



## Antenna Test Report

|                 |                    |
|-----------------|--------------------|
| REPORT NO.      | A231001            |
| APPLICANT       | : Tesla, Inc.      |
| MANUFACTURER    | : Tesla, Inc.      |
| EQUIPMENT       | : Antenna on PCB   |
| MODEL NAME      | : 1755080          |
| DATE OF RECEIPT | : January 6, 2023  |
| DATE OF TEST    | : January 6, 2023  |
| ISSUE DATE      | : January 17, 2023 |

Tested by:

Neil Kao

We, SPORTON INTERNATIONAL (USA) INC., would like to declare that the tested sample has been evaluated in accordance with the procedures and shown the compliance with the applicable technical standards.

The test results in this report apply exclusively to the tested model / sample. Without written approval of SPORTON INTERNATIONAL (USA) INC., the test report shall not be reproduced except in full.

The declared product specification for EUT presented in this report is provided by the manufacturer / applicant, and the manufacturer / applicant takes all the responsibilities for the accuracy of product specification.

**SPORTON INTERNATIONAL (USA) INC.**



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***Revision History***

| REPORT NO. | VERSION | DESCRIPTION             | ISSUE DATE       |
|------------|---------|-------------------------|------------------|
| A231001    | 1.0     | Initial issue of report | January 17, 2023 |
|            |         |                         |                  |
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|            |         |                         |                  |



## 1. Test Laboratory

|                  |                                                                                                                                                                                                                       |
|------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Test Site</b> | Sporton International Inc.<br><input type="checkbox"/> EMC & Wireless Communications Laboratory<br><input type="checkbox"/> Wensan Laboratory<br><input checked="" type="checkbox"/> Sporton International (USA) inc. |
| <b>Address</b>   | Sporton International (USA) inc.:<br>1175 Montague Expressway, Milpitas, CA 95035 USA                                                                                                                                 |
| <b>Chamber</b>   | Sporton International (USA) inc.:<br><input type="checkbox"/> OTA01-CA <input checked="" type="checkbox"/> OTA02-CA                                                                                                   |

☒ : The chamber(s) used to perform the test.



## **2. Client Information**

### **2.1 Applicant**

|                       |                                           |
|-----------------------|-------------------------------------------|
| <b>Company Name</b>   | Tesla, Inc.                               |
| <b>Address</b>        | 3500 DEER CREEK ROAD, PALO ALTO, CA 94304 |
| <b>Contact Person</b> | Viraj Andrabadu Kurundu Patabendige       |

### **2.2 Manufacturer**

|                       |                                           |
|-----------------------|-------------------------------------------|
| <b>Company Name</b>   | Tesla, Inc.                               |
| <b>Address</b>        | 3500 DEER CREEK ROAD, PALO ALTO, CA 94304 |
| <b>Contact Person</b> | Viraj Andrabadu Kurundu Patabendige       |

### **3. Equipment Under test(EUT) Information**

#### **3.1 Description of EUT**

| Product Feature & Specification |                |
|---------------------------------|----------------|
| EUT Type                        | Antenna on PCB |
| Brand Name                      | Tesla, Inc.    |
| Model Name                      | 1755080        |
| Antenna Type                    | PCB Antenna    |



#### 4. Measurement Environment

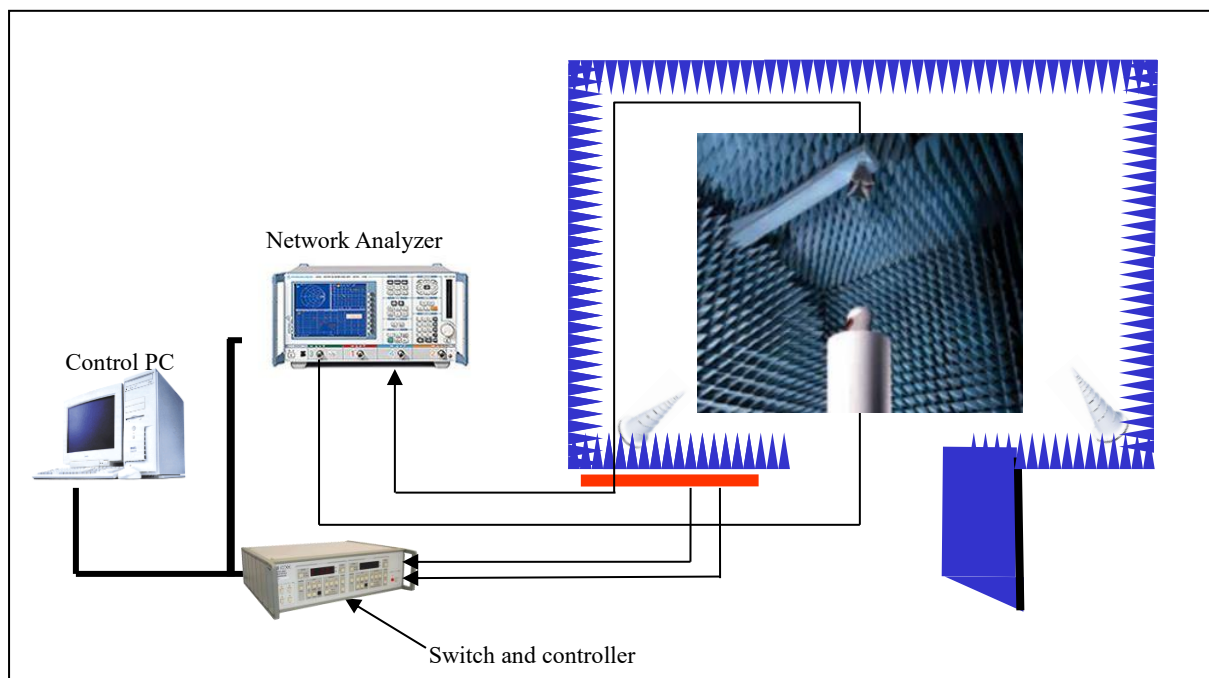
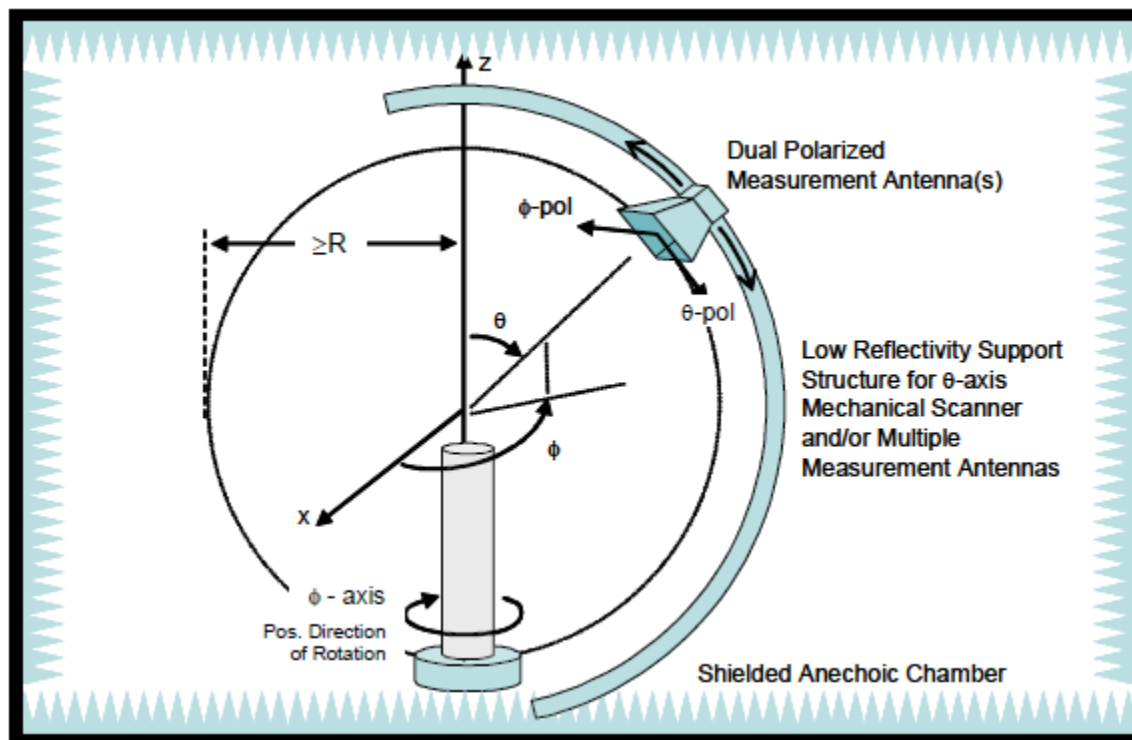
##### Ambient Condition

|                   |              |               |      |
|-------------------|--------------|---------------|------|
| Temperature (°C): | 25°C +/- 5°C | Humidity (%): | <60% |
|-------------------|--------------|---------------|------|

##### Test Equipment List

| Name                             | Manufacturer | Type/Model | Serial Number | Calibration |            |
|----------------------------------|--------------|------------|---------------|-------------|------------|
|                                  |              |            |               | Last Cal.   | Due Date   |
| ENA Series Network Analyzer      | R&S          | ZVB8       | 100110        | 2022/09/02  | 2023/09/01 |
| RF Switch                        | ETS-Lindgren | EMCenter   | N/A           | NCR         | NCR        |
| Multi-Axis Positioner Controller | ETS-Lindgren | 2090       | N/A           | NCR         | NCR        |
| Medium-Duty Positioner           | ETS-Lindgren | 2015       | N/A           | NCR         | NCR        |
| Measurement Horn Antenna         | EMCO         | 3164-08    | N/A           | NCR         | NCR        |
| Test software                    | ETS-Lindgren | EMQuest    | 1296          | NCR         | NCR        |

## Passive measurement setup





## **5. Summary of Test Results**

### **5.1 Declaration**

| <b>Declaration of Conformity:</b>                                                                                   |
|---------------------------------------------------------------------------------------------------------------------|
| The judgment of conformity in the report is based on the measurement results excluding the measurement uncertainty. |
| <b>Comments and Explanations:</b>                                                                                   |
| None                                                                                                                |

### **5.2 Abbreviations and Definitions**

Please note the following abbreviations in this section:

