



# TAOGLAS®



# Datasheet

## Magma X2

**Part No:**  
AA.175.301111

### Description:

MagmaX2 External Multi-Band GNSS Automotive Magnetic Mount Antenna

### Features:

Magnetic Mount

Covers:

- GPS/QZSS (L1/L2)
- Galileo (E1/E5b)
- GLONASS (G1/G2)
- BeiDou (B1/B2b)

Dimensions: 53\*50\*17mm

Excellent Out-Of-Band Rejection

Low Noise Figure & Low Axial Ratio

Cable: 3m of RG-174

Connector: SMA(M)

IP67 Waterproof Rating

RoHS & Reach Compliant

|                            |    |
|----------------------------|----|
| 1. Introduction            | 3  |
| 2. Specifications          | 4  |
| 3. Antenna Characteristics | 7  |
| 4. 2D Radiation Patterns   | 13 |
| 5. 3D Radiation Patterns   | 15 |
| 6. Field Test Results      | 16 |
| 7. Mechanical Drawing      | 17 |
| 8. Packaging               | 18 |
| <hr/>                      |    |
| Changelog                  | 19 |

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# 1. Introduction



The Taoglas MagmaX2 AA.175, with Taoglas Sure Technology, is an embedded, active stacked patch, GPS antenna supporting both L1 and L2 bands. It is a high performance, economical solution for the highest accuracy centimeter-level tracking applications.

Typical applications include:

- UAVs and Robotics
- RTK
- Transportation
- Agriculture
- Autonomous Vehicles
- Navigation
- Marine

This compact antenna exhibits excellent radiation patterns on both L1 and L2 bands and with a low noise figure to preserve signal quality helps minimize time to first fix. It also features excellent out-of-band rejection to prevent out-of-band signals from overdriving or damaging its LNAs.

The AA.175 features very tight Phase Centre Offset (PSO) at just  $\pm 2\text{cm}$  at the L1 Band and  $\pm 5\text{cm}$  at the L2. The precision of antenna phase center directly affects the accuracy of GNSS positioning systems and can ensure that the accuracy of the receiver really is cm level.

This antenna has been tuned and tested on a 70 x 70 mm ground plane, working at GPS L1(1575.42MHz), GPS L2(1227.6MHz) and GLONASS L1(1602MHz) with a 2 stage LNA ensuring good signal strength. It can operate with an input voltage ranging from 1.8 to 5 volts.

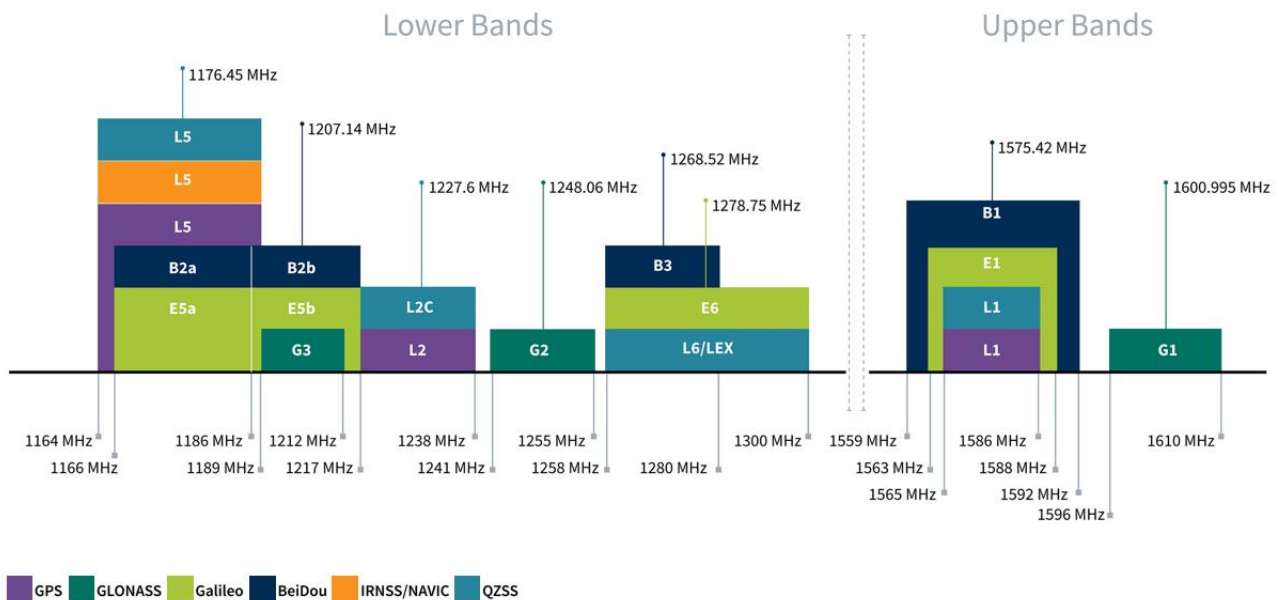
Cables and connectors are customizable. Contact your regional Taoglas customer support team to request these services or additional support to integrate and test this antenna's performance in your device.

## 2. Specifications

| GNSS Frequency Bands Covered |          |            |     |    |    |  |
|------------------------------|----------|------------|-----|----|----|--|
| GPS                          | L1       | L2         | L5  |    |    |  |
|                              | ■        | ■          | □   |    |    |  |
| GLONASS                      | G1       | G2         | G3  |    |    |  |
|                              | ■        | ■          | □   |    |    |  |
| Galileo                      | E1       | E5a        | E5b | E6 |    |  |
|                              | ■        | □          | ■   | □  |    |  |
| BeiDou                       | B1       | B2a        | B2b | B3 |    |  |
|                              | ■        | □          | ■   | □  |    |  |
| QZSS (Regional)              | L1       | L2C        | L5  | L6 |    |  |
|                              | ■        | ■          | □   | □  |    |  |
| IRNSS (Regional)             | L5       |            |     |    |    |  |
|                              | □        |            |     |    |    |  |
| SBAS                         | L1/E1/B1 | L5/B2a/E5a | G1  | G2 | G3 |  |
|                              | ■        | □          | ■   | □  | □  |  |

■ GNSS Frequency Bands Covered. □ GNSS Frequency Bands Not Covered.

\*SBAS systems: WASS(L1/L5), EGNOS(E1/E5a), SDCM(G1/G2/G3), SNAS(B1,B2a), GAGAN(L1/L5), QZSS(L1/L5), KAZZ(L1/L5).



### GNSS Bands and Constellations

| GNSS Antenna          |           |            |            |
|-----------------------|-----------|------------|------------|
| Band                  | GPS L2    | GPS L1     | GLONASS L1 |
| Centre Frequency      | 1227.6MHz | 1575.42MHz | 1602MHz    |
| VSWR                  | <2        | <2         | <2         |
| Efficiency            | 85.5%     | 66%        | 67%        |
| Peak Gain             | 3.78dBi   | 2.22dBi    | 2.05dBi    |
| Group Delay           | 19        | 11         | 11         |
| PCO (cm)              | 5         | 5          | 5          |
| PCV (cm)              | 13.9      | 18         | 17         |
| Axial Ratio at Zenith | 3(typ)    | n/a        | n/a        |
| Polarization          | RHCP      | Linear     |            |
| Impedance             | 50Ω       |            |            |

| LNA and Filter Electrical Properties |                    |                      |               |
|--------------------------------------|--------------------|----------------------|---------------|
| Band                                 | GPS L2             | GPS L1               | GLONASS L1    |
| Centre Frequency                     | 1227.6MHz±1.023MHz | 1575.42MHz ±1.023MHz | 1602MHz ±5MHz |
| Pin 1dB gain Compression Point       | +2dBm Typ          | +2dBm Typ            | +2dBm Typ     |
| Output Impedance                     | 50 Ω               |                      |               |
| Return Loss                          | <-10 dB            |                      |               |

| LNA Gain, Power Consumption and Noise Figure |          |        |       |
|--|----------|--------|-------|
|  | 1.8V Min | 3V Typ | 5.5V  |
| LNA Gain GPS L1                              | 27dB     | 27dB   | 27dB  |
| LNA Gain GLONASS L1                          | 25dB     | 25dB   | 25dB  |
| LNA Gain GPS L2                              | 28dB     | 28dB   | 28dB  |
| Noise Figure GPS L1                          | 2.6dB    | 2.6dB  | 2.6dB |
| Noise Figure GLONASS L1                      | 2.6dB    | 2.6dB  | 2.6dB |
| Noise Figure GPS L2                          | 2.6dB    | 2.6dB  | 2.6dB |
| Current Consumption                          | 16mA     | 16mA   | 16mA  |

