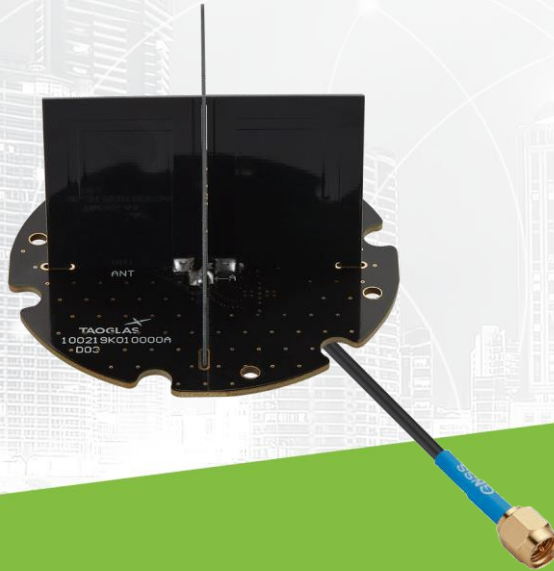




# TAOGLAS®



# Datasheet

## Embedded Cross Dipole Active Multiband GNSS Antenna

**Part No:**  
EAHP.50.01.0100D

### Description:

Embedded Active Multiband High Precision GNSS Antenna  
With 100mm RG-174 and SMA(M)

### Features:

Bands Covered:

- GPS/QZSS (L1/L2)
- GPS/QZSS/IRNSS (L5)
- QZSS (L6)
- Galileo (E1/E5a/E5b/E6)
- GLONASS (G1/G2/G3)
- BeiDou (B1/B2a/B2b/B3)

Excellent out-of-band rejection

Cable: 100mm RG-174

Connector: SMA(M) Straight

CE Certified

Dimensions: Ø75 x 42mm

RoHS & Reach Compliant

|                            |    |
|----------------------------|----|
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# 1. Introduction



The Taoglas EAHP.50 is an embedded active multi-band GNSS antenna that has been carefully designed for high performance cm-level positional accuracy on the full GNSS spectrum. Bands covered include GPS/QZSS L1/L2/L5, GLONASS G1/G2/G3, Galileo E1/E5a/E5b/E6, BeiDou B1/B2a/B2b/B3, QZSS L6, NAVIC L5, as well as SBAS (WAAS/EGNOS/GAGAN/SDCM/SNAS. This allows the user to achieve higher location accuracy, as well as stability of position tracking in urban environments with their device.

The EAHP.50 has excellent performance across the full bandwidth of the antenna and its design has an even gain across the hemisphere giving almost excellent, broad axial ratio which in turn makes it resilient to multipath rejection and excellent phase centre stability. The LNA used in the EAHP.50 ensures excellent out of band rejection and provides excellent positioning stability and reliability of GNSS signals.

Typical applications for the EAHP.50 include:

- Autonomous Driving
- Precision Positioning for Robotics
- Precision Agriculture
- Inventory Management & Container tracking
- Telematics & Asset Tracking
- Timing Accuracy Synchronization

