Landau damping measurements by means of BTF

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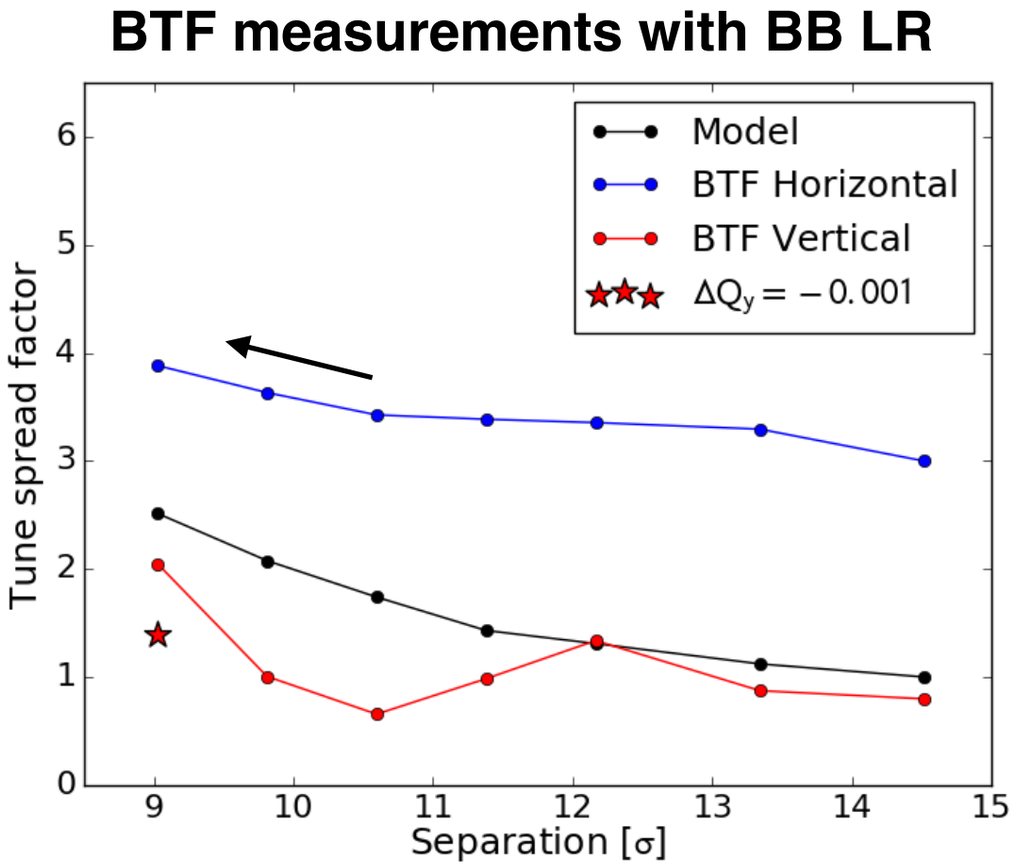
MD Motivation

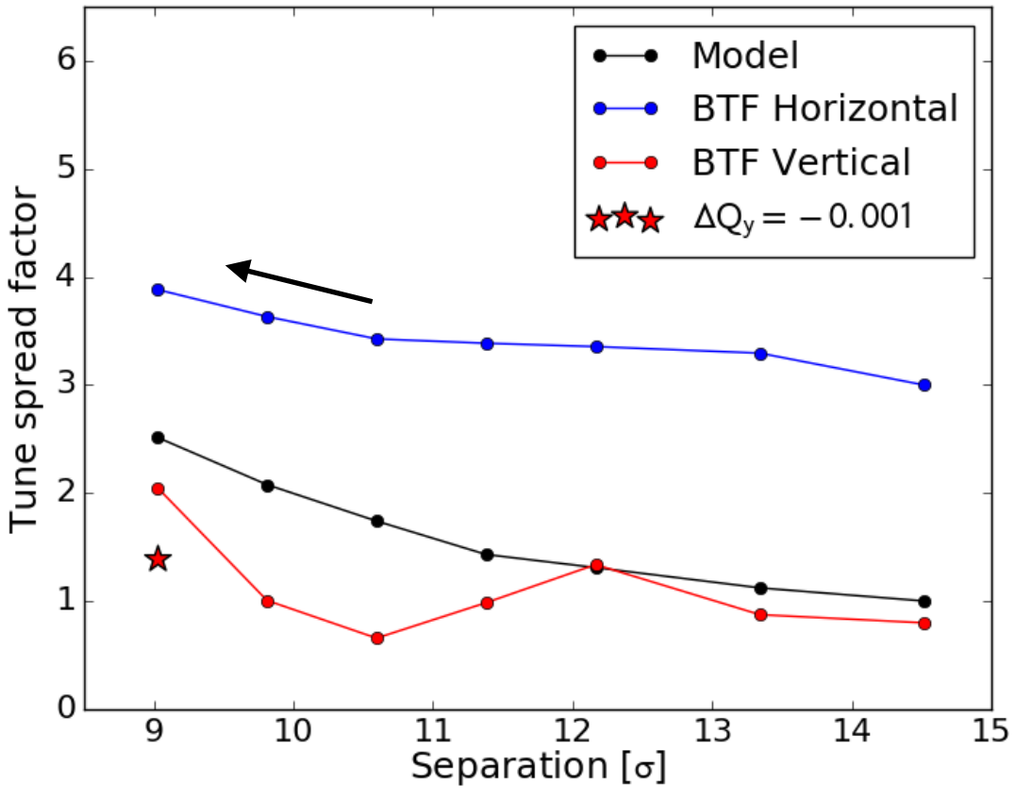


- Measure stability diagram by means of BTFs for the different stages of operations
- **Measure the impact of beam-beam long range interactions** on beam stability reaching small beam-beam separations

