University of Zagreb

Analysis of a "3 phases system" model

Study name: AC Magnetic study

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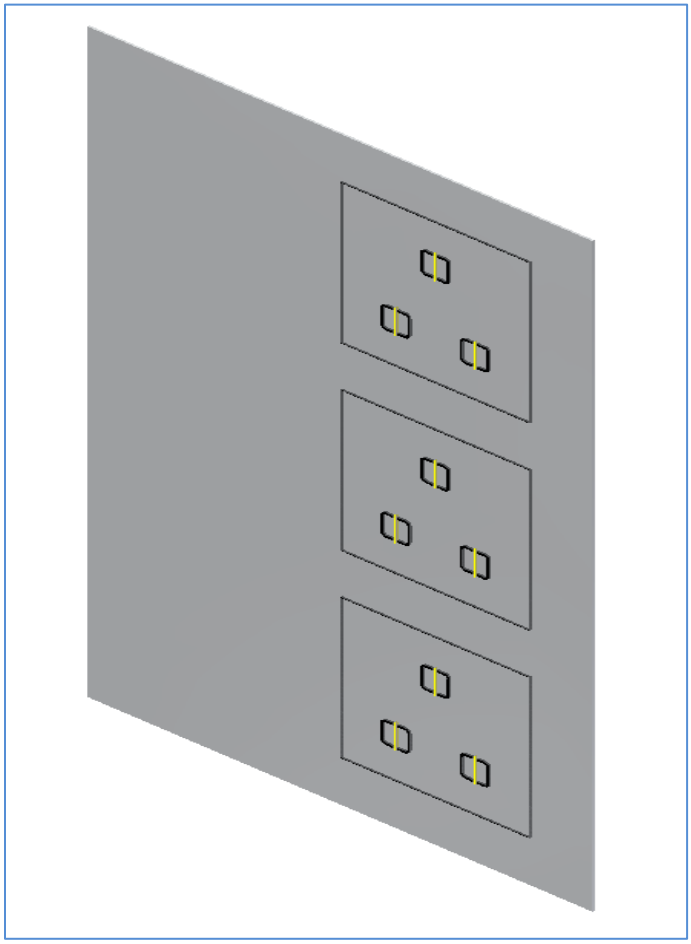
Analyzed with EMS- Inventor

Description

This report summarizes the simulation results of a "3 phases system". It presents the modeling steps, the simulation parameters, meshing information and the obtained results.



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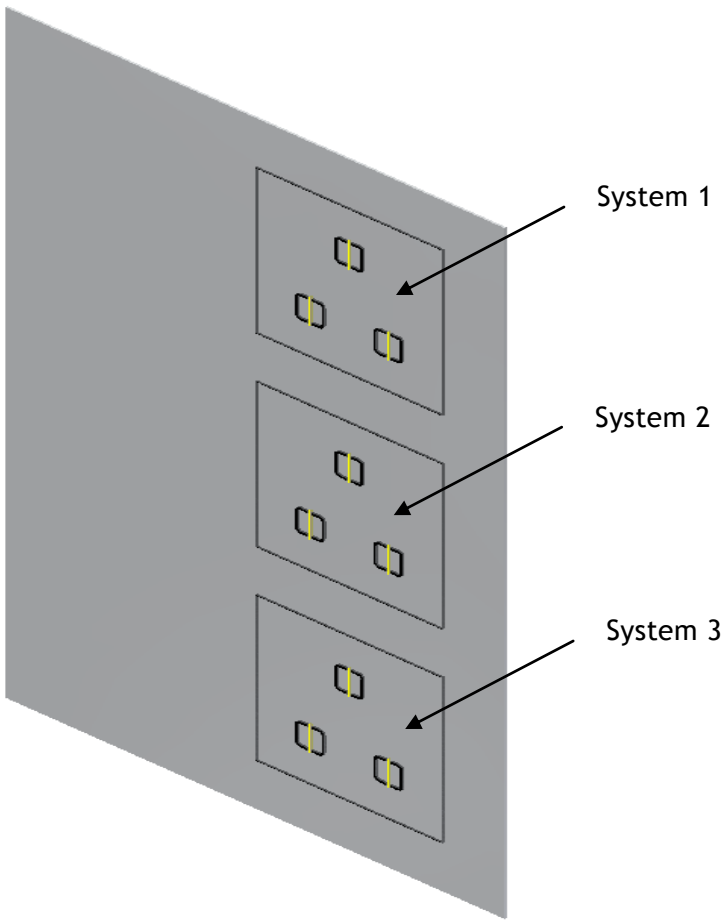
Model Information

The following figure shows the original model of the 3 phases system.



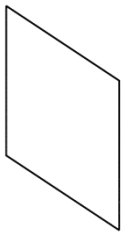
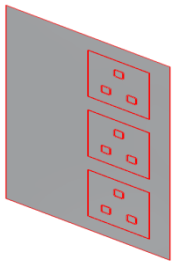
Model name in the study : 3 phases system model with Air

Units

Unit system	MKS
Magnetic Flux	Tesla
Magnetic Field	A/m

Material Properties

The following table shows the different materials assigned to each part in the studied model.

Model Reference	Properties	Components
	**Aluminum(56 MS/m)**	**Shield**
	**Aluminum(56 MS/m)**	**coil**
	**air**	**air**

Mesh Information

Unless otherwise specified, the mesher will use the global element size to mesh the entire model. The tolerance indicates that features below the tolerance size will be ignored. In this model, we set the average number of mesh elements per diagonal of each solid body to 50.

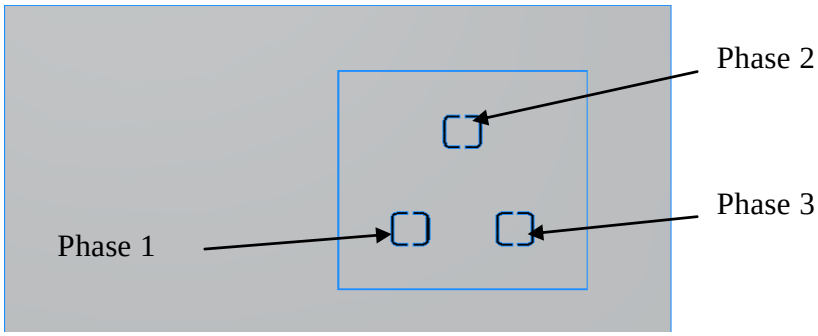
Element Size (m)	0.08905824m
Tolerance (m)	0.0001m

Mesh Details

The overall mesh statistics are as follows:

Number of Nodes	168376
Number of Elements	755223

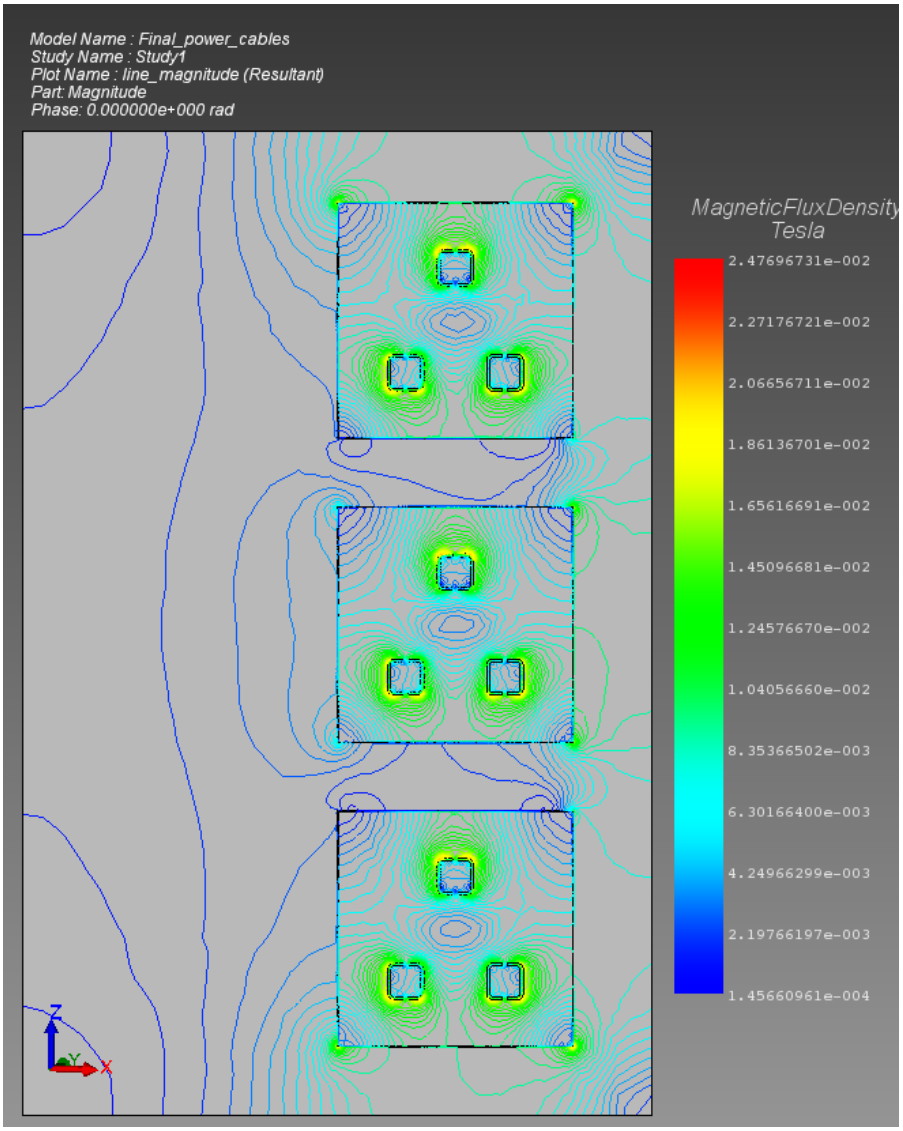
Excitation details



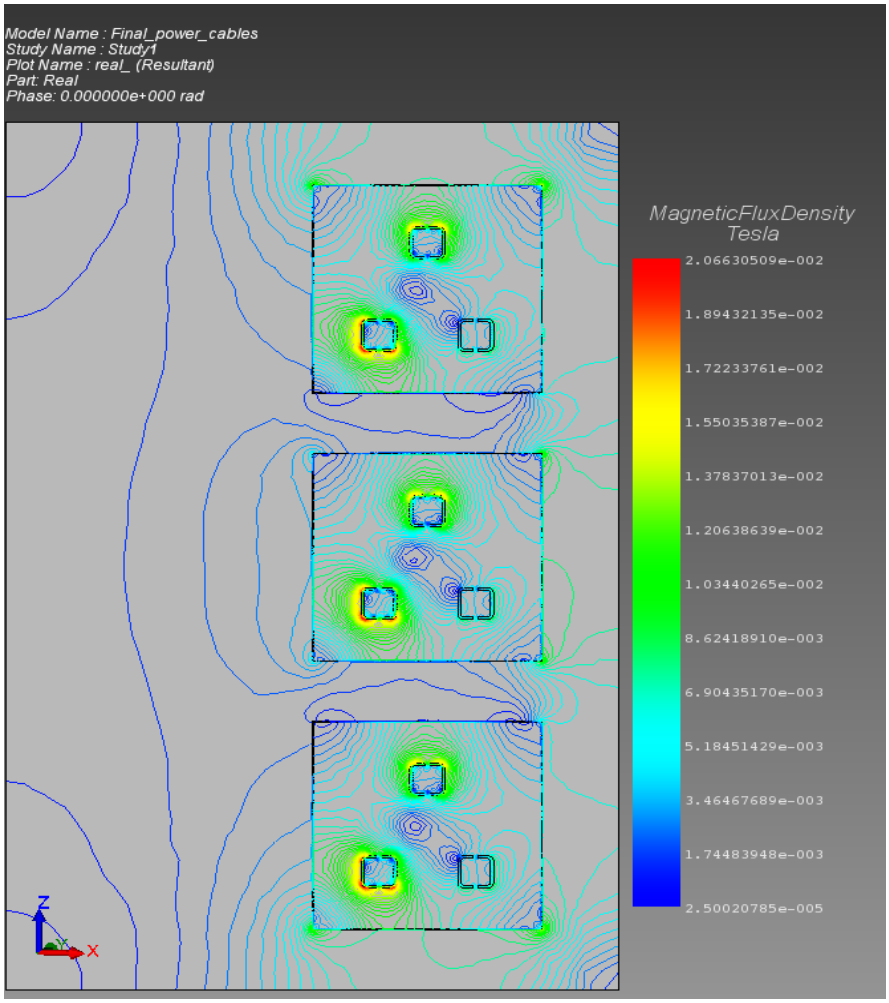
- Phase one has a phase of 0 deg, each half of the profile has half of 4400A effective.
- Phase two has a phase of 120 deg, each half of the profile has half of 4400A effective.
- Phase three has a phase of 240 deg, each half of the profile has half of 4400A effective.

Study Results

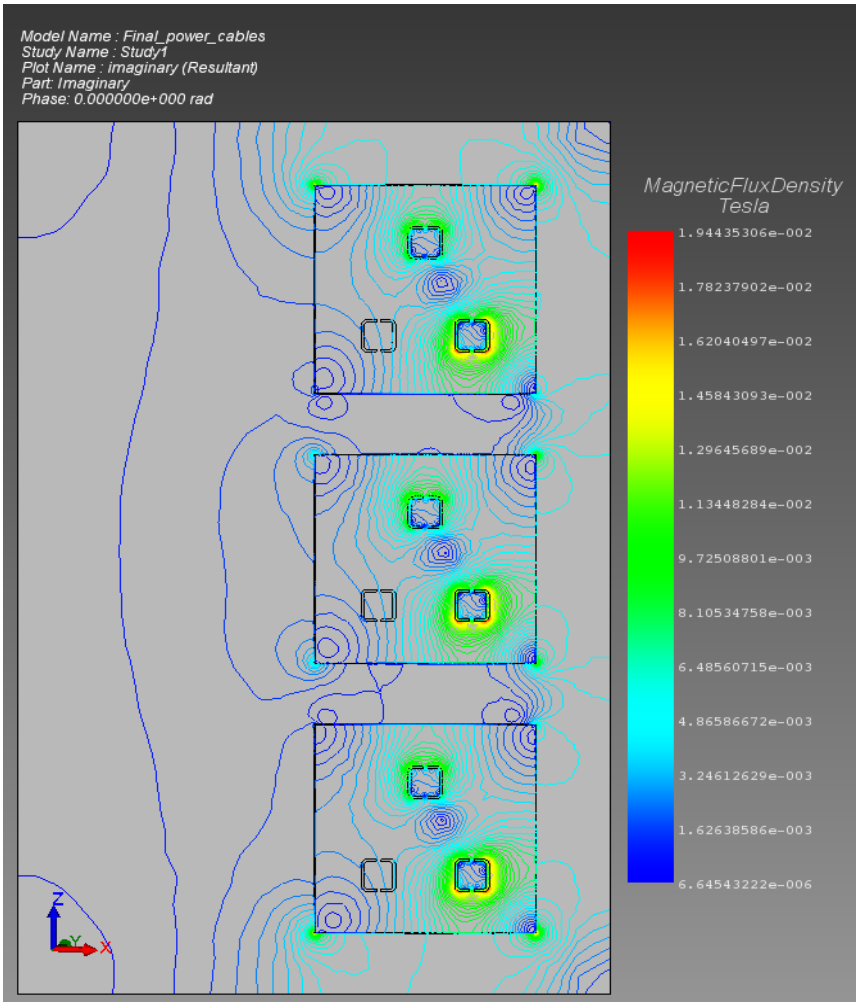
Line plot of the magnitude of the magnetic flux density (Tesla)