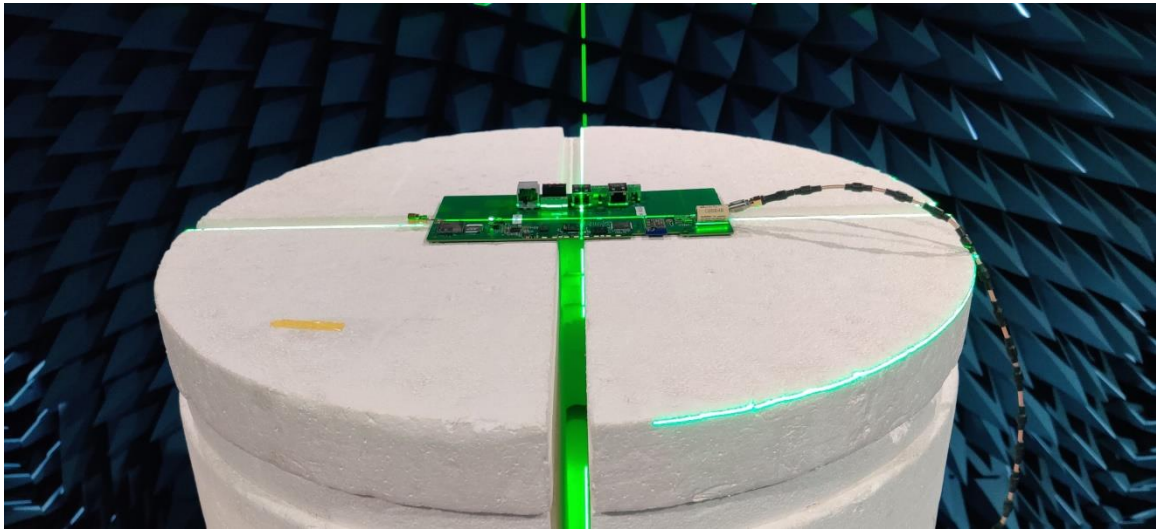
FS        =        Free Space

**5.3 Summary Table**

| Frequency<br>(MHz) | Ant. Port<br>Input Pwr.<br>(dBm) | Total Radiated<br>Power (dBm) | Gain<br>(dBi) | Directivity<br>(dBi) | Efficiency<br>(dB) | Efficiency<br>(%) |
|--------------------|----------------------------------|-------------------------------|---------------|----------------------|--------------------|-------------------|
| 2402.00            | 0.00                             | -1.22                         | 4.19          | 5.41                 | -1.22              | 75.53             |
| 2412.00            | 0.00                             | -1.15                         | 4.09          | 5.24                 | -1.15              | 76.70             |
| 2437.00            | 0.00                             | -1.08                         | 3.99          | 5.07                 | -1.08              | 78.03             |
| 2441.00            | 0.00                             | -1.01                         | 3.95          | 4.96                 | -1.01              | 79.16             |
| 2462.00            | 0.00                             | -0.94                         | 3.77          | 4.71                 | -0.94              | 80.56             |
| 2472.00            | 0.00                             | -0.90                         | 3.89          | 4.79                 | -0.90              | 81.30             |
| 2480.00            | 0.00                             | -0.77                         | 4.19          | 4.96                 | -0.77              | 83.77             |
| 5180.00            | 0.00                             | -3.08                         | 3.05          | 6.13                 | -3.08              | 49.20             |
| 5220.00            | 0.00                             | -3.12                         | 4.09          | 7.22                 | -3.12              | 48.70             |
| 5240.00            | 0.00                             | -3.10                         | 4.52          | 7.63                 | -3.10              | 48.92             |
| 5260.00            | 0.00                             | -3.33                         | 4.20          | 7.53                 | -3.33              | 46.47             |
| 5300.00            | 0.00                             | -3.31                         | 4.34          | 7.65                 | -3.31              | 46.63             |
| 5320.00            | 0.00                             | -3.21                         | 4.70          | 7.91                 | -3.21              | 47.75             |
| 5500.00            | 0.00                             | -2.30                         | 3.42          | 5.72                 | -2.30              | 58.84             |
| 5600.00            | 0.00                             | -2.07                         | 2.82          | 4.89                 | -2.07              | 62.14             |
| 5700.00            | 0.00                             | -2.52                         | 2.65          | 5.18                 | -2.52              | 55.92             |
| 5745.00            | 0.00                             | -2.85                         | 2.61          | 5.46                 | -2.85              | 51.92             |
| 5785.00            | 0.00                             | -2.90                         | 3.02          | 5.93                 | -2.90              | 51.23             |
| 5805.00            | 0.00                             | -2.96                         | 3.39          | 6.35                 | -2.96              | 50.57             |
| 5825.00            | 0.00                             | -2.93                         | 2.94          | 5.87                 | -2.93              | 50.95             |

## **6. Description for EUT Testing Position**

Placed and fixed it as shown below.

