

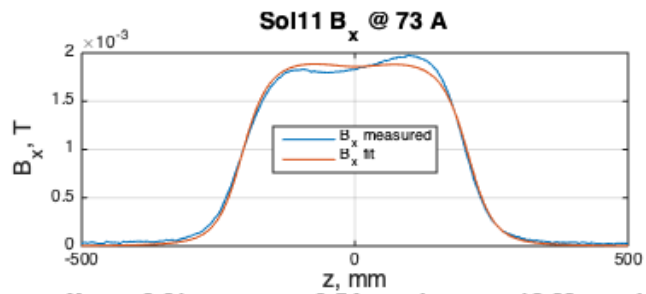
Analysis of Magnetic Measurements Data of PCA Solenoids

On axis

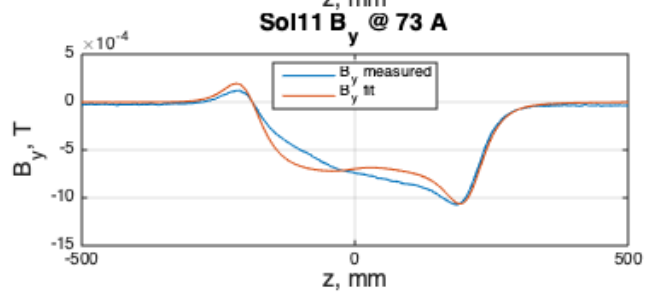
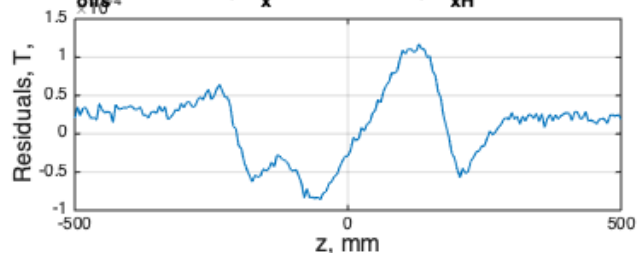
Processed Data

- Magnetic measurements data were collected and Superconducting Magnet Division
- Axial B_z , transverse B_x and B_y were measured on axis and with offset
- Only on axis data are presented here with fit of Hall probe tilt as well as scan line (offset and angle)
- Three current setpoints were analyzed 73, 122, and 145 A (36 A data are also available)

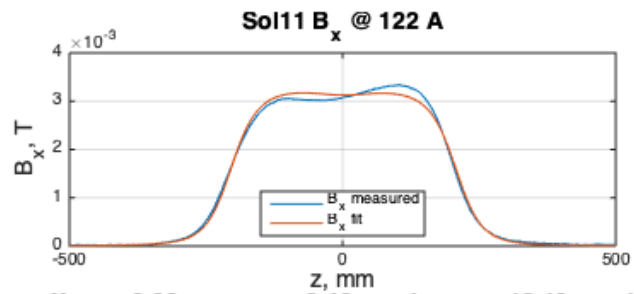
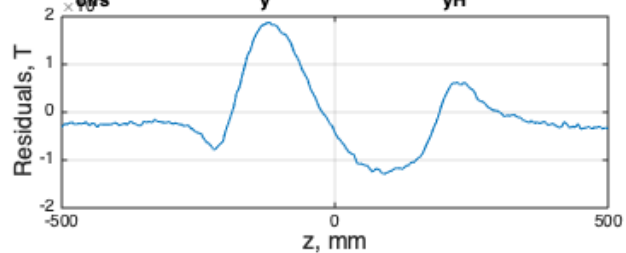
Solenoid 11



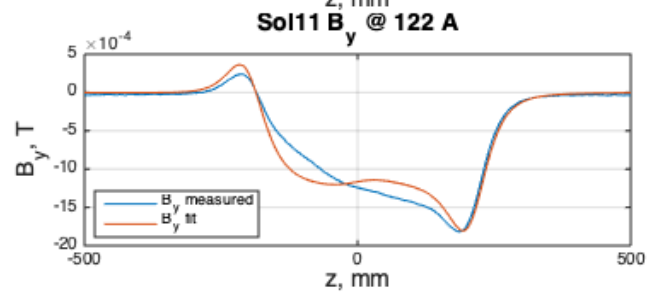
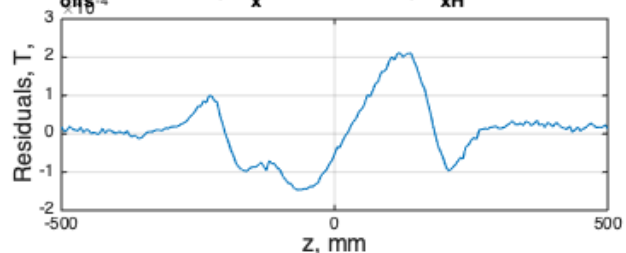
$X_{\text{offs}} = -0.01 \text{ mm}, \alpha_x = +0.54 \text{ mrad}, \alpha_{xH} = +12.99 \text{ mrad}$



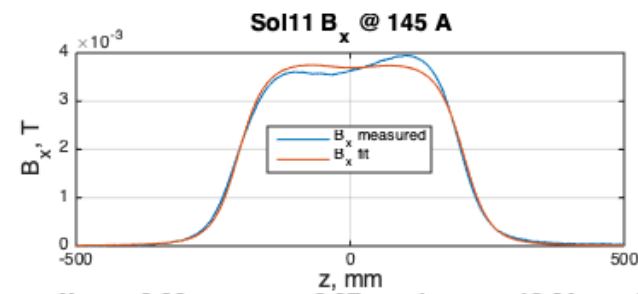
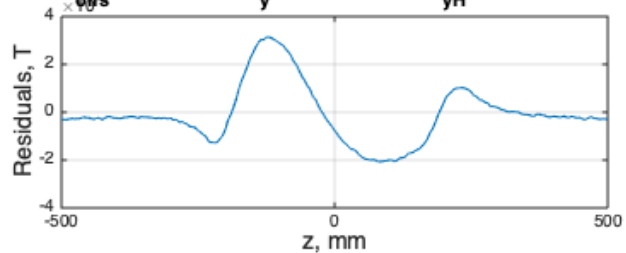
$Y_{\text{offs}} = -0.76 \text{ mm}, \alpha_y = -0.57 \text{ mrad}, \alpha_{yH} = -4.87 \text{ mrad}$



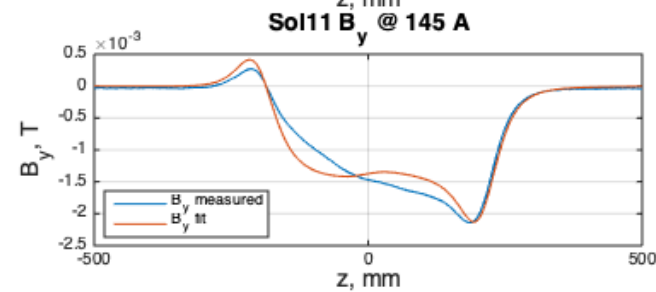
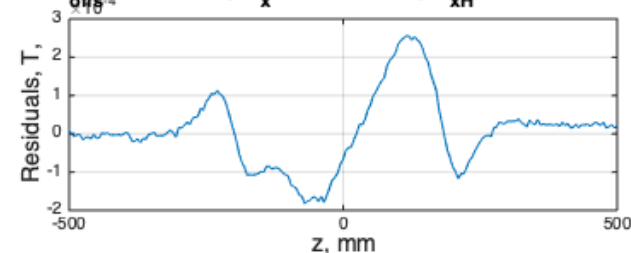
$X_{\text{offs}} = +0.02 \text{ mm}, \alpha_x = +0.42 \text{ mrad}, \alpha_{xH} = +13.10 \text{ mrad}$



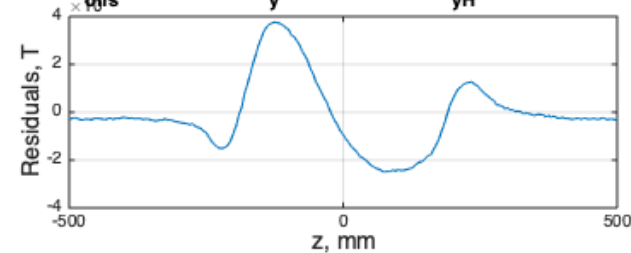
$Y_{\text{offs}} = -0.80 \text{ mm}, \alpha_y = -0.54 \text{ mrad}, \alpha_{yH} = -4.88 \text{ mrad}$



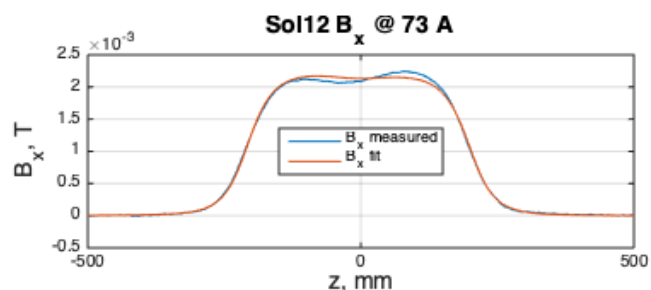
$X_{\text{offs}} = +0.02 \text{ mm}, \alpha_x = +0.37 \text{ mrad}, \alpha_{xH} = +13.04 \text{ mrad}$



