Solenoid Model Status Update

Nov 2018

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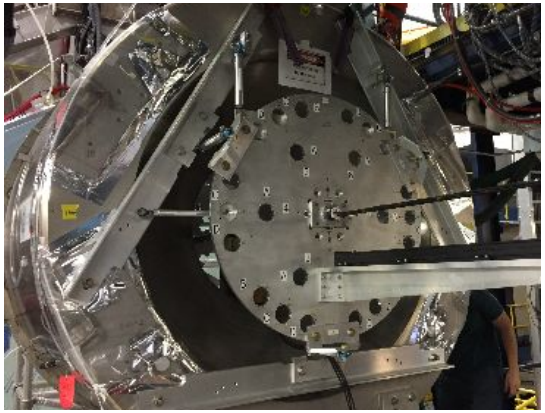
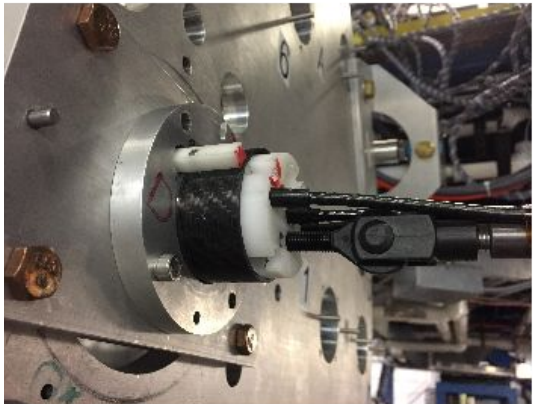
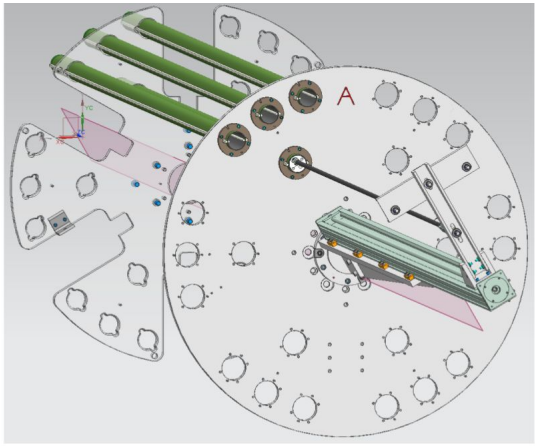
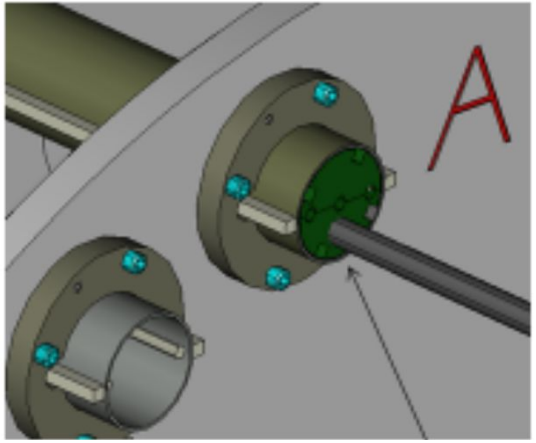
with help from Mac Mestayer, Ruben Fair and
Renuka Rajput-Ghoshal (JLab)

Last Update









Short Runs (middle 10 cm, 1 mm steps)	
Radius (cm)	*Phi*
0	/
1.25	0, 90, 180, 270, 90, 45, 45, 45, 135, 225, 315
Long Runs (full length, 1 cm steps)	
Radius (cm)	*Phi*
0	/
1.25	0, 45, 45, 45, 90, 90, 135, 180, 225, 270, 315
30	0, 90, 270
Long Runs (probe rotated in place)	
Radius (cm)	*Phi*
0	/
1.25	90
30	0

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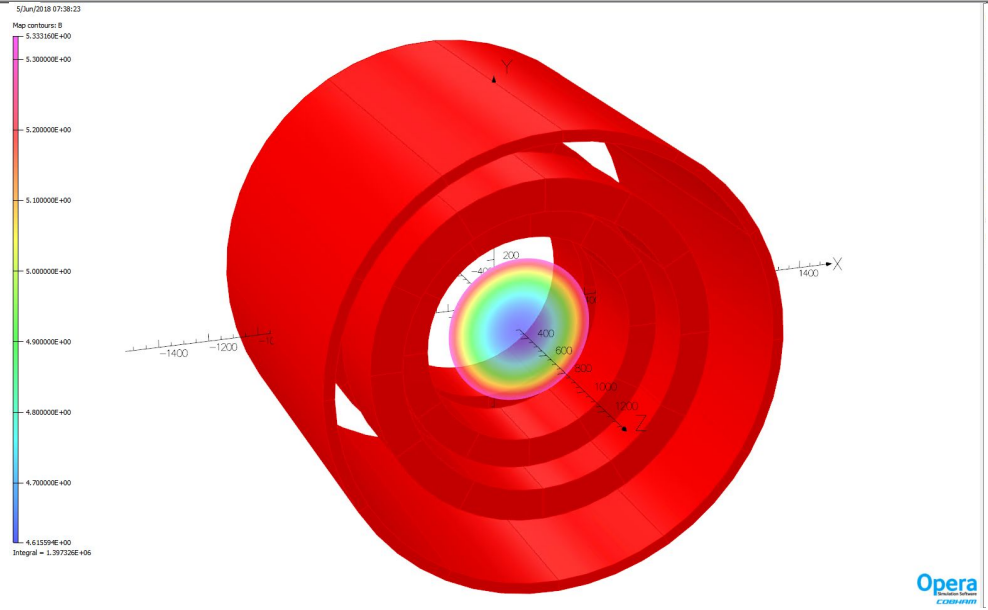
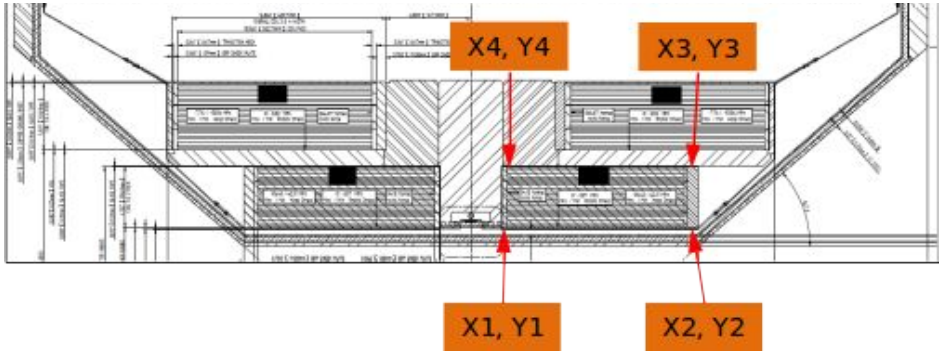




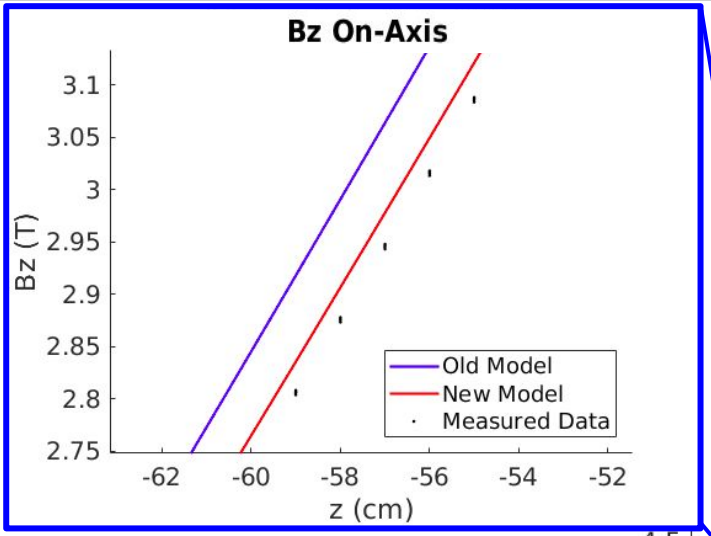
Ruben Fair

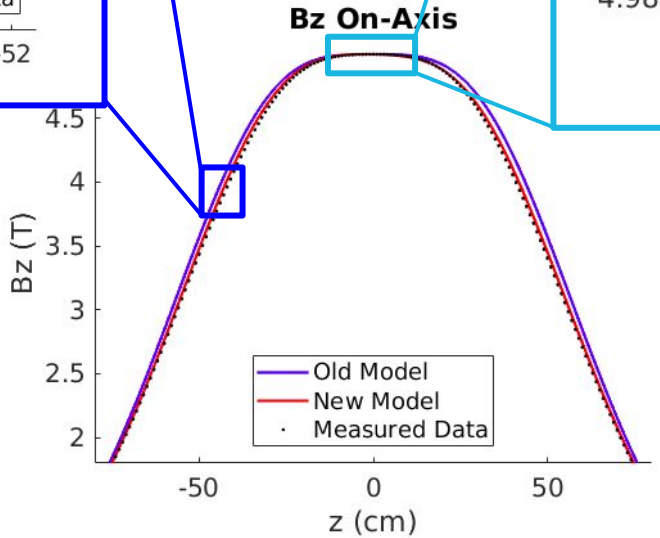
INCLUDED:
(i) AS-WOUND DIMENSIONS
(ii) CONTRACTION TO 4.2 K (AXIAL AND RADIAL)
(iii) C1, C2, C3, C4 MOVEMENT IN Z DUE TO ENERGIZATION

