



AP340

Antenna Test Report



Senao Networks Inc.

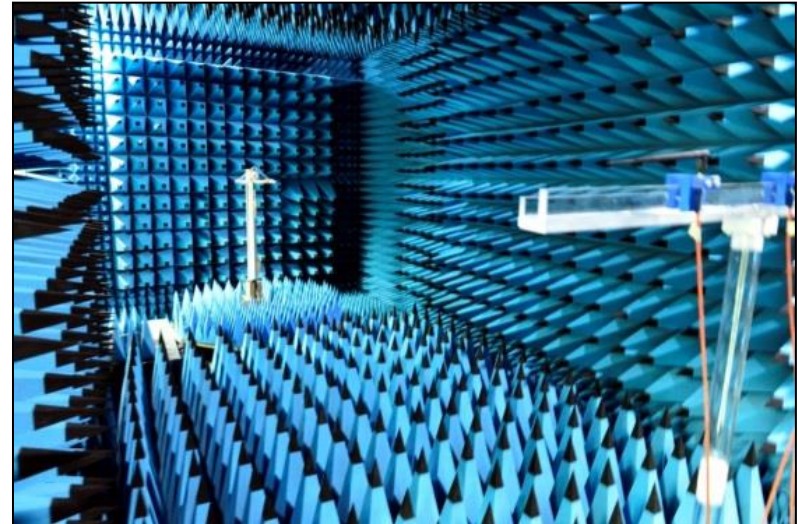
Customer	WatchGuard
Project	AP340
Project Description	2G antenna*2 5G antenna*2 6G antenna*2 Tri band antenna*2
Date	2025/02/26
Prepared by	Daniel
Report Version	V02

Version	Date	Description
V01	2024/12/30	EVT sample testing
V02	2025/02/26	DVT sample testing

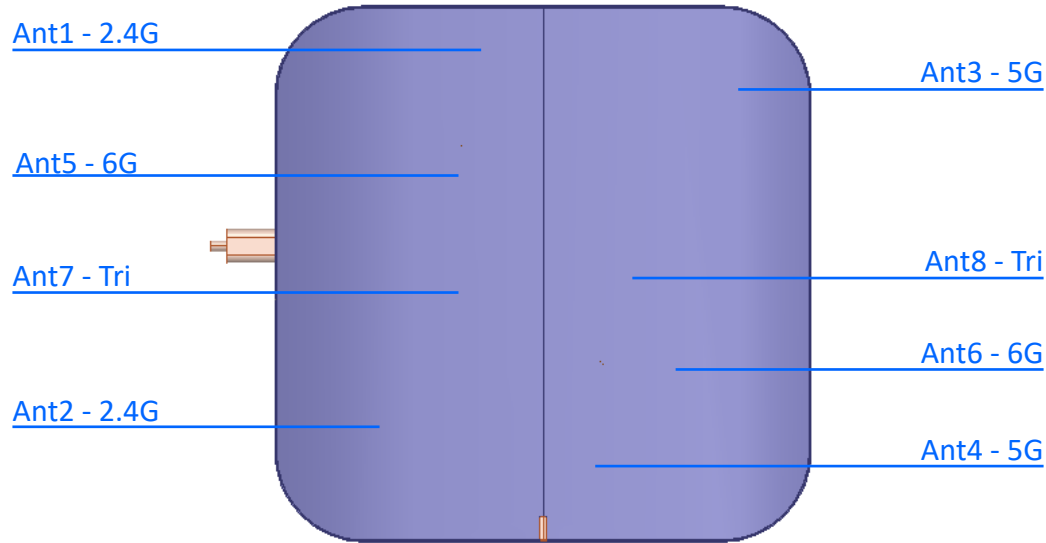
- Antenna Test Information
- Placement and Specification
- Antenna Return Loss
- Antenna Isolation
- Radiation Pattern
- Combine Pattern
- Efficiency and Gain

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
Ant 1~2	2400MHz ~ 2500 MHz	68 @2G	PIFA	Cable
Ant 3~4	5150MHz ~ 5895 MHz	67 @5G	PIFA	Cable
Ant 5~6	5925MHz ~ 7125 MHz	66 @6G	Alford Loop	Cable
Ant 7~8	2400MHz ~ 2500 MHz	69 @2G	PIFA	Cable
	5150MHz ~ 5895 MHz	68 @5G		
	5925MHz ~ 7125 MHz	69 @6G		

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

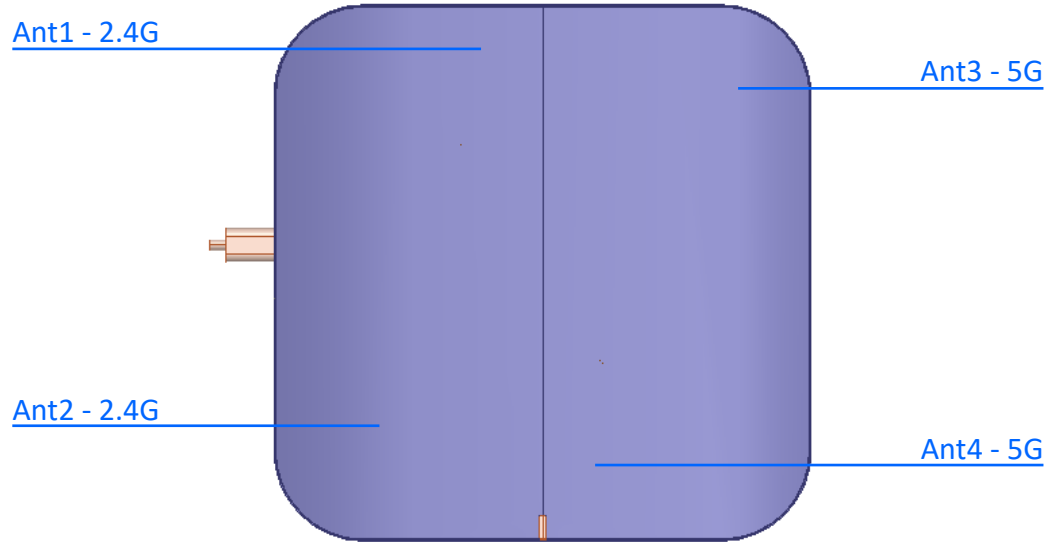
Radio_2 Ant.3~4
 Wi-Fi Frequency 5150~5895MHz
 Return Loss -10dB
 Antenna Type Pifa
 Material Metal
 Feeding Cable

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
 Brand Name : Enrack
 P/N 7102A1225000



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

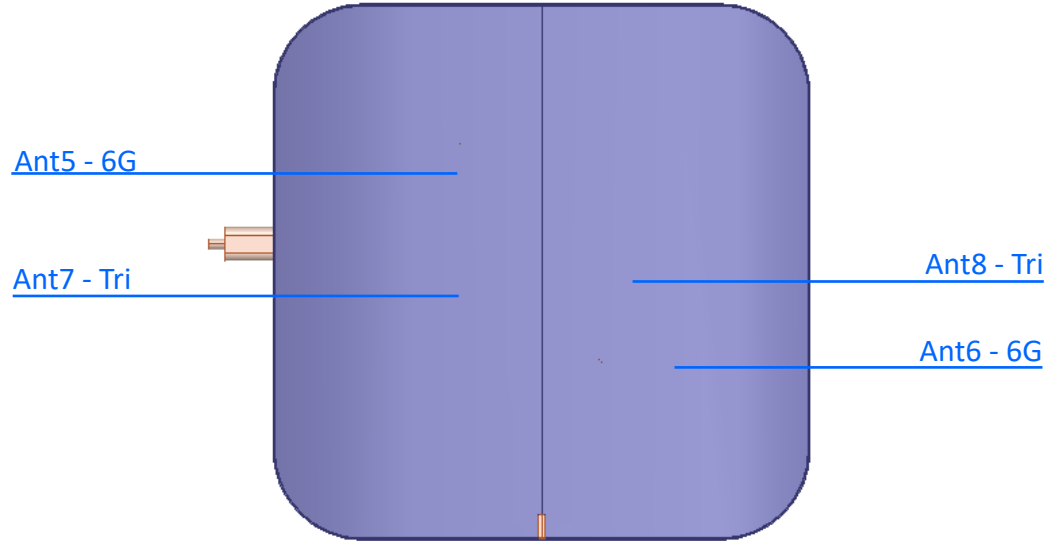
Ant.5
 Brand Name : AWAN
 P/N 7102A0952000

