

# Simulation Updates

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WP6 Meeting

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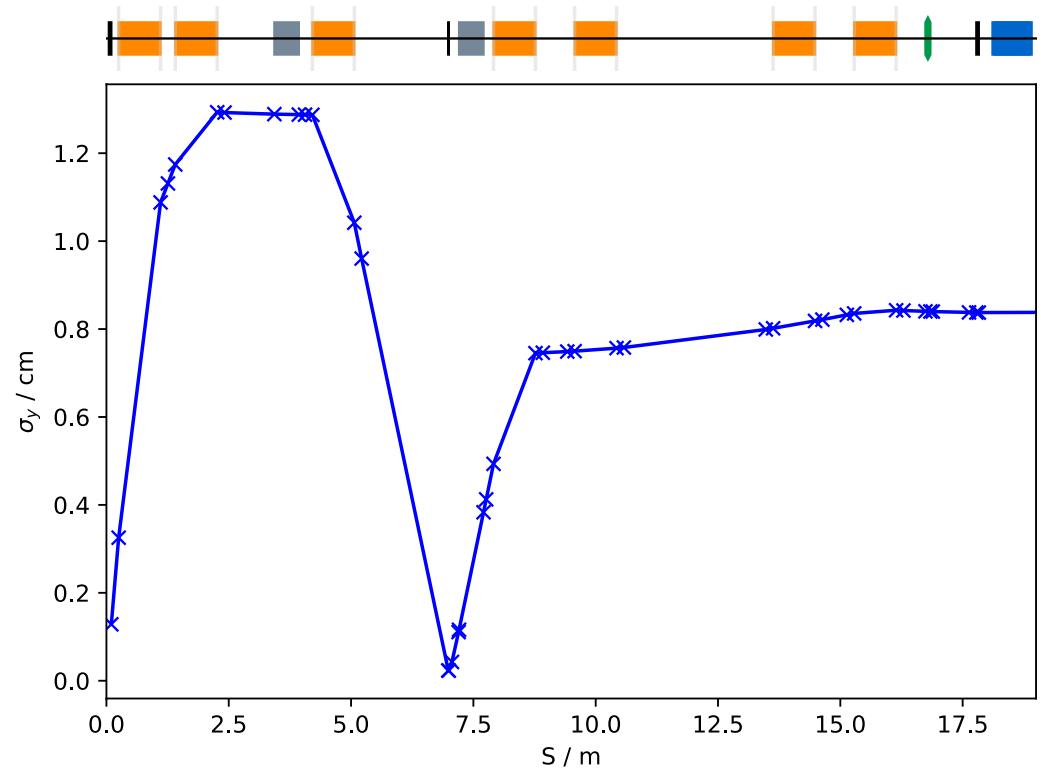
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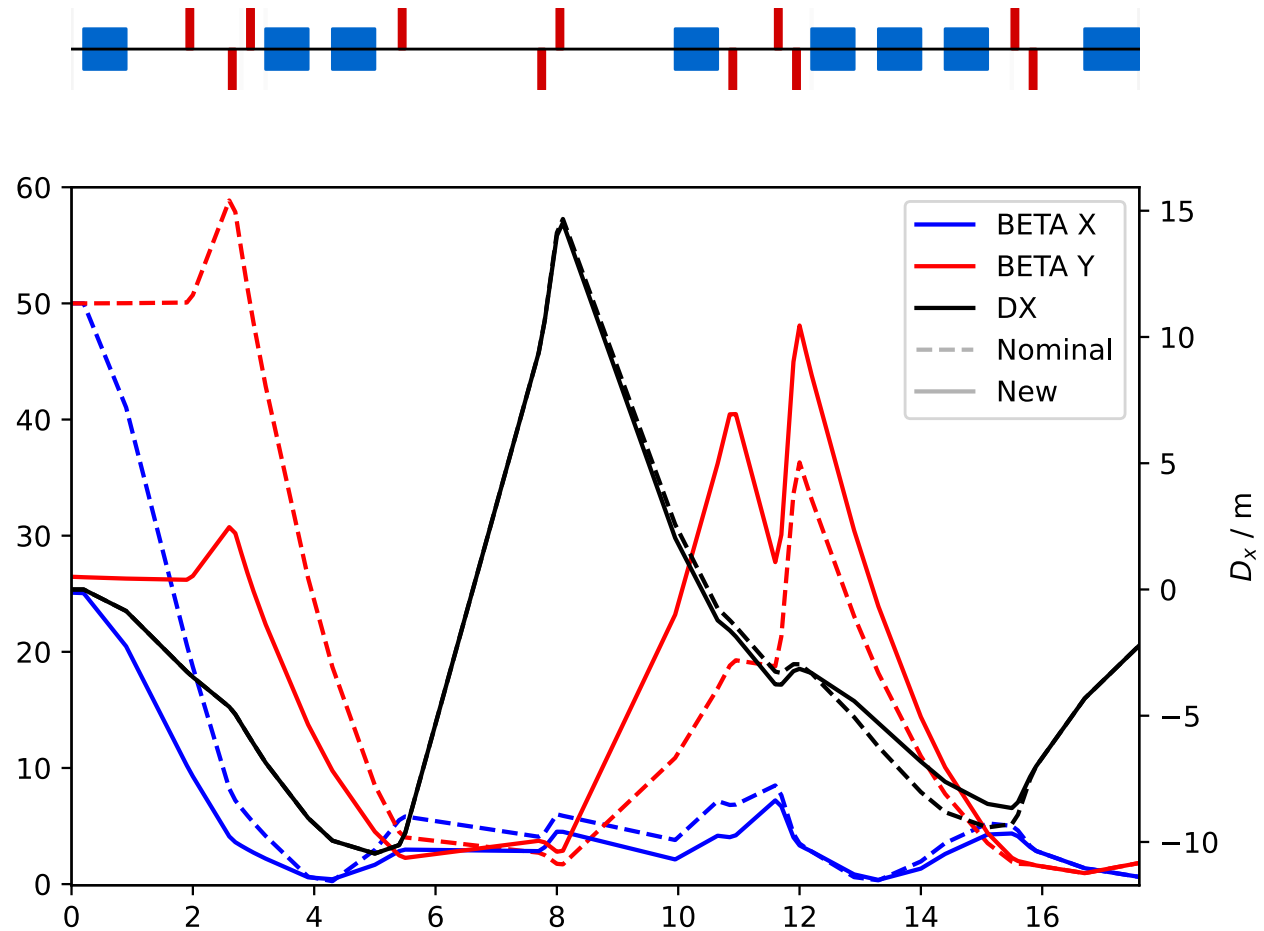
- Emittance growth introducing difficulties optimising for injection line conditions
  - Emittance  $\sim 2.7e-6$ , beta of 50m = 1 sigma beam radius of 1.16 cm.
  - Prioritise alpha = 0
- Solution: beam at start of switching dipole:

Alpha x: 0.094  
Alpha y: 0.104  
Beta x: 25.092  
Beta y: 26.463  
Emit x: 2.822e-06  
Emit y: 2.707e-06

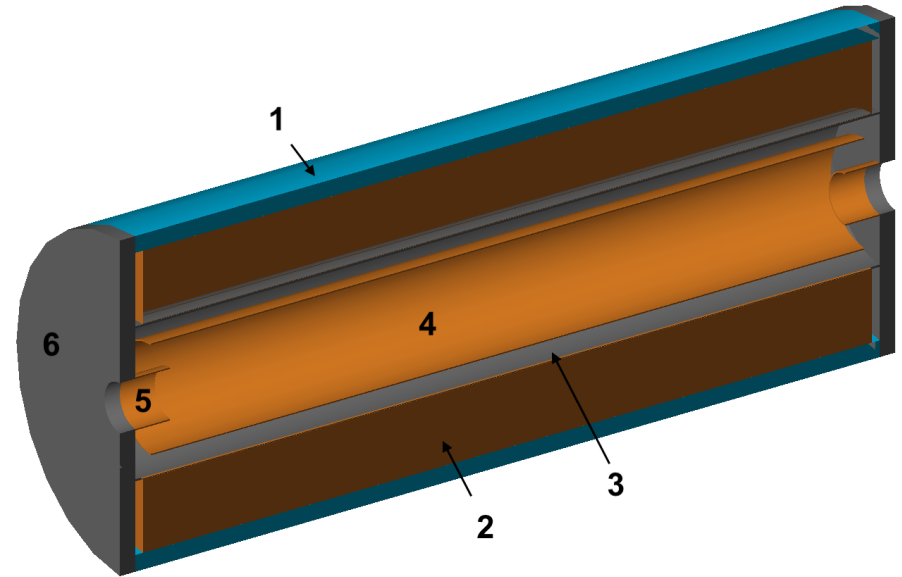
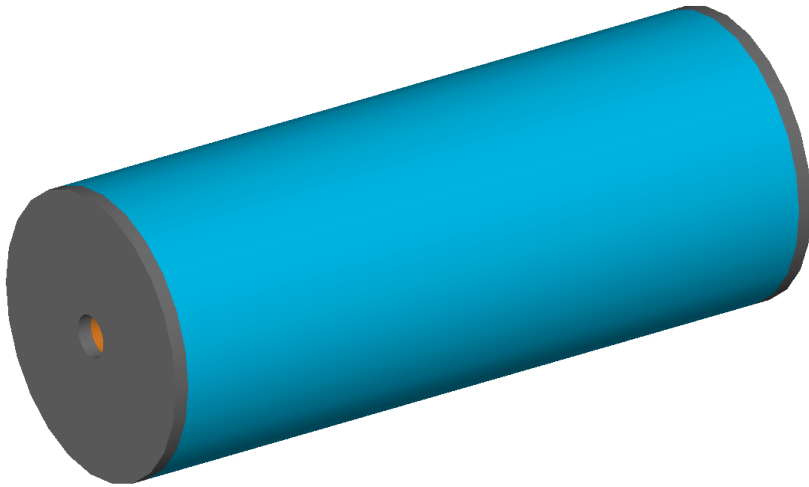
- Solenoids 5 & 6 **off**
- Solenoid 4 KS = 1.95
  - Field = **1.096 T**
- Solenoid 7 KS = 0.4
  - Field = **0.225 T**



- Able to meet conditions at injection septum
- Vary last 7 quads only
  - Constraint of 9.55 T/m.
- Solution found:
  - Small changes to field gradients
  - Confident we can handle minor shifting of quad (engineering)



- Effectively complete:



- Geometry:

