

Simulation Update

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WP6 Meeting

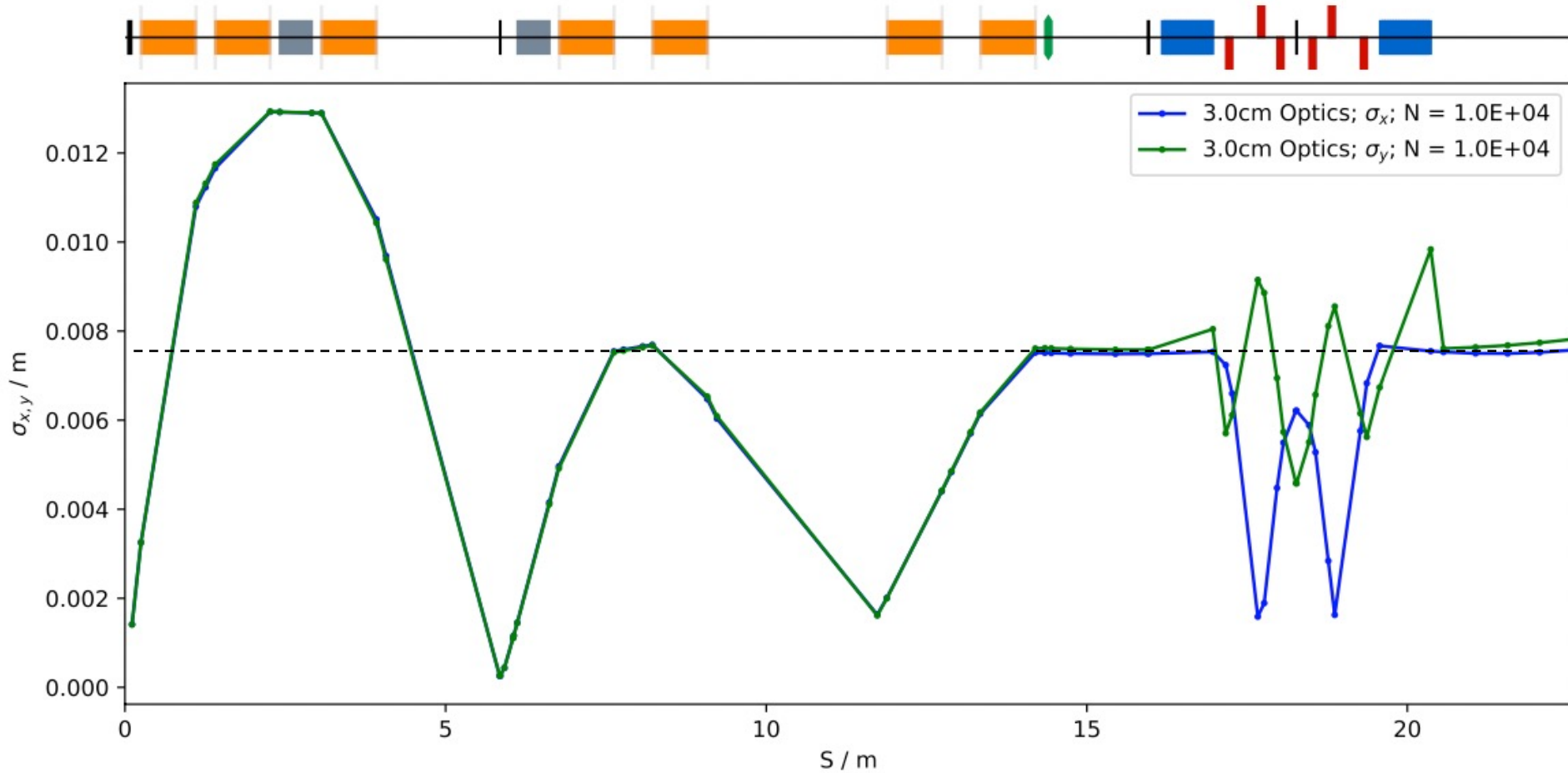
