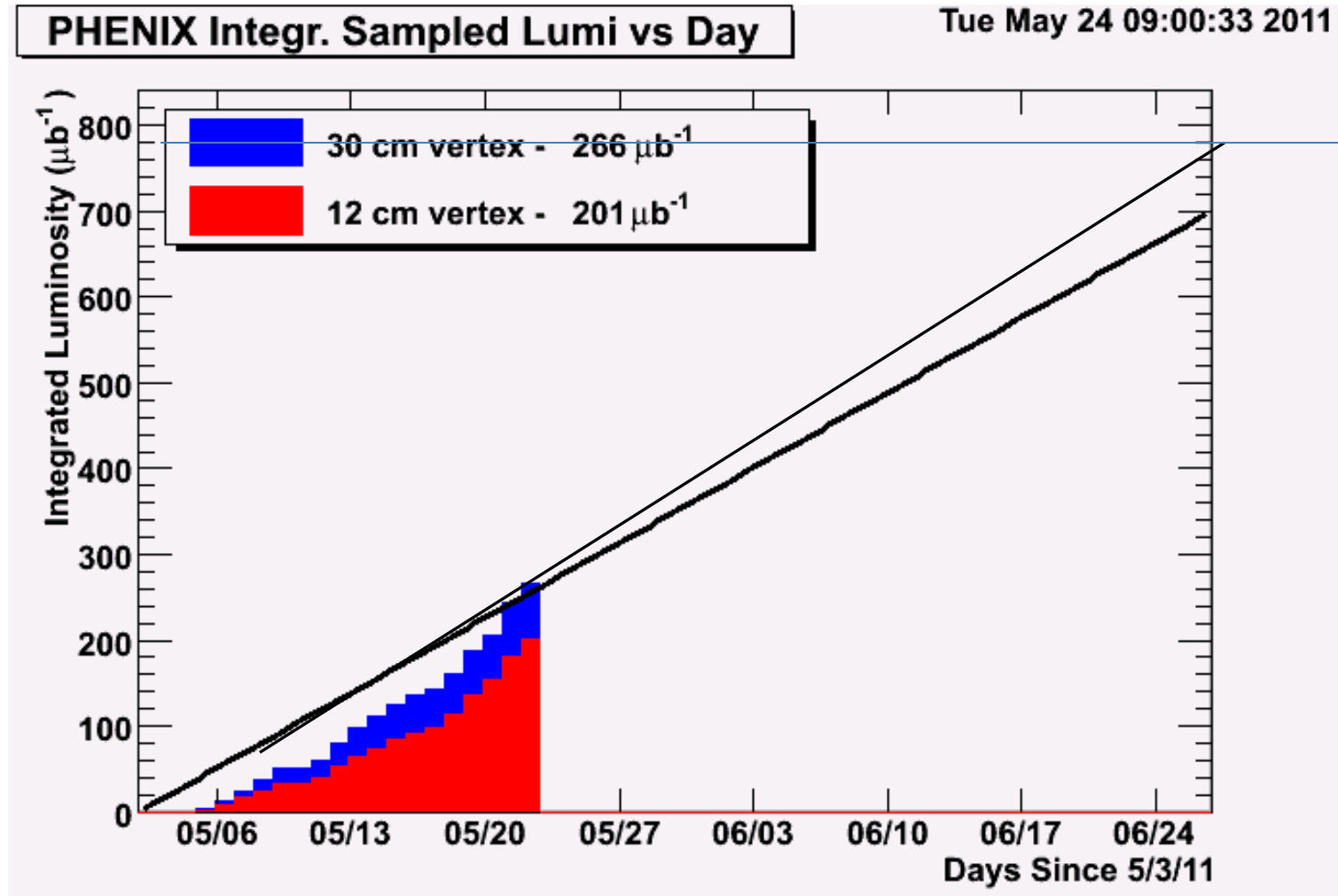


**Old information**

Through fill 15928 delivered 1474  $\mu\text{b}^{-1}$

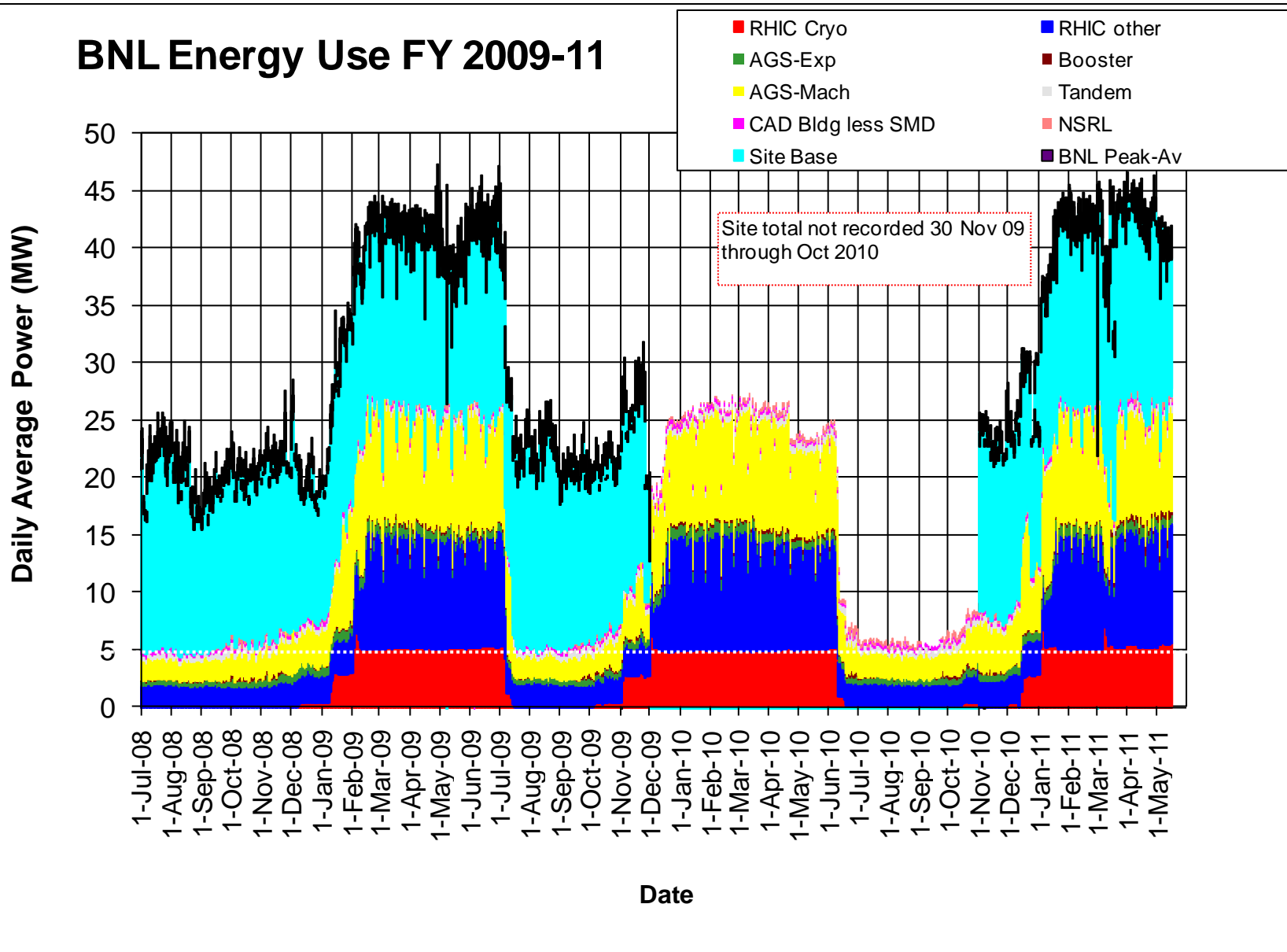
201  $\mu\text{b}^{-1}$  of 700  $\mu\text{b}^{-1}$  accumulated in 12cm vertex

