

# 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)

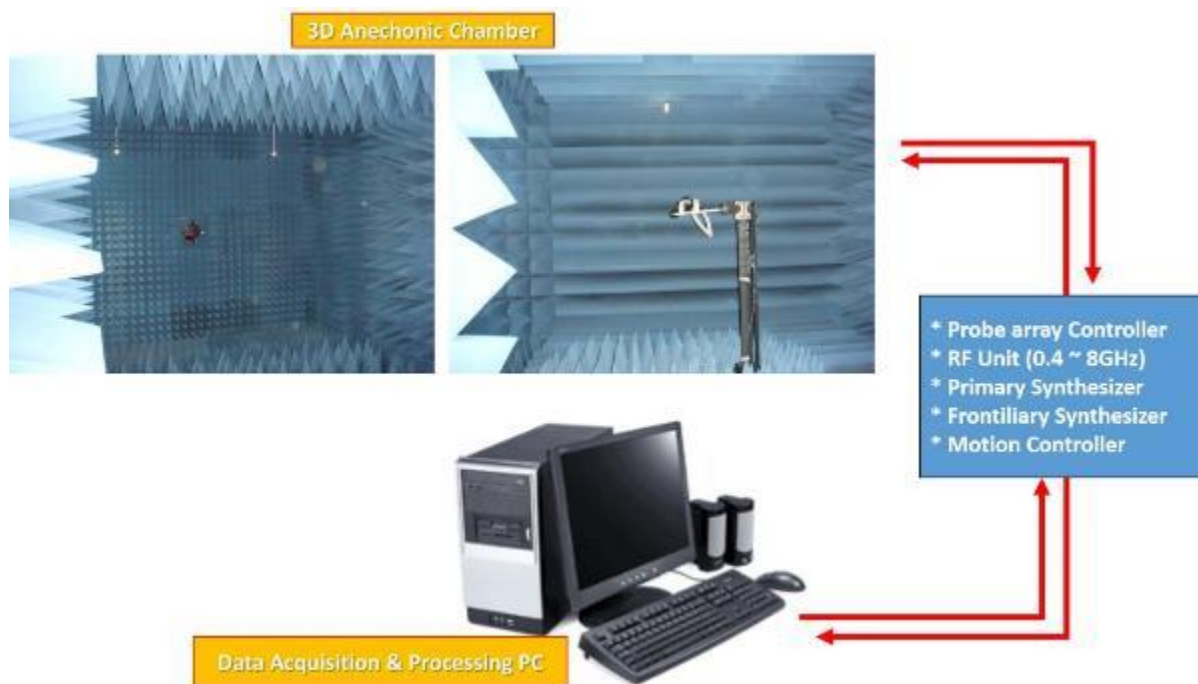
| Platform information                                                                                                                                                           |                             |                                                                       |                        |                        |                                       |                                                              |                        |                               |                        |                         |                                          |
|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-----------------------------|-----------------------------------------------------------------------|------------------------|------------------------|---------------------------------------|--------------------------------------------------------------|------------------------|-------------------------------|------------------------|-------------------------|------------------------------------------|
| 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)  |                        |                         |                                          |
| Lenovo                                                                                                                                                                         | Compal                      | Legion Slim 5 16IRH8<br>Legion Slim 5 16APH8<br>Legion Slim 5 16APH8A |                        |                        | Yes                                   | NB                                                           |                        | 13.2                          |                        |                         |                                          |
| ****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)     |                        |                         |                                          |
| High-Tek Electronics Co., Ltd                                                                                                                                                  |                             | PIFA                                                                  |                        |                        | DC33002T900<br>(0ACCN022019N)         |                                                              |                        | DC33002T910<br>(0ACCN022020N) |                        |                         |                                          |
| Peak gain w/ cable loss (dBi)*                                                                                                                                                 |                             |                                                                       |                        |                        |                                       |                                                              |                        |                               |                        |                         |                                          |
|                                                                                                                                                                                | 2.4GHz<br>2400-2483.5 MHz   | 5.2GHz<br>5150-5250MHz                                                | 5.3GHz<br>5250-5350MHz | 5.6GHz<br>5470-5725MHz | 5.8GHz<br>5725-5850MHz                | 5.9GHz<br>5850-5895MHz                                       | 6.2GHz<br>5925-6425MHz | 6.5GHz<br>6425-6525MHz        | 6.7GHz<br>6525-6875MHz | 7.0 GHz<br>6875-7125MHz |                                          |
| Main                                                                                                                                                                           | 1.91                        | 1.88                                                                  | 1.88                   | 2.06                   | 0.37                                  | 0.19                                                         | 1.27                   | 1.10                          | 2.46                   | 1.18                    |                                          |
| Aux                                                                                                                                                                            | 0.23                        | -1.38                                                                 | -0.26                  | -0.23                  | -0.23                                 | 0.46                                                         | 0.67                   | 1.00                          | 0.14                   | 0.17                    |                                          |
| Intel Reference Gain/Type/ Separation distance                                                                                                                                 |                             |                                                                       |                        |                        |                                       |                                                              |                        |                               |                        |                         |                                          |
| Antenna Type                                                                                                                                                                   | Antenna Peak gain (In dBi)* |                                                                       |                        |                        |                                       |                                                              |                        |                               |                        |                         | Distance to the end user (mm)            |
|                                                                                                                                                                                | 2.4GHz<br>2400-2483.5 MHz   | 5.2GHz<br>5150-5250MHz                                                | 5.3GHz<br>5250-5350MHz | 5.6GHz<br>5470-5725MHz | 5.8GHz<br>5725-5850MHz                | 5.9GHz<br>5850-5895MHz                                       | 6.2GHz<br>5925-6425MHz | 6.5GHz<br>6425-6525MHz        | 6.7GHz<br>6525-6875MHz | 7.0GHz<br>6875-7125MHz  | Generic: refer to modular FCC SAR report |
| Design                                                                                                                                                                         | 3.00                        | 5.00                                                                  | 5.00                   | 5.00                   | 5.00                                  | 5.00                                                         | 5.00                   | 5.00                          | 5.00                   | 5.00                    | Mid-power: ≥ 8 mm                        |
| PIFA                                                                                                                                                                           | 3.24                        | 3.64                                                                  | 3.73                   | 4.77                   | 4.97                                  | 4.72                                                         | 4.83                   | 4.30                          | 5.37                   | 5.59                    | Low power: ≥ 5 mm                        |
| 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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2. Test & System Description
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## 1. Applicable test methods