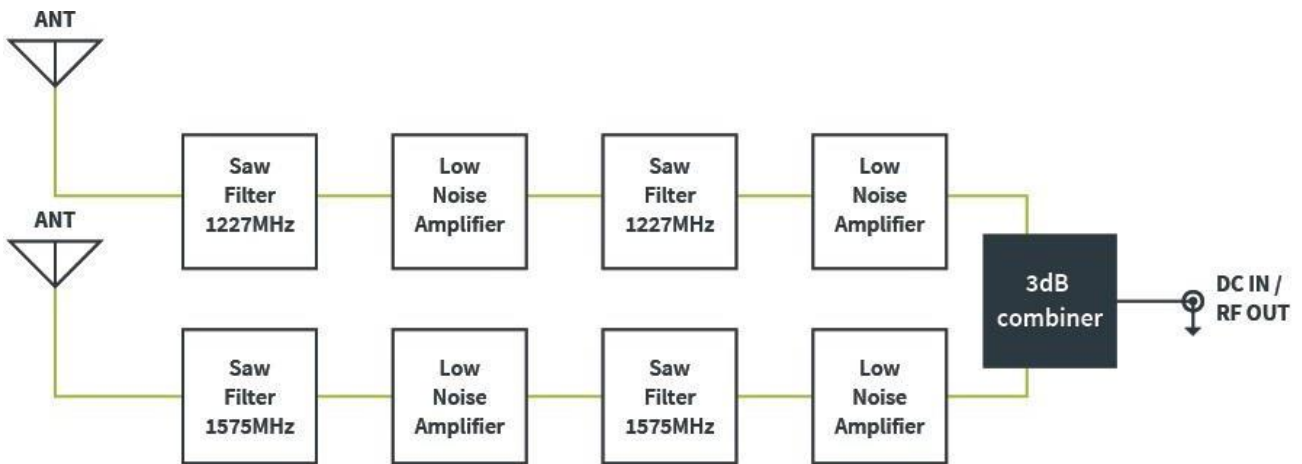
| Outer Band Attenuation |                 |                 |
|------------------------|-----------------|-----------------|
| 100MHz~1180MHz         | 1280MHz~1520MHz | 1700MHz~6000MHz |
| 40dB                   | 30dB            | 45dB            |

| Mechanical                                   |  |
|--|--|
| Embedded Ceramic Patch<br>Housing Dimensions | 53*50*17mm   |
| Housing Material                             | ABS  |
| Cable  | 3M RG174 (fully customizable)  |
| Connector                                    | SMA(M) (fully customizable)  |
| Waterproof                                   | IP67   |
| Weight                                       | 98g  |
| Magnetic Pull Force                          | Pull horizontal max pull force(kgf): 0.52<br>Pull vertical max pull force(kgf): 0.48 |

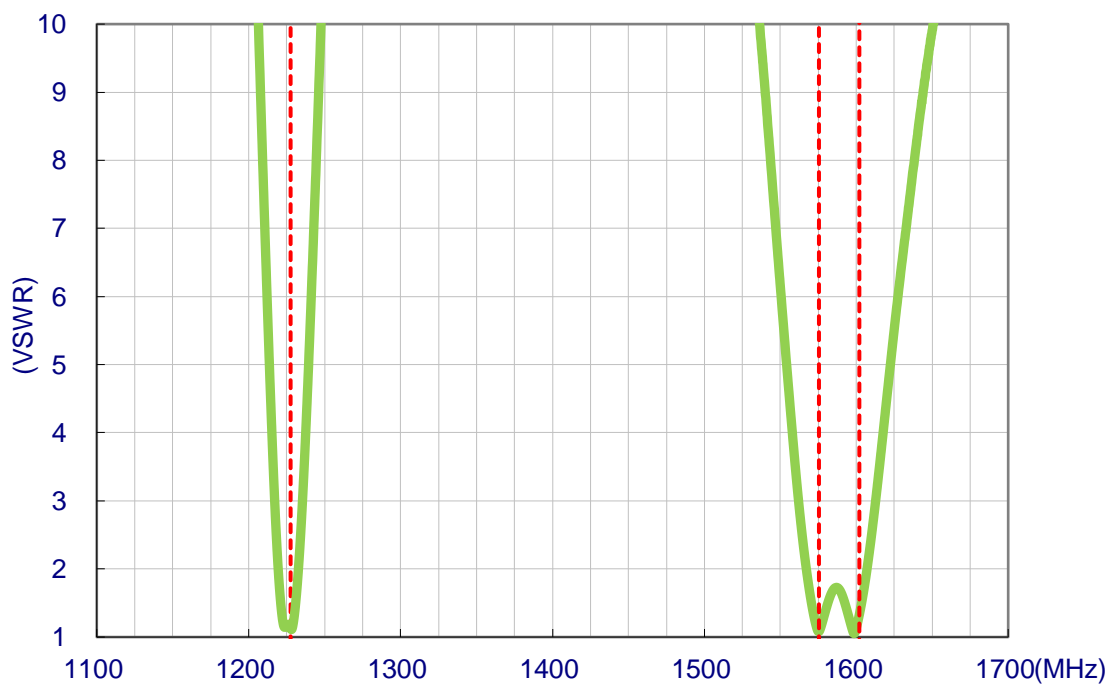
| Environmental         |                            |
|-----------------------|----------------------------|
| Operation Temperature | -40°C ~ +85°C              |
| Storage Temperature   | -40°C ~ +90°C              |
| Humidity              | Non-condensing 40°C 95% RH |

### 3. Antenna Characteristics

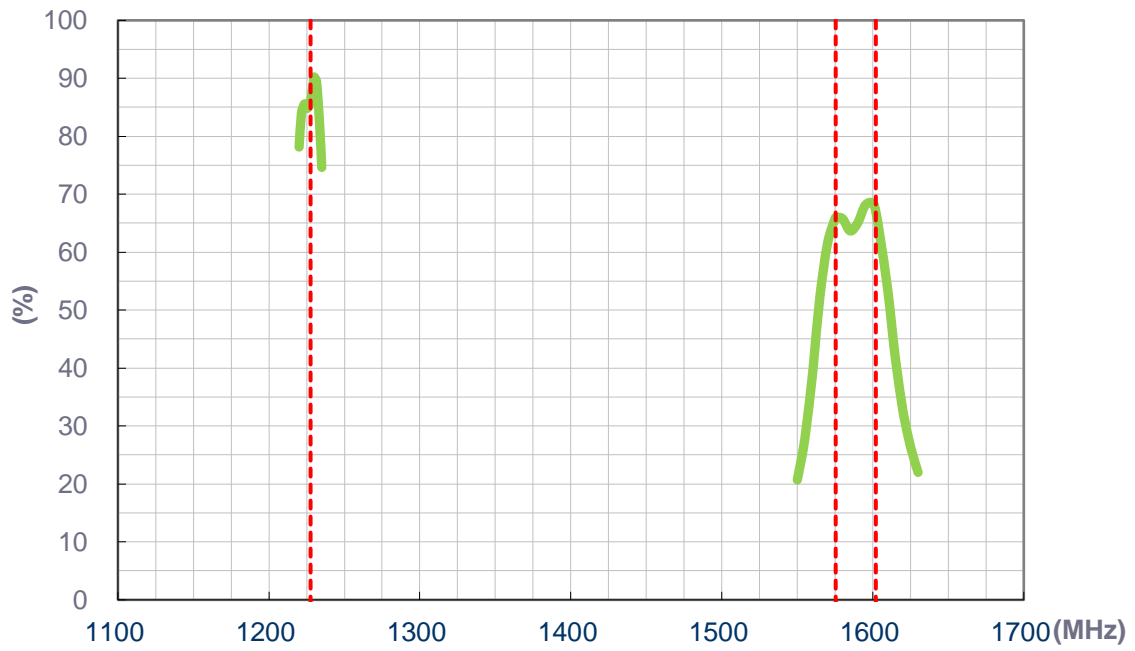
#### 3.1 Block Diagram (Active Antenna)



