



# TAOGLAS®



## Datasheet

### MA114 2-in-1 Permanent Mount

**Part No:**  
MA114.B.LB.001

**Description:**

2-in-1 GNSS and 5G/4G Low Profile, Permanent Mount Combination Antenna with 1m cables and SMA(M) Connectors

**Features:**

2-in-1 low profile, Permanent mount combination antenna

1\* GNSS GPS/GLONASS/BeiDou/Galileo

1\* 5G/4G 600-6000MHz

Ideal for mounting on enclosed metal devices

Cables: 1m RG-174 GNSS, 1m TGC-1.5DS 5G/4G

Connectors: SMA(M)ST, fully customizable

Dimensions: Ø57\*35mm

RoHS & Reach Compliant

|                                   |    |
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# 1. Introduction



The Taoglas MA114.B.LB.001, is a small form factor 2-in-1 permanent mount combination antenna for use cases requiring worldwide 5G and 4G LTE coverage, covering all cellular frequencies from 600MHz to 6000MHz and GPS/GLONASS/BeiDou/Galileo for positioning. The MA114 has been designed to be mounted directly onto metal with no performance degradation. The MA114 covers fallback to 3G/2G bands where 5G/4G coverage is not available and can also be used to cover Cat M1/LTE-M & NB-IoT bands.

Typical Applications include:

- Remote Monitoring
- Smart Metering
- Transportation
- Industrial IoT

The IP67 waterproof PC / ABS enclosure measures just 35mm high and 57mm in diameter making it a superb choice for areas where space and heights constraints are present. The 5G/4G LTE coaxial cable is low loss TGC-1.5DS with SMA(M) connectors and the GPS/GLONASS/BeiDou/Galileo cable is RG-174 and includes an SMA(M) connector.

The MA114.B.LB.001 has been designed to be mounted on an enclosed metal box with no performance degradation and is perfect for metering and monitoring applications. The low profile, 35mm high, robust enclosure makes it the ideal design for any industrial sector applications.

Customized cables and connector versions are also available. Contact your regional Taoglas customer support team for further information.

## 2. Specifications

| GNSS Frequency Bands Covered |                               |                           |                  |                    |                  |               |                  |
|------------------------------|-------------------------------|---------------------------|------------------|--------------------|------------------|---------------|------------------|
| <b>GPS/QZSS</b>              | L1<br>1575.42MHz              | L2<br>1227.6MHz           | L5<br>1176.45MHz | L6<br>1278.75MHz   |                  |               |                  |
|                              | ■                             | □                         | □                | □                  |                  |               |                  |
| <b>GLONASS</b>               | L5R<br>1176.45MHz             | L3PT<br>1201.5MHz         | L2PT<br>1246MHz  | L1CR<br>1575.42MHz | L1PT<br>1602MHz  |               |                  |
|                              | □                             | □                         | □                | ■                  | ■                |               |                  |
| <b>Galileo</b>               | E5a<br>1176.45MHz             | E5b<br>1201.5MHz          | E4<br>1215MHz    | E3<br>1256MHz      | E6<br>1278.75MHz | E2<br>1561MHz | L1<br>1575.42MHz |
|                              | □                             | □                         | □                | □                  | □                | ■             | ■                |
| <b>BeiDou</b>                | B1<br>1561MHz                 | B2<br>1207.14MHz          | B3<br>1268.52MHz |                    |                  |               |                  |
|                              | ■                             | □                         | □                |                    |                  |               |                  |
| <b>Compass</b>               | E5B(B2)/ E6(B3)<br>1268.56MHz | E2(B1)<br>1561MHz         |                  |                    |                  |               |                  |
|                              | □                             | ■                         |                  |                    |                  |               |                  |
| <b>SBAS</b>                  | Omnistar<br>1542.5MHz         | WAAS/EGN OS<br>1575.42MHz |                  |                    |                  |               |                  |
|                              | □                             | ■                         |                  |                    |                  |               |                  |

| GNSS Electrical                       |               |         |       |
|---------------------------------------|---------------|---------|-------|
| Frequency (MHz)                       | 1561          | 1575.42 | 1602  |
| VSWR (max.)                           | 3.0:1         | 2.0:1   | 2.0:1 |
| Passive Antenna Efficiency (%)        | 42.6          | 56.89   | 61.9  |
| Passive Antenna Gain at Zenith (dBic) | 1.08          | 2.11    | 2.08  |
| Axial Ratio (dB)                      | 13            | 9       | 3     |
| Polarization                          | RHCP          |         |       |
| Impedance                             | 50Ω           |         |       |
| Cable                                 | 1000mm RG-174 |         |       |
| Connector                             | SMA(M)        |         |       |

| <b>LNA and Filter Electrical Properties</b>                      |             |                |             |
|--|-------------|----------------|-------------|
| <b>Frequency (MHz)</b>   | <b>1561</b> | <b>1575.42</b> | <b>1602</b> |
| VSWR (max.)  | 2.0:1       | 2.0:1          | 2.0:1       |
| Gain@1.8V (Typ.)   | 28.8        | 28.8           | 28.0        |
| Gain@3.0V (Typ.)   | 29.1        | 29.0           | 28.3        |
| Gain@5.5V (Typ.)   | 29.6        | 29.3           | 28.7        |
| Noise@1.8V (Typ.)  | 2.7         | 2.2            | 2.7         |
| Noise@3.0V (Typ.)  | 2.7         | 2.2            | 2.6         |
| Noise@5.5V (Typ.)  | 2.8         | 2.2            | 2.7         |
| Power consumption@1.8V (Typ.)                                    | 8.6         |                |             |
| Power consumption@3.0V (Typ.)                                    | 8.9         |                |             |
| Power consumption@5.5V (Typ.)                                    | 10.5        |                |             |
| <b>Total Specification (Through Antenna, SAW Filter and LNA)</b> |             |                |             |
| <b>Frequency (MHz)</b>   | <b>1561</b> | <b>1575.42</b> | <b>1602</b> |
| Gain@3V (dBi)  | 28          | 28             | 28          |
| Noise@3V (dB)  | 3           | 3              | 3           |
| Output Impedance   | 50 Ω        |                |             |

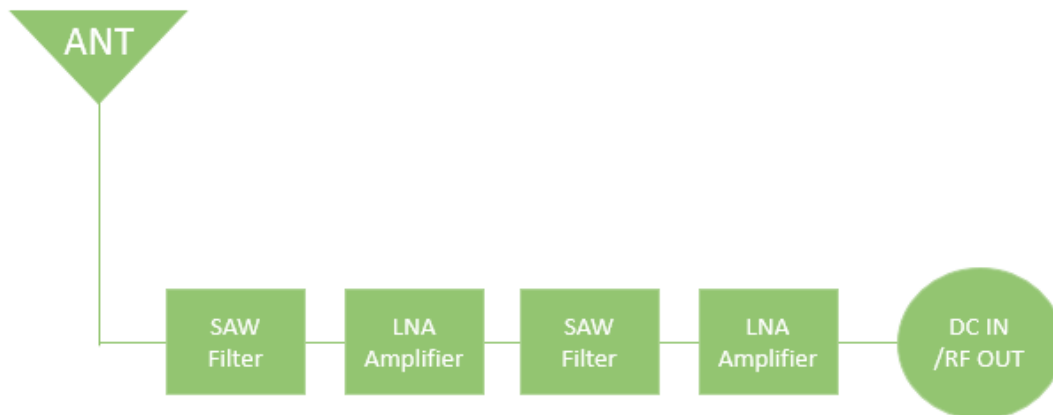
| 5G/4G Electrical                              |                 |                |                   |                 |           |                 |              |                   |
|---|-----------------|----------------|-------------------|-----------------|-----------|-----------------|--------------|-------------------|
| Band  | Frequency (MHz) | Efficiency (%) | Average Gain (dB) | Peak Gain (dBi) | Impedance | Max Input Power | Polarization | Radiation Pattern |
| 5G NR/4G<br>Band 71                           | 617~698         | 46.8           | -3.3              | 2.8             | 50 Ω      | 10W             | Linear       | Omni-Directional  |
| 4G/3G<br>Band 12,13,14,17,28,29               | 698~824         | 66.1           | -1.8              | 4               |           |                 |              |                   |
| 4G/3G/NB-IoT/Cat M<br>Band 5,8,18,19,20,26,27 | 824~960         | 63.5           | -2                | 4.1             |           |                 |              |                   |
| 5G NR/4G<br>Band 21,32,74,75,76               | 1427~1518       | 43.7           | -3.6              | 3.8             |           |                 |              |                   |
| 4G/3G<br>Band 1,2,3,4,9,23,25,35,39,66        | 1710~2200       | 55.4           | -2.6              | 5.2             |           |                 |              |                   |
| 4G/3G<br>Band 7,30,38,40,41                   | 2300~2690       | 56.6           | -2.5              | 6.1             |           |                 |              |                   |
| 5G NR/4G<br>Band 22,42,48,77,78               | 3300~4200       | 50.2           | -3                | 5.7             |           |                 |              |                   |
| 5G NR/4G<br>Band 79                           | 4400~5000       | 57.7           | -2.4              | 5.4             |           |                 |              |                   |
| LTE5200/<br>Wi-Fi 5800                        | 5150~5925       | 49.7           | -3                | 7.3             |           |                 |              |                   |

| Mechanical        |   |
|-------------------|---|
| Height            | 35mm  |
| Planner Dimension | Ø57mm   |
| Casing            | PC+ABS  |
| Cable             | 1m RG174 for 5G/4G – Fully Customizable<br>1m RG174 for GNSS – Fully Customizable |
| Connector         | 5G/4G: SMA-Plug – Fully Customizable<br>GNSS: SMA-Plug – Fully Customizable       |
| Weight            | 90g (Not Including Packaging)   |
| Environmental     |   |
| Temperature Range | -40°C to 85°C   |
| Humidity          | Non-condensing 65°C 95% RH  |
| Cable Pull Force  | RG174 - 4 Kgf   |

