整合至自偏壓收發機模組的透明基材天線

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組員：李俊毅 107360707
游鎮遠 107360734
李彥霖 107360741

目錄

- 專題簡介
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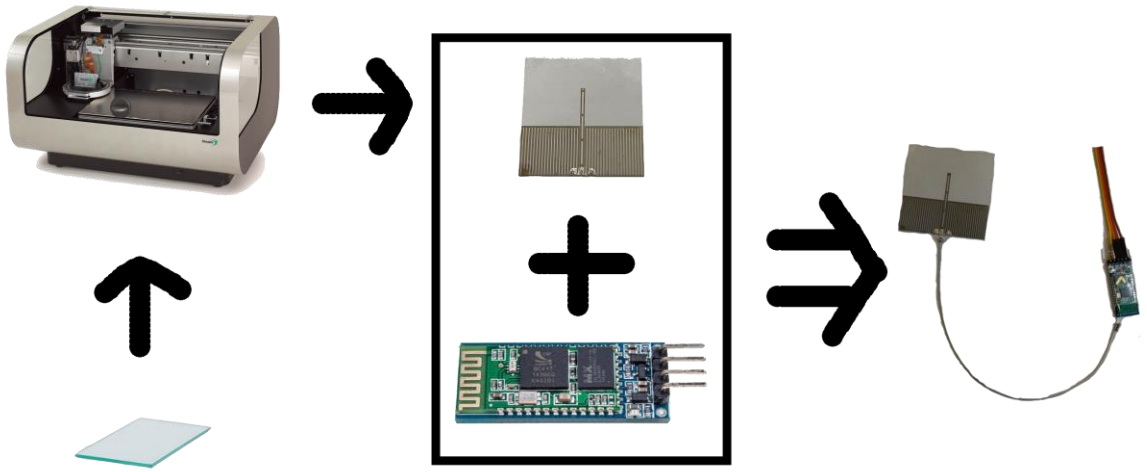
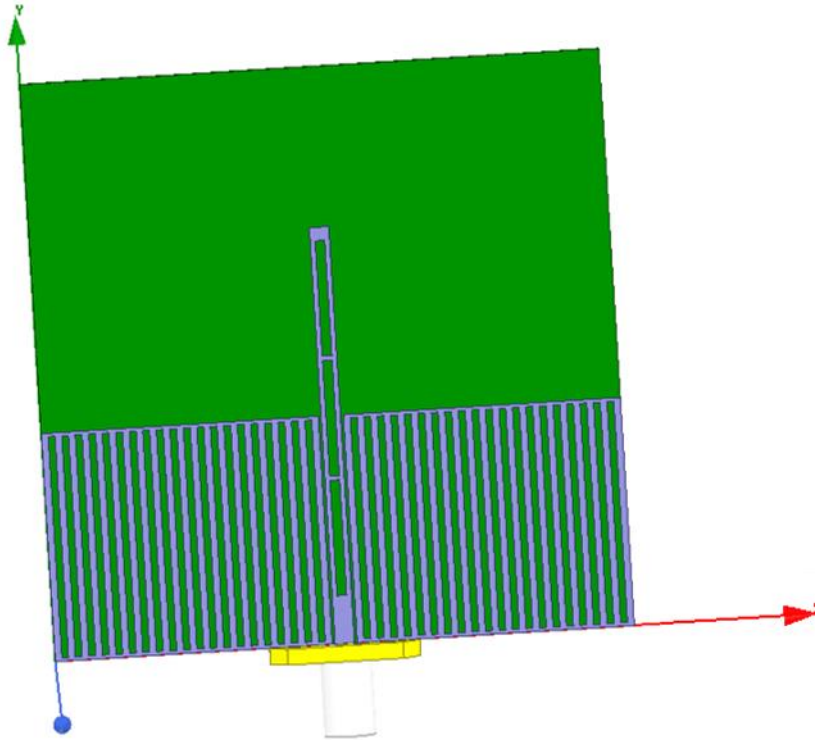
- 結論與展望
- 組員分工與貢獻度
- 參考資料

專題簡介

- Monopole 天線外型
- 透光天線
- 透明基板
- 奈米噴印
- 太陽能板
- 藍牙模組
- 自偏壓之收發機模組



研究方法 - HFSS 模擬



傳統 Monopole 天線外型為基礎
於導體中取出透光間距

玻璃基板厚度：0.3mm
介電係數：6.4
介電損耗：0.012

導體：奈米銀
饋入方式：SMA接頭

ANSYS Electronics Desktop - Project8 big hole1 - HFSSDesign2 - 3D Modeler - SOLVED - [Project8 big hole1 - HFSSDesign2 - Modeler]

File Edit View Project Draw Modeler HFSS Tools Window Help

Local | XY | 3D | vacuum | Model

Project Manager

- Project8 big hole1
  - HFSSDesign2 (DrivenMod
  - HFSSDesign3 (DrivenModal)
  - Definitions

Model
- Coordinate Systems
- Planes
- Lists

Properties

Name	Va...	Unit	Evaluate

Variables

Component ...
- Favorites
- Most Recentl
- HFSS Compc
  - Antennas
  - Human Bc
  - Rectangul
  - Surface M

Components

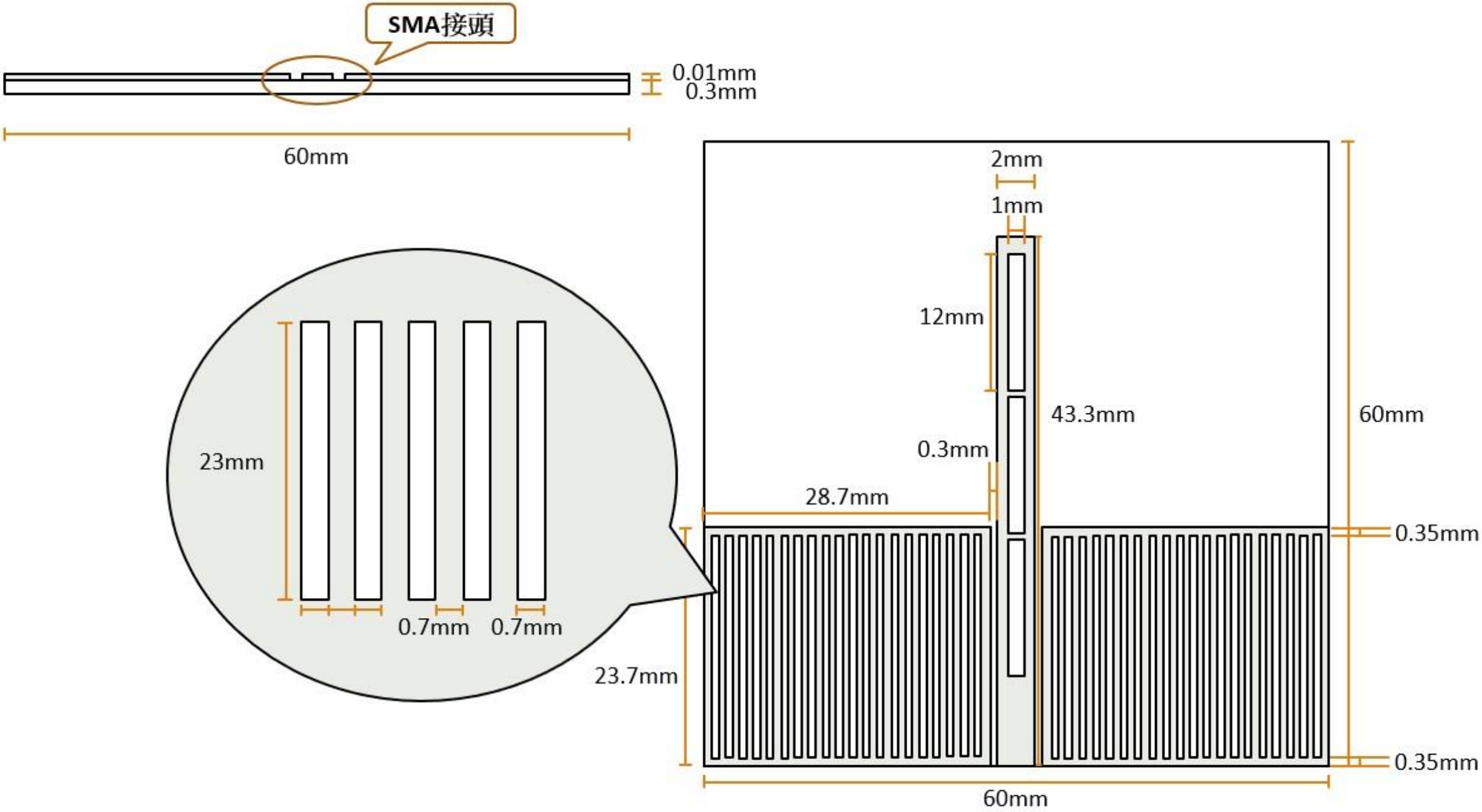
Message Manager

Progress

Ready

Hide 0 Messages | Hide Progress

下午 02:38
2021/5/5


SMA接頭
0.01mm
0.3mm
60mm
2mm
1mm
12mm
43.3mm
60mm
0.3mm
28.7mm
0.35mm
23mm
0.7mm
0.7mm
23.7mm
0.35mm
60mm

ANSYS Electronics Desktop - Project8 big hole - HFSSDesign1 - S parameter - SOLVED - [Project8 big hole - HFSSDesign1 - S parameter]

