

Applicant	Plume Design, Inc.
Product Type	SuperPod with WiFi 6E
Model Number	M1A

## Antenna Data Sheet

### 1. Measurement information

- Measurement: Eurofins E&E Wireless Taiwan Co., Ltd.
- Equipment: ETS AMS-8500 chamber , KEYSIGHT E5080B ENA

#### \* Test Equipment list

Description	Manufacturer	Model	S/N	Cal Date
Network Analyzer	KEYSIGHT	E5080B	MY59202160	2022-03-06
Anechoic Chamber	ETS-Lindgren	AMS 8500	Q2077	N.C.R <sup>1</sup>
Quad Ridge Horn	ETS-Lindgren	3164-10	SN00238901	2021-09-21
Antenna Positioner Controller	EMCO	EMCenter	SN00241195	N.C.R <sup>1</sup>
MAPS Positioner	EMCO	EMCenter	SN00241195	N.C.R <sup>1</sup>

Note 1: N.C.R. = No Calibration Request.

\*Test Engineer: Jason Tsai

### 2. Measurement Standards

-Reference: IEEE Std. 149-2021 section 8.4.1

### 3. Measurement Method

EUT set on multi-axis positioner and adjust EUT's physical center to measurement reference center. Measurement antenna set at phi polarization and 1.5 meters height. Port 1 of Network analyzer connect to antenna 1 of EUT. Record G value every 15 degree from 0 to 345 degree on Phi angle and 0 to 180 on theta of multi-axis positioner. Then set measurement antenna to theta polarization and repeat process. Repeat process to each antenna of EUT.



\*

## 4. Measurement Environment

To use anechoic chamber with full 3D far field measurement capability. The detail refers to the Information below.

### 4.1. Radiation Pattern Test

Antennas tested for Gain and Efficiency must be assembled into the enclosure and tested in the fully assembled and operating M1X. The antenna is tested in free space in the full 3D anechoic chamber in the H, E1 and, E2 planes. The radiation patterns are measured at the center of transmit and receive bands.

### 4.2. Rectangular Fully Anechoic Chamber

Shield Dimensions (L x W x H): 7.3 m x 3.7 m x 3.7 m; Path Length: 4.9 m

### 4.3. Open Boundary Quad-ridged Horn Antenna

Open boundary Quad-ridged Horn Antenna design is similar to two double-ridged waveguide antennas, placed orthogonally to each other, providing the ability to measure the two principal components of a radiating electric field.

### 4.4. Multi-Axis Positioner System (MAPS)

Multi-Axis Positioner System (MAPS) is designed with adjustment rails to position the Antenna Under Test (AUT) to the center of rotation axes (both in Theta and Phi axes) for accurate antenna measurements. The MAPS rotates the device under test (DUT) around two orthogonal axes for full spherical coverage.

### 4.5. Data Acquisition and Analysis Software

EMQuest Antenna Measurement Software supports data acquisition in either the great circle-cut or conical-cut test sequence to perform full spherical antenna measurements. Post-processing calculations include derivation of antenna half-power beam-width, directivity, gain, radiation efficiency, total radiated power, and total optional isotropic sensitivity. Advanced graphic capabilities allow acquired data to be displayed in a variety of 2D and 3D formats.

### 4.6. Instrumentation

The system is configured to perform generic antenna measurement by using a multi-channel Vector Network Analyzer (VNA).

