

# First Orbit, First Collisions

## Reminiscences of RHIC Construction and Commissioning

---

**Biased:** Gleaned from presentations/discussions

(Only occasional shouting)

Summary First Page  
from RHIC Retreat 2003

**Diverse:** Vibrant discussions throughout Retreat

- Future: Count 5 minutes/talk for discussions
- Impressive preparation so close to run end!

**Brief:** 30 minutes to cover 2.5 days (plus!)

Written summary *necessary*: Mid-July?

(Serves me right for using PowerPoint...)

# First Orbit, First Collisions

## Reminiscences of RHIC Construction and Commissioning

---

**Biased:** Gleaned from memories, photos, internet

(Only occasional shouting) Still true

Updated for RHICFest!!

**Diverse:** Vibrant company throughout RHICFest

- Future: Count 7-ish years for first EIC collisions
- Impressive preparation so close to RHIC end!

**Brief:** 15 minutes to cover years and years

Written summary *necessary*: Book/movie deal?

(Serves me right for using PowerPoint...) Still true

# Coming to BNL in 1993



Todd's feeling  
unpacking at  
BNL

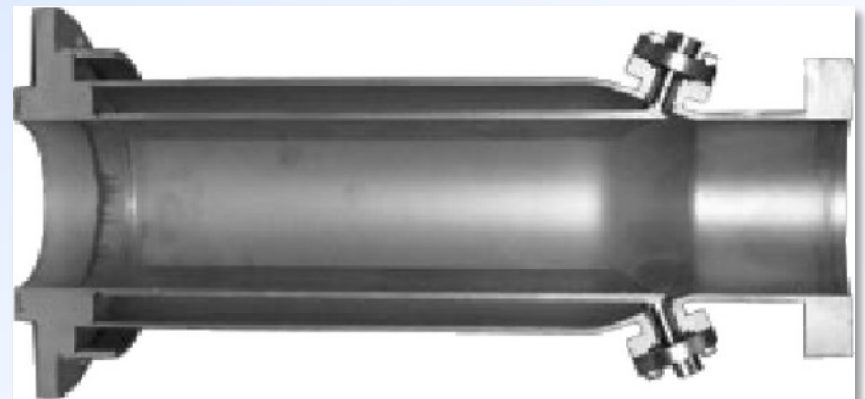
Followed Peggs, Trbojevic, Harrison from FNAL

RHIC BPMs and orbits became  
a big part of my life for the next  
dozen years...

No pics of 1005 (not photogenic)  
But memories!



Tom  
Shea



# Tonight We're Gonna Party Like It's...

## RHIC Beam Commissioning: 1999

[Cooldown status](#) . . [MCR broadcast](#)

[RHIC Retreat 1999: Sept 16 & 17](#)

## EARLY BEAM COMMISSIONING

Highlights of control room graphics, recorded between July 2 and August 13, 1999.

For more details in the form of a graphical history see the

[BEAM PICTURE GALLERY](#)

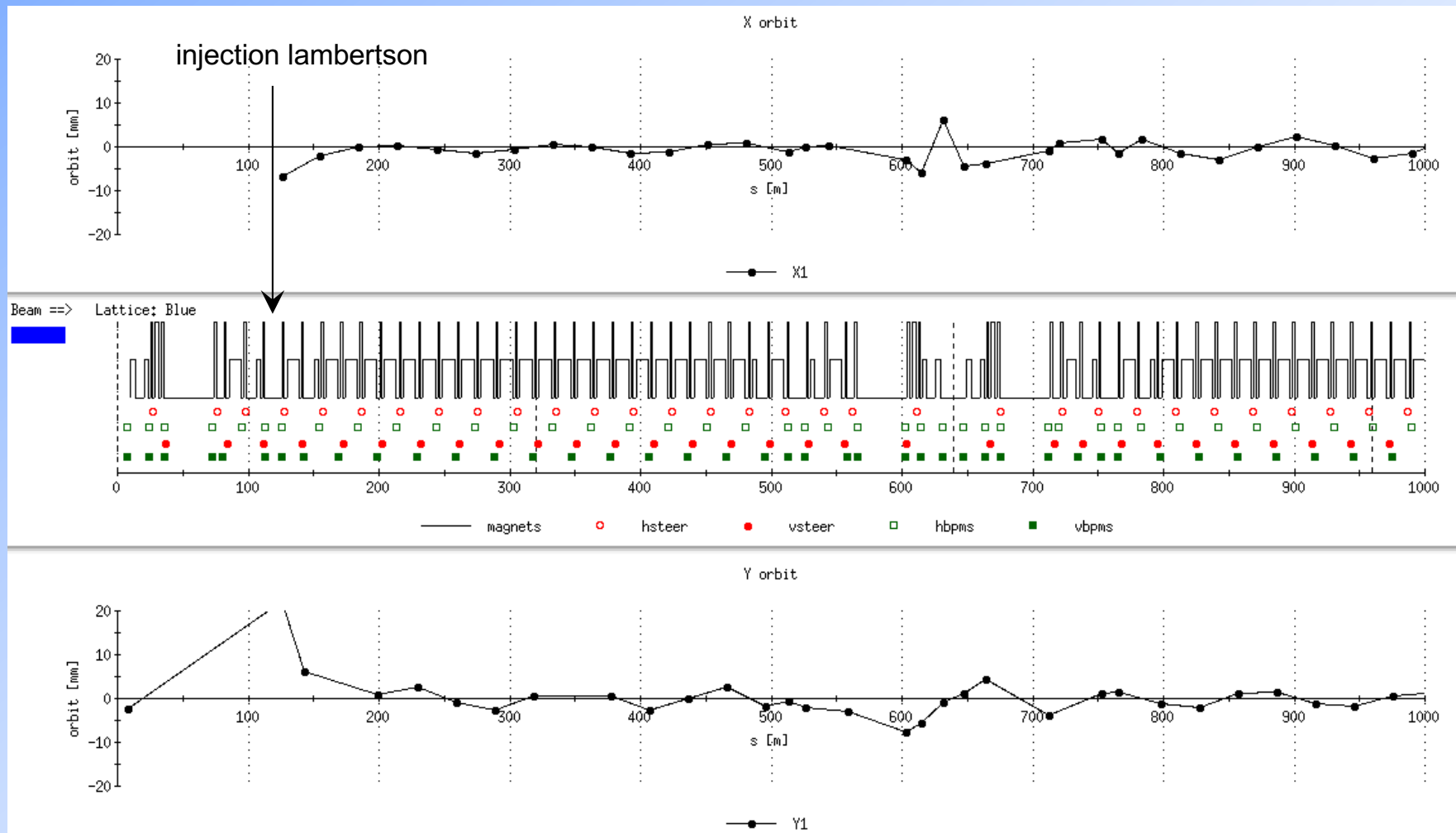
**0600 Monday August 16** The first RHIC Beam Commissioning run finished this morning. Beam is next expected to be seen in RHIC in December 1999. A brief summary of progress so far in BLUE and YELLOW rings is as follows:

