

# Simulation Update

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WP6 Meeting

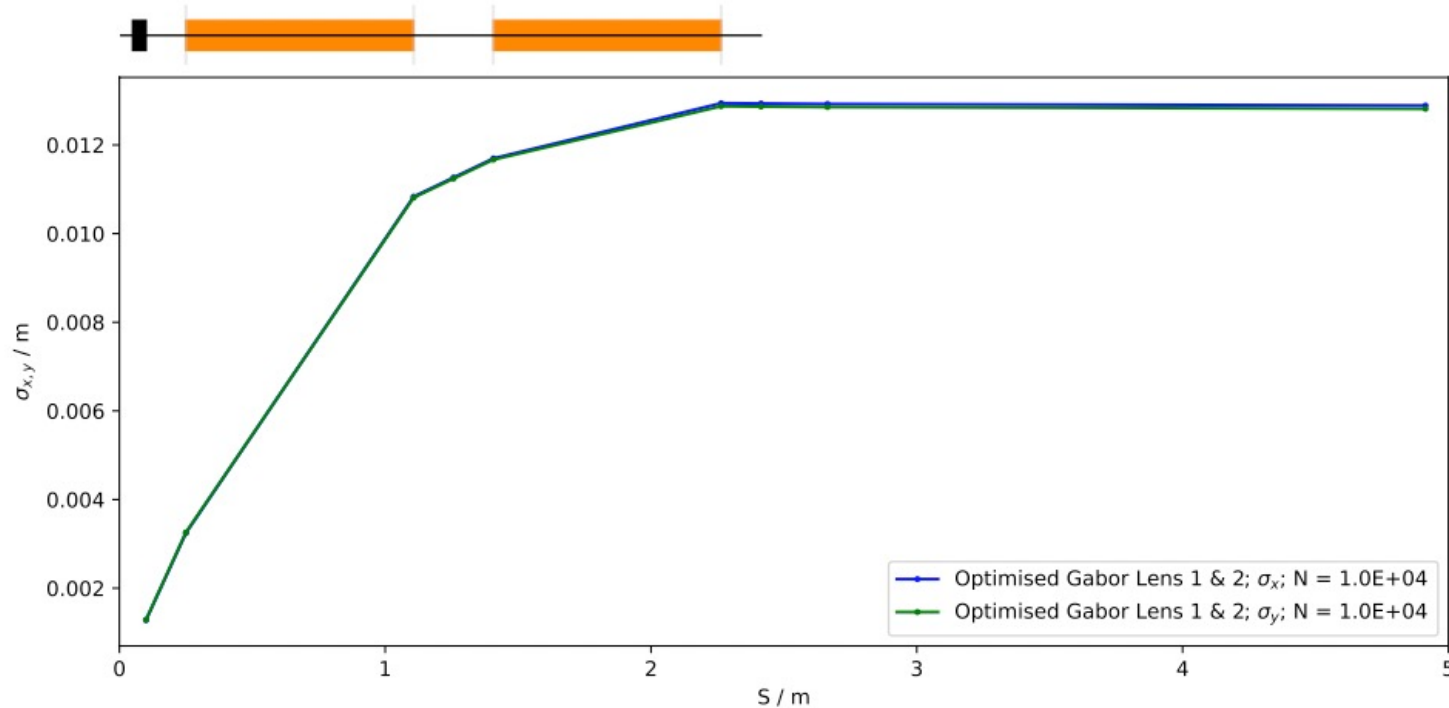
22<sup>nd</sup> August 2023



ROYAL  
HOLLOWAY  
UNIVERSITY  
OF LONDON