File Edit View Project Report2D HFSS Tools Window Help

Local

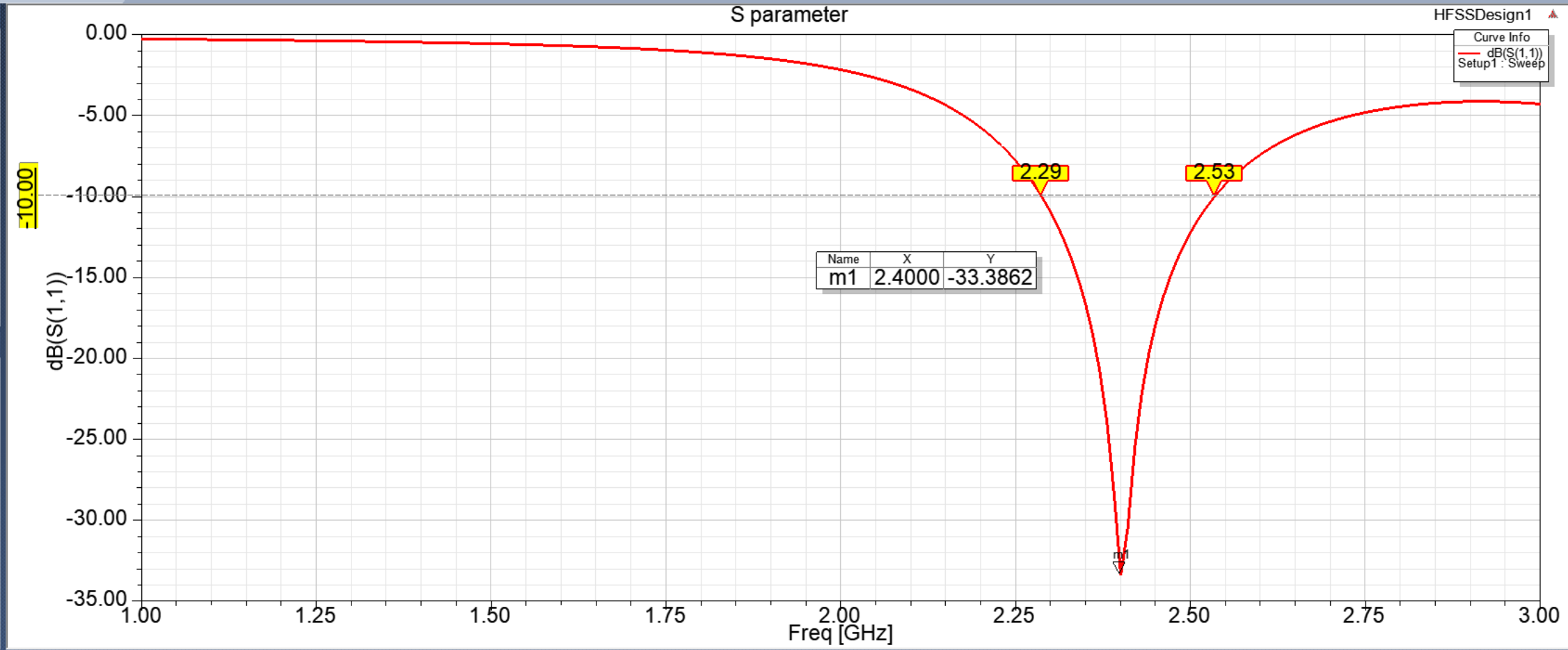
Project Manager

- Mesh Operations
- Analysis
- Optimetrics
- Results
  - **S parameter**
  - Radiation Pattern 2
  - Radiation Pattern 3
  - Radiation Pattern 4
  - XY Plot 2
  - Smith Chart 1
  - 3D Polar Plot 1
  - Radiation Pattern 5
  - Radiation Pattern 6
  - Radiation Pattern 7
- Port Field Display

Properties

Name	Va...	Unit	Evalu
--Global			
Show ...	☐		
Snap	☐		
--Y Ma...			
Show ...	☑		
DelY Li...			
DelY Li...	So...		
DelY Li...	1		
DelY F...	Fo...		

Y Marker | Cartesian | G



Message Manager

Progress

Ready

Hide 0 Messages | Hide Progress | X | 1.3198 | Y1 | -5.6230

下午 02:41
2021/5/5

ANSYS Electronics Desktop - Project8 big hole - HFSSDesign1 - Impedance - SOLVED - [Project8 big hole - HFSSDesign1 - Impedance]

File Edit View Project Report2D HFSS Tools Window Help

Local

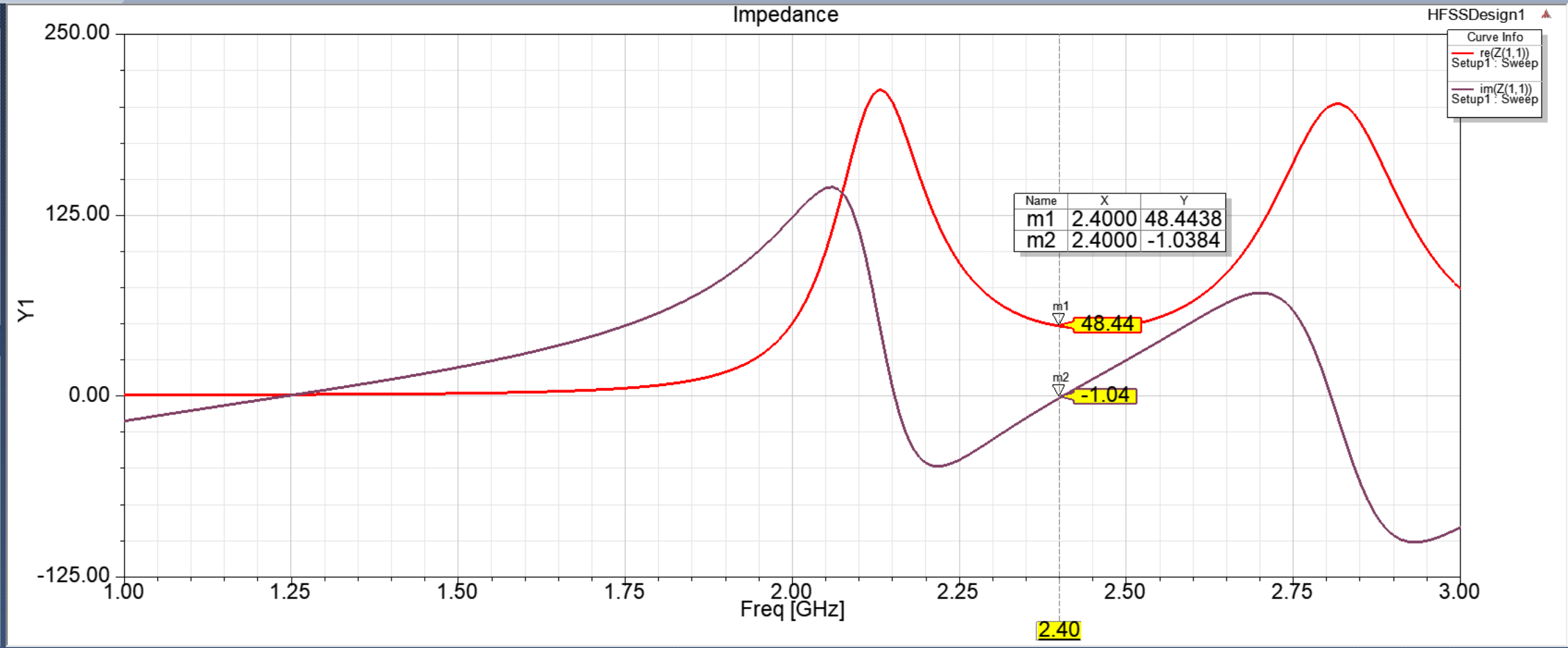
Project Manager

- Mesh Operations
- Analysis
- Optimetrics
- Results
  - S parameter
  - Radiation Pattern 2
  - Radiation Pattern 3
  - Radiation Pattern 4
  - Impedance
    - re(Z(1,1))
    - im(Z(1,1))
  - Smith Chart
  - 3D Polar Plot 1
  - Radiation Pattern 5
  - Radiation Pattern 6

Properties

Name	Value
Name	Impedance
Report ...	Modal Solution ...
Display...	Rectangular Plot
re(Z(1,...	Freq ,re(Z(1,1))
im(Z(1,...	Freq ,im(Z(1,1))

Report



Message Manager

Progress

Ready

Hide 0 Messages | Hide Progress | X | 1.3402 | Y1 | 250.0000

下午 02:58
2021/5/5

ANSYS Electronics Desktop - Project8 big hole - HFSSDesign1 - Smith Chart - SOLVED - [Project8 big hole - HFSSDesign1 - Smith Chart]

