Run 14 RHIC Machine/Experiments Meeting

6 May 2014

Agenda:

- **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

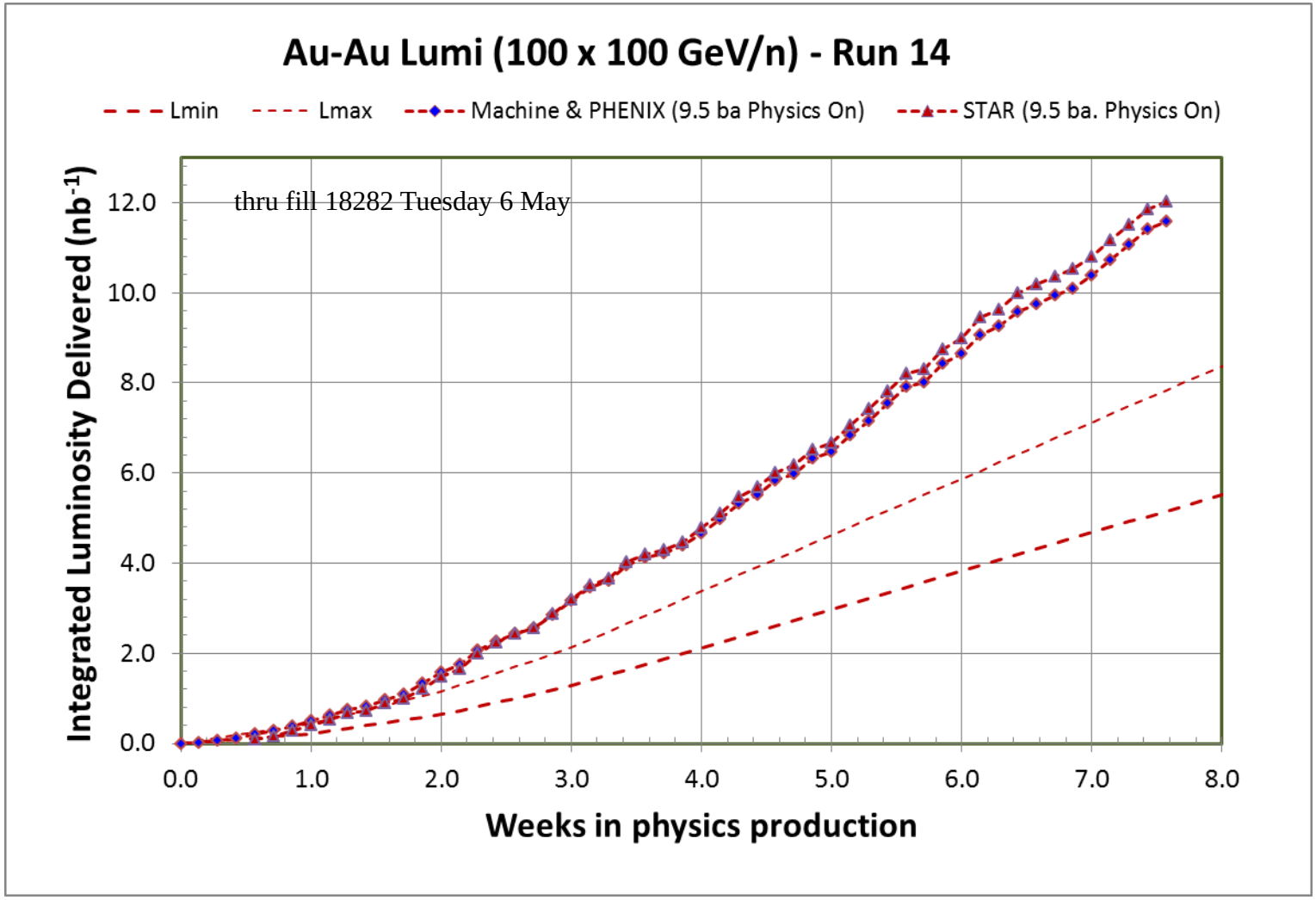
and Fischer et.al. RHIC Collider Projections (FY 2013 – FY 2017), 4 Jun 2013

- ✓ 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)

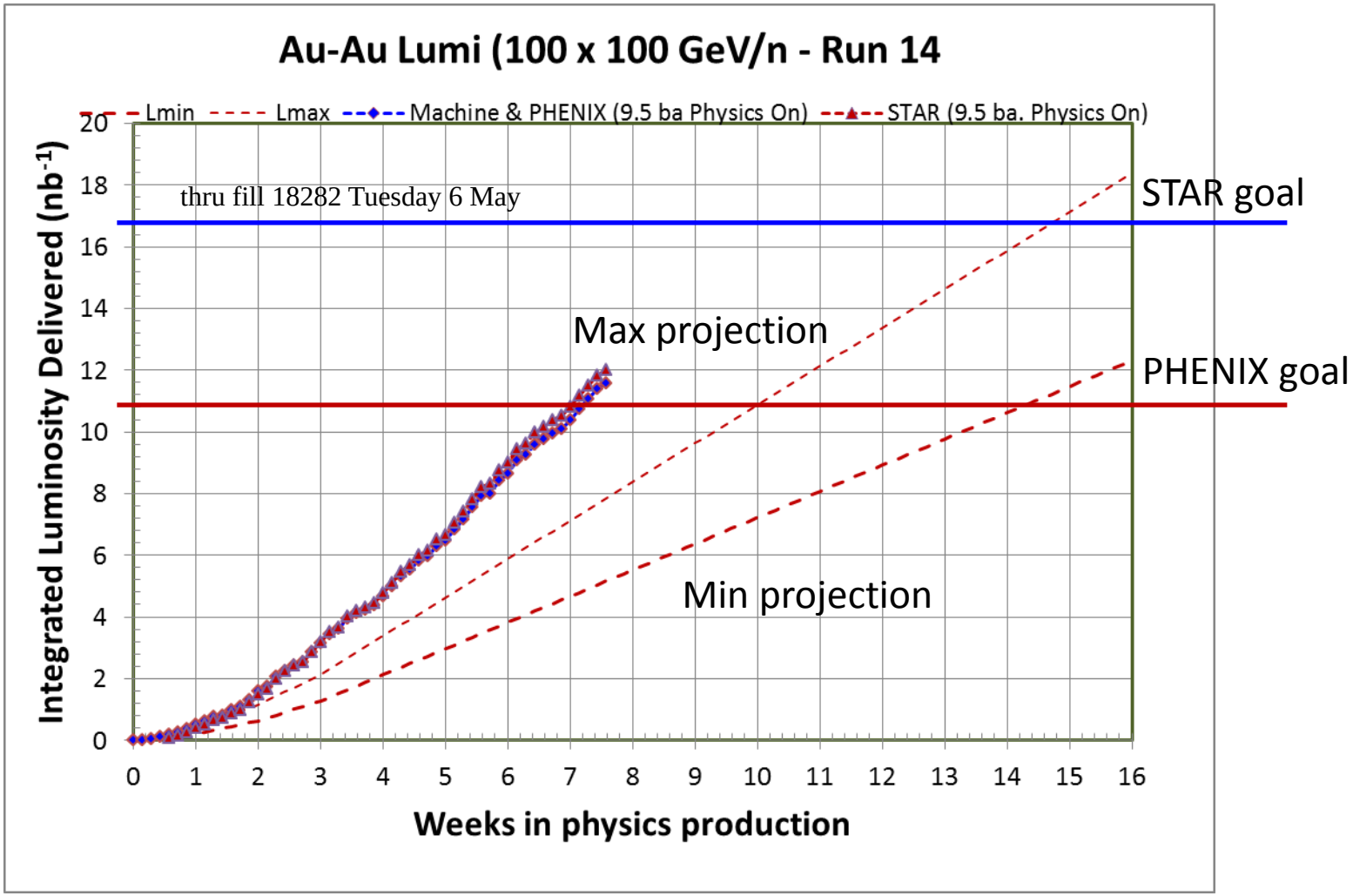
today, 6 May…

- 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

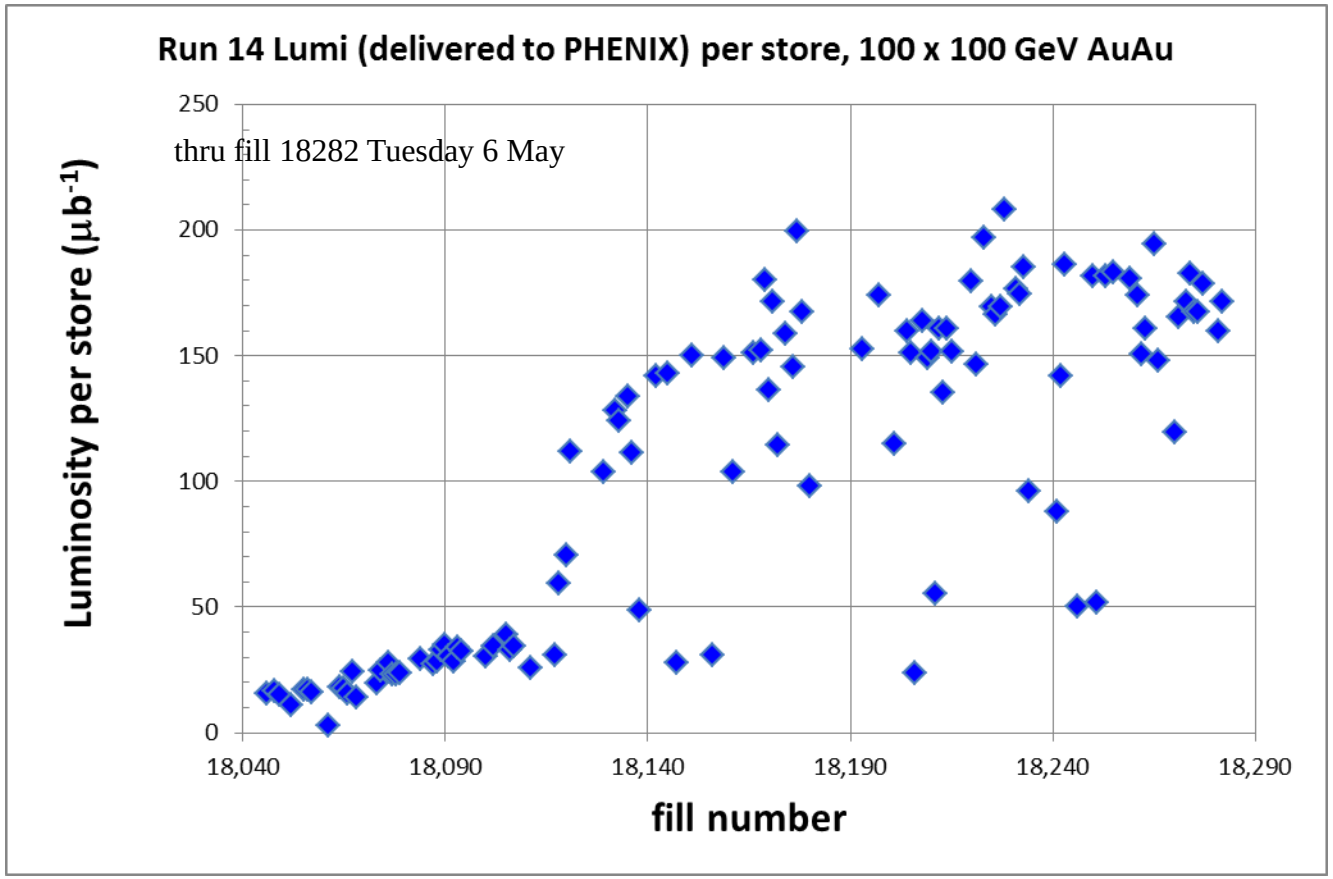
See http://www.rhichome.bnl.gov/AP/RHIC2014/ for the Run Coordinator's detailed plan


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 18282 Tuesday 6 May
Integrated Luminosity Delivered (nb-1)
12.0
10.0
8.0
6.0
4.0
2.0
0.0
0.0
1.0
2.0
3.0
4.0
5.0
6.0
7.0
8.0
Weeks in physics production

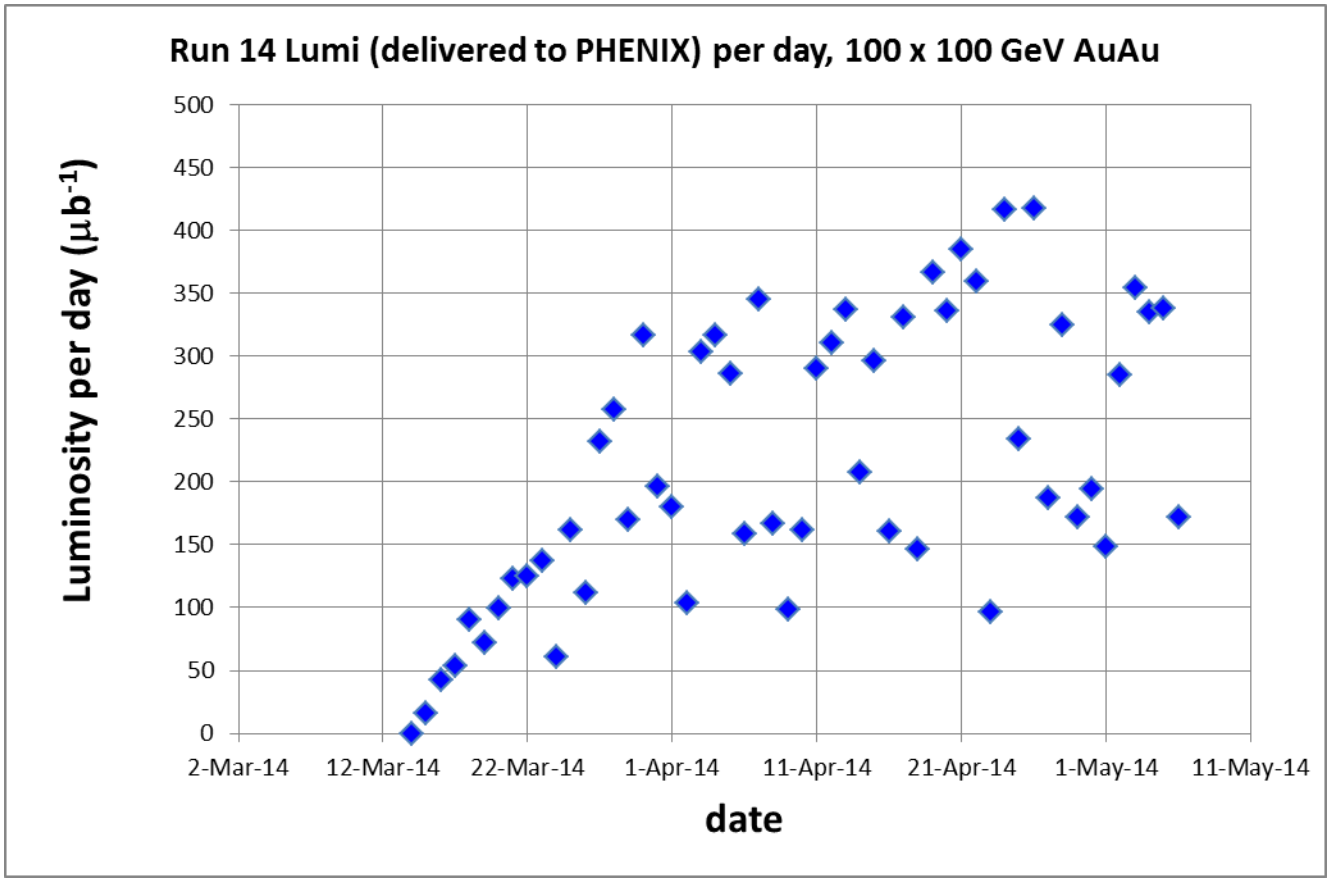
We should update goals soon!