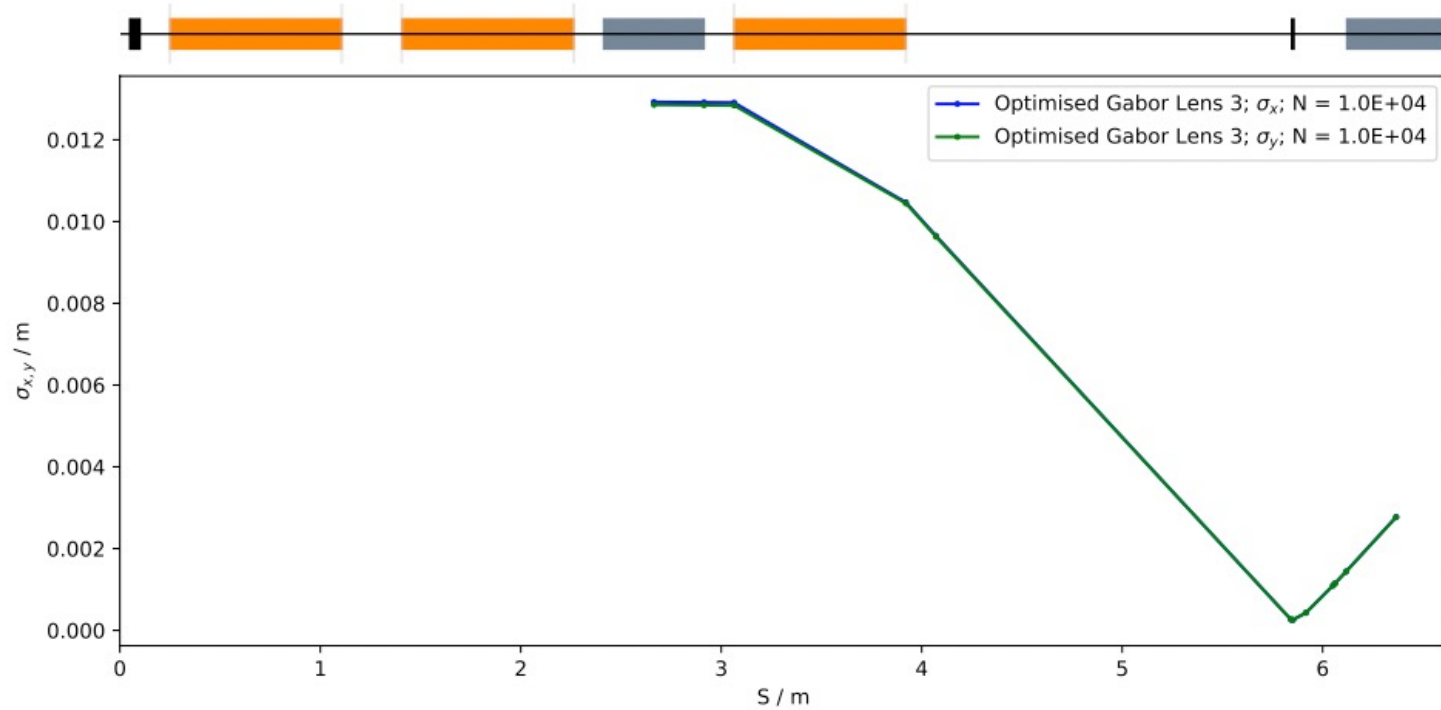


- Gabor lens 1 & 2:



	Original		Optimized	
	KS	B [T]	KS	B [T]
Gabor Lens 1*	2.491764	1.4	2.491764	1.4
Gabor Lens 2	1.018776	0.5724	1.045545	0.587440