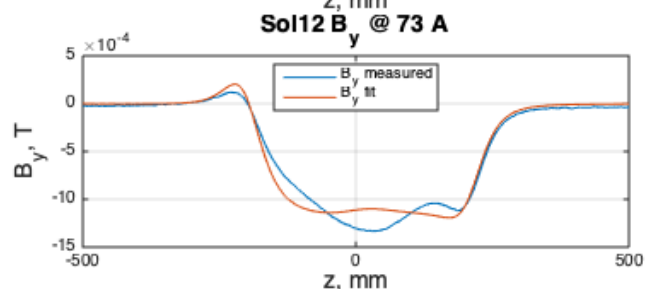
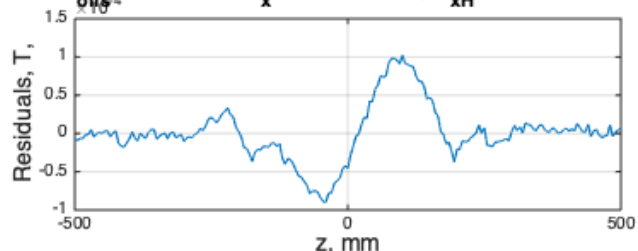
$Y_{\text{offs}} = -0.79 \text{ mm}, \alpha_y = -0.56 \text{ mrad}, \alpha_{yH} = -4.84 \text{ mrad}$



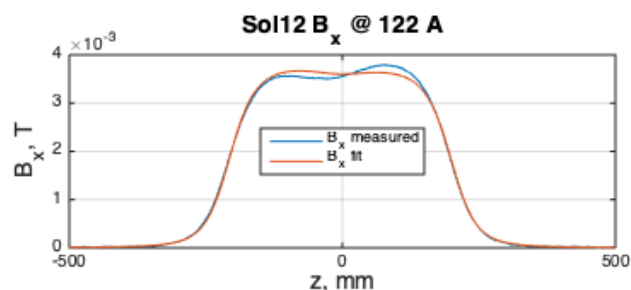
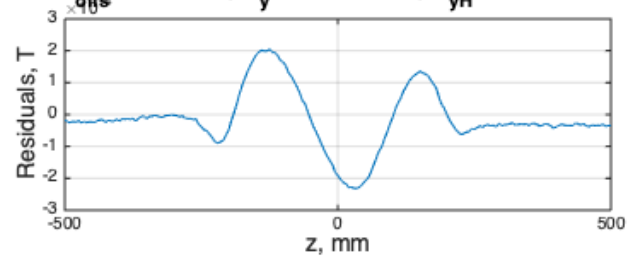
Solenoid 12 (6)



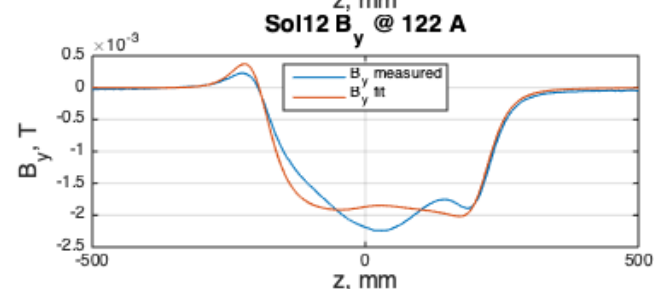
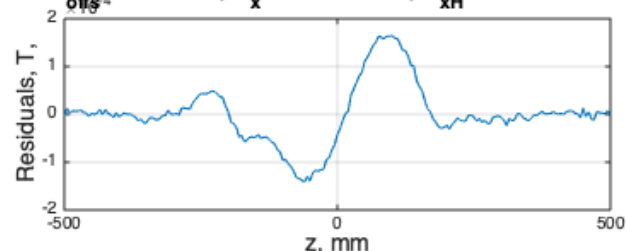
$X_{\text{offs}} = -0.16 \text{ mm}, \alpha_x = +0.07 \text{ mrad}, \alpha_{xH} = +14.90 \text{ mrad}$



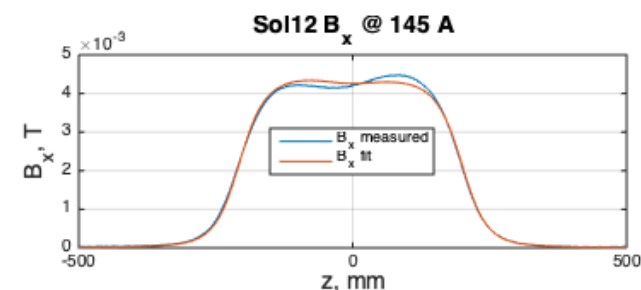
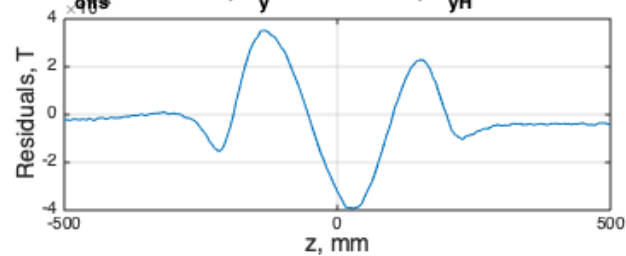
$Y_{\text{offs}} = -0.73 \text{ mm}, \alpha_y = +0.58 \text{ mrad}, \alpha_{yH} = -7.74 \text{ mrad}$



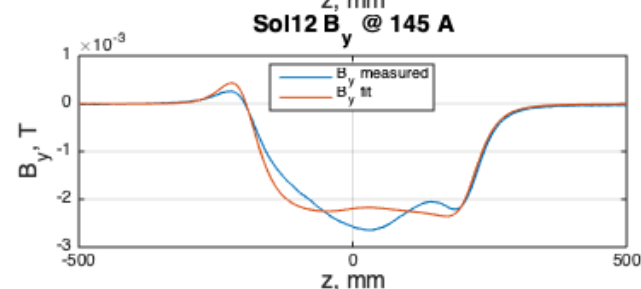
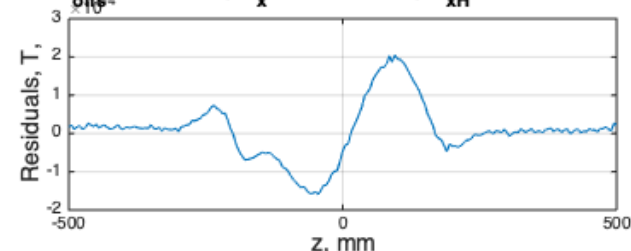
$X_{\text{offs}} = -0.14 \text{ mm}, \alpha_x = +0.05 \text{ mrad}, \alpha_{xH} = +15.09 \text{ mrad}$



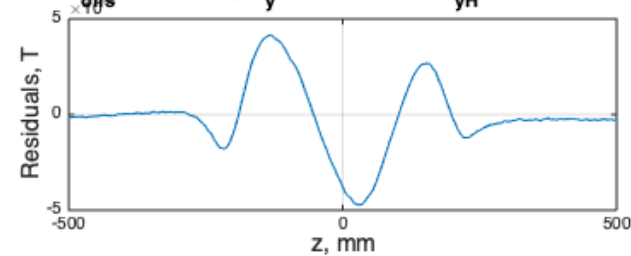
$Y_{\text{offs}} = -0.76 \text{ mm}, \alpha_y = +0.61 \text{ mrad}, \alpha_{yH} = -7.79 \text{ mrad}$



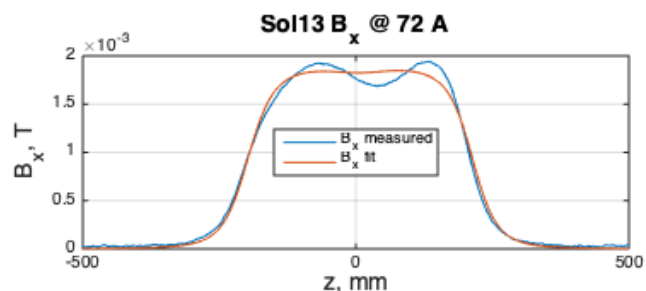
$X_{\text{offs}} = -0.15 \text{ mm}, \alpha_x = +0.06 \text{ mrad}, \alpha_{xH} = +15.02 \text{ mrad}$



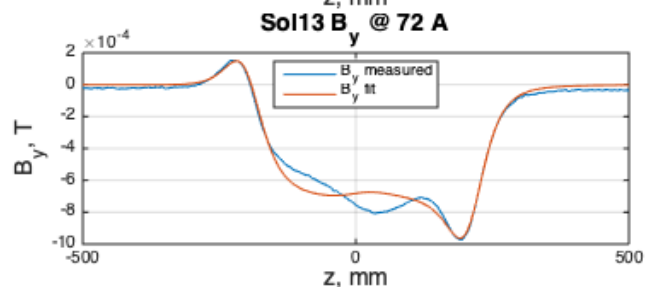
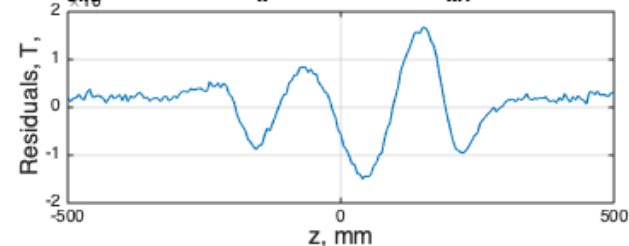
$Y_{\text{offs}} = -0.74 \text{ mm}, \alpha_y = +0.64 \text{ mrad}, \alpha_{yH} = -7.72 \text{ mrad}$



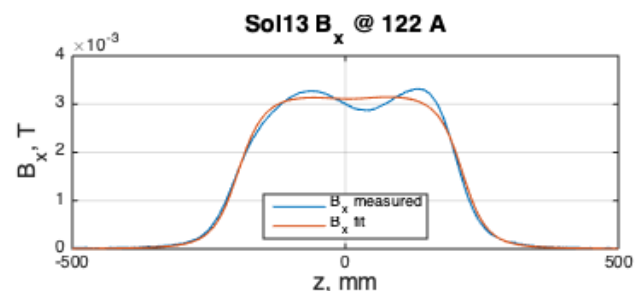
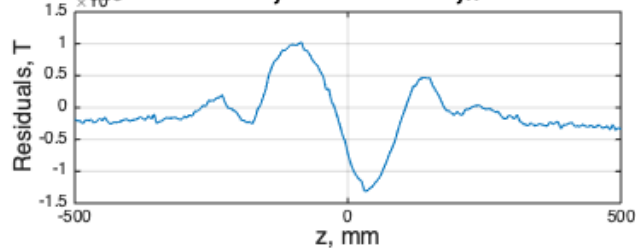
Solenoid 13 (5)



