Run 15 RHIC Machine/Experiments Meeting

28 Apr 2015

<u>Agenda:</u>

- **Run 15 Schedule** (Pile)

Run 15 plan based on 22 weeks cryo operation
with 10 day extension of the 100 GeV pp run

- 20 Jan, Begin cool-down to 4.5K
- 21 Jan (morning), Blue cold
- 22 Jan (evening), Yellow cold
- 23 Jan (after midnight), Beam in Blue
- 7 Feb, First overnight stores for experiments
- 10 Feb (3 days early) store 18662, Begin 9 week **√s=200 GeV pp** physics run

- ***14-17 Mar, Power Dip downtime***

- 27 April (Mon, 0700), End 10.9 week √s=200 GeV pp physics run

  today, 28 Apr…

- 8 May (Fri), ***[Chuyu estimates physics start on 2 May, 6 days early]***
  Begin 5 week **√s=200 GeV/n pAu** physics run
- 12 June (Fri), End 5 week √s=200 GeV/n pAu physics run

- 15 June (Mon), Begin 2 week **√s=200 GeV/n pAl** physics run
- 19 June (Mon), End **4 day (???)** √s=200 GeV/n pAl physics run

- 19 June (Fri), begin cryo warm-up
- 23 June, cryo warm-up complete, ***22.0 cryo weeks*** of operation

See http://www.rhichome.bnl.gov/AP/Spin2015/ for the Run Coordinator's detailed plan

p+Au @ 200 GeV, Experiment Goals

PHENIX:

- 5 week goal is 190 nb−1 sampled within |z| < 40 cm and polarization (transverse) = 60%.
- Assumptions:
  - Uptime = 70%
  - Fraction of events within 40 cm = 70%
  - Live Time = 90%

→ delivered lumi = 190/(0.7*0.7*0.9)= 430 nb-1

STAR:

- 5 week goal is 300 nb−1 sampled and polarization (transverse) = 60%.
- Assumptions:
  - Sampling efficiency = 60%

→ delivered lumi = 300/(0.6)= 500 nb-1

Pol goal = 60% (experiments)

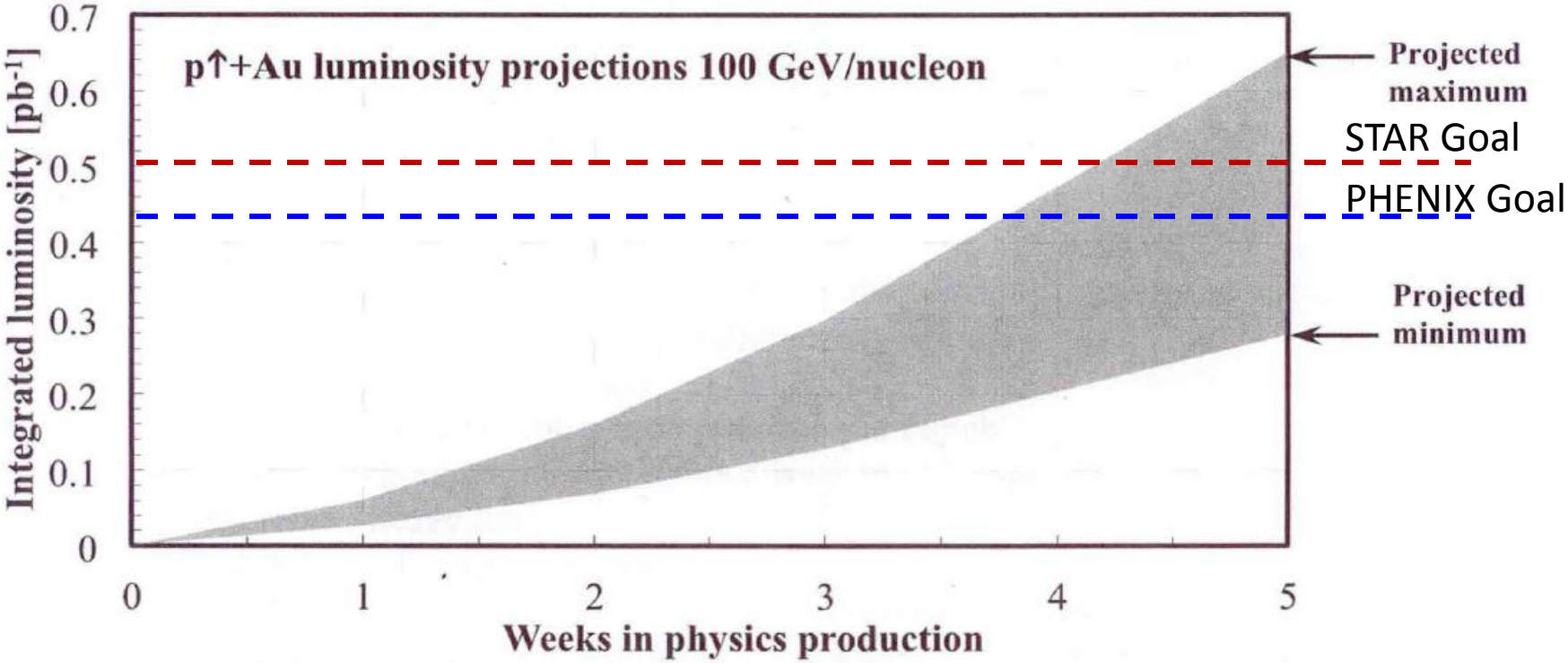
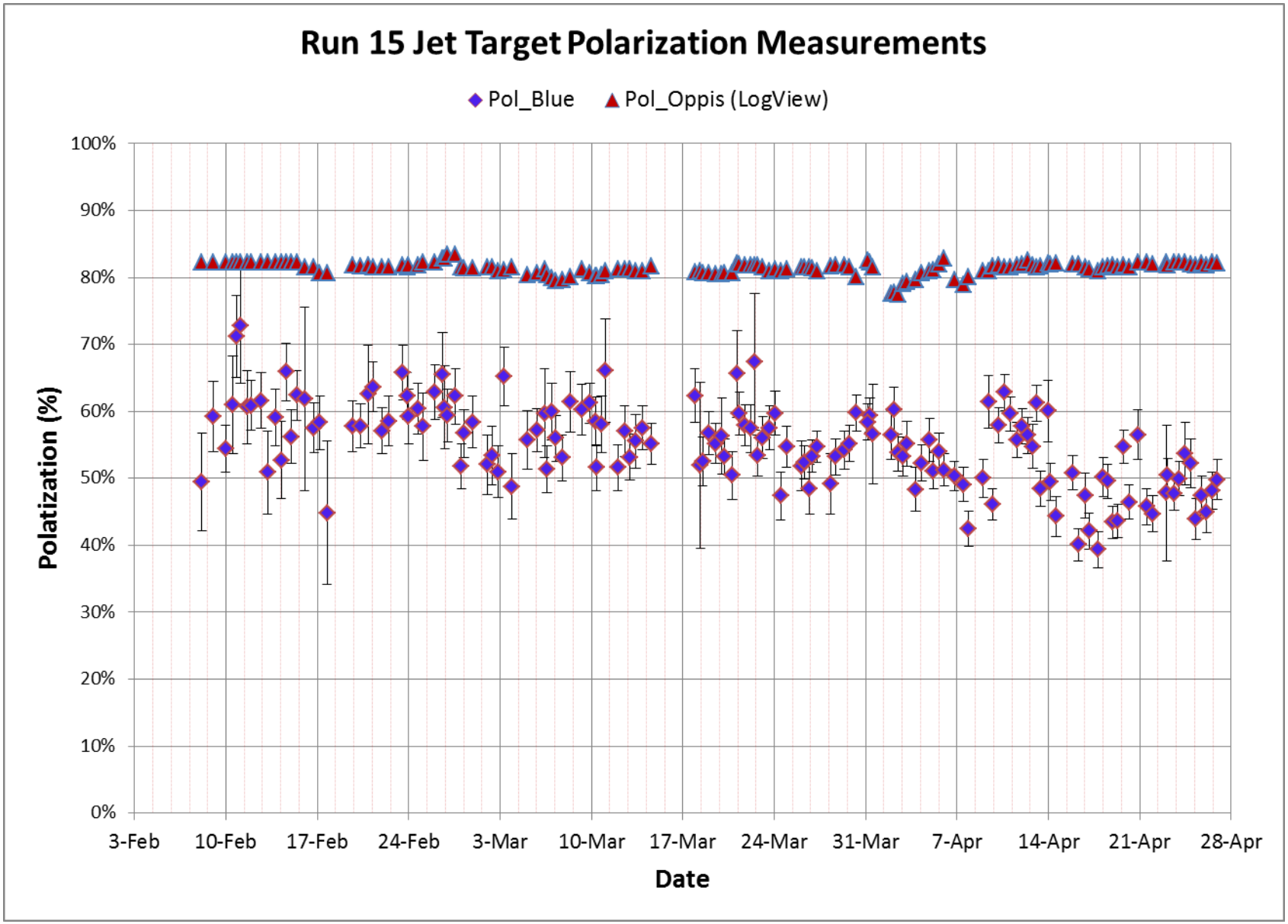
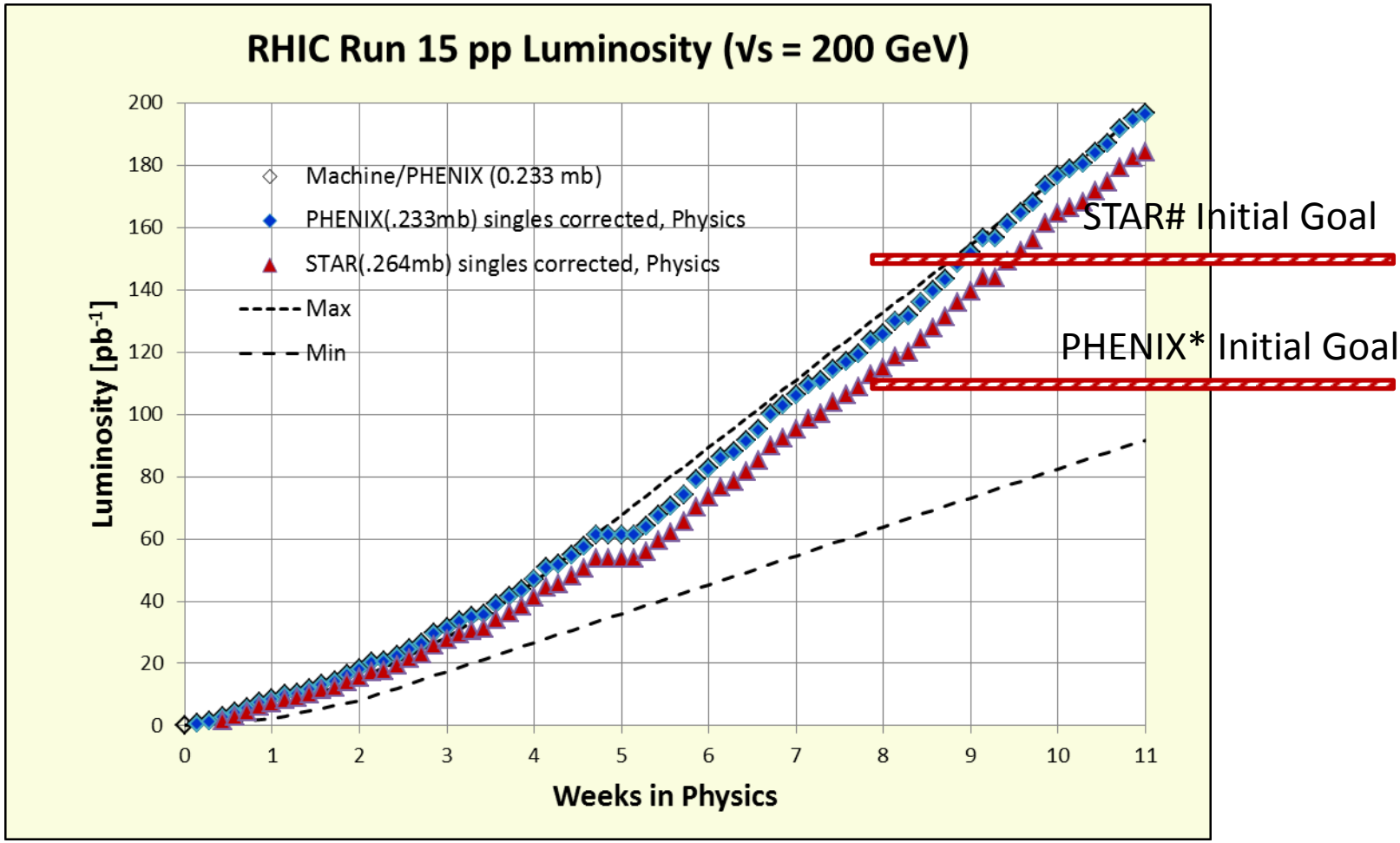


Figure 4: Projected minimum and maximum integrated luminosities for p↑+Au at 100 GeV/nucleon assuming linear weekly luminosity ramp-up in 4 weeks. The average store polarization of the proton beam expected to be close to the polarization achieved in the 100 GeV p↑+p↑ run.



