Solenoid Magnetic Field: Comparison with the Measurements (Update)

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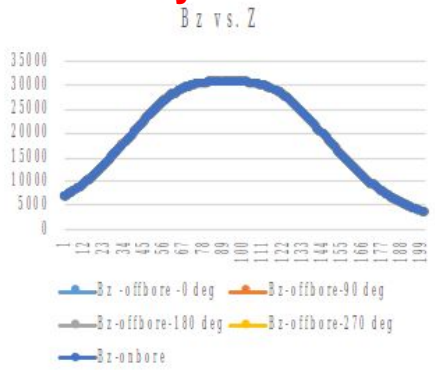
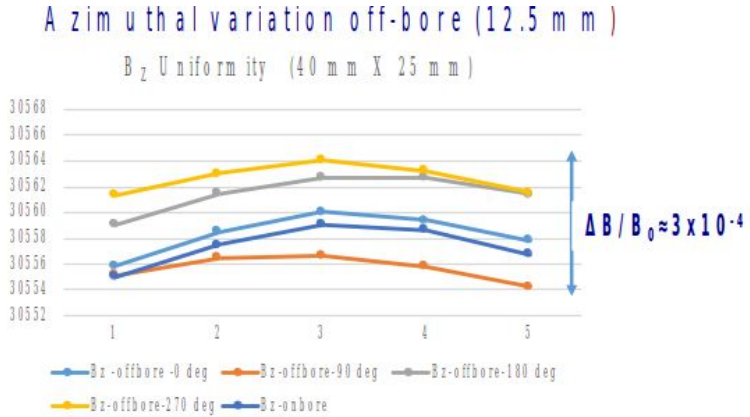
Sebastian Kuhn (ODU)
with help from Mac Mestayer, Ruben Fair and
Renuka Rajput-Ghoshal

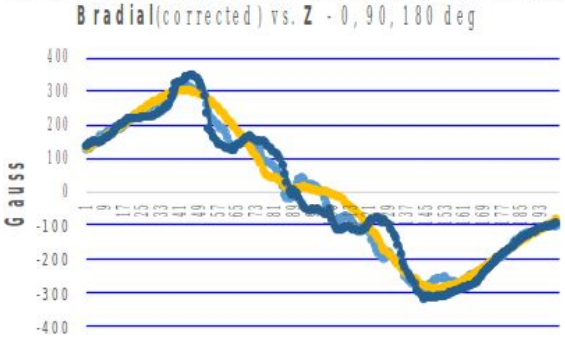
Last Update

Magnetic field measurements

Mac Mestayer







Equality of the off-axis radial components to +/- 30 Gauss
à Survey axis agrees with magnetic axis within 2 mm (preliminary).

Followed the initial max field test in September 2017

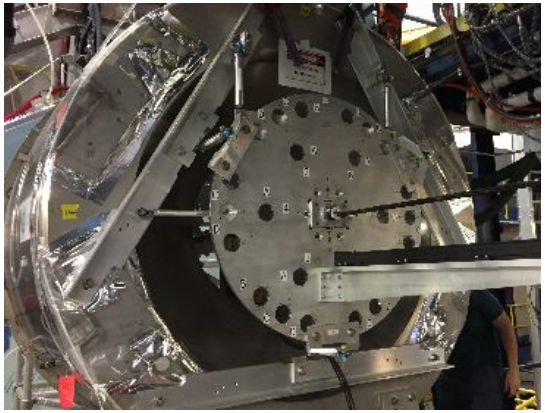
Most with reduced field (1450 A = 3 T)

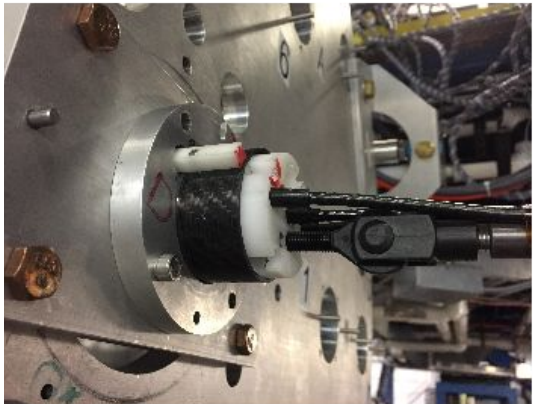
Measurements with 3D Hall probes along z

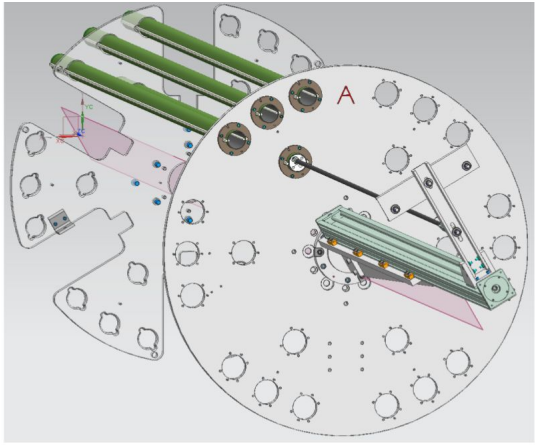
Roughly 50 “runs” at various positions in r and phi, and various orientations of the Hall probes

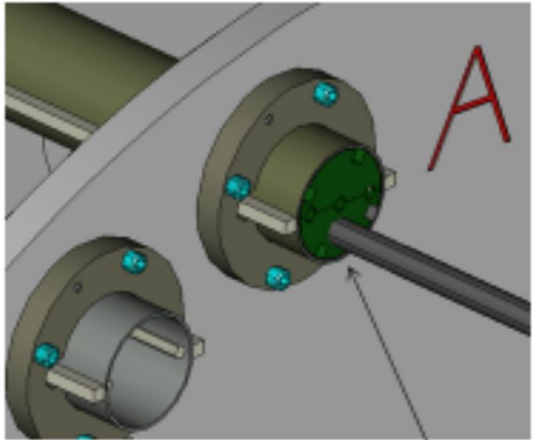
Some “long” (about 2 m) and some short (20 cm) runs.

