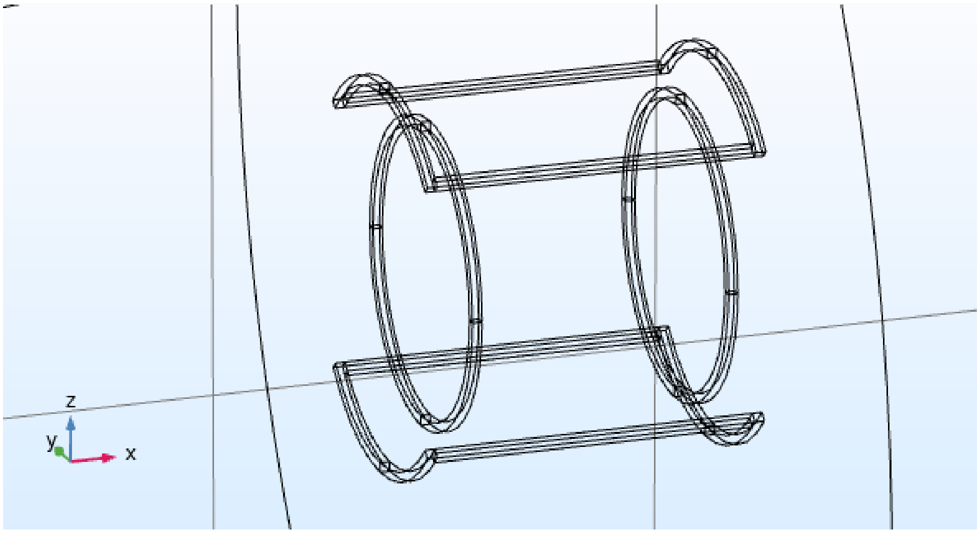
Gradient Magnetic Field Generation Setting

1. Geometry

   The complete model contains two parts: saddle coils and Helmholtz coils.



   The saddle coils are for generating gradient magnetic field in **y** and **z** directions. The Helmholtz coils are for **x** direction.

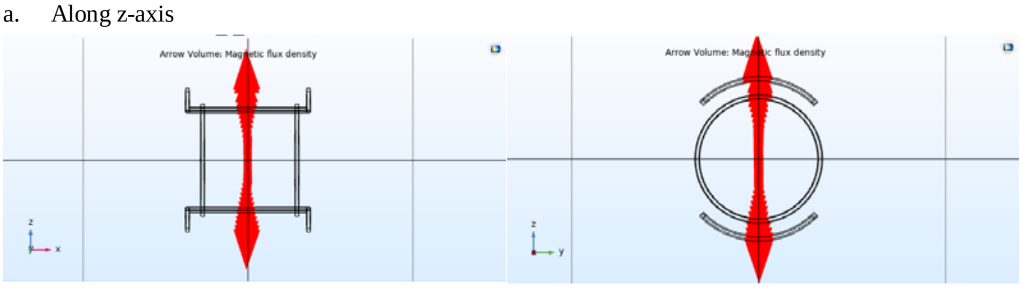
2. Geometry of setting

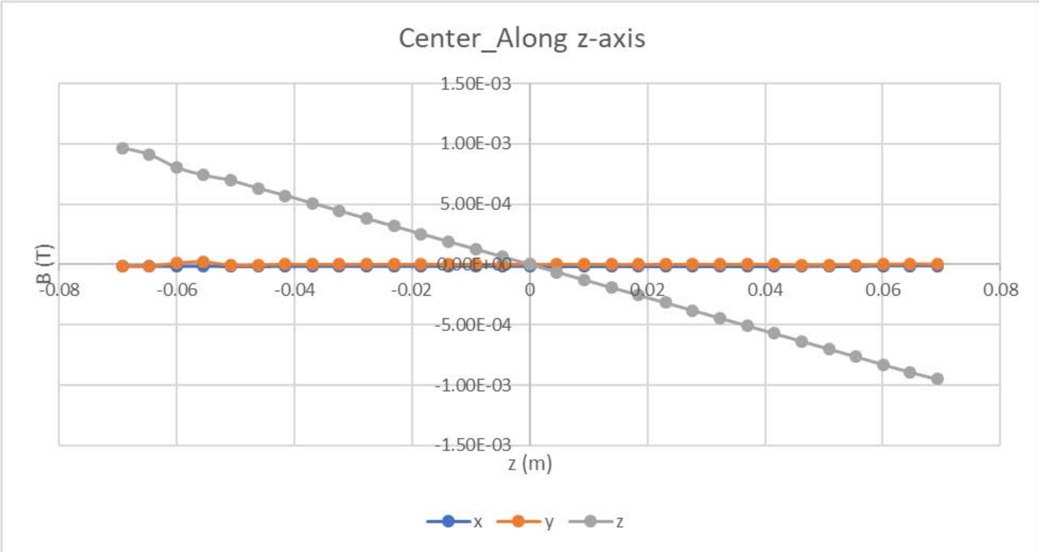
Name	Value	Description
I_saddle [A]	5	Current of saddle coils
r_saddle [m]	0.2	Radius of saddle coils
Theta_1	43.86	Start degree of revolve
Theta_2	136.14	End degree of revolve
Theta	46.14	Half degree of circular part of saddle coils
l [m]	1.7321*r_saddle	Distance between circular parts of saddle coils
a [m]	0.05*r_saddle	Side length of square model of insulator
n	100	Turns of coils
r_h [m]	0.15	Radius of Helmholtz coils
l_h [m]	1.8*r_h	Length of Helmholtz coils
I_h [A]	1	Current of Helmholtz coils

