

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)						
Dell	Compal	P151G	Yes	regular NB	2.68mm						
****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)				
WNC	Monopole			Antenna P/N:			Antenna P/N:				
				81ELA115.G09			81ELA115.G09				
				Compal P/N :			Compal P/N :				
DC33002L21L			DC33002L21L								
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	2.86	1.82	1.22	0.66	1.51	1.51	2.2	0.01	0.75	2.93	
Aux	1.17	0.94	0.11	0.49	1.18	1.18	2.2	-0.5	1.31	-1.12	
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		
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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1. **Applicable test methods**

<insert test description here for test method>

The gain measurement shall follow by following conditions:

- It is required that all the antenna gain to be measured spherically and computed by spatial average be computed of the resultant gain.
- During gain measurement, all other antennas not under test should be terminated by 50 Ohm load in end of cable.
- Space points of 3D gain measurement are increase by specific steps from Theta 0~180 degrees, and Phi, 0~360 degrees, as figure below. The increments steps are different steps are different by antenna functions.

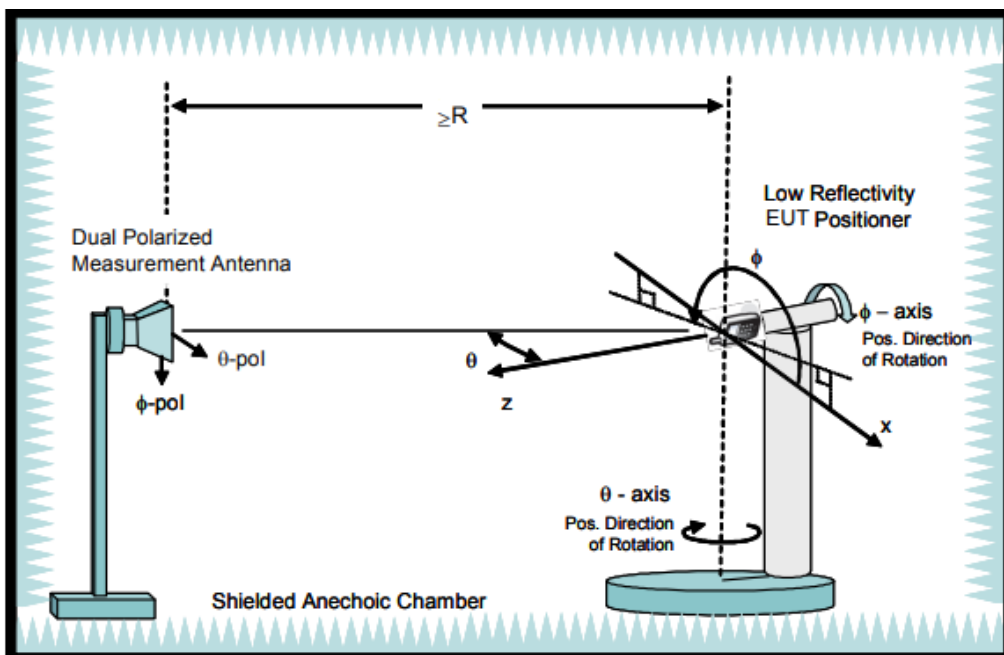
Theta Start	0 degree	Phi Start	0 degree
Theta Stop	165 degree	Phi Stop	345 degree
Theta Increment	15 degree	Phi Increment	15 degree

2. **Test & System Description**

a. Test setup

<insert test diagram here for test site utilized>

The testing of antenna gain should be made at a CTIA qualified lab with an RF anechoic chamber with at least 3-meter separation from the receive antenna to the antenna under test. The antenna gain report from unqualified lab can't be referenced a passing. Besides, all test equipment including horn antennas, adapters, cables, network analyzers, and receivers shall be calibrated per manufacturer's minimum calibration requirements.



b. Equipment list

<insert test diagram here for test site utilized>

Device	Type/Model	Serial #	Manufacturer	Cal. Date	Cal. Due Date
Anechoic Chamber	AMS8500	-	ETS-Lindgren	22-Jun-22	10-Jul-24
Turn Table	2117-7200	SN00231447	ETS-Lindgren	22-Jun-22	10-Jul-24
Switch & Positioning systems	EMCenter	SN00242606	ETS-Lindgren	22-Jun-22	10-Jul-24
Measurement SW	EMQuest V1.15 build 27347	SN1802	ETS-Lindgren	22-Jun-22	10-Jul-24
Horn antenna	3164-10	SN00246202	ETS-Lindgren	22-Jun-22	10-Jul-24
Vector Network Analyzer	E5071C	PN5188-4462	Keysight	30-May-22	30-Nov-23
Cable 7.5m 400MHz to 18GHz(H-pol)	SS402	00100A1F5A1XXS	WOKEN	22-Jun-22	10-Nov-24
Cable 7.5m 400MHz to 18GHz(V-pol)	SS402	00100A1F5A1XXS	WOKEN	22-Jun-22	10-Nov-24
Cable 14m 400MHz to 18GHz	SS402	00100A1F5A1XXS	WOKEN	22-Jun-22	10-Nov-24
Temp & Humidity Logger	830	SN84972	PROVA	16-Jul-22	10-Jul-23

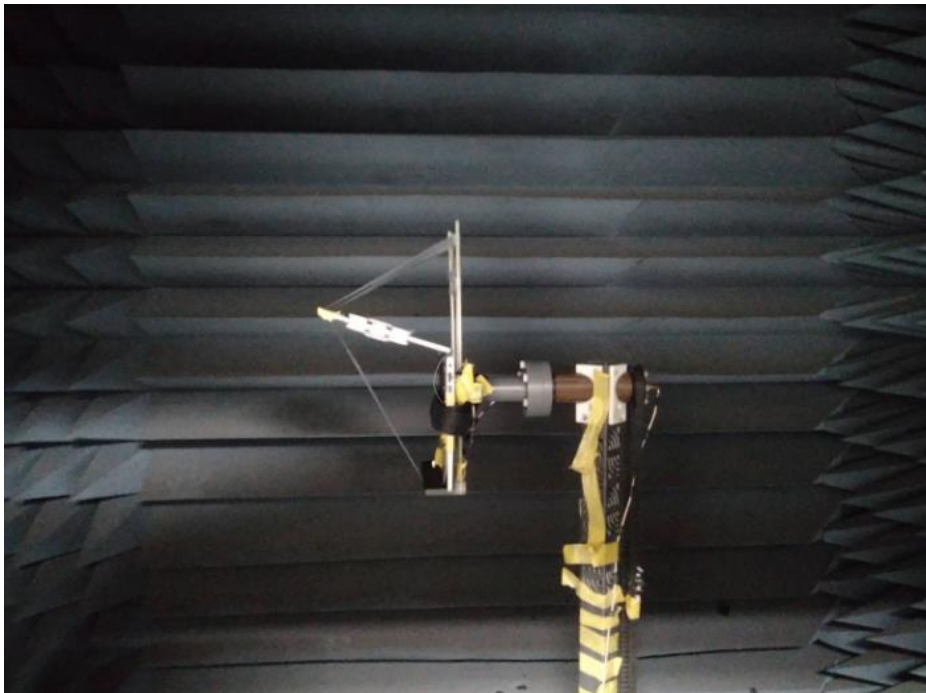
3. Setup photo

Test Conditions

NB under test placed on a non-conductive structure at sufficient height to be in the 'quiet zone' of the chamber

The NB under test must be fully populated with a power, motherboard, hard drive, disk drives, etc... The purpose is to characterize the antennas on a fully populated customer deliverable unit.

NB's panel should be parallel with XY-plane and face to Y-axle, see diagram below.



