



AP140

Antenna Test Report

A faint, light blue world map is visible in the background of the lower-left section of the slide.

Senao Networks Inc.

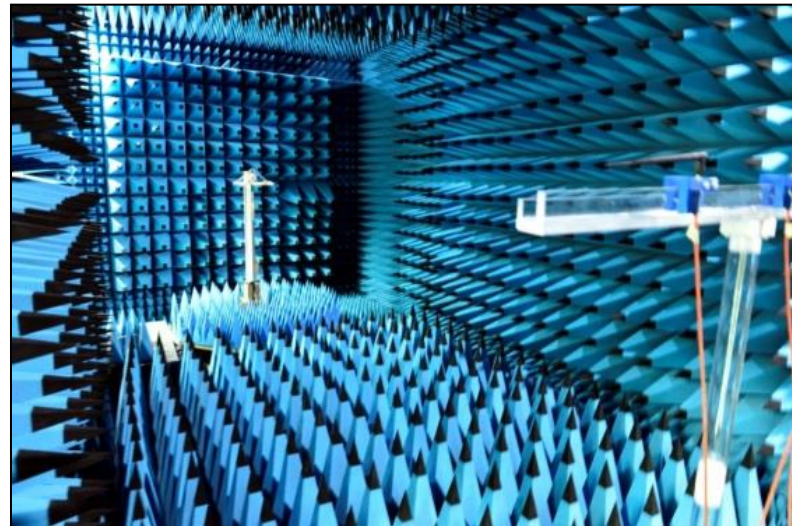
Customer	WatchGuard
Project	AP140
Project Description	2G antenna*2 5G antenna*2 6G antenna*2
Date	2025/02/25
Prepared by	Daniel
Report Version	V02

Version	Date	Description
V01	2024/12/26	EVT sample testing
V02	2025/02/25	DVT sample testing

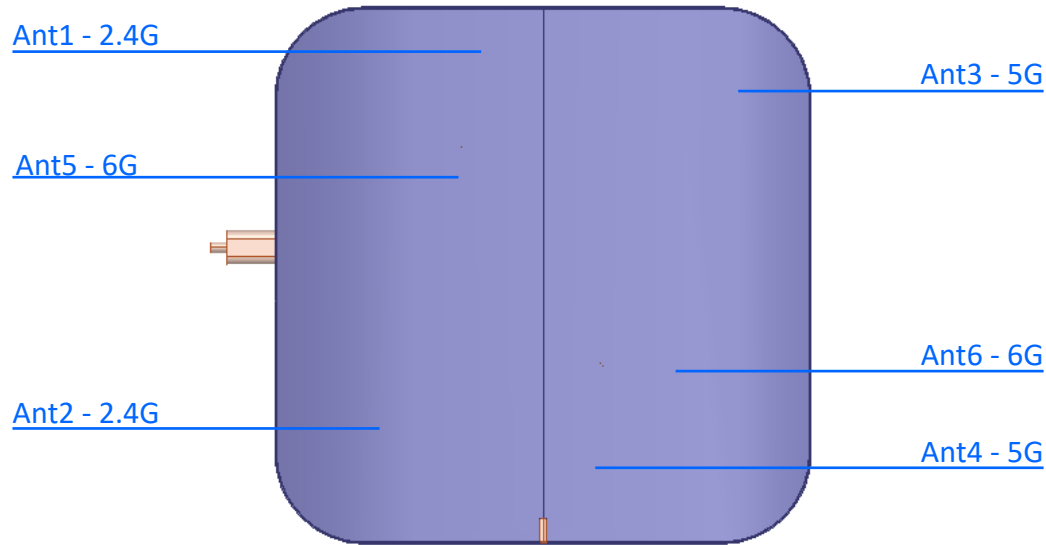
- Antenna Test Information
- Placement and Specification
- S11 & Isolation
- Radiation Pattern
- Combine Pattern
- Efficiency and Gain

3D Anechoic Chamber - BWANT

- Size: 7.32M(L)x3.66M(W)x3.66M(H)
- Testing range from 600MHz to 8.5GHz
- Chamber Isolation : 10KHz to 10GHz >100dB (NSA 94-106)
- Calibration antenna : BWANT SD650 /SD740 /SD900 /SD1150 /SD1575 /SD1800 /SD2140 /SD2450 /SD3200 /SD3600 /SD4550 /SD5400 /HA-0508
- Test software : BWANT 3D Passive



Placement and Specification



Ant No.	Operating Band	Efficiency (%)	Ant Type	Feeding
A 1~2	2400MHz ~ 2500 MHz	71 @2G	PIFA	Cable
A 3~4	5150MHz ~ 5895 MHz	68 @5G	PIFA	Cable
A 5~6	5925MHz ~ 7125 MHz	69 @6G	Alford Loop	Cable