File Edit View Project Report2D HFSS Tools Window Help

Local

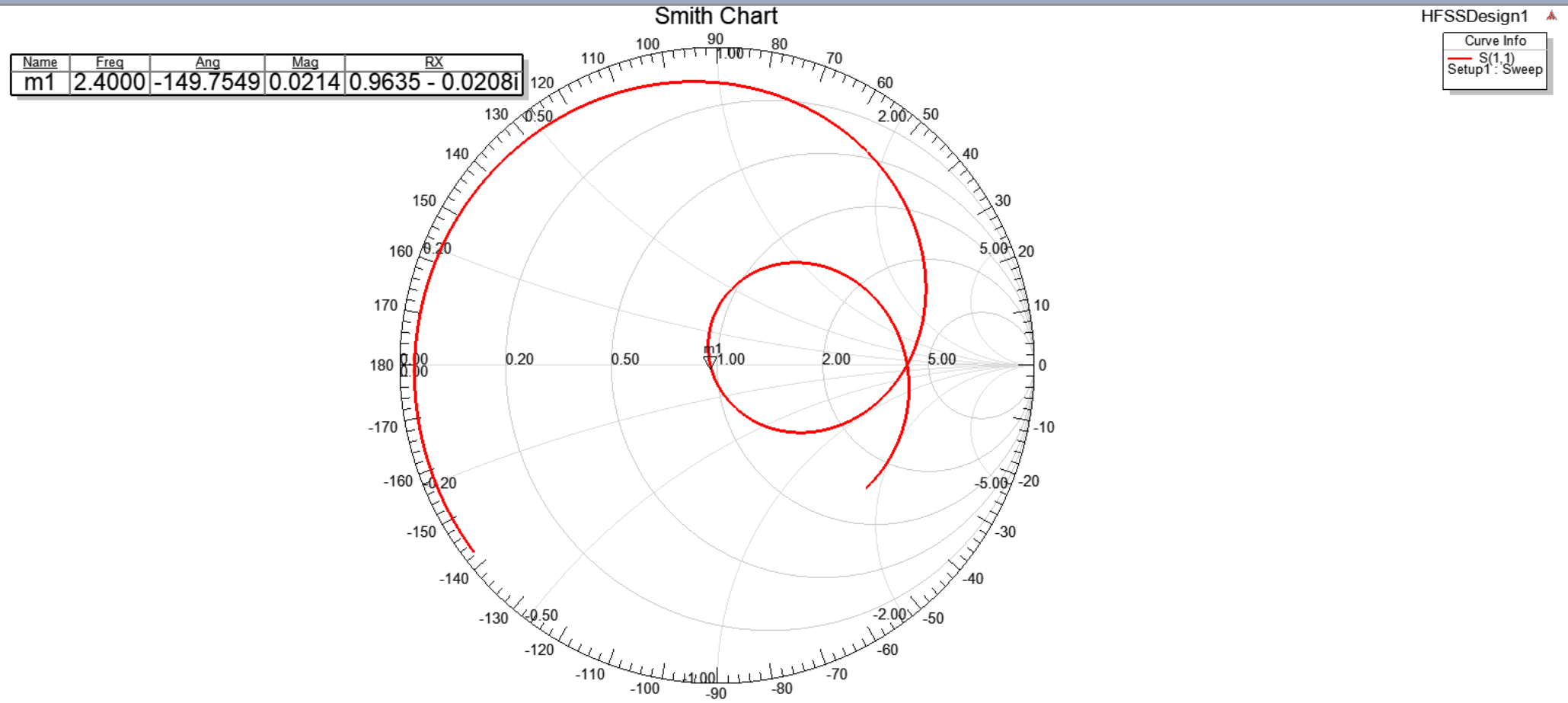
Project Manager

- Mesh Operations
- Analysis
- Optimetrics
- Results
  - S parameter
  - Radiation Pattern 2
  - Radiation Pattern 3
  - Radiation Pattern 4
  - XY Plot 2
  - **Smith Chart**
  - 3D Polar Plot 1
  - Radiation Pattern 5
  - Radiation Pattern 6
  - Radiation Pattern 7
- Port Field Display

Properties

Name	Value
Name	Smith Chart
Report ...	Modal Solution ...
Display...	Smith Chart
S(1,1)	S(1,1)

Report



Message Manager

Progress

Ready

Hide 0 Messages | Hide Progress | Ang 168.5970 | Mag 2.1122 | RX -0.3605 + 0.0870i | Q 0.2413 | VSW 2.7982

下午 02:42
2021/5/5

ANSYS Electronics Desktop - Project8 big hole1 - HFSSDesign2 - XY plane - SOLVED - [Project8 big hole1 - HFSSDesign2 - XY plane]

File Edit View Project Report2D HFSS Tools Window Help

Local

Project Manager

- Radiation Pattern 16
- Radiation Pattern 17
- Radiation Pattern 18
- Radiation Pattern 19
- Radiation Pattern 20
- Radiation Pattern 21
- Radiation Pattern 22
- Radiation Pattern 23
- 3D Polar Plot 3
- **XY plane**
  - dB(RealizedGainPhi)
  - dB(RealizedGainThet
- Radiation Pattern YZ
- Radiation Pattern XZ
- Port Field Display

Properties

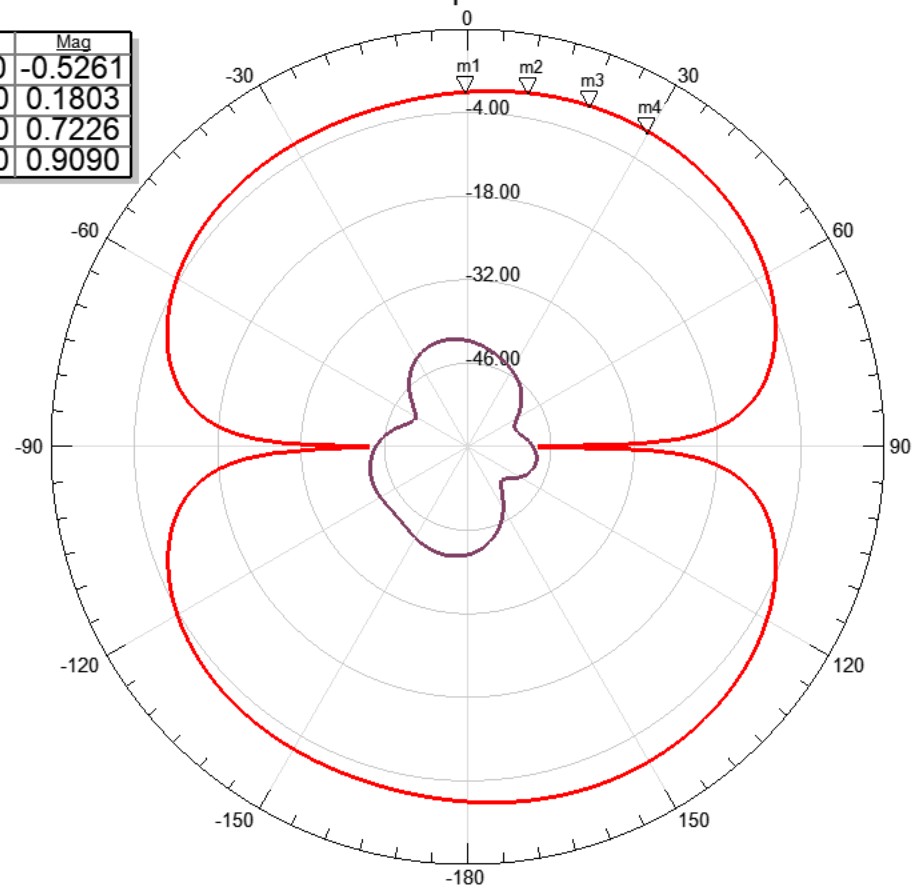
Name	Value
Show ...	✔
Font	Font
Back C...	
Border...	
Border...	1
Grid C...	
Grid Li...	1

Marker Table | Radiatio

XY plane

HFSSDesign2

Name	Phi	Ang	Mag
m1	360.0000	-0.0000	-0.5261
m2	10.0000	10.0000	0.1803
m3	20.0000	20.0000	0.7226
m4	30.0000	30.0000	0.9090



Curve Info

dB(RealizedGainPhi)
Setup1 : Sweep
Freq='2.4GHz' Theta='90deg'

dB(RealizedGainTheta)
Setup1 : Sweep
Freq='2.4GHz' Theta='90deg'

Message Manager

Progress

Ready

Hide 0 Messages | Hide Progress | Ang 67.0612 | Mag 77.6478

下午 04:45
2021/5/10

ANSYS Electronics Desktop - Project8 big hole1 - HFSSDesign2 - YZ plane - SOLVED - [Project8 big hole1 - HFSSDesign2 - YZ plane]

File Edit View Project Report2D HFSS Tools Window Help

Local

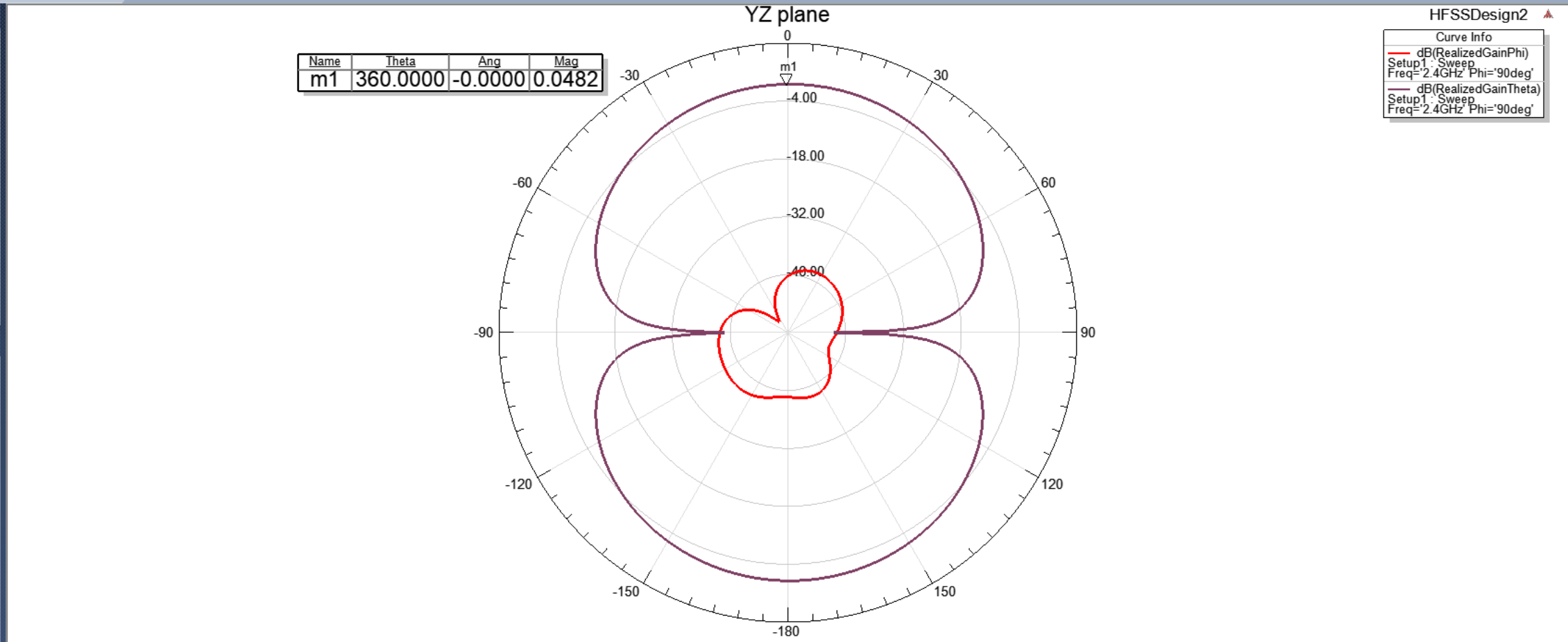
Project Manager

- Radiation Pattern 21
- Radiation Pattern 22
- Radiation Pattern 23
- 3D Polar Plot 3
- XY plane
  - dB(RealizedGainPhi)
  - dB(RealizedGainTheta)
- **YZ plane**
  - dB(RealizedGainPhi)
  - dB(RealizedGainTheta)
- Port Field Display
- Field Overlays
- Radiation
- HFSSDesign3 (DrivenModal)
- Definitions

Properties

Name	Value
Show ...	☑
Font	Font
Back C...	
Border...	
Border...	1
Grid C...	
Grid Li...	1

Marker Table | Radiatio



Message Manager

Progress

1 items selected.