**BLUE** Beam has been efficiently injected, captured, and stored in the BLUE ring, with lifetimes as long as 45 minutes. Acceleration by a modest amount - about 1 GeV per nucleon - has been demonstrated at a slow ramp rate. The biggest challenge in commissioning the BLUE ring was the need to maneuver the closed orbit around a small number of apparent obstacles in the beam pipe. These obstacles will be investigated - and removed - when the ring is warmed up in September.

**YELLOW** Thousands of turns of beam were briefly seen in the YELLOW ring, allowing successful RF capture. Long lifetimes have not yet been established, nor has acceleration been performed. No apparent obstacles have been found in YELLOW, in a positive contrast to BLUE. On the other hand, steering and second turn closure in the injection region were found to be more difficult than in BLUE, as also was steering through the YELLOW dump area. The situation will be greatly ameliorated in the next beam commissioning run, when we will be able to use the nominal injection optics with a beta function value of  $\beta^* = 10.0$  meters at all 6 interaction points. The optics used so far had  $\beta^* = 2.9$  meters, much closer to the nominal luminosity optics with  $\beta^* = 2.0$  than to the injection optics.

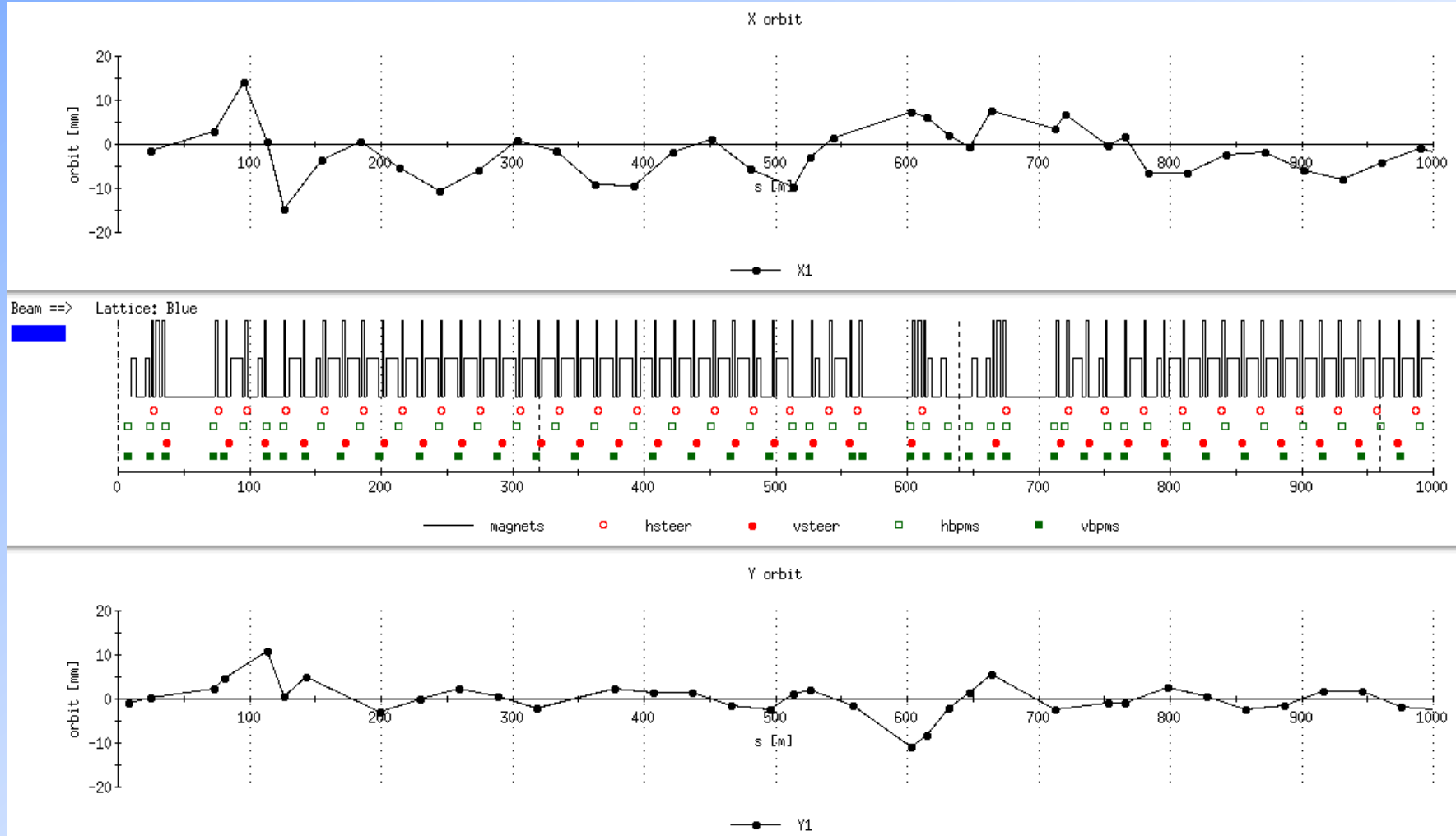
<https://web.archive.org/web/20020716074910/http://www.agsrhichome.bnl.gov/RHIC/YearZero/>

