

# ANTENNA INFORMATION

|   |                                      |
|---|--------------------------------------|
| OEM   | Lenovo                               |
| ODM   | LCFC                                 |
| Platform model name                                       | TP00151B "ThinkPad X1 2-in-1 Gen 10" |
| Intel platform (ex: Yes, No or NA)                        | Yes                                  |
| Platform type (ex: regular NB, convertible PC, AIO...etc) | Convertible PC                       |
| SAR minimum separation (mm)                               | 2.7mm                                |

|                                       |   |                          |
|---------------------------------------|---|--------------------------|
| Antenna manufacturer                  | SPEED   |                          |
| Address                               | No. 138, Hi-tech District East-river, Huizhou, Guangdong, China |                          |
| Antenna Part number                   | Main: F-0G-JV-0228-005-00                                       | Aux: F-0G-JV-0228-010-00 |
| Antenna type (ex: PIFA, Dipole...etc) | PIFA  |                          |

| Antenna 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                                   | -1.73                     | 2.82                   | 2.69                   | 2.87                   | 2.88                   | 3.91                   | 3.76                   | 2.68                   | 2.92                   | 2.65                    |
| Aux                                    | 1.68                      | 2.34                   | 1.95                   | 1.90                   | 1.86                   | 1.52                   | 3.84                   | 3.77                   | 3.92                   | 2.94                    |

| Cable Assembly Part Number and Information |               |                  |                    |                |                |
|--|---------------|------------------|--------------------|----------------|----------------|
|  | Cable PN      | Cable length(cm) | Cable diameter(mm) | Impedance(ohm) | Connector type |
| Main                                       | SY113L/50-001 | 14.6             | 1.13               | 50             | I-PEX          |
| Aux  | SY113L/50-016 | 9.7              | 1.13               | 50             | I-PEX          |

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

# Table of Contents

|   |          |
|---|----------|
| Cover page.....   | 1        |
| <b>1. Intel Reference Gain and Type.....</b>                                | <b>3</b> |
| <b>2. Document Revision History.....</b>                                    | <b>3</b> |
| <b>3. Test &amp; System Description</b>                                     |          |
| 3.1 Measurement Method and System.....                                      | 4        |
| 3.2 Test setup.....   | 4        |
| 3.3 Equipment list.....   | 4        |
| <b>4. Radiation characteristics of antenna loaded in Host Platform.....</b> | <b>5</b> |
| <b>Annex A. Photographs</b>   |          |
| A.1 Setup Photo.....  | 15       |
| A.2 Test sample.....  | 16       |
| <b>Annex B. Antenna Location</b>  |          |
| B.1 Antenna Host Platform Location Information.....                         | 18       |
| B.2 Antenna dimensional information for SAR evaluation.....                 | 19,20    |
| <b>Annex C. Host PC Labeling</b>  |          |
| C.1 E-label screen.....   | 21       |
| C.2 Carton Box Label.....   | 22       |

## 1. Intel Reference Gain and Type

| Antenna Peak gain w/ cable loss (dBi) |                         |                           |                        |                        |                        |                        |                        |                        |                        |                        |                         |
|---------------------------------------|-------------------------|---------------------------|------------------------|------------------------|------------------------|------------------------|------------------------|------------------------|------------------------|------------------------|-------------------------|
| Band/Frequency                        |                         | 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 |
| Design                                | EU/UK                   | 3.00                      | 5.00                   | 5.00                   | 5.00                   | 5.00                   | 5.00                   | 5.00                   | 5.00                   | 5.00                   | 5.00                    |
| PIFA                                  | For WiFi 6E and earlier | 3.24                      | 3.64                   | 3.73                   | 4.77                   | 4.97                   | 4.72                   | 4.83                   | 4.30                   | 5.37                   | 5.59                    |
|                                       | From WiFi 7             | 2.95                      | 5.11                   | 4.55                   | 5.15                   | 5.13                   | 4.45                   | 5.02                   | 5.02                   | 4.96                   | 4.96                    |
| Dipole                                | For WiFi 6E and earlier | 2.89                      | 2.92                   | 3.19                   | 4.41                   | 4.22                   | 4.22                   | 4.83                   | 4.30                   | 4.49                   | 5.34                    |
|                                       | From WiFi 7             | 2.95                      | 4.03                   | 4.11                   | 5.15                   | 5.13                   | 4.45                   | 5.02                   | 4.71                   | 4.49                   | 4.96                    |