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

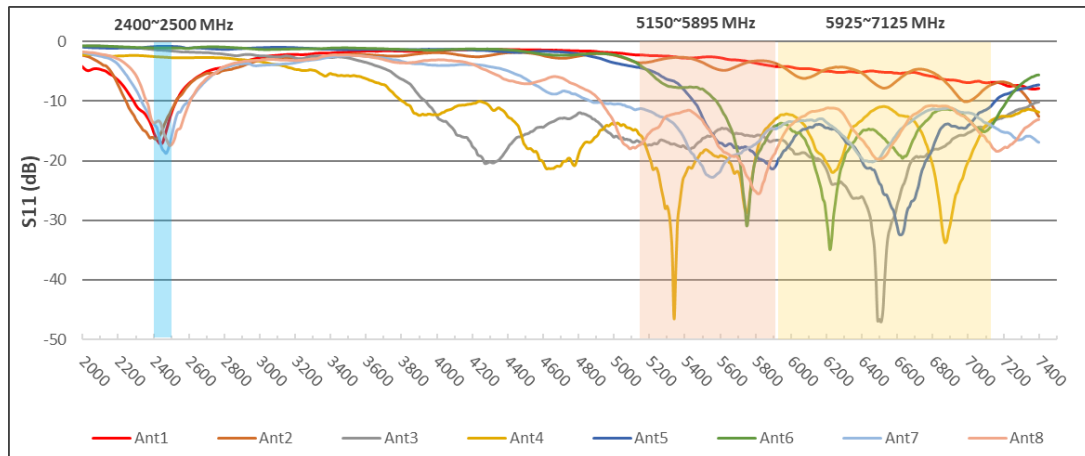
Scanning Ant.7~8
 Frequency 2400~2500MHz
 5150~5895MHz
 5925~7125MHz
 Return Loss -10dB
 Antenna Type Pifa
 Material Metal
 Feeding Cable

Ant.7
 Brand Name : Enrack
 P/N 7102A1355000

Ant.8
 Brand Name : Enrack
 P/N 7102A1356000



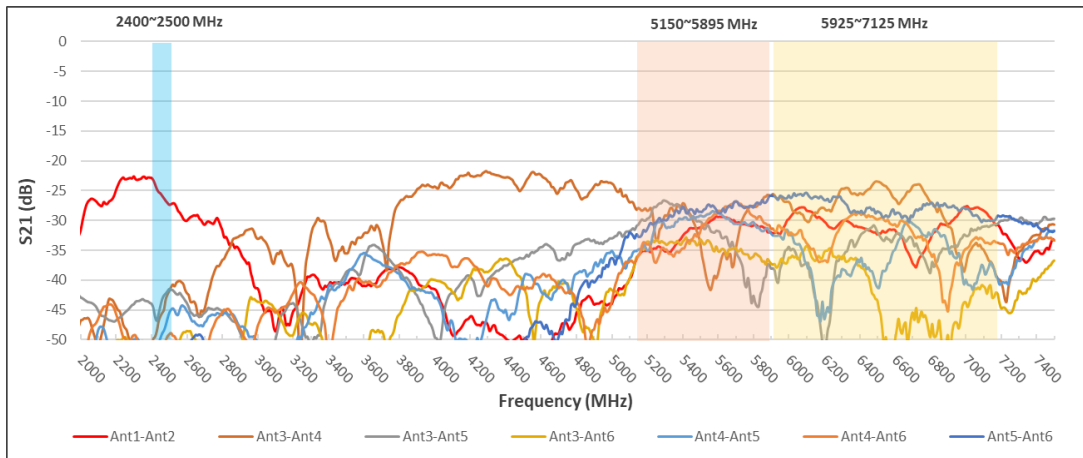
Antenna Return loss (S11)



Ant1~2	Radio 1_2G
Ant3~4	Radio 2_5G
Ant5~6	Radio 3_6G
Ant5~6	Scan Radio_2/5/6G

Antenna S11								
Freq. (MHz)	Ant1	Ant2	Ant3	Ant4	Ant5	Ant6	Ant7	Ant8
2400	-15.12	-16.06						-13.79 -13.58
2450	-16.93	-14.72						-18.09 -14.66
2500	-12.00	-11.43						-16.20 -17.29
5150			-16.87	-15.67				-11.21 -17.24
5550			-16.25	-18.60				-20.95 -13.17
5850			-16.01	-14.87				-15.49 -23.21
5895			-16.58	-13.34				-14.65 -19.08
5925					-18.78	-13.66	-14.04	-16.04
6500					-23.76	-15.52	-19.60	-19.68
7125					-10.12	-13.25	-14.38	-18.08

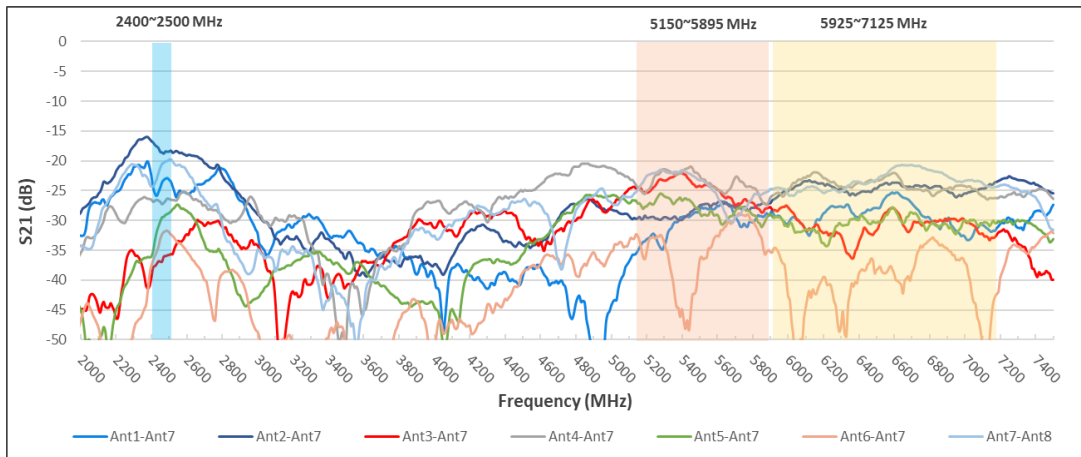
Antenna Isolation (S21)



Ant1~2	Radio 1_2G
Ant3~4	Radio 2_5G
Ant5~6	Radio 3_6G
Ant5~6	Scan Radio_2/5/6G

Antenna S21							
Freq. (MHz)	Ant1-Ant2	Ant3-Ant4	Ant3-Ant5	Ant3-Ant6	Ant4-Ant5	Ant4-Ant6	Ant5-Ant6
2400	-22.88						
2450	-25.47						
2500	-27.39						
5150		-27.92	-30.74	-36.05	-34.83	-35.83	
5550		-33.81	-30.23	-33.21	-29.12	-31.96	
5850		-26.74	-41.59	-36.91	-31.74	-29.98	
5895		-25.88	-38.08	-37.24	-32.12	-31.49	
5925			-38.30	-36.97	-32.50	-30.98	-25.81
6500			-31.93	-43.40	-41.12	-29.88	-28.41
7125			-30.80	-42.96	-37.58	-33.72	-29.85