Last Update



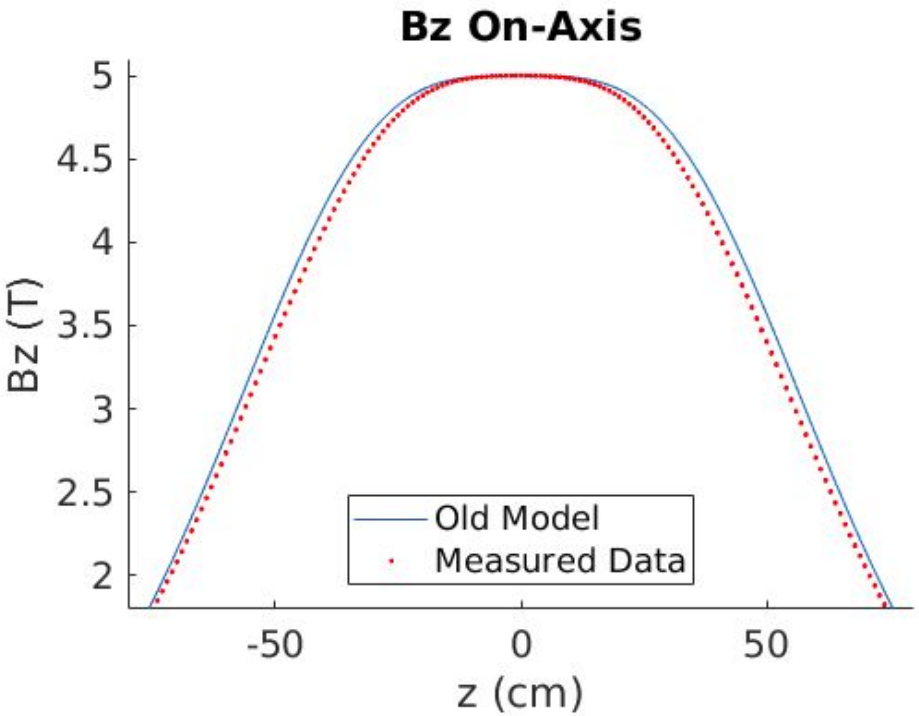


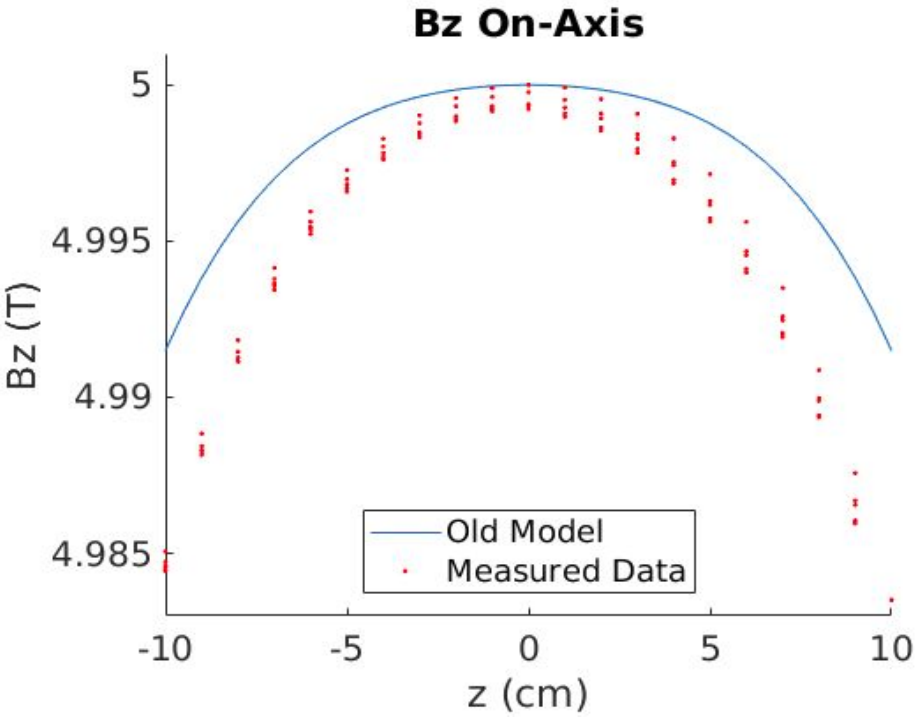




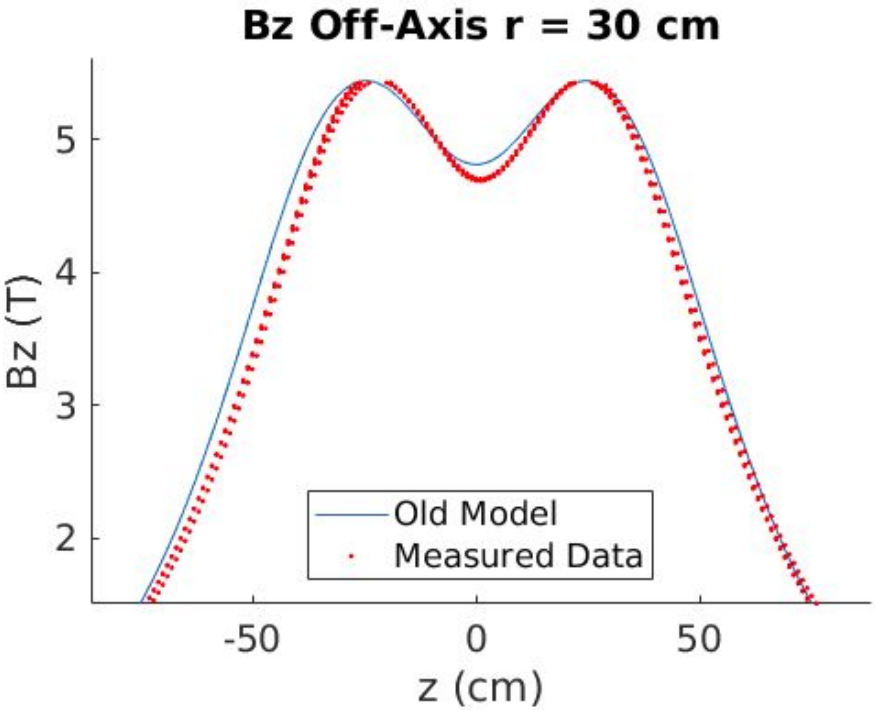
Short Runs (middle 10 cm, 1 mm steps)	
Radius (cm)	*Phi*
0	/
1.25	0, 90, 180, 270, 90, 45, 45, 45, 135, 225, 315
Long Runs (full length, 1 cm steps)	
Radius (cm)	*Phi*
0	/
1.25	0, 45, 45, 45, 90, 90, 135, 180, 225, 270, 315
30	0, 90, 270
Long Runs (probe rotated in place)	
Radius (cm)	*Phi*
0	/
1.25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

