TAOGLAS


# Datasheet

**Part No:**
**SXP.25.4.A.02**

## Description

SDARS 2320~2345MHz Dual-Band XM & Sirius Patch Antenna

## Features:

SDARS (Satellite Digital Audio Radio Services)
High Efficiency >85% across all bands
Radiation pattern designed for XM & SIRIUS Requirements
Optimized LHCP Radiation Pattern
Pin & Adhesive Mounting
Dims: 25 x 25 x 4mm
RoHS & Reach Compliant

# 1. Introduction


The Taoglas SXP.25.4.A.02 is part of a series of high-efficiency patch antennas designed for use with Satellite Digital Audio Radio Services (SDARS). It features left-hand circular polarization and excellent gain characteristics in the 2320 to 2345 MHz band, making it compatible with the most popular satellite radio services available in many new vehicles.

The SXP.25 comes in a convenient, compact form factor, with dimensions of just 25mm x 25mm x 4mm, and is manufactured with high-quality ceramic. It is mounted via pin and 3M adhesive tape.

For further optimization to customer-specific device environments, custom tuned patch antennas can be supplied. Your regional Taoglas sales office can help you identify the best patch antenna for your specific SDARS application.

# 2. Specification

| SDARS Electrical | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| **System** | **Frequency (MHz)** | **Measurement** | **Efficiency (%)** | **Average Gain (dB)** | **Peak Gain (dBi)** | **Impedance** | **Polarization** | **Max. input power** |
| **XM** | 2332.5-2345 | 100x100cm Ground Plane | 87.7 | -0.57 | 5.11 | 50 Ω | LHCP | 10W |
| | | 50x50cm Ground Plane | 93.8 | -0.28 | 5.92 | | | |
| | | 30x30cm Ground Plane | 87.4 | -0.59 | 5.56 | | | |
| | | 15x15cm Ground Plane | 92.0 | -0.36 | 6.16 | | | |
| | | 7x7cm Ground Plane | 88.8 | -0.52 | 5.69 | | | |
| **SIRIUS** | 2320-2332.5 | 100x100cm Ground Plane | 87.4 | -0.59 | 5.11 | | | |
| | | 50x50cm Ground Plane | 91.0 | -0.41 | 5.92 | | | |
| | | 30x30cm Ground Plane | 85.4 | -0.69 | 5.48 | | | |
| | | 15x15cm Ground Plane | 87.9 | -0.56 | 5.93 | | | |
| | | 7x7cm Ground Plane | 87.8 | -0.57 | 5.53 | | | |

| Mechanical | |
|---|---|
| **Dimensions** | 25mm x 25mm x 4mm |
| **Weight** | 10g |
| **Material** | Ceramic |
| **Pin Diameter** | 0.9±0.2mm |
| **Pin Length** | 2.4±0.3mm |

| Environmental | |
|---|---|
| **Operation Temperature** | -40°C to 105°C |
| **Storage Temperature** | -40°C to 105°C |
| **Humidity** | Non-condensing 65°C 95% RH |

## XM Gain Requirements (Satellite) - Ground Plane (2338.75MHz)

| Elevation Angle(degrees) | XM Sirius Limits (dBic) | Measured Average Gain (dBic) | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | | 7x7cm Ground | | 15x15cm Ground | | 30x30cm Ground | | 50x50cm Ground | | 100x100cm Ground | |
| | | Phi 0 | Phi 90 | Phi 0 | Phi 90 | Phi 0 | Phi 90 | Phi 0 | Phi 90 | Phi 0 | Phi 90 |
| 20 ≤ Φ ≤ 25 | 0.5 | 0.1 | 0.2 | 0.2 | -0.3 | 0.2 | 0.4 | 0.7 | 1.5 | 1.7 | 1.7 |
| 25 ≤ Φ ≤ 30 | 1 | 0.8 | 0.9 | 1.2 | 0.6 | 1.3 | 1.5 | 2.3 | 3.0 | 2.1 | 1.7 |
| 30 ≤ Φ ≤ 50 | 2 | 3.0 | 3.0 | 3.9 | 3.0 | 2.7 | 3.5 | 3.4 | 4.0 | 3.2 | 3.0 |
| 50 ≤ Φ ≤ 70 | 4 | 4.7 | 4.8 | 5.3 | 5.0 | 2.9 | 3.8 | 3.7 | 3.8 | 4.2 | 4.1 |
| 70 ≤ Φ ≤ 90 | 2 | 5.3 | 5.3 | 5.8 | 5.8 | 4.6 | 4.6 | 3.7 | 4.2 | 4.9 | 4.9 |

## XM Gain Requirements (Satellite) - Ground Plane (2326.25MHz)

| Elevation Angle(degrees) | XM Sirius Limits (dBic) | Measured Average Gain (dBic) | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | | 7x7cm Ground | | 15x15cm Ground | | 30x30cm Ground | | 50x50cm Ground | | 100x100cm Ground | |
| | | Phi 0 | Phi 90 | Phi 0 | Phi 90 | Phi 0 | Phi 90 | Phi 0 | Phi 90 | Phi 0 | Phi 90 |
| 20 ≤ Φ ≤ 25 | 0.5 | 0.0 | 0.7 | 0.0 | 0.9 | 0.1 | 1.0 | 0.8 | 2.0 | 1.9 | 1.3 |
| 25 ≤ Φ ≤ 30 | 1 | 0.9 | 1.4 | 1.0 | 1.8 | 1.3 | 2.0 | 2.5 | 3.4 | 2.2 | 1.5 |
| 30 ≤ Φ ≤ 50 | 2 | 3.1 | 3.3 | 3.6 | 4.1 | 3.1 | 3.6 | 4.1 | 4.3 | 3.3 | 3.0 |
| 50 ≤ Φ ≤ 70 | 4 | 4.8 | 5.0 | 5.5 | 5.6 | 3.7 | 3.7 | 4.3 | 4.5 | 4.3 | 4.3 |
| 70 ≤ Φ ≤ 90 | 2 | 5.5 | 5.5 | 6.1 | 6.1 | 4.6 | 4.6 | 4.4 | 4.6 | 4.6 | 4.7 |

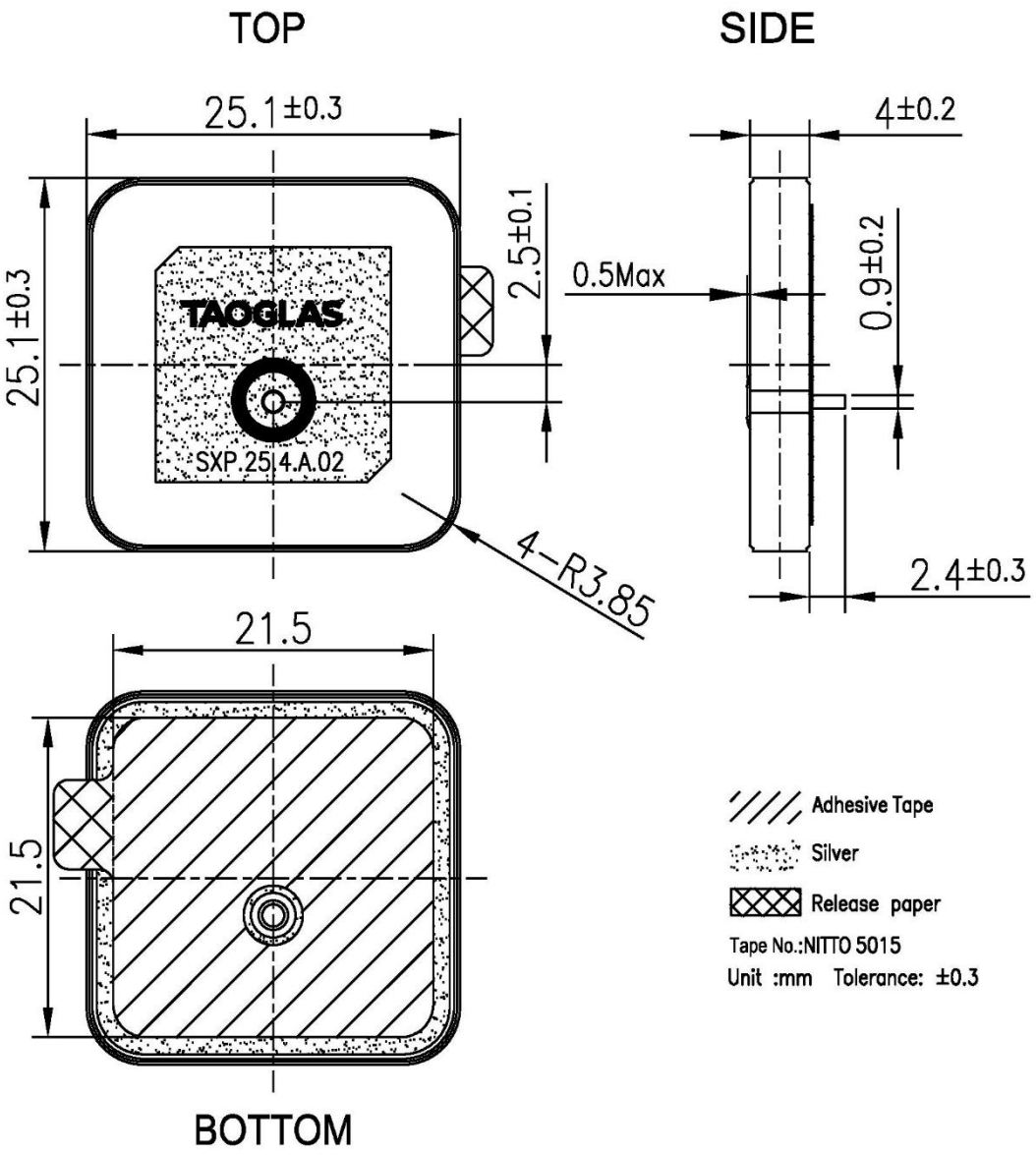
## XM Gain Requirements (Terrestrial)- Ground Plane Antenna Mean Passive VP Gain Over Solid Angle (dBi)

| AUT Location | Elevation Angle (degrees) | Measured Average Gain (dBic) | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | | 7x7cm Ground | | 15x15cm Ground | | 30x30cm Ground | | 50x50cm Ground | | 100x100cm Ground | |
| | | 2326.25 MHz | 2338.75 MHz | 2326.25 MHz | 2338.75 MHz | 2326.25 MHz | 2338.75 MHz | 2326.25 MHz | 2338.75 MHz | 2326.25 MHz | 2338.75 MHz |
| Passive Ground Plane | 0 ≤ Φ ≤ 10 | 3.8 | 3.5 | 3.8 | 4.7 | 2.3 | 3.3 | 2.3 | 3.3 | 2.8 | 3.1 |

## XM Gain Requirements (Terrestrial)- Ground Plane Antenna P/P Gain variation(dB)

| AUT Location | Elevation Angle (degrees) | Measured Average Gain (dBic) | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | | 7x7cm Ground | | 15x15cm Ground | | 30x30cm Ground | | 50x50cm Ground | | 100x100cm Ground | |
| | | 2326.25 MHz | 2338.75 MHz | 2326.25 MHz | 2338.75 MHz | 2326.25 MHz | 2338.75 MHz | 2326.25 MHz | 2338.75 MHz | 2326.25 MHz | 2338.75 MHz |
| Passive Ground Plane | Φ ≤ 5 | 0.05 | 0.05 | 0.05 | 0.08 | 0.22 | 0.26 | 0.14 | 0.09 | 0.17 | 0.25 |

# 3. Mechanical Drawing



# 4. Antenna Integration Guide

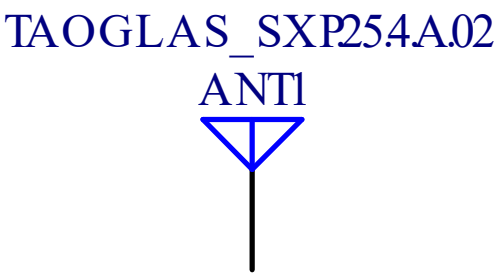
The following is an example on how to integrate the SXP.25.4.A.02 into a design. The SXP.25.4.A.02 has one pin which is used for the RF Feed. Taoglas recommends using a minimum of 70x70mm ground plane to ensure optimal performance.


Top view of an example 70x70mm PCB Reference Design.

## 4.1 Schematic Symbol and Pin Definitions


Top view of an example 70x70mm PCB Reference Design.

The circuit symbol for a SXP.25.4.A.02 is shown below. The antenna has 1 pin as indicated below.

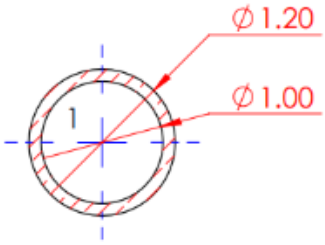



| Pin | Description |
|---|---|
| 1 | RF Feed |

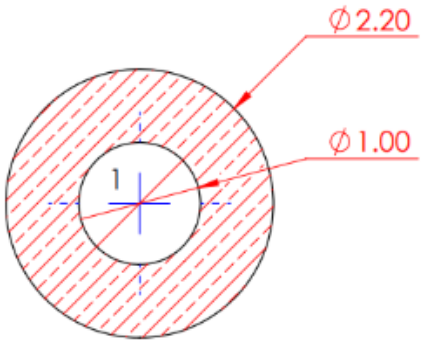
Above is a schematic symbol of the SXP.25.4.A.02 and a table of the pin definitions.

