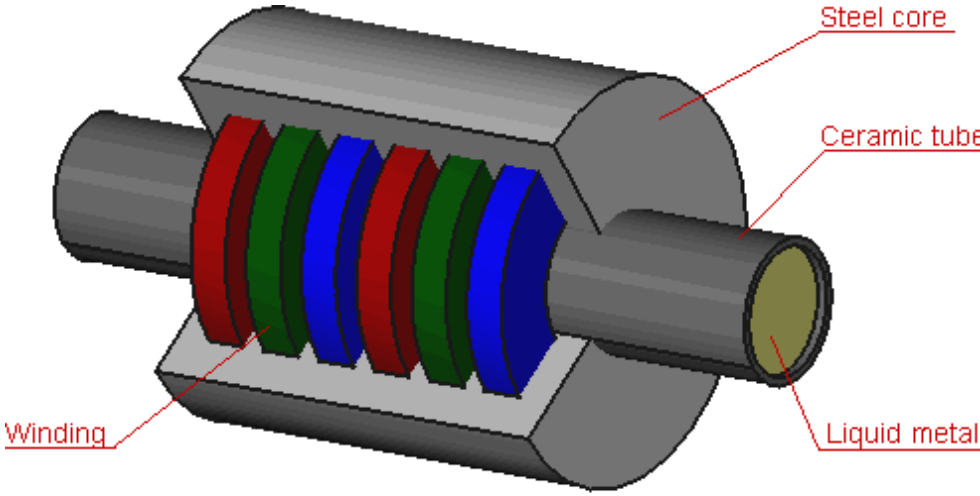
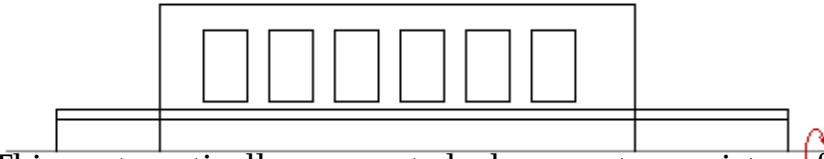
QuickField simulation report

HMagn5: Induction pump

Calculation of the pump force and pressure as functions of temperature.





This automatically generated document consists of several sections, which specify the problem setup and finite element analysis simulation results. Navigation links in the top of each page lead to corresponding sections of this report.

Problem description and QuickField simulation files:
https://quickfield.com/advanced/hmang5_induction_pump.htm

Problem info

Problem type: AC Magnetics , frequency: 50 Hz,
Geometry model class: Axisymmetric
Problem database file names:

- Problem: *HMagn5.pbm*
- Geometry: *Hmagn5.mod*
- Material Data: *Hmagn5.dhe*
- Material Data 2 (library): *none*
- Electric circuit: *none*

Results taken from other problems:

- *none*

Geometry model

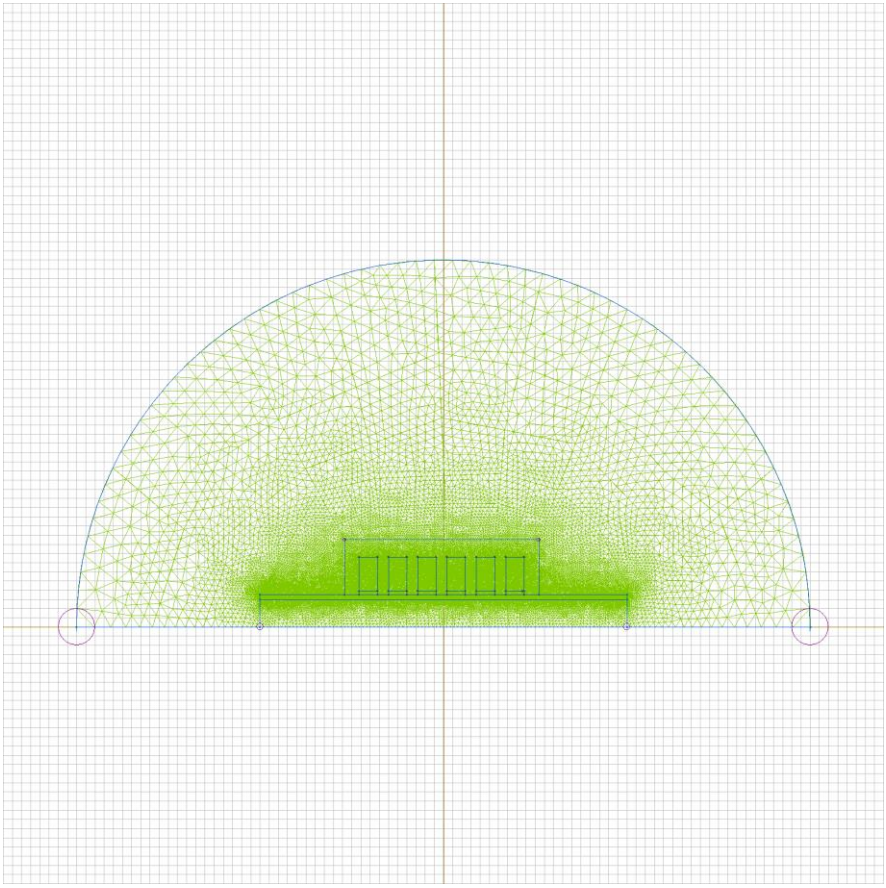


Table 1. Geometry model statistics

	With Label	Total
Blocks	10	16
Edges	1	64
Vertices	0	49

Number of nodes: 34827.

