Murata Software

Femtet Seminar

Magnetic Analysis Exercise

202009

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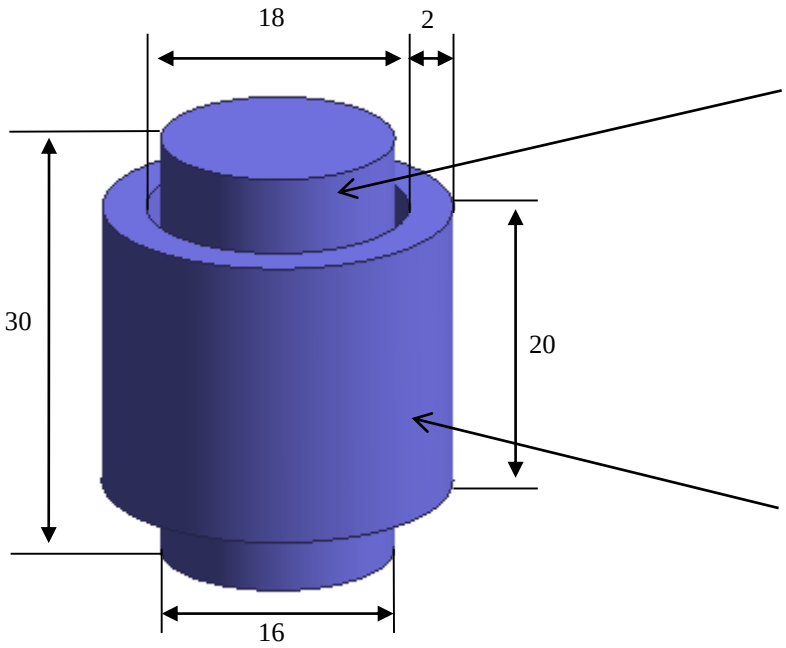
1. Make an analysis model of coil with core and solve inductance

2. (If time allows)
   Make a quarter model and verify the results match those of the full model

Analysis Model

3D static analysis is performed on the model below.



unit : mm

Core
Material: Soft magnet
Permeability: 5000

Coil
Material: Cu
Applied current: 1A
Turns: 100

Create Model

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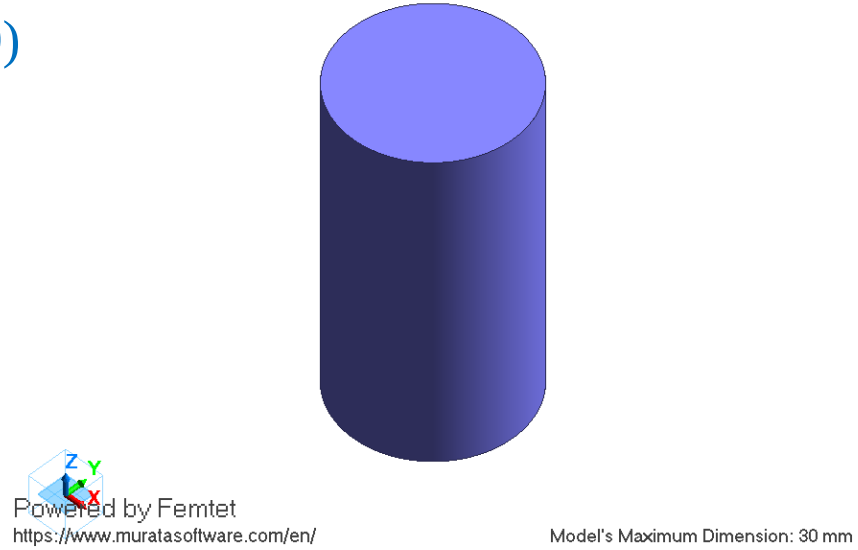
Create a core body.

Command: Primitive → Solid Body → Cylinder

Center (0, 0, 0)
Radius (8)
Height (30)



Create Model

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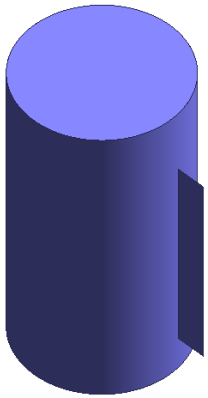
Create a cross-sectional body of the coil.

