FAP-231FL
Antenna Test Report

Senao Networks, Inc.

Customer	Fortinet
Project	FAP-231FL
Project Description	Dual antenna*2 Scanning antenna*1
Test Date	2020/06/30
Test Personnel	Tony
Report Version	A03

Address: No. 500, Fusing 3rd Rd., Hwa-Ya Technology Park Kuei-Shan Dist., Taoyuan City 33383, Taiwan

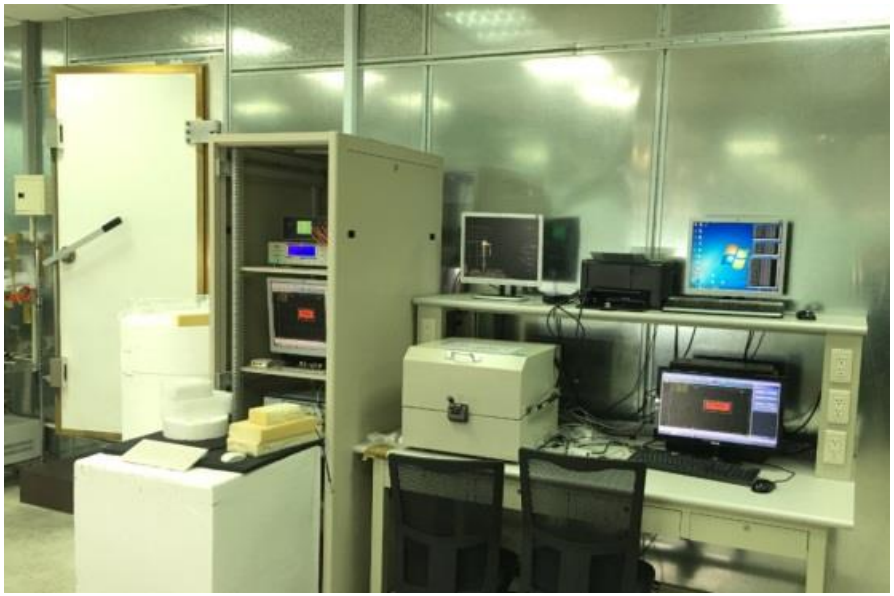
Executive Summary

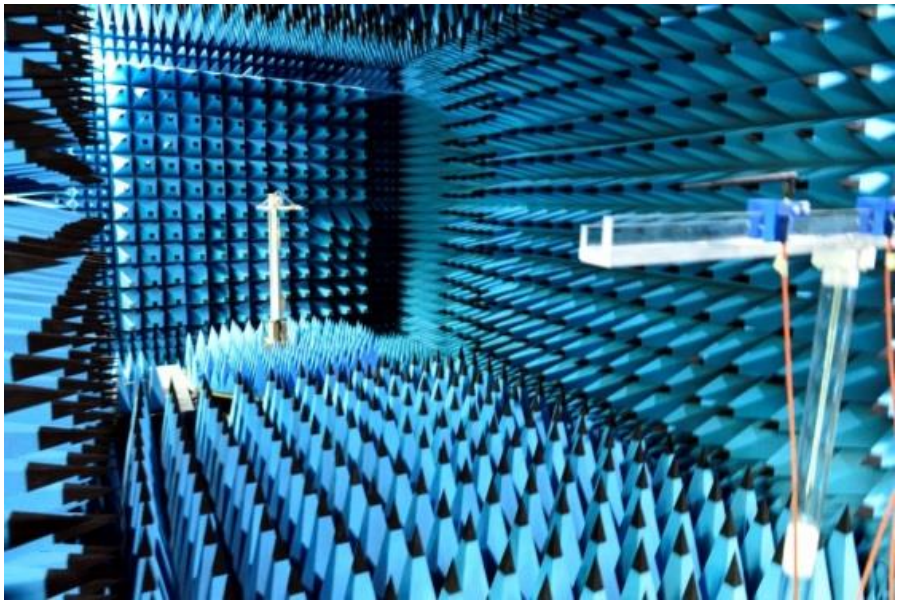
- **Agenda**
  - Antenna Development Resource
  - Antenna Testing Set Up
  - Placement and Specification
  - S11 & Isolation
  - Radiation Pattern
  - Efficiency and Gain

Antenna Development Resource

3D Anechoic Chamber - BWANT

- Size: 7.32M(L)x3.66M(W)X3.66M(H)
- Testing range from 400MHz to 7GHz
- 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
- Calibration date: 2022/10/27
- Test software : BWANT 3D Passive

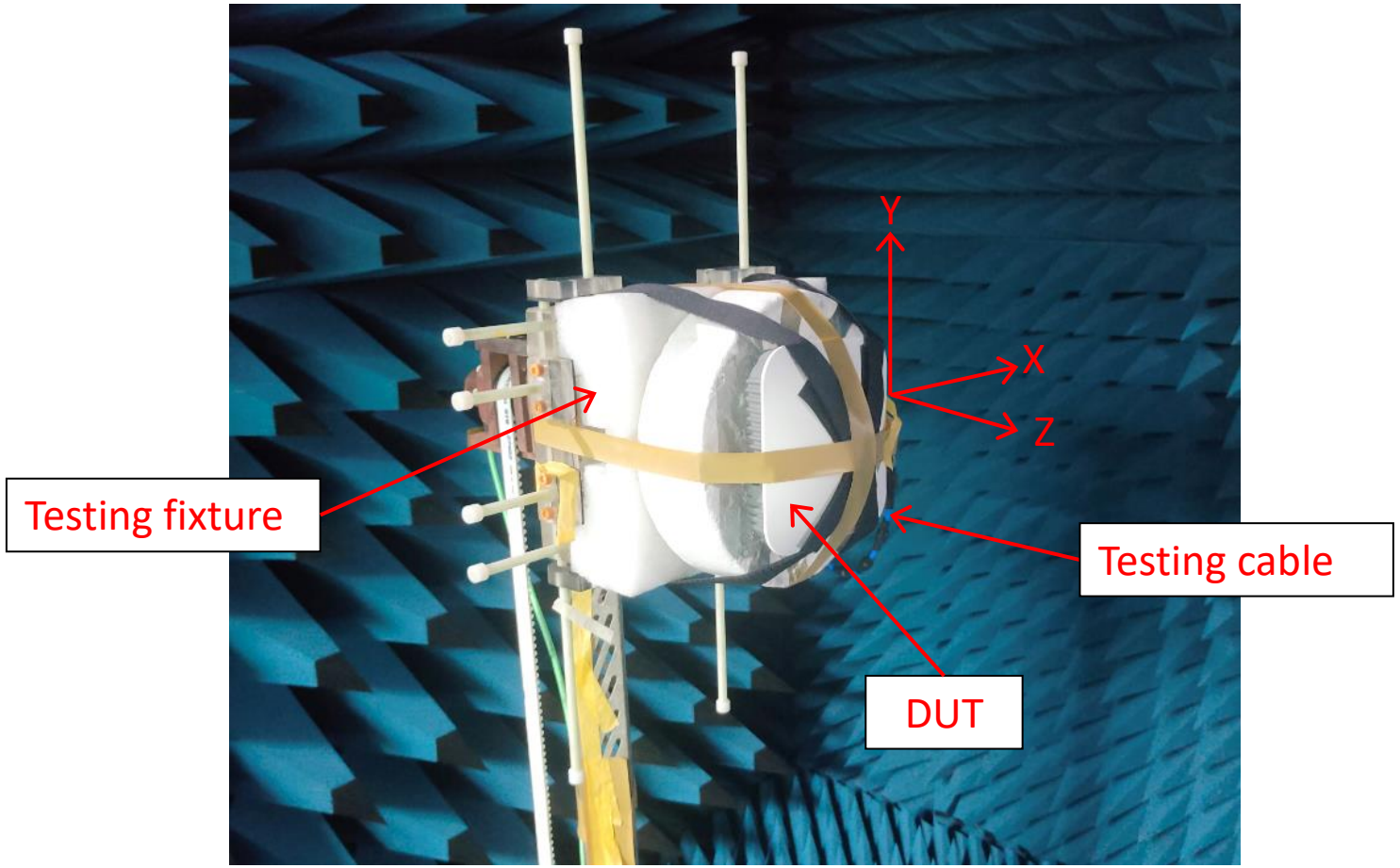




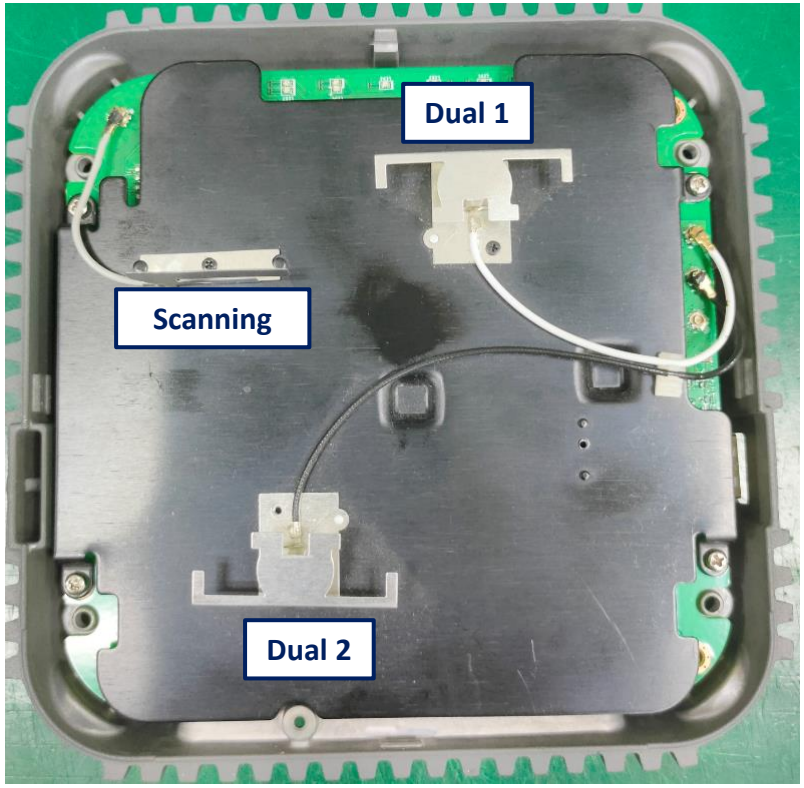
3D Anechoic Chamber

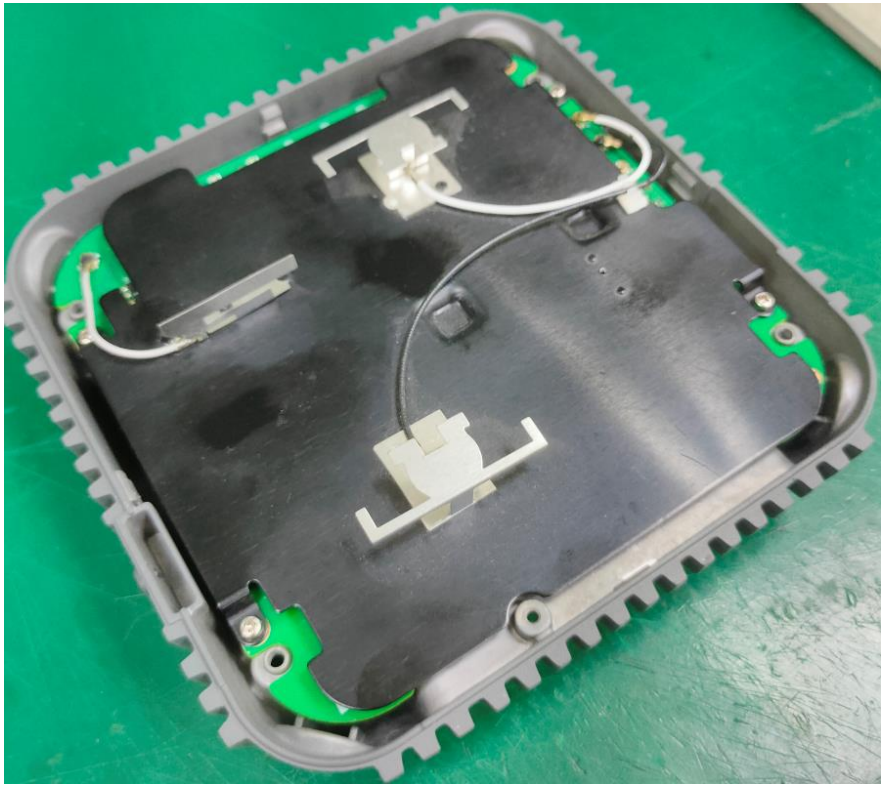
Antenna Testing Set Up

- The DUT is set up on the test fixture and the antenna is connected to the test cable to measure the antenna performance.



