LYNwave Technology

Antenna & Thermal solution provider

2022

www.lynwave.com

Antenna Test Report

Model Name: W550CA ,HX-W550CA-NA, HX-W550CA-EU ,HX-W550CA-UK ,HX-W550CA-00

Feature: 2.4G/5G

Application: Wi-Fi AP

Date	Owner	Revision
2021/09/27	Alon Cai	1. S-Parameters Measurement 2. Antenna 3D Passive Measurement
2022/01/21	Alon Cai	1. S-Parameters Measurement 2. Antenna 3D Passive Measurement
2022/02/14	Xavi / Danny	1. Approval
2022/06/06	Alon Cai	1. Add Device Description
2022/06/07	Xavi/Danny	Approval
2022/06/22	Xavi/Danny	1.Added antenna chamber calibration description
2022/06/23	Daniel	1. Update antenna chamber calibration description

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Table of Contents

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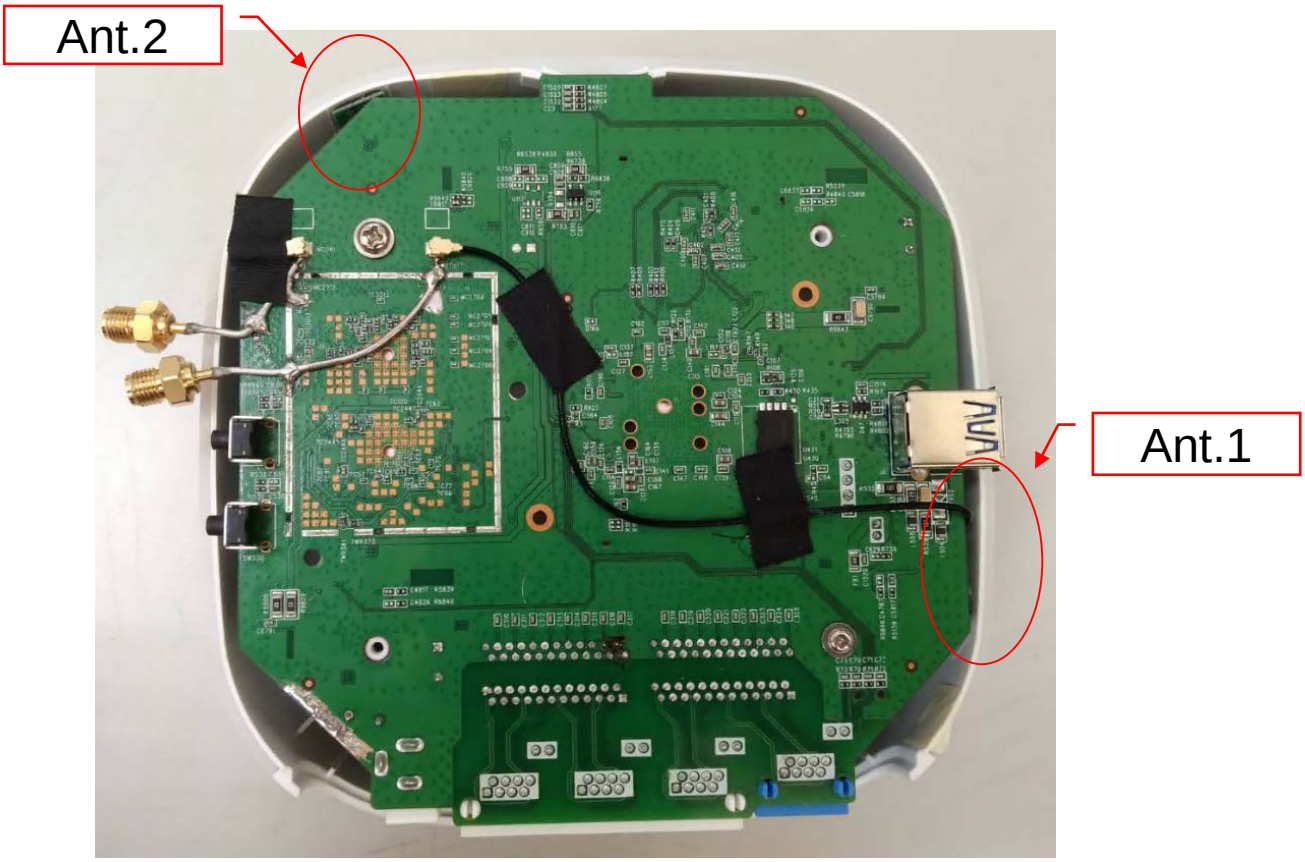
Antenna Placement

Antenna	Description	Frequency
Ant.1	ALX21P-221AA6-00	2412~2484 MHz ; 5150 ~ 5825 MHz
Ant.2	ALX21P-221AA6-01	2412~2484 MHz ; 5150 ~ 5825 MHz



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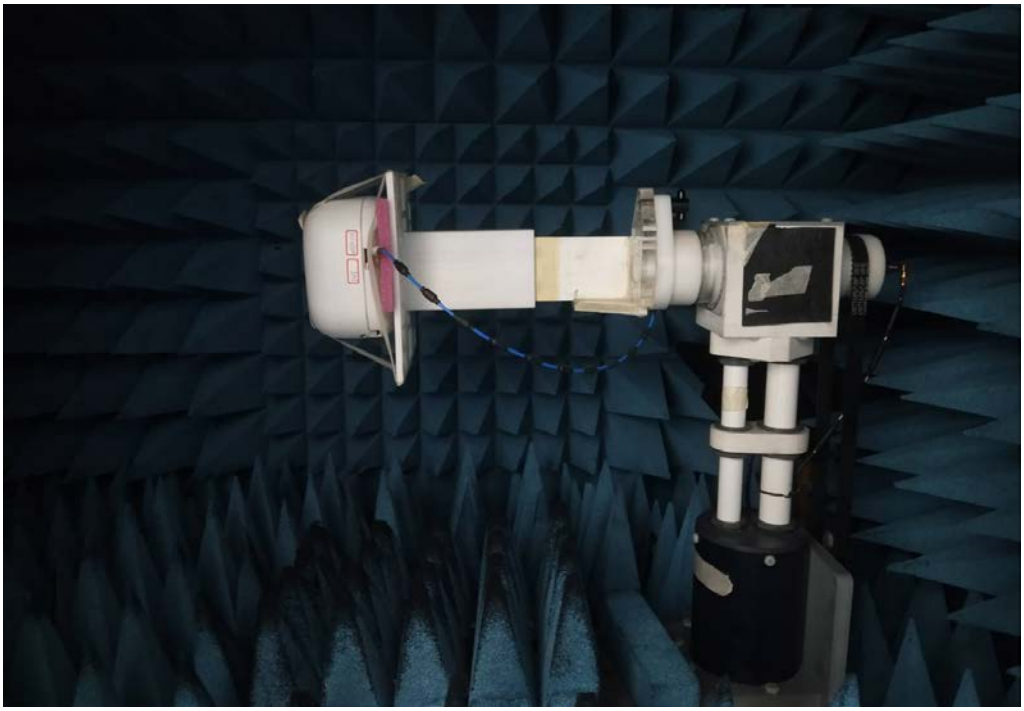
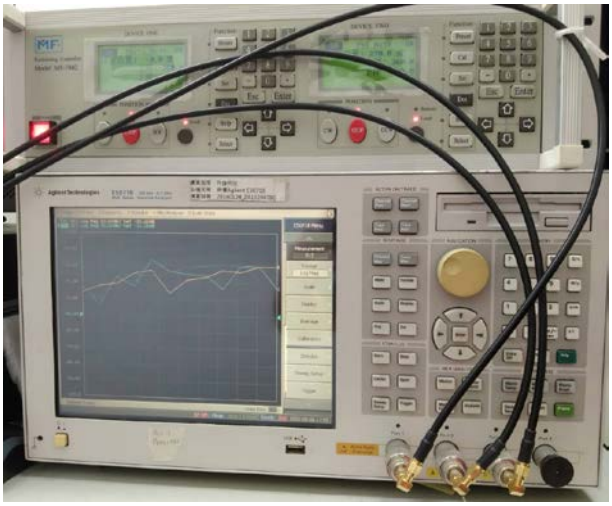
Equipment List :

Antenna Chamber	MFC-2531(1.4x1.4x2.8m)
Test software	Passive 2D/3D川升
Network analyzer	Agilent E5071B
Controller	MF7802
Calibration time	2022/04/30

Antenna Chamber



Network analyzer and Controller :



