Run 10 plan based on 25 Nov Revised Plan and √s=200 extended by 1 week

- Dec. 1, Begin cool down to 4.5K
- Dec. 4, Cooldown to 4.5K complete in both rings!
- Dec. 5, beam setup in RHIC begins.
- Dec 16, 20 hr unplanned Maintenance day
- Dec 20 (AM)-21(PM), blizzard 09 shut us down
- Dec. 27, RHIC Setup complete, begin Ramp Up for Physics (was 14 Dec, late)
- Dec 31 (midnight-store 11340), Machine, Physics declared (store 11340) √s=200 GeV/n Au-Au
- Jan 2 (midnight) STAR in Physics Mode
- Jan 8 (0600) PHENIX in Physics Mode
- Jan 12, Rebucketing not yet routine, stochastic cooling still to come.
- Jan 22, changed beta* from 0.6 to 0.7 meters, rebucketing ~established, yellow transverse stochastic cooling on
- Mar. 18 (0556), End 10 week √s = 200 GeV/n Run, begin √s = 62.4 GeV/n setup
- Mar. 19, Begin 4 week √s = 62.4 GeV/n run
  - Machine physics 19 March for stores ≥11954
  - PHENIX Physics 19 Mar for stores ≥11955
  - STAR Physics 22 March for stores ≥11976
- Apr. 8, End 2.9 week √s = 62.4 GeV/n Run, begin √s = 39 GeV/n setup
- Apr. 9, Begin 1.5 week √s = 39 GeV/n run
  - Machine physics 9 April for stores ≥12119
  - PHENIX and STAR Physics 9 April for stores ≥12122
- Apr. 14, 24 hours APEX for n= 0.67 studies
- Apr. 22, End 1.9 week √s = 39 GeV/n Run
- Apr 22, Begin √s = 7.7 GeV/n setup (12 hr pol. switches)
- Apr 24 (fill 12238, 2300 hrs), Begin 4 week √s = 7.7 GeV/n run
- 13 May ½ Sextupole Polarity Switch
- May 17 √s = 5 GeV/n development, 8 hour block
- May 27(Thursday) End 4 week √s = 7.7 GeV/n Run, begin √s = 11.5 GeV/n setup **(No polarity switch required)**
- May 29, begin √s = 11.5 GeV/n for STAR
- Jun 12, end 2 week √s = 11.5 GeV/n run
- Jun 12, resume √s = 5 GeV development
- Jun 13 (Sunday) , Begin Cryo Warm-up
- Jun 14, Warm-up complete, Run 10 ends – **27.9 CRYO WEEKS**
- **Last Week of June – Commission EBIS with He beam to NSRL**

Run 10 plan based on 25 Nov Revised Plan and √s=200 extended by 1 week

- Apr 22, Begin √s = 7.7 GeV/n setup (12 hr pol. switches)
- Apr 24 (fill 12238, 2300 hrs), Begin 4 week √s = 7.7 GeV/n run
- 13 May ½ Sextupole Polarity Switch
- May 17 √s = 5 GeV/n development, 8 hour block

- May ~~22(Saturday)~~ **27(Thursday)** End 4.7 week √s = 7.7 GeV/n Run, begin √s = 11.5 GeV/n setup **(No polarity switch required)**
- **May 20 – Jun 3, Satogata is away**
- **May 23 – 28 IPAC (Kyoto)**
- May ~~24~~ 29, begin √s = 11.5 GeV/n for STAR
- Jun ~~7~~ 12, end 2 week √s = 11.5 GeV/n run
- ~~10-12 Jun – 3 days contingency~~
- Jun 12, resume √s = 5 GeV development
- Jun 13 (Sunday) , Begin Cryo Warm-up
- Jun 14, Warm-up complete, Run 10 ends – **27.9 CRYO WEEKS**
- **Last Week of June – Commission EBIS with He beam to NSRL**

Run 10 Au-Au Goals

4/27/10

- STAR
  - $\sqrt{s}$ = 7.7 GeV/n
    - Luminosity Sampled/Delivered = ?/? μb^{-1}
    - 5M Min-bias events
  - $\sqrt{s}$ = 11.5 GeV/n
    - Luminosity Sampled/Delivered = ?/? μb^{-1}
    - 5M Min-bias events

- PHENIX
  - $\sqrt{s}$ = 7.7 GeV/n
    - Luminosity Recorded/Delivered = ?/? μb^{-1}
    - 0.5M Min-bias events

An Issue

When do we end the "2 week" $\sqrt{s}$ = 11.5 GeV/n run?

- After 5M events have been recorded by STAR

– OR—

- After 2 weeks

- @ 7.7 STAR averaged (last part of run) 250K/day with 6 Hz average rate/store (prediction was 3 Hz)
  - 11.5 GeV prediction is 10Hz, if we get x2 this then we get 500K/day → 10 days to goal

PHENIX BUR

Table 6: Detailed plan for Run-10.

	$\sqrt{s_{NN}}$	weeks	events	comment
cooldown		2		
Au+Au start/rampup	200	3		
Au+Au physics	200	10		record 1.4nb^{-1}
	62.4	3.5	350M	← (Actual 2.9 weeks, 660M)
	≈ 39	1.6	50M	← (Actual 1.9 weeks, 250M)
	27	4.5	25M	
p+p development	500	4		PHENIX ops as needed
p+p physics	22.4	1	2.5B	
warm-up		0.5		
TOTAL		30		

Table II: Detailed breakdown of Critical Point search and Beam Energy Scan

STAR BUR

Beam Energy	Event Rate	8-hr Days/ 1M Events	Events proposed	8-hr days proposed
5	0.8	45	100 k	5
7.7	3	11	5 M	56
11.5	10	3.7	5M	19
17.3	33	1.1	15M	16
27	92	0.4	33M	12
39	190	0.2	24M	5

Actual Average good event rate ~6 Hz

(Actual 4.7 weeks, ~5M)

Actual Average ZDC Rate ~1200 Hz

(Actual 1.9 weeks, ~250M)

Archive

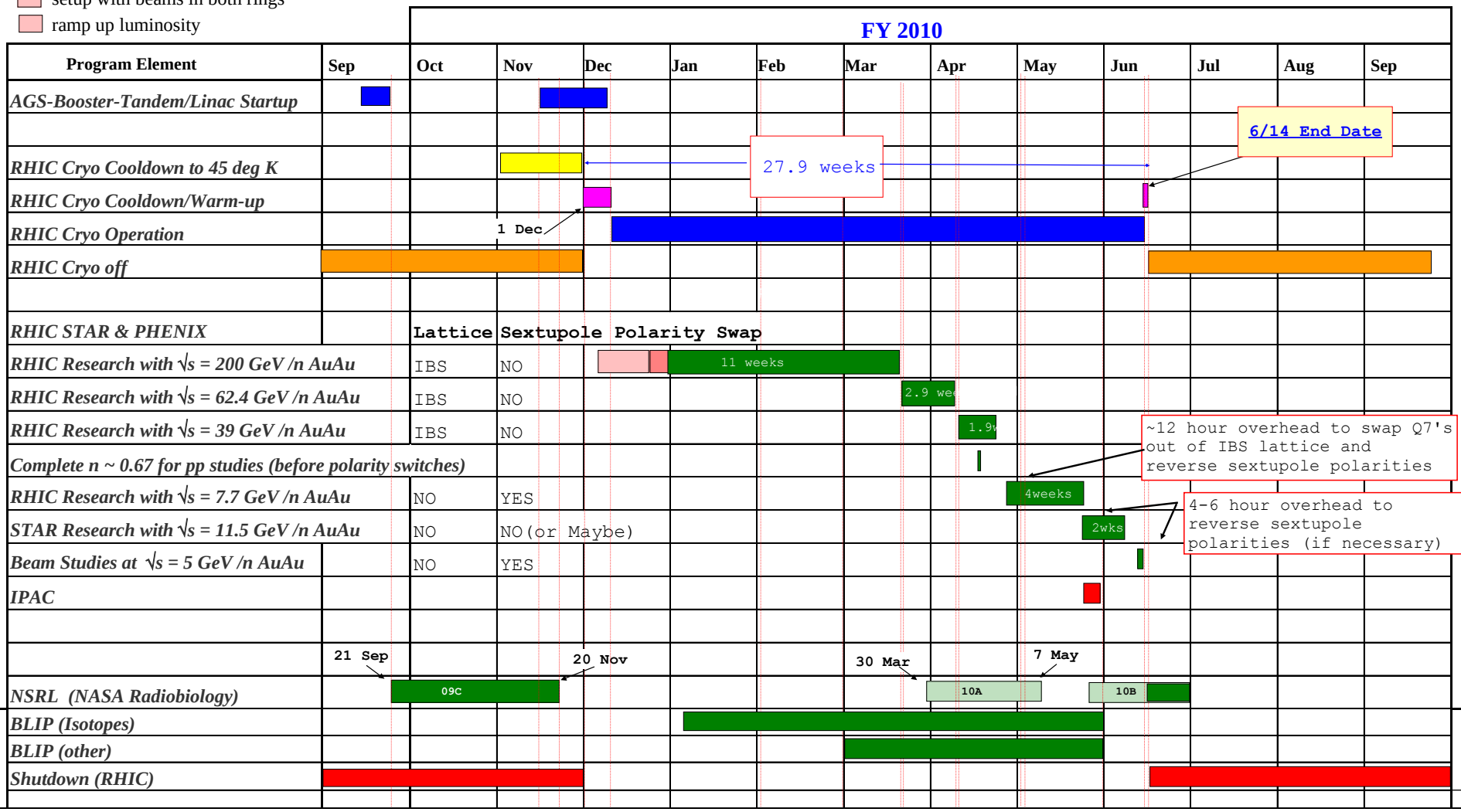
http://www.bnl.gov/cad/esfd

15 Apr 10

C-A Operations-FY10

as run/planned

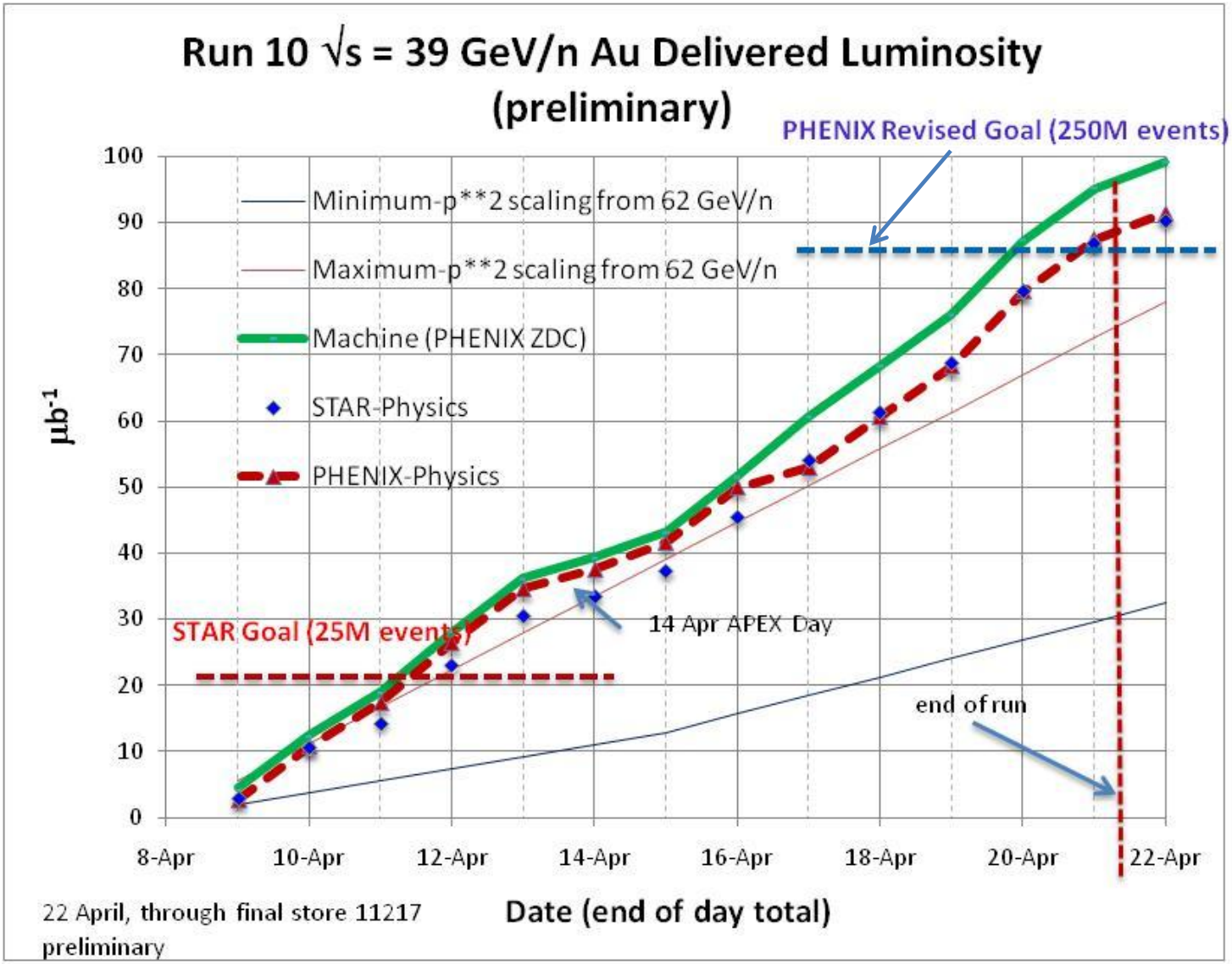
concurrent with RHIC
setup with beams in both rings
ramp up luminosity

