

# Regulatory WLAN Antenna Information (Template)

English Language Required for Intel Regulatory Review / Approval

(OEM/ODM or antenna vendor is required to complete this document with platform antenna information.

Remove Intel references and make this your own document)

| Platform information   |                                  |                               |                               |                               |                                       |                               |  |                               |                               |  |  |  |  |  |  |  |  |  |  |
|--|----------------------------------|-------------------------------|-------------------------------|-------------------------------|---------------------------------------|-------------------------------|--|-------------------------------|-------------------------------|--|--|--|--|--|--|--|--|--|--|
| Brand  | ODM                              | ****End product model name    |                               |                               | Intel platform<br>(ex: Yes, No or NA) |                               | Platform type<br>(ex: regular NB, convertible PC, AIO...etc) |                               | *SAR minimum separation (mm)  |  |  |  |  |  |  |  |  |  |  |
| Dell   | Wistron                          | P171G                         |                               |                               | Yes                                   |                               | Regular NB   |                               | 3.3                           |  |  |  |  |  |  |  |  |  |  |
| *****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  |                                  | PIFA                          |                               |                               | Antenna P/N:<br>81EABW15.011          |                               |  | Antenna P/N:<br>81EABW15.012  |                               |  |  |  |  |  |  |  |  |  |  |
| Peak gain w/ cable loss (dBi)*   |                                  |                               |                               |                               |                                       |                               |  |                               |                               |  |  |  |  |  |  |  |  |  |  |
|  | <b>2.4GHz</b><br>2400-2483.5 MHz | <b>5.2GHz</b><br>5150-5250MHz | <b>5.3GHz</b><br>5250-5350MHz | <b>5.6GHz</b><br>5470-5725MHz | <b>5.8GHz</b><br>5725-5850MHz         | <b>5.9GHz</b><br>5850-5895MHz | <b>6.2GHz</b><br>5925-6425MHz                                | <b>6.5GHz</b><br>6425-6525MHz | <b>6.7GHz</b><br>6525-6875MHz | <b>7.0 GHz</b><br>6875-7125MHz           |  |  |  |  |  |  |  |  |  |
| Main   | -0.81                            | 0.55                          | 0.25                          | 1.57                          | 1.57                                  | 3.91                          | 4.10   | 3.53                          | 3.38                          | 3.39                                     |  |  |  |  |  |  |  |  |  |
| Aux  | 0.09                             | 0.53                          | -0.35                         | 0.70                          | -0.03                                 | 1.52                          | 1.43   | 1.92                          | 1.92                          | 2.27                                     |  |  |  |  |  |  |  |  |  |
| Intel Reference Gain/Type/ Separation distance   |                                  |                               |                               |                               |                                       |                               |  |                               |                               |  |  |  |  |  |  |  |  |  |  |
| Antenna Type   | Antenna Peak gain (In dBi)*      |                               |                               |                               |                                       |                               |  |                               |                               | Distance to the end user (mm)            |  |  |  |  |  |  |  |  |  |
|  | <b>2.4GHz</b><br>2400-2483.5 MHz | <b>5.2GHz</b><br>5150-5250MHz | <b>5.3GHz</b><br>5250-5350MHz | <b>5.6GHz</b><br>5470-5725MHz | <b>5.8GHz</b><br>5725-5850MHz         | <b>5.9GHz</b><br>5850-5895MHz | <b>6.2GHz</b><br>5925-6425MHz                                | <b>6.5GHz</b><br>6425-6525MHz | <b>6.7GHz</b><br>6525-6875MHz | <b>7.0GHz</b><br>6875-7125MHz            |  |  |  |  |  |  |  |  |  |
| Design   | <b>3.00</b>                      | <b>5.00</b>                   | <b>5.00</b>                   | <b>5.00</b>                   | <b>5.00</b>                           | <b>5.00</b>                   | <b>5.00</b>  | <b>5.00</b>                   | <b>5.00</b>                   | Generic: refer to modular FCC SAR report |  |  |  |  |  |  |  |  |  |
| PIFA   | <b>3.24</b>                      | <b>3.64</b>                   | <b>3.73</b>                   | <b>4.77</b>                   | <b>4.97</b>                           | <b>4.72</b>                   | <b>4.83</b>  | <b>4.30</b>                   | <b>5.37</b>                   | Mid-power: ≥ 8 mm                        |  |  |  |  |  |  |  |  |  |
| Dipole   | <b>2.89</b>                      | <b>2.92</b>                   | <b>3.19</b>                   | <b>4.41</b>                   | <b>4.22</b>                           | <b>4.22</b>                   | <b>4.83</b>  | <b>4.30</b>                   | <b>4.49</b>                   | Low power: ≥ 5 mm                        |  |  |  |  |  |  |  |  |  |
| 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

The gain measurement shall follow by following conditions:

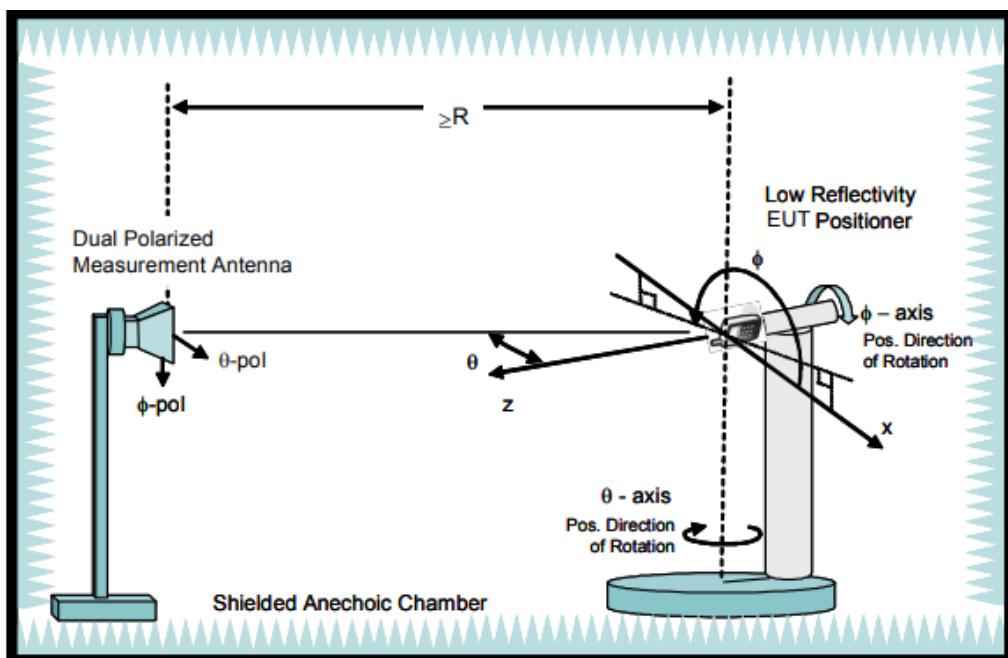
- It is required that all the antenna gain to be measured spherically and computed by spatial average be computed of the resultant gain.
- During gain measurement, all other antennas not under test should be terminated by 50 Ohm load in end of cable.
- Space points of 3D gain measurement are increase 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

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

| 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<br>V1.15<br>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     |