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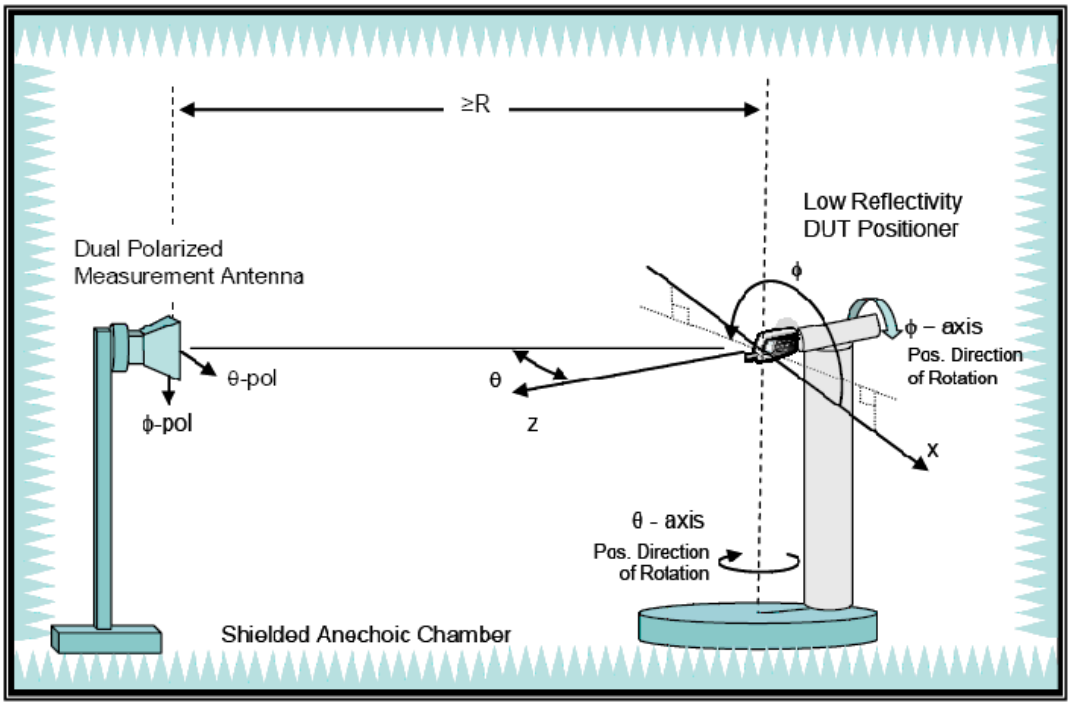
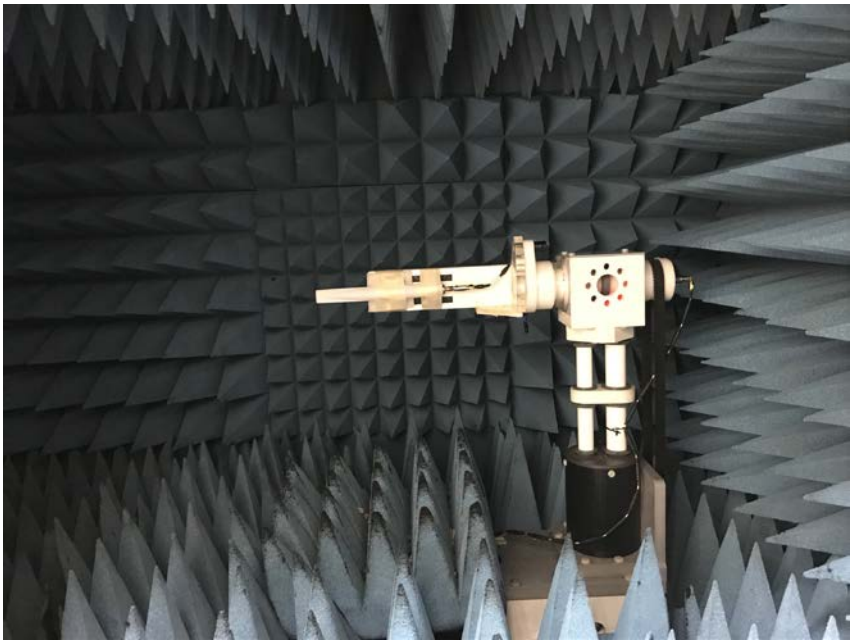
Test architecture :



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.

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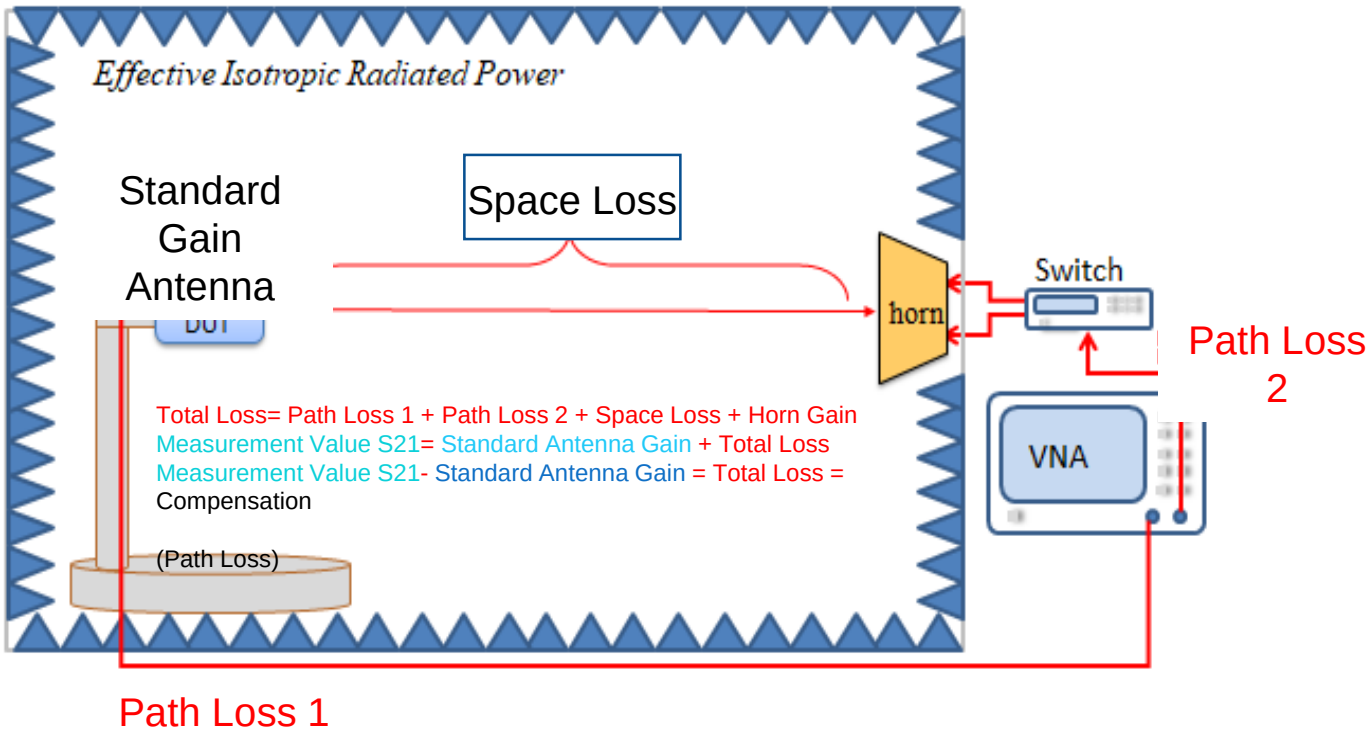
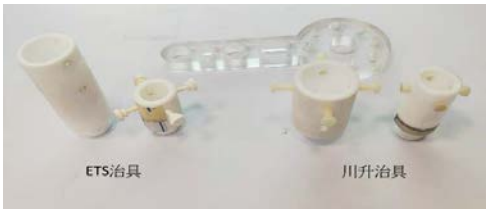
Theory


Effective Isotropic Radiated Power
Standard Gain Antenna
Space Loss
horn
Switch
VNA
Path Loss 2
Total Loss= Path Loss 1 + Path Loss 2 + Space Loss + Horn Gain
Measurement Value S21= Standard Antenna Gain + Total Loss
Measurement Value S21- Standard Antenna Gain = Total Loss = Compensation
(Path Loss)
Path Loss 1

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.



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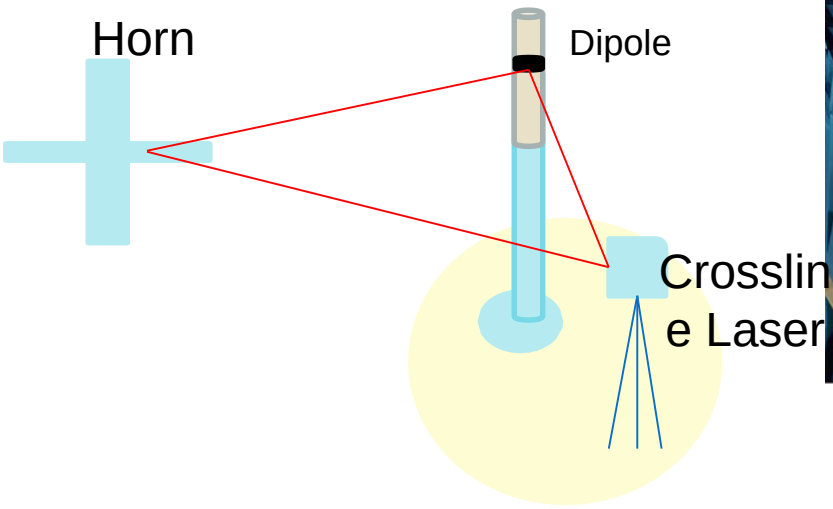
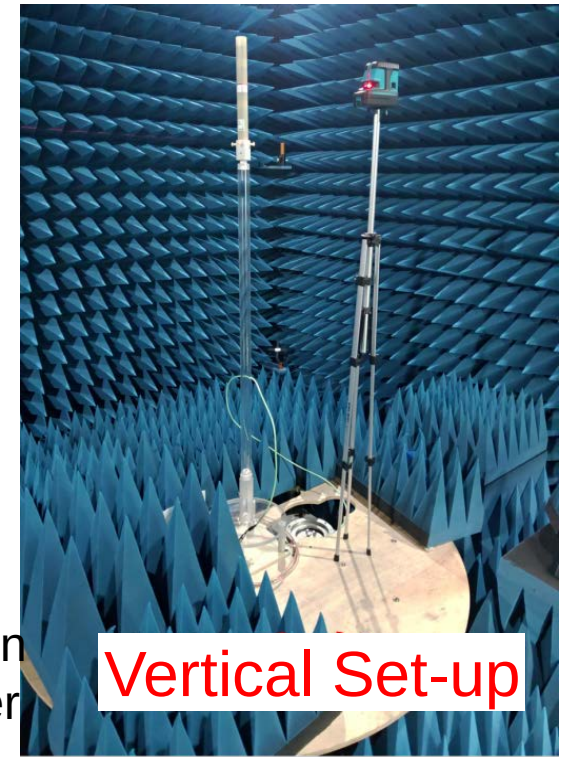
1. Align the horn horizontal blade by crossline laser.
2. Align the dipole feeding point to laser line.