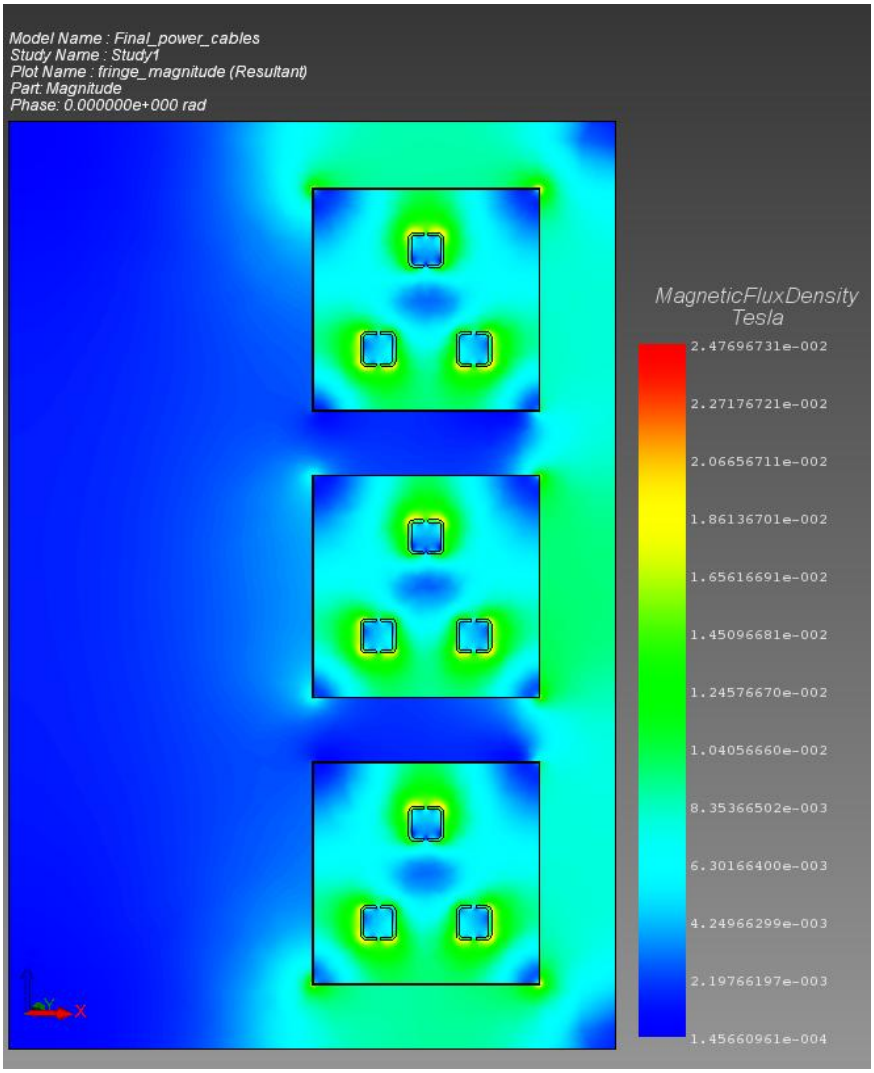


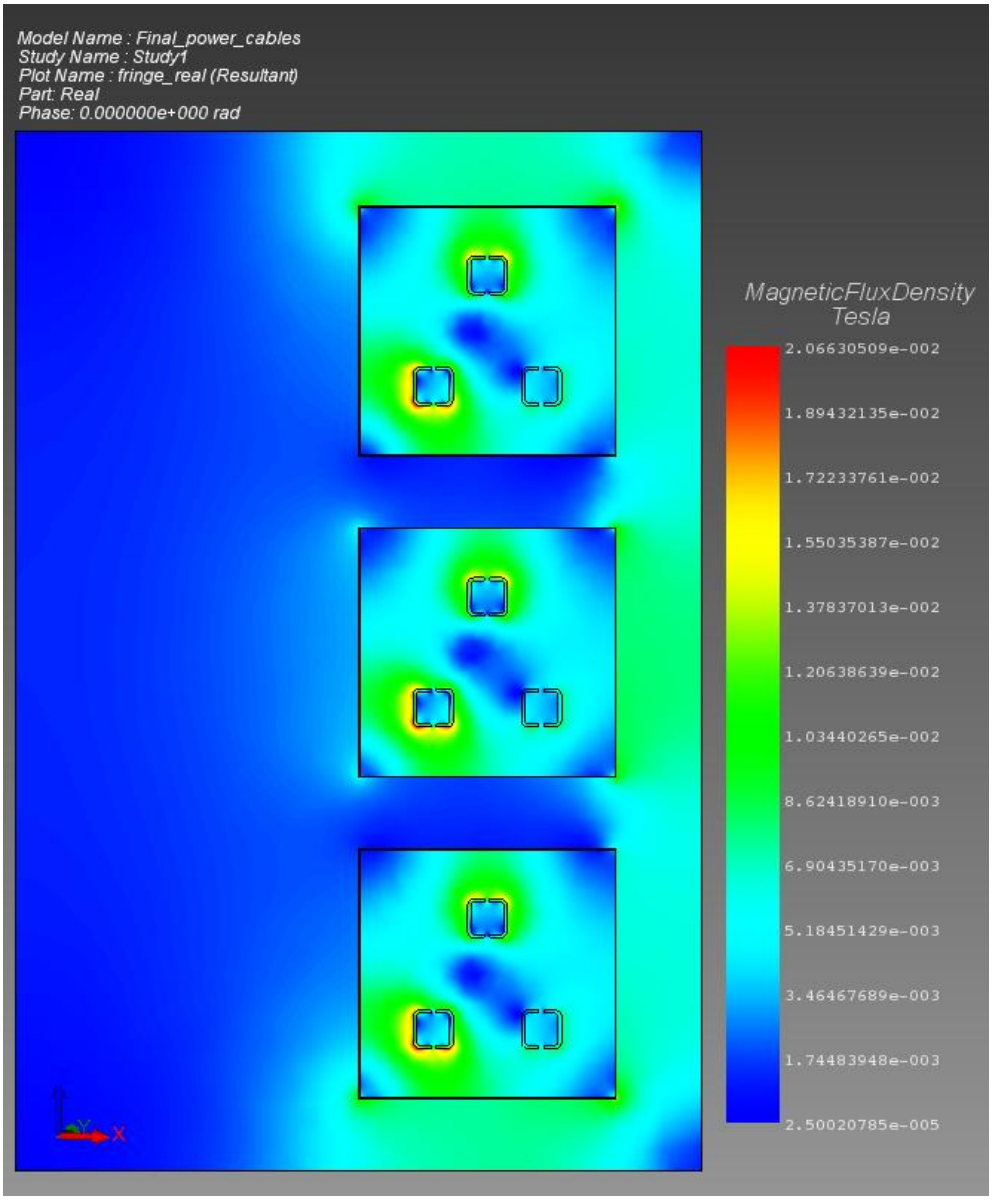
Line plot of the real part of the magnetic flux density (Tesla)