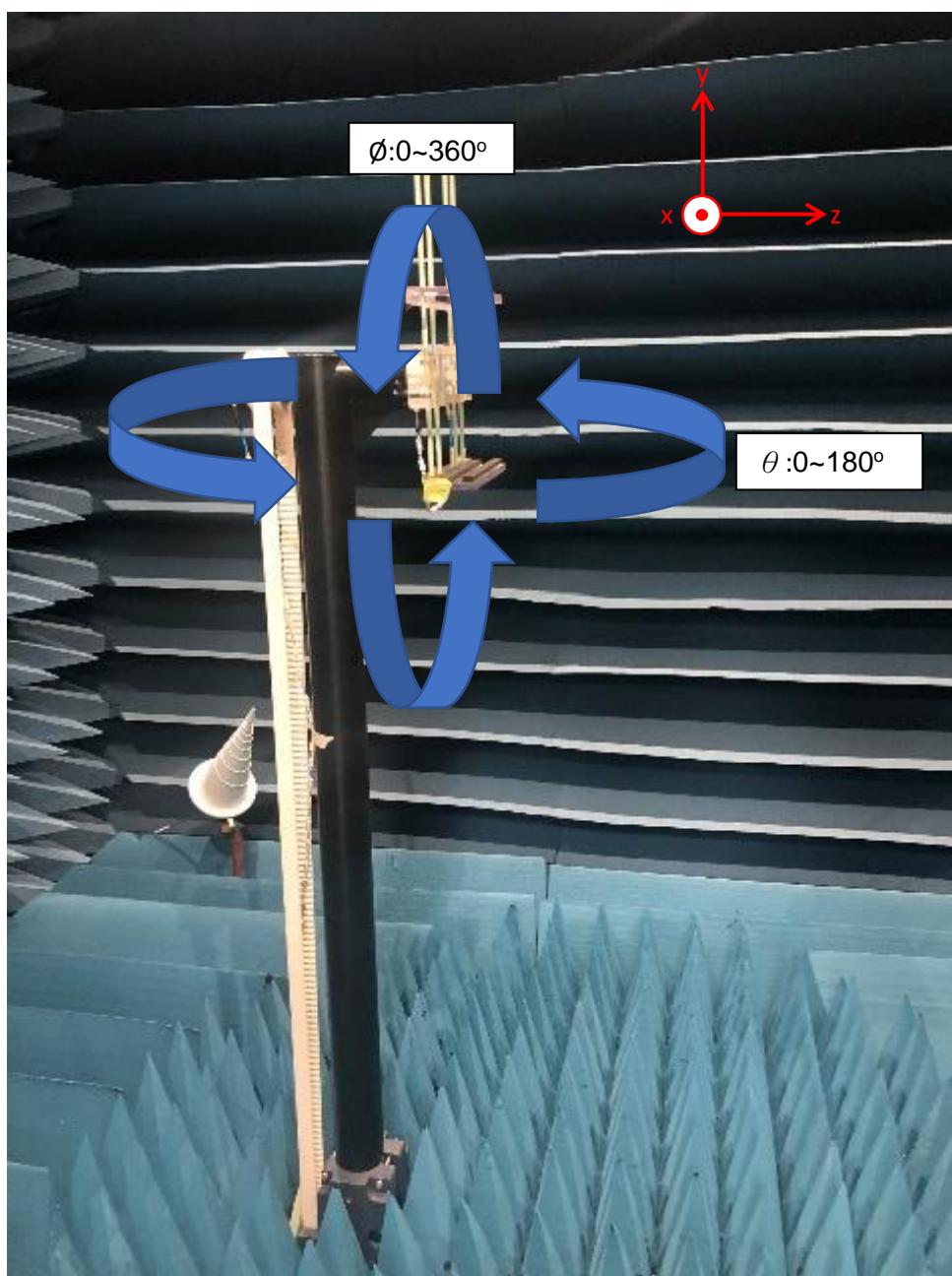
### 3. Setup photo

#### 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

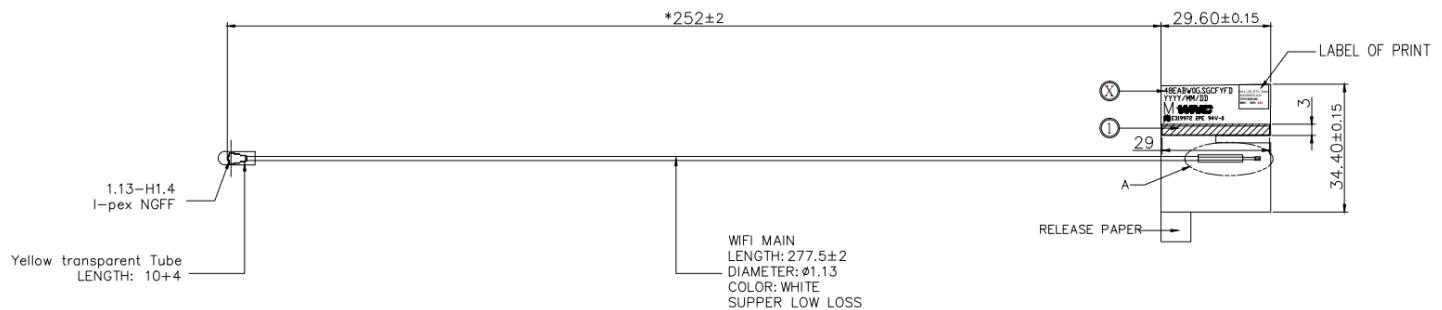
| 1A<br>Antenna Part<br>Number        | 1B<br>Manufacturer | 1C<br>Antenna Type | 1D<br>Cable Assembly Part<br>Number and<br>Information                  | Freq Range<br>MHz | 1E<br>* Peak Gain<br>W/ Cable loss<br>(dBi) | 1F<br>Peak Gain<br>w/o Cable<br>Loss (dBi) | 1G<br>Max VSWR | 1H<br>Cable Loss<br>(dB) |
|-------------------------------------|--------------------|--------------------|---|-------------------|---|--|----------------|--------------------------|
| (P/N: 81EABW15.011)<br>Main Antenna | WNC                | PIFA               | 50 ohm Coaxial<br>length: 252mm<br>diameter: 1.13mm<br>Connector : IPEX | 2400-2483.5       | -0.81                                       | 0.83                                       | 3.0            | 0.74                     |
|                                     |                    |                    |   | 5150-5250         | 0.55  | 4.00                                       | 3.0            | 1.10                     |
|                                     |                    |                    |   | 5250-5350         | 0.25  | 3.94                                       | 3.0            | 1.12                     |
|                                     |                    |                    |   | 5470-5725         | 1.57  | 5.15                                       | 3.0            | 1.17                     |
|                                     |                    |                    |   | 5725-5850         | 1.57  | 5.24                                       | 3.0            | 1.17                     |
|                                     |                    |                    |   | 5850-5895         | 3.91  | 5.1  | 3.0            | 1.19                     |
|                                     |                    |                    |   | 5925-6425         | 4.10  | 4.63                                       | 3.0            | 1.25                     |
|                                     |                    |                    |   | 6425-6525         | 3.53  | 4.34                                       | 3.0            | 1.26                     |
|                                     |                    |                    |   | 6525-6875         | 3.38  | 4.96                                       | 3.0            | 1.28                     |
|                                     |                    |                    |   | 6875-7125         | 3.39  | 5.23                                       | 3.0            | 1.33                     |
| (P/N: 81EABW15.012)<br>Aux Antenna  | WNC                | PIFA               | 50 ohm Coaxial<br>length: 196mm<br>diameter: 1.13mm<br>Connector : IPEX | 2400-2483.5       | 0.09  | -0.5                                       | 3.0            | 0.58                     |
|                                     |                    |                    |   | 5150-5250         | 0.53  | 3.86                                       | 3.0            | 0.85                     |
|                                     |                    |                    |   | 5250-5350         | -0.35                                       | 3.69                                       | 3.0            | 0.86                     |
|                                     |                    |                    |   | 5470-5725         | 0.70  | 5.38                                       | 3.0            | 0.89                     |
|                                     |                    |                    |   | 5725-5850         | -0.03                                       | 4.44                                       | 3.0            | 0.91                     |
|                                     |                    |                    |   | 5850-5895         | 1.52  | 2.44                                       | 3.0            | 0.92                     |
|                                     |                    |                    |   | 5925-6425         | 1.43  | 4.5  | 3.0            | 0.95                     |
|                                     |                    |                    |   | 6425-6525         | 1.92  | 3.86                                       | 3.0            | 0.99                     |
|                                     |                    |                    |   | 6525-6875         | 1.92  | 5.24                                       | 3.0            | 0.99                     |
|                                     |                    |                    |   | 6875-7125         | 2.27  | 5.07                                       | 3.0            | 1.04                     |

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

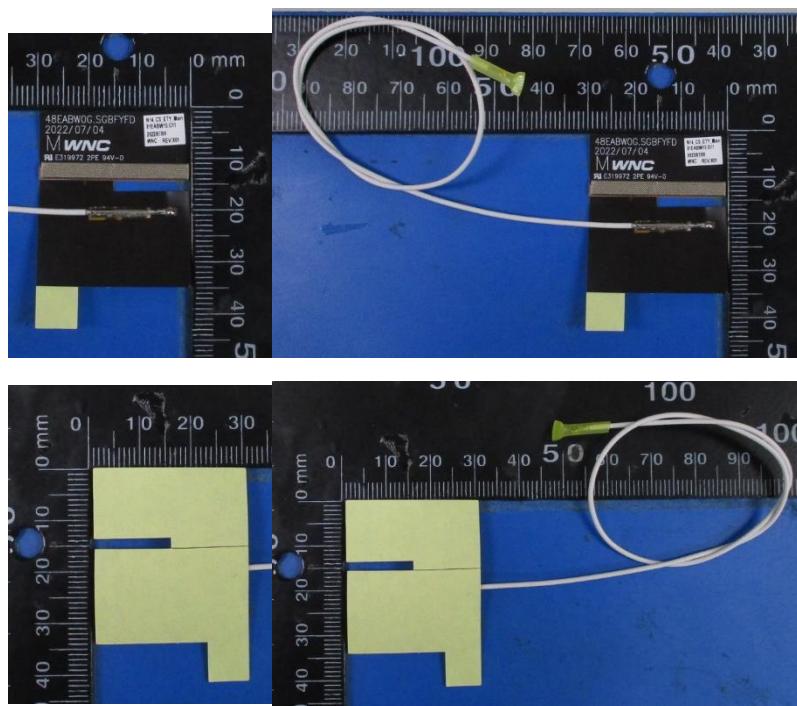
## Section 2. Dimensioned Photos and Drawings of Antennas

Include the dimensioned photo and drawing of Main antenna here.

Main Antenna Drawing:



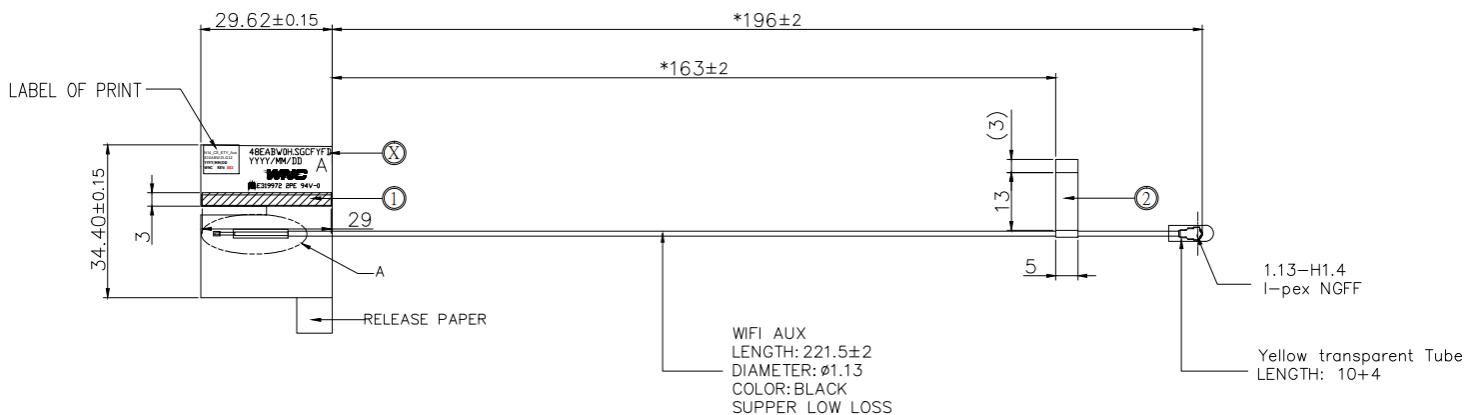
Main Antenna Photo (Front/Back):



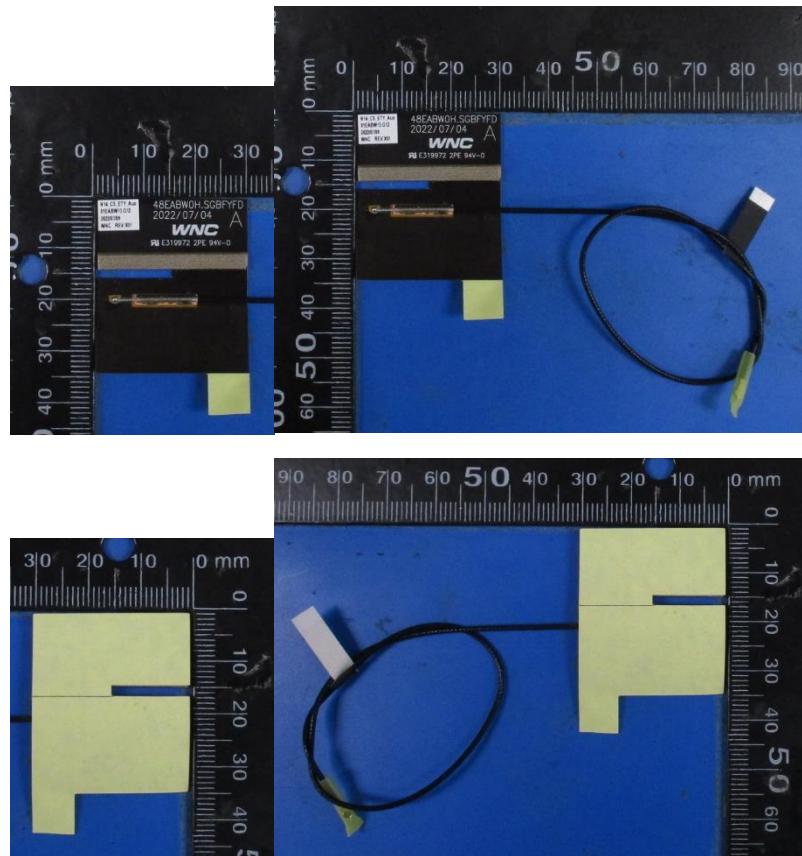
Note: antenna photo should include L type ruler

Include the dimensioned photo and drawing of Aux antenna here.