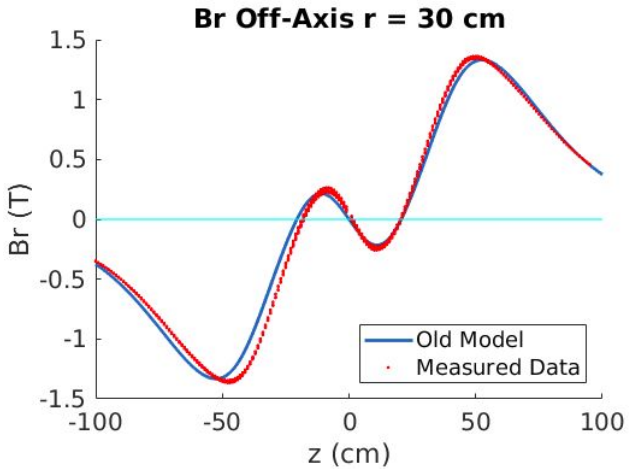
Old Model On-Axis

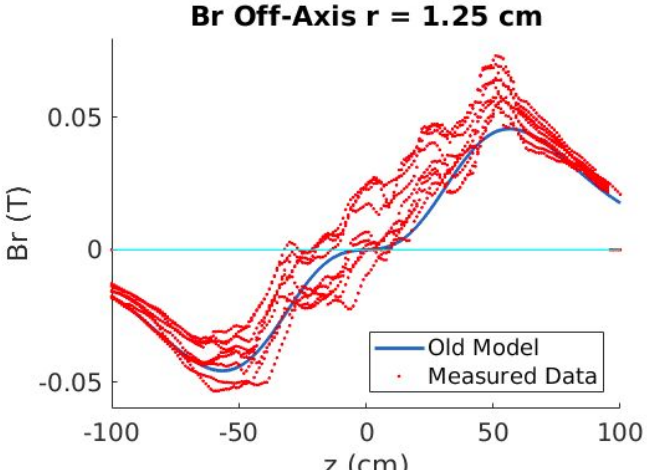




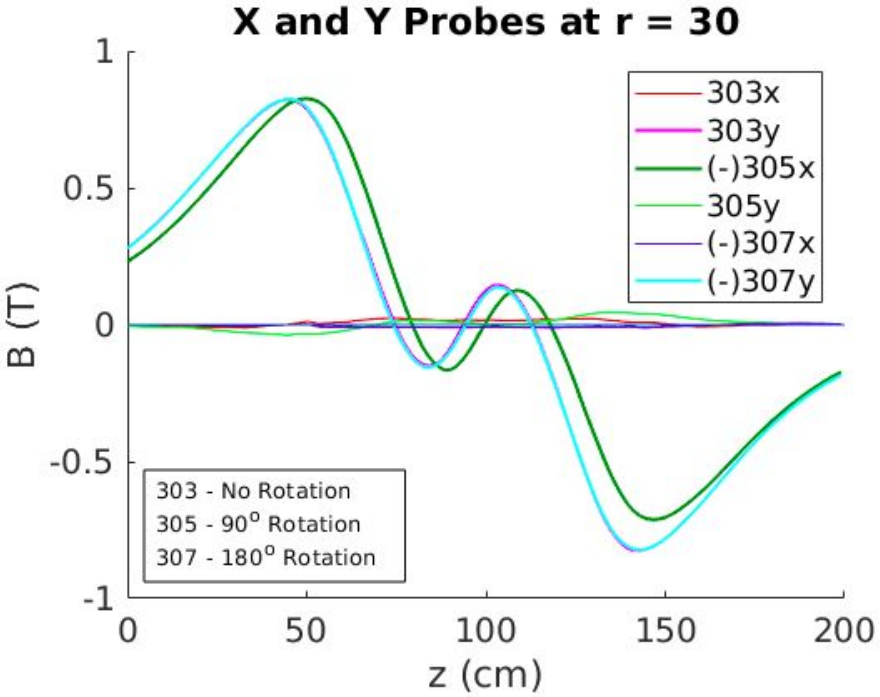
Old Model Off-Axis

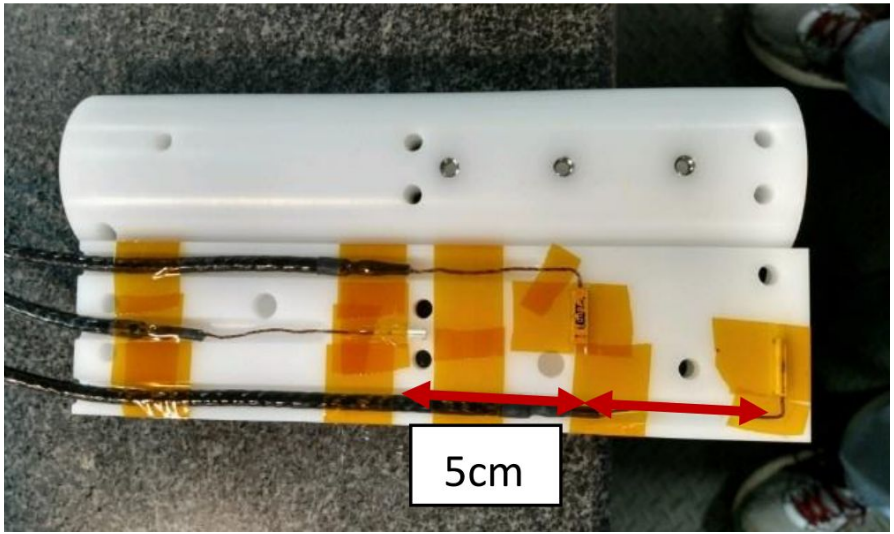




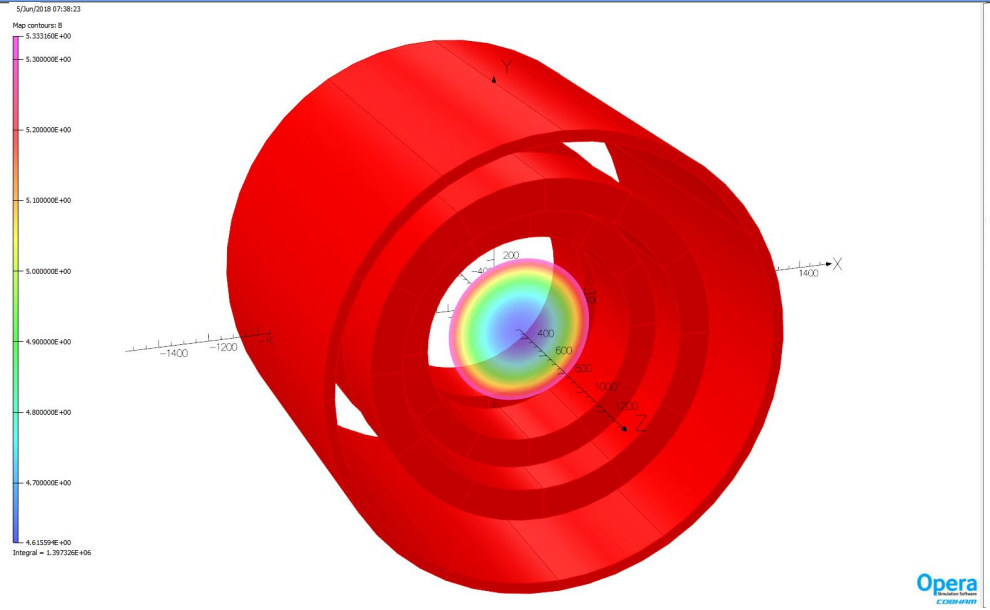


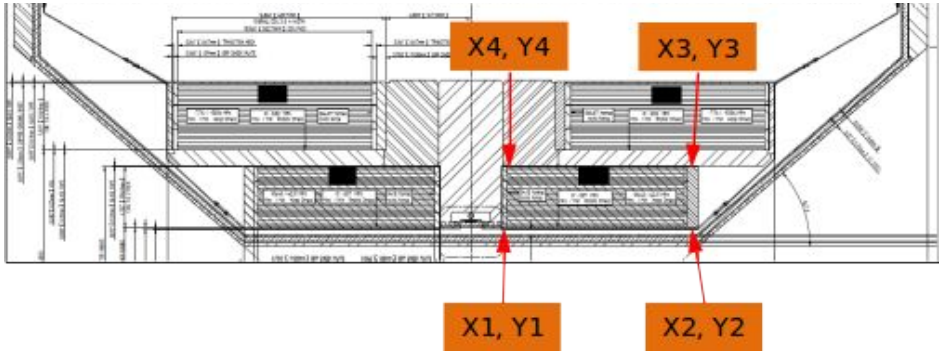
Probe Displacement





New Simulation





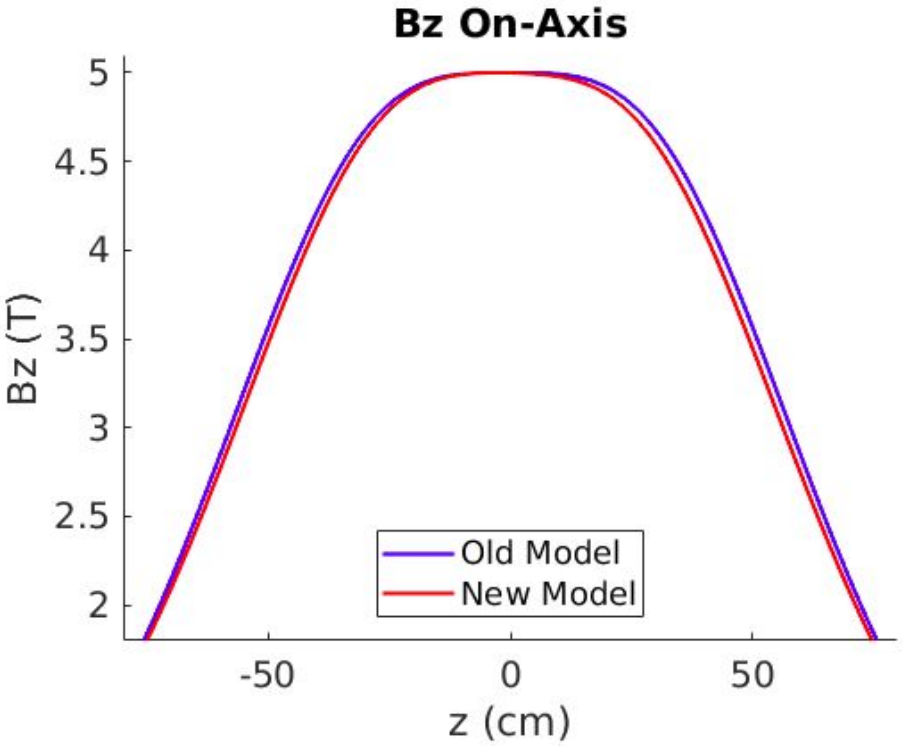
Ruben Fair

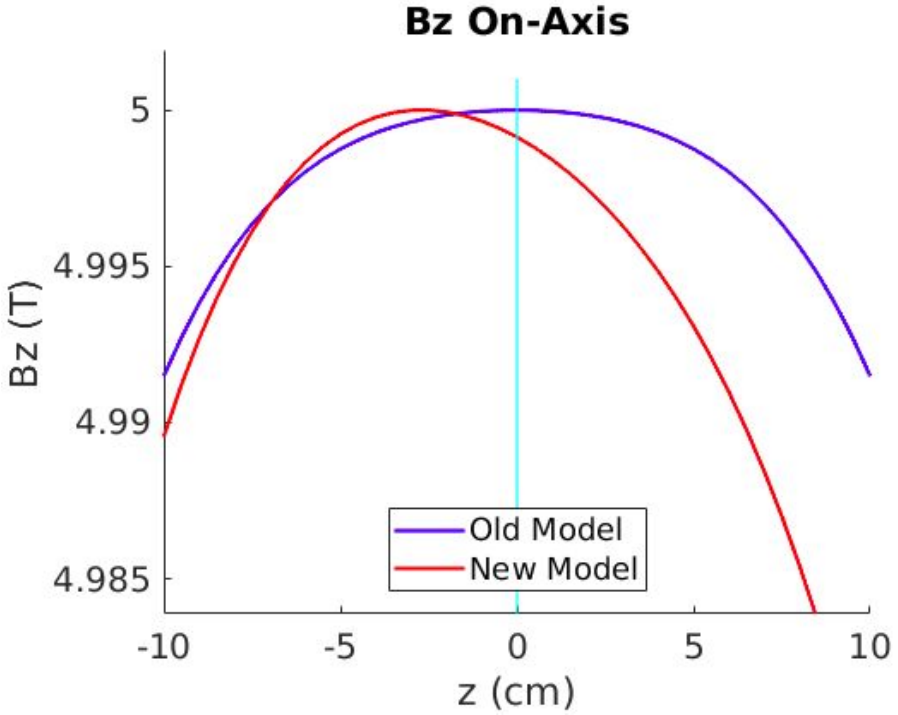
INCLUDED:
(i) AS-WOUND DIMENSIONS
(ii) CONTRACTION TO 4.2 K (AXIAL AND RADIAL)