Hide 0 Messages | Hide Progress | Ang -63.3224 | Mag 93.9170

下午 02:50
2021/5/5

ANSYS Electronics Desktop - Project8 big hole1 - HFSSDesign2 - XZ plane - SOLVED - [Project8 big hole1 - HFSSDesign2 - XZ plane]

File Edit View Project Report2D HFSS Tools Window Help

Local

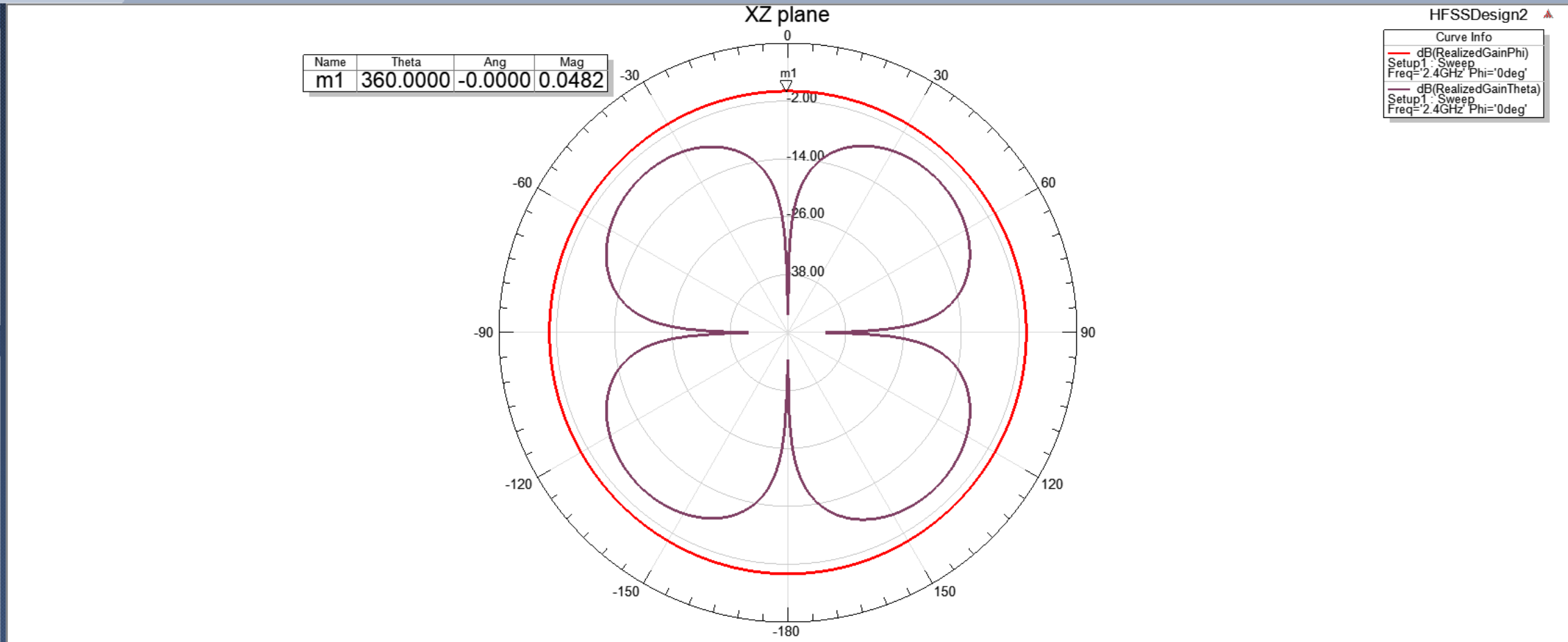
Project Manager

- Radiation Pattern 19
- Radiation Pattern 20
- Radiation Pattern 21
- Radiation Pattern 22
- Radiation Pattern 23
- 3D Polar Plot 3
- Radiation Pattern XY
- Radiation Pattern YZ
- **XZ plane**
  - dB(RealizedGainPhi)
  - dB(RealizedGainTheta)
- Port Field Display
- Field Overlays
- Radiation
- HFSSDesign3 (DrivenModal)

Properties

Name	Value
Show ...	☑
Show ...	☑

Radiation Pattern | General



Message Manager

Progress

0 items selected.

Hide 0 Messages | Hide Progress | Ang -72.8547 | Mag 50.6256

下午 04:40
2021/5/10

ANSYS Electronics Desktop - Project8 big hole1 - HFSSDesign2 - 3D Polar Plot - SOLVED - [Project8 big hole1 - HFSSDesign2 - 3D Polar Plot]

File Edit View Project Report3D HFSS Tools Window Help

Local

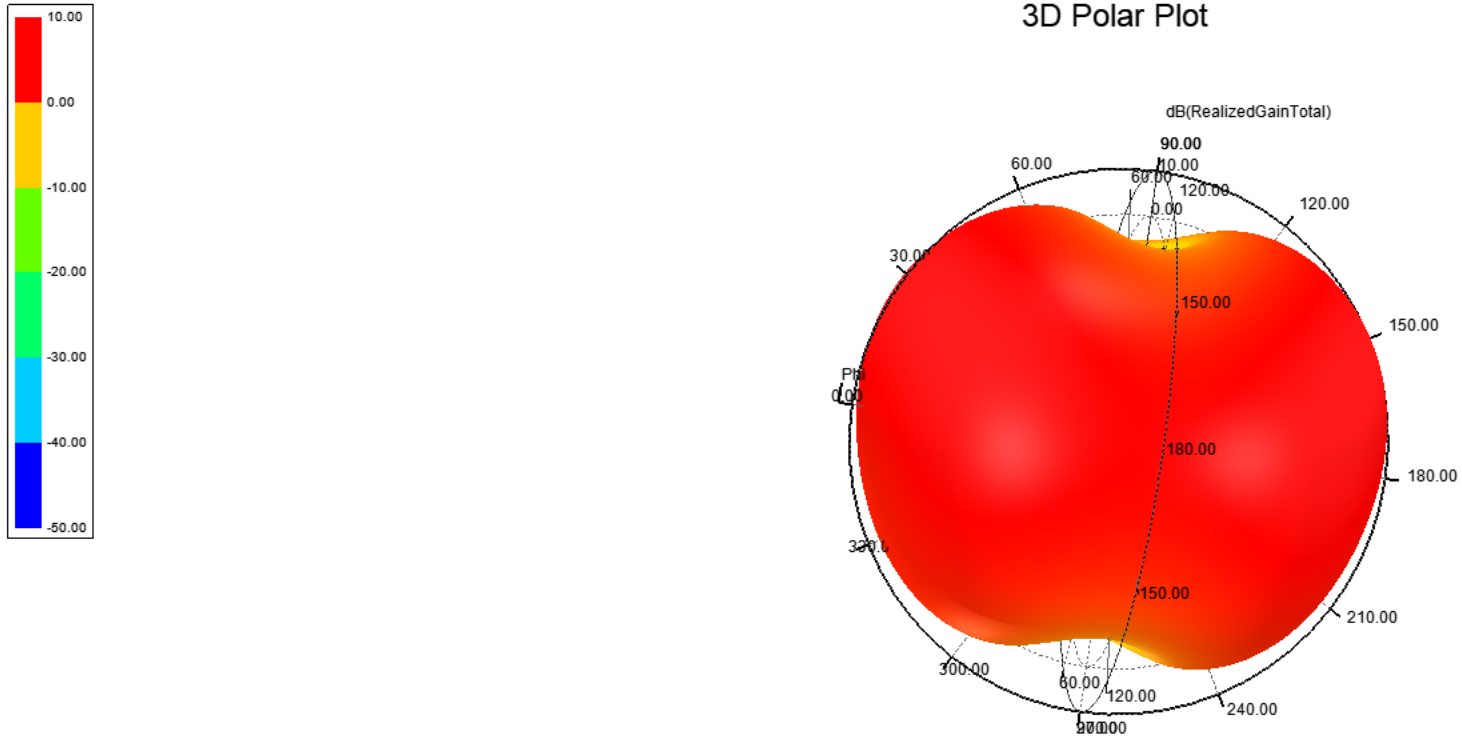
Project Manager

- Radiation Pattern 14
- Radiation Pattern 15
- Radiation Pattern 16
- Radiation Pattern 17
- Radiation Pattern 18
- Radiation Pattern 19
- Radiation Pattern 20
- Radiation Pattern 21
- Radiation Pattern 22
- Radiation Pattern 23
- **3D Polar Plot**
- XY plane
  - dB(RealizedGainPhi)
  - dB(RealizedGainTheta)
- YZ plane

Properties

Name	Va...	Unit	Evalu
Axis Co...			
Axis Fo...	Fo...		
Specify...			
Name	Phi		
Display...	✔		
Show ...	✔		
Show T...	✔		
--Scali...			
Specify...			

Axis Phi



Message Manager

Progress

Ready

Hide 0 Messages | Hide Progress

下午 02:55
2021/5/5

ANSYS Electronics Desktop - Project1 - HFSSDesign2 - Radiation Efficiency - SOLVED - [Project1 - HFSSDesign2 - Radiation Efficiency]

File Edit View Project Report2D HFSS Tools Window Help

Local

Project Manager

- Project1
  - HFSSDesign2 (Driven
    - 3D Components
    - Model
    - Boundaries
    - Excitations
    - Hybrid Regions
    - Mesh Operations
    - Analysis
    - Optimetrics
    - Results
      - Radiation Effici
    - Port Field Display
    - Field Overlays
    - Radiation

Properties

Name	Value
Name	Radiation Efficie...
Report ...	Far Fields
Display...	Rectangular Plot
Radiati...	Freq ,RadiationE...

