

安諾電子股份有限公司
Amphenol Taiwan Corporation

APPROVAL SHEET

Customer Name: BYD COMPANY LIMITED

Date: Nov 29, 2022

Customer P/N	14067952-00 14067953-00
Amphenol P/N	BY5964-16-001-C BY5964-16-002-C
Description	WLAN Main Antenna WLAN Aux Antenna
Version	A

Prepared by	Signed by	Approved by Customer
RF Engineer	Danny	
ME Engineer	Barry	
RF Manager	Tommy	
ME Manager	Richard	
Project Manager	George	

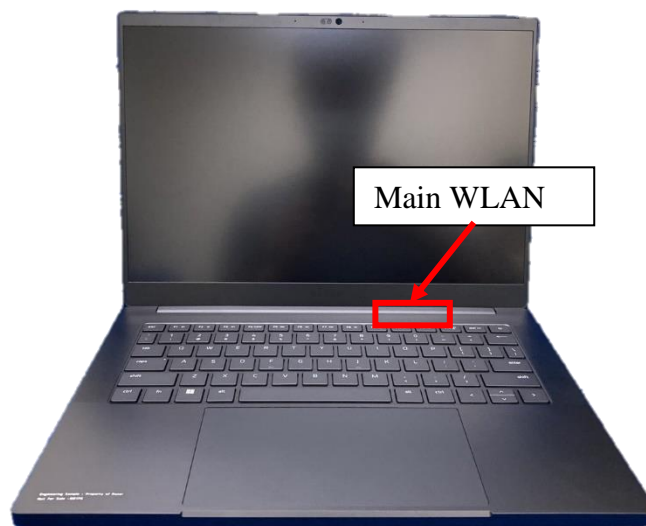
Revision History

DATE	Revision	Description of changes
Nov 29	A	DVT Release

- 1. Description.....3**
- 2. Specification.....6**
- 3. Antenna Performance Test.....10**
- 4. Drawing.....TBD**
- 5. FirstArticleInspection.....TBD**
- 6. Cp/CpkAnalysis.....TBD**
- 7. Reliability report.....TBD**
- 8. GP(RoHs & REACH)TBD**
- 9. QCP.....TBD**
- 10. Package.....TBD**

1. Antenna Description

1.1 Location of the antenna

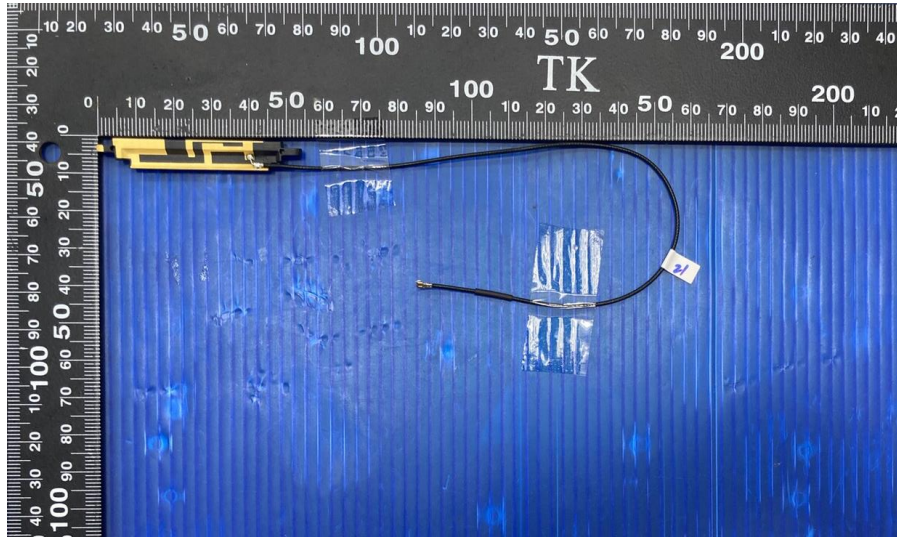
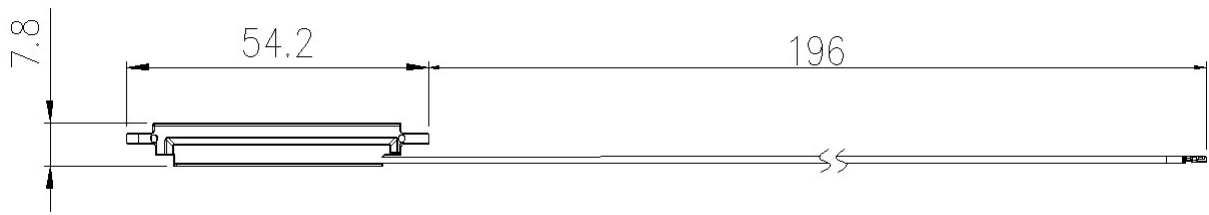


WLAN Main Antenna Structure
1. LDS
2. PIFA type
3.Cable length :196mm
4. Connector type IPX4

