

LYNwave Technology

Antenna & Thermal solution provider

Antenna Test Report

Project Name: EW-7822UNIX
Model Name:
Feature: Wifi Dual Band
Application: Dongle

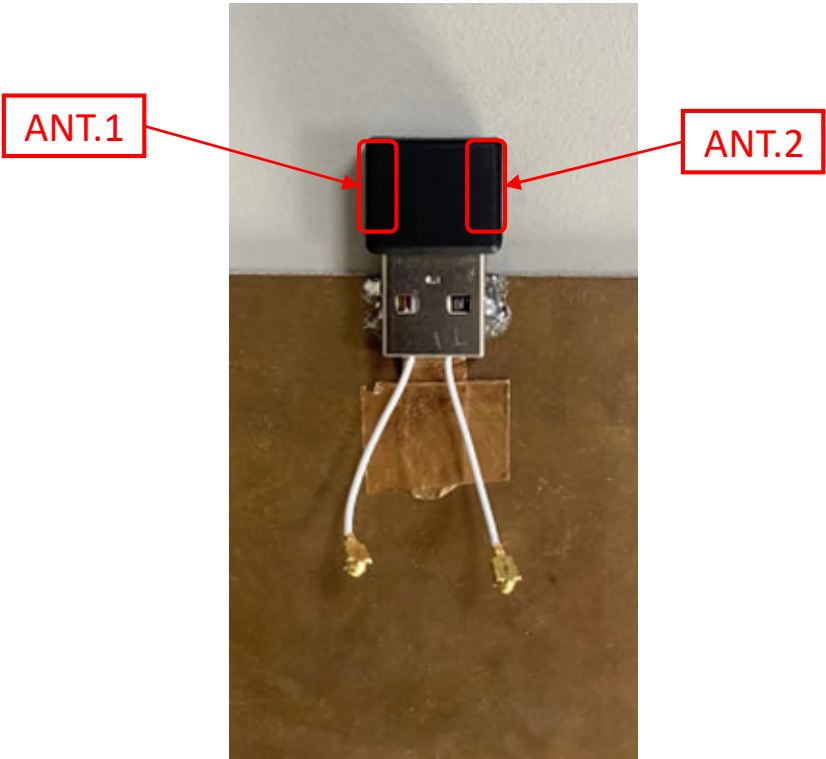
Date	Owner	Revision
01/17	Alex	1. Antenna passive measurement with V1 mockup
02/07	Zino	1. Antenna passive measurement with V1 mockup (new thermal sol.)
05/04	Zino	1. Antenna passive measurement with V2 mockup (without heatsink)
06/23	Zino	1. Antenna passive measurement with T2 mockup
07/06	Zino	1. Add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

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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



S-parameter Measurement Equipment

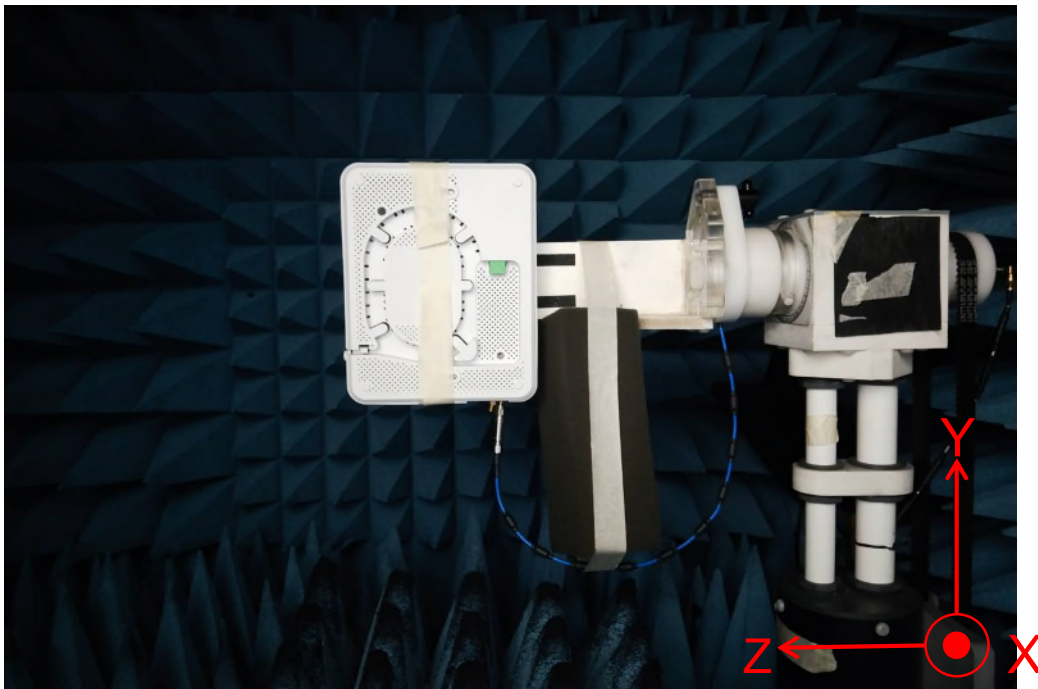


Equipment	Brand	Model	Calibration Date
Network analyzer	Keysight	M9010A	2022/07/04

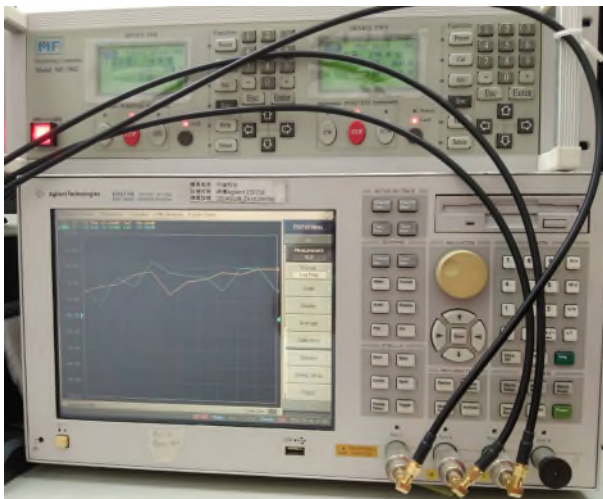
Passive Equipment List :

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

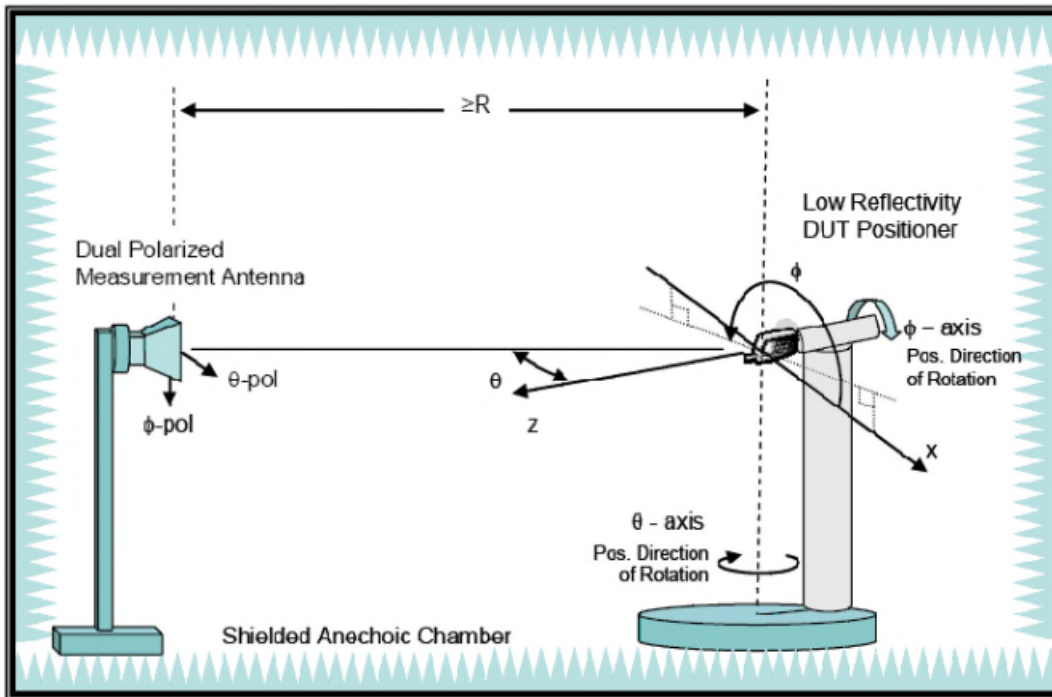
Antenna Chamber



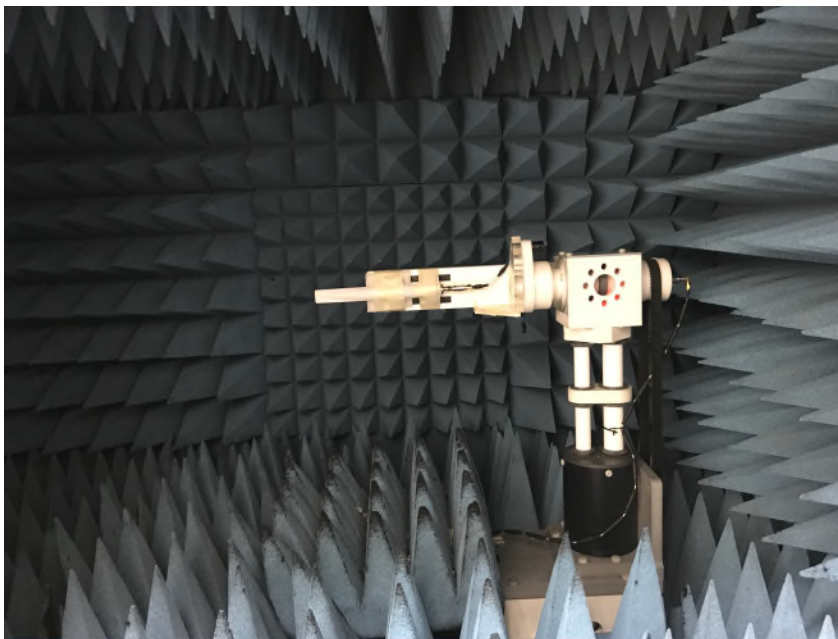
Network analyzer and Controller :



