RHIC Machine Status

Wolfram Fischer

— Run Coordinator for Run-4 Gold-Gold Operation —

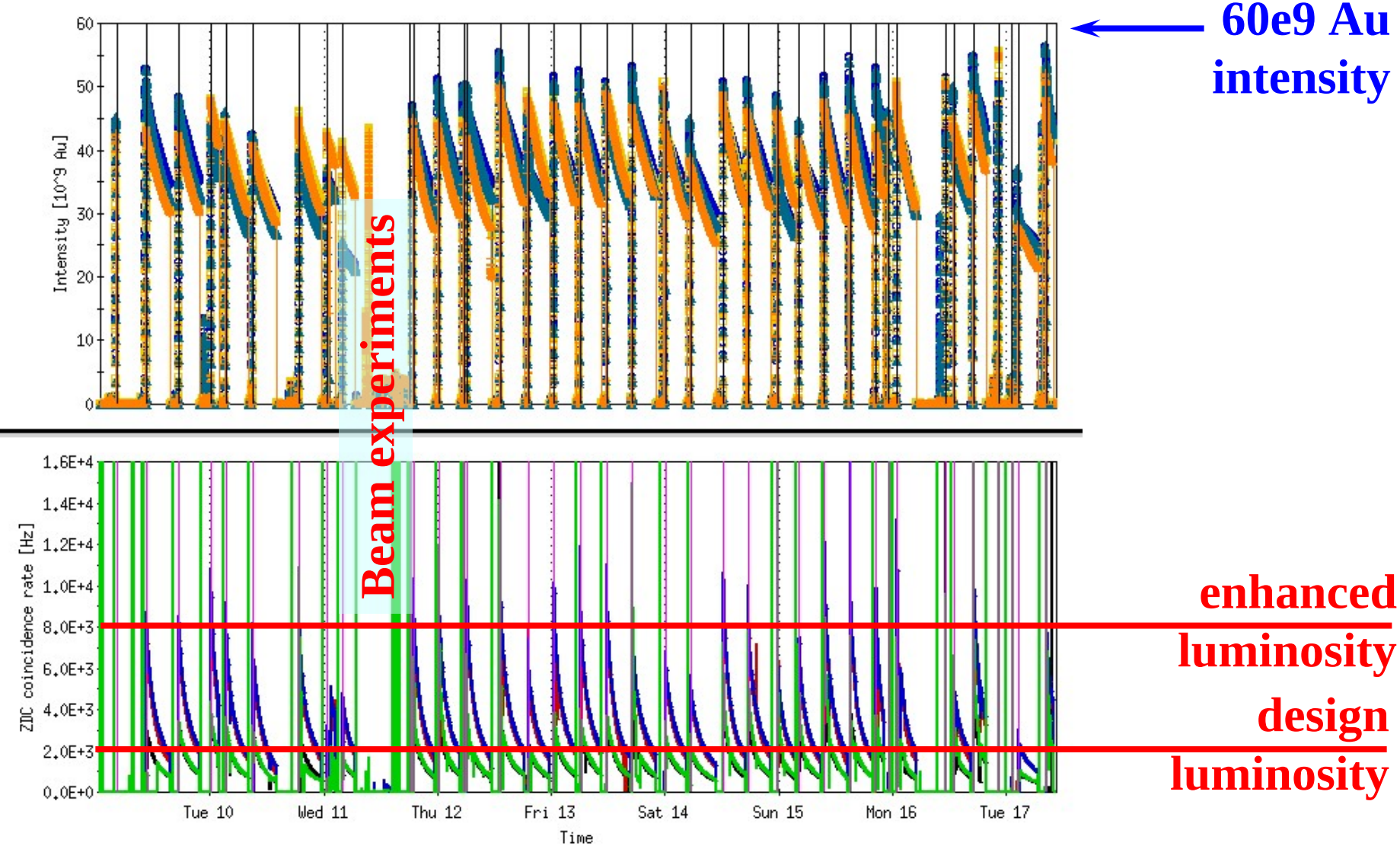
For the C-A RHIC Team

BROOKHAVEN NATIONAL LABORATORY

UEC Meeting
20 February 2004