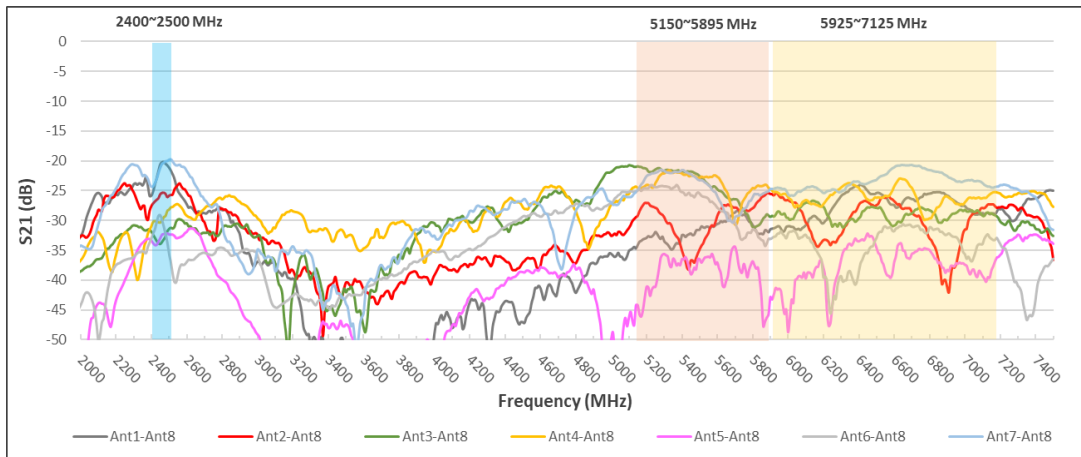
Antenna Isolation (S21)



Ant1~2	Radio 1_2G
Ant3~4	Radio 2_5G
Ant5~6	Radio 3_6G
Ant5~6	Scan Radio_2/5/6G

Antenna S21						
Freq. (MHz)	Ant1-Ant7	Ant2-Ant7	Ant3-Ant7	Ant4-Ant7	Ant5-Ant7	Ant6-Ant7
2400	-22.54	-16.64				
2450	-24.45	-18.45				
2500	-23.14	-18.42				
5150			-24.61	-24.48		
5550			-24.22	-22.53		
5850			-28.70	-26.66		
5895			-27.79	-26.17		
5925					-29.51	-35.67
6500					-30.41	-38.33
7125					-30.56	-46.28

Antenna Isolation (S21)

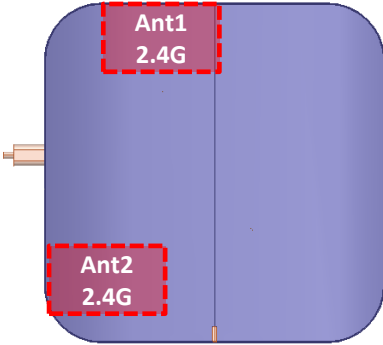


Ant1~2	Radio 1_2G
Ant3~4	Radio 2_5G
Ant5~6	Radio 3_6G
Ant5~6	Scan Radio_2/5/6G

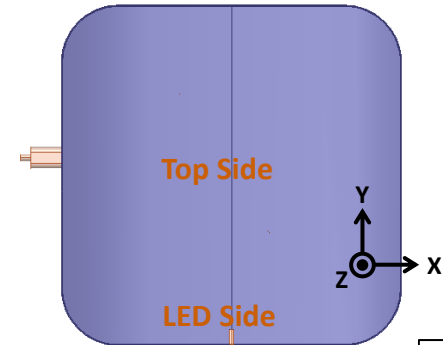
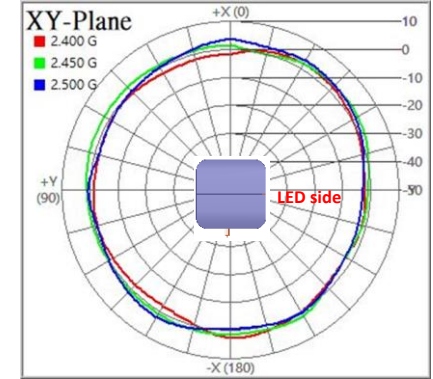
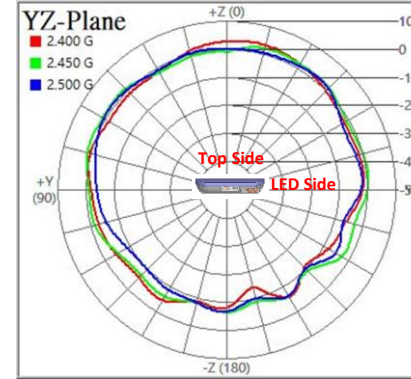
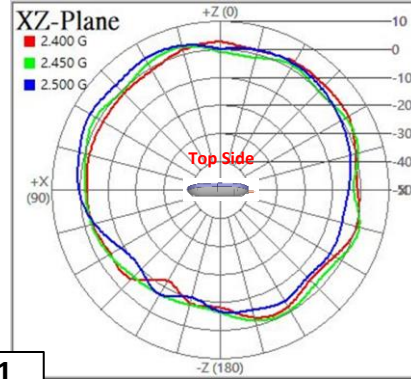
Antenna S21							
Freq. (MHz)	Ant1-Ant8	Ant2-Ant8	Ant3-Ant8	Ant4-Ant8	Ant5-Ant8	Ant6-Ant8	Ant7-Ant8
2400	-25.88	-27.63					-24.29
2450	-20.63	-25.63					-21.08
2500	-21.19	-25.88					-19.75
5150			-20.95	-24.59			-24.81
5550			-22.61	-22.87			-23.20
5850			-30.26	-24.28			-25.59
5895			-29.45	-24.74			-24.65
5925					-41.44	-32.19	-24.47
6500					-34.54	-32.97	-23.14
7125					-38.39	-33.08	-24.41

2D Radiation Pattern – Radio 1

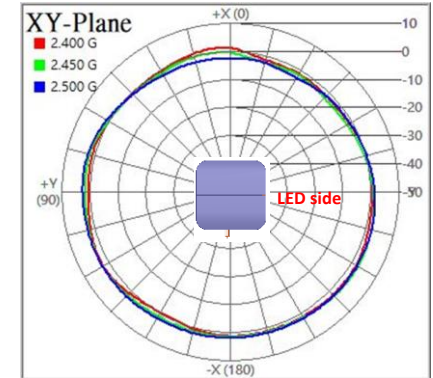
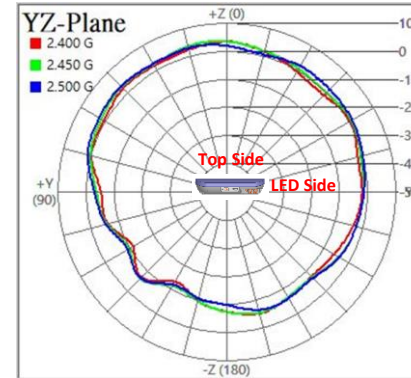
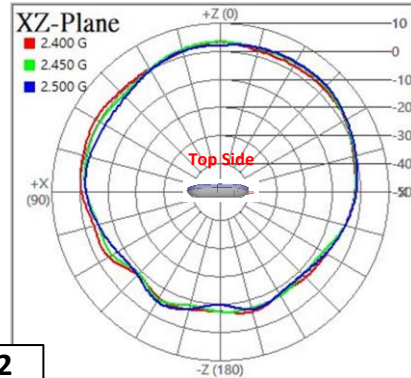
Represent the all X-Y plane using down tiles 30-degree angle.