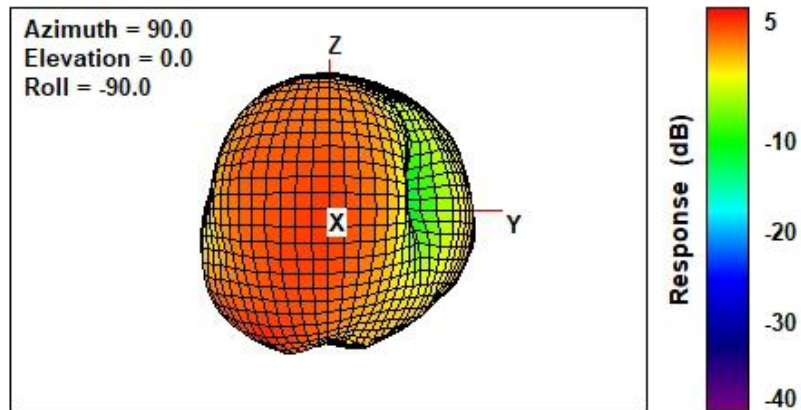


**Figure 6-1 Test Position Free Space**

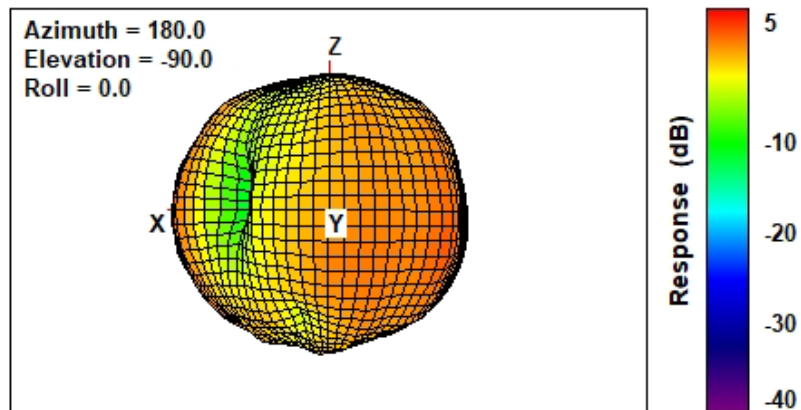


## ***Appendix A 3D pattern***

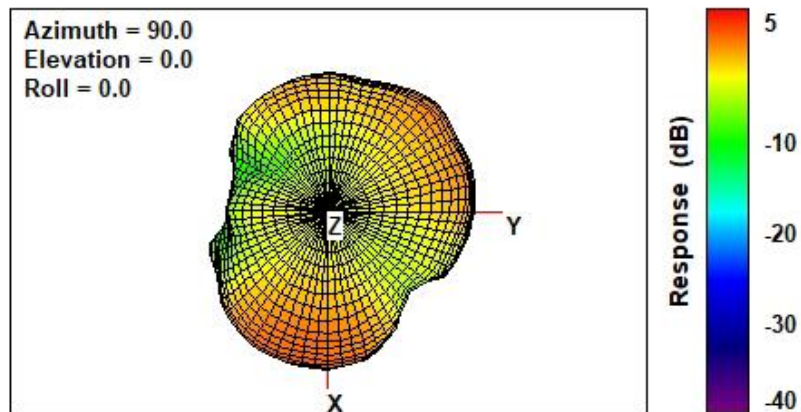
Total - 2402 MHz



Total - 2402 MHz

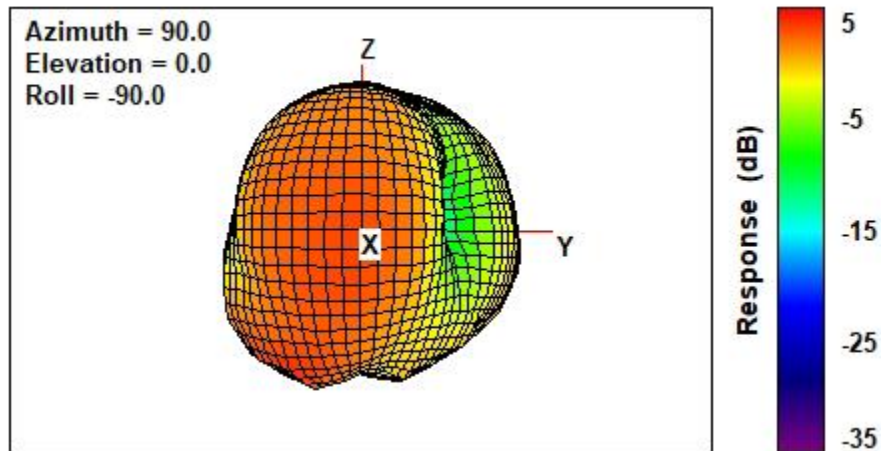


Total - 2402 MHz

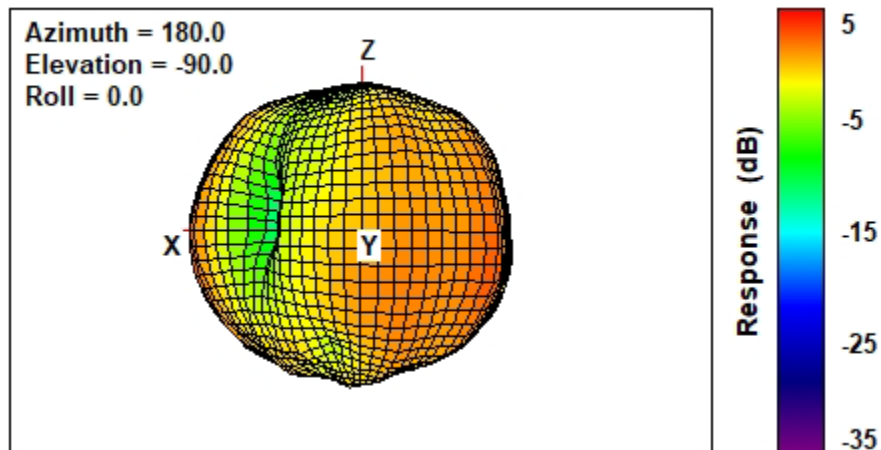


Frequency 2402 MHz

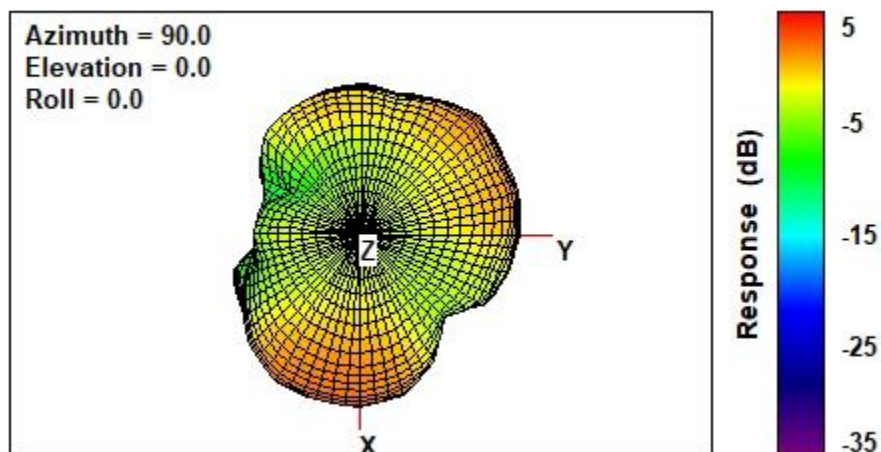
Total - 2412 MHz



Total - 2412 MHz

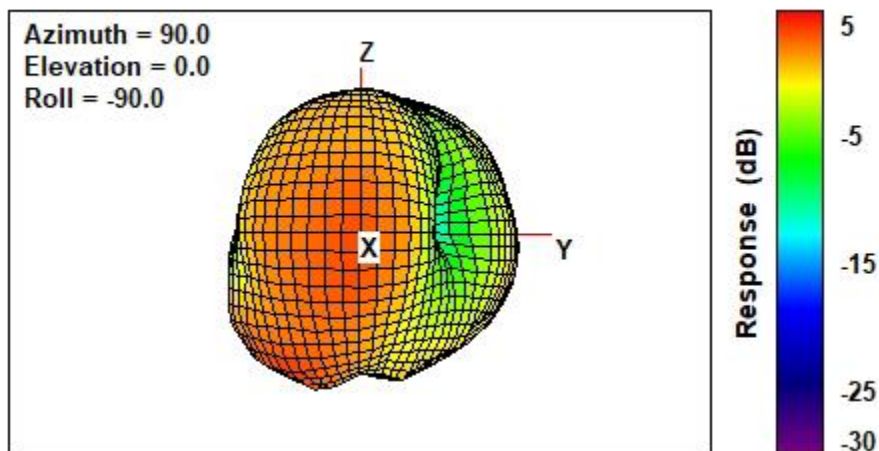


Total - 2412 MHz

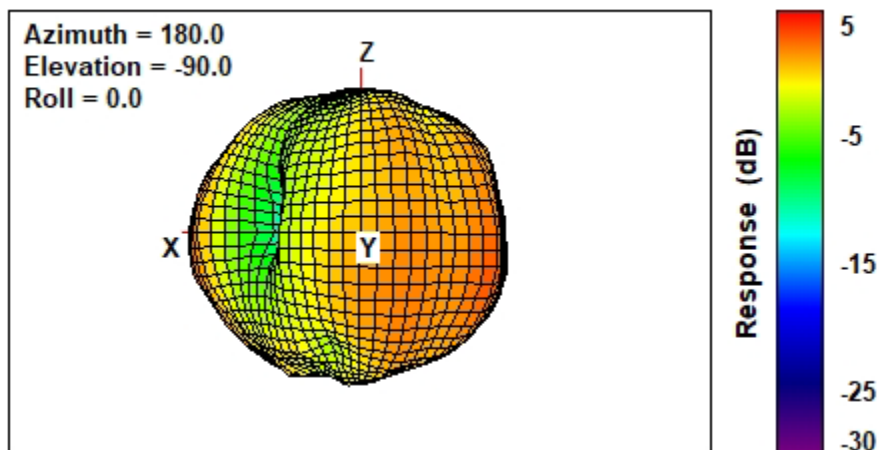


Frequency 2412 MHz

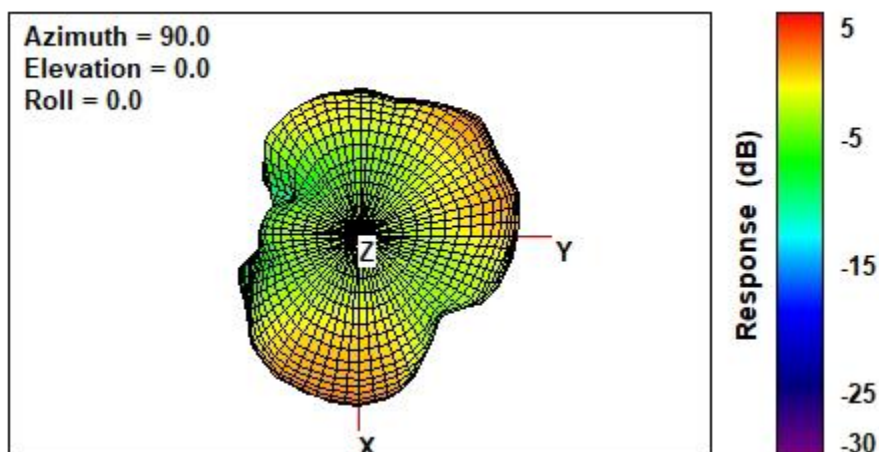
Total - 2437 MHz



Total - 2437 MHz