Aux Antenna Drawing:



Aux Antenna Photo (Front/Back):



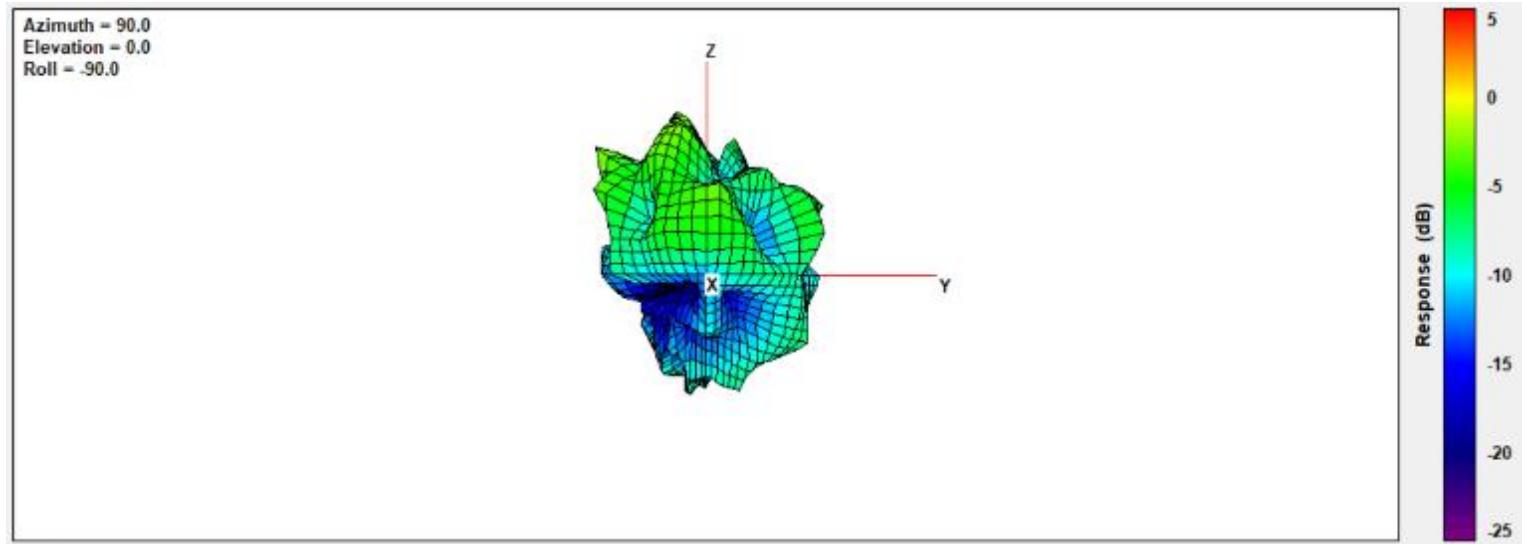
Note: antenna photo should include L type ruler

## Section 3. Radiation characteristics of antenna loaded in Host Platform

### Main Antenna

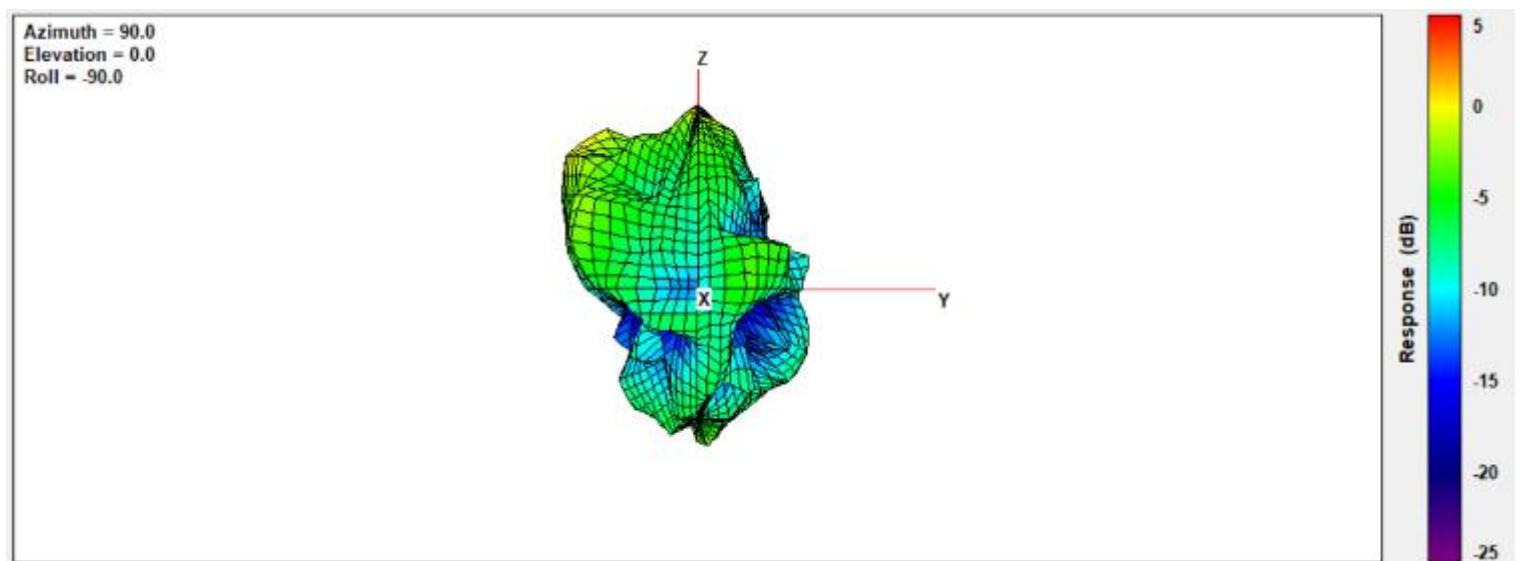
#### Max Antenna 3D Radiation Pattern 2400 – 2483.5 MHz

| Frequency<br>(MHz) | Peak Gain w/ Cable Loss<br>(dBi) |
|--------------------|----------------------------------|
| 2400-2483.5        | -0.81                            |



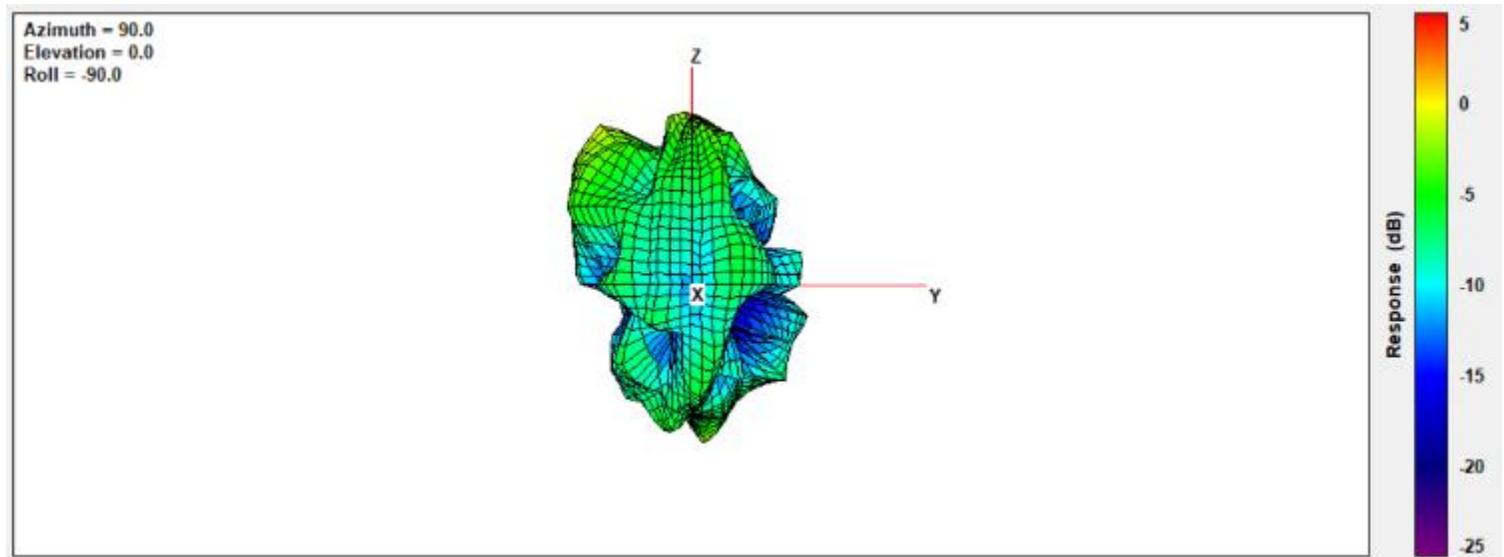
#### Max Antenna 3D Radiation Pattern 5150-5250 MHz

| Frequency<br>(MHz) | Peak Gain w/ Cable Loss<br>(dBi) |
|--------------------|----------------------------------|
| 5150-5250          | 0.55                             |



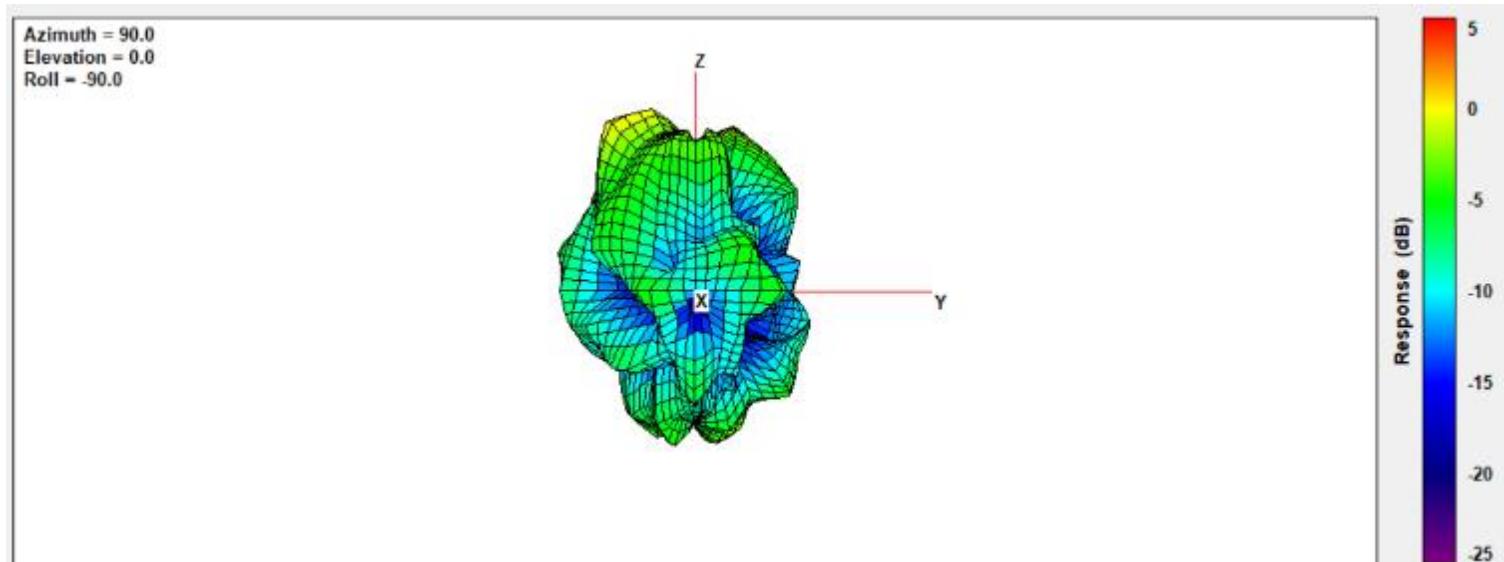
## Max Antenna 3D Radiation Pattern 5250-5350 MHz

| Frequency<br>(MHz) | Peak Gain w/ Cable Loss<br>(dBi) |
|--------------------|----------------------------------|
| 5250-5350          | 0.25                             |