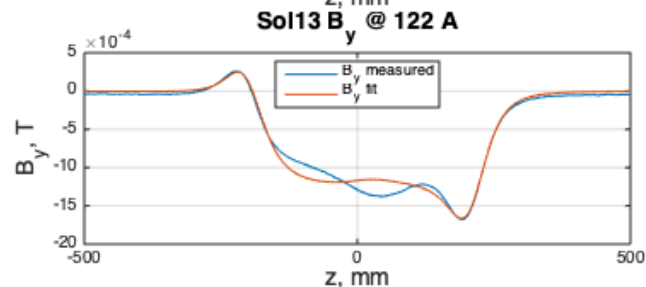
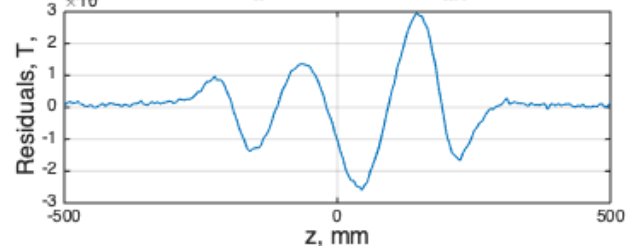
$X_{\text{offs}} = +0.18 \text{ mm}, \alpha_x = +0.44 \text{ mrad}, \alpha_{xH} = +12.89 \text{ mrad}$



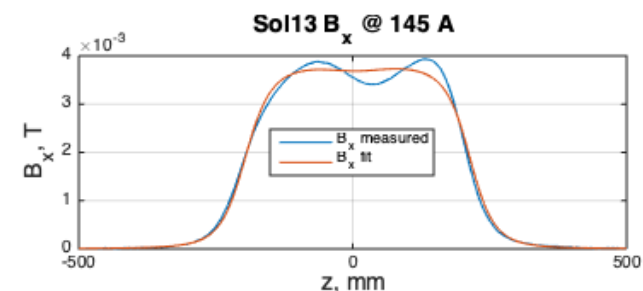
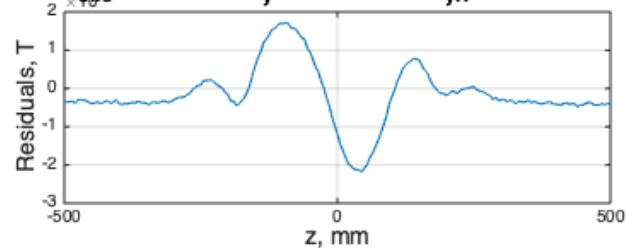
$Y_{\text{offs}} = -0.67 \text{ mm}, \alpha_y = -0.43 \text{ mrad}, \alpha_{yH} = -4.82 \text{ mrad}$



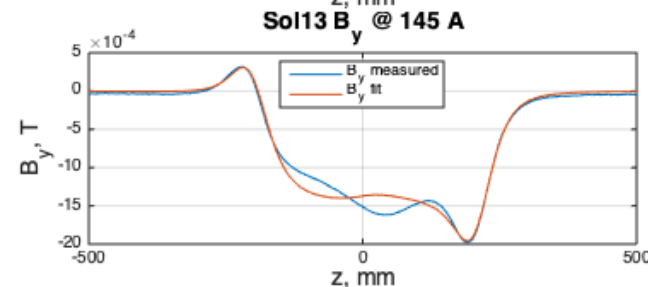
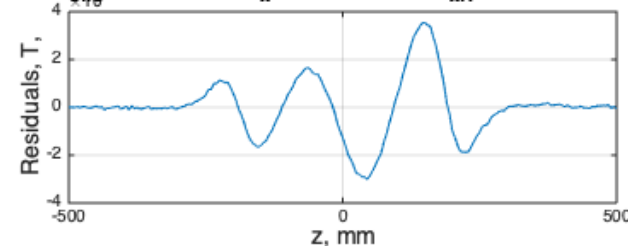
$X_{\text{offs}} = +0.21 \text{ mm}, \alpha_x = +0.39 \text{ mrad}, \alpha_{xH} = +12.98 \text{ mrad}$



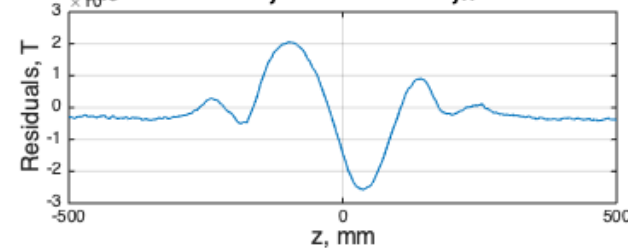
$Y_{\text{offs}} = -0.68 \text{ mm}, \alpha_y = -0.47 \text{ mrad}, \alpha_{yH} = -4.89 \text{ mrad}$



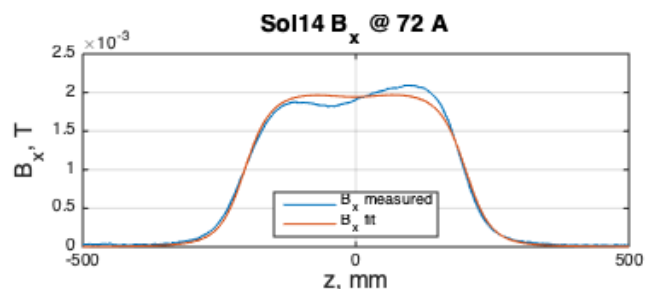
$X_{\text{offs}} = +0.21 \text{ mm}, \alpha_x = +0.35 \text{ mrad}, \alpha_{xH} = +12.96 \text{ mrad}$



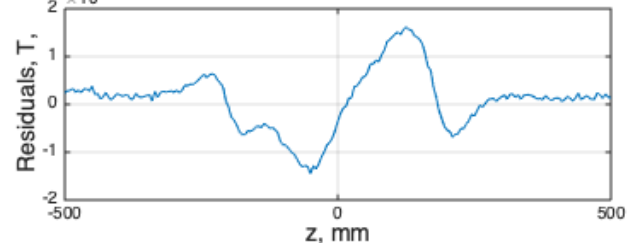
$Y_{\text{offs}} = -0.68 \text{ mm}, \alpha_y = -0.44 \text{ mrad}, \alpha_{yH} = -4.83 \text{ mrad}$



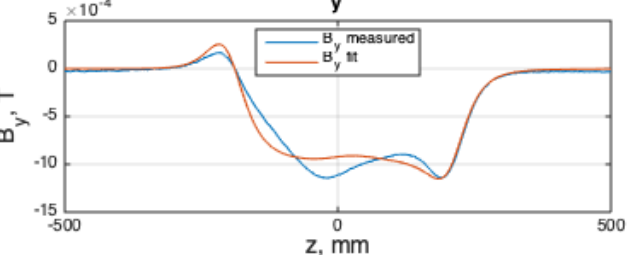
Solenoid 14 (4)



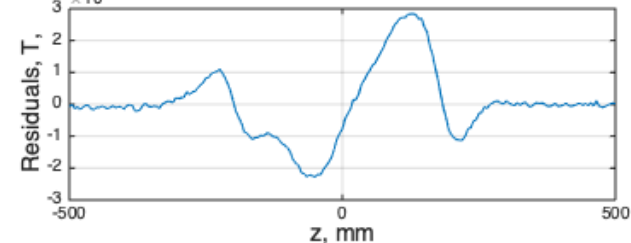
$X_{offs} = -0.05 mm, \alpha_x = +0.03 mrad, \alpha_{xH} = +13.73 mrad$



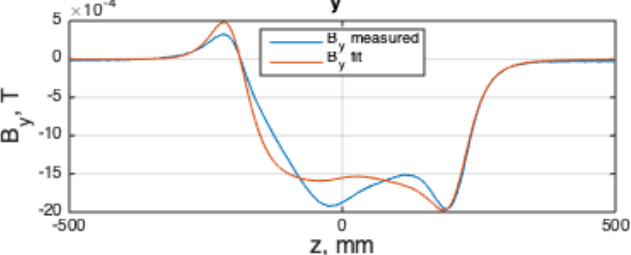
$Y_{offs} = -0.82 mm, \alpha_y = +0.16 mrad, \alpha_{yH} = -6.52 mrad$



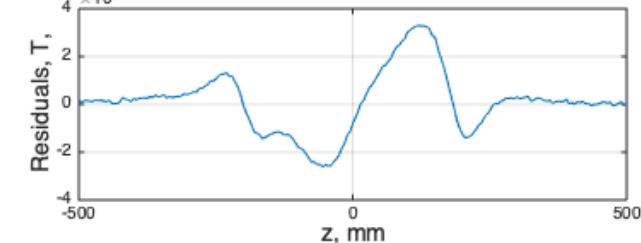
$X_{offs} = -0.02 mm, \alpha_x = -0.13 mrad, \alpha_{xH} = +13.69 mrad$



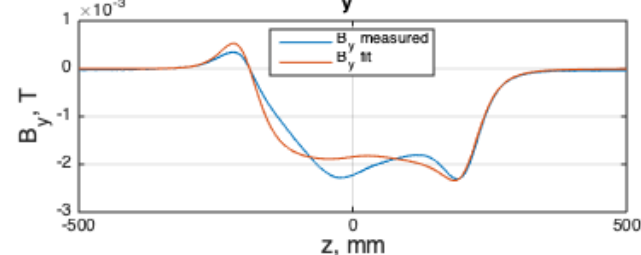
$Y_{offs} = -0.86 mm, \alpha_y = +0.19 mrad, \alpha_{yH} = -6.49 mrad$