Antenna Information

Section 1. Antenna Assembly Specifications

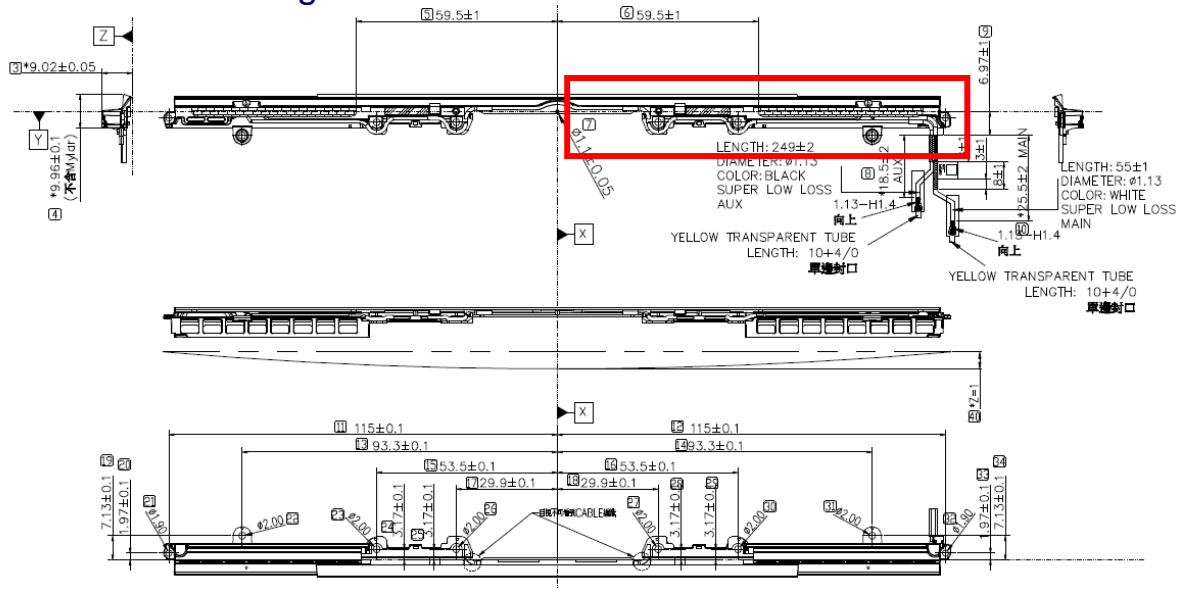
1A Antenna Part Number	1B Manufacturer	1C Antenna Type	1D Cable Assembly Part Number and Information	Freq Range MHz	1E * Peak Gain W/ Cable loss (dBi)	1F Peak Gain w/o Cable Loss (dBi)	1G Max VSWR	1H Cable Loss (dB)
P/N:DC33002L21L (81ELA115.G09) Main Antenna	WNC	Monopole	Iplex 20565-001R-13 50 ohm Coaxial length: 25.5 mm diameter: 1.13 mm	2400-2483.5	2.86	3.01	3.0	0.15
				5150-5250	1.82	2.05	3.0	0.23
				5250-5350	1.22	1.45	3.0	0.23
				5470-5725	0.66	0.89	3.0	0.23
				5725-5850	1.51	1.75	3.0	0.24
				5850-5895	1.51	1.75	3.0	0.24
				5925-6425	2.2	2.45	3.0	0.25
				6425-6525	0.01	0.26	3.0	0.25
				6525-6875	0.75	1.01	3.0	0.26
6875-7125	2.93	3.2	3.0	0.27				
P/N:DC33002L21L (81ELA115.G09) Aux Antenna	WNC	Monopole	Iplex 20565-001R-13 50 ohm Coaxial length: 185 mm diameter: 1.13mm	2400-2483.5	1.17	1.88	3.0	0.71
				5150-5250	0.94	2	3.0	1.06
				5250-5350	0.11	1.17	3.0	1.06
				5470-5725	0.49	1.58	3.0	1.09
				5725-5850	1.18	2.28	3.0	1.1
				5850-5895	1.18	2.28	3.0	1.1
				5925-6425	2.2	3.34	3.0	1.14
				6425-6525	-0.5	0.68	3.0	1.18
				6525-6875	1.31	2.52	3.0	1.21
6875-7125	-1.12	0.12	3.0	1.24				

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

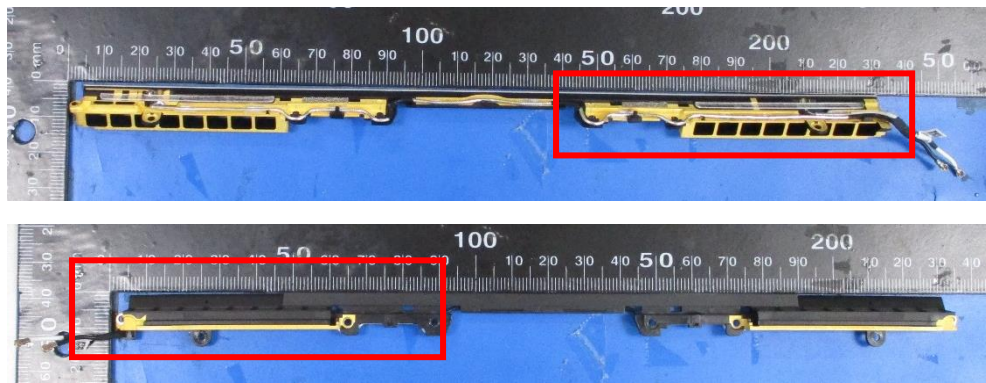
Section 2. Dimensioned Photos and Drawings of Antennas

Include the dimensioned photo and drawing of Main antenna here.

Main Antenna Drawing:



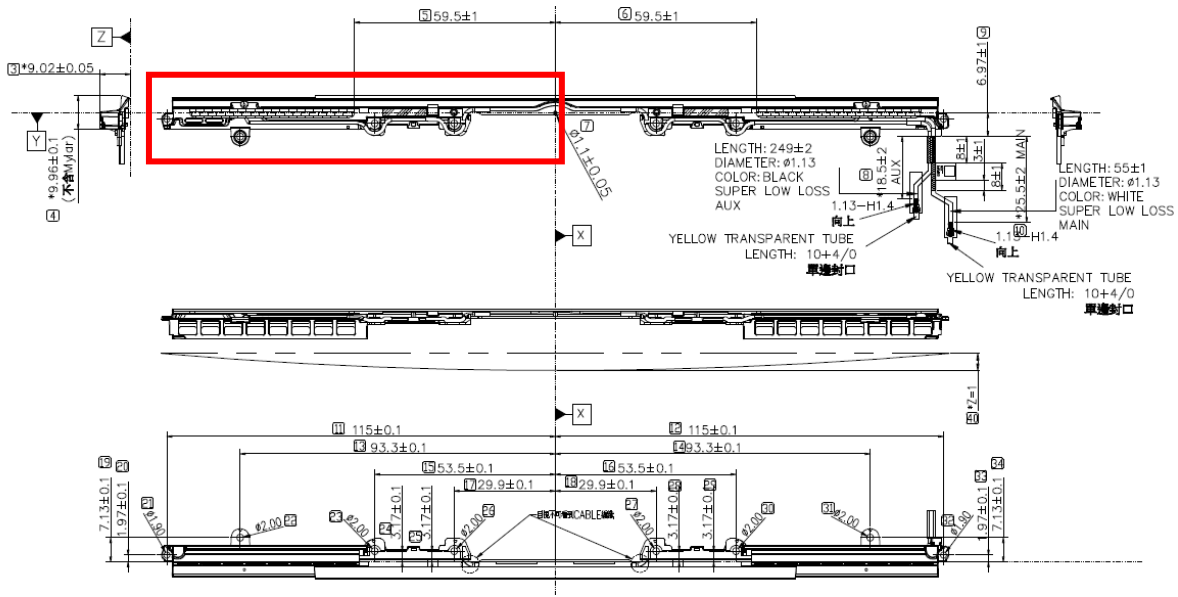
Main Antenna Photo (Front/Back):



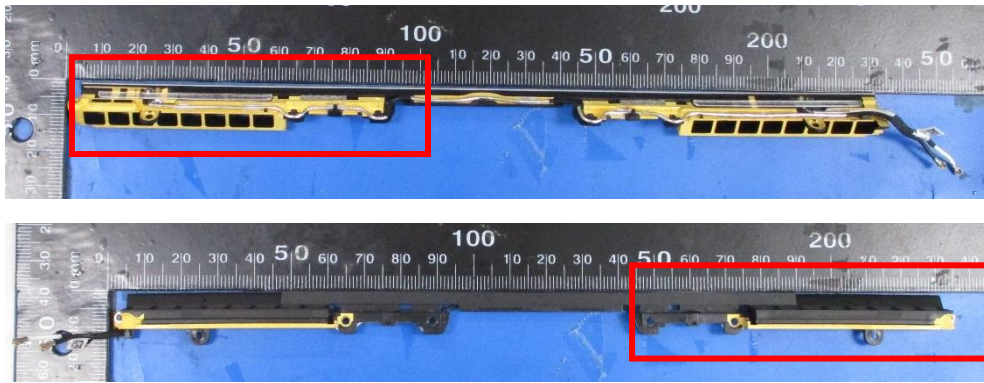
Note: antenna photo should include L type ruler

Include the dimensioned photo and drawing of Aux antenna here.