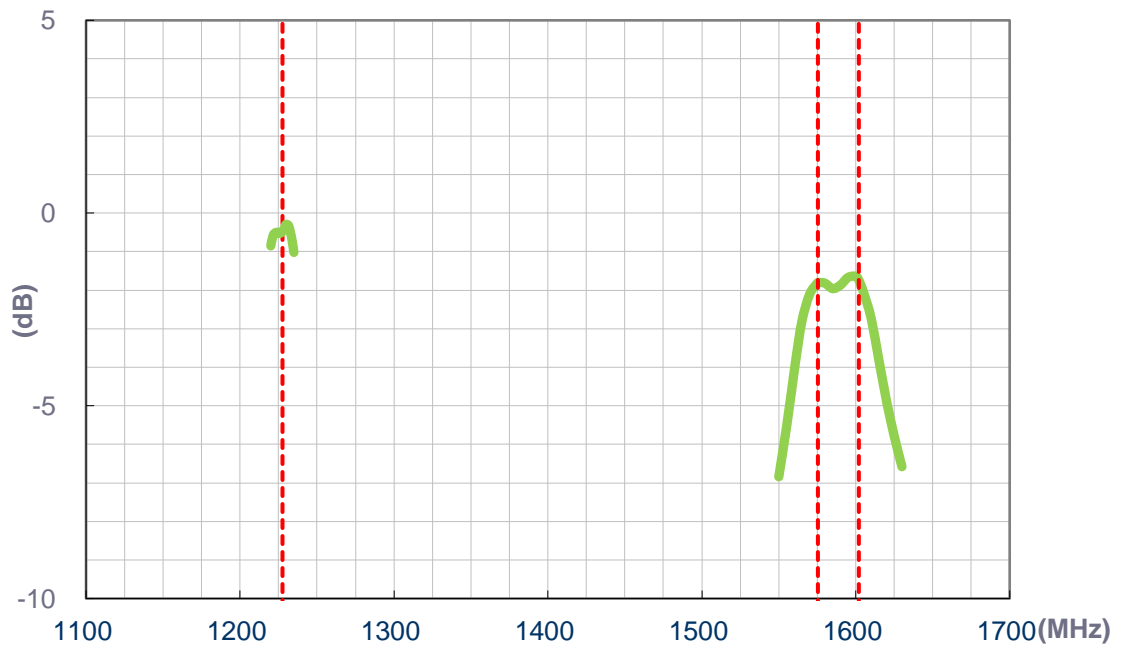
#### 3.2 VSWR (Passive antenna)



