Run 14 RHIC Machine/Experiments Meeting

15 Apr 2014

<u>Agenda:</u>

- **Run 14 Schedule** (Pile)
- **Machine Status** (Robert-Demolaize)
- **STAR and PHENIX Status** (Experiments)
- **Other**

Call in bridge line is 631-344-8383

Run 14 plan based on 22 weeks cryo operation

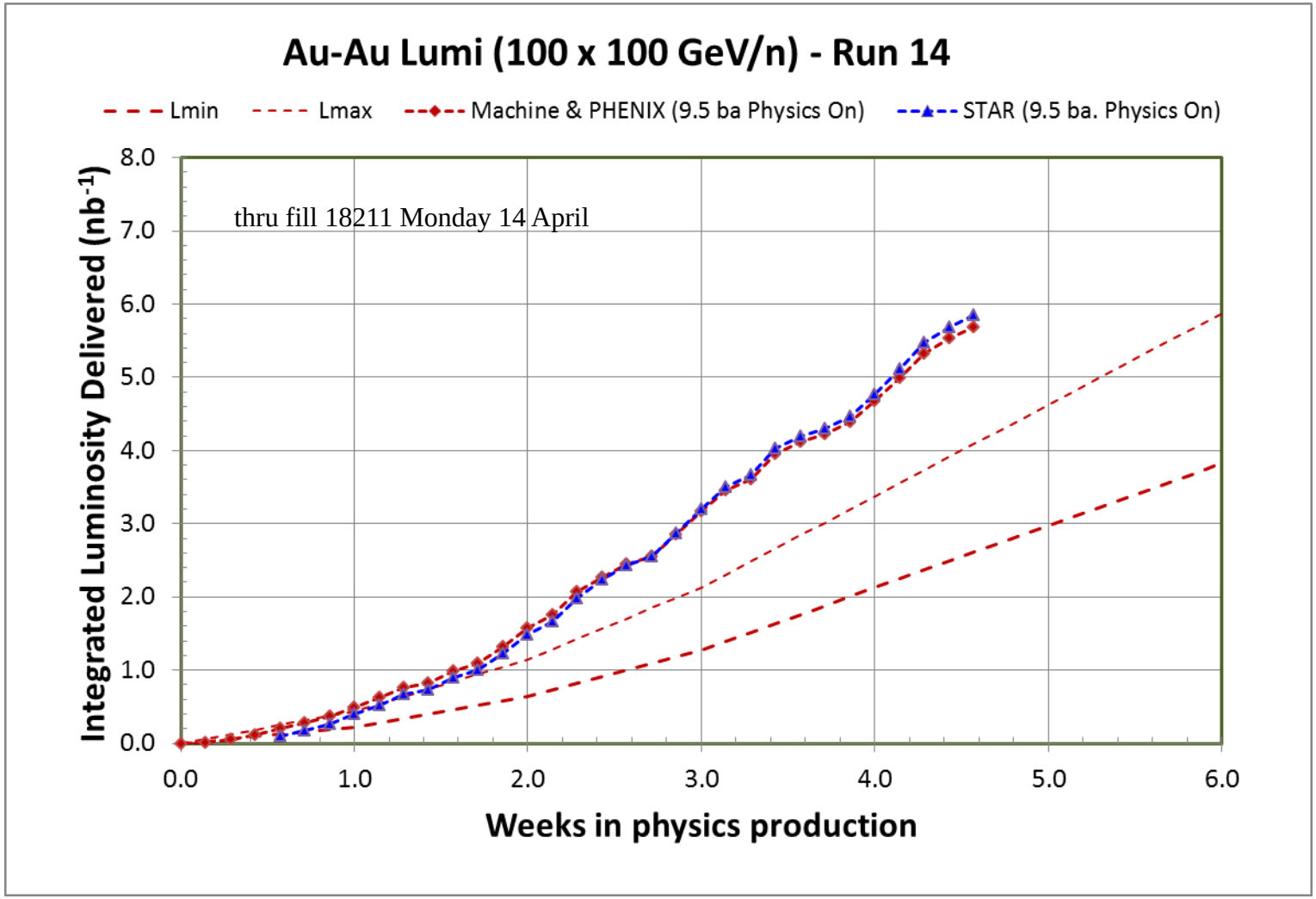
and Fischer et.al. RHIC Collider Projections (FY 2013 – FY 2017), 4 Jun 2013

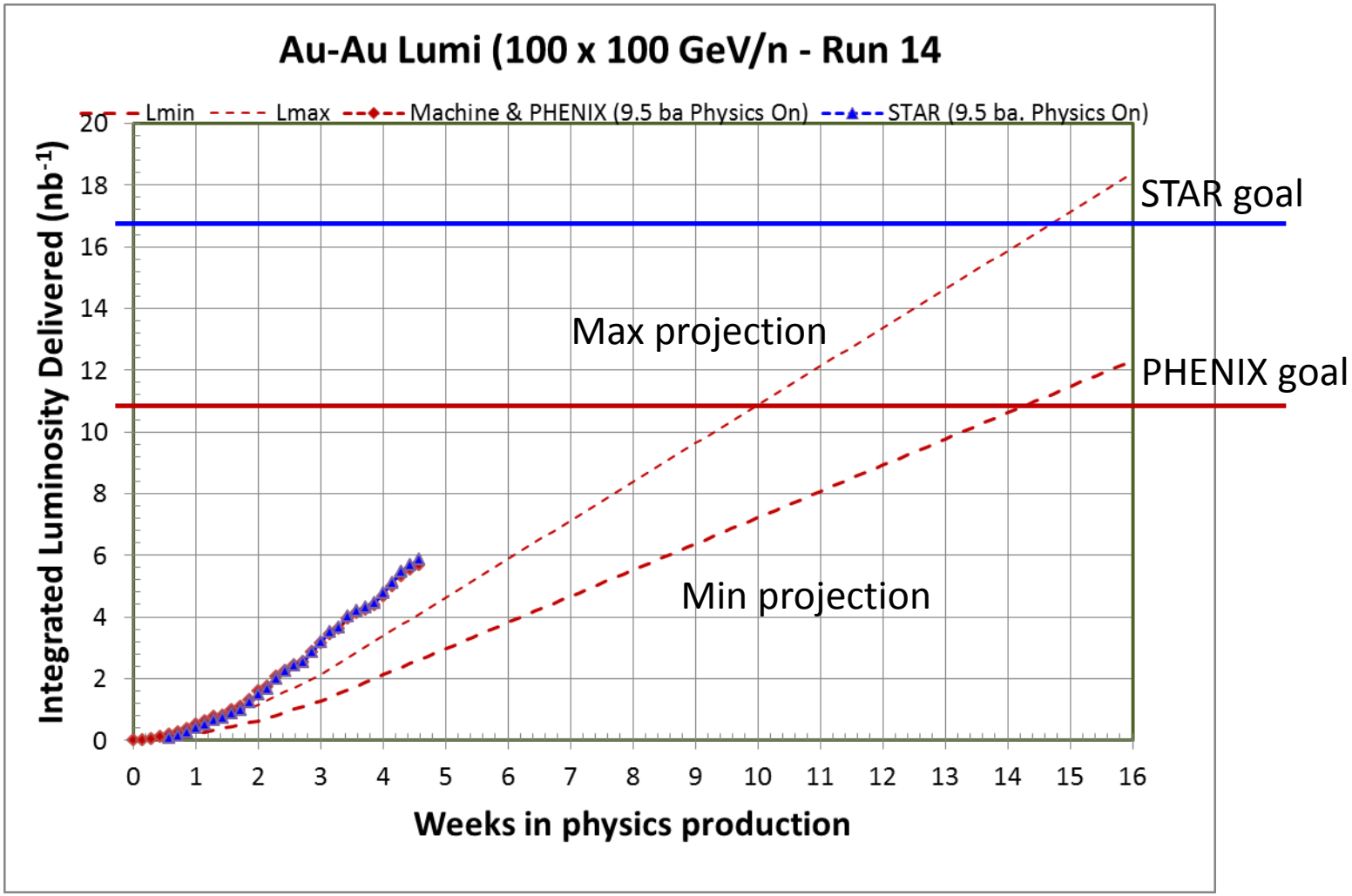
- ✓ 3 Feb, Begin cool-down to 4.5K
- ✓ 4 Feb, Cool-down to 6K in Blue
- ✓ 7 Feb, Blue and Yellow at 4.5 deg K
- ✓ 10-Feb, Beam in Blue and Yellow at injection
- ✓ 15-Feb, Begin √s = 14.6 GeV/n AuAu physics
- ✓ ~~8-10~~ 11 Mar (Tuesday, 0800), End √s = 14.6 GeV/n AuAu physics run begin setup for √s = 200 GeV/n AuAu
- ✓ 15-Mar (~14:00, store 18046), Begin √s = 200 GeV/n AuAu physics run
  - ✓ PHENIX 1st physics store = 18046 (15 March)
  - ✓ STAR 1st physics store = 18064 (17 March)

today, 15 Apr…

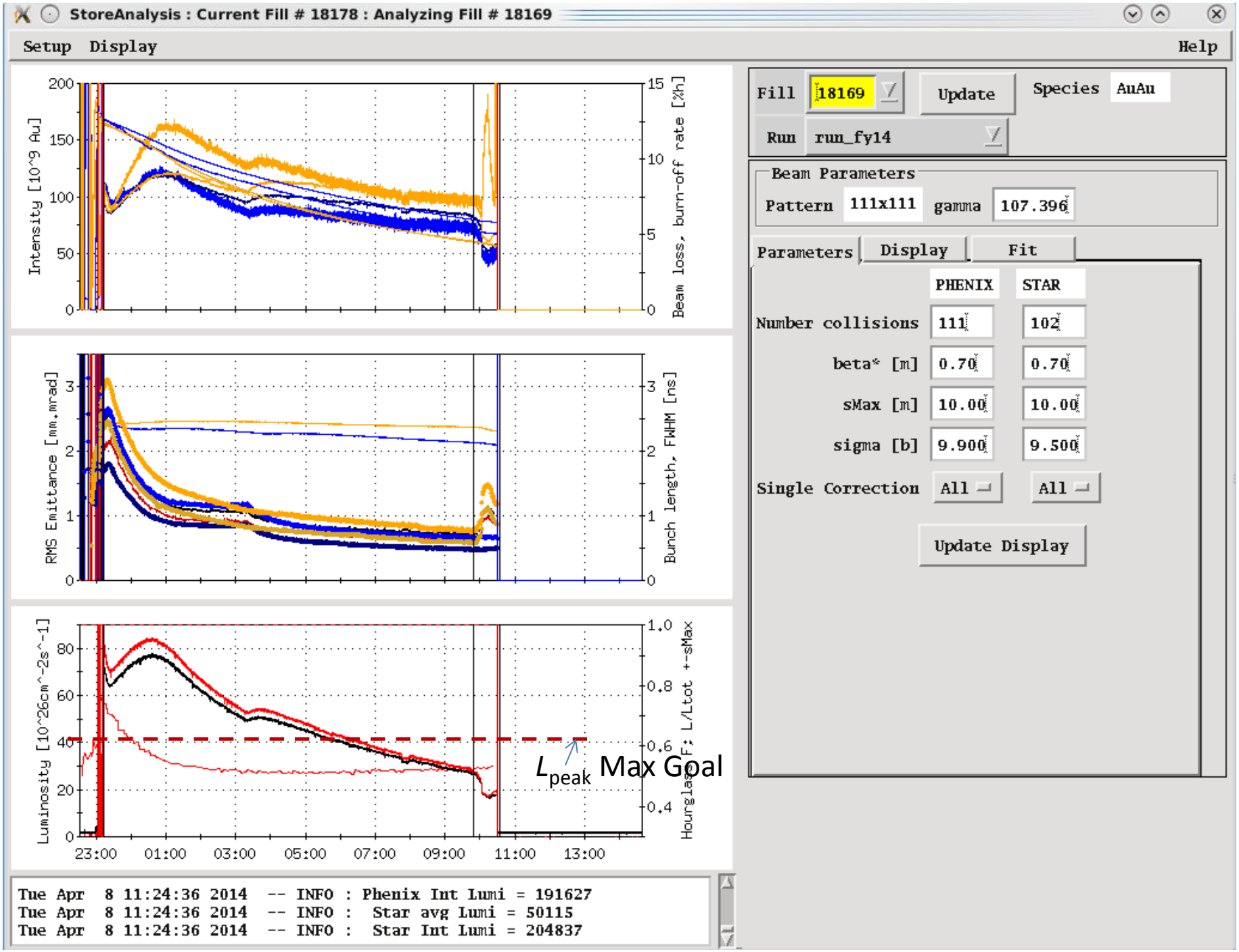
- 27-Jun, End 15 week √s = 200 GeV/n AuAu run
- 27-June through 4 July , 7 days contingency/TBD
- 4-July, begin cryo warm-up
- 7- July, warm-up complete, 22.0 cryo weeks of operation

