

RHIC Operations Performance and Plans

Wolfram Fischer

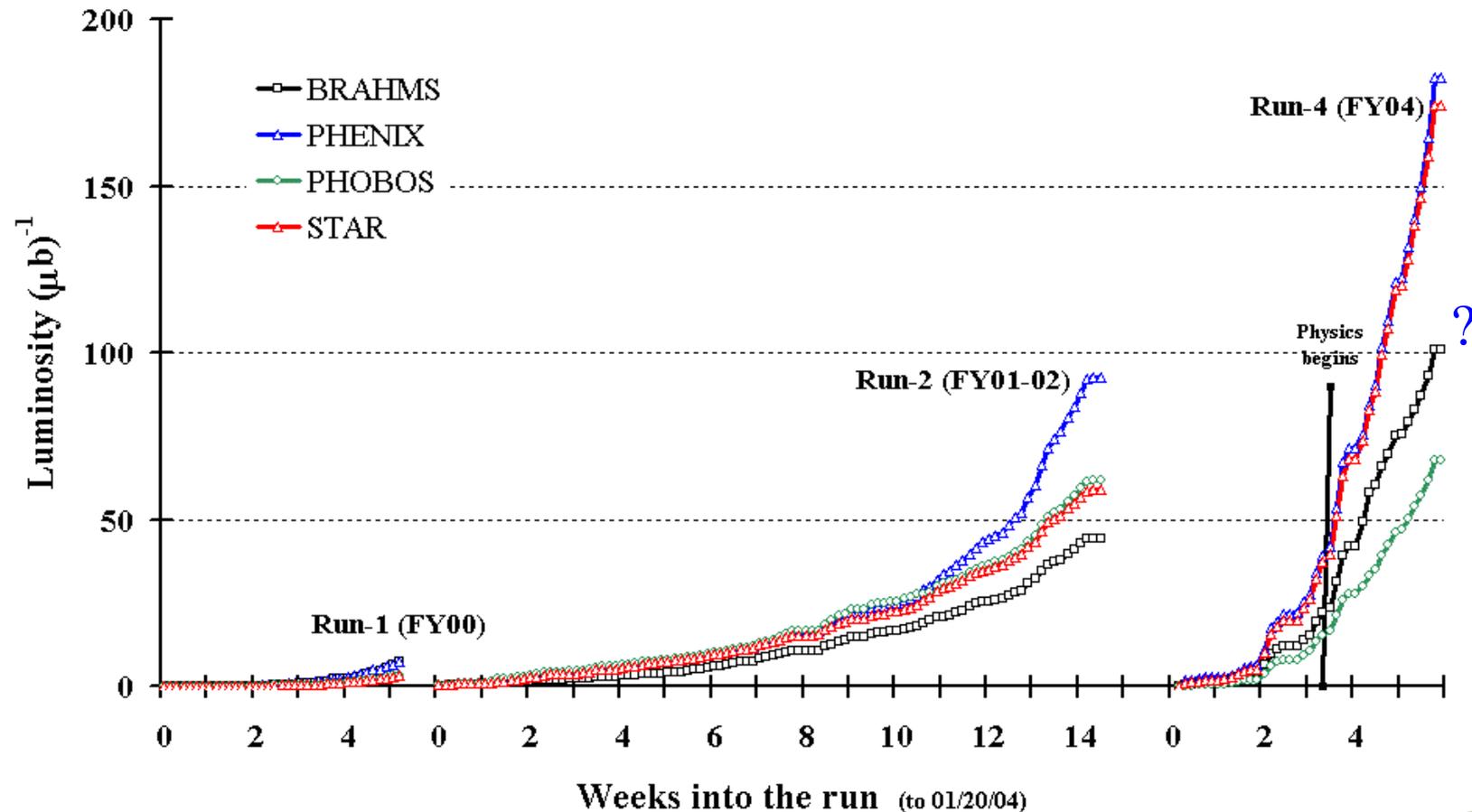


DOE Review for RSVP
27 January 2004

1. Run-4 performance
2. 5-year luminosity projections
3. Major machine changes beyond 2008
4. Start-up and ramp-up
5. Physics operation
6. Summary