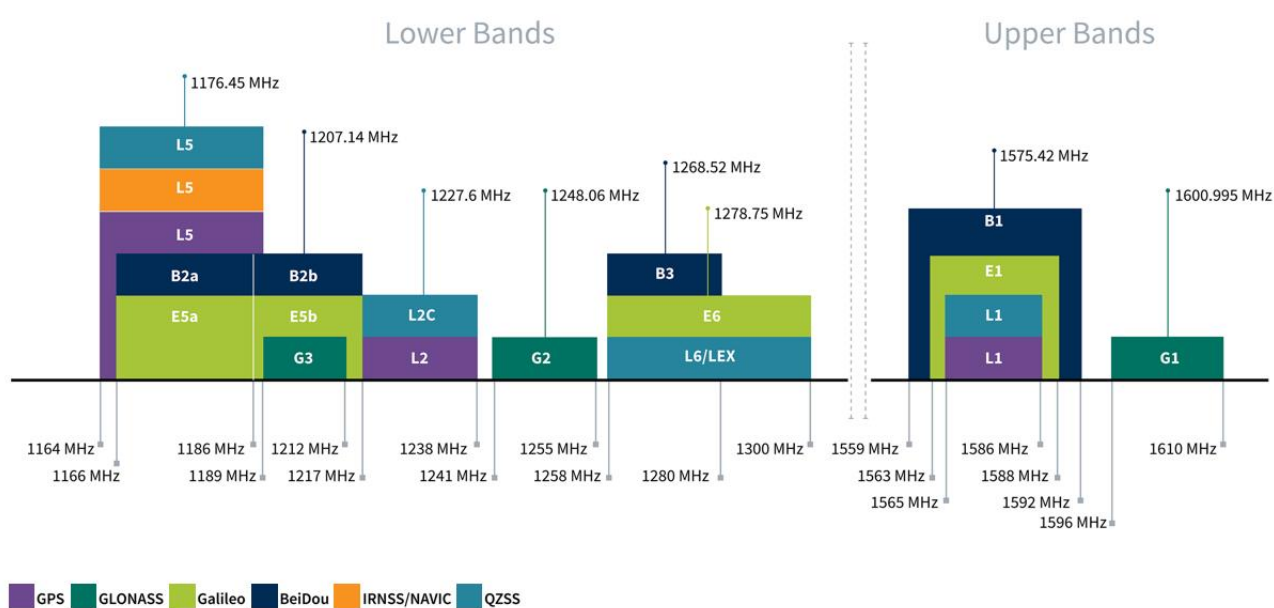
The EAHP.50 is the latest addition to an ongoing product road map of high precision antennas by Taoglas. For RTK applications, when used on the base and/or the rover, the EAHP.50 can achieve genuine cm-level accuracy.

Cable and connectors are customizable. Please contact your regional Taoglas customer support team for further information.

## 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 |  |  |
|                              | ■        | ■          | ■   | ■  | ■  |  |  |

\*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 Electrical                      |                                        |        |         |       |         |       |
|--------------------------------------|----------------------------------------|--------|---------|-------|---------|-------|
| Frequency (MHz)                      | 1176.45                                | 1227.6 | 1278.75 | 1561  | 1575.42 | 1602  |
| VSWR (max.)                          | 1.3:1                                  | 1.3:1  | 1.5:1   | 1.5:1 | 1.5:1   | 1.4:1 |
| Passive Antenna Efficiency (%)       | 44.3                                   | 50.6   | 48      | 53    | 59      | 59    |
| Passive Antenna Gain at Zenith (dBi) | 4.3                                    | 4.5    | 3.9     | 4.7   | 5.1     | 4.6   |
| Average Gain (dB)                    | -3.5                                   | -3     | -2.8    | -2.7  | -2.3    | -2.3  |
| Axial Ratio (dB) Ground Plane        | 1.2                                    | 1      | 1.5     | 1.5   | 1.5     | 1.9   |
| Group Delay (ns)                     | 5                                      | 5      | 4       | 15    | 15      | 15    |
| PCO (cm)                             | 0.5                                    | 0.01   | 0.6     | 1     | 1       | 1     |
| PCV (cm)                             | 1.9                                    | 1.1    | 1.04    | 0.6   | 0.6     | 0.6   |
| Polarization                         | Right-Hand Circularly Polarized (RHCP) |        |         |       |         |       |
| Impedance                            | 50Ω                                    |        |         |       |         |       |
| Cable                                | 100mm RG-174 as Standard               |        |         |       |         |       |
| Connector                            | SMA(M) Straight as Standard            |        |         |       |         |       |

