

Regulatory WLAN Antenna Information

Platform information											
Brand	ODM	****End product model name	Intel platform (ex: Yes, No or NA)	Platform type (ex: regular NB, convertible PC, AIO...etc)	*SAR minimum separation (mm)						
Lenovo	Wistron	Lenovo 300w Yoga Gen 4	Yes	convertible NB	5.16						
*****Please fill in exact product model name and make sure the model name is visible on product cover or any parts for end users recognize for authority inspection.											
Antenna information											
Vendor		Type	Antenna Part number (Main)			Antenna Part number (Aux)					
High-Tek Electronics Co., Ltd		PIFA	025.90272.0001 (0ACAR022015N)			025.90273.0001 (0ACAR022016N)					
Peak gain w/ cable loss (dBi)*											
	2.4GHz 2400-2483.5 MHz	5.2GHz 5150-5250MHz	5.3GHz 5250-5350MHz	5.6GHz 5470-5725MHz	5.8GHz 5725-5850MHz	5.9GHz 5850-5895MHz	6.2GHz 5925-6425MHz	6.5GHz 6425-6525MHz	6.7GHz 6525-6875MHz	7.0 GHz 6875-7125MHz	
Main	-1.12	-0.08	0.51	1.69	1.55	-1.23	2.35	1.26	1.64	1.91	
Aux	-1.71	0.88	0.92	1.17	0.98	0.78	1.83	1.38	1.40	1.39	
Intel Reference Gain/Type/ Separation distance											
Antenna Type	Antenna Peak gain (In dBi)*										Distance to the end user (mm)
	2.4GHz 2400-2483.5 MHz	5.2GHz 5150-5250MHz	5.3GHz 5250-5350MHz	5.6GHz 5470-5725MHz	5.8GHz 5725-5850MHz	5.9GHz 5850-5895MHz	6.2GHz 5925-6425MHz	6.5GHz 6425-6525MHz	6.7GHz 6525-6875MHz	7.0GHz 6875-7125MHz	Generic: refer to modular FCC SAR report Mid-power: ≥ 8 mm Low power: ≥ 5 mm
Design	3.00	5.00	5.00	5.00	5.00	5.00	5.00	5.00	5.00	5.00	
PIFA	3.24	3.64	3.73	4.77	4.97	4.72	4.83	4.30	5.37	5.59	
Dipole	2.89	2.92	3.19	4.41	4.22	4.22	4.83	4.30	4.49	5.34	
Notes (marked with *)											
* SAR minimum separation (mm)											
- Regular NB: Minimum antenna-to-body (from antenna bottom to the bottom of the device)											
- Tablet / Convertible PC: Minimum antenna-to-edge (5 sides of the device)											
- Mini-tablet: Minimum antenna-to-edge (6 sides of the device)											
* 3D Peak Antenna gain should be equal or greater than -2 dBi											
- If a host integrator plans to use a lower gain antenna of the same type, additional CBP(FCC)/EDT(EU) testing need to be performed while the module is installed in the host.											

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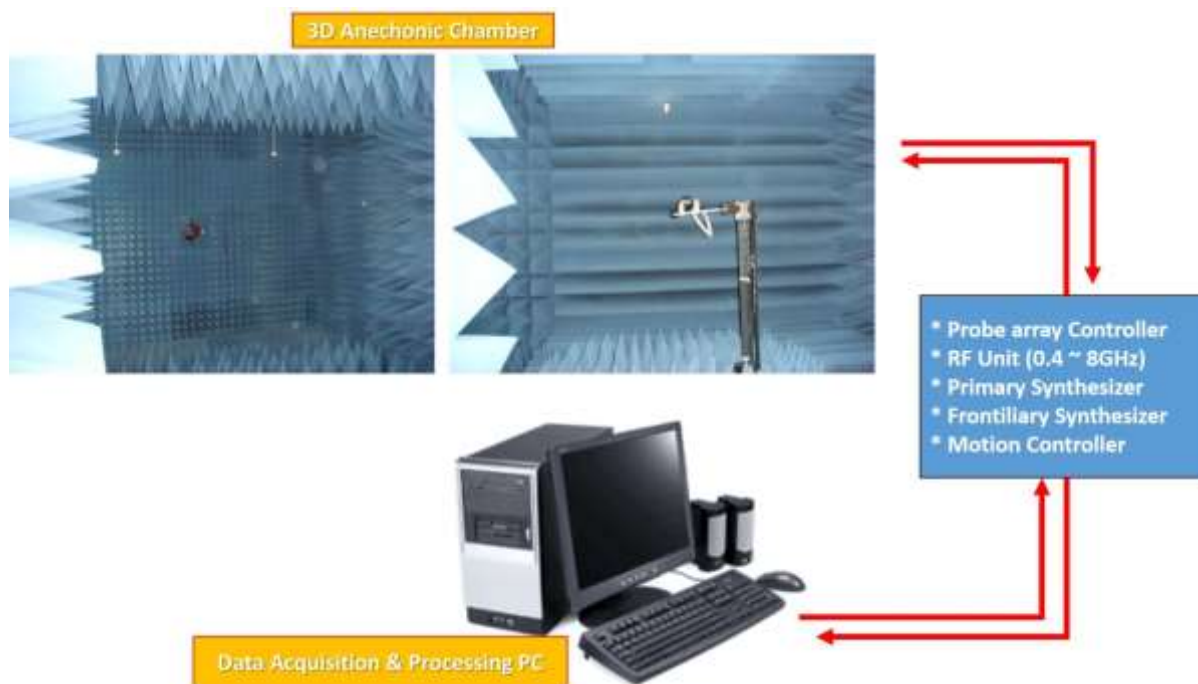
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1. Applicable test methods

The radiation pattern of antenna is measured in both horizontal polarization and vertical polarization. The radiation pattern measurements are performed in the three-dimensional anechoic chamber. The chamber provides less than – 30dB reflectivity from 800MHz through 8GHz. The chamber is calibrated using both standard dipole antenna and horn antenna. The Gain here is expressed as dBi that standardizes the isotropic antenna. The Gain measurements and antenna radiation pattern are also performed in the same chamber described previously. Figure 2 shows the schematic diagram for measuring radiation pattern and Gain.



2. Test & System Description

a. Test setup

1. Frequency Range

2400~2500MHz, for WLAN application.

5150~5850MHz, for WLAN application

2. Antenna Configuration

The antenna basically has two parts; the stamping and the cable assembly with the connector on one side. The detailed drawing is attached.

3. VSWR

The VSWR is measured with network analyzer that support up to 8GHz. All the measurements are performed with the customer provided fixture. Figure 1 shows the typical schematic diagram for measuring VSWR.



Figure 1. The schematic diagram for measuring VSWR

b. Equipment list

Test Equipment

The equipment for the antenna measurement we used is as follows:

- A. Network Analyzer, support up to 8GHz, to measure the VSWR and input impedance of antenna.
- B. Three-dimensional anechoic chamber to measure antenna gain and radiation pattern(Standard horn antenna was used to calibrate the chamber)
- C. Digital caliper to measure the dimensions.
- D. Climatic chamber for mechanical tests.

Radiated Setup

item	Device	Type/Model	manufacturer	Cal. Date	Cal. Due Date
1	Anechoic Chamber	AMS-8500	ETS-Lindgren	2021/12/20	2022/12/20
2	Turn Table	ETS	ETS-Lindgren	N/A	N/A
3	Measurement SW	EMQuest1.08	ETS-Lindgren	N/A	N/A
4	Vector Network Analyzer	Agilent E5071B	Agilent	2021/12/17	2022/12/17
5	Receive Antenna Absorber Nested Dual- Polarized Dual-Vivaldi Array Antenna 700MHz to 6GHz	EMCO 3164-08	ETS-Lindgren	N/A	N/A
6	Multi Axis Positioning System (MAPS™)	EMCO 2115CR	ETS-Lindgren	N/A	N/A
7	MAPS™ Controller	MECO 2090	ETS-Lindgren	N/A	N/A
8	Horn antenna	3164-08	ETS-Lindgren	2021/12/15	2022/12/15
9	Cable 0.5m - 700MHz~10GHz	RG316	Senyu	2021/12/21	2022/12/21

N/A : Not Applicable

3. Setup photo



Antenna Information

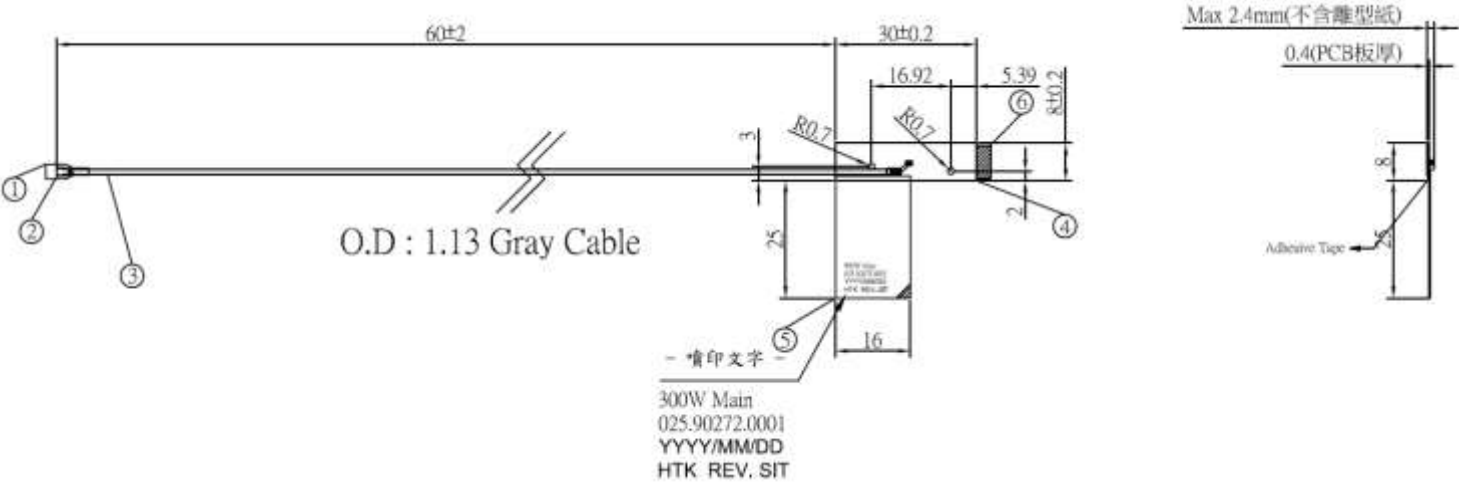
Section 1. Antenna Assembly Specifications