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

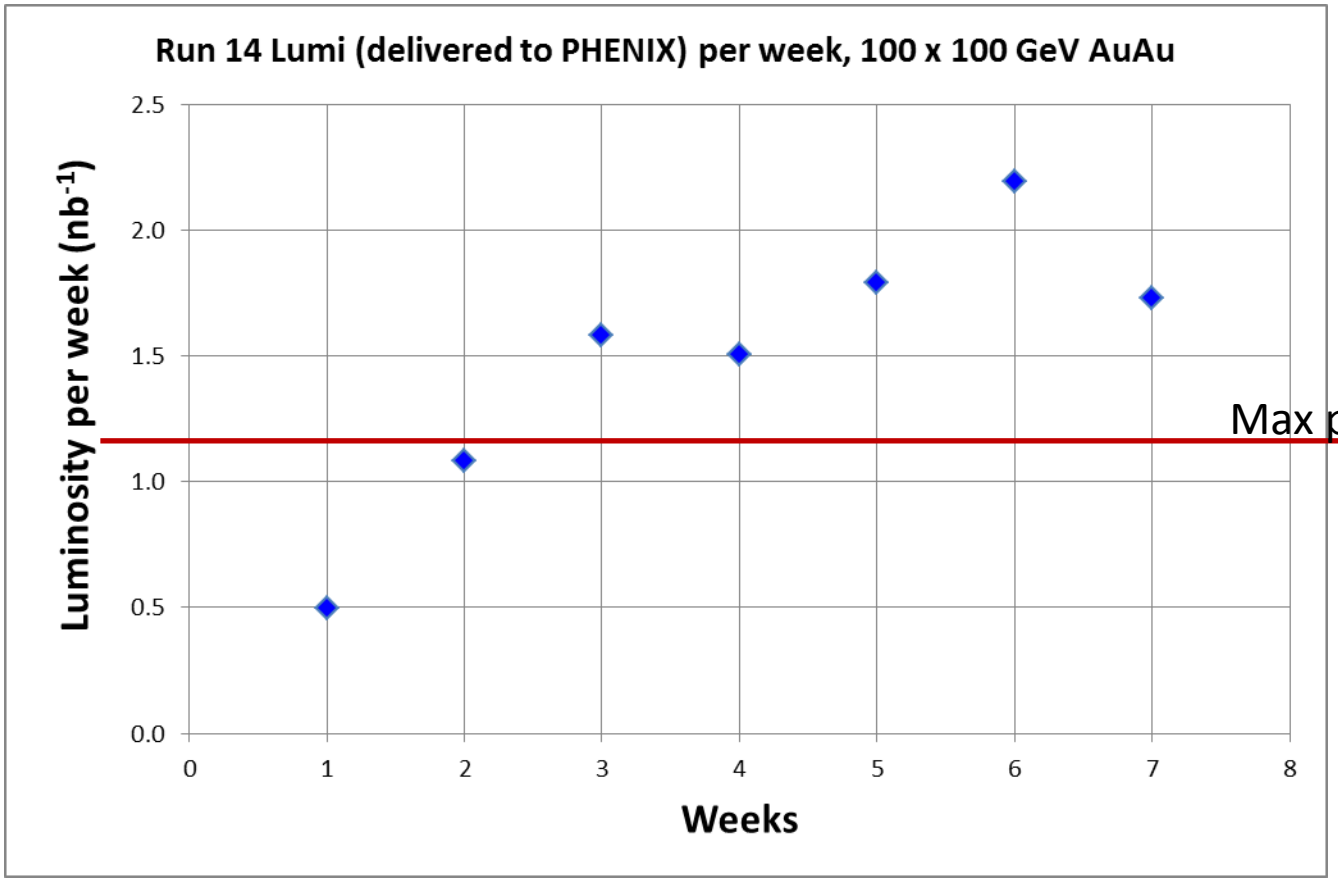

Run 14 Lumi (delivered to PHENIX) per store, 100 x 100 GeV AuAu
thru fill 18282 Tuesday 6 May
Luminosity per store (μb-1)
250
200
150
100
50
0
18,040
18,090
18,140
18,190
18,240
18,290
fill number

thru fill 18282 Tuesday 6 May



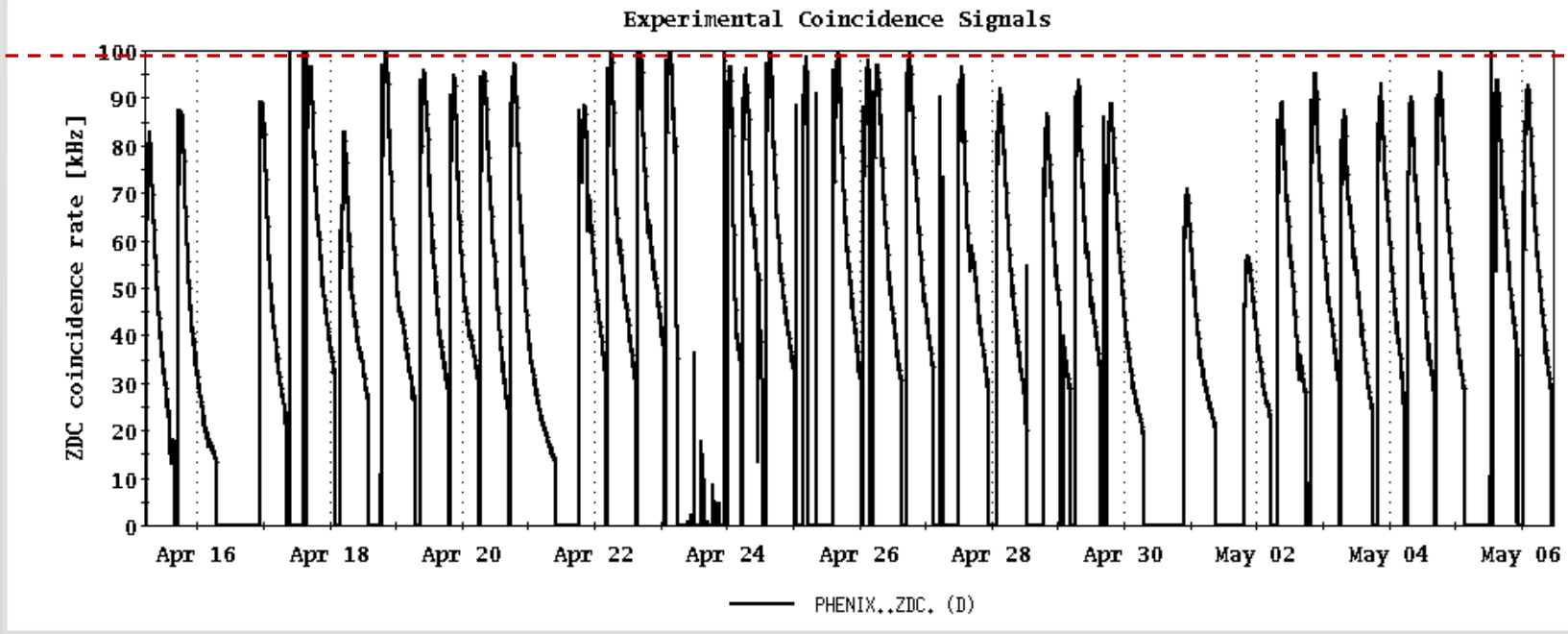
Fischer et. al. “RHIC Collider Projections (FY 2014 – FY 2018)”, 4 June 2013