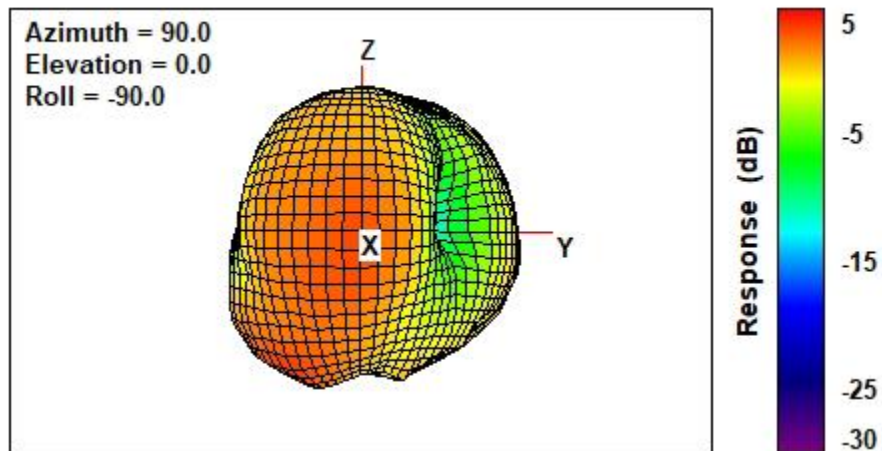


Total - 2437 MHz

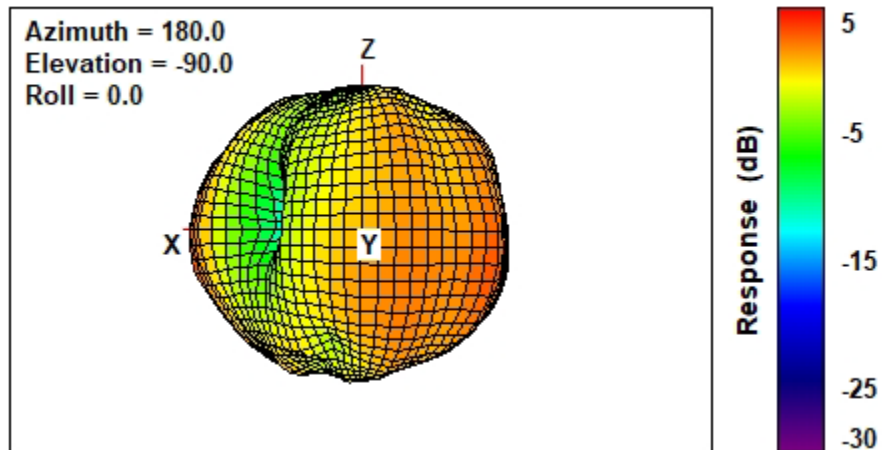


Frequency 2437 MHz

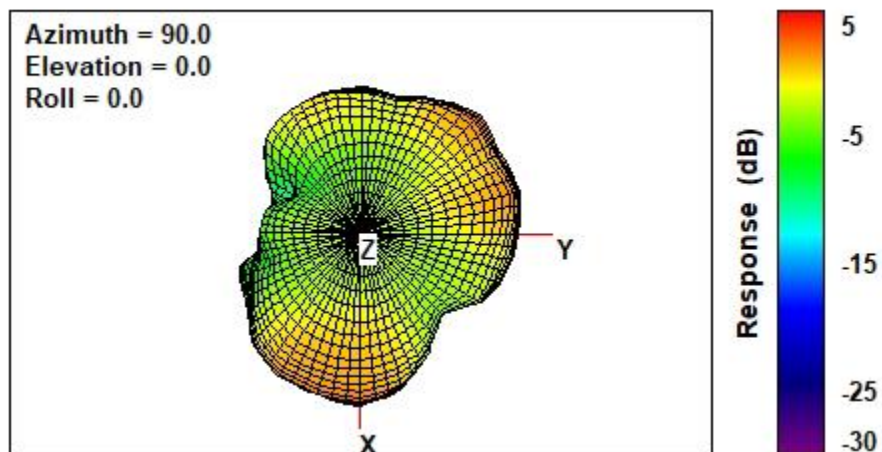
Total - 2441 MHz



Total - 2441 MHz

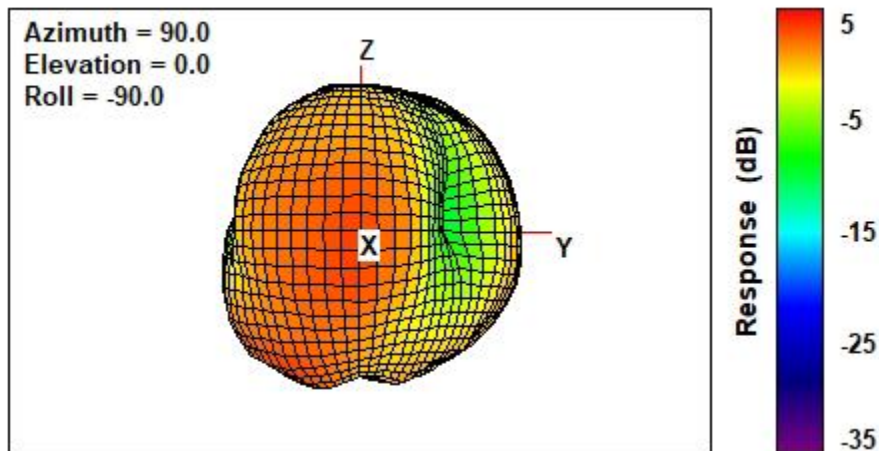


Total - 2441 MHz

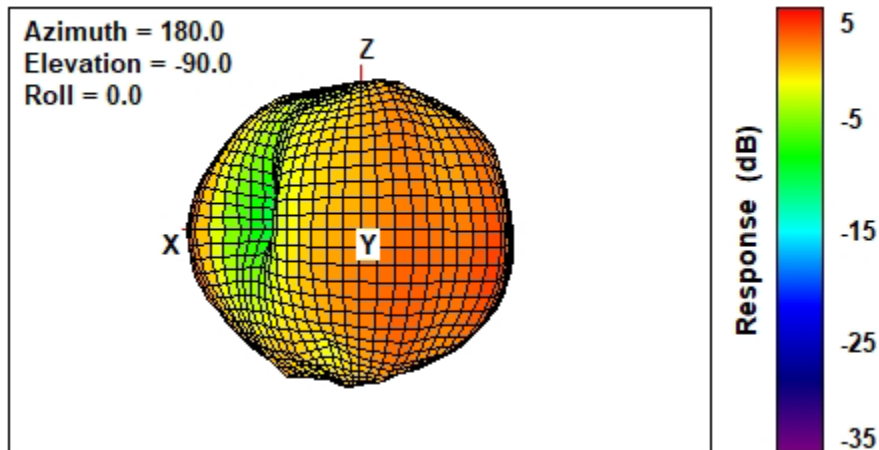


Frequency 2441 MHz

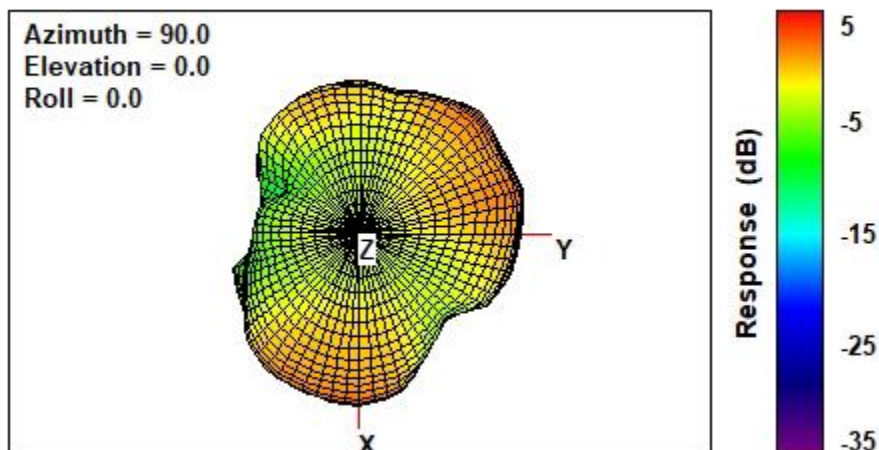
Total - 2462 MHz



Total - 2462 MHz

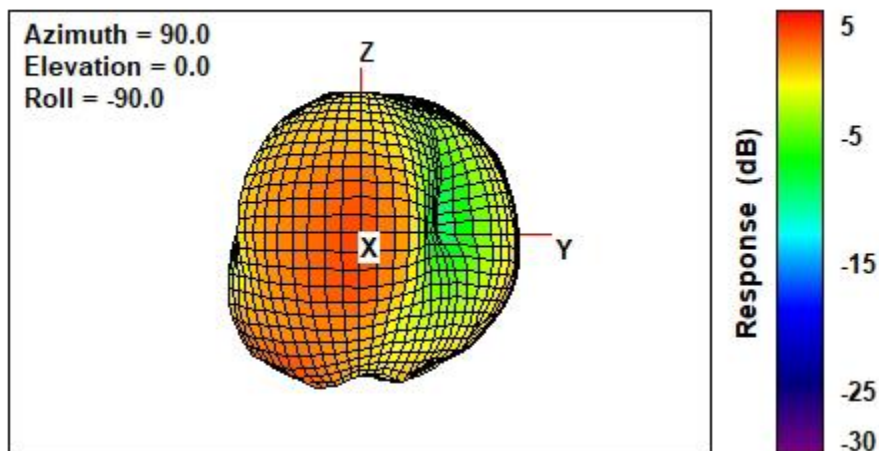


Total - 2462 MHz

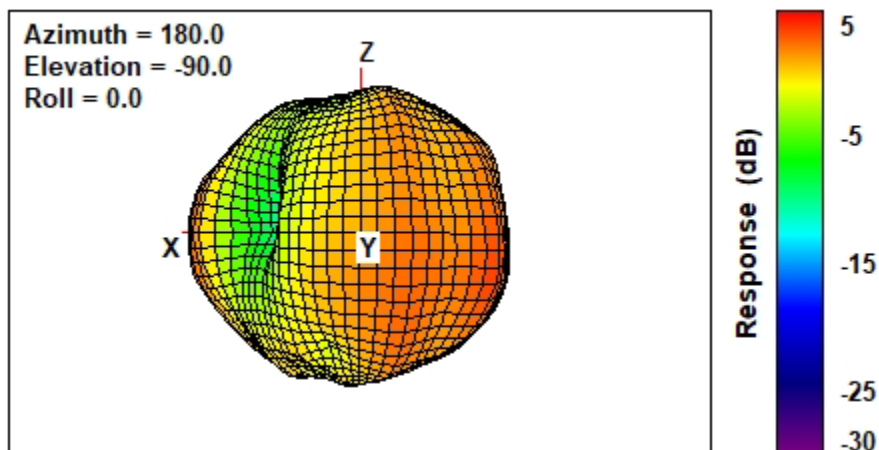


Frequency 2462 MHz

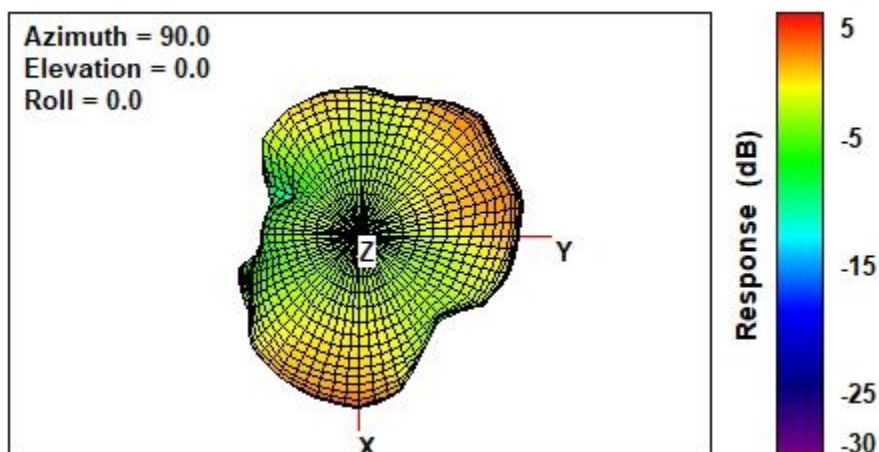
Total - 2472 MHz



Total - 2472 MHz

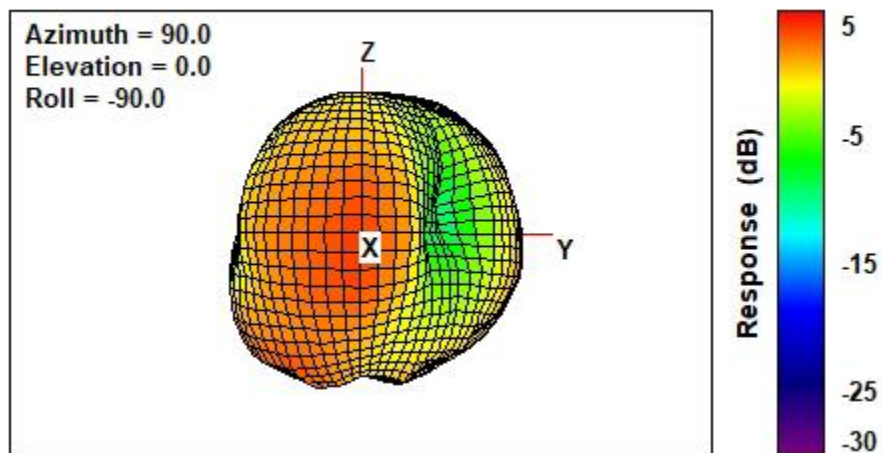


