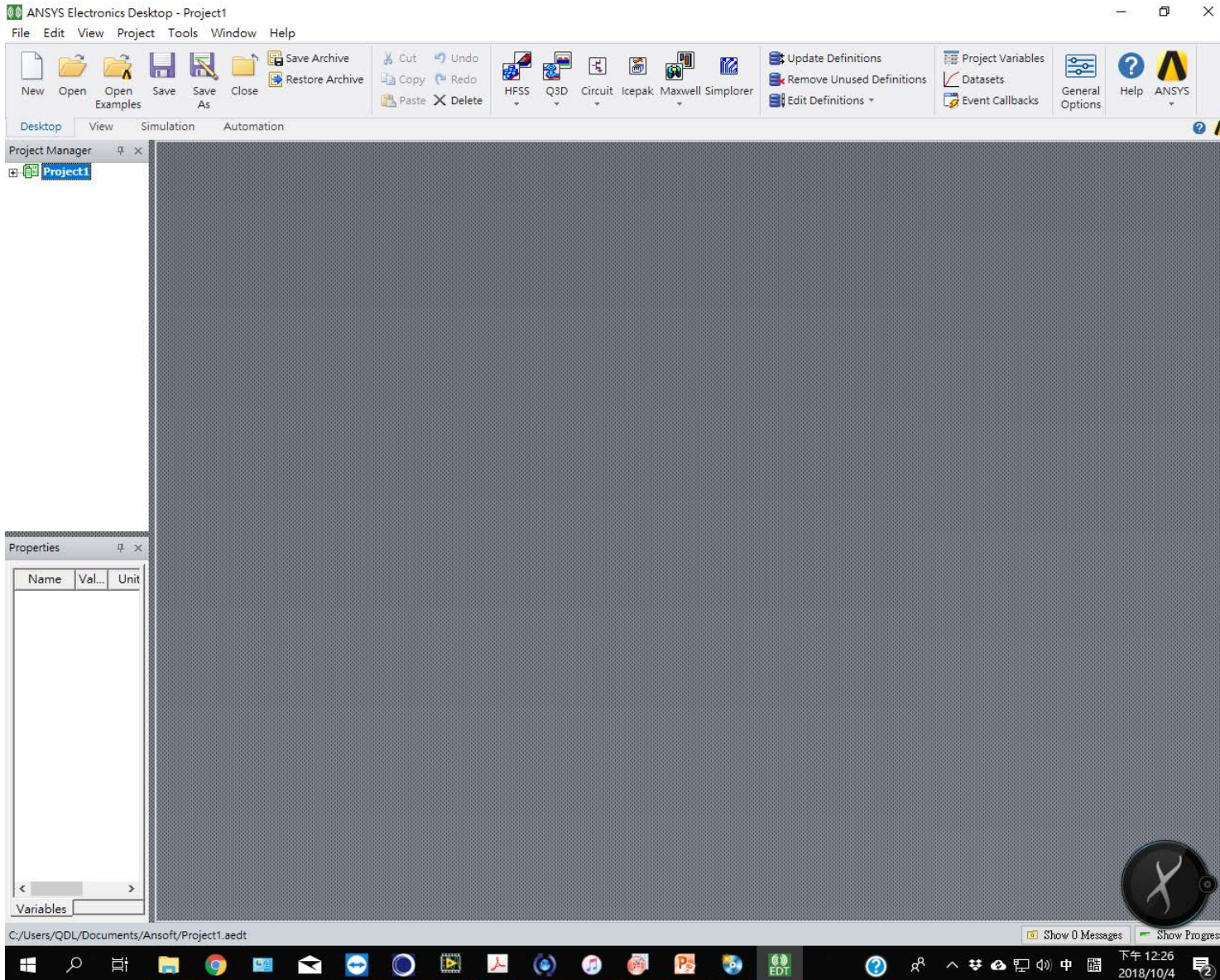


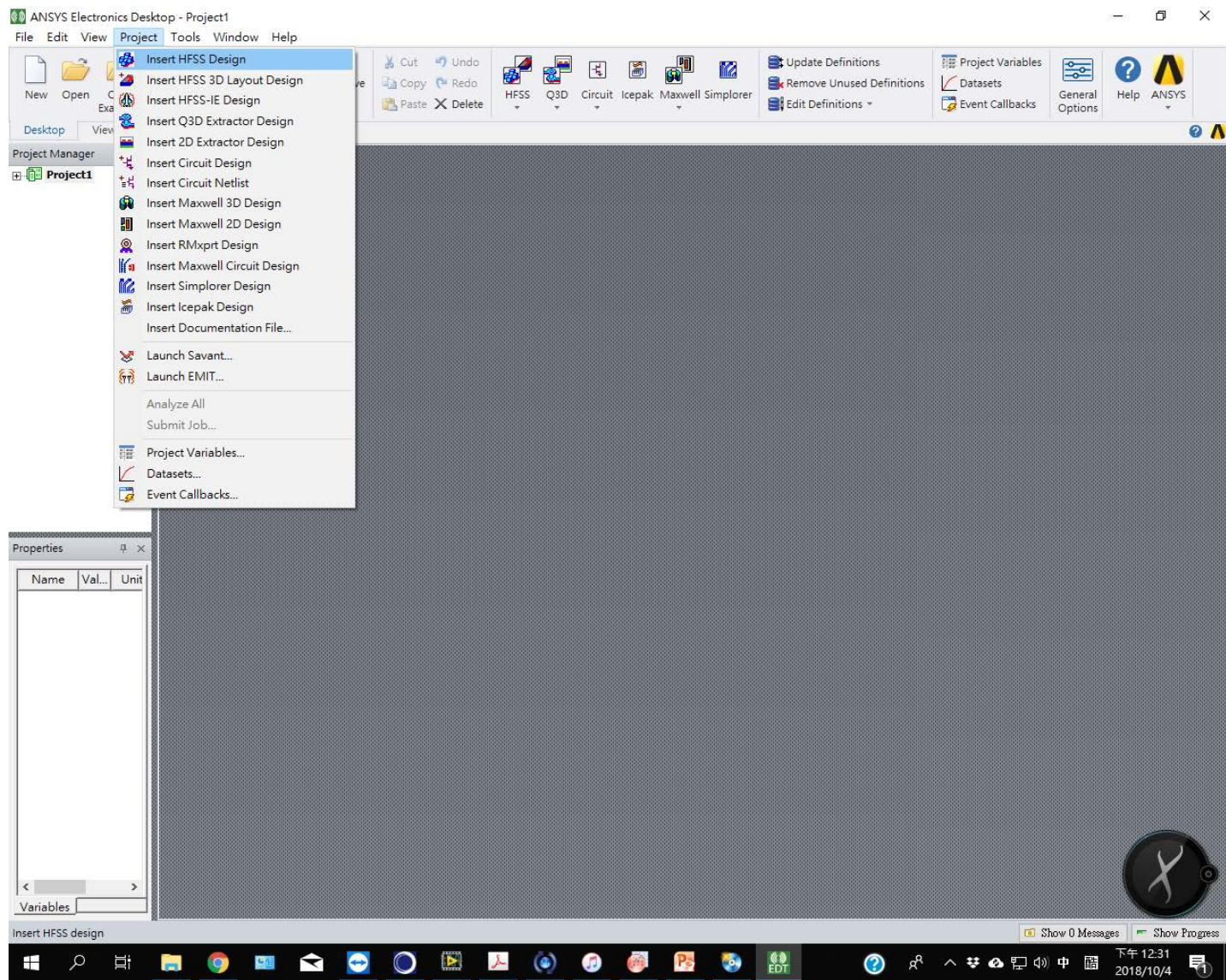
HFSS 建模與計算(1)

- 1.建立3D模型，設定位置尺寸與材質
- 2.建立激發源，阻抗和積分線
- 3.設定邊界條件
- 4.設定計算頻率與精確度
- 5.設定掃頻方法和資料圖表
- 6.進行模型驗證和計算

