



AP571

Antenna Test Report

Version:V1
2025-6-13

Table of Contents

1.	Test Information.....	2
2.	Testing Location.....	2
3.	Test Frequency	2
4.	Antenna Information	2
5.	Test Configuration.....	3
6.	Reference Test	5
7.	Test Method	5
8.	Measured Values and Calculation of Correlated / Uncorrelated Gains	6
9.	Radiation Pattern	11

1. Test Information

Equipment	EMT Chamber
Applicant	Han-Networks
Manufacturer	AOT

2. Testing Location

Testing Location	
AOT	ADD: 289 Jinghua Road,Shipai, BachengTown, Kunshan City, Jiangsu Province

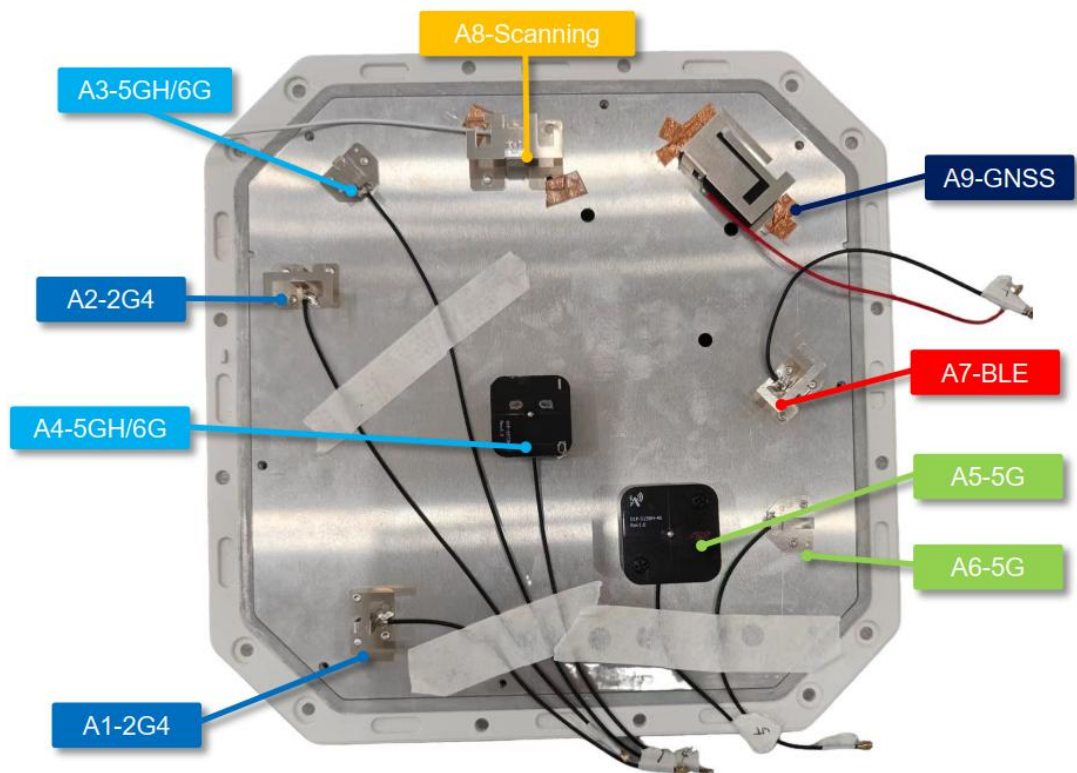
Test Condition	Test Engineer	Test Environment (°C / %)	Test Date
Radiated	Changgang Lai	20-24 / 45-60	20250604

3. Test Frequency

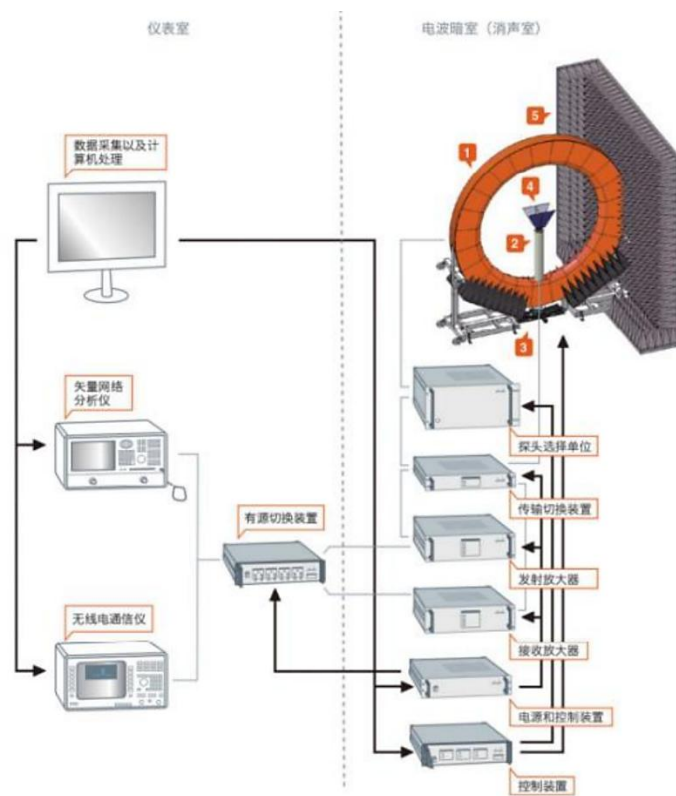
Band (MHz)	Test Frequency (MHz)
2400-2500	2450
5150-5850	5200/5300/5500/5800
5925-7125	6000/6800

4. Antenna Information

	Freq.	Type	Size(L*W*H)	Cable length (mm)	Polarization Type
A1	2G4	Dipole	23*13.48*11.9	80	Vertical
A2	2G4	Dipole	23*13.48*11.9	170	Vertical
A3	5GH/6G	Monopole	17.1*4*8.8	200	Vertical
A4	5GH/6G	Dipole	27*27*0.8	115	Horizontal
A5	5G	Dipole	32.4*32.4*0.8	70	Horizontal
A6	5G	Monopole	17.1*4*8.8	60	Vertical
A7	BLE	Dipole	23*13.4*11.9	80	Vertical
A8	Scanning	Dipole	33*16*9.8	220	Vertical
A9	GNSS	PIFA	35.5*20.9*8.5	150	Vertical



5. Test Configuration





Microwave anechoic chamber



6. Reference Test



Measurement Instrument

7. Test Method

The “great circle” cut method, whereby the Measurement Antenna remains fixed and the EUT is rotated about two axes in sequential order. The radiated RF performance of the Equipment Under Test (EUT) is measured by sampling the radiated transmit power of the mobile at various locations surrounding the device. A three-dimensional characterization of the 'transmit' performance of the EUT is pieced together by analyzing the

data from the spatially distributed measurements.