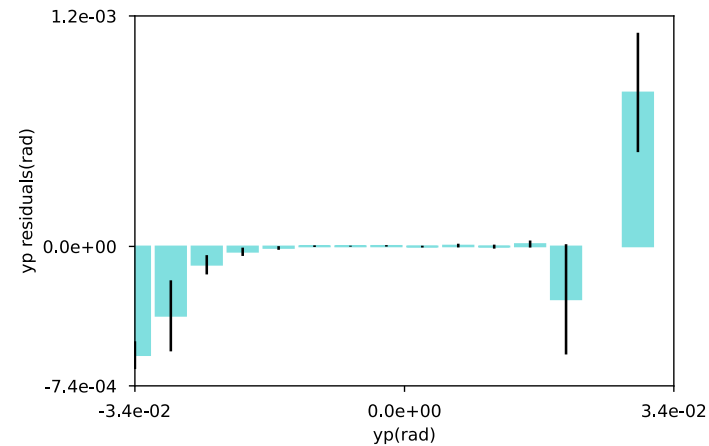
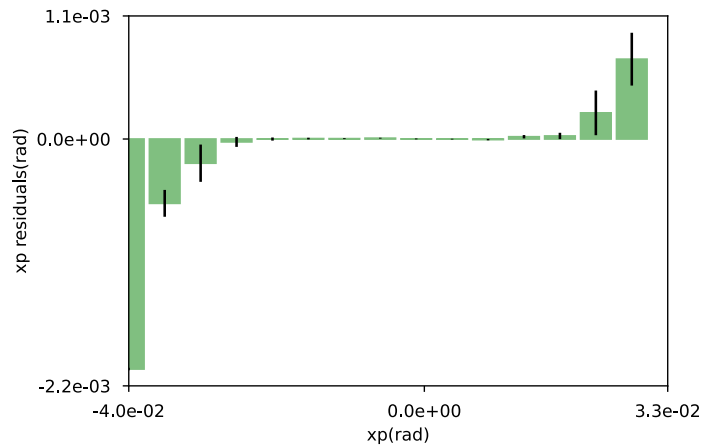
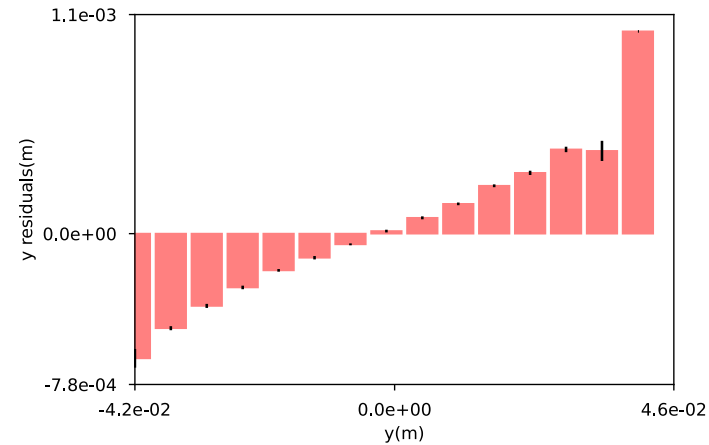
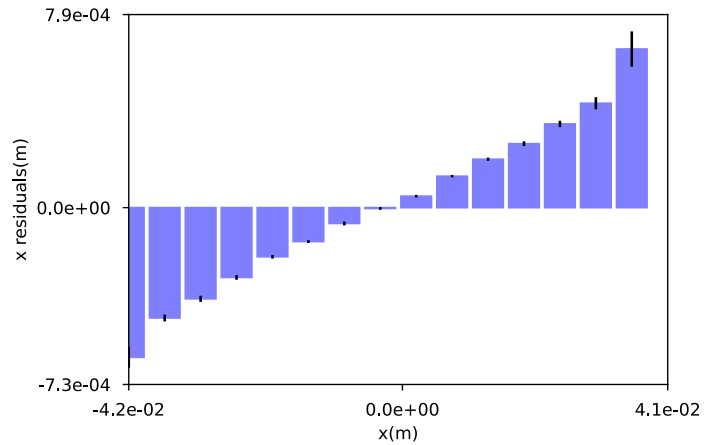
- 1) Outer tube (variable, default iron)
- 2) Solenoid coils (copper)
- 3) Vacuum tube
- 4) Anode (copper)
- 5) Electrode (copper)
- 6) End caps (stainless steel)

- Anode & electrode:

- User defined radius, length, and aperture

- EM field

- Radial plasma (electric) field only
- Future-proofed to later allow addition of confinement fields
- Restricted to  $\pm$  anode radius



- Phase space residuals too large (field – element)
- Spatial residuals looks systematic – incorrect strength / field
- Ongoing investigation.

- Strength parameterisation – open to suggestions
- Currently based on B [T]: solenoid equivalent field strength
  - Used in field map generation – useful for tracking comparisons
- Alternative (not implemented):

$$k_G = \frac{e}{2\epsilon_0} \frac{m_p \gamma}{p^2} n_e$$

- Literature derived
- Requires BDSIM internal conversion to E field strength – ongoing debugging

- Done (nearly)
  - Gabor lens in BDSIM
  - Optimise updated stage 1 for low beta
- Ongoing:
  - FFA injection line performance simulations (slow)
  - Base line design update report write-up
  - RF-Track – particle reader from BDSIM/GPT files.
- Todo:
  - Update models of alternative baseline design (v5.5)
  - +....