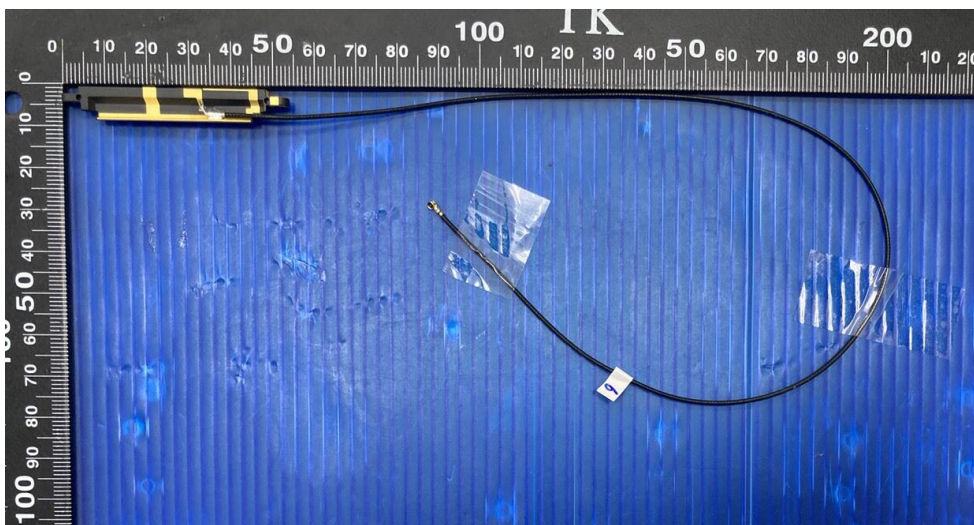
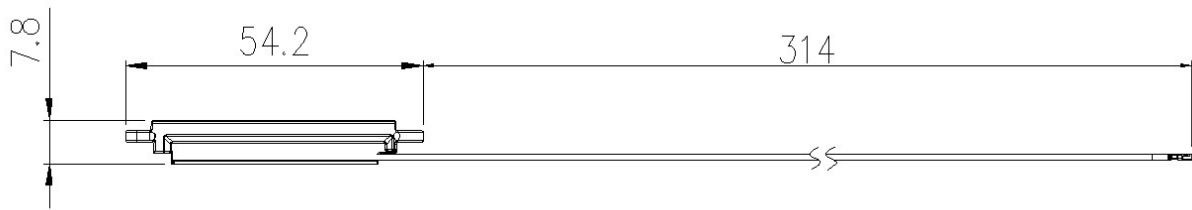


WLAN Aux Antenna Structure
1. LDS
2. PIFA type
3. Cable length :314mm
4. Connector type IPX4

1.2. Picture of the antennas MAIN WLAN



AUX WLAN



1.3 Features of the antenna

The bottom left main wlan antenna is used as a media to transmit and receive data using the 802.11b/g/n/a/ac/ax band.

2. Product Specification

2.1 VSWR (Voltage Standing Wave Ratio)

The VSWR over the frequencies stated in the below table below shall be measured at the connector end of the cable for each antenna assembly. The VSWR are measured with the antennas installed on the whole platform. The VSWR shall be 100% tested in production.

Test Parameter	2400 MHz to 2500 MHz	5150MHz to 5850MHz	5925MHz to 7125MHz
UPL VSWR: Whole platform	3.0:1 max	3.0:1 max	3.0:1 max

2.2 Test environment

The radiation pattern and antenna gain shall be tested either with a conventional far field anechoic chamber or a near field anechoic chamber such as a Satimo StarGate 24.

For a far field anechoic chamber, the gain measurements shall be made within an RF anechoic chamber with at least 3-meter separation from the receive antenna to the antenna under test (AUT). The RF anechoic chamber must be lined with absorptive material rated as a minimum frequency range from 500MHz to 8GHz. The notebook with the antenna assemblies installed shall be placed on a non-conductive structure at a sufficient height to be in the 'quiet zone' of the chamber. All test equipment including horn antennas, adapters, cables, network analyzers, and receivers shall be calibrated per manufacturer's minimum calibration requirements.

For a near field anechoic chamber, the AUT test must be place in the center (and within the admissible offset) of the probe array elements. The RF anechoic chamber must be lined with absorptive material rated as a minimum frequency range from 500MHz to 8GHz. The notebook with the antenna assemblies installed shall be placed on a non-conductive structure.

2.3 Antenna radiation measurement

In order to ensure compliance with Razer specifications, it is required to measure a 3-D gain measurement for WLAN antenna.

Theta Start: 15°	Phi Start: 0°
Theta Stop: 165°	Phi Stop: 345°
Theta increment: 15°	Phi Increment: 15°

Table gain measurement points

The table above specifies the minimum 264 measurement points (x2 polarizations) for each measurement frequency.

The axis and AUT orientation for gain measurements are outlined below in Figure 1.

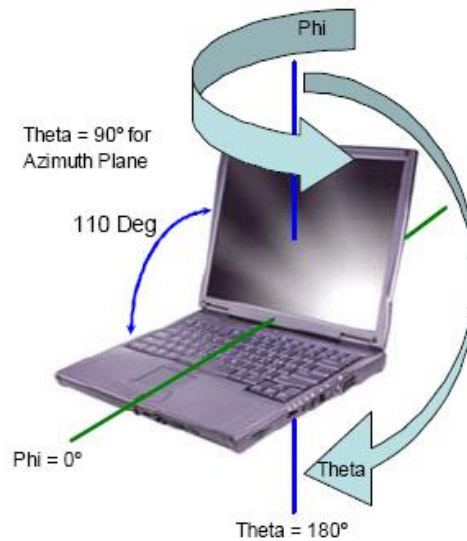


Figure 1AUT orientation and axis definition

2.4. Antenna average gain specification

Test Parameter	2400 GHz to 2500 GHz	5150 GHz to 5850 GHz	5925 GHz to 7125 GHz
Average Gain (Main / Auxiliary) Notebook Open (110°)	>-4dB	>-4.5dB	>-4.5dB

WLAN MAIN antenna average gain specification

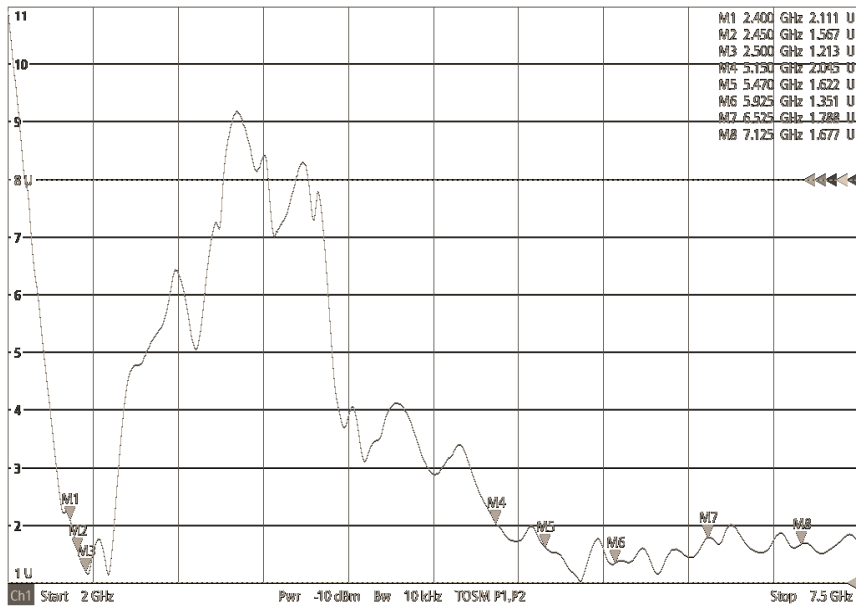
Test Parameter	2400 GHz to 2500 GHz	5150 GHz to 5850 GHz	5925 GHz to 7125 GHz
Peak Gain, Dominant Polarization Notebook Open (110°)	<3.5dBi	<5.5dBi	<5.5dBi