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)

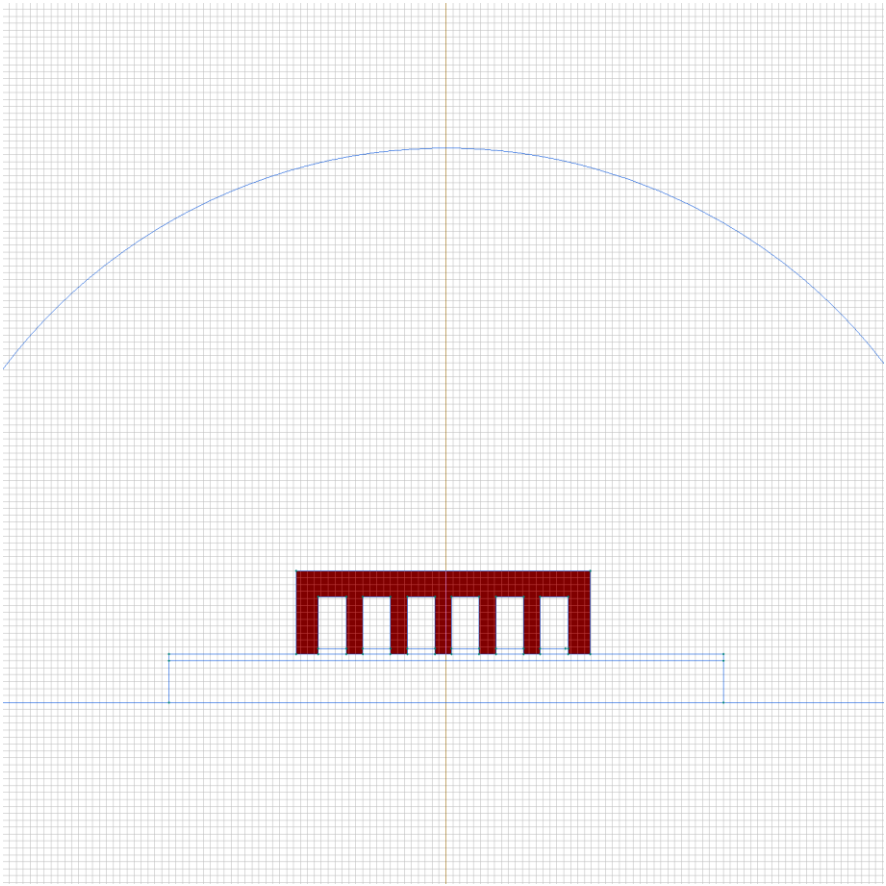
Blocks:	Edges:	Vertices:
• core • air • A • B • tube • Z • X • Y • liquid metal • C •	• boundary •	

Detailed information about each label is listed below.

Labelled objects: block "core"

There are (1) objects with this label

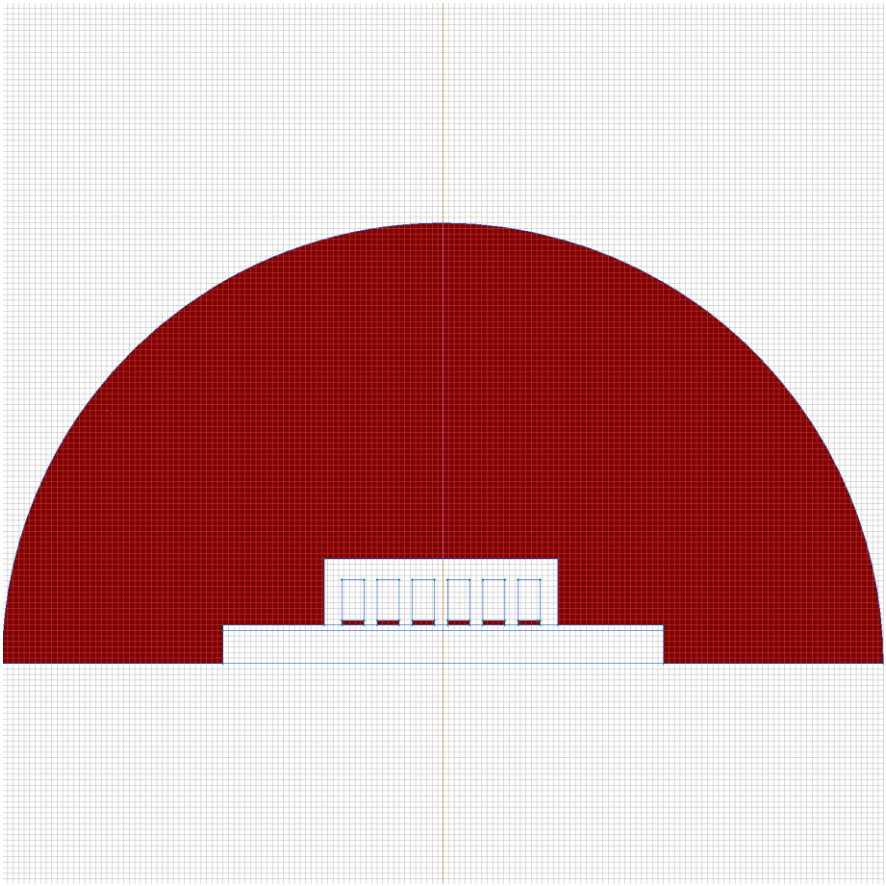
Relative magnetic permeability: mu_x=200, mu_y=200
Electric conductivity: sigma=0 [S/m]
Current density: j=0 [A/m2], phase 0 [deg]
Conductor's connection: in parallel