Placement and Specification

Radio_1 Ant.1~2
 Wi-Fi Frequency 2400~2500MHz
 Return Loss -10dB
 Antenna Type Pifa
 Material Metal
 Feeding Cable

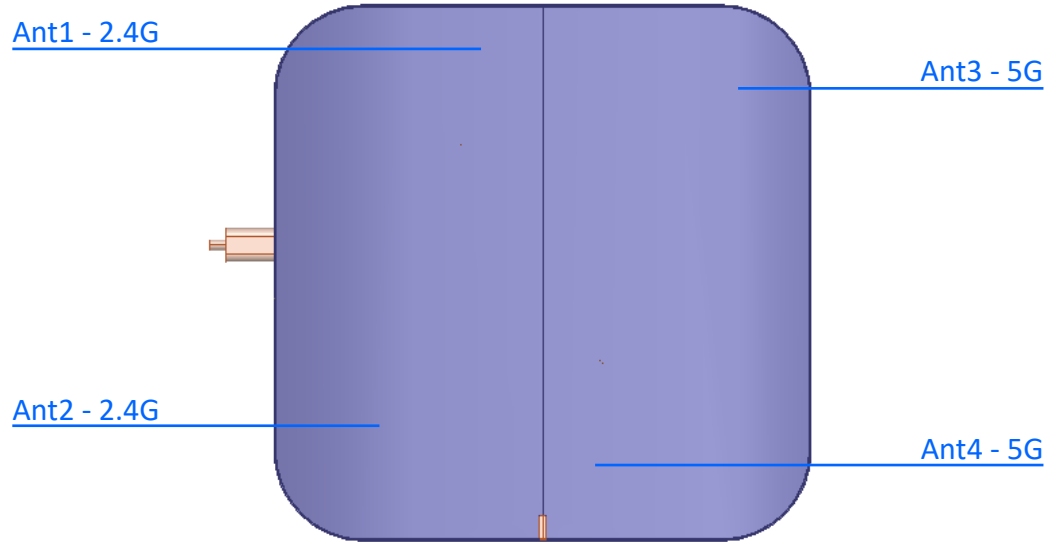
Radio_2 Ant.3~4
 Wi-Fi Frequency 5150~5895MHz
 Return Loss -10dB
 Antenna Type Pifa
 Material Metal
 Feeding Cable

Ant.1
 Brand Name : Enrack
 P/N 7102A1222000

Ant.2
 Brand Name : Enrack
 P/N 7102A1223000

Ant.3
 Brand Name : Enrack
 P/N 7102A1224000

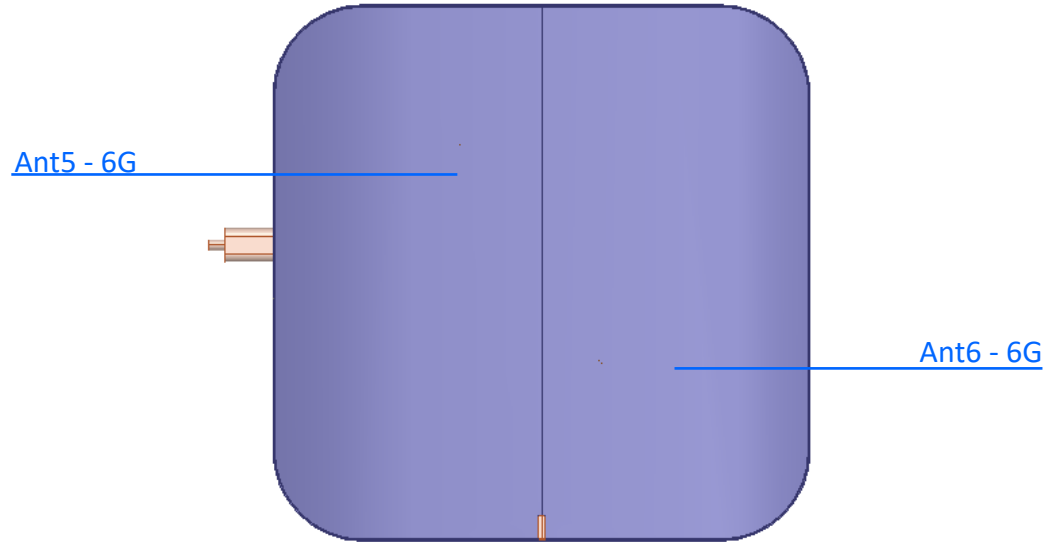
Ant.4
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 P/N 7102A1225000