3. Simulation Result

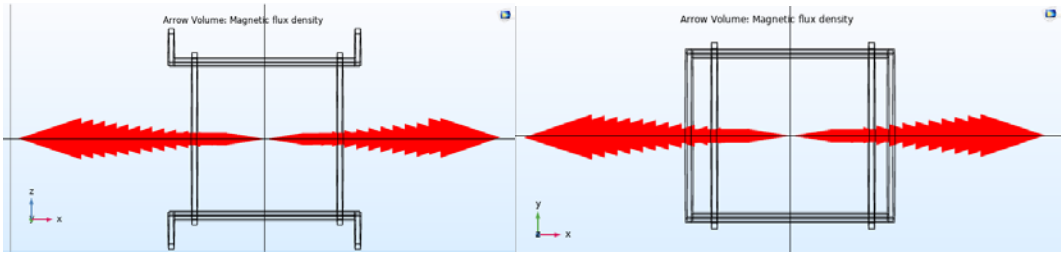
   1) At the center of coils

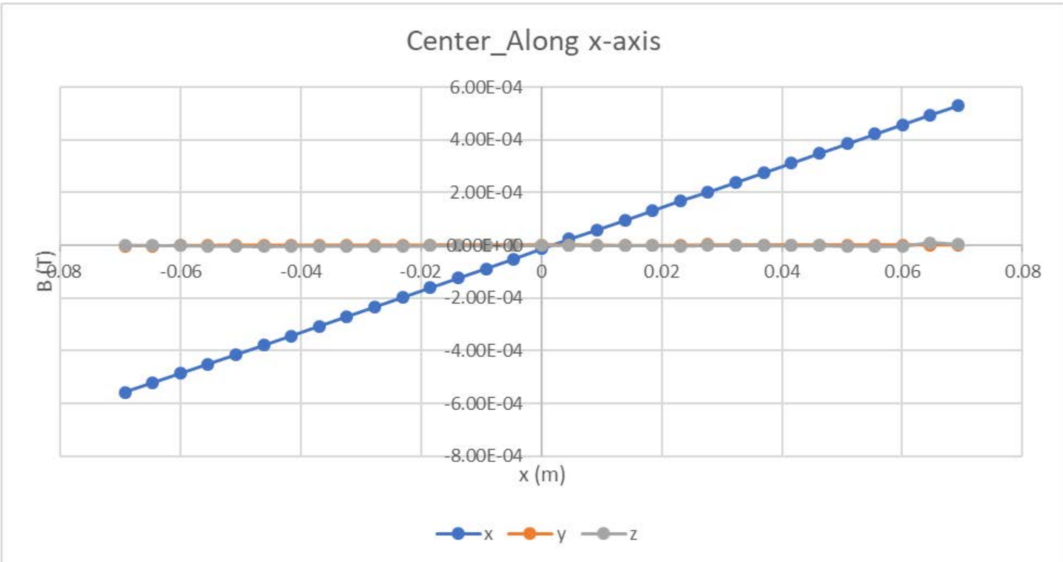
   a. Along z-axis



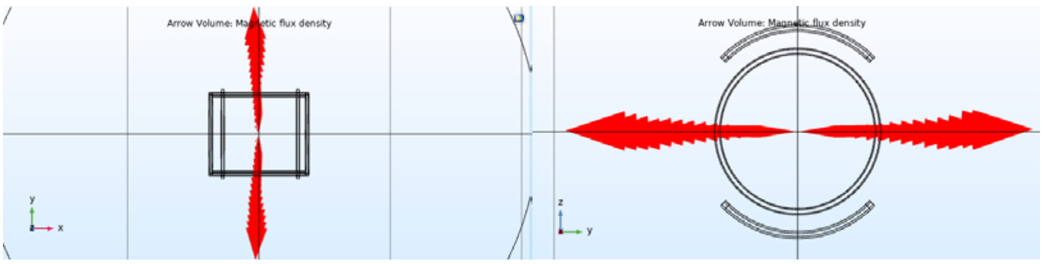