through fill 18926, 4/20/15

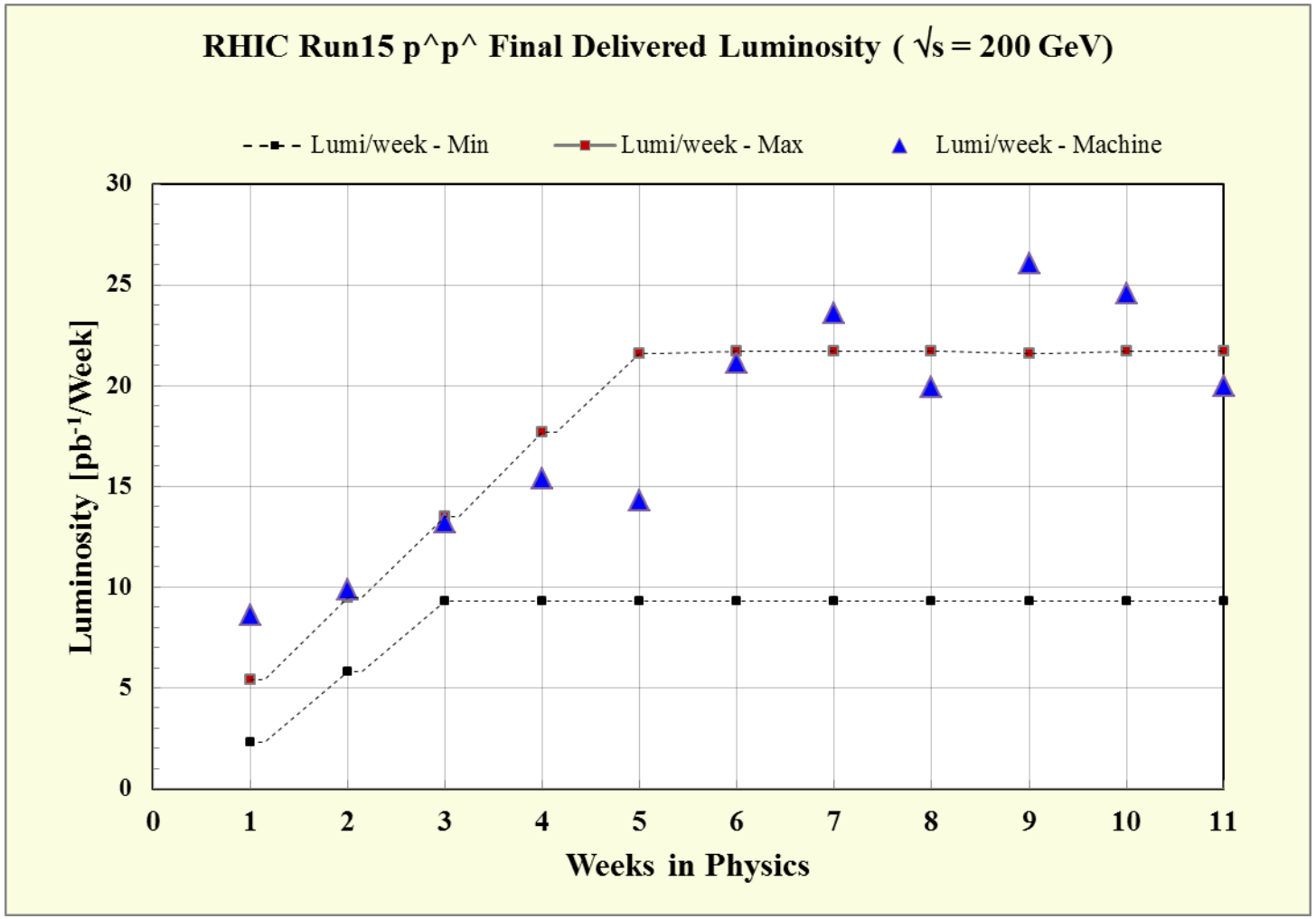
Through final store (18953) 27 April



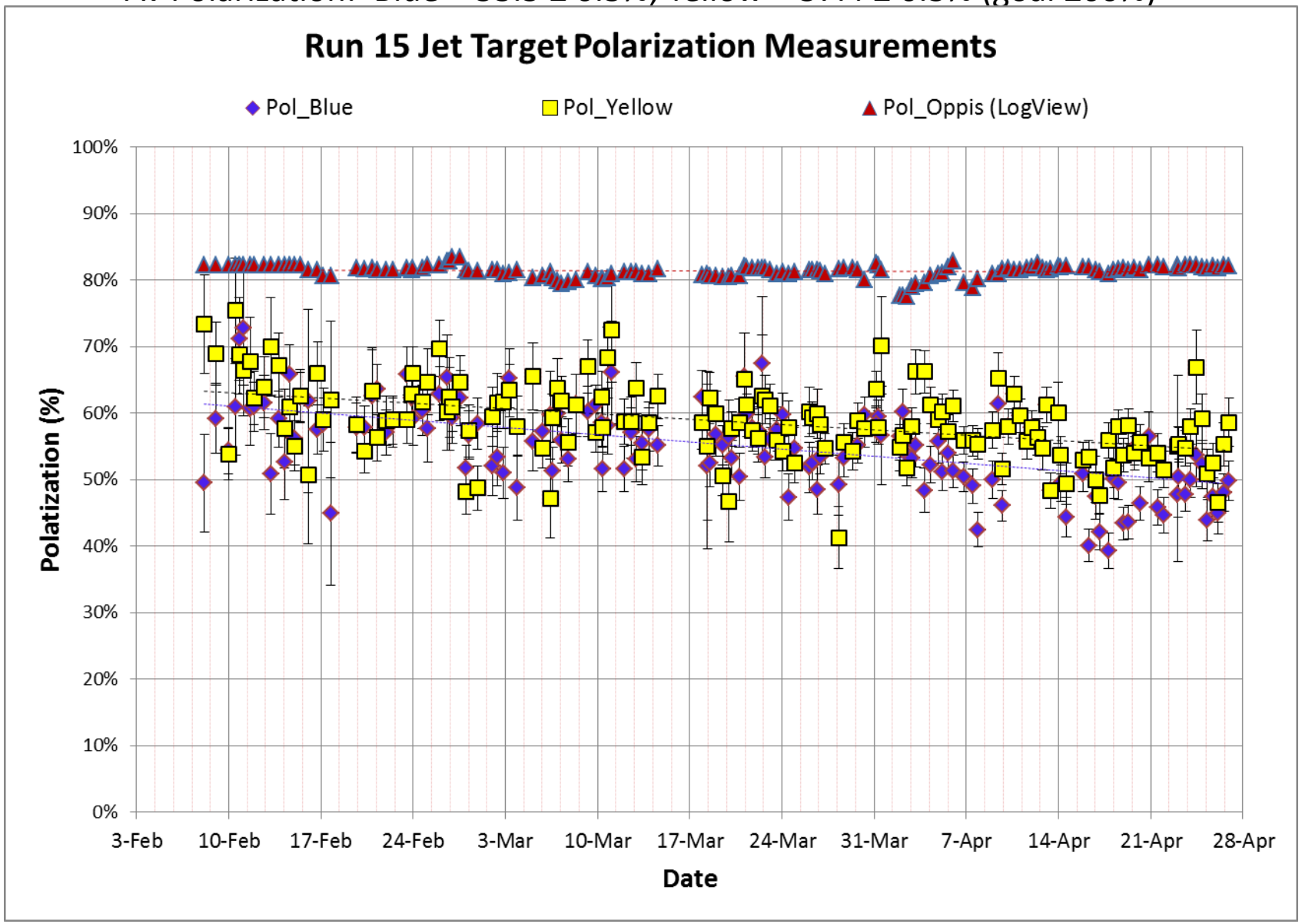
*Based on beam use request

Based on beam use request with 12 weeks physics

Through final store (18953) 27 April

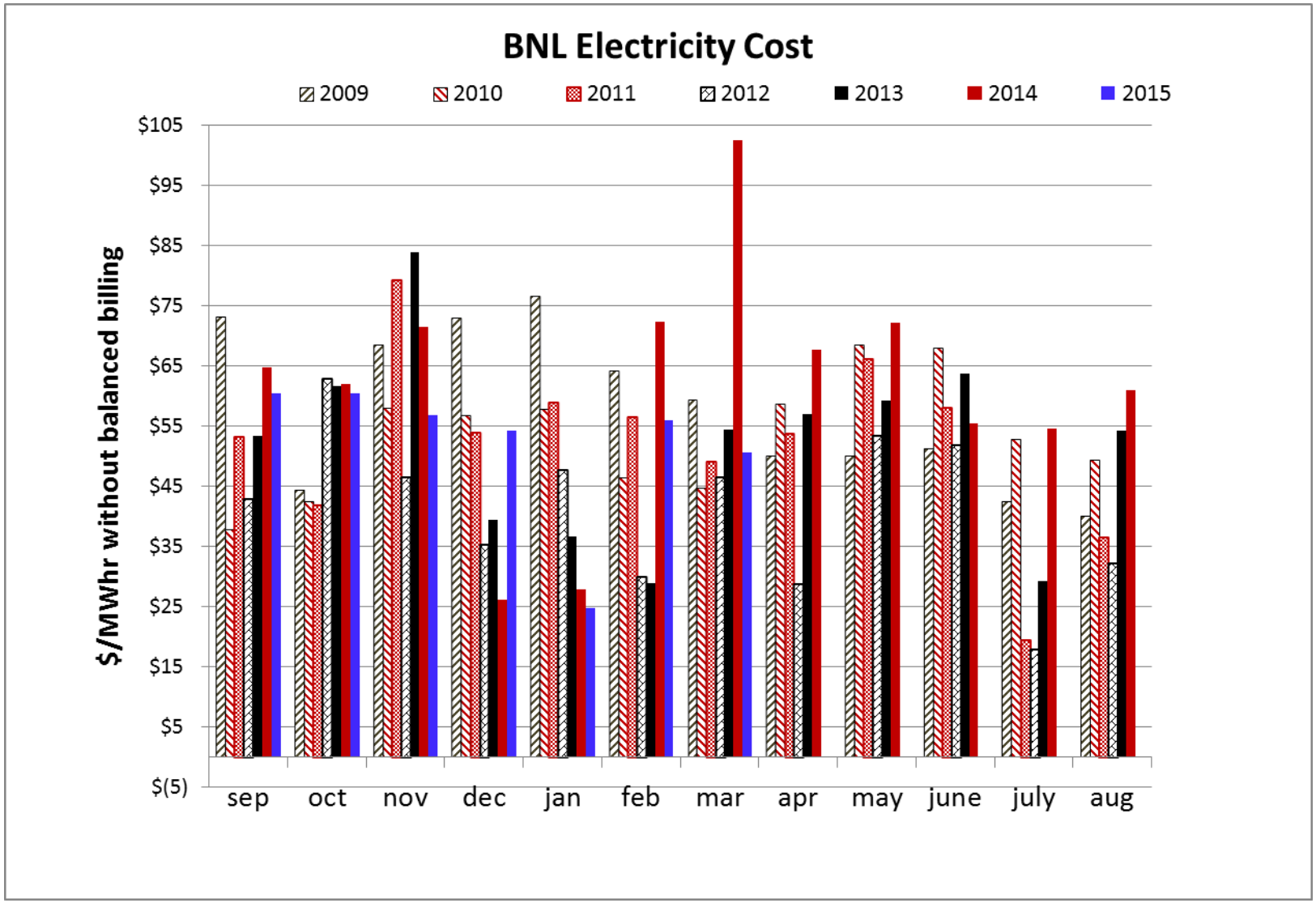


Av Polarization: Blue = 53.5 ± 0.3%; Yellow = 57.4 ± 0.3% (goal ≥60%)

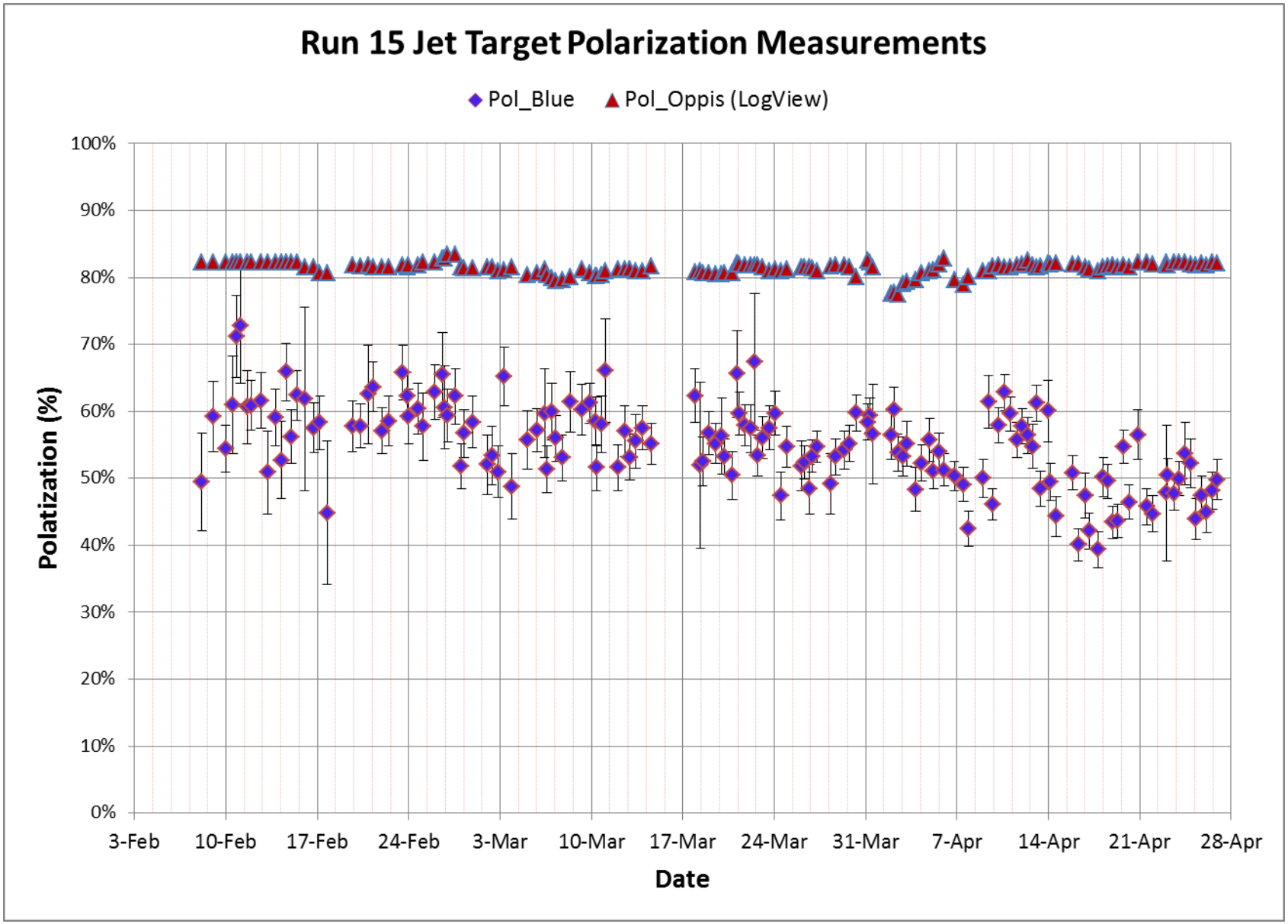


through fill 18926, 4/20/15

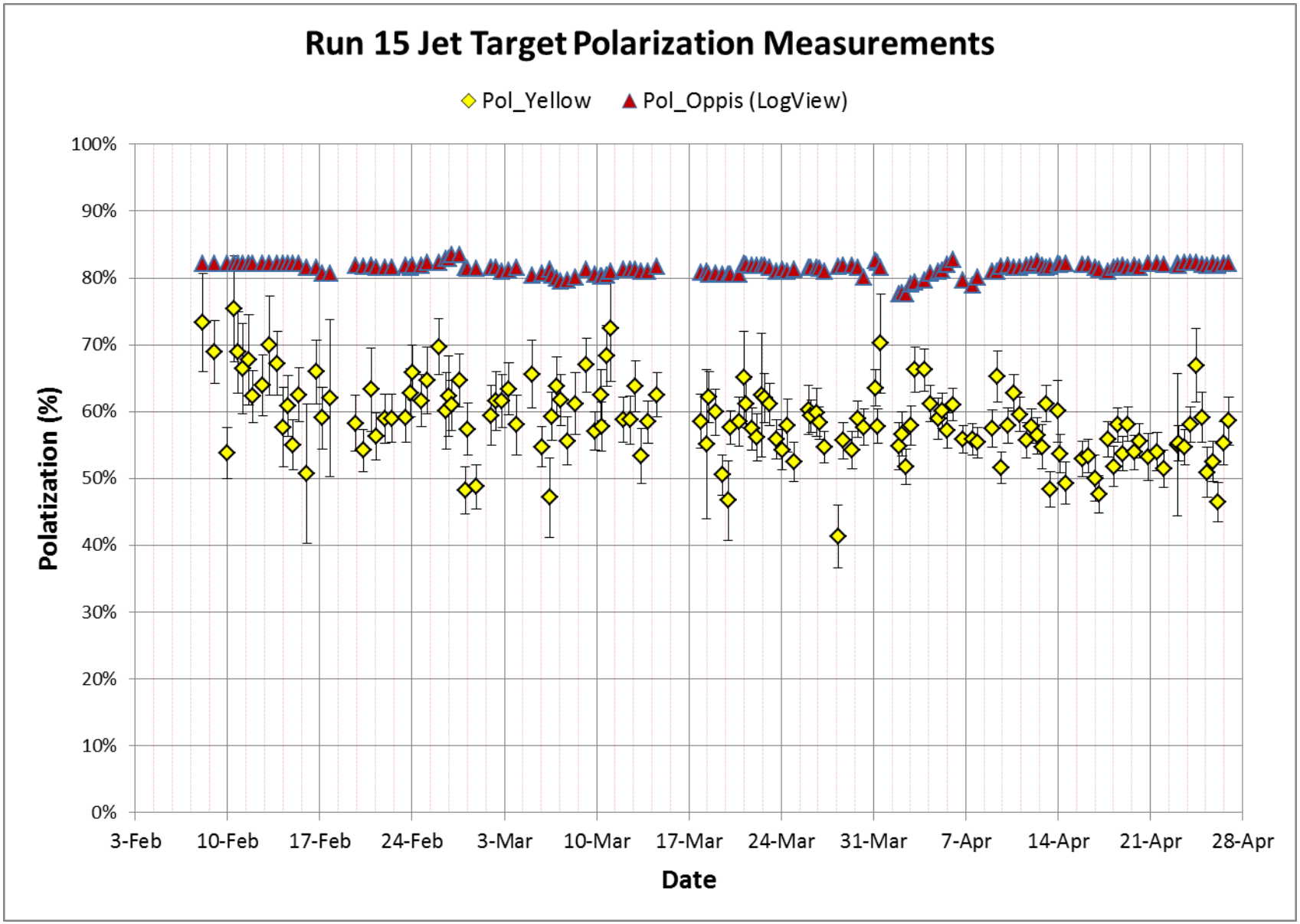
Balanced Billing for the lab - +1,483K through Mar 2015