Delivered $182.5 (\mu\text{b})^{-1}$ to Phenix [week ago: 109.8]
 $72.7 (\mu\text{b})^{-1}$ last week [week ago: 42.4]
Target 330 $(\mu\text{b})^{-1}$

Star $\times 0.9$
 Phobos $\times 0.3$
 Brahms $\times 0.5?$



- **Enhanced Luminosity Goals**

(before e-cooling, about to be reached when RSVP starts)

- For Au-Au, average per store (4× design)

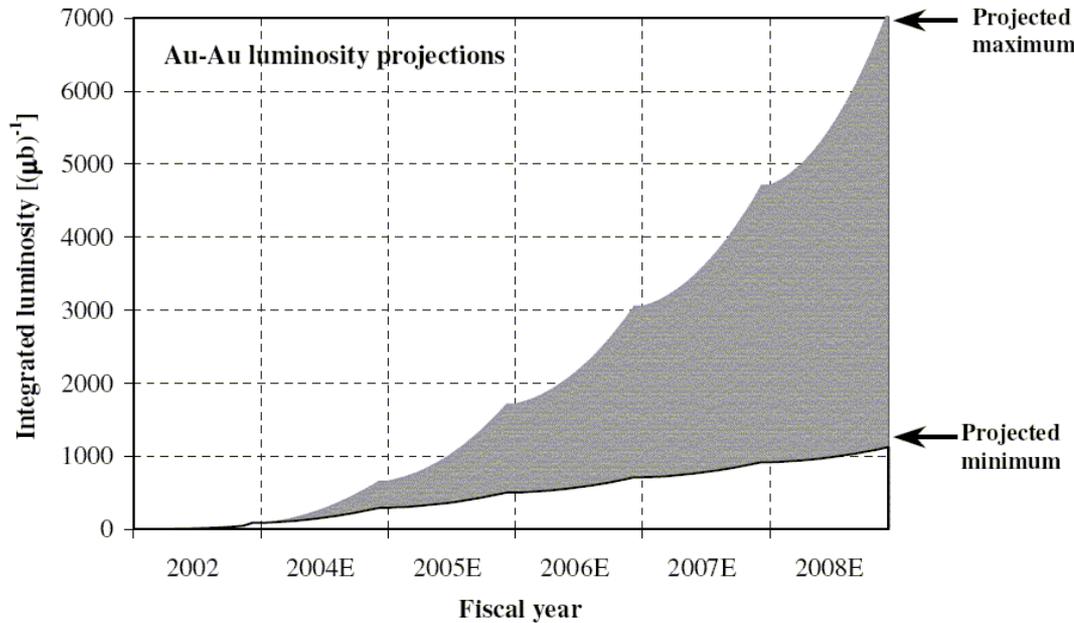
$$\mathbf{L = 8 \cdot 10^{26} \text{cm}^{-2} \text{s}^{-1}} \text{ at } 100 \text{GeV/u}$$

- For p↑-p↑ average per store, 2 IRs (16× design)

$$\mathbf{L = 6 \cdot 10^{31} \text{cm}^{-2} \text{s}^{-1}} \text{ at } 100 \text{GeV}$$

$$\mathbf{L = 1.5 \cdot 10^{32} \text{cm}^{-2} \text{s}^{-1}} \text{ at } 250 \text{GeV}$$