1. Select ZX plane for drawing

2. Command: Primitives → Sheet Body → Rectangle [Specify Length]]

Startpoint (9, 0, 5)
Width (20)
Height (3)

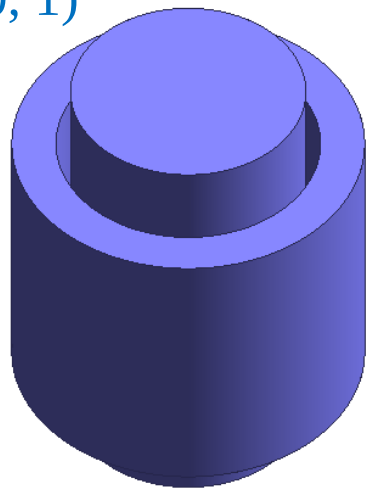


Model's Maximum Dimension: 30 mm

Create Model

Modify the cross-sectional body to make a revolving body
Command: Modification Operation → Revolve

Points on the revolving axis (0, 0, 0)
Directional vector of the revolving axis（0, 0, 1)
Revolving angle (360)



Model's Maximum Dimension: 30 mm

Create Model

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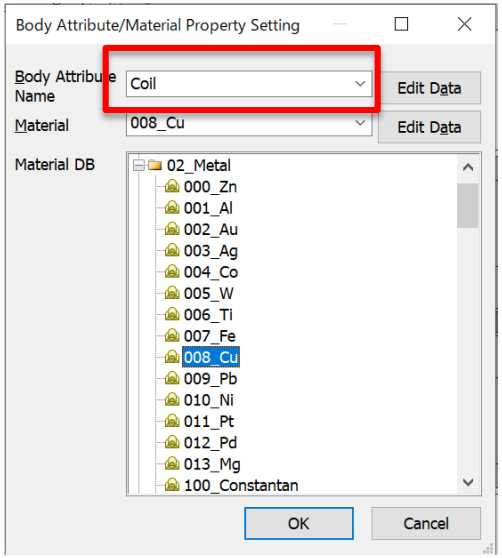
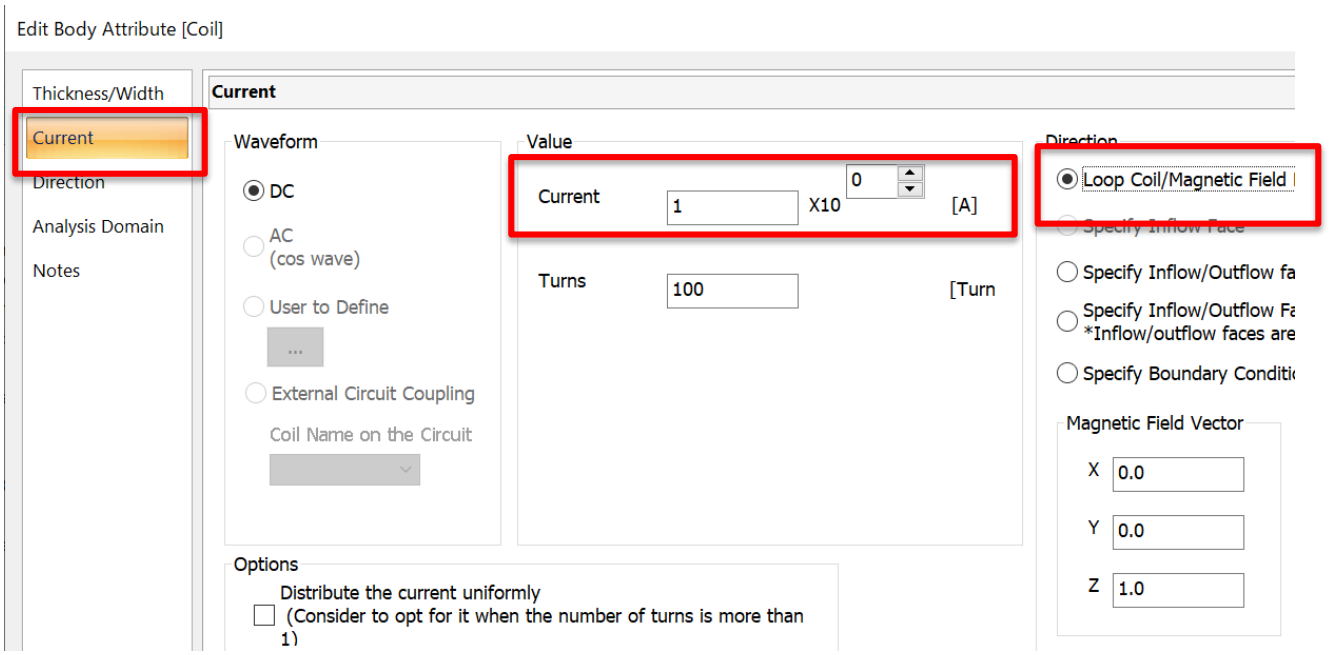
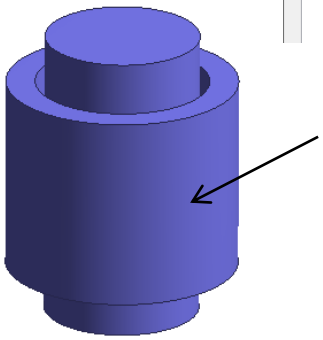
Setting body attribute and material property of Coil