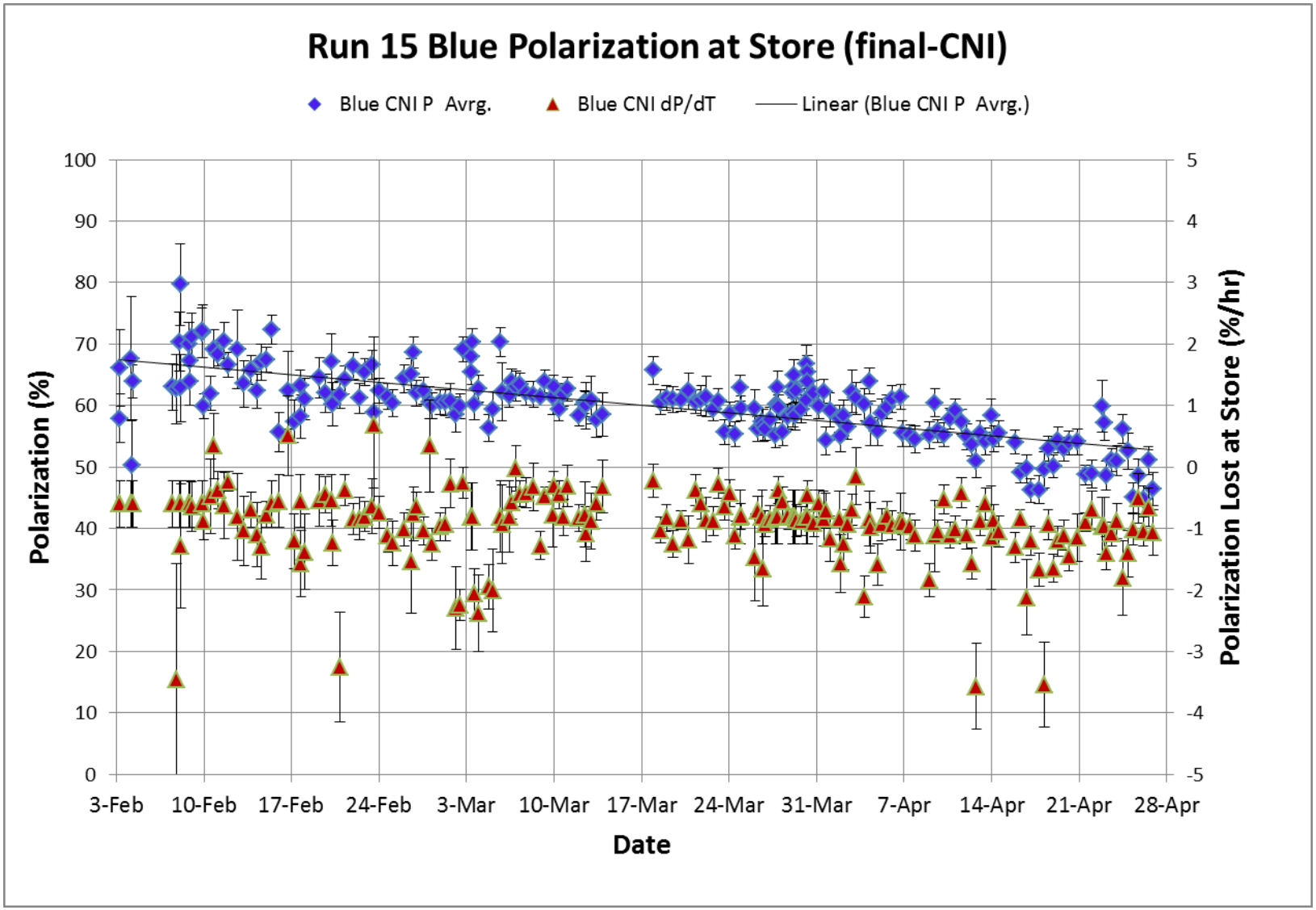
Supplemental 1



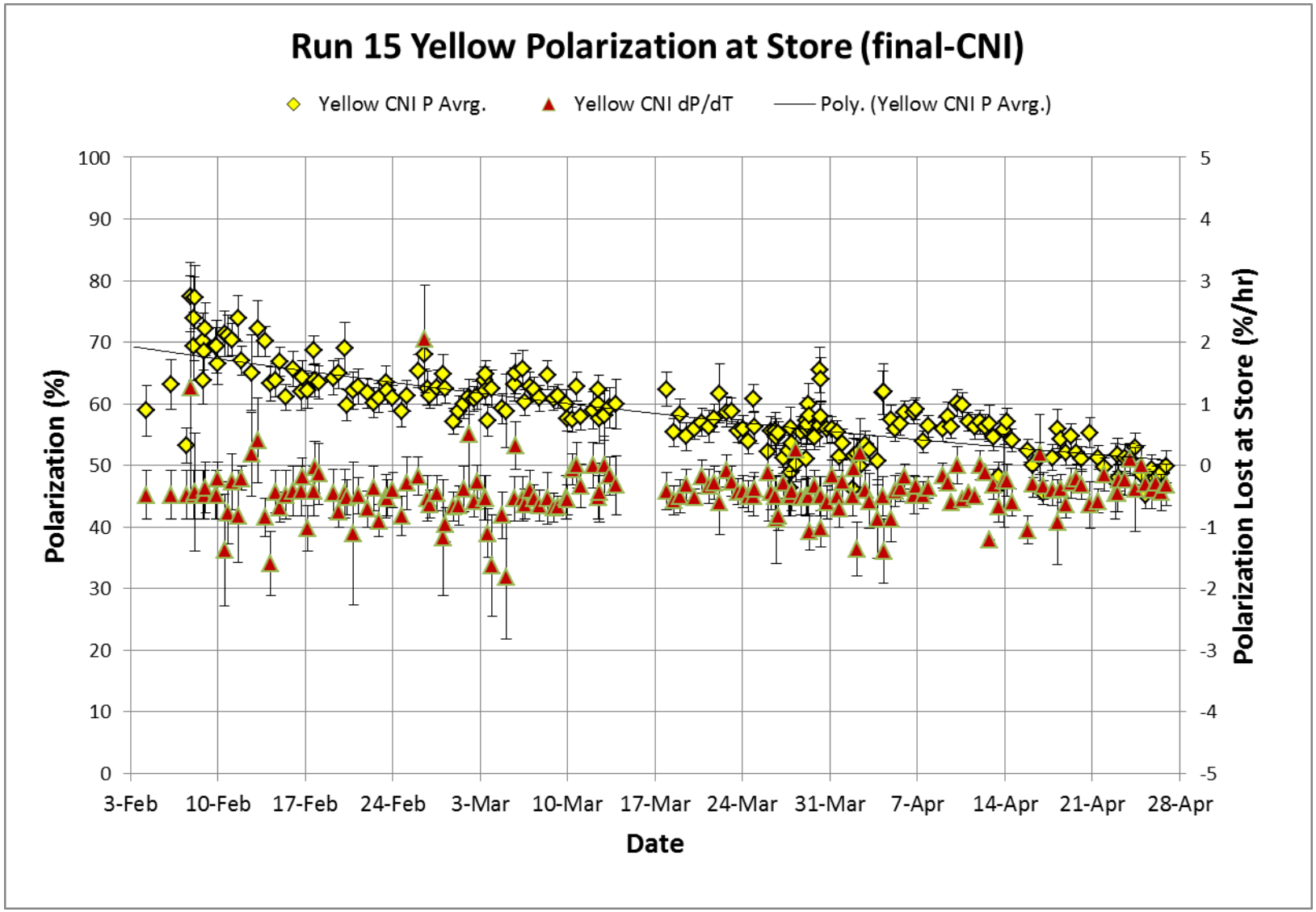
through fill 18926, 4/20/15



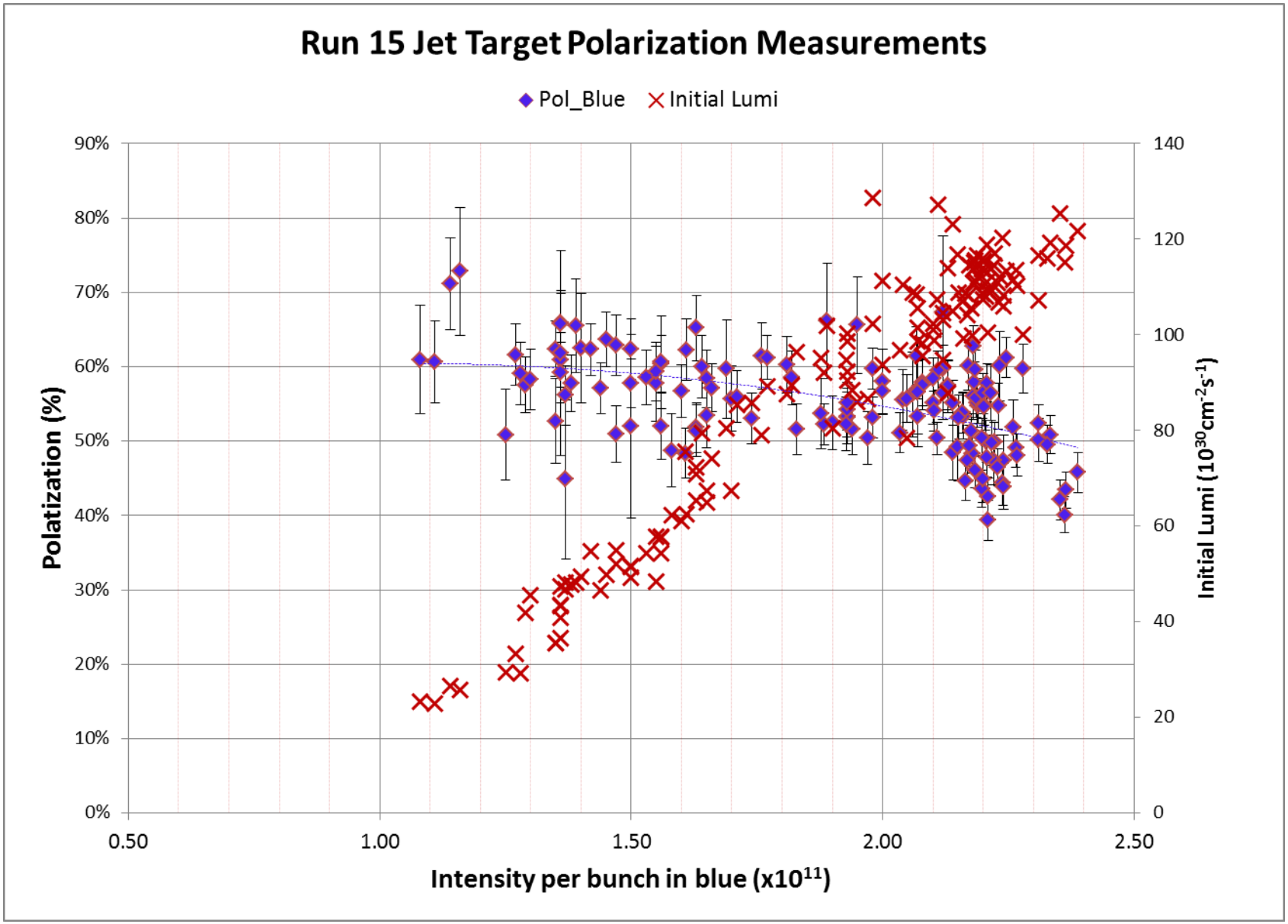
through fill 18926, 4/20/15

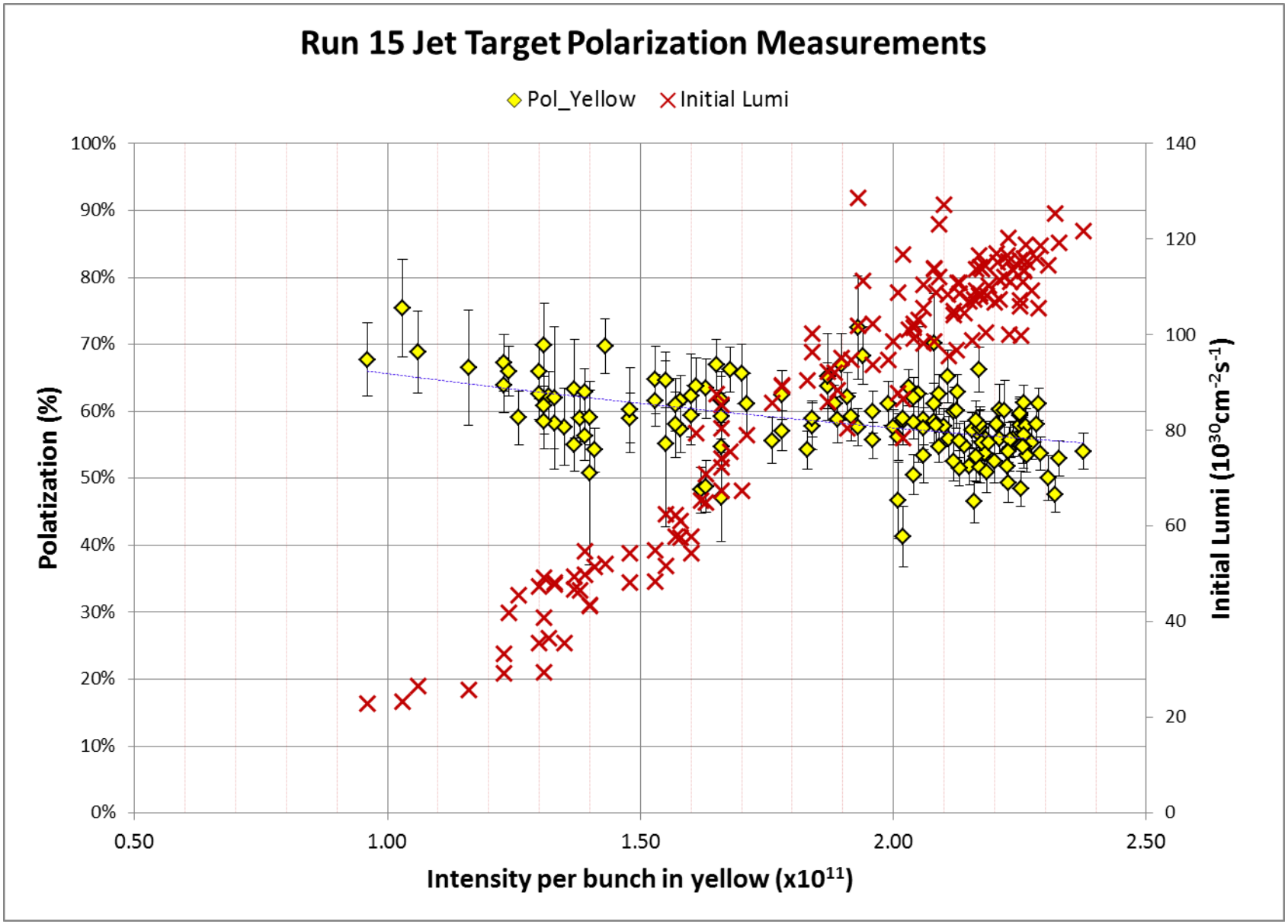


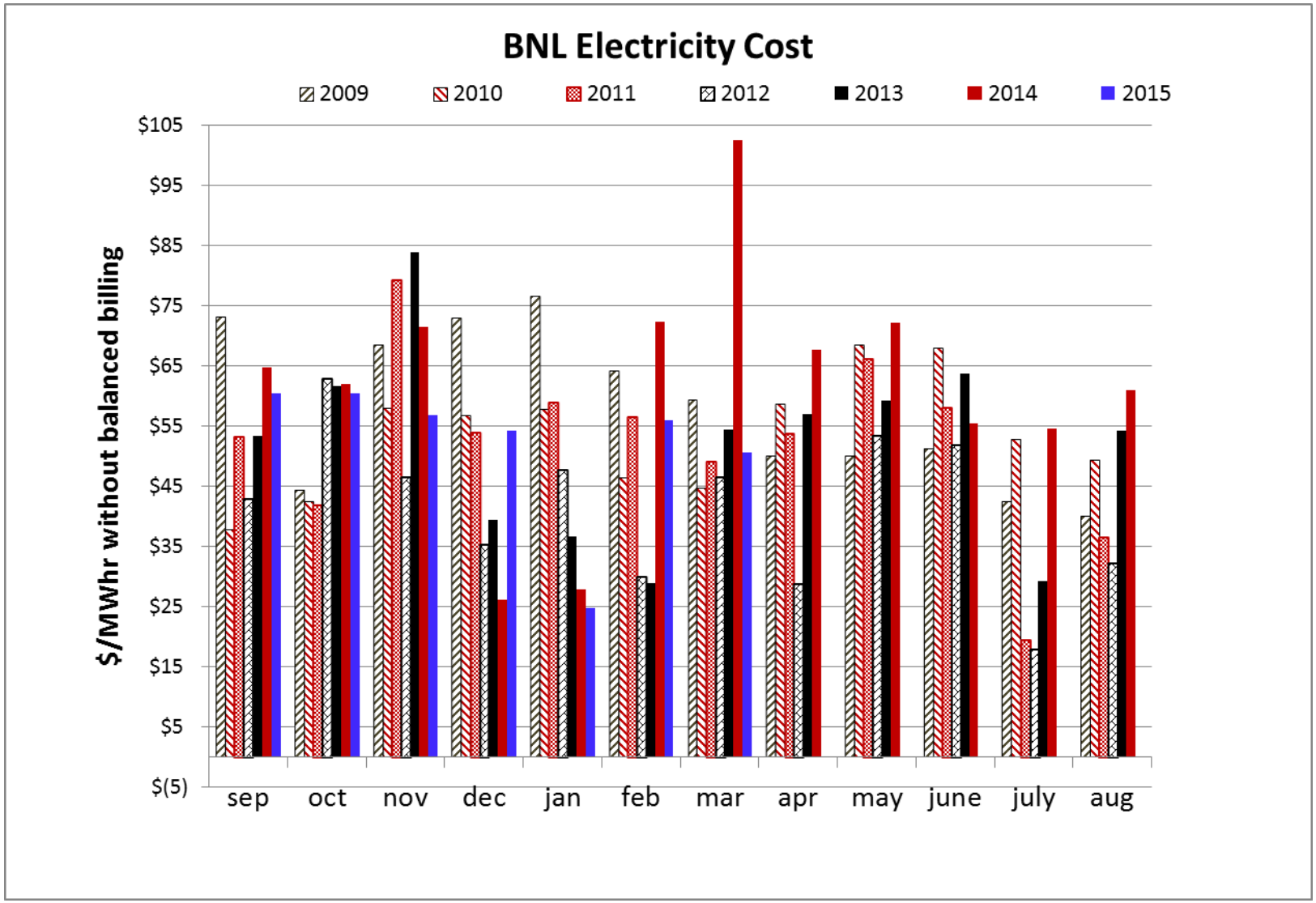
through fill 18928, 4/20/15



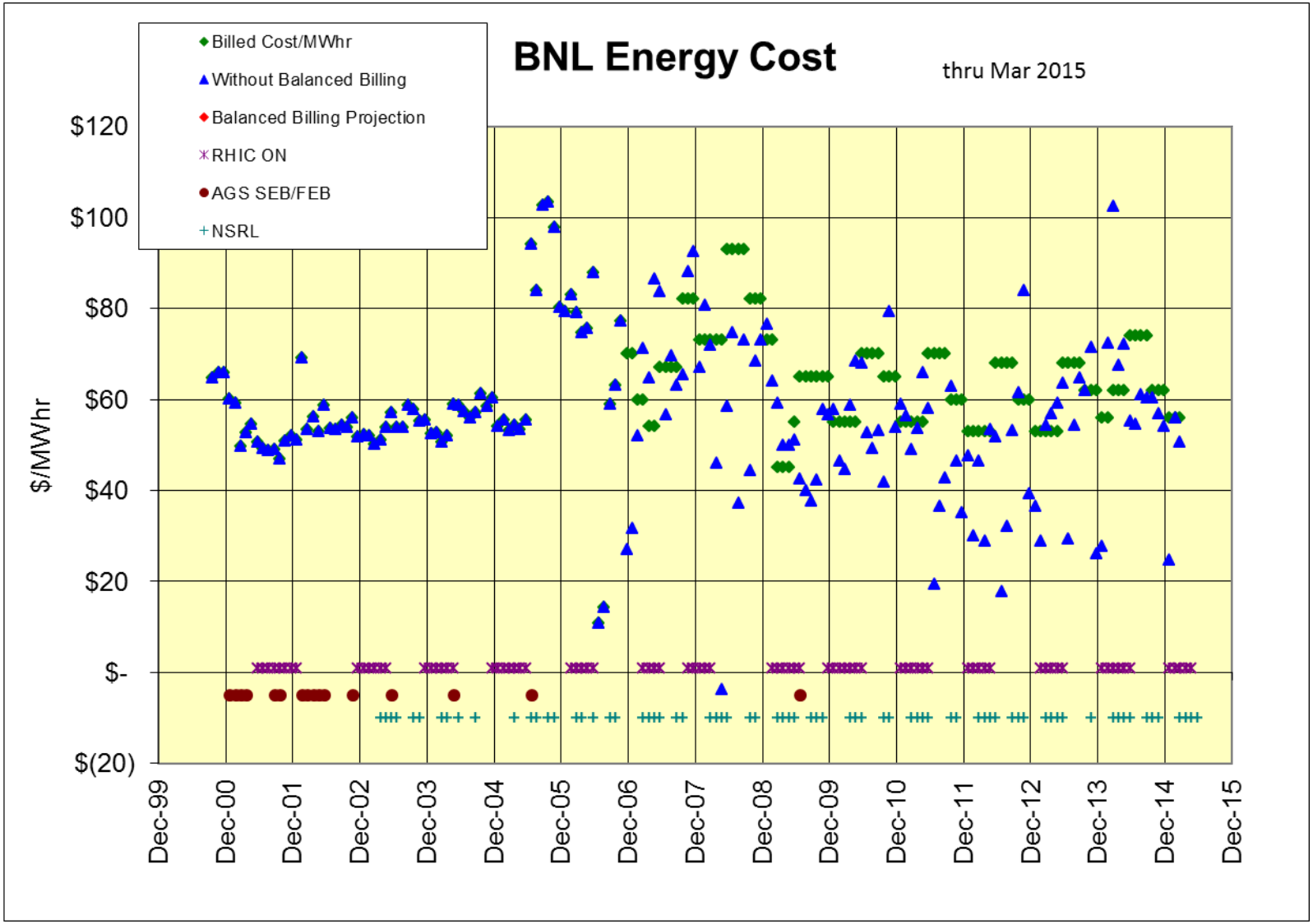
through fill 18928, 4/20/15

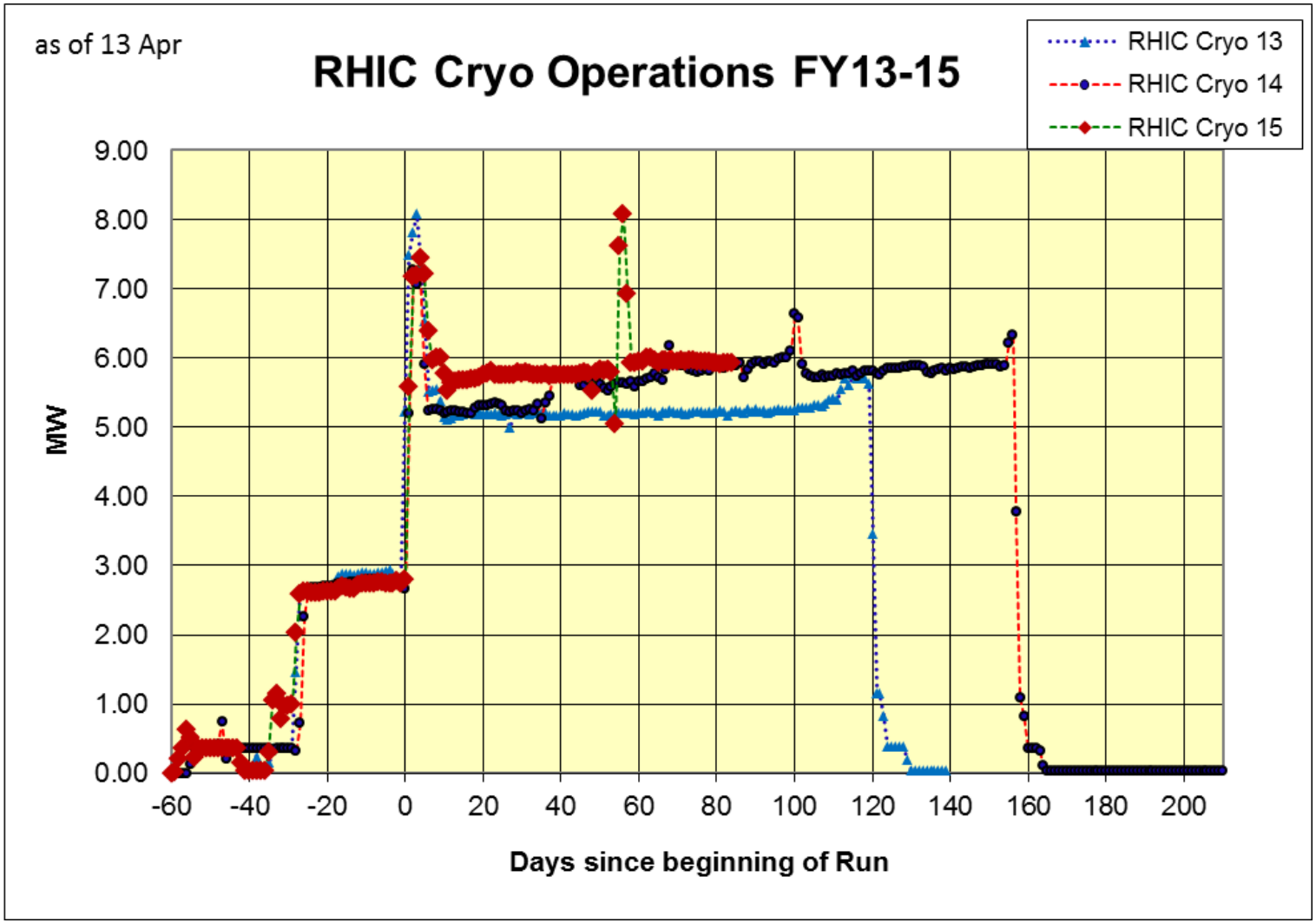

Run 15 Jet Target Polarization Measurements
Pol_Blue
Initial Lumi
Polatization (%)
90%
80%
70%
60%
50%
40%
30%
20%
10%
0%
0.50
1.00
1.50
2.00
2.50
Intensity per bunch in blue (x10^11)
140
120
100
80
60
40
20
0
Initial Lumi (10^30cm^-2s^-1)