Test architecture :



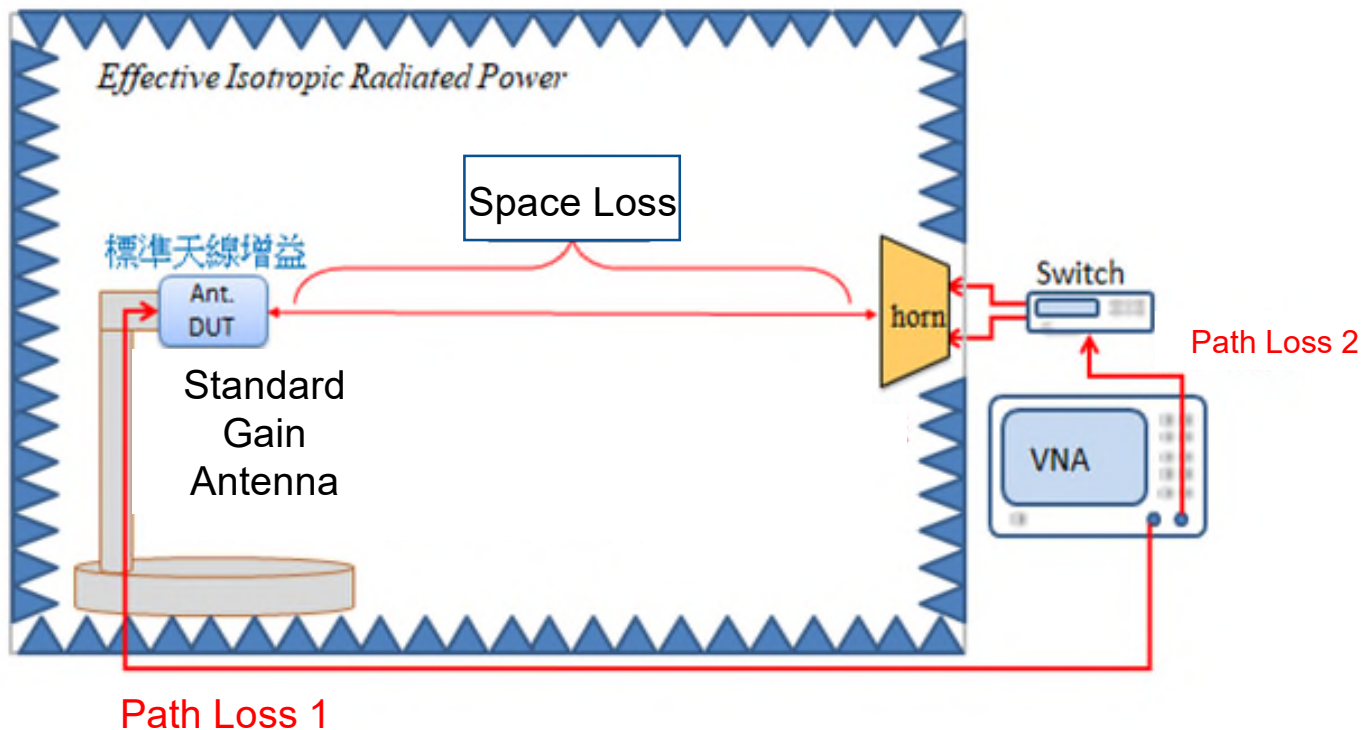
Test System Calibration



We will use a standard antenna which have been 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.

Conversion from S21 to antenna gain dBi performed step



Step :

1. Calculate Total Loss: $\text{Total Loss} = \text{Path Loss 1} + \text{Path Loss 2} + \text{Space Loss} + \text{Horn Gain}$
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

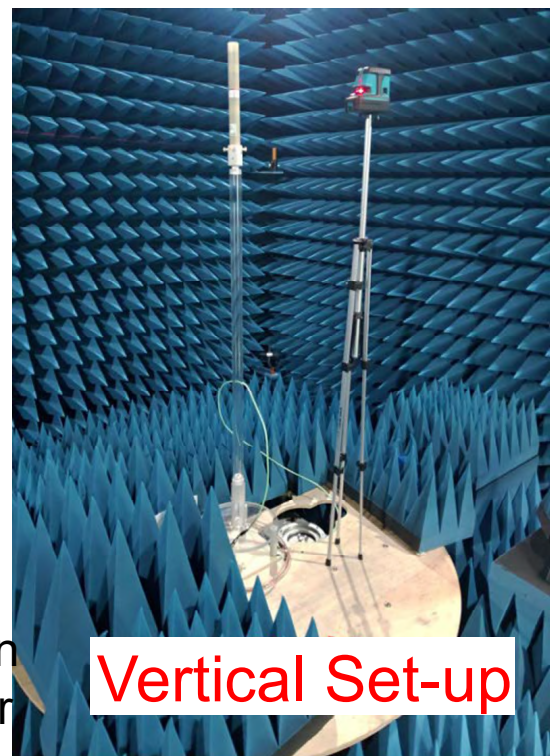
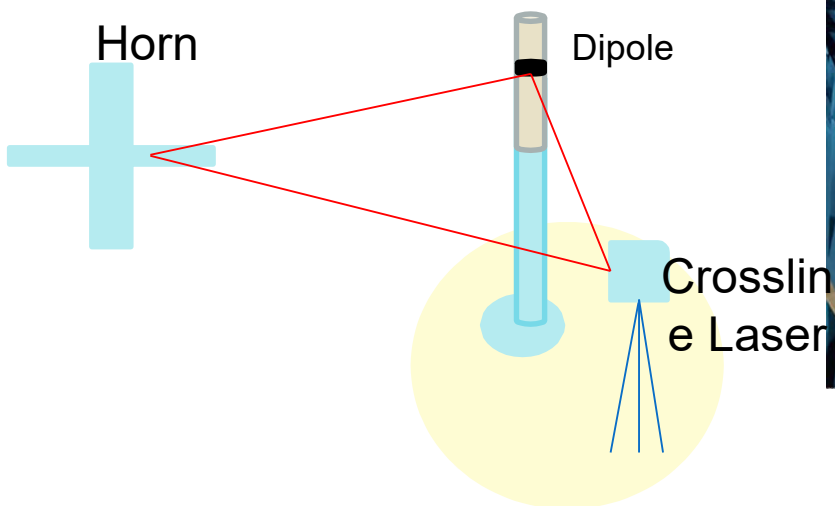
➤ Confirmation before calibration list and step

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

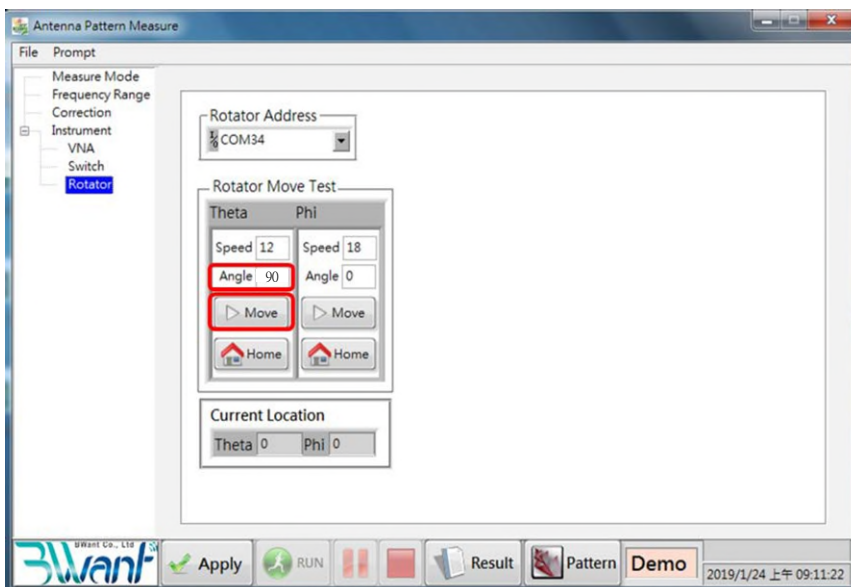
- ◆ The measured value of the same test object might be changed before and after calibration, so it is not recommended to calibrate frequently.



