

Problem info

Problem type: Transient Magnetics (integration time: 7.00000002980232E-02 s.)

Geometry model class: Plane-Parallel

Problem database file names:

- Problem: *transformer.pbm*
- Geometry: *Transformer.mod*
- Material Data: *Transformer.dms*
- Material Data 2 (library): *none*
- Electric circuit: *transformer.qcr*

Results taken from other problems:

- *none*

Geometry model

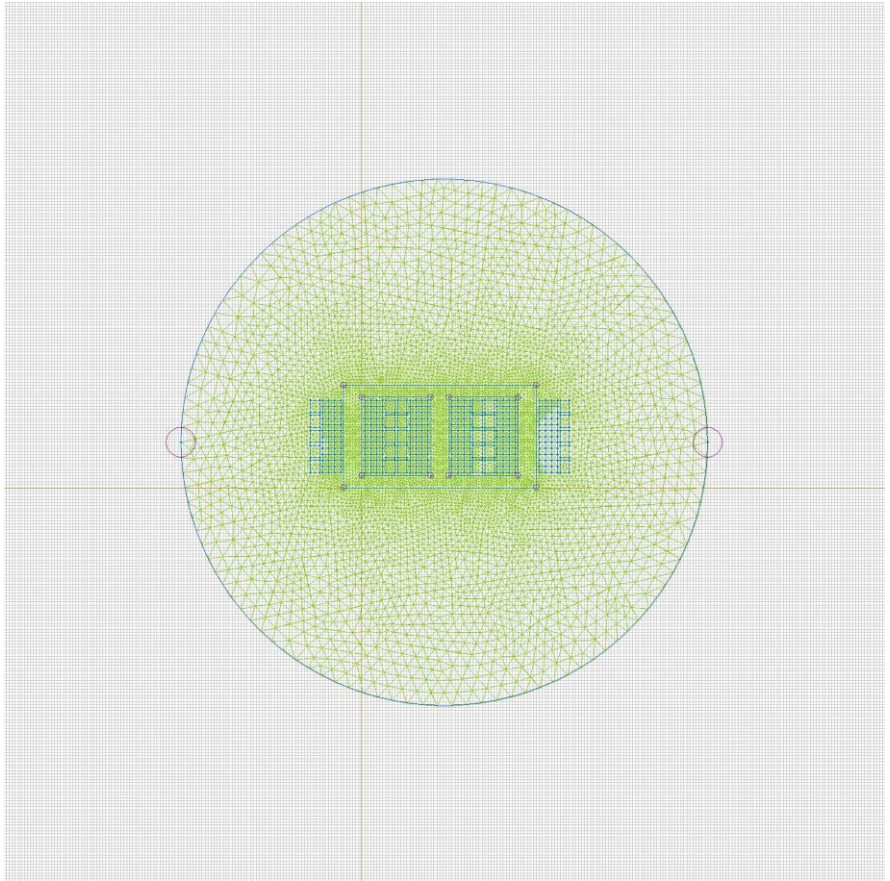


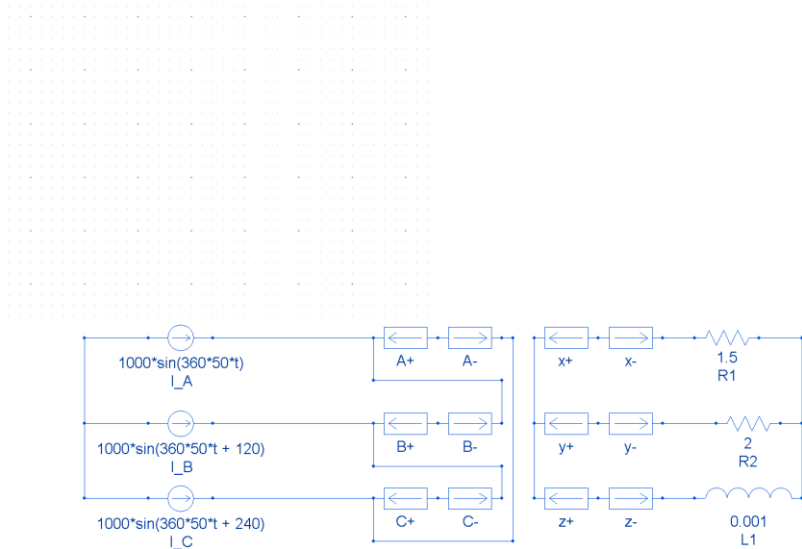
Table 1. Geometry model statistics

	With Label	Total
Blocks	15	250
Edges	1	656
Vertices	0	446

Number of nodes: 7563.

Electric circuit

Coupled electric circuit



Circuit elements:

QuickField block 'x-'

QuickField block 'x+'

QuickField block 'y-'

QuickField block 'y+'

QuickField block 'z-'

QuickField block 'z+'

Resistor R1=1.5 [Ohm]

Resistor R2=2 [Ohm]

Inductor L1=0.001 [H]

QuickField block 'A-'

QuickField block 'A+'

QuickField block 'B-'

QuickField block 'B+'

QuickField block 'C-'

QuickField block 'C+'

Current source I_A=1000*sin(360*50*t) [A]

Current source I_B=1000*sin(360*50*t + 120) [A]

Current source I_C=1000*sin(360*50*t + 240) [A]

Labelled objects

There are following labelled objects in the geometry model (Material Data file could contain more labels, but only those labels that assigned to geometric objects are listed)

Blocks:

- [x+](#)
- [z-](#)
- [core](#)
- [B-](#)
- [x-](#)
- [A-](#)
- [A+](#)
- [z+](#)
- [y+](#)
- [y-](#)
- [B+](#)
- [C+](#)
- [C-](#)
- [insulation](#)
- [air](#)
-

Edges:

- [A=0](#)
-

Vertices:

Detailed information about each label is listed below.

Labelled objects: block "x+"