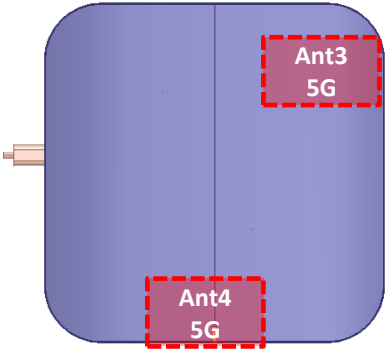
Ant1



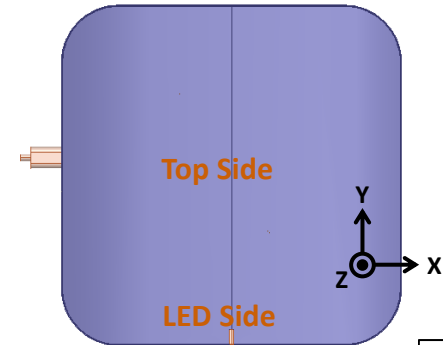
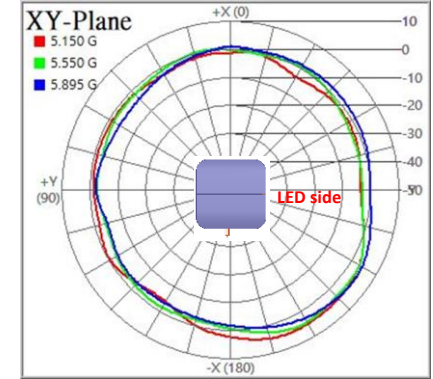
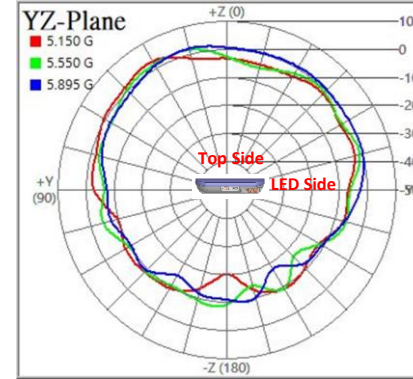
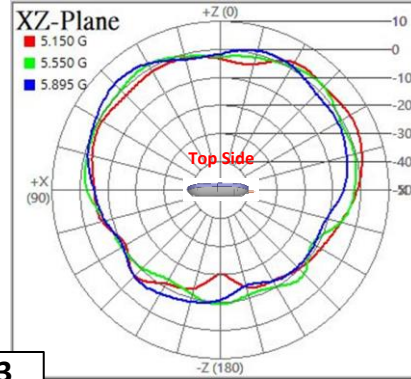
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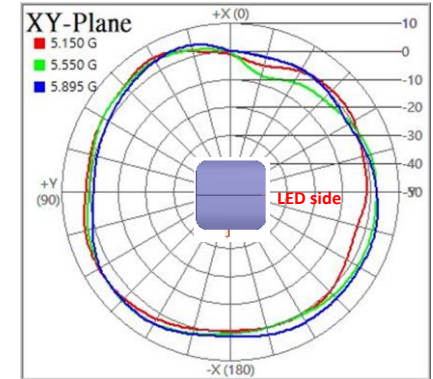
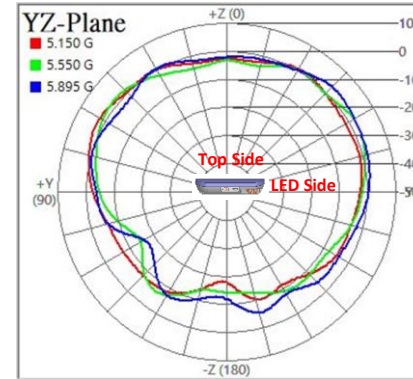
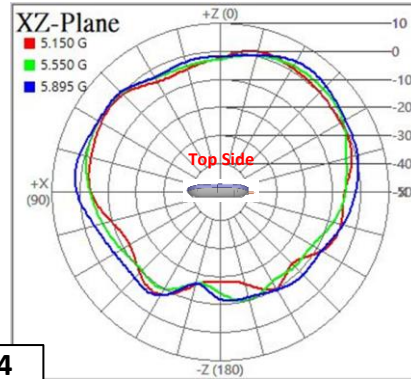
2D Radiation Pattern – Radio 2



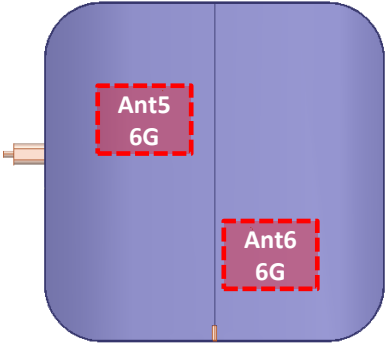
Ant3



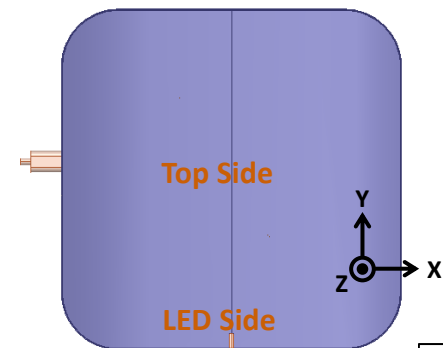
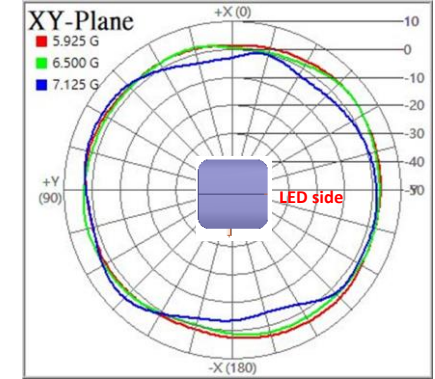
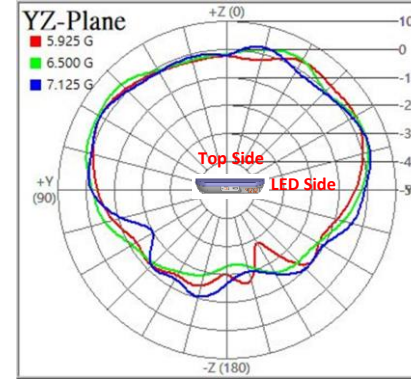
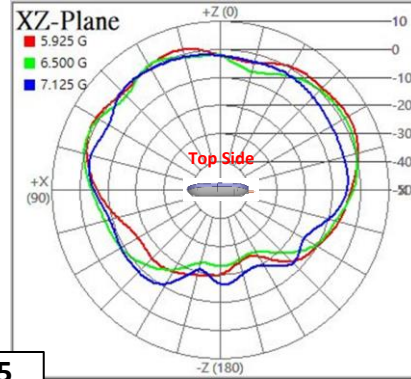
Ant4



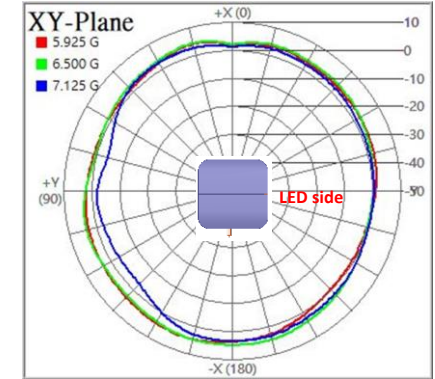
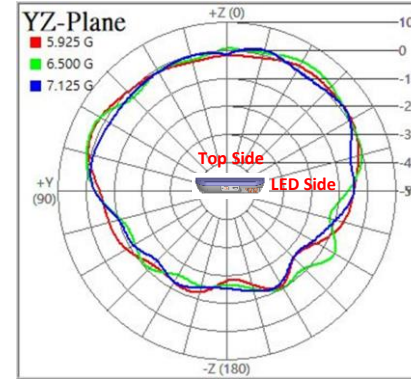
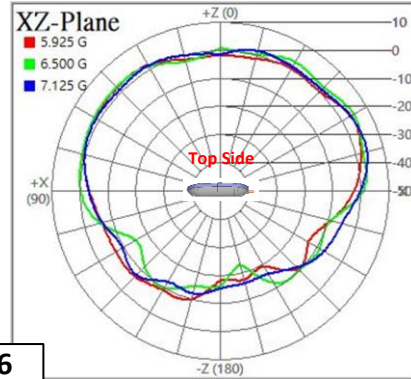
2D Radiation Pattern – Radio 3



