LYNwave Technology

Antenna & Thermal solution provider

2022

www.lynwave.com

Antenna Test Report

Project Name: **EW-7822UNX**

Model Name:

Feature: **Wifi Dual Band**

Application: **Dongle**

Date	Owner	Revision
01/17	Alex	1. Antenna passive measurement with V1 mockup
02/07	Zino	1. Antenna passive measurement with V1 mockup (new thermal sol.)
05/04	Zino	1. Antenna passive measurement with V2 mockup (without heatsink)
06/23	Zino	1. Antenna passive measurement with T2 mockup
07/06	Zino	1. Add USB GND
07/18	Zino	1. Antenna passive measurement with T3 mockup (Grounding USB)

5F., No. 655, Xuecheng Rd., Shulin Dist., New Taipei City 23854,
Taiwan
www.lynwave.com
+886 2 3501 8700

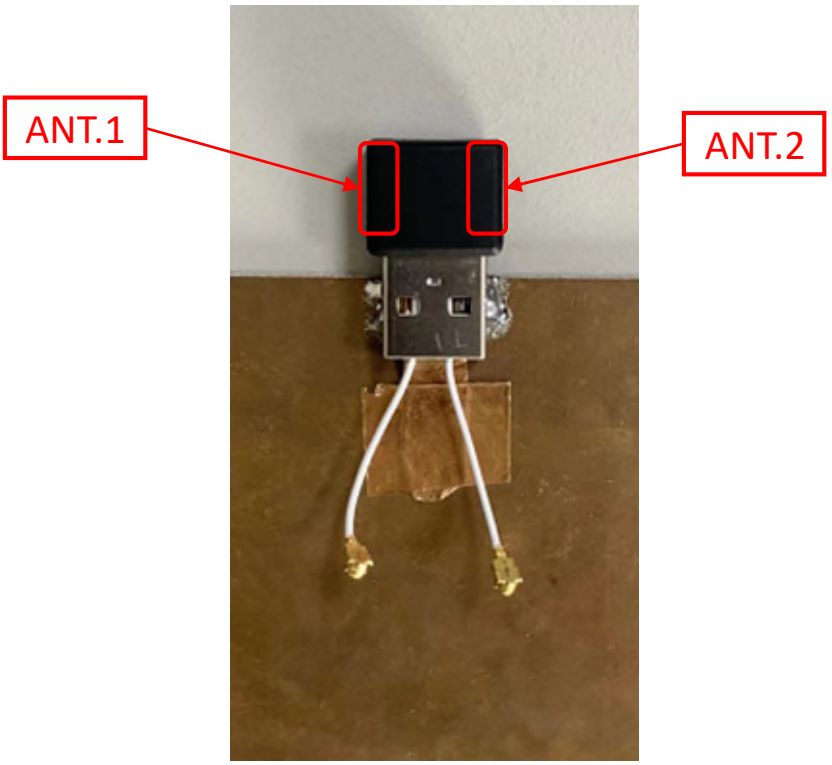
Table of Contents

A. Antenna RF Characteristics
1. Antenna Placement
2. Equipment List
3. Test architecture
4. Conversion from S21 to antenna gain dBi performed step
5. S-Parameters
6. Gain Table
7. 2D/ 3D Radiation Pattern
8. Summary

5F., No. 655, Xuecheng Rd., Shulin Dist., New Taipei City 23854, Taiwan
www.lynwave.com
+886 2 3501 8700

Antenna Placement

Antenna	Description	Frequency
Ant.1	2.4/5G	2400 MHz ~ 2500 MHz / 5150 MHz ~ 5825 MHz
Ant.2	2.4/5G	2400 MHz ~ 2500 MHz / 5150 MHz ~ 5825 MHz



5F., No. 655, Xuecheng Rd., Shulin Dist., New Taipei City 23854,
Taiwan
www.lynwave.com
+886 2 3501 8700

S-parameter Measurement Equipment

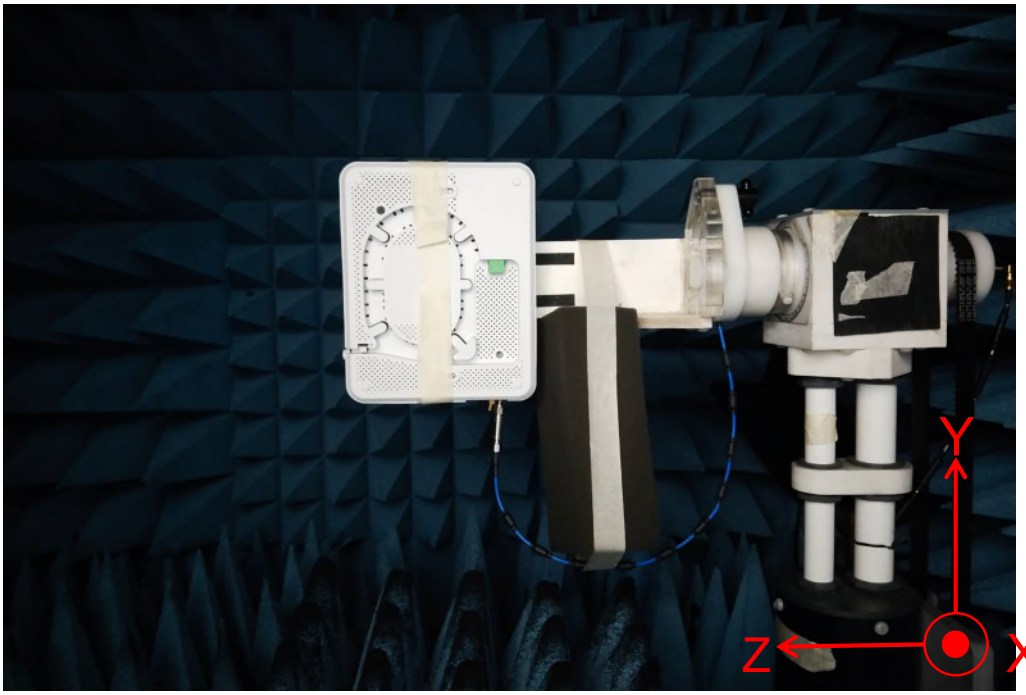
Equipment	Brand	Model	Calibration Date
Network analyzer	Keysight	M9010A	2022/07/04

5F., No. 655, Xuecheng Rd., Shulin Dist., New Taipei City 23854,
Taiwan
www.lynwave.com
+886 2 3501 8700

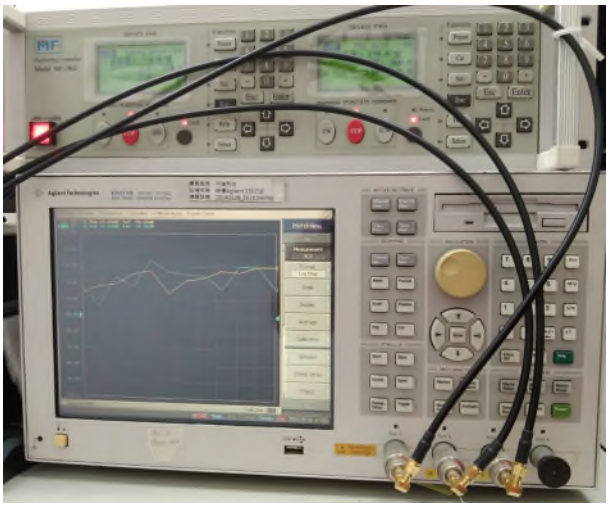
Passive Equipment List :

Antenna Chamber	MFC-2531(1.4x1.4x2.8m)
Test software	Passive 2D/3D川升
Network analyzer	Agilent E5071B
Controller	MF7802
Calibration time	2022/07/04

Antenna Chamber

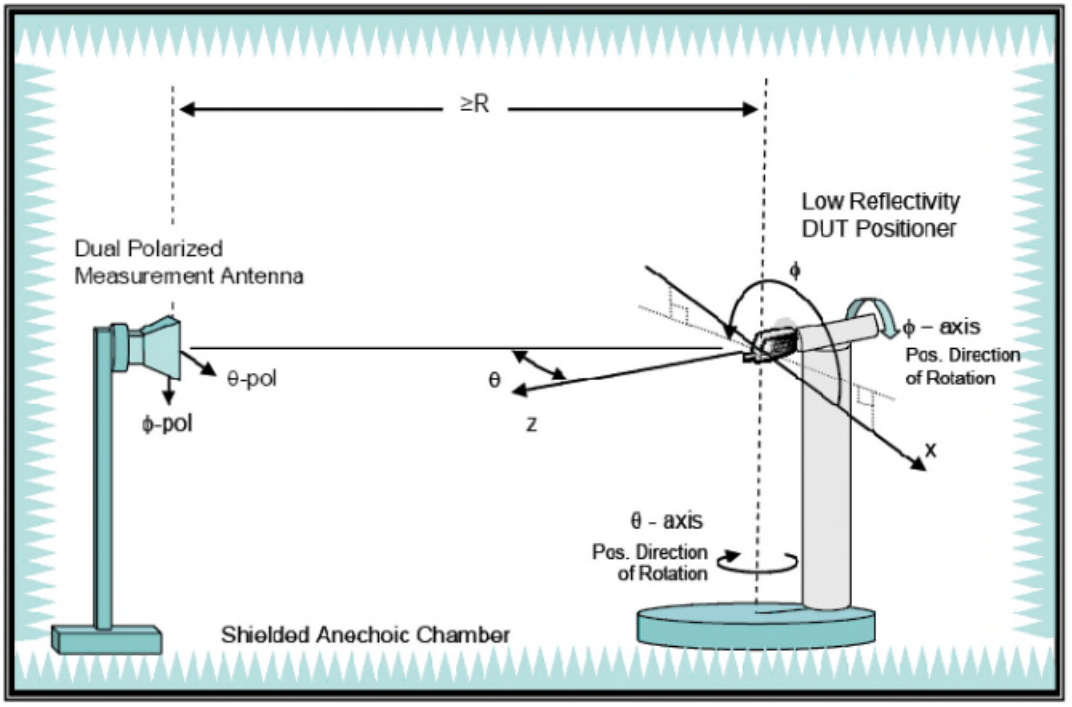


Network analyzer and Controller :

