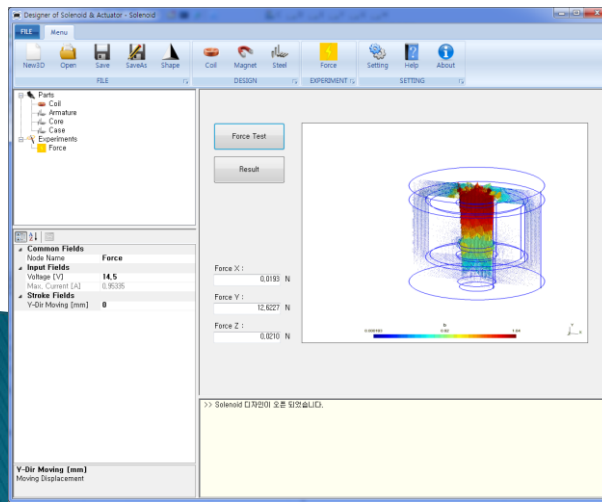


# DoSA-Open\_3D User Manual

## Example of Linear Vibrator

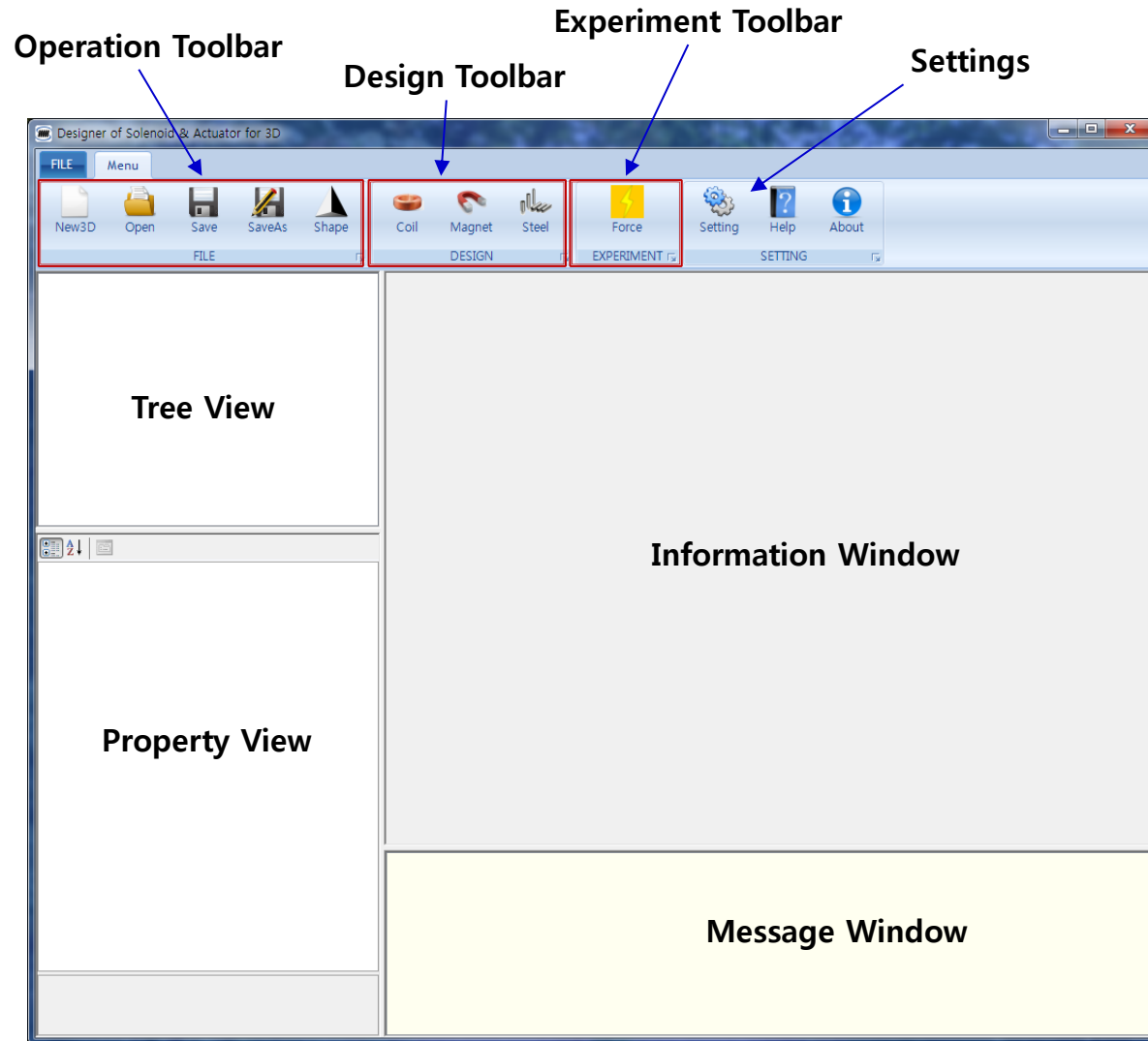


2019-11-27

GiTae Kweon (zgitae@gmail.com)

# DoSA Structure

# Program Structure



# Toolbar

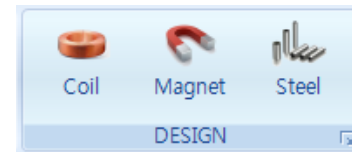
## 1. Operations

- ✓ New : Create a new design
- ✓ Open : Open previous design
- ✓ Save : Save the design
- ✓ SaveAs : Save in different name
- ✓ Shape : Check the 3D Shape



## 2. Design

- ✓ Coil : Add a coil and specification design
- ✓ Magnet : Add a magnet and determine specifications
- ✓ Steel : Add a steel and determine specifications



