Run 12 RHIC Machine/Experiments Meeting

29 Jun 2012

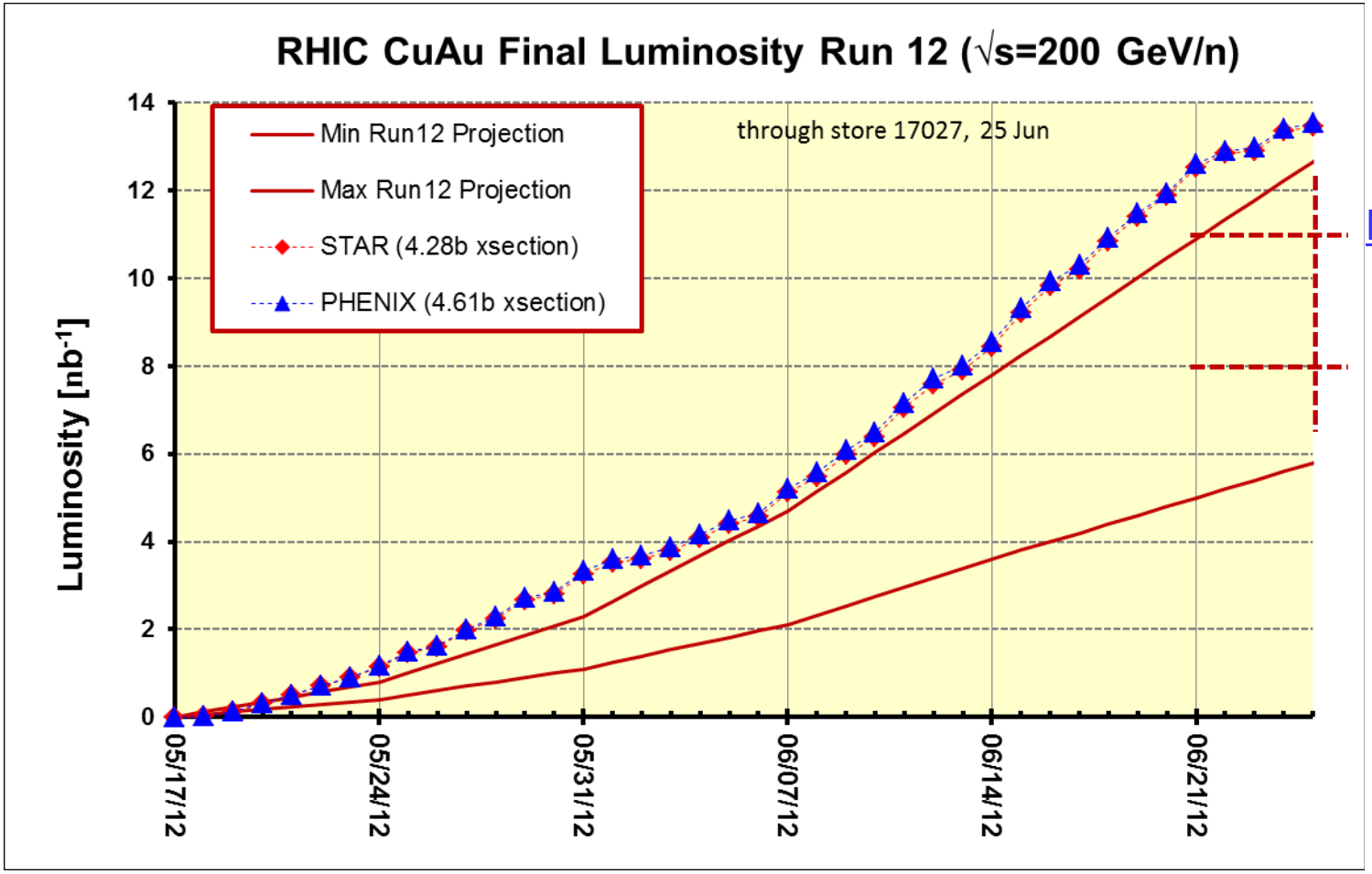
Run 12 Summary Slides

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

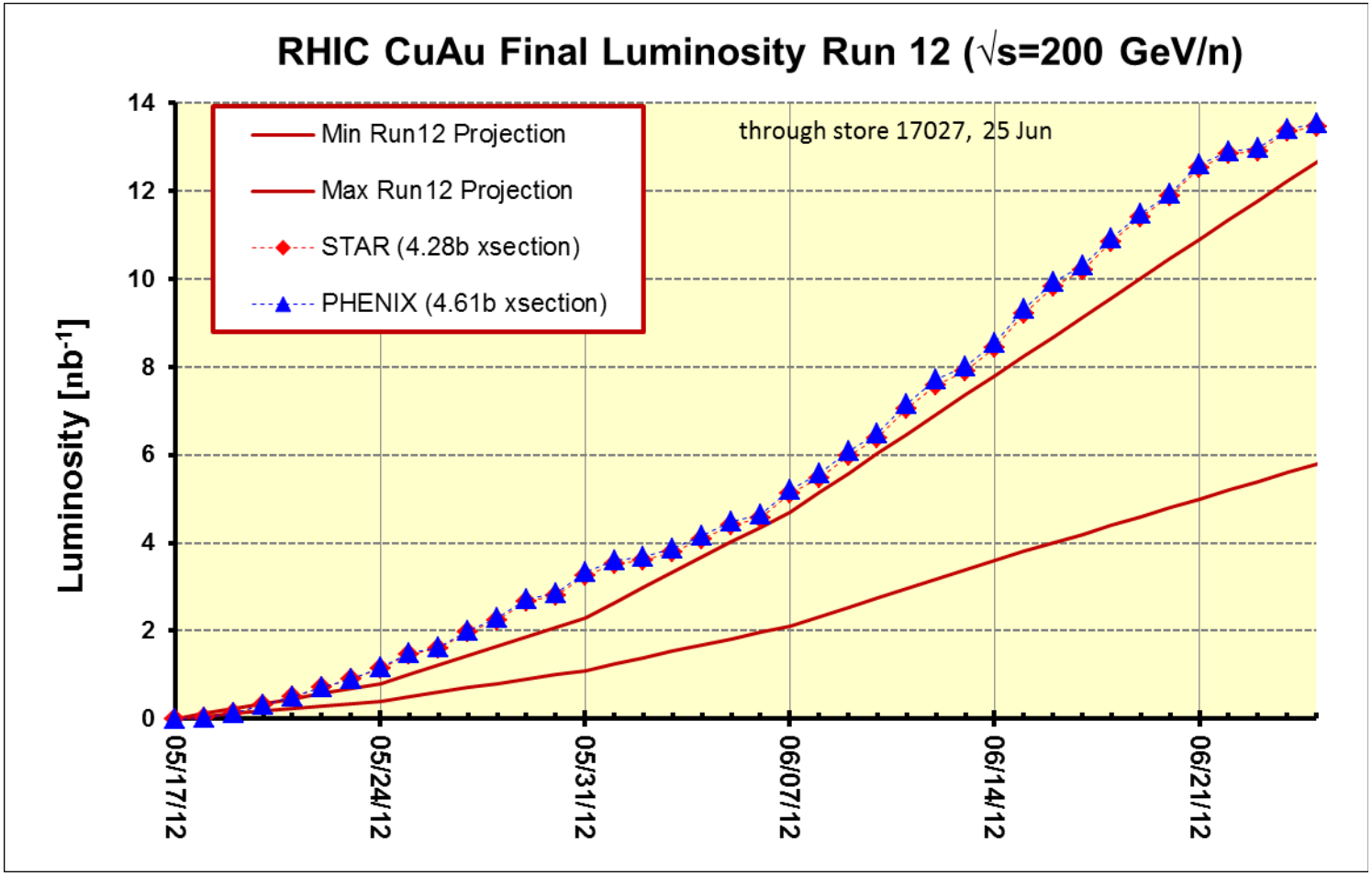
- 17 Jan, Begin cool-down to 4.5K
- 20 Jan, Cool-down to 4.5K in Blue and Yellow Ring complete, begin magnet setup
- 21-28 Jan, pp injection setup
- 28 Jan-3 Feb, LLRF, Ramp and store setup, begin 8 hr/night for experiments
- 3-10 Feb, 1 week ramp-up with 8 hrs/night for experiments
- 10 Feb, with store # 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
- 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, 12:00 – begin cryo warm-up
- 30 June, cryo warm-up complete (23.6 cryo-weeks)

Total Physics Weeks = 17.7

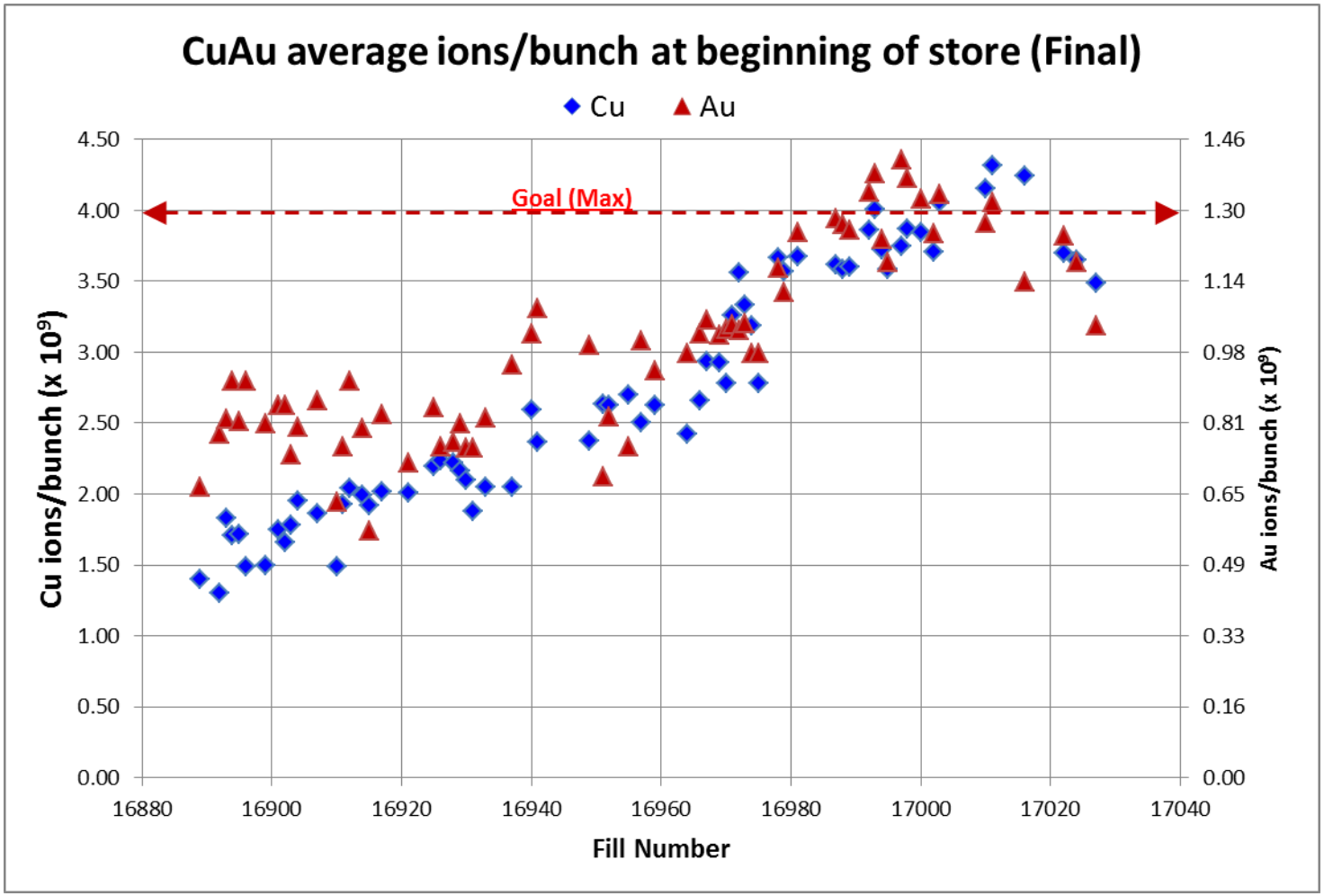
PHENIX BUR Goal = 2.4 nb^{-1} sampled, ~11 delivered
STAR Goal = ~5 nb^{-1} sampled, ~8 nb^{-1} delivered



Goals
PHENIX
STAR

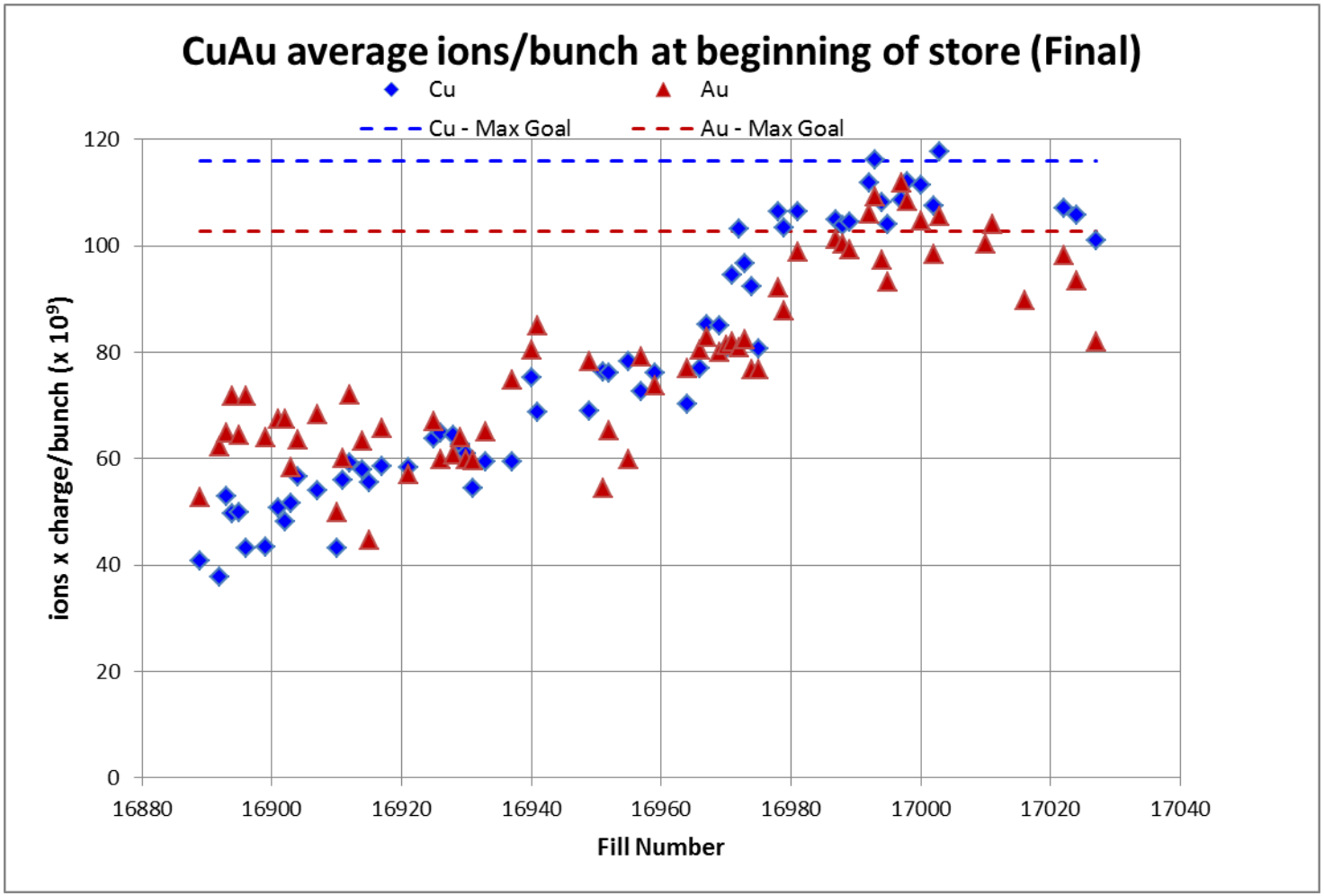

RHIC CuAu Final Luminosity Run 12 (√s=200 GeV/n)
Min Run12 Projection
Max Run12 Projection
STAR (4.28b xsection)
PHENIX (4.61b xsection)
through store 17027, 25 Jun
Luminosity [nb-1]
0
2
4
6
8
10
12
14
05/17/12
05/24/12
05/31/12
06/07/12
06/14/12
06/21/12