### 3.3 Efficiency (Passive Antenna)

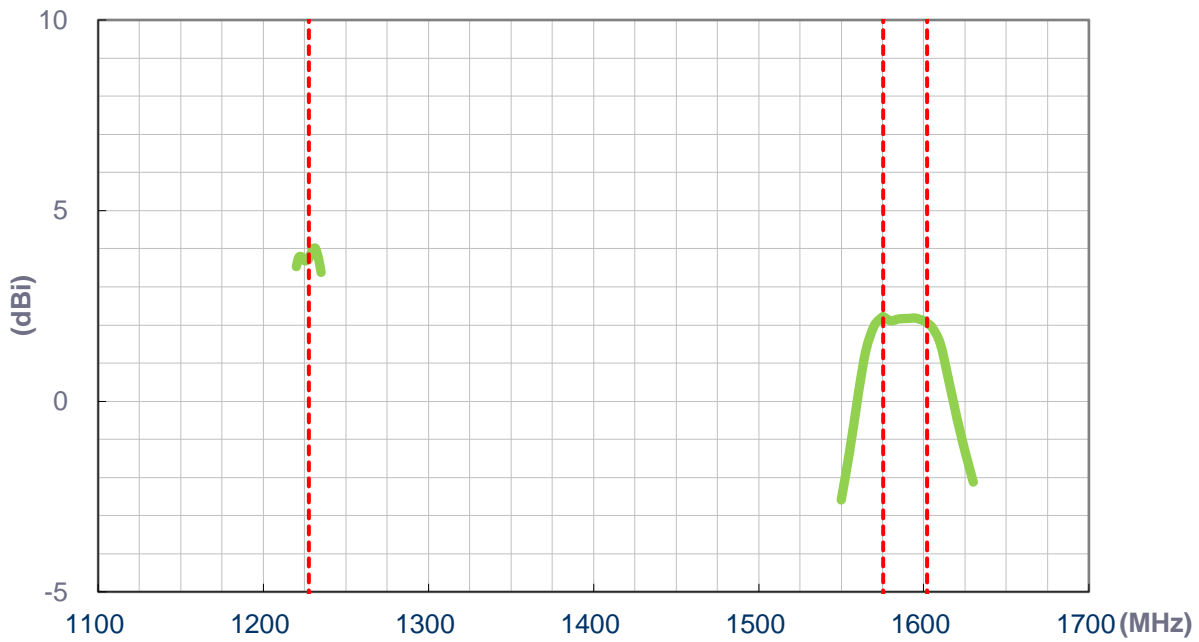


### 3.4 Average Gain (Passive Antenna)

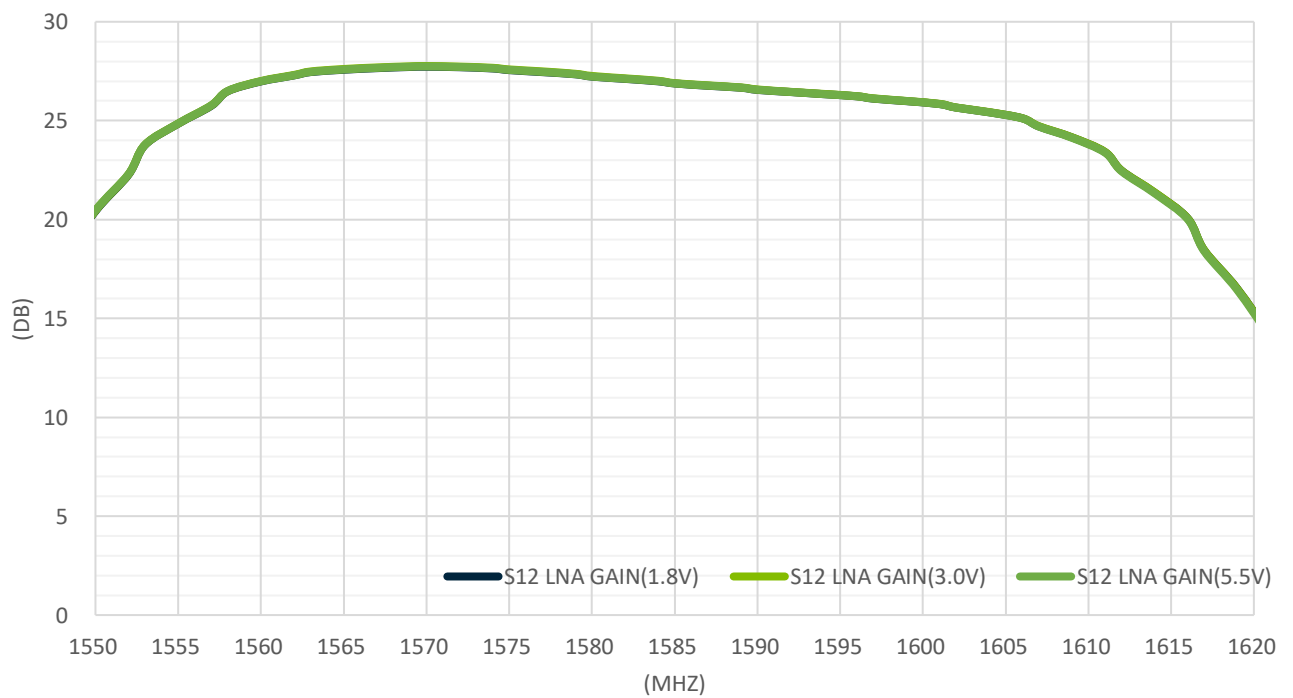




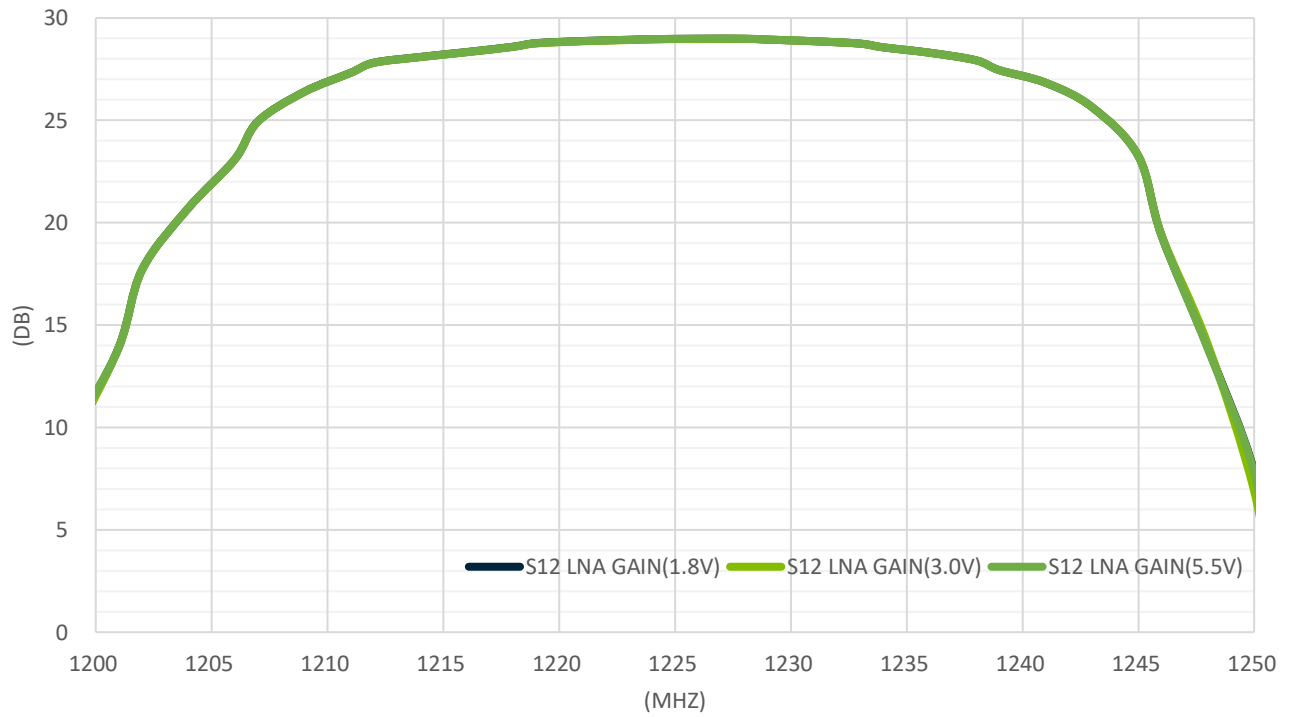
### 3.5 Peak Gain (Passive Antenna)



