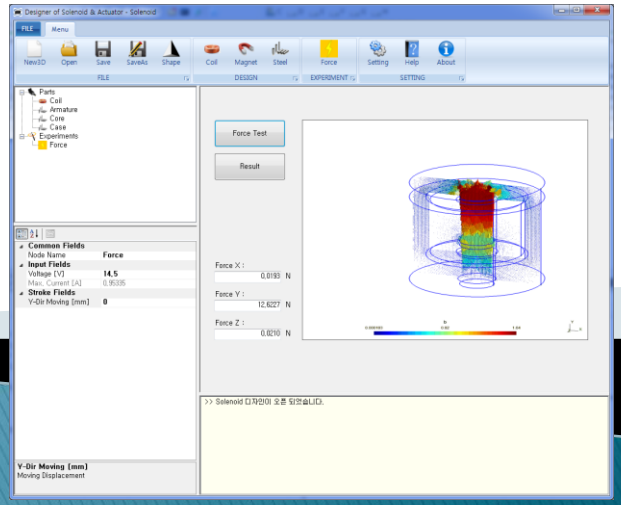
DoSA-Open_3D 사용 메뉴얼

Example of Linear Vibrator



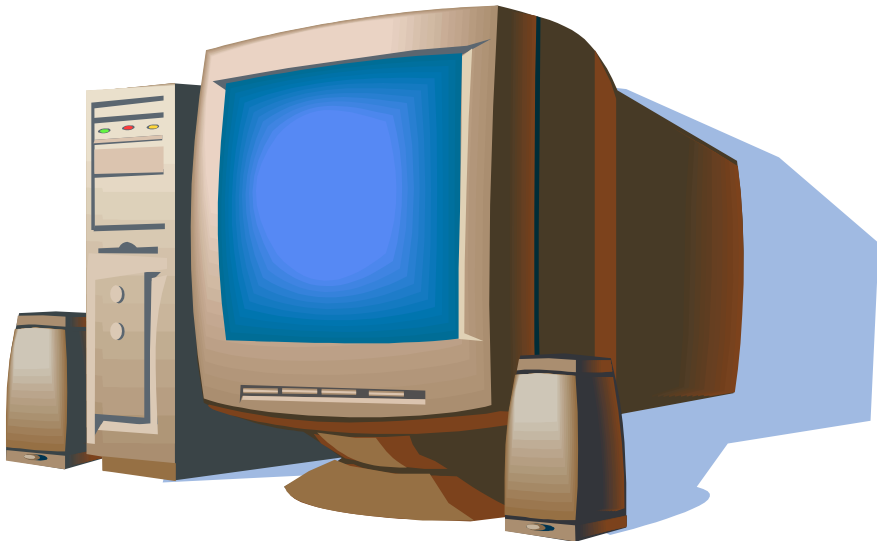
2020-12-02

GiTae Kweon (zgitae@gmail.com)