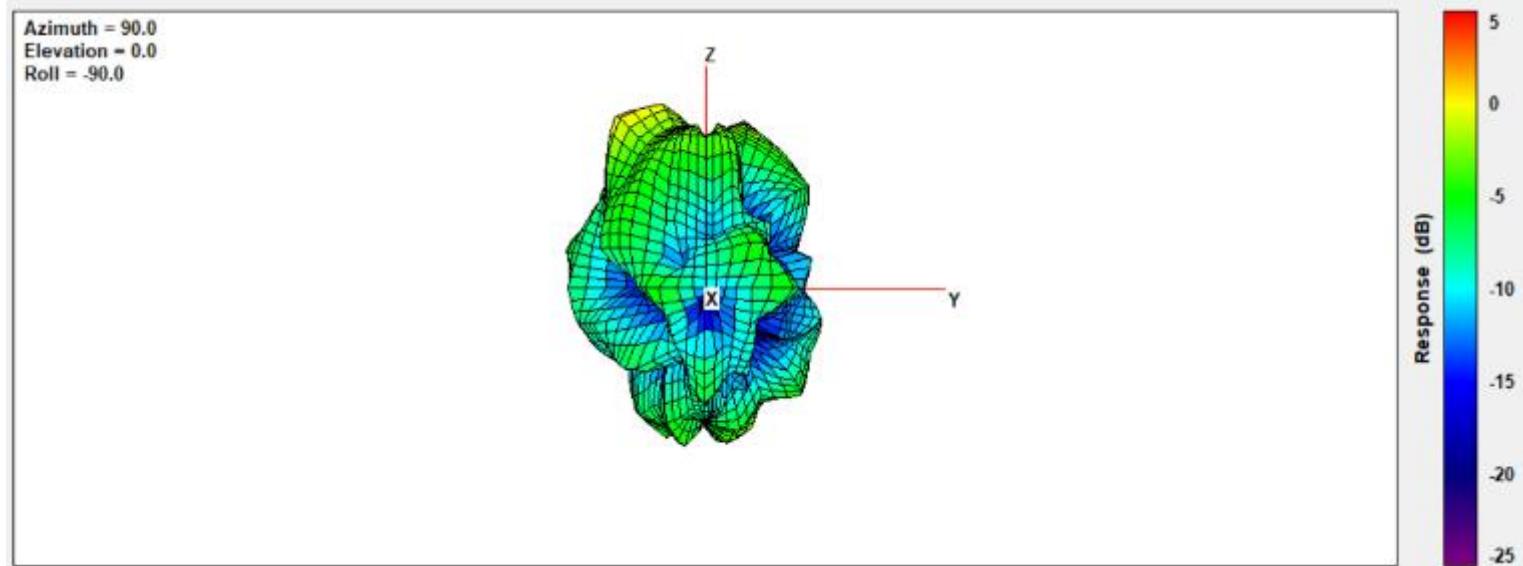
## Max Antenna 3D Radiation Pattern 5470-5725 MHz

| Frequency<br>(MHz) | Peak Gain w/ Cable Loss<br>(dBi) |
|--------------------|----------------------------------|
| 5470-5725          | 1.57                             |



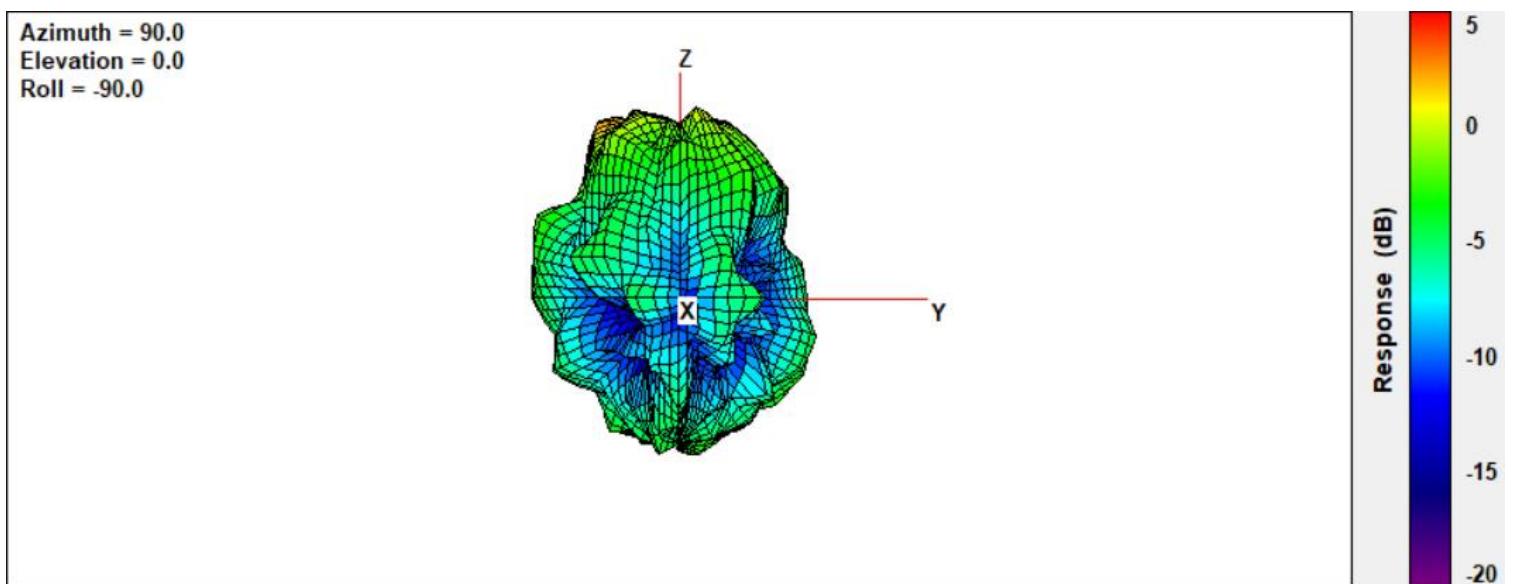
## Max Antenna 3D Radiation Pattern 5725-5850 MHz

| Frequency<br>(MHz) | Peak Gain w/ Cable Loss<br>(dBi) |
|--------------------|----------------------------------|
| 5725-5850          | 1.57                             |



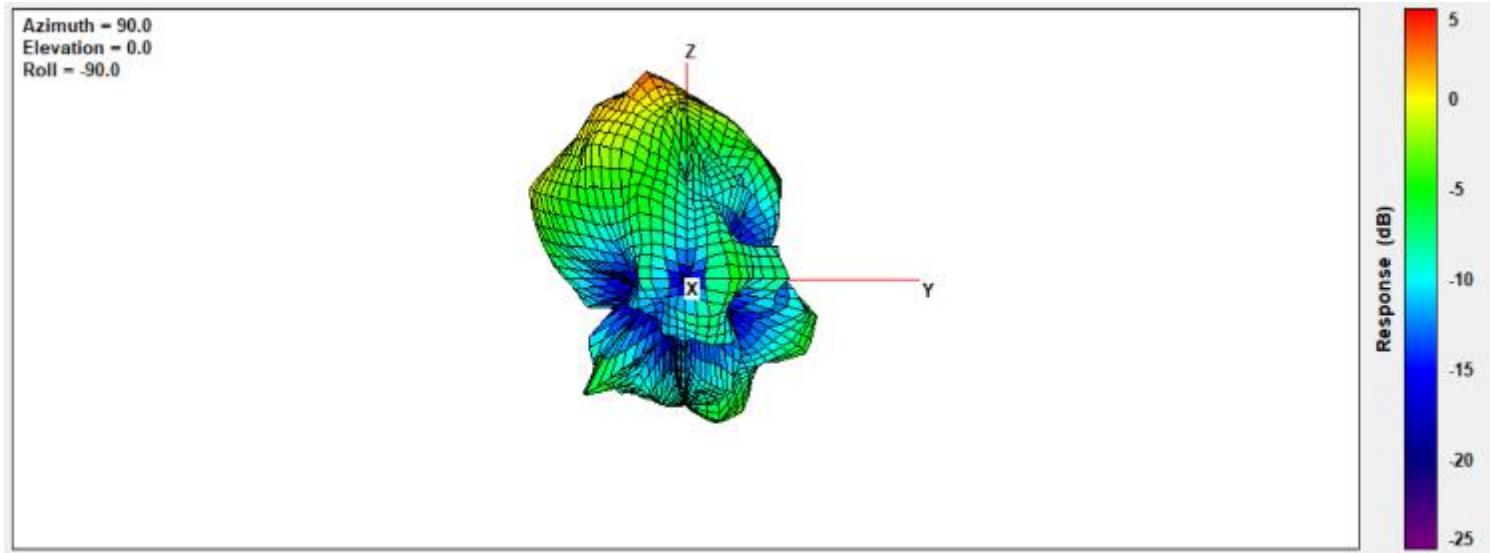
## Max Antenna 3D Radiation Pattern 5850-5895 MHz

| Frequency<br>(MHz) | Peak Gain w/ Cable Loss<br>(dBi) |
|--------------------|----------------------------------|
| 5850-5895          | 3.91                             |



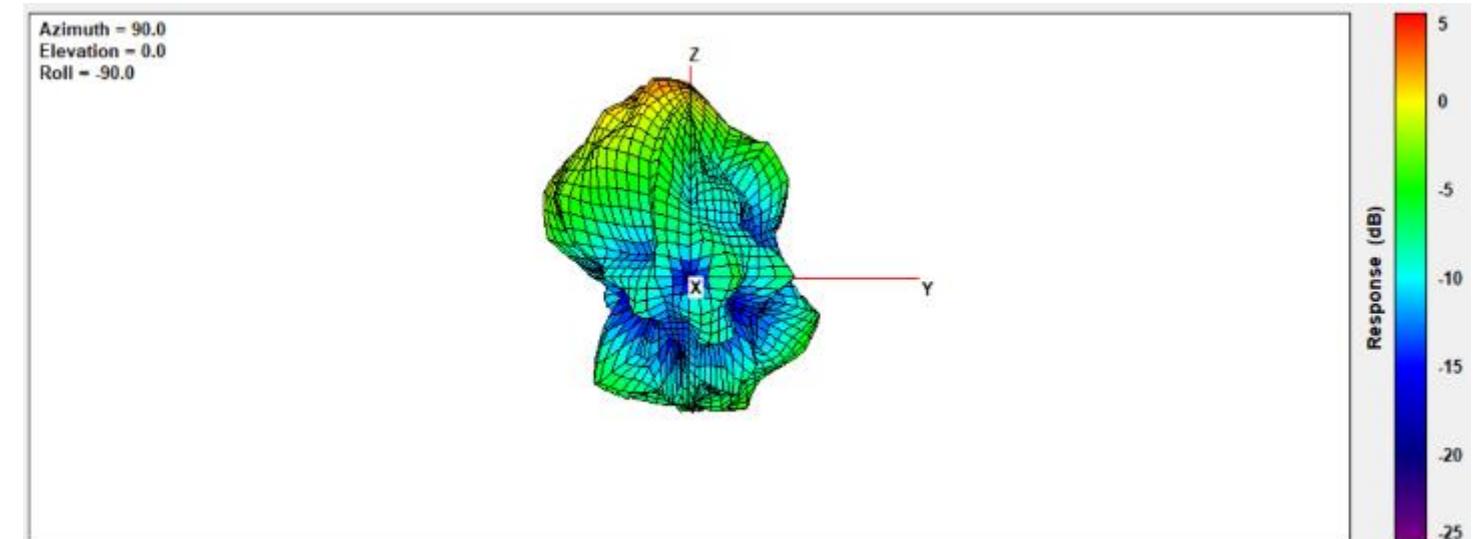
## Max Antenna 3D Radiation Pattern 5925-6425 MHz

| Frequency<br>(MHz) | Peak Gain w/ Cable Loss<br>(dBi) |
|--------------------|----------------------------------|
| 5925-6425          | 4.10                             |