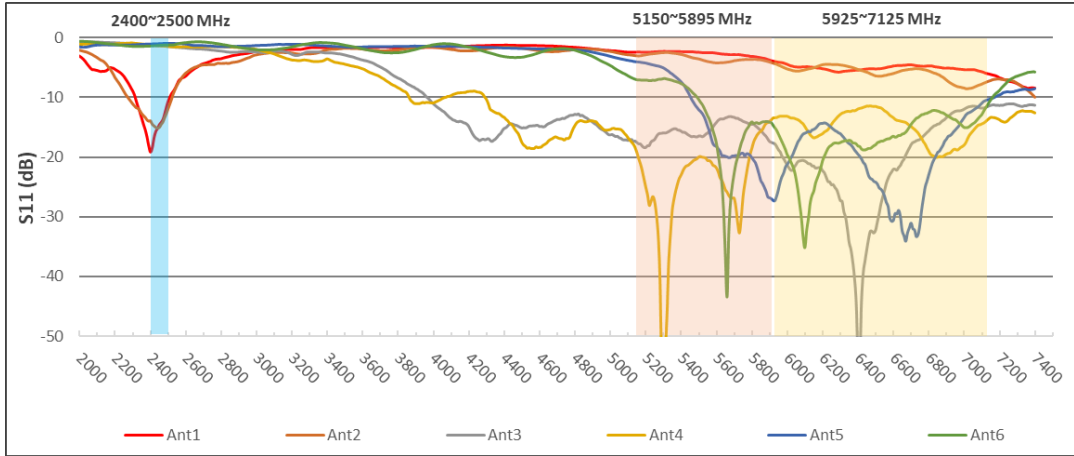


Radio_3	Ant.5~6
Wi-Fi Frequency	5925~7125MHz
Return Loss	-10dB
Antenna Type	Alford Loop
Material	FR4
Feeding	Cable

Ant.5	
Brand Name :	AWAN
P/N	7102A0952000

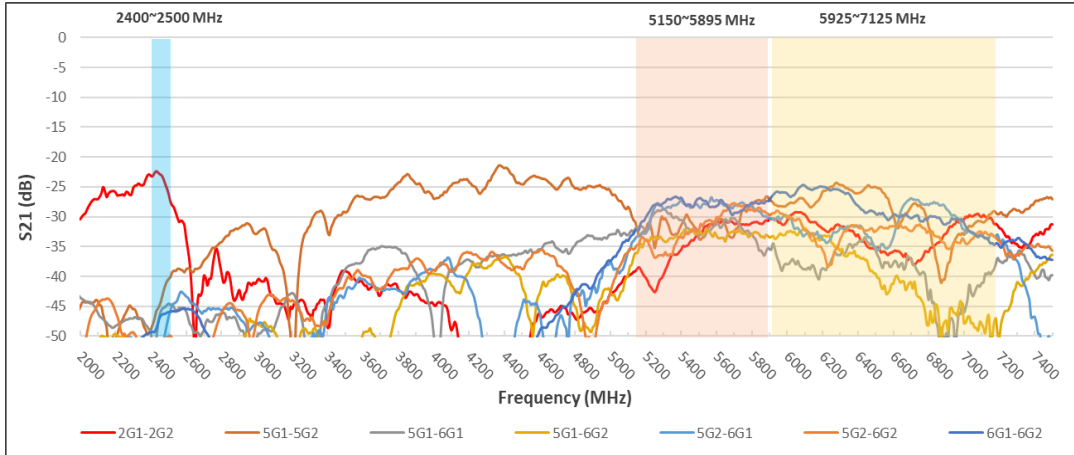
Ant.6	
Brand Name :	AWAN
P/N	7102A0951000





Antenna S11						
Freq. (MHz)	Ant1 2G	Ant2 2G	Ant3 5G	Ant4 5G	Ant5 6G	Ant6 6G
2400	-19.16	-13.92				
2450	-14.58	-15.02				
2500	-10.64	-11.88				
5150			-17.56	-19.18		
5550			-16.48	-19.94		
5850			-15.52	-15.64		
5895			-17.40	-13.96		
5925					-25.46	-16.16
6500					-24.21	-17.96
7125					-10.18	-10.47

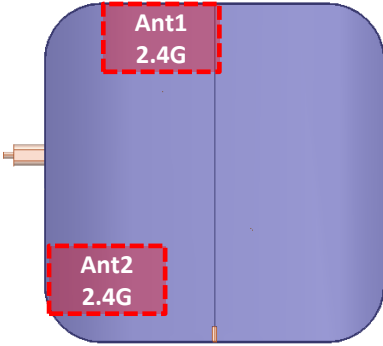
Antenna Isolation (S21)



