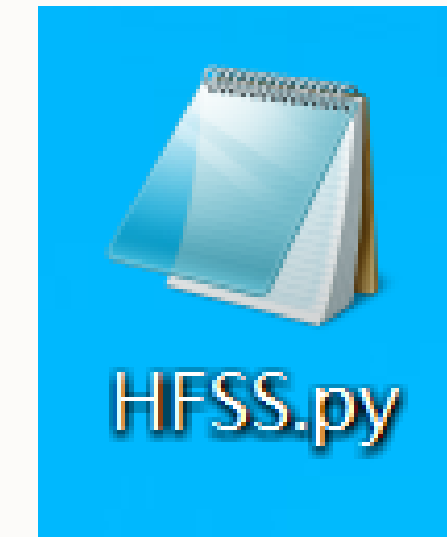


# Python-HFSS API

## Week 03\_ HFSS python库函数

- 函数库的导入
- 基本函数
- 库函数的扩展

## ➤ HFSS.py file



- HFSS.py 为定义的HFSS python库函数
- HFSS 内包含了一个名为HFSS的类（class）以及相关的HFSS 函数（functions）

```
from win32com import client
import os
import re

class HFSS:

#####
# Launch ANSYS Electronics Desktop
#####
    def init(self):

    def launch(self):

    def openProject(self, Path, Projectname):

    def openProjectwithdesign(self, Path, Proje

    def activeDesign(self, Designname) :
```

```
#####
#Command of project
# Example:
#     result_path = r'C:\Users\cyang58\Desktop\Python for HFSS\Result'
#     Filename='Complex E field.fld'
#     exportField('ComplexMag_E', result_path, Filename)
#
#####
def saveProjectdefault(self):

def saveProject(self, result_path, file_name):

def closeProject(self):

def closeAnsysapp(self):
```

