Dynamic Aperture studies with Beam-beam Octupoles and Chromaticity effects
Preliminary results

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• Impact of Octupoles and Chromaticity (IP1&5 only, 15 cm beta* optics, 1 & 2.2 e11 ppb)
  – End of squeeze
  – In collision
  – Comparison to LHC 2015

• Up-date on IP8 crossing angle 280 vs 250 µrad and separations

• Summary
Full squeeze: NO Head-On

Parallel separation on for IP1 and IP5

• Negative polarity better DA
• Positive polarity worse DA < 4 $\sigma$
• Only Beam-beam between the two

Positive Octupole polarity very BAD, other resonances excited 5th, 7th… Can we use the Oct to compensate BBLRs?

Chromaticity reduces DA: stronger effect with octupoles OFF
Resonances

Positive Octupole polarity with BB gets worse
Negative seems better avoids diagonal
Footprints
In collision

IP1 and IP5 colliding head-on
DA reduced by head-on part

• Negative polarity better DA
• Positive polarity worse DA
• Only Beam-beam between the two

Can we use the Oct to compensate BBLRs?

Chromaticity reduces DA: stronger effect with octupoles OFF
Comparison with LHC: squeeze

IP1 and IP5 separation bump on

- Negative polarity worse DA
- Positive polarity worse DA
- Beam-beam only better

- Not same behaviour, LRs stronger compared to Octupoles for LHC
- Chromaticity stronger impact.
- Difficult to find configuration with better DA

TO BE UNDERSTOOD!
Comparison LHC: collisions

IP1 and IP5 collision

- Negative polarity lower DA
- Positive polarity worse DA
- Beam-beam only better

- Not same behaviour as with ATS, LRs stronger compared to Octupoles for LHC
- Chromaticity stronger impact.
- Difficult to find configuration with better DA for compensation studies!

TO BE UNDERSTOOD!
• Impact of Octupoles and Chromaticity
  (IP1&5 only, 15 cm beta* optics, 1 & 2.2 e11 ppb)
  – End of squeeze
  – In collision
  – Comparison to LHC 2015

• **Up-date on IP8 crossing angle 280 vs 250 μrad and separations**

• Summary
IP8 & IP2 up-date: sep and 250 $\mu$rad angle

Crossing angle of 250 $\mu$rad gives results equivalent to 280 $\mu$rad
Crossing angle of 250 µrad gives results equivalent to 280 µrad
Summary

• Octupoles and chromaticity have a strong impact on DA
  • Positive octupole polarity reduces DA below 4 $\sigma$
  • Negative octupole polarity improves DA 2 $\sigma$ effect
  • LHC case very different
  • With ATS octupoles dominate
  • NEED to UNDERSTAND BETTER

• IP8 crossing angle at 250 mrad has been tested and no deprecation has been observed in DA
• Nominal separation at IP8 and IP2 show DA similar to scan values