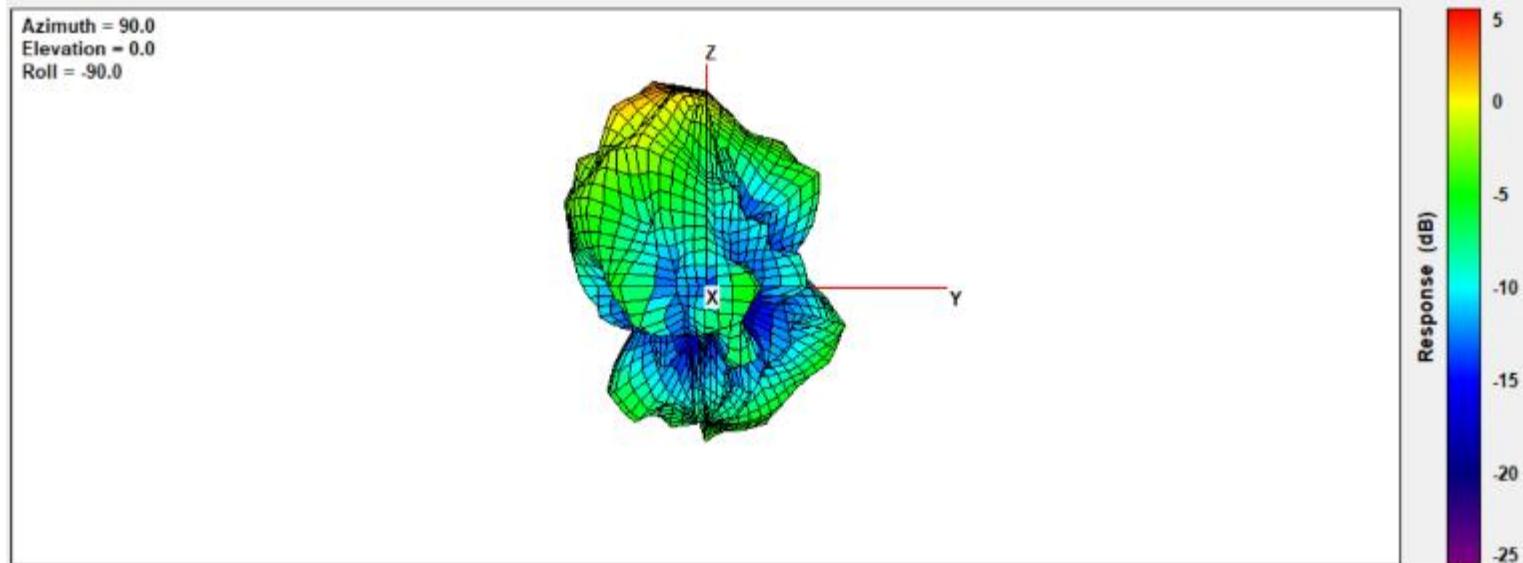
## Max Antenna 3D Radiation Pattern 6425-6525 MHz

| Frequency<br>(MHz) | Peak Gain w/ Cable Loss<br>(dBi) |
|--------------------|----------------------------------|
| 6425-6525          | 3.53                             |



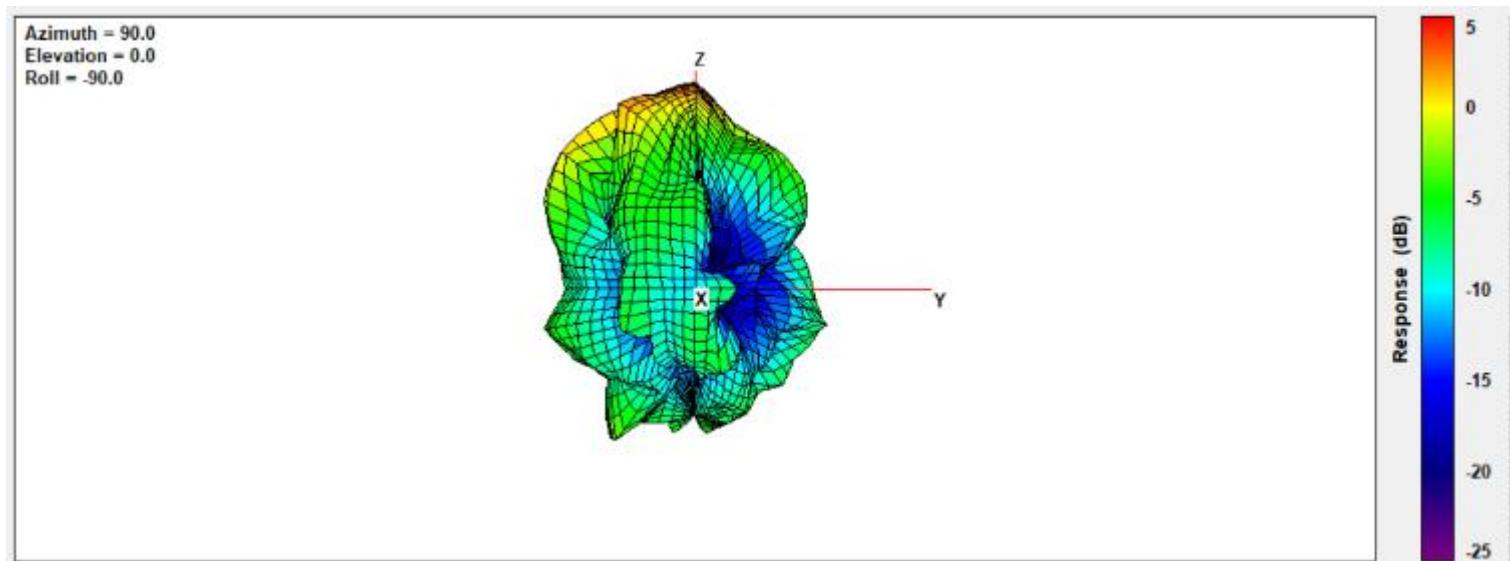
## Max Antenna 3D Radiation Pattern 6525-6875 MHz

| Frequency (MHz) | Peak Gain w/ Cable Loss (dBi) |
|-----------------|-------------------------------|
| 6525-6875       | 3.38                          |



## Max Antenna 3D Radiation Pattern 6875-7125 MHz

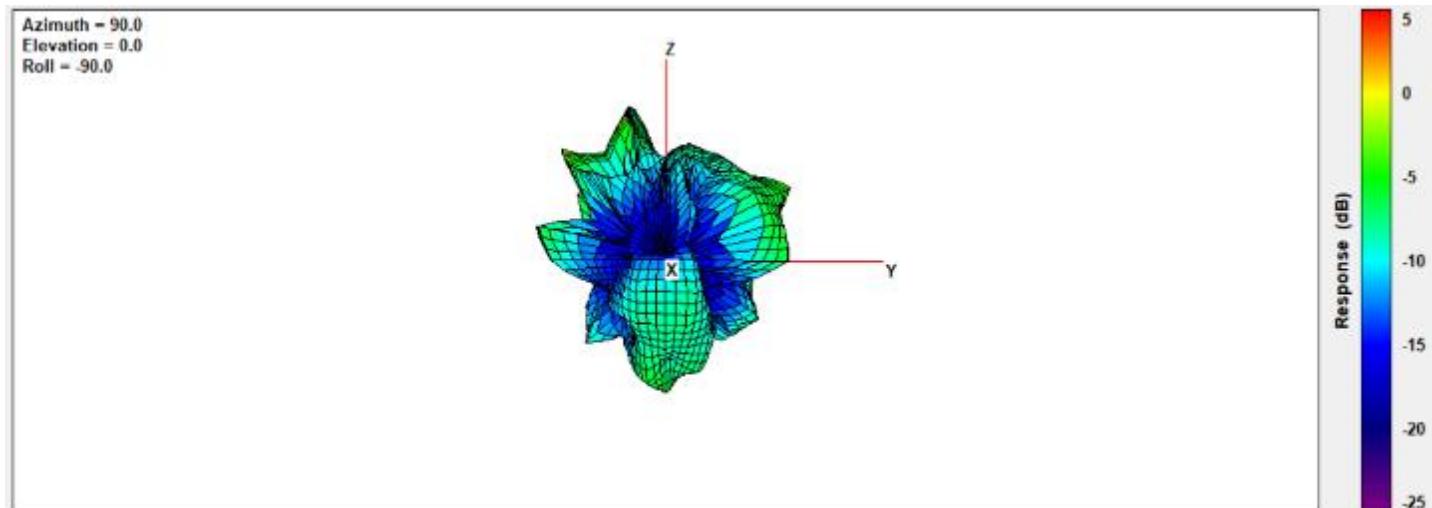
| Frequency (MHz) | Peak Gain w/ Cable Loss (dBi) |
|-----------------|-------------------------------|
| 6875-7125       | 3.39                          |