## ➤ Import HFSS.py

- 导入同级模块（在同一个文件夹中的.py文件）

main.py import HFSS.py 内的 class HFSS

*from HFSS import HFSS*

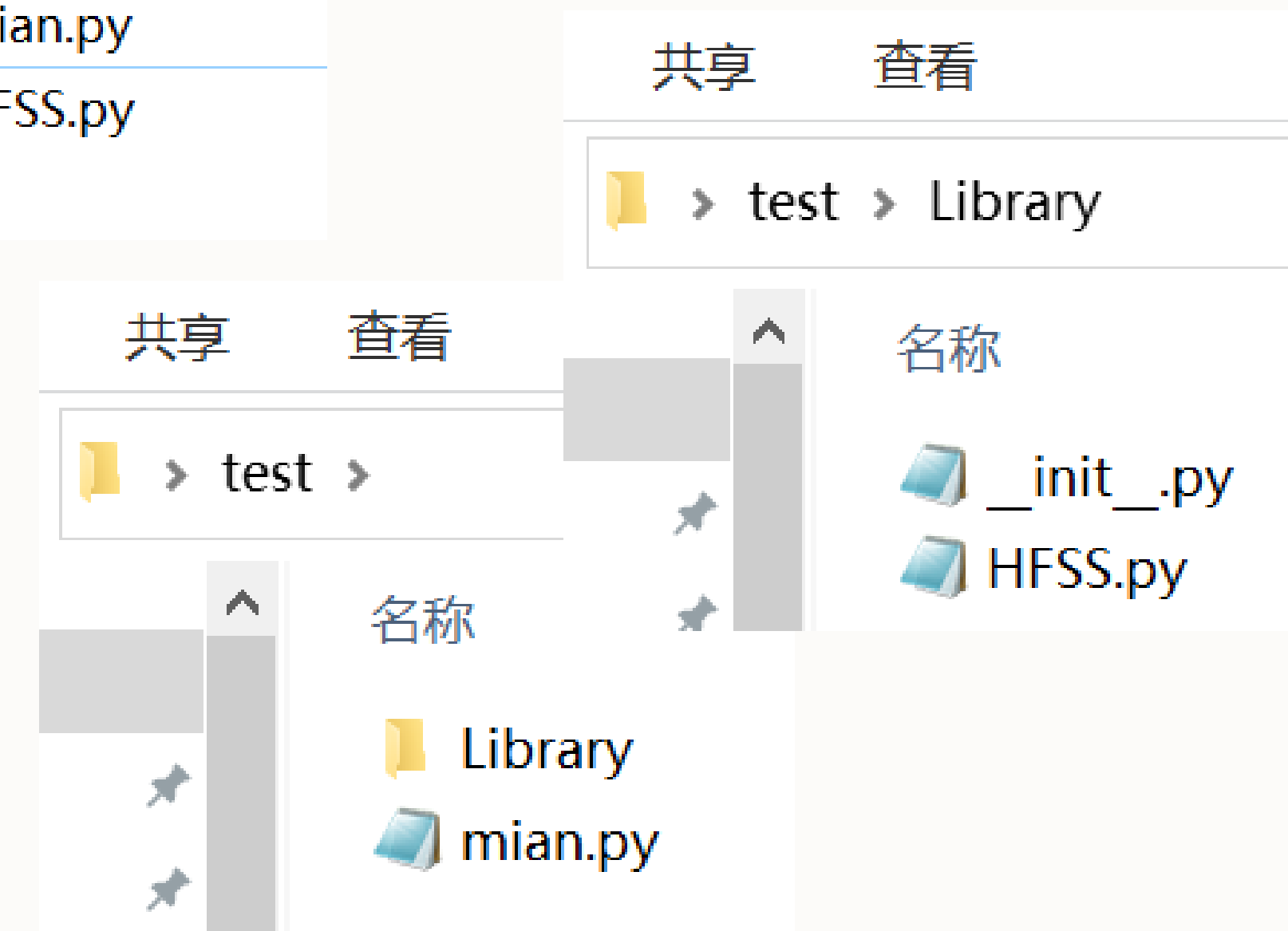
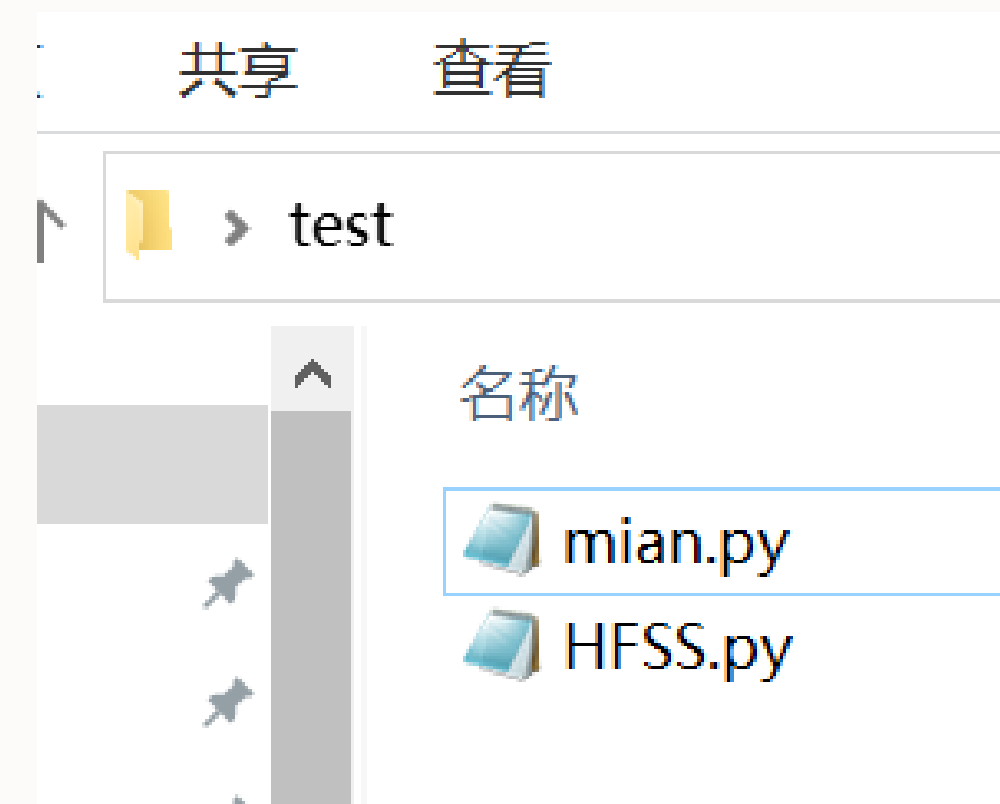
- 导入下级模块（在下级文件夹中的.py文件）

main.py import Library文件夹下 HFSS.py 内的 class HFSS

*from Library.HFSS import HFSS*

## ➤ class HFSS instance（实例化）

*h = HFSS()*



### ➤ Connect Python with Ansys HFSS

- Create a new .aedt file (**new project and design**)