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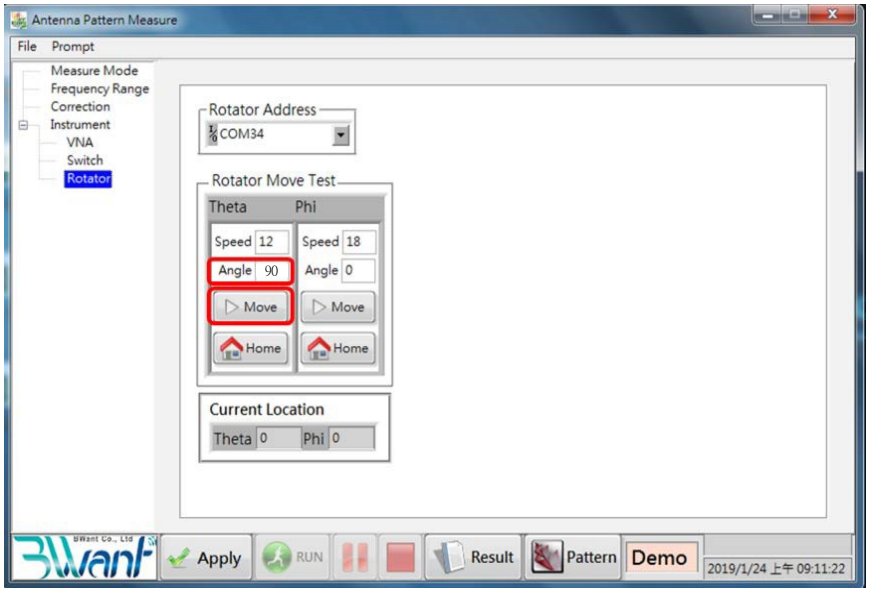
1. Set-up the dipole start from low frequency (SD650).
2. Rotate 90 degree on Theta axis.



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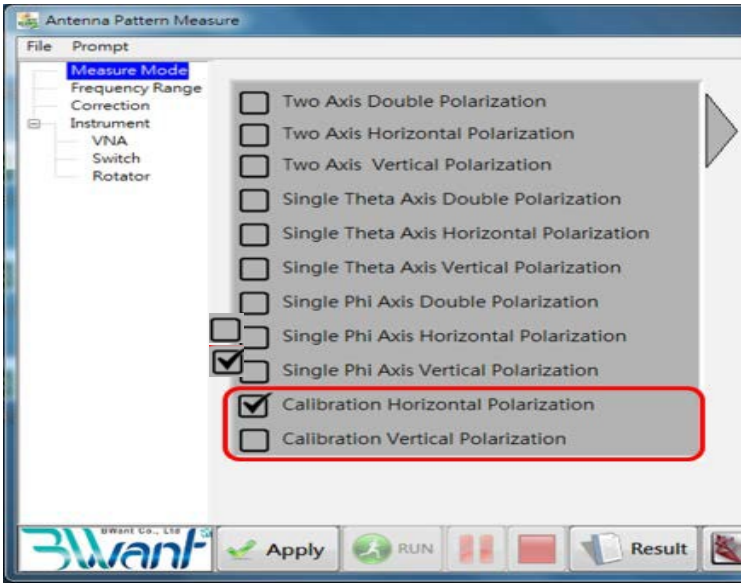
- Choose “Calibration Vertical Polarization“.
- Or choose “Calibration Horizontal Polarization” if you need a horizontal one.



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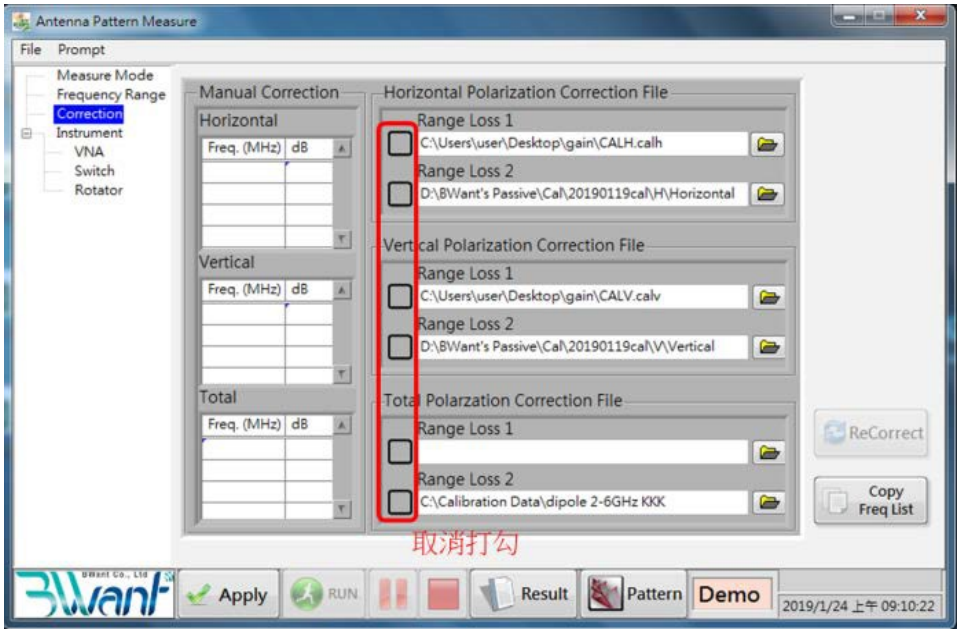
- Cancel all the selection as follow picture.



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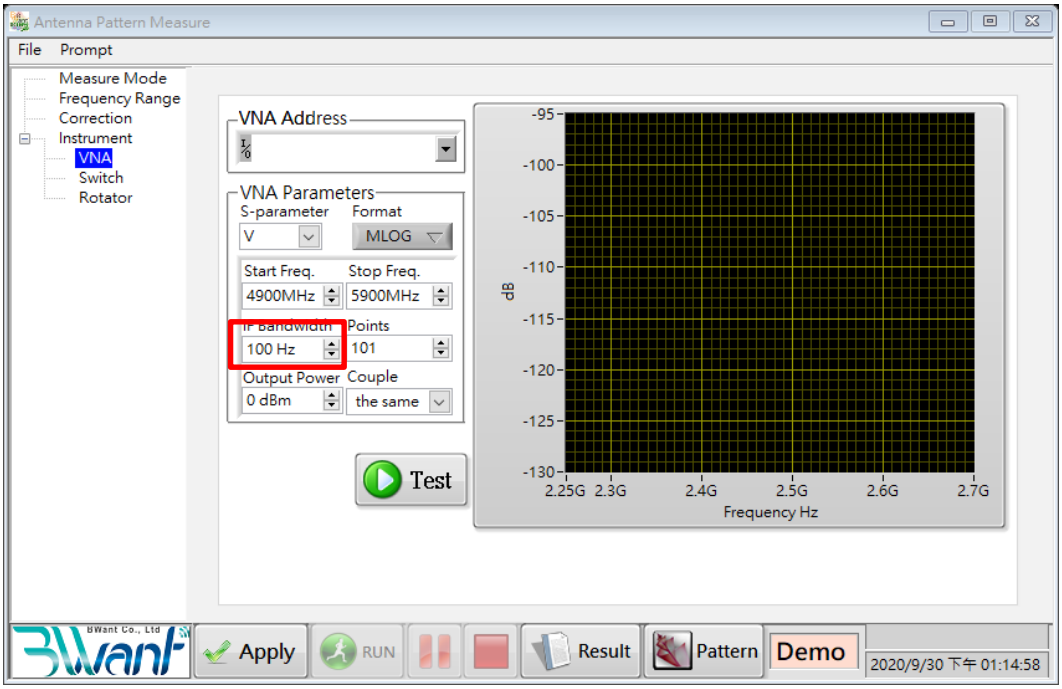
- Set the IF Bandwidth to 100Hz.



