

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

# APPROVAL SHEET

Customer Name: BYD COMPANY LIMITED

Date: Nov 22, 2022

Customer P/N	14127865-00
Amphenol P/N	BY5973-15-001-C
Description	WLAN Main & Aux Antenna Combo
Version	C

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## **Revision History**

DATE	Revision	Description of changes
Nov 11	A	DVT Release
Nov 14	B	SPEC update
Nov 22	C	Peak gain table update

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<b>4. Drawing.....</b>	<b>TBD</b>
<b>5. FirstArticleInspection.....</b>	<b>TBD</b>
<b>6. Cp/CpkAnalysis.....</b>	<b>TBD</b>
<b>7. Reliability report.....</b>	<b>TBD</b>
<b>8. GP(RoHs &amp; REACH) .....</b>	<b>TBD</b>
<b>9. QCP.....</b>	<b>TBD</b>
<b>10. Package.....</b>	<b>TBD</b>

# 1. Antenna Description

## 2.1. Location of the antenna

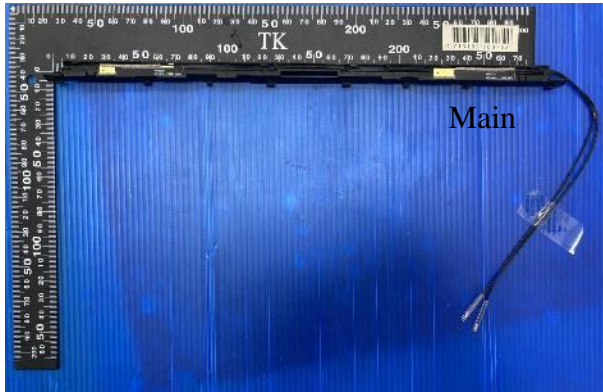
The bottom right antenna is the MAIN WLAN. A black cable is used for MAIN WLAN

The bottom left antenna is the AUXILIARY WLAN. A black cable is used the AUXILIARY WLAN.

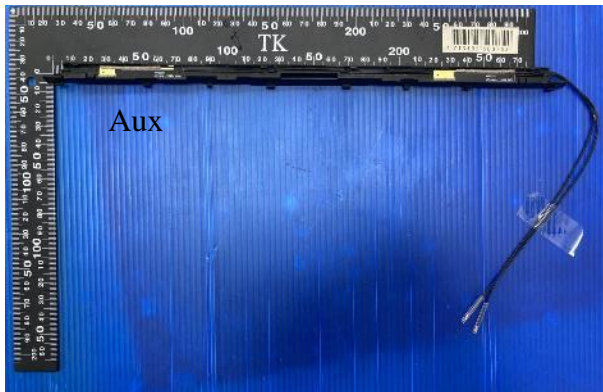


## 1.2. Picture of the antennas

### MAIN WLAN



### AUXILARY WLAN



### Antenna Structure

1. Plastic antenna holder
2. LDS holder with cable with connector.
3.  $\Phi$  1.13mm low loss cable and IPEX connector

## 2.1. Features of the antenna

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

The bottom left auxiliary 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 platfor. The VSWR shall be 100% tested in production.

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

**Table WLAN antenna VSWR**

## 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 64.

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 6GHz. 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 6GHz. The notebook with the antenna assemblies installed shall be placed on a non-conductive structure.

### 2.3. Antenna radiation measurement

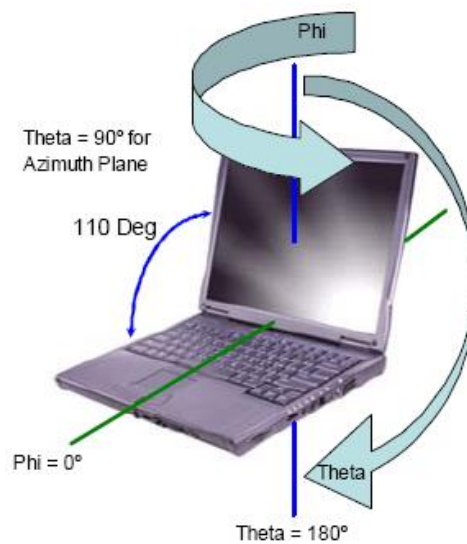
In order to ensure compliance with Razer specifications, it is required to measure a 3-D gain measurement for WLAN antenna.

