# Run 12 RHIC Machine/Experiments Meeting

12 Jun 2012

**Agenda:**

- Status Reports
- Other business

## Run 12 Plan based on 20 weeks cryo operation
## 23 week schedule based on 4/10/12 Vigdor guidance, 6 June update

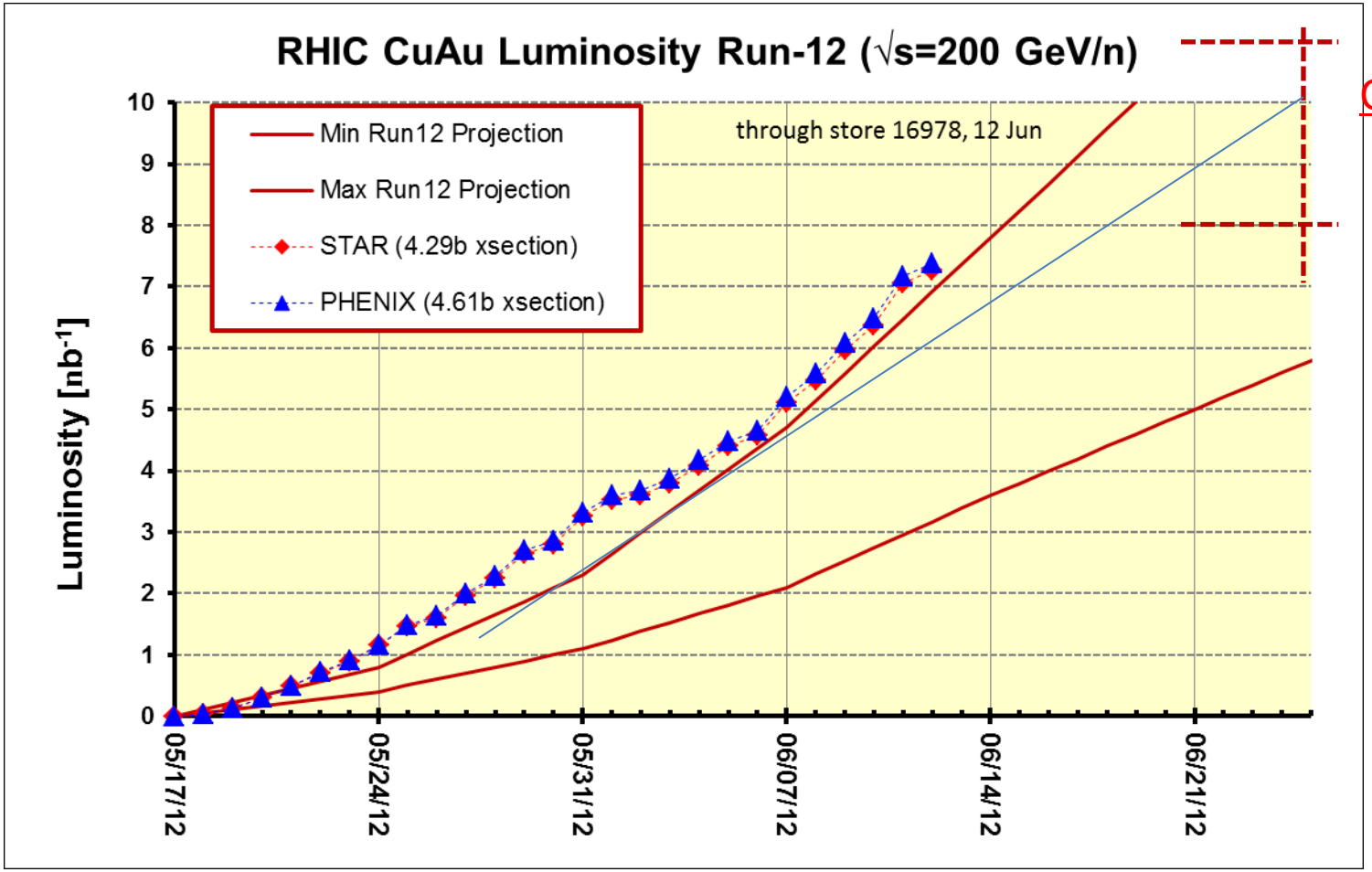
- 17 Jan, Begin cool-down to 4.5K
- 20 Jan, Cool-down to 4.5K in Blue and Yellow Ring complete, begin magnet setup
- 21-28 Jan, pp injection setup
- 28 Jan-3 Feb, LLRF, Ramp and store setup, begin 8 hr/night for experiments
- 3-10 Feb, 1 week ramp-up with 8 hrs/night for experiments
- 10 Feb, with store # 16397, begin *4 weeks pp physics* with further ramp-up
- 16 Feb, 24/7 stores begin
- 12 (Monday) March, **end 4.4 week pp physics √s = 200 GeV**, begin ½ week setup for √s = 510 GeV pp
- 16 March, begin 5 week pp physics (machine only) √s = 510 GeV
- 17/18 March, STAR/PHENIX physics start with longitudal polarization
- 18 April (Wednesday 1300), end physics begin pp beam development/APEX
- 19 April (Thursday, 0800), **end 4.9 week pp physics at √s = 510 GeV**
- 19 April (Thursday, store 16580), begin 1 week setup for UU
- 22 April (evening) first overnight stores for experiments
- 25 April (Wednesday), begin *3 week UU physics run*
- 15 May (Tuesday) **end 2.9 week UU physics √s = 193 GeV/n**, begin setup for √s = 200 GeV/n CuAu
- 18 May (Friday, store 16889) begin CuAu physics run

***Today – 12 Jun***

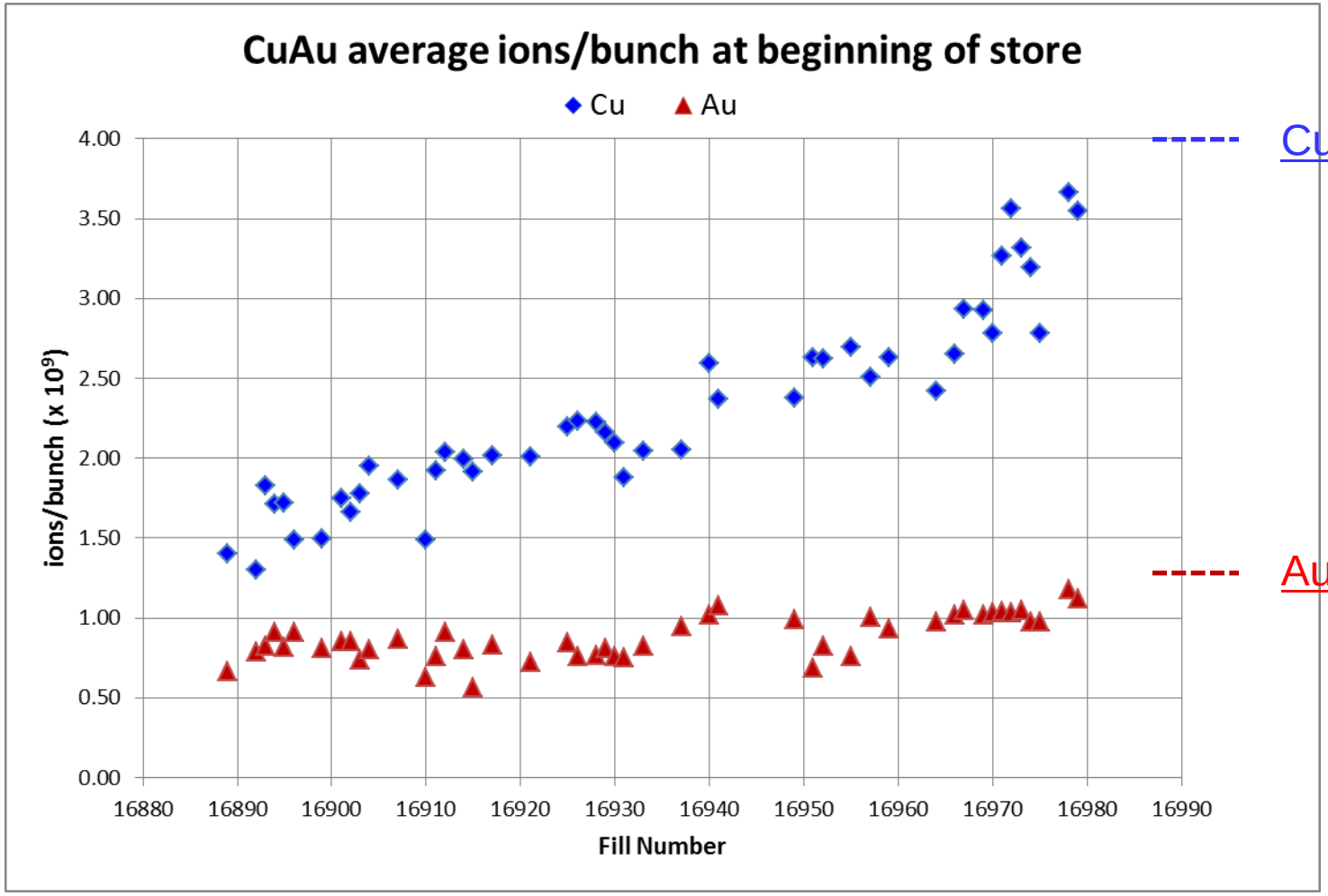
- 25 June (Monday, 08:00), **end 5.5 week √s = 200 GeV/n CuAu run**
- 25 June, begin √s = 5 GeV/n AuAu development
- 27 June (Wednesday, 08:00 – earlier if test complete) begin cryo warm-up
- 30 June, cryo warm-up complete (23.6 cryo-weeks)

***Total Physics Weeks = 17.7***

PHENIX BUR Goal = 2.4 $nb^{-1}$ sampled, ~11 delivered
STAR Goal = ~5 $nb^{-1}$ sampled, ~8 $nb^{-1}$ delivered

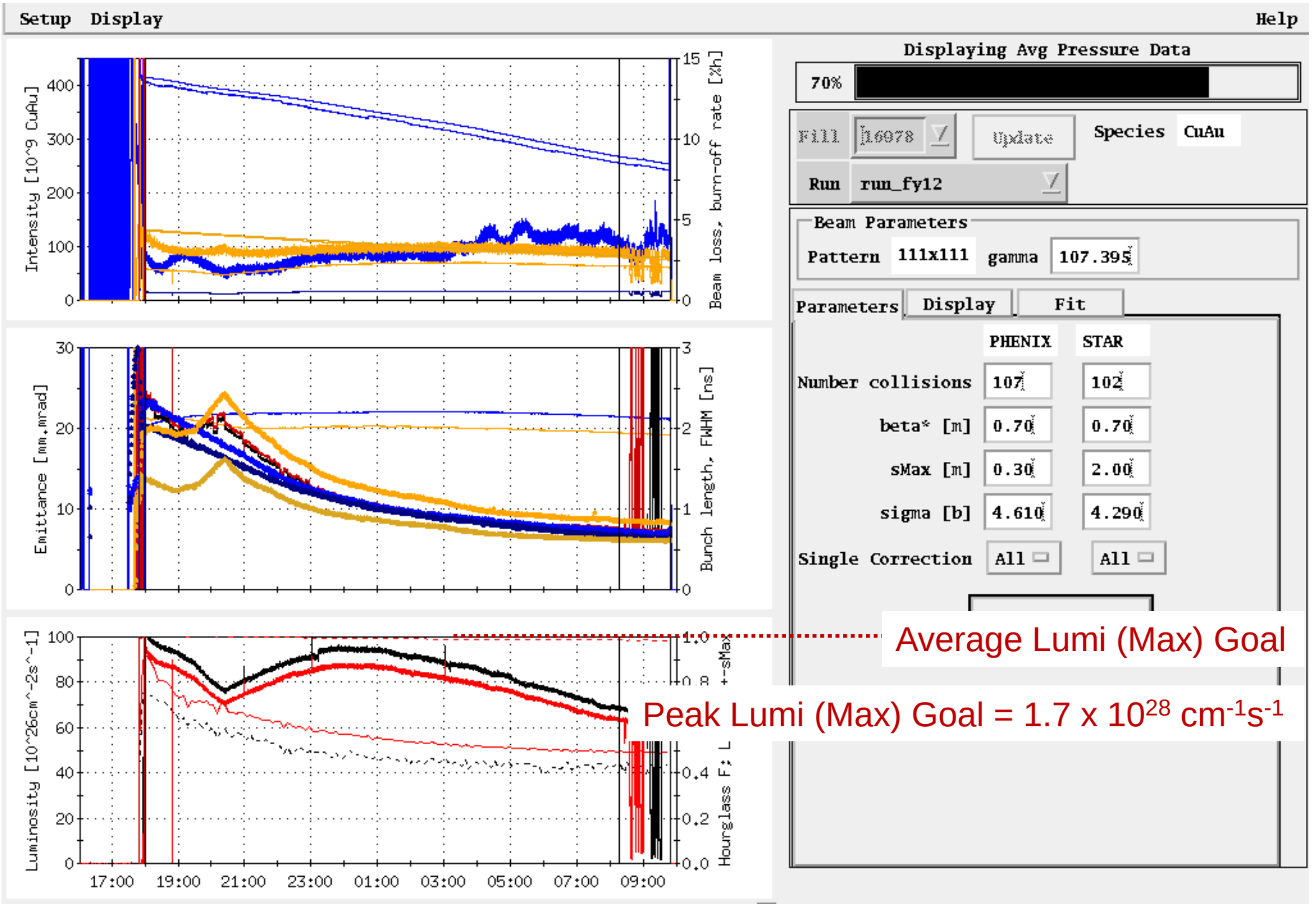


Through store 16979, 12 June




http://www.rhichome.bnl.gov/AGS/Operations/Run12/Run12_Lumi_100Cu_100Au.xlsx
and LogView

# Store 16889, 18 May (first physics store)



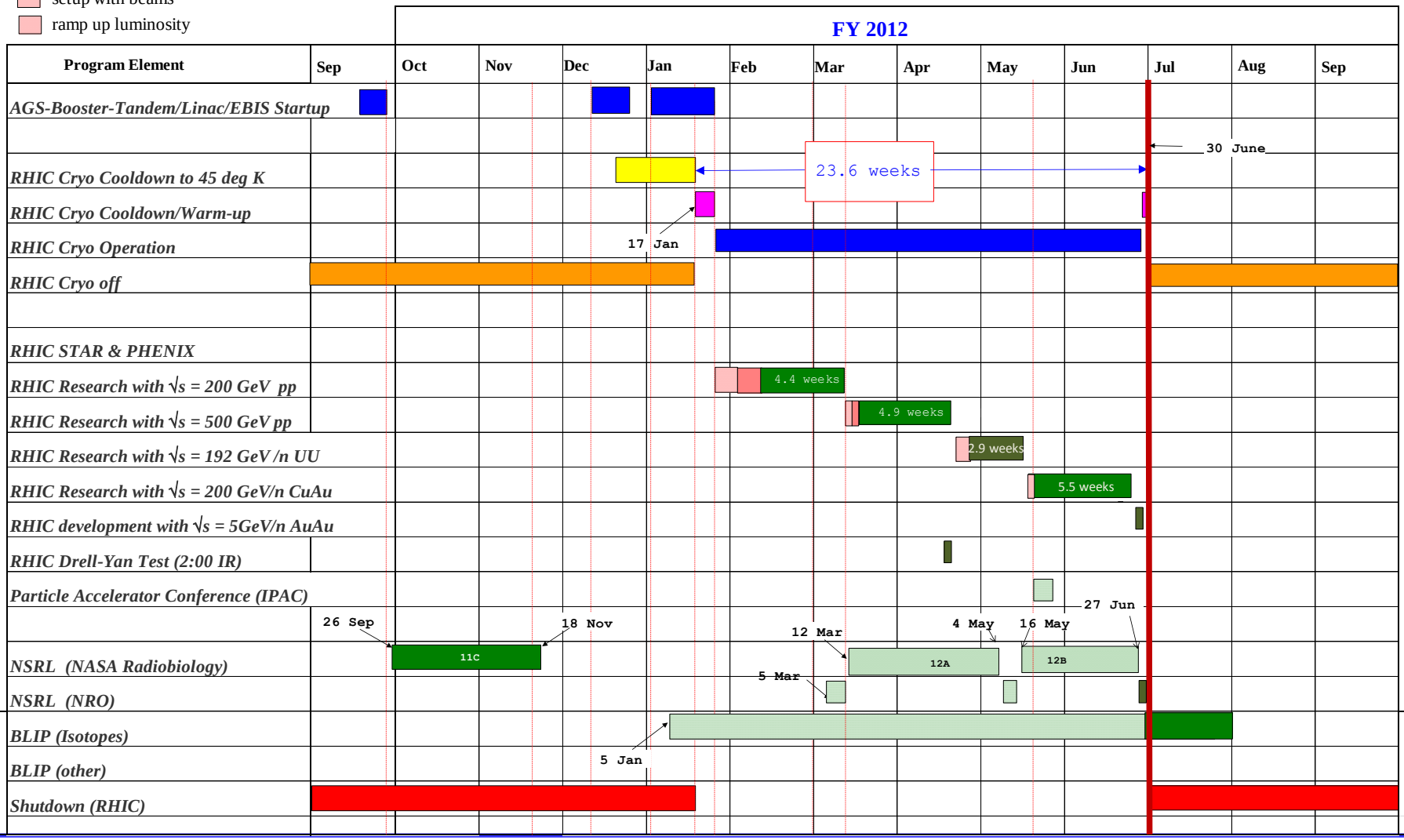
http://www.bnl.gov/cad/esfd

# C-A Operations-FY12

12 Jun 12

*in progress/planned*

concurrent with RHIC
setup with beams
ramp up luminosity



Other Slides

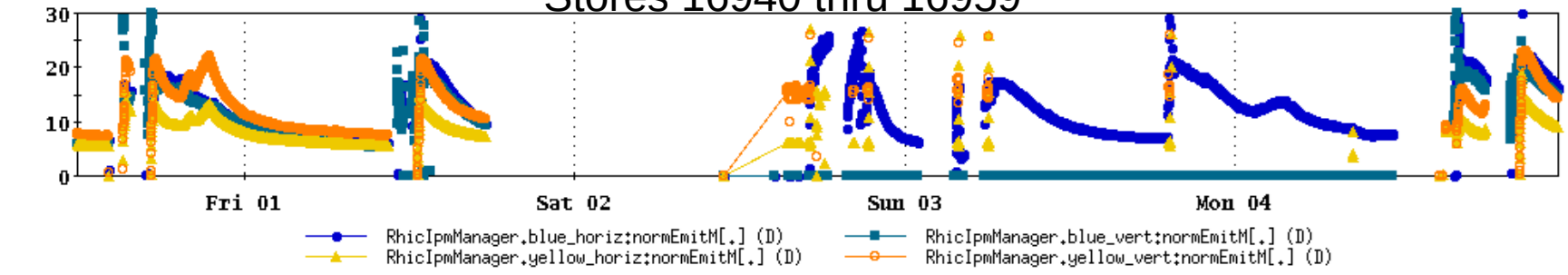
**Table 2: Maximum luminosities that can be reached after a sufficiently long running period. For ion operation numbers are given for a beam energy of 100 GeV/nucleon. For polarized proton operation the beam energy is stated.**

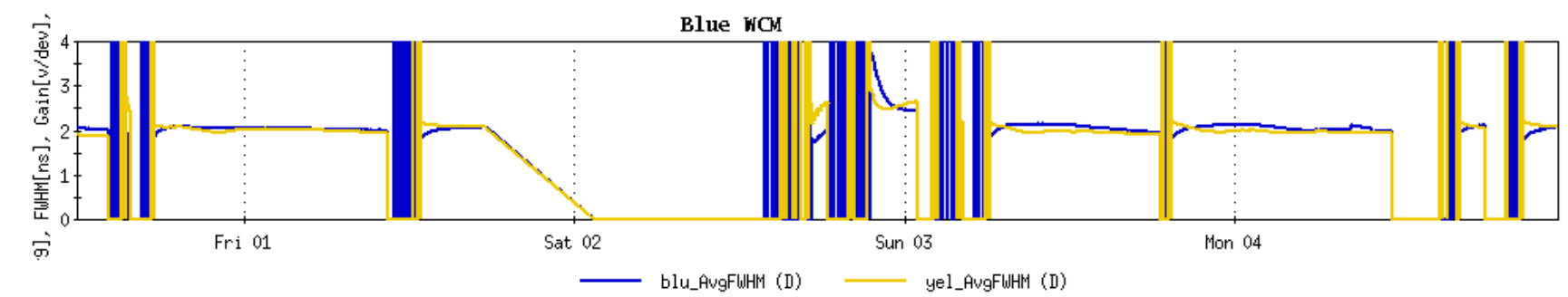
| Mode | No of colliding bunches | Ions/bunch [$10^9$] | $\beta^*$ [m] | Emittance [μm] | $L_{peak}$ [$cm^{-2}s^{-1}$] | $L_{store\ avg}$ [$cm^{-2}s^{-1}$] | $L_{week}$ |
|---|---|---|---|---|---|---|---|
| U-U | 111 | 0.85 | 0.75 | 15-10 | $20\times10^{26}$ | $14\times10^{26}$ | 0.5 $nb^{-1}$ |
| Au-Au | 111 | 1.3 | 0.75 | 15-10 | $50\times10^{26}$ | $35\times10^{26}$ | 1.1 $nb^{-1}$ |
| Cu-Cu | 68 | 6.0 | 0.75 | 15-20 | $8\times10^{28}$ | $5\times10^{28}$ | 16 $nb^{-1}$ |
| Cu-Au | 111 | 4.0Cu/1.3Au | 0.85 | 15-20 | $1.7\times10^{28}$ | $1.0\times10^{28}$ | 3.1 $nb^{-1}$ |
| d-Au | 111 | 110d/1.1Au | 0.85 | 18-30 | $30\times10^{28}$ | $18\times10^{28}$ | 60 $nb^{-1}$ |
| p↑-p↑* 100 GeV | 107 | 135 | 0.85 | 15-20 | $50\times10^{30}$ | $30\times10^{30}$ | 10 $pb^{-1}$ |
| p↑-p↑* 250 GeV | 107 | 165 | 0.6 | 20-25 | $200\times10^{30}$ | $120\times10^{30}$ | 40 $pb^{-1}$ |

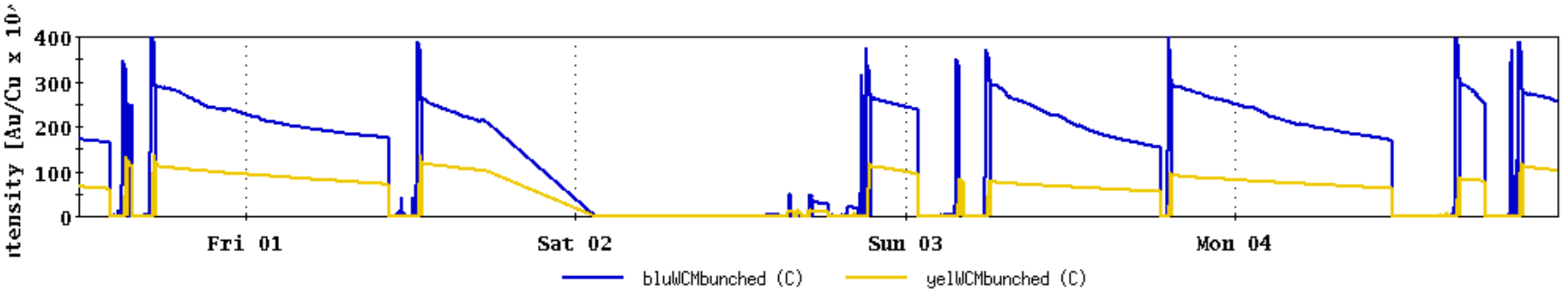
* We expect that an intensity-averaged store polarization $P$ of up to about 60%, as measured by the H jet, can be reached at 100 GeV. At 250 GeV we expect the polarization $P$ to reach about 55%. In Run-11 PHENIX had 107 and STAR 102 colliding bunches.

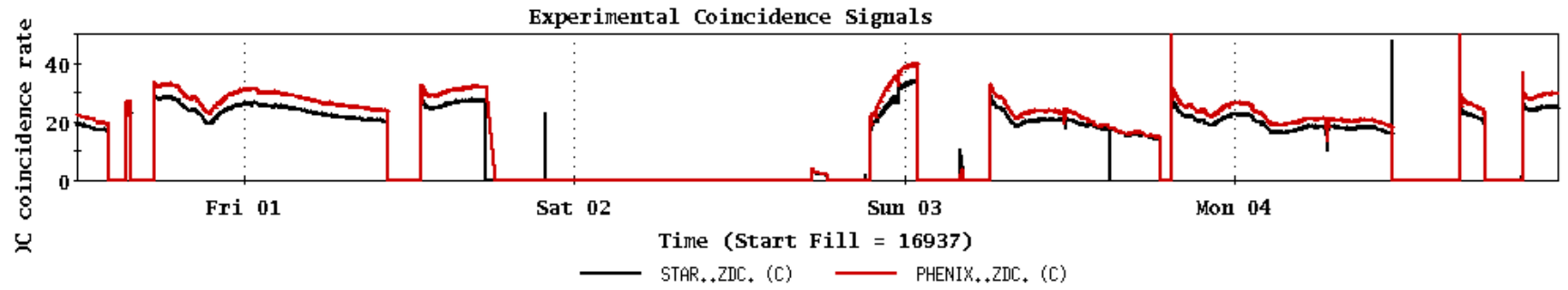
File Window Markers Analysis

# Stores 16940 thru 16959

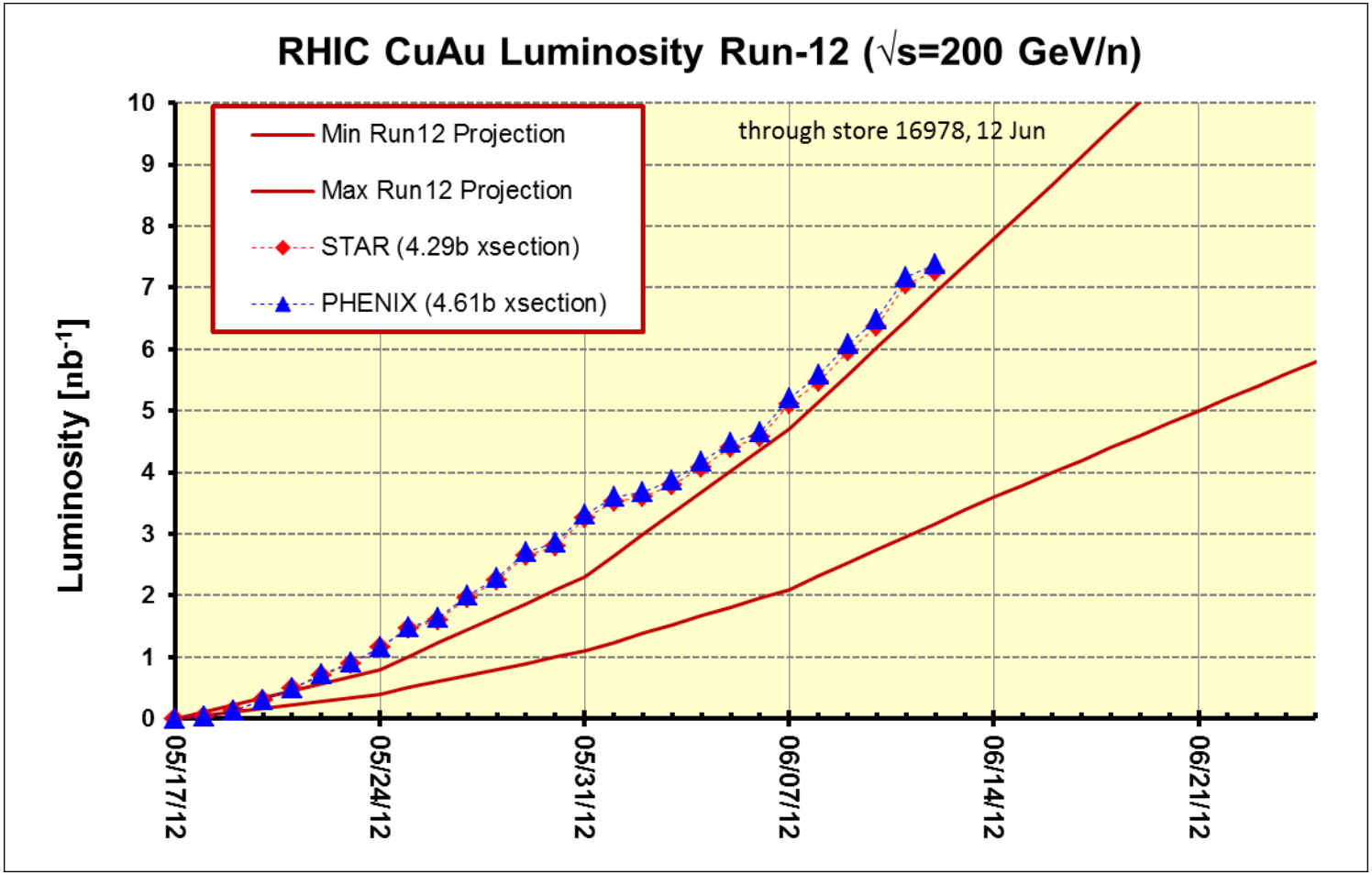


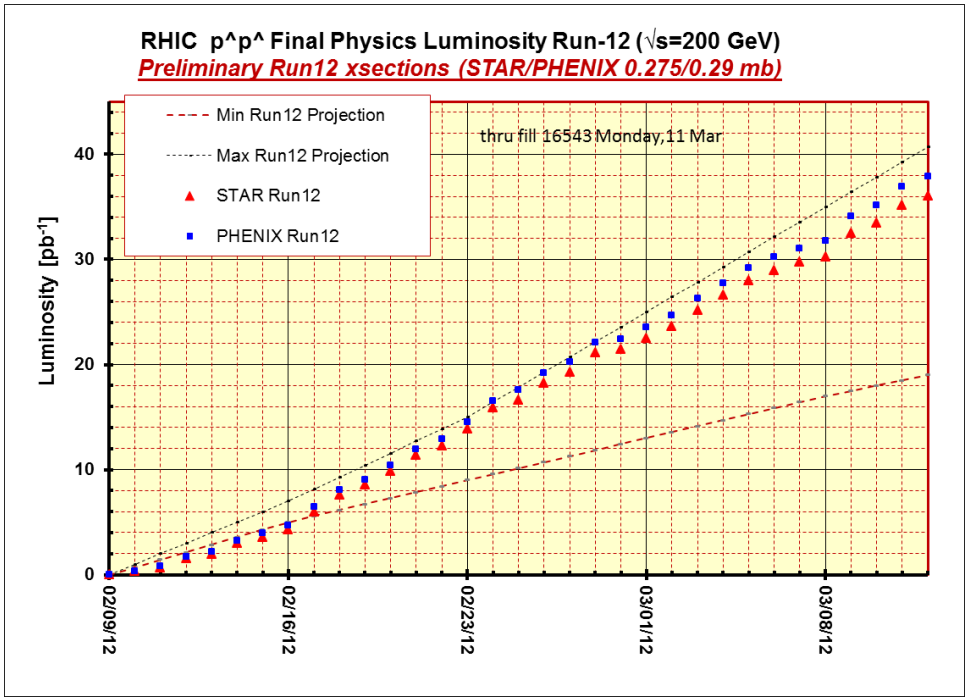



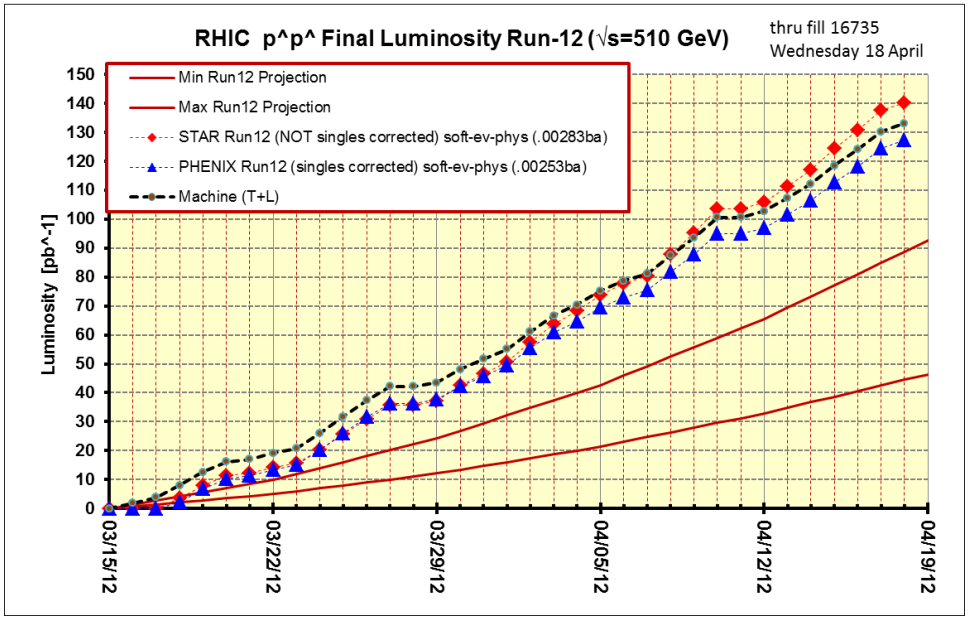



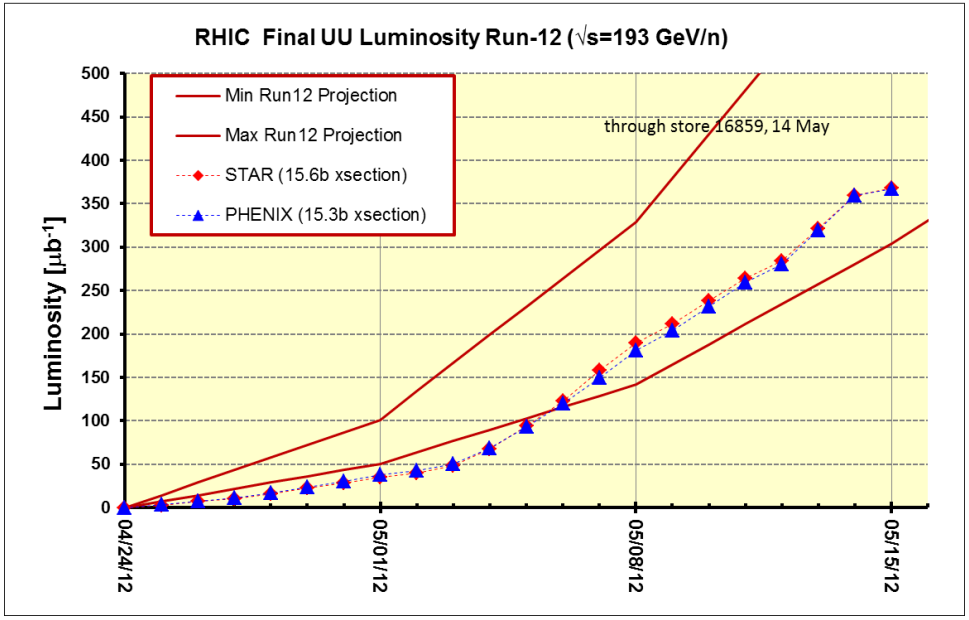
PHENIX BUR Goal = 2.4 $nb^{-1}$ sampled, ~11 delivered
STAR Goal = ~5 $nb^{-1}$ sampled, ~8 $nb^{-1}$ delivered



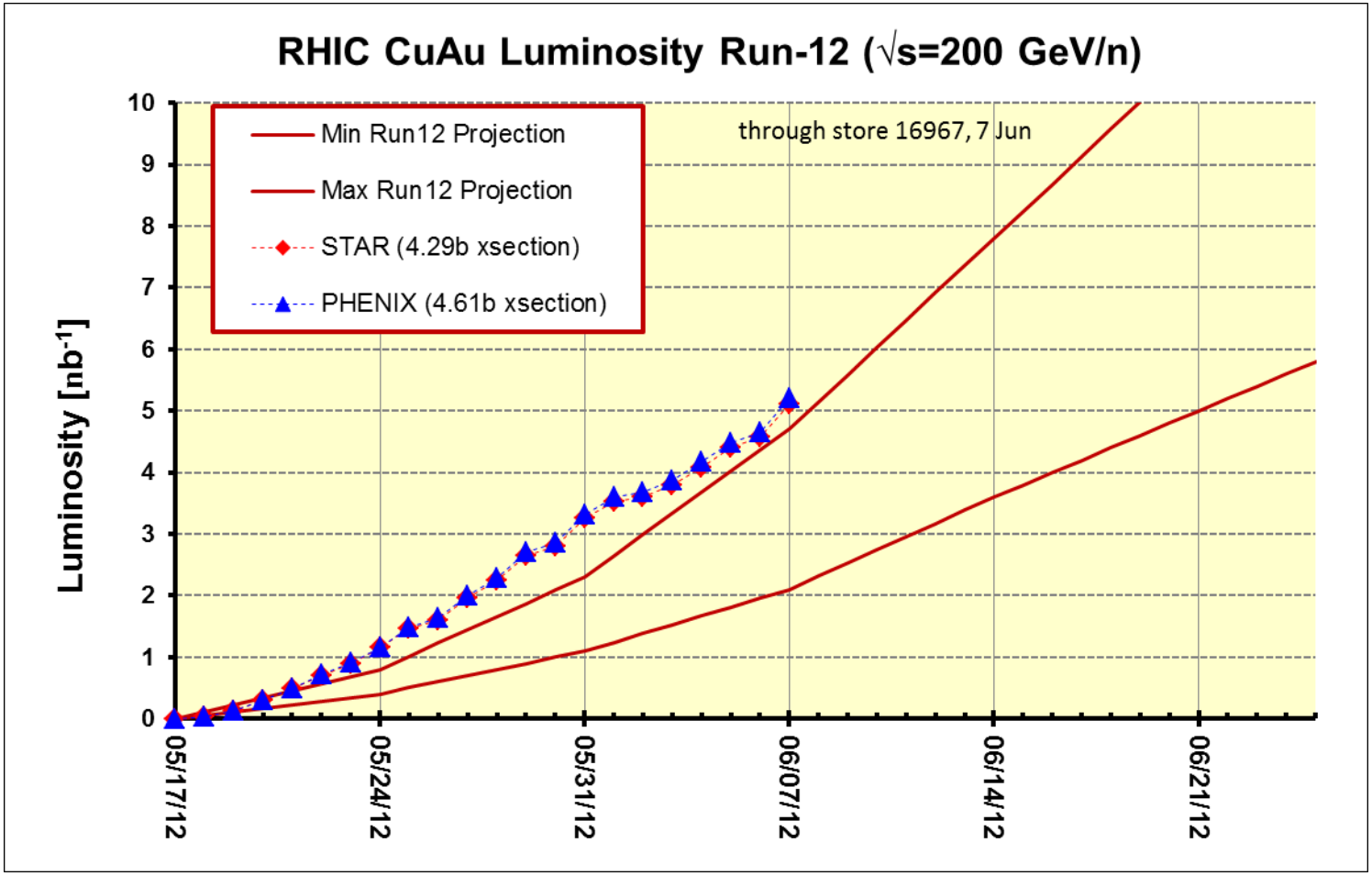

RHIC p^p^ Final Physics Luminosity Run-12 (√s=200 GeV)
Preliminary Run12 xsections (STAR/PHENIX 0.275/0.29 mb)
Min Run12 Projection
Max Run12 Projection
STAR Run12
PHENIX Run12
thru fill 16543 Monday,11 Mar
Luminosity [pb-1]
0
10
20
30
40
02/09/12
02/16/12
02/23/12
03/01/12
03/08/12

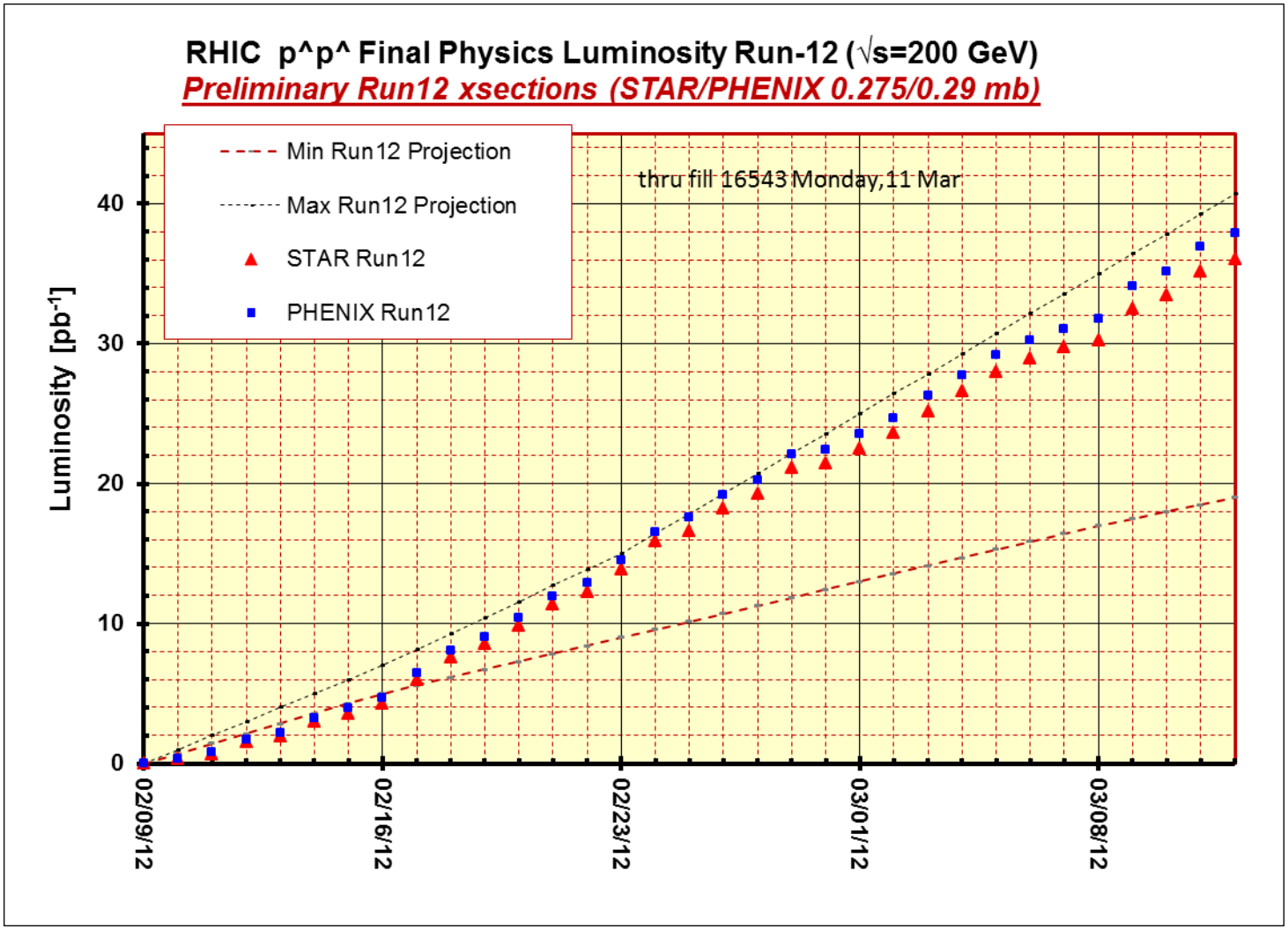
# Thru final store, 16735, 18 Apr



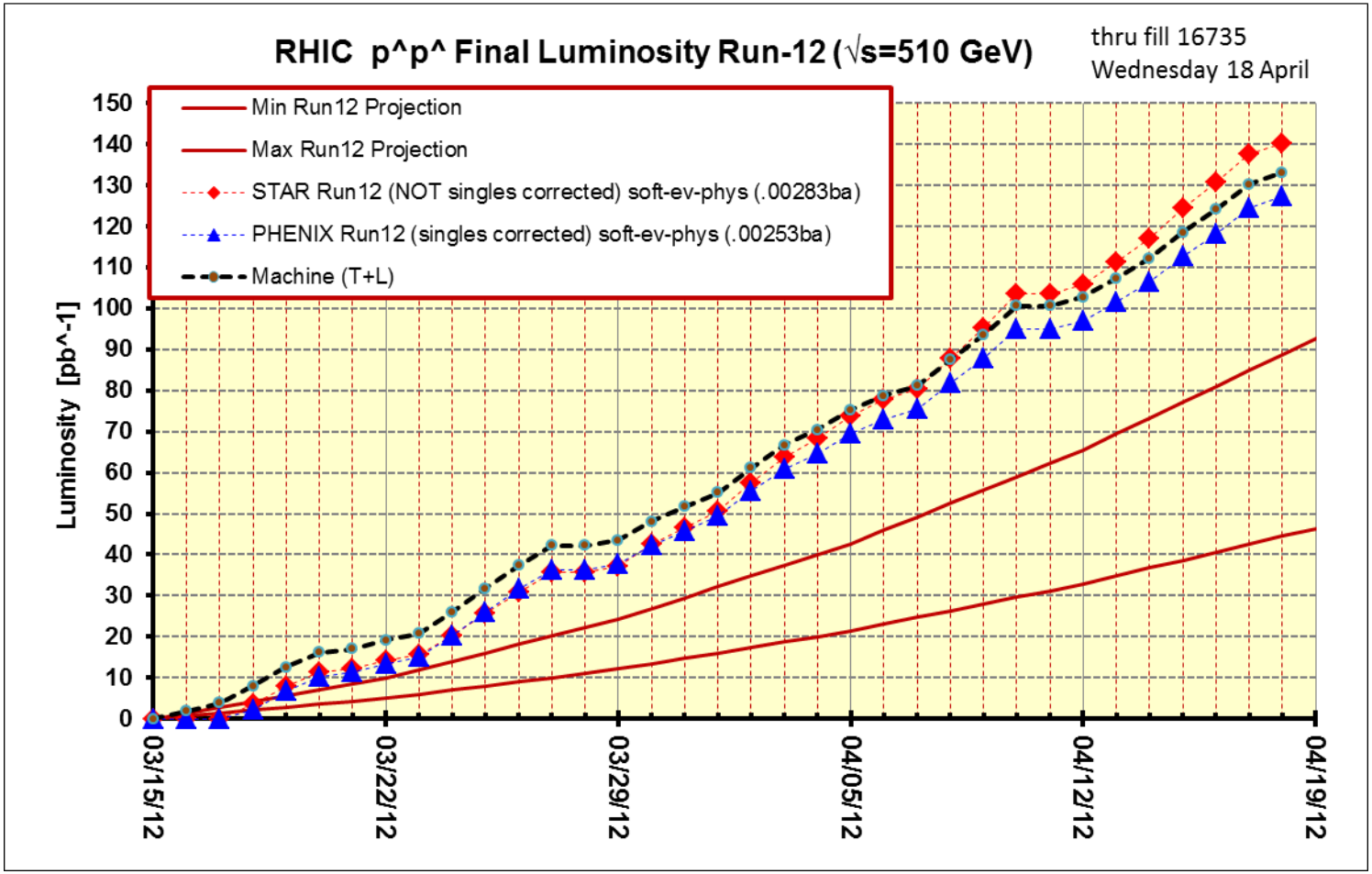

RHIC Final UU Luminosity Run-12 (√s=193 GeV/n)
Min Run12 Projection
Max Run12 Projection
STAR (15.6b xsection)
PHENIX (15.3b xsection)
through store 16859, 14 May
Luminosity [μb-1]
500
450
400
350
300
250
200
150
100
50
0
04/24/12
05/01/12
05/08/12
05/15/12