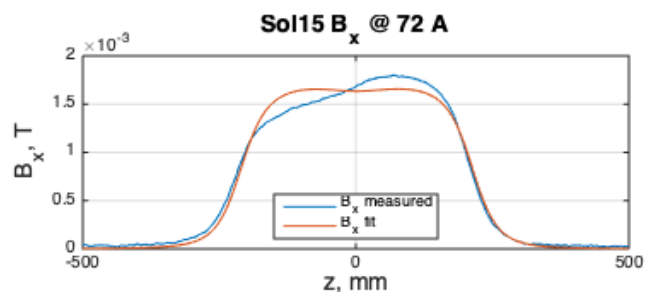
$X_{offs} = -0.05 mm, \alpha_x = -0.11 mrad, \alpha_{xH} = +13.83 mrad$



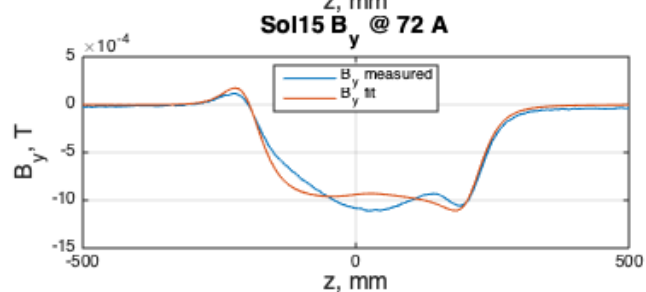
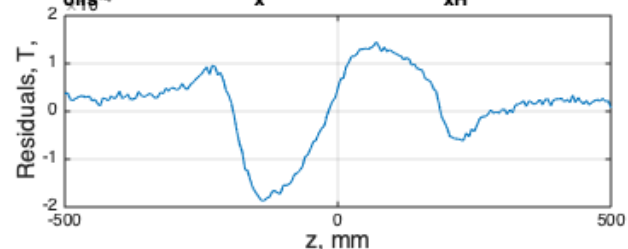
$Y_{offs} = -0.84 mm, \alpha_y = +0.13 mrad, \alpha_{yH} = -6.50 mrad$



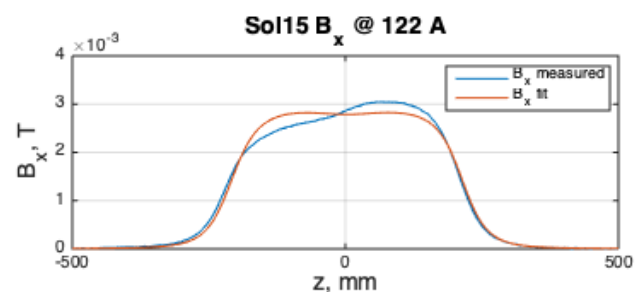
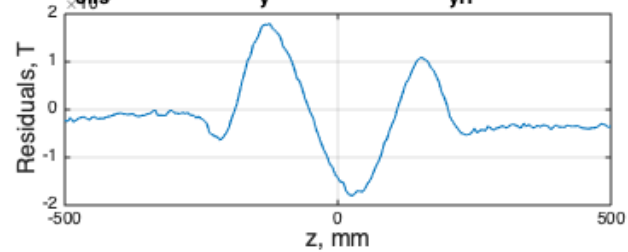
Solenoid 15 (2)



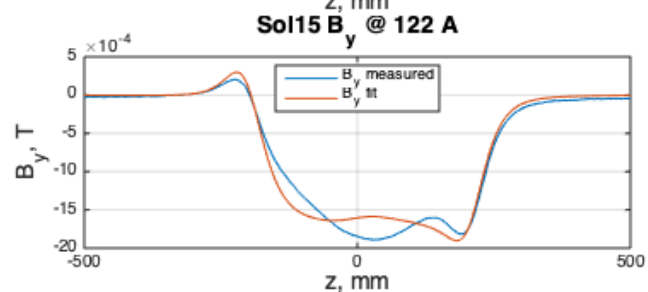
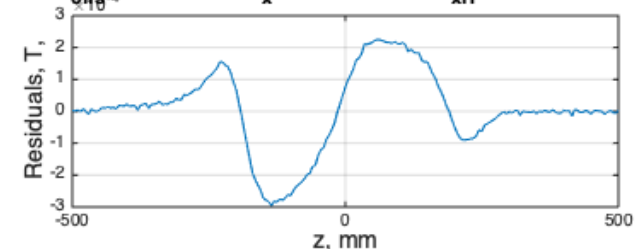
$X_{\text{offs}} = +0.01 \text{ mm}, \alpha_x = +1.03 \text{ mrad}, \alpha_{xH} = +11.58 \text{ mrad}$



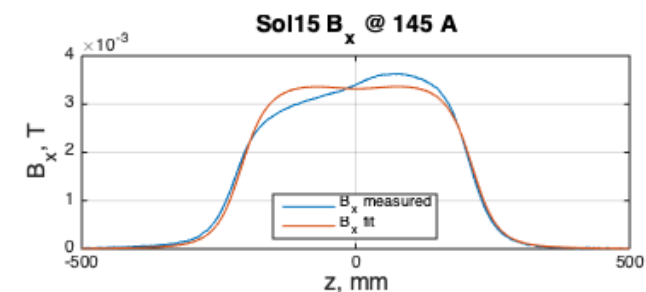
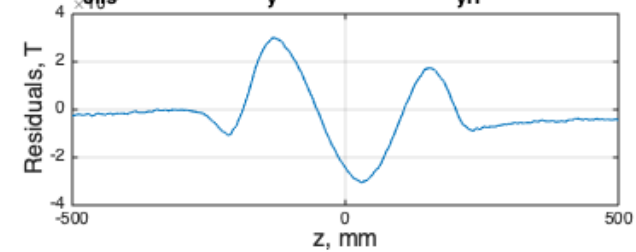
$Y_{\text{offs}} = -0.72 \text{ mm}, \alpha_y = +0.12 \text{ mrad}, \alpha_{yH} = -6.66 \text{ mrad}$



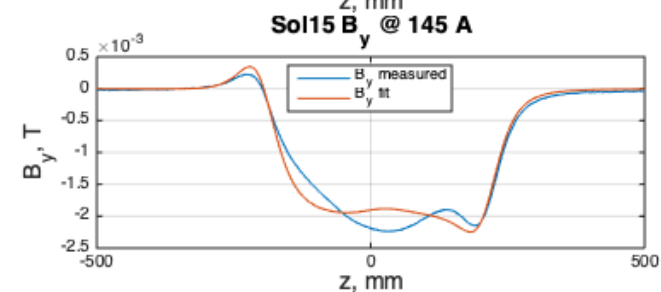
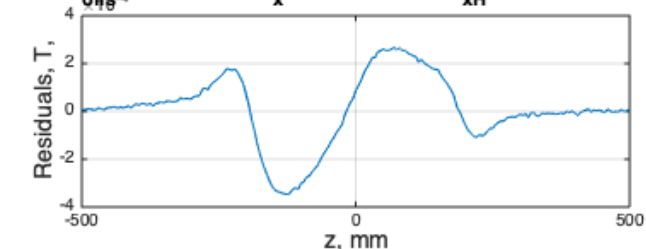
$X_{\text{offs}} = +0.05 \text{ mm}, \alpha_x = +0.97 \text{ mrad}, \alpha_{xH} = +11.67 \text{ mrad}$



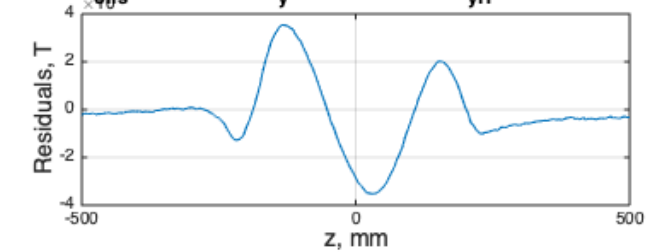
$Y_{\text{offs}} = -0.73 \text{ mm}, \alpha_y = +0.10 \text{ mrad}, \alpha_{yH} = -6.72 \text{ mrad}$



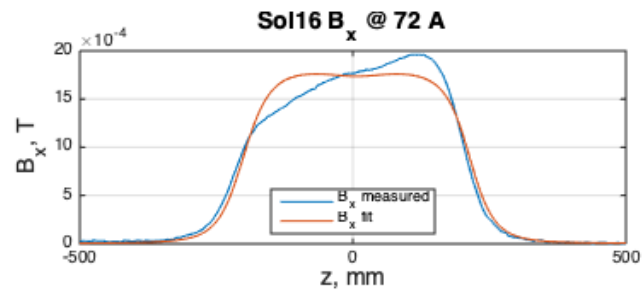
$X_{\text{offs}} = +0.02 \text{ mm}, \alpha_x = +0.92 \text{ mrad}, \alpha_{xH} = +11.71 \text{ mrad}$