## Auxiliary Antenna

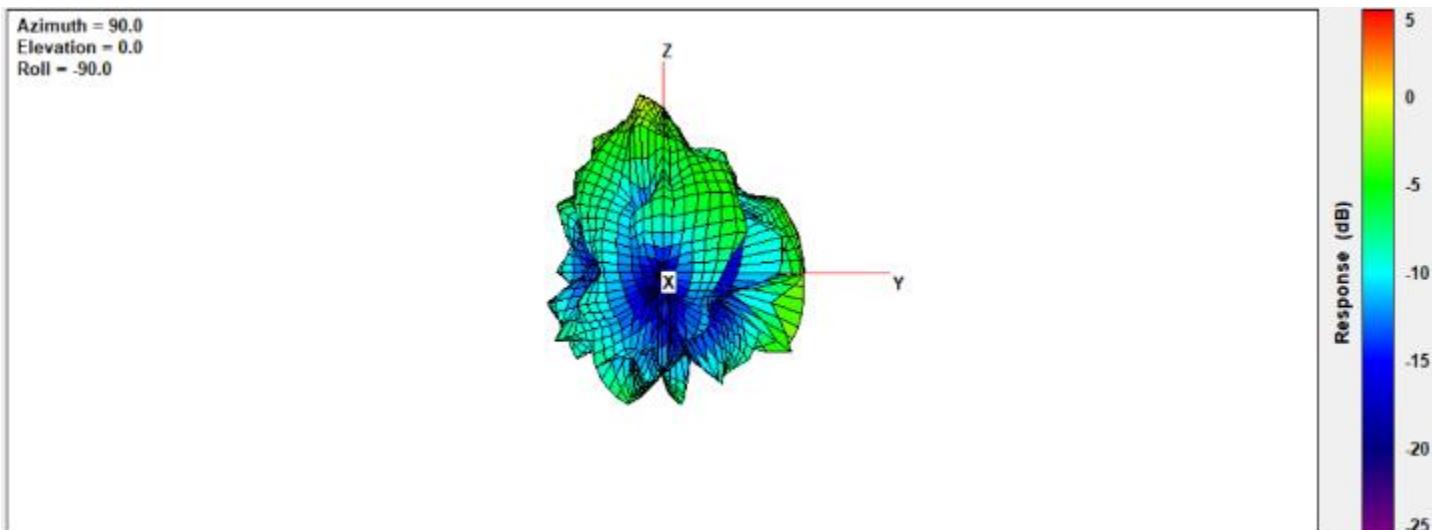
### Max Antenna 3D Radiation Pattern 2400 – 2483.5 MHz

| Frequency<br>(MHz) | Peak Gain w/ Cable Loss<br>(dBi) |
|--------------------|----------------------------------|
| 2400-2483.5        | 0.09                             |



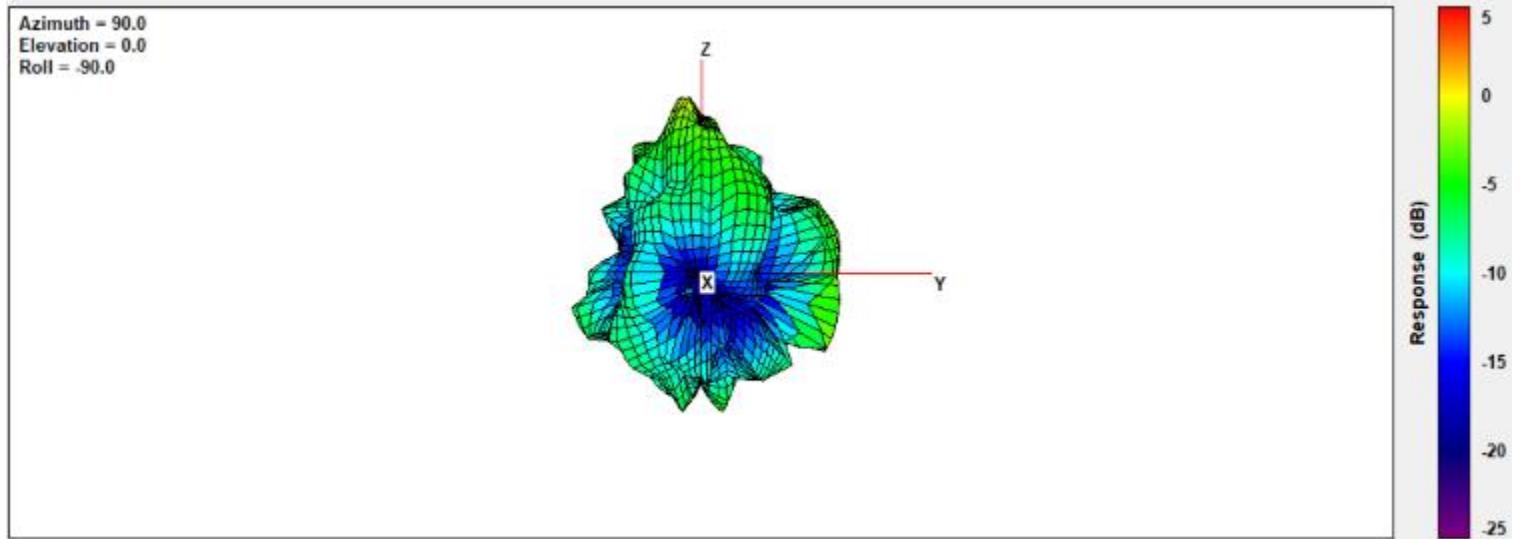
### Max Antenna 3D Radiation Pattern 5150-5250 MHz

| Frequency<br>(MHz) | Peak Gain w/ Cable Loss<br>(dBi) |
|--------------------|----------------------------------|
| 5150-5250          | 0.53                             |



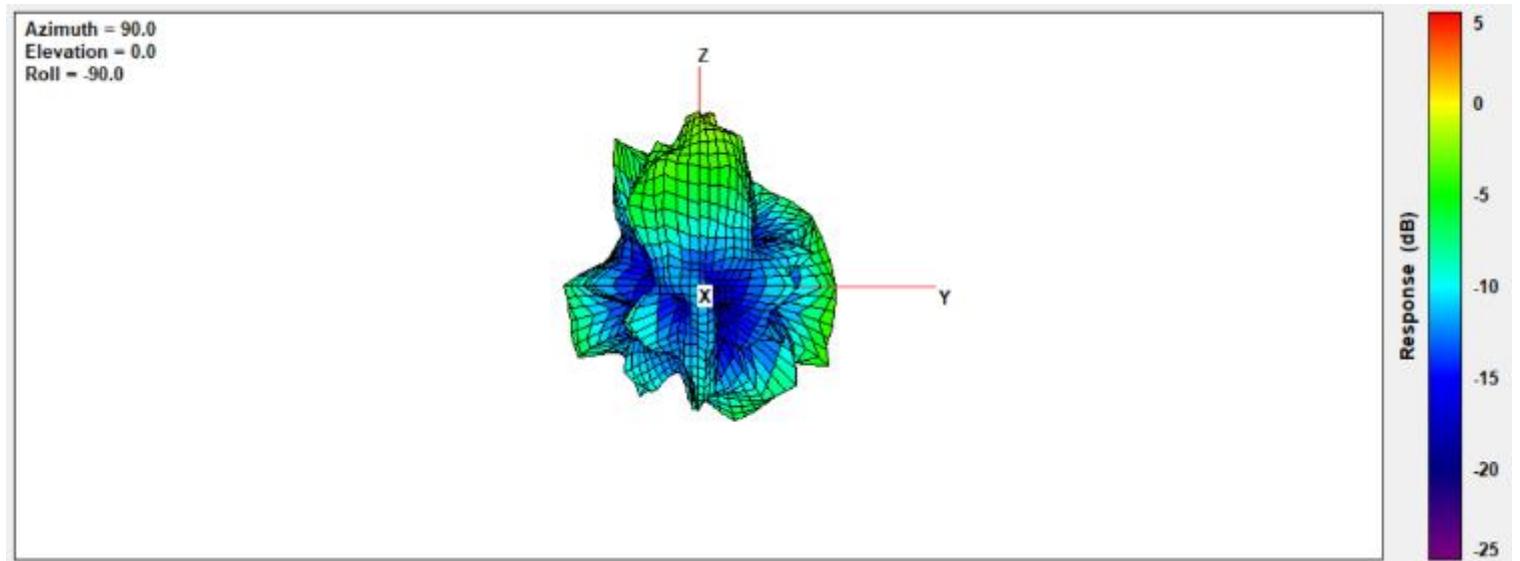
## Max Antenna 3D Radiation Pattern 5250-5350 MHz

| Frequency<br>(MHz) | Peak Gain w/ Cable Loss<br>(dBi) |
|--------------------|----------------------------------|
| 5250-5350          | -0.35                            |



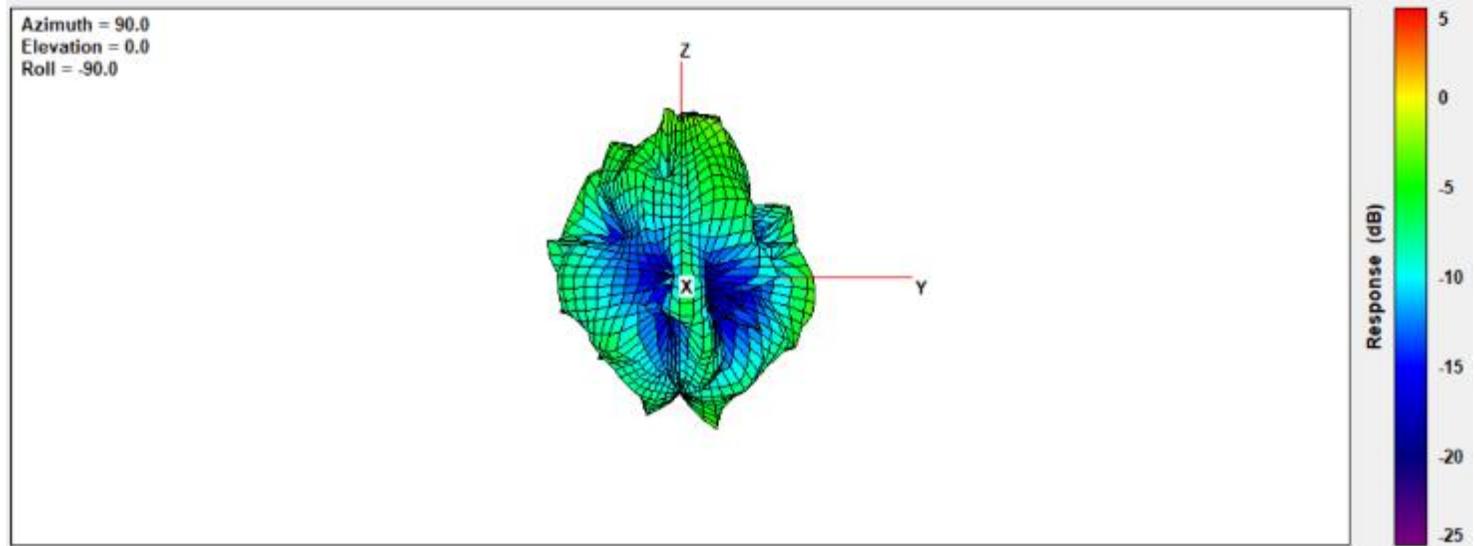
## Max Antenna 3D Radiation Pattern 5470-5725 MHz

| Frequency<br>(MHz) | Peak Gain w/ Cable Loss<br>(dBi) |
|--------------------|----------------------------------|
| 5470-5725          | 0.70                             |