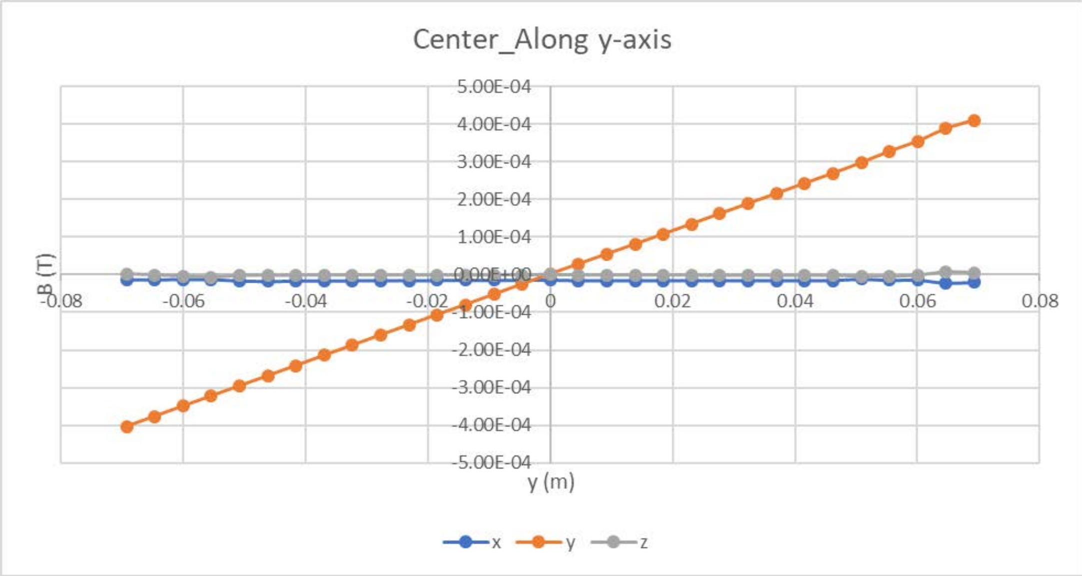
b. Along x-axis





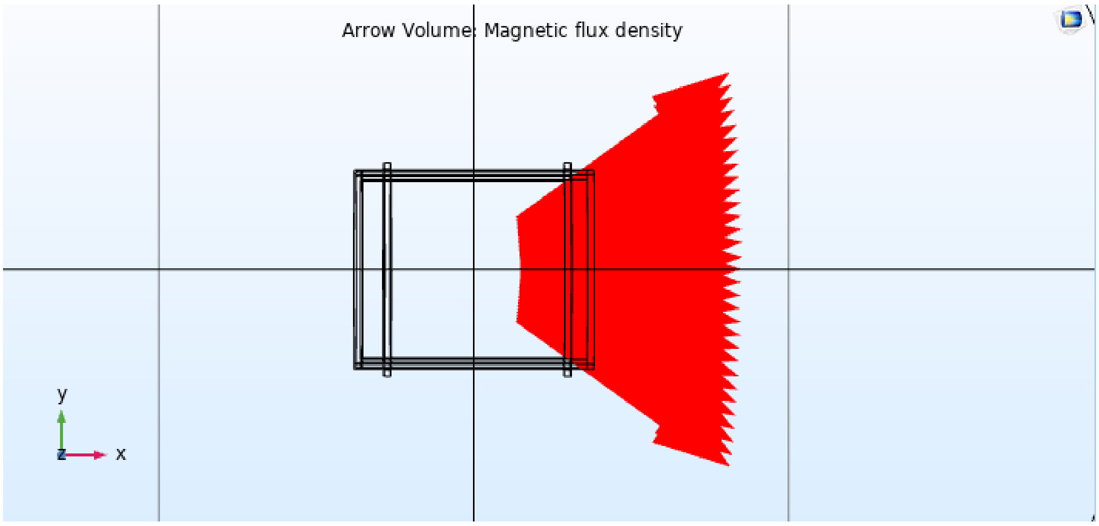
c. Along y-axis

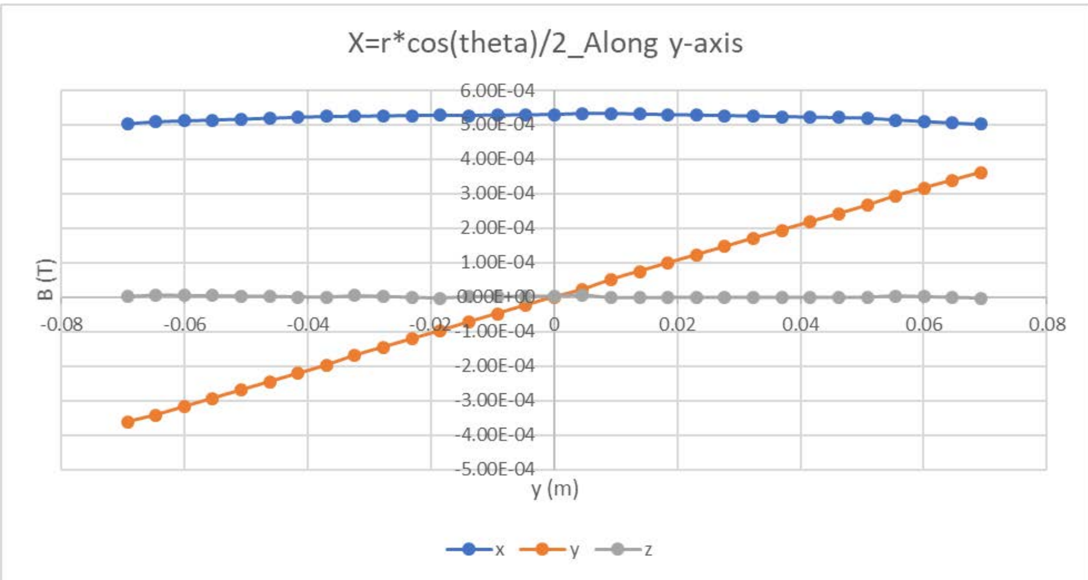