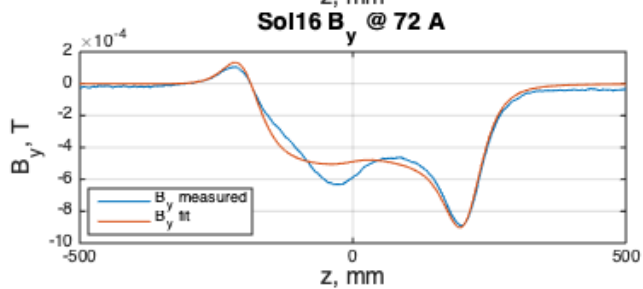
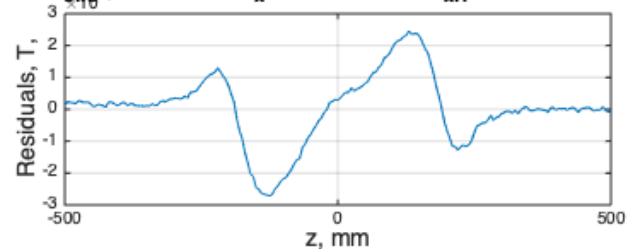
$Y_{\text{offs}} = -0.72 \text{ mm}, \alpha_y = +0.10 \text{ mrad}, \alpha_{yH} = -6.71 \text{ mrad}$



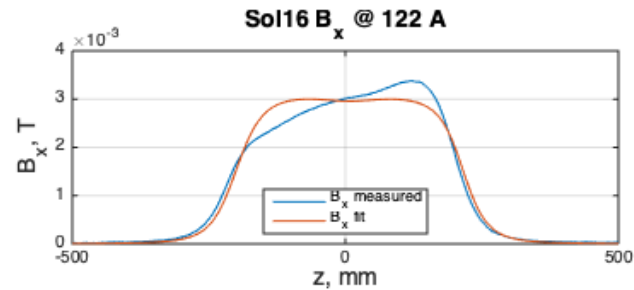
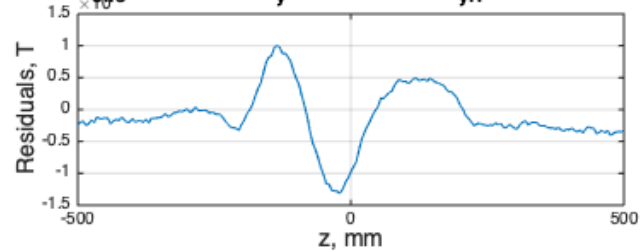
Solenoid 16 (3)



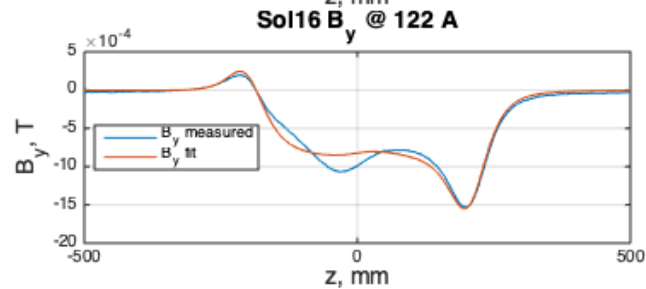
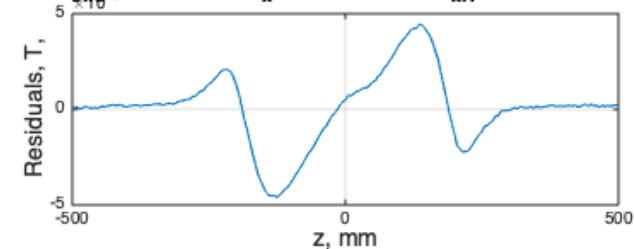
$X_{\text{offs}} = +0.15 \text{ mm}, \alpha_x = +0.63 \text{ mrad}, \alpha_{xH} = +12.31 \text{ mrad}$



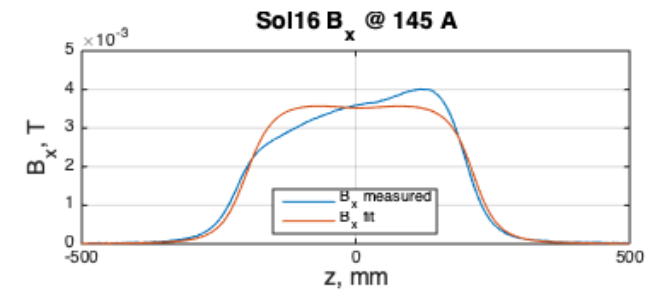
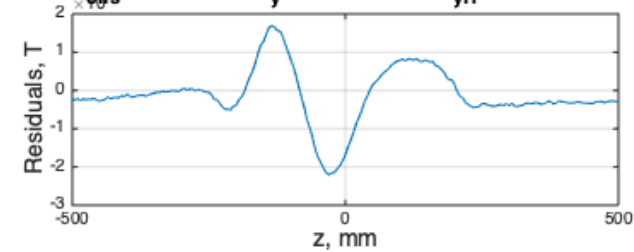
$Y_{\text{offs}} = -0.65 \text{ mm}, \alpha_y = -0.93 \text{ mrad}, \alpha_{yH} = -3.47 \text{ mrad}$



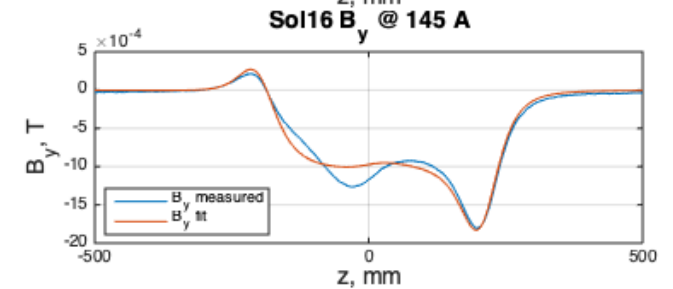
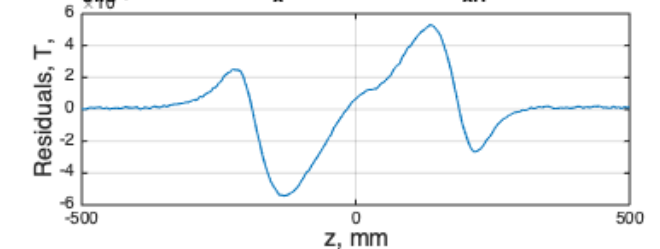
$X_{\text{offs}} = +0.18 \text{ mm}, \alpha_x = +0.70 \text{ mrad}, \alpha_{xH} = +12.40 \text{ mrad}$



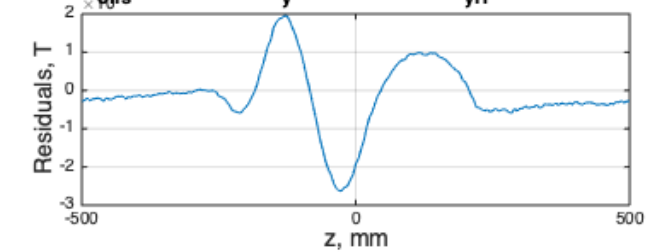
$Y_{\text{offs}} = -0.67 \text{ mm}, \alpha_y = -0.95 \text{ mrad}, \alpha_{yH} = -3.45 \text{ mrad}$



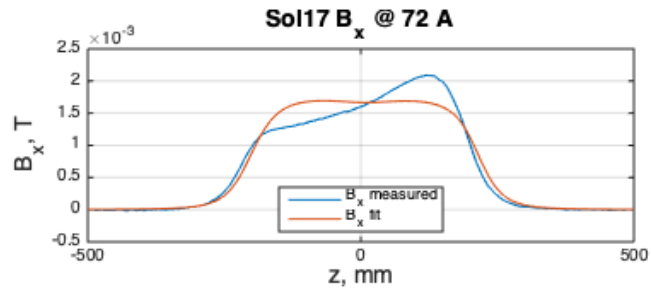
$X_{\text{offs}} = +0.17 \text{ mm}, \alpha_x = +0.61 \text{ mrad}, \alpha_{xH} = +12.44 \text{ mrad}$



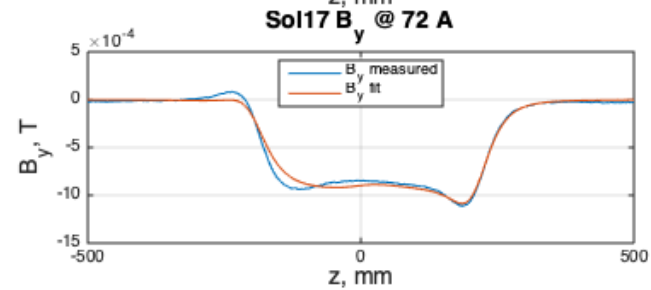
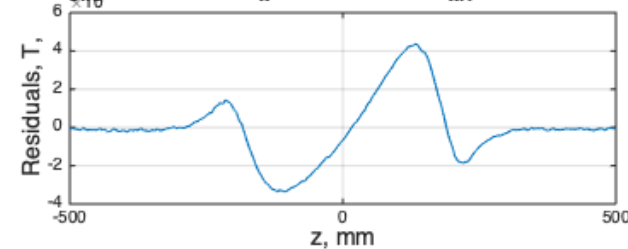
$Y_{\text{offs}} = -0.66 \text{ mm}, \alpha_y = -0.97 \text{ mrad}, \alpha_{yH} = -3.44 \text{ mrad}$



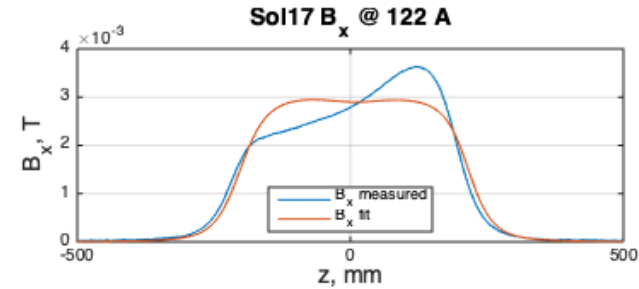
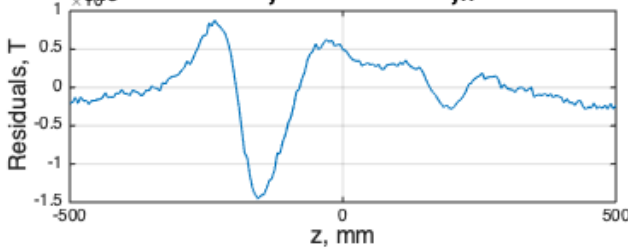
Solenoid 17 (7)