# First Orbit... Dispersive Beam Motion

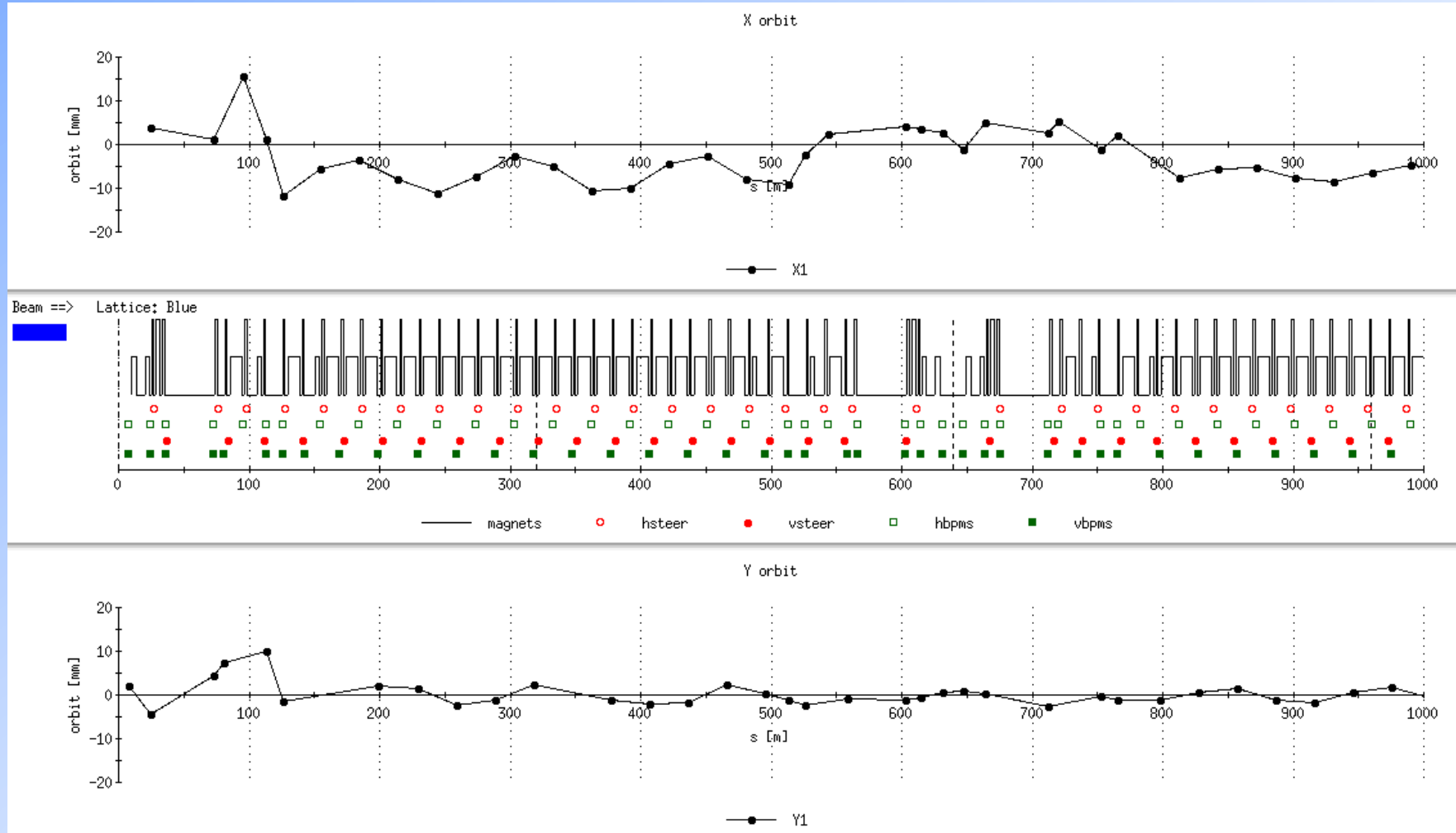


Beam injected on 4<sup>th</sup> turn of 1024-turn BPM buffer

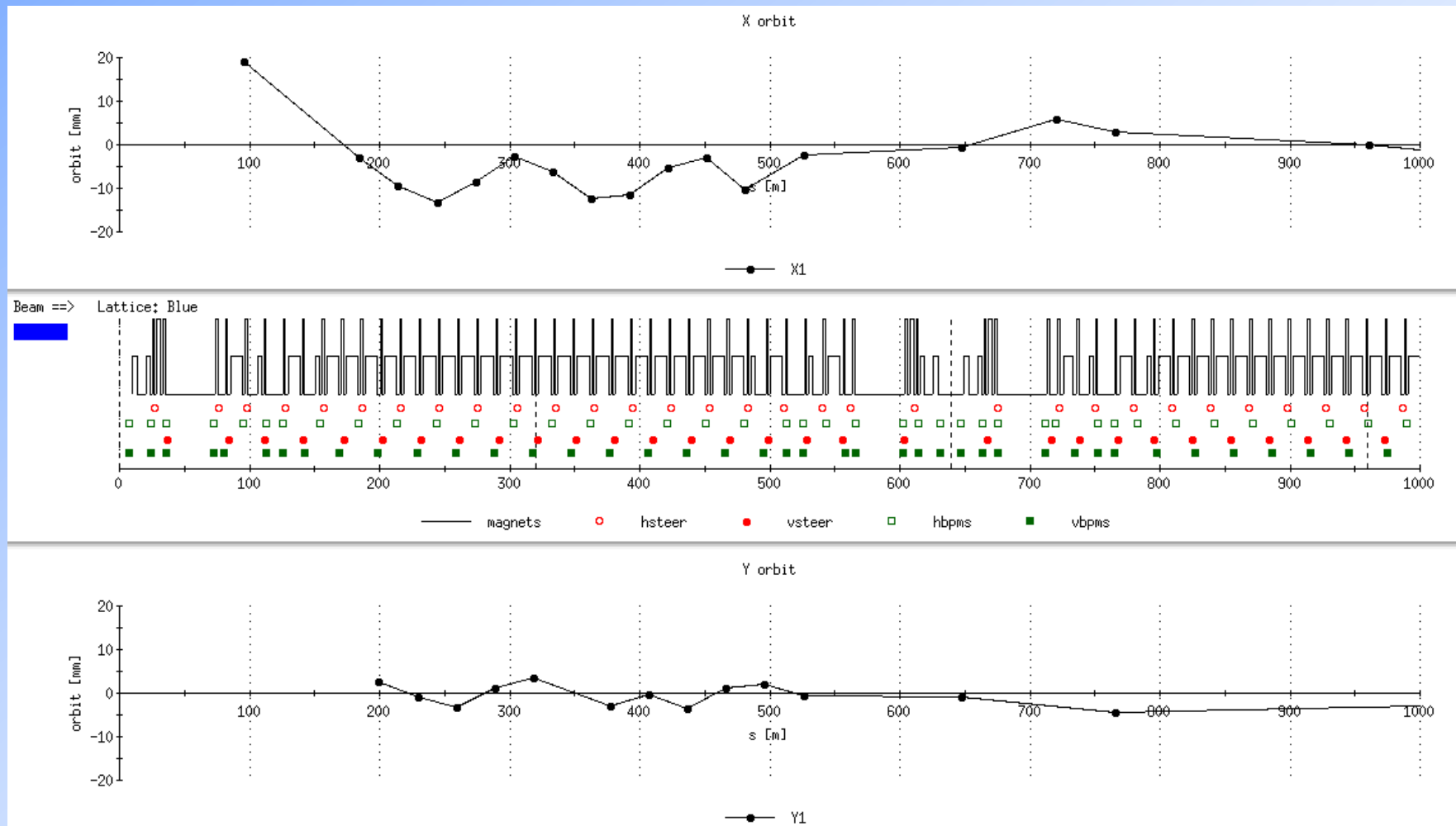
# First Orbit...