→ Efficiency =  $201/1474 = 14\%$



Through 16 May 2011

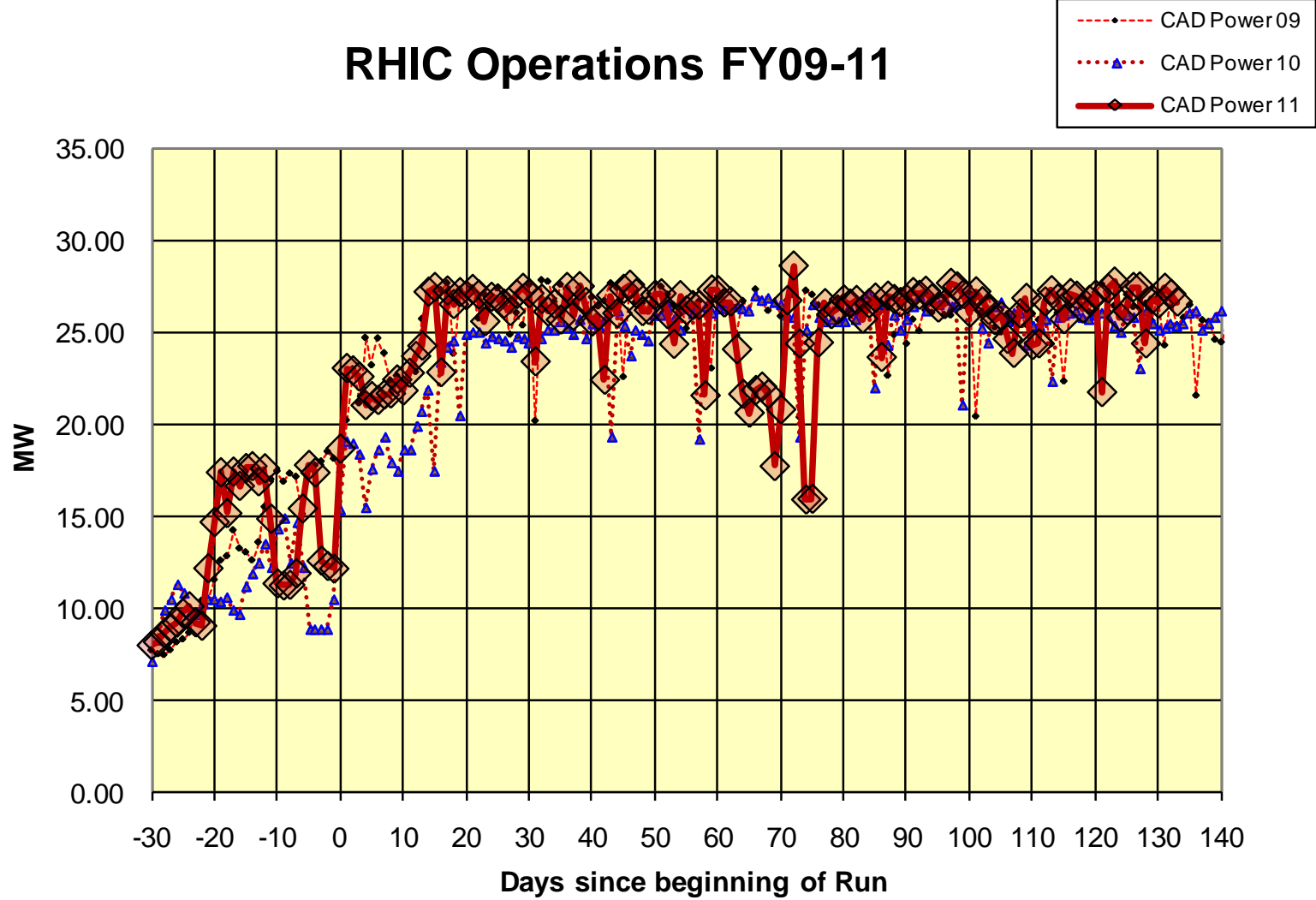
# BNL Energy Use FY 2009-11





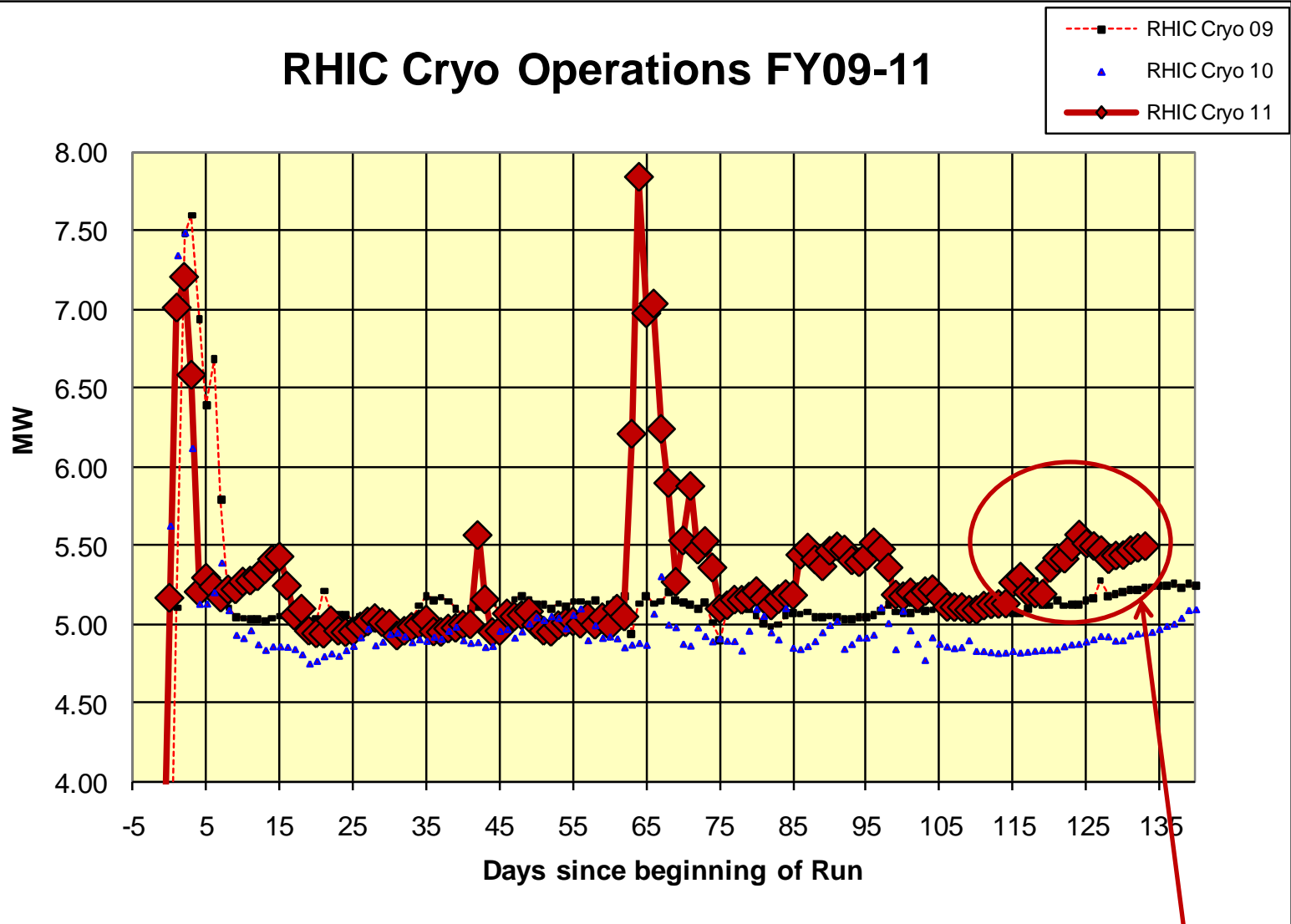
Through 16 May 2011

# RHIC Operations FY09-11



Through 16 May 2011

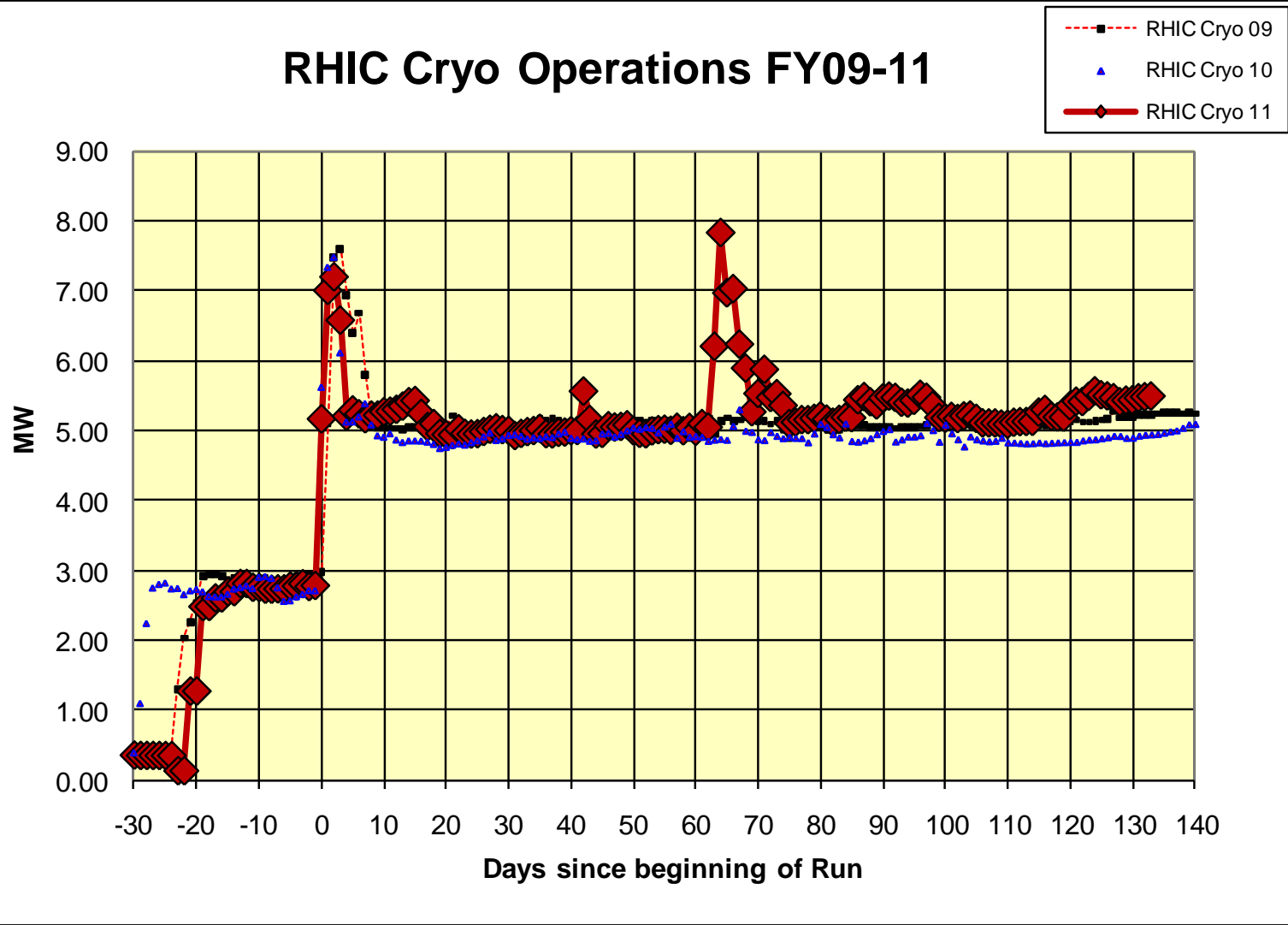
## RHIC Cryo Operations FY09-11



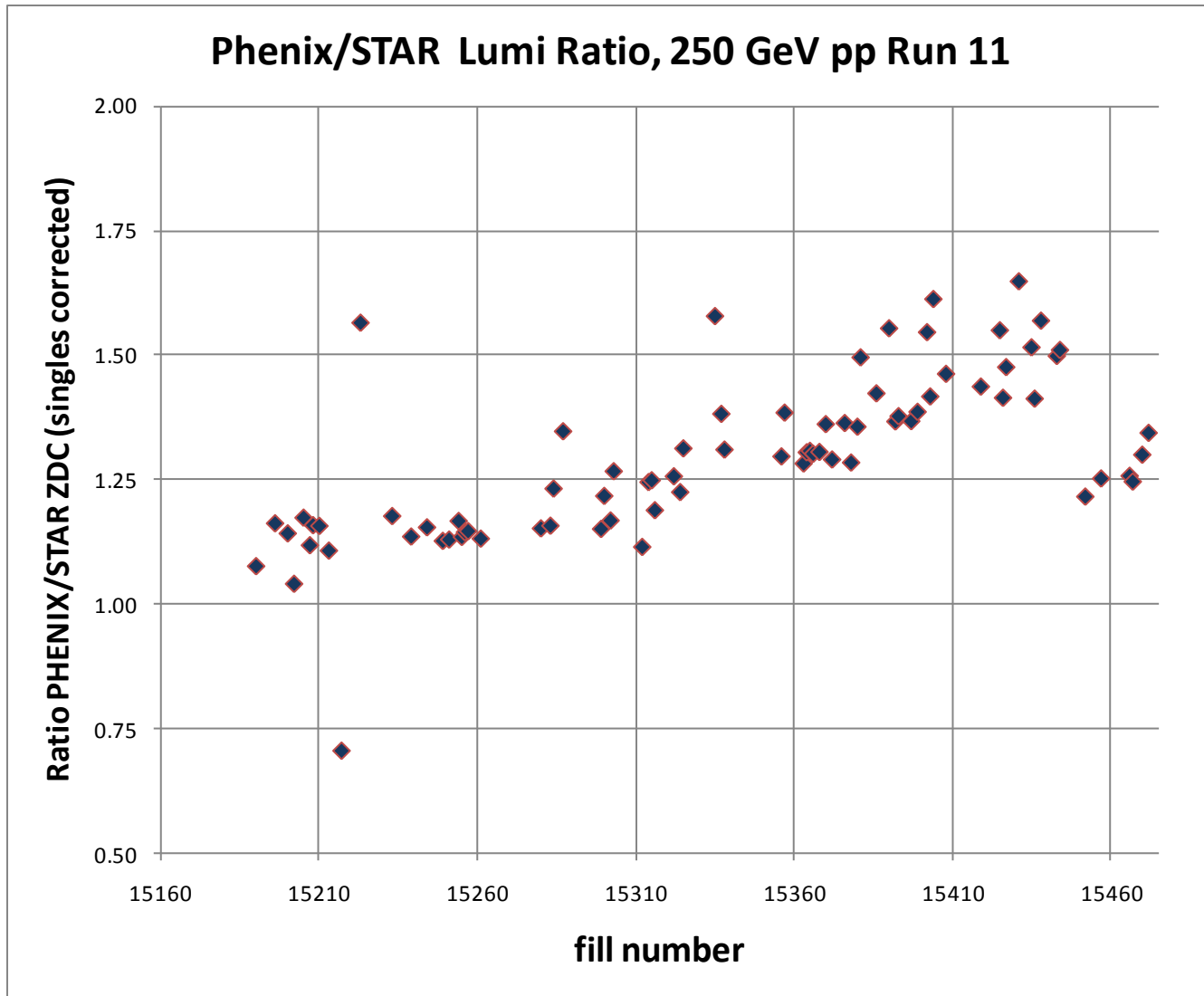
Possible oil contamination in one of the heat exchangers

Through 16 May 2011

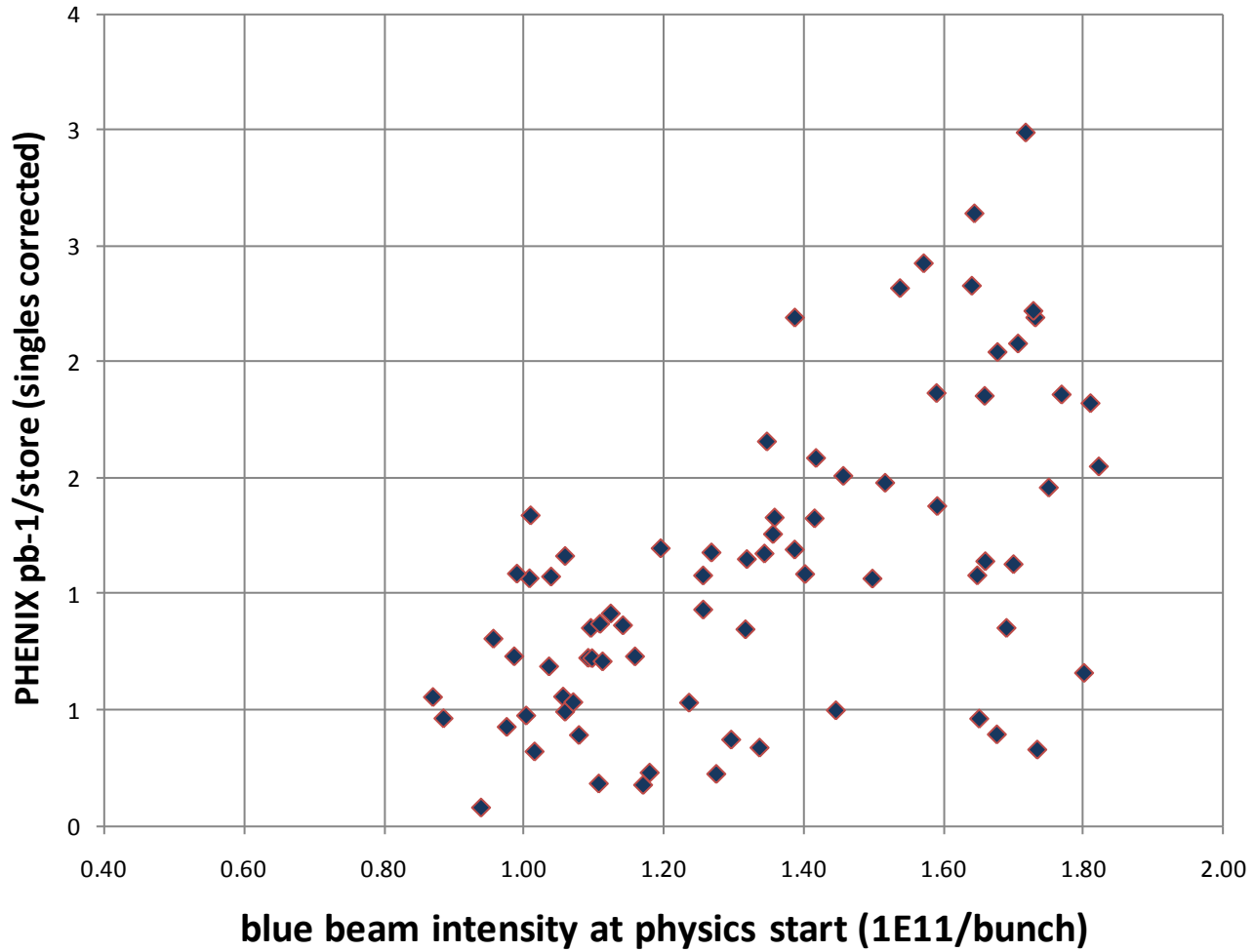
### RHIC Cryo Operations FY09-11



Final Lumi should change as it appears there's an issue with the singles correction



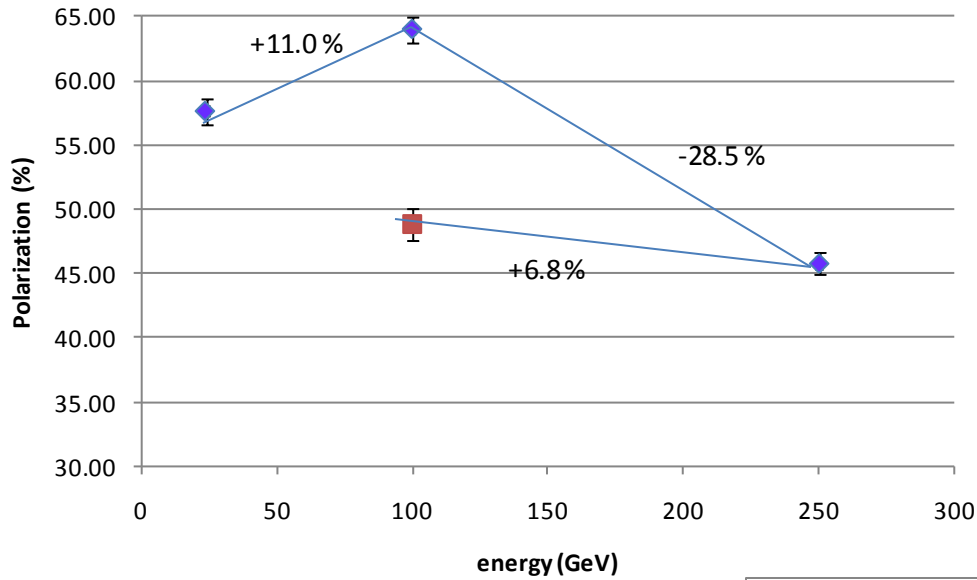
Phenix Lumi vs beam intensity, 250 GeV pp Run 11



## Run 11 Plan based on PAC recommendation/ALD Guidance and available funds 4/26/10 update (1/2)

- 3 Jan, Begin cool-down to 4.5K
- 8 Jan, Cool-down to 4.5K complete in both rings, preliminary setup begins
- ~11 Jan, 2 ½ weeks beam setup for  $\sqrt{s} = 500$  GeV pp in RHIC begins.
- 15 Jan, power supply work/DX training complete
- 17 Jan, first successful ramp
- 19 Jan, 1<sup>st</sup> maint day
- 24 Jan, 1 week Ramp-up with 8 hr/night beam to experiments
- **11 Feb (machine and ~experiments), begin ~10 week physics run ( $\sqrt{s} = 500$  GeV pp)**
- 16 Feb, AGS Jump Quads in routine operation for RHIC injection
- 24 Feb, 9 MHz cavity in routine operation
- 7 Mar, cryo troubles, extended maintenance, 0900 hrs till 2000 hrs 14 Mar – lost 7.5 days
- 17 Mar, power distribution problem, extended maintenance, 1930 hrs till 0315 hrs 20 Mar – lost 2.3 days
- 28 March – 1 April, PAC 2011
- **15 April Continuing Resolution Ends, guidance to follow**
- **18 Apr, end 9.4 week pp physics run at  $\sqrt{s} = 500$  GeV**
- 18 Apr jet target polarization measurement at injection (<5%)
- 19 Apr, short maintenance followed by setup for  $\sqrt{s} = 18$  GeV AuAu
- **23 Apr, begin ~1 week physics run ( $\sqrt{s} = 19.6$  AuAu)**
  
