Summary of lumi development at 100 GeV

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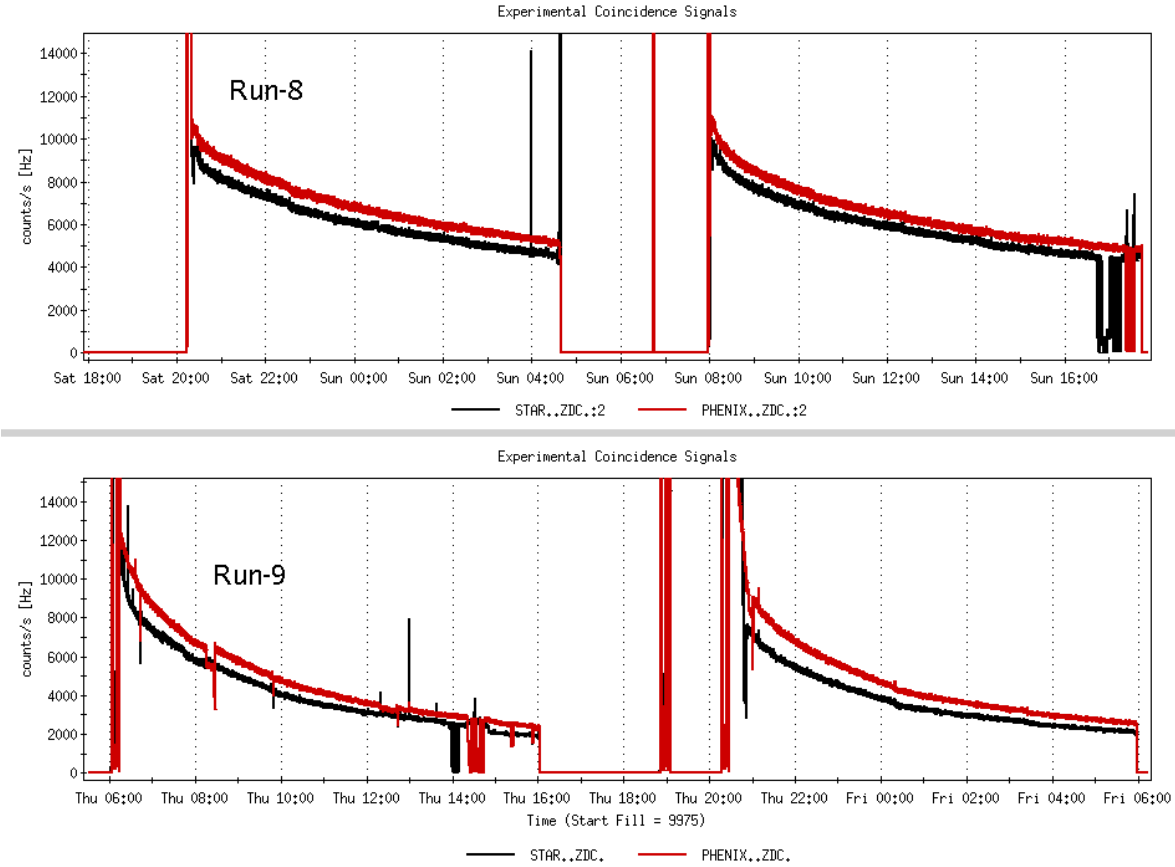
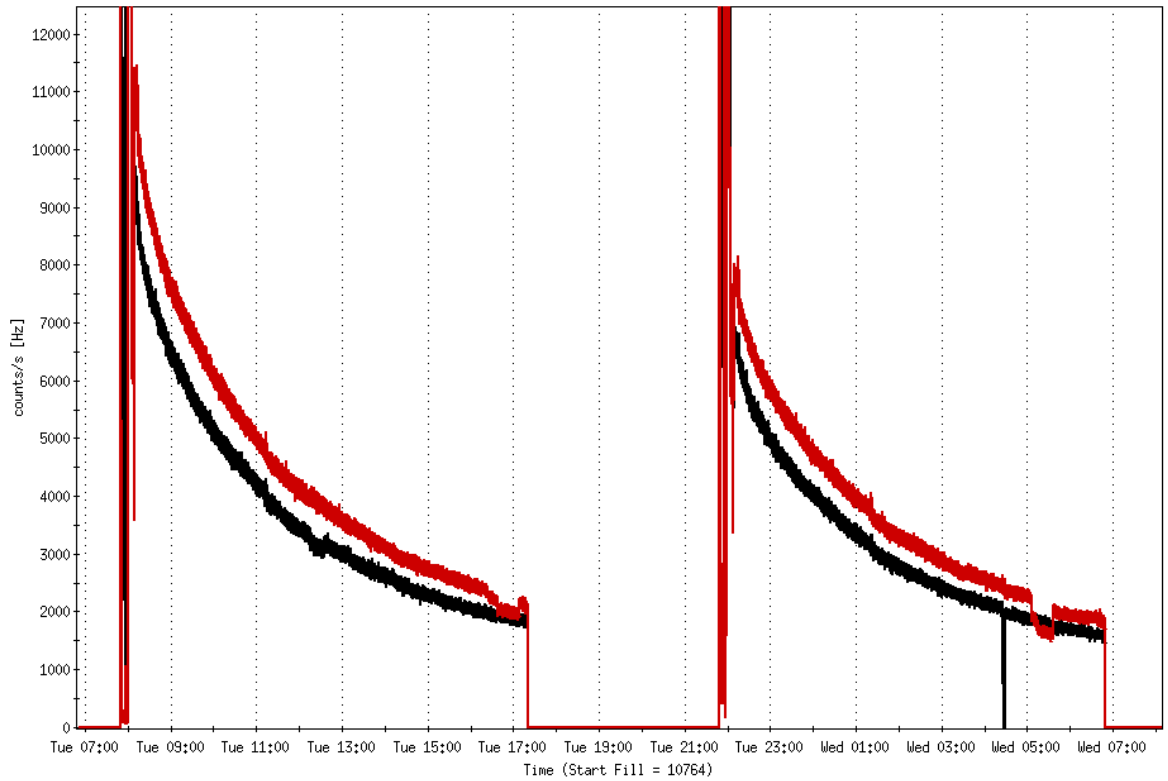
The problem