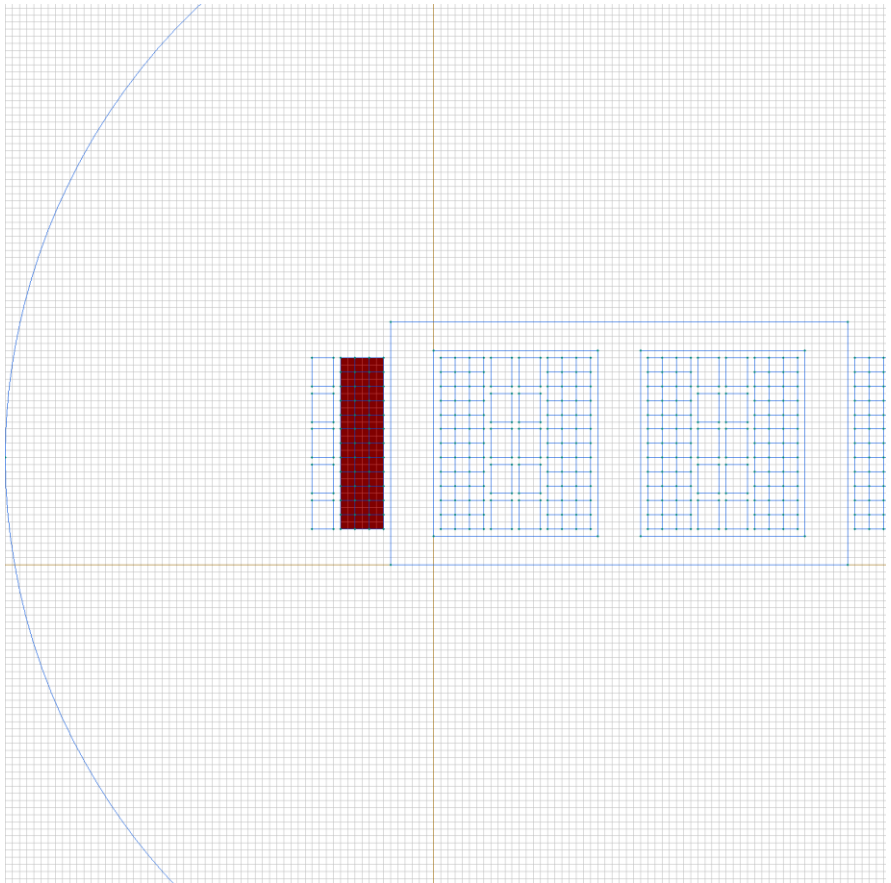
There are (36) objects with this label

Relative magnetic permeability: $\mu_x=1$, $\mu_y=1$

Electric conductivity: $\sigma(T)=56000000$ [S/m]

Voltage: $U=0$ [V]

Conductor's connection: in series



Labelled objects: block "z-"

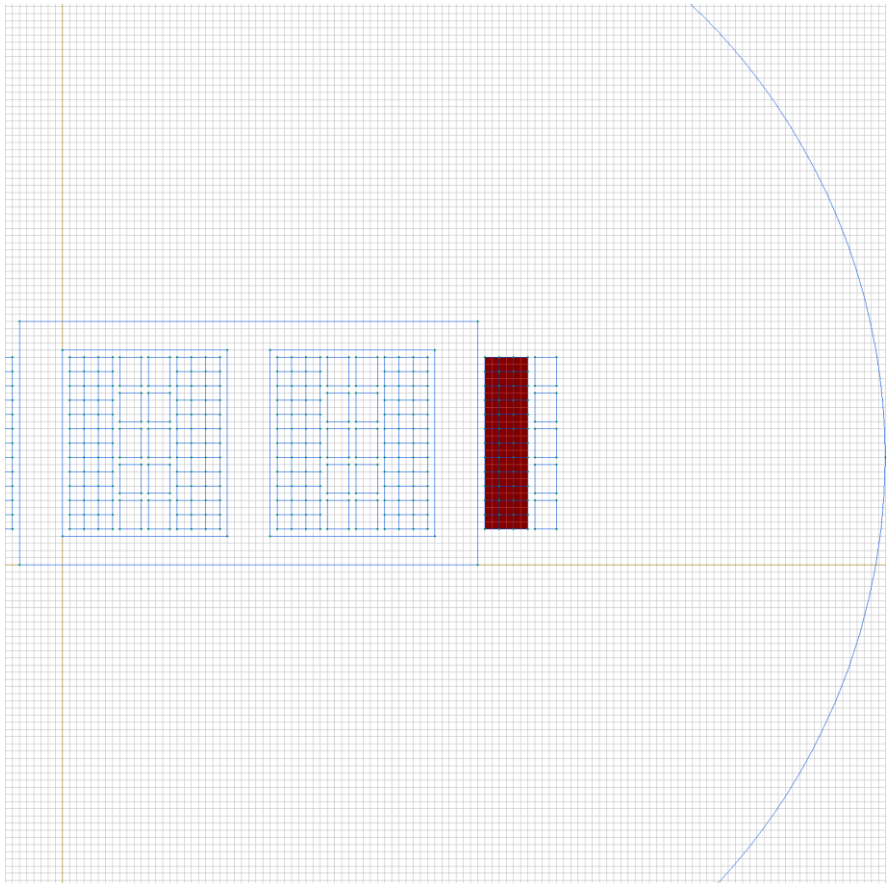
There are (36) objects with this label

Relative magnetic permeability: $\mu_x=1$, $\mu_y=1$

Electric conductivity: $\sigma(T)=56000000$ [S/m]

Voltage: $U=0$ [V]

Conductor's connection: in series



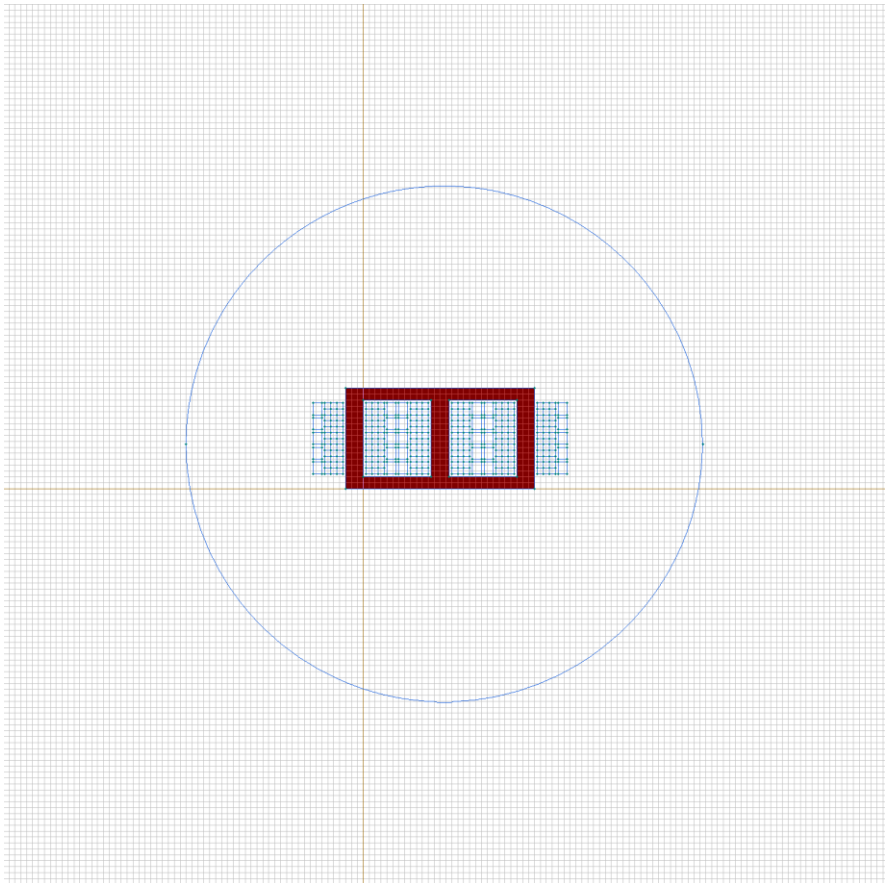
Labelled objects: block "core"