Total - 2472 MHz

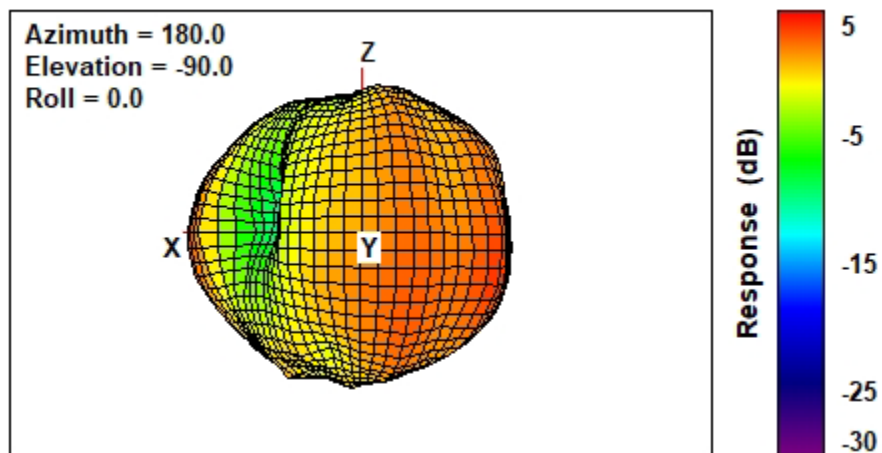


Frequency 2472 MHz

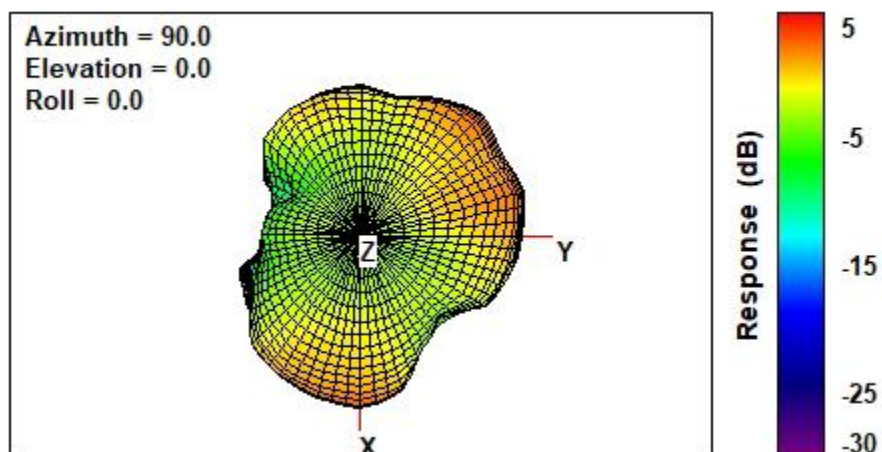
Total - 2480 MHz



Total - 2480 MHz

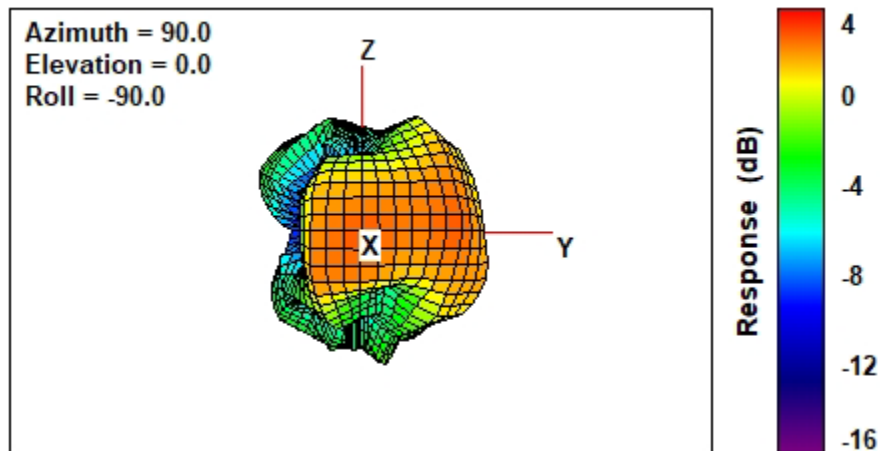


Total - 2480 MHz

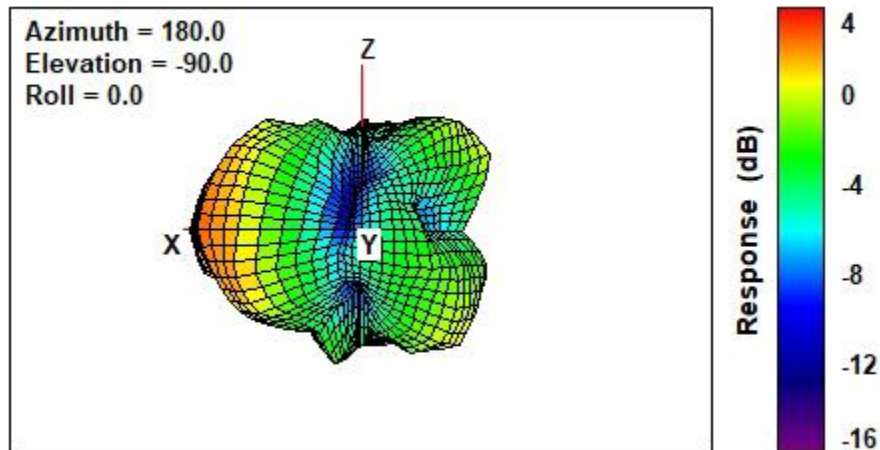


Frequency 2480 MHz

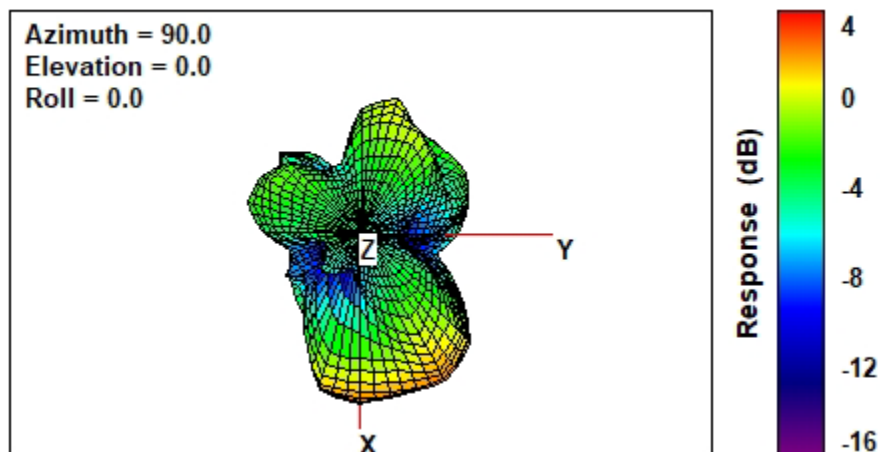
Total - 5180 MHz



Total - 5180 MHz

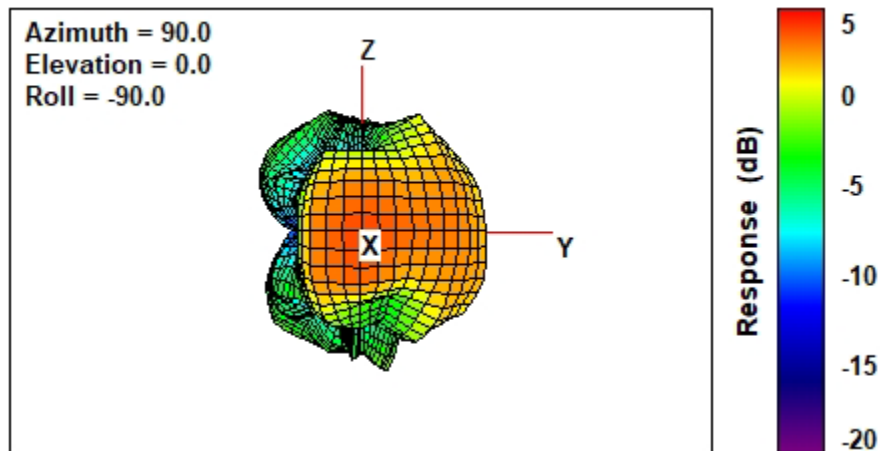


Total - 5180 MHz

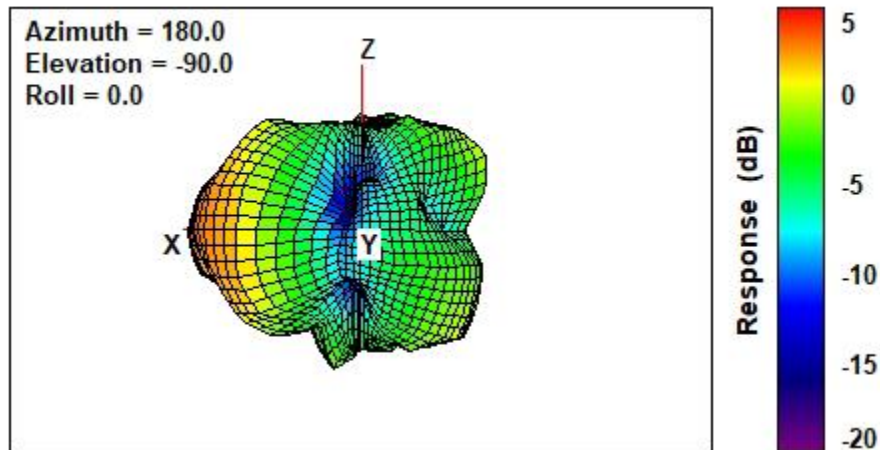


Frequency 5180 MHz

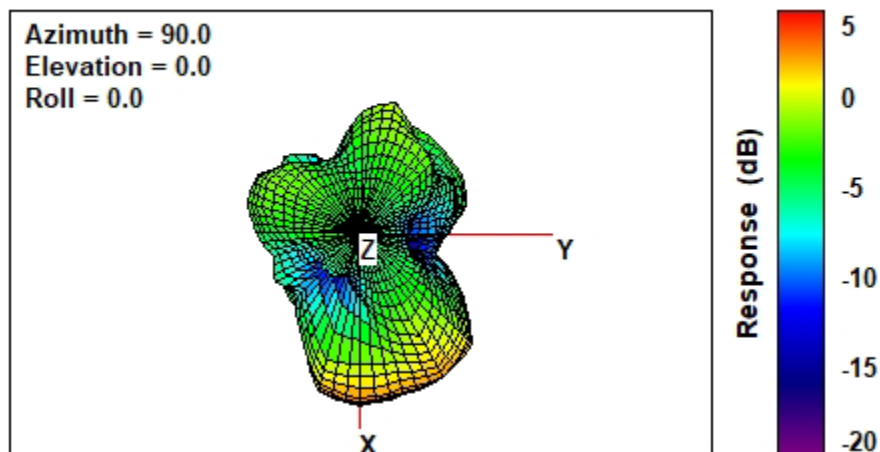
## Total - 5220 MHz



## Total - 5220 MHz

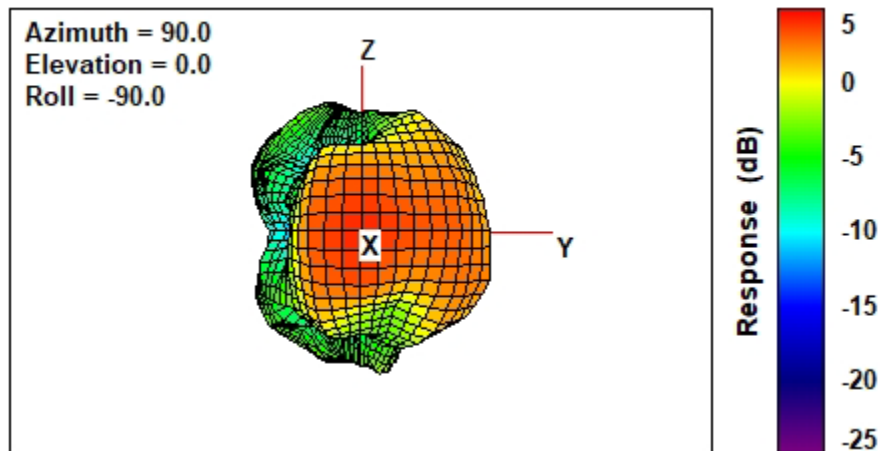


## Total - 5220 MHz

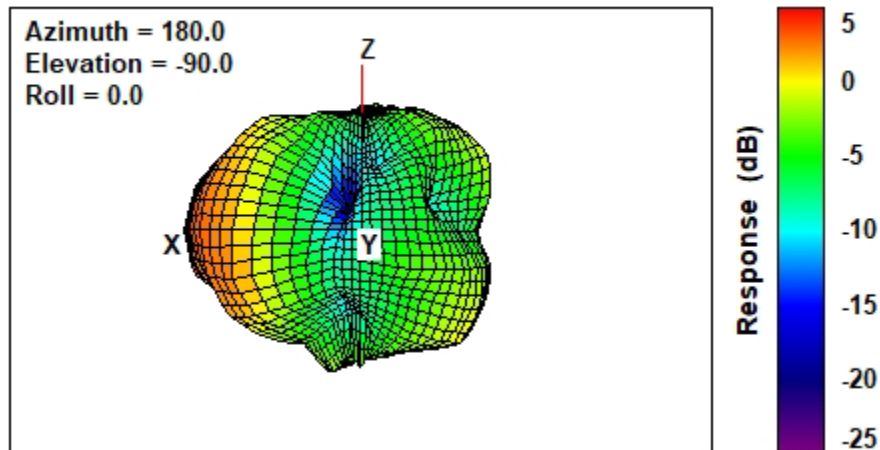