## 3. Experiment

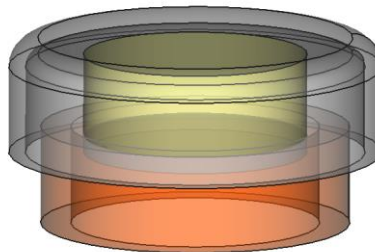
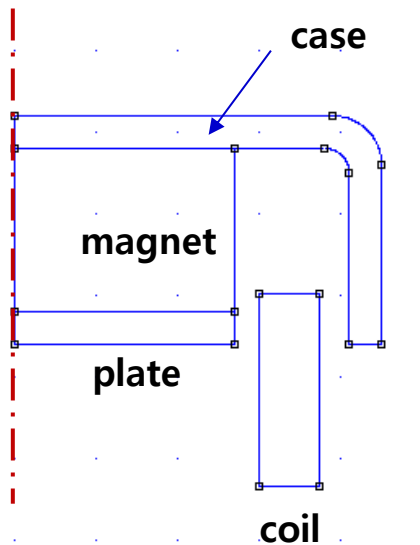
- ✓ Force : Magnetic force estimation for driving part



# Analysis Model

# Analysis Model

## 1. Shape Model



## 2. Product Specifications

### A. Coil

- Coil Turns : 126 turns
- Coil Resistance : 15.75 Ohm

### B. Magnet

- Material : NdFeB 40
- Magnetization Direction : 90 (UP)

### C. Power

- Voltage : 2.5V

( Example Files : DoSA Install directory > Samples > LV )

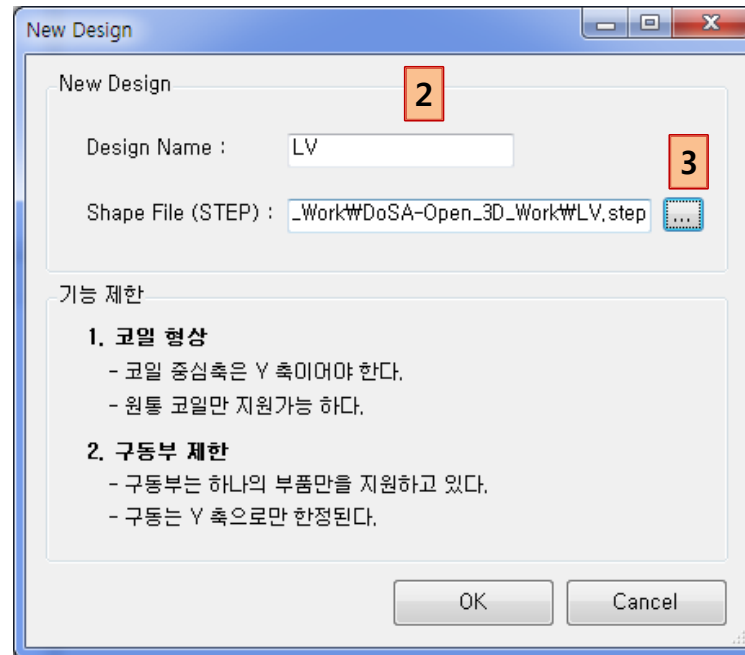
# New design

1. Toolbar > Click New button



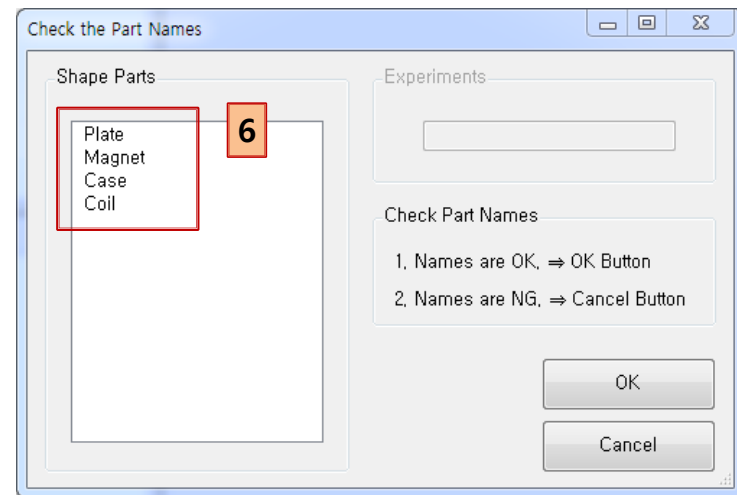
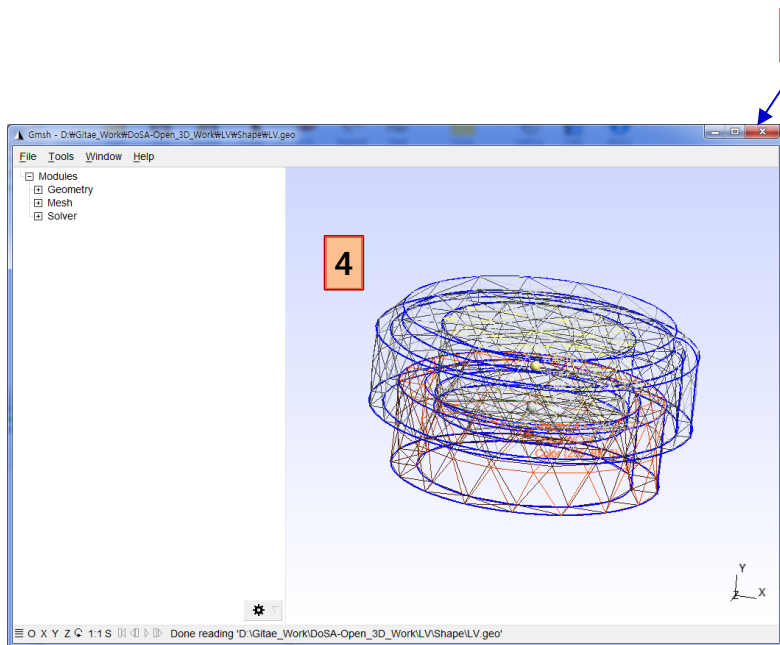
2. Design Name : "LV"