The radiation pattern of antenna is measured in both horizontal polarization and vertical polarization. The radiation pattern measurements are performed in the three-dimensional anechoic chamber. The chamber provides less than  $-30\text{dB}$  reflectivity from  $800\text{MHz}$  through  $8\text{GHz}$ . The chamber is calibrated using both standard dipole antenna and horn antenna. The Gain here is expressed as  $\text{dBi}$  that standardizes the isotropic antenna. The Gain measurements and antenna radiation pattern are also performed in the same chamber described previously. Figure 2 shows the schematic diagram for measuring radiation pattern and Gain.



## 2. Test & System Description

### a. Test setup

#### 1. Frequency Range

2400~2500MHz, for WLAN application.

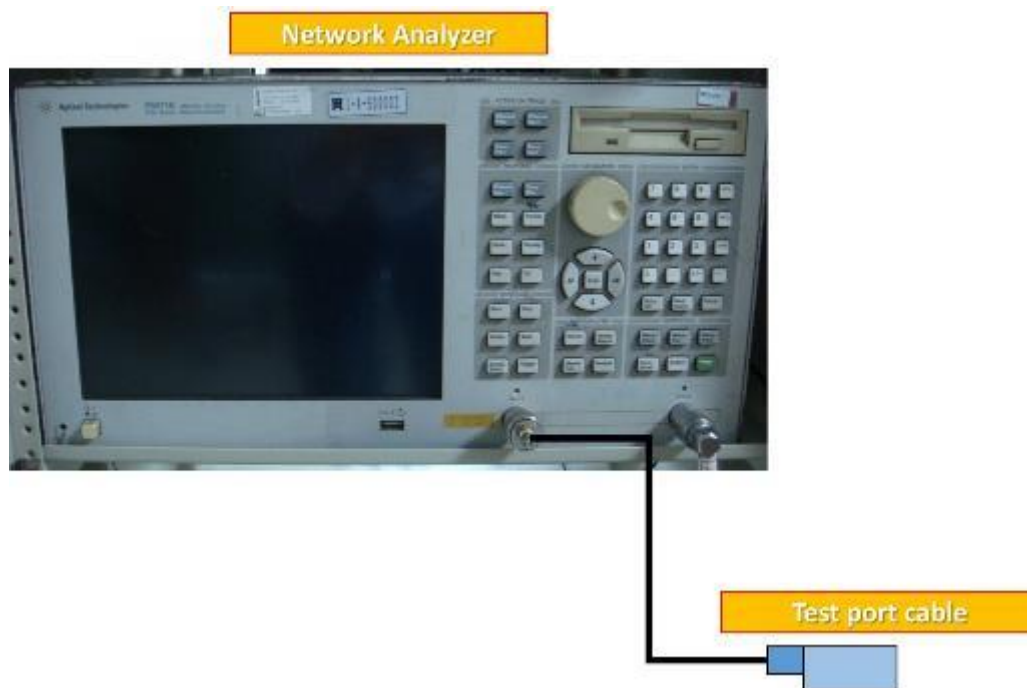
5150~5850MHz, for WLAN application

#### 2. Antenna Configuration

The antenna basically has two parts; the stamping and the cable assembly with the connector on one side. The detailed drawing is attached.

#### 3. VSWR

The VSWR is measured with network analyzer that support up to 8GHz. All the measurements are performed with the customer provided fixture. Figure 1 shows the typical schematic diagram for measuring VSWR.



**Figure 1. The schematic diagram for measuring VSWR**

## b. Equipment list

**Test Equipment**

The equipment for the antenna measurement we used is as follows:

- A. Network Analyzer, support up to 8GHz, to measure the VSWR and input impedance of antenna.
- B. Three-dimensional anechoic chamber to measure antenna gain and radiation pattern(Standard horn antenna was used to calibrate the chamber)
- C. Digital caliper to measure the dimensions.
- D. Climatic chamber for mechanical tests.
- E.

