MD plans for transverse stability and noise

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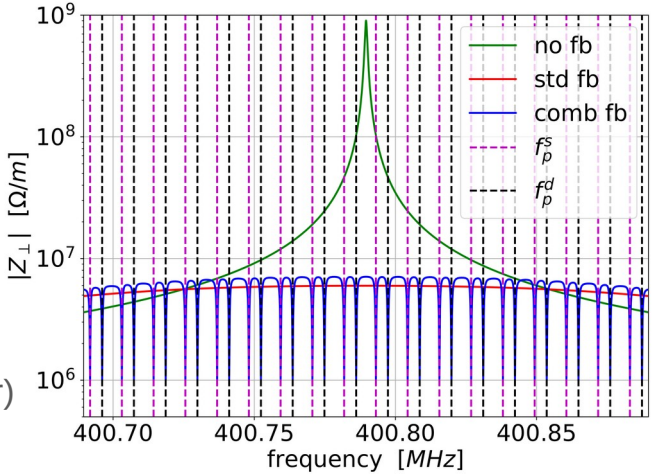
Beams stability

- Bunch-by-bunch tune shift measurement at flat top

  → Tolerance for CC comb filter

  - Few trains in each beam (1.6E11, 5x48b and 72b)
  - Nominal cycle to flat top
  - Transverse kicks on single/few bunches (ADT)
  - **1-2 slots of 8h** (ideally one early and possibly one late in the year)



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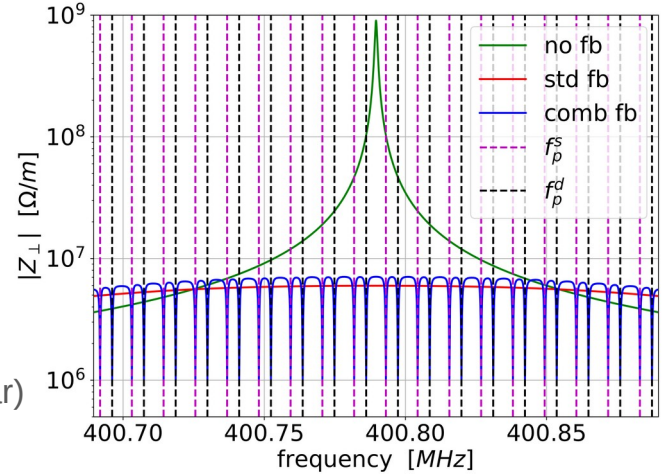
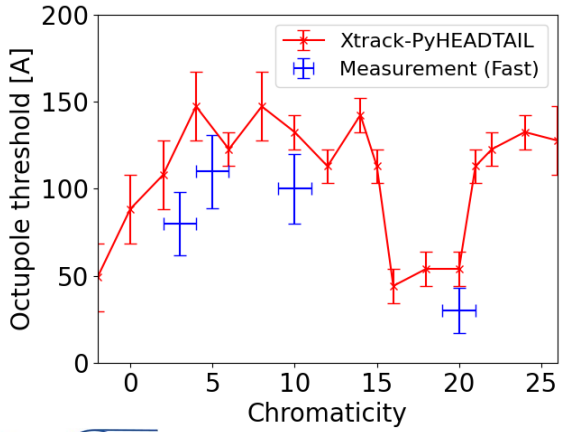




- Fast octupole threshold vs chromaticity and ADT gain at flat top

  → Characterisation of the impedance model, determining optimal configurations with reduced octupole and/or chromaticity