**Note:** The antenna was tested on a 30 x 30 cm ground plane

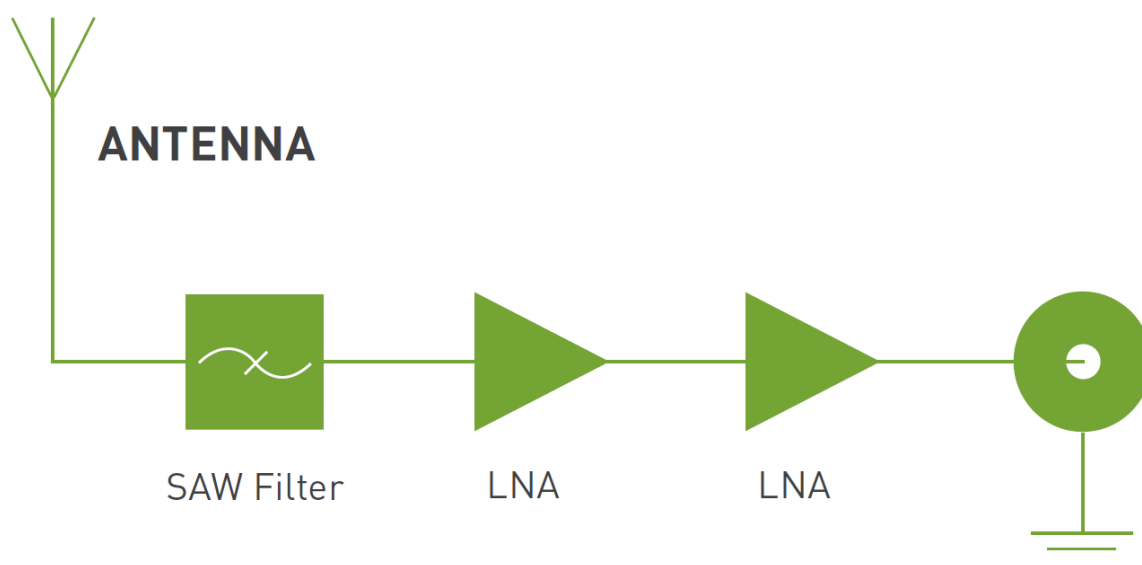
| LNA and Filter Electrical Properties |                 |                 |                |                  |            |               |              |
|--------------------------------------|-----------------|-----------------|----------------|------------------|------------|---------------|--------------|
| Frequency (MHz)                      | L5<br>1176.45   | GAL E5b<br>1207 | GPS L2<br>1227 | L6/E6<br>1278.75 | B1<br>1561 | L1<br>1575.42 | L1PT<br>1602 |
| Gain (typical)                       | 25 dB           | 27 dB           | 26 dB          | 24 dB            | 25 dB      | 27 dB         | 25 dB        |
| Noise Figure (typical)               | 5.0 dB          | 4.3 dB          | 4.1 dB         | 3.8 dB           | 3.0 dB     | 2.8 dB        | 2.6 dB       |
| Current Draw (typical)               | < 20 mA         |                 |                |                  |            |               |              |
| Input Voltage                        | +1.8 to +5 VDC  |                 |                |                  |            |               |              |
| Out-Of-Band Attenuation (dB)         | 100 - 900 MHz   |                 |                | > 45             |            |               |              |
|                                      | 900 - 1000 MHz  |                 |                | > 30             |            |               |              |
|                                      | 1350 - 1520 MHz |                 |                | > 25             |            |               |              |
|                                      | 1700 - 2000 MHz |                 |                | > 35             |            |               |              |
|                                      | 2000 - 6000 MHz |                 |                | > 45             |            |               |              |

| Mechanical              |                             |
|-------------------------|-----------------------------|
| Height                  | 42 mm                       |
| Planner Dimension       | 75 mm Diameter              |
| Cable*                  | 100mm of RG-174 as standard |
| Connector*              | SMA(M)ST as standard        |
| Weight                  | 31g                         |
| Environmental           |                             |
| Temperature Range       | -40°C to 85°C               |
| Humidity                | Non-condensing 65°C 95% RH  |
| RoHS Compliant          | Yes                         |
| REACH Compliant         | Yes                         |
| RED Directive Compliant | Yes                         |