- **2 May, end 1.3 week physics run at  $\sqrt{s} = 19.6$  GeV**

**Up down ramp, Blue Beam  
polarization with current analyzing powers**

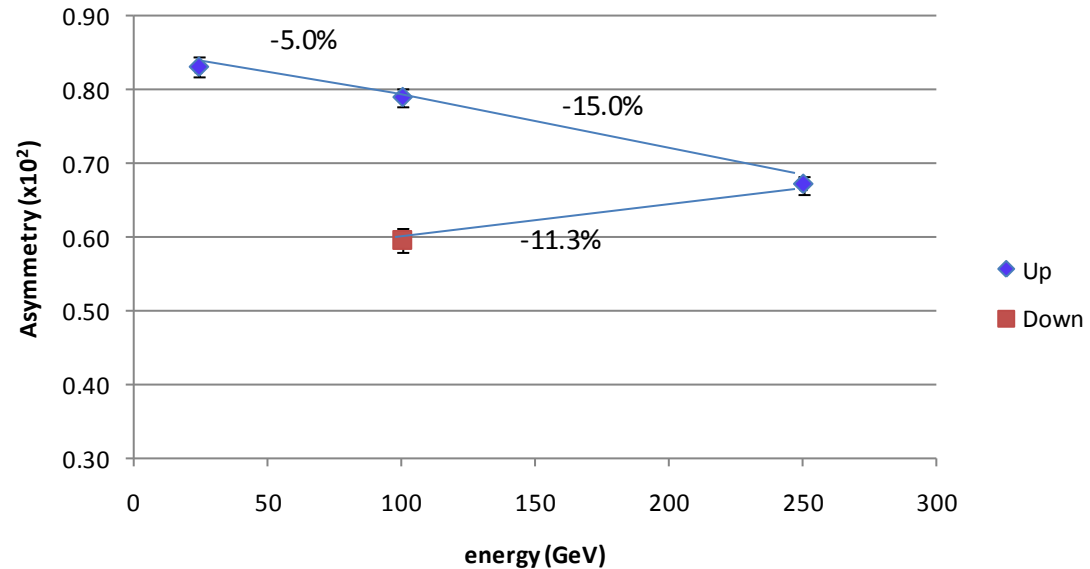


7 April Up-Down Ramp measurement  
Blue Beam

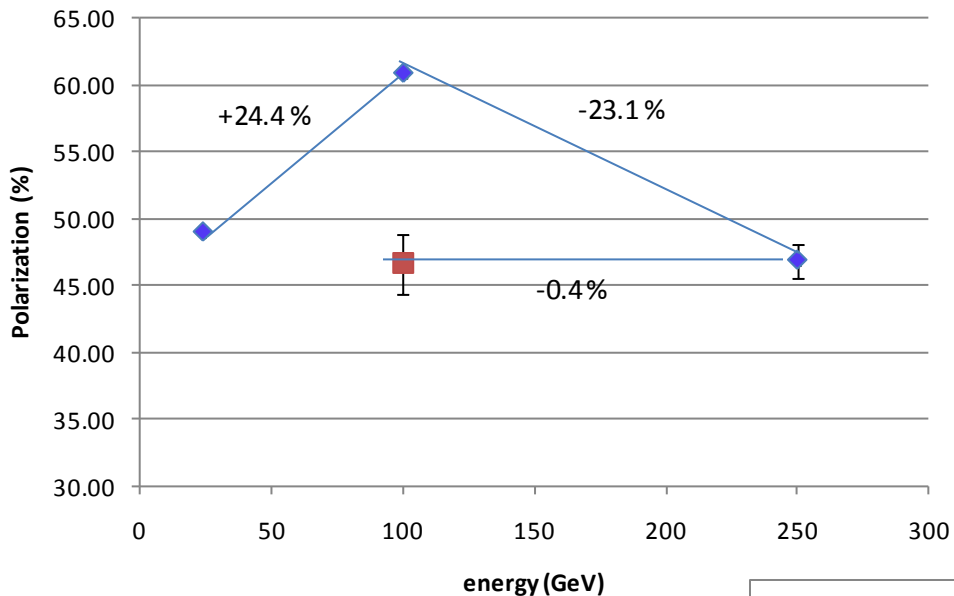
Current CNI average analyzing powers are:

Energy	AN
24	0.0144
100	0.0122
250	0.0147

**Up down ramp, Blue Beam  
Asymmetry**



**Up down ramp, Yellow Beam**  
**polarization (#1 only) with current analyzing powers**



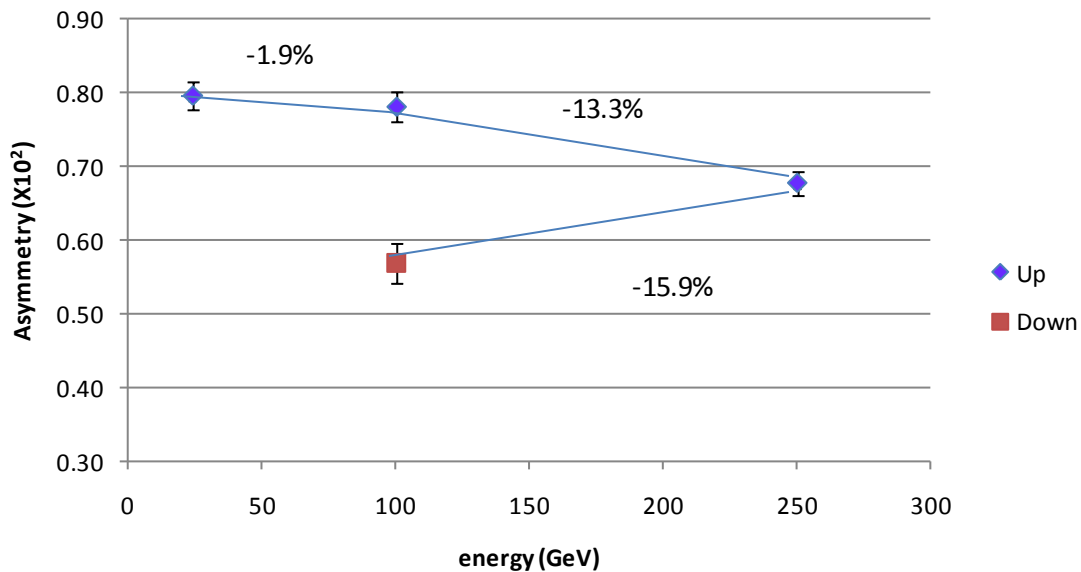
7 April Up-Down Ramp measurement  
 Yellow Beam (only Yellow 1 was used as Yellow 2 was acting up)

Current CNI average analyzing powers are:

Energy	AN
24	0.0144
100	0.0122
250	0.0147

◆ Up  
 ■ Down

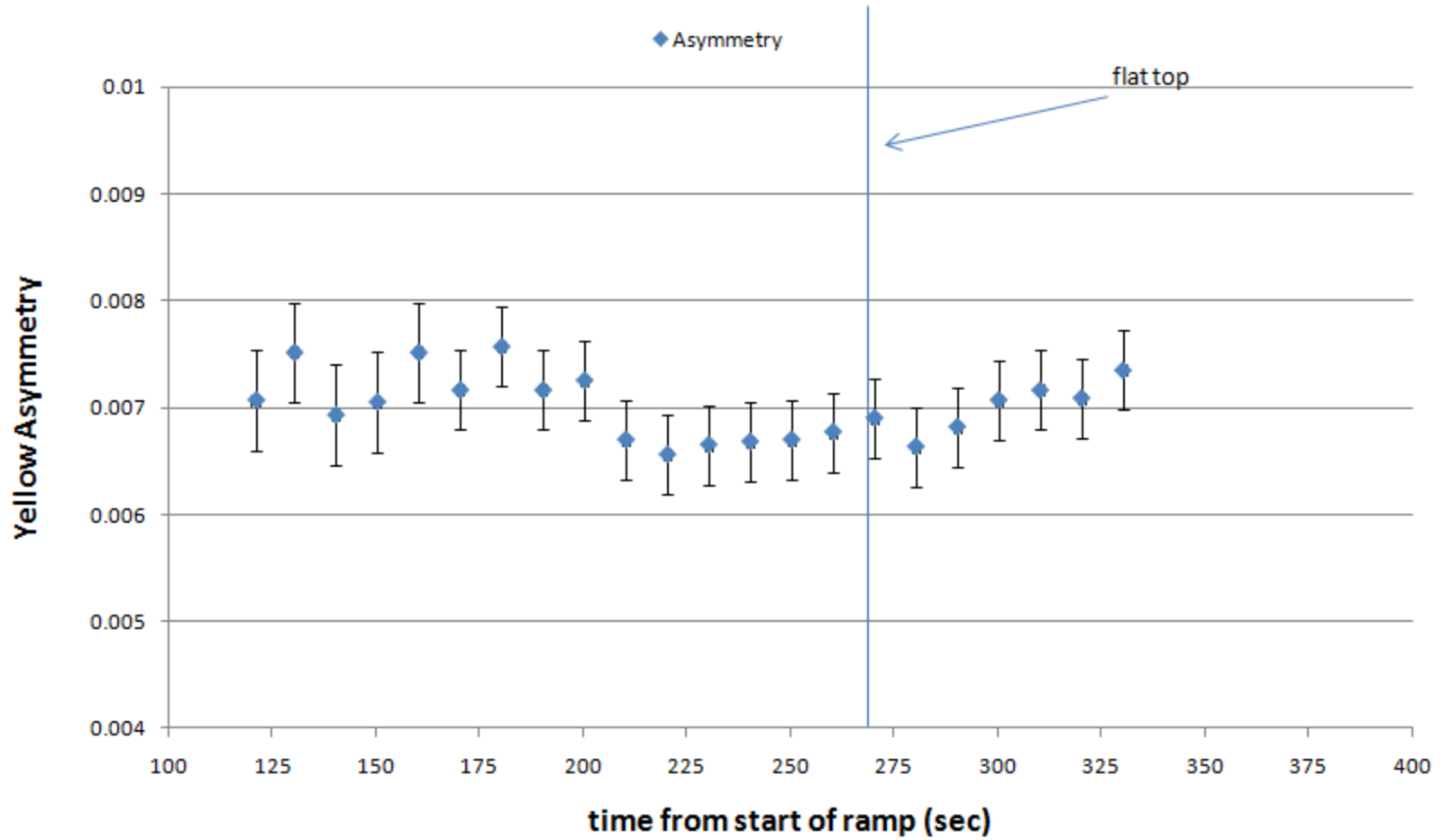
**Up down ramp, Yellow Beam**  
**asymmetry (CNI #1 only)**