Create Model

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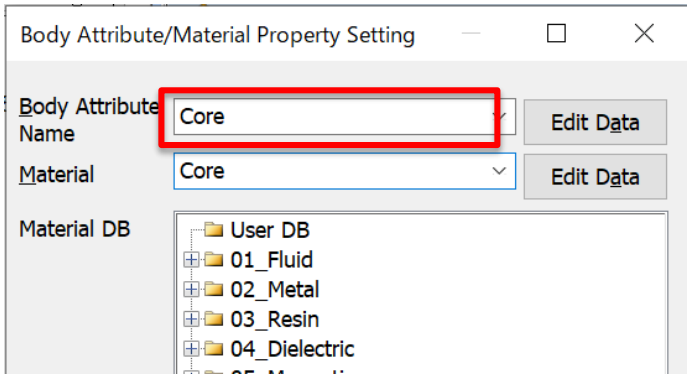
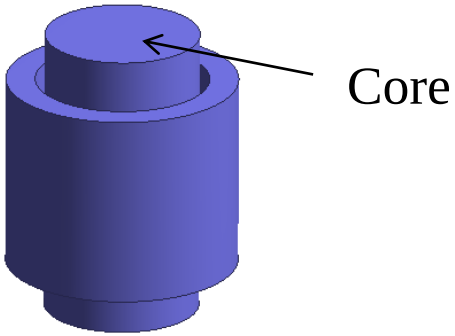
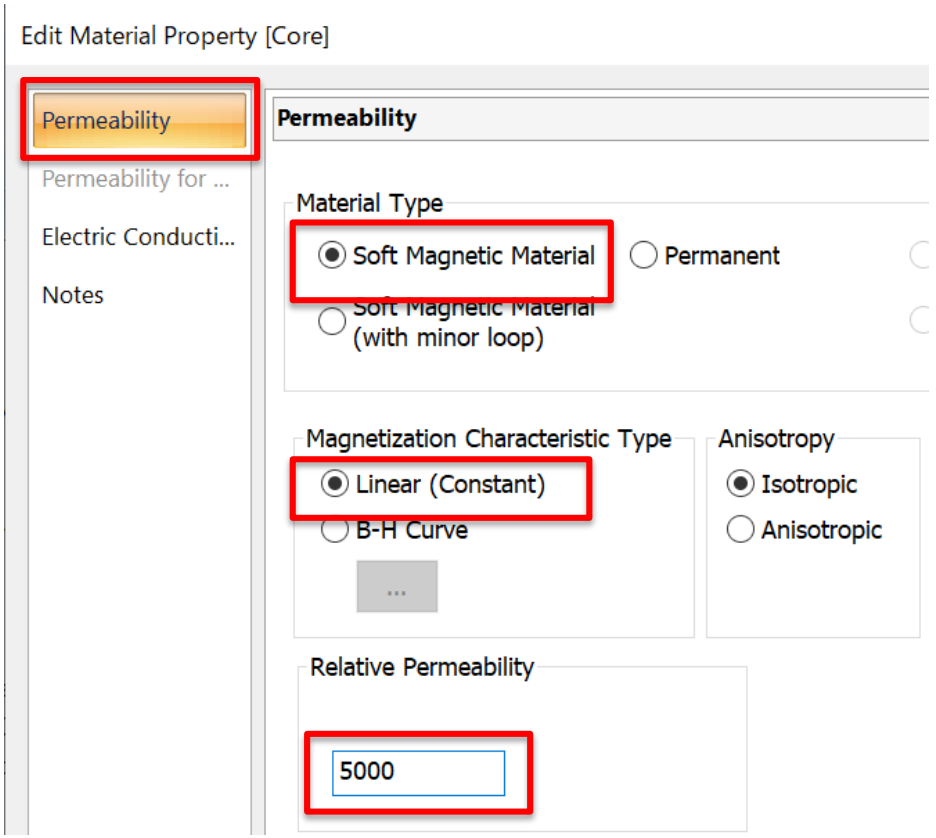
Setting body attribute and material property of Core