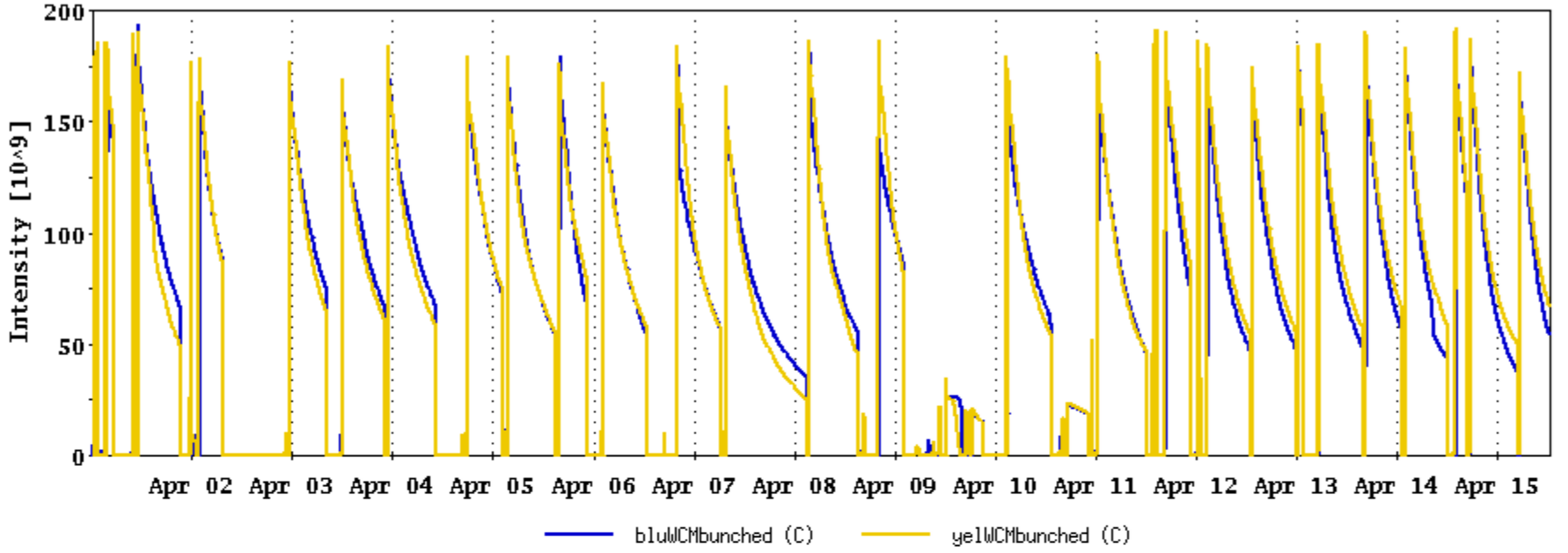
See http://www.rhichome.bnl.gov/AP/RHIC2014/ for the Run Coordinator's detailed plan


Au-Au Lumi (100 x 100 GeV/n) - Run 14
Lmin
Lmax
Machine & PHENIX (9.5 ba Physics On)
STAR (9.5 ba. Physics On)
thru fill 18211 Monday 14 April
Integrated Luminosity Delivered (nb-1)
8.0
7.0
6.0
5.0
4.0
3.0
2.0
1.0
0.0
0.0
1.0
2.0
3.0
4.0
5.0
6.0
Weeks in physics production



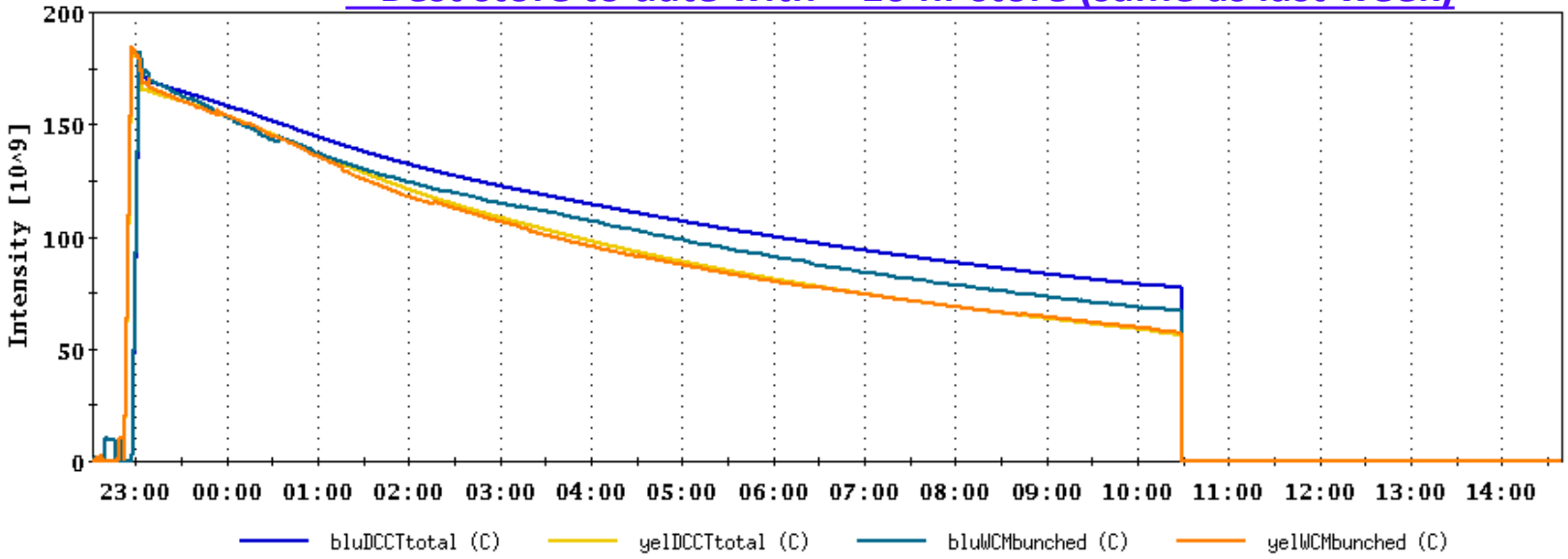
Fischer et. al. “RHIC Collider Projections (FY 2014 – FY 2018)”, 4 June 2013

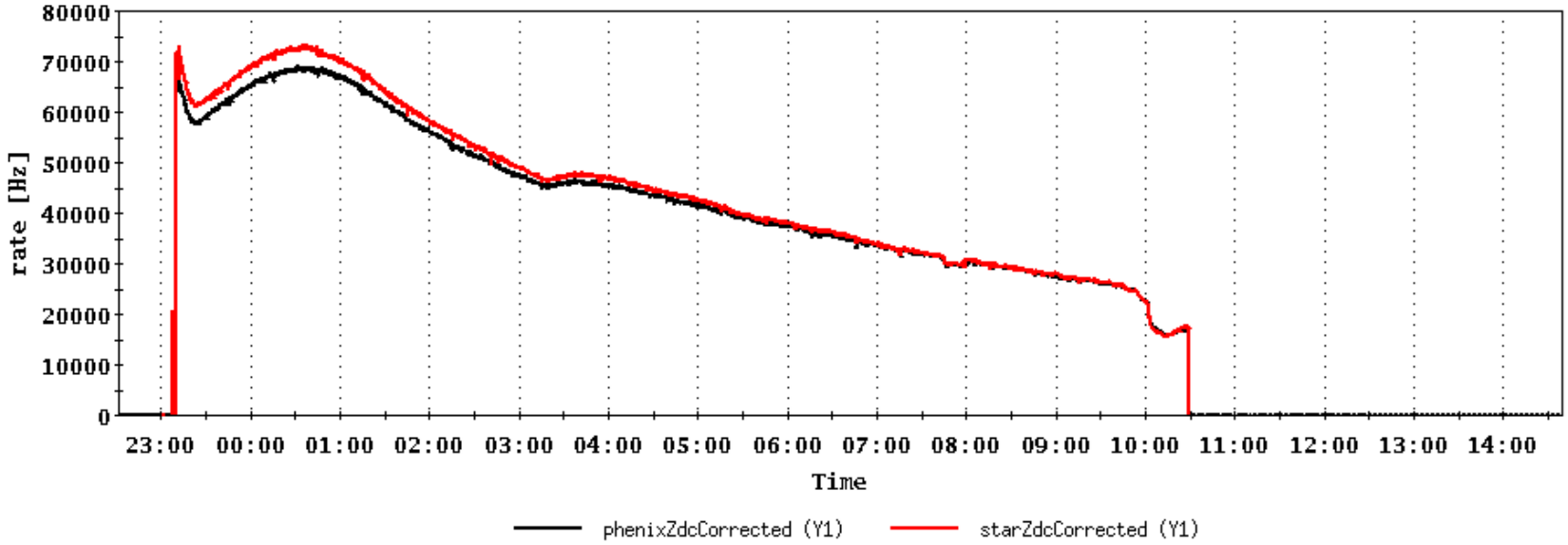

StoreAnalysis : Current Fill # 18178 : Analyzing Fill # 18169
Setup
Display
Help
Intensity [10^9 Au]
Beam loss, burn-off rate [%h]
RMS Emittance [mm,mrad]
Bunch length, FWHM [ns]
Luminosity [10^26cm^-2s^-1]
Hourglass F; L/Ltot +-sMax
23:00
01:00
03:00
05:00
07:00
09:00
11:00
13:00
L_{peak} Max Goal
Tue Apr 8 11:24:36 2014 -- INFO : Phenix Int Lumi = 191627
Tue Apr 8 11:24:36 2014 -- INFO : Star avg Lumi = 50115
Tue Apr 8 11:24:36 2014 -- INFO : Star Int Lumi = 204837
Fill
18169
Update
Species
AuAu
Run
run_fy14
Beam Parameters
Pattern
111x111
gamma
107.396
Parameters
Display
Fit
PHENIX
STAR
Number collisions
111
102
beta* [m]
0.70
0.70
sMax [m]
10.00
10.00
sigma [b]
9.900
9.500
Single Correction
All
All
Update Display


Intensity [10^9]
200
150
100
50
0
Apr 02 Apr 03 Apr 04 Apr 05 Apr 06 Apr 07 Apr 08 Apr 09 Apr 10 Apr 11 Apr 12 Apr 13 Apr 14 Apr 15
bluWCMbunched (C)
yelWCMbunched (C)

Best ~10 hr store (same as last week)
rate [Hz]
100000
80000
60000
40000
20000
0
Apr 02 Apr 03 Apr 04 Apr 05 Apr 06 Apr 07 Apr 08 Apr 09 Apr 10 Apr 11 Apr 12 Apr 13 Apr 14 Apr 15
Time
phenixZdcCorrected (Y1)

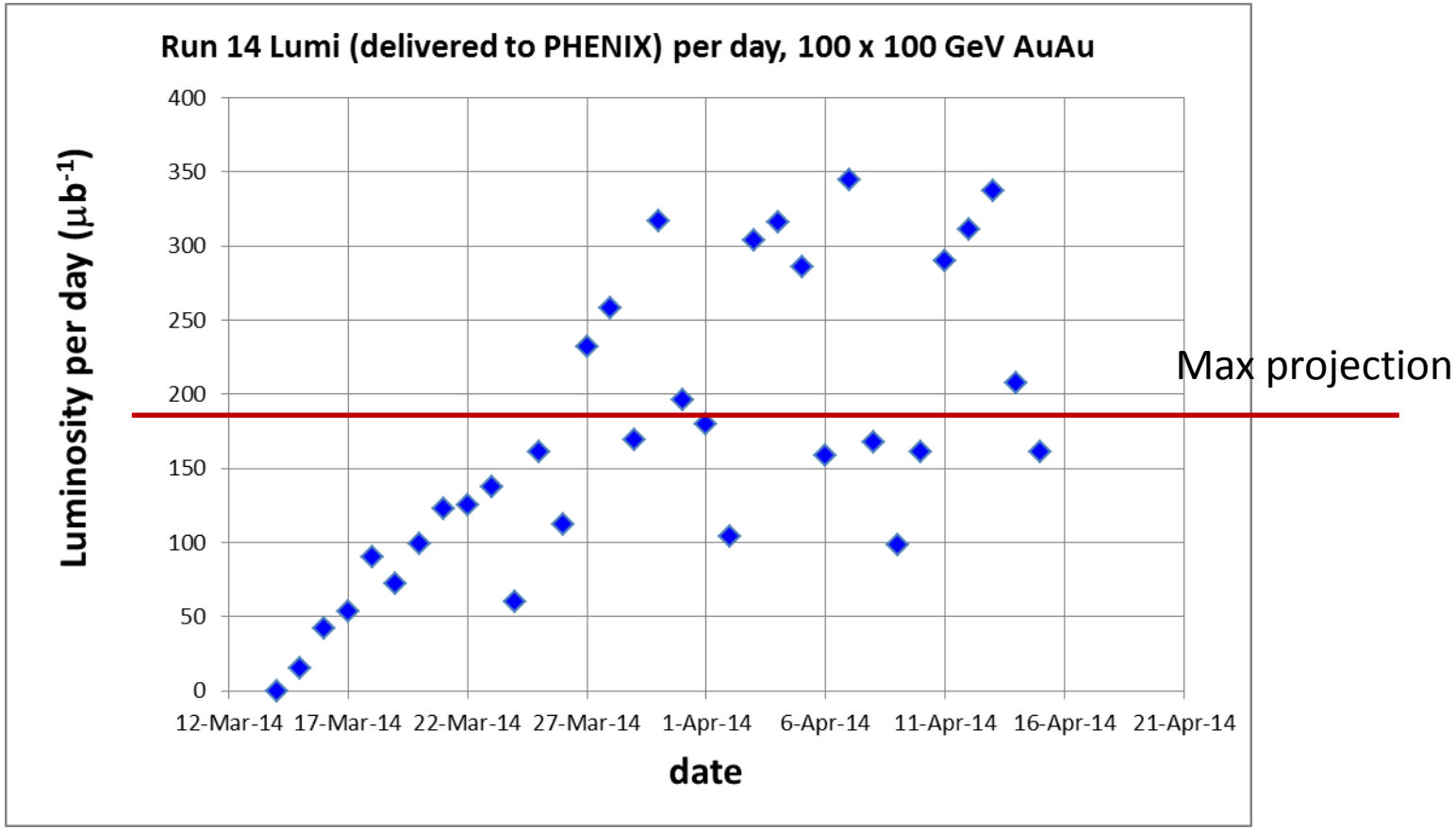
~ Best store to date with ~ 10 hr store (same as last week)