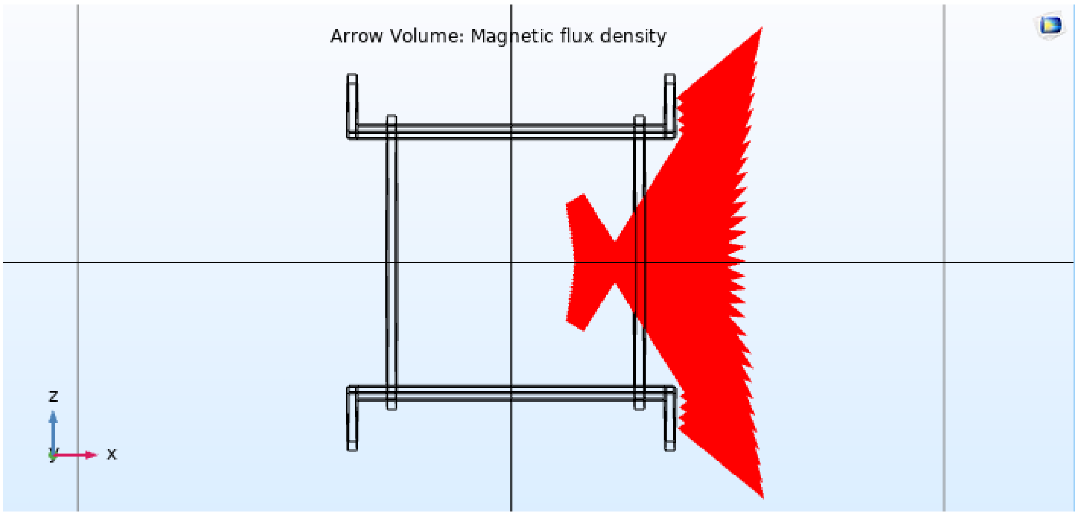
2) X=r_saddle*cos(theta)/2

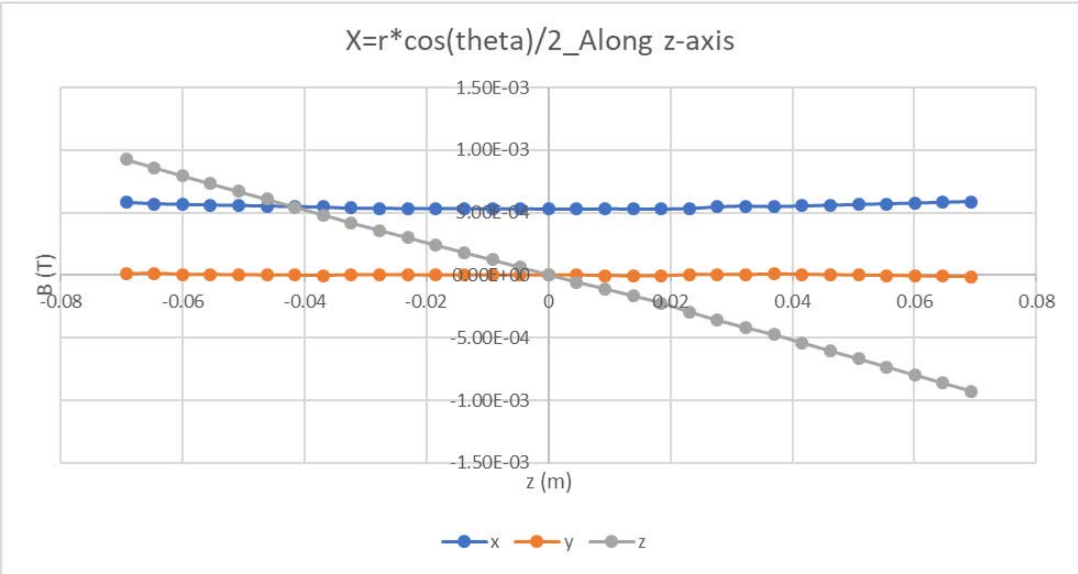
a. Along y axis





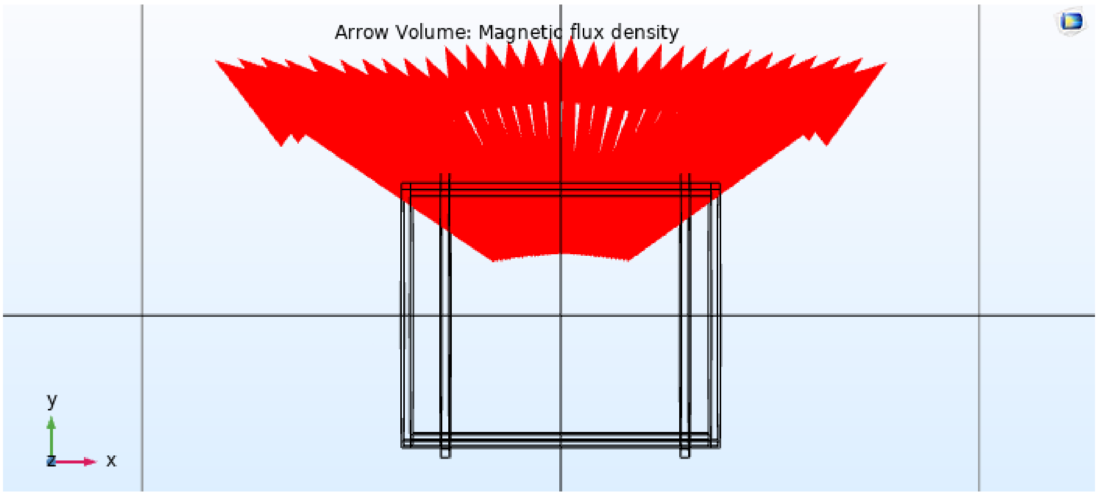
b. Along z axis