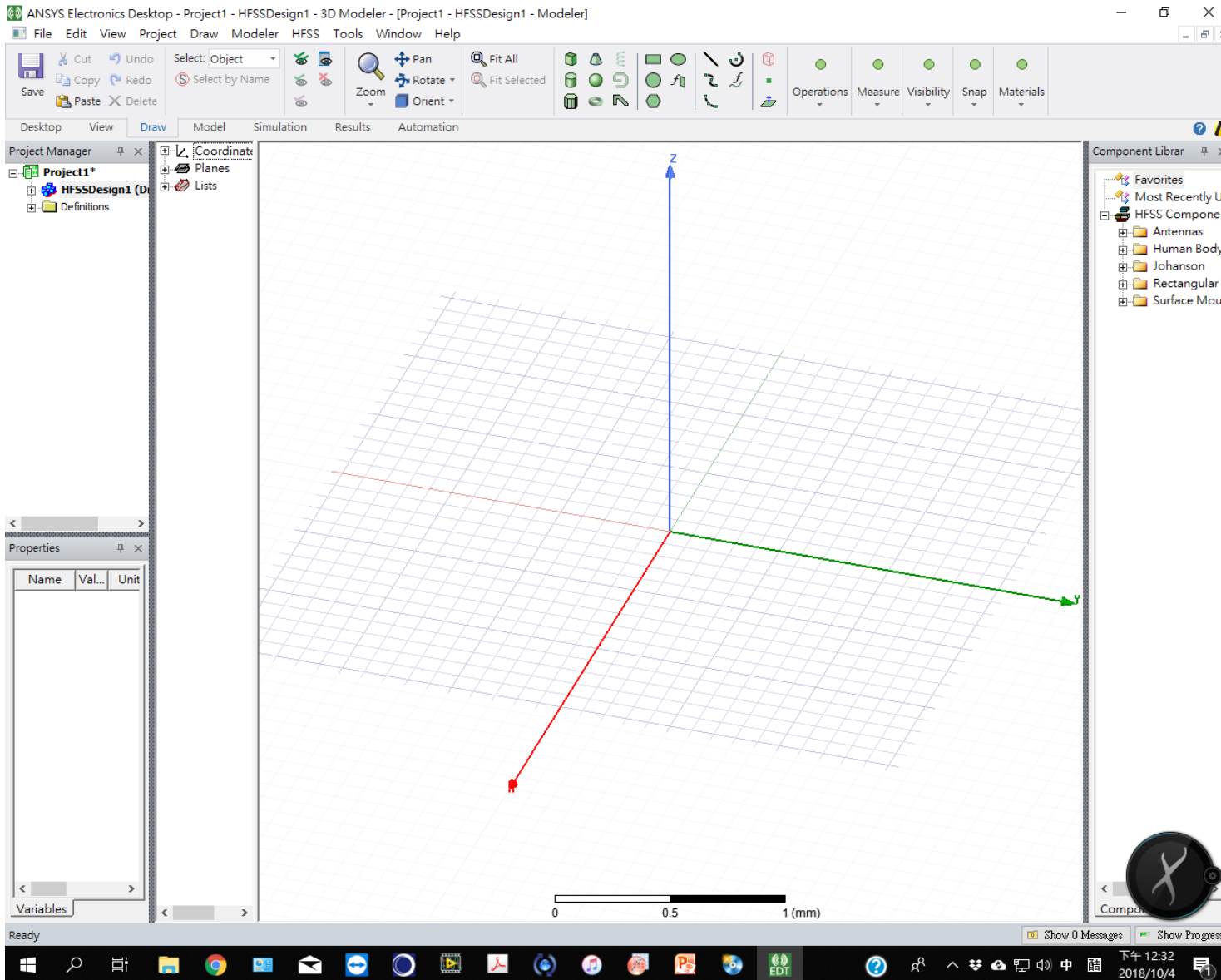
0.1 打開Electronics Desktop



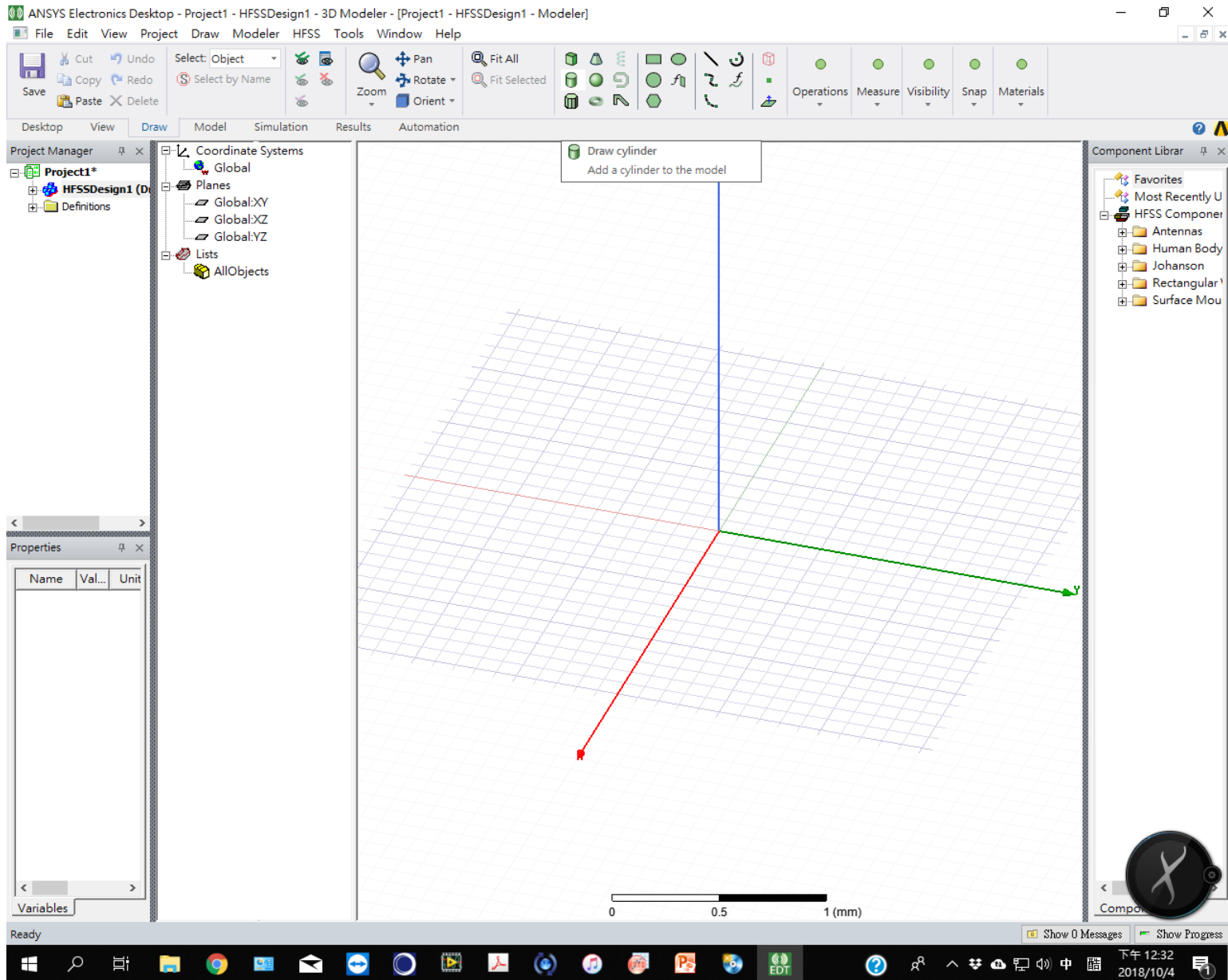
0.2 Project 下拉選單 Insert HFSS design 。如果沒有出現是否沒安裝好？