## 4.2 Antenna Footprint

TOP




BOTTOM

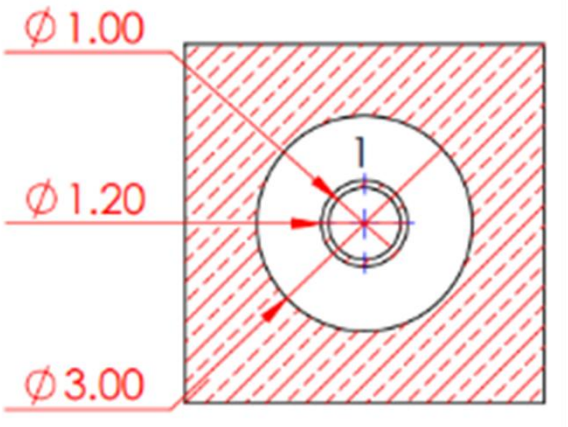



| Pin | Description |
|---|---|
| 1 | RF Feed |

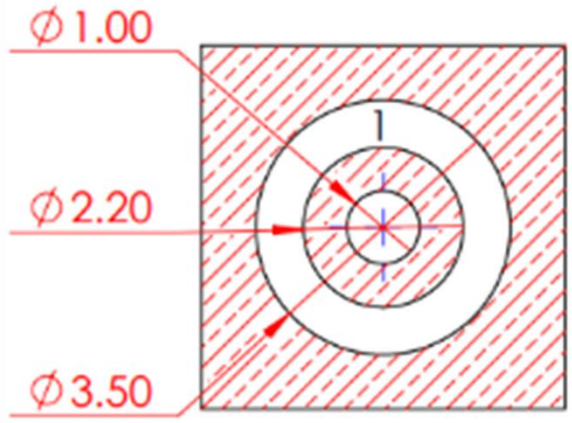
## 4.3 Copper Clearance

The footprint and clearance on the PCB must comply with the antenna's specification. The PCB layout shown in the diagrams below demonstrates the SXP.25.4.A.02 clearance area for Pin 1 (RF Feed Pad). The bottom copper keep out area only applies to the bottom layer and the top copper keep out area applies to all other layers.

There should be a Ø3mm copper clearance around the antenna pins on the top side of the PCB with a Ø3.5mm copper clearance around the antenna pins on the bottom side.




TOP SIDE

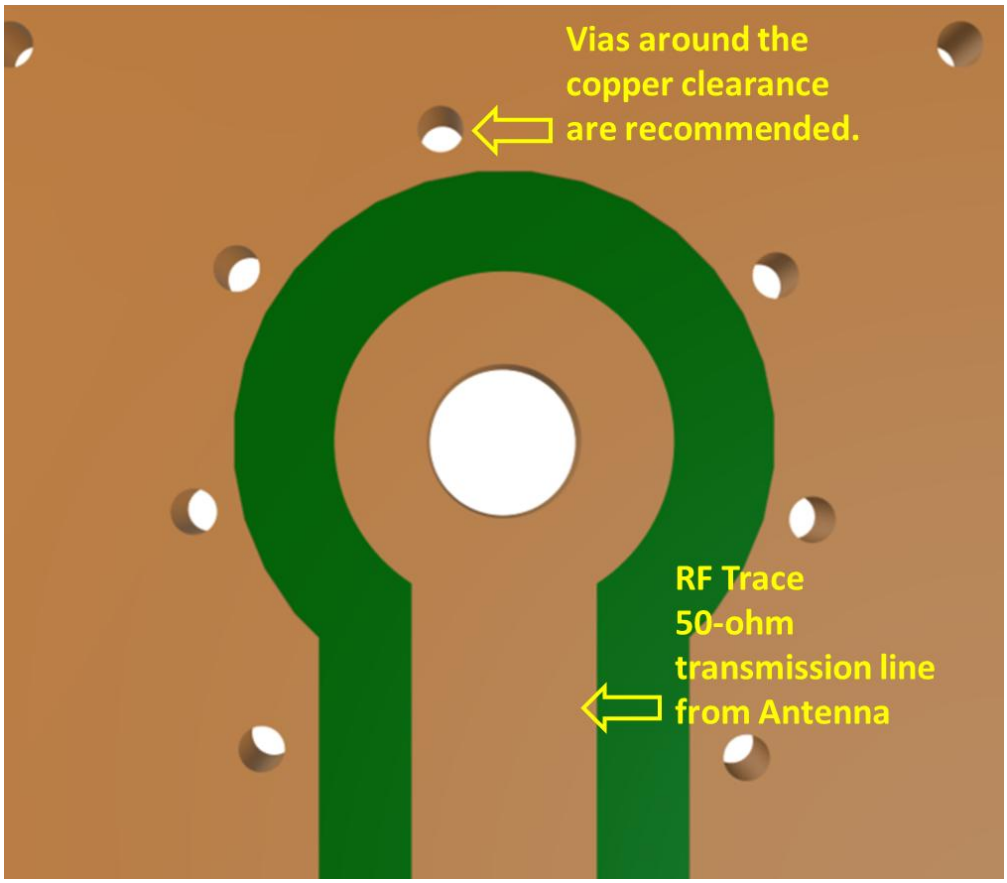



BOTTOM SIDE

2D Images of Copper Clearances for the SXP.25.4.A.02

## 4.4 Antenna Integration

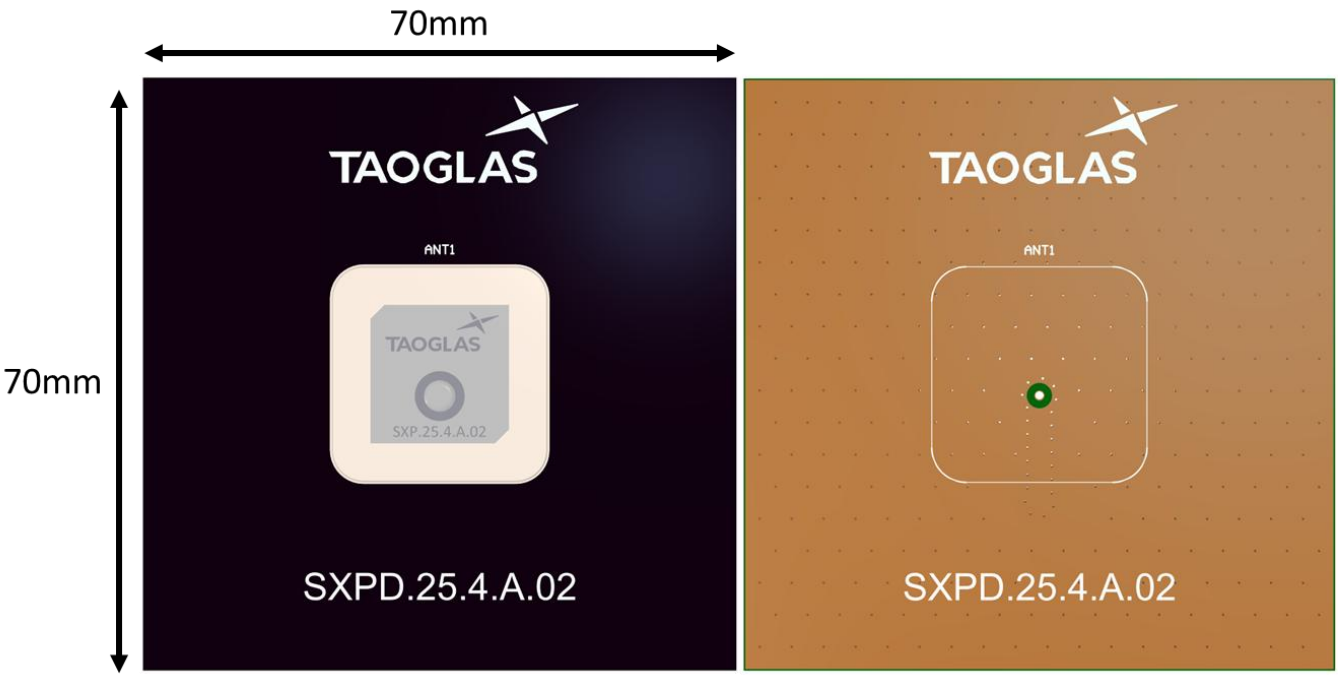
The SXP.25.4.A.02 should be placed in the centre of the PCB to take advantage of the ground plane. The RF traces must maintain a 50 Ohm transmission line. Ground vias should be placed around the copper clearance area and the transmission line. Note that depending on the design application, tuning may be required for optimal performance. This may be achieved using a 'pi' matching network or custom tuning of the patch antenna.



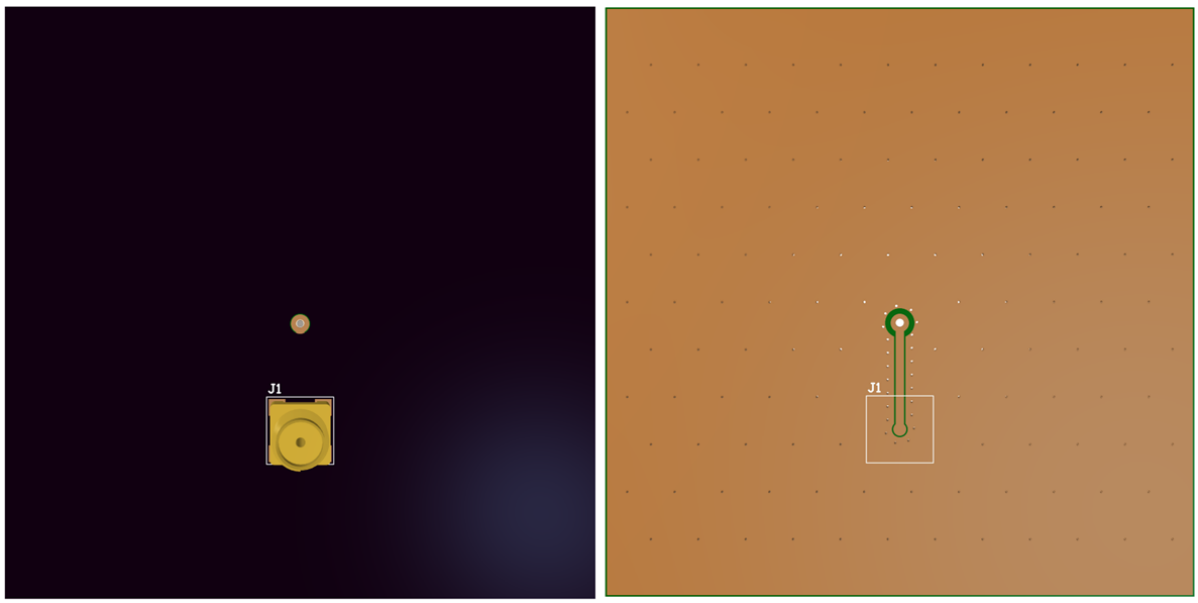

Bottom view of the PCB Reference Design, showing transmission lines and integration notes.

## 4.5 Final Integration

The bottom side image shown below highlights the antenna transmission line. Taoglas recommends using a minimum of 70x70mm ground plane to ensure optimal performance.



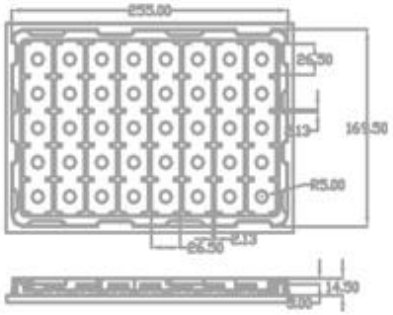

Top Side (70x70mm example PCB Reference Design)