3. Shape File (STEP) : Select LV.step (Example Files : DoSA Install directory > Samples > LV )



# New design

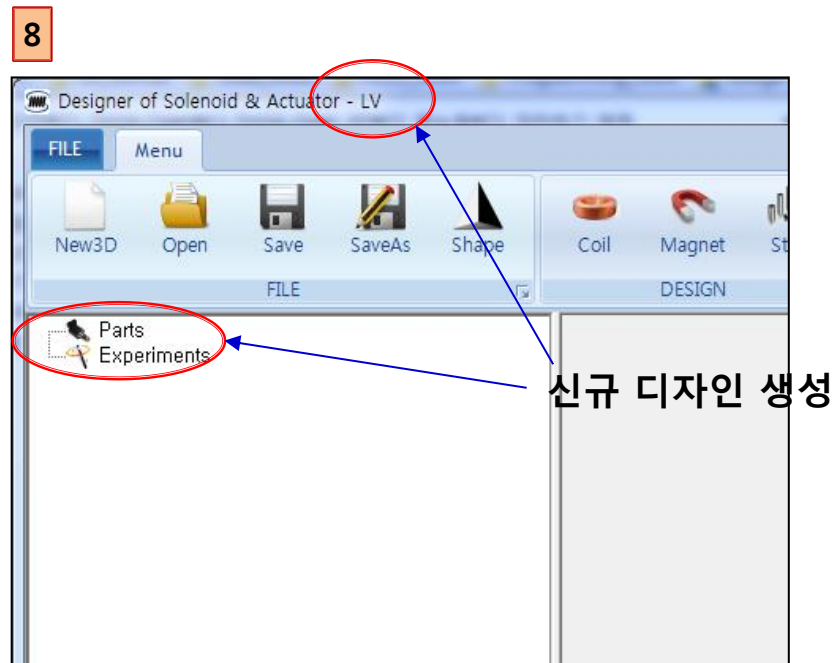
4. Check the solenoid shape in Gmsh.
5. Exit the Gmsh.
6. Check the part names.
7. Click the OK button if there are no problem with the shape and part names.





# New design

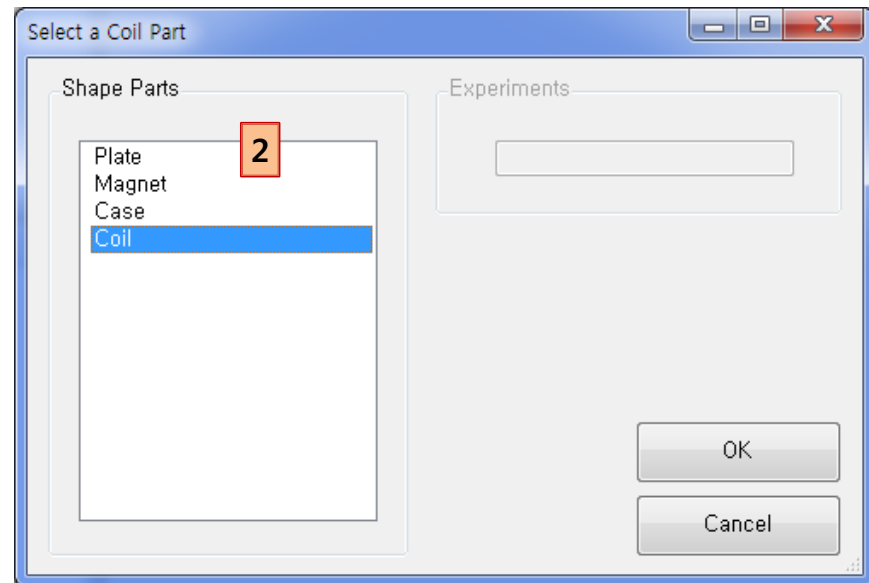
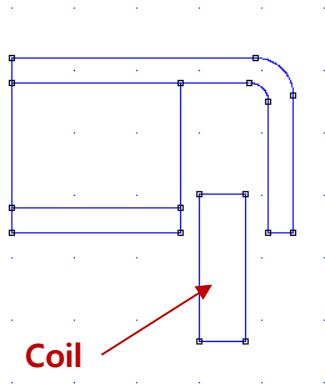
8. Check the design creation.