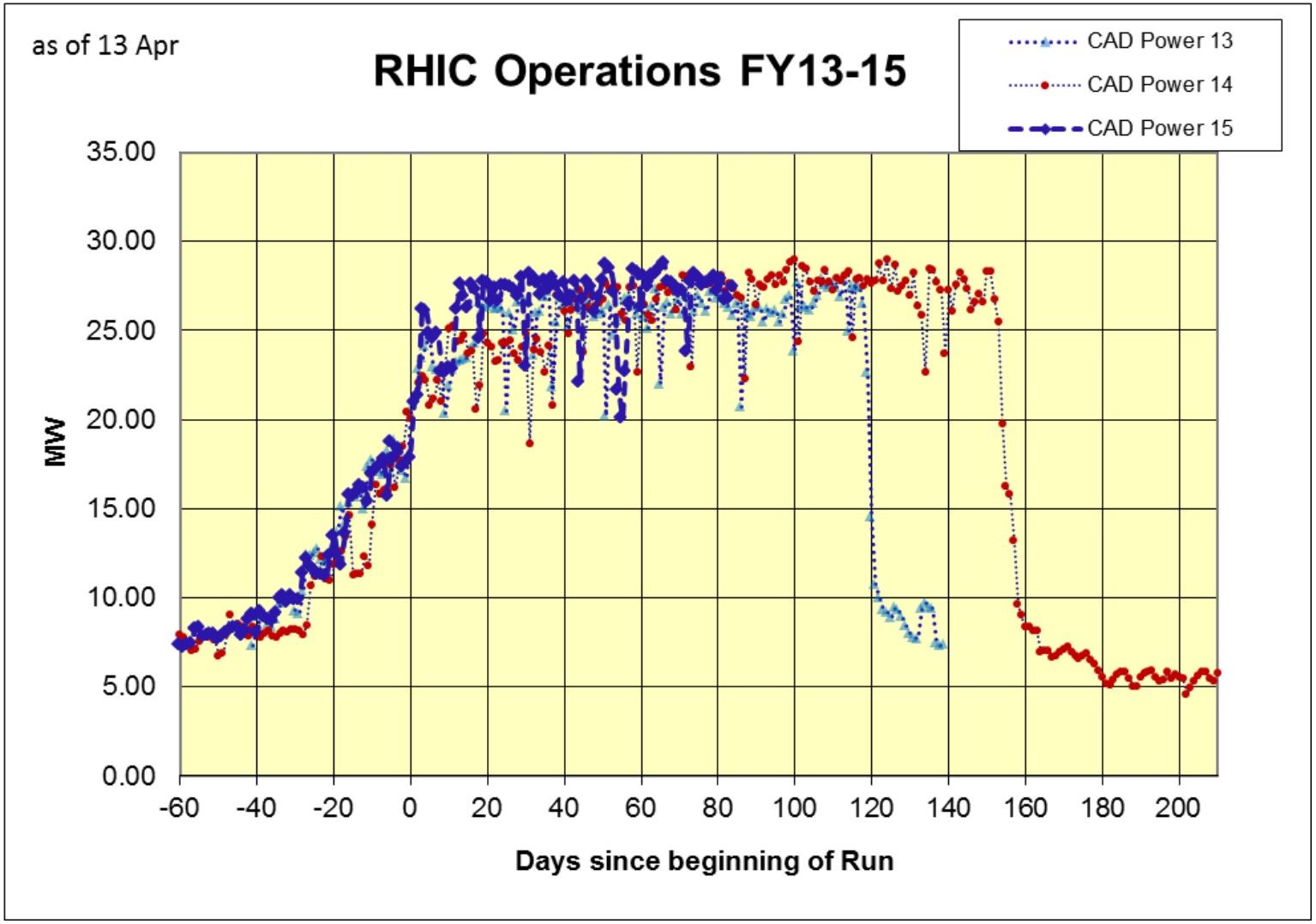

Run 15 Jet Target Polarization Measurements
Pol_Yellow
Initial Lumi
Polatization (%)
100%
90%
80%
70%
60%
50%
40%
30%
20%
10%
0%
0.50
1.00
1.50
2.00
2.50
Intensity per bunch in yellow (x10^11)
140
120
100
80
60
40
20
0
Initial Lumi (10^30cm^-2s^-1)


BNL Electricity Cost
2009
2010
2011
2012
2013
2014
2015
$/MWhr without balanced billing
$105
$95
$85
$75
$65
$55
$45
$35
$25
$15
$5
$(5)
sep
oct
nov
dec
jan
feb
mar
apr
may
june
july
aug

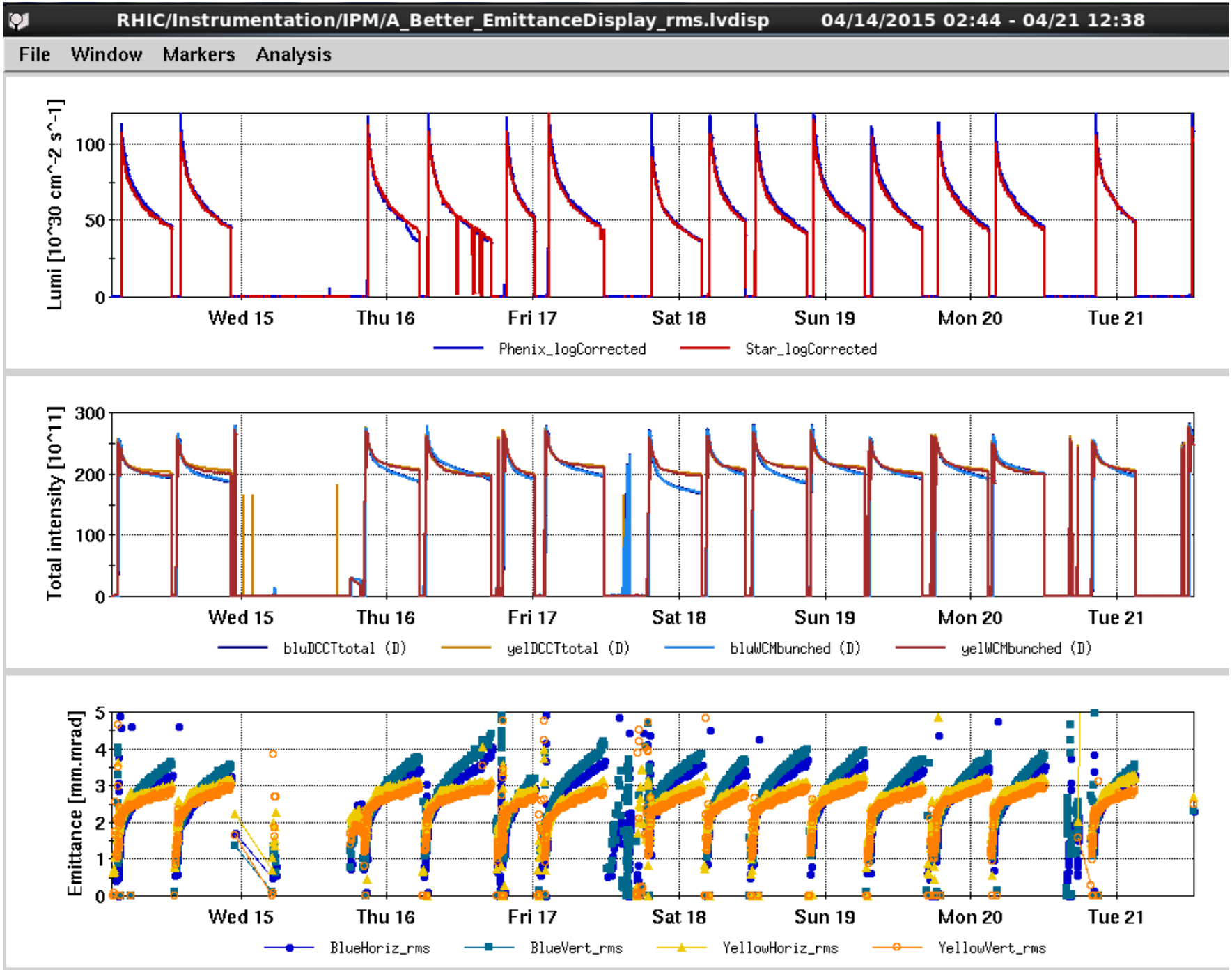
Balanced Billing for the lab - +1,483K through Mar 2015

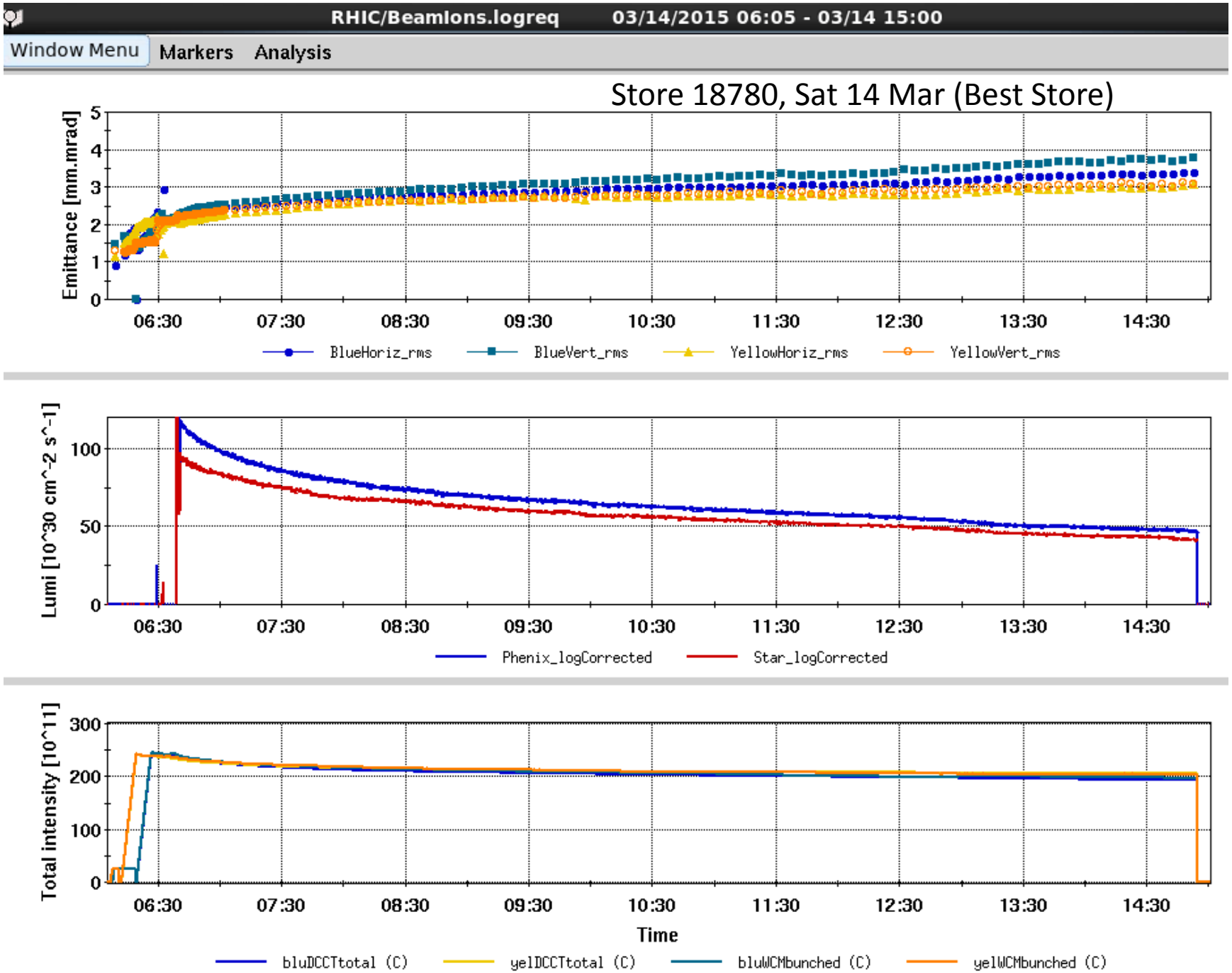



as of 13 Apr
RHIC Cryo Operations FY13-15
RHIC Cryo 13
RHIC Cryo 14
RHIC Cryo 15
MW
9.00
8.00
7.00
6.00
5.00
4.00
3.00
2.00
1.00
0.00
-60
-40
-20
0
20
40
60
80
100
120
140
160
180
200
Days since beginning of Run


as of 13 Apr
RHIC Operations FY13-15
CAD Power 13
CAD Power 14
CAD Power 15
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

Archive

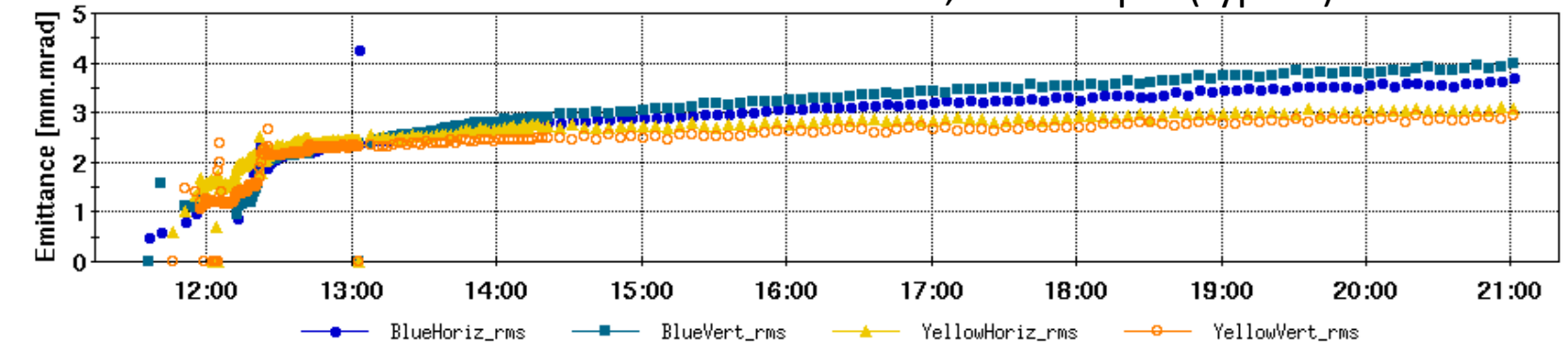

RHIC/Instrumentation/IPM/A_Better_EmittanceDisplay_rms.lvdisp
04/14/2015 02:44 - 04/21 12:38
File
Window
Markers
Analysis
Lumi [10^30 cm^-2 s^-1]
100
50
0
Wed 15
Thu 16
Fri 17
Sat 18
Sun 19
Mon 20
Tue 21
Phenix_logCorrected
Star_logCorrected
Total intensity [10^11]
300
200
100
0
bluDCCTtotal (D)
yelDCCTtotal (D)
bluWCMbunched (D)
yelWCMbunched (D)
Emittance [mm.mrad]
5
4
3
2
1
0
BlueHoriz_rms
BlueVert_rms
YellowHoriz_rms
YellowVert_rms

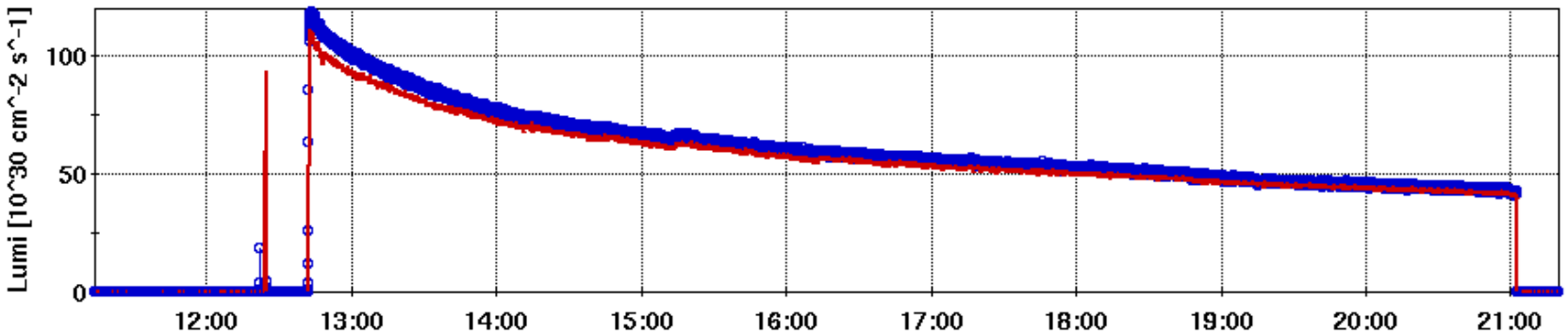

RHIC/BeamIons.logreq 03/14/2015 06:05 - 03/14 15:00
Window Menu
Markers
Analysis
Store 18780, Sat 14 Mar (Best Store)
Emittance [mm.mrad]
0
1
2
3
4
5
06:30
07:30
08:30
09:30
10:30
11:30
12:30
13:30
14:30
BlueHoriz_rms
BlueVert_rms
YellowHoriz_rms
YellowVert_rms
Lumi [10^30 cm^-2 s^-1]
0
50
100
Phenix_logCorrected
Star_logCorrected
Total intensity [10^11]
0
100
200
300
Time
bluDCCTtotal (C)
yelDCCTtotal (C)
bluWCMbunched (C)
yelWCMbunched (C)