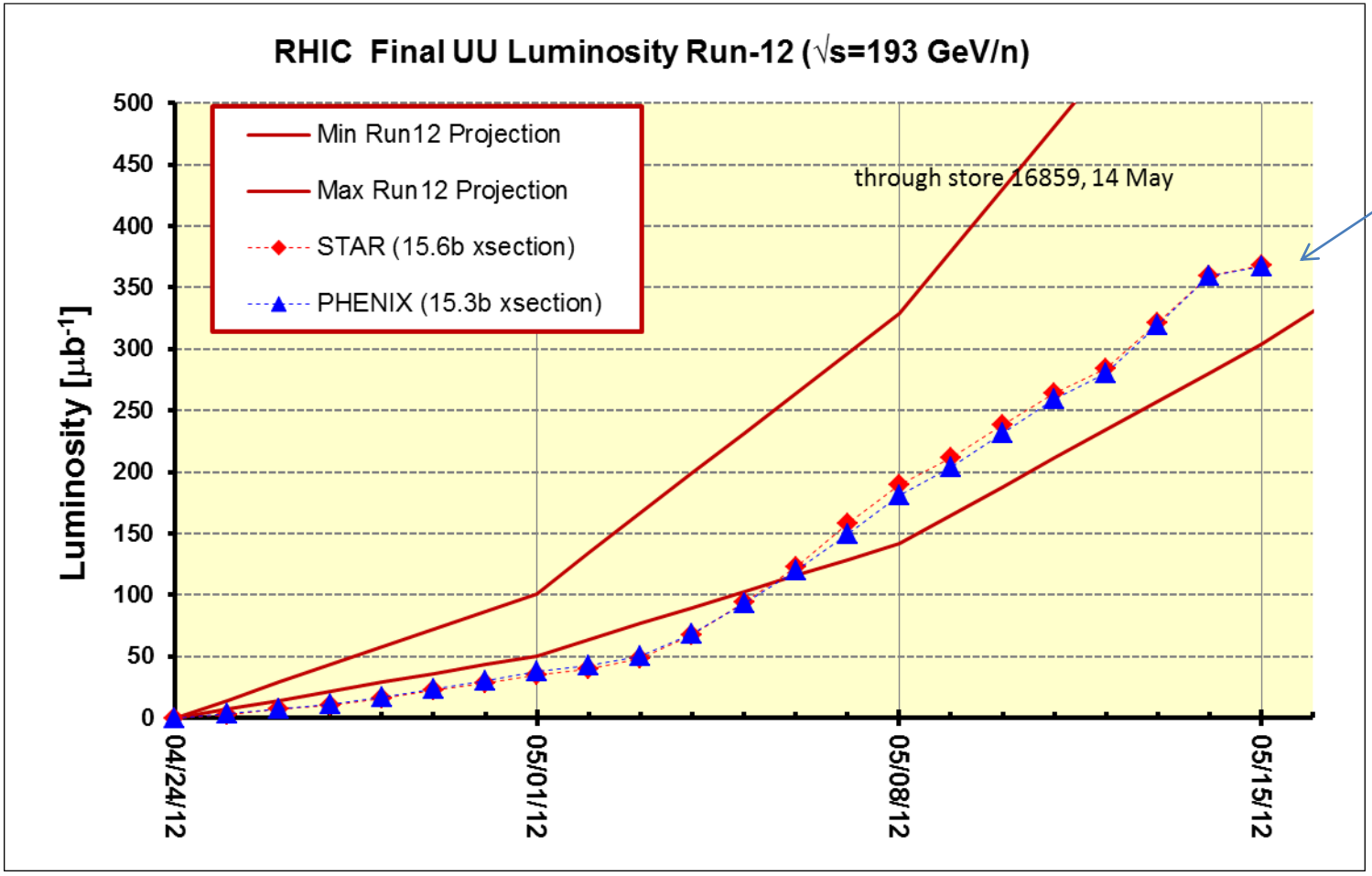
PHENIX BUR Goal = 2.4 $nb^{-1}$ sampled, ~11 delivered
STAR Goal = ~5 $nb^{-1}$ sampled, ~8 $nb^{-1}$ delivered



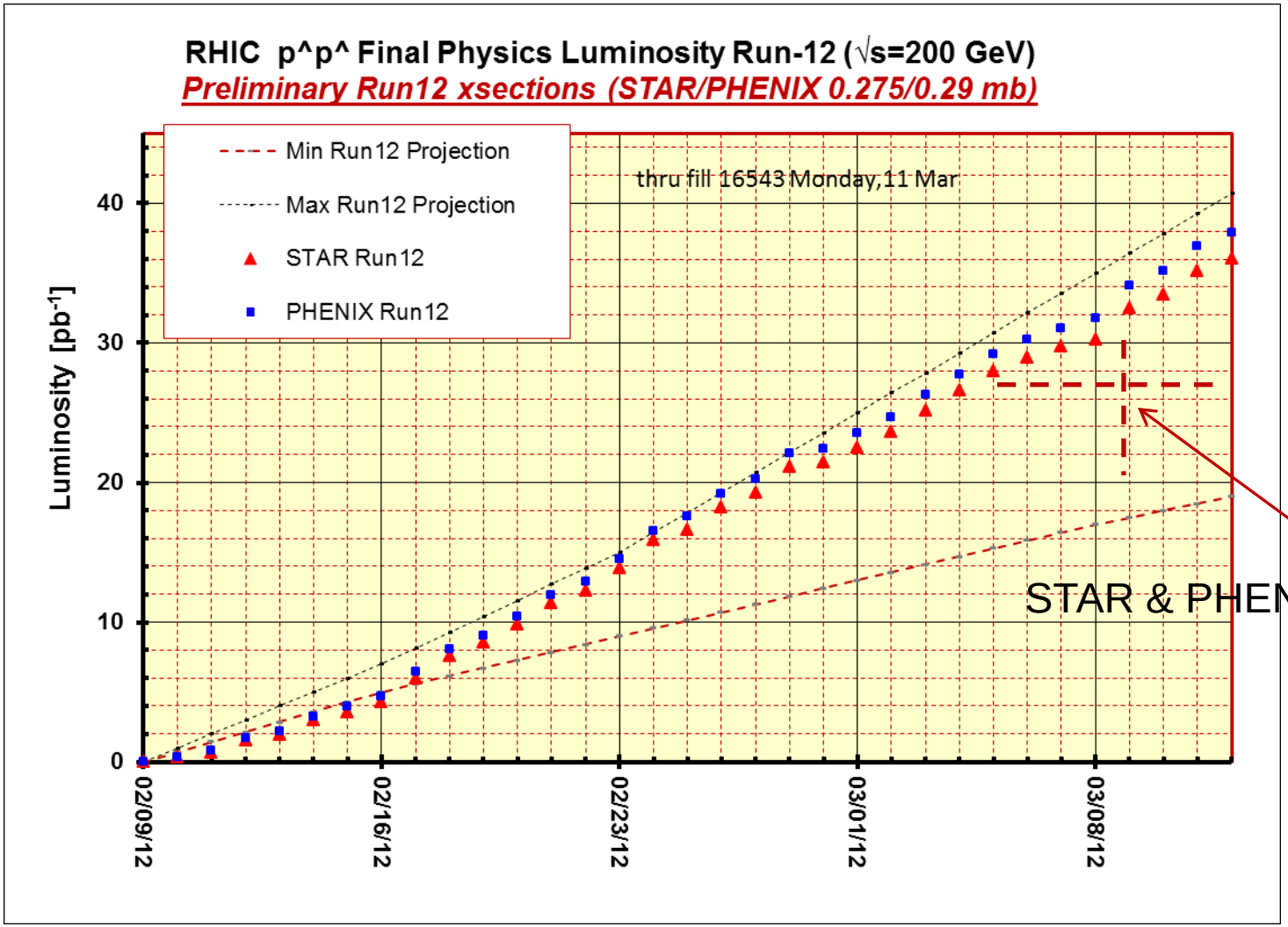

RHIC p^p^ Final Physics Luminosity Run-12 (√s=200 GeV)
Preliminary Run12 xsections (STAR/PHENIX 0.275/0.29 mb)
Min Run12 Projection
Max Run12 Projection
STAR Run12
PHENIX Run12
thru fill 16543 Monday,11 Mar
Luminosity [pb-1]
0
10
20
30
40
02/09/12
02/16/12
02/23/12
03/01/12
03/08/12

Thru final store, 16735, 18 Apr

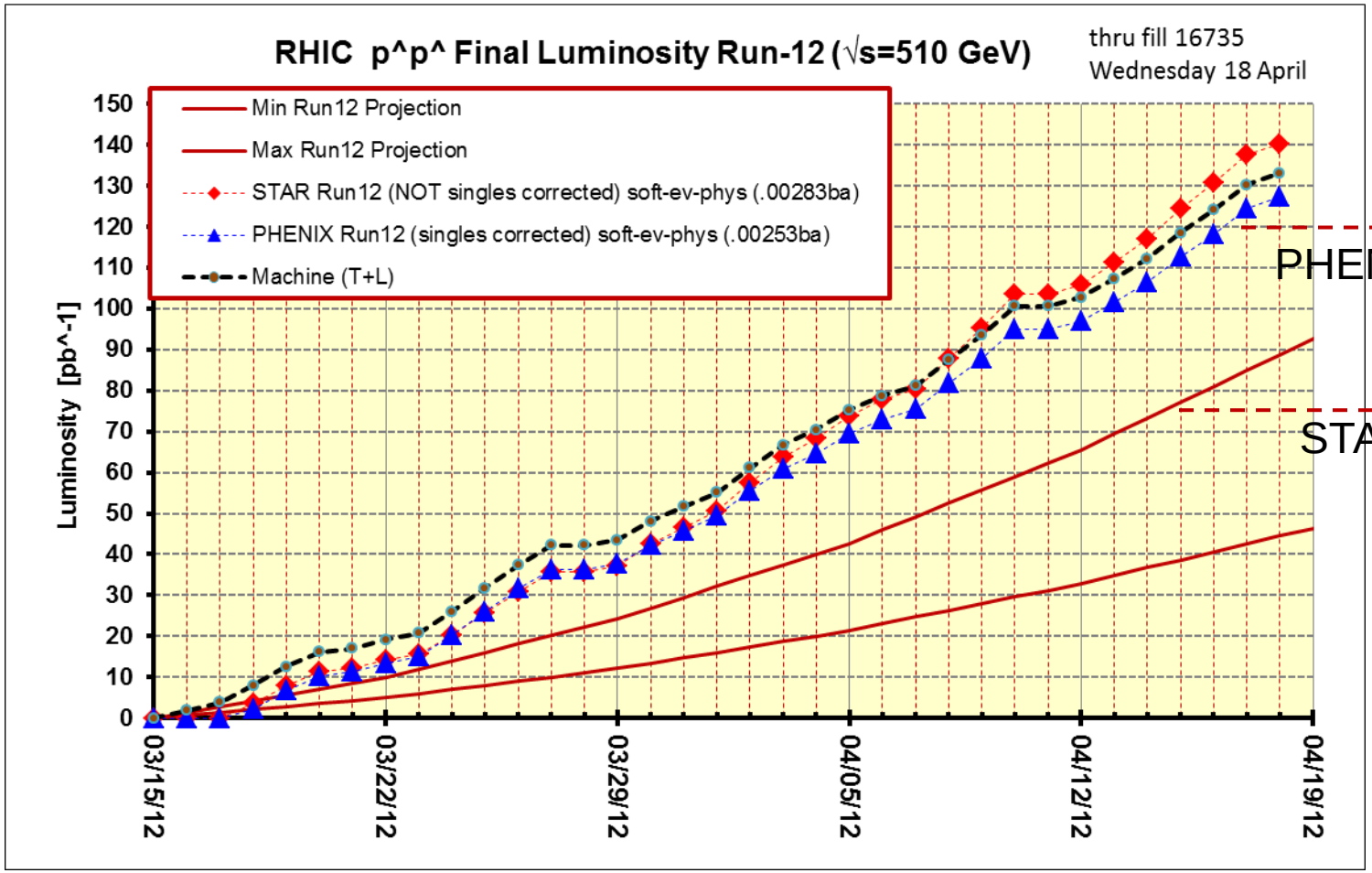



RHIC Final UU Luminosity Run-12 (√s=193 GeV/n)
Min Run12 Projection
Max Run12 Projection
STAR (15.6b xsection)
PHENIX (15.3b xsection)
through store 16859, 14 May
Luminosity [μb-1]
500
450
400
350
300
250
200
150
100
50
0
04/24/12
05/01/12
05/08/12
05/15/12

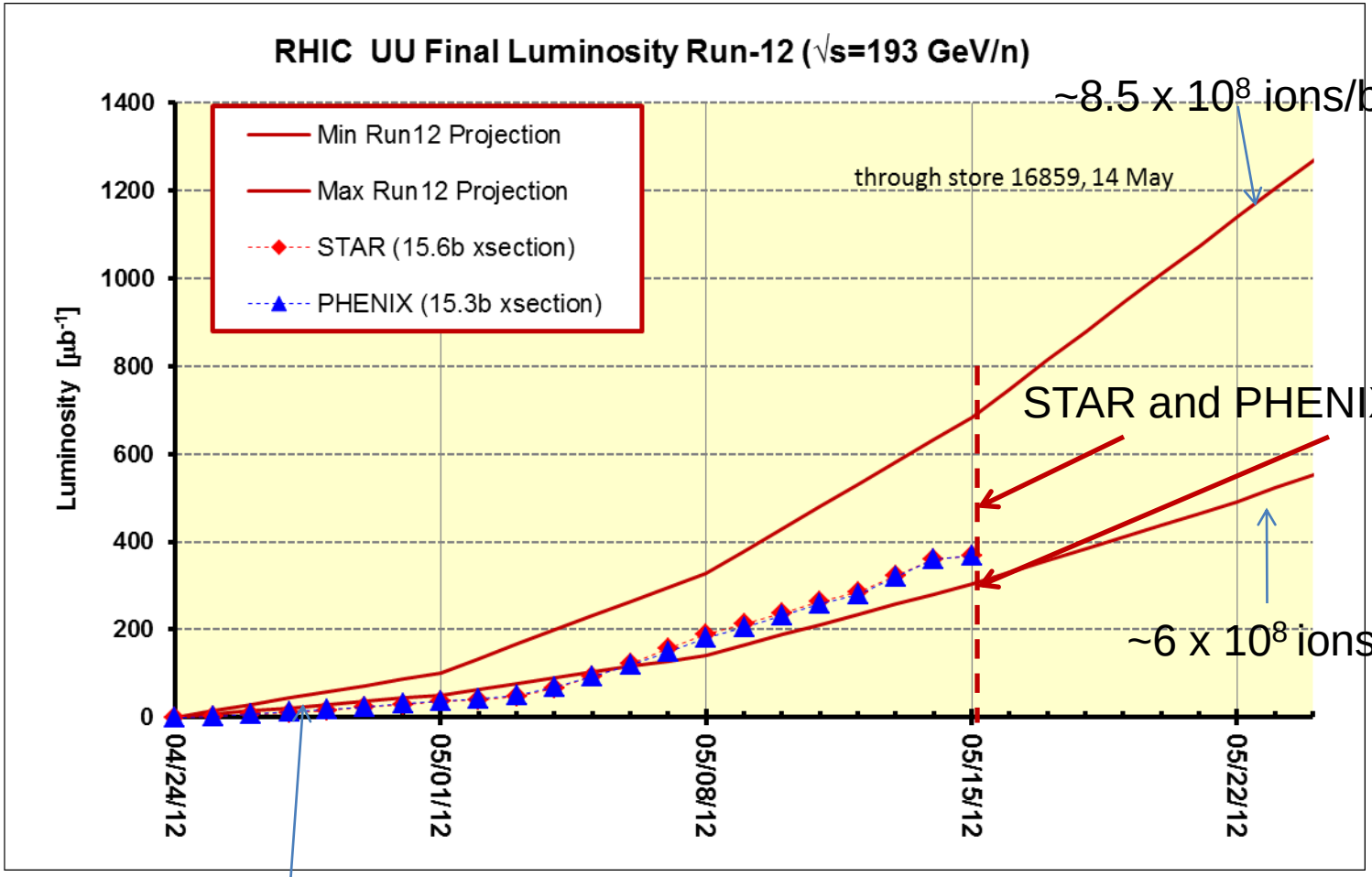
368 $\mu b^{-1}$


RHIC p^p^ Final Physics Luminosity Run-12 (√s=200 GeV)
Preliminary Run12 xsections (STAR/PHENIX 0.275/0.29 mb)
Min Run12 Projection
Max Run12 Projection
STAR Run12
PHENIX Run12
thru fill 16543 Monday,11 Mar
Luminosity [pb-1]
0
10
20
30
40
02/09/12
02/16/12
02/23/12
03/01/12
03/08/12
STAR & PHENIX Goal

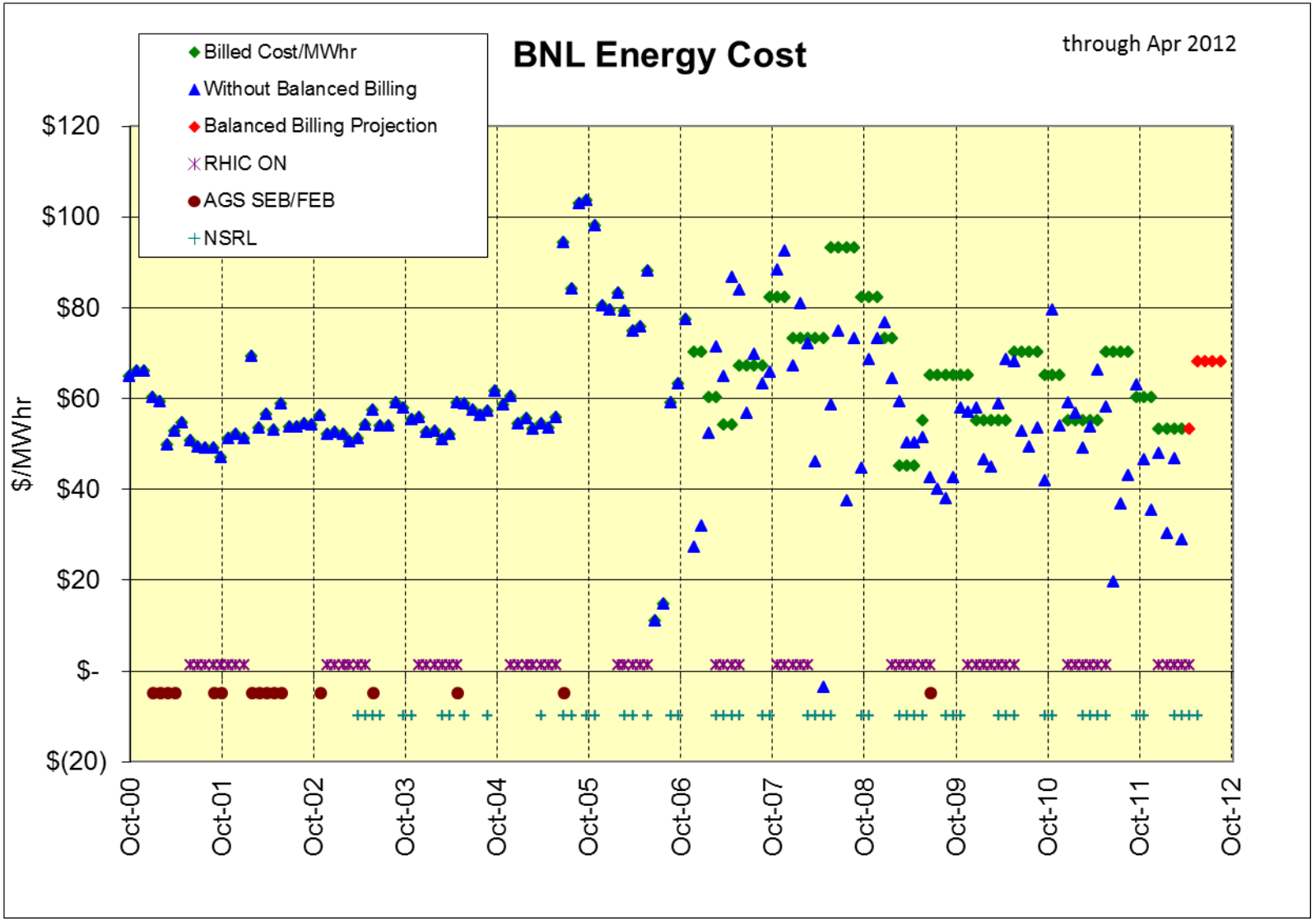
Thru final store, 16735, 18 Apr



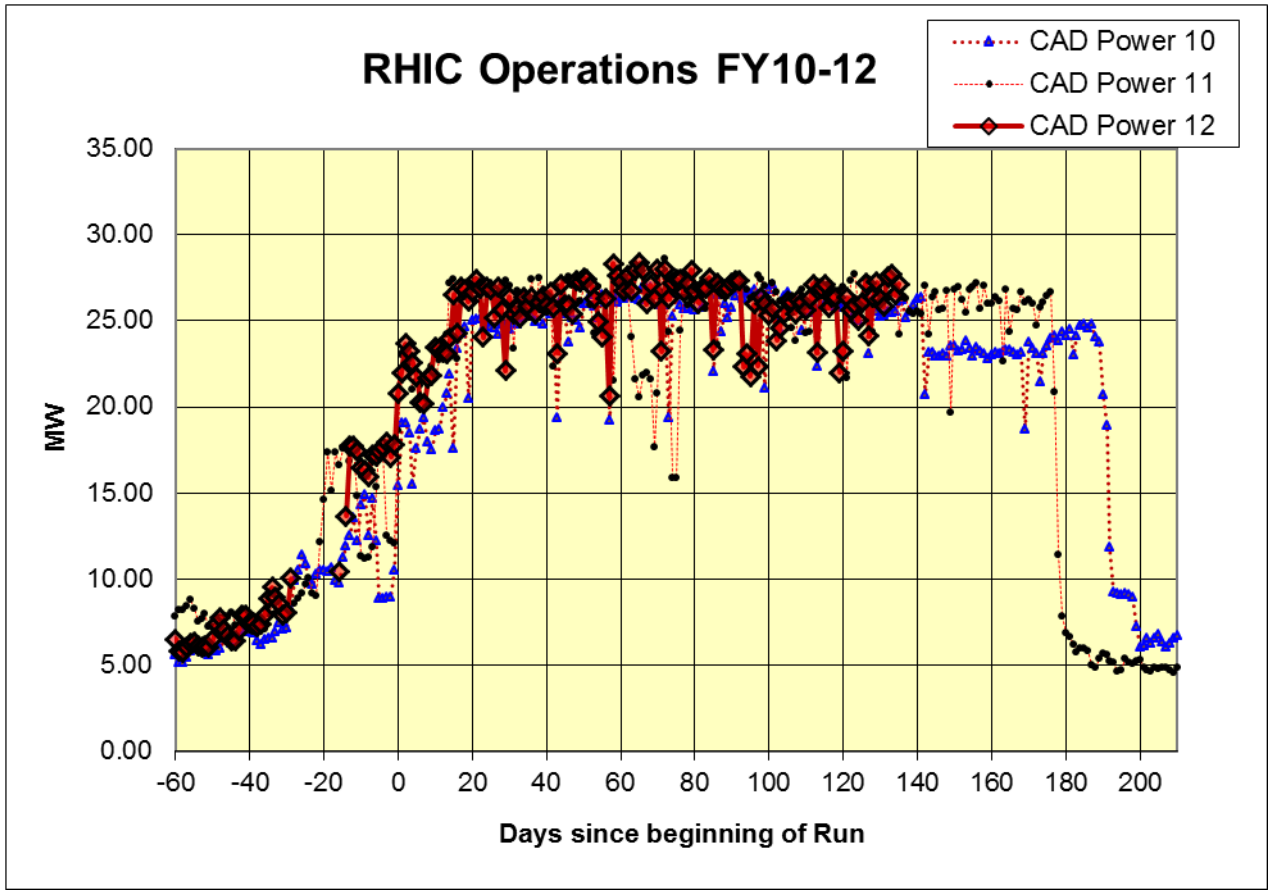
Best store (16857) = 3.0 x $10^8$ ions/bunch, blue/yellow beginning of store (physics)



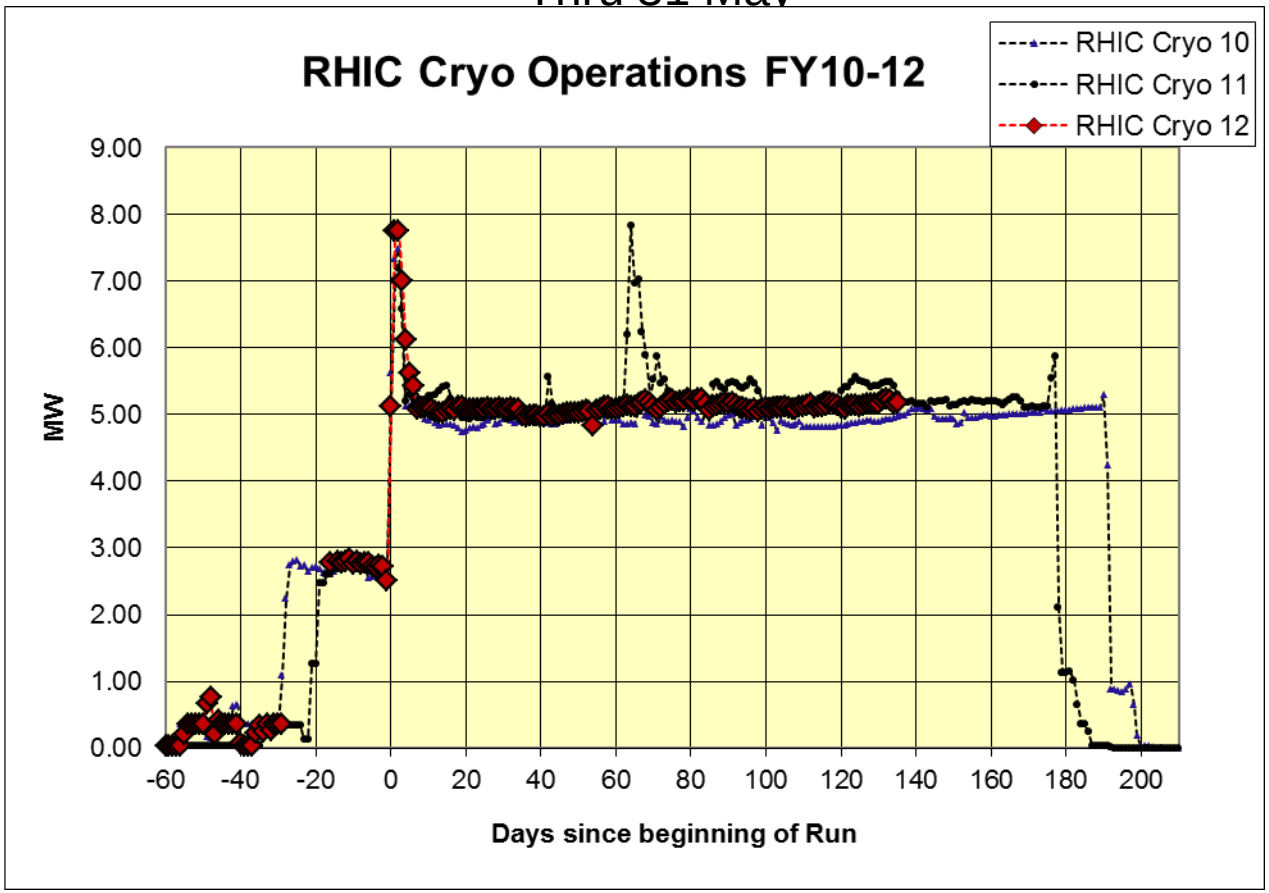
Total in bank through April = $2,781K (CAD contribution = $1,360K)
Total CAD rebate to date = $625K (owed $735K)

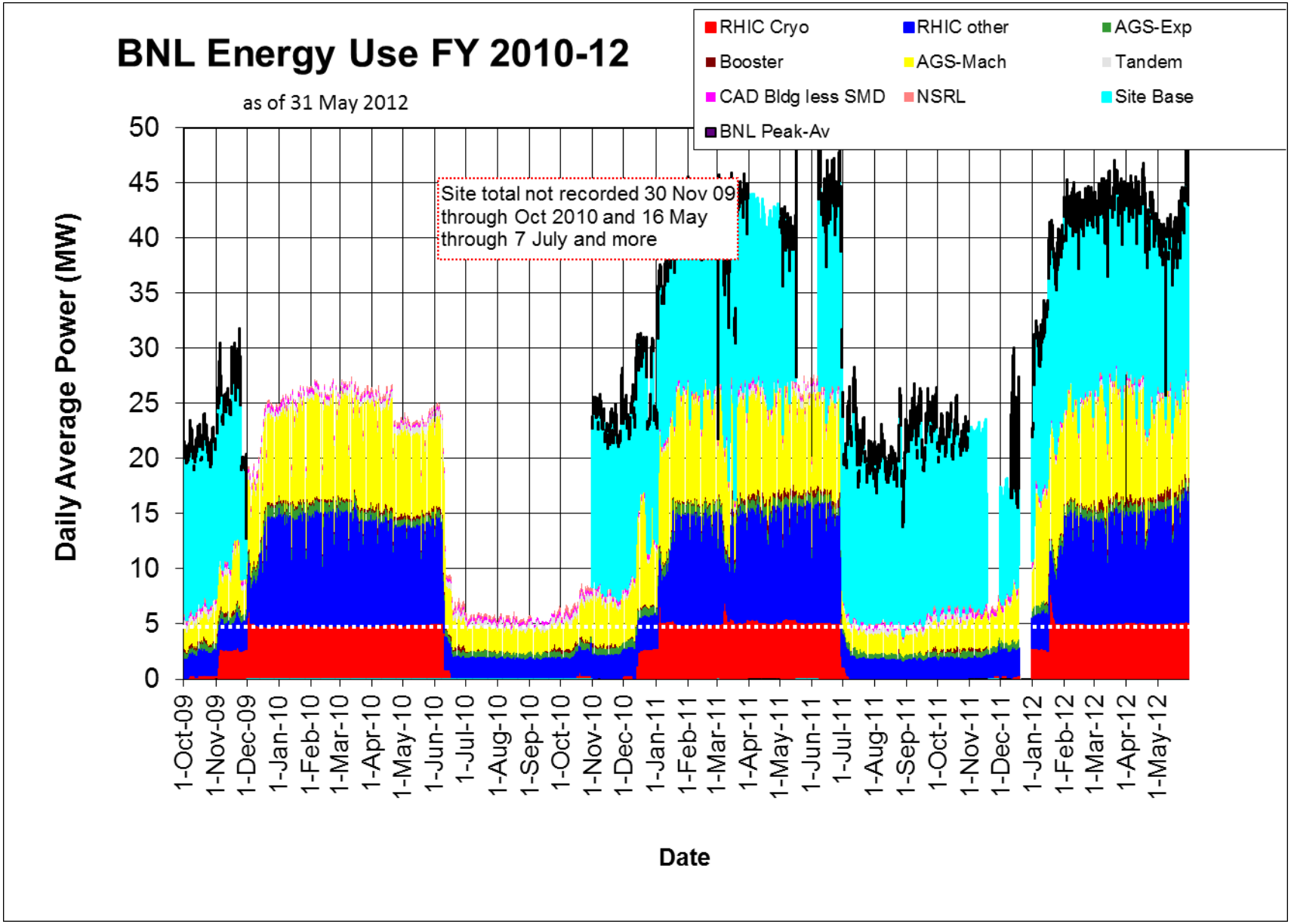


Thru 31 May

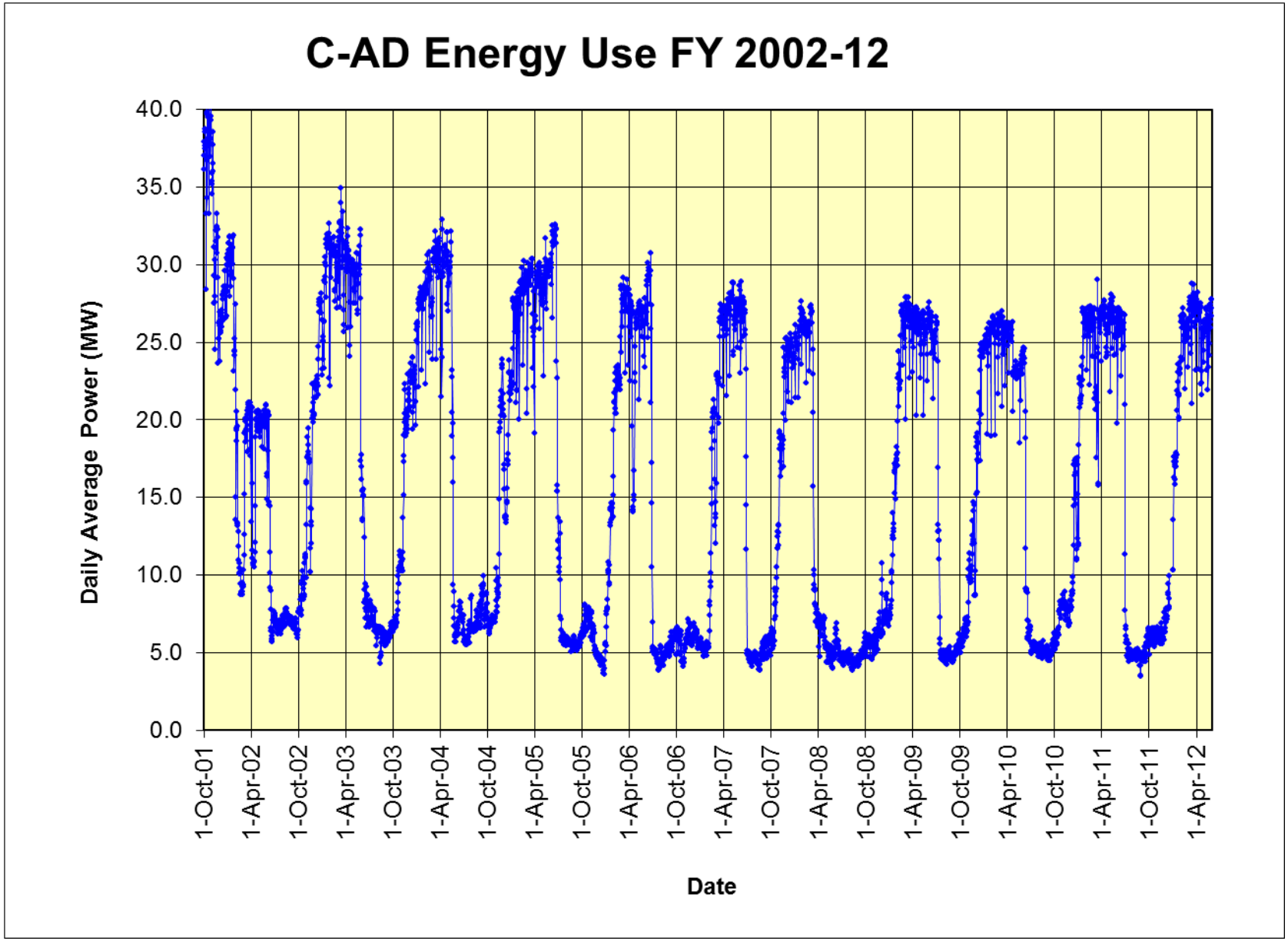

RHIC Operations FY10-12
CAD Power 10
CAD Power 11
CAD Power 12
MW
35.00
30.00
25.00
20.00
15.00
10.00
5.00
0.00
-60
-40
-20
0
20
40
60
80
100
120
140
160
180
200
Days since beginning of Run

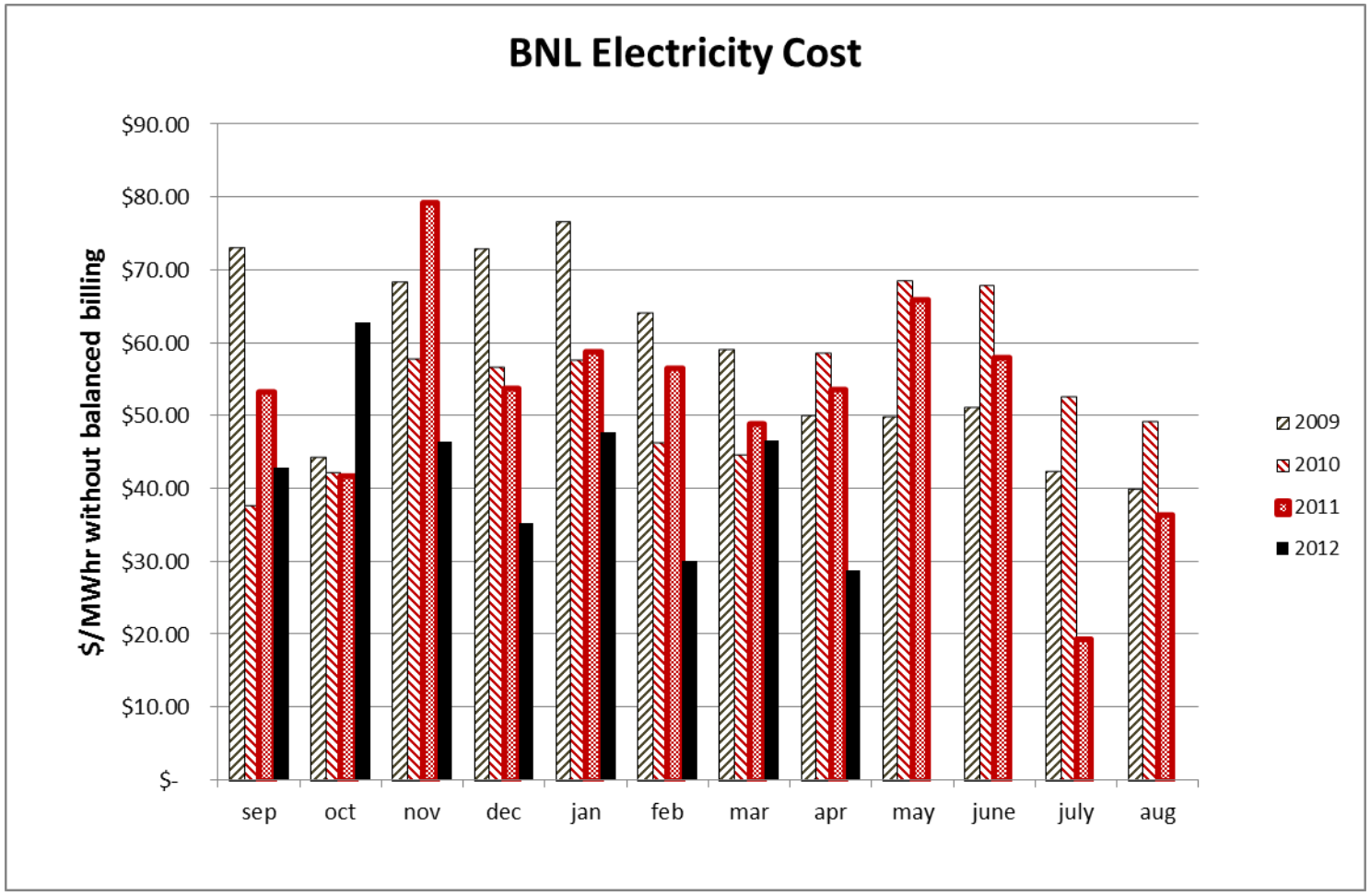
Thru 31 May


RHIC Cryo Operations FY10-12
RHIC Cryo 10
RHIC Cryo 11
RHIC Cryo 12
MW
9.00
8.00
7.00
6.00
5.00
4.00
3.00
2.00
1.00
0.00
-60
-40
-20
0
20
40
60
80
100
120
140
160
180
200
Days since beginning of Run

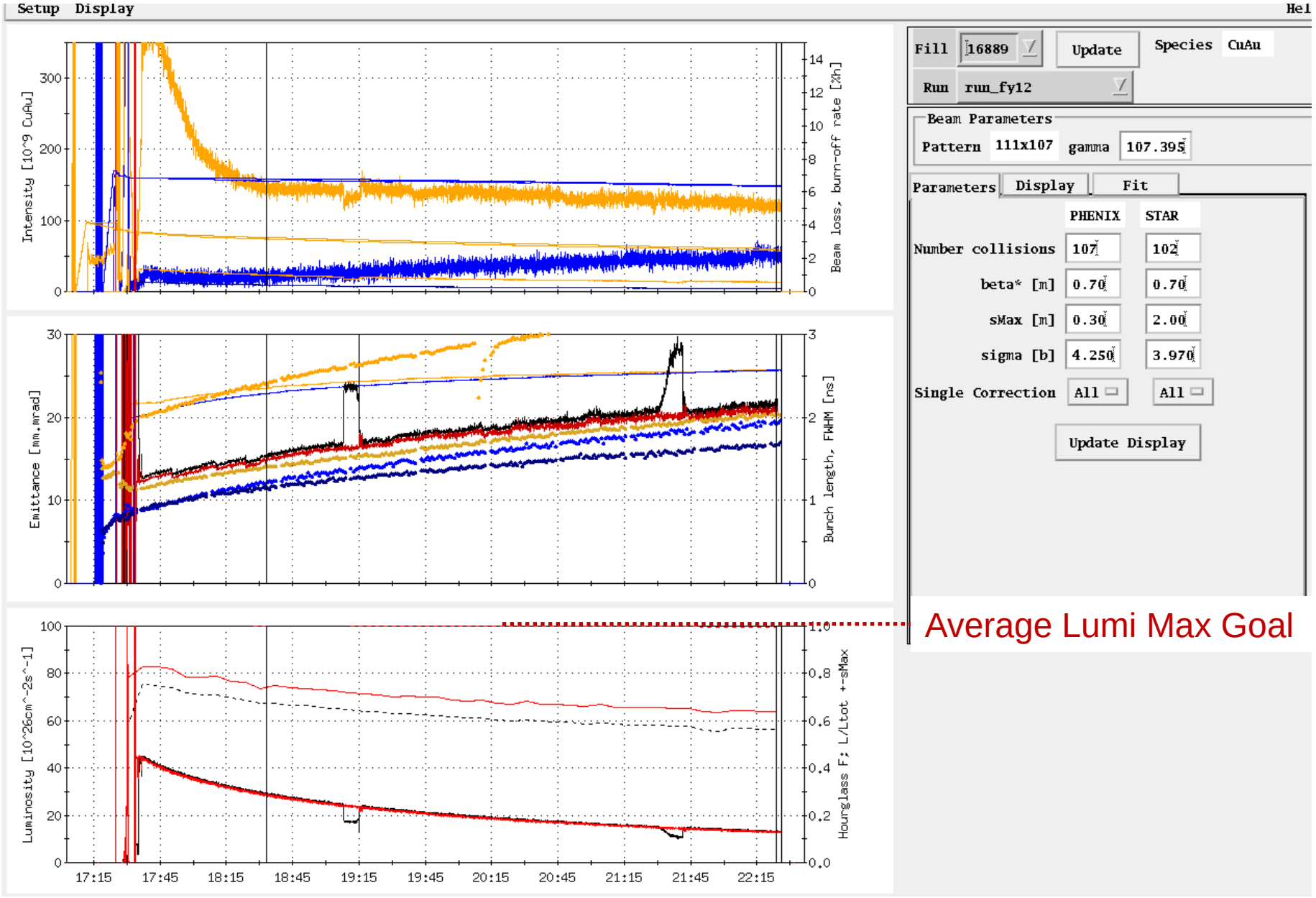

BNL Energy Use FY 2010-12
as of 31 May 2012
RHIC Cryo
RHIC other
AGS-Exp
Booster
AGS-Mach
Tandem
CAD Bldg less SMD
NSRL
Site Base
BNL Peak-Av
Site total not recorded 30 Nov 09 through Oct 2010 and 16 May through 7 July and more
Daily Average Power (MW)
0
5
10
15
20
25
30
35
40
45
50
1-Oct-09
1-Nov-09
1-Dec-09
1-Jan-10
1-Feb-10
1-Mar-10
1-Apr-10
1-May-10
1-Jun-10
1-Jul-10
1-Aug-10
1-Sep-10
1-Oct-10
1-Nov-10
1-Dec-10
1-Jan-11
1-Feb-11
1-Mar-11
1-Apr-11
1-May-11
1-Jun-11
1-Jul-11
1-Aug-11
1-Sep-11
1-Oct-11
1-Nov-11
1-Dec-11
1-Jan-12
1-Feb-12
1-Mar-12
1-Apr-12
1-May-12
Date