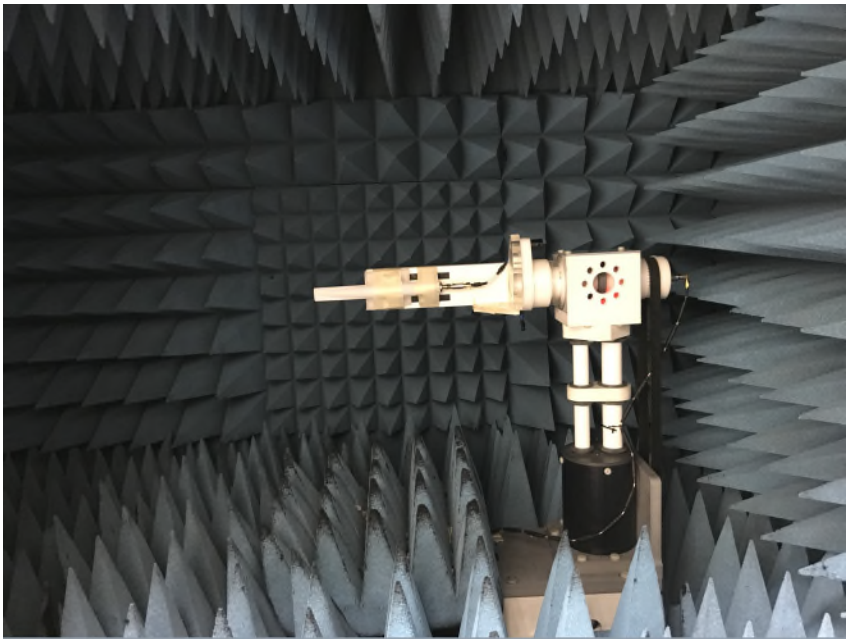


5F., No. 655, Xuecheng Rd., Shulin Dist., New Taipei City 23854,
Taiwan
www.lynwave.com
+886 2 3501 8700

Test architecture :



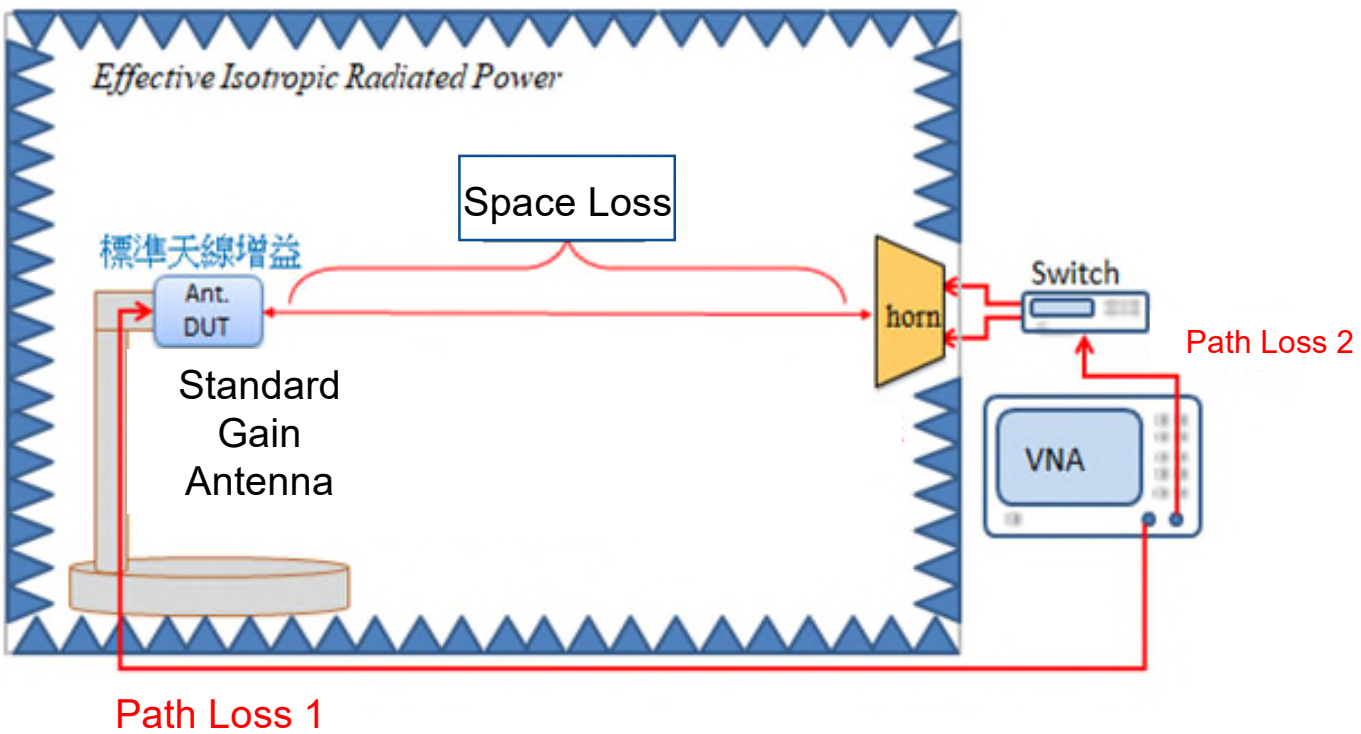
Test System Calibration



We will use a standard antenna which have bean verified and whose accurate gain table is available to carry out the chamber calibration.
The standard antenna will be re-measured by the chamber. The difference between the measured gain values and its verified gain table will be compensated to the measurement system.

5F., No. 655, Xuecheng Rd., Shulin Dist., New Taipei City 23854,
Taiwan
www.lynwave.com
+886 2 3501 8700

Conversion from S21 to antenna gain dBi performed step



Step :

1.Calculate Total Loss: Total Loss= Path Loss 1 + Path Loss 2 + Space Loss + Horn Gain

2.Measurement Value S21 By Chamber

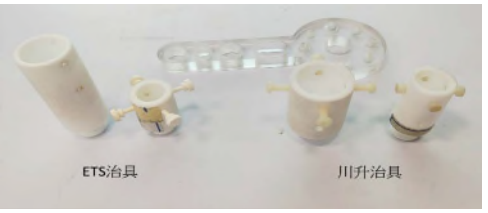
3.Measurement Value S21- Standard Antenna Gain = Total Loss = Compensation (Path Loss)

4.Measurement Value S21 = Standard Antenna Gain + Total Loss

➢ Confirmation before calibration list and step

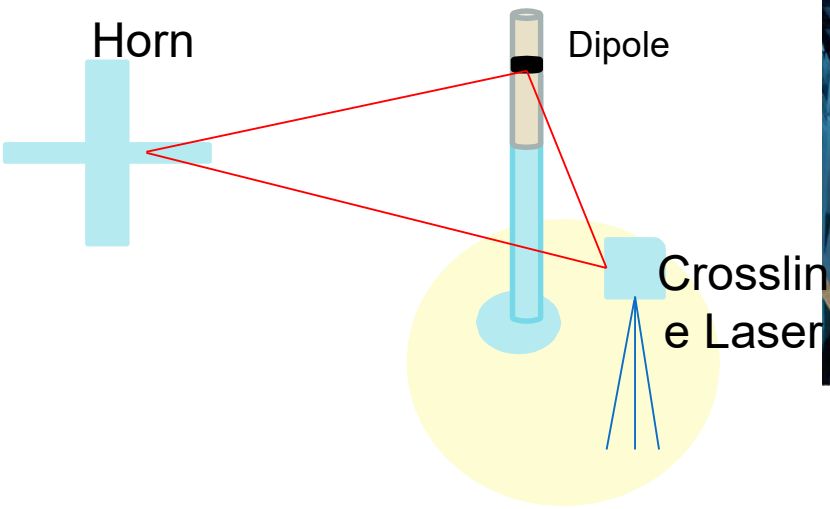
Check	List
	Remove the 3dB attenuator from the DUT's cable
	No other metal substances in the measurement environment
	No extension cable taped on Phi axis
	Align the DUT to the laser line center
	Prepare ETS or Bwant Dipole Fixture
	Crossline laser
	VNA, Turn Table, Switch on and confirm in NIMAX
	Passive Software

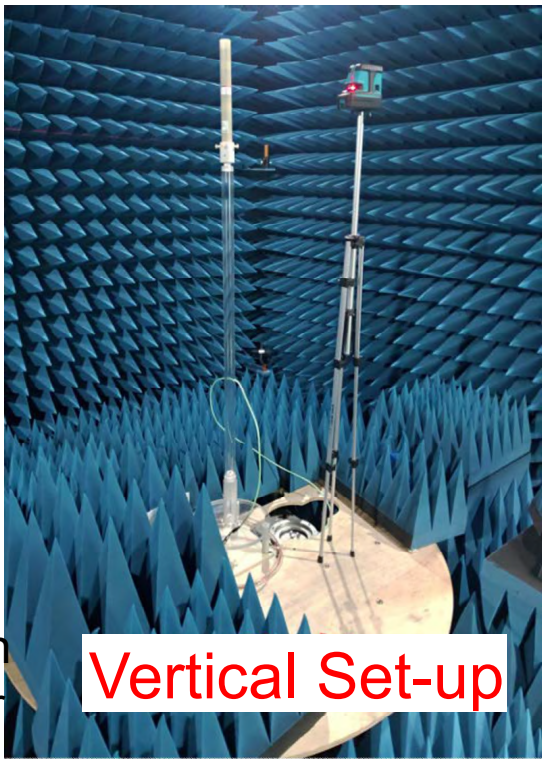
◆ The measured value of the same test object might be changed before and after calibration, so it is not recommended to calibrate frequently.



5F., No. 655, Xuecheng Rd., Shulin Dist., New Taipei City 23854, Taiwan
www.lynwave.com
+886 2 3501 8700

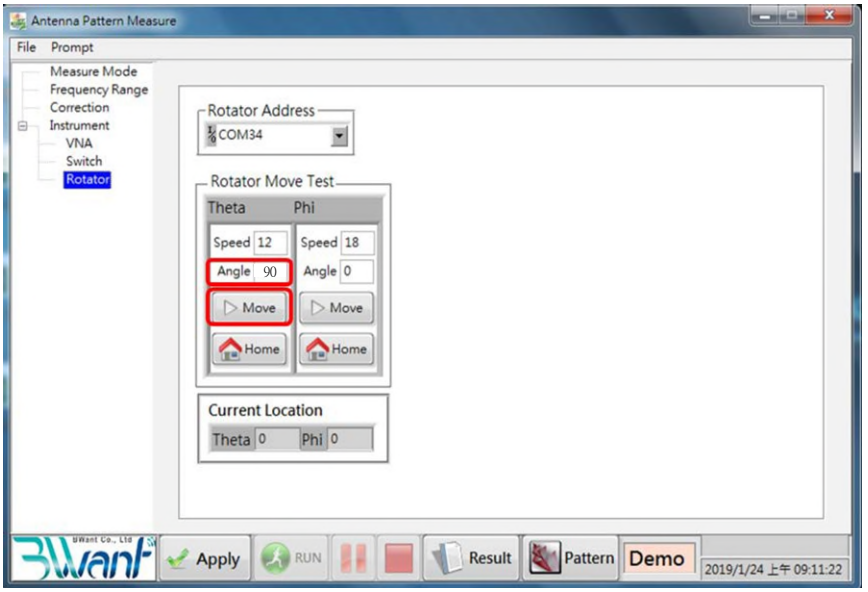
1. Align the horn horizontal blade by crossline laser.
2. Align the dipole feeding point to laser line.



