

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

APPROVAL SHEET

Customer Name: BYD COMPANY LIMITED

Supplier Name: Amphenol Taiwan Corporation

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Customer P/N	18062119-00 18062191-00 18062193-00
Amphenol P/N	BY515A-16-011-C BY515A-16-012-C BY515A-16-013-C
Description	WLAN Main Antenna WLAN Aux Antenna Isolator
Version	C

Prepared by	Signed by	Approved by Customer
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Revision History

DATE	Revision	Description of changes
Dec 19	A	DVT Release
Jan 17	B	PVT Release
Feb 10	C	MR Release

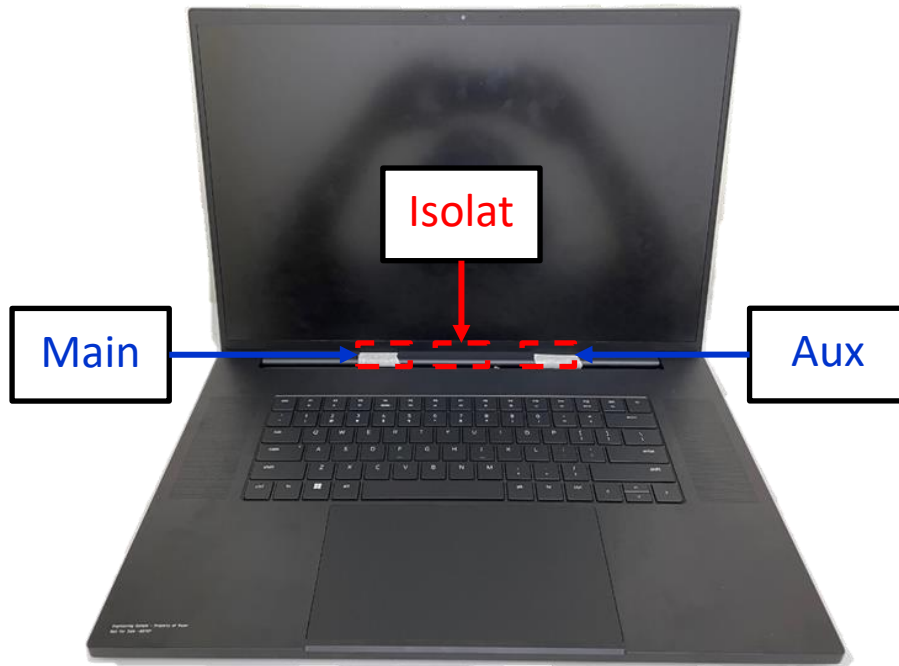
- 1. Description.....**
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1. Antenna Description

1.1. Location of the antenna

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

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



1.2. Structure of the antennas

Antenna Structure
1. Plastic antenna holder
2. LDS holder with cable with connector.
3. Φ 1.13mm low loss cable and IPEX connector
4. Physical weight: 2.1g (Main complete set)
5. Physical weight: 1.7g (Aux complete set)

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.

The bottom right 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 platform. 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.

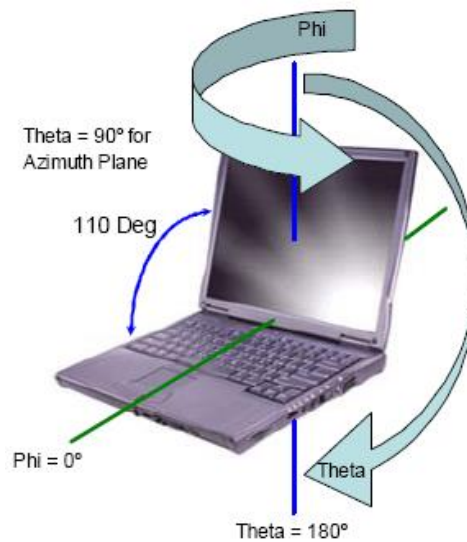


Figure 1 AUT orientation and axis definition

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°)	-4.0 dB min	-4.0 dB min	-4.5 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.