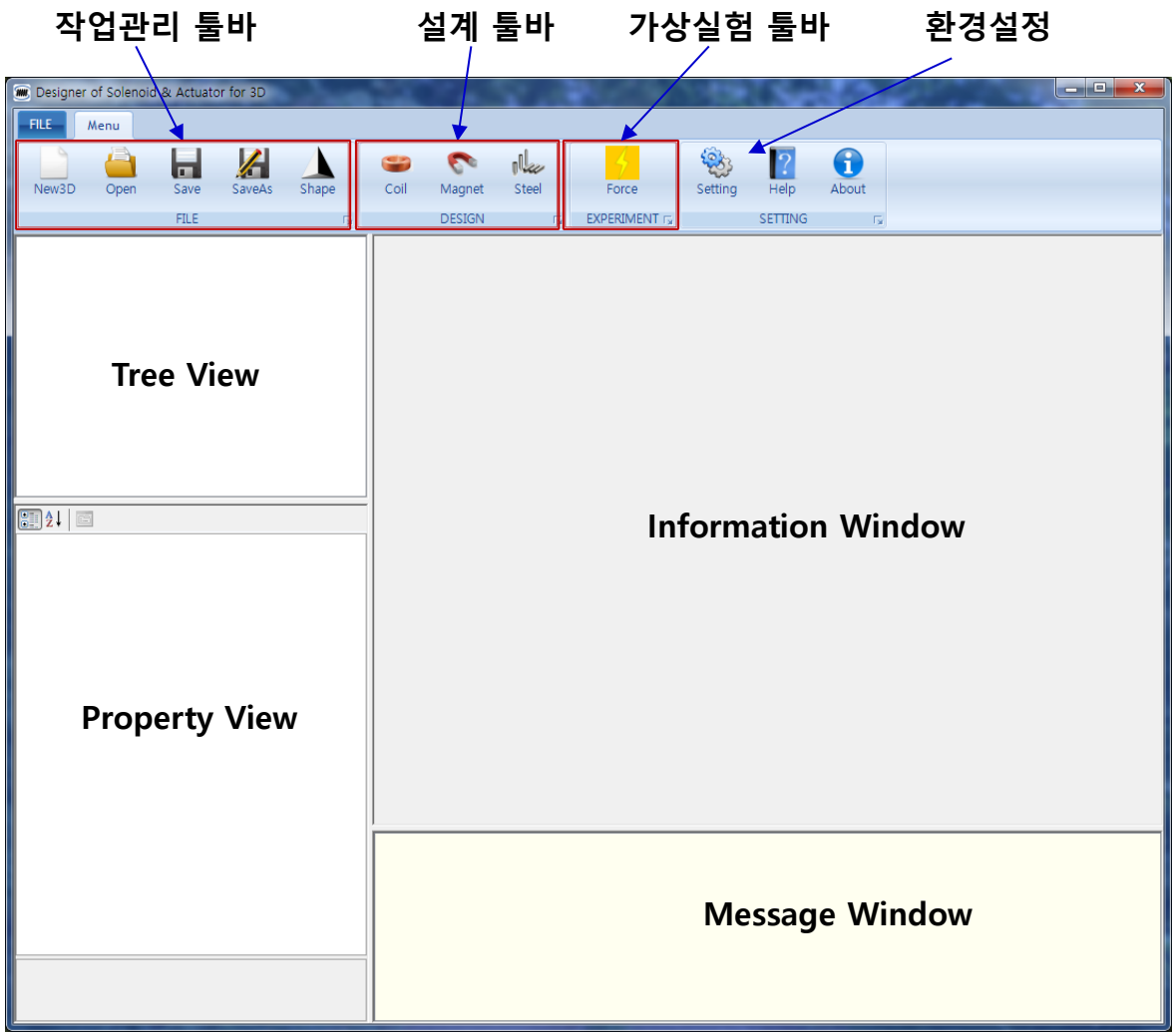
DoSA 구성

PC 요구사항

- CPU : 4 Core 이상
- RAM : 16GB 이상



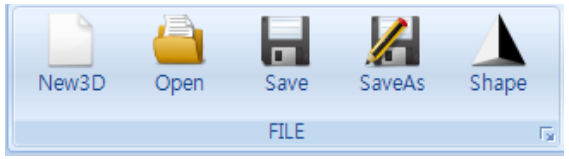
프로그램 구성


작업관리 툴바
설계 툴바
가상실험 툴바
환경설정
Designer of Solenoid & Actuator for 3D
FILE
Menu
New3D
Open
Save
SaveAs
Shape
FILE
Coil
Magnet
Steel
DESIGN
Force
EXPERIMENT
Setting
Help
About
SETTING
Tree View
Property View
Information Window
Message Window

Toolbar

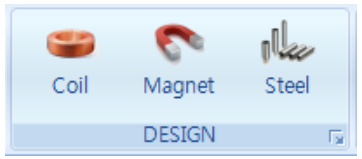
1. 작업관리

- ✓ New : 신규작업 생성
- ✓ Open : 이전작업 열기
- ✓ Save : 작업 저장
- ✓ SaveAs : 다른 이름으로 저장
- ✓ Shape : 3D 형상 확인



2. 설계

- ✓ Coil : 권선 추가 및 사양 설계
- ✓ Magnet : 영구자석 추가 및 사양 설정
- ✓ Steel : 연자성체 추가 및 사양 설정



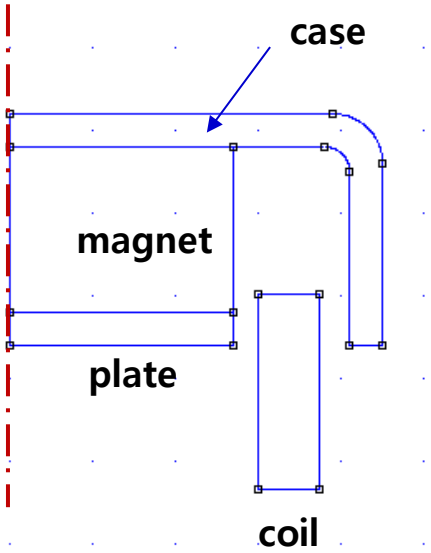
3. 가상실험

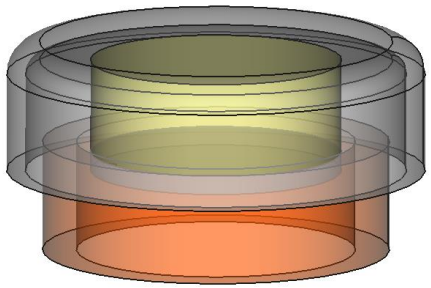
- ✓ Force : 구동부 자기력 예측

해석 모델

해석모델 설명

1. 형상 모델





2. 제품 사양

가. 코일권선

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

나. 영구자석

- Material : NdFeB 40
- 착자방향 : 90 (UP)

다. 전원

- Voltage : 2.5V

(작업 예제파일 : DoSA-Open_3D 설치 디렉토리 > Samples > LV)

Design 생성

1. Toolbar > New 버튼 클릭 

2. Design Name : 작업 명칭 입력 (LV)

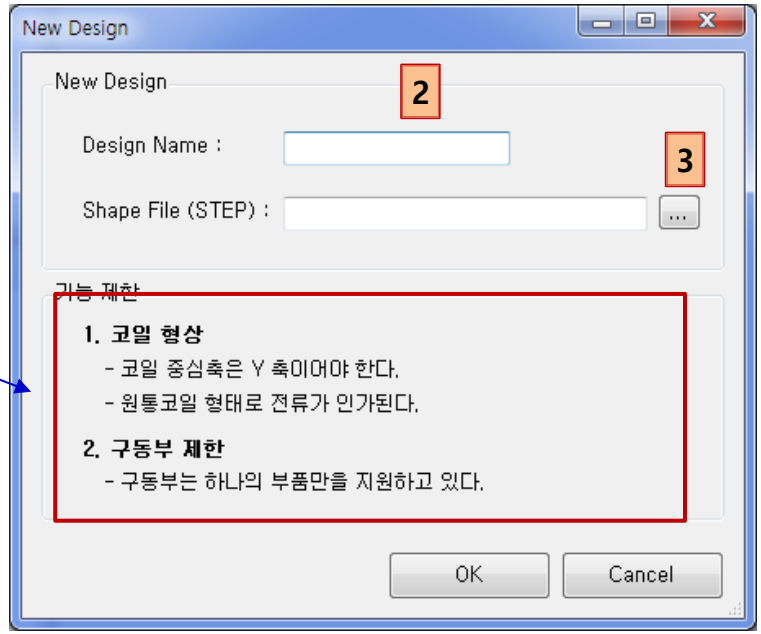
3. Shape File (STEP) : LV.step 선택하기 (작업 예제파일 : DoSA 설치 디렉토리 > Samples > LV)

[형상모델 주의 사항]

DoSA-Open_3D 는 아직 아래의 기능제한을 가지고 있음

가. 코일 형상 제한
- 코일 중심 축이 Y 방향이어야 한다.
- 원통코일 형태로 전류가 인가된다.
  (사각 코일인 경우는 약간의 차이가 발생할 수 있음)

나. 구동부 형상 제한
- 구동부는 아직 하나의 부품만을 지원하고 있다.