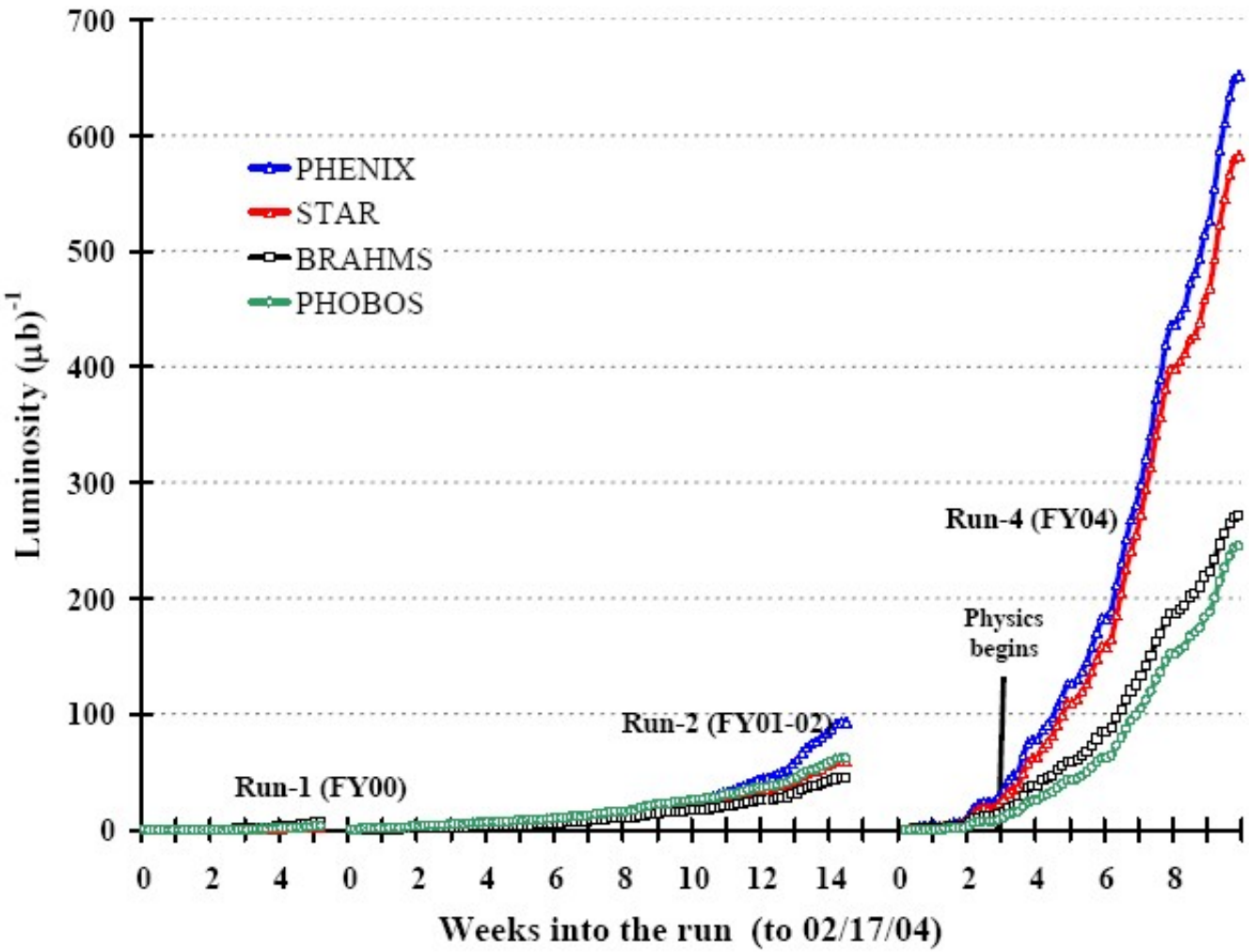
1. Run-4 Au-Au luminosity development
2. Peak luminosities and best performance
3. Time in store
4. Luminosity limitations
5. Preparation for the pp run
6. Summary