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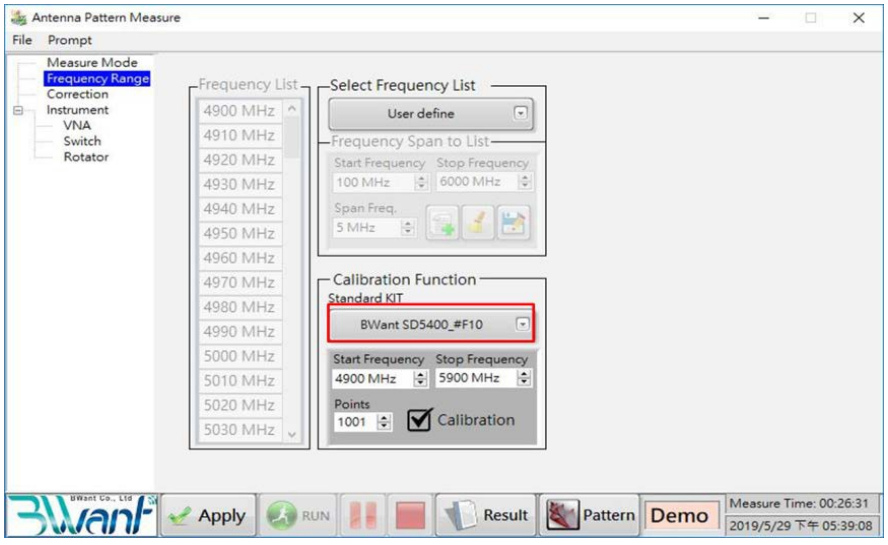
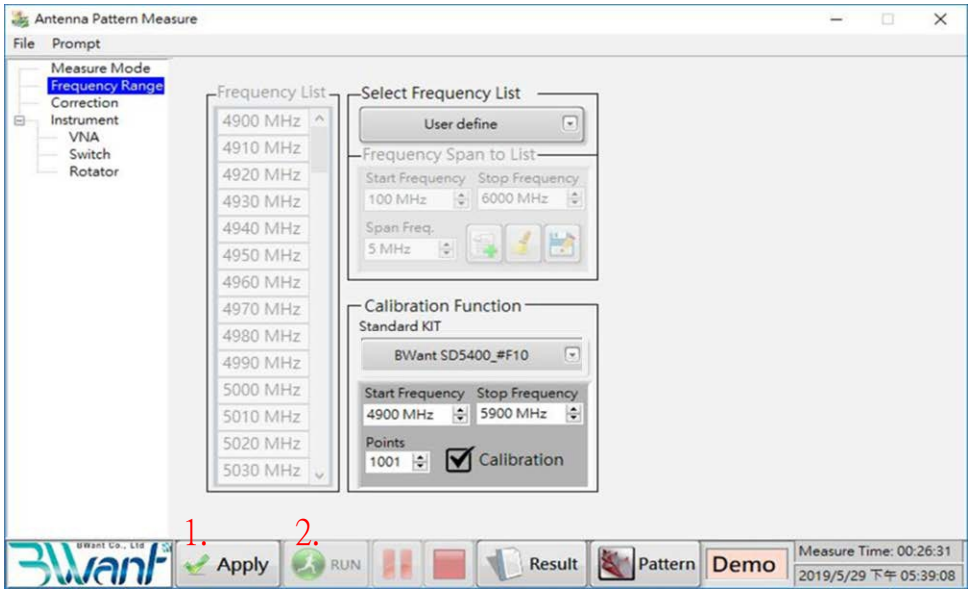
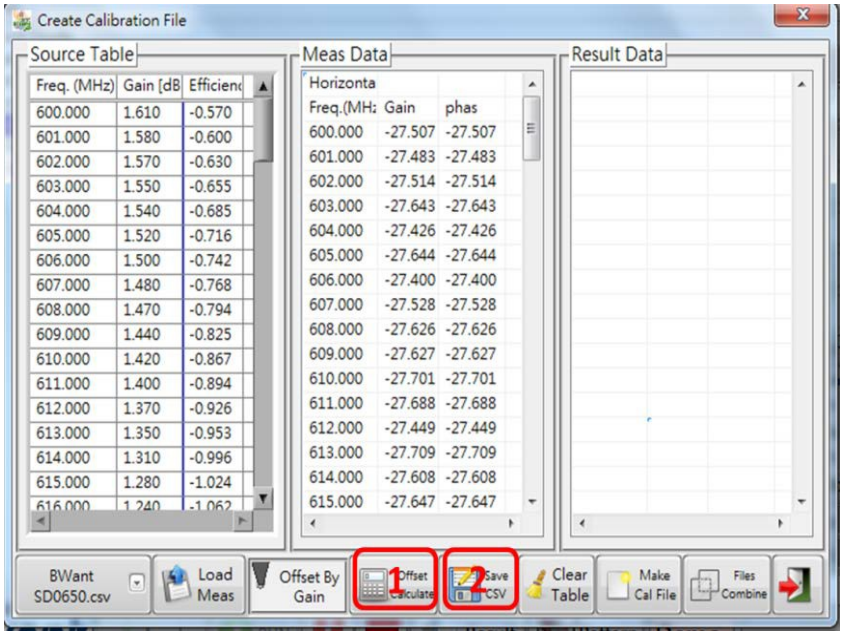
- Select the calibration dipole type from Standard KIT.
  - The frequency band is labeled on the dipole (the start & cutoff frequencies and the test points number would be set automatically after selection).



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“.



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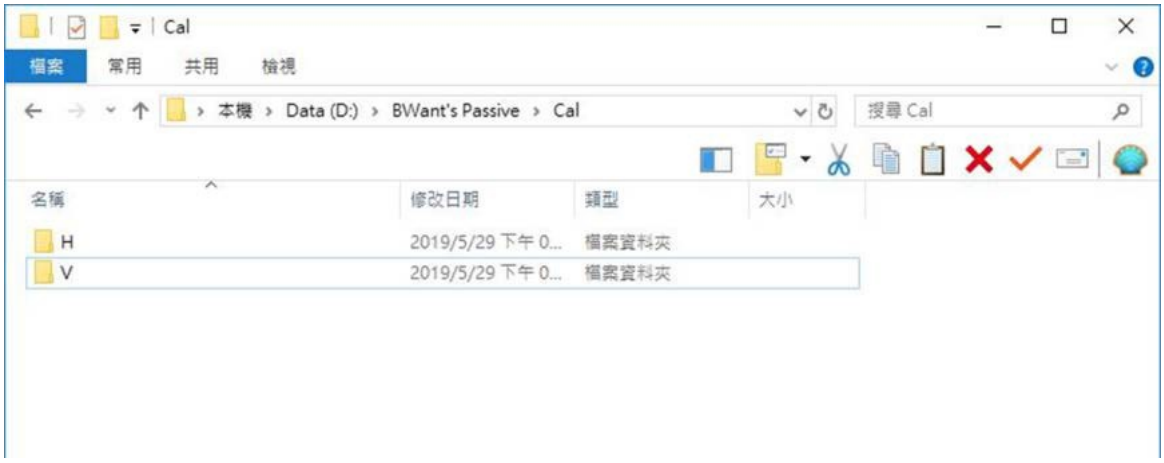
- Save the testing file according by each dipole test band and polarization.
  - Ex Vertical Polarization SD650
  - Place the Cal->V Folder and named it as “SD650_V"



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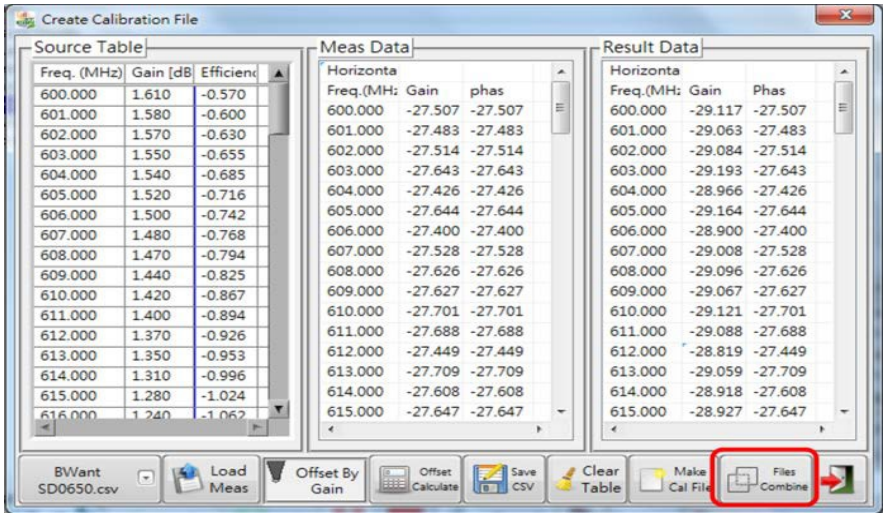
- Repeat all the 11pcs antenna as right table to complete the full band frequency according the steps from Page 5~12.
- Click on “Files Combine“ , select the “Folder V” and all frequency band file would be generated.
  - Ex. Vertical Polarization 600-5900 MHzPath Loss.csv



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

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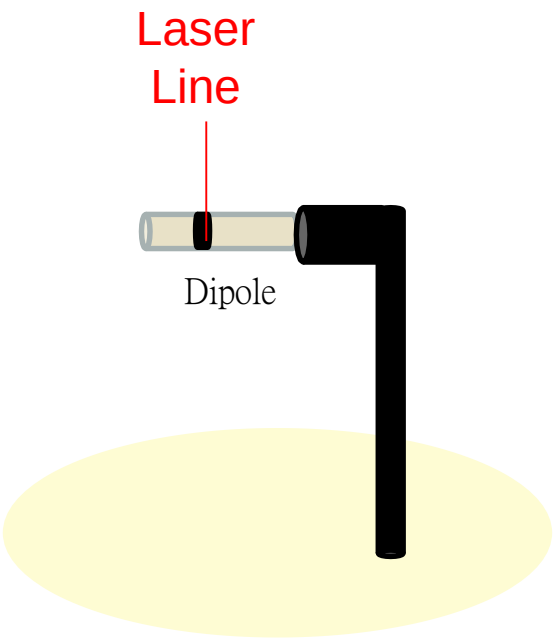
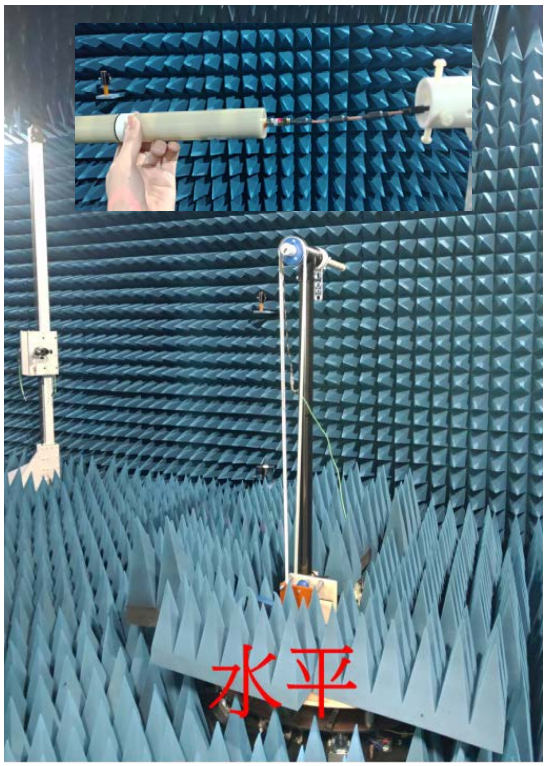
1. Align the dipole feeding point to laser line.