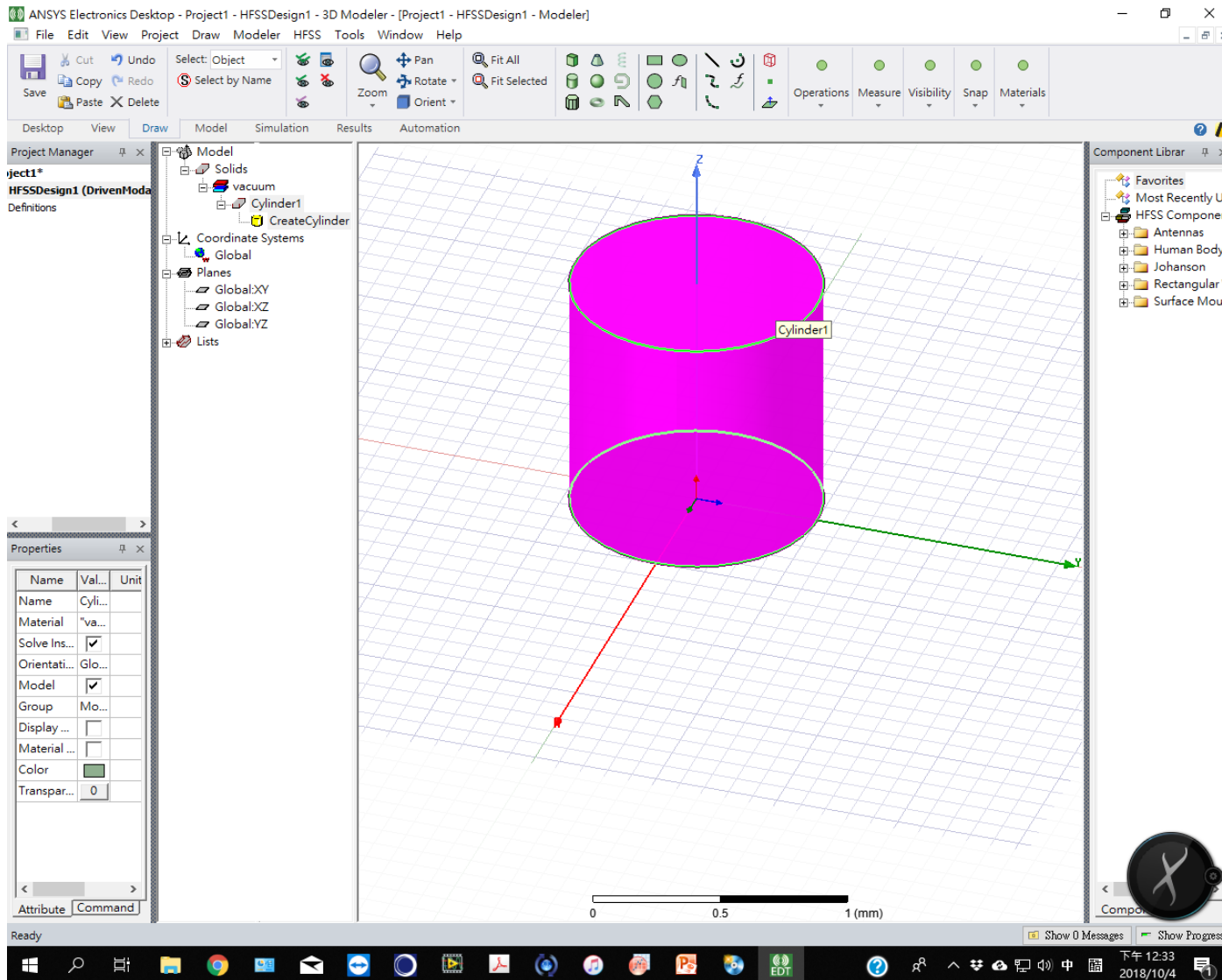
0.3 出現繪圖模式



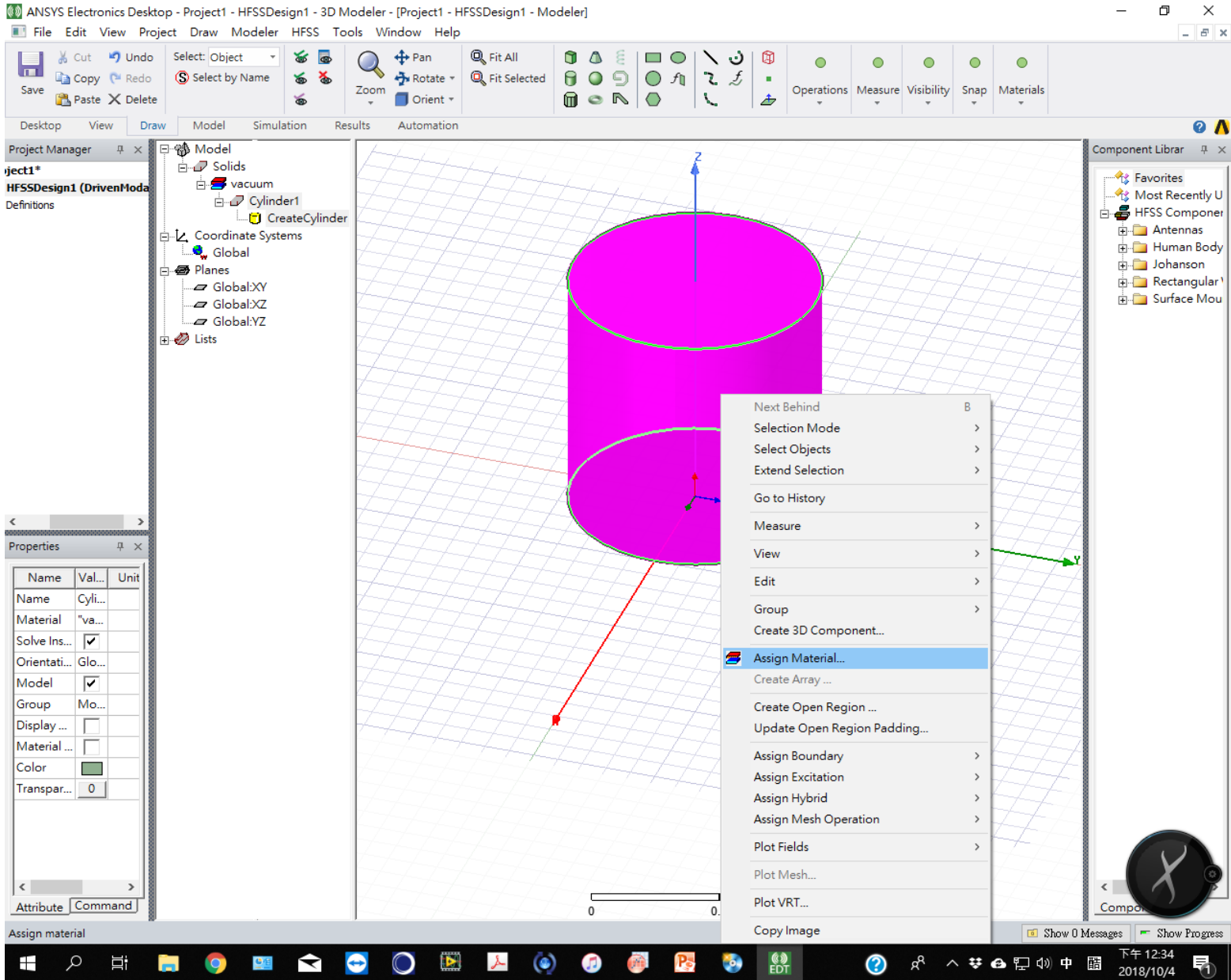
1.1 在繪圖模式選draw cylinder



1.2 先畫一個小圓柱



1.3 按右鍵修改材質



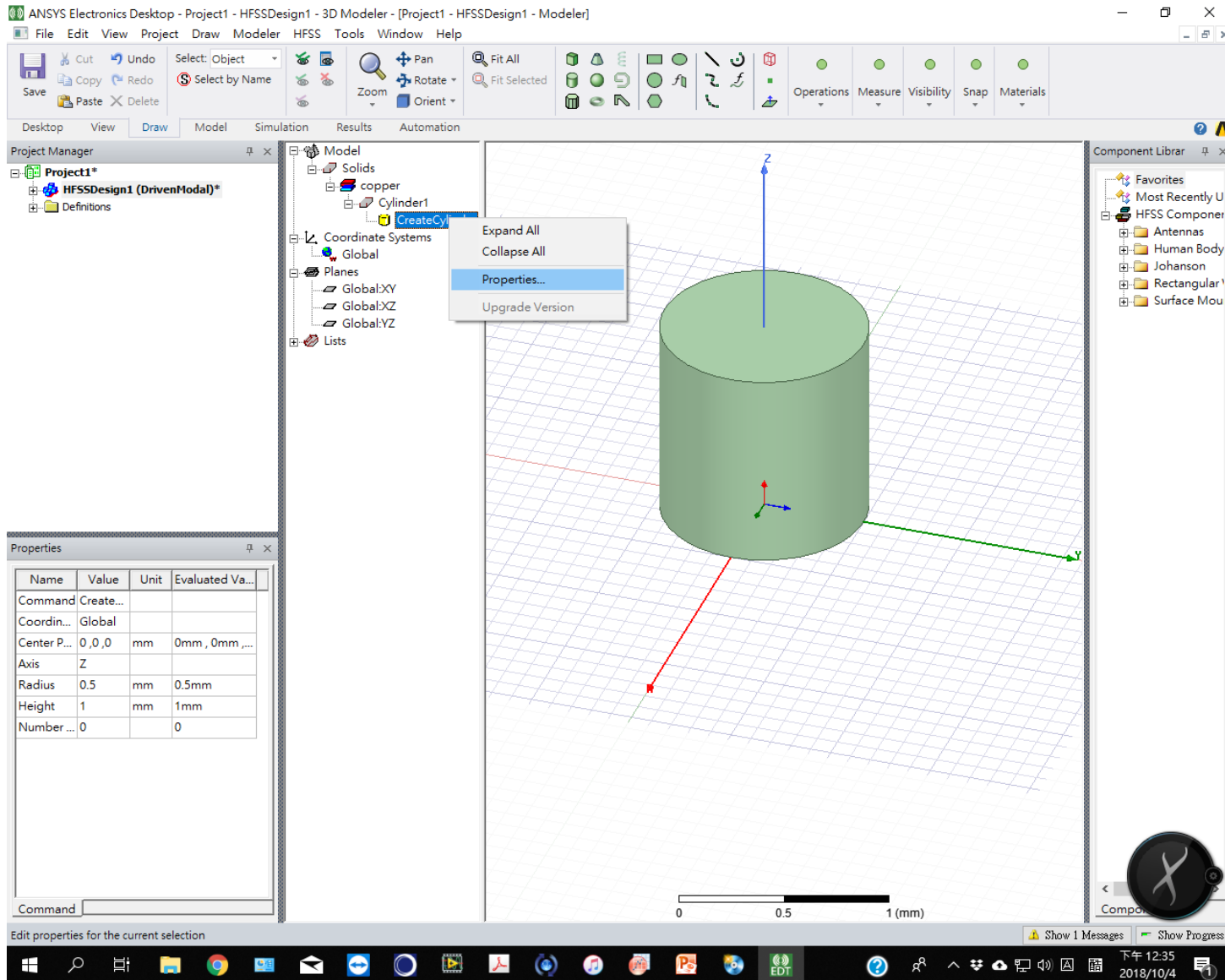
1.4 在材質列中搜尋copper，並選定

The screenshot shows the ANSYS Electronics Desktop interface. The 'Select Definition' dialog box is open, displaying a list of materials. The 'copper' material is highlighted in blue. The search criteria are set to 'by Name' and 'Relative Permittivity'. The search parameters are 'Search by Name' and 'Search'. The materials list includes the following data:

| Name | Location | Origin | Relative Permittivity | Relative Permeability | Bu Condu |
|------------------------------|------------|-----------|-----------------------|-----------------------|--------------|
| cast_iron | SysLibrary | Materials | 1 | 60 | 1500000siem |
| chromium | SysLibrary | Materials | 1 | 1 | 7600000siem |
| cobalt | SysLibrary | Materials | 1 | 250 | 10000000sien |
| copper | SysLibrary | Materials | 1 | 0.999991 | 58000000sien |
| corning_glass | SysLibrary | Materials | 5.75 | 1 | 0 |
| cyanate_ester | SysLibrary | Materials | 3.8 | 1 | 0 |
| diamond | SysLibrary | Materials | 16.5 | 1 | 0 |
| diamond_hi_pres | SysLibrary | Materials | 5.7 | 1 | 0 |
| diamond_pl_cvd | SysLibrary | Materials | 3.5 | 1 | 0 |
| Dupont Type 100 HN Film (tm) | SysLibrary | Materials | 3.5 | 1 | 0 |
| Duroid (tm) | SysLibrary | Materials | 2.2 | 1 | 0 |
| epoxy_Kevlar_xy | SysLibrary | Materials | 3.6 | 1 | 0 |

The dialog box also includes buttons for 'View/Edit Materials...', 'Add Material...', 'Clone Material(s)', 'Remove Material(s)', and 'Export to Library...'. The 'Properties' panel on the left shows the material properties for the selected 'copper' material.

1.5 在模型列表找到圓柱cylinder 1的項目，並按右鍵選擇properties



The screenshot displays the ANSYS Electronics Desktop interface. The main workspace shows a 3D model of a green cylinder on a grid. A context menu is open over the cylinder, with the 'Properties...' option selected. The Properties panel in the bottom left corner shows the following data:

| Name | Value | Unit | Evaluated Va... |
|-------------------|--------|------|-----------------|
| Command Create... | | | |
| Coordin... | Global | | |
| Center P... | 0,0,0 | mm | 0mm , 0mm , ... |
| Axis | Z | | |
| Radius | 0.5 | mm | 0.5mm |
| Height | 1 | mm | 1mm |
| Number ... | 0 | | 0 |

The Project Manager on the left shows the hierarchy: Model > Solids > copper > Cylinder1. The Component Library on the right shows various components like Antennas, Human Body, etc. The bottom status bar indicates 'Edit properties for the current selection'.

1.6 修改尺寸和原點位置。高度設50mm，原點z設為0.5mm

The screenshot displays the ANSYS Electronics Desktop interface. The main window shows a 3D model of a green cylinder on a grid. The cylinder's height is being modified. The Properties dialog box is open, showing the following parameters:

| Name | Value | Unit | Evaluated Value | Description |
|------------------|----------------|------|-----------------|-------------|
| Command | CreateCylinder | | | |
| Coordinate ... | Global | | | |
| Center Positi... | 0, 0, 0 | mm | 0mm, 0mm, ... | |
| Axis | Z | | | |
| Radius | 0.5 | mm | 0.5mm | |
| Height | 50 | mm | 1mm | |
| Number of ... | 0 | | 0 | |

The dialog box also includes a "Show Hidden" checkbox and buttons for "確定" (OK), "取消" (Cancel), and "套用(A)" (Apply).

The Project Manager on the left shows the hierarchy: Project1* > HFSSDesign1 (DrivenModal)* > Definitions > CreateCylinder. The Component Library on the right shows various components like Antennas, Human Body, Johanson, Rectangular, and Surface Mou.

The bottom status bar shows "Ready" and the system clock: 下午 12:36, 2018/10/4.

1.7 將圖形元素直接複製並貼上，產生cylinder 2

The screenshot displays the ANSYS Electronics Desktop interface. The 'Edit' menu is open, with 'Copy' selected. The 3D workspace shows a vertical purple cylinder along the Z-axis. The Component Library on the right lists various components like Antennas, Human Body, and Rectangular. The Properties panel at the bottom left shows the material 'copper' and other attributes.

| Name | | |
|--------------|-------------------------------------|----------|
| Name | | |
| Material | "copper" | "copper" |
| Solve Ins... | <input type="checkbox"/> | |
| Orientati... | Global | |
| Model | <input checked="" type="checkbox"/> | |
| Group | Model | |
| Display ... | <input type="checkbox"/> | |
| Material ... | <input type="checkbox"/> | |
| Color | | |
| Transpar... | 0 | |

1.8 修改原點位置：z=-50.5mm

Properties: Project1 - HFSSDesign1 - Modeler

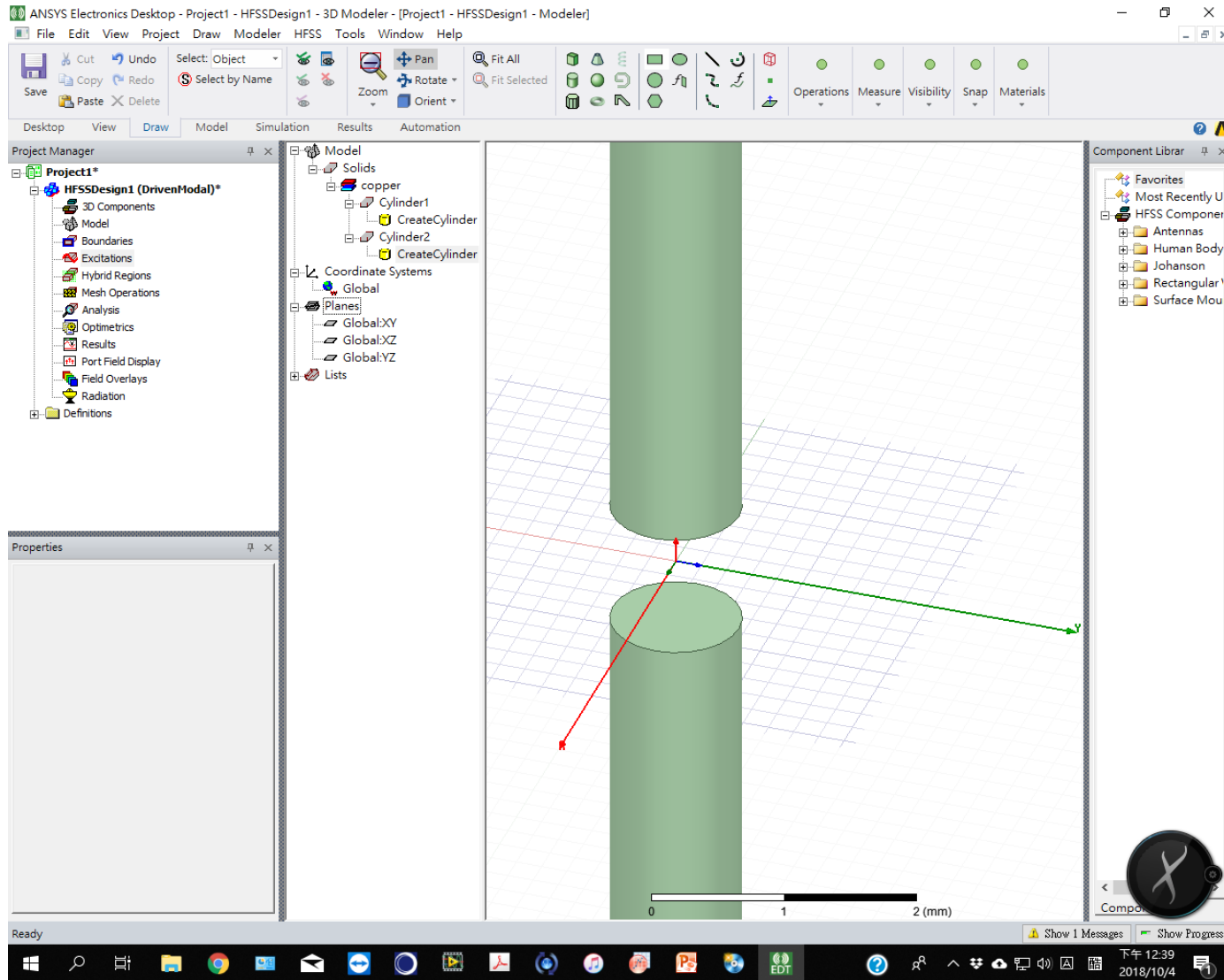
| Name | Value | Unit | Evaluated Va... | Description |
|------------------|----------------|------|-----------------|-------------|
| Command | CreateCylinder | | | |
| Coordinate ... | Global | | | |
| Center Positi... | 0, 0, -50.5 | mm | 0mm, 0mm, ... | |
| Axis | Z | | | |
| Radius | 0.5 | mm | 0.5mm | |
| Height | 50 | mm | 50mm | |
| Number of ... | 0 | | 0 | |