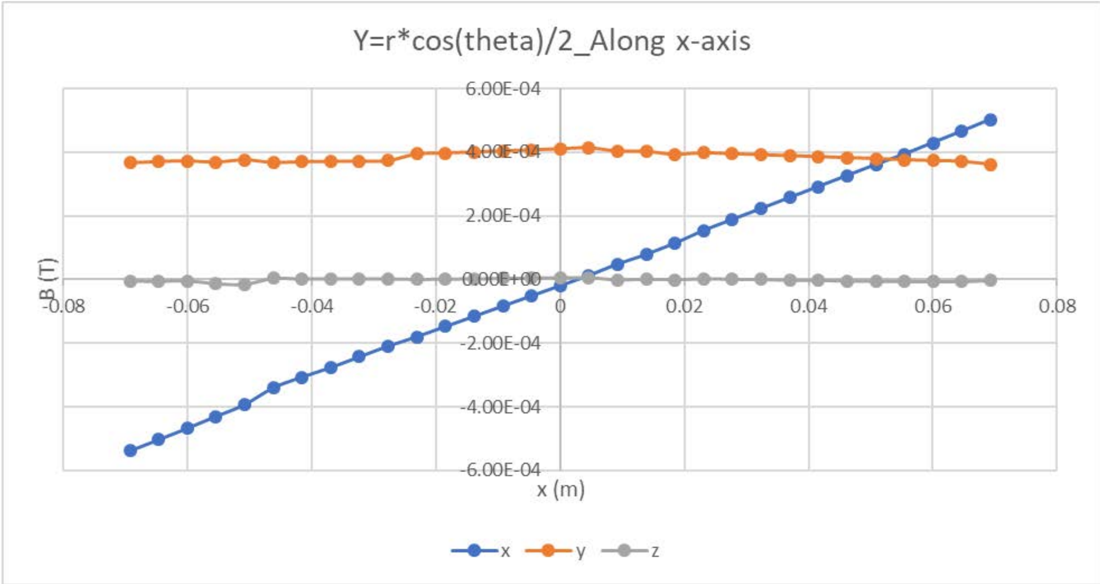




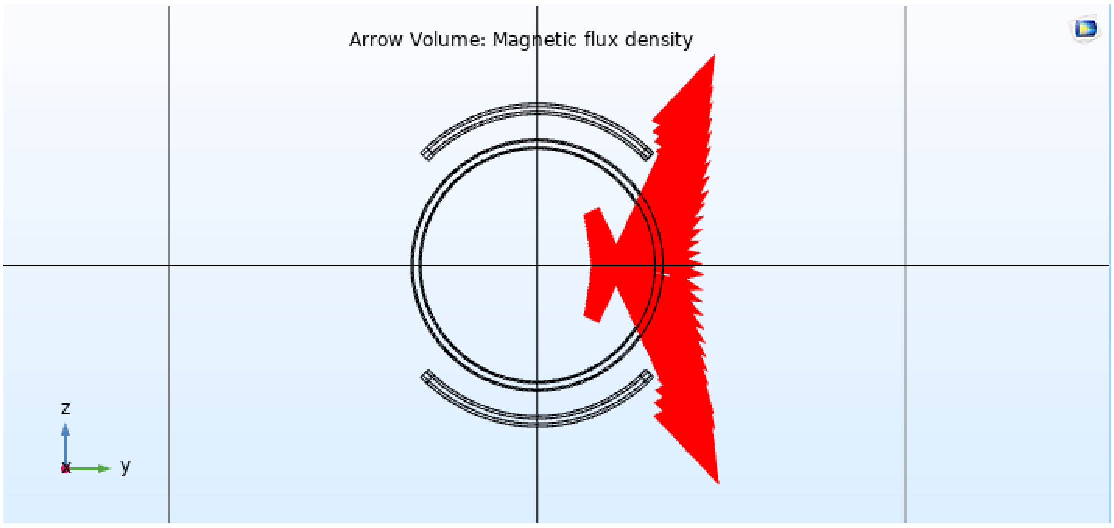
3) Y= r_saddle*cos(theta)/2

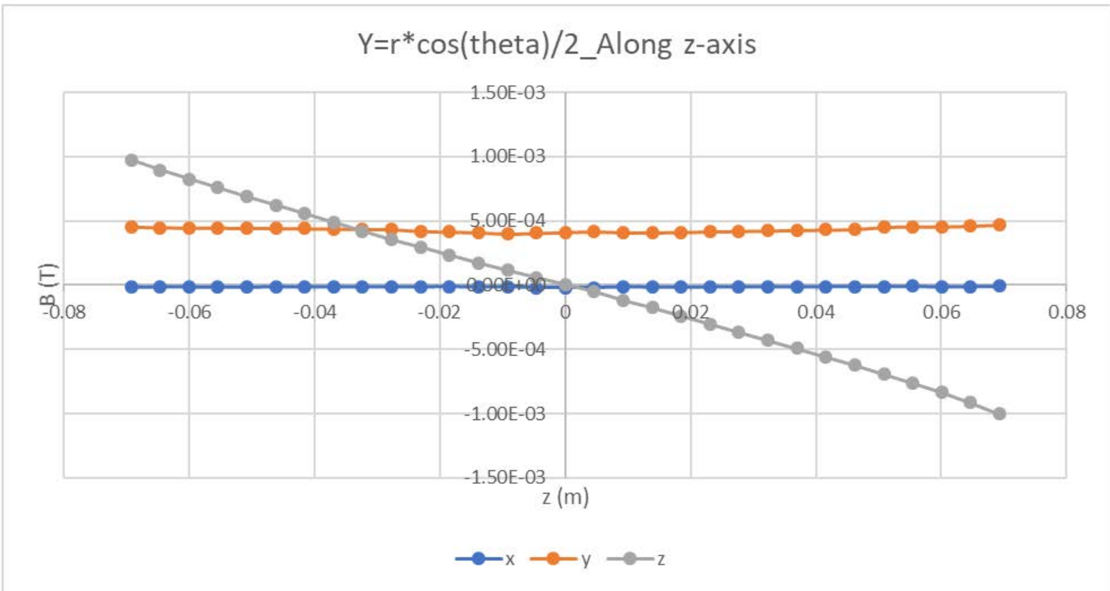
a. Along x-axis