Aux Antenna Drawing:



Aux Antenna Photo (Front/Back):



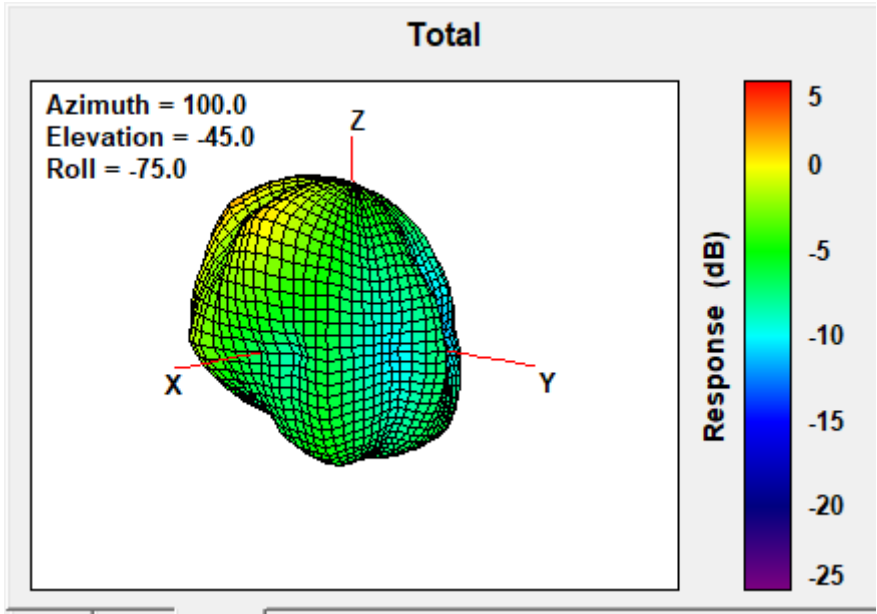
Note: antenna photo should include L type ruler

Section 3. Radiation characteristics of antenna loaded in Host Platform

Main Antenna

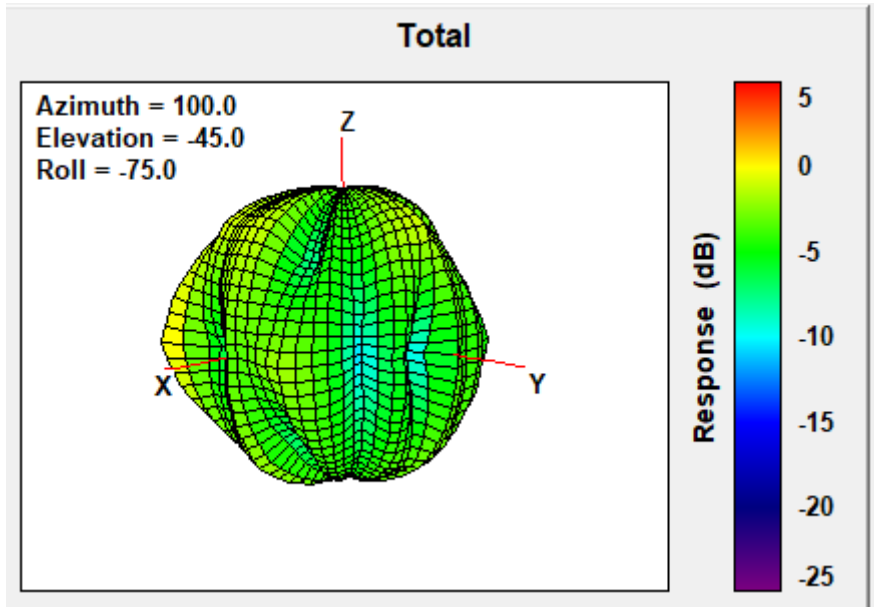
Max Antenna 3D Radiation Pattern 2400 – 2483.5 MHz

Frequency (MHz)	Peak Gain w/ Cable Loss (dBi)
2400-2483.5	2.86



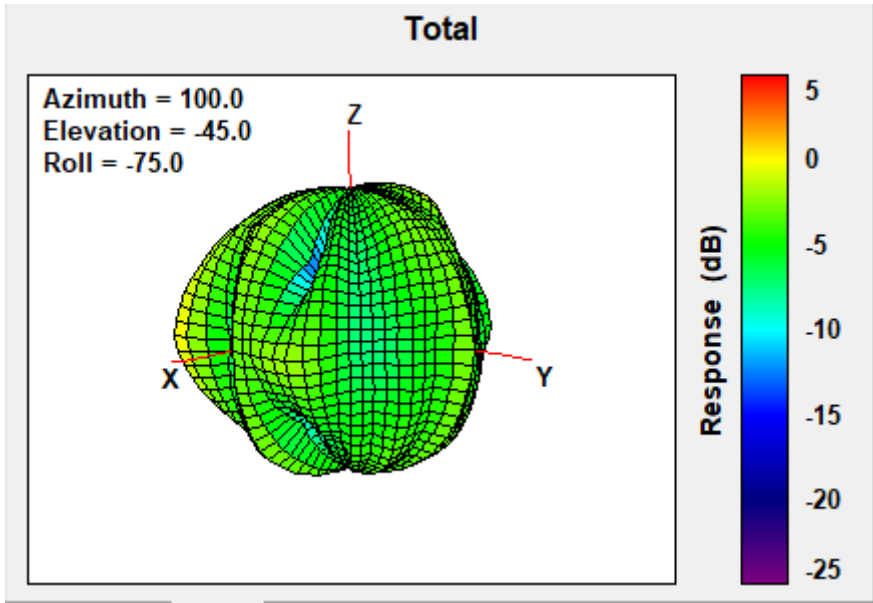
Max Antenna 3D Radiation Pattern 5150-5250 MHz

Frequency (MHz)	Peak Gain w/ Cable Loss (dBi)
5150-5250	1.82



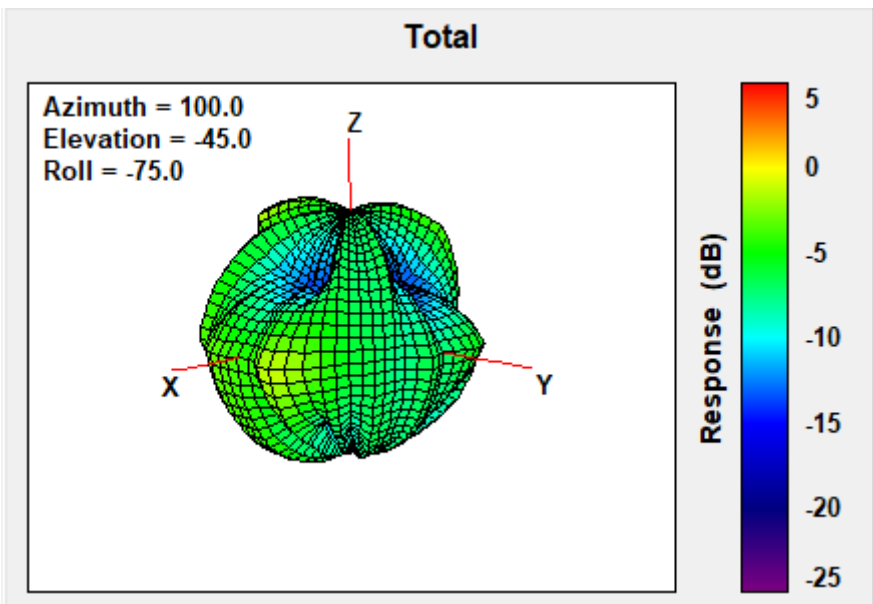
Max Antenna 3D Radiation Pattern 5250-5350 MHz

Frequency (MHz)	Peak Gain w/ Cable Loss (dBi)
5250-5350	1.22



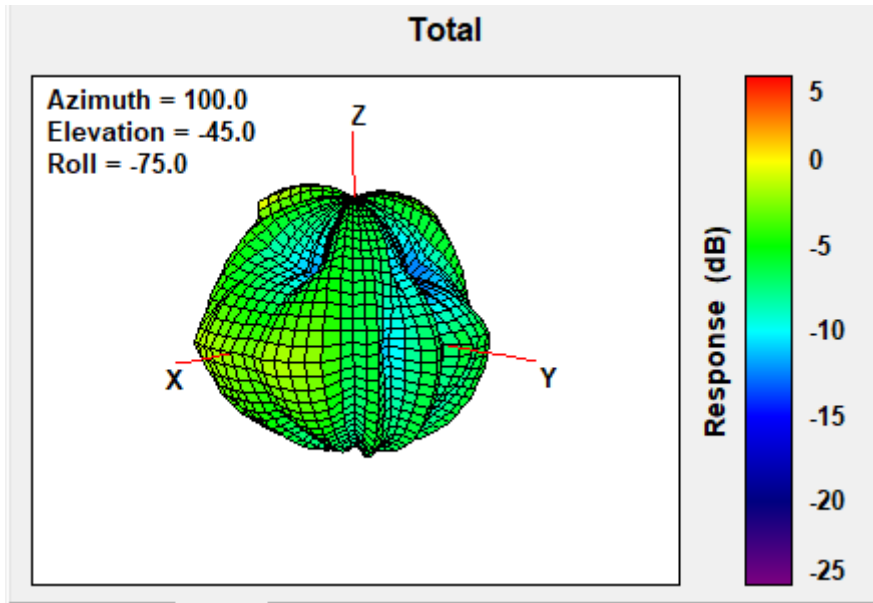
Max Antenna 3D Radiation Pattern 5470-5725 MHz