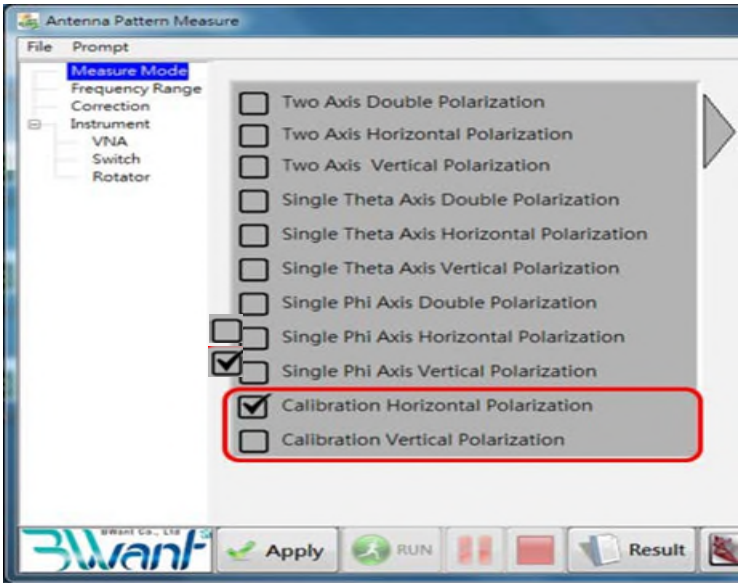


5F., No. 655, Xuecheng Rd., Shulin Dist., New Taipei City 23854, Taiwan
www.lynwave.com
+886 2 3501 8700

1. Set-up the dipole start from low frequency (SD650).
2. Rotate 90 degree on Theta axis.

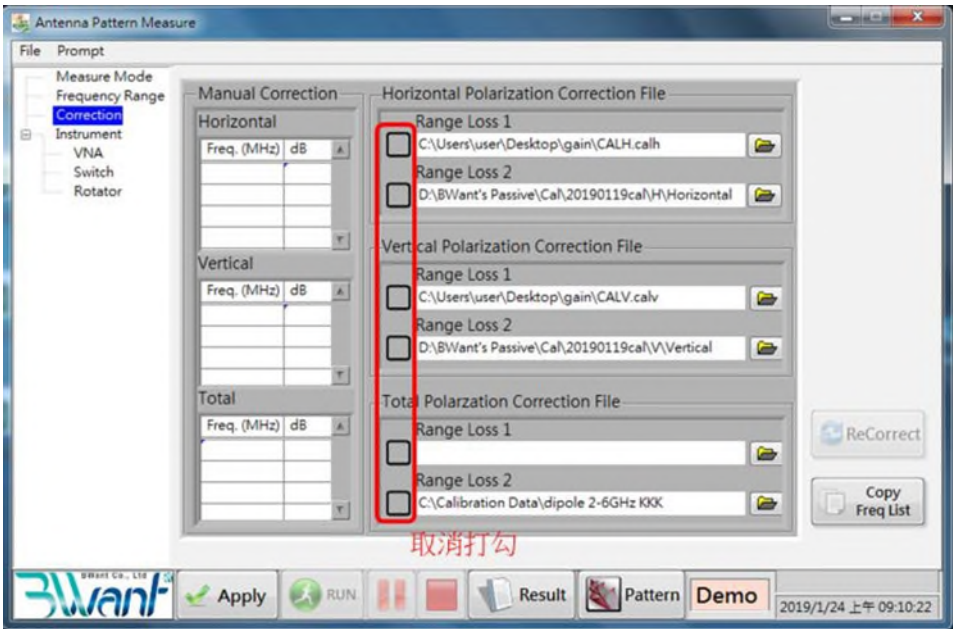


- Choose “Calibration Vertical Polarization“.
- Or choose “Calibration Horizontal Polarization” if you need a horizontal one.

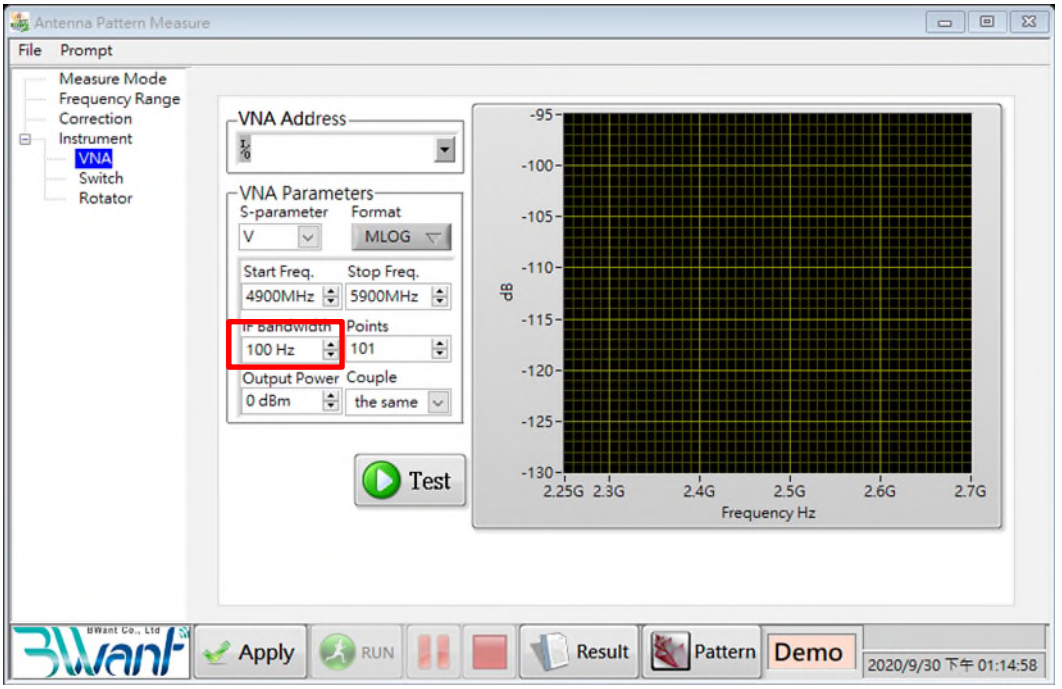


5F., No. 655, Xuecheng Rd., Shulin Dist., New Taipei City 23854,
Taiwan
www.lynwave.com
+886 2 3501 8700

- Cancel all the selection as follow picture.

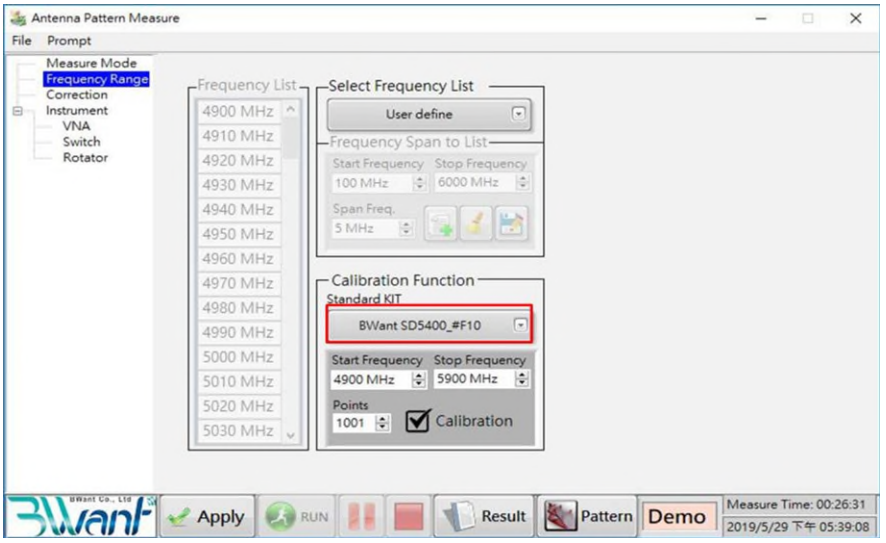


- Set the IF Bandwidth to 100Hz.

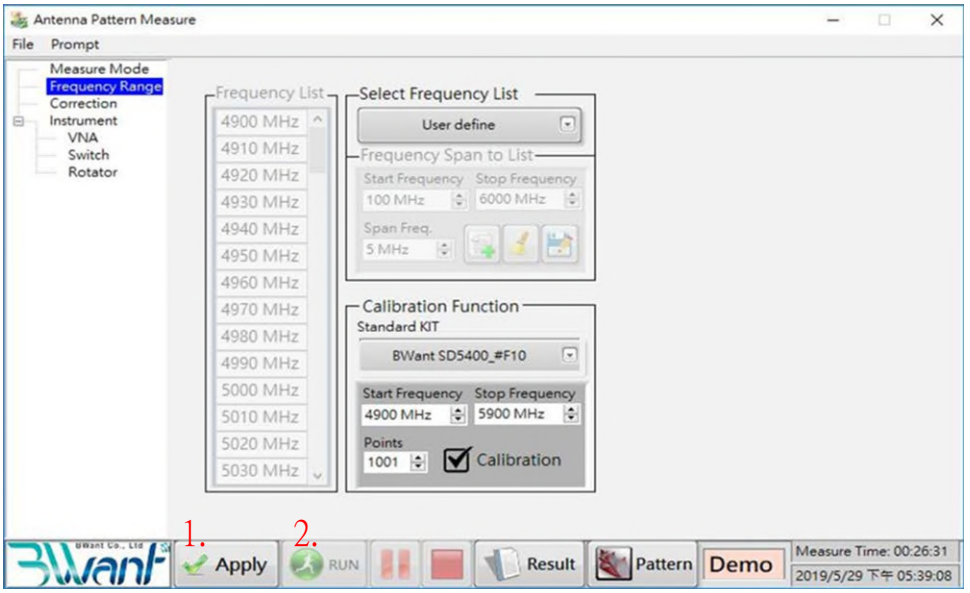


5F., No. 655, Xuecheng Rd., Shulin Dist., New Taipei City 23854,
Taiwan
www.lynwave.com
+886 2 3501 8700

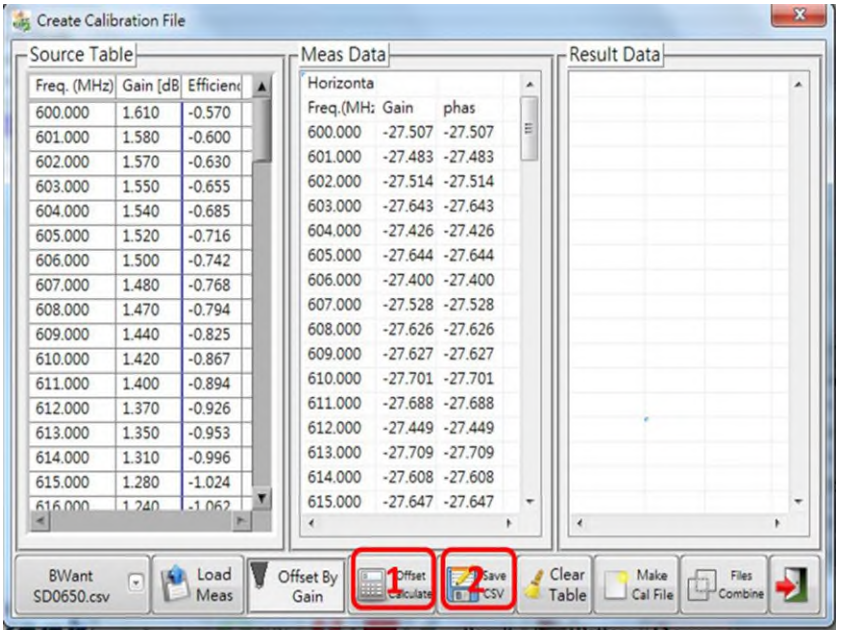
- Select the calibration dipole type from Standard KIT.
  - The frequency band is labeled on the dipole (the start & cutoff frequencies and the test points number would be set automatically after selection).