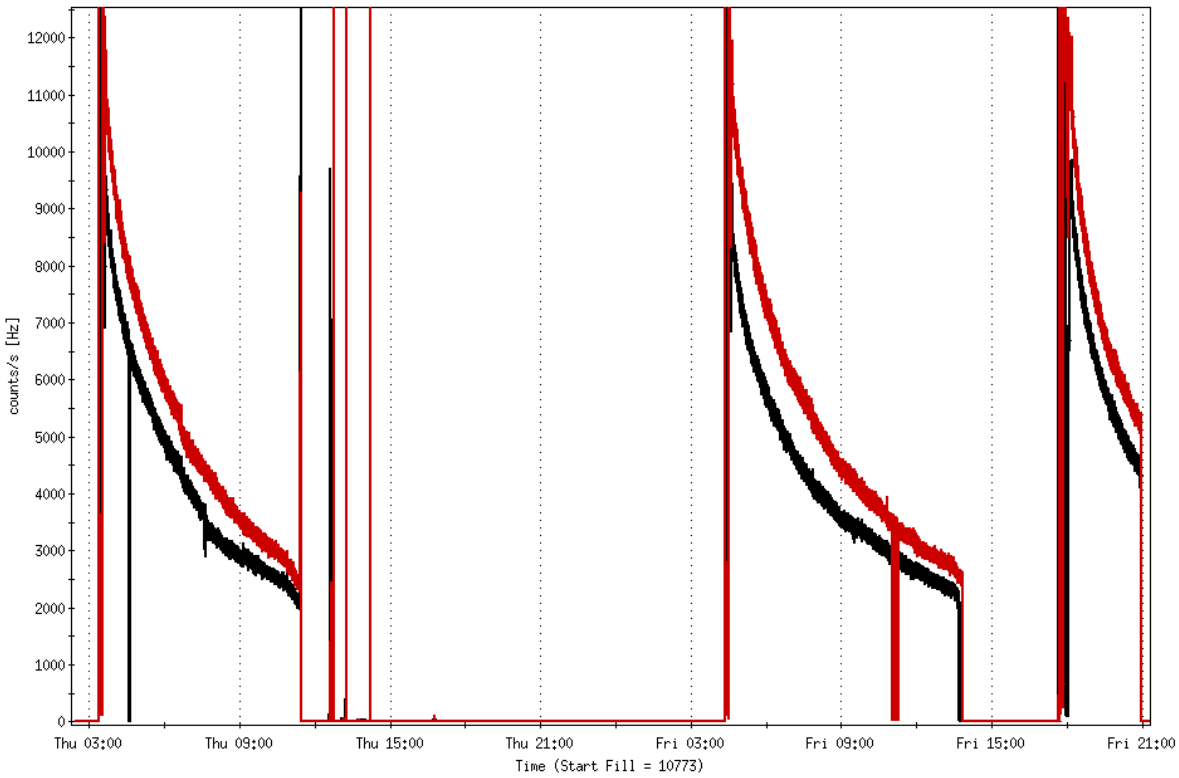
Luminosity lifetime in Run-9 was only 6 h, vs. 10 h in Run-6/8