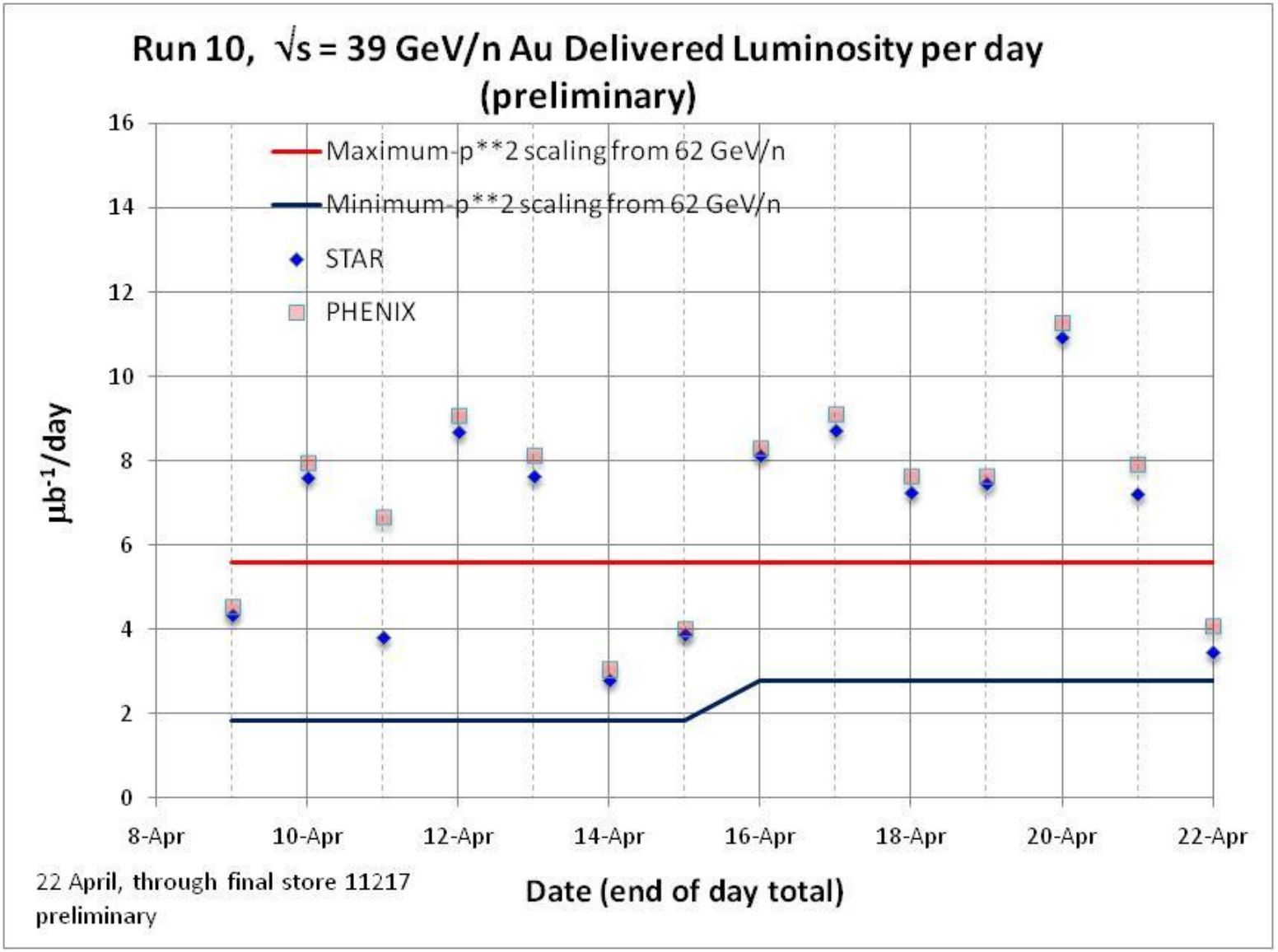


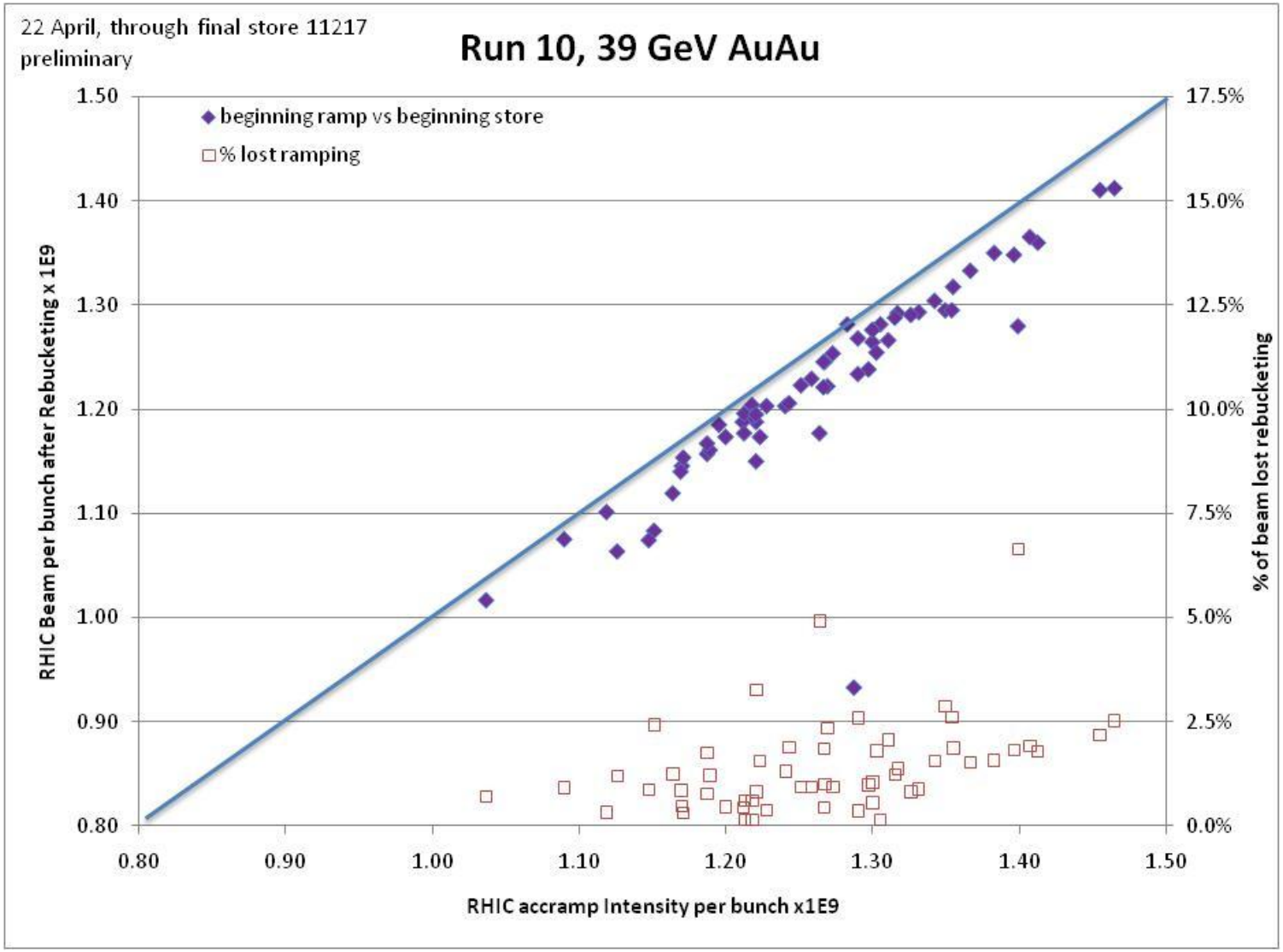
Run 10 Au-Au Goals, $\sqrt{s}$ = 39 GeV/n

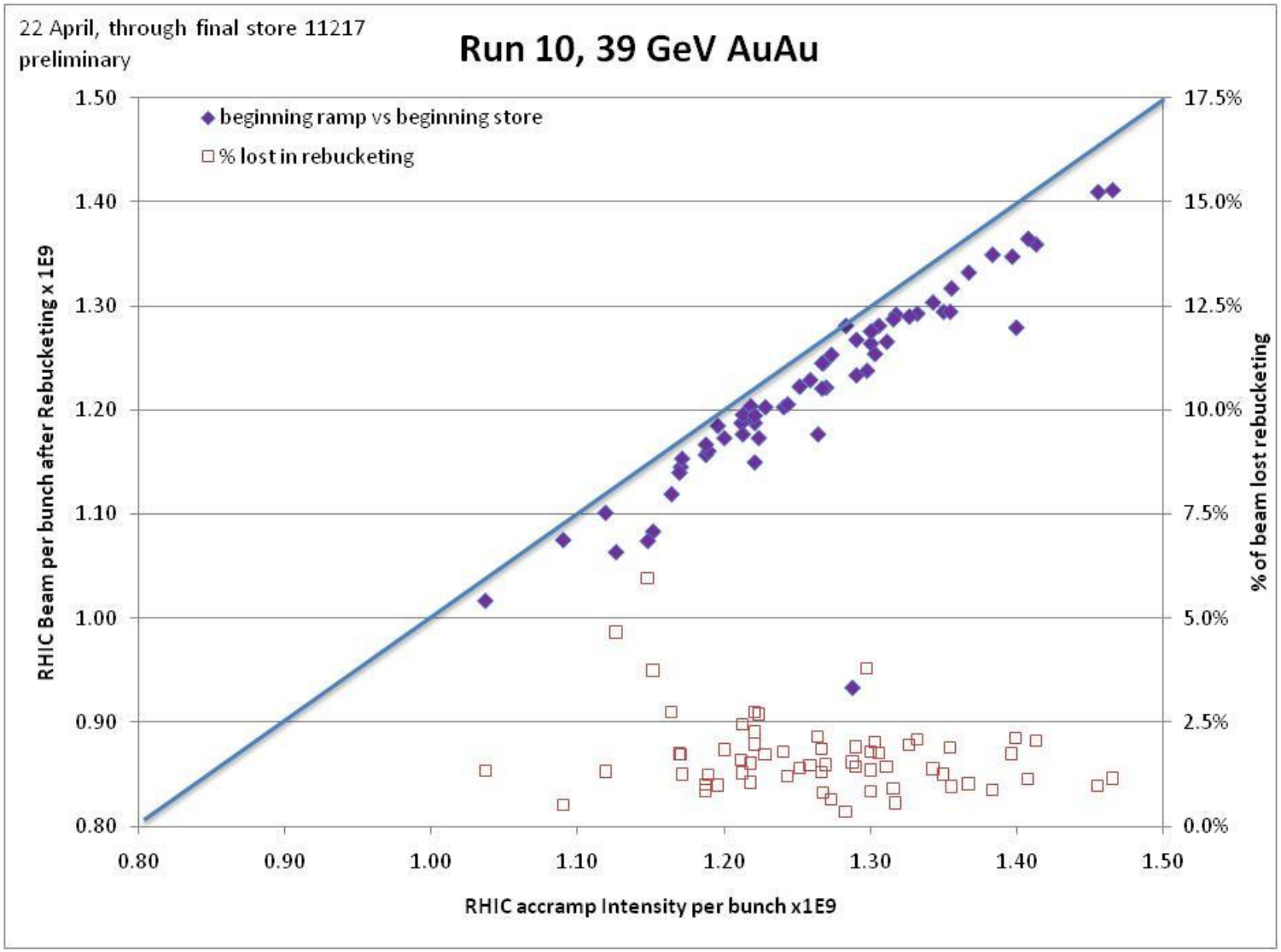
4/13/10

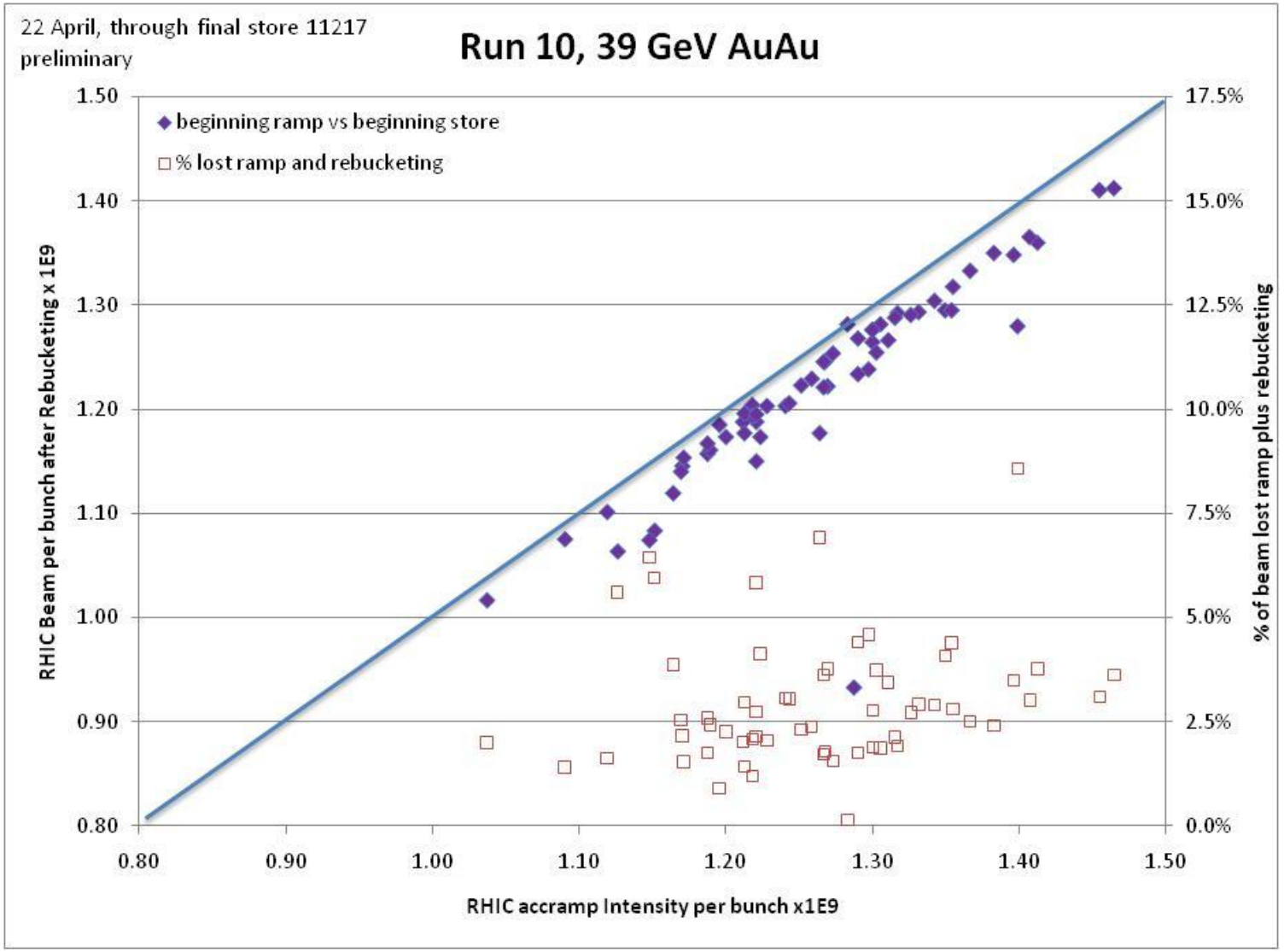
- STAR
  - $\sqrt{s}$ = 39 GeV/n
    - Luminosity Sampled/Delivered = ?/? μb^{-1}
    - 24M Min-bias events
- PHENIX
  - $\sqrt{s}$ = 39 GeV/n
    - Luminosity Recorded/Delivered = ?/? μb^{-1}
    - 50M Min-bias events <30 cm vertex, (revised request 250M)

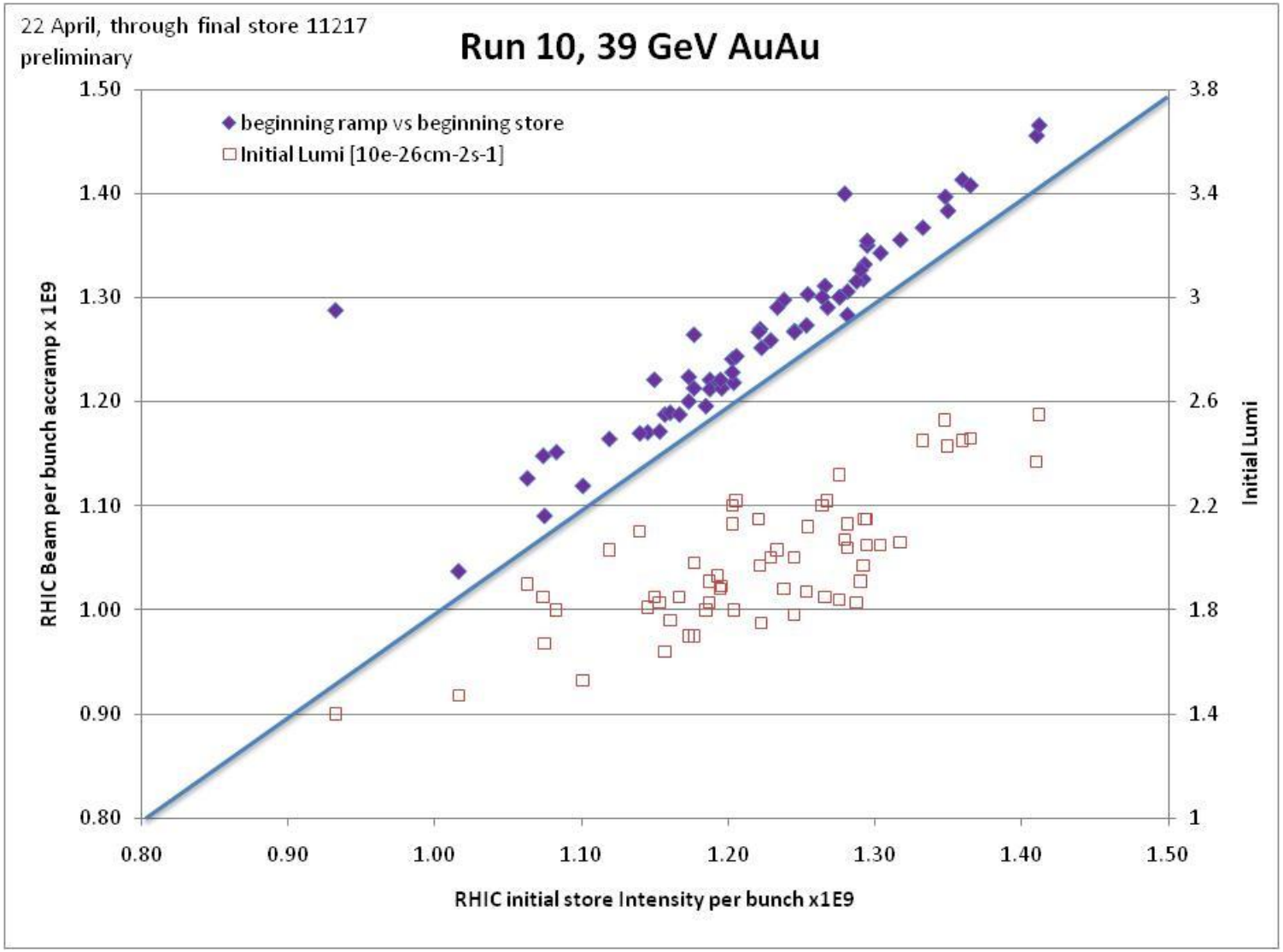

Run 10 √s = 39 GeV/n Au Delivered Luminosity
(preliminary)
PHENIX Revised Goal (250M events)
Minimum-p**2 scaling from 62 GeV/n
Maximum-p**2 scaling from 62 GeV/n
Machine (PHENIX ZDC)
STAR-Physics
PHENIX-Physics
STAR Goal (25M events)
14 Apr APEX Day
end of run
μb-1
100
90
80
70
60
50
40
30
20
10
0
8-Apr
10-Apr
12-Apr
14-Apr
16-Apr
18-Apr
20-Apr
22-Apr
Date (end of day total)
22 April, through final store 11217
preliminary

