Meeting Minutes of the
228th FCC-ee Optics Design Meeting

Indico: https://indico.cern.ch/event/1717972/
When: 20/08/26, 10:30-12:00 GVA time

Agenda

Presenter	Title
F. Zimmermann	**General information**
L. Sievert	**Xsuite Imperfection Model and Corrections with Beam–Beam Effects**
P. Raimondi	**Enhanced arc tunability and increased dipole filling ratio**

1 General Information

F. Zimmermann opened the meeting by recalling the main points from the previous FCC-ee Accelerator Design Meeting on 2 July. The RF-frequency choice remains one of the most urgent open decisions, with the currently discussed options being 600 MHz only, 800 MHz only, or a combined 600/800 MHz solution. The high-priority 2026 deliverables were also recalled. For the IR solenoid compensation, the working hypothesis remains under study, with concern that the resulting vertical emittance contribution may still depend strongly on the solenoid shape and compensation details.

2 Xsuite Imperfection Model and Corrections with Beam–Beam Effects

L. Sievert presented the Xsuite imperfection model developed, aimed at studying the interplay between imperfections, corrections and beam-beam effects in a single framework. The work focuses on the LCC lattice at the Z pole and reimplements and extends earlier MAD-X work on imperfections and orbit correction in Xsuite. The correction sequence applies imperfections, corrects the orbit using SVD/MICADO with sextupole ramping, and then corrects optics distortions using response matrices for phase advance, dispersion and coupling. Corrected lattices were generated for FCC-ee, with residual orbit and optics distortions reduced, although seed failures remain under investigation.

The beam-beam part used corrected lattices and applied a quasi-strong-strong beam-beam model. The studies showed that beam-beam can significantly enhance residual optics distortions. IP tuning knobs were shown to recover part of the beta-star symmetry and move performance closer to target values, although the results remain strongly seed-dependent.

3 Enhanced arc tunability and increased dipole filling ratio

P. Raimondi presented a study of the LCC arc sextupole layout, with the goals of increasing the arc emittance and momentum-compaction portfolio, reducing hardware requirements, and relaxing tolerances. The

baseline arc uses 5-FODO supercells with four sextupole families, which are effective for cancelling first-order detuning over a large range of horizontal phase advance. The study compared longer supercell periods from 5 to 9 cells while keeping a symmetric sextupole layout. The 9-period supercell, with four sextupole families per plane, was identified as the best option so far, since it allows simultaneous control of horizontal, vertical and cross-plane detuning as well as second-order chromaticities. It also increases the range of available emittance and momentum-compaction settings without changing the underlying cell structure.

Compared with the baseline, the proposed configuration uses shorter quadrupoles, sextupoles that are about 15% weaker, and a larger total number of arc sextupoles, increasing from 1728 to 1920. The final quadrupole and sextupole dimensions still need optimisation with the magnet group. The main follow-up items are to compare RDTs between the 5- and 9-period supercells, check DA and MA at ttbar against the baseline, study sensitivity to errors, explore second-order chromaticity knobs, and iterate with **X. Buffat** and **I. Karpov** on phase advances compatible with beam-beam, polarization and RF needs.

36 Participants:

M. Ady, C. Antuono, G. Arduini, H. Bartosik, G. Broggi, X. Buffat, P. Burrows, C. Carli, T. Choudbury, R. De Maria, Y. Dutheil, O. Etisken, A. Florence Potet, A. Furman, V. Gawas, S. Jagabathuni, M. Jebramcik, J. Jowett, I. Karpov, J. Keintzel, A. Korsun, A. Lasheen, L. Mether, K. Oide, T. Prebibaj, T. Pieloni, F. Poirier, P. Raimondi, S. Redaelli, J. Salvesen, L. Sievert, K. Skoufaris, L. Todorovic, W. Van Goethem, J. Wenninger, and F. Zimmermann