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 1 AUT orientation and axis definition**



## 2.4. Antenna average gain specification

Test Parameter	2400 to 2500 GHz	5150 to 5850 GHz	5925 to 7125 GHz
Average Gain (Main / Aux) Notebook Open (110°)	-4dB min	-5dB min	-5 dB min

### WLAN antenna average gain specification

Test Parameter	2400 to 2500 GHz	5150 to 5850 GHz	5925 to 7125 GHz
Peak Gain, Dominant Polarization Notebook Open (110°)	+3 dBi	+5 dBi	+5 dBi

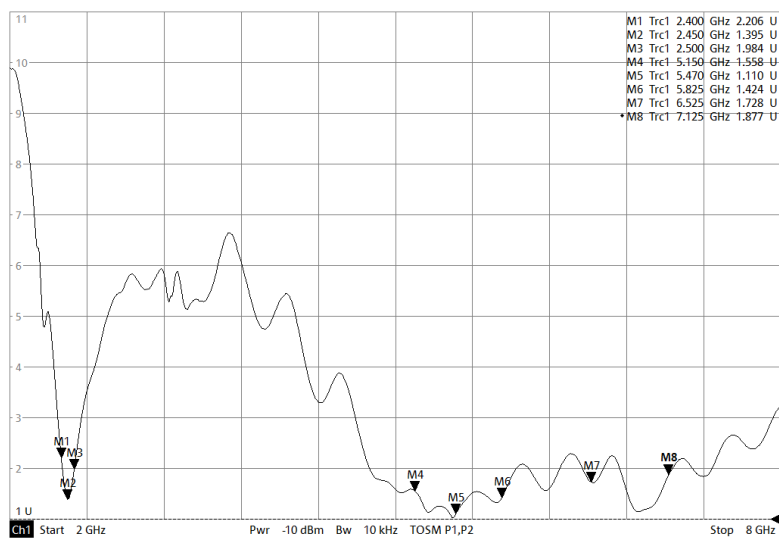
### WLAN antenna peak gain specification