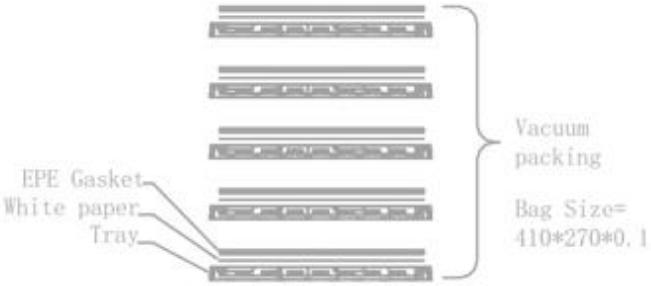

Bottom Side

# 5. Packaging

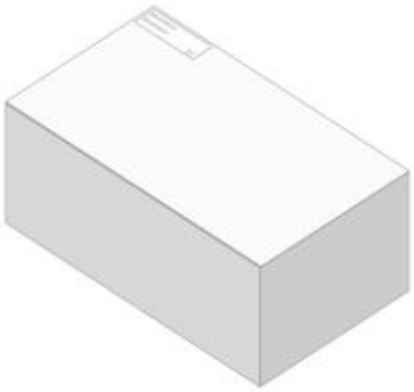
SXP.25.4.A.02
40 PCS / Tray




SXP.25.4.A.02
200 PCS / Vacuum package



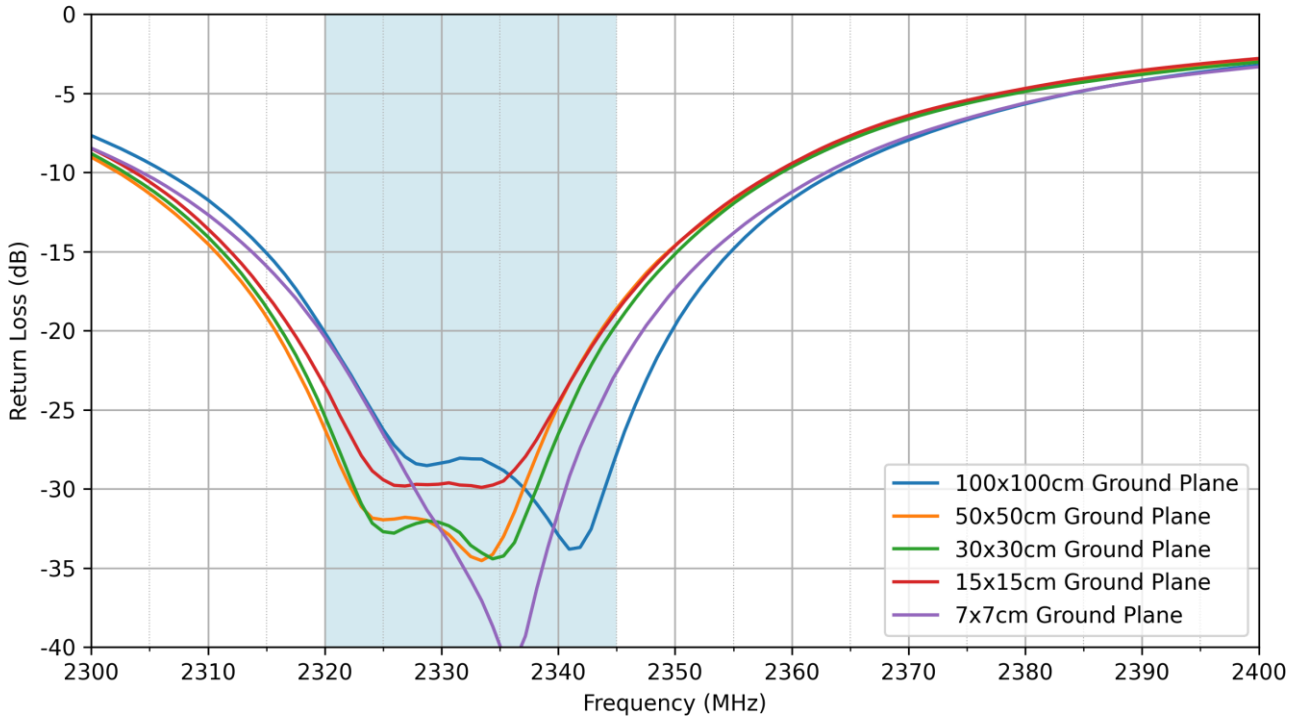

200 PCS / Box
Small box (mm): 280 x 187 x 70
Weight (Kg): 2.2 ±3%



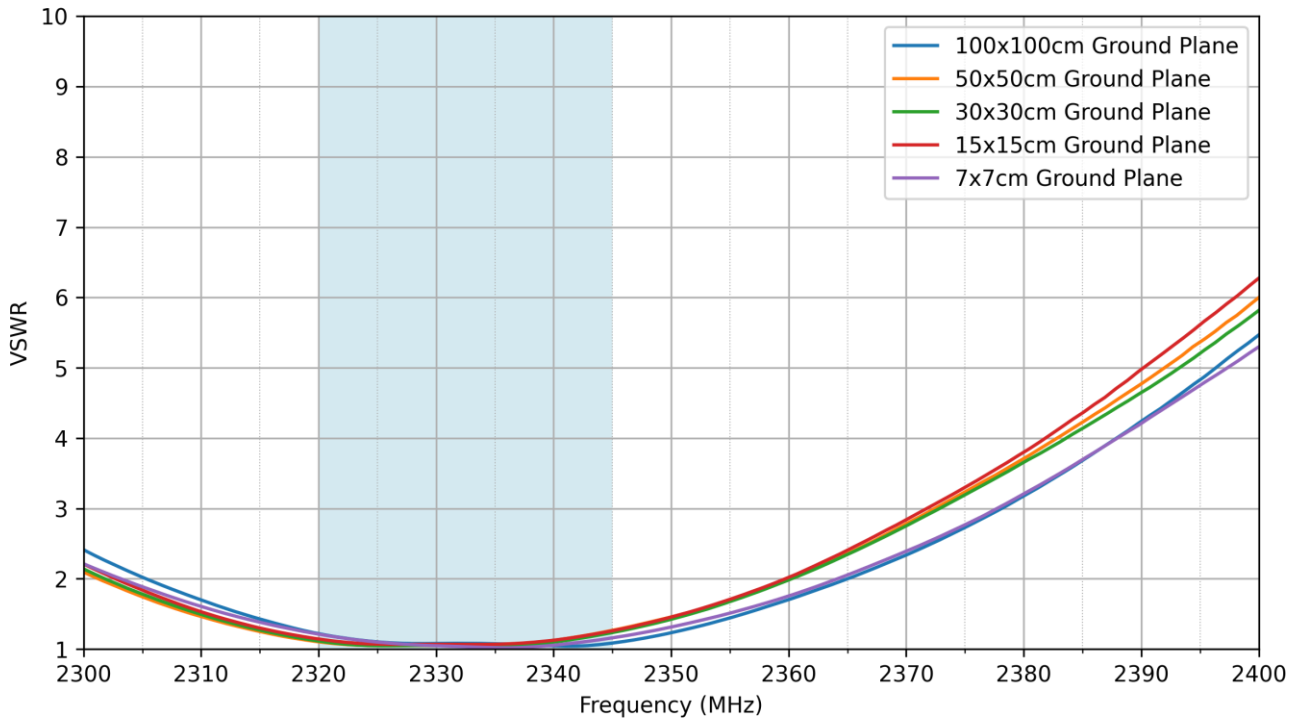
800 PCS / Carton
Carton(mm): 405 x 293 x 185
Weight (Kg): 8.6 ±3%