### 3.6 LNA Gain

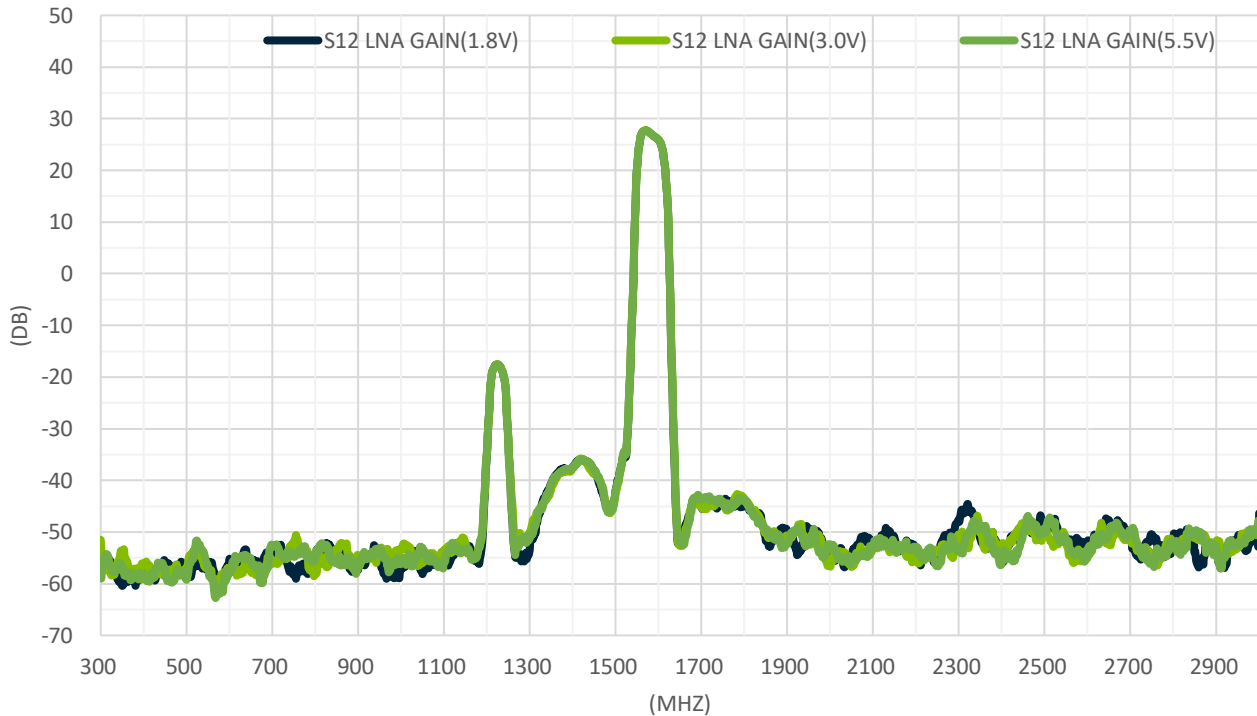


L1 1575MHz

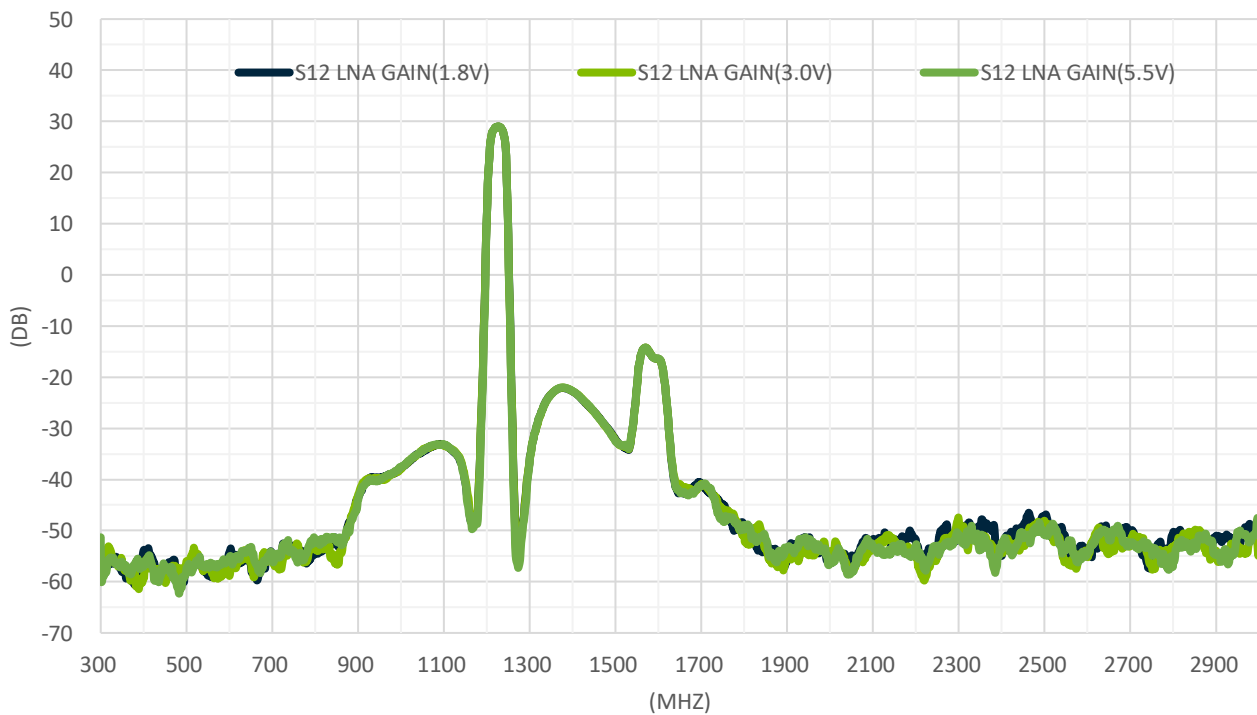


## L2 1227MHz

### 3.7 S12 Wide Band Plot

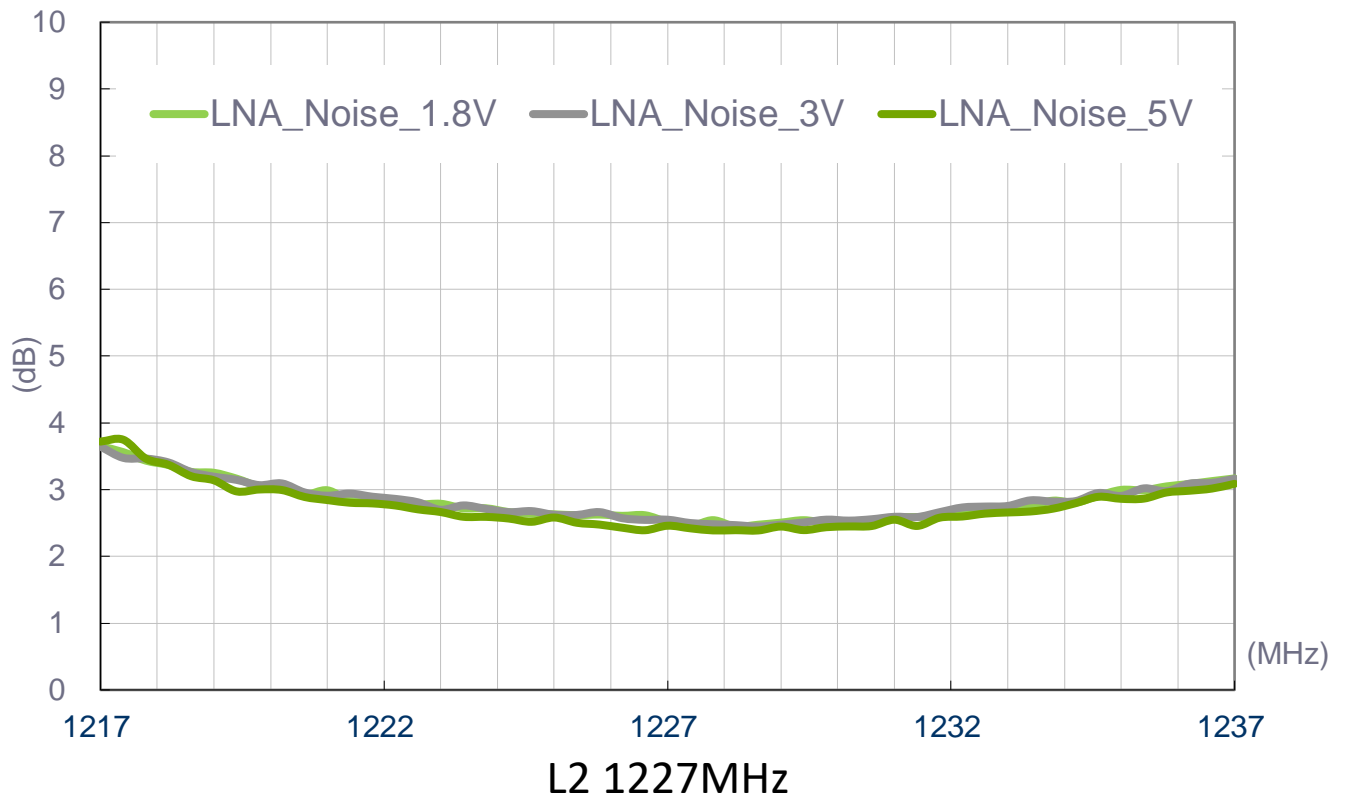
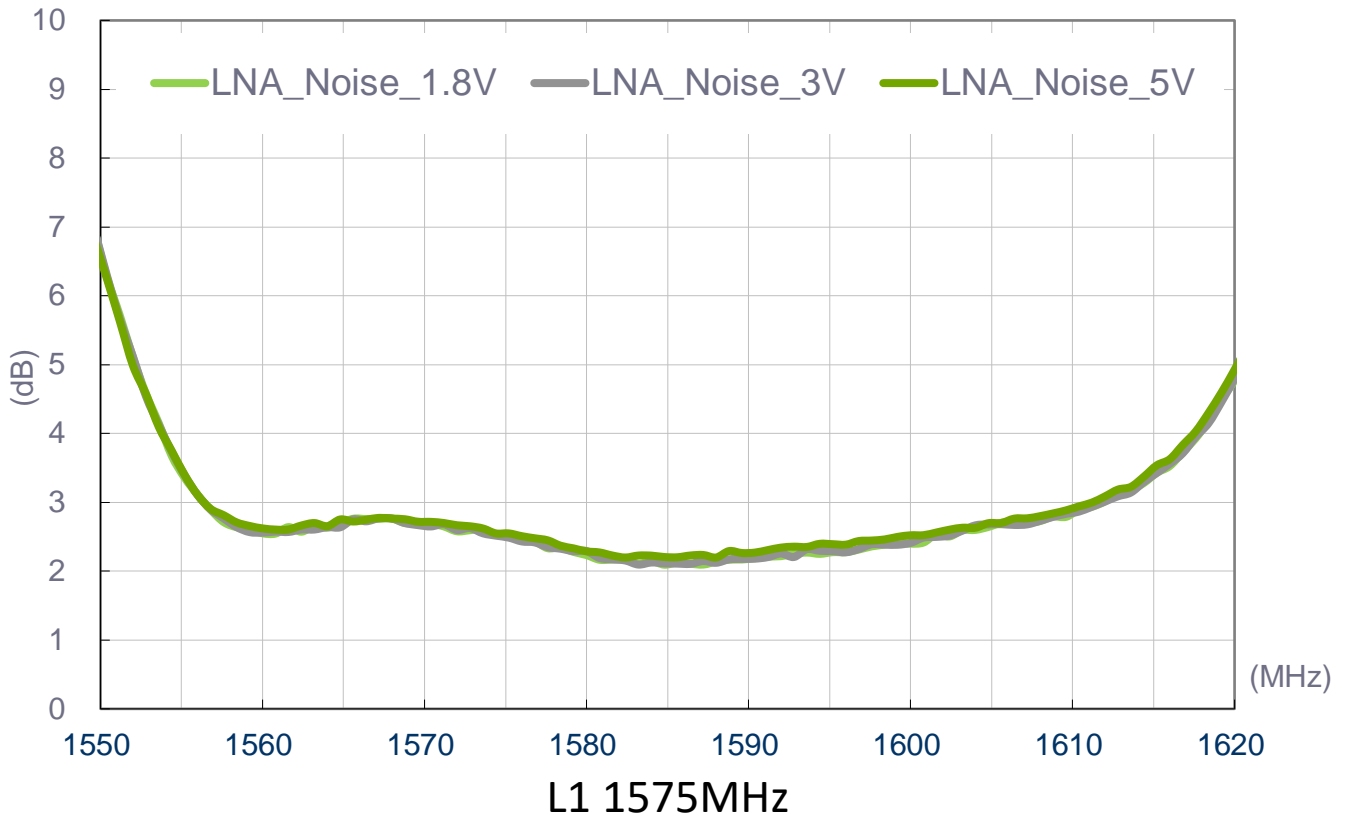