**NOTE:** Antenna gain includes connector and cable loss.

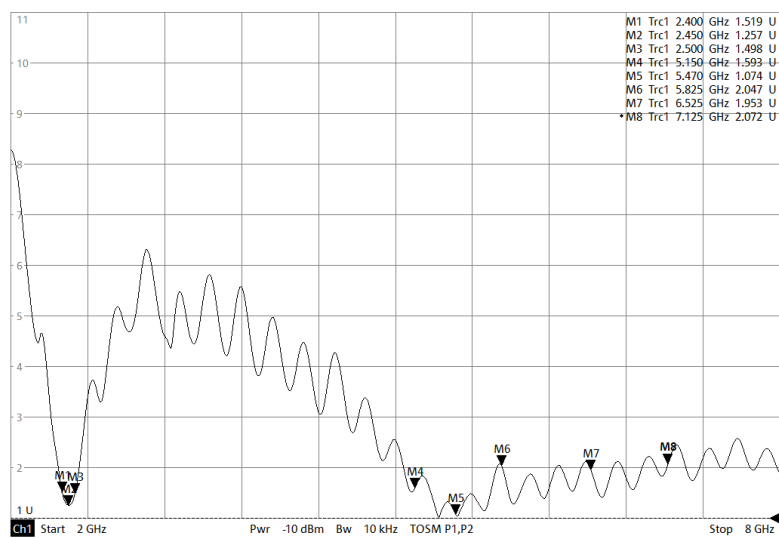
# 3. Antenna Performance Test

## 3.1. VSWR

### 3.1.1. MAIN WLAN



### 3.1.2. AUXILARY WLAN



### 3.2. Antenna radiated gain

#### 3.2.1 WLAN Main Antenna

<b>Main antenna @ Clamshell mode</b>			
Band / Frequency (MHz)		Gain(dB)	Efficiency (%)
802.11b/g/n	2400	-4.1	38
	2450	-3.8	41
	2500	-3.9	40
<b>2.4GHz average</b>			<b>40</b>
802.11a/ac	5150	-4.5	35
	5250	-4.4	36
	5350	-4.2	38
	5470	-4.4	36
	5600	-4.4	36
	5725	-4.5	36
	5785	-4.2	38
	5800	-3.9	40
	5850	-4.3	37
<b>5GHz average</b>			<b>37</b>
802.11a/ac/ax	5925	-4.2	38
	6175	-3.9	40
	6425	-4.5	35
	6525	-4.1	39
	6700	-5.2	30
	6875	-5.0	31
	7000	-5.2	30
	7125	-5.1	31
<b>6GHz average</b>			<b>34</b>

<b>Main antenna @ Close mode</b>			
<b>Band / Frequency (MHz)</b>		<b>Gain(dB)</b>	<b>Efficiency (%)</b>
802.11b/g/n	2400	-6.3	23
	2450	-6.8	21
	2500	-7.0	20
<b>2.4GHz average</b>			<b>21</b>
802.11a/ac	5150	-5.5	28
	5250	-5.6	28
	5350	-5.7	27
	5470	-5.7	27
	5600	-5.5	28
	5725	-5.7	27
	5785	-5.6	27
	5800	-5.4	29
	5850	-5.5	28
<b>5GHz average</b>			<b>28</b>
802.11a/ac/ax	5925	-5.8	26
	6175	-5.8	26
	6425	-5.6	27
	6525	-5.7	27
	6700	-5.8	26
	6875	-6.1	25
	7000	-5.0	32
	7125	-5.5	28
<b>6GHz average</b>			<b>27</b>

### 3.2.2 WLAN Auxiliary Antenna

<b>Aux antenna @ Clamshell mode</b>			
Band / Frequency (MHz)		Gain(dB)	Efficiency (%)
802.11b/g/n	2400	-4.0	40
	2450	-3.7	43
	2500	-4.0	39
<b>2G average</b>			<b>41</b>
802.11a/ac	5150	-3.8	41
	5250	-3.9	41
	5350	-4.0	40
	5470	-5.0	32
	5600	-5.0	32
	5725	-4.3	37
	5785	-4.7	34
	5800	-4.6	35
5850	-5.2	30	
<b>5G average</b>			<b>36</b>
802.11a/ac/ax	5925	-5.3	30
	6175	-4.9	33
	6425	-4.3	37
	6525	-4.4	36
	6700	-4.4	37
	6875	-4.3	37
	7000	-4.9	32
	7125	-4.5	36
<b>6G average</b>			<b>35</b>

<b>Aux antenna @ Close mode</b>			
<b>Band / Frequency (MHz)</b>		<b>Gain(dB)</b>	<b>Efficiency (%)</b>
802.11b/g/n	2400	-6.6	22
	2450	-6.6	22
	2500	-7.1	20
<b>2.45GHz average</b>			<b>21</b>
802.11a/ac	5150	-5.8	26
	5250	-6.0	25
	5350	-6.2	24
	5470	-6.5	23
	5600	-6.0	25
	5725	-5.4	29
	5785	-5.6	27
	5800	-5.5	28
	5850	-6.0	25
<b>5GHz average</b>			<b>26</b>
802.11a/ac/ax	5925	-6.3	23
	6175	-5.4	29
	6425	-4.7	34
	6525	-5.3	29
	6700	-5.1	31
	6875	-5.1	31
	7000	-5.6	27
	7125	-5.2	30
<b>6GHz average</b>			<b>29</b>