Stores during last week, Monday to Tuesday next



Delivered 634 $(\mu b)^{-1}$ to Phenix
153 $(\mu b)^{-1}$ best week

As of 02/15/04 24:00
[after 7wks of
Star ×0.9
Phobos ×0.3
Brahms ×0.4



maximum projection

physics target

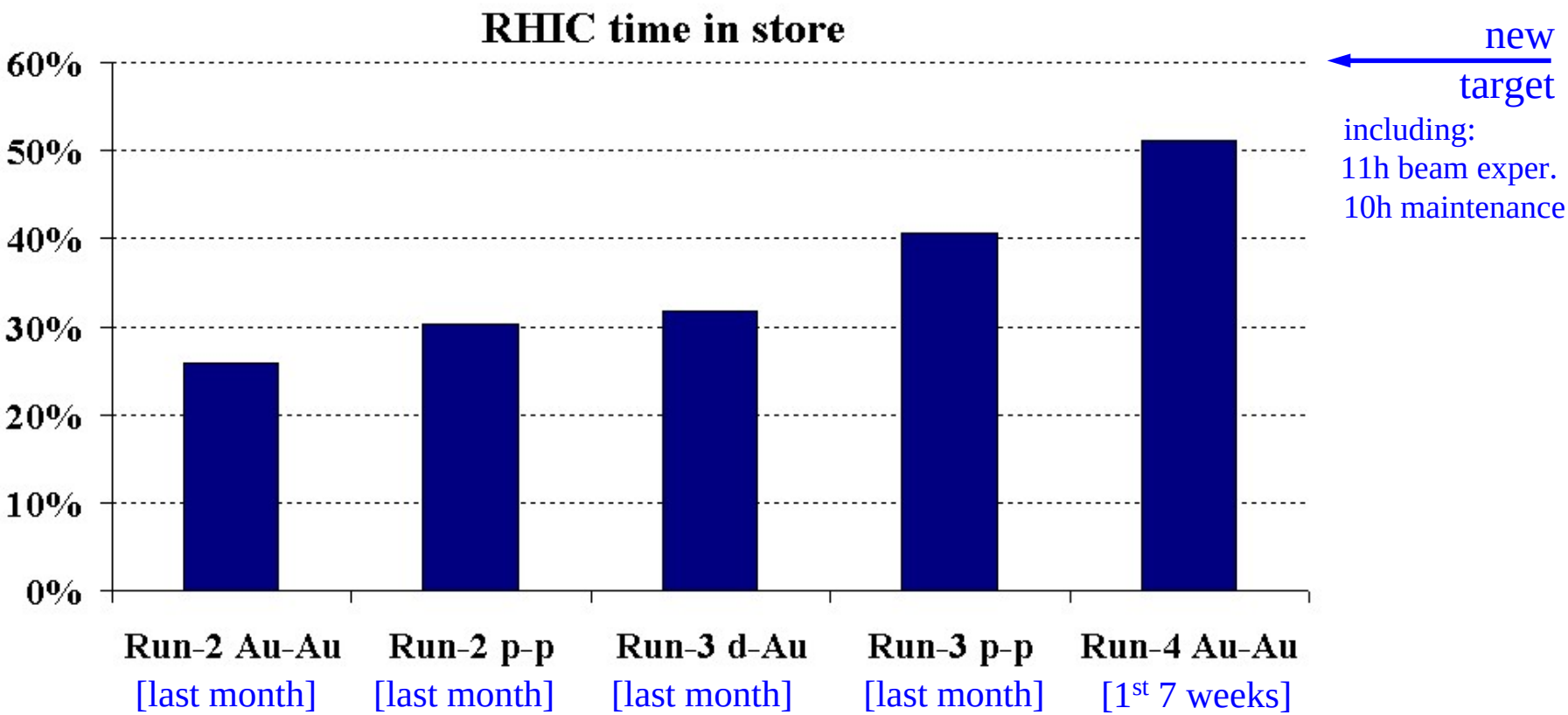
minimum projection

[targets were for 14wks of physics

Peak luminosity and best week performance

Mode	No of bunches	Ions/bunch [10^9]	β* [m]	Emittance [μm]	$\mathcal{L}_{peak}$ [$cm^{-2}s^{-1}$]	$\mathcal{L}_{store\ ave}$ [$cm^{-2}s^{-1}$]	L_{week} [$(\mu b)^{-1}$]
Run-4 achieved	56	0.9	1	15-40	14×10^{26}	4×10^{26}	153
Run-4 goal*	56	0.9	1	15-40	12×10^{26}	3×10^{26}	70
Design	56	1.0	2	15-40	9×10^{26}	2×10^{26}	50