# First Orbit...

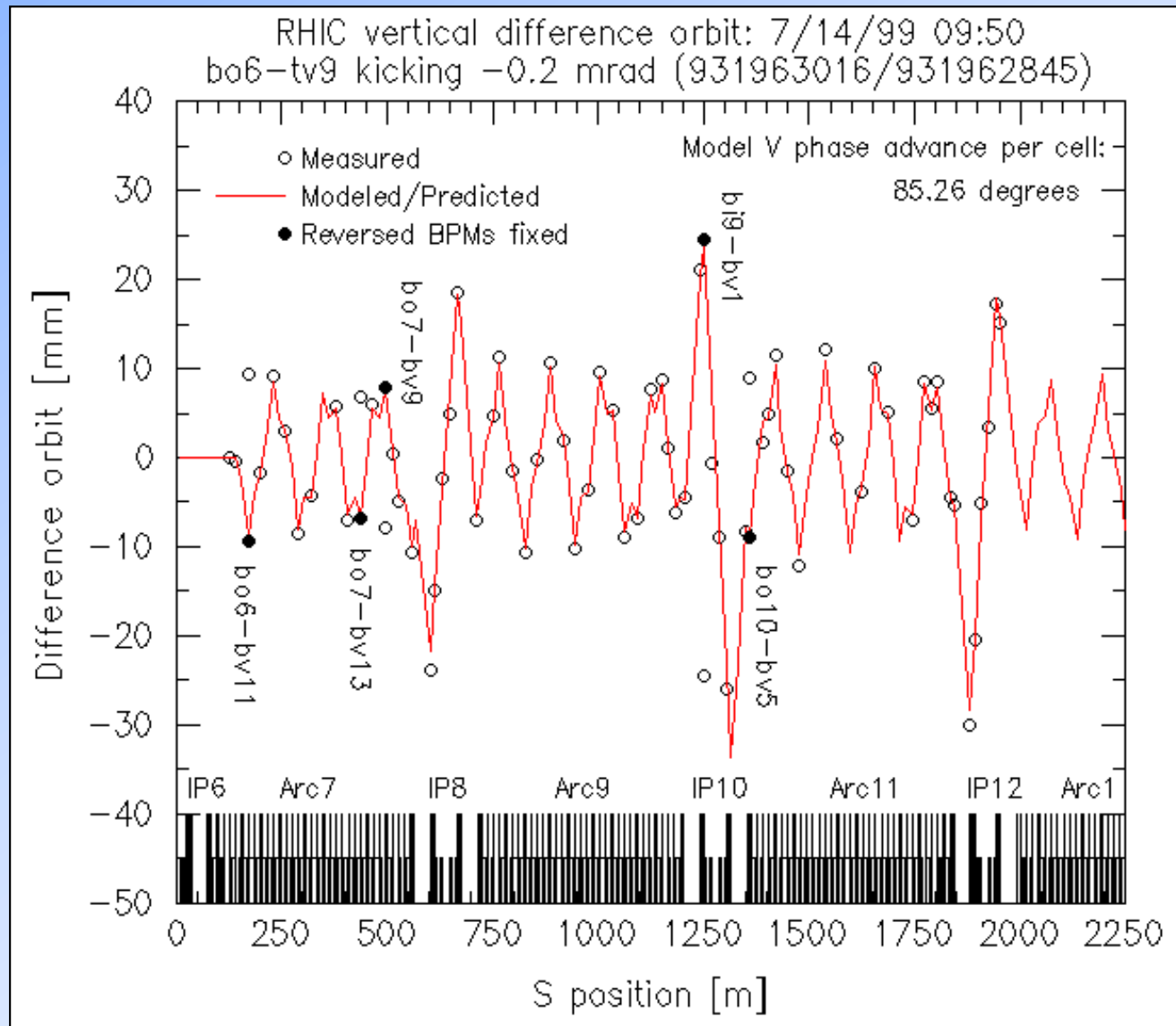


# First Orbit... ? Four turns



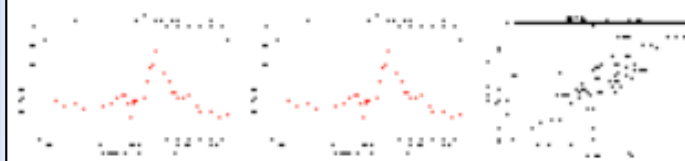
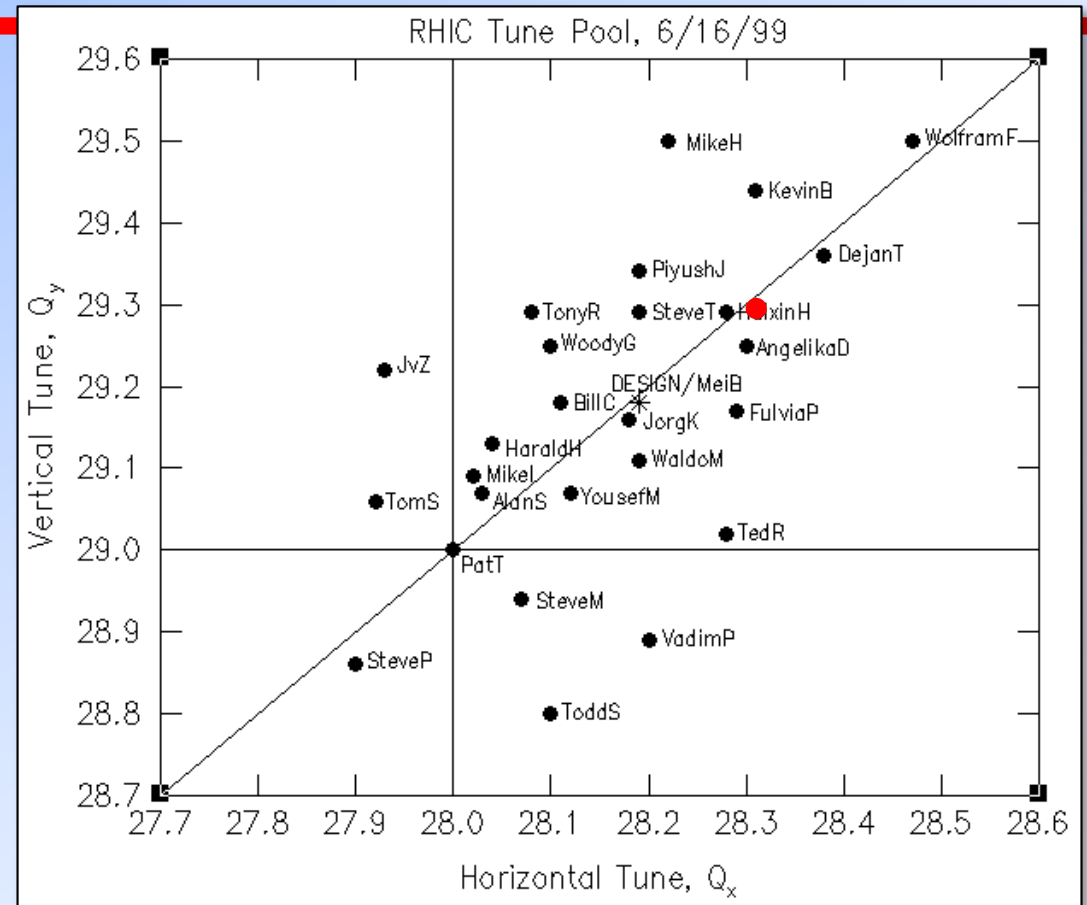
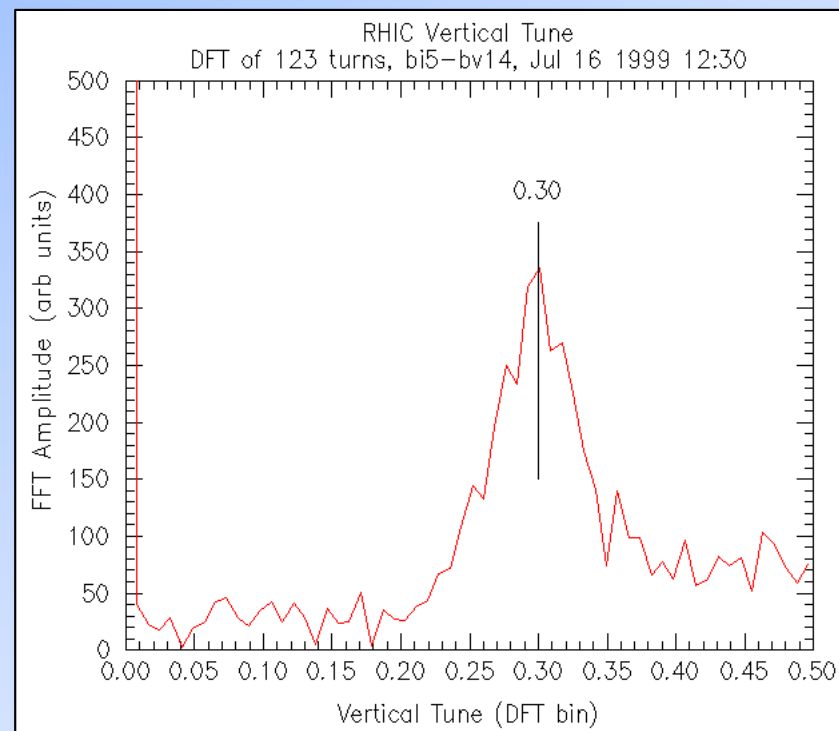