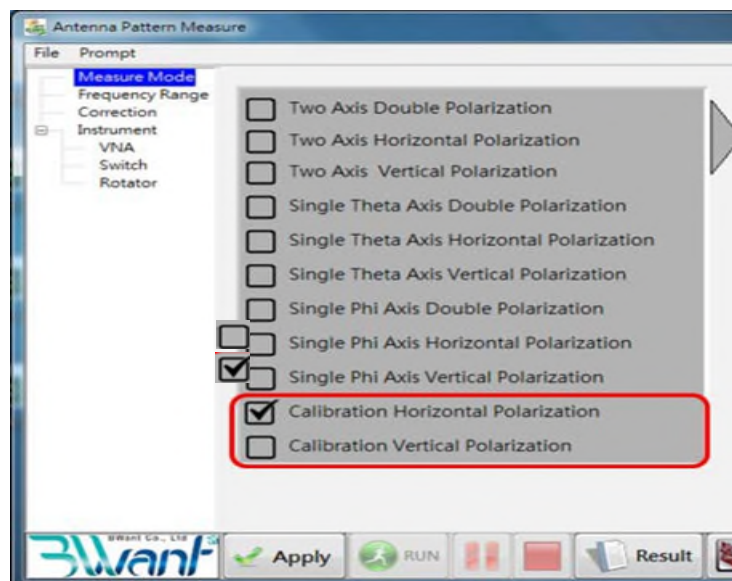
1. Align the horn horizontal blade by crossline laser.
2. Align the dipole feeding point to laser line.



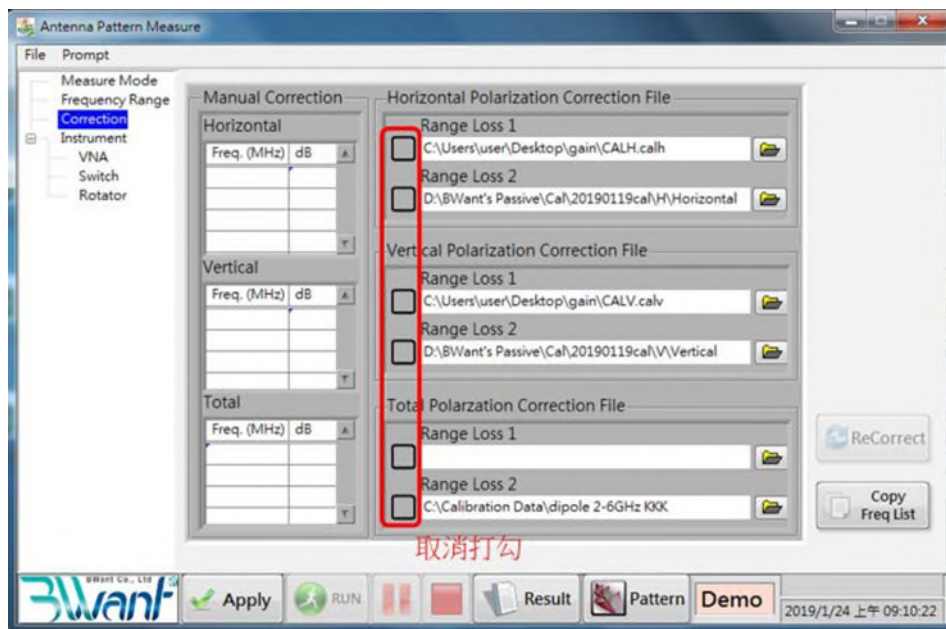
1. Set-up the dipole start from low frequency (SD650).
2. Rotate 90 degree on Theta axis.



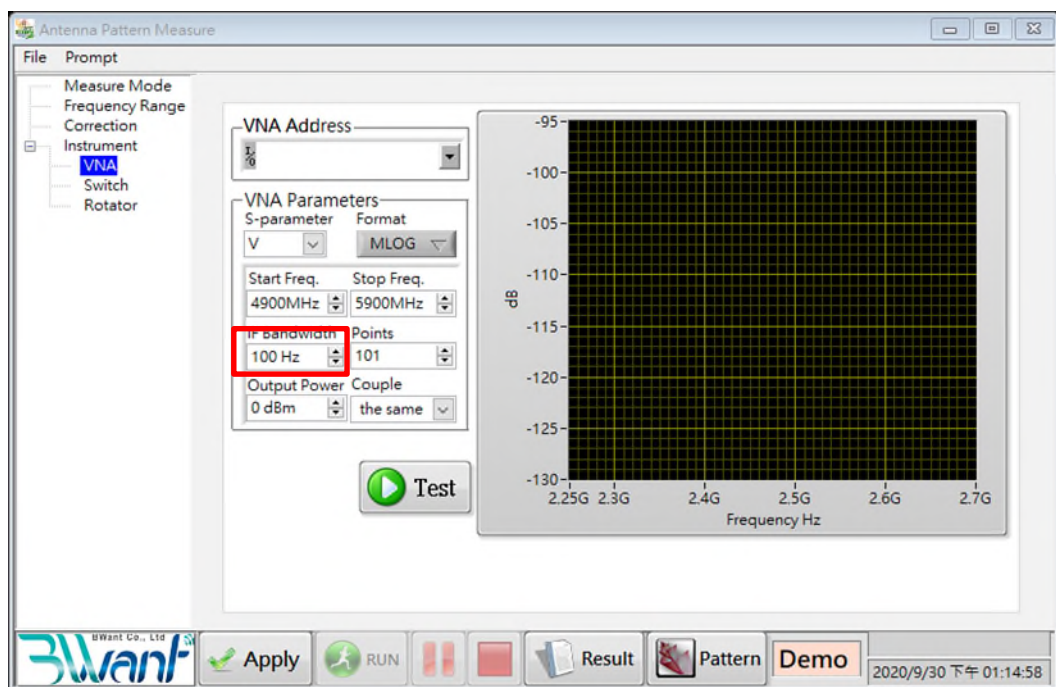
- Choose “Calibration Vertical Polarization”.
- Or choose “Calibration Horizontal Polarization” if you need a horizontal one.



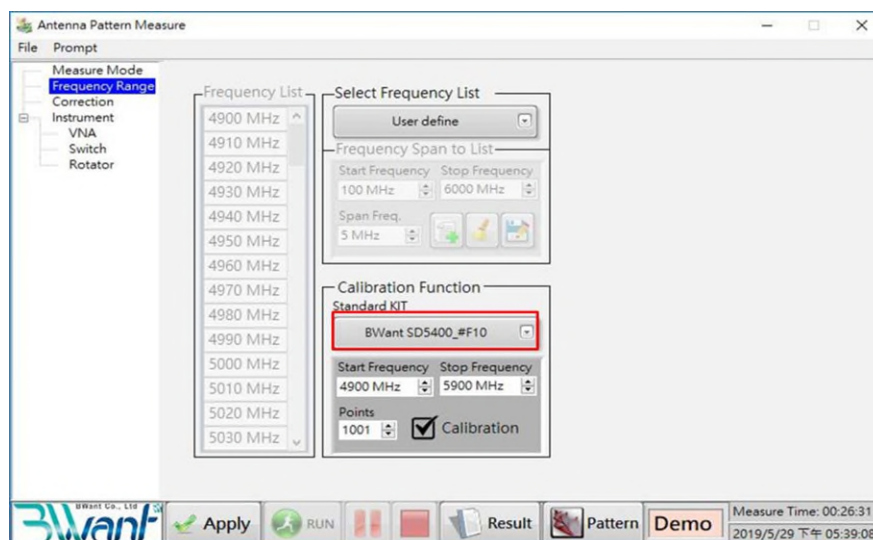
- Cancel all the selection as follow picture.



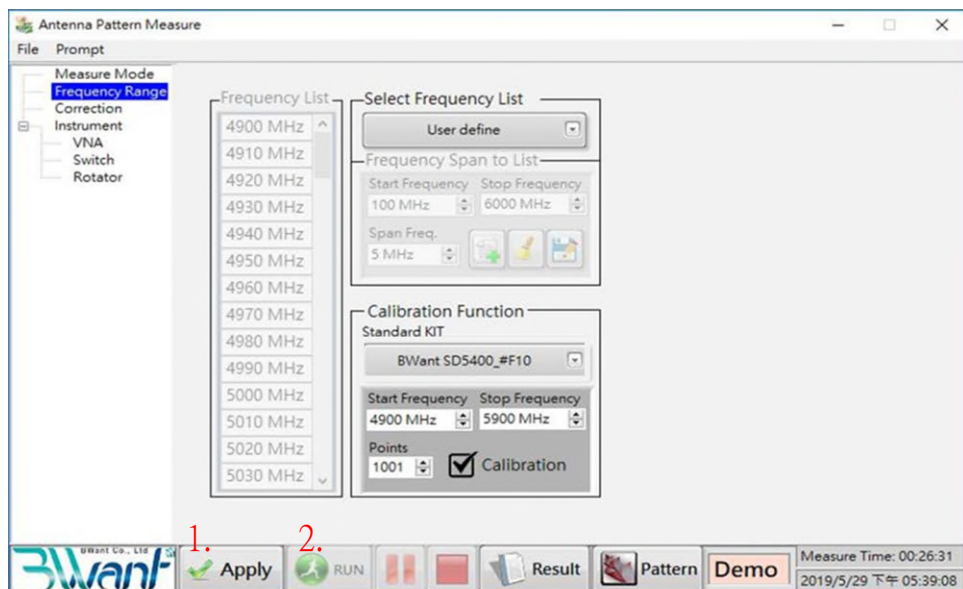
- Set the IF Bandwidth to 100Hz.