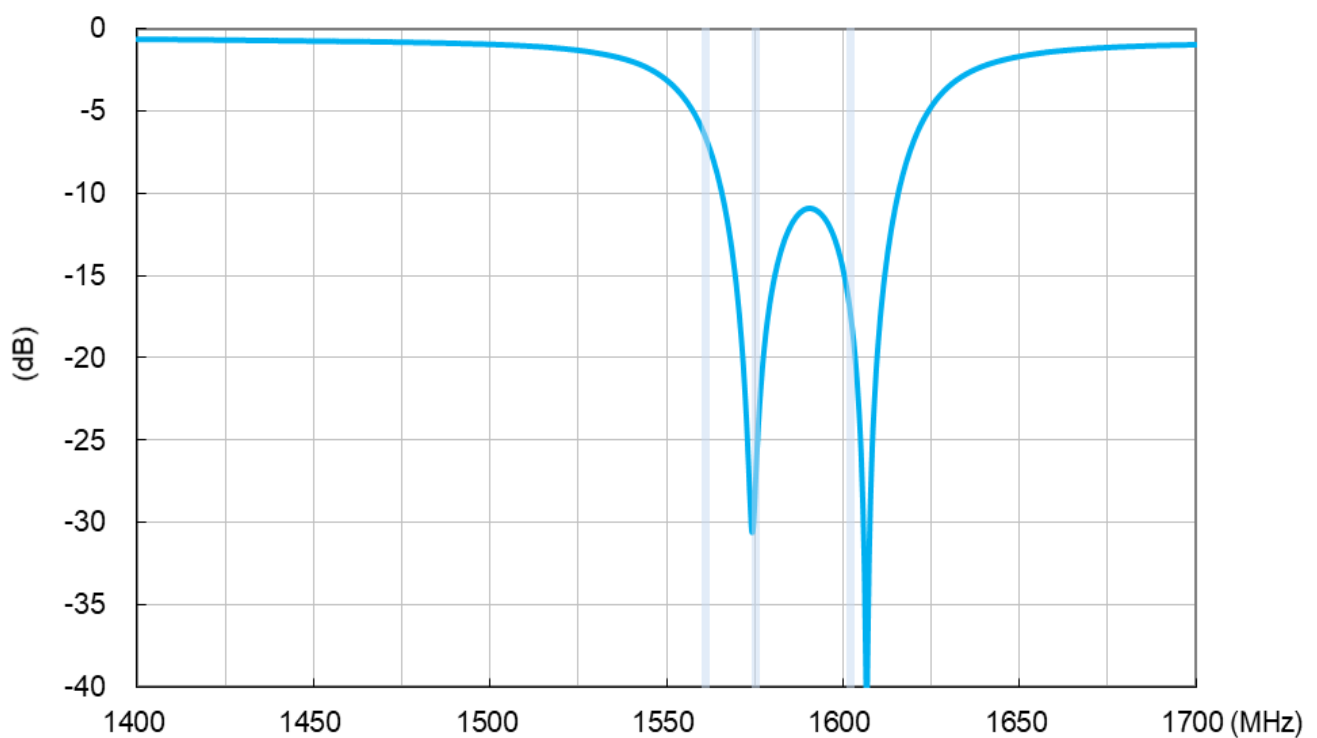
| 5G/4G Bands |   |                      |         |
|-------------|---|----------------------|---------|
| Band Number | 5G NR / FR1 / LTE / LTE-Advanced / WCDMA / HSPA / HSPA+ / TD-SCDMA / Cat M / NB-IoT |                      |         |
|             | Uplink  | Downlink             | Covered |
| 1           | UL: 1920 to 1980  | DL: 2110 to 2170     | ✓       |
| 2           | UL: 1850 to 1910  | DL: 1930 to 1990     | ✓       |
| 3           | UL: 1710 to 1785  | DL: 1805 to 1880     | ✓       |
| 4           | UL: 1710 to 1755  | DL: 2110 to 2155     | ✓       |
| 5           | UL: 824 to 849  | DL: 869 to 894       | ✓       |
| 7           | UL: 2500 to 2570  | DL: 2620 to 2690     | ✓       |
| 8           | UL: 880 to 915  | DL: 925 to 960       | ✓       |
| 9           | UL: 1749.9 to 1784.9  | DL: 1844.9 to 1879.9 | ✓       |
| 11          | UL: 1427.9 to 1447.9  | DL: 1475.9 to 1495.9 | ✓       |
| 12          | UL: 699 to 716  | DL: 729 to 746       | ✓       |
| 13          | UL: 777 to 787  | DL: 746 to 756       | ✓       |
| 14          | UL: 788 to 798  | DL: 758 to 768       | ✓       |
| 17          | UL: 704 to 716  | DL: 734 to 746       | ✓       |
| 18          | UL: 815 to 830  | DL: 860 to 875       | ✓       |
| 19          | UL: 830 to 845  | DL: 875 to 890       | ✓       |
| 20          | UL: 832 to 862  | DL: 791 to 821       | ✓       |
| 21          | UL: 1447.9 to 1462.9  | DL: 1495.9 to 1510.9 | ✓       |
| 22          | UL: 3410 to 3490  | DL: 3510 to 3590     | ✓       |
| 23          | UL: 2000 to 2020  | DL: 2180 to 2200     | ✓       |
| 24          | UL: 1625.5 to 1660.5  | DL: 1525 to 1559     | ✓       |
| 25          | UL: 1850 to 1915  | DL: 1930 to 1995     | ✓       |
| 26          | UL: 814 to 849  | DL: 859 to 894       | ✓       |
| 27          | UL: 807 to 824  | DL: 852 to 869       | ✓       |
| 28          | UL: 703 to 748  | DL: 758 to 803       | ✓       |
| 29          | UL: -   | DL: 717 to 728       | ✓       |
| 30          | UL: 2305 to 2315  | DL: 2350 to 2360     | ✓       |
| 31          | UL: 452.5 to 457.5  | DL: 462.5 to 467.5   | ✗       |
| 32          | UL: -   | DL: 1452 – 1496      | ✓       |
| 35          |   | 1850 to 1910         | ✓       |
| 38          |   | 2570 to 2620         | ✓       |
| 39          |   | 1880 to 1920         | ✓       |
| 40          |   | 2300 to 2400         | ✓       |
| 41          |   | 2496 to 2690         | ✓       |
| 42          |   | 3400 to 3600         | ✓       |
| 43          |   | 3600 to 3800         | ✓       |
| 48          |   | 3550 to 3700         | ✓       |
| 66          | UL: 1710-1780   | DL: 2110-2200        | ✓       |
| 71          |   | 617 to 698           | ✓       |
| 74/75/76    |   | 1427 to 1518         | ✓       |
| 77          |   | 3300 to 4200         | ✓       |
| 78          |   | 3300 to 3800         | ✓       |
| 79          |   | 4400 to 5000         | ✓       |