## Frequency 5220 MHz

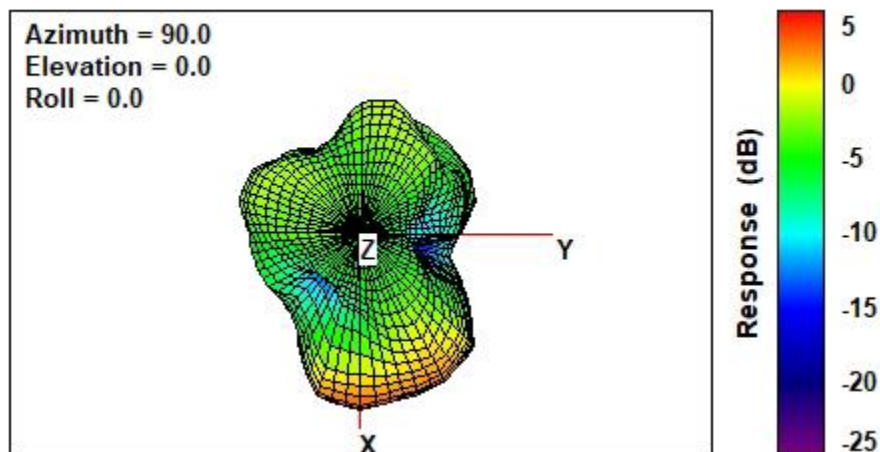
## Total - 5240 MHz



## Total - 5240 MHz

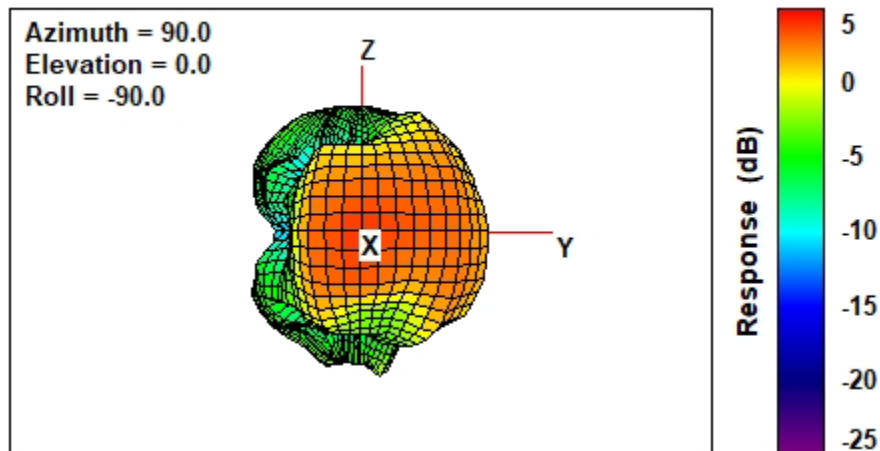


## Total - 5240 MHz

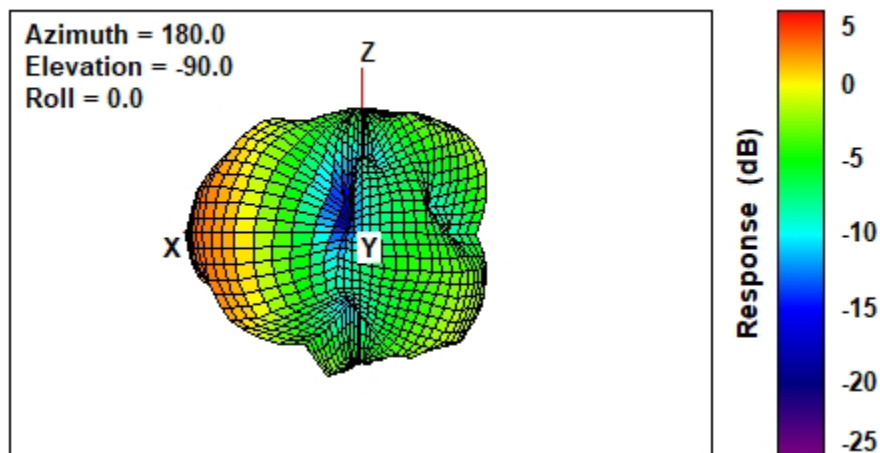


## Frequency 5240 MHz

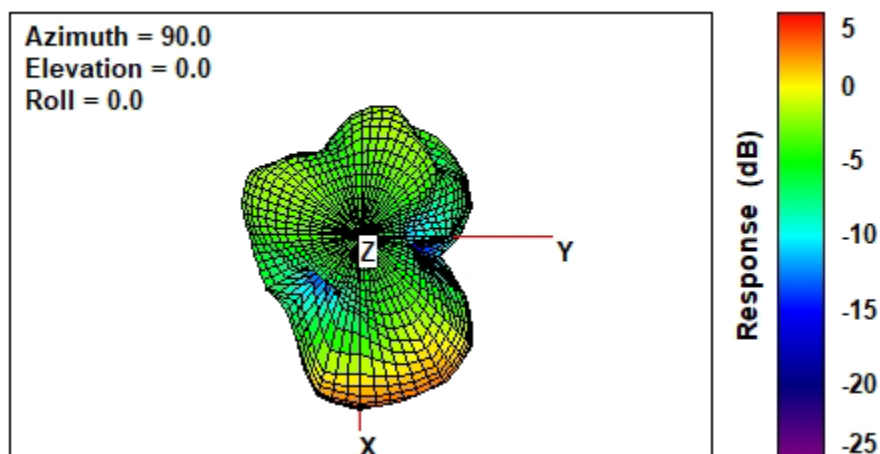
## Total - 5260 MHz



## Total - 5260 MHz

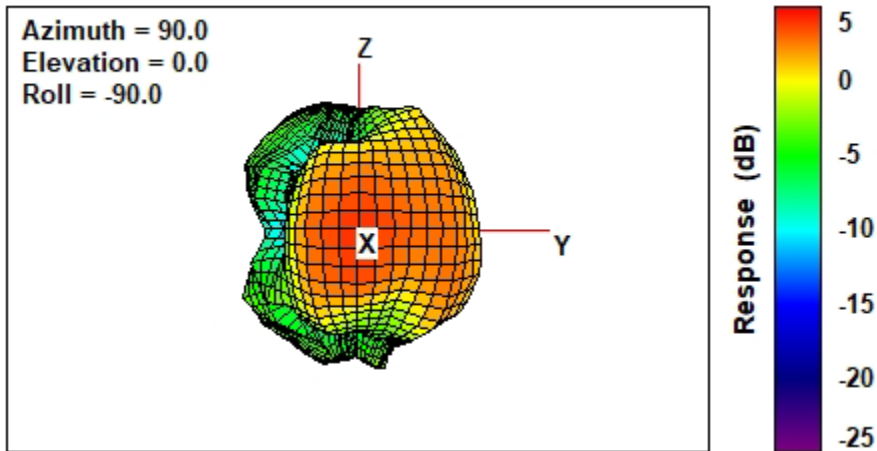


## Total - 5260 MHz

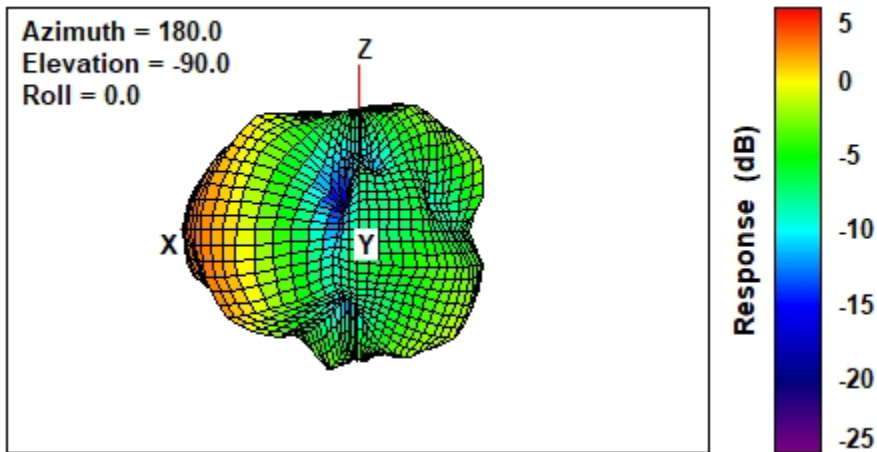


## Frequency 5260 MHz

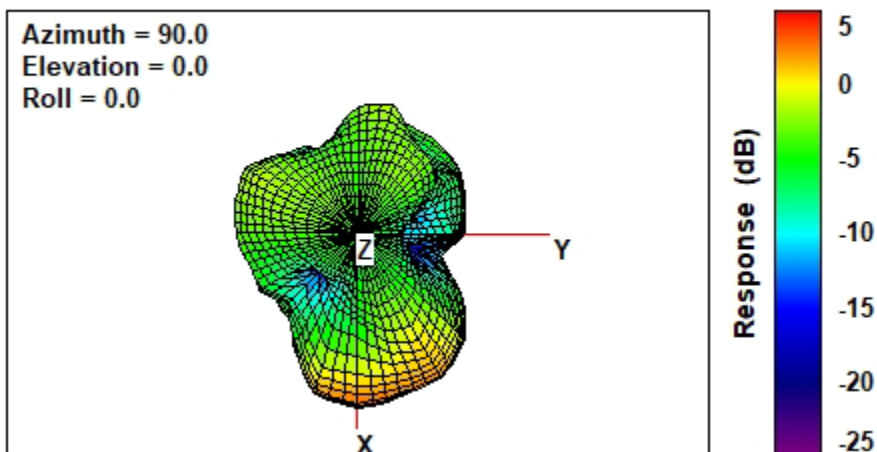
## Total - 5300 MHz



## Total - 5300 MHz

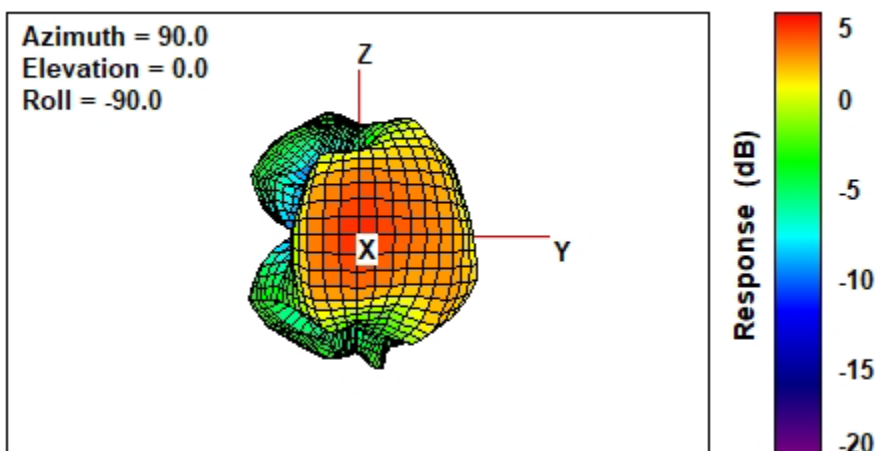


## Total - 5300 MHz

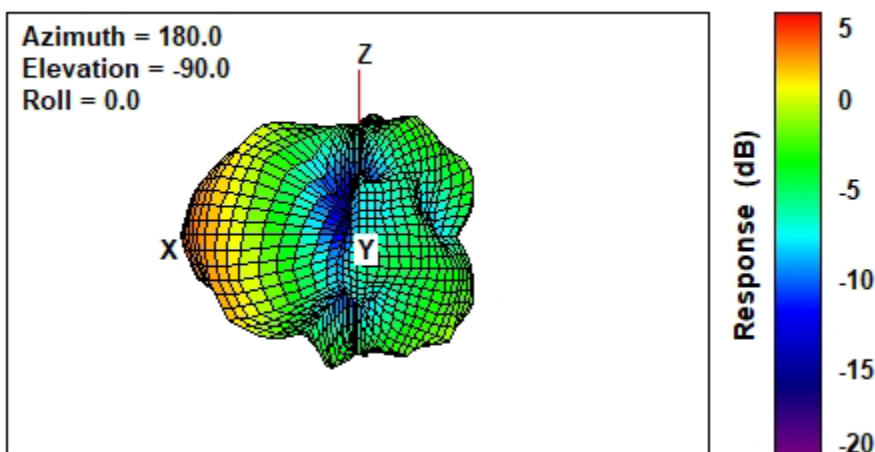