Thru 31 May

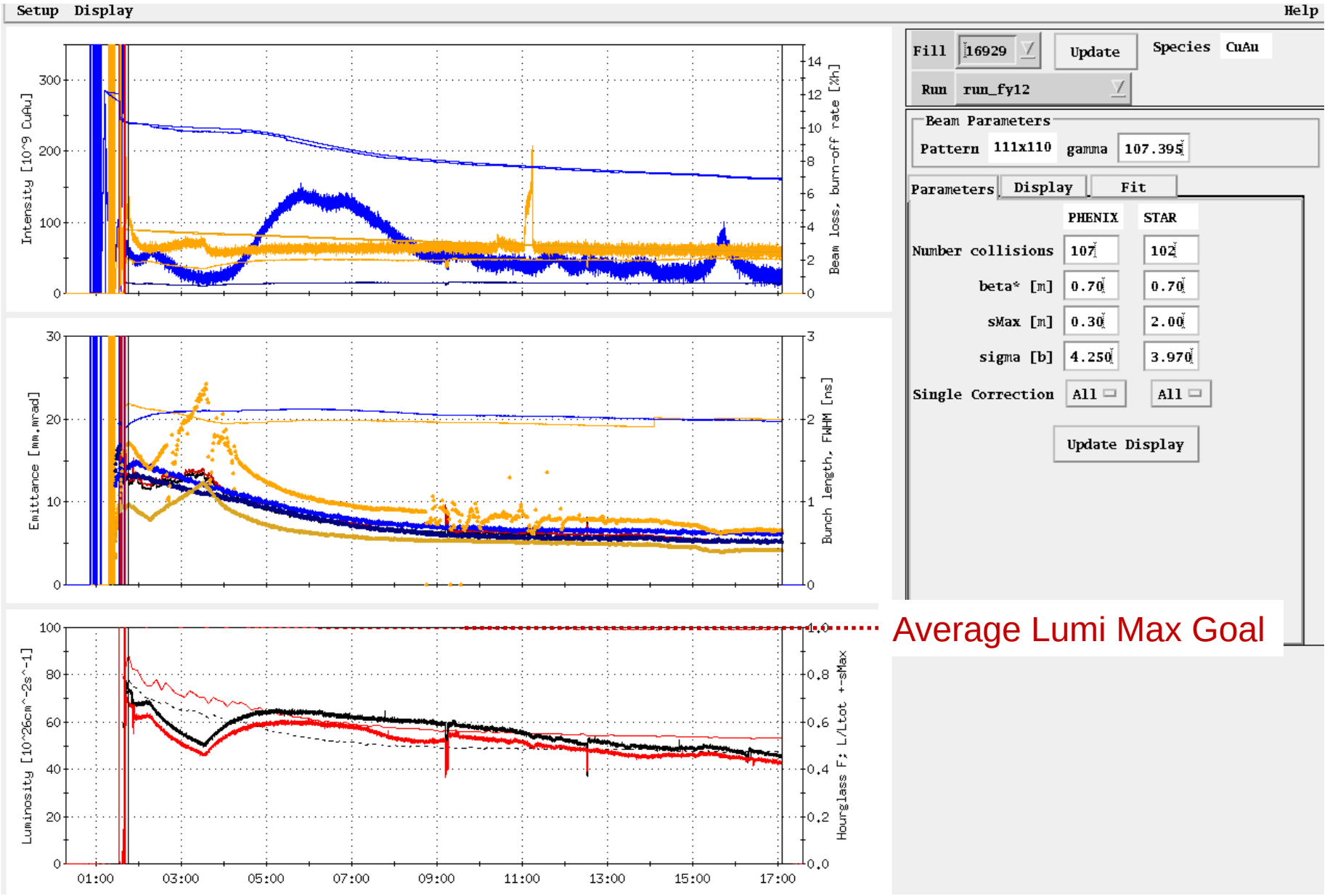

C-AD Energy Use FY 2002-12
Daily Average Power (MW)
40.0
35.0
30.0
25.0
20.0
15.0
10.0
5.0
0.0
1-Oct-01
1-Apr-02
1-Oct-02
1-Apr-03
1-Oct-03
1-Apr-04
1-Oct-04
1-Apr-05
1-Oct-05
1-Apr-06
1-Oct-06
1-Apr-07
1-Oct-07
1-Apr-08
1-Oct-08
1-Apr-09
1-Oct-09
1-Apr-10
1-Oct-10
1-Apr-11
1-Oct-11
1-Apr-12
Date


BNL Electricity Cost
$/MWhr without balanced billing
$90.00
$80.00
$70.00
$60.00
$50.00
$40.00
$30.00
$20.00
$10.00
$-
sep
oct
nov
dec
jan
feb
mar
apr
may
june
july
aug
2009
2010
2011
2012

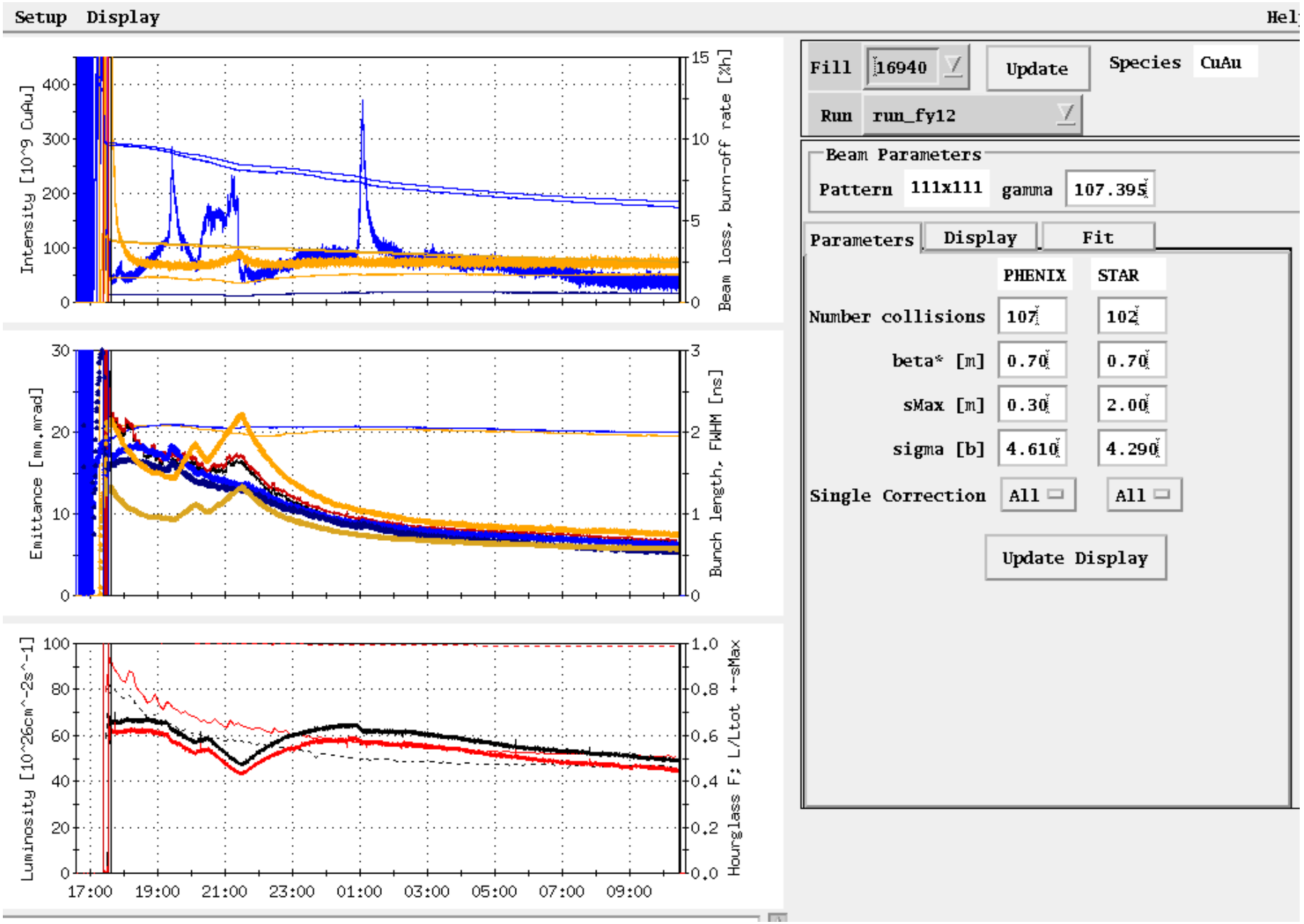
# Store 16889, 18 May (first physics store)



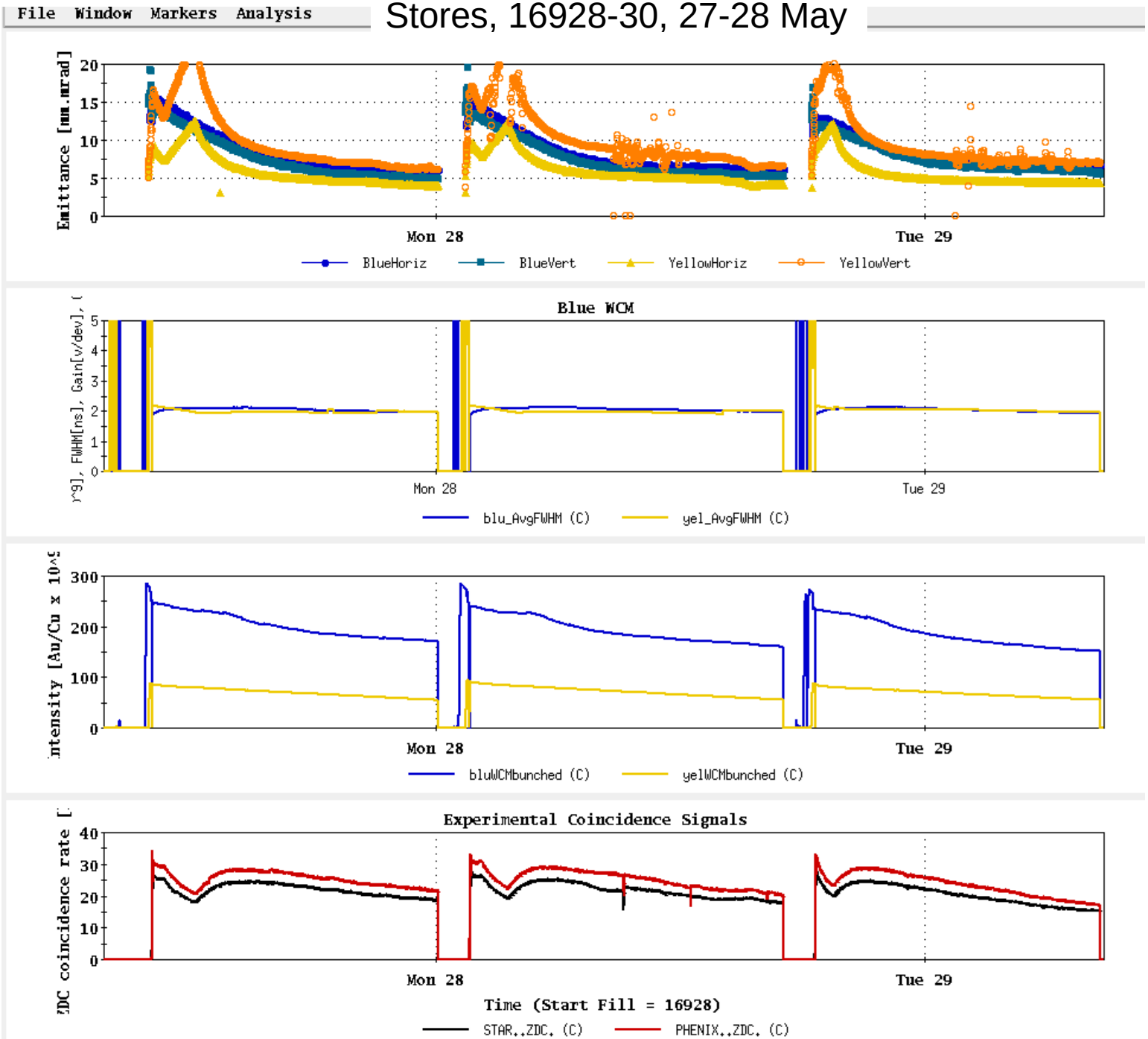
# Store, 16929, 28 May



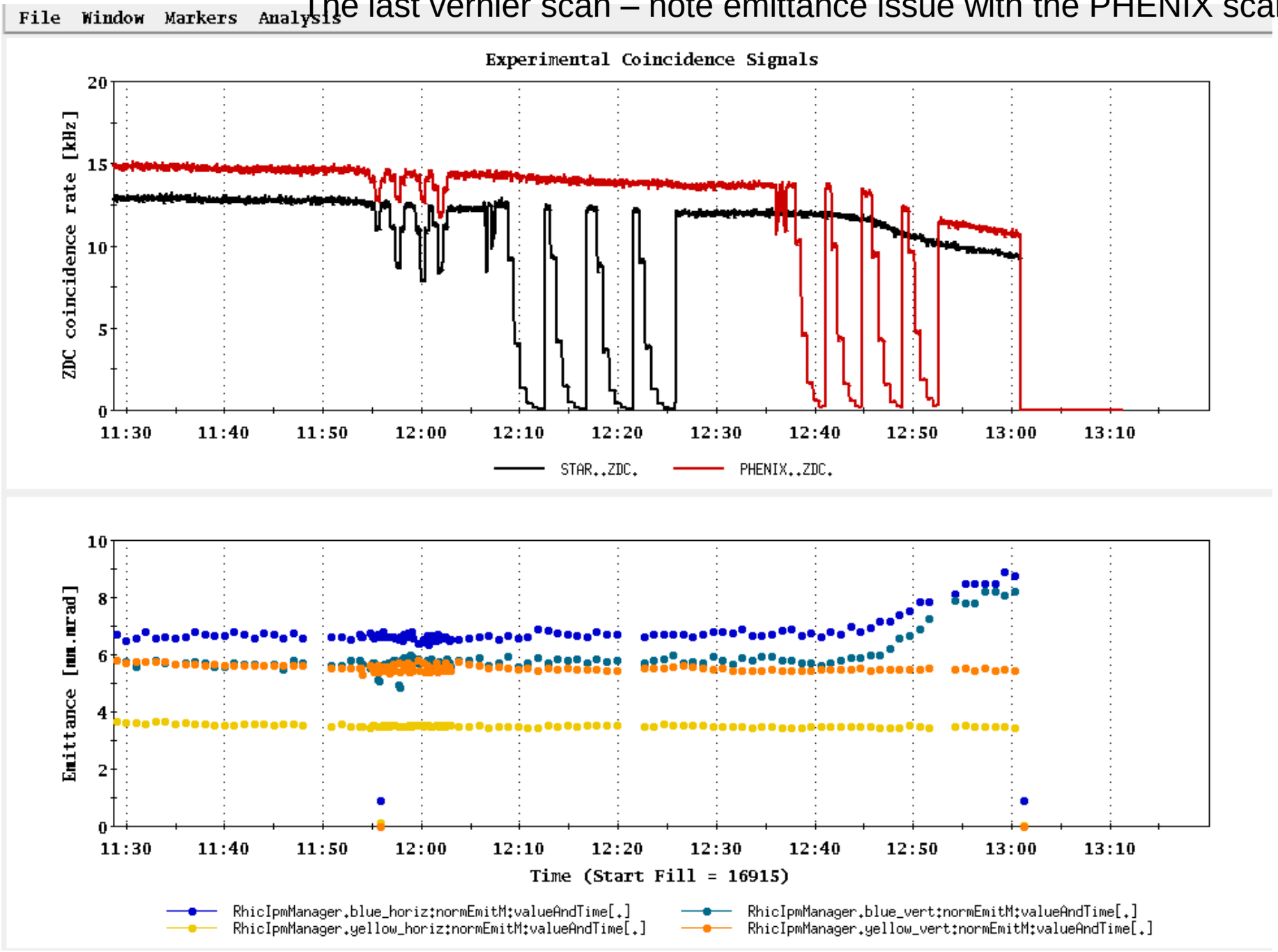
# Store, 16940, 31 May



# Stores, 16928-30, 27-28 May



# The last vernier scan – note emittance issue with the PHENIX scan



RHIC/Beamlons.logreq 05/17/2012 19:

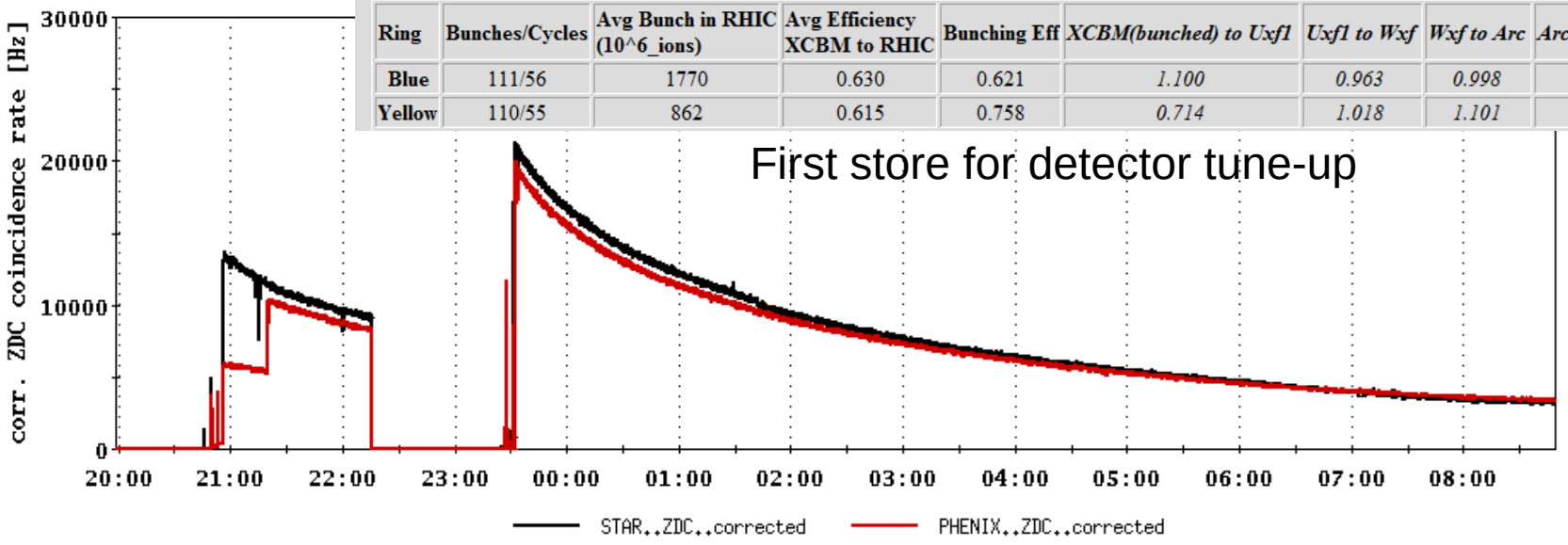
File Window Markers Anal

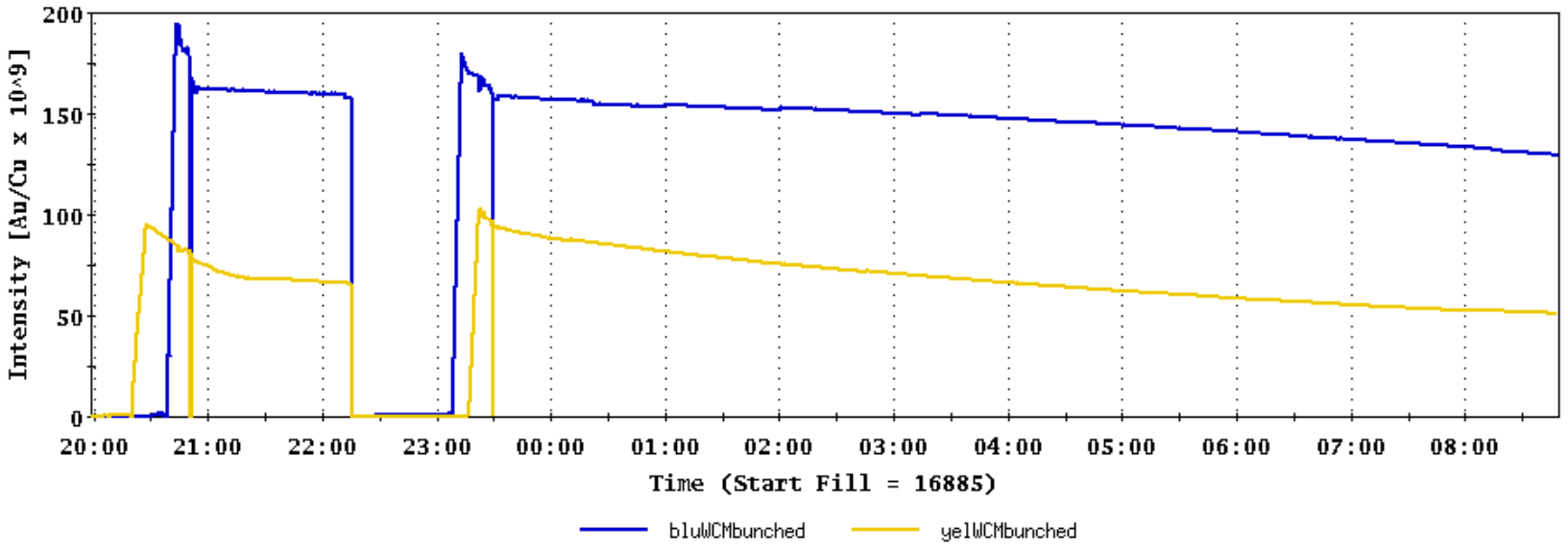
## Injected Beam Statistics for Fill number 16885

Started filling RHIC: Thu May 17 20:20:08 2012, Fill complete: Thu May 17 20:43:16 2012, Minutes to fill: 23
Newfill time: Thu May 17 19:58:33 2012, Minutes from newfill to accramp: 46

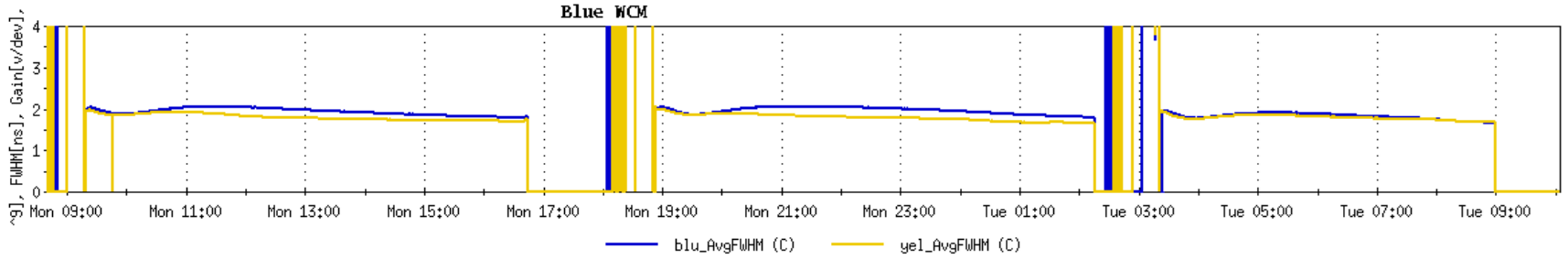
| Ring | Bunches/Cycles | Avg Bunch in RHIC (10^6_ions) | Avg Efficiency XCBM to RHIC | Bunching Eff | *XCBM(bunched) to Uxf1* | *Uxf1 to Wxf* | *Wxf to Arc* | *Arc to RHIC* |
|---|---|---|---|---|---|---|---|---|
| Blue | 111/56 | 1770 | 0.630 | 0.621 | *1.100* | *0.963* | *0.998* | *0.961* |
| Yellow | 110/55 | 862 | 0.615 | 0.758 | *0.714* | *1.018* | *1.101* | *1.018* |

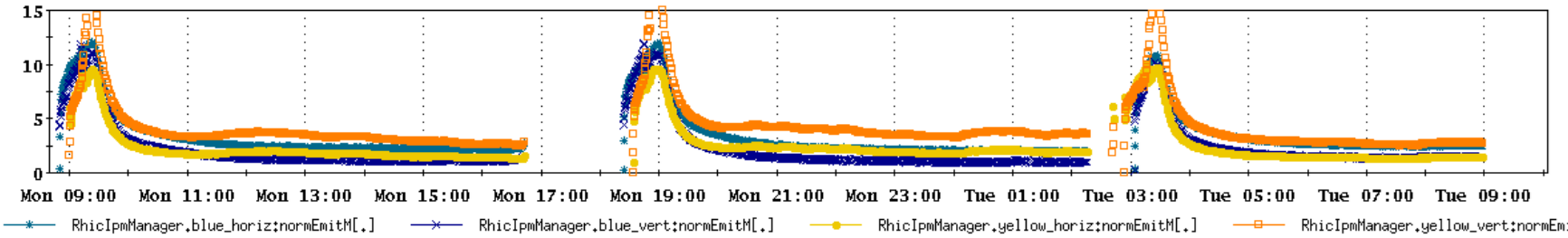
First store for detector tune-up

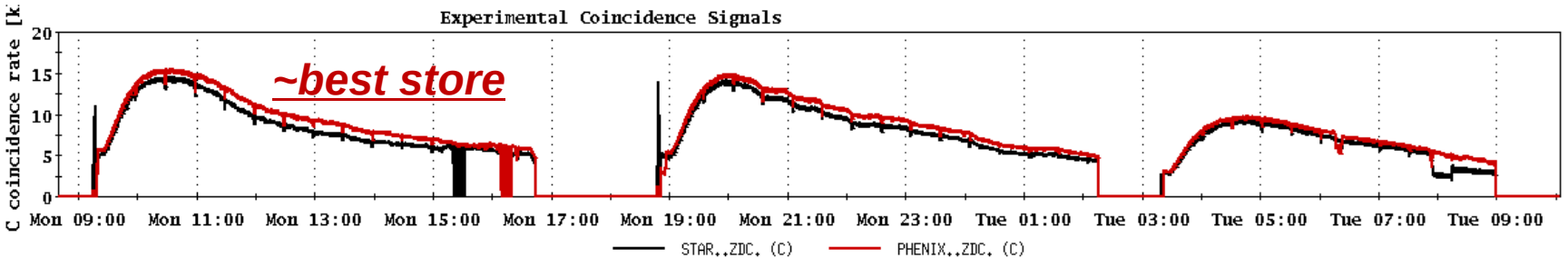


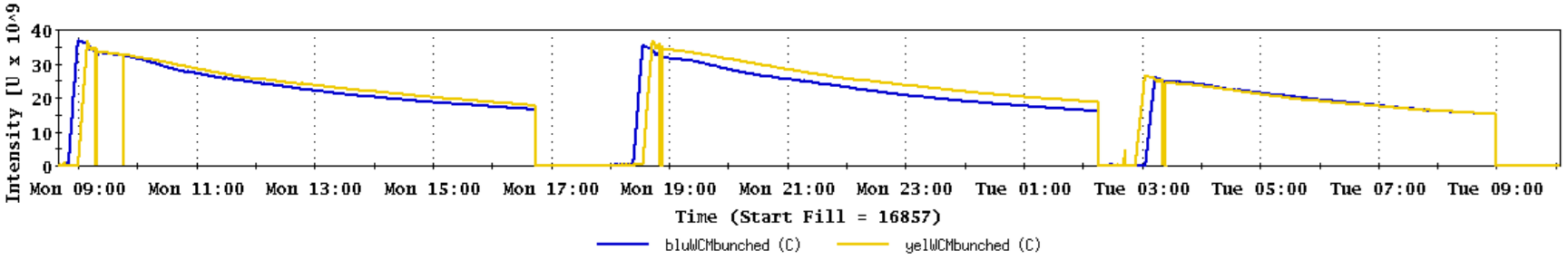



# Last three UU physics stores



PHENIX BUR Goal = 2.4 $nb^{-1}$ sampled, ~8 delivered (?)
STAR Goal = ?

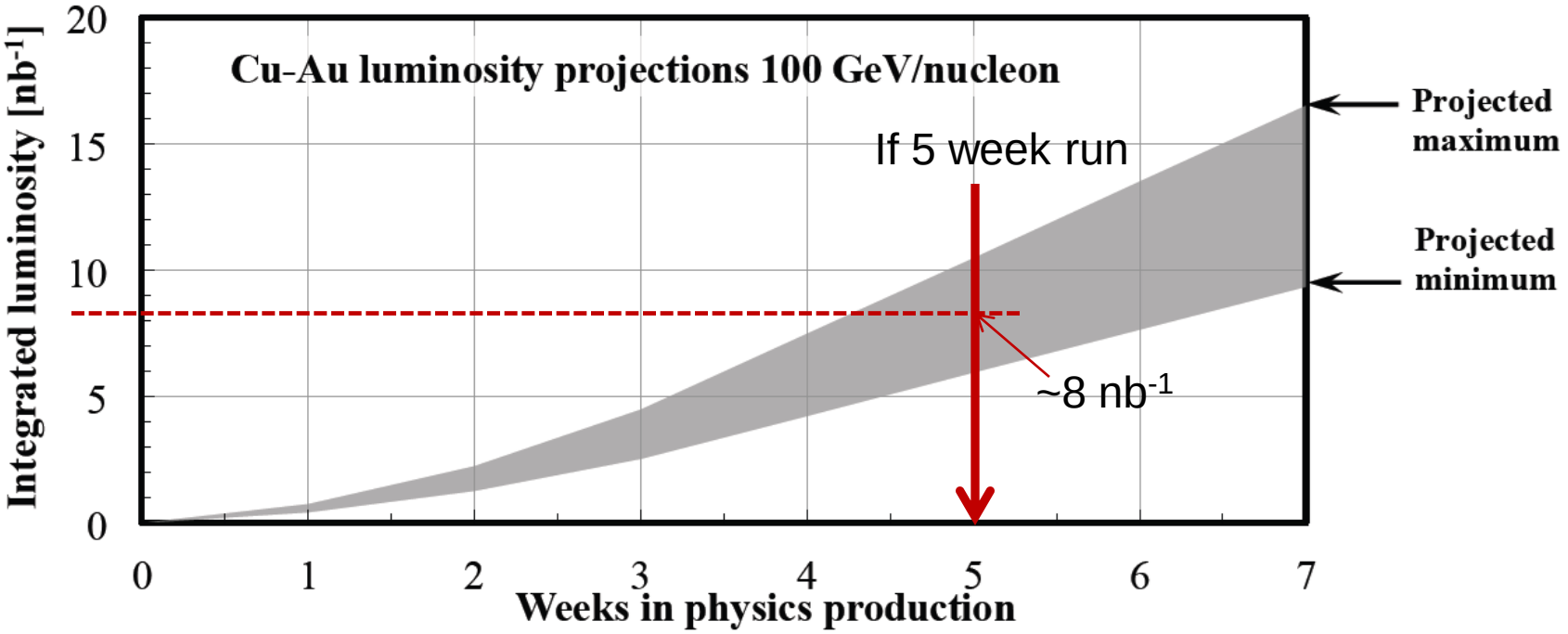
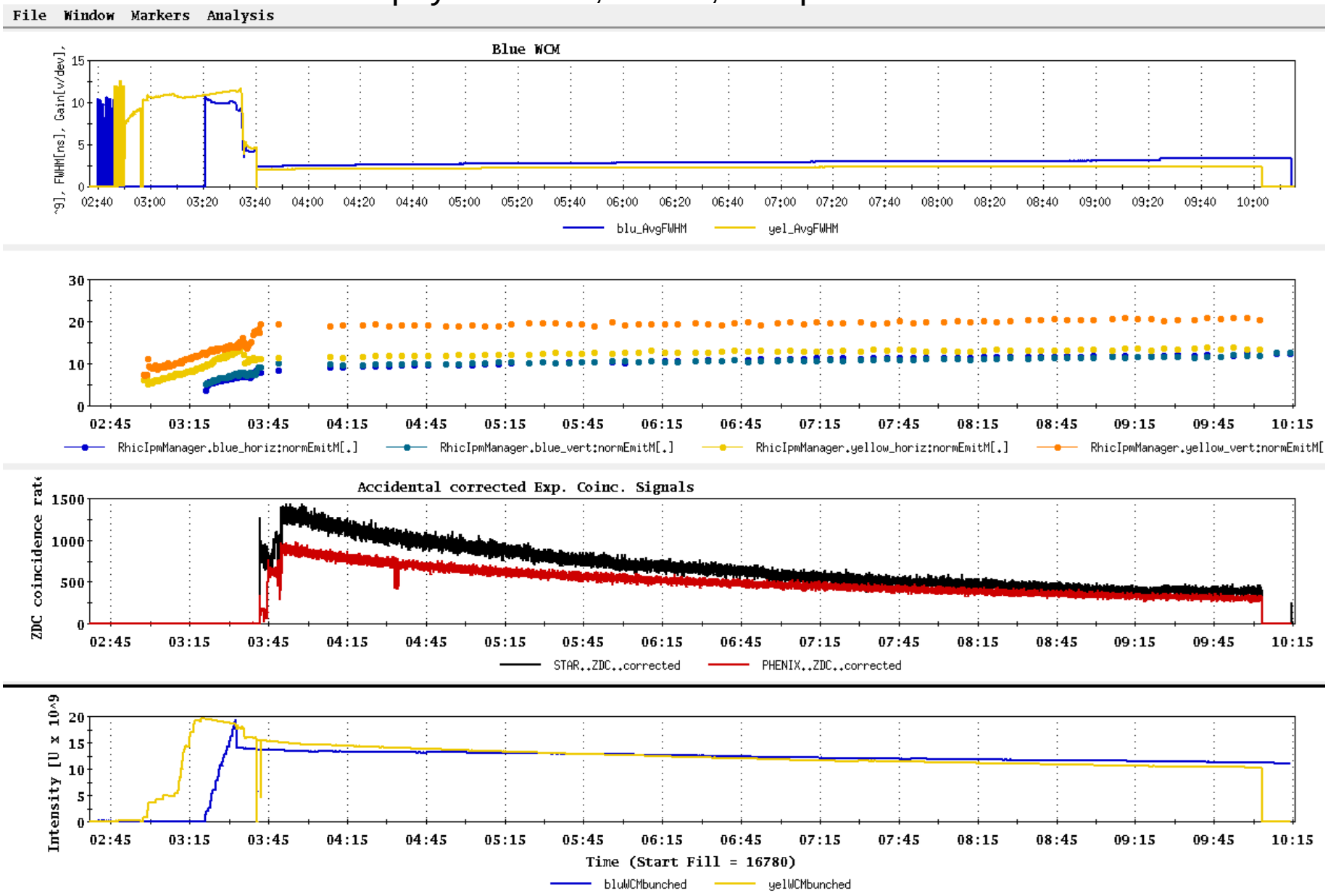


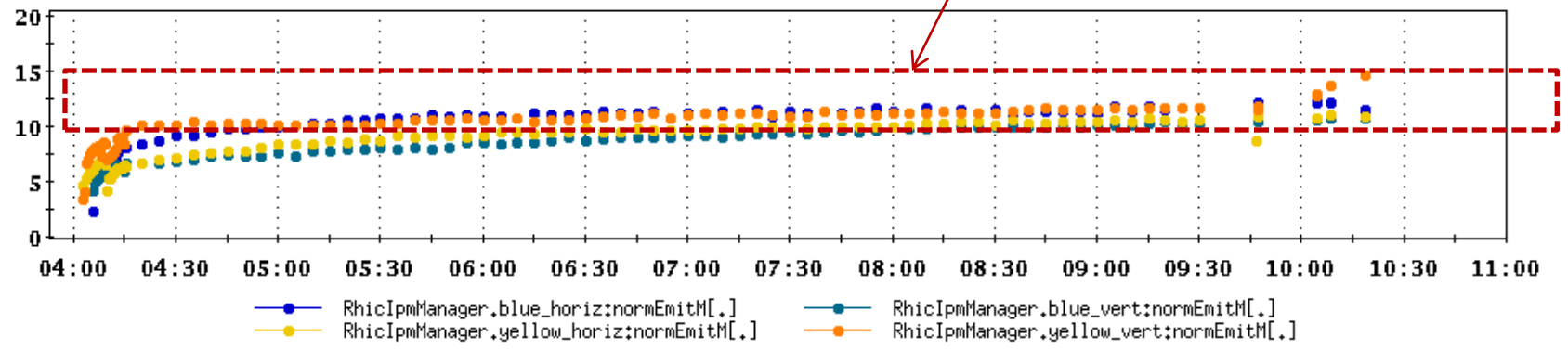

**Figure 6: Projected minimum and maximum integrated luminosities for copper-gold collisions at 100 GeV/nucleon beam energy, assuming linear weekly luminosity ramp-up in 4 weeks.**

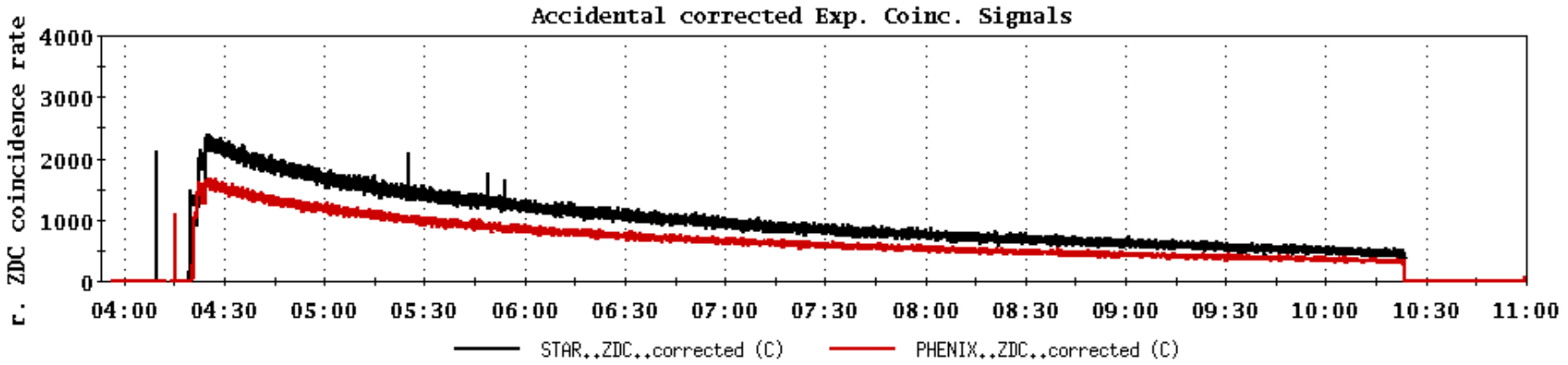
# First UU physics store, 16780, 25 April



