

Magnetic Field Mapping - New Data

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Overview

- 1 Field Model with the New Data
- 2 Field Linearity
- 3 Effect of the PRY
- 4 Next Steps

New Data

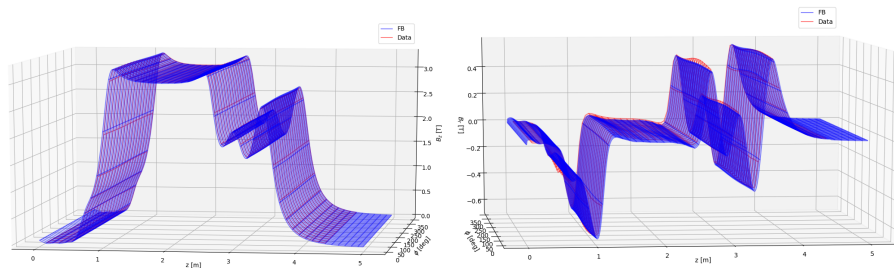
New field mapping data was taken of both SSD and SSU in situ – data with PRY!

Data was taken of all the working match coils at 30A along with both ECE's at 30A. These fields were then used to fit the FB terms for the full model to compare with the high current settings.

Setting	I_{M1}	I_{M2}	I_{E1}	I_{CC}	I_{E2}
SSU 3T	191.0	168.25	205.70	205.70	205.70
SSD 2T	0.0	195.72	144.0	144.0	144.0
SSD 3T	0.0	193.78	205.70	205.70	205.70

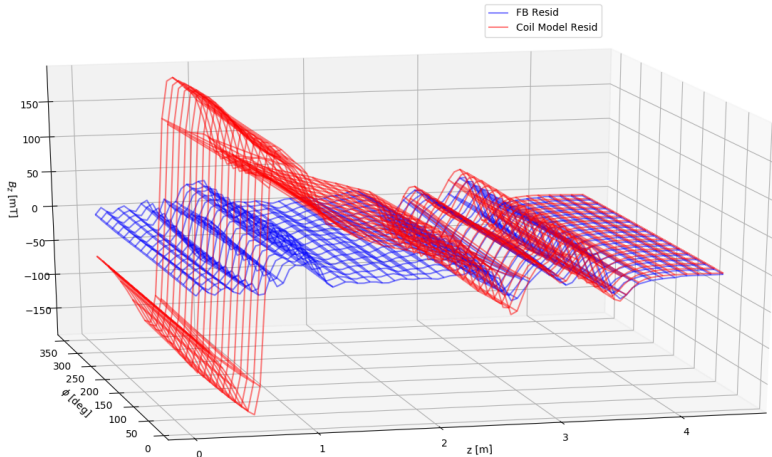
Field Model of SSU 3T setting

And now for the results...

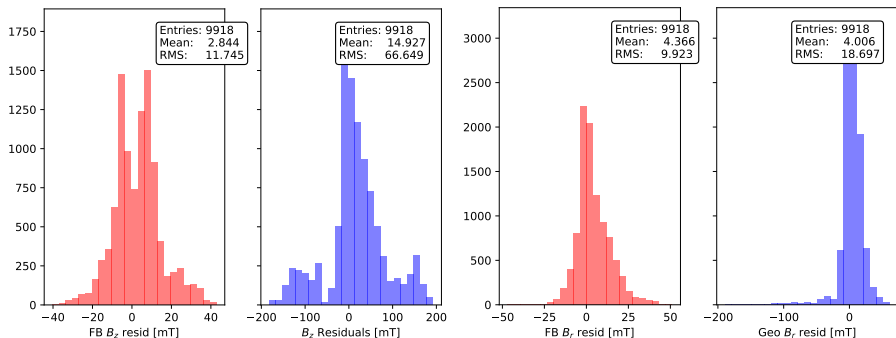


B_z and B_r for outermost probe ($r = 0.15\text{m}$). Blue is full model and red is data although they're fairly indistinguishable.

Residual between Full model (blue) and coil model (red). The effect of the PRY can be clearly seen at the $z = 0$ end – This is the upstream end of SSU.



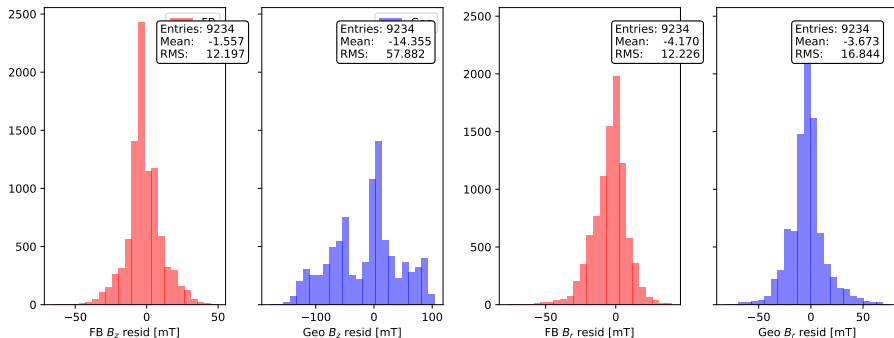
Histograms of the residuals.



Interesting double peak feature in B_z residuals.

