Progress Updates

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WP6 Meeting

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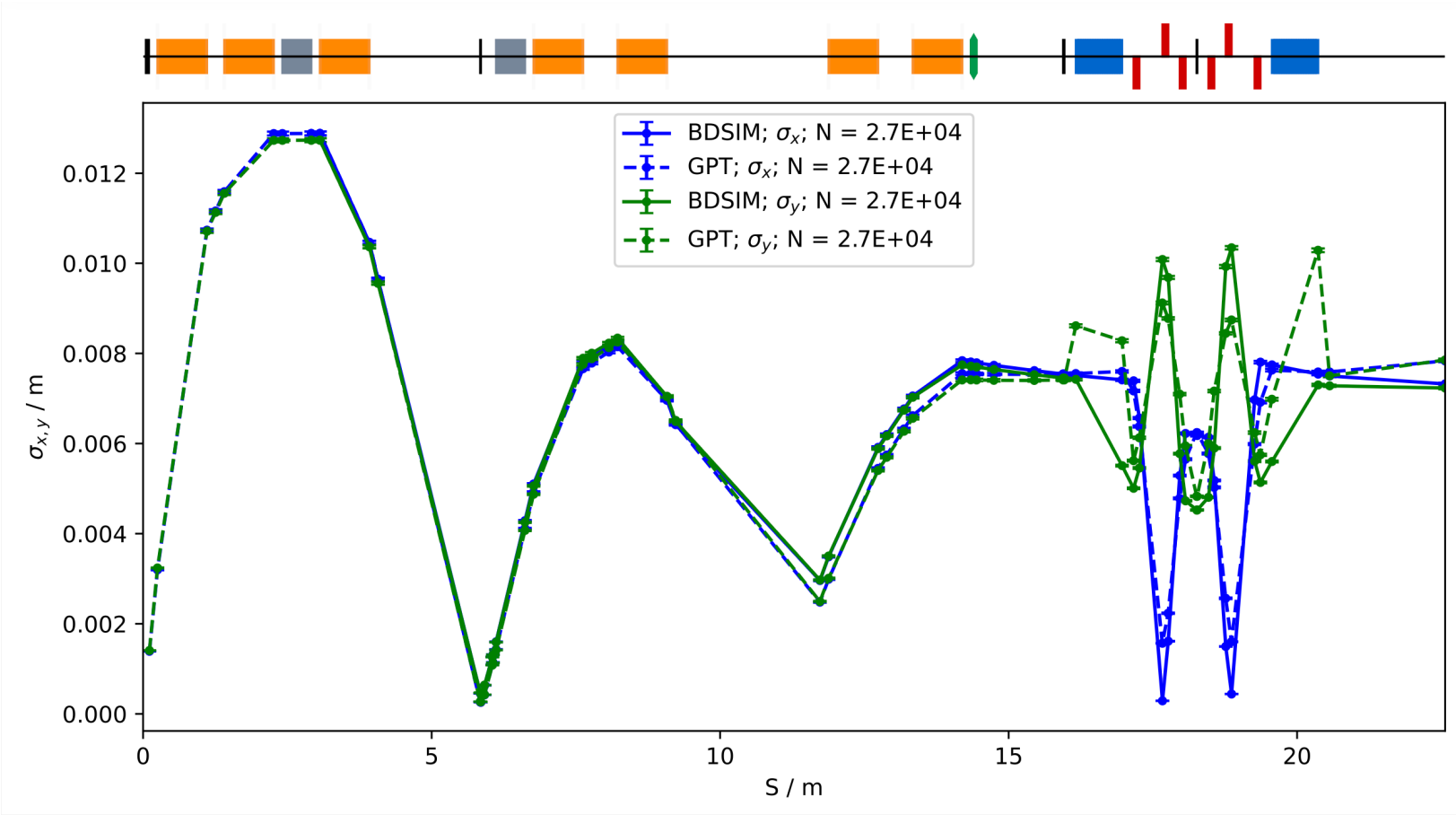
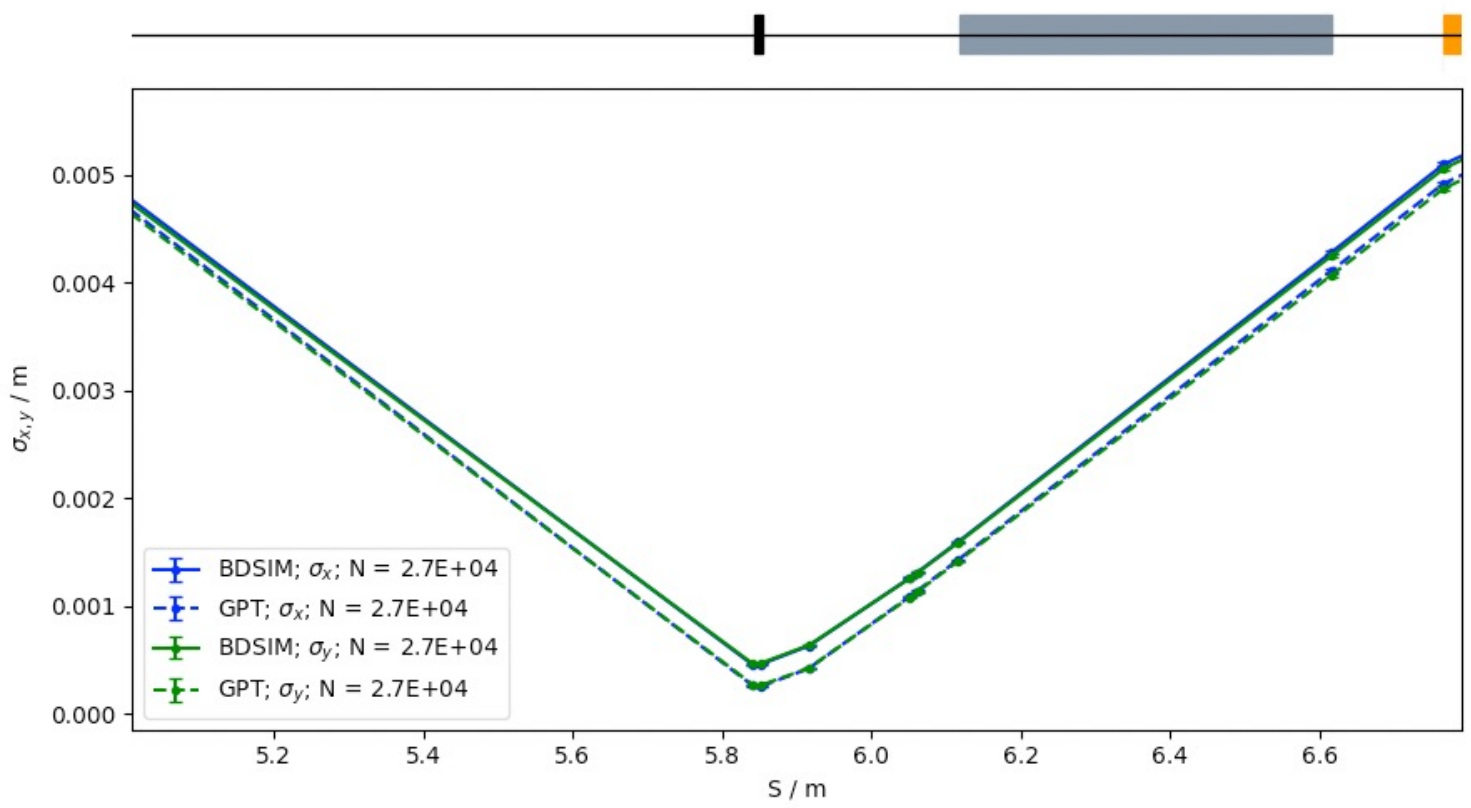
LhARA Solenoid Optimisation