1A	1B	1C	1D		1E	1F	1G	1H
Antenna Part Number	Manufacturer	Antenna Type	Cable Assembly Part Number and Information	Freq Range MHz	* Peak Gain W/ Cable loss (dBi)	Peak Gain w/o Cable Loss (dBi)	Max VSWR	Cable Loss (dB)
(P/N: 025.90272.0001 (0ACAR022015N)) Main Antenna	High-Tek Electronics Co., Ltd	PIFA	1)Connector:CM 2)Connector P/N: 958-C413-W-B-Bu-A0 3) 50ohm coaxial cable 4) length : 60 mm Diameter:1.13mm	2400-2483.5	-1.12	-0.95	3	0.17
				5150-5250	-0.08	0.17	3	0.25
				5250-5350	0.51	0.77	3	0.26
				5470-5725	1.69	1.96	3	0.27
				5725-5850	1.55	1.83	3	0.28
				5850-5895	-1.23	-0.94	3	0.29
				5925-6425	2.35	2.65	3	0.30
				6425-6525	1.26	1.57	3	0.31
				6525-6875	1.64	1.96	3	0.32
(P/N: 025.90273.0001 (0ACAR022016N)) Aux Antenna	High-Tek Electronics Co., Ltd	PIFA	1)Connector:CM 2)Connector P/N: 958-C413-W-B-Bu-A0 3) 50ohm coaxial cable 4) length : 155.5 mm Diameter:1.13mm	2400-2483.5	-1.71	-1.26	3	0.45
				5150-5250	0.88	1.53	3	0.65
				5250-5350	0.92	1.58	3	0.66
				5470-5725	1.17	1.89	3	0.72
				5725-5850	0.98	1.71	3	0.73
				5850-5895	0.78	1.52	3	0.74
				5925-6425	1.83	2.61	3	0.78
				6425-6525	1.38	2.18	3	0.80
				6525-6875	1.40	2.23	3	0.83
				6875-7125	1.39	2.26	3	0.87

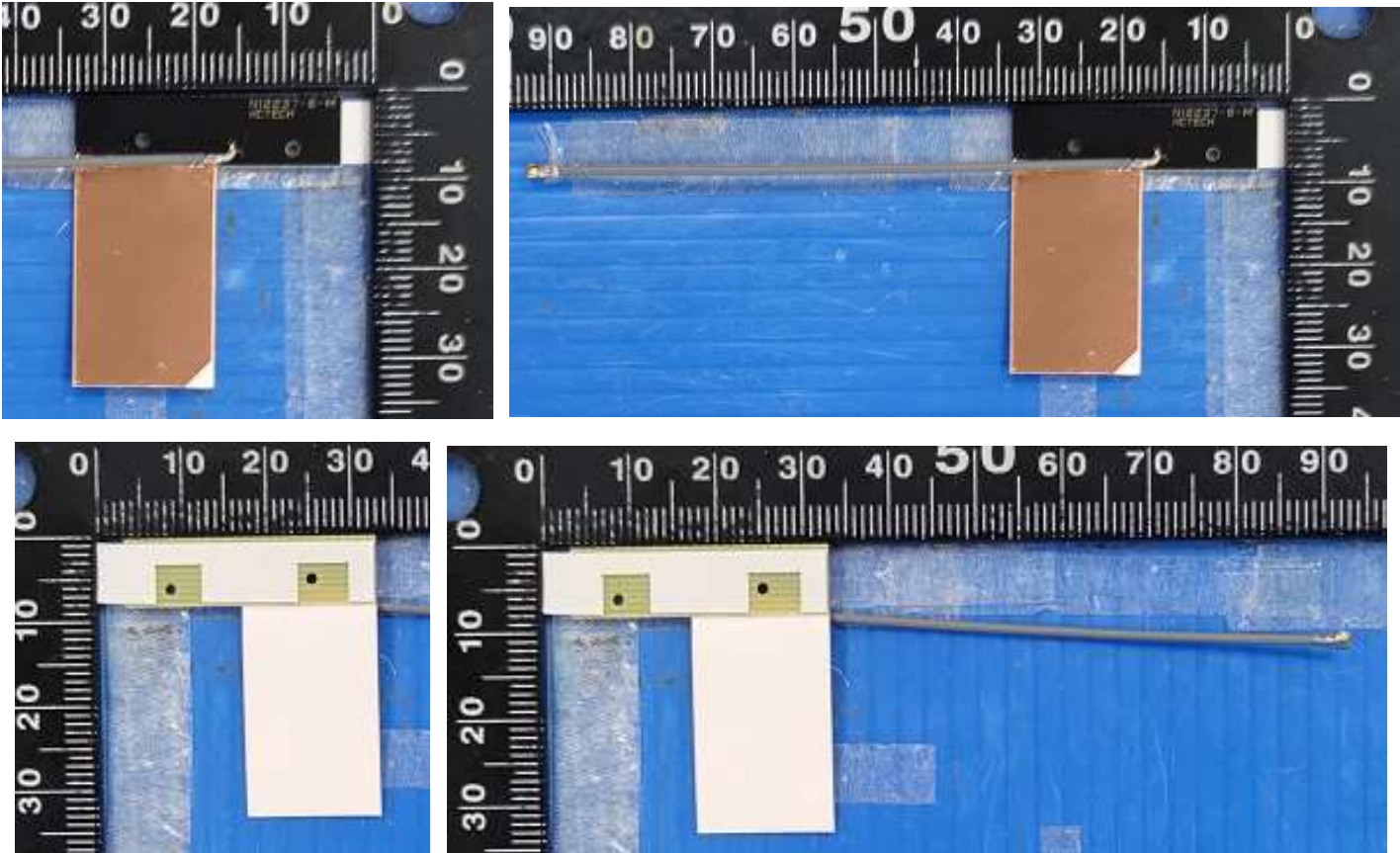
- 3D Antenna Peak Gain required being test in system basis.

Section 2. Dimensioned Photos and Drawings of Antennas

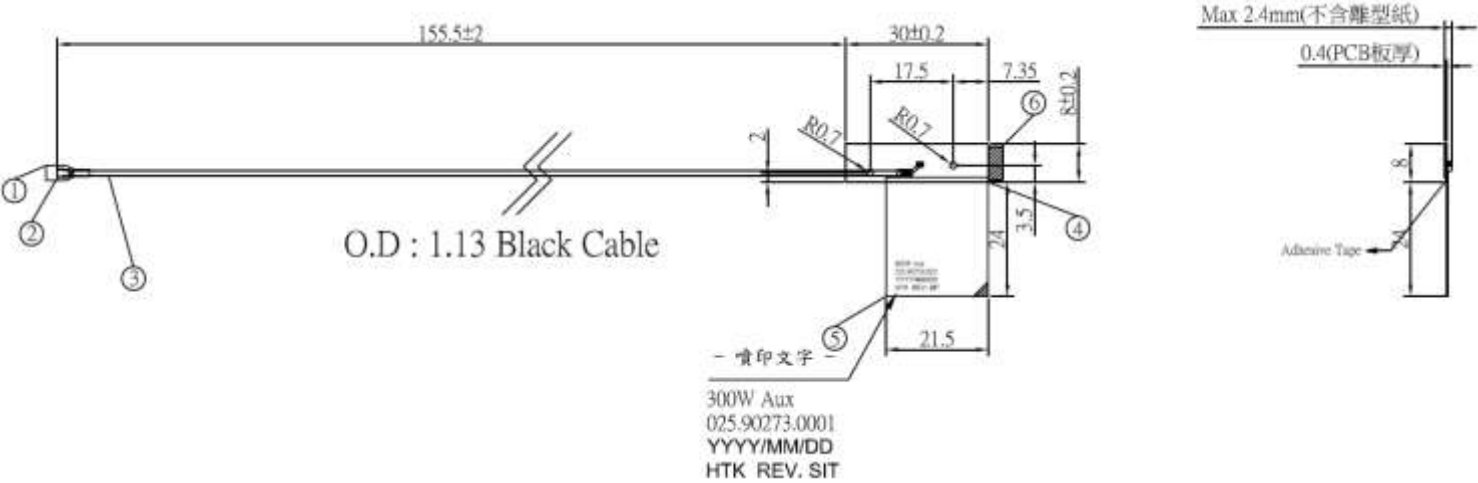
Main Antenna Drawing:



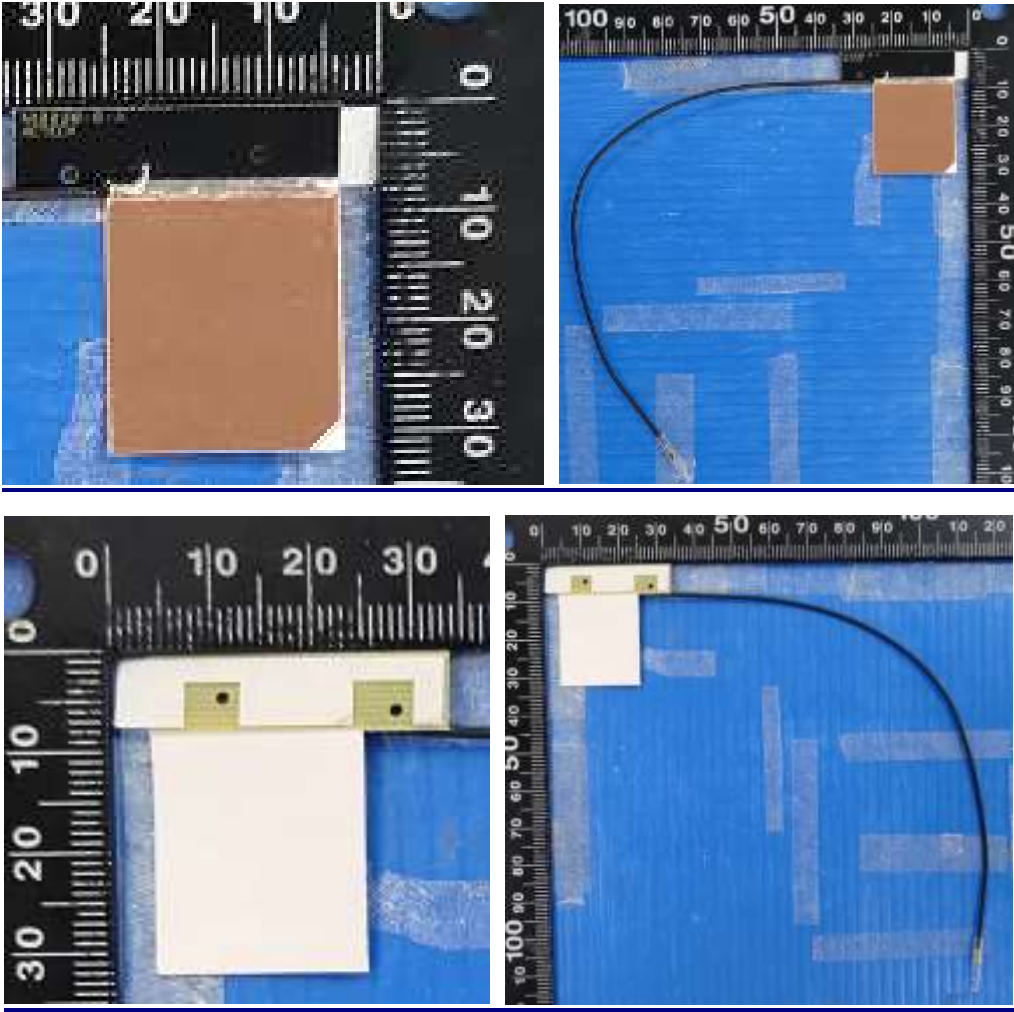
Main Antenna Photo:



Aux Antenna Drawing:



Aux Antenna Photo:

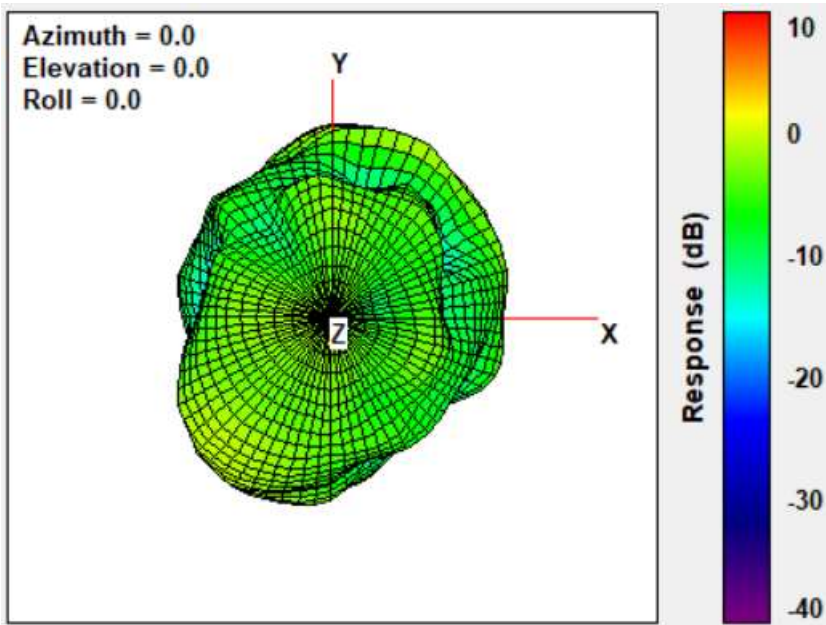


Section 3. Radiation characteristics of antenna loaded in Host Platform

Main Antenna

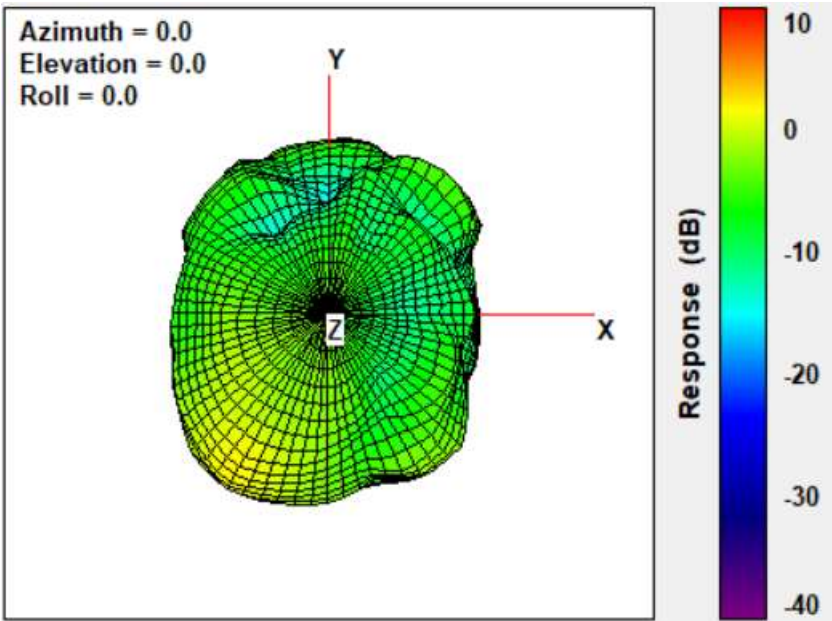
Max Antenna 3D Radiation Pattern 2400 – 2483.5 MHz

Frequency (MHz)	Peak Gain w/ Cable Loss (dBi)
2400-2483.5	-1.12



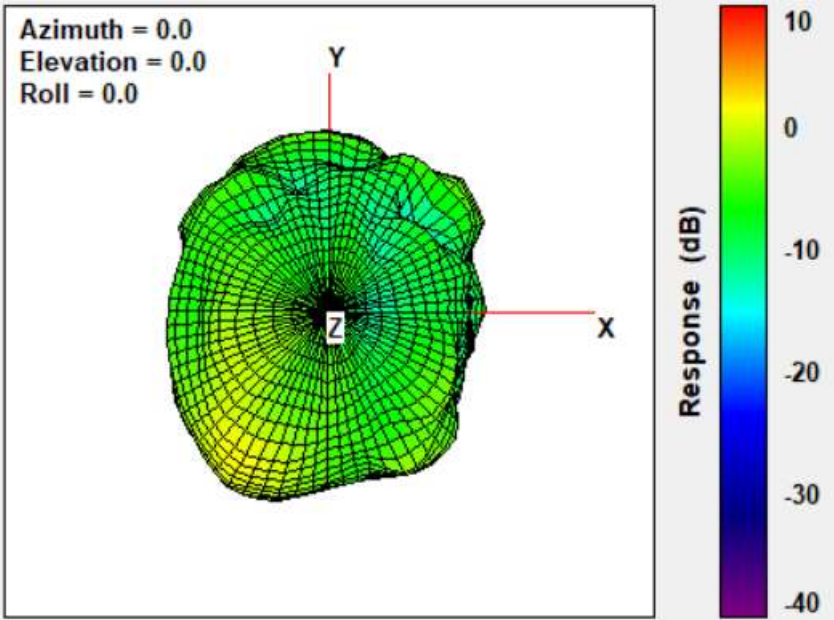
Max Antenna 3D Radiation Pattern 5150-5250 MHz

Frequency (MHz)	Peak Gain w/ Cable Loss (dBi)
5150-5250	-0.08



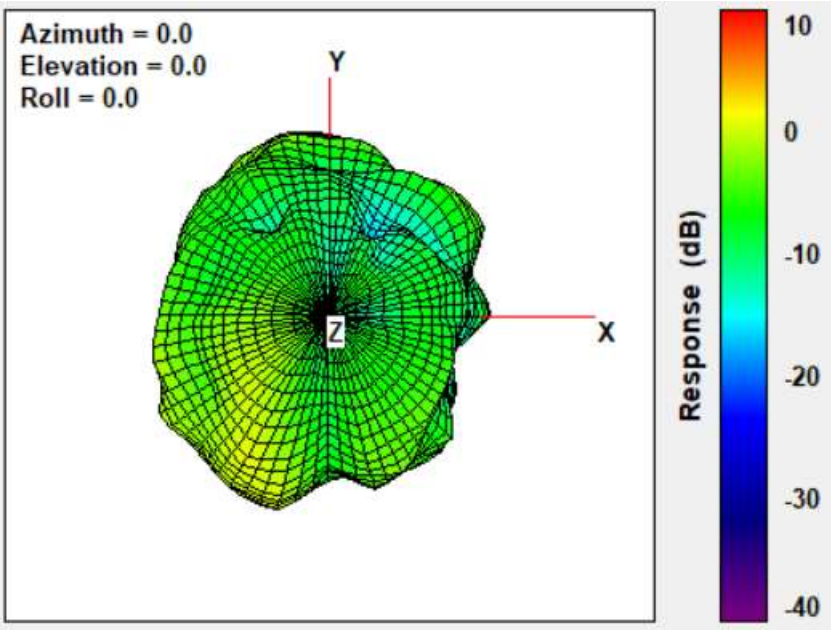
Max Antenna 3D Radiation Pattern 5250-5350 MHz