Command

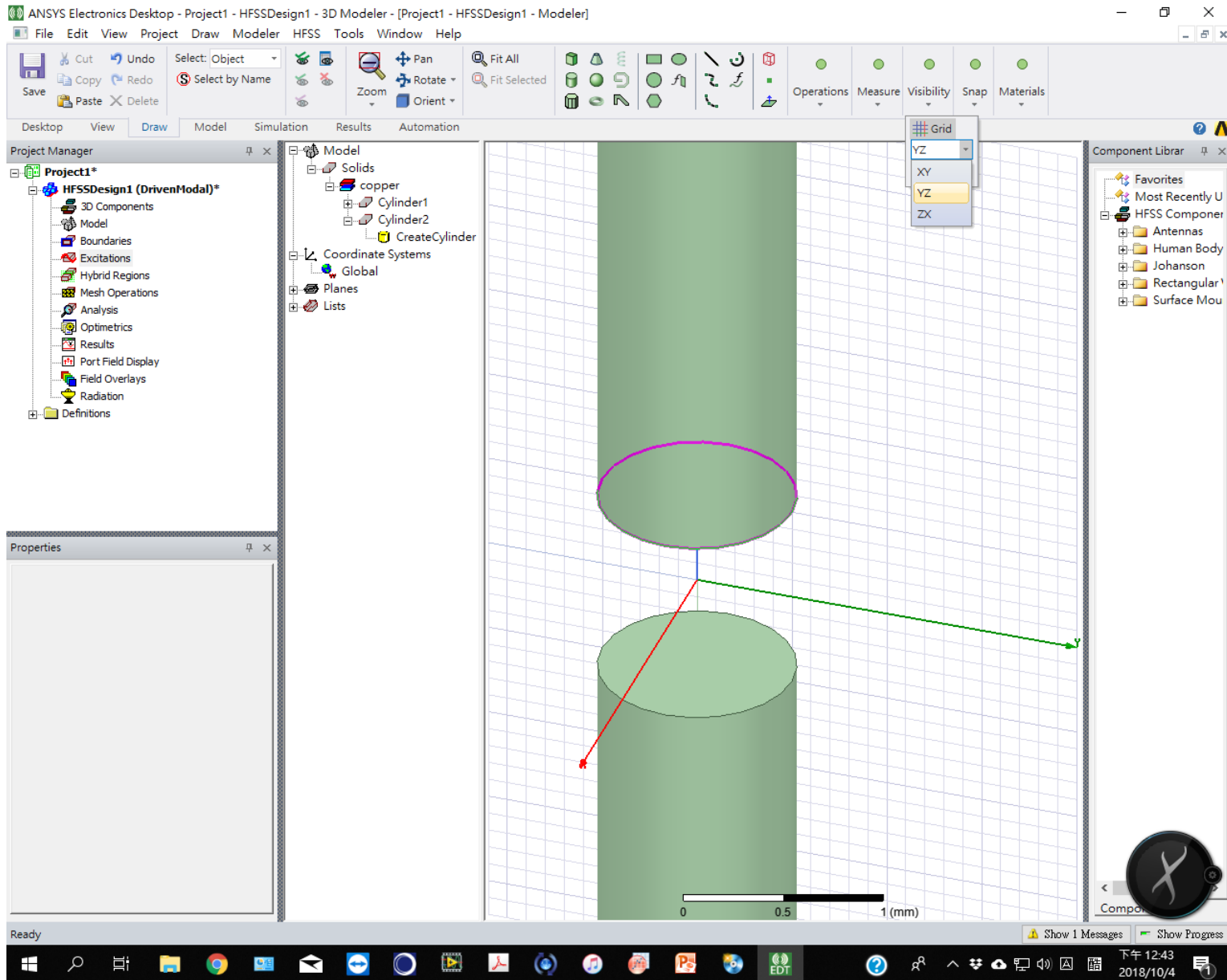
0 10 20 (mm)