*h.launch()*

- Open an exist .aedt file (**exist project and design**)

*h.openProject(hfss\_file\_dir, hfss\_file\_name)*

*h.openProjectwithdesign(hfss\_file\_dir, hfss\_project\_name, hfss\_design\_name)*

- Link to active .aedt file (opened project and design)

*h.init()*

- Active another design in the same .aedt file (**opened project and design**)

*h.activeDesign(hfss\_design\_name)*

### ➤ Connect Python with Ansys HFSS

- Create a new .aedt file (**new project and design**)

*h.launch()*

- Open an exist .aedt file (**exist project and design**)

*h.openProject(hfss\_file\_dir, hfss\_file\_name)*

*h.openProjectwithdesign(hfss\_file\_dir, hfss\_project\_name, hfss\_design\_name)*

- Link to active .aedt file (opened project and design)

*h.init()*

- Active another design in the same .aedt file (**opened project and design**)

*h.activeDesign(hfss\_design\_name)*

### ➤ For Variables

- **Set new variables**

*h.setVariable(name, value, unit)*

*Example: h.setVariable('Period', 3, 'mm'); h.setVariable('Segenment', 6, ''); h.setVariable('Phase', 10, 'deg');*

*h.setVariable('Boundary\_phase', '360/Segenment', 'deg')*

- **Change the variable value**

*h.setVariable(name, value, unit)*

*Example: h.changeVariablevalue('Period', '2.5', 'mm')*

- **Get variables value from HFSS (return a string)**

*h.getVariablevalue(name)*

*Example: h.getVariablevalue('Period')*



### ➤ For Material

- Add new material and change material...

**Noted: Loss\_tan is set as 2.4 GHz**

*h.addMaterial(name, DK, loss\_tan)*

*h.addMaterial(object, material)*

*Example:*

*h.addMaterial('DK10', 10, 0.0032)*

*h.changeMaterial('Cylinder1', 'DK10')*



### ➤ For basic shape

- Create box, Cylinder, Polyprism, Sphere, Regularpolyhedron, Rectangular, Circle...

**Noted: Material: 'defined material'**

*Example:*

*h.createBox('0mm','0mm','0mm','10mm','20mm','30mm', 'DR', 'DK10')*

*h.createCylinder('0mm','0mm','0mm','3mm','3mm','Z','Cylinder1','vacuum')*

*h.createRegularpolyhedron('0mm','0mm','0mm','3mm','3mm','0mm','300mm',7,'Z','Cylinder10','vacuum')*

#####

```
def createBox(self,
```

```
def createCylinder(s
```

```
def createPolyprism(
```

```
def createSphere(sel
```

```
def createRegularpol
```

```
def createSpherenonm
```

```
def createRectangle(
```

```
def createCircle(sel
```

### ➤ For Basic model operation

- **Basic model operation... copy, unite, subtract, insert, connect, move, rotate, mirror, duplicate move, duplicate rotate, duplicate mirror**

*Example:*

*h.copy('Cylinder1 '); h.connect( 'Cylinder1','Cylinder2 ');*

*h.unitef('Cylinder1','Cylinder2 '); h.unitet('Cylinder1','Cylinder2 ');*

*h.subtractf('Cylinder1','Cylinder2'); h. subtractt('Cylinder1','Cylinder2 ');*

*h.intersectf('Cylinder1','Cylinder2 '); h. intersectt('Cylinder1','Cylinder2 ');*

*h.rotate('Cylinder1','Z','30deg '); h.move('Cylinder1','10mm','30mm','20mm ',);*