Frequency (MHz)	Peak Gain w/ Cable Loss (dBi)
5470-5725	0.66



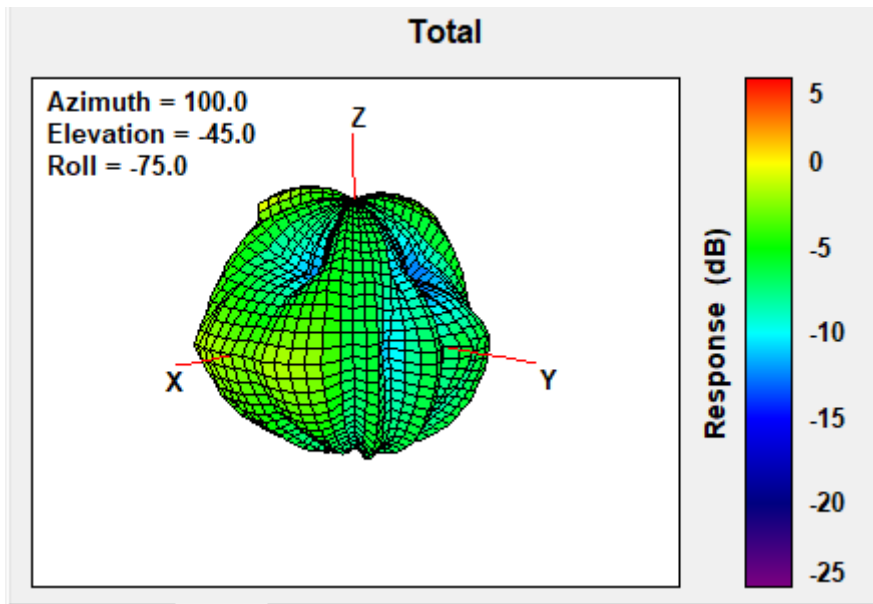
Max Antenna 3D Radiation Pattern 5725-5850 MHz

Frequency (MHz)	Peak Gain w/ Cable Loss (dBi)
5725-5850	1.51



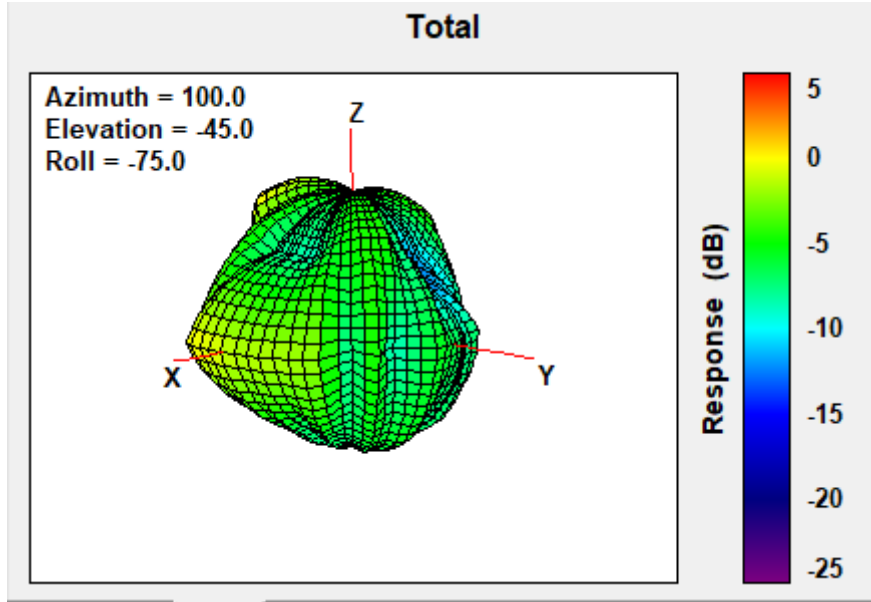
Max Antenna 3D Radiation Pattern 5850-5895 MHz

Frequency (MHz)	Peak Gain w/ Cable Loss (dBi)
5850-5895	1.51



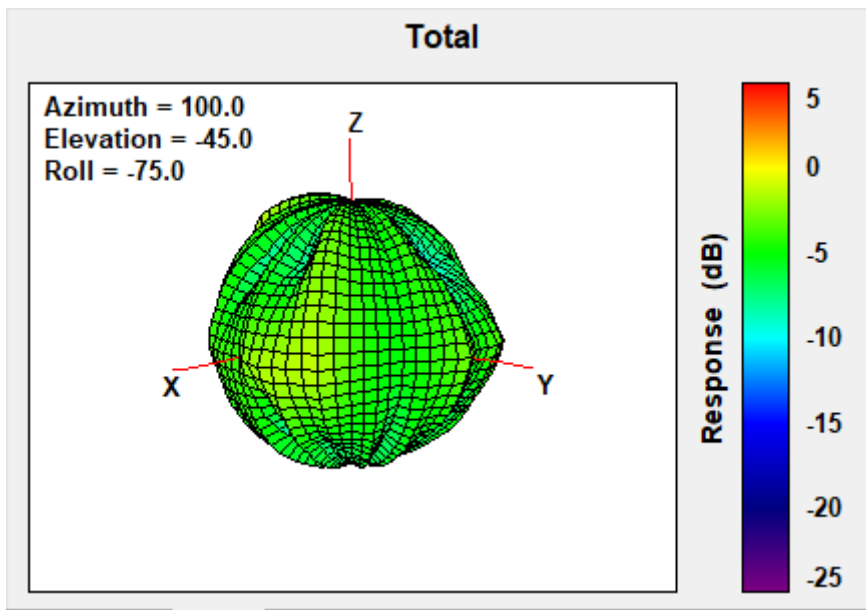
Max Antenna 3D Radiation Pattern 5925-6425 MHz

Frequency (MHz)	Peak Gain w/ Cable Loss (dBi)
5925-6425	2.20



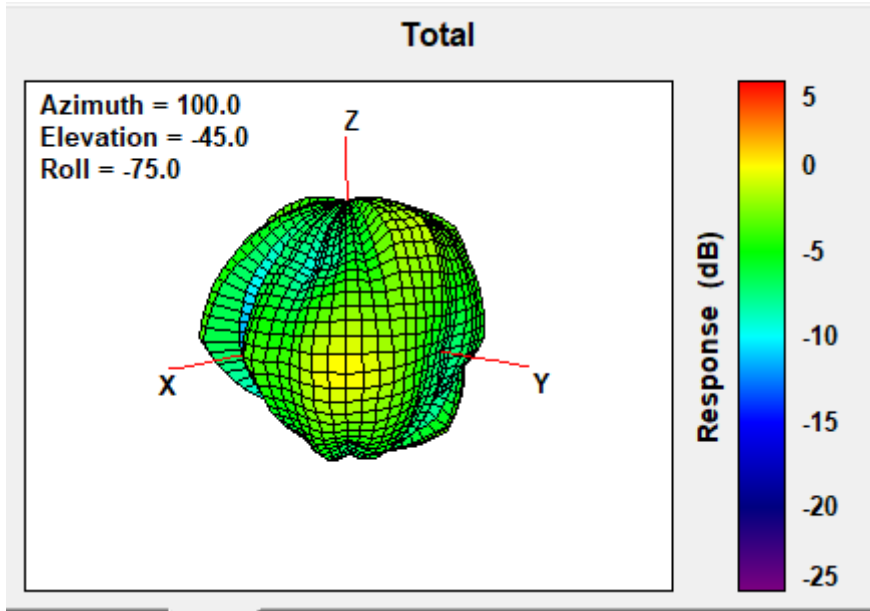
Max Antenna 3D Radiation Pattern 6425-6525 MHz