There are (1) objects with this label

Relative magnetic permeability: μ =nonlinear (see Table 2 in the "Nonlinear dependencies" section)

Current density: $j=0$ [A/m²]

Conductor's connection: in parallel



Labelled objects: block "B-"

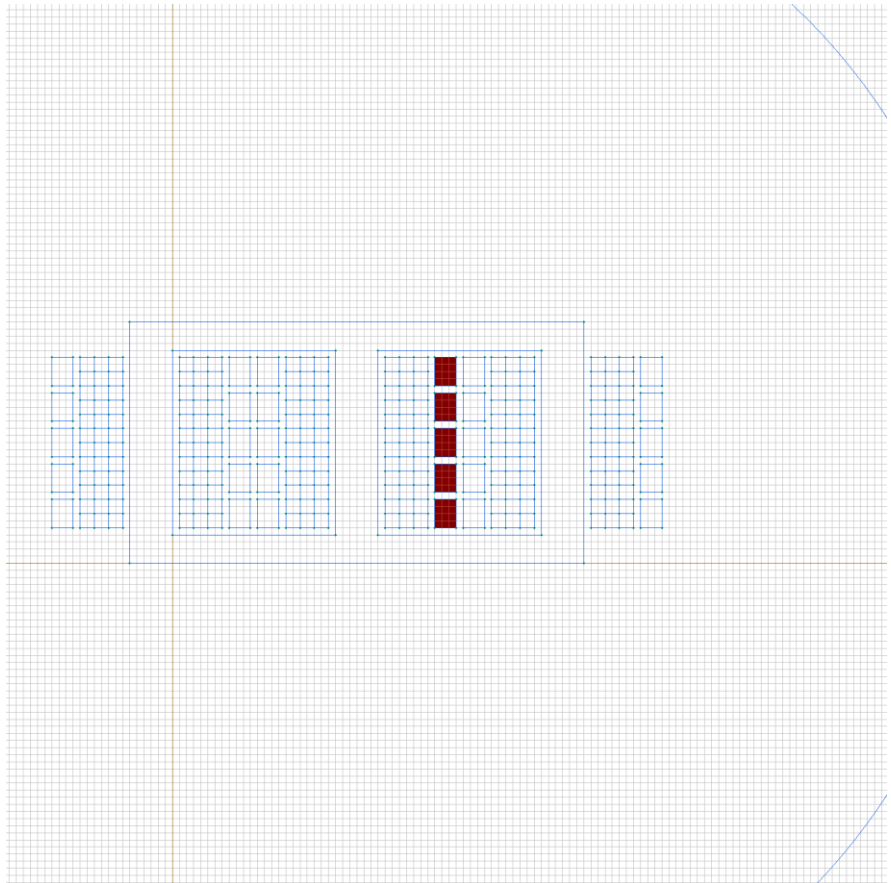
There are (5) objects with this label

Relative magnetic permeability: $\mu_x=1$, $\mu_y=1$

Electric conductivity: $\sigma(T)=56000000$ [S/m]

Voltage: $U=0$ [V]

Conductor's connection: in series



Labelled objects: block "x-"

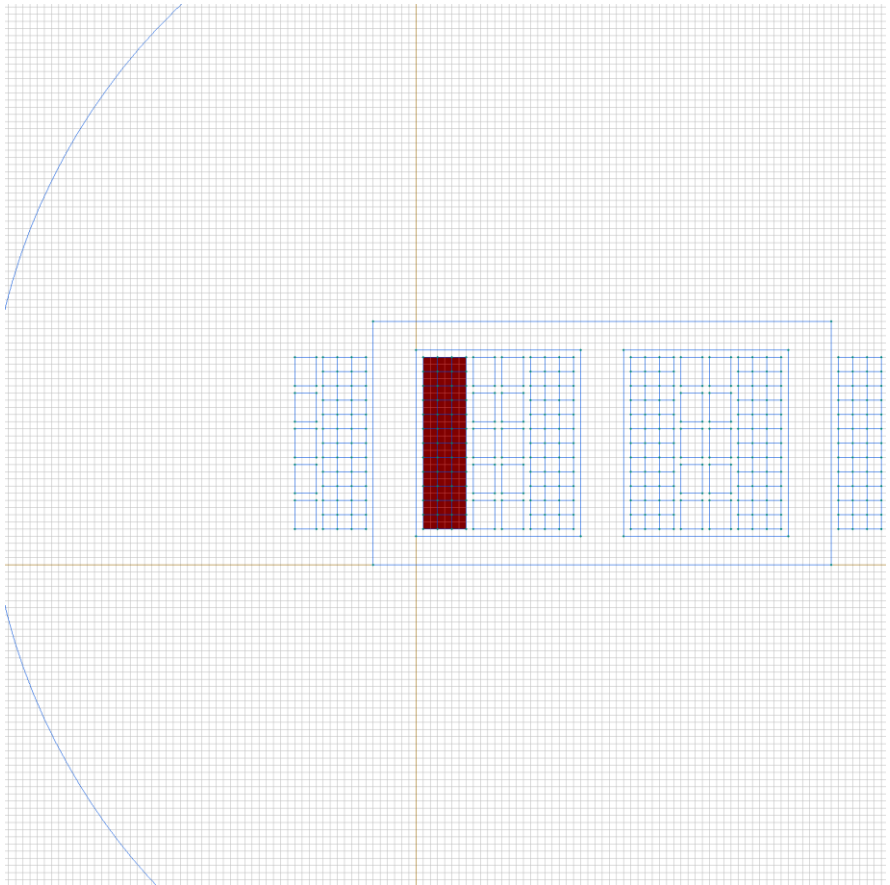
There are (36) objects with this label

Relative magnetic permeability: $\mu_x=1$, $\mu_y=1$

Electric conductivity: $\sigma(T)=56000000$ [S/m]

Voltage: $U=0$ [V]

Conductor's connection: in series



Labelled objects: block "A-"