Data points taken every 2 degrees in the theta and in the phi axes are deemed sufficient to fully characterize the EUT's Far-Field radiation pattern and total radiated power. All of the measured power values will be integrated.

8. Measured Values and Calculation of Correlated / Uncorrelated Gains

Summary of Antenna Peak Gain

Antenna Peak Gain Table (Ant. Position: 2.4G Ant.1~2)

Band (MHz)	2400-2500
Ant.1 Max Gain (dBi)	5.75
Ant.2 Max Gain (dBi)	5.02

Antenna Peak Gain Table (Ant. Position: 5G Ant.5~6)

Band (MHz)	5150 ~ 5250	5250 ~ 5350	5470 ~ 5725	5725 ~ 5850
Ant.5 Max Gain (dBi)	3.38	3.51	3.82	4.89
Ant.6 Max Gain (dBi)	7.99	7.65	5.97	5.44

Antenna Peak Gain Table (Ant. Position: 5GH/6G Ant.3~4)

Band (MHz)	5470 ~ 5725	5725 ~ 5850	5925 ~ 6425	6525 ~ 6875
Ant.3 Max Gain (dBi)	5.82	5.87	5.44	5.46
Ant.4 Max Gain (dBi)	4.05	4.98	6.19	5.96

Antenna Peak Gain Table (Ant. Position: BLE/Zigbee Ant.7)

Band (MHz)	2400-2500
Ant.7 Max Gain (dBi)	6.19

Antenna Peak Gain Table (Ant. Position: Scanning Ant.8)

Band (MHz)	2400-2500			
Ant.8 Max Gain (dBi)	5.85			
Band (MHz)	5150 ~ 5250	5250 ~ 5350	5470 ~ 5725	5725 ~ 5850
Ant.8 Max Gain (dBi)	5.52	5.5	5.52	6.09
Band (MHz)	5925 ~ 6425	6525 ~ 6875		
Ant.8 Max Gain (dBi)	5.66	6.68		

Antenna Peak Gain Table (Ant. Position: GNSS Ant.9)

Band (MHz)	1176	1575
Ant.9 Max Gain (dBi)	-1.52	1.71

Peak Realized Gain of Antennas in angle 30° relative to horizontal

	Gain(dBi)		
Frequency MHz	5150 ~ 5250	5925 ~ 6425	6525 ~ 6875
Ant.3	/	-2.5	-2.2

Ant.4	/	0.0	-3.9
Ant.5	-4.7	/	/
Ant.6	-2.0	/	

Result for Uncorrelated Gain and Correlated Gain

Maximum Correlated Gain Calculation

Because the antennas are fixed in location within the device the directional antenna gain for MIMO is calculated over a sphere using the raw spatial data taken at 10 degree steps of theta and 10 degree of theta phi for each antenna using the equations from KDB 662911 D01. The raw antenna data is located in the appendix of this report.

The correlated antenna gain was calculated using KDB 662911 D01 F(2)(d)(i).

$$\text{Directional gain} = 10 \log[(10^{G_1/20} + 10^{G_2/20} + \dots + 10^{G_N/20})^2 / N_{\text{ANT}}] \text{ dBi}$$

The uncorrelated antenna gain was calculated using KDB 662911 D01 F(2)(d)(ii)

$$\text{Directional gain} = 10 \log[(10^{G_1/10} + 10^{G_2/10} + \dots + 10^{G_N/10}) / N_{\text{ANT}}] \text{ dBi}$$

The correlated gains were calculated for each point in the spatial data and the highest values reported.

Correlated Directional Gain for 2.4GHz (Ant. Position: 2.4G Ant.1~2)