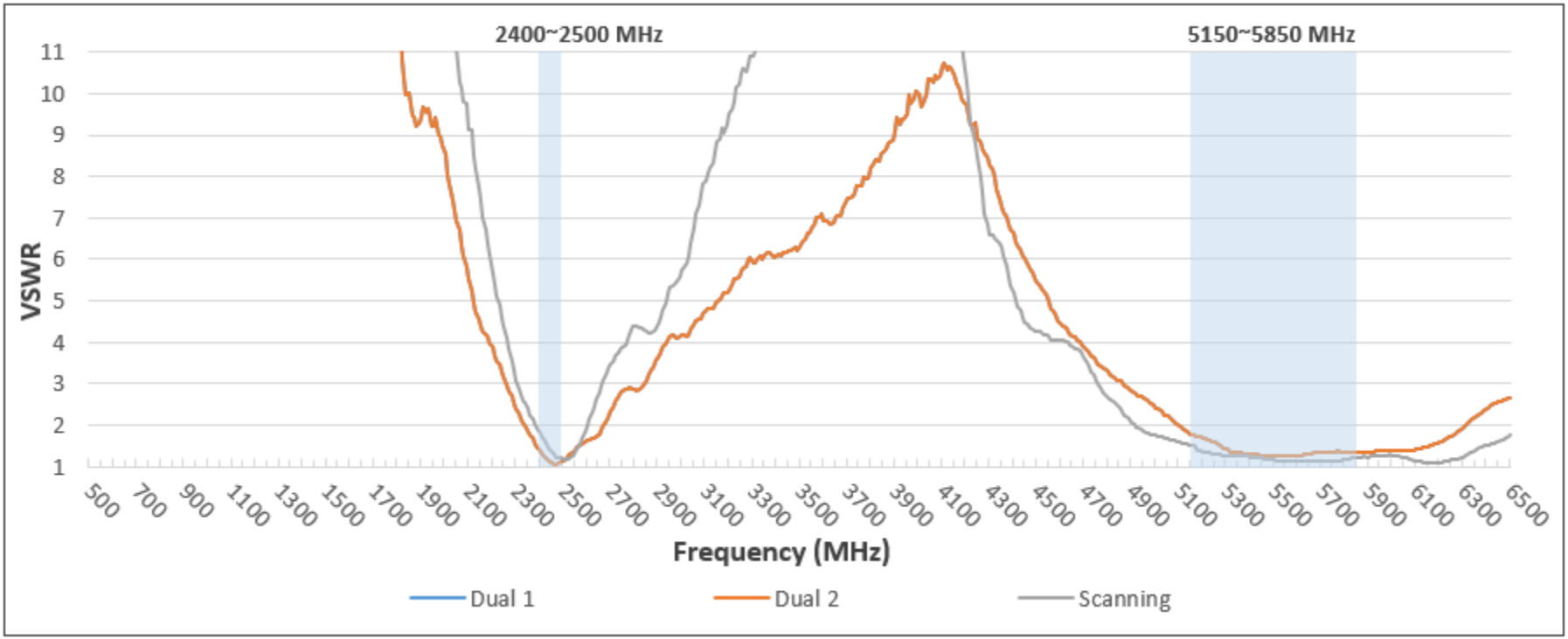
Placement and specification





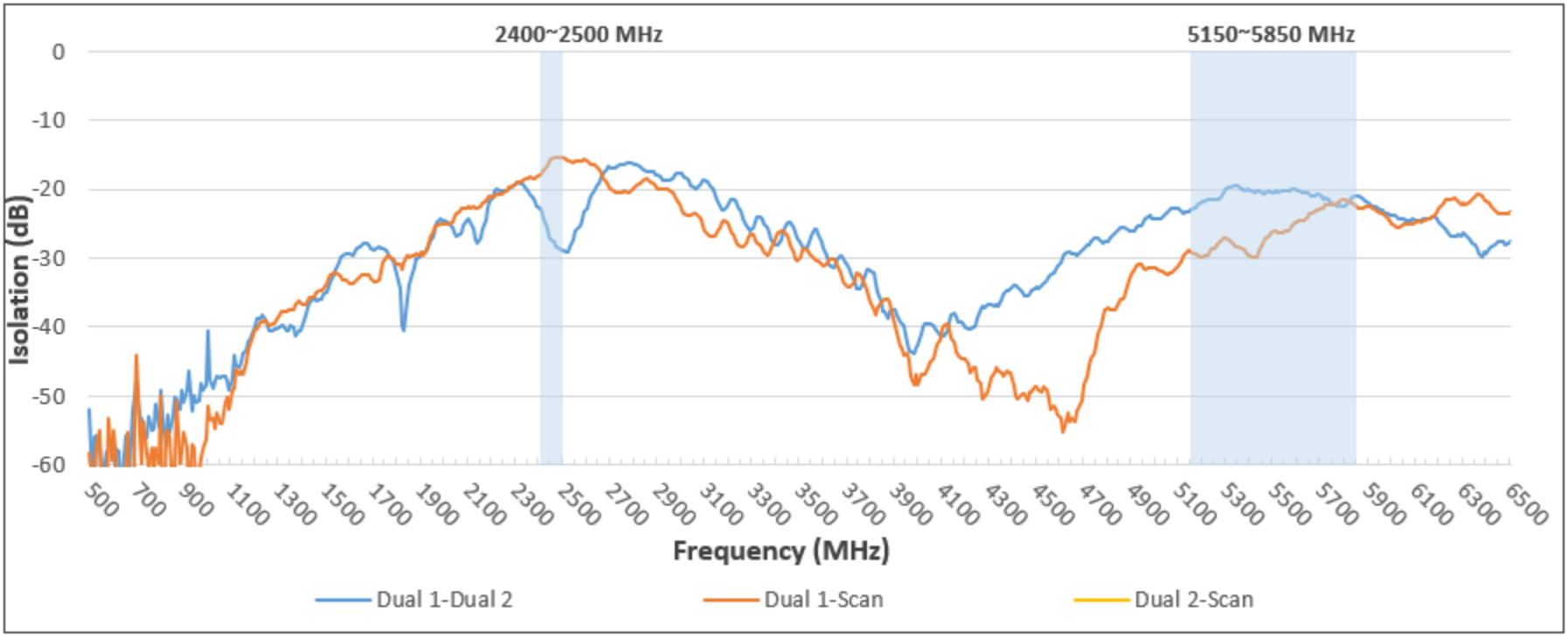
Ant No.	Brand name	P/N	Operating Band	Gain (dBi)	Efficiency (%)	Ant Type	Material	Feeding
Dual 1	Senao	5718A0543300	2400MHz ~ 2500 MHz 5150MHz ~ 5850 MHz	4.9@2G 5.2@5G	68.9@2G 72.6@5G	PIFA	Metal	Cable
Dual 1	Senao	5718A0544300	2400MHz ~ 2500 MHz 5150MHz ~ 5850 MHz	3.8@2G 5.5@5G	66.6@2G 67.7@5G	PIFA	Metal	Cable
Scanning	Senao	5718A0545300	2400MHz ~ 2500 MHz 5150MHz ~ 5850 MHz	4.0@2G 5.1@5G	62.6@2G 66.2@5G	PIFA	Metal	Cable

VSWR



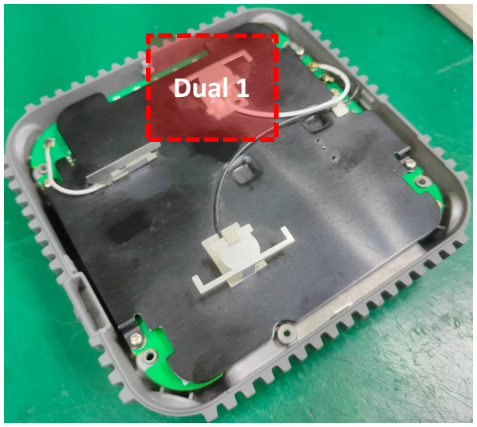
VSWR			
Freq. (MHz)	Dual 1	Dual 2	Scanning
2400	1.38	1.38	1.82
2450	1.09	1.09	1.35
2500	1.16	1.16	1.19
5150	1.79	1.79	1.52
5500	1.27	1.27	1.13
5850	1.36	1.36	1.22

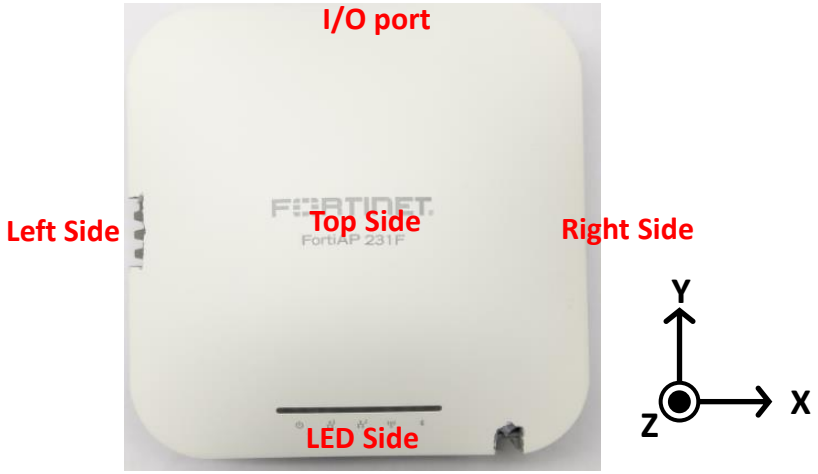
Isolation

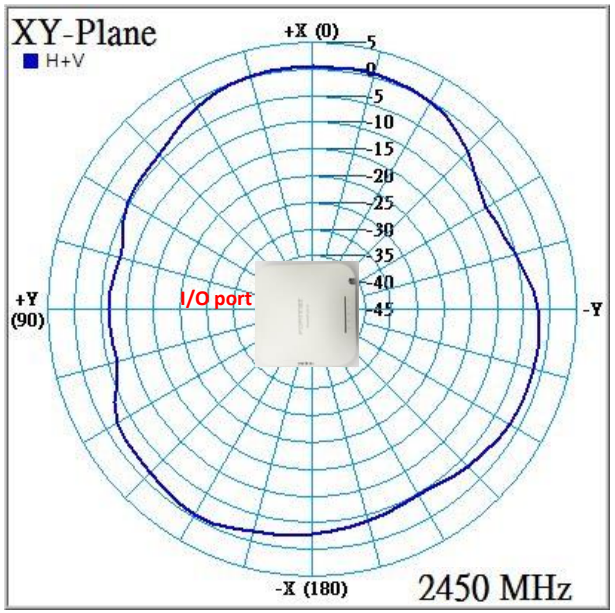


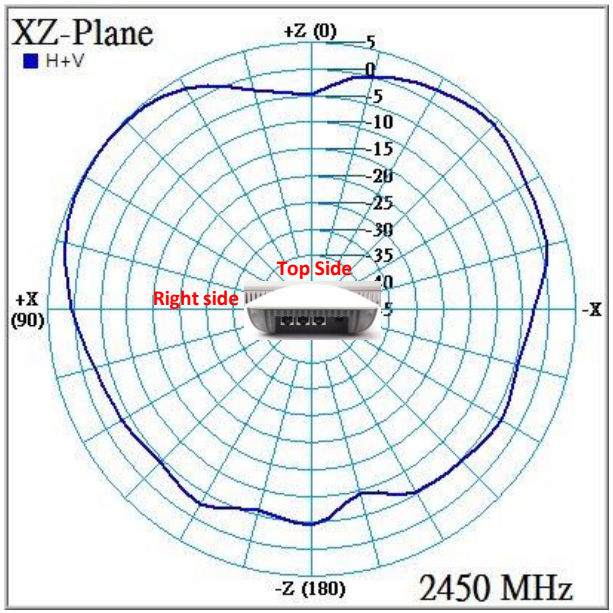
Isolation			
Freq. (MHz)	Dual 1-Dual 2	Dual 1-Scan	Dual 2-Scan
2400	-22.69	-17.99	-16.23
2450	-27.39	-15.76	-15.57
2500	-28.84	-15.51	-15.64
5150	-23.03	-29.06	-22.95
5500	-20.41	-26.06	-21.44
5850	-21.02	-22.62	-21.40