**Radiated Setup**

| item | Device                                                                                                | Type/Model     | manufacturer | Cal. Date  | Cal. Due Date |
|------|-------------------------------------------------------------------------------------------------------|----------------|--------------|------------|---------------|
| 1    | Anechoic Chamber                                                                                      | AMS-8500       | ETS-Lindgren | 2021/12/20 | 2022/12/20    |
| 2    | Turn Table                                                                                            | ETS            | ETS-Lindgren | N/A        | N/A           |
| 3    | Measurement SW                                                                                        | EMQuest1.08    | ETS-Lindgren | N/A        | N/A           |
| 4    | Vector Network Analyzer                                                                               | Agilent E5071B | Agilent      | 2021/12/17 | 2022/12/17    |
| 5    | Receive Antenna<br>Absorber Nested Dual-<br>Polarized Dual-Vivaldi Array<br>Antenna<br>700MHz to 6GHz | EMCO 3164-08   | ETS-Lindgren | N/A        | N/A           |
| 6    | Multi Axis Positioning System<br>(MAPS™)                                                              | EMCO 2115CR    | ETS-Lindgren | N/A        | N/A           |
| 7    | MAPS™ Controller                                                                                      | MECO 2090      | ETS-Lindgren | N/A        | N/A           |
| 8    | Horn antenna                                                                                          | 3164-08        | ETS-Lindgren | 2021/12/15 | 2022/12/15    |
| 9    | Cable 0.5m - 700MHz~10GHz                                                                             | RG316          | Senyu        | 2021/12/21 | 2022/12/21    |

N/A : Not Applicable

Note: Chamber calibration included full set of implement

# Antenna Information

## Section 1. Antenna Assembly Specifications

| 1A                                             | 1B                            | 1C           | 1D                                                                                                                          |                | 1E                              | 1F                             | 1G       | 1H              |
|------------------------------------------------|-------------------------------|--------------|-----------------------------------------------------------------------------------------------------------------------------|----------------|---------------------------------|--------------------------------|----------|-----------------|
| Antenna Part Number                            | Manufacturer                  | Antenna Type | Cable Assembly Part Number and Information                                                                                  | Freq Range MHz | * Peak Gain W/ Cable loss (dBi) | Peak Gain w/o Cable Loss (dBi) | Max VSWR | Cable Loss (dB) |
| (P/N: DC33002T900 (0ACCN022019N)) Main Antenna | High-Tek Electronics Co., Ltd | PIFA         | 1)Connector: SpeedTech<br>2)Connector P/N: 202SPE002101<br>3) 50ohm coaxial cable<br>4)length : 132.5 mm<br>Diameter:1.13mm | 2400-2483.5    | 1.91                            | 2.10                           | 3.0      | 0.19            |
|                                                |                               |              |                                                                                                                             | 5150-5250      | 1.88                            | 2.15                           | 3.0      | 0.27            |
|                                                |                               |              |                                                                                                                             | 5250-5350      | 1.88                            | 2.15                           | 3.0      | 0.27            |
|                                                |                               |              |                                                                                                                             | 5470-5725      | 2.06                            | 2.34                           | 3.0      | 0.28            |
|                                                |                               |              |                                                                                                                             | 5725-5850      | 0.37                            | 0.66                           | 3.0      | 0.29            |
|                                                |                               |              |                                                                                                                             | 5850-5895      | 0.19                            | 0.48                           | 3.0      | 0.29            |
|                                                |                               |              |                                                                                                                             | 5925-6425      | 1.27                            | 1.58                           | 3.0      | 0.31            |
|                                                |                               |              |                                                                                                                             | 6425-6525      | 1.10                            | 1.42                           | 3.0      | 0.32            |
|                                                |                               |              |                                                                                                                             | 6525-6875      | 2.46                            | 2.79                           | 3.0      | 0.33            |
|                                                |                               |              |                                                                                                                             | 6875-7125      | 1.18                            | 1.52                           | 3.0      | 0.34            |
| (P/N: DC33002T910 (0ACCN022020N)) Aux Antenna  | High-Tek Electronics Co., Ltd | PIFA         | 1)Connector: SpeedTech<br>2)Connector P/N: 202SPE002101<br>3) 50ohm coaxial cable<br>4)length : 363 mm<br>Diameter:1.13mm   | 2400-2483.5    | 0.23                            | 1.46                           | 3.0      | 1.23            |
|                                                |                               |              |                                                                                                                             | 5150-5250      | -1.38                           | 0.37                           | 3.0      | 1.75            |
|                                                |                               |              |                                                                                                                             | 5250-5350      | -0.26                           | 1.49                           | 3.0      | 1.75            |
|                                                |                               |              |                                                                                                                             | 5470-5725      | -0.23                           | 1.65                           | 3.0      | 1.88            |
|                                                |                               |              |                                                                                                                             | 5725-5850      | -0.23                           | 1.68                           | 3.0      | 1.91            |
|                                                |                               |              |                                                                                                                             | 5850-5895      | 0.46                            | 2.37                           | 3.0      | 1.91            |
|                                                |                               |              |                                                                                                                             | 5925-6425      | 0.67                            | 2.66                           | 3.0      | 1.99            |
|                                                |                               |              |                                                                                                                             | 6425-6525      | 1.00                            | 3.01                           | 3.0      | 2.01            |
|                                                |                               |              |                                                                                                                             | 6525-6875      | 0.14                            | 2.20                           | 3.0      | 2.06            |
|                                                |                               |              |                                                                                                                             | 6875-7125      | 0.17                            | 2.35                           | 3.0      | 2.18            |