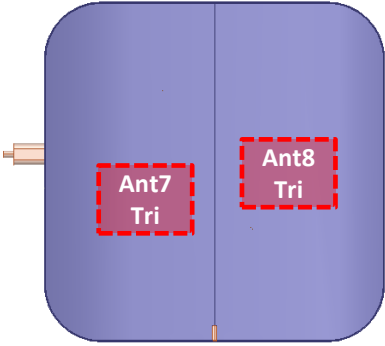
Ant5



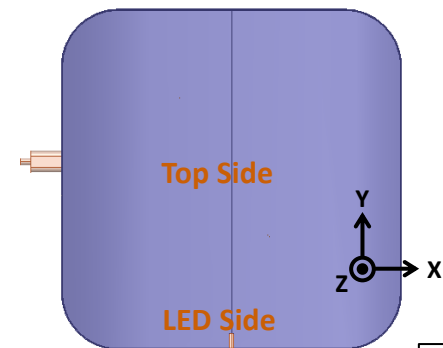
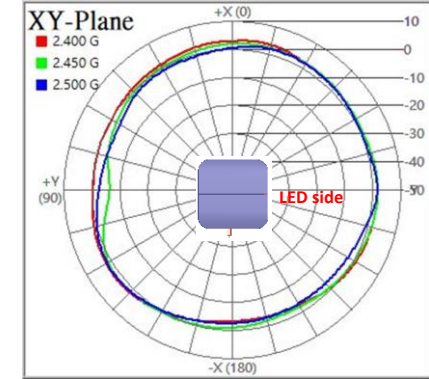
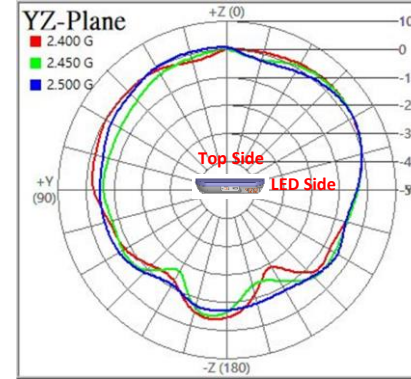
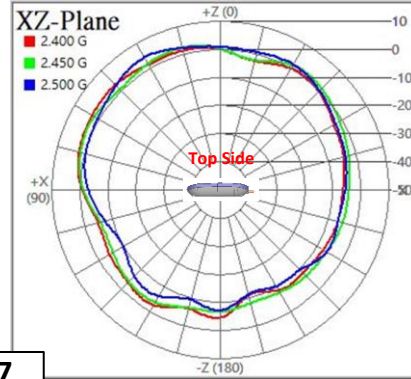
Ant6



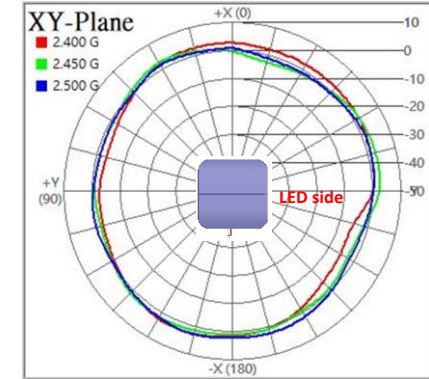
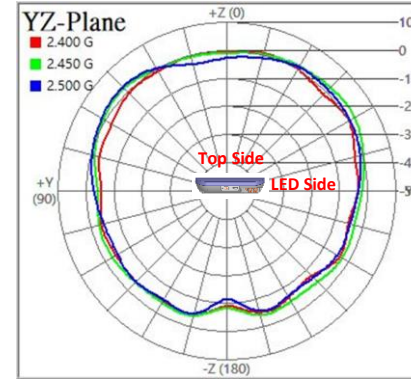
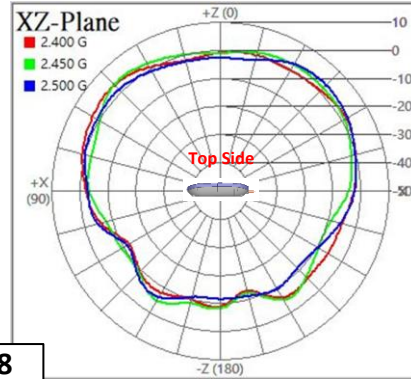
2D Radiation Pattern – Scanning_2.4G



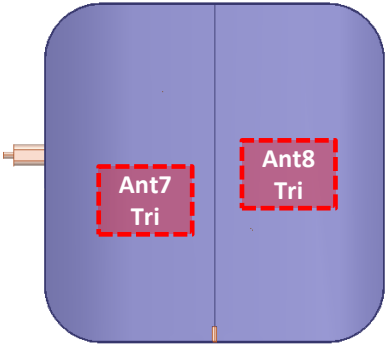
Ant7



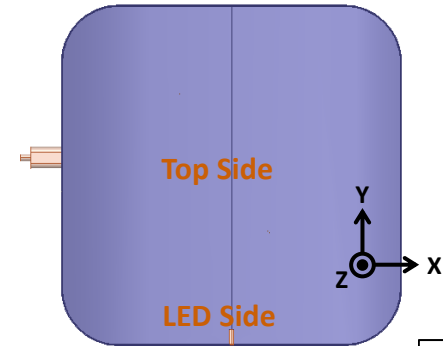
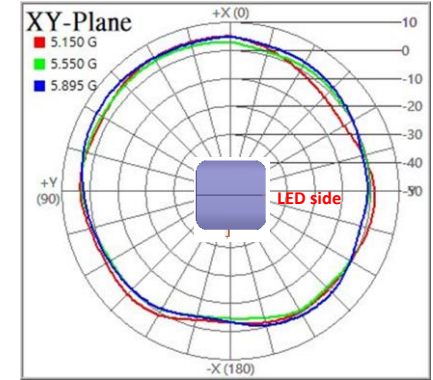
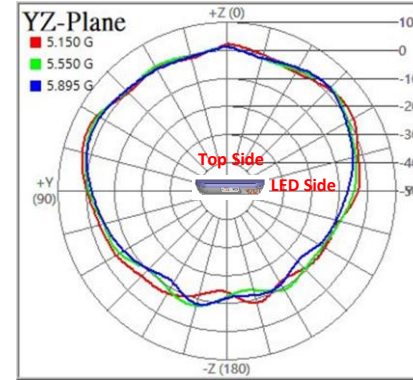
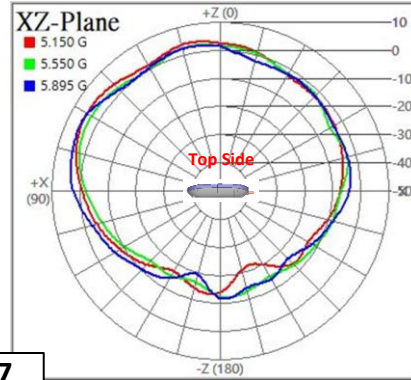
Ant8



