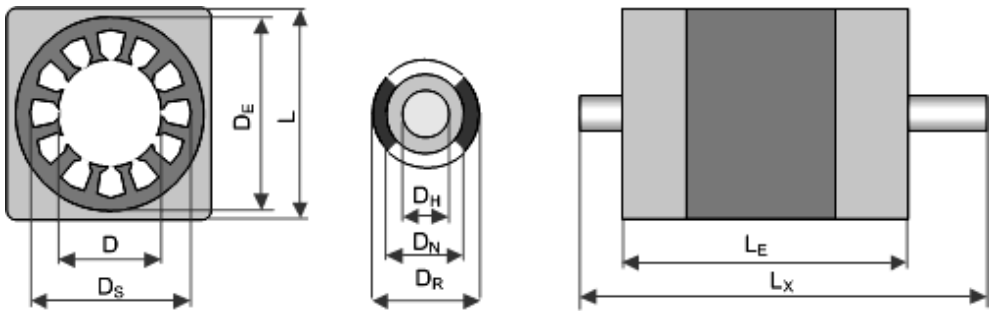# QuickField simulation report

ssues in the design of permanent magnet based electri

Calculation of the temperature of the rotor under the different working conditions

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/dc_motor.htm

Problem info

Problem type: Magnetostatics
Geometry model class: Plane-Parallel
Problem database file names:

- Problem: *BLDCelev2.pbm*
- Geometry: *Bldcelev2.mod*
- Material Data: *Bldcelev2.dms*
- Material Data 2 (library): *none*
- Electric circuit: *none*

Results taken from other problems:
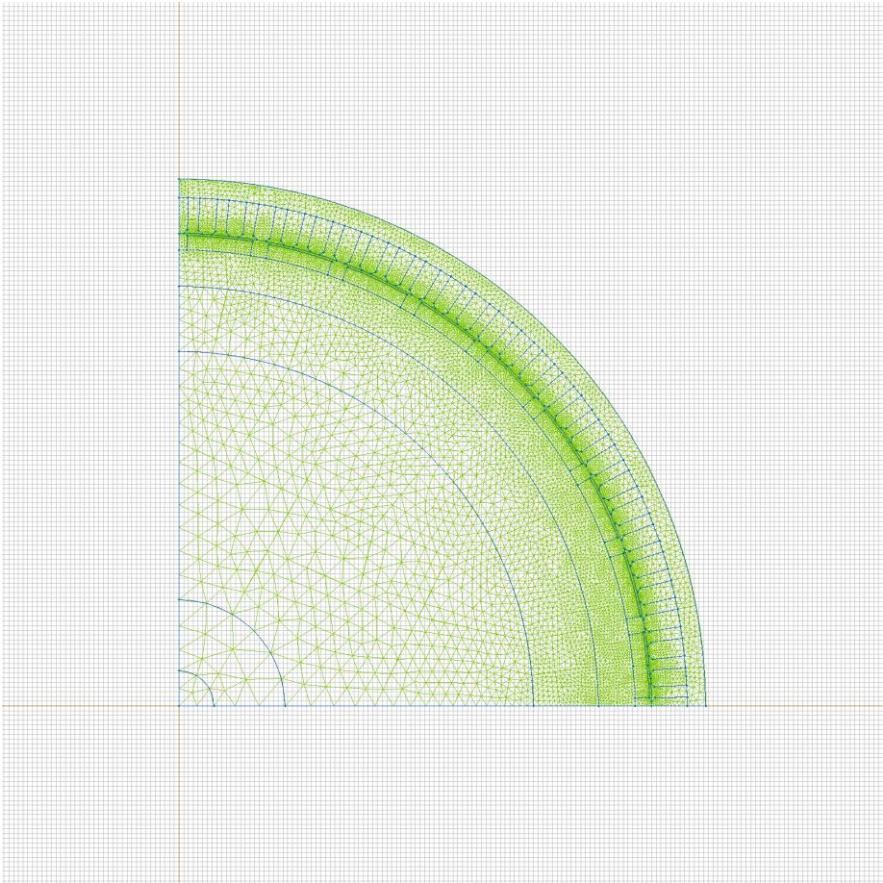
- *none*

Geometry model

Table 1. Geometry model statistics

	With Label	Total
Blocks	11	71
Edges	2	289
Vertices	0	219

Number of nodes: 11434.

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)