Setup Store, no rebucketing yet…

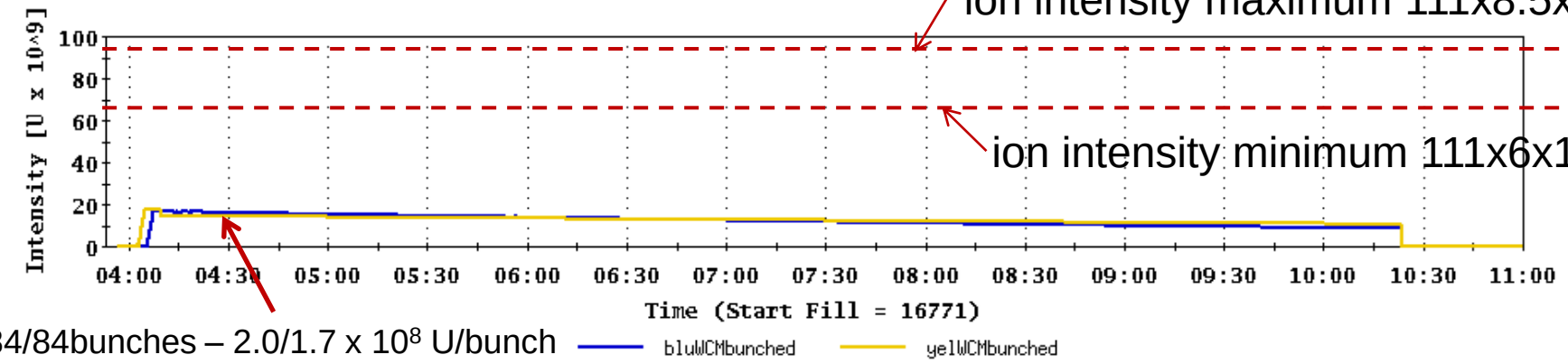
Transverse emittance projection



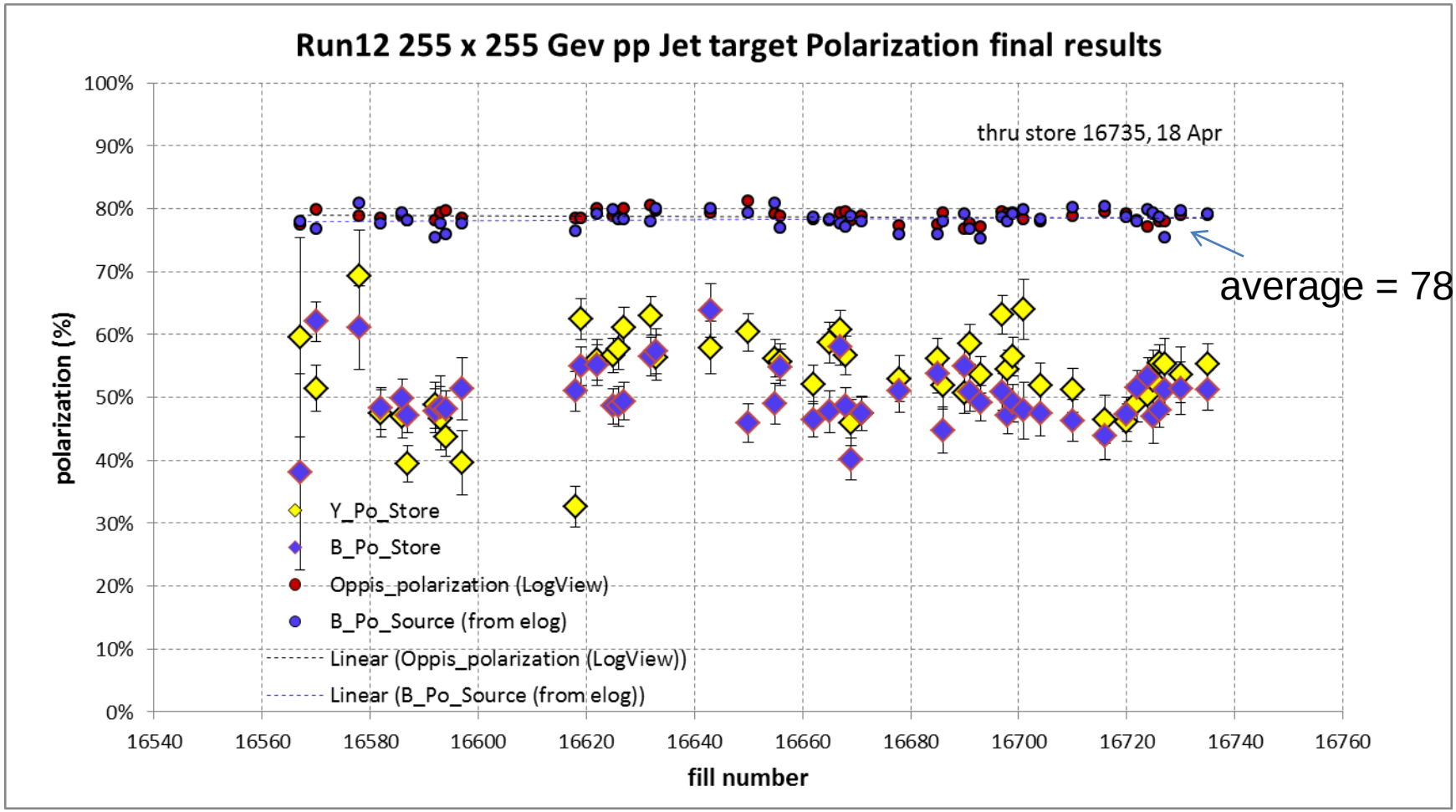

ion intensity maximum 111x8.5x10$^8$

ion intensity minimum 111x6x10$^8$

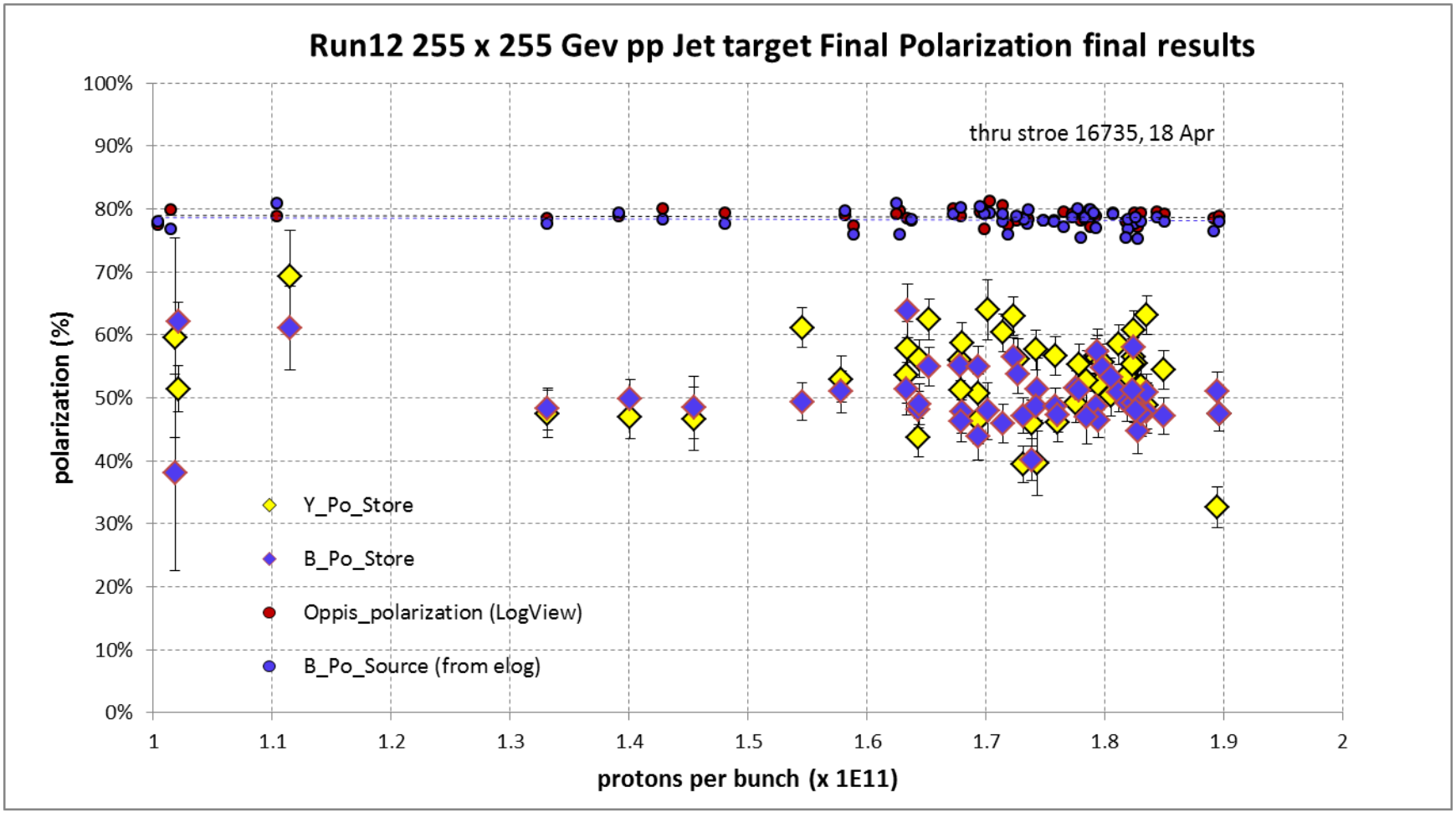


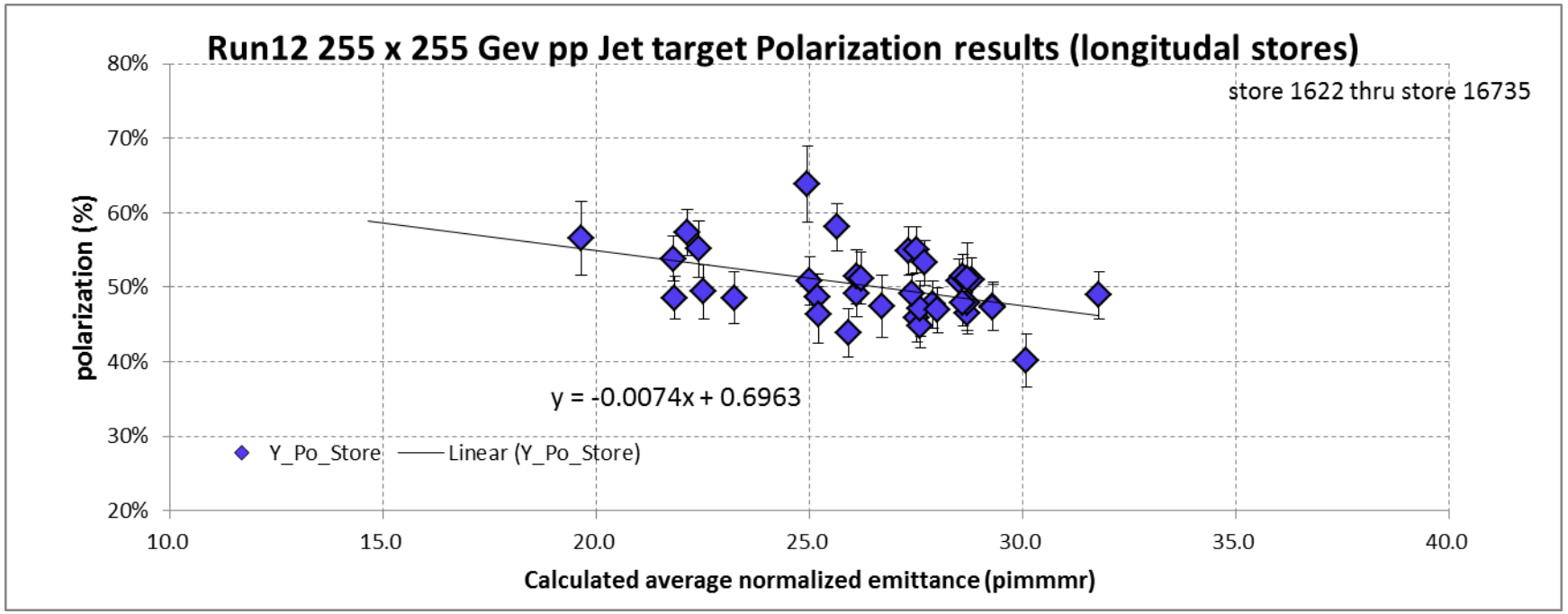

84/84bunches – 2.0/1.7 x 10$^8$ U/bunch

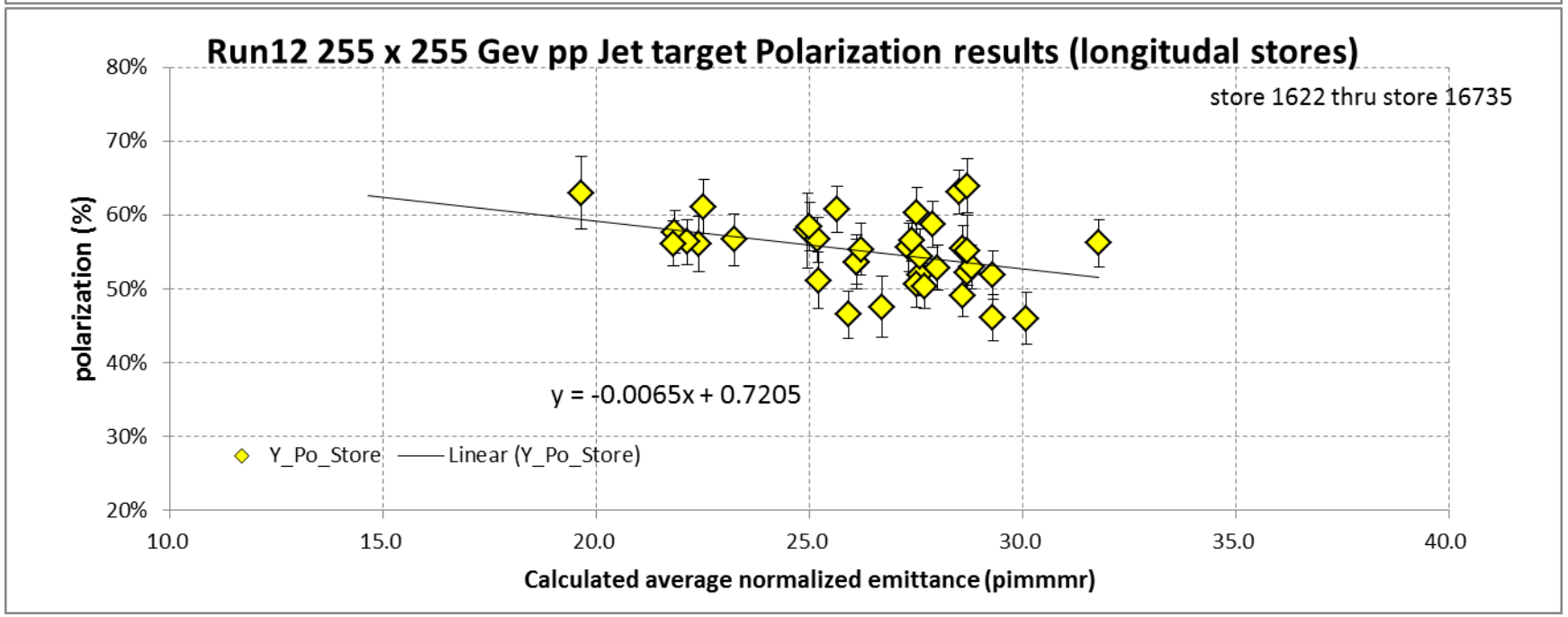
Blue beam at injection jet target result = ? %




Blue weighted average = 50.3% ± 0.5%
Yellow weighted average = 53.4% ± 0.5%


Run12 255 x 255 Gev pp Jet target Final Polarization final results
thru stroe 16735, 18 Apr
polarization (%)
100%
90%
80%
70%
60%
50%
40%
30%
20%
10%
0%
1
1.1
1.2
1.3
1.4
1.5
1.6
1.7
1.8
1.9
2
protons per bunch (x 1E11)
Y_Po_Store
B_Po_Store
Oppis_polarization (LogView)
B_Po_Source (from elog)


Run12 255 x 255 Gev pp Jet target Polarization results (longitudal stores)
store 1622 thru store 16735
polarization (%)
80%
70%
60%
50%
40%
30%
20%
y = -0.0074x + 0.6963
Y_Po_Store
Linear (Y_Po_Store)
10.0
15.0
20.0
25.0
30.0
35.0
40.0
Calculated average normalized emittance (pimmmr)


Run12 255 x 255 Gev pp Jet target Polarization results (longitudal stores)
store 1622 thru store 16735
polarization (%)
80%
70%
60%
50%
40%
30%
20%
y = -0.0065x + 0.7205
Y_Po_Store
Linear (Y_Po_Store)
10.0
15.0
20.0
25.0
30.0
35.0
40.0
Calculated average normalized emittance (pimmmr)

Where we are with Uranium (From K. Zeno)

Into the booster 8 x 10^8 in 4 bunches

These are then combined into one bunch

Booster extraction 6.5 x 10^8 / bunch

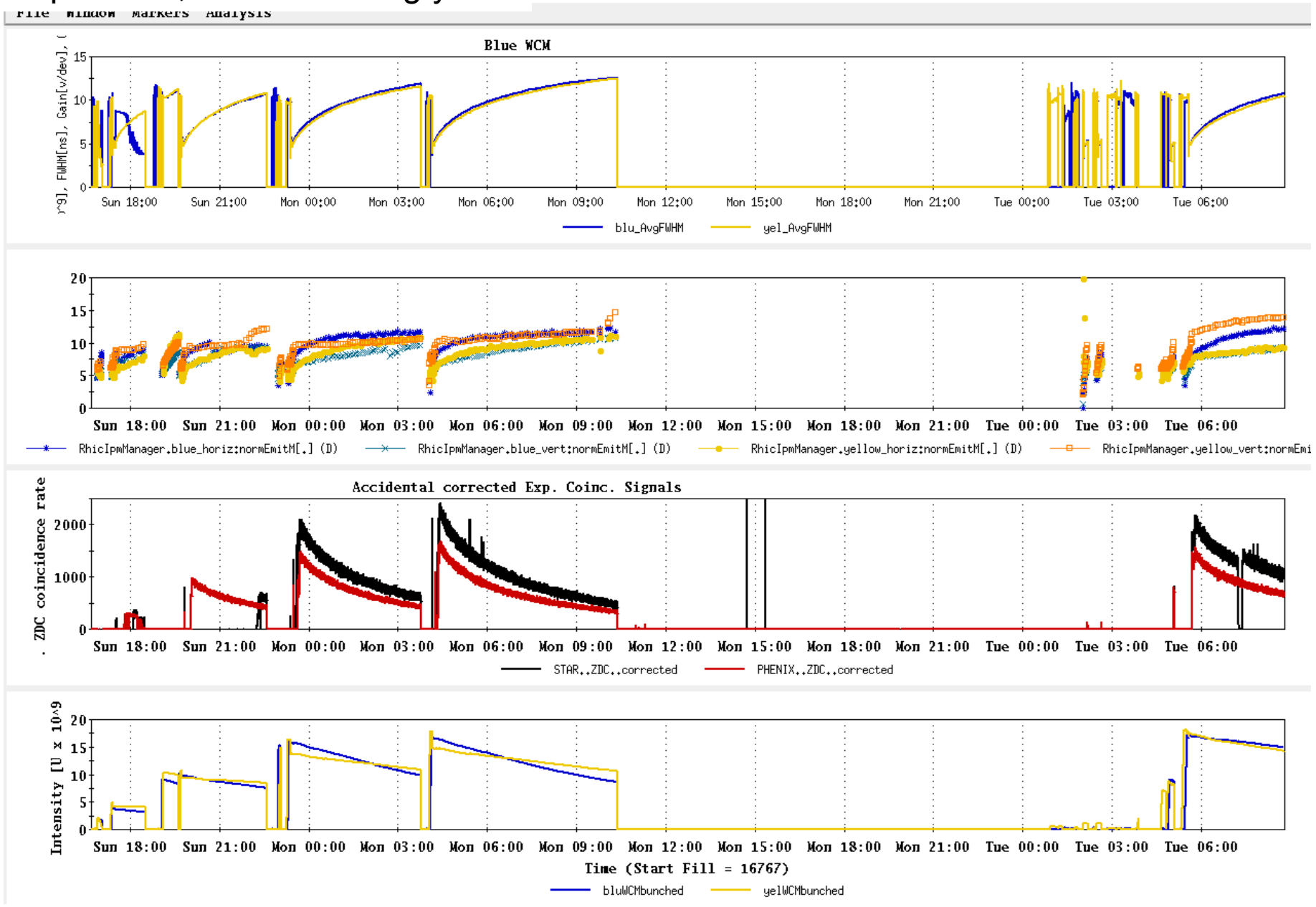
30% efficiency into the AGS

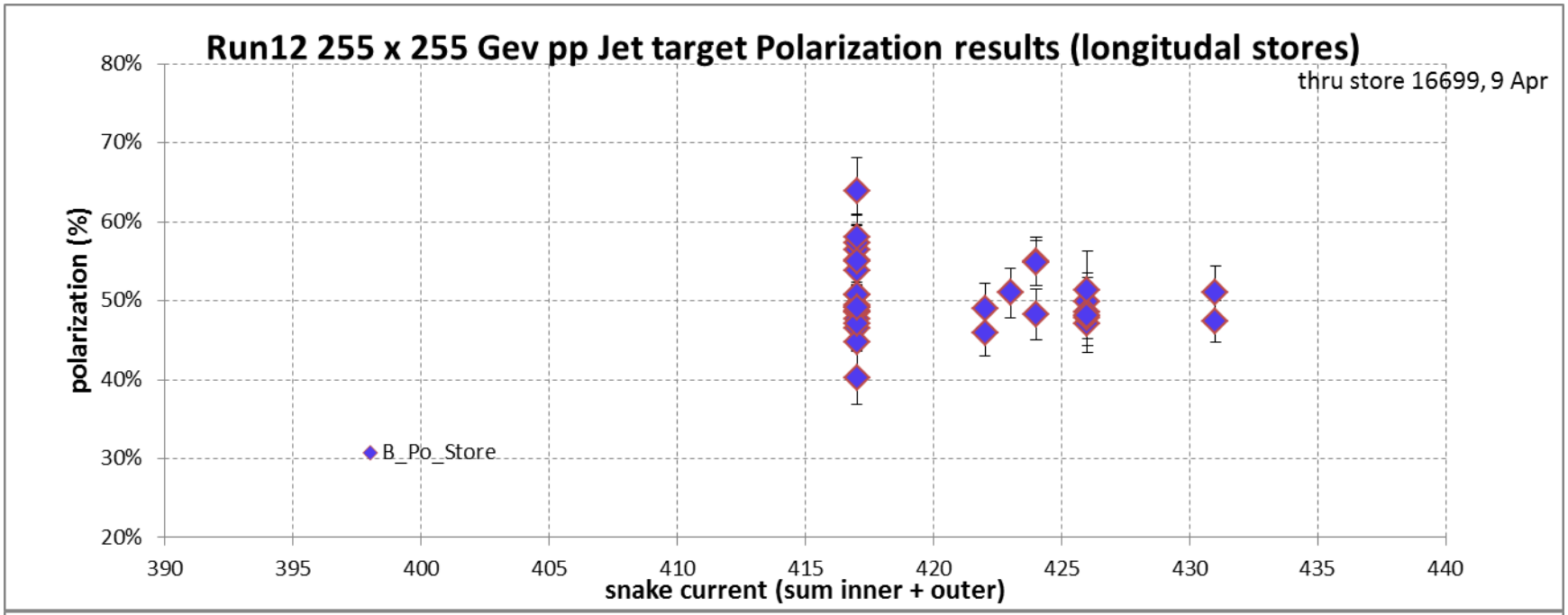
AGS extraction is at 2 x 10^8 / bunch

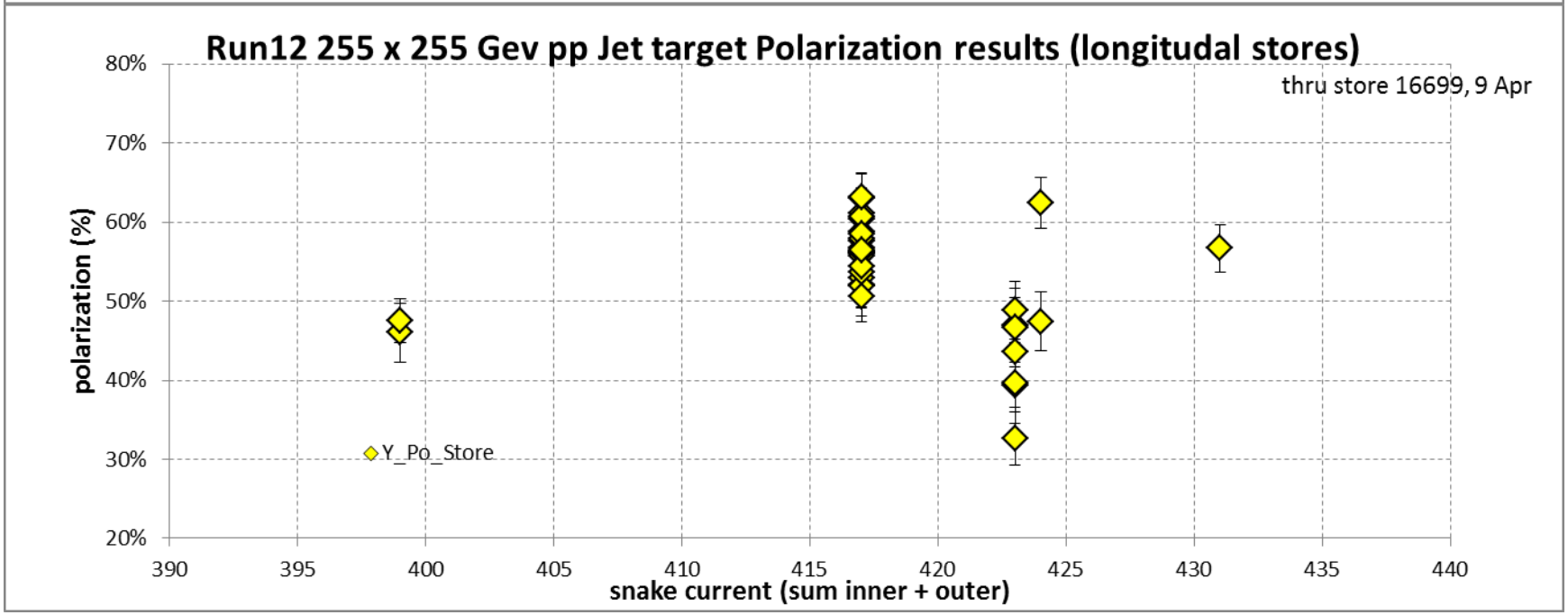
Desired (Wolfram) ~ 7 x 10^8 / bunch

>>> 6 x 10^8 / bunch in RHIC

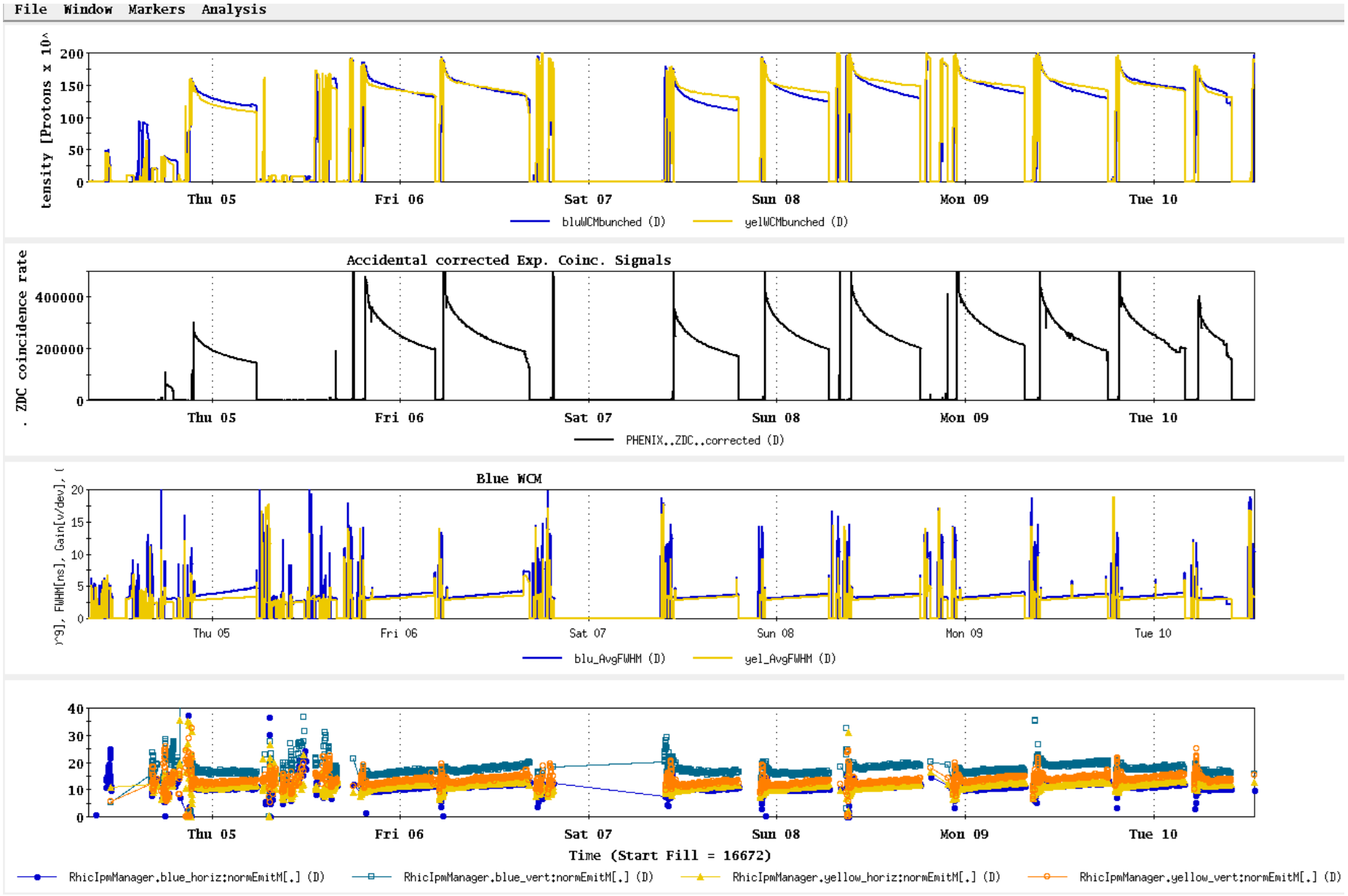
Setup Stores, no rebucketing yet… √s = 193 GeV/n UU – stores 16769 through 16775




Run12 255 x 255 Gev pp Jet target Polarization results (longitudal stores)
thru store 16699, 9 Apr
polarization (%)
80%
70%
60%
50%
40%
30%
20%
B_Po_Store
390
395
400
405
410
415
420
425
430
435
440
snake current (sum inner + outer)


Run12 255 x 255 Gev pp Jet target Polarization results (longitudal stores)
thru store 16699, 9 Apr
polarization (%)
80%
70%
60%
50%
40%
30%
20%
Y_Po_Store
390
395
400
405
410
415
420
425
430
435
440
snake current (sum inner + outer)

# 4 Apr – 10 Apr stores



## Run 12, $\sqrt{s}$ = 510 GeV polarized proton run – experiment goals

**STAR Goal for 5 weeks longitudal polarization (50% polarization):**

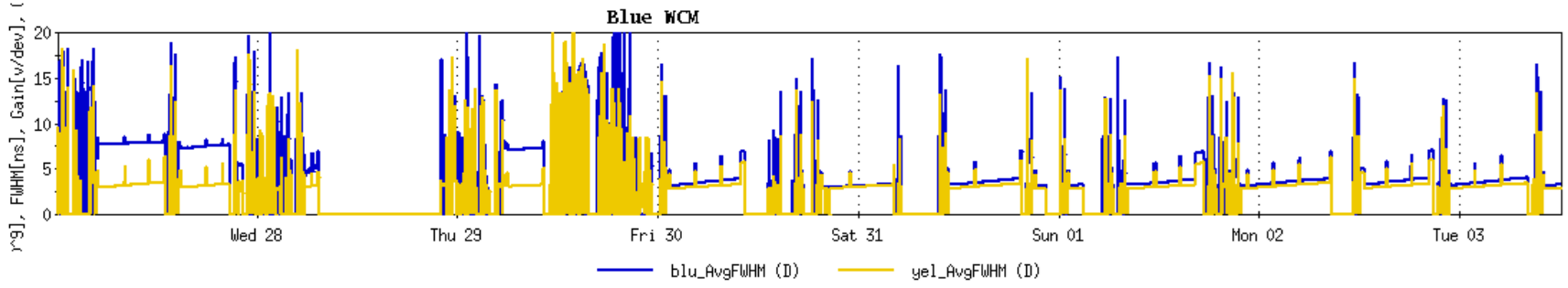
- Sampled Luminosity = 45 $pb^{-1}$ with 50% polarization
- Delivered Luminosity = 75 $pb^{-1}$

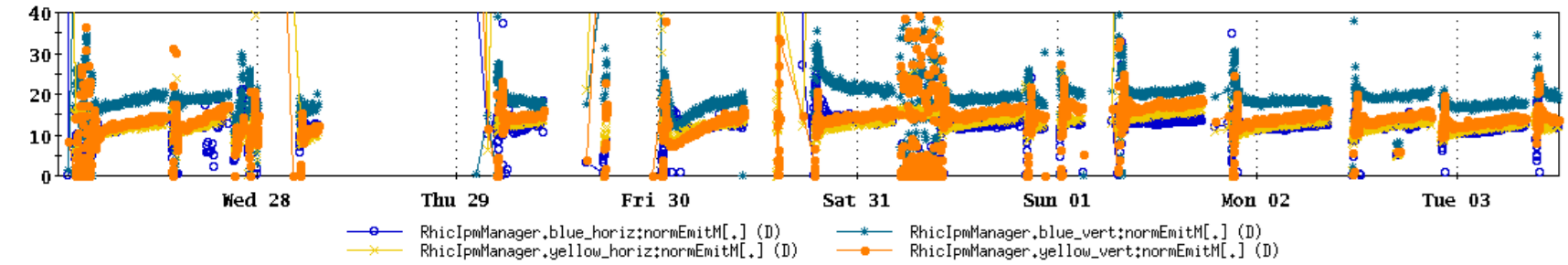
**PHENIX Goal for 5 weeks longitudal polarization (50% polarization):**

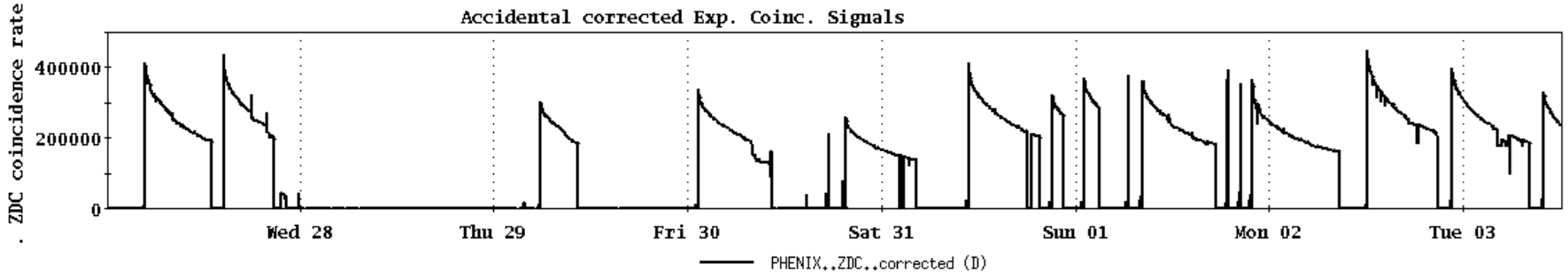
- Sampled Luminosity = 30 $pb^{-1}$ with |z| <30 cm
  = 10 $pb^{-1}$ with |z| <10 cm
- Delivered Luminosity = ~~75~~ $pb^{-1}$ changed to 120 $pb^{-1}$, 3/29/12, Ed O'Brien email

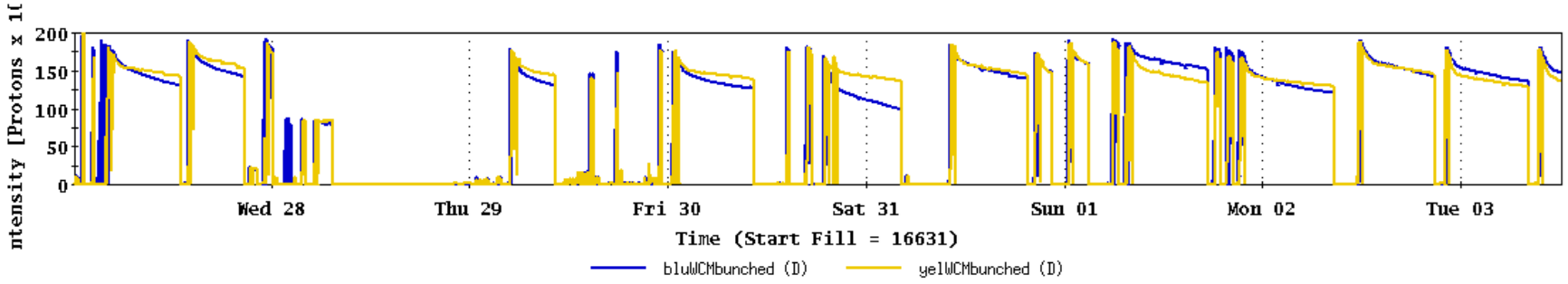
# 27 Mar – 3 Apr stores

File Window Markers Analysis

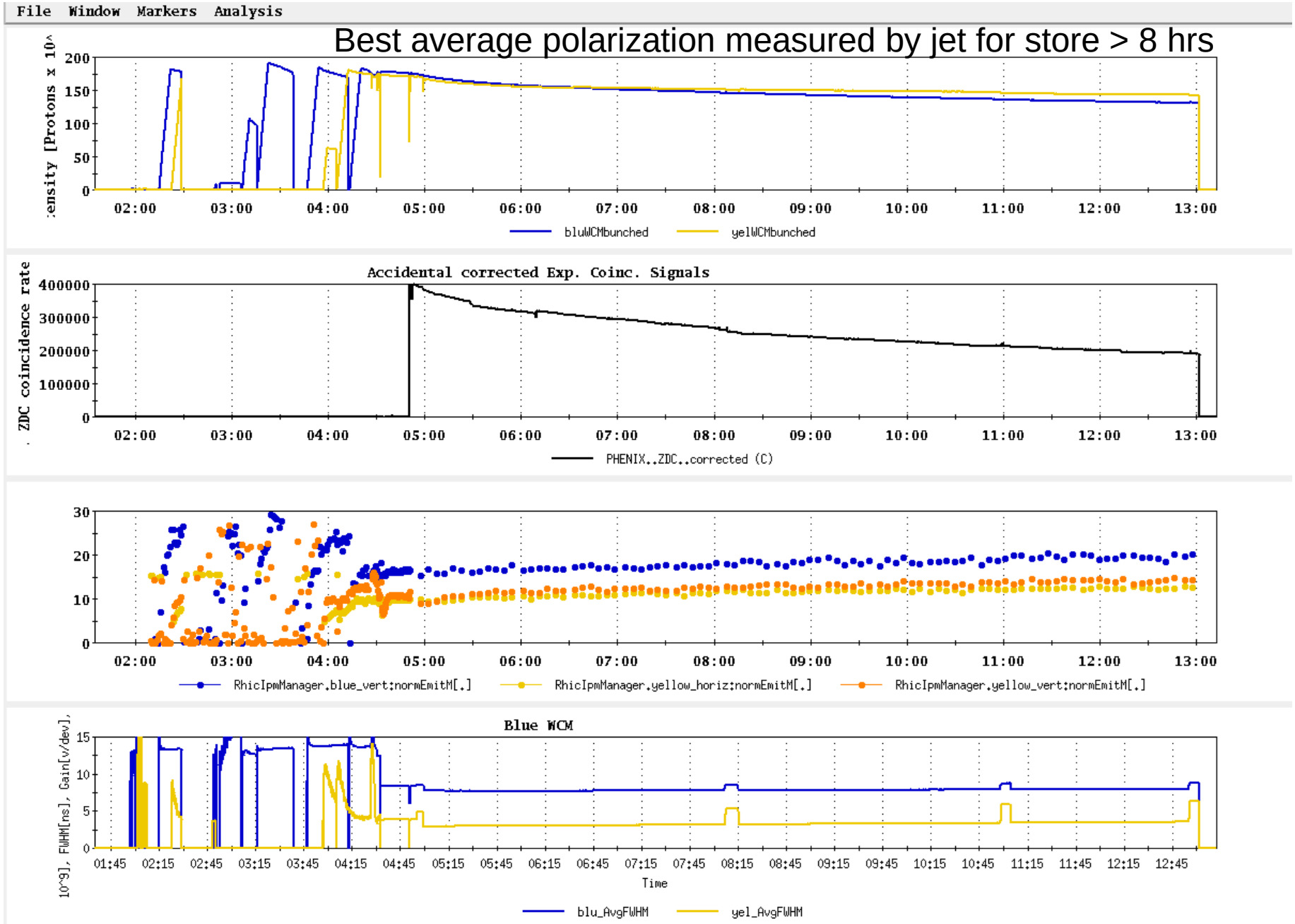


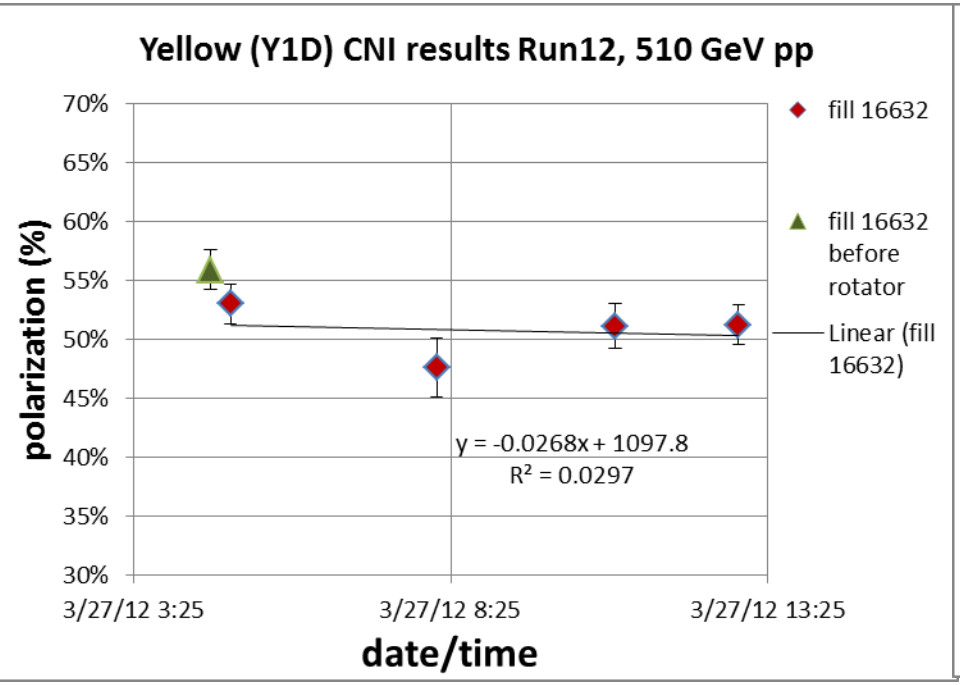



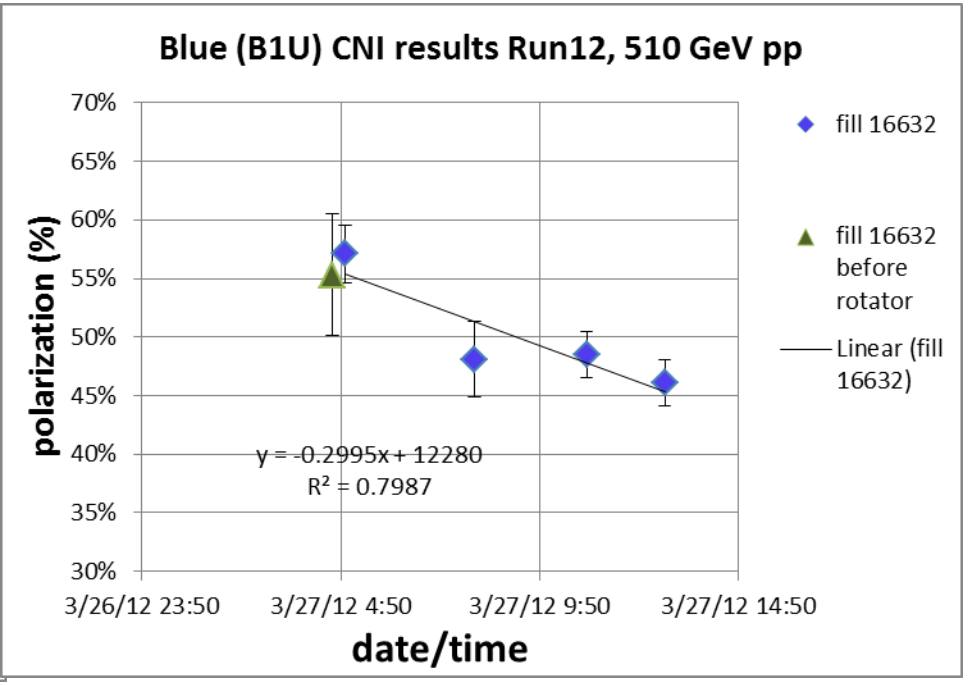



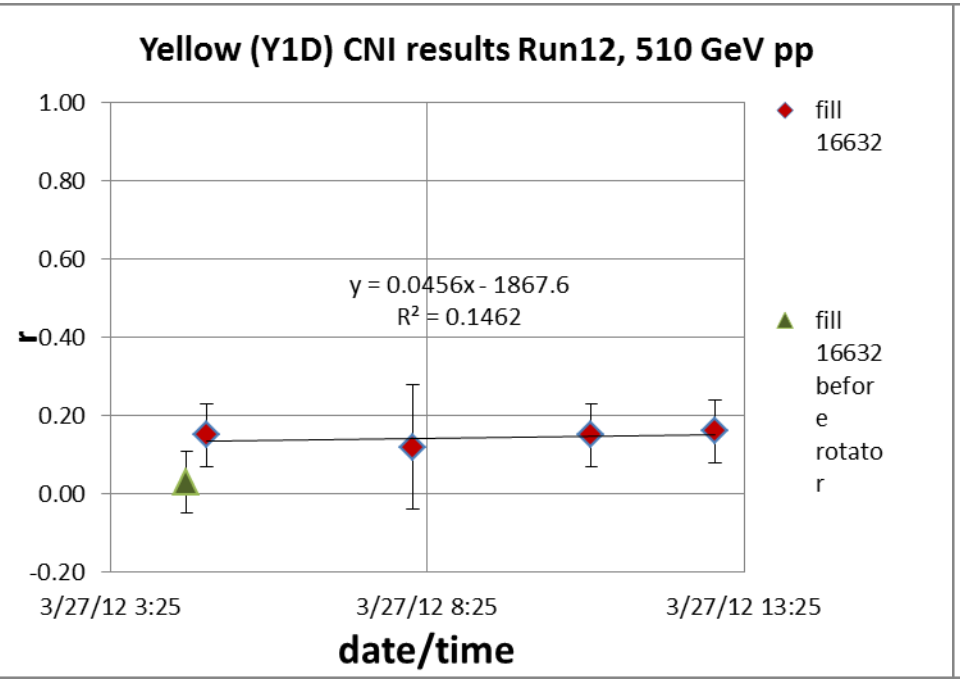



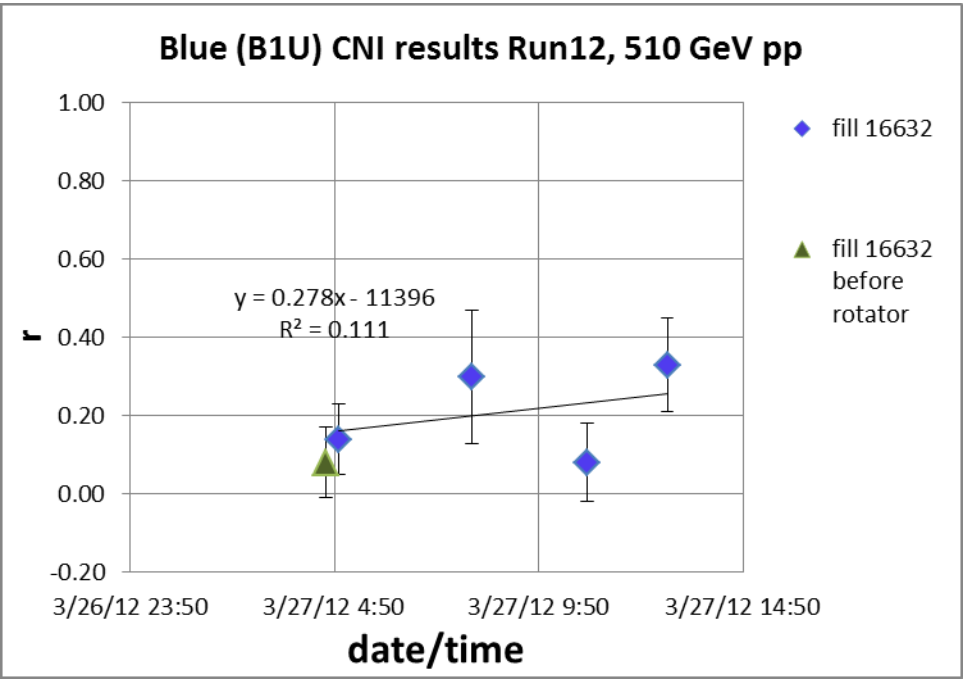
# Store 16632, Blue jet = 56.5 +/- 3.0; Yellow jet = 63.0 +/- 3.1




Yellow (Y1D) CNI results Run12, 510 GeV pp
polarization (%)
70%
65%
60%
55%
50%
45%
40%
35%
30%
3/27/12 3:25
3/27/12 8:25
3/27/12 13:25
date/time
y = -0.0268x + 1097.8
R² = 0.0297
fill 16632
fill 16632 before rotator
Linear (fill 16632)

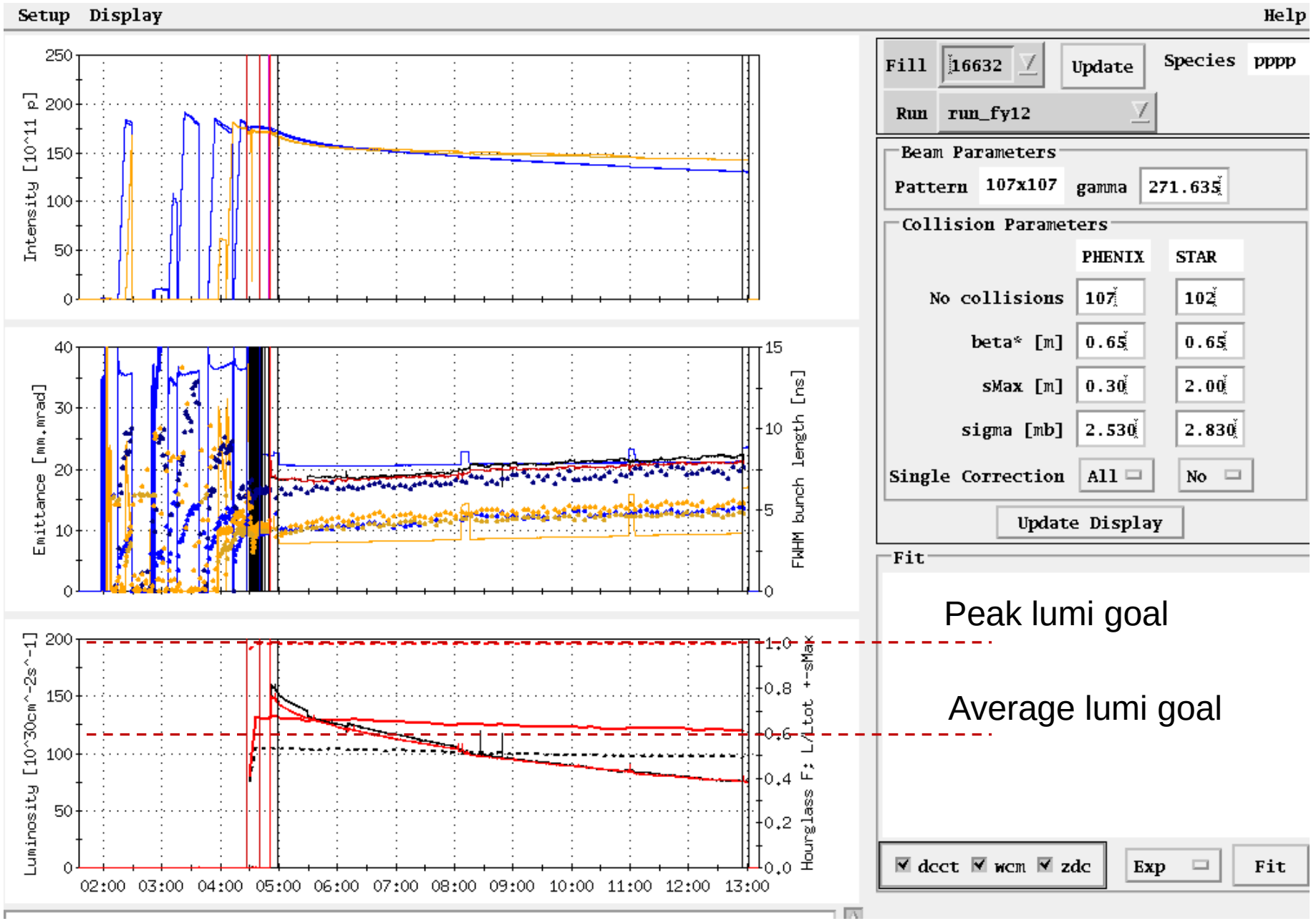

Blue (B1U) CNI results Run12, 510 GeV pp
polarization (%)
70%
65%
60%
55%
50%
45%
40%
35%
30%
3/26/12 23:50
3/27/12 4:50
3/27/12 9:50
3/27/12 14:50
date/time
y = -0.2995x + 12280
R² = 0.7987
fill 16632
fill 16632 before rotator
Linear (fill 16632)