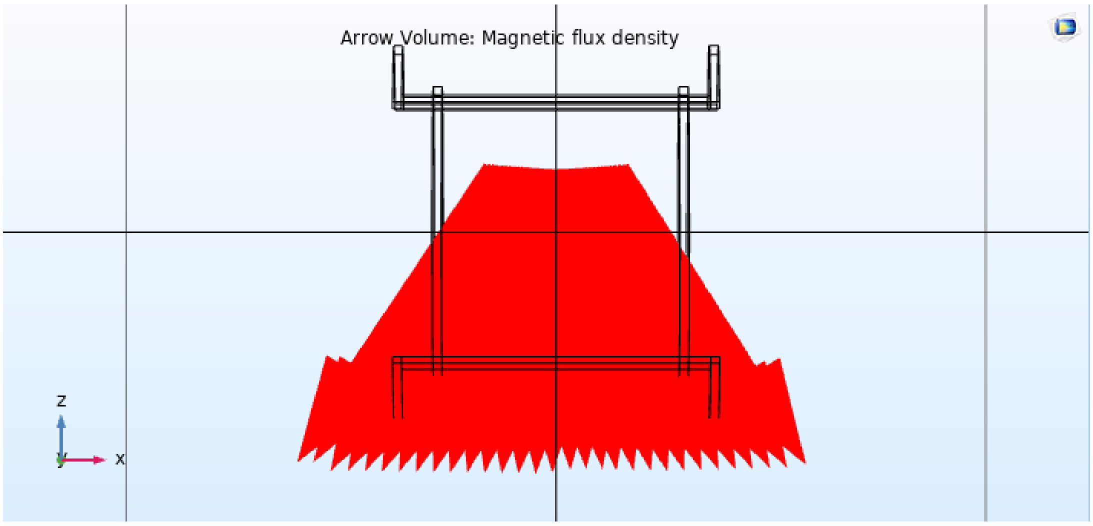
b. Along z-axis

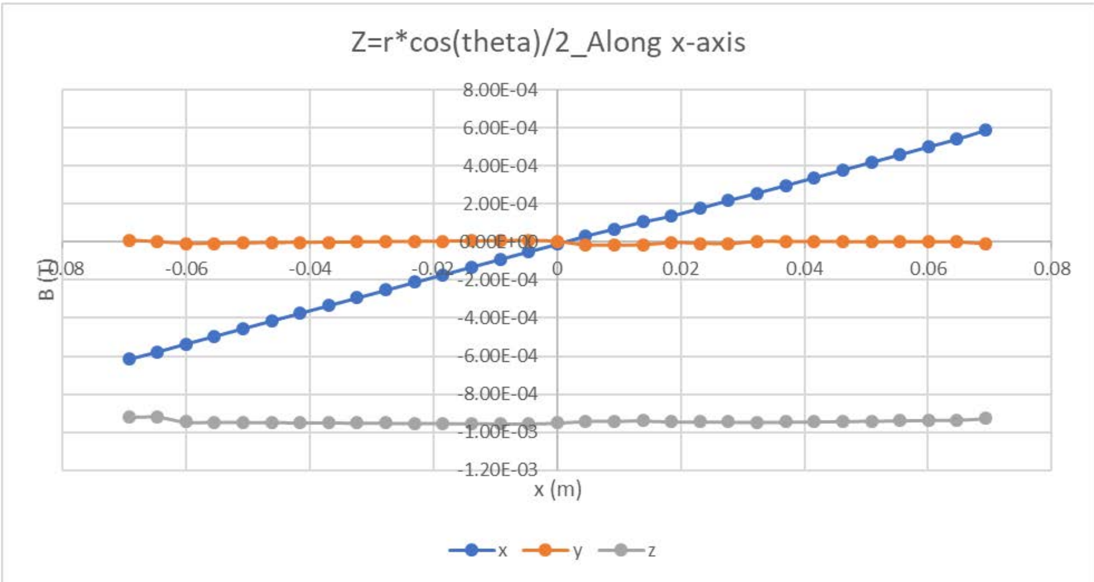




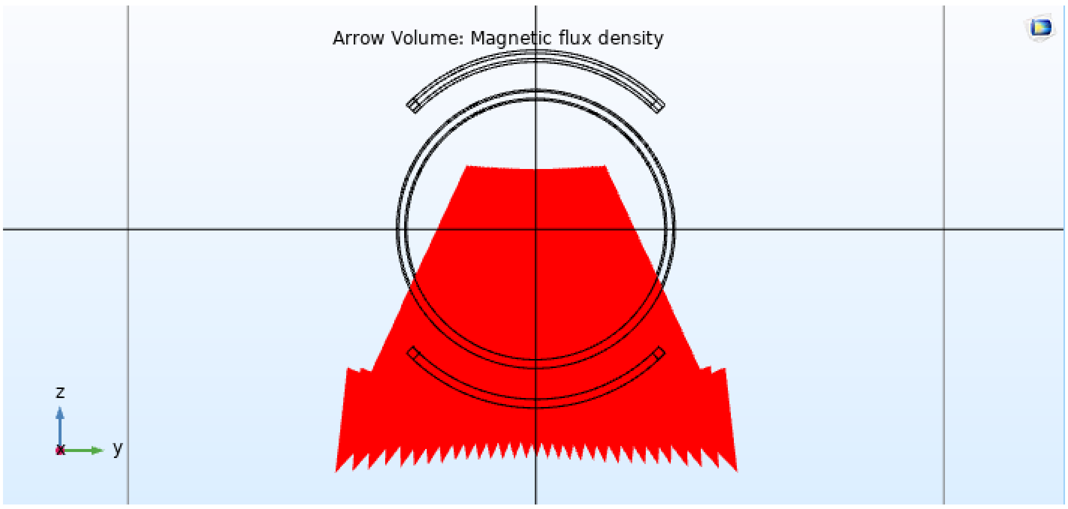
4) Z= r_saddle*cos(theta)/2