### 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.

## 2. Document Revision History

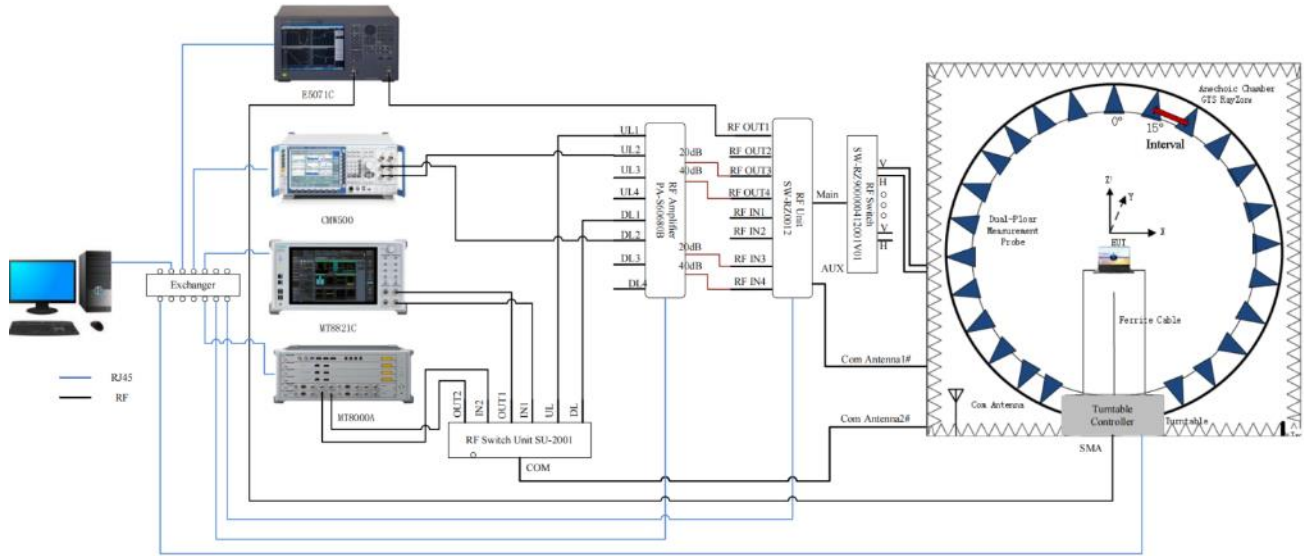
| Revision # | Revision Details  | Issued Date |
|------------|---|-------------|
| Rev. 00    | First Issue   | 2024.05.28  |
| Rev. 01    | Revise Annex C module information<br>BE200D2W →BE201D2W | 2024.08.23  |

### 3. Test & System Description

#### 3.1 Measurement Method and System

This test report is prepared for host antenna testing under a Full Anechoic Chamber.