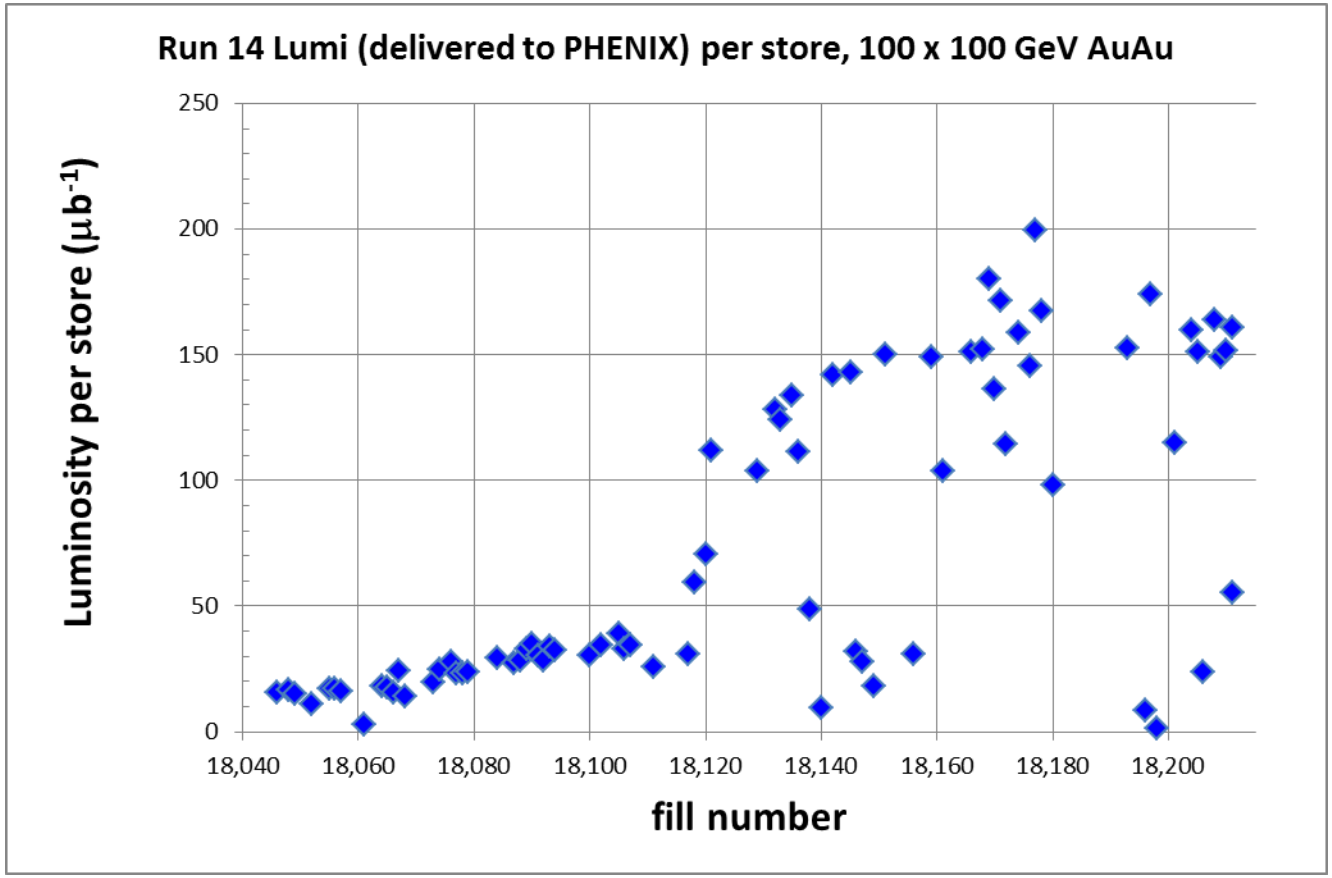

```
Time = Fri Apr  4 00:34:03 2014+4ms,    starZdcCorrected = 72228.4
Time = Fri Apr  4 00:36:03 2014+2ms,    phenixZdcCorrected = 68429.1
```

Through fill 18211, 14 April

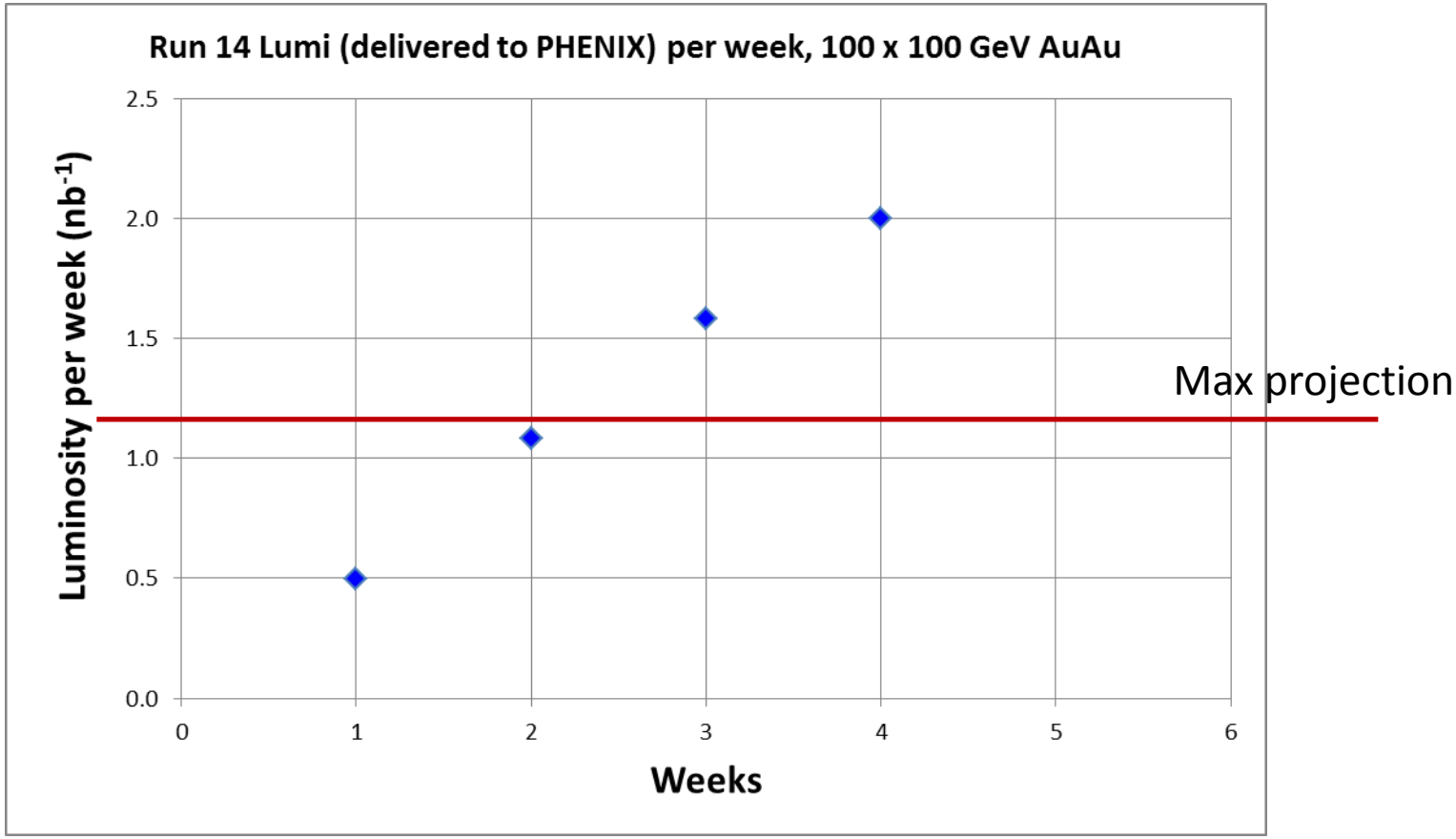


Fischer et. al. “RHIC Collider Projections (FY 2014 – FY 2018)”, 4 June 2013

Through fill 18211, 14 April



Through 11 April stores



Fischer et. al. “RHIC Collider Projections (FY 2014 – FY 2018)”, 4 June 2013

Archive

Goals for Run 14 (based on Beam Use Requests)

*(11 Feb, DRAFT, **to be updated** by experiments)*

PHENIX

- Au+Au @ 200 GeV for 12 weeks, L = 1.5 nb^{-1} sampled luminosity within |z| < 10 cm]
  - ~30% within |z| < 10 cm]
  - ~90% DAQ efficiency
  - ~50% bandwidth, DAQ saturation factor (?)
  - → 11 nb^{-1} delivered

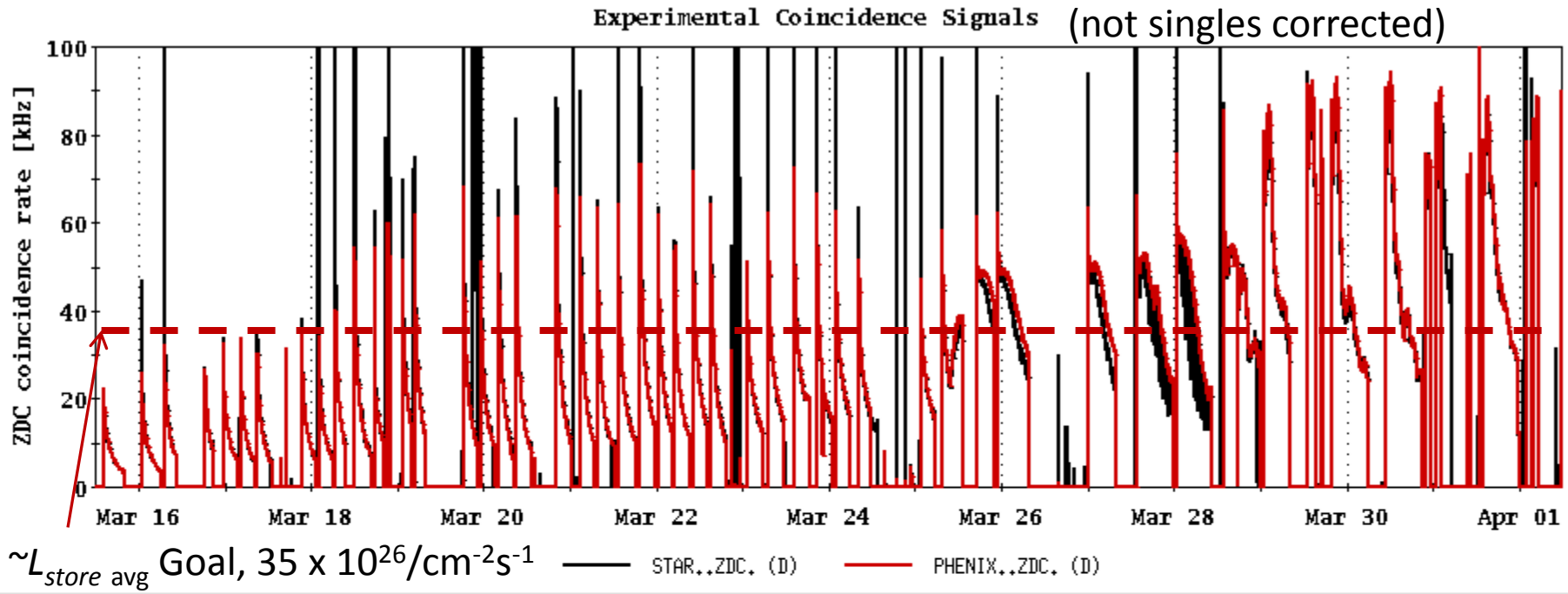
STAR

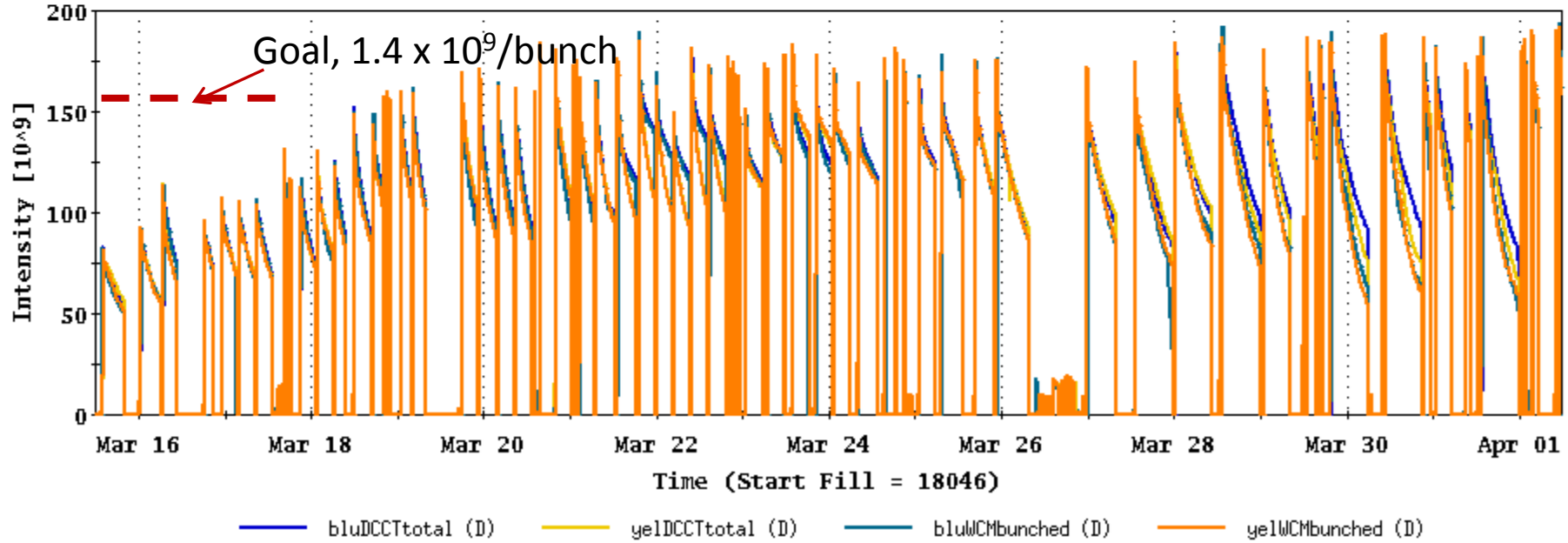
- Au+Au @ 200 GeV for 14 weeks, L= 10 nb^{-1} recorded, 10^9 min bias triggers within |z| < 5 cm] → ($2x10^9$ triggers required)
  - ~ 60% (should be better) sampling efficiency
  - → 16.7 nb^{-1} delivered

