$$\frac{d^2r}{dz^2} + [\frac{(\omega_L^2(z) - \omega_L^2(z=0))}{\beta^2 c^2}]r = 0$$

$e/m = 1.76 * 10^{11}\ s^{-1}T^{-1}$

$\gamma = 1.59$

$\beta = 0.78$

$c = 3 * 10^8\ ms^{-1}$

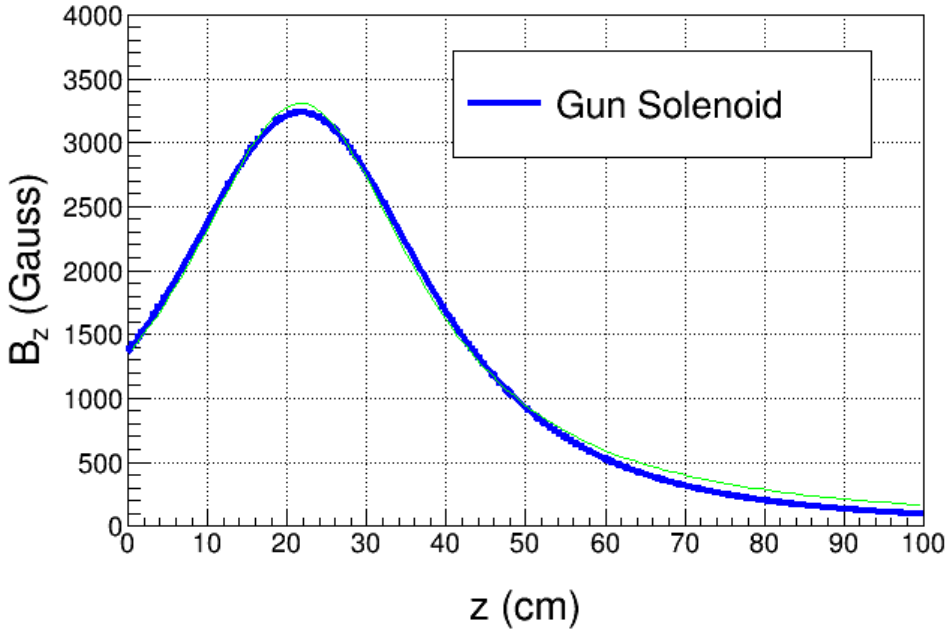
$B(z=0) = 0.145\ T$

$$\omega_L = \frac{eB}{2\gamma m}$$

Therefore

$\omega_L^2(z=0) = 6.44031 * 10^{19}\ s^{-2}$

Fit for the magnetic filed map



and the equation is,

$$B = \frac{3310.54}{1 + (\frac{z - 21.6284}{17.9171})^2}$$

By substituting these values

$$\frac{d^2r}{dz^2} + 5.59 * 10^4 [\frac{0.331054}{1 + (\frac{z-0.216284}{0.179171})^2}]^2 r - 1.18 * 10^3 r = 0$$

The above equation was solved using the 4th order Range-Kutta method in c++.

Initial conditions ,

$r(z = 0) = 0.106$ mm (laser size)

$$\frac{dr}{dz}(z = 0) = 0$$

Units,

B in T, z in m and r in mm.