WLAN MAIN antenna peak gain specification

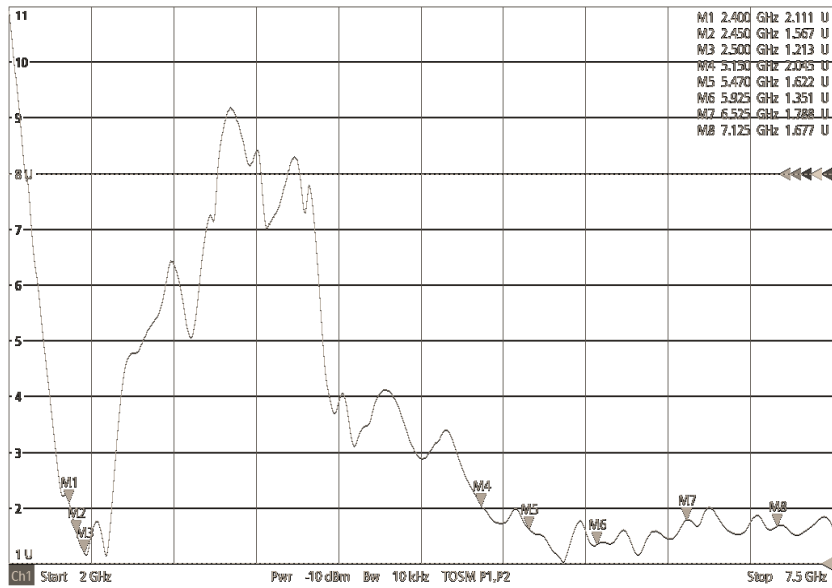
NOTE: Antenna gain includes connector and cable loss.

3. Antenna Performance Test

3.1.1 VSWR_WLAN MAIN



3.1.2 VSWR_WLAN AUX



3.2 Antenna radiated gain

3.2.1. WLAN Main Antenna

WLAN Main				
Freq. (GHz)	Clamshell Mode		Close Mode	
	Effi. (%)	Avg. Gain	Effi. (%)	Avg. Gain
2.4	36	-4.4	21	-6.7
2.45	42	-3.7	23	-6.4
2.5	44	-3.6	23	-6.3
5.15	42	-3.8	42	-3.8
5.25	43	-3.6	45	-3.5
5.35	38	-4.2	37	-4.3
5.47	35	-4.5	31	-5.1
5.6	46	-3.3	33	-4.8
5.725	40	-4.0	34	-4.6
5.785	42	-3.8	31	-5.1
5.8	39	-4.1	33	-4.8
5.85	33	-4.8	35	-4.5
5.925	46	-3.3	39	-4.1
6.175	36	-4.5	32	-5.0
6.425	38	-4.2	36	-4.4
6.525	34	-4.7	33	-4.8
6.7	32	-4.9	33	-4.8
6.875	41	-3.9	36	-4.4
7	36	-4.4	33	-4.9
7.125	41	-3.9	33	-4.8

WLAN Main	Open Mode	Close Mode
Average Effi. @2.4G	41%	22%
Average Effi. @5G	40%	36%
Average Effi. @6G	38%	34%

WLAN Main	
Freq. (GHz)	Clamshell Mode Peak Gain(dBi)
2.4	3.16
2.45	2.01
2.5	3.09
5.15	2.76
5.25	2.33
5.35	2.69
5.47	3.89
5.6	4.24
5.725	3.94
5.785	3.69
5.800	3.75
5.850	3.45
5.925	3.70
6.175	4.57
6.425	4.11
6.525	3.04
6.7	2.10
6.875	3.71
7.000	2.50
7.125	4.37

3.2.2. WLAN Aux Antenna

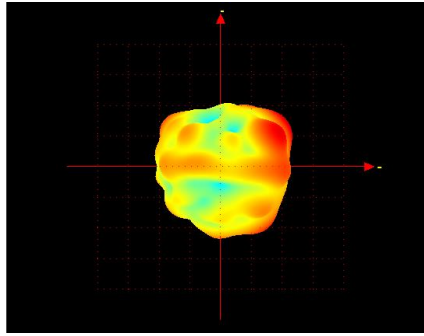
WLAN Aux				
Freq. (GHz)	Clamshell Mode		Close Mode	
	Effi. (%)	Avg. Gain	Effi. (%)	Avg. Gain
2.4	43	-3.6	24	-6.3
2.45	44	-3.5	22	-6.7
2.5	40	-4.0	18	-7.5
5.15	40	-3.9	33	-4.8
5.25	37	-4.3	34	-4.7
5.35	39	-4.1	34	-4.7
5.47	38	-4.2	31	-5.1
5.6	45	-3.5	36	-4.4
5.725	39	-4.1	37	-4.4
5.785	41	-3.8	35	-4.5
5.8	39	-4.1	37	-4.3
5.85	38	-4.2	36	-4.5
5.925	39	-4.1	36	-4.5
6.175	35	-4.6	27	-5.7
6.425	36	-4.4	28	-5.6
6.525	37	-4.3	30	-5.2
6.7	40	-4.0	30	-5.2
6.875	38	-4.1	36	-4.4
7	34	-4.7	38	-4.2
7.125	38	-4.2	42	-3.8