- GPT optimisation ongoing – no progress
  - No solutions yet with GDF solve for 1.0 & 1.5 mm beams
  - No solutions yet with drift length between GL5 & GL7 as a free parameter
- BDSIM model (3 cm beam configuration):



BDSIM vs GPT – GL3 Focus

- Focus after GL3 (no physics)
- Unexpected smaller beam in GPT simulations with space charge
- Identical initial beams



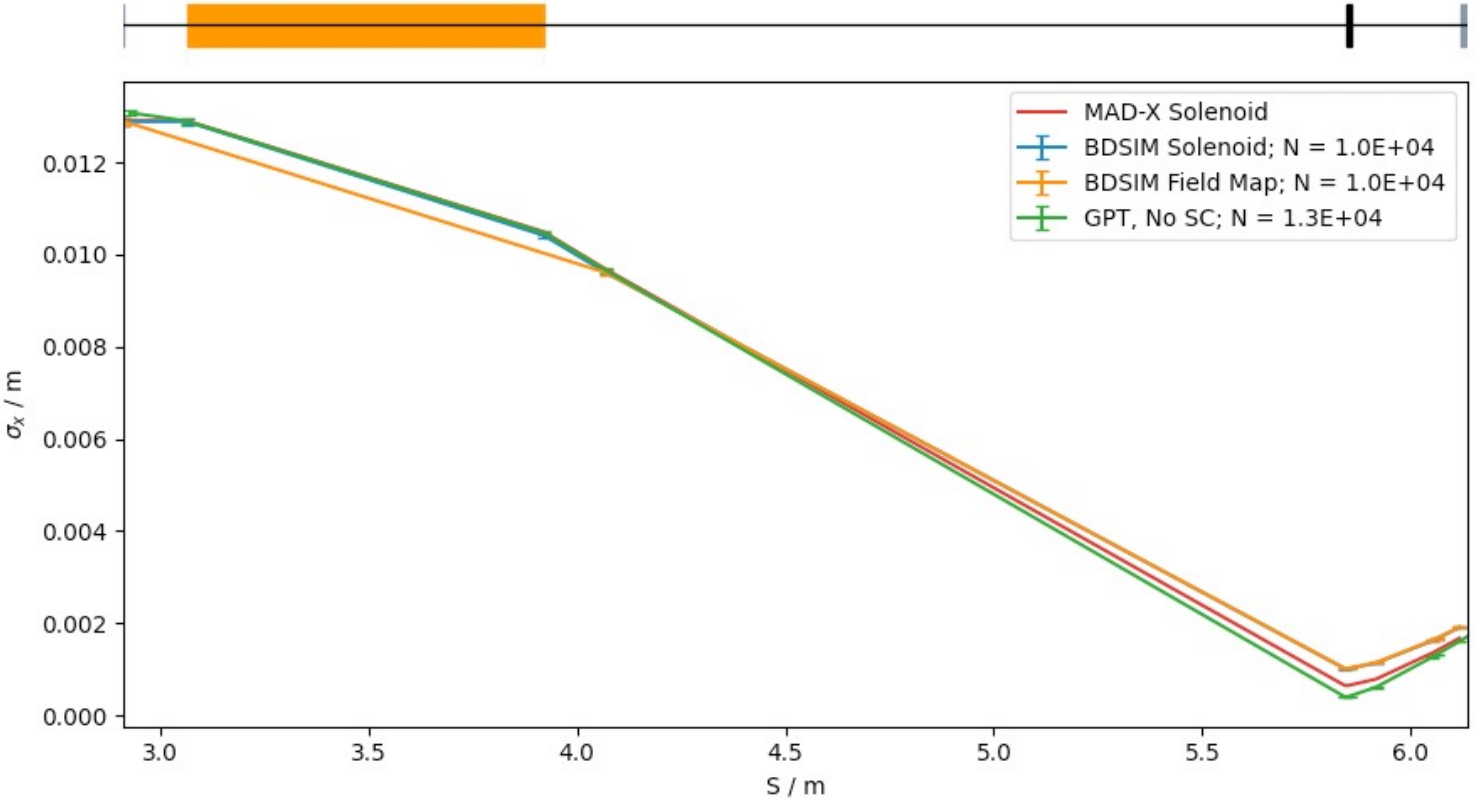
Solenoid Validation

- SVD & implementation of GPT solenoid in MAD-X: shelved

- Tracked through GPT solenoid in BDSIM with an external field map
  - BDSIM solenoid tracking based on MAD-X Rmatrix

- Excellent agreement between BDSIM matrix & field map methods

- Disagreement between MADX, BDSIM, and GPT (no sc)