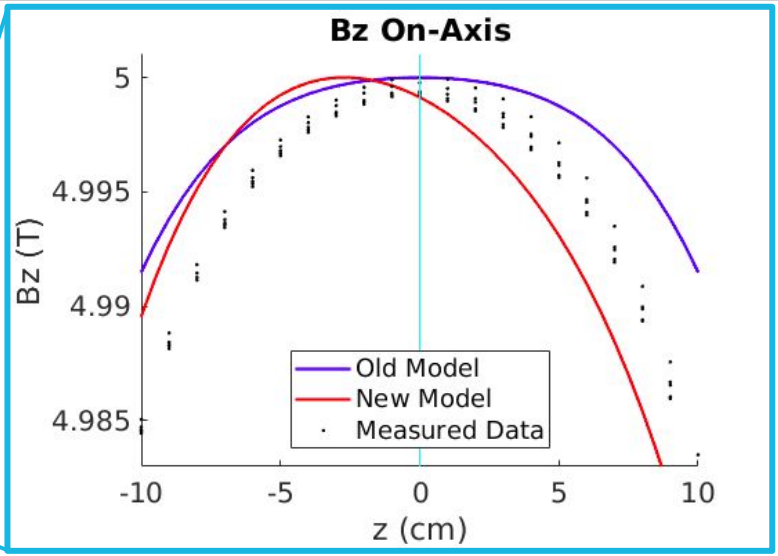
NOT INCLUDED:
(i) RADIAL COIL DEFORMATION DUE TO ENERGIZATION
(ii) COIL DEFORMATION DUE TO GRAVITATIONAL LOADS
(iii) COIL DISPLACEMENTS DUE TO BUILD OR TRANSPORT
(iv) COIL MOVEMENTS RELATIVE TO ONE ANOTHER DURING COOL DOWN AND/OR ENERGIZATION

	Copper +St. St. contraction COLD - New Model, Cu+SS			Copper +St. St. contraction COLD - New Model, Cu+SS		
Coil No	ID (mm)	OD (mm)	LG (mm)	dID (mm)	dOD (mm)	dLG (mm)
1	854.71	1089.35	346.82	-2.79	-3.56	-1.13
2	853.27	1089.00	346.82	-2.79	-3.56	-1.13
3	1160.12	1415.41	381.48	-3.45	-4.62	-1.25
4	1157.48	1415.31	381.48	-3.45	-4.62	-1.25
5	1800.34	1892.47	1508.18	-5.38	-6.18	-4.93

Last Update



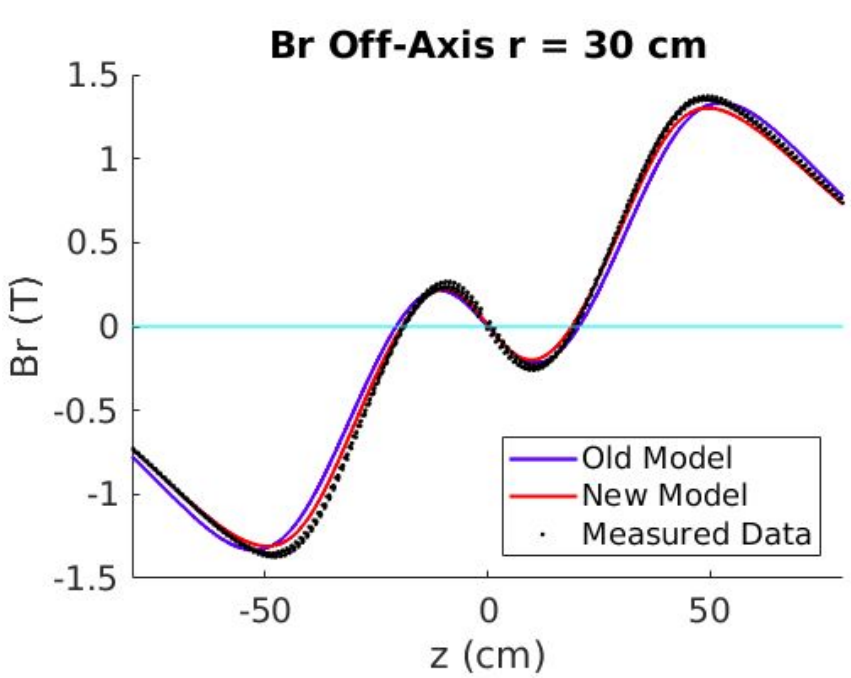


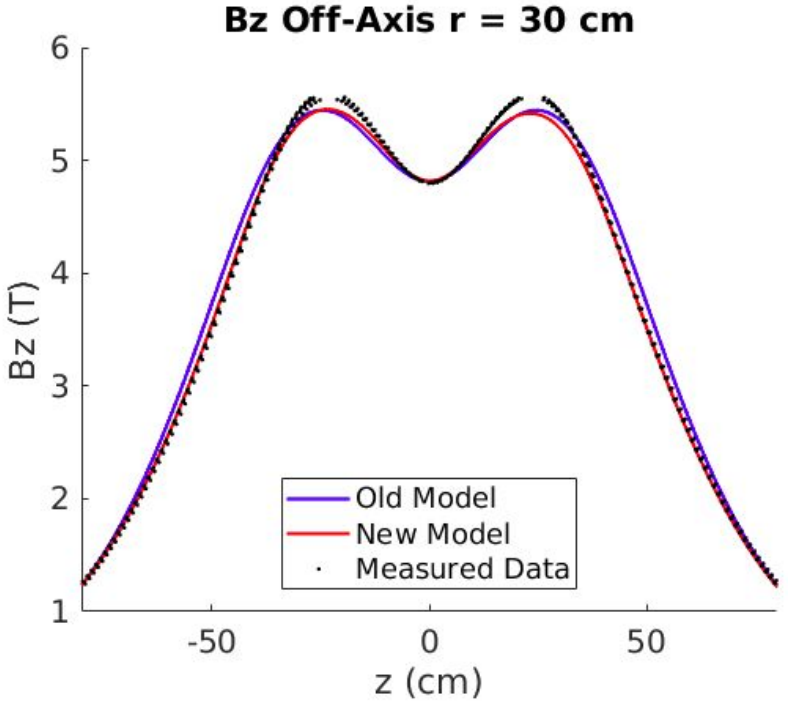


New (June) model (red) fit the data (black) more closely on the sides and the overall shape...

...but, in the central region, there was an asymmetry that could not corrected for.

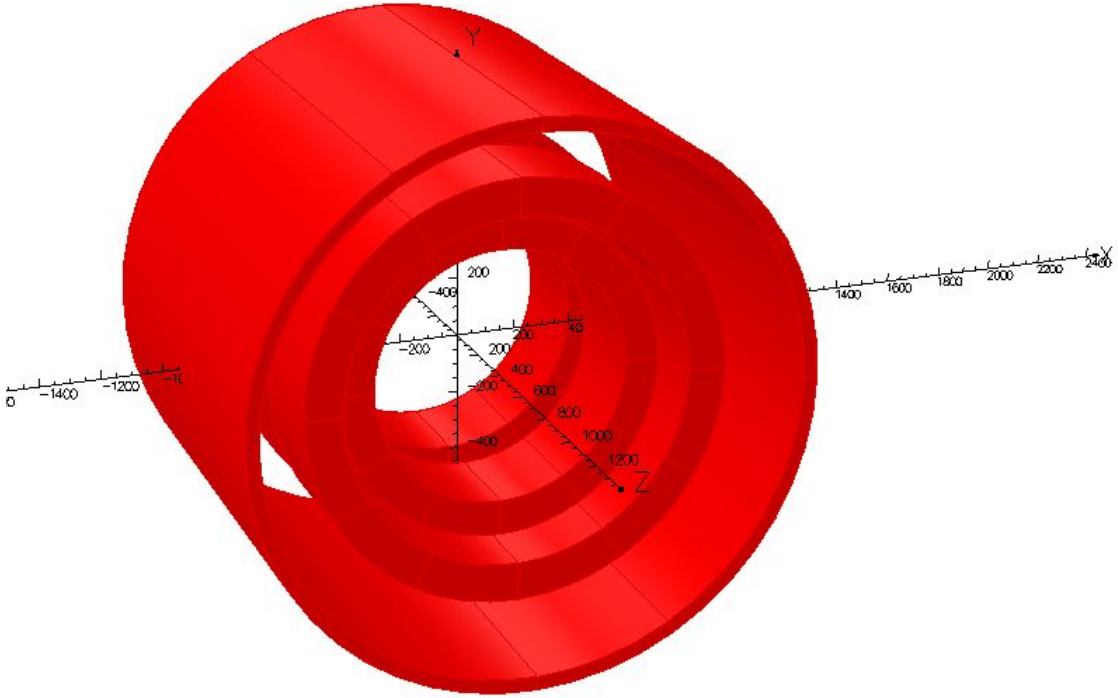
Last Update





Both old and new models were unable to account for the data far off-axis (r = 30 cm).