Labelled objects: block "air"

There are (7) objects with this label

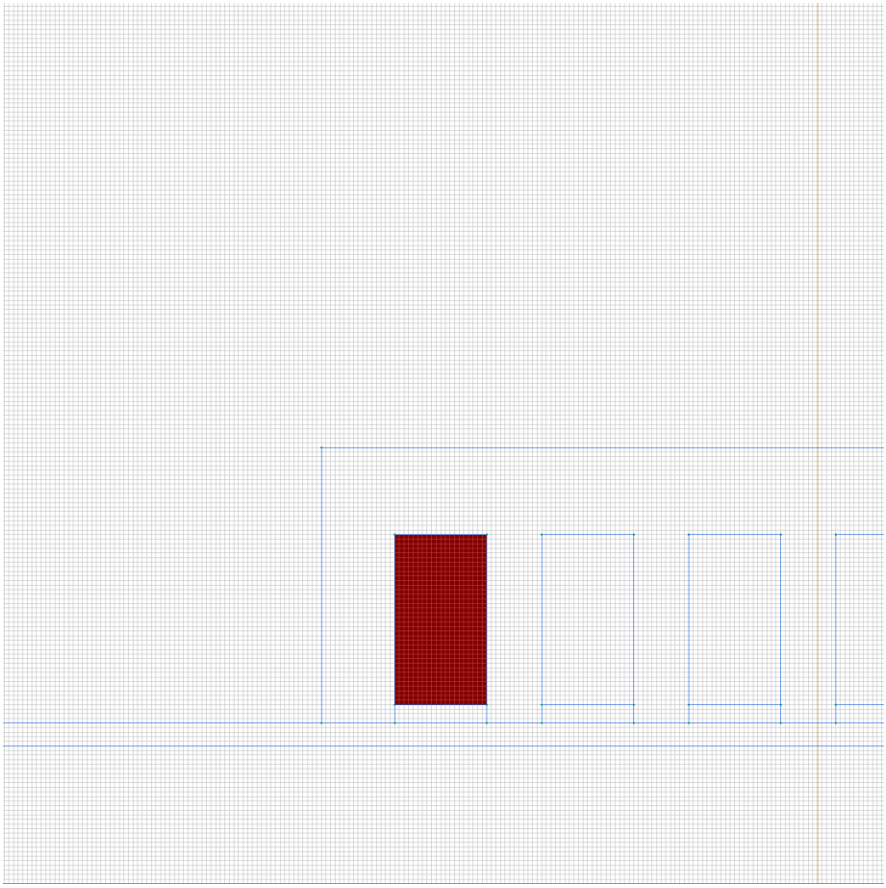
Relative magnetic permeability: mu_x=1, mu_y=1
Electric conductivity: sigma=0 [S/m]
Current density: j=0 [A/m2], phase 0 [deg]
Conductor's connection: in parallel



Labelled objects: block "A"