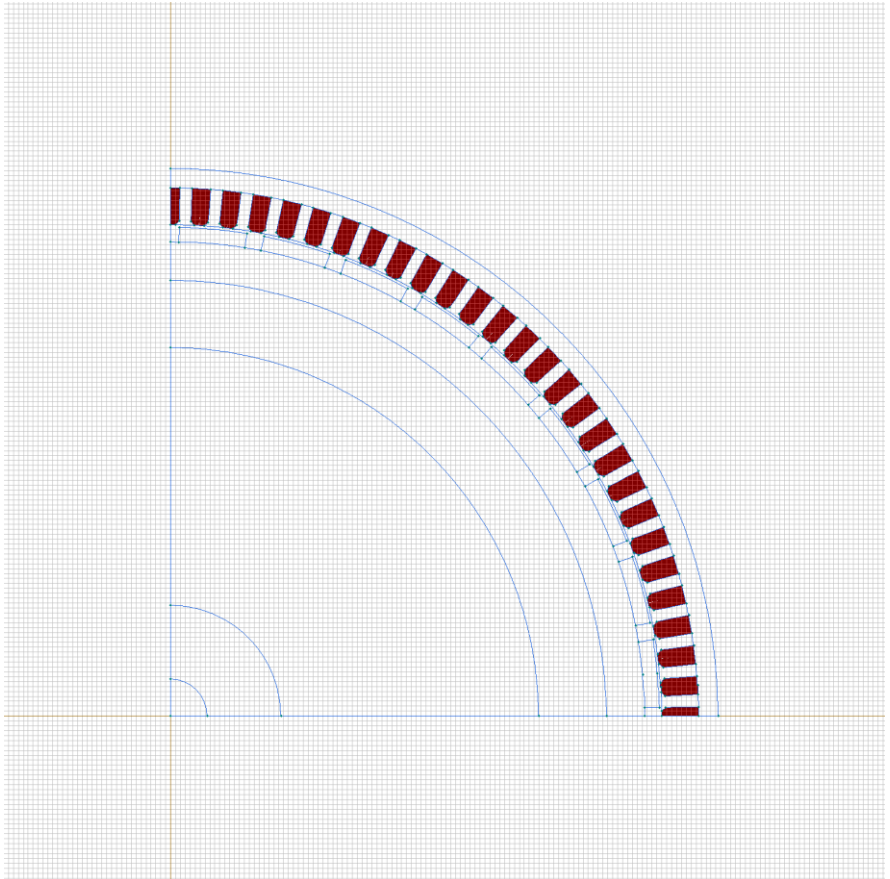| Blocks:	Edges:	Vertices:
- winding - tooth - stator - disc - magnet N - hub - magnet S - spokes - rim - shaft - air	- symmetry - outer boundary	

Detailed information about each label is listed below.

Labelled objects: block "winding"
There are (28) objects with this label

Relative magnetic permeability: mu_x=1, mu_y=1
Current density: j=0 [A/m2]
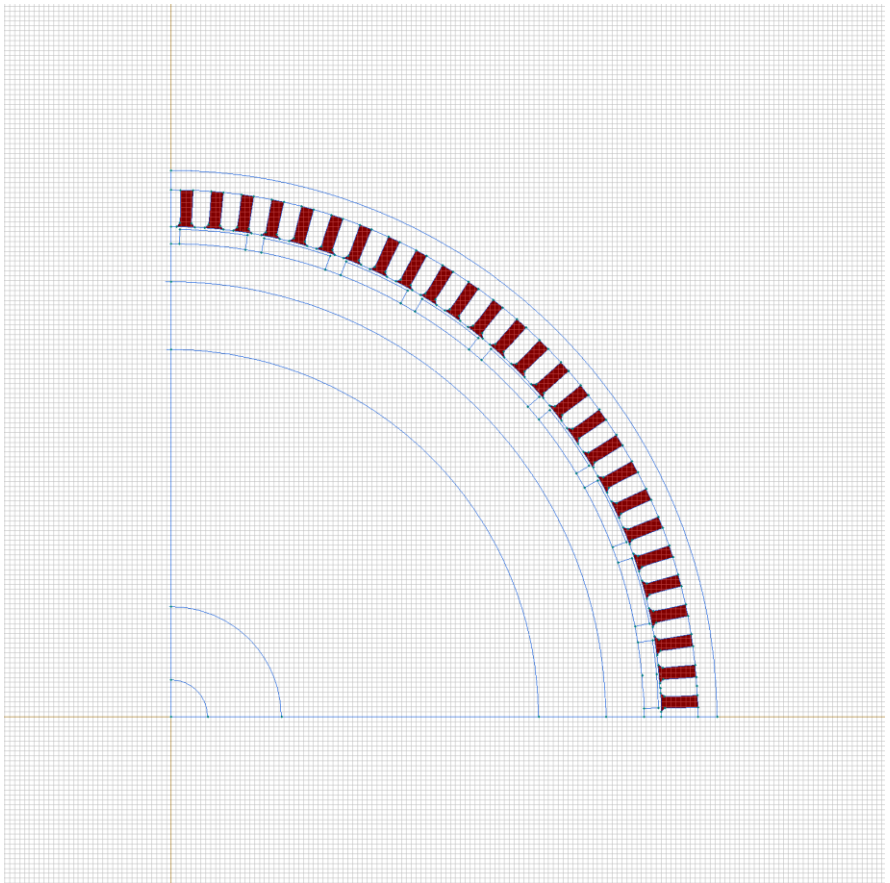Conductor's connection: in parallel