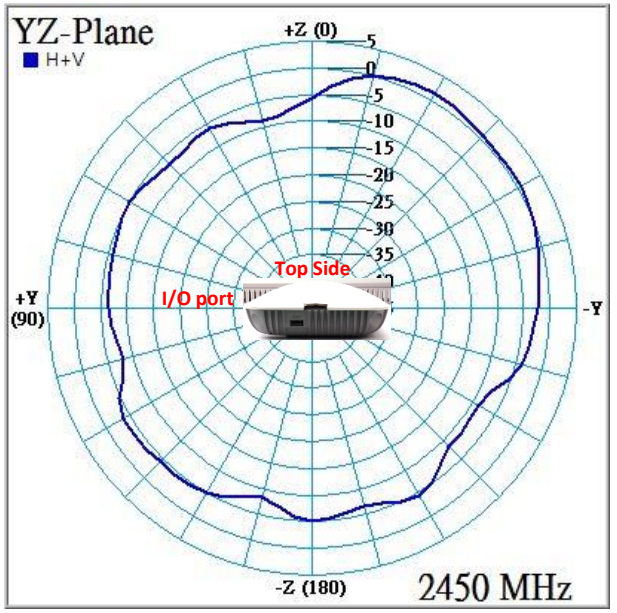
2D Radiation Pattern – Dual 1 @ 2.45GHz



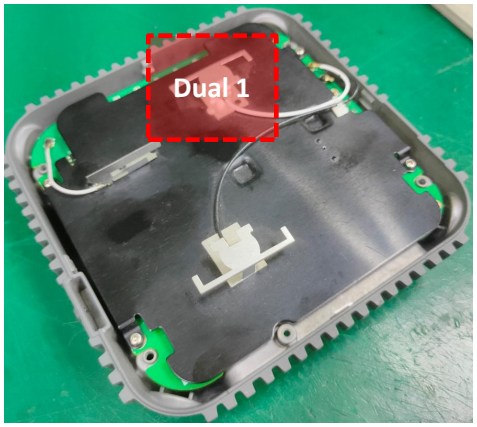


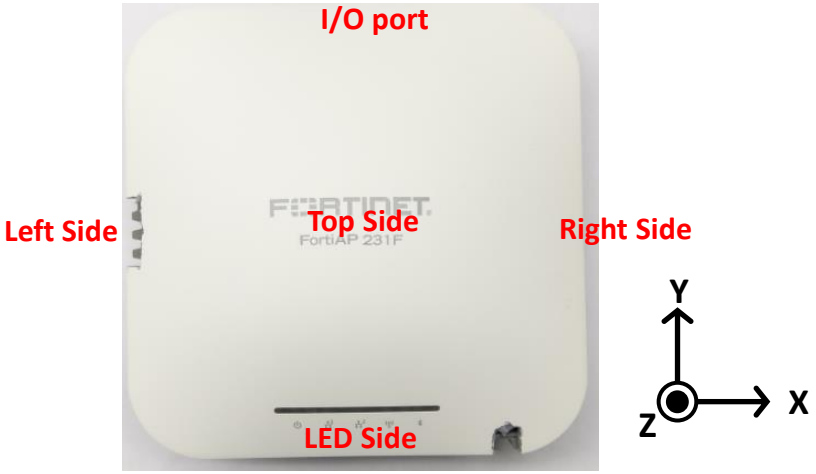


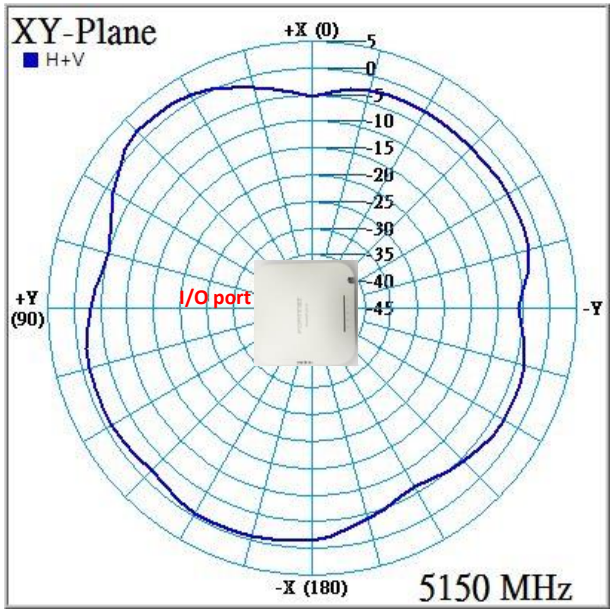


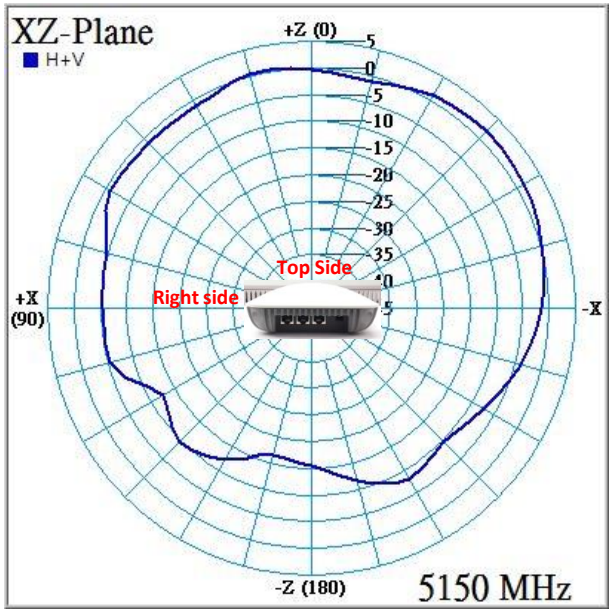


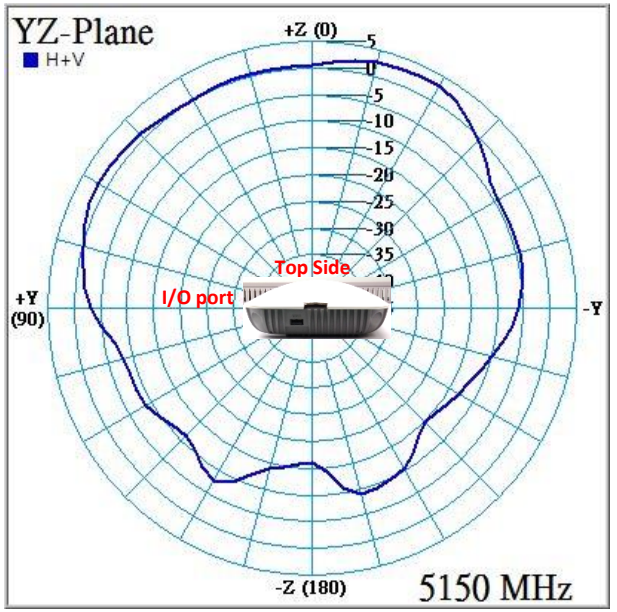
2D Radiation Pattern – Dual 1 @ 5.15GHz



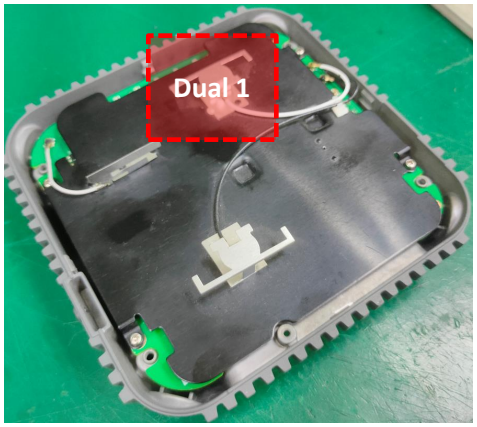


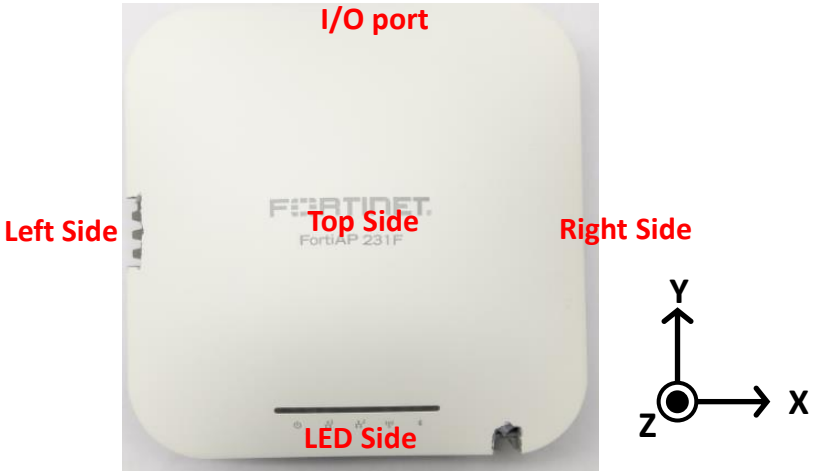


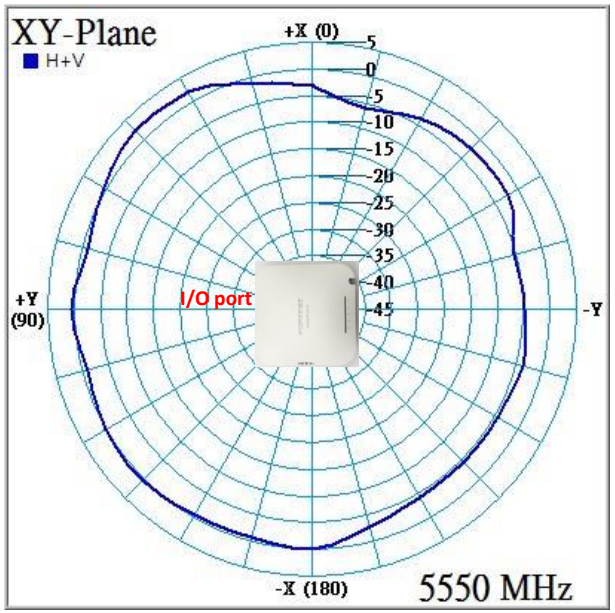


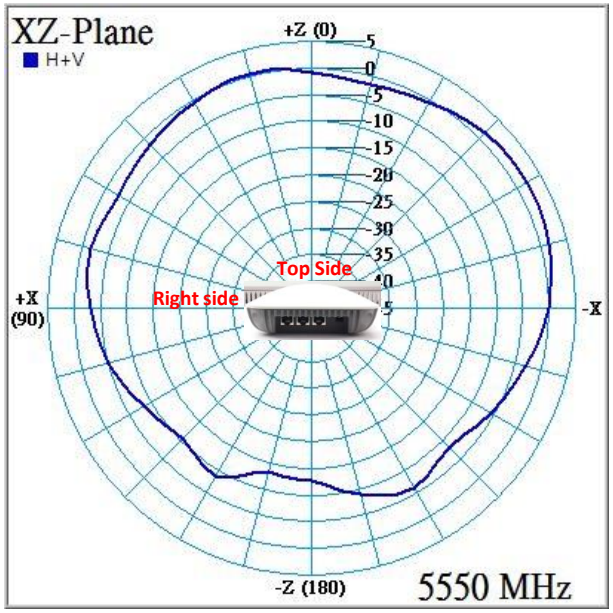


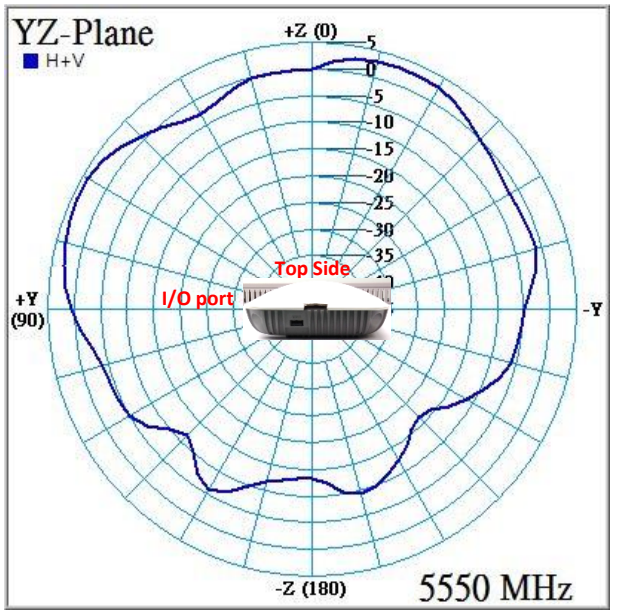