(iii) C1, C2, C3, C4 MOVEMENT IN Z DUE TO ENERGIZATION

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

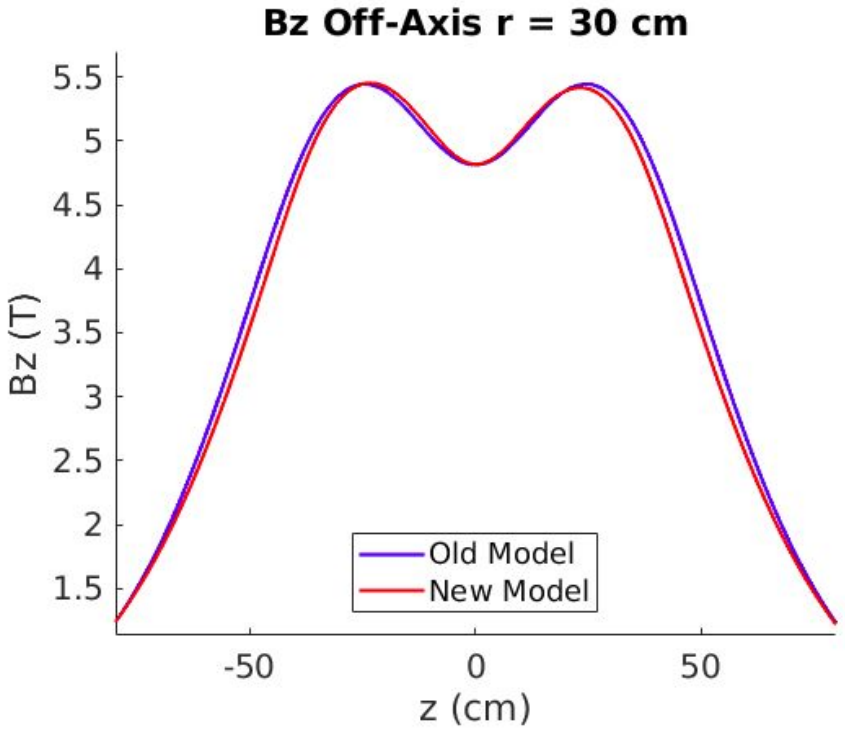
	Copper +St. St. contraction COLD - New Model, Cu+SS			Copper +St. St. contraction COLD - New Model, Cu+SS		
Coil No	ID (mm)	OD (mm)	LG (mm)	dID (mm)	dOD (mm)	dLG (mm)
1	854.71	1089.35	346.82	-2.79	-3.56	-1.13
2	853.27	1089.00	346.82	-2.79	-3.56	-1.13
3	1160.12	1415.41	381.48	-3.45	-4.62	-1.25
4	1157.48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