There are (1) objects with this label

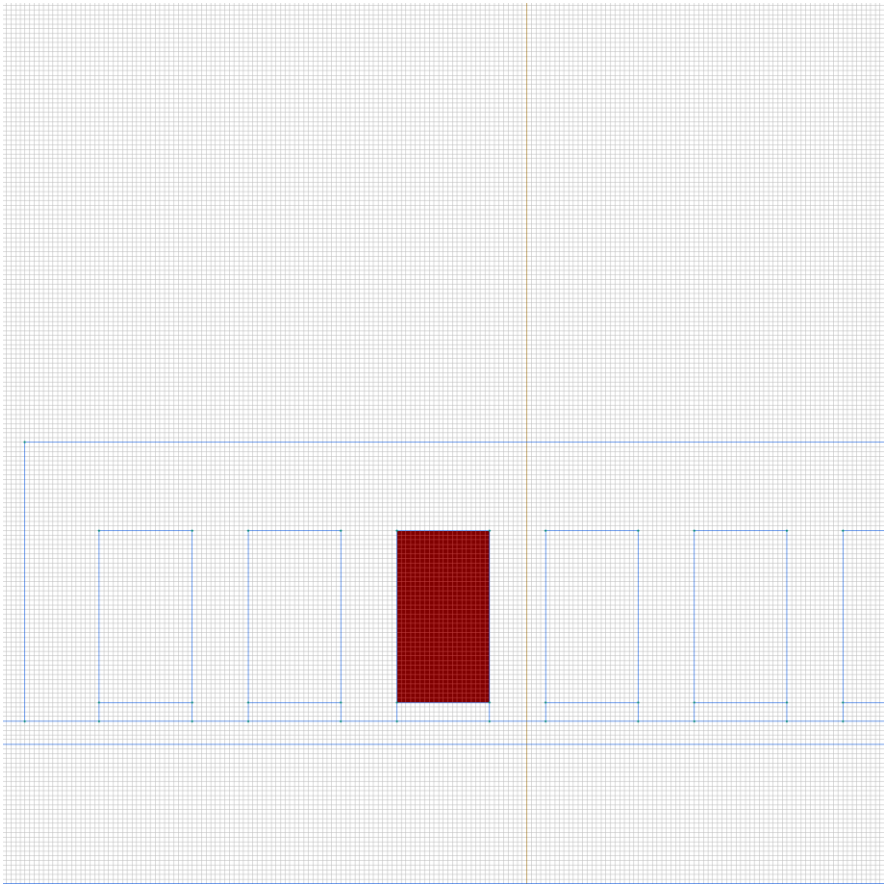
Relative magnetic permeability: mu_x=1, mu_y=1
Electric conductivity: sigma=0 [S/m]
Current density: j=6000000 [A/m2], phase 0 [deg]
Conductor's connection: in parallel



Labelled objects: block "B"

There are (1) objects with this label

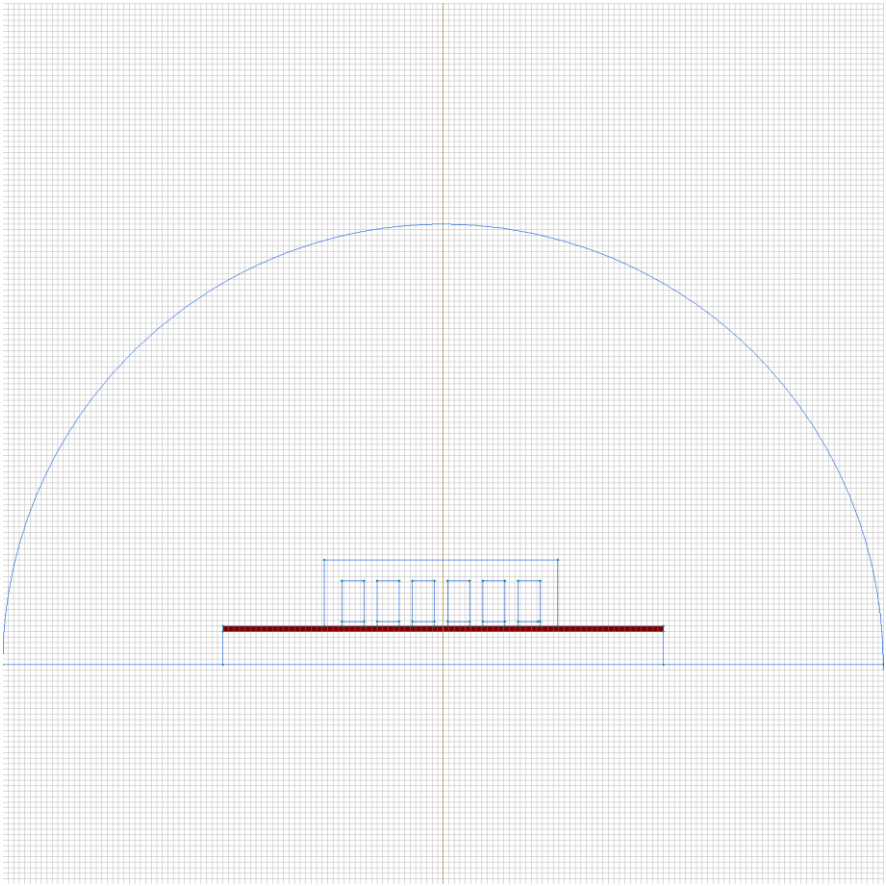
Relative magnetic permeability: mu_x=1, mu_y=1
Electric conductivity: sigma=0 [S/m]
Current density: j=6000000 [A/m2], phase 120 [deg]
Conductor's connection: in parallel



Labelled objects: block "tube"