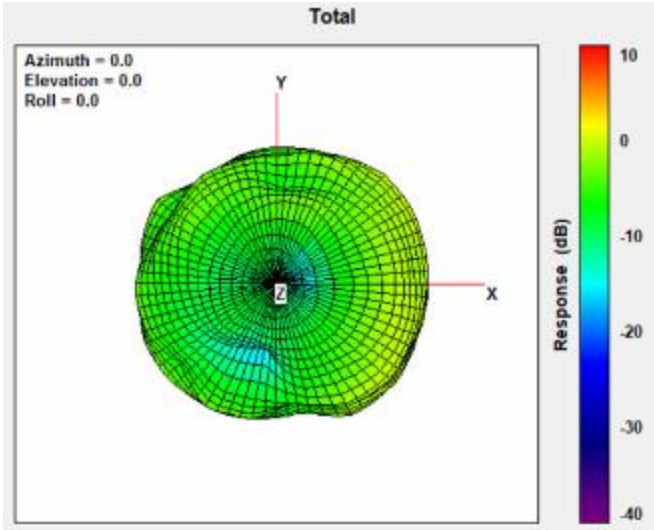
- 3D Antenna Peak Gain required being test in system basis.

Section 3. Radiation characteristics of antenna loaded in Host Platform

Main Antenna

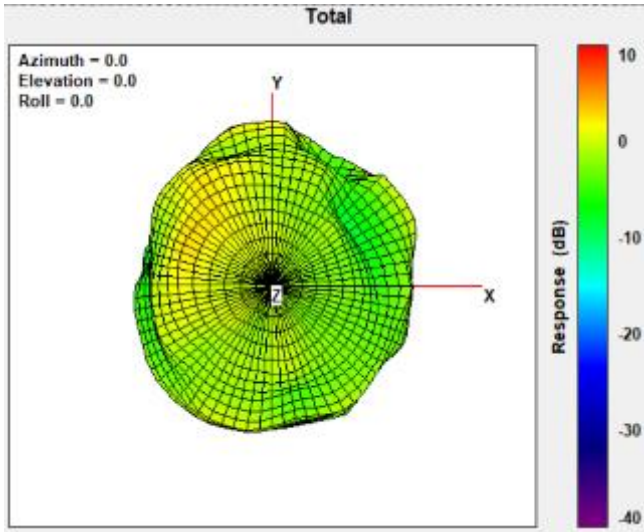
Max Antenna 3D Radiation Pattern 2400 – 2483.5 MHz

| Frequency (MHz) | Peak Gain w/ Cable Loss (dBi) |
|-----------------|-------------------------------|
| 2400-2483.5     | 1.91                          |



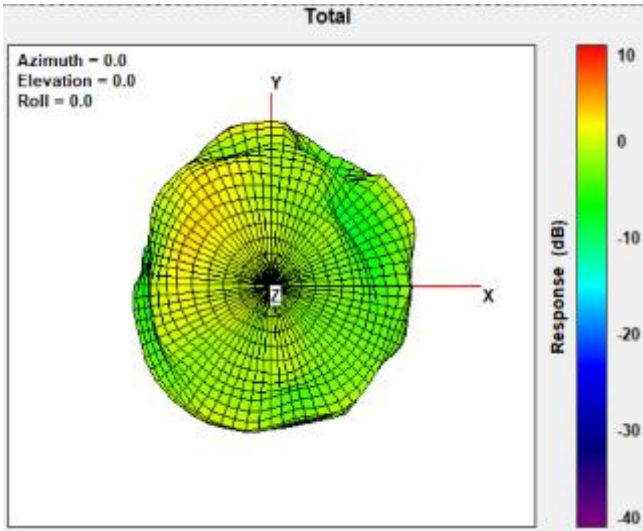
Max Antenna 3D Radiation Pattern 5150-5250 MHz

| Frequency (MHz) | Peak Gain w/ Cable Loss (dBi) |
|-----------------|-------------------------------|
| 5150-5250       | 1.88                          |



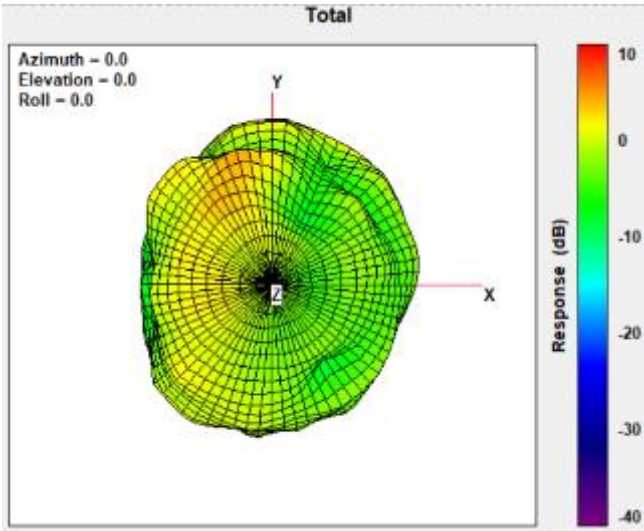
Max Antenna 3D Radiation Pattern 5250-5350 MHz

| Frequency (MHz) | Peak Gain w/ Cable Loss (dBi) |
|-----------------|-------------------------------|
| 5250-5350       | 1.88                          |



