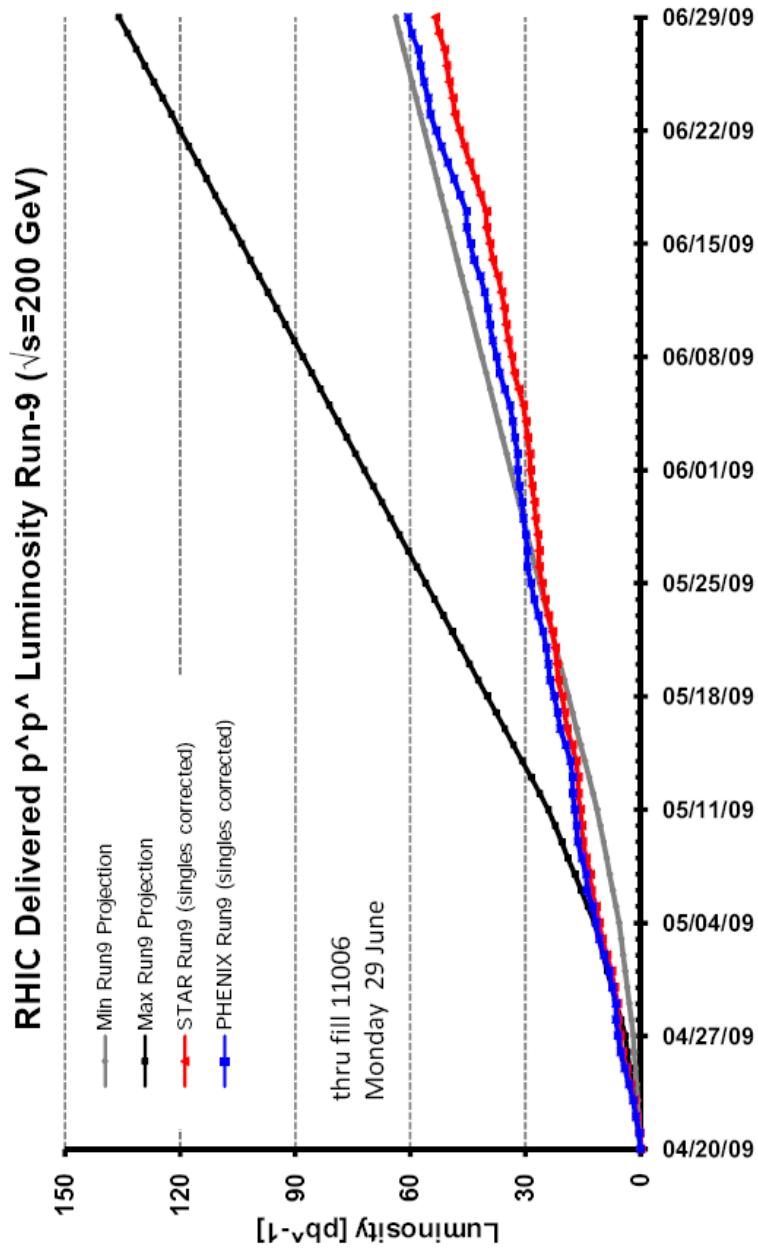


Run-9: 100 GeV

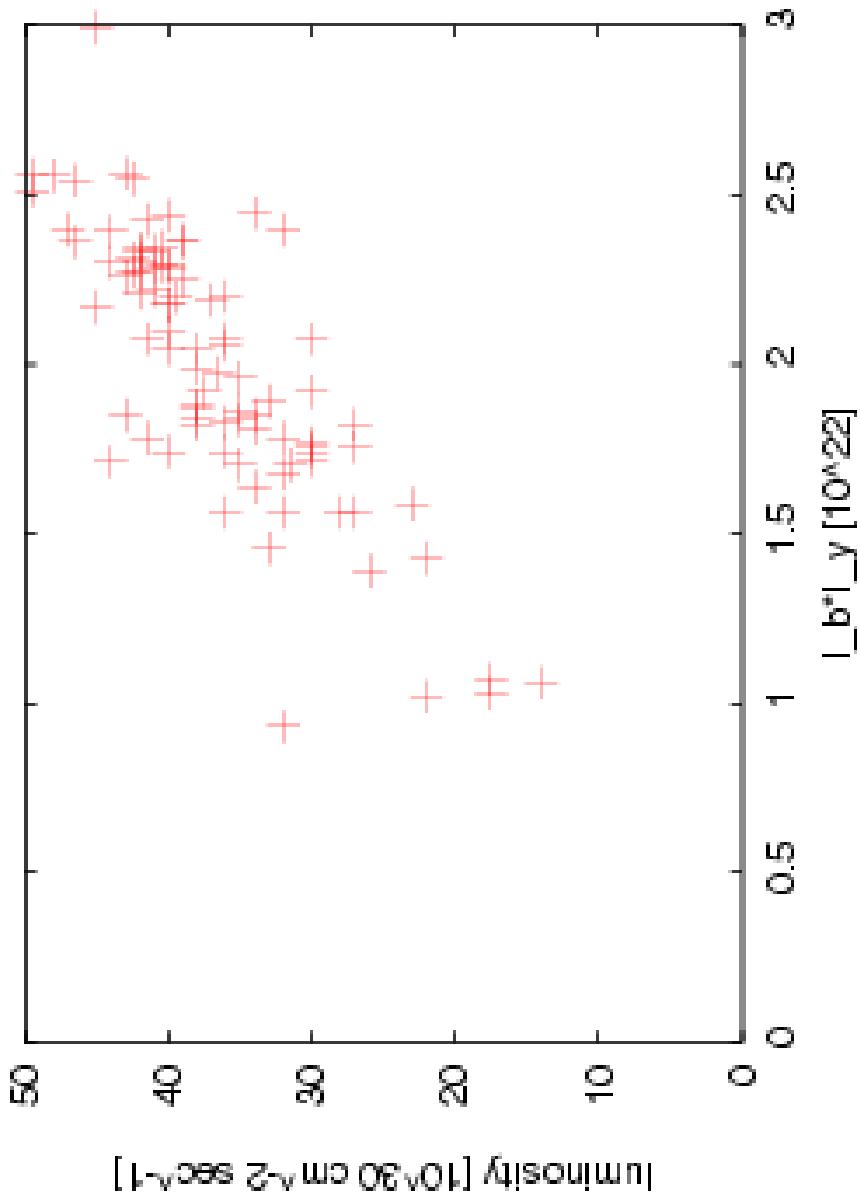
Christoph Montag

Integrated luminosity



Integrated luminosity barely matches minimum projections