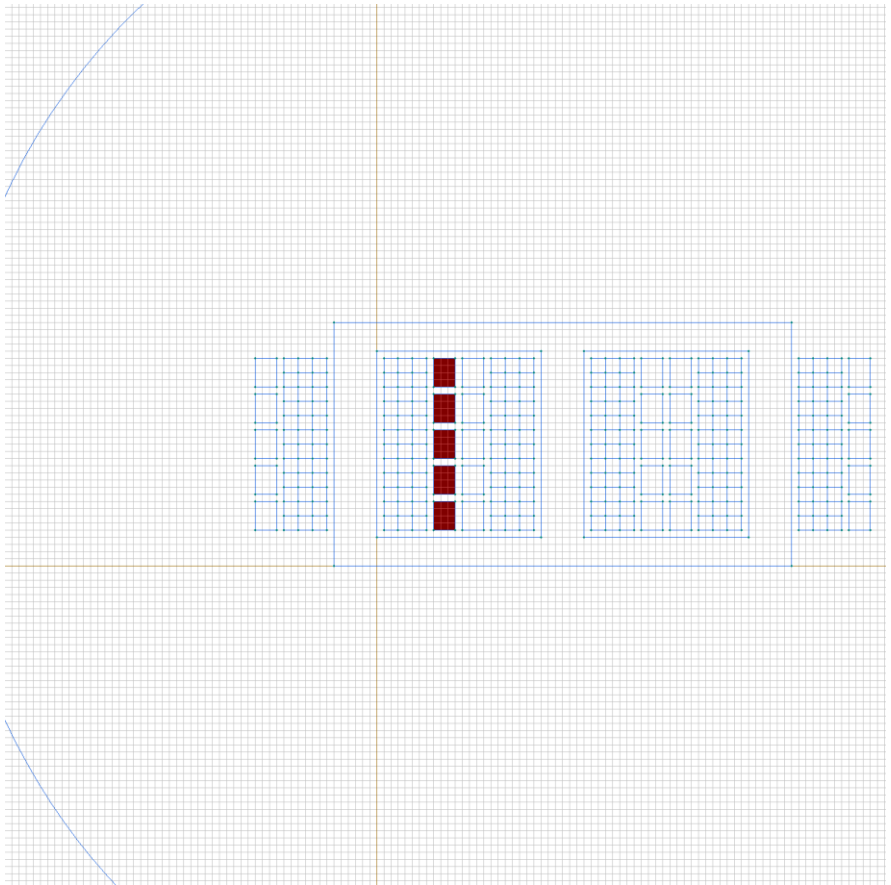
There are (5) objects with this label

Relative magnetic permeability: $\mu_x=1$, $\mu_y=1$

Electric conductivity: $\sigma(T)=56000000$ [S/m]

Voltage: $U=0$ [V]

Conductor's connection: in series



Labelled objects: block "A+"

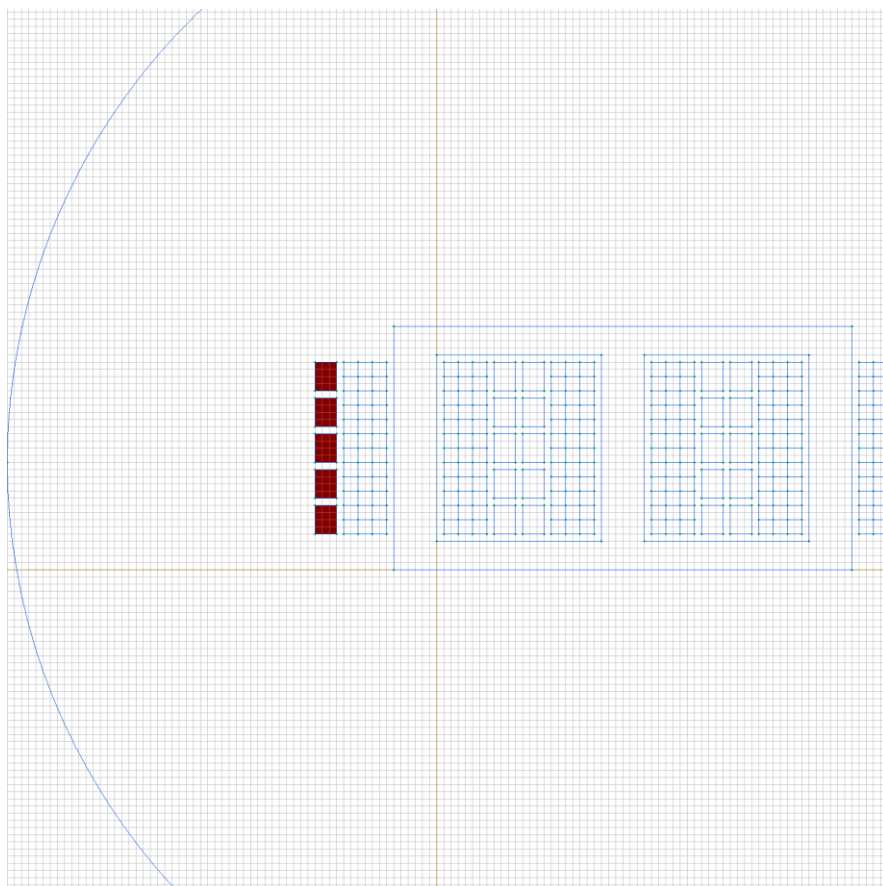
There are (5) objects with this label

Relative magnetic permeability: $\mu_x=1$, $\mu_y=1$

Electric conductivity: $\sigma(T)=56000000$ [S/m]

Voltage: $U=0$ [V]

Conductor's connection: in series



Labelled objects: block "z+"

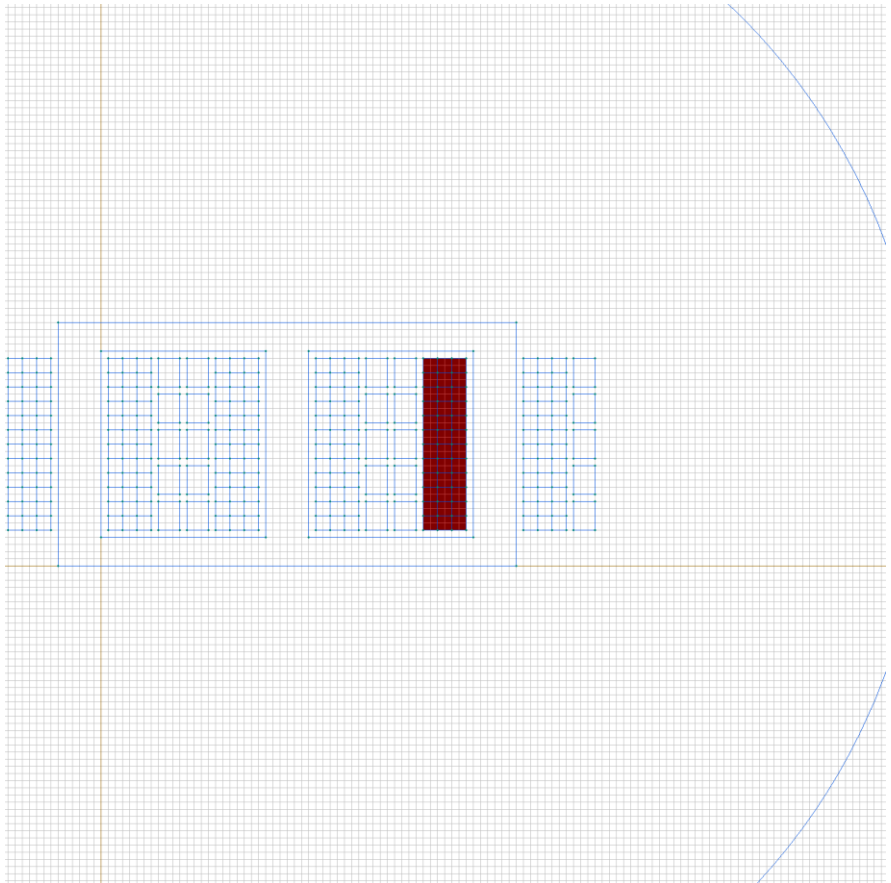
There are (36) objects with this label

Relative magnetic permeability: $\mu_x=1$, $\mu_y=1$

Electric conductivity: $\sigma(T)=56000000$ [S/m]