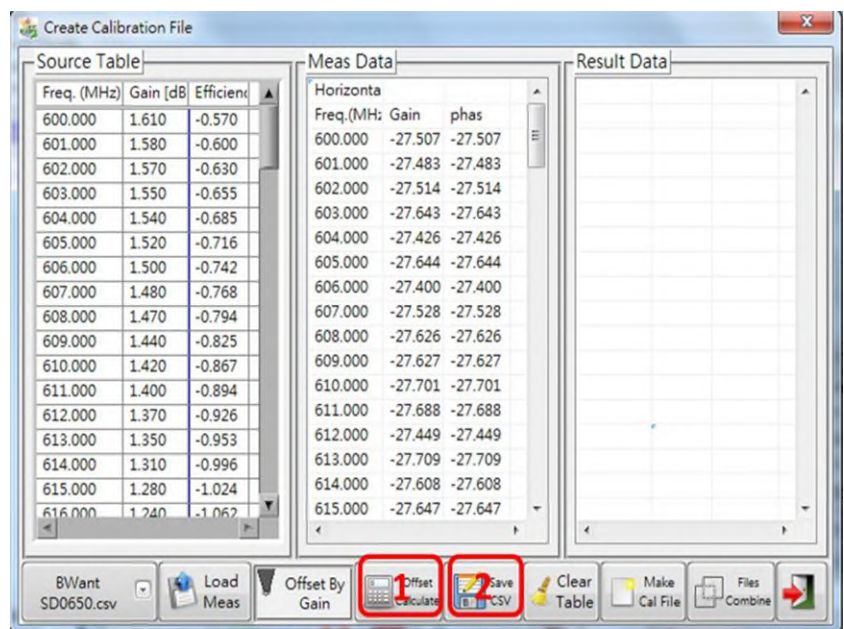
- Select the calibration dipole type from Standard KIT.
 - The frequency band is labeled on the dipole (the start & cutoff frequencies and the test points number would be set automatically after selection).



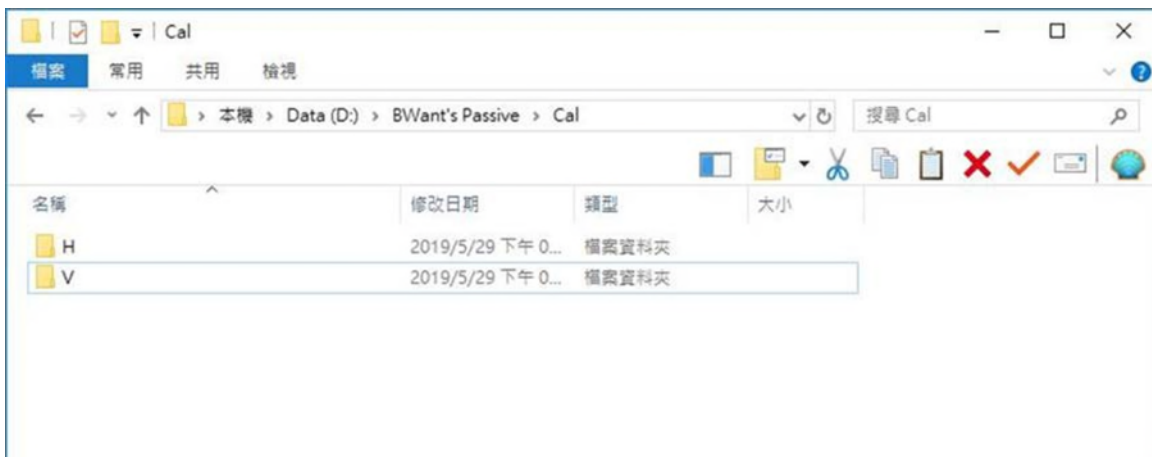
1. Click on "Apply".
2. Click on "Run" and start the testing.



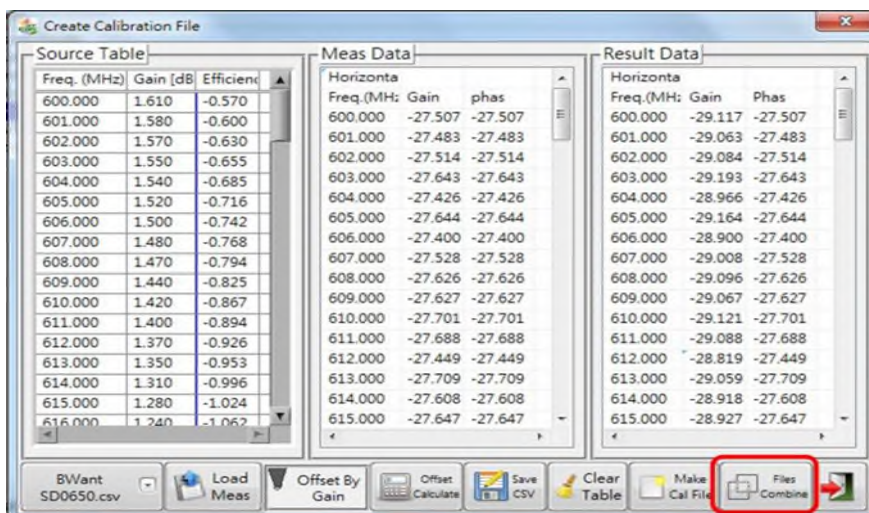
1. Confirm there is testing value in “Meas Data” field.
2. Click on “Offset Calculate”.
3. Click on “Save CSV”.



- 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”

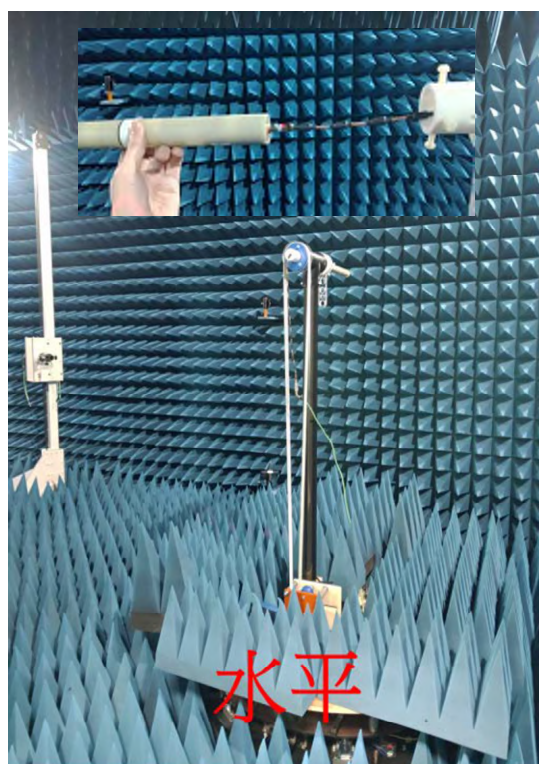
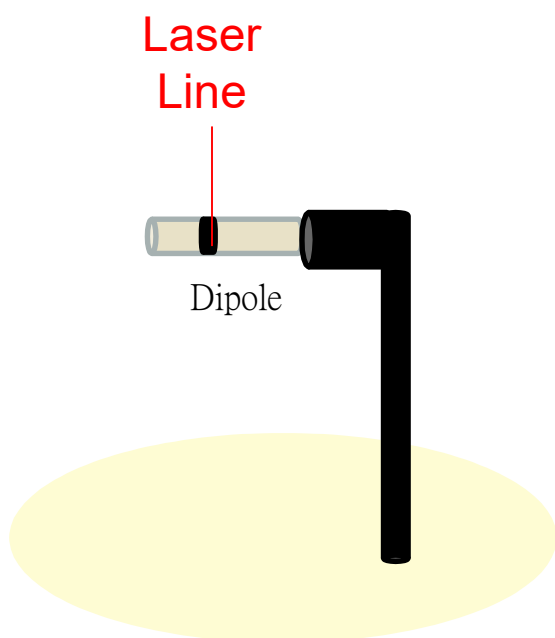


- Repeat all the 11pcs antenna as right table to complete the full band frequency according the steps from Page 5~12.
- Click on “Files Combine” , select the “Folder V” and all frequency band file would be generated.
 - Ex. Vertical Polarization 600-5900 MHzPath Loss.csv