2D Radiation Pattern – Dual 1 @ 5.55GHz



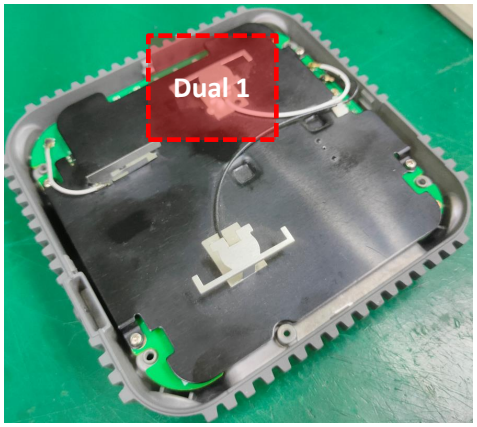


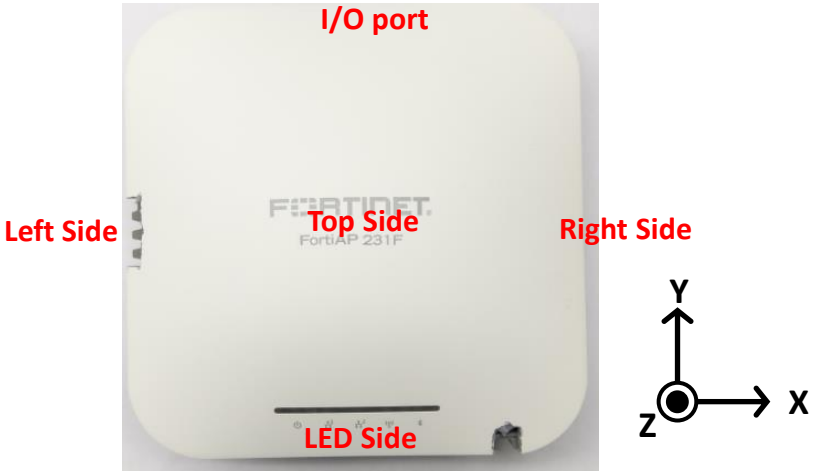


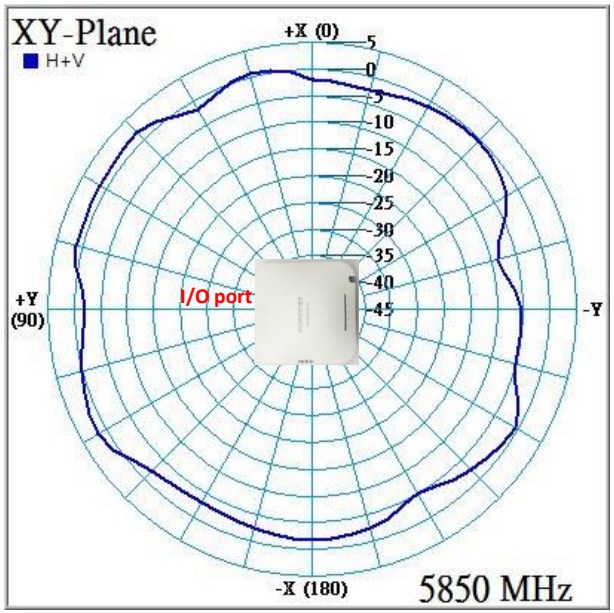


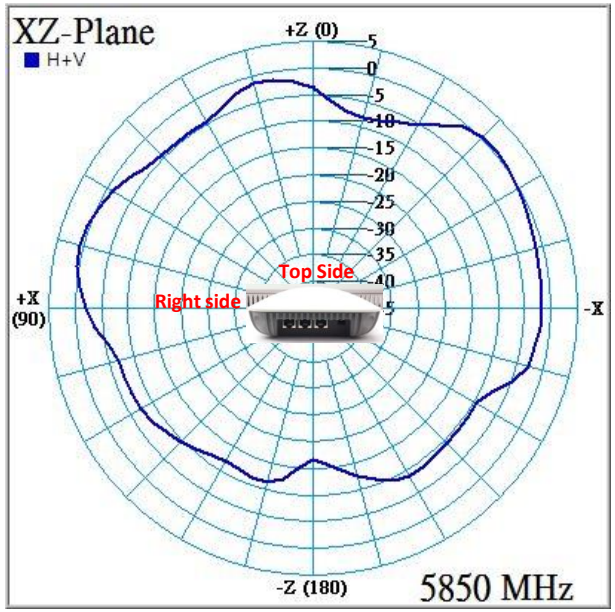


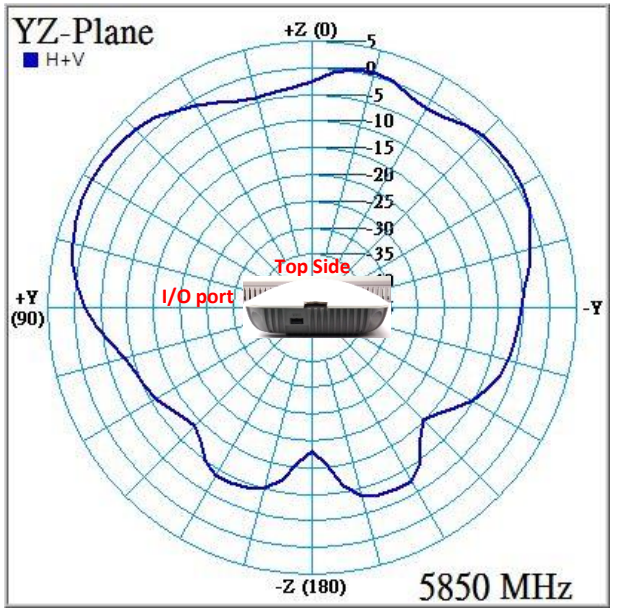
2D Radiation Pattern – Dual 1 @ 5.85GHz



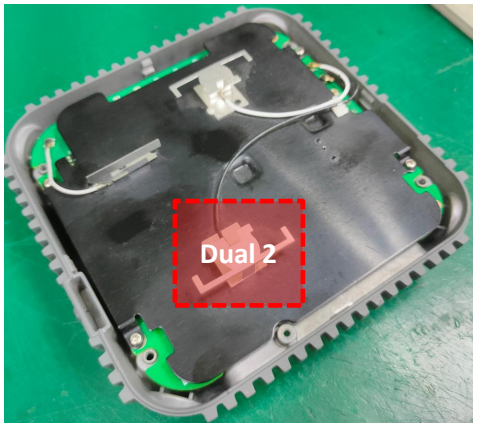


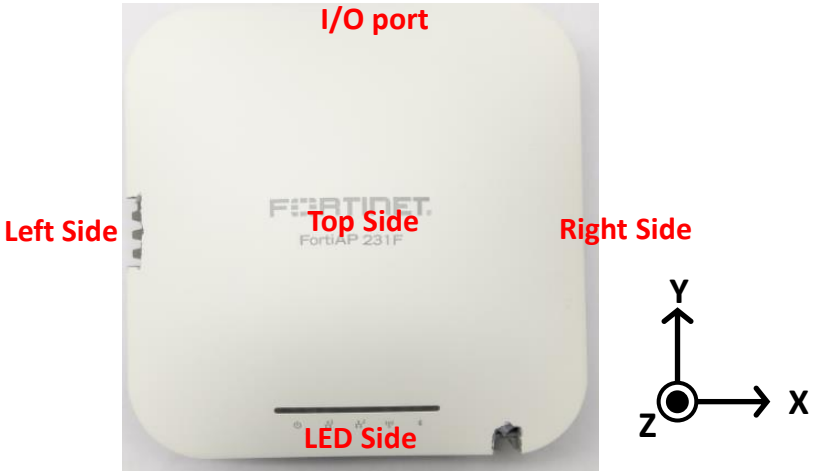


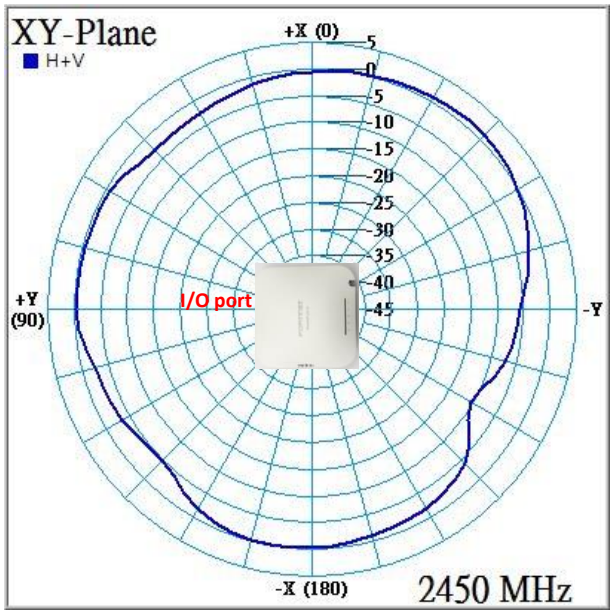


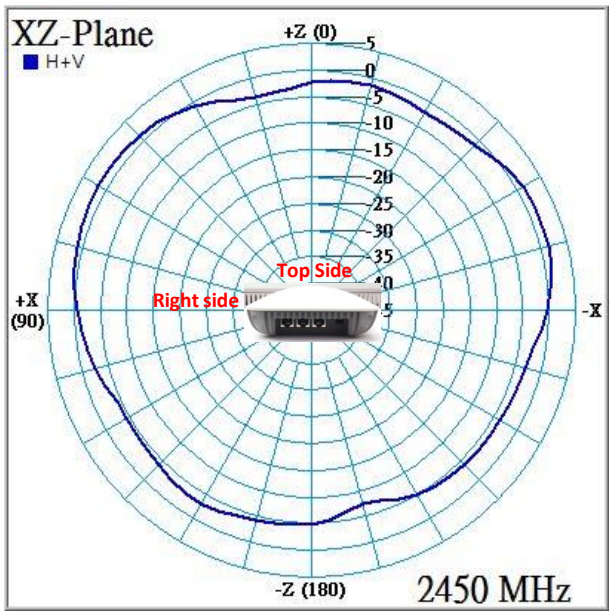


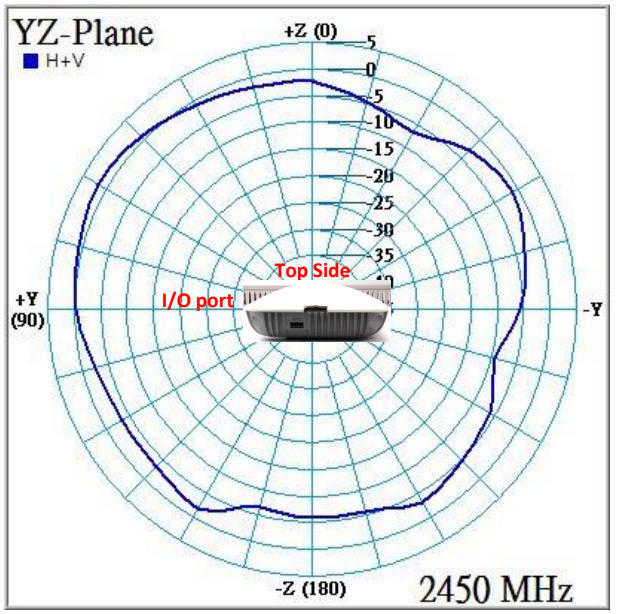