WLAN Aux	Open Mode	Close Mode
Average Effi. @2.4G	42%	21%
Average Effi. @5G	40%	35%
Average Effi. @6G	37%	33%

WLAN Aux	
Freq. (GHz)	Clamshell Mode Peak Gain(dBi)
2.4	3.09
2.45	2.84
2.5	2.67
5.15	2.65
5.25	2.71
5.35	1.99
5.47	3.55
5.6	4.33
5.725	3.95
5.785	3.96
5.800	3.93
5.850	3.72
5.925	3.27
6.175	2.14
6.425	1.55
6.525	3.25
6.7	3.46
6.875	2.61
7.000	1.51
7.125	2.95

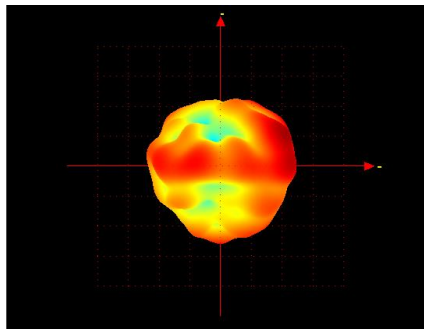
WLAN Main Antenna radiation pattern

Main antenna: 2400 MHz



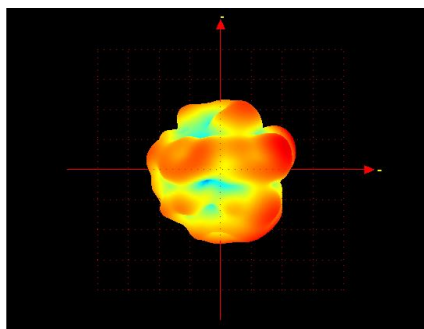
Frequency (MHz)	2400 MHz
Peak Gain w/ Cable Loss (dBi)	3.16

Main antenna: 2450 MHz



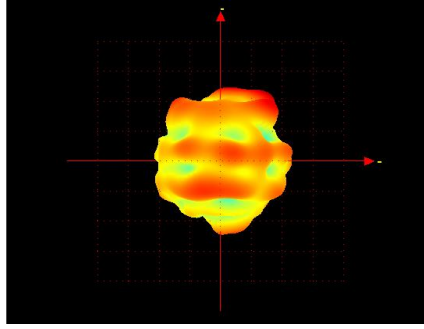
Frequency (MHz)	2450 MHz
Peak Gain w/ Cable Loss (dBi)	2.01

Main antenna: 2500 MHz



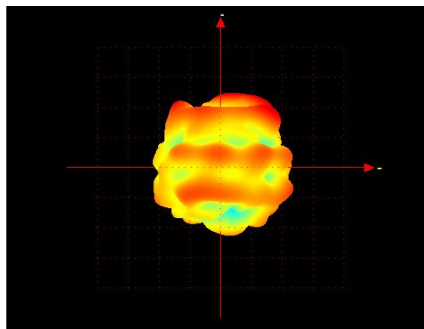
Frequency (MHz)	2500MHz
Peak Gain w/ Cable Loss (dBi)	3.09

Main antenna: 5150 MHz



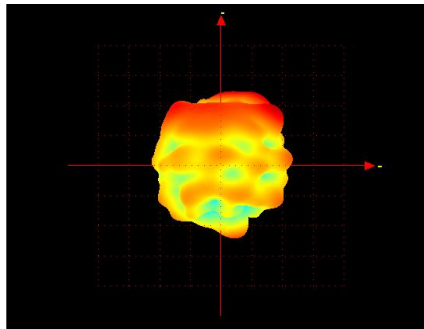
Frequency (MHz)	5150 MHz
Peak Gain w/ Cable Loss (dBi)	2.76

Main antenna: 5250 MHz



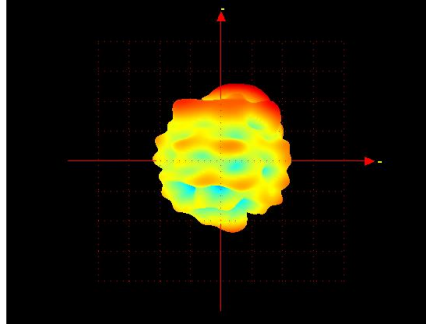
Frequency (MHz)	5250MHz
Peak Gain w/ Cable Loss (dBi)	2.33

Main antenna: 5350 MHz



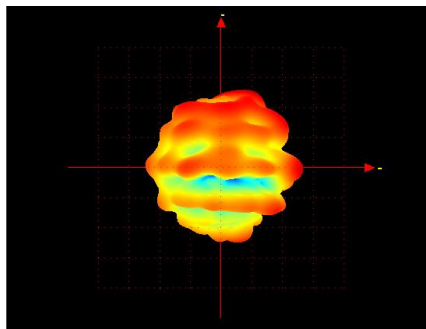
Frequency (MHz)	5350MHz
Peak Gain w/ Cable Loss (dBi)	2.69

Main antenna: 5470 MHz



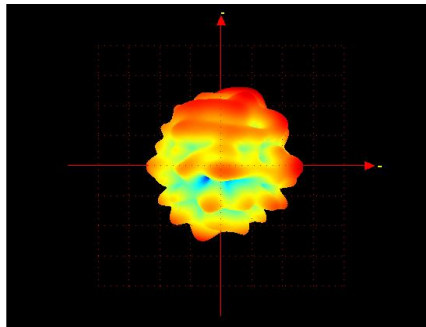
Frequency (MHz)	5470 MHz
Peak Gain w/ Cable Loss (dBi)	3.89