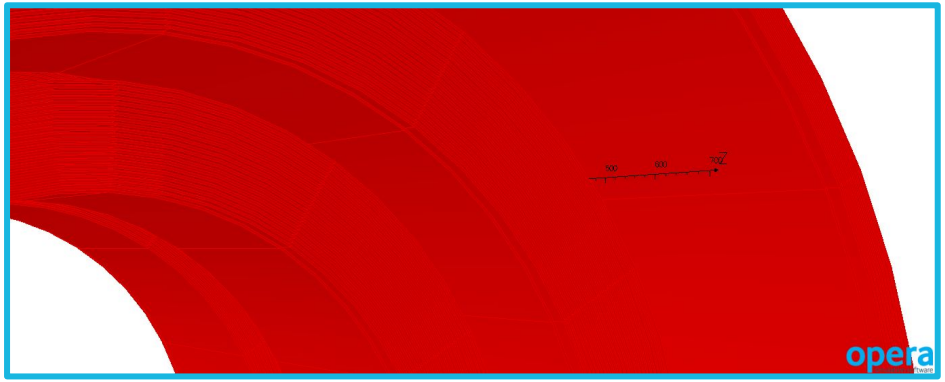
New Work

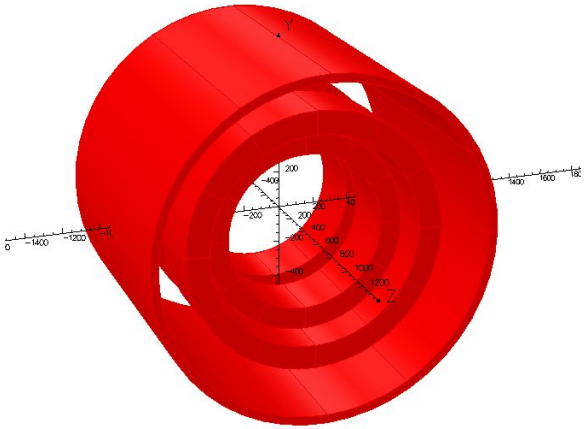


opera simulation software

After last meeting: received models and began work on updating them to agree with measured data.

Opera Models

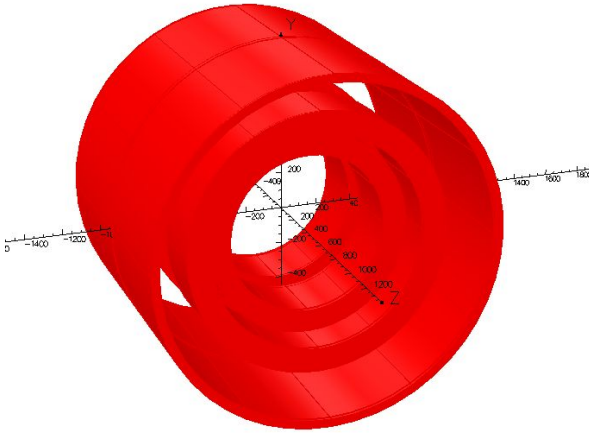




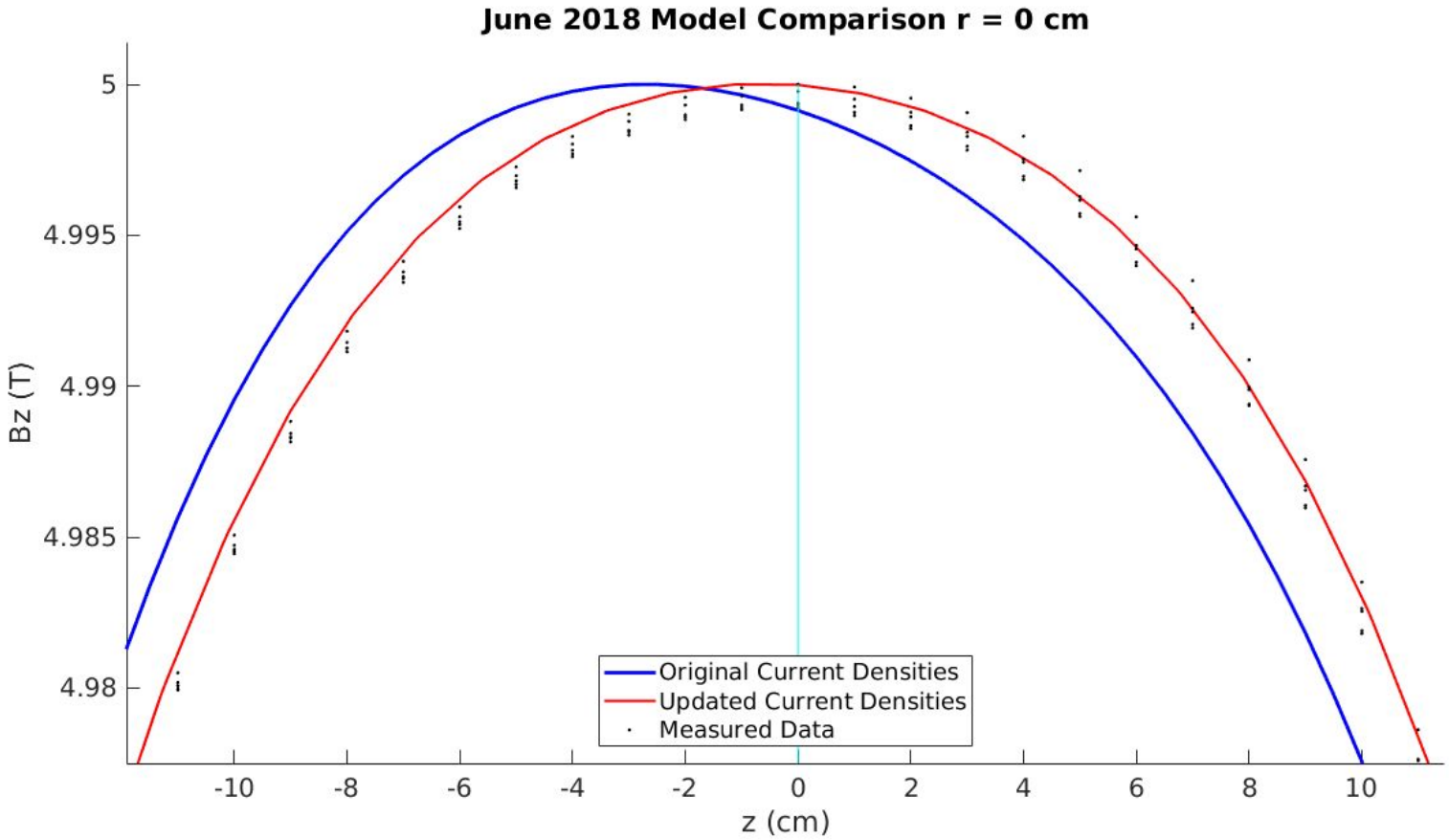
Solenoid modelled using Opera-3D software.

‘Conductors’ defined by cross sectional area and current density.