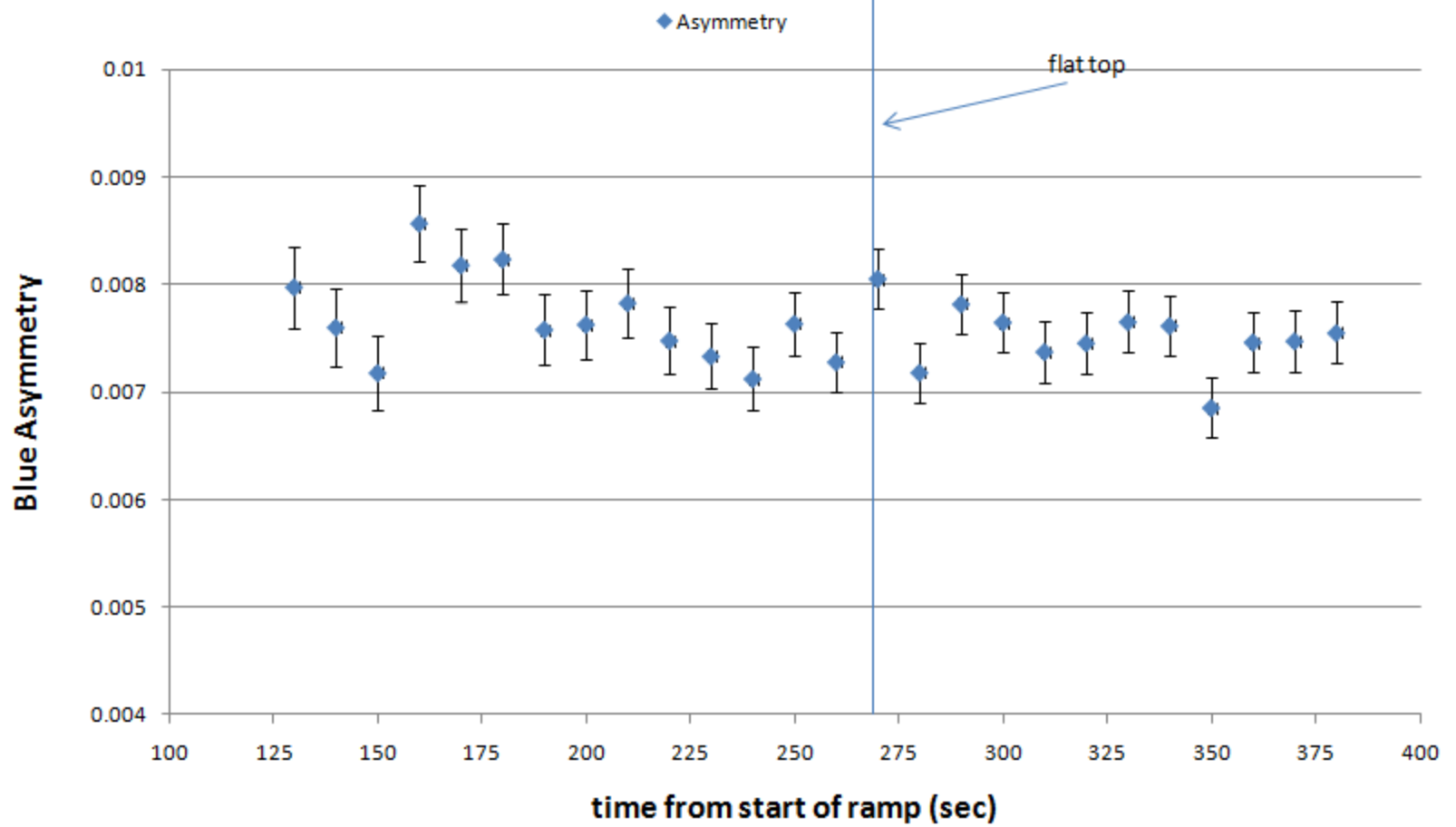
◆ Up  
 ■ Down

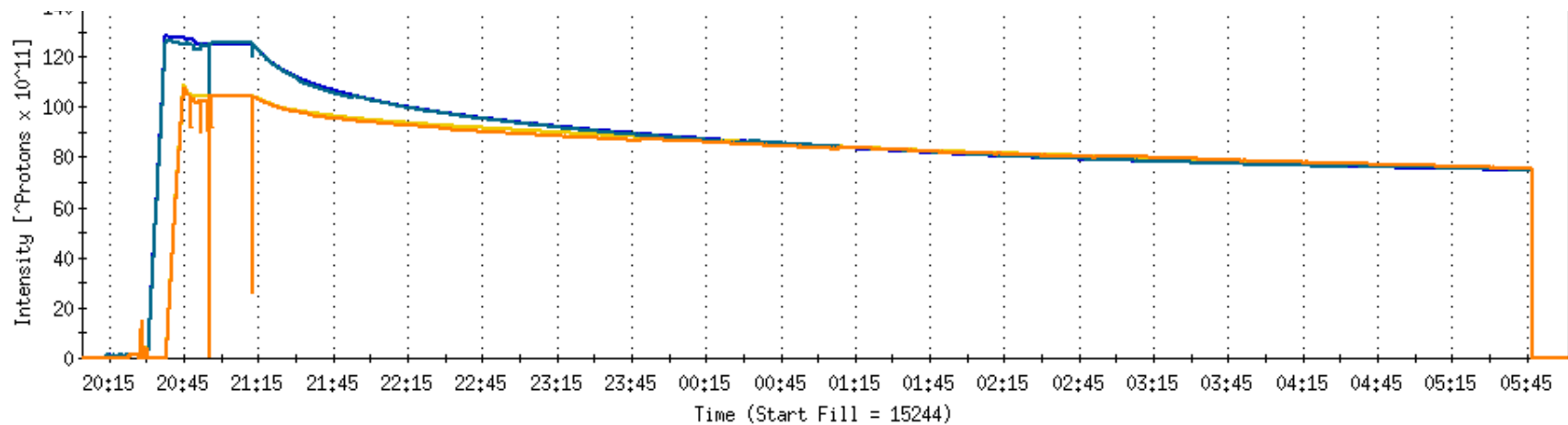
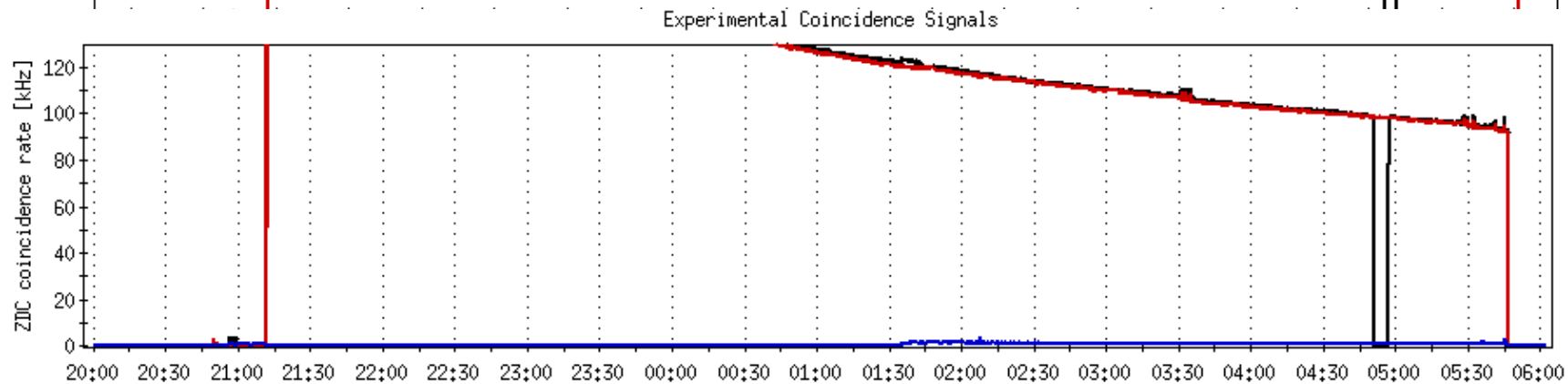
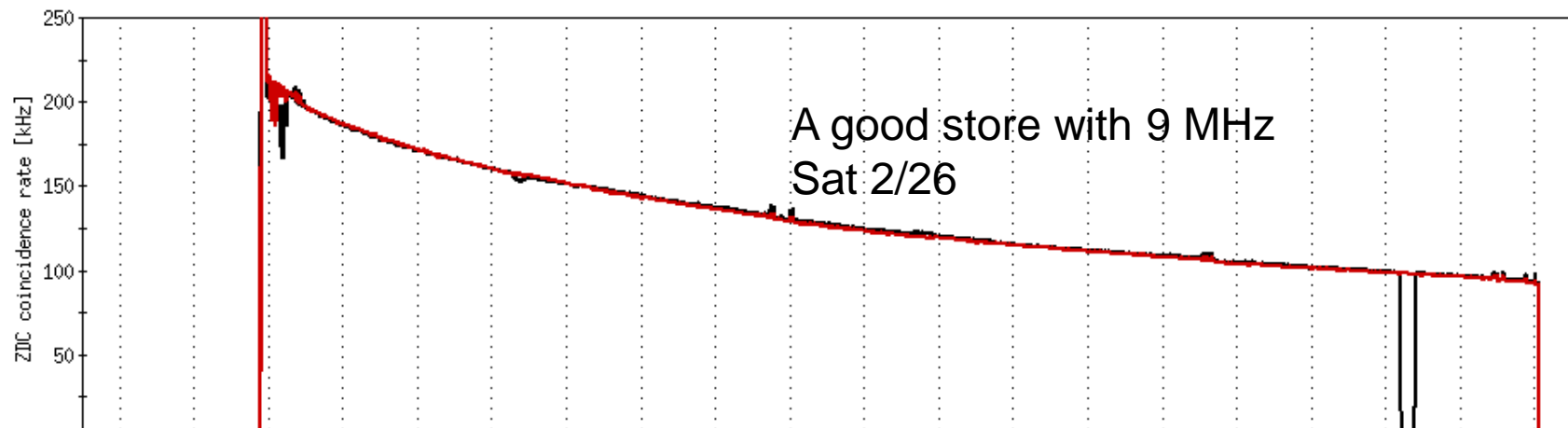


