Magnetostatic Analysis of Study 1

Author: ElectromagneticWorks Inc.

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1. Introduction

In this analysis, the inner set of magnets and the outer set are separated by an offset of beteen 0 and 15 degrees in steps of 5 degrees. The torque applied on the inner rotor increases as the angular offset increases.

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2. Description

Study 1 represents the assembly with an angular offset of 0 degrees.

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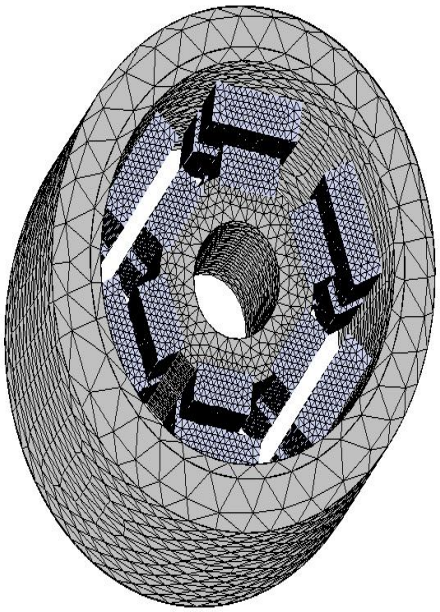
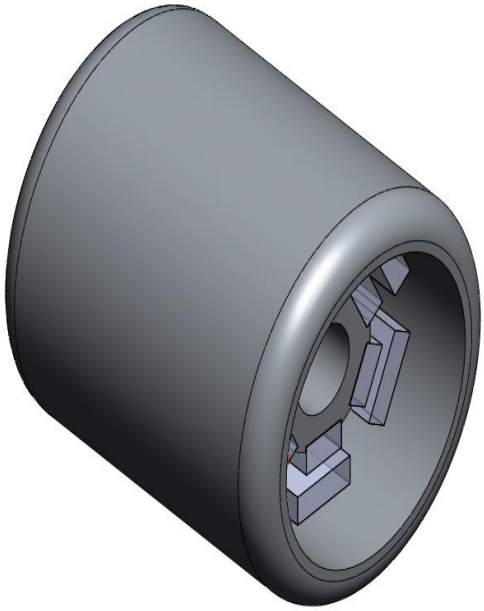
3. Model View

Magnetic_Model_Comps_Current View (Mesh)



Magnetic_Model_Comps_Isometric View



4. Materials

Note: R.P. stands for Relative Permeability

Nbr.	Part Name	Material Name	Permeability Type
1	BAR-TABLE-1-Body 1 (MAGNET_LENGTH)	S2818	Isotropic
2	BAR-TABLE-10-Body 1 (MAGNET_LENGTH)	S2818	Isotropic

3	BAR-TABLE-11-Body 1 (MAGNET_LENGTH)	S2818	Isotropic
4	BAR-TABLE-12-Body 1 (MAGNET_LENGTH)	S2818	Isotropic
5	BAR-TABLE-13-Body 1 (MAGNET_LENGTH)	S2818	Isotropic
6	BAR-TABLE-14-Body 1 (MAGNET_LENGTH)	S2818	Isotropic
7	BAR-TABLE-15-Body 1 (MAGNET_LENGTH)	S2818	Isotropic
8	BAR-TABLE-16-Body 1 (MAGNET_LENGTH)	S2818	Isotropic
9	BAR-TABLE-17-Body 1 (MAGNET_LENGTH)	S2818	Isotropic
10	BAR-TABLE-18-Body 1 (MAGNET_LENGTH)	S2818	Isotropic
11	BAR-TABLE-19-Body 1 (MAGNET_LENGTH)	S2818	Isotropic
12	BAR-TABLE-2-Body 1 (MAGNET_LENGTH)	S2818	Isotropic
13	BAR-TABLE-20-Body 1 (MAGNET_LENGTH)	S2818	Isotropic
14	BAR-TABLE-21-Body 1 (MAGNET_LENGTH)	S2818	Isotropic
15	BAR-TABLE-22-Body 1 (MAGNET_LENGTH)	S2818	Isotropic
16	BAR-TABLE-23-Body 1 (MAGNET_LENGTH)	S2818	Isotropic
17	BAR-TABLE-24-Body 1 (MAGNET_LENGTH)	S2818	Isotropic
18	BAR-TABLE-3-Body 1 (MAGNET_LENGTH)	S2818	Isotropic
19	BAR-TABLE-4-Body 1 (MAGNET_LENGTH)	S2818	Isotropic
20	BAR-TABLE-5-Body 1 (MAGNET_LENGTH)	S2818	Isotropic
21	BAR-TABLE-6-Body 1 (MAGNET_LENGTH)	S2818	Isotropic
22	BAR-TABLE-7-Body 1 (MAGNET_LENGTH)	S2818	Isotropic
23	BAR-TABLE-8-Body 1	S2818	Isotropic