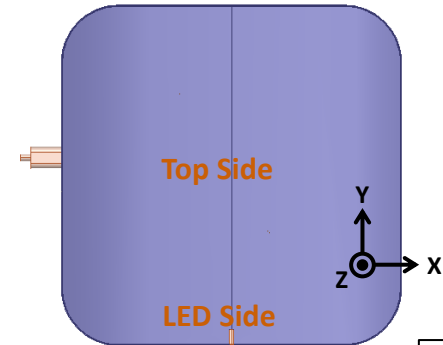
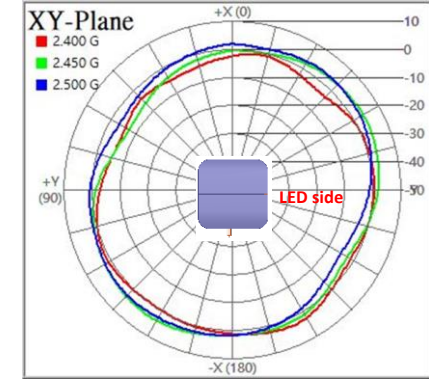
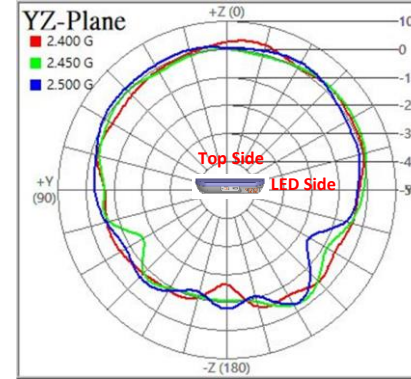
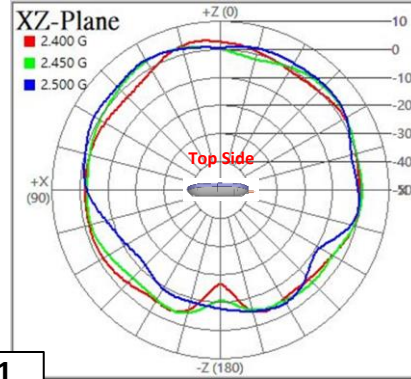
		S21 (Isolation)					
Freq. (MHz)	Ant1-Ant2	Ant3-Ant4	Ant3-Ant5	Ant3-Ant6	Ant4-Ant5	Ant4-Ant6	Ant5-Ant6
2400	-23.06						
2450	-22.78						
2500	-26.06						
5150		-31.90	-31.92	-36.11	-33.30	-34.73	
5550		-33.66	-33.16	-32.30	-28.33	-32.18	
5850		-27.31	-35.58	-33.37	-29.31	-28.67	
5895		-27.27	-35.37	-33.49	-30.30	-29.74	
5925			-37.35	-33.22	-29.99	-29.06	-25.79
6500			-35.62	-39.58	-35.01	-32.36	-29.43
7125			-39.60	-50.51	-32.87	-33.00	-34.44

2D Radiation Pattern – Radio 1

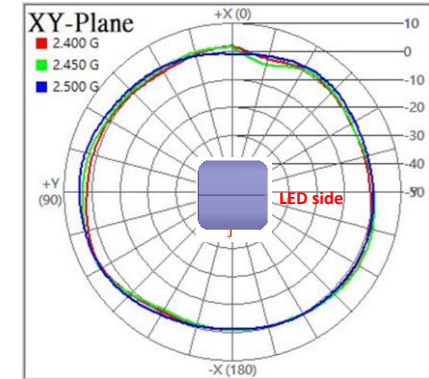
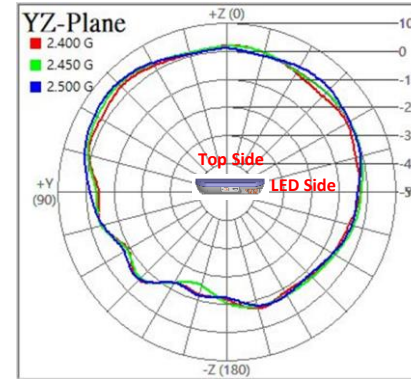
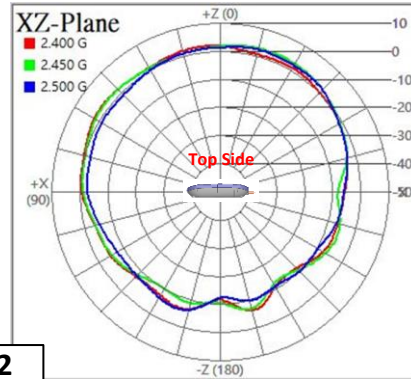
Represent the all X-Y plane using down tiles 30-degree angle.