# 6. Antenna Characteristics

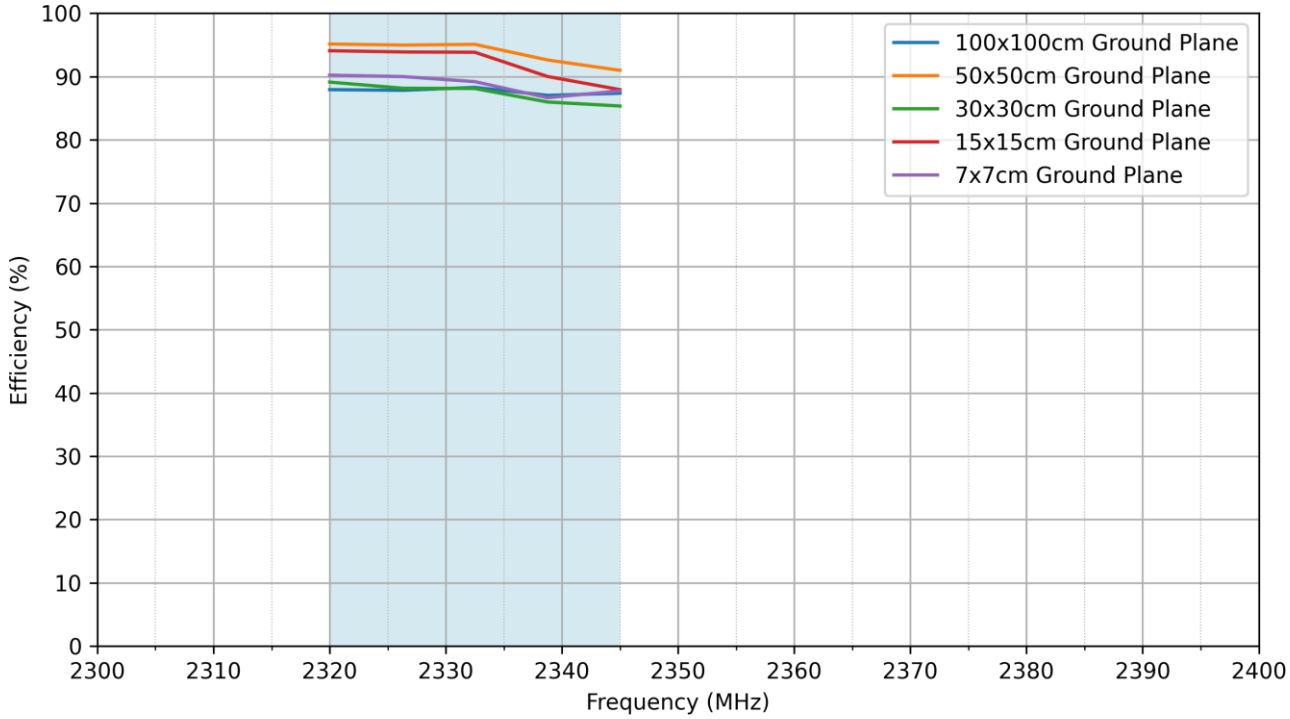
## 6.1 Return Loss



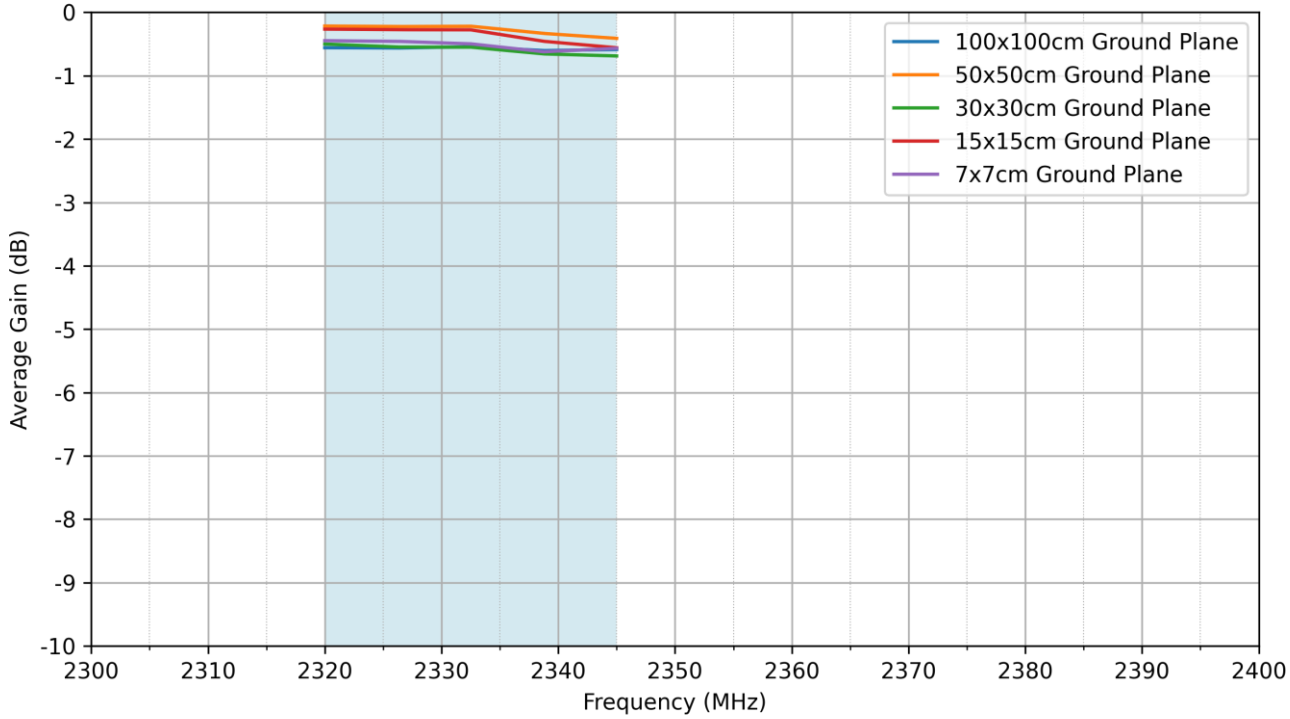

## 6.2 VSWR



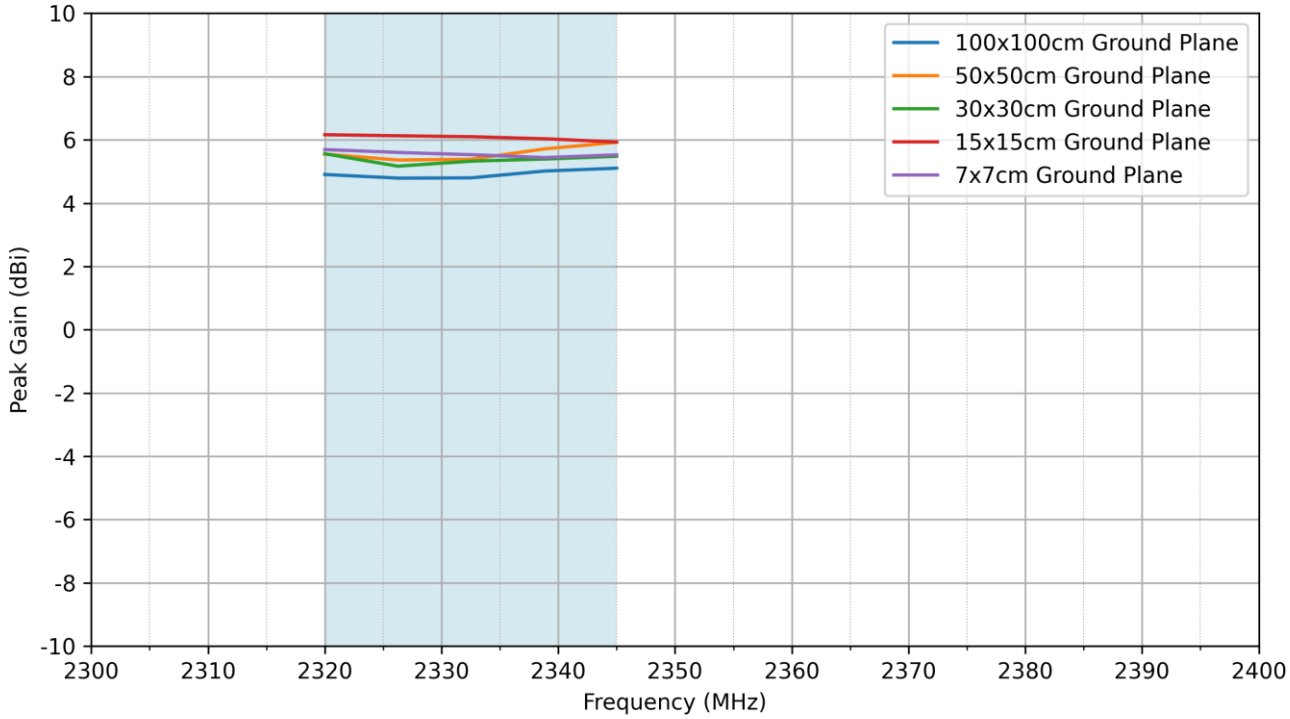
## 6.3 Efficiency



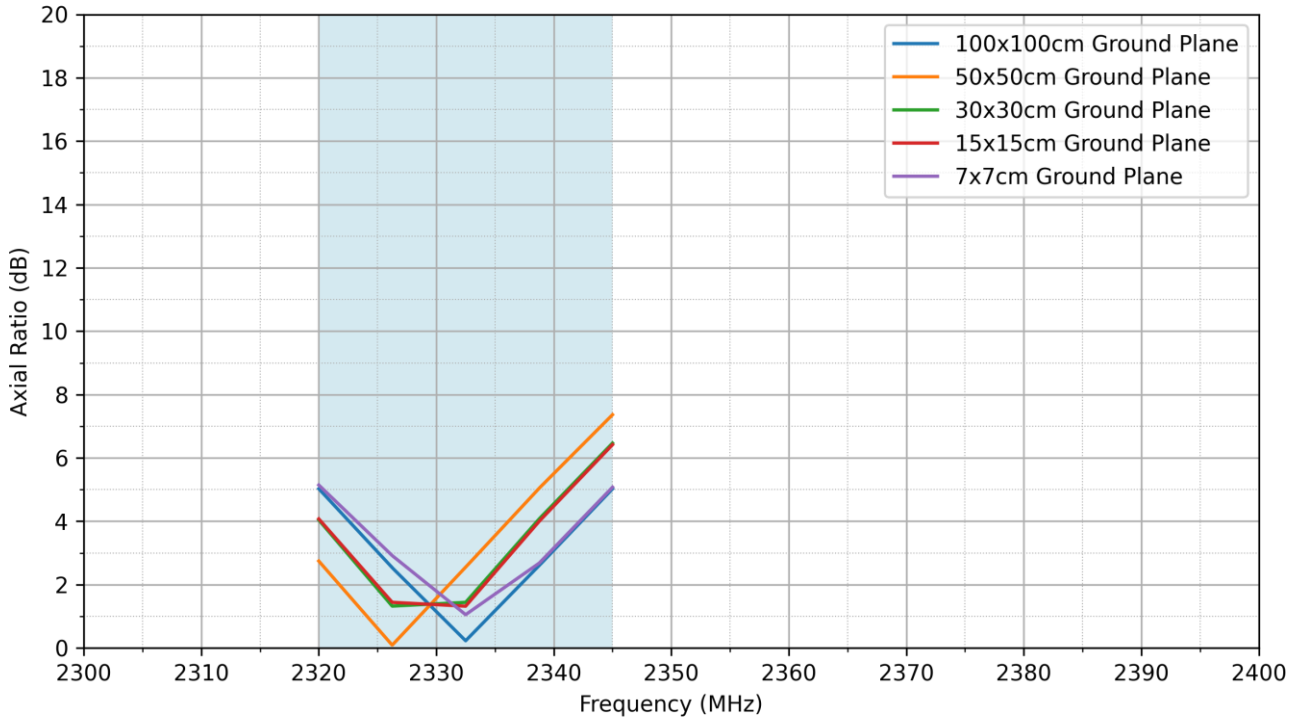

## 6.4 Average Gain



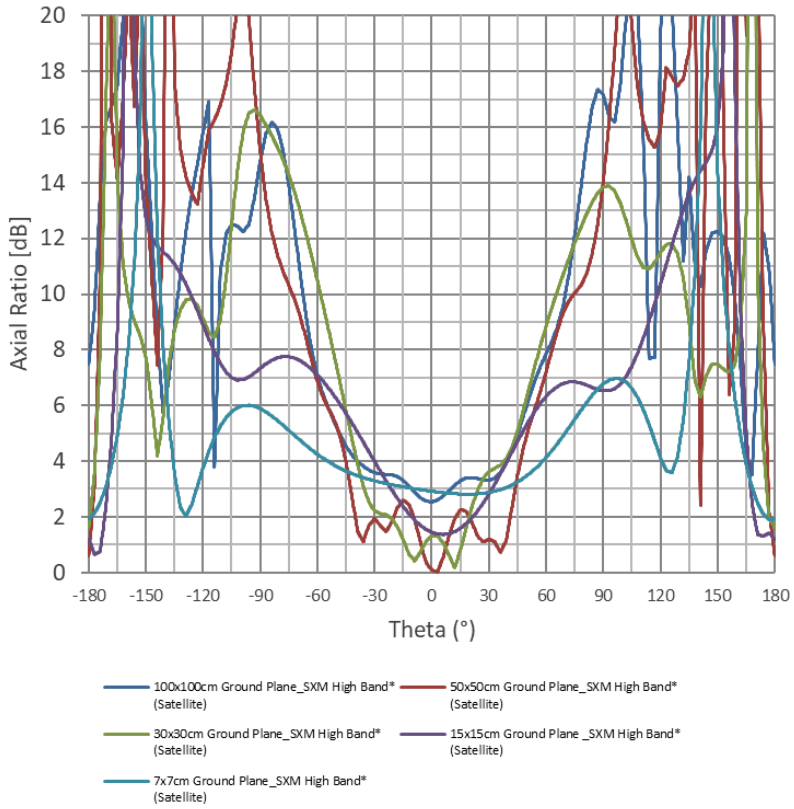
## 6.5 Peak Gain



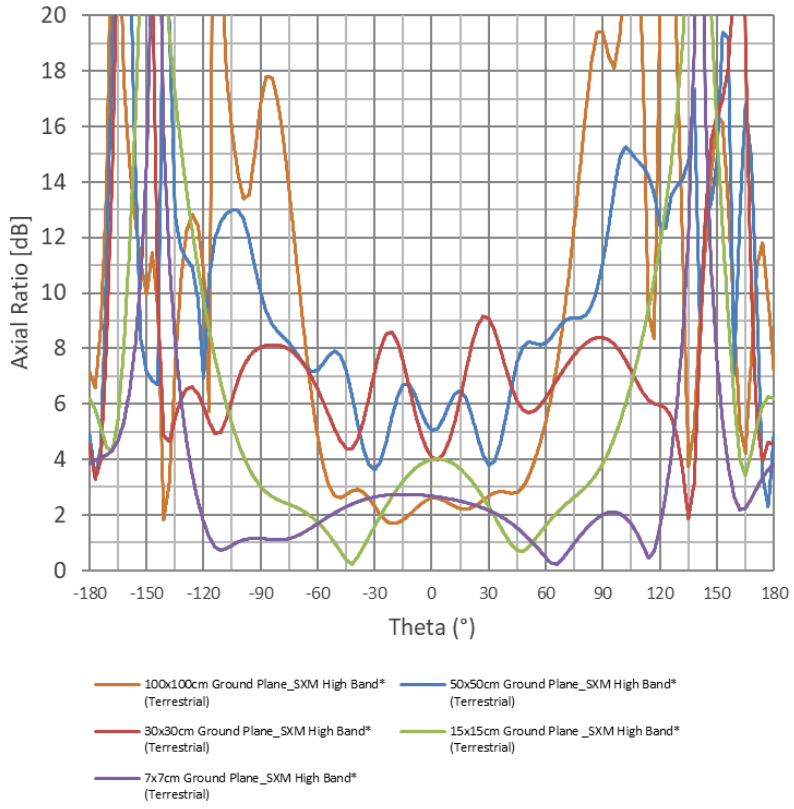

## 6.6 Axial Ratio



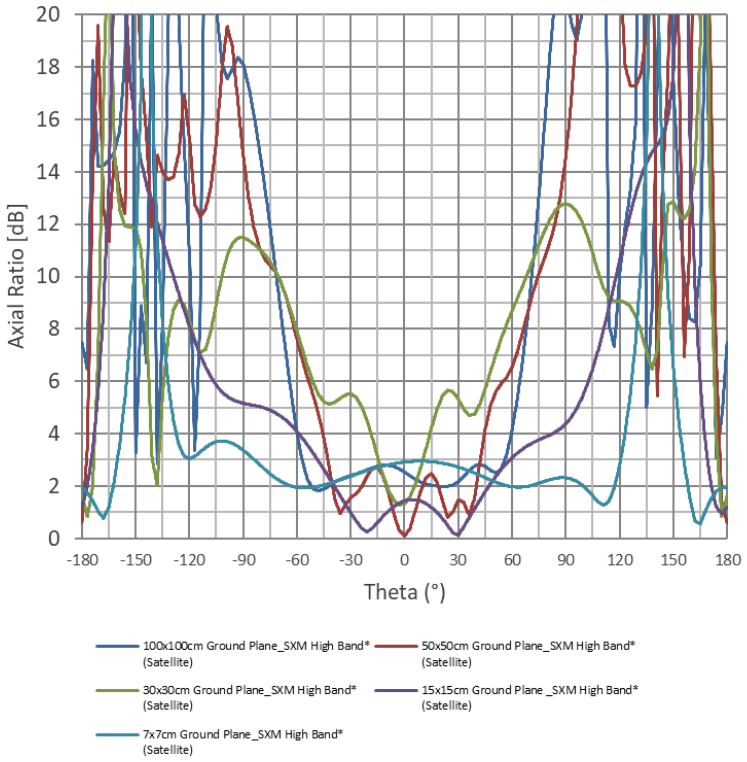
## 6.7 AR vs Angle for Phi=0 (Satellite)



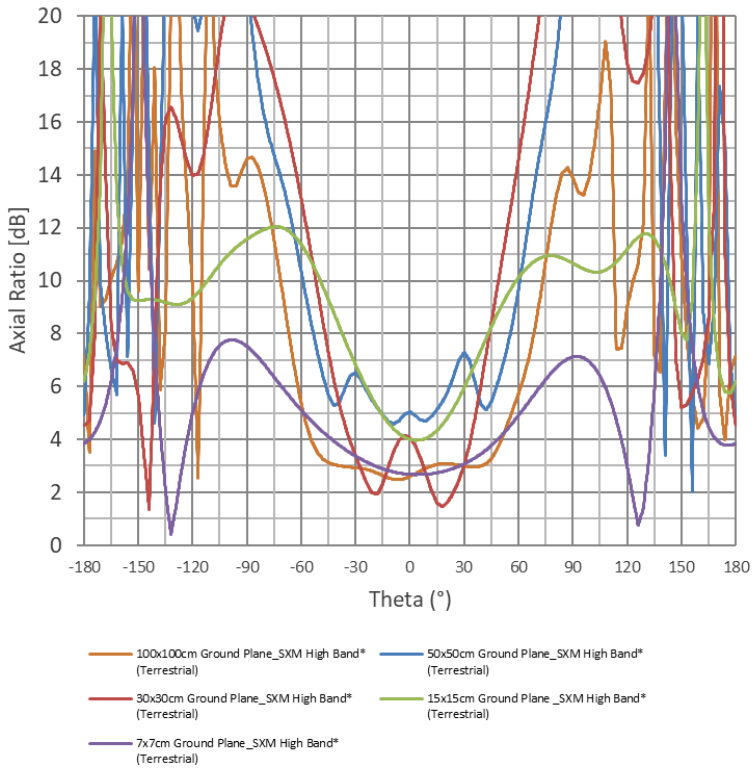

## 6.8 AR vs Angle for Phi=0 (Terrestrial)



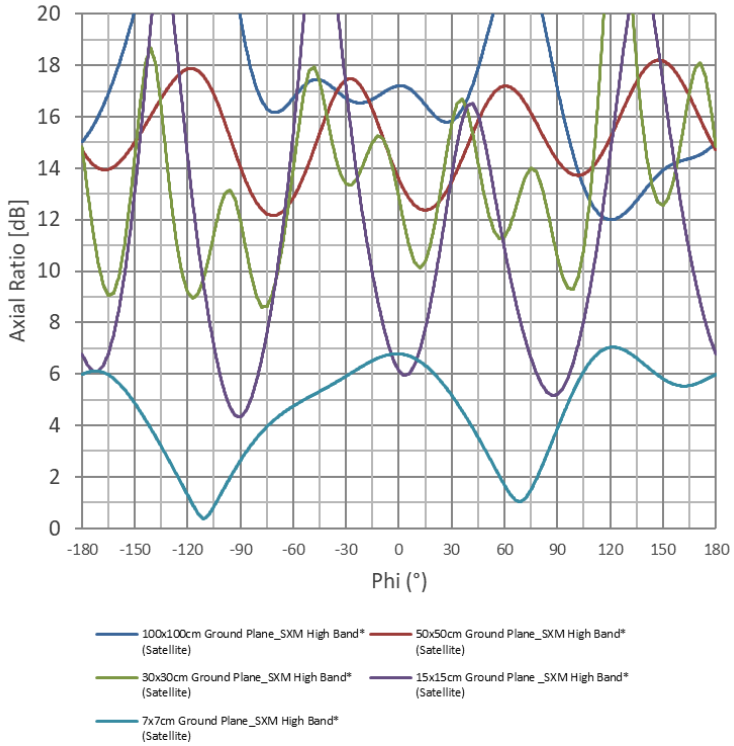
## 6.9 AR vs Angle for Phi=90 (Satellite)