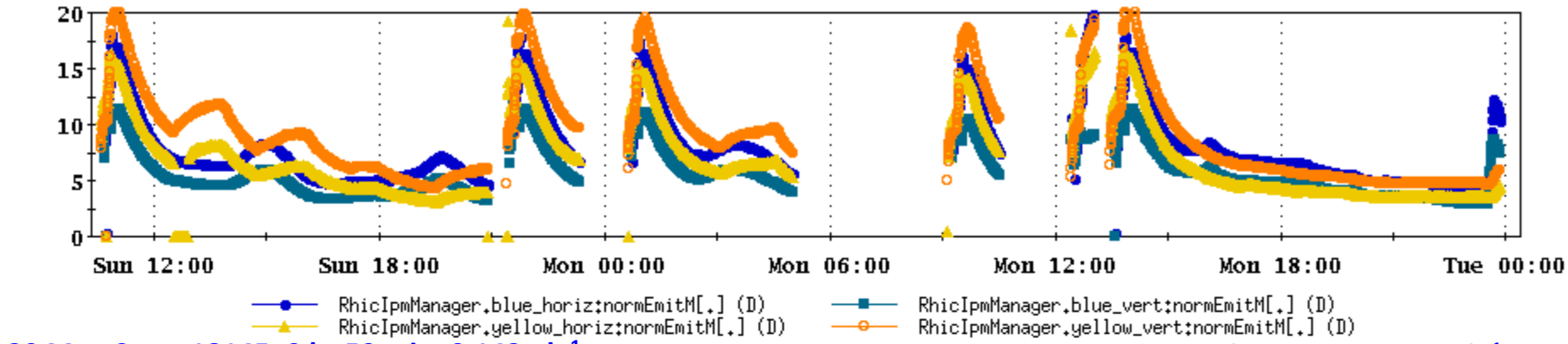
- Au+Au @ 15 GeV for 3 weeks, 150M min bias triggers

4/8/2014 New Electric Rates for this year

FY2014 Rates						
	Original	Revised xxxx				
Month	$/MWh	$/MWh				
13-Oct	62	62				
13-Nov	62	62				
13-Dec	62	62				
14-Jan	56	56				
14-Feb	56	56	delta	~ average MW	additional cost at 27 MW	
14-Mar	56	62	$ 6.00	$ 27.00	$ 120,528	
14-Apr	56	62	$ 6.00	$ 27.00	$ 116,640	
14-May	56	62	$ 6.00	$ 27.00	$ 120,528	
14-Jun	69	74	$ 5.00	$ 27.00	$ 97,200	
14-Jul	69	74	$ 5.00	$ 5.00	$ 18,600	
14-Aug	69	74	$ 5.00	$ 5.00	$ 18,600	
14-Sep	69	74	$ 5.00	$ 5.00	$ 18,000	
					$ 510,096	

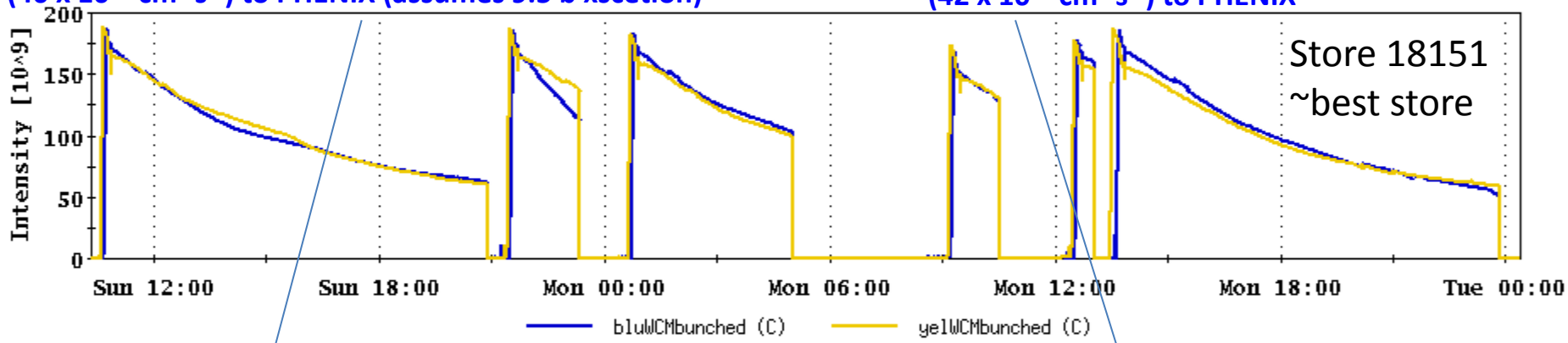

Experimental Coincidence Signals
(not singles corrected)
ZDC coincidence rate [kHz]
100
80
60
40
20
0
Mar 16
Mar 18
Mar 20
Mar 22
Mar 24
Mar 26
Mar 28
Mar 30
Apr 01
~$L_{store\ avg}$ Goal, 35 x 10^{26}/cm^{-2}s^{-1}
STAR.,ZDC, (D)
PHENIX.,ZDC, (D)

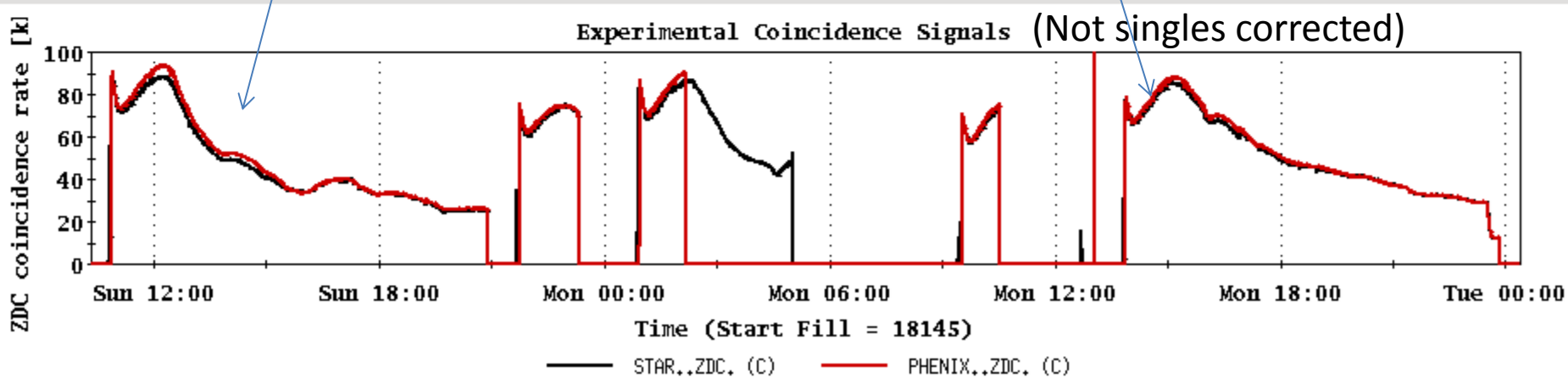

Goal, 1.4 x 10^9/bunch
Intensity [10^9]
200
150
100
50
0
Mar 16
Mar 18
Mar 20
Mar 22
Mar 24
Mar 26
Mar 28
Mar 30
Apr 01
Time (Start Fill = 18046)
bluDCCTtotal (D)
yelDCCTtotal (D)
bluWCMbunched (D)
yelWCMbunched (D)



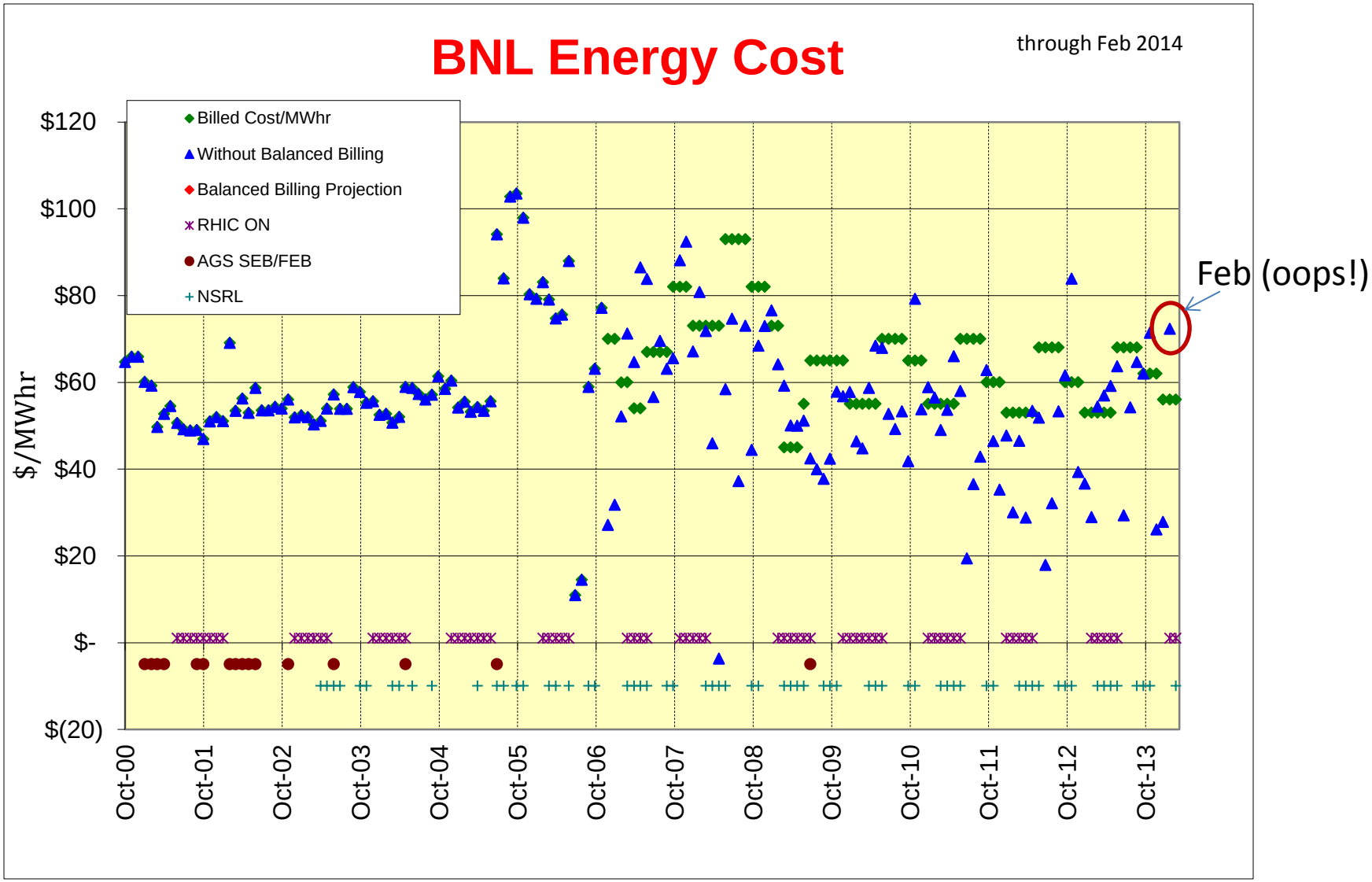
30 Mar, Store 18145, 9 hr 59 min, 0.143 nb^{-1}
(40 x 10^{26} cm^{-2}s^{-1}) to PHENIX (assumes 9.5 b xscetion)

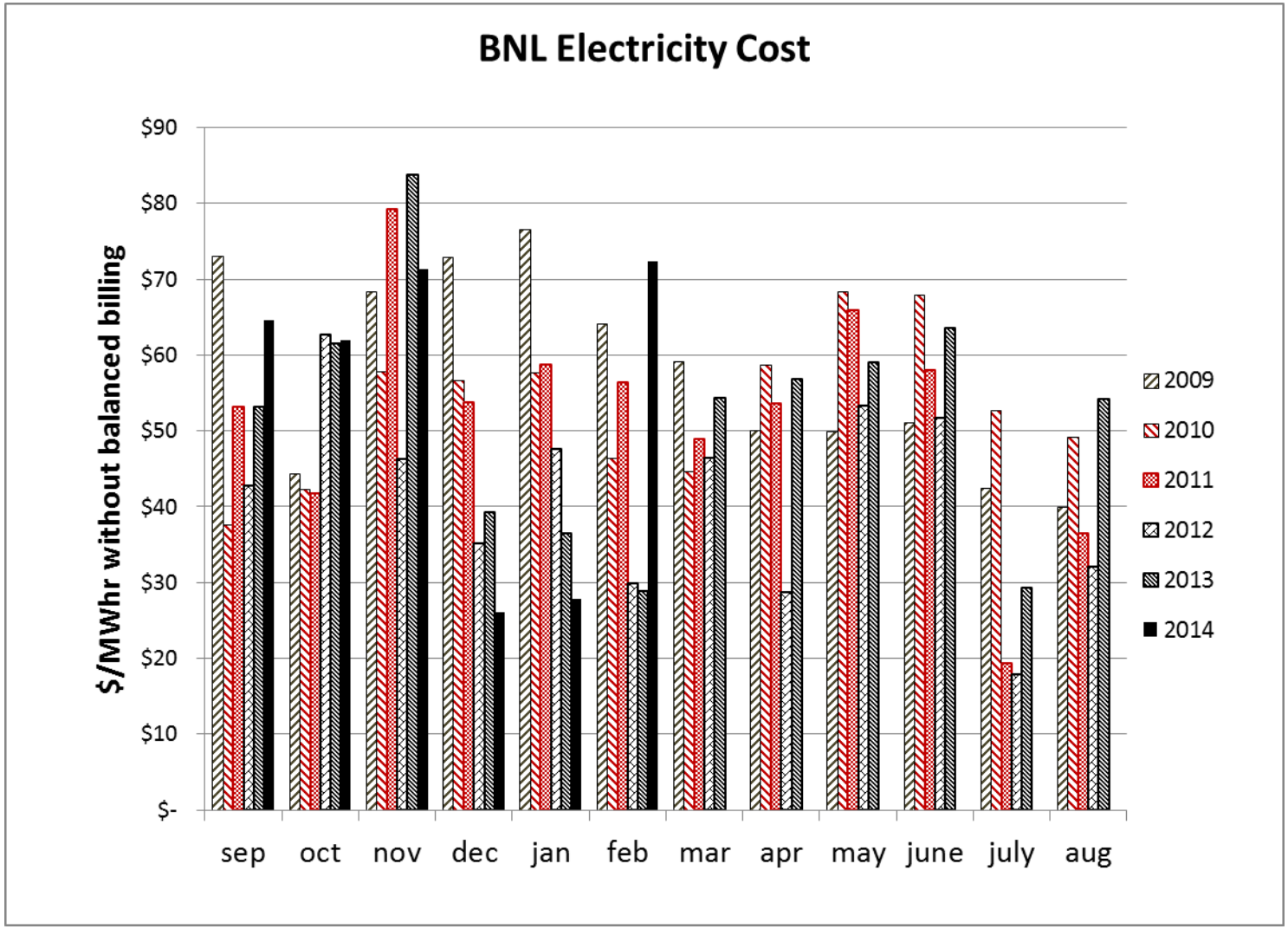
31 Mar, Store 18151, 9 hr 49 min, 0.149 nb^{-1}
(42 x 10^{26} cm^{-2}s^{-1}) to PHENIX