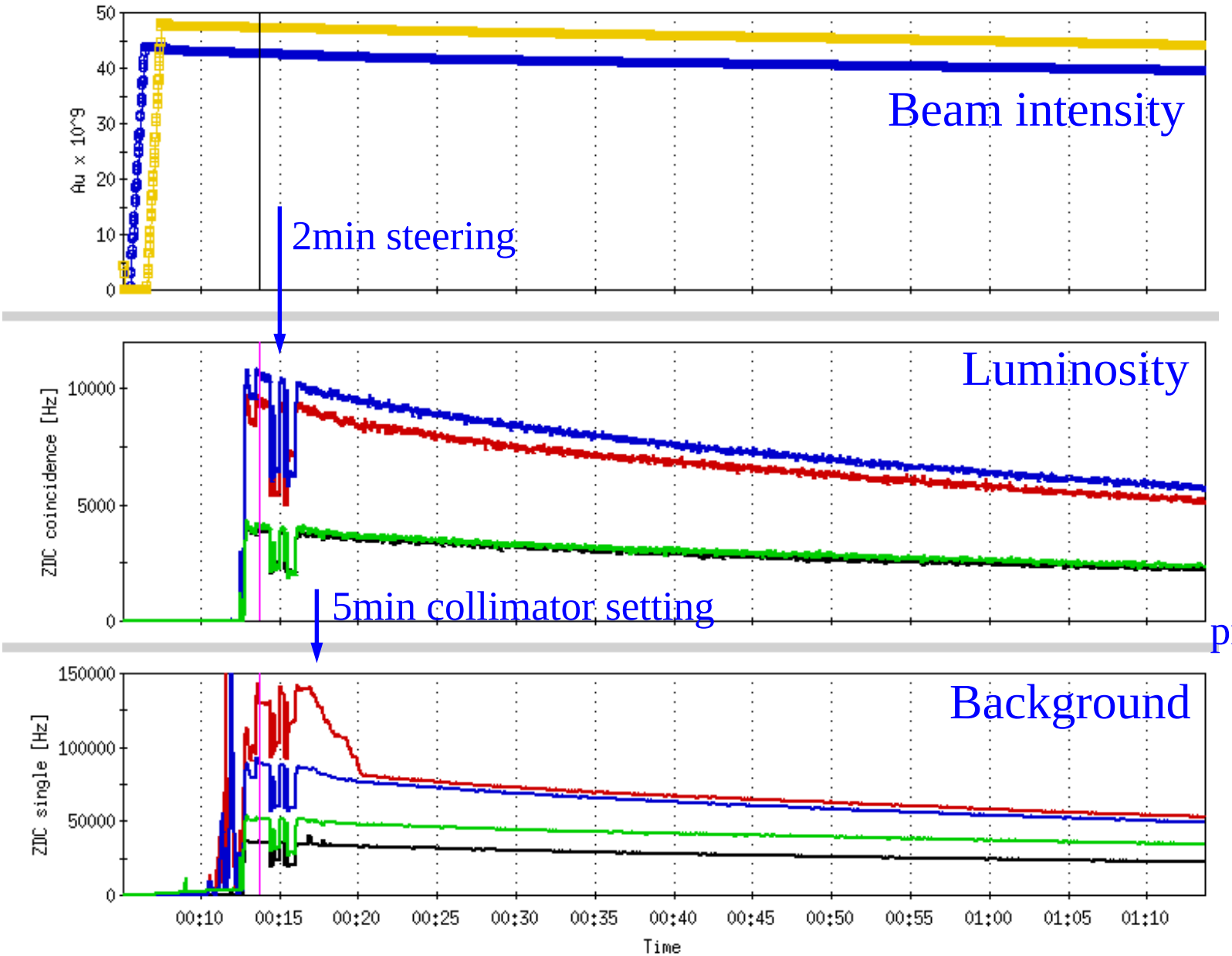
[* Run-4 goal: basis for maximum projection]



[Best week without maintenance: 66%]