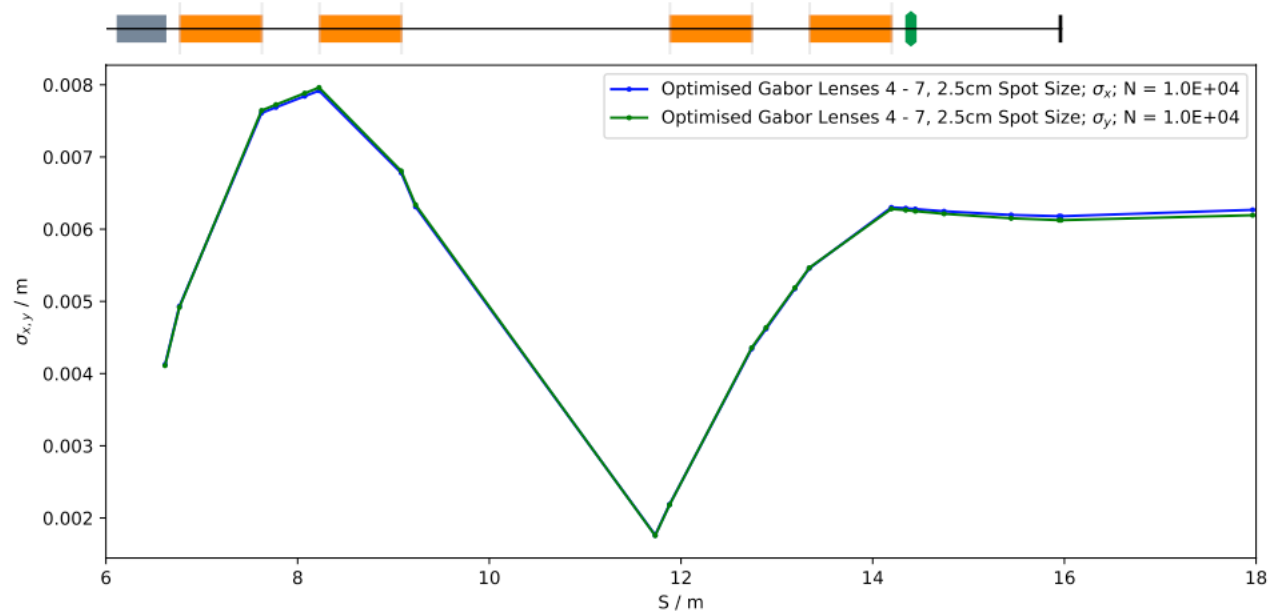
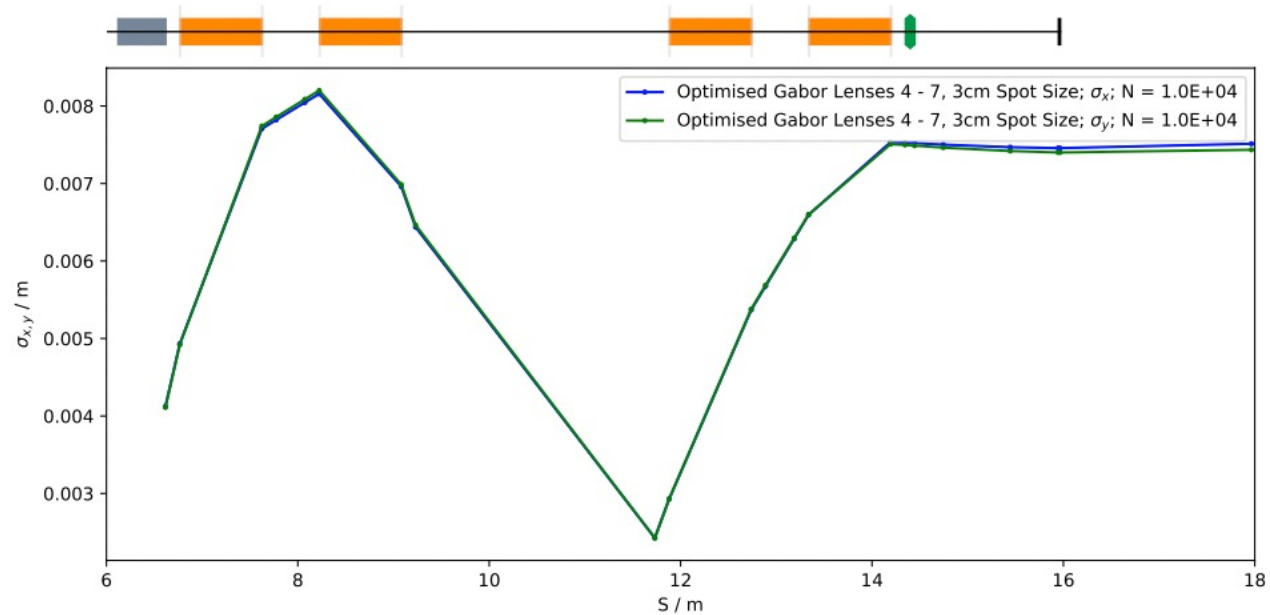
- Gabor lens 3:



	Original		Optimized	
	KS	B [T]	KS	B [T]
Gabor Lens 3	1.448605	0.813900	1.449852	0.814601