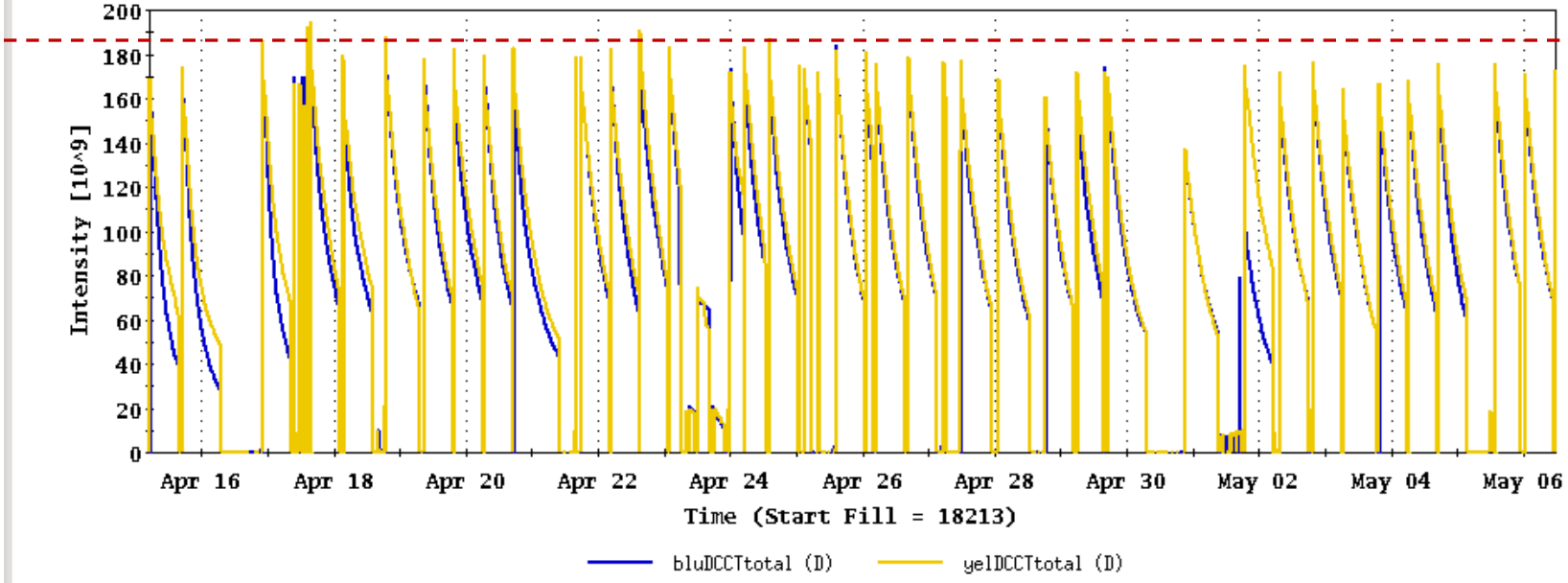
Through 2 May stores

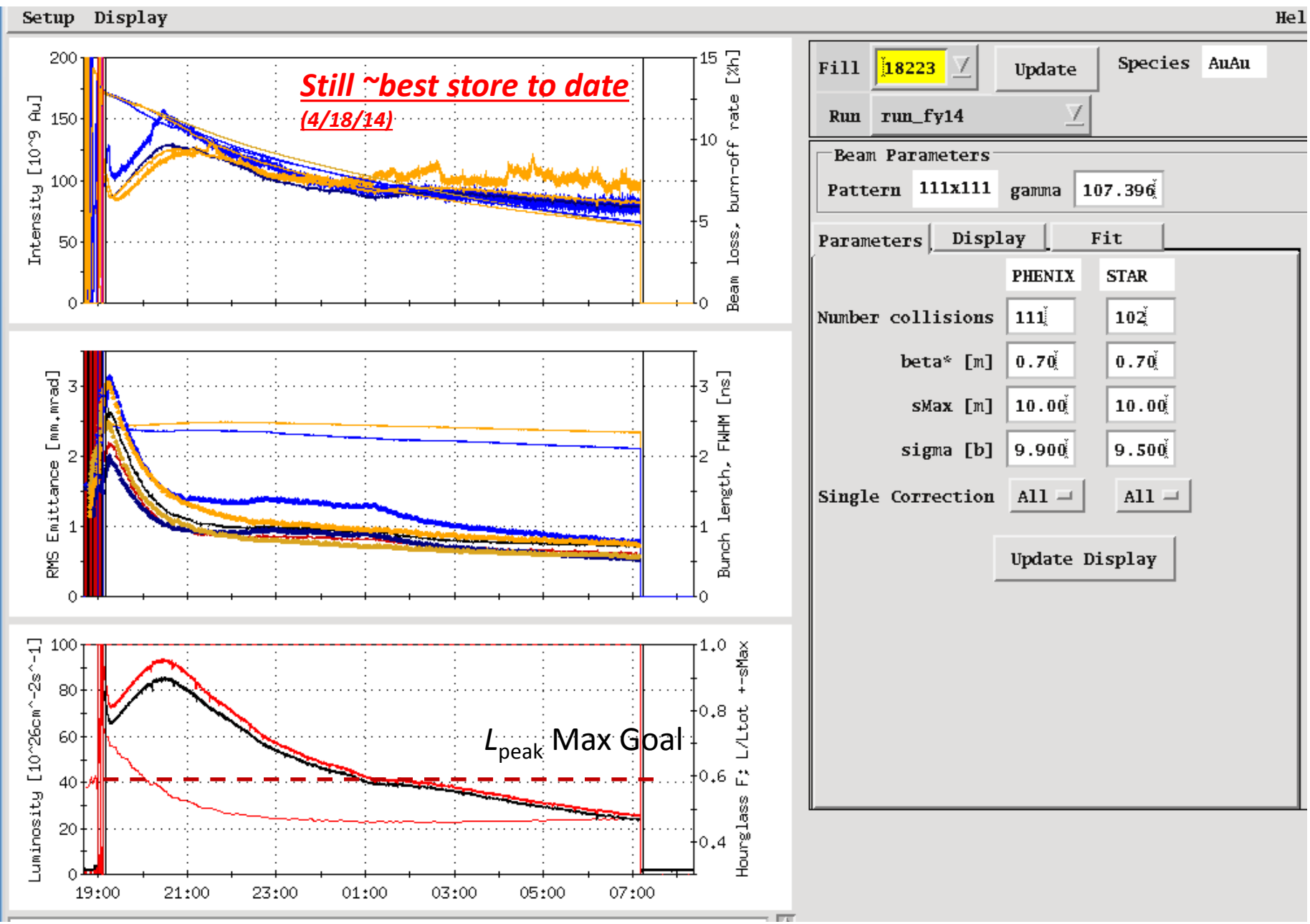


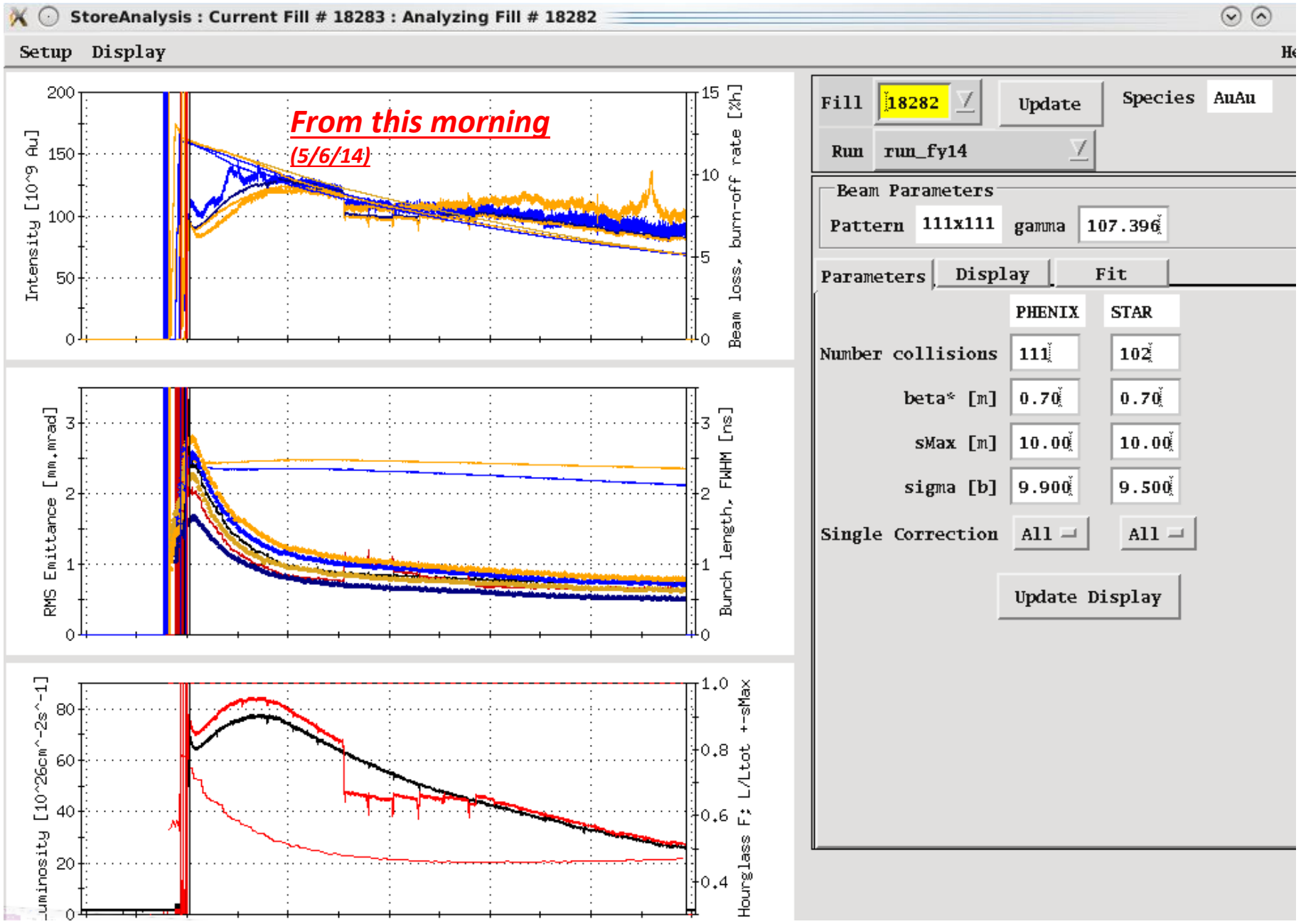
Fischer et. al. “RHIC Collider Projections (FY 2014 – FY 2018)”, 4 June 2013

File Window Markers Analysis



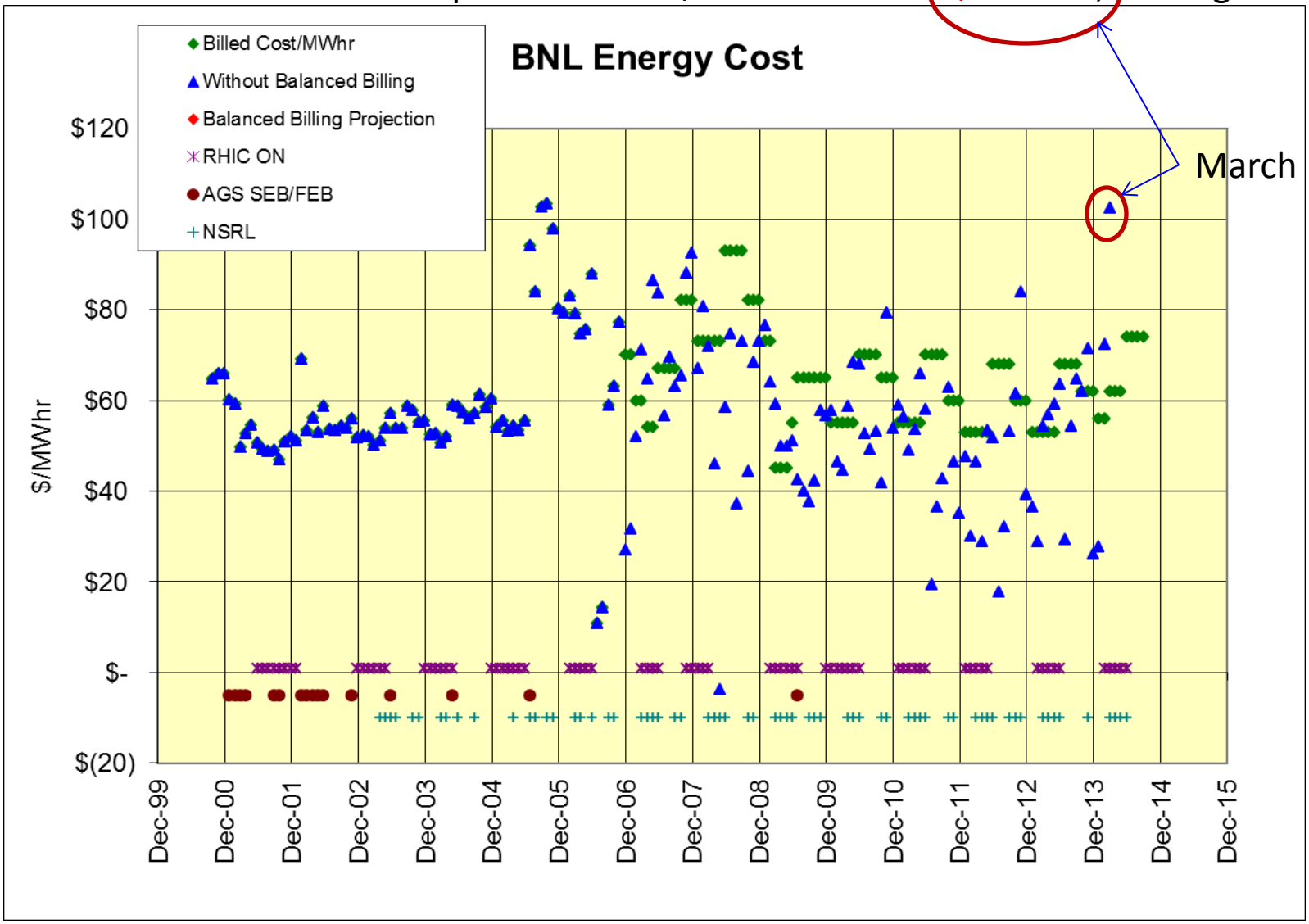


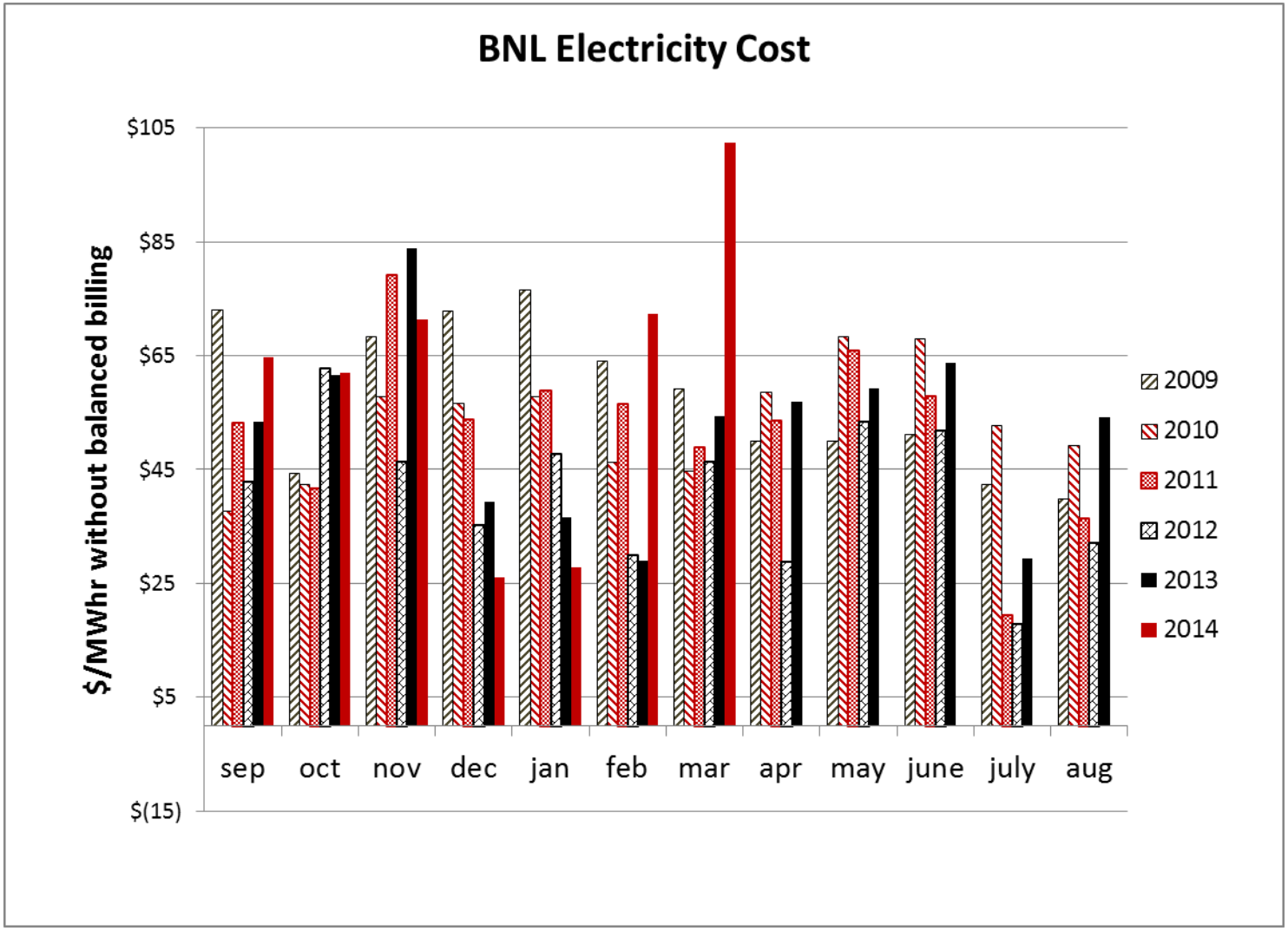

Setup Display
Hel
Still ~best store to date
(4/18/14)
Intensity [10^9 Au]
Beam loss, burn-off rate [%/h]
RMS Emittance [mm.mrad]
Bunch length, FWHM [ns]
Luminosity [10^26cm^-2s^-1]
Hourglass F; L/Ltot +-sMax
L_{peak} Max Goal
19:00
21:00
23:00
01:00
03:00
05:00
07:00
Fill 18223
Update
Species AuAu
Run 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


StoreAnalysis : Current Fill # 18283 : Analyzing Fill # 18282
Setup
Display
From this morning
(5/6/14)
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
Fill
18282
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