*h.mirror('Cylinder1','10mm','30mm','20mm','0mm','1mm','0mm ')*

*h.duplicateRotate('Cylinder1','Z','30deg',3)*

*h.duplicateMove('Cylinder1','10mm','0mm','0mm',6)*

*h.duplicateMirror('Cylinder1','0mm','0mm','0mm','0mm','0mm','1mm')*

### ➤ For analysis setup

- **Set an analysis setup**

*h.insertSetup(Setupname, Centerfrequency)*

*Example: h.insertSetup('Setup1', '3.5GHz')*

- **Set a Sweep analysis** (Sweep\_type: 'Discrete' 'Fast' 'Interpolating' )

*h.insertFrequencysweep(Setupname, Minfrequency, Maxfrequency, Step, Sweep\_type)*

*Example: insertFrequencysweep('Setup1', '6GHz', '20GHz', '100MHz', 'Fast')*

- **Solve an analysis setup**

*h.solve(Setupname)*

*Example: h.solve('Setup1')*

### ➤ For project

- **Save the .aedt file**

*h.saveProject(result\_path, file\_name)*

*Example: h. saveProject(r'C:\Users\cyang58\Desktop\Python for HFSS\Result',  
'Hfssproject1')*

- **Close the current project**

*h.closeProject()*

*Example: h.closeProject()*

### ➤ For model view

*h.fitAll( )*

*Example: h.fitAll()*

### ➤ Get face ID for assign port

*h.getFacebyposition(Object, Xposition, Yposition, Zposition)*

*Example: h.getFacebyposition('Port','Monopole\_position','0mm','-' + Feed\_height')*

### ➤ Assign Excitation: Wave port, Floquet port, Lumped port

*h.assignWaveport(FaceID, Startx, Starty, Startz, Endx, Endy, Endz)*

*Example: h.assignWaveport(face\_id, Monopole\_po, '0mm', '+' + Feed\_he, Monopole\_po, '3mm', '-' + Feed\_he)*