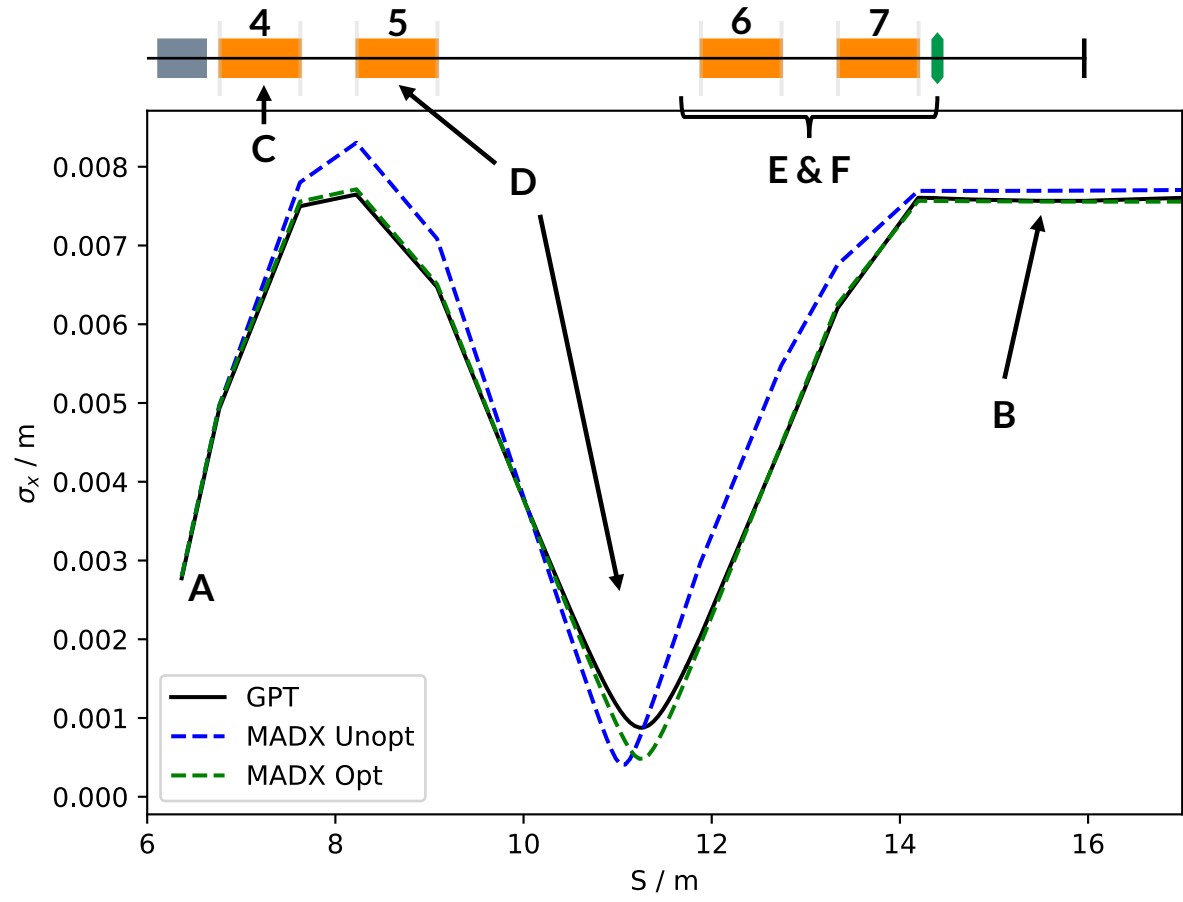
# Optics Optimisation Status

- Solutions for spot sizes:
  - 3.0 cm
    - $1\sigma$  radius= 7.5mm
  - 2.5 cm
    - $1\sigma$  radius= 7.5mm
- Cannot converge on solution for smaller sizes.
- No solutions yet with split optimisation (GL4&5, GL6&7).
- Focus after GL7

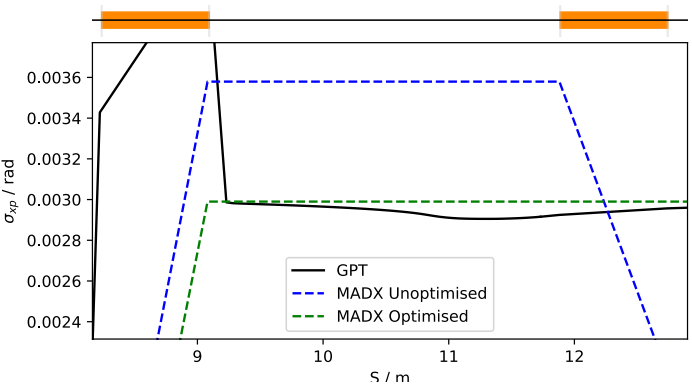


# New Optimisation Strategy

- Gabor lenses 4-7:
  - A. Beam from optimised GL3
  - B. Optimise GL 4-7 in MADX
  - C. Set GL4 in GPT
  - D. Vary GL5, find  $\alpha=0$  at focus
  - E. Set GL6 & GL7 in GPT
  - F. Vary GL6 & GL7 if needed