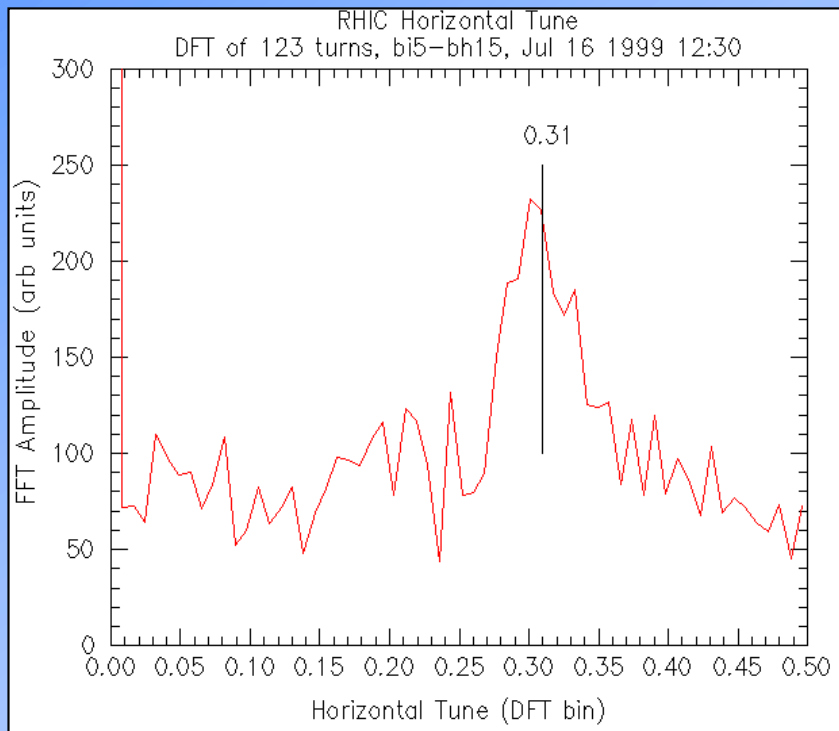
Horizontal dispersive motion: energy-loss obstructions (kinked bellows)

# Reversed BPMS, (mostly) Good Optics



Integer  
tune  
correct!