### 3. Active Antenna Characteristics

#### 3.1 Block Diagram

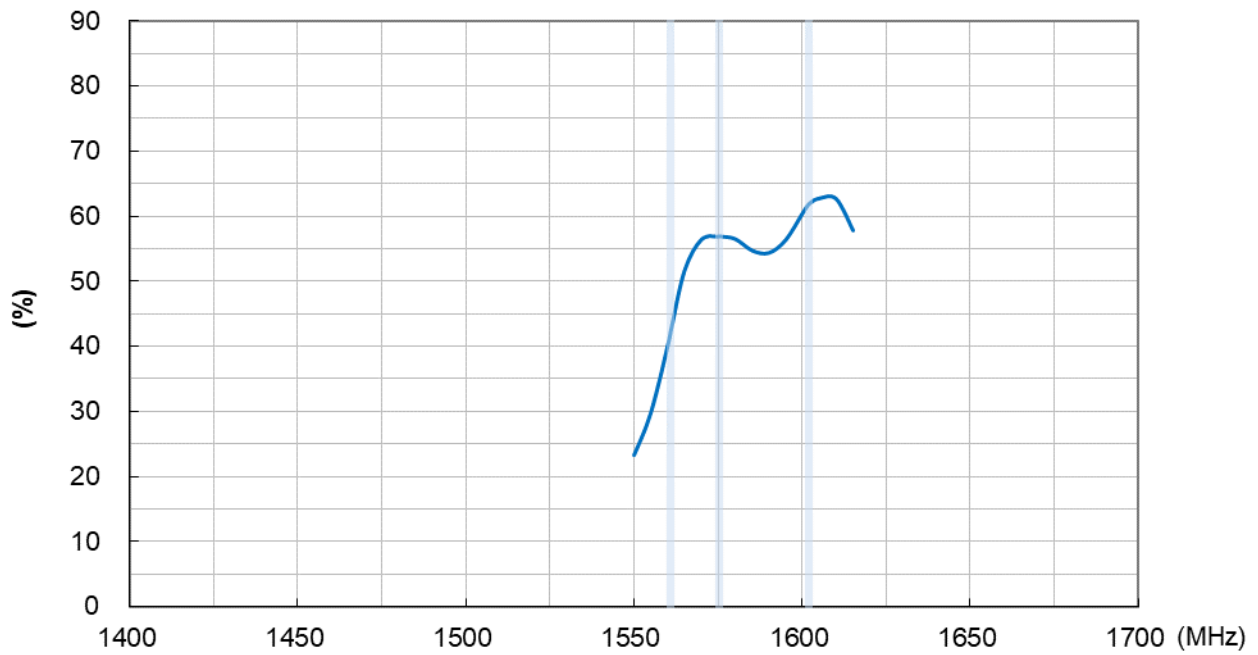


#### 3.2 Passive Antenna Return Loss

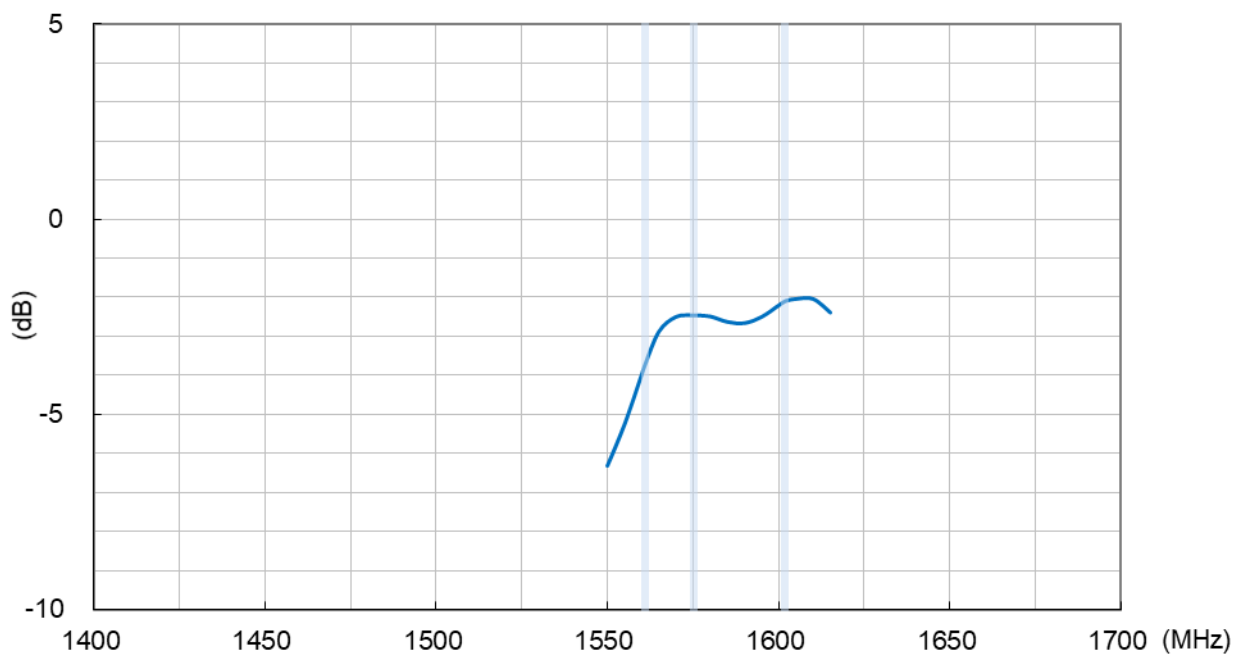




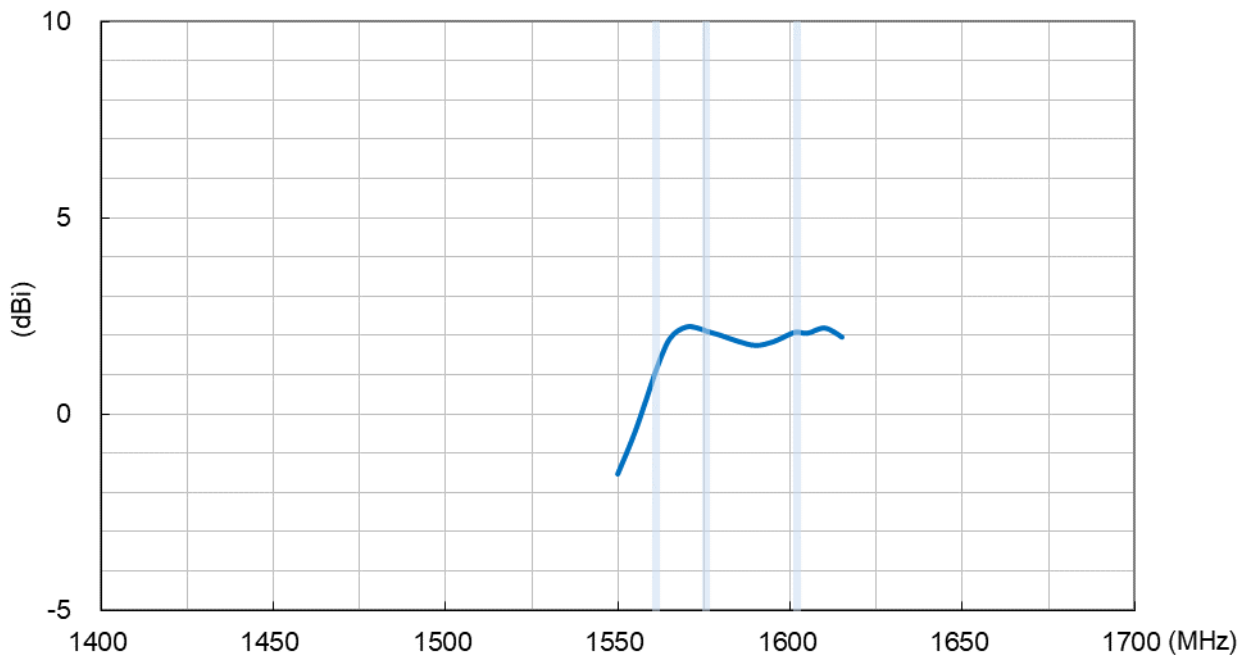
### 3.3 Passive Antenna Efficiency



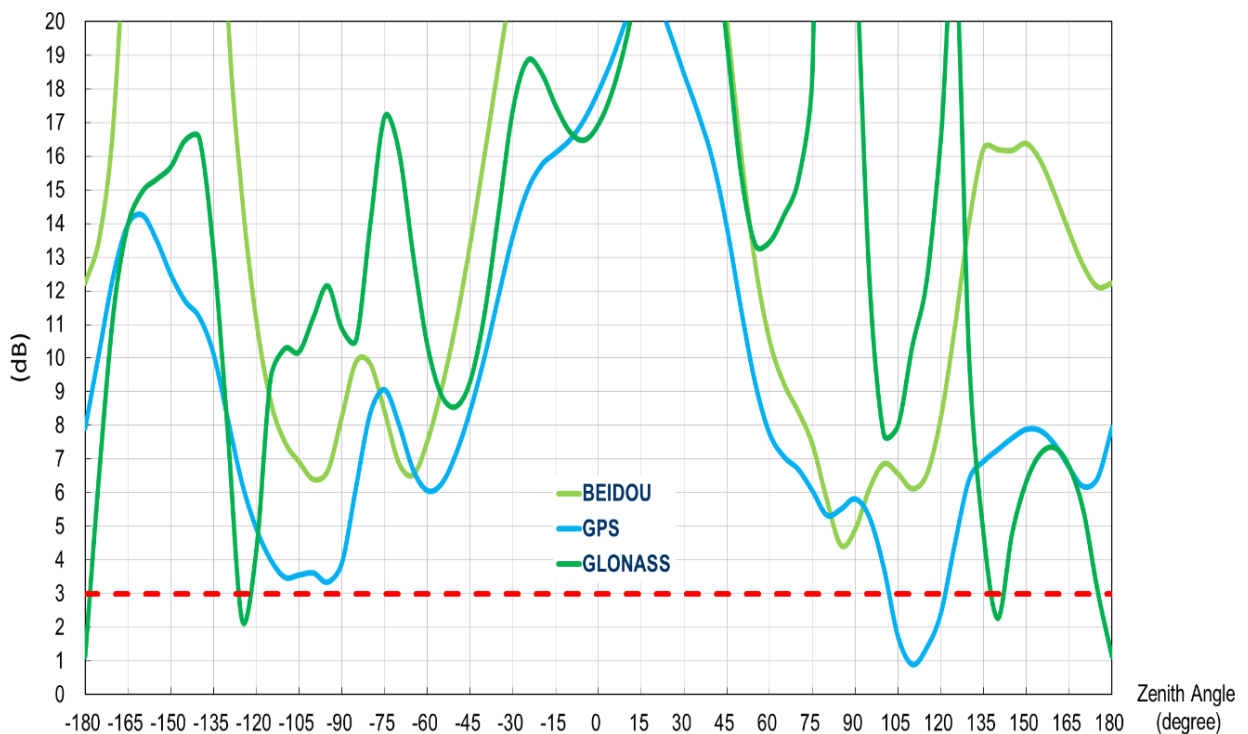