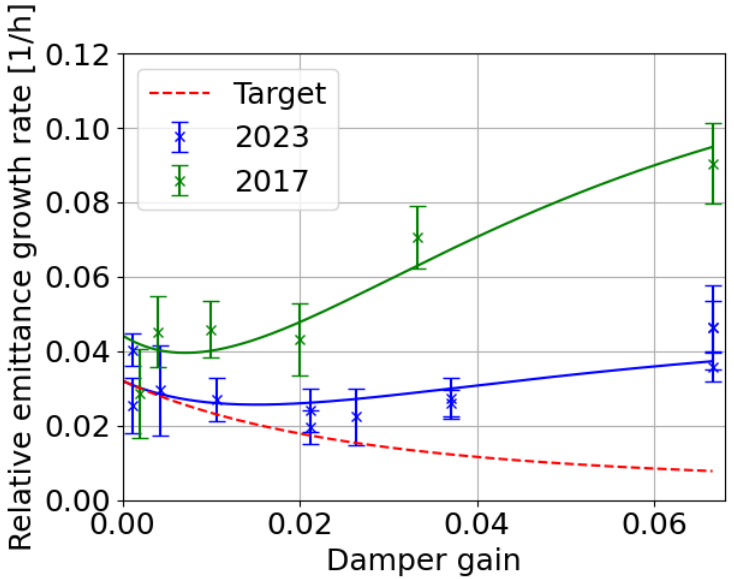
  - 40 individual non-colliding bunches (5x8b) in each beam, with significant spread in brightness and lenght
  - Nominal cycle to flat top
  - Reduction of octupoles in steps with varying chromaticity and ADT gain
  - **1 slot of 8h**

Emittance growth in collision

- Emittance growth in collision with new ADT pickups

  → Re-attempt validation of emittance growth reduction with new ADT pickups

  - 2x8b ($2 \cdot 10^{11}$ / 2µm) per beam, non colliding
  - Nominal cycle to collision, then enable bunch-by-bunch ADT mask featuring different gains for each damping loop
  - **1 slot of 5h**



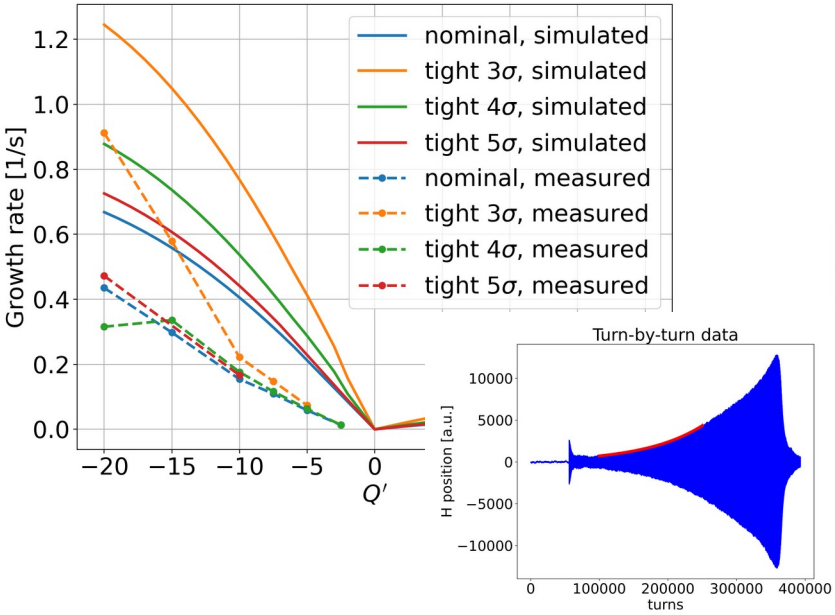
Impedance and intensity limitation

- Instability growth rate at injection

  → Characterisation of the imaginary impedance of individual collimators

  - Inject 1 pilot, change chroma, turn off ADT and kick
  - Test different collimator settings to enhance the impact of different sets

  → **1 slot of 4h (very flexible**)



- LIU intensities at injection

  → Probing for unknown limitations to reach high intensities in Run 4 ($2.3 \cdot 10^{11}$)