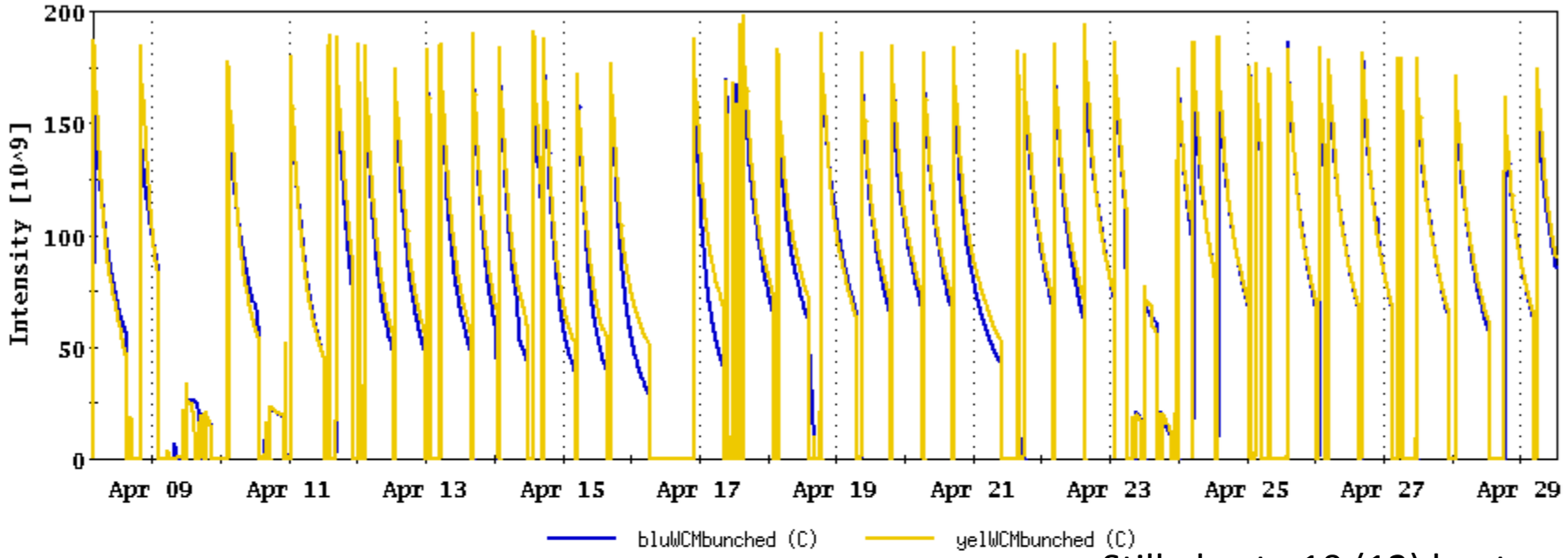
Archive

FY 2014 power rebate $ in BNL bank = -$0.680M, through Mar

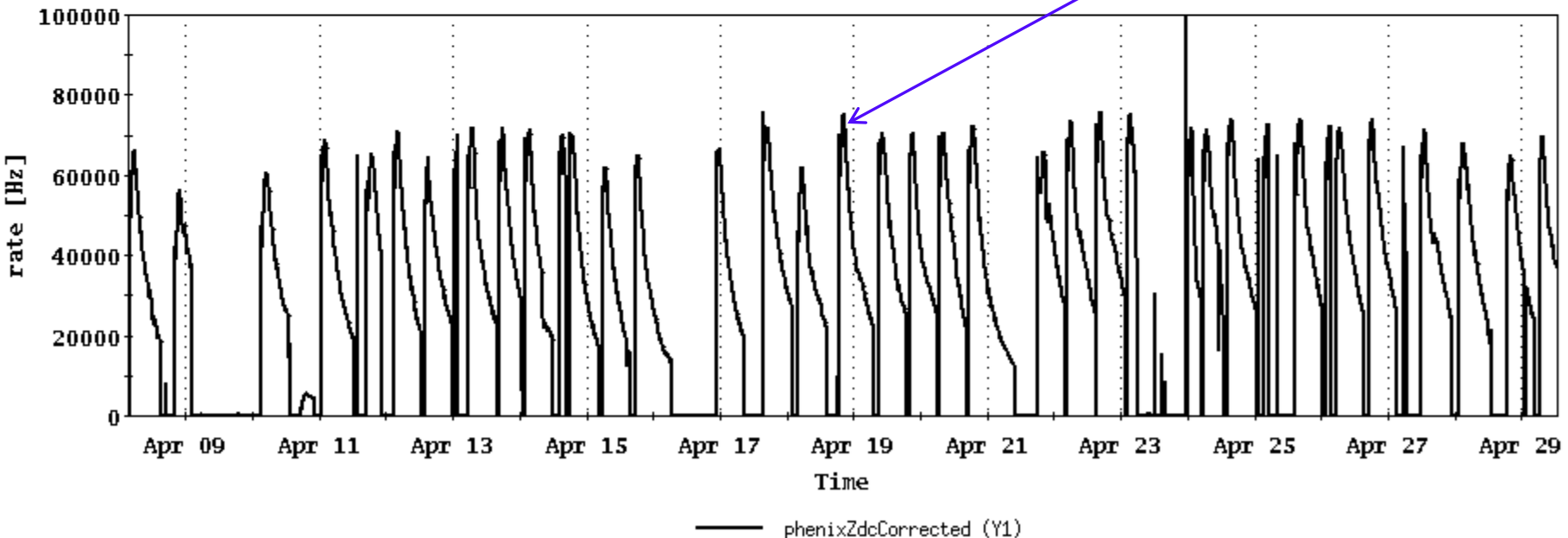



BNL Electricity Cost
$/MWhr without balanced billing
$105
$85
$65
$45
$25
$5
$(15)
sep
oct
nov
dec
jan
feb
mar
apr
may
june
july
aug
2009
2010
2011
2012
2013
2014

File Window Markers Analysis



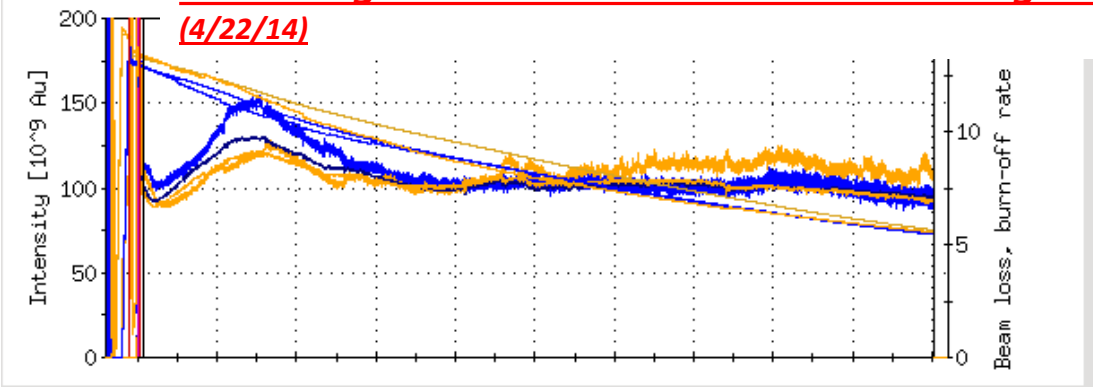
Still ~best ~10 (12) hr store

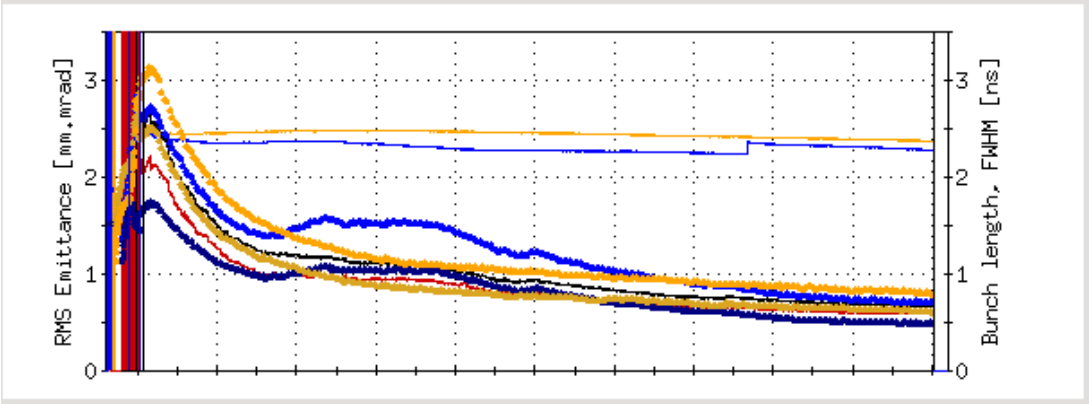


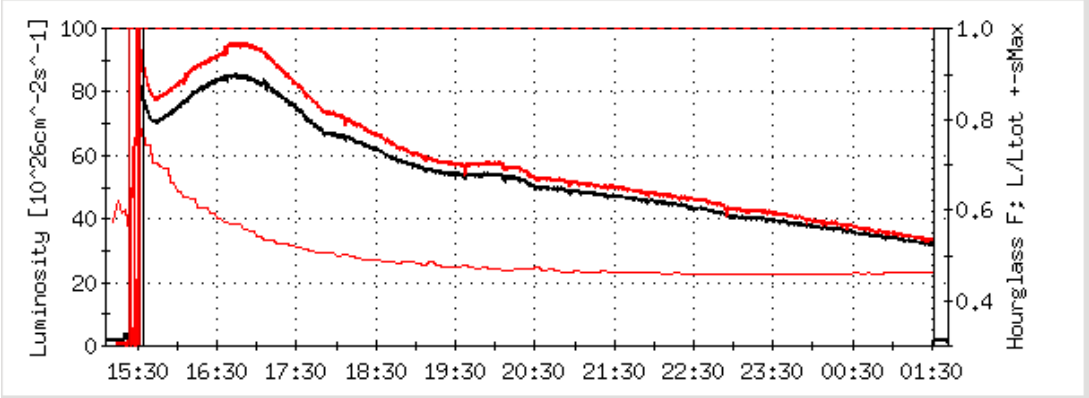
Setup Dis

Another good store – a lot more about as good!

(4/22/14)








```
Tue Apr 29 12:37:22 2014  -- INFO : Phenix Int Lumi = 193339
Tue Apr 29 12:37:22 2014  -- INFO :  Star avg Lumi = 57979
Tue Apr 29 12:37:22 2014  -- INFO :  Star Int Lumi = 208077
```

l 18233 Update Species AuAu

Run run_fy14

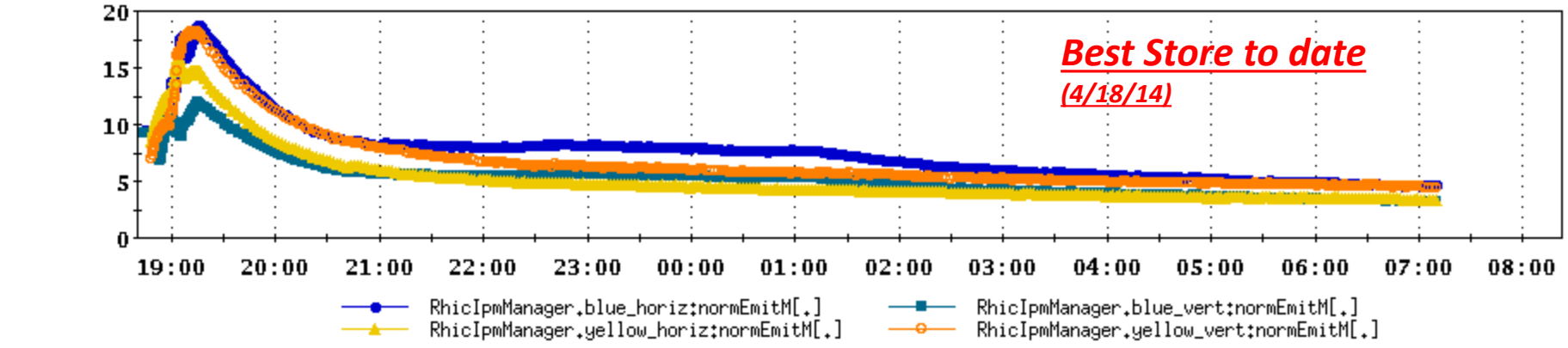
Beam Parameters

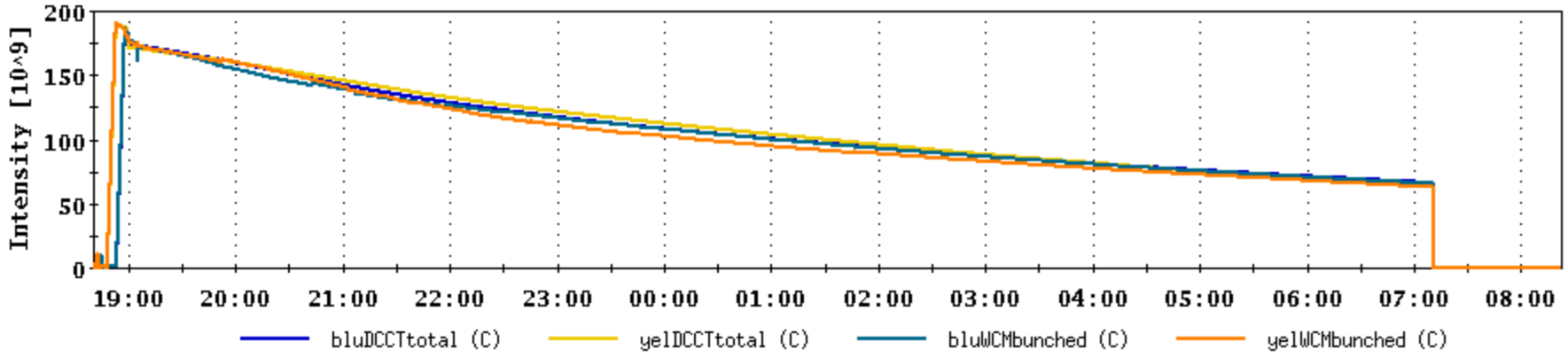
Pattern 111x111 gamma 107.396

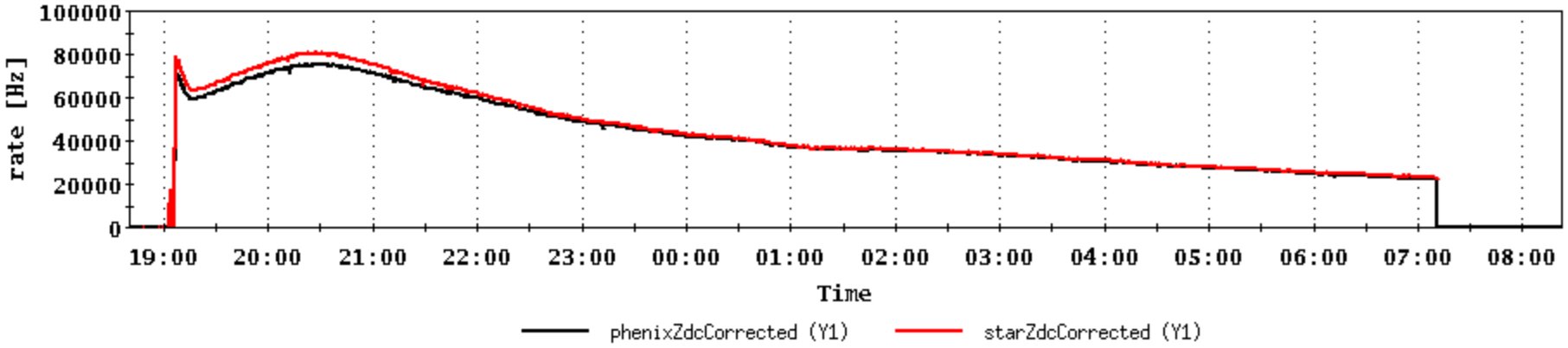
Parameters | Display | Fit

	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


Best Store to date
(4/18/14)
20
15
10
5
0
19:00
20:00
21:00
22:00
23:00
00:00
01:00
02:00
03:00
04:00
05:00
06:00
07:00
08:00
RhicIpmManager.blue_horiz:normEmitM[.]
RhicIpmManager.yellow_horiz:normEmitM[.]
RhicIpmManager.blue_vert:normEmitM[.]
RhicIpmManager.yellow_vert:normEmitM[.]