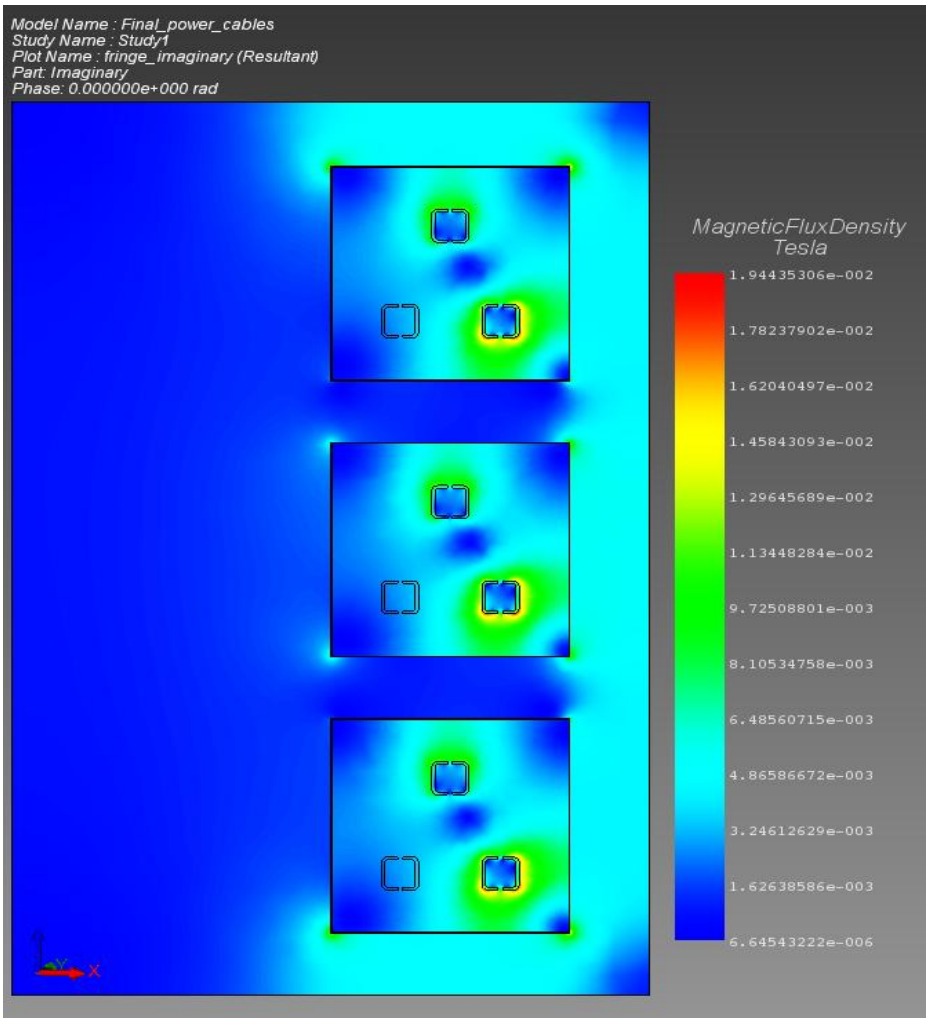


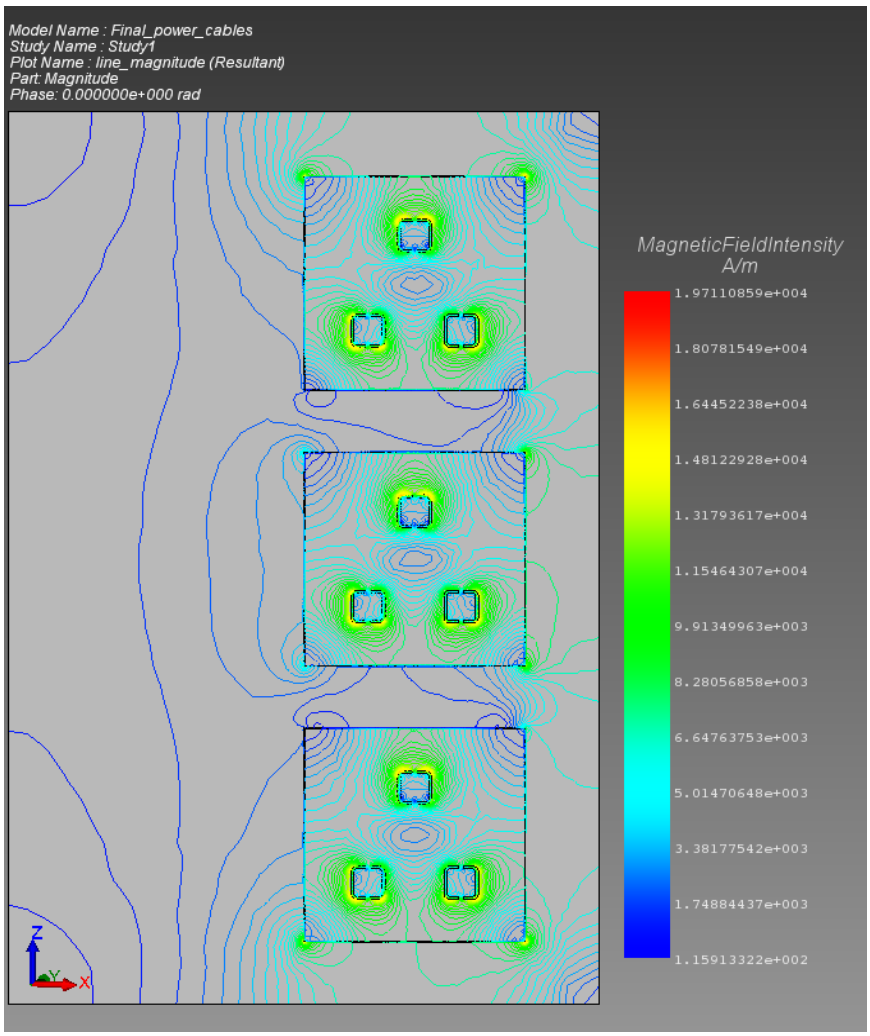
Line plot of the imaginary part of the magnetic flux density (Tesla)

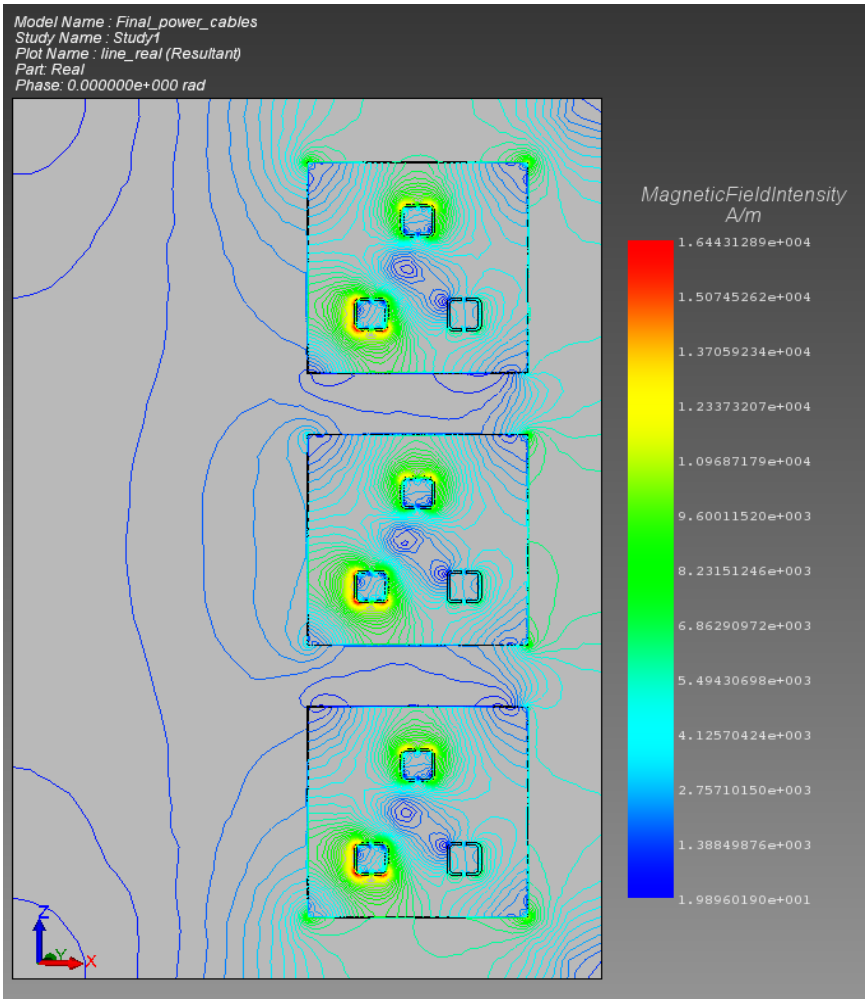



Model Name : Final_power_cables
Study Name : Study1
Plot Name : fringe_magnitude (Resultant)
Part: Magnitude
Phase: 0.000000e+000 rad
MagneticFluxDensity
Tesla
2.47696731e-002
2.27176721e-002
2.06656711e-002
1.86136701e-002
1.65616691e-002
1.45096681e-002
1.24576670e-002
1.04056660e-002
8.35366502e-003
6.30166400e-003
4.24966299e-003
2.19766197e-003
1.45660961e-004
Y
X