→ 8-9 σ separations we need larger emittance (2.5-2.0 μm rad) **blow-up the INDIVs from the injectors in order to use the validated application.**

MD Motivation

BTF measurements with BB LR



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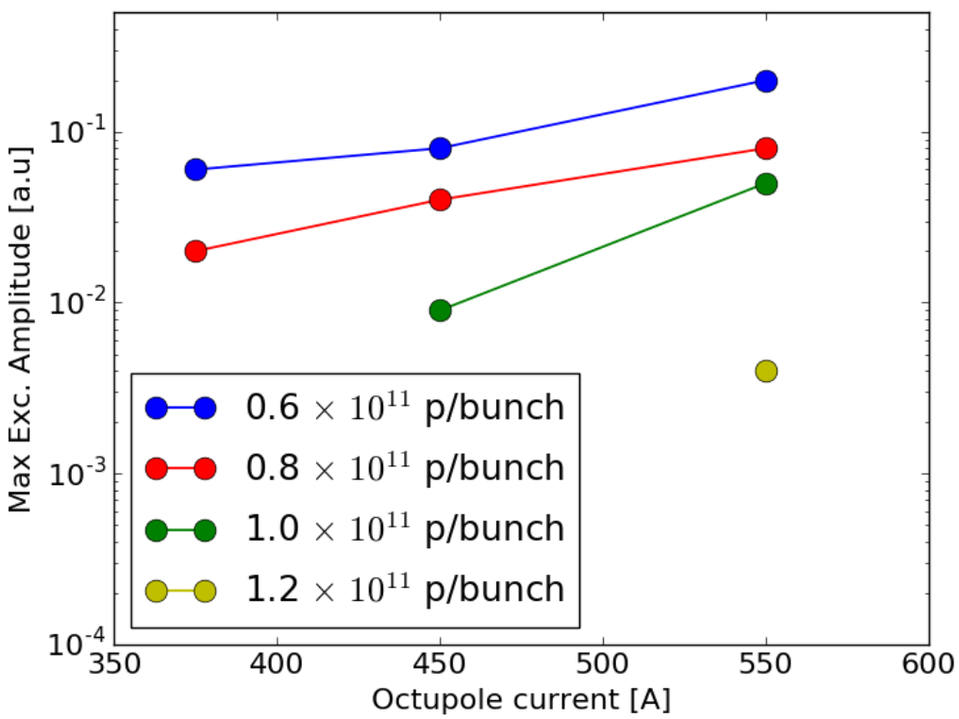
→ 8-9 σ separations we need larger emittance (2.5-2.0 μm rad) **blow-up the INDIVs from the injectors in order to use the validated application.**

We use the **gated BTF system**, we excite single INDIVs without ADT (we keep ADT on the other bunches)

Successful past MD BTF MD to set-up excitation amplitude to avoid triggering of instability

Excitations at the stability limit



MD Settings

Time required per MD [h]	8
Beams required [1, 2, 1&2]	1&2
Beam energy [GeV]	450 GeV and 6500 GeV
Optics (injection, squeezed, special)	Injection, flat top, squeezed and collision
Bunch intensity [#p, #ions]	1.2E11 for Beam 2 and lower intensity (~0.6E11) for Beam 1
Number of bunches	8 indiv lower intensity bunches in Beam 1 and 8 trains of 48 nominal bunches in Beam 2
Transv. emittance [m rad]	2-2.5 μm
Bunch length [ns @ 4σ]	Nominal
Optics change [yes/no]	No
Orbit change [yes/no]	Reduced crossing angles in IP1&5 and IP separations
Collimation change [yes/no]	TCTs moved with the crossing angle at colliding IP1 & IP5
RF system change [yes/no]	No
Feedback changes [yes/no]	Yes on single bunch ADT off and/or at reduced gain
Tune changes	Tune scan maximum deviation 0.01
What else will be changed?	Chromaticity, Octupole currents, linear coupling
Are parallel studies possible?	No

MD Procedure

1. **Fist part at injection energy** to **set-up BTF measurements**: quick **octupole scan** will be performed on **single nominal intensity** bunch in both beams.
2. **Second part of the MD**: inject 8 nominal trains in Beam 2 and 8 INDIVs of lower intensity (0.6-07E11 p/ bunch) in Beam 1 with emittance 2.0-2.5E-6 m rad (requested from the injectors).
3. Ramp the energy with nominal settings.
4. **BTF measurements will be performed only on single indiv of lower intensity (B1) by using gated BTF** system (**successfully used in the past MD 3290**). **ADT will act on trains during the full MD.**
5. We performed an **octupole scan at flat top energy exciting indiv bunches** switching off the ADT only on the selected bunch for measurements. We also perform linear coupling scan.
6. With nominal octupole current we proceed through the betatron squeeze.
7. At the end of the betatron squeeze we correct linear coupling and perform an octupole current scan.
8. **At the end of the betatron squeeze we perform crossing angle scan using the validate application** and acquire BTF measurements at each step. The larger emittance allows to reach the small wanted beam-beam separations of 8-9 σ (with minimum angle of 130 μrad).
9. We **set back nominal crossing angle** and we performed an **offset scan in IP1&5** and measure BTF for each step.
10. If time permits we introduce noise in a controlled way on the non-colliding bunches and we measure BTF with maximum octupole current.