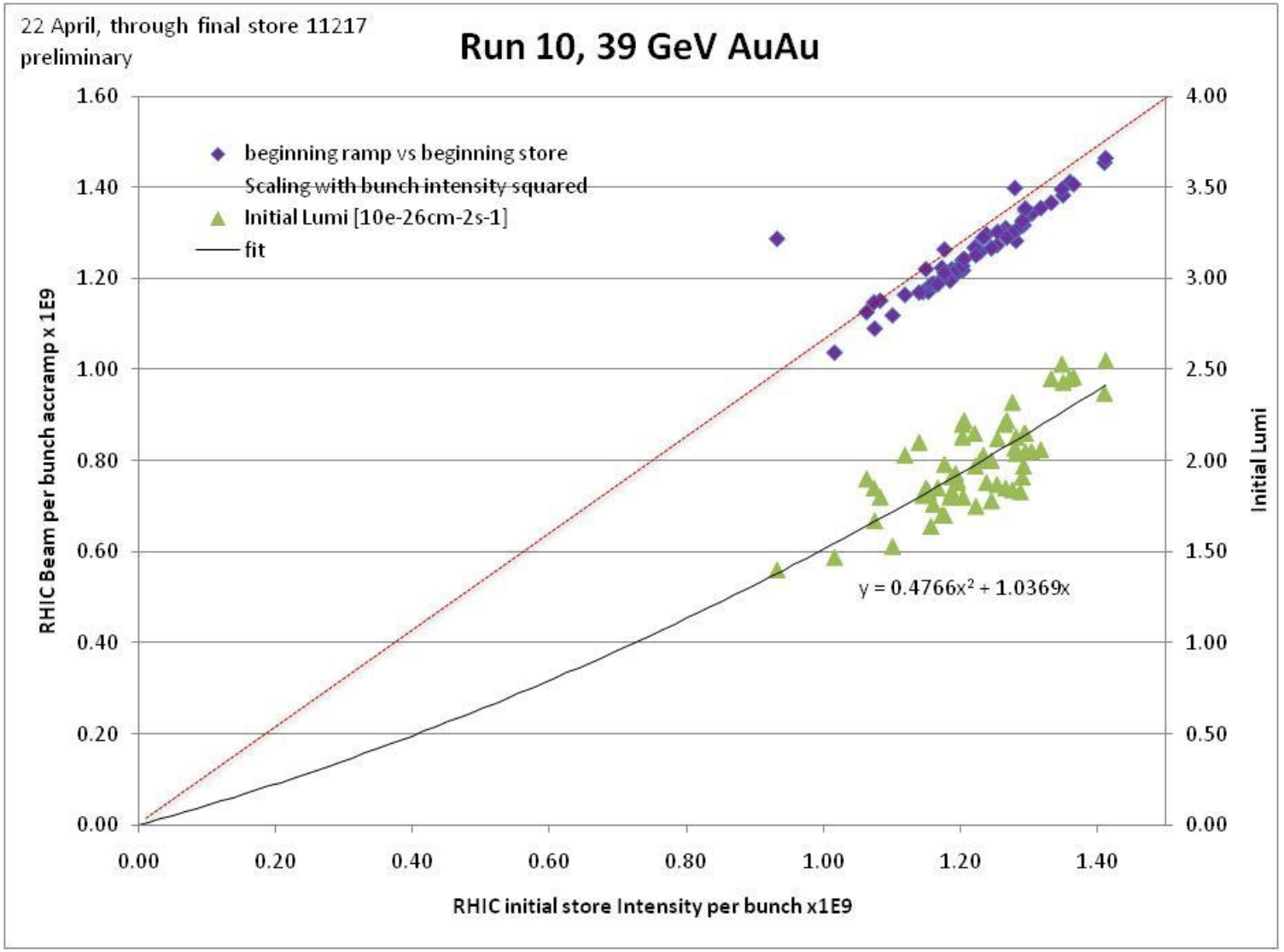

Run 10, √s = 39 GeV/n Au Delivered Luminosity per day (preliminary)
Maximum-p**2 scaling from 62 GeV/n
Minimum-p**2 scaling from 62 GeV/n
STAR
PHENIX
μb-1/day
16
14
12
10
8
6
4
2
0
8-Apr
10-Apr
12-Apr
14-Apr
16-Apr
18-Apr
20-Apr
22-Apr
Date (end of day total)
22 April, through final store 11217
preliminary

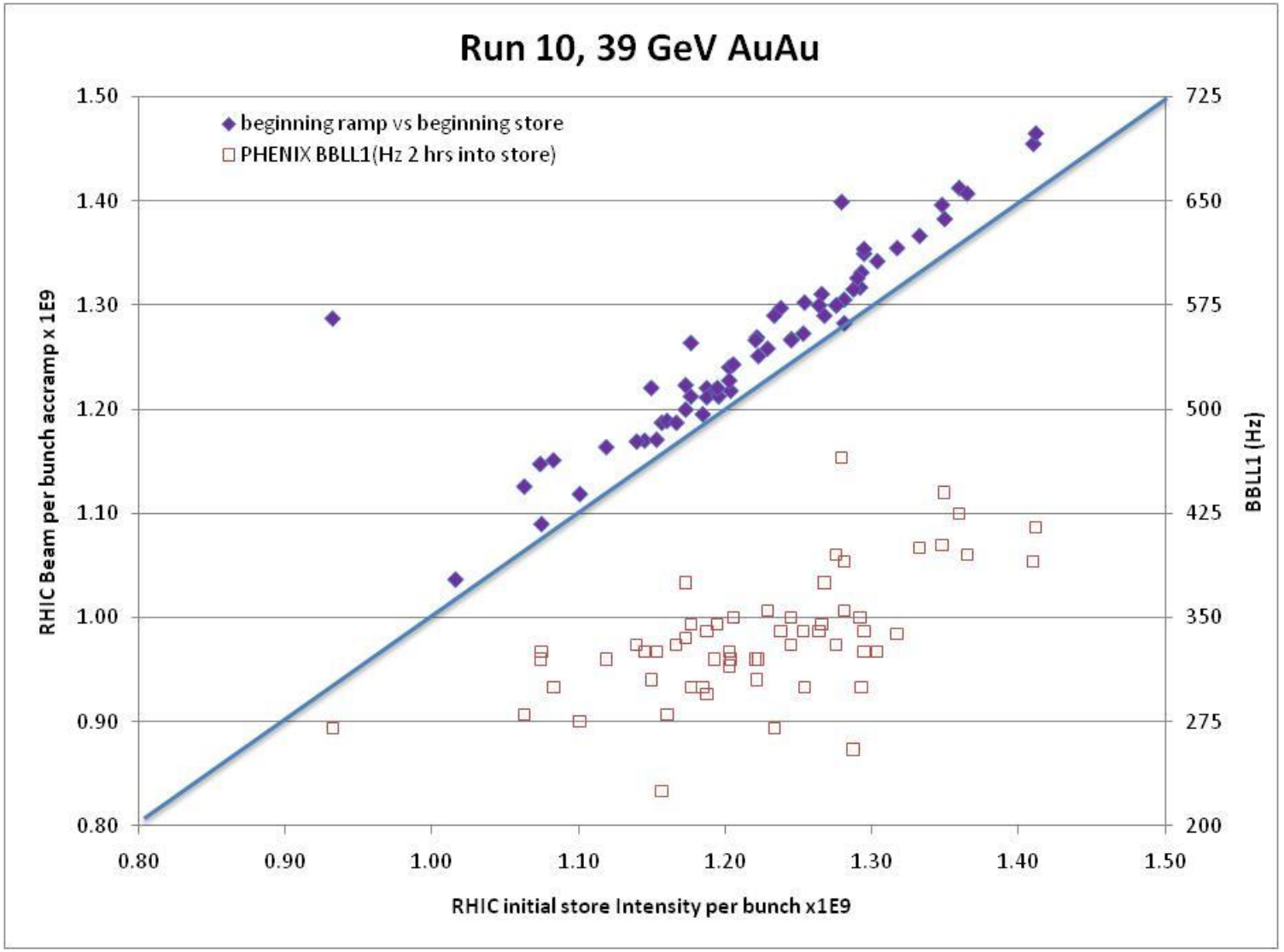

22 April, through final store 11217
preliminary
Run 10, 39 GeV AuAu
beginning ramp vs beginning store
% lost ramping
RHIC Beam per bunch after Rebucketing x 1E9
% of beam lost rebucketing
RHIC accramp Intensity per bunch x1E9
1.50
1.40
1.30
1.20
1.10
1.00
0.90
0.80
17.5%
15.0%
12.5%
10.0%
7.5%
5.0%
2.5%
0.0%
0.80
0.90
1.00
1.10
1.20
1.30
1.40
1.50

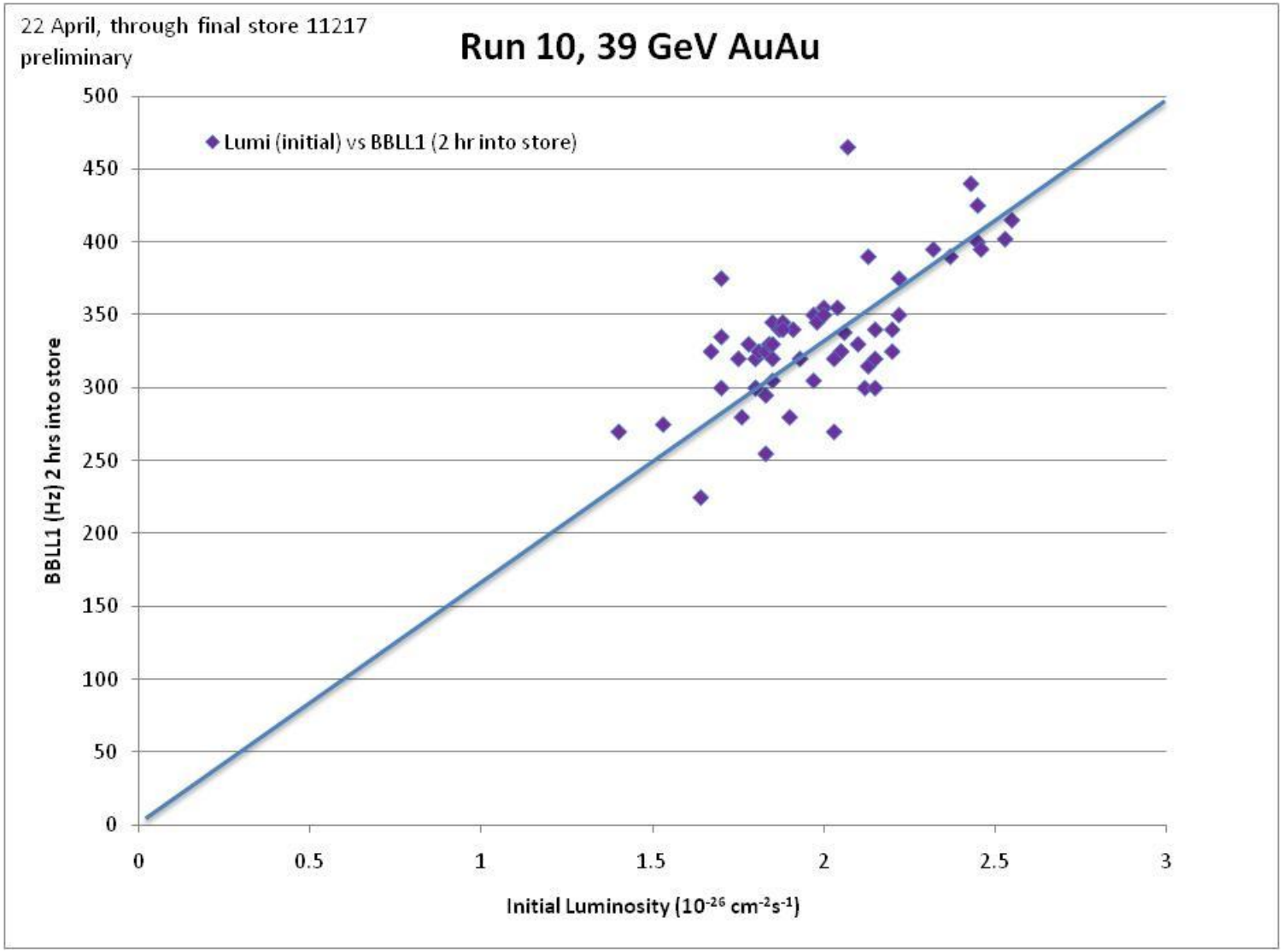

22 April, through final store 11217
preliminary
Run 10, 39 GeV AuAu
beginning ramp vs beginning store
% lost in rebucketing
RHIC Beam per bunch after Rebucketing x 1E9
% of beam lost rebucketing
RHIC accramp Intensity per bunch x1E9
1.50
1.40
1.30
1.20
1.10
1.00
0.90
0.80
17.5%
15.0%
12.5%
10.0%
7.5%
5.0%
2.5%
0.0%
0.80
0.90
1.00
1.10
1.20
1.30
1.40
1.50

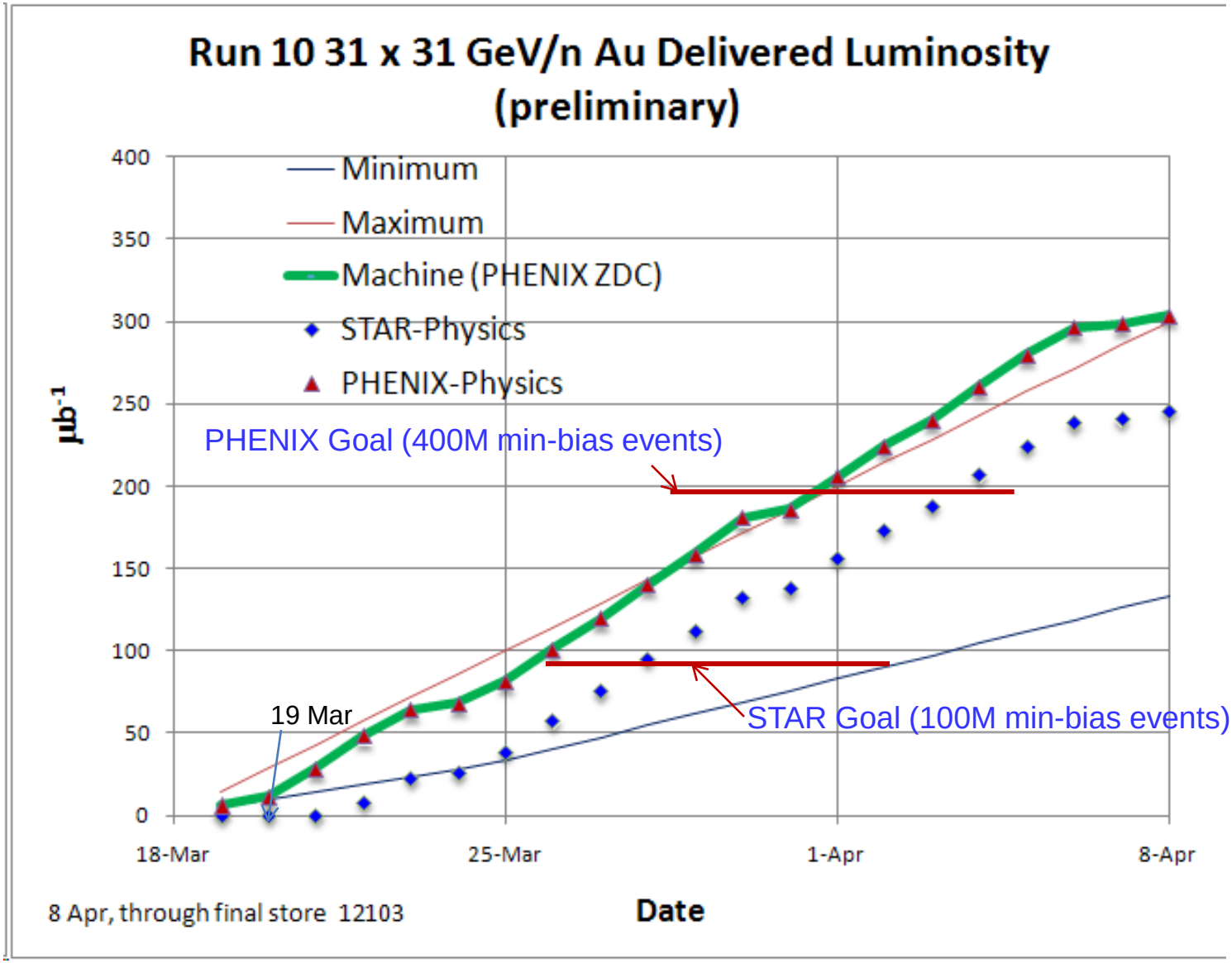

22 April, through final store 11217
preliminary
Run 10, 39 GeV AuAu
beginning ramp vs beginning store
% lost ramp and rebucketing
RHIC Beam per bunch after Rebucketing x 1E9
% of beam lost ramp plus rebucketing
RHIC accramp Intensity per bunch x1E9
1.50
1.40
1.30
1.20
1.10
1.00
0.90
0.80
17.5%
15.0%
12.5%
10.0%
7.5%
5.0%
2.5%
0.0%
0.80
0.90
1.00
1.10
1.20
1.30
1.40
1.50