Frequency (MHz)	Peak Gain w/ Cable Loss (dBi)
5250-5350	0.51



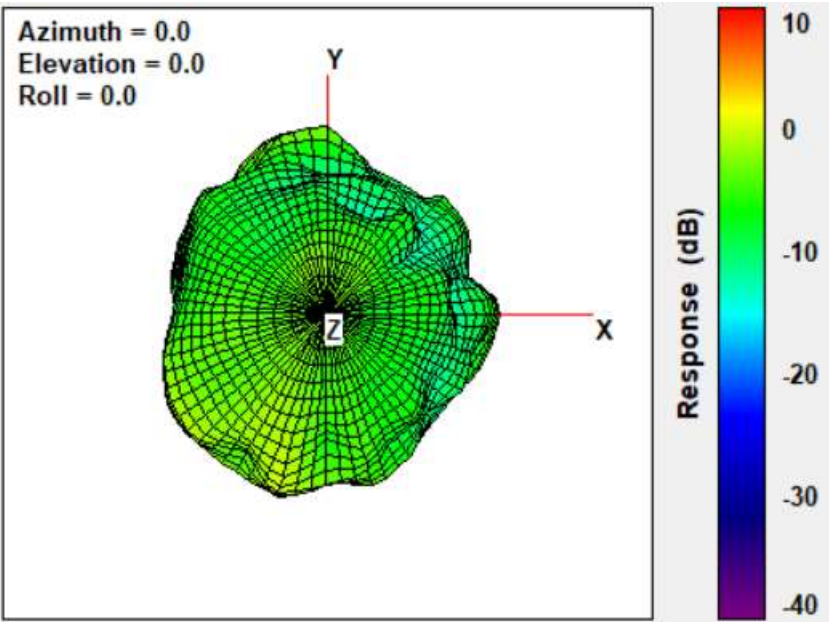
Max Antenna 3D Radiation Pattern 5470-5725 MHz

Frequency (MHz)	Peak Gain w/ Cable Loss (dBi)
5470-5725	1.69



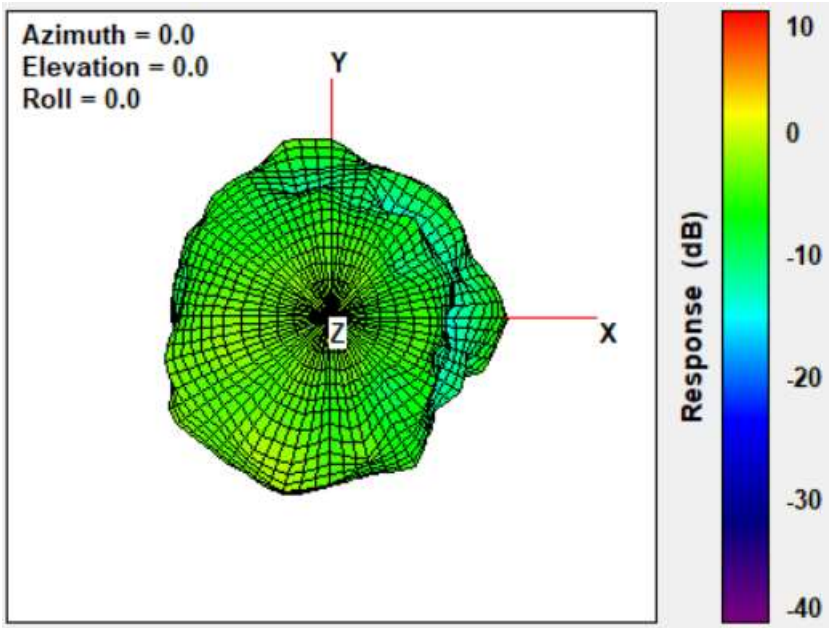
Max Antenna 3D Radiation Pattern 5725-5850 MHz

Frequency (MHz)	Peak Gain w/ Cable Loss (dBi)
5725-5850	1.55



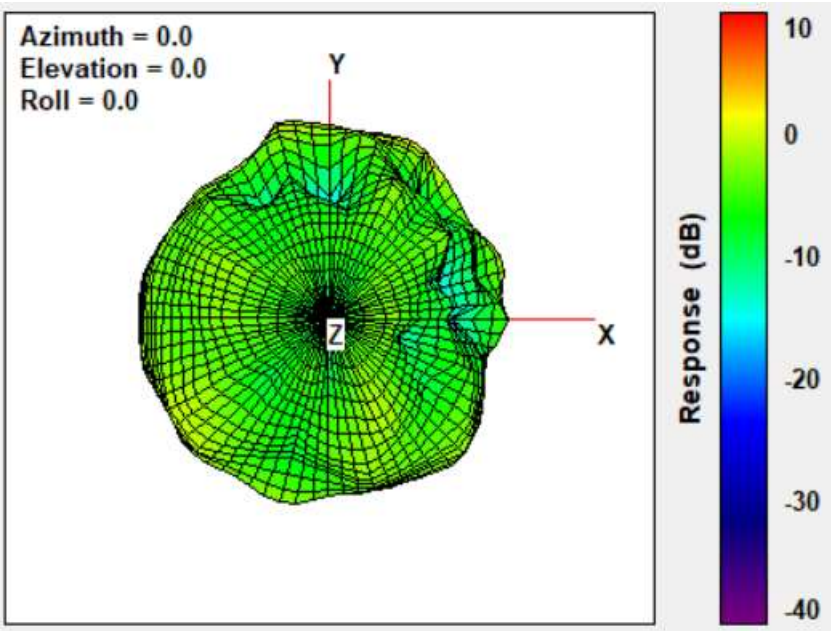
Max Antenna 3D Radiation Pattern 5850-5895 MHz

Frequency (MHz)	Peak Gain w/ Cable Loss (dBi)
5850-5895	-1.23



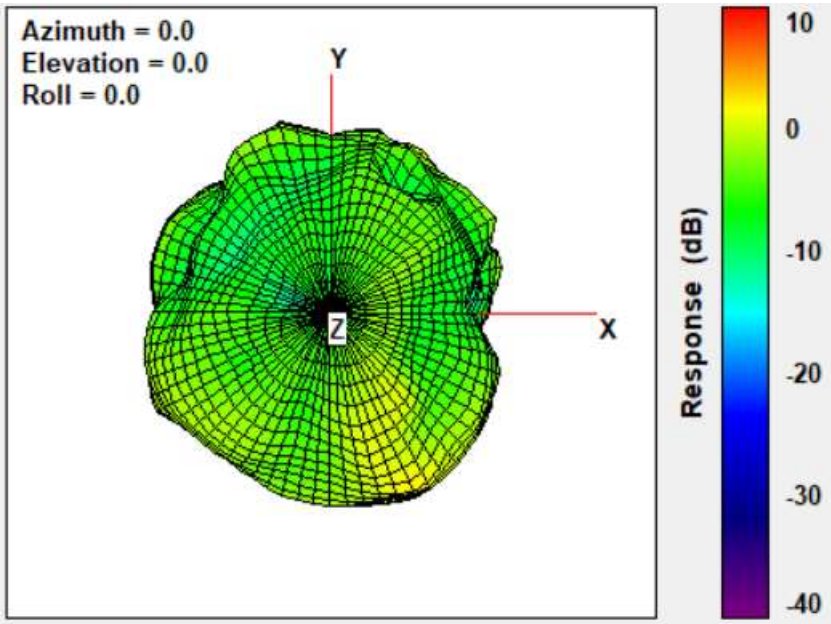
Max Antenna 3D Radiation Pattern 5925-6425 MHz

Frequency (MHz)	Peak Gain w/ Cable Loss (dBi)
5925-6425	2.35



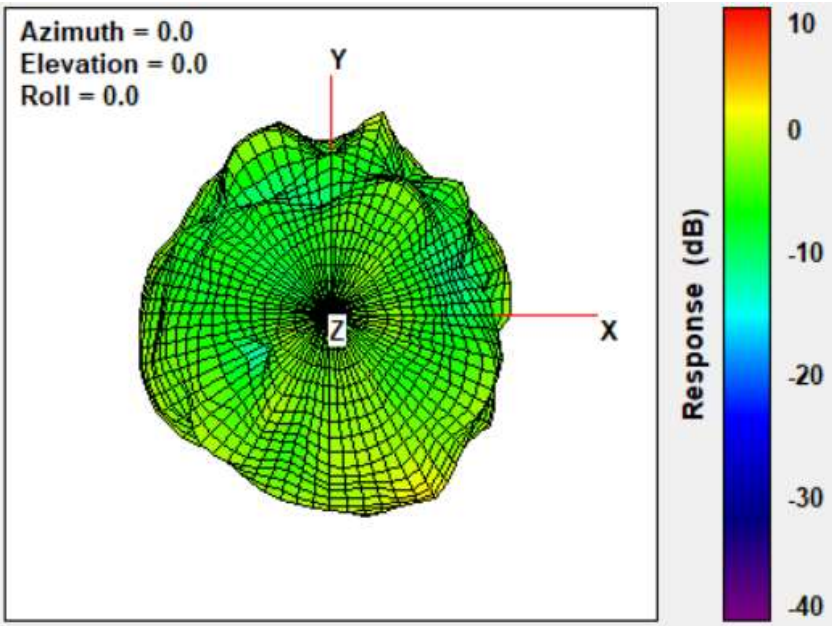
Max Antenna 3D Radiation Pattern 6425-6525 MHz

Frequency (MHz)	Peak Gain w/ Cable Loss (dBi)
6425-6525	1.26



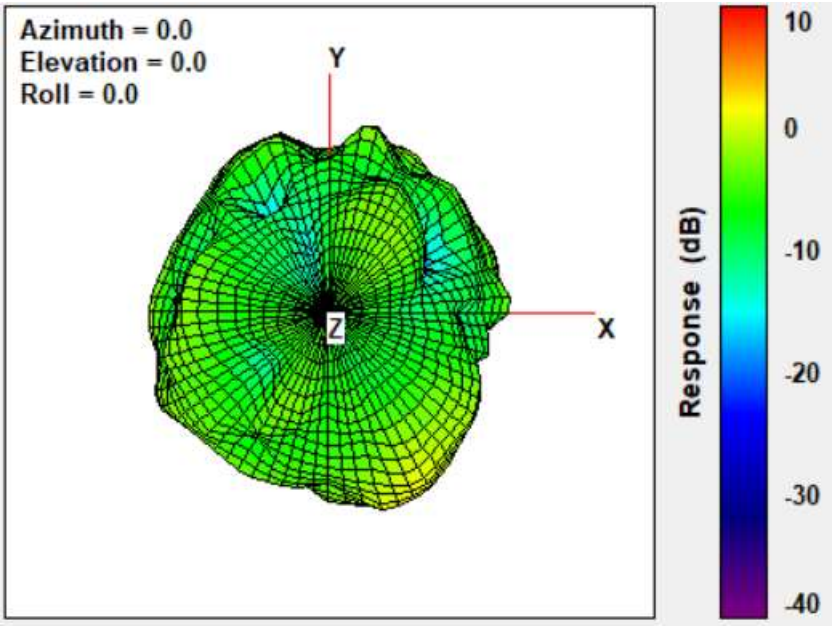
Max Antenna 3D Radiation Pattern 6525-6875 MHz