Labelled objects: block "tooth"
There are (27) objects with this label

Relative magnetic permeability: mu=nonlinear (see Table 2 in the "Nonlinear dependencies" section)
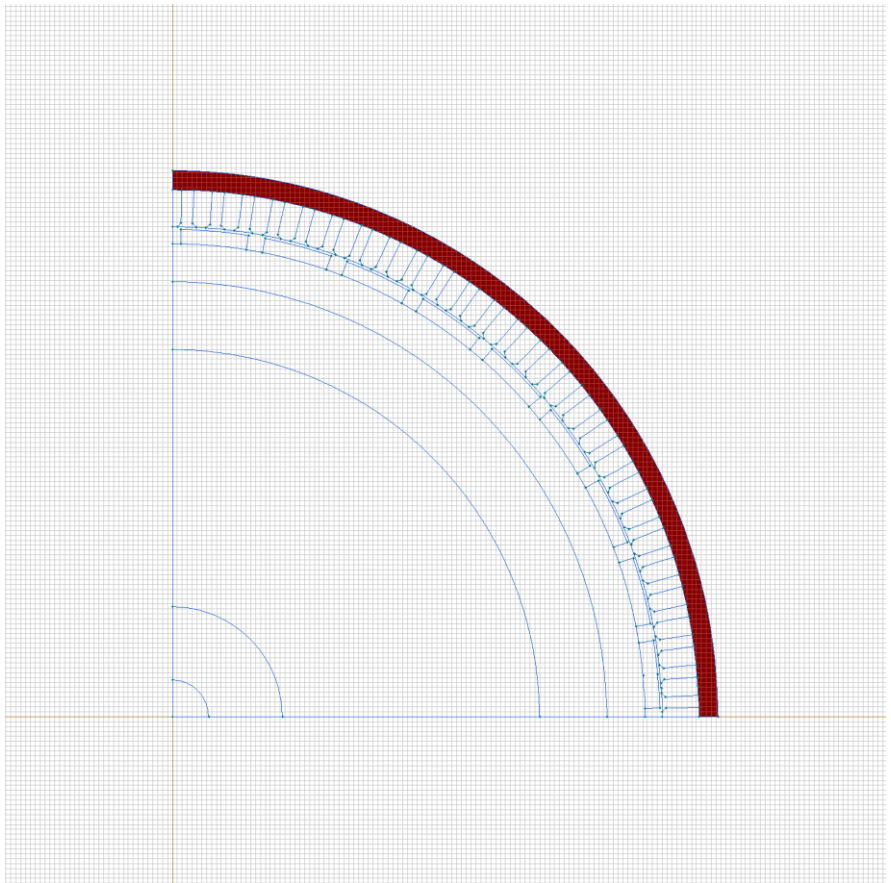Current density: j=0 [A/m2]
Conductor's connection: in parallel

Labelled objects: block "stator"
There are (1) objects with this label

Relative magnetic permeability: mu=nonlinear (see Table 3 in the "Nonlinear dependencies" section)
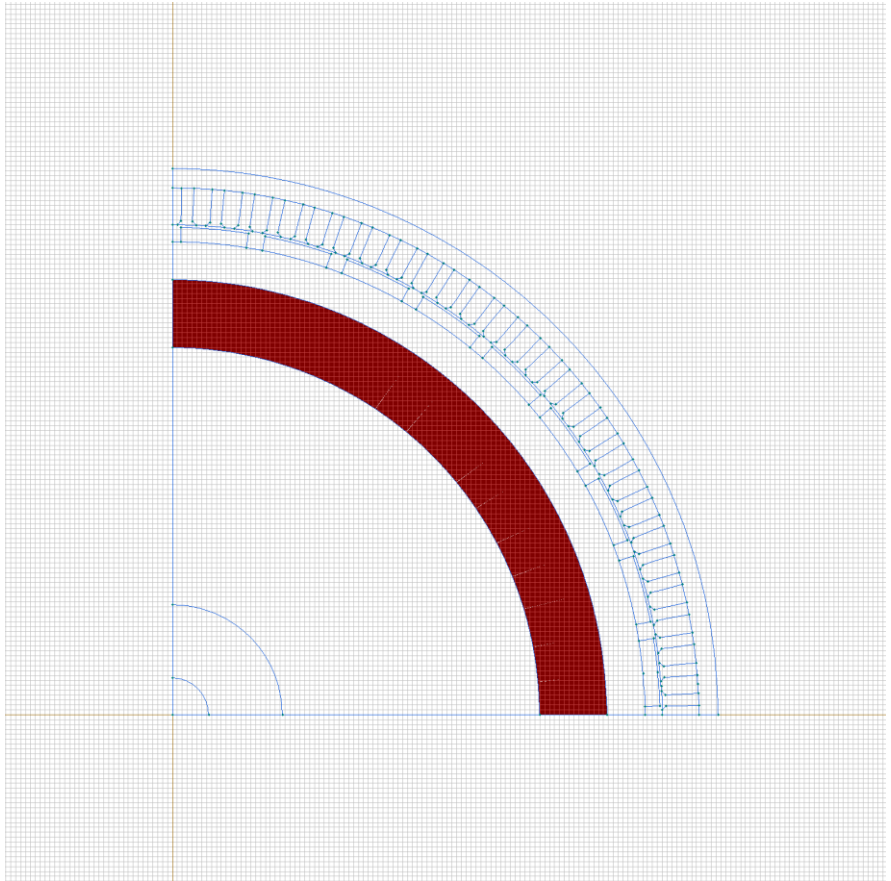Current density: j=0 [A/m2]
Conductor's connection: in parallel