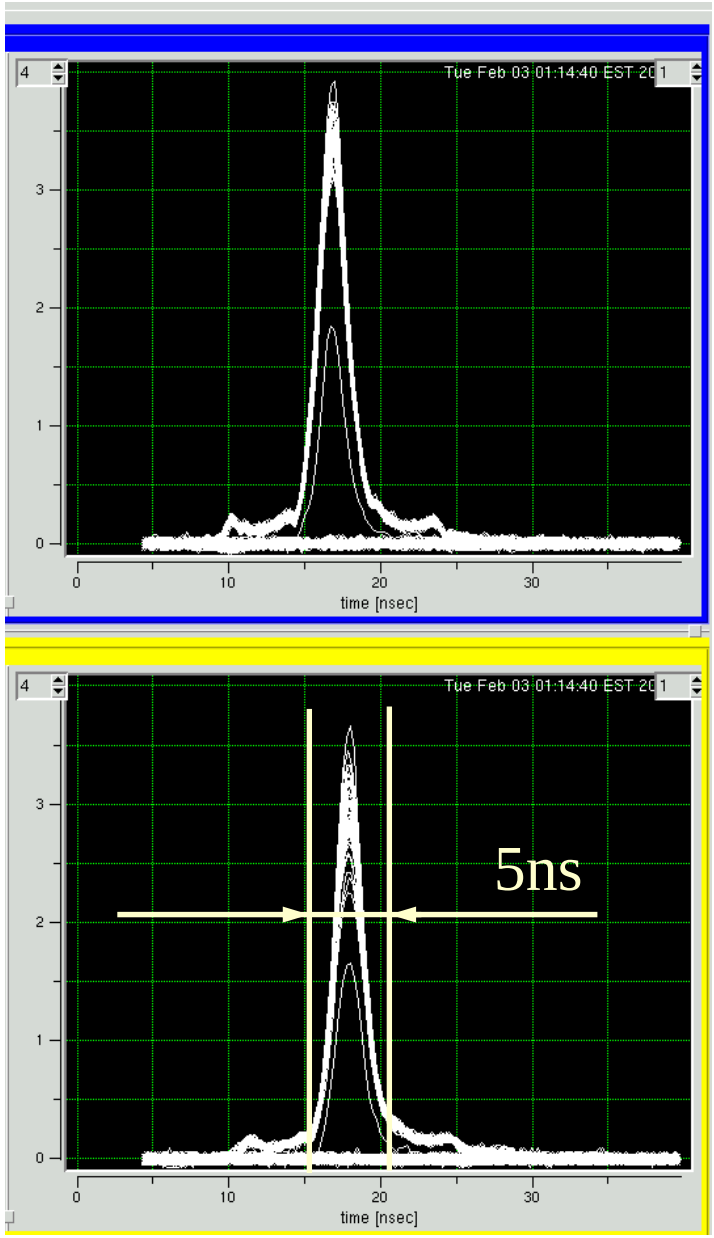
Comments:

- Not all store time used by experiments (initial background, detector turn-on, etc.)
- Usable store time differs from experiment to experiment



Steering and collimator setting within ~10min

[up to 1hr in previous Runs]



