FCC-ee positron linac status

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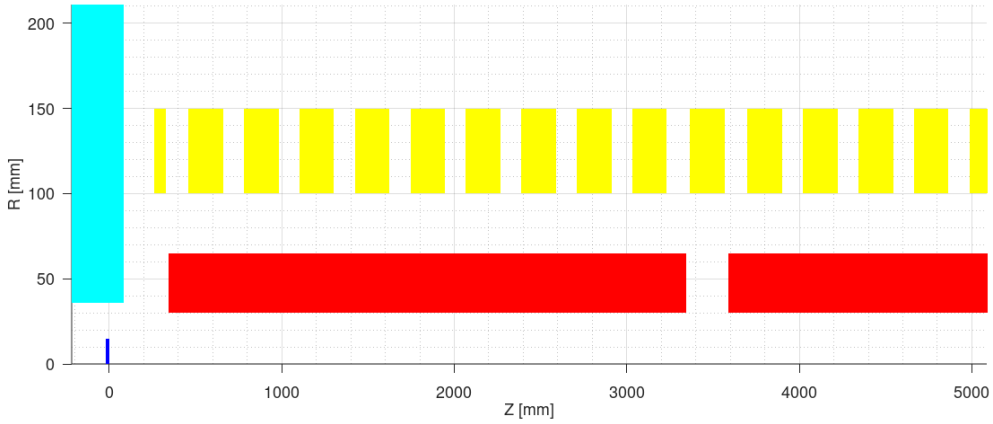
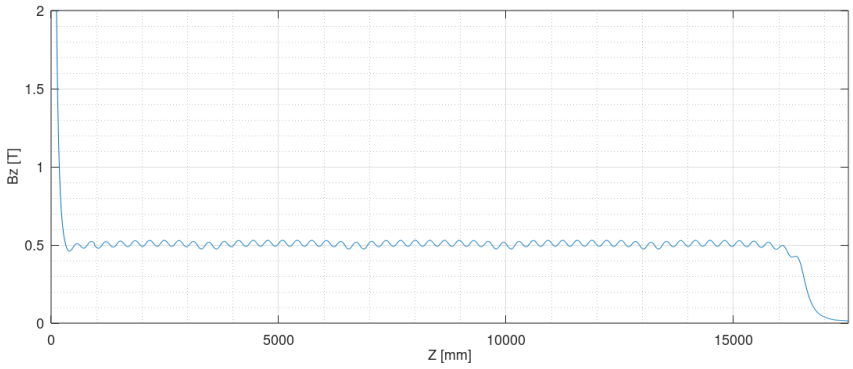
Many thanks to *M. Schaer* (PSI) for the work hand-over!

V1 configuration: capture system

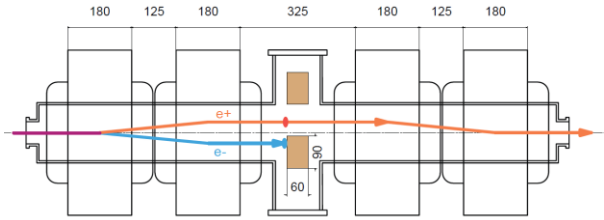
- Electron drive beam: 1 mm spot size (instead of 0.5 mm in “V0”)
- Target exit position: located at 40 mm w.r.t. HTS peak field (instead of 35 mm in “V0”)
- HTS solenoid AMD: 2D field map
- Capture linac (CL): up to ~**210 MeV** (peak energy)
  - 1 tuning solenoid (72 mm long, peak field ~ 0.1 T) between AMD and RF structures. 1D field map
  - 9 regular solenoids (each 200 mm long, peak field ~ 0.3 T) surrounding each RF structure. 1 regular solenoid between neighbouring RF structures. 1D field map
  - 5 RF structures. Each 3 m long, large aperture (R = 30 mm), 20 MV/m. 2D field map