Fewer bunches (84x84): 10764/10765



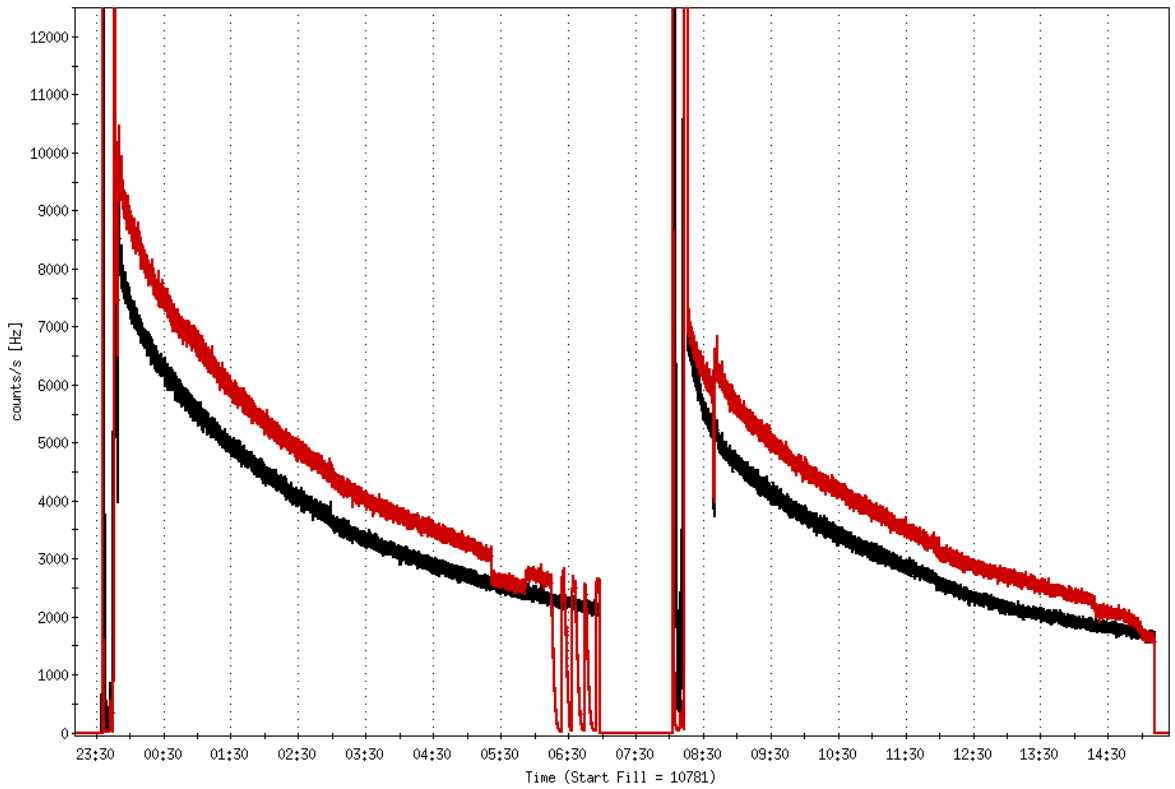
Luminosity lifetime: 6.8 h, for 80 percent of the total luminosity
(PHENIX luminosity, first 6 h after lumi event)

