Muon Collider Design Summary

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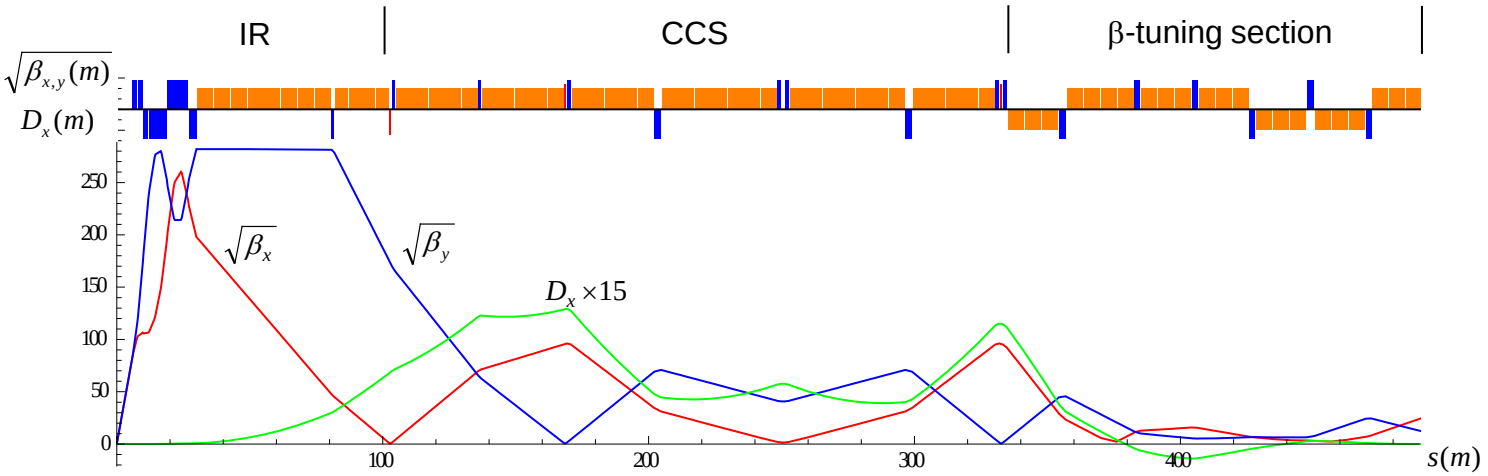
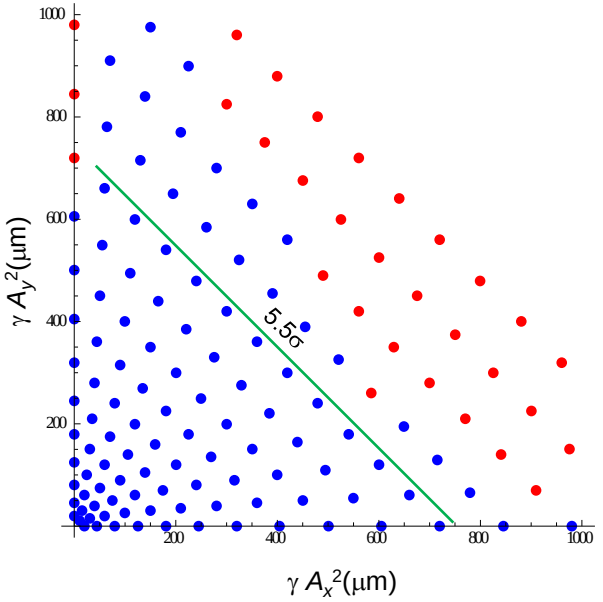
3 TeV c.o.m. Muon Collider