Model Name : Final_power_cables
Study Name : Study1
Plot Name : fringe_real (Resultant)
Part: Real
Phase: 0.000000e+000 rad
MagneticFluxDensity
Tesla
2.06630509e-002
1.89432135e-002
1.72233761e-002
1.55035387e-002
1.37837013e-002
1.20638639e-002
1.03440265e-002
8.62418910e-003
6.90435170e-003
5.18451429e-003
3.46467689e-003
1.74483948e-003
2.50020785e-005
Y
X


Model Name : Final_power_cables
Study Name : Study1
Plot Name : fringe_imaginary (Resultant)
Part: Imaginary
Phase: 0.000000e+000 rad
MagneticFluxDensity
Tesla
1.94435306e-002
1.78237902e-002
1.62040497e-002
1.45843093e-002
1.29645689e-002
1.13448284e-002
9.72508801e-003
8.10534758e-003
6.48560715e-003
4.86586672e-003
3.24612629e-003
1.62638586e-003
6.64543222e-006


Model Name : Final_power_cables
Study Name : Study1
Plot Name : line_magnitude (Resultant)
Part: Magnitude
Phase: 0.000000e+000 rad
MagneticFieldIntensity
A/m
1.97110859e+004
1.80781549e+004
1.64452238e+004
1.48122928e+004
1.31793617e+004
1.15464307e+004
9.91349963e+003
8.28056858e+003
6.64763753e+003
5.01470648e+003
3.38177542e+003
1.74884437e+003
1.15913322e+002
Z
Y
X


Model Name : Final_power_cables
Study Name : Study1
Plot Name : line_real (Resultant)
Part: Real
Phase: 0.000000e+000 rad
MagneticFieldIntensity
A/m
1.64431289e+004
1.50745262e+004
1.37059234e+004
1.23373207e+004
1.09687179e+004
9.60011520e+003
8.23151246e+003
6.86290972e+003
5.49430698e+003
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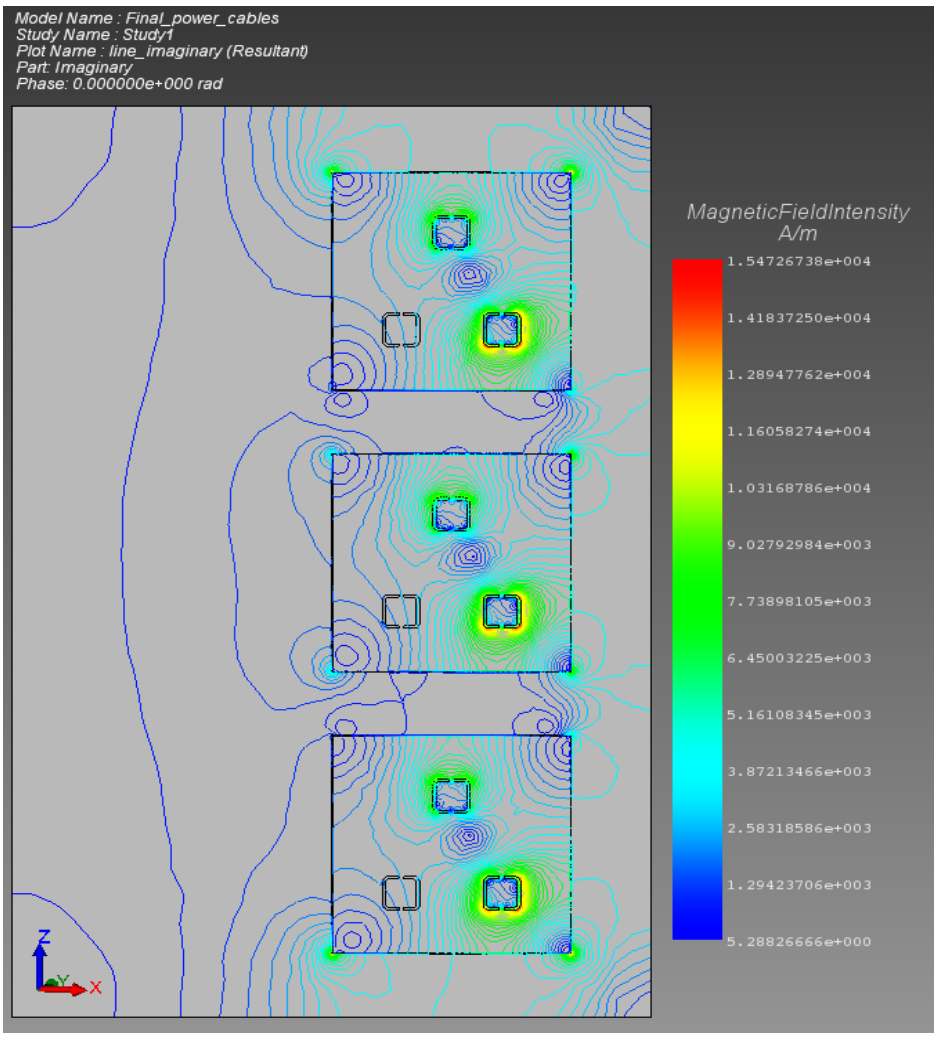
1.38849876e+003
1.98960190e+001
Z
Y
X