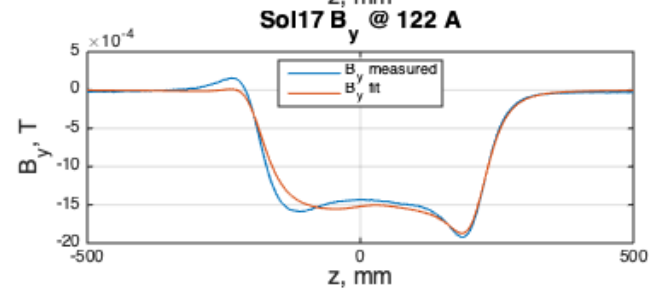
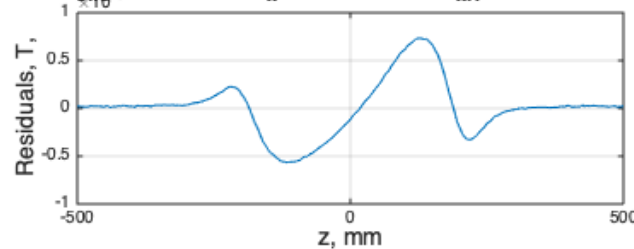
$X_{\text{offs}} = +0.14 \text{ mm}, \alpha_x = +0.63 \text{ mrad}, \alpha_{xH} = +11.84 \text{ mrad}$



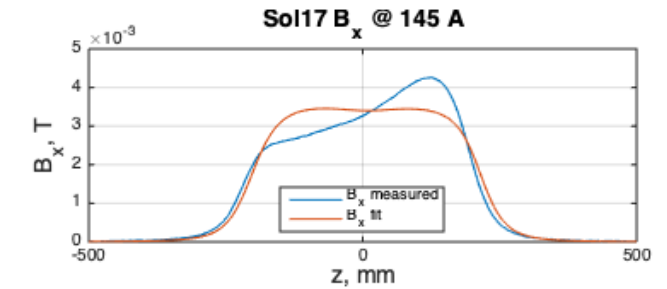
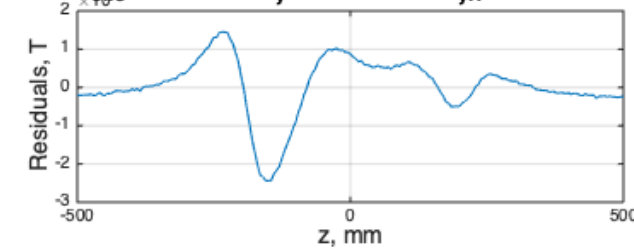
$Y_{\text{offs}} = -0.57 \text{ mm}, \alpha_y = -0.75 \text{ mrad}, \alpha_{yH} = -6.37 \text{ mrad}$



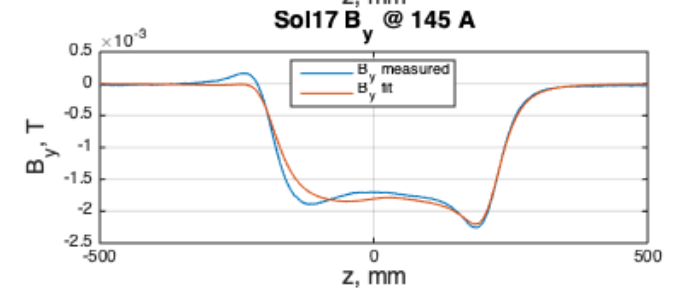
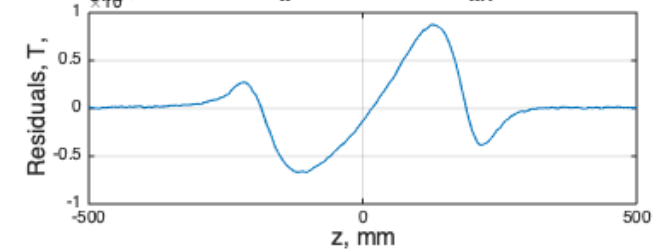
$X_{\text{offs}} = +0.16 \text{ mm}, \alpha_x = +0.80 \text{ mrad}, \alpha_{xH} = +12.17 \text{ mrad}$



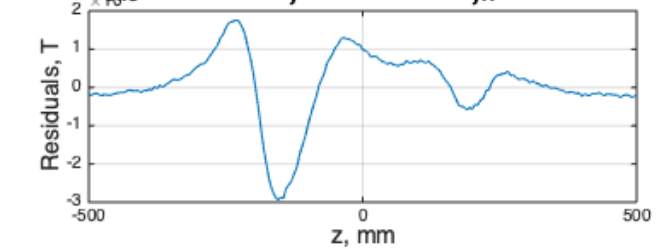
$Y_{\text{offs}} = -0.60 \text{ mm}, \alpha_y = -0.76 \text{ mrad}, \alpha_{yH} = -6.37 \text{ mrad}$



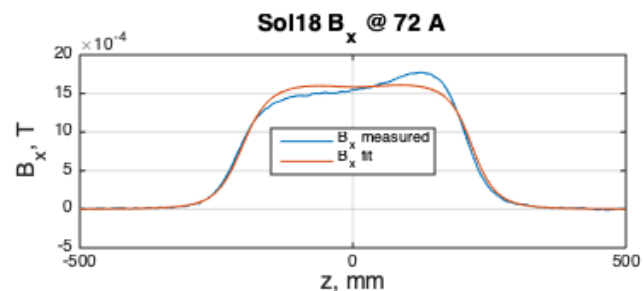
$X_{\text{offs}} = +0.13 \text{ mm}, \alpha_x = +0.72 \text{ mrad}, \alpha_{xH} = +12.02 \text{ mrad}$



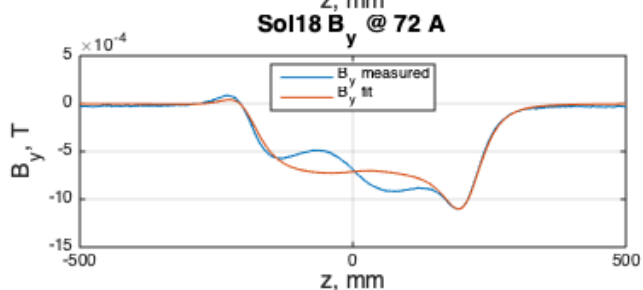
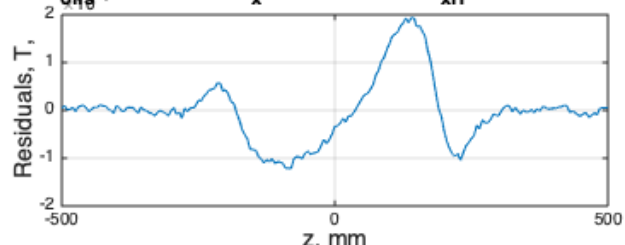
$Y_{\text{offs}} = -0.58 \text{ mm}, \alpha_y = -0.79 \text{ mrad}, \alpha_{yH} = -6.37 \text{ mrad}$



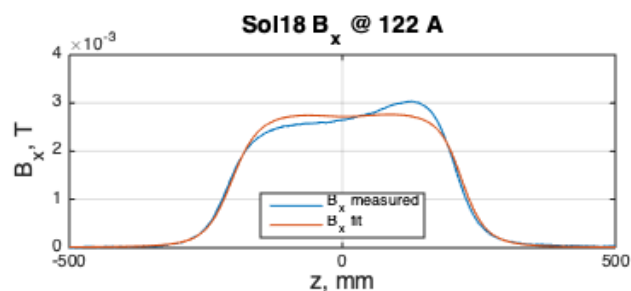
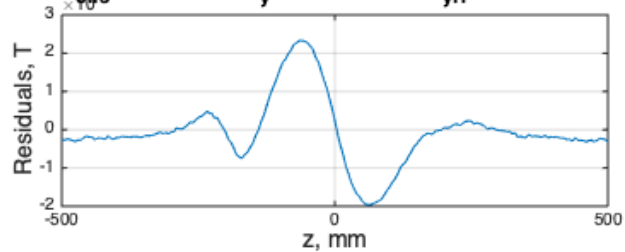
Solenoid 18



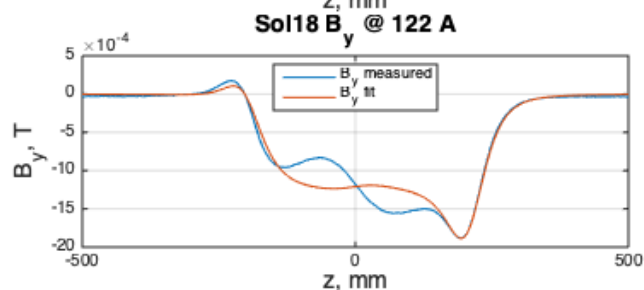
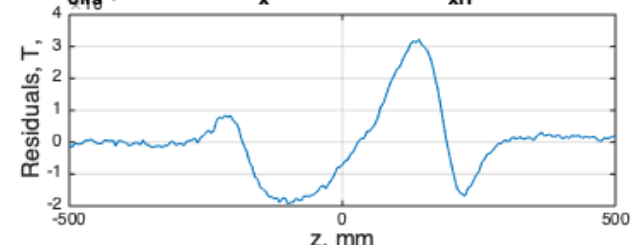
$X_{\text{offs}} = +0.16 \text{ mm}, \alpha_x = +0.92 \text{ mrad}, \alpha_{xH} = +11.22 \text{ mrad}$