Through final store 17027, 25 June

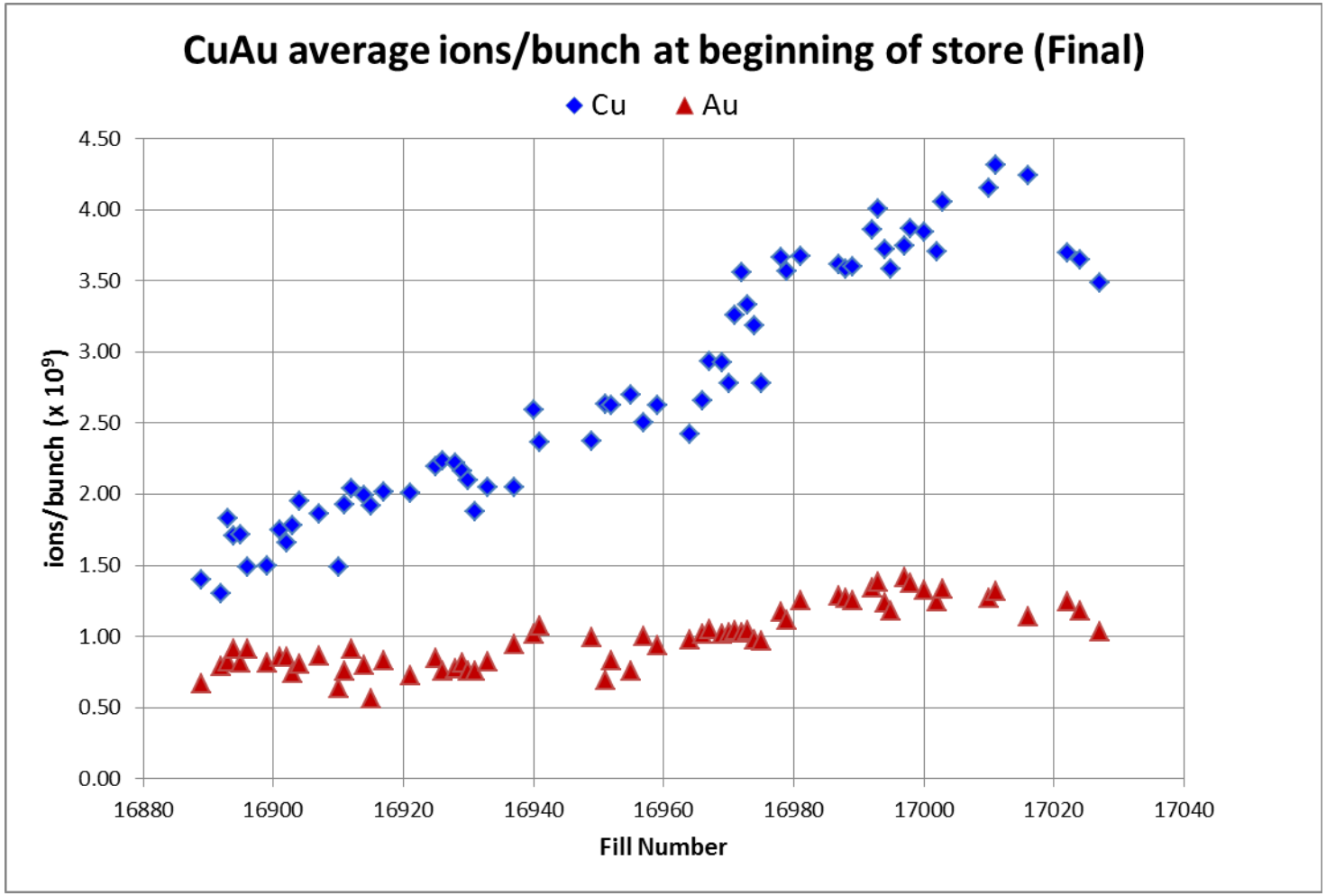


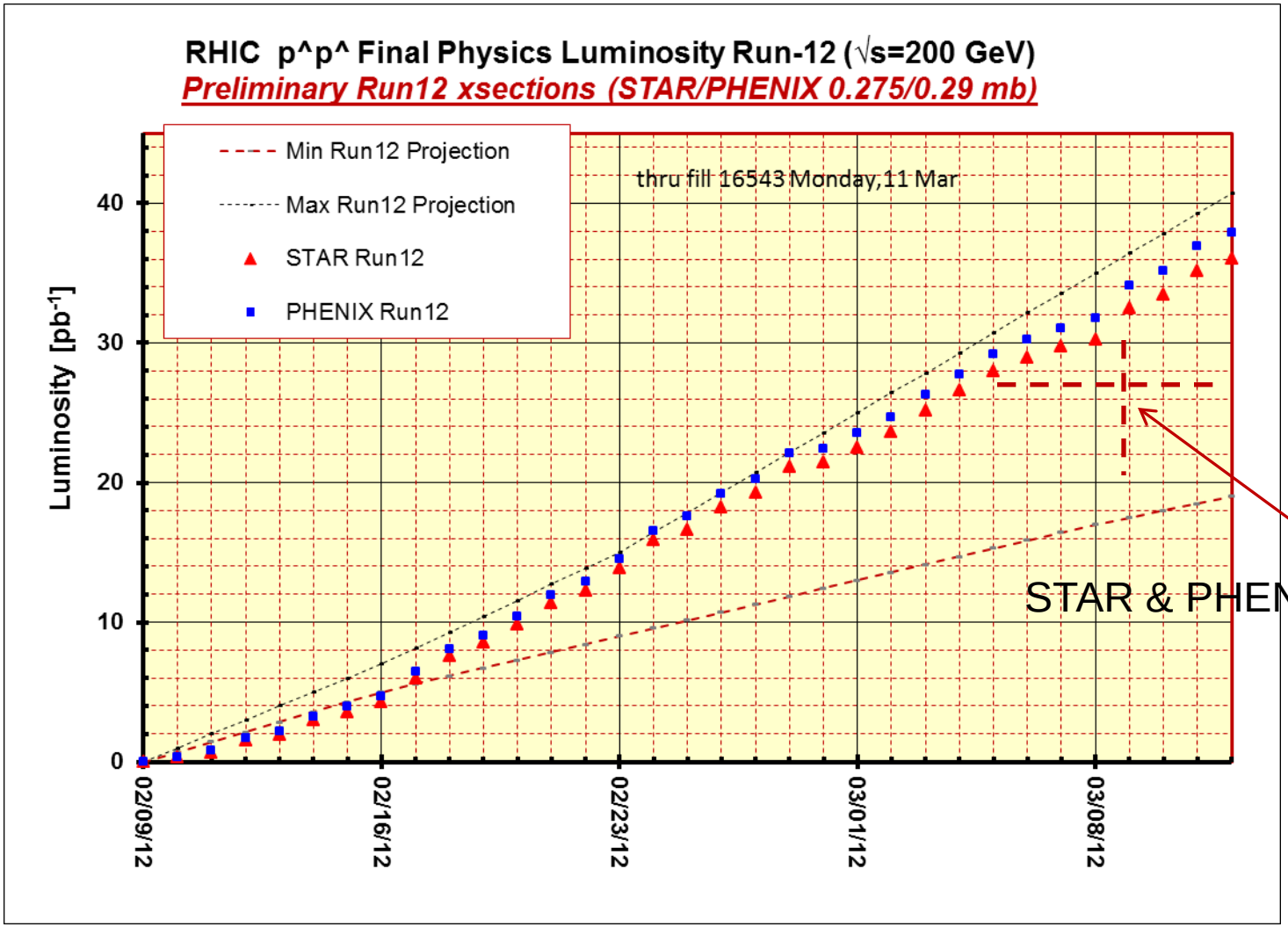
http://www.rhichome.bnl.gov/AGS/Operations/Run12/Run12_Lumi_100Cu_100Au.xlsx