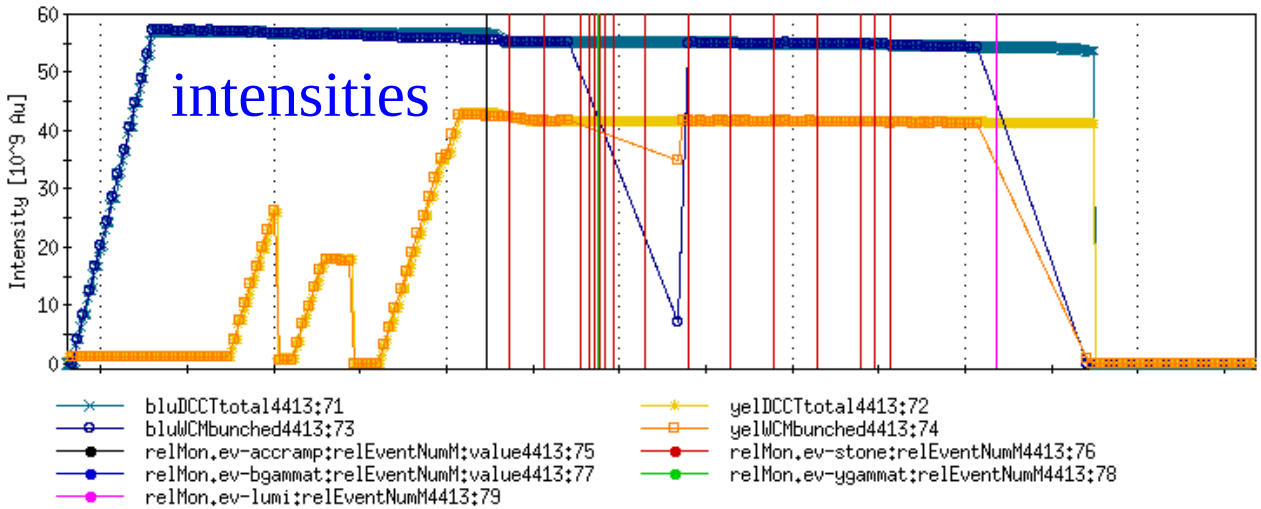
Improved rebucketing

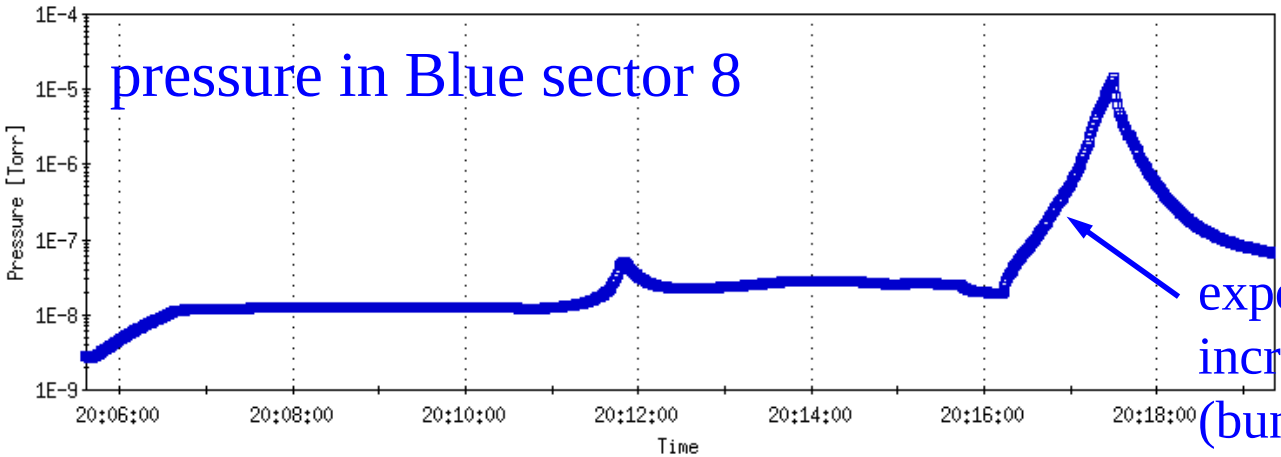
- fully automatic at end of energy ramp
- only small amount of beam in adjacent buckets

→ Almost no further improvement possible

(Widening of longitudinal distributions are from intra-beam scattering. This limit can only be overcome by beam cooling at full energy.)

- Beam intensities in both rings are limited by vacuum instabilities
- Machine operates as closely as possible at these limits