### 3.4 Passive Antenna Average Gain



### 3.5 Passive Antenna Peak Gain

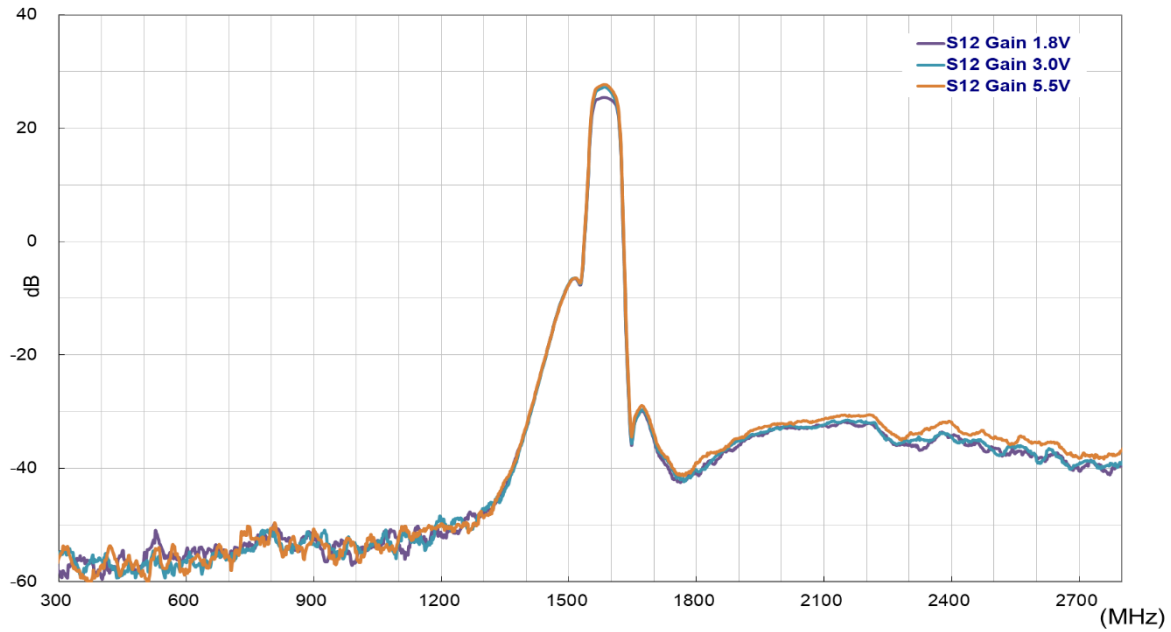


### 3.6 Passive Antenna Axial Ratio (Zenith is at 0°)



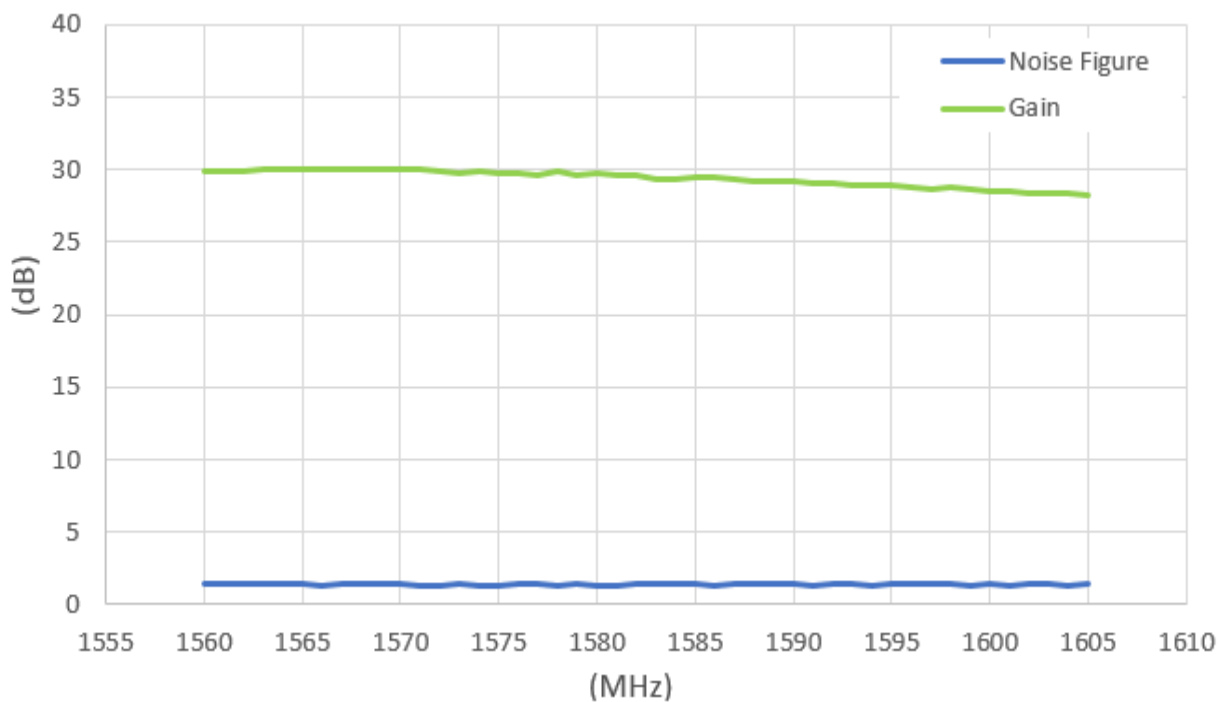
### 3.7 Active Measurements

#### LNA Gain @3.0V

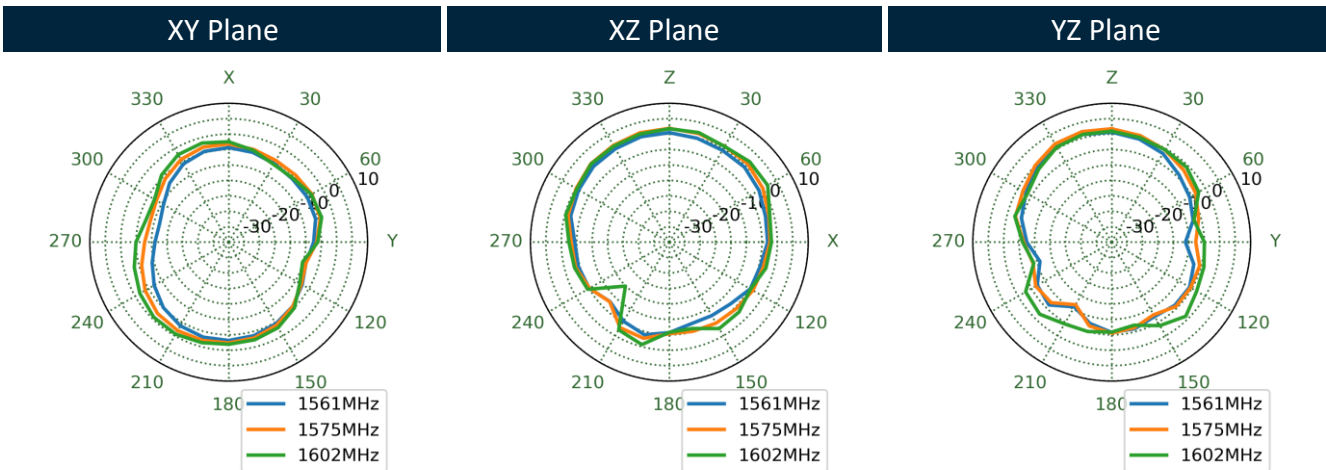
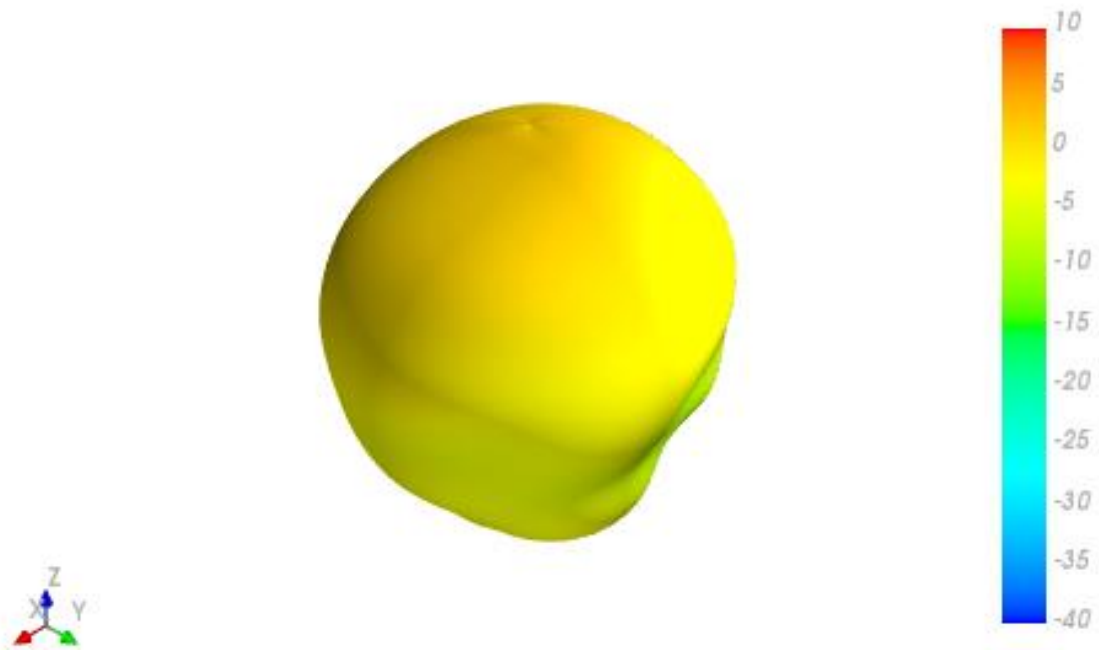