	(MAGNET_LENGTH)		
24	BAR-TABLE-9-Body 1 (MAGNET_LENGTH)	S2818	Isotropic
25	Inner Air^Magnetic_Model_Comps-1-Body 1 (Cavity1)	Air	Isotropic
26	Inner Magnet Thimble-1-Body 1 (CirPattern1)	Mild Steel	Isotropic
27	Outer Air^Magnetic_Model_Comps-1-Body 1 (Cavity1)	Air	Isotropic
28	Outer Thimble 3-1-Body 1 (Fillet1)	Mild Steel	Isotropic

5. Force and Torque Information

Nbr.	Name	Torque Center	Components & Bodies
1	Virtual Work - 1	At origin	Outer Thimble 3-1 Inner Magnet Thimble-1 BAR-TABLE-3 BAR-TABLE-10 BAR-TABLE-11 BAR-TABLE-12 BAR-TABLE-13 BAR-TABLE-14 BAR-TABLE-4 BAR-TABLE-5 BAR-TABLE-6 BAR-TABLE-7 BAR-TABLE-8 BAR-TABLE-9

6. Study Properties

Mesh Information

Nbr.Of Nodes	Nbr.Of Elements	Element Size (m)	Tolerance (m)
105551	631872	0.013363	0.000013

Solver information

Solver Type	Nbr. Current Increments	Compute Circuit Parameters
Direct Solver	1	No

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7. Results Table

Force Results

	Fx-axis (N)	Fy-axis (N)	Fz-axis (N)
Virtual Work - 1	-2.040432e-001	-4.368823e-002	2.361540e-001

Torque Results

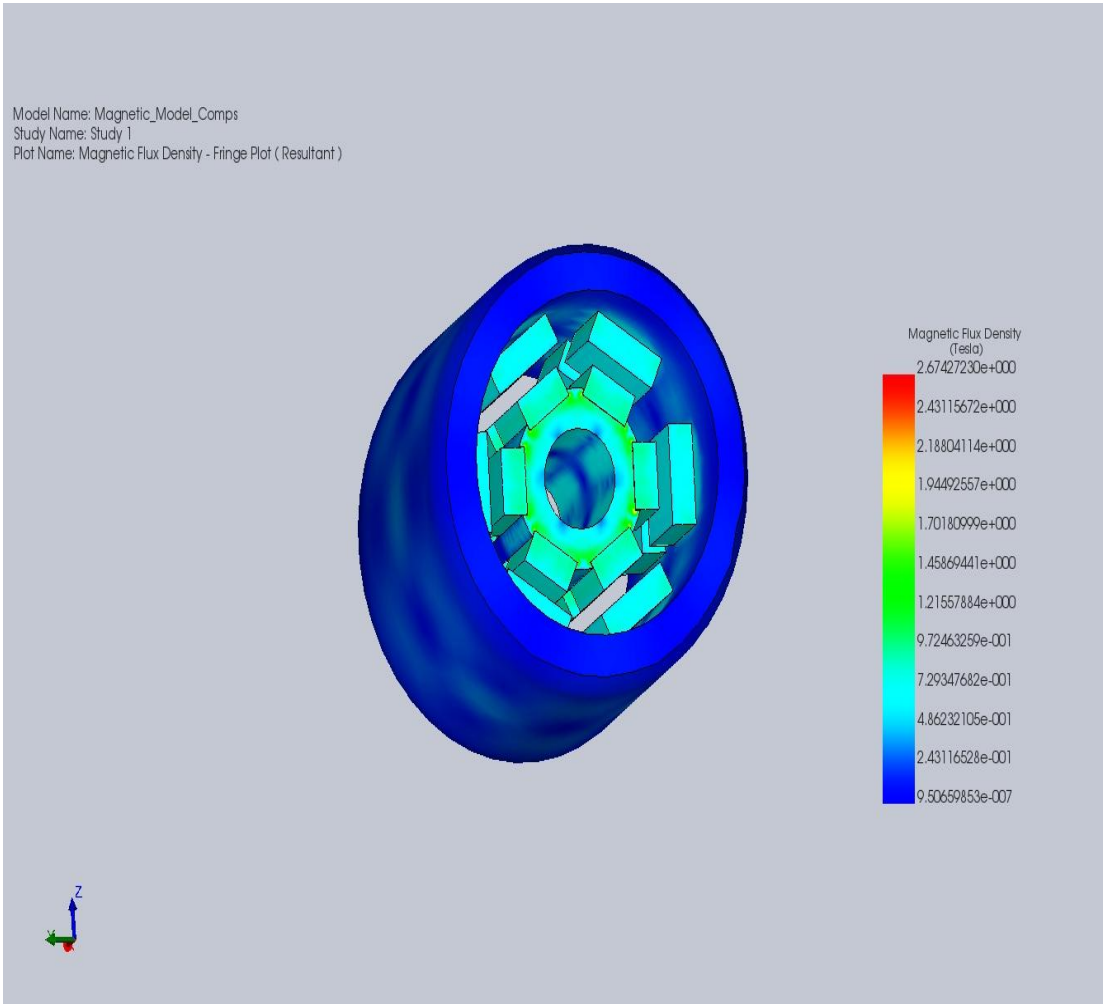
	Tx-axis (N.m)	Ty-axis (N.m)	Tz-axis (N.m)
Virtual Work - 1	1.644361e-003	-9.830126e-002	-2.187607e-002