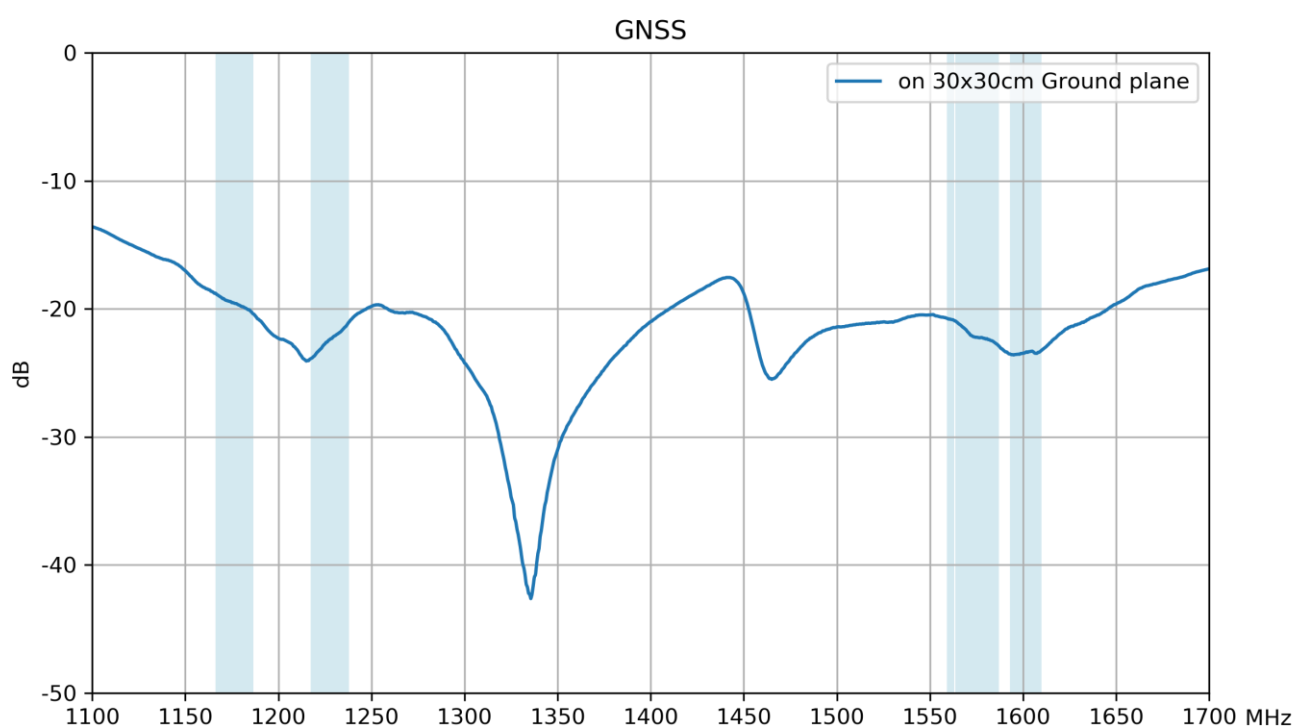
\*Cable and connectors are fully customizable.