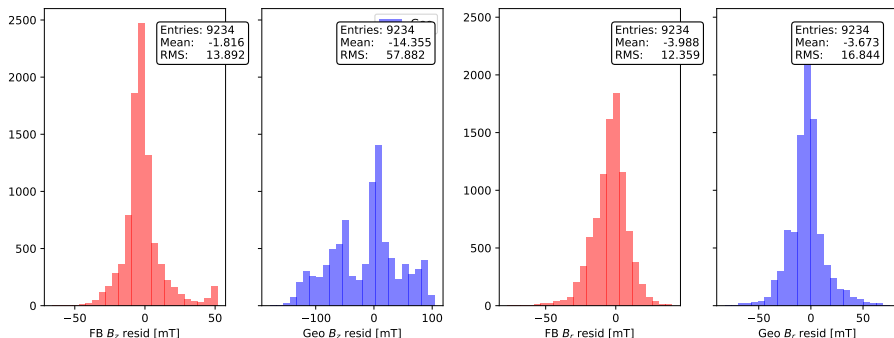
Residuals for SSD 2T setting

Just showing the histograms because the residual shape looks similar to the plot on slide 5.



Residuals for SSD 3T setting

Small extra peak in B_z residual caused by not fitting the FB terms over quite the right range.



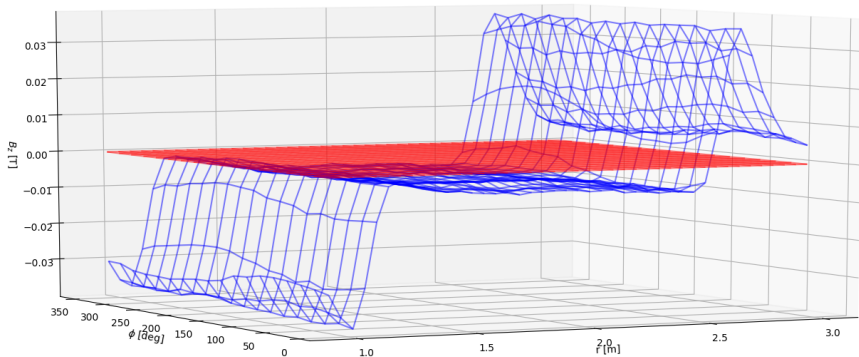
In Summary

The fits to the three settings are summarised in the table below.
The mean \pm the RMS is given.

Setting	B_z Resid [mT]	B_r Resid [mT]
SSU 3T	2.844 ± 11.745	4.366 ± 9.923
SSD 2T	-1.557 ± 12.197	-4.170 ± 12.226
SSD 3T	-1.816 ± 13.892	-3.988 ± 12.359

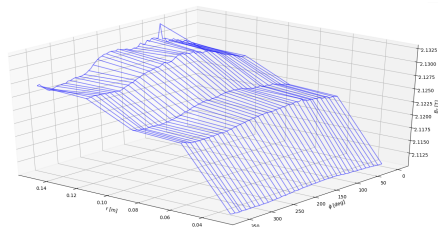
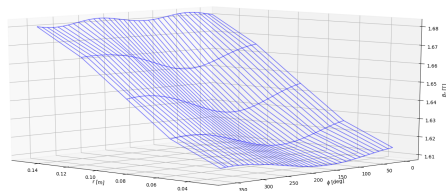
Field Linearity

Data was also taken for SSU with ECE only at 205.7A (3T). This can be used along with the 30A setting to check for the linearity of the field.

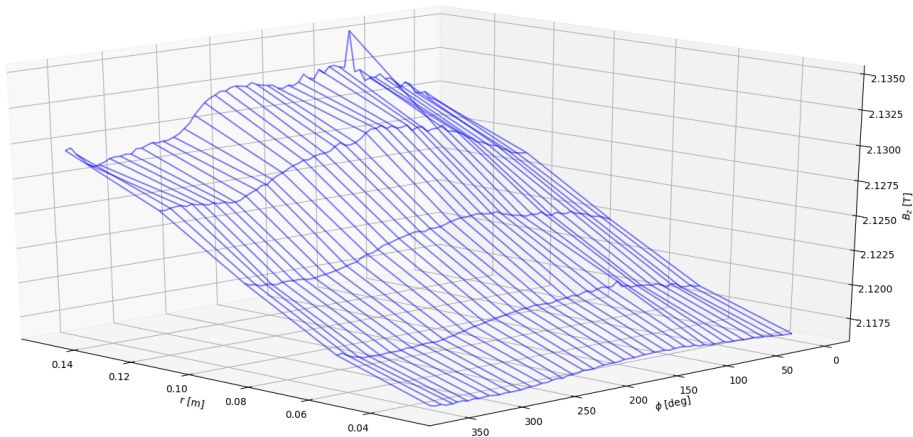


Probe Normalisation

Coil model on the left (lower current), data on the right.
Probes are not normalised to each other. This is possible using the Fourier-Bessel fit!



And with the normalisations.



(Interesting side note – I believe that the spike in the data on the outer most probe has roughly the same ϕ coordinate as the weld along SSU's bore)

Effect of the PRY

The Kalman fit routine uses the average B_z over the tracker region. The average of B_z was calculated for the full field model, 'As-built' coil model and the data for each of the new data settings. The average was naively calculated where the Centre Coil is. The same was done for the 7469 field but with the Comsol field map instead of the data.

Setting	Data/Comsol [T]	Coil Model [T]	Full Model [T]
SSU 3T	3.071	3.029	3.065
SSD 2T	2.151	2.118	2.146
SSD 3T	3.054	3.010	3.051
7469	3.960	4.033	4.008

Next Steps

- Do some Monte Carlo studies with my fields!
- Apply survey corrections to data (waiting for survey data from Tony)
- Make MICE note detailing the data that was taken and some plots and analysis etc... (See above point)