Report

Message Manager

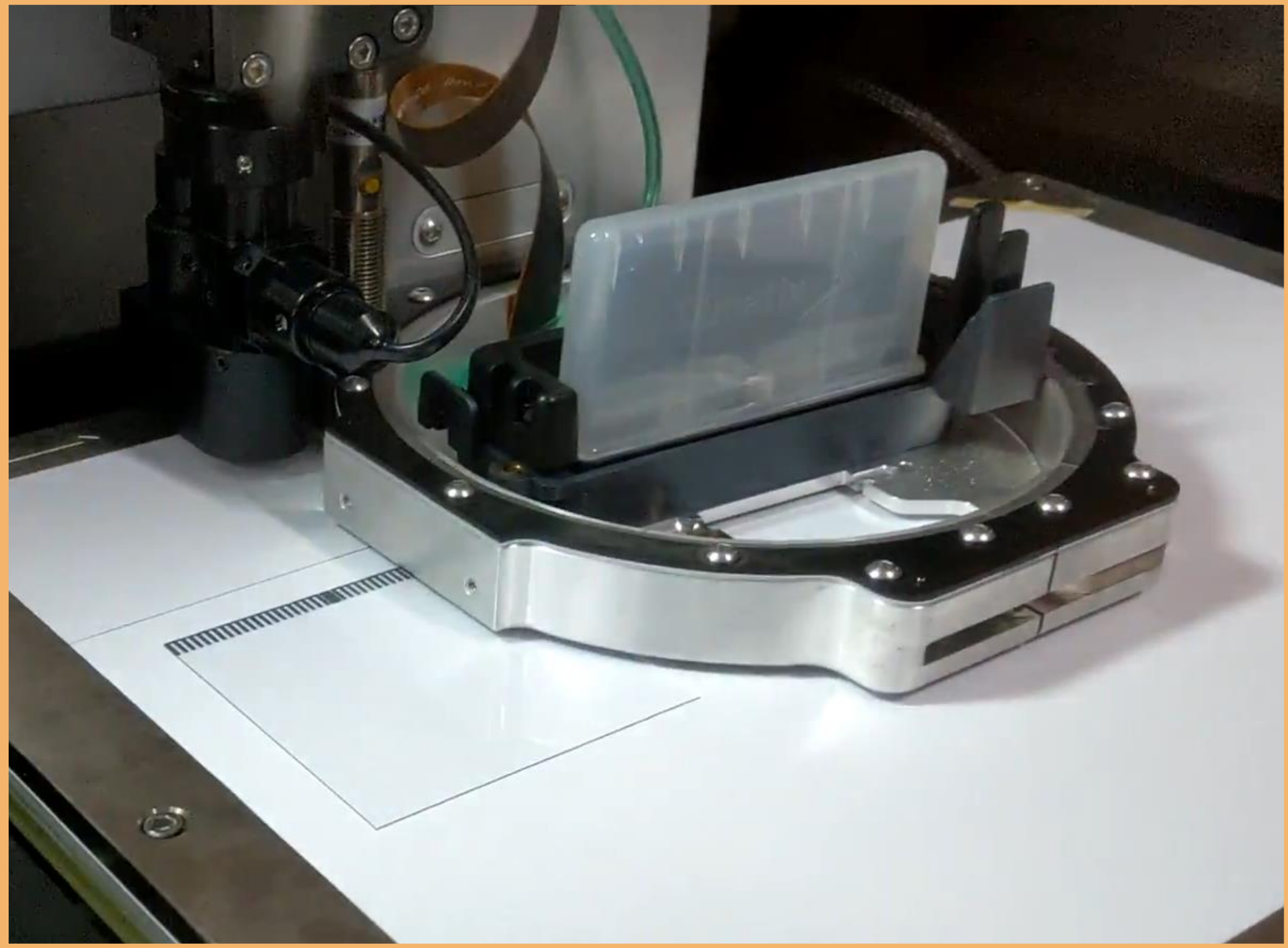
Progress

Ready

Hide 0 Messages | Hide Progress | X 1.5863 | Y1 0.9341

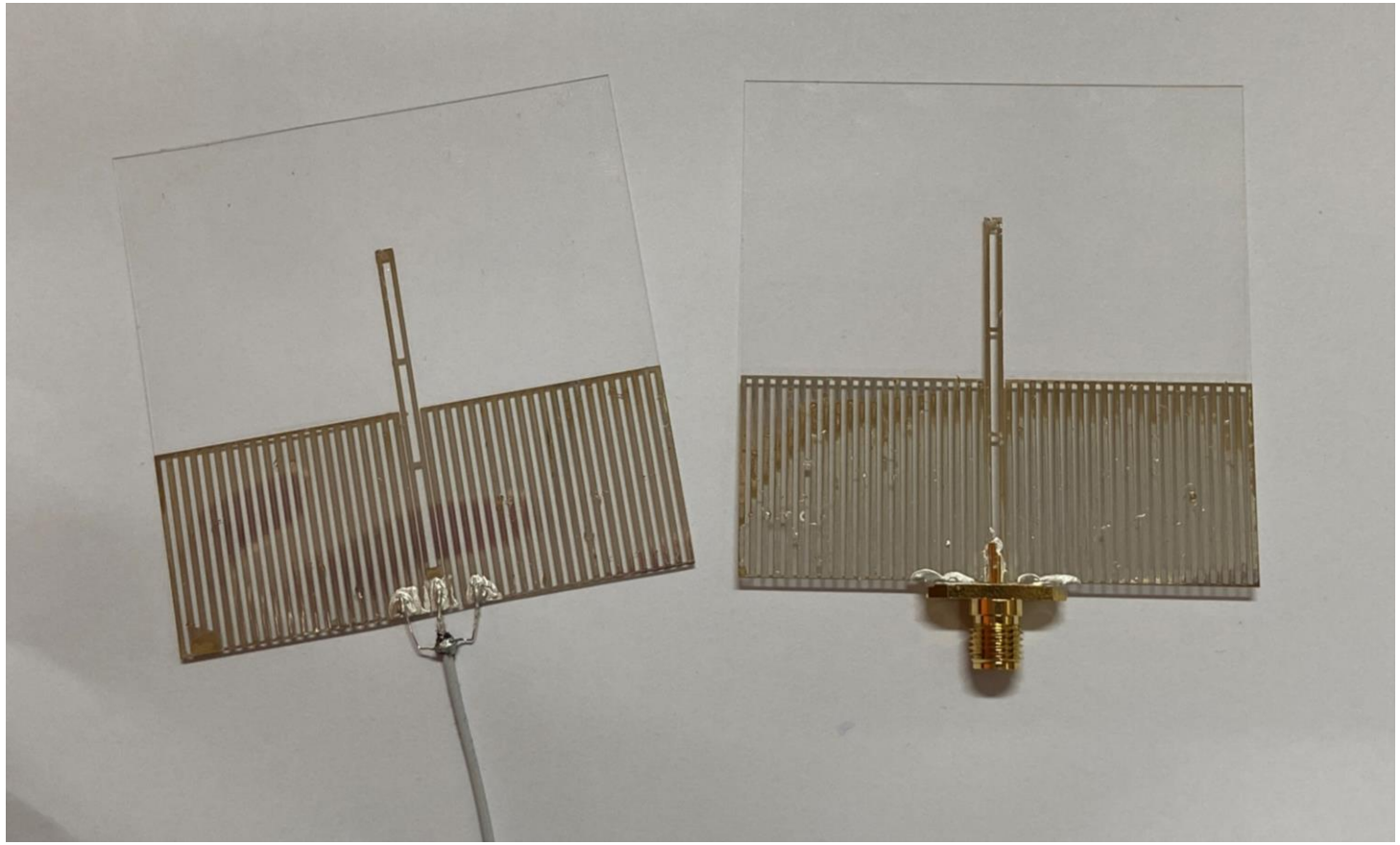
下午 03:00
2021/5/5

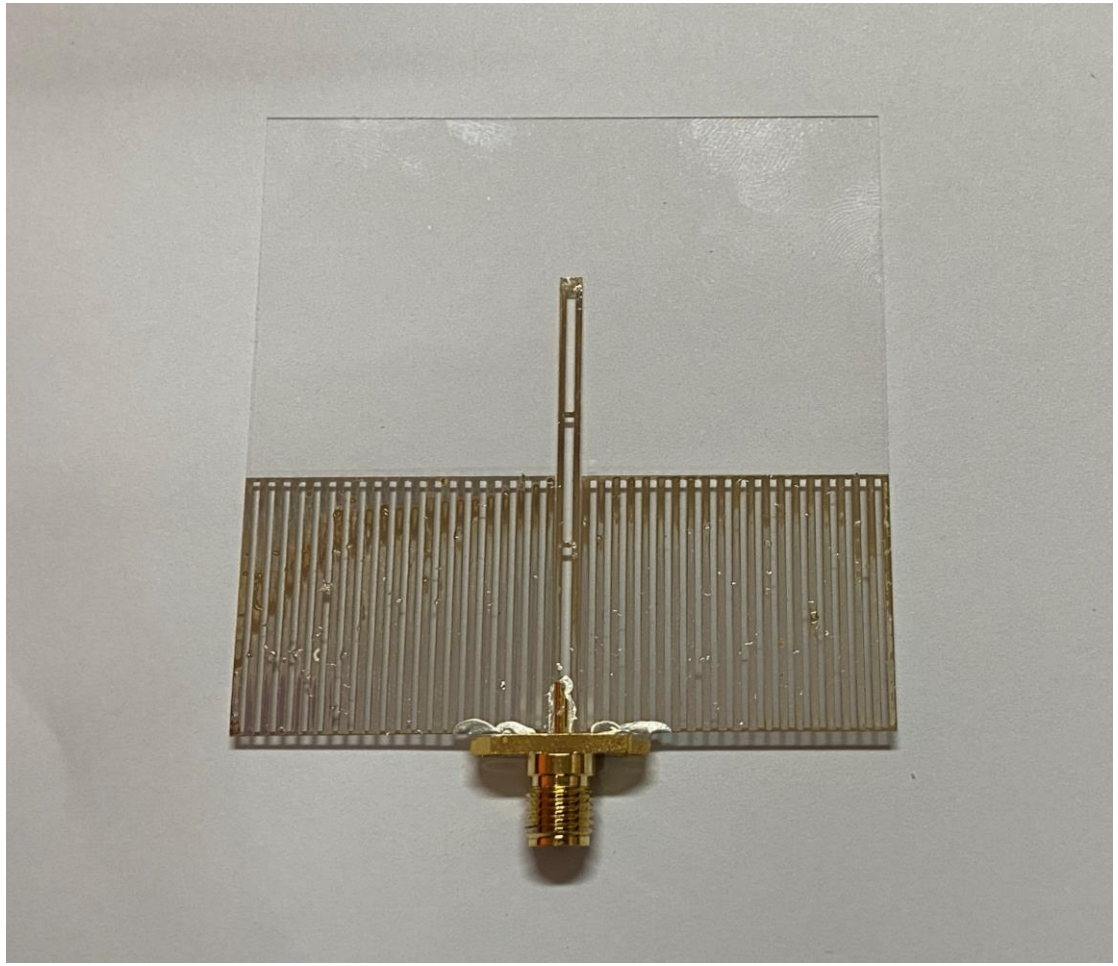
研究方法 -奈米材料噴印機

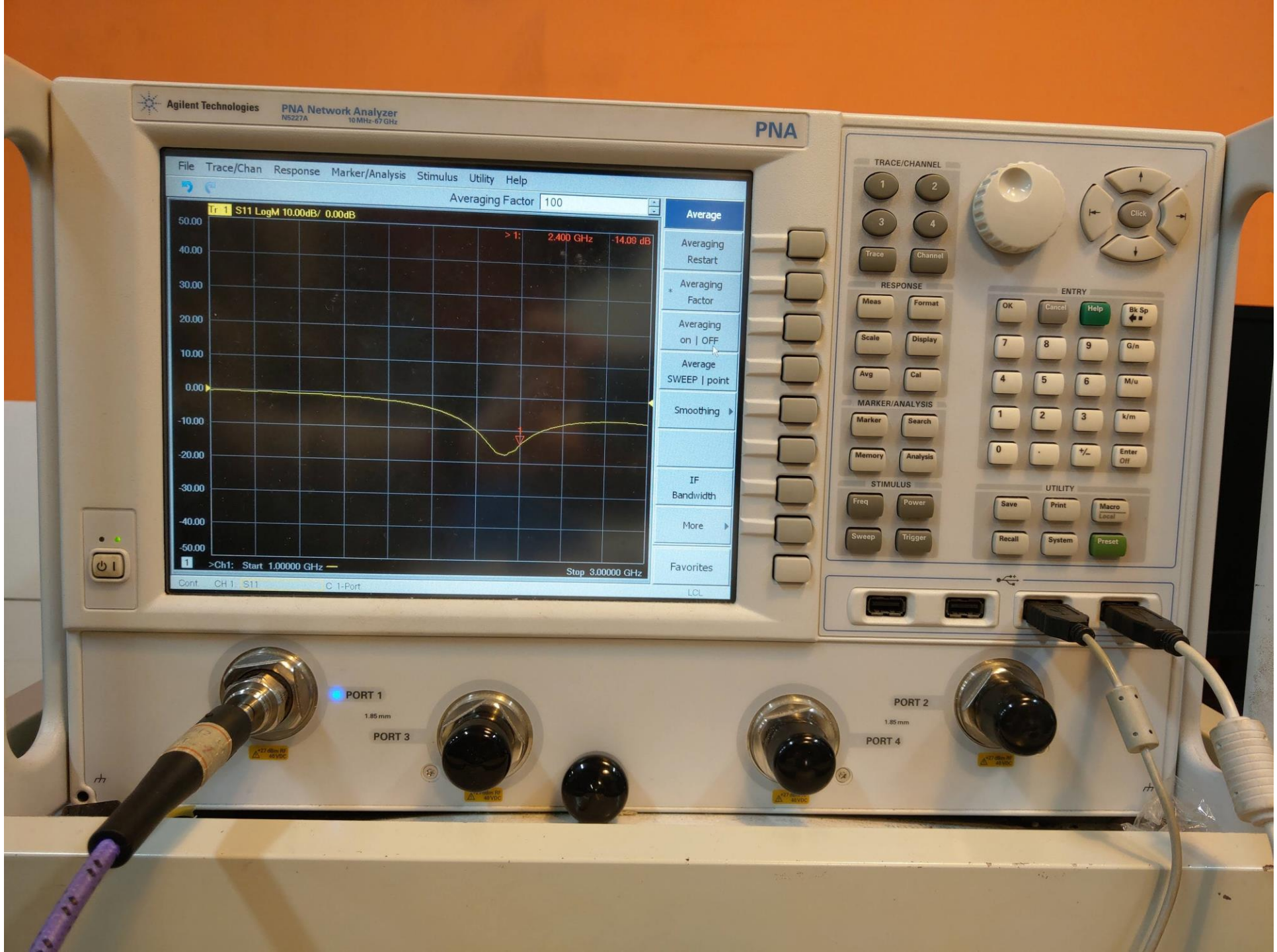


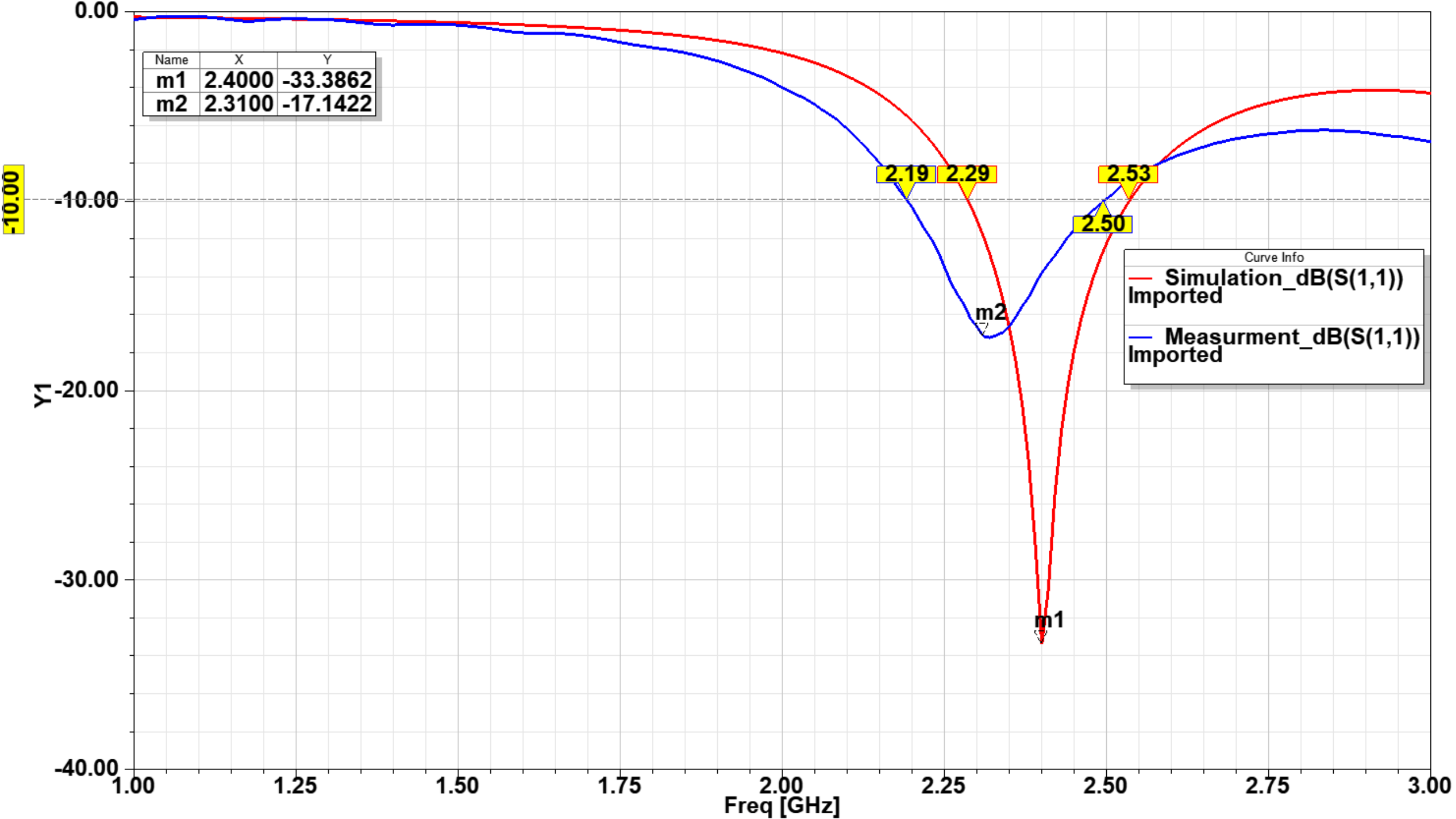

A4-16K

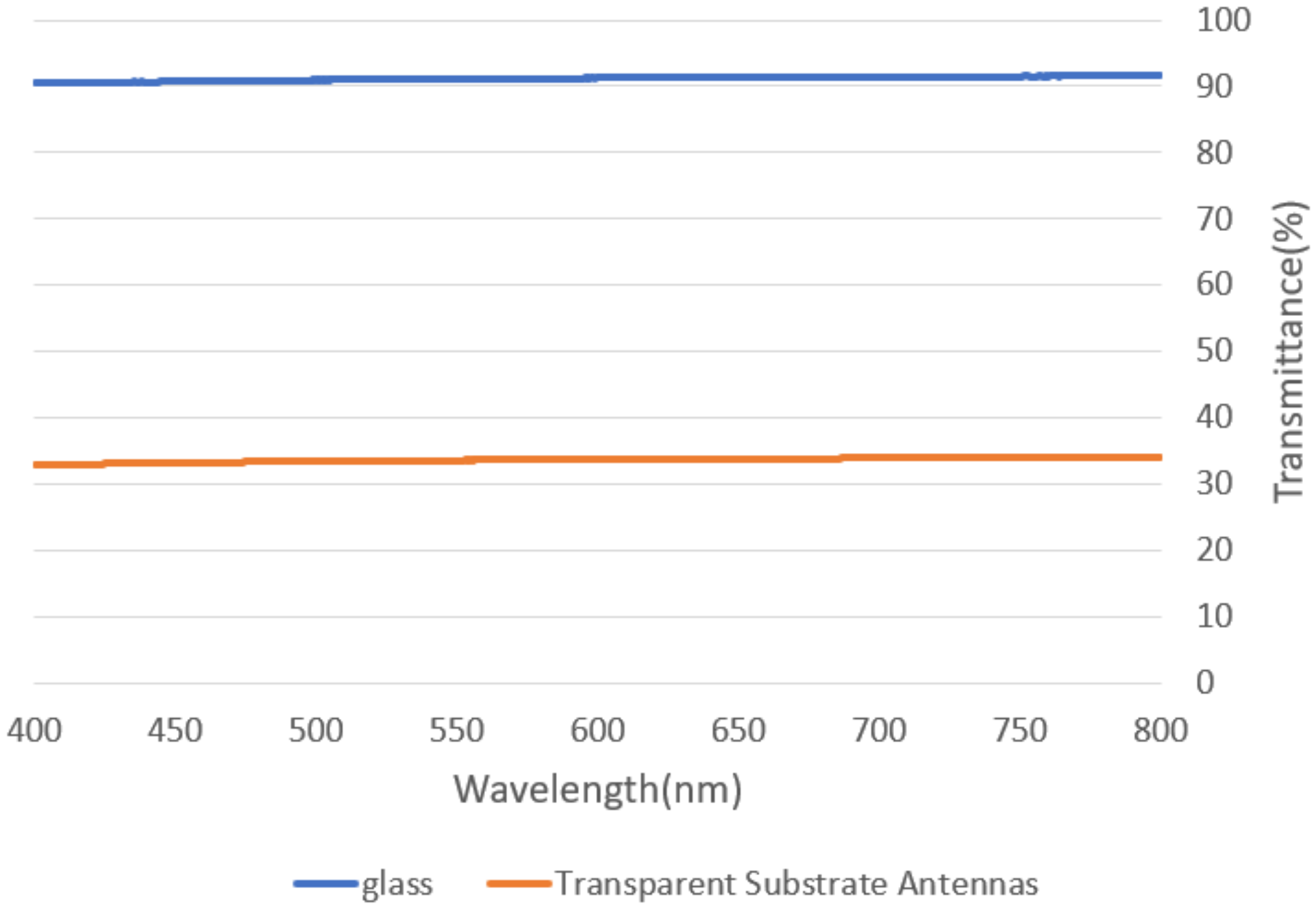
研究成果

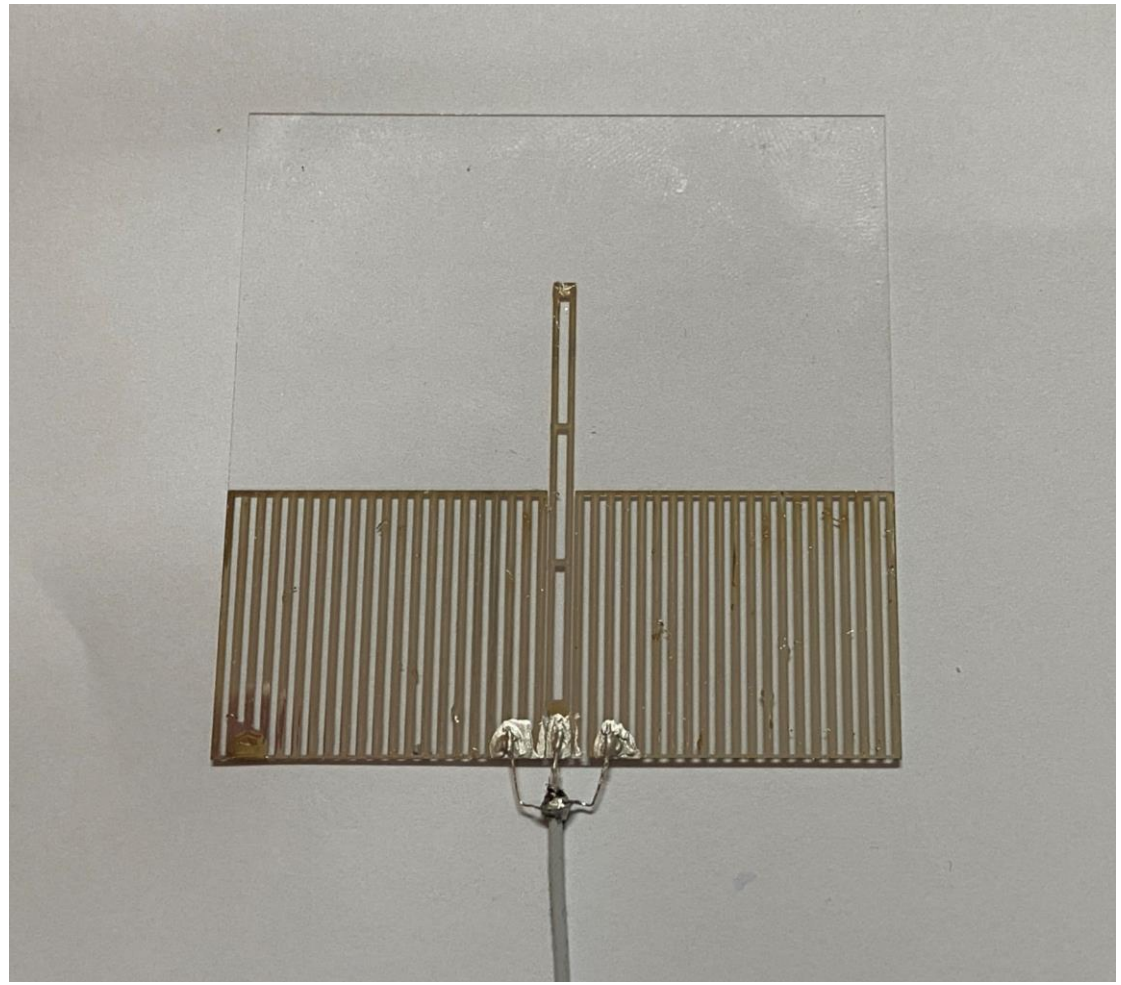


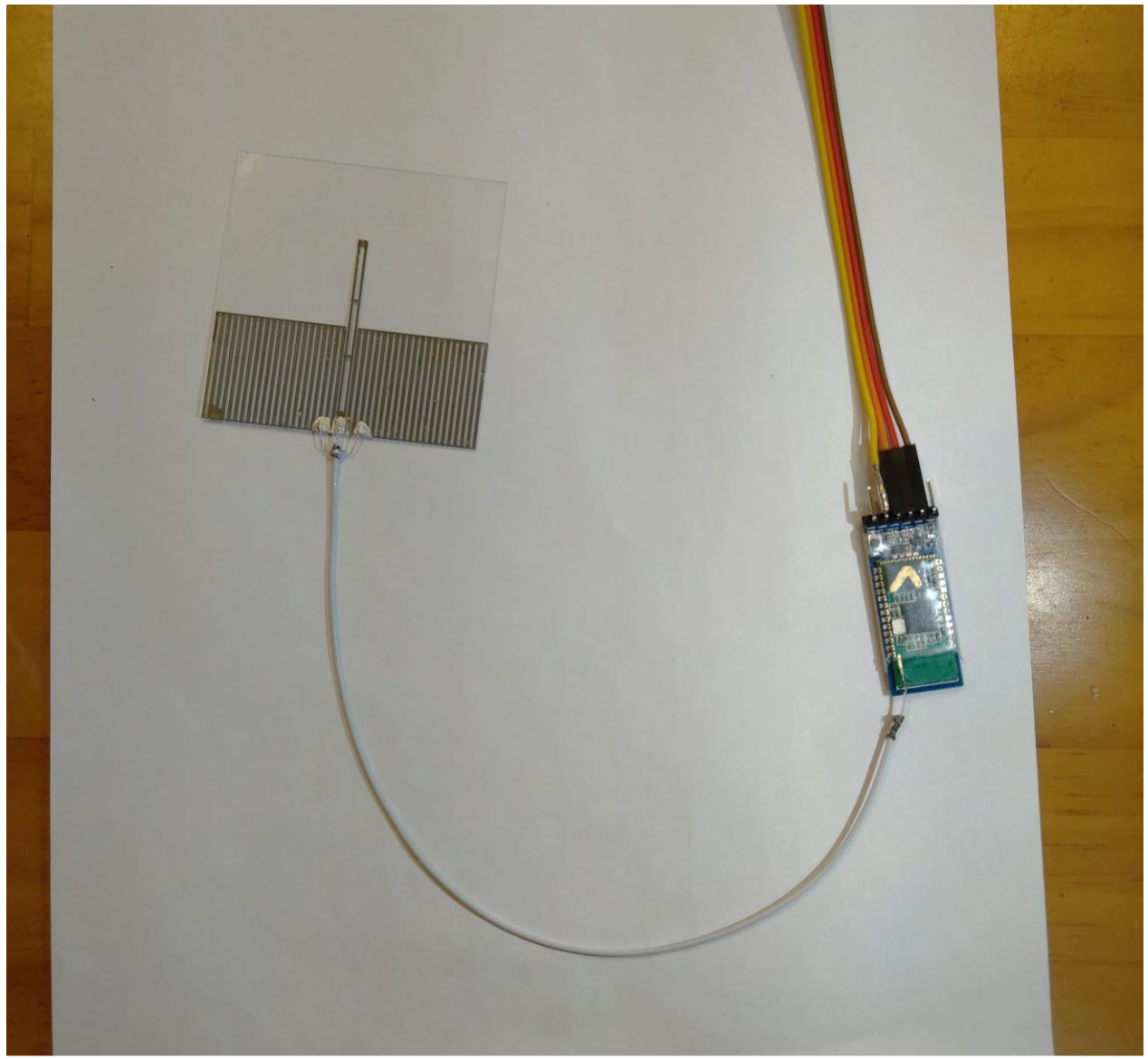


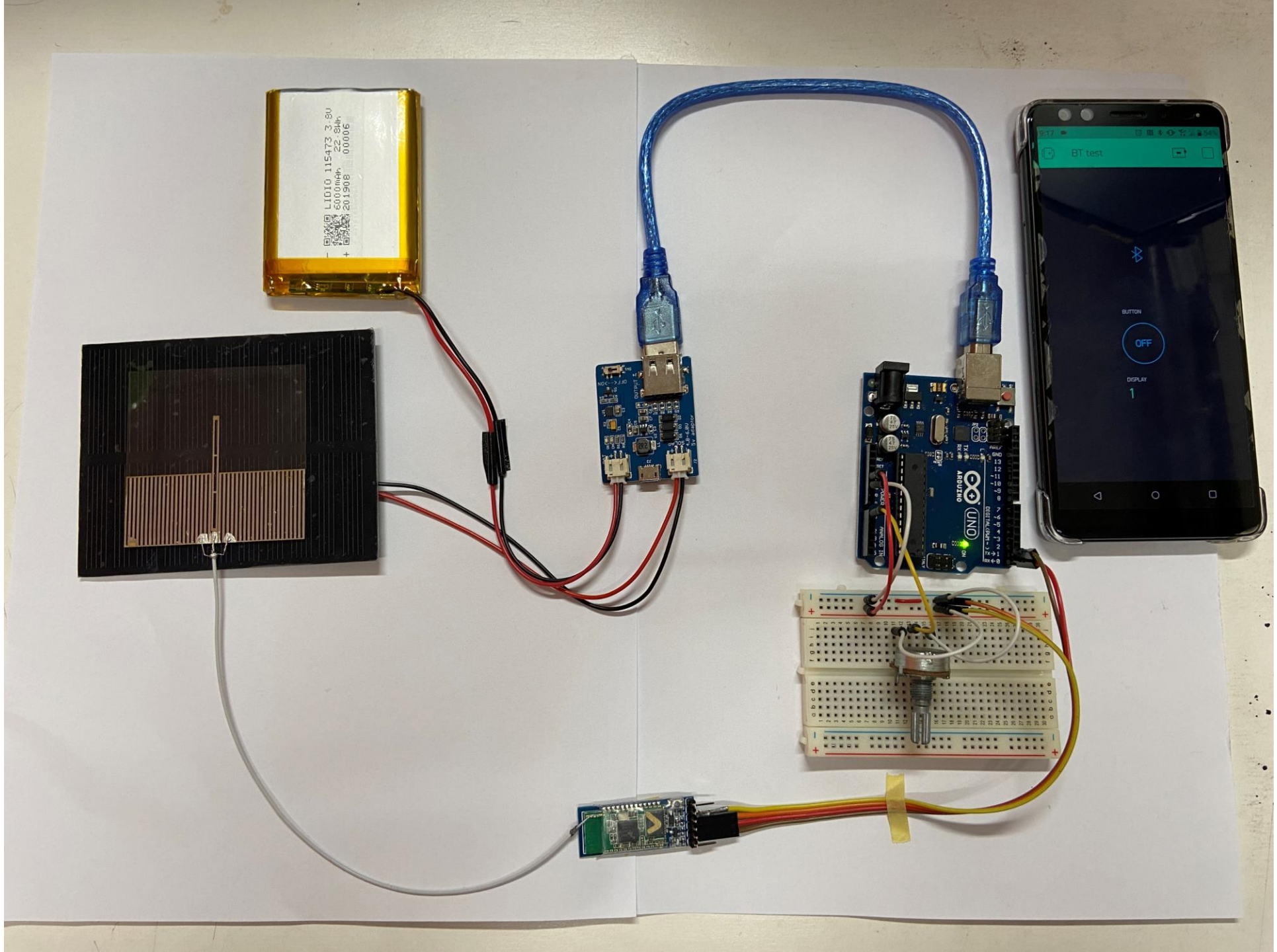

Agilent Technologies
PNA Network Analyzer
N5227A 10 MHz-67 GHz
PNA