2D Radiation Pattern – Dual 2 @ 2.45GHz



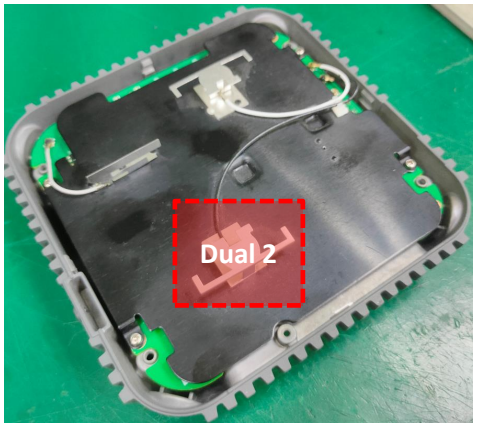


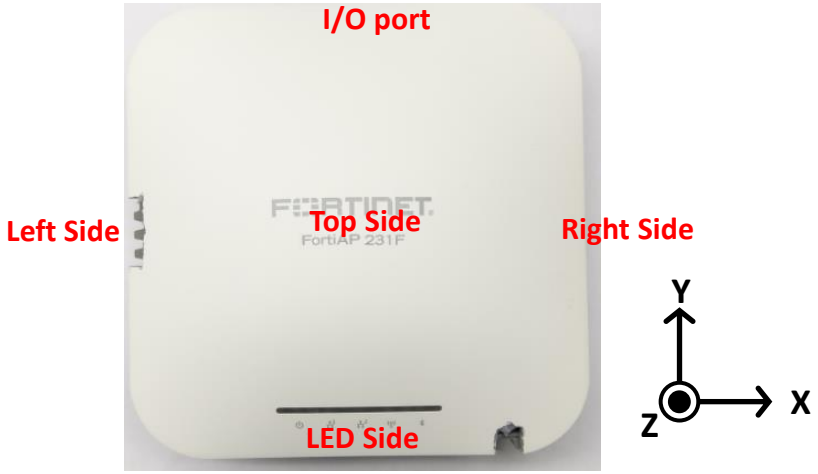


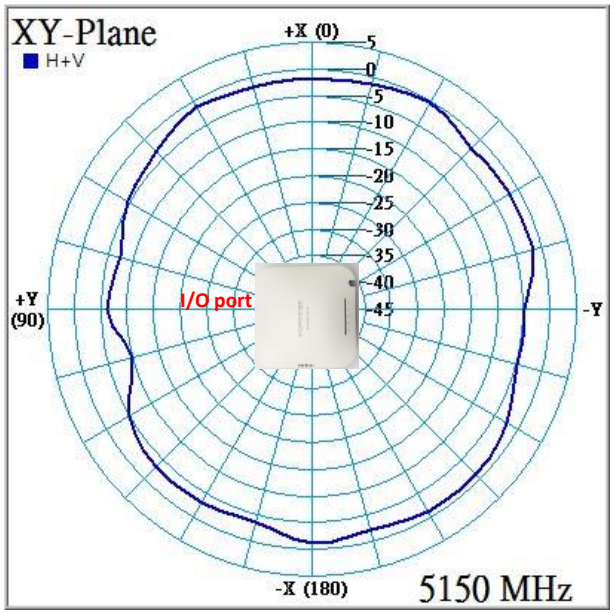


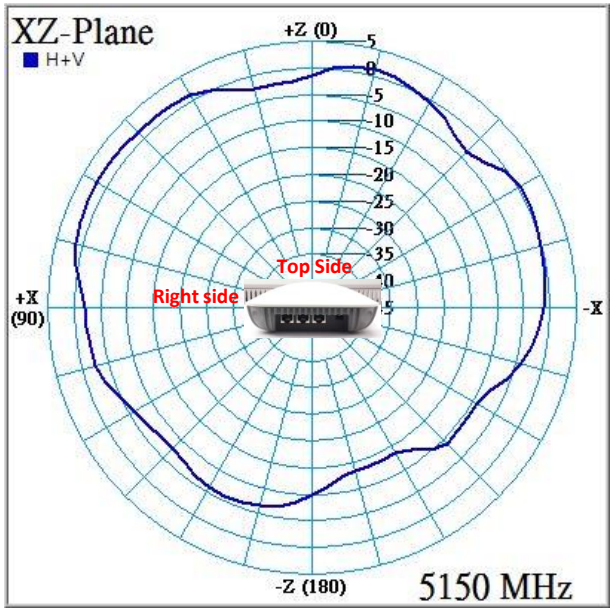


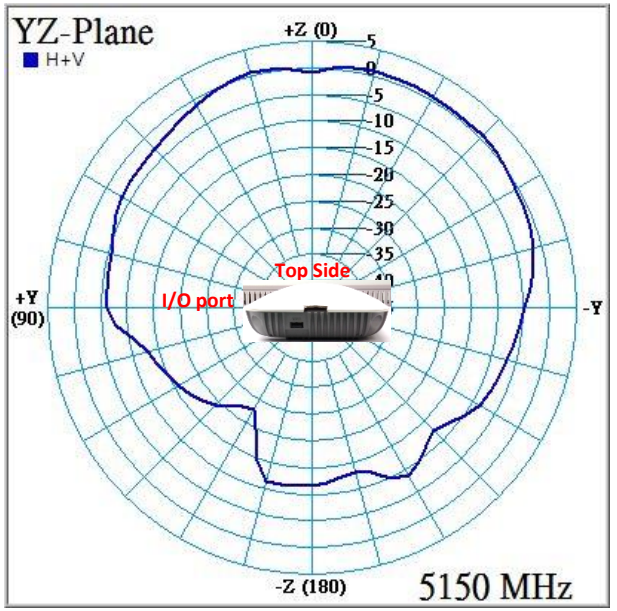
2D Radiation Pattern – Dual 2 @ 5.15GHz



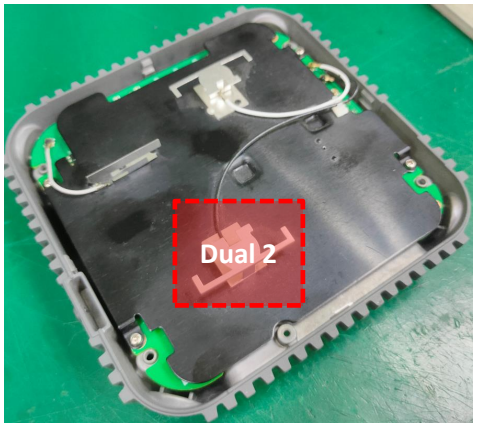


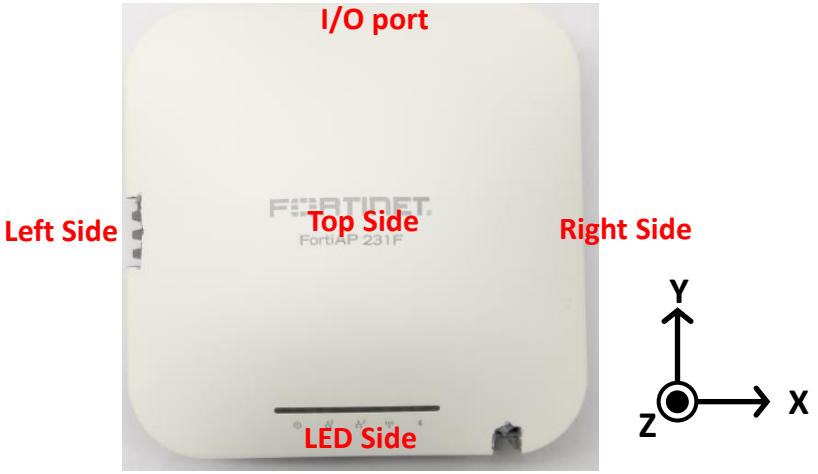


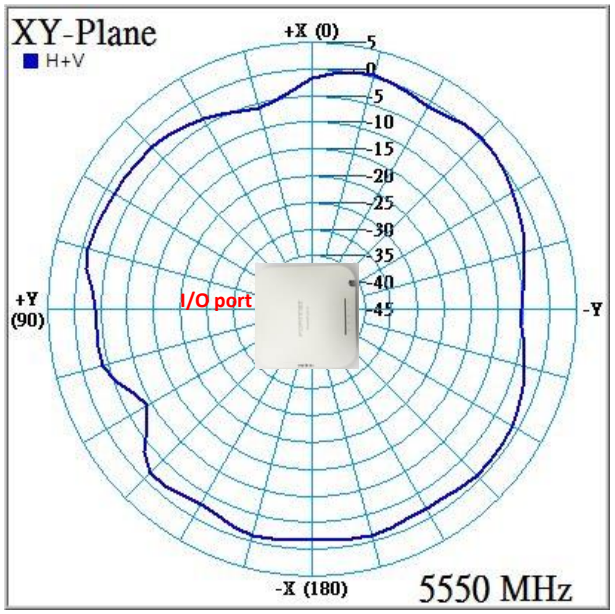


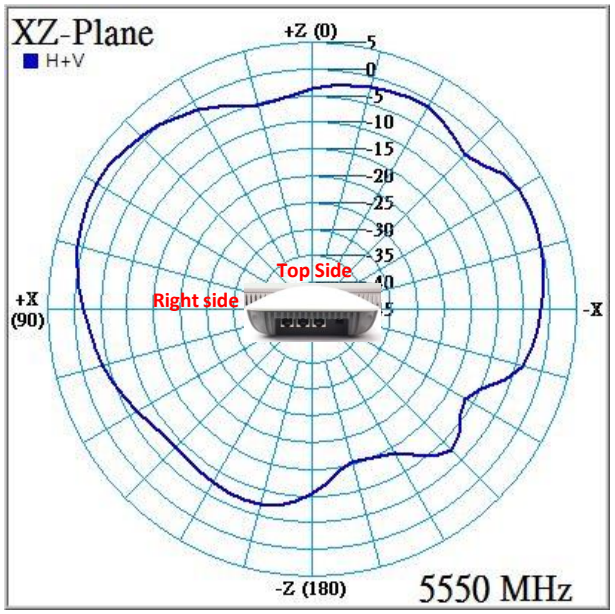


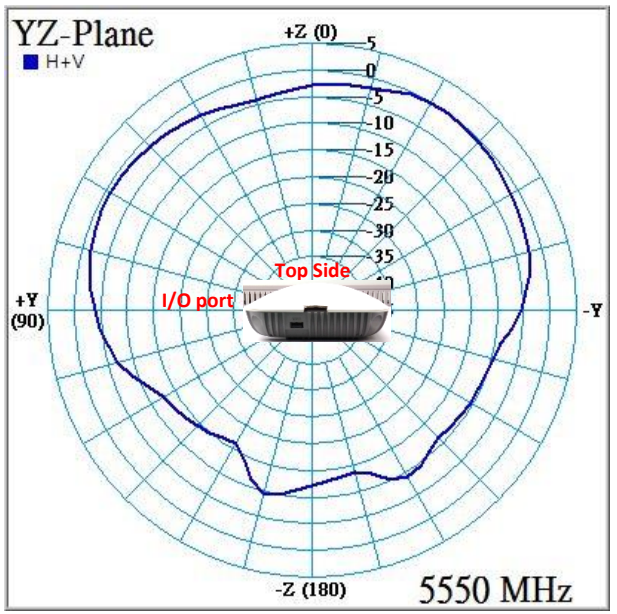
2D Radiation Pattern – Dual 2 @ 5.55GHz