### ➤ Create air box (region) and Set region as radiation boundary

*h.createRegion(Var\_region)*

*h.assignRadiationRegion( )*

*Example: h.createRegion('40mm')*

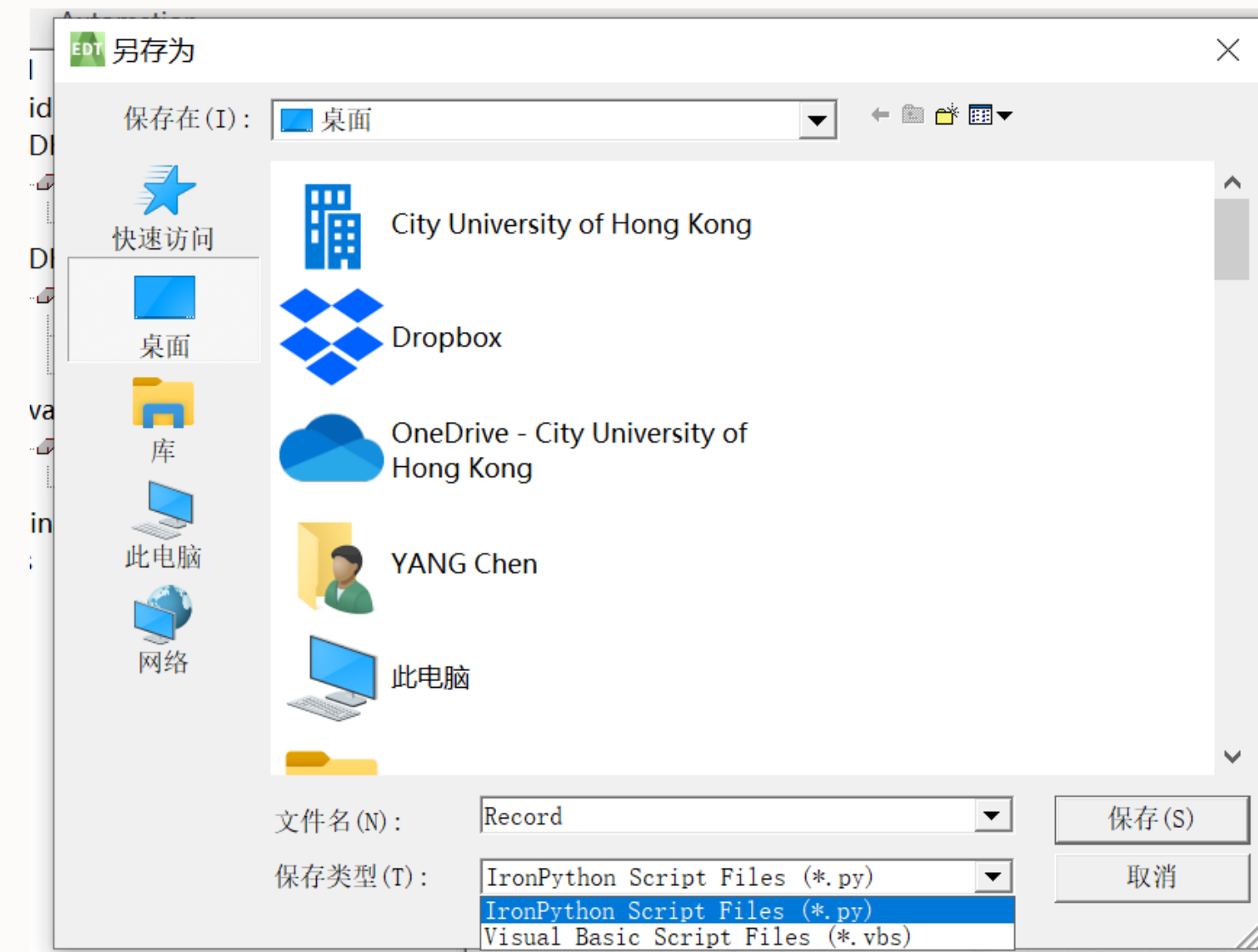
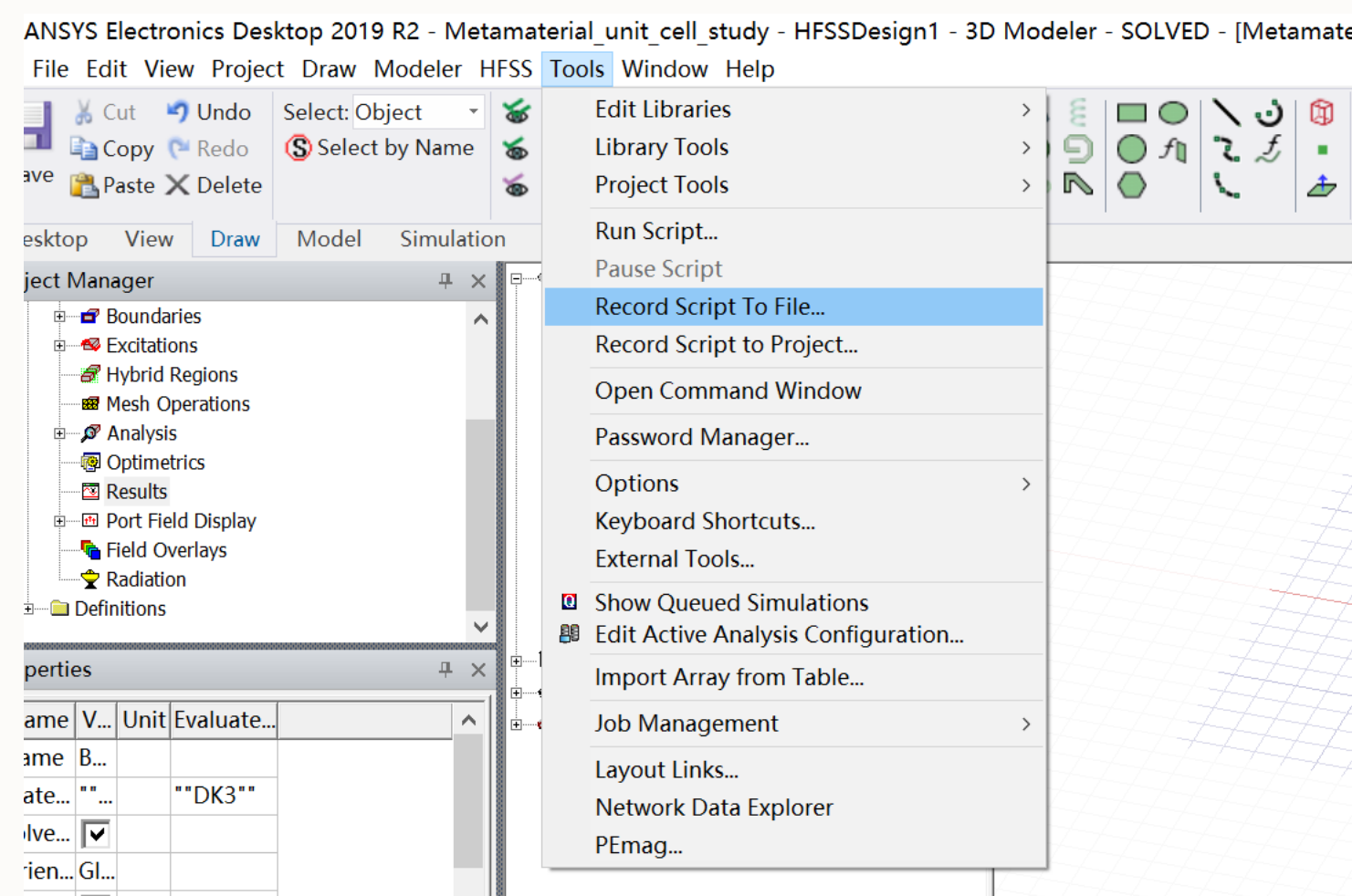
*h.assignRadiationRegion()*