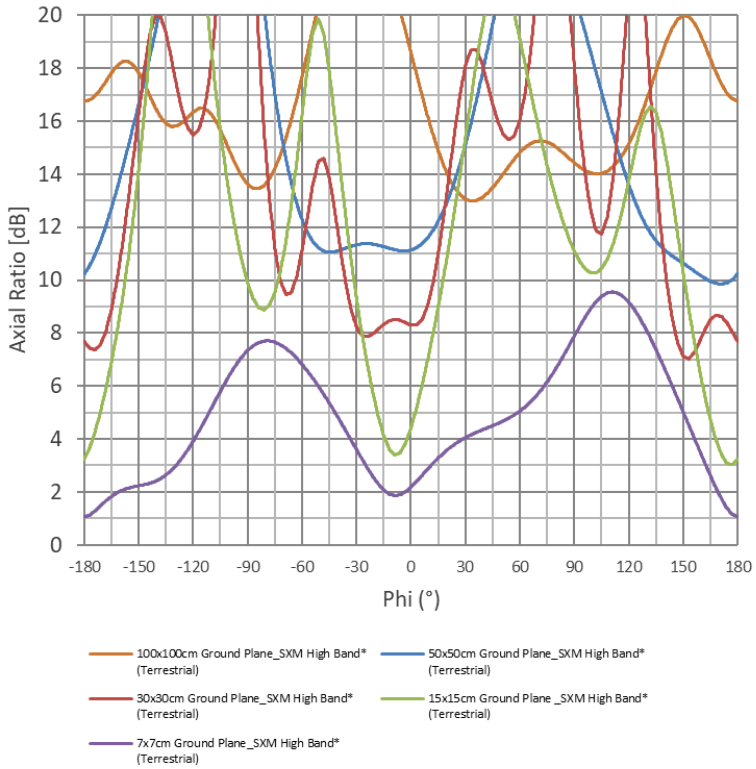

## 6.10 AR vs Angle for Phi=90 (Terrestrial)



## 6.11 AR vs Angle for Teata=0 (Satellite)

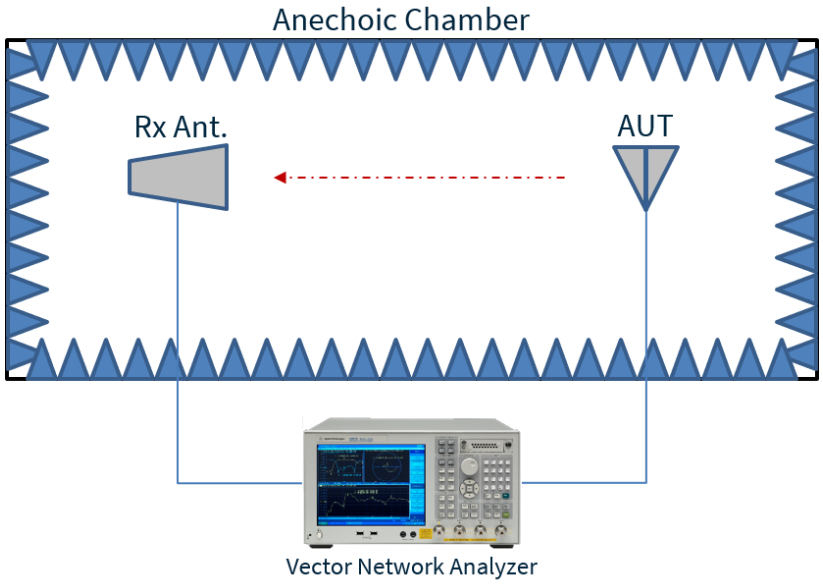


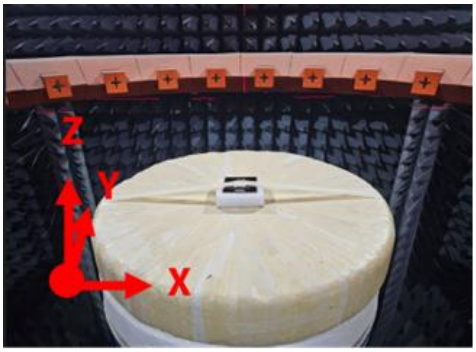

## 6.12 AR vs Angle for Theta=90 (Terrestrial)



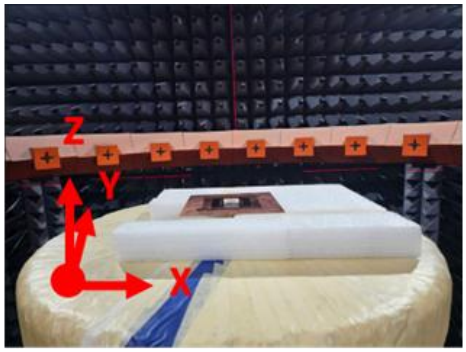
# 7. Radiation Patterns

## 7.1 Test Setup

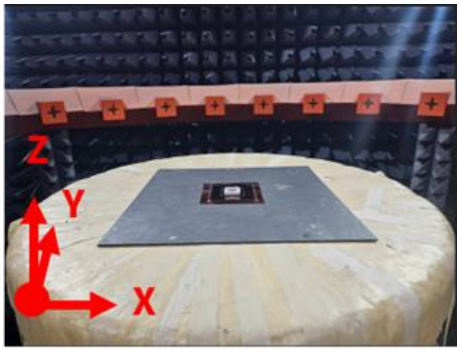


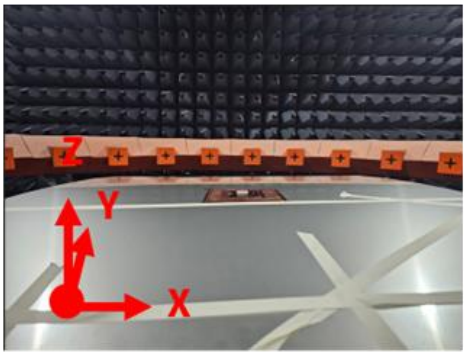

7x7cm Ground Plane



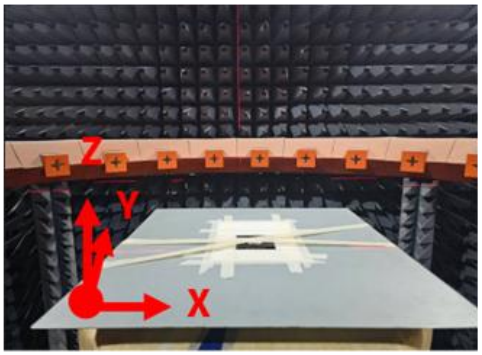

15x15cm Ground Plane




30x30cm Ground Plane

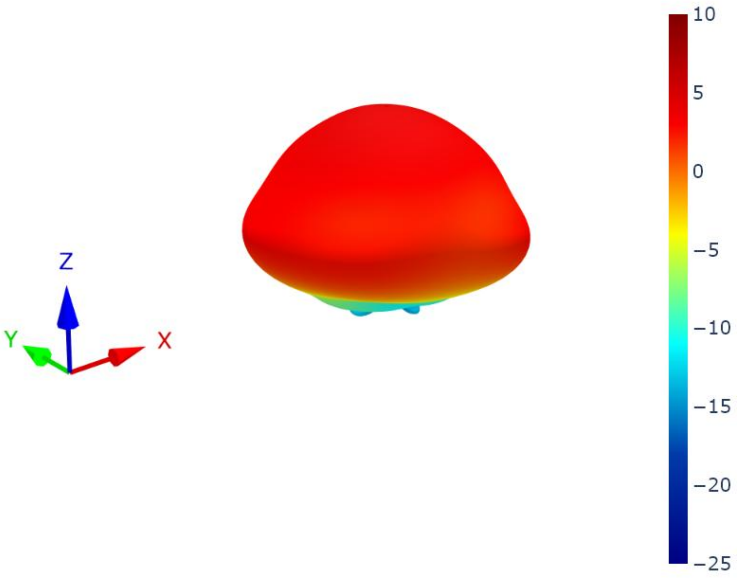


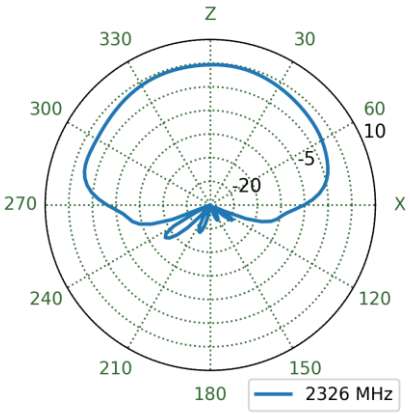
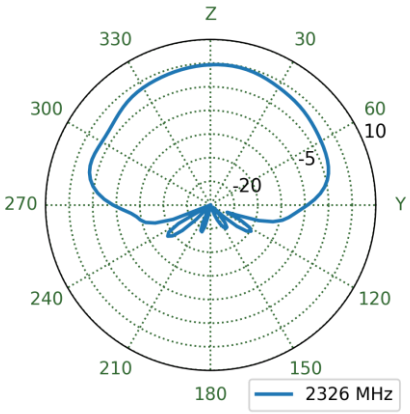
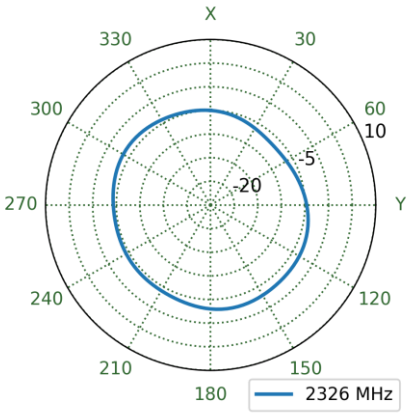

100x100cm Ground Plane



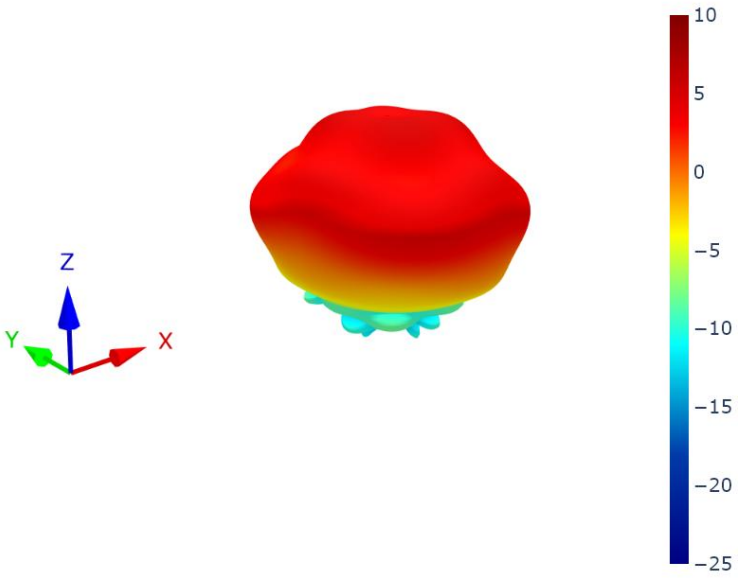

50x50cm Ground Plane

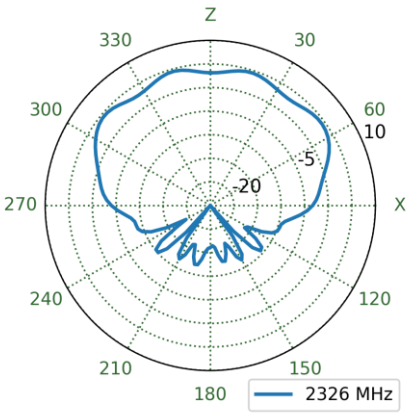
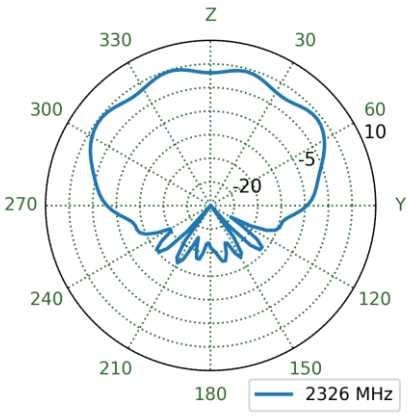
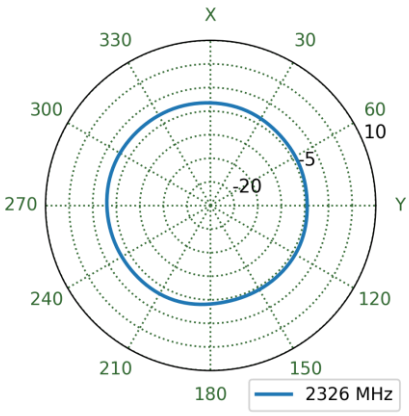
## 7.2 100x100cm Ground Plane Patterns at 2326 MHz