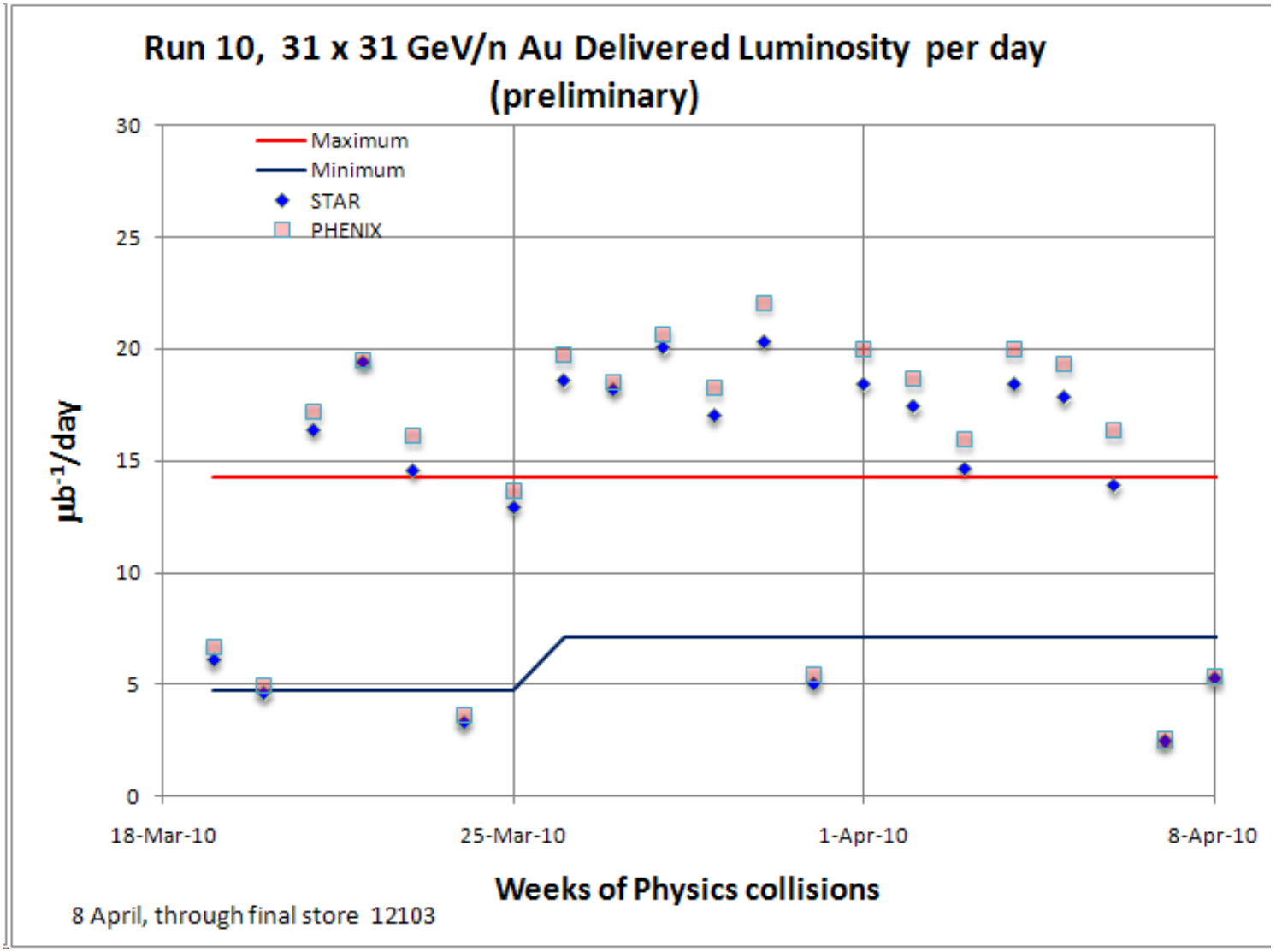

22 April, through final store 11217
preliminary
Run 10, 39 GeV AuAu
beginning ramp vs beginning store
Initial Lumi [10e-26cm-2s-1]
RHIC Beam per bunch accramp x 1E9
Initial Lumi
RHIC initial store Intensity per bunch x1E9
1.50
1.40
1.30
1.20
1.10
1.00
0.90
0.80
3.8
3.4
3
2.6
2.2
1.8
1.4
1
0.80
0.90
1.00
1.10
1.20
1.30
1.40
1.50


22 April, through final store 11217
preliminary
Run 10, 39 GeV AuAu
beginning ramp vs beginning store
Scaling with bunch intensity squared
Initial Lumi [10e-26cm-2s-1]
fit
y = 0.4766x² + 1.0369x
RHIC Beam per bunch accramp x 1E9
Initial Lumi
RHIC initial store Intensity per bunch x1E9
0.00
0.20
0.40
0.60
0.80
1.00
1.20
1.40
1.60
0.50
1.50
2.00
2.50
3.00
3.50
4.00

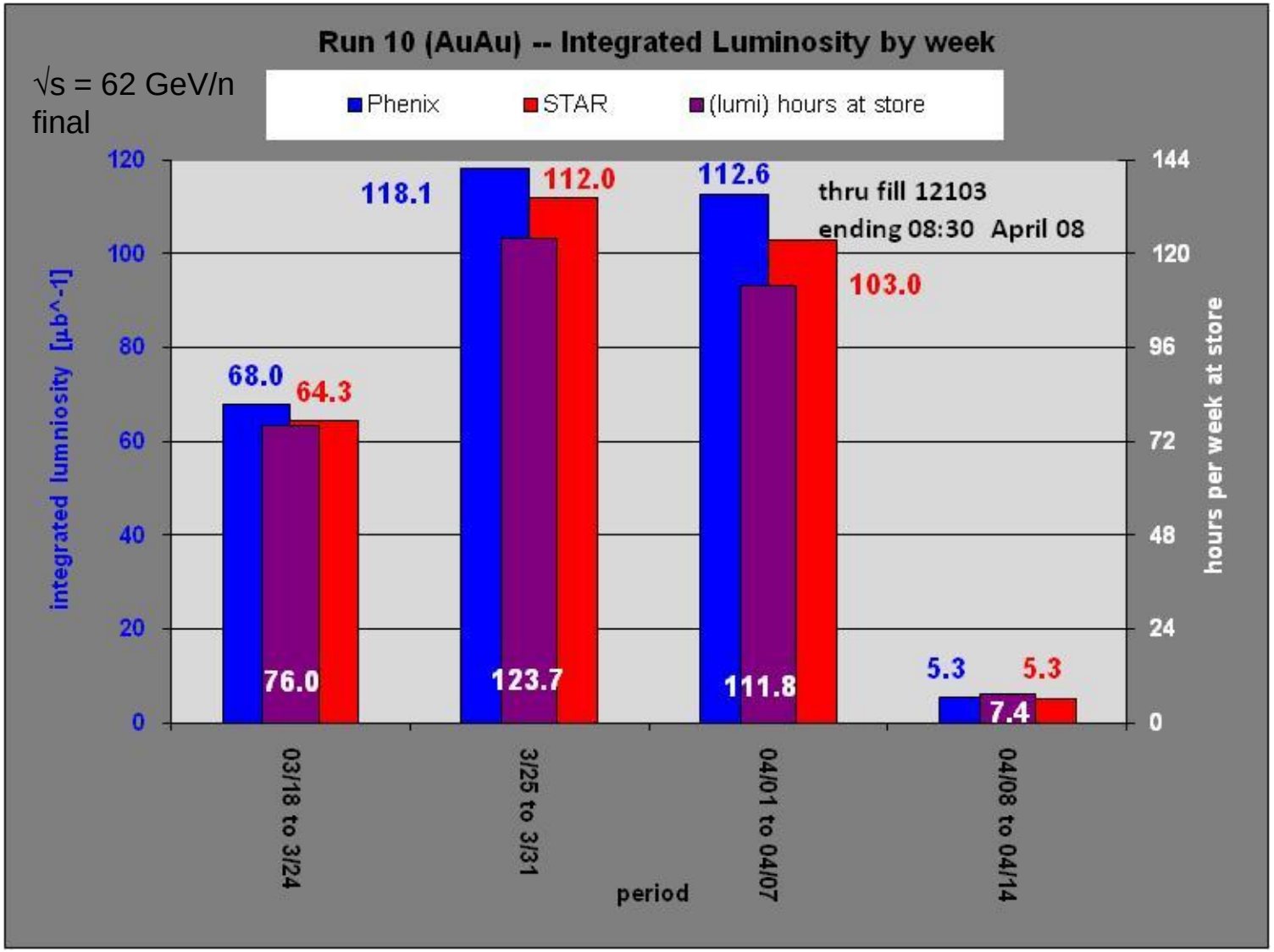

Run 10, 39 GeV AuAu
beginning ramp vs beginning store
PHENIX BBLL1(Hz 2 hrs into store)
RHIC Beam per bunch accramp x 1E9
BBLL1 (Hz)
RHIC initial store Intensity per bunch x1E9
1.50
1.40
1.30
1.20
1.10
1.00
0.90
0.80
725
650
575
500
425
350
275
200
0.80
0.90
1.00
1.10
1.20
1.30
1.40
1.50

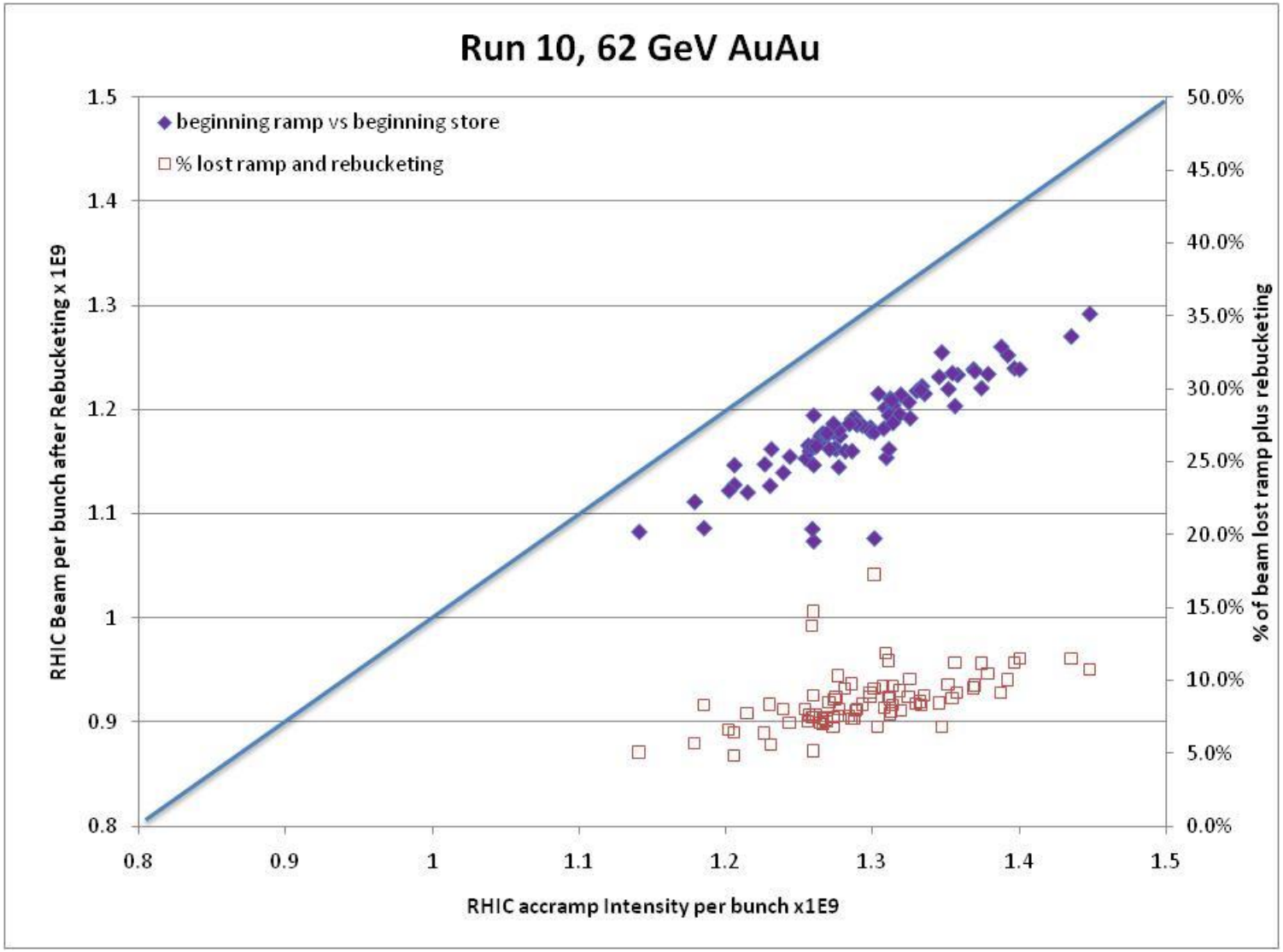

22 April, through final store 11217
preliminary
Run 10, 39 GeV AuAu
Lumi (initial) vs BBLL1 (2 hr into store)
BBLL1 (Hz) 2 hrs into store
Initial Luminosity (10^-26 cm^-2s^-1)
500
450
400
350
300
250
200
150
100
50
0
0
0.5
1
1.5
2
2.5
3

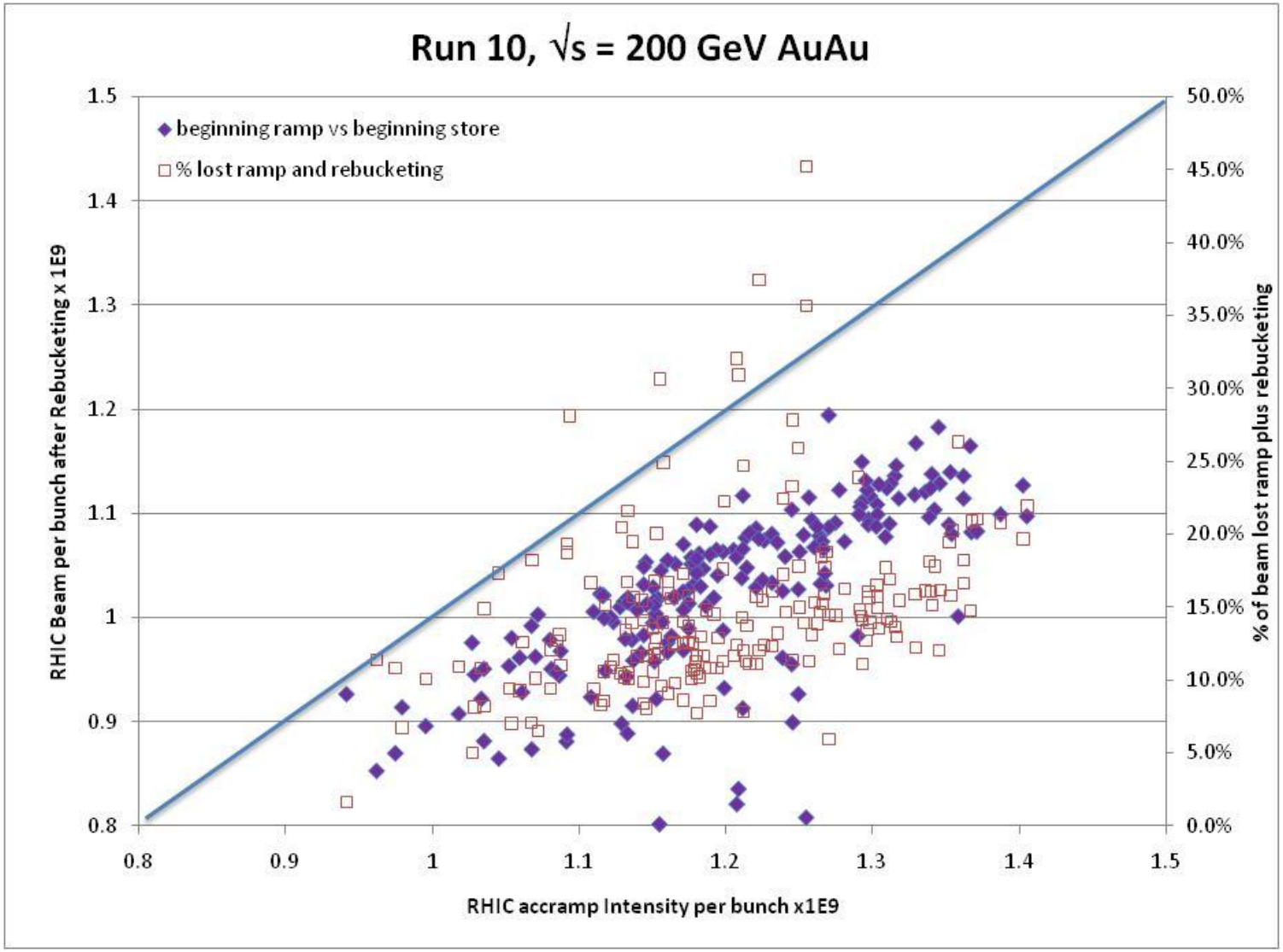

Run 10 31 x 31 GeV/n Au Delivered Luminosity
(preliminary)
Minimum
Maximum
Machine (PHENIX ZDC)
STAR-Physics
PHENIX-Physics
PHENIX Goal (400M min-bias events)
STAR Goal (100M min-bias events)
19 Mar
μb-1
400
350
300
250
200
150
100
50
0
18-Mar
25-Mar
1-Apr
8-Apr
Date
8 Apr, through final store 12103