Create Model

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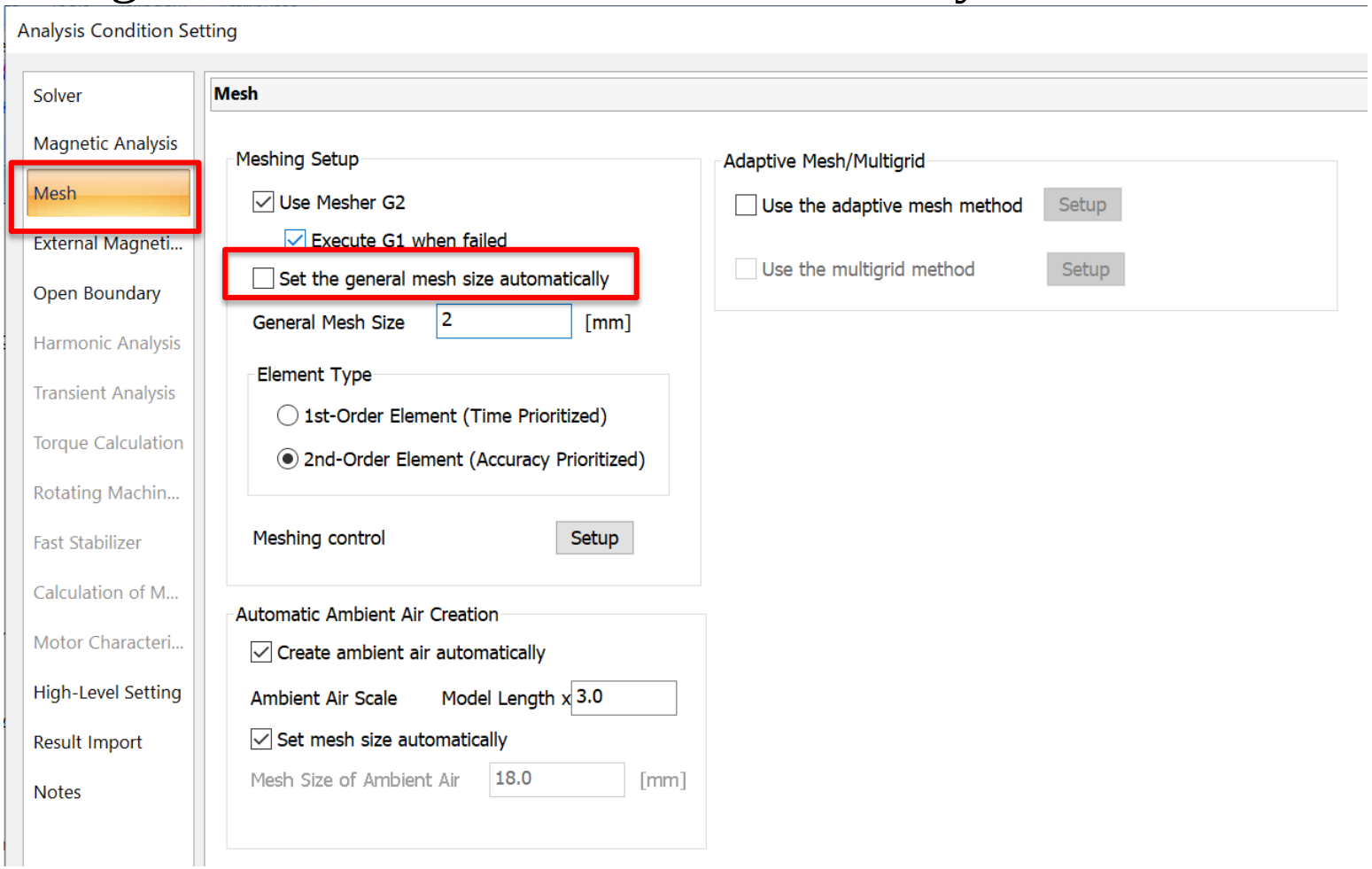
Set the general mesh size of 2mm in the analysis condition setting