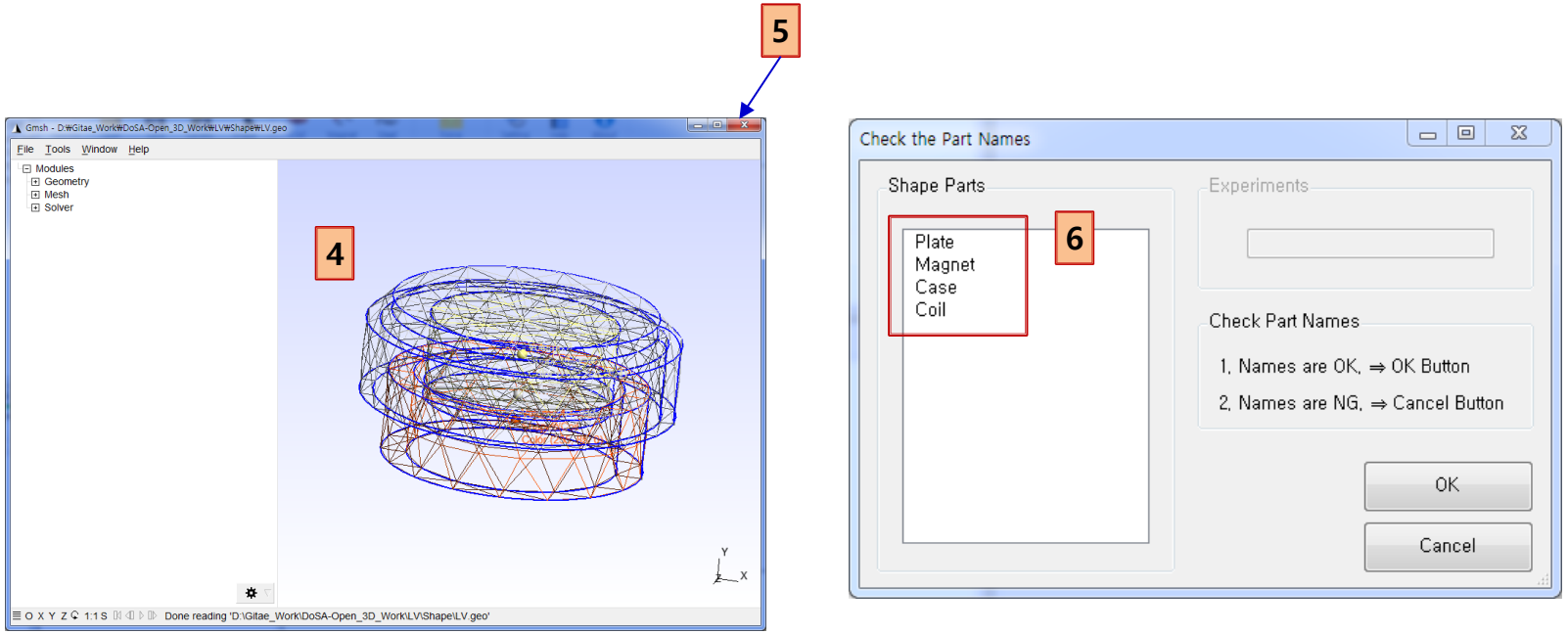
Design 생성

4. Gmsh 에서 Solenoid 3차원 형상을 확인한다.

5. Gmsh 를 종료한다.

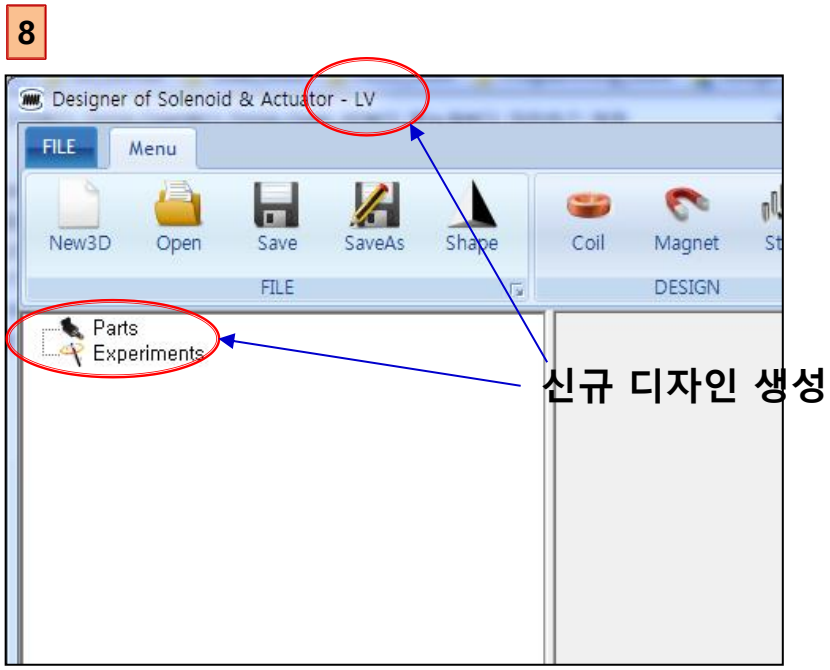
6. Part Name 을 확인 한다.

7. 형상과 Part Name 에 문제가 없다면 OK 를 클릭한다.