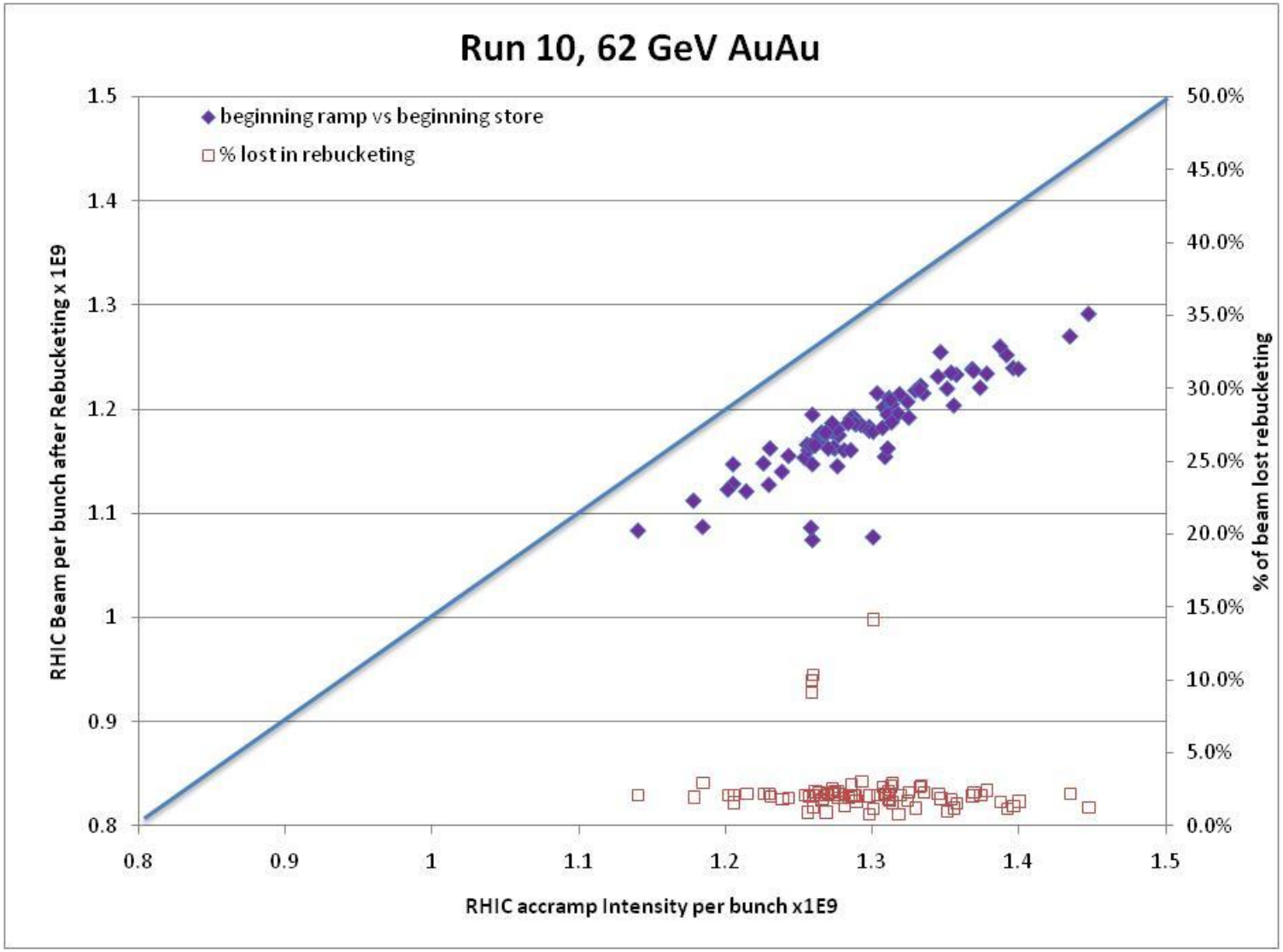

Run 10, 31 x 31 GeV/n Au Delivered Luminosity per day
(preliminary)
Maximum
Minimum
STAR
PHENIX
30
25
20
15
10
5
0
μb-1/day
18-Mar-10
25-Mar-10
1-Apr-10
8-Apr-10
Weeks of Physics collisions
8 April, through final store 12103

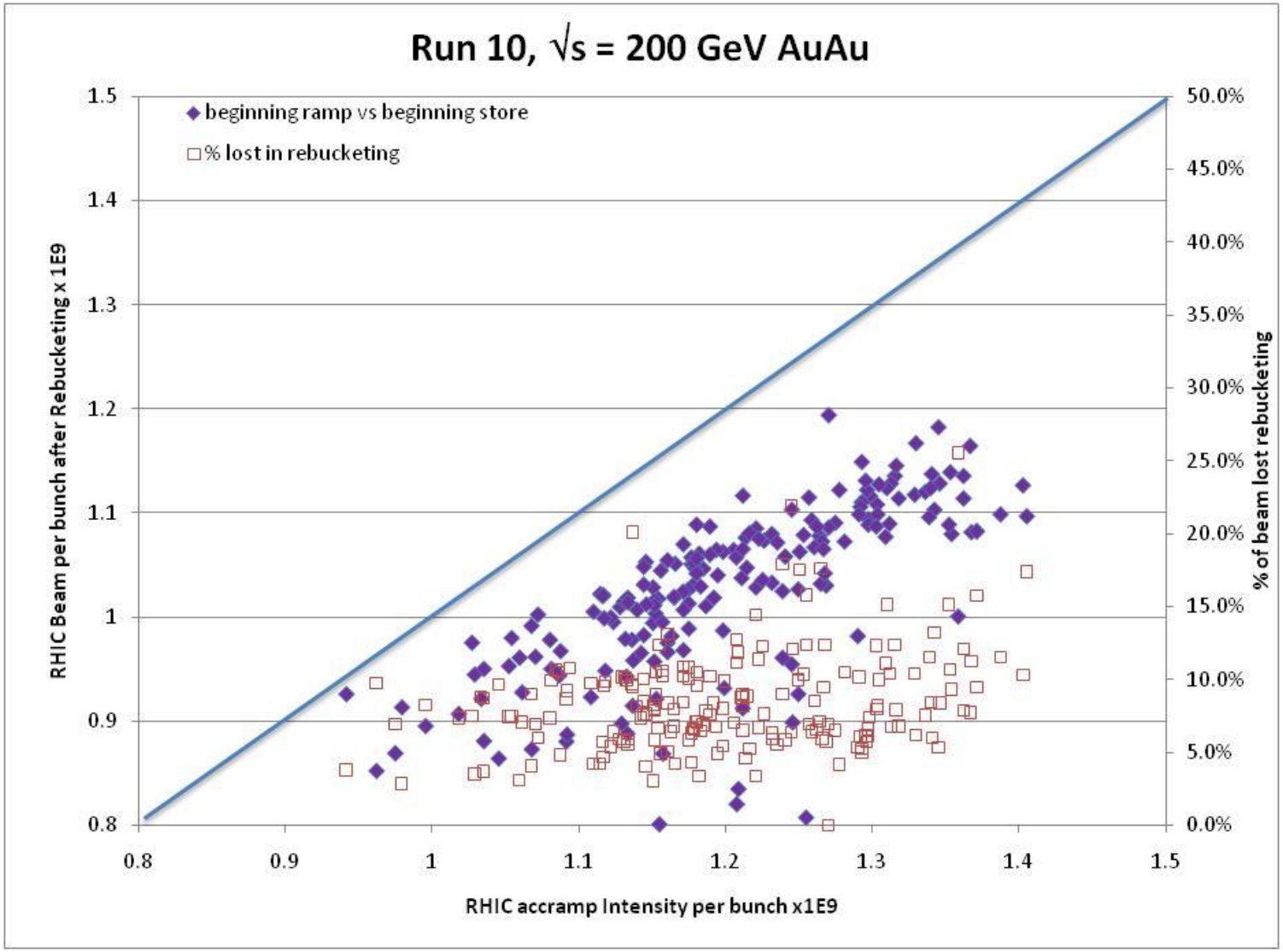
√s = 62 GeV/n
final

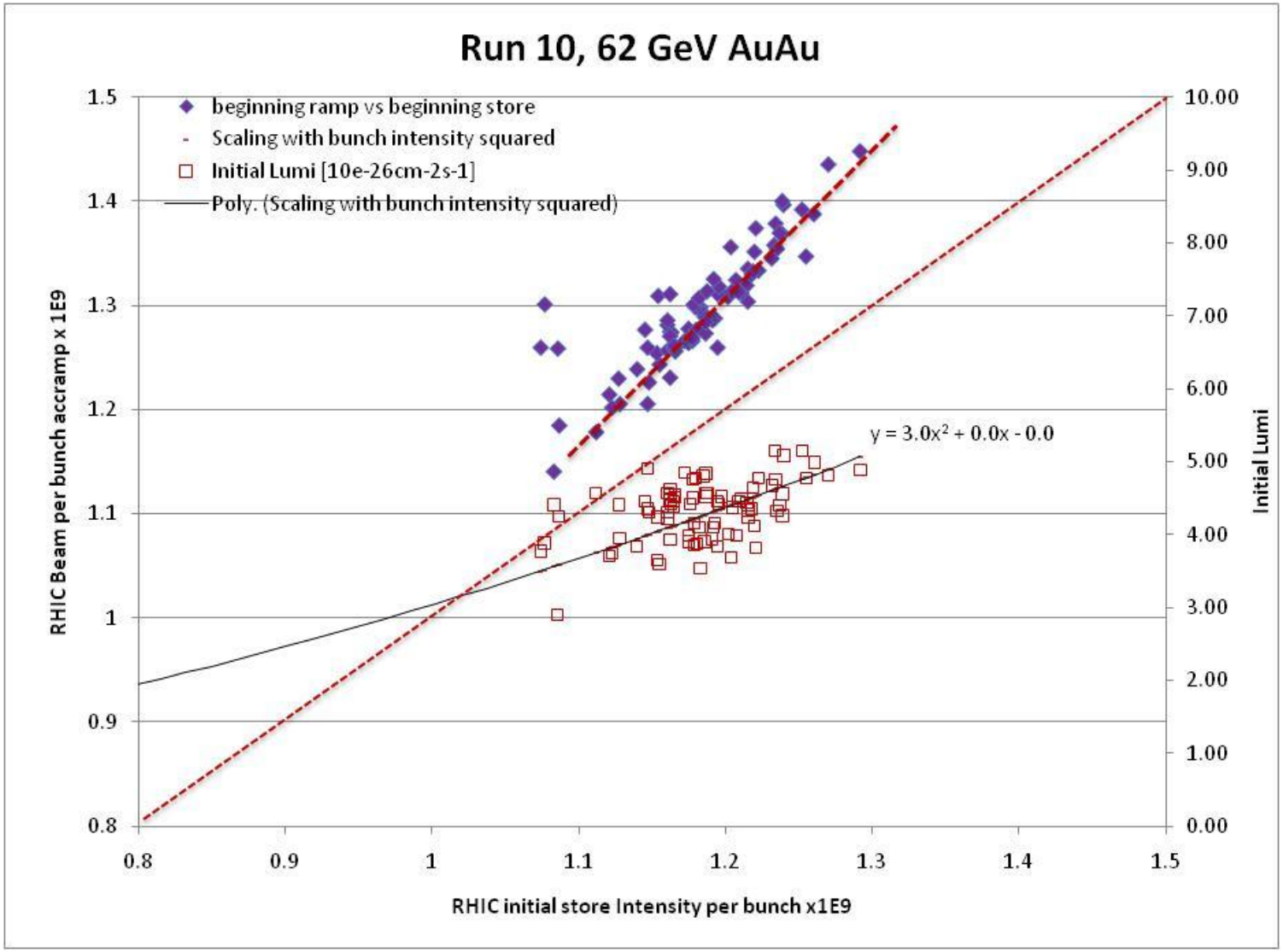


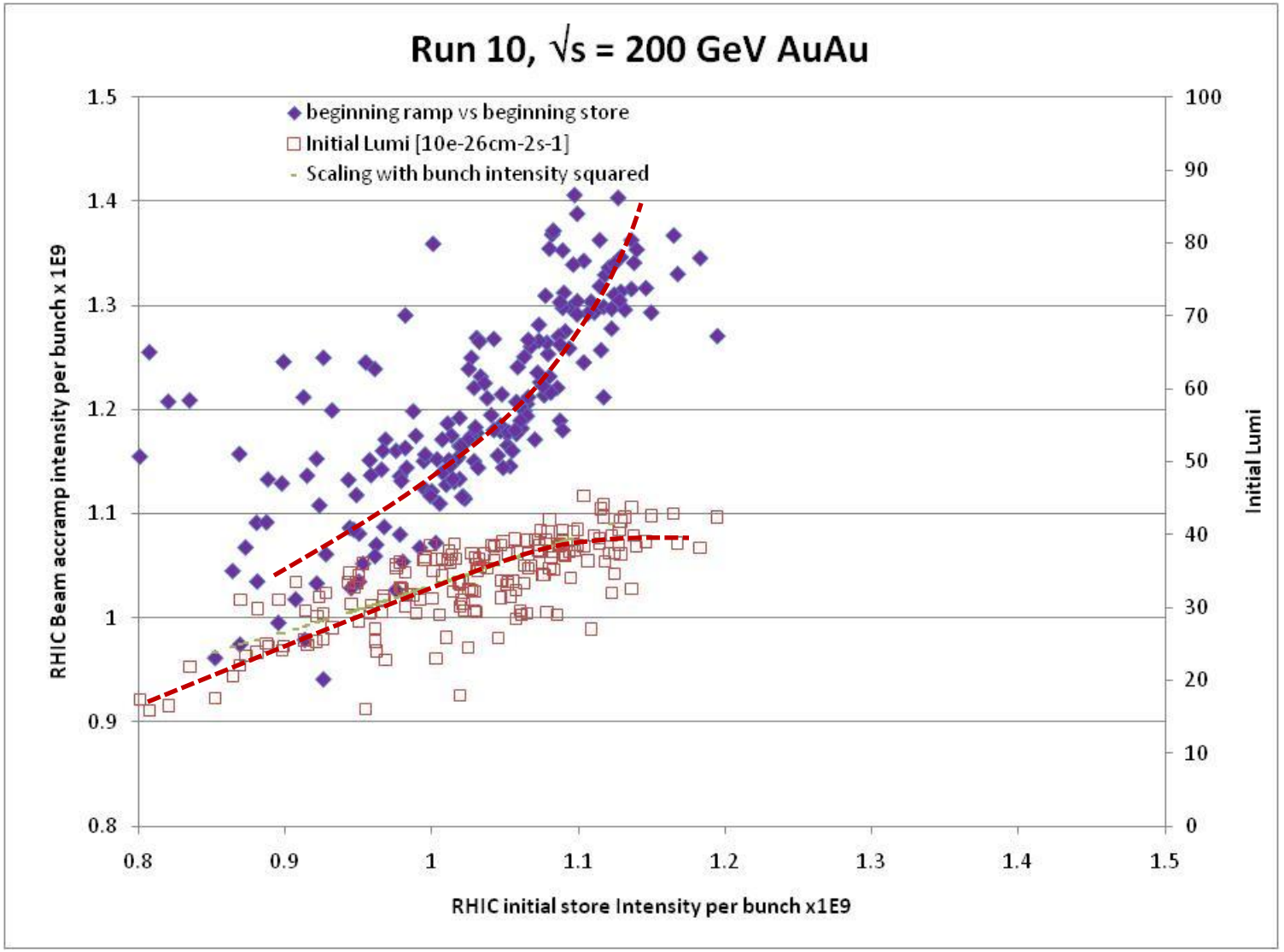

Run 10, 62 GeV AuAu
beginning ramp vs beginning store
% lost ramp and rebucketing
RHIC Beam per bunch after Rebucketing x 1E9
% of beam lost ramp plus rebucketing
RHIC accramp Intensity per bunch x1E9
1.5
1.4
1.3
1.2
1.1
1
0.9
0.8
50.0%
45.0%
40.0%
35.0%
30.0%
25.0%
20.0%
15.0%
10.0%
5.0%
0.0%
0.8
0.9
1
1.1
1.2
1.3
1.4
1.5