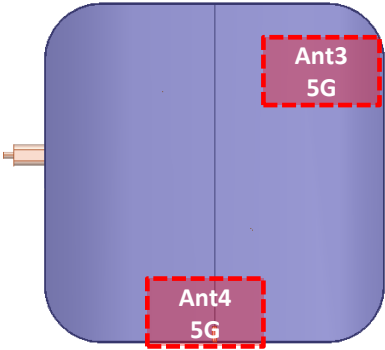
Ant1



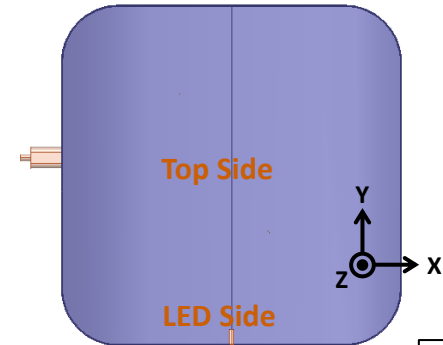
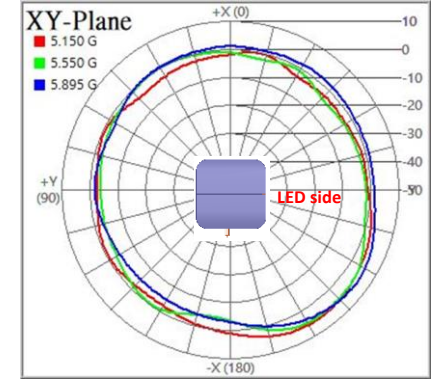
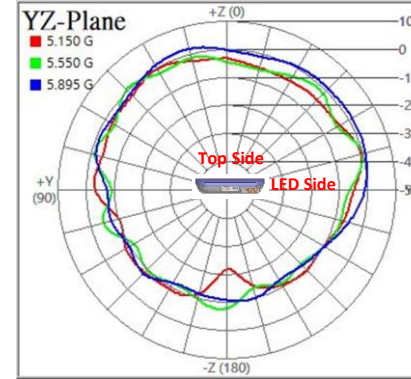
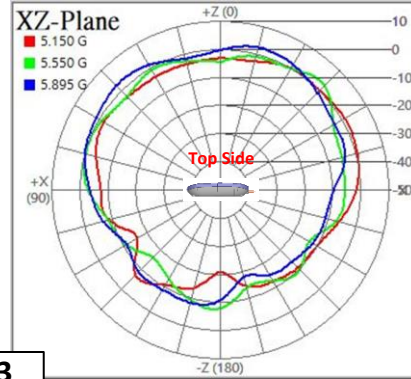
Ant2



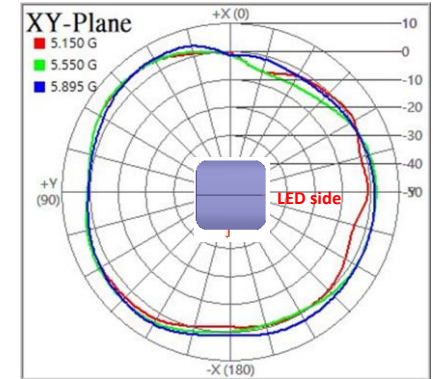
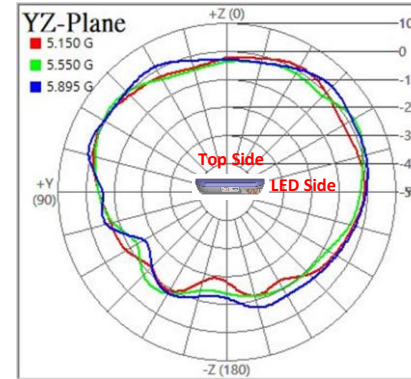
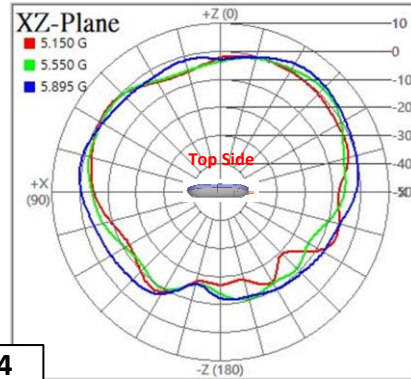
2D Radiation Pattern – Radio 2