Model Name : Final_power_cables
Study Name : Study1
Plot Name : line_imaginary (Resultant)
Part: Imaginary
Phase: 0.000000e+000 rad
MagneticFieldIntensity
A/m
1.54726738e+004
1.41837250e+004
1.28947762e+004
1.16058274e+004
1.03168786e+004
9.02792984e+003
7.73898105e+003
6.45003225e+003
5.16108345e+003
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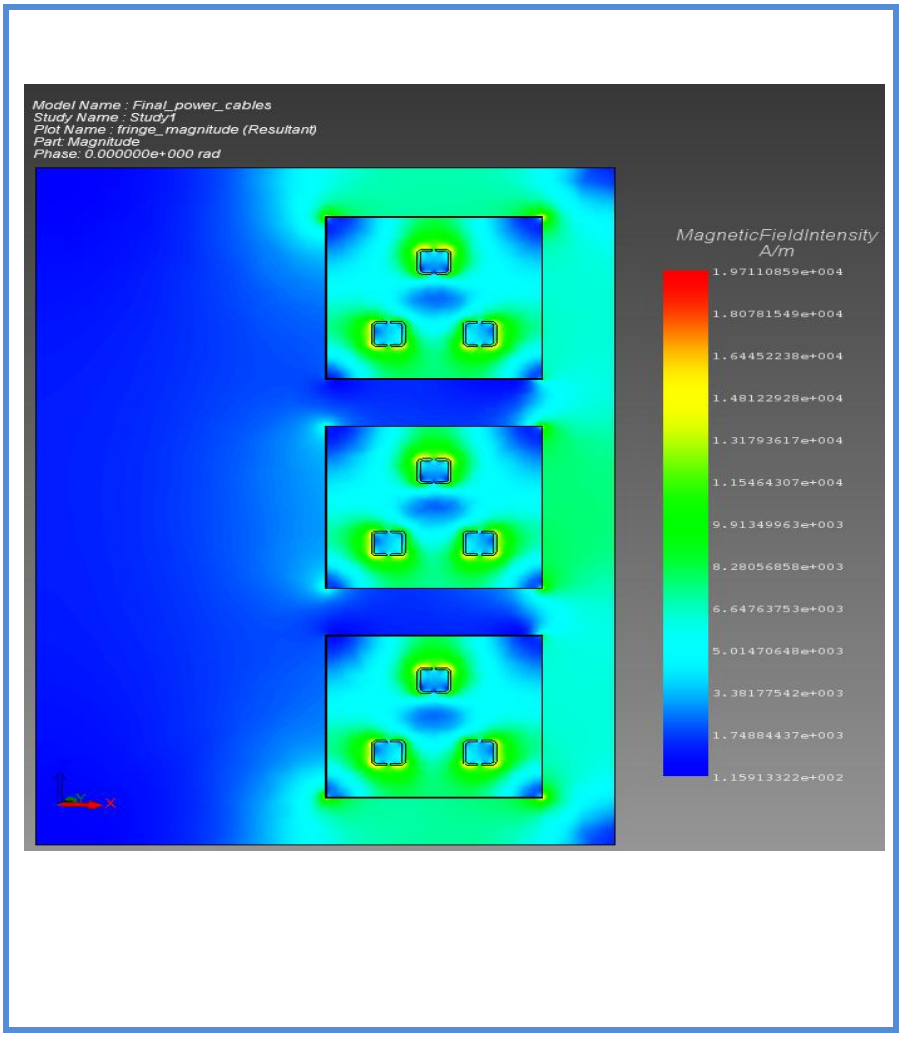
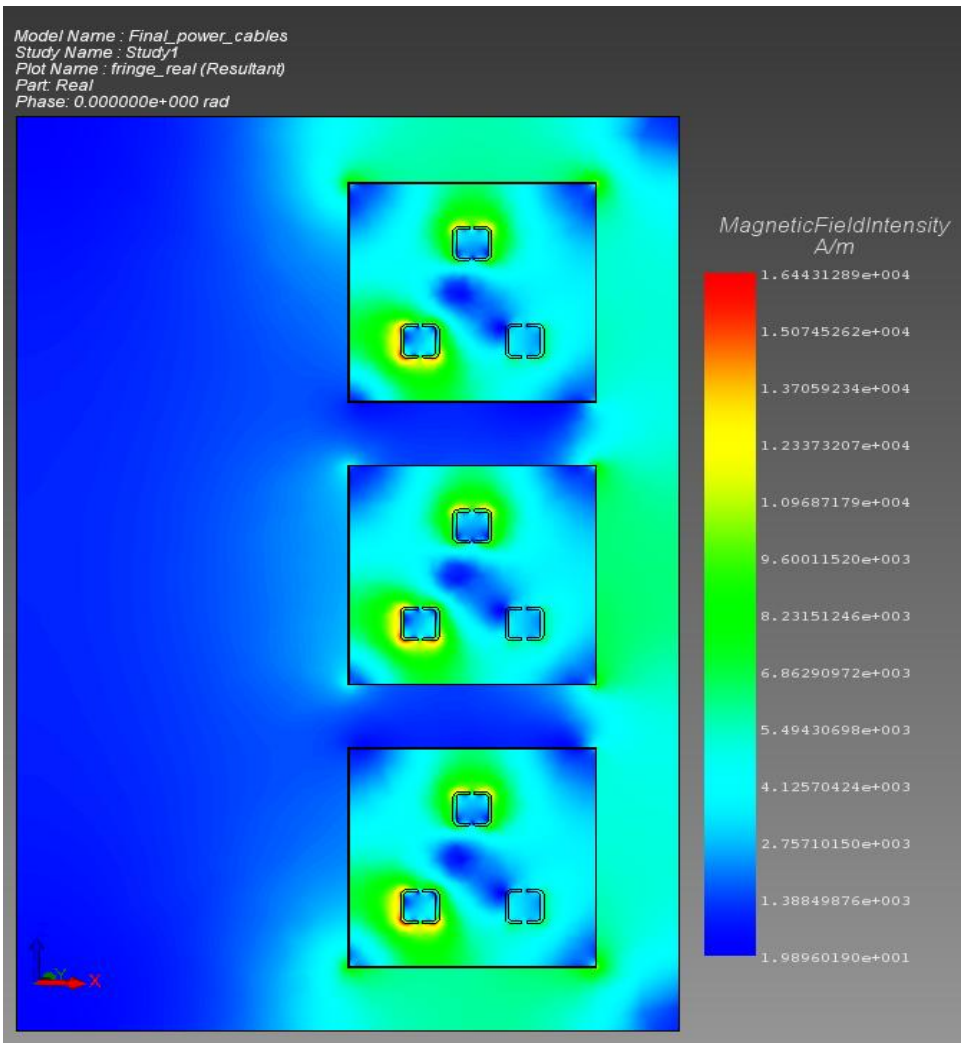
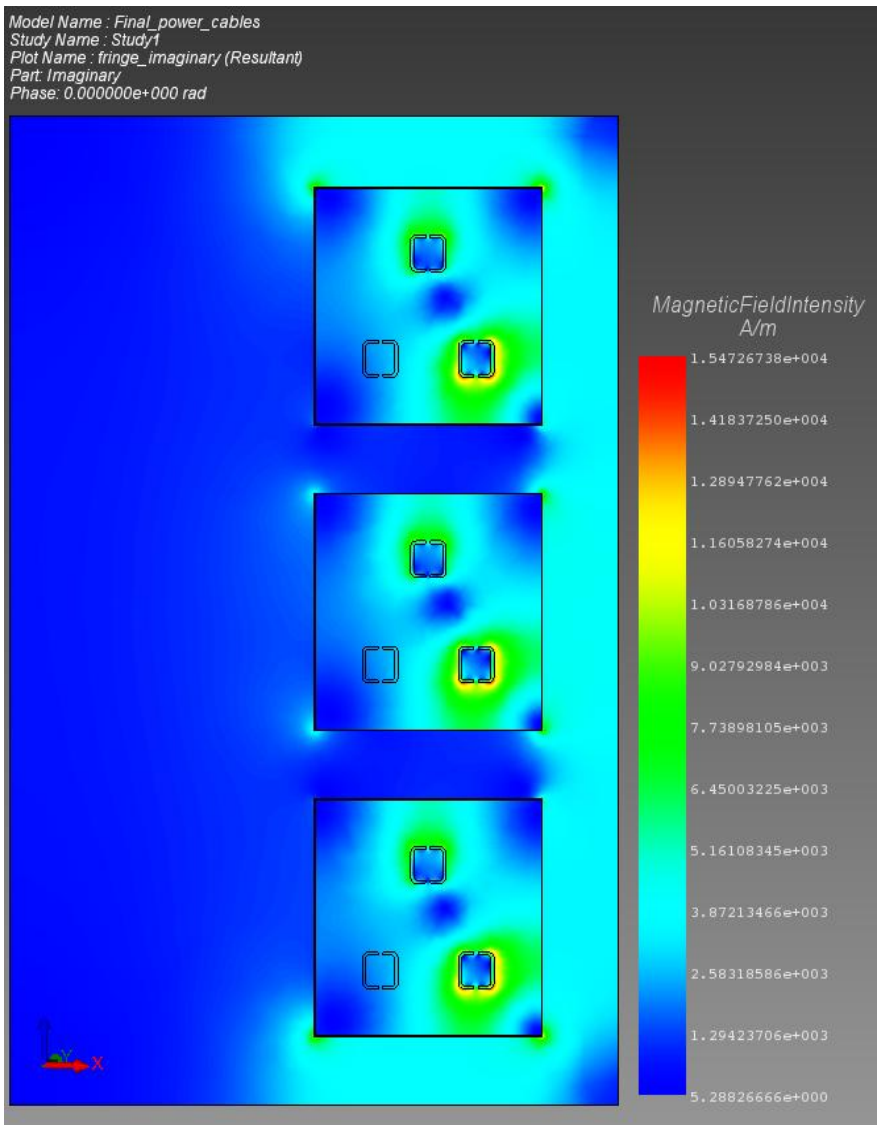
1.29423706e+003
5.28826666e+000
Z
Y
X


Model Name : Final_power_cables
Study Name : Study1
Plot Name : fringe_magnitude (Resultant)
Part: Magnitude
Phase: 0.000000e+000 rad
MagneticFieldIntensity
A/m
1.97110859e+004
1.80781549e+004
1.64452238e+004
1.48122928e+004
1.31793617e+004
1.15464307e+004
9.91349963e+003
8.28056858e+003
6.64763753e+003
5.01470648e+003
3.38177542e+003
1.74884437e+003
1.15913322e+002


Model Name : Final_power_cables
Study Name : Study1
Plot Name : fringe_real (Resultant)
Part: Real
Phase: 0.000000e+000 rad
MagneticFieldIntensity
A/m
1.64431289e+004
1.50745262e+004
1.37059234e+004
1.23373207e+004
1.09687179e+004
9.60011520e+003
8.23151246e+003
6.86290972e+003
5.49430698e+003
4.12570424e+003
2.75710150e+003
1.38849876e+003
1.98960190e+001
Y
X