No RF voltage ramp at store: 10773 – 10778



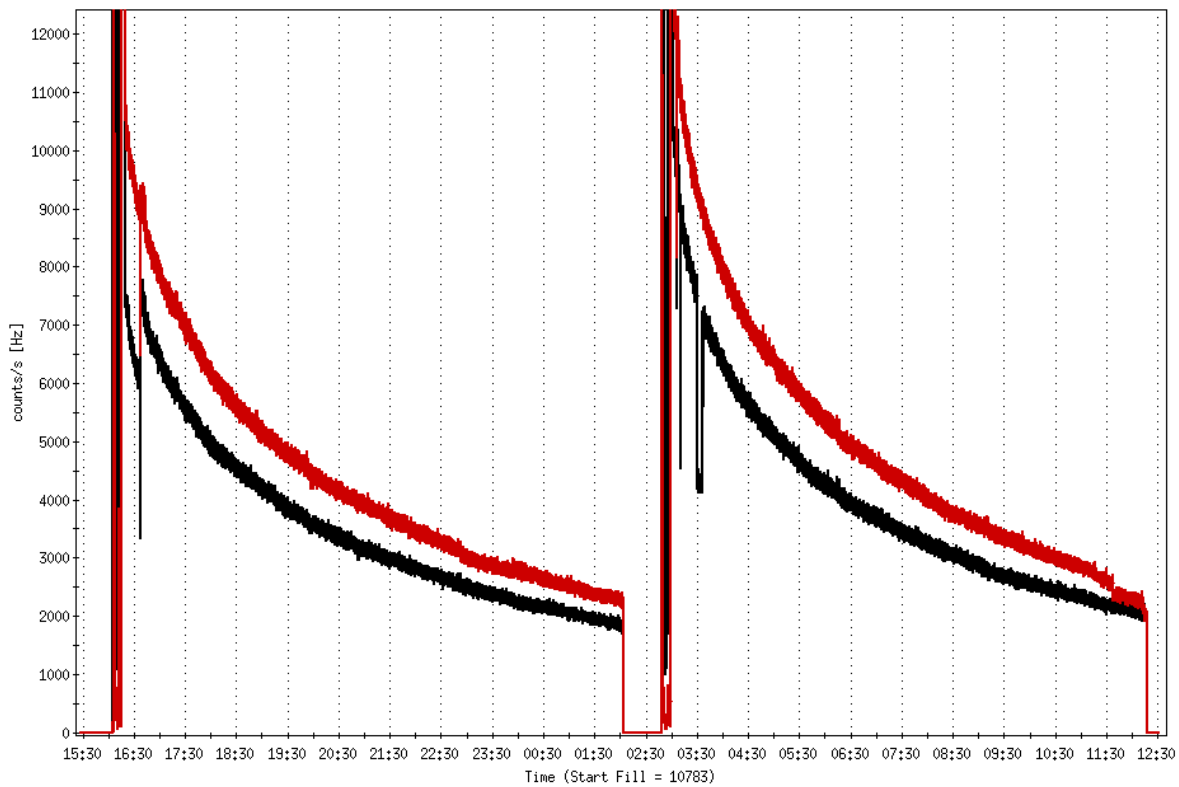
Luminosity lifetime: 6 – 8 h, for 75 – 80 percent

