

# Gabor Lens Simulation

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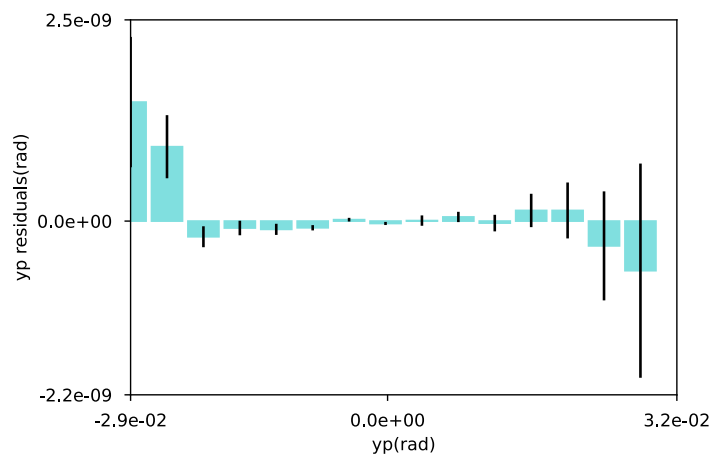
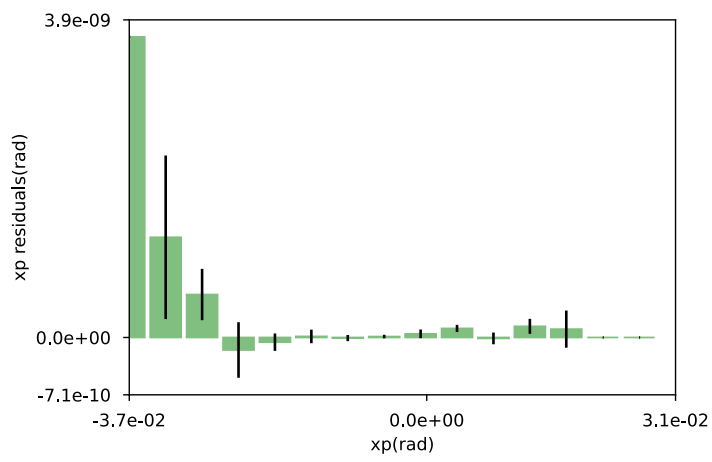
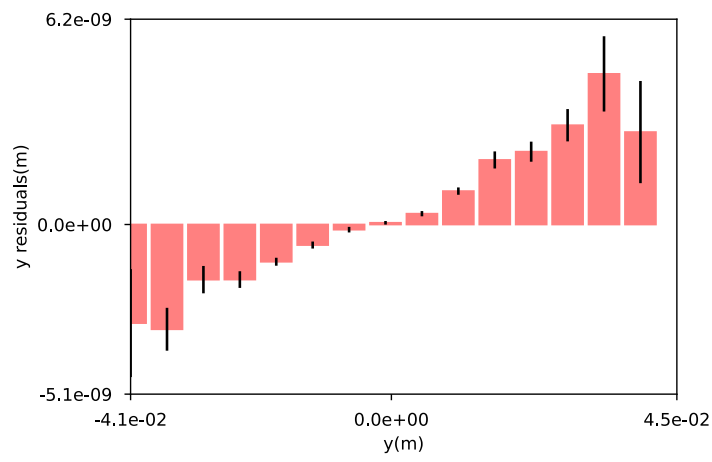
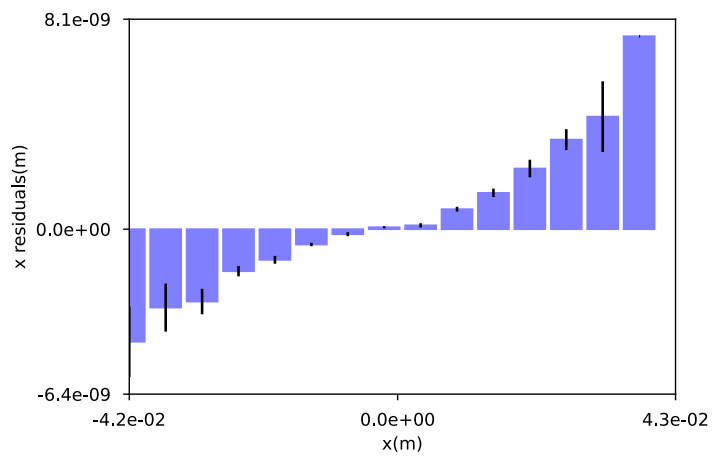
WP6 Meeting

27<sup>th</sup> February 2024



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- Good agreement with external field map
  - Residuals: Gabor lens - fieldmap
  - Map errors – incomplete extent, low precision in physical constants

# BDSIM Element: Parameterised Strength

- Currently based on B [T]: solenoid equivalent field strength
  - Used in field map generation – useful for tracking comparisons