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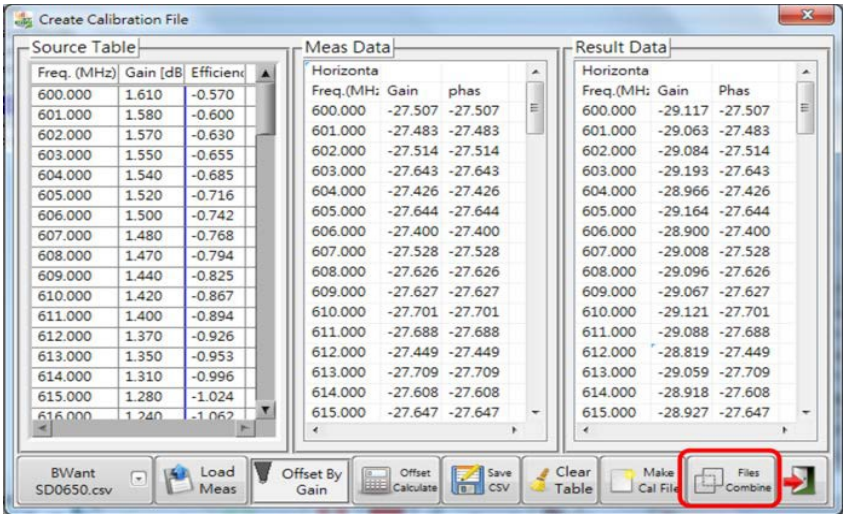
- Repeat all the 11pcs antenna as right table to complete the full band frequency according the steps from Page 5~12.
- Click on “Files Combine“ , select the “Folder H” and all frequency band file would be generated.
  - Ex. Horizontal Polarization 600-5900 MHzPath Loss.csv



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

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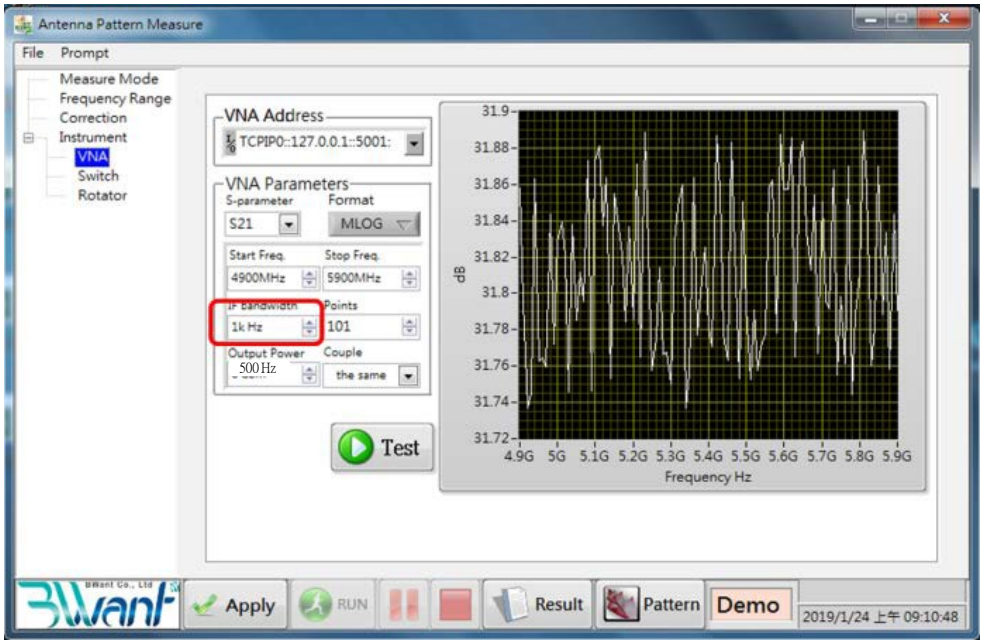
- Change the “IF Bandwidth" value back to 500Hz.



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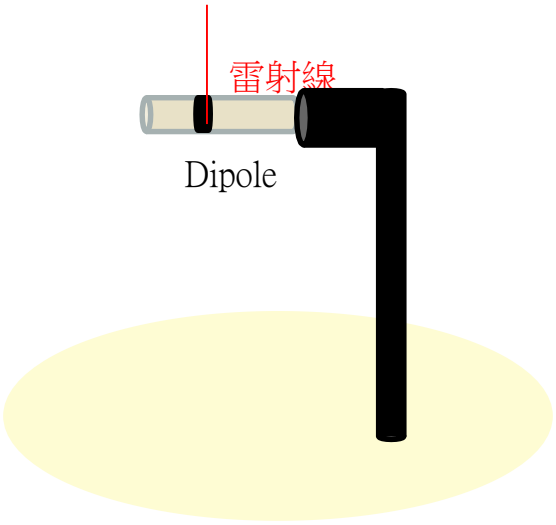
1. Set-up the dipole start from low frequency (SD650) as Page 14.



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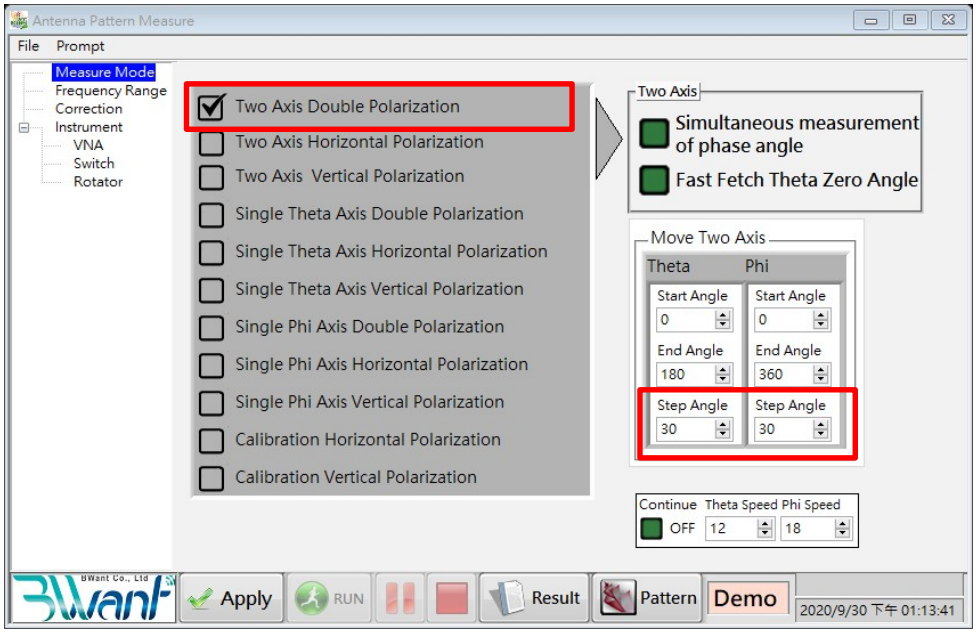
- Select “Two Axis Double Polarization “ on Measure Mode Page.
- Set the angle of Theta and Phi to 30 degree.



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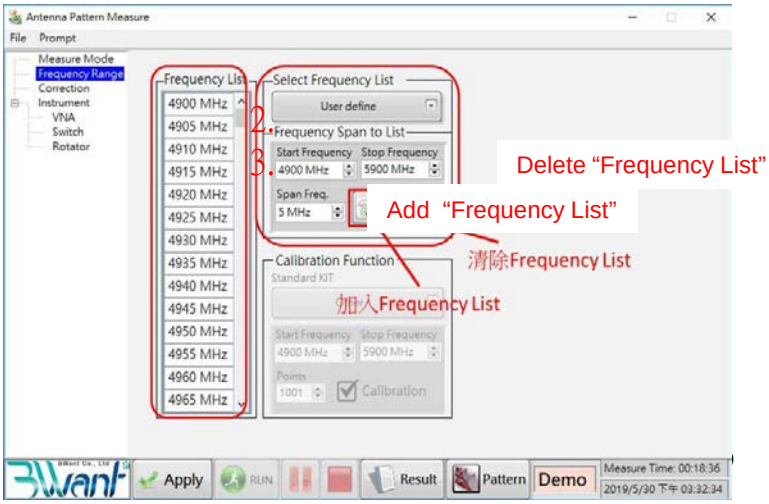
1. Delete “Frequency List“.
2. Insert the current dipole “start & cutoff frequencies”.
3. Insert Span Freq.
   - SD650、SD740: 1MHz
   - SD900、SD1575、SD5400: 5MHz
   - Other Dipole : 10MHz
4. Add “Frequency List“.
5. Apply.
6. Run.



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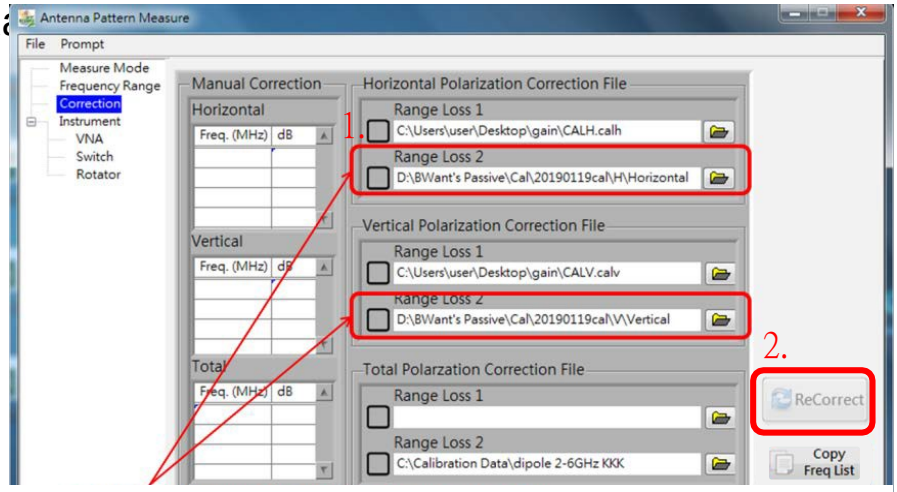
1. Select and check the calibration files that generated on Page 13 & Page 15.
2. Click on ”ReCorrect”.