下午 12:38
2018/10/4

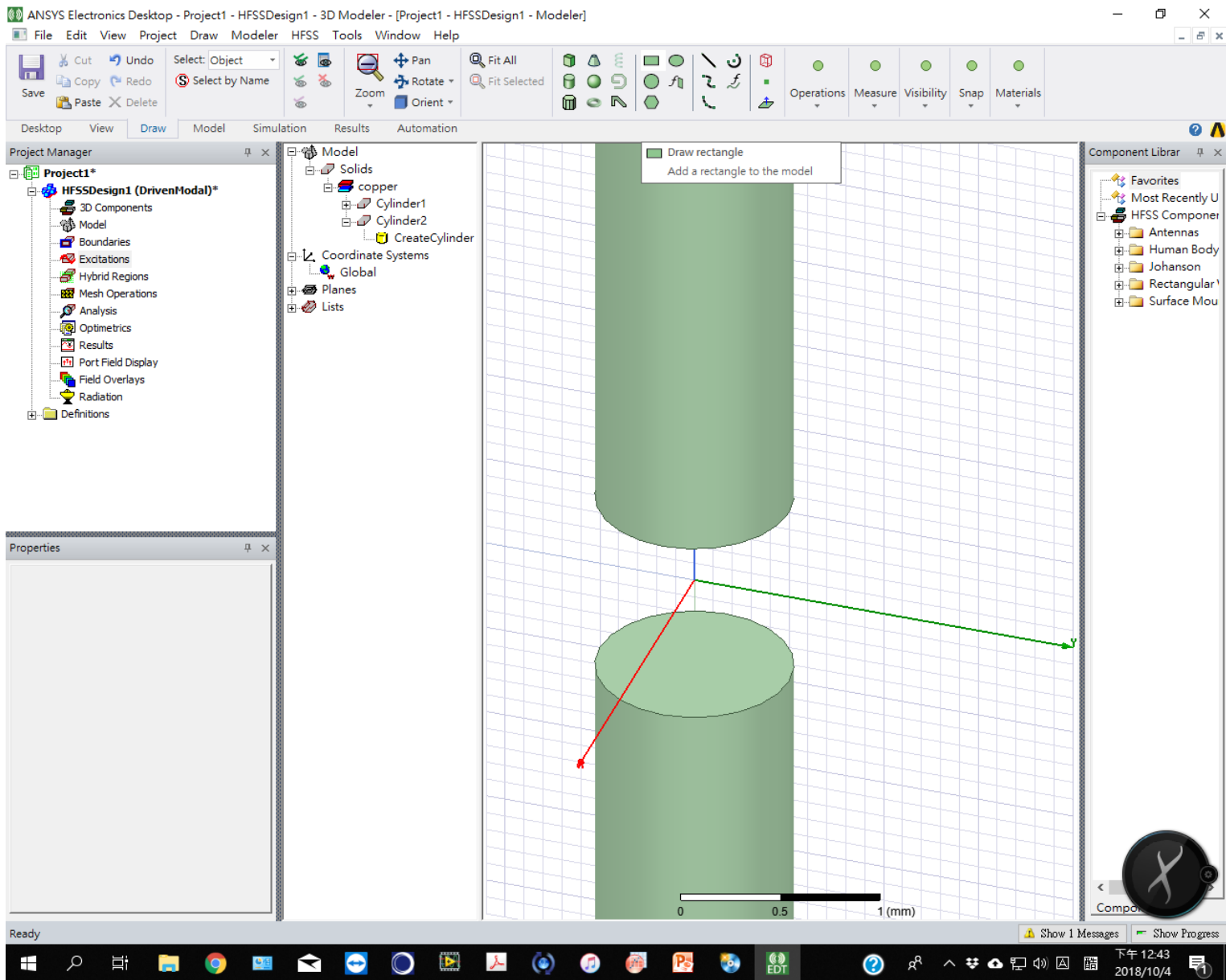
1.9 天線模型完成



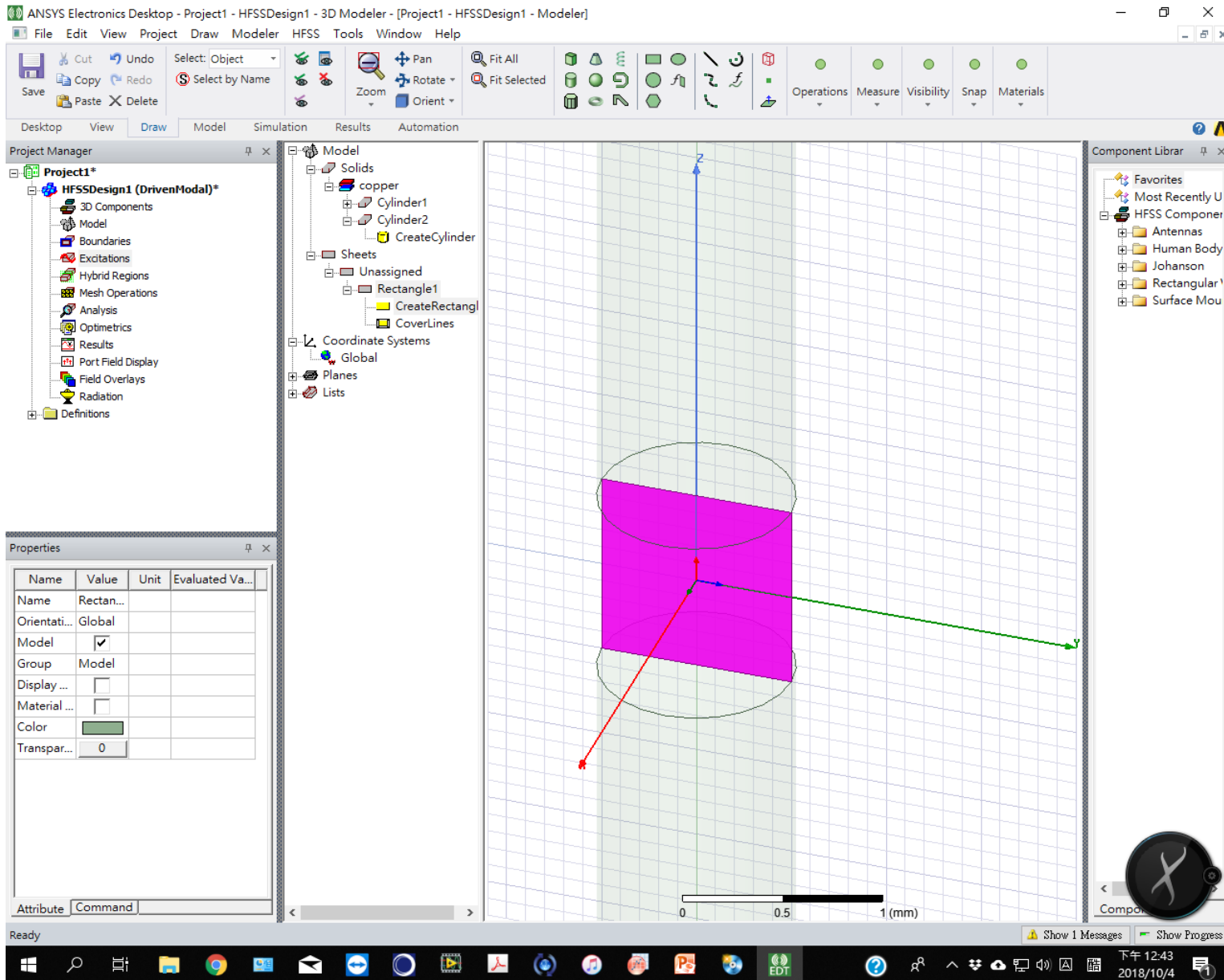
2.1 把網格標示由XY改為YZ，方便建立激發源



2.2 選擇draw rectangle



2.3 將矩形畫在連接兩個圓柱的中間位置



2.4 將此矩形設為excitations: lumped port

The screenshot displays the ANSYS Electronics Desktop interface. The main 3D view shows a purple rectangular object on a grid. A context menu is open over the object, with the 'Assign' option selected, leading to a sub-menu where 'Lumped Port...' is highlighted. The 'Properties' panel on the left shows the object's name as 'Rectan...' and its orientation as 'Global'. The 'Component Library' on the right lists various components like 'Antennas', 'Human Body', and 'Surface Mou'. The bottom status bar indicates the current task is 'Assign a Lumped Port Excitation'.

ANSYS Electronics Desktop - Project1 - HFSSDesign1 - 3D Modeler - [Project1 - HFSSDesign1 - Modeler]

File Edit View Project Draw Modeler HFSS Tools Window Help

Save Cut Undo Select: Object Select by Name Copy Redo Paste Delete Zoom Pan Rotate Orient Fit All Fit Selected

Desktop View Draw Model Simulation Results Automation

Project Manager

- Project1*
- HFSSDesign1 (DrivenModal)*
 - 3D Components
 - Model
 - Boundaries
 - Excitations
 - Assign
 - Auto Assign Terminals
 - Set Default Base Name
 - Edit Port Impedance Multiplier
 - Edit Sources...
 - List...
 - Delete All
 - Visualization...
 - Reorder Matrix...
 - Differential Pairs...
 - Set Terminal Renormalizing Impedances...
 - Set Incident Field Formulation
 - Hybrid
 - Mesh
 - Analysis
 - Optimization
 - Results
 - Port
 - Field
 - Radiation
 - Definition

Model

- Solids
 - copper
 - Cylinder1
 - Cylinder2
 - CreateCylinder
- Sheets

Component Library

- Favorites
- Most Recently U
- HFSS Componer
 - Antennas
 - Human Body
 - Johanson
 - Rectangular'
 - Surface Mou

Properties

| Name | Value | Unit | Evaluated Va... |
|--------------|-------------------------------------|------|-----------------|
| Name | Rectan... | | |
| Orientati... | Global | | |
| Model | <input checked="" type="checkbox"/> | | |
| Group | Model | | |
| Display ... | <input type="checkbox"/> | | |
| Material ... | <input type="checkbox"/> | | |
| Color | | | |
| Transpar... | 0 | | |

Assign a Lumped Port Excitation

Show 1 Messages Show Progress

下午 12:44 2018/10/4

2.5 阻抗設定：50 ohm

ANSYS Electronics Desktop - Project1 - HFSSDesign1 - 3D Modeler - [Project1 - HFSSDesign1 - Modeler]

File Edit View Project Draw Modeler HFSS Tools Window Help

Save Cut Copy Paste Undo Redo Select by Name Select: Object Zoom Pan Rotate Fit All Fit Selected Operations Measure Visibility Snap Materials

Desktop View Draw Model Simulation Results Automation

Project Manager

- Project1*
- HFSSDesign1 (DrivenModal)*
 - 3D Components
 - Model
 - Boundaries
 - Excitations
 - Hybrid Regions
 - Mesh Operations
 - Analysis
 - Optimetrics
 - Results
 - Port Field Display
 - Field Overlays
 - Radiation
 - Definitions

Model

- Solids
 - copper
 - Cylinder1
- Co...
- Plan...
- List...

Component Librar

- Favorites
- Most Recently U
- HFSS Componen
- Antennas
- Human Body
- Johanson
- Rectangular1
- Surface Mou

Lumped Port : General

Name: 1

Full Port Impedance: 50 ohm

Impedance ::= resistance + 1i * reactance

Use Defaults

< 上一步(B) 下一步(N) > 取消

Properties

| Name | Value | Unit | Evaluated Va... |
|--------------|-------------------------------------|------|-----------------|
| Name | Rectan... | | |
| Orientati... | Global | | |
| Model | <input checked="" type="checkbox"/> | | |
| Group | Model | | |
| Display ... | <input type="checkbox"/> | | |
| Material ... | <input type="checkbox"/> | | |
| Color | | | |
| Transpar... | 0 | | |

Attribute Command

Ready

Show 1 Messages Show Progress

下午 12:44 2018/10/4

2.6 下一步設定integration line：選 new line...

ANSYS Electronics Desktop - Project1 - HFSSDesign1 - 3D Modeler - [Project1 - HFSSDesign1 - Modeler]

File Edit View Project Draw Modeler HFSS Tools Window Help

Save Cut Copy Paste Undo Redo Select: Object Select by Name

Zoom Pan Rotate Orient

Fit All Fit Selected

Operations Measure Visibility Snap Materials

Desktop View Draw Model Simulation Results Automation

Project Manager

Project1*

HFSSDesign1 (DrivenModal)*

3D Components

Model

Boundaries

Excitations

Hybrid Regions

Mesh Operations

Analysis

Optimetrics

Results

Port Field Display

Field Overlays

Radiation

Definitions

Model

Solids

copper

Cylinder1

Component Library

Favorites

Most Recently U

HFSS Componer

Antennas

Human Body

Johanson

Rectangular1

Surface Mou

Lumped Port: Modes

Number of Modes: 1

| Mode | Integration Line | Characteristic Impedance (Zo) |
|------|------------------|-------------------------------|
| 1 | None | Zpi |
| | None | |
| | New Line... | |

Use Defaults

< 上一步(B) 下一步(N) > 取消

Properties

| Name | Value | Unit | Evaluated Va... |
|--------------|-------------------------------------|------|-----------------|
| Name | Rectan... | | |
| Orientati... | Global | | |
| Model | <input checked="" type="checkbox"/> | | |
| Group | Model | | |
| Display ... | <input type="checkbox"/> | | |
| Material ... | <input type="checkbox"/> | | |
| Color | <input type="checkbox"/> | | |
| Transpar... | 0 | | |

Attribute

Ready

Show 1 Messages Show Progress

下午 12:45 2018/10/4

2.7 設定integration line 為由下方圓柱指向上方圓柱：z的距離是1mm

ANSYS Electronics Desktop - Project1 - HFSSDesign1 - 3D Modeler - [Project1 - HFSSDesign1 - Modeler]

File Edit View Project Draw Modeler HFSS Tools Window Help

Create Line
Draw the port line. When you are finished, the port edit dialog will reappear.

Measure Data
Position1(Reference) = [0, 0, -0.5]mm
Position2(EdgeCenter_37) = [0, 0, 0.5]mm
Distance = 1mm
X Distance = 0mm
Y Distance = 0mm
Z Distance = 1mm
Angle(P20 - P10) = 180deg

Properties

| Name | Value | Unit | Evaluated Va... |
|--------------|-------------------------------------|------|-----------------|
| Name | Rectan... | | |
| Orientati... | Global | | |
| Model | <input checked="" type="checkbox"/> | | |
| Group | Model | | |
| Display ... | <input type="checkbox"/> | | |
| Material ... | <input type="checkbox"/> | | |
| Color | <input type="checkbox"/> | | |
| Transpar... | 0 | | |

Hold '!X!', '!Y!', or '!Z!' key to constrain relative movement.
Using F3/F4 to toggle between point and dialog entry mode.
Use context menu to choose in Plane movement

1 (mm)

Show 1 Messages Show Progress dX: 0 dY: 0 dZ: 1 Relative Cartesian mm

下午 12:45
2018/10/4

2.8 integration line 設定後即完成激發源設定

ANSYS Electronics Desktop - Project1 - HFSSDesign1 - 3D Modeler - [Project1 - HFSSDesign1 - Modeler]

File Edit View Project Draw Modeler HFSS Tools Window Help

Save Cut Copy Paste Undo Redo Select: Object Select by Name

Pan Rotate Orient Zoom Fit All Fit Selected

Operations Measure Visibility Snap Materials

Desktop View Draw Model Simulation Results Automation

Project Manager

- Project1*
- HFSSDesign1 (DrivenModal)*
 - 3D Components
 - Model
 - Boundaries
 - Excitations
 - Hybrid Regions
 - Mesh Operations
 - Analysis
 - Optimetrics
 - Results
 - Port Field Display
 - Field Overlays
 - Radiation
 - Definitions

Model

- Solids
 - copper
 - Cylinder1
- Coc...
- Plan...
- List...

Component Librar

- Favorites
- Most Recently U
- HFSS Composer
 - Antennas
 - Human Body
 - Johanson
 - Rectangular 1
 - Surface Mou

Lumped Port : Post Processing

Port Renormalization

Do Not Renormalize

Renormalize All Modes

Full Port Impedance: 50 ohm

Impedance ::= resistance + 1i * reactance

Deembed Settings

Deembed

Use Defaults

< 上一步(B) 完成 取消

Properties

| Name | Value | Unit | Evaluated Va... |
|--------------|-------------------------------------|------|-----------------|
| Name | Rectan... | | |
| Orientati... | Global | | |
| Model | <input checked="" type="checkbox"/> | | |
| Group | Model | | |
| Display ... | <input type="checkbox"/> | | |
| Material ... | <input type="checkbox"/> | | |
| Color | | | |
| Transpar... | 0 | | |