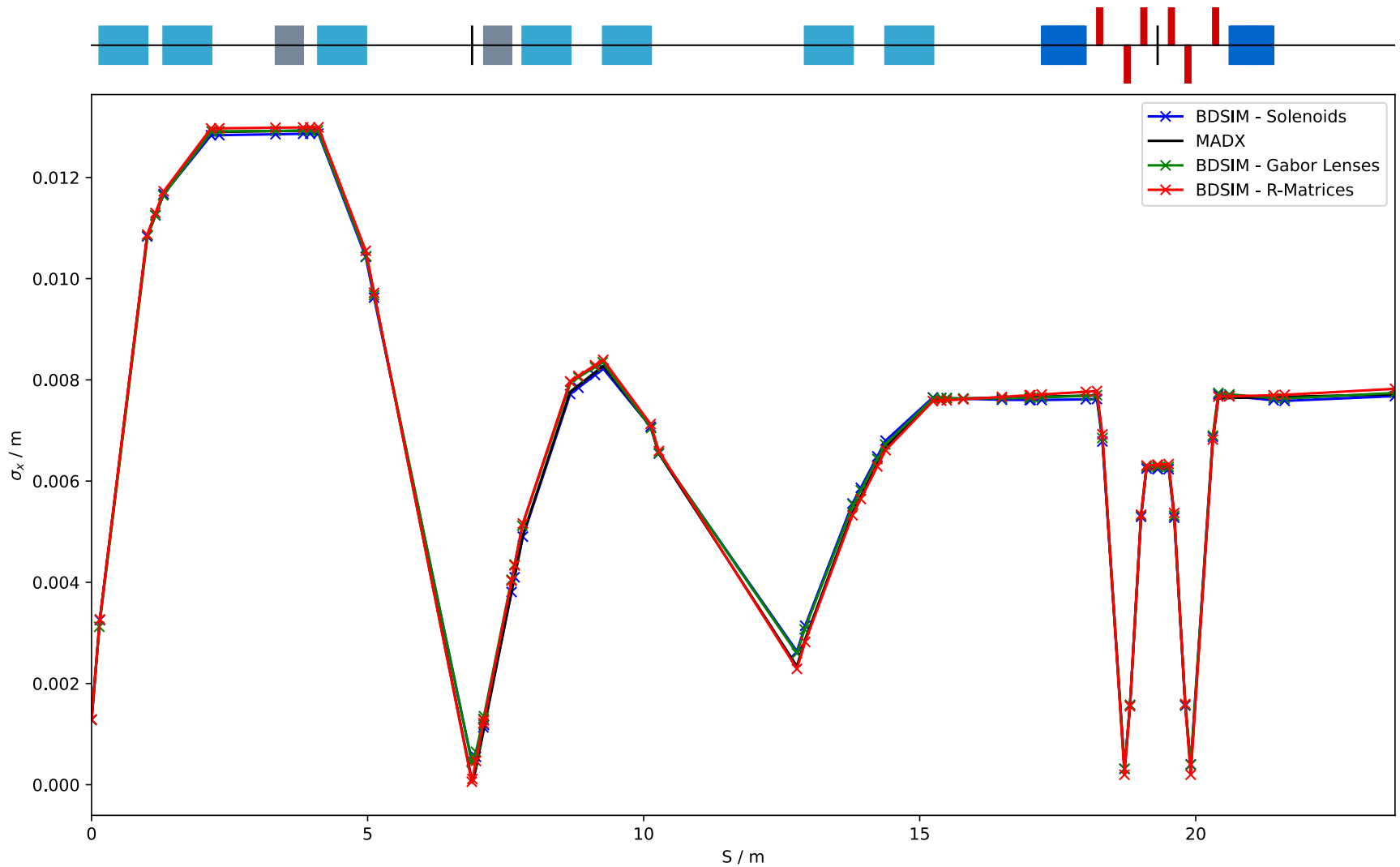
- R-matrix:

$$R_{GL} = \begin{pmatrix} \cos(\omega L) & \frac{\sin(\omega L)}{\omega} & 0 & 0 & 0 & 0 \\ -\omega \sin(\omega L) & \cos(\omega L) & 0 & 0 & 0 & 0 \\ 0 & 0 & \cos(\omega L) & \frac{\sin(\omega L)}{\omega} & 0 & 0 \\ 0 & 0 & -\omega \sin(\omega L) & \cos(\omega L) & 0 & 0 \\ 0 & 0 & 0 & 0 & 1 & \frac{L}{\beta_0^2 \gamma_0^2} \\ 0 & 0 & 0 & 0 & 0 & 1 \end{pmatrix}$$

$$\omega = \sqrt{k}$$

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

- Kg strength now allowed (definition via  $B_{sol}$  still permitted)
  - Dependant on manually defined constants – CLHEP preferred