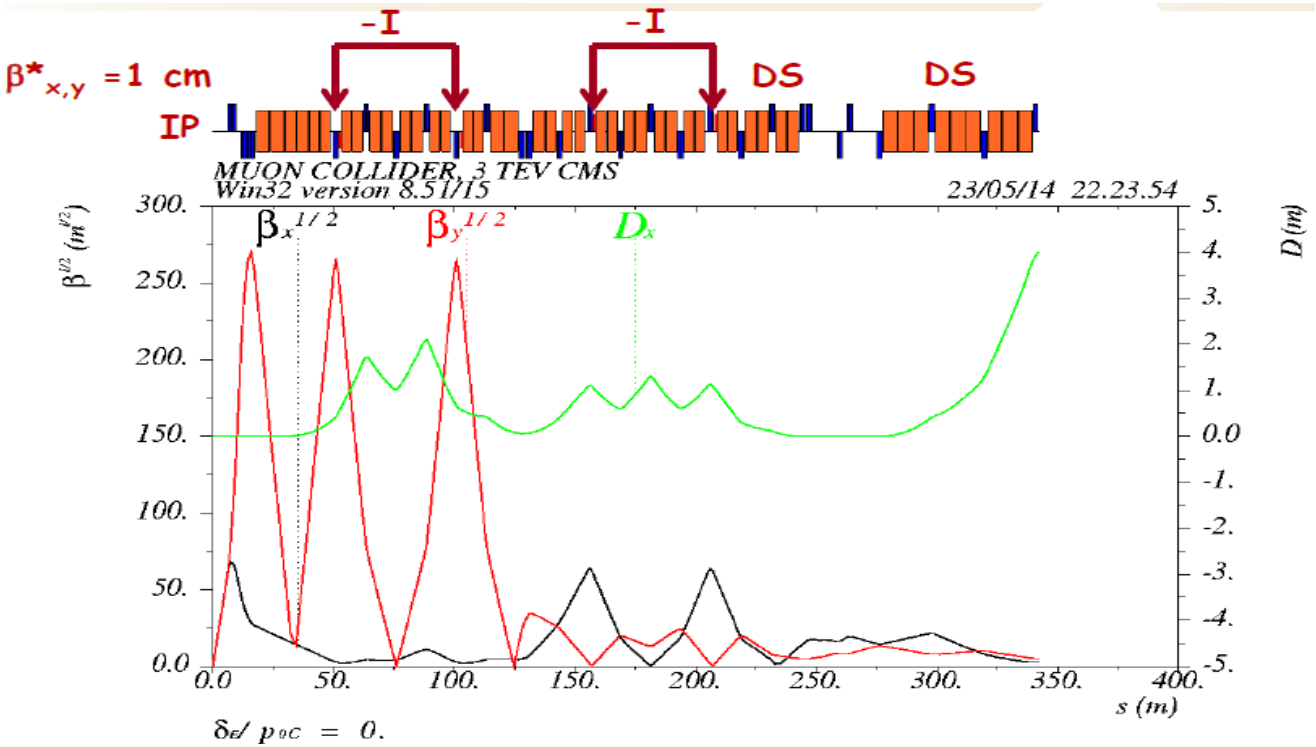


- Interaction Region (IR) designed with quadruplet FF which promises better detector protection from secondaries
- $\beta_y^{(max)}$ is reduced to 80km compared to 118km in the design with triplet FF
- Maximum quadrupole aperture is reduced from 18cm to 15cm (while maximum pole tip field increased to 12T)
- Dynamic Aperture did not suffer despite β_x increase in sextupoles of Chromaticity Correction Section (CCS)



Muon Collider Design Effort @ SLAC

- M.-H. Wang, Y. Nosochkov and Y. Cai joined the effort
- A futuristic 3TeV design with doublet FF was presented employing 20T dipoles and quadrupoles with 15T pole tip to reduce circumference to 2.77km compared to 4.5km for the quadruplet-based lattice with 10T dipoles
- Chromaticity Correction based on two $-I$ sextupole pairs was used instead of 3 sextupole scheme developed at FNAL to increase vertical Dynamic Aperture. This hope did not materialize thus far (may be by a different reason)



Coherent Effects @ Higgs Factory (A. Burov)

- Coherent instabilities (both resistive wall and geometric impedance driven) do not present danger due to long rise-time compared to muon lifetime
- Special measures should be taken to mitigate the potential well distortion

- For the normalized rms emittance $\varepsilon_n = 0.2\text{mm}$, this yields as high as

$$\Delta Q_s / Q_s \approx -0.6; \quad D \approx 1.5$$

- With the mentioned geometrical impedance, this number doubles. That high number of the potential well distortion means that one should expect up to ~50% of the bunch lengthening with some energy widening.

- This effect could be probably reduced by means of the second harmonic RF.

Plans (downscaled)

- Finish of the 3TeV MC lattice with quadruplet FF (will be done no matter what by the end of July)
- Study tolerances on field errors and misalignments – very important for understanding the real constraints on beta-functions, momentum compaction factor etc. (will be done only if authorized)
- First look at 6TeV lattice (?)

All other issues can wait