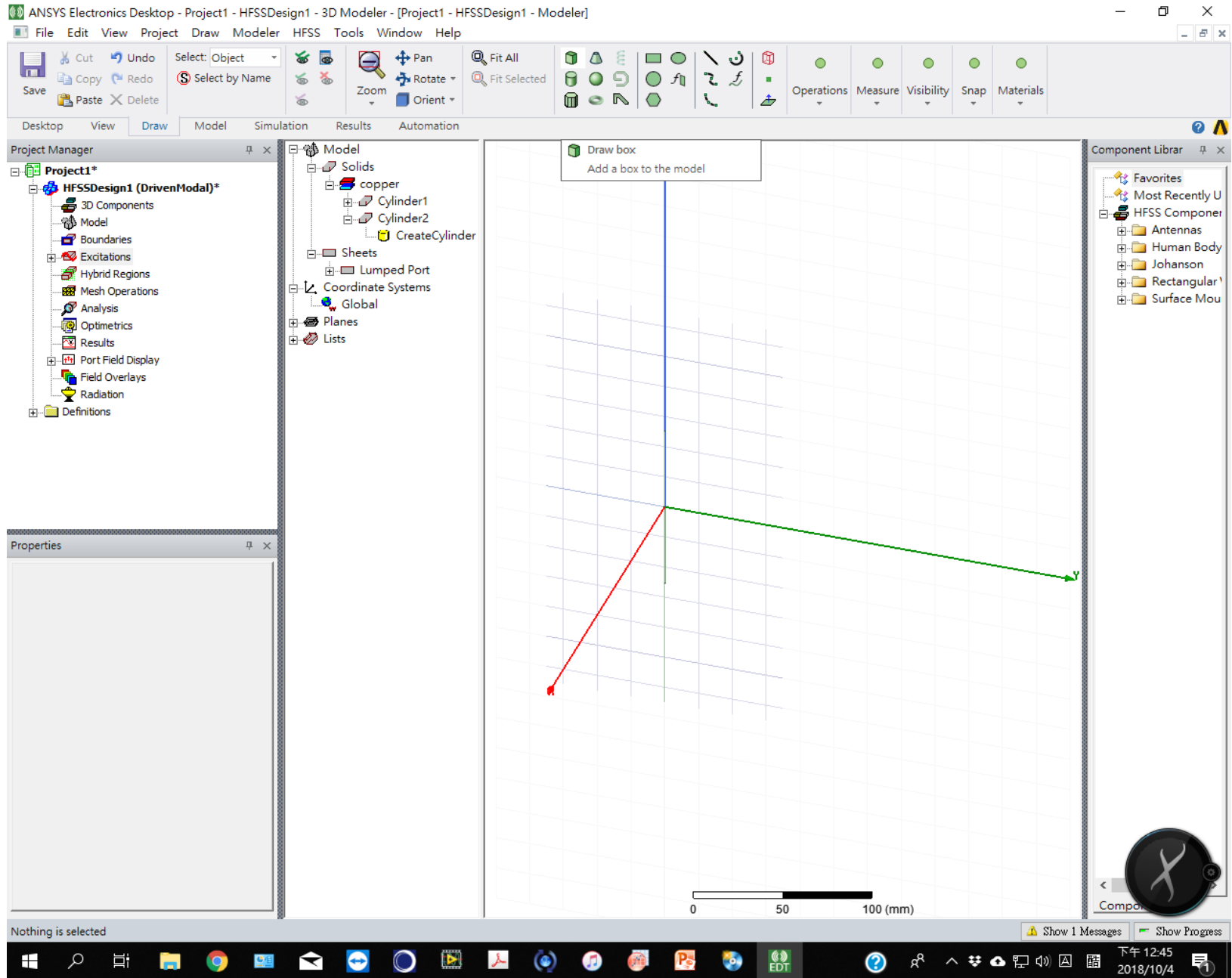
Attribute

0 0.5 1 (mm)

Show 1 Messages Show Progress

下午 12:45 2018/10/4

3.1 點選draw box



3.2 將box包住天線作為計算輻射場的空間，尺寸設x:100mm, y:100mm, z: 200mm

The screenshot displays the ANSYS Electronics Desktop interface. The main 3D workspace shows a magenta rectangular box labeled "Box1" centered in a 3D coordinate system. The box is surrounded by a grid. The Properties panel on the left shows the following details for "Box1":

| Name | Value | Unit | Evaluated Va... |
|--------------|---|------|-----------------|
| Name | Box1 | | |
| Material | "vacuu..." | | "vacuum" |
| Solve Ins... | <input checked="" type="checkbox"/> | | |
| Orientati... | Global | | |
| Model | <input checked="" type="checkbox"/> | | |
| Group | Model | | |
| Display ... | <input type="checkbox"/> | | |
| Material ... | <input type="checkbox"/> | | |
| Color | | | |
| Transpar... | 0 | | |

The Project Manager on the left shows the hierarchy: Project1* > HFSSDesign1 (DrivenModal)* > Model > Solids > copper > Cylinder1, Cylinder2 > CreateCylinder > vacuum > Box1 > CreateBox. The Component Library on the right shows various components like Antennas, Human Body, and Surface Mou. The bottom status bar shows "Ready" and a scale bar from 0 to 60 mm.

3.3 修改材質為air

ANSYS Electronics Desktop - Project1 - HFSSDesign1 - 3D Modeler - [Project1 - HFSSDesign1 - Modeler]

File Edit View Project Draw Modeler HFSS Tools Window Help

Save Cut Undo Select: Object Select by Name Paste Redo Delete Zoom Pan Rotate Orient Fit All Fit Selected Operations Measure Visibility Snap Materials

Desktop View Draw Model Simulation Results Automation

Project Manager

- Project1*
- HFSSDesign1 (DrivenModal)*
- 3D Components
- Model
- Boundaries
- Excitations
- Hybrid Regions
- Mesh Operations
- Analysis
- Optimetrics
- Results
- Port Field Display
- Field Overlays
- Radiation
- Definitions

Model

- Solids
- copper
- Cylinder1
- Cylinder2
- CreateCylinder
- vacuum
- Box1
- CreateBox
- Sheets

Component Librar

- Favorites
- Most Recently U
- HFSS Componer
- Antennas
- Human Body
- Johanson
- Rectangular
- Surface Mou

Select Definition

Materials | Material Filters

Search Parameters

Search by Name: air

Search Criteria: by Name (Selected) by Property

Relative Permittivity

Libraries: Show Project definitions Show all libraries

| Name | Location | Origin | Relative Permittivity | Relative Permeability | Bu |
|-------------------|------------|-----------|-----------------------|-----------------------|--------------|
| air | SysLibrary | Materials | 1.0006 | 1.0000004 | 0 |
| Al2_O3_ceramic | SysLibrary | Materials | 9.8 | 1 | 0 |
| Al_N | SysLibrary | Materials | 8.8 | 1 | 0 |
| alumina_92pct | SysLibrary | Materials | 9.2 | 1 | 0 |
| alumina_96pct | SysLibrary | Materials | 9.4 | 1 | 0 |
| aluminum | SysLibrary | Materials | 1 | 1.000021 | 38000000sien |
| aluminum_EC | SysLibrary | Materials | 1 | 1.000021 | 36000000sien |
| aluminum_no2_EC | SysLibrary | Materials | 1 | 1.000021 | 33000000sien |
| Arlon 25FR (tm) | SysLibrary | Materials | 3.58 | 1 | 0 |
| Arlon 25N (tm) | SysLibrary | Materials | 3.38 | 1 | 0 |
| Arlon AD1000 (tm) | SysLibrary | Materials | 10.2 | 1 | 0 |
| Arlon AD250A (tm) | SysLibrary | Materials | 2.5 | 1 | 0 |

View/Edit Materials... Add Material... Clone Material(s) Remove Material(s) Export to Library...

確定 取消 說明

Ready

Show 1 Messages Show Progress

下午 12:48 2018/10/4

3.4 在box元素上按右鍵，assign boundary: radiation 代表輻射邊界條件

ANSYS Electronics Desktop - Project1 - HFSSDesign1 - 3D Modeler - [Project1 - HFSSDesign1 - Modeler]

File Edit View Project Draw Modeler HFSS Tools Window Help

Save Cut Copy Paste Undo Redo Delete Select: Object Select by Name Zoom Rotate Orient Fit All Fit Selected Operations Measure Visibility Snap Materials

Desktop View Draw Model Simulation Results Automation

Project Manager

- Project1*
- HFSSDesign1 (DrivenModal)*
 - 3D Components
 - Model
 - Boundaries
 - Excitations
 - 1
 - Hybrid Regions
 - Mesh Operations
 - Analysis
 - Optimetrics
 - Results
 - Port Field Display
 - Field Overlays
 - Radiation
 - Definitions

Model

- Solids
 - air
 - Box1
 - CreateBox
 - copper
 - Cylinder1
 - CreateCylinder
 - Cylinder2
 - CreateCylinder
 - Sheets
 - Lumped Port
 - Coordinate Systems
 - Global
 - Planes
 - Lists

Component Librar

- Favorites
- Most Recently U
- HFSS Componen
- Antennas
- Human Body
- Johanson
- Rectangular1
- Surface Mou

Properties

| Name | Value | Unit | Evaluated Va... |
|--------------|-------------------------------------|------|-----------------|
| Name | Box1 | | |
| Material | "air" | | "air" |
| Solve Ins... | <input checked="" type="checkbox"/> | | |
| Orientati... | Global | | |
| Model | <input checked="" type="checkbox"/> | | |
| Group | Model | | |
| Display ... | <input type="checkbox"/> | | |
| Material ... | <input type="checkbox"/> | | |
| Color | | | |
| Transpar... | 0 | | |

Attribute

Next Behind B
Selection Mode >
Select Objects >
Extend Selection >
Go to History
Measure >
View >
Edit >
Group >
Create 3D Component...
Assign Material...
Create Array ...
Create Open Region ...
Update Open Region Padding...
Assign Boundary >
Assign Excitation >
Assign Hybrid >
Assign Mesh Operation >
Plot Fields >
Plot Mesh...
Plot VRT...
Copy Image

0 45 90 (ft)

下午 12:51
2018/10/4

4.1 在project manager中選analysis: add solution setup

The screenshot displays the ANSYS Electronics Desktop interface. The main window shows a 3D model of a rectangular box with a coordinate system (X, Y, Z) and a scale bar (0 to 90 mm). The Project Manager on the left shows a tree view with 'HFSSDesign1 (DrivenModal)*' selected. A context menu is open over the 'HFSSDesign1' folder, with 'Add Solution Setup...' highlighted. The Properties panel at the bottom left shows details for a selected cylinder object.

| Name | Value | Unit | Evaluated Va... |
|--------------|-------------------------------------|----------|-----------------|
| Name | Cylinde... | | |
| Material | "copper" | "copper" | |
| Solve Ins... | <input type="checkbox"/> | | |
| Orientati... | Global | | |
| Model | <input checked="" type="checkbox"/> | | |
| Group | Model | | |
| Display ... | <input type="checkbox"/> | | |
| Material ... | <input type="checkbox"/> | | |
| Color | | | |
| Transpar... | 0 | | |

Windows taskbar at the bottom shows the time as 下午 12:49 on 2018/10/4.

4.2 Solution frequency 設為3 GHz, number of pass :20 , Max Delta S: 0.02 後面兩項跟計算精確度有關

The screenshot displays the ANSYS Electronics Desktop interface for a dipole antenna simulation. The main window shows the Project Manager on the left, the Properties panel at the bottom left, and the HFSSDesign1 window on the right. The Driven Solution Setup dialog box is open in the center, showing the following settings:

- Setup Name: Setup1
- Enabled: Enabled
- Solve Ports Only: Solve Ports Only
- Adaptive Solutions:
 - Solution Frequency: Single
 - Frequency: 3 GHz
 - Maximum Number of Passes: 20
 - Maximum Delta S: 0.02
 - Use Matrix Convergence: Use Matrix Convergence

The Properties panel shows the following values for Setup1:

| Name | Value | Unit | Evaluated Va... |
|--------------|-------------------------------------|------|-----------------|
| Name | Setup1 | | |
| Enabled | <input checked="" type="checkbox"/> | | |
| Passes | 20 | | |
| Percent ... | 30 | | |
| Delta S | 0.02 | | |
| Solution ... | 3 | GHz | |
| Basis Or... | First Or... | | |
| Max Refi... | 1000000 | | |
| Use Max... | <input type="checkbox"/> | | |
| Use ABC ... | <input type="checkbox"/> | | |

The HFSSDesign1 window shows a plot of dB(S(1,1)) vs frequency (GHz). The plot shows a resonance peak at approximately 8.5 GHz. The y-axis ranges from -12.5 to 2.5, and the x-axis ranges from 7.00 to 10.00. The plot is titled "Curve Info" and shows "dB(S(1,1))" for "Setup1: Sweep".