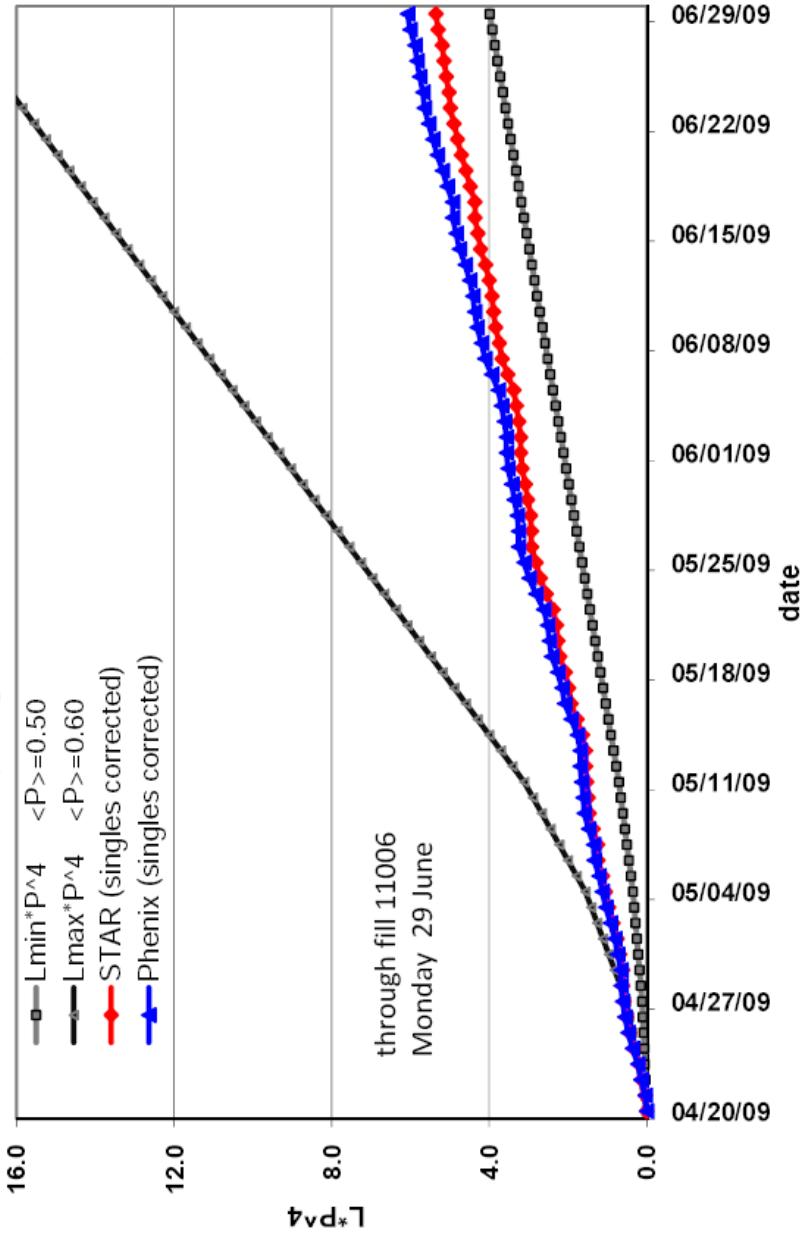
Luminosity vs. bunch intensities



Linear increase with $I_b \cdot I_y$.
Peak luminosity is 50 percent higher than in Run-6/8.