There are (1) objects with this label

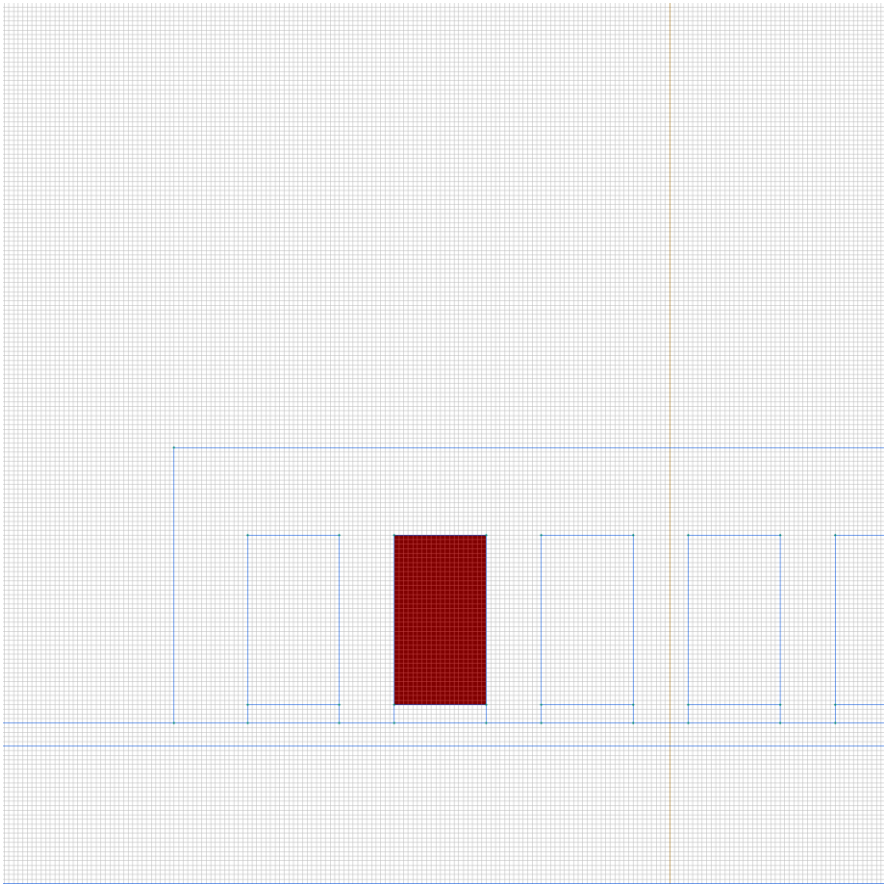
Relative magnetic permeability: mu_x=1, mu_y=1
Electric conductivity: sigma=0 [S/m]
Current density: j=0 [A/m2], phase 0 [deg]
Conductor's connection: in parallel



Labelled objects: block "Z"

There are (1) objects with this label

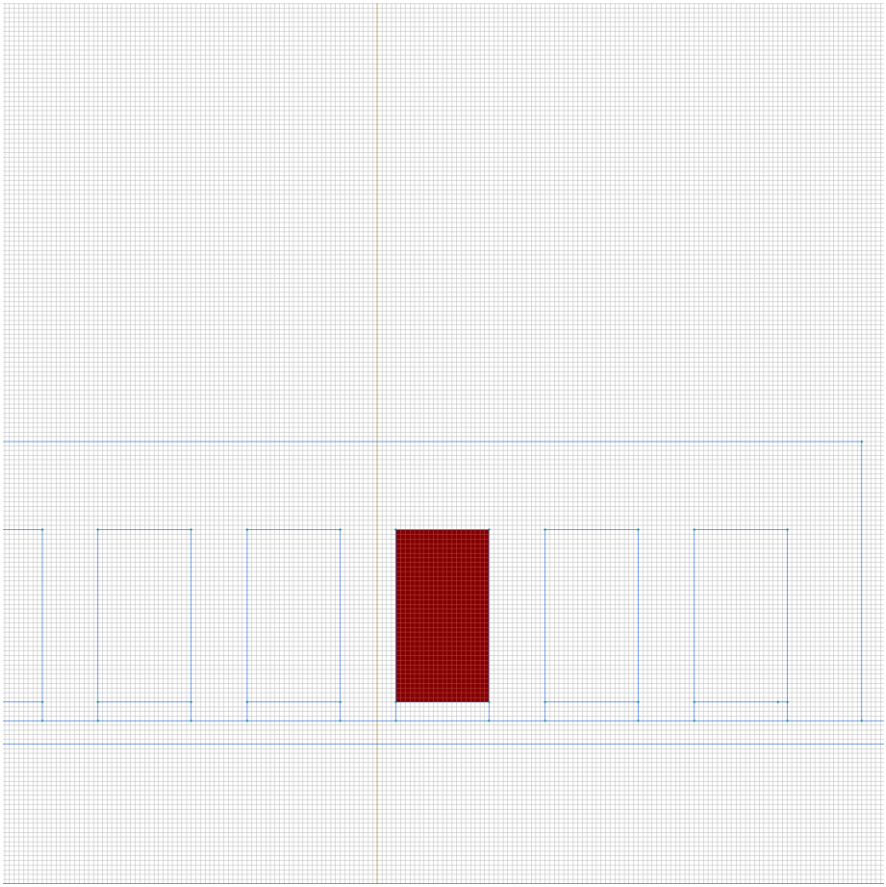
Relative magnetic permeability: mu_x=1, mu_y=1
Electric conductivity: sigma=0 [S/m]
Current density: j=-6000000 [A/m2], phase 240 [deg]
Conductor's connection: in parallel