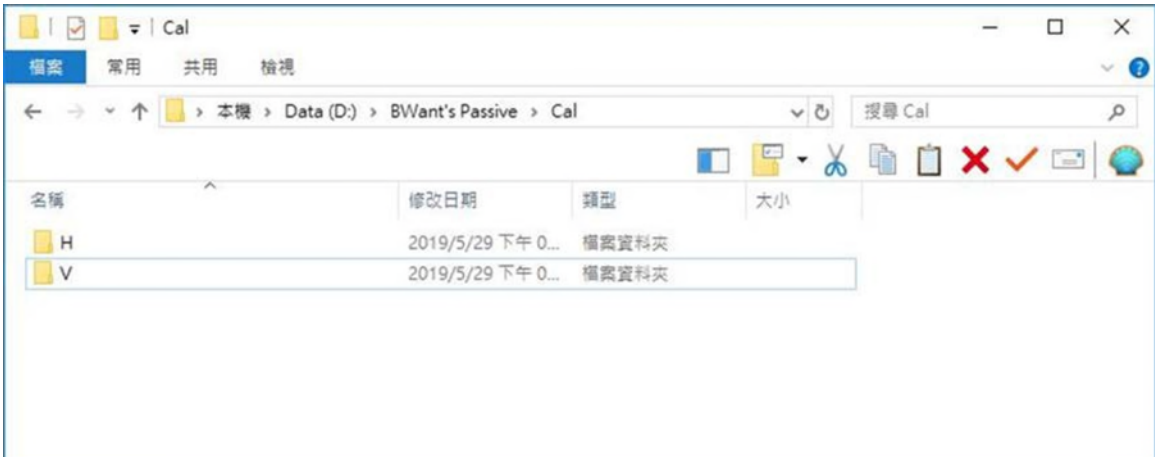
1. Click on “Apply“.
2. Click on ”Run“ and start the testing.



1. Confirm there is testing value in “Meas Data” field.
2. Click on “Offset Calculate“.
3. Click on “Save CSV“.

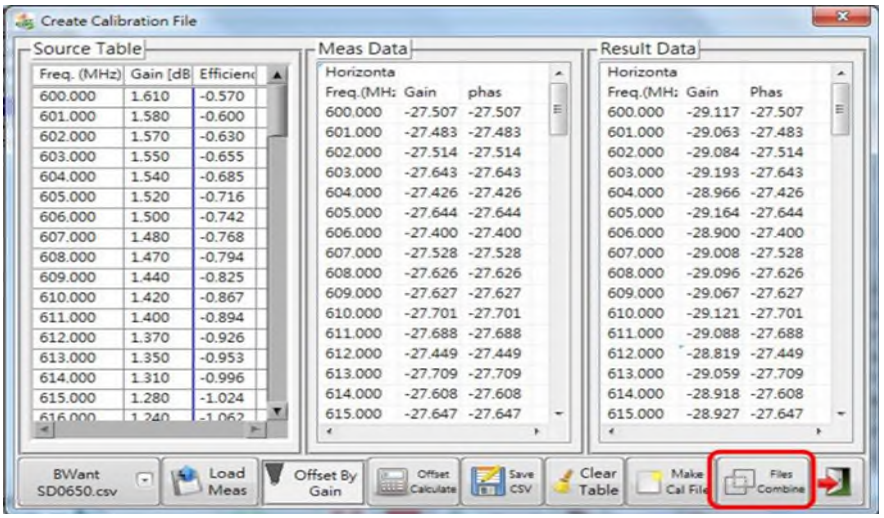


- Save the testing file according by each dipole test band and polarization.
  - Ex Vertical Polarization SD650
  - Place the Cal->V Folder and named it as “SD650_V"



5F., No. 655, Xuecheng Rd., Shulin Dist., New Taipei City 23854,
Taiwan
www.lynwave.com
+886 2 3501 8700

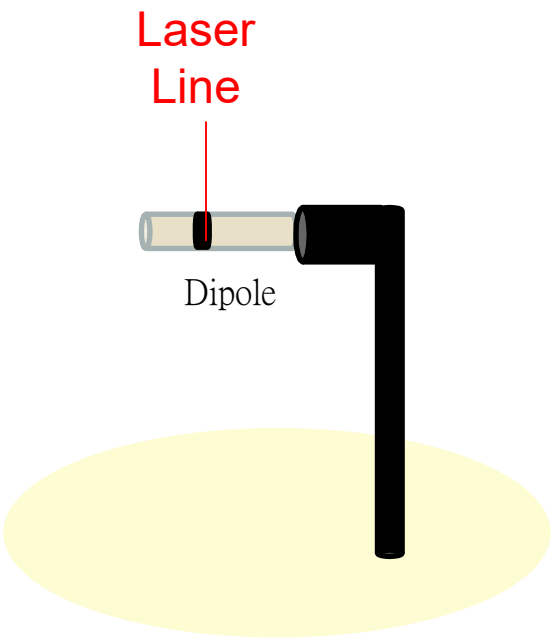
- Repeat all the 11pcs antenna as right table to complete the full band frequency according the steps from Page 5~12.
- Click on “Files Combine“ , select the “Folder V” and all frequency band file would be generated.
  - Ex. Vertical Polarization 600-5900 MHzPath Loss.csv

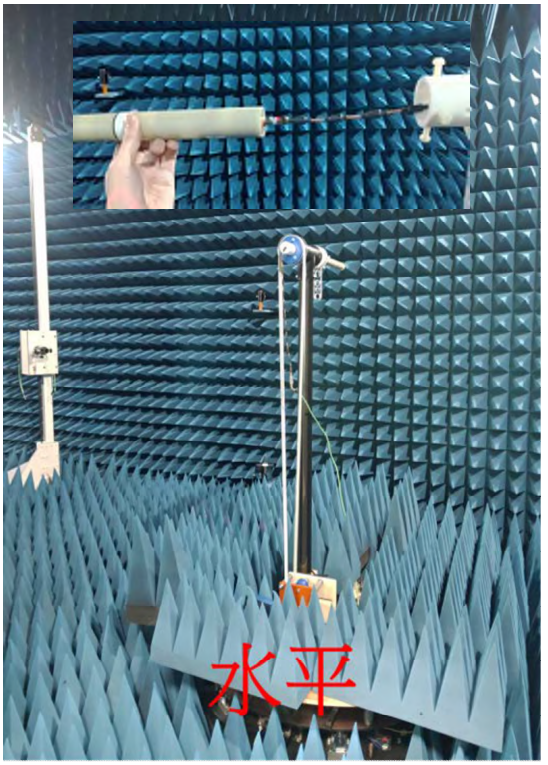


Vertical Confirmation	Dipole Name
	SD650
	SD740
	SD900
	SD1150
	SD1575
	SD1800
	SD2140
	SD2450
	SD3200
	SD3600
	SD5400

5F., No. 655, Xuecheng Rd., Shulin Dist., New Taipei City 23854, Taiwan
www.lynwave.com
+886 2 3501 8700

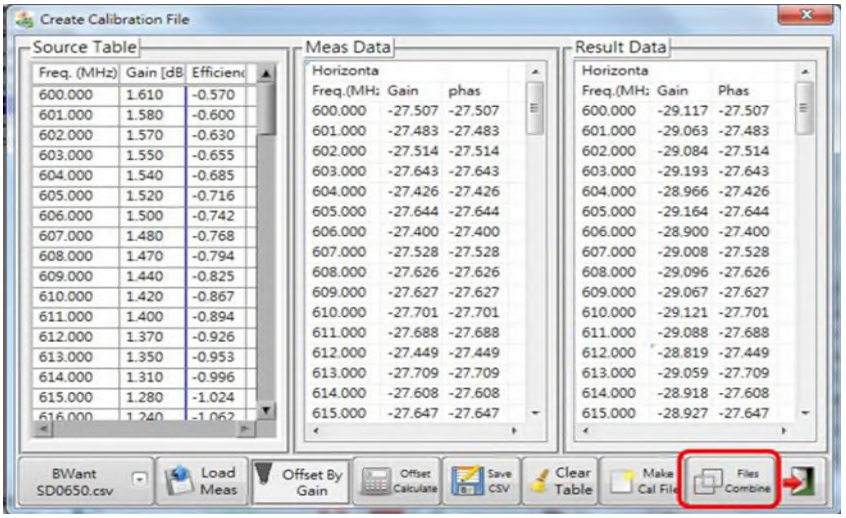
1. Align the dipole feeding point to laser line.