Through final store 17027, 25 June

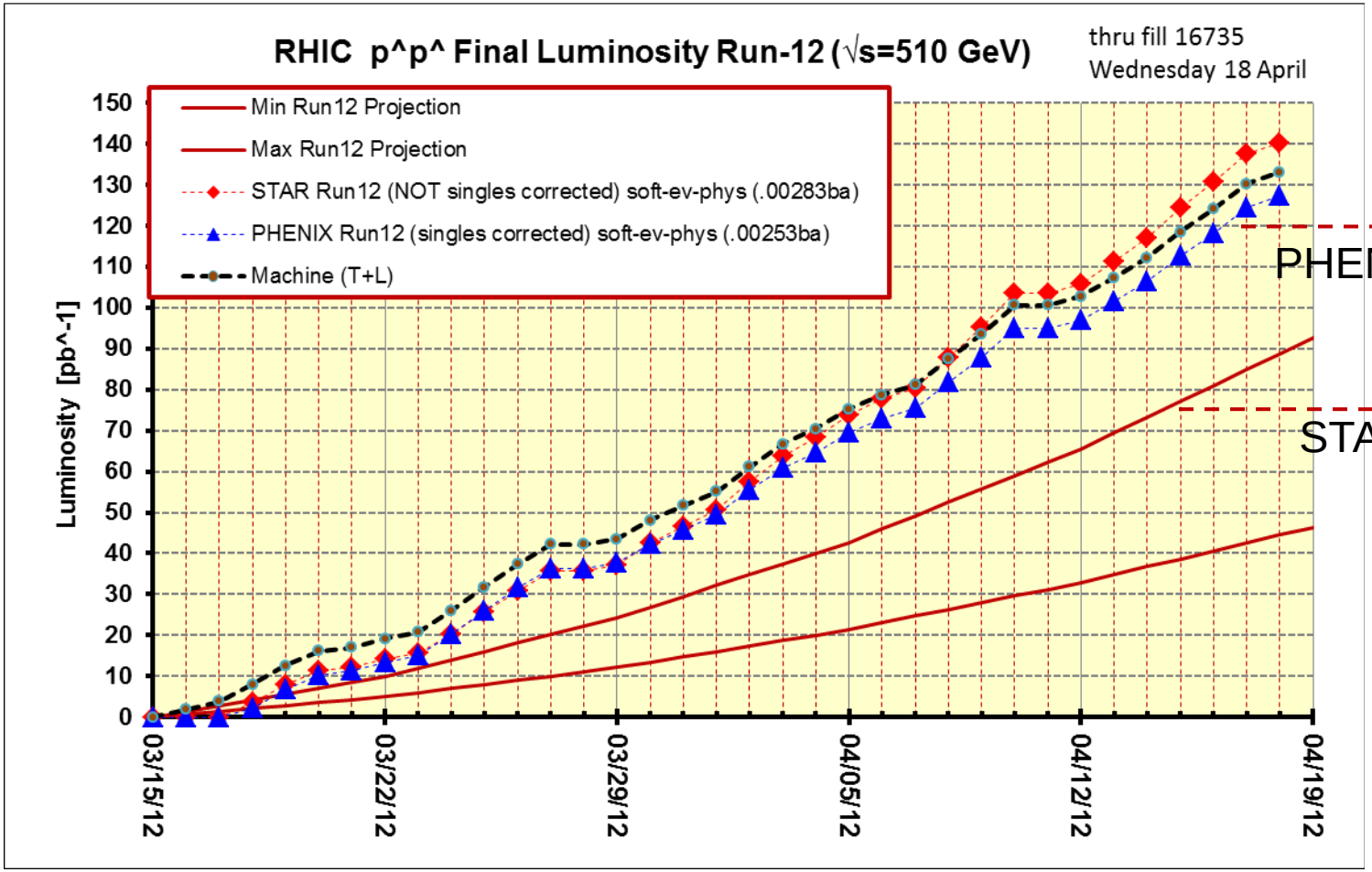


Through final store 17027, 25 June

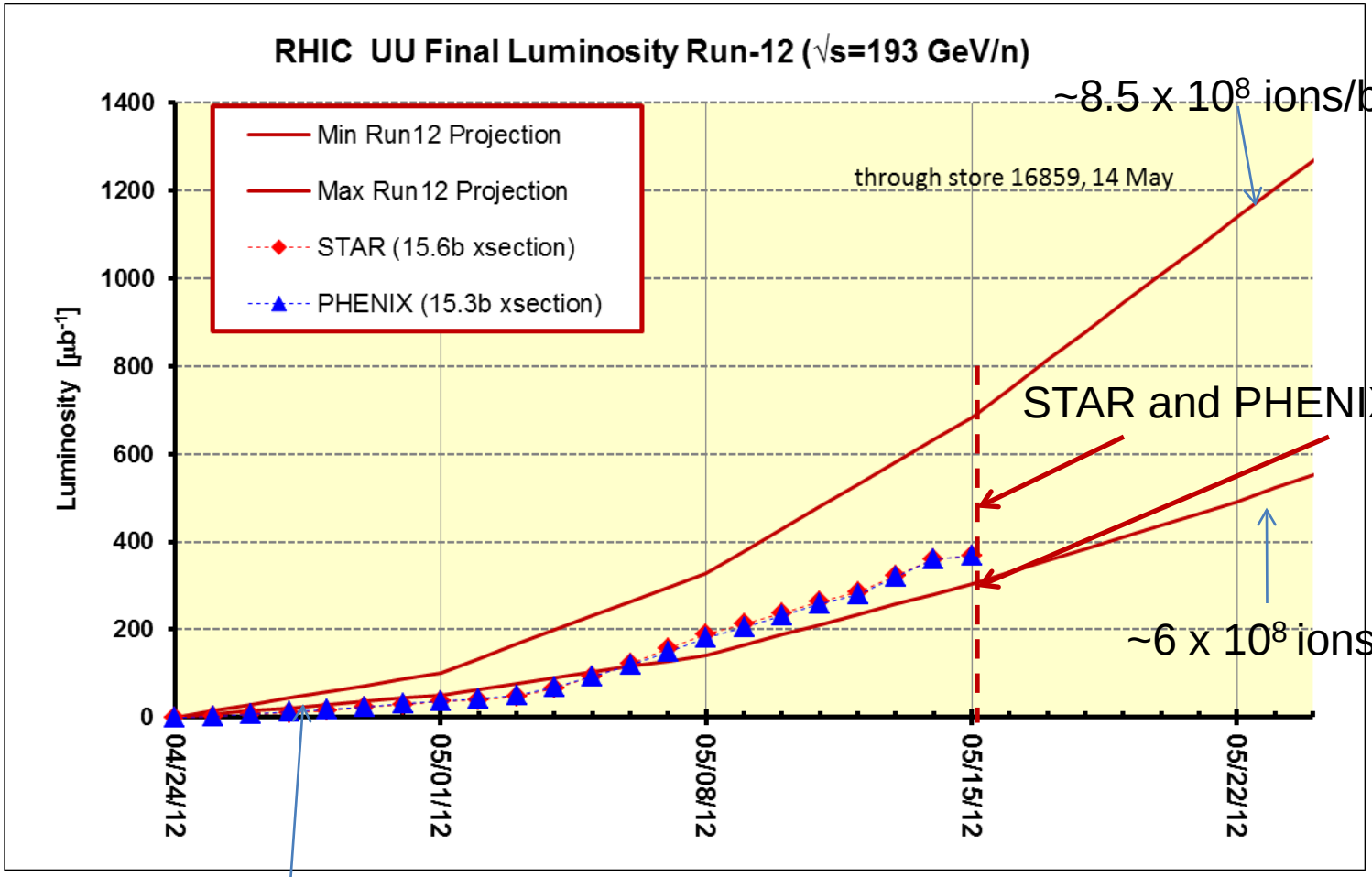



RHIC p^p^ Final Physics Luminosity Run-12 (√s=200 GeV)
Preliminary Run12 xsections (STAR/PHENIX 0.275/0.29 mb)
Min Run12 Projection
Max Run12 Projection
STAR Run12
PHENIX Run12
thru fill 16543 Monday,11 Mar
Luminosity [pb-1]
0
10
20
30
40
02/09/12
02/16/12
02/23/12
03/01/12
03/08/12
STAR & PHENIX Goal