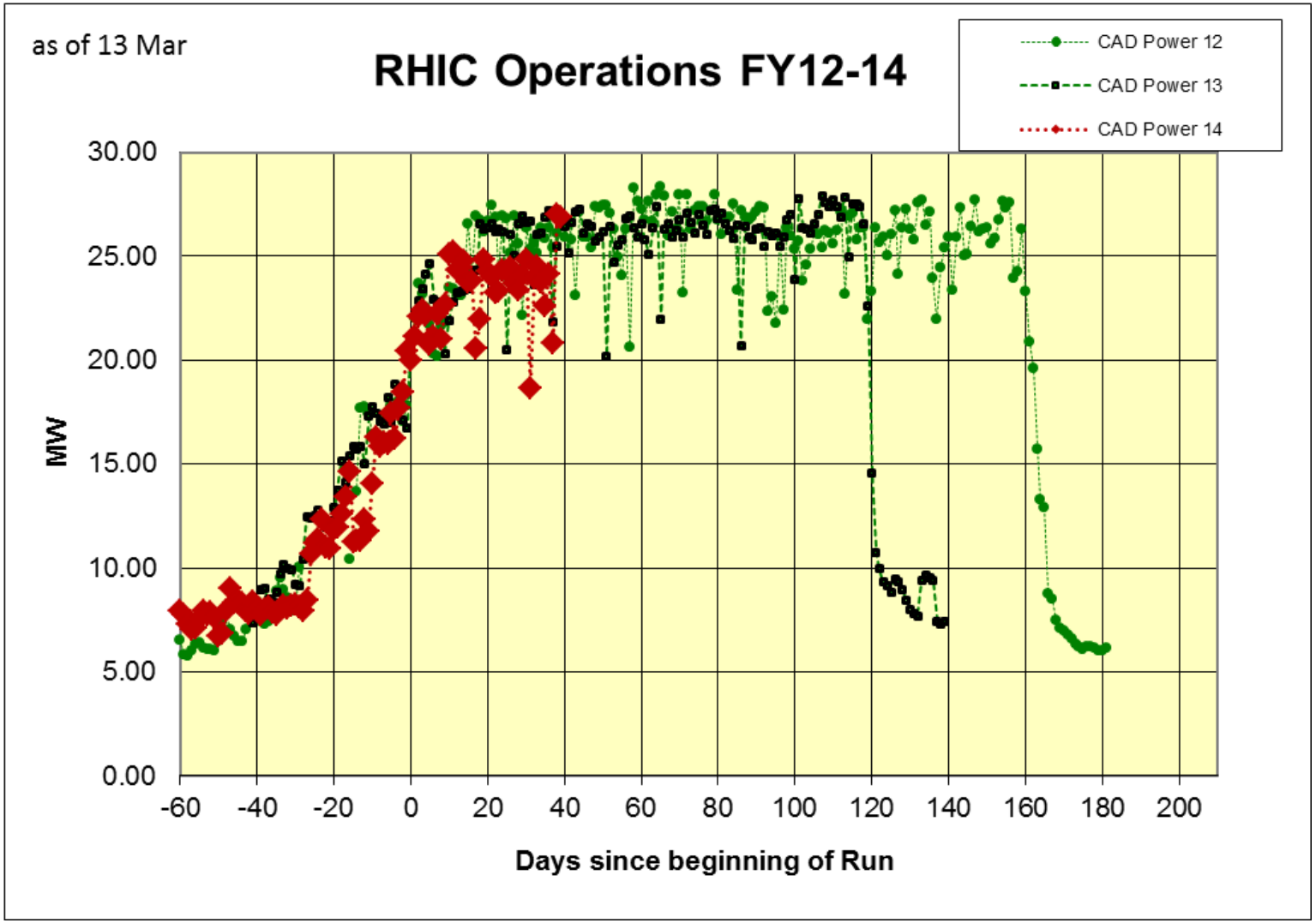


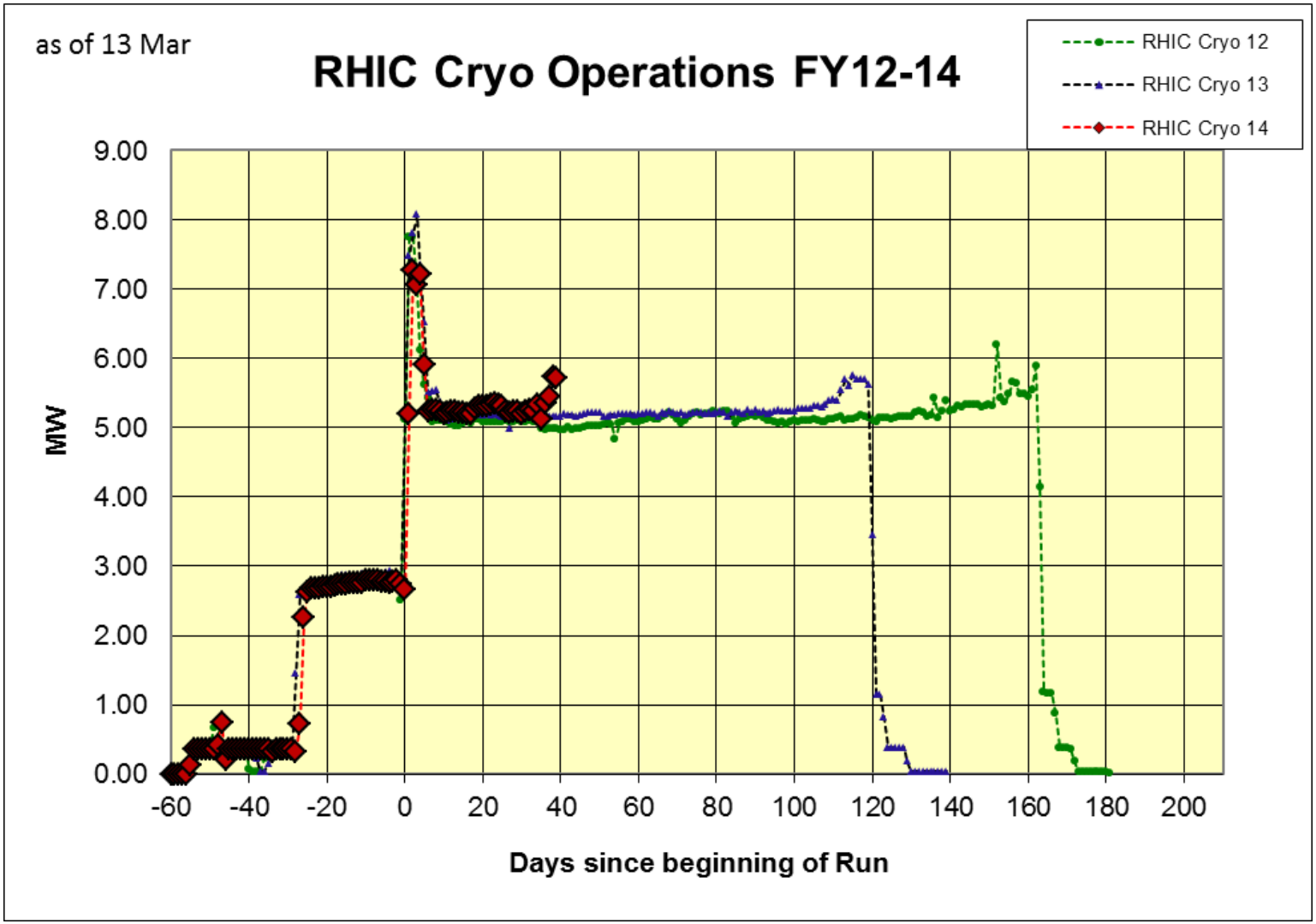


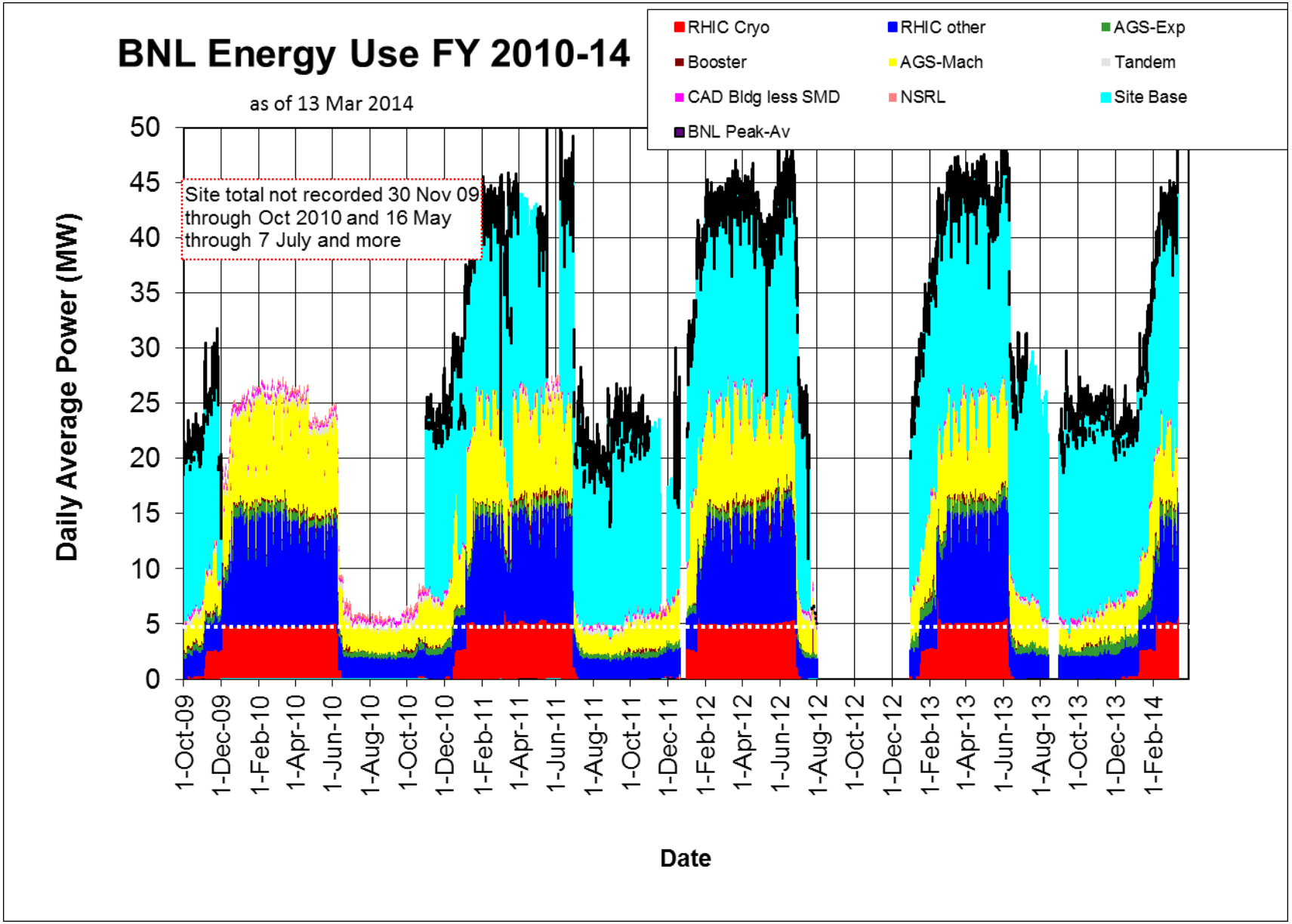
FY 2014 power rebate $ in BNL bank = $0.628M, through Feb




BNL Electricity Cost
$/MWhr without balanced billing
$90
$80
$70
$60
$50
$40
$30
$20
$10
$-
sep
oct
nov
dec
jan
feb
mar
apr
may
june
july
aug
2009
2010
2011
2012
2013
2014