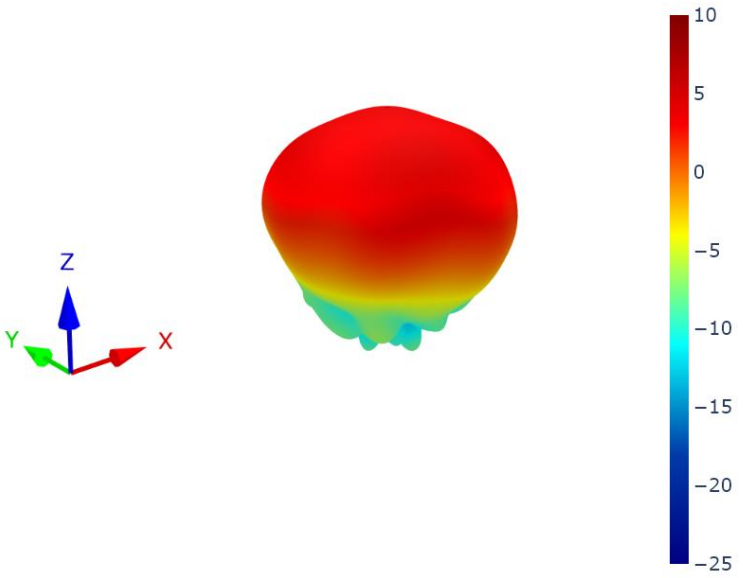

| XZ Plane | YZ Plane | XY Plane |
|---|---|---|
|  |  |  |

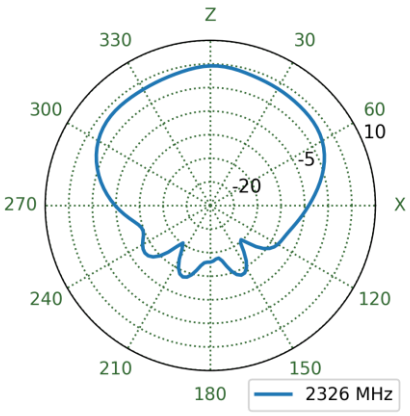
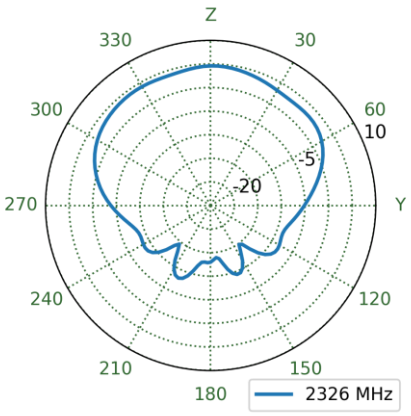
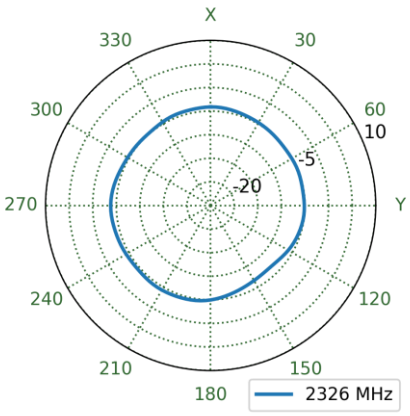
## 7.3 50x50cm Ground Plane Patterns at 2326 MHz



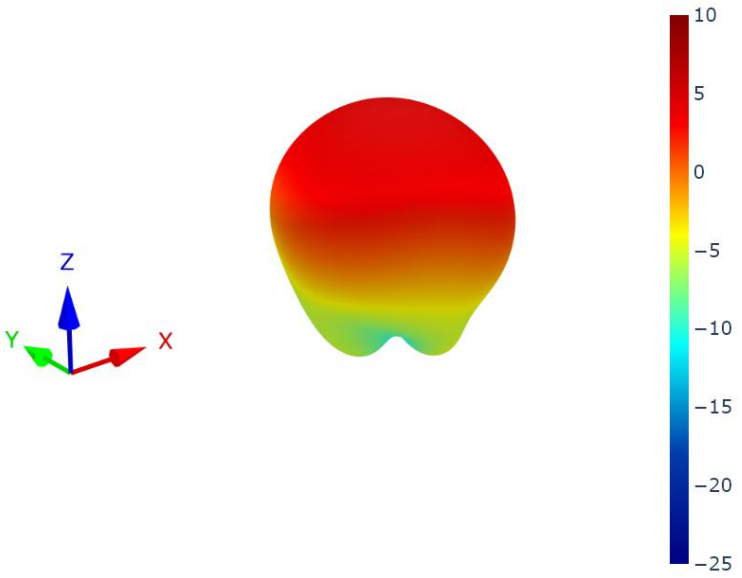

| XZ Plane | YZ Plane | XY Plane |
|---|---|---|
|  |  |  |

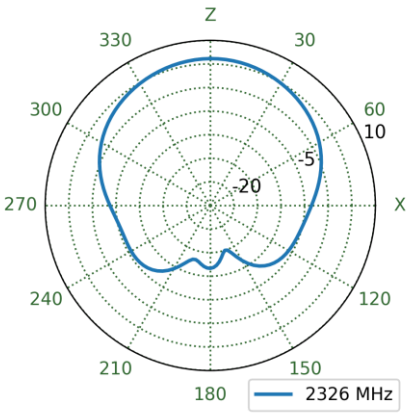
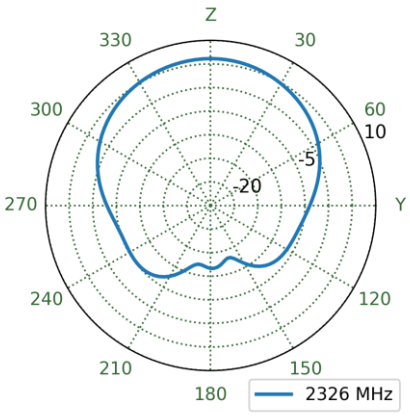
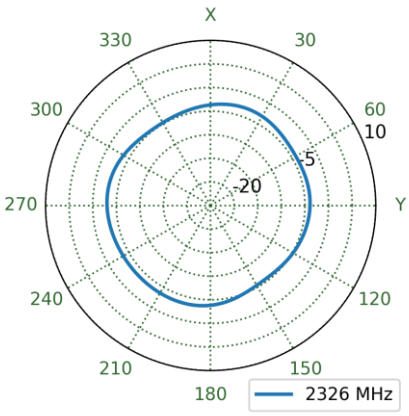
## 7.4 30x30cm Ground Plane Patterns at 2326 MHz



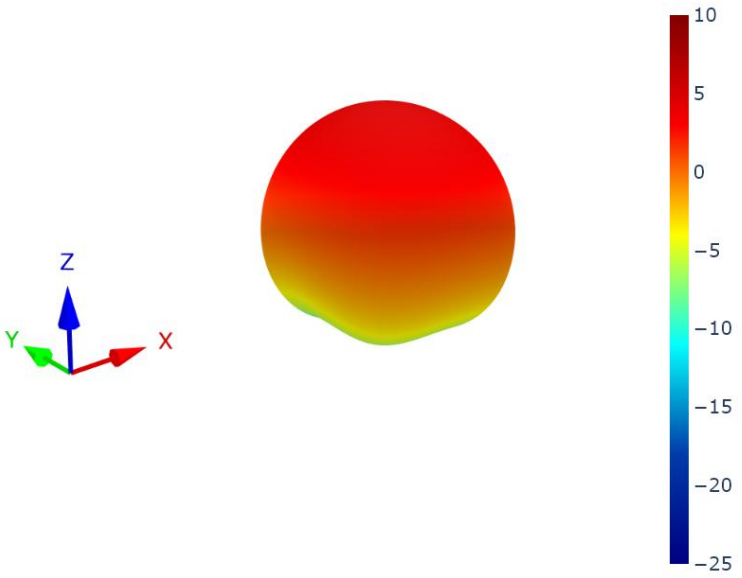

| XZ Plane | YZ Plane | XY Plane |
|---|---|---|
|  |  |  |

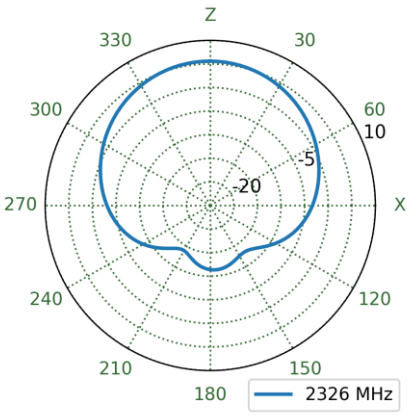
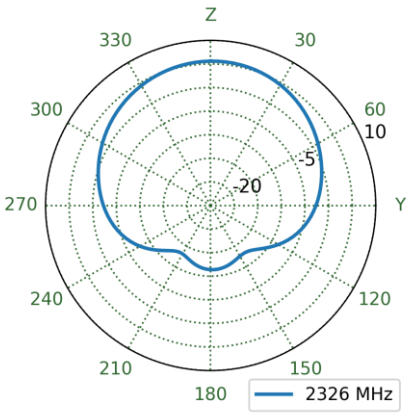
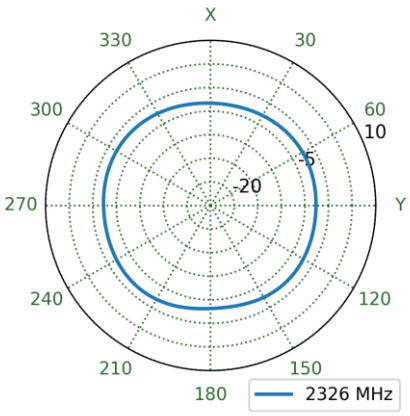
## 7.5 15x15cm Ground Plane Patterns at 2326 MHz



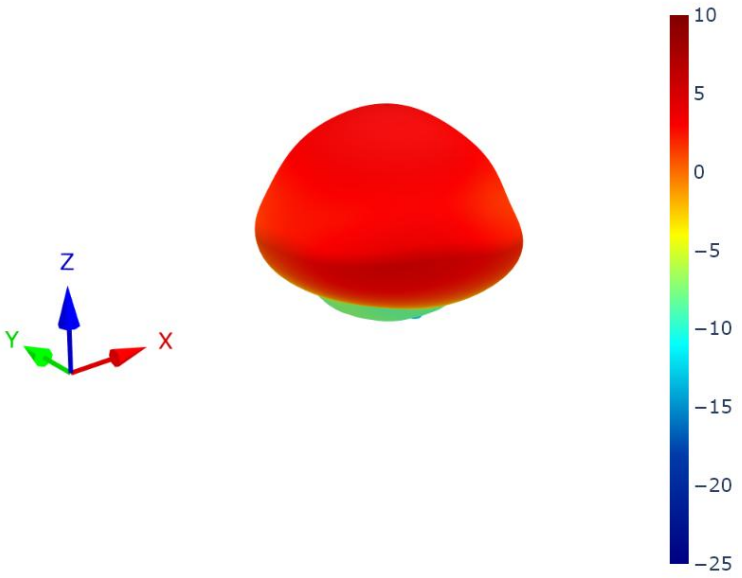

| XZ Plane | YZ Plane | XY Plane |
|---|---|---|
|  |  |  |

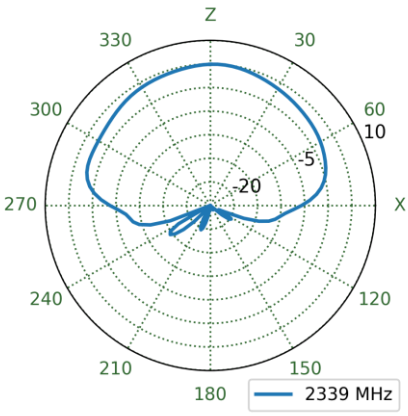
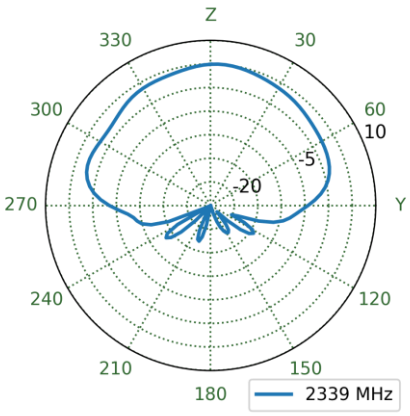
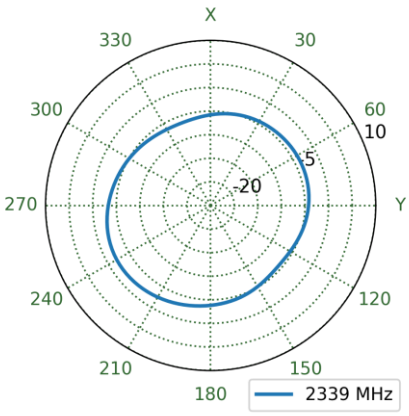
## 7.6 7x7cm Ground Plane Patterns at 2326 MHz



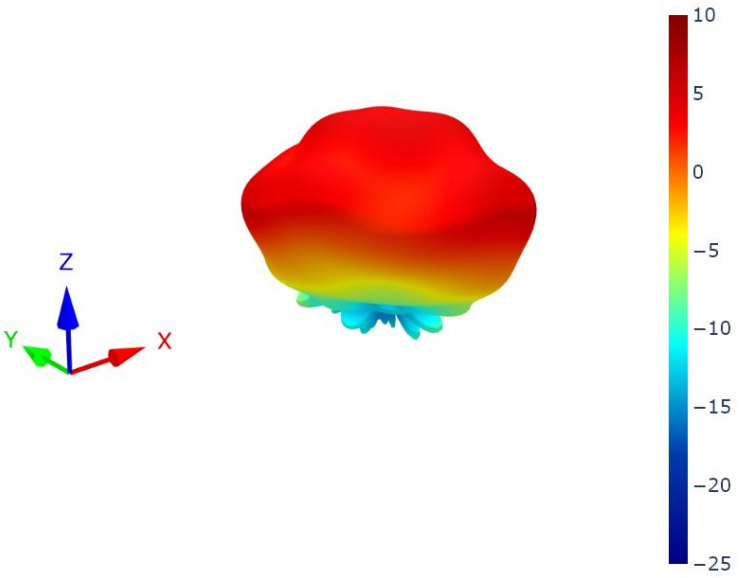

| XZ Plane | YZ Plane | XY Plane |
|---|---|---|
|  |  |  |

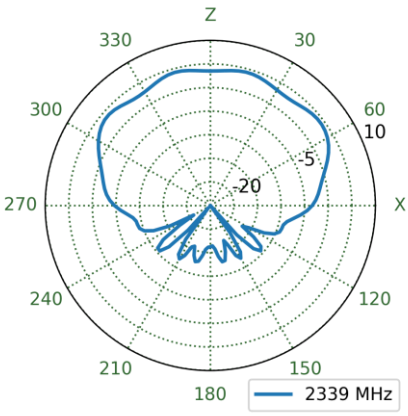
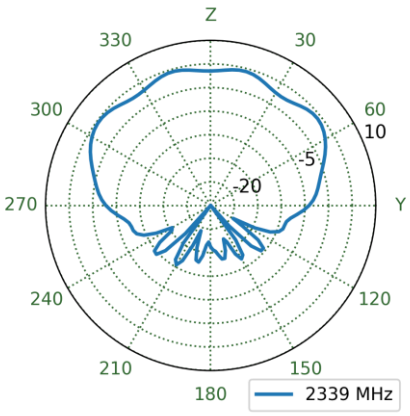
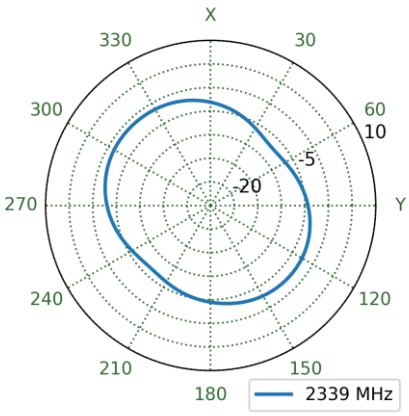
## 7.7 100x100cm Ground Plane Patterns at 2339 MHz