Yellow (Y1D) CNI results Run12, 510 GeV pp
r
1.00
0.80
0.60
0.40
0.20
0.00
-0.20
3/27/12 3:25
3/27/12 8:25
3/27/12 13:25
date/time
y = 0.0456x - 1867.6
R² = 0.1462
fill 16632
fill 16632 before rotator


Blue (B1U) CNI results Run12, 510 GeV pp
r
1.00
0.80
0.60
0.40
0.20
0.00
-0.20
3/26/12 23:50
3/27/12 4:50
3/27/12 9:50
3/27/12 14:50
date/time
y = 0.278x - 11396
R² = 0.111
fill 16632
fill 16632 before rotator

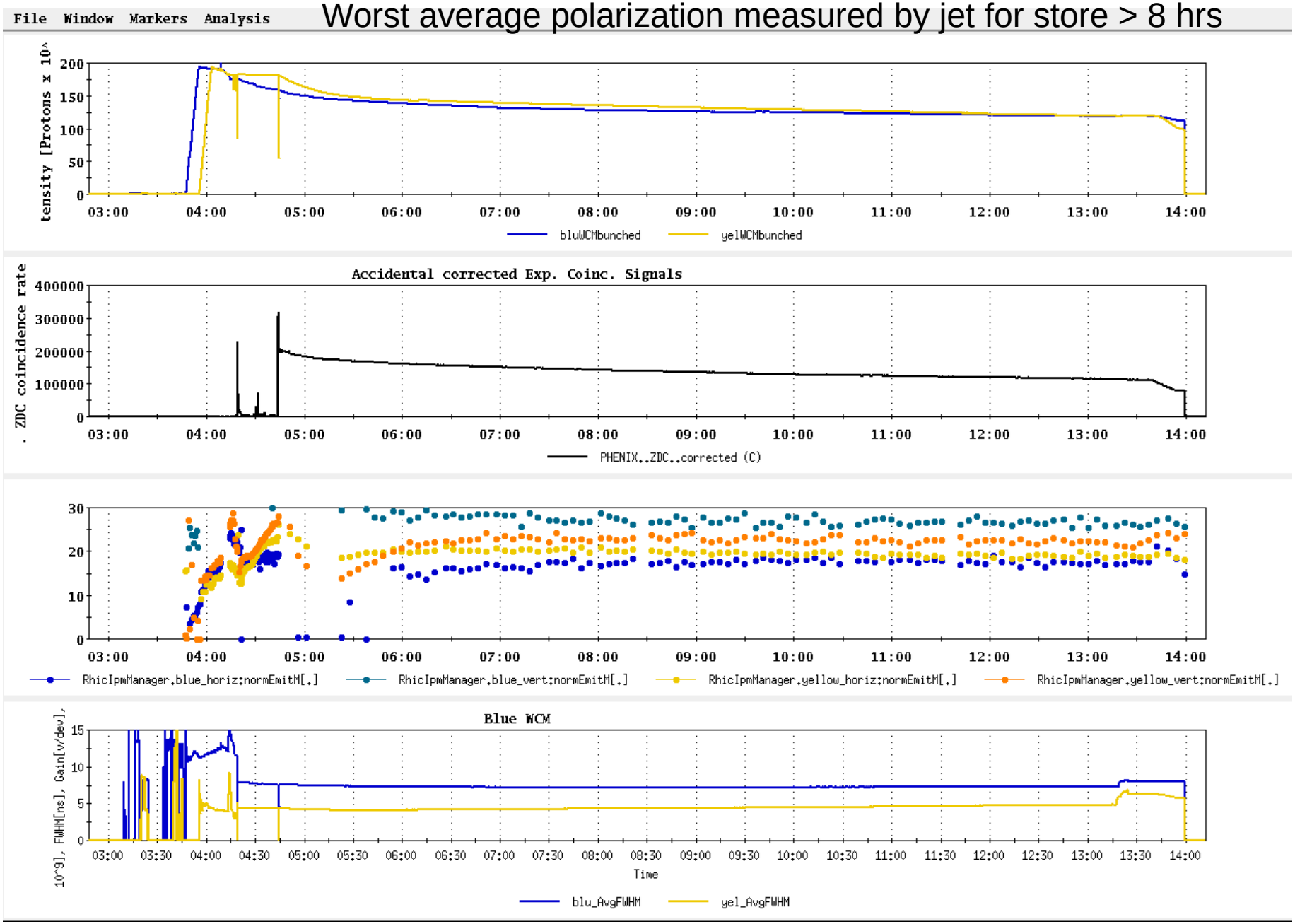
Store 16632

# Best average polarization measured by jet for store > 8 hrs



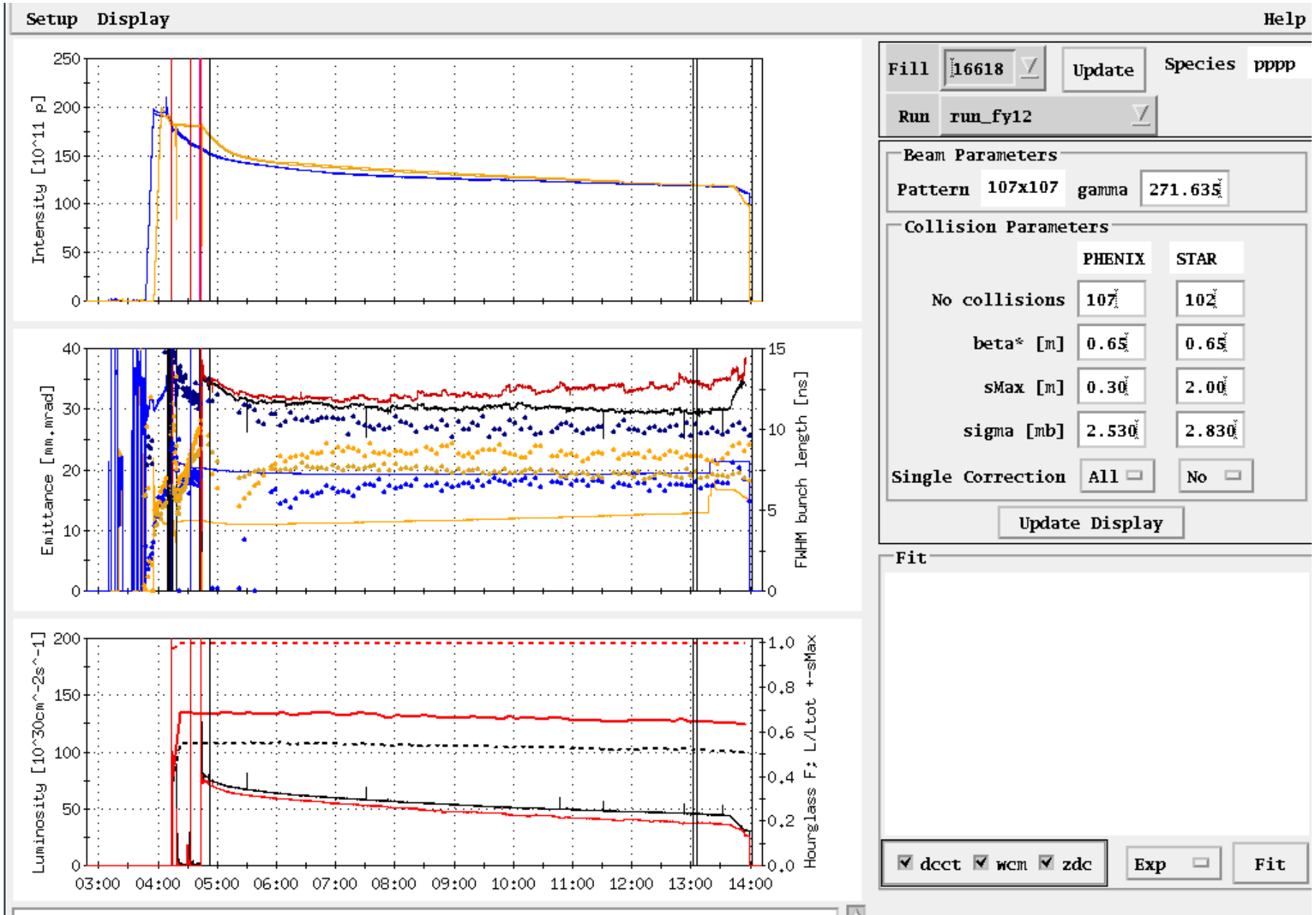
# Store 16618, Blue jet = 51.0 +/- 3.2; Yellow jet = 32.6 +/- 3.3

## Worst average polarization measured by jet for store > 8 hrs



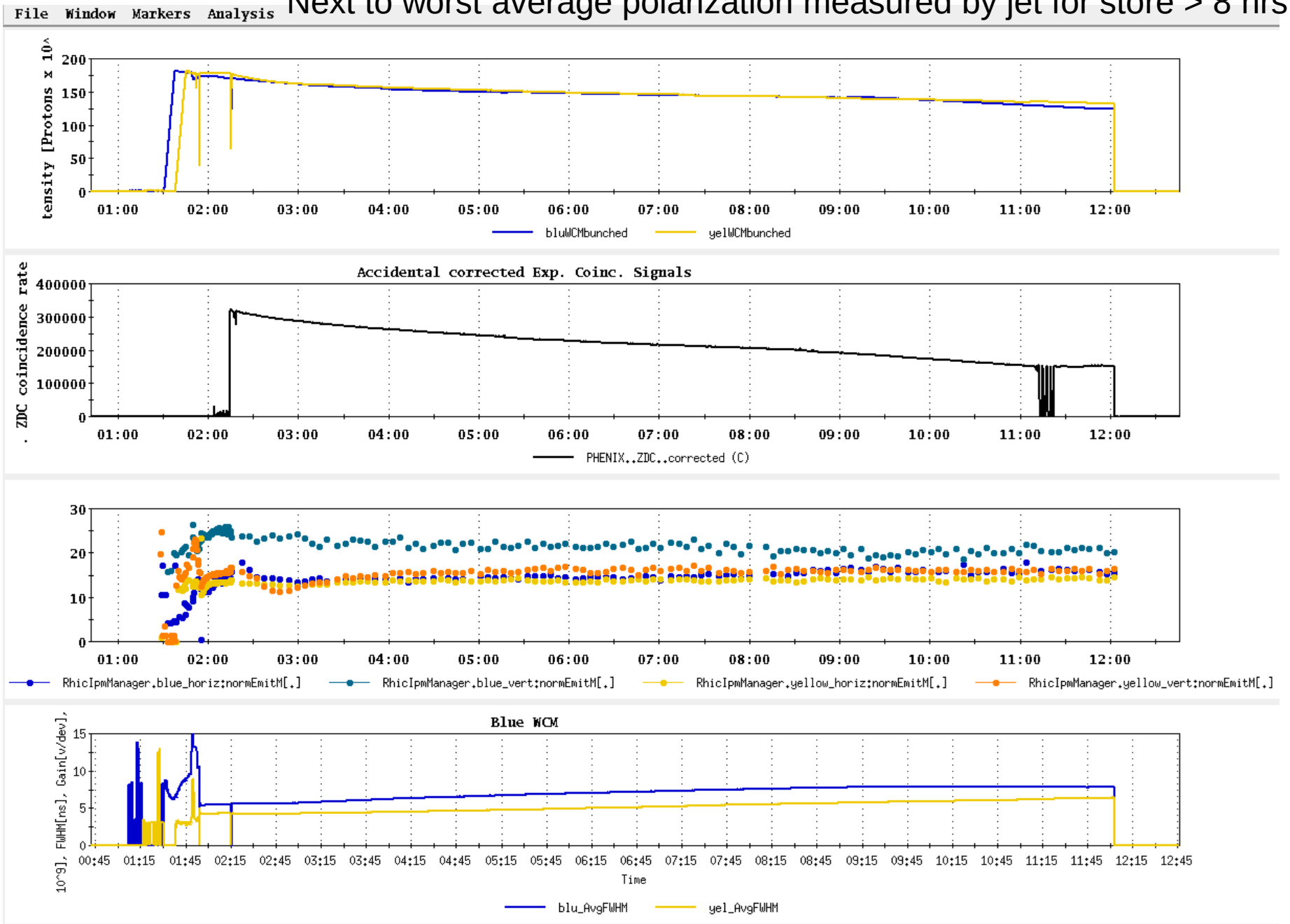
Store 16618

# Worst average polarization measured by jet for store > 8 hrs

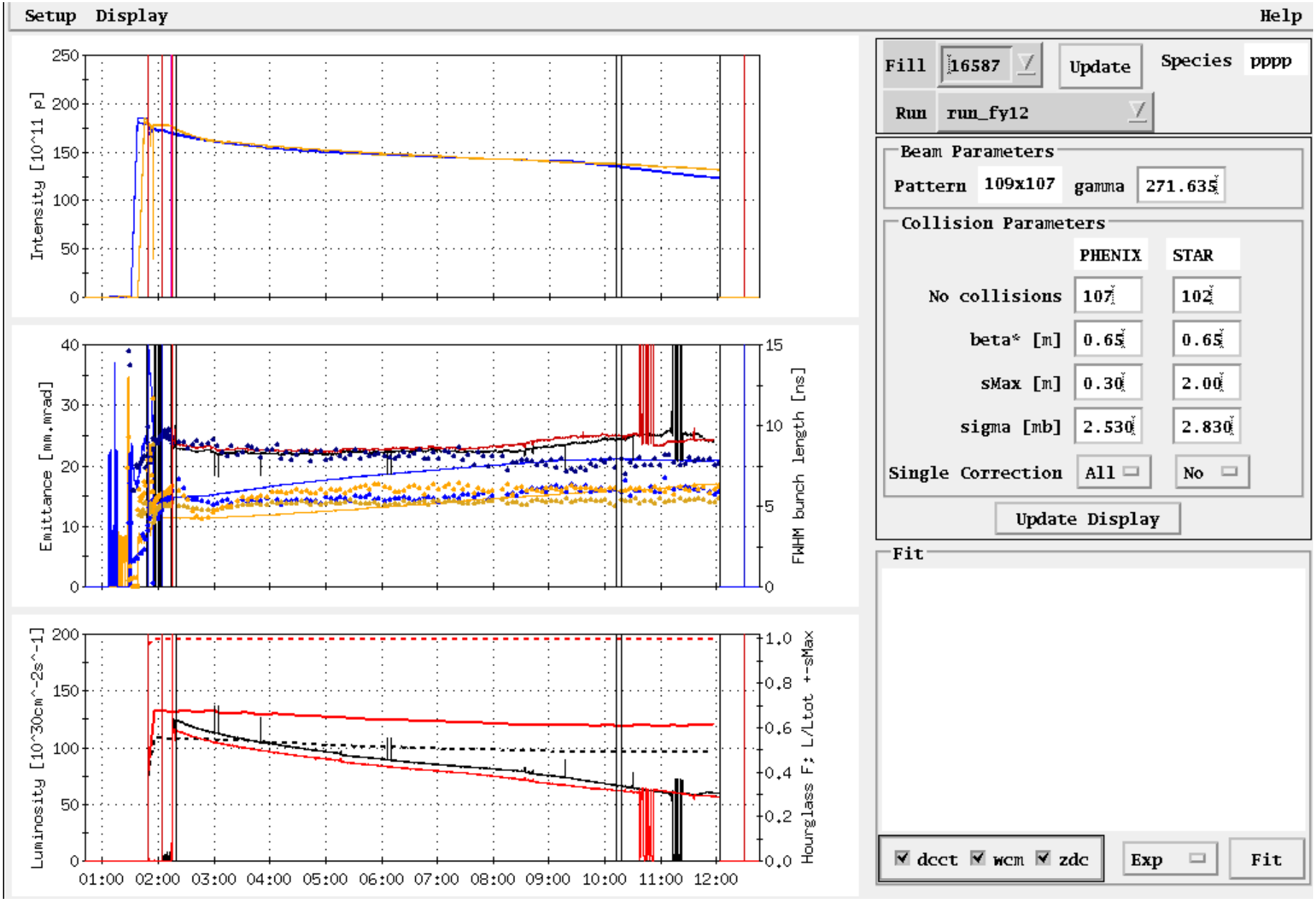


# Store 16587, Blue jet = 47.2 +/- 2.8; Yellow jet = 39.4 +/- 2.9

## Next to worst average polarization measured by jet for store > 8 hrs

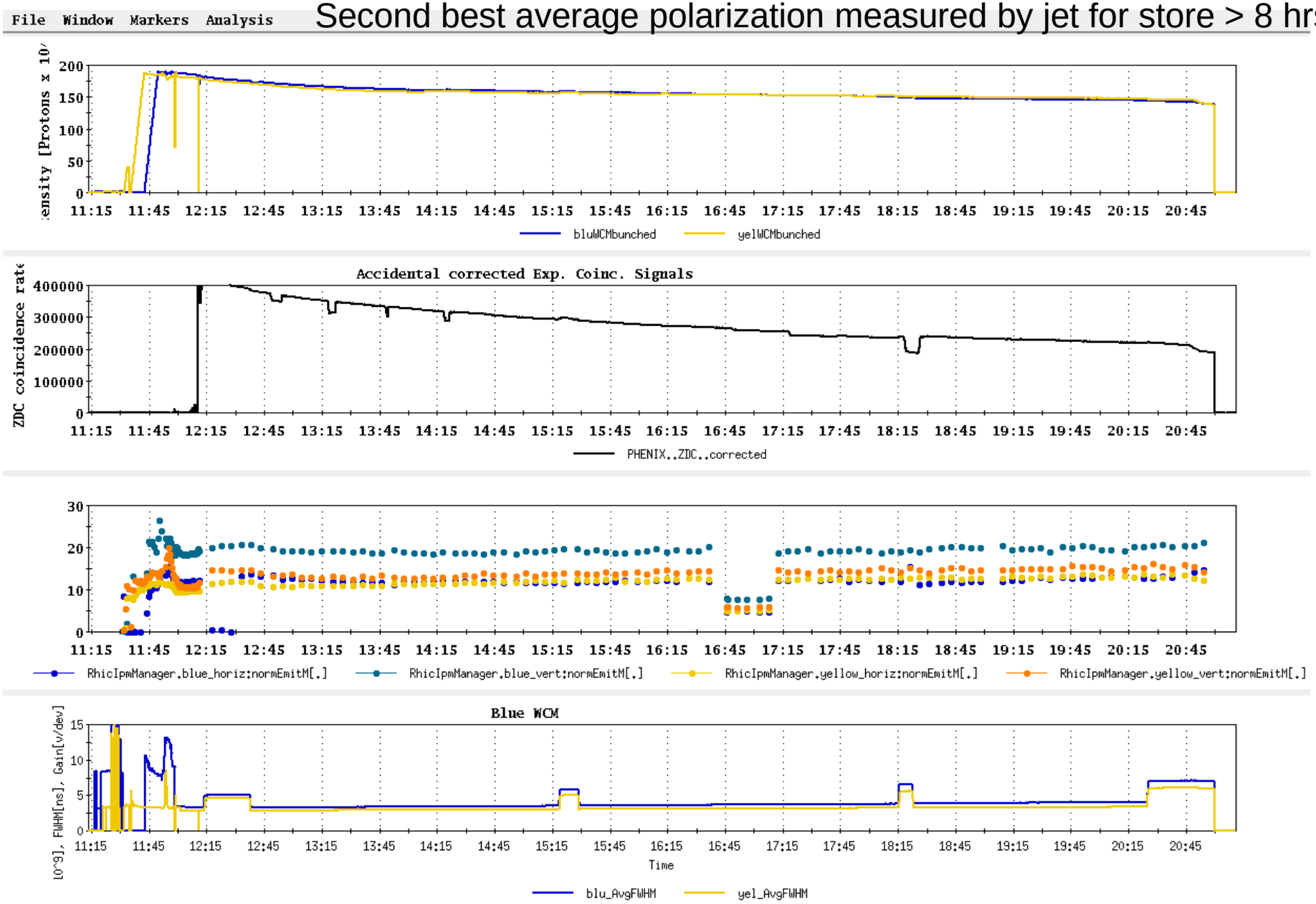


Store 16587 Next to worst average polarization measured by jet for store > 8 hrs

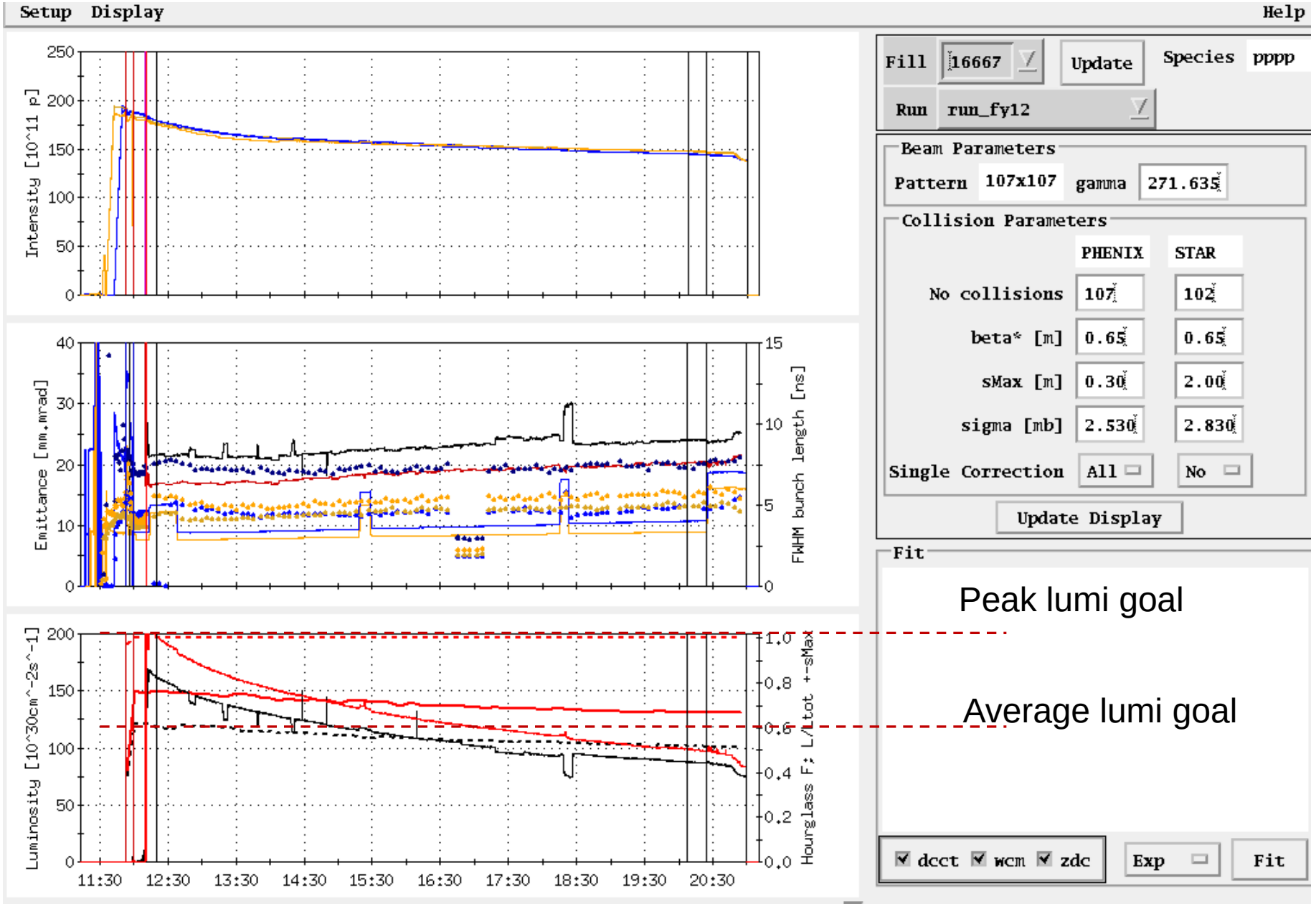


# Store 16667, Blue jet = 58.1 +/- 2.9; Yellow jet = 60.7 +/- 3.1

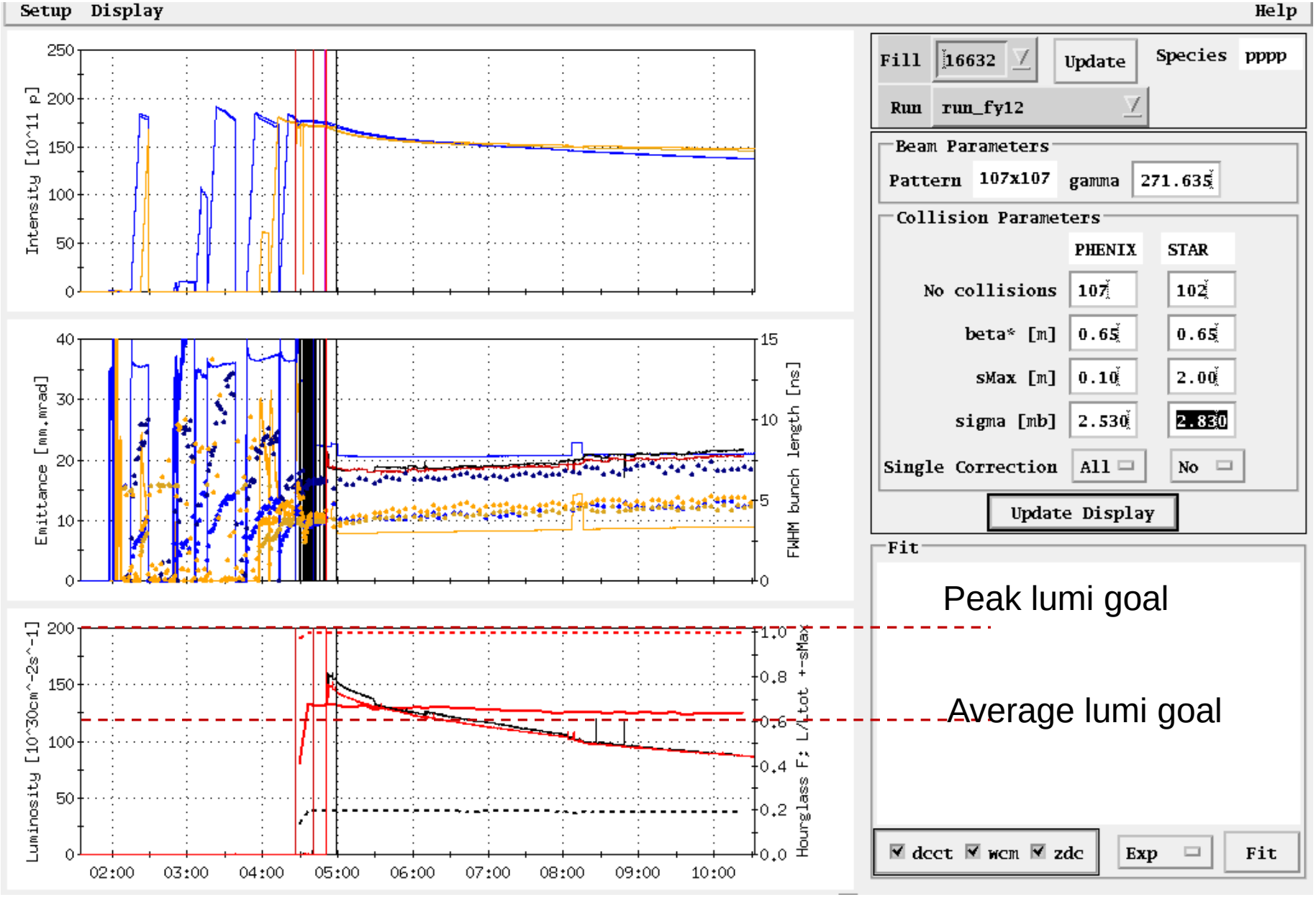
## Second best average polarization measured by jet for store > 8 hrs



Store 16667 Second best average polarization measured by jet for store > 8 hrs



# Store 16632, 3/27/12

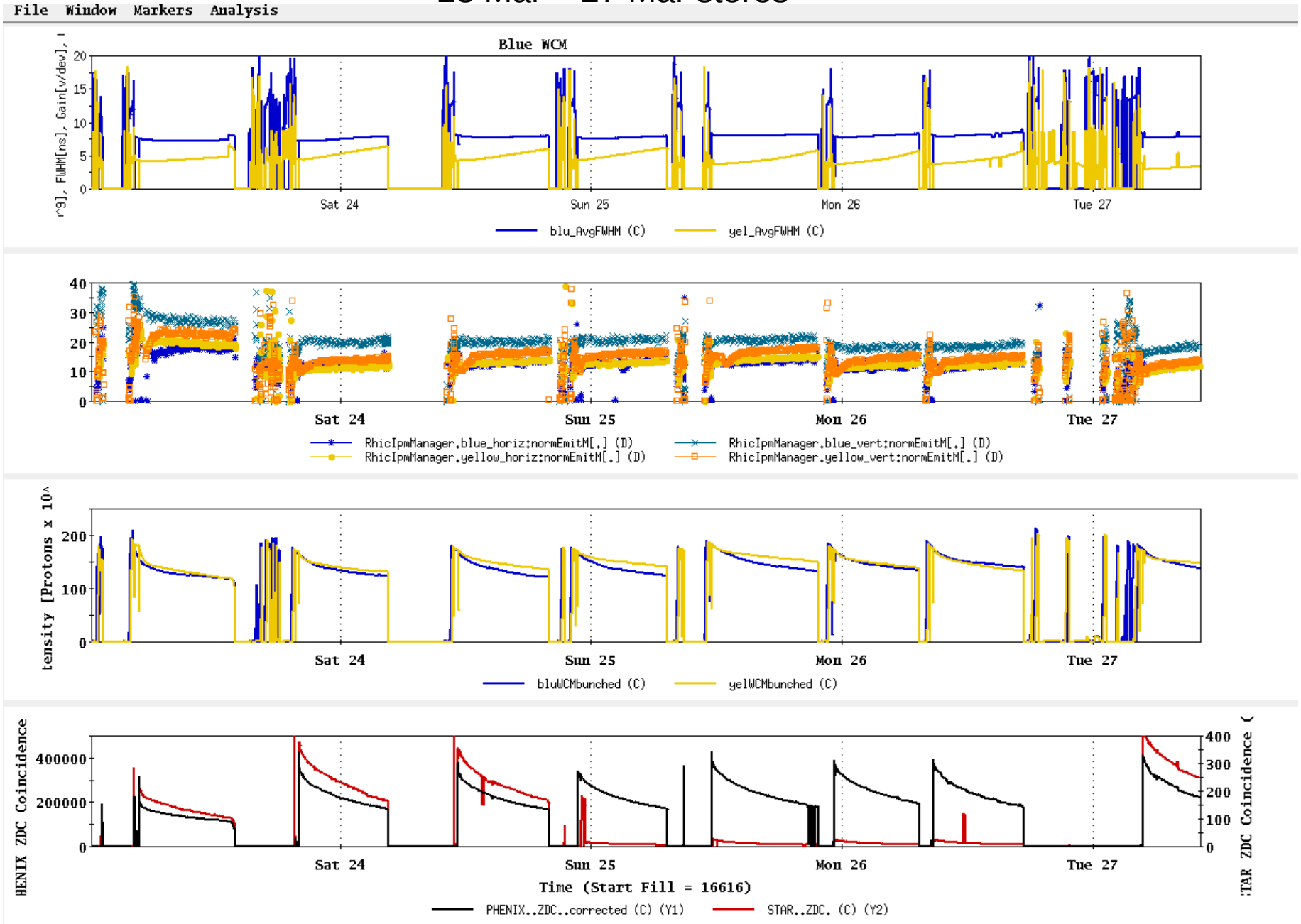


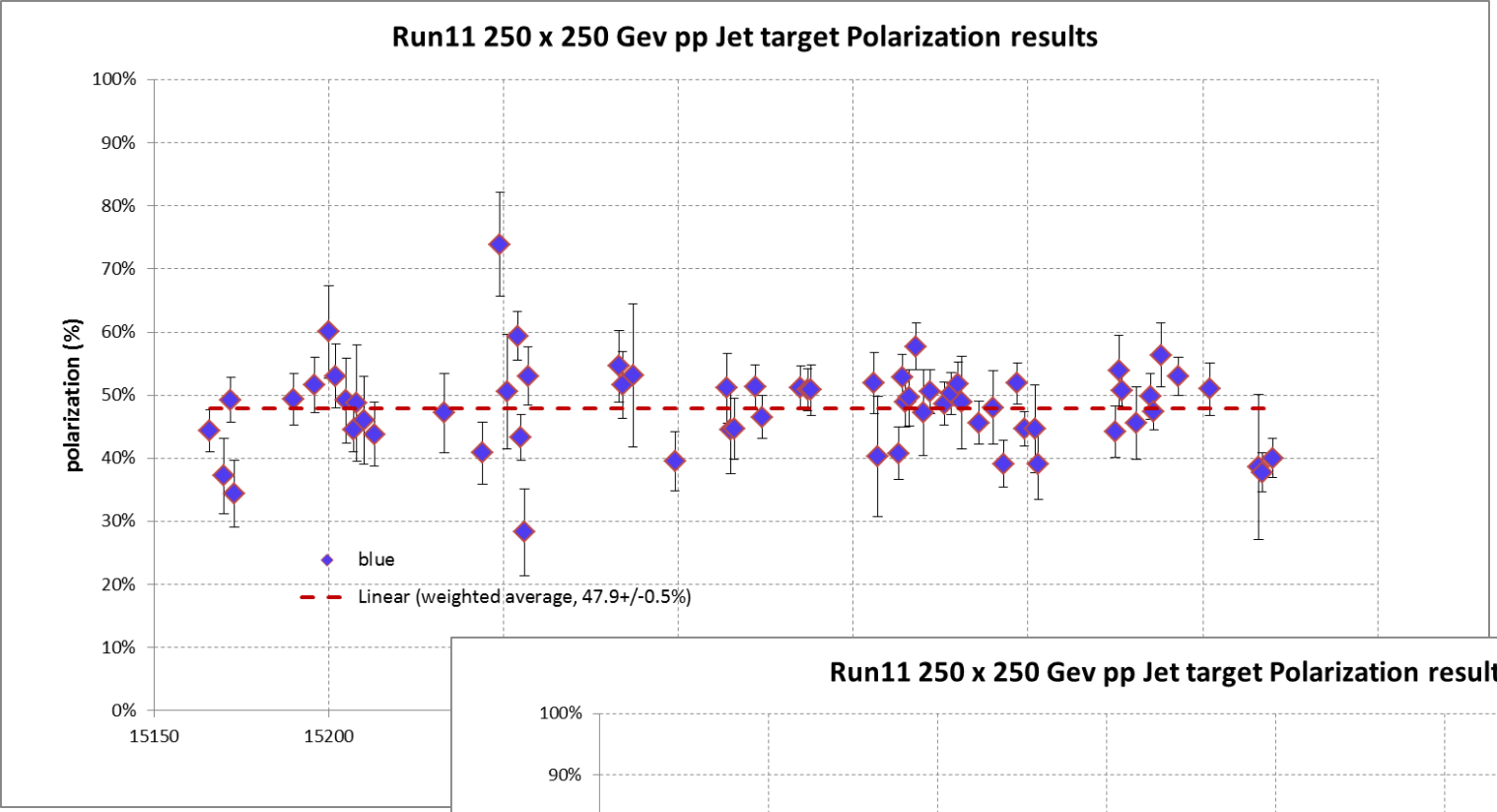

Peak lumi goal

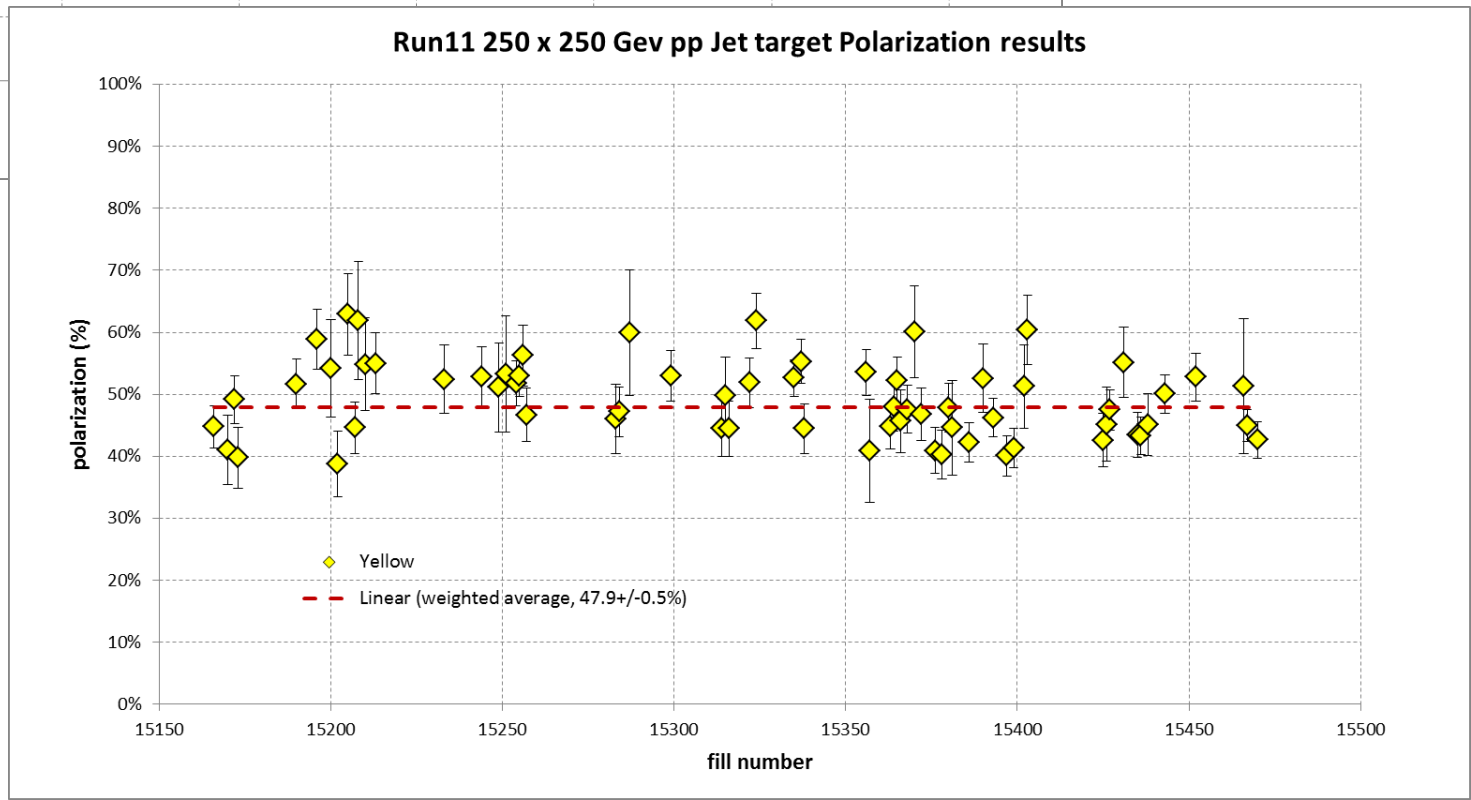
Average lumi goal

Table2: Max lumi parameters: 1.65x10$^{9}$/bunch, 0.6 β*, 20-25 mmmr emitt → peak = 200x10$^{30}$ cm$^{-2}$s$^{-1}$

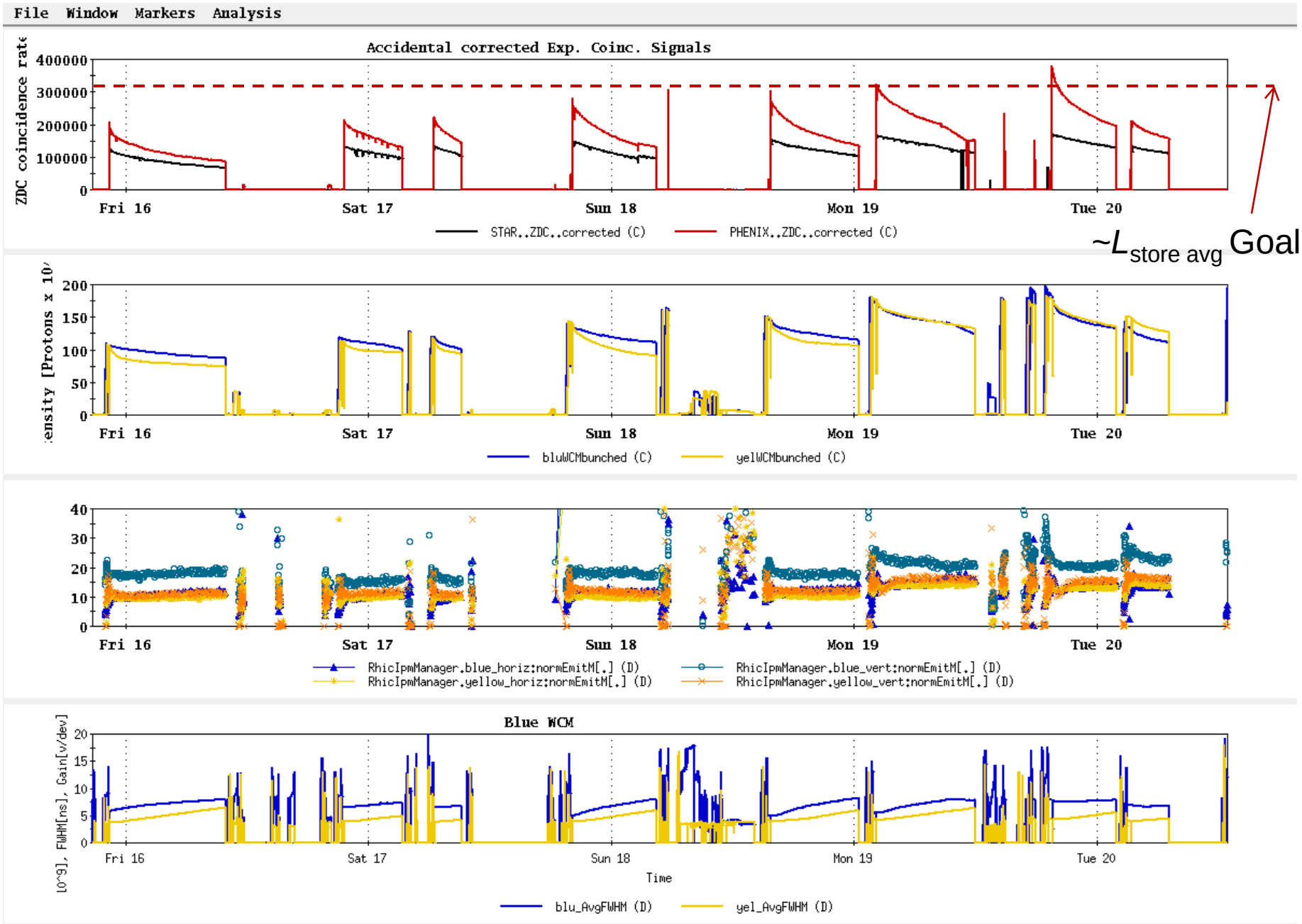
# 23 Mar – 27 Mar stores



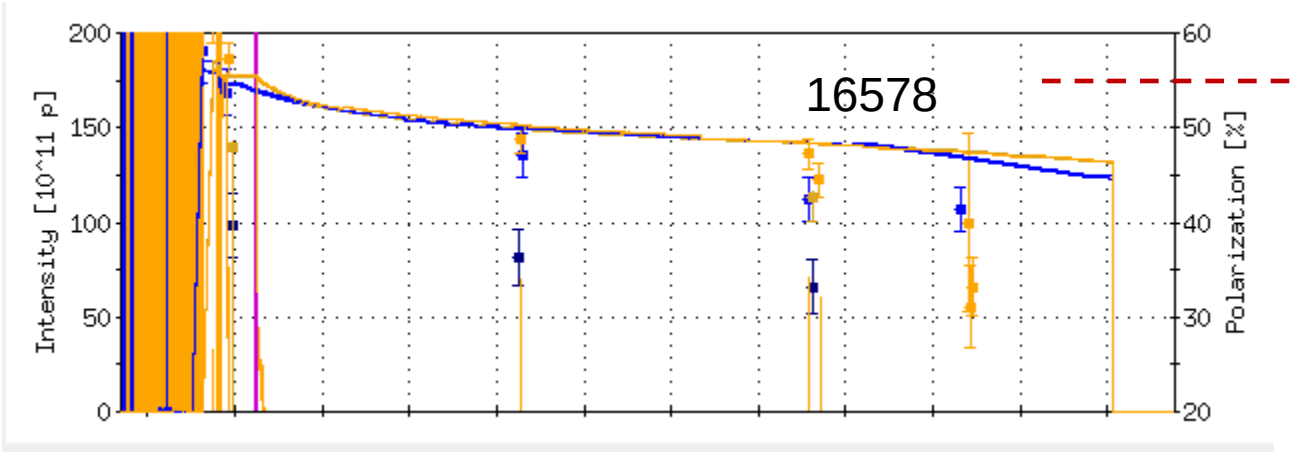

Run11 250 x 250 Gev pp Jet target Polarization results
polarization (%)
100%
90%
80%
70%
60%
50%
40%
30%
20%
10%
0%
15150
15200
blue
Linear (weighted average, 47.9+/-0.5%)