Intensity [10^9]
200
150
100
50
0
19:00
20:00
21:00
22:00
23:00
00:00
01:00
02:00
03:00
04:00
05:00
06:00
07:00
08:00
bluDCCTtotal (C)
yelDCCTtotal (C)
bluWCMbunched (C)
yelWCMbunched (C)


rate [Hz]
100000
80000
60000
40000
20000
0
19:00
20:00
21:00
22:00
23:00
00:00
01:00
02:00
03:00
04:00
05:00
06:00
07:00
08:00
Time
phenixZdcCorrected (Y1)
starZdcCorrected (Y1)

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

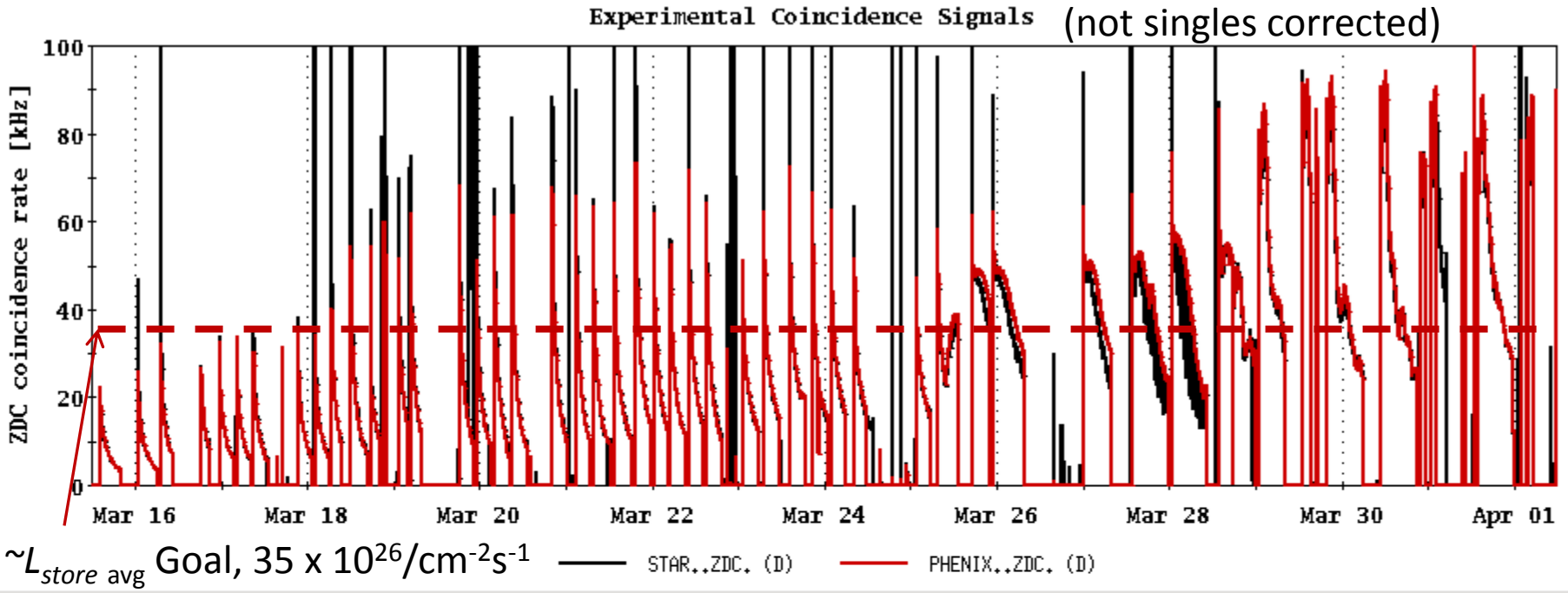
STAR

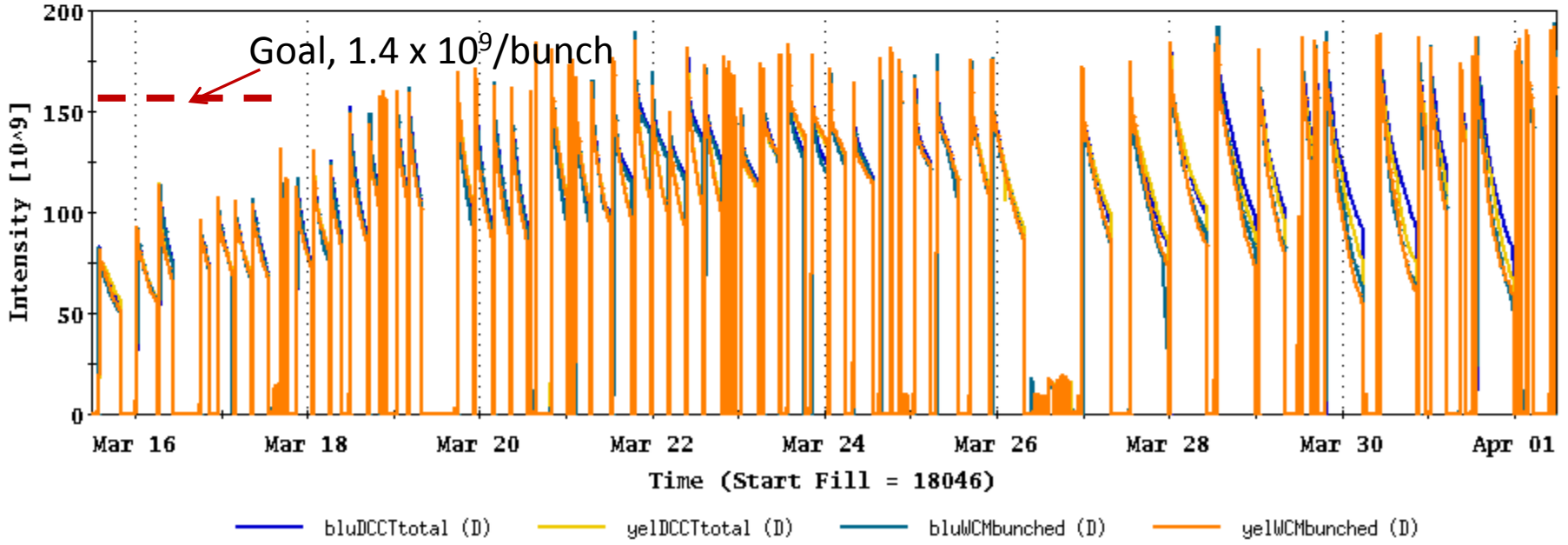
- Au+Au @ 200 GeV for 14 weeks, L= 10 nb^{-1} recorded, 10^9 min bias triggers within |z| < 5 cm] → ($2x10^9$ triggers required)
  - ~ 60% (should be better) sampling efficiency
  - → 16.7 nb^{-1} delivered

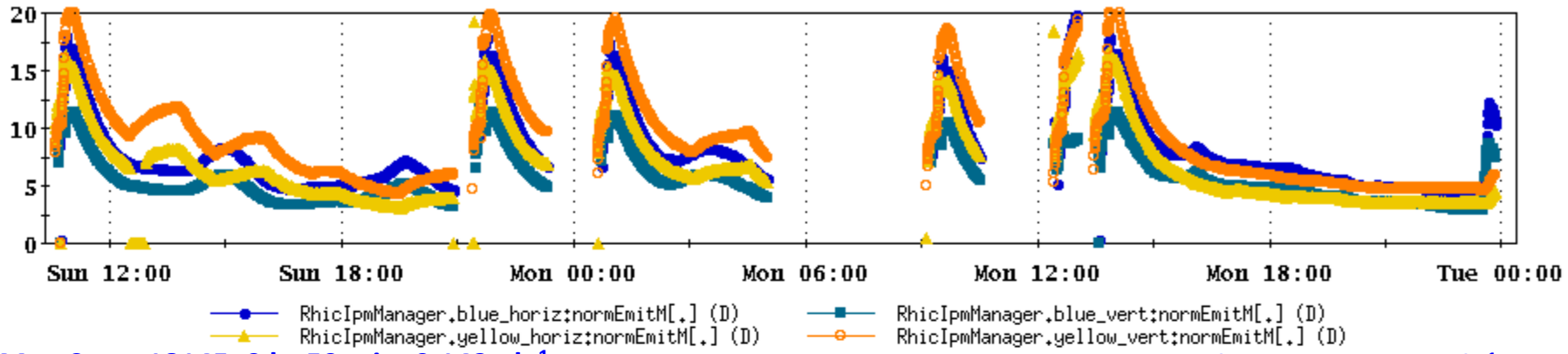
- Au+Au @ 15 GeV for 3 weeks, 150M min bias triggers

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**

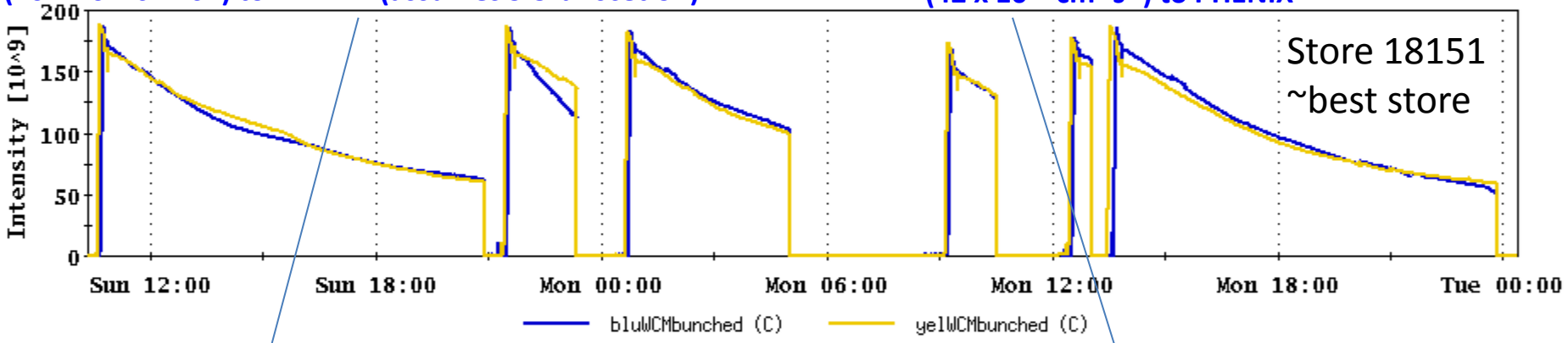

Experimental Coincidence Signals
(not singles corrected)
ZDC coincidence rate [kHz]
100
80
60
40
20
0
Mar 16
Mar 18
Mar 20
Mar 22
Mar 24
Mar 26
Mar 28
Mar 30
Apr 01
~L_{store} avg Goal, 35 x 10^{26}/cm^{-2}s^{-1}
STAR..ZDC. (D)
PHENIX..ZDC. (D)

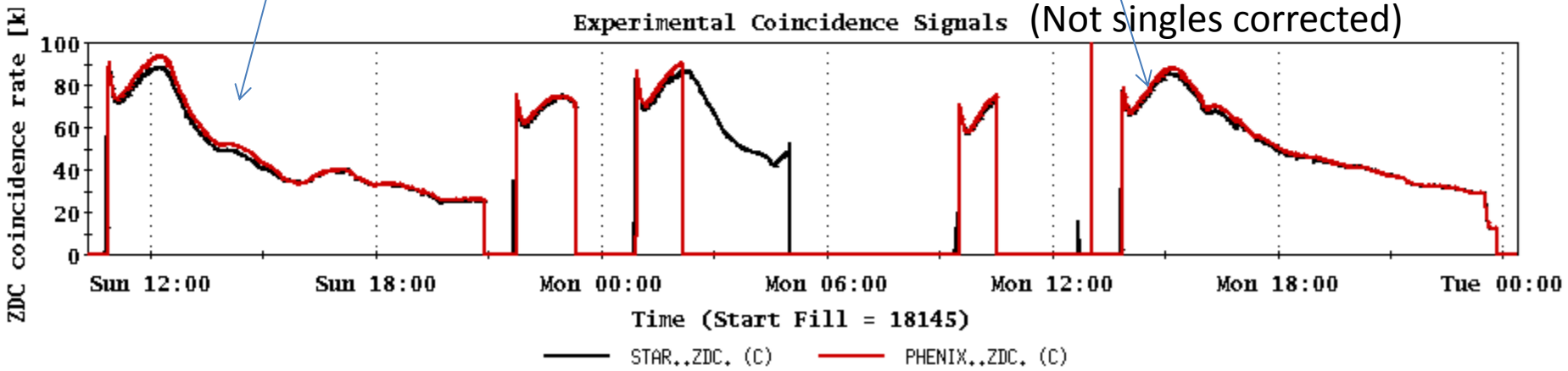

Goal, 1.4 x 10^{9}/bunch
Intensity [10^9]
200
150
100
50
0
Mar 16
Mar 18
Mar 20
Mar 22
Mar 24
Mar 26
Mar 28
Mar 30
Apr 01
Time (Start Fill = 18046)
bluDCCTtotal (D)
yelDCCTtotal (D)
bluWCMbunched (D)
yelWCMbunched (D)