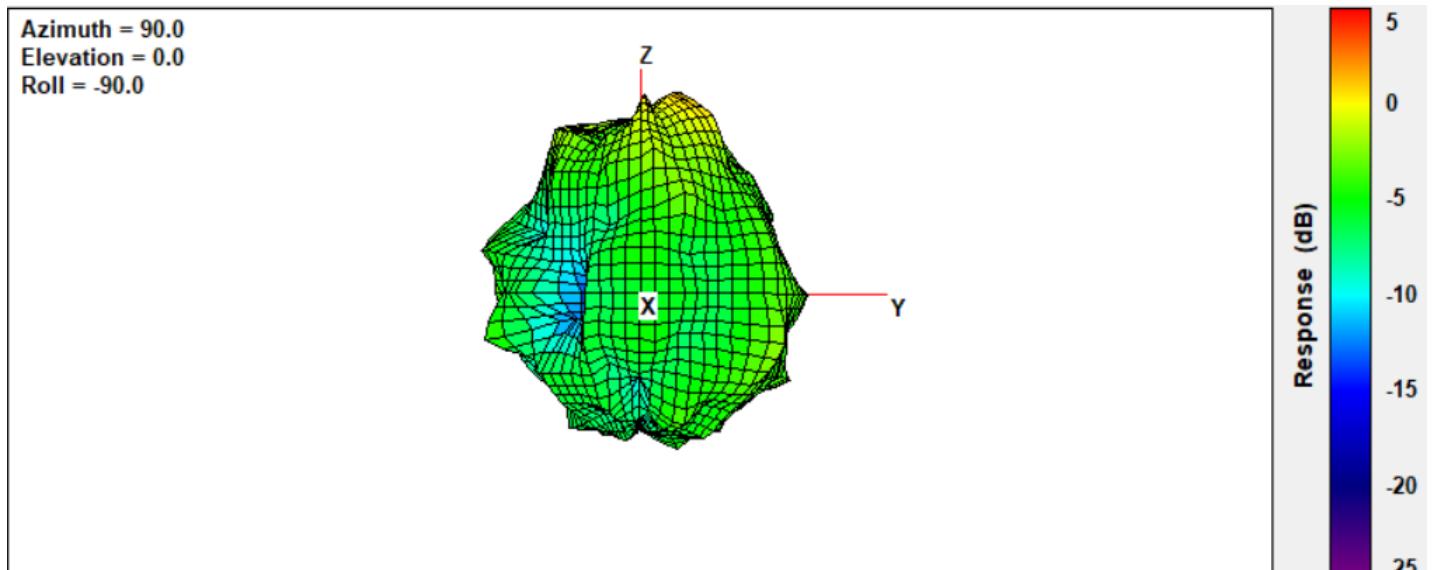
## Max Antenna 3D Radiation Pattern 5725-5850 MHz

| Frequency (MHz) | Peak Gain w/ Cable Loss (dBi) |
|-----------------|-------------------------------|
| 5725-5850       | -0.03                         |



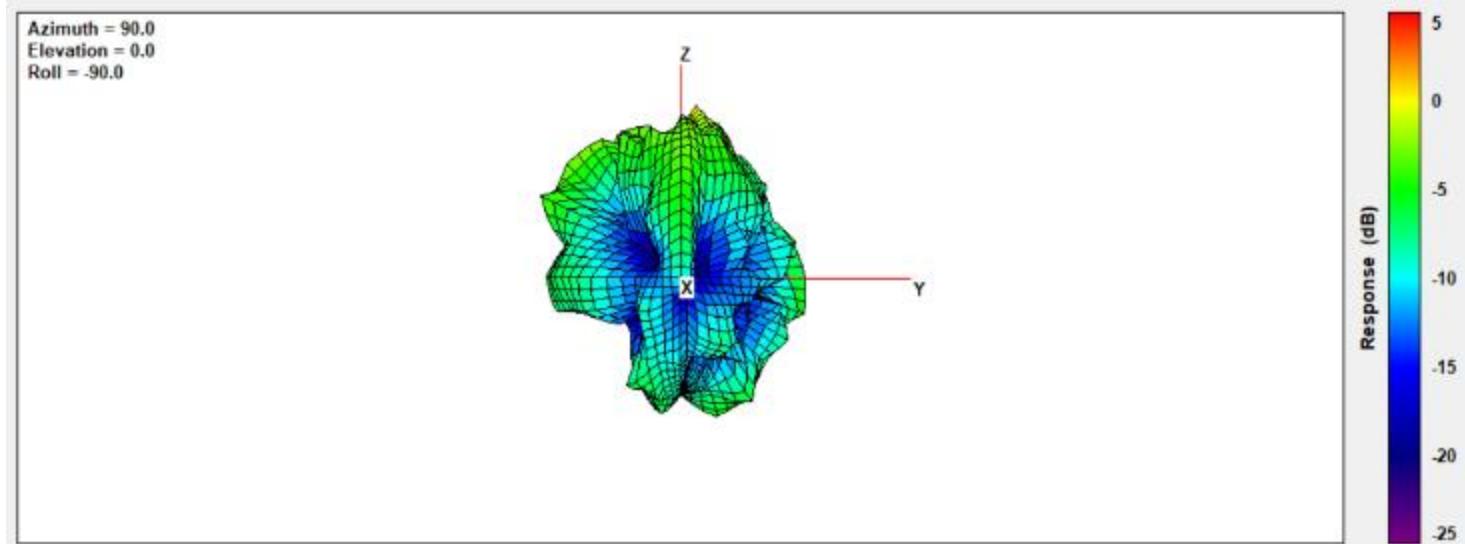
## Max Antenna 3D Radiation Pattern 5850-5895 MHz

| Frequency (MHz) | Peak Gain w/ Cable Loss (dBi) |
|-----------------|-------------------------------|
| 5850-5895       | 1.52                          |



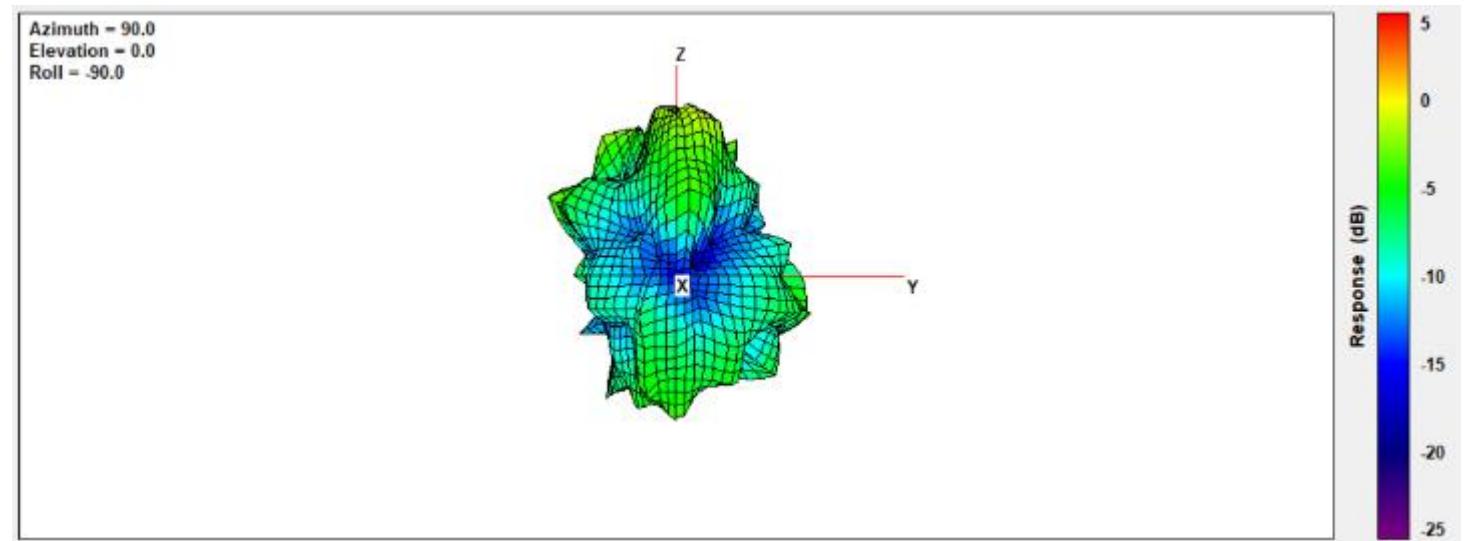
## Max Antenna 3D Radiation Pattern 5925-6425 MHz

| Frequency<br>(MHz) | Peak Gain w/ Cable Loss<br>(dBi) |
|--------------------|----------------------------------|
| 5925-6425          | 1.43                             |



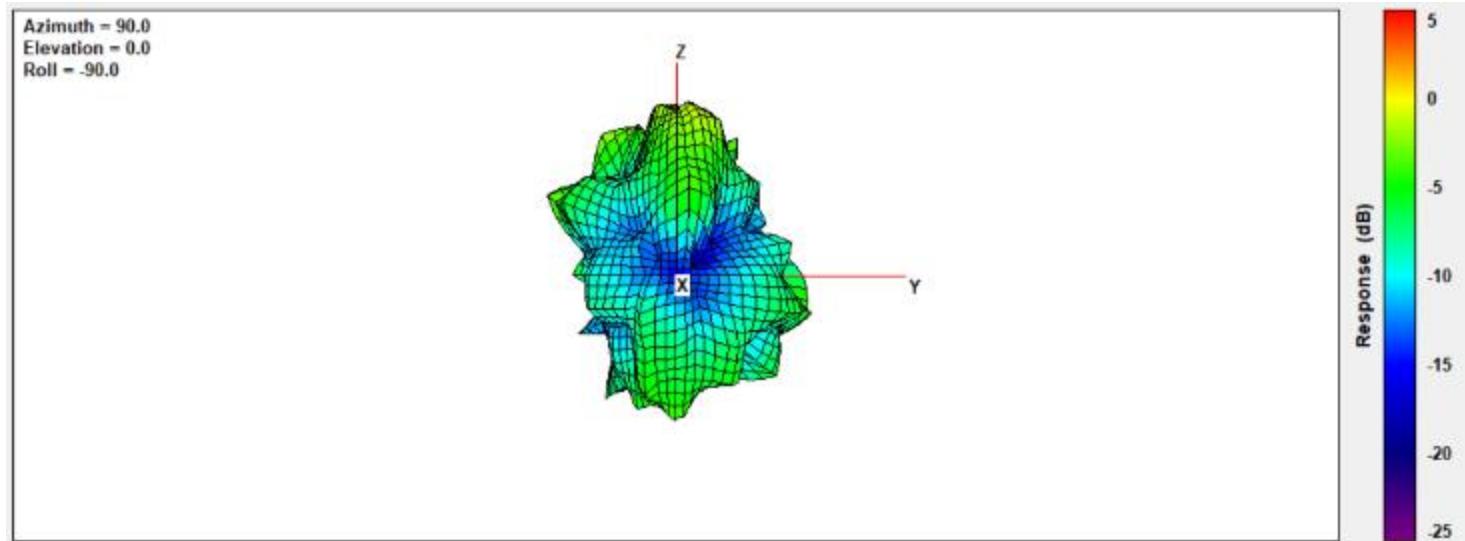
## Max Antenna 3D Radiation Pattern 6425-6525 MHz

| Frequency<br>(MHz) | Peak Gain w/ Cable Loss<br>(dBi) |
|--------------------|----------------------------------|
| 6425-6525          | 1.92                             |