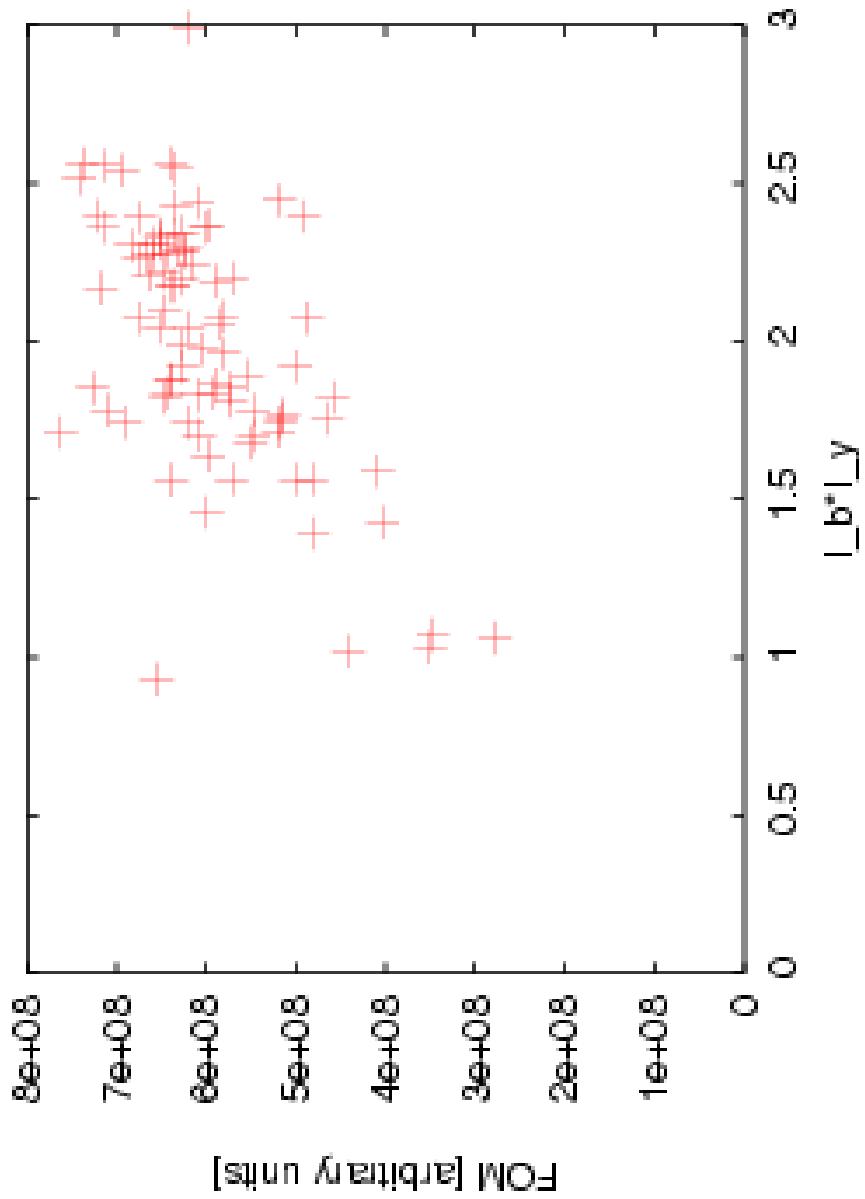
Integrated figure-of-merit

Run9 ($\sqrt{s}=200 \text{ GeV}$)-- STAR / PHENIX Figure of Merit
(Longitudinal Polarization)