### CNI On the Ramp, fill 15366



### CNI On the Ramp, fill 15378





— bluDCCTtotal

— yelDCCTtotal

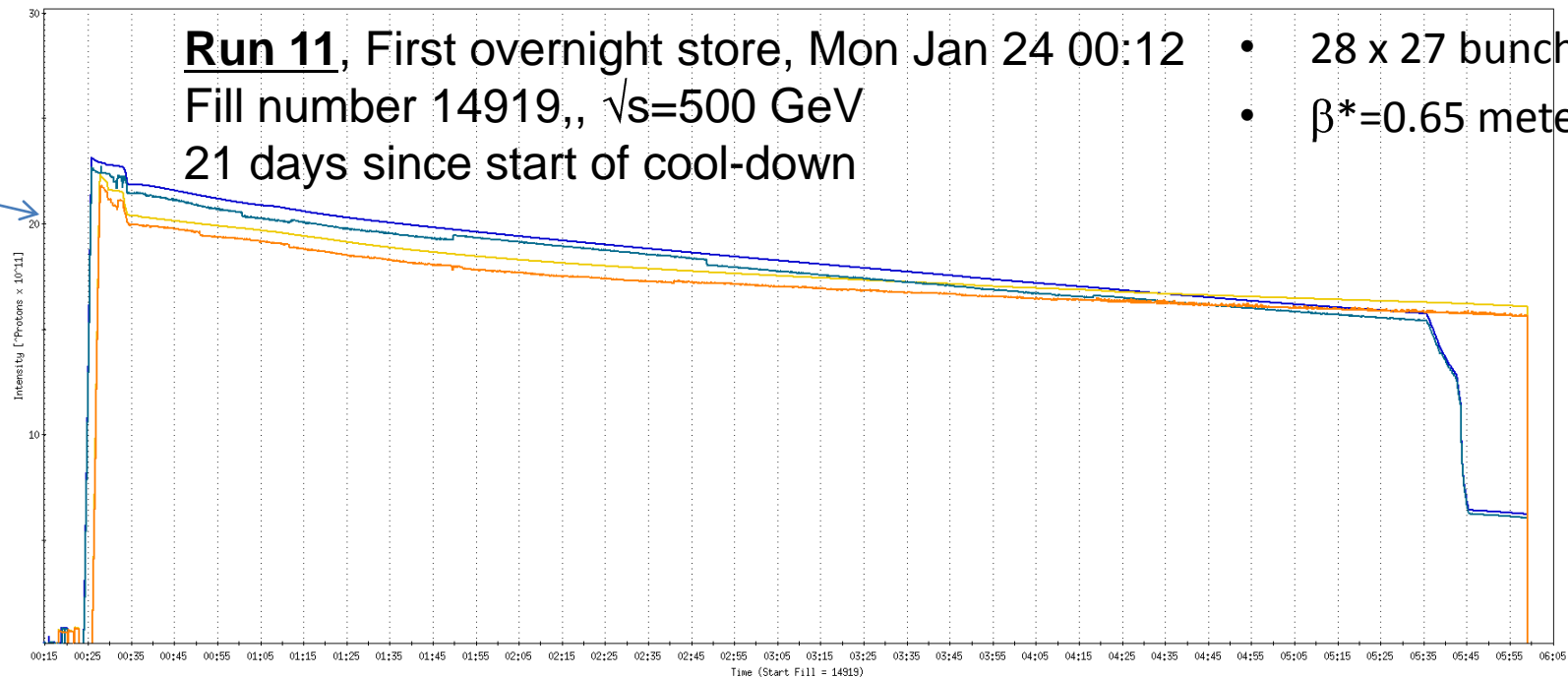
— bluWCMbunched

— yelWCMbunched

**Run 11**, First overnight store, Mon Jan 24 00:12  
Fill number 14919,,  $\sqrt{s}=500$  GeV  
21 days since start of cool-down

- 28 x 27 bunches
- $\beta^*=0.65$  meters

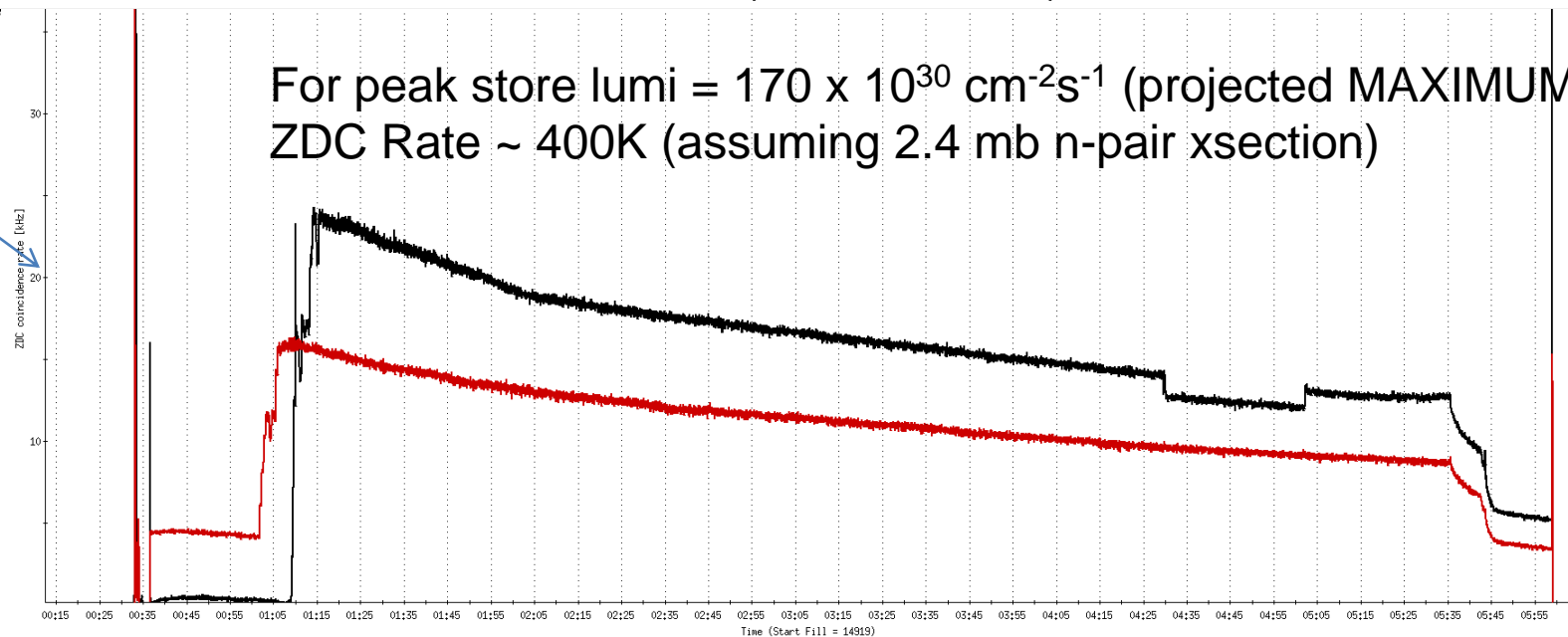
20 x 10<sup>11</sup>



bluDCCTtotal (C)    yelDCCTtotal (C)    bluDCBunched    yelDCBunched

For peak store lumi =  $170 \times 10^{30} \text{ cm}^{-2}\text{s}^{-1}$  (projected MAXIMUM)  
ZDC Rate ~ 400K (assuming 2.4 mb n-pair xsection)

20K



STAR\_ZDC (C)    PHENIX\_ZDC (C)

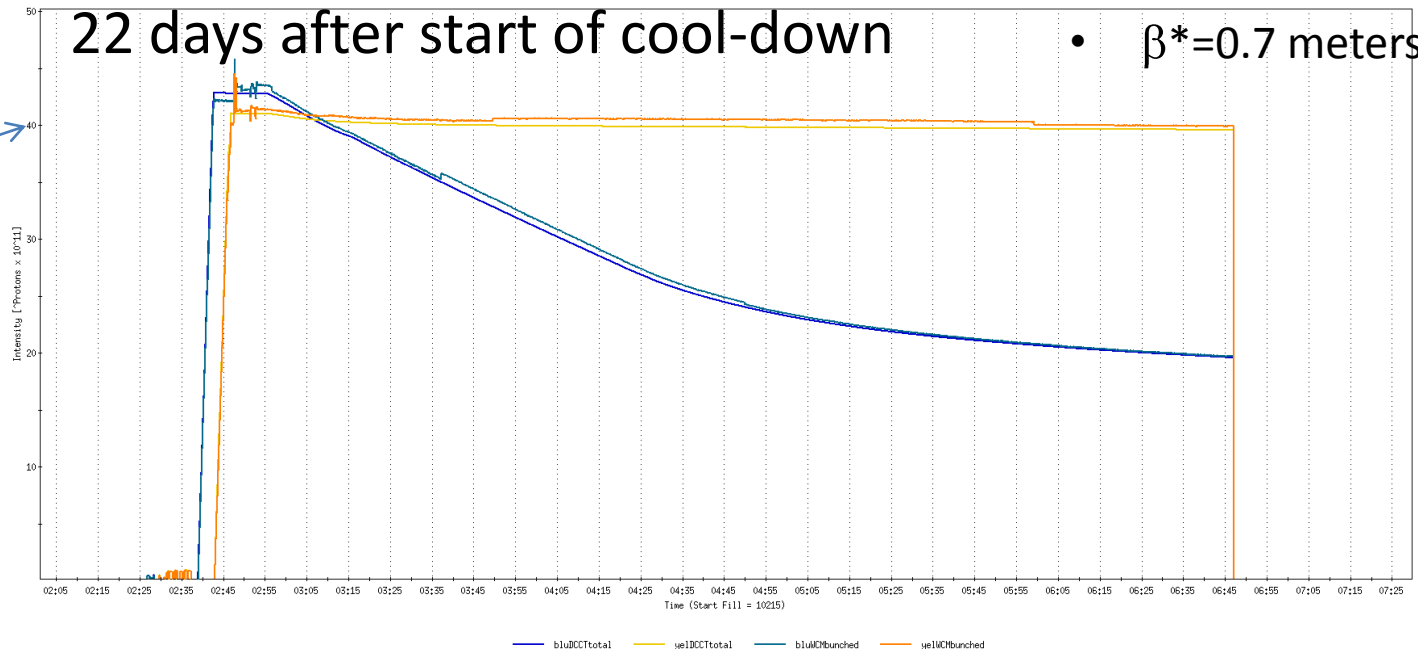
# Run 9, First overnight store at $\sqrt{s}=500$ GeV