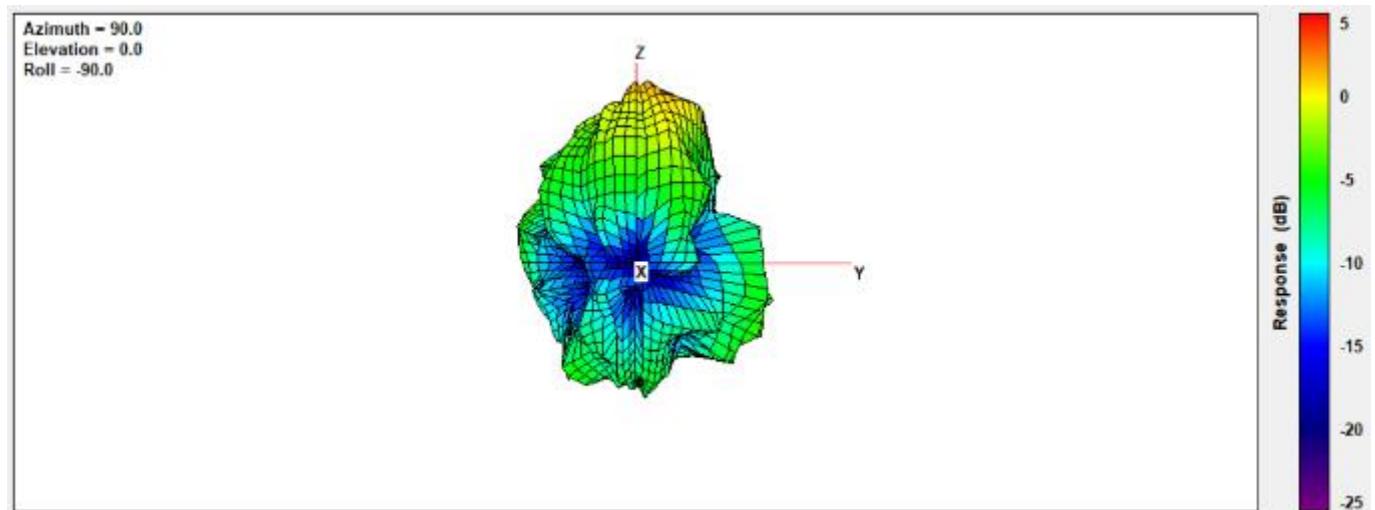
## Max Antenna 3D Radiation Pattern 6525-6875 MHz

| Frequency<br>(MHz) | Peak Gain w/ Cable Loss<br>(dBi) |
|--------------------|----------------------------------|
| 6525-6875          | 1.92                             |



## Max Antenna 3D Radiation Pattern 6875-7125 MHz

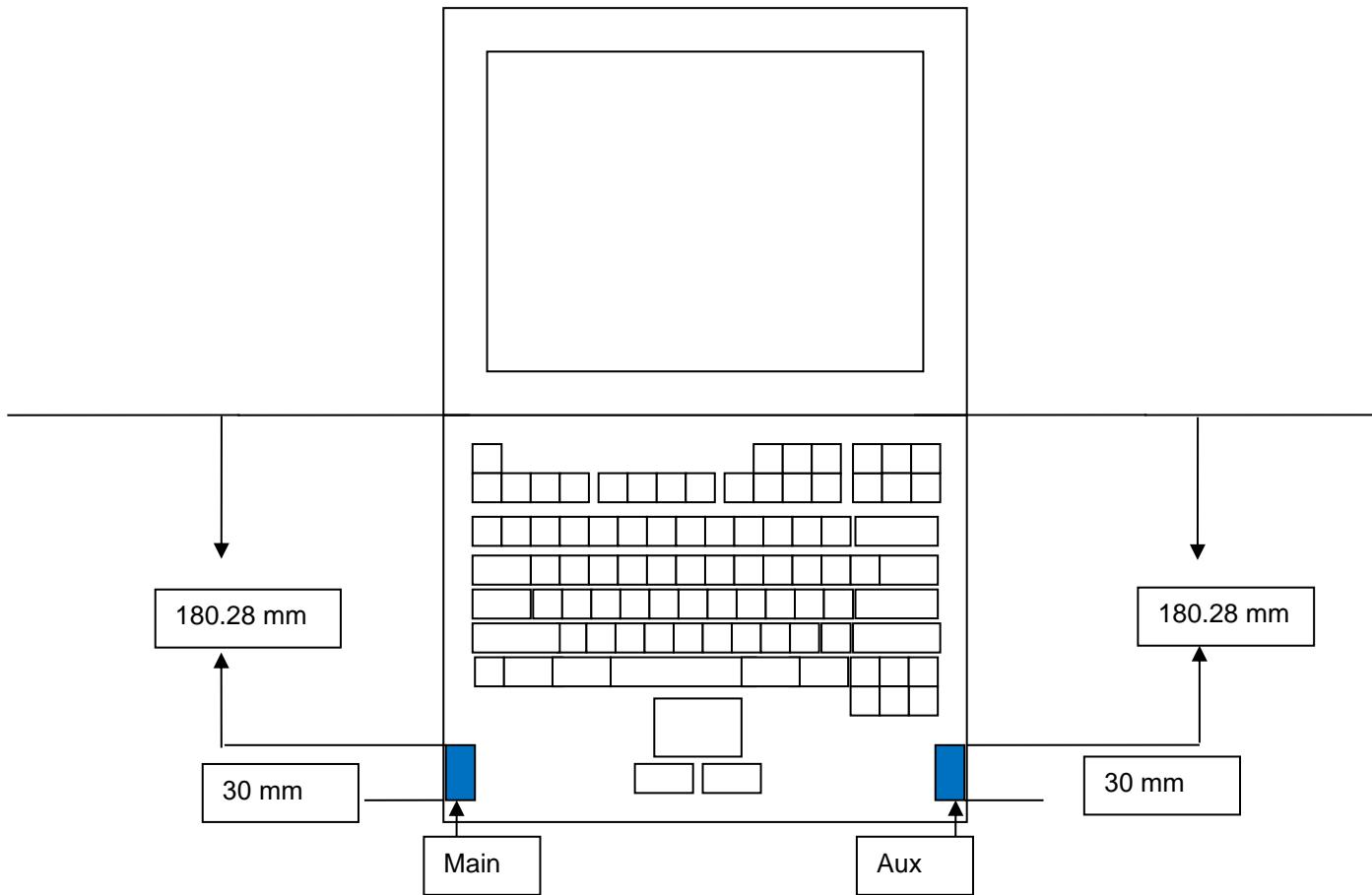
| Frequency<br>(MHz) | Peak Gain w/ Cable Loss<br>(dBi) |
|--------------------|----------------------------------|
| 6875-7125          | 2.27                             |



## Section 4. Antenna Host Platform Location Information

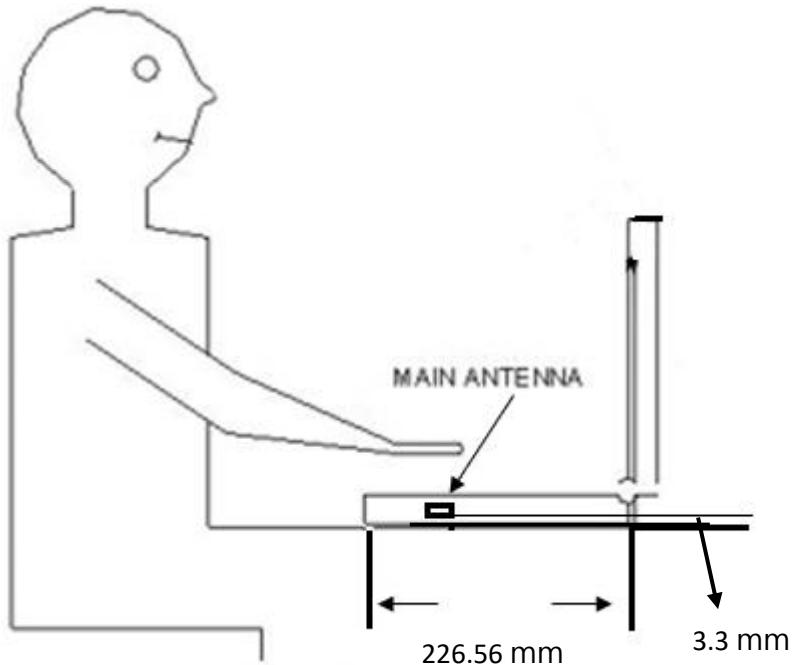
Include a **dimensioned photo(s) or dimensioned drawing(s)** of Main and Aux antenna placements (measurements are not required for receive-only antenna).

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.



## Section 5. Antenna dimensional information for SAR evaluation

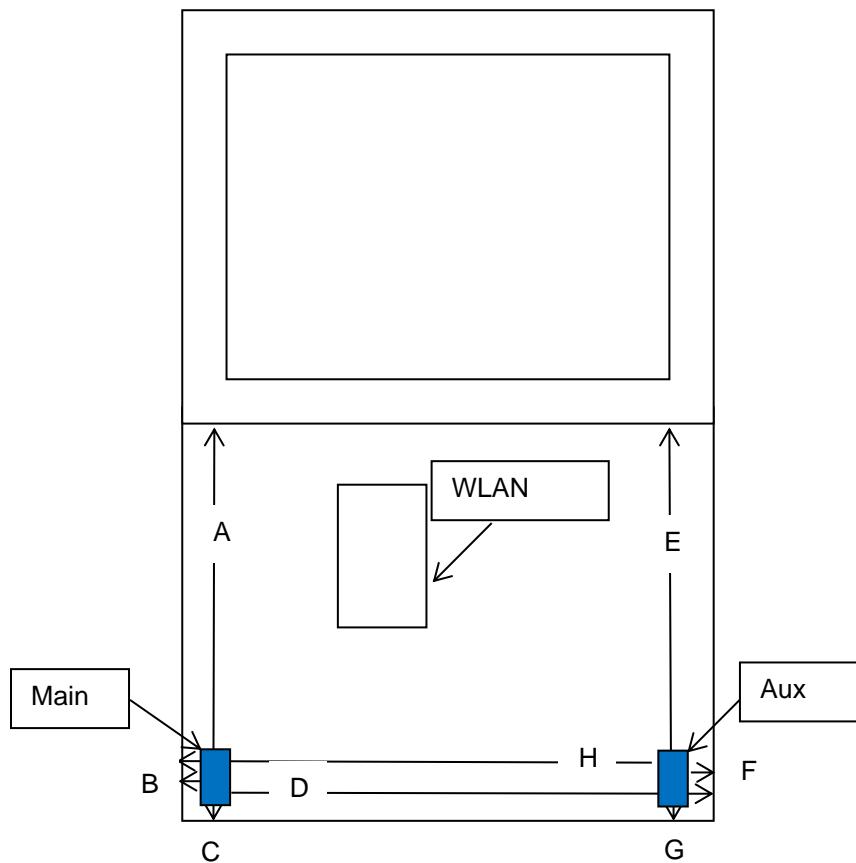
Include a **dimensioned photo(s) or dimensioned drawing(s)** showing the distance (mm) between the transmit antennas and the user. For notebook/laptop hosts show lapheld position (example below). For tablet hosts show all orientations including lapheld, primary & secondary portrait, primary & secondary 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)



| Distance (mm) | A      | B   | C     | D       | E      | F   | G     | H       |
|---------------|--------|-----|-------|---------|--------|-----|-------|---------|
|               | 180.28 | 4.8 | 16.28 | 296.265 | 180.28 | 4.8 | 16.28 | 296.265 |

## Revision History

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