The Message Manager at the bottom shows the following messages:

- Warning - Boundary Rad1' and Boundary Rad2' overlap. (5:44:16 下午 十月 05, 2018)
- Warning - Boundary Rad1' and Boundary Rad2' overlap. (5:44:16 下午 十月 05, 2018)
- Warning - Boundary Rad1' and Boundary Rad2' overlap. (5:44:16 下午 十月 05, 2018)
- Normal completion of simulation on server: Local Machine. (5:46:32 下午 十月 05, 2018)
- Parametric Analysis on ParametricSetup1 has been started. (5:46:32 下午 十月 05, 2018)
- A variation (\$length=50mm') has been requested using the following machines: Local Machine. (5:46:32 下午 十月 05, 2018)
- Parametric Analysis is done. (5:46:32 下午 十月 05, 2018)

4.3 Option裡面 Minimum Number of Passes 設為5

The screenshot displays the ANSYS Electronics Desktop interface for a dipole antenna simulation. The 'Driven Solution Setup' dialog box is open, showing the 'Options' tab. The 'Minimum Number of Passes' is set to 5. The background plot shows the S-parameter $dB(S(1,1))$ versus frequency (GHz), with a red curve showing a resonance peak around 8.5 GHz.

Driven Solution Setup - Options Tab

- Initial Mesh Options**
 - Do Lambda Refinement
 - Lambda: 0.3333
 - Use Default Value
 - Use Free Space Lambda
- Adaptive Options**
 - Maximum Refinement Per Pass: 30 %
 - Maximum Refinement: 1000000
 - Minimum Number of Passes: 5
 - Minimum Converged Passes: 1
- Solution Options**
 - Order of Basis Functions: First Order
 - Direct Solver
 - Relative Residual: 1e-06
 - Iterative Solver
 - Relative Residual: 0.0001
 - Domain Decomposition

Properties Panel

| Name | Value | Unit | Evaluated Va... |
|--------------|-------------------------------------|------|-----------------|
| Name | Setup1 | | |
| Enabled | <input checked="" type="checkbox"/> | | |
| Passes | | | |
| Percent ... | 30 | | |
| Delta S | 0.02 | | |
| Solution ... | 3 | GHz | |
| Basis Or... | First Or... | | |
| Max Refi... | 1000000 | | |
| Use Max... | <input type="checkbox"/> | | |
| Use ABC ... | <input type="checkbox"/> | | |

Message Manager

- Warning - Boundary Rad1' and Boundary Rad2' overlap. (5:44:16 下午 十月 05, 2018)
- Warning - Boundary Rad1' and Boundary Rad2' overlap. (5:44:16 下午 十月 05, 2018)
- Warning - Boundary Rad1' and Boundary Rad2' overlap. (5:44:16 下午 十月 05, 2018)
- Normal completion of simulation on server: Local Machine. (5:46:32 下午 十月 05, 2018)
- Parametric Analysis on ParametricSetup1 has been started. (5:46:32 下午 十月 05, 2018)
- A variation (\$length=50mm) has been requested using the following machines: Local Machine. (5:46:32 下午 十月 05, 2018)
- Parametric Analysis is done. (5:46:32 下午 十月 05, 2018)

5.1 在setup1中按右键，add frequency sweep

The screenshot displays the ANSYS Electronics Desktop interface. The main window shows a 3D model of a rectangular component on a grid. A context menu is open over the 'Setup1' entry in the Project Manager tree. The menu options include: Copy (Ctrl+C), Paste (Ctrl+V), Rename (F2), Delete, Properties..., Disable Setup, **Add Frequency Sweep...** (highlighted), Analyze, Submit Job..., Revert to Initial Mesh, Add Mesh Linked Solution Setup, Apply Mesh Operations, Clear Linked Data, Create Quick Report..., Perform FFT on Report..., Perform TDR on Report..., Profile..., Convergence..., Matrix Data, Mesh Statistics..., and Network Data Explorer... The Properties panel on the left shows details for Setup1, including Name, Enabled, Passes (6), Percent (30), Delta S (0.02), Solution (1), Basis Order (First Order), Max Refinement (100000), and Solver Type (Direct). The Component Library on the right shows various components like Antennas, Human Body, and Surface Mount. The Windows taskbar at the bottom shows the system clock as 12:52 on 2018/10/4.

| Name | Value |
|---------------|-------------------------------------|
| Name | Setup1 |
| Enabled | <input checked="" type="checkbox"/> |
| Passes | 6 |
| Percent ... | 30 |
| Delta S | 0.02 |
| Solution ... | 1 |
| Basis Or... | First Or |
| Max Refi... | 100000 |
| Use Max... | <input type="checkbox"/> |
| Use ABC ... | <input type="checkbox"/> |
| Solver Ty... | Direct |
| IE Solver ... | Auto |

5.2 Sweep type 選 fast 計算較快

ANSYS Electronics Desktop - Project1 - HFSSDesign1 - 3D Modeler - [Project1 - HFSSDesign1 - Modeler]

File Edit View Project Draw Modeler HFSS Tools Window Help

Save Cut Copy Paste Undo Redo Delete Select: Object Select by Name

Pan Rotate Orient Zoom Fit All Fit Selected

Operations Measure Visibility Snap Materials

Desktop View Draw Model Simulation Results Automation

Project Manager

- Project1*
- HFSSDesign1 (DrivenModal)*
- 3D Components
- Model
- Boundaries
- Excitations
- 1
- Hybrid Regions
- Mesh Operations
- Analysis
- Setup1
- Optimetrics
- Results
- Port Field Display
- 1
- Field Overlays
- Radiation
- Definitions

Model

- Solids
- air
- Box1
- CreateBox

Component Librar

- Favorites
- Most Recently U
- HFSS Composer
- Antennas
- Human Body
- Johanson
- Rectangular 1
- Surface Mou

Edit Frequency Sweep

General Defaults

Sweep Name: Sweep Enabled

Sweep Type: Fast

Frequency Sweeps

| | Distribution | Start | End | Points | |
|---|--------------|-------|-------|--------|-----|
| 1 | Linear Count | 1GHz | 10GHz | Points | 451 |

Add Above Add Below Delete Selection Preview ...

3D Fields Save Options

Save Fields

Save radiated fields only

Generate fields at solve time (All Frequencies)

Time Domain Calculation...

確定 取消

Properties

| Name | Value | Unit | Evaluated Va... |
|---------------|-------------------------------------|------|-----------------|
| Name | Setup1 | | |
| Enabled | <input checked="" type="checkbox"/> | | |
| Passes | 6 | | |
| Percent ... | 30 | | |
| Delta S | 0.02 | | |
| Solution ... | 1 | GHz | |
| Basis Or... | First Or... | | |
| Max Refi... | 1000000 | | |
| Use Max... | <input type="checkbox"/> | | |
| Use ABC ... | <input type="checkbox"/> | | |
| Solver Ty... | Direct ... | | |
| IE Solver ... | Auto | | |

HFSS

Ready

Show 1 Messages Show Progress

下午 12:53 2018/10/4

5.3 Sweep的範圍選擇 start :1GHz, end: 10GHz, points 100

The screenshot displays the ANSYS Electronics Desktop interface. The 'Edit Frequency Sweep' dialog box is open, showing the following configuration:

- Sweep Name: Sweep
- Sweep Type: Fast
- Frequency Sweeps [451 points defined]:

| Distribution | Start | End | Points |
|--------------|-------|-------|--------|
| Linear Count | 1GHz | 10GHz | 100 |
- 3D Fields Save Options:
 - Save Fields
 - Save radiated fields only
 - Generate fields at solve time (All Frequencies)

The Properties panel on the left shows the sweep parameters:

| Name | Value | Unit | Evaluated Va... |
|---------|-------------------------------------|------|-----------------|
| Name | Sweep | | |
| Enabled | <input checked="" type="checkbox"/> | | |
| Start | 1 | GHz | |
| Stop | 10 | GHz | |
| Count | 451 | | |
| Type | Fast | | |

The 3D model in the background shows a rectangular box with dimensions 0, 45, and 90 (mm) along the x, y, and z axes respectively. A red arrow points to the x-axis, a green arrow to the y-axis, and a blue arrow to the z-axis.

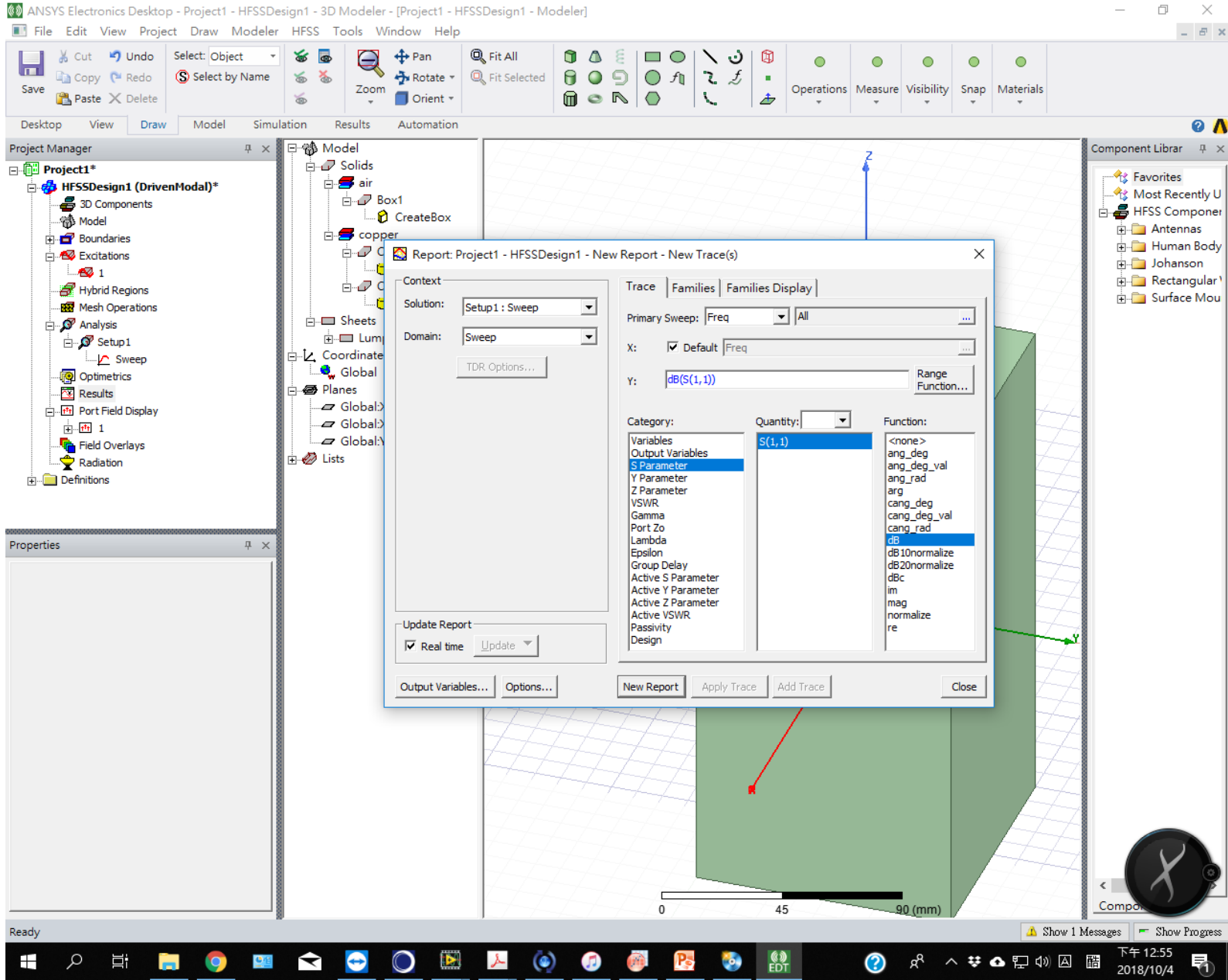
5.4 回到project manager，點result右鍵 create model solution data report: rectangular plot