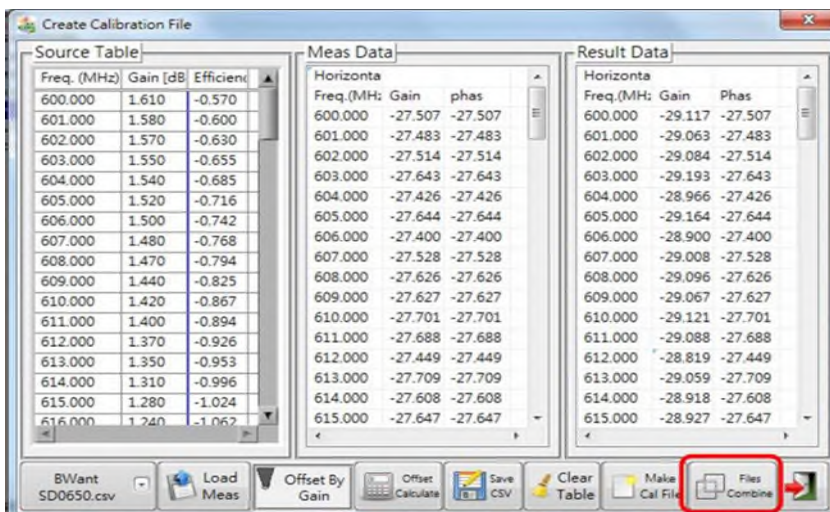


Vertical Confirmation	Dipole Name
	SD650
	SD740
	SD900
	SD1150
	SD1575
	SD1800
	SD2140
	SD2450
	SD3200
	SD3600
	SD5400

1. Align the dipole feeding point to laser line.

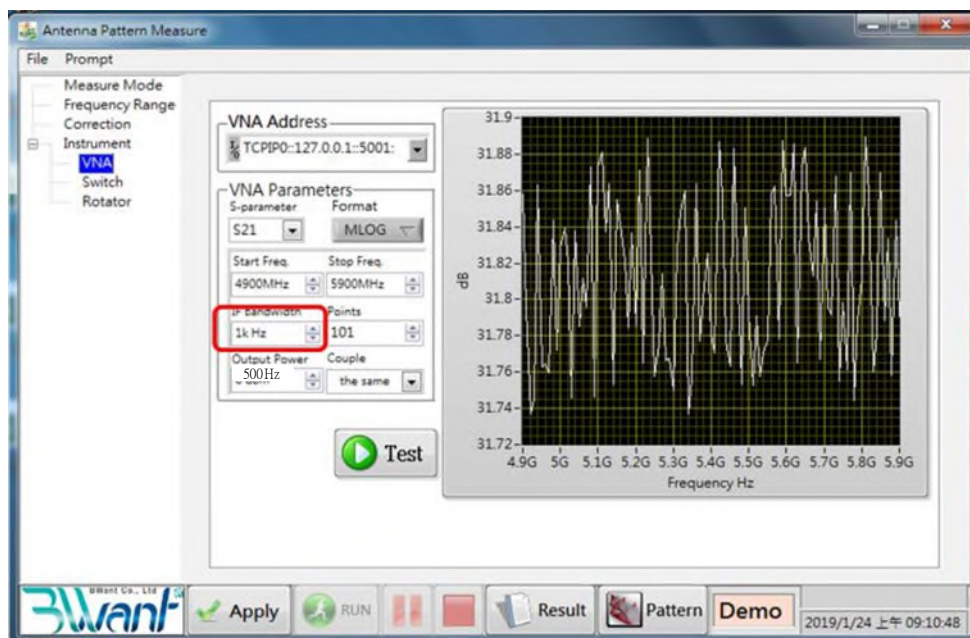


- Repeat all the 11pcs antenna as right table to complete the full band frequency according the steps from Page 5~12.
- Click on “Files Combine” , select the “Folder H” and all frequency band file would be generated.
 - Ex. Horizontal Polarization 600-5900 MHzPath Loss.csv

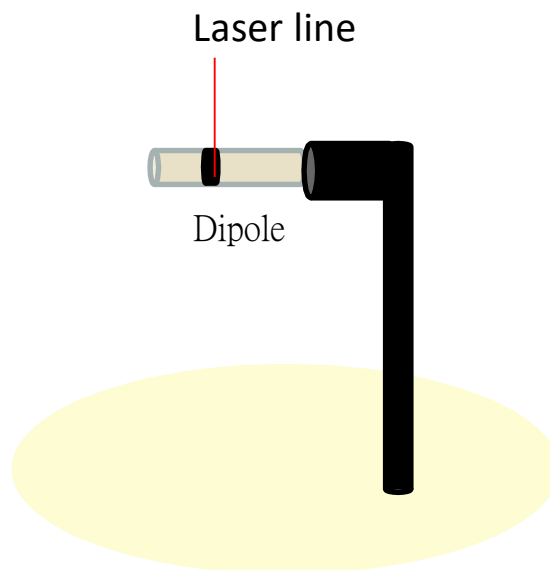


Horizontal Confirmation	Dipole Name
	SD650
	SD740
	SD900
	SD1150
	SD1575
	SD1800
	SD2140
	SD2450
	SD3200
	SD3600
	SD5400

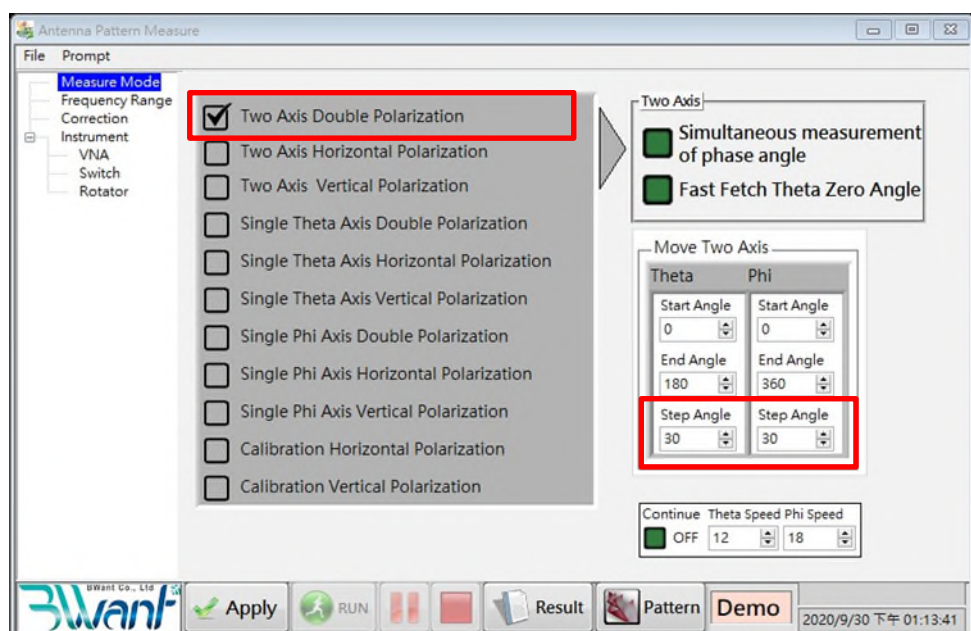
- Change the "IF Bandwidth" value back to 500Hz.



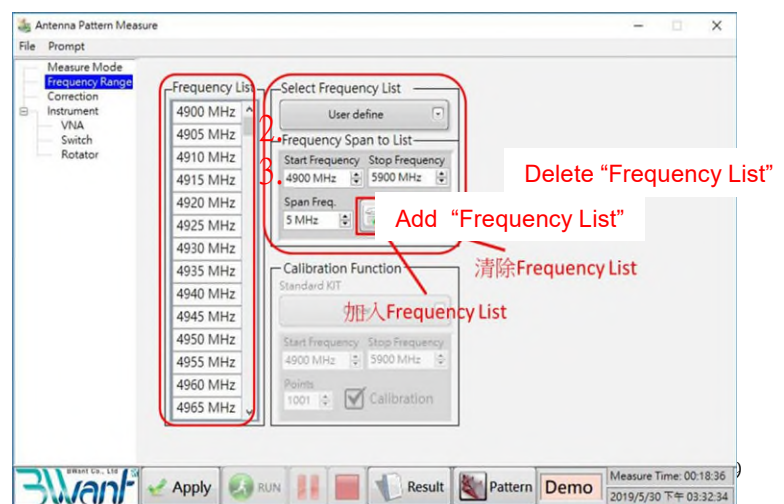
1. Set-up the dipole start from low frequency (SD650) as Page 14.



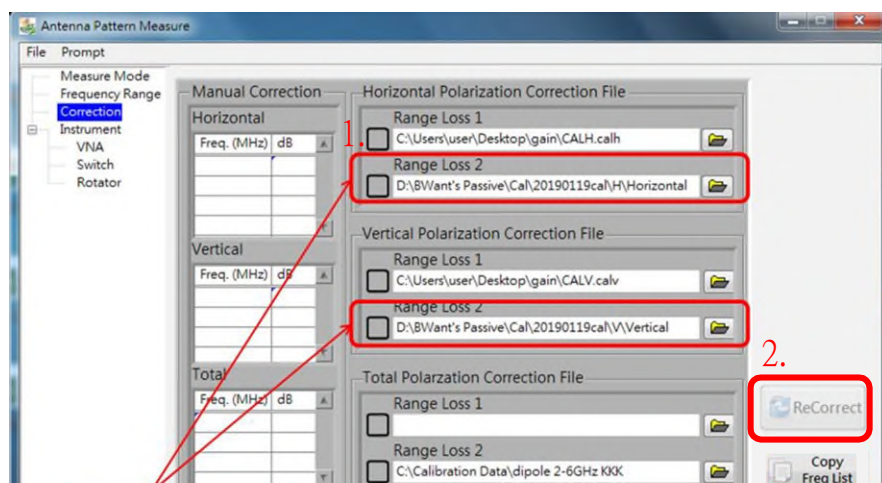
- Select “Two Axis Double Polarization “ on Measure Mode Page.
- Set the angle of Theta and Phi to 30 degree.