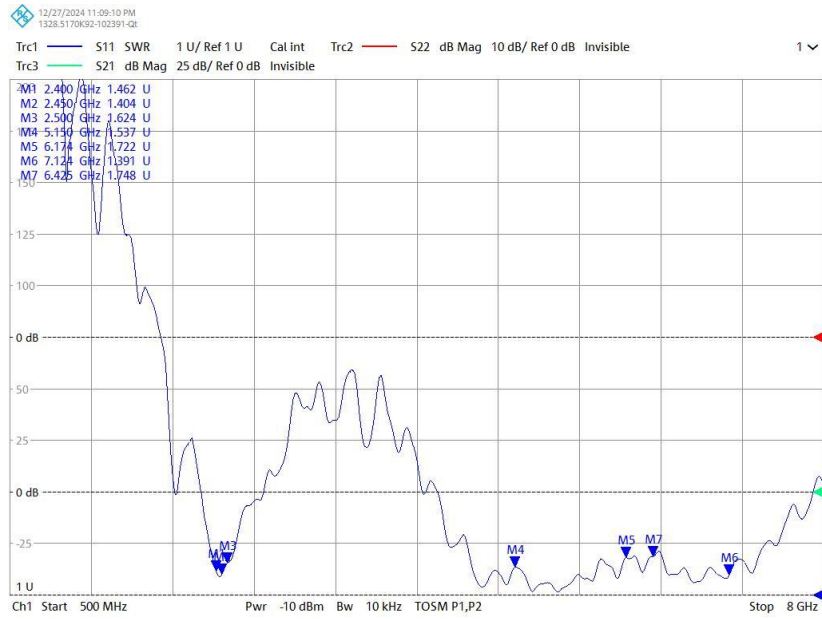
2.5. Antenna peak gain specification

Antenna 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	2.55	2.79	2.69	3.64	3.39	3.92	3.52	3.07	3.58	3.52
Aux	2.37	3.13	3.32	2.50	3.45	3.71	3.35	3.46	3.38	2.01

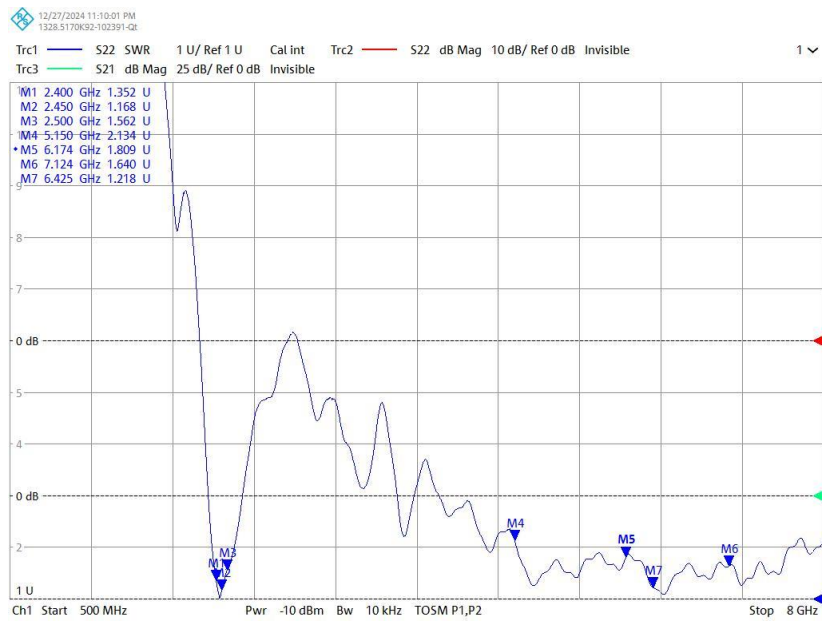
3. Antenna Performance Test

3.1. VSWR

3.1.1. MAIN WLAN



3.1.2. AUXILIARY WLAN



3.2. Antenna radiated gain

3.2.1 WLAN Main Antenna

Main Antenna @ Clamshell Mode			
Band / Frequency (MHz)		Gain(dB)	Efficiency(%)
802.11b/g/n	2400	-3.7	43
	2450	-3.5	45
	2500	-3.8	42
2G average			43
802.11a/ac	5150	-3.8	42
	5250	-3.2	48
	5350	-3	50
	5470	-3.3	47
	5600	-3.3	47
	5725	-3.1	49
	5785	-3.2	48
	5800	-3.5	45
5850	-3.7	43	
5G average			46
802.11a/ac	5925	-3.1	49
	6175	-3.4	46
	6425	-4.3	37
	6525	-4.2	38
	6700	-4.3	37
	6875	-4.2	38
	7000	-3.9	41
	7125	-3.9	41
6G average			41