Frequency (MHz)	Peak Gain w/ Cable Loss (dBi)
6525-6875	1.64



Max Antenna 3D Radiation Pattern 6875-7125 MHz

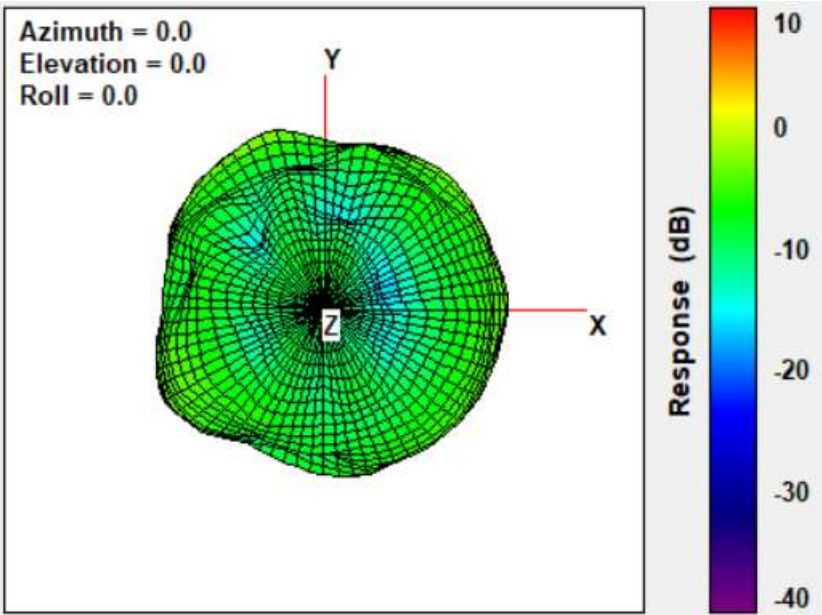
Frequency (MHz)	Peak Gain w/ Cable Loss (dBi)
6875-7125	1.91



Auxiliary Antenna

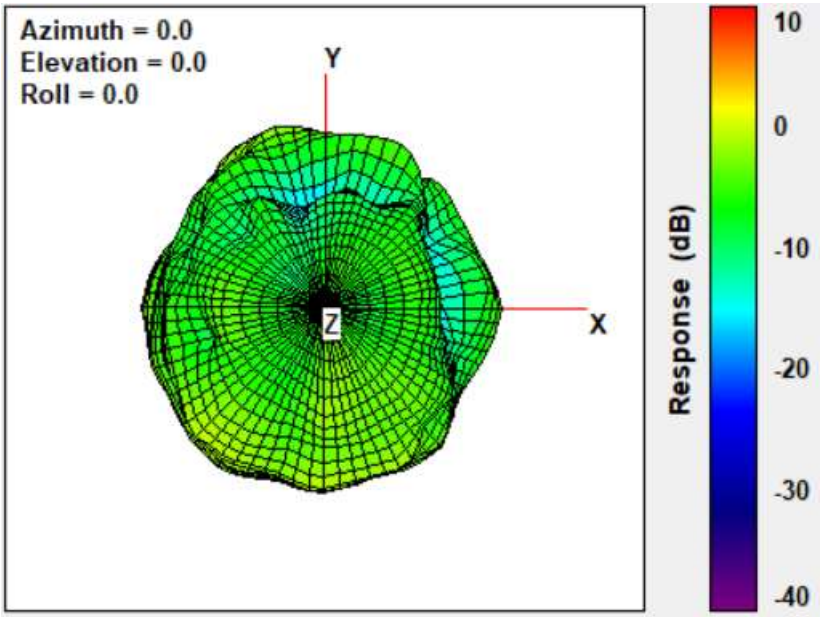
Max Antenna 3D Radiation Pattern 2400 – 2483.5 MHz

Frequency (MHz)	Peak Gain w/ Cable Loss (dBi)
2400-2483.5	-1.71



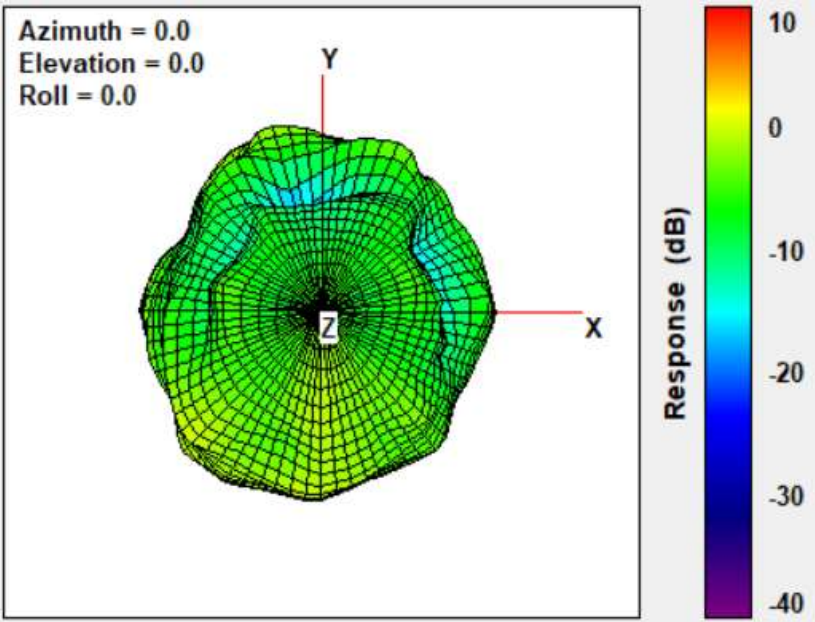
Max Antenna 3D Radiation Pattern 5150-5250 MHz

Frequency (MHz)	Peak Gain w/ Cable Loss (dBi)
5150-5250	0.88



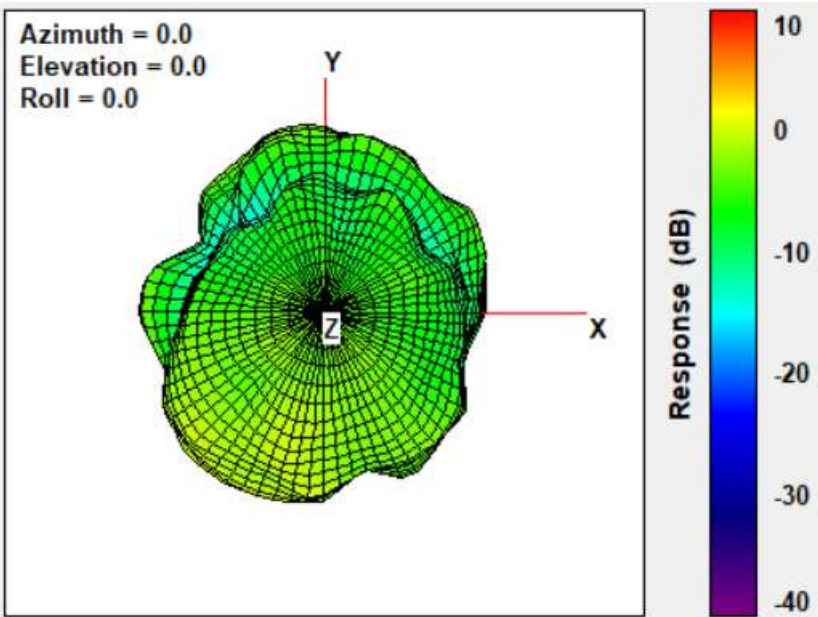
Max Antenna 3D Radiation Pattern 5250-5350 MHz

Frequency (MHz)	Peak Gain w/ Cable Loss (dBi)
5250-5350	0.92



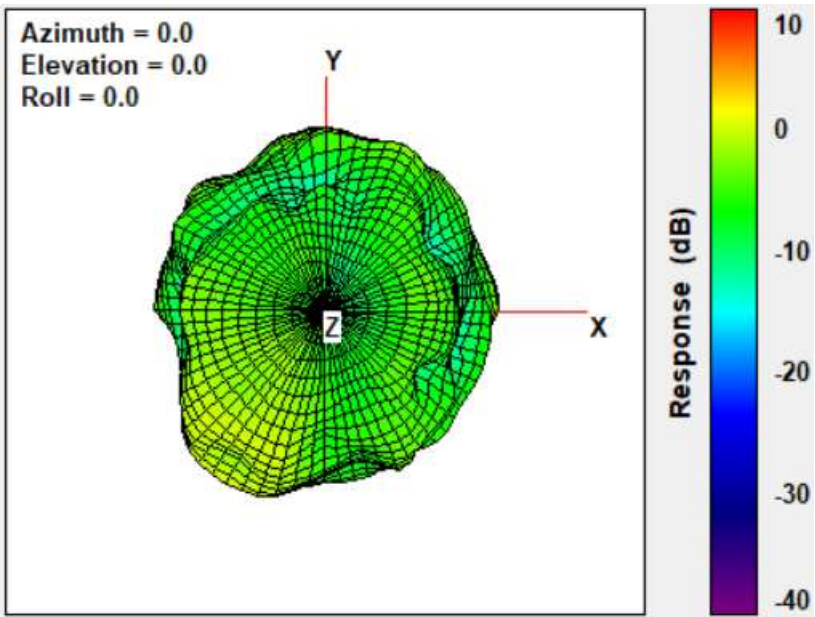
Max Antenna 3D Radiation Pattern 5470-5725 MHz