#### 3.2 Test setup



#### 3.3 Equipment list

Radiated Setup

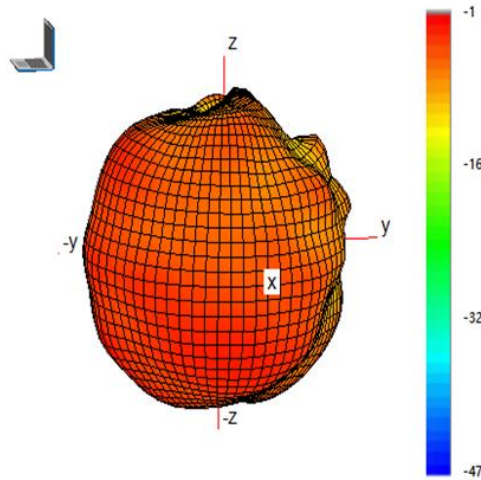
| ID# | Device               | Type/Model       | Manufacturer | Cal.Date   | Cal.Due Date |
|-----|----------------------|------------------|--------------|------------|--------------|
| 1   | Anechoic Chamber     | GTS Rayzone 2800 | GTS          | 5-Jan-2022 | 5-Jan-2024   |
| 2   | Network Analyzer     | E5071C           | Keysight     | 8-Oct-2022 | 8-Oct-2024   |
| 3   | Communication Tester | E5515C           | Agilent      | 5-Jan-2022 | 5-Jan-2024   |
| 4   | Communication Tester | MT8000A          | Anritsu      | 5-Jan-2022 | 5-Jan-2024   |
| 4   | Communication Tester | MT8821C          | Anritsu      | 5-Jan-2022 | 5-Jan-2024   |
| 4   | Communication Tester | CMW500           | R&S          | 5-Jan-2022 | 5-Jan-2024   |

#### 4. Radiation characteristics of antenna loaded in Host Platform

##### Main Antenna

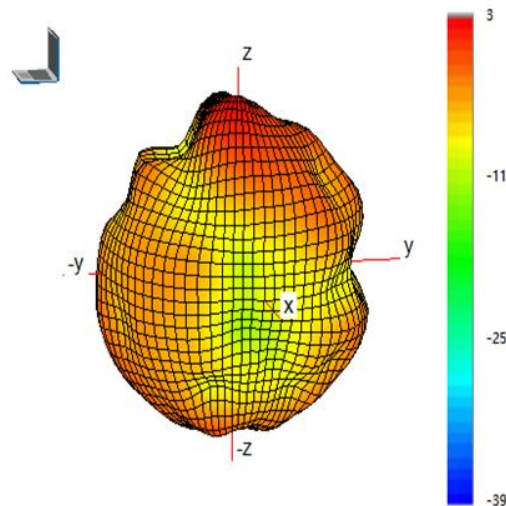
Max Antenna 3D Radiation Pattern 2400 – 2483.5 MHz

| Frequency (MHz) | Peak Gain w/ Cable Loss (dBi) |
|-----------------|-------------------------------|
| 2400-2483.5     | -1.73                         |



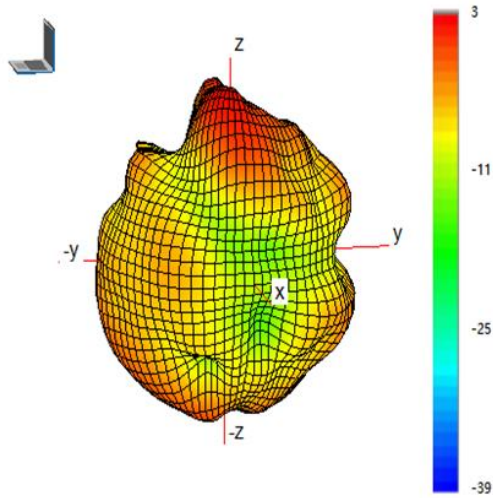
Max Antenna 3D Radiation Pattern 5150-5250 MHz

| Frequency (MHz) | Peak Gain w/ Cable Loss (dBi) |
|-----------------|-------------------------------|
| 5150-5250       | 2.82                          |



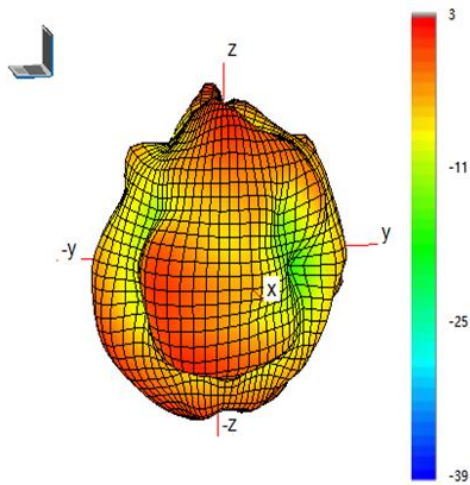
### Max Antenna 3D Radiation Pattern 5250-5350 MHz

| Frequency (MHz) | Peak Gain w/ Cable Loss (dBi) |
|-----------------|-------------------------------|
| 5250-5350       | 2.69                          |



