Transition

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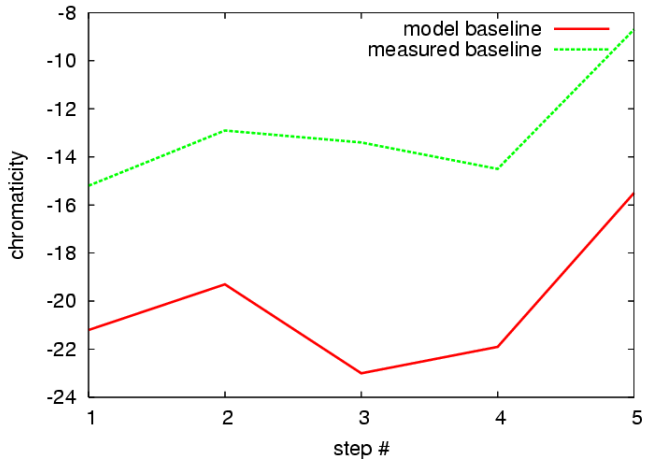
Chromaticity jump

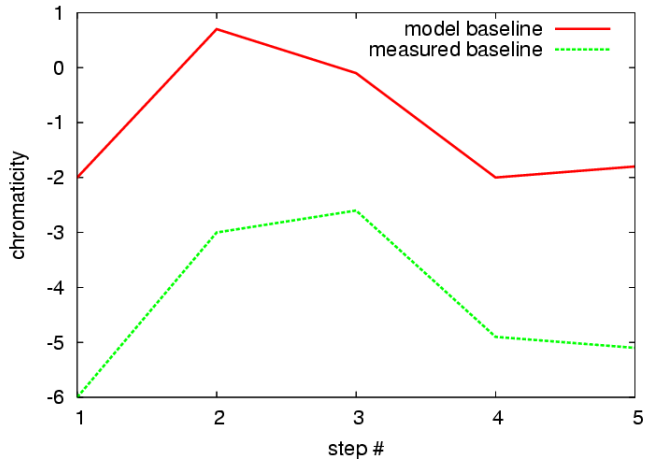
- γ_t quadrupoles modify β and dispersion around the machine

- This modified lattice changes the chromaticity, leading to a fast (30 msec) chromaticity jump when quads change polarity

- Using RHIC's 8 sextupoles families, chromaticity jump can be modified

- Tested at in injection during Run-8:

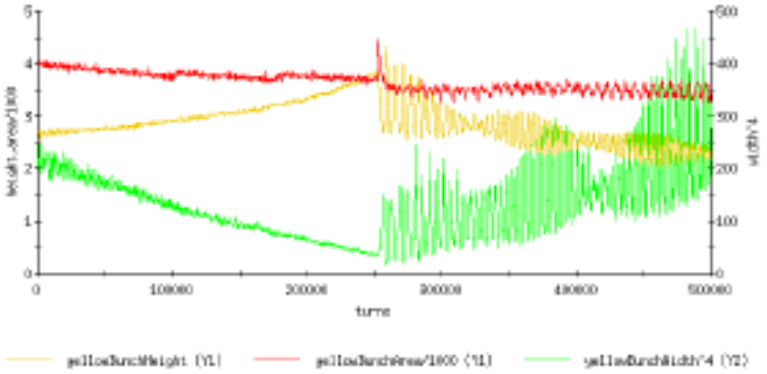




- Difficulty: changing chromaticity in stepstones around transition modifies the jump

Chromaticity jump knobs need to be part of the Model

Longitudinal quadrupole oscillations

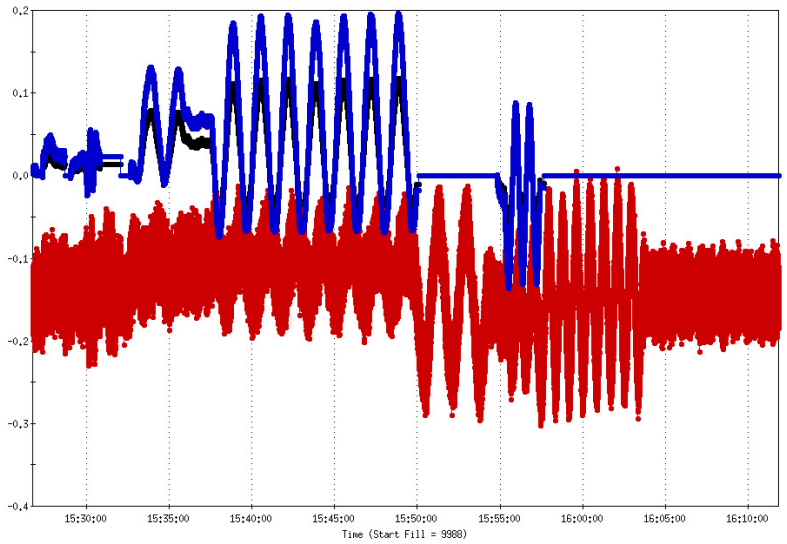


- γ_t-jump results in longitudinal quadrupole oscillations in both rings

- Longitudinal quad mode damper reduces these oscillations considerably, but effect on resulting bunch length is still questionable

Now part of new LLRF; talk by Kevin Smith

Radial feedback in Yellow



- Near transition, small dipole field errors result in large radius changes.
- Yellow RF is tied to Blue master and cannot compensate.
- Adjust Yellow dipole field instead, based on BPMs.
- Tested successfully with protons at end of Run-8.
- Bandwidth limited to 0.038 Hz due to 34 msec delay.

Different γ_t in the two rings

- Crossing γ_t at different times proved beneficial during Run-8 d-Au

- Since in a pure FODO ring

$$\gamma_t \propto Q_x,$$

  this was achieved by vastly different tunes in the two rings (IBS lattice in Yellow)

- For Au-Au in Run-10, we want to run with IBS lattices in both rings, but different γ_t

- Simple solution: different integer tunes, leading to different lattices

Alternative method to separate γ_t

- γ_t depends only on the phase advance in the arcs, not the dispersion-free straights:

$$\gamma_t \propto N_{\text{arc}} \cdot Q_{\text{arc}}$$

- Horizontal tune $Q = N_{\text{arc}} \cdot Q_{\text{arc}} + N_{\text{straight}} \cdot Q_{\text{straight}}$

- Change Q_{arc} by $+(-)\Delta Q_{\text{arc}}$, and Q_{straight} by $-(+)\Delta Q_{\text{arc}}$

$$\begin{aligned} \Rightarrow \Delta\gamma_t &\propto N_{\text{arc}} \cdot \Delta Q_{\text{arc}}, \\ \Delta Q &= 0 \end{aligned}$$