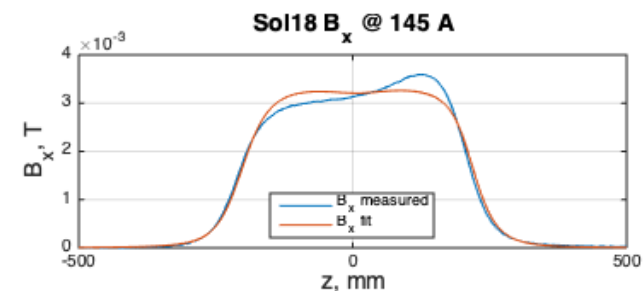
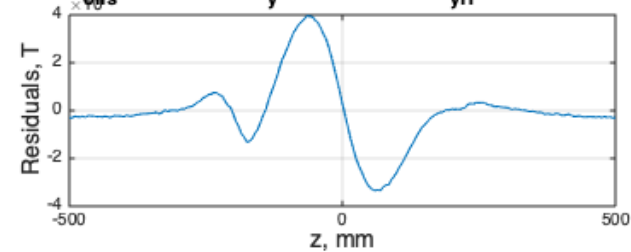
$Y_{\text{offs}} = -0.68 \text{ mm}, \alpha_y = -1.19 \text{ mrad}, \alpha_{yH} = -5.05 \text{ mrad}$



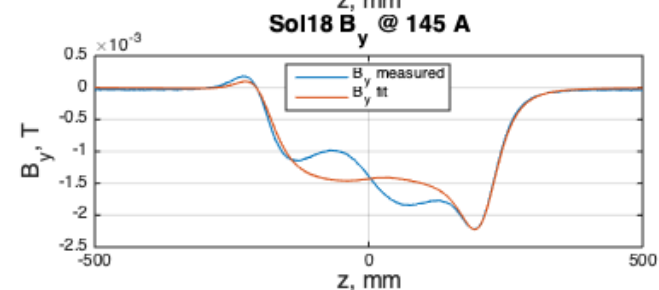
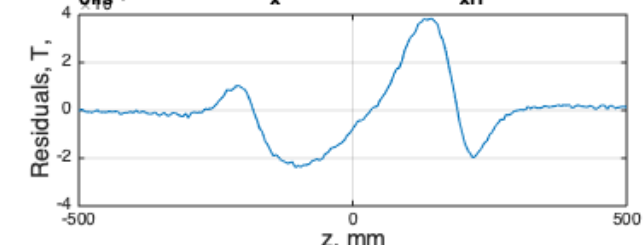
$X_{\text{offs}} = +0.17 \text{ mm}, \alpha_x = +0.95 \text{ mrad}, \alpha_{xH} = +11.38 \text{ mrad}$



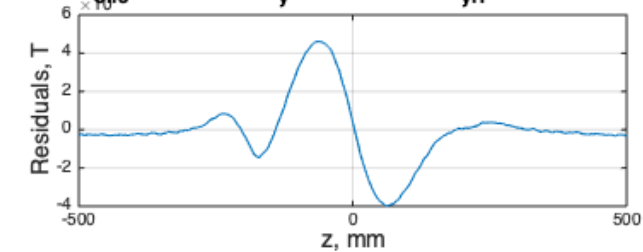
$Y_{\text{offs}} = -0.71 \text{ mm}, \alpha_y = -1.14 \text{ mrad}, \alpha_{yH} = -5.07 \text{ mrad}$



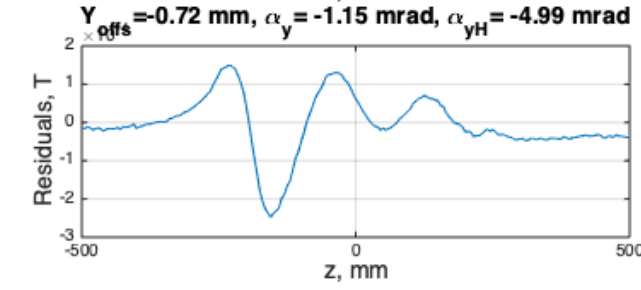
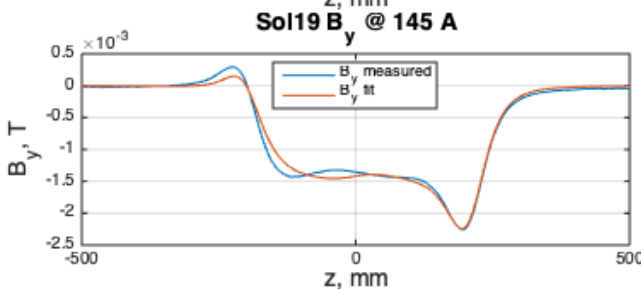
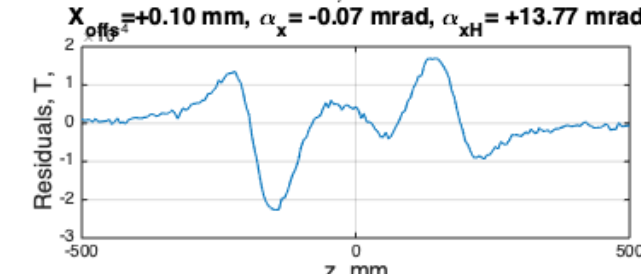
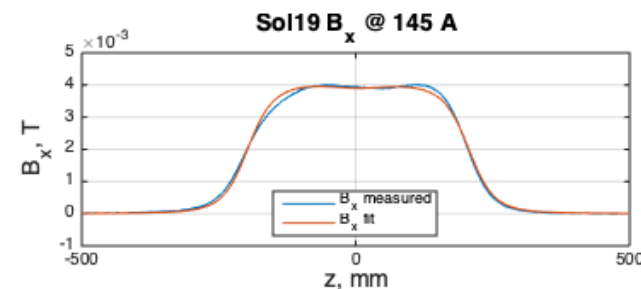
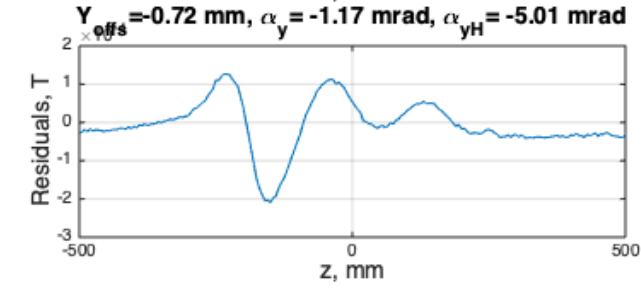
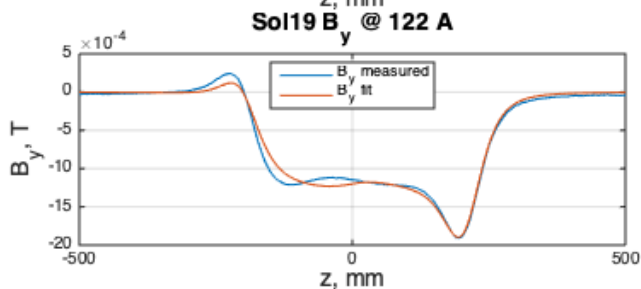
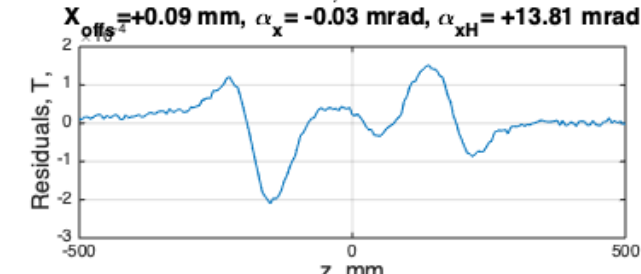
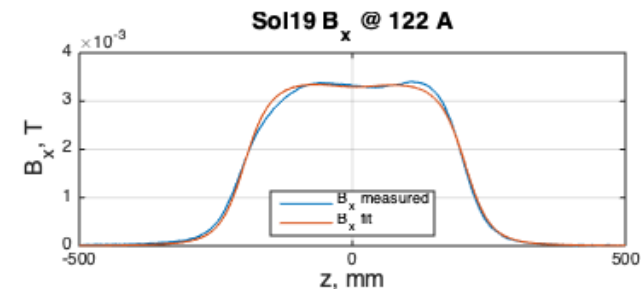
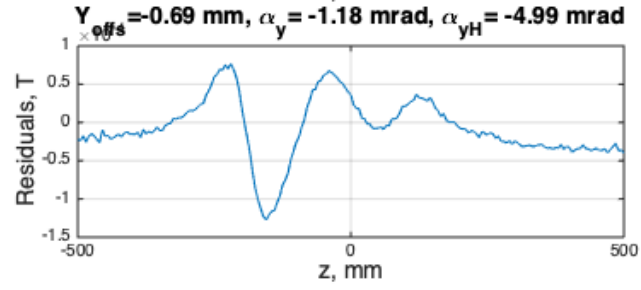
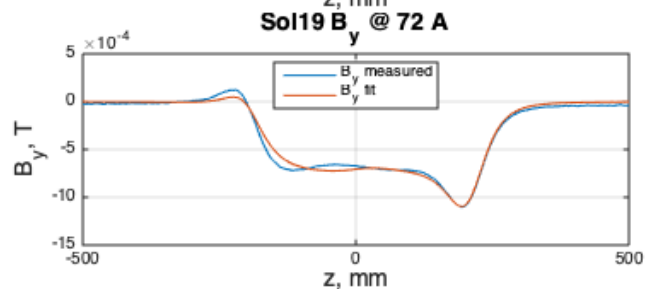
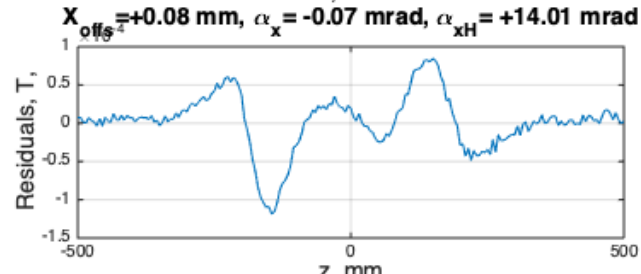
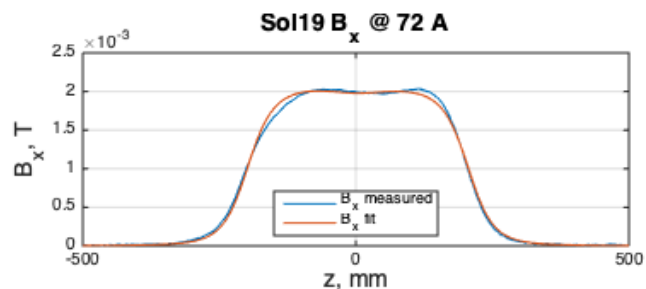
$X_{\text{offs}} = +0.18 \text{ mm}, \alpha_x = +0.94 \text{ mrad}, \alpha_{xH} = +11.32 \text{ mrad}$