L1 1575MHz



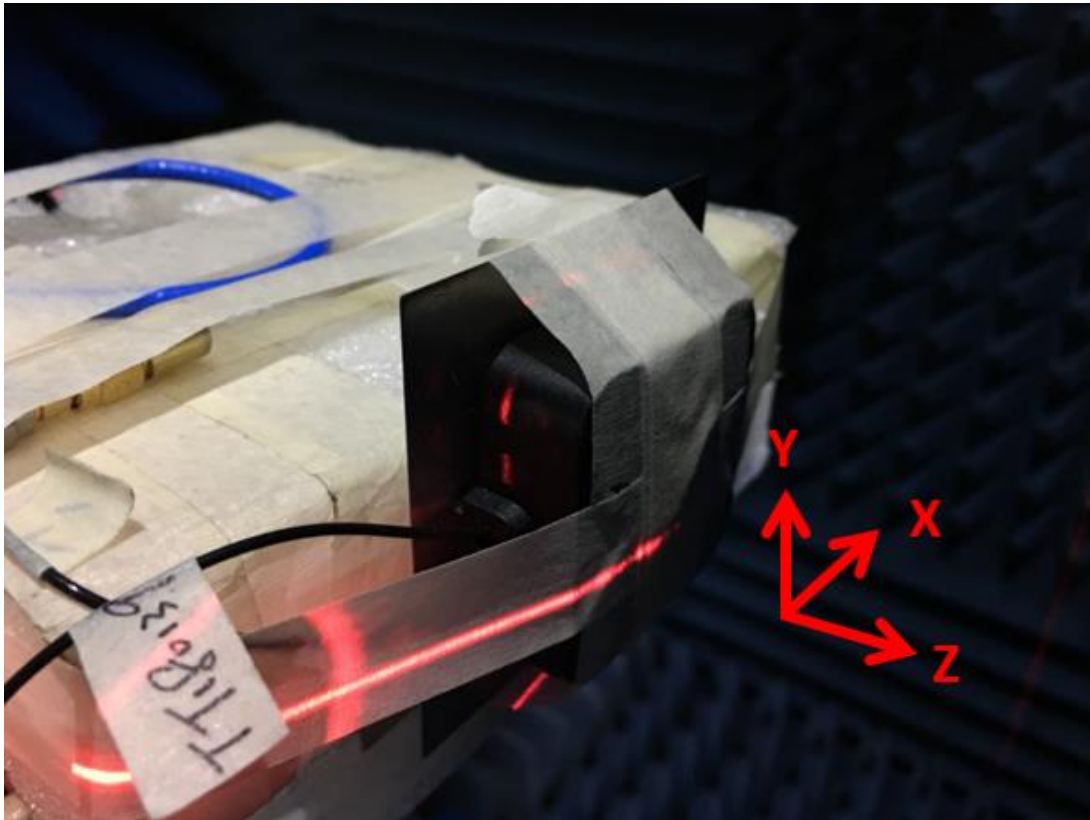
L2 1227MHz

3.8 Noise Figure

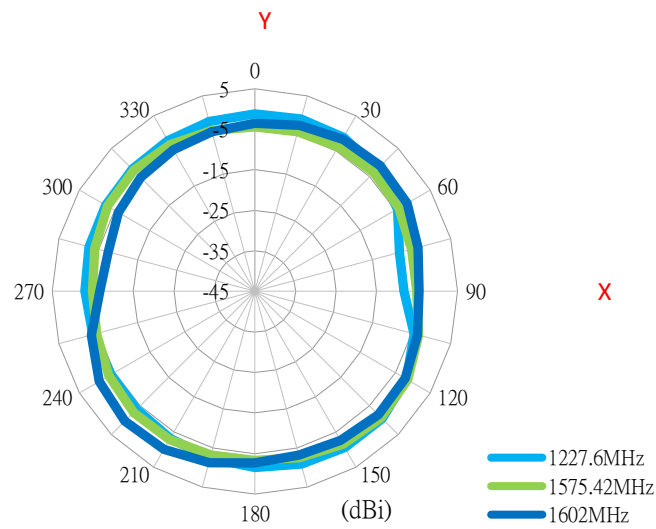


## 4. 2D Radiation Patterns

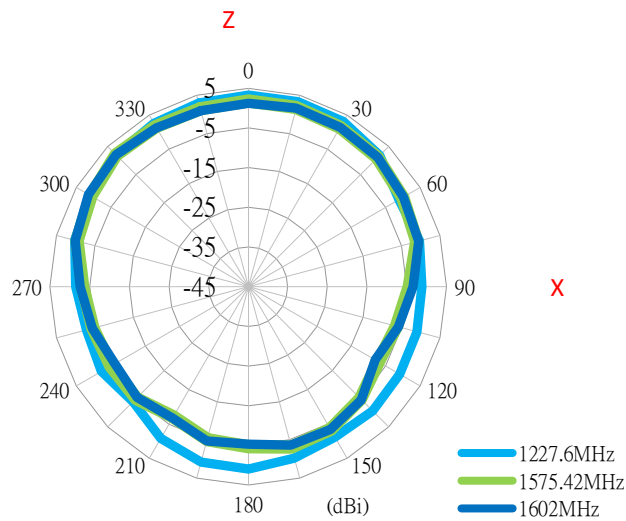
### 4.1 Test Setup



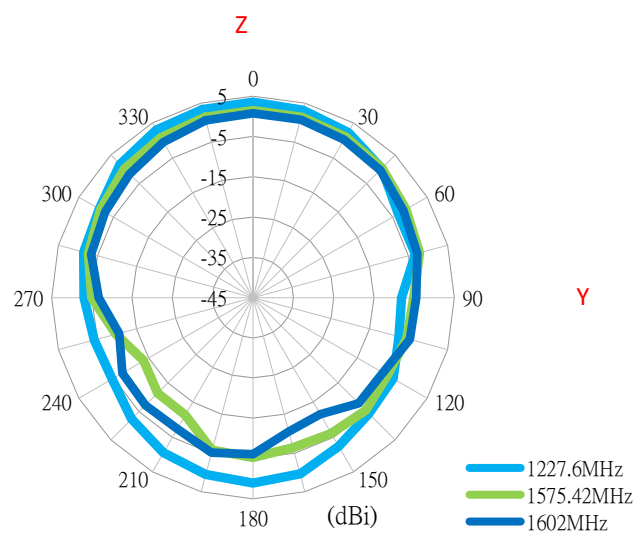
XY Plane



XZ Plane

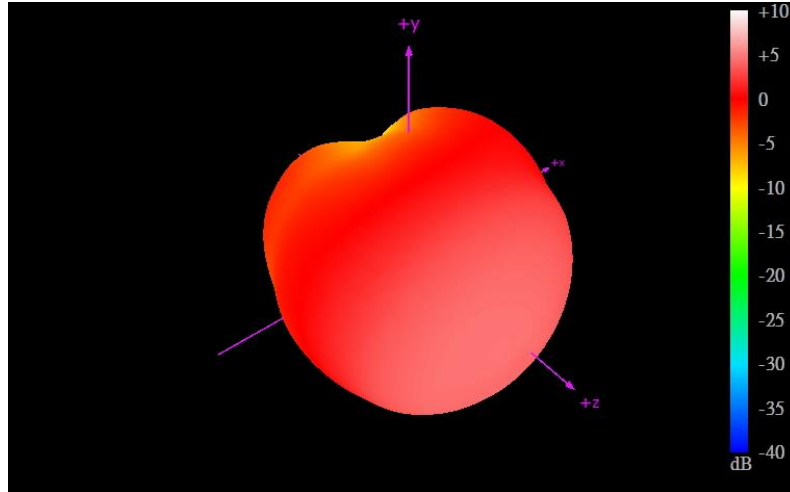


YZ Plane

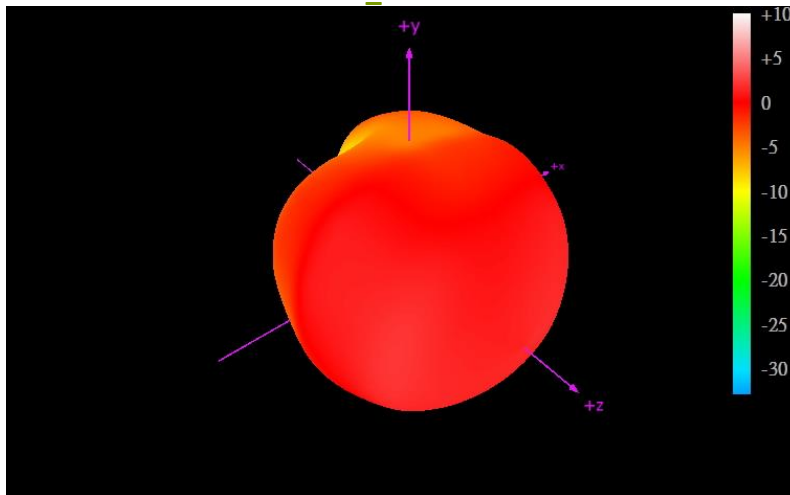


# 5. 3D Radiation Patterns

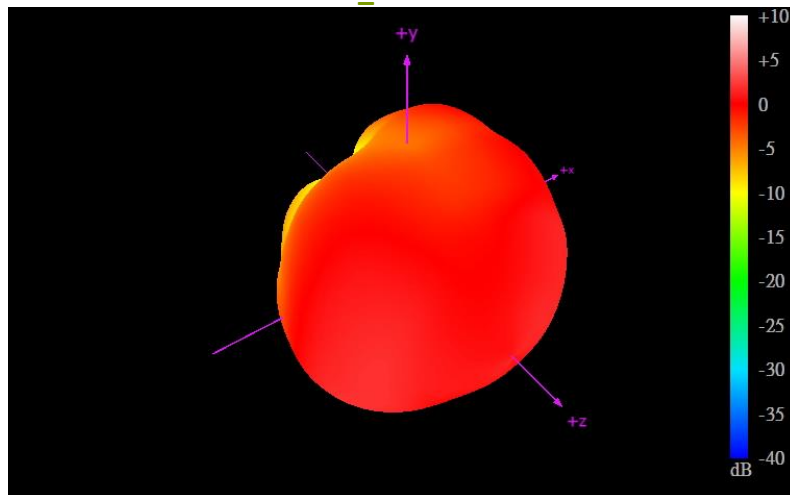
## 5.1 Free Space



GPS L2\_1227.6MHz



GPS L1\_1575.42MHz



GLONASS L1\_1602MHz

## 6. Field Test Results

### 6.1 Rooftop test

In this section Taoglas will present the field test