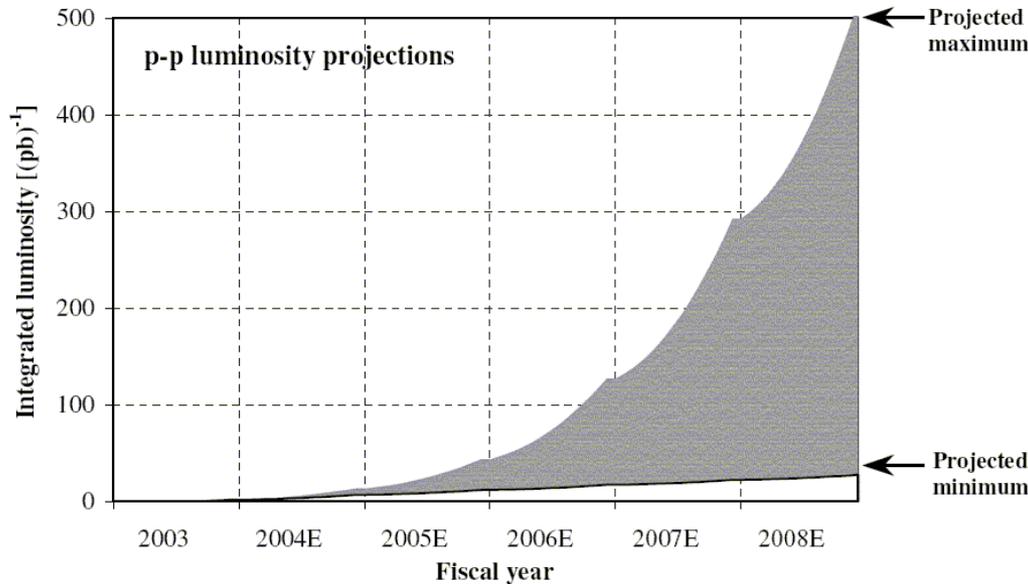
with **70% polarization**



- Assume**
- 14 weeks production in every year
 - linear luminosity increase during run
 - 4 experiments
 - completion of improvements

achieved **projected maximum**

Fiscal year		2002A	2008E
No of bunches	...	55	112
Ions/bunch, initial	10^9	0.7	1.0
Average store luminosity	$10^{26} \text{ cm}^{-2}\text{s}^{-1}$	1.5	8.0
Time in store	%	25	60
Maximum luminosity/week	$(\mu\text{b})^{-1}$	25	290



Assume

- 14 weeks production in every year
- linear luminosity increase during run
- only 2 experiments
- completion of improvements

achieved projected
maximum

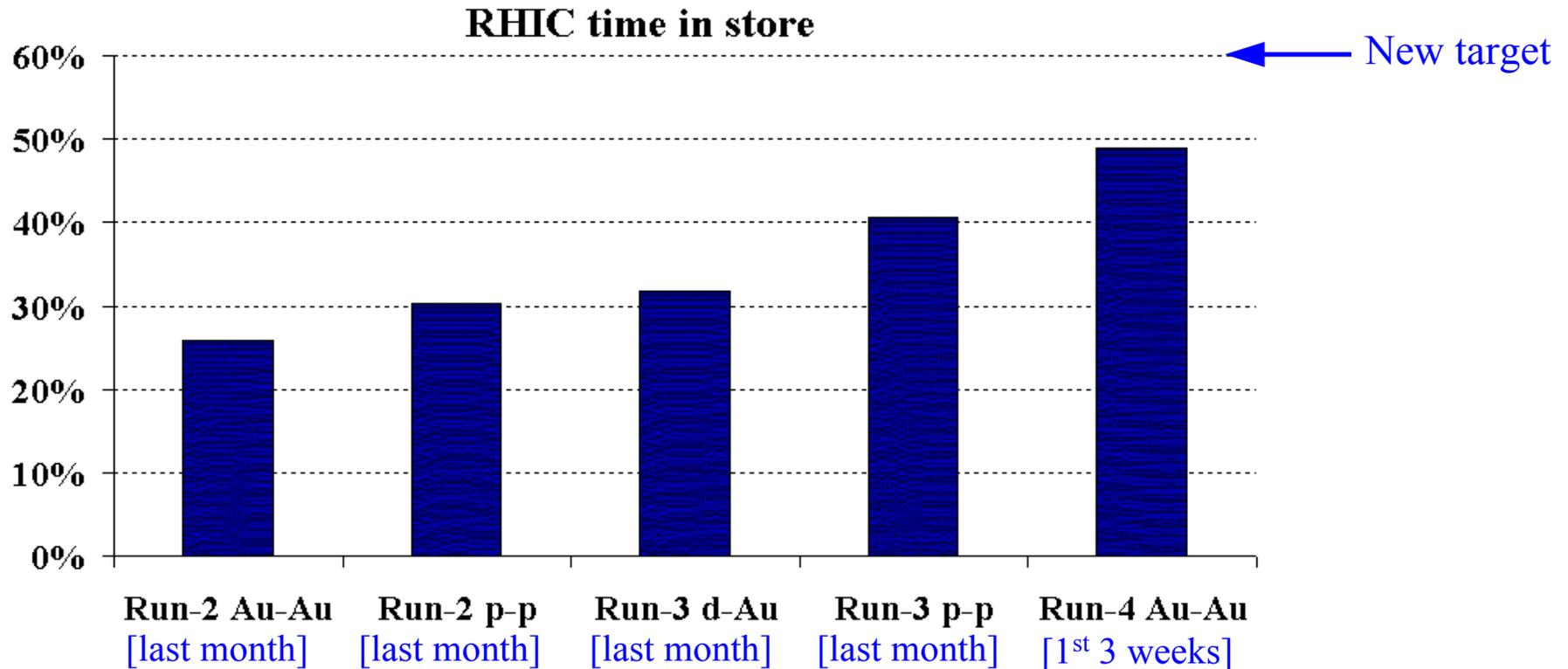
Fiscal year		2003A	2008E
No of bunches	...	55	112
Ions/bunch, initial	10^{11}	0.7	2.0
Average store luminosity	$10^{30} \text{ cm}^{-2} \text{ s}^{-1}$	3	72
Time in store	...	41	60
Maximum luminosity/week	$(\text{pb})^{-1}$	0.6	26
RHIC store polarization, average	%	30	70