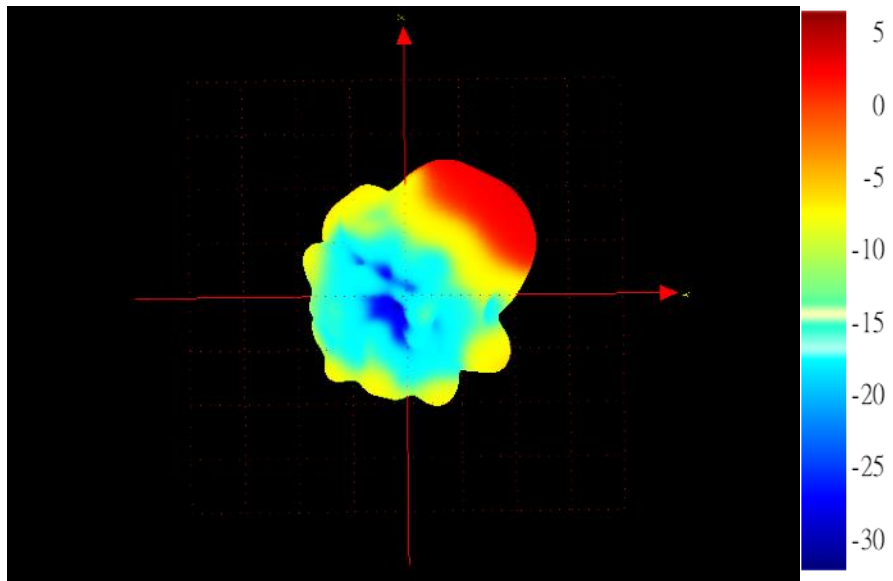
### 3.2.3 Antenna peak gain

1A Antenna Part Number	1B Manufacturer	1C Antenna Type	1D Cable Assembly Part Number and Information	Freq Range MHz	1E * Peak Gain W/ Cable loss (dBi)	1F Peak Gain w/o Cable Loss (dBi)	1G Max VSWR	1H Cable Loss (dB)
(P/N: BY5973-15-001-C) Main Antenna	Amphenol	PIFA	Example: (P/N: C-5973-15-001-78) 50 ohm Coaxial length: 19.8cm diameter: 1.13mm	2400-2483.5	2.74	3.24	3	0.5
				5150-5250	2.86	3.67	3	0.81
				5250-5350	3.31	4.15	3	0.84
				5470-5725	3.76	4.61	3	0.85
				5725-5850	3.25	4.12	3	0.87
				5850-5895	3.47	4.35	3	0.88
				5925-6425	3.73	4.61	3	0.88
				6425-6525	2.84	3.74	3	0.90
				6525-6875	2.84	3.76	3	0.92
				6875-7125	2.38	3.39	3	1.01
(P/N: BY5962-15-001-C) Aux Antenna	Amphenol	PIFA	Example: (P/N: C-5973-15-002-78) 50 ohm Coaxial length: 39.8cm diameter: 1.13mm	2400-2483.5	2.53	3.48	3	0.95
				5150-5250	3.19	4.68	3	1.49
				5250-5350	3.17	4.69	3	1.52
				5470-5725	3.59	5.13	3	1.54
				5725-5850	3.59	5.19	3	1.60
				5850-5895	3.25	4.86	3	1.61
				5925-6425	3.02	4.64	3	1.62
				6425-6525	3.63	5.27	3	1.64
				6525-6875	3.47	5.14	3	1.67
				6875-7125	3.01	4.86	3	1.85