29th August 2023



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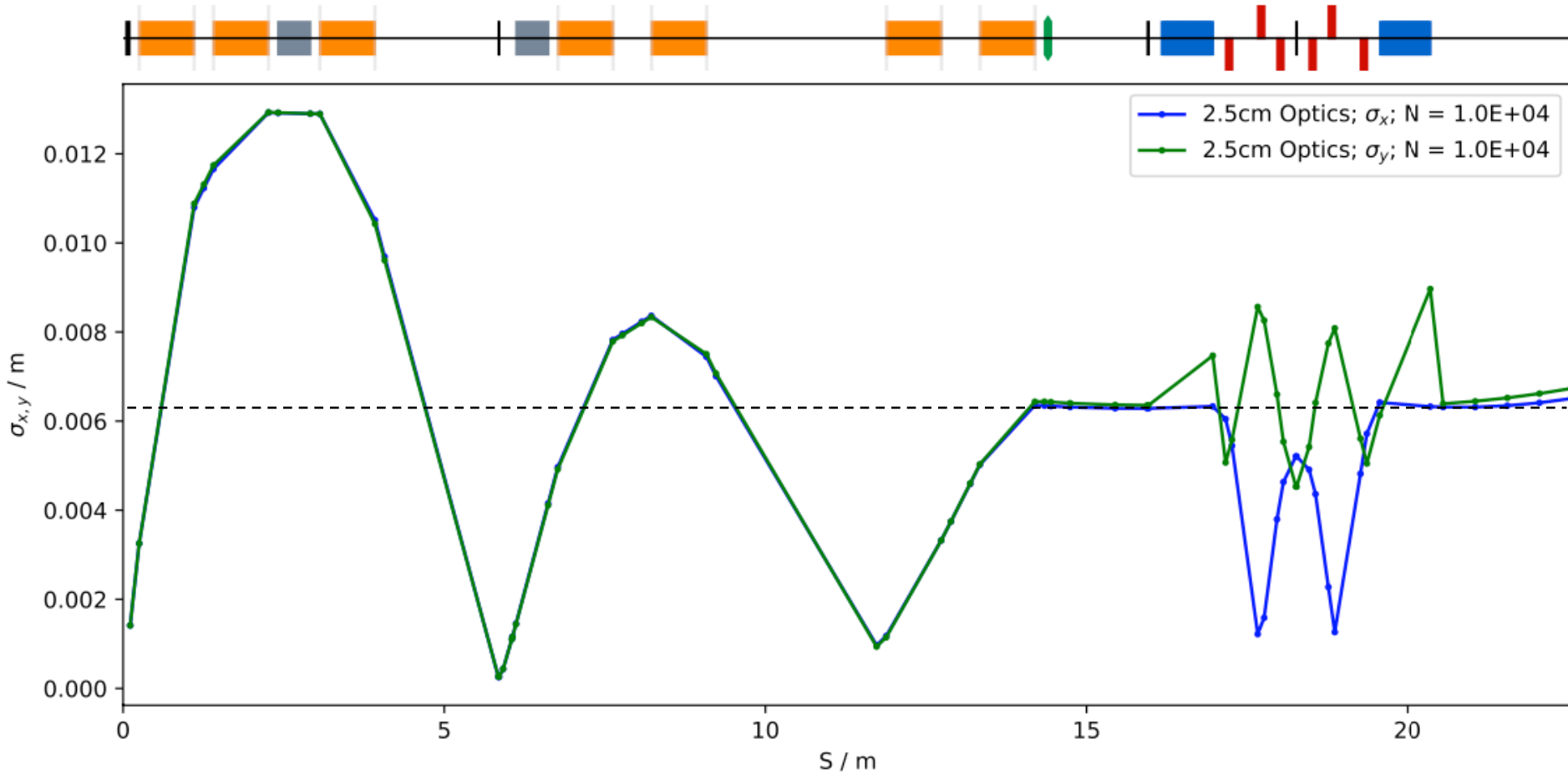