Labelled objects: block "disc"
There are (1) objects with this label

Relative magnetic permeability: mu_x=1, mu_y=1
Current density: j=0 [A/m2]
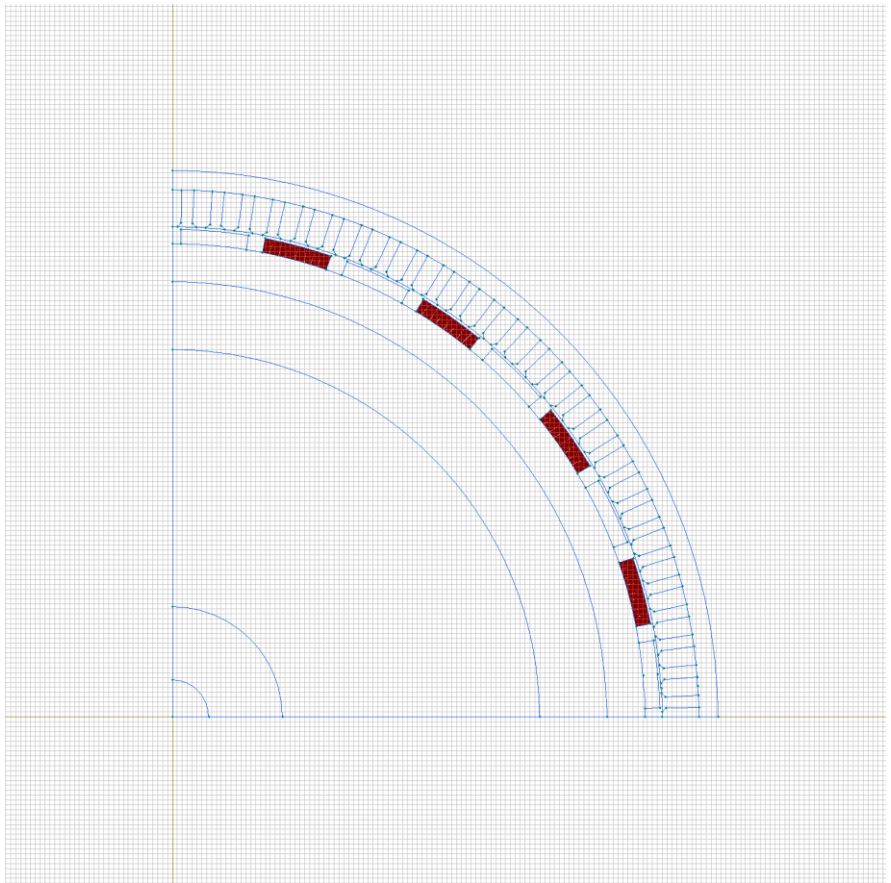Conductor's connection: in parallel

Labelled objects: block "magnet N"
There are (4) objects with this label

Relative magnetic permeability: mu_x=1.1, mu_y=1.1
Coercive force: Hc=756000 [A], direction: 0 [deg]
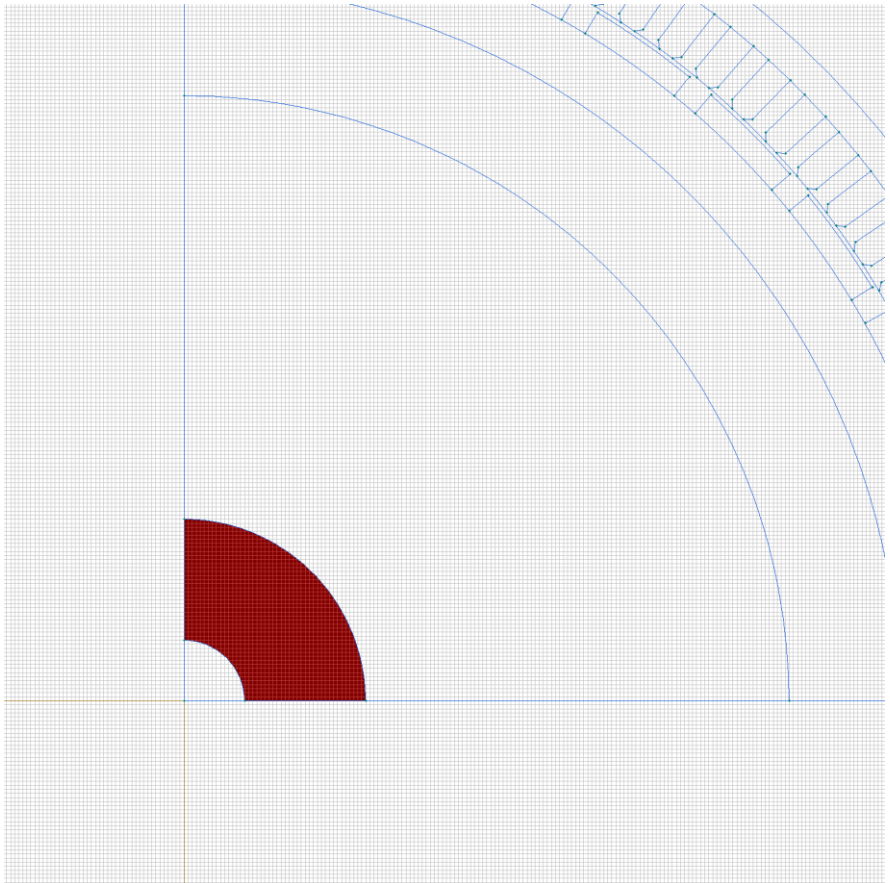Current density: j=0 [A/m2]
Conductor's connection: in parallel