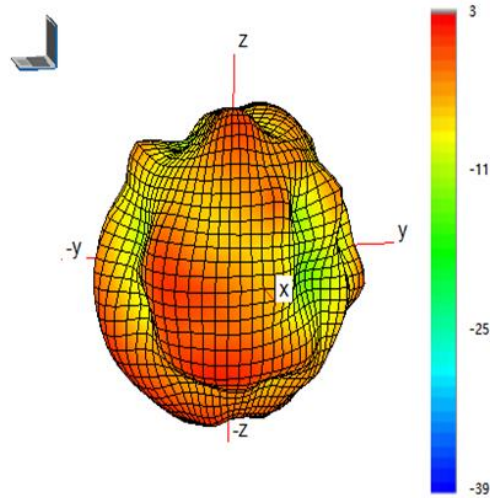
### Max Antenna 3D Radiation Pattern 5470-5725 MHz

| Frequency (MHz) | Peak Gain w/ Cable Loss (dBi) |
|-----------------|-------------------------------|
| 5470-5725       | 2.87                          |



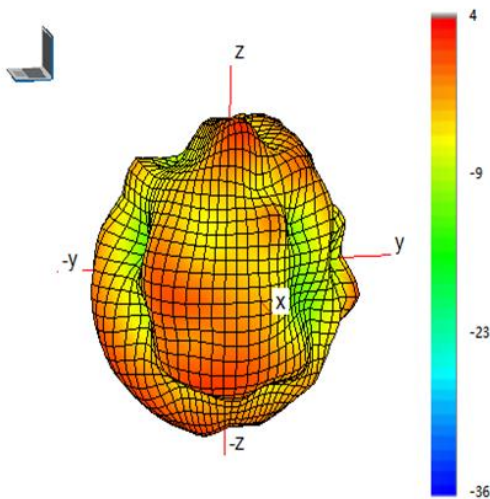
### Max Antenna 3D Radiation Pattern 5725-5850 MHz

| Frequency (MHz) | Peak Gain w/ Cable Loss (dBi) |
|-----------------|-------------------------------|
| 5725-5850       | 2.88                          |



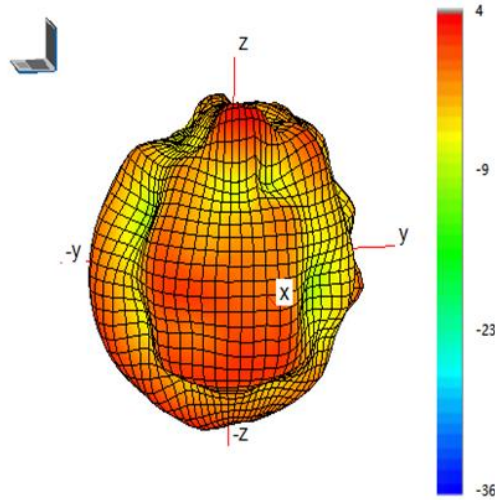
### Max Antenna 3D Radiation Pattern 5850-5895 MHz

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



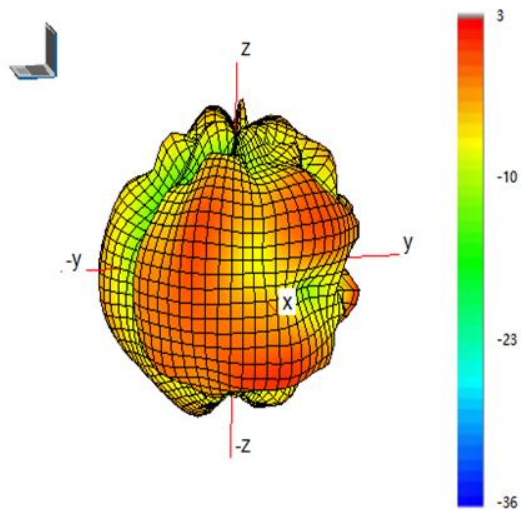
### Max Antenna 3D Radiation Pattern 5925-6425 MHz

| Frequency (MHz) | Peak Gain w/ Cable Loss (dBi) |
|-----------------|-------------------------------|
| 5925-6425       | 3.76                          |