The screenshot displays the ANSYS Electronics Desktop interface. The main window is titled "ANSYS Electronics Desktop - Project1 - HFSSDesign1 - 3D Modeler - [Project1 - HFSSDesign1 - Modeler]". The Project Manager on the left shows a tree structure for "Project1*" and "HFSSDesign1 (DrivenModal)*". The "Results" tab is active, and a context menu is open over the "Results" area. The menu options include:

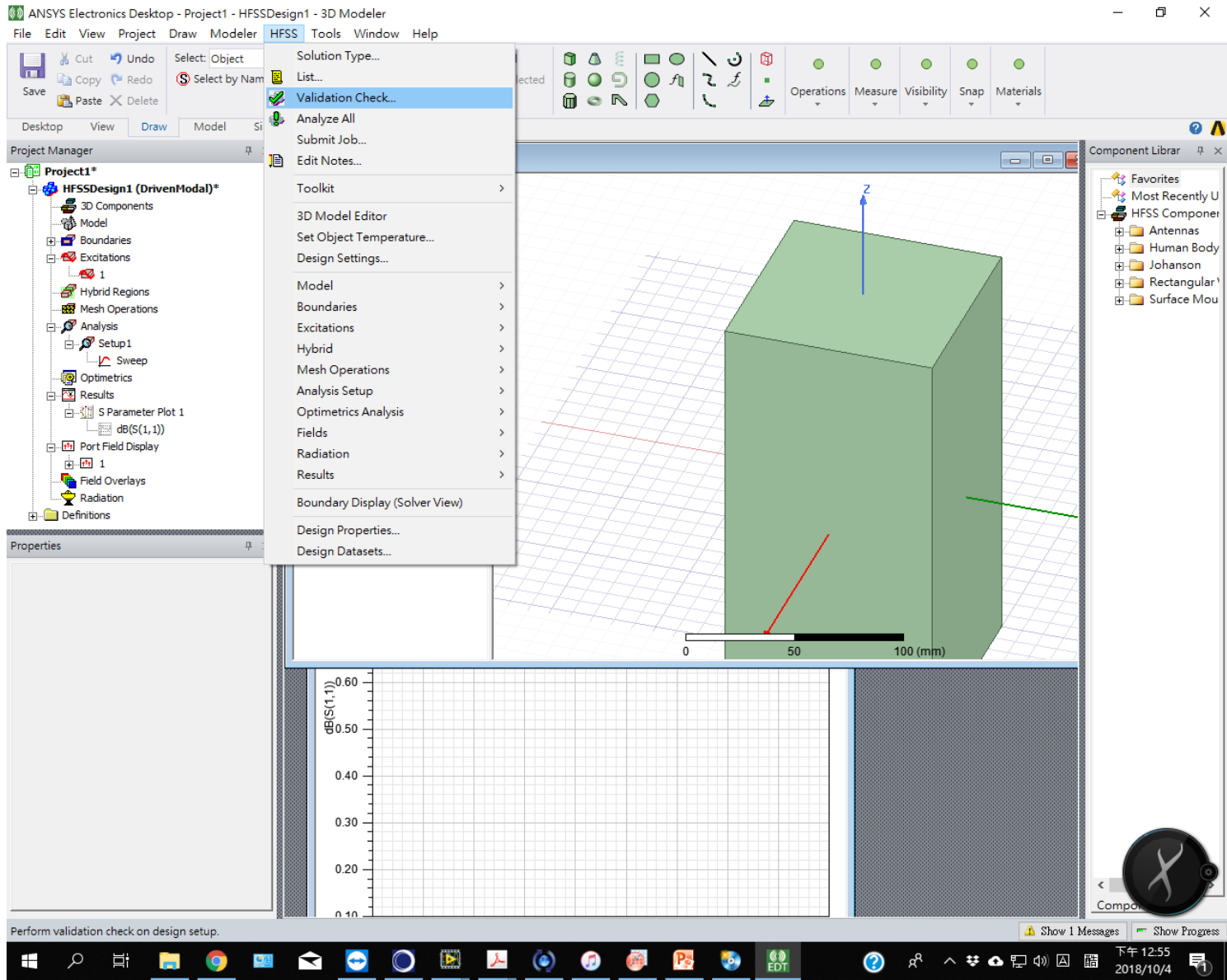
- Create Modal Solution Data Report > Rectangular Plot
- Create Fields Report > Rectangular Stacked Plot
- Create Emission Test Report > Polar Plot
- Create Report From File... > Data Table
- Delete All Reports
- Report Templates > Smith Chart
- User Defined Solutions... > 3D Rectangular Plot
- Create User Defined Solution > 3D Polar Plot
- Dataset Solutions... > Rectangular Contour Plot
- Output Variables... > Smith Contour Plot
- Link Output...
- Update All Reports
- Open All Reports
- Create Document >
- Create Quick Report...
- Perform FFT on Report ...
- Perform TDR on Report ...
- Solution Data... >
- Tune Reports ...
- Browse Solutions...
- Clean Up Solutions...
- Import Solutions...
- Apply Solved Variation...

The 3D model in the center is a green rectangular block with a coordinate system (X, Y, Z) and a scale bar at the bottom indicating 0, 45, and 90 (mm). The Component Library on the right shows various components like Antennas, Human Body, and Surface Mou.

5.5 數據內容選 S parameter: S(1,1): dB。會在右側出現空的圖形



6.1 計算前先在HFSS選單下進行 Validation check



6.2 通過模型檢查，可以進行Analyze all

ANSYS Electronics Desktop - dipole antenna - HFSSDesign1 - 3D Modeler - SOLVED - [dipole antenna - HFSSDesign1 - Modeler]

File Edit View Project Draw Modeler HFSS Tools Window Help

Save Cut Copy Paste Undo Redo Select: Object Select by Name Delete

Desktop View Draw Model Simulate

Project Manager

- dipole antenna*
- HFSSDesign1 (DrivenModal)*
- 3D Components
- Model
- Boundaries
- Excitations
- 1
- Hybrid Regions
- Mesh Operations
- Analysis
- Setup1
- Sweep
- Optimetrics
- Results
- S Parameter Plot 1
- dB(S(1,1))
- Port Field Display

Properties

| Name | Value | Unit | Evaluated Va... |
|--------------|-------------------------------------|------|-----------------|
| Name | Setup1 | | |
| Enabled | <input checked="" type="checkbox"/> | | |
| Passes | 6 | | |
| Percent ... | 30 | | |
| Delta S | 0.02 | | |
| Solution ... | 3 | GHz | |
| Basis Or... | First Or... | | |
| Max Refi... | 1000000 | | |
| Use Max... | <input type="checkbox"/> | | |
| Use ABC ... | <input type="checkbox"/> | | |

HFSS

Component Librar

- Favorites
- Most Recently U
- HFSS Componer
- Antennas
- Human Body
- Johanson
- Rectangular '
- Surface Mou

Components

0 45 90 (mm)

Message Manager

- dipole antenna (C:/Users/QDL/Documents/Ansoft/)
- HFSSDesign1 (DrivenModal)
- Solve inside' for object 'Cylinder1' is unset, due to material assignment change. (12:34:38 下午 十月 04, 2018)
- Normal completion of simulation on server: Local Machine. (12:57:35 下午 十月 04, 2018)

Simulate all optimetrics and solution setups.

Hide 2 Messages Hide Progress

下午 01:41
2018/10/4

6.3 可以把下方progress視窗打開，追蹤計算進度

The screenshot displays the ANSYS Electronics Desktop interface for a dipole antenna simulation. The main window shows a 3D model of the antenna structure on a grid, with a scale bar at the bottom indicating 0, 50, and 100 mm. The interface includes a menu bar (File, Edit, View, Project, Draw, Modeler, HFSS, Tools, Window, Help), a toolbar with various modeling and simulation tools, and several panels:

- Project Manager:** Shows the project hierarchy for 'dipole antenna*' and 'HFSSDesign1 (DrivenModal)*', including 3D Components, Model, Boundaries, Excitations, Hybrid Regions, Mesh Operations, Analysis, Setup1, Sweep, Optimetrics, Results, and S Parameter Plot 1.
- Properties:** A panel for viewing and editing object properties.
- Component Library:** A panel for selecting components from a library, including Favorites, Most Recently Used, HFSS Component, Antennas, Human Body, Johanson, Rectangular, and Surface Mount.
- Message Manager:** Displays a warning message: "Solve inside' for object 'Cylinder1' is unset, due to material assignment change. (12:34:38 下午 十月 04, 2018)".
- Progress:** A panel showing the progress of the simulation. It indicates 'dipole antenna - HFSSDesign1 - Setup1:' is solving matrix part 1 of 2, with a progress bar and a play button.

The Windows taskbar at the bottom shows the system time as 12:56 on 2018/10/4. A small circular icon with a stylized 'X' is visible in the bottom right corner of the application window.

6.4 經過一些等待。計算完成後可以打開之前的圖表看到計算結果

ANSYS Electronics Desktop - dipole antenna - HFSSDesign1 - S Parameter Plot 1 - SOLVED - [dipole antenna - HFSSDesign1 - S Parameter Plot 1]

File Edit View Project Report2D HFSS Tools Window Help

Save Cut Copy Paste Undo Redo Delete Docking Windows Layouts Zoom Zoom In Zoom Out Pan Fit All Fit Selected

Desktop View Simulation Results Automation

Project Manager

- dipole antenna*
- HFSSDesign1 (DrivenModal)*
 - 3D Components
 - Model
 - Boundaries
 - Rad1
 - Excitations
 - 1
 - Hybrid Regions
 - Mesh Operations
 - Analysis
 - Setup1
 - Optimetrics
 - ParametricSetup1
 - Results
 - S Parameter Plot 1
 - dB(S(1,1))

Properties

| Name | Value | Unit | Evaluated Va... |
|--------------|-------------------------------------|------|-----------------|
| Name | Setup1 | | |
| Enabled | <input checked="" type="checkbox"/> | | |
| Passes | 20 | | |
| Percent ... | 30 | | |
| Delta S | 0.02 | | |
| Solution ... | 3 | GHz | |
| Basis Or... | First Or... | | |
| Max Refi... | 1000000 | | |
| Use Max... | <input type="checkbox"/> | | |
| Use ABC ... | <input type="checkbox"/> | | |

HFSS

S Parameter Plot 1

HFSSDesign1

Curve Info
— dB(S(1,1))
Setup1 : Sweep

dB(S(1,1))

Freq [GHz]

Message Manager

- Warning - Boundary Rad1' and Boundary Rad2' overlap. (5:43:43 下午 十月 05, 2018)
- Warning - Boundary Rad1' and Boundary Rad2' overlap. (5:44:12 下午 十月 05, 2018)
- Warning - Boundary Rad1' and Boundary Rad2' overlap. (5:44:16 下午 十月 05, 2018)
- Normal completion of simulation on server: Local Machine. (5:46:32 下午 十月 05, 2018)
- Parametric Analysis on ParametricSetup1 has been started. (5:46:32 下午 十月 05, 2018)
- A variation (\$length=50mm) has been requested using the following machines: Local Machine. (5:46:32 下午 十月 05, 2018)
- Parametric Analysis is done. (5:46:32 下午 十月 05, 2018)

Progress

Ready

Hide 12 Messages Hide Progress x 5.5809 Y1 -0.2997

下午 06:02
2018/10/5