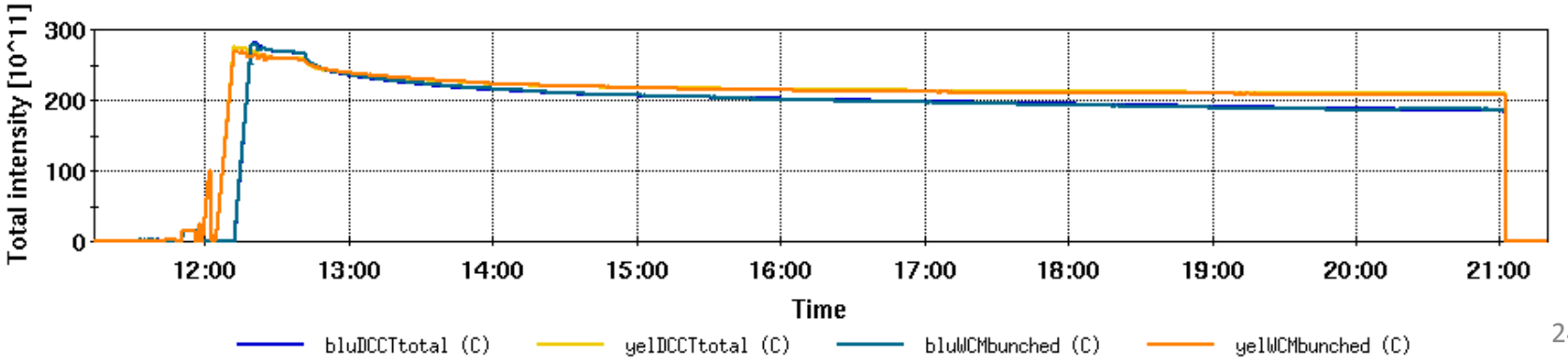
RHIC/BeamIons.logreq 04/18/2015 11:13 - 04/18 21:19

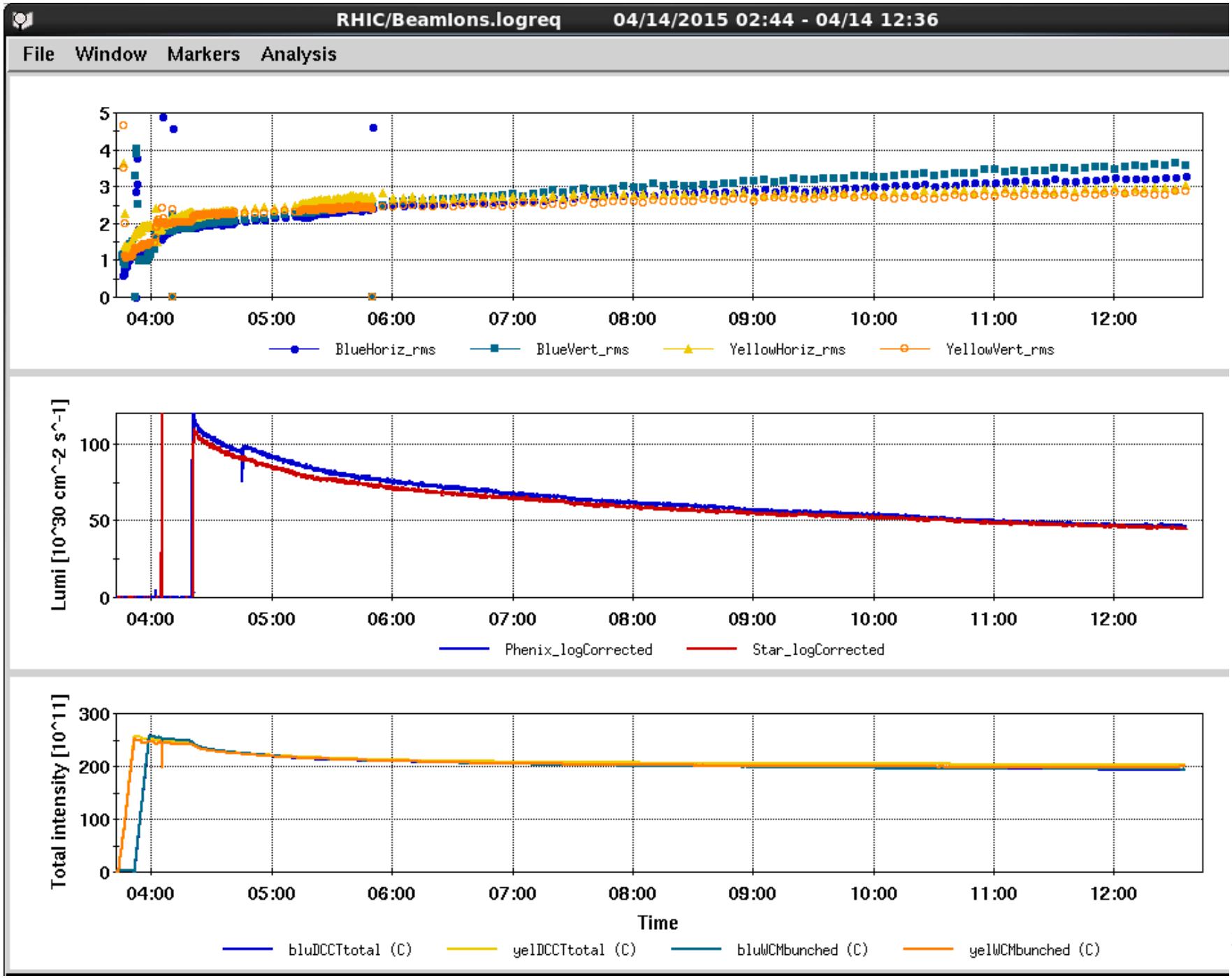
File Window Markers Analysis

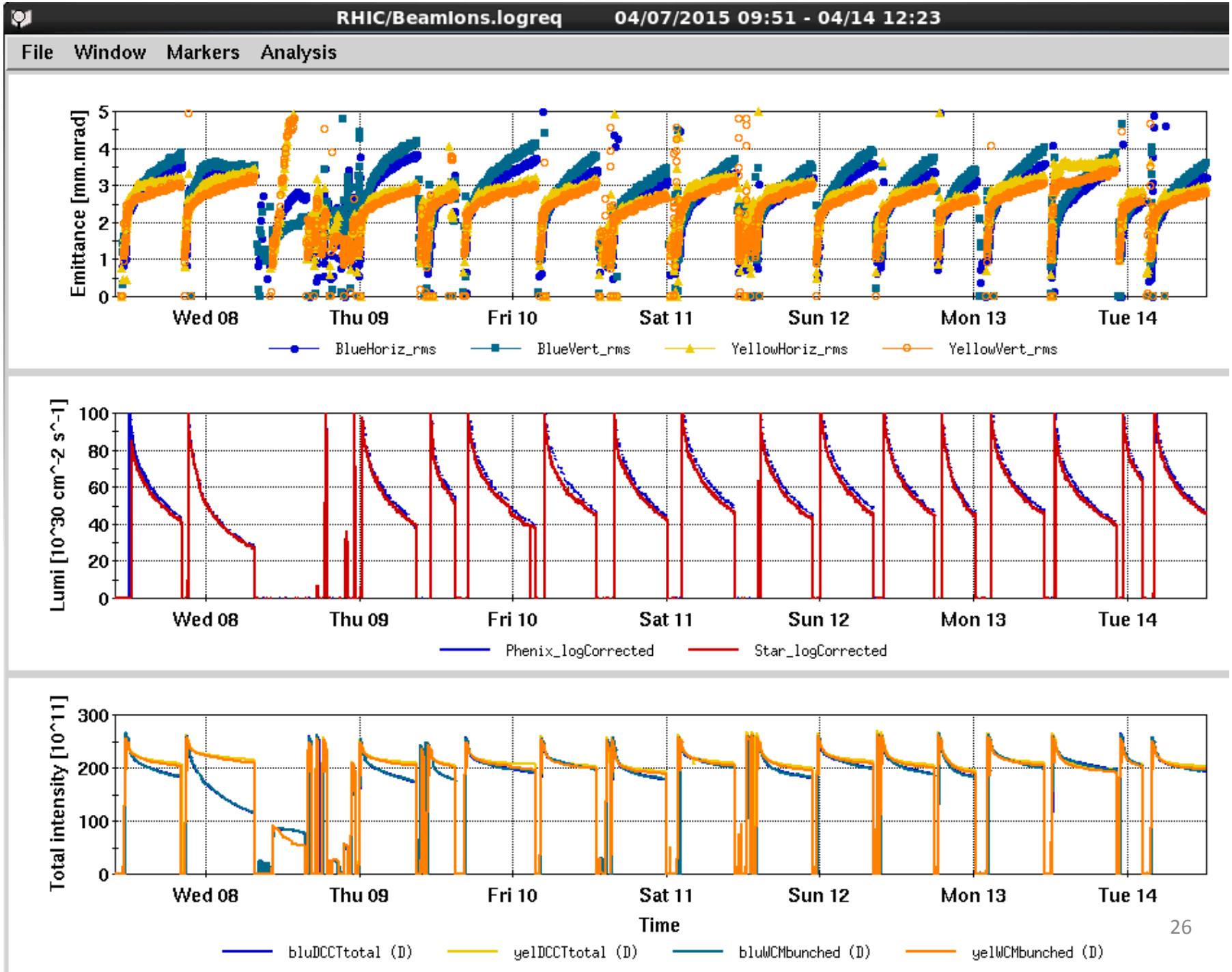
Store 18922, Sat 18 April (typical)



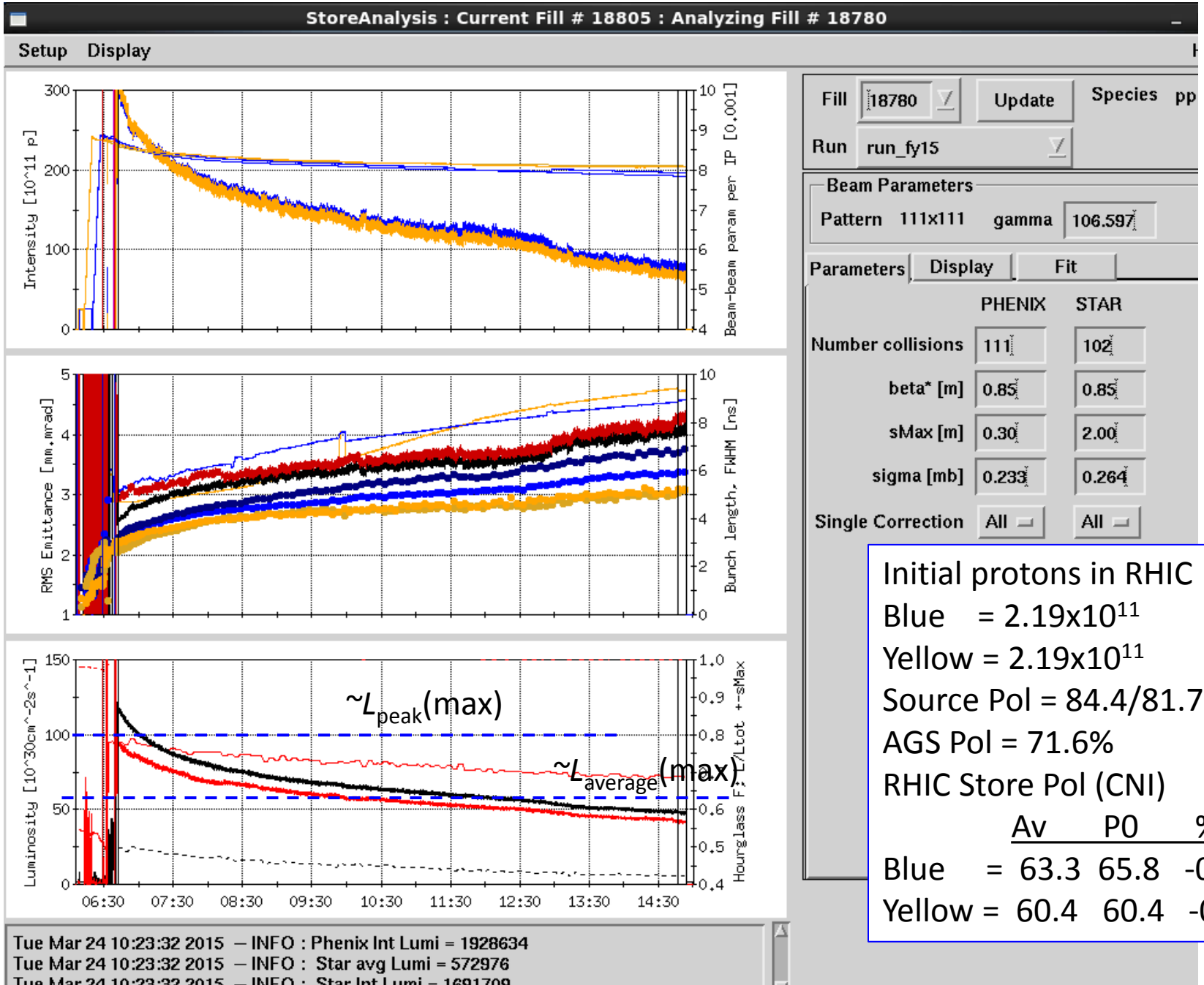





RHIC/BeamIons.logreq 04/14/2015 02:44 - 04/14 12:36
File Window Markers Analysis
BlueHoriz_rms
BlueVert_rms
YellowHoriz_rms
YellowVert_rms
Lumi [10^30 cm^-2 s^-1]
Phenix_logCorrected
Star_logCorrected
Total intensity [10^11]
Time
bluDCCTtotal (C)
yelDCCTtotal (C)
bluWCMbunched (C)
yelWCMbunched (C)


RHIC/BeamIons.logreq 04/07/2015 09:51 - 04/14 12:23
File Window Markers Analysis
Emittance [mm.mrad]
Wed 08
Thu 09
Fri 10
Sat 11
Sun 12
Mon 13
Tue 14
BlueHoriz_rms
BlueVert_rms
YellowHoriz_rms
YellowVert_rms
Lumi [10^30 cm^-2 s^-1]
Phenix_logCorrected
Star_logCorrected
Total intensity [10^11]
Time
bluDCCTtotal (D)
yelDCCTtotal (D)
bluWCMbunched (D)
yelWCMbunched (D)

Still Best Store to Date – 18780, Sat 14 Mar –



Initial protons in RHIC

Blue = 2.19×10^{11}

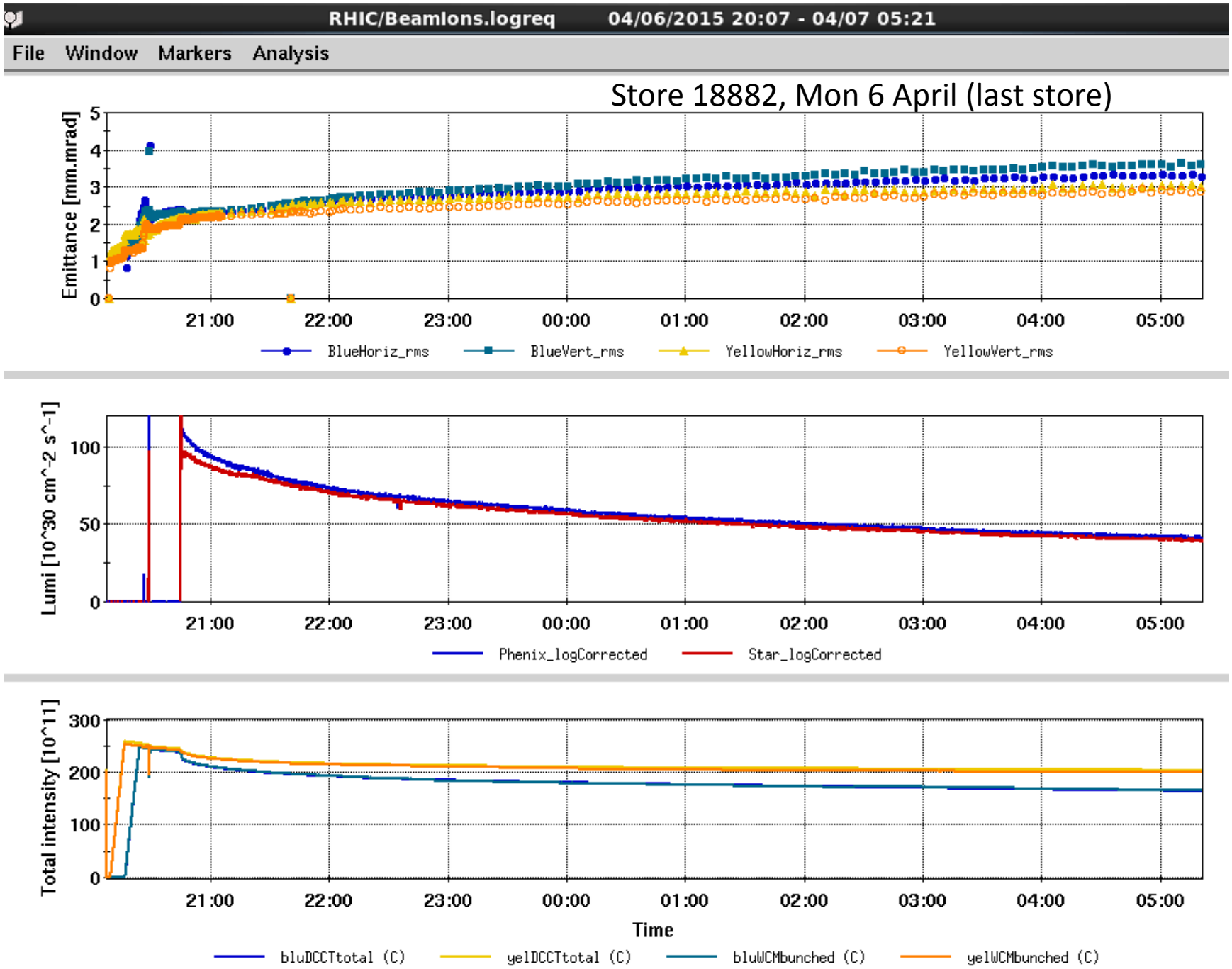
Yellow = 2.19×10^{11}

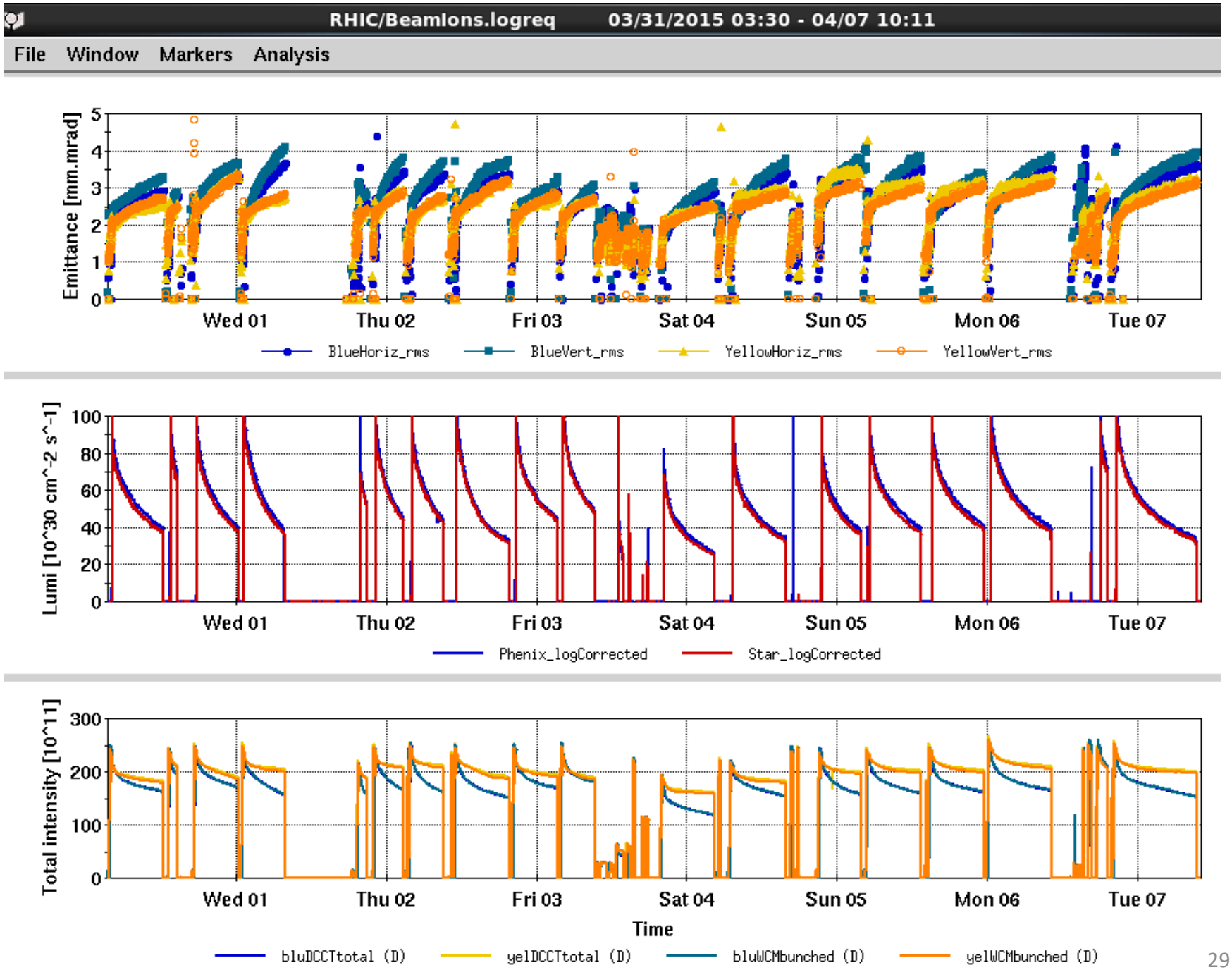
Source Pol = 84.4/81.7%

AGS Pol = 71.6%

RHIC Store Pol (CNI)