## 3. Antenna Characteristics

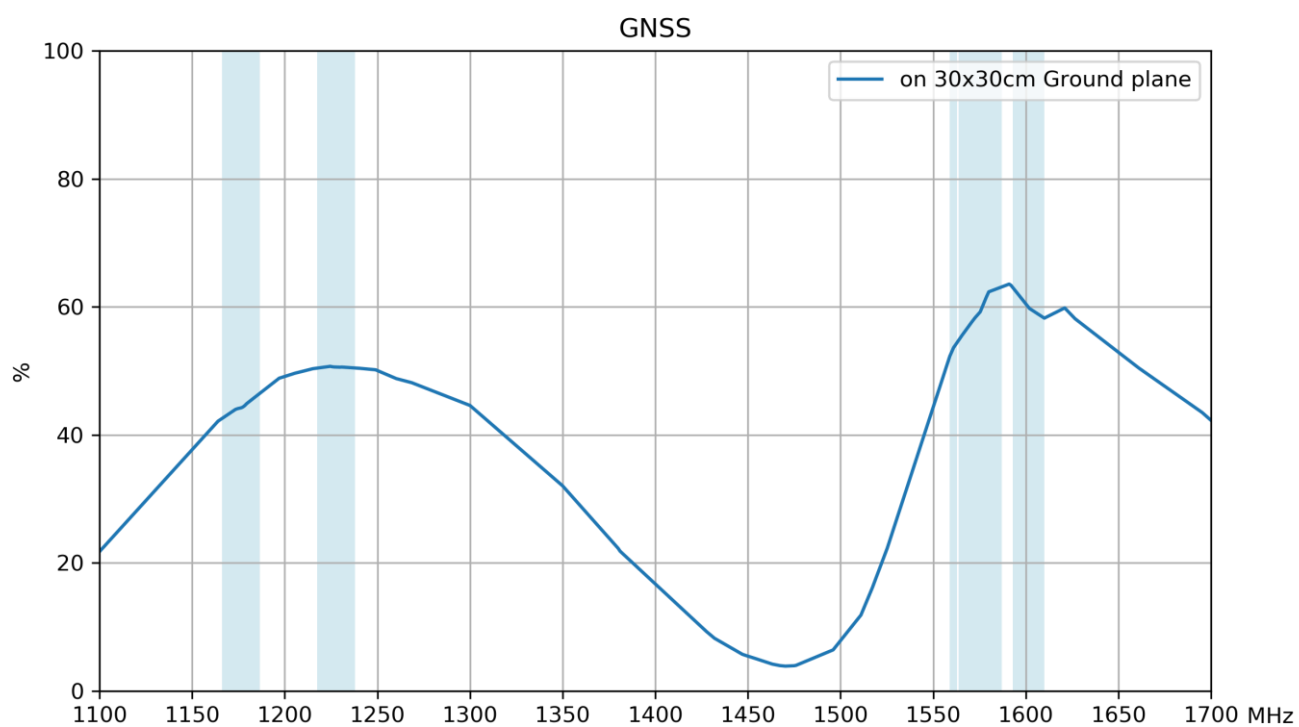
### 3.1 Block Diagram