Thru final store, 16735, 18 Apr



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



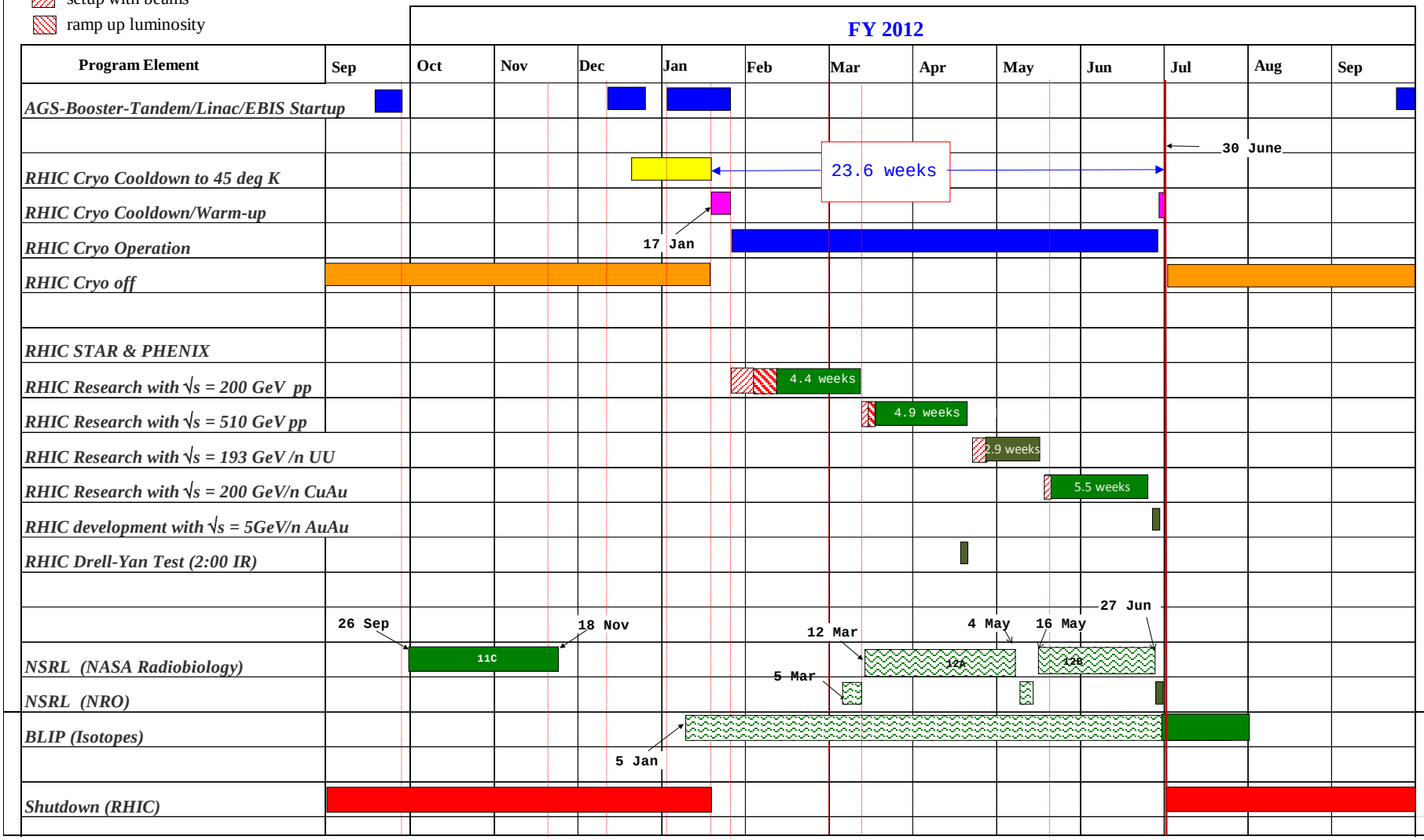
http://www.bnl.gov/cad/esfd

C-A Operations-FY12

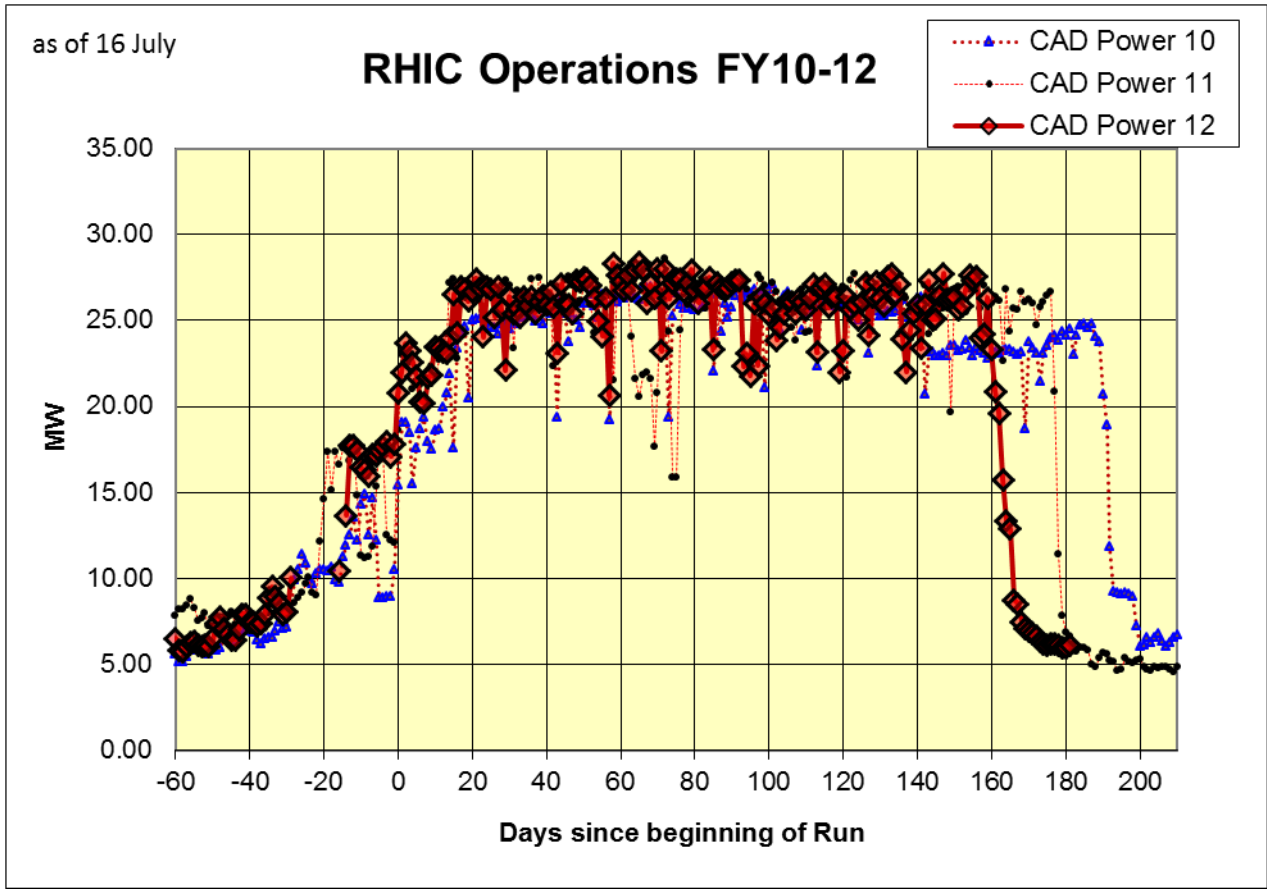
30 Sep 12

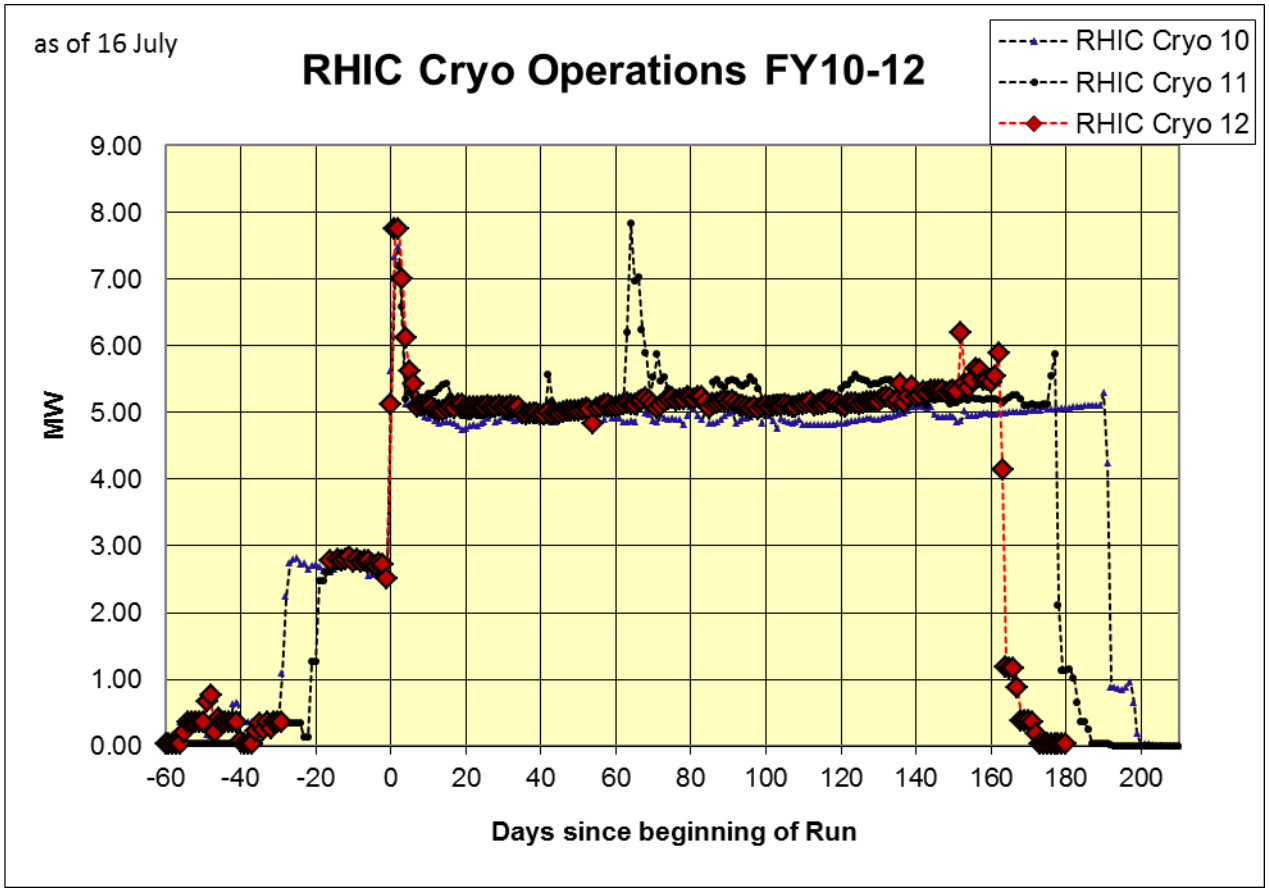
as run

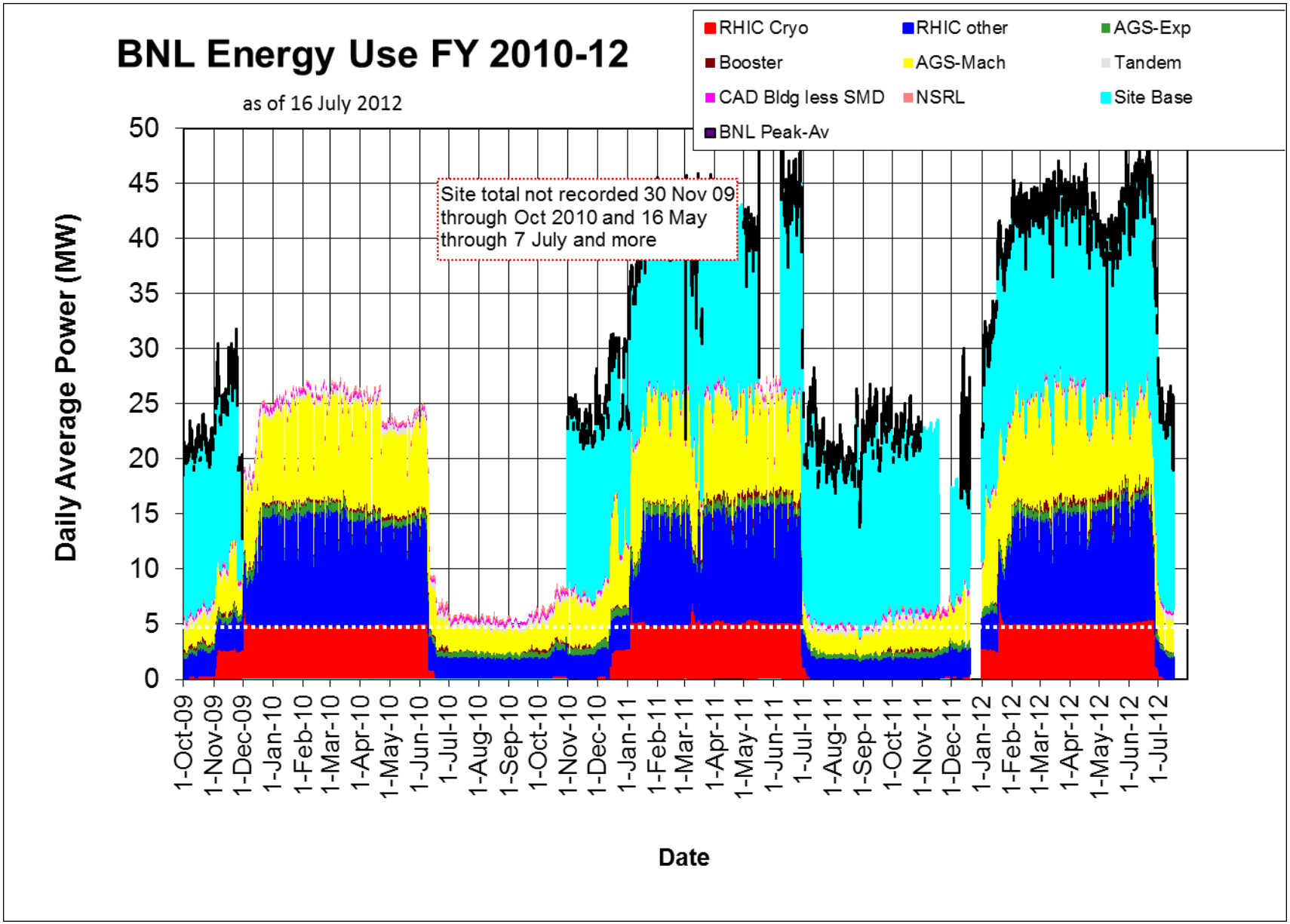
concurrent with RHIC
setup with beams
ramp up luminosity



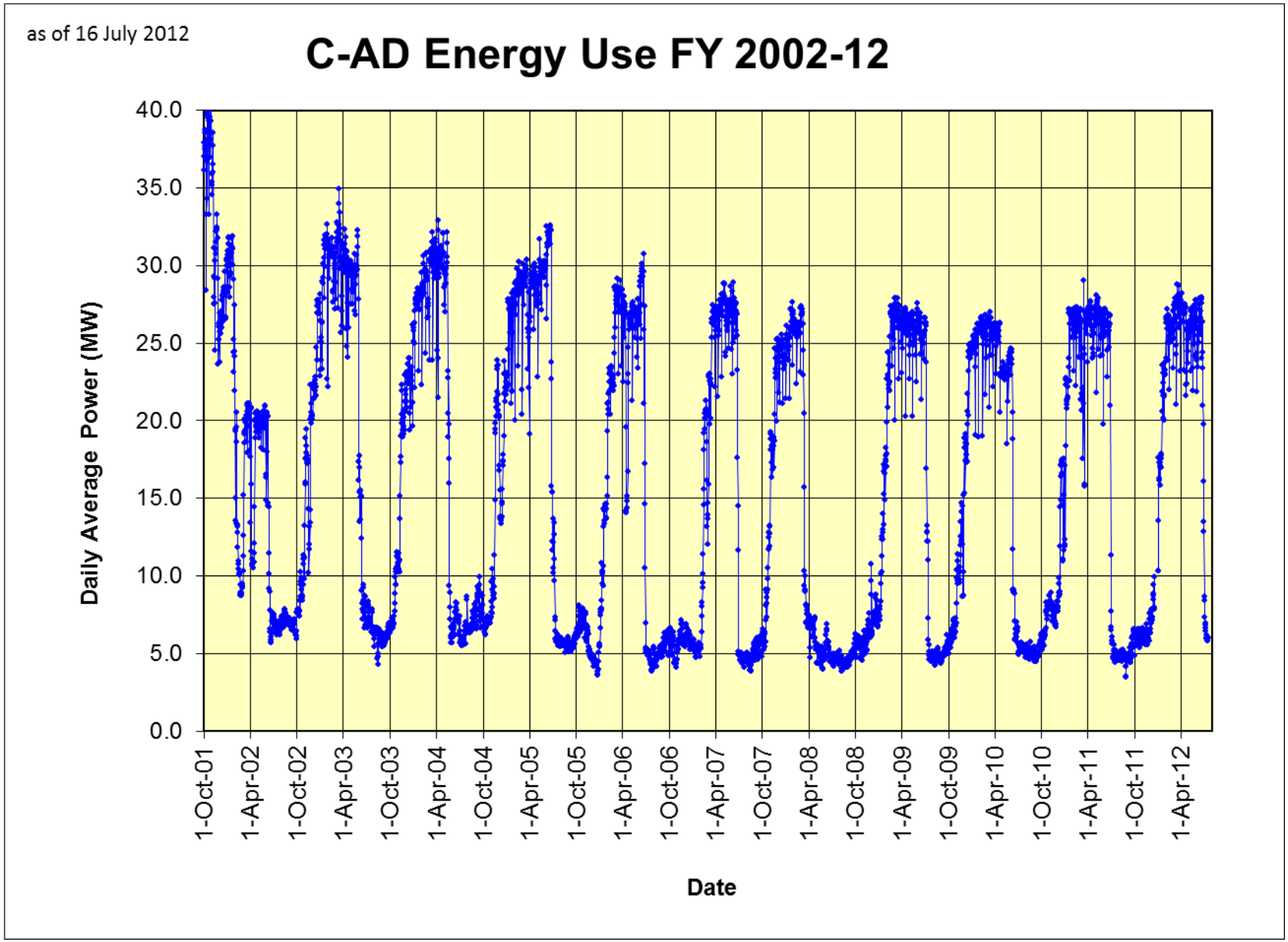
Other Slides

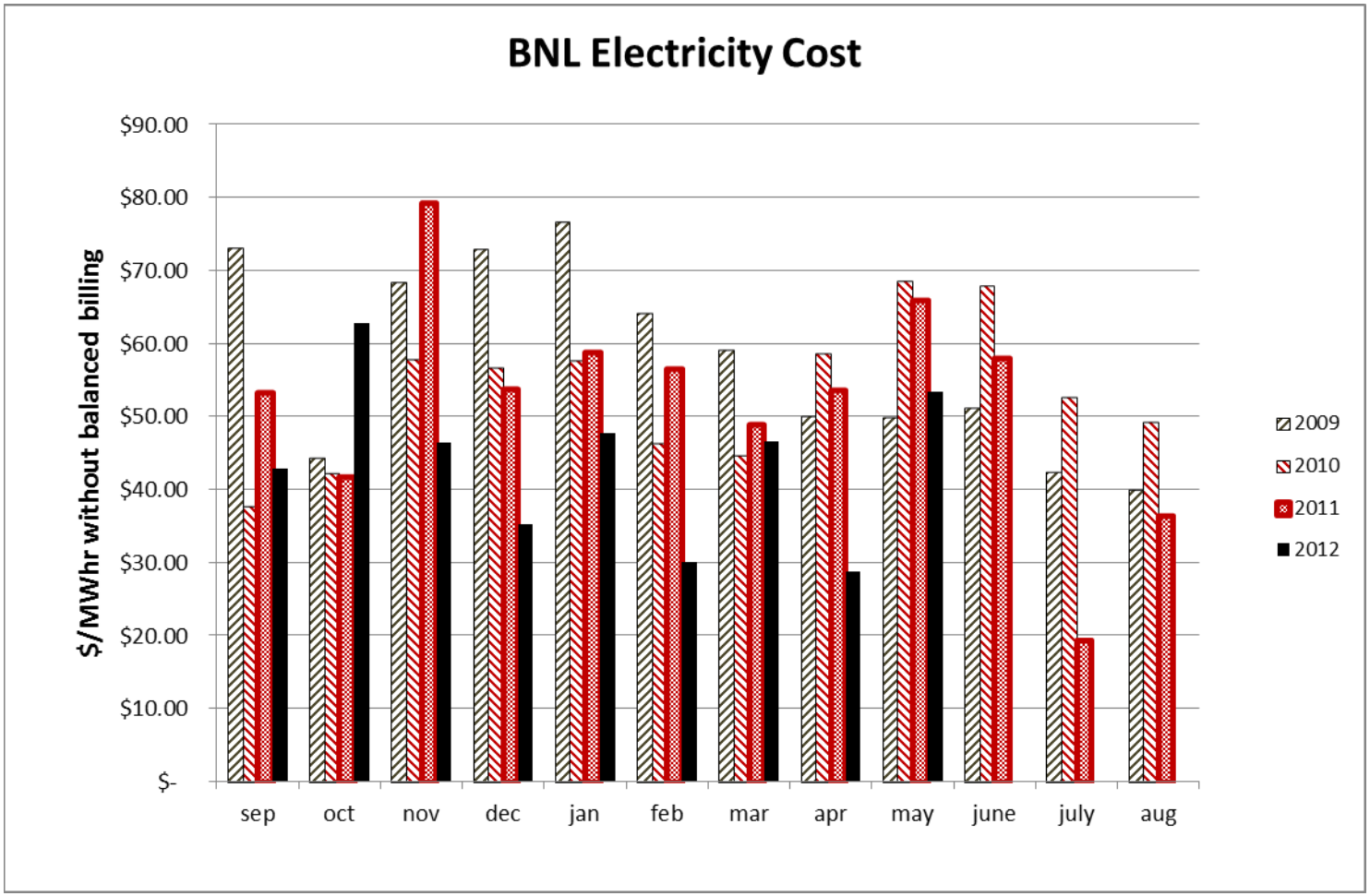

as of 16 July
RHIC Operations FY10-12
CAD Power 10
CAD Power 11
CAD Power 12
MW
35.00
30.00
25.00
20.00
15.00
10.00
5.00
0.00
-60
-40
-20
0
20
40
60
80
100
120
140
160
180
200
Days since beginning of Run


as of 16 July
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 16 July 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
1-Jun-12
1-Jul-12
Date

Thru 31 May


as of 16 July 2012
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

Total in bank through May = $2,768K (CAD contribution = $1,360K)
Total CAD rebate to date = $625K (owed $735K)