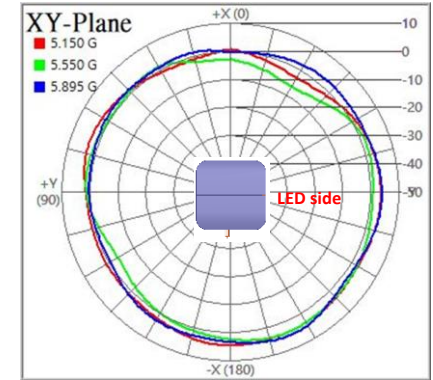
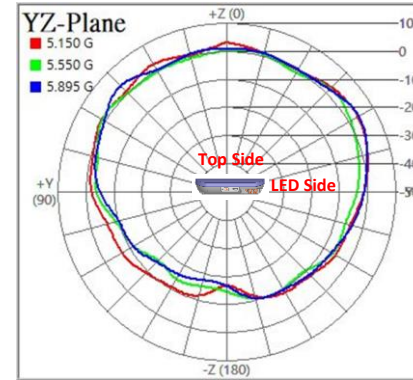
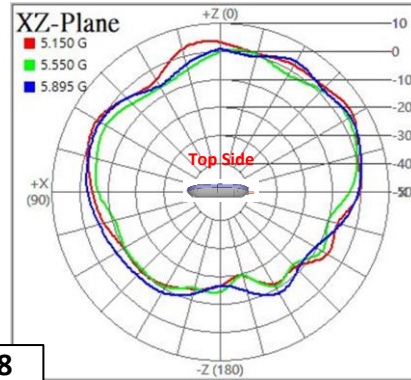
2D Radiation Pattern – Scanning_5G



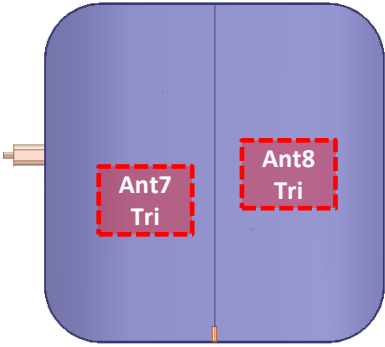
Ant7



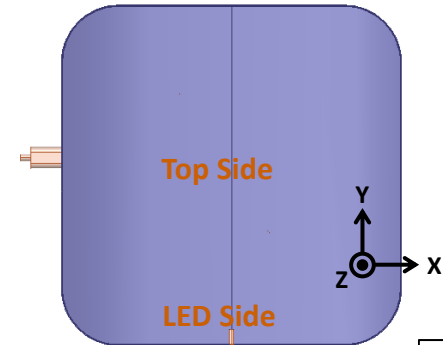
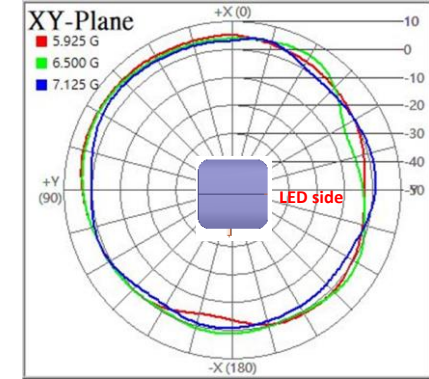
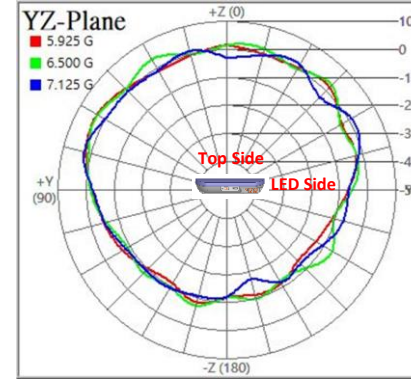
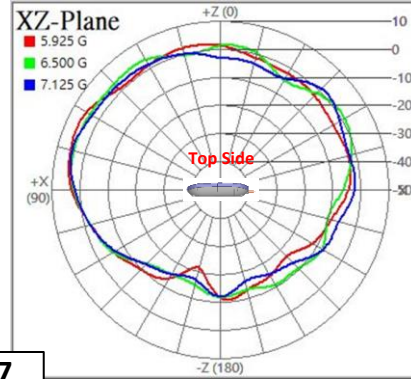
Ant8



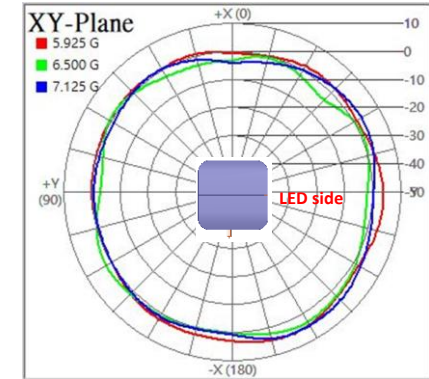
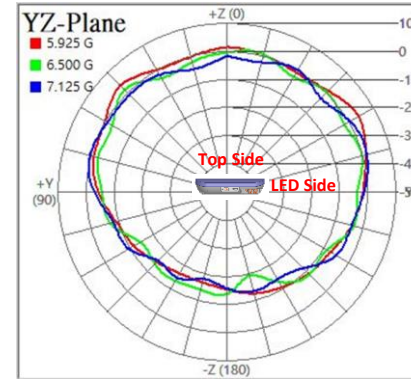
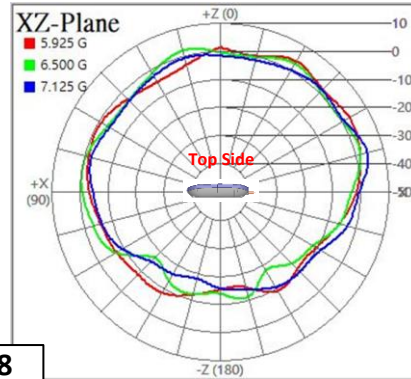
2D Radiation Pattern – Scanning_6G



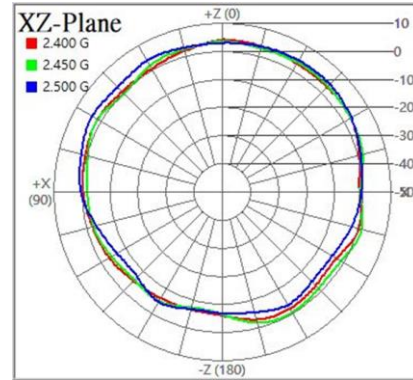
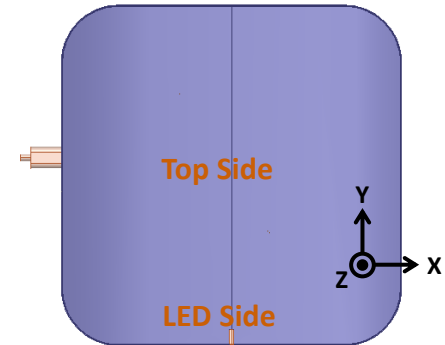
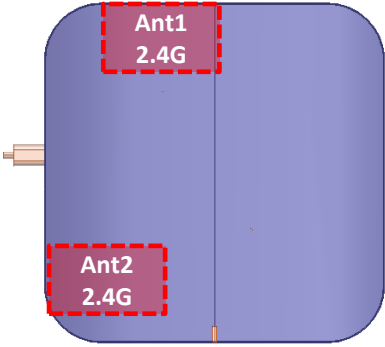
Ant7