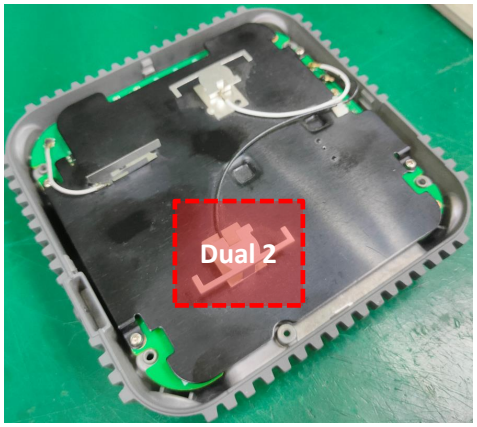


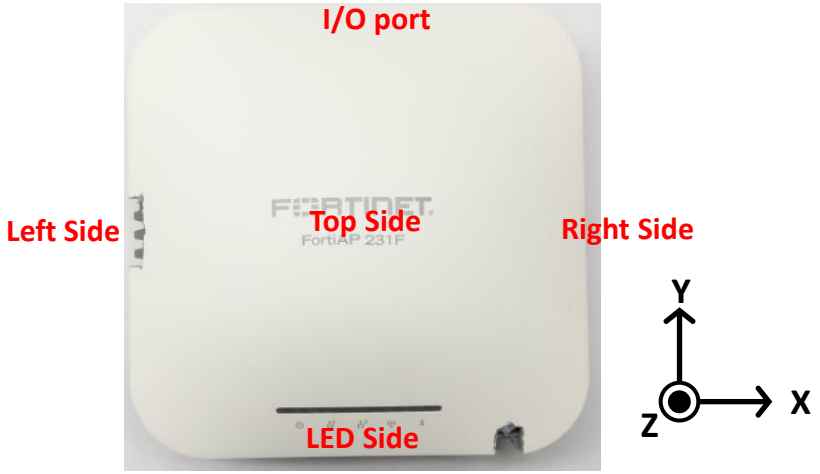


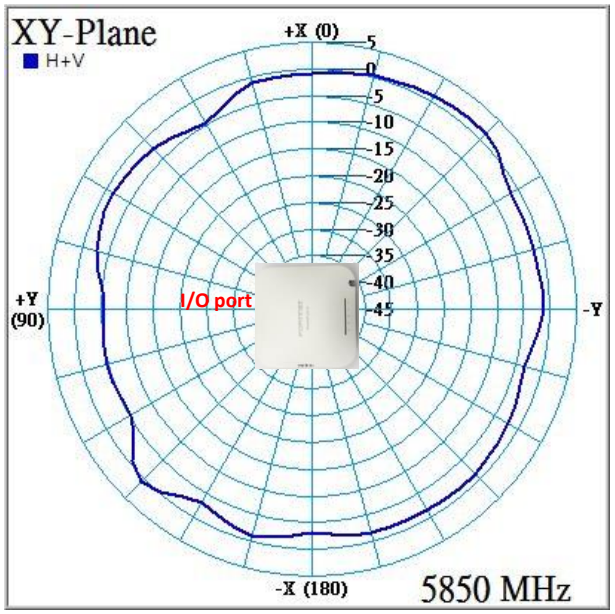


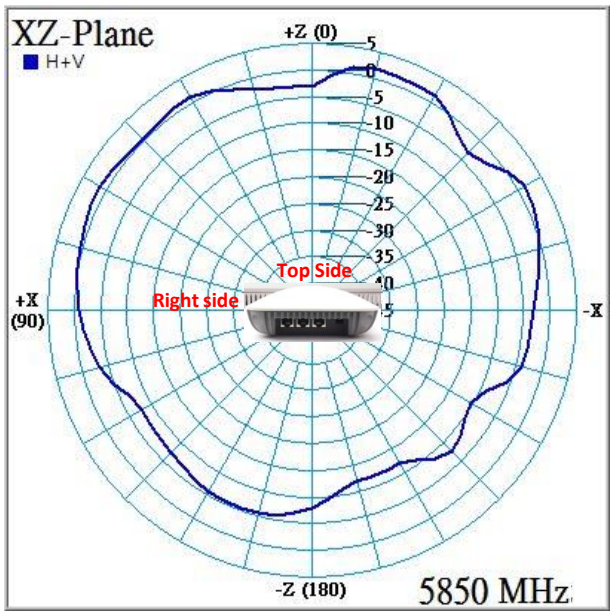


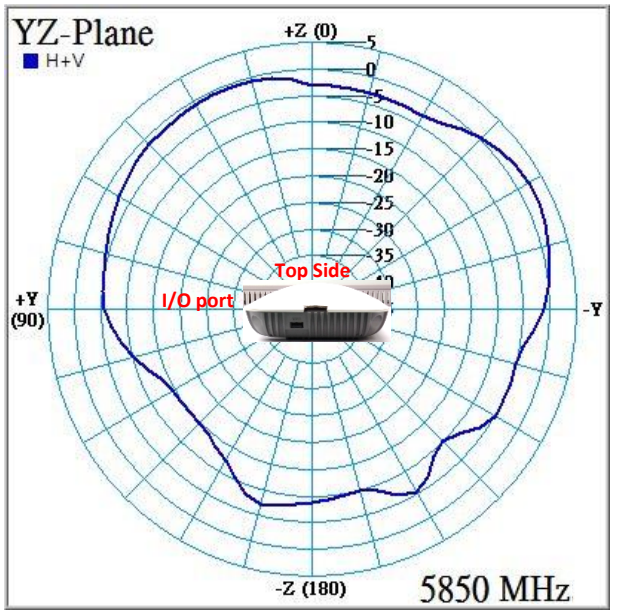
2D Radiation Pattern – Dual 2 @ 5.85GHz



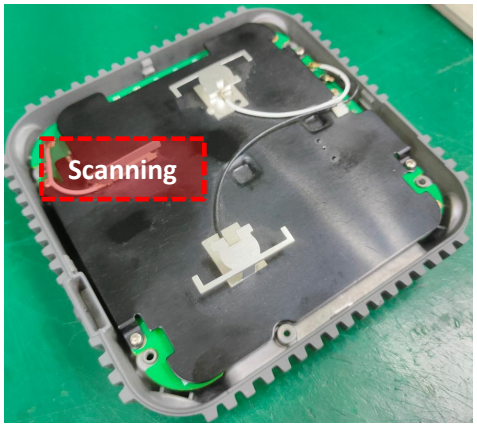


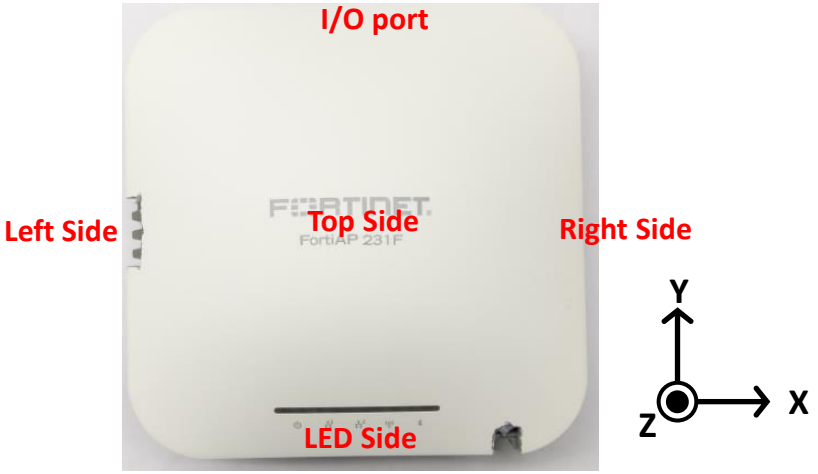


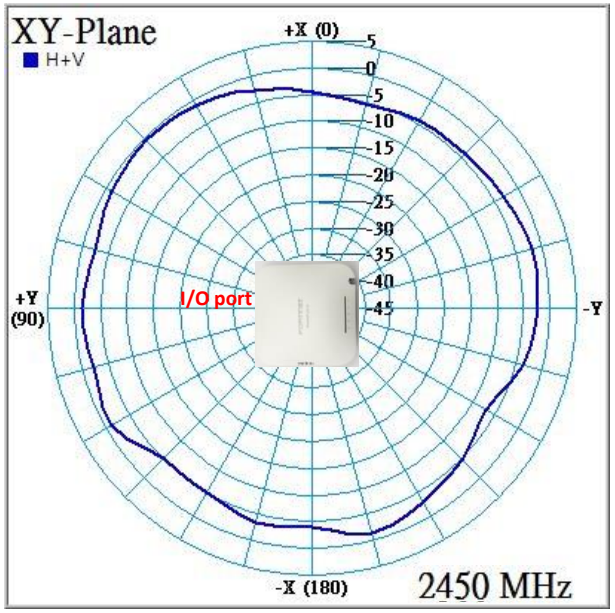


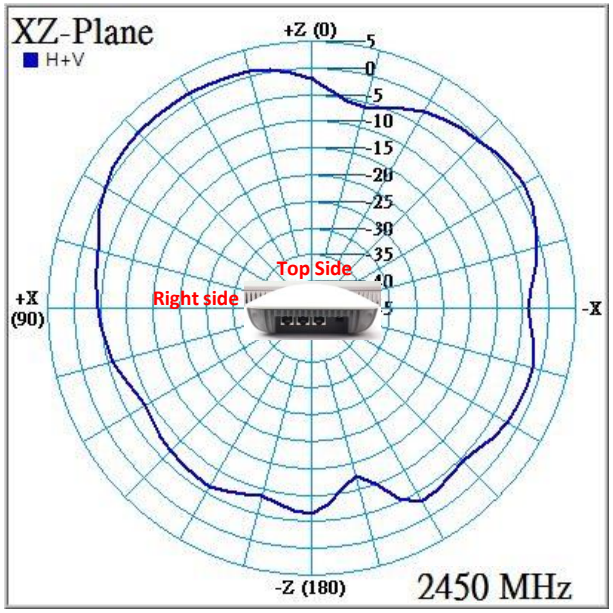


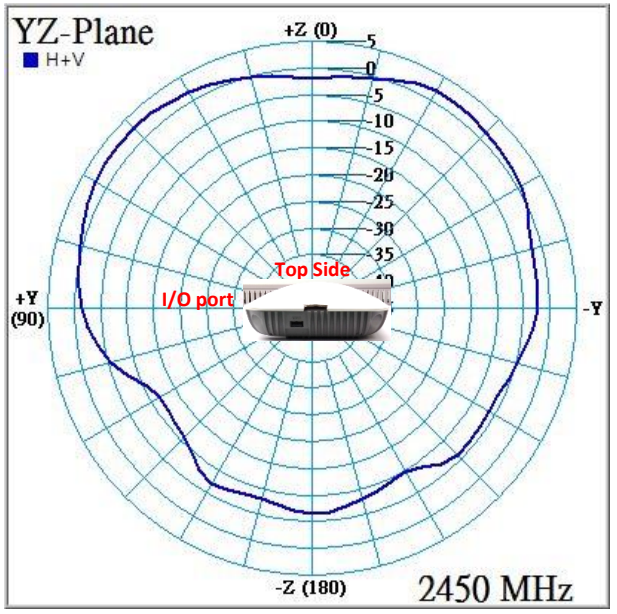
2D Radiation Pattern – Scanning @ 2.45GHz