File Trace/Chan Response Marker/Analysis Stimulus Utility Help
Averaging Factor 100
Tr 1 S11 LogM 10.00dB/ 0.00dB
>1: 2.400 GHz -14.09 dB
50.00
40.00
30.00
20.00
10.00
0.00
-10.00
-20.00
-30.00
-40.00
-50.00
>Ch1: Start 1.00000 GHz
Stop 3.00000 GHz
Cont CH 1 S11 C 1-Port
LCL
Average
Averaging Restart
Averaging Factor
Averaging on | OFF
Average SWEEP | point
Smoothing
IF Bandwidth
More
Favorites
TRACE/CHANNEL
Trace
Channel
Click
RESPONSE
Meas
Format
Scale
Display
Avg
Cal
ENTRY
OK
Cancel
Help
Bk Sp
G/n
M/u
k/m
Enter
MARKER/ANALYSIS
Marker
Search
Memory
Analysis
STIMULUS
Freq
Power
Sweep
Trigger
UTILITY
Save
Print
Macro
Recall
System
Preset
PORT 1
1.85 mm
PORT 3
PORT 2
1.85 mm
PORT 4


Name X Y
m1 2.4000 -33.3862
m2 2.3100 -17.1422
2.19
2.29
2.53
2.50
m2
m1
Curve Info
Simulation_dB(S(1,1))
Imported
Measurment_dB(S(1,1))
Imported
0.00
-10.00
-20.00
-30.00
-40.00
Y1
1.00
1.25
1.50
1.75
2.00
2.25
2.50
2.75
3.00
Freq [GHz]


100
90
80
70
60
50
40
30
20
10
0
Transmittance(%)
400
450
500
550
600
650
700
750
800
Wavelength(nm)
glass
Transparent Substrate Antennas






LIDO 115473 3.8V
6000mAh 22.8Wh
201908 00006
BT test
BUTTON
OFF
DISPLAY
1
ARDUINO
UNO

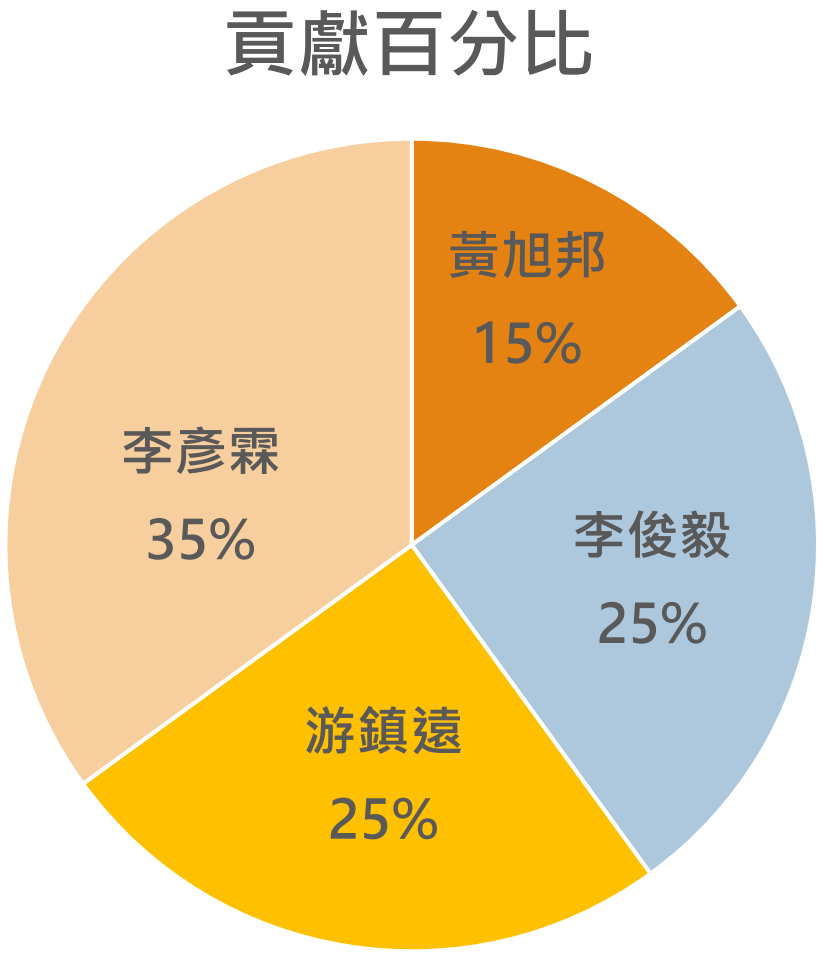
結論與展望

- 本專題之透明基板天線擁有許多網格，為基於傳統 Monopole 天線的一大創新，不僅能使天線具有良好的透光度，還能節省導體面積。

- 以藍牙工作頻率2.4GHz為例，將本專題的天線與傳統 Monopole 天線相比較，本專題天線導體面積為766.98mm2，傳統未具有網格的天線導體面積為3151.97 mm2，可省下75.6%的導體面積，使製作此天線的成本降低，但網格天線的設計會造成增益下降，將來可再對此方面進行改良。

組員的分工與貢獻百分比

黃旭邦 107360709 （組長）	團隊精神領袖、吉祥物、靈魂繪師、友好的同學、撰寫報告
李俊毅 107360707	噴印天線、焊接天線、撰寫報告
游鎮遠 107360734	噴印天線、製作影片、撰寫報告
李彥霖 107360741	天線設計、噴印天線、撰寫報告



參考資料

- 希馬科技股份有限公司 DMP-2850 奈米材料噴印機
- https://sigmatekcorp.com/product/186/?category=2&sub_category=55

- Solar-Powered Active Integrated Antennas Backed by a Transparent Reflectarray for CubeSat Applications - IEEE
- https://ieeexplore.ieee.org/stamp/stamp.jsp?arnumber=9149864


Team Stark
IRON MAN