Labelled objects: block "hub"
There are (1) objects with this label

Relative magnetic permeability: mu_x=1, mu_y=1
Current density: j=0 [A/m2]
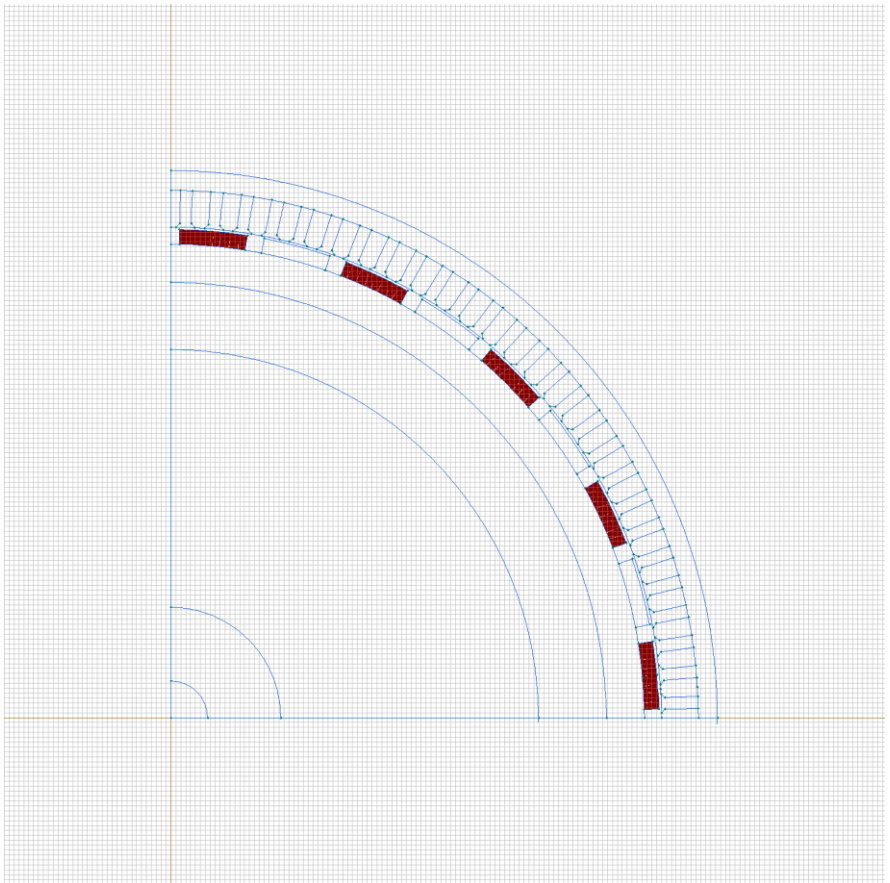Conductor's connection: in parallel

Labelled objects: block "magnet S"
There are (5) objects with this label

Relative magnetic permeability: mu_x=1.1, mu_y=1.1
Coercive force: Hc=756000 [A], direction: 180 [deg]
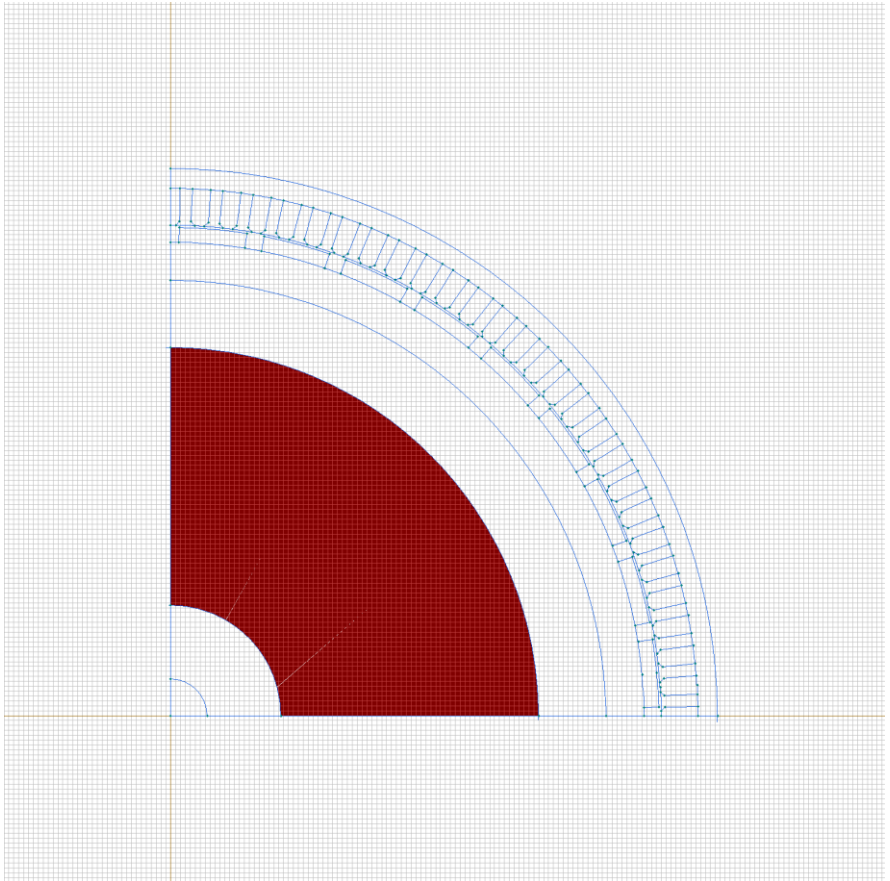Current density: j=0 [A/m2]
Conductor's connection: in parallel

Labelled objects: block "spokes"
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: block "rim"
There are (1) objects with this label

Relative magnetic permeability: mu=nonlinear (see Table 4 in the "Nonlinear dependencies" section)
Current density: j=0 [A/m2]
Conductor's connection: in parallel