Energy Results

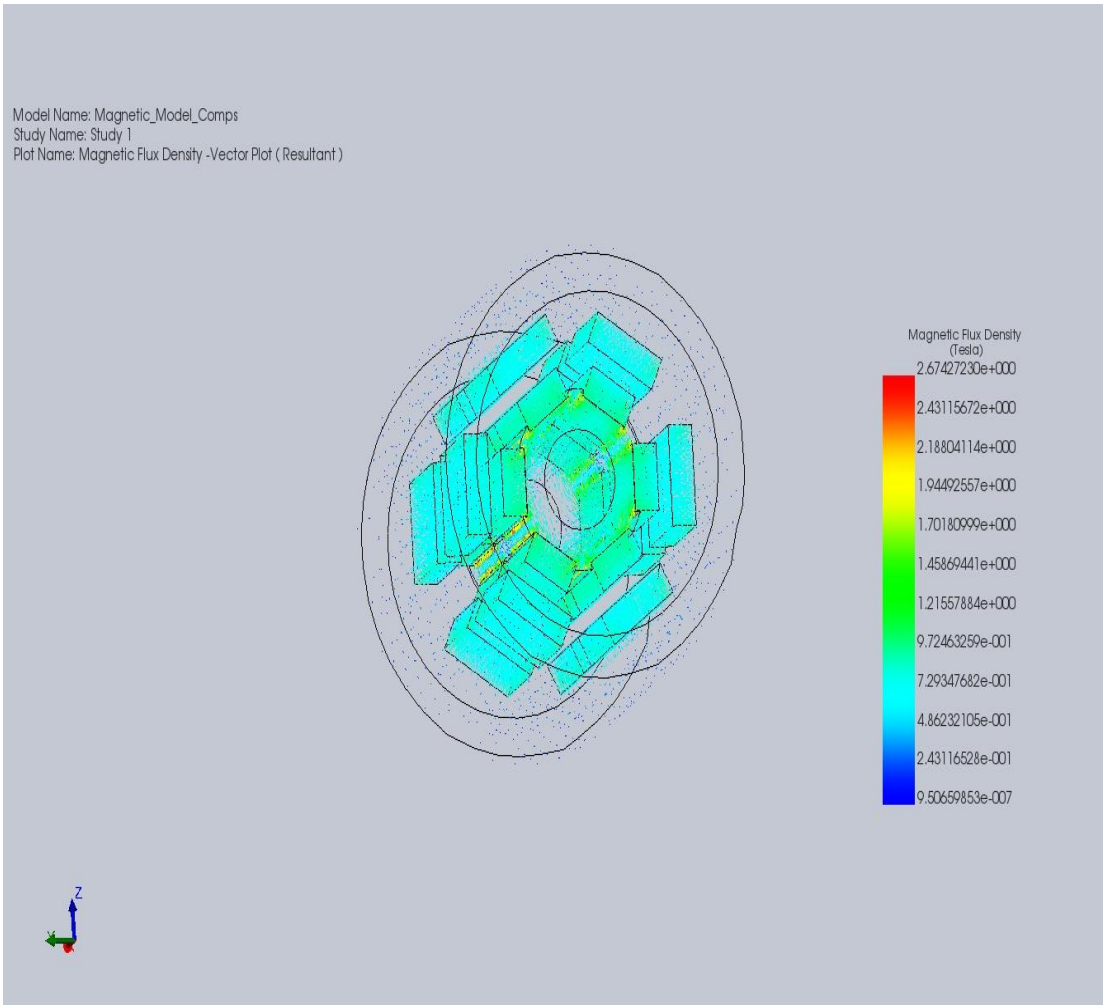
Energy (J)	Co-Energy (J)
9.870622e+000	9.870622e+000