Frequency (MHz)	Peak Gain w/ Cable Loss (dBi)
6425-6525	0.01



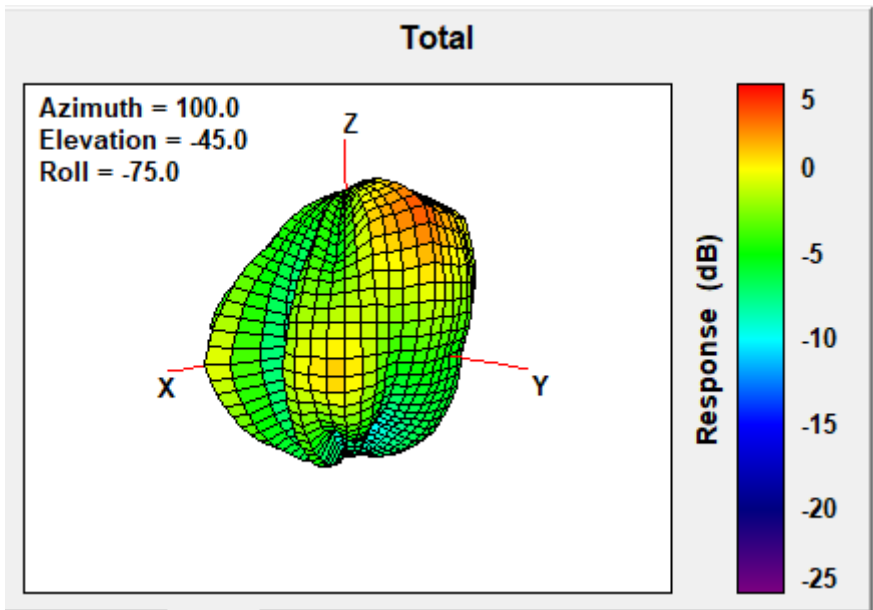
Max Antenna 3D Radiation Pattern 6525-6875 MHz

Frequency (MHz)	Peak Gain w/ Cable Loss (dBi)
6525-6875	0.75



Max Antenna 3D Radiation Pattern 6875-7125 MHz

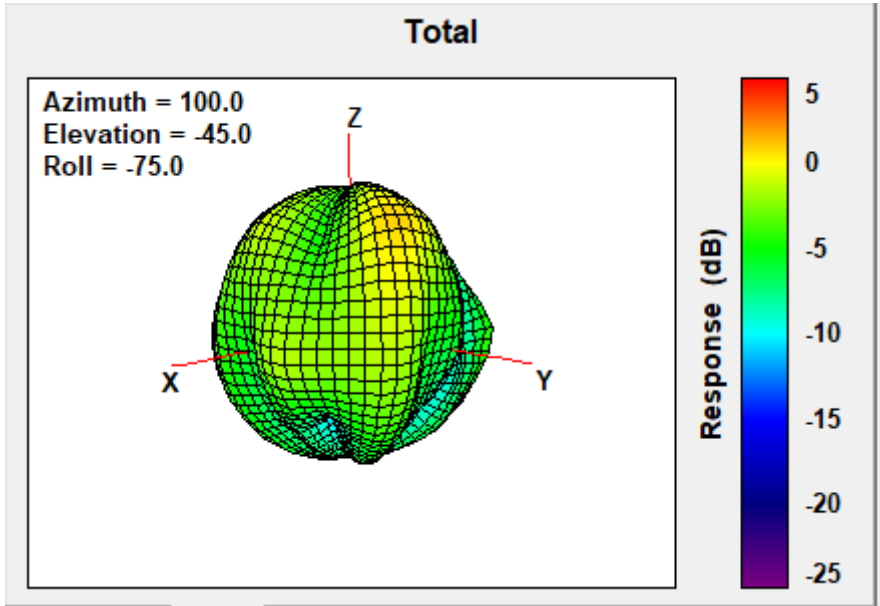
Frequency (MHz)	Peak Gain w/ Cable Loss (dBi)
6875-7125	2.93



Auxiliary Antenna

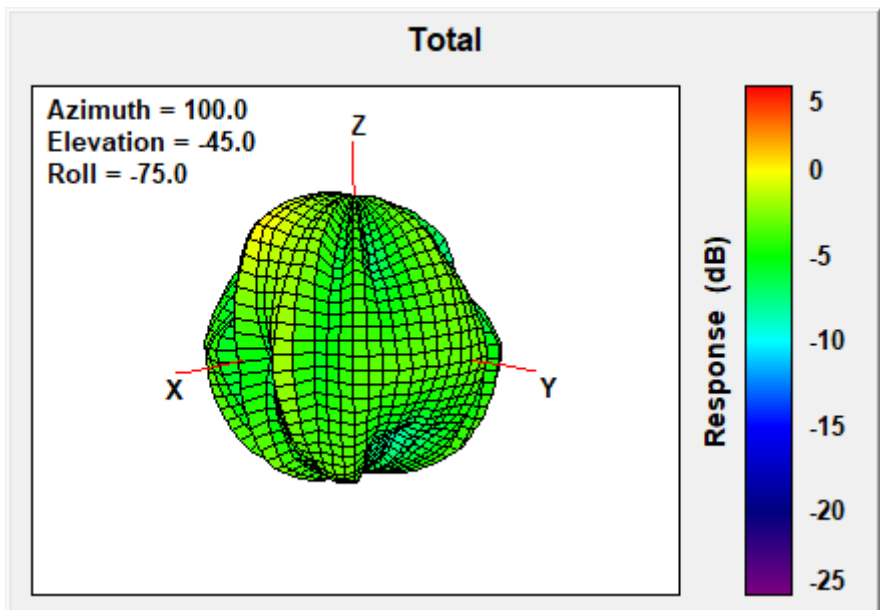
Max Antenna 3D Radiation Pattern 2400 – 2483.5 MHz

Frequency (MHz)	Peak Gain w/ Cable Loss (dBi)
2400-2483.5	1.17



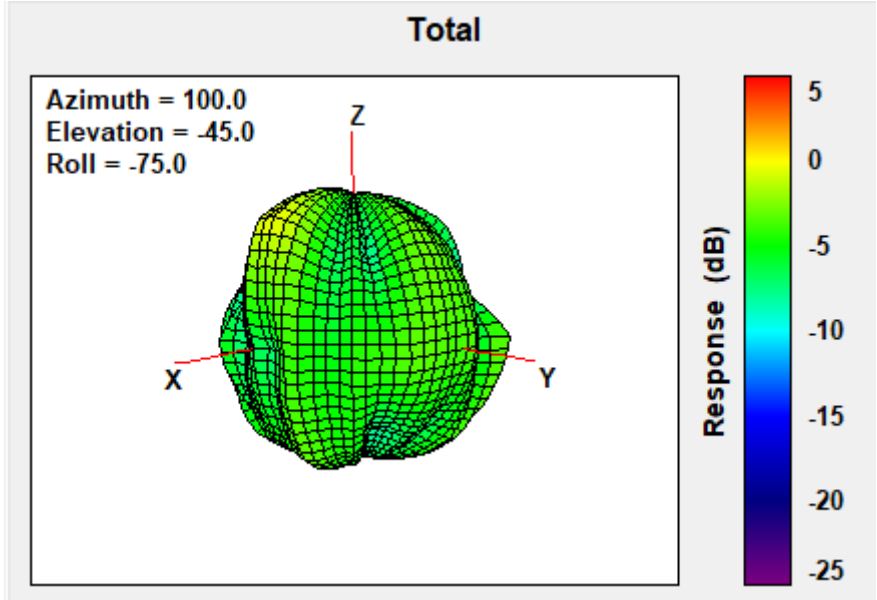
Max Antenna 3D Radiation Pattern 5150-5250 MHz

Frequency (MHz)	Peak Gain w/ Cable Loss (dBi)
5150-5250	0.94



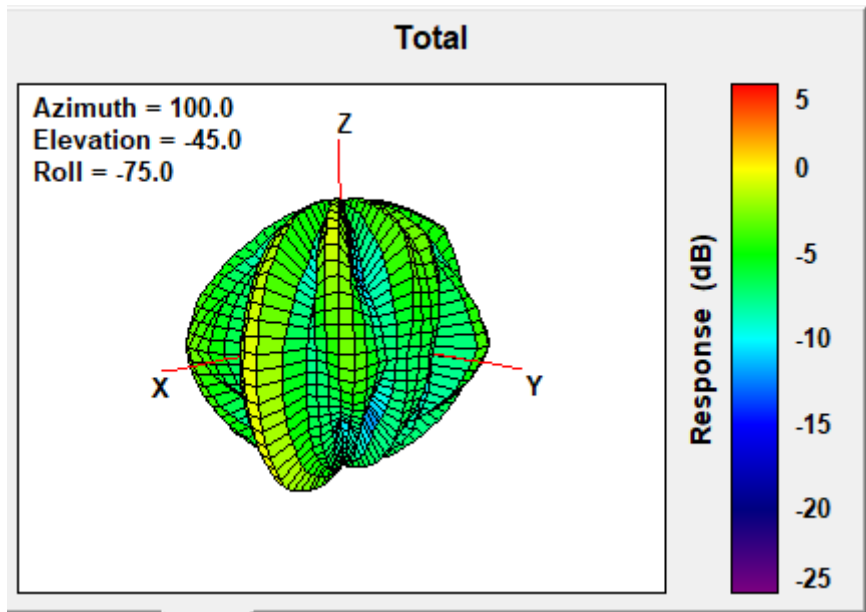
Max Antenna 3D Radiation Pattern 5250-5350 MHz