• 56 x 56 bunches

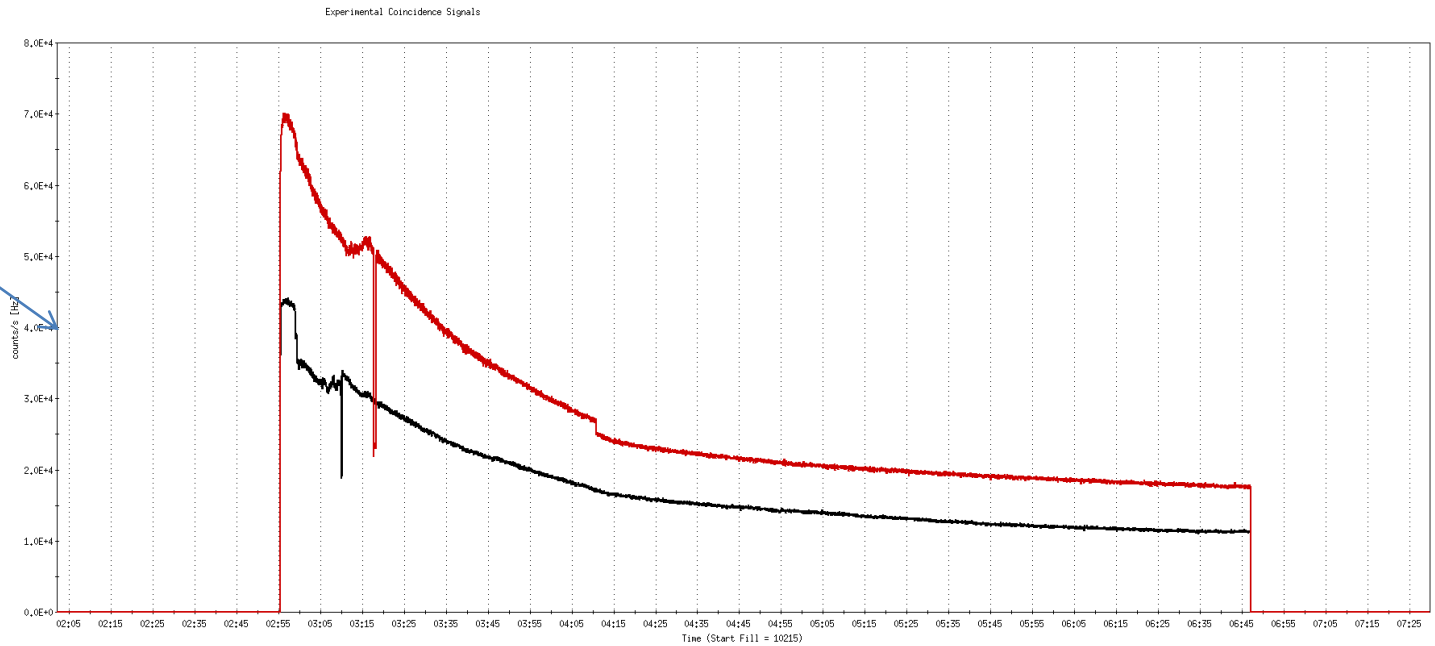
•  $\beta^*=0.7$  meters

## 22 days after start of cool-down

$40 \times 10^{11}$

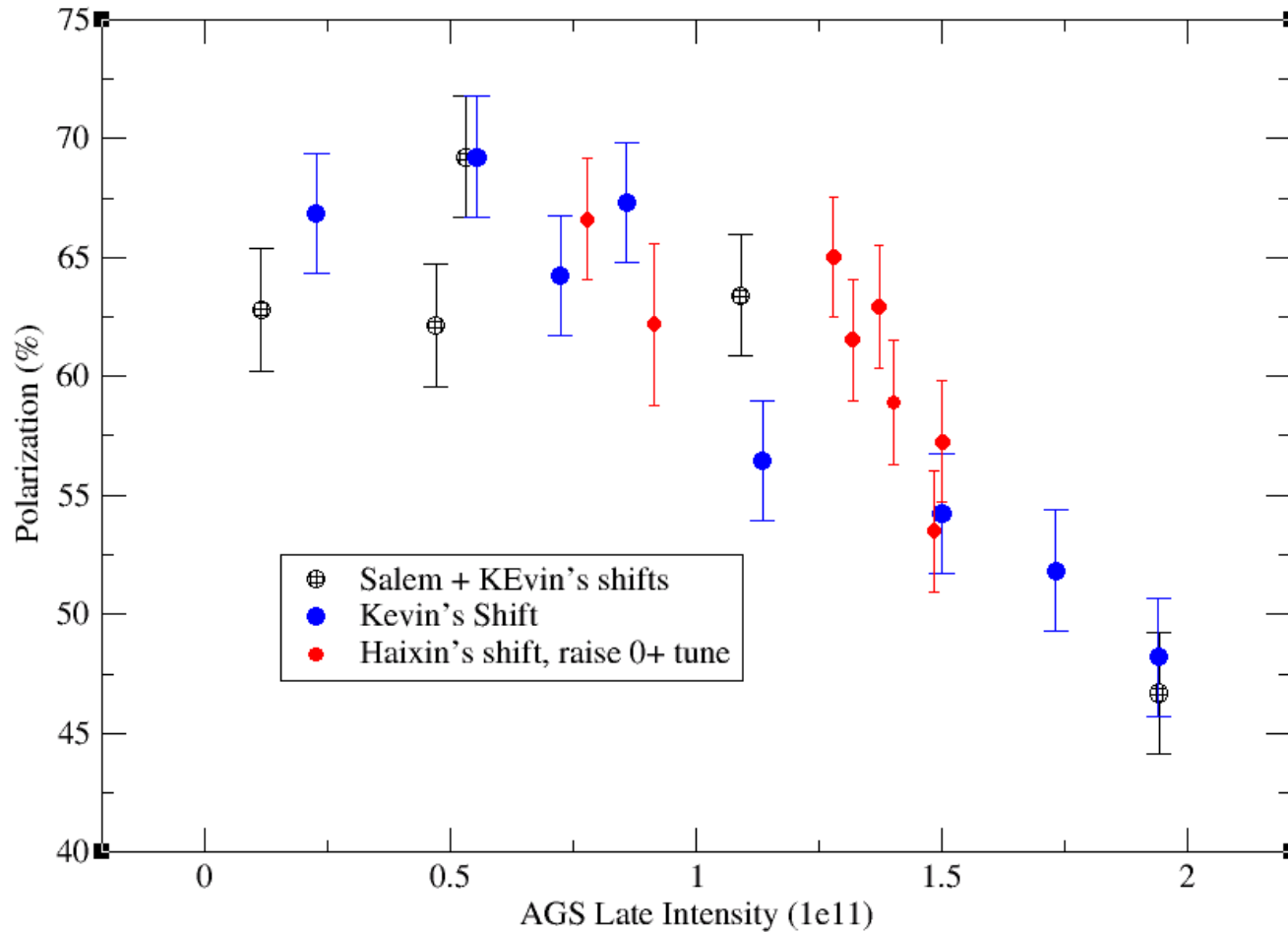


40K



G0: X, Y = [-0.402176, 34.134]

## AGS pp log, 23 Feb 09, 00:26

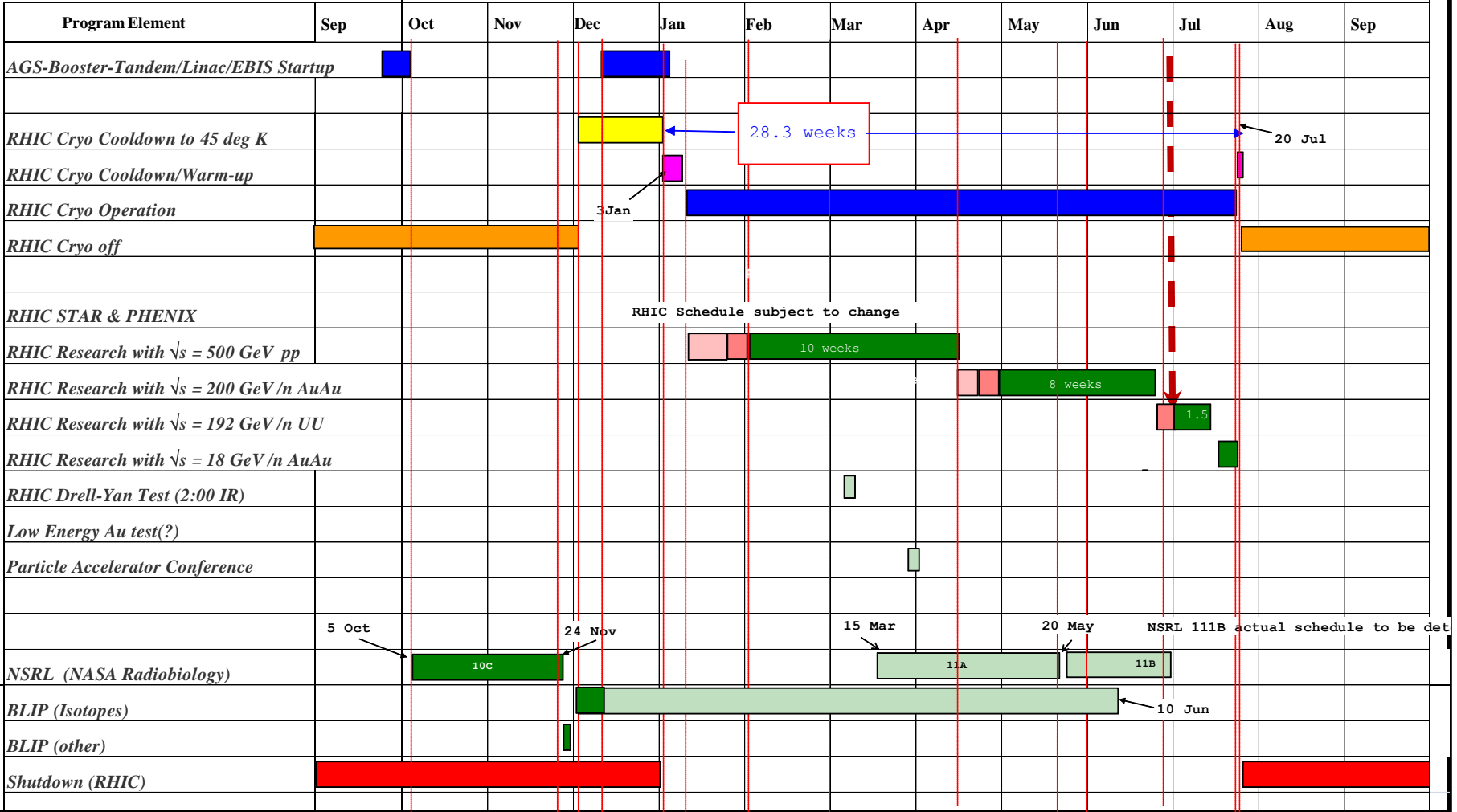


# C-A Operations-FY11

planned (budget permitting)