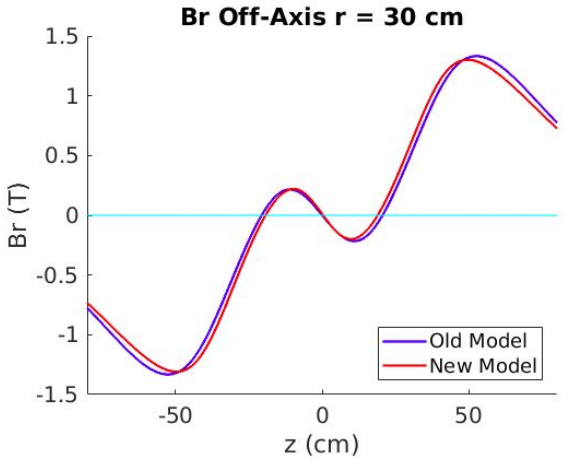
New Model vs. Old Model

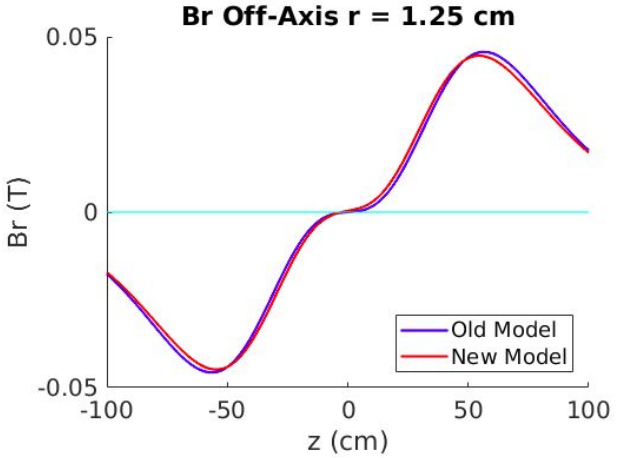




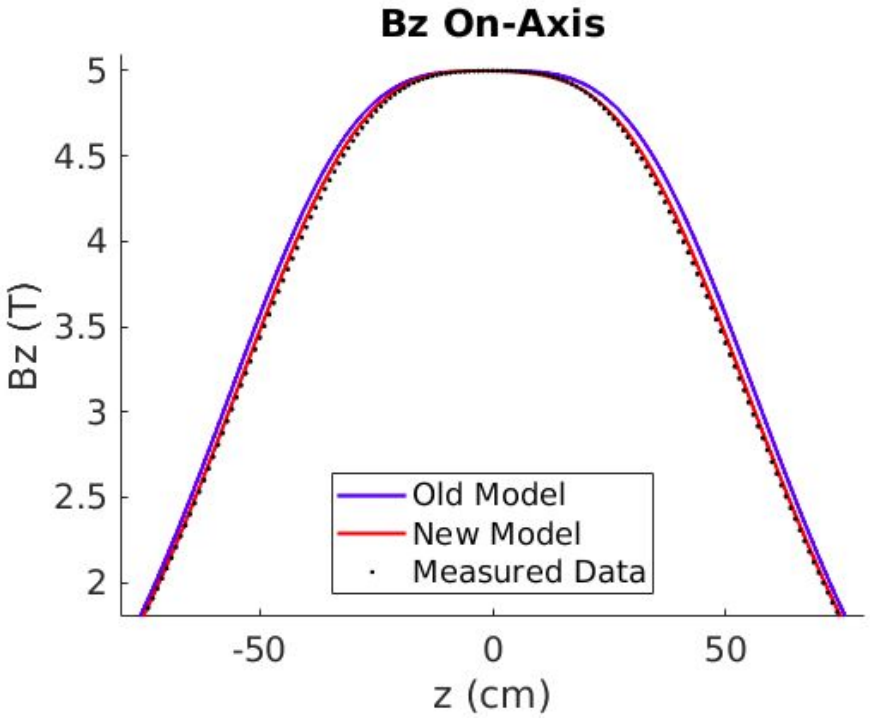
New Model vs. Old Model

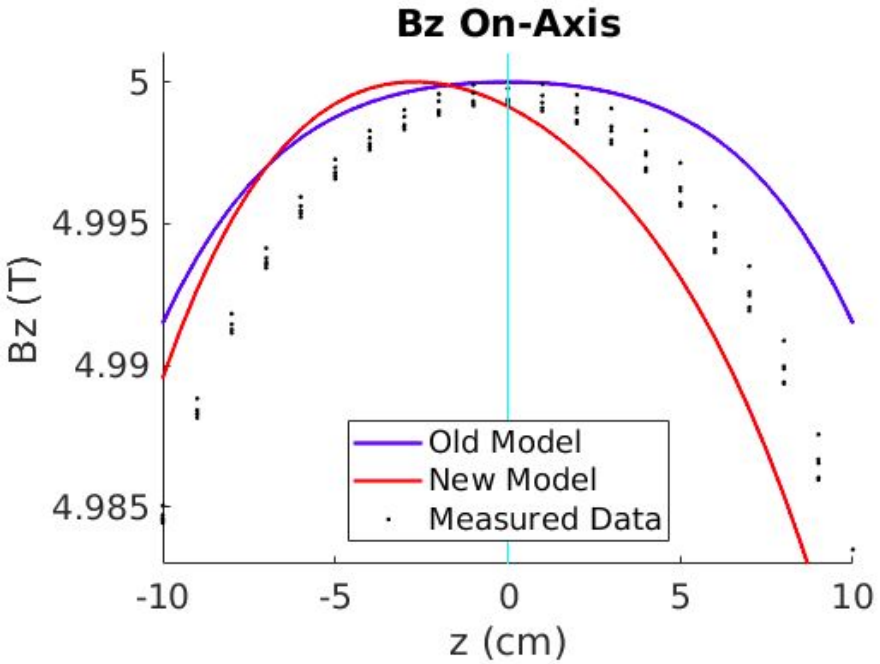




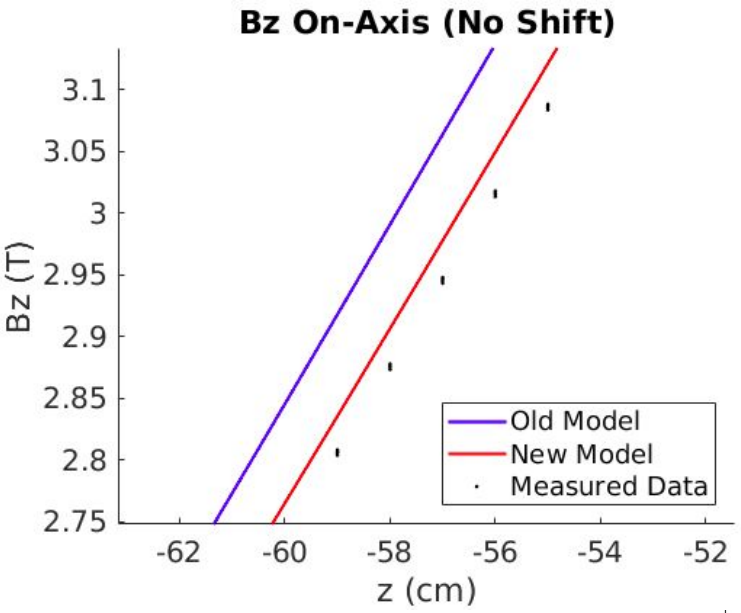


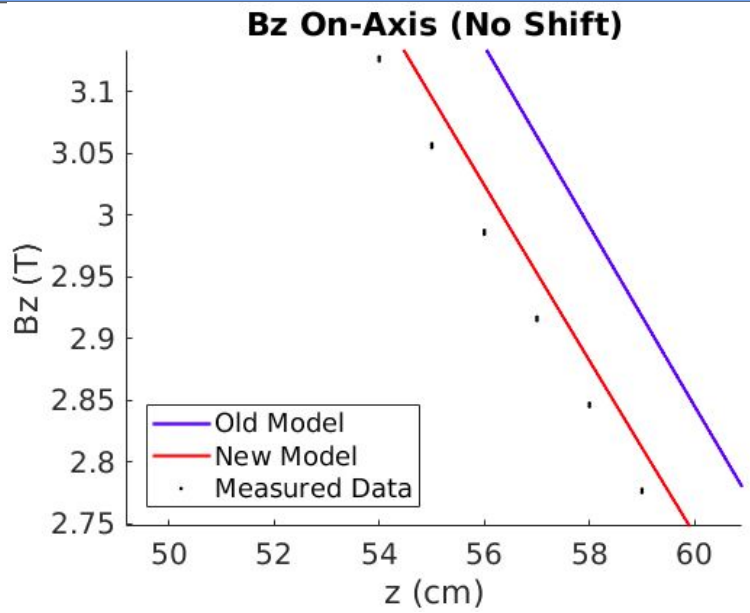