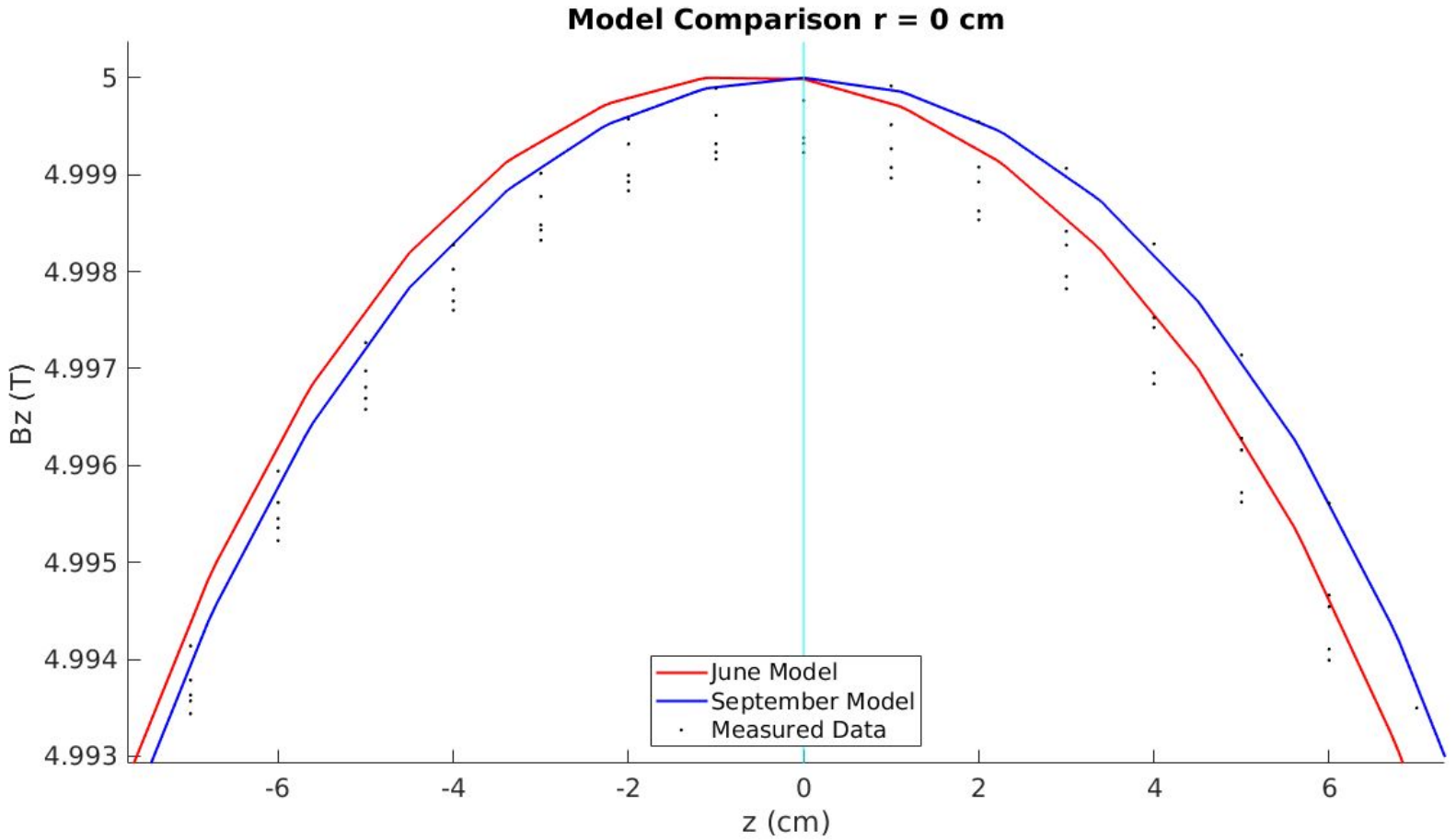
Two base models available.



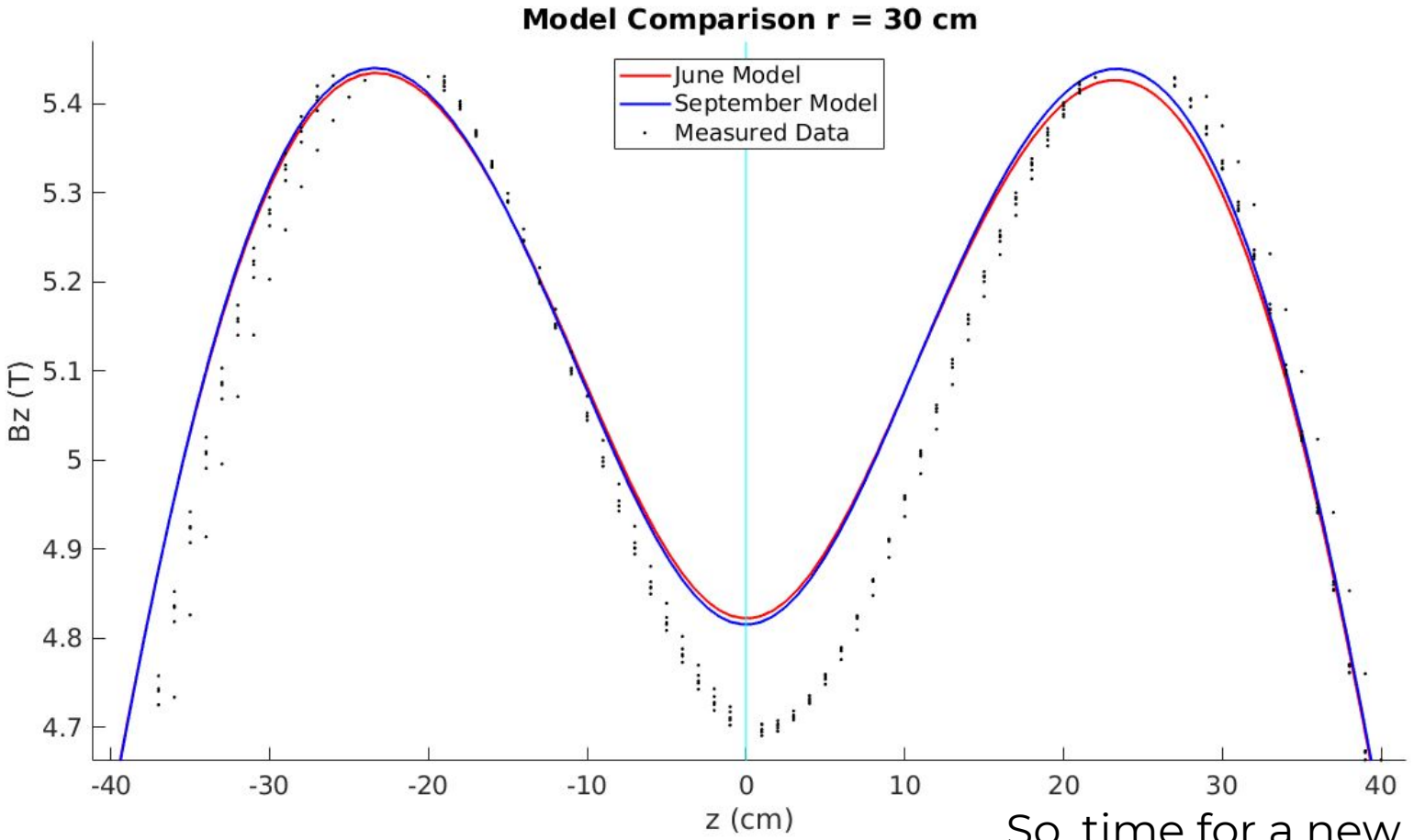
June Model Updated



Two Models Agree

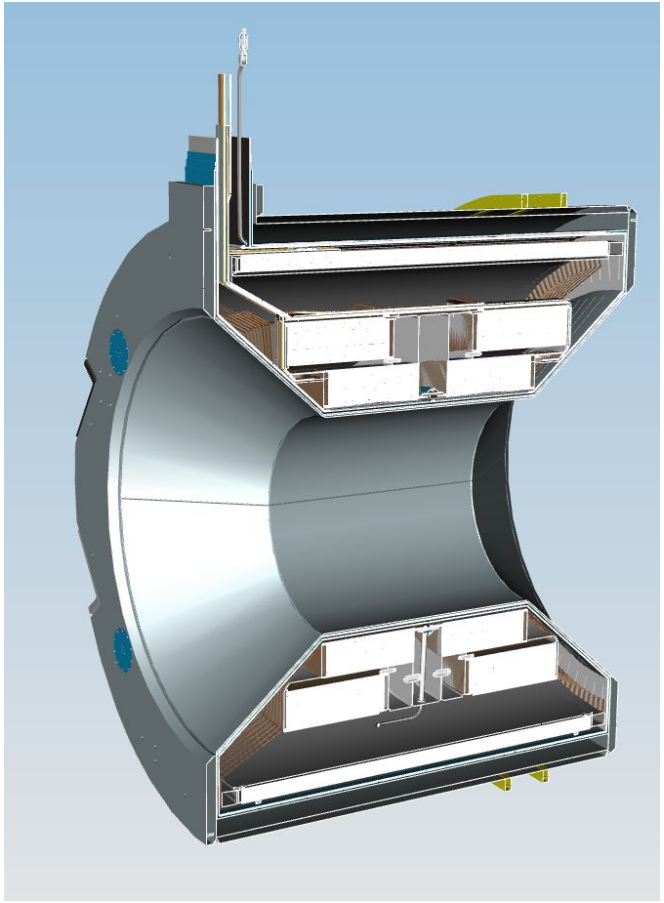


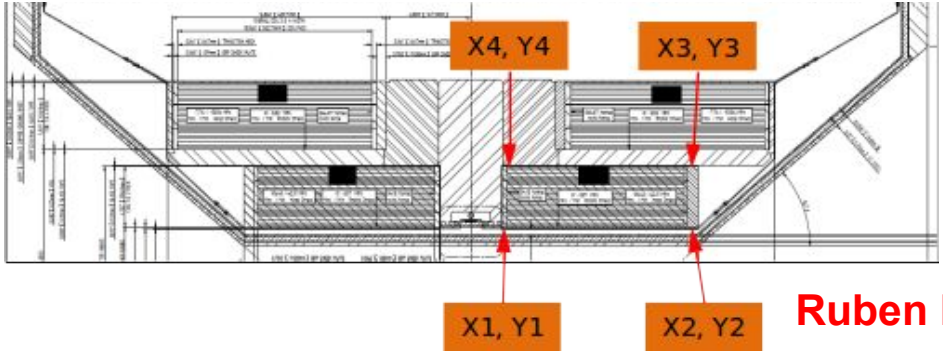
Far Off Field



So, time for a new model...