Main antenna: 5600 MHz



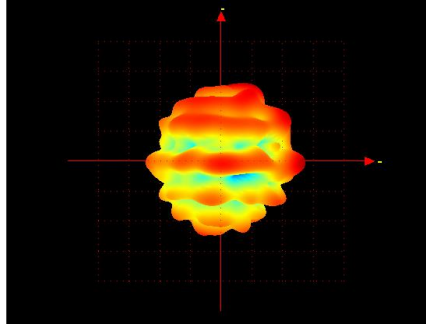
Frequency (MHz)	5600 MHz
Peak Gain w/ Cable Loss (dBi)	4.24

Main antenna: 5725 MHz



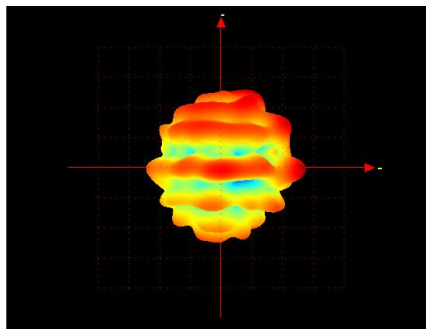
Frequency (MHz)	5725 MHz
Peak Gain w/ Cable Loss (dBi)	3.94

Main antenna: 5785 MHz



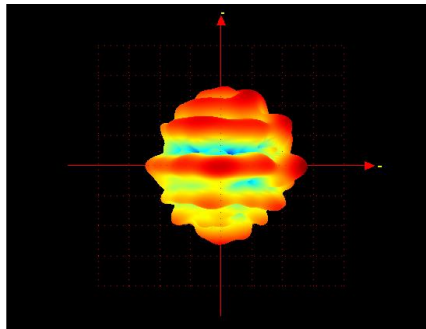
Frequency (MHz)	5785 MHz
Peak Gain w/ Cable Loss (dBi)	3.69

Main antenna: 5800 MHz



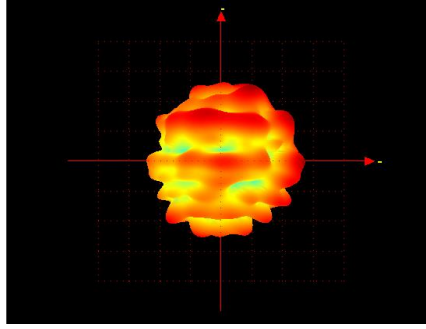
Frequency (MHz)	5800 MHz
Peak Gain w/ Cable Loss (dBi)	3.75

Main antenna: 5850 MHz



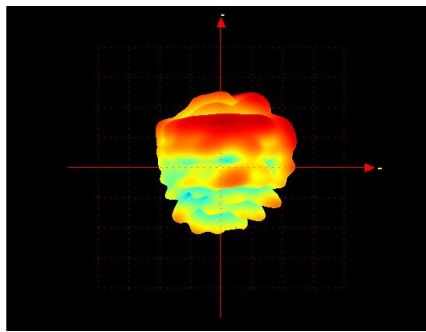
Frequency (MHz)	5850 MHz
Peak Gain w/ Cable Loss (dBi)	3.45

Main antenna: 5925 MHz



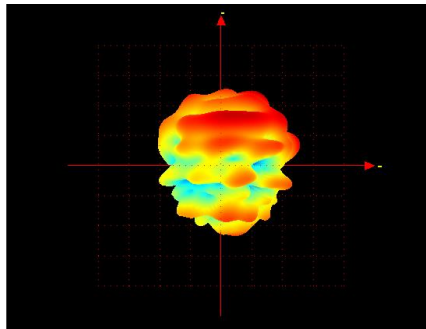
Frequency (MHz)	5925 MHz
Peak Gain w/ Cable Loss (dBi)	3.70

Main antenna: 6175 MHz



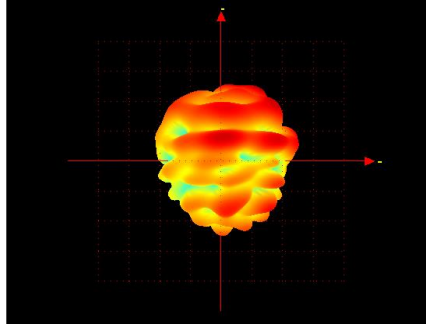
Frequency (MHz)	6175 MHz
Peak Gain w/ Cable Loss (dBi)	4.57

Main antenna: 6425 MHz



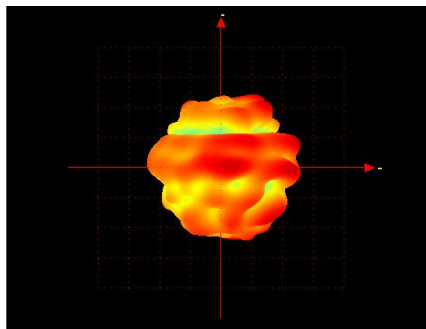
Frequency (MHz)	6425 MHz
Peak Gain w/ Cable Loss (dBi)	4.11

Main antenna: 6525 MHz



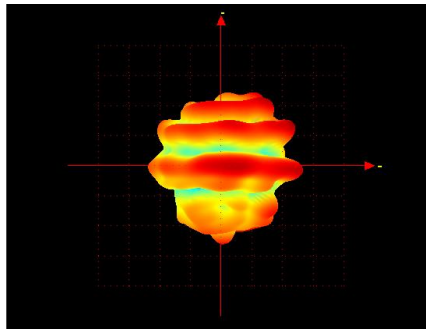
Frequency (MHz)	6525 MHz
Peak Gain w/ Cable Loss (dBi)	3.04

Main antenna: 6700 MHz



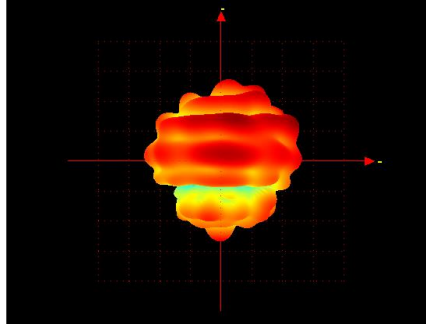
Frequency (MHz)	6700 MHz
Peak Gain w/ Cable Loss (dBi)	2.10

