Permeability of free space:

$$\mu_o := 4\cdot\pi 10^{-7}\cdot\frac{H}{m}$$

Properties of an "ideal" 40MGOe magnet:

$$H_c := 10^6\cdot\frac{A}{m}$$

$$B_r := \mu_o\cdot H_c$$

Evaluate force expressions for planar and axisymmetric cases that result from modeling the magnets as point dipoles. This is a pretty good approximation as long as the magnets aren't too close together.

Planar:

$R := 4.5\cdot in$ R is the center-to-center distance between magnets

$$Area := 1\cdot in^2$$

$$Depth := 1\cdot m$$

$$F_{2d} := \frac{B_r\cdot H_c\cdot Area^2\cdot Depth}{\pi\cdot R^3}$$

$$F_{2d} = 111.495\,kg\,m\,s^{-2}$$

Results:

Mesh Size	WST	line integral
0.5"	-121.01 N	-108.8 N
0.25"	-126.98 N	-111.4 N
0.125"	-122.40 N	-111.2 N
0.0625"	-117.91 N	-111.1 N
0.03125"	-112.46 N	-111.0 N

where line integral taken on a box with the corners
(-5,7),(5,7),(5,0),(-5,0)

Axisymmetric

$$\text{Volume} := \pi \cdot (0.5 \cdot \text{in})^2 \cdot 1 \cdot \text{in}$$

$$F_{axi} := \frac{3B_r \cdot H_c \cdot \text{Volume}^2}{2 \cdot \pi \cdot R^4}$$

$$F_{axi} = 0.582\,\text{kg}\,\text{m}\,\text{s}^{-2}$$

Results:

Mesh Size	WST	line integral
0.5"	-3.672 N	-0.7060 N
0.25"	-2.073 N	-0.6249 N
0.125"	-0.757 N	-0.6000 N
0.0625"	-0.729 N	-0.5936 N
0.03125"	-0.591 N	-0.5930 N

where line integral taken on a box with the corners (0,7),(5,7),(5,0),(0,0)