Frequency (MHz)	Peak Gain w/ Cable Loss (dBi)
5250-5350	0.11



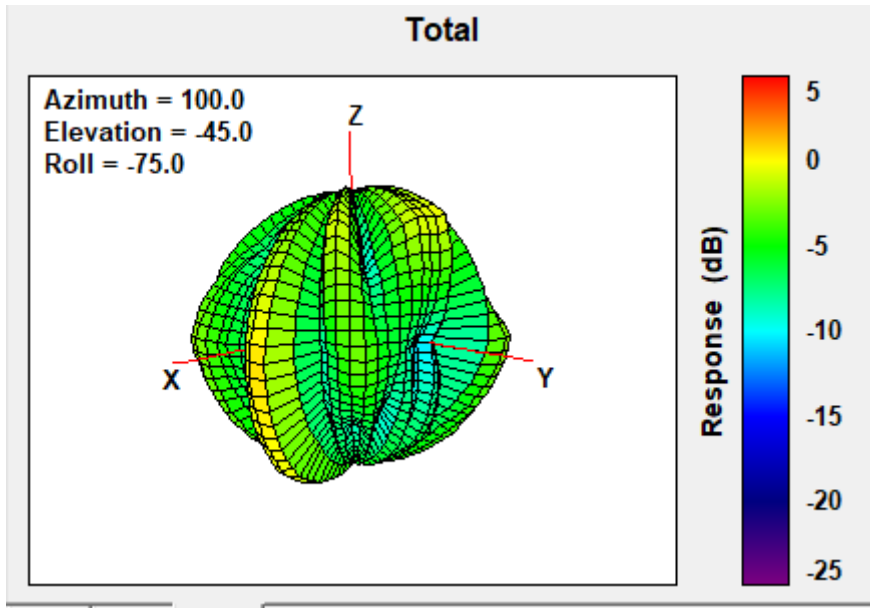
Max Antenna 3D Radiation Pattern 5470-5725 MHz

Frequency (MHz)	Peak Gain w/ Cable Loss (dBi)
5470-5725	0.49



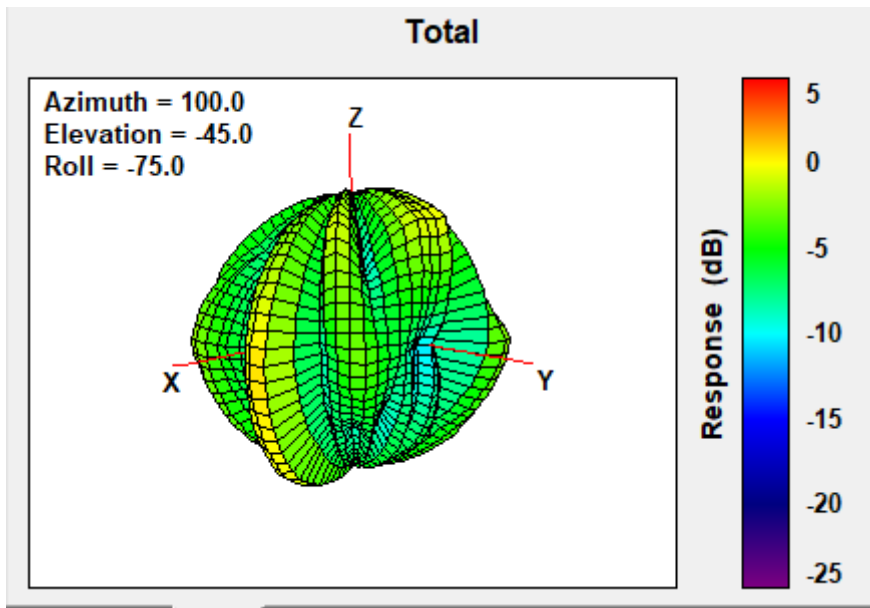
Max Antenna 3D Radiation Pattern 5725-5850 MHz

Frequency (MHz)	Peak Gain w/ Cable Loss (dBi)
5725-5850	1.18



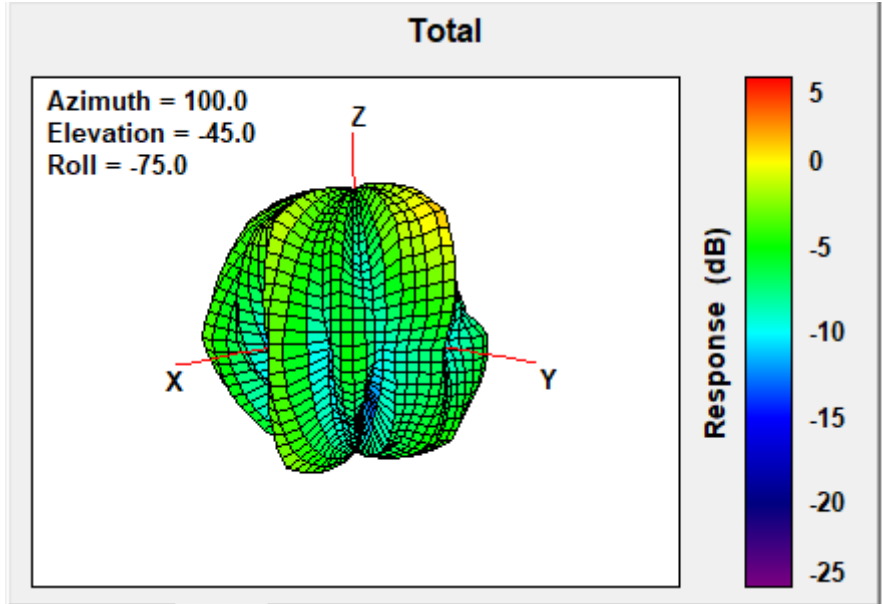
Max Antenna 3D Radiation Pattern 5850-5895 MHz

Frequency (MHz)	Peak Gain w/ Cable Loss (dBi)
5850-5895	1.18



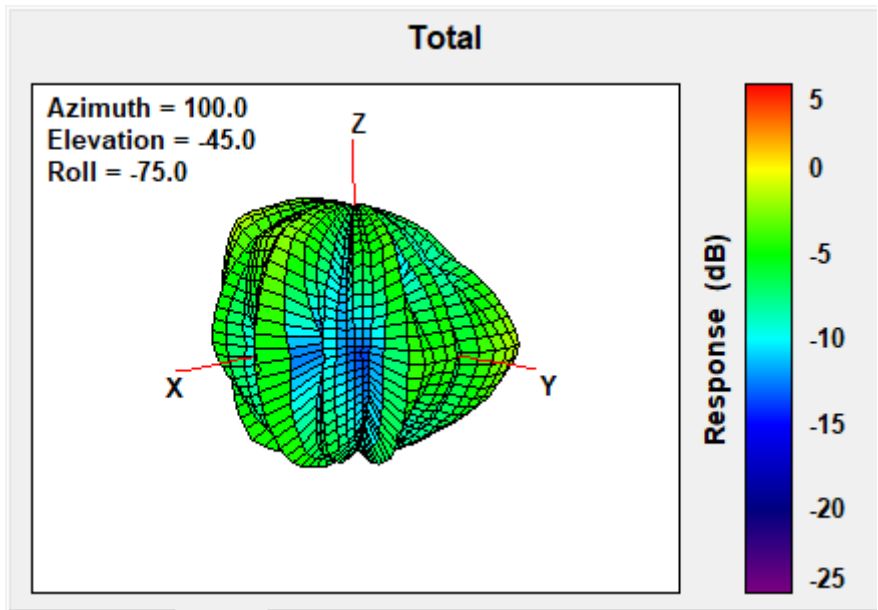
Max Antenna 3D Radiation Pattern 5925-6425 MHz