Frequency (MHz)	Peak Gain w/ Cable Loss (dBi)
5470-5725	1.17



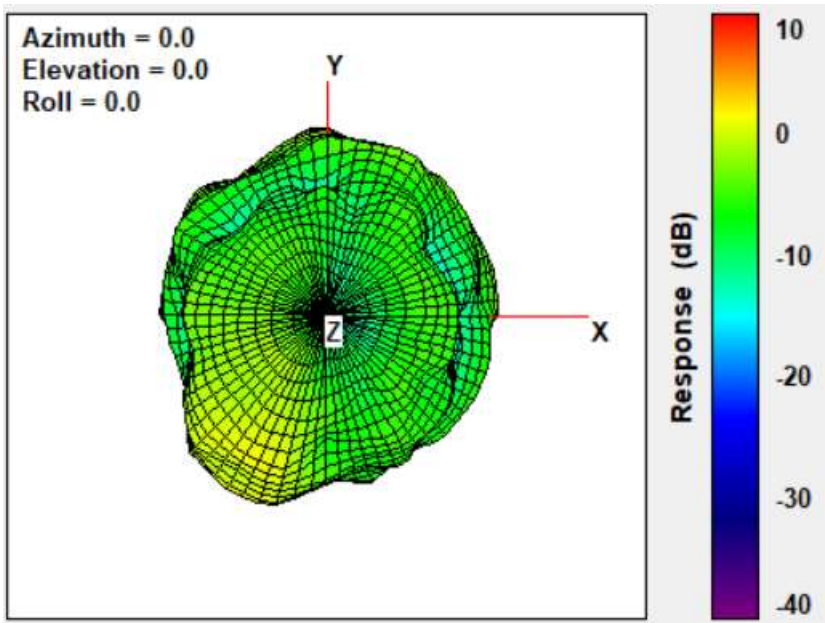
Max Antenna 3D Radiation Pattern 5725-5850 MHz

Frequency (MHz)	Peak Gain w/ Cable Loss (dBi)
5725-5850	0.98



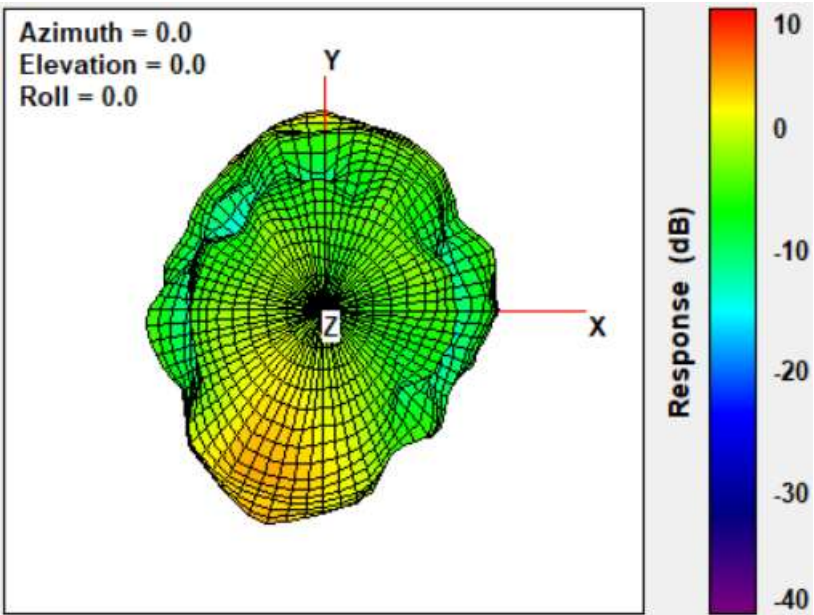
Max Antenna 3D Radiation Pattern 5850-5895 MHz

Frequency (MHz)	Peak Gain w/ Cable Loss (dBi)
5850-5895	0.78



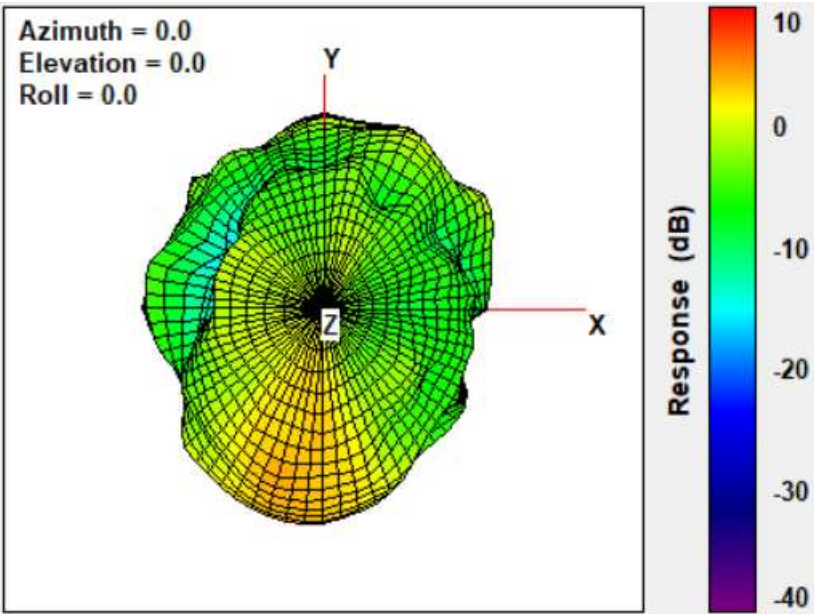
Max Antenna 3D Radiation Pattern 5925-6425 MHz

Frequency (MHz)	Peak Gain w/ Cable Loss (dBi)
5925-6425	1.83



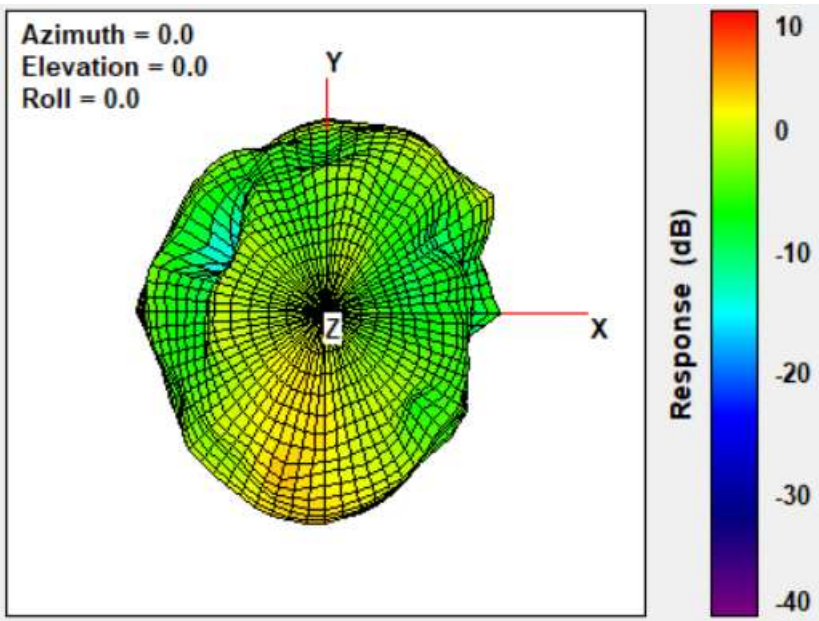
Max Antenna 3D Radiation Pattern 6425-6525 MHz

Frequency (MHz)	Peak Gain w/ Cable Loss (dBi)
6425-6525	1.38



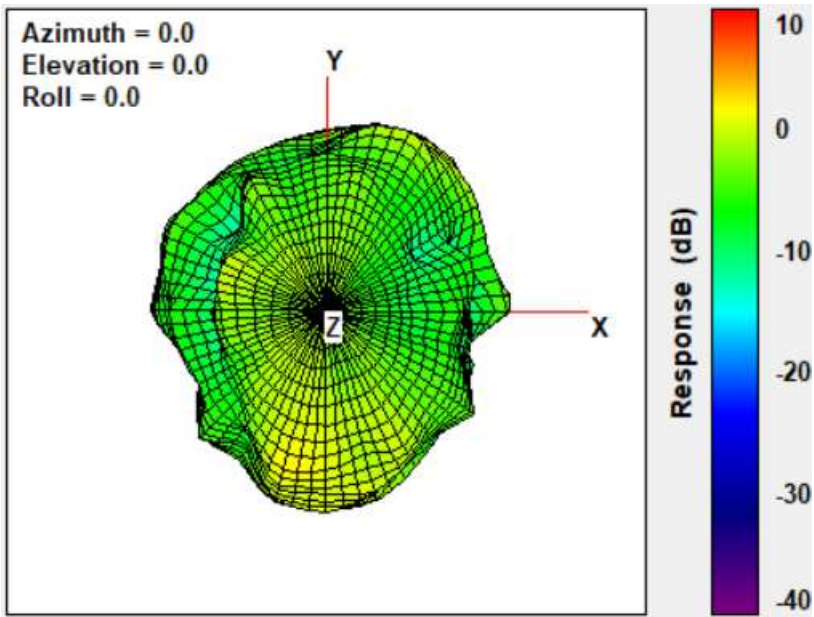
Max Antenna 3D Radiation Pattern 6525-6875 MHz