New Model vs. Old Model vs. Data

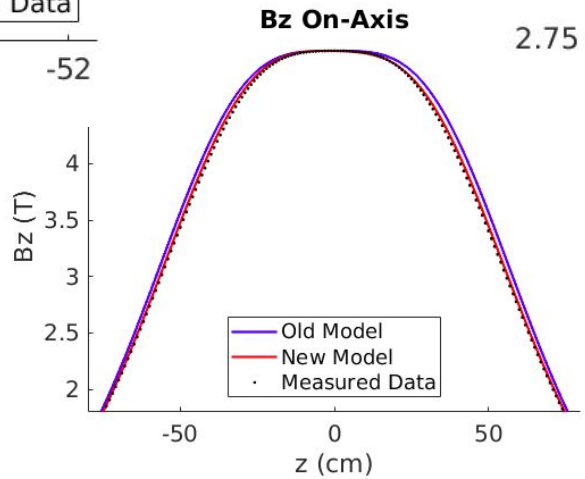




New Model vs. Old Model vs. Data







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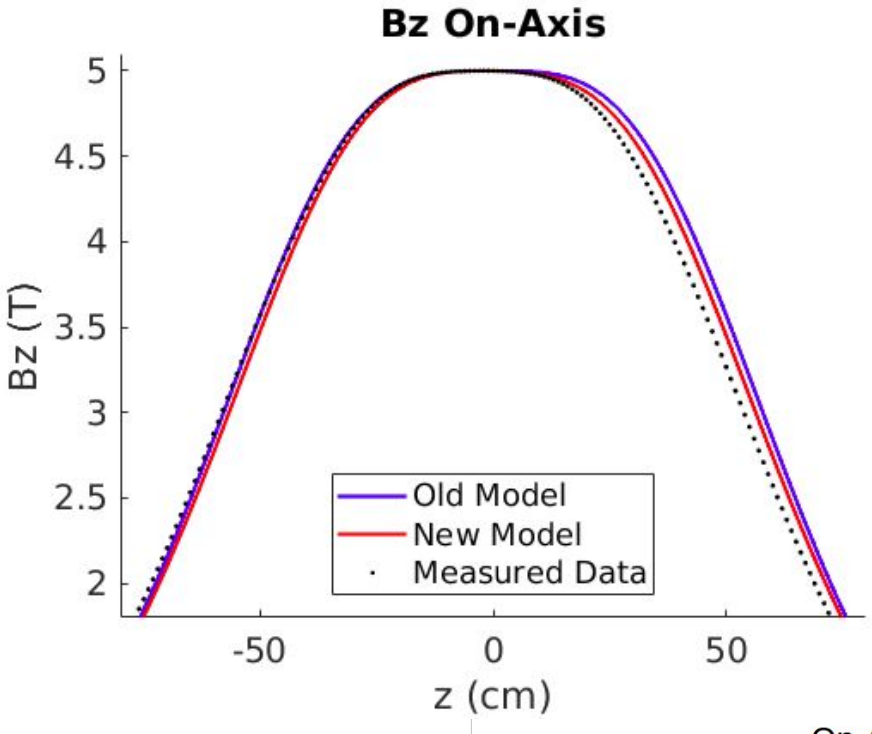
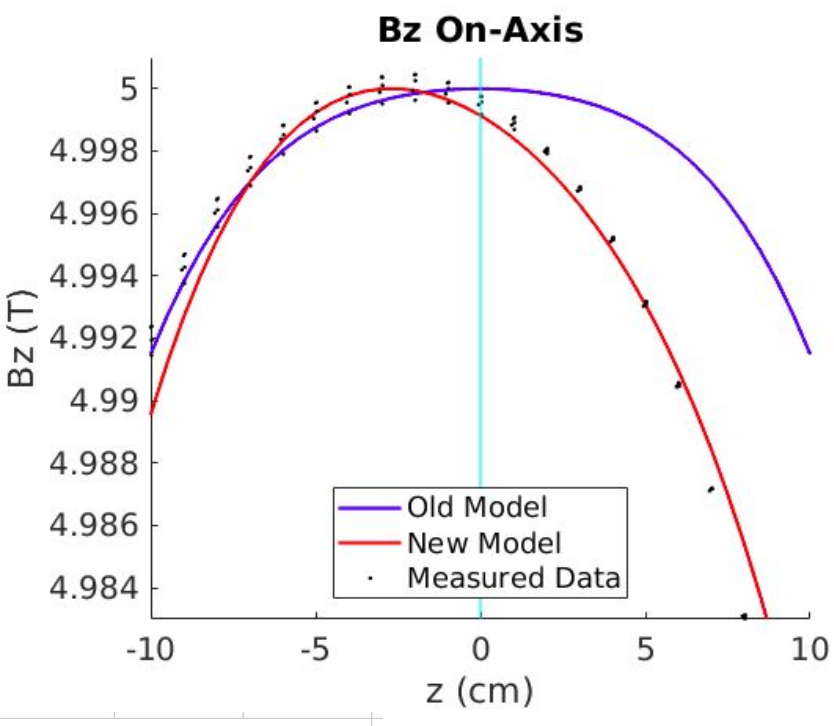
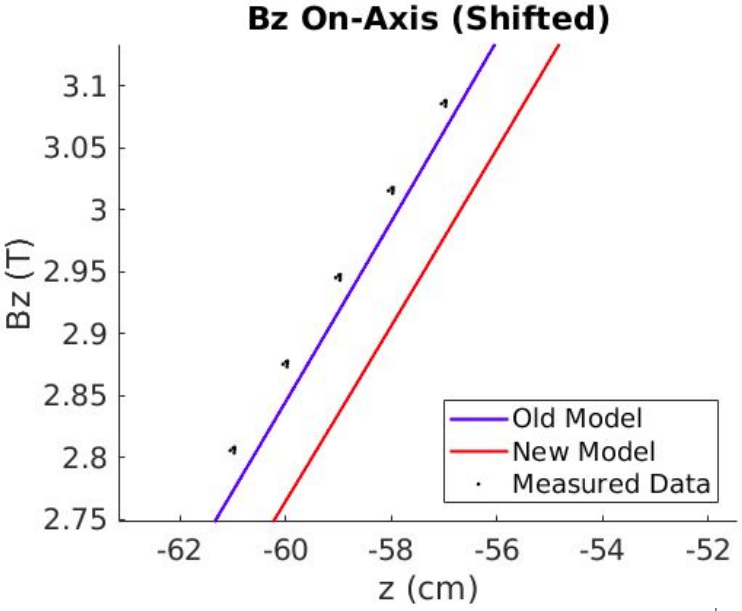
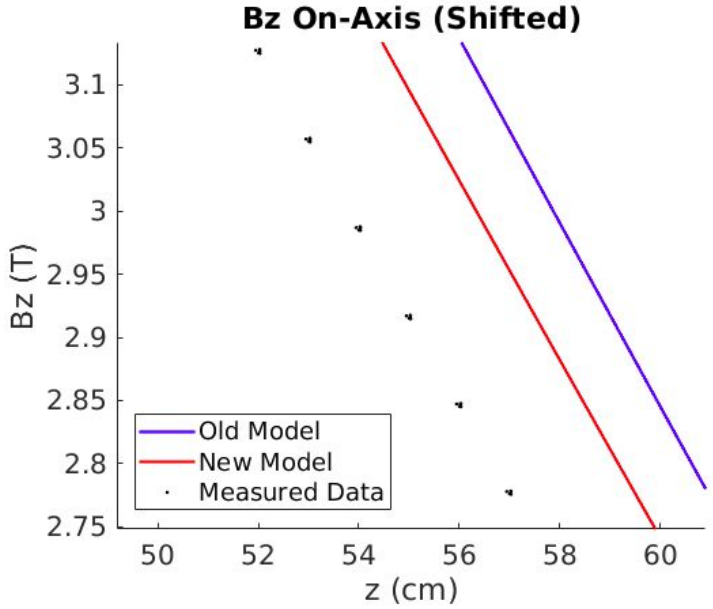


