UPDATE ON COLLIMATION STUDIES FOR THE FCC-EE

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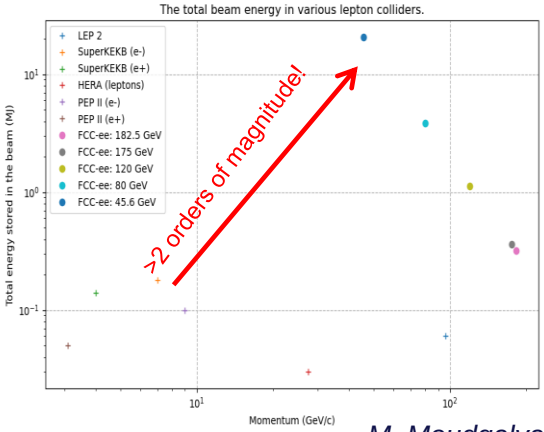
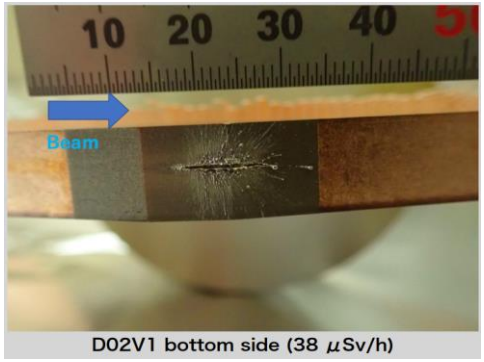
Collimation strategy

- Motivation for study of a β-tron collimation system in FCC-ee and study plan presented in the 31st FCC-ee MDI meeting
  - Protection of sensitive machine elements
    e.g., SC final focus doublet from irregular losses
  - Locate collimation insertion
    in one of the secondary straight section
    - Two stage system with primary collimator
      as the aperture bottleneck in the ring



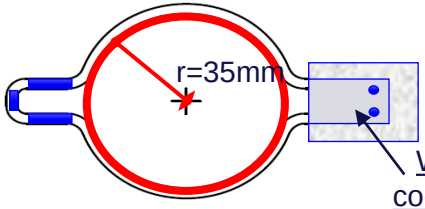
M. Moudgalya



T. Ishibashi, SuperKEKB collimation system, FCC Week 2021

Workplan

- Establish aperture model for the whole ring and find minimum aperture to protect
  - For most of the ring, SKEKB type beampipe with $r = 35mm$, but excluding winglets
  - Model around IP updated to include new central chamber diameter and SR mask after QC1



Plot adapted from R. Kersevan, "Vacuum system", at FCC November Week 2020

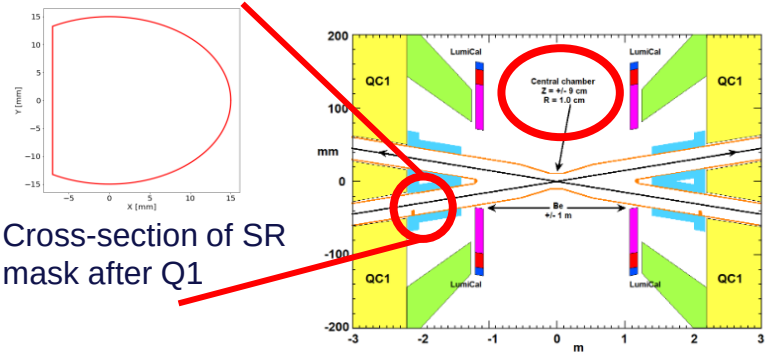
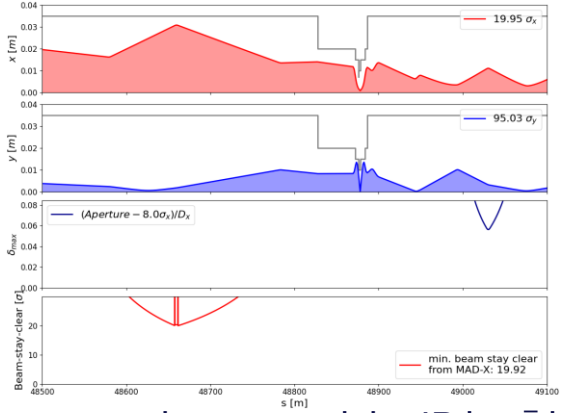


Figure 1: IR layout with 10 mm radius of the central pipe.