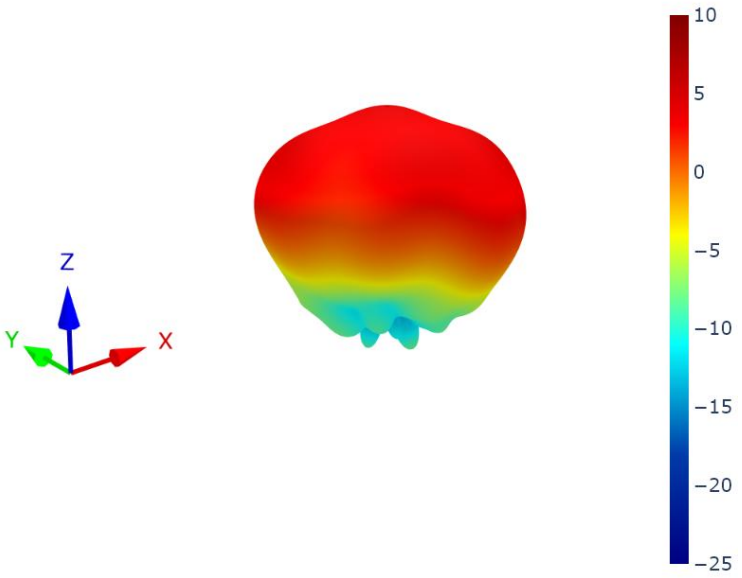

| XZ Plane | YZ Plane | XY Plane |
|---|---|---|
|  |  |  |

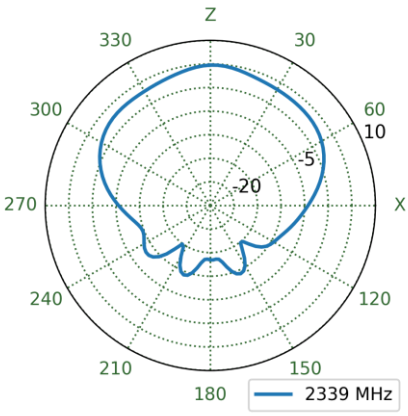
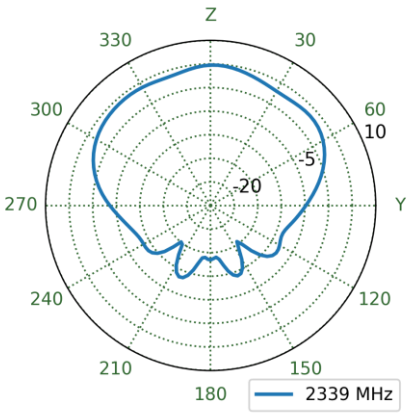
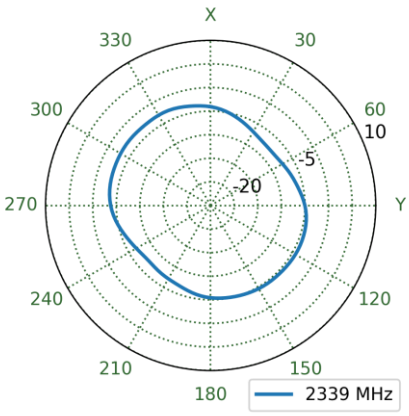
## 7.8 50x50cm Ground Plane Patterns at 2339 MHz



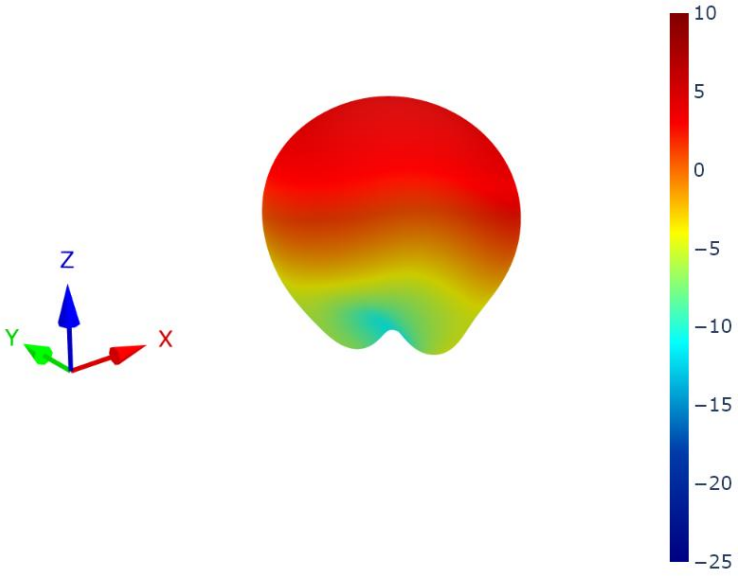

| XZ Plane | YZ Plane | XY Plane |
|---|---|---|
|  |  |  |

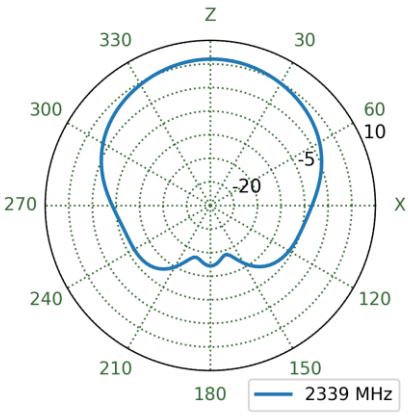
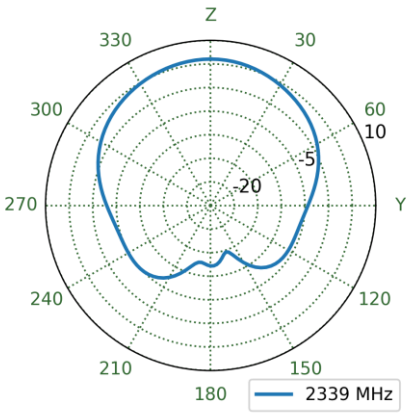
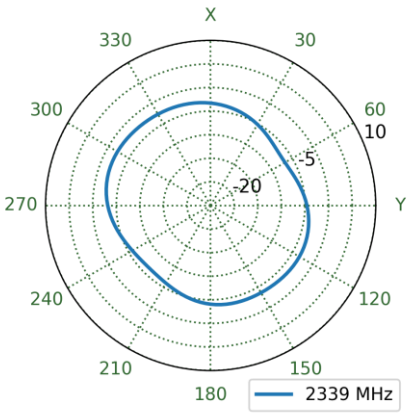
## 7.9 30x30cm Ground Plane Patterns at 2339 MHz



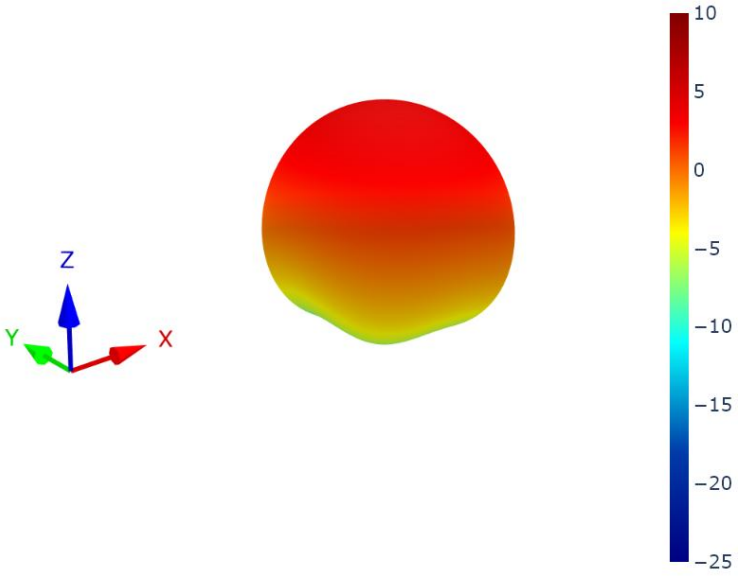

| XZ Plane | YZ Plane | XY Plane |
|---|---|---|
|  |  |  |

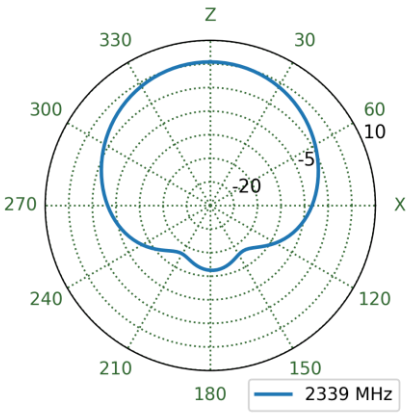
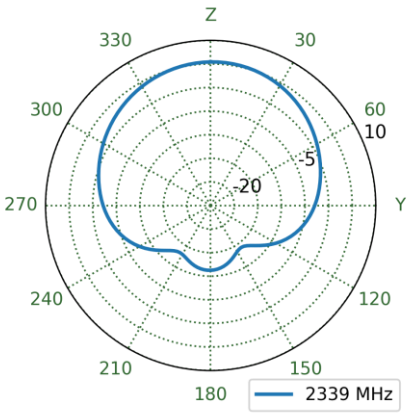
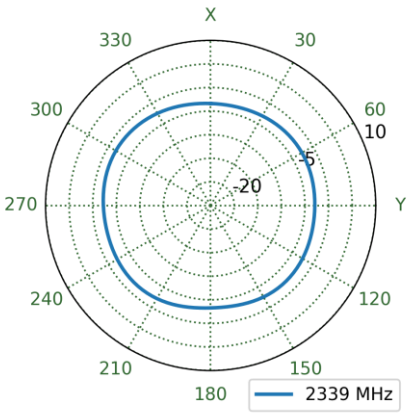
## 7.10 15x15cm Ground Plane Patterns at 2339 MHz



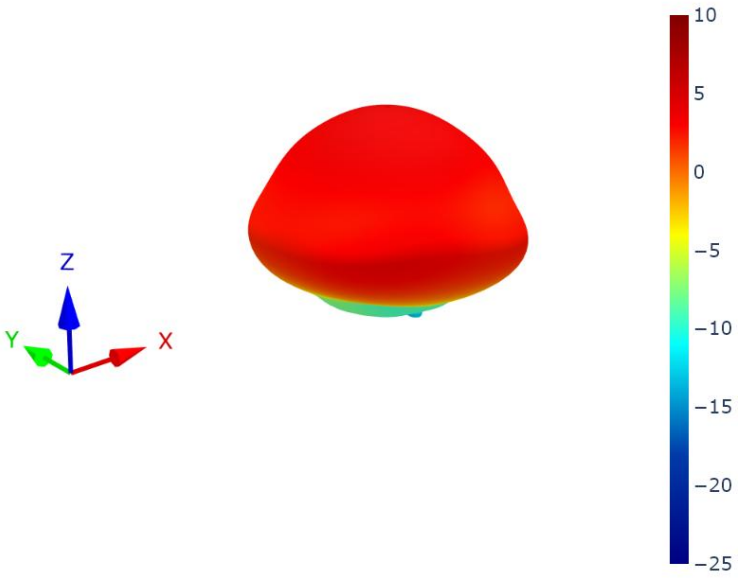

| XZ Plane | YZ Plane | XY Plane |
|---|---|---|
|  |  |  |

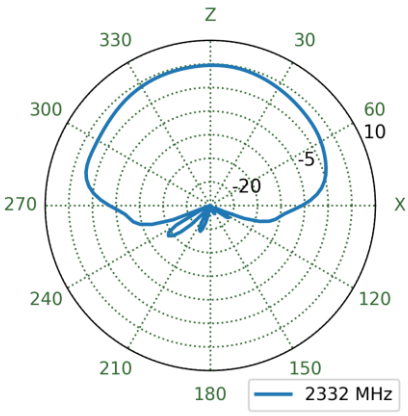
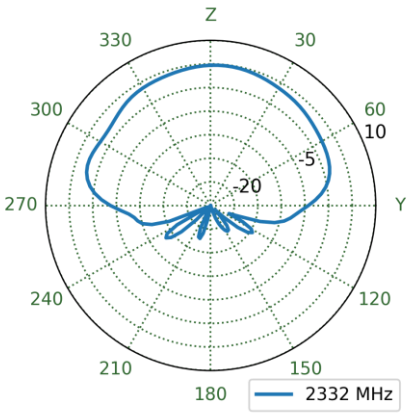
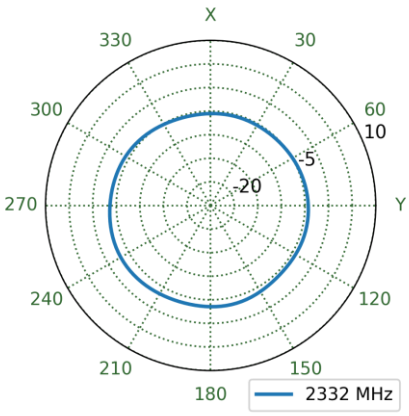
## 7.11 7x7cm Ground Plane Patterns at 2339 MHz