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

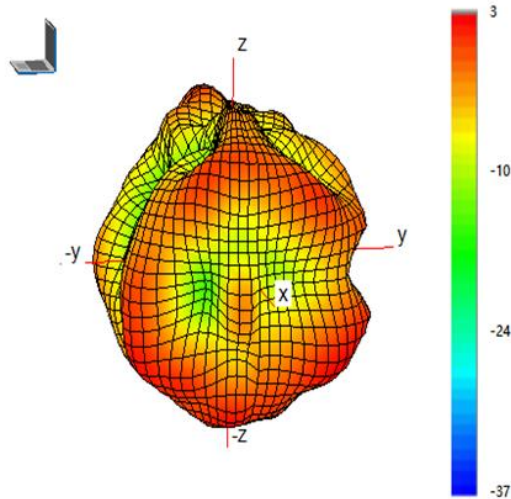
| Frequency (MHz) | Peak Gain w/ Cable Loss (dBi) |
|-----------------|-------------------------------|
| 6425-6525       | 2.68                          |





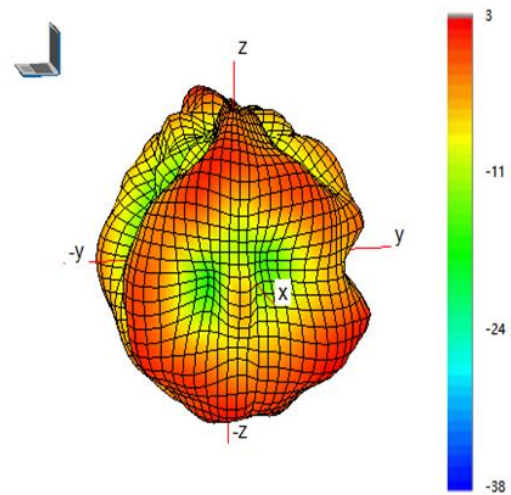
### Max Antenna 3D Radiation Pattern 6525-6875 MHz

| Frequency (MHz) | Peak Gain w/ Cable Loss (dBi) |
|-----------------|-------------------------------|
| 6525-6875       | 2.92                          |



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

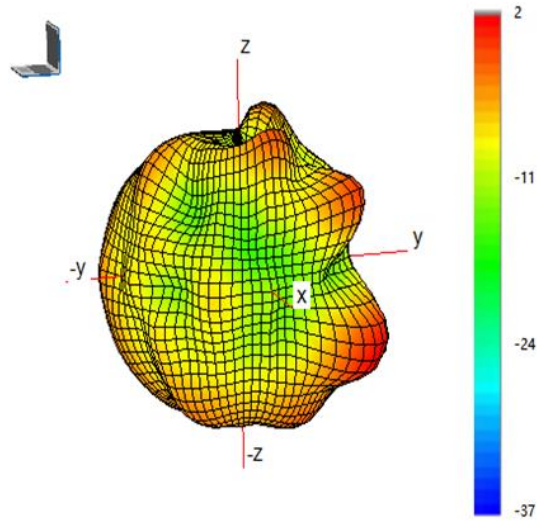
| Frequency (MHz) | Peak Gain w/ Cable Loss (dBi) |
|-----------------|-------------------------------|
| 6875-7125       | 2.65                          |



## Auxiliary Antenna

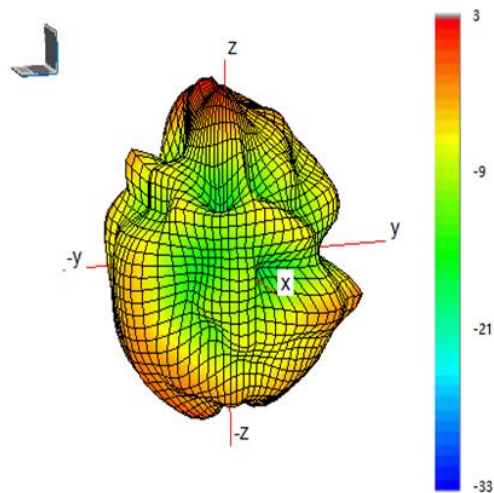
### Max Antenna 3D Radiation Pattern 2400 – 2483.5 MHz

| Frequency (MHz) | Peak Gain w/ Cable Loss (dBi) |
|-----------------|-------------------------------|
| 2400-2483.5     | 1.68                          |