Frequency (MHz)	2450
Directional Gain	7.69

Ant.1~2 @2.45GHz

Phi(deg)	Theta(deg)	0	10	20	30	40	50	60	70	80	90	100	110	120	130	140	150	160	170	180
0	-180.00	-170.00	-160.00	-150.00	-140.00	-130.00	-120.00	-110.00	-100.00	-90.00	-80.00	-70.00	-60.00	-50.00	-40.00	-30.00	-20.00	-10.00	0.00	10.00
0	-180.00	-170.00	-160.00	-150.00	-140.00	-130.00	-120.00	-110.00	-100.00	-90.00	-80.00	-70.00	-60.00	-50.00	-40.00	-30.00	-20.00	-10.00	0.00	10.00
10	-180.00	-170.00	-160.00	-150.00	-140.00	-130.00	-120.00	-110.00	-100.00	-90.00	-80.00	-70.00	-60.00	-50.00	-40.00	-30.00	-20.00	-10.00	0.00	10.00
20	-180.00	-170.00	-160.00	-150.00	-140.00	-130.00	-120.00	-110.00	-100.00	-90.00	-80.00	-70.00	-60.00	-50.00	-40.00	-30.00	-20.00	-10.00	0.00	10.00
30	-180.00	-170.00	-160.00	-150.00	-140.00	-130.00	-120.00	-110.00	-100.00	-90.00	-80.00	-70.00	-60.00	-50.00	-40.00	-30.00	-20.00	-10.00	0.00	10.00
40	-180.00	-170.00	-160.00	-150.00	-140.00	-130.00	-120.00	-110.00	-100.00	-90.00	-80.00	-70.00	-60.00	-50.00	-40.00	-30.00	-20.00	-10.00	0.00	10.00
50	-180.00	-170.00	-160.00	-150.00	-140.00	-130.00	-120.00	-110.00	-100.00	-90.00	-80.00	-70.00	-60.00	-50.00	-40.00	-30.00	-20.00	-10.00	0.00	10.00
60	-180.00	-170.00	-160.00	-150.00	-140.00	-130.00	-120.00	-110.00	-100.00	-90.00	-80.00	-70.00	-60.00	-50.00	-40.00	-30.00	-20.00	-10.00	0.00	10.00
70	-180.00	-170.00	-160.00	-150.00	-140.00	-130.00	-120.00	-110.00	-100.00	-90.00	-80.00	-70.00	-60.00	-50.00	-40.00	-30.00	-20.00	-10.00	0.00	10.00
80	-180.00	-170.00	-160.00	-150.00	-140.00	-130.00	-120.00	-110.00	-100.00	-90.00	-80.00	-70.00	-60.00	-50.00	-40.00	-30.00	-20.00	-10.00	0.00	10.00
90	-180.00	-170.00	-160.00	-150.00	-140.00	-130.00	-120.00	-110.00	-100.00	-90.00	-80.00	-70.00	-60.00	-50.00	-40.00	-30.00	-20.00	-10.00	0.00	10.00
100	-180.00	-170.00	-160.00	-150.00	-140.00	-130.00	-120.00	-110.00	-100.00	-90.00	-80.00	-70.00	-60.00	-50.00	-40.00	-30.00	-20.00	-10.00	0.00	10.00
110	-180.00	-170.00	-160.00	-150.00	-140.00	-130.00	-120.00	-110.00	-100.00	-90.00	-80.00	-70.00	-60.00	-50.00	-40.00	-30.00	-20.00	-10.00	0.00	10.00
120	-180.00	-170.00	-160.00	-150.00	-140.00	-130.00	-120.00	-110.00	-100.00	-90.00	-80.00	-70.00	-60.00	-50.00	-40.00	-30.00	-20.00	-10.00	0.00	10.00
130	-180.00	-170.00	-160.00	-150.00	-140.00	-130.00	-120.00	-110.00	-100.00	-90.00	-80.00	-70.00	-60.00	-50.00	-40.00	-30.00	-20.00	-10.00	0.00	10.00
140	-180.00	-170.00	-160.00	-150.00	-140.00	-130.00	-120.00	-110.00	-100.00	-90.00	-80.00	-70.00	-60.00	-50.00	-40.00	-30.00	-20.00	-10.00	0.00	10.00
150	-180.00	-170.00	-160.00	-150.00	-140.00	-130.00	-120.00	-110.00	-100.00	-90.00	-80.00	-70.00	-60.00	-50.00	-40.00	-30.00	-20.00	-10.00	0.00	10.00
160	-180.00	-170.00	-160.00	-150.00	-140.00	-130.00	-120.00	-110.00	-100.00	-90.00	-80.00	-70.00	-60.00	-50.00	-40.00	-30.00	-20.00	-10.00	0.00	10.00
170	-180.00	-170.00	-160.00	-150.00	-140.00	-130.00	-120.00	-110.00	-100.00	-90.00	-80.00	-70.00	-60.00	-50.00	-40.00	-30.00	-20.00	-10.00	0.00	10.00
180	-180.00	-170.00	-160.00	-150.00	-140.00	-130.00	-120.00	-110.00	-100.00	-90.00	-80.00	-70.00	-60.00	-50.00	-40.00	-30.00	-20.00	-10.00	0.00	10.00

Uncorrelated Directional Gain for 2.4GHz (Ant. Position: 2.4G Ant.1~2)