Voltage: $U=0$ [V]

Conductor's connection: in series



Labelled objects: block "y+"

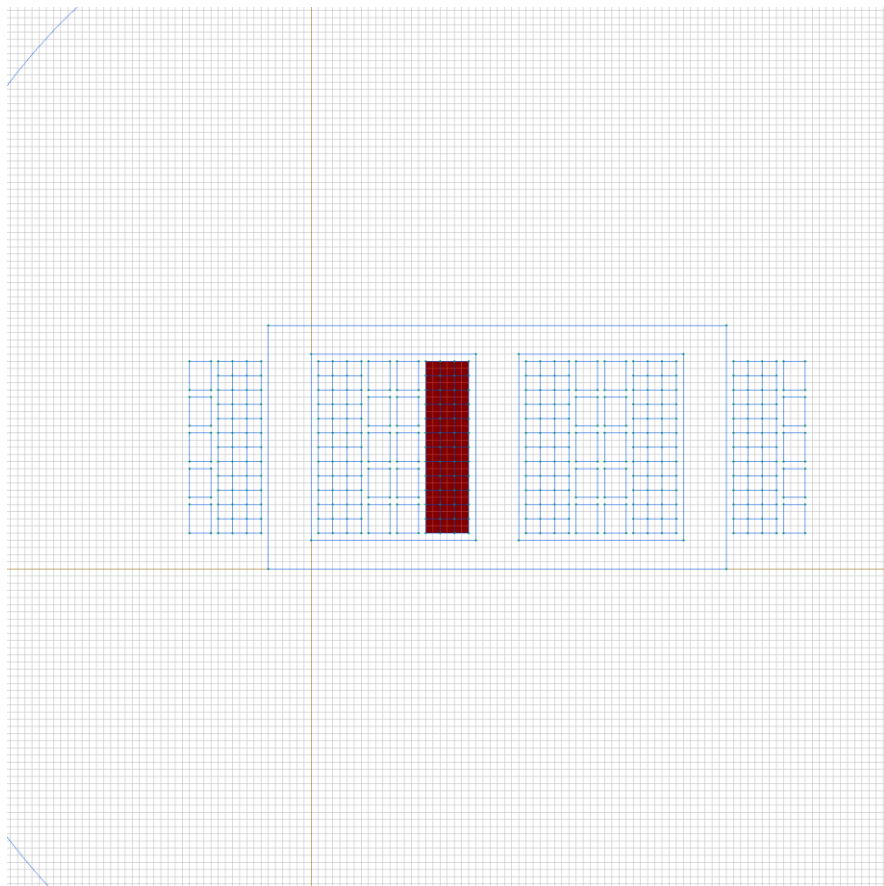
There are (36) objects with this label

Relative magnetic permeability: $\mu_x=1$, $\mu_y=1$

Electric conductivity: $\sigma(T)=56000000$ [S/m]

Voltage: $U=0$ [V]

Conductor's connection: in series



Labelled objects: block "y-"

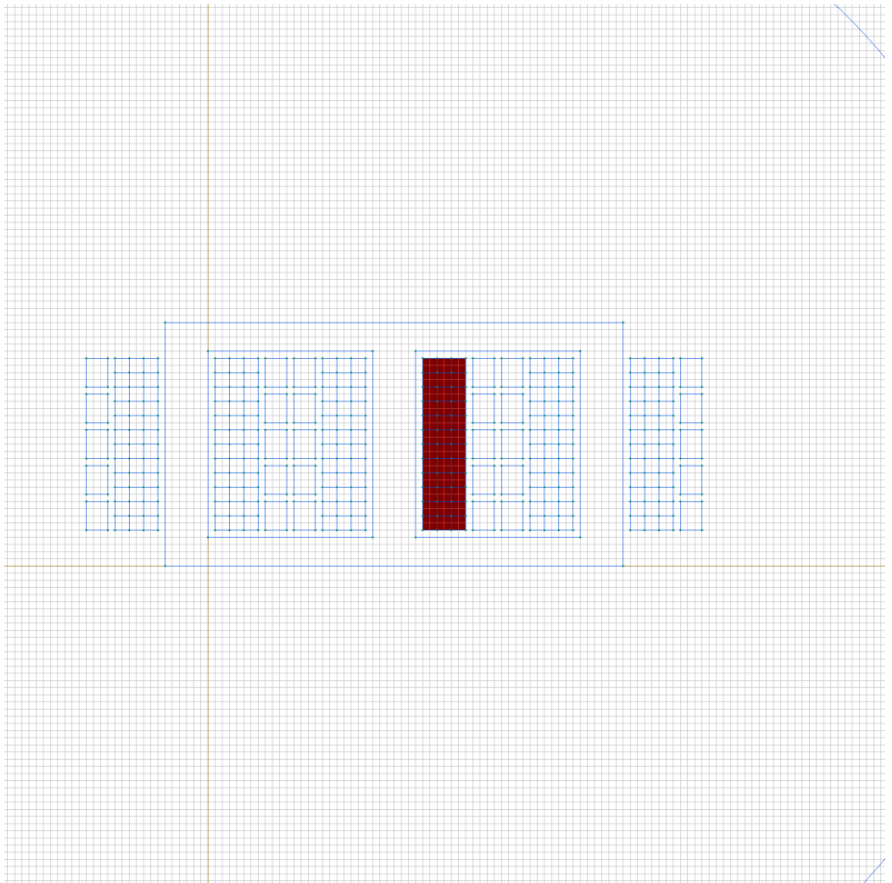
There are (36) objects with this label

Relative magnetic permeability: $\mu_x=1$, $\mu_y=1$

Electric conductivity: $\sigma(T)=56000000$ [S/m]

Voltage: $U=0$ [V]

Conductor's connection: in series



Labelled objects: block "B+"