### 3.8 Passive Antenna Axial Ratio (Zenith is at 0°)

#### Noise Figure @ 3.0V

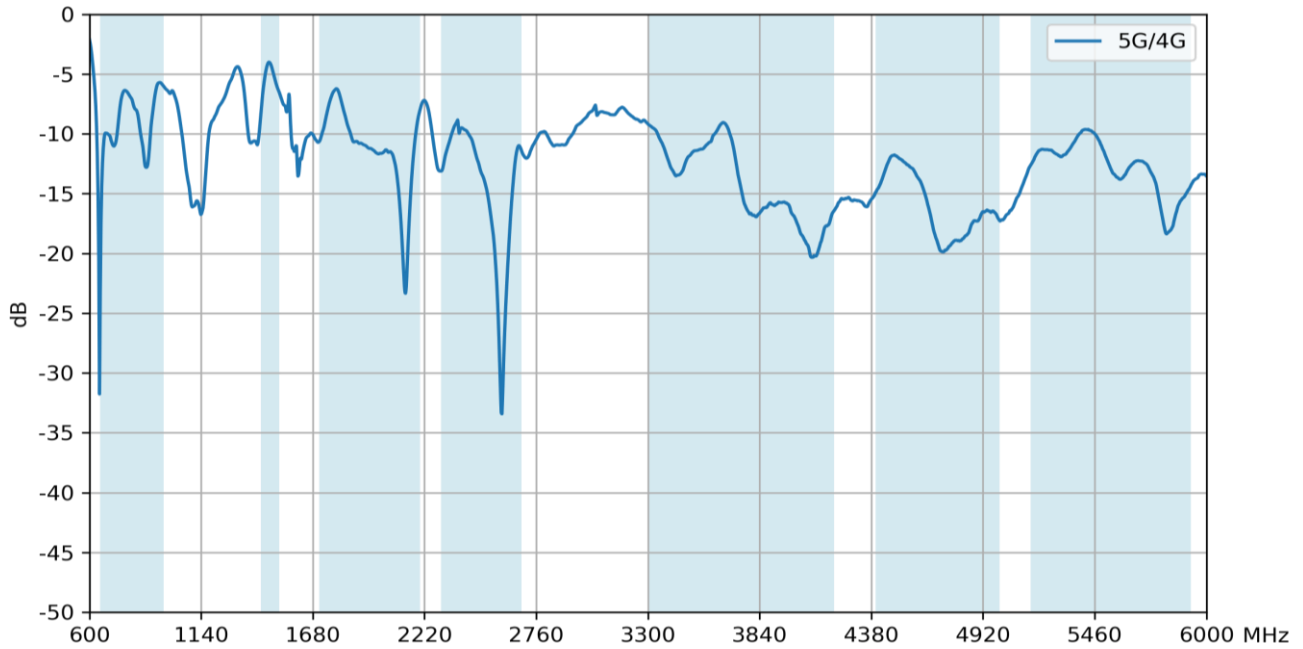


### 3.9 GNSS 3D and 2D Radiation Patterns

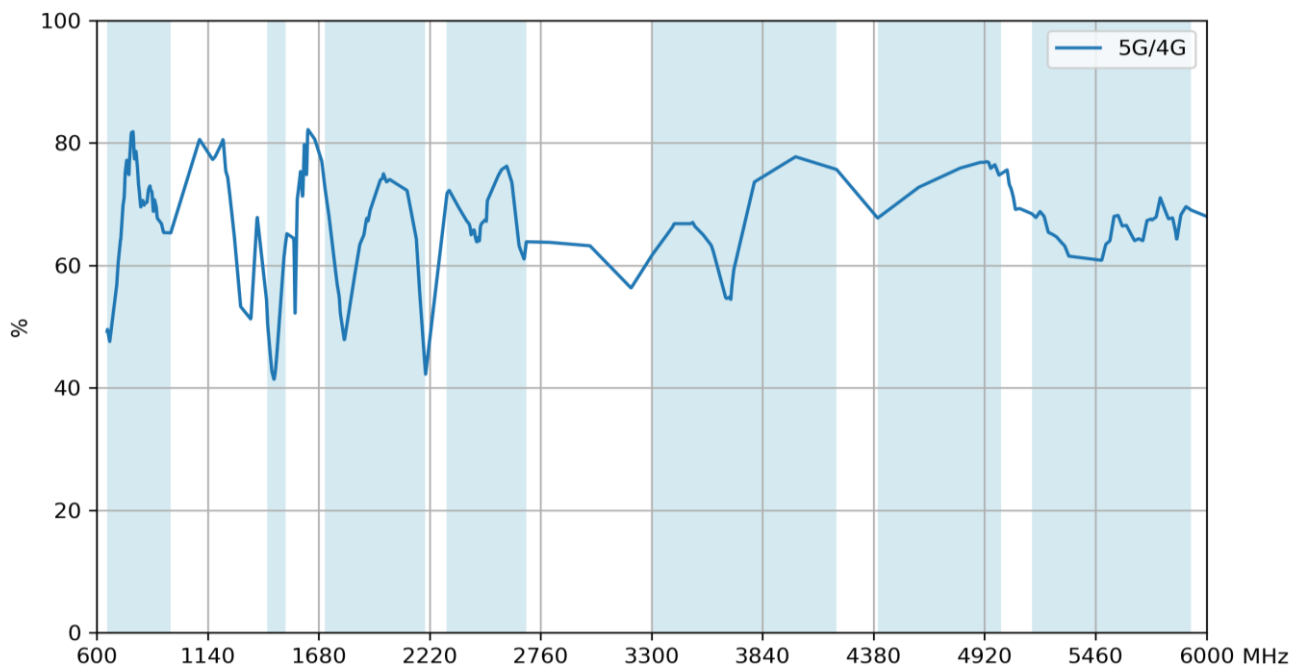


## 4. 4G Antenna Characteristics

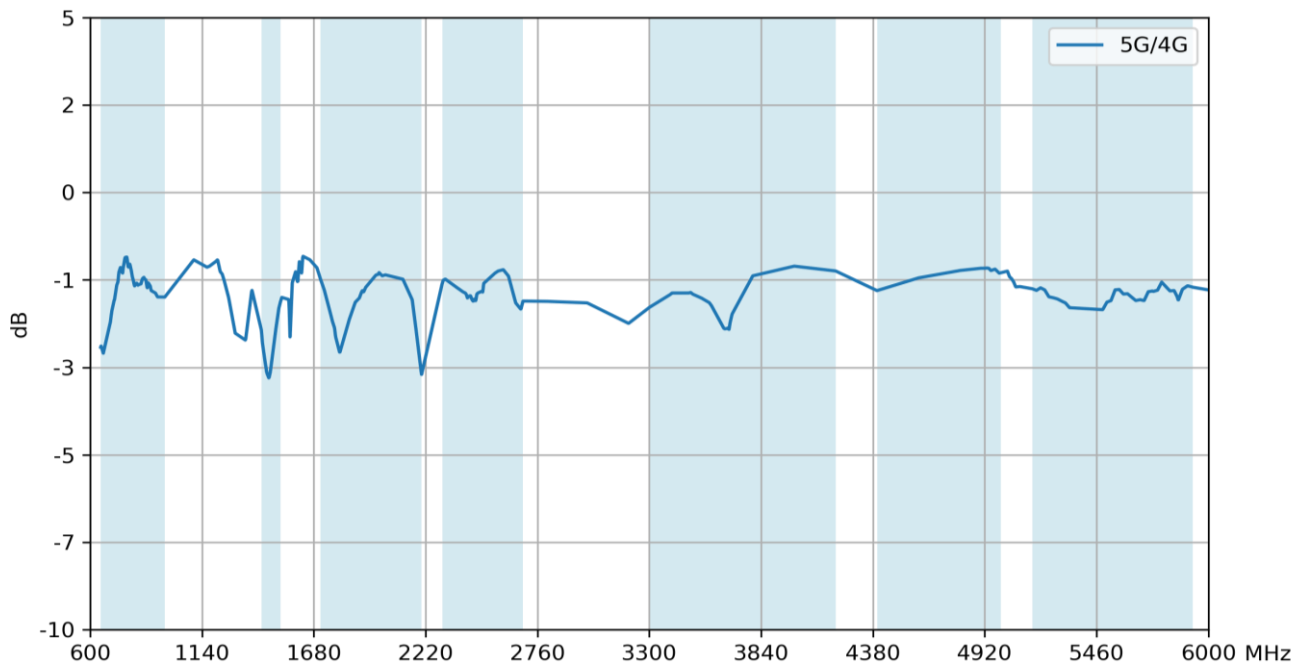
### 4.1 Return Loss



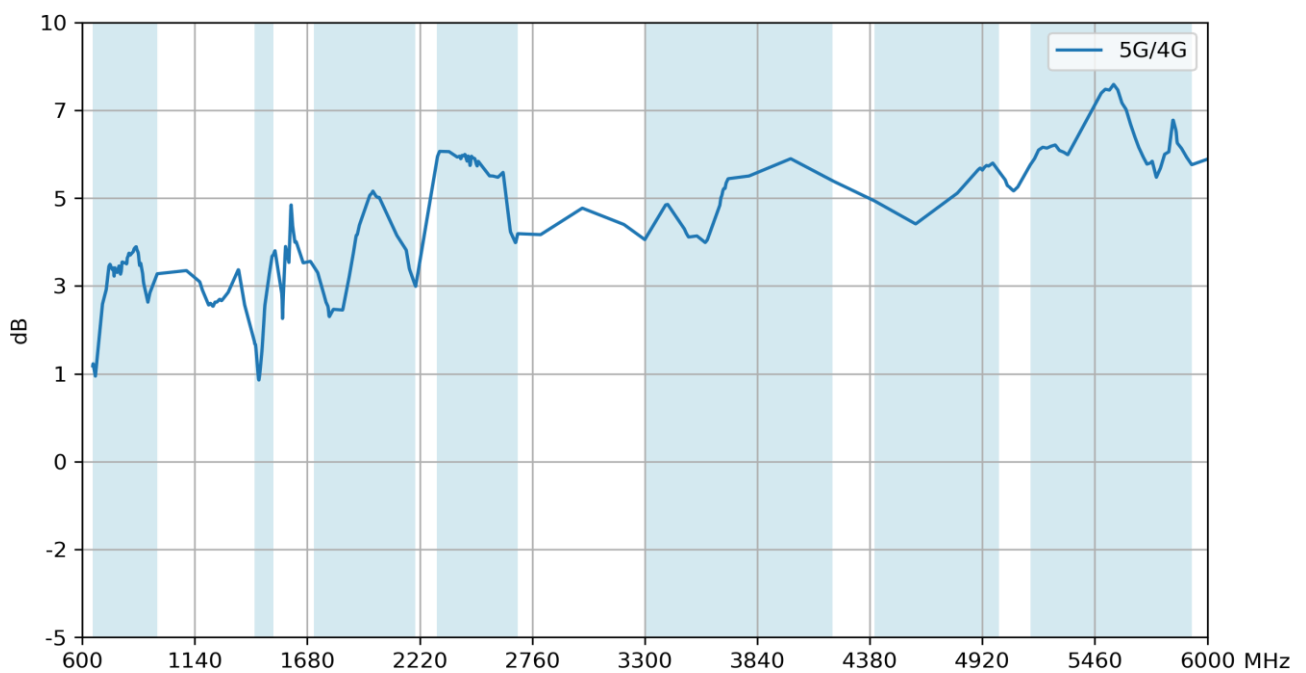
### 4.2 Efficiency



### 4.3 Average Gain



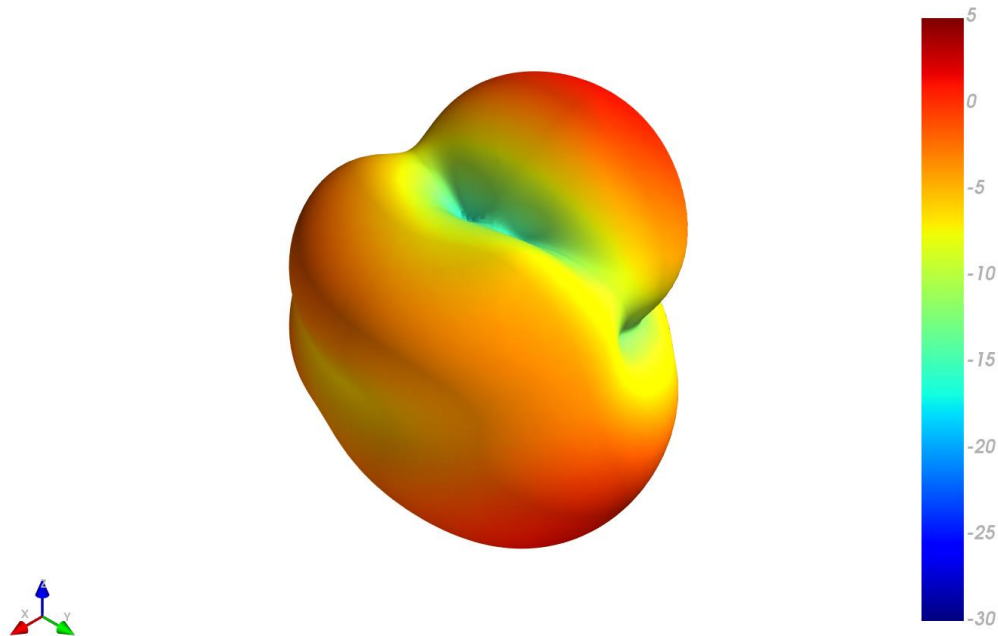
### 4.4 Peak Gain



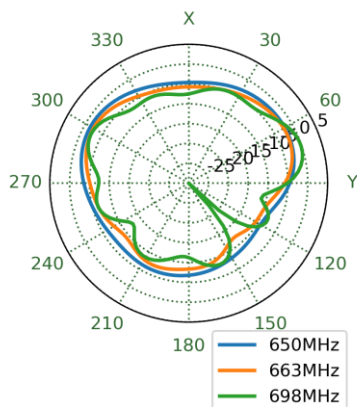
# 5. Radiation Patterns

## 5.1 5G/4G - 3D and 2D Radiation Patterns

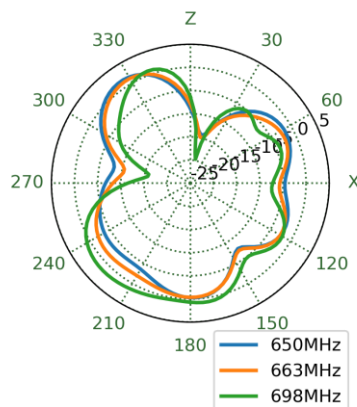
663MHz



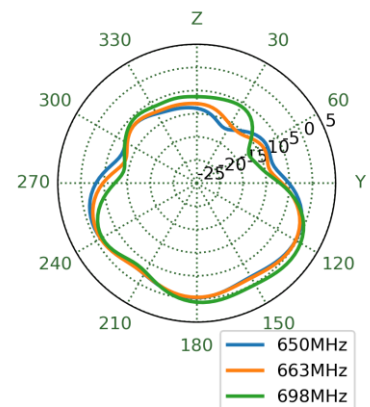
XY Plane



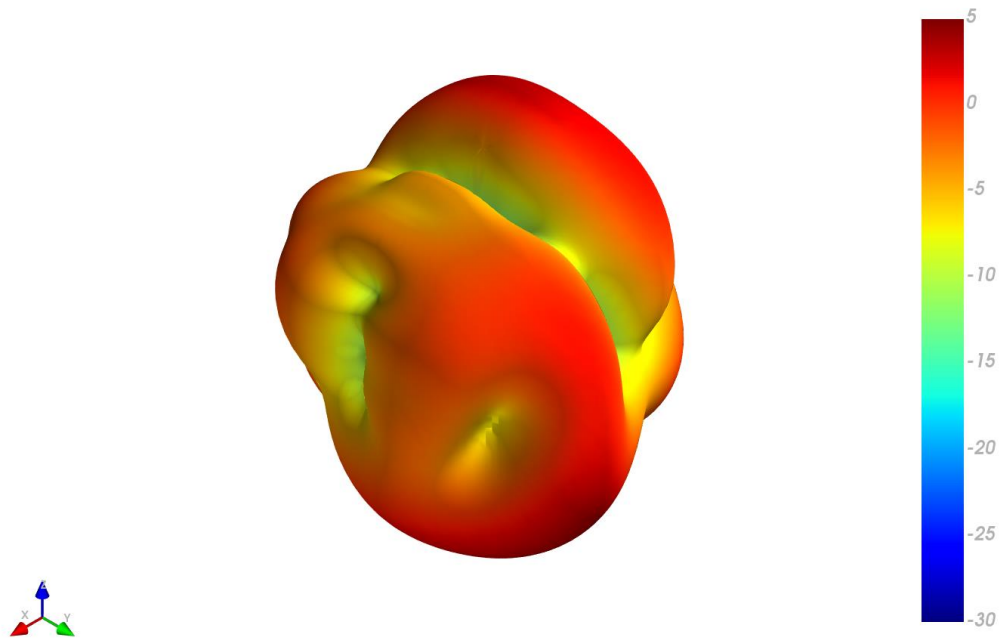
XZ Plane



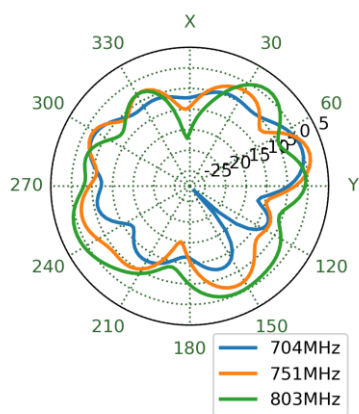
YZ Plane



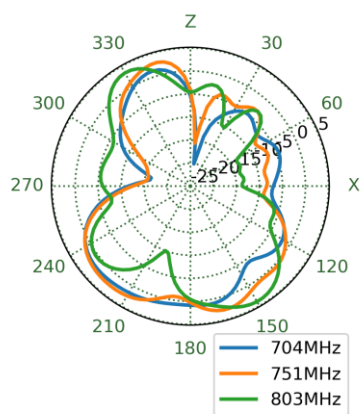
# 751MHz



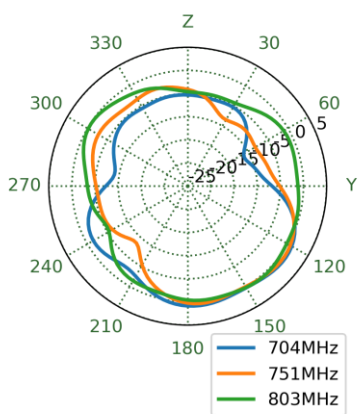
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XZ Plane