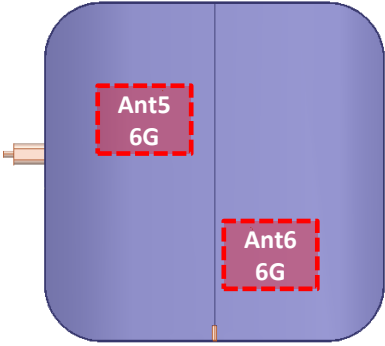
Ant3



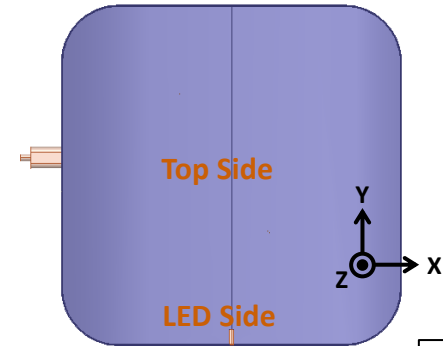
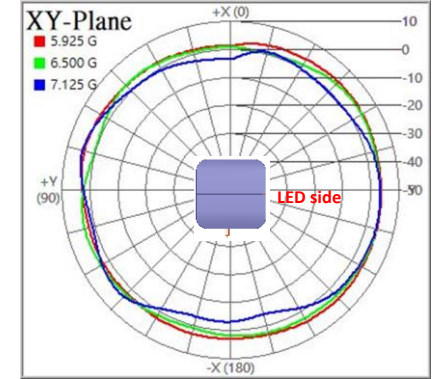
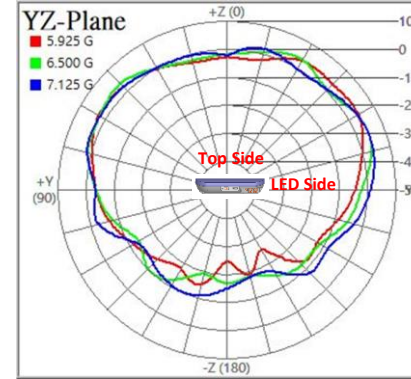
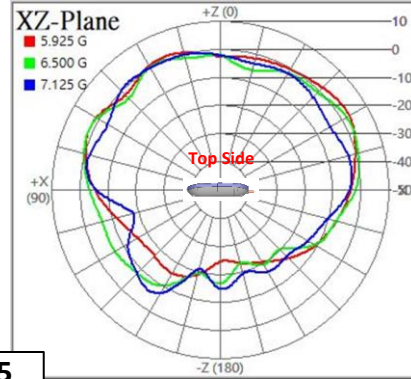
Ant4



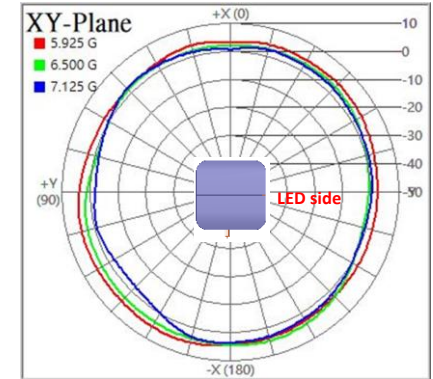
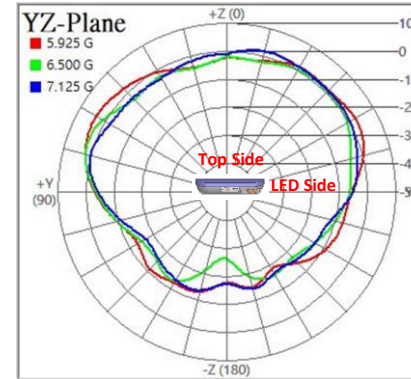
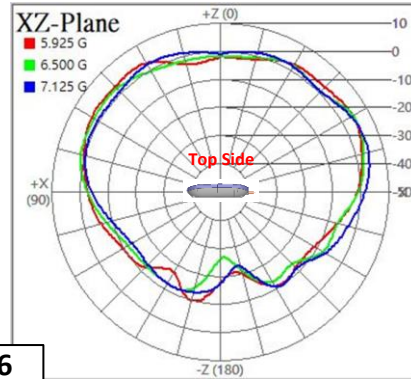
2D Radiation Pattern – Radio 3