Low intensity stores (1e11), 3h RF ramp: 10781/10782



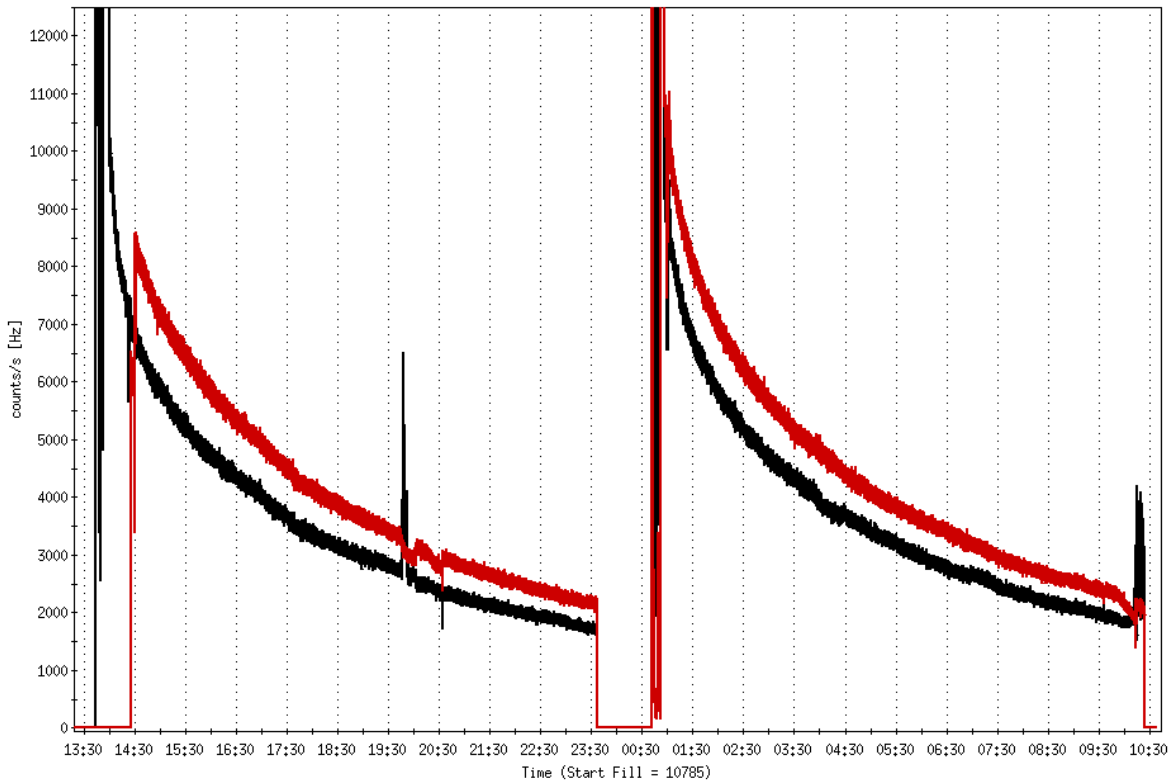
Luminosity lifetime: 6 − 6.5 h, for 90 percent