# Parts Design

# Add coil

1. Toolbar > Click Coil button
2. Select "Coil" in the list box.
3. Click the OK button.



# Coil design

## 1. Input the coil instrumental specifications

- ✓ Part Material : Select Copper
- ✓ Current Direction : Select IN (Inner direction)
- ✓ Moving Parts : MOVING (Moving Component)
- ✓ Coil Wire Grade : Bonded\_IEC\_Grade\_1B
- ✓ Inner Diameter : 3 mm
- ✓ Outer Diameter : 3.73 mm
- ✓ Coil Height : 1.18 mm
- ✓ Copper Diameter : 0.045 mm
- ✓ Horizontal Coefficient : 0.95 (Bonded Type)
- ✓ Vertical Coefficient : 1.13 (Bonded Type)
- ✓ Resistance Coefficient : 1.1 (Bonded Type)

## 2. Calculate the coil specification

- ✓ Click the "Coil Design" button

2

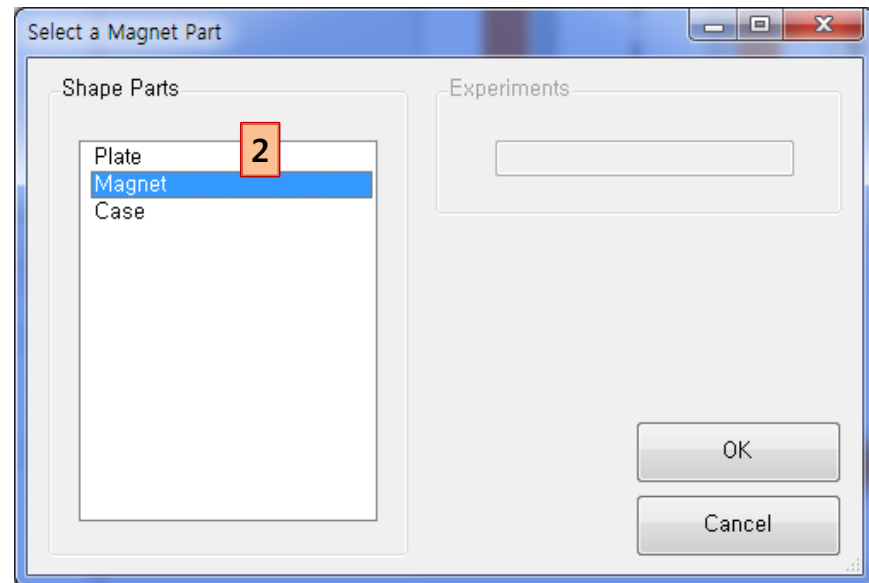
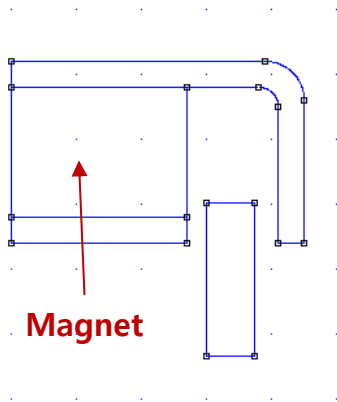
Coil Design

1

<b>Common Fields</b>	
Node Name	Coil
<b>Specification Fields</b>	
Part Material	Copper
Current Direction	IN
Moving Parts	MOVING
<b>Calculated Fields</b>	
Coil Turns	126
Coil Resistance [ $\Omega$ ]	15,74769
Coil Layers	6
Turns of One Layer	21
<b>Design Fields (optional)</b>	
Coil Wire Grade	Bonded_IEC_Grade_1B
Inner Diameter [mm]	3
Outer Diameter [mm]	3.73
Coil Height [mm]	1.18
Copper Diameter [mm]	0.045
Wire Diameter [mm]	0.04953
Coil Temperature [ $^{\circ}\text{C}$ ]	20
Horizontal Coefficient	0.95
Vertical Coefficient	1.13
Resistance Coefficient	1.1

# Add magnet

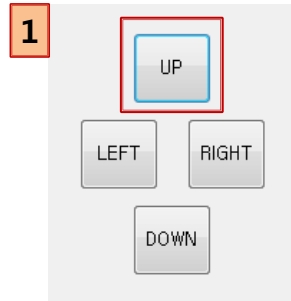
1. Toolbar > Click Magnet button
2. Select "Magnet" in the list box.
3. Click the OK button.



# Magnet setting

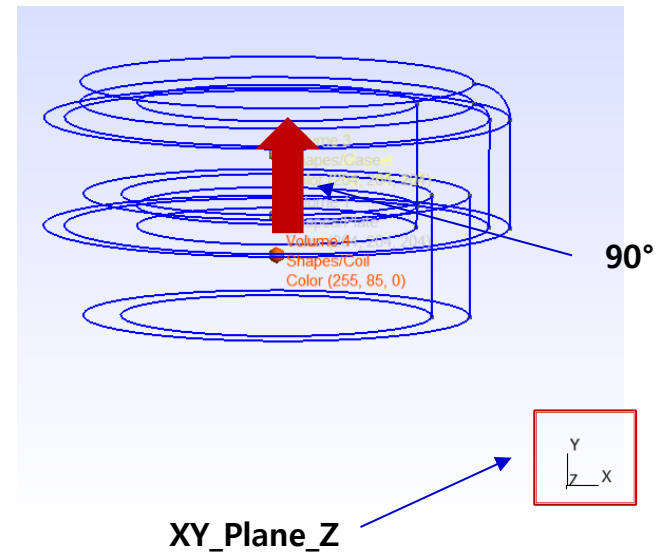
## 1. Magnet Settings

- ✓ Part Material : NdFeB\_40
- ✓ Hc, Br is set automatically
- ✓ Moving Parts : FIXED (Fixed Component)
- ✓ Magnet Plane : XY\_Plane\_Z
- ✓ Magnet Angle : 90 or Click the Up Button