Design 생성

8. Design 생성을 확인한다.

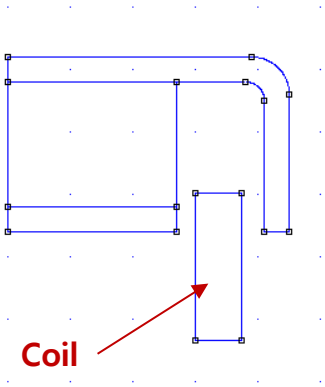


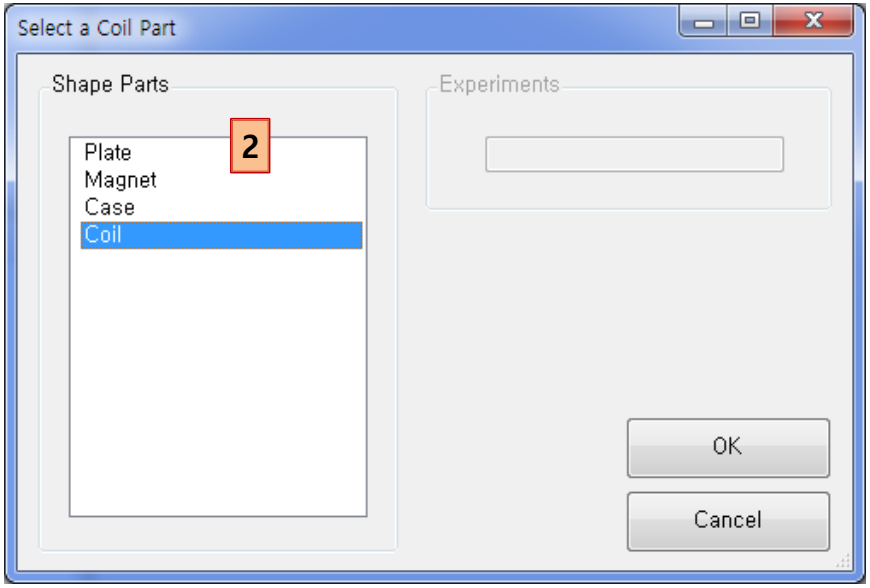
Parts Design

Coil 추가

1. Toolbar > Coil 버튼 클릭 

2. List Box 에서 "Coil" 선택
3. OK 버튼 클릭





Coil 설계

1. Coil 기구사양 입력
   - ✓ Part Material : Copper 선택
   - ✓ Current Direction : IN 선택 (안쪽 방향)
   - ✓ Moving Parts : MOVING 선택 (구동 부품)
   - ✓ Coil Wire Grade : Bonded_IEC_Grade_1B 선택
   - ✓ 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. Coil 사양 계산
   - ✓ Design Coil 버튼 클릭

2

Coil Design

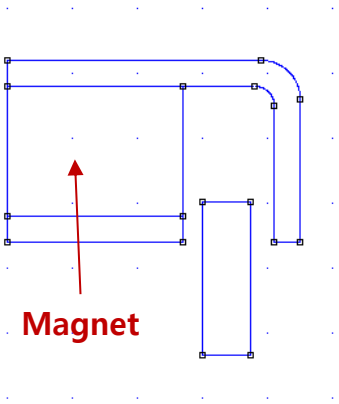
1

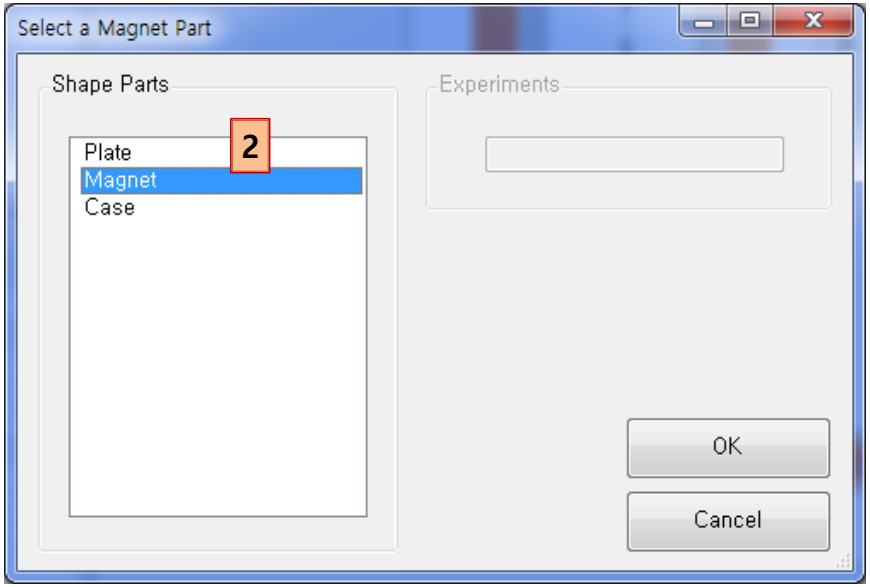
Common Fields	
Node Name	**Coil**
Specification Fields	
Part Material	**Copper**
Curent Direction	**IN**
Moving Parts	**MOVING**
Calculated Fields	
Coil Turns	**126**
Coil Resistance [Ω]	**15.74769**
Coil Layers	6
Turns of One Layer	21
Design Fields (optional)	
Coil Wire Grade	**Bonded_IEC_Grade_1B**
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 [℃]	**20**
Horizontal Coefficient	**0.95**
Vertical Coefficient	**1.13**
Resistance Coefficient	**1.1**

Magnet 추가

1. Toolbar > Magnet 버튼 클릭 

2. List Box 에서 "Magnet" 선택
3. OK 버튼 클릭





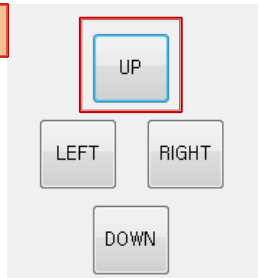
Magnet 설정

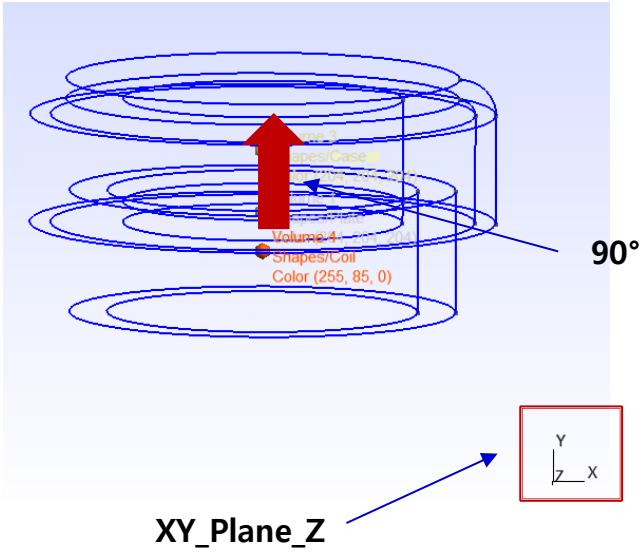
1. Magnet 속성 설정
   - ✓ Part Material : NdFeB_40 선택
   - ✓ Hc, Br 은 자동 설정됨
   - ✓ Moving Parts : FIXED 선택 (고정 부품)
   - ✓ Magnet Plane : XY_Plane_Z
   - ✓ Magnet Angle : 90 or Up 버튼 클릭