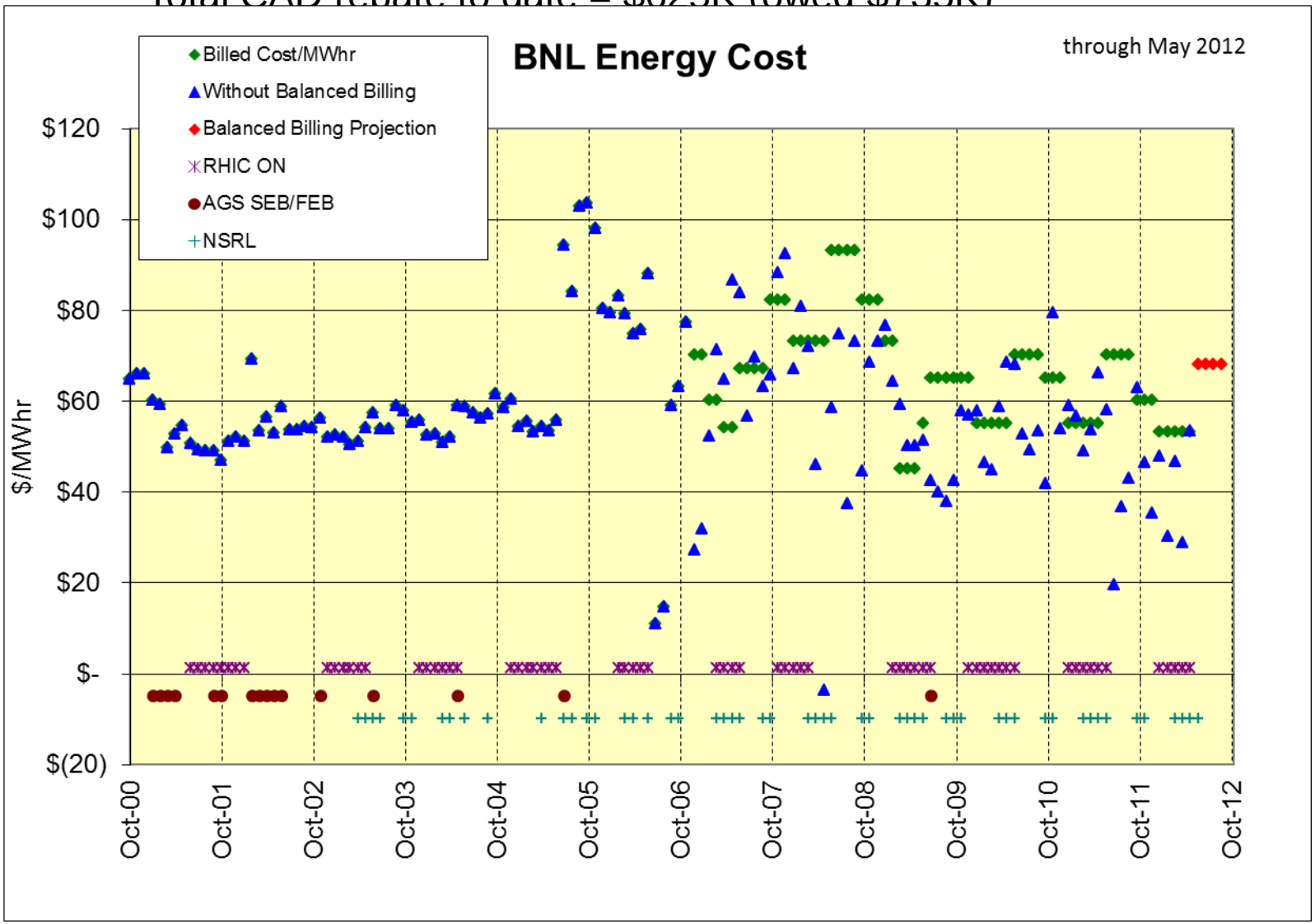
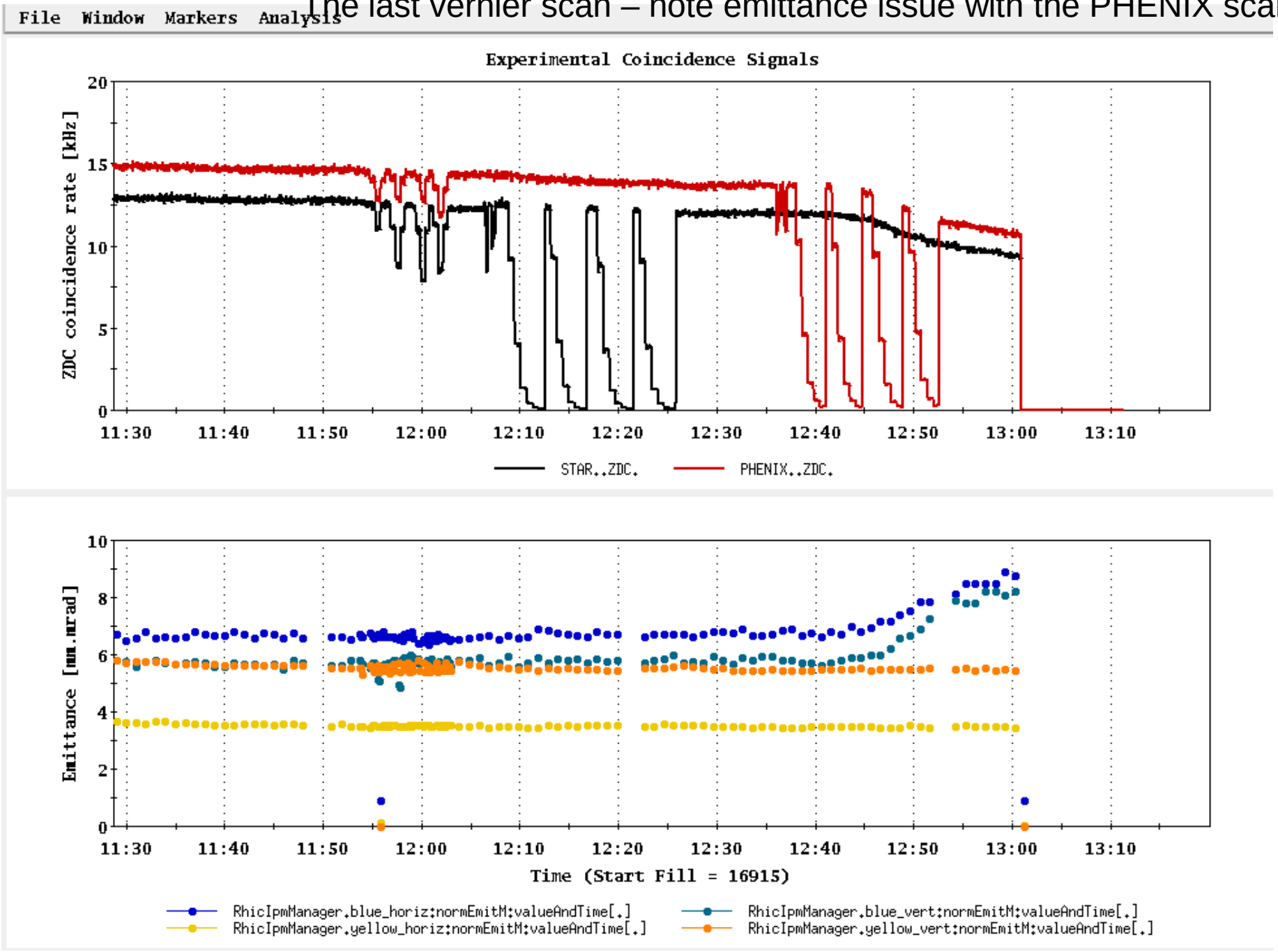


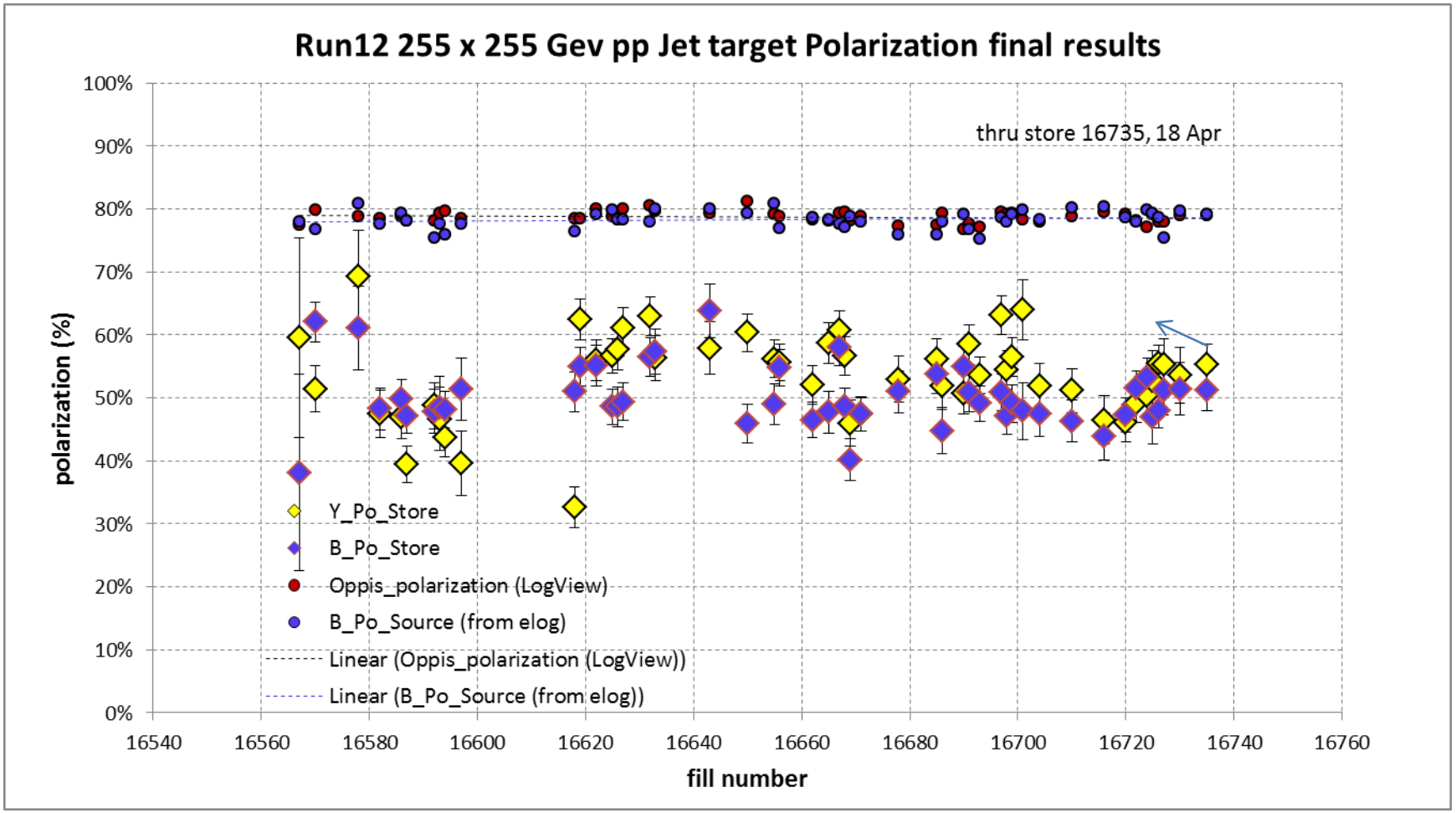
Table 2: Maximum luminosities that can be reached after a sufficiently long running period. For ion operation numbers are given for a beam energy of 100 GeV/nucleon. For polarized proton operation the beam energy is stated.

Mode	No of colliding bunches	Ions/bunch [10^9]	β^* [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	20×10^{26}	14×10^{26}	0.5 nb^{-1}
Au-Au	111	1.3	0.75	15-10	50×10^{26}	35×10^{26}	1.1 nb^{-1}
Cu-Cu	68	6.0	0.75	15-20	8×10^{28}	5×10^{28}	16 nb^{-1}
Cu-Au	111	4.0Cu/1.3Au	0.85	15-20	1.7×10^{28}	1.0×10^{28}	3.1 nb^{-1}
d-Au	111	110d/1.1Au	0.85	18-30	30×10^{28}	18×10^{28}	60 nb^{-1}
p↑-p↑* 100 GeV	107	135	0.85	15-20	50×10^{30}	30×10^{30}	10 pb^{-1}
p↑-p↑* 250 GeV	107	165	0.6	20-25	200×10^{30}	120×10^{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.