8. Magnetic Flux Density Results

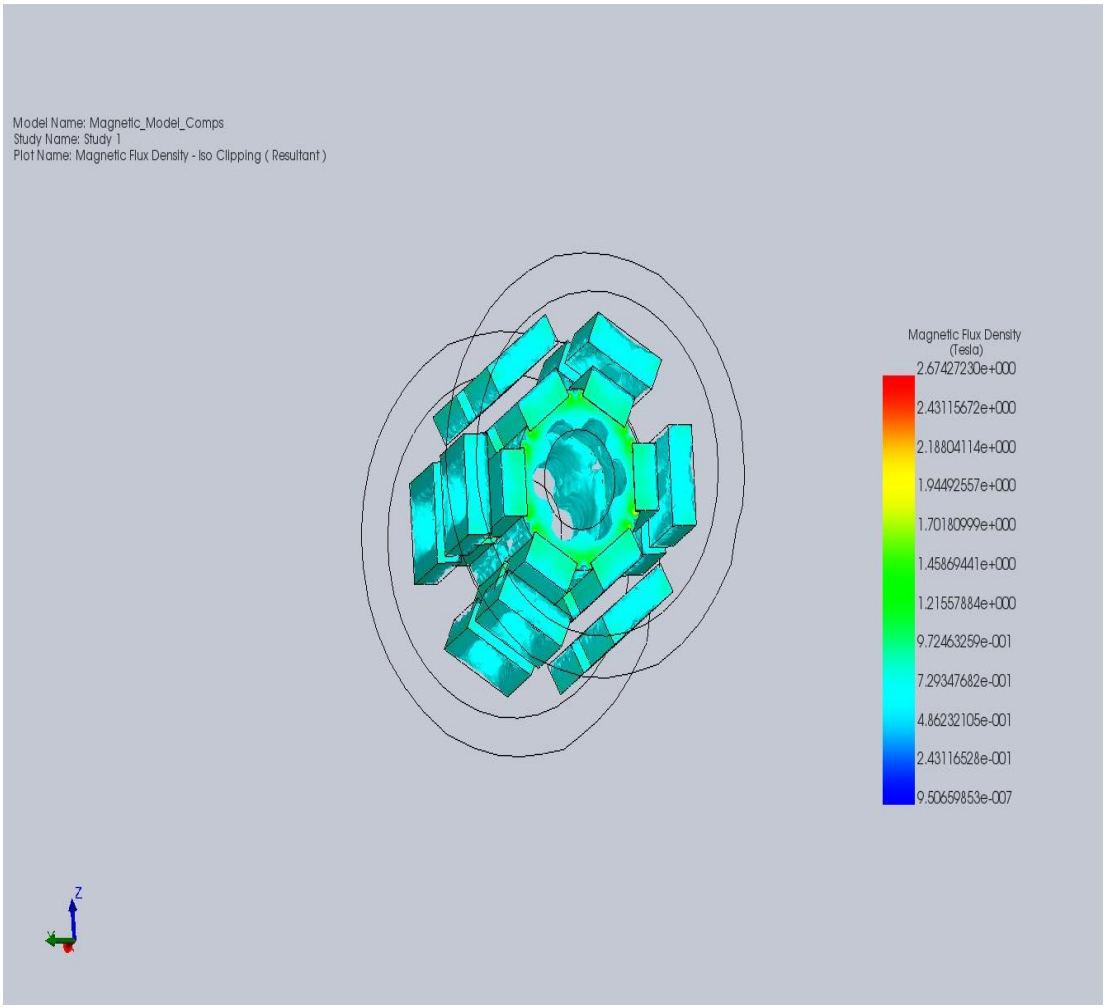
Magnetic Flux Density - Fringe Plot



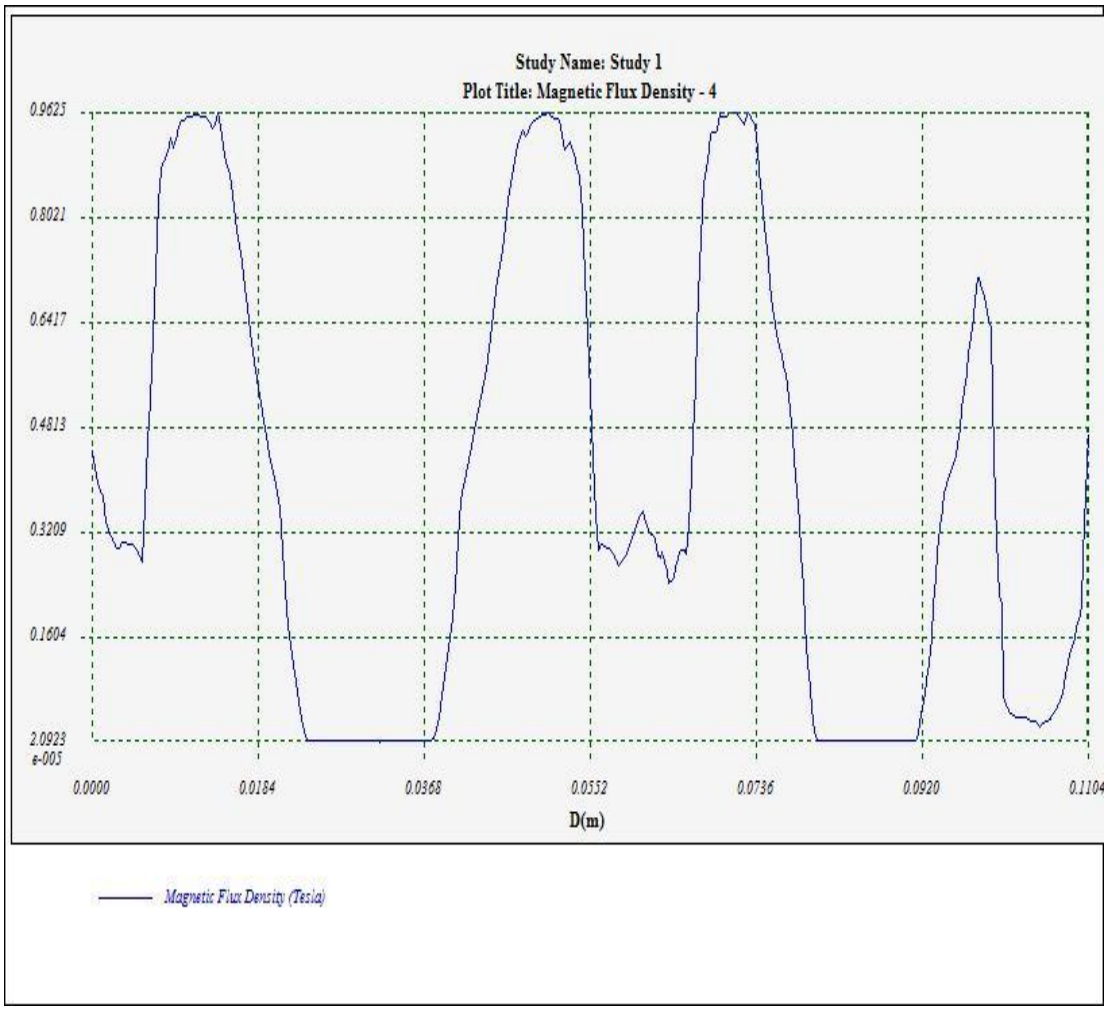
Magnetic Flux Density -Vector Plot



Magnetic Flux Density - Iso Clipping