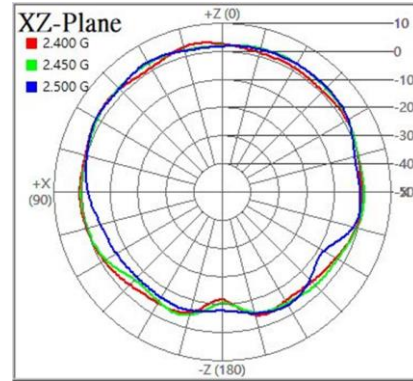
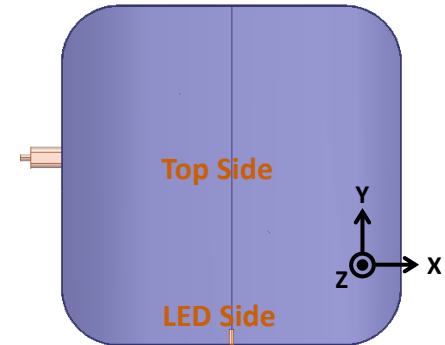
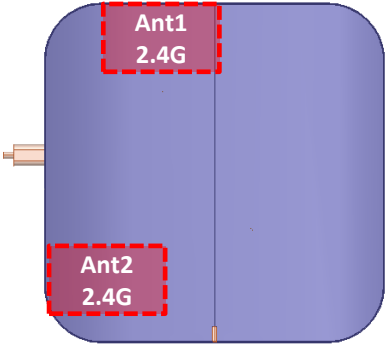
Ant5



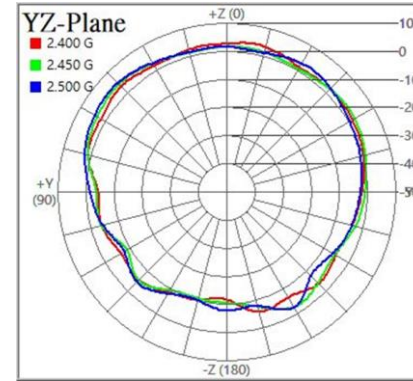
Ant6



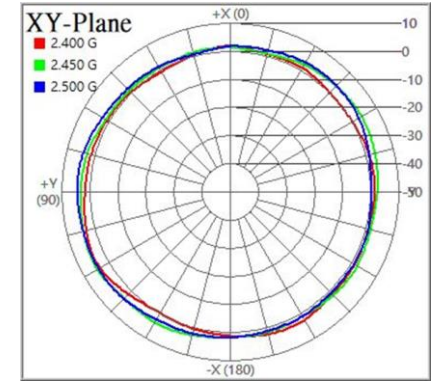
Combine Pattern – Radio 1



XZ-Plane

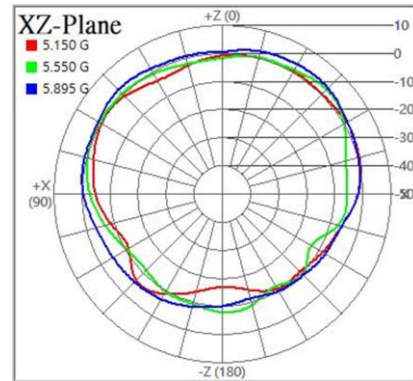
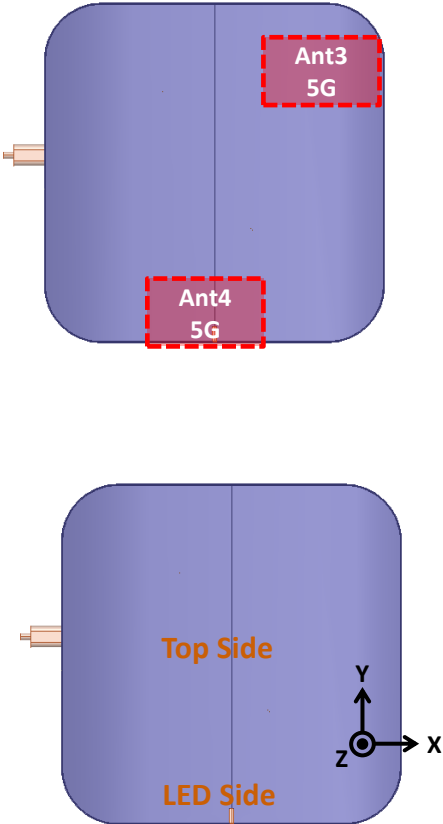