3.0 cm Stage 1 Optics Check



- Asymmetry in beam size at the end station (target = 7.5mm):
 - $1\sigma_x$: 7.572 mm (+ 0.96%)
 - $1\sigma_y$: 7.815 mm (+ 4.19%)

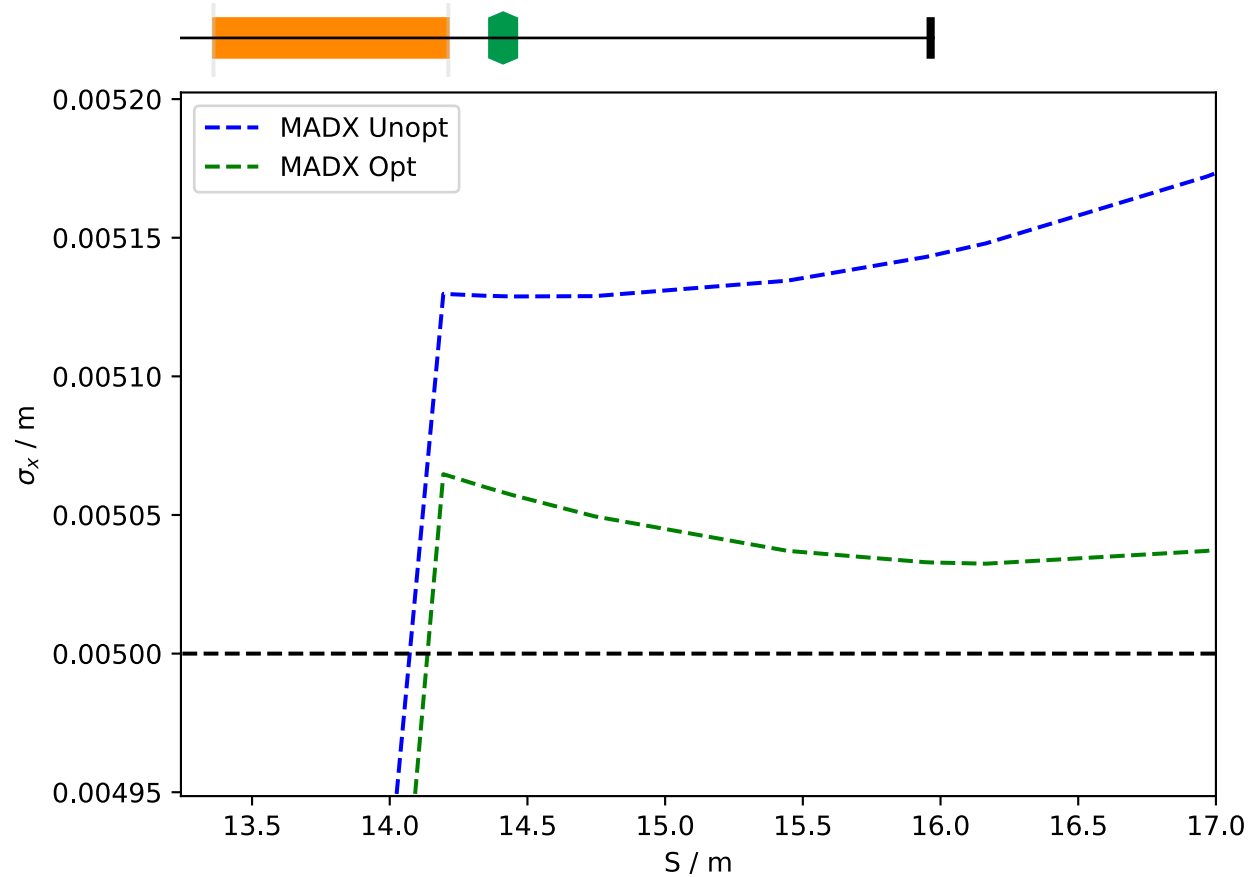
2.5 cm Stage 1 Optics Check



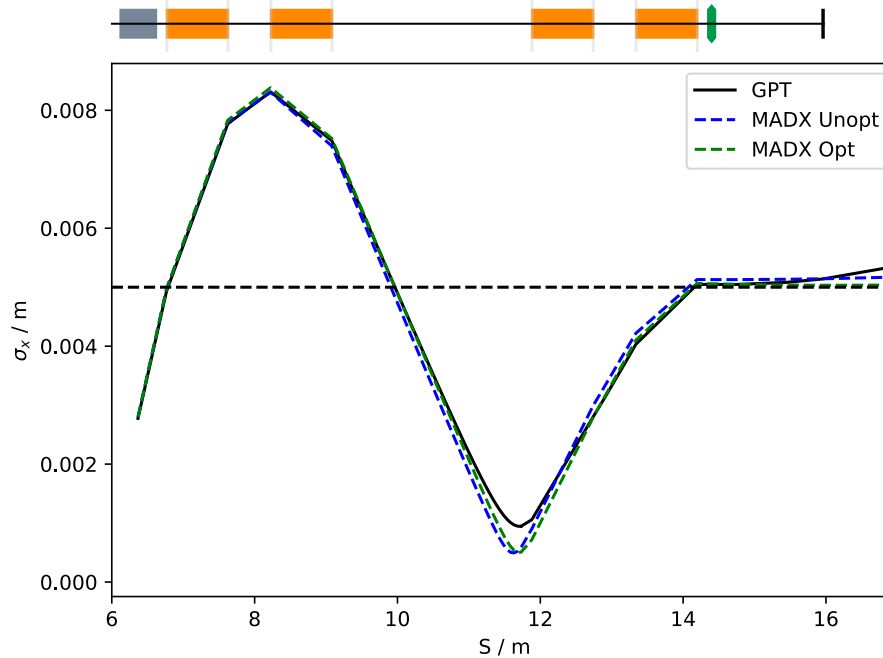