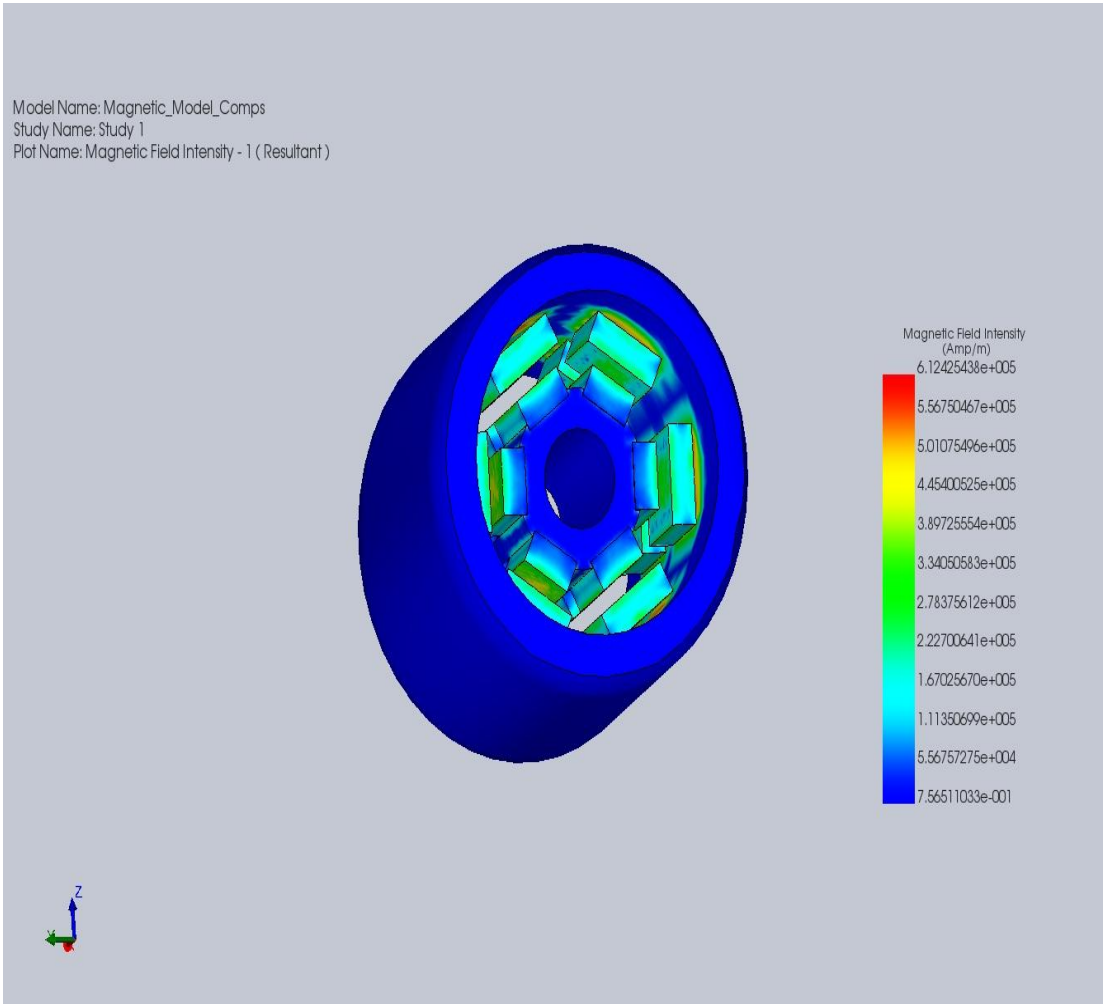


Magnetic Flux Density - 2D Plot across the top face of the magnets

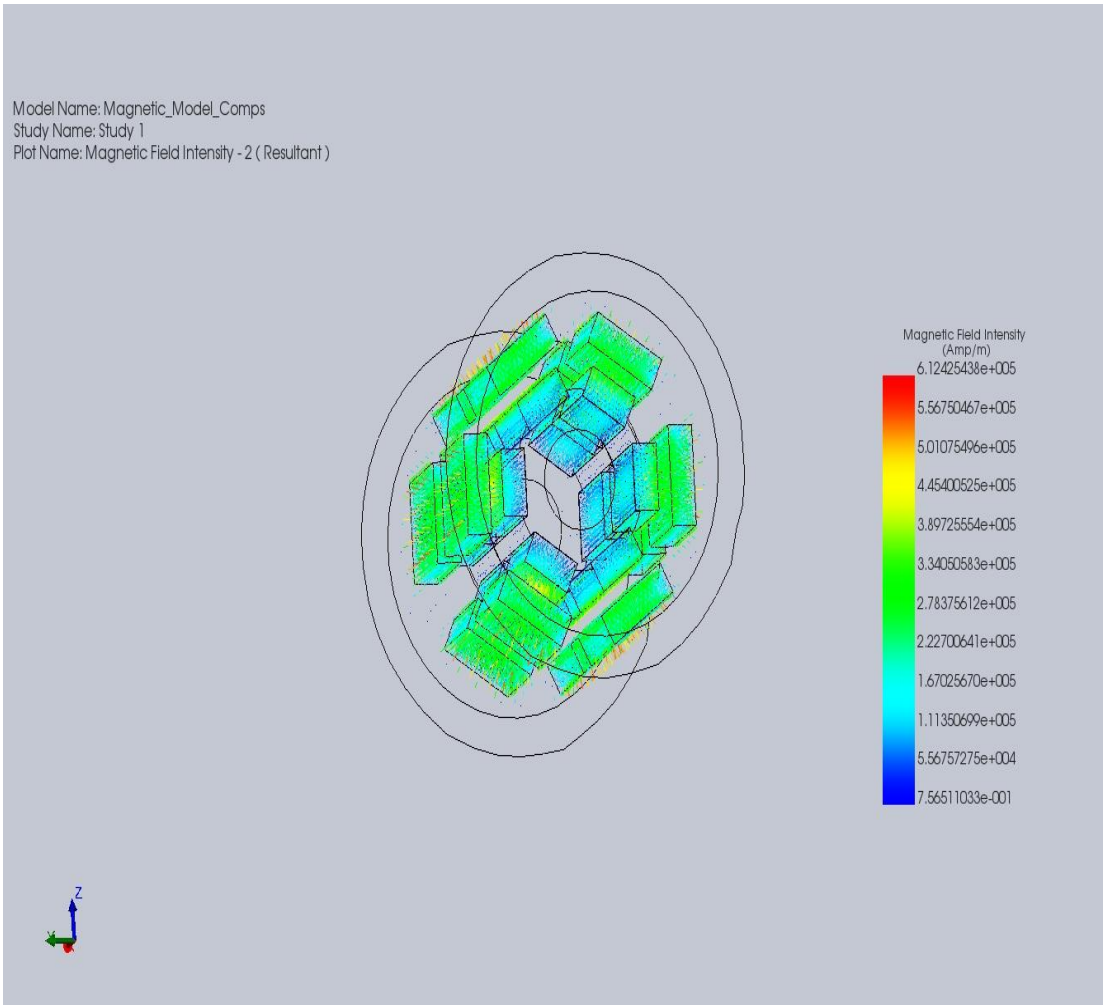


9. Magnetic Field Intensity Results

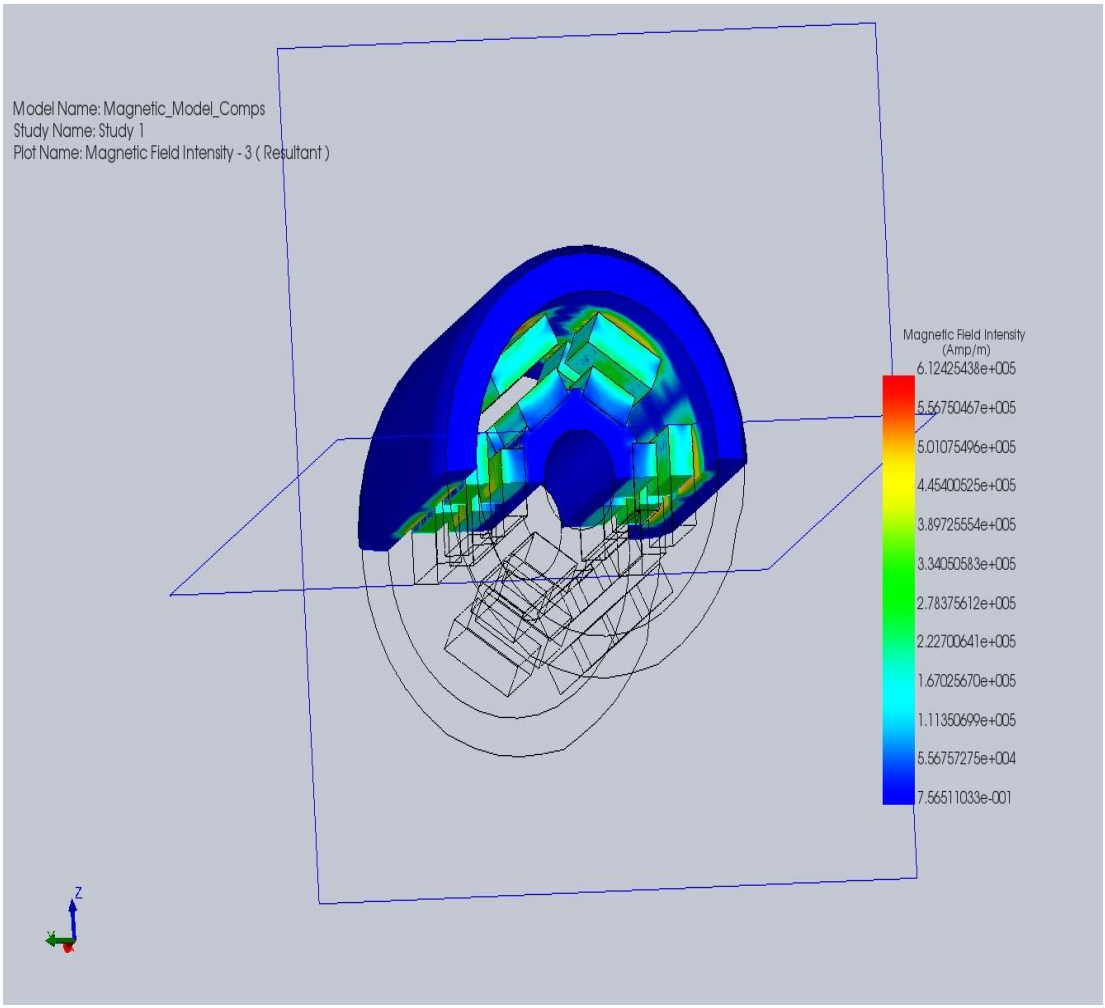
Magnetic Field Intensity - 1