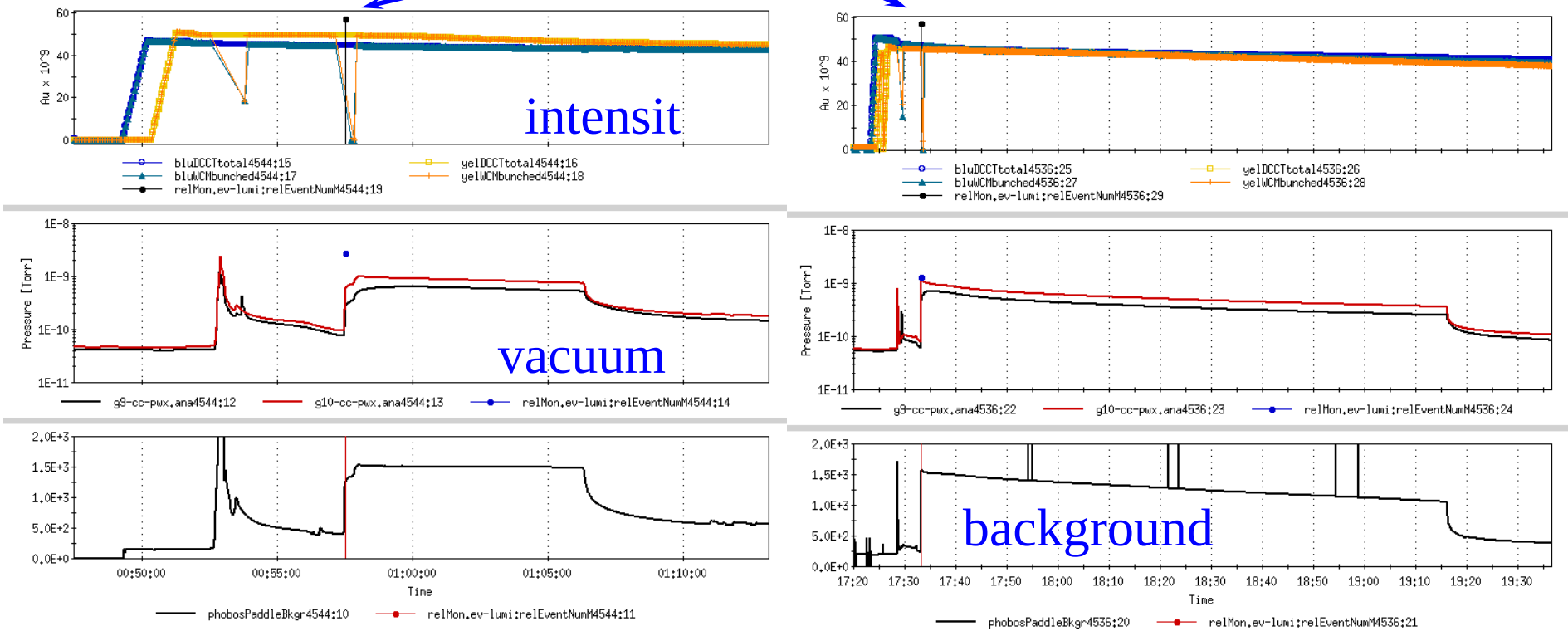


exponential pressure increase after rebucketing (bunch length shortened)