Frequency (MHz)	Peak Gain w/ Cable Loss (dBi)
5925-6425	2.2



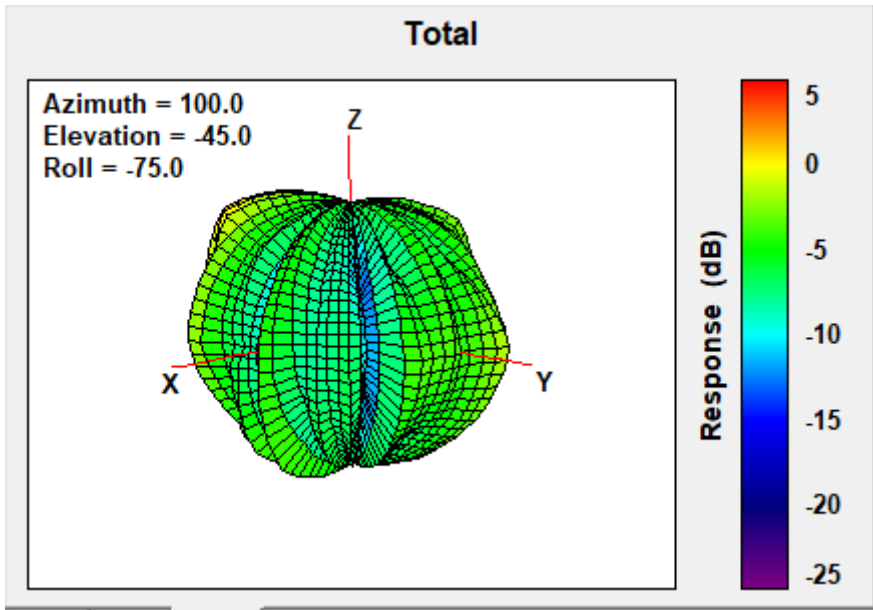
Max Antenna 3D Radiation Pattern 6425-6525 MHz

Frequency (MHz)	Peak Gain w/ Cable Loss (dBi)
6425-6525	-0.5



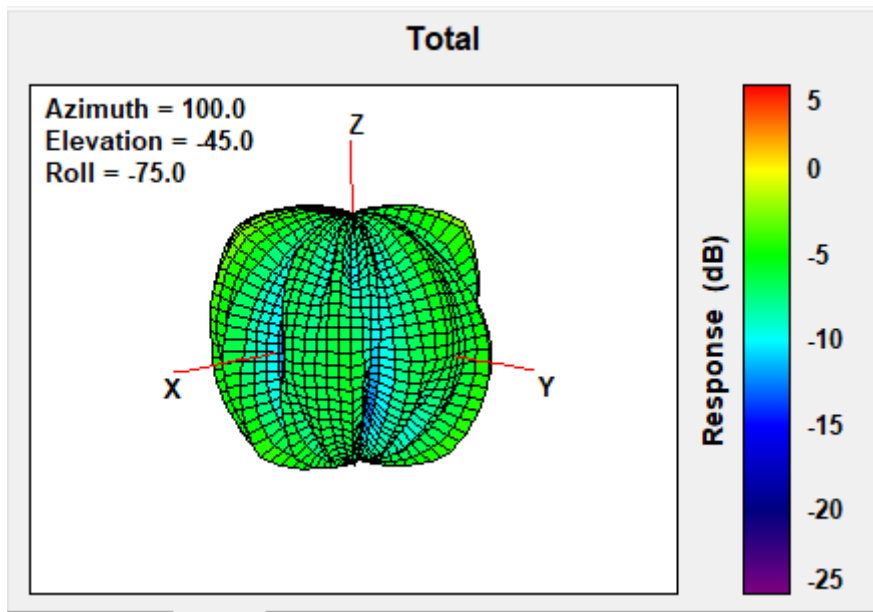
Max Antenna 3D Radiation Pattern 6525-6875 MHz

Frequency (MHz)	Peak Gain w/ Cable Loss (dBi)
6525-6875	1.31



Max Antenna 3D Radiation Pattern 6875-7125 MHz

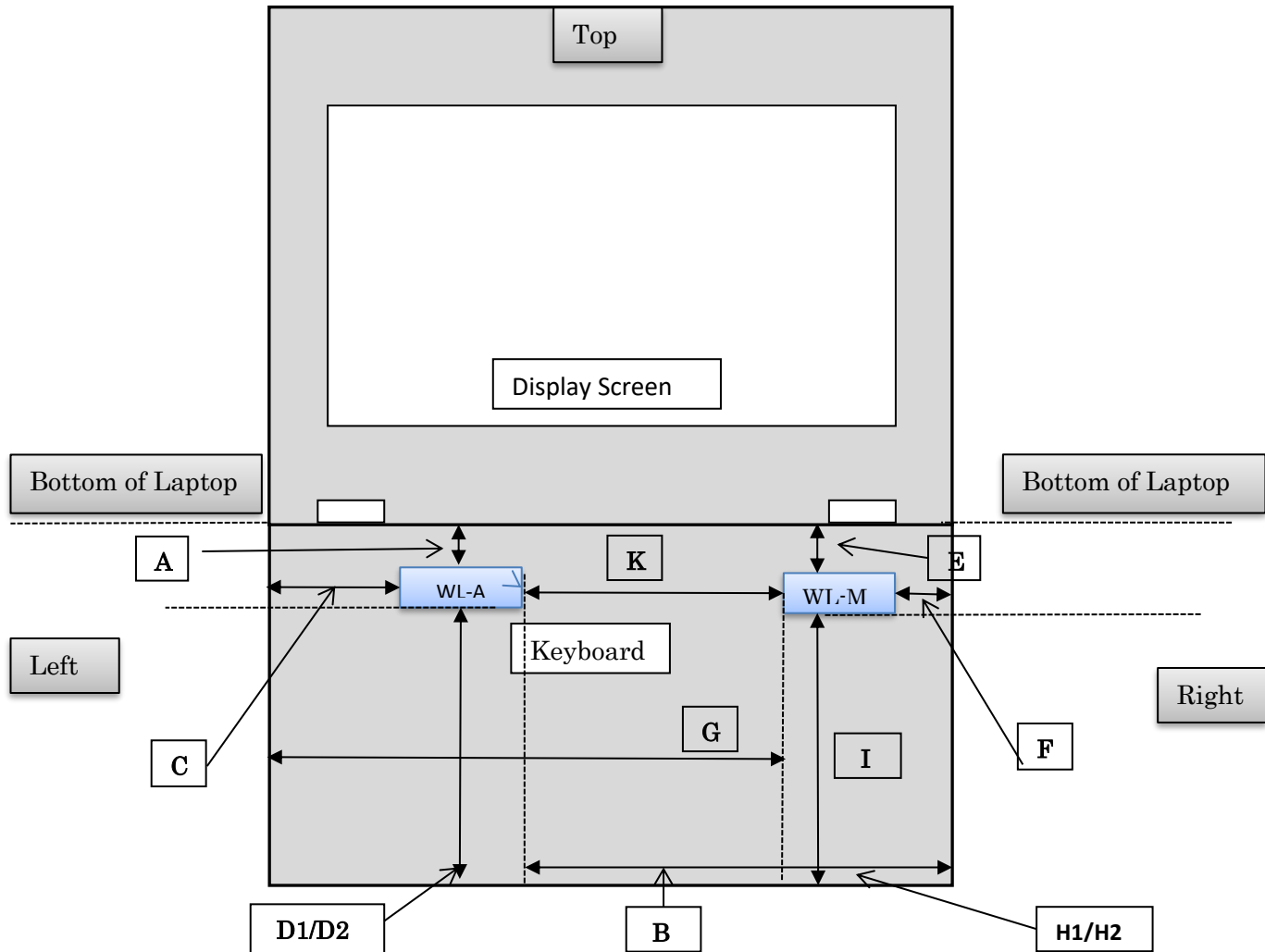
Frequency (MHz)	Peak Gain w/ Cable Loss (dBi)
6875-7125	-1.12



Section 4. Antenna Host Platform Location Information

Include a **dimensioned photo(s) or dimensioned drawing(s)** of Main and Aux antenna placements (measurements are not required for receive-only antenna).

Any antenna that transmits must show dimensions to bottom of laptop. Provide a description of the materials that are used for supporting or surrounding transmit antennas; for example, non-conductive plastics vs. conductive coated plastic or metallic materials.