Run Solver

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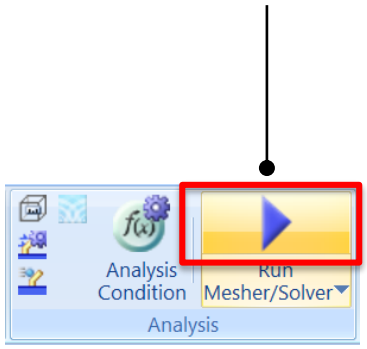
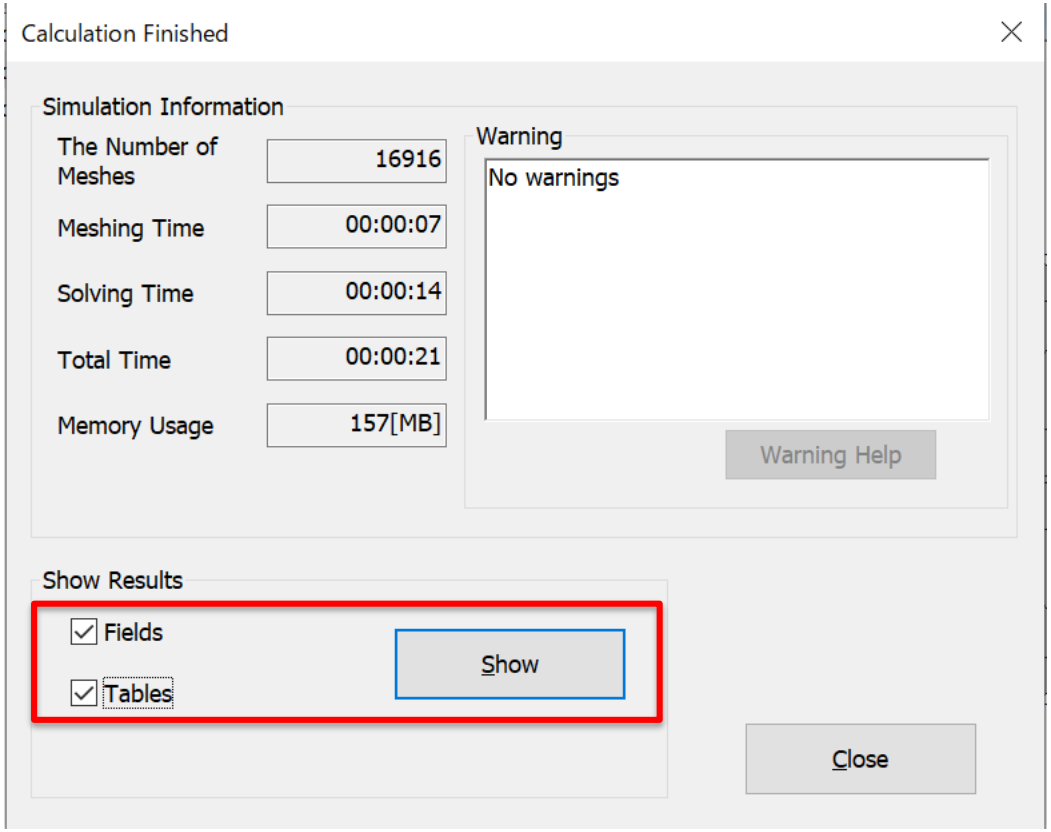
Run Mesher/Solver



Show Results



Results

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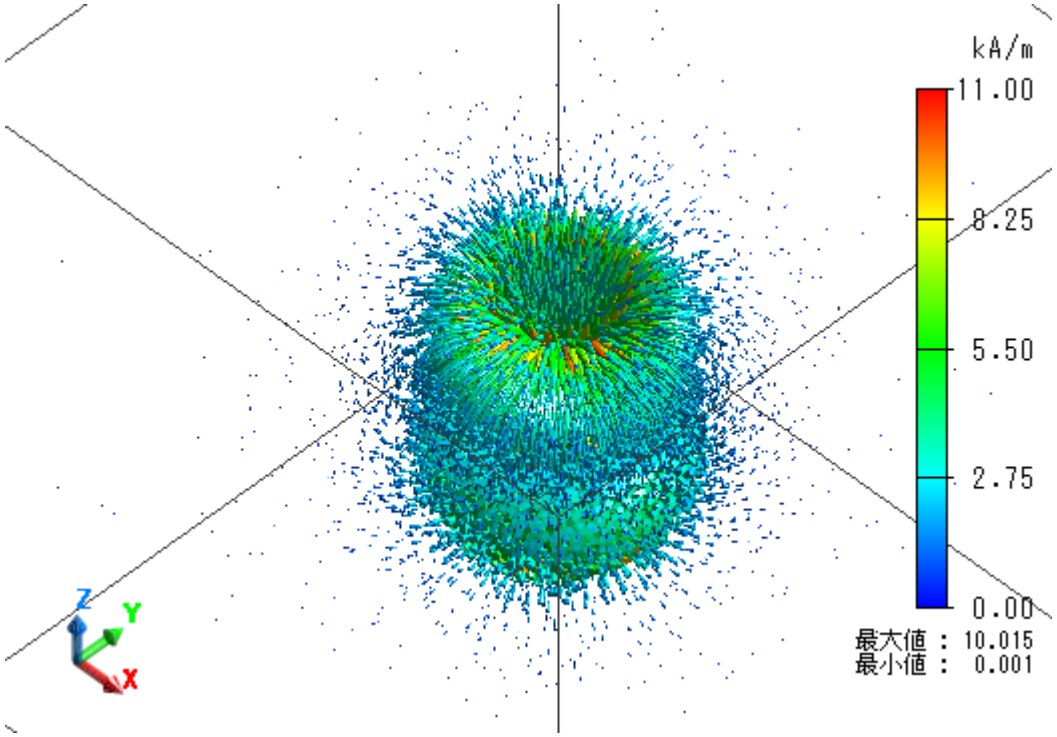
Inductance