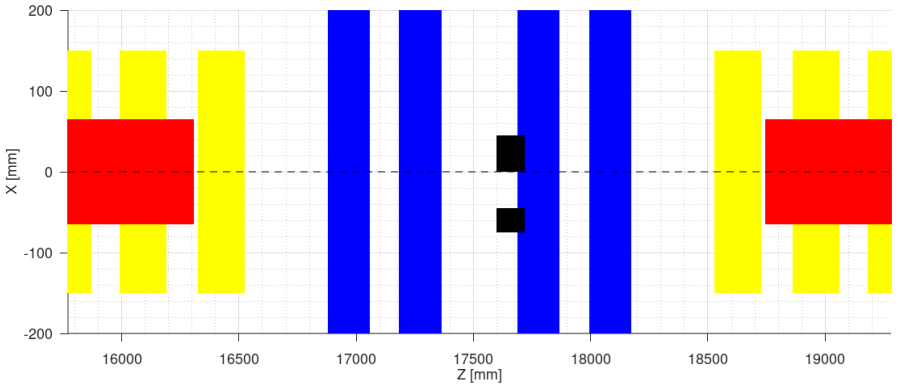


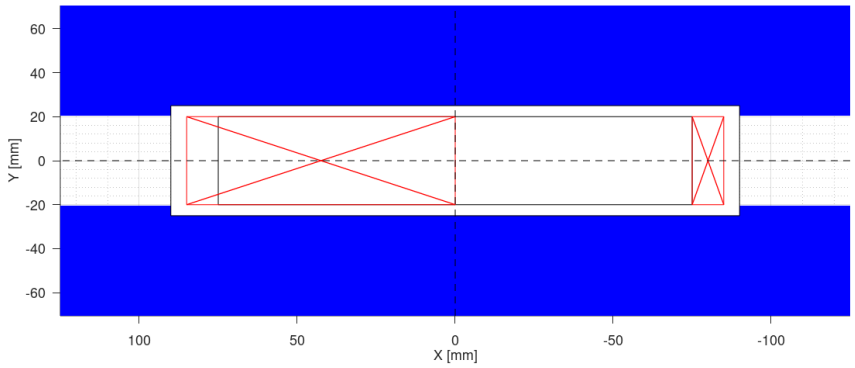
V1 configuration: chicane

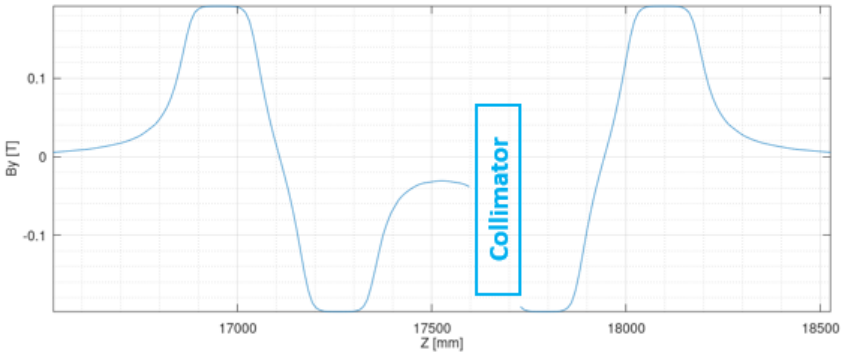
- Chicane (CC): same with SKEKB
  - Beam pipe (rectangle): Rx = 75 mm, Ry = 20 mm, L = 2 m
  - 3D field map
- Collimator (CM): same with “V0”
  - Rx = 37.5 mm, Ry = 20 mm, L = 120 mm, z0 = 132.5 mm (w.r.t CC center)