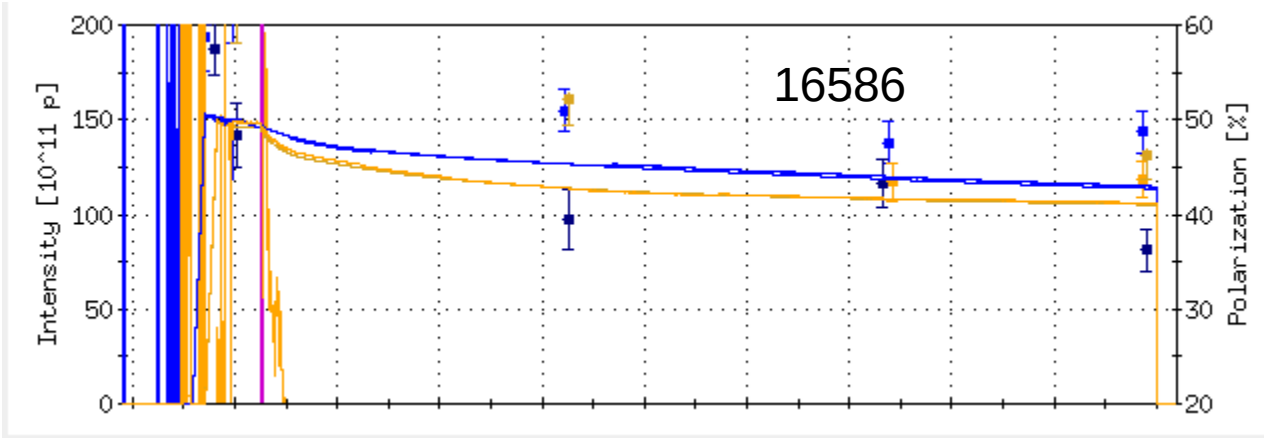

Run11 250 x 250 Gev pp Jet target Polarization results
polarization (%)
100%
90%
80%
70%
60%
50%
40%
30%
20%
10%
0%
15150
15200
15250
15300
15350
15400
15450
15500
fill number
Yellow
Linear (weighted average, 47.9+/-0.5%)

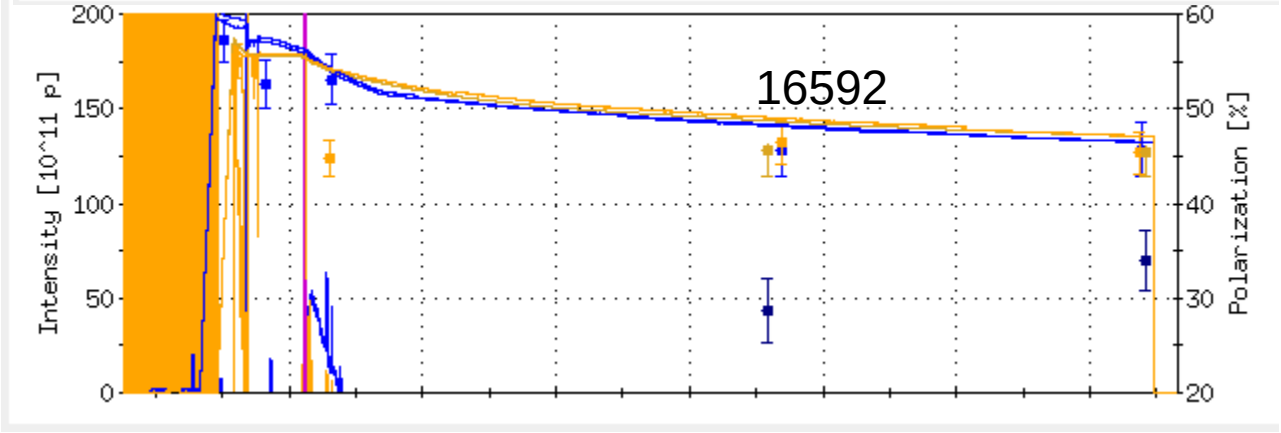
# All “physics” stores beginning with16570, 15 March



From “StoreAnalysis” program in “StartUp”



## *Expectation for 5 weeks physics:*
## *45-95 pb$^{-1}$ delivered luminosity with 45-50% polarization*

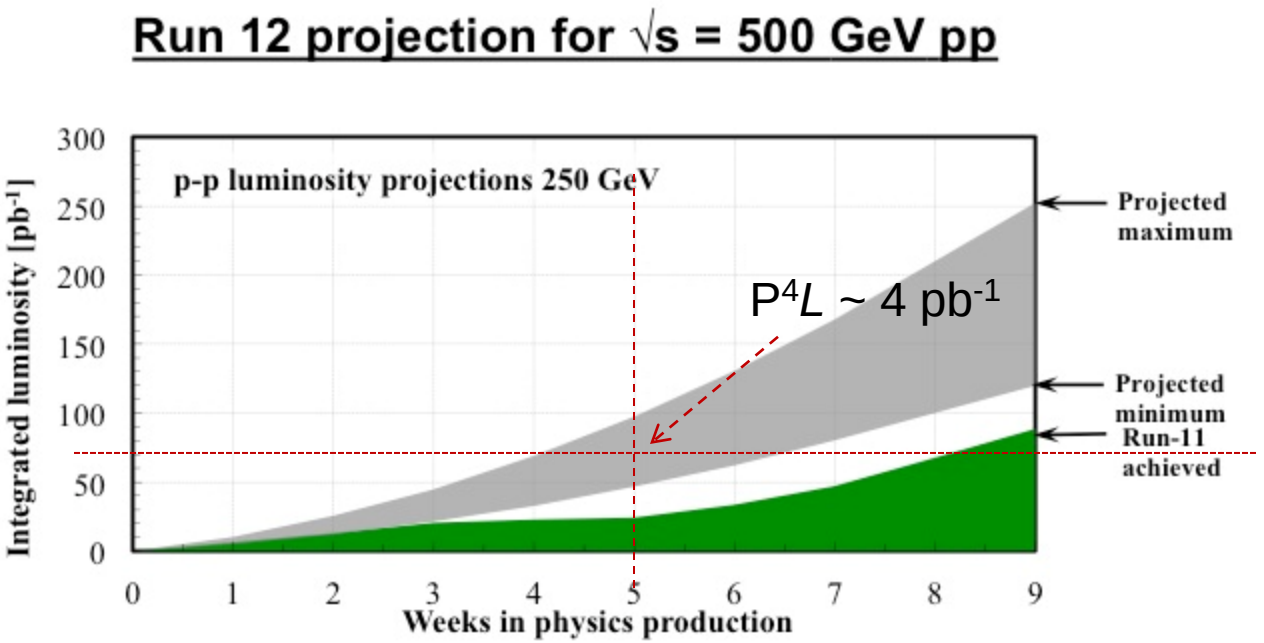
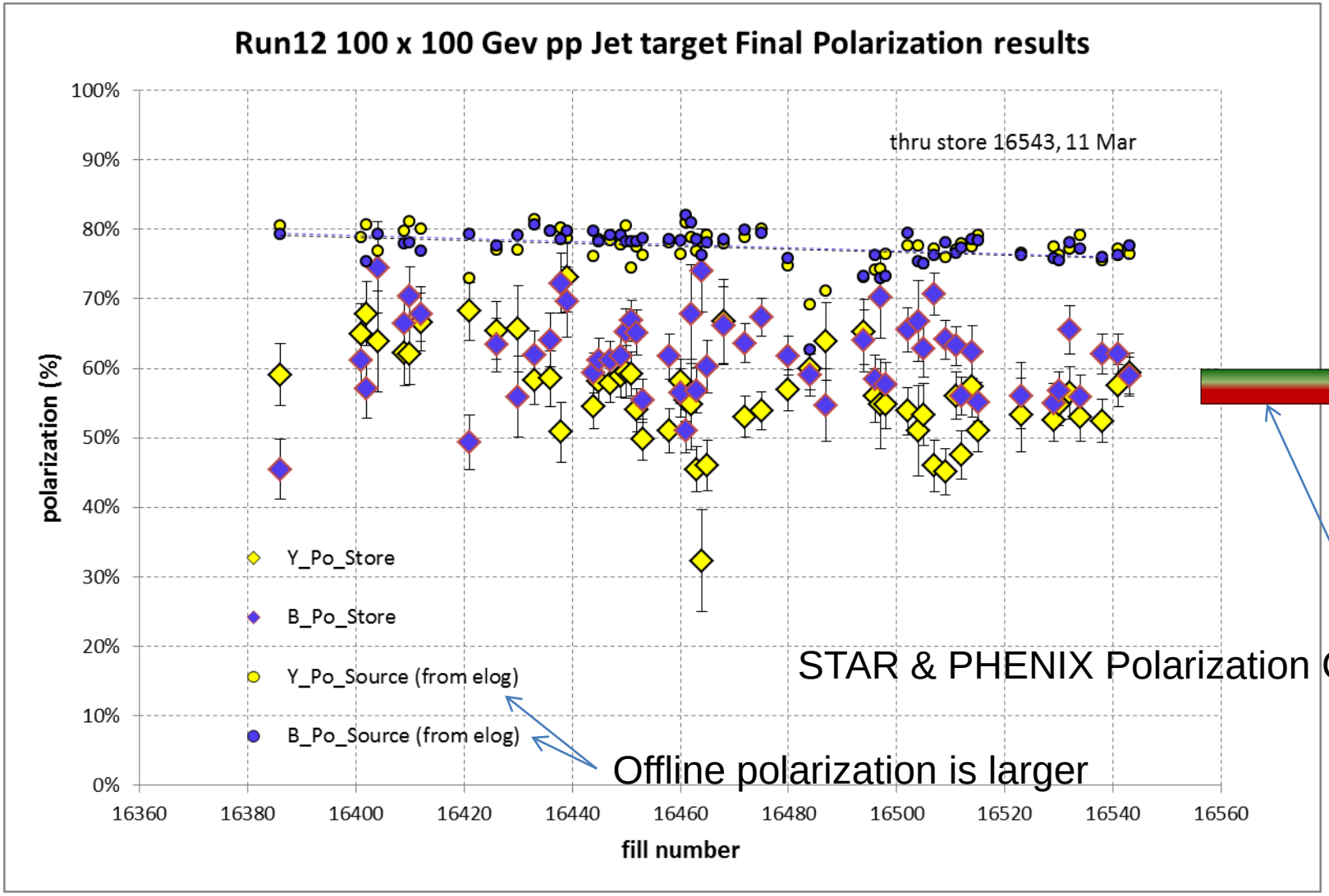


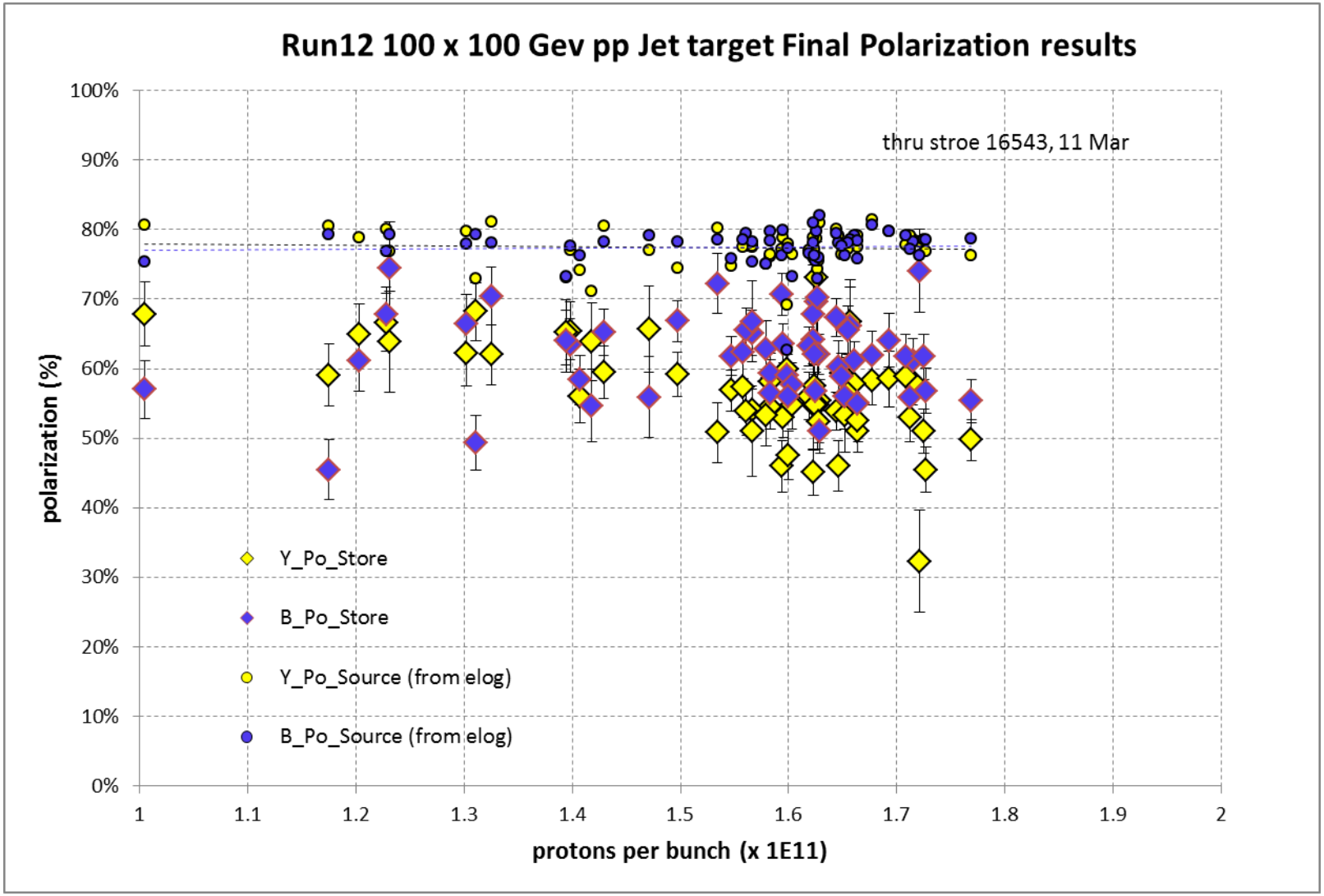

**Figure 4: Projected minimum and maximum integrated luminosities for polarized proton collisions at 250 GeV beam energy, assuming linear weekly luminosity ramp-up in 8 weeks. An average store polarization between 45 and 50% is expected.**

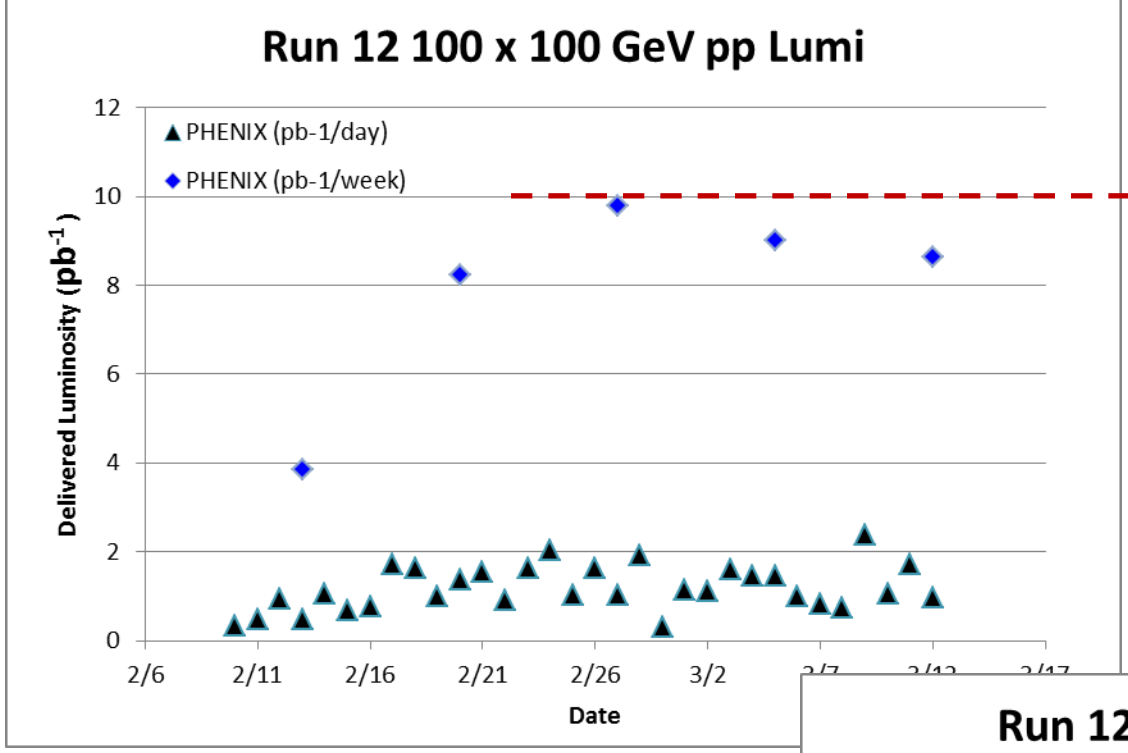
**From Fischer et. Al. "RHIC Collider Projections (FY 2012 – FY 2016)"**
14 October 2011




Blue Jet weighted average = 61.2% ± 0.5%;
Yellow Jet weighted average = 55.8% ± 0.5%;

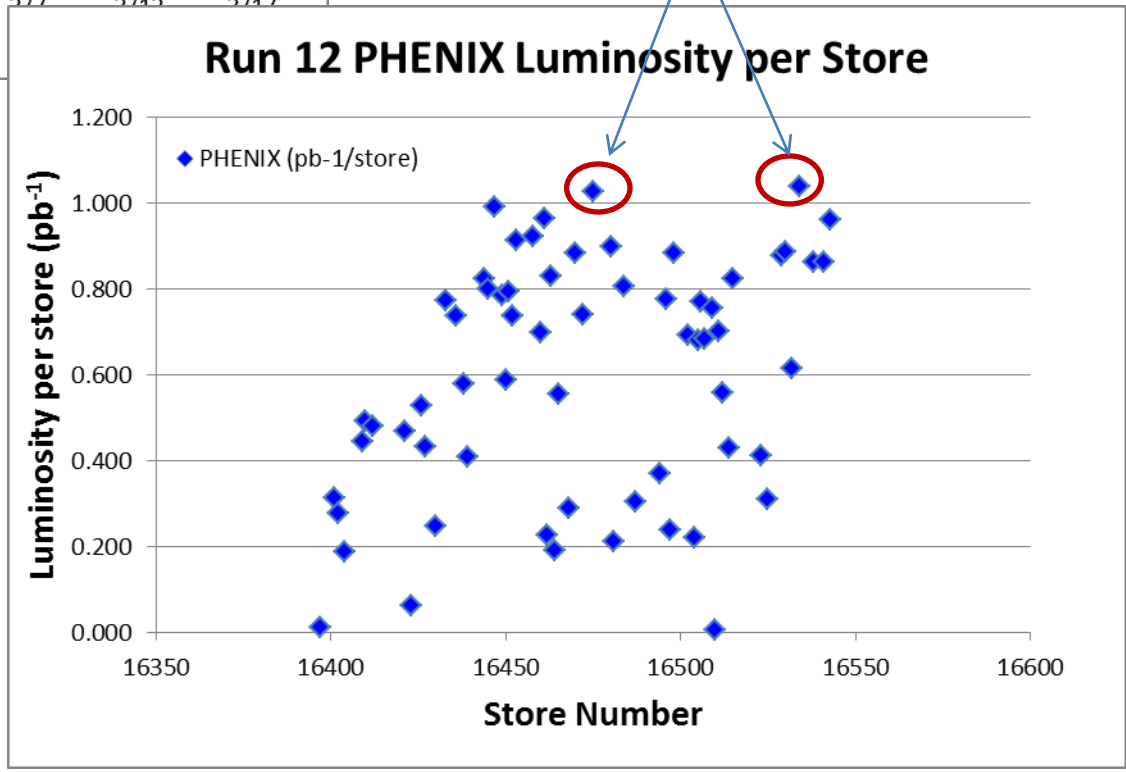
source blue average = 77.5% → **20% lost**
source yellow average = 77.4% → **28% lost**

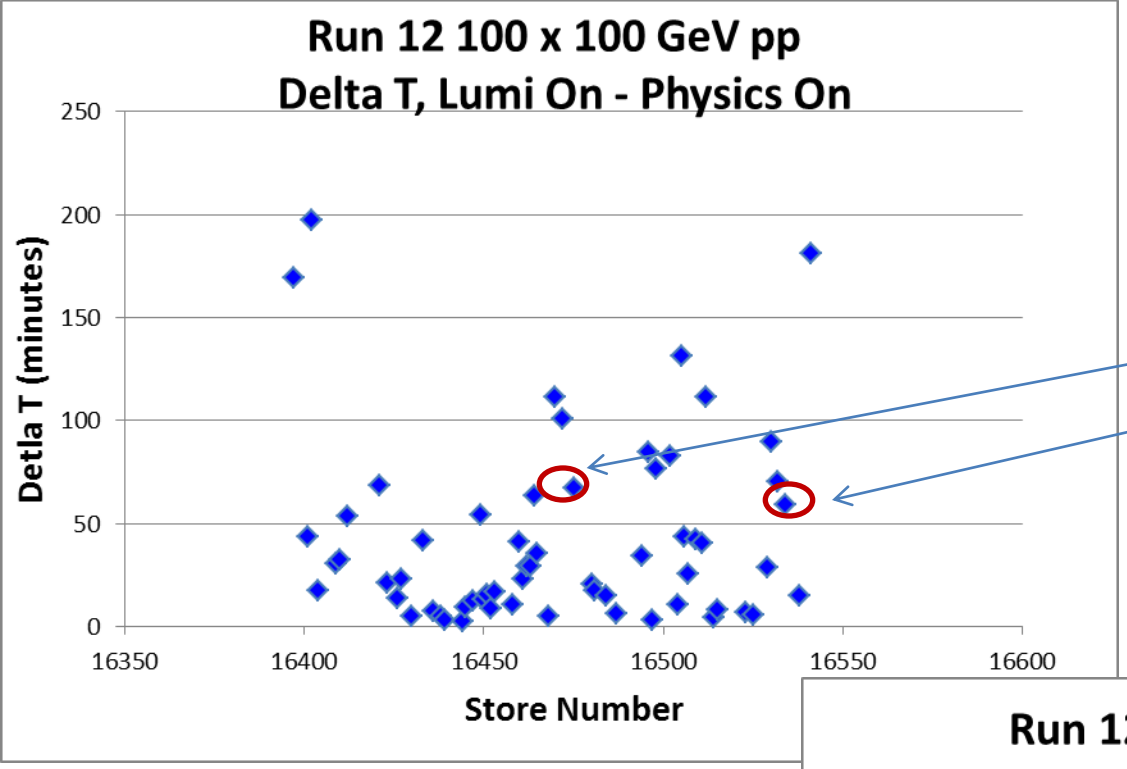

Run12 100 x 100 Gev pp Jet target Final Polarization results
thru stroe 16543, 11 Mar
polarization (%)
100%
90%
80%
70%
60%
50%
40%
30%
20%
10%
0%
1
1.1
1.2
1.3
1.4
1.5
1.6
1.7
1.8
1.9
2
protons per bunch (x 1E11)
Y_Po_Store
B_Po_Store
Y_Po_Source (from elog)
B_Po_Source (from elog)



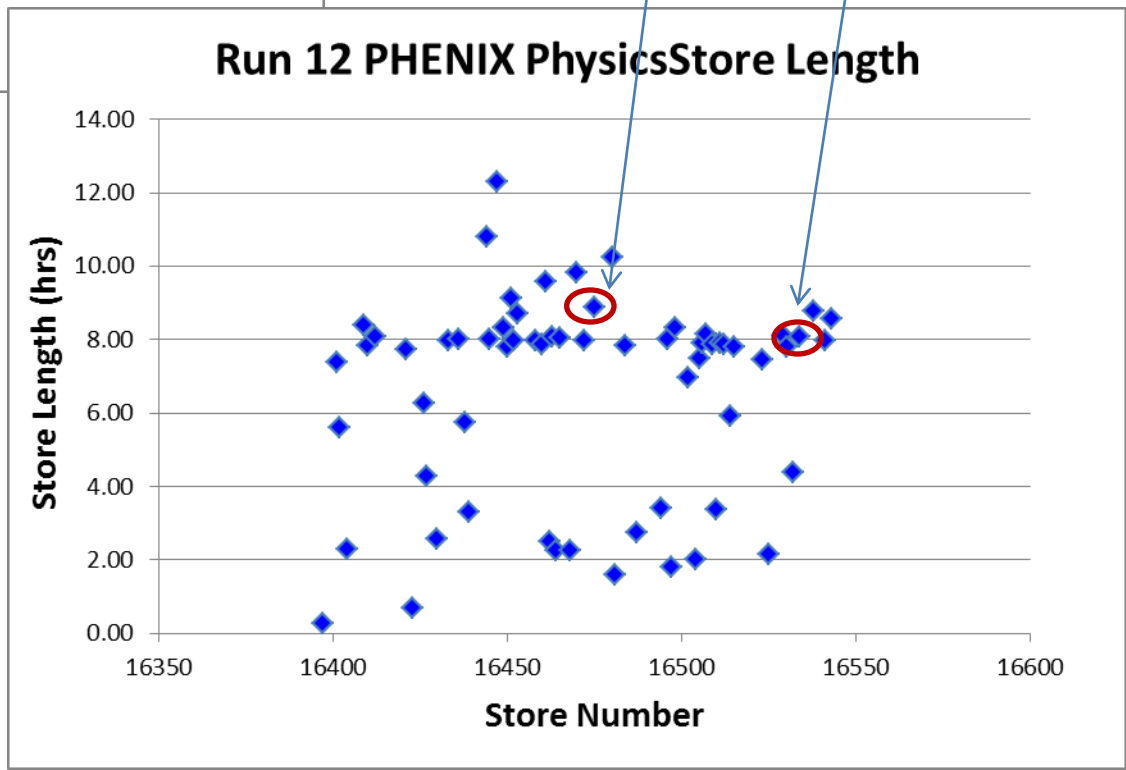

Target (max projection)

Best stores, 16475 and 16534

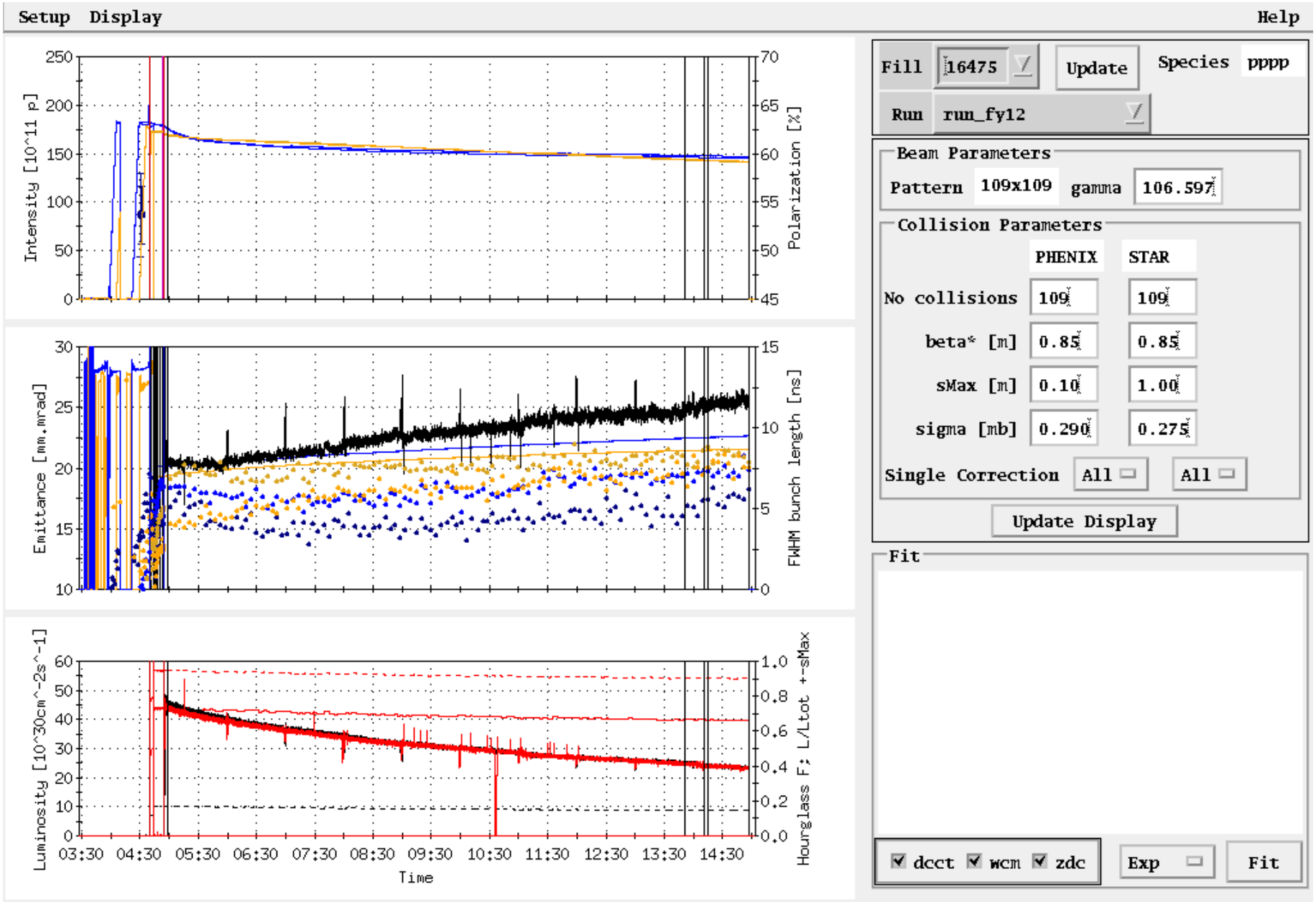




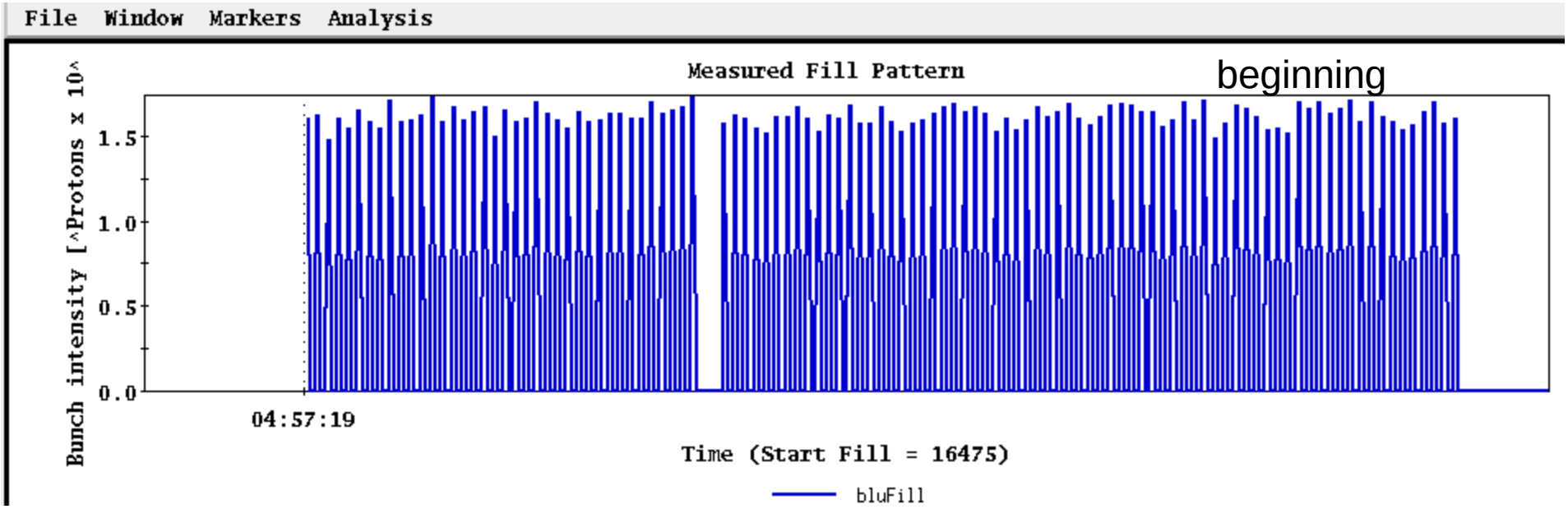

Best stores, 16475 and 16534

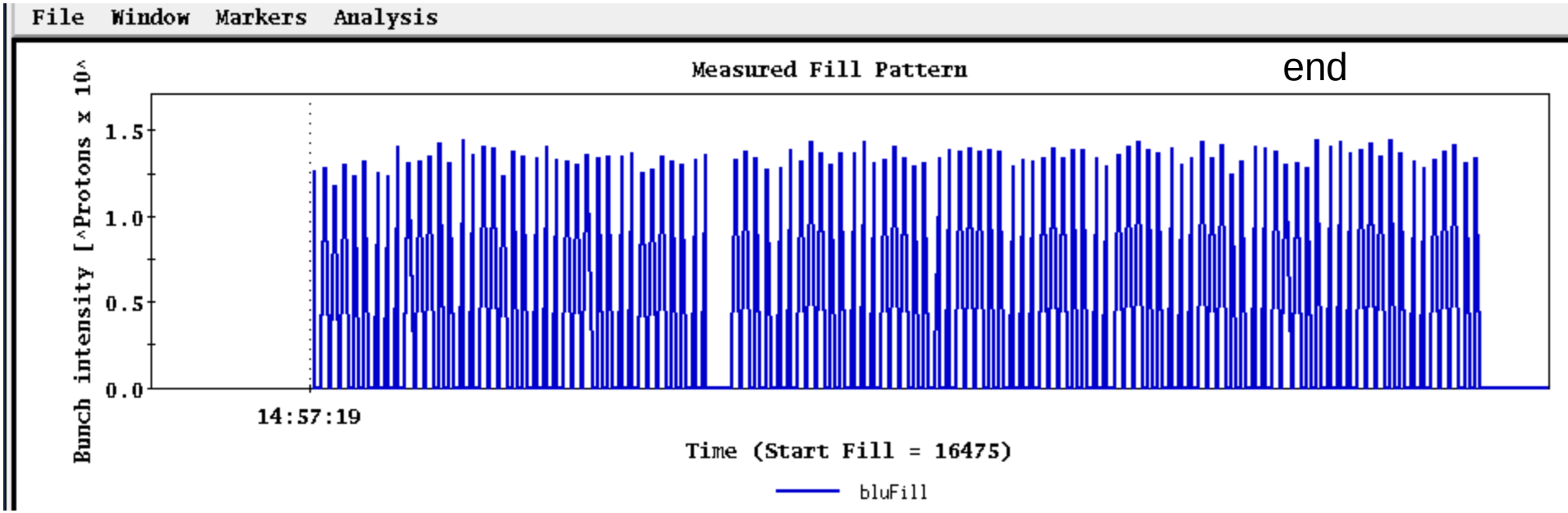


# Fill 16475, 27 Feb, 8.9 hours physics store (10 hour Lumi on Store), PHENIX 1.03 pb$^{-1}$

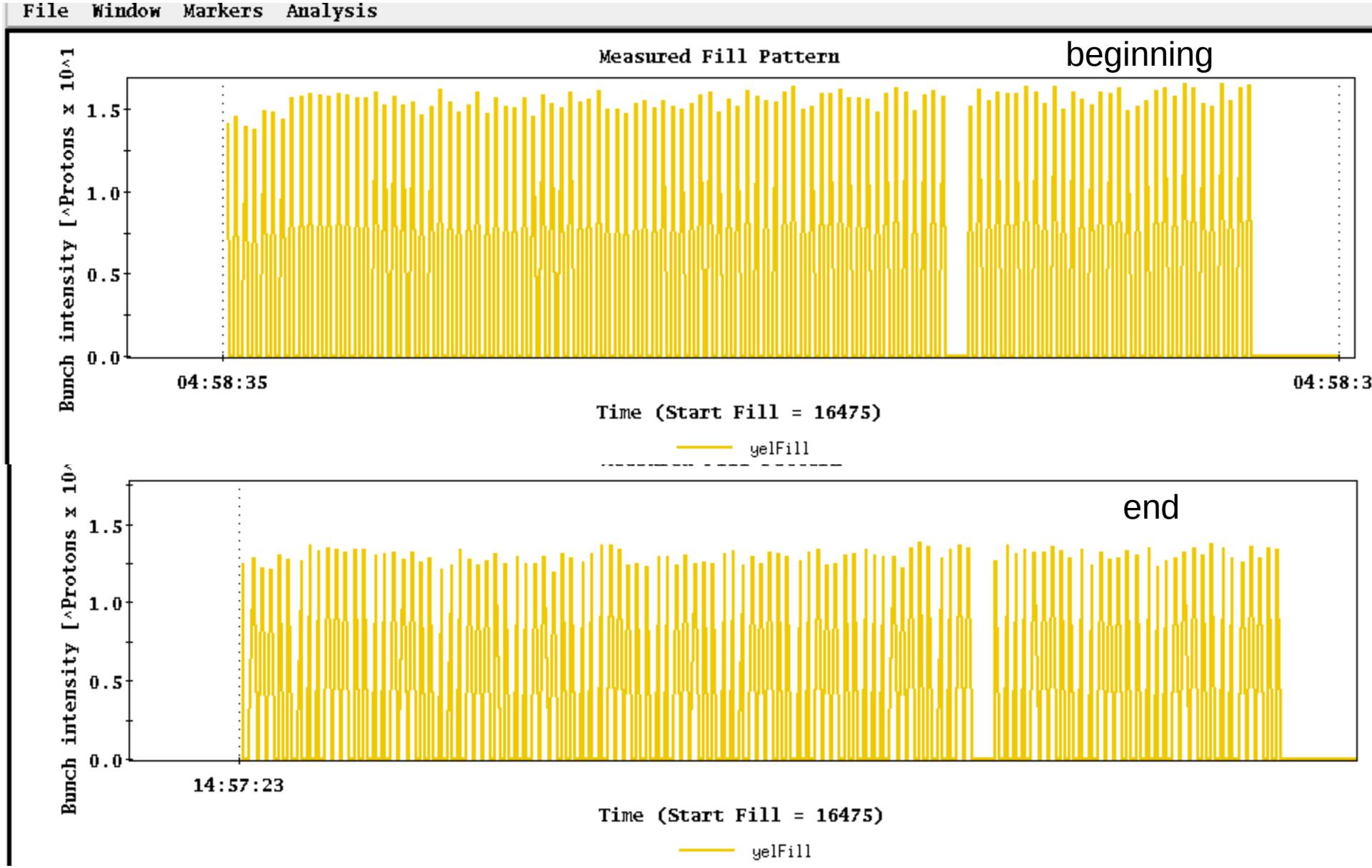


Fill 16475, 27 Feb, 8.9 hours physics store (10 hour Lumi on Store), PHENIX 1.03 $pb^{-1}$

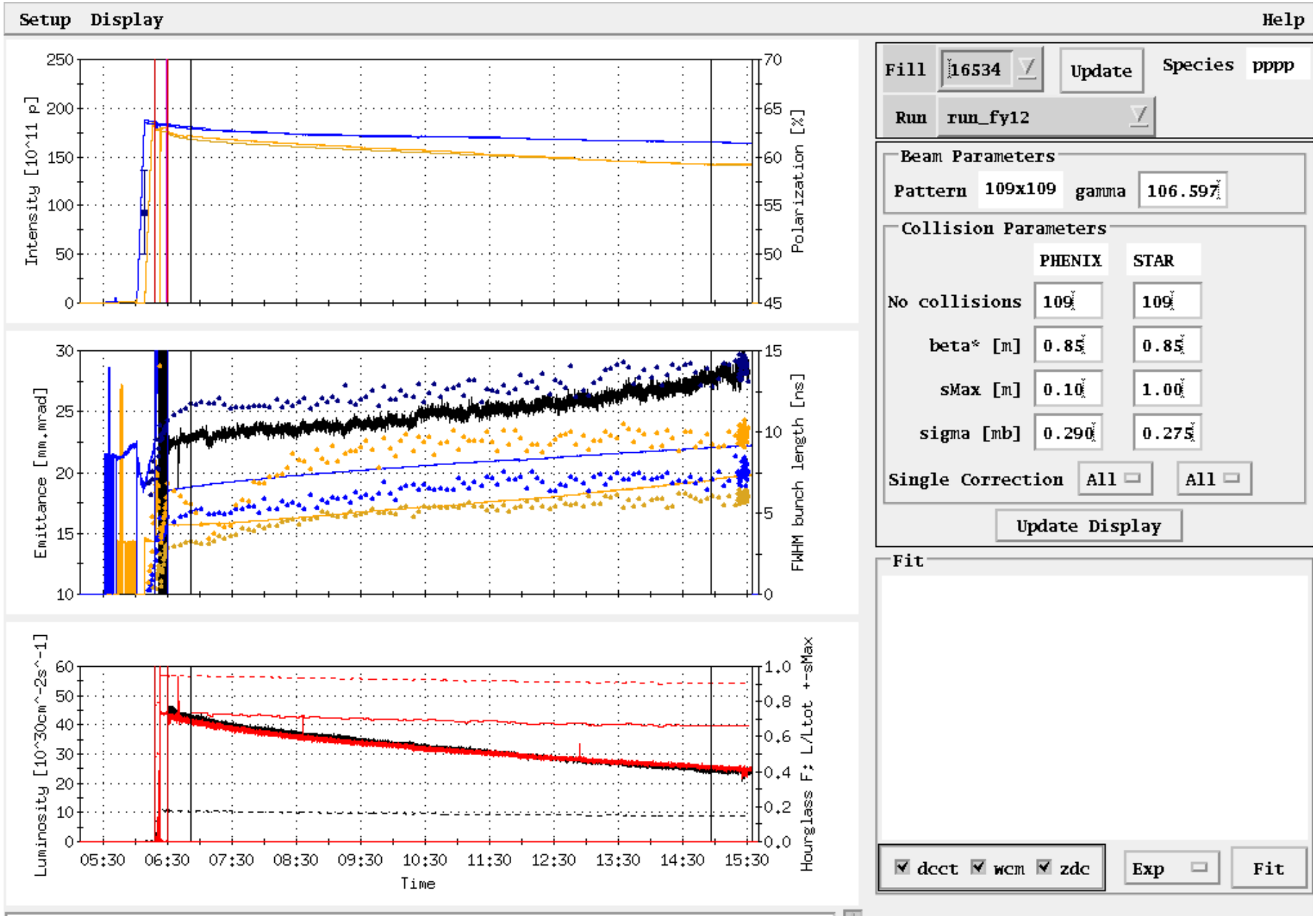


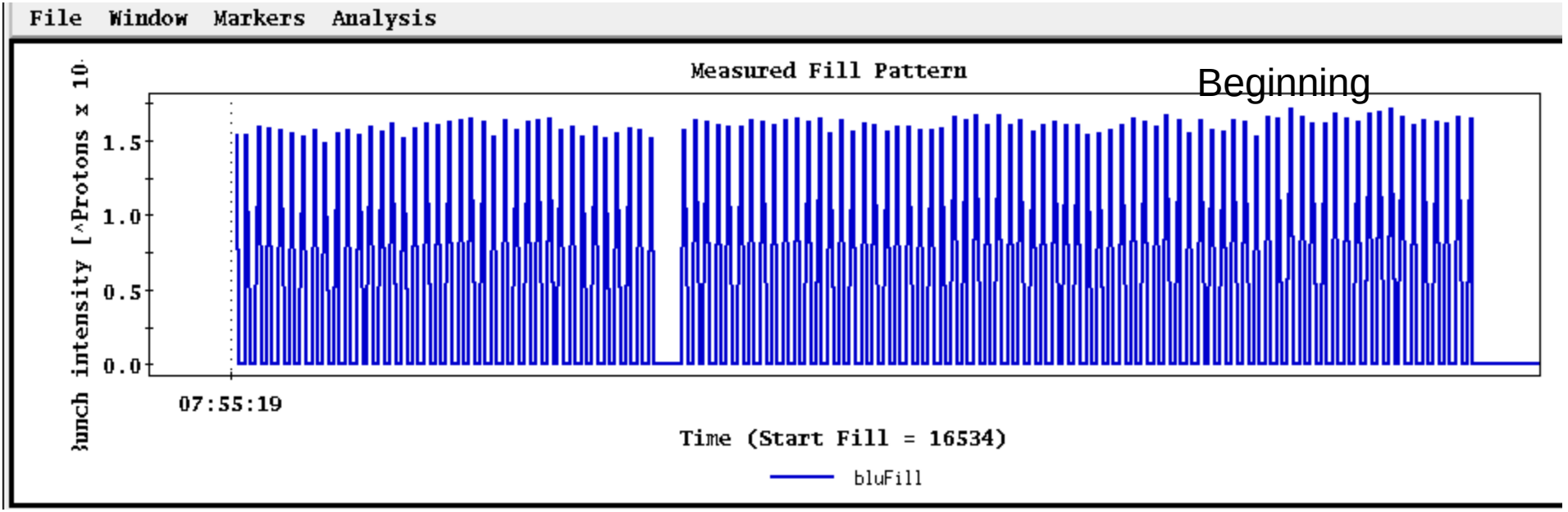
Fill 16475, 27 Feb, 8.9 hours physics store (10 hour Lumi on Store), PHENIX 1.03 $pb^{-1}$