	Av	P0	%/hr
Blue =	63.3	65.8	-0.78
Yellow =	60.4	60.4	-0.52


RHIC/BeamIons.logreq 04/06/2015 20:07 - 04/07 05:21
File Window Markers Analysis
Store 18882, Mon 6 April (last store)
Emittance [mm.mrad]
BlueHoriz_rms
BlueVert_rms
YellowHoriz_rms
YellowVert_rms
Lumi [10^30 cm^-2 s^-1]
Phenix_logCorrected
Star_logCorrected
Total intensity [10^11]
Time
bluDCCTtotal (C)
yelDCCTtotal (C)
bluWCMbunched (C)
yelWCMbunched (C)


RHIC/BeamIons.logreq 03/31/2015 03:30 - 04/07 10:11
File Window Markers Analysis
Emittance [mm.mrad]
Wed 01
Thu 02
Fri 03
Sat 04
Sun 05
Mon 06
Tue 07
BlueHoriz_rms
BlueVert_rms
YellowHoriz_rms
YellowVert_rms
Lumi [10^30 cm^-2 s^-1]
Phenix_logCorrected
Star_logCorrected
Total intensity [10^11]
Time
bluDCCTtotal (D)
yelDCCTtotal (D)
bluWCMbunched (D)
yelWCMbunched (D)

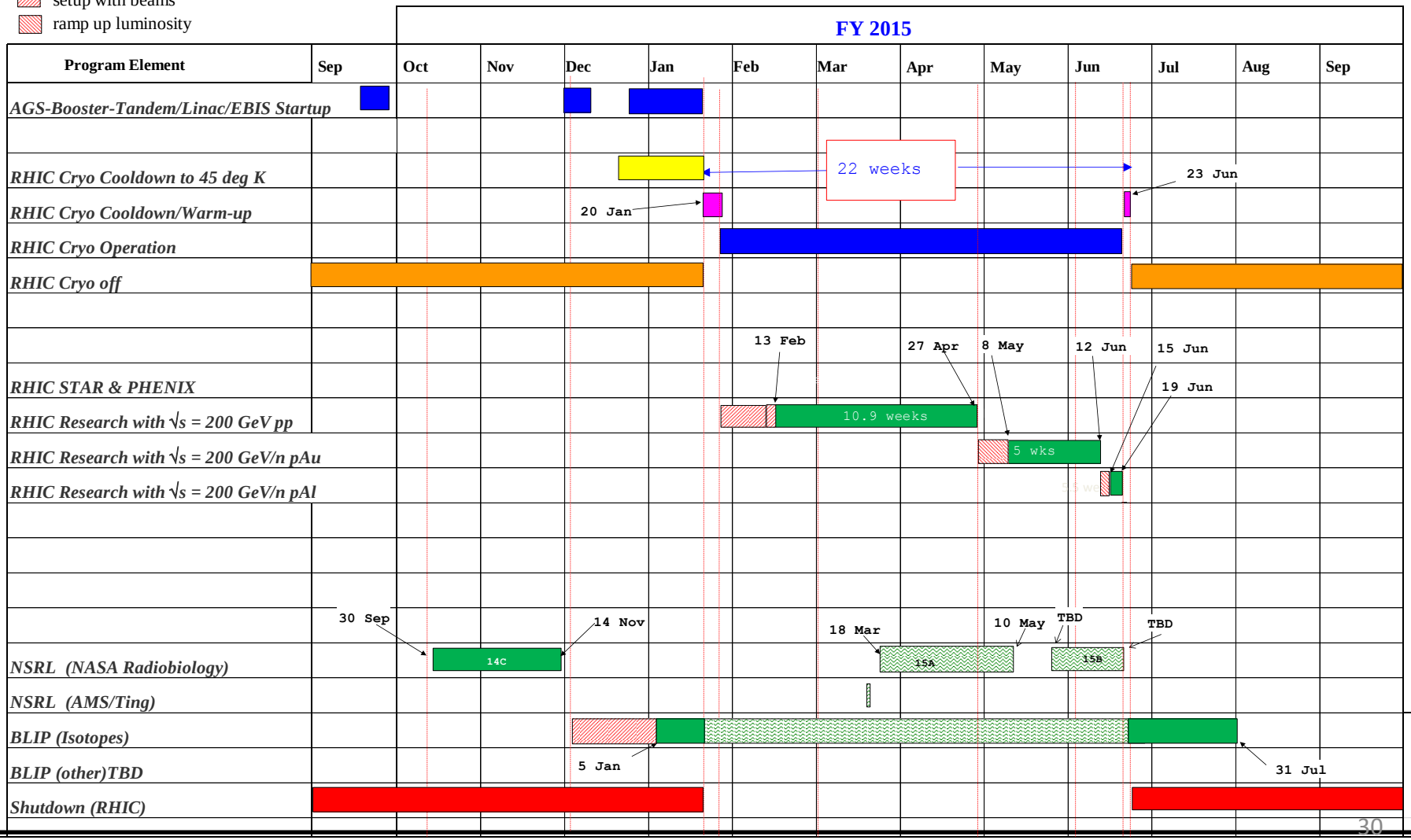
http://www.bnl.gov/cad/esfd

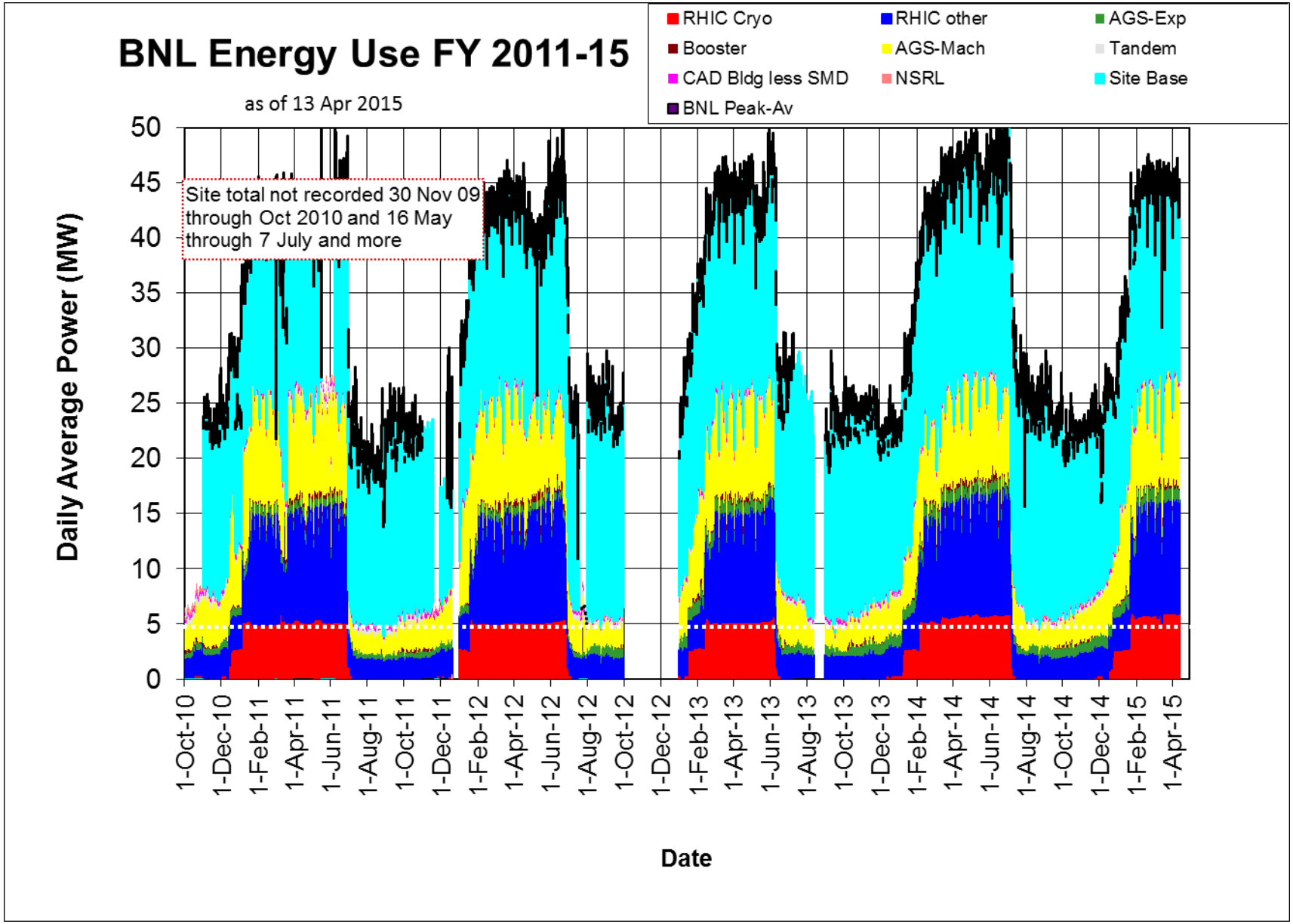
Scheduling Physicist: Makdisi/Pile

C-A Operations-FY15

7 Apr 15

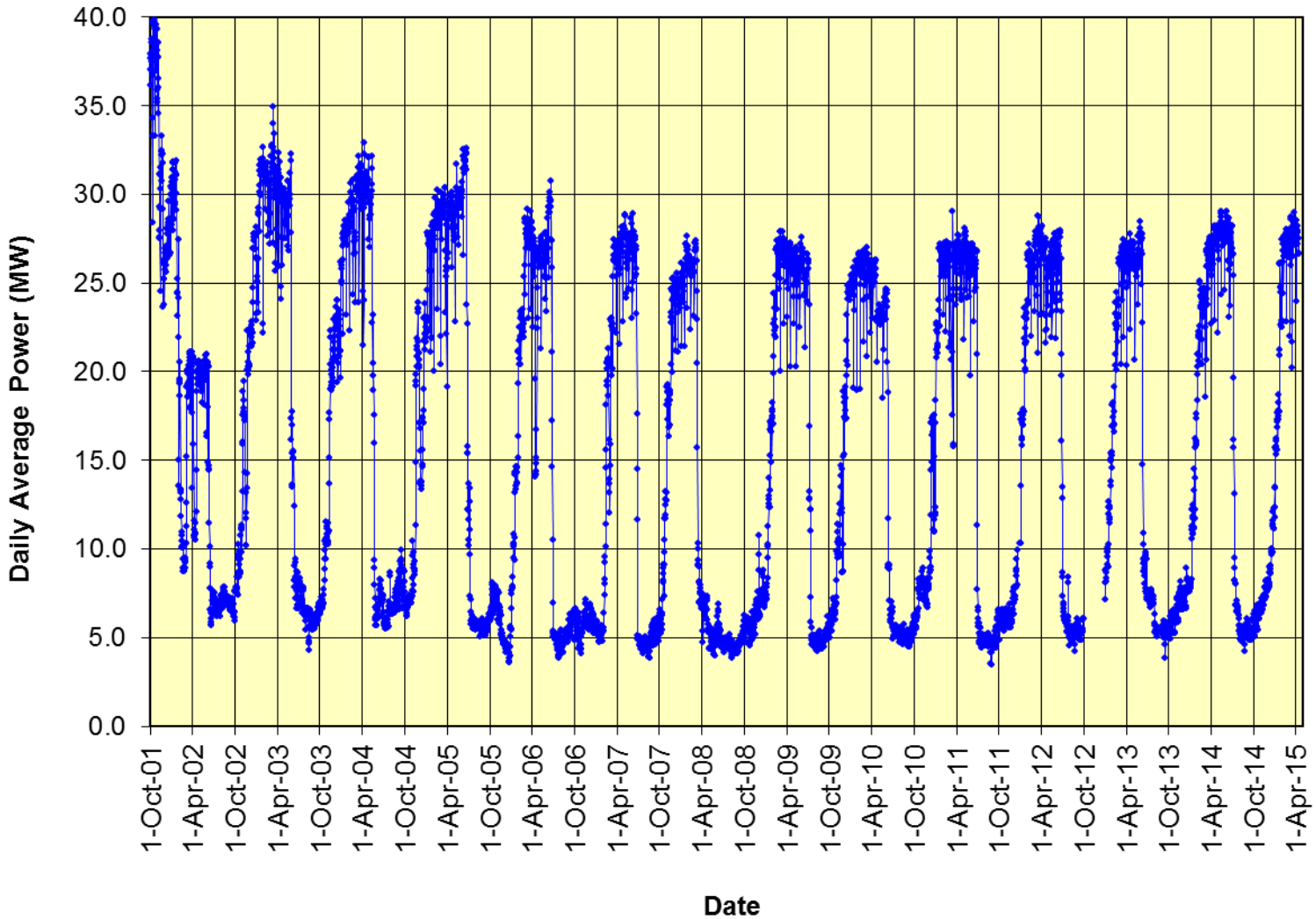
Plan, subject to change




BNL Energy Use FY 2011-15
as of 13 Apr 2015
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-10
1-Dec-10
1-Feb-11
1-Apr-11
1-Jun-11
1-Aug-11
1-Oct-11
1-Dec-11
1-Feb-12
1-Apr-12
1-Jun-12
1-Aug-12
1-Oct-12
1-Dec-12
1-Feb-13
1-Apr-13
1-Jun-13
1-Aug-13
1-Oct-13
1-Dec-13
1-Feb-14
1-Apr-14
1-Jun-14
1-Aug-14
1-Oct-14
1-Dec-14
1-Feb-15
1-Apr-15
Date

as of 13 Apr 2015

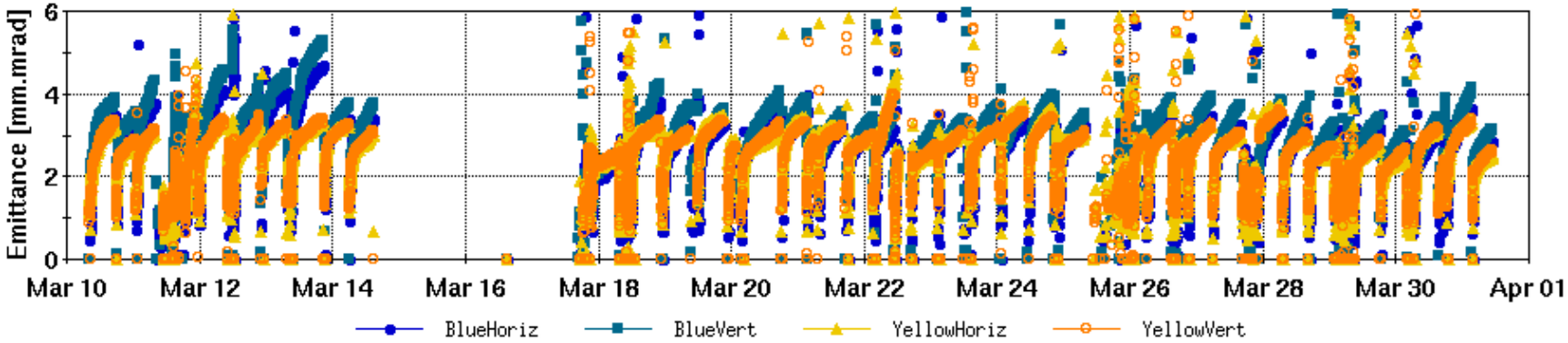
C-AD Energy Use FY 2002-15

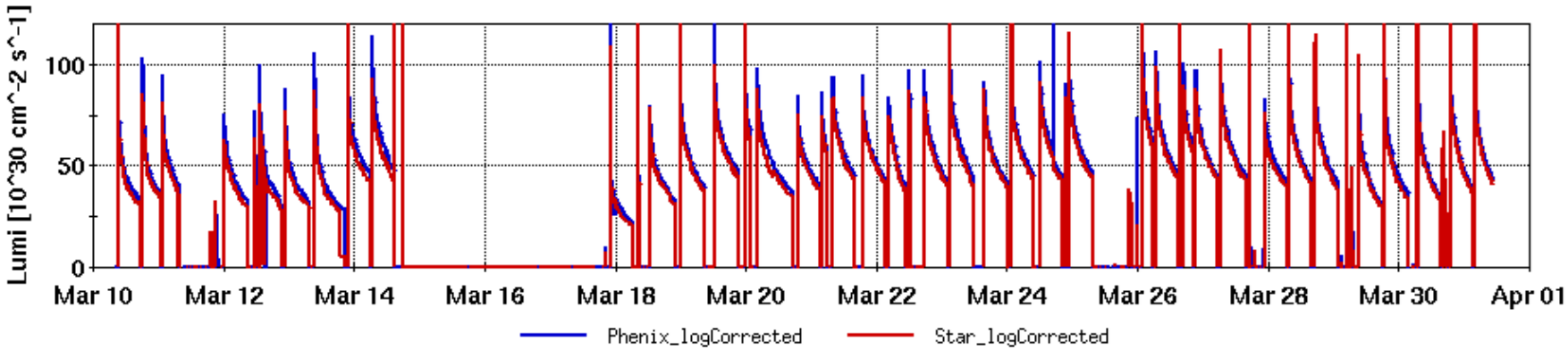


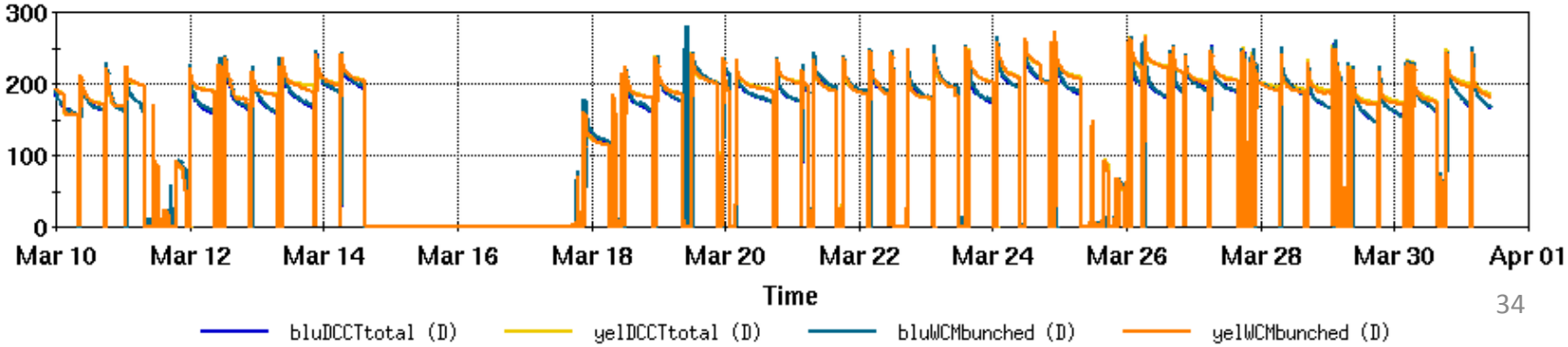
RHIC/BeamIons.logreq 03/10/2015 00:00 - 03/31 23:59
File Window Markers Analysis
~Lumi (max)
Lumi [10^30 cm^-2 s^-1]
120
100
80
60
40
20
0
Mar 10
Mar 12
Mar 14
Mar 16
Mar 18
Mar 20
Mar 22
Mar 24
Mar 26
Mar 28
Mar 30
Apr 01
Phenix_logCorrected
Star_logCorrected
~Lumi (max)
~ions/bunch (max)
Total intensity [10^11]
300
200
100
0
Time
bluDCCTtotal (D)
yelDCCTtotal (D)
bluWCMbunched (D)
yelWCMbunched (D)