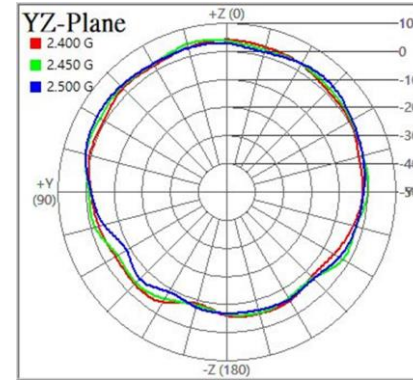
Ant8



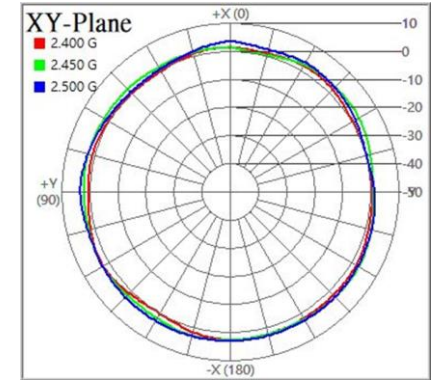
Combine Pattern – Radio 1



XZ-Plane

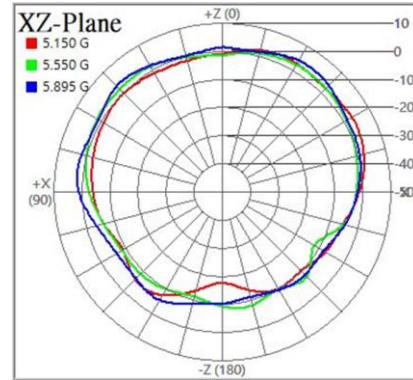
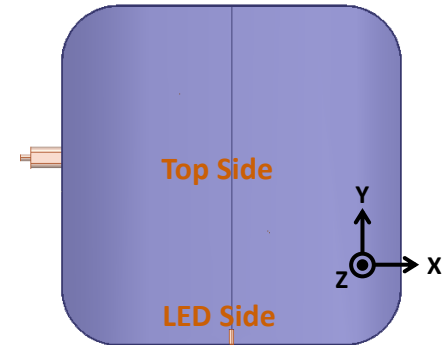
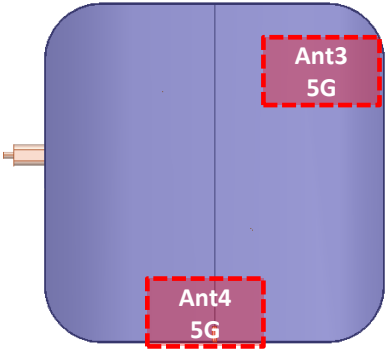


YZ-Plane

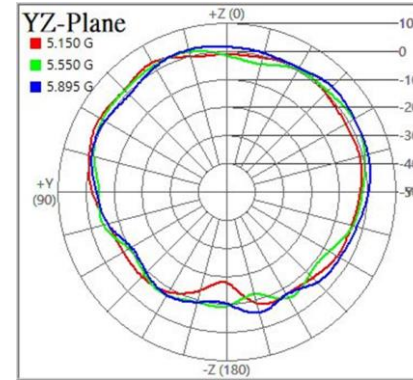


XY-Plane

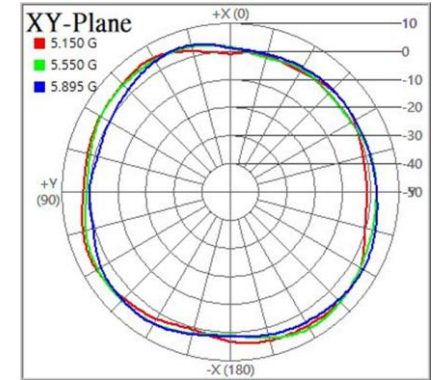
Combine Pattern – Radio 2



XZ-Plane

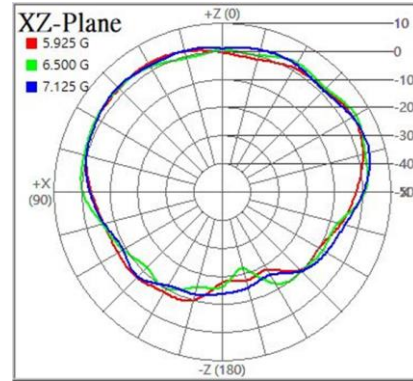
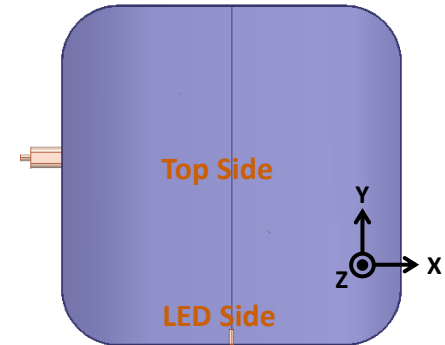
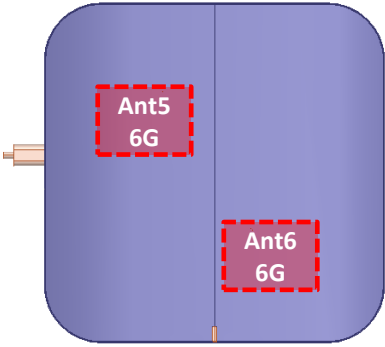


YZ-Plane

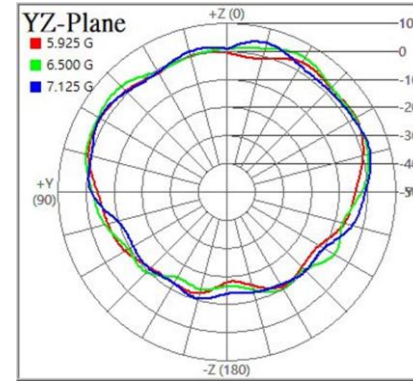


XY-Plane

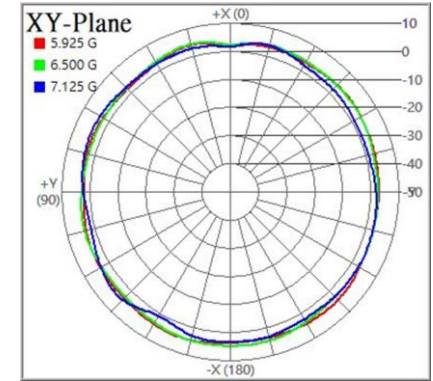
Combine Pattern – Radio 3



XZ-Plane

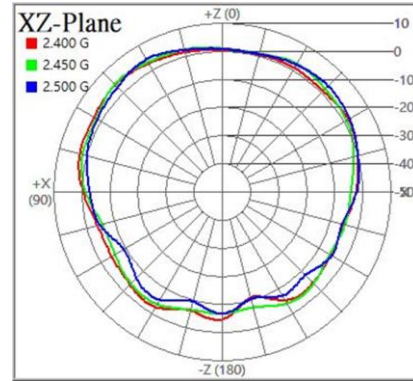
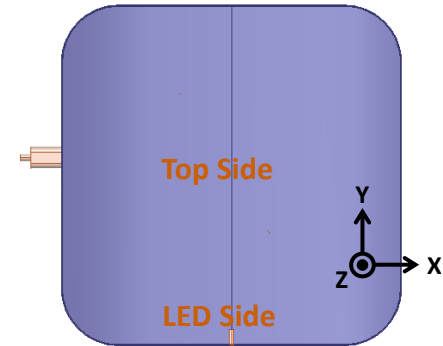
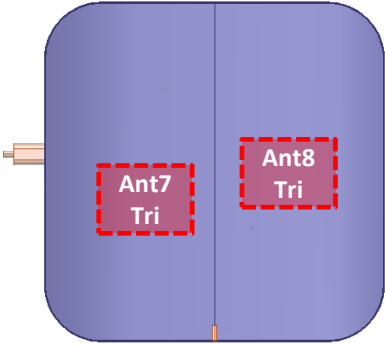


