Update on MERLIN-SixTrack comparison and ATS optics

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Summary

- HiLumi talks from MERLIN group
- “Final” setup for the LHC standard optics collimation simulation
- New loss maps comparison between Merlin and Sixtrack for standard optics and some ideas about a quantitative comparison
- New longitudinal losses distribution on the main collimators
- Some news about the ATS optics problem
- Conclusions and short-long term code development
HiLumi talks

- R. Appleby: collimation review, status of WP5, plans for HiLumi and simulation tools
- M. Serluca: SixTrack/MERLIN comparison, ATS PreSqueeze (also Squeeze if it is ready) loss map and an introduction to the improved scattering routines
- J. Molson: physics and code implementation of the new single diffractive and elastic routines, some results with a single collimator
- H. Rafique: developments of the “general” version of MERLIN code and the roadmap to merge it with the “collimation” version
Simulation setup update in MERLIN

- Same beam halo input without any cut in the transverse phase space (see plot below)
- TCDQs are now one-sided collimators
- TCTs in IR2/IR8 are set at the correct opening (30 sigma) and updated to the new longitudinal position as TCTVA
- TCLs downstream experiments have been added (position and material setup from Roderick file/email)
• No more losses in the TCTs in IR2/IR8 with the new TCTVA with 30 sigma aperture
• New spike in the TCL downstream IP1
• New spike in TCL.6R5
NOTE: The cold inefficiencies were normalized to 1m instead of 0.1m.
Now the inefficiencies in the Dispersion Suppressors have the same values as in SixTrack.
MERLIN vs SixTrack

Loss Map plots made by Claudia
Merlin and SixTrack longitudinal losses histograms
Some ideas about a numerical comparison

- Divide the comparison between collimator and warm/cold losses (with also a zoom in IR3 and IR7)
- Plot the relative differences between SixTrack and MERLIN:
  \[
  \frac{\text{inef}(\text{SixTrack}) - \text{inef}(\text{Merlin})}{\text{inef}(\text{SixTrack})}
  \]
- Highlight in some way the lattice elements where only one code sees losses
- Percentage of total cold and warm losses respect to the total losses in the collimators
- Percentage of losses in the DS that have been previously subjected to single diffractive or elastic scattering in the upstream collimators
- I need to make some tests to get the better way to show the results
Single pass dispersion calculation for ATS optics (preliminary test)

- We tested the dispersion calculation tracking two off-momentum protons (+/- 0.001) both with ptc_track (thick optics tracking in MADX) and MERLIN

\[ D_x = \frac{x^+ - x^-}{0.002} \]
Conclusions and future plan

- A detailed MERLIN/SixTrack comparison is almost ready
- A first ATS PreSqueeze simulation is ready but it needs to be analysed

**Short term plan:**
- New scattering routine test and implementation (high priority).
- Loss map for standard optics with alignments and magnetic errors, jaw deformation and so on.
- Loss map for ATS Squeeze case.

**Long term plan:**
- Implement a routine for new mixed materials
- Implement correctly the synchrotron motion in MERLIN