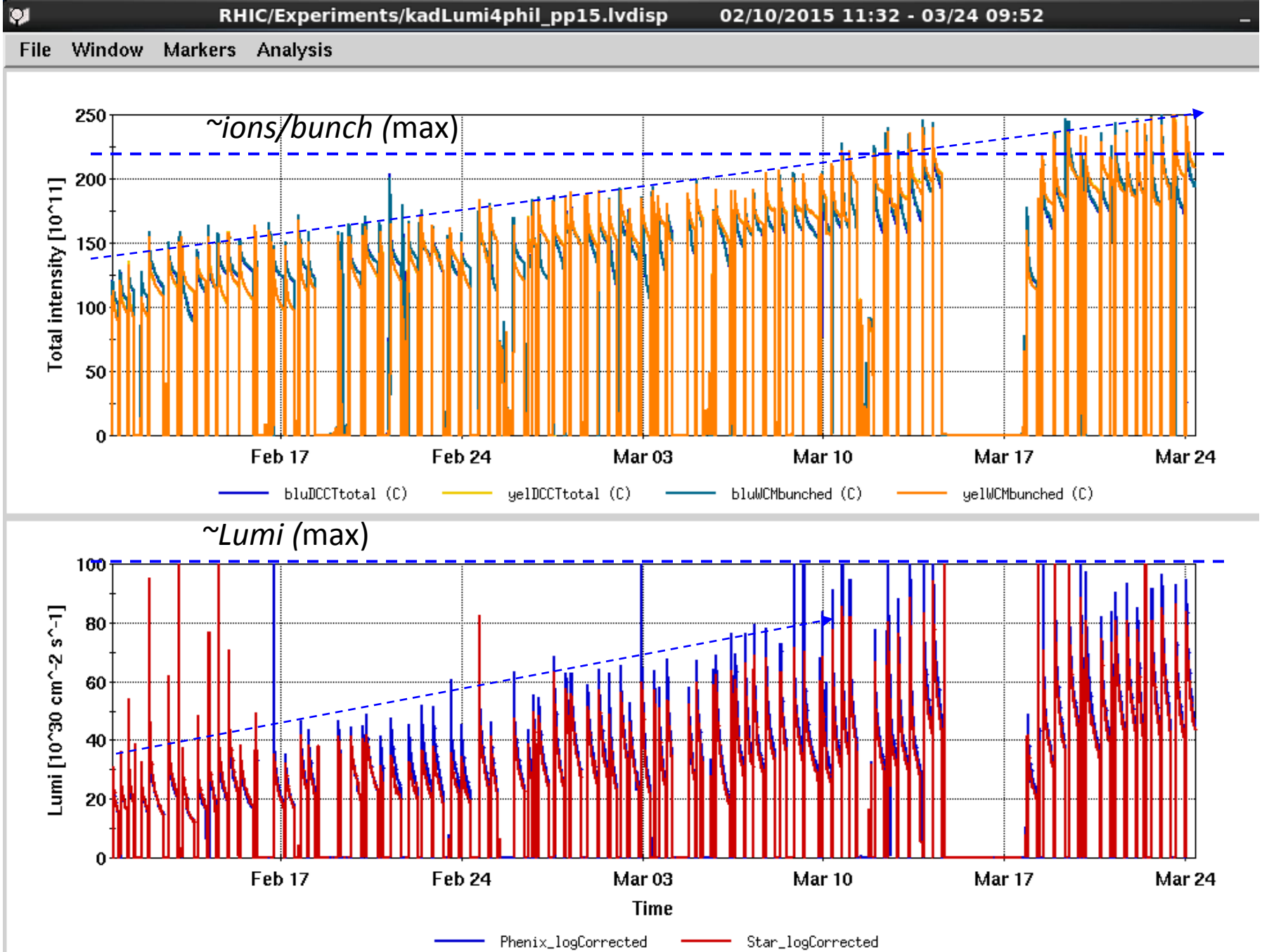
RHIC/BeamIons.logreq 03/10/2015 00:00 - 03/31 23:59

File Window Markers Analysis








RHIC/Experiments/kadLumi4phil_pp15.lvdisp 02/10/2015 11:32 - 03/24 09:52
File Window Markers Analysis
~ions/bunch (max)
Total intensity [10^11]
250
200
150
100
50
0
Feb 17
Feb 24
Mar 03
Mar 10
Mar 17
Mar 24
bluDCCTtotal (C)
yelDCCTtotal (C)
bluWCMbunched (C)
yelWCMbunched (C)
~Lumi (max)
Lumi [10^30 cm^-2 s^-1]
100
80
60
40
20
0
Feb 17
Feb 24
Mar 03
Mar 10
Mar 17
Mar 24
Time
Phenix_logCorrected
Star_logCorrected

Run 15 plan based on 22 weeks cryo operation

and Fischer et.al. RHIC Collider Projections (FY 2013 – FY 2022), 21 Sep 2014

- 20 Jan, Begin cool-down to 4.5K
- 21 Jan (morning), Blue cold
- 22 Jan (evening), Yellow cold
- 23 Jan (after midnight), Beam in Blue
- 7 Feb, First overnight stores for experiments
- 10 Feb (3 days early) store 18662, Begin 9 week **√s=200 GeV pp** physics run

- ***14-17 Mar, Power Dip downtime***

- ***today, 24 Mar…***

- 17 April (Fri), End 9 week √s=200 GeV pp physics run – ***note this is a Friday!***

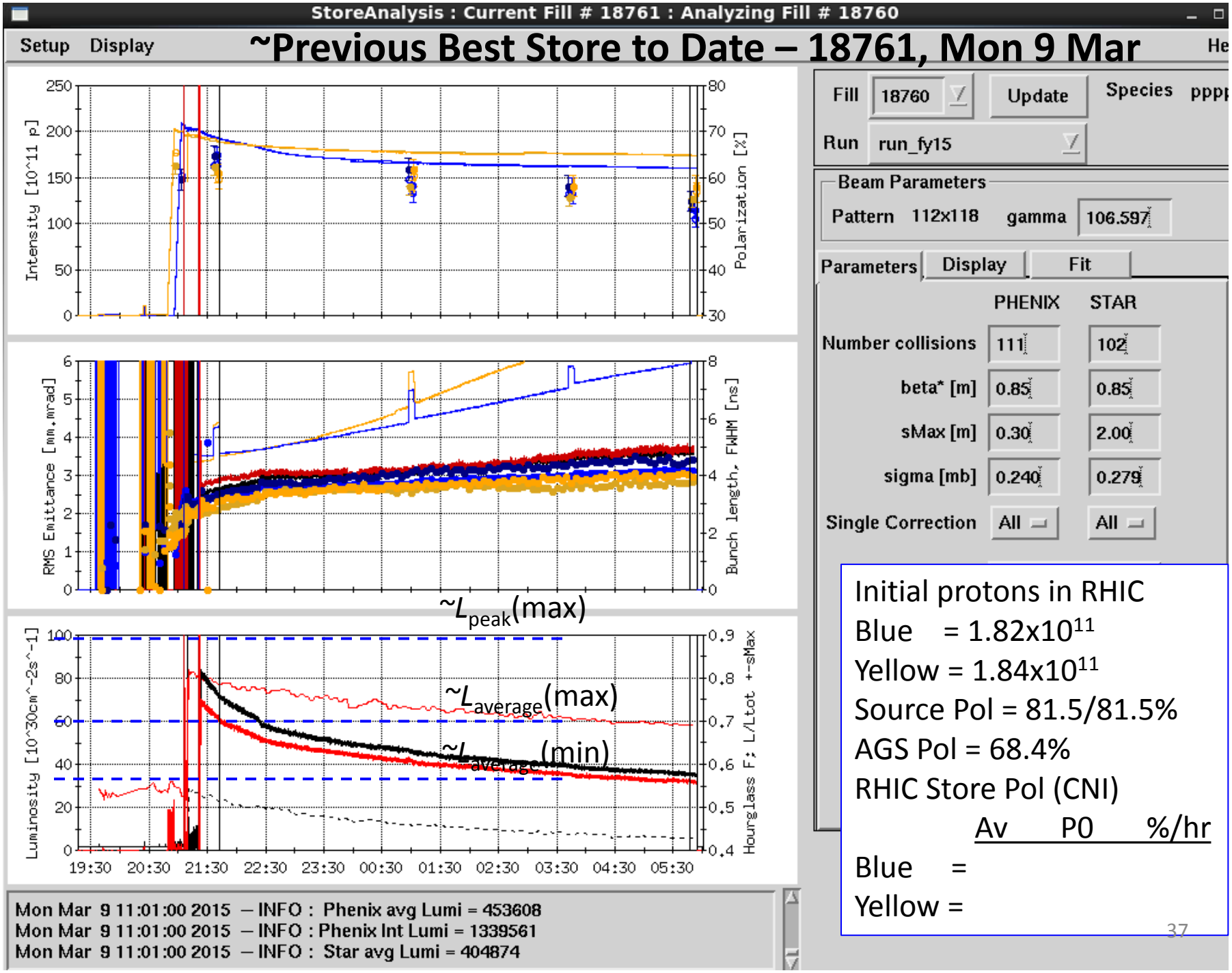
- 28 April (Tue), Begin 5 week **√s=200 GeV/n pAu** physics run
- 2 June (Tue), End 5 week √s=200 GeV/n pAu physics run

- 5 June (Fri), Begin 2 week **√s=200 GeV/n pAl** physics run
- 19 June (Fri), End 2 week √s=200 GeV/n pAl physics run

- 19 June (Fri), begin cryo warm-up
- 23 June, cryo warm-up complete, ***22.0 cryo weeks*** of operation

See http://www.rhichome.bnl.gov/AP/Spin2015/ for the Run Coordinator's detailed plan

~Previous Best Store to Date – 18761, Mon 9 Mar



Initial protons in RHIC

Blue = 1.82×10^{11}

Yellow = 1.84×10^{11}

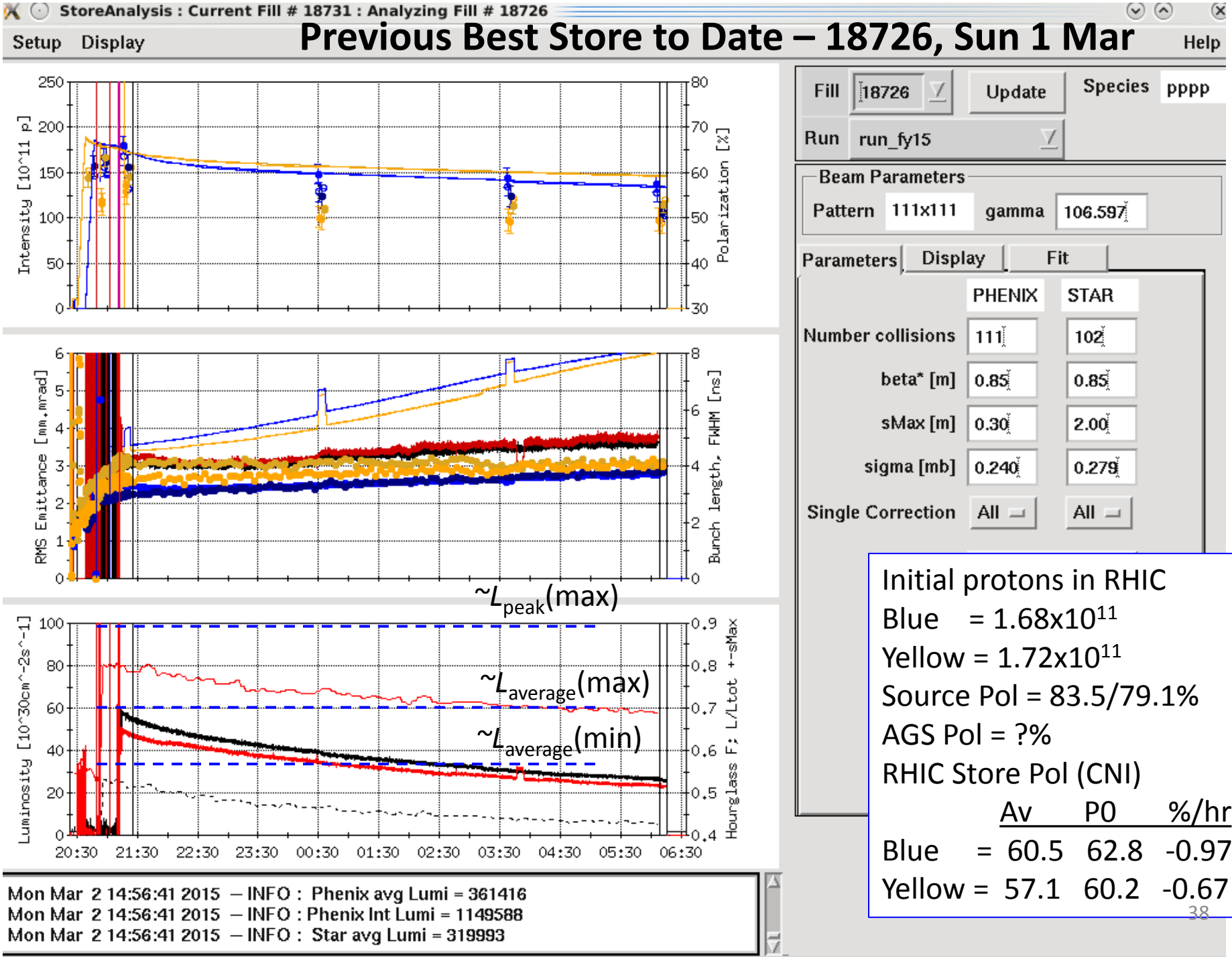
Source Pol = 81.5/81.5%

AGS Pol = 68.4%

RHIC Store Pol (CNI)