Frequency (MHz)	2450
Directional Gain	4.68

Ant.1~2 @2.45GHz

Phi(deg)	Theta(deg)	0	10	20	30	40	50	60	70	80	90	100	110	120	130	140	150	160	170	180
0	-180.00	-170.00	-160.00	-150.00	-140.00	-130.00	-120.00	-110.00	-100.00	-90.00	-80.00	-70.00	-60.00	-50.00	-40.00	-30.00	-20.00	-10.00	0.00	10.00
0	-180.00	-170.00	-160.00	-150.00	-140.00	-130.00	-120.00	-110.00	-100.00	-90.00	-80.00	-70.00	-60.00	-50.00	-40.00	-30.00	-20.00	-10.00	0.00	10.00
10	-180.00	-170.00	-160.00	-150.00	-140.00	-130.00	-120.00	-110.00	-100.00	-90.00	-80.00	-70.00	-60.00	-50.00	-40.00	-30.00	-20.00	-10.00	0.00	10.00
20	-180.00	-170.00	-160.00	-150.00	-140.00	-130.00	-120.00	-110.00	-100.00	-90.00	-80.00	-70.00	-60.00	-50.00	-40.00	-30.00	-20.00	-10.00	0.00	10.00
30	-180.00	-170.00	-160.00	-150.00	-140.00	-130.00	-120.00	-110.00	-100.00	-90.00	-80.00	-70.00	-60.00	-50.00	-40.00	-30.00	-20.00	-10.00	0.00	10.00
40	-180.00	-170.00	-160.00	-150.00	-140.00	-130.00	-120.00	-110.00	-100.00	-90.00	-80.00	-70.00	-60.00	-50.00	-40.00	-30.00	-20.00	-10.00	0.00	10.00
50	-180.00	-170.00	-160.00	-150.00	-140.00	-130.00	-120.00	-110.00	-100.00	-90.00	-80.00	-70.00	-60.00	-50.00	-40.00	-30.00	-20.00	-10.00	0.00	10.00
60	-180.00	-170.00	-160.00	-150.00	-140.00	-130.00	-120.00	-110.00	-100.00	-90.00	-80.00	-70.00	-60.00	-50.00	-40.00	-30.00	-20.00	-10.00	0.00	10.00
70	-180.00	-170.00	-160.00	-150.00	-140.00	-130.00	-120.00	-110.00	-100.00	-90.00	-80.00	-70.00	-60.00	-50.00	-40.00	-30.00	-20.00	-10.00	0.00	10.00
80	-180.00	-170.00	-160.00	-150.00	-140.00	-130.00	-120.00	-110.00	-100.00	-90.00	-80.00	-70.00	-60.00	-50.00	-40.00	-30.00	-20.00	-10.00	0.00	10.00
90	-180.00	-170.00	-160.00	-150.00	-140.00	-130.00	-120.00	-110.00	-100.00	-90.00	-80.00	-70.00	-60.00	-50.00	-40.00	-30.00	-20.00	-10.00	0.00	10.00
100	-180.00	-170.00	-160.00	-150.00	-140.00	-130.00	-120.00	-110.00	-100.00	-90.00	-80.00	-70.00	-60.00	-50.00	-40.00	-30.00	-20.00	-10.00	0.00	10.00
110	-180.00	-170.00	-160.00	-150.00	-140.00	-130.00	-120.00	-110.00	-100.00	-90.00	-80.00	-70.00	-60.00	-50.00	-40.00	-30.00	-20.00	-10.00	0.00	10.00
120	-180.00	-170.00	-160.00	-150.00	-140.00	-130.00	-120.00	-110.00	-100.00	-90.00	-80.00	-70.00	-60.00	-50.00	-40.00	-30.00	-20.00	-10.00	0.00	10.00
130	-180.00	-170.00	-160.00	-150.00	-140.00	-130.00	-120.00	-110.00	-100.00	-90.00	-80.00	-70.00	-60.00	-50.00	-40.00	-30.00	-20.00	-10.00	0.00	10.00
140	-180.00	-170.00	-160.00	-150.00	-140.00	-130.00	-120.00	-110.00	-100.00	-90.00	-80.00	-70.00	-60.00	-50.00	-40.00	-30.00	-20.00	-10.00	0.00	10.00
150	-180.00	-170.00	-160.00	-150.00	-140.00	-130.00	-120.00	-110.00	-100.00	-90.00	-80.00	-70.00	-60.00	-50.00	-40.00	-30.00	-20.00	-10.00	0.00	10.00
160	-180.00	-170.00	-160.00	-150.00	-140.00	-130.00	-120.00	-110.00	-100.00	-90.00	-80.00	-70.00	-60.00	-50.00	-40.00	-30.00	-20.00	-10.00	0.00	10.00
170	-180.00	-170.00	-160.00	-150.00	-140.00	-130.00	-120.00	-110.00	-100.00	-90.00	-80.00	-70.00	-60.00	-50.00	-40.00	-30.00	-20.00	-10.00	0.00	10.00
180	-180.00	-170.00	-160.00	-150.00	-140.00	-130.00	-120.00	-110.00	-100.00	-90.00	-80.00	-70.00	-60.00	-50.00	-40.00	-30.00	-20.00	-10.00	0.00	10.00

Correlated / Uncorrelated Directional Gain for 5GHz (Ant. Position: 5G Ant.5~6)

Frequency (MHz)	5200	5300	5500	5800
Directional Gain	5.61	5.37	3.72	3.41

Note: 5G WiFi outputs drive a cross-polarized pair of linearly polarized antennas. Therefore, the results are the same for correlated and uncorrelated gains.

Ant.5~6 @5.2GHz

Frequency (MHz)	5200	5300	5500	5800
Directional Gain	5.61	5.37	3.72	3.41

Ant.5~6 @5.3GHz

Frequency (MHz)	5200	5300	5500	5800
Directional Gain	5.61	5.37	3.72	3.41

Ant.5~6 @5.5GHz

Frequency (MHz)	5200	5300	5500	5800
Directional Gain	5.61	5.37	3.72	3.41

Ant.5~6 @5.8GHz

Frequency (MHz)	5200	5300	5500	5800
Directional Gain	5.61	5.37	3.72	3.41

Frequency (MHz)	5500	5800	6000	6800
Directional Gain	3.48	3.91	4.13	4.54

Note: Two 5G High/6GHz outputs drive a cross-polarized pair of linearly polarized antennas. Therefore, the results are the same for correlated and uncorrelated gains.