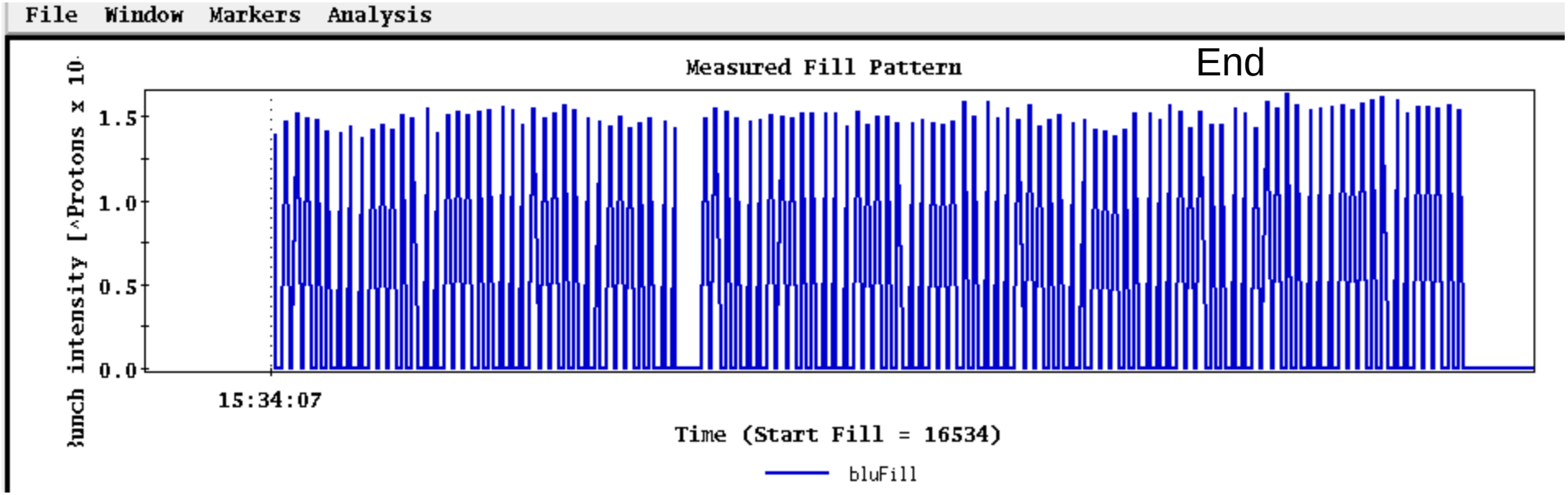


# Fill 16534, 9 Mar, 8.1 hours physics store (9.1 hr Lumi on store), PHENIX 1.04 $pb^{-1}$

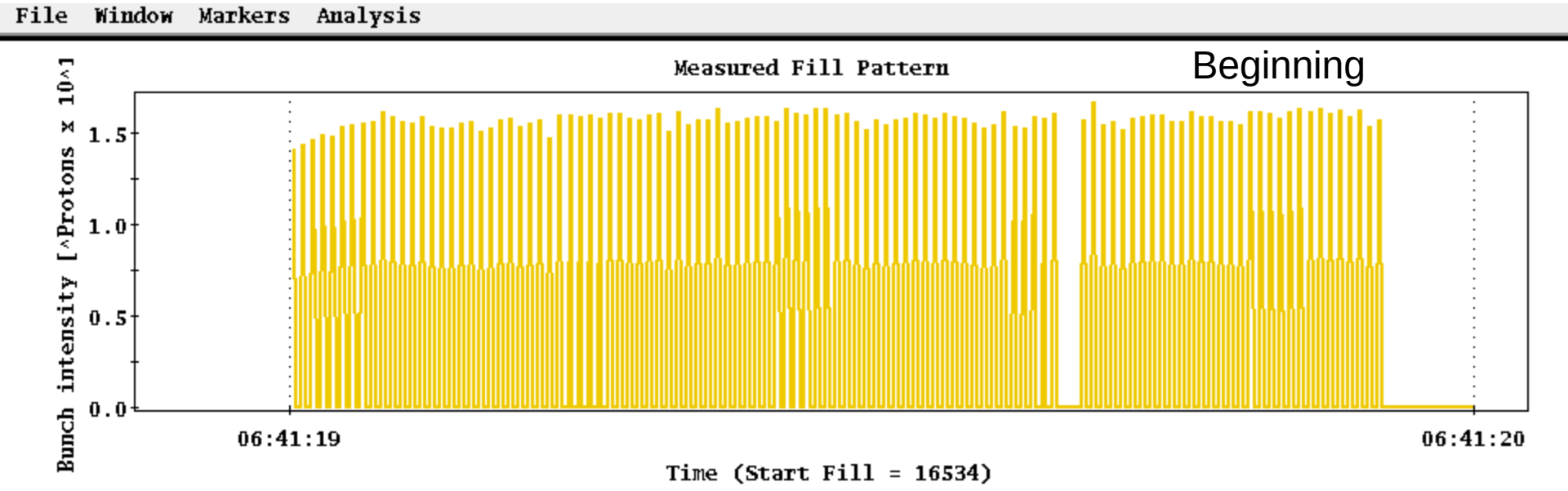


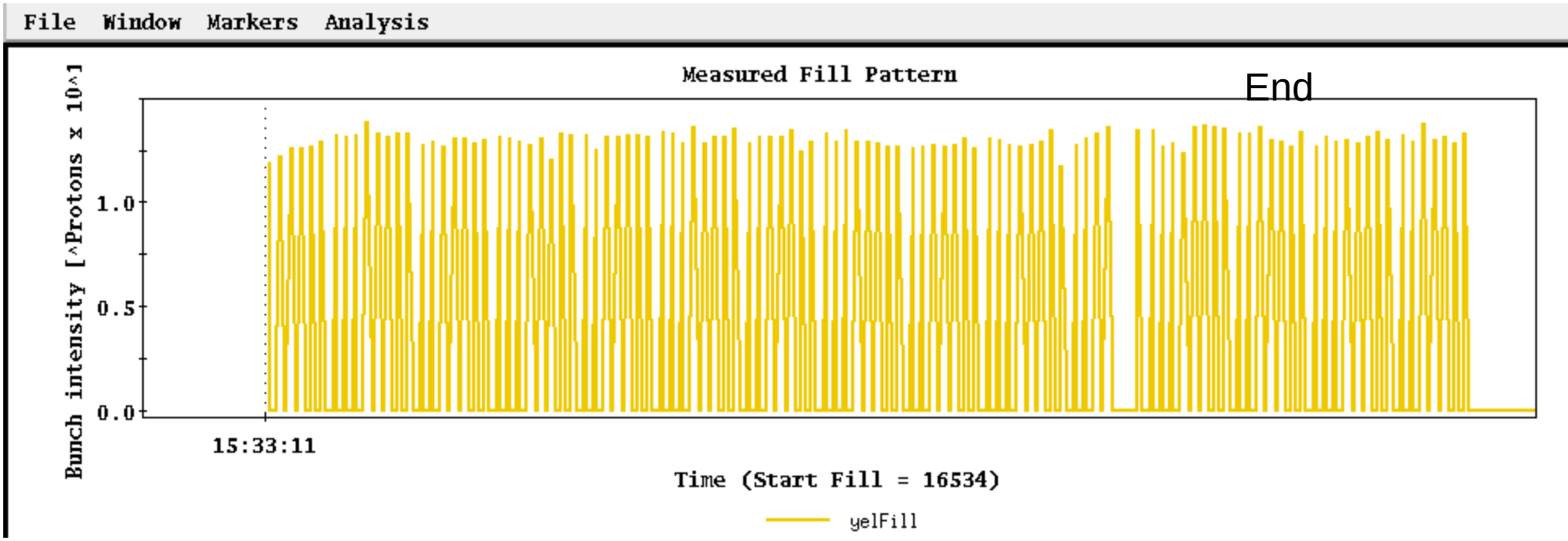
Fill 16534, 9 Mar, 8.1 hours physics store (9.1 hr Lumi on store), PHENIX 1.04 $pb^{-1}$

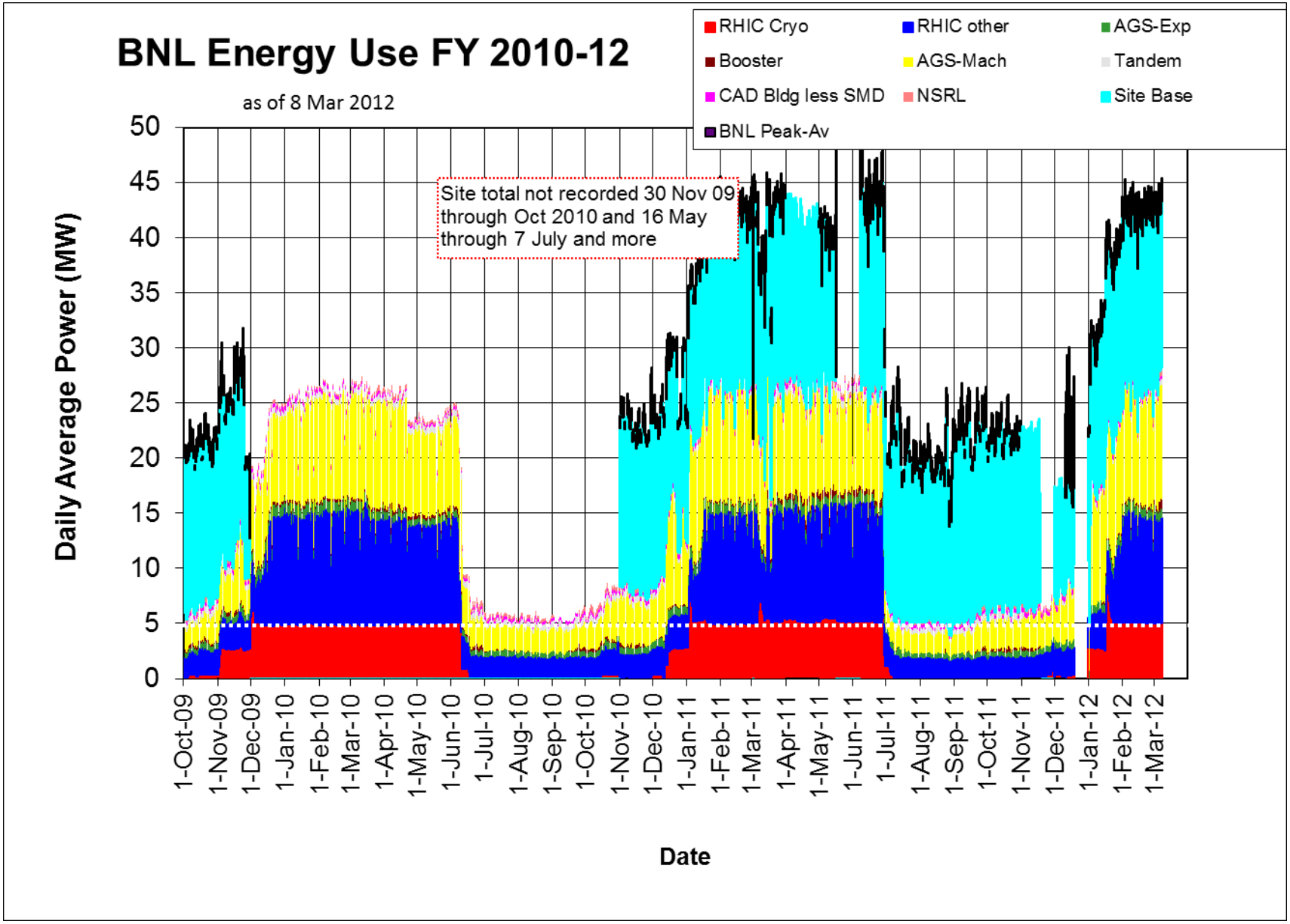


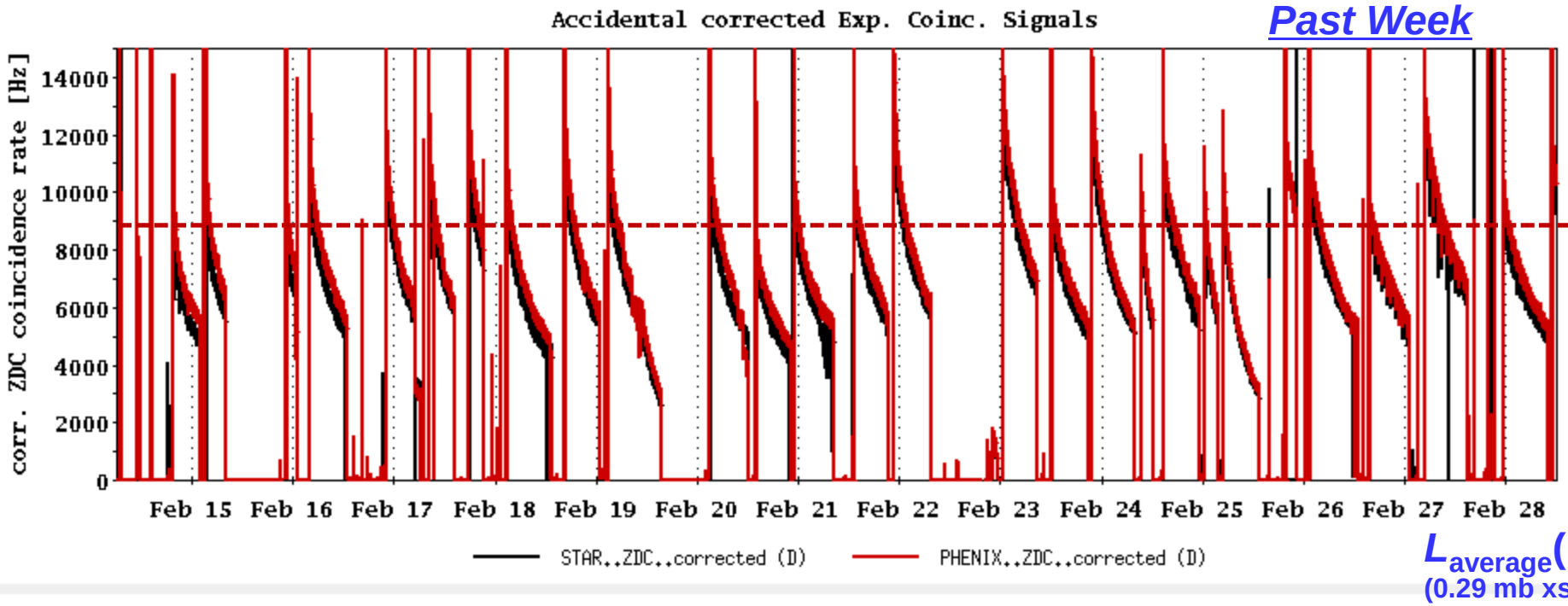
Fill 16534, 9 Mar, 8.1 hours physics store (9.1 hr Lumi on store), PHENIX 1.04 $pb^{-1}$



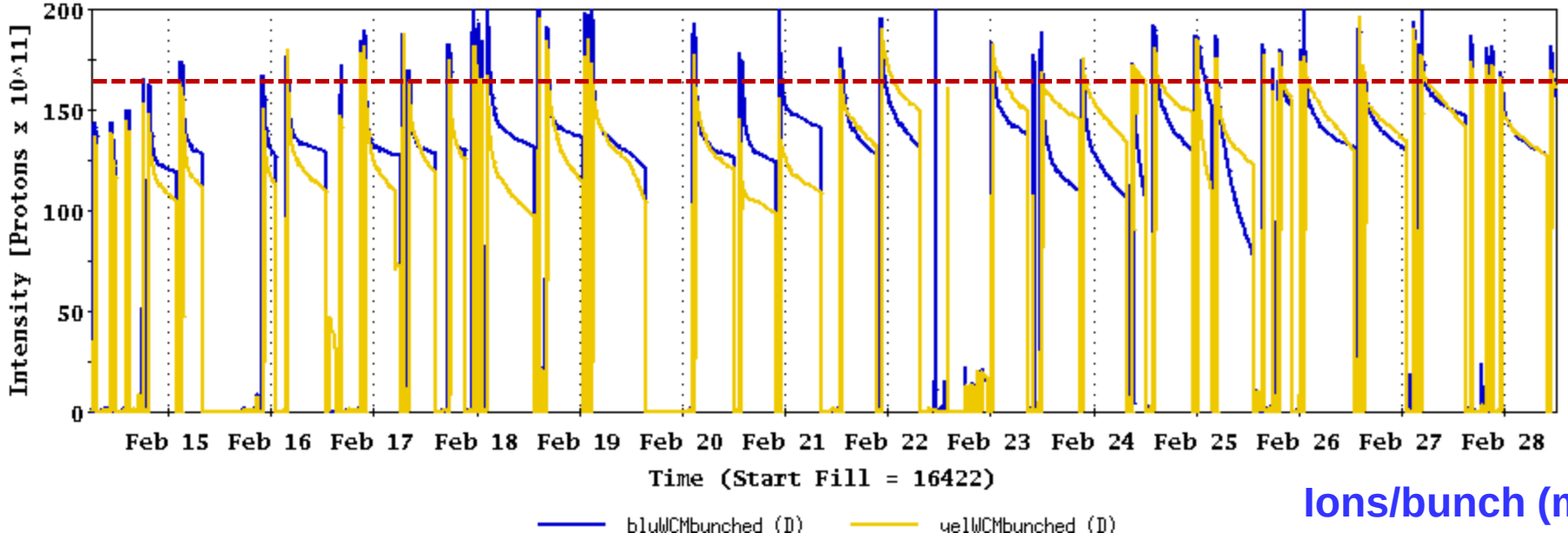

BNL Energy Use FY 2010-12
as of 8 Mar 2012
RHIC Cryo
RHIC other
AGS-Exp
Booster
AGS-Mach
Tandem
CAD Bldg less SMD
NSRL
Site Base
BNL Peak-Av
Site total not recorded 30 Nov 09 through Oct 2010 and 16 May through 7 July and more
Daily Average Power (MW)
50
45
40
35
30
25
20
15
10
5
0
1-Oct-09
1-Nov-09
1-Dec-09
1-Jan-10
1-Feb-10
1-Mar-10
1-Apr-10
1-May-10
1-Jun-10
1-Jul-10
1-Aug-10
1-Sep-10
1-Oct-10
1-Nov-10
1-Dec-10
1-Jan-11
1-Feb-11
1-Mar-11
1-Apr-11
1-May-11
1-Jun-11
1-Jul-11
1-Aug-11
1-Sep-11
1-Oct-11
1-Nov-11
1-Dec-11
1-Jan-12
1-Feb-12
1-Mar-12
Date

File Window Markers Analysis

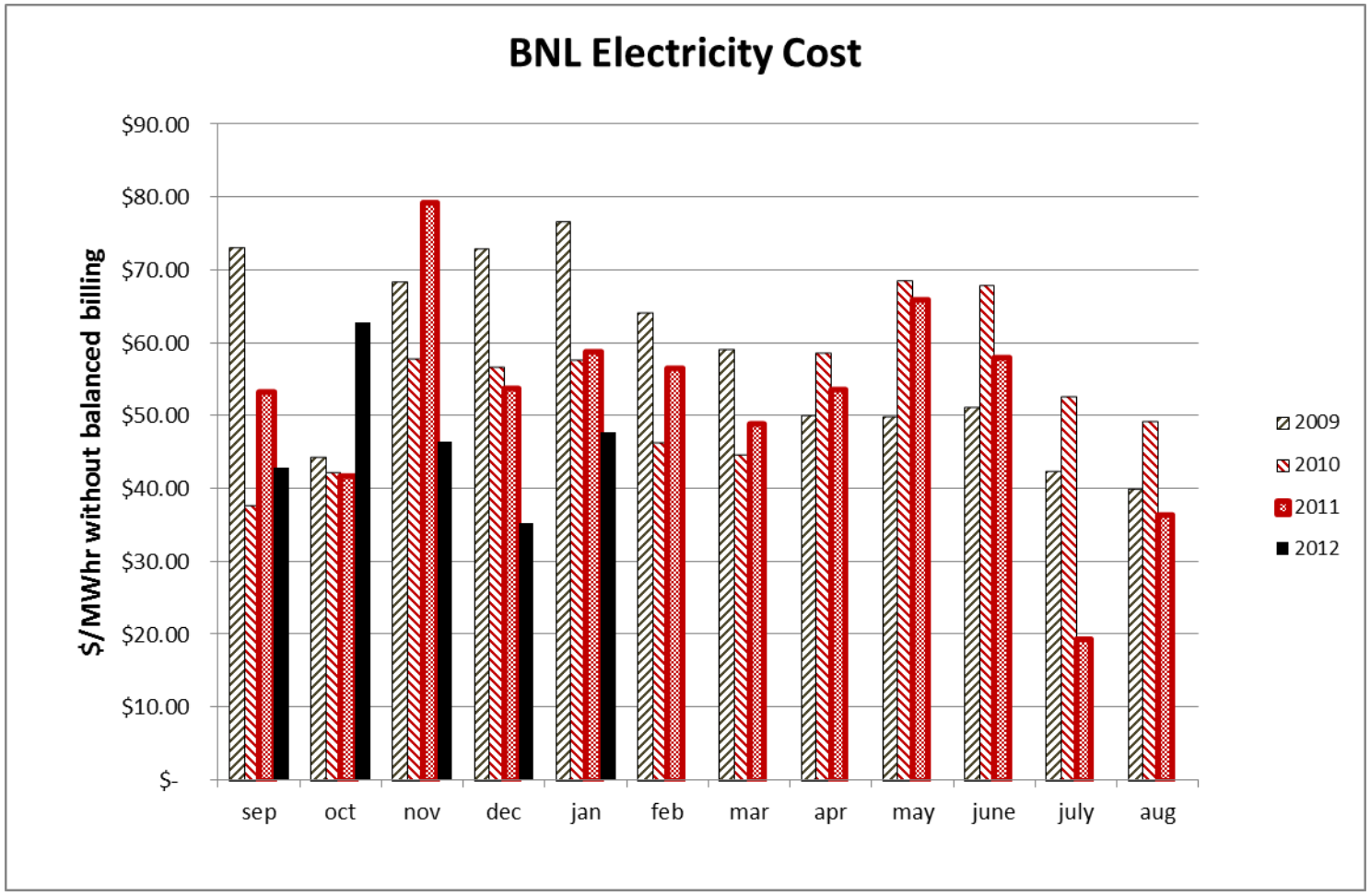



Past Week

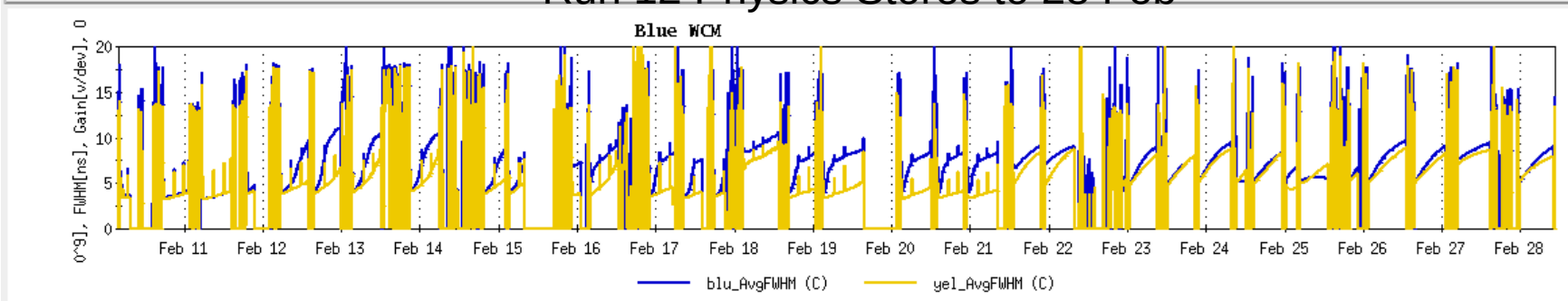
$L_{average}$(ma
(0.29 mb xsect

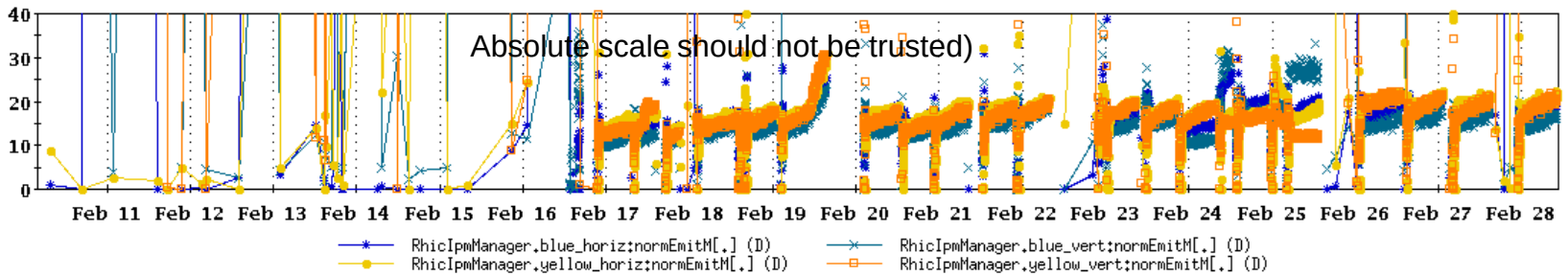


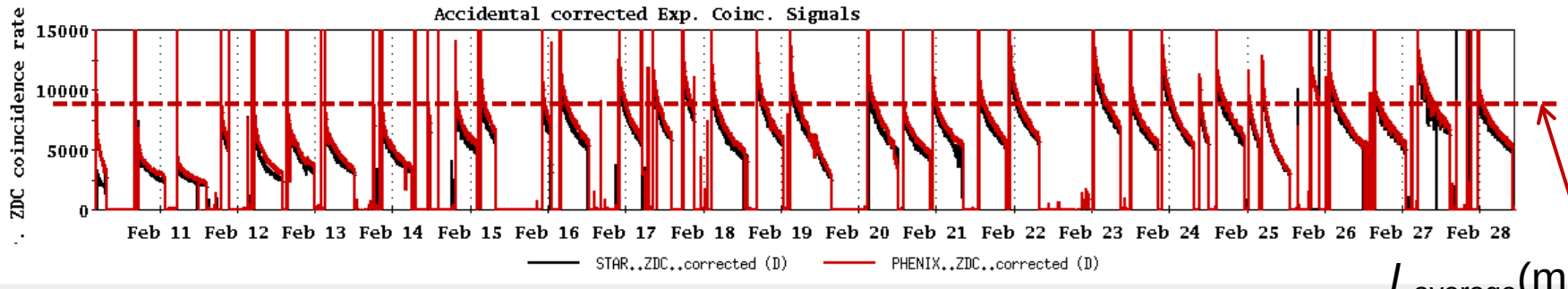

Ions/bunch (ma


BNL Electricity Cost
$/MWhr without balanced billing
$90.00
$80.00
$70.00
$60.00
$50.00
$40.00
$30.00
$20.00
$10.00
$-
sep
oct
nov
dec
jan
feb
mar
apr
may
june
july
aug
2009
2010
2011
2012

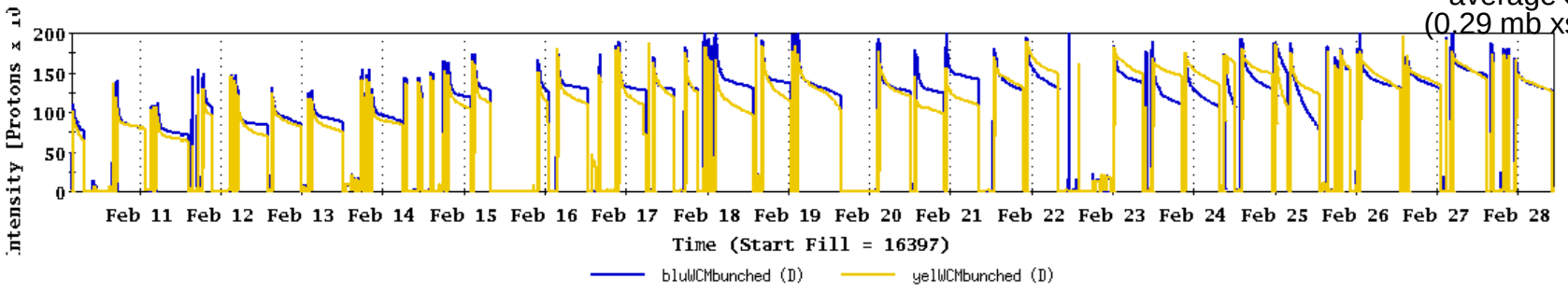
# Run 12 Physics Stores to 28 Feb



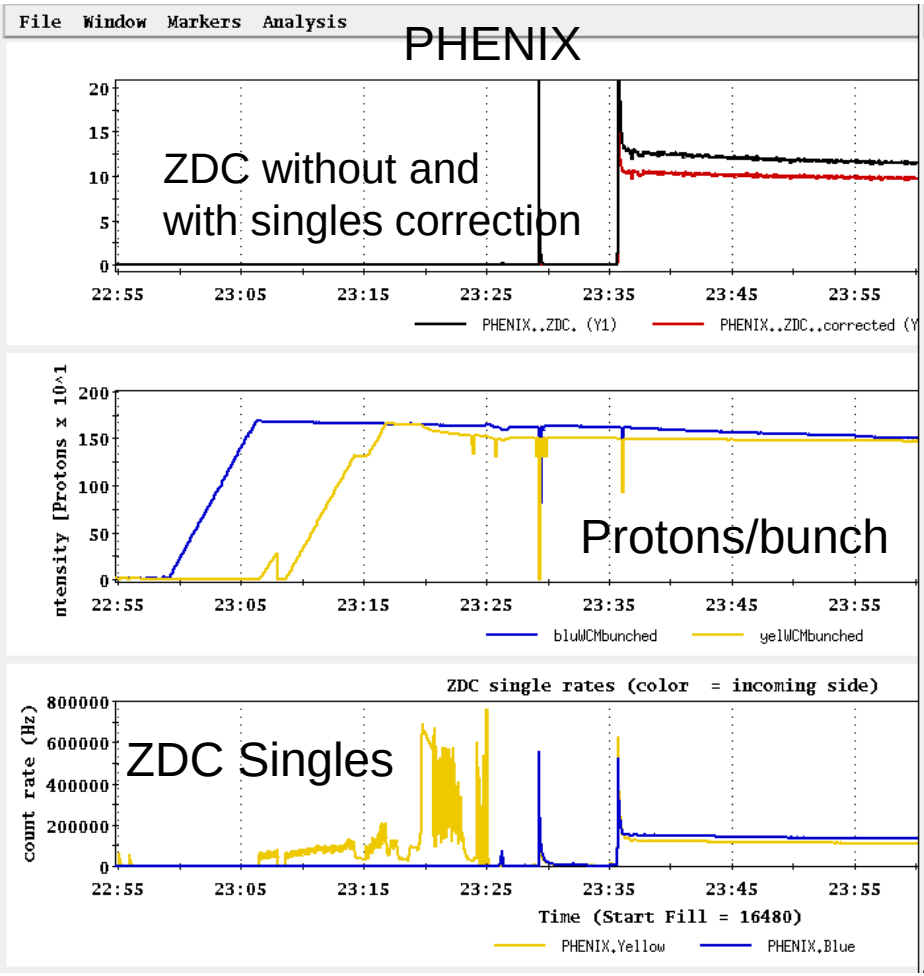



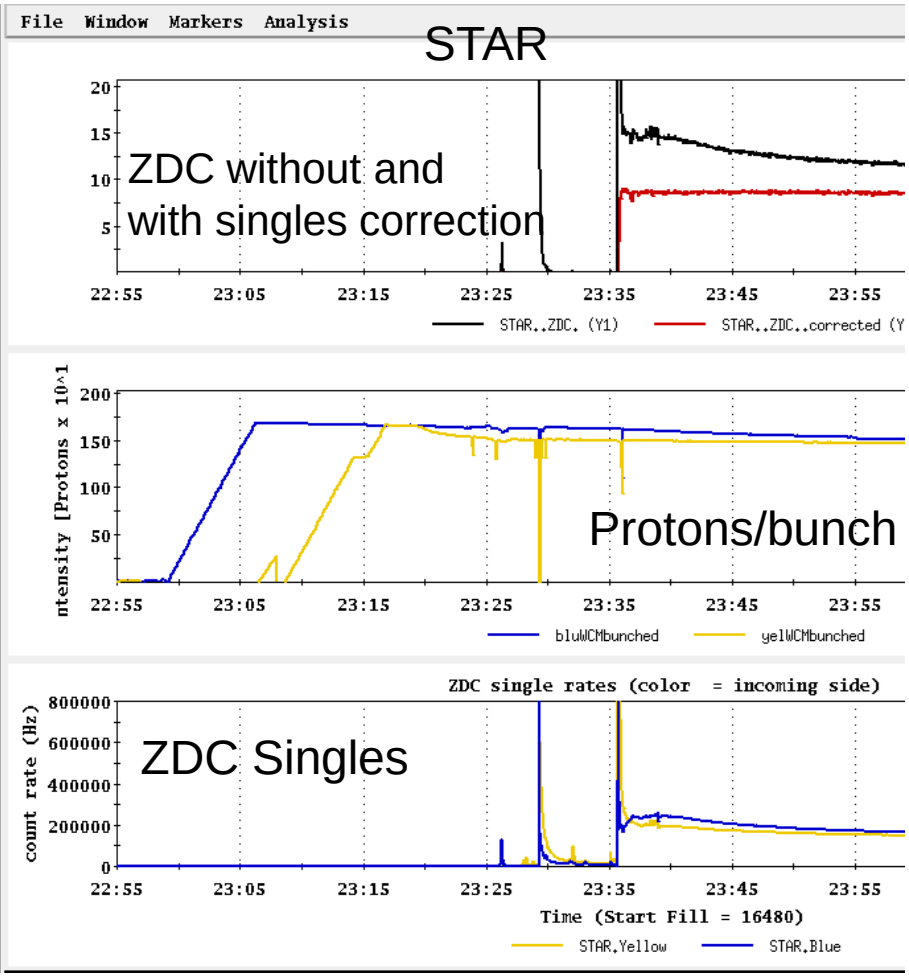




$L_{average}$(max)
(0.29 mb xsection)

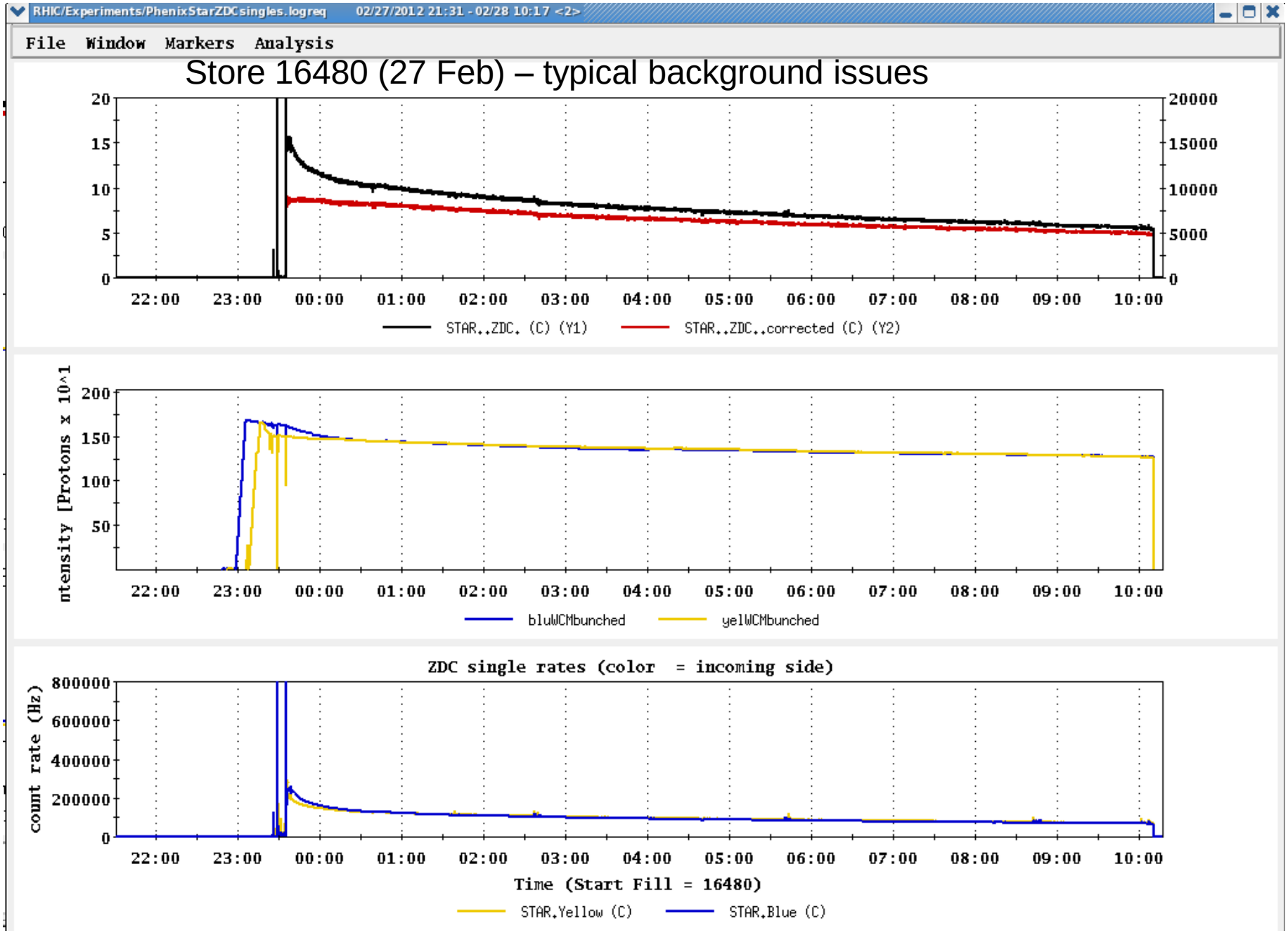


# Store 16480 (27 Feb) – typical background issues

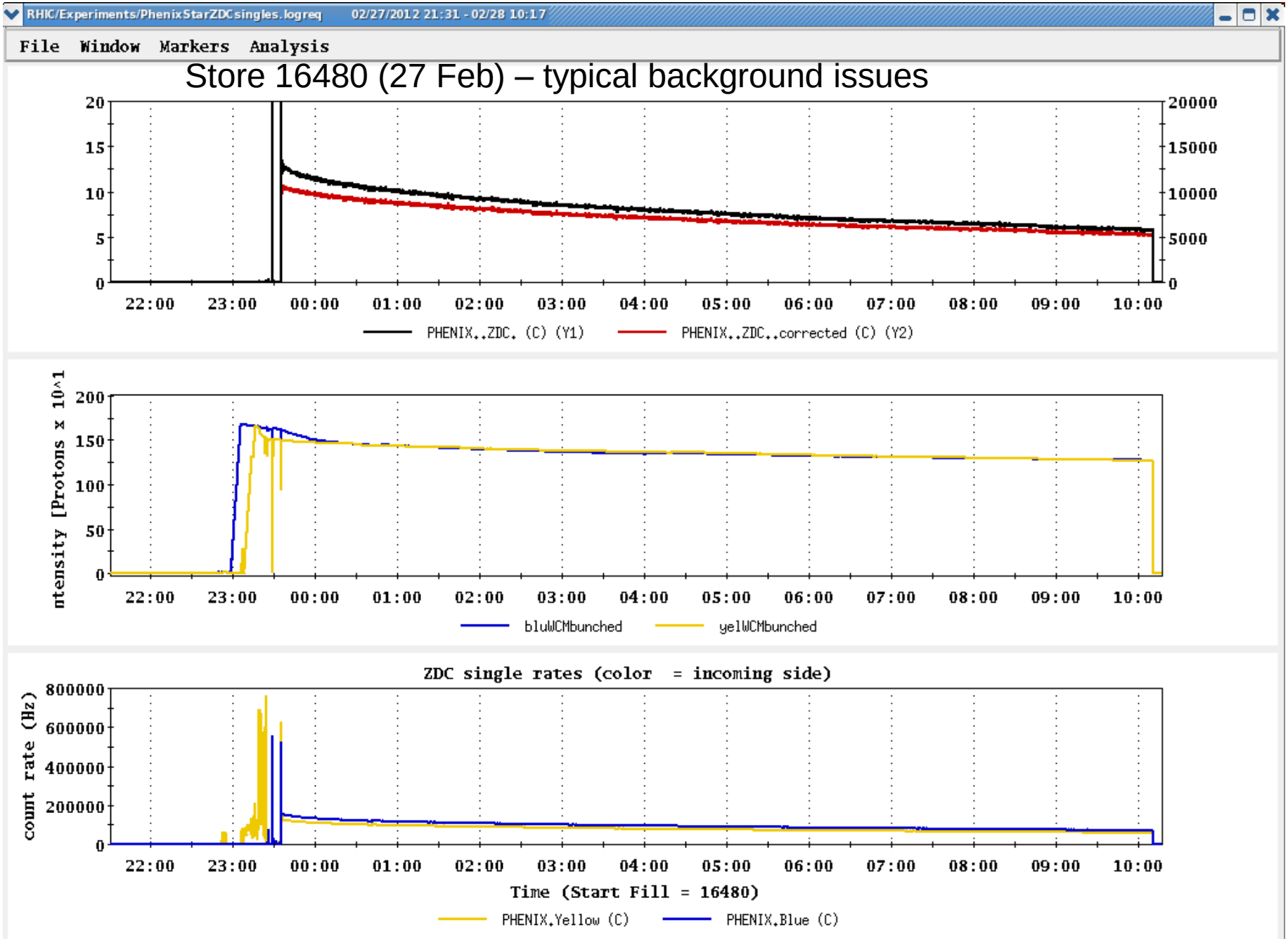


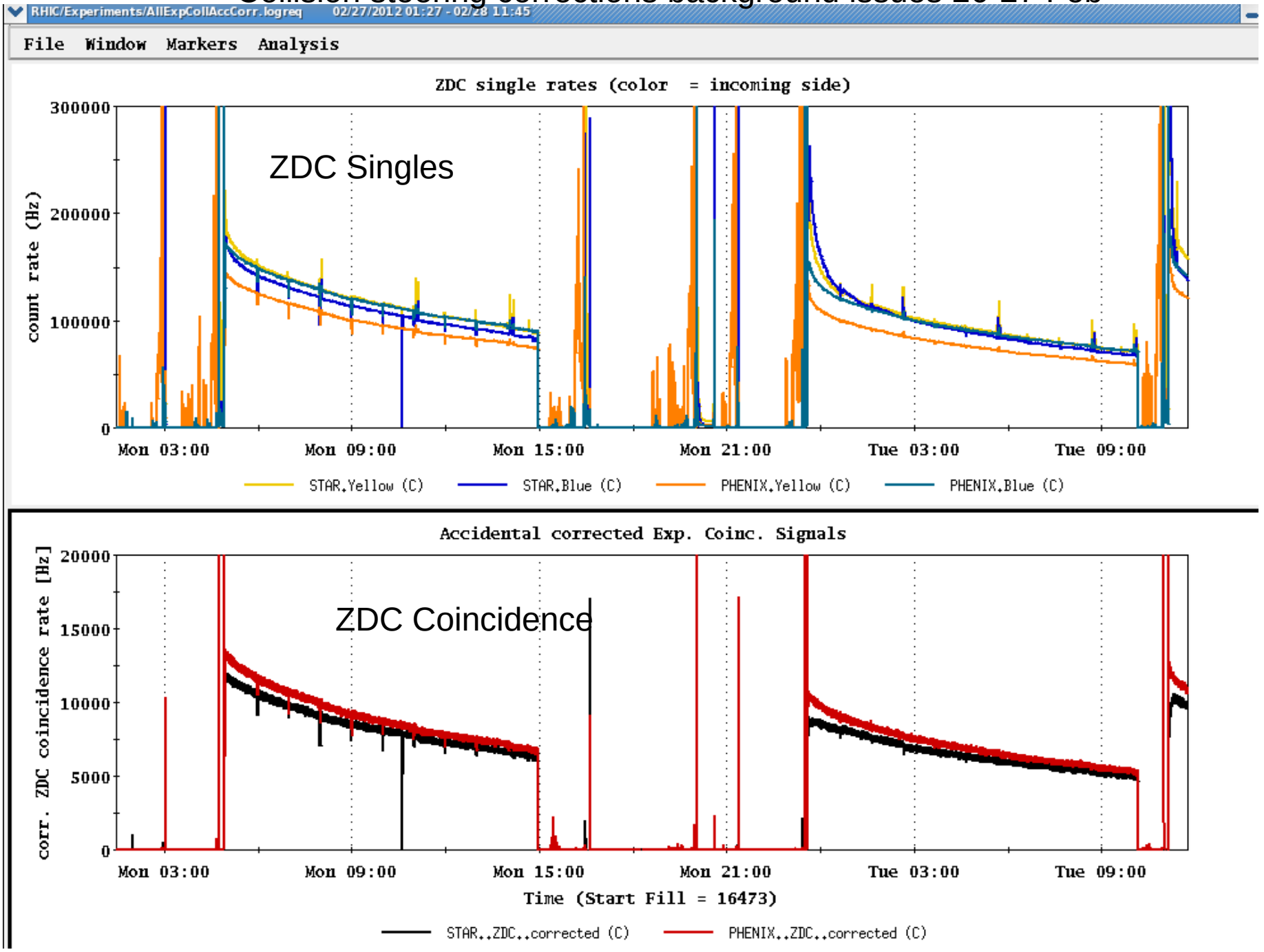
# Store 16480 (27 Feb) – typical background issues