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



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

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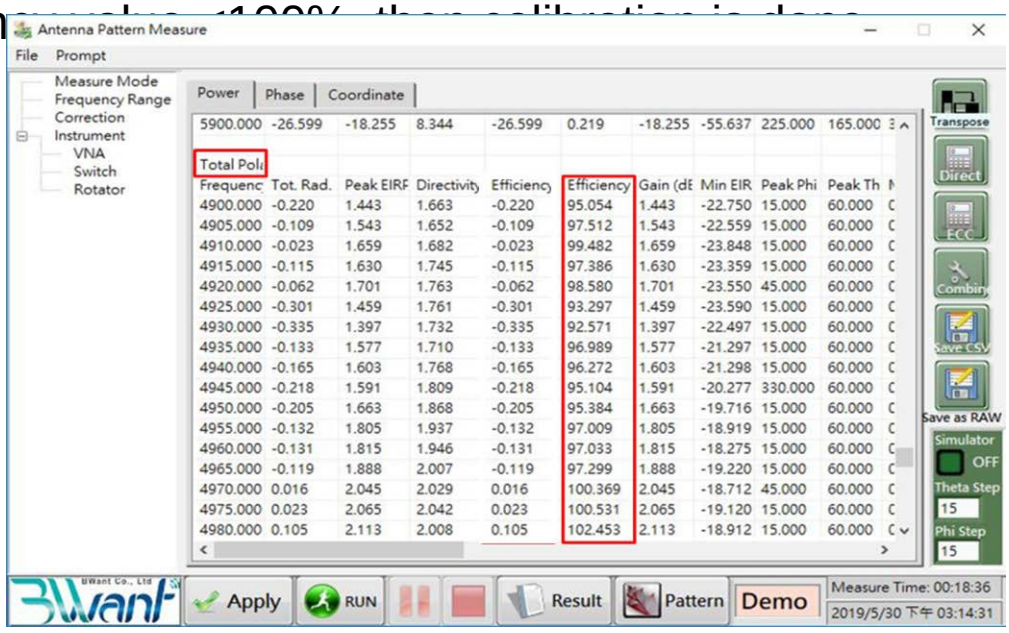
- If any efficiency value >100%, please refer to the next page to correct.
- Efficien



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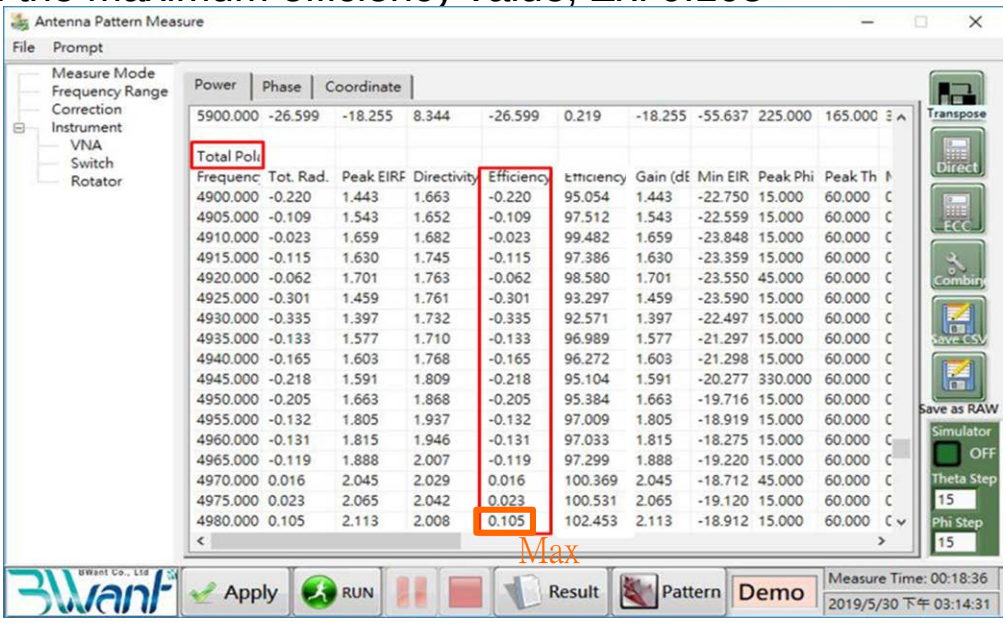
- If any efficiency value >100%, please refer to the following steps to correct:
  1. Backup the Horizontal & Vertical combined files
  2. Find the maximum efficiency value, Ex. 0.105



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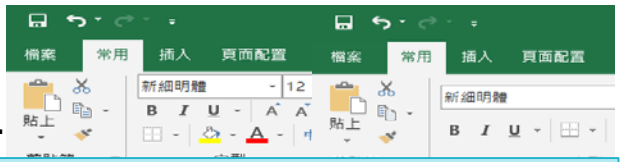
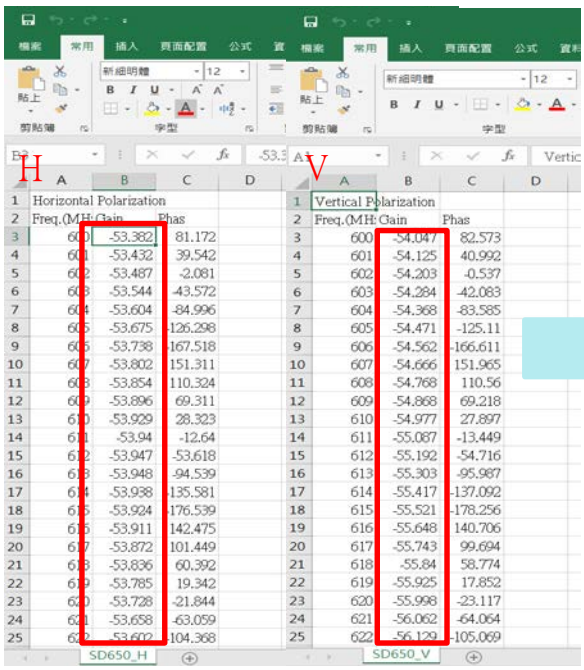
3. Correct the H & V calibration data.
   - Ex. Max: 0.105
   - New Gain=Red Frame + Max + 0.





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

Freq.(MH	Gain	Phas
600	-53.177	81.172
601	-53.227	39.542
602	-53.282	-2.081
603	-53.339	-43.572
604	-53.399	-84.996
605	-53.47	-126.298
606	-53.533	-167.518
607	-53.597	151.311
608	-53.649	110.324
609	-53.691	69.311
610	-53.724	28.323
611	-53.735	-12.64
612	-53.742	-53.618
613	-53.743	-94.539
614	-53.733	-135.581
615	-53.719	-176.539
616	-53.706	142.475
617	-53.667	101.449
618	-53.631	60.392
619	-53.58	19.342
620	-53.523	-21.844
621	-53.453	-63.059
622	-53.397	-104.368

Freq.(MH	Gain	Phas
600	-53.842	82.573
601	-53.92	40.992
602	-53.998	-0.537
603	-54.079	-42.083
604	-54.163	-83.585
605	-54.266	-125.11
606	-54.357	-166.611
607	-54.461	151.965
608	-54.563	110.56
609	-54.663	69.218
610	-54.772	27.897
611	-54.882	-13.449
612	-54.987	-54.716
613	-55.098	-95.987
614	-55.212	-137.092
615	-55.316	-178.256
616	-55.443	140.706
617	-55.538	99.694
618	-55.635	58.774
619	-55.72	17.852
620	-55.793	-23.117
621	-55.857	-64.064
622	-55.924	-105.069

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- 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

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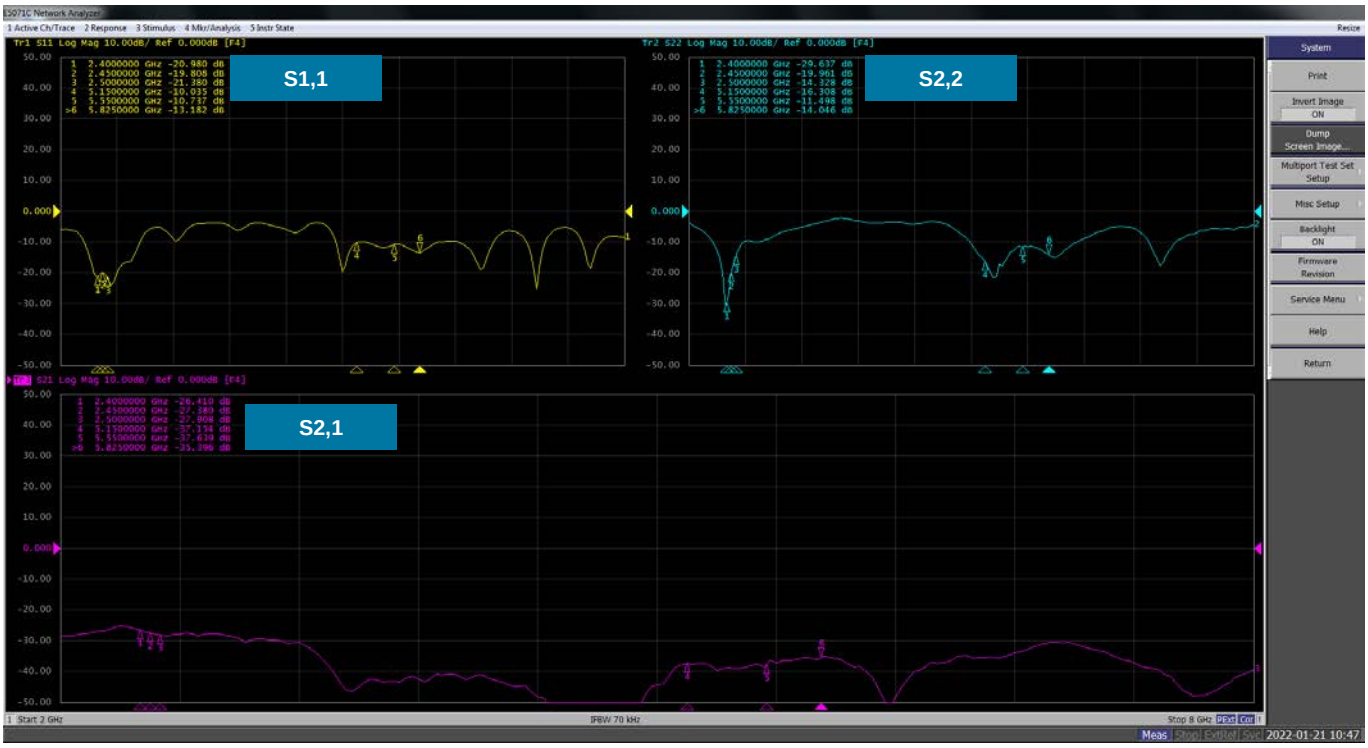
S-Parameter