Run 10, √s = 200 GeV AuAu
beginning ramp vs beginning store
% lost ramp and rebucketing
RHIC Beam per bunch after Rebucketing x 1E9
% of beam lost ramp plus rebucketing
RHIC accramp Intensity per bunch x1E9
1.5
1.4
1.3
1.2
1.1
1
0.9
0.8
50.0%
45.0%
40.0%
35.0%
30.0%
25.0%
20.0%
15.0%
10.0%
5.0%
0.0%
0.8
0.9
1
1.1
1.2
1.3
1.4
1.5


Run 10, 62 GeV AuAu
beginning ramp vs beginning store
% lost in rebucketing
RHIC Beam per bunch after Rebucketing x 1E9
% of beam lost rebucketing
RHIC accramp Intensity per bunch x1E9
1.5
1.4
1.3
1.2
1.1
1
0.9
0.8
50.0%
45.0%
40.0%
35.0%
30.0%
25.0%
20.0%
15.0%
10.0%
5.0%
0.0%
0.8
0.9
1
1.1
1.2
1.3
1.4
1.5


Run 10, √s = 200 GeV AuAu
beginning ramp vs beginning store
% lost in rebucketing
RHIC Beam per bunch after Rebucketing x 1E9
% of beam lost rebucketing
RHIC accramp Intensity per bunch x1E9
1.5
1.4
1.3
1.2
1.1
1
0.9
0.8
50.0%
45.0%
40.0%
35.0%
30.0%
25.0%
20.0%
15.0%
10.0%
5.0%
0.0%
0.8
0.9
1
1.1
1.2
1.3
1.4
1.5


Run 10, 62 GeV AuAu
beginning ramp vs beginning store
Scaling with bunch intensity squared
Initial Lumi [10e-26cm-2s-1]
Poly. (Scaling with bunch intensity squared)
y = 3.0x² + 0.0x - 0.0
RHIC Beam per bunch accramp x 1E9
Initial Lumi
RHIC initial store Intensity per bunch x1E9
1.5
1.4
1.3
1.2
1.1
1
0.9
0.8
10.00
9.00
8.00
7.00
6.00
5.00
4.00
3.00
2.00
1.00
0.00
0.8
0.9
1
1.1
1.2
1.3
1.4
1.5

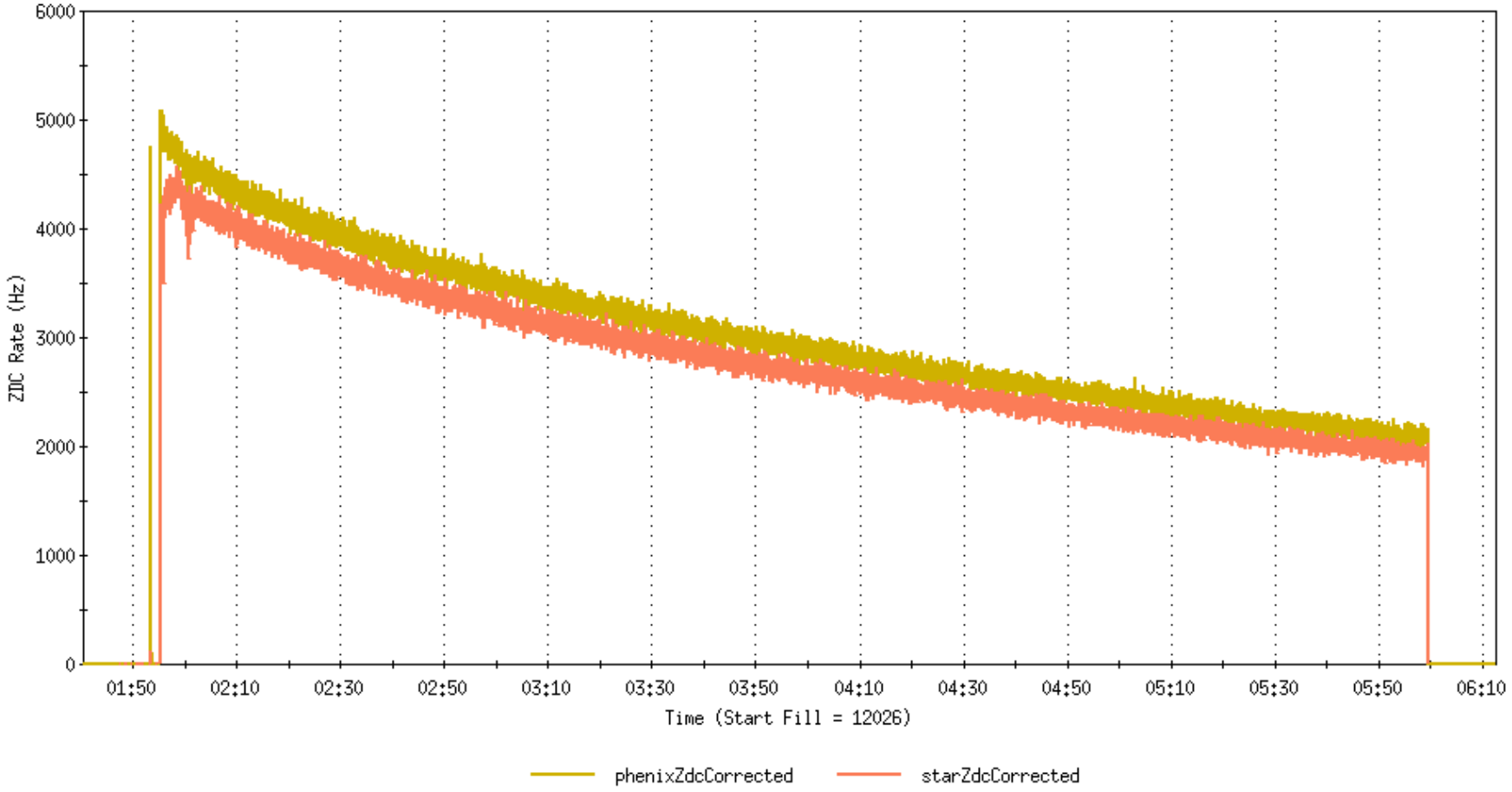

Run 10, √s = 200 GeV AuAu
beginning ramp vs beginning store
Initial Lumi [10e-26cm-2s-1]
Scaling with bunch intensity squared
RHIC Beam accramp intensity per bunch x 1E9
Initial Lumi
RHIC initial store Intensity per bunch x1E9
1.5
1.4
1.3
1.2
1.1
1
0.9
0.8
100
90
80
70
60
50
40
30
20
10
0
0.8
0.9
1
1.1
1.2
1.3
1.4
1.5

Run 10 Au-Au Goals

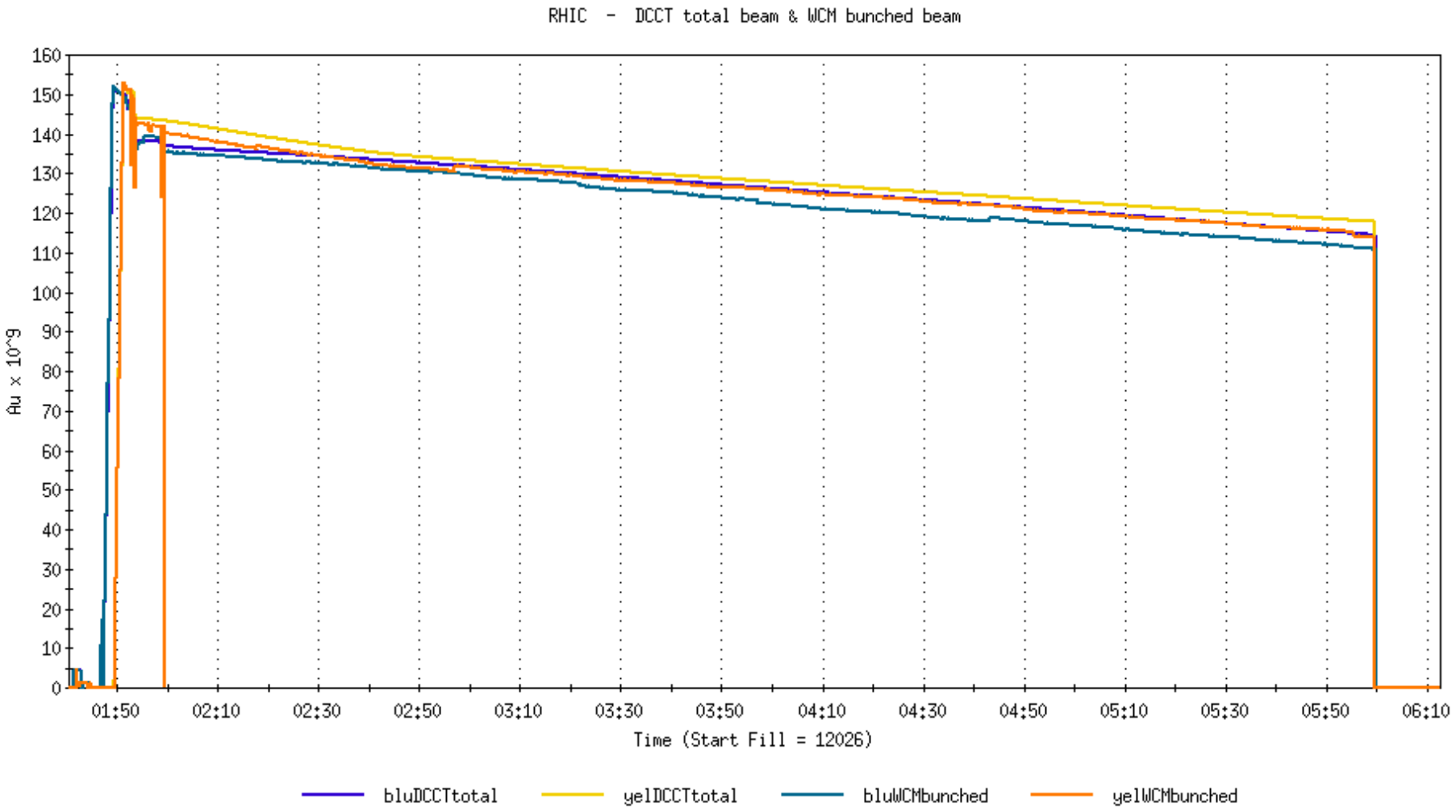
3/30/10

- STAR
  - $\sqrt{s}$ = 62 GeV/n
    - Luminosity Sampled/Delivered = ?/90 μb^{-1}
    - 100M Min-bias events
- PHENIX
  - $\sqrt{s}$ = 62 GeV/n
    - Luminosity Recorded/Delivered = 64/193 μb^{-1}
    - 400M Min-bias events

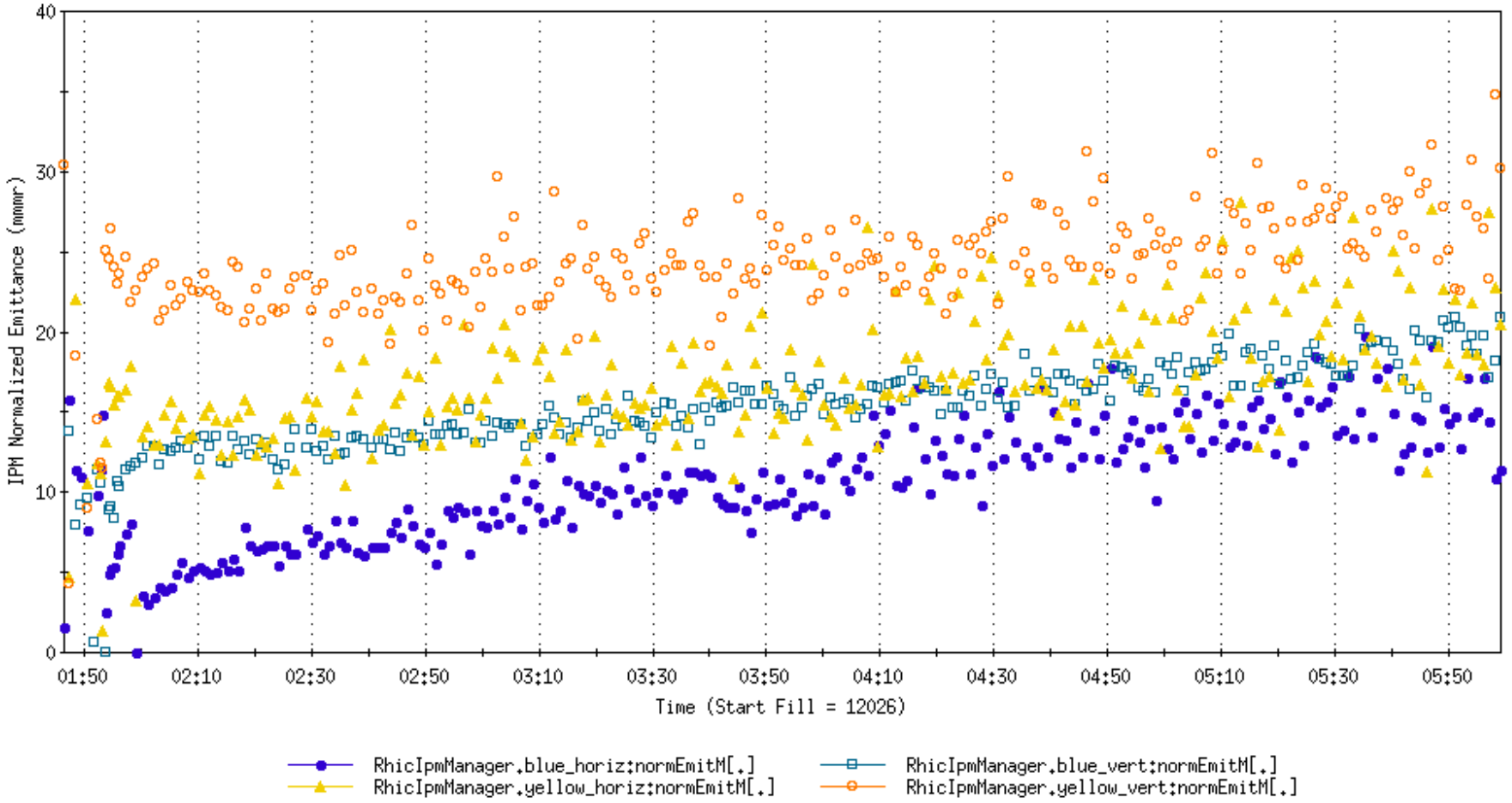
First Store Monday, 29 March, Store 12026