YZ-Plane

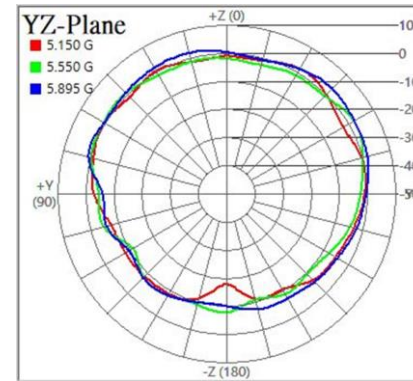


XY-Plane

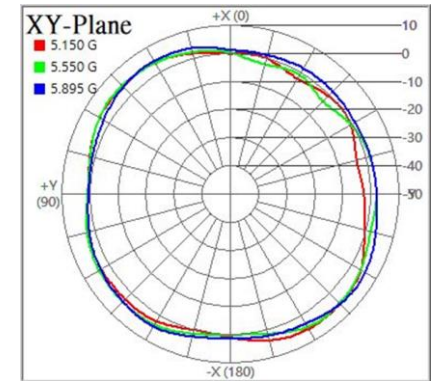
Combine Pattern – Radio 2



XZ-Plane

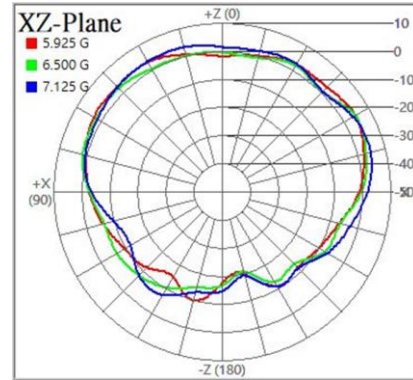
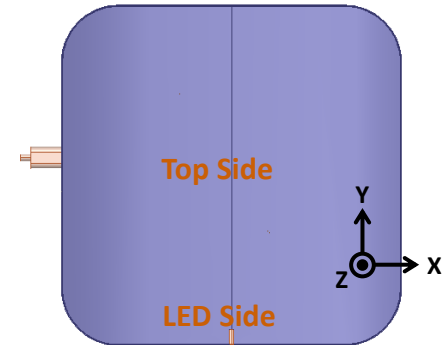
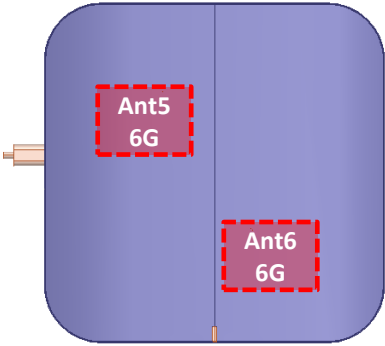


YZ-Plane

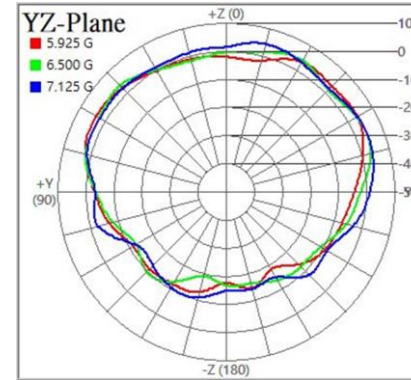


XY-Plane

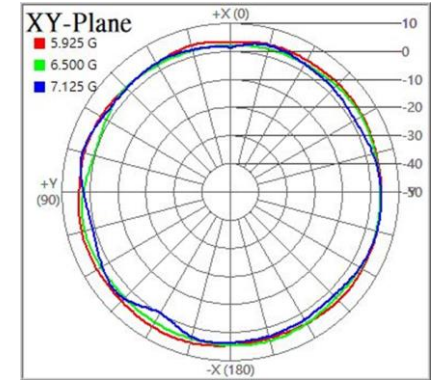
Combine Pattern – Radio 3



XZ-Plane



YZ-Plane



XY-Plane

Antenna Efficiency and Gain

Freq. (MHz)	ANT1_2G		ANT2_2G		ANT3_5G		ANT4_5G		ANT5_6G		ANT6_6G	
	Efficiency (%)	Peak Gain (dBi)	Efficiency (%)	Peak Gain (dBi)	Efficiency (%)	Peak Gain (dBi)	Efficiency (%)	Peak Gain (dBi)	Efficiency (%)	Peak Gain (dBi)	Efficiency (%)	Peak Gain (dBi)
2400	64	3.7	63	4.0								
2450	71	4.1	67	4.0								
2500	70	4.4	66	3.8								
5150					64	5.5	63	4.6				
5550					65	4.7	62	4.5				
5850					64	5.3	65	4.5				
5895					61	5.6	68	4.5				
5925									67	4.5	64	5.5
6500									69	4.3	67	4.8
7125									62	5.0	64	4.7

- Wi-Fi 2/5G antenna is metal PIFA, Wi-Fi 6G is PCB Alford Loop, all antenna are feeding by cable.
- Wi-Fi antennas efficiency is around 61~71%, peak gain around 4.4 at Radio1, 5.6 at Radio2, 5.5dBi at Radio3.
- Antennas are mounted on antenna plate, the radiation energy of the antennas cover different directions respectively, and good system coverage can be obtained after combination.