PHOBOS background increase after rebucketing, drops after minutes to 2 hours

→ under investigation

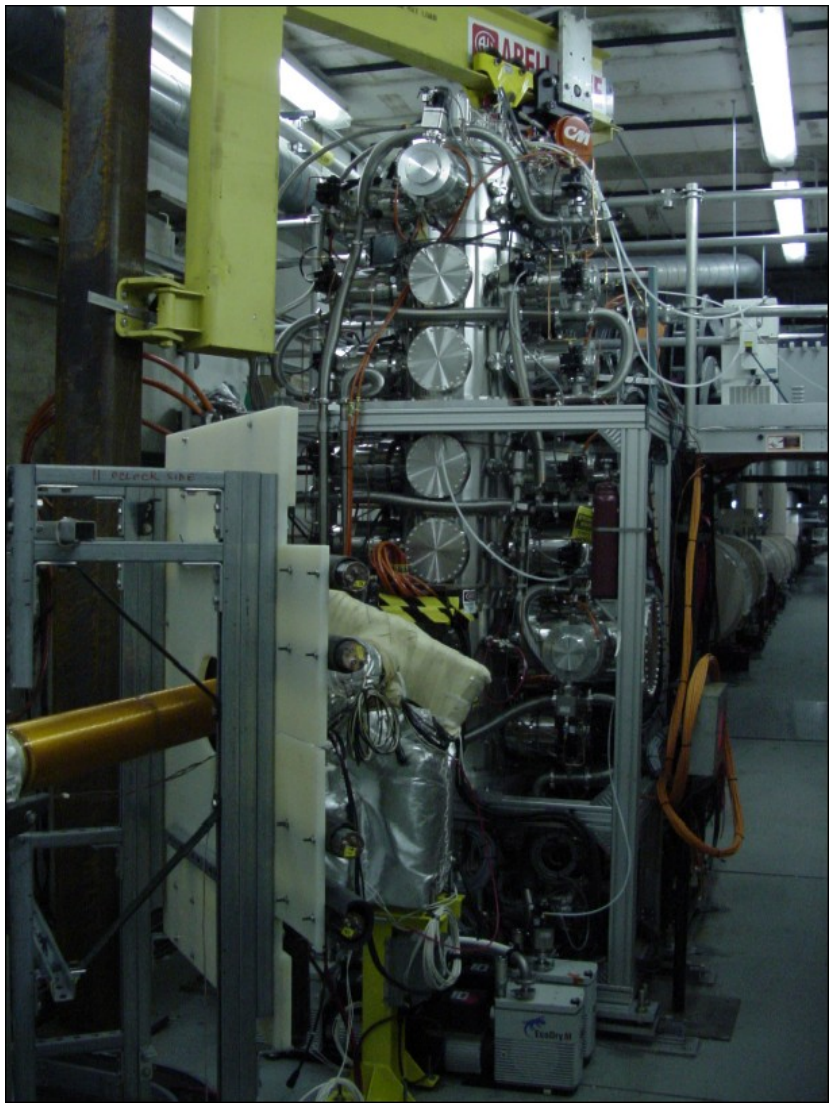
rebucketing



4544: drop after 8min

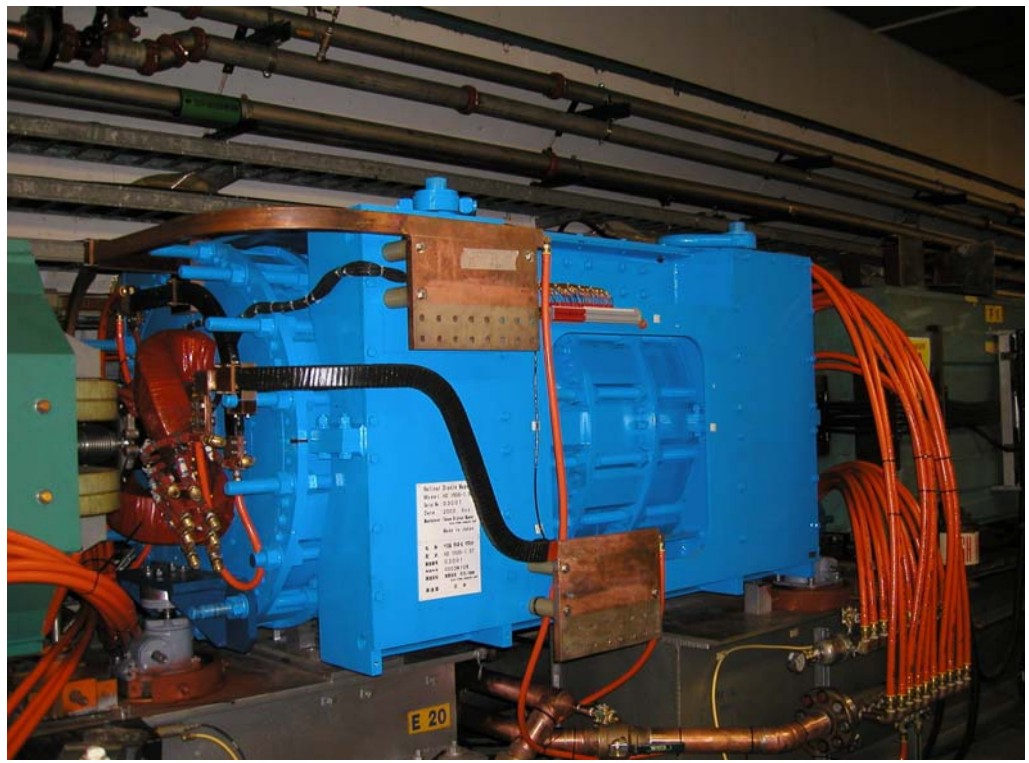
4536: drop after 1:43hrs

- Run coordinator: Mei Bai
- Plan:
  - Commission new AGS snake
    (→50% polarization in RHIC)
  - Commission polarized gas jet
  - Increase pp luminosity
    (beam-beam dominated, test new working point)
  - Calibrate RHIC polarimeters with gas jet
    (about 1 week running time)
- Progress so far
  - Gas target was tested in RHIC (reinstallation before pp run)
  - New AGS warm snake is installed and connected
  - Proton Linac is running
  - AGS shifts will start beginning of March



← gas jet in RHIC tunnel

new warm snake in AGS tunnel



- Delivered Au-Au luminosity exceeded most optimistic assumptions:
  delivered 620(μb)$^{-1}$ to PHENIX in 7 weeks
  (almost the same to STAR, 1/3 to BRAHMS and PHOBOS)
- Calendar time in store increased to 50%
- Smaller vertex distribution,
  fast steering and collimator setting
- Vacuum limits beam intensity, and
  severely affects PHOBOS background
- Polarized proton run preparation is on track