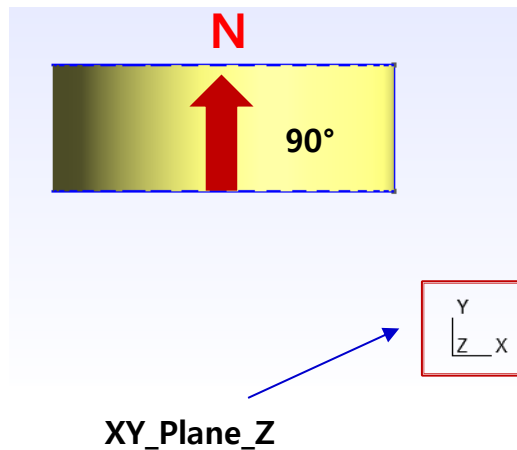
1

Common Fields	
Node Name	Magnet
Specification Fields	
Part Material	NdFeB_40
Hc	969969
Br	1.26497
Moving Parts	FIXED
Magnetization Fields	
Magnet Plane	XY_Plane_Z
Magnet Angle	90

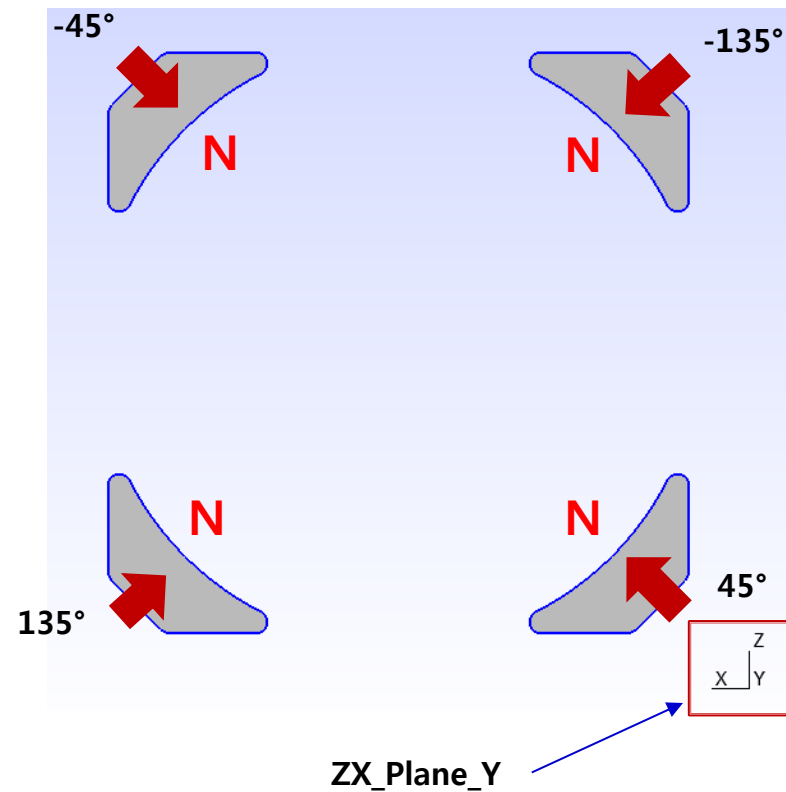


# [Ref.] Magnetization Setting of Magnet

- ✓ Magnet Plane : XY\_Plane\_Z
- ✓ Magnet Angle : 90°

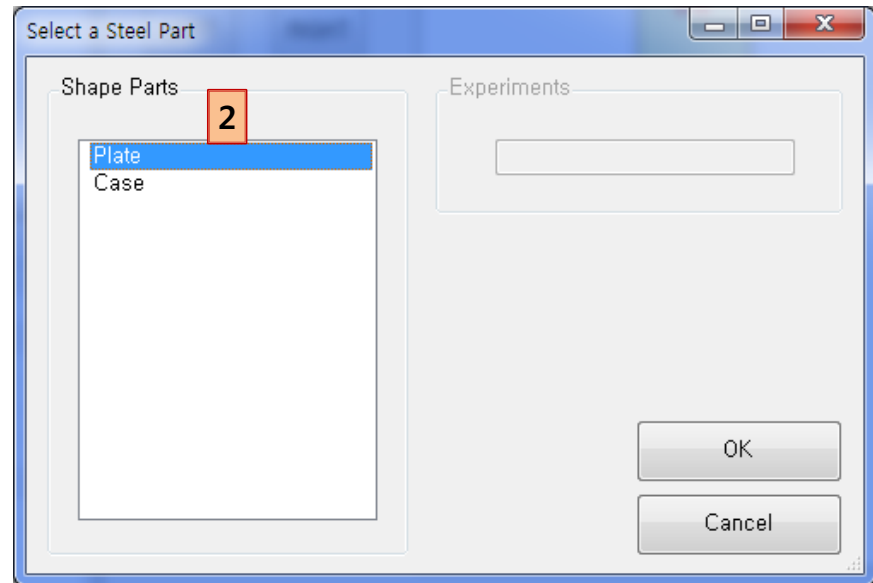
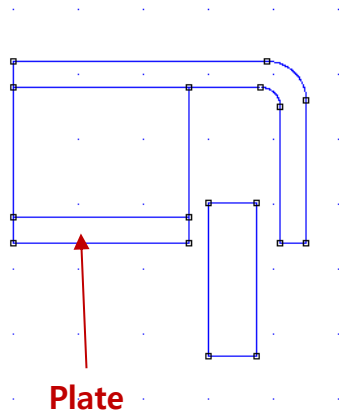


- ✓ Magnet Plane : ZX\_Plane\_Y
- ✓ Magnet Angle : 45° (135°, -45°, -135°)