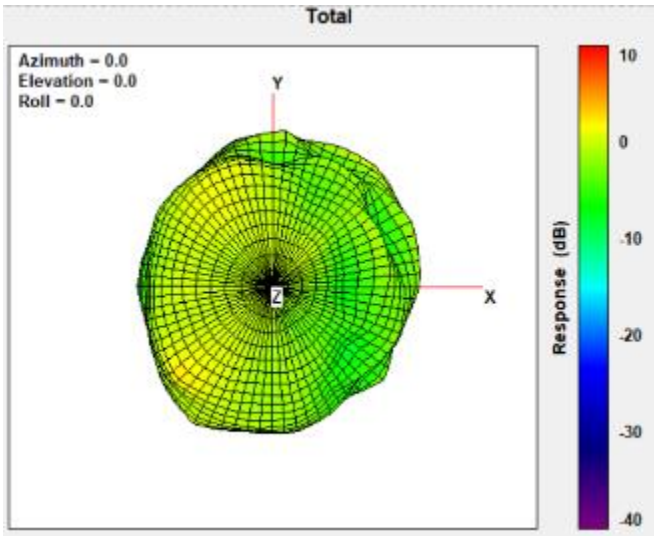
Max Antenna 3D Radiation Pattern 5470-5725 MHz

| Frequency (MHz) | Peak Gain w/ Cable Loss (dBi) |
|-----------------|-------------------------------|
| 5470-5725       | 2.06                          |



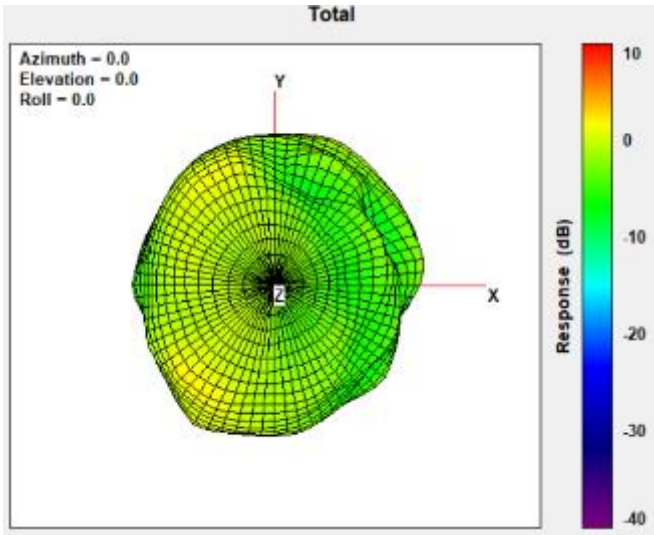
Max Antenna 3D Radiation Pattern 5725-5850 MHz

| Frequency (MHz) | Peak Gain w/ Cable Loss (dBi) |
|-----------------|-------------------------------|
| 5725-5850       | 0.37                          |



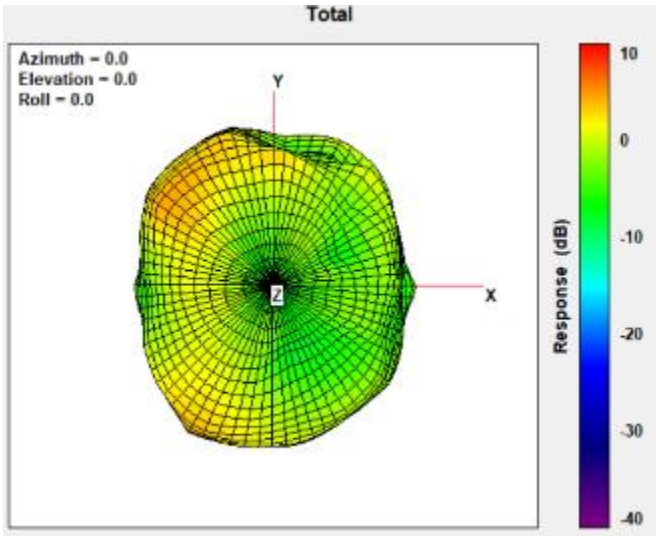
Max Antenna 3D Radiation Pattern 5850-5895 MHz

| Frequency (MHz) | Peak Gain w/ Cable Loss (dBi) |
|-----------------|-------------------------------|
| 5850-5895       | 0.19                          |



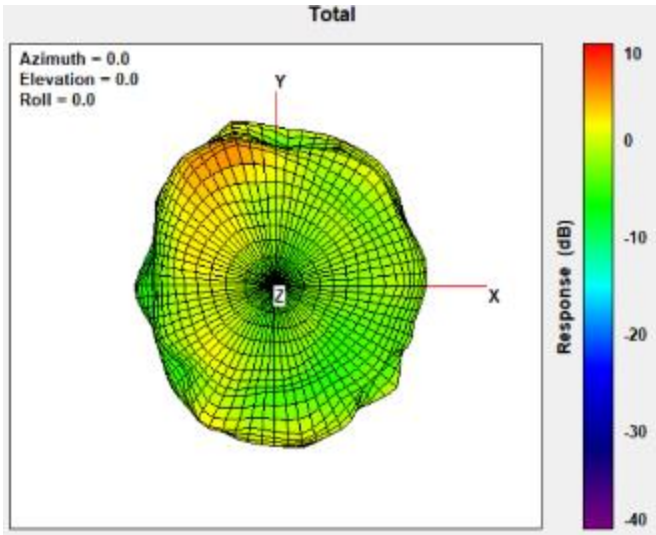
Max Antenna 3D Radiation Pattern 5925-6425 MHz

| Frequency (MHz) | Peak Gain w/ Cable Loss (dBi) |
|-----------------|-------------------------------|
| 5925-6425       | 1.27                          |