Main Antenna @ Close Mode			
Band / Frequency (MHz)		Gain(dB)	Efficiency(%)
802.11b/g/n	2400	-4.3	37
	2450	-4.9	33
	2500	-5.5	28
2G average			33
802.11a/ac	5150	-3.3	47
	5250	-3.0	50
	5350	-2.8	52
	5470	-3.2	48
	5600	-3.2	48
	5725	-3.1	49
	5785	-3.1	49
	5800	-3.3	47
	5850	-3.2	48
5G average			48
802.11a/ac	5925	-3.5	45
	6175	-4.0	40
	6425	-4.8	33
	6525	-4.7	34
	6700	-4.5	36
	6875	-4.5	35
	7000	-4.9	33
	7125	-5.2	30
6G average			36

3.2.2.WLAN Auxiliary Antenna

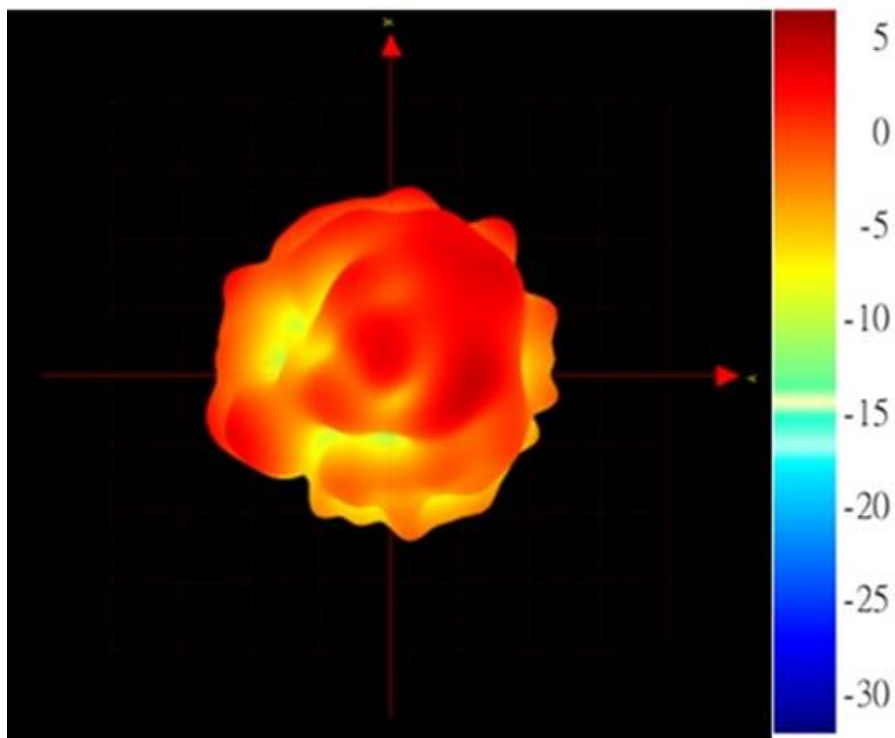
Aux Antenna @ Clamshell Mode			
Band / Frequency (MHz)		Gain(dB)	Efficiency(%)
802.11b/g/n	2400	-3.6	44
	2450	-4	40
	2500	-3.9	41
2G average			42
802.11a/ac	5150	-3.8	42
	5250	-3.0	51
	5350	-2.7	54
	5470	-3.0	50
	5600	-3.5	44
	5725	-3.8	42
	5785	-3.7	43
	5800	-3.8	41
5850	-3.8	42	
5G average			45
802.11a/ac	5925	-3.3	47
	6175	-3.5	45
	6425	-3.9	41
	6525	-3.9	41
	6700	-4.5	35
	6875	-4.6	35
	7000	-4.3	37
	7125	-4.2	38
6G average			40

Aux Antenna @ Close Mode			
Band / Frequency (MHz)		Gain(dB)	Efficiency(%)
802.11b/g/n	2400	-5.3	30
	2450	-5.9	26
	2500	-5.6	28
2G average			28
802.11a/ac	5150	-3.3	47
	5250	-3.1	49
	5350	-2.8	52
	5470	-2.8	52
	5600	-3.2	48
	5725	-3.3	47
	5785	-3.3	47
	5800	-3.4	46
	5850	-3.2	48
5G average			48
802.11a/ac	5925	-3.2	48
	6175	-3.4	46
	6425	-3.8	42
	6525	-3.7	43
	6700	-3.9	41
	6875	-4.0	39
	7000	-4.5	36
	7125	-4.6	35
6G average			41