Model Name : Final_power_cables
Study Name : Study1
Plot Name : fringe_imaginary (Resultant)
Part: Imaginary
Phase: 0.000000e+000 rad
MagneticFieldIntensity
A/m
1.54726738e+004
1.41837250e+004
1.28947762e+004
1.16058274e+004
1.03168786e+004
9.02792984e+003
7.73898105e+003
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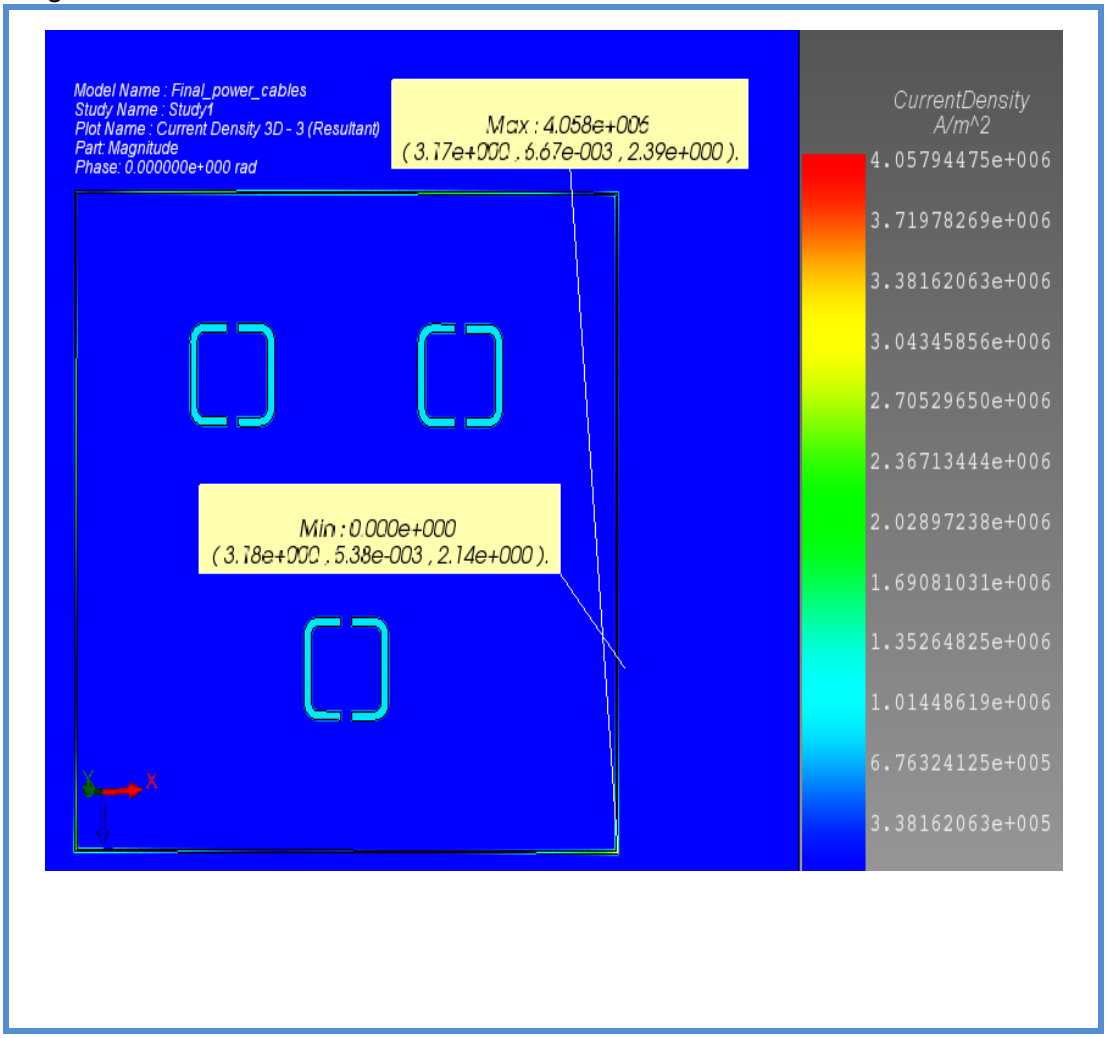
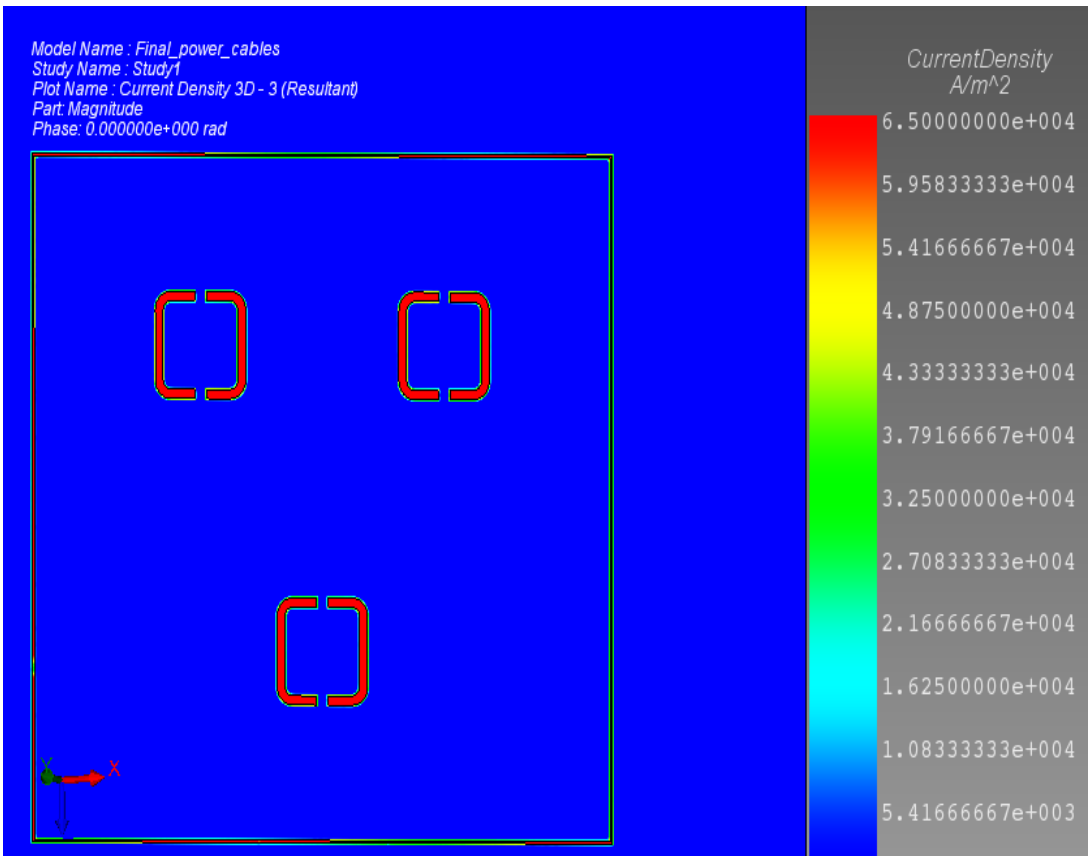
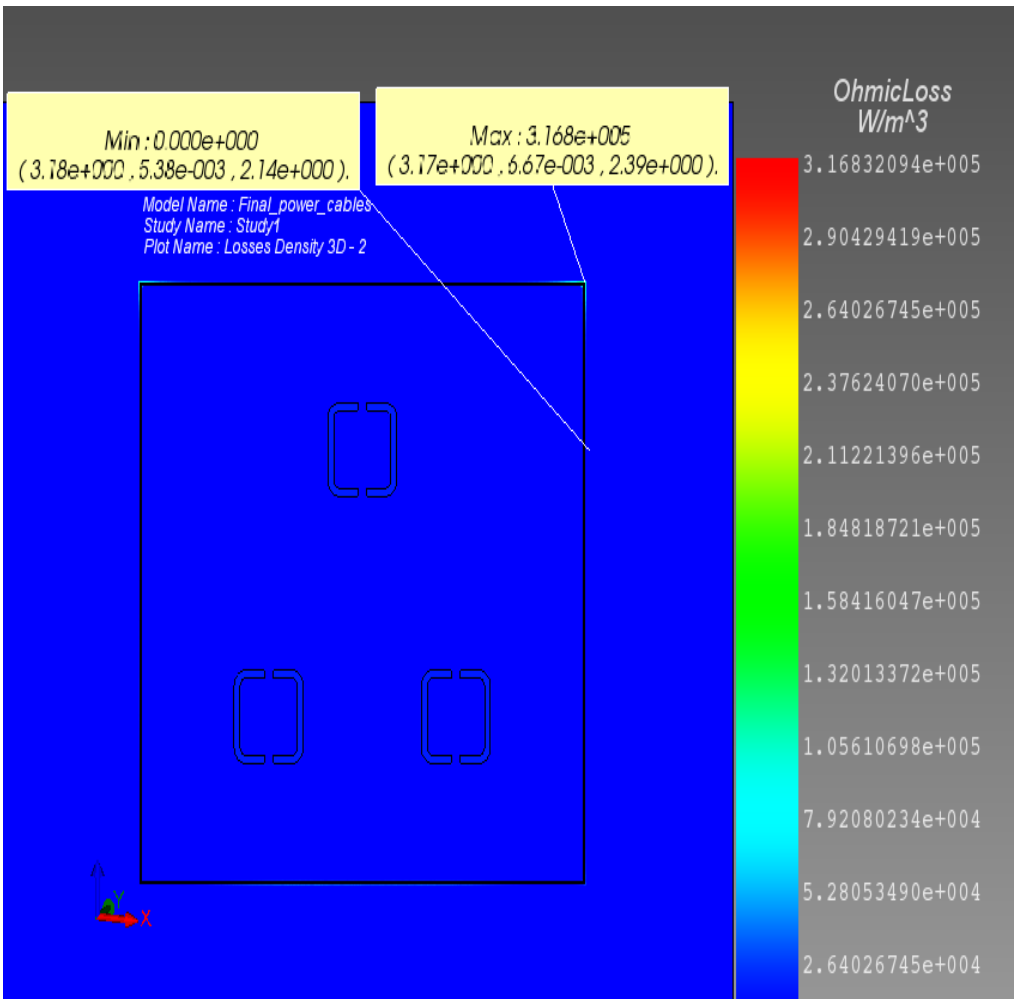
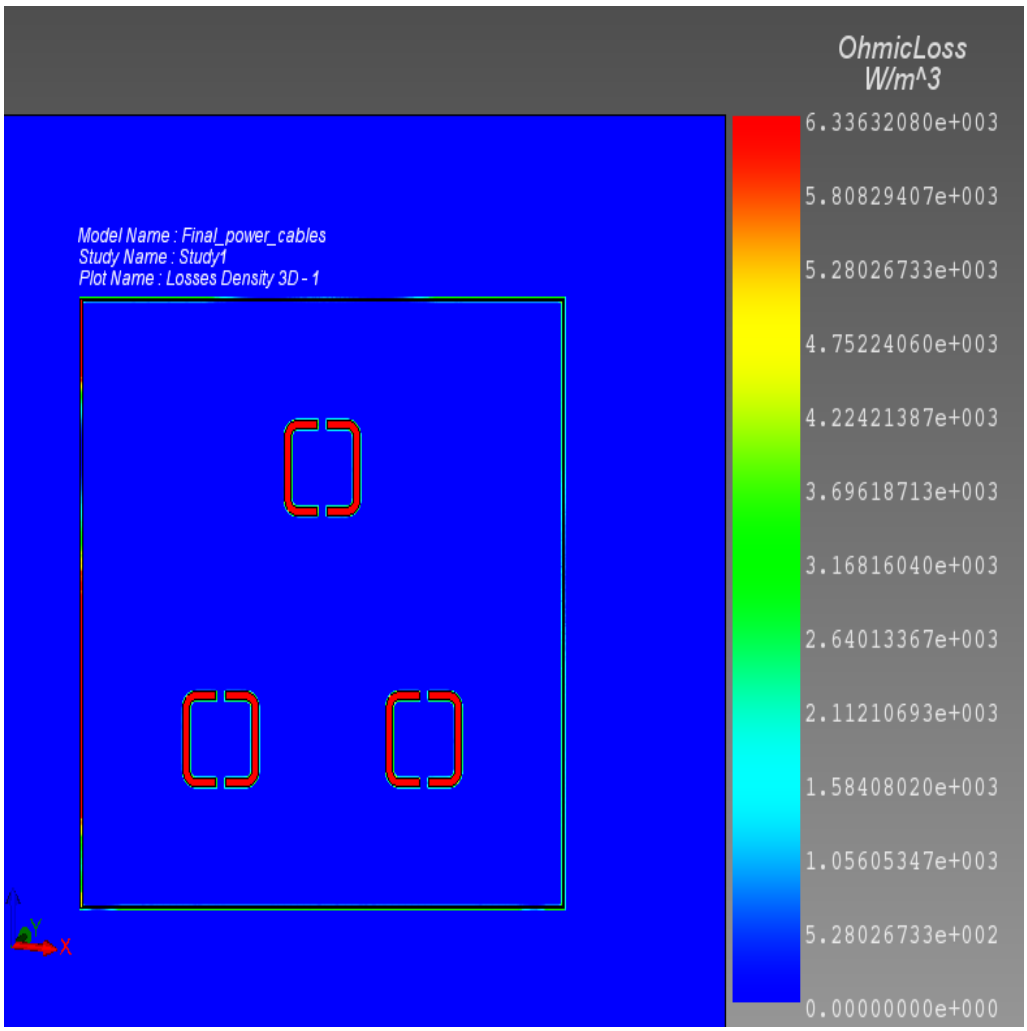
2.58318586e+003
1.29423706e+003
5.28826666e+000