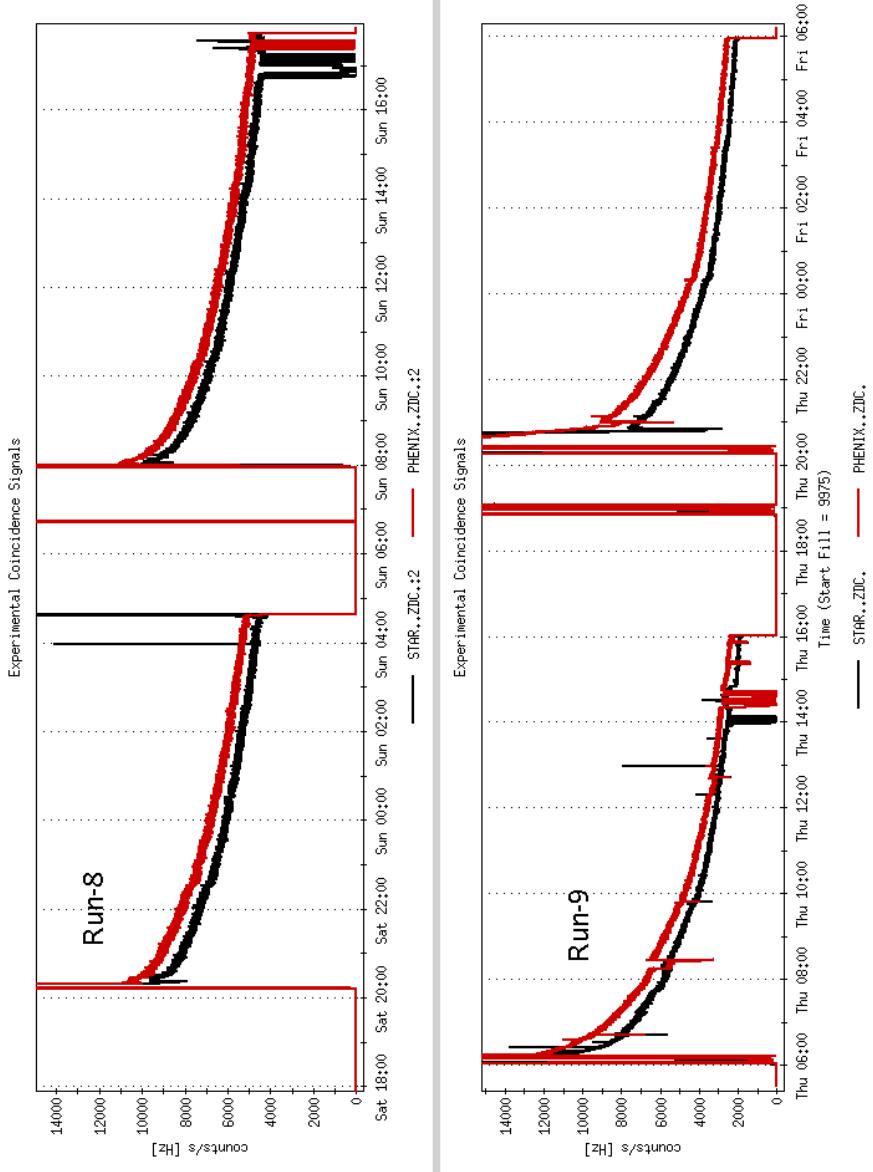
Average polarization is around 56 percent in both rings.

Figure-of-Merit $L \cdot P_b^2 \cdot P_y^2$ vs. bunch intensities



Most stores near optimum figure-of-merit.
Using AGS polarization fit $P = 75 - 8 \cdot I$.

What happened?