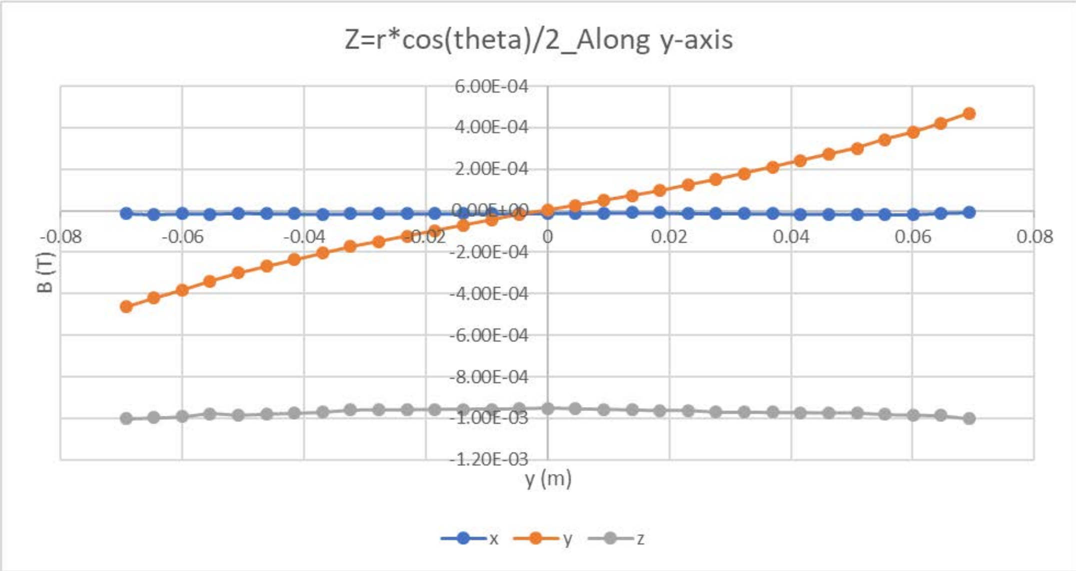
a. Along x-axis



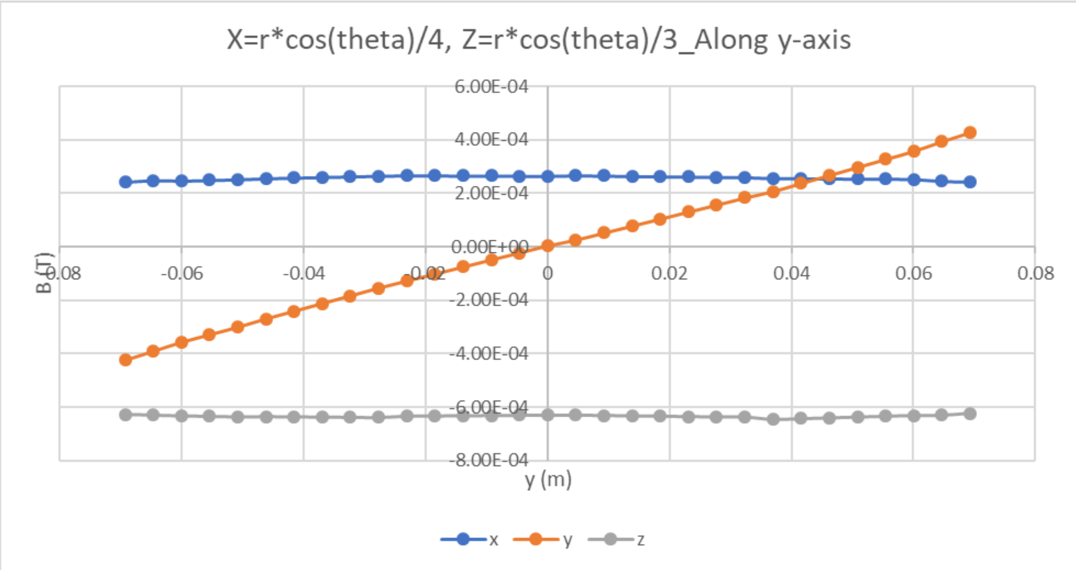


b. Along y-axis





5) Random x, z along y-axis



The effective region of gradient magnetic field is x,y,z=[-0.07m, 0.07m]. Y-axis needs highest resolution, which is about 500G/m = 0.5G/mm. For I_saddle, it should be at least about 3(A) to get an enough resolution in y, z directions.