5F., No. 655, Xuecheng Rd., Shulin Dist., New Taipei City 23854,
Taiwan
www.lynwave.com
+886 2 3501 8700

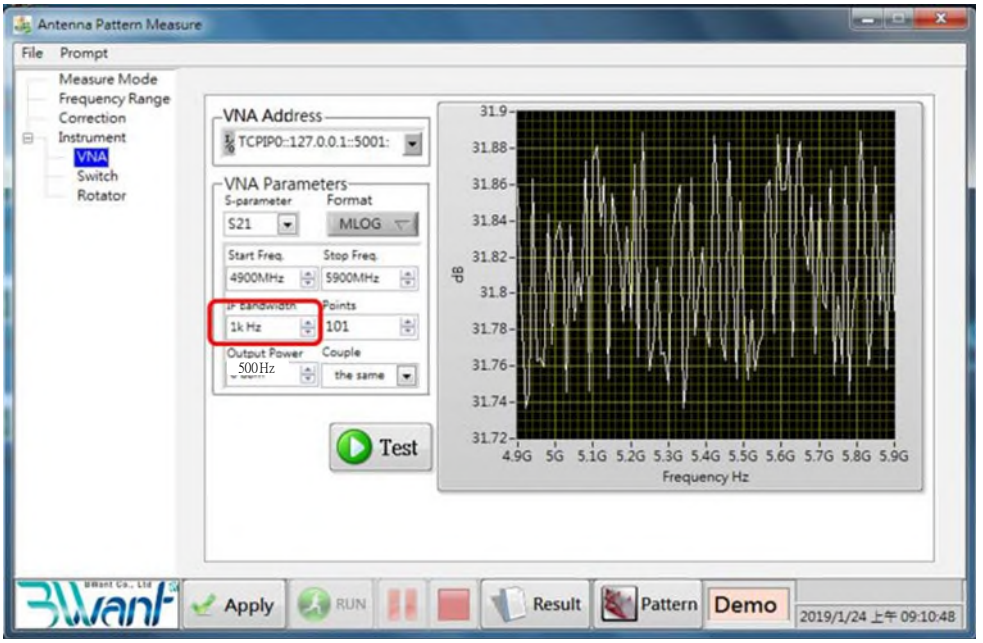
- Repeat all the 11pcs antenna as right table to complete the full band frequency according the steps from Page 5~12.
- Click on “Files Combine“ , select the “Folder H” and all frequency band file would be generated.
  - Ex. Horizontal Polarization 600-5900 MHzPath Loss.csv



Horizontal Confirmation	Dipole Name
	SD650
	SD740
	SD900
	SD1150
	SD1575
	SD1800
	SD2140
	SD2450
	SD3200
	SD3600
	SD5400

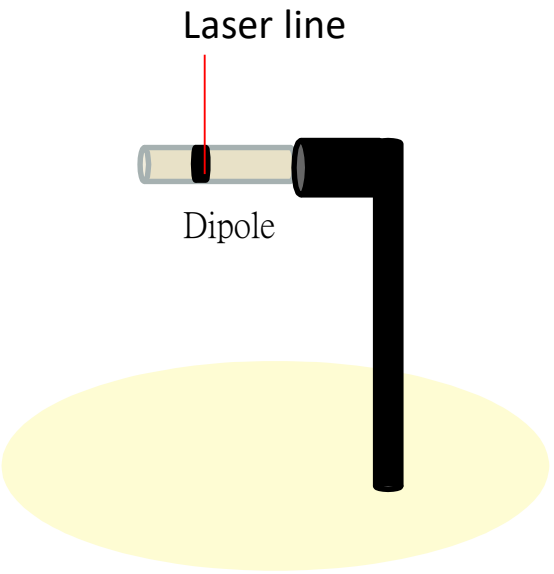
5F., No. 655, Xuecheng Rd., Shulin Dist., New Taipei City 23854, Taiwan
www.lynwave.com
+886 2 3501 8700

- Change the “IF Bandwidth" value back to 500Hz.



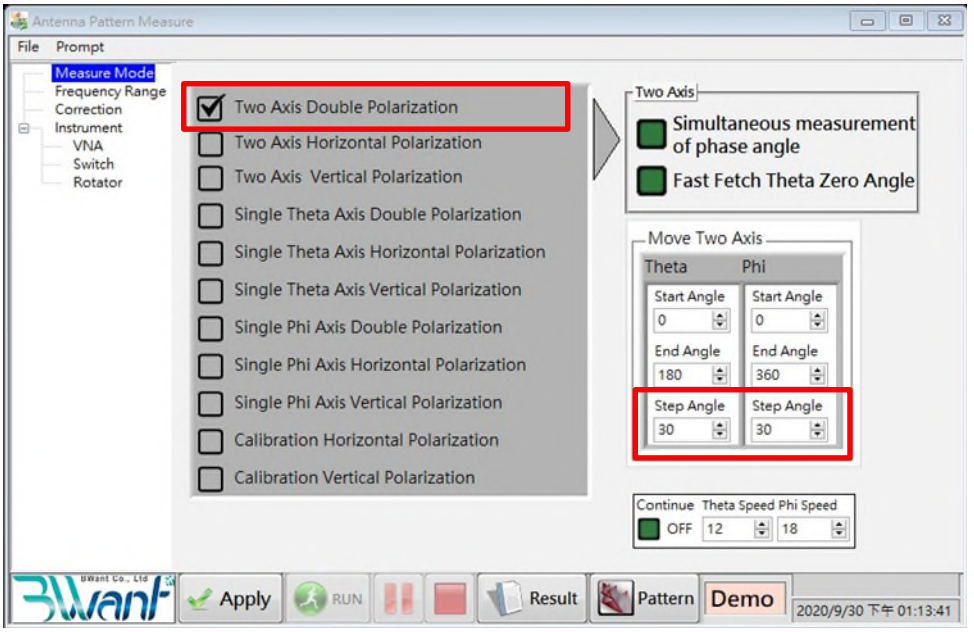
5F., No. 655, Xuecheng Rd., Shulin Dist., New Taipei City 23854,
Taiwan
www.lynwave.com
+886 2 3501 8700

1. Set-up the dipole start from low frequency (SD650) as Page 14.

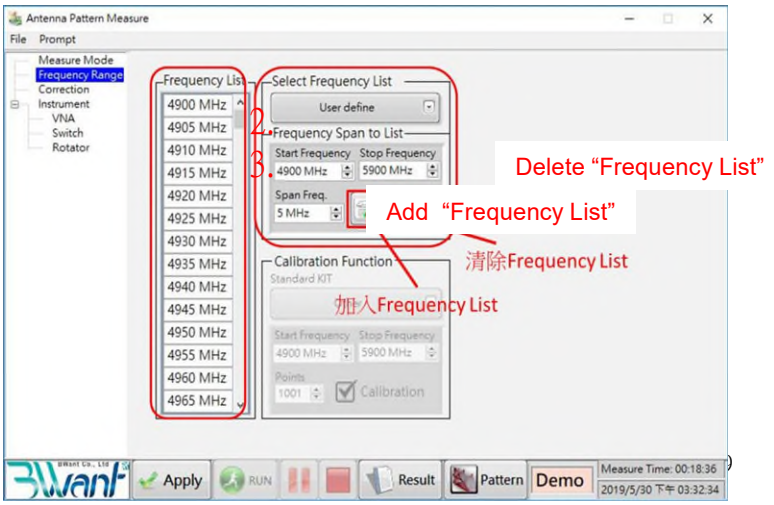


5F., No. 655, Xuecheng Rd., Shulin Dist., New Taipei City 23854,
Taiwan
www.lynwave.com
+886 2 3501 8700

- Select “Two Axis Double Polarization “ on Measure Mode Page.
- Set the angle of Theta and Phi to 30 degree.



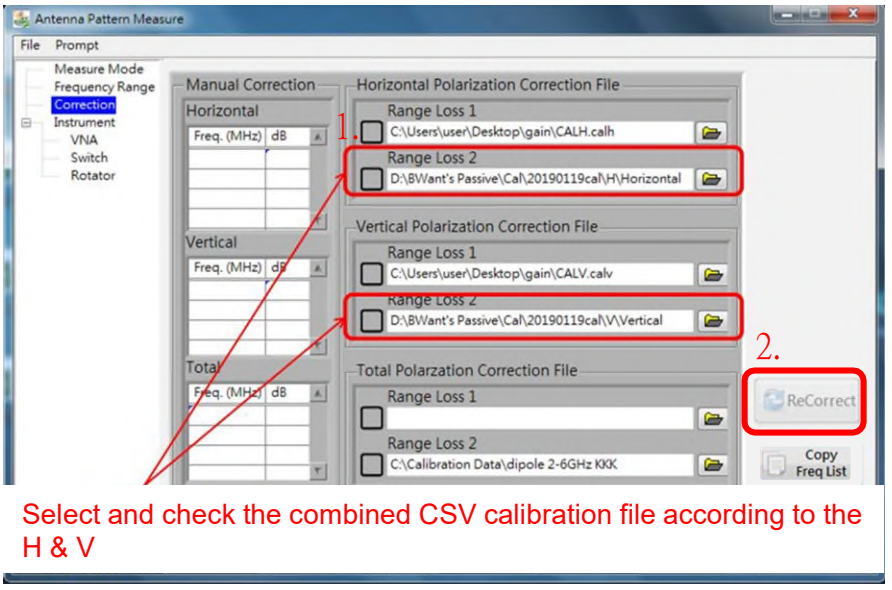
- Delete “Frequency List“.
- Insert the current dipole “start & cutoff frequencies”.
- Insert Span Freq.
  - SD650、SD740: 1MHz
  - – SD900、SD1575、SD5400: 5MHz
  - Other Dipole : 10MHz
- Add “Frequency List“.
- Apply.
- Run.



5F., No. 655, Xuecheng Rd., Shulin Dist., New Taipei City 23854, Taiwan
www.lynwave.com
+886 2 3501 8700

1. Select and check the calibration files that generated on Page 13 & Page 15.
2. Click on ”ReCorrect”.

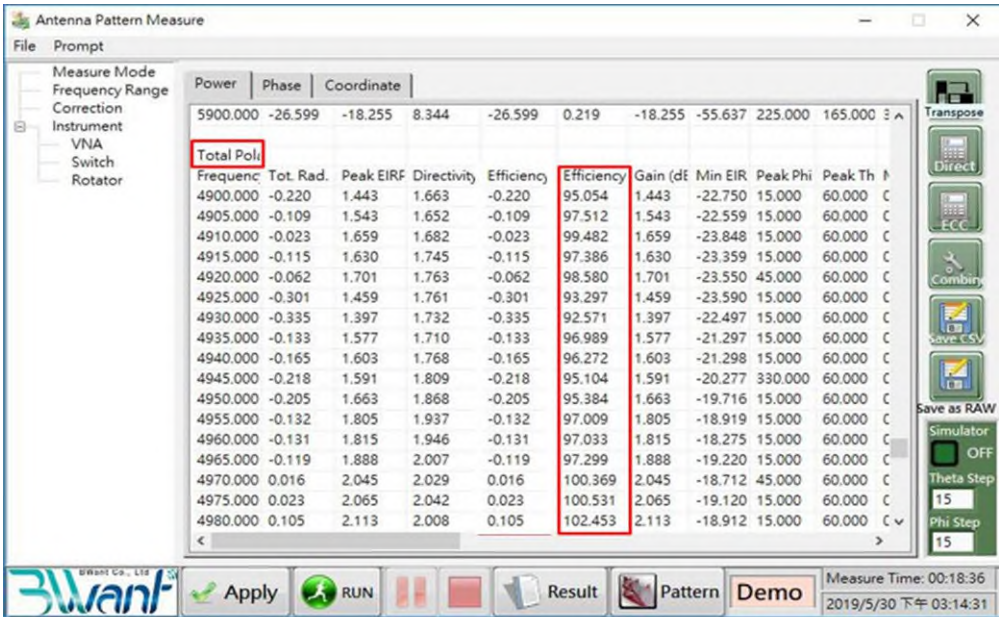
- Apply .calh file in “Range Loss1"
- Apply .csv file in “Range Loss2"