# Add plate

1. Toolbar > Click Steel button
2. Select "Plate" in the list box.
3. Click the OK button.



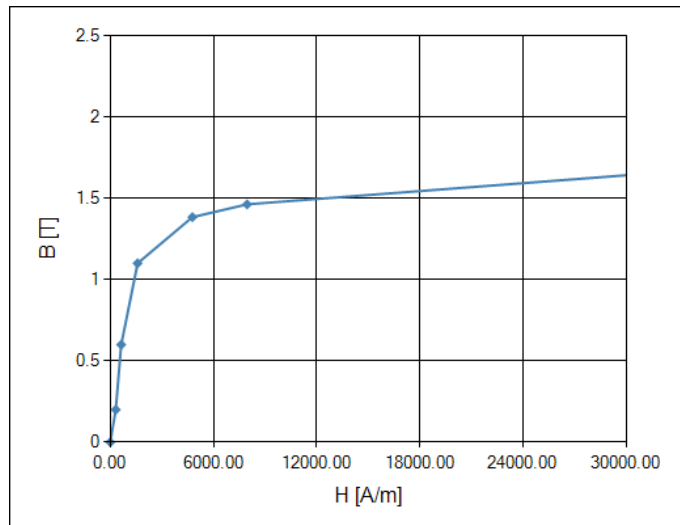


# Plate setting

## 1. Plate settings

- ✓ Part Material : SUS\_430
- ✓ Moving Parts : FIXED (Fixed Component)

[ BH Curve ]

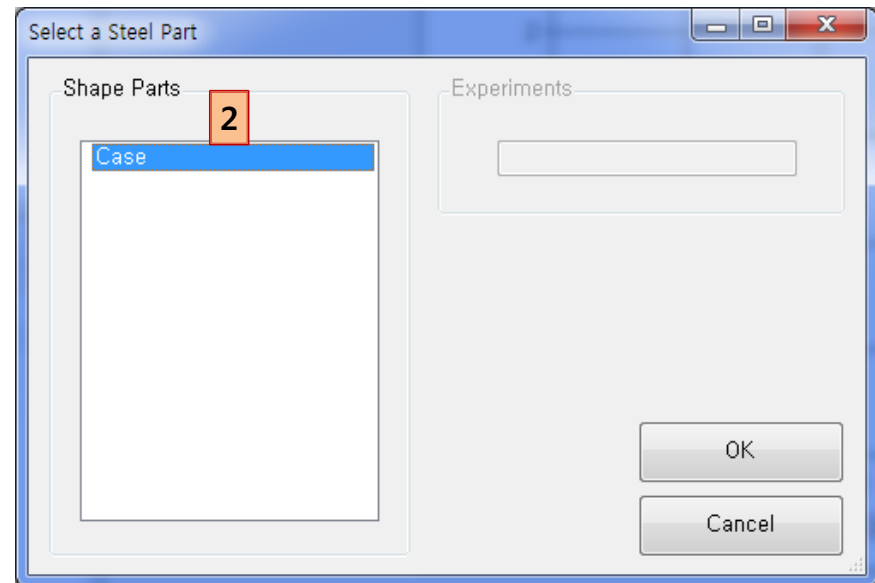
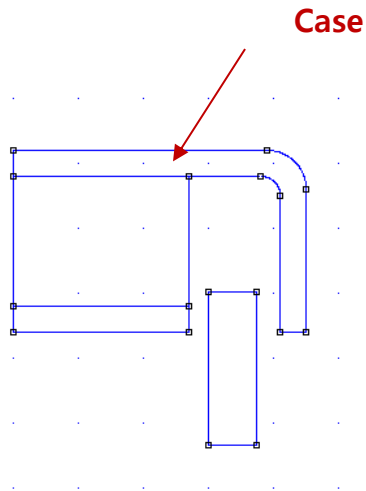


1

Common Fields	
Node Name	Plate
Specification Fields	
Part Material	SUS_430
Moving Parts	FIXED

# Add case

1. Toolbar > Click Steel button
2. Select "Case" in the list box.
3. Click the OK button.

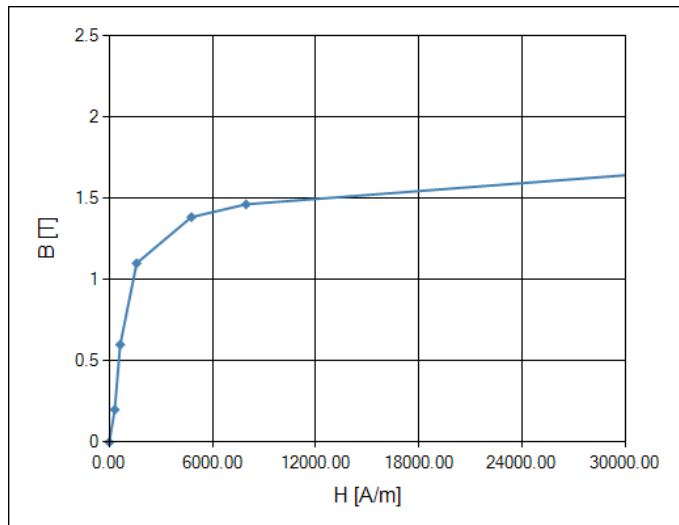


# Case setting

## 1. Case Setting

- ✓ Part Material : SUS\_430
- ✓ Moving Parts : FIXED (Fixed Component)

[ BH Curve ]



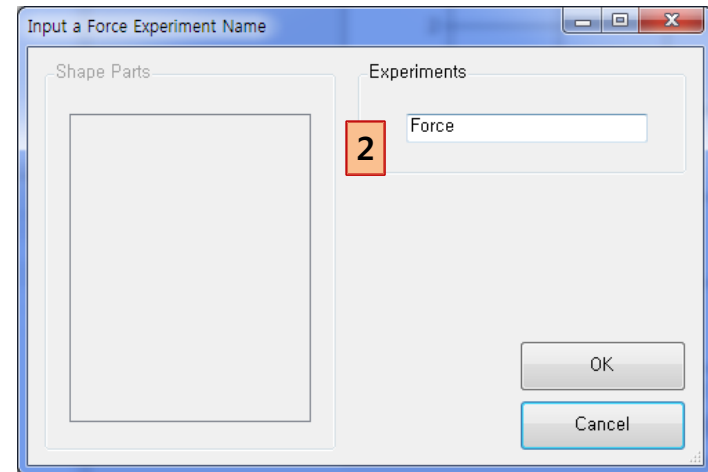
1

Common Fields	
Node Name	Case
Specification Fields	
Part Material	SUS_430
Moving Parts	FIXED