Main antenna: 6875 MHz



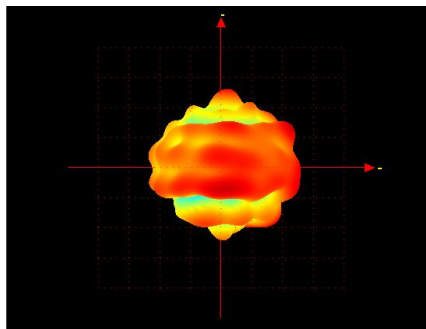
Frequency (MHz)	6875 MHz
Peak Gain w/ Cable Loss (dBi)	3.71

Main antenna: 7000 MHz



Frequency (MHz)	7000 MHz
Peak Gain w/ Cable Loss (dBi)	2.50

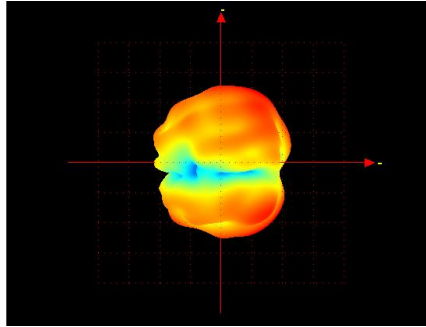
Main antenna: 7125 MHz



Frequency (MHz)	7125 MHz
Peak Gain w/ Cable Loss (dBi)	4.37

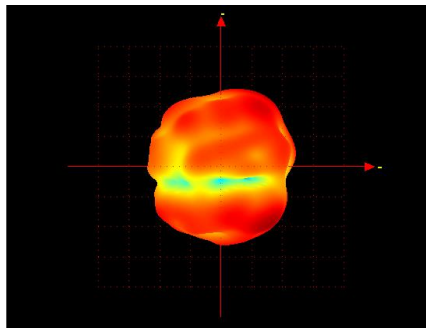
WLAN Aux Antenna radiation pattern

Aux antenna: 2400 MHz



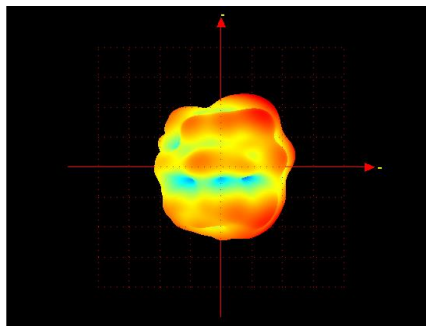
Frequency (MHz)	2400 MHz
Peak Gain w/ Cable Loss (dBi)	3.09

Aux antenna: 2450 MHz



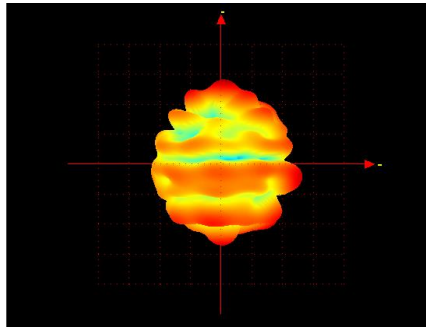
Frequency (MHz)	2450 MHz
Peak Gain w/ Cable Loss (dBi)	2.84

Aux antenna: 2500 MHz



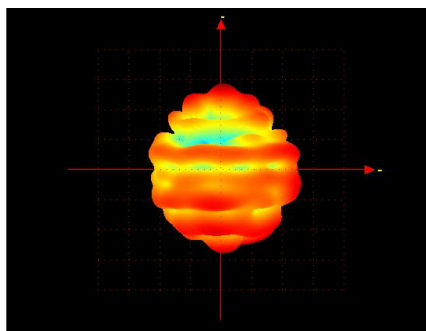
Frequency (MHz)	2500MHz
Peak Gain w/ Cable Loss (dBi)	2.67

Aux antenna: 5150 MHz



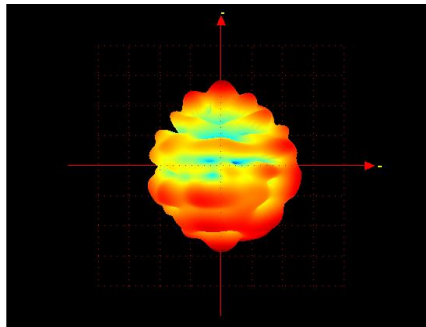
Frequency (MHz)	5150 MHz
Peak Gain w/ Cable Loss (dBi)	2.65

Aux antenna: 5250 MHz



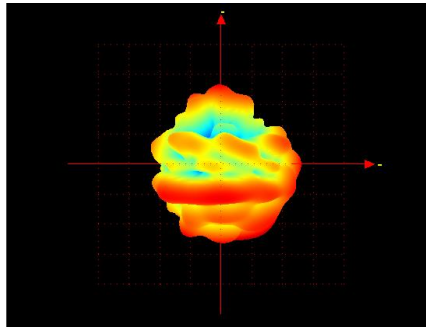
Frequency (MHz)	5250MHz
Peak Gain w/ Cable Loss (dBi)	2.71

Aux antenna: 5350 MHz



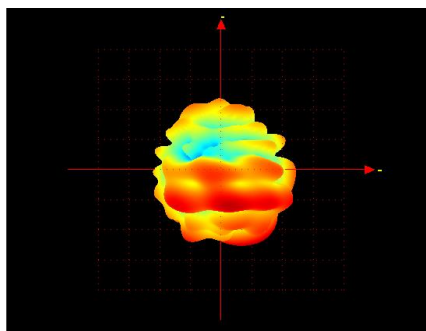
Frequency (MHz)	5350MHz
Peak Gain w/ Cable Loss (dBi)	1.99