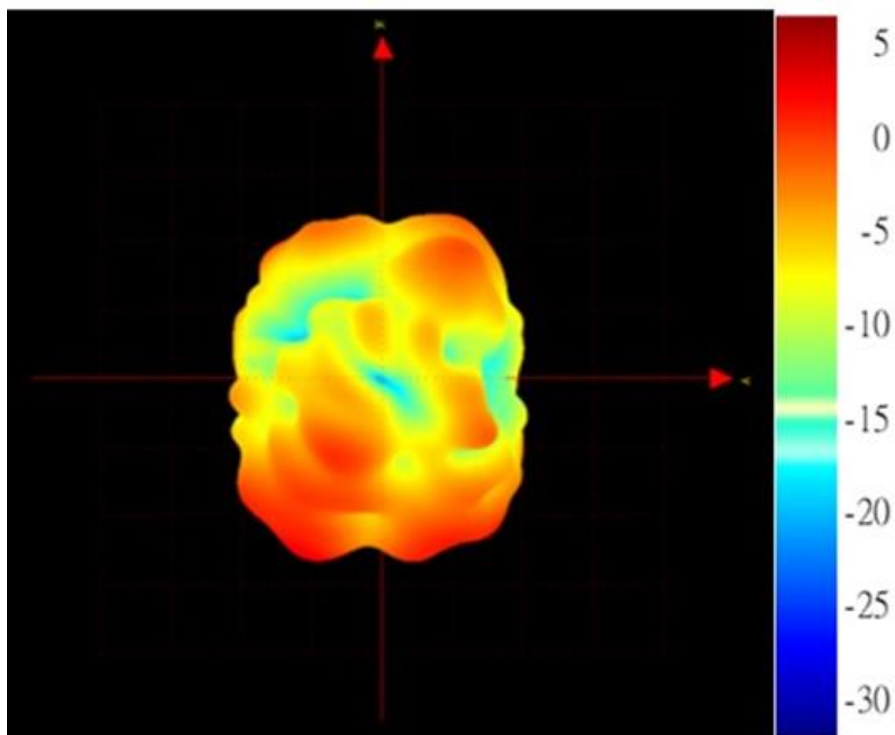
3.2.3. Antenna radiation pattern

Main antenna @ Clamshell mode

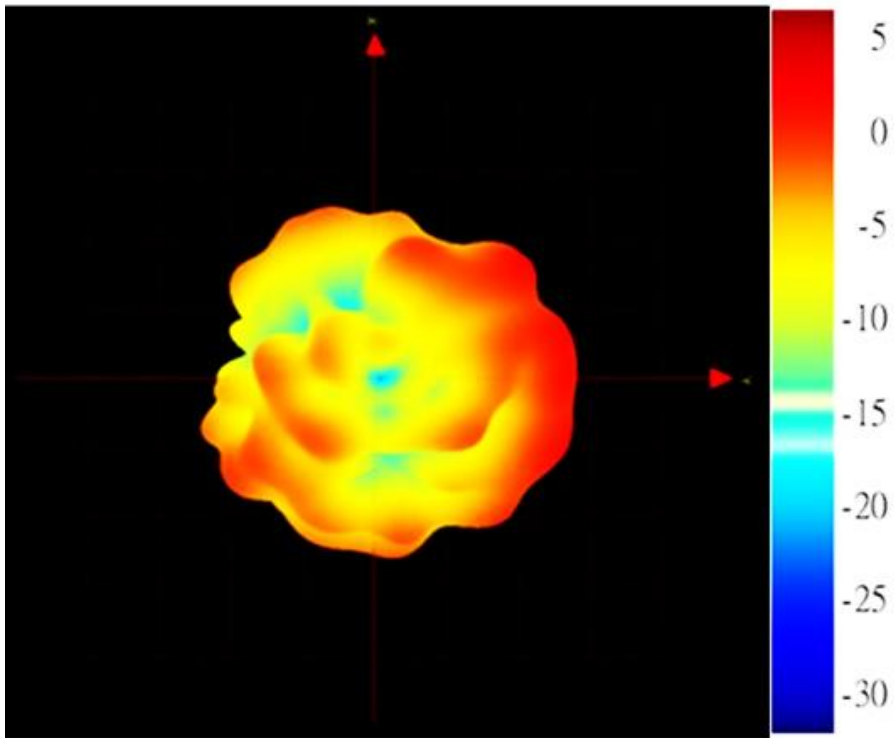