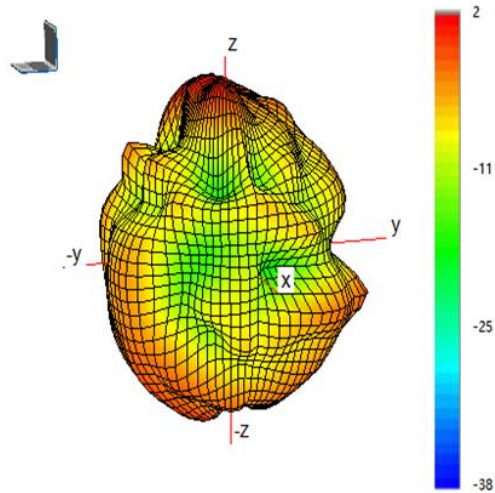
### Max Antenna 3D Radiation Pattern 5150-5250 MHz

| Frequency (MHz) | Peak Gain w/ Cable Loss (dBi) |
|-----------------|-------------------------------|
| 5150-5250       | 2.34                          |



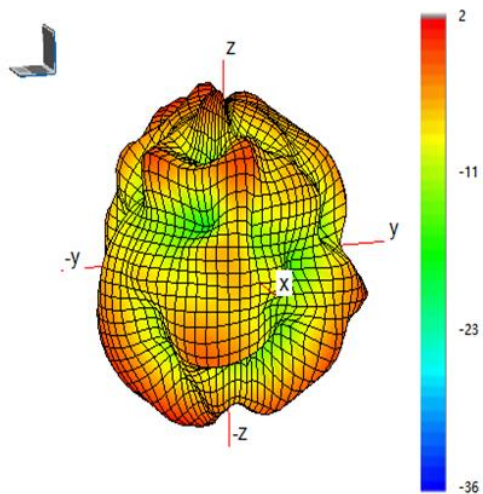
### Max Antenna 3D Radiation Pattern 5250-5350 MHz

| Frequency (MHz) | Peak Gain w/ Cable Loss (dBi) |
|-----------------|-------------------------------|
| 5250-5350       | 1.95                          |



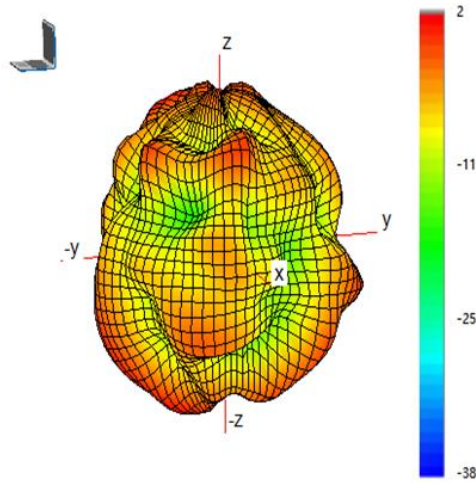
### Max Antenna 3D Radiation Pattern 5470-5725 MHz

| Frequency (MHz) | Peak Gain w/ Cable Loss (dBi) |
|-----------------|-------------------------------|
| 5470-5725       | 1.90                          |