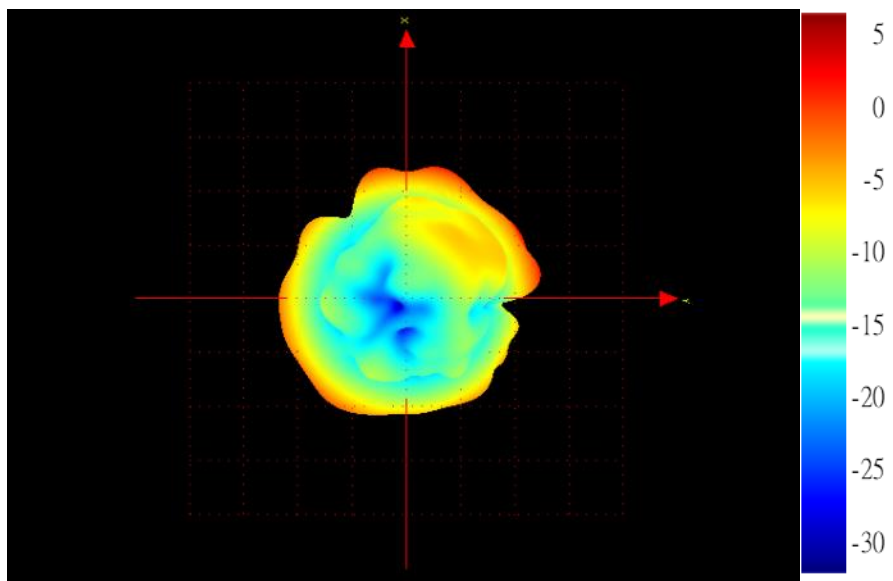
### 3.2.4 Antenna radiation pattern

- Main antenna @ Clamshell mode

2.45GHz

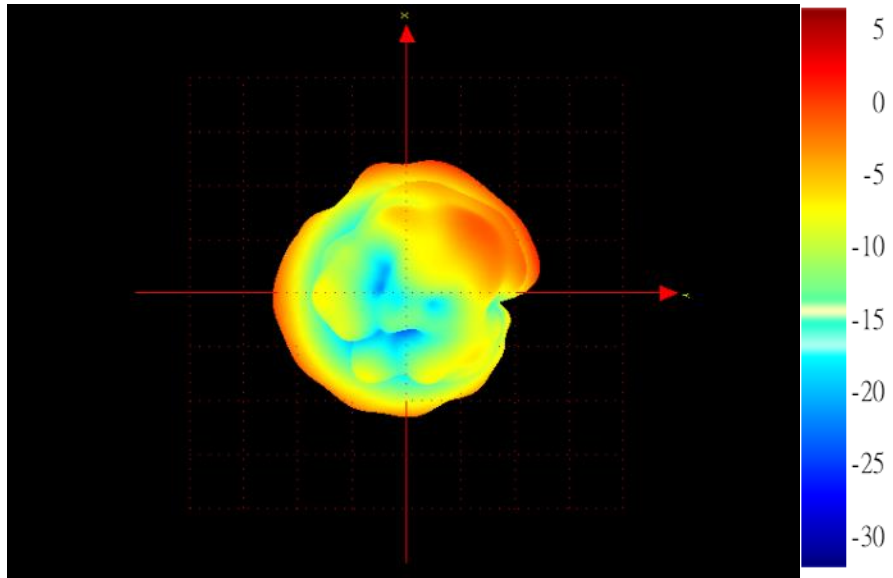


5.47GHz

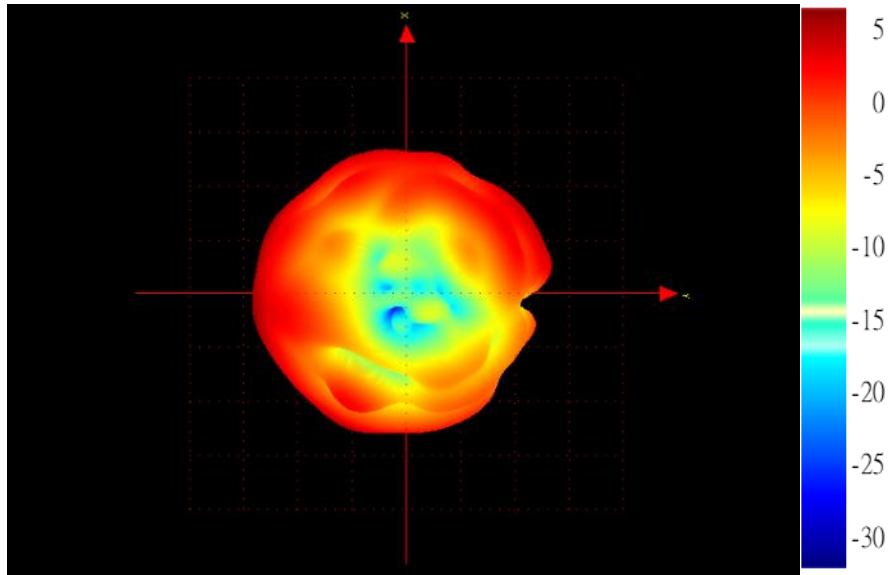