Table

Magnetic energy [J] | Inductance [H] | Coupling

	Value
Coil 1	Coil Coil_InAuto Coil_OutAuto
L1	5.409e−4

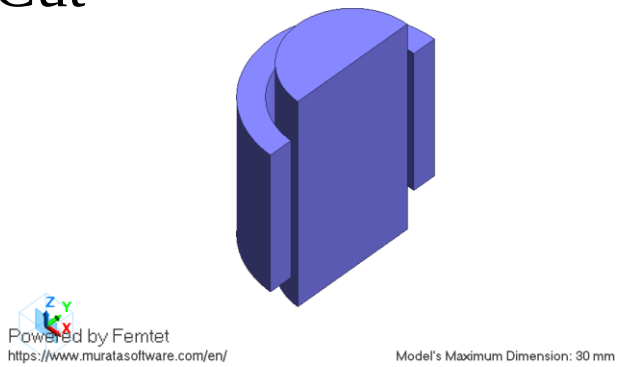
Magnetic Field Vector



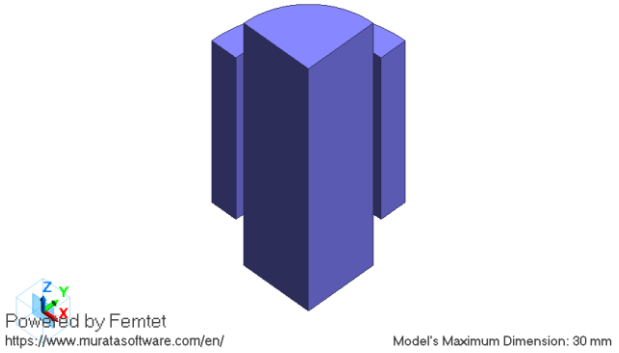
Create Quarter Model

Select two bodies and cut to a quarter.
Command: Modification Operation → Cut

Point on the cutting plane: Origin (0, 0, 0)
Normal vector of the cutting plane:（-1, 0, 0)
Select [Keep bodies in the positive normal direction only]