Gain Table _Copper tube

Ant.1						
Frequency (MHz)	2400	2450	2500	5150	5550	5825
Efficiency(%)	62	64	61	60	61	62
Peak Gain(dBi)	2.5	2.7	2.4	2.8	3.1	3.1
Ant.2						
Frequency (MHz)	2400	2450	2500	5150	5550	5825
Efficiency(%)	68	69	65	60	60	63
Peak Gain(dBi)	2.9	2.6	2.4	3.4	2.9	3.9

The antenna characteristics

- Return loss
  - RL < -10dB in operating band
- Gain
  - 2G Band : 2.4~2.9dBi
  - 5G Band : 2.8~3.1dBi
- Efficiency
  - 2G Band > 60%
  - 5G Band > 60%
- Isolation
  - 2G Band > 25dB
  - 5G Band > 25dB

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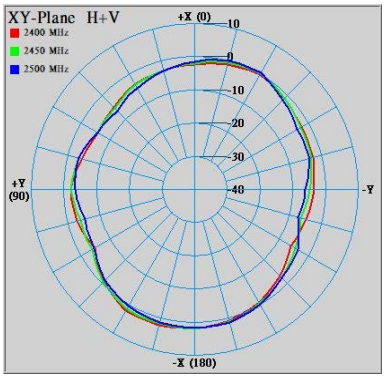
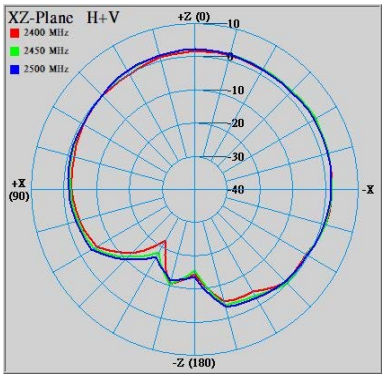
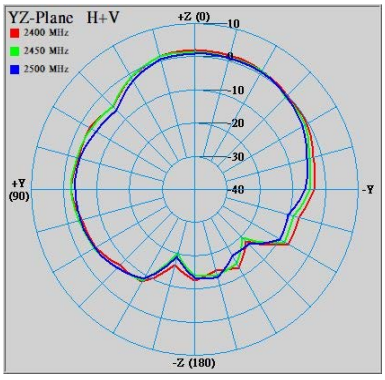
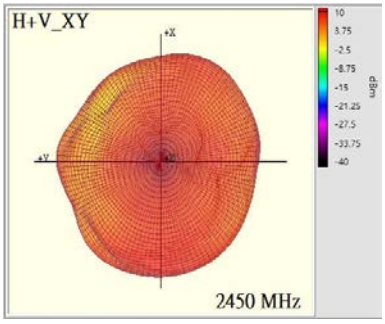
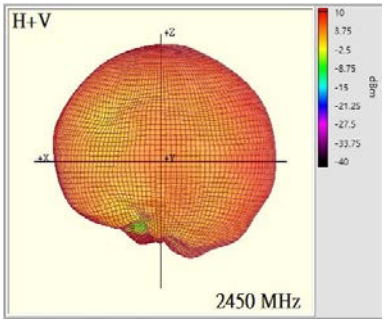
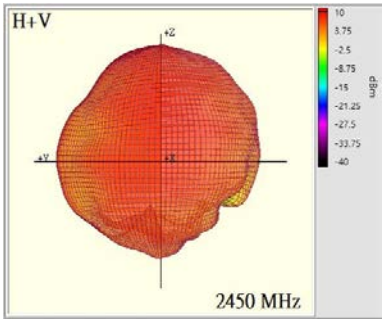
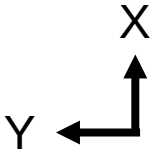
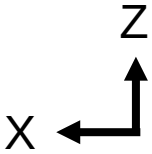
Ant.1_2.4GHz 2D.3D Radiation Pattern with Heatsink
Frequency(MHz) : 2D. 2400~2500
3D. 2450

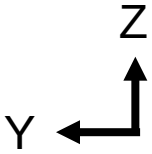
Radiation Pattern :

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

Setup :







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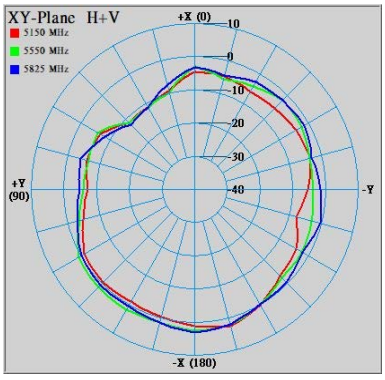
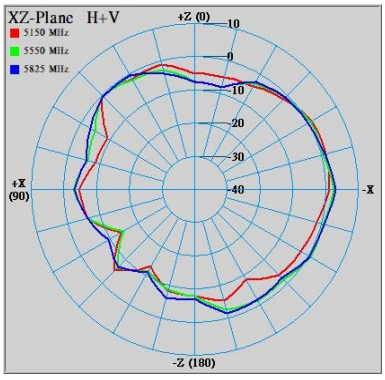
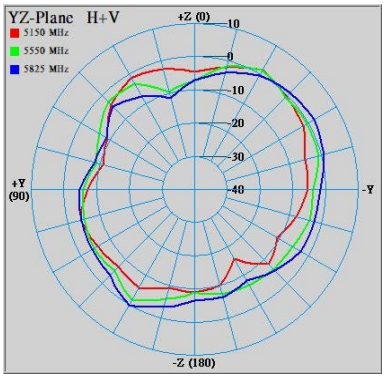
Ant.1_5GHz 2D.3D Radiation Pattern with Heatsink
Frequency(MHz) : 2D. 5150~5825
3D. 5550

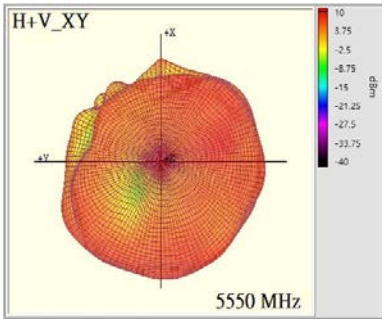
Radiation Pattern :

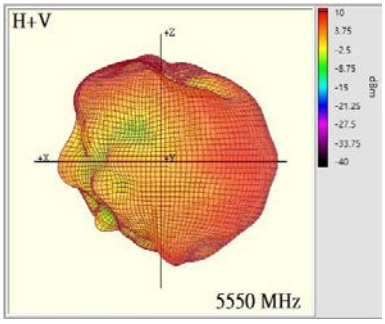
Azimuth Plane	Elevation Plane phi = 0	Elevation Plane phi = 90

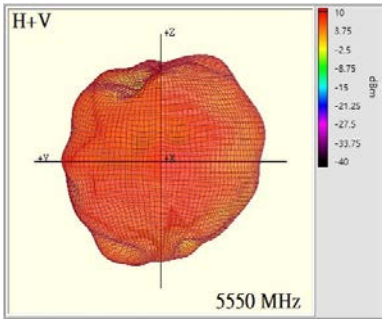




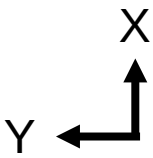


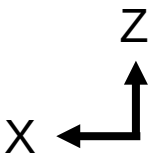


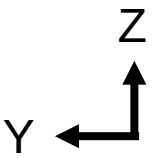




Setup :







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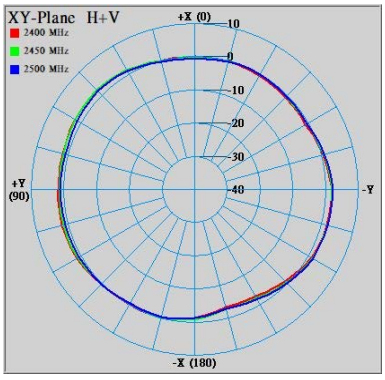
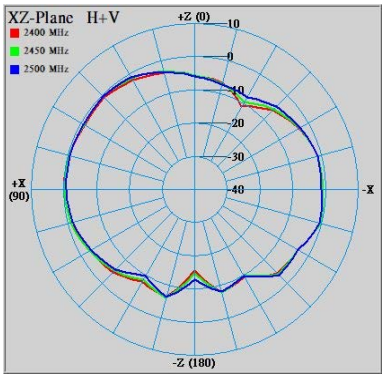
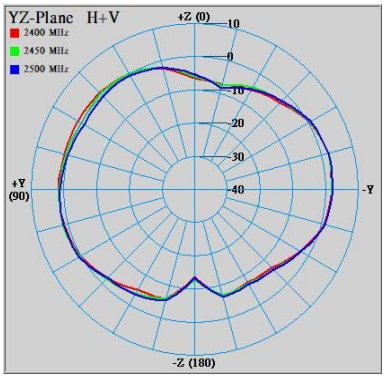
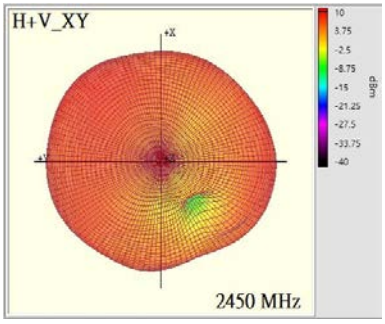
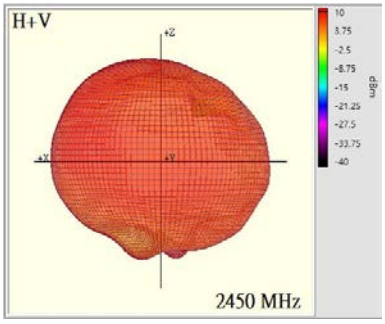
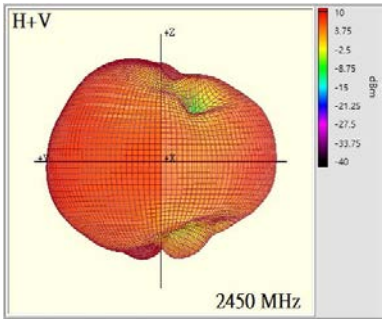
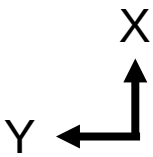
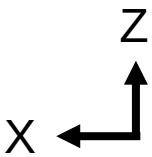
Ant.2_2.4GHz 2D.3D Radiation Pattern with Heatsink
Frequency(MHz) : 2D. 2400~2500
3D. 2450