Ant.3~4 @5500MHz

Position	Lat	Long	Altitude	Temperature	Humidity	Pressure	Wind Speed	Wind Direction	Cloud Cover	Visibility	Weather	Time	Location	Notes
0	-12.12	-11.12	1000	25.0	65.0	1013.25	1.5	135	10	1000	Clear	12:00	Station A	Start of run
1	-12.12	-11.12	1000	25.0	65.0	1013.25	1.5	135	10	1000	Clear	12:01	Station A	
2	-12.12	-11.12	1000	25.0	65.0	1013.25	1.5	135	10	1000	Clear	12:02	Station A	
3	-12.12	-11.12	1000	25.0	65.0	1013.25	1.5	135	10	1000	Clear	12:03	Station A	
4	-12.12	-11.12	1000	25.0	65.0	1013.25	1.5	135	10	1000	Clear	12:04	Station A	
5	-12.12	-11.12	1000	25.0	65.0	1013.25	1.5	135	10	1000	Clear	12:05	Station A	
6	-12.12	-11.12	1000	25.0	65.0	1013.25	1.5	135	10	1000	Clear	12:06	Station A	
7	-12.12	-11.12	1000	25.0	65.0	1013.25	1.5	135	10	1000	Clear	12:07	Station A	
8	-12.12	-11.12	1000	25.0	65.0	1013.25	1.5	135	10	1000	Clear	12:08	Station A	
9	-12.12	-11.12	1000	25.0	65.0	1013.25	1.5	135	10	1000	Clear	12:09	Station A	
10	-12.12	-11.12	1000	25.0	65.0	1013.25	1.5	135	10	1000	Clear	12:10	Station A	
11	-12.12	-11.12	1000	25.0	65.0	1013.25	1.5	135	10	1000	Clear	12:11	Station A	
12	-12.12	-11.12	1000	25.0	65.0	1013.25	1.5	135	10	1000	Clear	12:12	Station A	
13	-12.12	-11.12	1000	25.0	65.0	1013.25	1.5	135	10	1000	Clear	12:13	Station A	
14	-12.12	-11.12	1000	25.0	65.0	1013.25	1.5	135	10	1000	Clear	12:14	Station A	
15	-12.12	-11.12	1000	25.0	65.0	1013.25	1.5	135	10	1000	Clear	12:15	Station A	
16	-12.12	-11.12	1000	25.0	65.0	1013.25	1.5	135	10	1000	Clear	12:16	Station A	
17	-12.12	-11.12	1000	25.0	65.0	1013.25	1.5	135	10	1000	Clear	12:17	Station A	
18	-12.12	-11.12	1000	25.0	65.0	1013.25	1.5	135	10	1000	Clear	12:18	Station A	
19	-12.12	-11.12	1000	25.0	65.0	1013.25	1.5	135	10	1000	Clear	12:19	Station A	
20	-12.12	-11.12	1000	25.0	65.0	1013.25	1.5	135	10	1000	Clear	12:20	Station A	
21	-12.12	-11.12	1000	25.0	65.0	1013.25	1.5	135	10	1000	Clear	12:21	Station A	
22	-12.12	-11.12	1000	25.0	65.0	1013.25	1.5	135	10	1000	Clear	12:22	Station A	
23	-12.12	-11.12	1000	25.0	65.0	1013.25	1.5	135	10	1000	Clear	12:23	Station A	
24	-12.12	-11.12	1000	25.0	65.0	1013.25	1.5	135	10	1000	Clear	12:24	Station A	
25	-12.12	-11.12	1000	25.0	65.0	1013.25	1.5	135	10	1000	Clear	12:25	Station A	
26	-12.12	-11.12	1000	25.0	65.0	1013.25	1.5	135	10	1000	Clear	12:26	Station A	
27	-12.12	-11.12	1000	25.0	65.0	1013.25	1.5	135	10	1000	Clear	12:27	Station A	
28	-12.12	-11.12	1000	25.0	65.0	1013.25	1.5	135	10	1000	Clear	12:28	Station A	
29	-12.12	-11.12	1000	25.0	65.0	1013.25	1.5	135	10	1000	Clear	12:29	Station A	
30	-12.12	-11.12	1000	25.0	65.0	1013.25	1.5	135	10	1000	Clear	12:30	Station A	

Ant.3~4 @5800MHz

[illegible]

Ant.3~4 @6000MHz

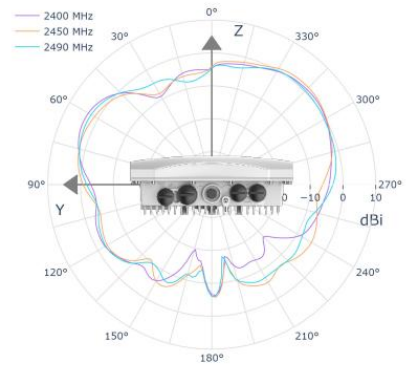
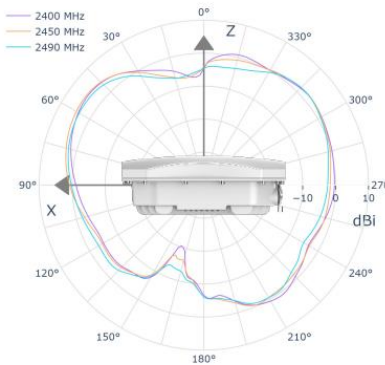
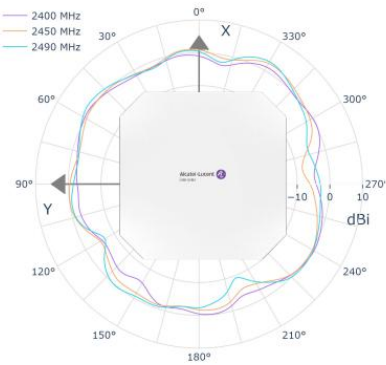
[illegible]

Ant.3~4 @6800MHz

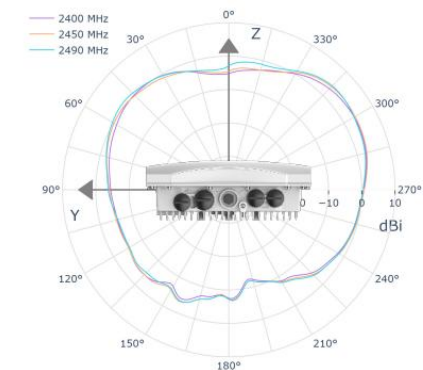
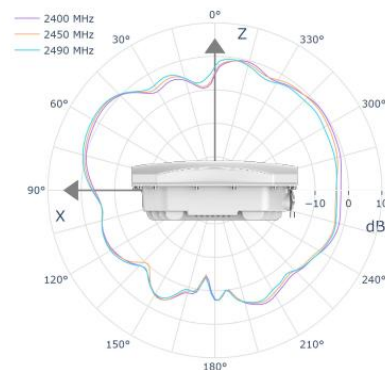
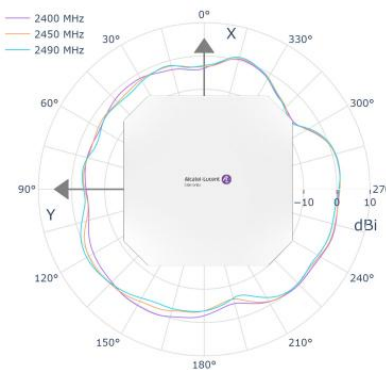
[illegible]