- concurrent with RHIC
- setup with beams
- ramp up luminosity

FY 2011



28.3 weeks

20 Jul

3 Jan

RHIC Schedule subject to change

10 weeks

8 weeks

1.5

5 Oct

24 Nov

15 Mar

20 May

NSRL 111B actual schedule to be det

10c

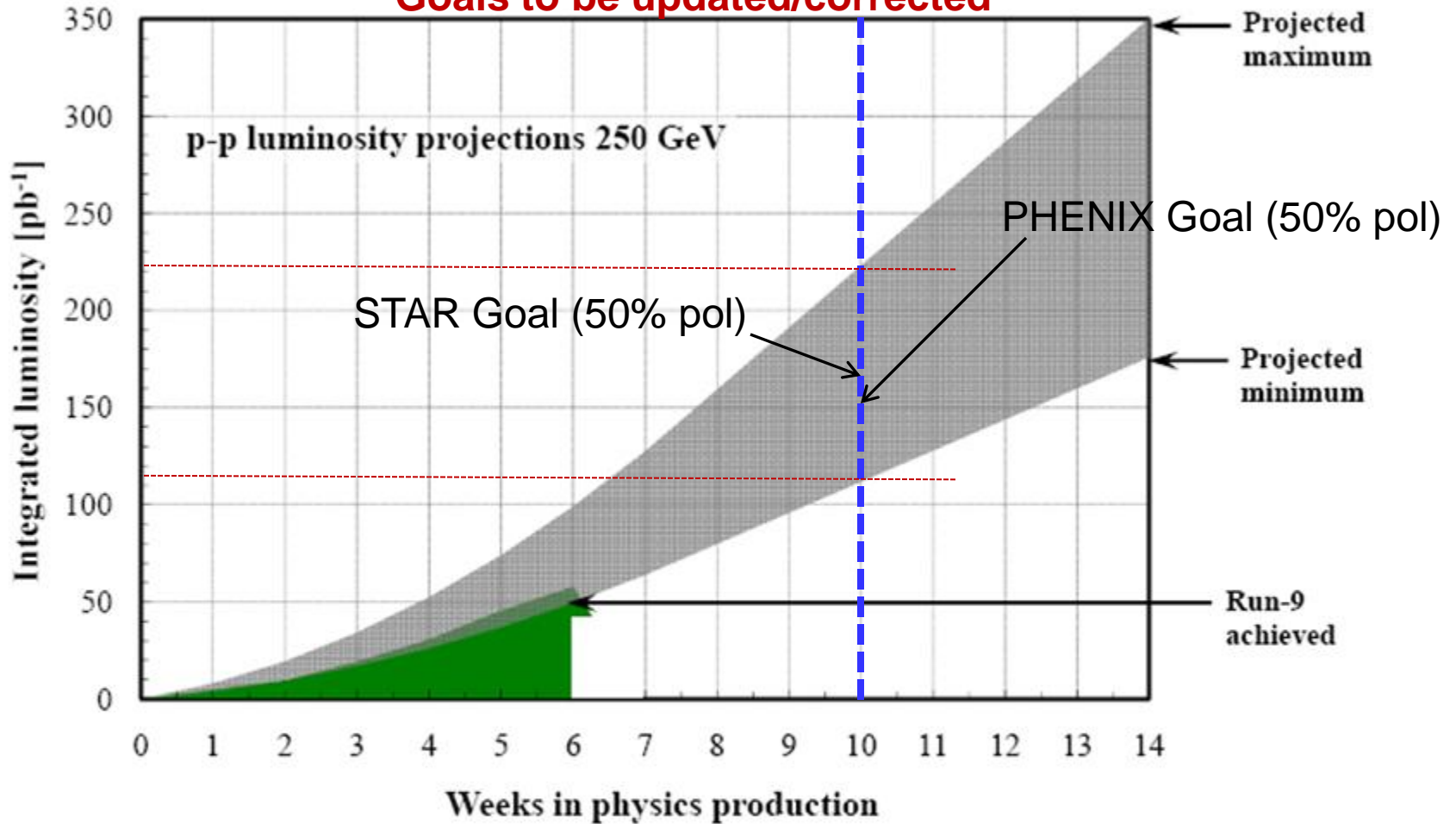
11A

11B

10 Jun

# Run-11 p<sup>↑</sup>-p<sup>↑</sup> luminosity projections

Goals to be updated/corrected



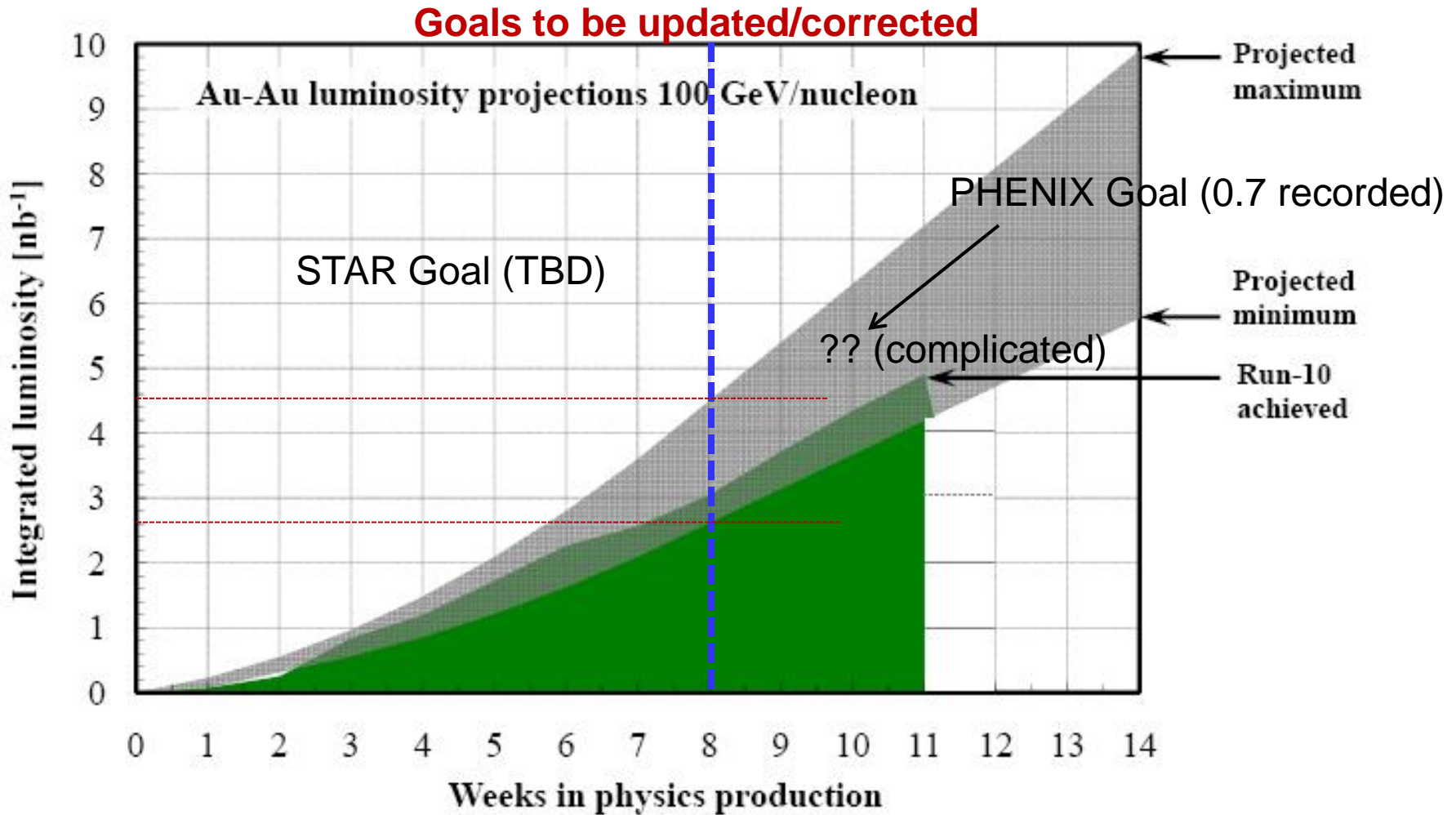
Assume 8 weeks to ramp-up for max.

Expect store  $P_{\text{avg}} = 35\text{-}50\%$ ,  $L_{\text{avg}}$  up to  $100 \times 10^{30} \text{cm}^{-2} \text{s}^{-1}$  (+80%).

[from Run-9 to max projection:  $\beta^* = 0.7 \rightarrow 0.6 \text{ m}$ ,  $N_b = 1.1 \rightarrow 1.4 \times 10^{11}$ ]



# Run-11 Au-Au luminosity projections 100 GeV/nucleon



Assume 6 weeks to ramp-up for min, and 8 weeks for max (stoch. cooling re-commissioning).

**Expect  $L_{\text{avg}}$  up to  $25 \times 10^{26} \text{cm}^{-2} \text{s}^{-1}$  (+25%).**

**[from Run-10 to max:  $\beta^* = 0.75 \rightarrow 0.65$  m,  $N_b = 1.1 \rightarrow 1.1 \times 10^9$ , more cooling]**