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**

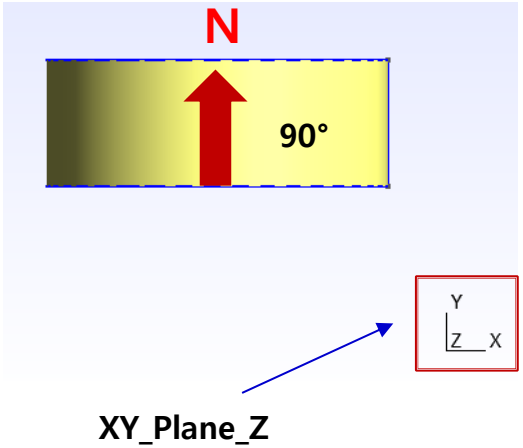
1





[참고] Magnet 착자설정

- ✓ Magnet Plane : XY_Plane_Z
- ✓ Magnet Angle : 90



- ✓ Magnet Plane : ZX_Plane_Y
- ✓ Magnet Angle : 45° (135°, -45°, -135°)

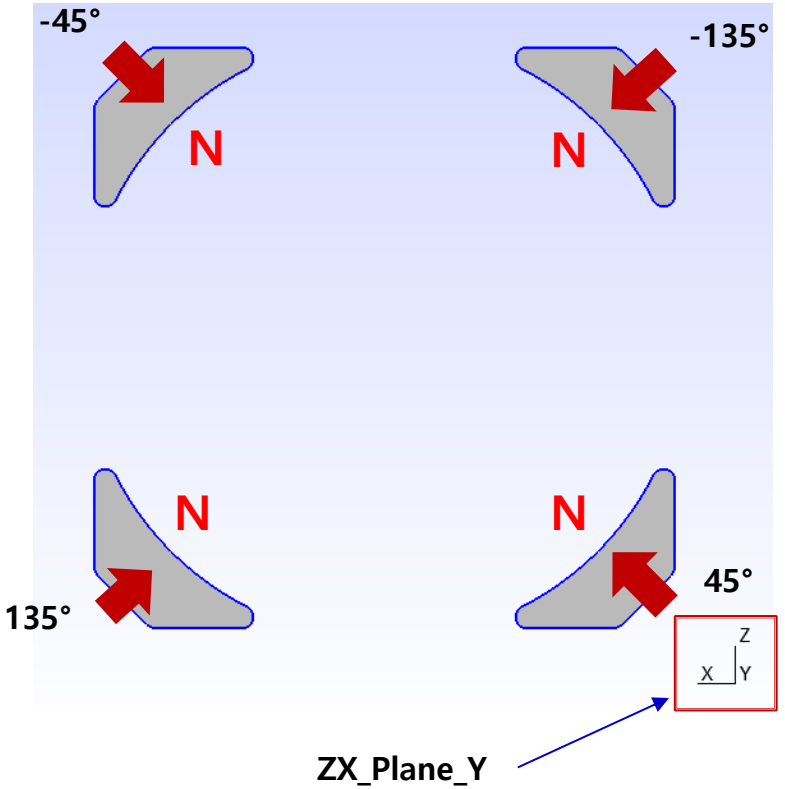
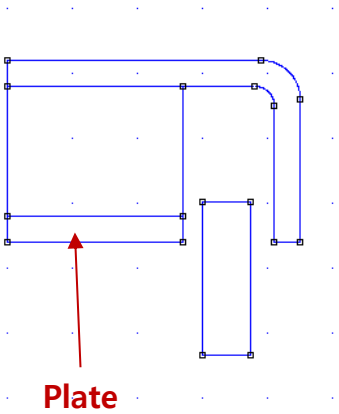