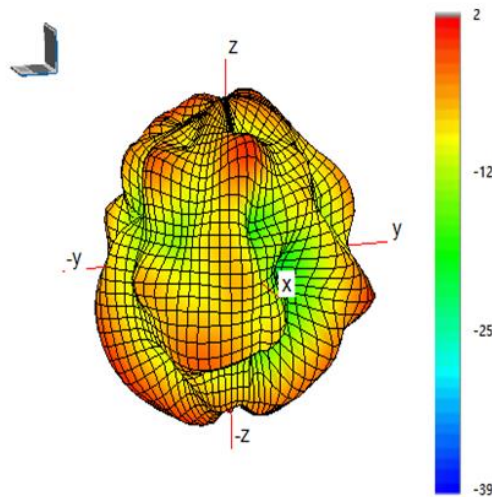
### Max Antenna 3D Radiation Pattern 5725-5850 MHz

| Frequency (MHz) | Peak Gain w/ Cable Loss (dBi) |
|-----------------|-------------------------------|
| 5725-5850       | 1.86                          |



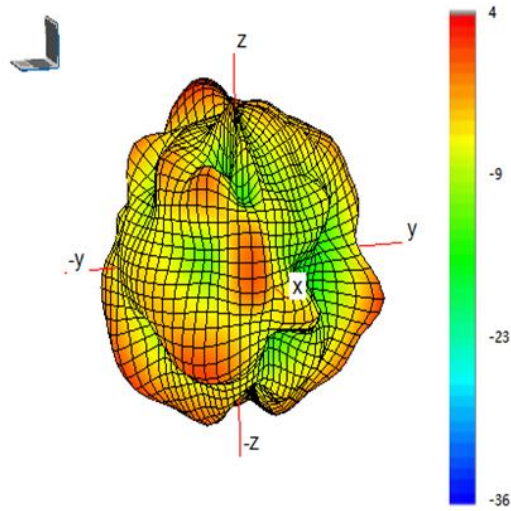
### Max Antenna 3D Radiation Pattern 5850-5895 MHz

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



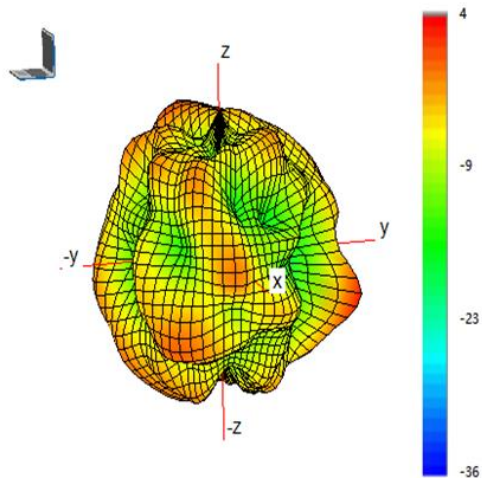
### Max Antenna 3D Radiation Pattern 5925-6425 MHz

| Frequency (MHz) | Peak Gain w/ Cable Loss (dBi) |
|-----------------|-------------------------------|
| 5925-6425       | 3.84                          |



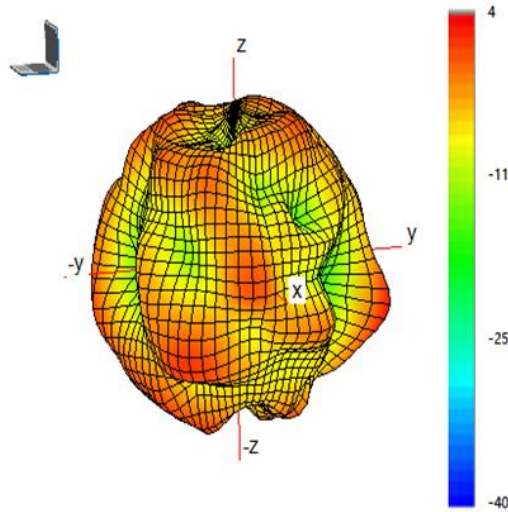
### Max Antenna 3D Radiation Pattern 6425-6525 MHz

| Frequency (MHz) | Peak Gain w/ Cable Loss (dBi) |
|-----------------|-------------------------------|
| 6425-6525       | 3.77                          |



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

| Frequency (MHz) | Peak Gain w/ Cable Loss (dBi) |
|-----------------|-------------------------------|
| 6525-6875       | 3.92                          |



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

| Frequency (MHz) | Peak Gain w/ Cable Loss (dBi) |
|-----------------|-------------------------------|
| 6875-7125       | 2.94                          |