- 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.



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

- 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

Antenna Pattern Measure

File Prompt

Measure Mode
Frequency Range
Correction
Instrument
VNA
Switch
Rotator

Power	Phase	Coordinate												
5900.000	-26.599	-18.255	8.344	-26.599	0.219	-18.255	-55.637	225.000	165.000	3				
Total Poli														
Frequenc	Tot. Rad.	Peak EIRP	Directivity	Efficiency	Efficiency	Gain (dB)	Min EIR	Peak Phi	Peak Theta					
4900.000	-0.220	1.443	1.663	-0.220	95.054	1.443	-22.750	15.000	60.000	C				
4905.000	-0.109	1.543	1.652	-0.109	97.512	1.543	-22.559	15.000	60.000	C				
4910.000	-0.023	1.659	1.682	-0.023	99.482	1.659	-23.848	15.000	60.000	C				
4915.000	-0.115	1.630	1.745	-0.115	97.386	1.630	-23.359	15.000	60.000	C				
4920.000	-0.062	1.701	1.763	-0.062	98.580	1.701	-23.550	45.000	60.000	C				
4925.000	-0.301	1.459	1.761	-0.301	93.297	1.459	-23.590	15.000	60.000	C				
4930.000	-0.335	1.397	1.732	-0.335	92.571	1.397	-22.497	15.000	60.000	C				
4935.000	-0.133	1.577	1.710	-0.133	96.989	1.577	-21.297	15.000	60.000	C				
4940.000	-0.165	1.603	1.768	-0.165	96.272	1.603	-21.298	15.000	60.000	C				
4945.000	-0.218	1.591	1.809	-0.218	95.104	1.591	-20.277	330.000	60.000	C				
4950.000	-0.205	1.663	1.868	-0.205	95.384	1.663	-19.716	15.000	60.000	C				
4955.000	-0.132	1.805	1.937	-0.132	97.009	1.805	-18.919	15.000	60.000	C				
4960.000	-0.131	1.815	1.946	-0.131	97.033	1.815	-18.275	15.000	60.000	C				
4965.000	-0.119	1.888	2.007	-0.119	97.299	1.888	-19.220	15.000	60.000	C				
4970.000	0.016	2.045	2.029	0.016	100.369	2.045	-18.712	45.000	60.000	C				
4975.000	0.023	2.065	2.042	0.023	100.531	2.065	-19.120	15.000	60.000	C				
4980.000	0.105	2.113	2.008	0.105	102.453	2.113	-18.912	15.000	60.000	C				

Transpose
Direct
ECC
Combine
Save CSV
Save as RAW
Simulator
OFF
Theta Step
15
Phi Step
15

Measure Time: 00:18:36
2019/5/30 下午 03:14:36

3. Correct the H & V calibration data.

– Ex. Max: 0.105

– New Gain=Red Frame + Max + 0.1

Horizontal Polarization			Vertical Polarization		
Freq.(MHz)	Gain	Phas	Freq.(MHz)	Gain	Phas
600	-53.382	81.172	600	-54.047	82.573
601	-53.432	39.542	601	-54.125	40.992
602	-53.487	-2.081	602	-54.203	-0.537
603	-53.544	-43.572	603	-54.284	-42.083
604	-53.604	-84.996	604	-54.368	-83.585
605	-53.675	-126.298	605	-54.471	-125.11
606	-53.738	-167.518	606	-54.562	-166.611
607	-53.802	151.311	607	-54.666	151.965
608	-53.854	110.324	608	-54.768	110.56
609	-53.896	69.311	609	-54.868	69.218
610	-53.929	28.323	610	-54.977	27.897
611	-53.94	-12.64	611	-55.087	-13.449
612	-53.947	-53.618	612	-55.192	-54.716
613	-53.948	-94.539	613	-55.303	-95.987
614	-53.938	-135.581	614	-55.417	-137.092
615	-53.924	-176.539	615	-55.521	-178.256
616	-53.911	-142.475	616	-55.648	-140.706
617	-53.872	101.449	617	-55.743	99.694
618	-53.836	60.392	618	-55.84	58.774
619	-53.785	19.342	619	-55.925	17.852
620	-53.728	-21.844	620	-55.998	-23.117
621	-53.658	-63.059	621	-56.062	-64.064
622	-53.602	-104.368	622	-56.129	-105.069

Ex. Original Freq 600 Gain= -53.382

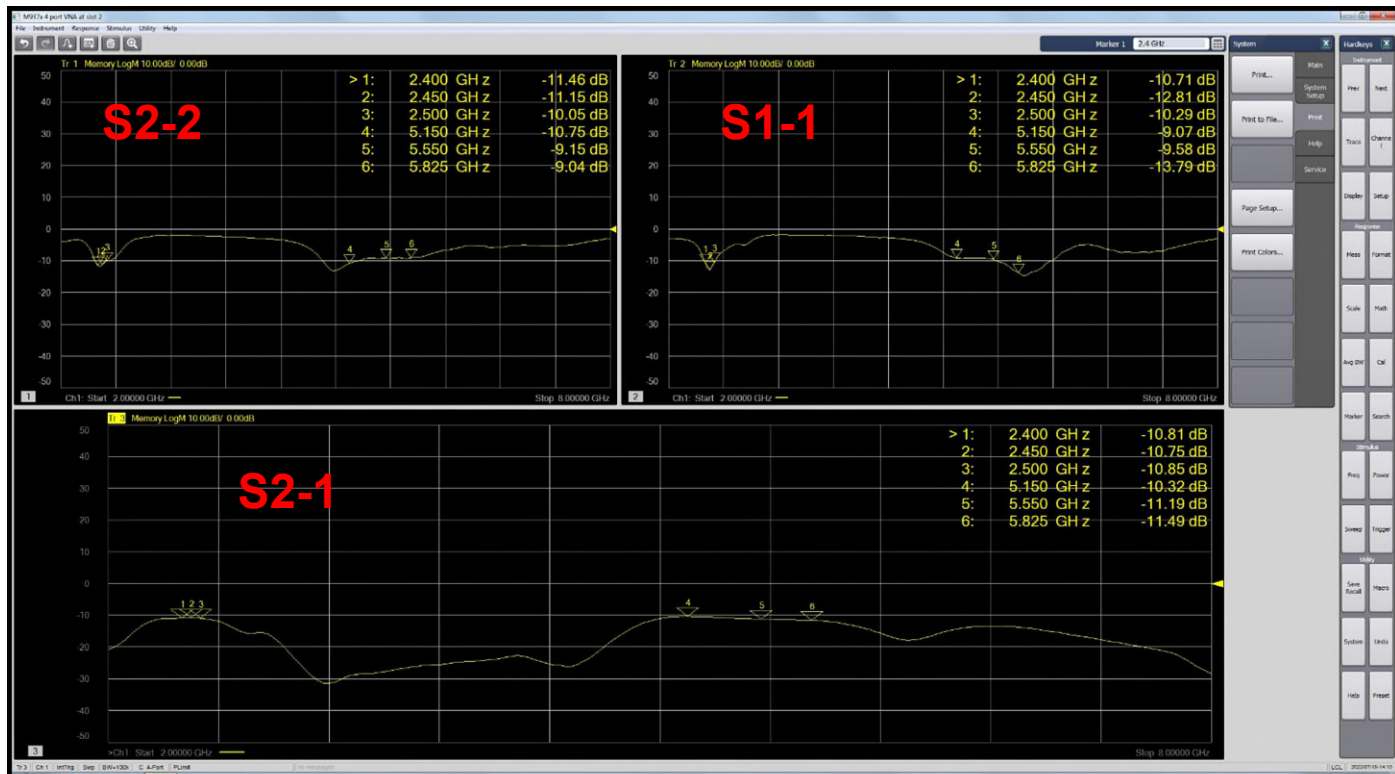
New Gain=-53.382 +0.105 + 0.1= -53.177

Horizontal Polarization			Vertical Polarization		
Freq.(MHz)	Gain	Phas	Freq.(MHz)	Gain	Phas
600	-53.177	81.172	600	-53.842	82.573
601	-53.227	39.542	601	-53.92	40.992
602	-53.282	-2.081	602	-53.998	-0.537
603	-53.339	-43.572	603	-54.079	-42.083
604	-53.399	-84.996	604	-54.163	-83.585
605	-53.47	-126.298	605	-54.266	-125.11
606	-53.533	-167.518	606	-54.357	-166.611
607	-53.597	151.311	607	-54.461	151.965
608	-53.649	110.324	608	-54.563	110.56
609	-53.691	69.311	609	-54.663	69.218
610	-53.724	28.323	610	-54.772	27.897
611	-53.735	-12.64	611	-54.882	-13.449
612	-53.742	-53.618	612	-54.987	-54.716
613	-53.743	-94.539	613	-55.098	-95.987
614	-53.733	-135.581	614	-55.212	-137.092
615	-53.719	-176.539	615	-55.316	-178.256
616	-53.706	-142.475	616	-55.443	-140.706
617	-53.667	101.449	617	-55.538	99.694
618	-53.631	60.392	618	-55.635	58.774
619	-53.58	19.342	619	-55.72	17.852
620	-53.523	-21.844	620	-55.793	-23.117
621	-53.453	-63.059	621	-55.857	-64.064
622	-53.397	-104.368	622	-55.924	-105.069