9h RF ramp to 200kV/cavity: 10783/10784



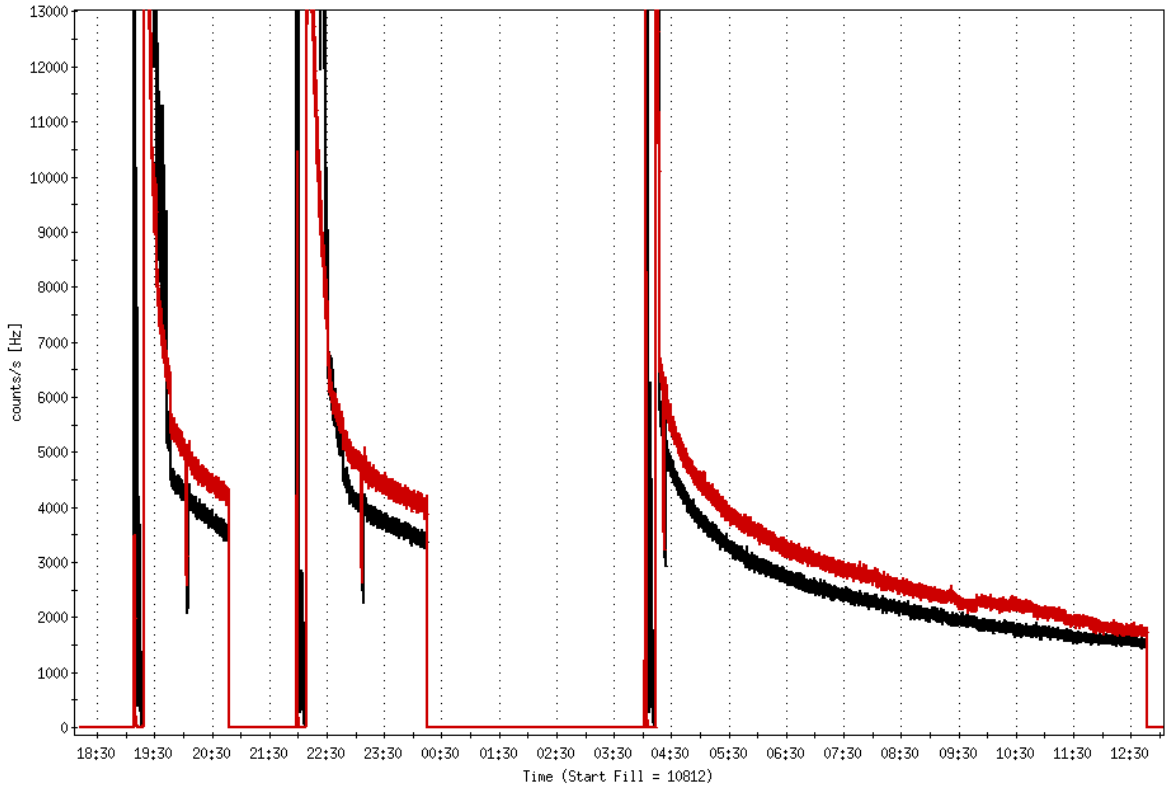
Luminosity lifetime: 8.9 h, for 80 percent of the total luminosity

9h RF ramp to 150kV/cavity: 10785/10786



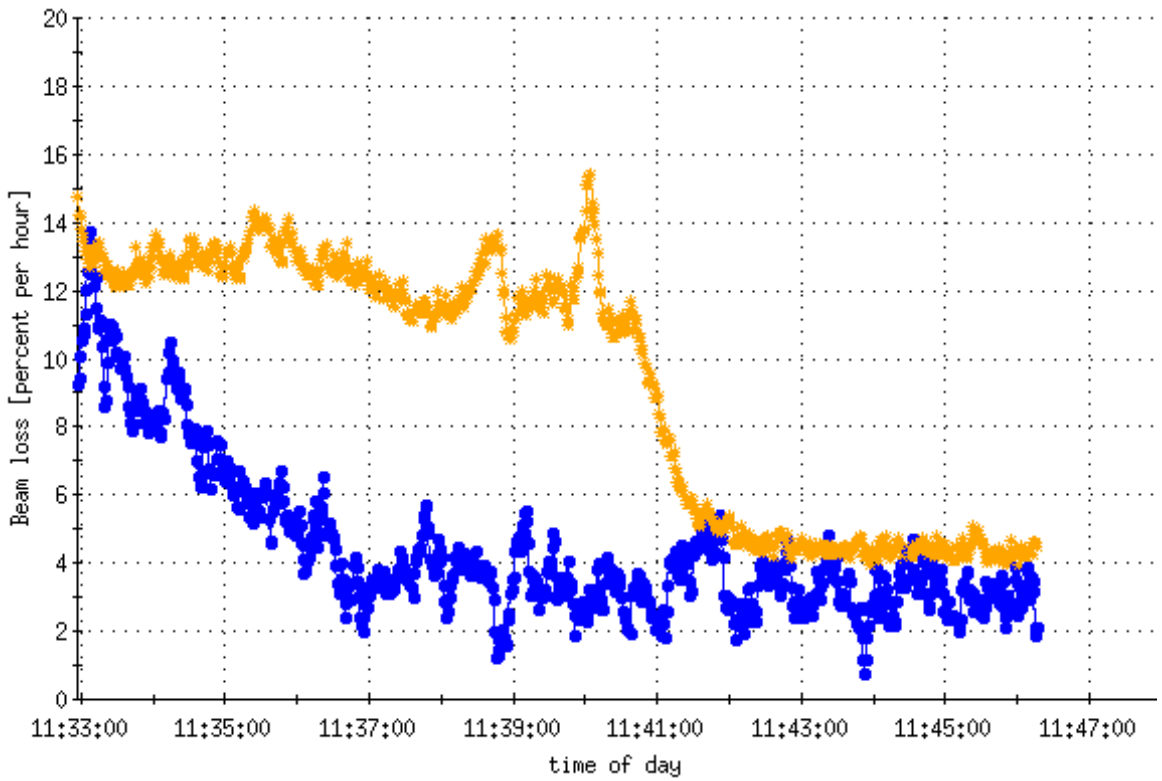
Luminosity lifetime: $7 - 8$ h, for $75 - 90$ percent