Aux antenna: 5470 MHz



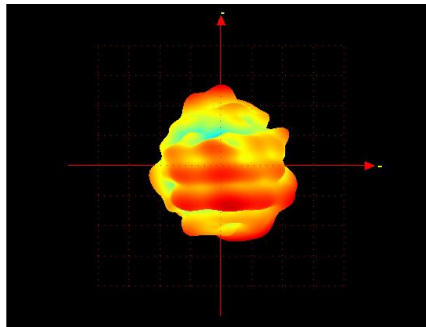
Frequency (MHz)	5470 MHz
Peak Gain w/ Cable Loss (dBi)	3.55

Aux antenna: 5600 MHz



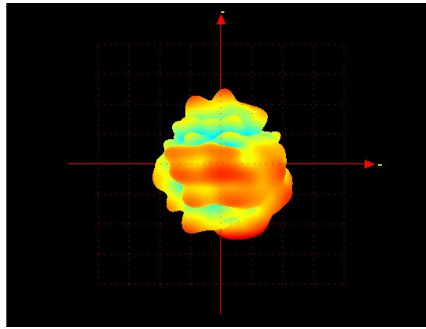
Frequency (MHz)	5600 MHz
Peak Gain w/ Cable Loss (dBi)	4.33

Aux antenna: 5725 MHz



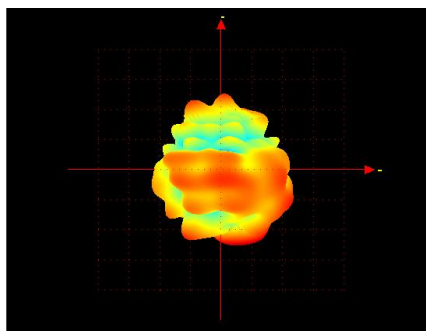
Frequency (MHz)	5725 MHz
Peak Gain w/ Cable Loss (dBi)	3.95

Aux antenna: 5785 MHz



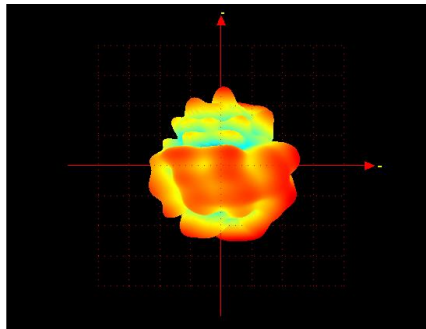
Frequency (MHz)	5785 MHz
Peak Gain w/ Cable Loss (dBi)	3.96

Aux antenna: 5800 MHz



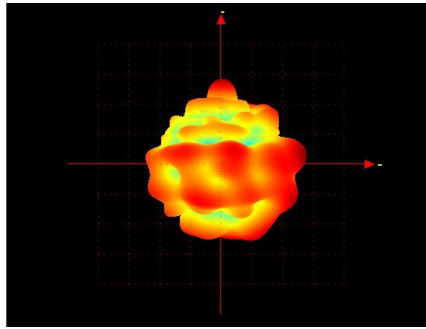
Frequency (MHz)	5800 MHz
Peak Gain w/ Cable Loss (dBi)	3.93

Aux antenna: 5850 MHz



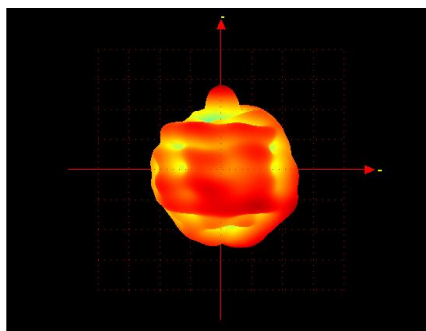
Frequency (MHz)	5850 MHz
Peak Gain w/ Cable Loss (dBi)	3.72

Aux antenna: 5925 MHz



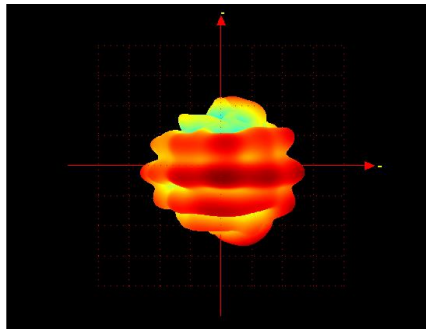
Frequency (MHz)	5925 MHz
Peak Gain w/ Cable Loss (dBi)	3.27

Aux antenna: 6175 MHz



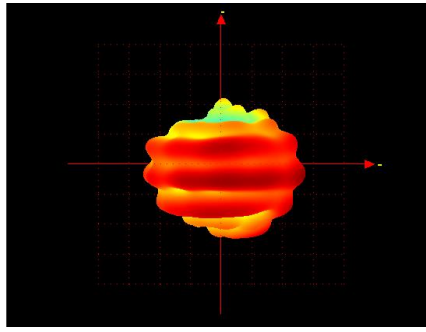
Frequency (MHz)	6175 MHz
Peak Gain w/ Cable Loss (dBi)	2.14

Aux antenna: 6425 MHz



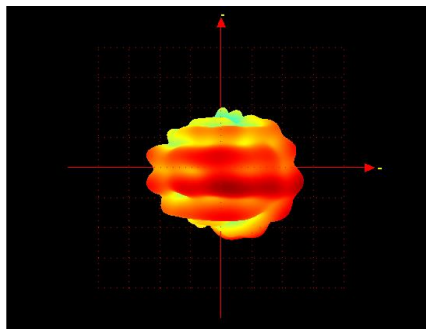
Frequency (MHz)	6425 MHz
Peak Gain w/ Cable Loss (dBi)	1.55

Aux antenna: 6525 MHz



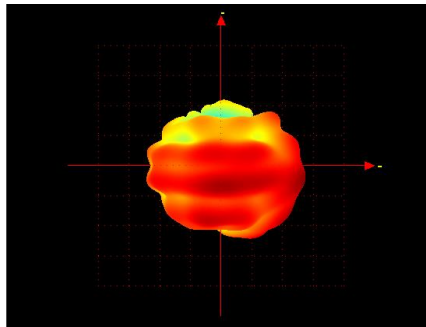
Frequency (MHz)	6525 MHz
Peak Gain w/ Cable Loss (dBi)	3.25