## 03 库函数的扩展

### ➤ Add new function for HFSS.py

HFSS支持脚本控制，可将操作录制为一段脚本，便于自动化运行以及实现较为复杂的建模功能，该功能位于Tools——Record Script File中，支持vbs和python两种格式(这里我们统一使用python)



### ➤ Record.py

*Example: Set a variable named 'Start' with value of '2021 mm'*



```
import ScriptEnv
ScriptEnv.Initialize("Ansoft.ElectronicsDesktop")
oDesktop.RestoreWindow()
oProject = oDesktop.SetActiveProject("Metamaterial_unit_cell_study")
oDesign = oProject.SetActiveDesign("HFSSDesign1")
oDesign.ChangeProperty(
    [ "NAME:AllTabs",
      [ "NAME:LocalVariableTab",
        ["NAME:PropServers",
          "LocalVariables"],
        ["NAME:NewProps",
          [ "NAME:Start",
            "PropType:=", "VariableProp",
            "UserDef:=", True,
            "Value:=", "2021mm"
          ]
        ]
      ]
    ]
)
```



### ➤ From Record.py to Function in HFSS.py

```
oDesign.ChangeProperty(  
    [ "NAME:AllTabs",  
      [ "NAME:LocalVariableTab",  
        ["NAME:PropServers",  
         "LocalVariables"],  
        ["NAME:NewProps",  
         [ "NAME:Start",  
           "PropType:=", "VariableProp",  
           "UserDef:=", True,  
           "Value:=", "2021mm"  
         ]  
        ]  
      ]  
    ]  
)
```

```
def setVariable(self, Var_name, Var_value, unit):  
    Self.oDesign.ChangeProperty(  
        [ "NAME:AllTabs",  
          [ "NAME:LocalVariableTab",  
            ["NAME:PropServers",  
             "LocalVariables"],  
            ["NAME:NewProps",  
             [ "NAME:" + Var_name,  
               "PropType:=", "VariableProp",  
               "UserDef:=", True,  
               "Value:=", str(Var_value)+' '+ unit ]  
             ]  
            ]  
          ]  
        ]  
    )
```

*h.setVariable(name, value, unit)*

*Example: h.setVariable('Period', 3, 'mm');*



This program is writing for Ansys HFSS software. It possesses three parts including the basic software operations, advanced data post-process, and optimization algorithms. Maybe it will also have some GUI design and others.

This is the first part ---Class HFSS, which mainly includes the basic software operations. To make it easier to use these functions, there are examples for each function.

**Hope you will have a pleasant experience!**

The program starts from 18th NOV. 2020 at City University of HK. Here we have a group of partners (Chen Yang, Ting Li, Zhiyi Zhang, and Zhili Su) with the guidance of Dr. Lu Kai, Hope we can complete this huge project. Best regards to us. If you have any questions, please email to

[Chen.Yang@my.cityu.edu.hk](mailto:Chen.Yang@my.cityu.edu.hk)

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