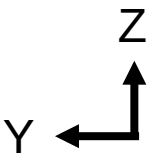
Radiation Pattern :

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

Setup :







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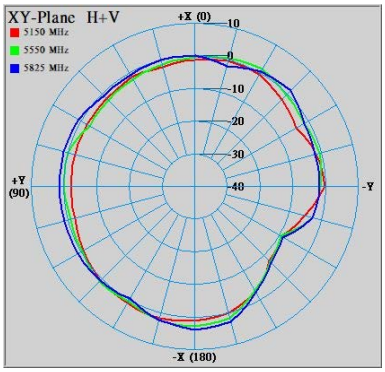
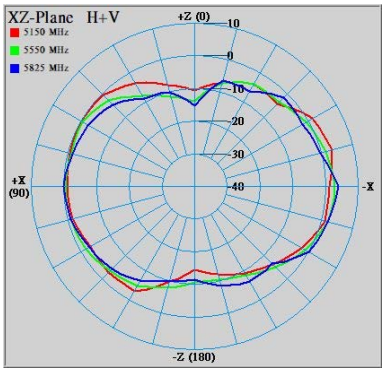
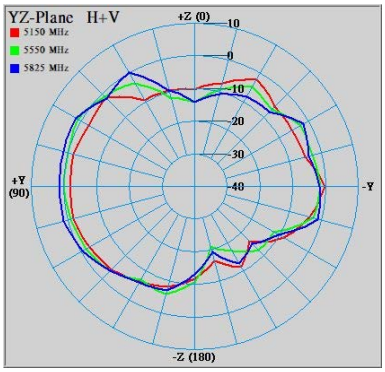
Ant.2_5GHz 2D.3D Radiation Pattern with Heatsink
Frequency(MHz) : 2D. 5150~5825
3D. 5550

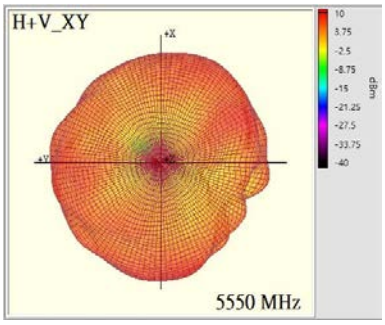
Radiation Pattern :

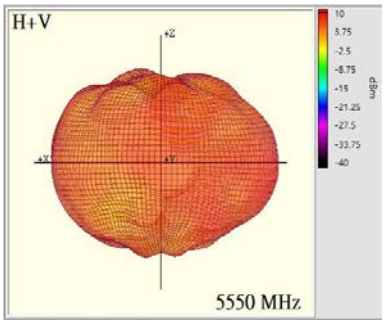
Azimuth Plane	Elevation Plane phi = 0	Elevation Plane phi = 90

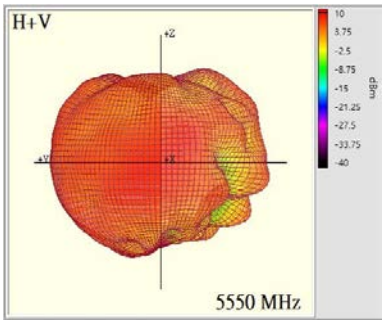












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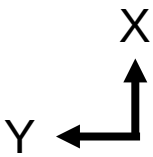

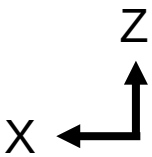

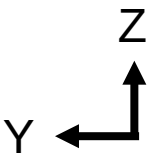

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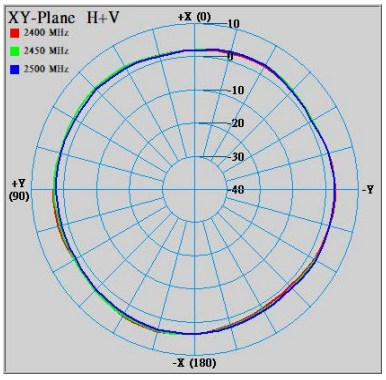
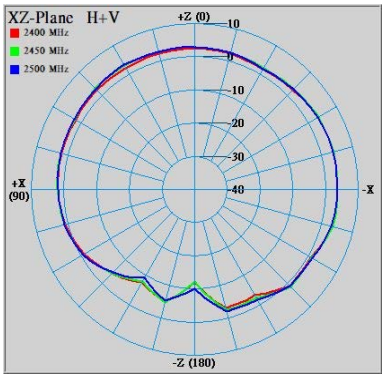
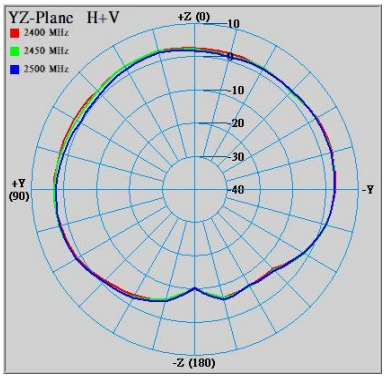
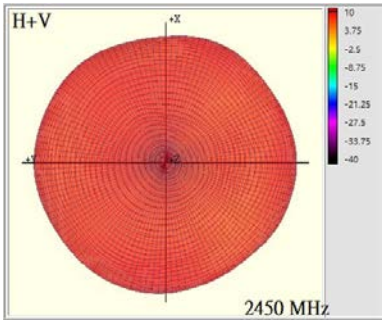
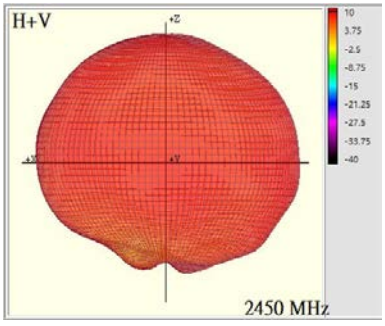
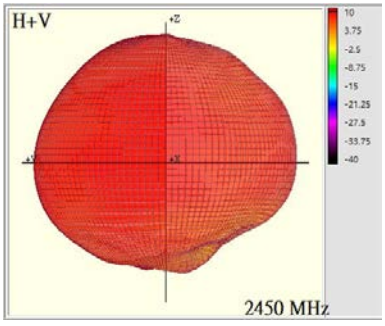
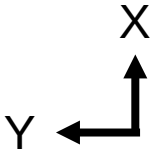
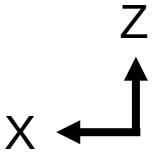
Combine Gain 2D Radiation Pattern with Heatsink
Frequency(MHz) : 2400~2500

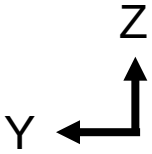
Radiation Pattern :

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

Setup :







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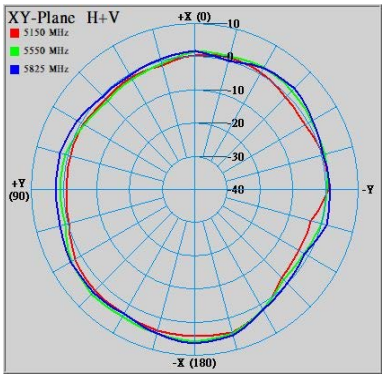
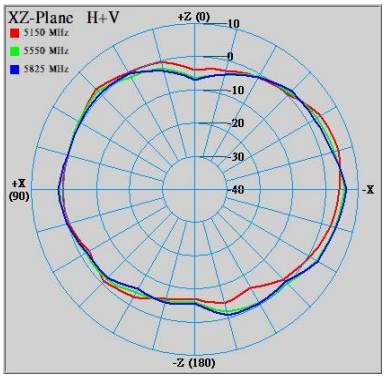
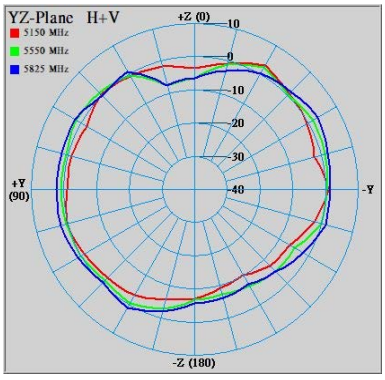
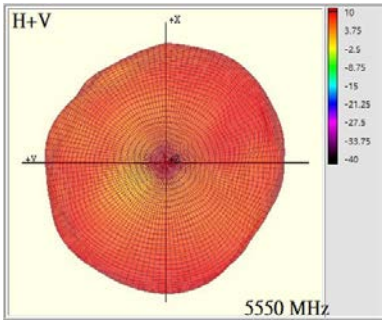
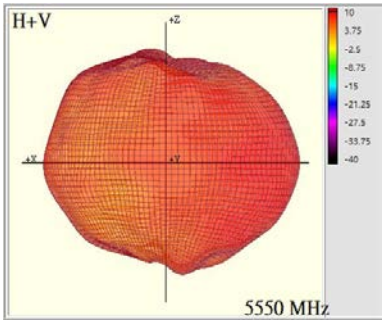
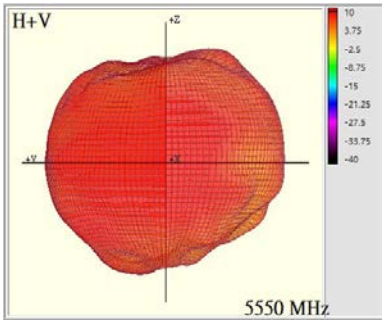
Combine Gain 2D Radiation Pattern with Heatsink
Frequency(MHz) : 5150~5825

Radiation Pattern :

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

Setup :


X
Y

Z
X

Z
Y

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Summary

- Antenna meet the specification .

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