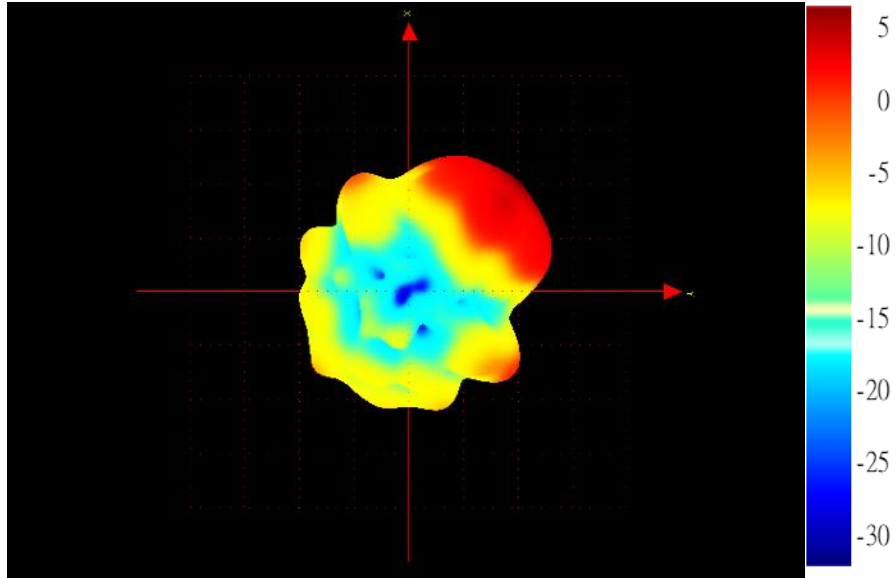
5.85GHz



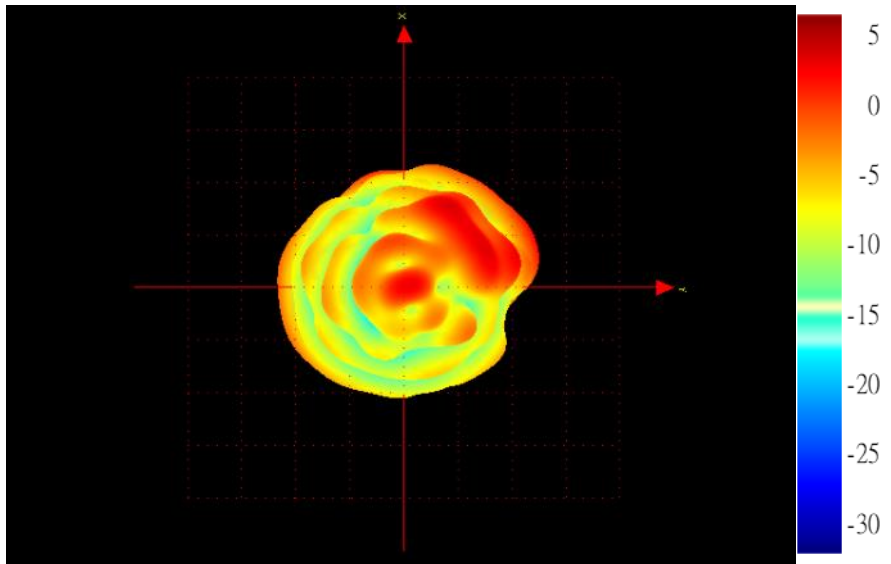
6.525GHz



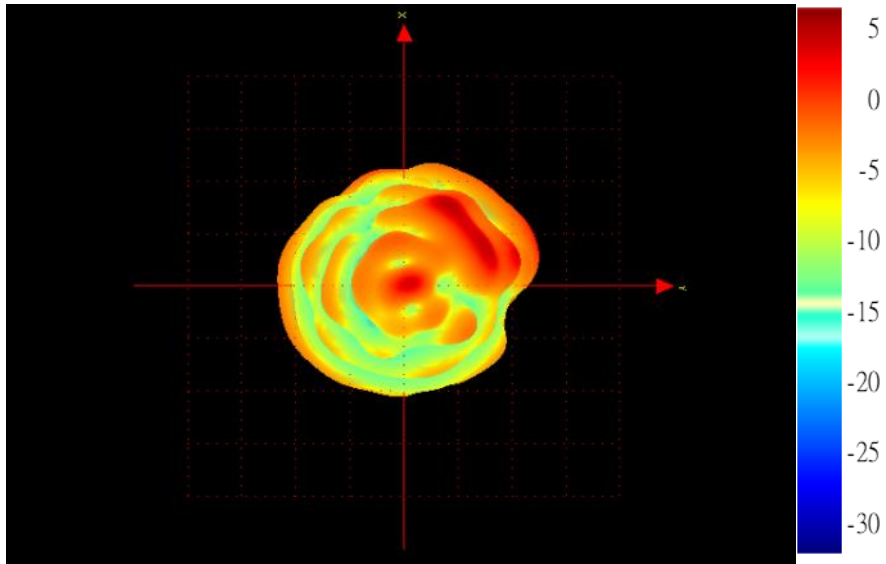
Auxiliary antenna @ Clamshell mode  
