OPTICS SUMMARY

27 Jan. 2017
K. Oide

Circumference [km]	99.984	
Vending radius of arc dimple [km]	11.190	
Number of IPs / ring	2	
Crossing angle at IP [mrad]	30	
Solenoid field at the IP [T]	±2	
ℓ^* [m]	2.2	
Local chromaticity correction	y-plane with crab sextuple effect	
Arc cell	FODO, 90°/90°	
Arc sextuple families	292 (paired)	
mom. comp. [10^{-6}]	6.99	
Tunes (x/y)	387.08 / 387.14	
RF frequency [MHz]	400	
Ebeam [GeV]	**45.6**	**175**
SR energy loss per turn [GeV]	0.0346	7.47
Current / beam [mA]	1450	6.6
Bunches / ring	30180 (91500)	81
$P_{SR,tot}$ [MW]	100.3	98.6
ε_x [nm]	0.86	1.26
β^*_x [m]	0.5 (1)	1 (0.5)
β^*_y [mm]	1 (2)	2 (1)
$\sigma_{\delta,SR}$ [%]	0.038	0.141
$\sigma_{z,SR}$ [mm]	2.6 @ V_c = 88 MV	2.4 @ V_c = 9.04 GV

SUMMARY

- The baseline optics for FCC-ee satisfies the requirements on layout / luminosity / dynamic aperture / synchrotron radiation, with the parameters 2016.

  - Symmetric $\ell^* = 2.2$ m.

  - Slight modification is needed to satisfy $2a \gtrsim 30$ mm for final focus quadrupoles. The effect on the performance will be minimal.

- Further refinement will be done without affecting the MDI:

  - Detailed matching to the new FCC-hh arc lattice.

  - Lattice with common-flux quadrupoles.

  - Incorporation of optics for polarimeter.

- Mitigation for the strong-strong beam-beam instability at Z needs further investigation on the choice of parameters (β^*_x, ε_x, etc.). This may have an impact on the optics near the IP.

  - An example for $\beta^*_x = 10$ cm has been presented.

  - Dividing the final quadrupole into 3 or 4 pieces along s will be necessary.