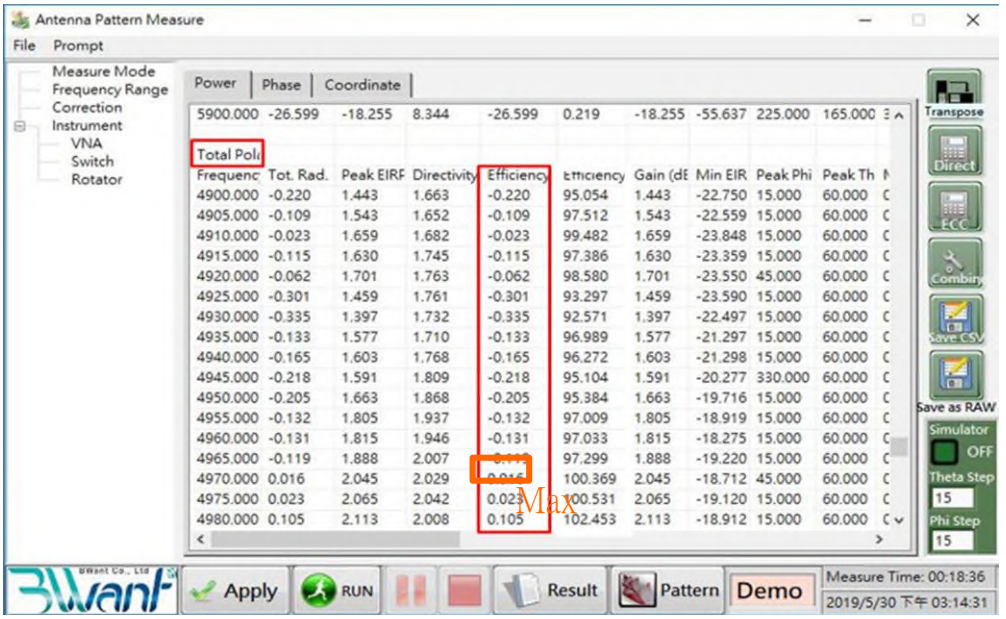
Select and check the combined CSV calibration file according to the H & V

5F., No. 655, Xuecheng Rd., Shulin Dist., New Taipei City 23854, Taiwan
www.lynwave.com
+886 2 3501 8700

- If any efficiency value >100%, please refer to the next page to correct.
- Efficiency value <100%, then calibration is done.

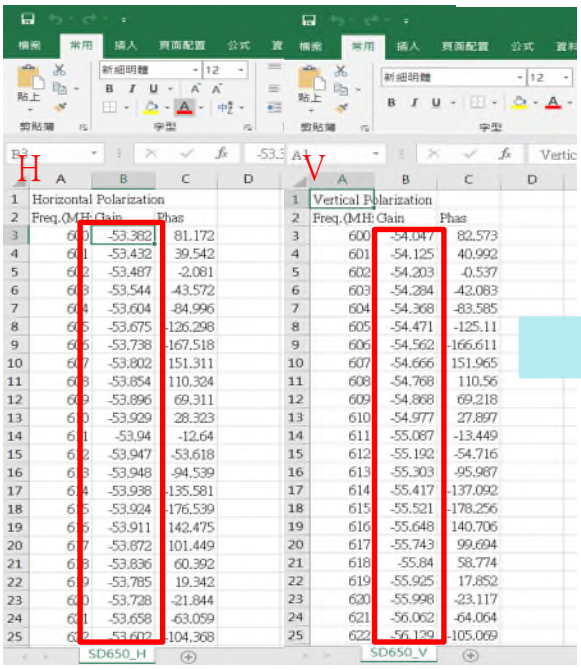


- If any efficiency value >100%, please refer to the following steps to correct:
  1. Backup the Horizontal & Vertical combined files
  2. Find the maximum efficiency value, Ex. 0.105



5F., No. 655, Xuecheng Rd., Shulin Dist., New Taipei City 23854,
Taiwan
www.lynwave.com
+886 2 3501 8700

3. Correct the H & V calibration data.
   - Ex. Max: 0.105
   - New Gain=Red Frame + Max + 0.1



Ex. Original Freq 600 Gain= -53.382
New Gain=-53.382 +0.105 + 0.1= -53.177

	A	B	C	D
1	Horizontal Polarization			
2	Freq.(MH:	Gain	Phas	
3	600	-53.177	81.172	
4	601	-53.227	39.542	
5	602	-53.282	-2.081	
6	603	-53.339	-43.572	
7	604	-53.399	-84.996	
8	605	-53.47	-126.298	
9	606	-53.533	-167.518	
10	607	-53.597	151.311	
11	608	-53.649	110.324	
12	609	-53.691	69.311	
13	610	-53.724	28.323	
14	611	-53.735	-12.64	
15	612	-53.742	-53.618	
16	613	-53.743	-94.539	
17	614	-53.733	-135.581	
18	615	-53.719	-176.539	
19	616	-53.706	142.475	
20	617	-53.667	101.449	
21	618	-53.631	60.392	
22	619	-53.58	19.342	
23	620	-53.523	-21.844	
24	621	-53.453	-63.059	
25	622	-53.397	-104.368	

	A	B	C	D
1	Vertical Polarization			
2	Freq.(MH:	Gain	Phas	
3	600	-53.842	82.573	
4	601	-53.92	40.992	
5	602	-53.998	-0.537	
6	603	-54.079	-42.083	
7	604	-54.163	-83.585	
8	605	-54.266	-125.11	
9	606	-54.357	-166.611	
10	607	-54.461	151.965	
11	608	-54.563	110.56	
12	609	-54.663	69.218	
13	610	-54.772	27.897	
14	611	-54.882	-13.449	
15	612	-54.987	-54.716	
16	613	-55.098	-95.987	
17	614	-55.212	-137.092	
18	615	-55.316	-178.256	
19	616	-55.443	140.706	
20	617	-55.538	99.694	
21	618	-55.635	58.774	
22	619	-55.72	17.852	
23	620	-55.793	-23.117	
24	621	-55.857	-64.064	
25	622	-55.924	-105.069	

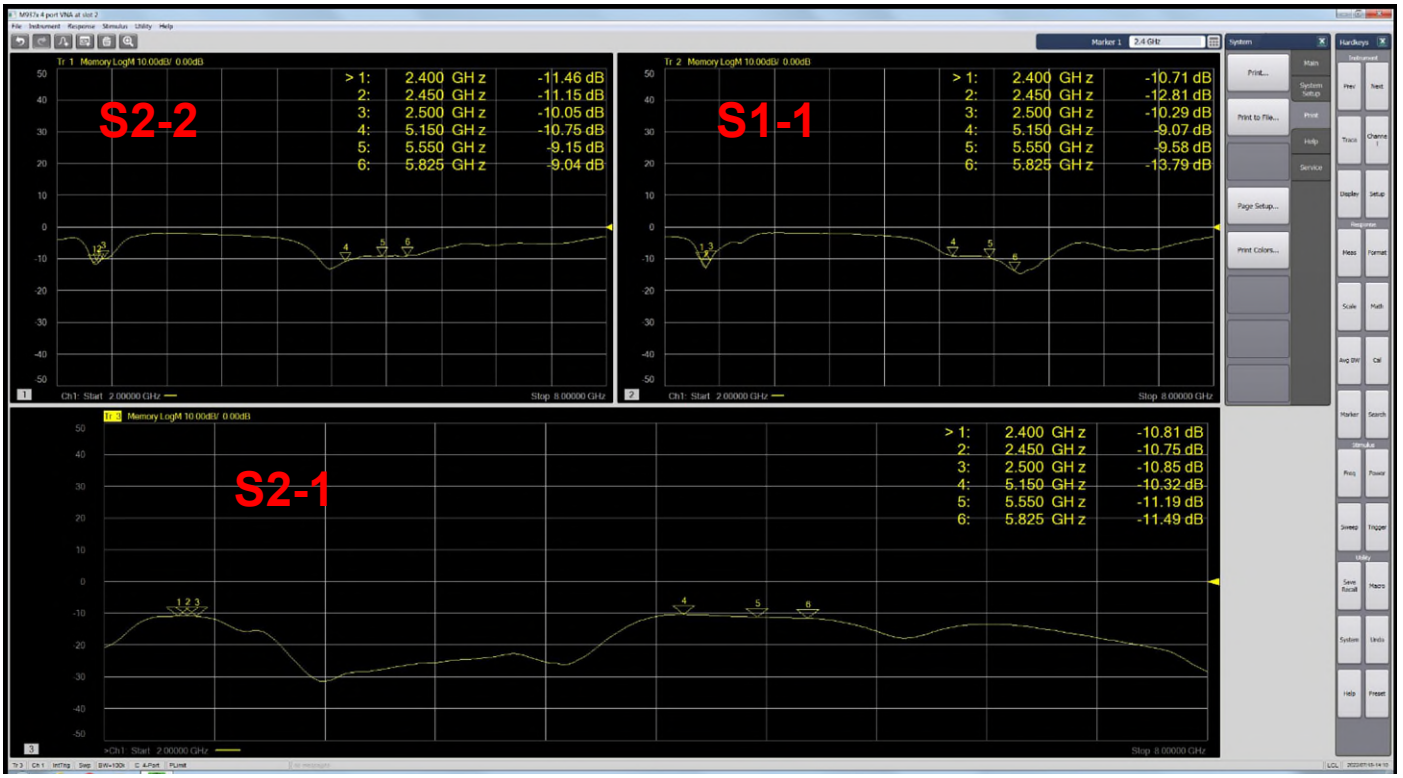
5F., No. 655, Xuecheng Rd., Shulin Dist., New Taipei City 23854, Taiwan
www.lynwave.com
+886 2 3501 8700

- According to the Page 17~24, keep confirm all the antennas' efficiency value.