Labelled objects: block "shaft"
There are (1) objects with this label

Relative magnetic permeability: mu=nonlinear (see Table 5 in the "Nonlinear dependencies" section)
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
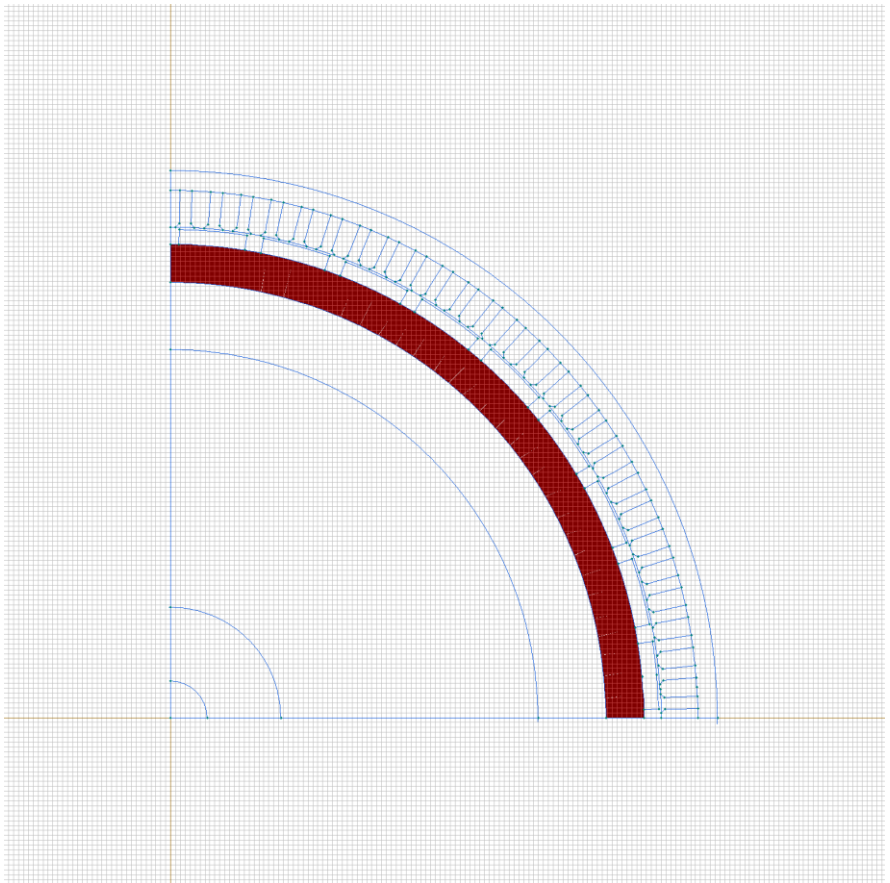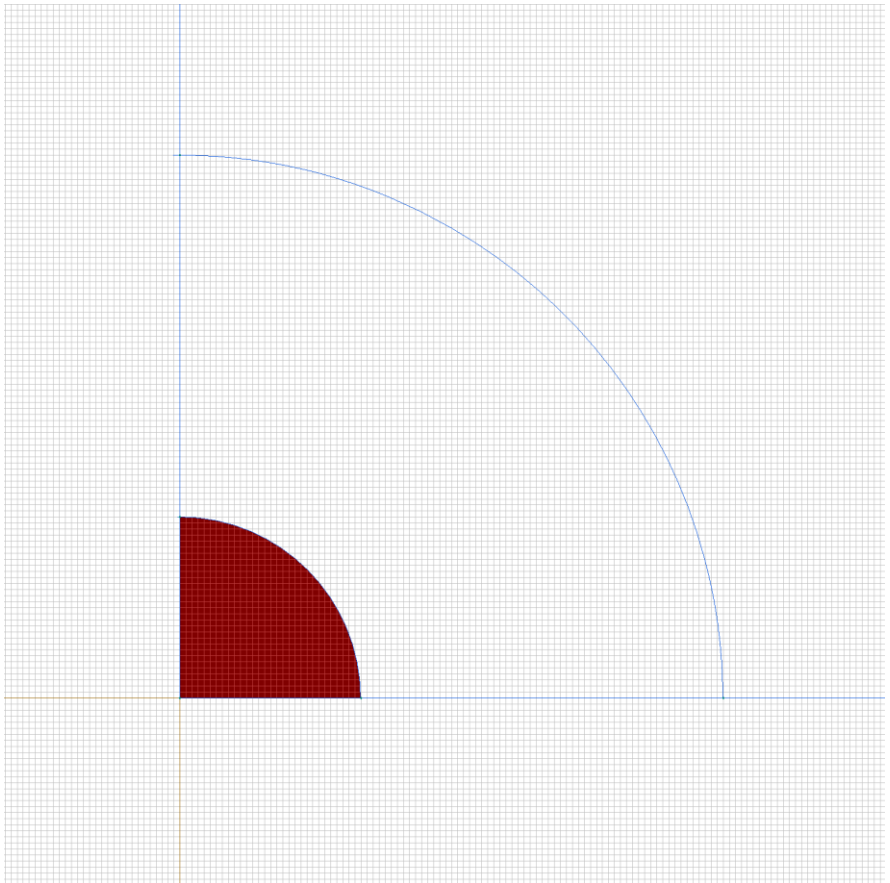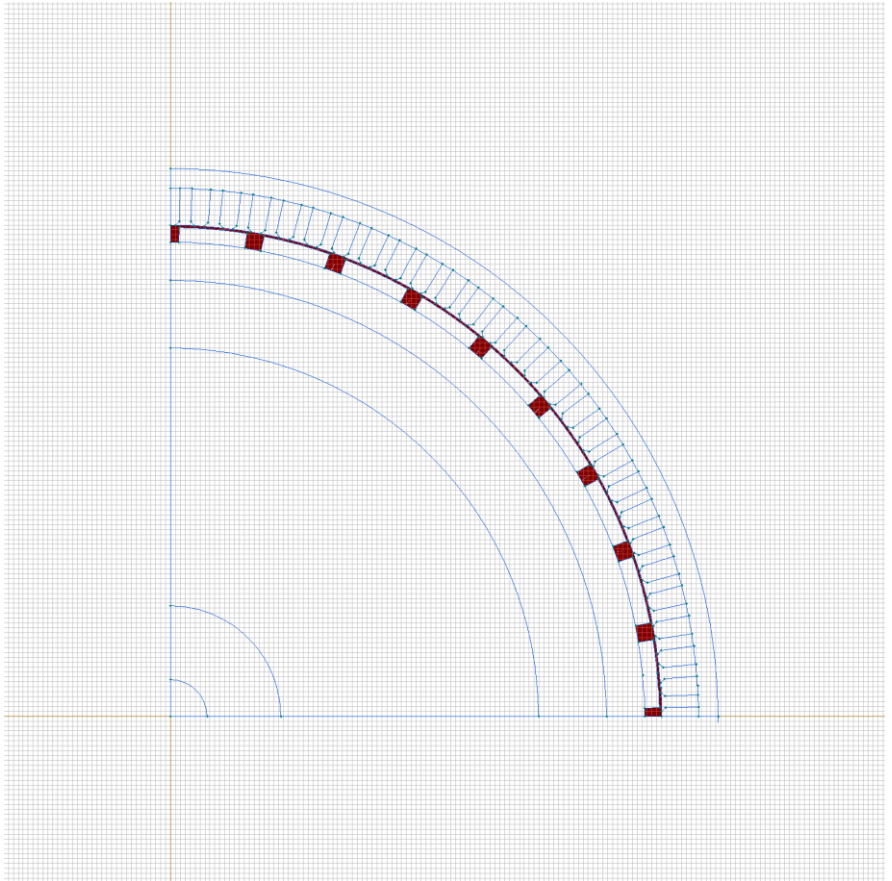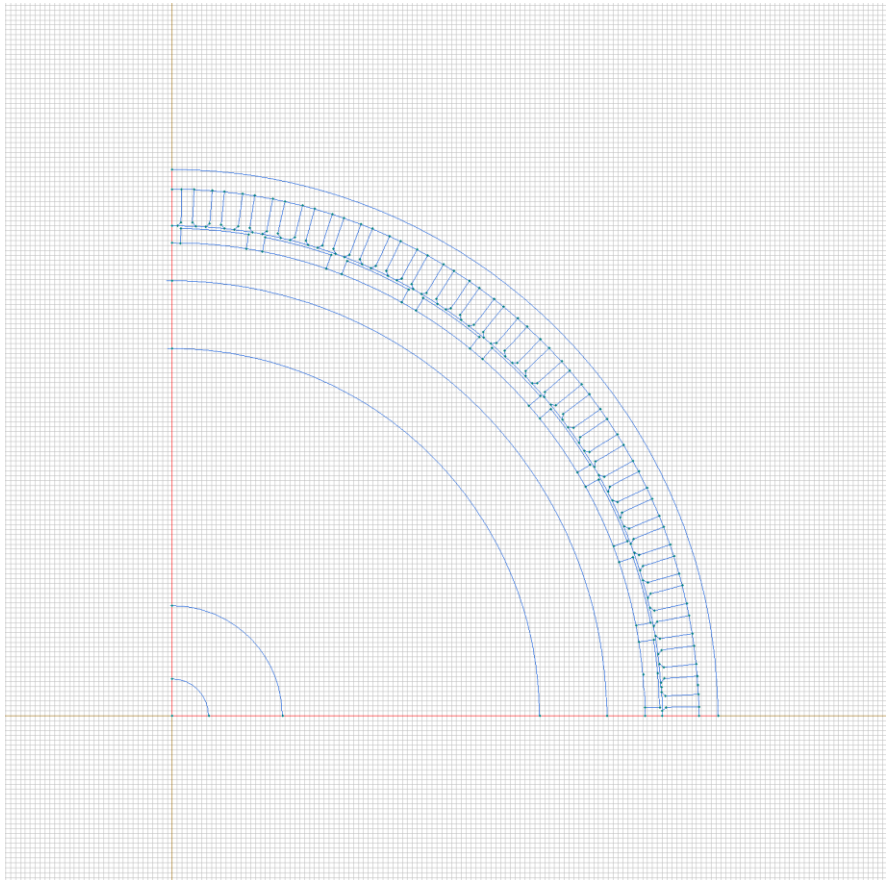Current density: j=0 [A/m2]
Conductor's connection: in parallel