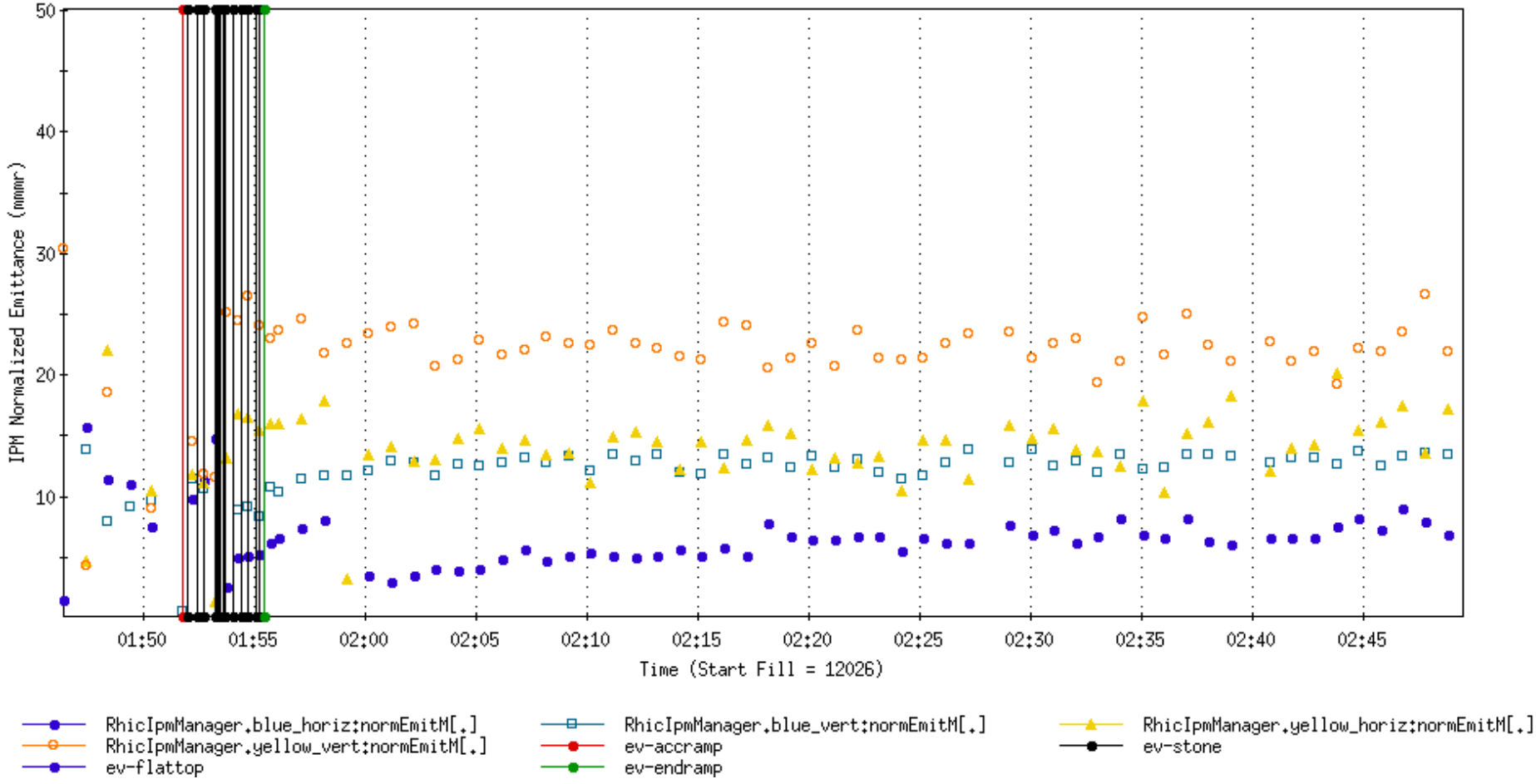
First Store Monday, 29 March, Store 12026



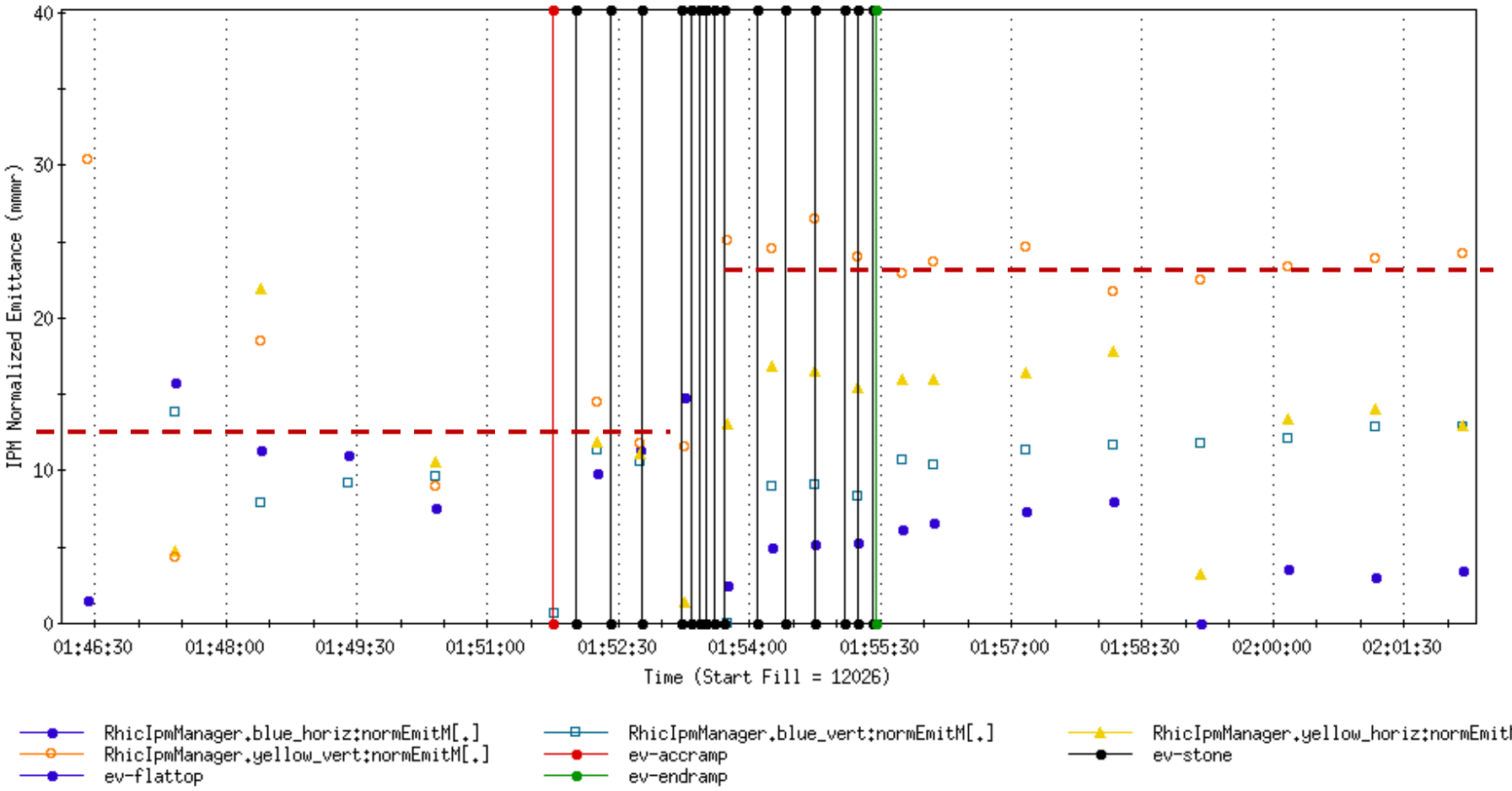
First Store Monday, 29 March, Store 12026



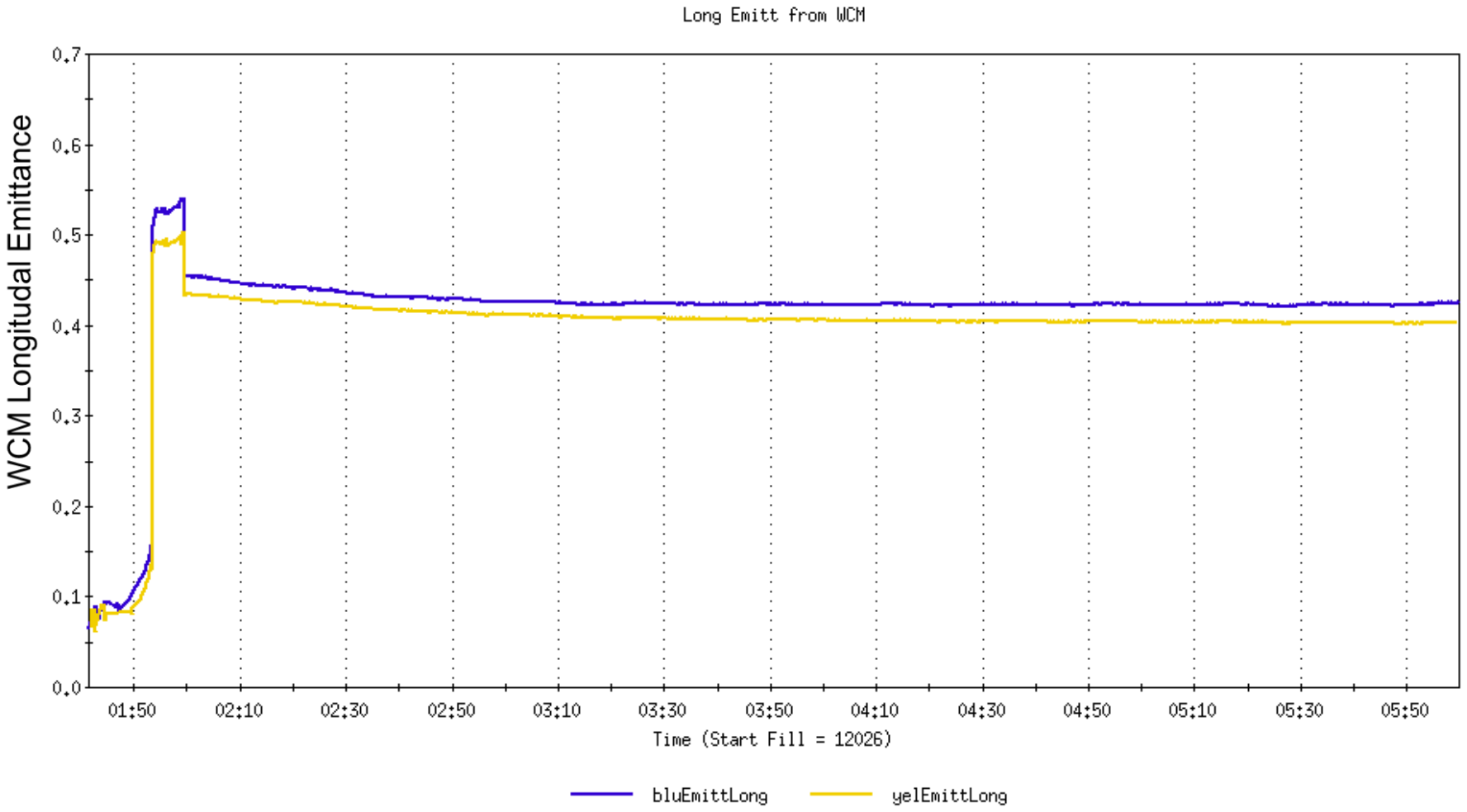
First Store Monday, 29 March, Store 12026



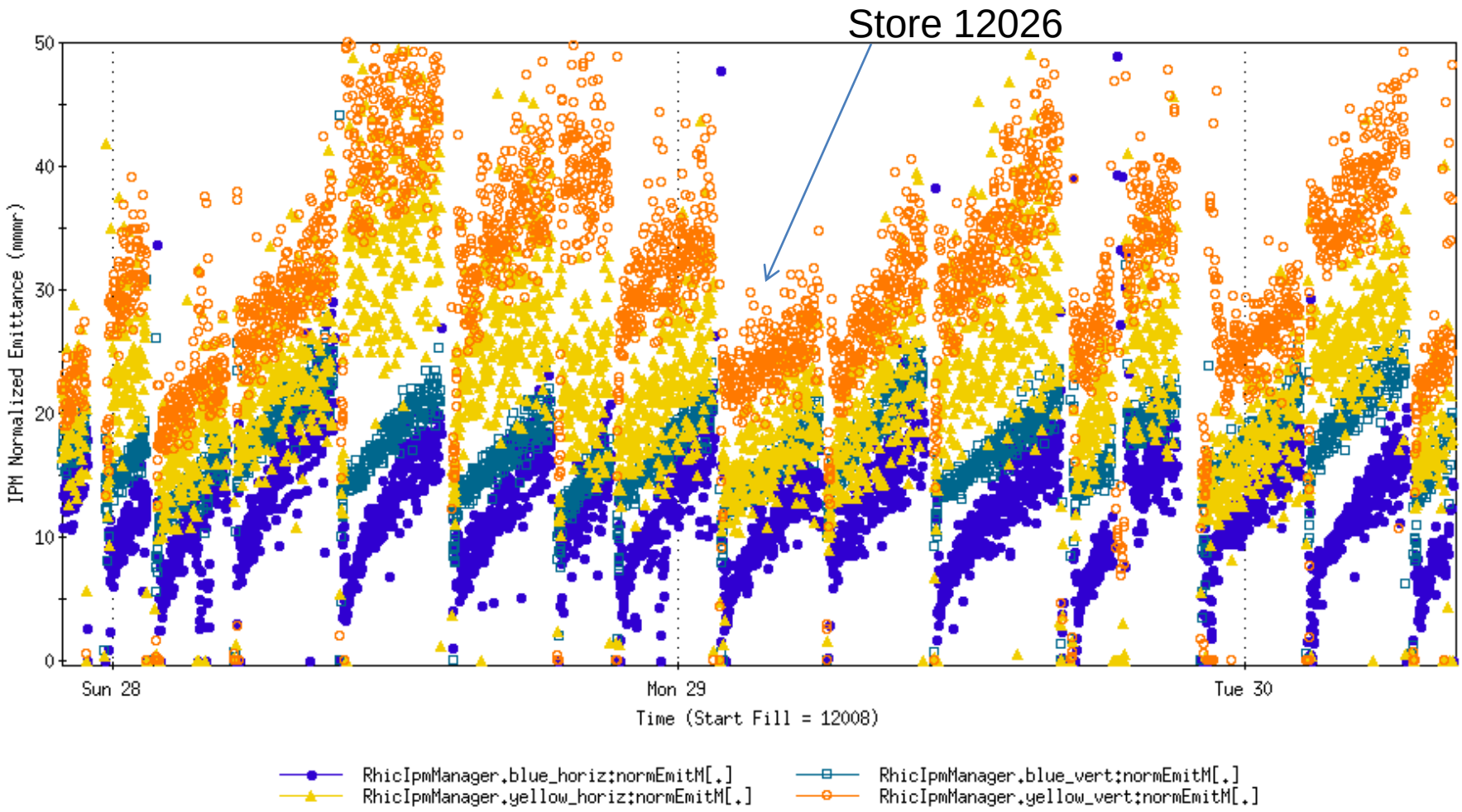
First Store Monday, 29 March, Store 12026