Efficiency Value Confirmation	Dipole Name
	SD650
	SD740
	SD900
	SD1150
	SD1575
	SD1800
	SD2140
	SD2450
	SD3200
	SD3600
	SD5400

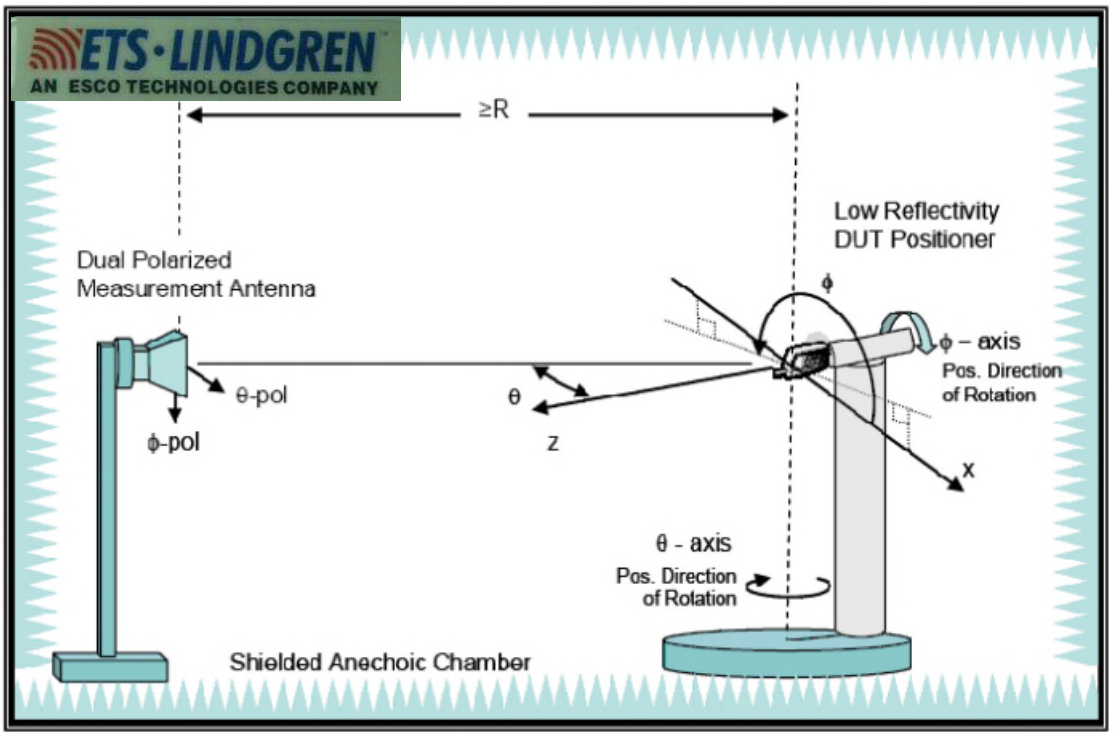
5F., No. 655, Xuecheng Rd., Shulin Dist., New Taipei City 23854, Taiwan
www.lynwave.com
+886 2 3501 8700

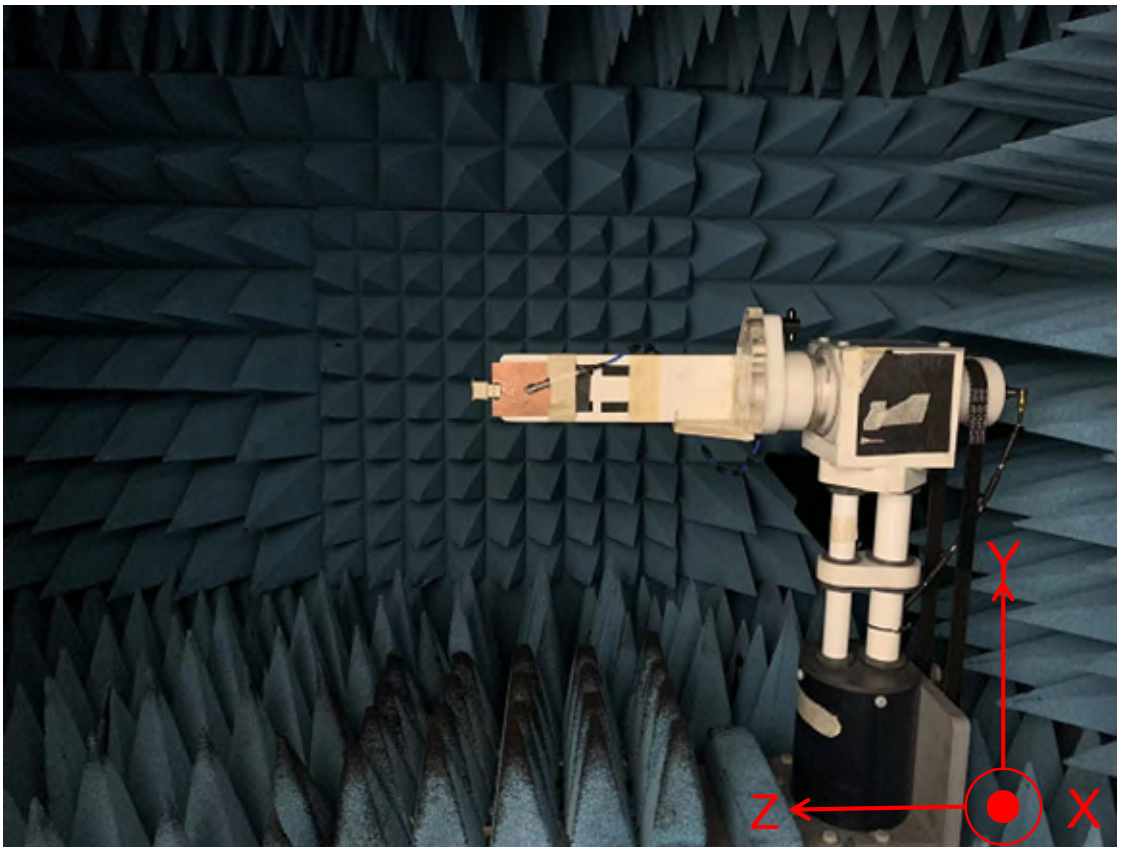
S-Parameters



5F., No. 655, Xuecheng Rd., Shulin Dist., New Taipei City 23854,
Taiwan
www.lynwave.com
+886 2 3501 8700

Equipment :
ETS Chamber





5F., No. 655, Xuecheng Rd., Shulin Dist., New Taipei City 23854,
Taiwan
www.lynwave.com
+886 2 3501 8700

Gain Table

Ant.1						
Frequency (MHz)	2400	2450	2500	5150	5550	5825
Efficiency(%)	31	32	33	42	43	42
Peak Gain(dBi)	-1.4	-0.9	-0.6	0.4	1.8	2.6
Ant.2						
Frequency (MHz)	2400	2450	2500	5150	5550	5825
Efficiency(%)	33	33	34	41	43	43
Peak Gain(dBi)	-1.7	-1.1	-0.9	0.5	2.8	3.0

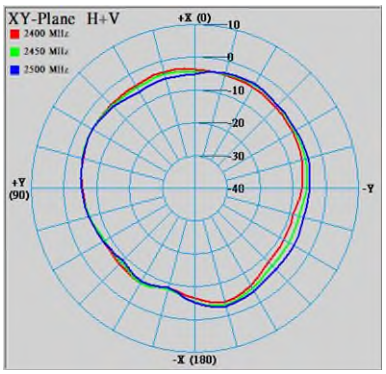
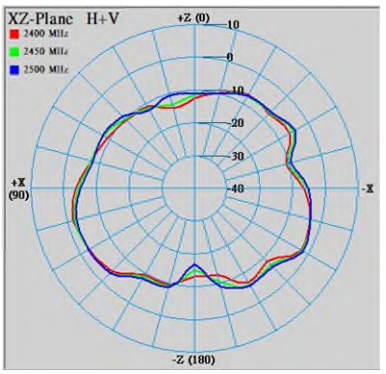
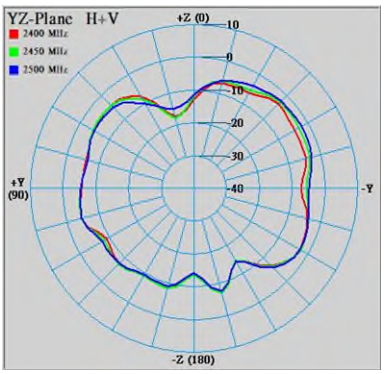
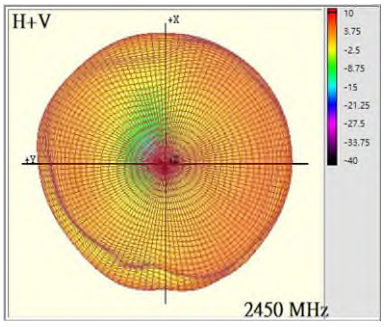
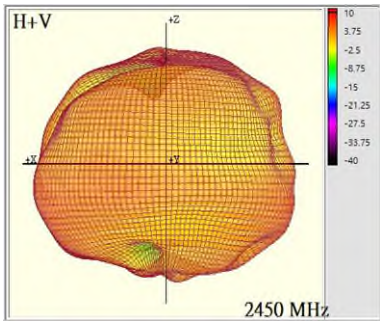
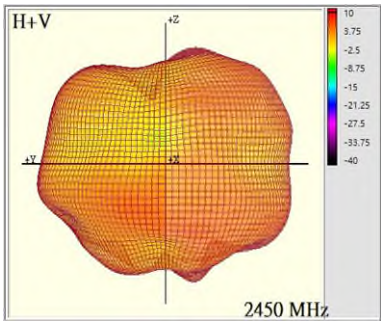
The antenna characteristics

- Return loss < -8dB in operating band
- Isolation
  - All Band > 10 dB
- Efficiency
  - WIFI 2.4GHz Band ≥ 30%
  - WIFI 5GHz Band ≥ 40%
- Gain
  - WIFI 2.4GHz Band -1.7 ~ -0.6dBi
  - WIFI 5GHz Band 0.4 ~ 3.0dBi

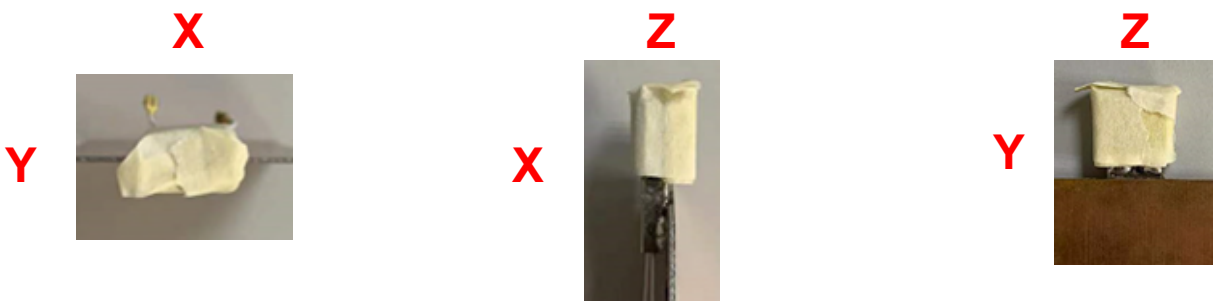
5F., No. 655, Xuecheng Rd., Shulin Dist., New Taipei City 23854,
Taiwan
www.lynwave.com
+886 2 3501 8700