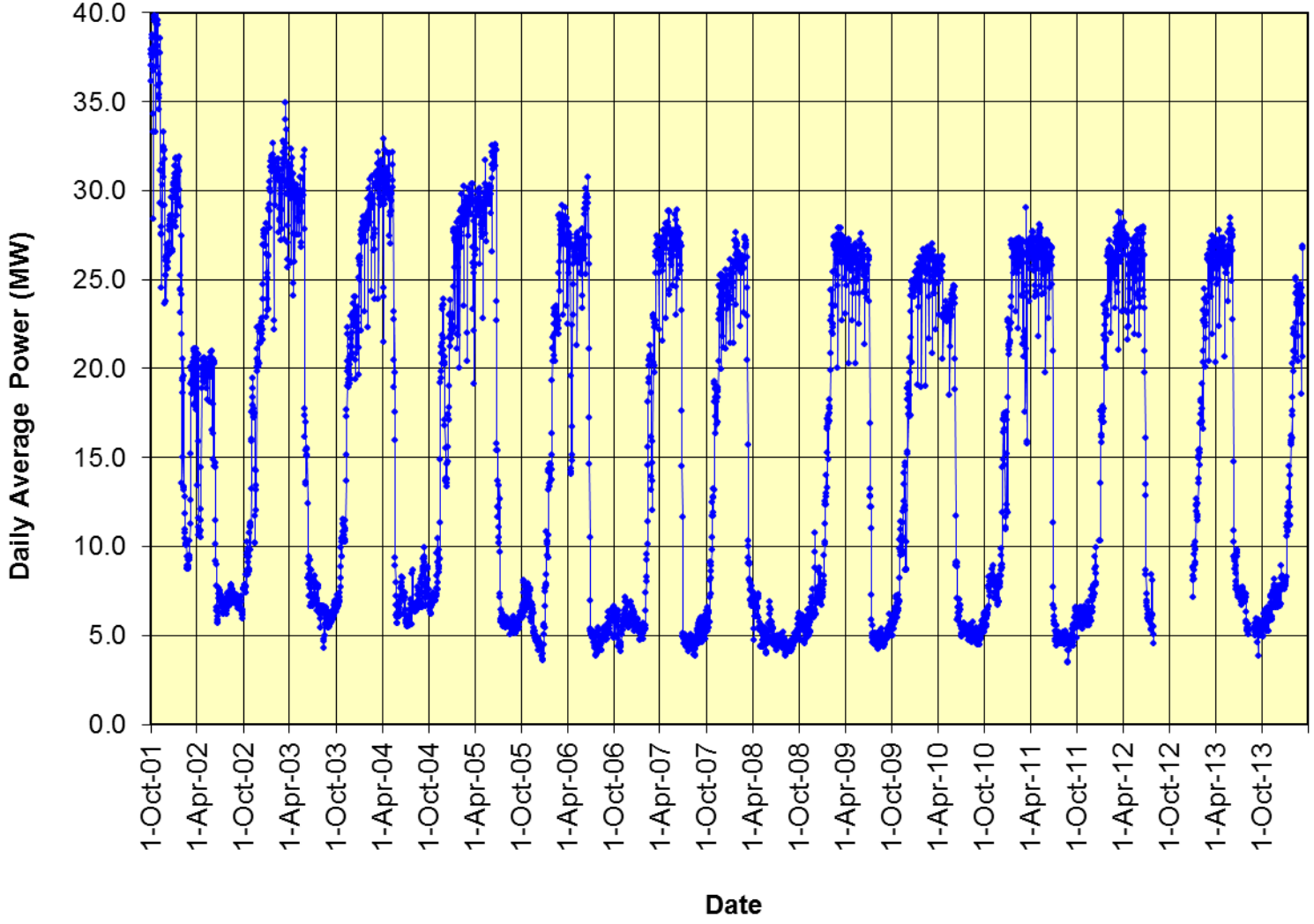

as of 13 Mar
RHIC Operations FY12-14
CAD Power 12
CAD Power 13
CAD Power 14
MW
30.00
25.00
20.00
15.00
10.00
5.00
0.00
-60
-40
-20
0
20
40
60
80
100
120
140
160
180
200
Days since beginning of Run


as of 13 Mar
RHIC Cryo Operations FY12-14
RHIC Cryo 12
RHIC Cryo 13
RHIC Cryo 14
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 2010-14
as of 13 Mar 2014
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-Dec-09
1-Feb-10
1-Apr-10
1-Jun-10
1-Aug-10
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
Date

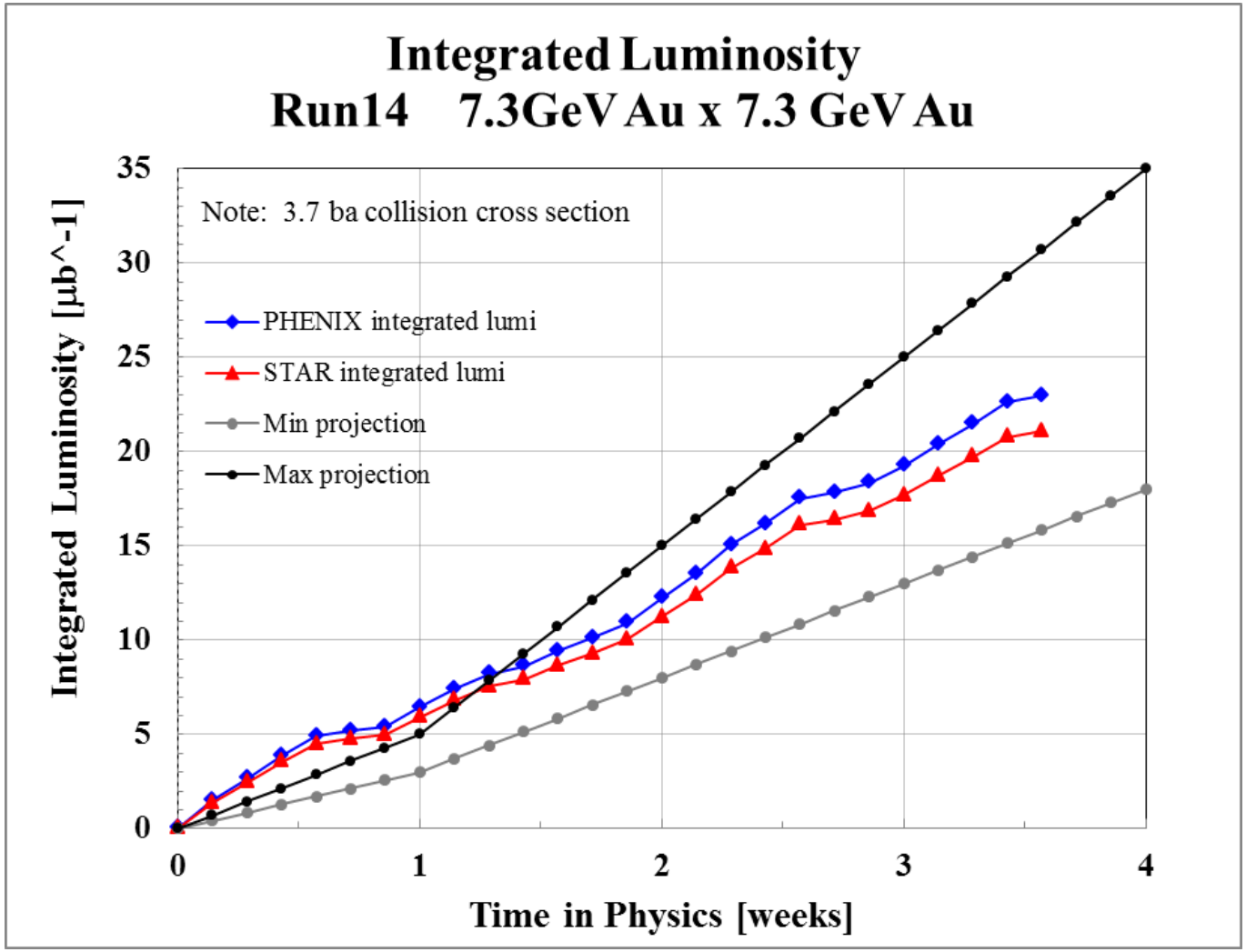
as of 13 Mar 2013

C-AD Energy Use FY 2002-14

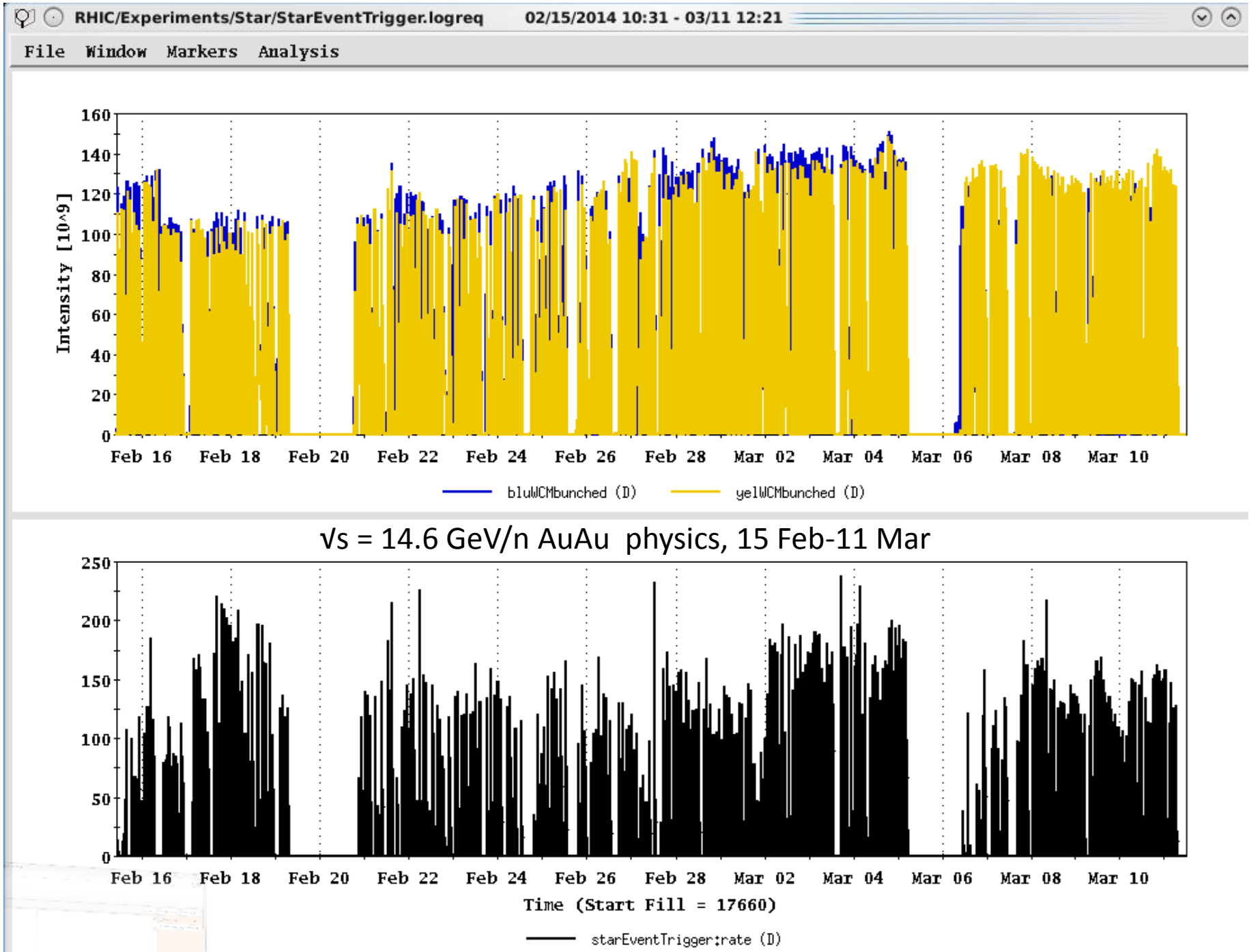


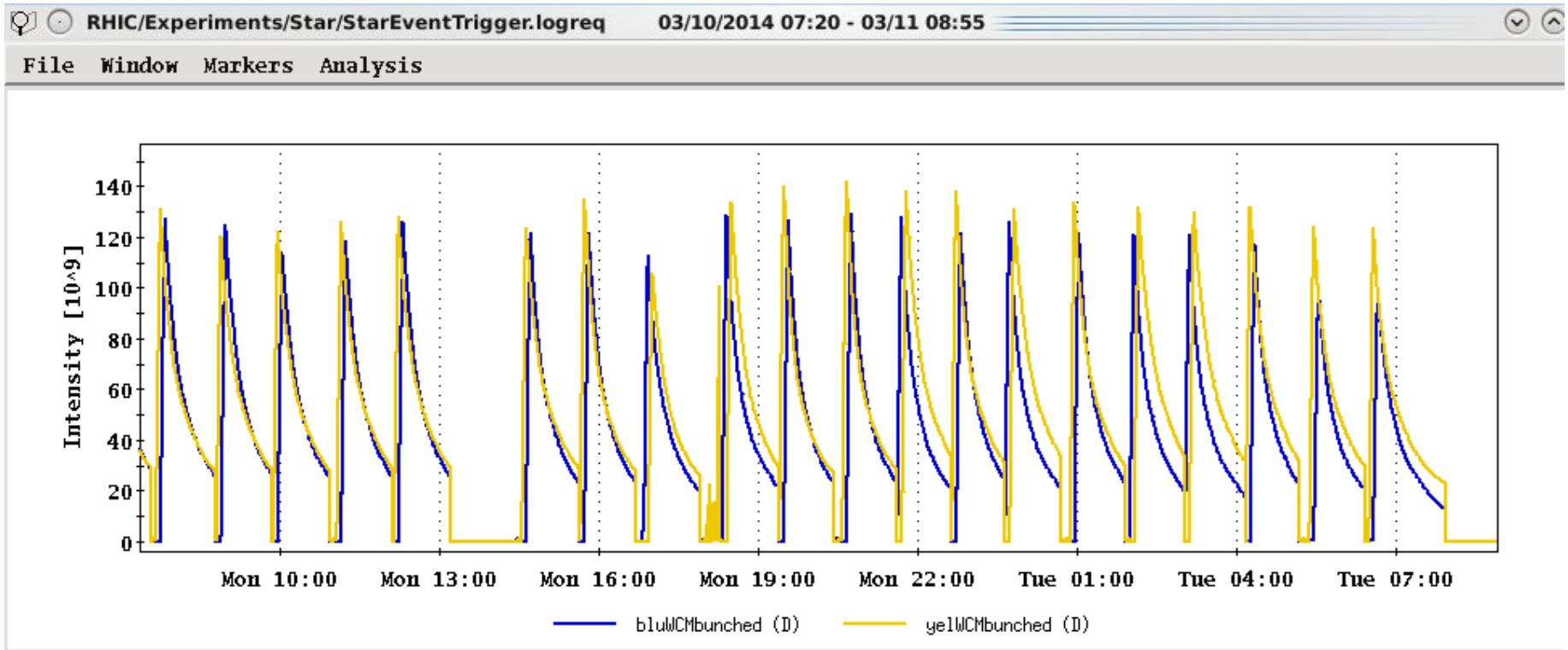
Through final fill 18010, 11 Mar 2015

max/min projections from Fischer et.al. "RHIC Collider Projections (FY2014-FY2018)", 4 June 2013