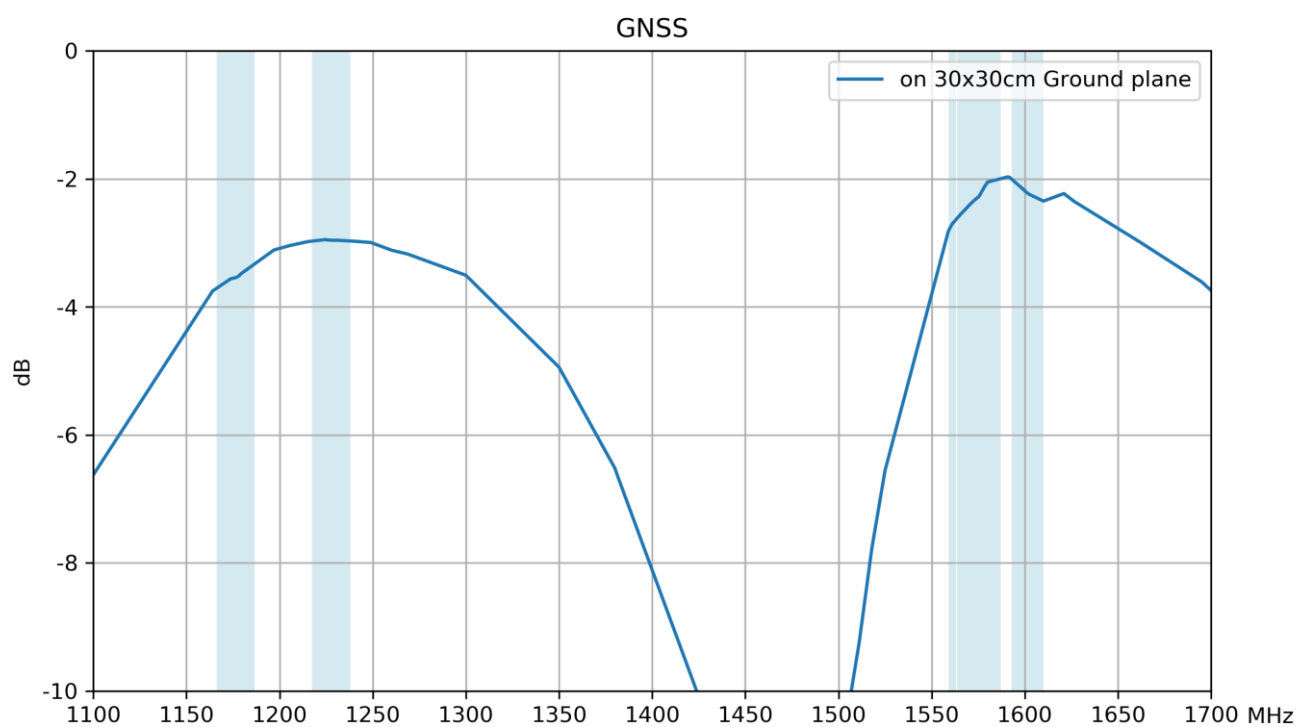
### 3.2 Return Loss



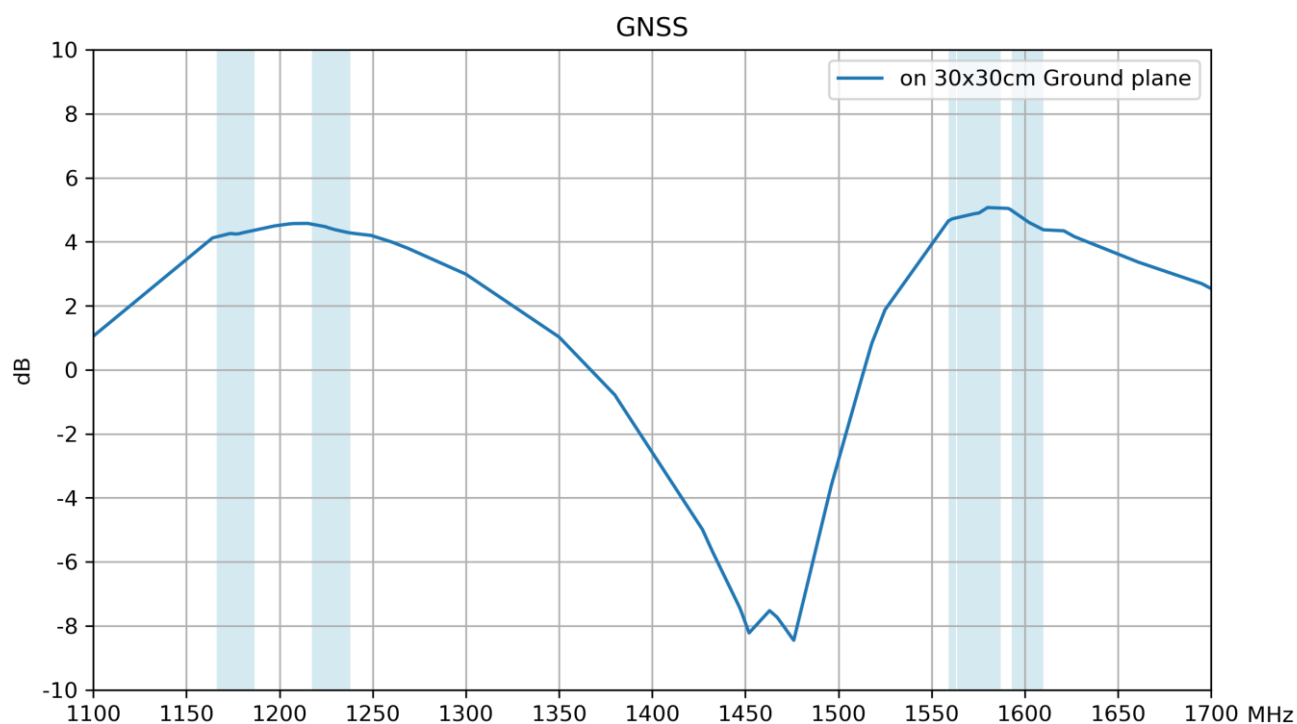