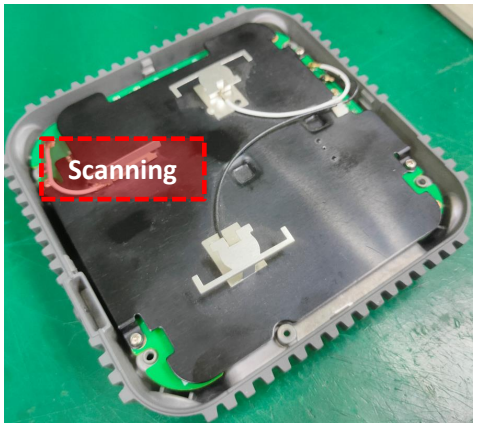


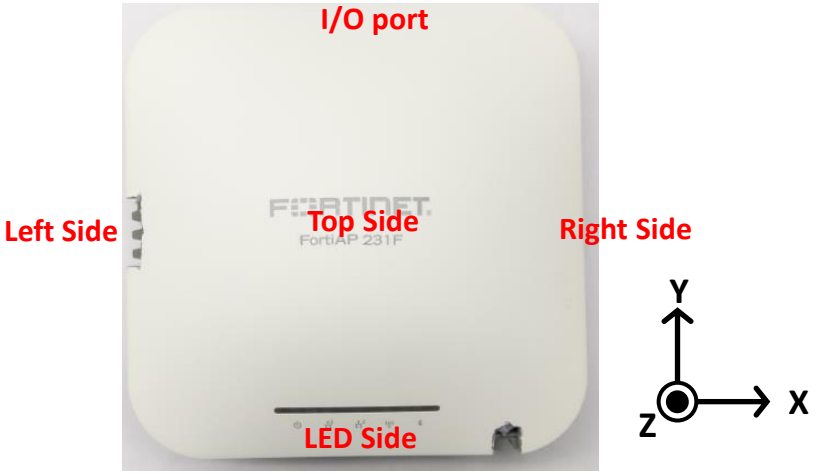


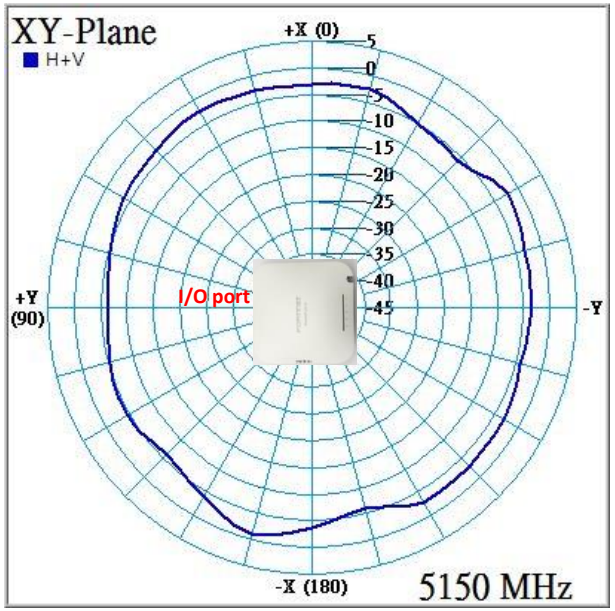


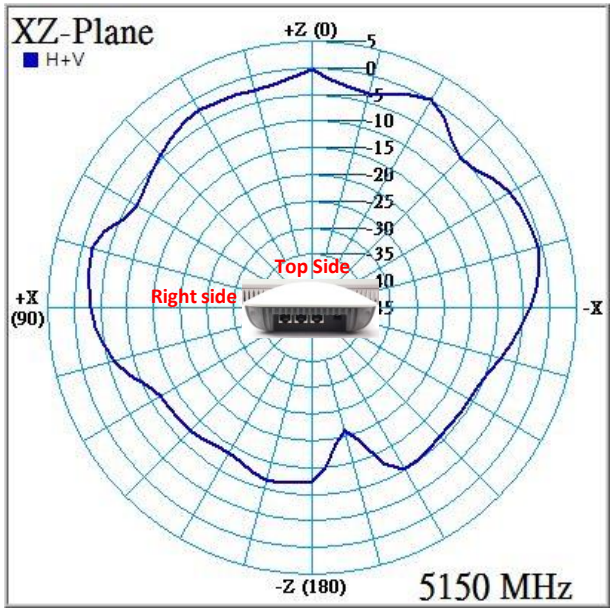


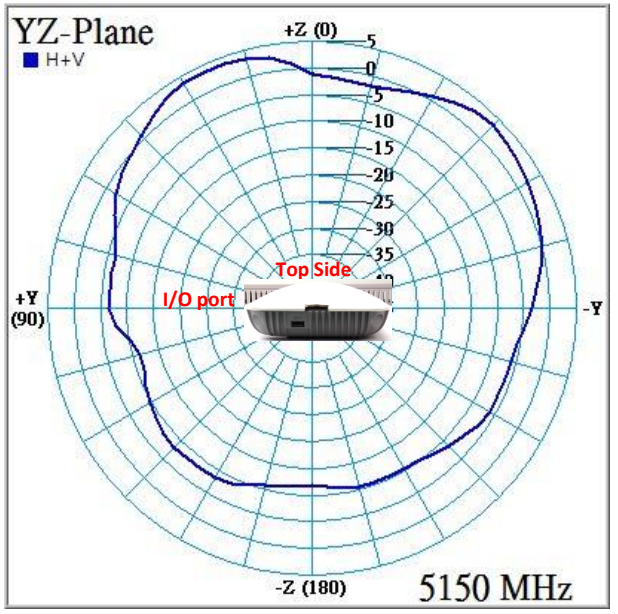
2D Radiation Pattern – Scanning @ 5.15GHz



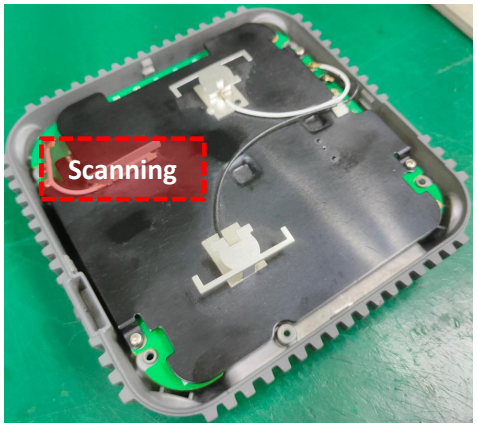


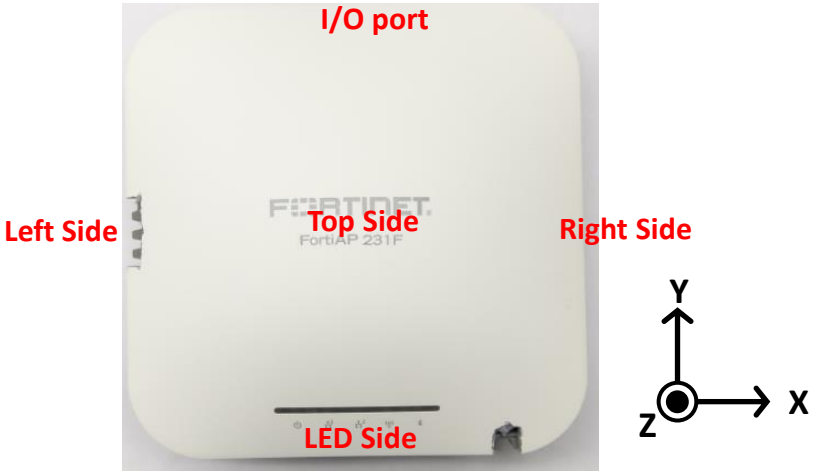


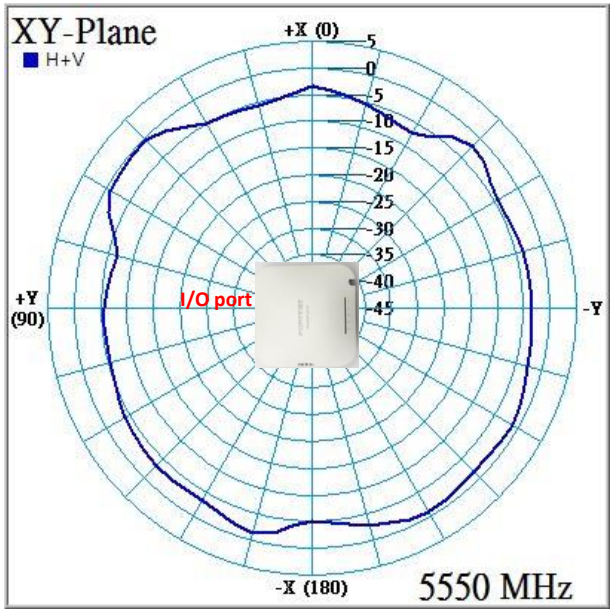


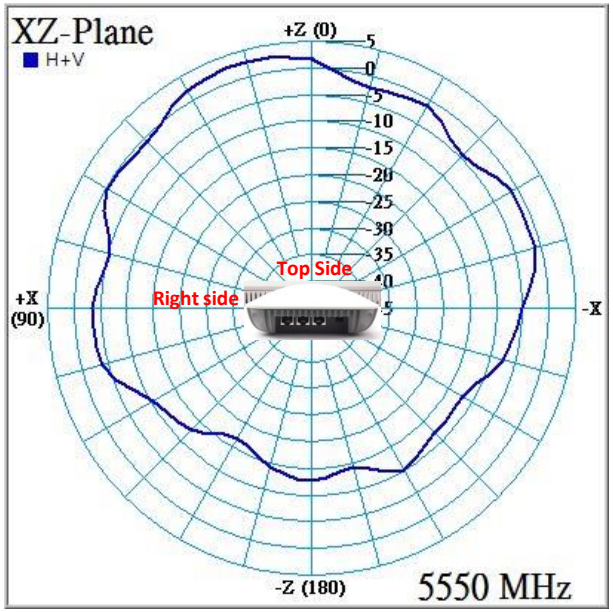


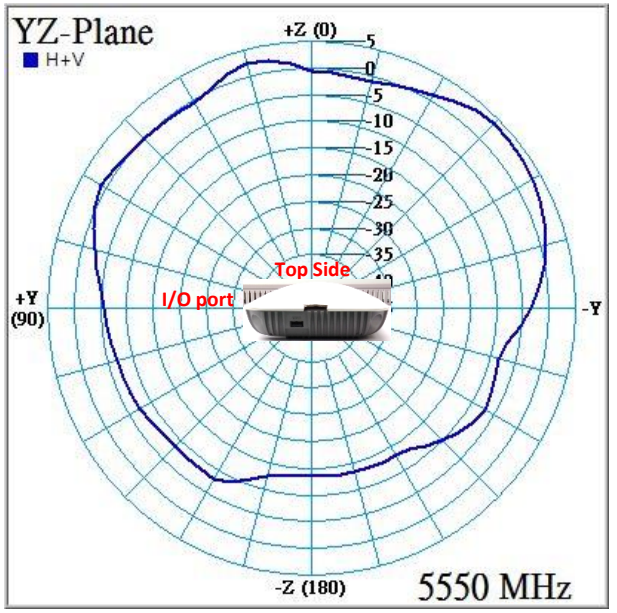
2D Radiation Pattern – Scanning @ 5.55GHz