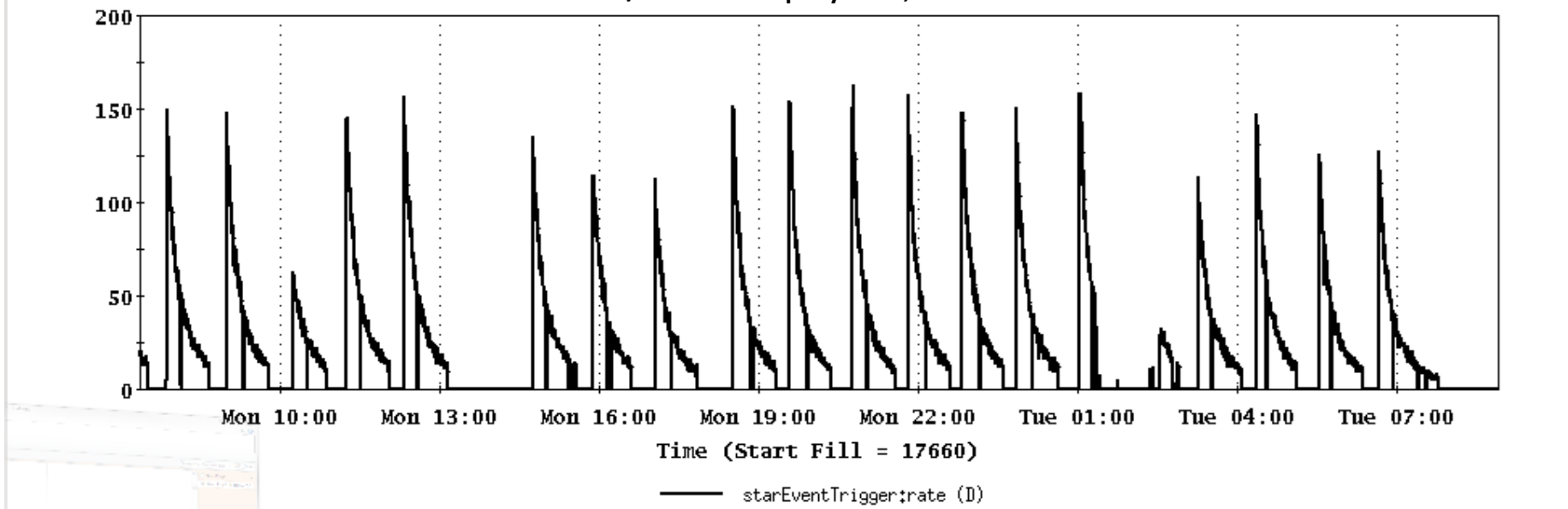


From Ingrassia,
http://www.cadops.bnl.gov/AGS/Operations/Run14/


RHIC/Experiments/Star/StarEventTrigger.logreq
02/15/2014 10:31 - 03/11 12:21
File Window Markers Analysis
Intensity [10^9]
160
140
120
100
80
60
40
20
0
Feb 16 Feb 18 Feb 20 Feb 22 Feb 24 Feb 26 Feb 28 Mar 02 Mar 04 Mar 06 Mar 08 Mar 10
bluWCMbunched (D)
yelWCMbunched (D)
√s = 14.6 GeV/n AuAu physics, 15 Feb-11 Mar
250
200
150
100
50
0
Feb 16 Feb 18 Feb 20 Feb 22 Feb 24 Feb 26 Feb 28 Mar 02 Mar 04 Mar 06 Mar 08 Mar 10
Time (Start Fill = 17660)
starEventTrigger:rate (D)



√s = 14.6 GeV/n AuAu physics, last 24 hours



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

Scheduling Physicist: Chuyu Liu

C-A Operations-FY14

4 Mar 14

planned, budget permitting

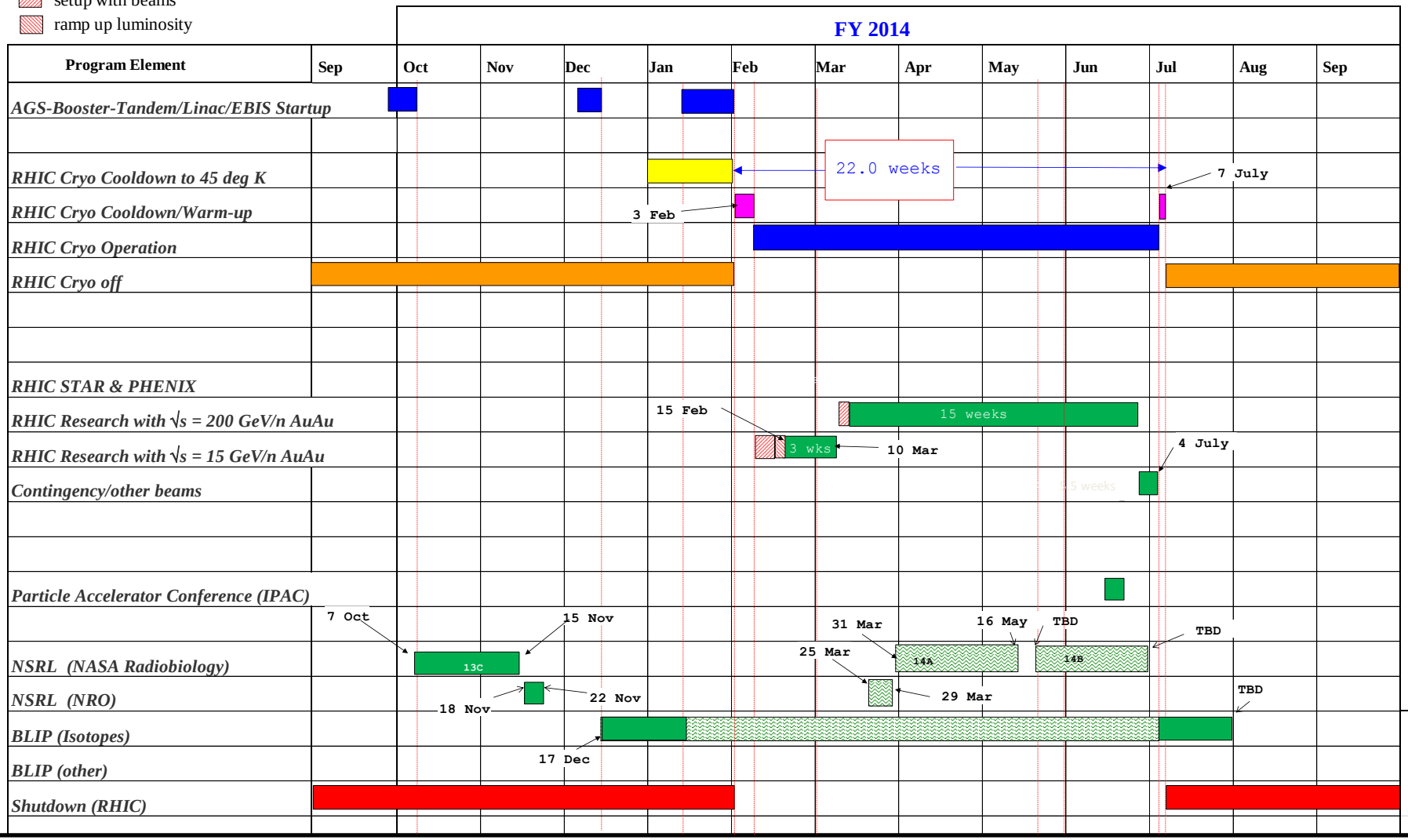


Table 2: Maximum luminosities that can be reached after a sufficiently long running period. The beam energy is stated. Other ion combinations can be estimated on demand. For species combinations not yet run the minimum luminosities are approximately 50% of the maximum.

Mode	Beam energy [GeV/n]	No of colliding bunches	Ions/bunch [10^9]	β^* [m]	Emittance [mm]	L_{peak} [$cm^{-2}s^{-1}$]	$L_{store\ avg}$ [$cm^{-2}s^{-1}$]	L_{week}
Pb-Pb	98.3	111	1.1	0.7	23→8	20×10^{26}	17×10^{26}	0.6 nb^{-1}
Au-Au	100	111	1.4	0.7	23→8	40×10^{26}	35×10^{26}	1.2 nb^{-1}
h-Au ★	100	111	20 / 1.3	0.8	20→23	8×10^{28}	5×10^{28}	16 nb^{-1}
d-Au ★	100	111	110 / 1.4	0.8	17→25	47×10^{28}	28×10^{28}	95 nb^{-1}
p↑-C	100	111	180 / 20	0.8	18→23	10×10^{32}	7×10^{32}	2.3 pb^{-1}
p↑-Cu	100	111	180 / 4.0	0.8	18→23	200×10^{28}	150×10^{28}	475 nb^{-1}
p↑-Au	100	111	180 / 1.4	0.8	18→23	70×10^{28}	50×10^{28}	165 nb^{-1}
p↑-p↑*	100	107	160	0.85	17→25	65×10^{30}	38×10^{30}	14 pb^{-1}
p↑-p↑*	255	107	200	0.65	20→25	280×10^{30}	170×10^{30}	56 pb^{-1}

★ h (helion) – nucleus of the ^{3}He atom; d (deuteron) – nucleus of the ^{2}H atom; p (proton) – nucleus of the ^{1}H atom.
* We expect that an intensity- and time-averaged store polarization *P* of up to 65%, as measured by the H jet, can be reached at 100 GeV. At 255 GeV we expect the polarization *P* to reach up to 57%. In Run-11 PHENIX had 107 and STAR 102 colliding bunches.