9. Radiation Pattern

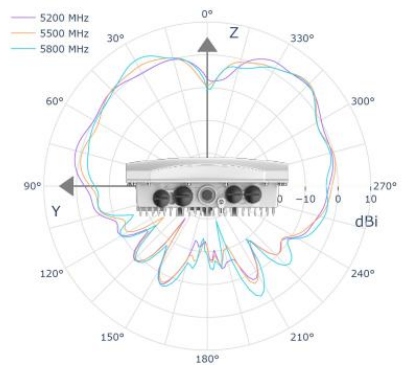
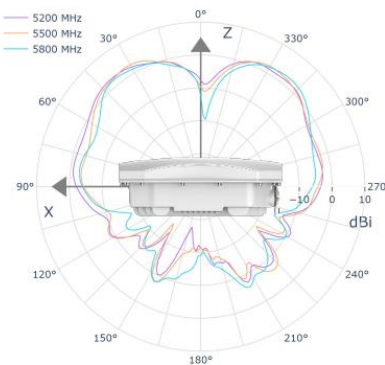
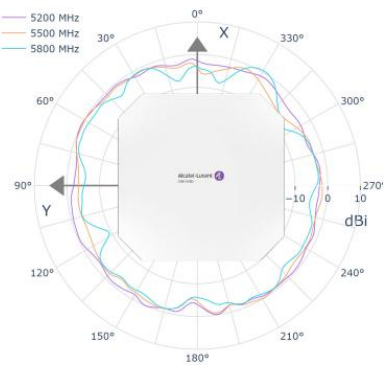
Ant. Position: 2.4G Ant.1



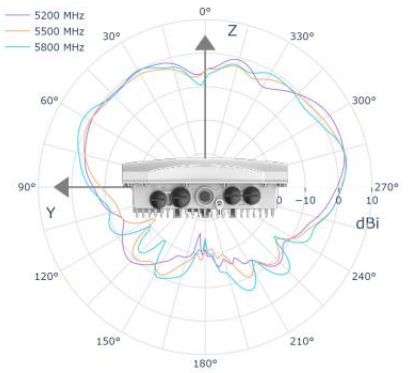
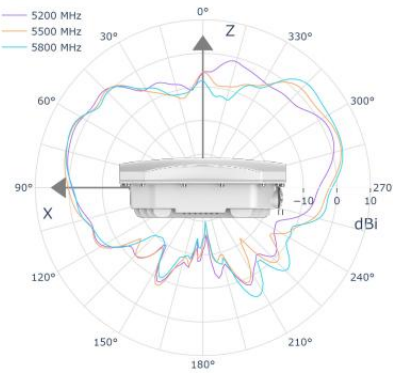
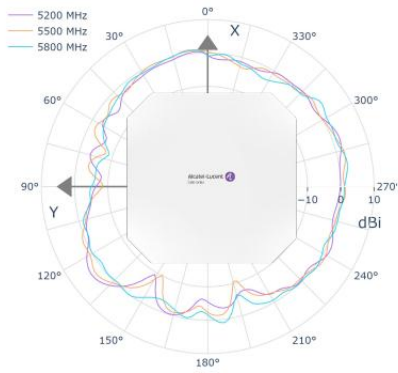
Ant. Position: 2.4G Ant.2



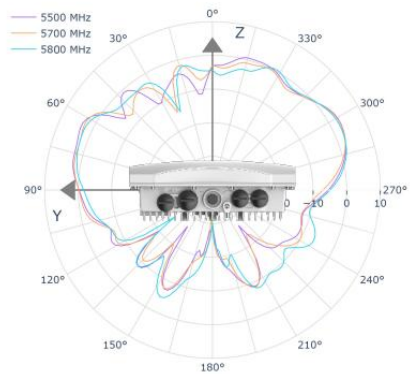
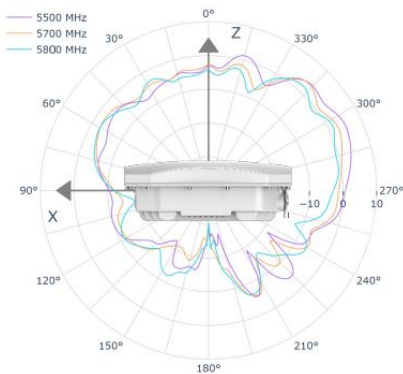
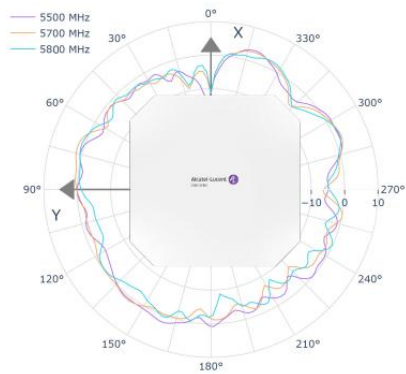
Ant. Position: 5G Ant.5



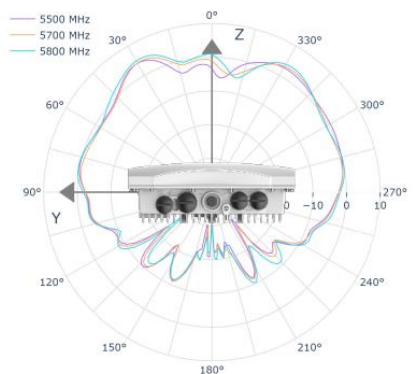
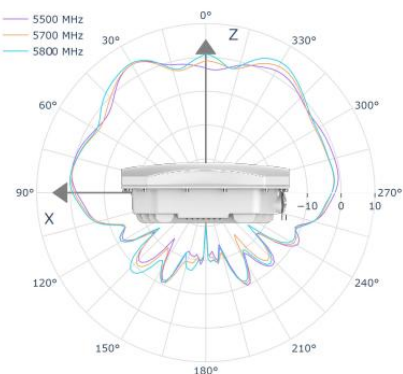
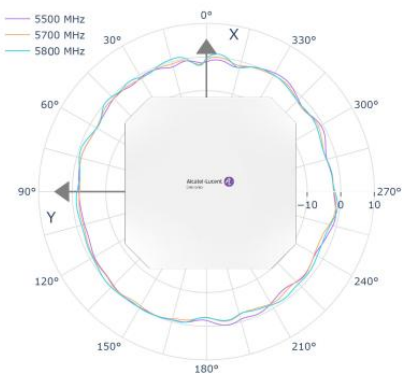
Ant. Position: 5G Ant.6