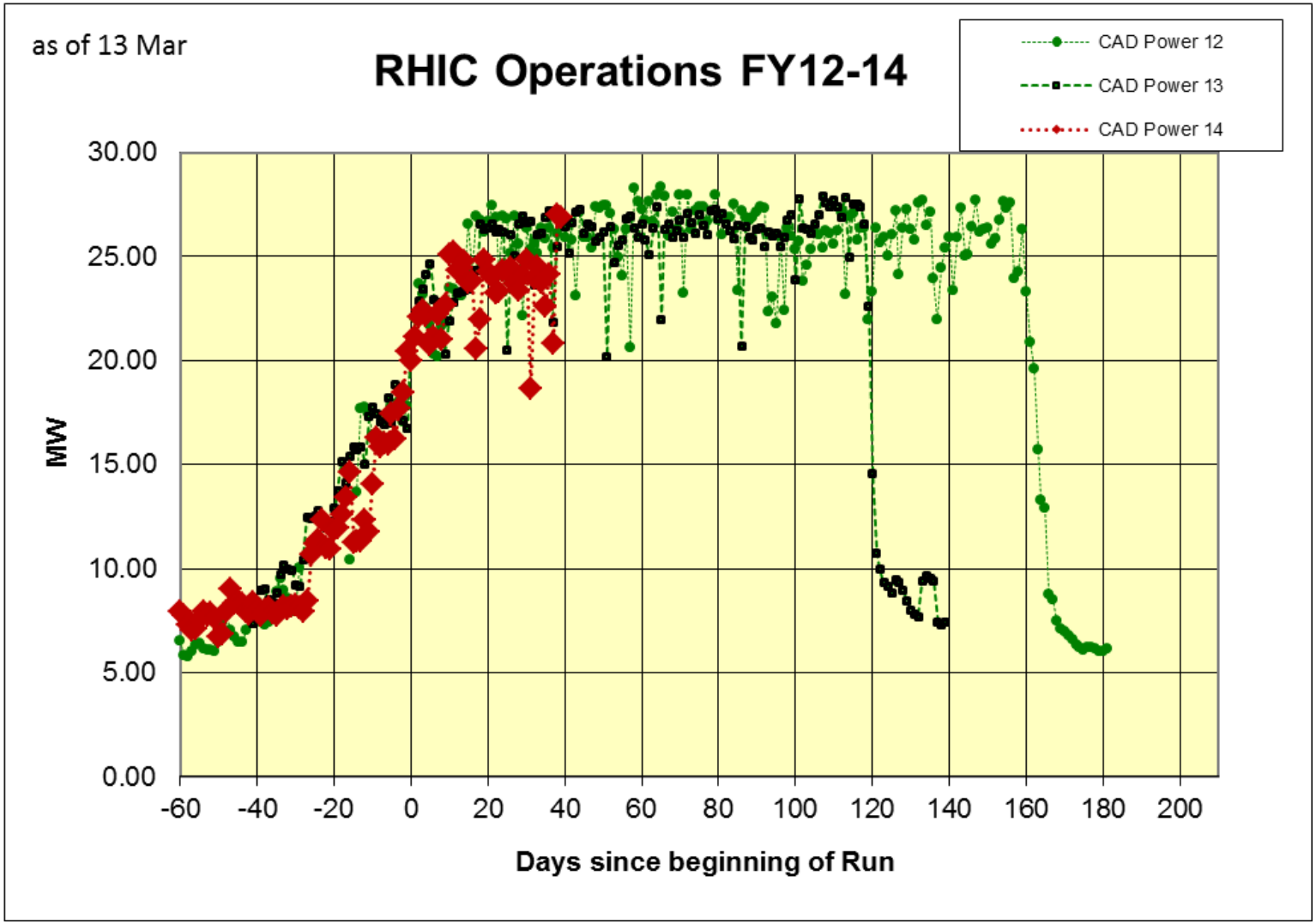


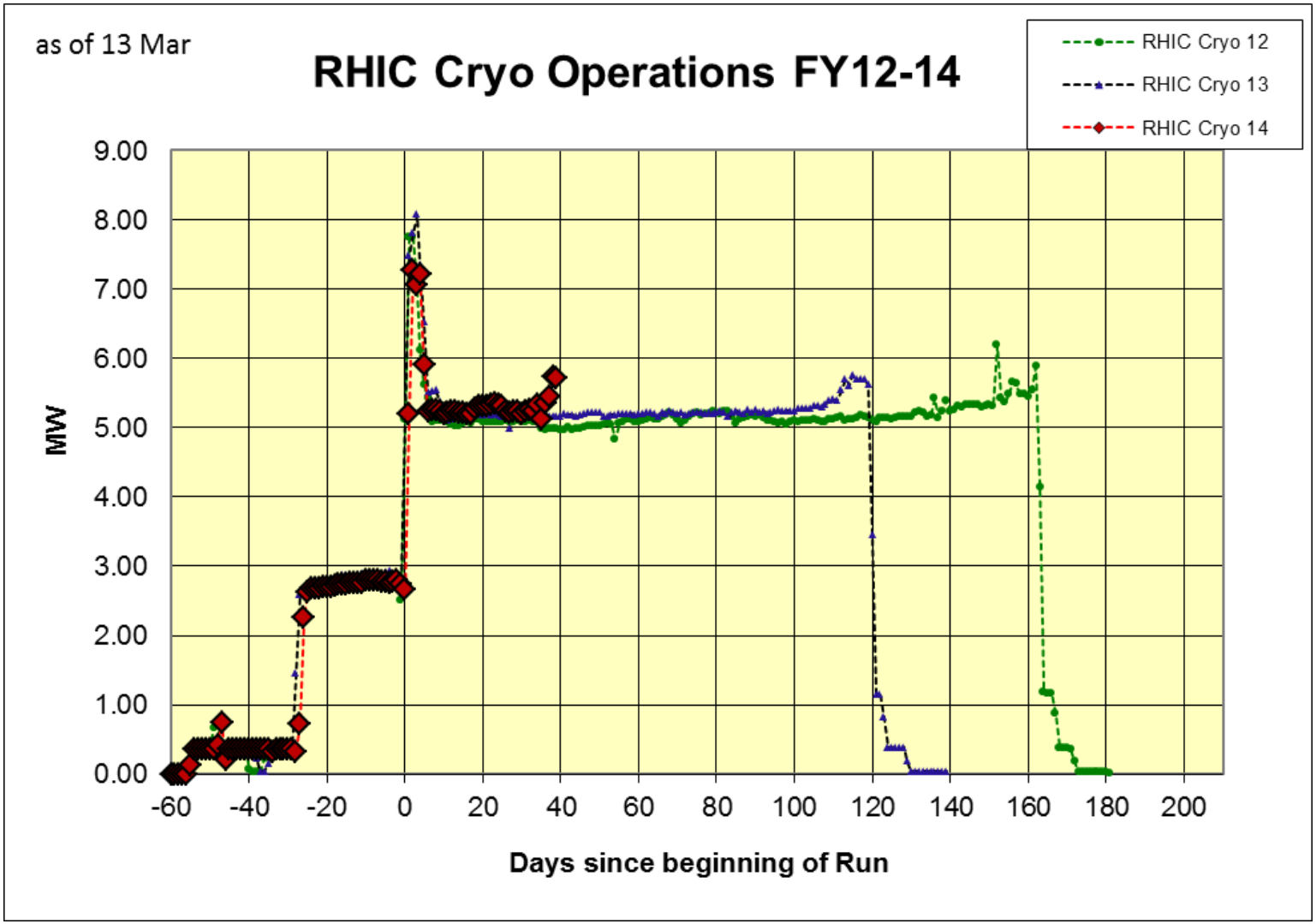
30 Mar, Store 18145, 9 hr 59 min, 0.143 nb^{-1}
(40 x 10^{26} $cm^{-2}s^{-1}$) to PHENIX (assumes 9.5 b xscetion)

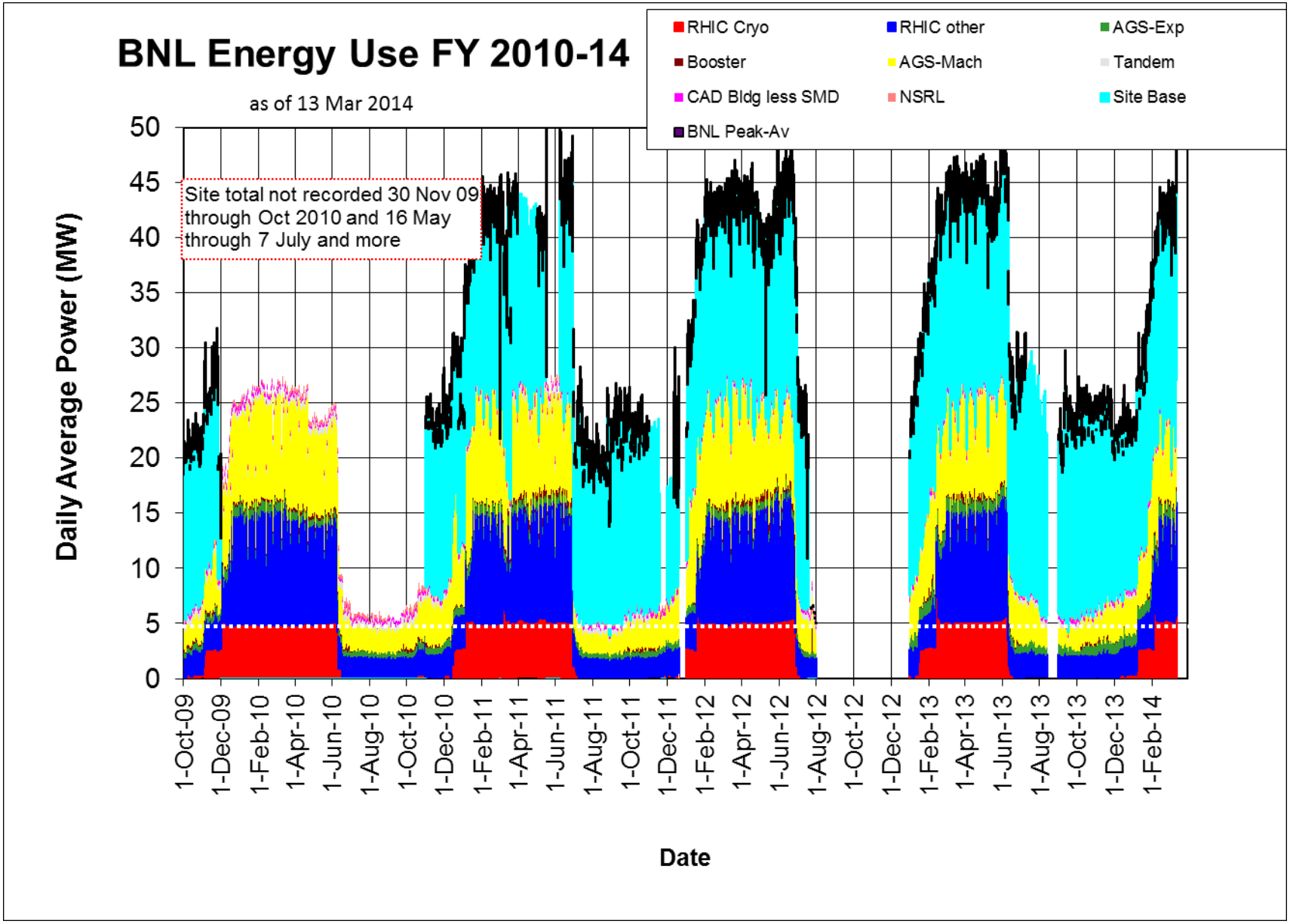
31 Mar, Store 18151, 9 hr 49 min, 0.149 nb^{-1}
(42 x 10^{26} $cm^{-2}s^{-1}$) to PHENIX





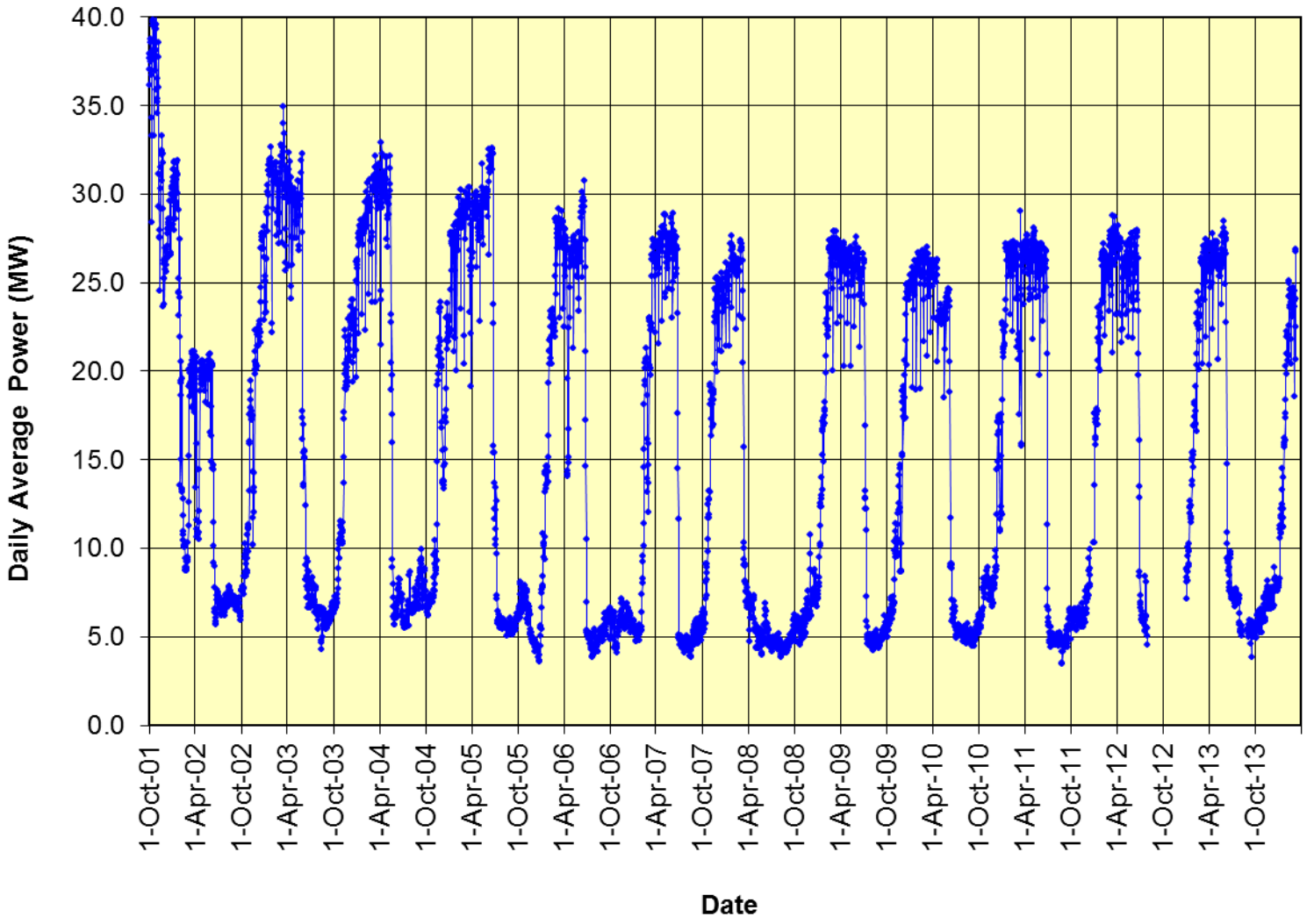

as of 13 Mar
RHIC Operations FY12-14
CAD Power 12
CAD Power 13
CAD Power 14
30.00
25.00
20.00
15.00
10.00
5.00
0.00
MW
-60
-40
-20
0
20
40
60
80
100
120
140
160
180
200
Days since beginning of Run