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



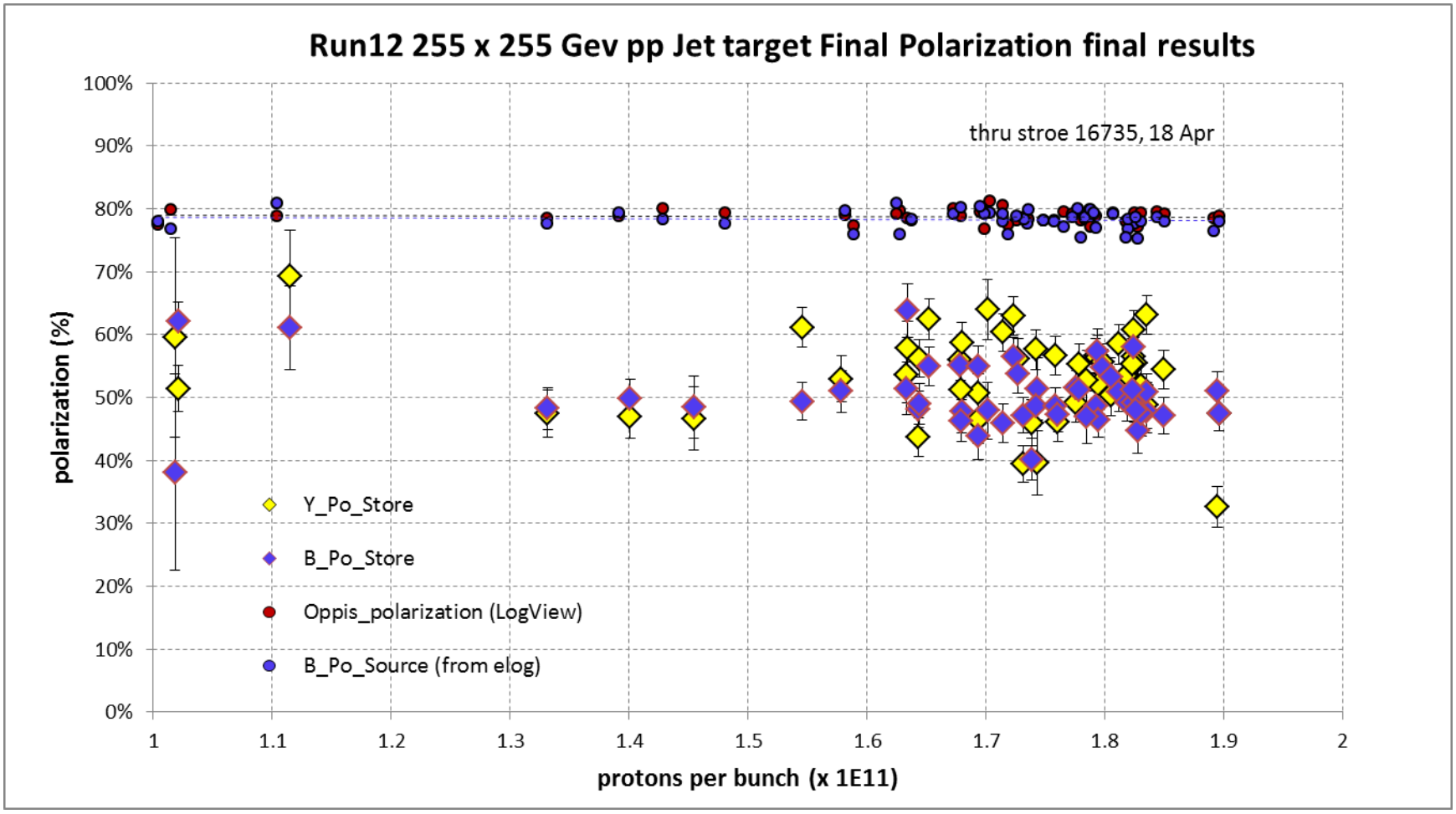


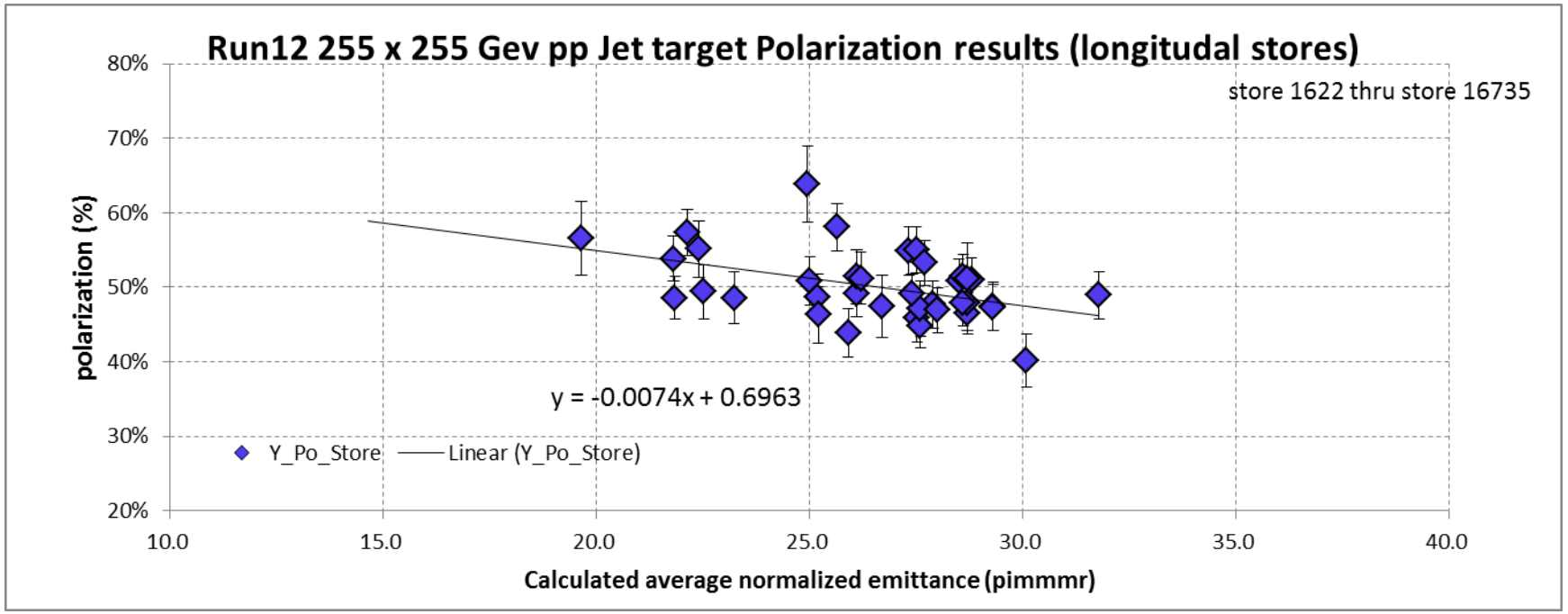
And Yellow beam at injection jet target Run 12 result = 63.0 ± 4.4%

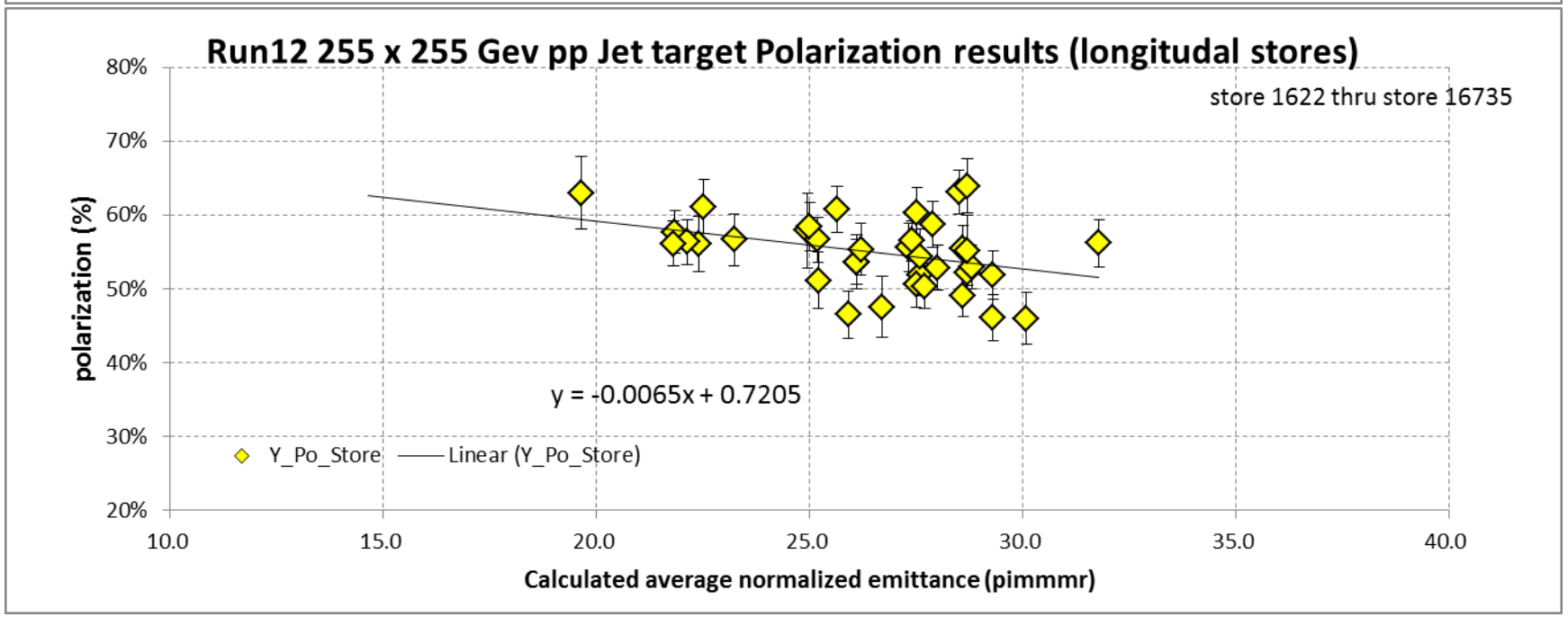
Blue jet target weighted average = 50.3% ± 0.5%

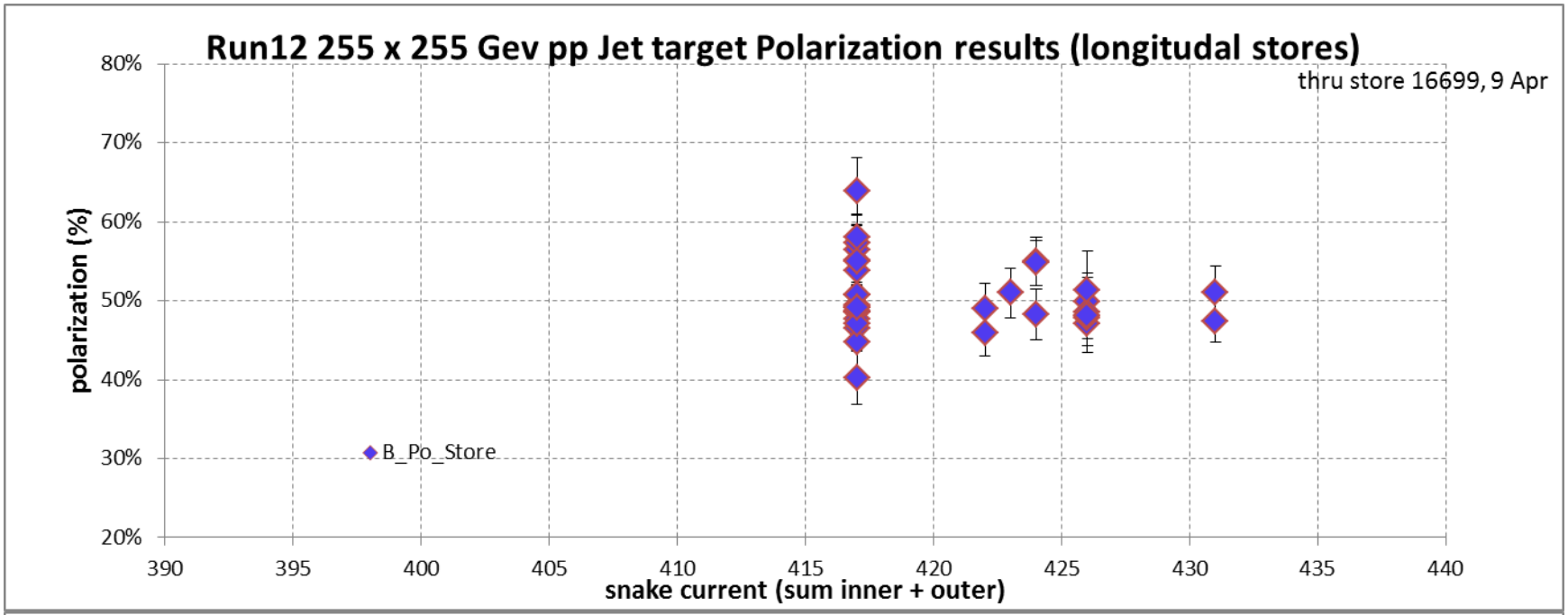
Yellow jet target weighted average = 53.4% ± 0.5%

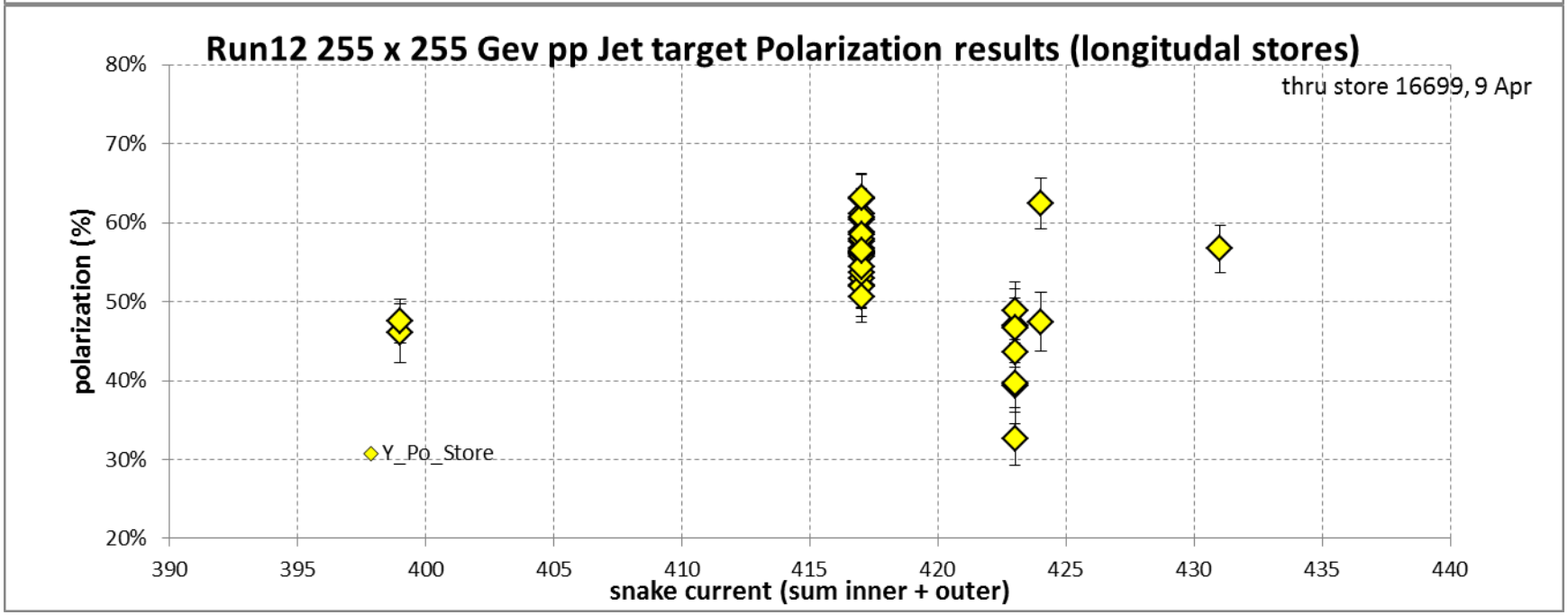
Yellow average = 53.4 ± 0.5%
Blue average = 50.3 ± 0.5%