Solenoid Design





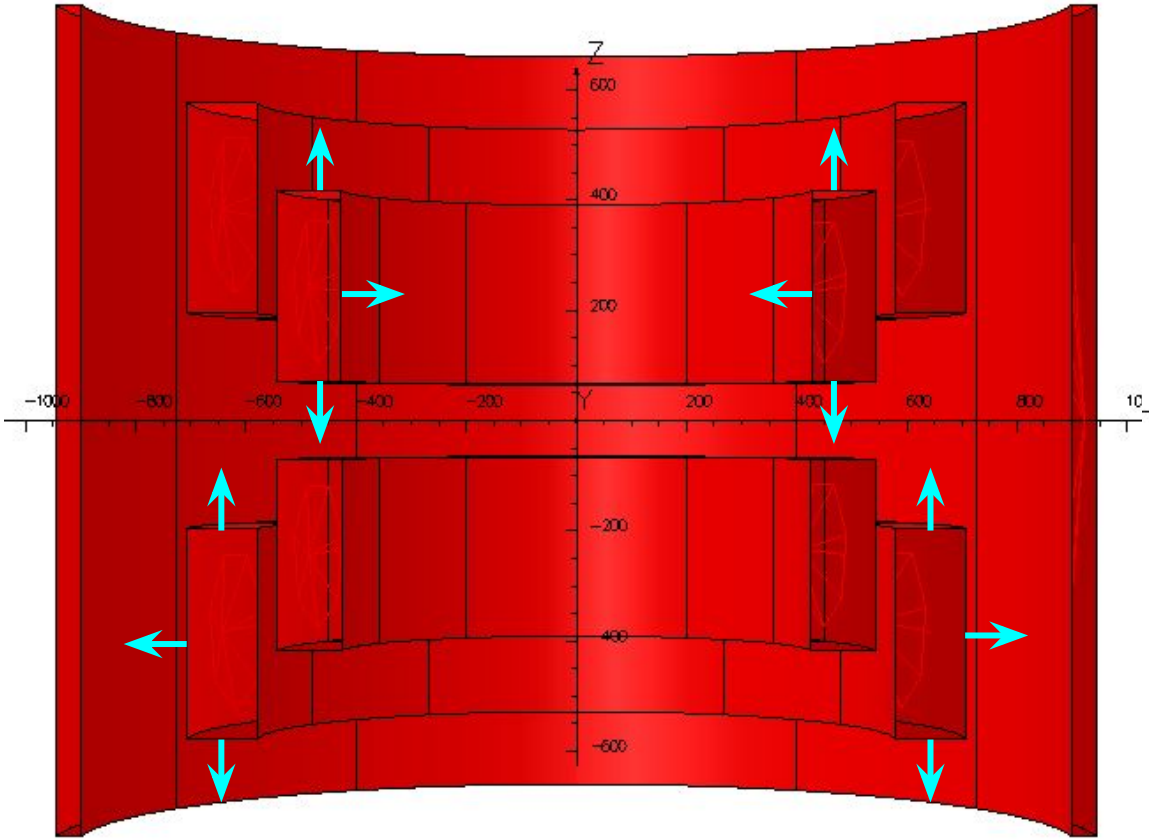
Ruben Fair

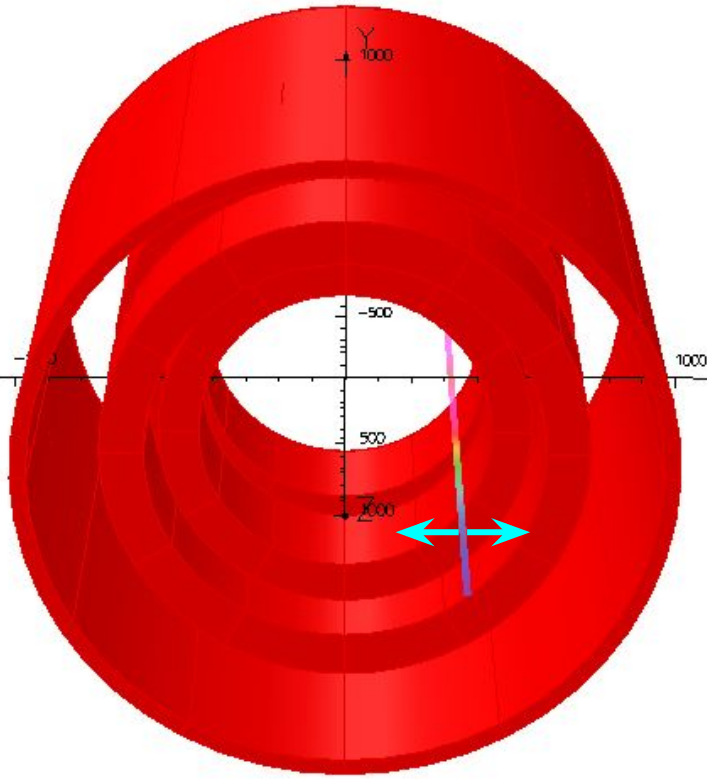
John Hogan

Solenoid design: Two bobbins holding five coils.

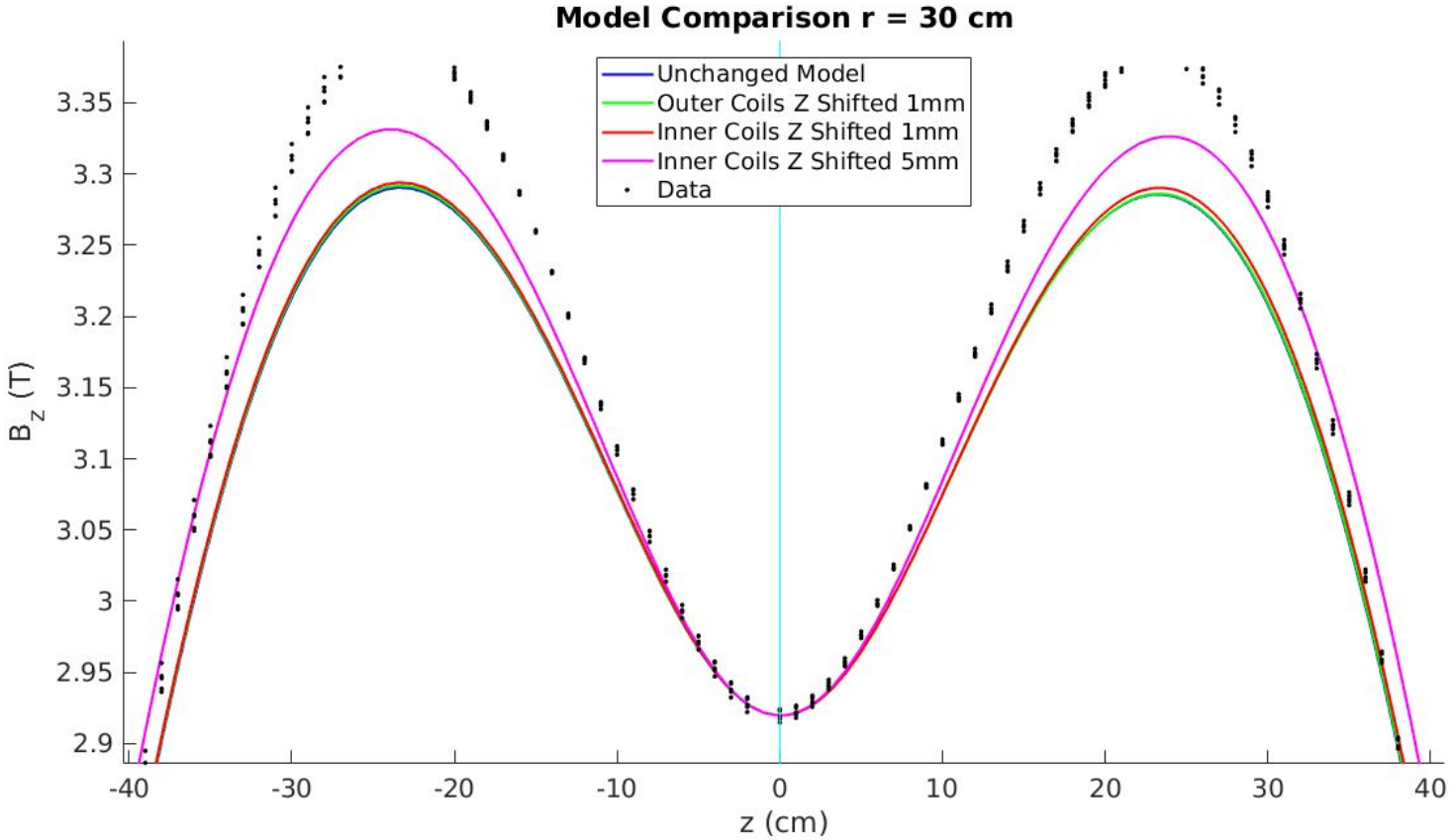
Some coils more restricted than others.