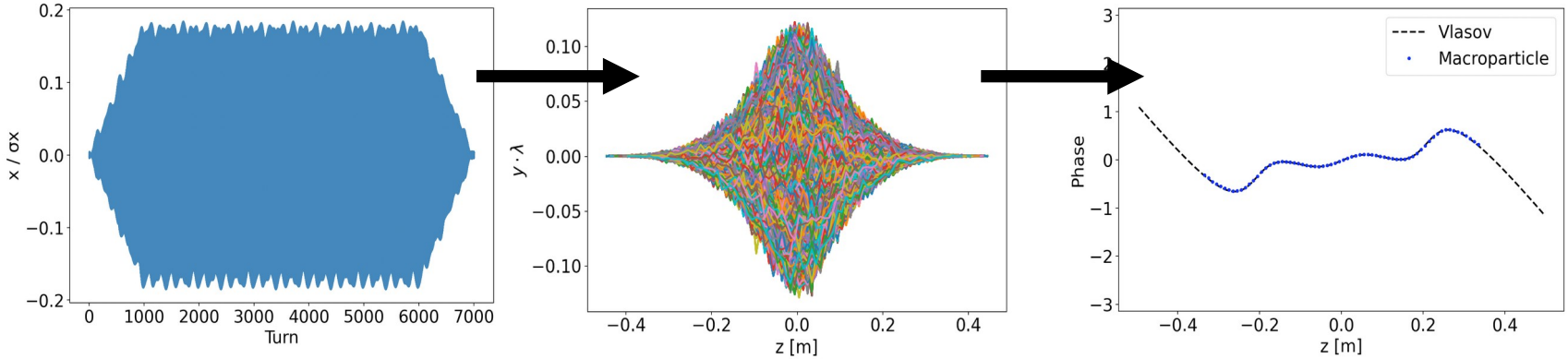
  - Fill the machine with trains of increasing intensity, monitoring beam stability and heating. Intensity steps and validation procedure to be defined with injectors, MPP, LMC ?

  → **1-2 slots of 8h ?** (synergy with RF MD?)

MD11667: Chromaticity from intrabunch motion and ac dipole kicks

Motivation:

- The intrabunch motion during an ac-dipole (ADT) excitation was recently described by solving the Vlasov equation.
- Possibility to fit the motion with model to measure chromaticity and potentially enable **live/on-demand measurement of chromaticity during operation**.



$$Y(z) = B\cos(\omega_D t)\lambda(z)e^{-\frac{iQ'_y z}{\beta_s Q_s}} \sum_{l=-\infty}^{\infty} i^{-l} D(Q_D - Q_{y0} - lQ_s) w_l\left(z; Q'_y\right)$$

MD11667: Chromaticity from intrabunch motion and ac dipole kicks

Setup:

- "Single" bunches:
- Use ac-dipole excitations from ADT (as done in regular operation for measurement of linear coupling).
- Observe signal in HEAD-TAIL monitor

Time:

- 3 hours at **450 GeV** with pilots.
- 3 hours at **6800 GeV** with pilots.

Tests to validate model and method by scanning:

1. Chromaticity.
2. Excitation tune.
3. Octupole current.
4. Damping time.

and compared with Accelerator Cockpit chromaticity.

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Many measurements can be done fully parasitically during optics measurements, simply by looking at the head-tail monitor.

Very loose requirements – can be easily combined with other MDs or be done as End-Of-Fill.

Method also to be tested in SPS MDs.

Summary

- Bunch-by-bunch tune shift measurement at flat top (1-2 slots of 8h, preferably early)
- Fast octupole threshold vs chromaticity and gain at flat top (8h)
- Instability growth rate at injection (4h, flexible)
- LIU intensities at injection (1-2 slots of 8h ?, end of the year)
- Emittance growth in collision with new ADT pickups (5h)
- AC-KFC (6h to 12h, flexible / potential for combined or parasitic studies)
- Low impedance IR3/7 optics (→ see R. Bruce)
- Losses in ADJUST (→ See. R. De Maria)