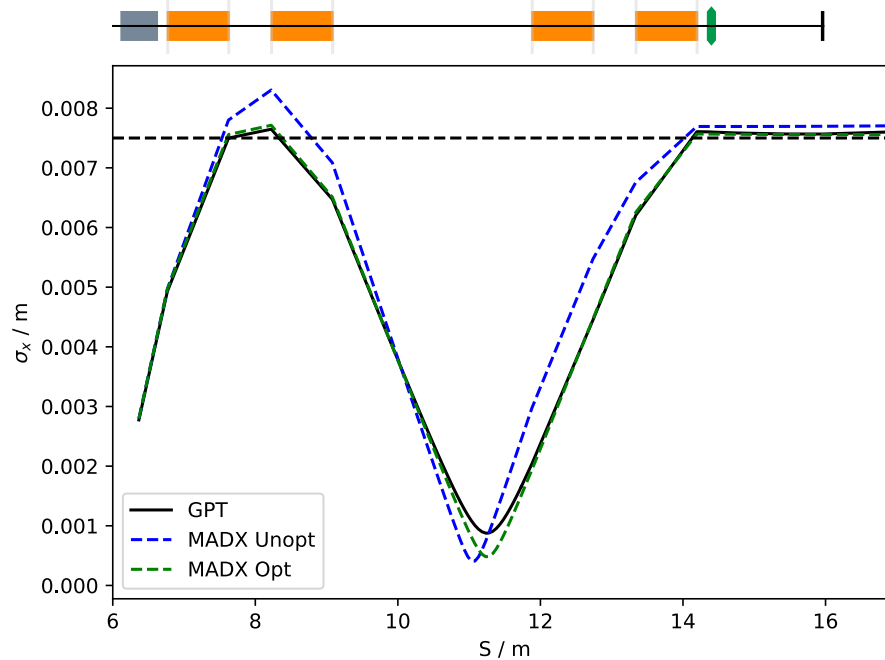


- Space charge affecting beam at focus
  - Horizontal momentum:



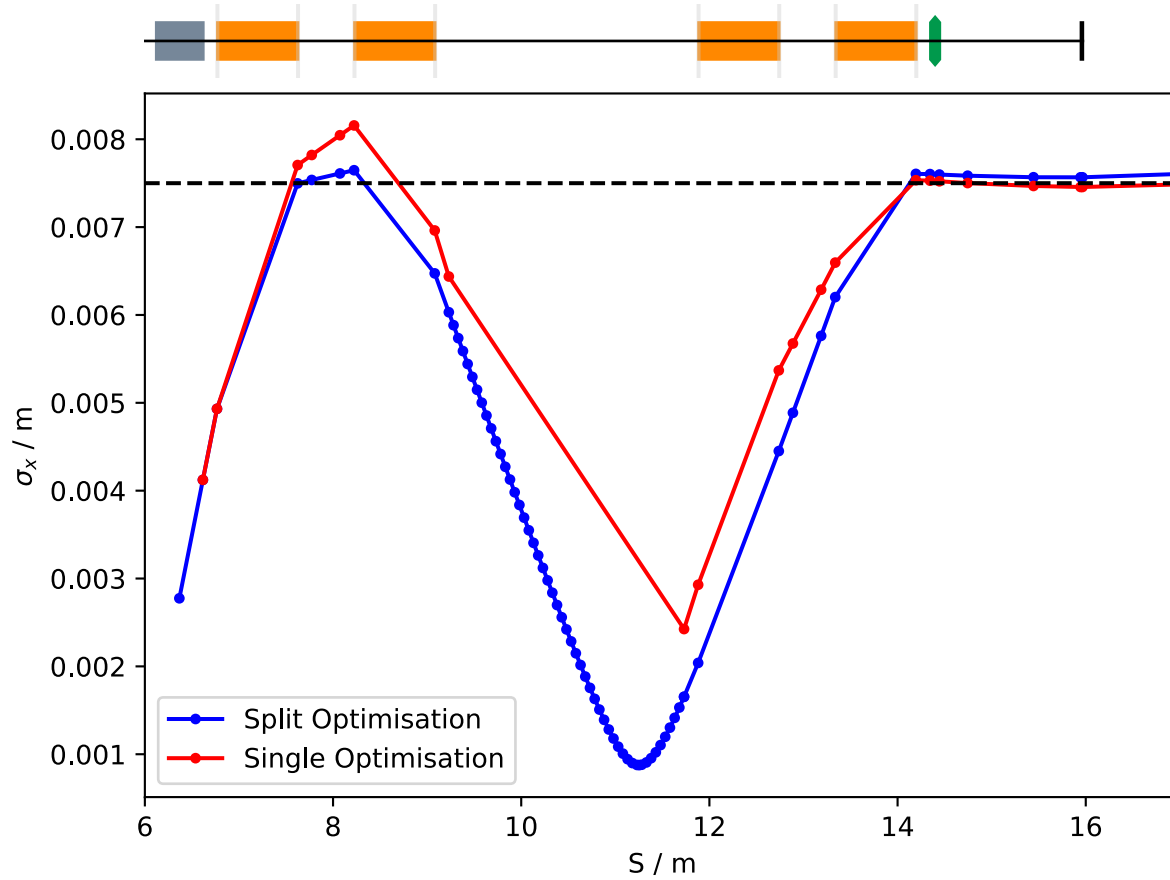
# 3.0 cm Beam Optimisation

- Gabor lens 4-7:



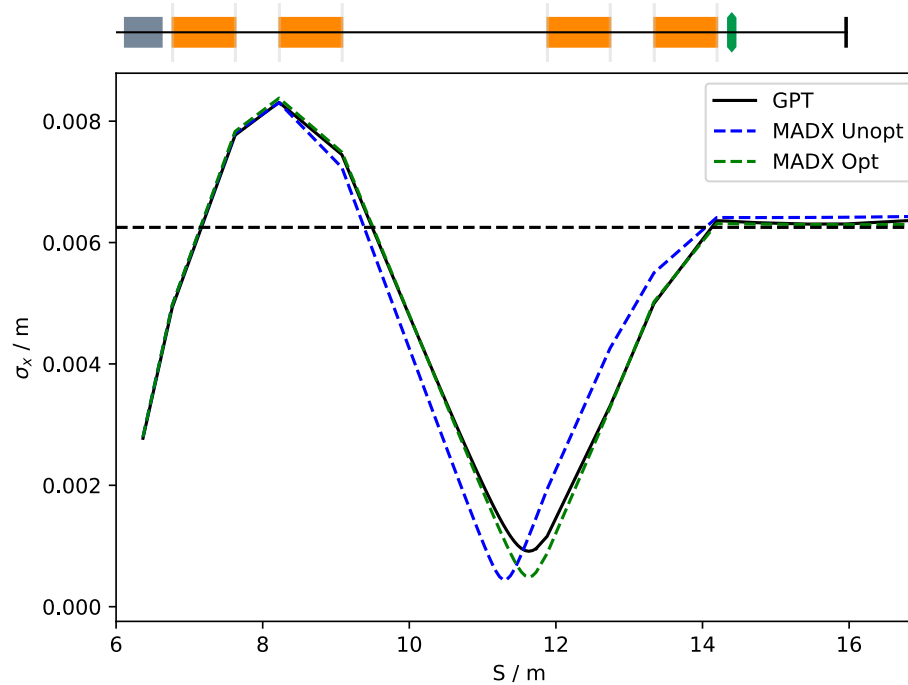
	Original		Optimized	
	KS	B [T]	KS	B [T]
Gabor Lens 4	1.78886	1.00507	1.90960	1.07291
Gabor Lens 5	1.60434	0.90140	1.43666	0.80719
Gabor Lens 6	1.24481	0.69939	0.00212	0.00191
Gabor Lens 7	1.16597	0.65510	1.40096	0.78713

- Method Comparison:



# 2.5 cm Beam Optimisation

- Gabor lens 4-7:

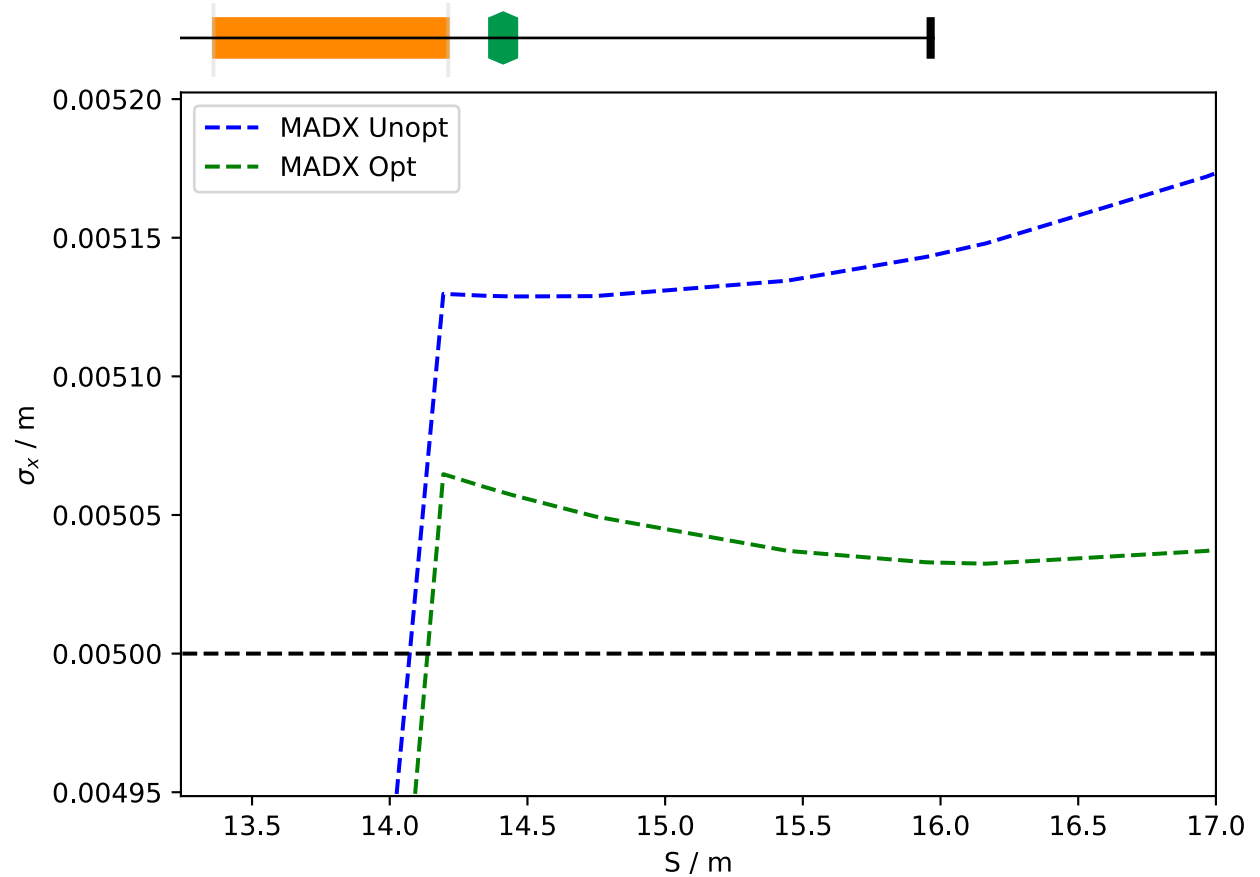


	Original		Optimized	
	KS	B [T]	KS	B [T]
Gabor Lens 4	1.78886	1.00507	1.77322	0.99629
Gabor Lens 5	1.53902	0.86470	1.48182	0.83256
Gabor Lens 6	1.31298	0.73770	0.00155	0.00087
Gabor Lens 7	1.26475	0.71060	1.52830	0.85867



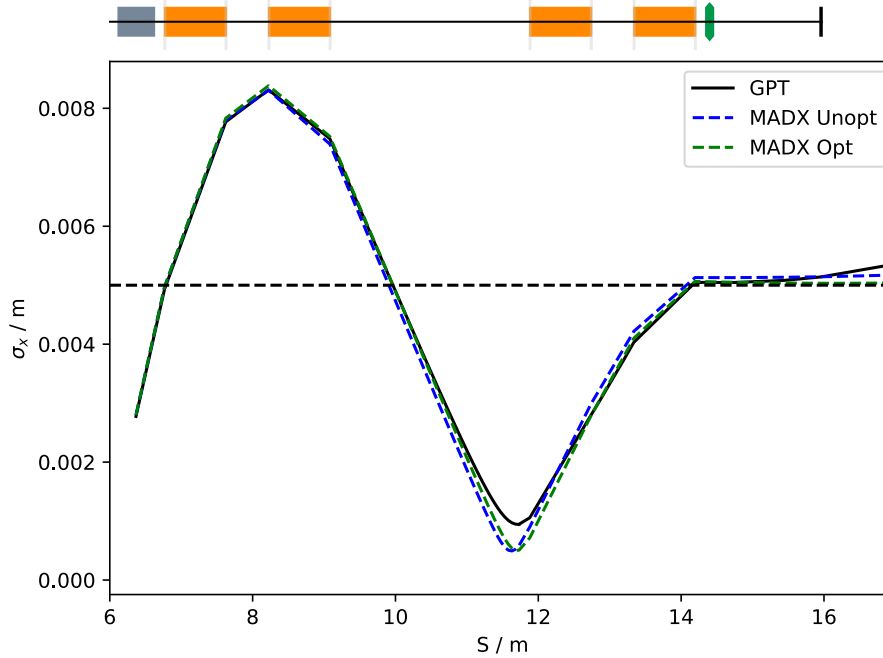
- Gabor lens 4-7:

- Stronger focusing behaviour observed in MADX optimised optics



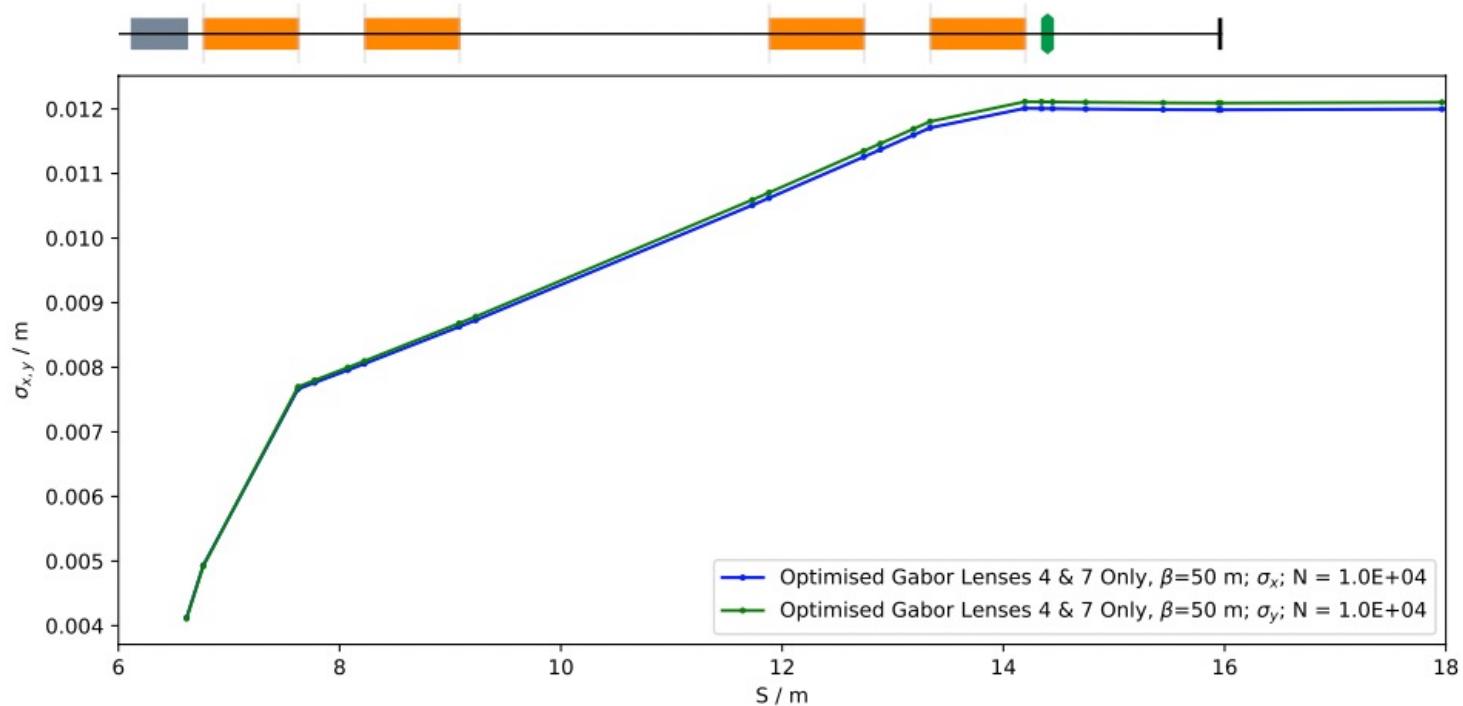
# 2.5 cm Beam Optimisation

- Gabor lens 4-7:



	Original		Optimized	
	KS	B [T]	KS	B [T]
Gabor Lens 4				
Gabor Lens 5				
Gabor Lens 6				
Gabor Lens 7				

- Gabor lens 4 & 7 (5 & 6 = 0):



	Original		Optimized	
	KS	B [T]	KS	B [T]
Gabor Lens 4	-	-	1.82756	1.02682
Gabor Lens 7	-	-	0.55688	0.31288

- Done:
  - Optimisation for spot sizes of:
    - 3.0 cm
    - 2.5 cm
    - ~2.0 cm
- Ongoing:
  - Full stage 1 verification of optimised optics
  - 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