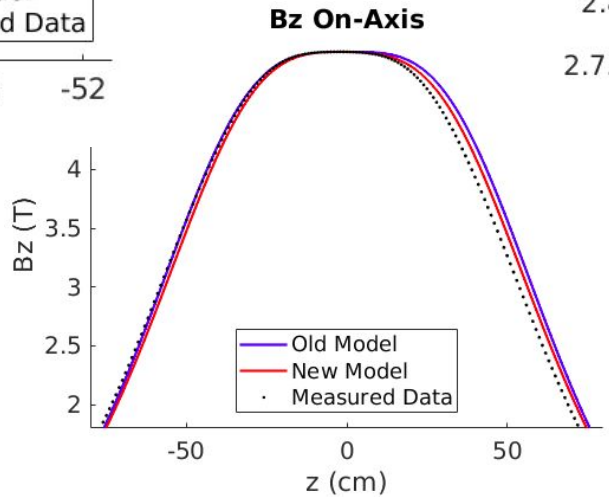


On-Axis Runs					
Shift (cm)	2.00	1.97	1.97	2.05	1.98
Scaling Factor	1.6364	1.6363	1.6361	1.6361	1.6358

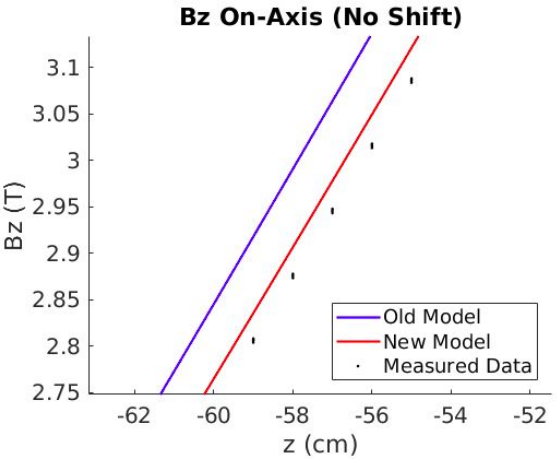
New Model vs. Old Model vs. Data

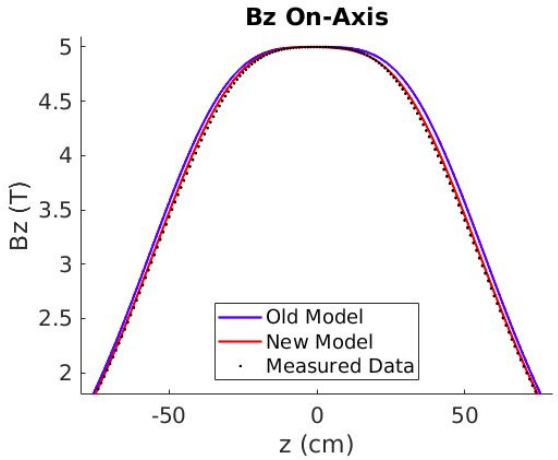


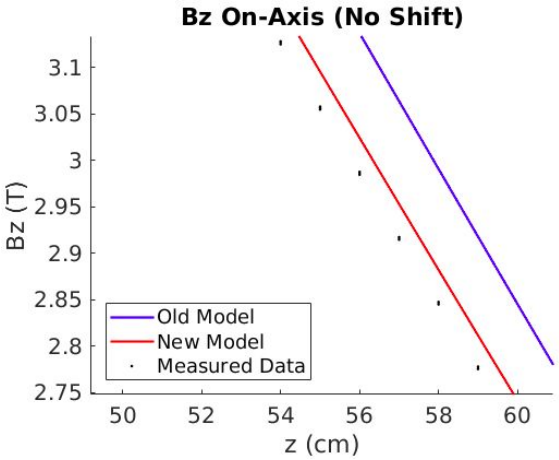


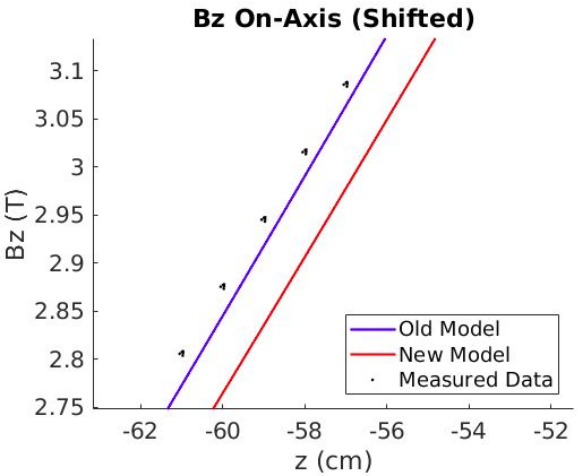


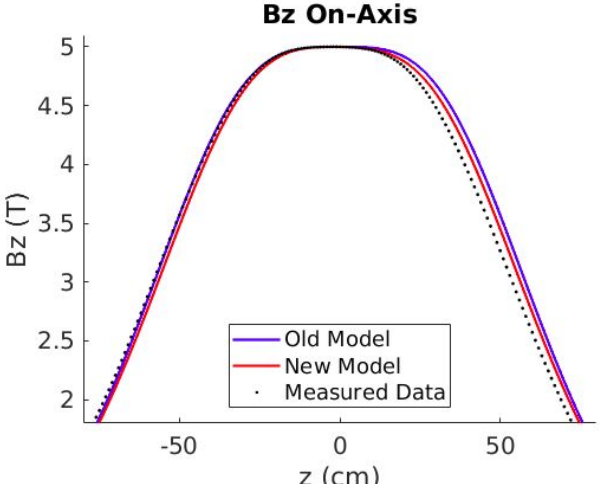
New Model vs. Old Model vs. Data

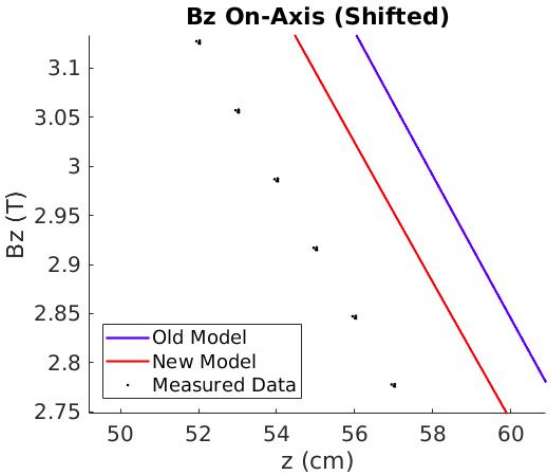




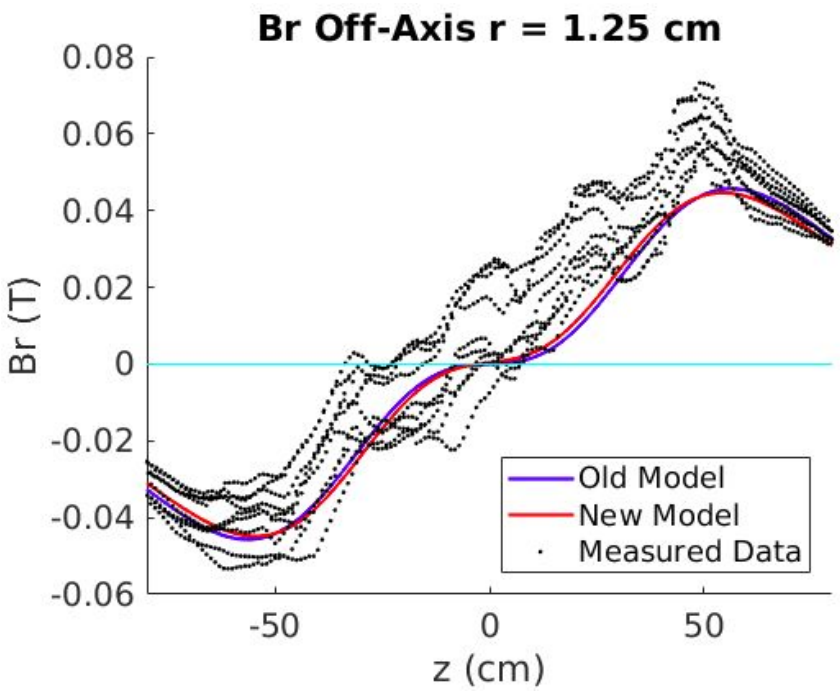