Labelled objects: block "X"

There are (1) objects with this label

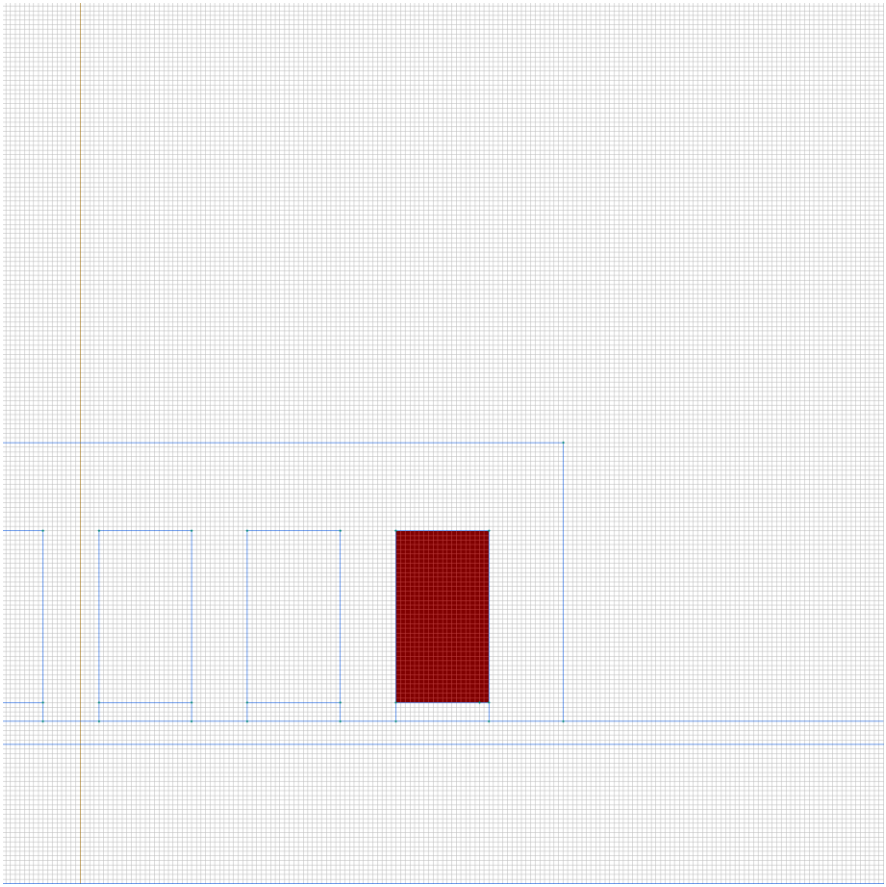
Relative magnetic permeability: mu_x=1, mu_y=1
Electric conductivity: sigma=0 [S/m]
Current density: j=-6000000 [A/m2], phase 0 [deg]
Conductor's connection: in parallel



Labelled objects: block "Y"

There are (1) objects with this label

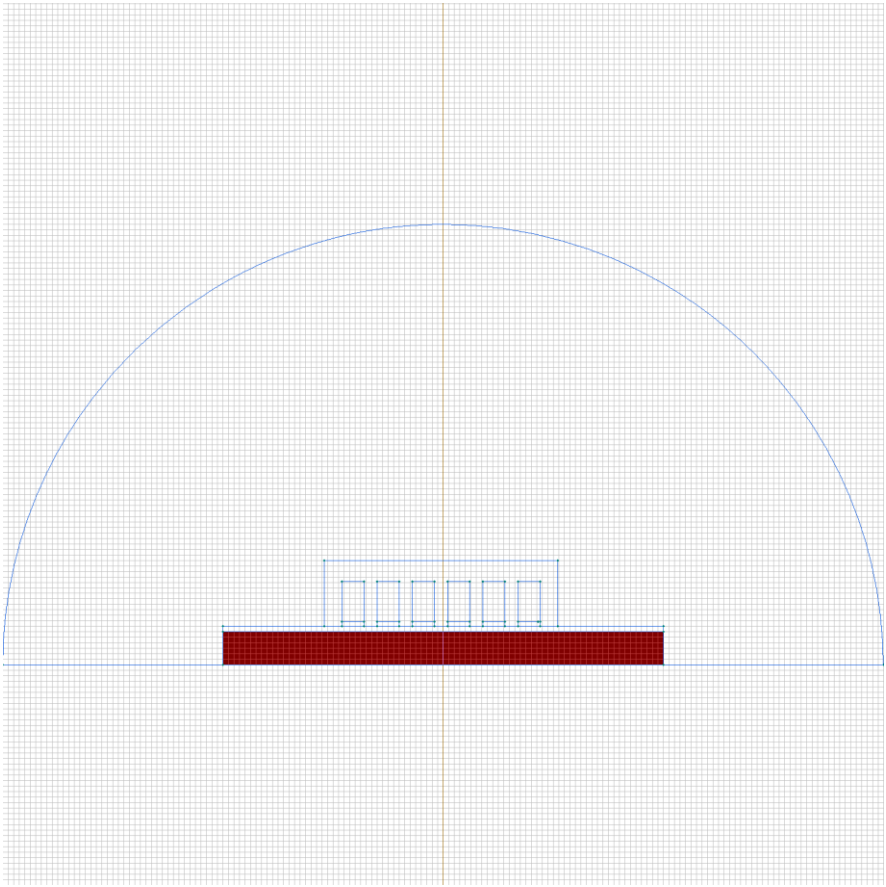
Relative magnetic permeability: mu_x=1, mu_y=1
Electric conductivity: sigma=0 [S/m]
Current density: j=-6000000 [A/m2], phase 120 [deg]
Conductor's connection: in parallel