Unsqueezed to 80cm: 10812/10814



Luminosity lifetime: 11 h, but only for 60 percent

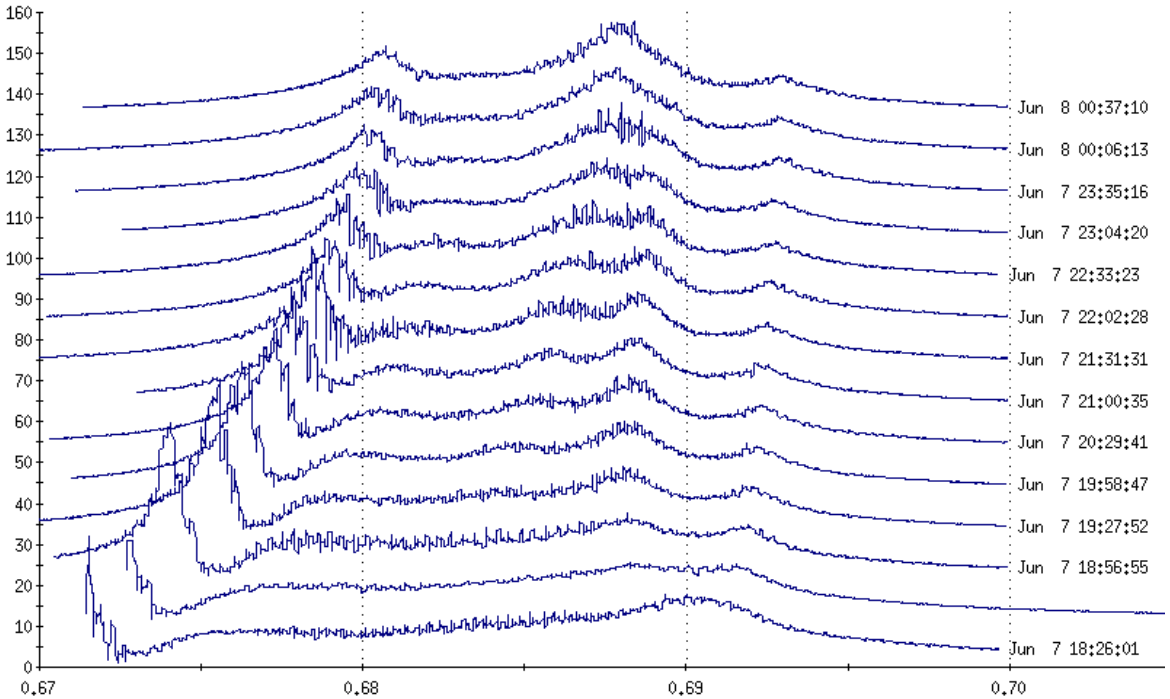
Re-loaded $\beta^* = 1\,\mathrm{m}$ ramp from Run-8