Magnetic Field Intensity - 2

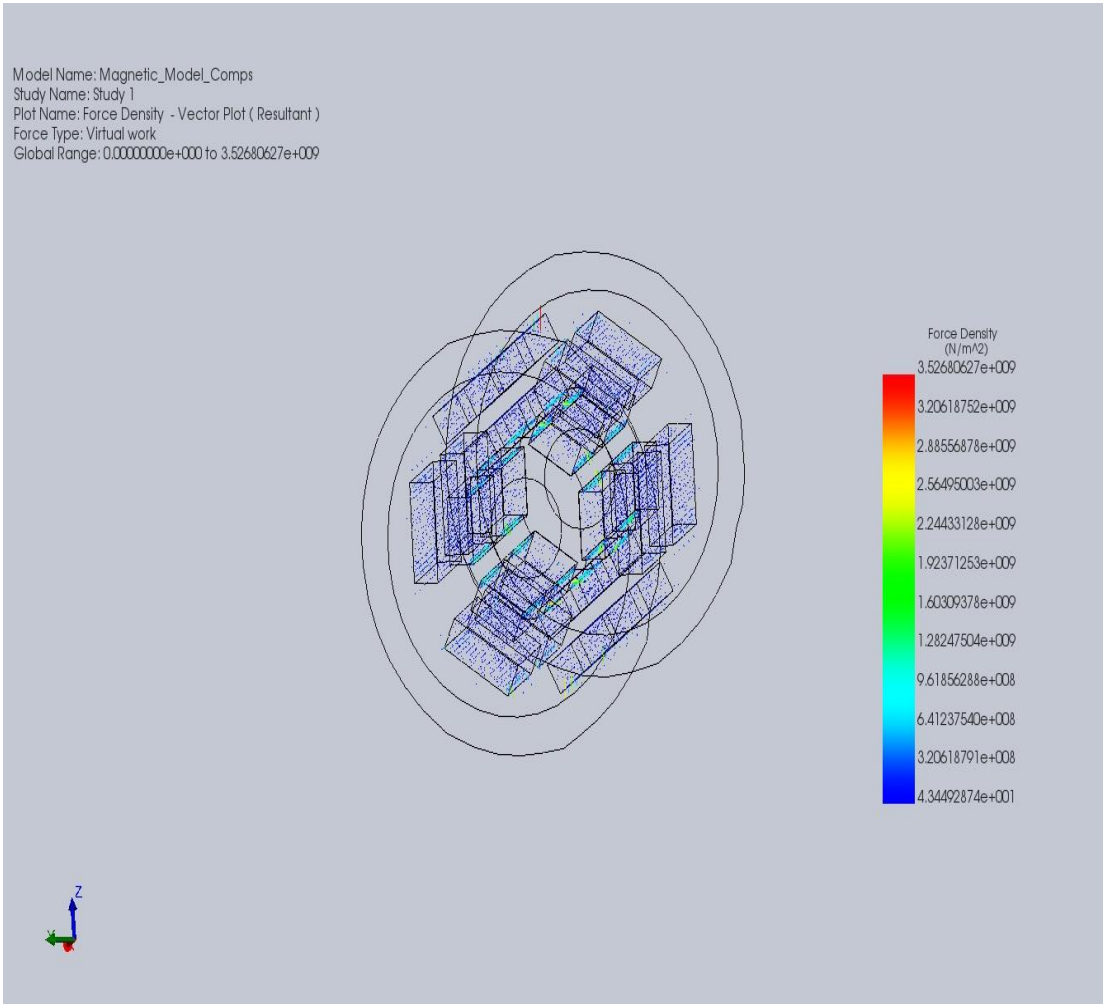


Magnetic Field Intensity - 3



10. Force Density Results

Force Density - Vector Plot



11. Appendix

Material Name: S2818

Permeability Type: Isotropic

Note: R.P. stands for Relative Permeability

R.P.	Permanent Magnet	Coercivity	Thermal Conductivity (W/m.K)
1.039e+000	Yes	8.196e+005	0.000e+000

Material Name: Air

Permeability Type: Isotropic

Note: R.P. stands for Relative Permeability

R.P.	Permanent Magnet	Thermal Conductivity (W/m.K)
1.000e+000	No	2.400e-002

Material Name: Mild Steel

Permeability Type: Isotropic

Note: R.P. stands for Relative Permeability

R.P.	Permanent Magnet	Thermal Conductivity (W/m.K)
2.000e+003	No	0.000e+000