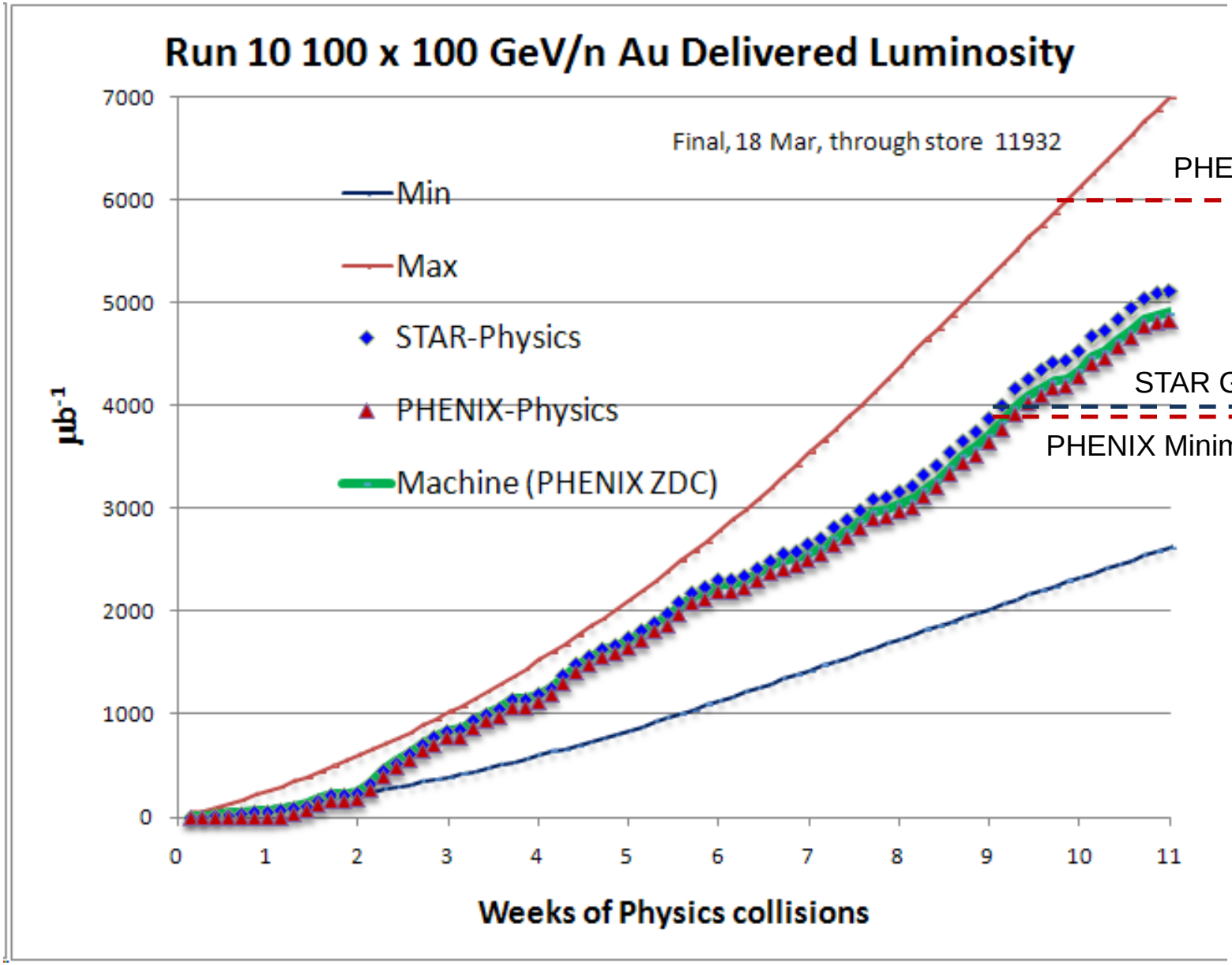


First Store Monday, 29 March, Store 12026

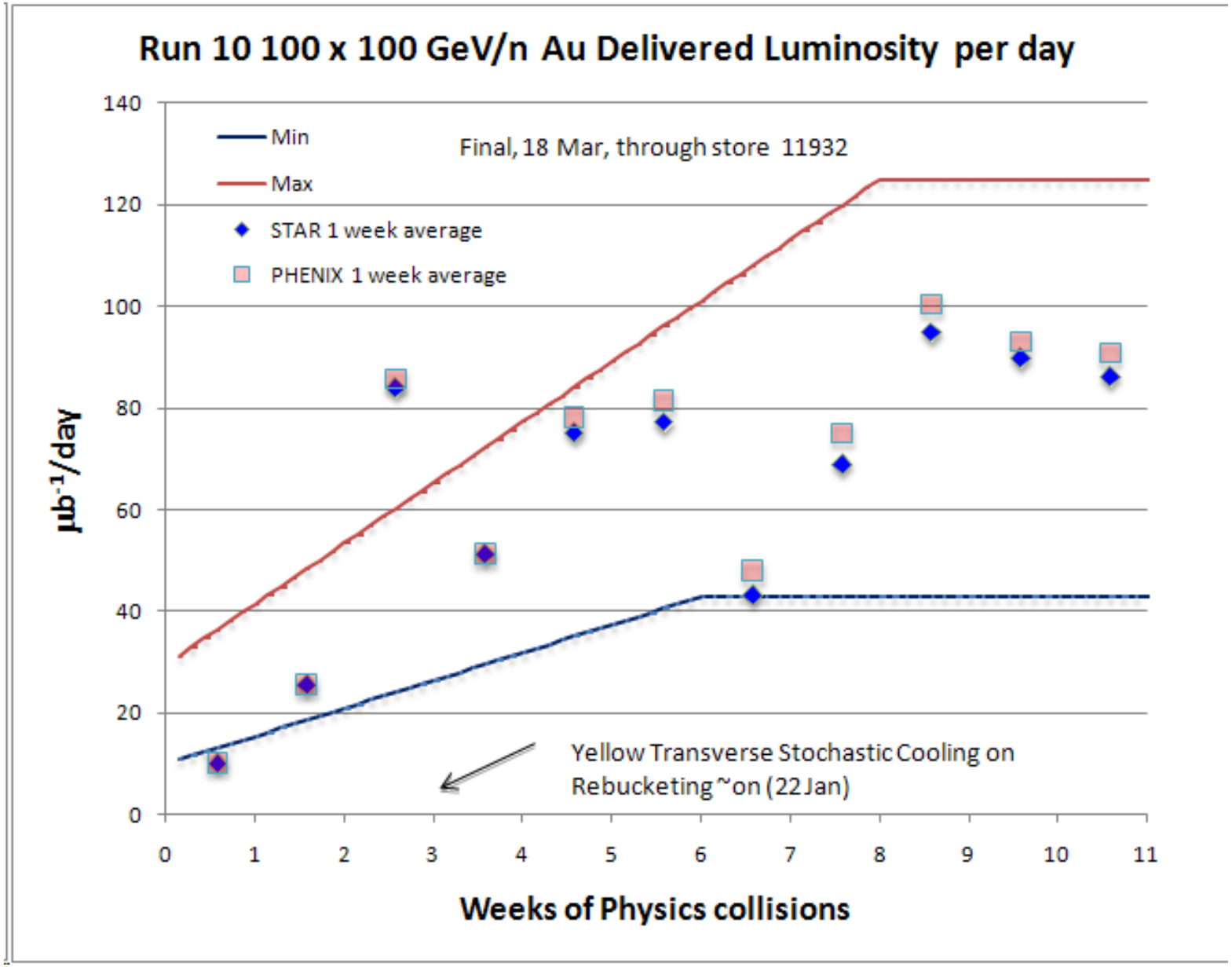


31 x 31 GeV/n Au horiz and vert emittances

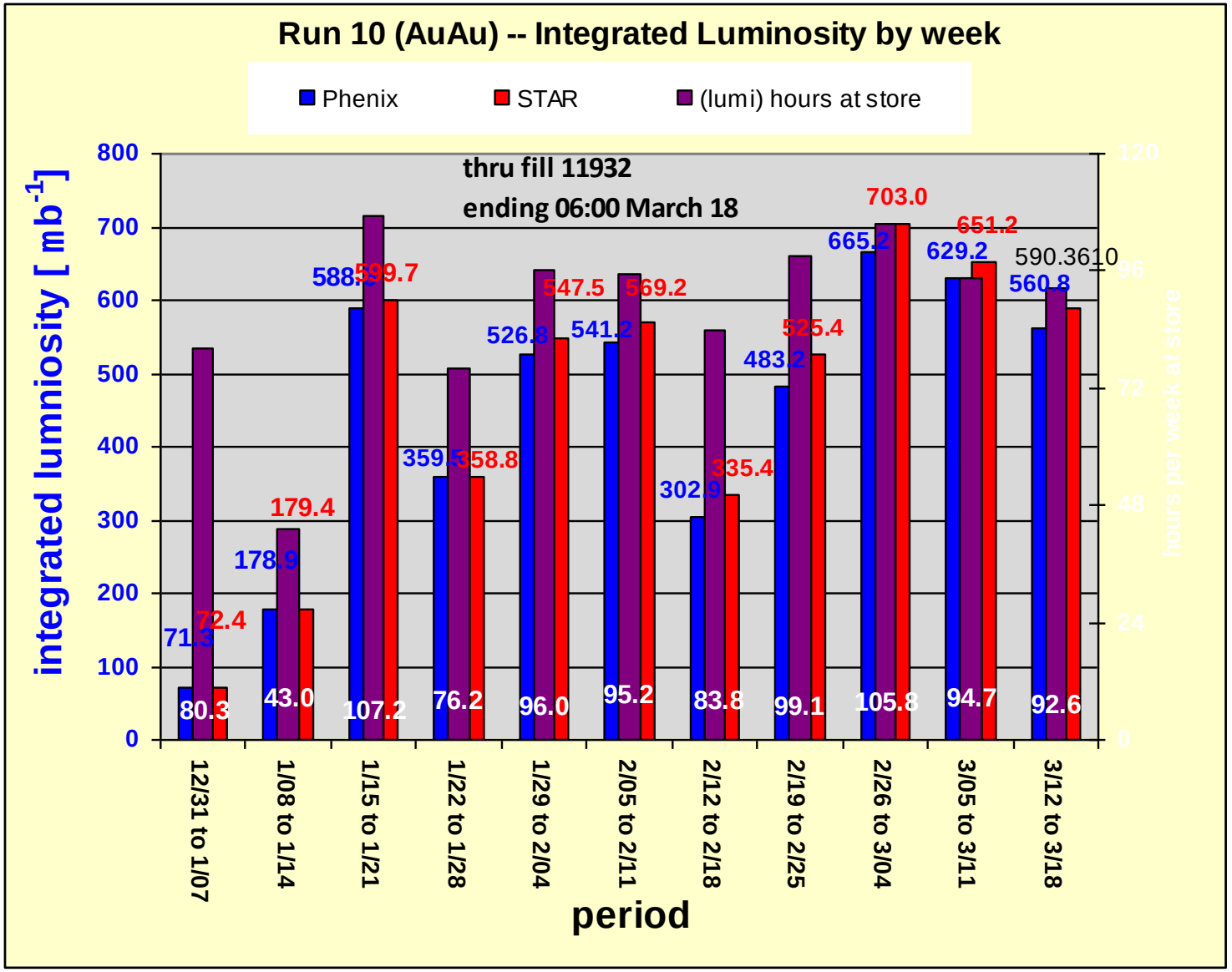




* With 20 cm sigma IR diamond


Run 10 100 x 100 GeV/n Au Delivered Luminosity per day
Final, 18 Mar, through store 11932
Min
Max
STAR 1 week average
PHENIX 1 week average
Yellow Transverse Stochastic Cooling on
Rebucketing ~on (22 Jan)
μb-1/day
Weeks of Physics collisions
0
20
40
60
80
100
120
140
0
1
2
3
4
5
6
7
8
9
10
11

Average hours per week at store = 88.5



31 Dec **1st Physics Store** 11340, 0.6 m β* No cooling or rebucketing, STAR 3.2 μb^{-1}, 2.6 hr store

Ring	Bunches/Cycles	Avg Bunch in RHIC (10^6 ions)	Avg Efficiency XCBM to RHIC	XCBM to Uxf1	*Uxf1 to Wxf*	*Wxf to Arc*	*Arc to RHIC*
Blue	56/56	909	0.836	1.056	*0.963*	*0.992*	*0.828*
Yellow	56/56	990	0.971	1.085	*0.962*	*0.959*	*0.970*

18 Jan Physics Store 11489, **0.6 m β* No cooling or rebucketing**, STAR 22.6 μb^{-1}, 3.9 hr store

Ring	**Bunches/Cycles**	**Avg Bunch in RHIC (10^6 ions)**	**Avg Efficiency XCBM to RHIC**	**XCBM to Uxf1**	***Uxf1 to Wxf***	***Wxf to Arc***	***Arc to RHIC***
Blue	111/28	1196	0.911	1.024	*0.961*	*0.999*	*0.927*
Yellow	111/29	1168	0.879	1.023	*0.961*	*0.989*	*0.905*

28 Feb Physics Store 11824, **0.7 m β* with some cooling and with rebucketing**, STAR 32.7 μb-1, 3.9 hr store

Ring	**Bunches/Cycles**	**Avg Bunch in RHIC (10^6 ions)**	**Avg Efficiency XCBM to RHIC**	**XCBM to Uxf1**	***Uxf1 to Wxf***	***Wxf to Arc***	***Arc to RHIC***
Blue	111/28	1262	0.917	0.975	*0.961*	*1.001*	*0.977*
Yellow	111/28	1246	0.910	0.961	*0.964*	*0.988*	*0.994*

2 Mar Physics Store 11834, **0.7 m β* with some cooling and with rebucketing**, STAR 29.4 μb^{-1},3.9 hr store)

Ring	**Bunches/Cycles**	**Avg Bunch in RHIC (10^6 ions)**	**Avg Efficiency XCBM to RHIC**	**XCBM to Uxf1**	***Uxf1 to Wxf***	***Wxf to Arc***	***Arc to RHIC***
Blue	111/28	1354	0.927	0.990	*0.965*	*1.003*	*0.968*
Yellow	111/28	1377	0.931	0.990	*0.964*	*0.989*	*0.987*

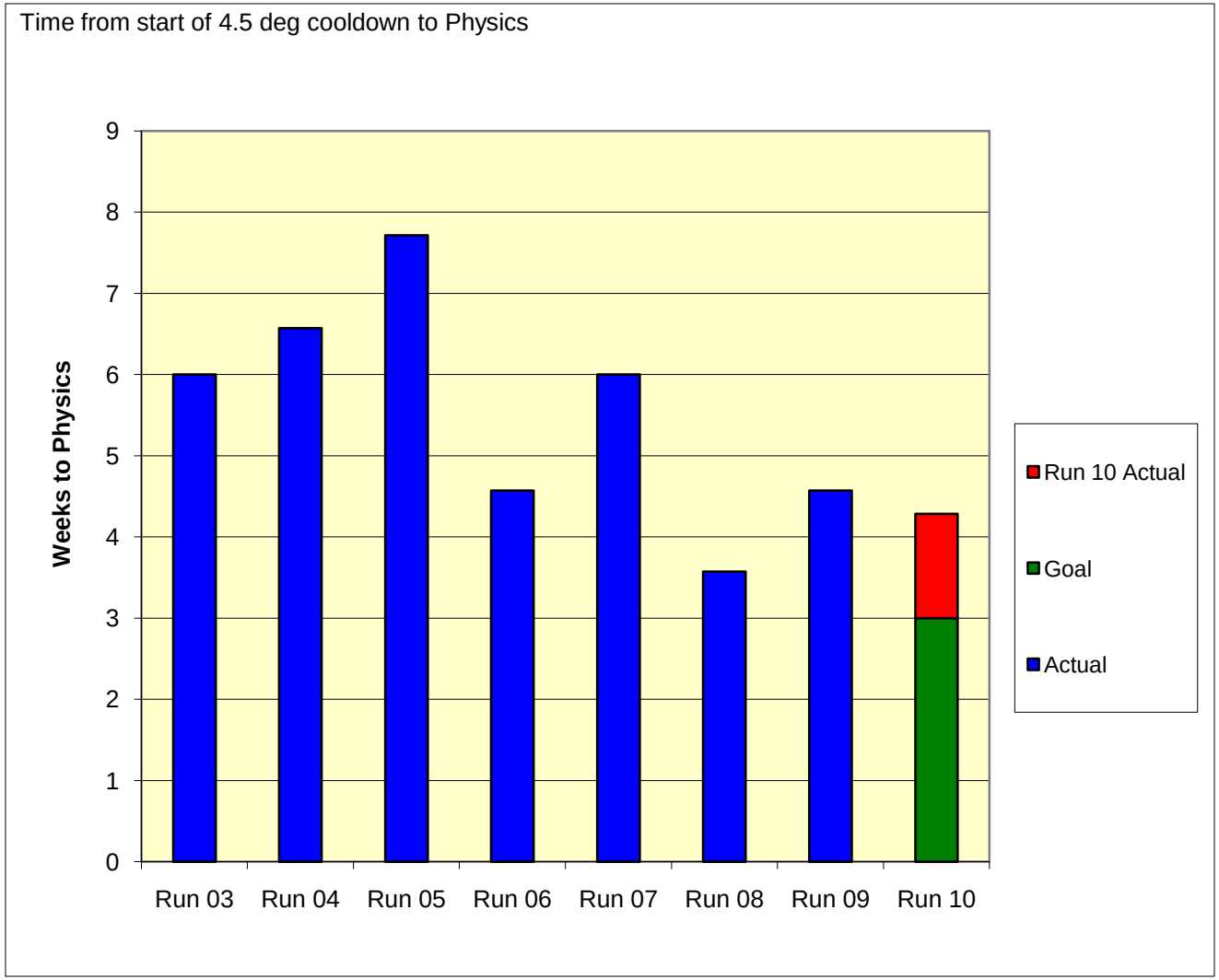
Revised Run 10 Plan, Nov 25, 2009

	Physics production or beam studies weeks	
$\sqrt{s_{NN}}$ (GeV)	25-cryoweek run	27-cryoweek run
200	10	10
62.4	4	4
39	1.5	1.5
27	0	0
18	0	0
11.5 @ STAR	0	2
7.7	4	4
Beam studies @ 5 GeV and @ $\nu \approx 0.67$	0.5	0.5

Run 10 Au-Au Goals

11/19/09

- STAR
  - $\sqrt{s}$ = 200 GeV/n
    - Luminosity Sampled/Delivered = 2/4 nb^{-1}
    - 250M Central Events
    - 300M Min-bias events
- PHENIX
  - $\sqrt{s}$ = 200 GeV/n
    - Luminosity Recorded/Delivered = 1.4/>6 nb^{-1}
    - Minimum Goal:
      - Luminosity Recorded/Delivered = 1.1/3.9 nb^{-1}


Time from start of 4.5 deg cooldown to Physics
Weeks to Physics
0
1
2
3
4
5
6
7
8
9
Run 03
Run 04
Run 05
Run 06
Run 07
Run 08
Run 09
Run 10
Run 10 Actual
Goal
Actual