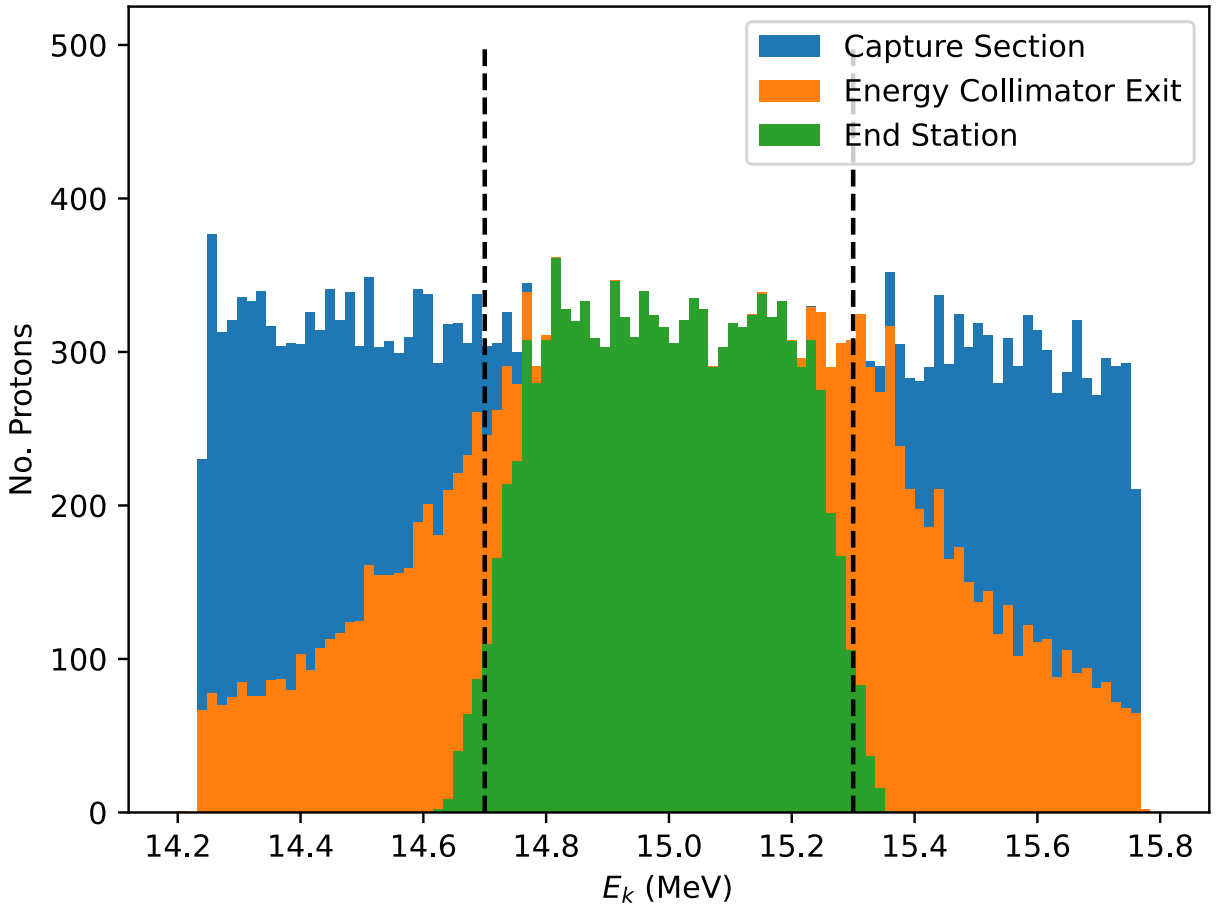
Transmission

- End-station transmission with varying energy collimator aperture
  - Beam starts after GL2 – space charge optimised capture section.
  - 30000 particles (+/- 5%), 11940 (+/- 2%).

- Arc energy cleaning collimator aperture kept at19mm (hor.), 6.9mm (ver.). Collimator after octupole open. Beam pipe radius of 3.65cm.

- Settings for 3.0cm wide beam

- +/- 2% achievable, mostly collimated by momentum cleaning collimator.