## 5. Equipment Configuration

### 5.1. EUT supports bands.

	Frequency Band	Frequency Range (MHz)	Number of Channels	
Operate Frequency (WLAN 2.4G)	IEEE 802.11b IEEE 802.11g IEEE 802.11n 20 MHz (64QAM) IEEE 802.11ac 20 MHz (256QAM) IEEE 802.11ax 20 MHz	2412 – 2462	11	
	IEEE 802.11n 40 MHz (64QAM) IEEE 802.11ac 40 MHz (256QAM) IEEE 802.11ax 40 MHz	2422 – 2452	9	
	IEEE 802.11a IEEE 802.11n 5 GHz 20 MHz / IEEE 802.11ac 20 MHz / IEEE 802.11ax 20 MHz	U-NII Band I	5180 – 5240	4
		U-NII Band II-A	5260 – 5320	4
U-NII Band II-C		5500 – 5720	12	
U-NII Band III		5745 – 5825	5	
Operate Frequency (WLAN 5G)	IEEE 802.11n 5 GHz 40 MHz / IEEE 802.11ac 40 MHz / IEEE 802.11ax 40 MHz /	U-NII Band I	5190 – 5230	2
		U-NII Band II-A	5270 – 5310	2
		U-NII Band II-C	5510 – 5710	6
		U-NII Band III	5755 – 5795	2
IEEE 802.11ac 80 MHz / IEEE 802.11ax 80 MHz /	U-NII Band I	5210	1	
	U-NII Band II-A	5290	1	
	U-NII Band II-C	5530 – 5690	3	
	U-NII Band III	5775	1	
Operate Frequency (WLAN 6G)	IEEE 802.11a IEEE 802.11ax HE20	U-NII Band 5	5955 – 6415	24
		U-NII Band 6	6435 – 6515	5
		U-NII Band 7	6535 – 6855	17
		U-NII Band 8	6875 – 7155	13
	IEEE 802.11ax HE40	U-NII Band 5	5965 – 6405	12
		U-NII Band 6	6445 – 6485	2
		U-NII Band 7	6525 – 6845	9
		U-NII Band 8	6885 – 7085	6
	IEEE 802.11ax HE80	U-NII Band 5	5985 – 6385	6
		U-NII Band 6	6465 – 6545	2
		U-NII Band 7	6625 – 6785	3
		U-NII Band 8	6865 – 7025	3
	IEEE 802.11ax HE160	U-NII Band 5	6025 – 6345	4
		U-NII Band 6	6505	1
		U-NII Band 7	6665	1
		U-NII Band 8	6825 - 6985	2
	Operate Frequency (BLE)		2402 – 2480	40
	Operate Frequency (Matter)		2405 – 2480	16