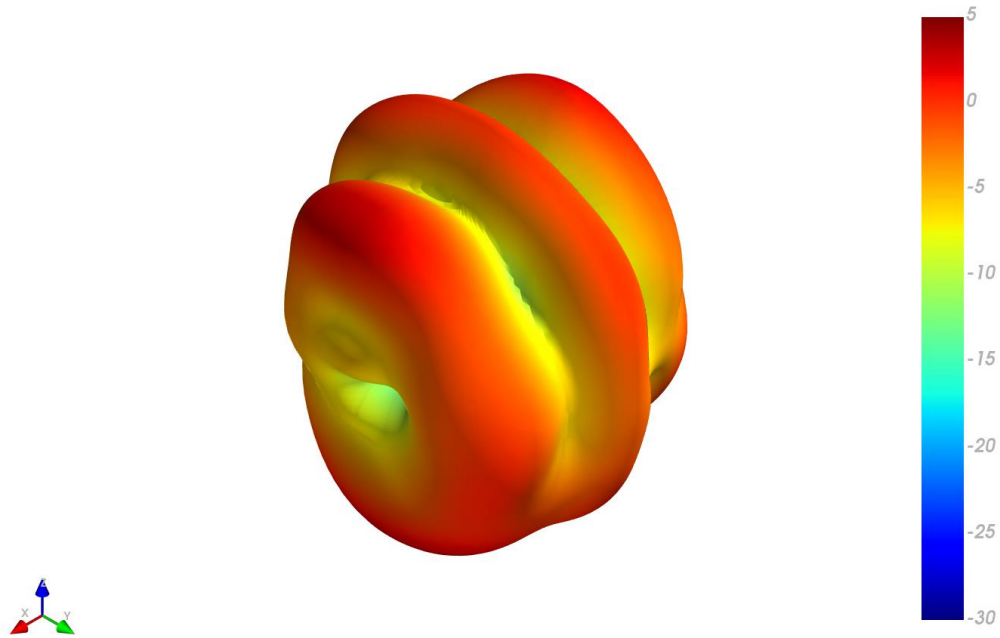


YZ Plane

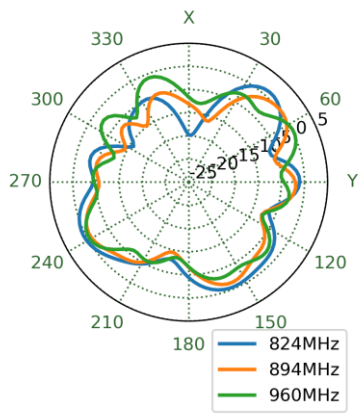




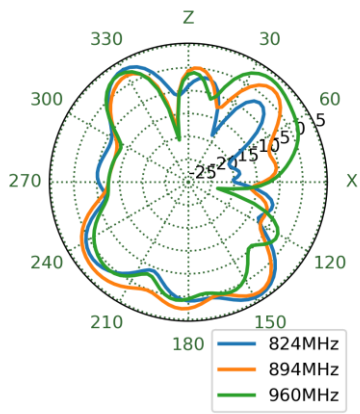
894MHz



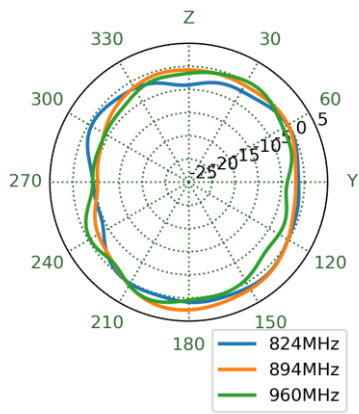
XY Plane



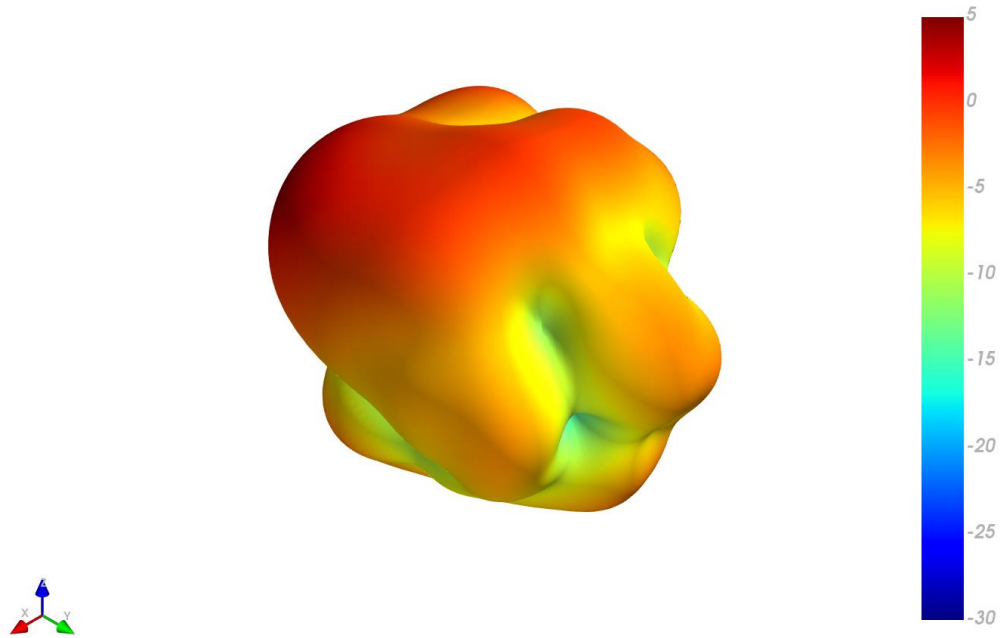
XZ Plane



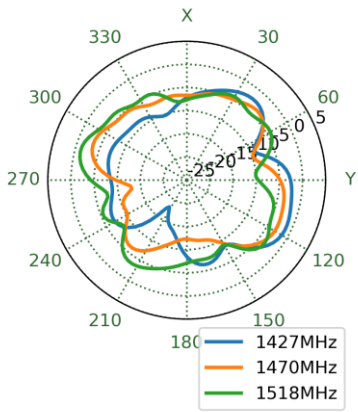
YZ Plane



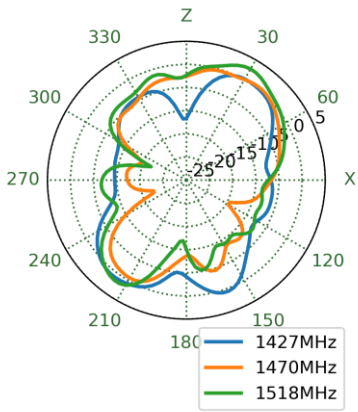
1470MHz



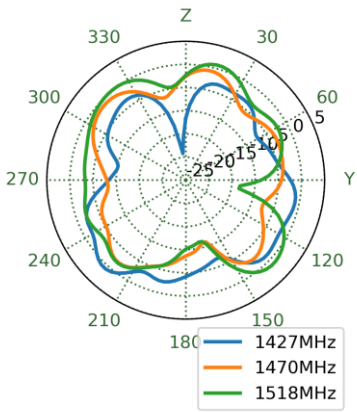
XY Plane



XZ Plane

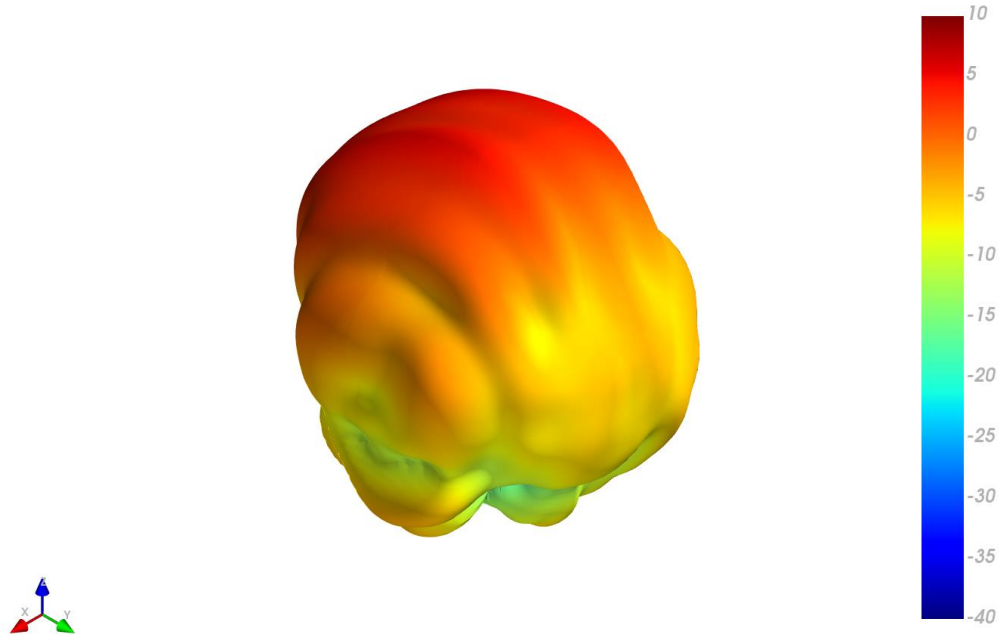


YZ Plane

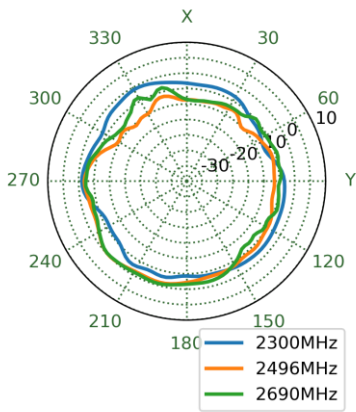




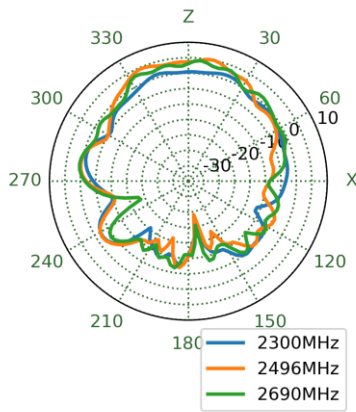
**2496MHz**



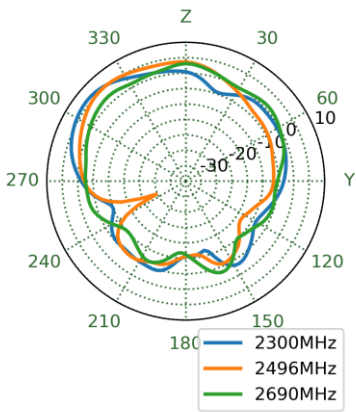
**XY Plane**



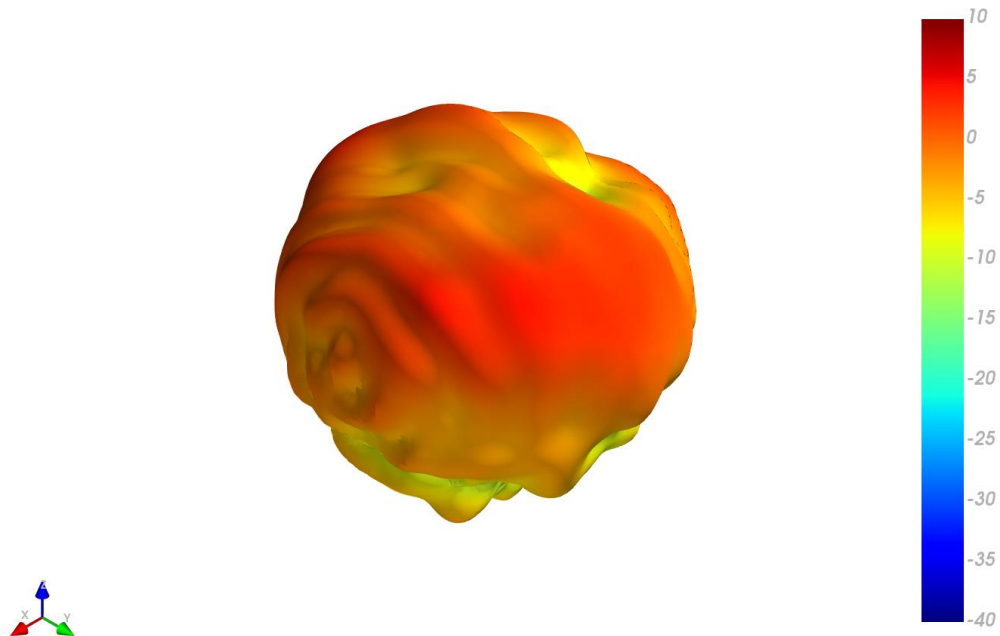
**XZ Plane**



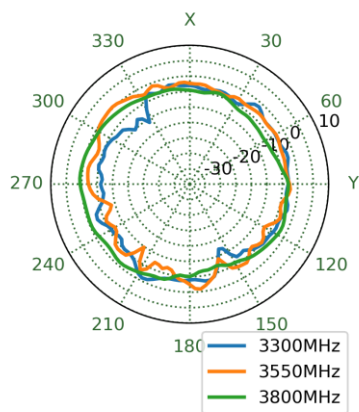
**YZ Plane**



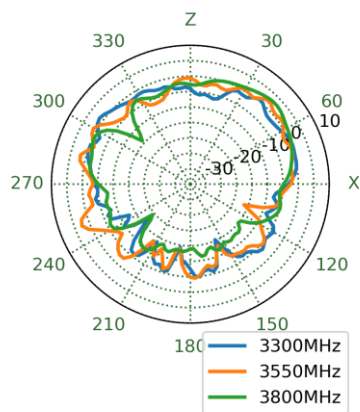
3550MHz



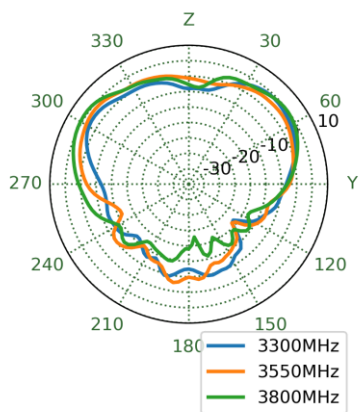
XY Plane



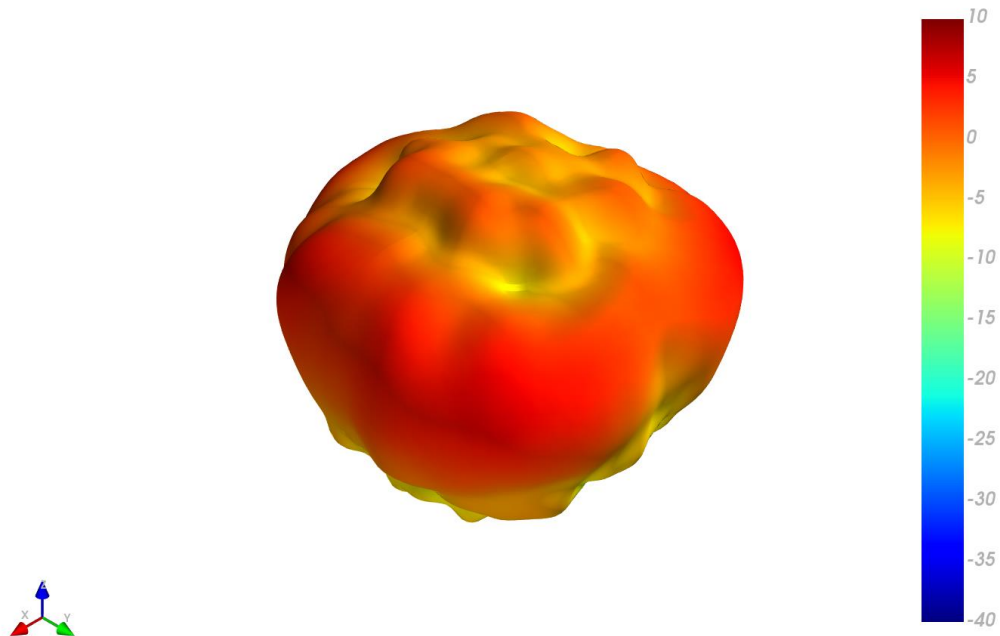
XZ Plane



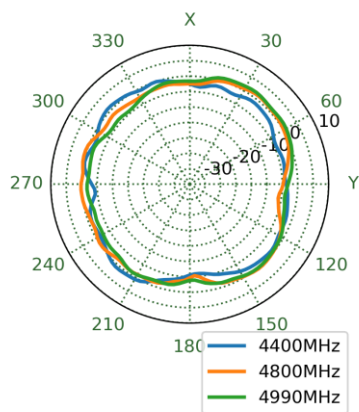
YZ Plane



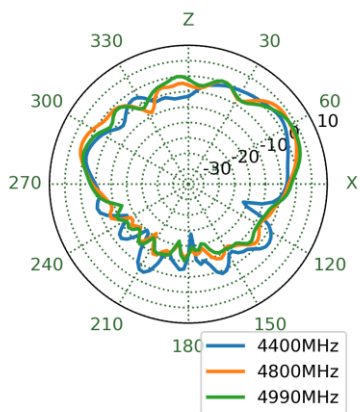
4800MHz



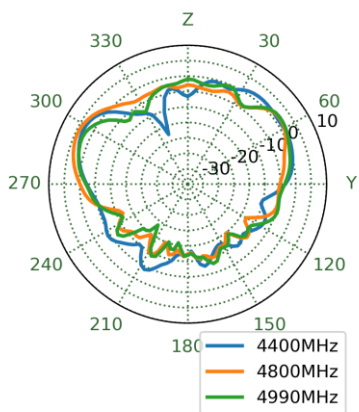
XY Plane



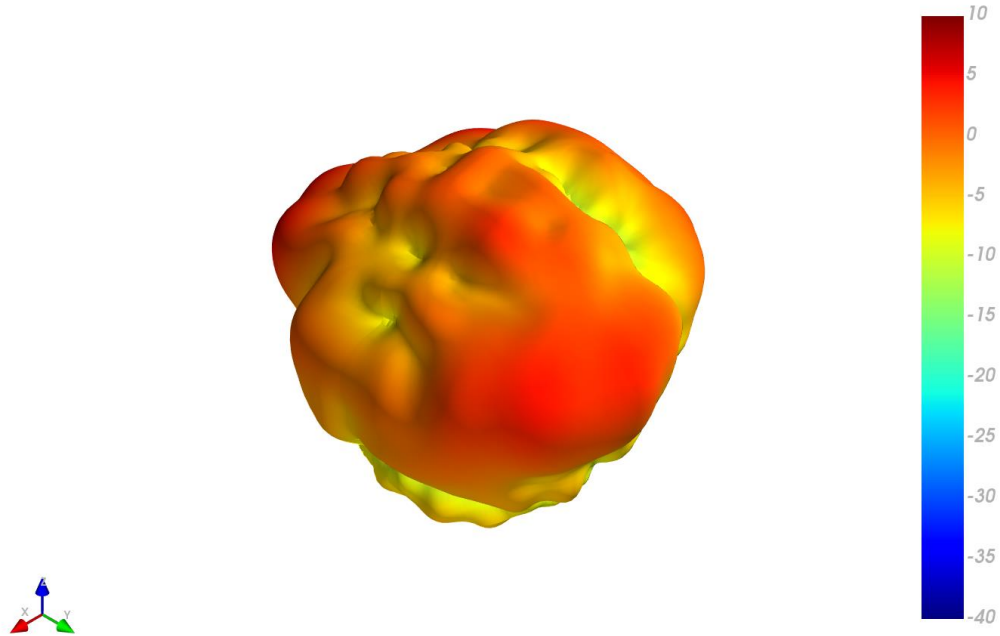
XZ Plane



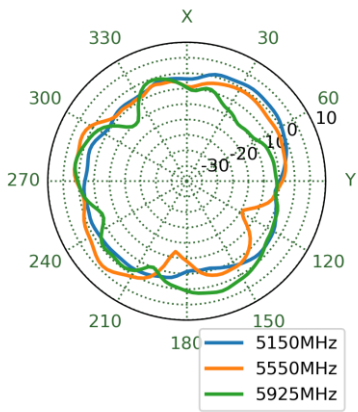
YZ Plane



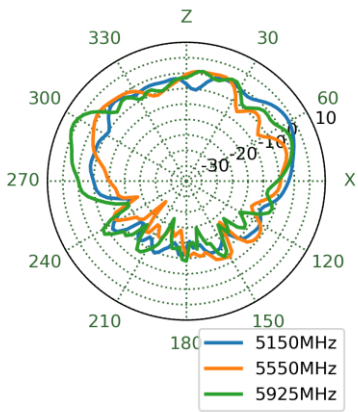
5550MHz



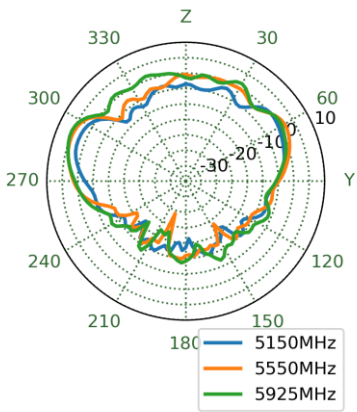
XY Plane



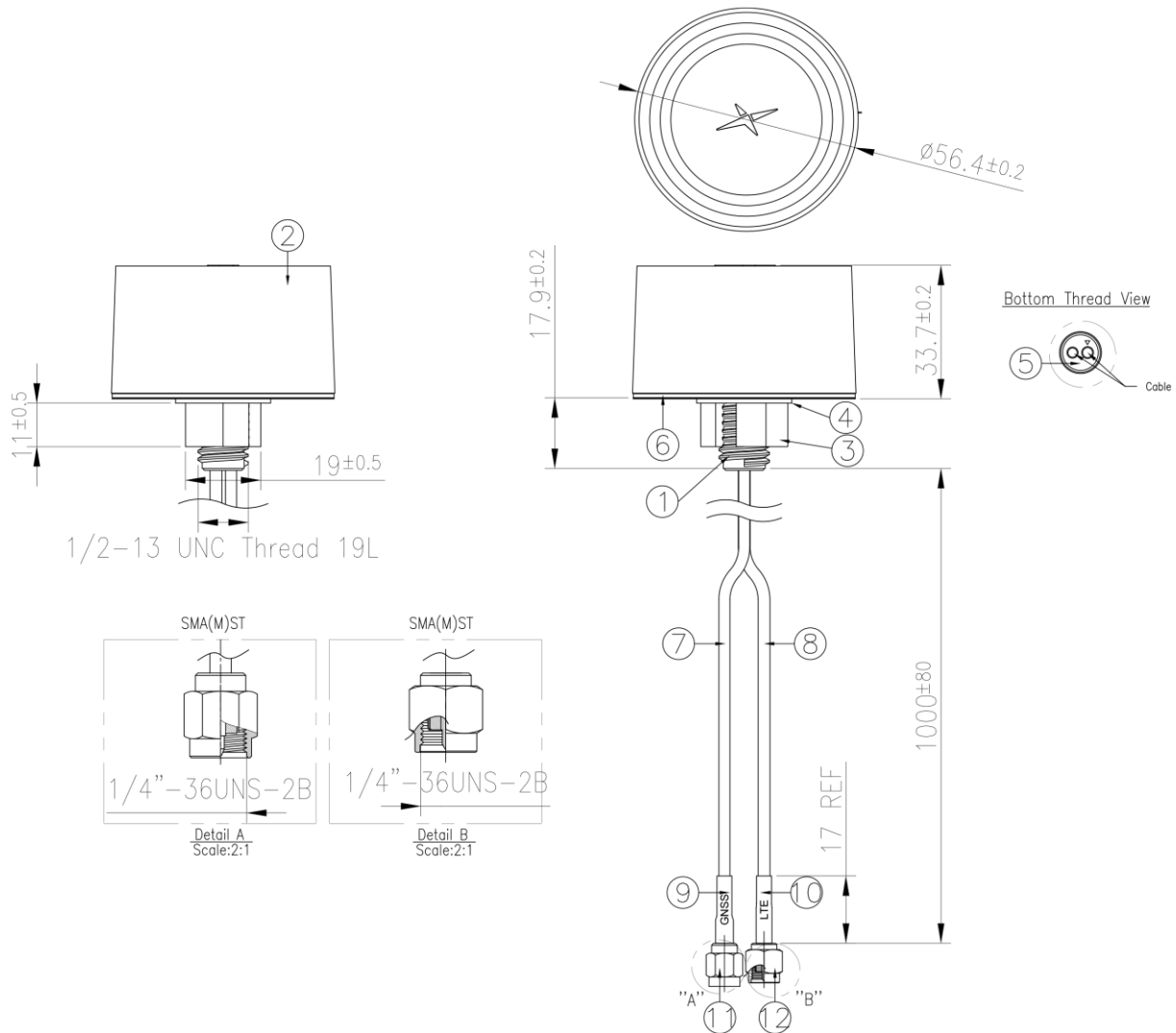
XZ Plane



YZ Plane



## 6. Mechanical Drawing (Units: mm)



|    | Name                              | Material            | Finish                 | QTY |
|----|-----------------------------------|---------------------|------------------------|-----|
| 1  | Bottom Housing                    | PC945               | Black                  | 1   |
| 2  | MA114 Enclosure, Top              | PC945               | PMS Cool Gray 11       | 1   |
| 3  | Nut(1/2-13 UNC 19.05*11.11mm_cut) | Steel               | Zn Plated              | 1   |
| 4  | Washer                            | Steel               | Zn Plated              | 1   |
| 5  | Cable Grommet, MA114              | Silicone            | Black                  | 1   |