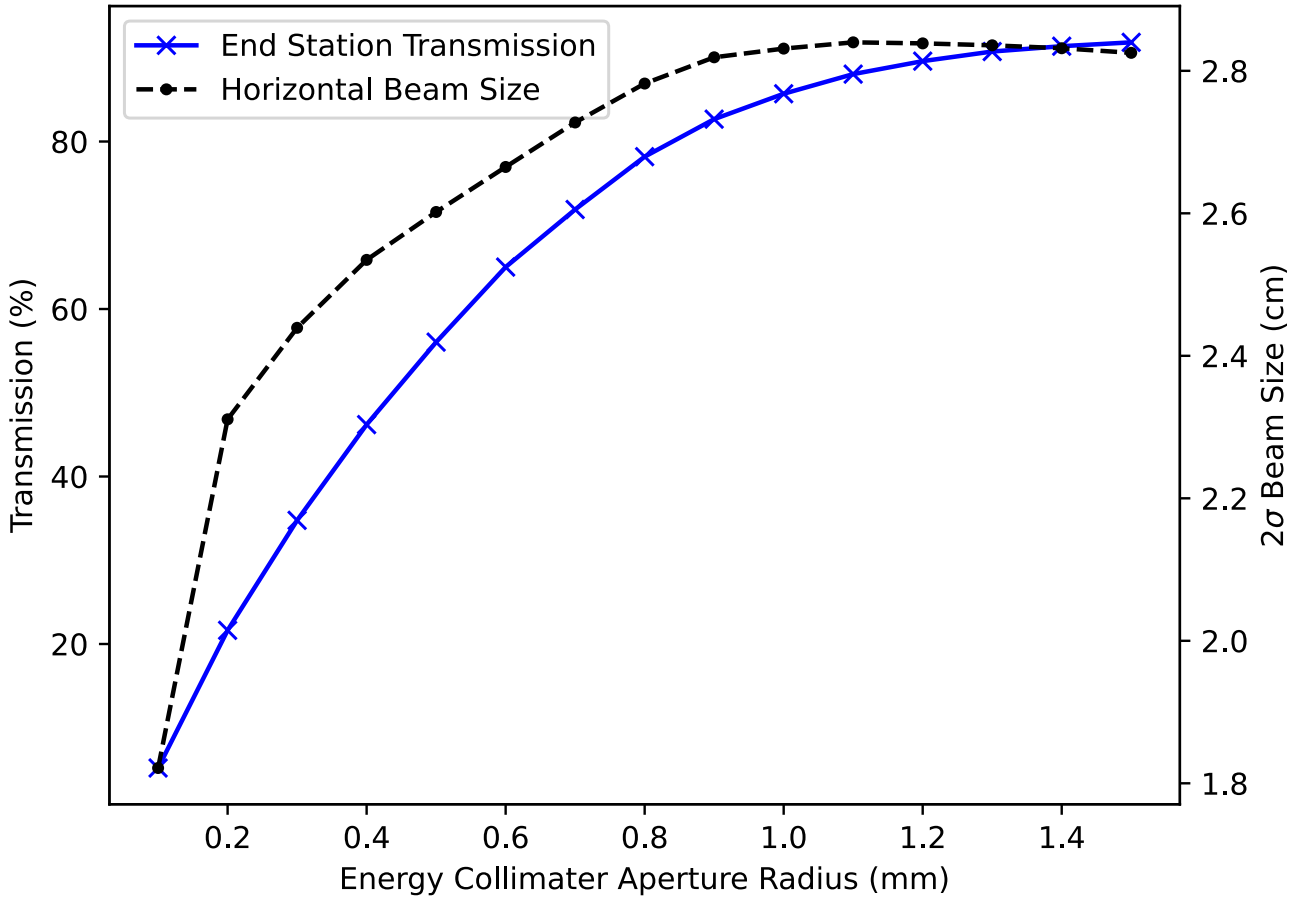
Transmission

- Varied energy collimator aperture size. Other collimators unchanged.

- Excellent transmission in +/- 2% window.