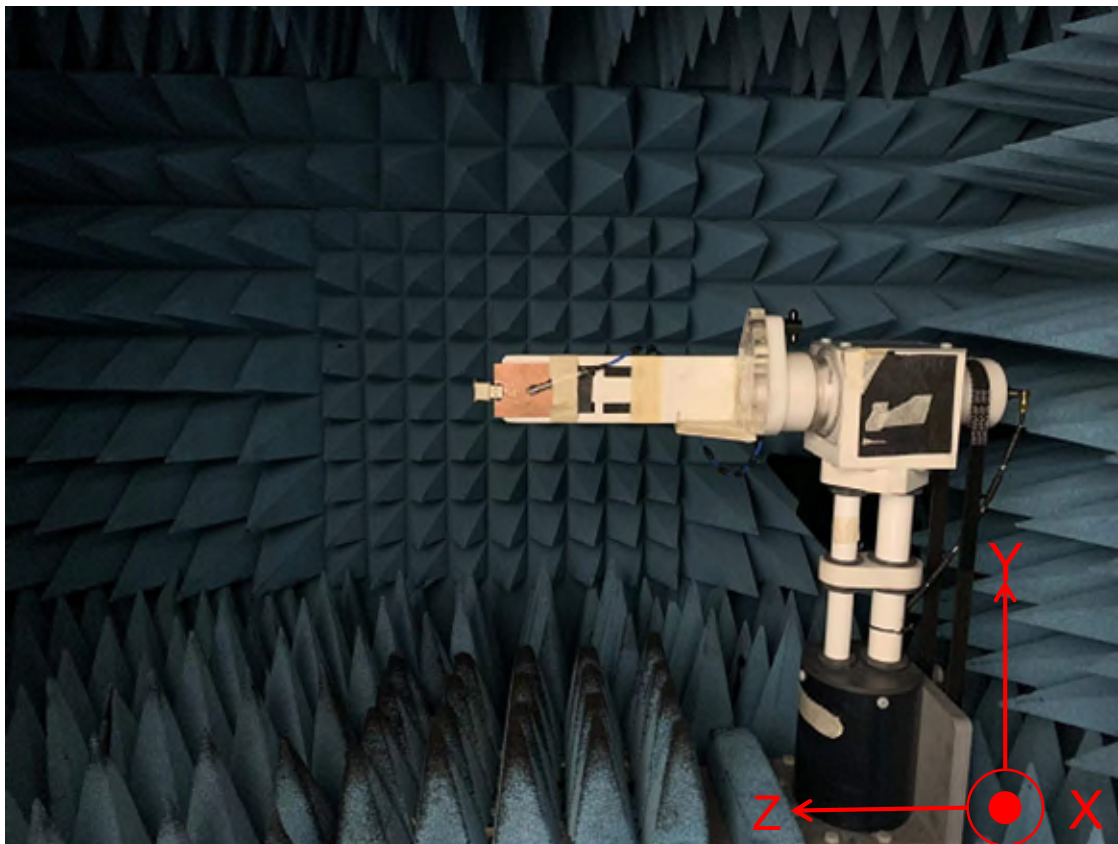
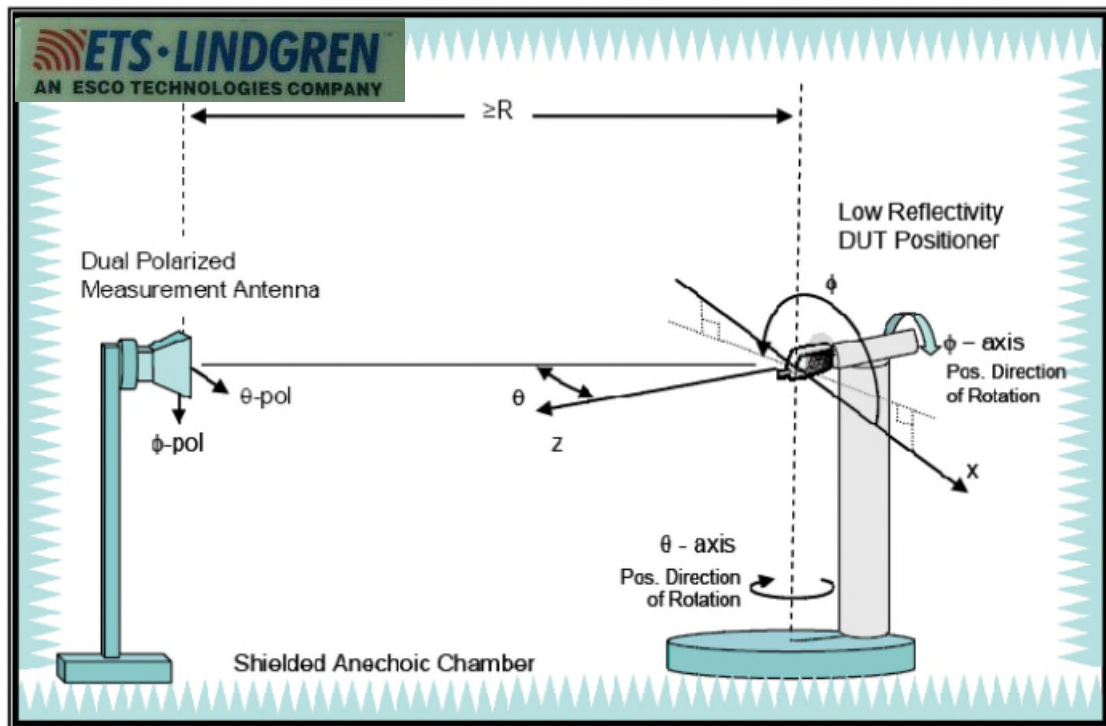
- According to the Page 17~24, keep confirm all the antennas' efficiency value.

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

S-Parameters



Equipment : ETS Chamber



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

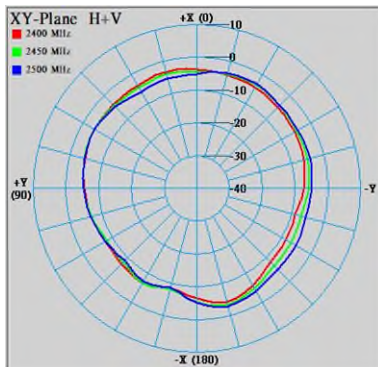
- Return loss < -8dB in operating band
- Isolation
 - All Band > 10 dB
- Efficiency
 - WIFI 2.4GHz Band $\geq 30\%$
 - WIFI 5GHz Band $\geq 40\%$
- Gain
 - WIFI 2.4GHz Band -1.7 ~ -0.6dBi
 - WIFI 5GHz Band 0.4 ~ 3.0dBi

Ant.1_ 2D.3D Radiation Pattern

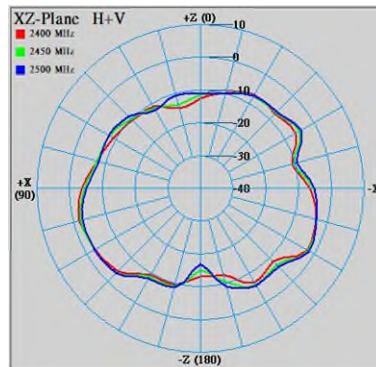
Frequency(MHz) : 2D. 2400~2500
3D. 2450

Radiation Pattern :

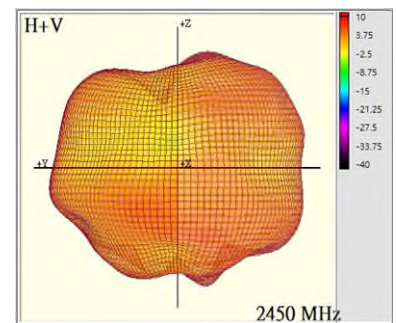
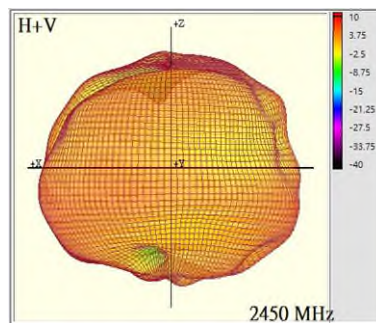
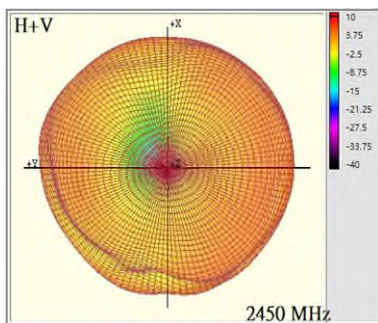
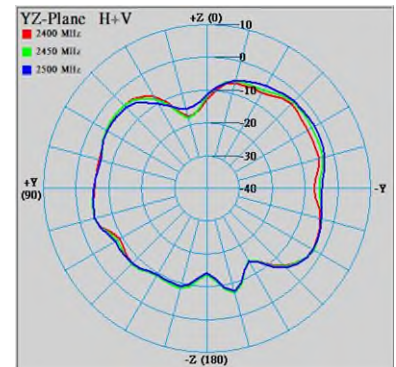
Azimuth Plane