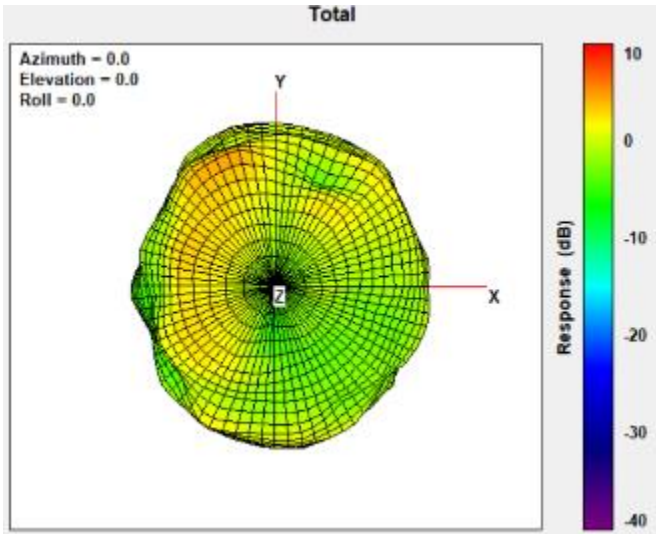
Max Antenna 3D Radiation Pattern 6425-6525 MHz

| Frequency (MHz) | Peak Gain w/ Cable Loss (dBi) |
|-----------------|-------------------------------|
| 6425-6525       | 1.10                          |



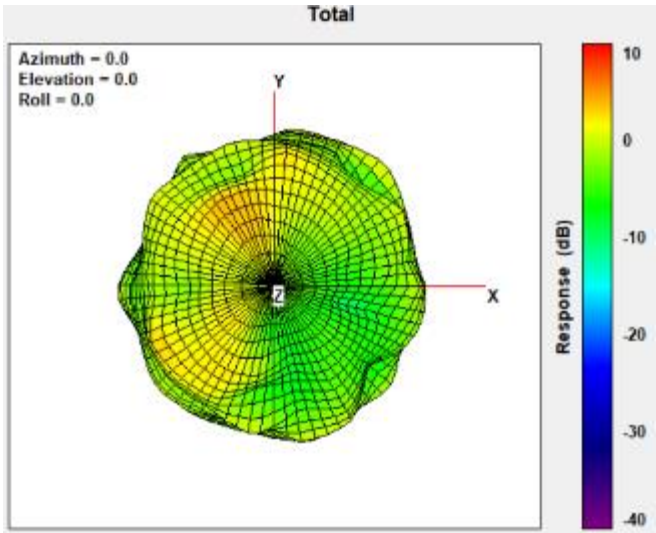
Max Antenna 3D Radiation Pattern 6525-6875 MHz

| Frequency (MHz) | Peak Gain w/ Cable Loss (dBi) |
|-----------------|-------------------------------|
| 6525-6875       | 2.46                          |



Max Antenna 3D Radiation Pattern 6875-7125 MHz

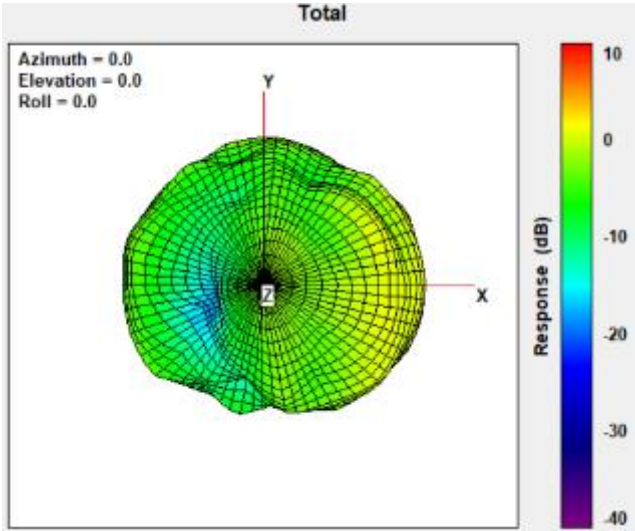
| Frequency (MHz) | Peak Gain w/ Cable Loss (dBi) |
|-----------------|-------------------------------|
| 6875-7125       | 1.18                          |



Auxiliary Antenna

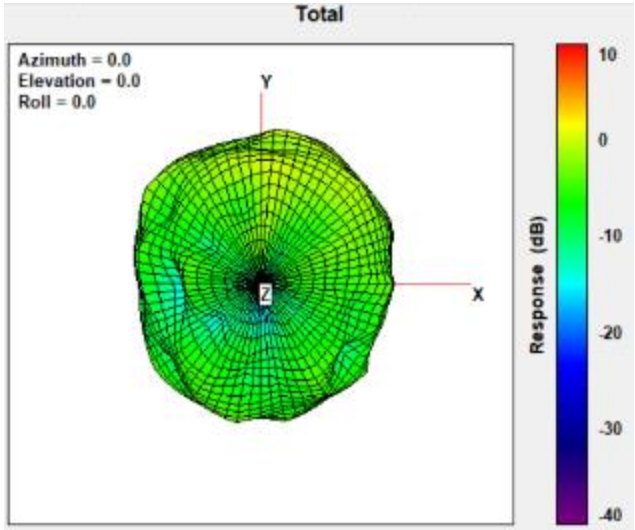
Max Antenna 3D Radiation Pattern 2400 – 2483.5 MHz

| Frequency (MHz) | Peak Gain w/ Cable Loss (dBi) |
|-----------------|-------------------------------|
| 2400-2483.5     | 0.23                          |