Labelled objects: block "liquid metal"

There are (1) objects with this label

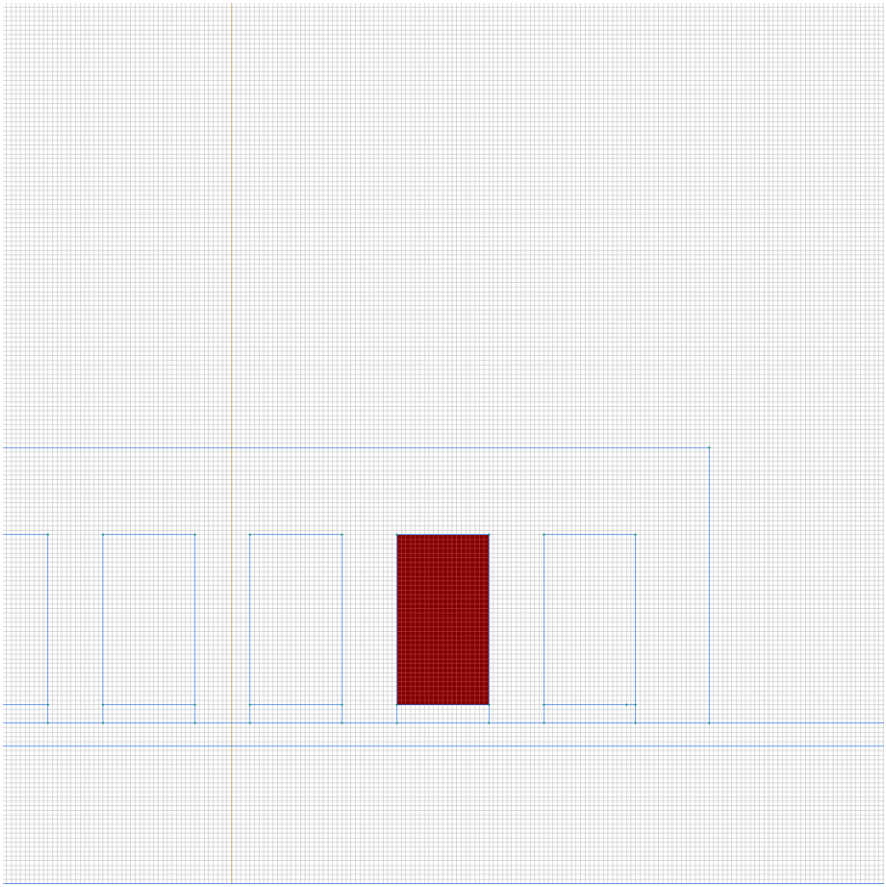
Relative magnetic permeability: mu_x=1, mu_y=1
Electric conductivity: sigma(T)=nonlinear (see Table 2 in the "Nonlinear dependencies" section)
Reference temperature: T=436.9 [K]
Voltage: U=0 [V], phase 0 [deg]
Conductor's connection: in parallel



Labelled objects: block "C"