Plate 추가

1. Toolbar > Steel 버튼 클릭

2. List Box 에서 "Plate" 선택

3. OK 버튼 클릭



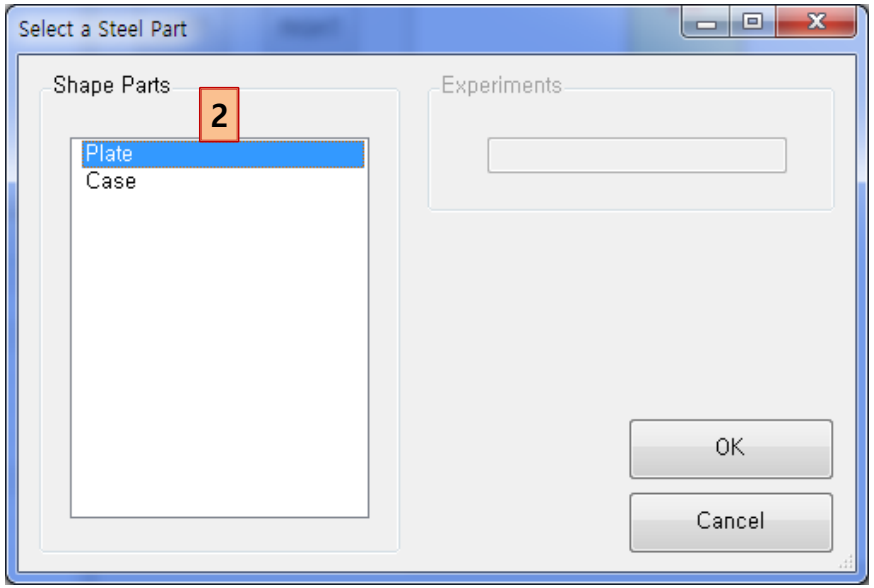


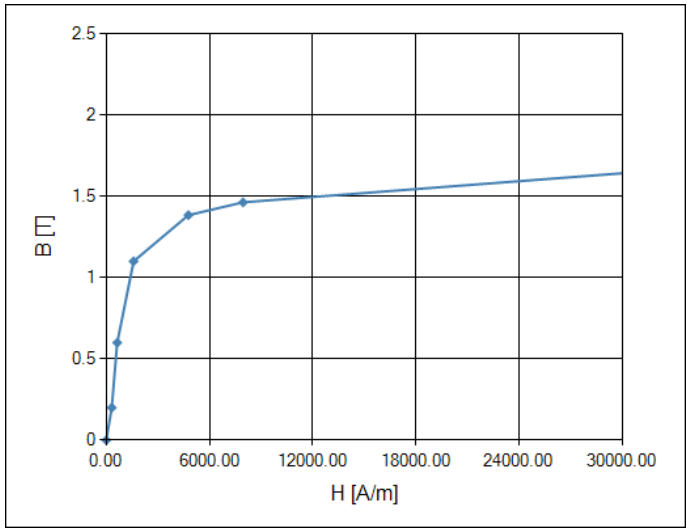
Plate 설정

1. Plate 속성 설정

   ✓ Part Material : SUS_430 선택

   ✓ Moving Parts : FIXED (고정 부품)

[BH 곡선]



1

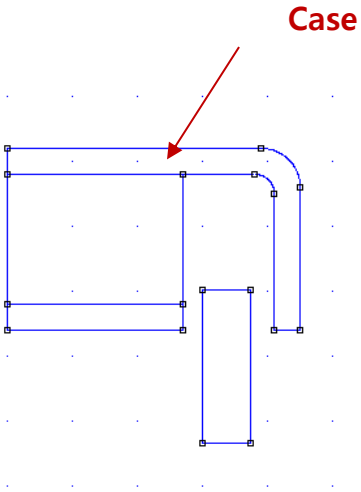
Common Fields	
Node Name	Plate
Specification Fields	
Part Material	SUS_430
Moving Parts	FIXED

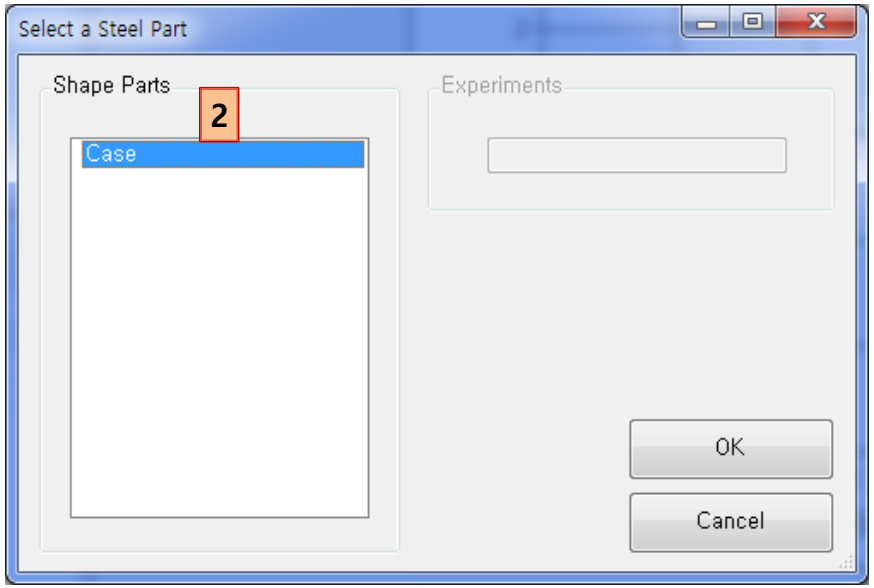
Case 추가

1. Toolbar > Steel 버튼 클릭

2. List Box 에서 "Case" 선택

3. OK 버튼 클릭





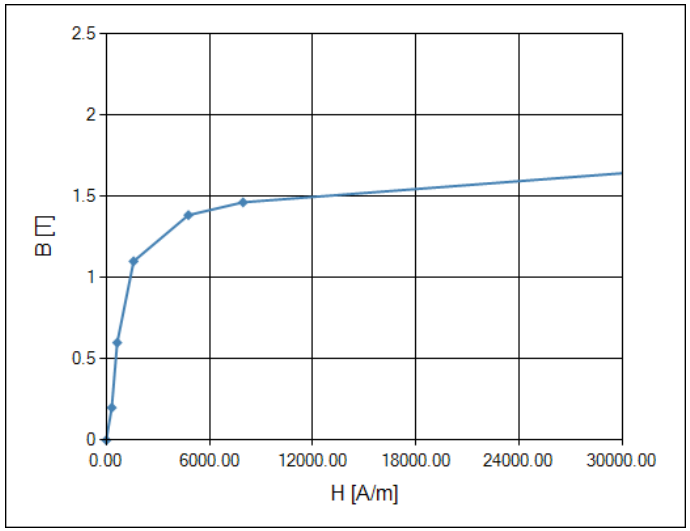
Case 설정

1. Case 속성 설정

   ✓ Part Material : SUS_430 선택

   ✓ Moving Parts : FIXED (고정 부품)

[BH 곡선]



1

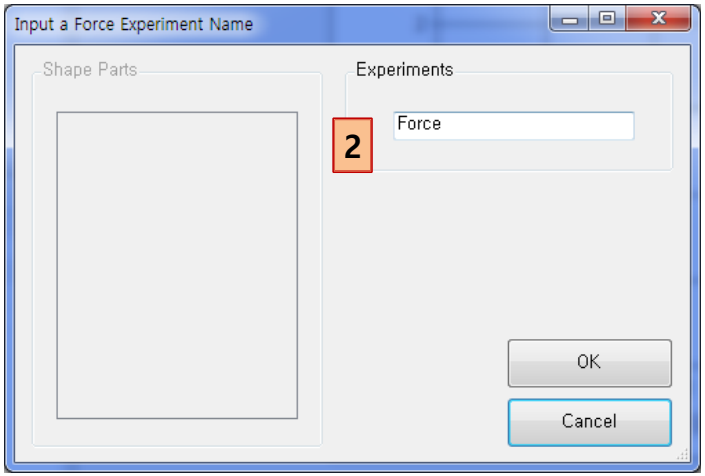
Common Fields	
Node Name	Case
Specification Fields	
Part Material	SUS_430
Moving Parts	FIXED