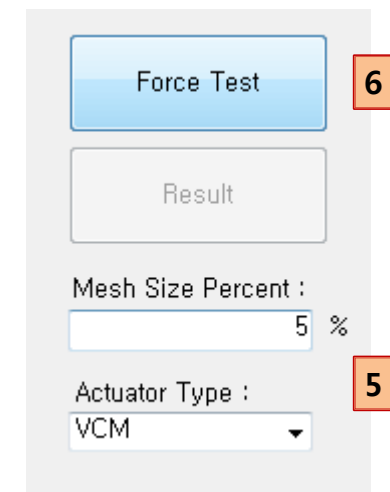
# Virtual Experiments

# Virtual experiment of magnetic force

1. Toolbar > Click Force Button
2. Force Experiment Name : "Force"
3. Click OK button
4. Setting of magnetic force experiment
  - ✓ Voltage : 2.5 V
5. Setting of analysis condition
  - ✓ Mesh Size Percent : 5 %
  - ✓ Actuator Type : VCM
6. Click "Force Test" Button

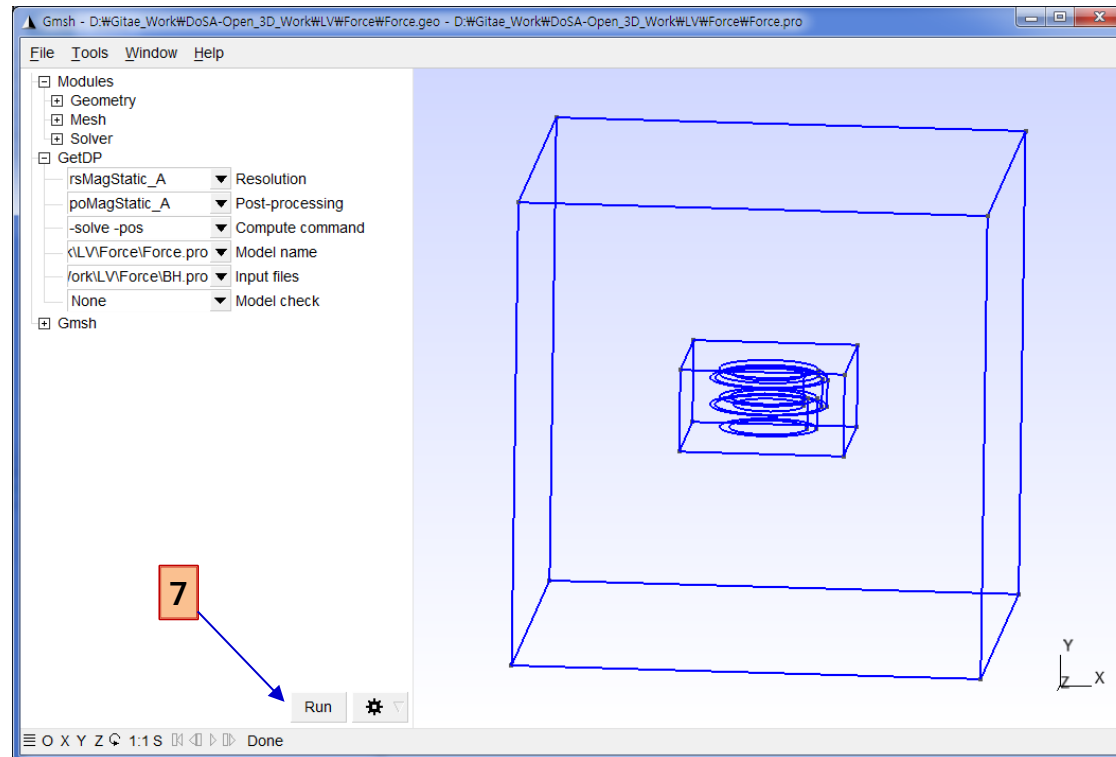


Common Fields	
Node Name	Force
Input Fields	
Voltage [V]	2.5
Max. Current [A]	0,15875
Stroke Fields	
Y-Dir Moving [mm]	0



