

MD 2722: Investigation of Landau damping by means of BTF measurements

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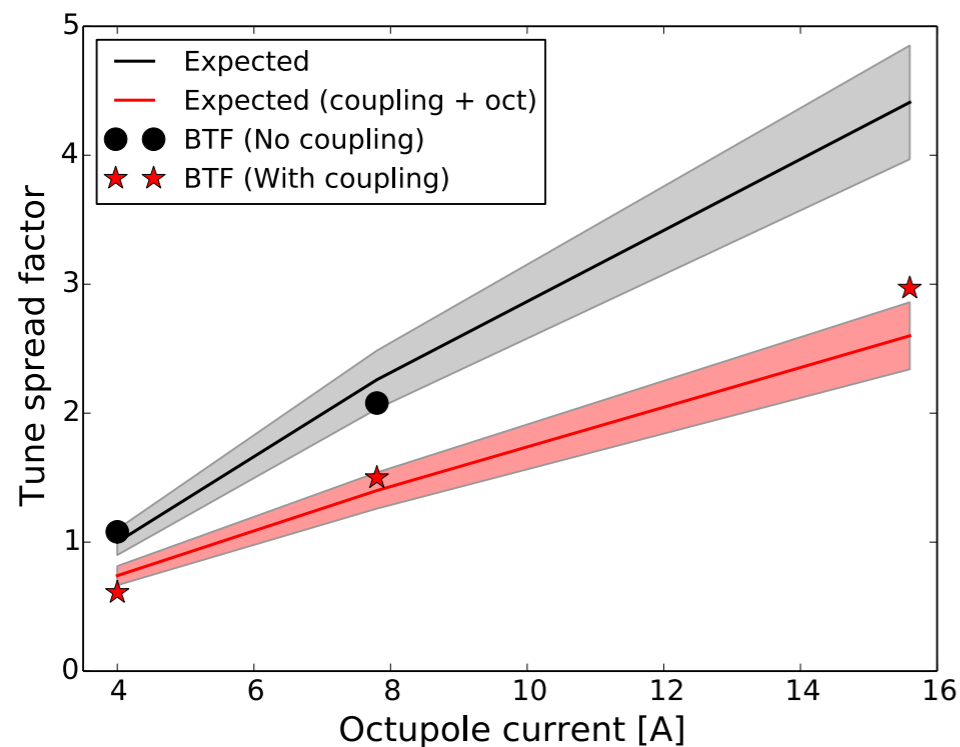
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Motivation

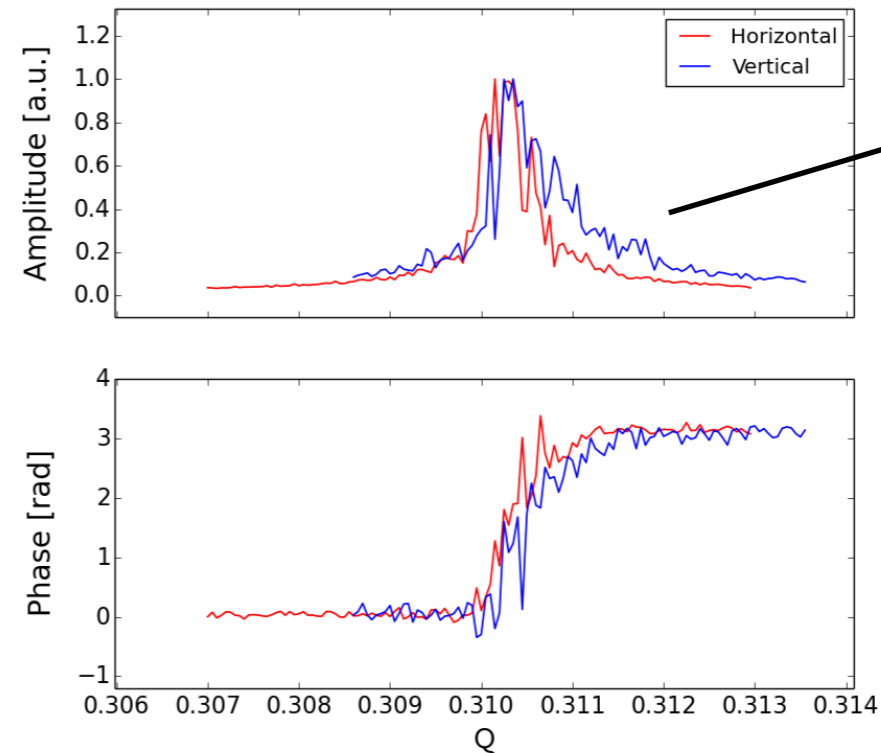
Several instabilities were affecting the beams at flat top during different moments of the operational cycle and in presence of different effects (beam-beam, e-cloud, linear coupling)

→ BTF measurements revealed unexpected effects and identified the impact of linear coupling and tunes on the beam tune spread and therefore stability.

Reduction of tune spread due to linear coupling well reproduced



Asymmetric H-V Landau damping due to linear coupling



Not due to freq. sweep direction

We want to characterize the Landau damping at flat top energy for different octupoles currents, tunes and linear coupling values and beam-beam effects

BTF system improvements

- New GUI: more flexible, BTF data now logged
- **Delay between excitation steps** to remove “fake spread” effect after tune excitation → **good comparison with expectations (gaussian distribution)**
- **Adapting BTF excitation amplitude** to improve signal to noise ratio with less impact on beam quality for reconstruction of SD → **Not sufficient to measure the impact of the particle distribution on measured stability diagram**
- **Possibility to excite longer**

During the first part of the MD we want to find an optimal setup of the BTF system to reconstruct SD with high precision and address the impact of particle distribution changes on the Landau damping

If available after TS2, we test the gated BTF system for a potential use during operations

→ **All the tests will be made at injection energy**

MD Plan (10h requested)

4 hours (measurements at injection energy)

- We inject one nominal bunch in Beam 1 and Beam 2 and perform BTF measurements for different excitation amplitudes and excitation times to acquire high precision measurements (we refill the machine if the BTF measurements deteriorate the beam quality due to longer acquisition time required)
- We acquire BTF measurements at injection for different octupole currents, tunes and linear coupling values to study the impact of these parameters on the Landau damping and correlated particle losses
- If available after TS2 we also test the gated BTF system

6 hours (measurements at flat top energy)

- Inject 1 single bunch in B1 (lower intensity) and a train of 48 nominal bunches in B2 (as already done in previous MDs, BTF measurements will be acquired on single bunch Beam 1) with reduced ADT gain)
- At flat top we perform an octupole current scan and a linear coupling scan
- We proceed to the betatron squeeze and acquire BTF measurements for different octupole currents and linear coupling in the presence of beam-beam long range interactions
- With nominal settings we perform a crossing angle scan in IP1 and IP5 and acquire BTF measurements at each step
- If time permit, we collide the beams with nominal crossing angle and perform separation scans in IP1 and IP5