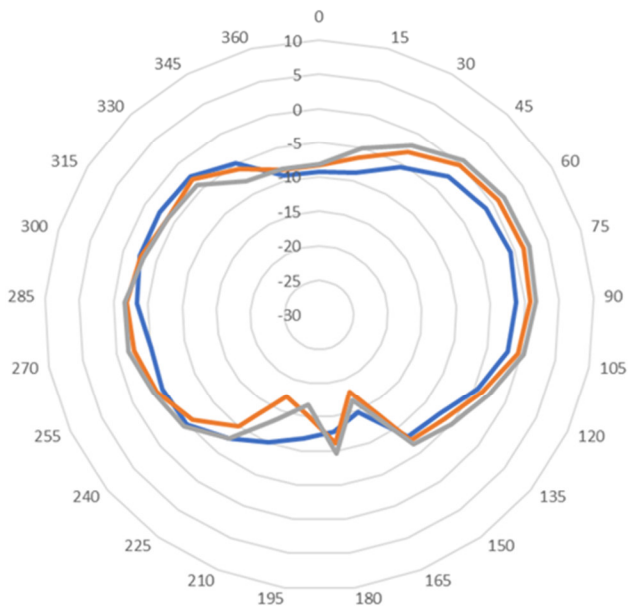


## 6. Result Summary and Pattern Plots

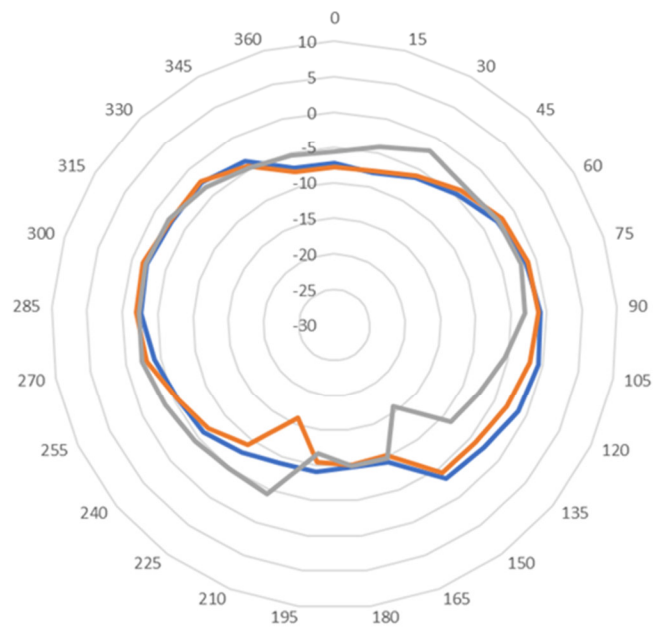
### 6.1. 2.4G

	2G Antenna 1(dBi)	2G Antenna 2(dBi)
2420 MHz	-0.8	-0.7
2450 MHz	1.3	-1.1
2480 MHz	2.2	-2.1

### Antenna1



### Antenna2

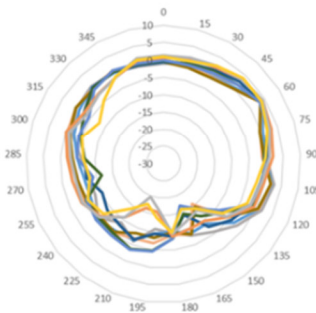




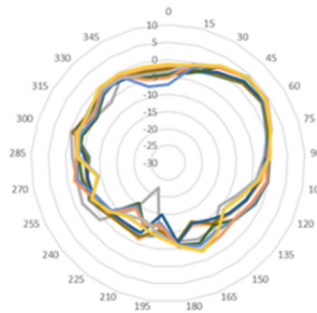
## 6.2. 5G

	5G Antenna 1 (dBi)	5G Antenna 2 (dBi)	5G Antenna 3 (dBi)	5G Antenna 4 (dBi)
5100 MHz	4.1	2.6	1.7	1.0
5200 MHz	3.6	2.7	2.1	2.1
5250 MHz (Added Point)	3.4	2.9	2.3	2.4
5300 MHz	3.5	3.4	1.8	2.9
5400 MHz	3.5	3.3	2.3	3.2
5500 MHz	3.5	3.9	3.0	3.1
5600 MHz	3.4	4.2	2.9	1.8
5700 MHz	4.2	4.3	3.2	1.7
5800 MHz	4.3	4.3	3.3	2.0
5900 MHz	3.9	4.1	3.0	2.7