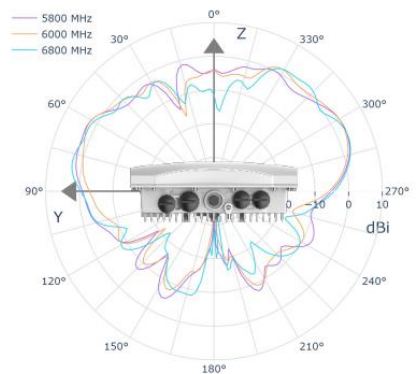
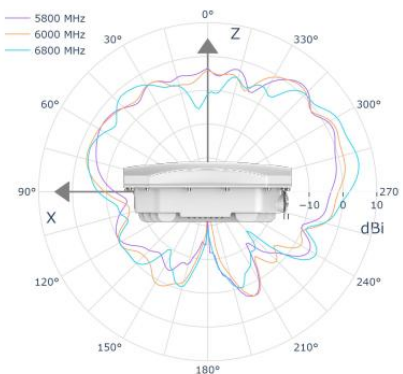
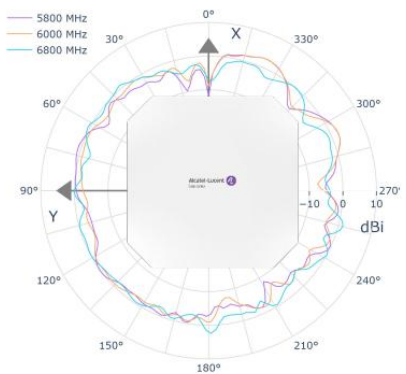
Ant. Position: 5G High Ant.3



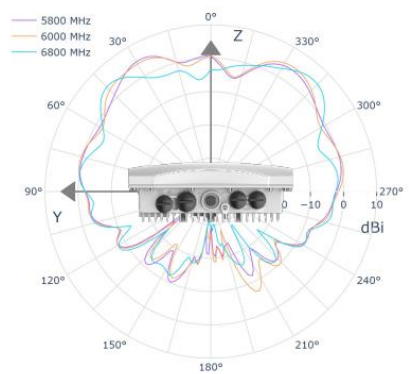
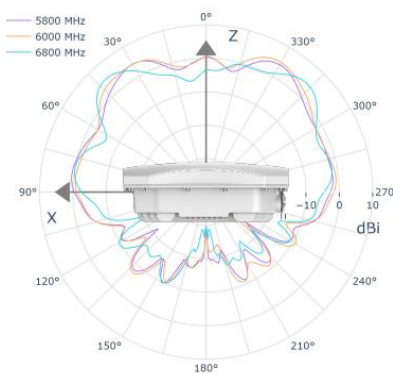
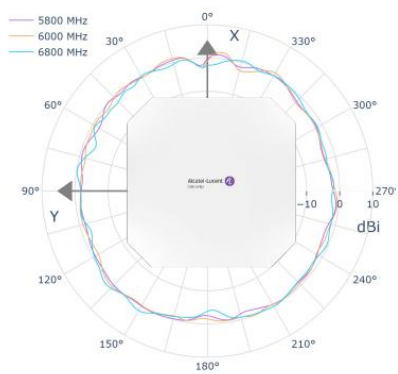
Ant. Position: 5G High Ant.4



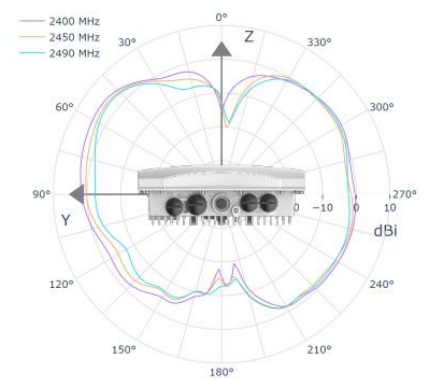
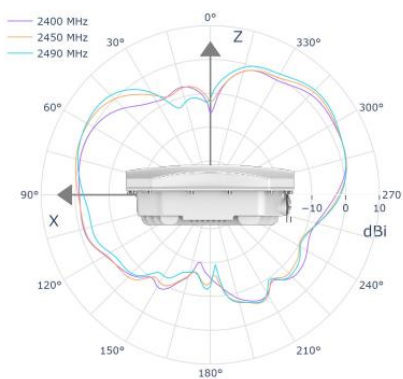
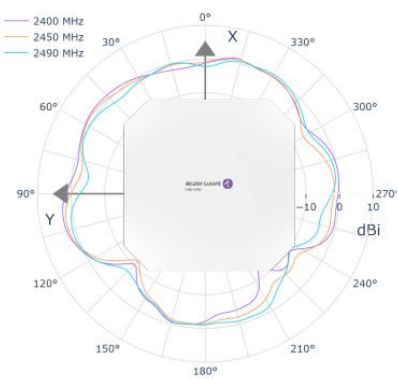
Ant. Position: 6G Ant.3