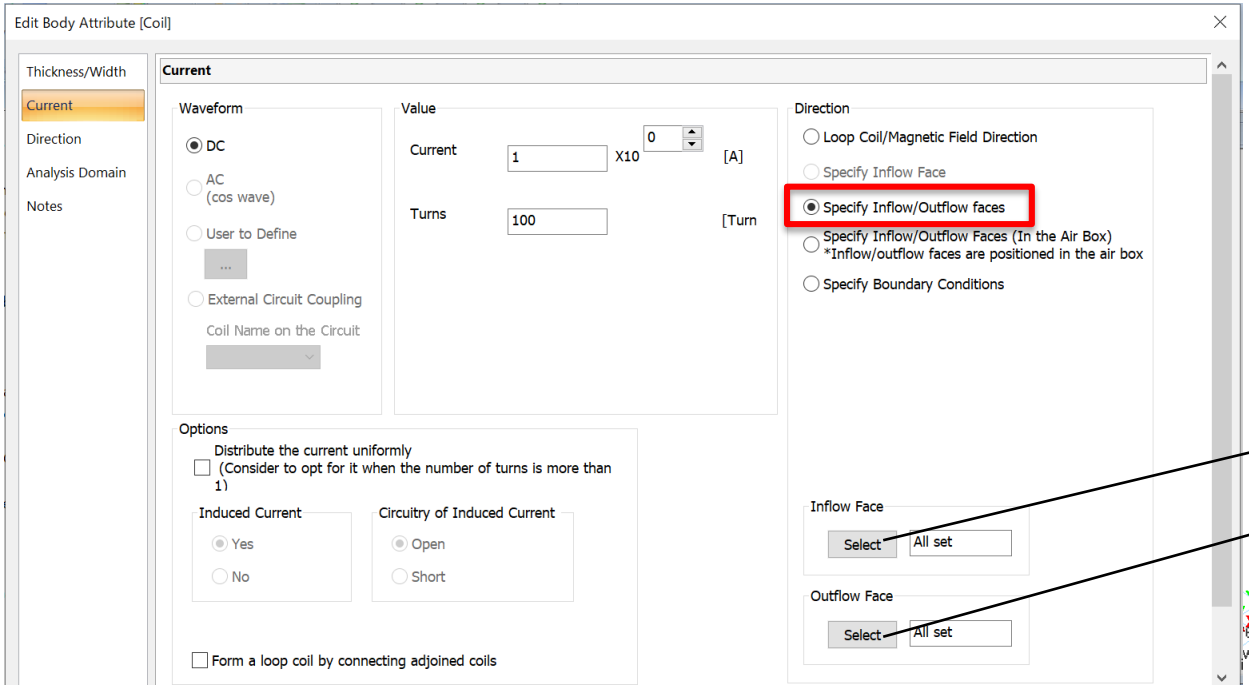


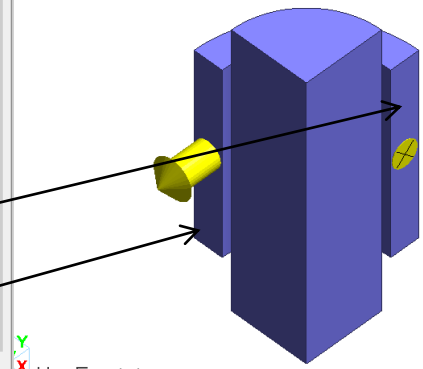
Point on the cutting plane: Origin(0, 0, 0)
Normal vector of the cutting plane:（0, 1, 0)
Select [Keep bodies in the positive normal direction only]



Create Quarter Model

The model is not a loop coil.
Set the current direction in the body attribute setting





ed by Femtet
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Model's Maximum Dimension: 30 mm

Create Quarter Model

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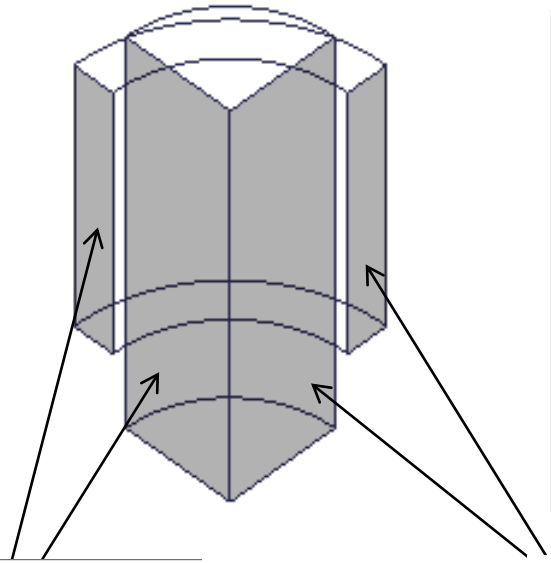
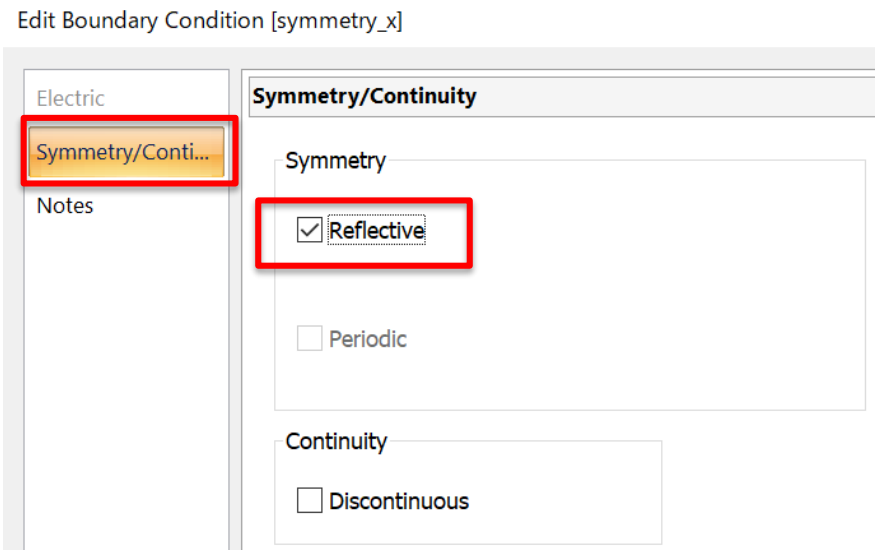
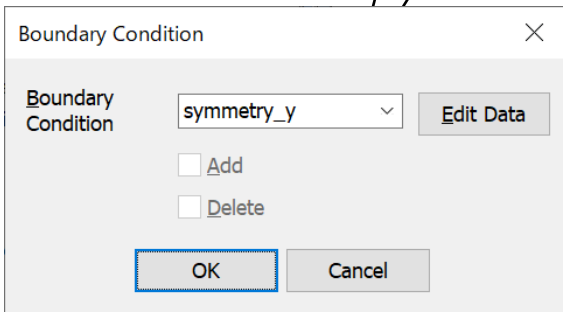
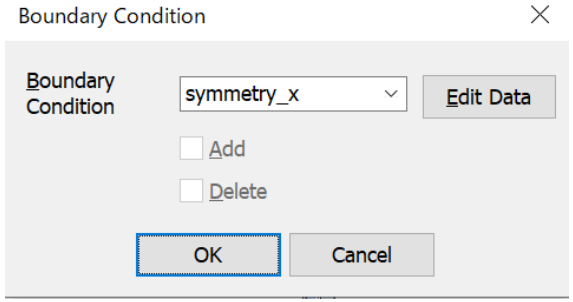
Set Reflective on the cutting plane