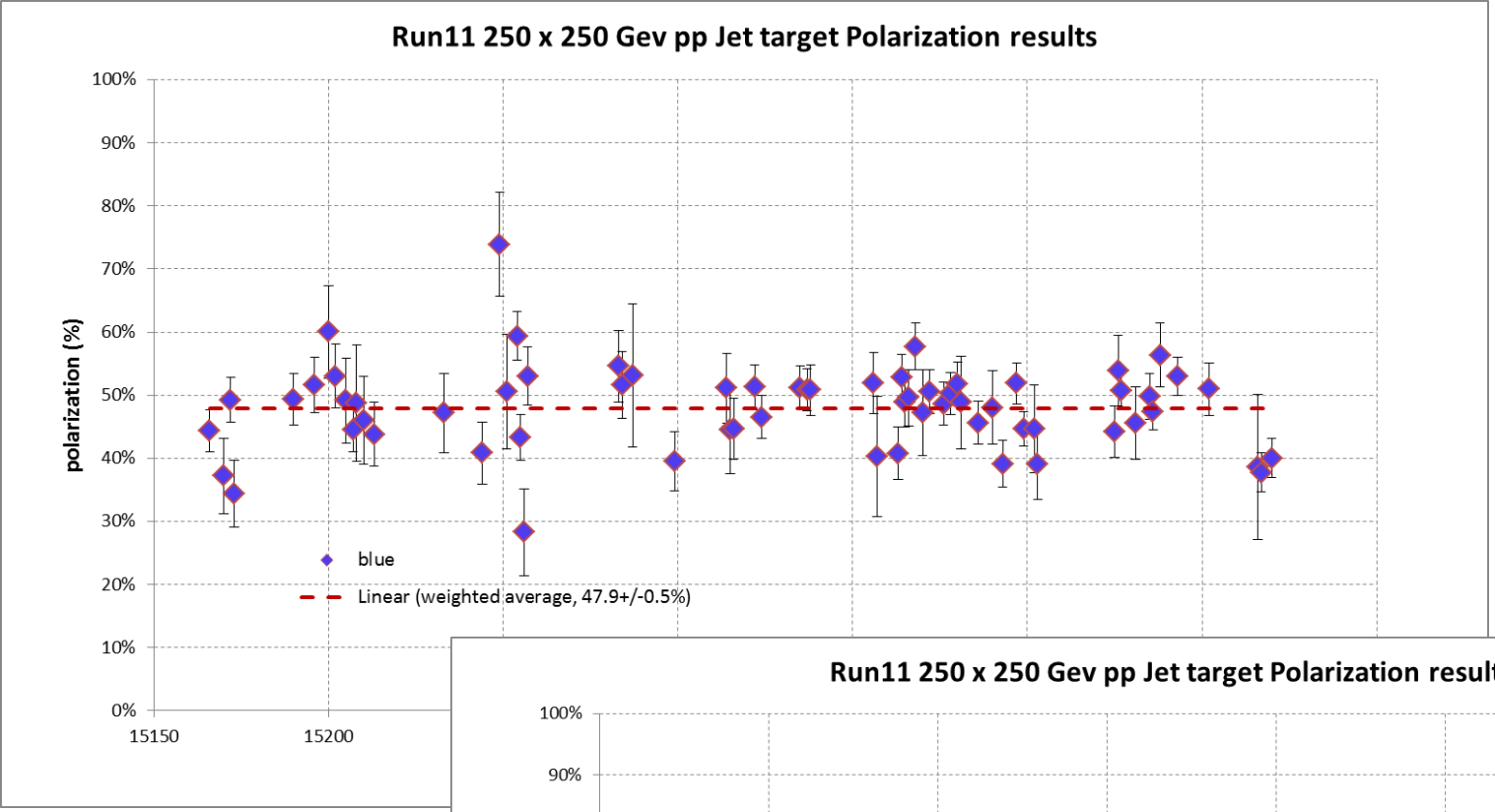


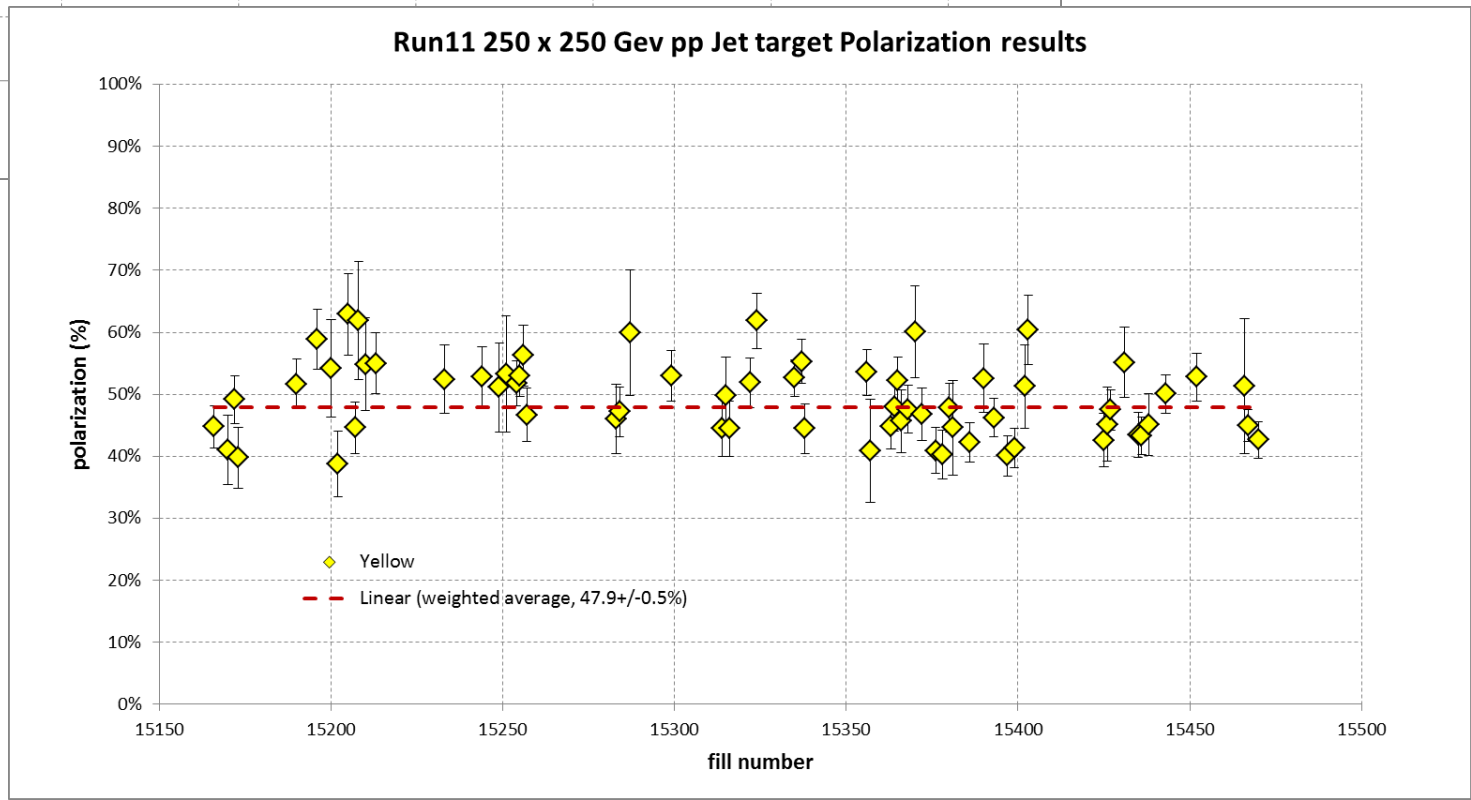

Run12 255 x 255 Gev pp Jet target Polarization results (longitudal stores)
store 1622 thru store 16735
polarization (%)
80%
70%
60%
50%
40%
30%
20%
y = -0.0074x + 0.6963
Y_Po_Store
Linear (Y_Po_Store)
10.0
15.0
20.0
25.0
30.0
35.0
40.0
Calculated average normalized emittance (pimmmr)

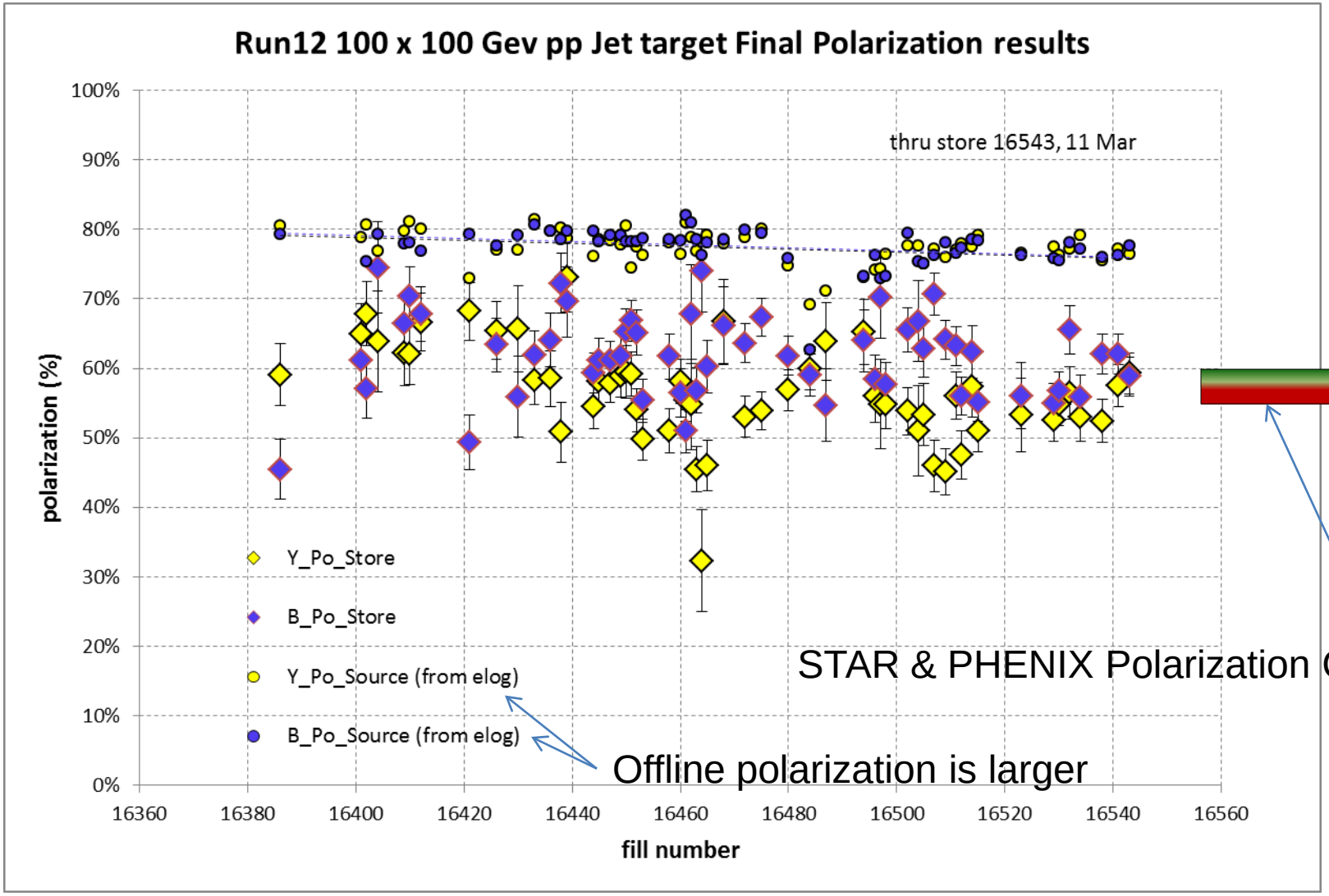

Run12 255 x 255 Gev pp Jet target Polarization results (longitudal stores)
store 1622 thru store 16735
polarization (%)
80%
70%
60%
50%
40%
30%
20%
y = -0.0065x + 0.7205
Y_Po_Store
Linear (Y_Po_Store)
10.0
15.0
20.0
25.0
30.0
35.0
40.0
Calculated average normalized emittance (pimmmr)


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)

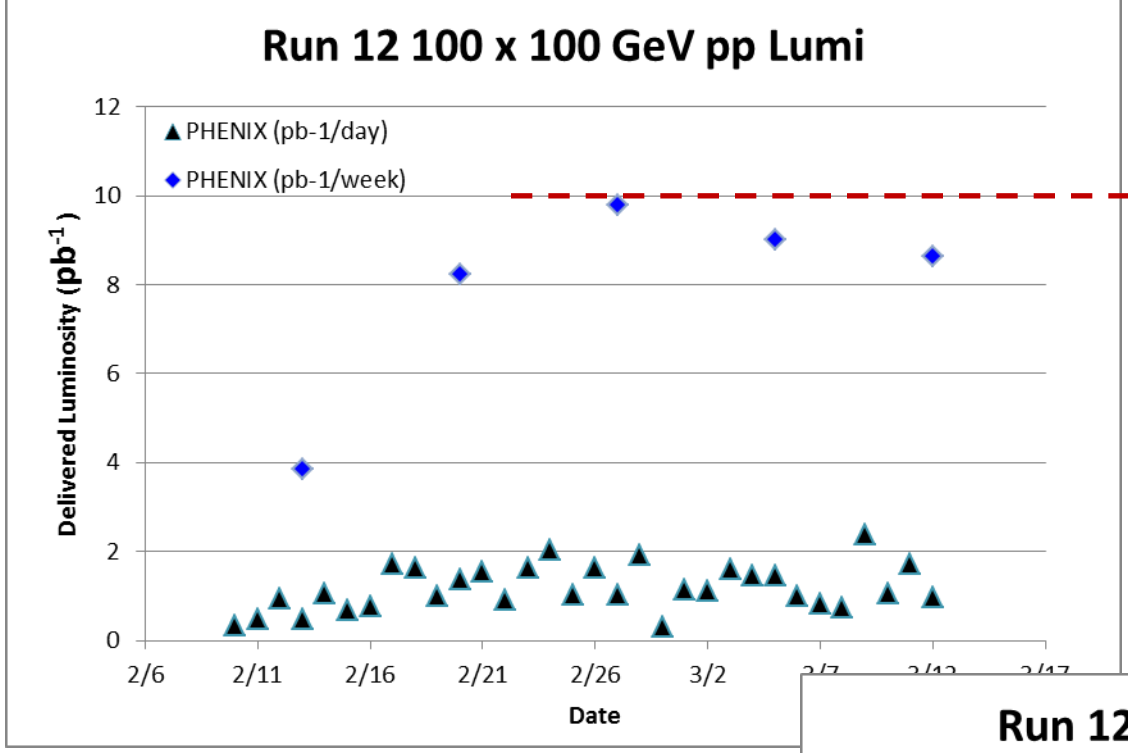

Run11 250 x 250 Gev pp Jet target Polarization results
polarization (%)
100%
90%
80%
70%
60%
50%
40%
30%
20%
10%
0%
15150
15200
blue
Linear (weighted average, 47.9+/-0.5%)


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%)



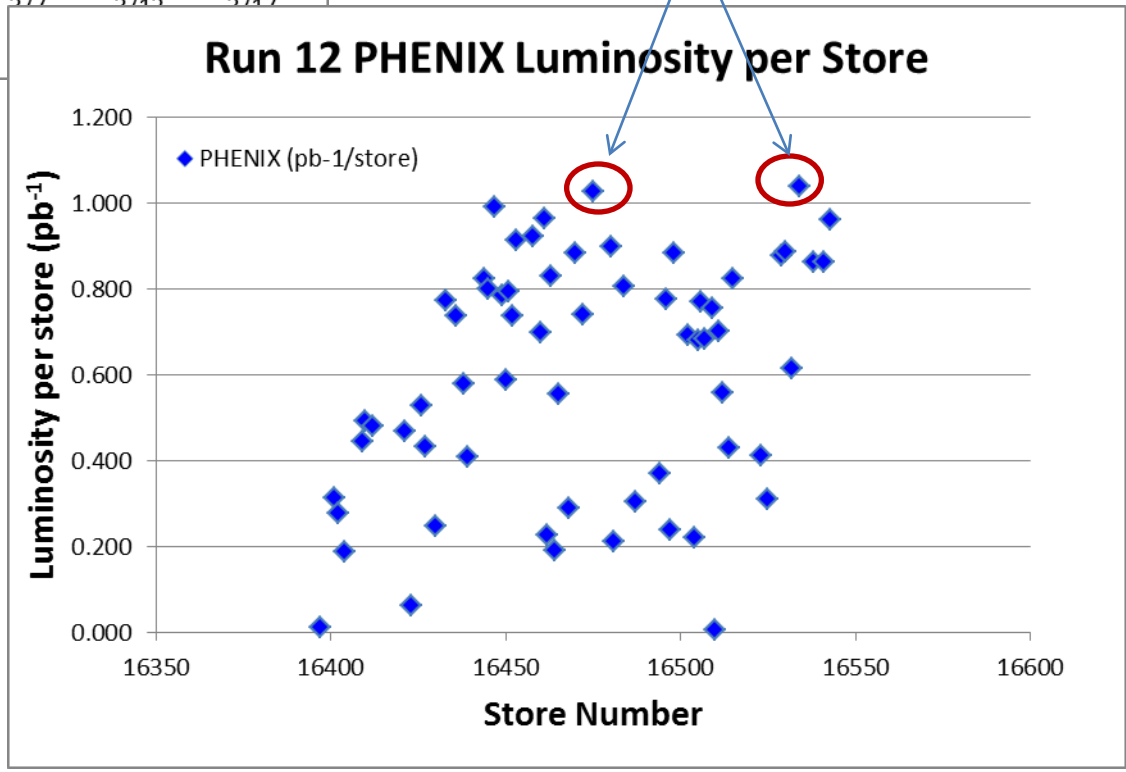
Blue Jet weighted average = 61.2% ± 0.5%;
Yellow Jet weighted average = 55.8% ± 0.5%;