| 6  | Foam Adhesive (Black Foam)        | 3M 9448HK+CR4305 1t | Black Foam/White Liner | 1   |
| 7  | RG174 Coaxial Cable               | PVC                 | Black                  | 1   |
| 8  | TGC-1.5DS Coaxial Cable           | XLPE                | Black                  | 1   |
| 9  | Heat Shrink Tube (GNSS)           | PE                  | Blue Tube/White Text   | 1   |
| 10 | Heat Shrink Tube (LTE)            | PE                  | Red Tube/White Text    | 1   |
| 11 | SMA(M)ST for RG174                | Brass               | Au Plated              | 1   |
| 12 | SMA(M)ST for 1.5DS                | Brass               | Au Plated              | 1   |



## 7. Installation Instructions

# Installation Instructions

## MA114 Series

### Combination Permanent Mount Antenna



#### Introduction

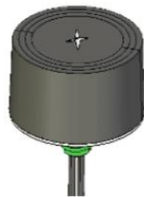
Following these guidelines will help ensure that your Taoglas MA114 antenna is installed correctly. The MA114 is be mounted via permanent through-hole mounting, as outlined below.



#### Installation Requirements

Antenna Components:

Hex Steel Nut & Washer (x1), Antenna Housing (x1), Coaxial Cable(x2), Pre-adhered Adhesive Pad(x1)



#### Additional Requirements:

Drill with 16mm(5/8") drill bit/hole saw

19mm [3/4in] hex wrench (optional)

#### Notices



##### Caution

To comply with FCC RF Exposure requirements in section 1.1310 of the FCC Rules, antennas used with this device must be installed to provide a separation distance of at least 20 cm from all persons to satisfy RF exposure compliance.



##### Warning

**Do not** Operate the transmitter when someone is within 20 cm of the antenna.  
**Do not** operate the equipment in an explosive atmosphere.



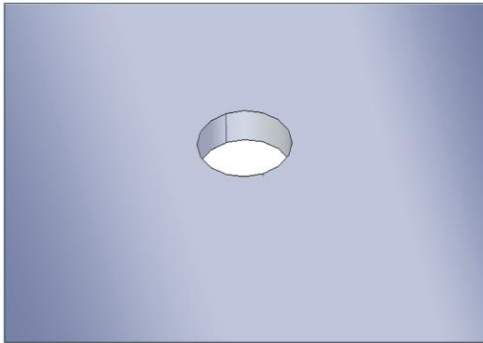
##### European Waste Electronic Equipment Directive 2002/96/EC

Please ensure that your old Waste Electricals and Electronics are recycled do not throw them away into standard waste.