# The Tune Pool



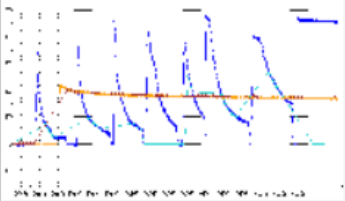
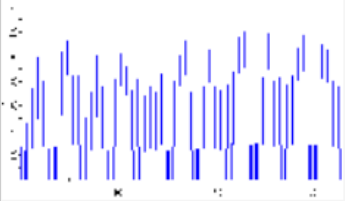
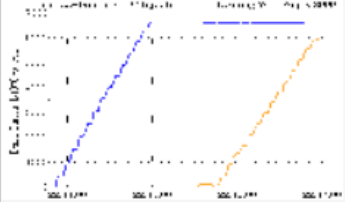
**1305 7/16/99:** FFT of 128 turns of horizontal and vertical BPM data, suggesting that the tunes are  $(Q_x, Q_y) \approx (28.31, 29.30)$ . Design values are  $(Q_x, Q_y) = (28.19, 29.18)$ . Haixin Huang appears to win the tune pool.

# First Collisions

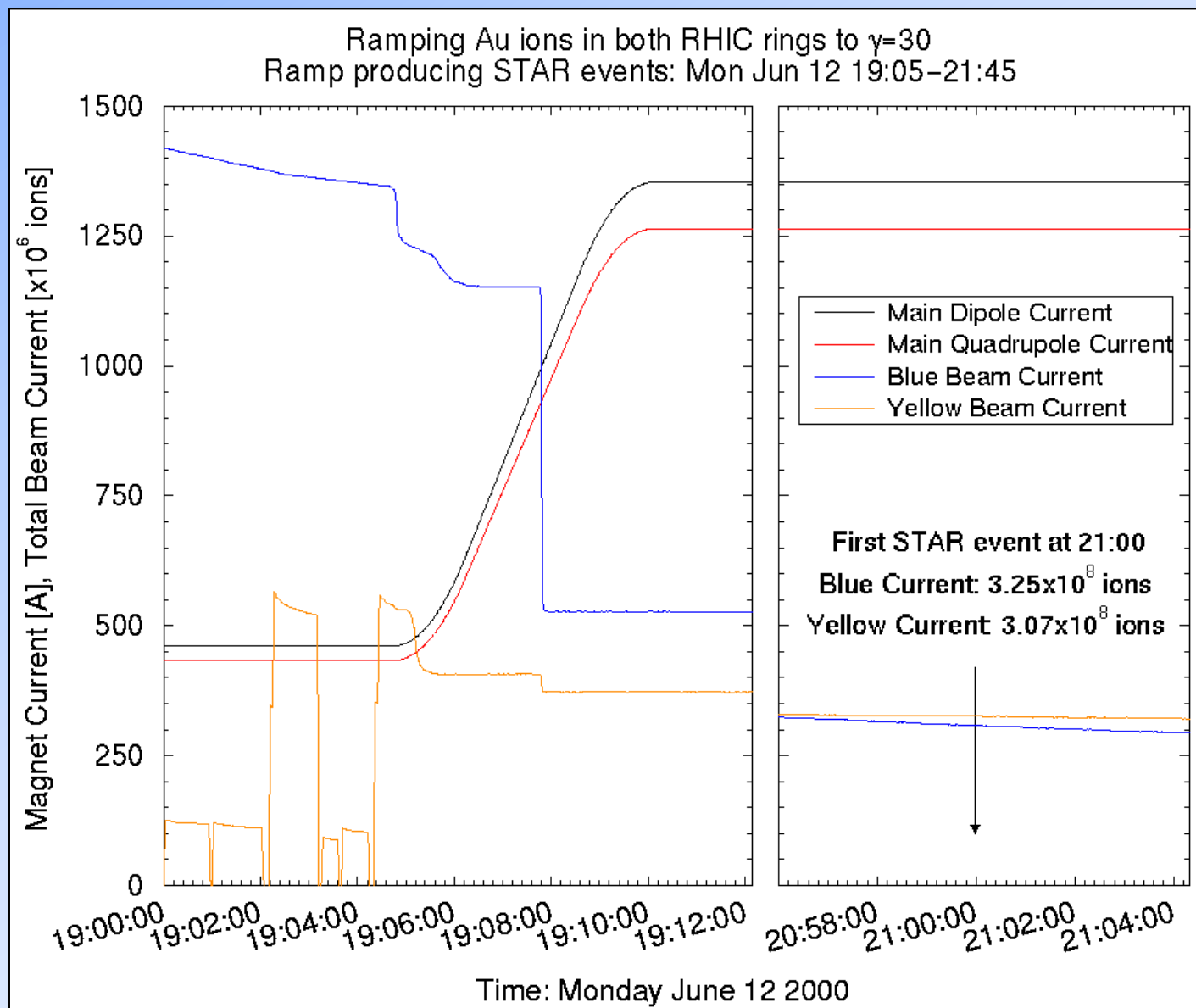
## ***RHIC and ATR Beam Commissioning 2000: Collider***

*Last update: July 20 2000*  
*Todd Satogata ([satogata@bnl.gov](mailto:satogata@bnl.gov))*