2.45GHz



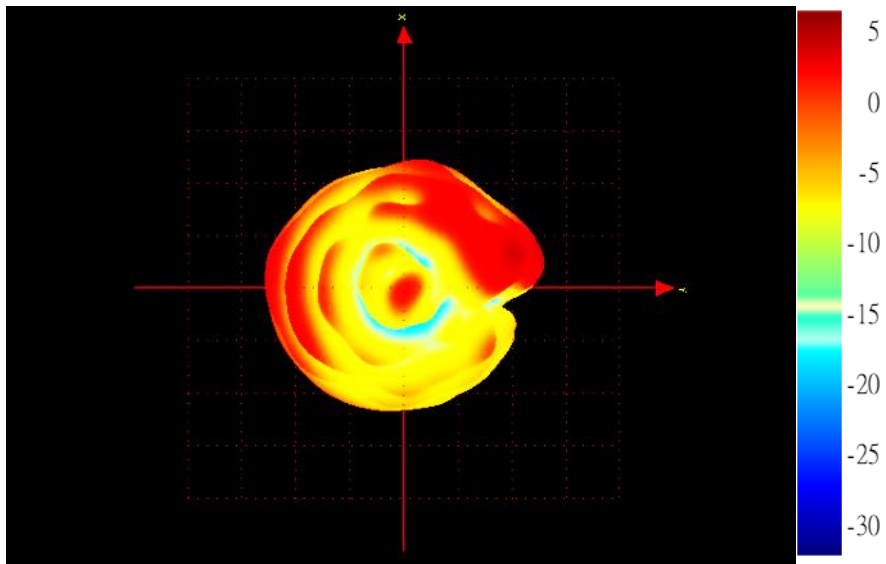
5.47GHz



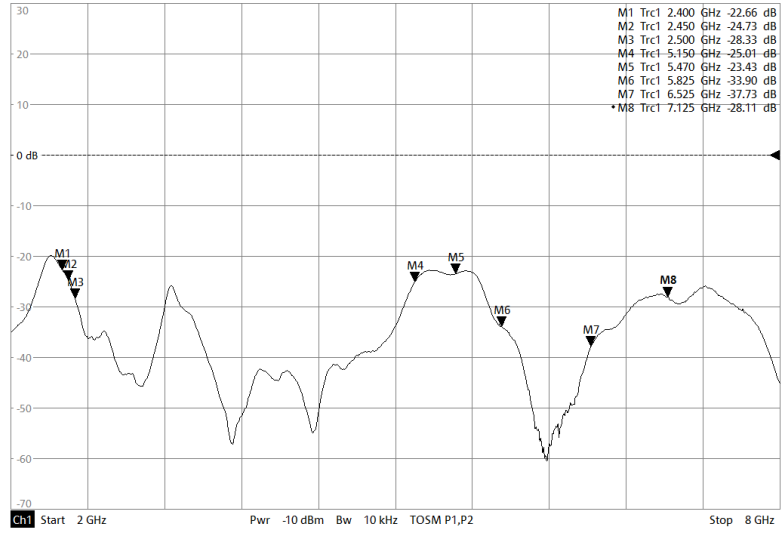
5.85GHz



6.525GHz



### 3.2.5 Antenna Isolation Clamshell mode



### Close mode

