

Magnetic Field Analysis of the MICE Cooling Channel Magnets

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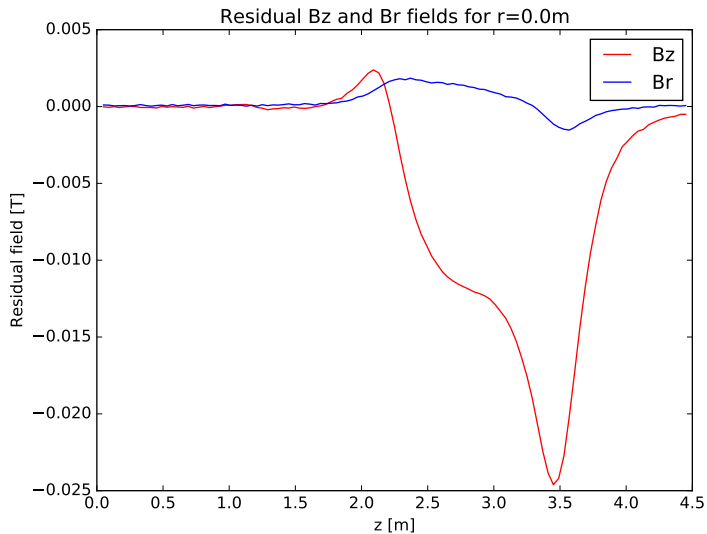
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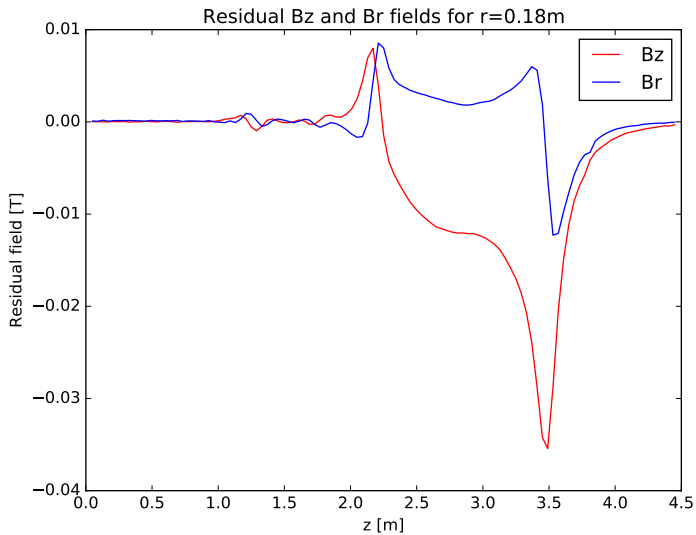
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Geometrical fit now takes into account rotations of the magnet coils about the coordinate axis of the field mapper.

It takes 7 parameters:

- Mixing
- Coordinate scaling
- Field scaling
- Rotation angle about y axis (θ_y)
- Rotation angle about x axis (θ_x)
- Offset from y axis
- Offset from x axis





$$\begin{aligned}
B_r(r, \phi, z) = & \sum_{n=0}^{\infty} \sum_{l=1}^{\infty} A_{nl} I'_n \left(\frac{l\pi}{z_{\max}} r \right) \cos(n\phi + \alpha_{nl}) \sin \left(\frac{l\pi}{z_{\max}} z \right) \\
& + \sum_{n=0}^{\infty} \sum_{l=1}^{\infty} B_{nl} I'_n \left(\frac{l\pi}{z_{\max}} r \right) \cos(n\phi + \beta_{nl}) \cos \left(\frac{l\pi}{z_{\max}} z \right) \\
& + \sum_{n=0}^{\infty} A_{n0} n r^{n-1} \cos(n\phi + \alpha_{n0}) z \\
& + \sum_{n=0}^{\infty} \sum_{m=1}^{\infty} C_{nm} J'_n \left(\frac{\zeta_{nm}}{r_{\max}} r \right) \cos(n\phi + \gamma_{nm}) \sinh \left(\frac{\zeta_{nm}}{r_{\max}} z \right) \\
& + \sum_{n=0}^{\infty} \sum_{m=1}^{\infty} D_{nm} J'_n \left(\frac{\zeta_{nm}}{r_{\max}} r \right) \cos(n\phi + \delta_{nm}) \cosh \left(\frac{\zeta_{nm}}{r_{\max}} z \right) \\
& + \sum_{n=0}^{\infty} E_n n r^{n-1} \cos(n\phi + \epsilon_n)
\end{aligned}$$

B_r component as given by Fourier-Bessel Series¹.

¹ Corrections to the solenoid field measurements, J.C. Hart, (2007), ATLAS Note

$n=0,1,2$ and $l=0,1,2,3,4,5$