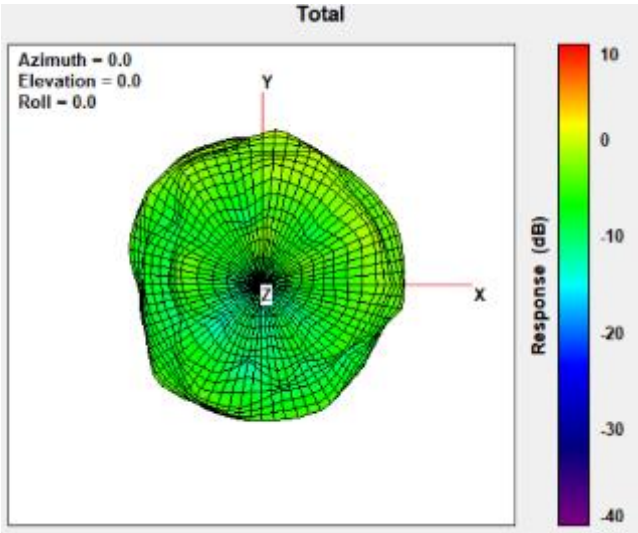
Max Antenna 3D Radiation Pattern 5150-5250 MHz

| Frequency (MHz) | Peak Gain w/ Cable Loss (dBi) |
|-----------------|-------------------------------|
| 5150-5250       | -1.38                         |



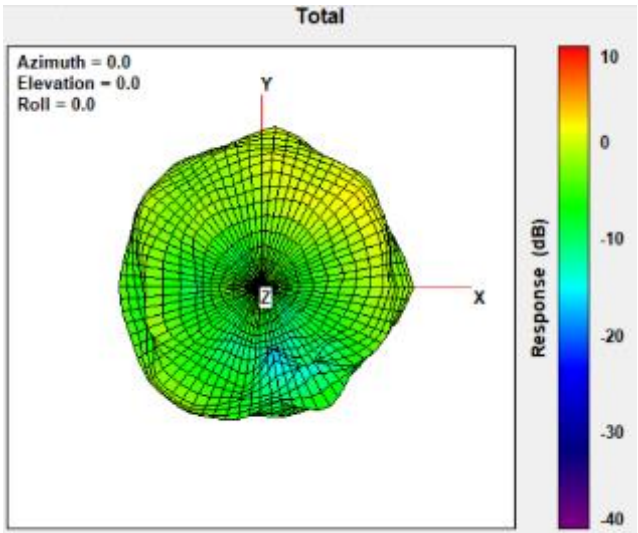
Max Antenna 3D Radiation Pattern 5250-5350 MHz

| Frequency (MHz) | Peak Gain w/ Cable Loss (dBi) |
|-----------------|-------------------------------|
| 5250-5350       | -0.26                         |



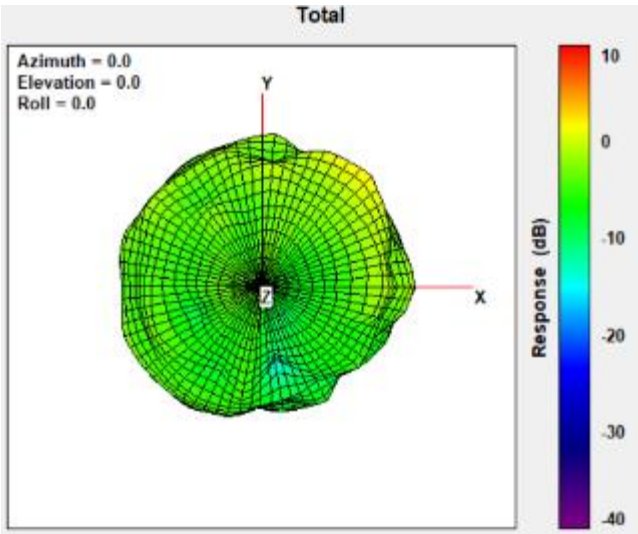
Max Antenna 3D Radiation Pattern 5470-5725 MHz

| Frequency (MHz) | Peak Gain w/ Cable Loss (dBi) |
|-----------------|-------------------------------|
| 5470-5725       | -0.23                         |