Model Parameters

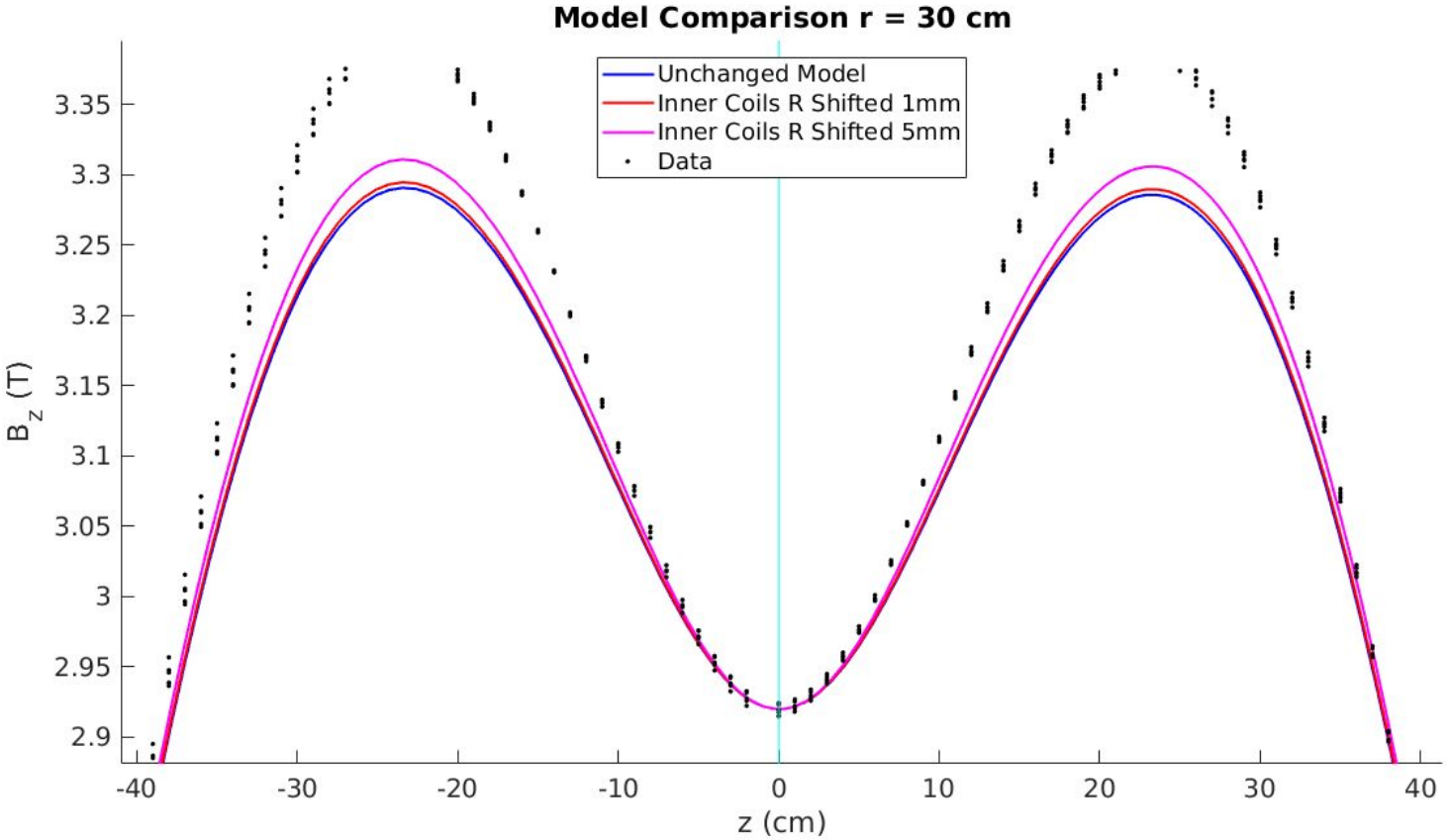




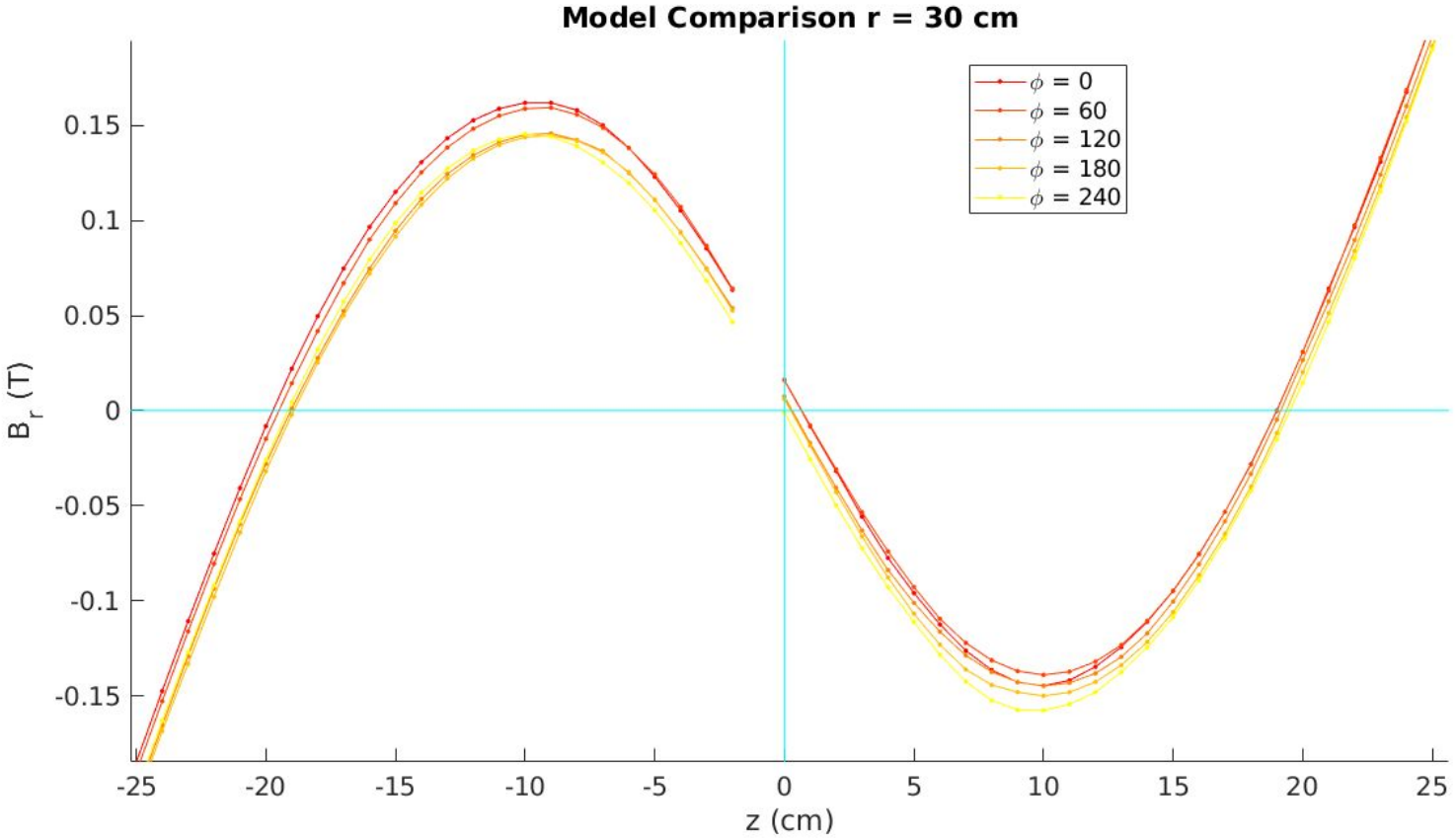
Shifting Coils in Z



Shifting Coils in R



Adjusting Radius of Measurement



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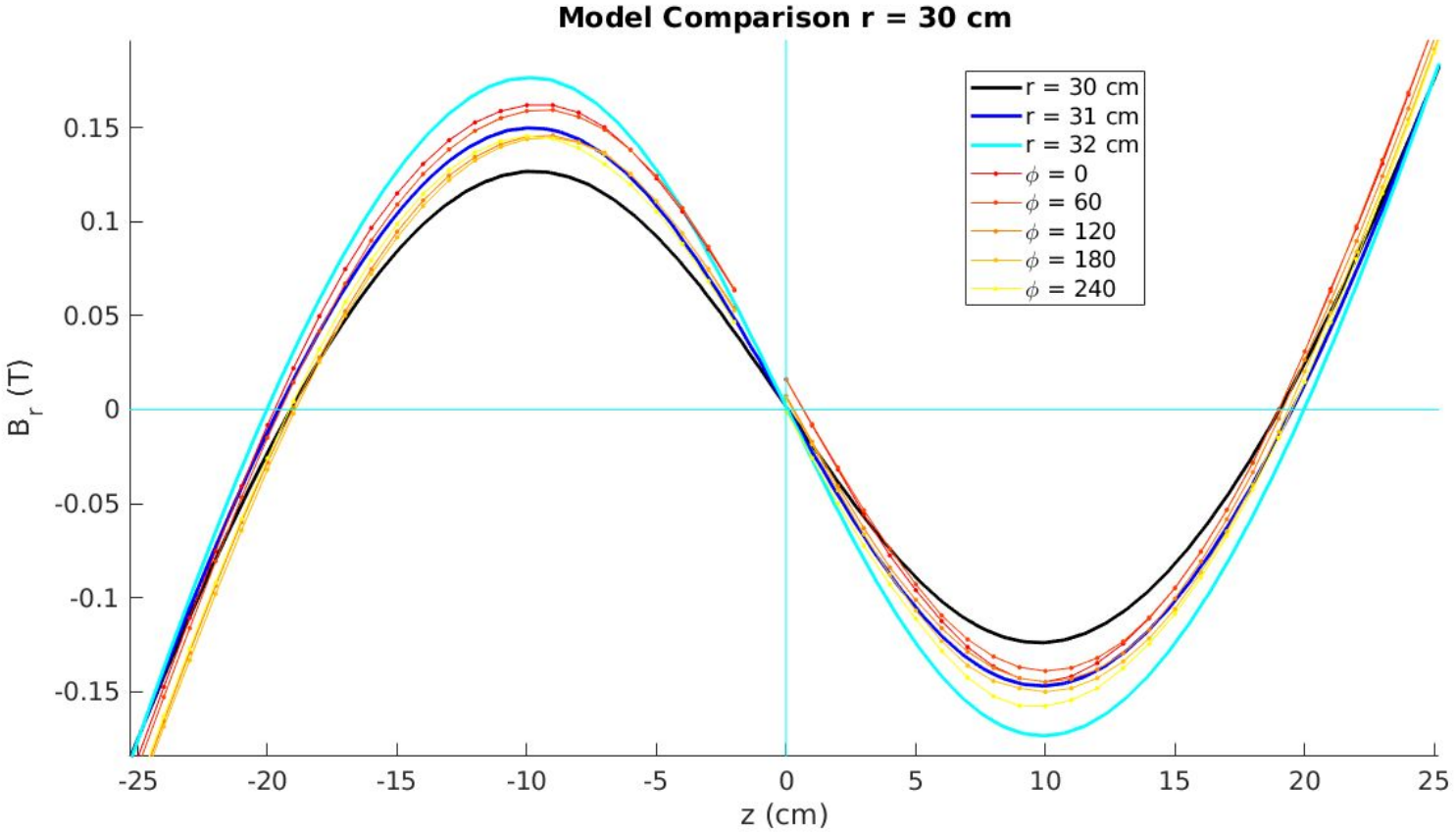