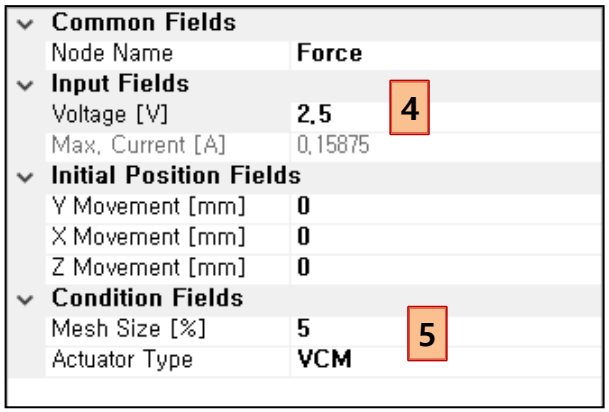
Virtual Experiments

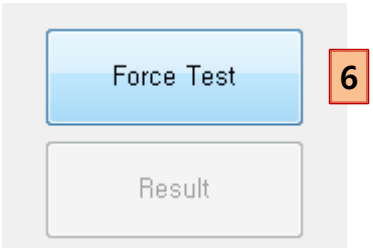
자기력 가상실험

1. Toolbar > Force 버튼 클릭 

2. Experiment Name 입력 : "Force"
3. OK 버튼 클릭
4. 자기력 가상실험 설정
   - ✓ Voltage : 2.5 V
5. 해석조건 설정
   - ✓ Mesh Size Percent : 5 %
   - ✓ Actuator Type : VCM 선택
6. Force Test 버튼 클릭