There are (1) objects with this label

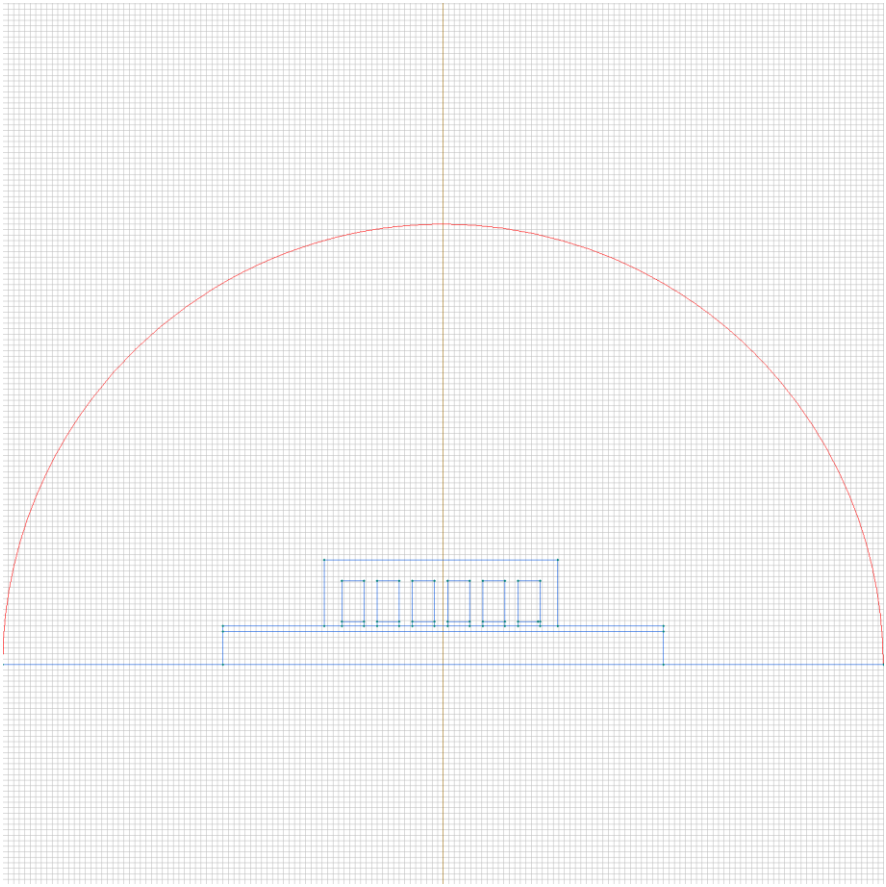
Relative magnetic permeability: mu_x=1, mu_y=1
Electric conductivity: sigma=0 [S/m]
Current density: j=6000000 [A/m2], phase 240 [deg]
Conductor's connection: in parallel



Labelled objects: edge "boundary"

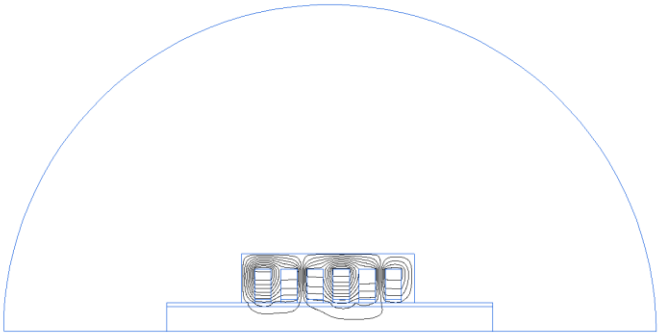
There are (1) objects with this label

Magnetic potential: A=0 [Wb/m], phase 0 [deg]



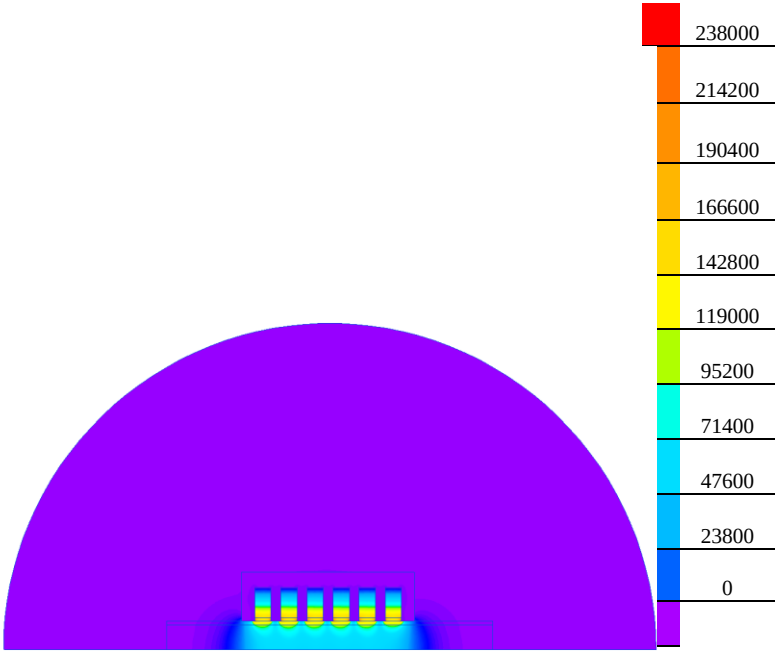
Results

Field lines



Results

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



Nonlinear dependencies

Table 2. Electric conductivity

T [K]	sigma [S/m]
373	18000000
600	10000000
900	6000000
1100	5000000