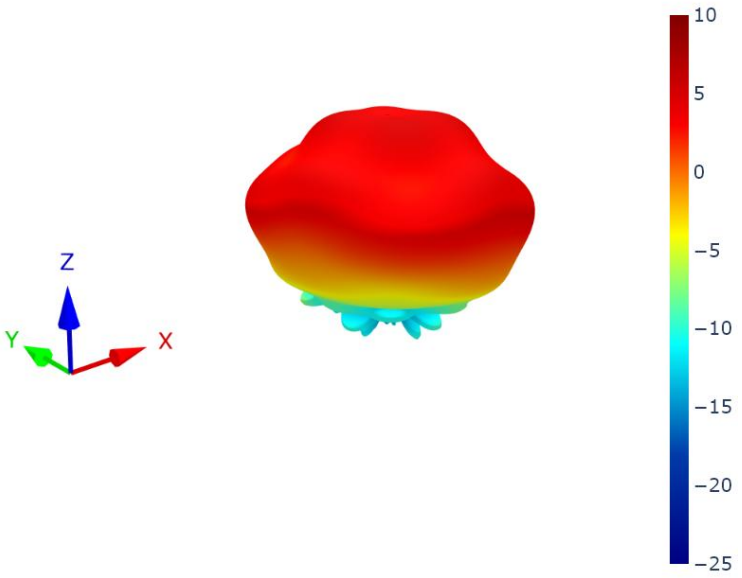

| XZ Plane | YZ Plane | XY Plane |
|---|---|---|
|  |  |  |

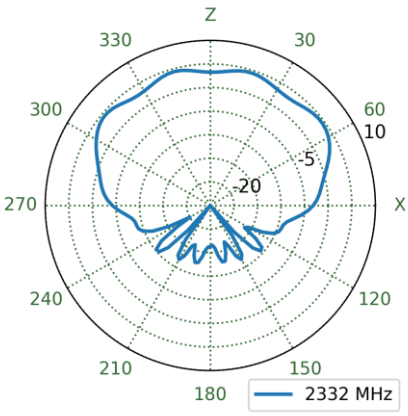
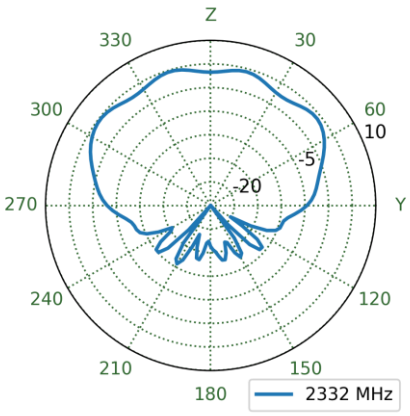
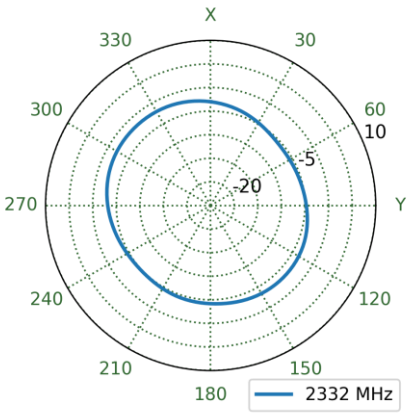
## 7.12 100x100cm Ground Plane Patterns at 2332 MHz



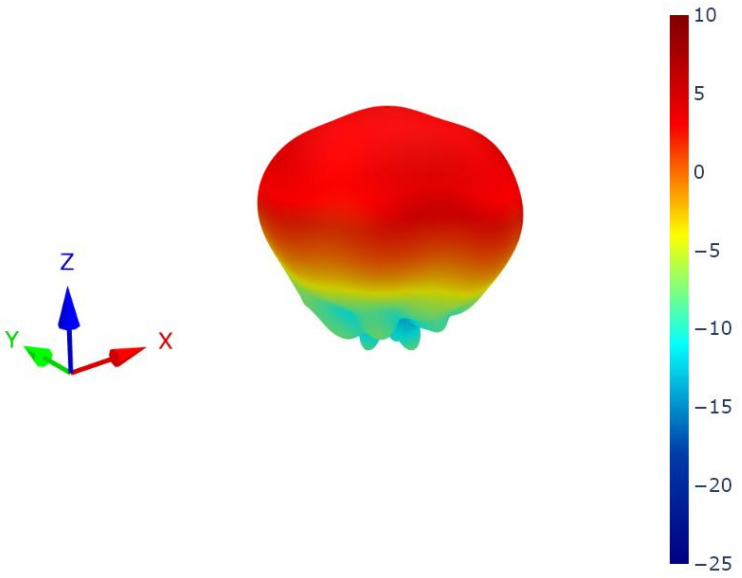

| XZ Plane | YZ Plane | XY Plane |
|---|---|---|
|  |  |  |

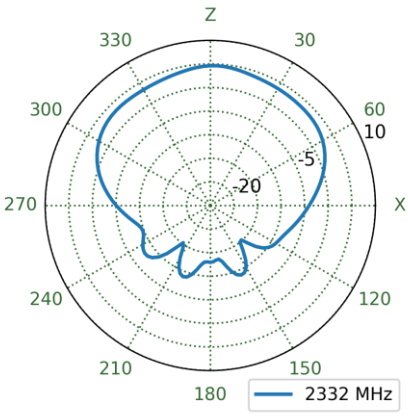
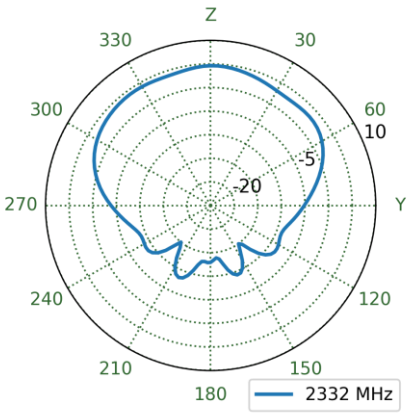
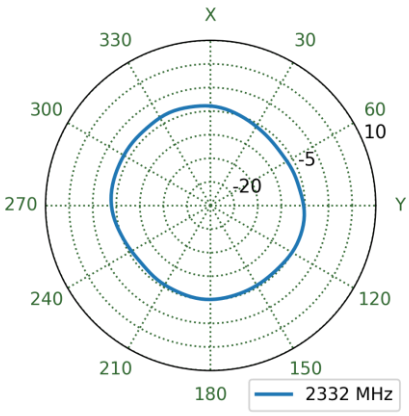
## 7.13 50x50cm Ground Plane Patterns at 2332 MHz



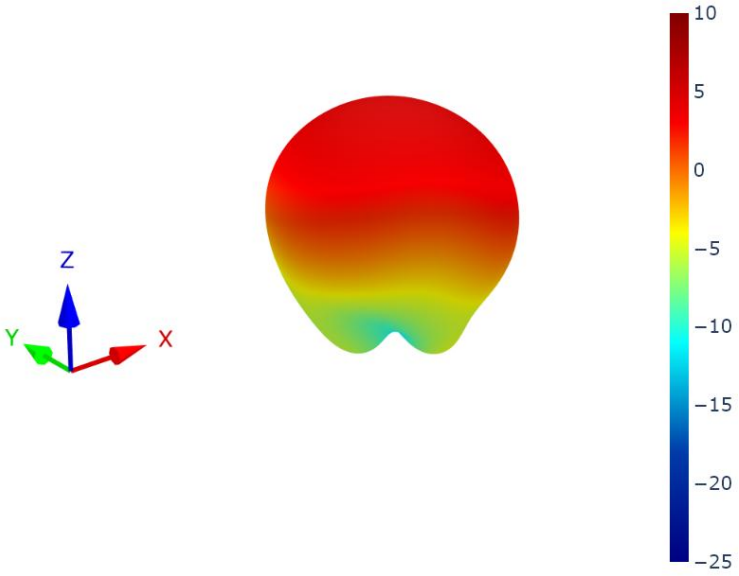

| XZ Plane | YZ Plane | XY Plane |
|---|---|---|
|  |  |  |

## 7.14 30x30cm Ground Plane Patterns at 2332 MHz

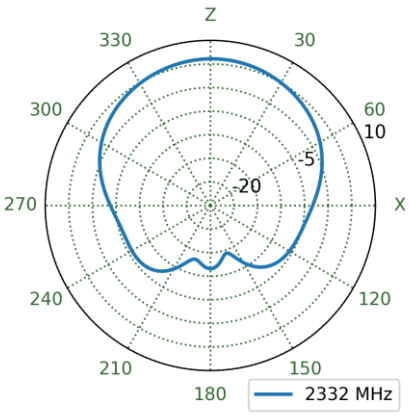


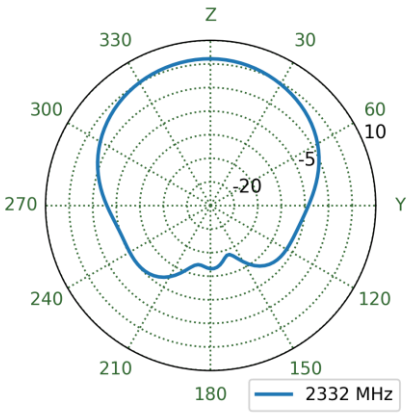

| XZ Plane | YZ Plane | XY Plane |
|---|---|---|
|  |  |  |

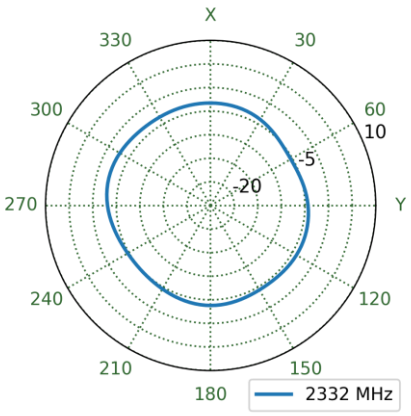
## 7.15 15x15cm Ground Plane Patterns at 2332 MHz



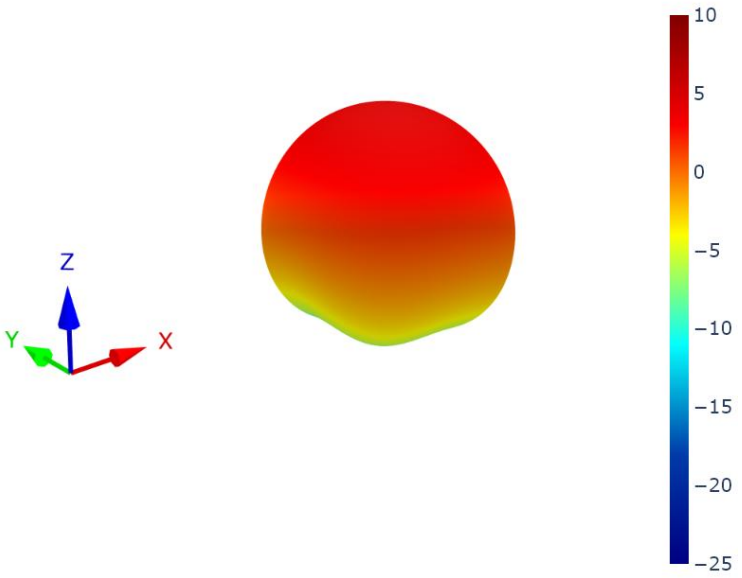

| XZ Plane | YZ Plane | XY Plane |
|---|---|---|

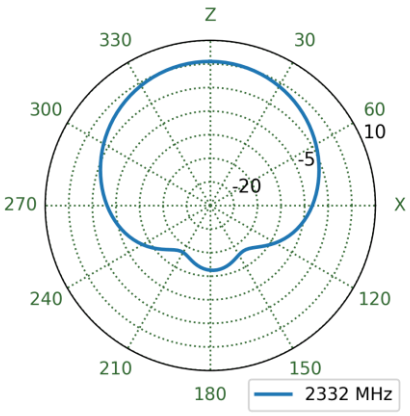
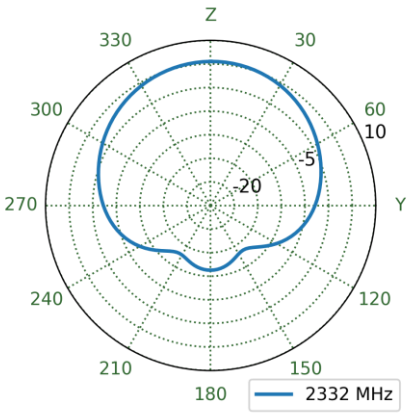
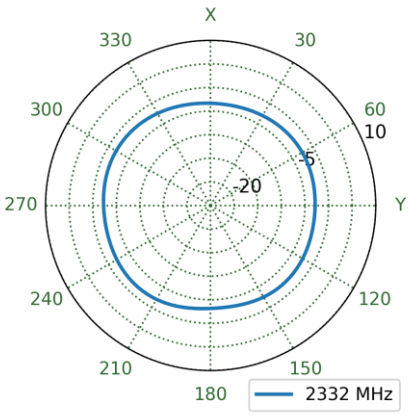


## 7.16 7x7cm Ground Plane Patterns at 2332 MHz




| XZ Plane | YZ Plane | XY Plane |
|---|---|---|
|  |  |  |

## Changelog for the datasheet

**SPE-25-8-109 – SXP.25.4.A.02**

| **Revision: B (Current Version)** | |
|---|---|
| Date: | 2026-04-07 |
| Notes: | Updated performance table. |
| Author: | Paul Liu |

**Previous Revisions**

| **Revision: A** | |
|---|---|
| Date: | 2025-04-02 |
| Notes: | Initial Release |
| Author: | Gary West |

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