### 3.3 Efficiency



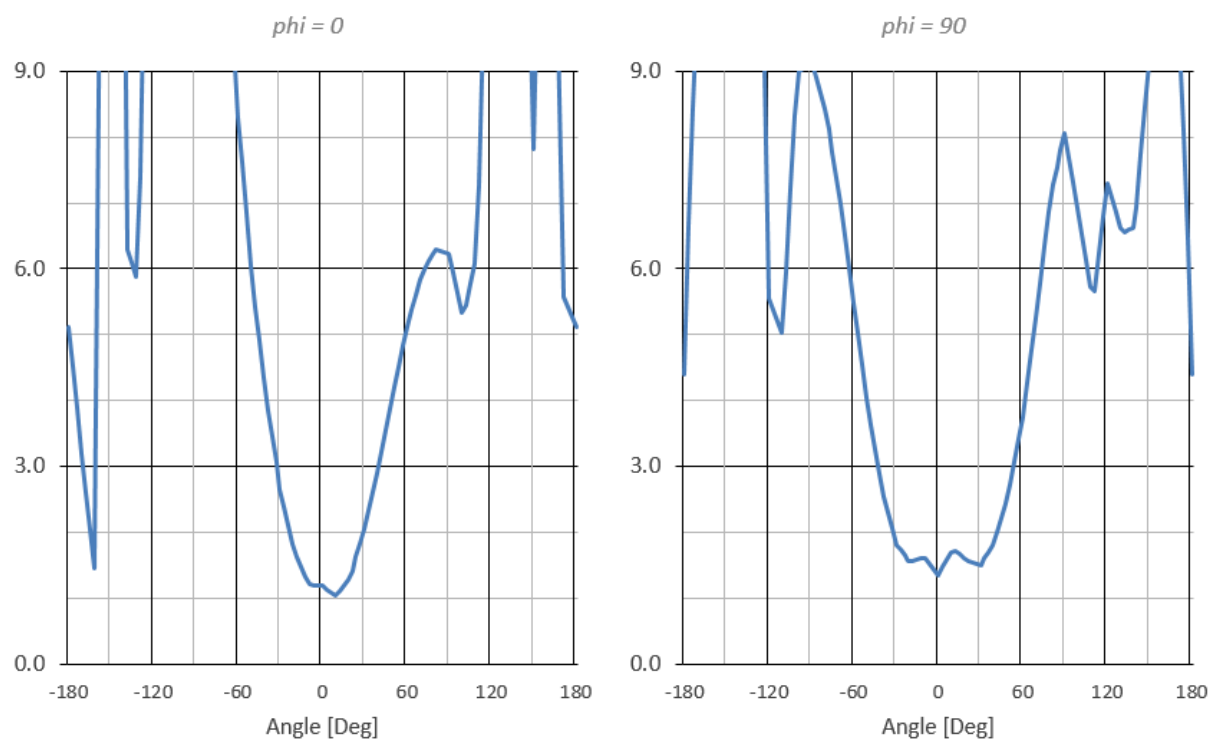
### 3.4 Average Gain



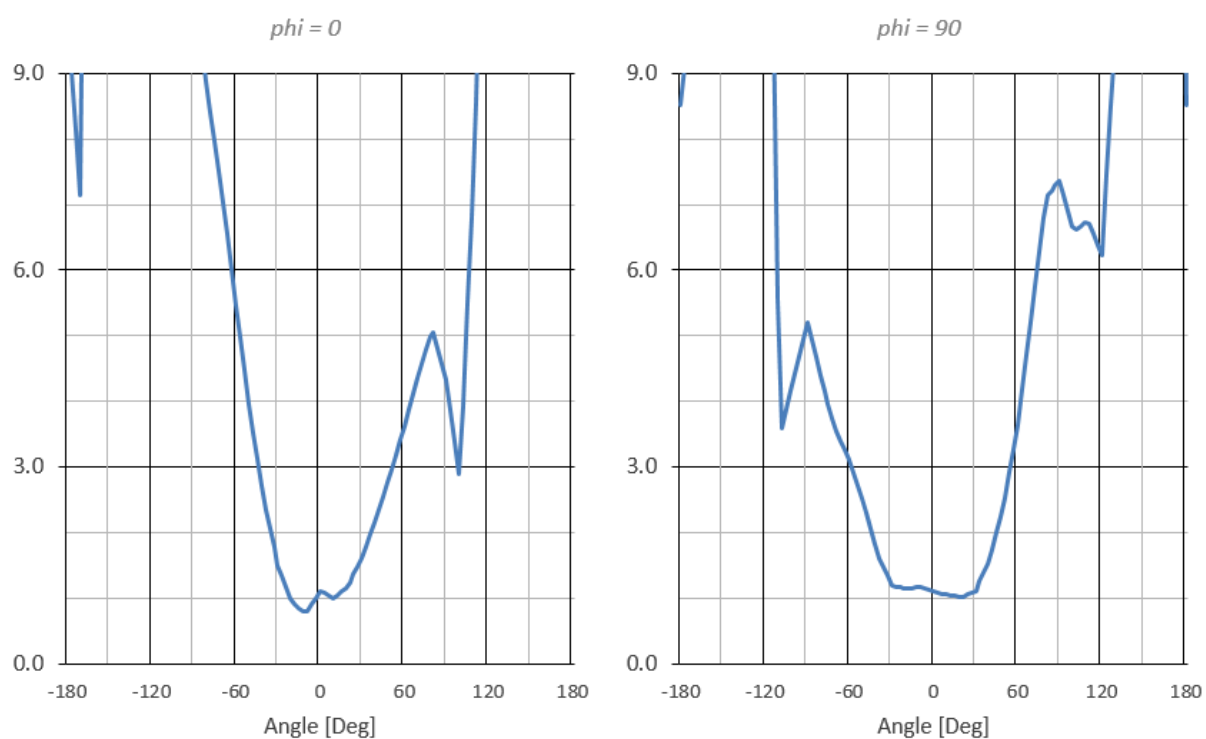