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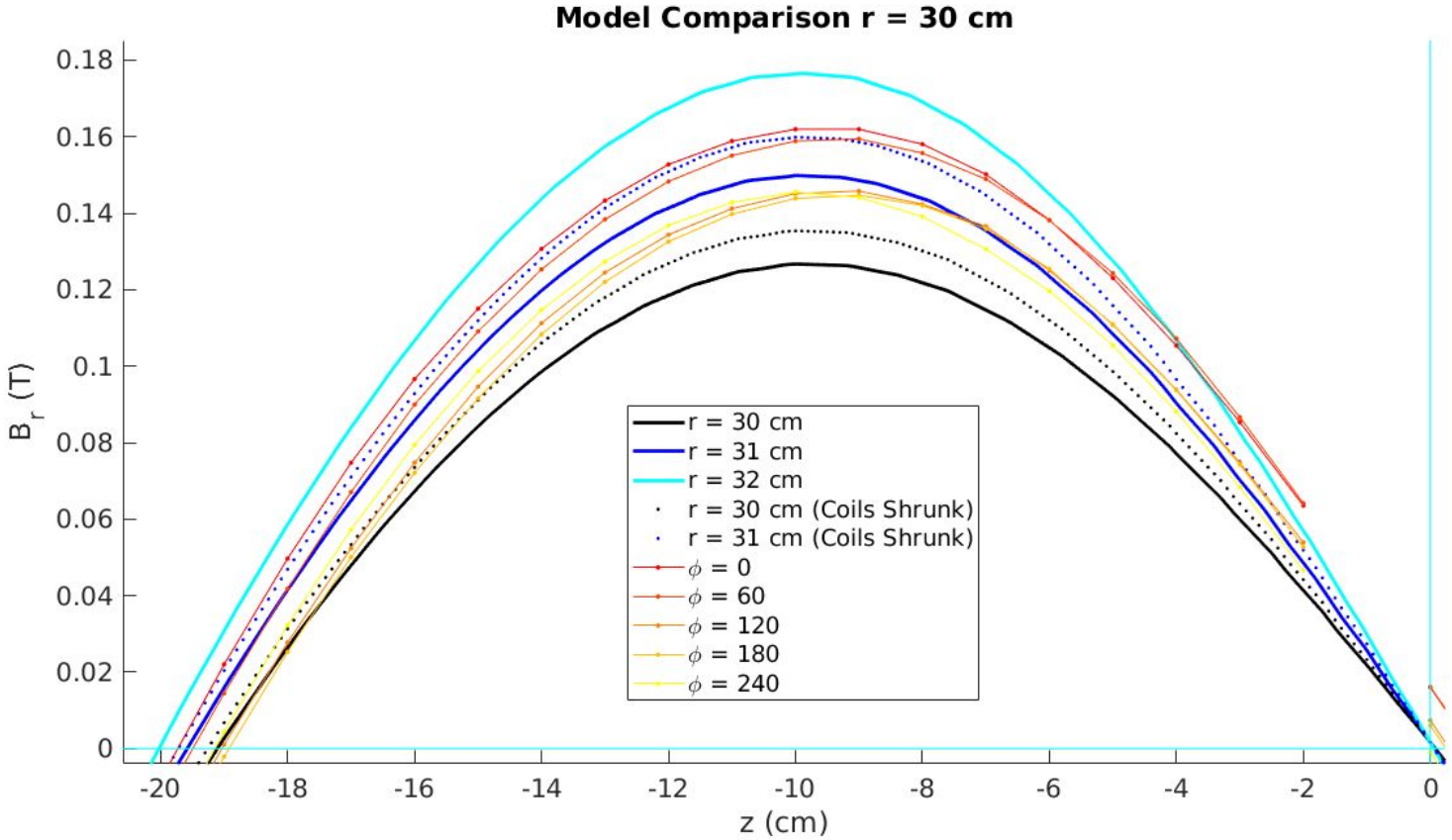
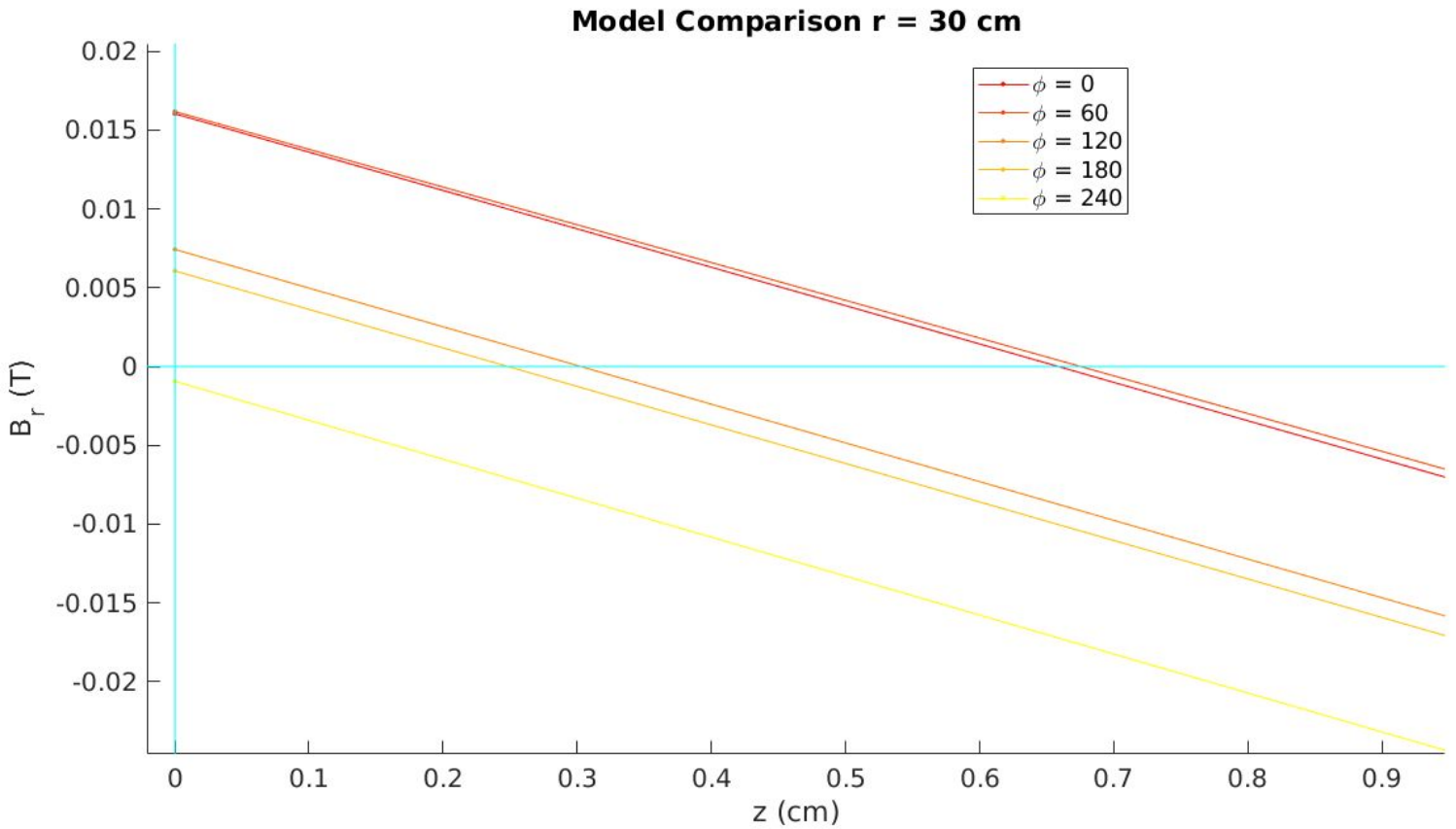
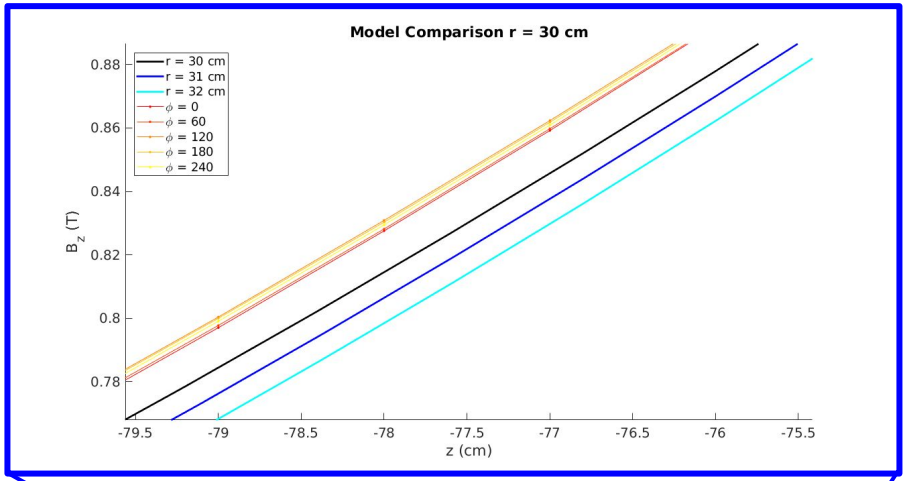
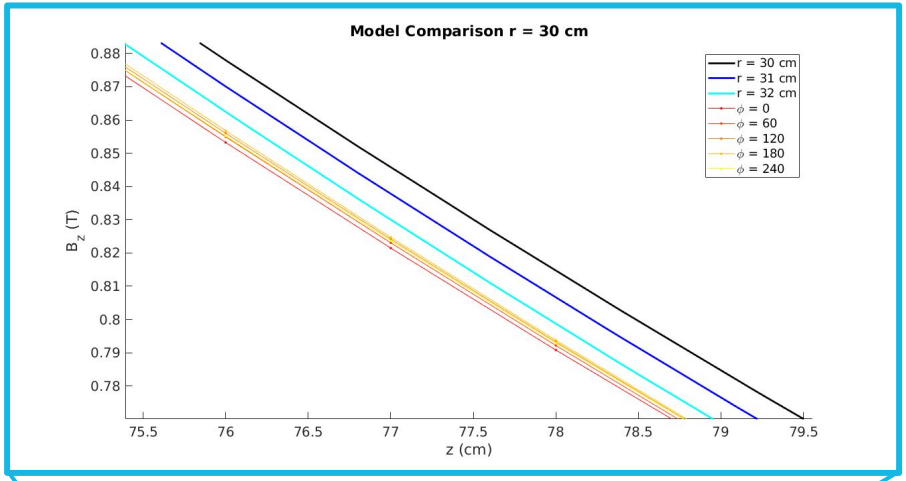