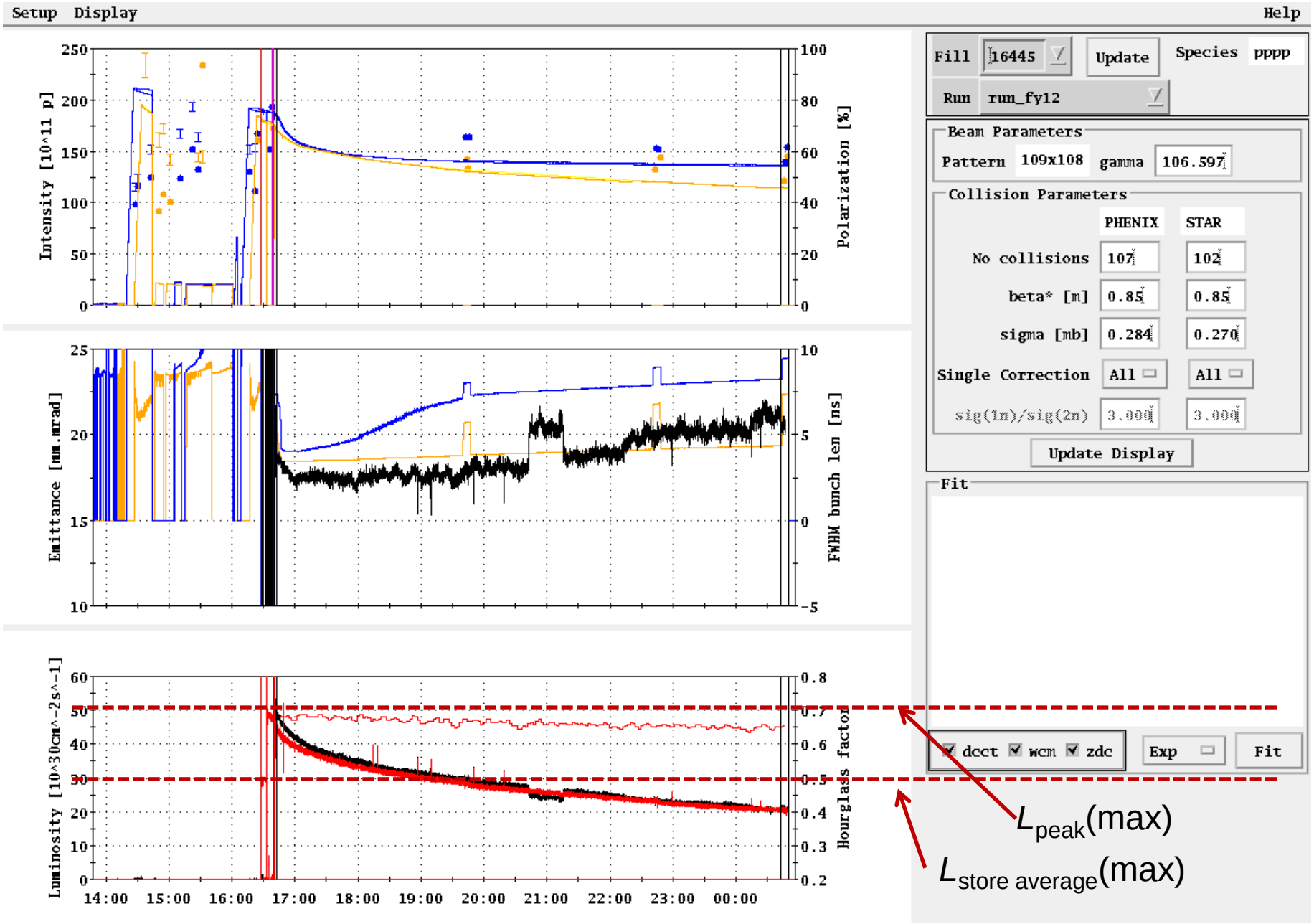
# Store 16480 (27 Feb) – typical background issues

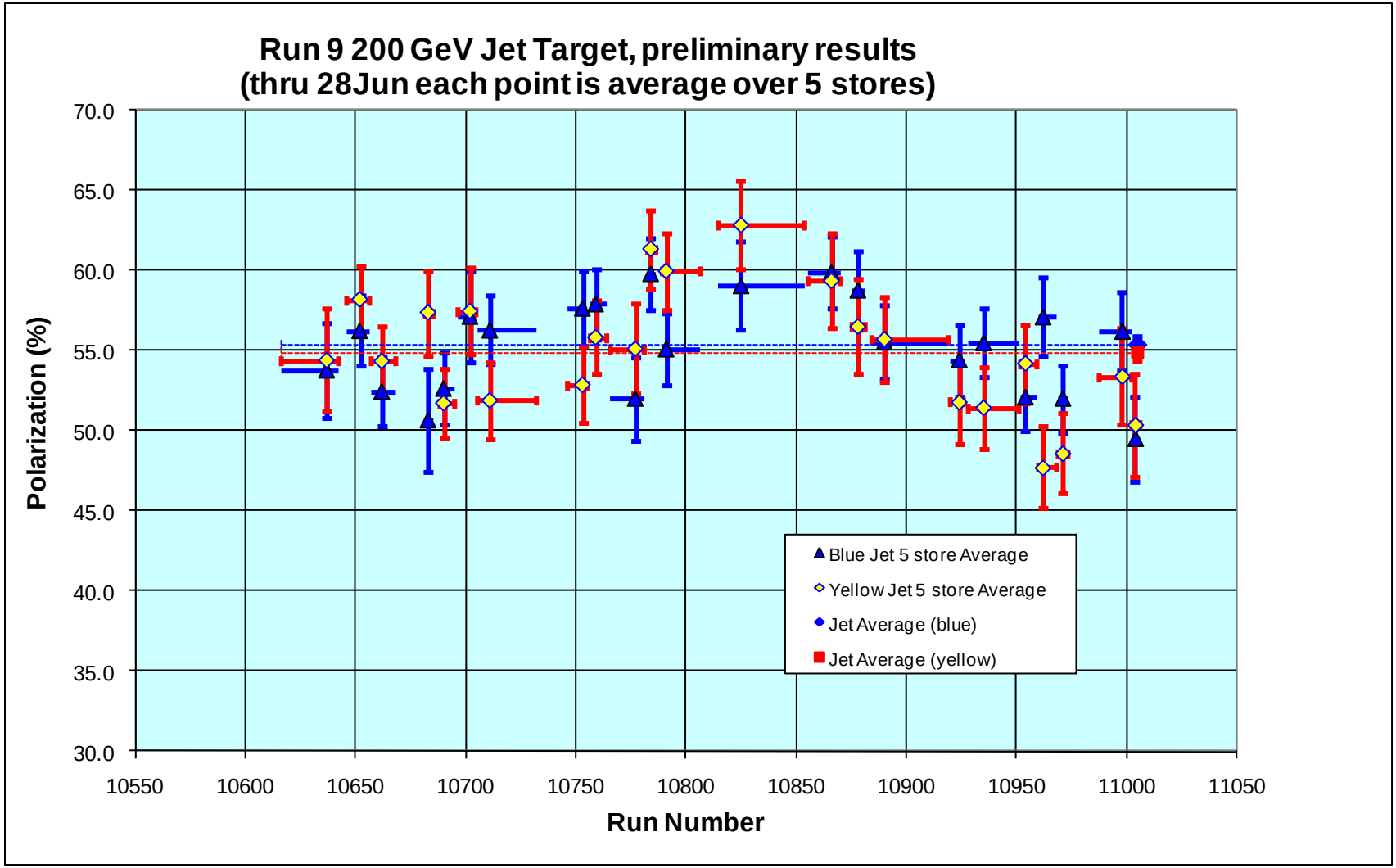


# Collision steering corrections background issues 26-27 Feb



# Example -- Store 16445, Sat Feb 18






Blue Jet weighted average = 55.4 ± 0.5

Yellow Jet weighted average = 54.9 ± 0.5

# Run 12 projection for √s = 200 GeV pp

STAR Goal: 27 pb-1 delivered with 55-60 % polarization
PHENIX Goal: 27 pb-1 delivered with 55-60 % polarization

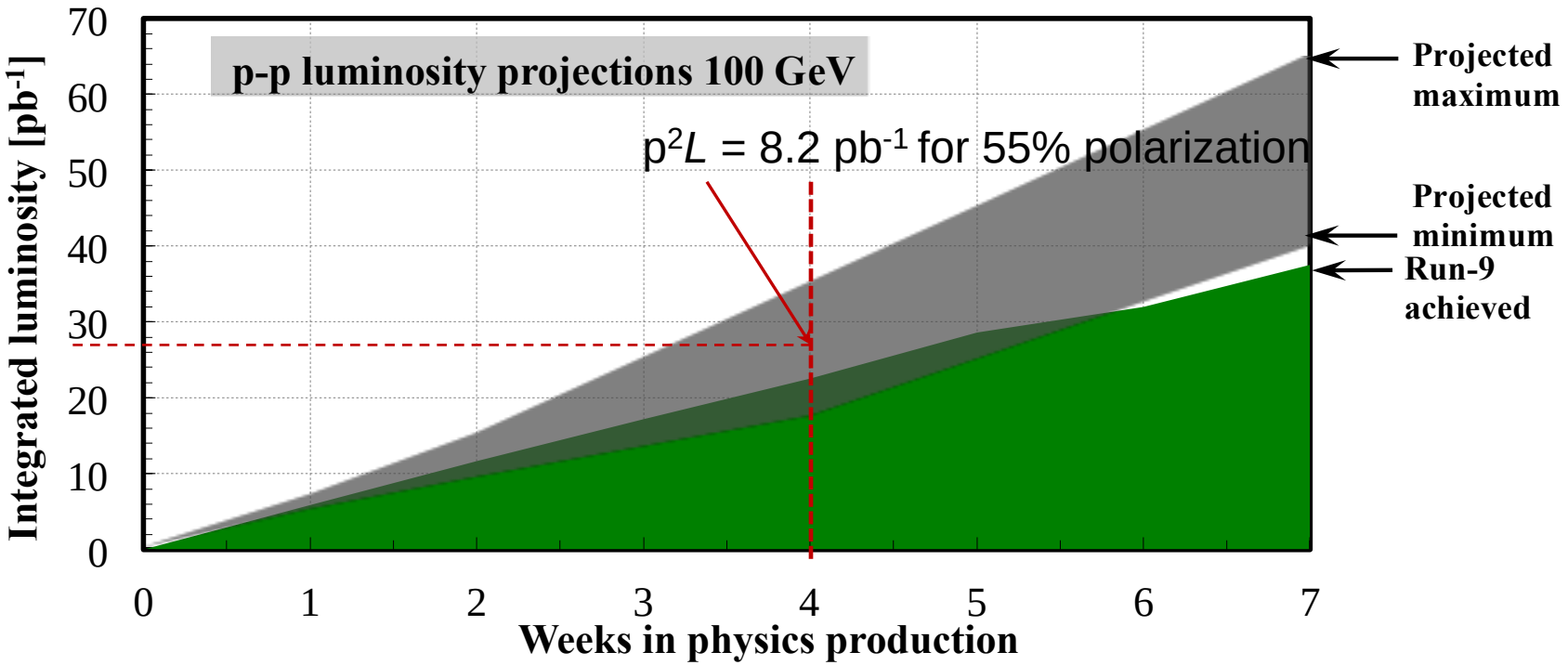
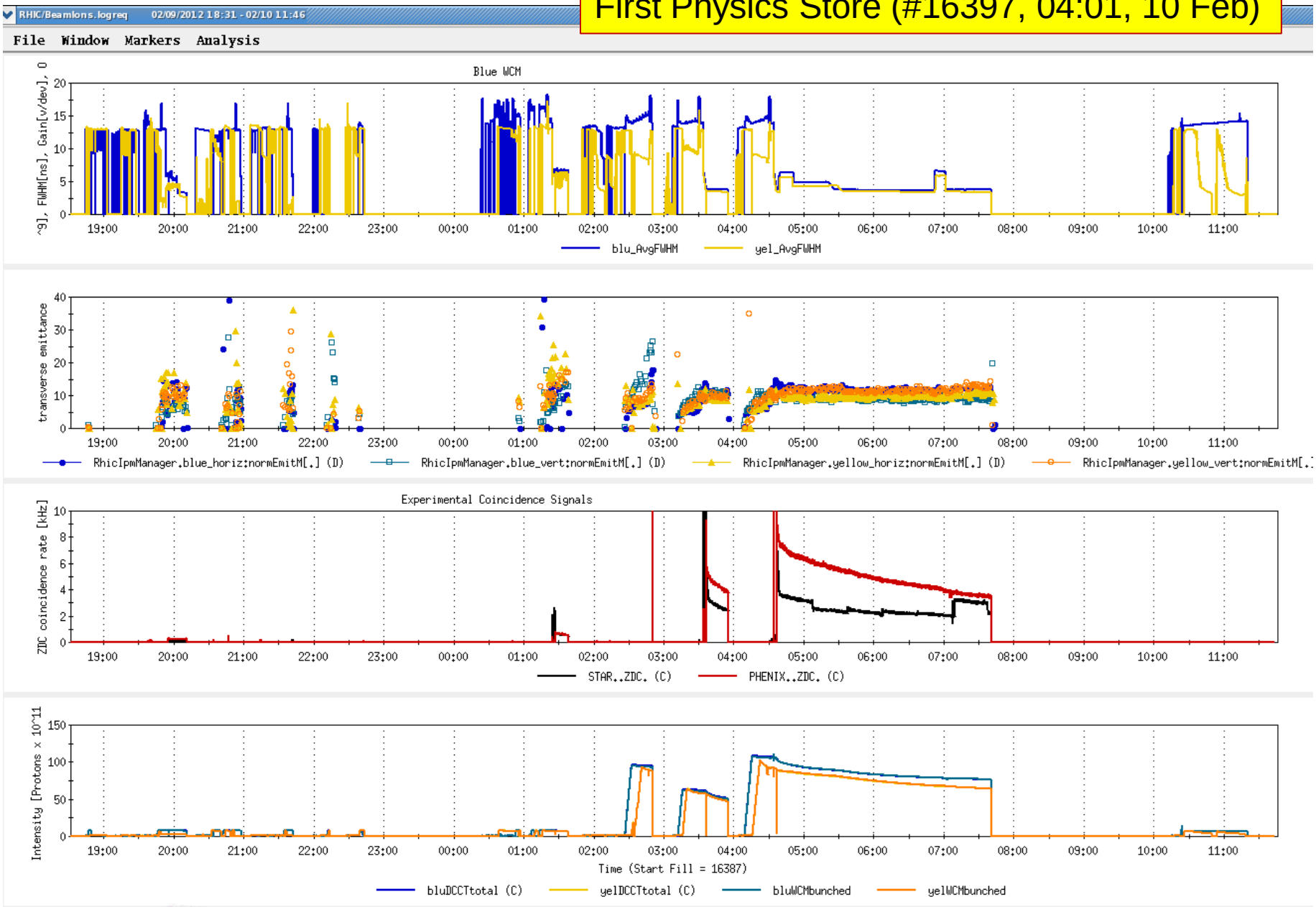


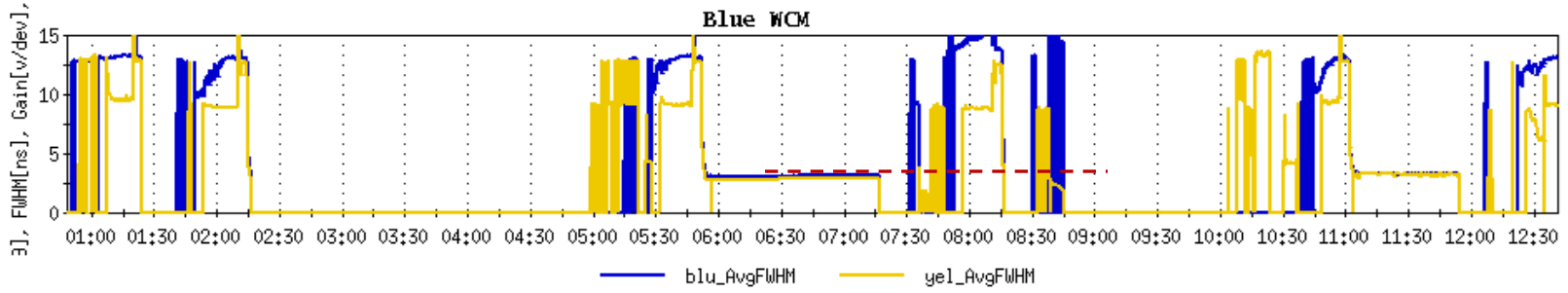

**Figure 3: Projected minimum and maximum integrated luminosities for polarized proton collisions at 100 GeV beam energy, assuming a linear weekly luminosity ramp-up in 4 weeks. An average store polarization between 50 and 60% is expected.**

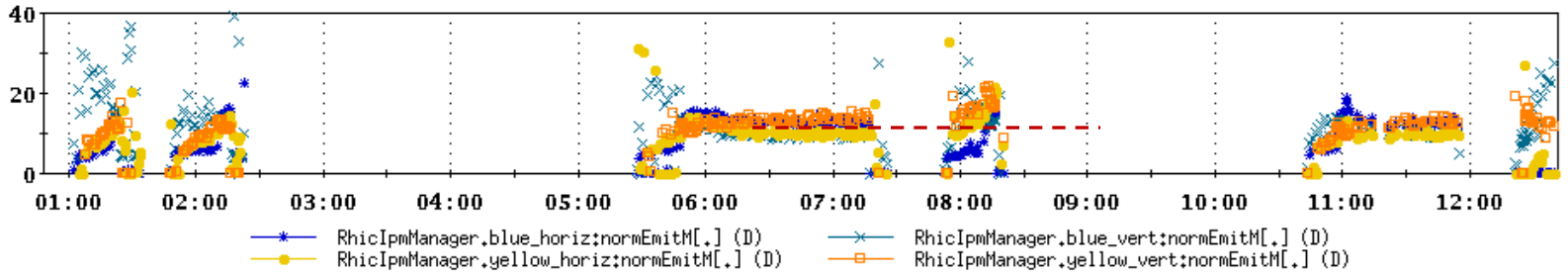
**From Fischer et. Al. "RHIC Collider Projections (FY 2012 – FY 2016)"**
14 October 2011

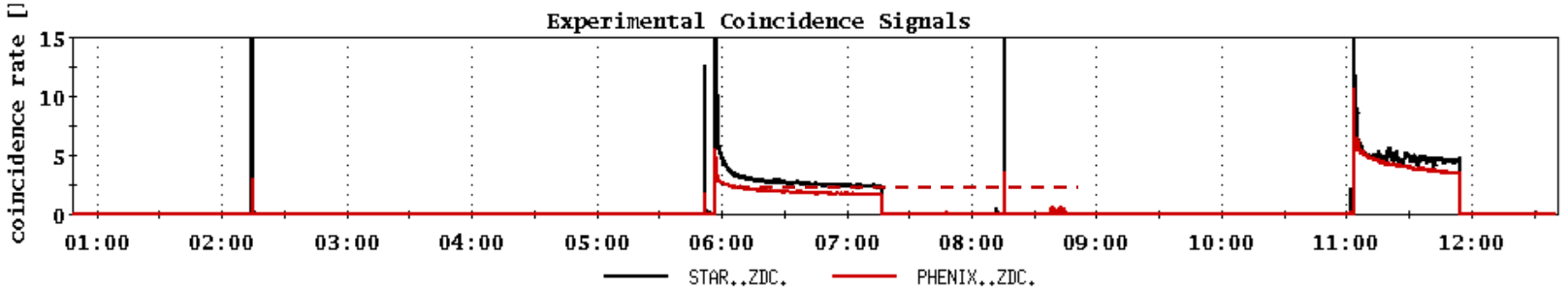
# First Physics Store (#16397, 04:01, 10 Feb)

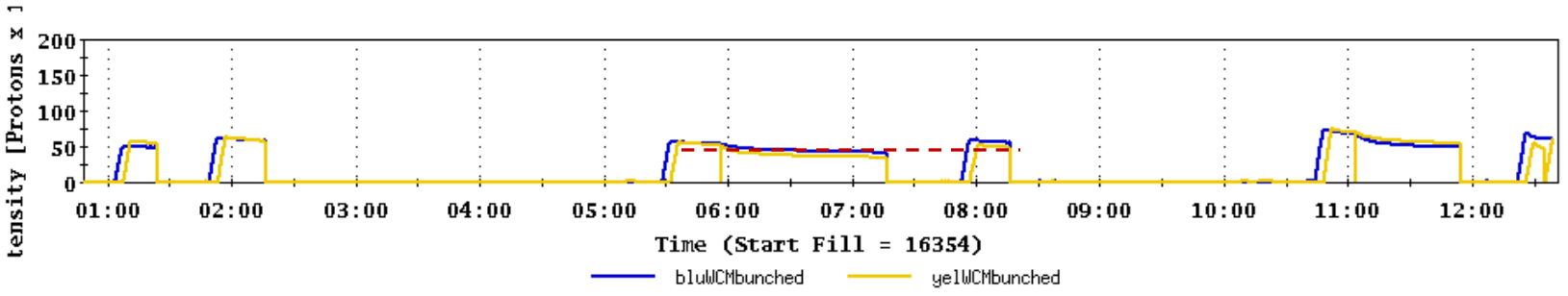


# Today, 7 Feb 2012

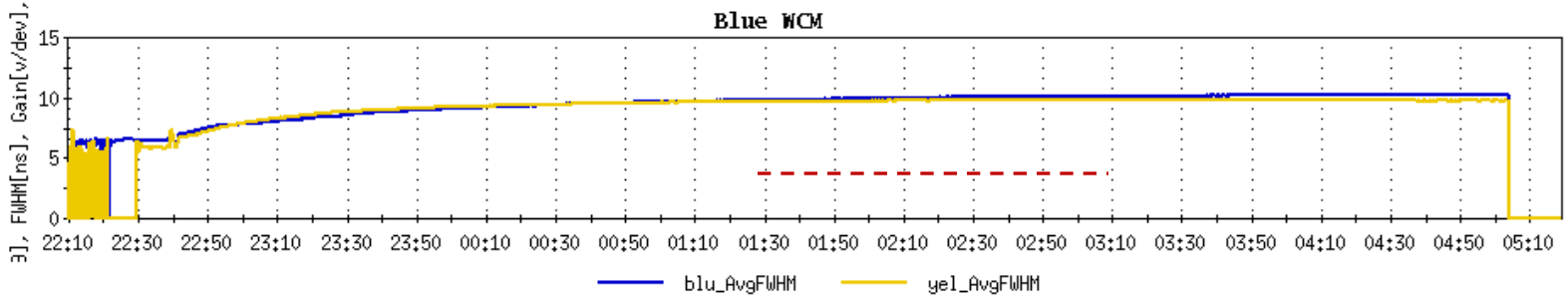


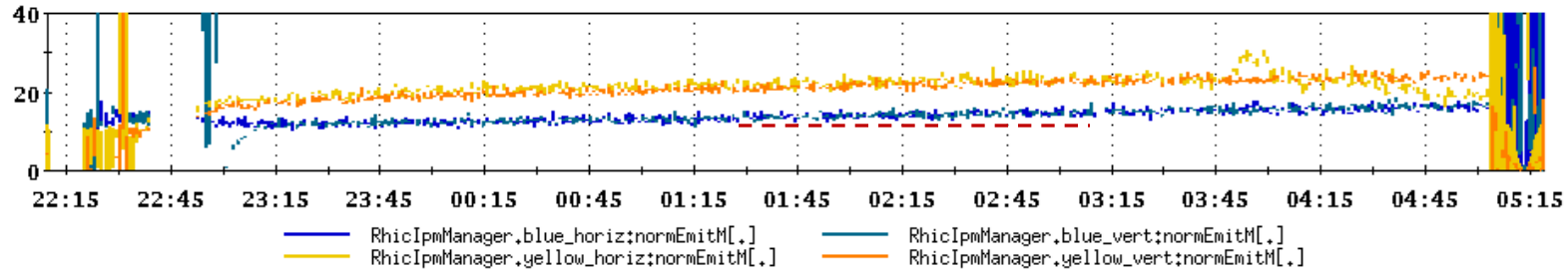



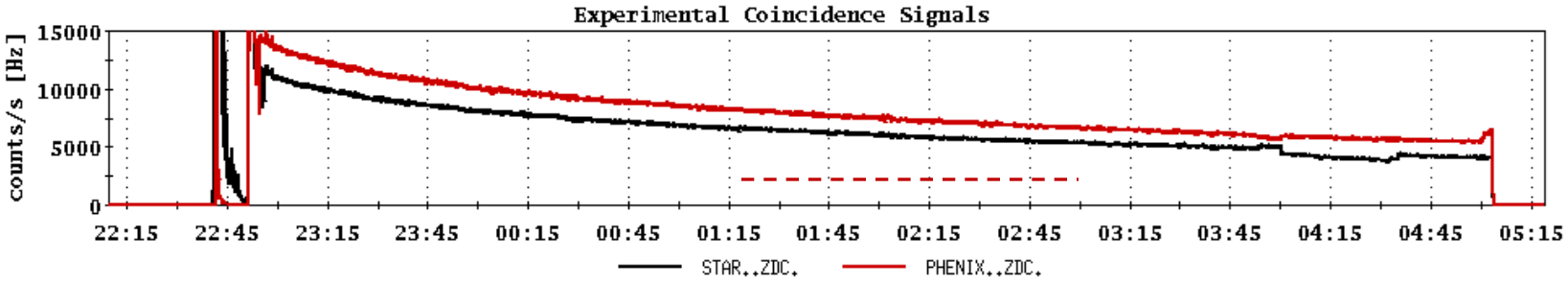



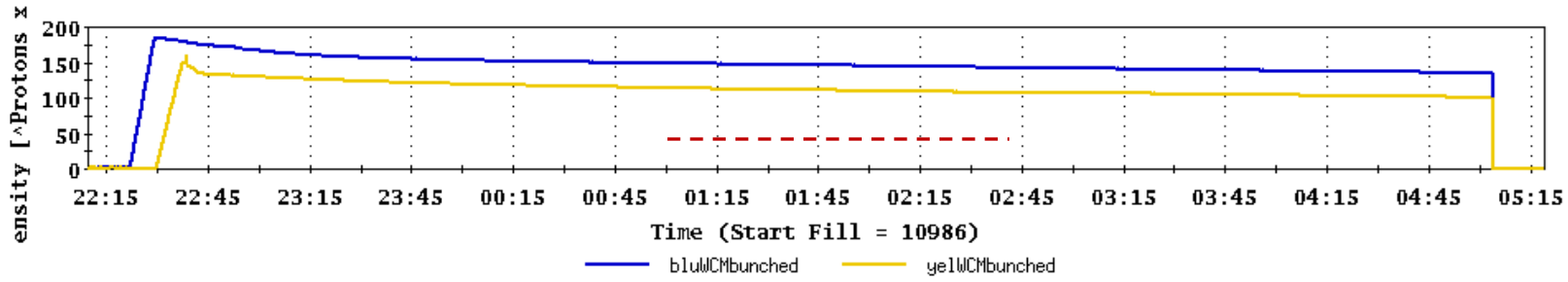



# Typical Store from Run 9, 100 x 100 GeV pp



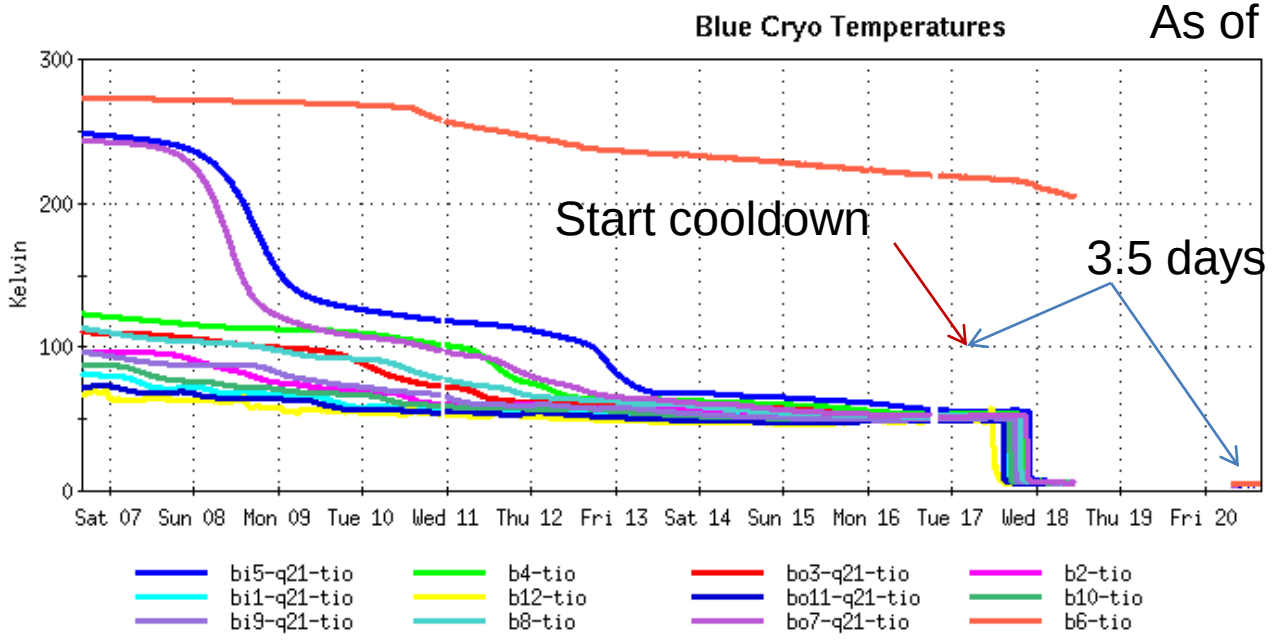



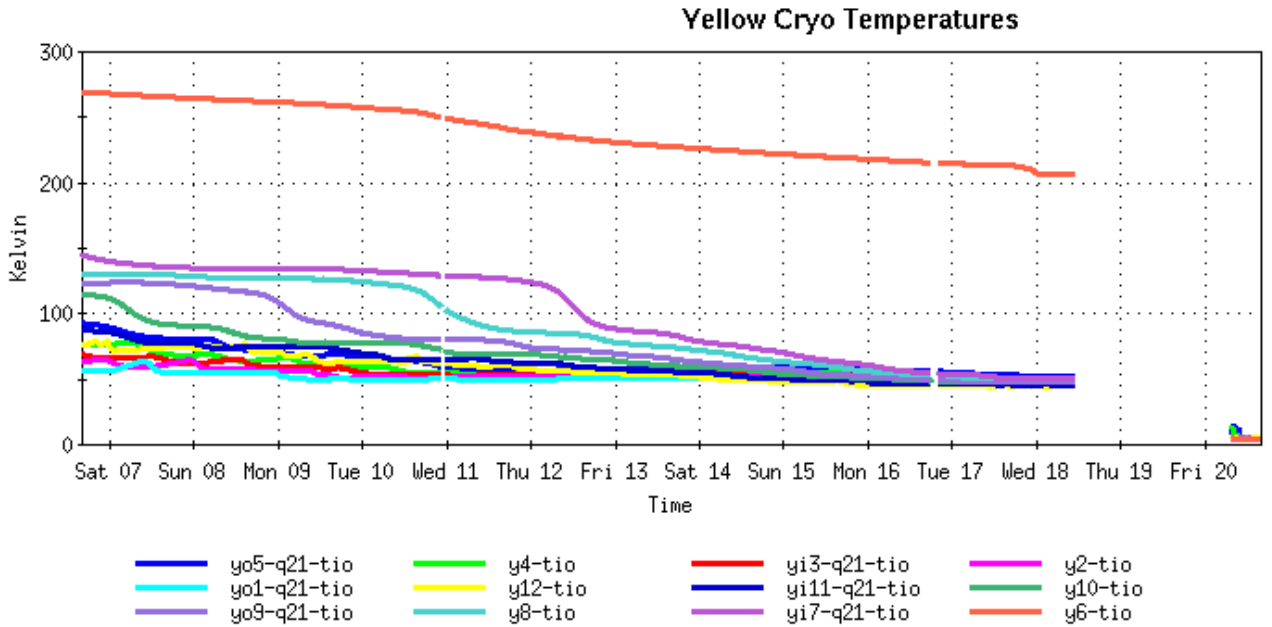



Ring Summary (1 day) Sector Plots (1 day) Sector Plots (14 days)

File Window Markers Analysis



# Recommendations following the June 6-8, 2011 PAC

For Run 12 the PAC recommends the following (*in order of priority*):

- 5 weeks of running with polarized proton collisions at 200 GeV.
- 7 weeks of running with polarized proton collisions at 500 GeV.
- 5 weeks of running with Cu+Au collisions at 200 GeV.
- 3 weeks of running with U+U collisions at 193 GeV.

For Run13 the PAC recommends the following (*not* in order of priority):

- 12 weeks of running with polarized proton collisions at 500 GeV.
- 5 week of running with polarized proton collisions at 200 GeV.
- 7 weeks of running with Au+Au collisions at full energy.

D.L. November 23, 2011 update

# Cryo Issue

Our helium supplier no longer able to meet our peek demand of 4 trailers in a one week period. They can give us one trailer a week starting on December 31st, so we expect to have all the helium we need, on time, but we will have to store most of it in the dewars outside 1006B. This will result in our 4K cooldown being a little less stable and predictable than it has been for the past few years when we received all of the helium at 1005R over a short period of time. Because of this, I expect the 4K cooldown will take a least one additional day.

## Cryogenic System Cooldown Projection based on Full Compressor Power Starting on January 17, 2012

**.5 to 1 MW – Nov 23, 2011 through Dec 18, 2011** (temporary peaks up to 2 MW)

Scrub of RHIC rings and cryo plant, 14 atm pressure test of blue sextants 2/3 and 8/9 M-lines. Main compressor testing and scrub.

**2.8 MW – Dec 19, 2011 through Jan 16, 2012**

| | |
|---|---|
| 12/19/11 | Start 45K cooldown of cryo plant |
| 12/20/11 | Start 45K wave in both RHIC rings |
| 12/31/11 | First liquid helium delivery, 1006B |
| 01/07/12 | Second liquid helium delivery, 1006B |
| 01/14/12 | Third liquid helium delivery, 1005R |

**6 to 8 MW – Jan 17, 2012 through Jan 22, 2012**

| | |
|---|---|
| 01/17/12 | Start 4K wave in Blue ring, Hi potting (3 days) |
| 01/20/12 | Estimate blue ring cold and stable, soak complete, ready for magnet powering. |
| 01/20/12 | Start 4K wave in Yellow ring, Hi potting (3 days) |
| 01/21/12 | Fourth liquid helium delivery |
| 01/23/12 | Estimate yellow ring cold and stable, soak complete, ready for magnet powering. |

**5 MW starting on Jan 23, 2012**

| | |
|---|---|
| 01/23/12 | Start T7 turbine |

**FY2012**

Sept billed at $70/MWhr actual cost $42.86 -- $438K added to bank

Oct billed at $60/MWhr actual cost $62.80 -- $45.5K withdrawn from bank

FY2012 Bank Total = $392,563

| FY2012 Electric Rates | | | FY11 Rates |
|---|---|---|---|
| Month | Original $/kWh | Revised $/kWh | As Billed $/kWh |
| | | | |
| Oct-11 | 0.060 | | 0.065 |
| Nov-11 | 0.060 | | 0.065 |
| Dec-11 | 0.060 | | 0.065 |
| Jan-12 | 0.053 | | 0.055 |
| Feb-12 | 0.053 | | 0.055 |
| Mar-12 | 0.053 | | 0.055 |
| Apr-12 | 0.053 | | 0.055 |
| May-12 | 0.053 | | 0.055 |
| Jun-12 | 0.068 | | 0.070 |
| Jul-12 | 0.068 | | 0.070 |
| Aug-12 | 0.068 | | 0.070 |
| Sep-12 | 0.068 | | 0.070 |
| | | | |

**From Fischer et. al. "RHIC Collider Projections (FY 2012 – FY 2016)"**
14 October 2011

| | | |
|---|---|---|
| Cool-down from 50 K to 4 K | 1 week | |
| Set-up mode 1 (p↑-p↑ at 100 GeV) | 1 week | (no dedicated time for experiments) |
| Ramp-up mode 1 | 2 week | (8 h/night for experiments) |
| Data taking mode 1 with further ramp-up | 5 weeks | |
| Set-up mode 2 (p↑-p↑ at 250 GeV) | ½ week | (no dedicated time for experiments) |
| Ramp-up mode 2 | 1 week | (8 h/night for experiments) |
| Data taking mode 2 with further ramp-up | 7 weeks | |
| Set-up mode 3 (U-U at 100 GeV/nucleon) | 1 week | (no dedicated time for experiments) |
| Data taking mode 3 with further ramp-up | 3 weeks | |
| Warm-up | ½ week | |

# Run 12 projection for √s = 500 GeV pp

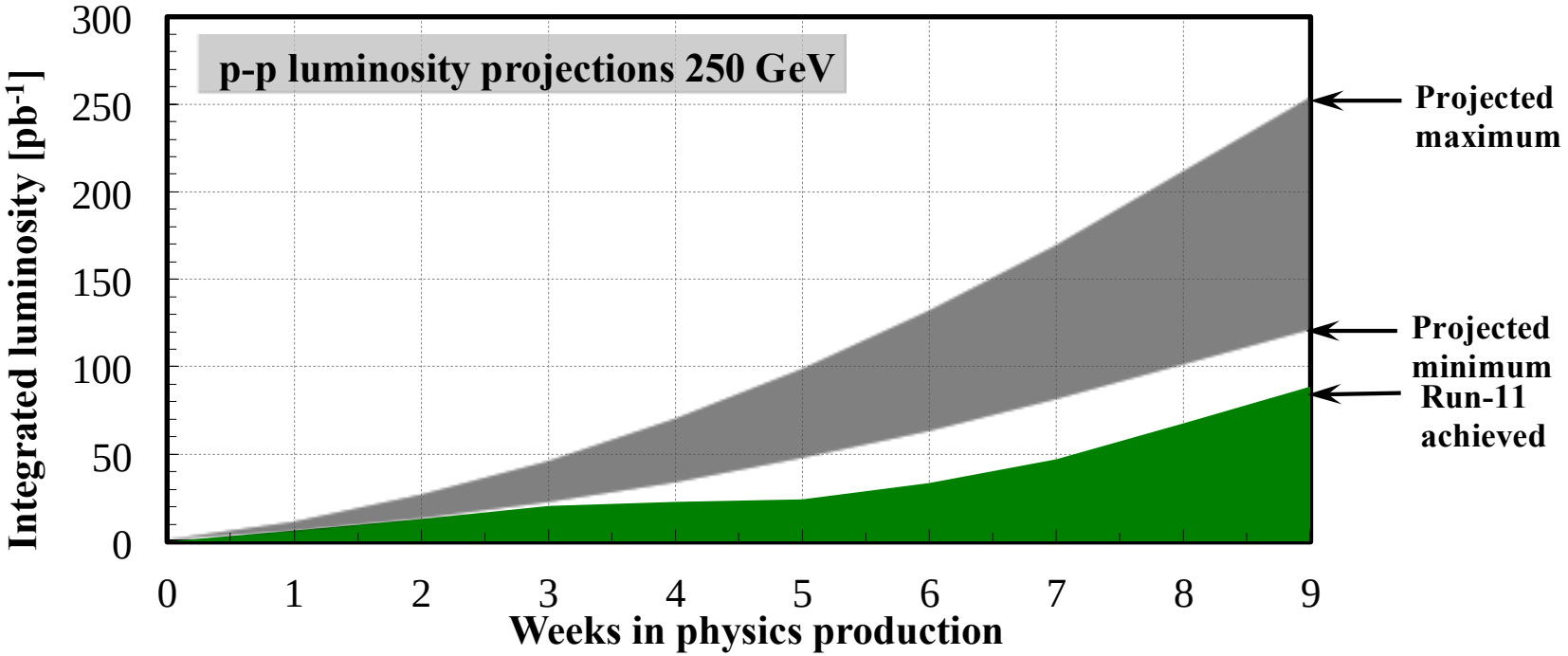



**Figure 4: Projected minimum and maximum integrated luminosities for polarized proton collisions at 250 GeV beam energy, assuming linear weekly luminosity ramp-up in 8 weeks. An average store polarization between 45 and 50% is expected.**

**From Fischer et. Al. "RHIC Collider Projections (FY 2012 – FY 2016)"**
14 October 2011

# Run 12 projection for √s = 193 GeV/n UU

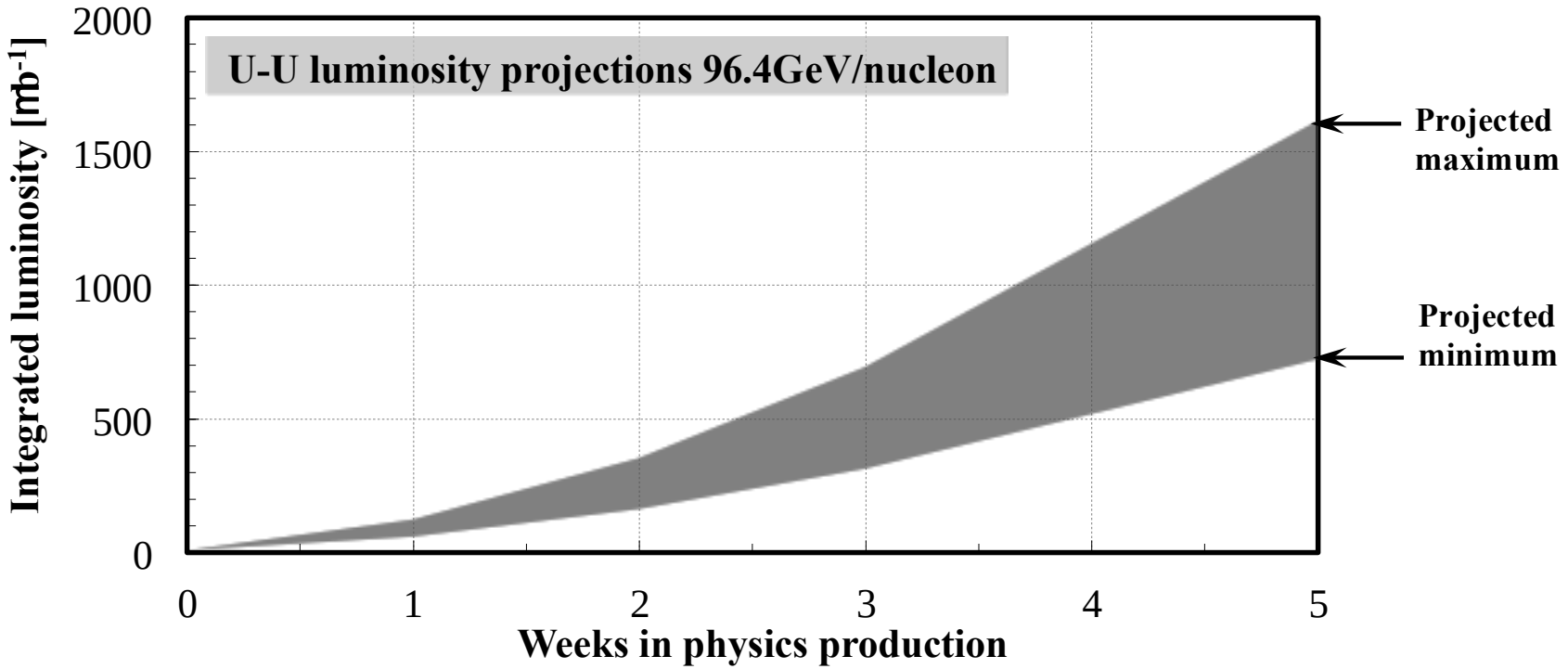



**Figure 5: Projected minimum and maximum integrated luminosities for uranium-uranium at 96.4 GeV/nucleon, assuming linear weekly luminosity ramp-up in 48 weeks.**

**From Fischer et. Al. "RHIC Collider Projections (FY 2012 – FY 2016)"**
14 October 2011

# Run 12 projection for √s = 200 GeV/n CuAu

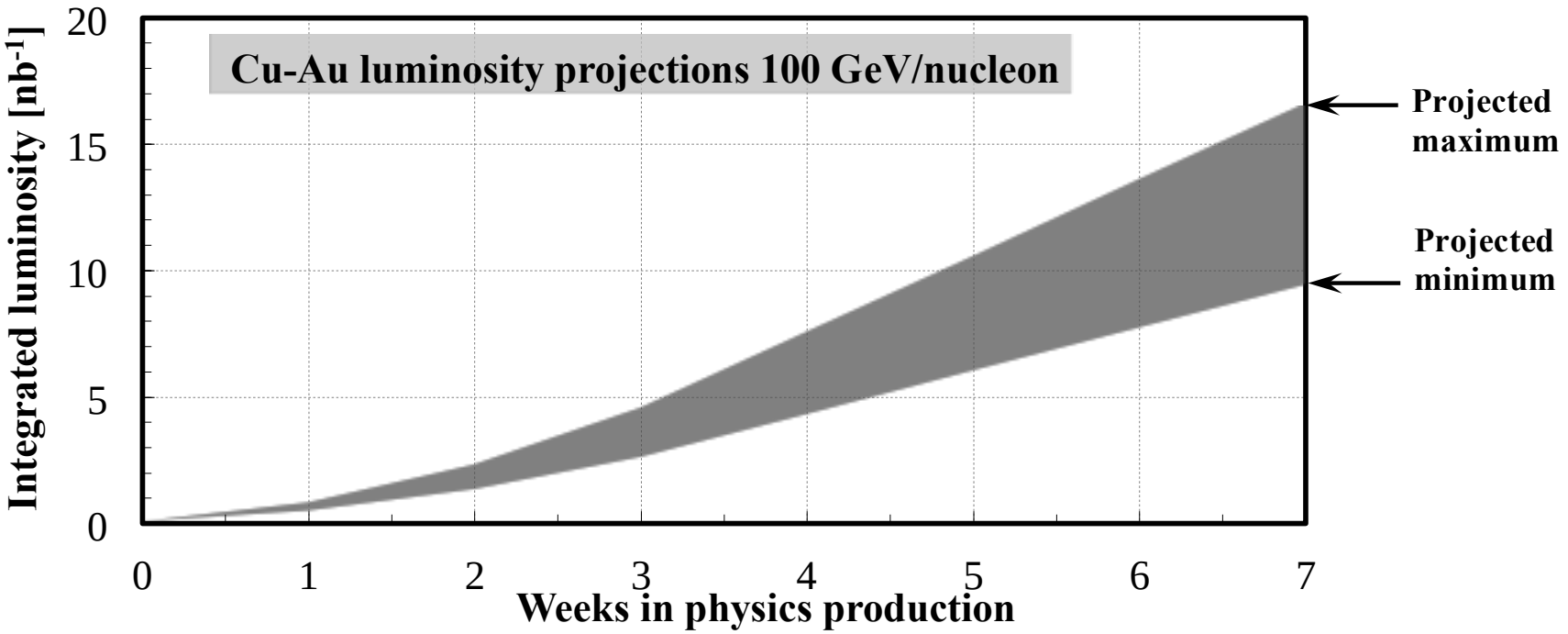



**Figure 6: Projected minimum and maximum integrated luminosities for copper-gold collisions at 100 GeV/nucleon beam energy, assuming linear weekly luminosity ramp-up in 4 weeks.**

**From Fischer et. Al. "RHIC Collider Projections (FY 2012 – FY 2016)"**
14 October 2011