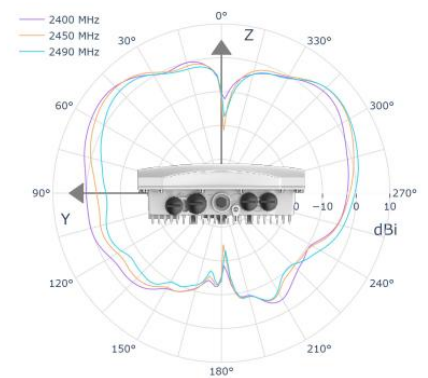
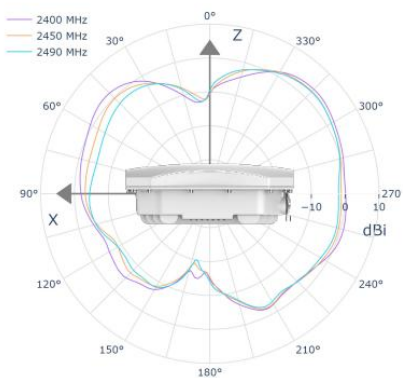
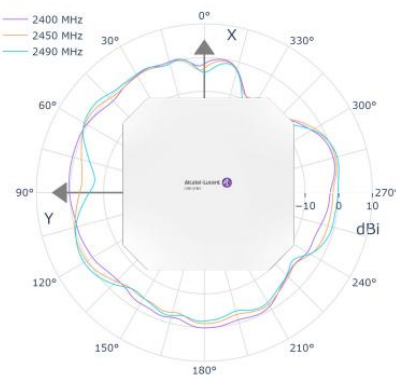
Ant. Position: 6G Ant.4



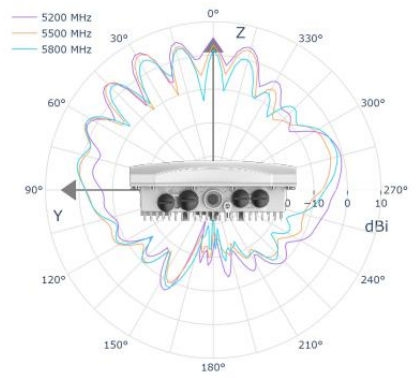
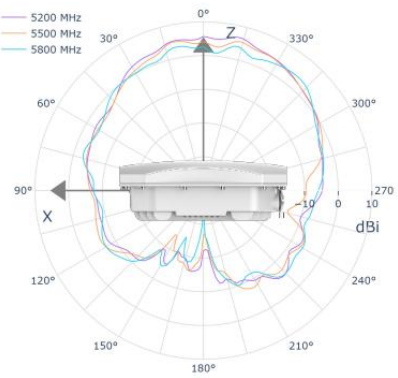
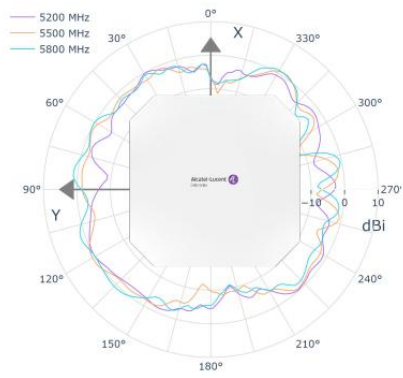
Ant. Position: 2.4G BLE Ant.7



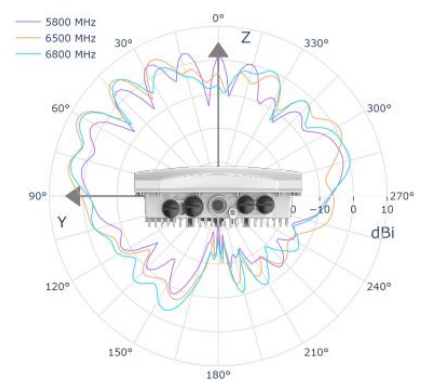
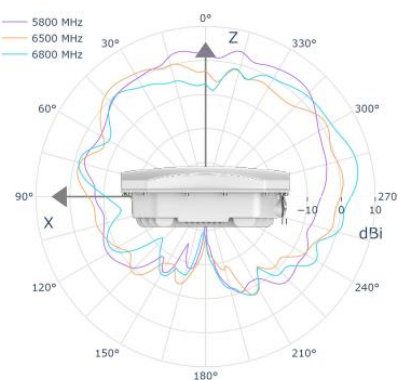
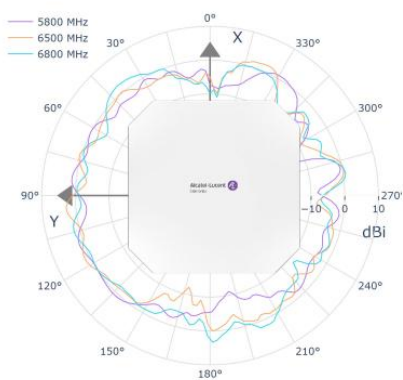
Ant. Position: 2.4G Ant.8



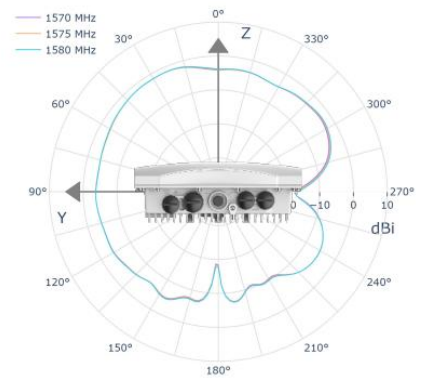
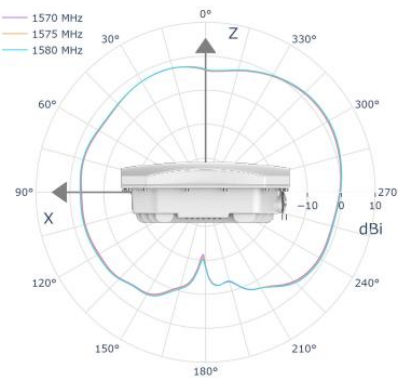
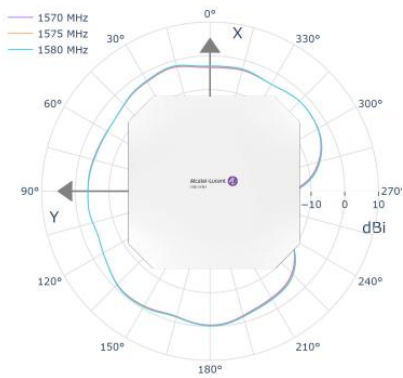
Ant. Position: 5G Ant.8



Ant. Position: 6G Ant.8



Ant. Position: GNSS-L5 Ant.9



Ant. Position: GNSS-L1 Ant.8