- Asymmetry in beam size at the end station (target = 6.25 mm):
 - $1 \sigma_x$: 6.508 mm (+ 4.1%)
 - $1 \sigma_y$: 6.734 mm (+ 7.5%)

- Gabor lens 4-7:

- Stronger focusing
behaviour
observed in
MADX optimised
optics



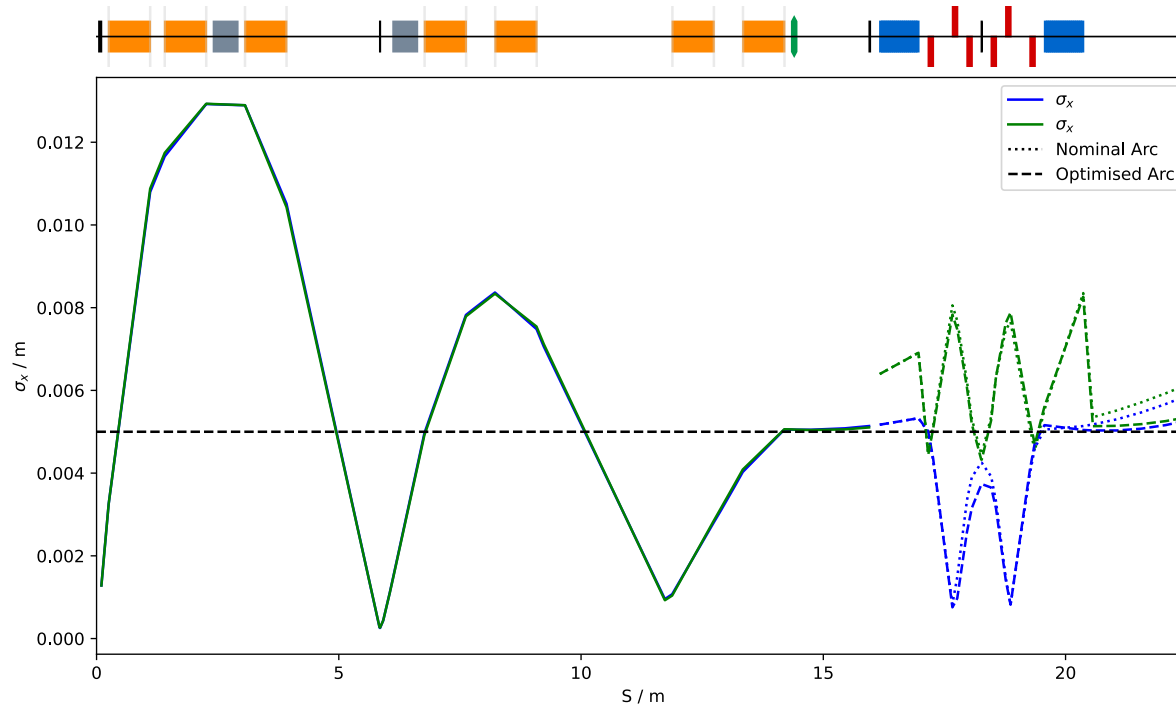
- Gabor lens 4-7:



	Original		Optimized	
	KS	B [T]	KS	B [T]
Gabor Lens 4	1.78886	1.00507	1.77262	0.99595
Gabor Lens 5	1.46694	0.82420	1.46646	0.82393
Gabor Lens 6	1.41443	0.79470	1.33359	0.74928
Gabor Lens 7	1.42102	0.79840	1.48889	0.83653

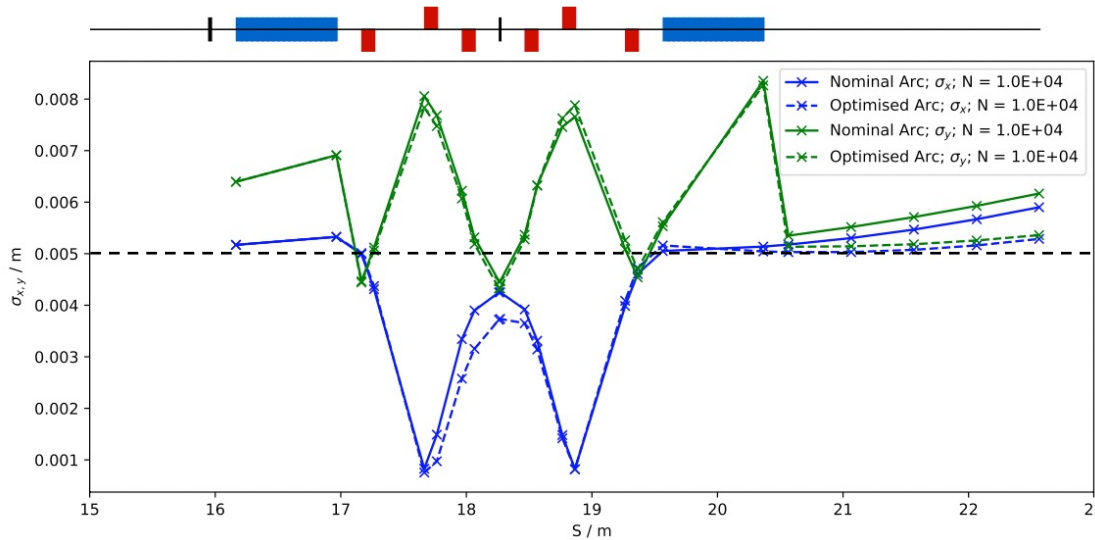
2.0 cm Beam Optimisation

- MADX
optimised arc:



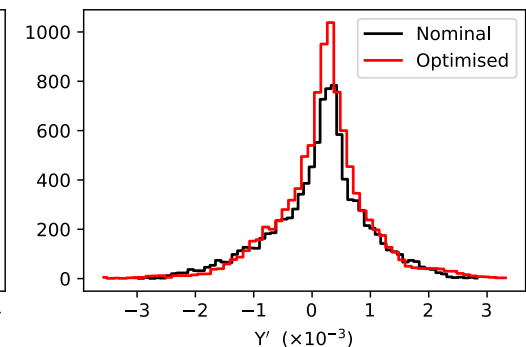
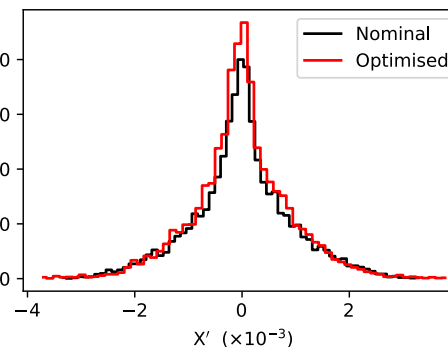
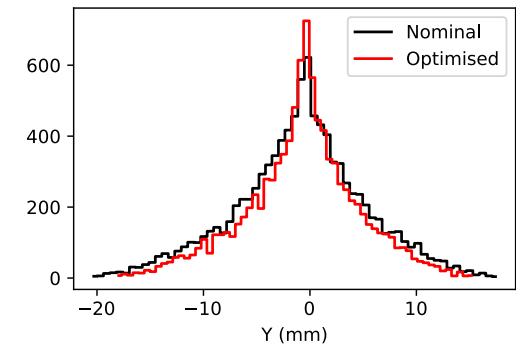
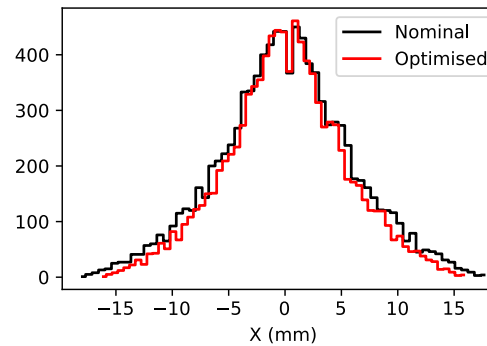
	Original	Optimized
	KS	KS
Quadrupole 1	-22.5440	-21.1299
Quadrupole 2	31.3768	30.8374
Quadrupole 3	-31.5123	-29.5522
Quadrupole 4	-31.5123	-36.2771
Quadrupole 5	31.3768	32.4886
Quadrupole 6	-22.5440	-22.4983

2.0 cm Beam Optimisation

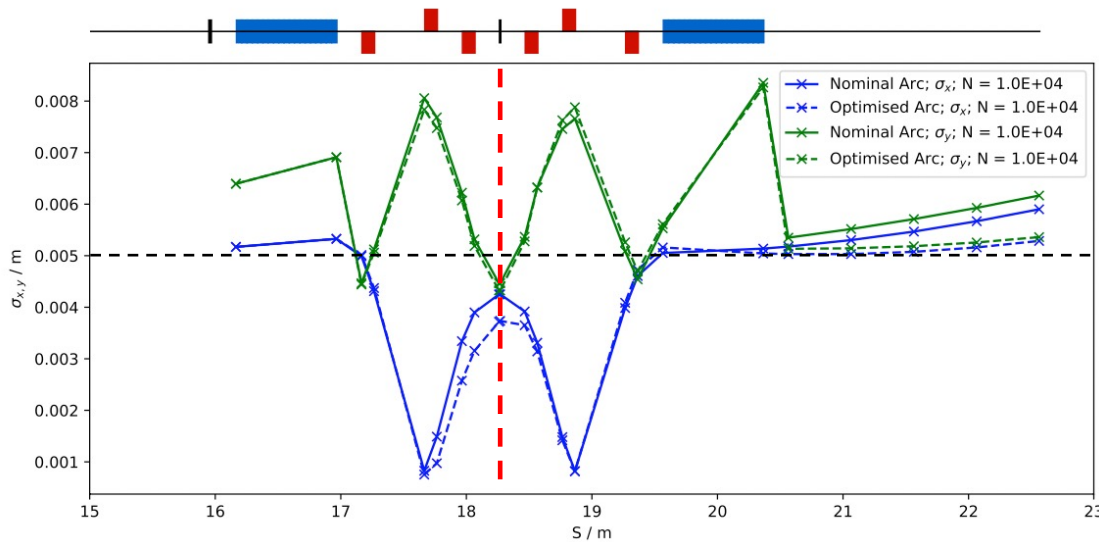


- No GPT optimisation
- Observable asymmetry
 - Small asymmetry at arc entrance
 - Possibly correct with collimator
- Modified arc optics likely needed for smaller spot sizes