Ant.1_ 2D.3D Radiation Pattern
Frequency(MHz) : 2D. 2400~2500
3D. 2450

Radiation Pattern :

Azimuth Plane	Elevation Plane phi = 0	Elevation Plane phi = 90
		
		

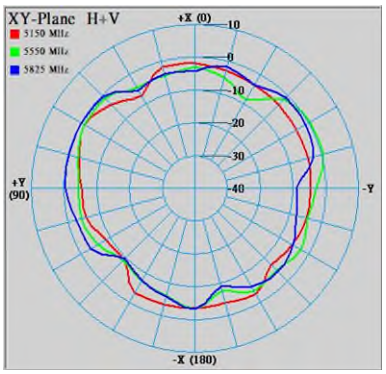
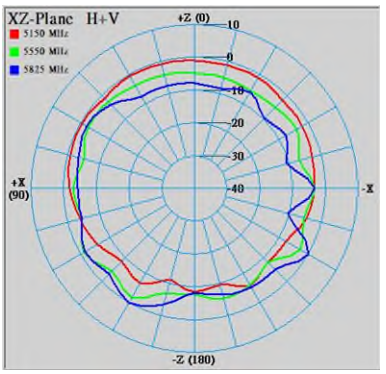
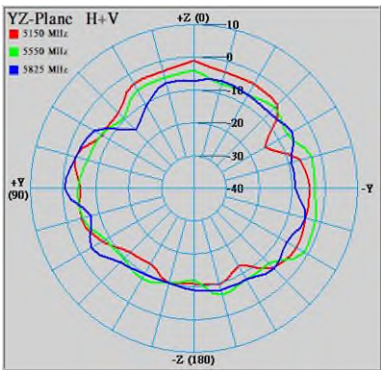
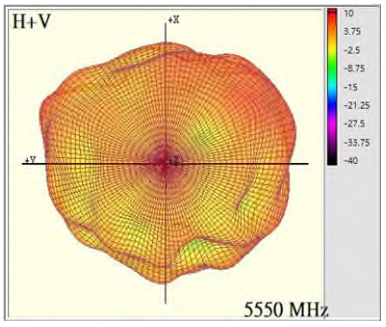
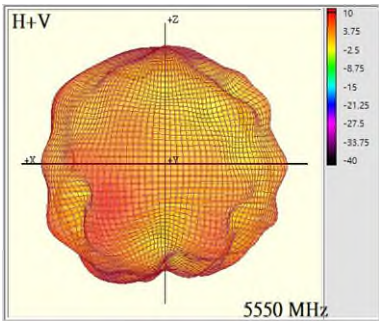
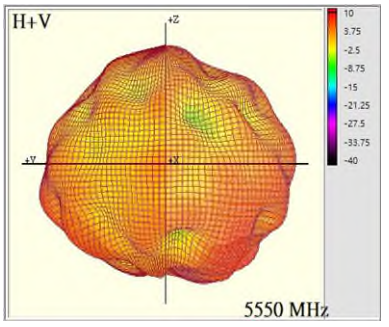
Setup :



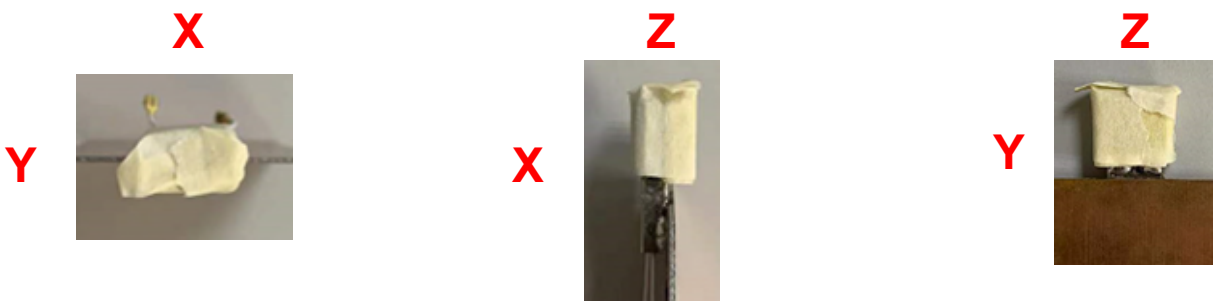
5F., No. 655, Xuecheng Rd., Shulin Dist., New Taipei City 23854, Taiwan
www.lynwave.com
+886 2 3501 8700

Ant.1_ 2D.3D Radiation Pattern
Frequency(MHz) : 2D. 5150~5825
3D. 5550

Radiation Pattern :

Azimuth Plane	Elevation Plane phi = 0	Elevation Plane phi = 90
		
		

Setup :

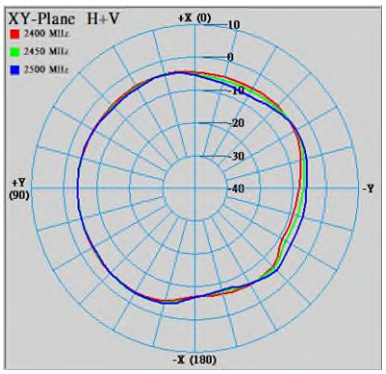


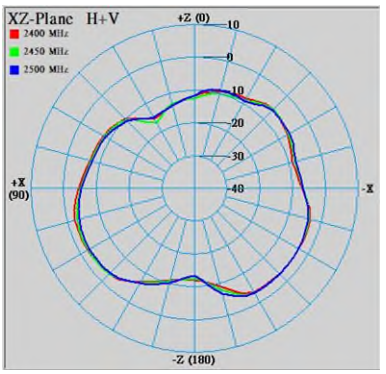
5F., No. 655, Xuecheng Rd., Shulin Dist., New Taipei City 23854, Taiwan
www.lynwave.com
+886 2 3501 8700

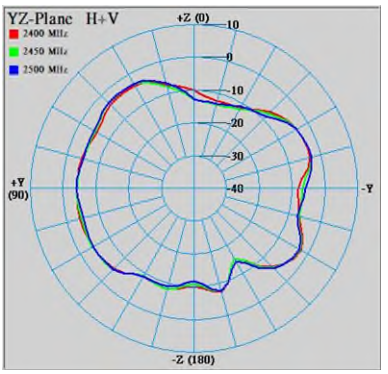
Ant.2_ 2D.3D Radiation Pattern
Frequency(MHz) : 2D. 2400~2500
3D. 2450

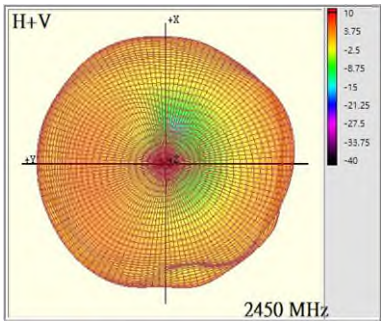
Radiation Pattern :

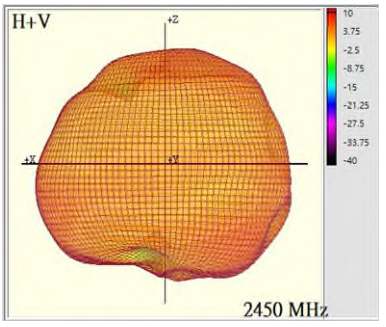
Azimuth Plane	Elevation Plane phi = 0	Elevation Plane phi = 90

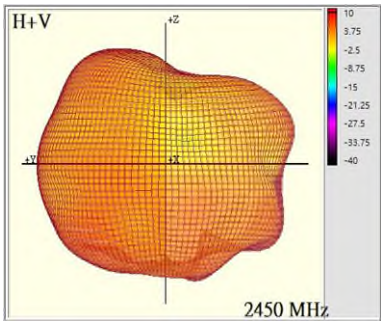




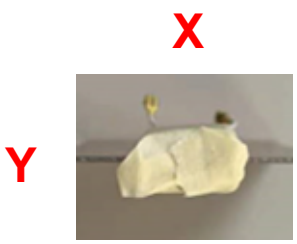


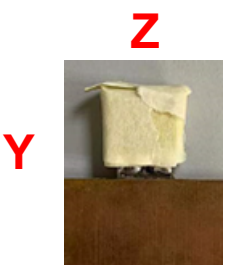






Setup :





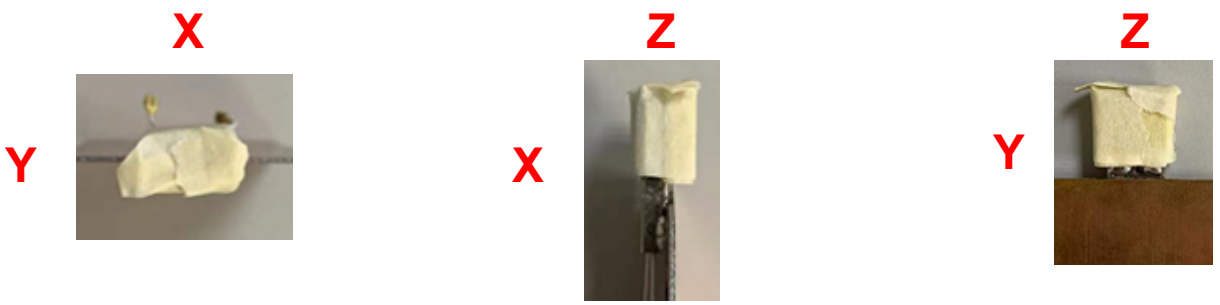
5F., No. 655, Xuecheng Rd., Shulin Dist., New Taipei City 23854, Taiwan
www.lynwave.com
+886 2 3501 8700

Ant.2_ 2D.3D Radiation Pattern
Frequency(MHz) : 2D. 5150~5825
3D. 5550

Radiation Pattern :

Azimuth Plane	Elevation Plane phi = 0	Elevation Plane phi = 90

Setup :



5F., No. 655, Xuecheng Rd., Shulin Dist., New Taipei City 23854, Taiwan
www.lynwave.com
+886 2 3501 8700

www.lynwave.com

https://www.facebook.com/LYNwaveTechnology/

https://www.linkedin.com/company/lynwave-technology-ltd./

https://lynwave.en.alibaba.com/

5F., No. 655, Xuecheng Rd., Shulin Dist., New Taipei City 23854,
Taiwan
www.lynwave.com
+886 2 3501 8700