Labelled objects: edge "symmetry"
There are (16) objects with this label
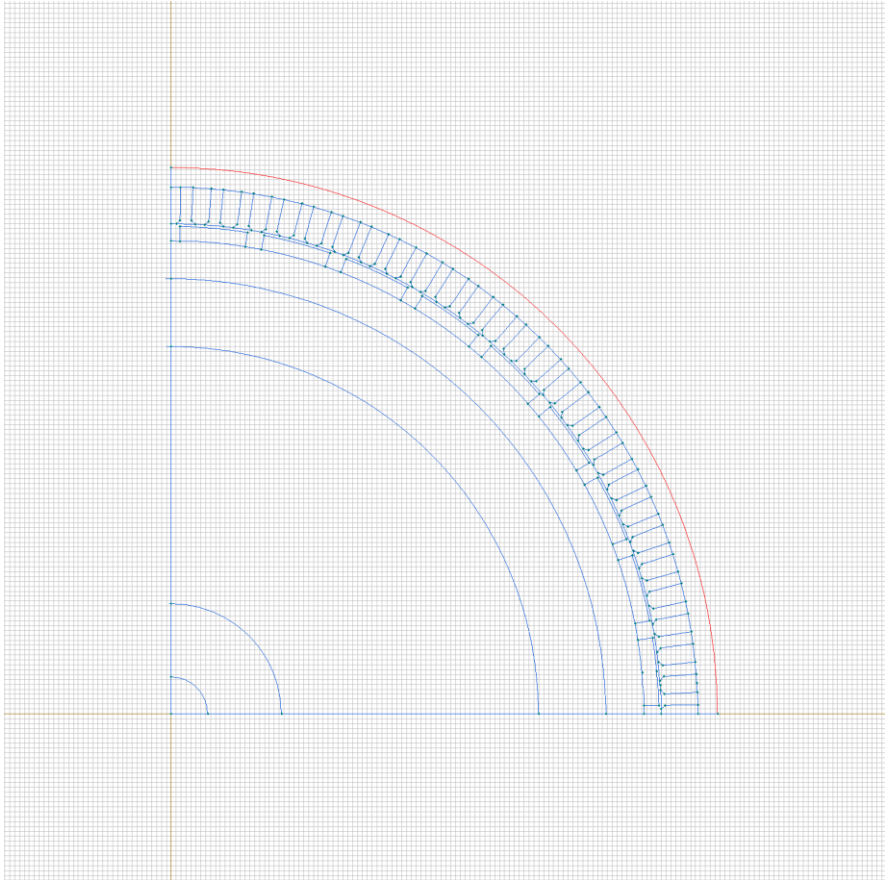
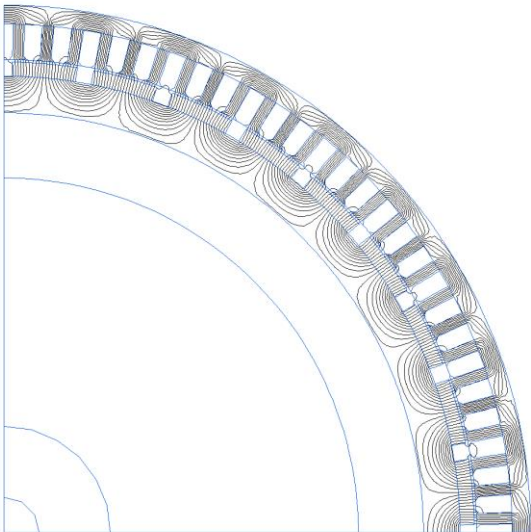Tangential field: H_t=0 [A/m]