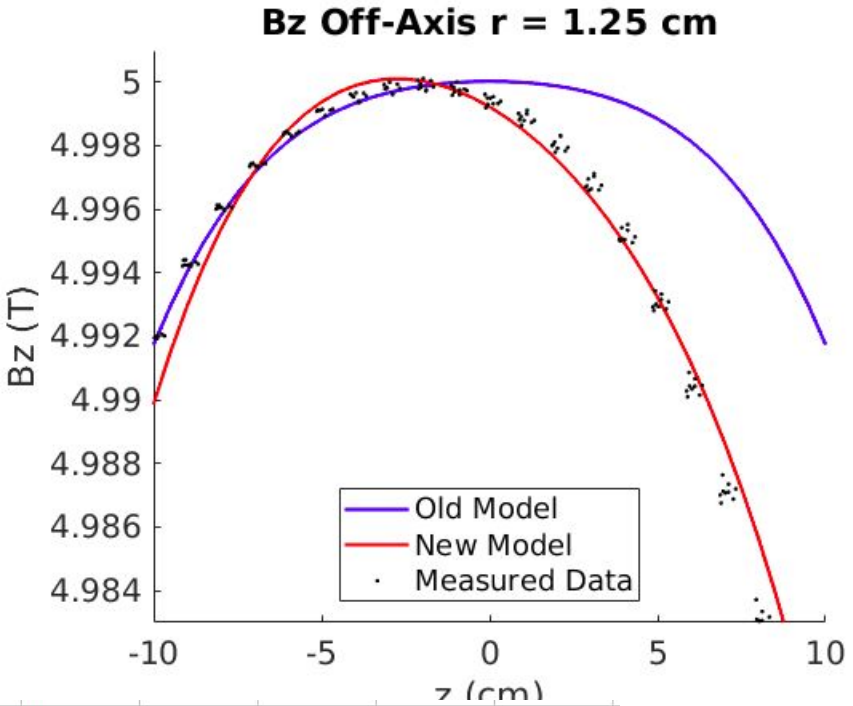






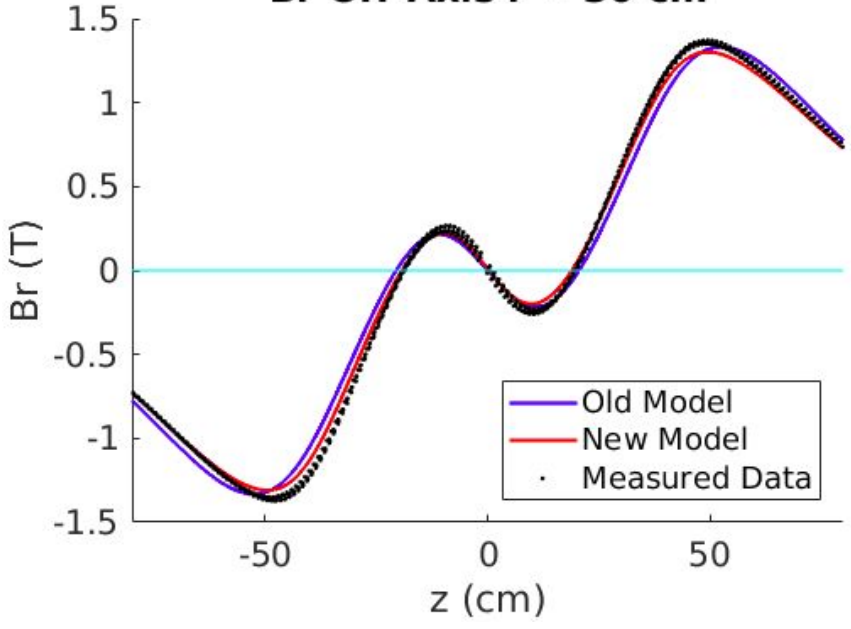
New Model vs. Old Model vs. Data

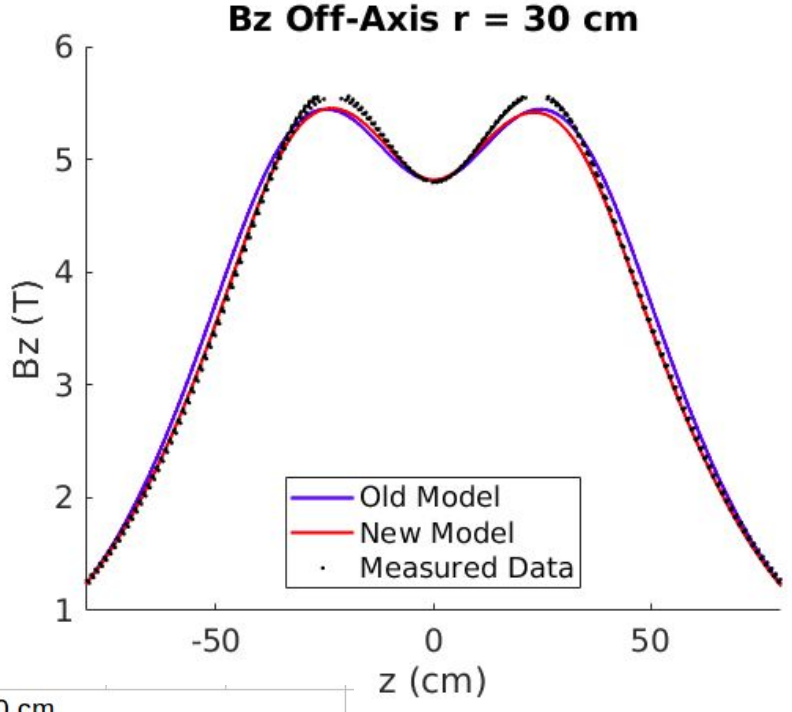




Off-Axis r = 1.25 cm									
Shift (cm)	1.75	1.89	2.06	2.11	2.14	1.67	1.89	2.05	1.98
Scaling Factor	1.6362	1.6363	1.6361	1.6359	1.6359	1.6363	1.6362	1.636	1.636

New Model vs. Old Model vs. Data





Off-Axis r = 30 cm					
Shift (cm)	0.62	0.47	0.61	0.72	1.15
Scaling Factor	1.6452	1.6473	1.6458	1.6435	1.6411

Thank You