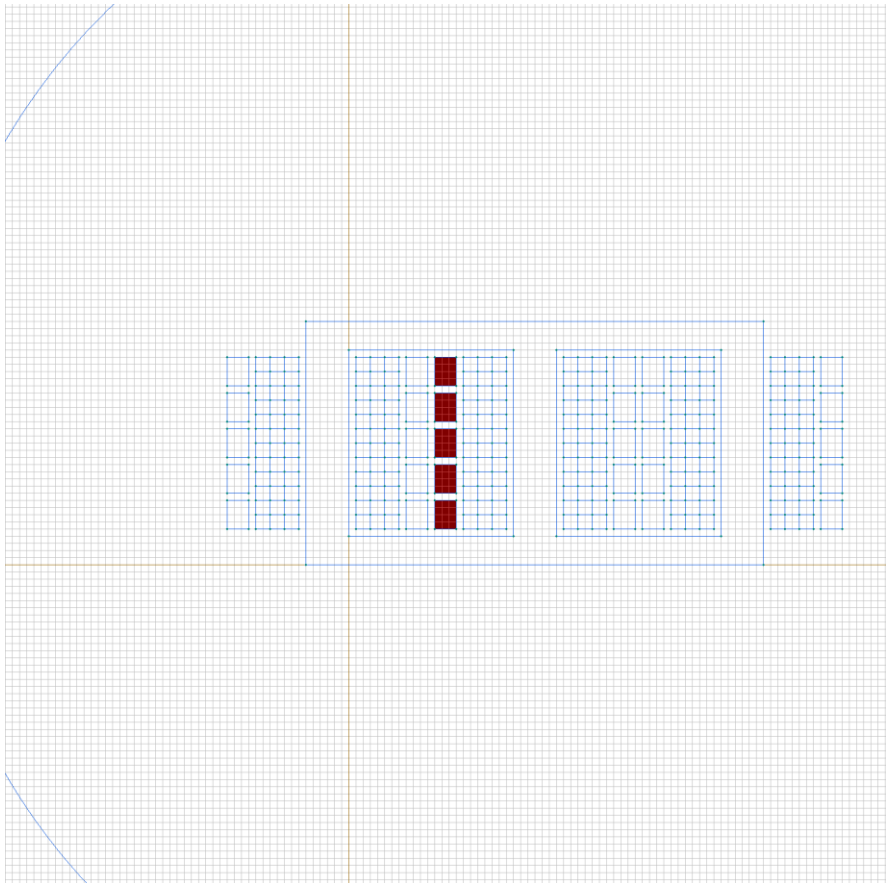
There are (5) objects with this label

Relative magnetic permeability: $\mu_x=1$, $\mu_y=1$

Electric conductivity: $\sigma(T)=56000000$ [S/m]

Voltage: $U=0$ [V]

Conductor's connection: in series



Labelled objects: block "C+"

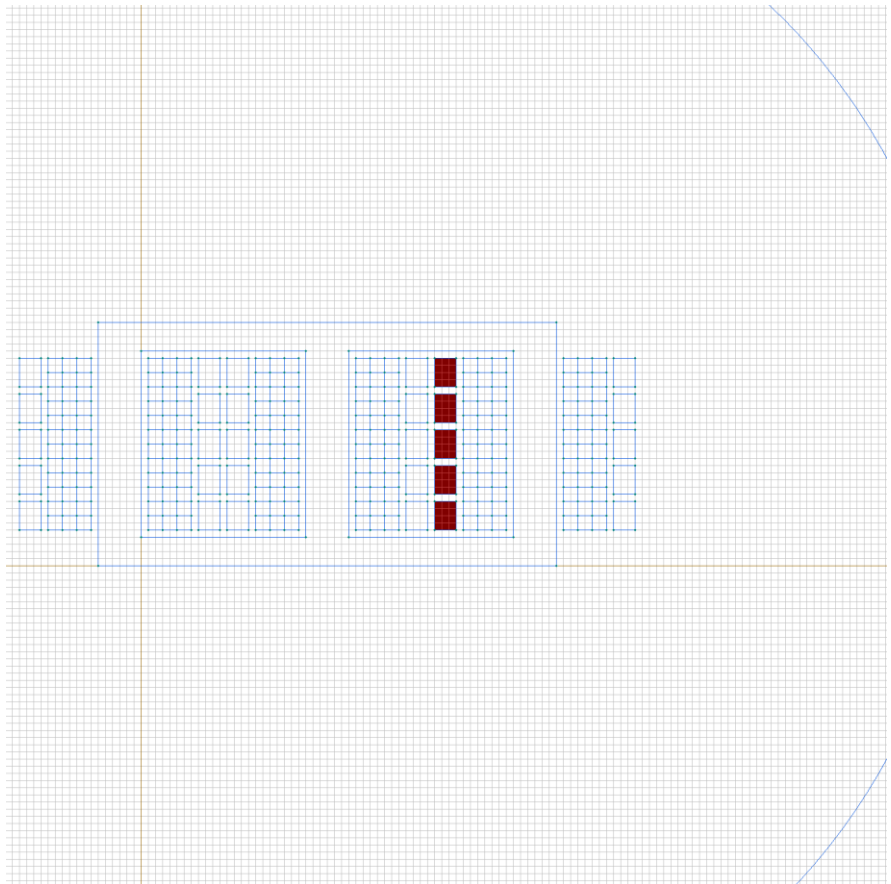
There are (5) objects with this label

Relative magnetic permeability: $\mu_x=1$, $\mu_y=1$

Electric conductivity: $\sigma(T)=56000000$ [S/m]

Voltage: $U=0$ [V]

Conductor's connection: in series



Labelled objects: block "C-"

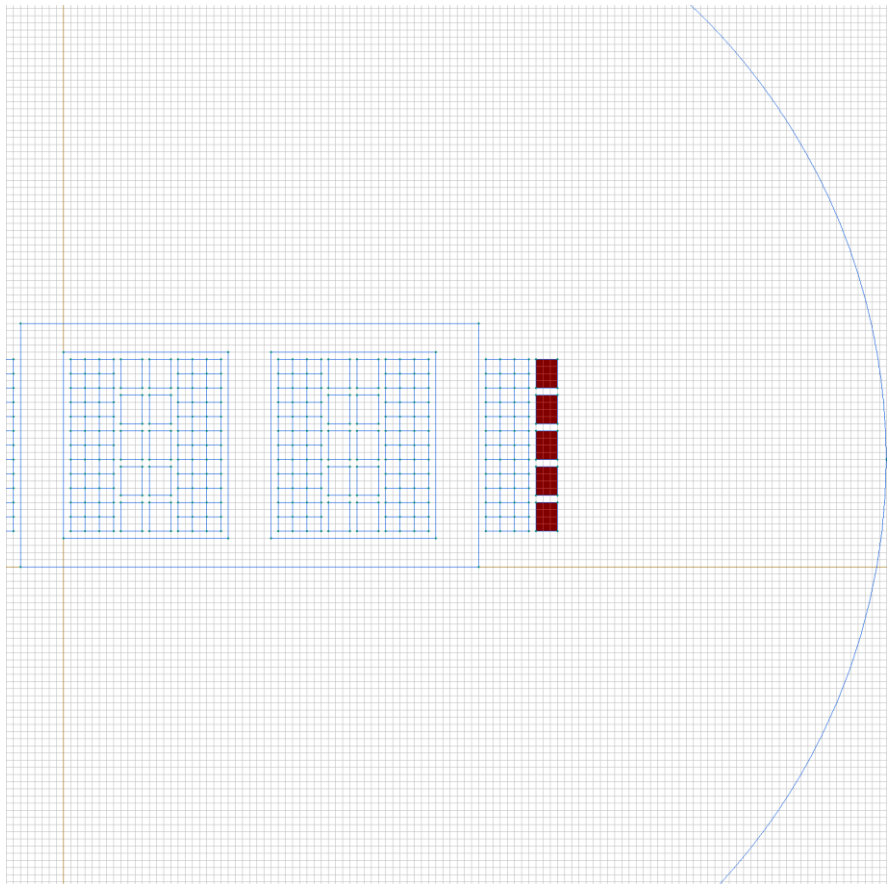
There are (5) objects with this label

Relative magnetic permeability: $\mu_x=1$, $\mu_y=1$

Electric conductivity: $\sigma(T)=56000000$ [S/m]