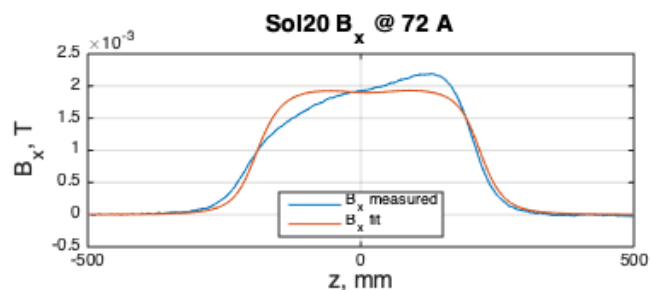
$Y_{\text{offs}} = -0.69 \text{ mm}, \alpha_y = -1.17 \text{ mrad}, \alpha_{yH} = -5.05 \text{ mrad}$



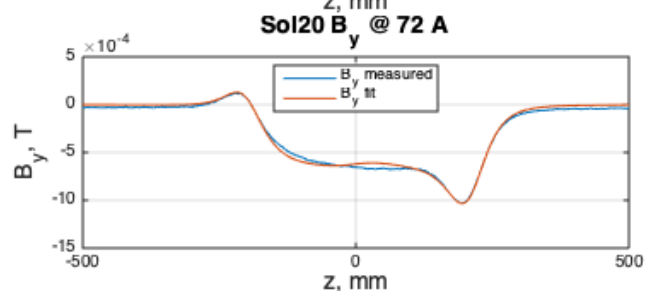
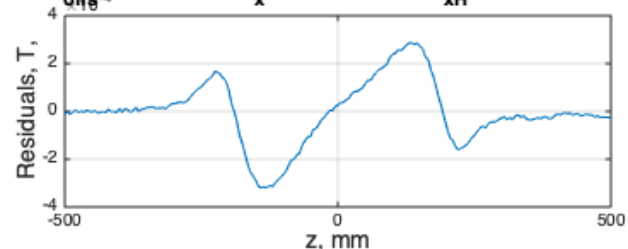
Solenoid 19 (1)



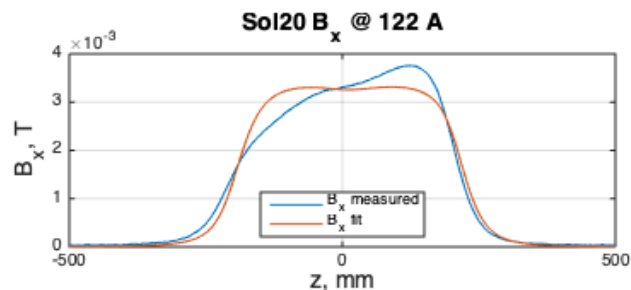
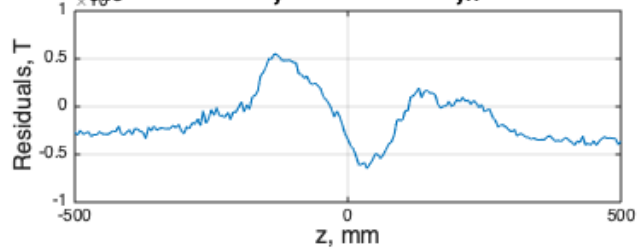
Solenoid 20



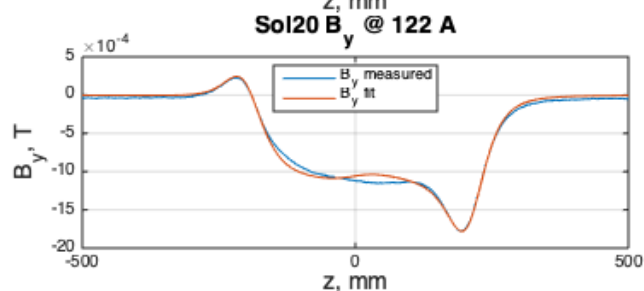
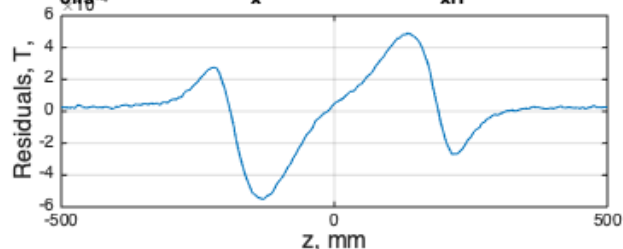
$X_{\text{offs}} = +0.39 \text{ mm}, \alpha_x = +0.30 \text{ mrad}, \alpha_{xH} = +13.48 \text{ mrad}$



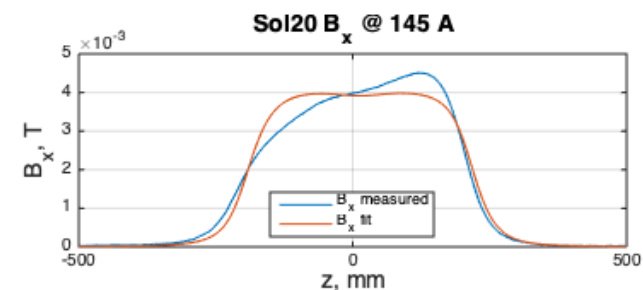
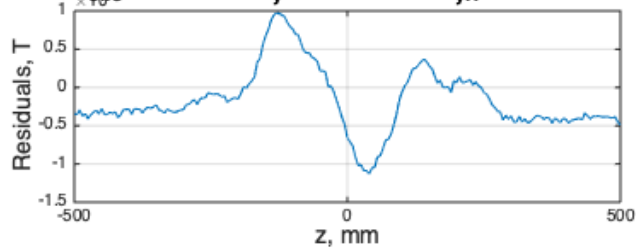
$Y_{\text{offs}} = -0.72 \text{ mm}, \alpha_y = -0.95 \text{ mrad}, \alpha_{yH} = -4.41 \text{ mrad}$



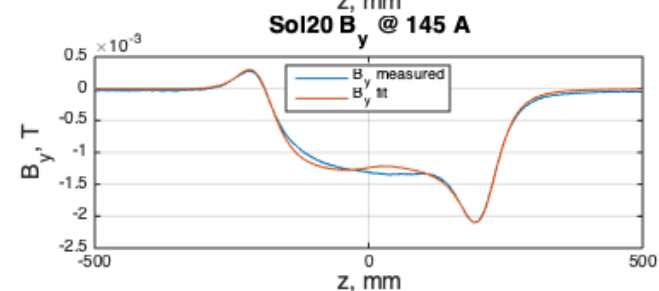
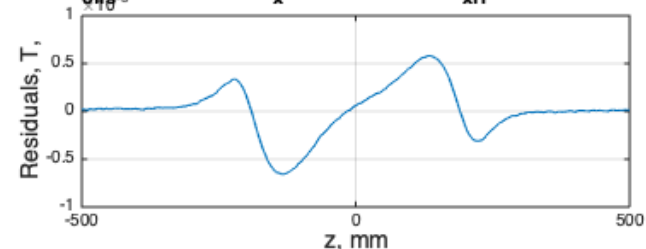
$X_{\text{offs}} = +0.38 \text{ mm}, \alpha_x = +0.42 \text{ mrad}, \alpha_{xH} = +13.68 \text{ mrad}$



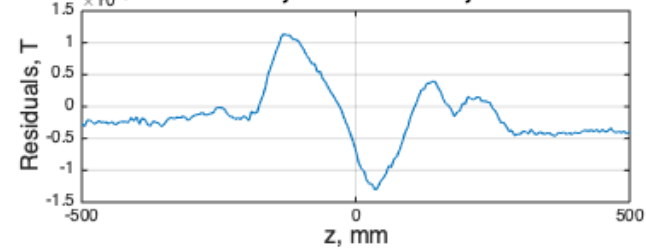
$Y_{\text{offs}} = -0.75 \text{ mm}, \alpha_y = -0.94 \text{ mrad}, \alpha_{yH} = -4.44 \text{ mrad}$



$X_{\text{offs}} = +0.39 \text{ mm}, \alpha_x = +0.32 \text{ mrad}, \alpha_{xH} = +13.84 \text{ mrad}$



$Y_{\text{offs}} = -0.74 \text{ mm}, \alpha_y = -0.93 \text{ mrad}, \alpha_{yH} = -4.38 \text{ mrad}$



Conclusion

- Most of the observed transverse field is caused by tilt of the Hall probe
- The tilt angles are reproducible for different current setting but vary slightly from solenoid to solenoid
- The residuals are scaled with excitation current – no effect of the yoke saturation