Fischer et. al. “RHIC Collider Projections (FY 2014 – FY 2018)”, 4 June 2013

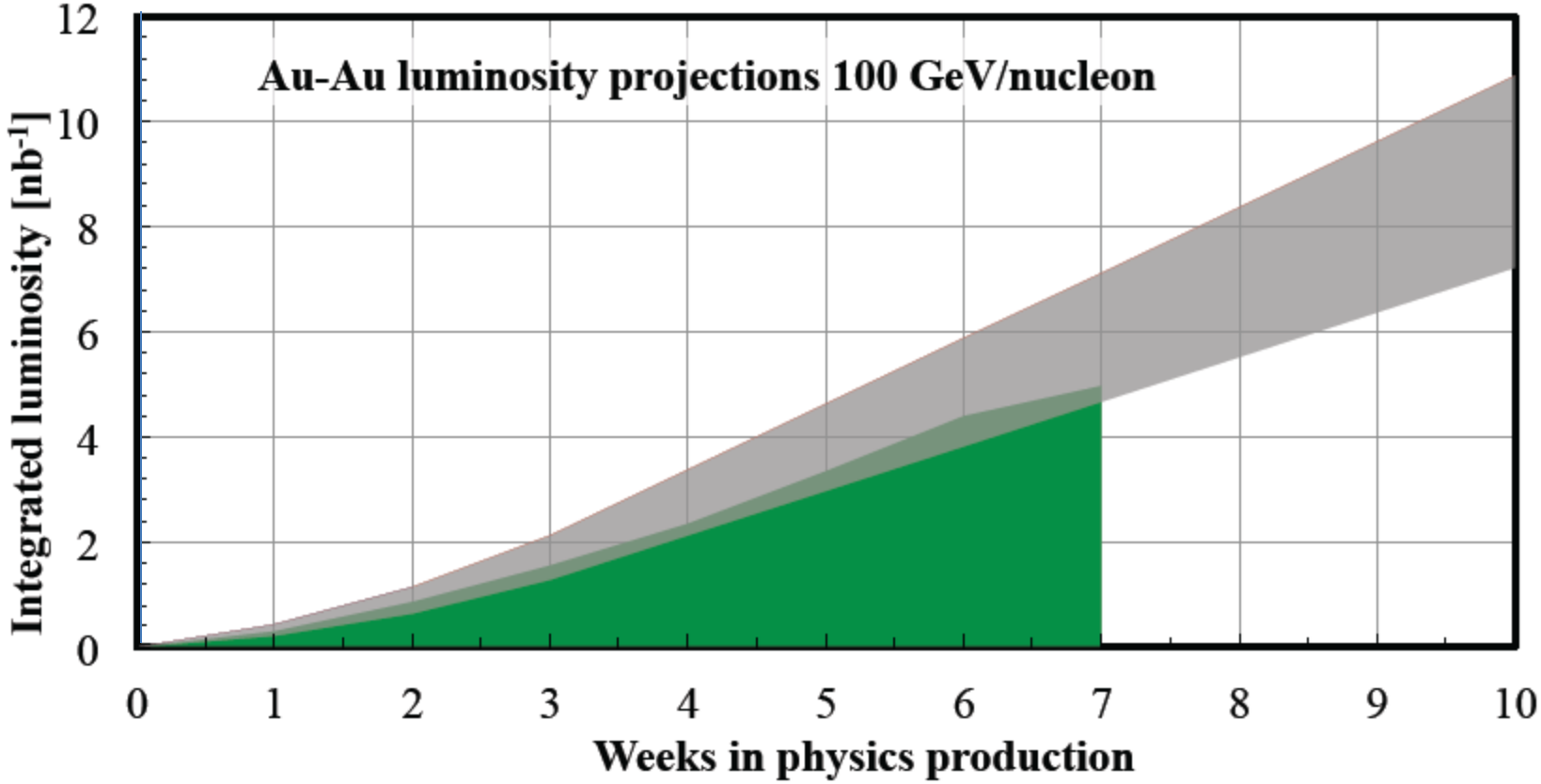


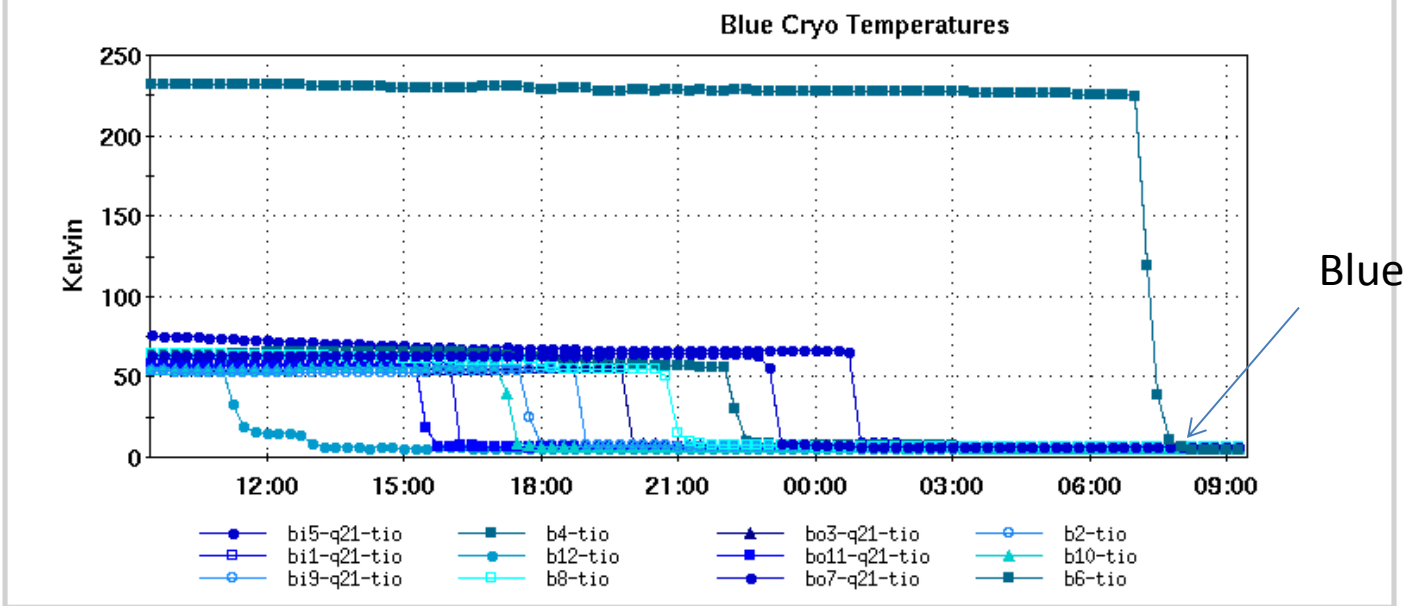
Figure 4: Projected minimum and maximum integrated luminosities for Au-Au at 100 GeV/nucleon.

Fischer et. Al. “RHIC Collider Projections (FY 2014 – FY 2018)”, 4 June 2013

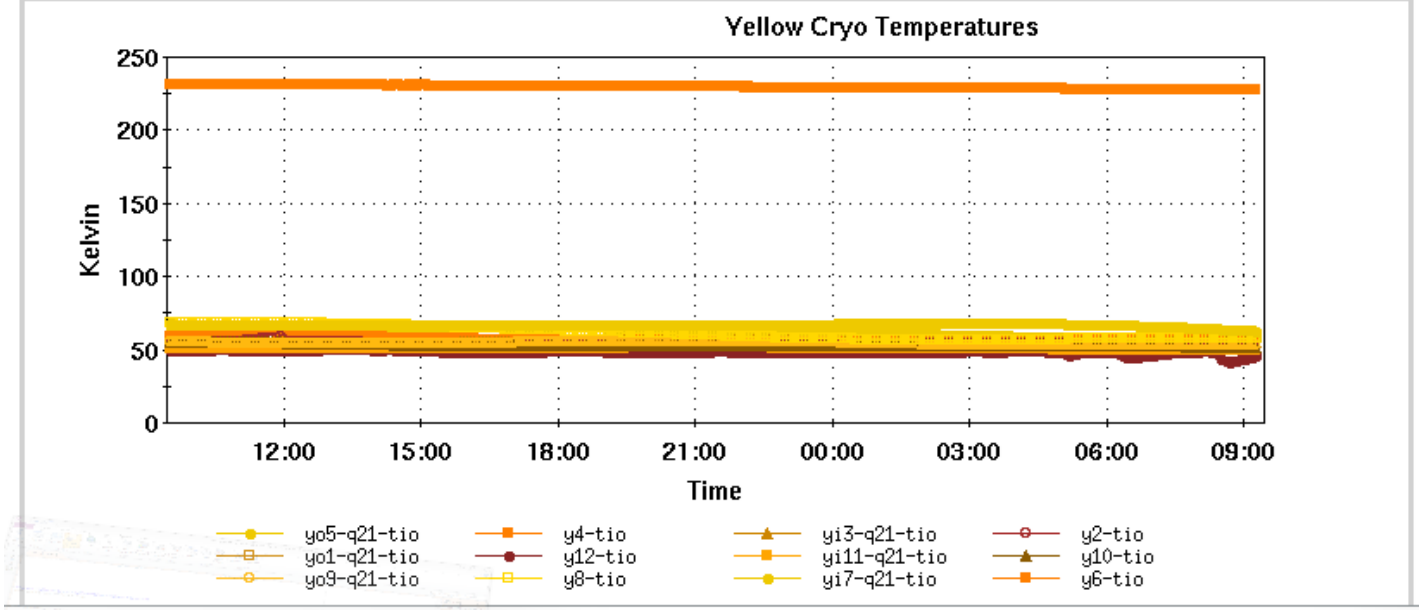
Ring Summary (14 days) Sector Plots (1 day) Sector Plots (14 days)

4 Feb 2014

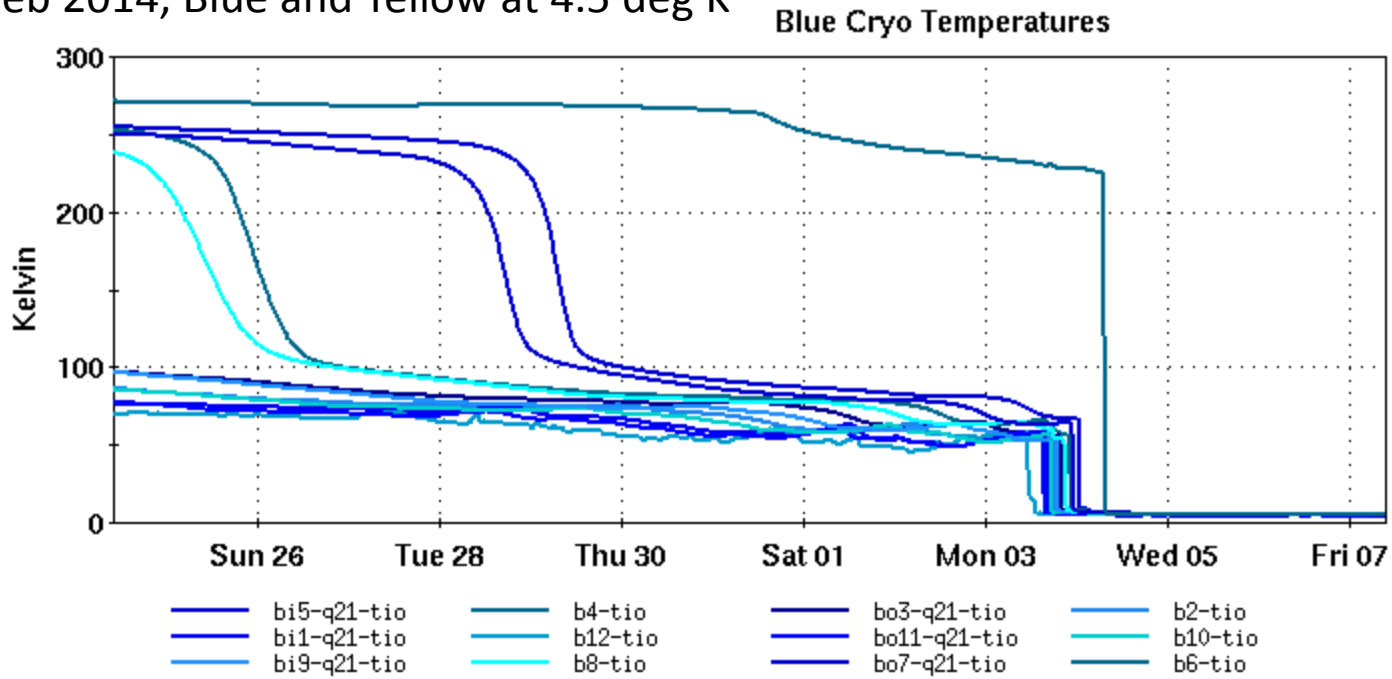
File Window Markers Analysis

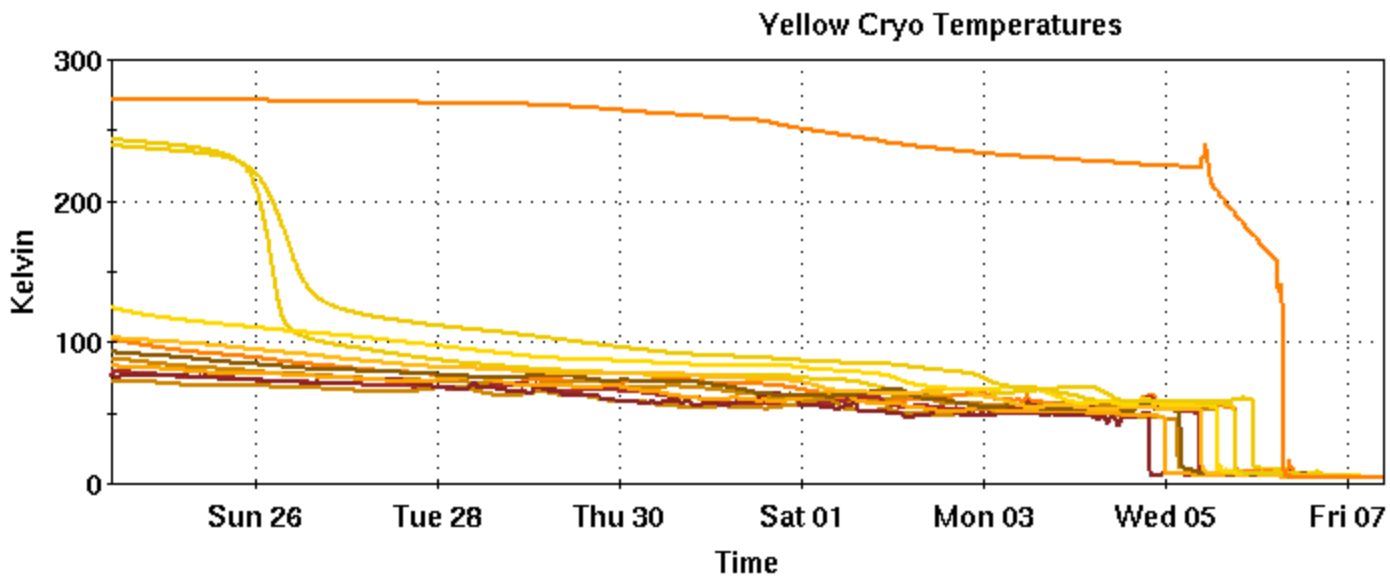


Blue at 4.5 deg



7 Feb 2014, Blue and Yellow at 4.5 deg K





Who's Who for 2014

RHIC Au-Au Run Coordinator Operations:	Gregory Marr	gmarr@bnl.gov	631-344-7810 (office)
	Vincent Schoefer	schoefer@bnl.gov	631-344-8453 (office)
	Travis Shrey	shrey@bnl.gov	631-344-7451 (office)
RHIC 7.3 GeV Au-Au Run Coordinator planning:	Christoph Montag	montagc@bnl.gov	631-344-4820 (office)
RHIC 100 GeV Au-Au Run Coordinator planning:	Guillaume Robert-Demolaize	grd@bnl.gov	631-344-8215 (office)
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For example, 20 weeks of RHIC refrigerator operation in FY 2014 could be scheduled in the following way:

Cool-down from 50 K to 4 K	1 week	
Set-up mode 1 (Au-Au at 7.5 GeV/nucleon)	1 week	(no dedicated time for experiments)
Ramp-up mode 1	½ weeks	(8 h/night for experiments)
Data taking mode 1	2 ½ weeks	
Set-up mode 2 (Au-Au at 100 GeV/nucleon)	½ week	(no dedicated time for experiments)
Data taking mode 2 with further ramp-up	10 weeks	
Set-up mode 3 (p↑-p↑ at 100 GeV)	1 week	(no dedicated time for experiments)
Ramp-up mode 3	½ weeks	(8 h/night for experiments)
Data taking mode 3+1 with further ramp-up	2 ½ weeks	
Warm-up	½ week	

From Fischer et. al., RHIC Collider Projections (FY 2014 – FY 2018), 4 June 2013