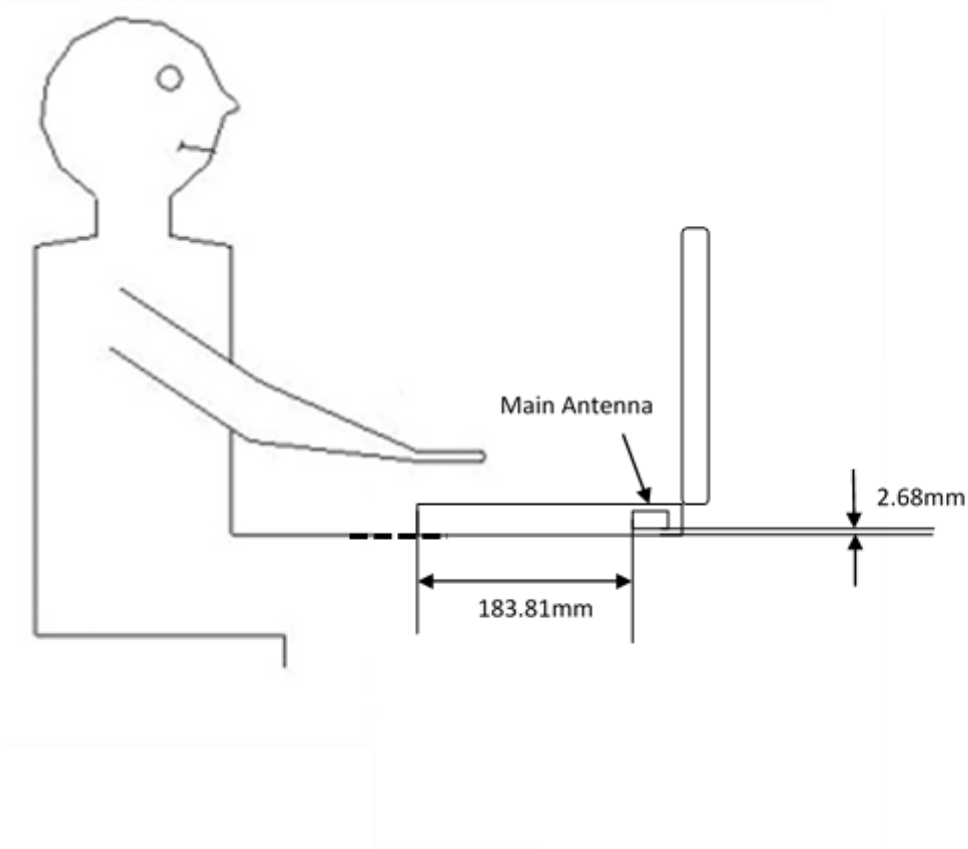


Minimum Separation Distance			
Item	Antenna	Position	Distance (mm)
A	WLAN-Main	to Top	4.53mm
B	WLAN-Main	to Right	31.07mm
C	WLAN-Main	to Left	205.67mm
D-1	WLAN-Main	to Bottom of Laptop (Include Bumper)	2.68mm
D-2	WLAN-Main	to Bottom of Laptop (NOT include Bumper)	0.9mm

E	WLAN-Aux	to Top	4.53mm
F	WLAN-Aux	to Right	205.67 mm
G	WLAN-Aux	to Left	31.07mm
H-1	WLAN-Aux	to Bottom of Laptop (Include Bumper)	2.68mm
H-1	WLAN-Aux	to Bottom of Laptop (NOT include Bumper)	0.9mm
K	WLAN Main	to WLAN Aux	116.04mm

Section 5. Antenna dimensional information for SAR evaluation

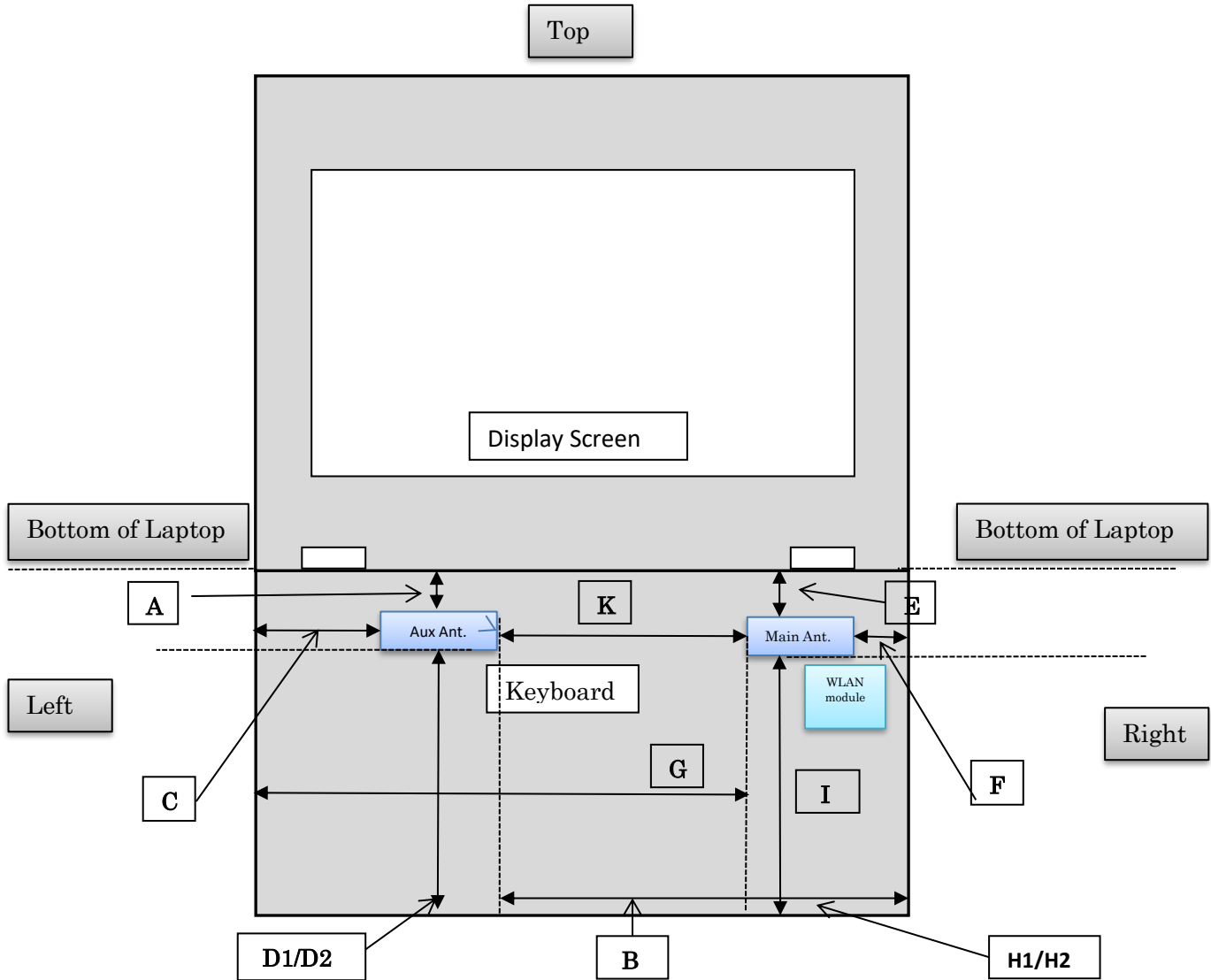
Include a **dimensioned photo(s) or dimensioned drawing(s)** showing the distance (mm) between the transmit antennas and the user. For notebook/laptop hosts show lapheld position (example below). For tablet hosts show all orientations including lapheld, primary & secondary portrait, primary & secondary landscape positions. Include a description of any proximity sensors or power throttling implementations that limit or exclude use of any host orientation.



Section 6. Diagram Example of Co-Location Antenna Separation

Include a **dimensioned photo or dimensioned drawing** showing the distance (mm) between **all WLAN transmit antennas** and other co-located radiator transmit antenna such as Bluetooth, WWAN,..

(Note: Due to the evolving rules regarding co-location, each platform will need to be reviewed on a case by case basis)



Minimum Separation Distance			
Item	Antenna	Position	Distance (mm)
A	WLAN-Main	to Top	4.53mm
B	WLAN-Main	to Right	31.07mm
C	WLAN-Main	to Left	205.67mm
D-1	WLAN-Main	to Bottom of Laptop	2.68mm

		(Include Bumper)	
D-2	WLAN-Main	to Bottom of Laptop (NOT include Bumper)	0.9mm
E	WLAN-Aux	to Top	4.53mm
F	WLAN-Aux	to Right	205.67 mm
G	WLAN-Aux	to Left	31.07mm
H-1	WLAN-Aux	to Bottom of Laptop (Include Bumper)	2.68mm
H-1	WLAN-Aux	to Bottom of Laptop (NOT include Bumper)	0.9mm
K	WLAN Main	to WLAN Aux	116.04mm

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