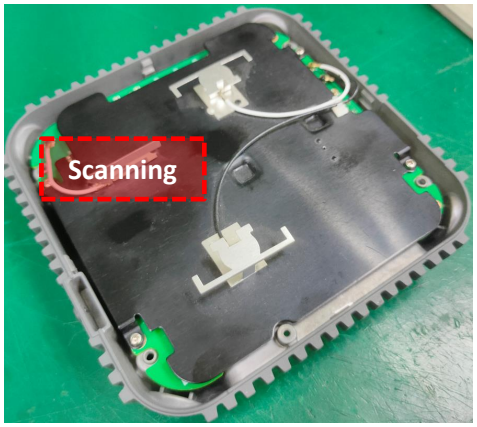


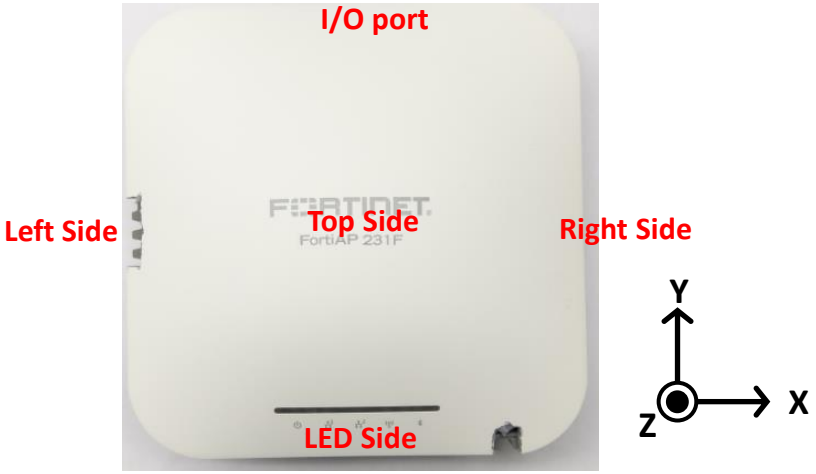


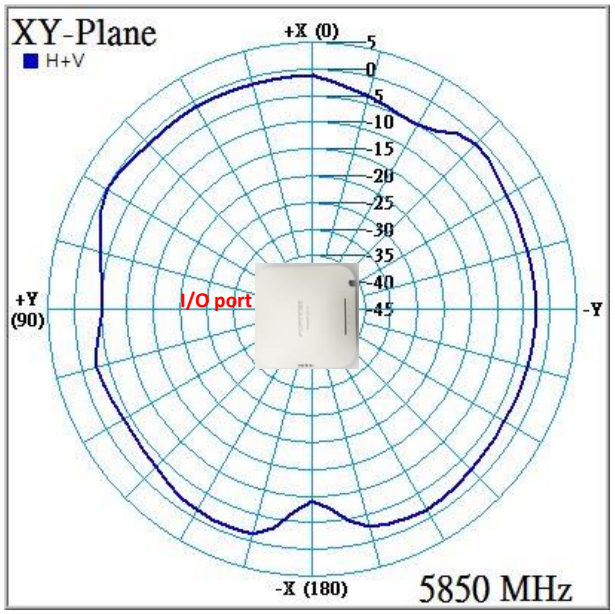


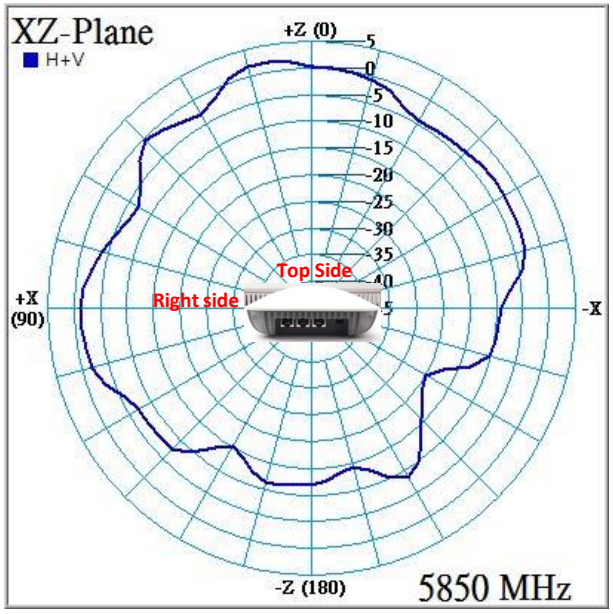


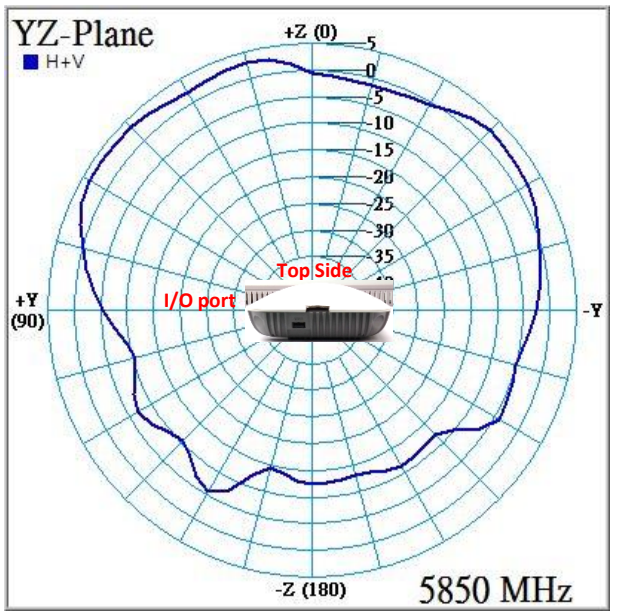
2D Radiation Pattern – Scanning @ 5.85GHz



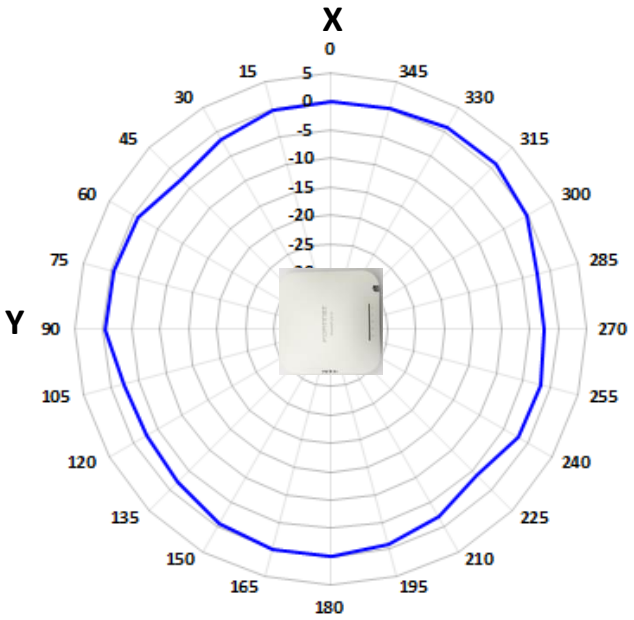




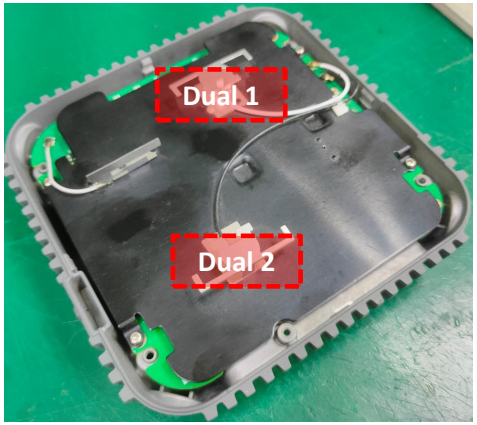


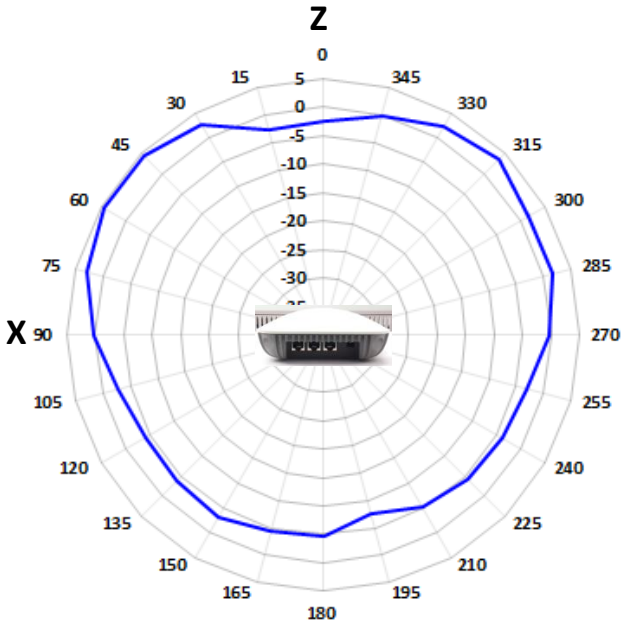


Combine pattern – dual1+dual2 @2.45 GHz

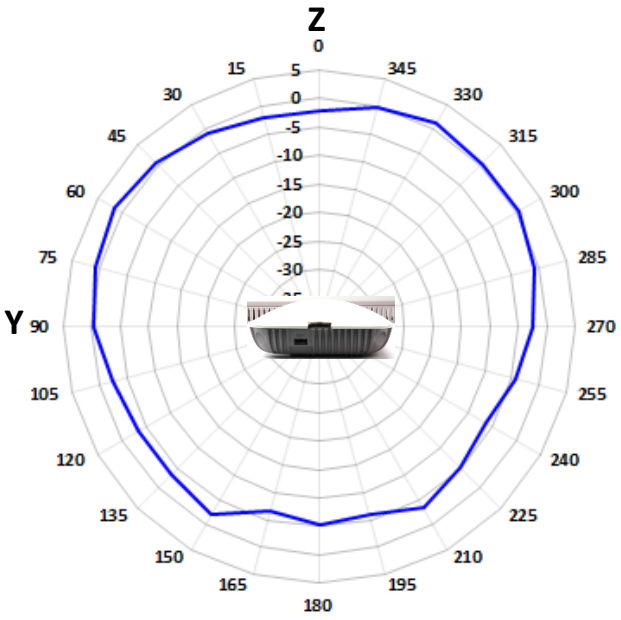


X-Y Plane



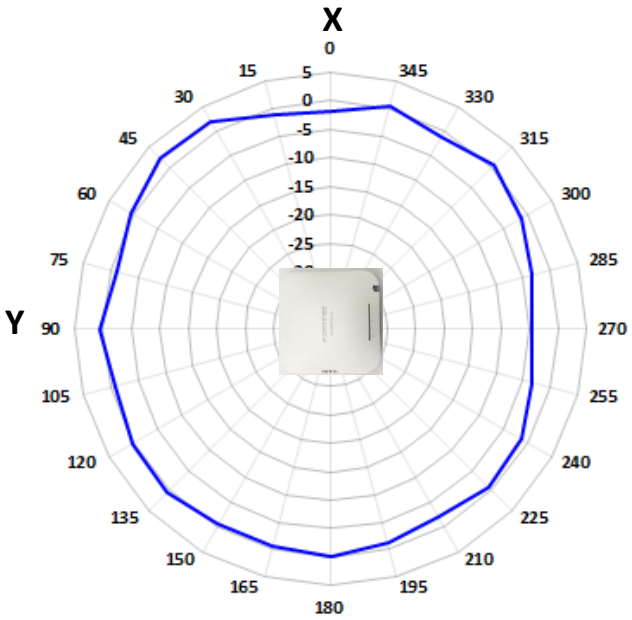


X-Z Plane

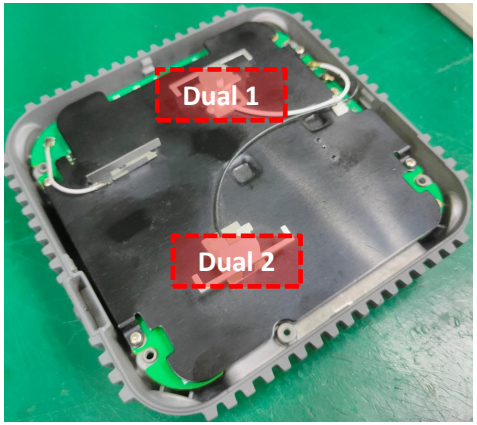


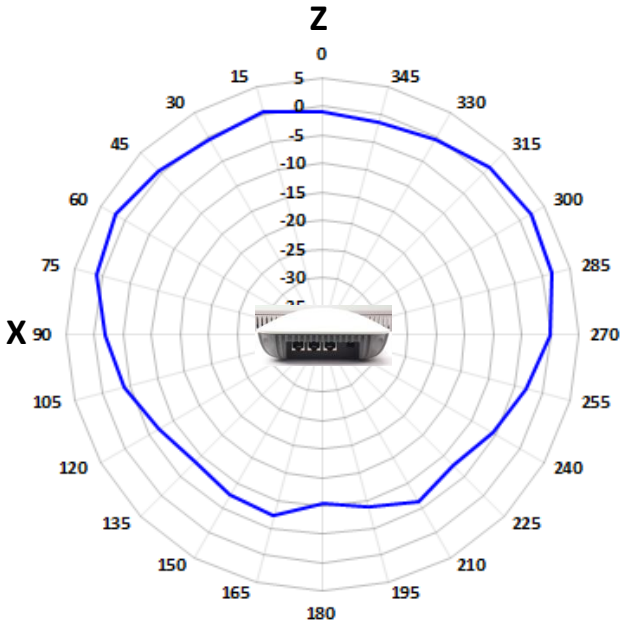
Y-Z Plane

Combine pattern – dual1+dual2 @5.55 GHz

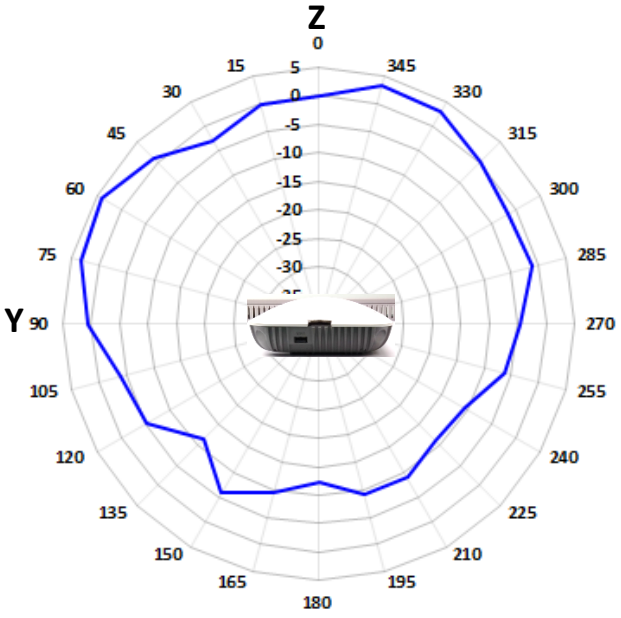


X-Y Plane





X-Z Plane



Y-Z Plane

Antenna Efficiency and Gain

Antenna Performance				
Freq. (MHz)	Dual Ant 1		Dual Ant 2	
	Efficiency (%)	Peak Gain (dBi)	Efficiency (%)	Peak Gain (dBi)
2400	60.7	4.4	56.2	3.3
2450	68.9	4.9	66.6	3.4
2500	66.4	4.8	64.5	3.8
5150	63.6	4.6	65.0	3.9
5500	72.6	5.0	67.7	4.2
5850	60.0	5.2	66.1	5.5

Antenna Performance		
Freq. (MHz)	Scanning	
	Efficiency (%)	Peak Gain (dBi)
2400	59.9	3.3
2450	62.6	3.2
2500	60.4	4.0
5150	56.2	4.4
5500	62.4	5.1
5850	66.2	4.1