- ~ 92% transmission for 1.5mm aperture, ~85% for 1.0mm aperture

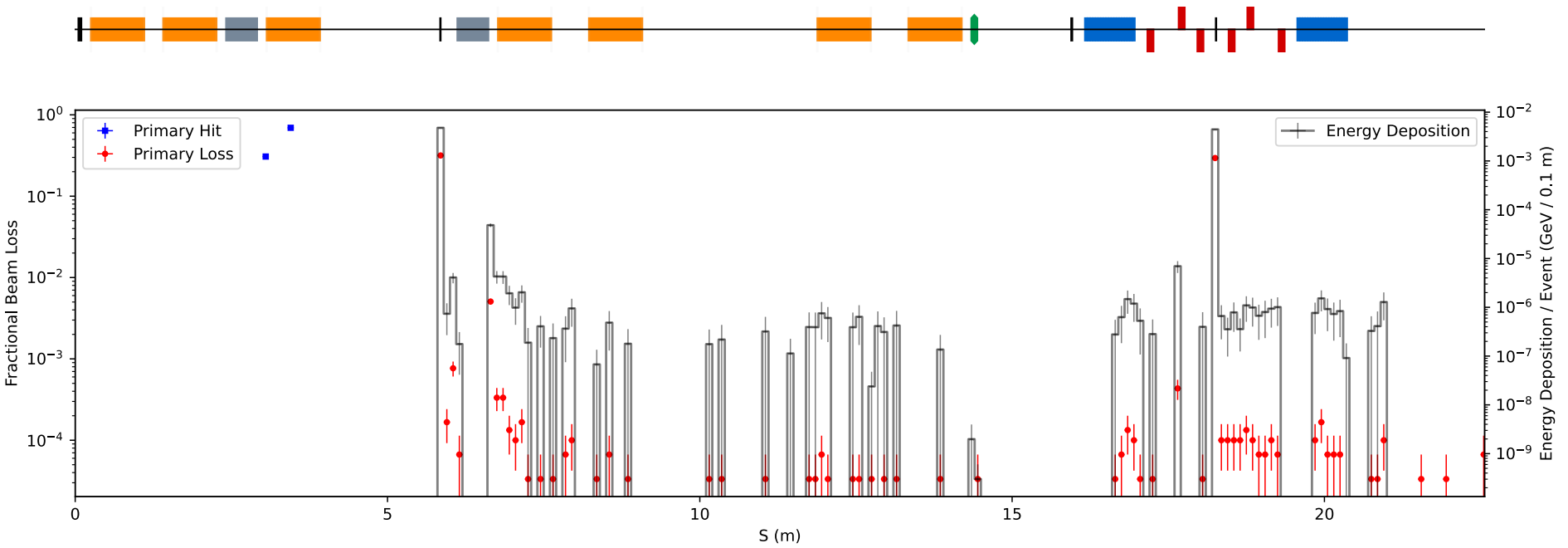
- Beam size relatively constant between 1.0 & 1.5mm apertures.