## Frequency 5300 MHz

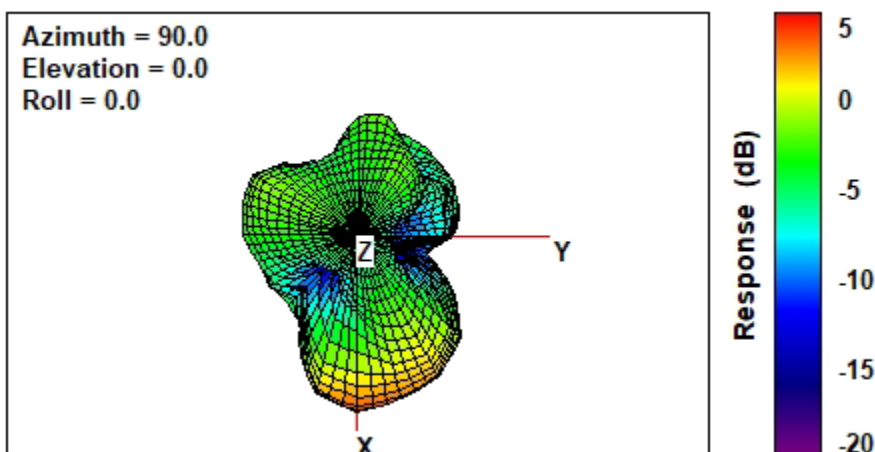
## Total - 5320 MHz



## Total - 5320 MHz

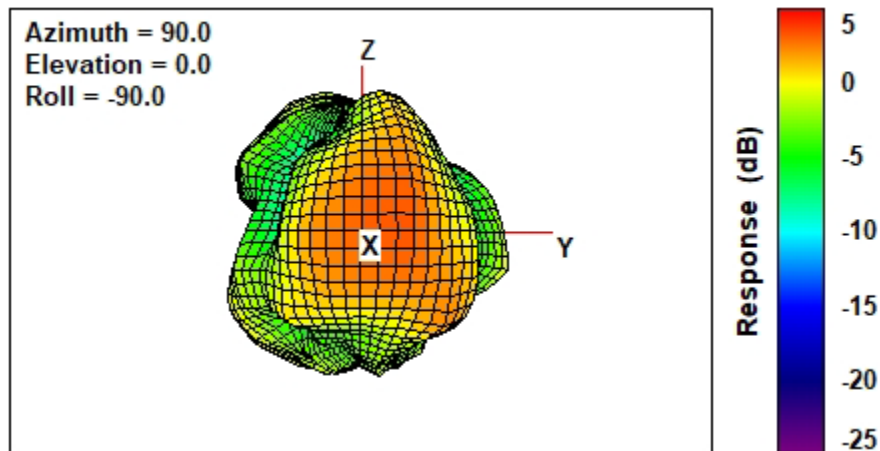


## Total - 5320 MHz

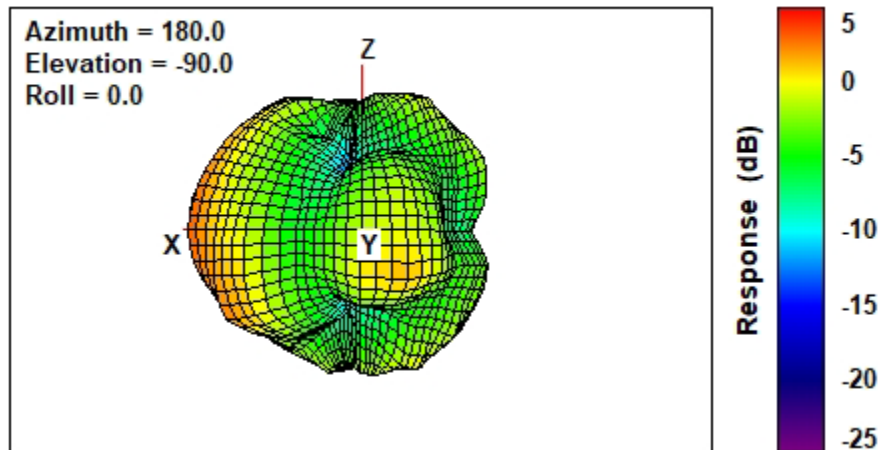


## Frequency 5320 MHz

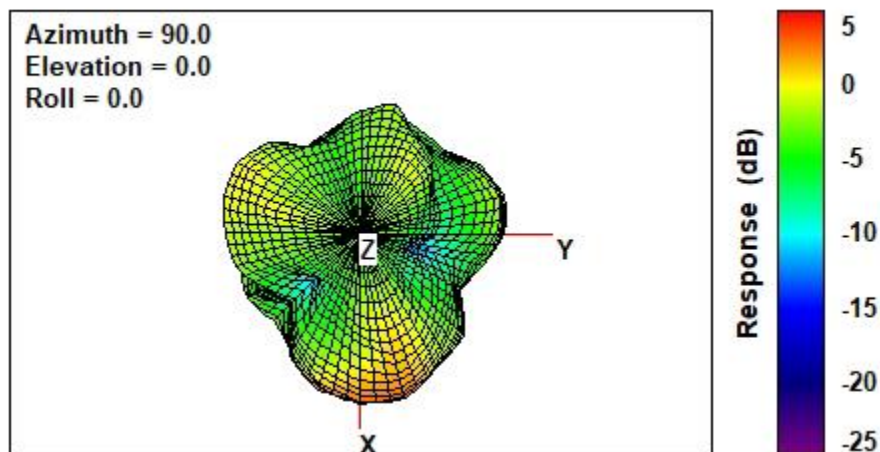
## Total - 5500 MHz



## Total - 5500 MHz

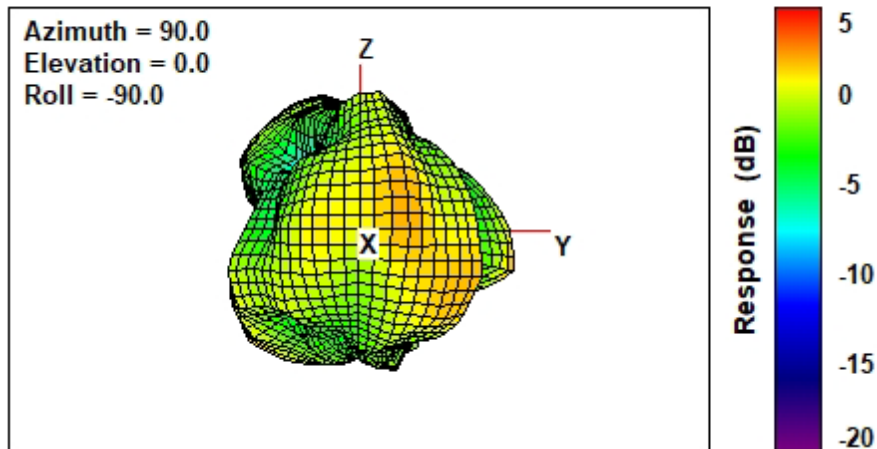


## Total - 5500 MHz

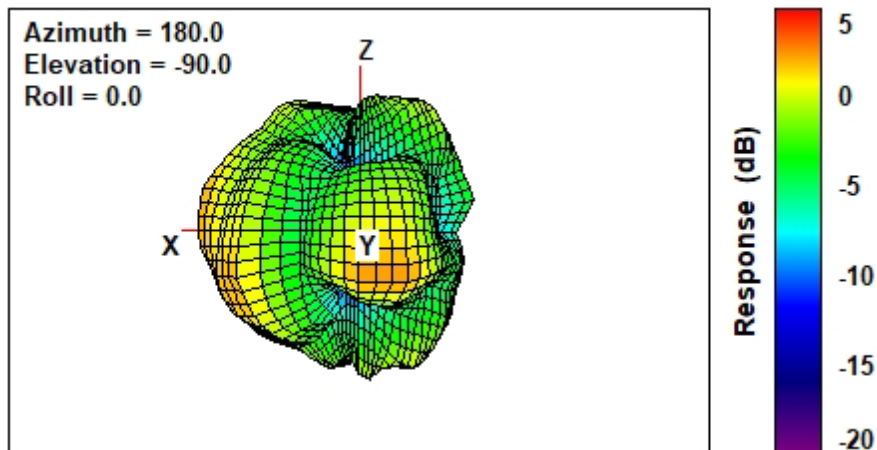


## Frequency 5500 MHz

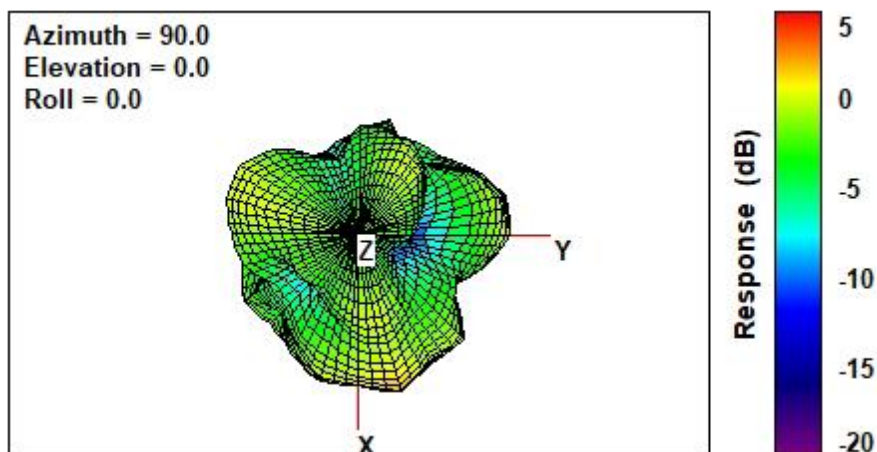
Total - 5600 MHz



Total - 5600 MHz



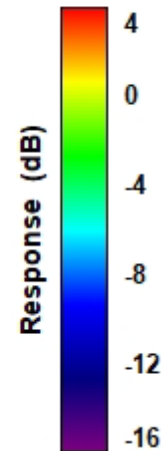
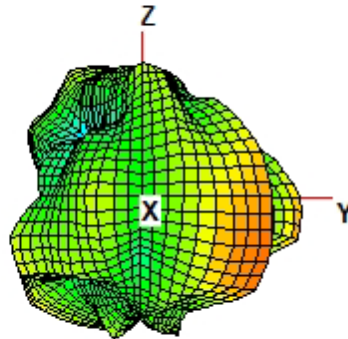
Total - 5600 MHz