Voltage: $U=0$ [V]

Conductor's connection: in series



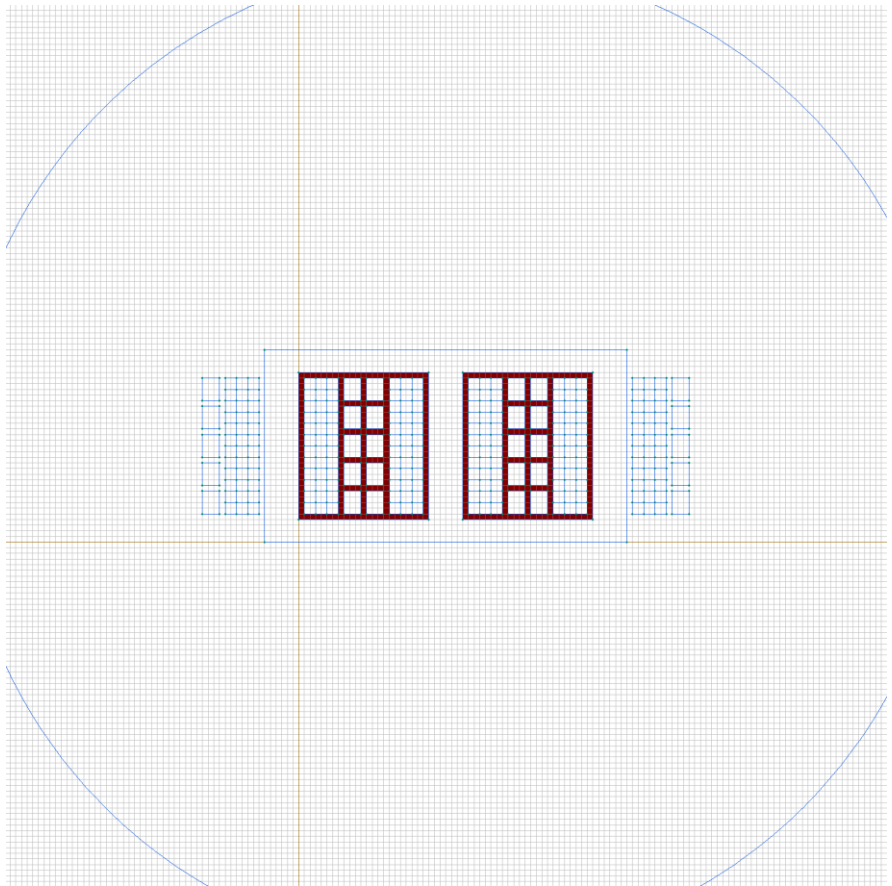
Labelled objects: block "insulation"

There are (2) objects with this label

Relative magnetic permeability: $\mu_x=1$, $\mu_y=1$

Current density: $j=0$ [A/m²]

Conductor's connection: in parallel



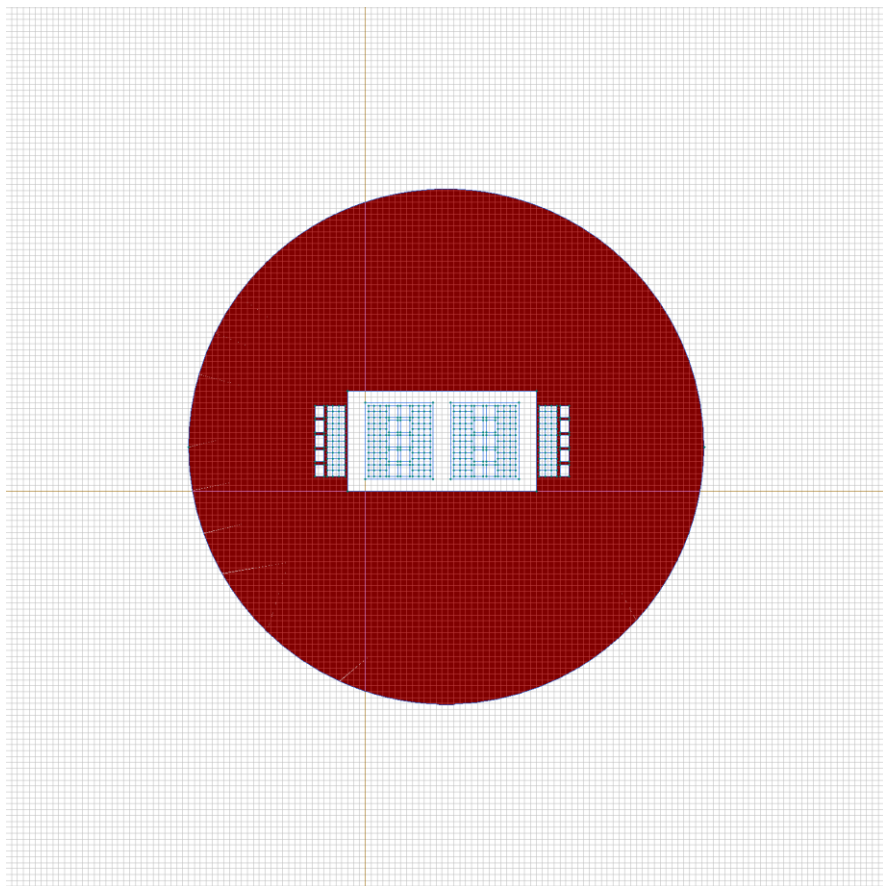
Labelled objects: block "air"

There are (1) objects with this label

Relative magnetic permeability: $\mu_x=1$, $\mu_y=1$

Current density: $j=0$ [A/m²]

