Initial Collimation Scenario and Possible Issues

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Initial Settings

• The collimation system is commissioned in a clearly defined way, going from more open jaws to more closed jaws.

• The further we close the jaws, the more difficult operation will become.

• The initial scenarios have been studied in detail for accelerator physics:
  – Cleaning efficiency was estimated and intensity reach specified.
  – The cleaning efficiency is limited by dispersion suppressor losses which originate from single-diffractive scattering in primary jaws.
  – Limitations deduced from AP and FLUKA studies, with some assumptions (same impact of imperfections) ➔ my Cassandra talk at LMC.
  – Intensity limit from cleaning efficiency was included for 2009/10 run plan: luminosity versus time.
  – Well aware of limited power to predict: loss rates, quench limit, SD process, …

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2009/2010 LHC Goals

• The 2009/2010 goals have been formulated with the collimation and beam-beam limits in mind. Presented widely (see talks M. Lamont, M. Ferro-Luzzi, …).

• Still, very challenging requirements for 3.5 - 5 TeV:
  – Up to $4 \times 10^{13}$ protons per beam: up to 13% of nominal
  – Up to 34 MJ per beam: up to 9.4% of nominal

• If compared to the world record in SC proton colliders, this is very challenging:
  – We must beat the world record in stored energy in the first year of LHC operation by a factor $\sim 15$.
  – Our SC magnets are more sensitive to beam loss than Tevatron and HERA.

• Always good to worry: Is there any other effect that will limit us initially $\rightarrow$ energy deposition?

• It is evident with more open jaws: More losses downstream in fixed aperture!
7 TeV Reference Case (Y)

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5 TeV Case (Y)
3.5 TeV (X)
Outlook

- We see very significant losses in the warm aperture, even for the perfect case: up to 5e-4 of primary losses.
- If we add a factor 10 for imperfections: up to 5e-3 of primary losses.
- Up to 5 kW into warm elements for 2009/10 parameters?
- Possible issues of over-heating and radiation damage!
- This does not include the energy carried forward from showers, originating in the collimators. Will also go further with less closed collimators?
- We must check with FLUKA that the 2009/10 operational parameters are safe for energy deposition and radiation damage!
- This study concerns the long straight section: no impact from SD!
- Margin for the dispersion-suppressors was taken into account.
- Feedback for other issues, if any, is important.

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