Frequency (MHz)	Peak Gain w/ Cable Loss (dBi)
6525-6875	1.40



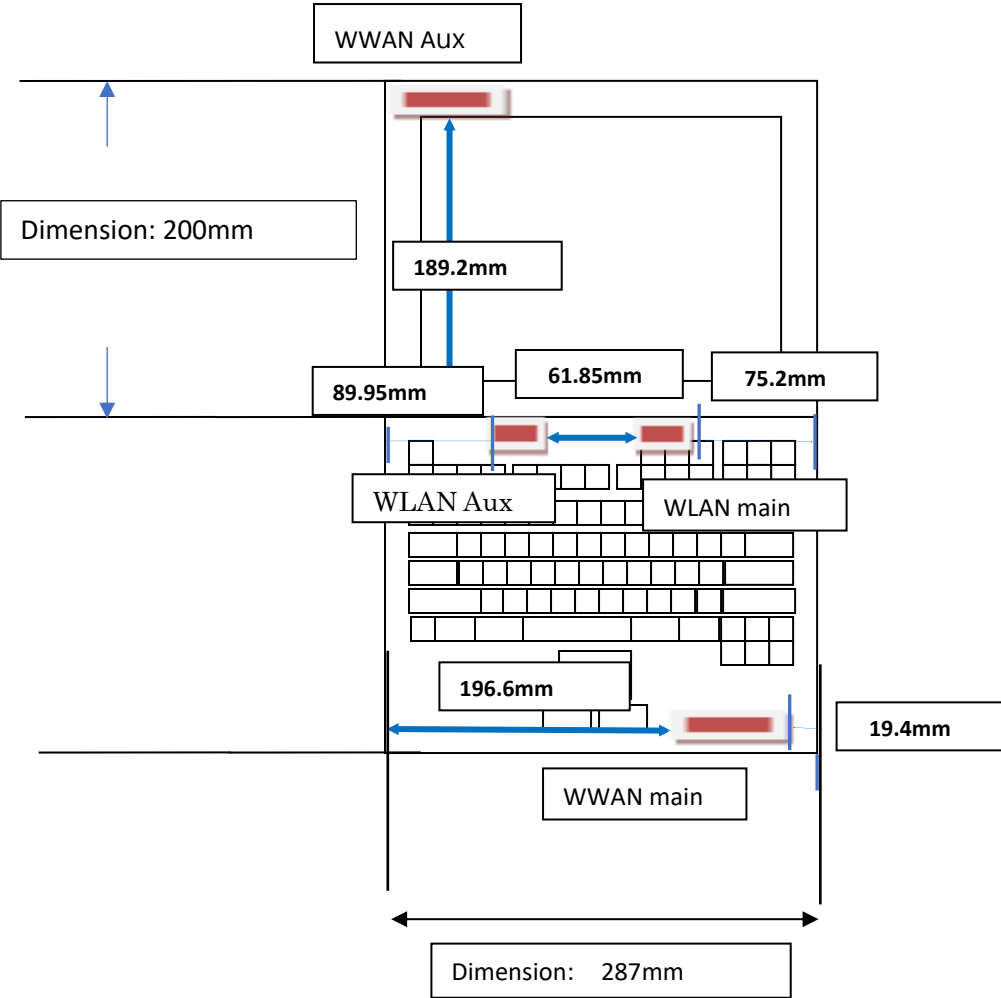
Max Antenna 3D Radiation Pattern 6875-7125 MHz

Frequency (MHz)	Peak Gain w/ Cable Loss (dBi)
6875-7125	1.39



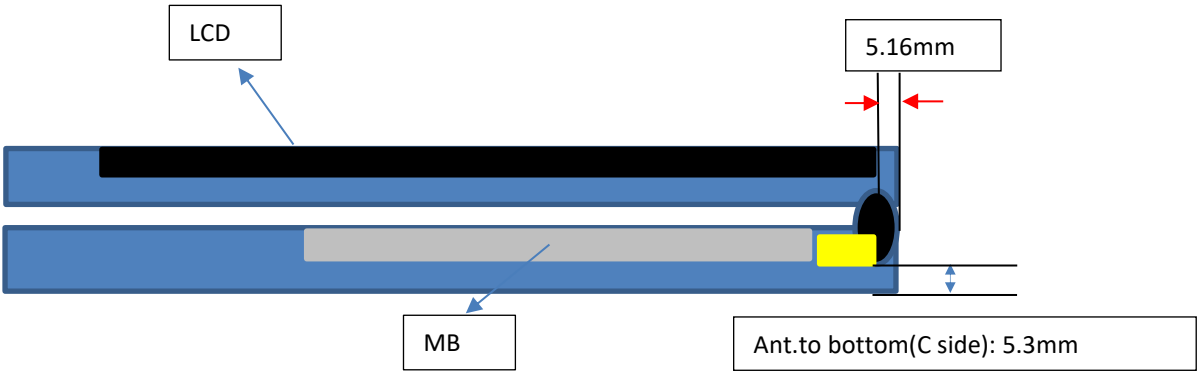
Section 4. Antenna Host Platform Location Information

Laptop mode:

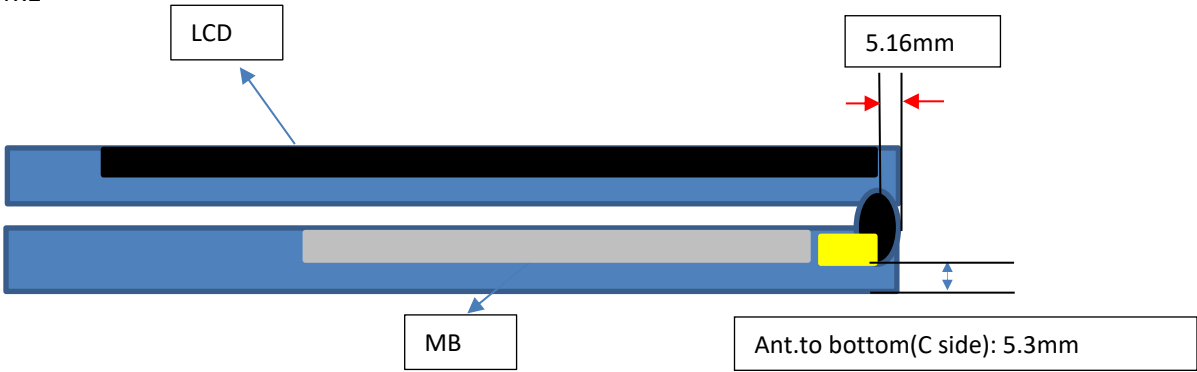


Tablet mode:

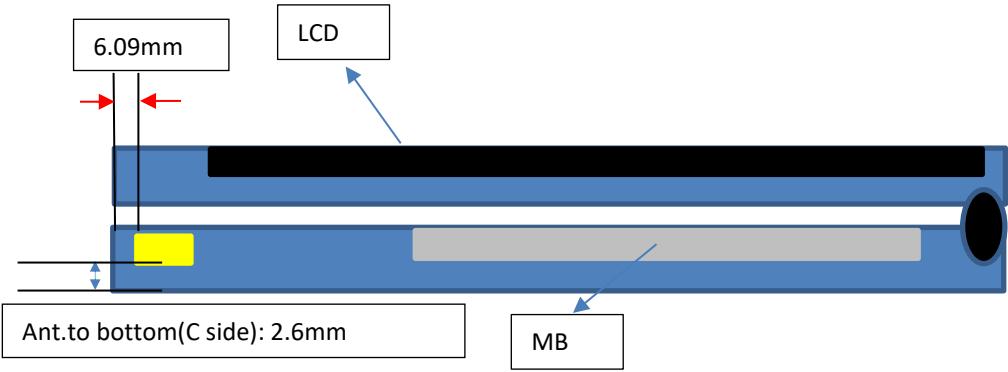
WLAN Main Tx1



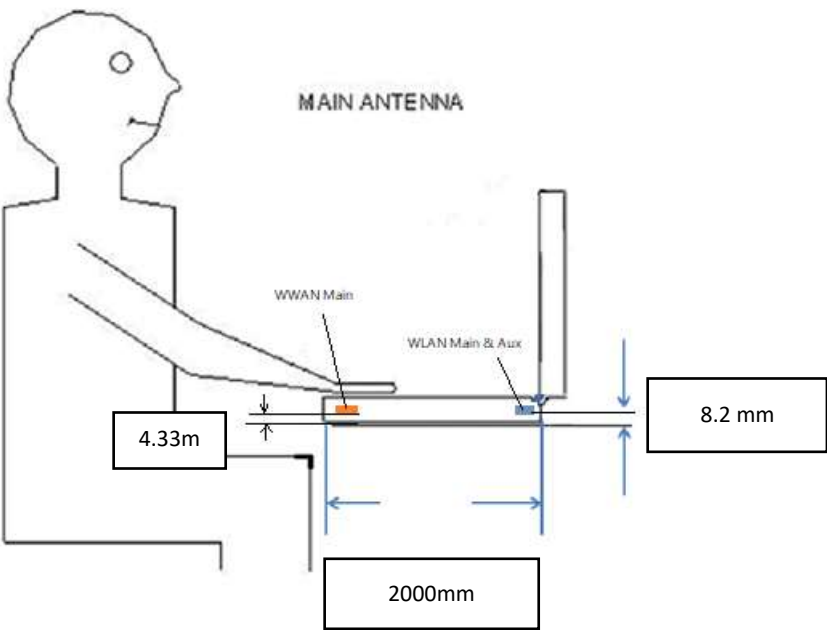
WLAN Aux Tx1



WWAN Main Tx1



Section 5. Antenna dimensional information for SAR evaluation



Tablet mode:

Figure-3:
Tablet PL (Primary Landscape)

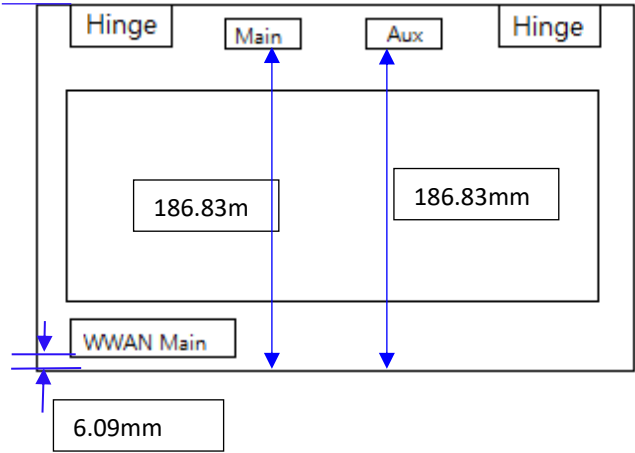


Figure-4:
Tablet PP (Primary Portrait)