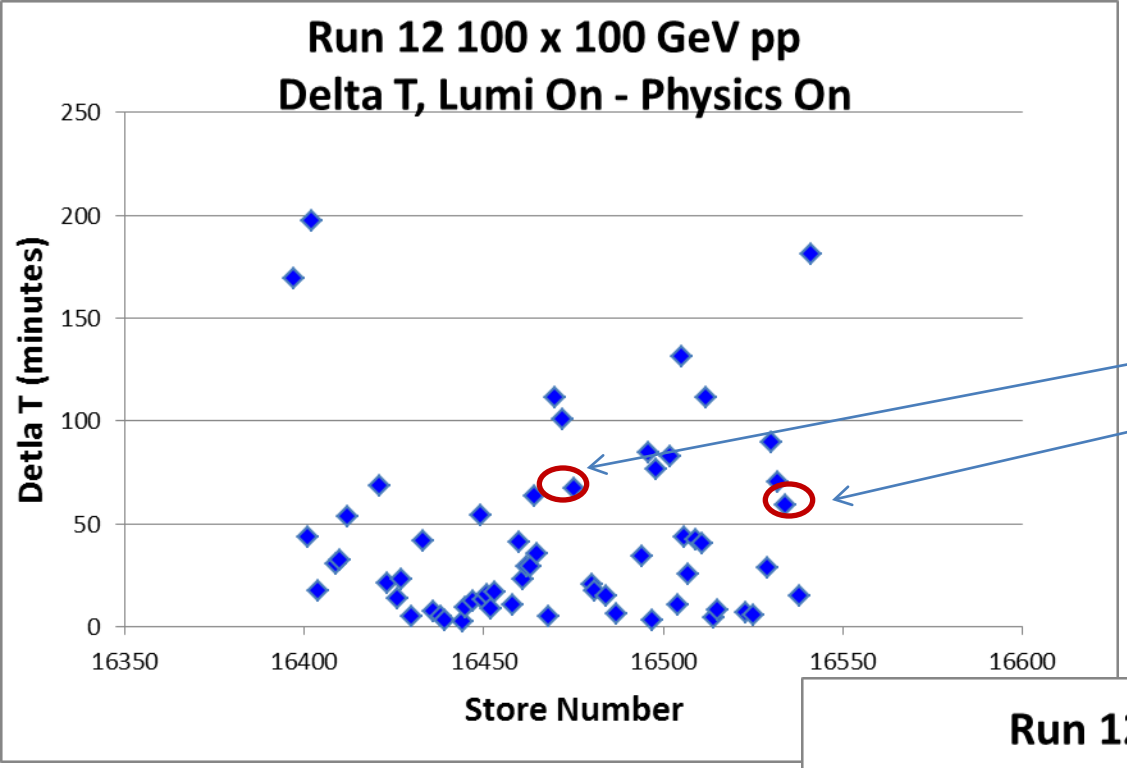
source blue average = 77.5% → **20% lost**
source yellow average = 77.4% → **28% lost**



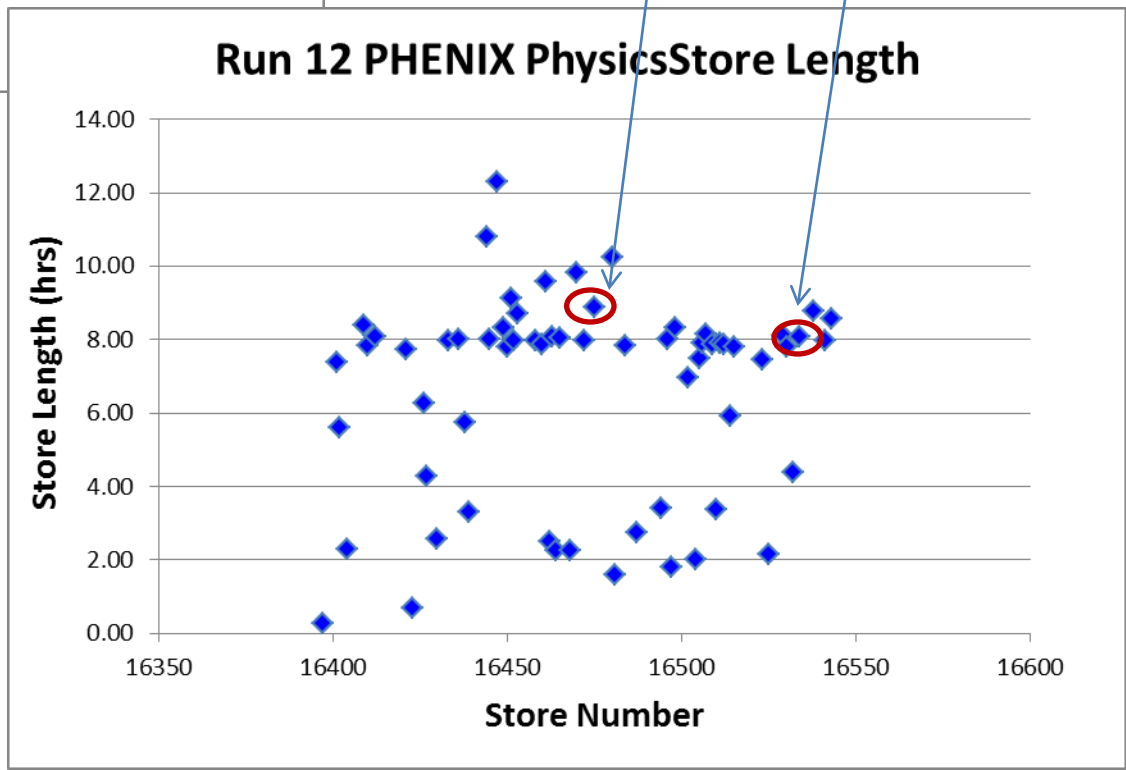
Target (max projection)

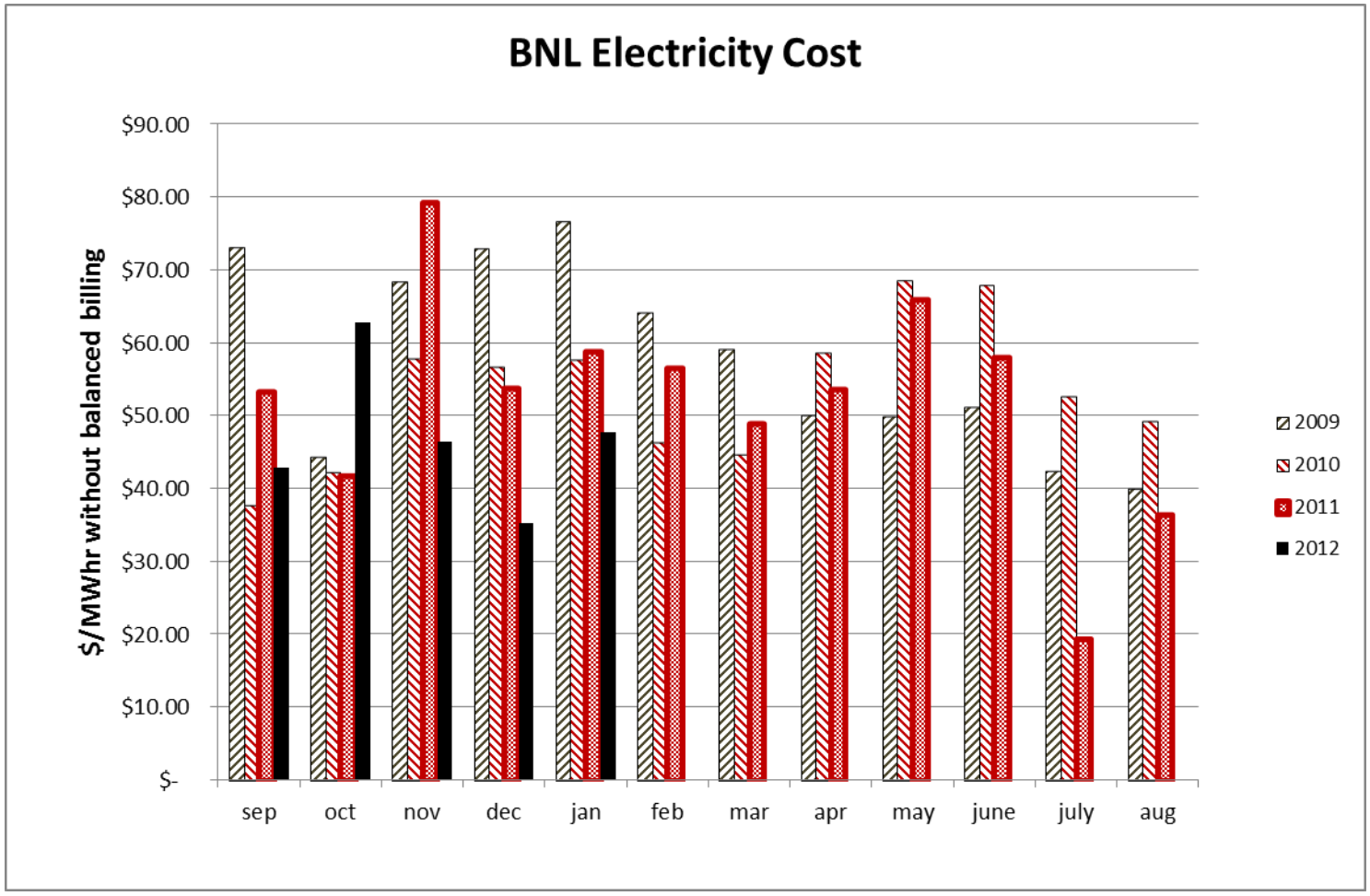
Best stores, 16475 and 16534

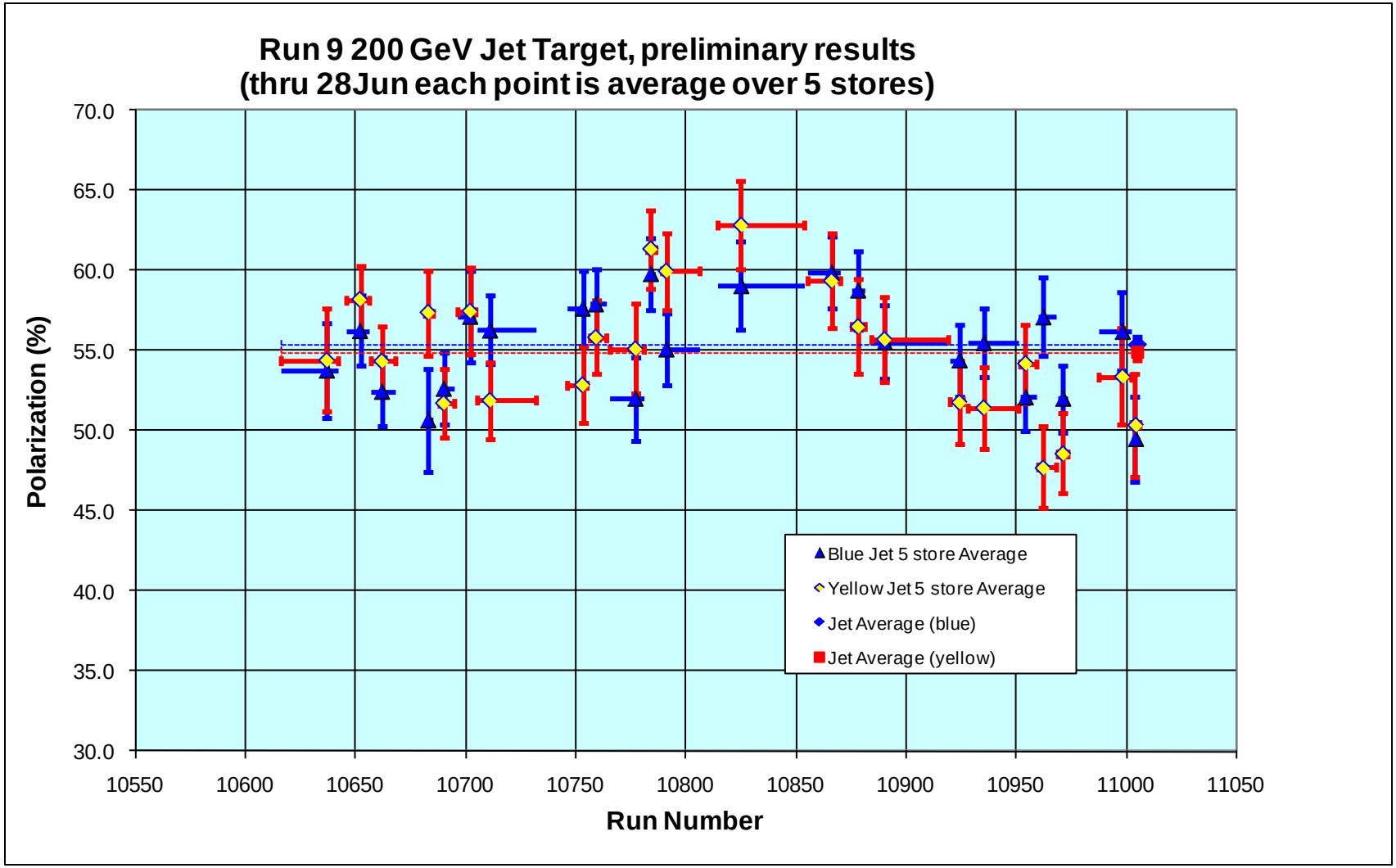




Best stores, 16475 and 16534




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



Blue Jet weighted average = 55.4 ± 0.5

Yellow Jet weighted average = 54.9 ± 0.5