	Av	P0	%/hr
Blue =			
Yellow =			

Previous Best Store to Date – 18726, Sun 1 Mar



Initial protons in RHIC

Blue = 1.68×10^{11}

Yellow = 1.72×10^{11}

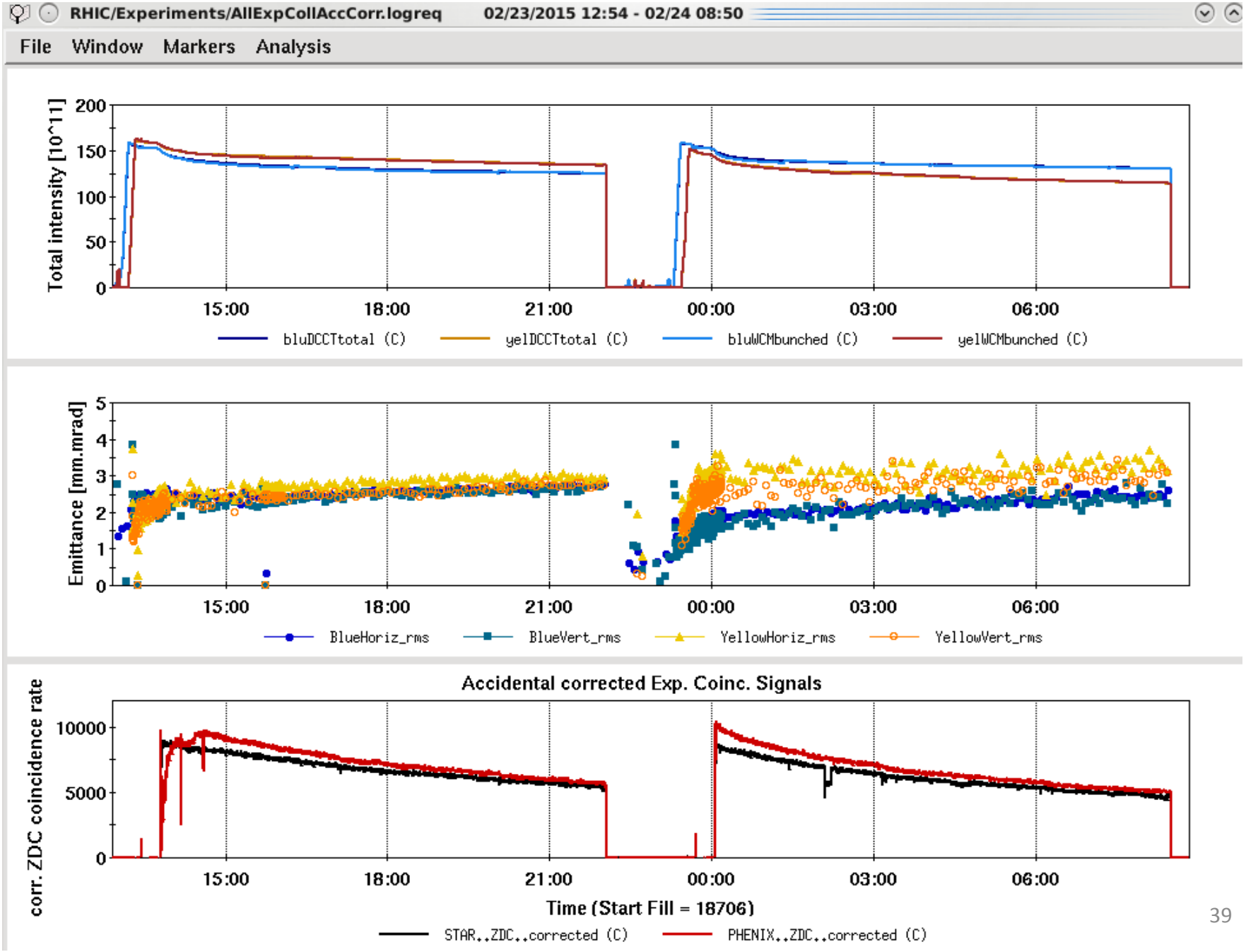
Source Pol = 83.5/79.1%

AGS Pol = ?%

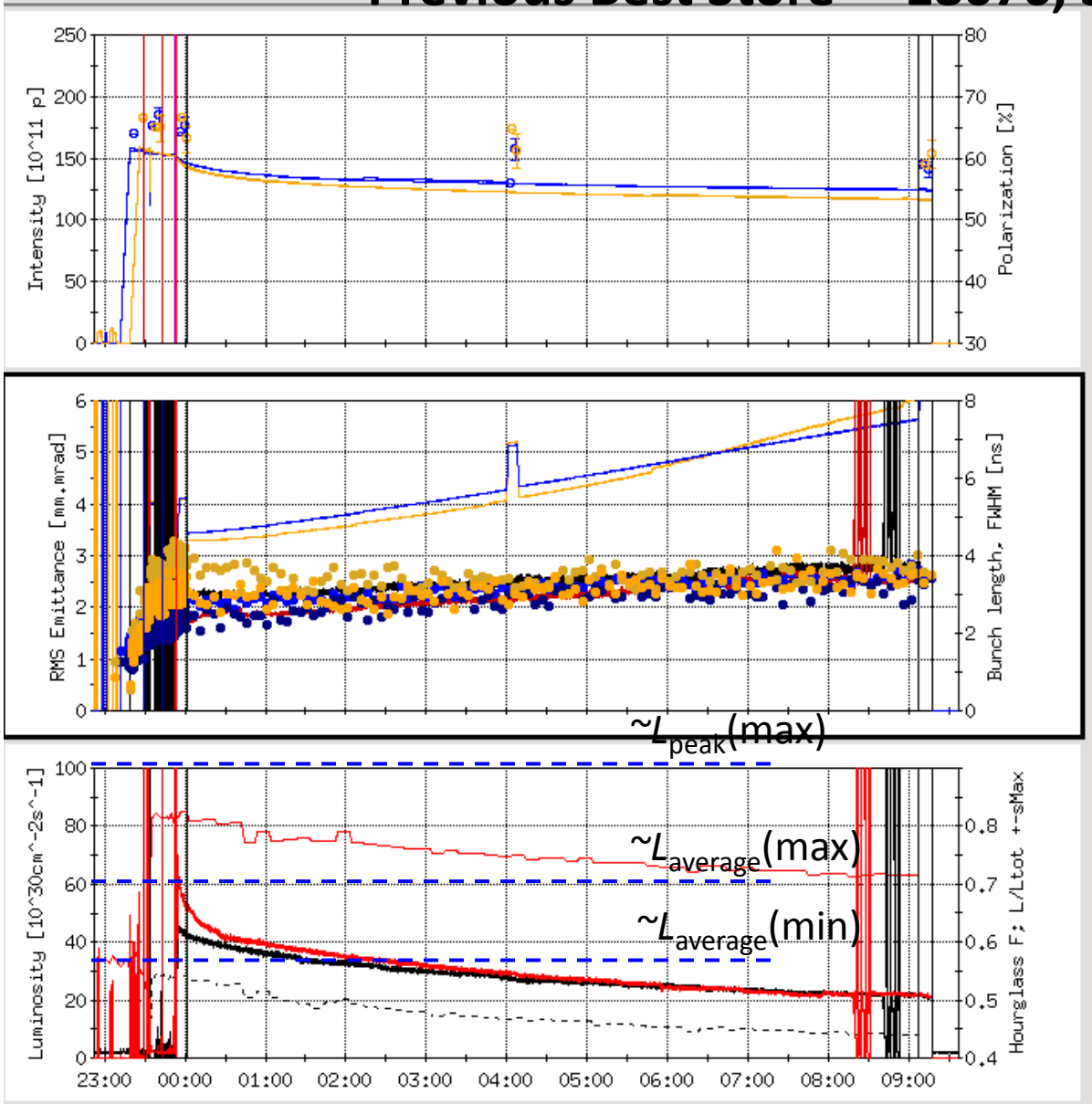
RHIC Store Pol (CNI)

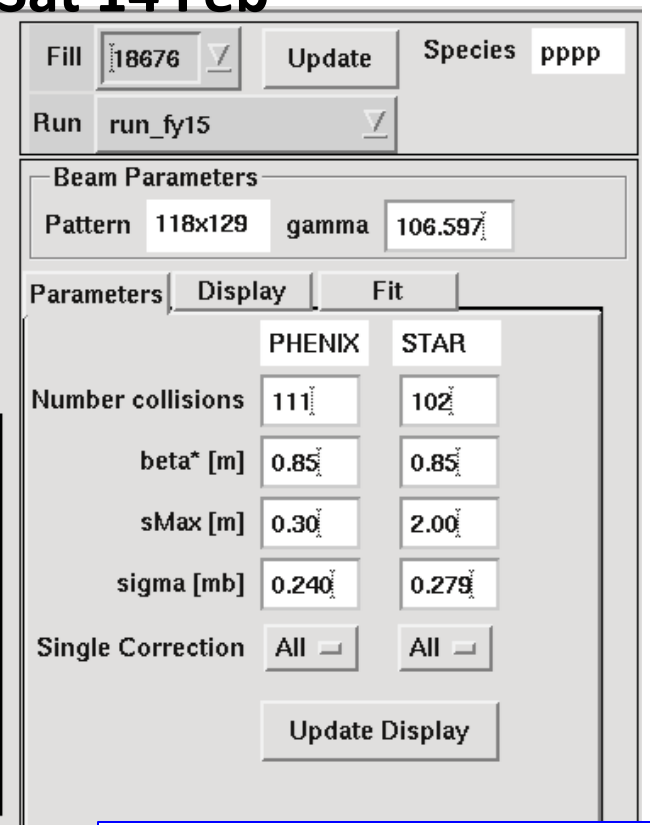
	Av	P0	%/hr
Blue =	60.5	62.8	-0.97
Yellow =	57.1	60.2	-0.67

23 Feb stores 18706 & 18707



Previous Best Store – 18676, Sat 14 Feb





Source Pol = 81.8/81.9%
AGS Pol = 73.7%
RHIC Store Pol

	Av	P0	%/hr
Yellow =	66.8	70.2	-0.68
Blue =	67.4	68.7	-0.78

PHENIX goals 9 weeks, 50pb-1 recorded within 40 cm vertex with 60% pol
STAR goals 12 weeks, 90 pb-1 recorded and 500M MB events, 60 % pol

Estimate of required lumi (based on Run 12 efficiencies):
STAR = 90/0.6 = 150 pb-1
PHENIX = 50/0.35 = 140 pb-1

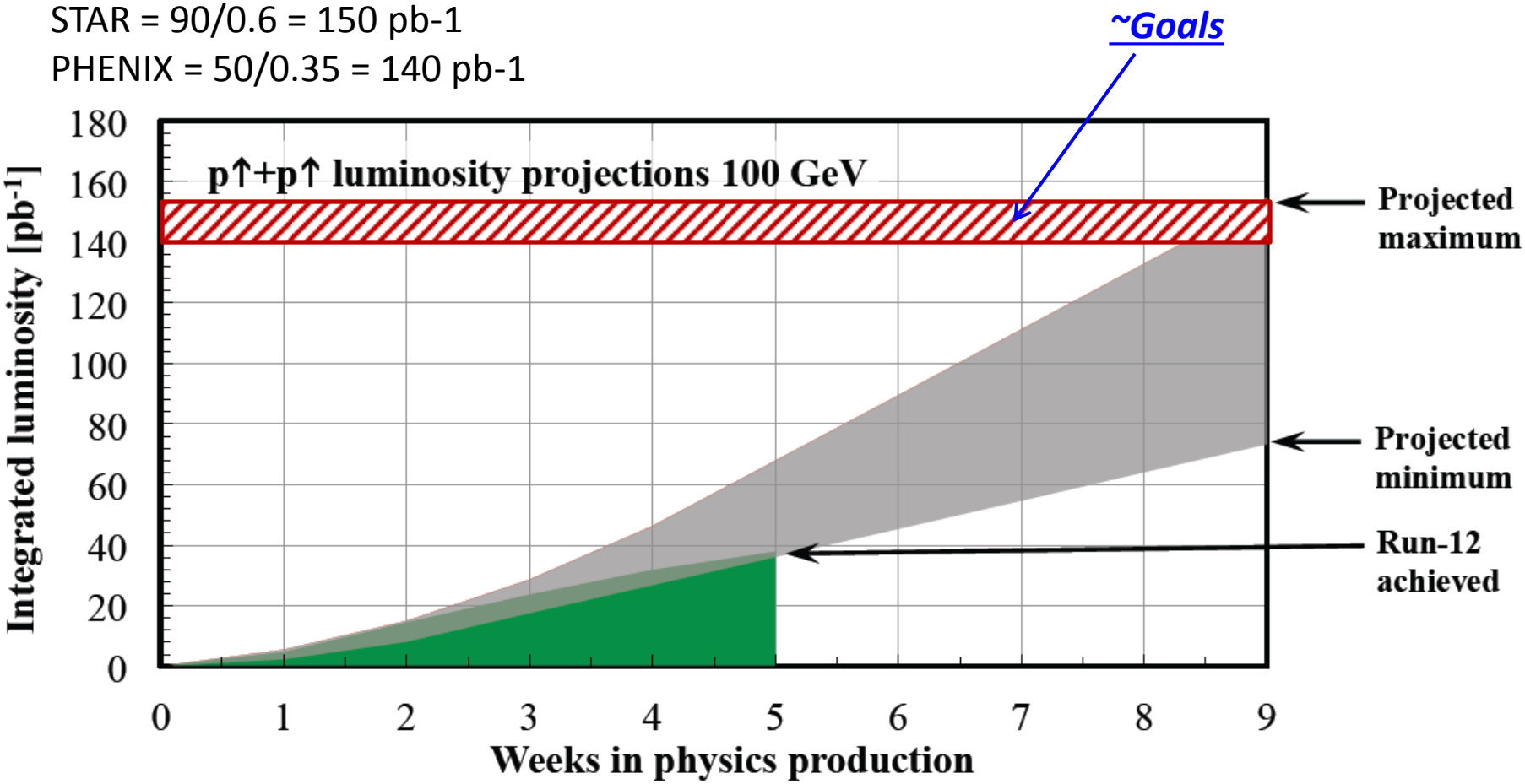
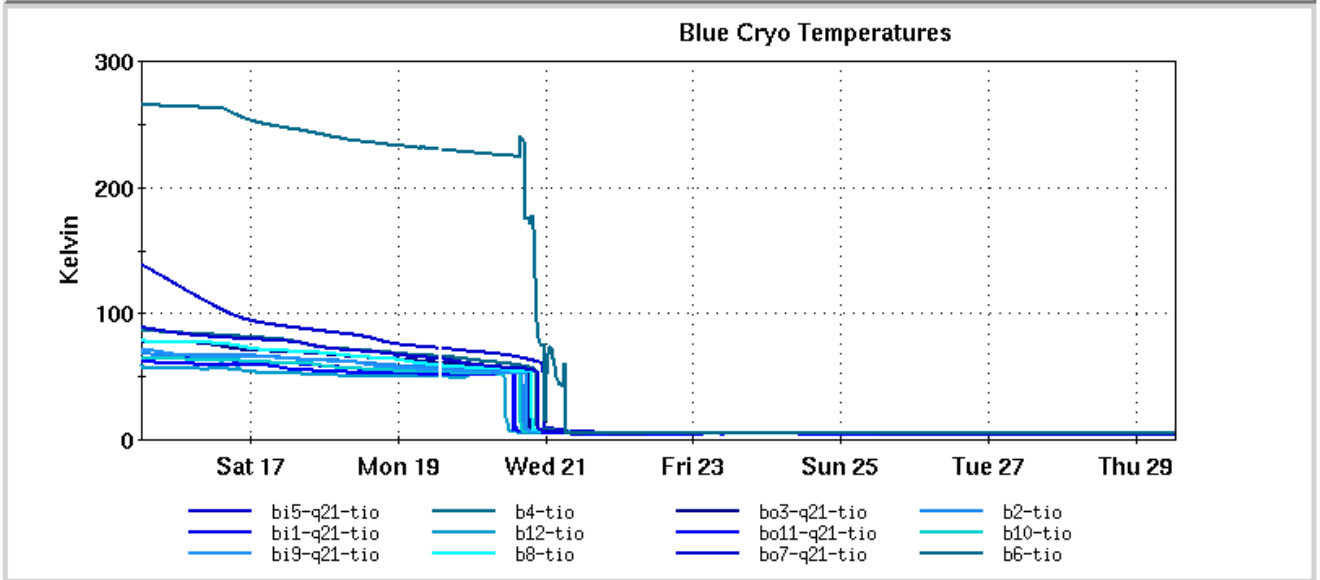


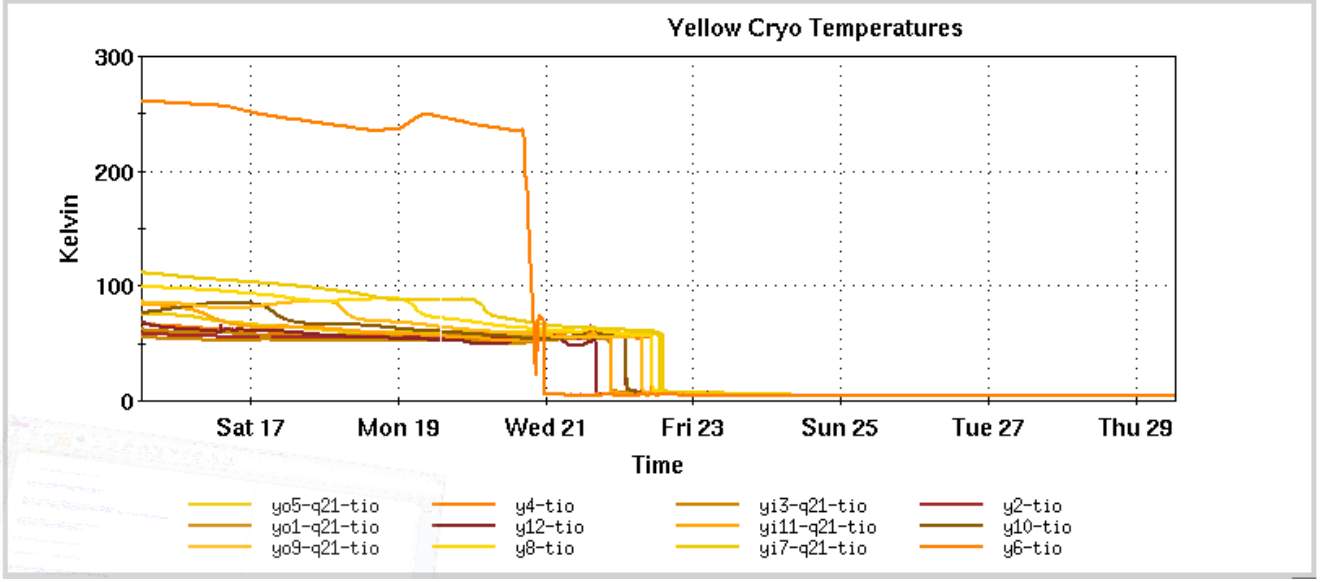
Figure 3: Projected minimum and maximum integrated luminosities for polarized proton collisions at 100 GeV beam energy, assuming linear weekly luminosity ramp-up in 5 weeks. An average store polarization between 59% and up to 63% is expected.

Cryogenic Blue & Yellow Rings (14 days)

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

File Window Markers Analysis





ePHENIX Update!

symmetry dimensions of particle physics

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Photo by Andy Freeberg, SLAC National Accelerator Laboratory

breaking

January 16, 2015

20-ton magnet heads to New York

A superconducting magnet begins its journey from SLAC laboratory in California to Brookhaven Lab in New York.

By Justin Eure

PDF download

Imagine an MRI magnet with a central chamber spanning some 9 feet—massive enough to accommodate a standing African elephant. Physicists at the US Department of Energy's Brookhaven National Laboratory need just such an extraordinary piece of equipment for an upcoming experiment. And, as luck would have it, physicists at SLAC

most popular

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20-ton magnet heads to New York
A superconducting magnet begins its journey from SLAC laboratory in California to Brookhaven Lab in New York.

January 13, 2015
Dark horse of the dark matter hunt
Dark matter might be made up of a type of particle not many scientists are looking for: the axion.

January 12, 2015
Mirror, mirror
After more than six years of grinding and polishing, the first-ever dual-surface mirror for a major telescope is complete.

symmetry tweets

January 19, 2015
ICYMI: Accelerator-driven carbon dating advances everything from archaeology to medicine: http://t.co/hqMcZnCCw4

Who's Who for 2015

RHIC 100 x 100 GeV polarized protons:
Run Coordinator: Vincent Schoefer, schoefer@bnl.gov , 631-344-8453 (office)

RHIC 100 x 100 GeV/n polarized protons on gold and polarized protons on aluminum:
Run Coordinator: Chuyu Liu, cliu1@bnl.gov , 631-344-4431 (office)

Scheduling Physicists:
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Phil Pile, pile@bnl.gov, 631-344-4643 (office), 631-834-2005 (cell)

AGS Liaison:
Haixin Huang, huanghai@bnl.gov , 631-344-5446 (office)

The Plan for Run 15: 22 weeks of cryo operations

Cool-down from 50 K to 4 K	0.5 weeks	
Set-up mode 1 (p↑+p↑ at 100 GeV)	2.5 weeks	(no dedicated time for experiments)
Ramp-up mode 1	0.5 weeks	(8 h/night for experiments)
Data taking mode 1	9 weeks	
Set-up mode 2 (p↑+Au at 100 GeV/nucleon)	1.5 weeks	(no dedicated time for experiments)
Data taking mode 2 with further ramp-up	5 weeks	
Set-up mode 3 (p↑+Al at 100 GeV/nucleon)	0.5 weeks	(no dedicated time for experiments)
Data taking mode 3+1 with further ramp-up	2 weeks	
Warm-up	0.5 week	

From Fischer et. al., RHIC Collider Projections (FY 2014 – FY 2022), 21 Sep 2014