- EBIS
 - More reliable, more flexible, more cost effective ion source
- Stochastic cooling in operation
 - Mostly for cooling of beam tails
(luminosity and beam quality preservation)
- Electron cooling in operation
 - Cooling of beam core
(luminosity increase by factor 10, faster beam burn-off)

- Currently 27 cryo-weeks per year
 - Need 1.5 weeks for cool-down
 - **Need for AGS to setup for RHIC**
 - Need 1 week for warm up
 - **No need for AGS in RHIC operation**
- Comments
 - RHIC operation was foreseen for up to 37 weeks/yr
 - Gained about ½ week in cool-down in Run-4
 - Cool-down/warm-up may be faster in a few years

- Need 2 weeks for start-up
 - 24h/day machine development
 - **Need AGS as RHIC injector 24h/day**
- Need 2 weeks for ramp-up
 - 16h/day machine development, 8h/day for experiments
 - **Need AGS as RHIC injector >16h/day**
- Comments:
 - Gained one week in ramp-up in Run-4
 - Potential for another week of gain
 - 8 days of larger failures during start-up/ramp-up in Run-4
 - Difficult to get total start-up and ramp-up time below 3 weeks (2 weeks beam time, 1 week failures)
- Need start-up/ramp-up for every mode switch in Run

- During physics operation
 - 12h/week beam experiments
 - **Need AGS as RHIC injector continuously, RSVP off**
 - ~8h/week for access and maintenance
 - **If AGS maintenance RSVP off**
 - Stores of about 4h, presently about 2h between stores
 - Store length may decrease somewhat (detector limited)
 - No significant change with e-cooling (increased burn-off)
 - **Need AGS as RHIC injector continuously between stores**
 - Time in store about 50% of calendar time, work on increase to 60%



Comments:

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

- Need AGS as RHIC injector for about 24 weeks/year at current funding level (longer with more funding)
- AGS must be able to deliver 2 different species to RHIC
- Injector not needed during time in store (currently 50% of calendar time, work on increase to 60%)
- When not in store, need AGS as RHIC injector
- A reliable injector is essential for reliable RHIC operation