Model Name : Final_power_cables
Study Name : Study1
Plot Name : Current Density 3D - 3 (Resultant)
Part: Magnitude
Phase: 0.000000e+000 rad
Max : 4.058e+006
(3.17e+000 , 6.67e-003 , 2.39e+000).
Min : 0.000e+000
(3.18e+000 , 5.38e-003 , 2.14e+000).
CurrentDensity
A/m^2
4.05794475e+006
3.71978269e+006
3.38162063e+006
3.04345856e+006
2.70529650e+006
2.36713444e+006
2.02897238e+006
1.69081031e+006
1.35264825e+006
1.01448619e+006
6.76324125e+005
3.38162063e+005


Model Name : Final_power_cables
Study Name : Study1
Plot Name : Current Density 3D - 3 (Resultant)
Part: Magnitude
Phase: 0.000000e+000 rad
CurrentDensity
A/m^2
6.50000000e+004
5.95833333e+004
5.41666667e+004
4.87500000e+004
4.33333333e+004
3.79166667e+004
3.25000000e+004
2.70833333e+004
2.16666667e+004
1.62500000e+004
1.08333333e+004
5.41666667e+003
Y
X


Min : 0.000e+000
(3.18e+000 , 5.38e-003 , 2.14e+000).
Max : 3.168e+005
(3.17e+000 , 6.67e-003 , 2.39e+000).
Model Name : Final_power_cables
Study Name : Study1
Plot Name : Losses Density 3D - 2
OhmicLoss
W/m^3
3.16832094e+005
2.90429419e+005
2.64026745e+005
2.37624070e+005
2.11221396e+005
1.84818721e+005
1.58416047e+005
1.32013372e+005
1.05610698e+005
7.92080234e+004
5.28053490e+004
2.64026745e+004
Y
X


OhmicLoss
W/m^3
6.33632080e+003
5.80829407e+003
5.28026733e+003
4.75224060e+003
4.22421387e+003
3.69618713e+003
3.16816040e+003
2.64013367e+003
2.11210693e+003
1.58408020e+003
1.05605347e+003
5.28026733e+002
0.00000000e+000
Model Name : Final_power_cables
Study Name : Study1
Plot Name : Losses Density 3D - 1
Y
X