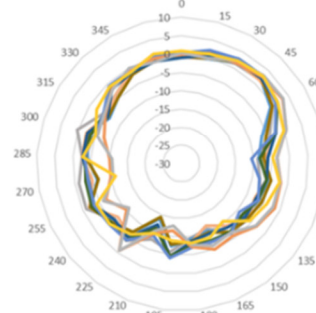
Antenna1



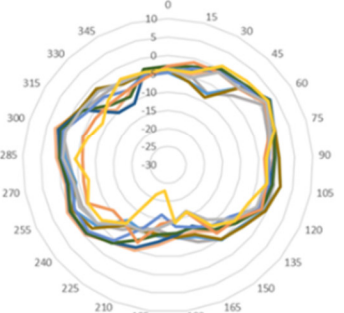
Antenna2



Antenna3



Antenna4

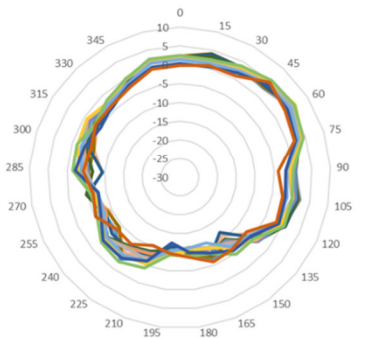




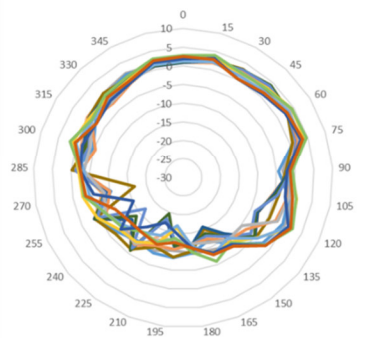
## 6.3. 6G

	6G Antenna 1(dBi)	6G Antenna 2 (dBi)	6G Antenna 3 (dBi)	6G Antenna 4 (dBi)
5900 MHz	4.8	3.7	4.2	3.3
6000 MHz	5.2	3.5	4.4	3.8
6100 MHz	5.5	3.3	4.0	3.5
6200 MHz	5.2	3.3	3.7	3.6
6300 MHz	4.9	3.7	3.8	4.3
6400 MHz	5.1	4.1	3.7	4.5
6500 MHz	5.2	3.7	3.4	4.5
6600 MHz	5.2	3.4	3.2	3.9
6700 MHz	5.6	3.6	3.5	4.2
6800 MHz	6.2	4.4	4.0	4.3
6900 MHz	4.8	3.2	3.3	3.9
7000 MHz	5.9	4.6	5.0	5.0
7100 MHz	3.9	3.2	4.3	3.8
7200 MHz	4.8	3.6	4.9	3.5