**Waiver:** This document represents information compiled by Taoglas to the best of our current knowledge. This is not intended to be used as a representation or warranty of fitness of the products described for any particular purpose. This document details guidelines for general information purposes only. When planning installations, always seek specialist advice and ensure that the products are always installed by a properly qualified installer in accordance with applicable regional laws and regulations.

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## Permanent Mounting



Determine where the antenna is to be mounted, please ensure this is a flat surface. Drill a 16mm [5/8"] diameter hole.

Note: Min panel thickness 4mm [5/32in], Max panel

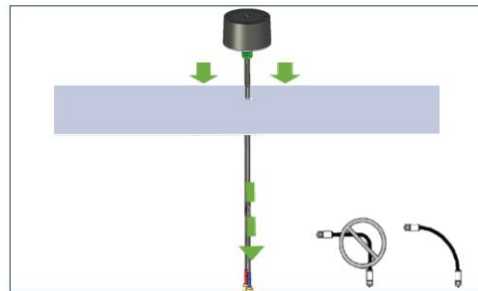


Unscrew the split steel nut from the antenna body and slide the the coaxial cable out through nut and washer.



Ensure the mouting surface is clean and all debris, dust, or any other contaminant is removed. Remove the protective liner from the pre-installed base adhesive on the antenna.

Note: Once exposed, avoid touching the adhesive.

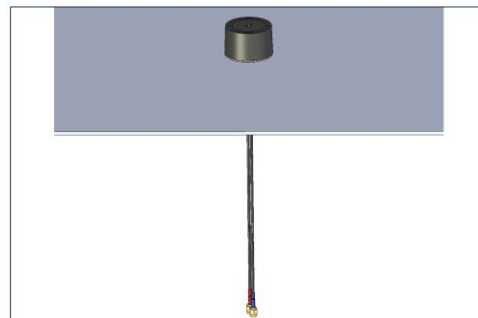


Route the coaxial cables through the hole in the panel. Align the antenna properly and press down to secure the adhesive base in place.

Note: Avoid sharp bends when routing coaxial cable.



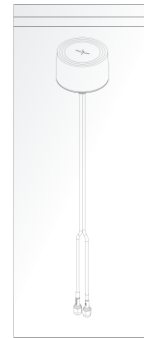
Insert the coaxial cables through the washer and steel nut and slide them upwards. Tighten to secure the antenna in place. Ensure the nut is fully tightened.



Completed Installation.

## 8. Packaging

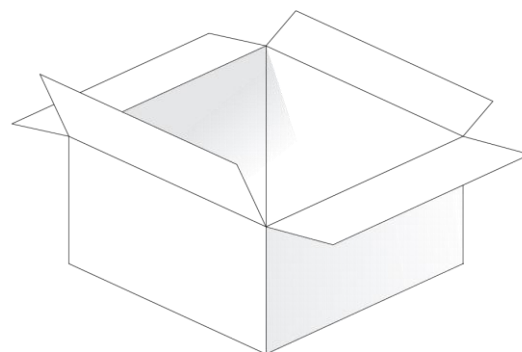
1pcs per Small PE Bag  
Weight - 100g



10pcs per Large PE Bag  
Weight - 1Kg



60pcs per Carton  
Weight - 6Kg



Changelog for the datasheet

**SPE-22-8-012-A - MA114.B.LB.001**

**Revision: A (Current Version)**

|          |                 |
|----------|-----------------|
| Date:    | 2021-03-08      |
| Changes: | Initial Release |
| Author:  | Jack Conroy     |

**Previous Revisions**

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