4 percent beam decay at beginning of store, with 1.8e11 injected

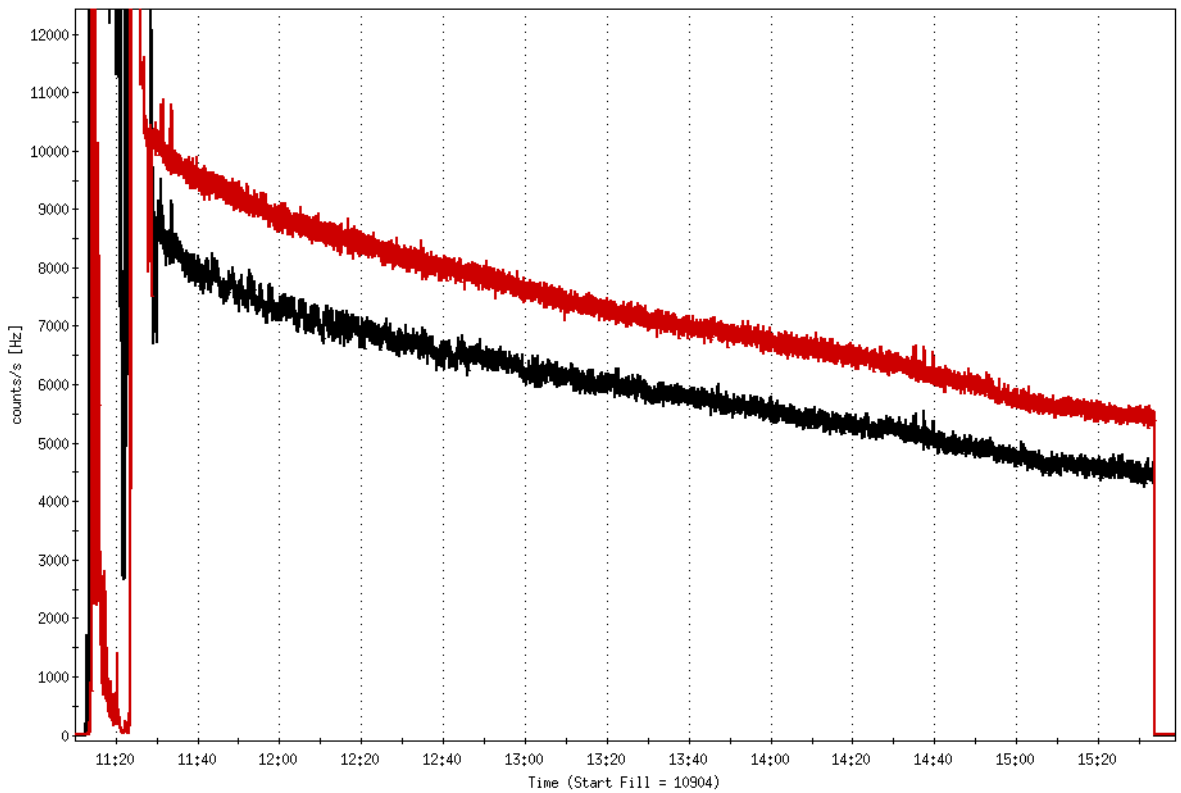
(70 cm stores started around 10 percent/hour)

Asymmetric fills to suppress π-mode: 10878 – 10881



No effect, π-mode still clearly visible

Large emittances due to AtR flags: 10904



Luminosity lifetime: 8.3 h for 95 percent, during first 4 h at store

Conclusions

- For 100 GeV protons, the dynamic aperture at $\beta^* = 0.7\,\mathrm{m}$ is too small – consistent with DA studies (Yun).

- At $\beta^* = 1.0\,\mathrm{m}$, RHIC performs as in Run-8 – no new, unknown noise source.

- Larger emittances at higher intensities seem to be the way to go. Emittances in Run-9 were significantly smaller than in previous years.

- Near-integer tunes should provide larger DA (to be studied for 70 cm in simulations). Requires global 10 Hz orbit feedback.