- Minor Gabor lens strength adjustments required

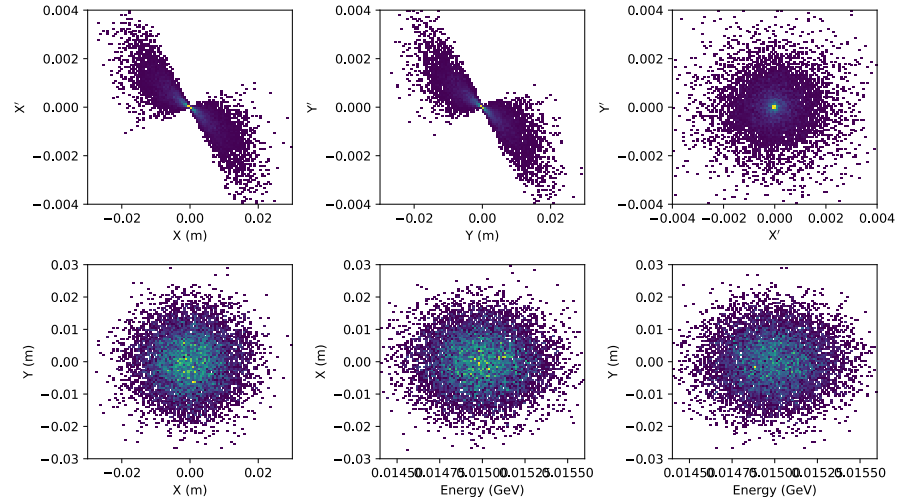
# Gabor Lens Strength Updates

- Tweaks only to **some** Gabor lens fields needed.
  - Unsure why - investigating
- Manual iteration, cumulatively.

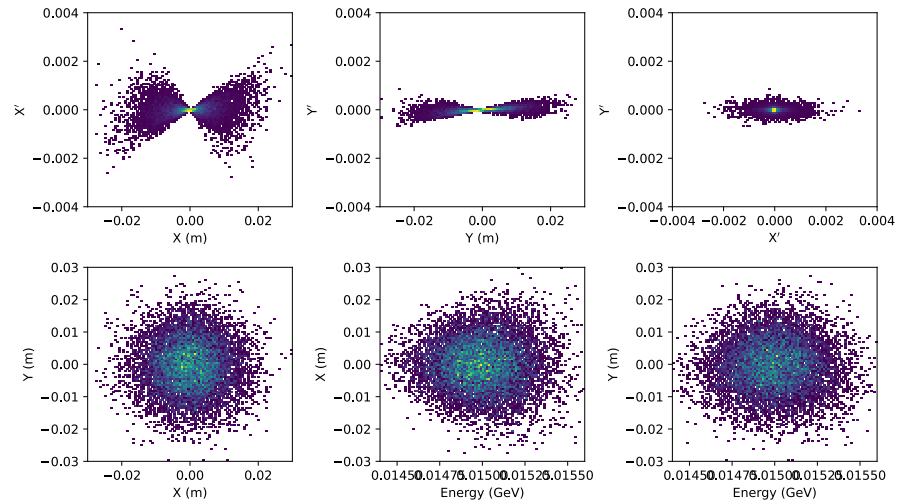
Solenoid / Gabor Lens	Solenoid (Design parameters)		Gabor Lens (simulation optimized)		
	KS	B [T]	B [equivalent]	$\Delta B/B$ (%)	Kg
1	2.4917	1.4000	1.3850	<b>1.07</b>	1.5433
2	1.0187	0.5724	0.5724	<b>0</b>	0.2636
3	1.4486	0.8139	0.8120	<b>0.23</b>	0.5304
4	1.7889	1.0051	1.0051	<b>0</b>	0.8126
5	1.6043	0.9014	0.8750	<b>2.929</b>	0.6160
6	1.2448	0.6994	0.6994	<b>0</b>	0.3936
7	1.1660	0.6551	0.6450	<b>1.54</b>	0.3347

# End Station Phase Space

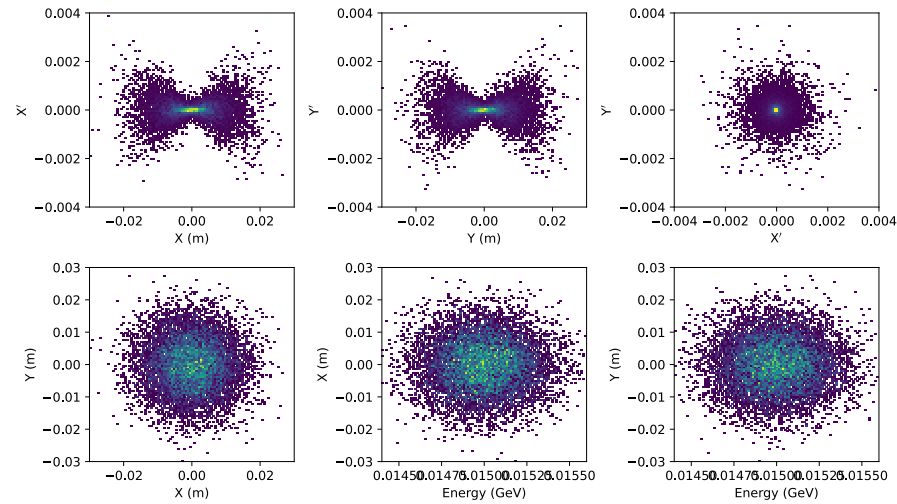
## Gabor Lens



## R-Matrix



## Solenoid



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