2.45GHz



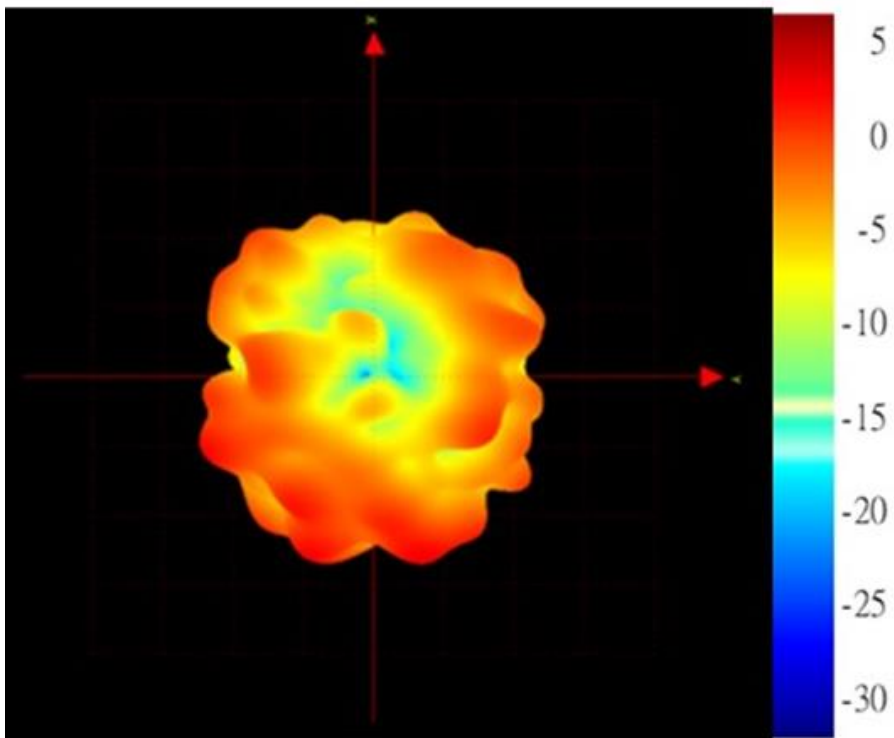
5.47GHz



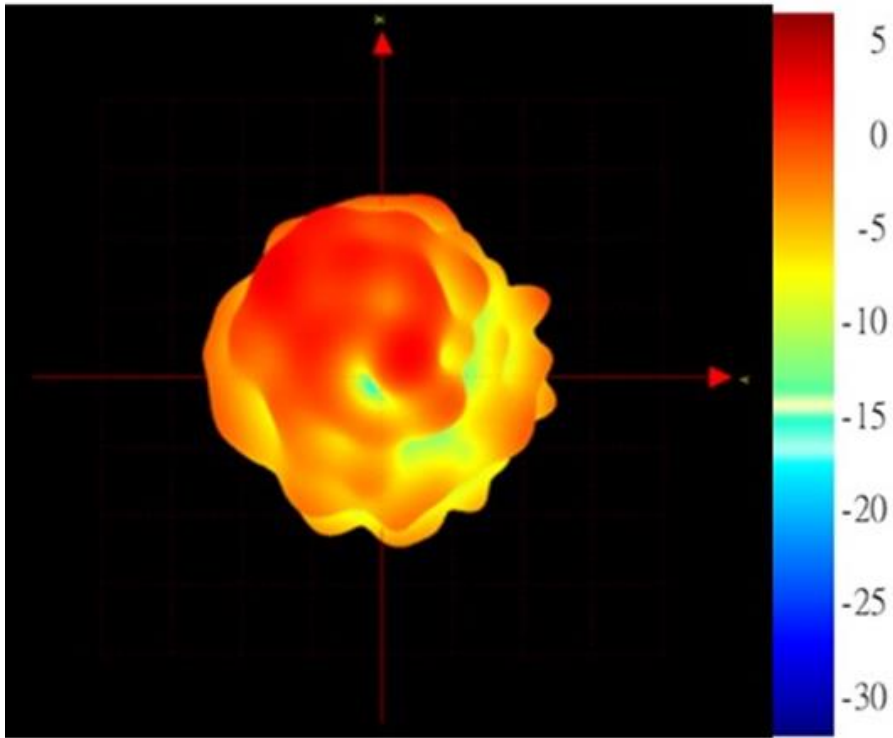
5.85GHz