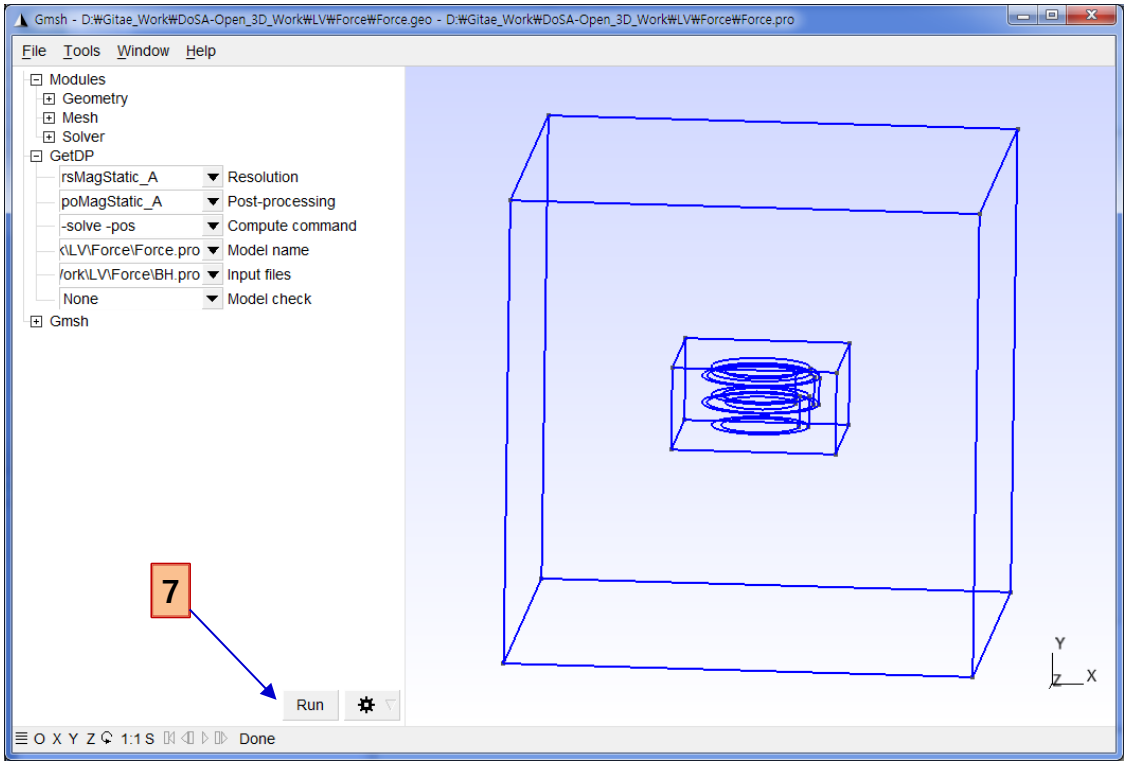






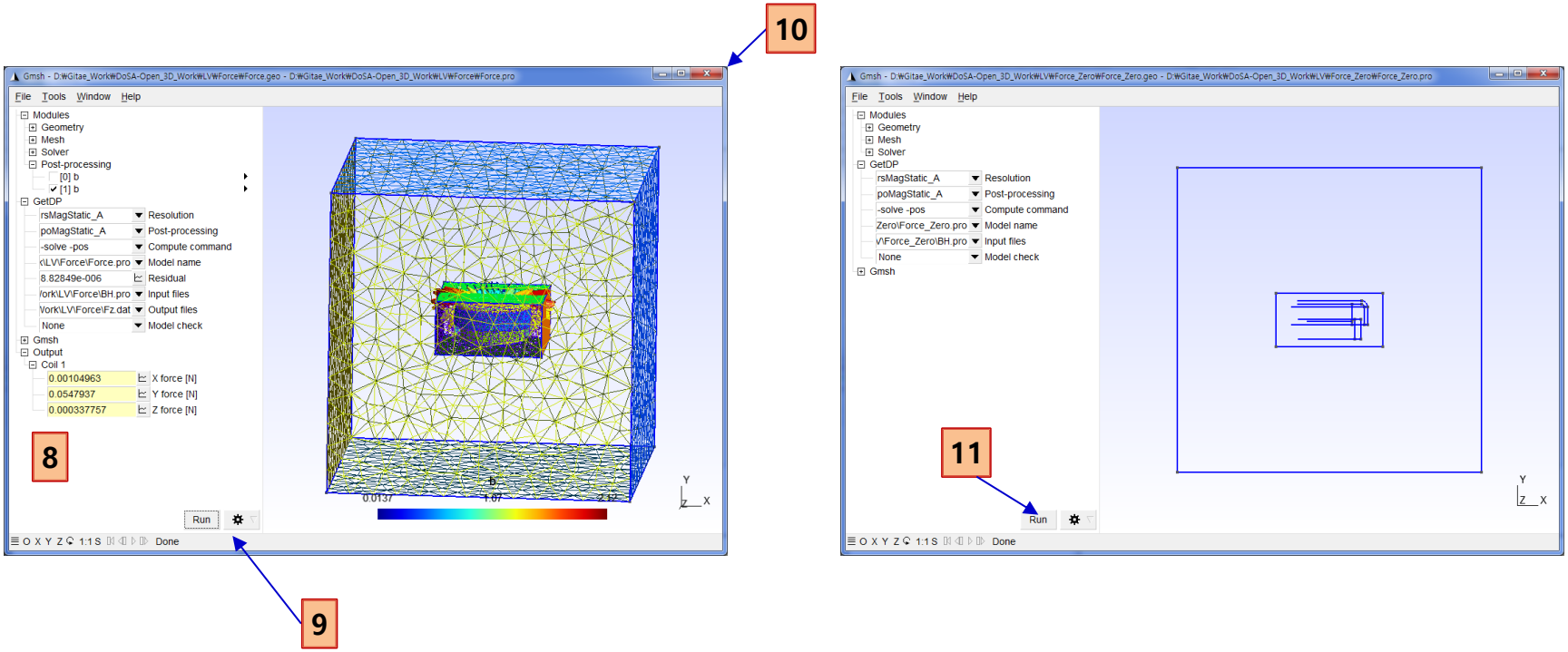
자기력 가상실험 실행

7. 형상을 확인 하고 Run 버튼 클릭



자기력 가상실험 실행

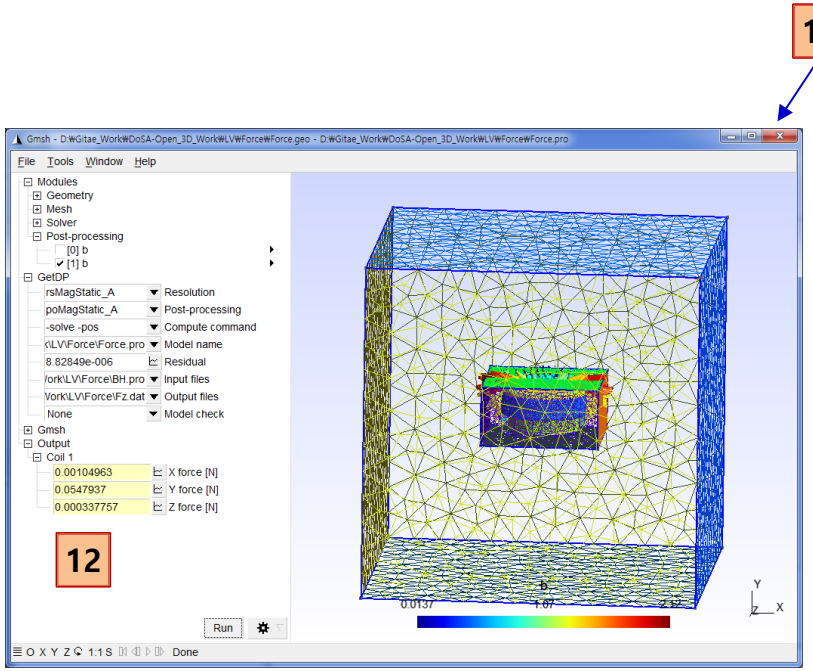
8. 해석 결과를 확인 함 (해석 시간은 컴퓨터 사양에 따라 다름)
9. 해석 진행 상황을 확인하려면 Gmsh 상태 바를 클릭하세요.
10. **Gmsh 를 종료함**
11. 다시 Run 버튼을 클릭함 (**VCM 방식 액추에이터는 자기력 정확도를 높이기 위해 두 번 해석을 진행함**)

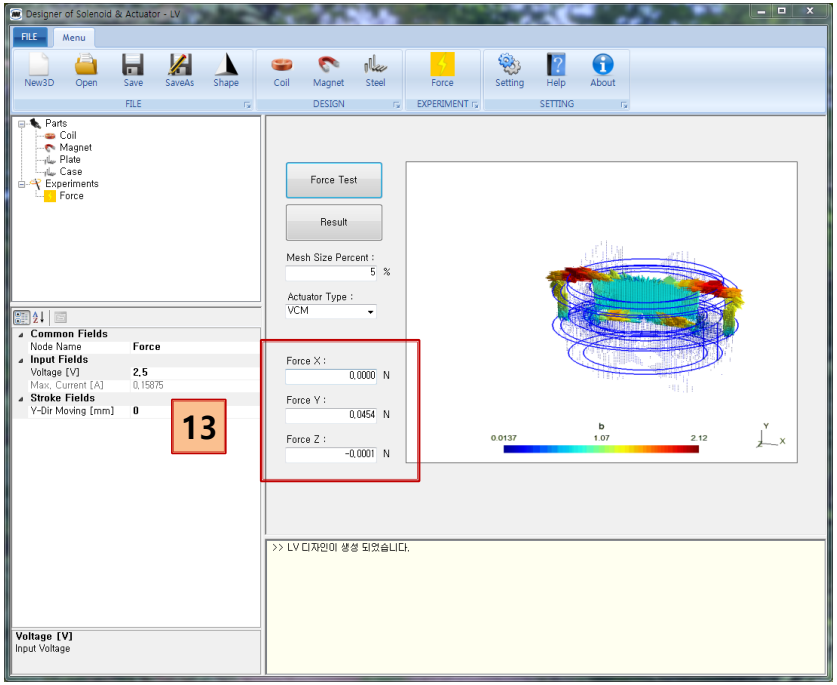


자기력 가상실험 결과

12. 해석 결과를 확인 하고 Gmsh 를 종료함

13. 자기력 확인





Thank You

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Homepage : http://openactuator.org