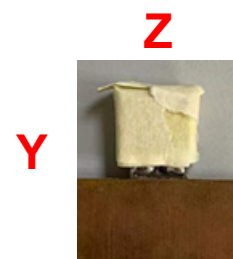
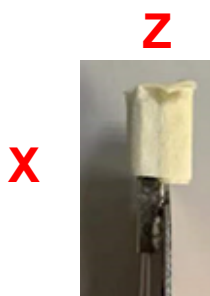
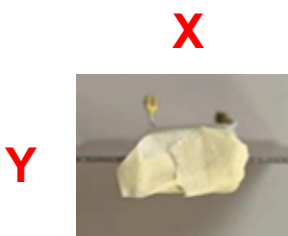
Elevation Plane
phi = 0



Elevation Plane
phi = 90



Setup :

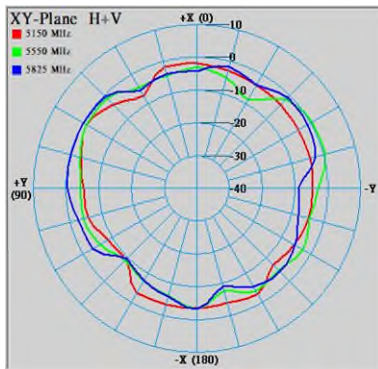


Ant.1_ 2D.3D Radiation Pattern

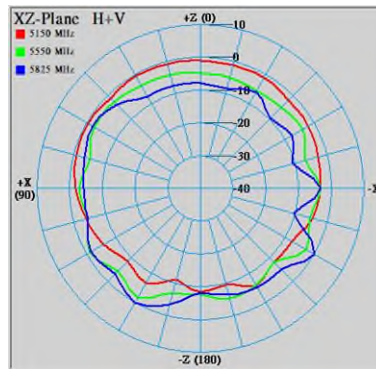
Frequency(MHz) : 2D. 5150~5825
3D. 5550

Radiation Pattern :

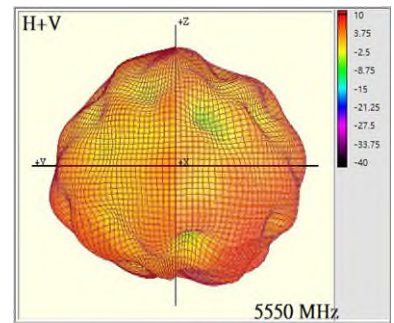
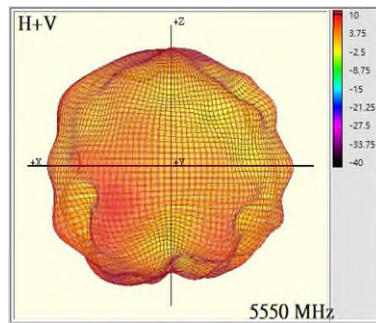
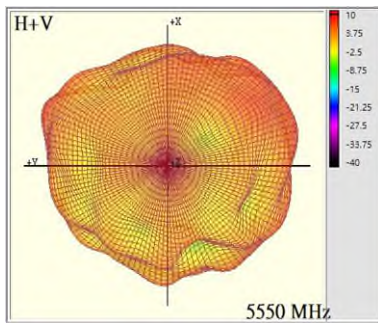
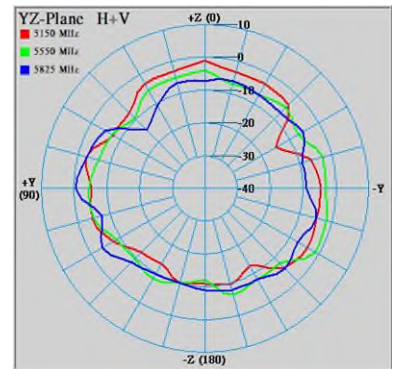
Azimuth Plane



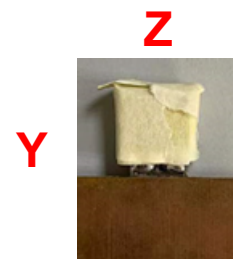
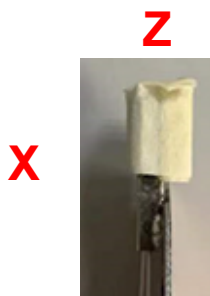
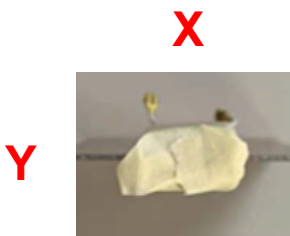
Elevation Plane
phi = 0



Elevation Plane
phi = 90



Setup :

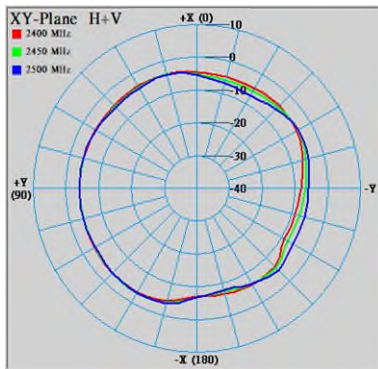


Ant.2_ 2D.3D Radiation Pattern

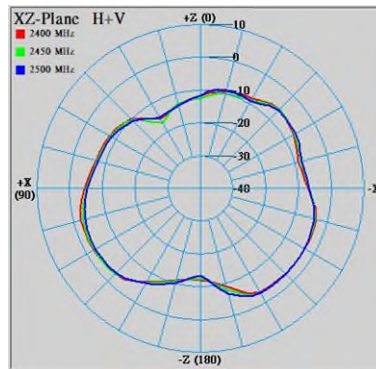
Frequency(MHz) : 2D. 2400~2500
3D. 2450

Radiation Pattern :

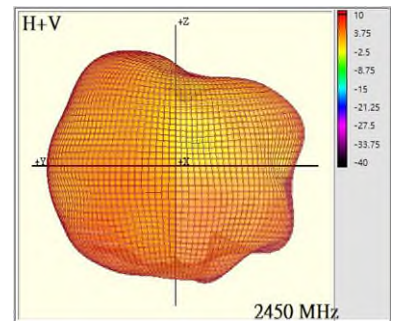
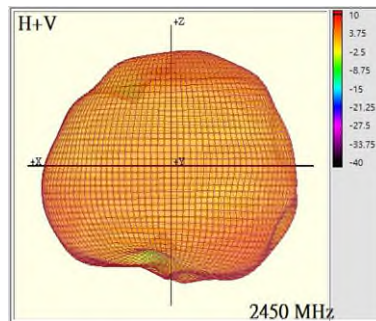
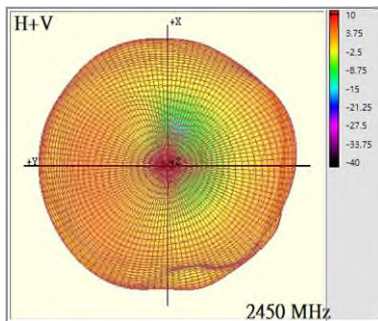
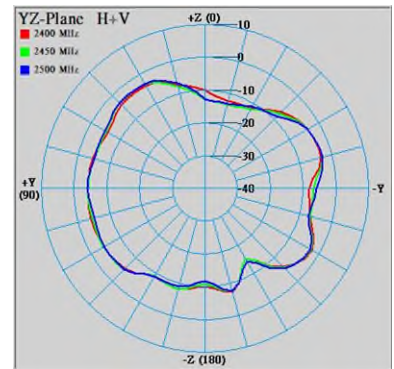
Azimuth Plane



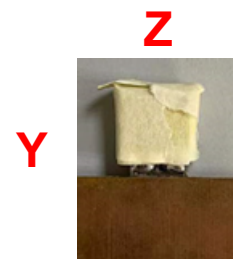
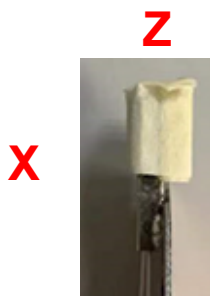
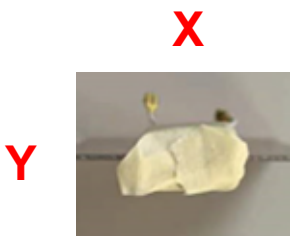
Elevation Plane
phi = 0



Elevation Plane
phi = 90



Setup :



Ant.2_ 2D.3D Radiation Pattern

Frequency(MHz) : 2D. 5150~5825
3D. 5550

Radiation Pattern :

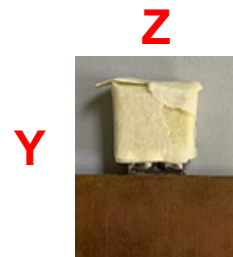
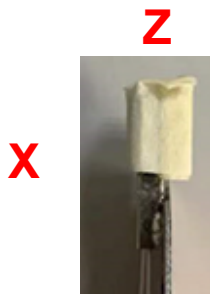
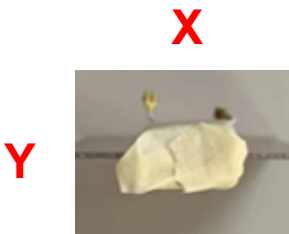
Azimuth Plane

Elevation Plane
 $\phi = 0$

Elevation Plane
 $\phi = 90$



Setup :



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