result for AA.175 antenna. The test was performed when the antenna was mounted on a static rooftop test set up in an open sky environment for at least **6 hours**.

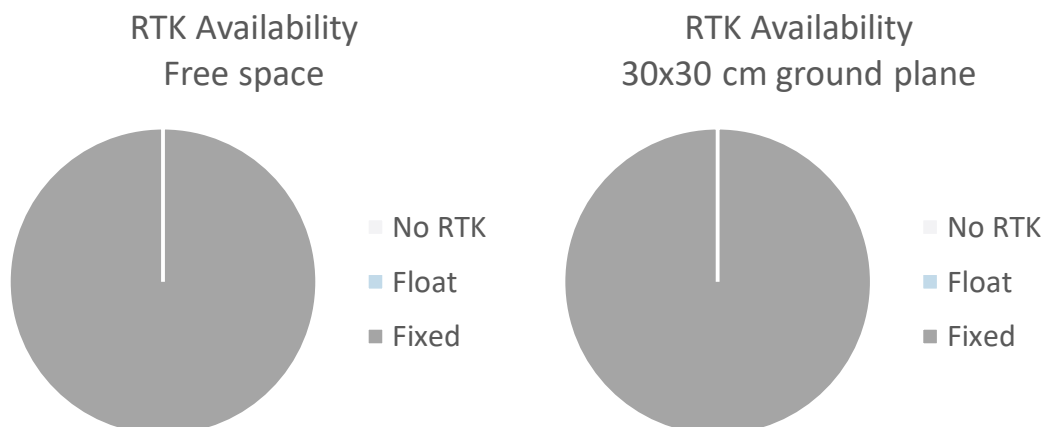
Taoglas will show the field test results using the following receiver:

#### 1. U-blox ZED-F9P

##### Receiver features:

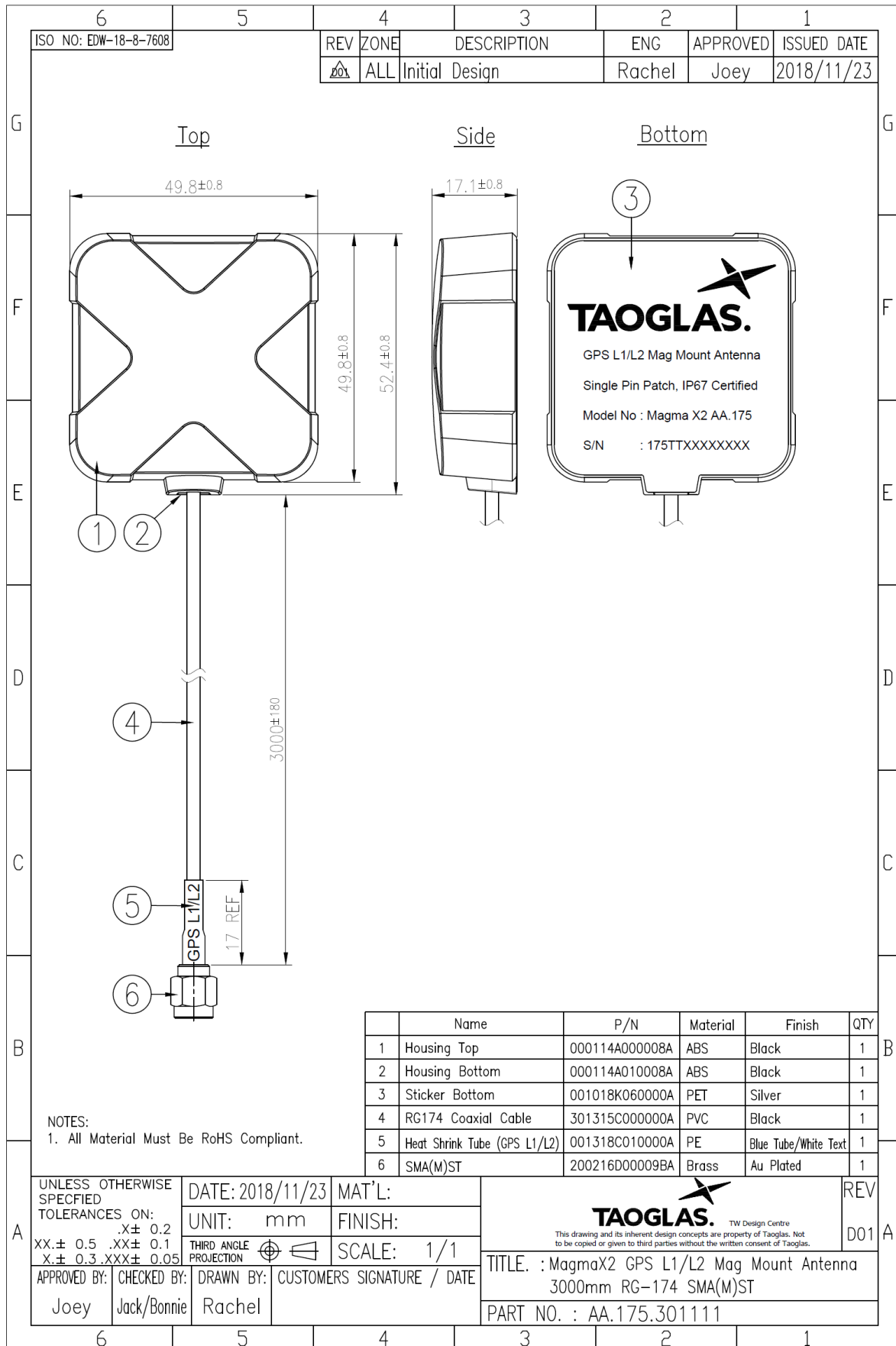
- Multi-band GNSS: 184-channel GPS L1C/A L2C, GLONASS: L1OF L2OF, Galileo: E1B/C E5b, BeiDou: B1I B2I, QZSS: L1C/A L2C
- Multi-band RTK with fast convergence times and reliable performance
- Nav. update rate RTK up to 20 Hz
- Position accuracy = RTK 0.01 m + 1 ppm CEP