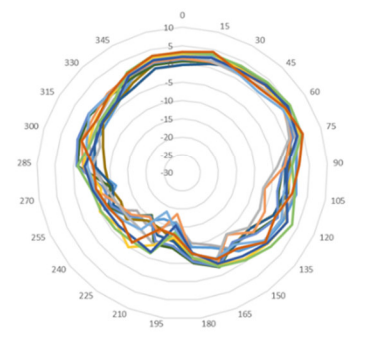
Antenna1



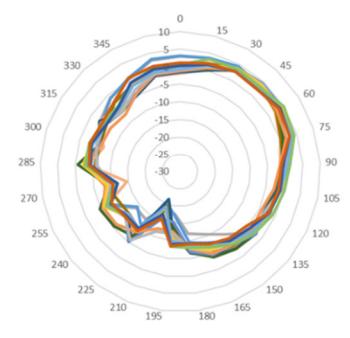
Antenna2



Antenna3



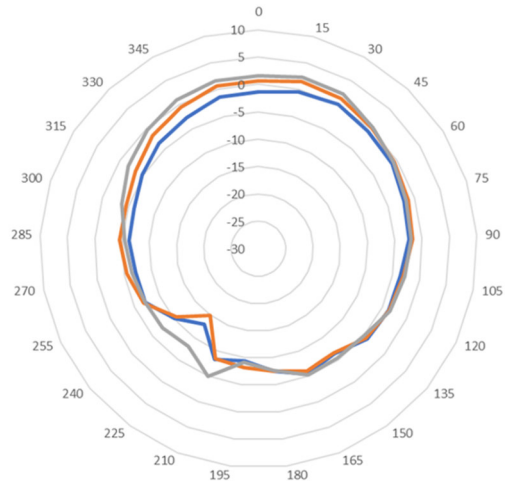
Antenna4





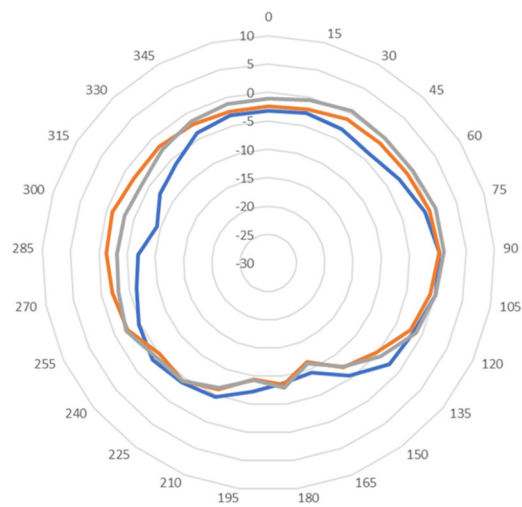
## 6.4. BLE

BLE (dBi)	
2400 MHz	0.14
2450 MHz	1.54
2500 MHz	2.34

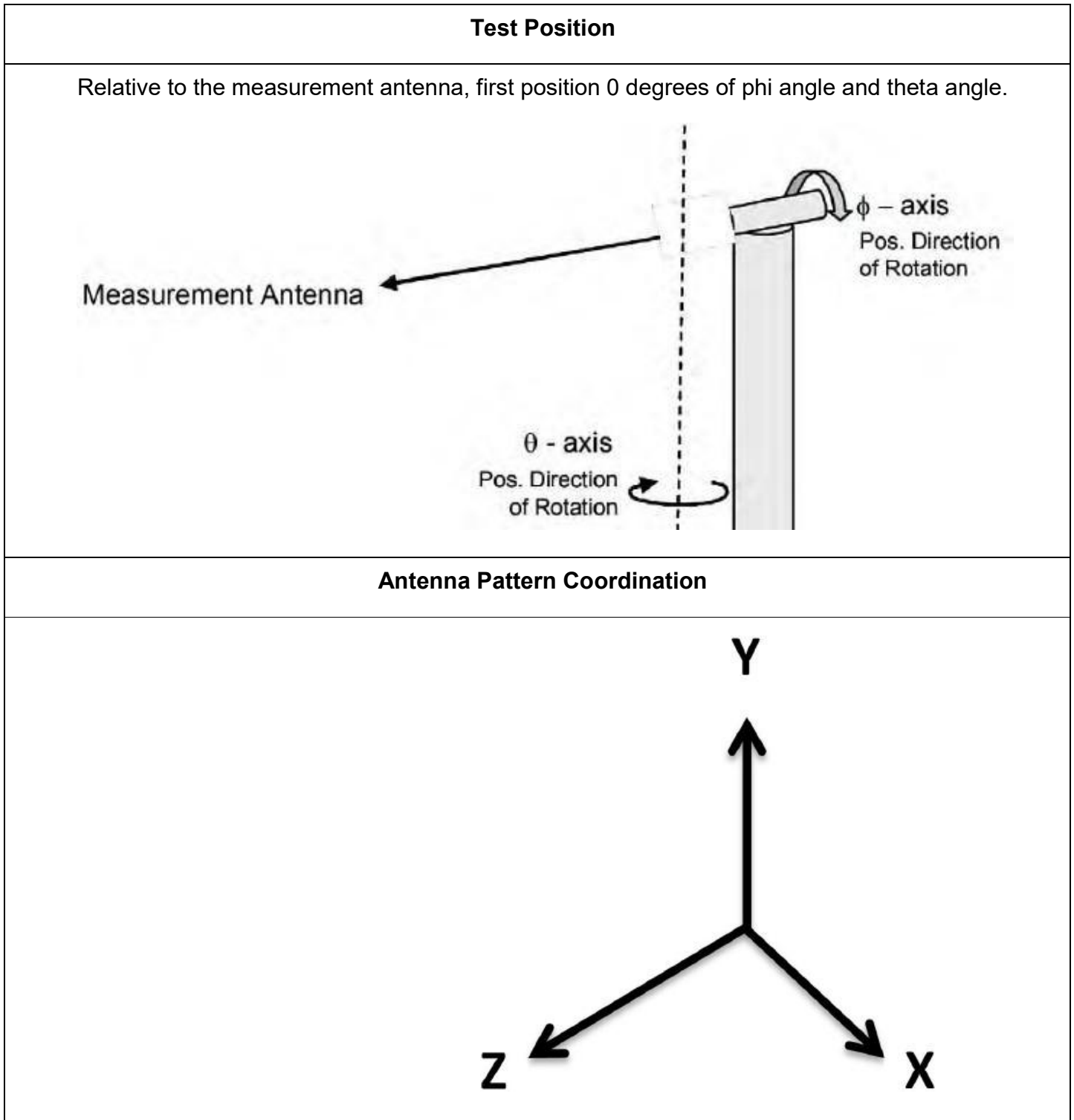


## 6.5. Matter

Matter (dBi)	
2400 MHz	0.45
2450 MHz	0.35
2500 MHz	1.15



## 7. Test Setup



Note: Photos of Test Position. Please refer to the test photos in the appendix.