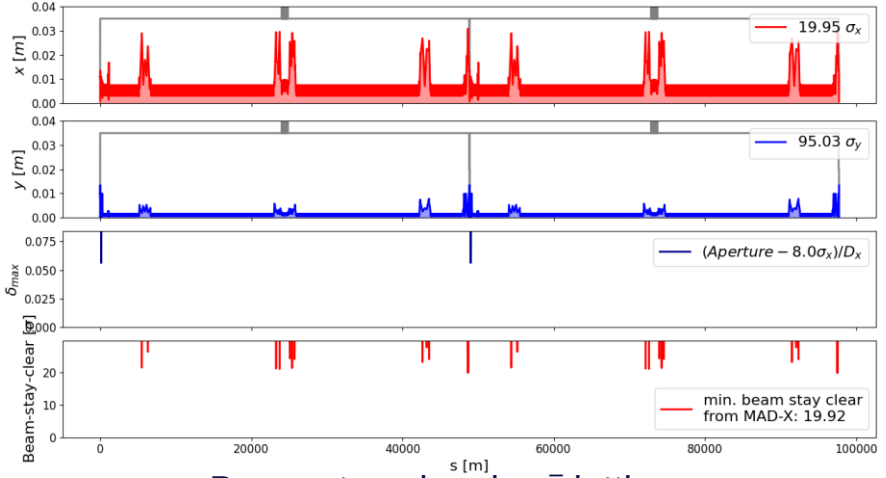
From arXiv:2105.09698

Workplan

- Establish aperture model for the whole ring and find minimum aperture to protect
  - For most of the ring, SKEKB type beampipe with $r = 35mm$, but excluding winglets
  - Model around IP updated to include new central chamber diameter and SR mask after QC1
  - More detailed model of detector region available?
    - Taper of beampipe towards QC2
    - SR collimators



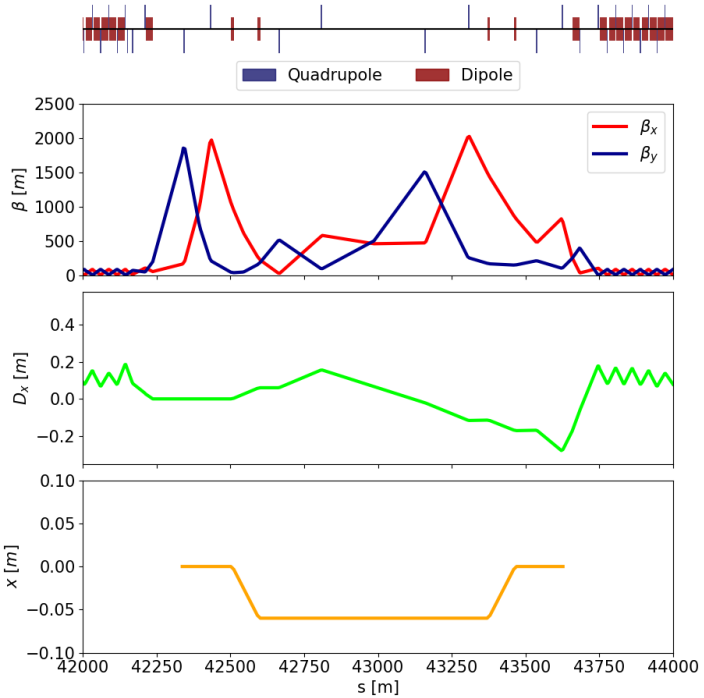
Beam-stay-clear around the IP in $t\bar{t}$-lattice



Beam-stay-clear in $t\bar{t}$-lattice

Workplan II

- Establish aperture model for the whole ring and find minimum aperture to protect
- Layout and optics for collimation section under development
  - Separate β–tron and momentum collimation section or combined system?
  - Different layout depending on number of IP
  - Integrate into new layout with longer straight sections ($1.4km$ → $2.1km$)



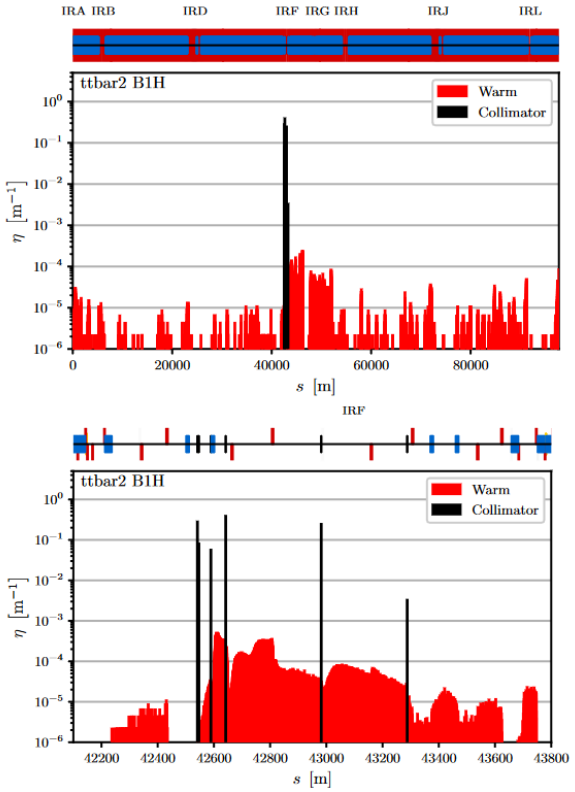
$t\bar{t}$-lattice (182.5 GeV)

A. Abramov

Workplan III

- Establish aperture model for the whole ring and find minimum aperture to protect
- Layout and optics for collimation section under development
- Setup of tracking codes to simulate particle losses around the ring in progress
- Estimates for acceptable losses for different systems required to determine efficacy of collimation system

  - Superconducting quadrupoles, detectors, RF-cavities, …
  - Estimates already available for some systems? Take from SKEKB?



Preliminary loss maps w/o SR radiation

Summary

- Collimation studies for FCC-ee well under way
  - Aperture model completed and used to define collimator gaps and for tracking studies
  - First set of optics for a collimation insertion matched

- MDI related aspects:
  - Detailed beampipe transition available?
  - Tolerable losses for components

Thanks for your attention!