*First Au-Au collisions seen at STAR and PHOBOS, Mon Jun 12!*

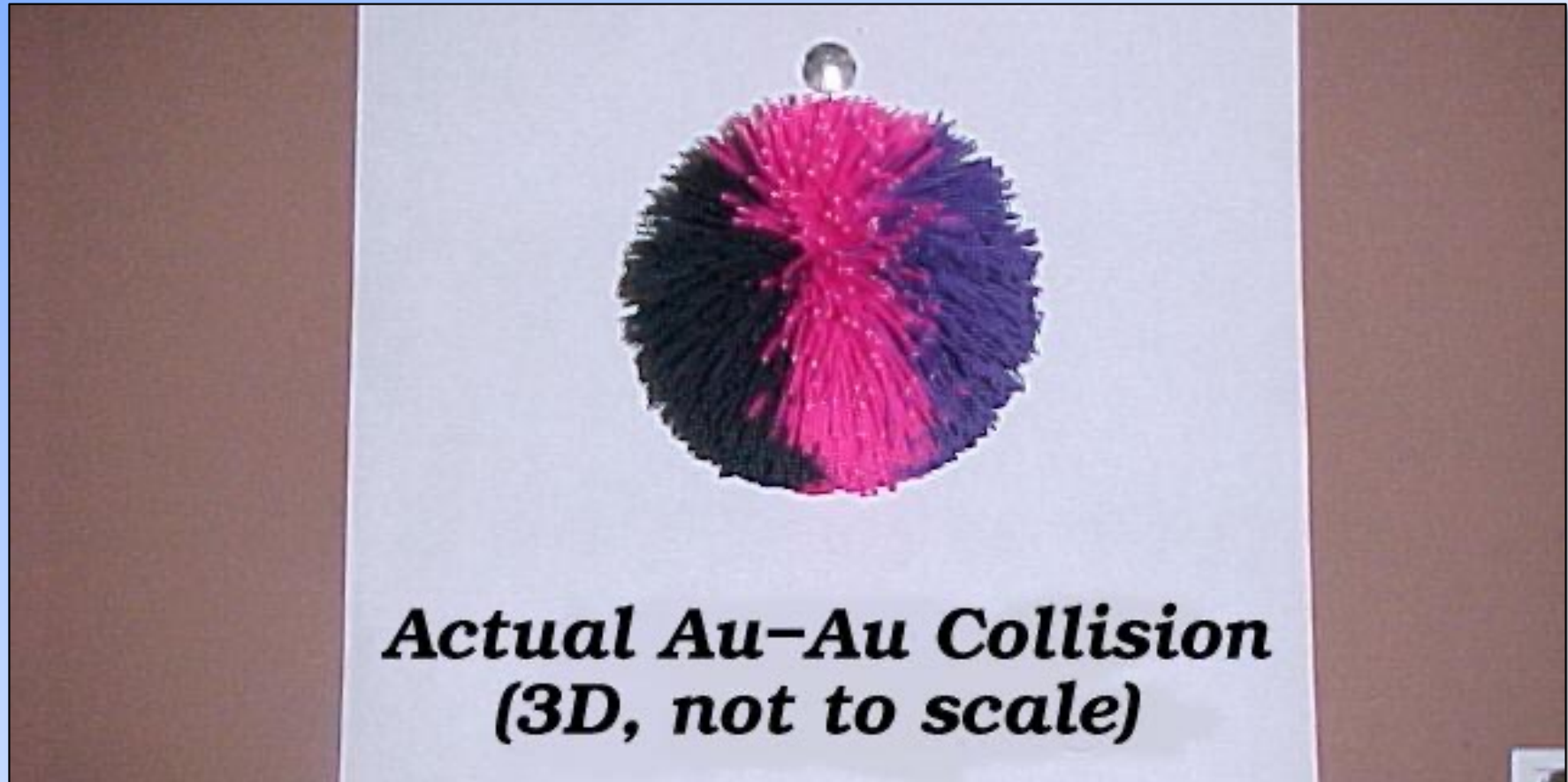
| <u><a href="#">ATR Commissioning</a></u><br>Last update: Apr 29 2000               | <u><a href="#">Blue Ring Commissioning</a></u><br>Last update: June 8 2000                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         | <u><a href="#">Yellow Ring Commissioning</a></u><br>Last update: June 8 2000 | <u><a href="#">Collider Commissioning</a></u><br>Last update: August 15 2000 |
|------------------------------------------------------------------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|------------------------------------------------------------------------------|------------------------------------------------------------------------------|
| <u><a href="#">BRAHMS</a></u>                                                      | <u><a href="#">PHENIX</a></u>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      | <u><a href="#">PHOBOS</a></u>                                                | <u><a href="#">STAR</a></u>                                                  |
|    | <p><b><u>12:45 August 13 2000: Blue Beam Lifetime Evolution upon Returning to Injection Field</u></b><br/>Immediately after a hysteresis ramp, returning to injection current from a high-energy store, single-bunch blue beam lifetime evolves from very bad to very good over 5 minutes, while yellow beam lifetime remains excellent. No changes were applied to the machine in this period, and the suspected cause of lifetime variation is persistent current decay after ramping.</p>                                                                                       |                                                                              |                                                                              |
|   | <p><b><u>22:47 August 9 2000: 55-bunch Injection, Acceleration, and Store</u></b><br/>After RF adjustments, 55 bunches of nearly <math>10^8</math> ions/bunch intensity were injected and accelerated for the first time this evening. Note that both DCCT and WCM indicate even bunch intensity population, with RMS variations approximately 10%. Acceleration ramp transmission of 55 bunches was approximately the same as for ramps with 6 bunches performed earlier in the day; event rates during this store surpassed 25 Hz at PHENIX and approximately 15 Hz at STAR.</p> |                                                                              |                                                                              |
|  |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    |                                                                              |                                                                              |

# First Collisions (press release)



# The Best RHIC Collision Scale Model

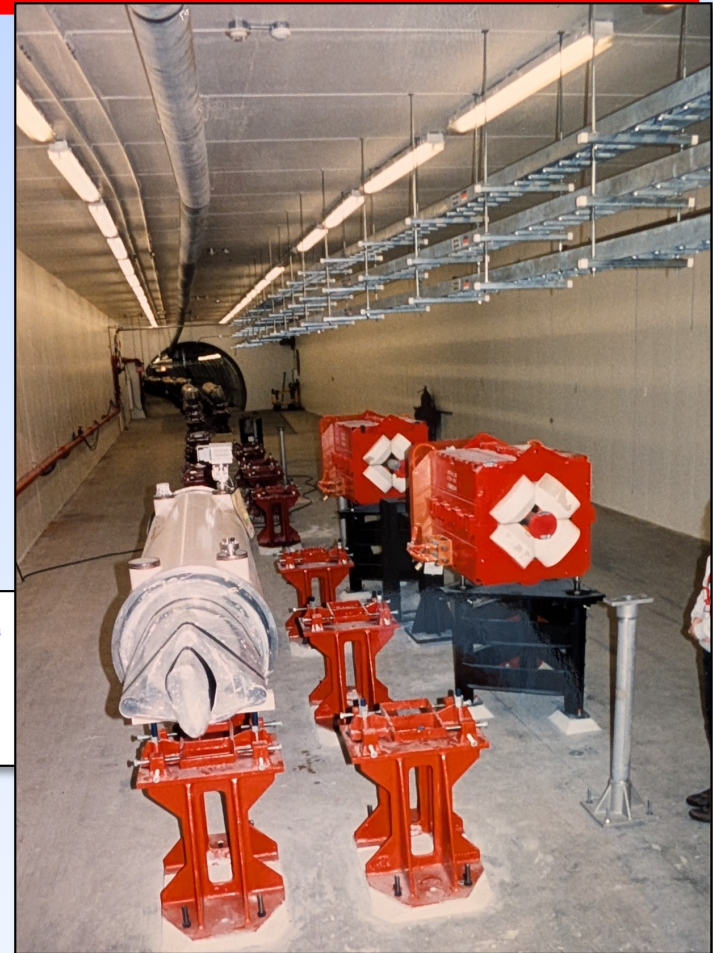
---



Often used as a visual aid in RHIC Summer Sundays and other tours

# Assorted Undocumented Memories

- Rollerblading in tunnel
  - The Peter Paul Meeting
  - Fridge contamination; “pretty” He venting
  - PASS gate races
  - ”Best ramp eeeeever!”
    - and “@#\*\$@#’ \$\*@&!”
  - RAP “zoo” (FNAL cartoons, SSC trees)
  - 2-page tech notes
1. Title: [Gold ion diffusion due to pair production](#)  
Authors: S. Peggs  
Comments: 2 pages  
Report-no: RHIC/AP/1, June 1993
- The lure of Big Quant \$\$
    - Mark Rhodes-Brown and Renaissance
  - Collide The Ions walk