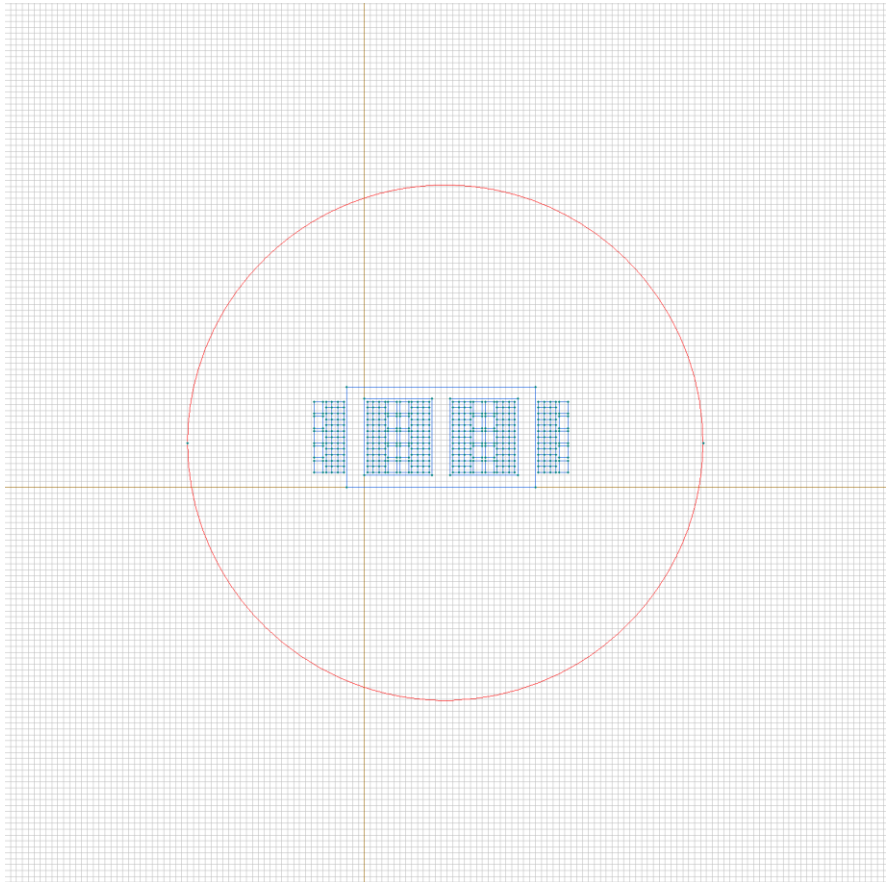
Conductor's connection: in parallel



Labelled objects: edge "A=0"

There are (2) objects with this label

Magnetic potential: $A=0$ [Wb/m]



[Problem info](#)

[Geometry model](#)

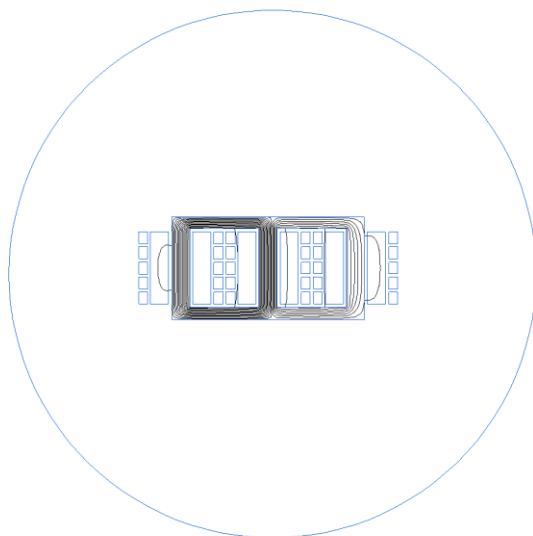
[Labelled Objects](#)

[Results](#)

[Nonlinear dependencies](#)

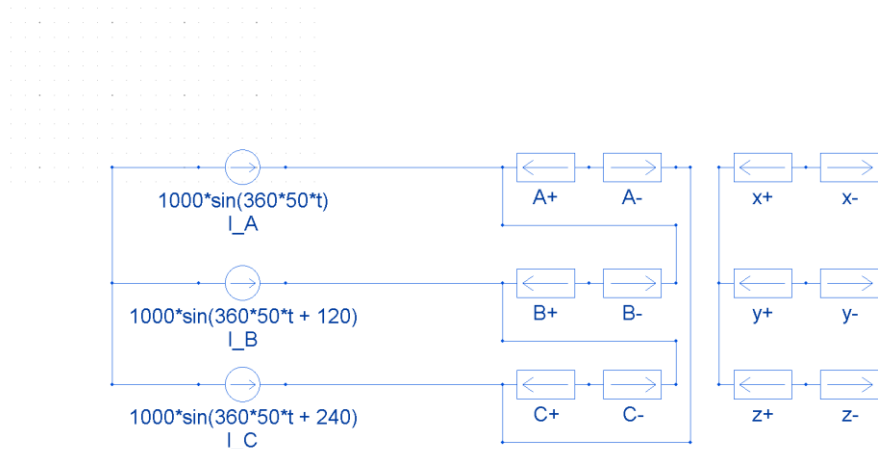
Results

Field lines



Results

Electric circuit currents



Circuit elements:

$x-$. $I=51.66$ [A]

$x+$. $I=51.66$ [A]

$y-$. $I=30.698$ [A]

$y+$. $I=30.698$ [A]

z-. I=82.35 [A]

z+. I=82.35 [A]

R1. I=51.66 [A]

R2. I=30.698 [A]

L1. I=82.35 [A]

A-. I=288.58 [A]

A+. I=288.58 [A]

B-. I=288.58 [A]

B+. I=288.58 [A]

C-. I=577.4 [A]

C+. I=577.4 [A]

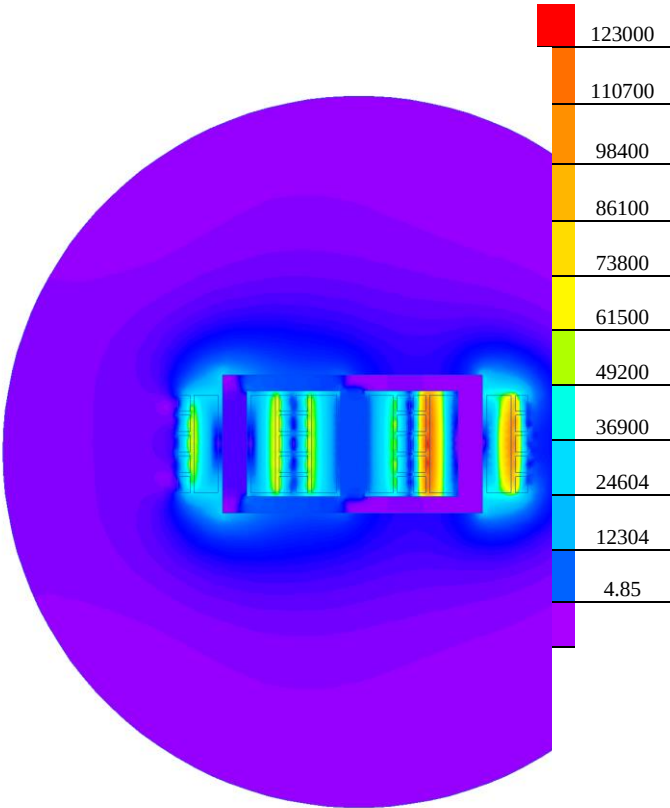
I_A. I=0.00009363 [A]

I_B. I=866 [A]

I_C. I=866 [A]

Results

Color map of Strength $|H|$ [A/m]



Nonlinear dependencies

Table 2. BH-curve

B [T]	H [A/m]
0	0
0.3	150
0.9	300
1.5	900
1.8	2800
2	5000