Labelled objects: edge "outer boundary"
There are (1) objects with this label

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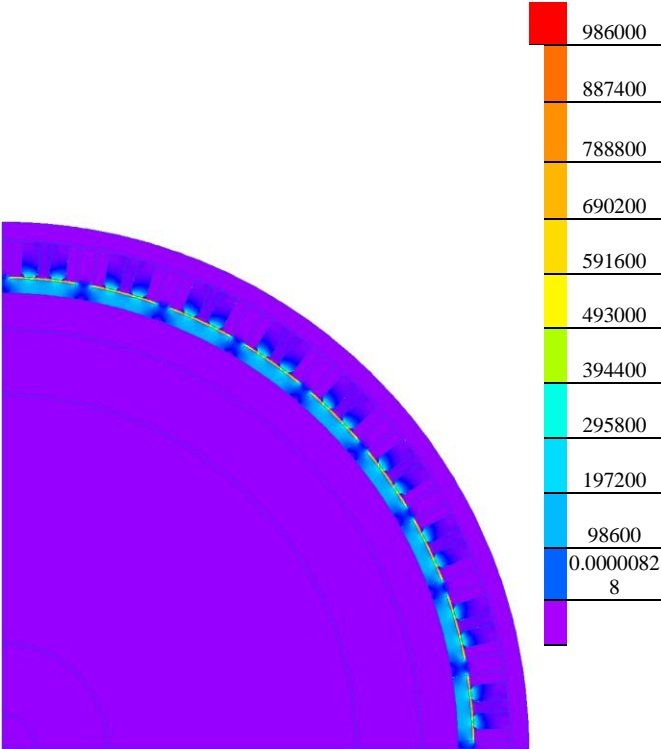
Results

Field lines

Results

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

	986000
	887400
	788800
	690200
	591600
	493000
	394400
	295800
	197200
	98600
	0.00000828

Nonlinear dependencies

Table 2. BH-curve

B [T]	H [A/m]
0	0
0.1	50
0.2	73
0.5	120
1	180
1.2	210
1.3	280
1.5	900
1.7	5000
1.8	9000

Table 3. BH-curve

B [T]	H [A/m]
0	0
0.1	50
0.2	73
0.5	120
1	180
1.2	210
1.3	280
1.5	900
1.7	5000
1.8	9000

Table 4. BH-curve

B [T]	H [A/m]
0	0
0.1	50
0.2	73
0.5	120
1	180
1.2	210
1.3	280
1.5	900
1.7	5000
1.8	9000

Table 5. BH-curve

B [T]	H [A/m]
0	0
0.1	50
0.2	73
0.5	120
1	180
1.2	210
1.3	280
1.5	900
1.7	5000
1.8	9000