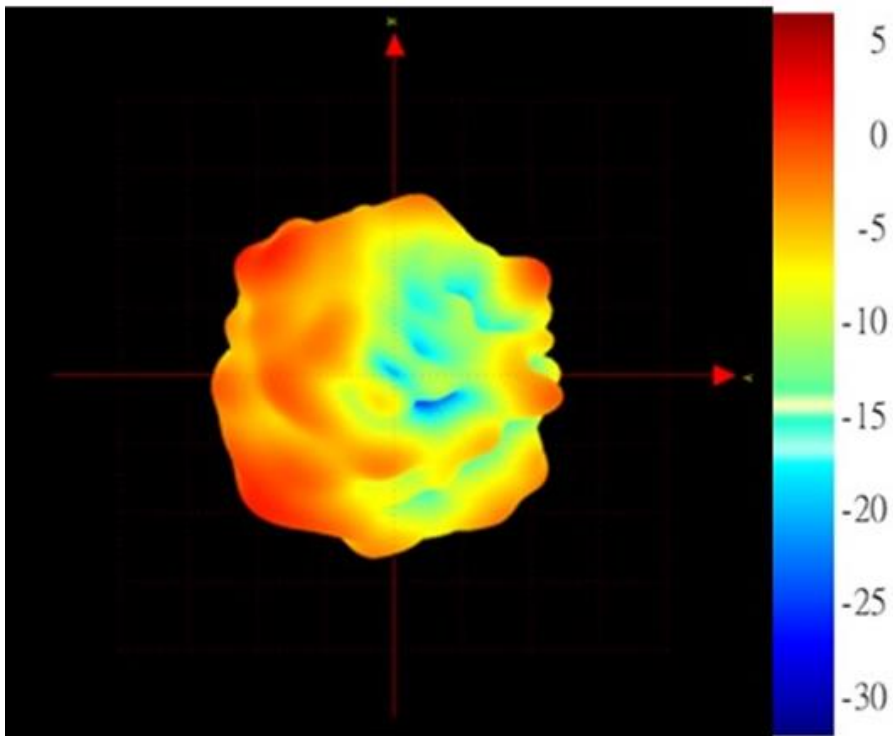
6.525GHz



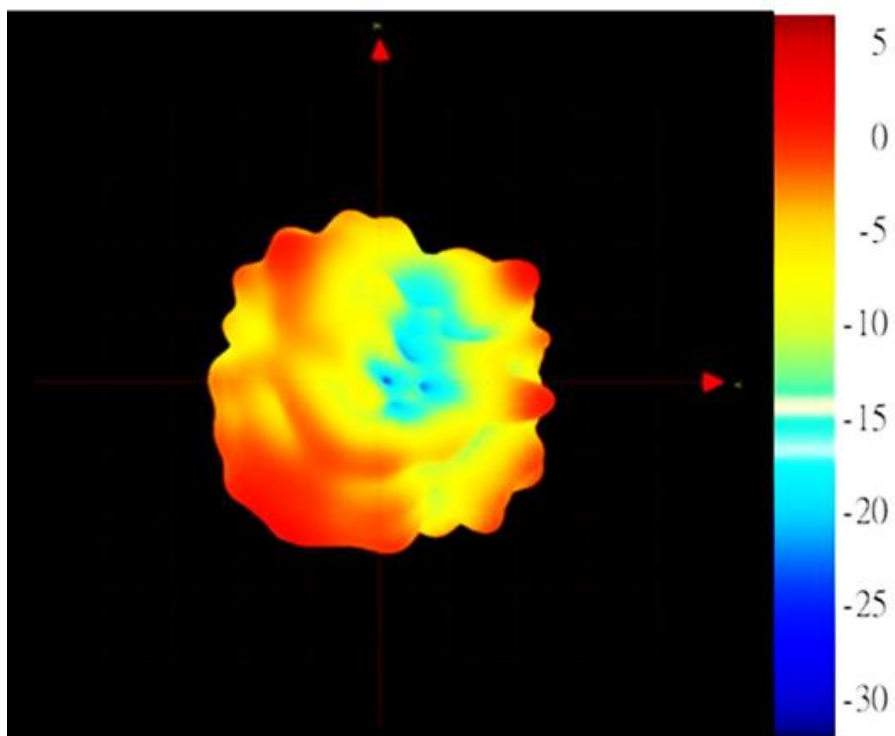
Auxiliary antenna @ Clamshell mode
2.45GHz