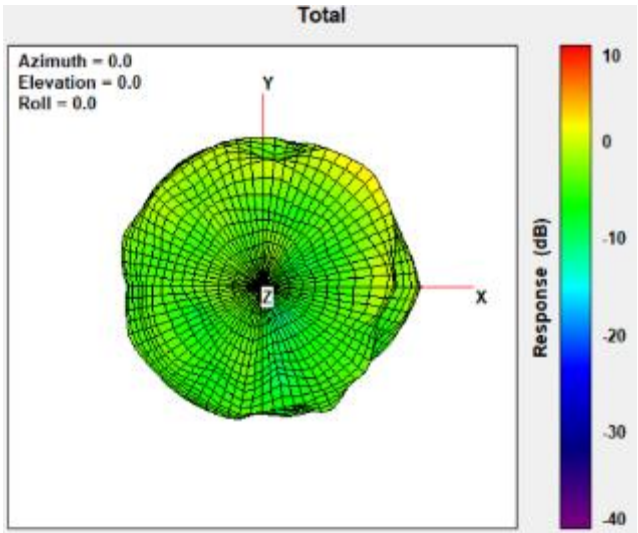
Max Antenna 3D Radiation Pattern 5725-5850 MHz

| Frequency (MHz) | Peak Gain w/ Cable Loss (dBi) |
|-----------------|-------------------------------|
| 5725-5850       | -0.23                         |



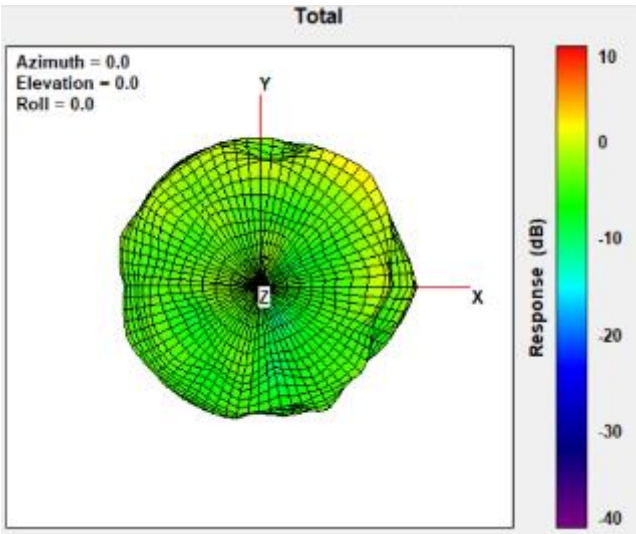
Max Antenna 3D Radiation Pattern 5850-5895 MHz

| Frequency (MHz) | Peak Gain w/ Cable Loss (dBi) |
|-----------------|-------------------------------|
| 5850-5895       | 0.46                          |



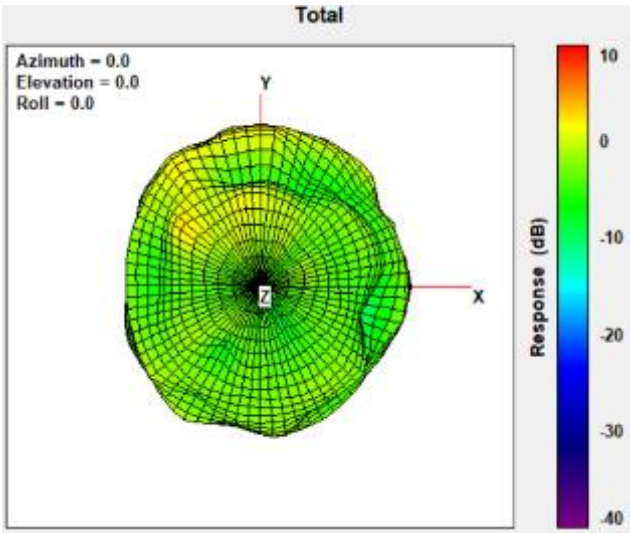
Max Antenna 3D Radiation Pattern 5925-6425 MHz

| Frequency (MHz) | Peak Gain w/ Cable Loss (dBi) |
|-----------------|-------------------------------|
| 5925-6425       | 0.67                          |



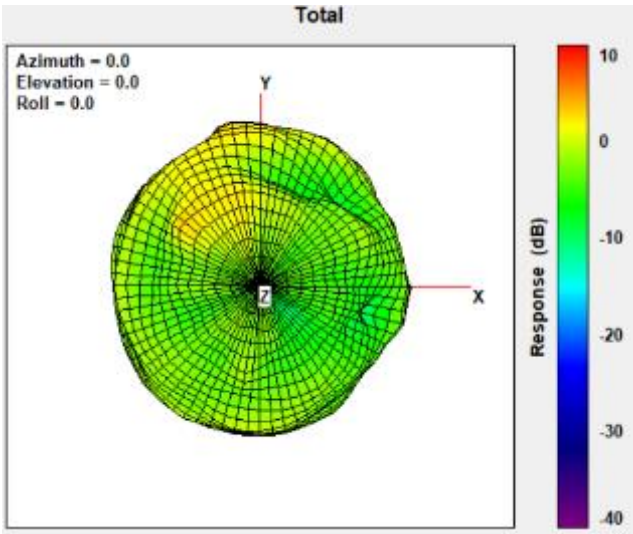
Max Antenna 3D Radiation Pattern 6425-6525 MHz

| Frequency (MHz) | Peak Gain w/ Cable Loss (dBi) |
|-----------------|-------------------------------|
| 6425-6525       | 1.00                          |



Max Antenna 3D Radiation Pattern 6525-6875 MHz

| Frequency (MHz) | Peak Gain w/ Cable Loss (dBi) |
|-----------------|-------------------------------|
| 6525-6875       | 0.14                          |



Max Antenna 3D Radiation Pattern 6875-7125 MHz

| Frequency (MHz) | Peak Gain w/ Cable Loss (dBi) |
|-----------------|-------------------------------|
| 6875-7125       | 0.17                          |