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

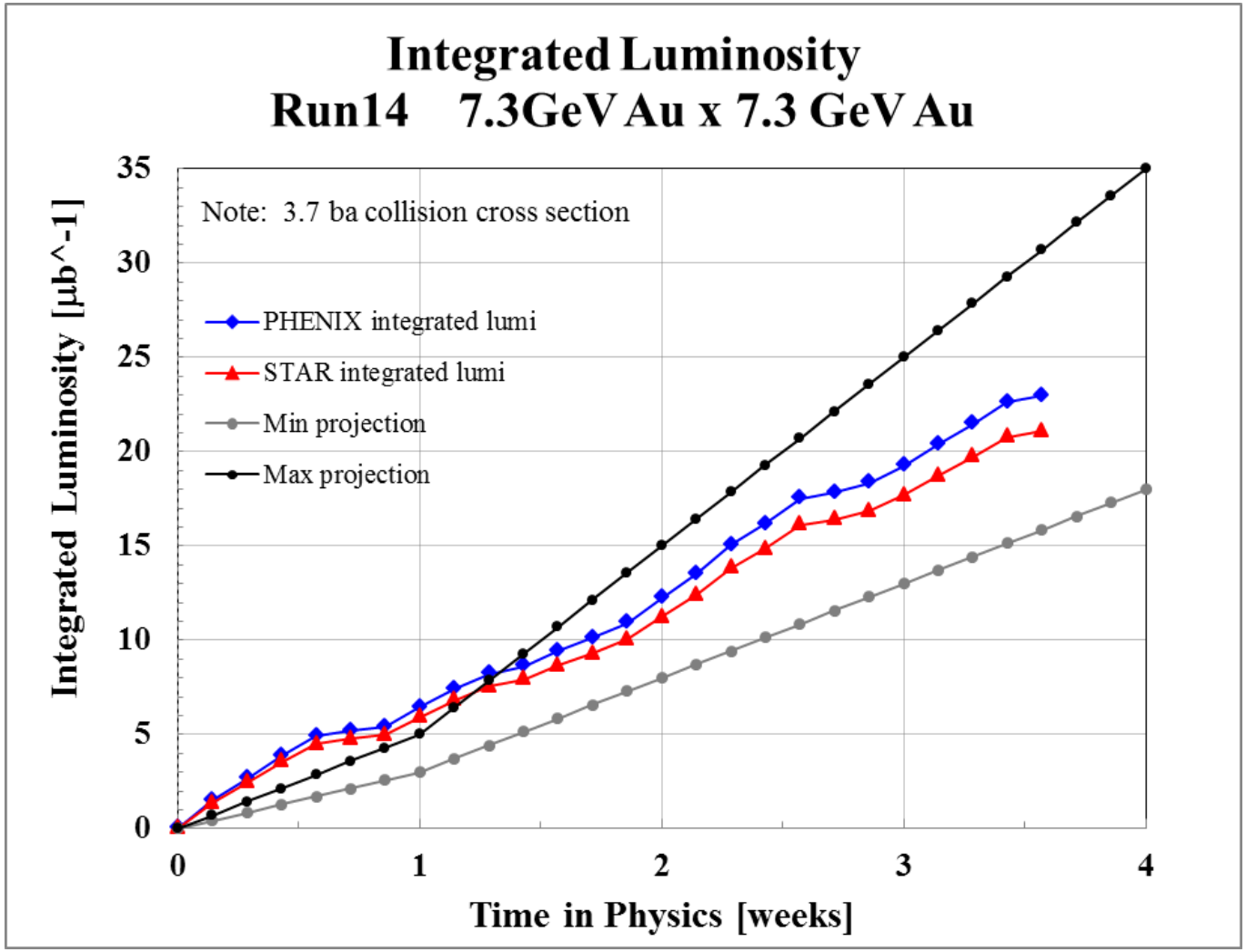
as of 13 Mar 2013

C-AD Energy Use FY 2002-14

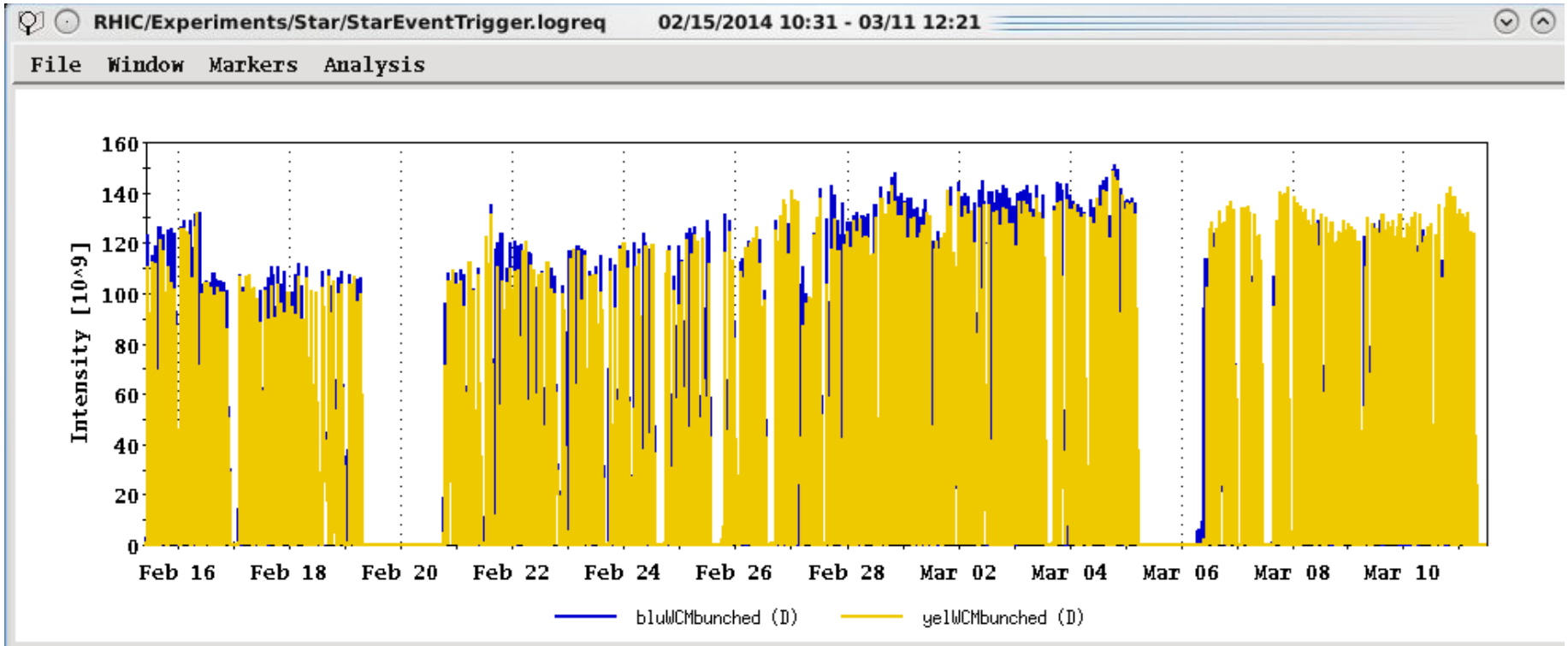


Through final fill 18010, 11 Mar 2015

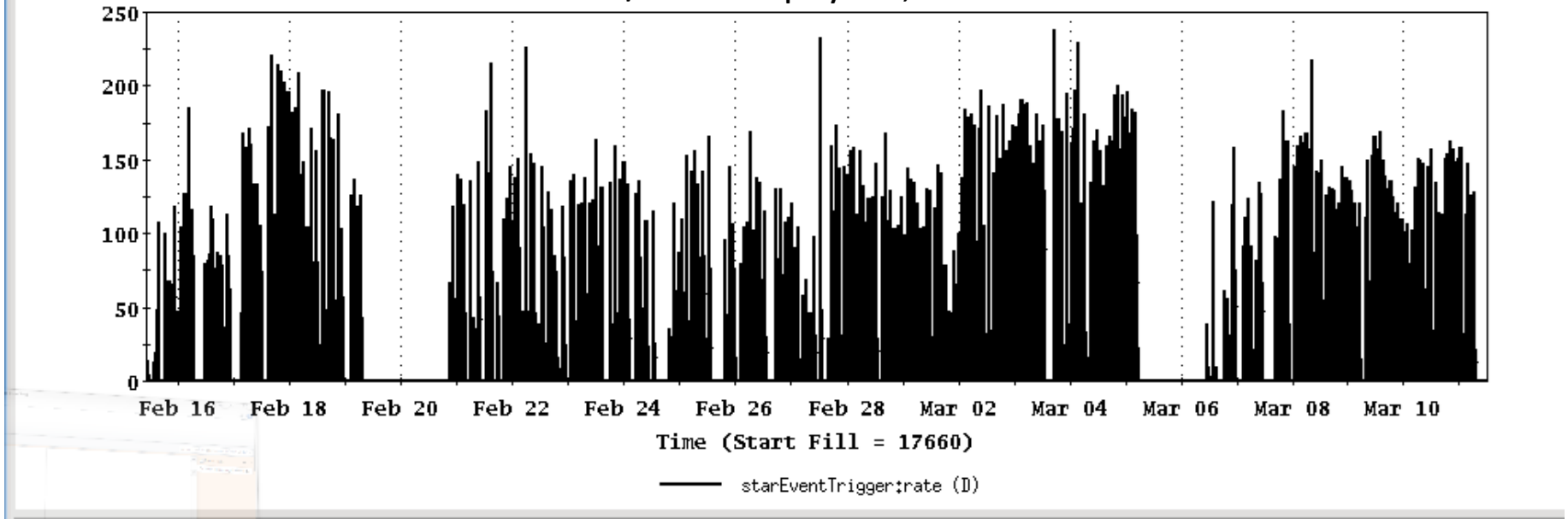
max/min projections from Fischer et.al. “RHIC Collider Projections (FY2014-FY2018)”, 4 June 2013

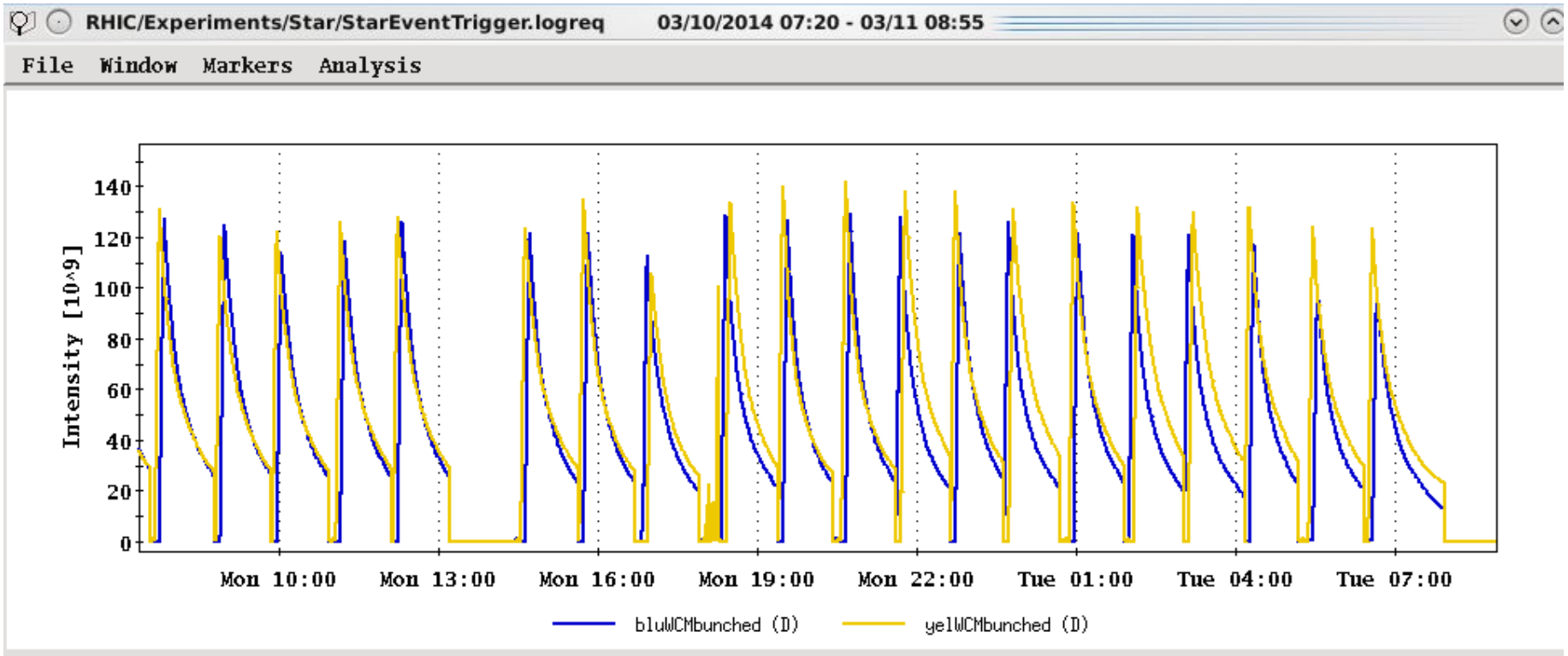


From Ingrassia,
http://www.cadops.bnl.gov/AGS/Operations/Run14/

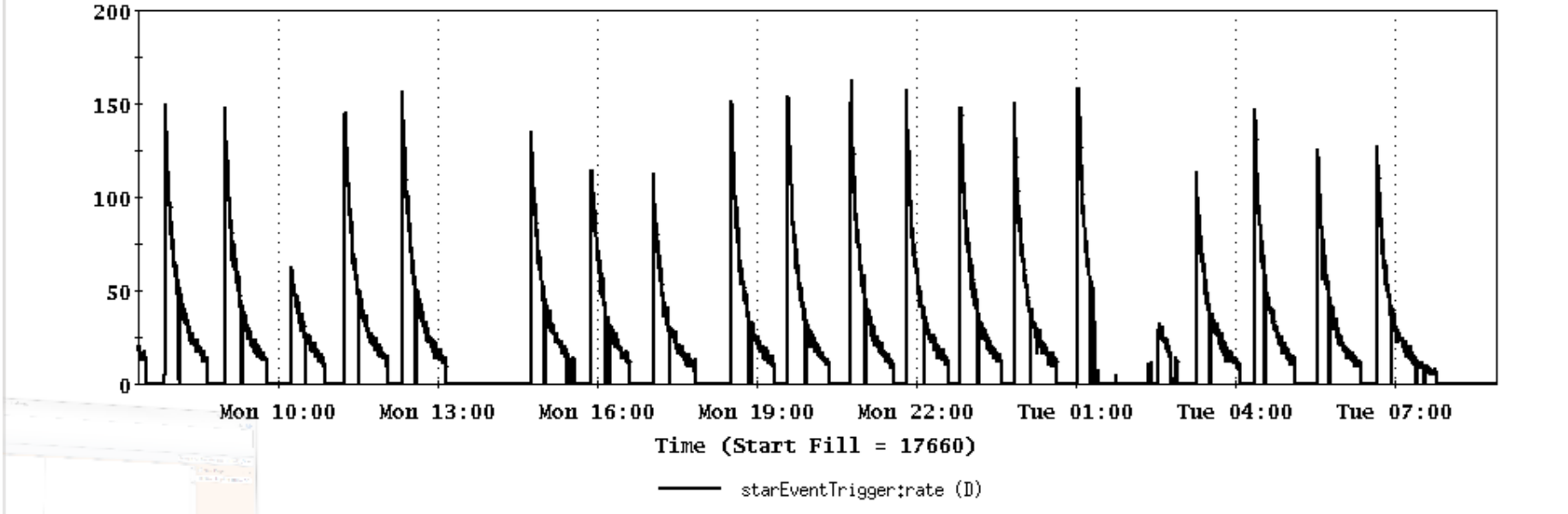


√s = 14.6 GeV/n AuAu physics, 15 Feb-11 Mar





√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

concurrent with RHIC
setup with beams
ramp up luminosity

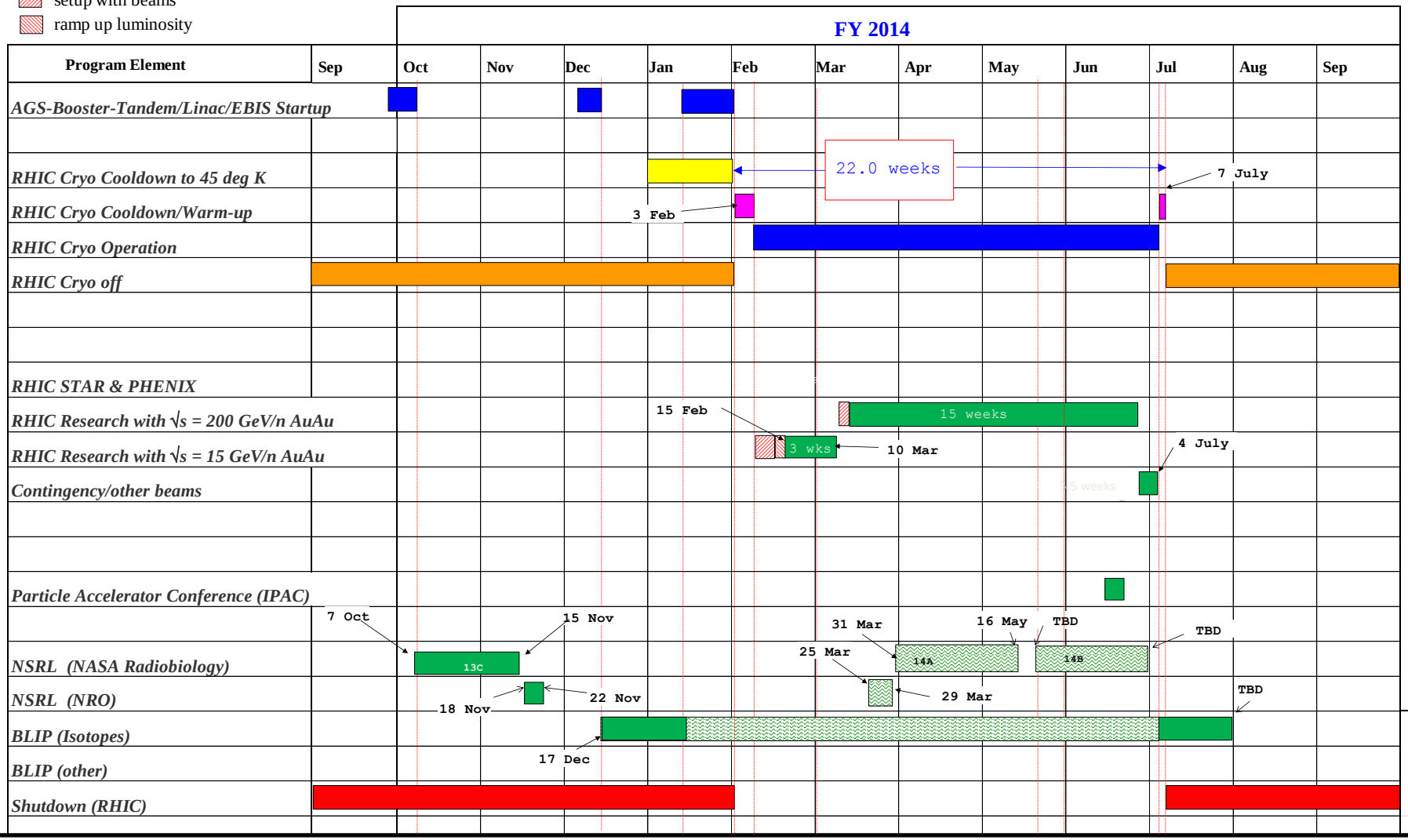


Table 2: Maximum luminosities that can be reached after a sufficiently long running period. The beam energy is stated. Other ion combinations can be estimated on demand. For species combinations not yet run the minimum luminosities are approximately 50% of the maximum.