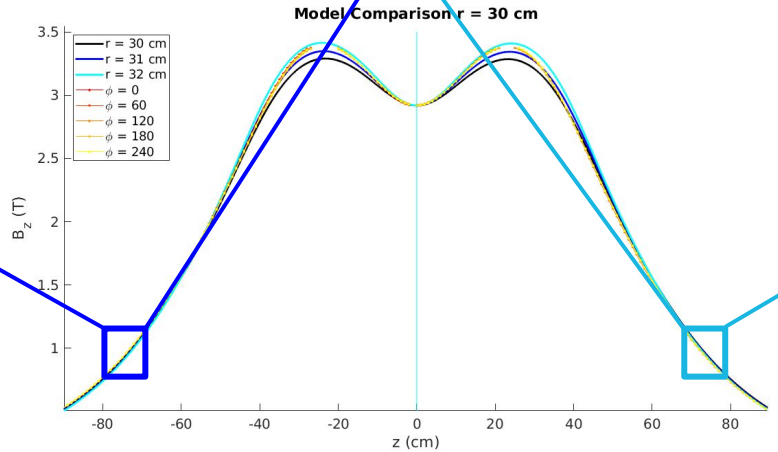
Asymmetry Needed



Asymmetry Needed







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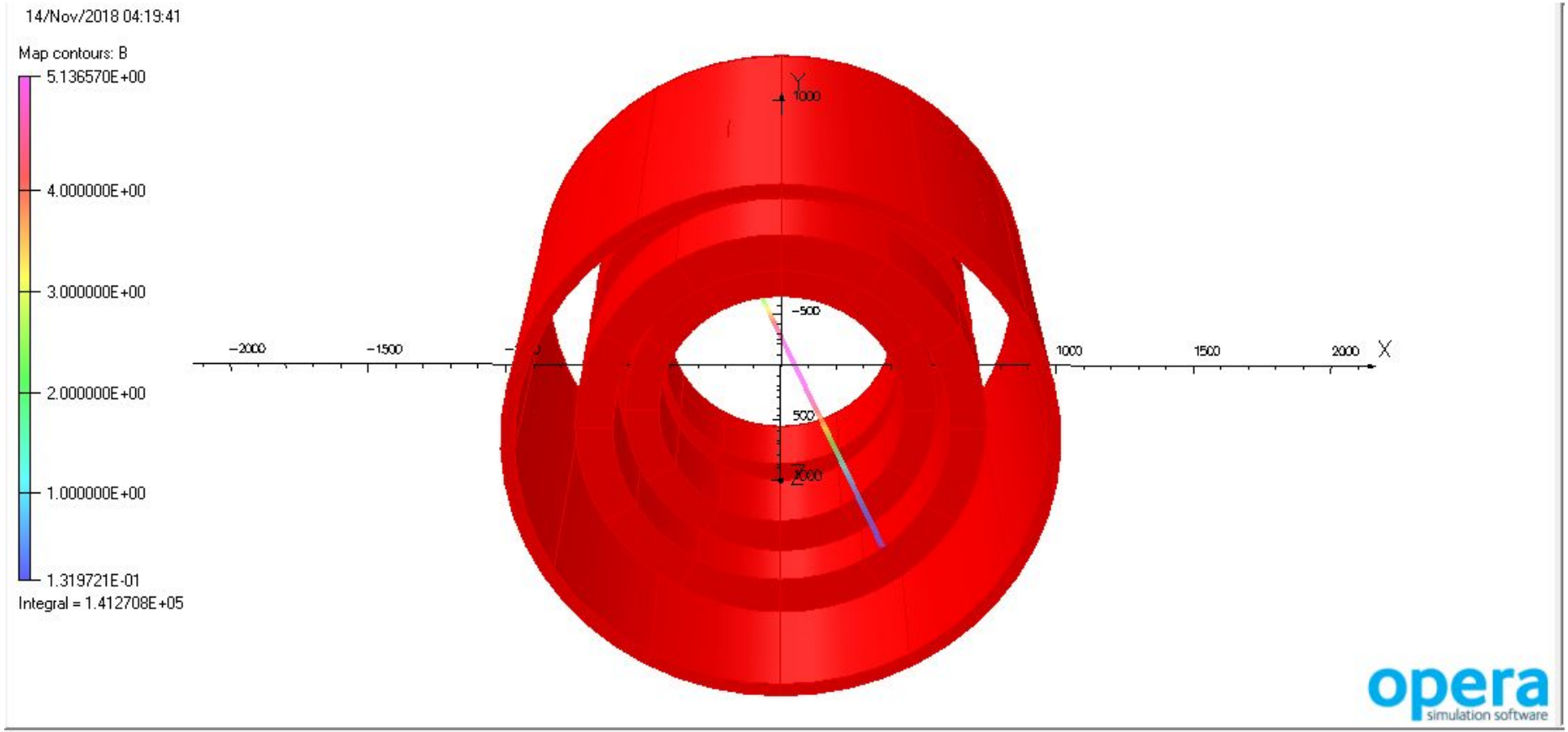

Needed Next

- Narrow down permissible range of current scaling
- Determine exact probe position relative to model
- Establish boundaries in coil movements to limit number of simulations
- Use on-axis comparisons to reduce redundant parameters
- Use similar technique used for Torus modelling