# Assorted Documented Friends

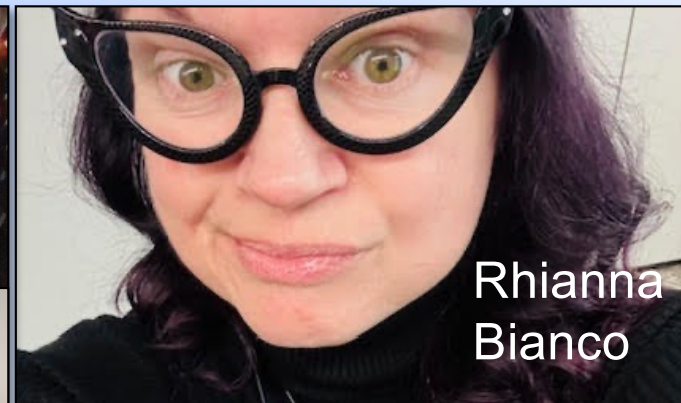
Rich  
Casella



Betsy  
Scholl



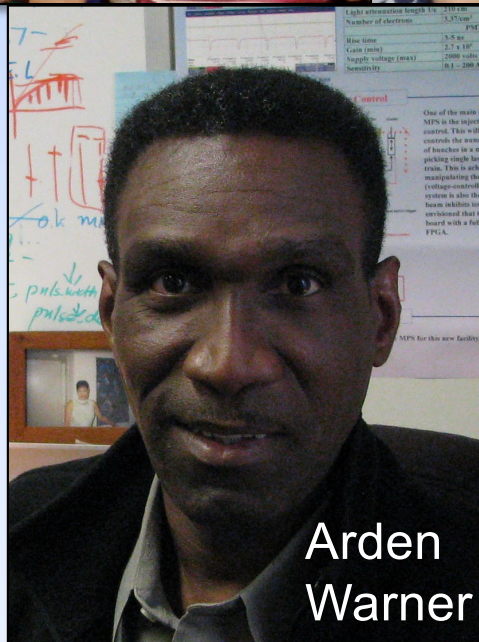
Rhianna  
Bianco



Ila  
Campbell



Arden  
Warner



Todd Satogata



RHICFest 2027

15

# In Case There's Time

---

# It's Amazing What We Kept In The Open (1)

## The New B&E Report

You do need the Acrobat Portable Document Viewer to successfully retrieve your B&E report and print it out to your local printer. To obtain a copy of the [AcroRead](#) program, just click on the link and choose "Download The Latest" reader.

### **RHIC Construction**

|                                              |                          |
|----------------------------------------------|--------------------------|
| <a href="#">1.0 Installation</a>             | Projects: 76000 to 76099 |
| <a href="#">1.1 Magnet System</a>            | Projects: 76100 to 76199 |
| <a href="#">1.2 Magnet Electrical System</a> | Projects: 76200 to 76299 |
| <a href="#">1.3 Cryogenics System</a>        | Projects: 76300 to 76399 |
| <a href="#">1.4 Vacuum System</a>            | Projects: 76400 to 76499 |
| <a href="#">1.5 Injection System</a>         | Projects: 76500 to 76599 |
| <a href="#">1.6 Beam Dump System</a>         | Projects: 76600 to 76699 |
| <a href="#">1.7 RF System</a>                | Projects: 76700 to 76799 |
| <a href="#">1.8 Beam Instrumentation</a>     | Projects: 76800 to 76899 |
| <a href="#">1.9 Controls System</a>          | Projects: 77900 to 76999 |
| <a href="#">1.10 Conventional Facilities</a> | Projects: 77000 to 77099 |
| <a href="#">1.11 Project Services</a>        | Projects: 77700 to 77799 |
| <a href="#">1.12 Safety System</a>           | Projects: 77200 to 77299 |

# It's Amazing What We Kept In The Open (2)

## Rhic Shift Summaries

[Click Here to Submit a New Summary](#), or  
[View the Known Hardware/Software Problems](#)

**Date:** August 16, 1999 **Shift:** Owl: 00:00-08:00

**Shift Leader:** Other Crew: W. Fischer, P. Thompson, D. Trbojevic, J. van Zeijts

**Logbook:** 20 **Pages:** 20 - 24

### Shift summary:

We inherited a machine with losses at 10 o'clock and the Lambertson septum, with a lifetime of about 5 turns from BPM readings. The consensus opinion at the shift change was that the removal of the losses at the Lambertson will lead to a lifetime of at least 120 turns.

We started tuning the injection by changing AtR elements by small amounts and closed the first turn horizontally and vertically while retaining the ring orbit. Losses at the Lambertson were almost eliminated (remainder < 20 counts). Losses at the injection kicker were about 120 counts and could be attributed to the first turn only (by putting in a beam stop).

The result of this tuning was saved in 990816.0225.yellow and injection\_934784935, beam lifetime was still 3-5 turns.

We then turned to 10 o'clock. A vertical bump using yo9-tv5, yo9-tv3 and yi10-tv2 did not lead to an reduction in the loss. But it shifted the losses from downstream to upstream of IP10. Putting all correctors at 10 o'clock to zero we found a large vertical orbit deviation (~30mm) at yo9-bv1. BPM reading in general were difficult to interpret since some BPMS read data from other BPMS/plans/rings. We corrected the large orbit deviation at yo9-bv1 using yi10-tv4. We then used yo9-tv5 and yo9-tv7 to reduce orbit oscillations after 10 o'clock. No progress, however, at the main losses.

A security trip around 5 o'clock in which we lost the AtR sweep lead to ~45min downtime. We then scanned the 10 o'clock aperture with yi10-tv2 with no conclusive result.

Went into shut down at 6:10am. END OF RHIC COMMISSIONING RUN.