Frequency 5600 MHz

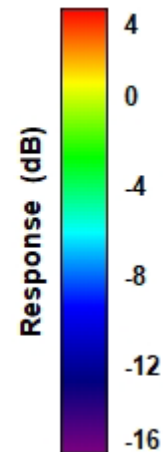
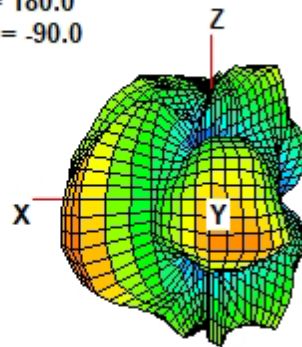
## Total - 5700 MHz

Azimuth = 90.0  
Elevation = 0.0  
Roll = -90.0



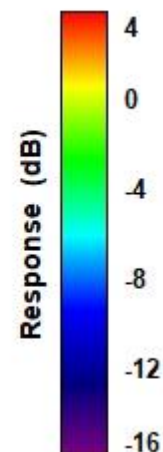
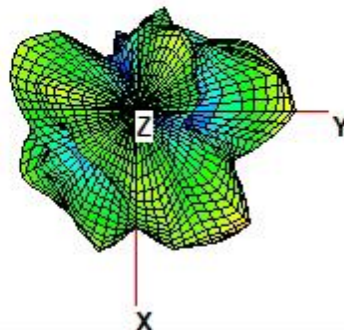
## Total - 5700 MHz

Azimuth = 180.0  
Elevation = -90.0  
Roll = 0.0



## Total - 5700 MHz

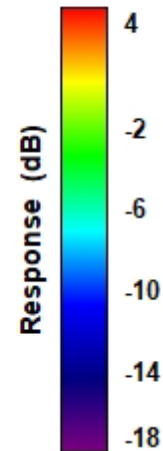
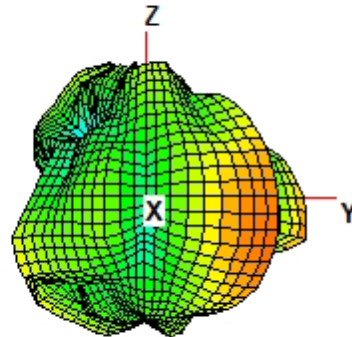
Azimuth = 90.0  
Elevation = 0.0  
Roll = 0.0



## Frequency 5700 MHz

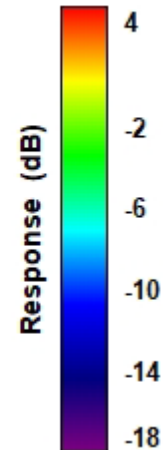
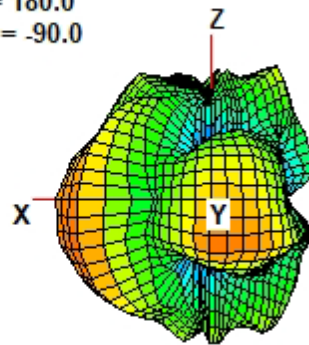
## Total - 5745 MHz

Azimuth = 90.0  
Elevation = 0.0  
Roll = -90.0



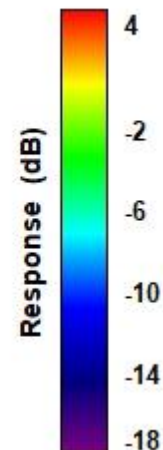
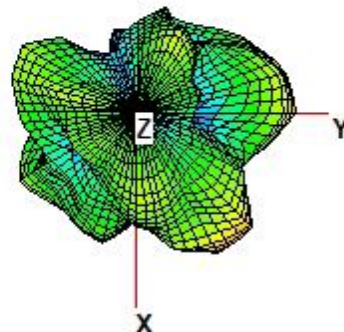
## Total - 5745 MHz

Azimuth = 180.0  
Elevation = -90.0  
Roll = 0.0



## Total - 5745 MHz

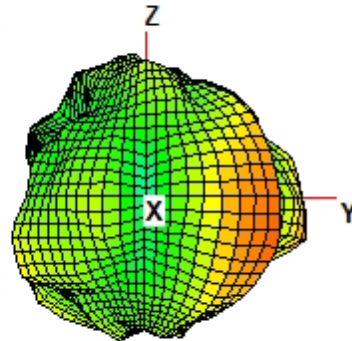
Azimuth = 90.0  
Elevation = 0.0  
Roll = 0.0



## Frequency 5745 MHz

## Total - 5805 MHz

Azimuth = 90.0  
Elevation = 0.0  
Roll = -90.0

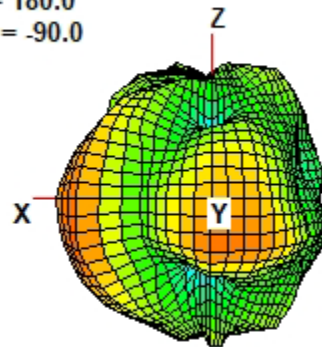


Response (dB)

5  
0  
-5  
-10  
-15  
-20  
-25

## Total - 5805 MHz

Azimuth = 180.0  
Elevation = -90.0  
Roll = 0.0

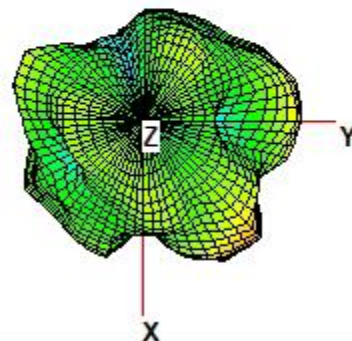


Response (dB)

5  
0  
-5  
-10  
-15  
-20  
-25

## Total - 5805 MHz

Azimuth = 90.0  
Elevation = 0.0  
Roll = 0.0

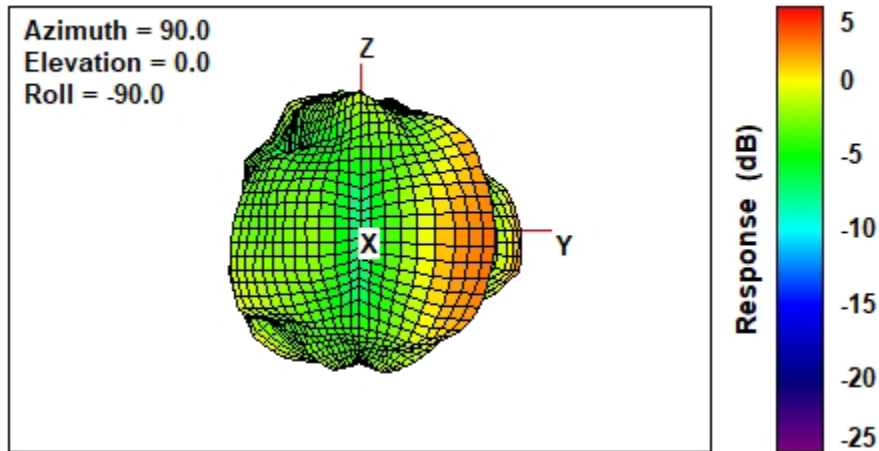


Response (dB)

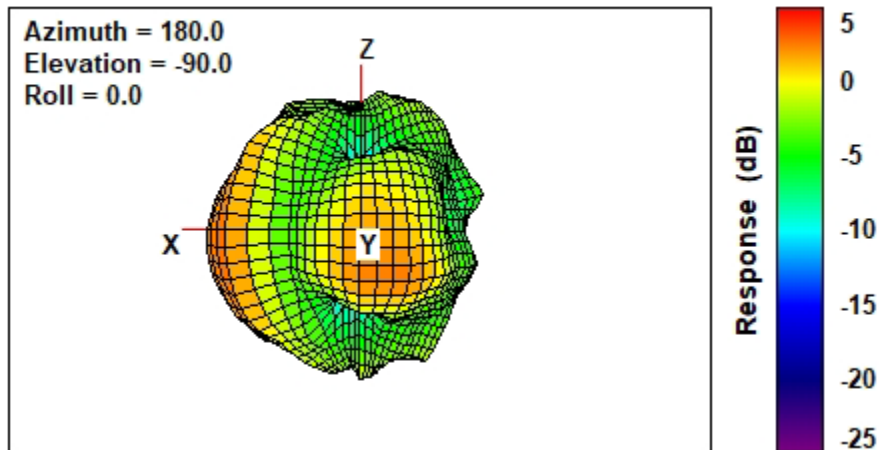
5  
0  
-5  
-10  
-15  
-20  
-25

## Frequency 5805 MHz

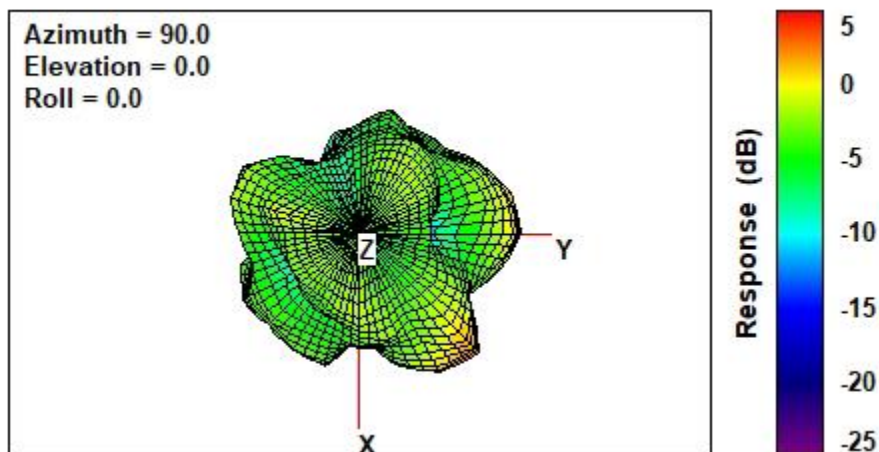
## Total - 5825 MHz



## Total - 5825 MHz



## Total - 5825 MHz



## Frequency 5825 MHz