| Positioning Accuracy Table (2D Accuracy) |                    |           |            |                  |           |
|--|--------------------|-----------|------------|------------------|-----------|
| Test Condition                           | Correction Service | CEP (50%) | DRMS (68%) | 2DRMS (95-98.2%) | TTF (sec) |
| Free Space                               | RTK DISABLED       | 71.9 cm   | 86.35 cm   | 172.7 cm         | 22        |
|  | RTK ENABLED        | 0.86 cm   | 1.03 cm    | 2.07 cm          | 22        |
| 30x30 cm Ground Plane                    | RTK DISABLED       | 62.43 cm  | 78.25 cm   | 156.5 cm         | 21        |
|  | RTK ENABLED        | 0.74 cm   | 0.9 cm     | 1.79 cm          | 21        |

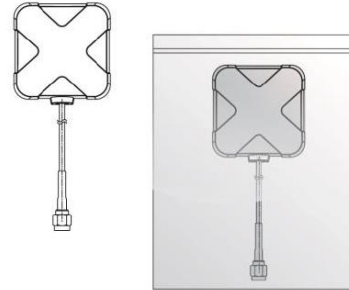




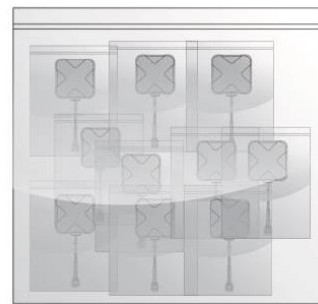
# 7. Mechanical Drawing (Units: mm)



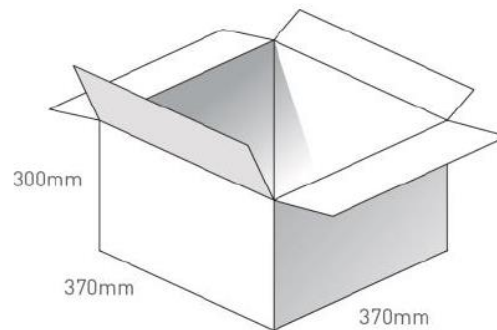
## 8. Packaging



1 pcs AA.175.301111 per PE Bag  
 SPQ: 10pcs/PE Bag



100pcs  
 10 Large PE Bags in one carton  
 Carton Dimensions-370\*370\*300mm



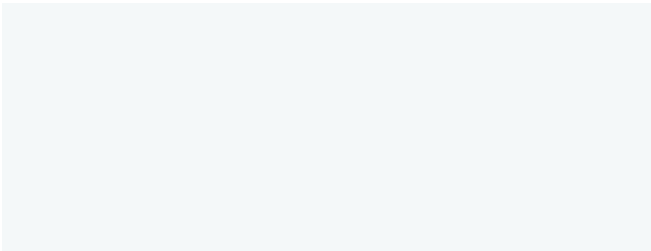
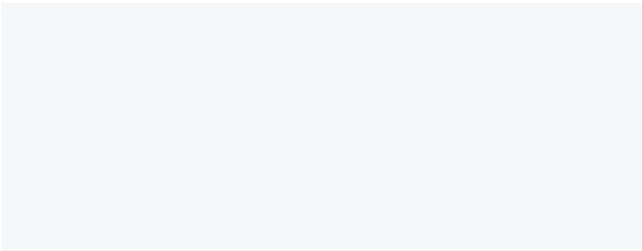
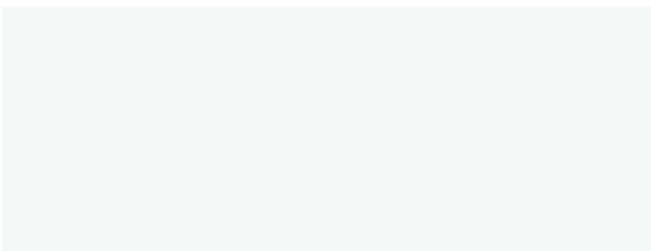
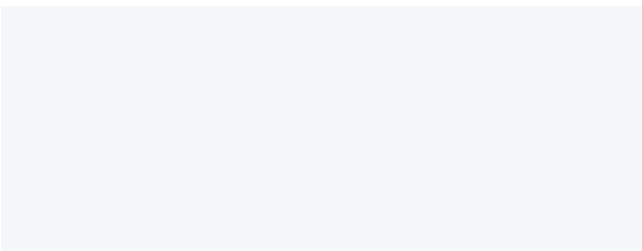
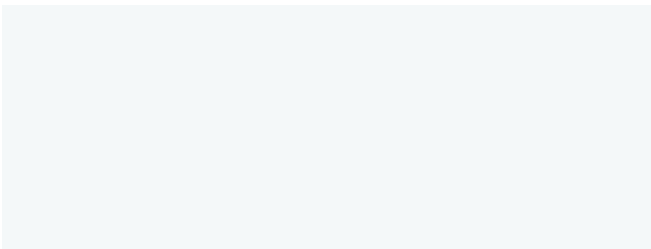
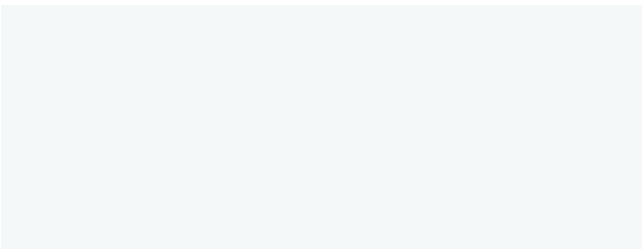
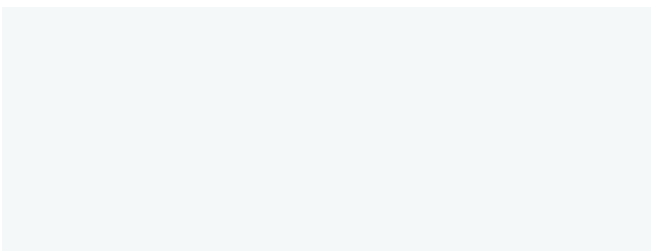
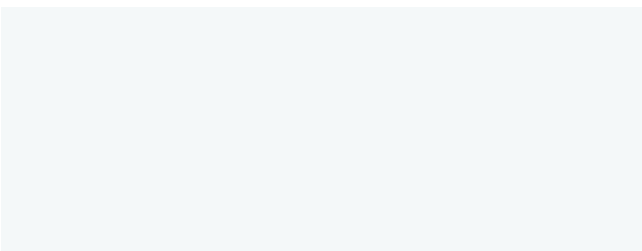
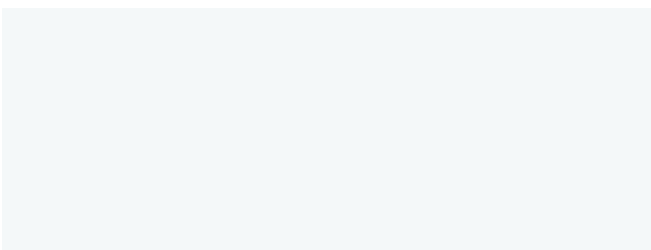
Changelog for the datasheet

**SPE-19-8-066 – AA.175.301111**

| Revision: B (Original First Release) |                  |
|--------------------------------------|------------------|
| Date:                                | 2020-06-02       |
| Notes:                               | Field test added |
| Author:                              | Victor Pinazo    |

**Previous Revisions**

| Revision: A (Original First Release) |                           |
|--------------------------------------|---------------------------|
| Date:                                | 2019-05-23                |
| Notes:                               | Initial Datasheet Release |
| Author:                              | Jack Conroy               |





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