Aux antenna: 6700 MHz



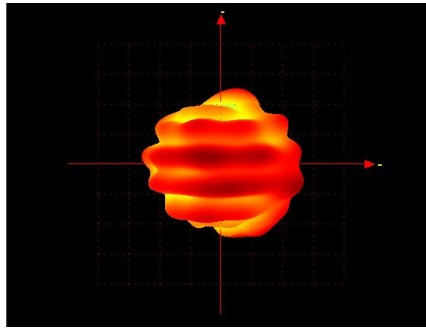
Frequency (MHz)	6700 MHz
Peak Gain w/ Cable Loss (dBi)	3.46

Aux antenna: 6875 MHz



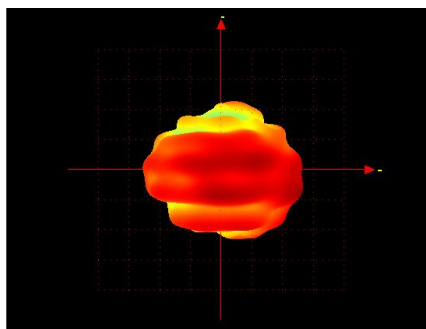
Frequency (MHz)	6875 MHz
Peak Gain w/ Cable Loss (dBi)	2.61

Aux antenna: 7000 MHz



Frequency (MHz)	7000 MHz
Peak Gain w/ Cable Loss (dBi)	1.51

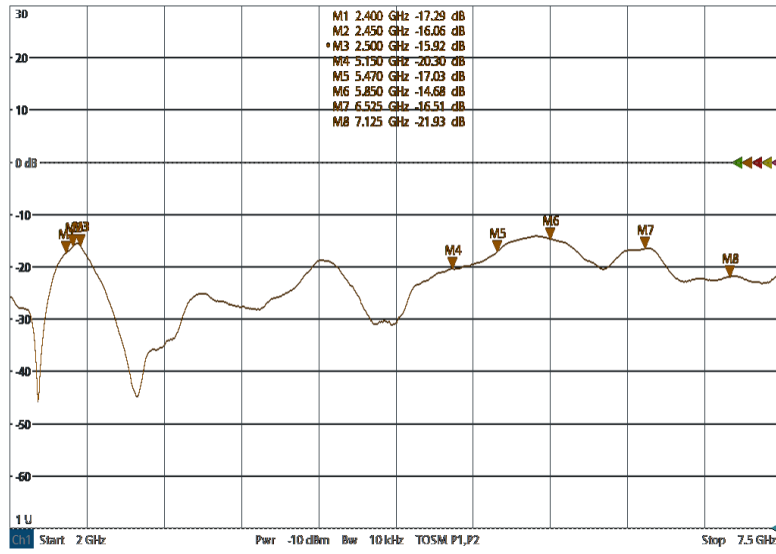
Aux antenna: 7125 MHz



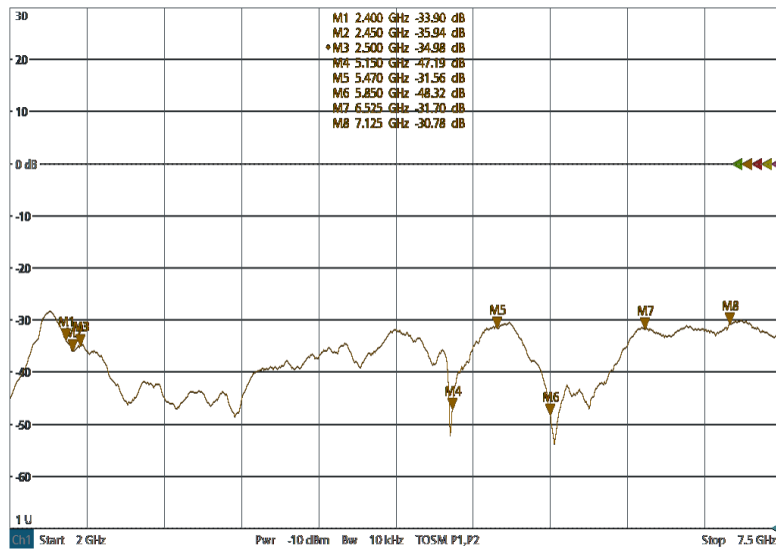
Frequency (MHz)	7125 MHz
Peak Gain w/ Cable Loss (dBi)	2.95

3.3.1 WLAN Main Antenna Isolation

Clamshell mode

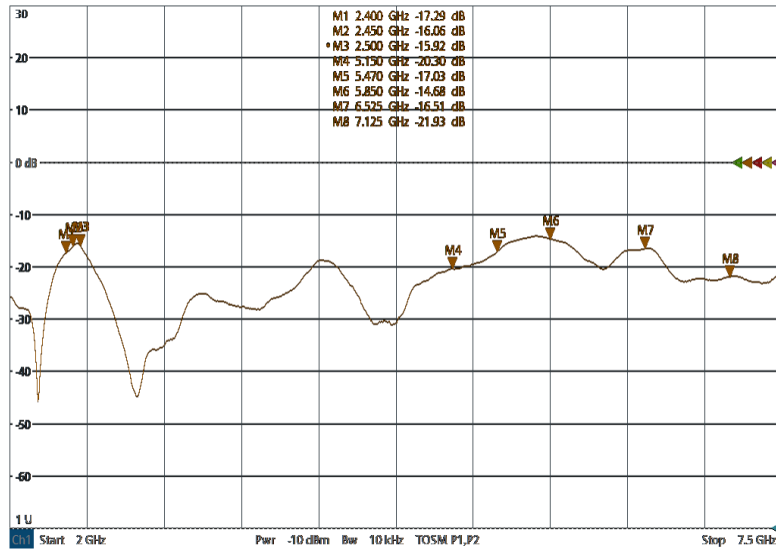


Close mode



3.3.2 WLAN Aux Antenna Isolation

Clamshell mode



Close mode