Results

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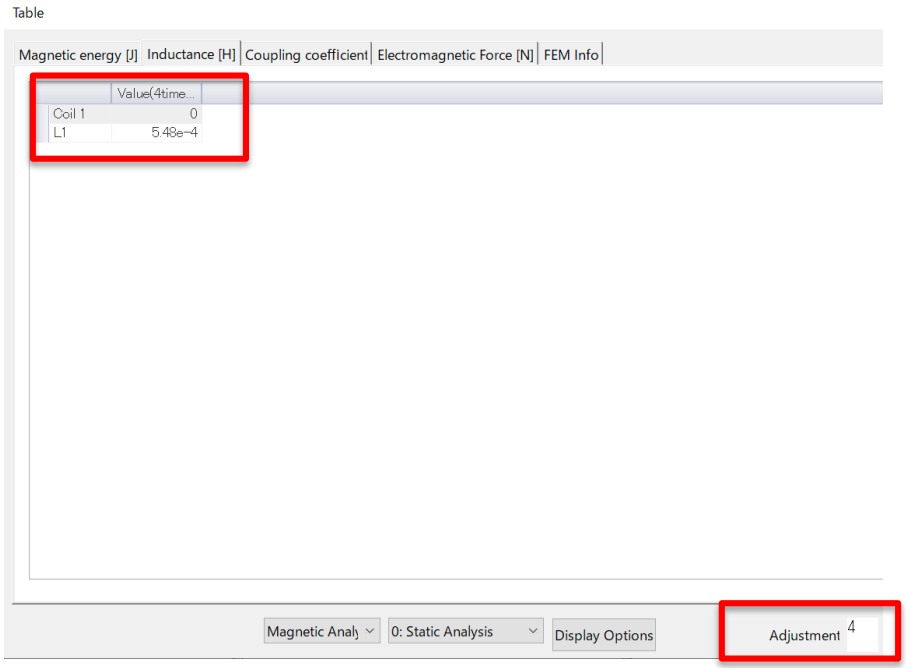
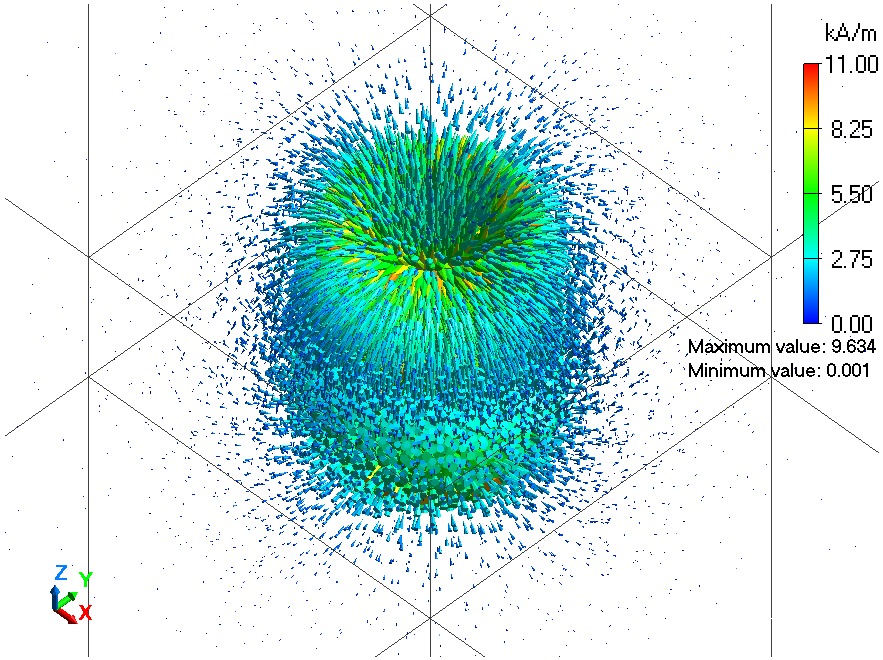
Inductance



Magnetic Field Vector



Type 4.0 as this is a quarter model.

The results mostly match those of the full model.