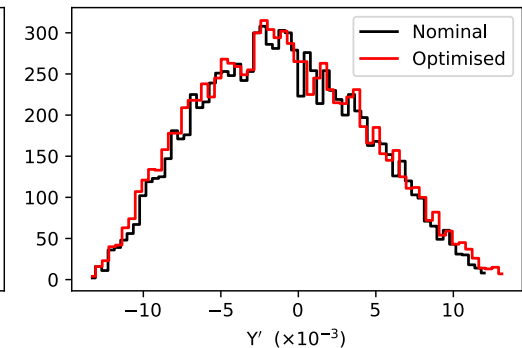
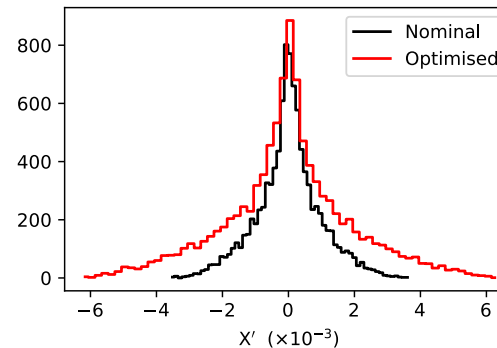
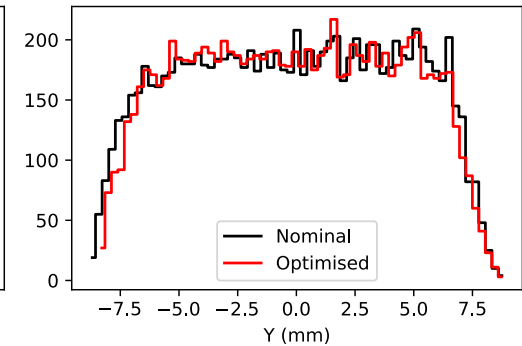
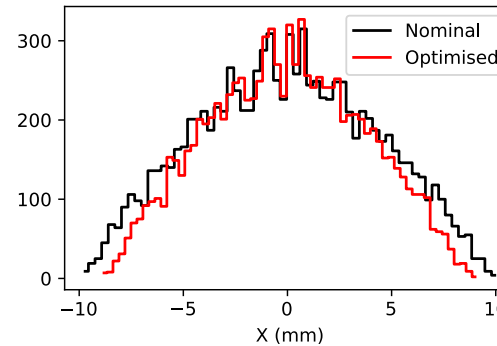
- End station beam profile:
- Uniform, symmetric beam could be challenging
- Optimised beam size at the end station (target = 5.0 mm):
 - $1 \sigma_x$: 5.286 mm (+ 5.72%)
 - $1 \sigma_y$: 5.360 mm (+ 7.20%)



2.0 cm Beam Optimisation



- Beam profile at collimator exit:
 - No active collimation, particle tracking ONLY
- Unexpected vertical uniformity
- Controllable horizontal & vertical collimator jaws needed.
 - Rectangular collimator.



- Done:
 - Full stage 1 verification of optimised optics
 - 3.0, 2.5, 2.0cm
 - Optimised arc for 2.0 cm spot size
 - Started baseline update technical note
 - Started end station dosimetry technical note
- Ongoing:
 - Optimisation verification & for spot sizes of:
 - 1.5 cm
 - 1.0 cm
 - Comparison to baseline design
 - FFA injection line simulations with updated beam
- Todo:
 - Performance evaluation of $\pm 5\%$ beams
 - No optimisation. Transport & transmission assessment.
 - Alternative space charge codes & model validation.
 - RF-track, OPAL, IMPACT-T, ...?
 - Update models of alternative baseline design (v5.5)
 - Develop OPAL model of FFA