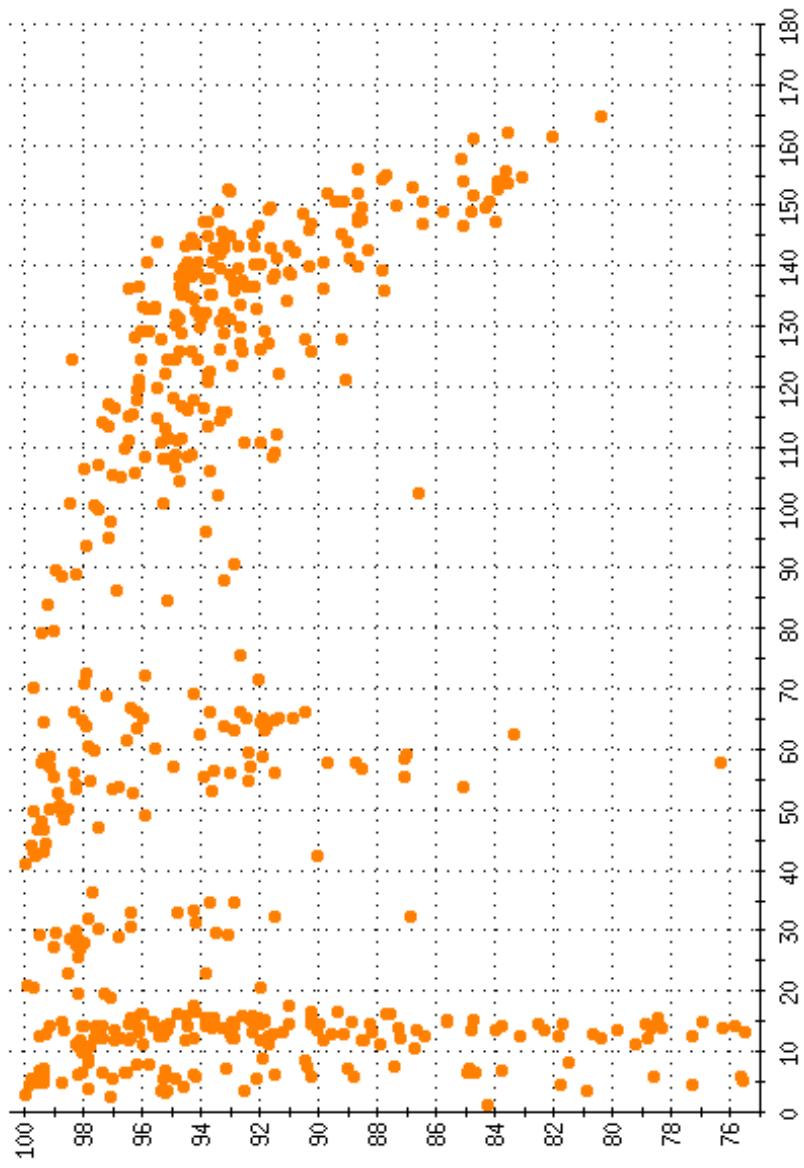
Luminosity lifetime in Run-9 is only 6 h, vs. 10 h in Run-6/8

What do we know?

- Fewer bunches (84x84) have better ramp efficiency in Yellow, but luminosity lifetime is unaffected. Back to 109x109.
- Turning off RF voltage ramp at store helps long-lived luminosity component, but bunches get very long (hour-glass, PHENIX vertex cut). Introduced slow, gentle ramp to 150 kV in 9 h (instead of 200 kV in 3 h).
- Low intensities (1e11) do not help luminosity lifetime.

- Unsqueezing to $\beta^* = 80\text{ cm}$ has no significant effect on luminosity lifetime.
- Run-8 ramp with $\beta^* = 1\text{ m}$ has good luminosity lifetime: No noise.
- DA tracking studies showed significant reduction when going from $\beta^* = 1\text{ m}$ to 70 cm . But that's only a relative number.

Yellow ramp efficiency vs. intensity



Limited Yellow bunch intensity to $1.4 \cdot 10^{11}$ while pushing
Blue only.

New systems

- New LLRF: Several days of commissioning during the entire run. Issues are understood; will start Run-10 with new system.
- 9 MHz: Limited by main p.s. glitch on the ramp, and beam loading in Landau cavities. Requires new dedicated Landau cavities.
- Spin flipper: Not operational yet; needs additional AC dipoles to form a closed bump.

Summary

- 100 GeV start-up was extremely fast, declared physics after 5 days.
- Integrated luminosity increased almost linearly during the entire run; the first week was already as good as any other week.
- Peak luminosity 50 percent higher than in Run-6/8.

- Spent considerable time on understanding the luminosity lifetime limitation.
- RHIC ran at its limit during the entire run. Future improvements require hardware upgrades (10 Hz orbit feedback to allow near-integer tunes, 9 MHz RF for shorter bunches).
- pp2pp during final week was very successful; set-up is very different from regular running (low intensity, small emittances, lots of collimation/scraping).