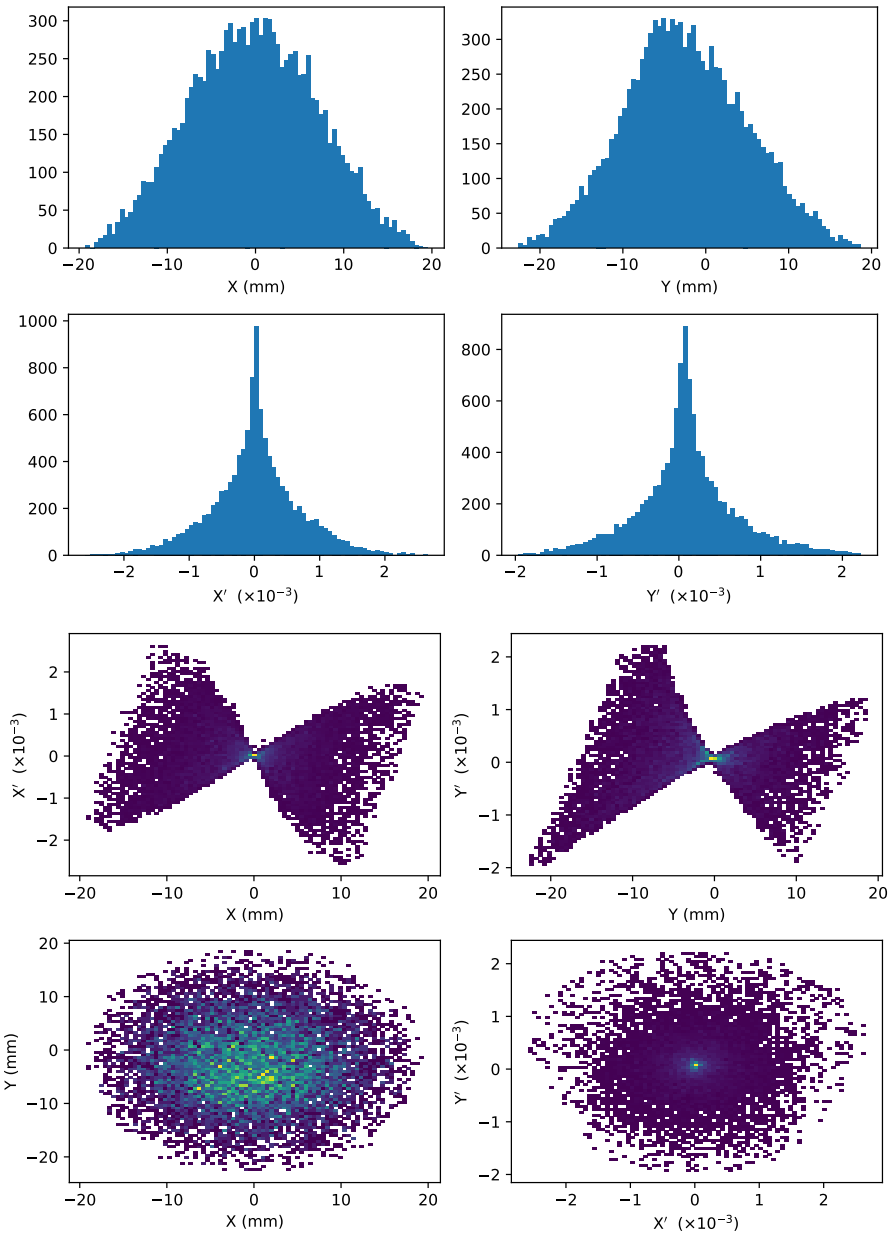
Energy Loss Map

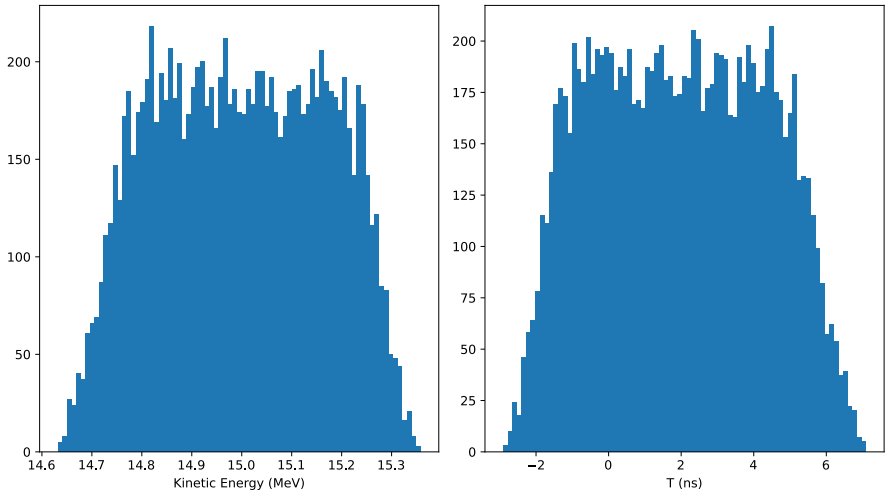
- Energy deposition primarily in collimators

- Bug in primary hit location– possibly due to offset beam.



End Station Phase Space





- Small drop in beam size due to non-optimised BDSIM solenoid strengths
  - Source of offset Y distribution unknown
- End station beam width (2 σ):
  - Horizontal: 2.82 cm
  - Vertical : 2.93 cm
- Octupole strength for uniformity to be determined.

Summary

- Done:
  - Preliminary study of energy collimator settings & transmission
    - Methodology & scripts

- Ongoing:
  - Find solutions for smaller beam sizes
  - Investigate source of GL3 focus discrepancy
  - Update models of alternative baseline design (v5.5)

- Todo:
  - Determine nominal octupole settings
  - Model beams with full energy spread
  - Quads only model (v6.0)
  - Develop OPAL model of FFA – need JP input.