YZ-Plane

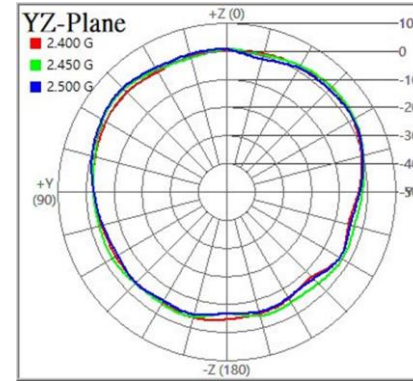


XY-Plane

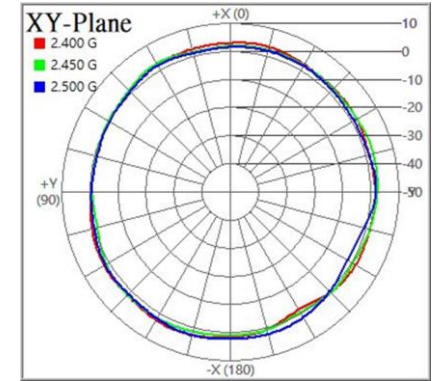
Combine Pattern – Scanning_2.4G



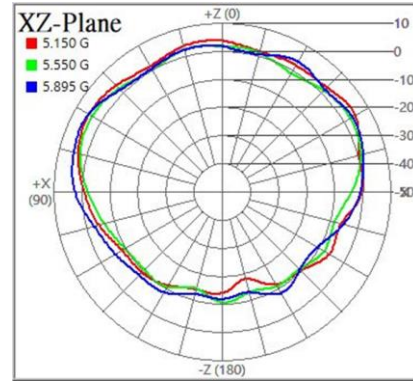
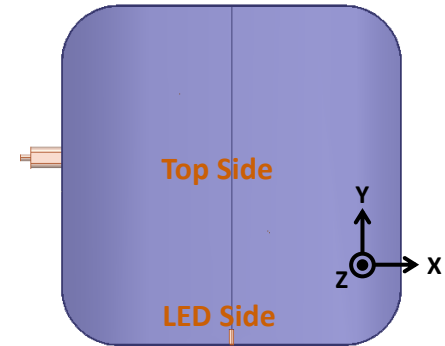
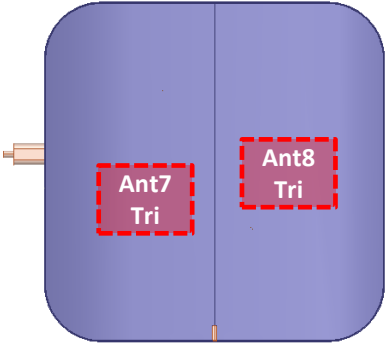
XZ-Plane



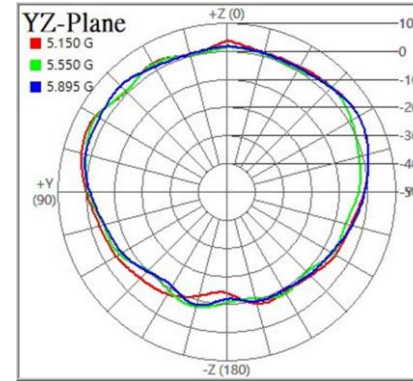
YZ-Plane



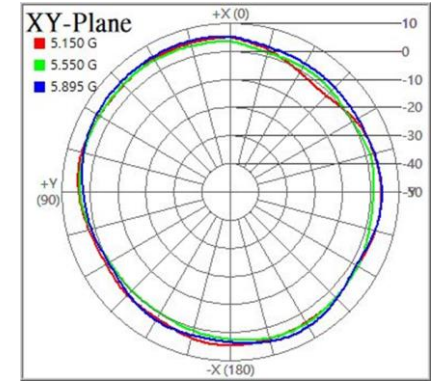
XY-Plane



XZ-Plane

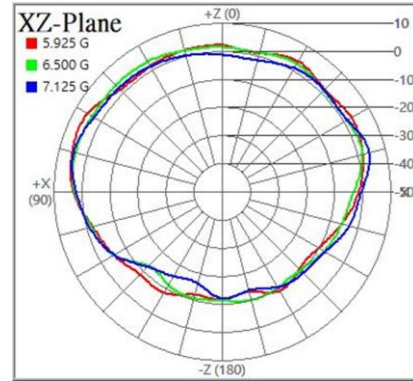
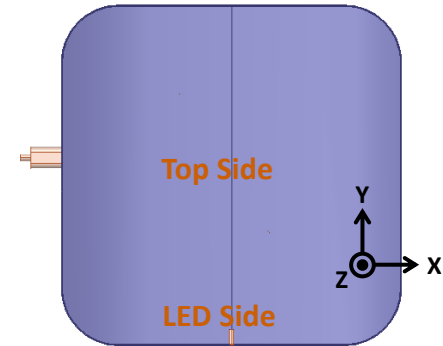
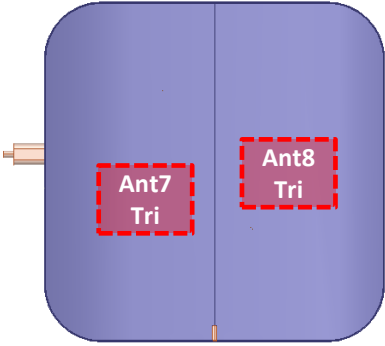


YZ-Plane

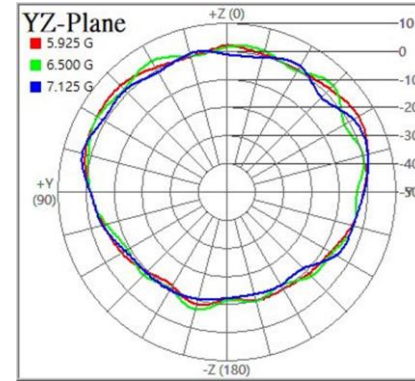


XY-Plane

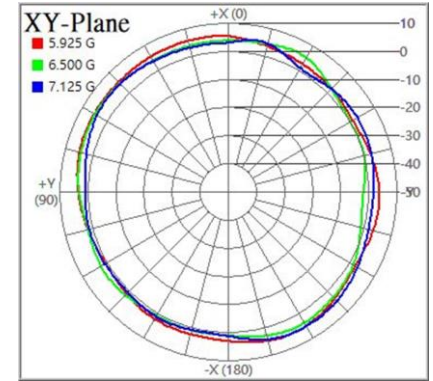
Combine Pattern – Scanning_6G



XZ-Plane



YZ-Plane



XY-Plane

Antenna Efficiency and Gain

Freq. (MHz)	ANT1_2G		ANT2_2G		ANT3_5G		ANT4_5G		ANT5_6G		ANT6_6G		ANT7_Tri		ANT8_Tri	
	Efficiency (%)	Peak Gain (dBi)	Efficiency (%)	Peak Gain (dBi)	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	63	4.4	66	3.5									65	3.7	61	3.5
2450	65	4.1	68	4.4									69	3.9	67	4.2
2500	65	3.8	64	4.1									64	4.2	69	4.1
5150					61	4.9	64	5.1					61	4.9	68	4.8
5550					62	5.6	61	4.5					60	5.0	66	4.4
5850					66	5.3	66	4.6					63	5.2	65	5.1
5895					63	5.2	67	4.6					65	5.1	65	4.9
5925									66	4.2	65	4.6	69	5.2	65	4.6
6500									65	5.0	64	5.5	65	5.3	60	4.4
7125									63	4.7	62	4.9	63	4.5	63	4.9

- Wi-Fi 2/5G and scanning antennas are metal PIFA, while the Wi-Fi 6G antennas are PCB Alford Loop, all fed by cable.
- The efficiency of the Wi-Fi antennas ranges from 61% to 68%, with peak gains of around 4.4 dBi at Radio1, 5.6 dBi at Radio2, and 5.5 dBi at Radio3.
- The scanning antennas have an efficiency of around 60% to 69%, with peak gains of approximately 4.2 dBi at 2.4G, 5.2 dBi at 5G, and 5.3 dBi at 6G.
- The antennas are mounted on an antenna plate, with their radiation energy covering different directions respectively. This combination ensures good system coverage.