SKEKB design

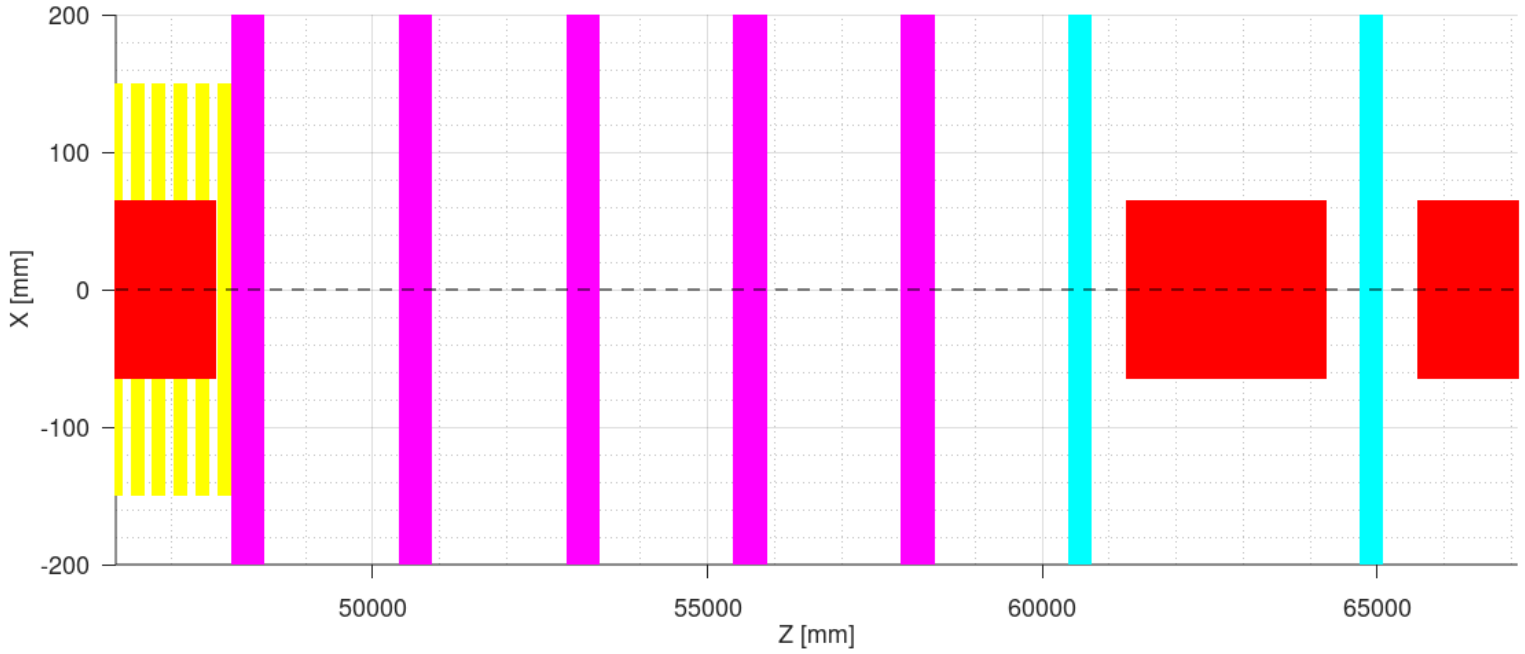






V1 configuration: positron linac

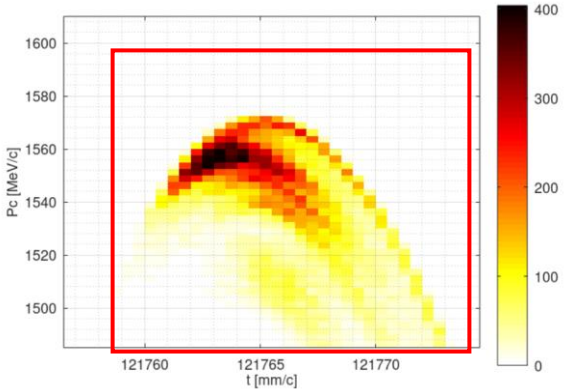
- Positron linac (PL): same with "V0"
  - Section 1 (PL1): up to 742.5 MeV (peak energy). **9 structures**. Phases on crest. Similar with CL. 2D field map
  - Matching section (PLM): **5 quadrupoles**. Quadrupole (0.5 m long) distance fixed to 2 m
  - Section 2 (PL2): up to 1.54 GeV. Same RF structure with CL. **14 structures** in 7 FODO cells. Quadrupole (0.35 m long) distance fixed to ~4 m. Phases on crest. 2D field map



V1 results

- Perfect machine (w/o imperfections)
  - Collective effects considered: space charge, short-range wakefield (in positron linac)

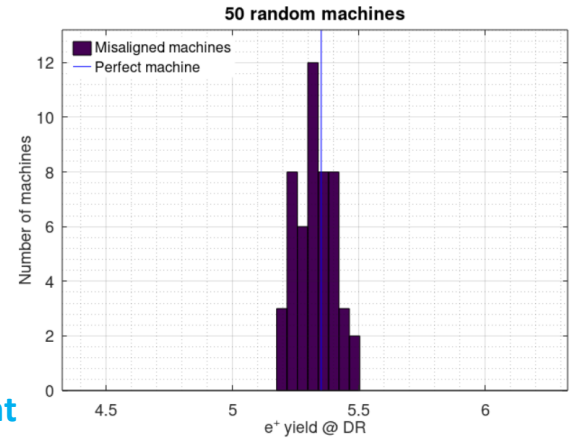
Results	Yield after CL, PL and DR cuts	$\varepsilon_{n,x,y}$ after DR cuts [mm]
W/o collective effects	8.1, 6.2, **5.3**	10.1, 10.6
W/ collective effects	8.0, 6.1, **5.2**	**10.1, 10.6**

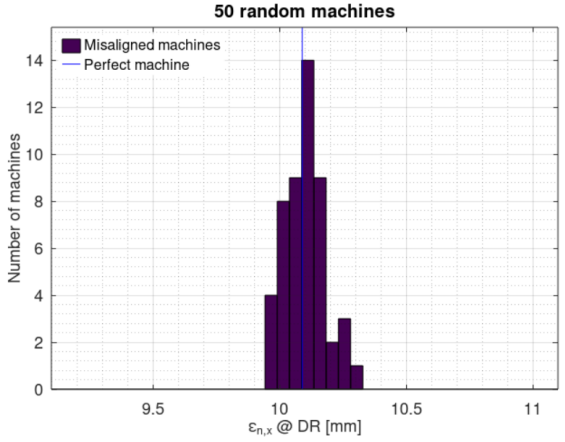


Results are **very preliminary** using the latest RF-Track version.

Yield needs to be checked with Andrea (after some updates & bug fixes of RF-Track last week, yield is reduced significantly: 5.7 → 5.3)

- Misalignments
  - Position error: 100 um RMS
  - Roll error: 100 urad RMS
  - Pitch, raw errors: 100 urad RMS





Effects of misalignments are negligible!

(which should be relatively independent on RF-Track versions)

Backup

Results	Yield after CL, PL and DR cuts	$\varepsilon_{n,x,y}$ after DR cuts [mm]
W/o collective effects	8.1, 6.2, **5.3**	10.1, 10.6
W/ collective effects	8.0, 6.1, **5.2**	**10.1, 10.6**