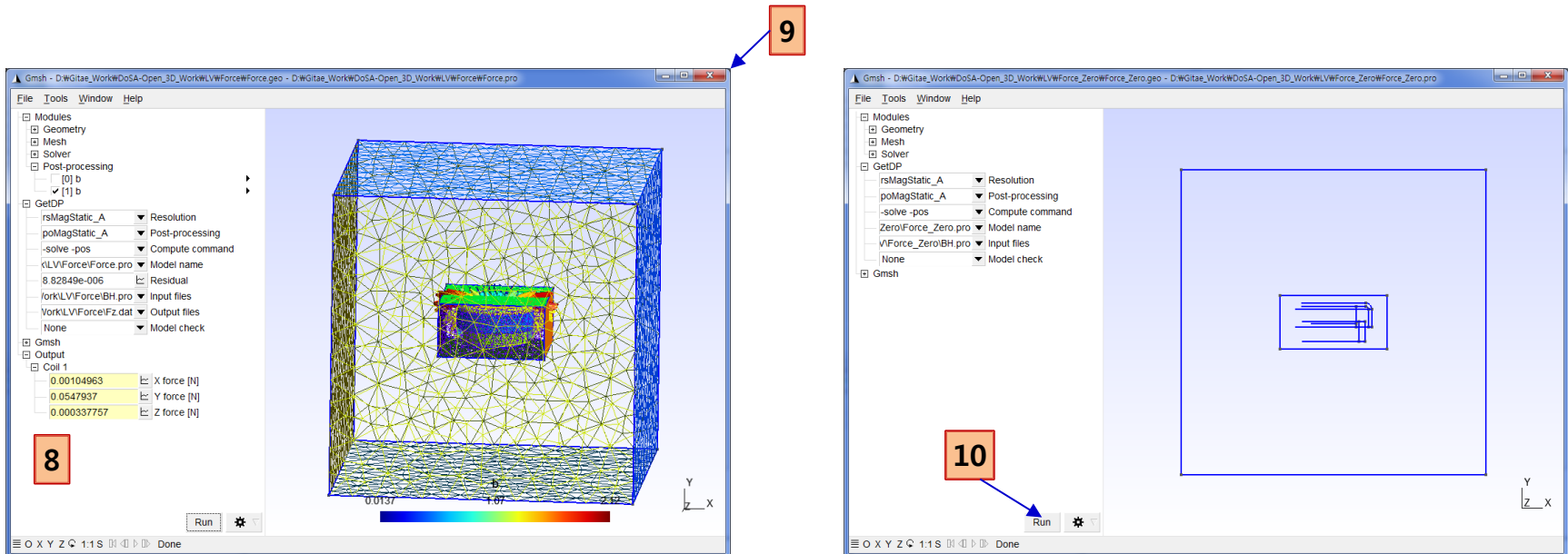
# Run the virtual experiment

7. Click the Run button after checking the shape.



# Run the virtual experiment

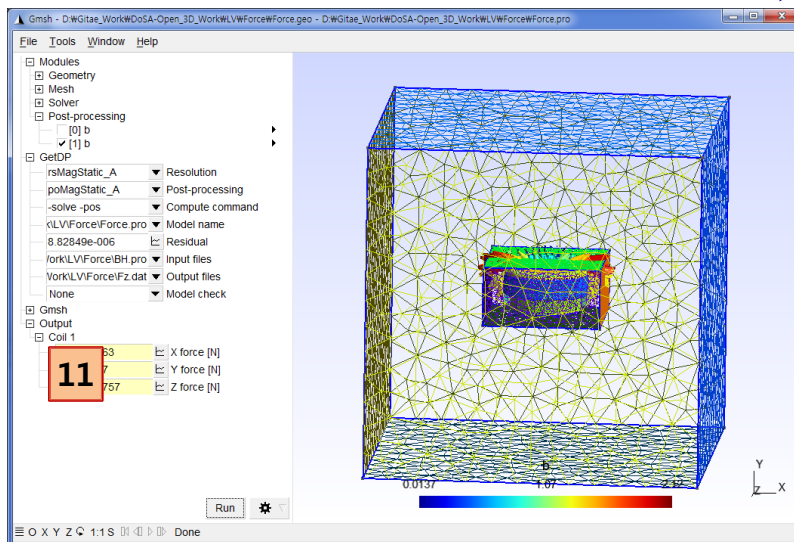
8. Check the analysis results after solving.
9. Quit the Gmsh.
10. Click the run button again. ( **VCM type actuators require twice analysis for accuracy** )



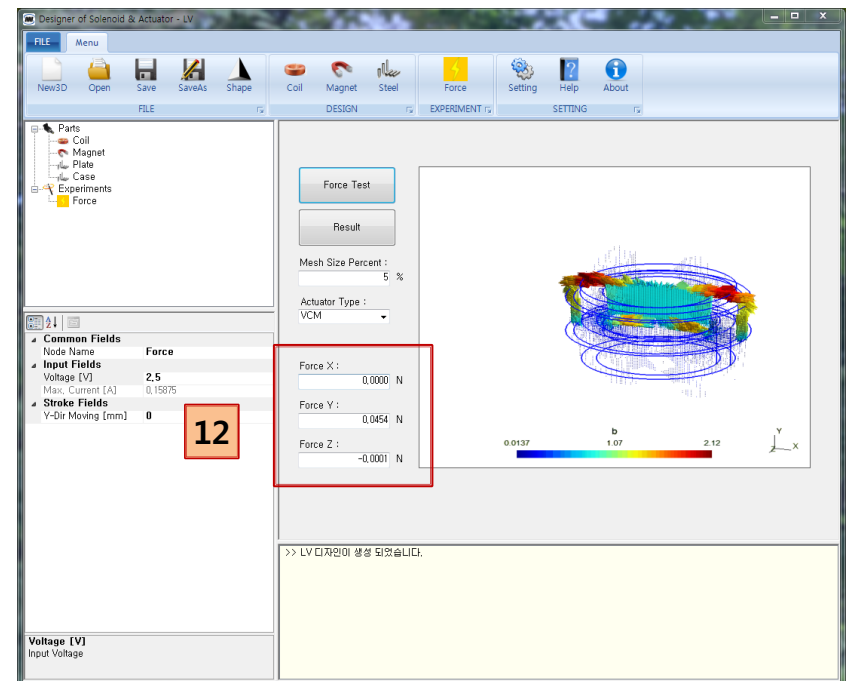
# Results of the virtual experiment

11. Quit the Gmsh after checking the analysis results.
12. Check the magnetic force of the VCM.

11



12





**Thank You**