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

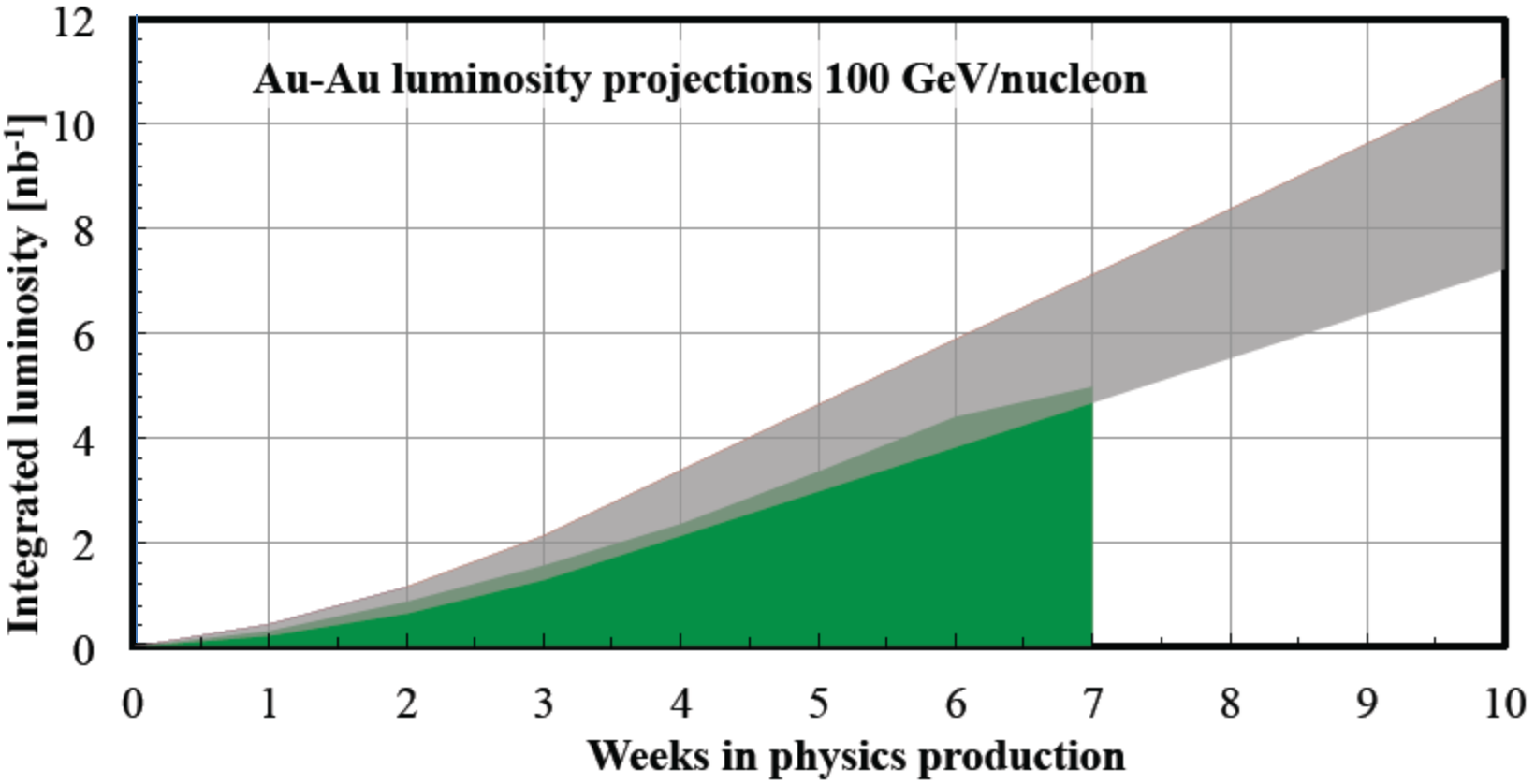
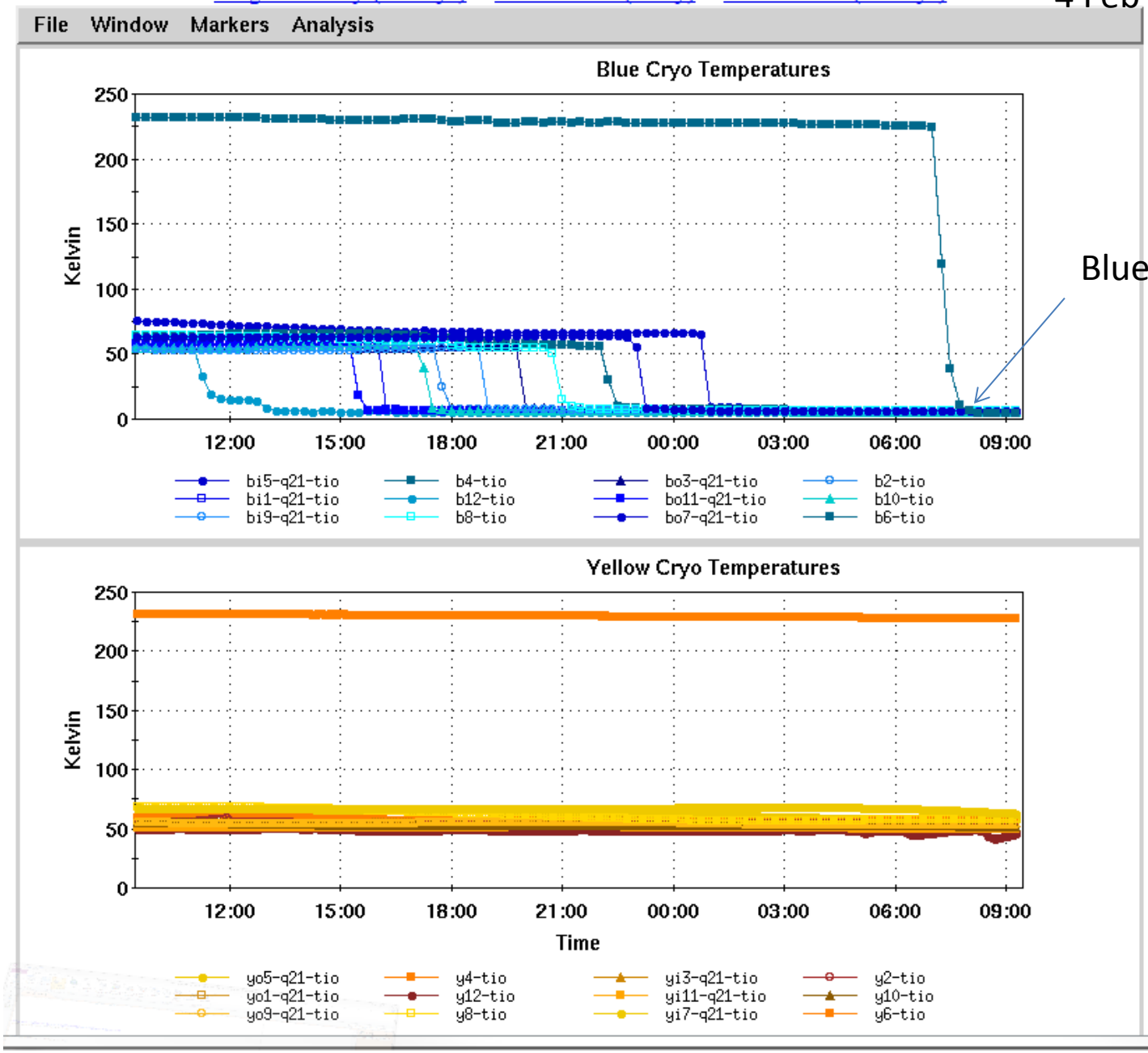


Figure 4: Projected minimum and maximum integrated luminosities for Au-Au at 100 GeV/nucleon.

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

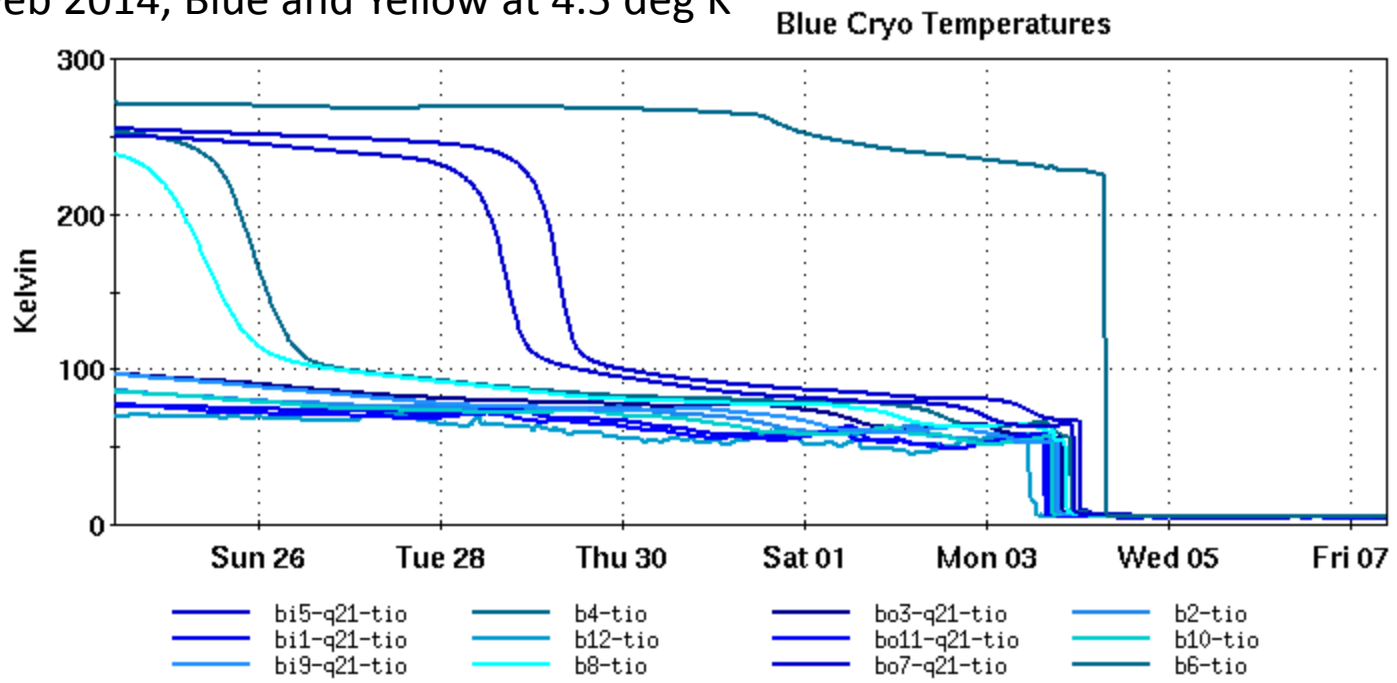
Ring Summary (14 days) Sector Plots (1 day) Sector Plots (14 days)

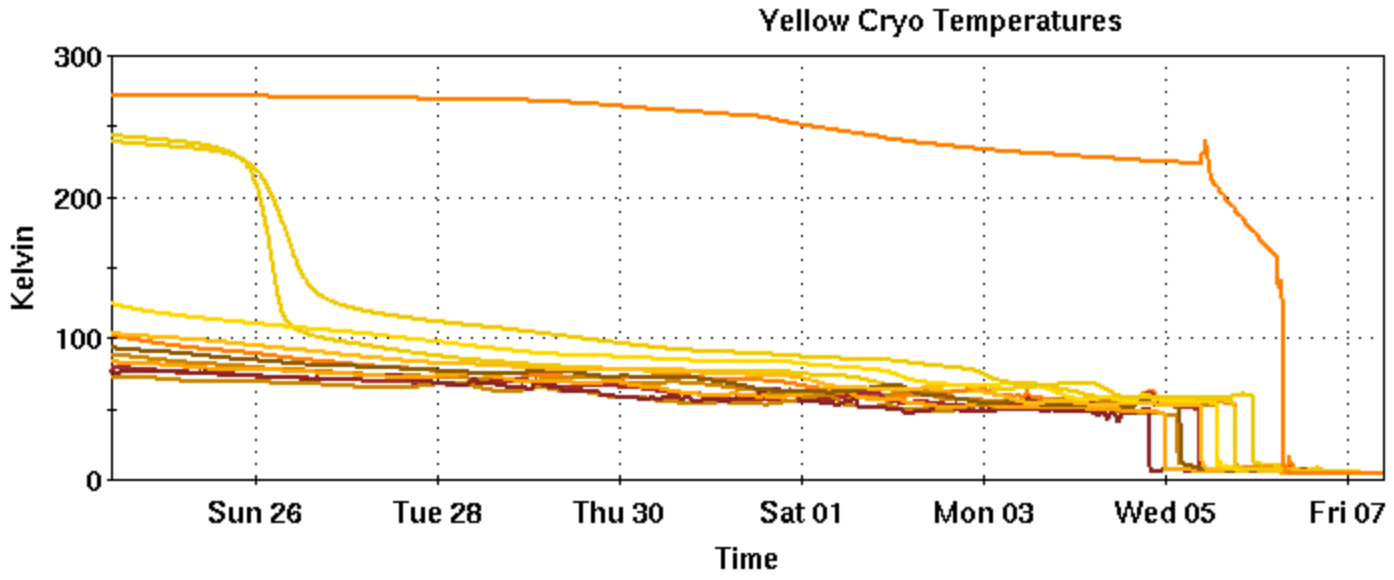
4 Feb 2014



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)**
Scheduling Physicist:	**Chuyu Liu**	**cliu1@bnl.gov**	**631-344-4431 (office)**
AGS liaison:	**Haixin Huang**	**huanghai@bnl.gov**	**631-344-5446 (office)**

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