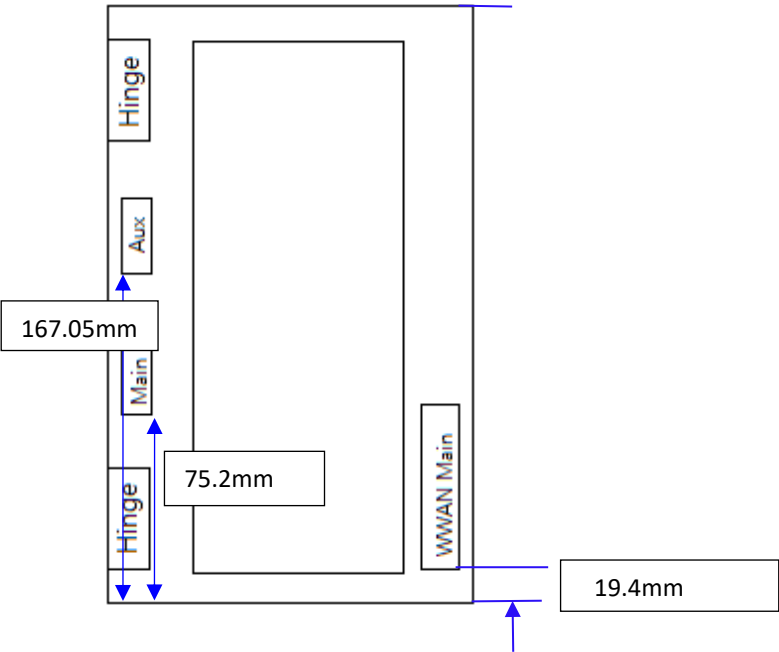


Figure-5:
Tablet SL (Secondary Landscape)

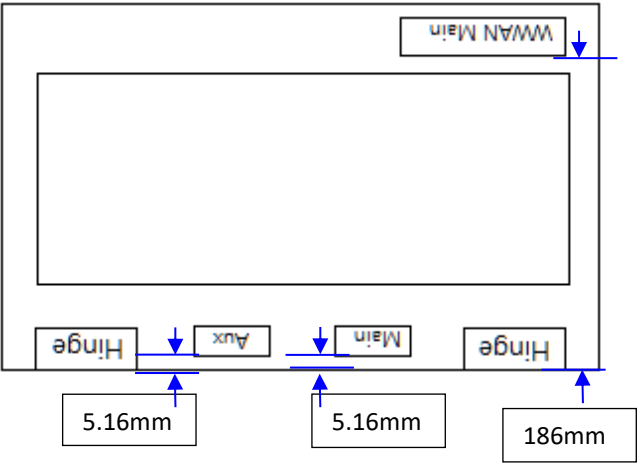
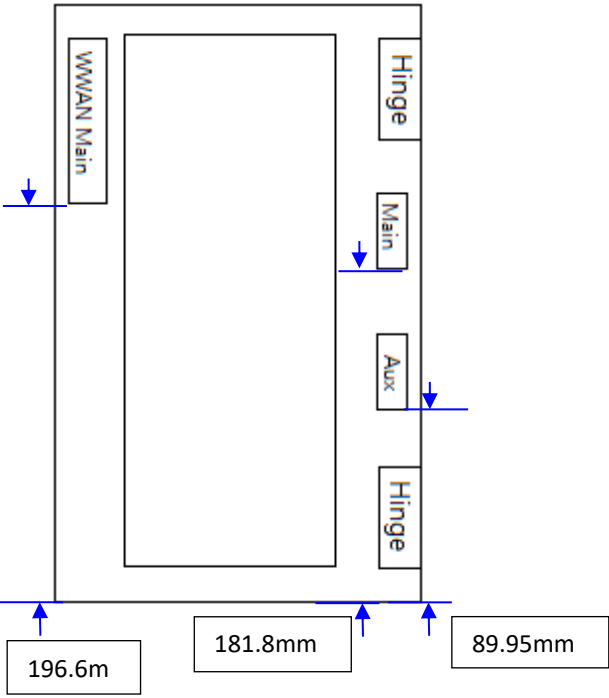


Figure-6:
Tablet SP (Secondary Portrait)



Section 6. Diagram Example of Co-Location Antenna Separation

Figure-1 Notebook mode

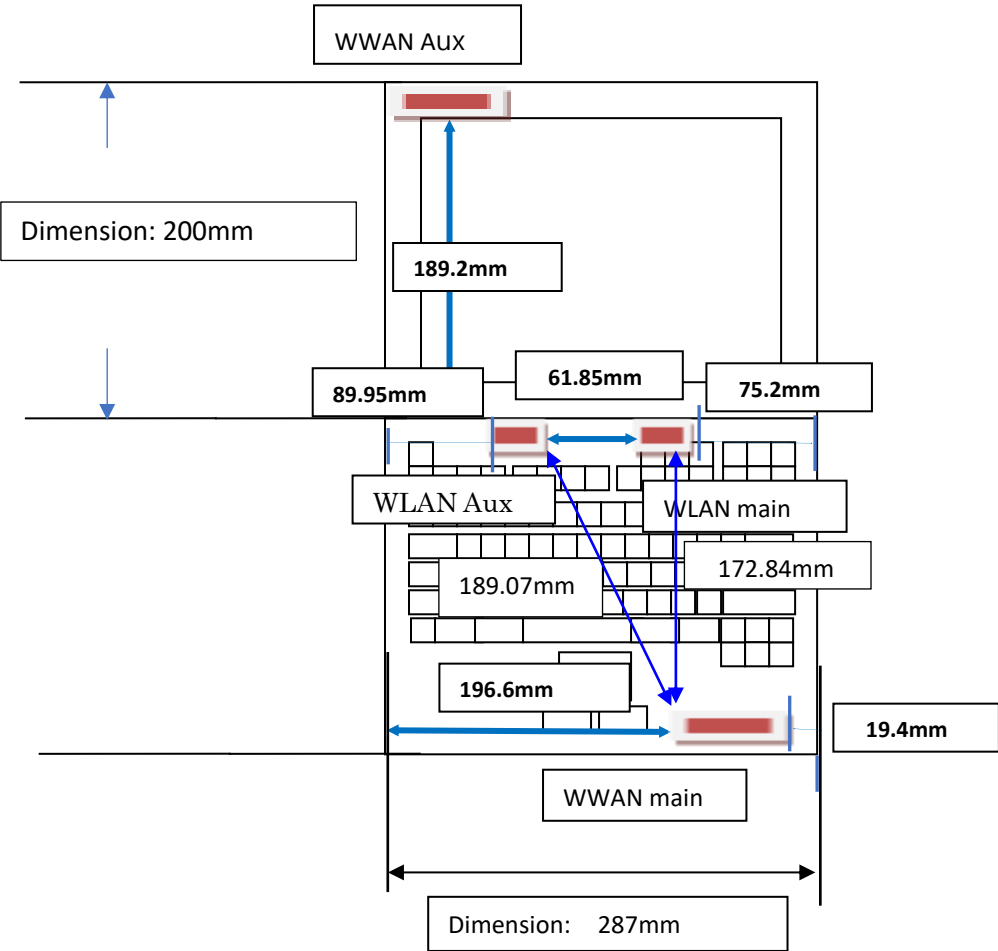
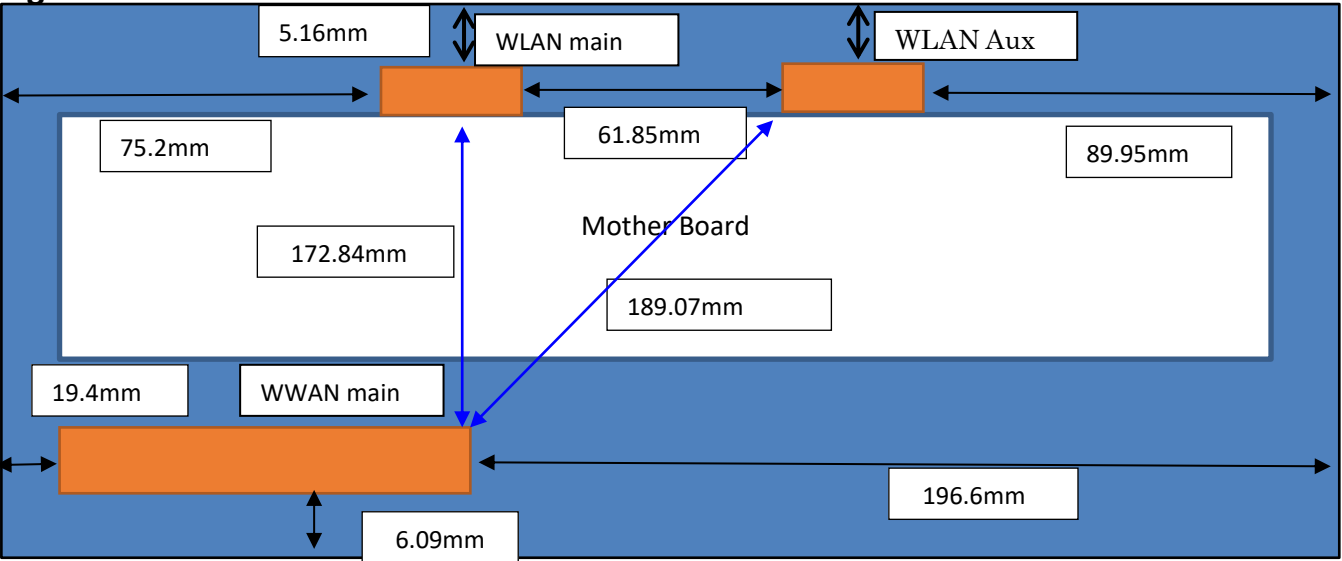


Figure-2 Tablet mode



Revision History

Revision	Description	Date
10.3	<u>Page2-5</u> Add Applicable test method, Test & System Description and Setup photo	July 24, 2022
10.4	<u>Cover page</u> Add Intel 5.9GHz reference antenna gain <u>Cover page/Section1/Section3</u> Add 5.9GHz antenna gain information	September 15, 2022