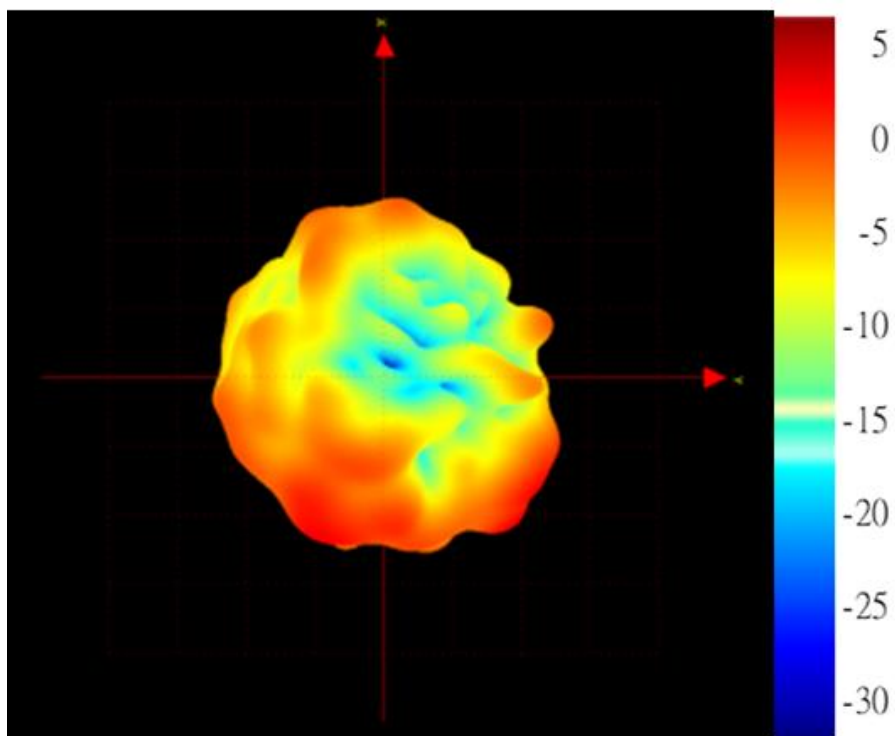
5.47GHz



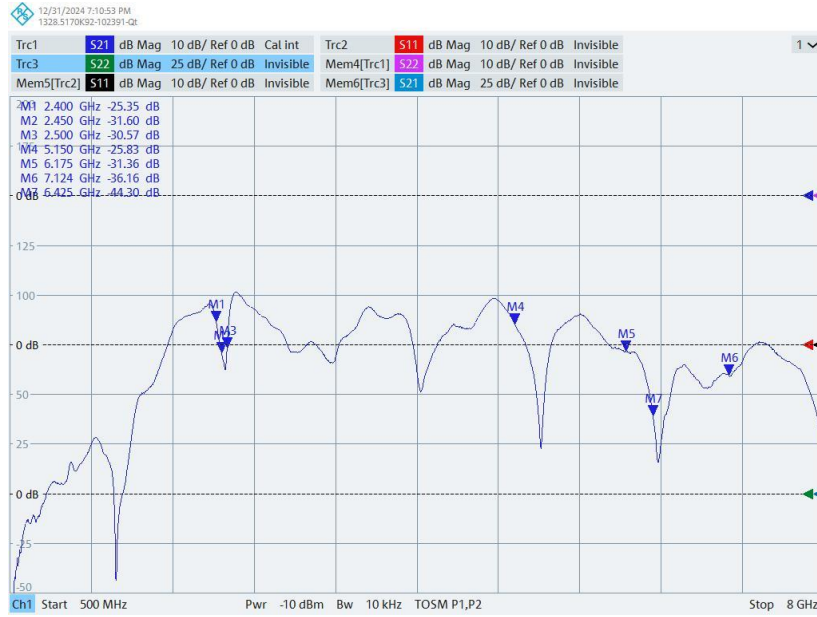
5.85GHz



6.525GHz



3.2.4. Antenna Isolation Clamshell mode



Close mode