### 3.5 Peak Gain



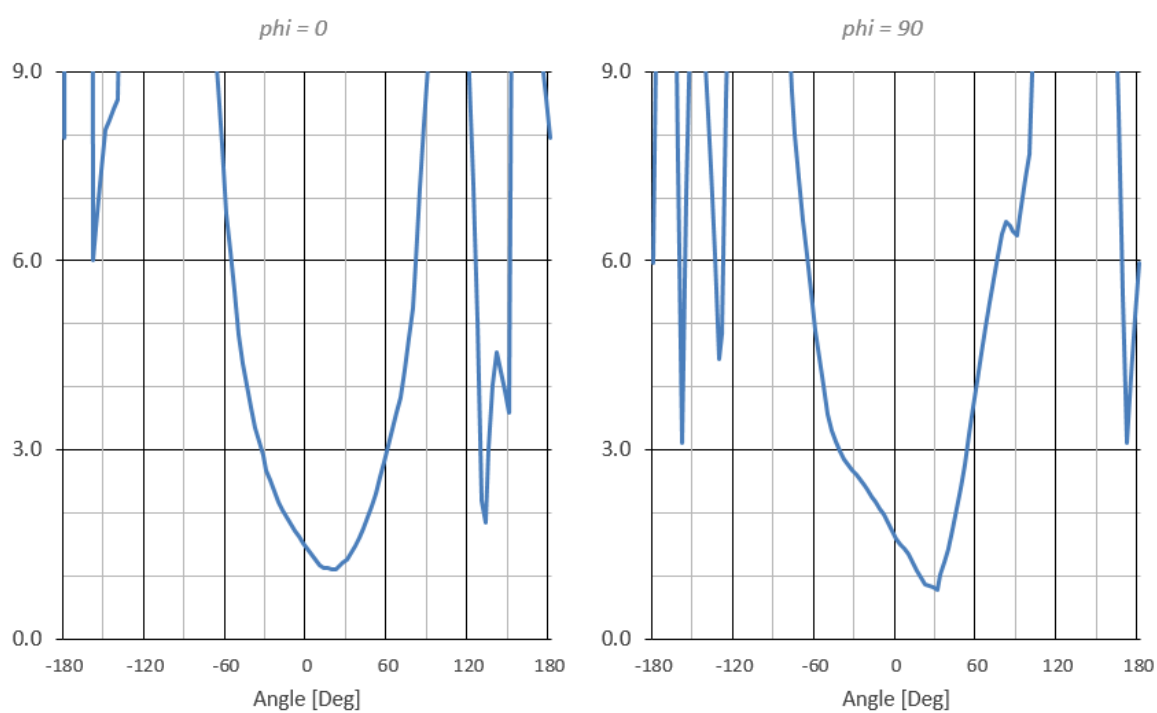
### 3.6 Axial Ratio @ 1176MHz



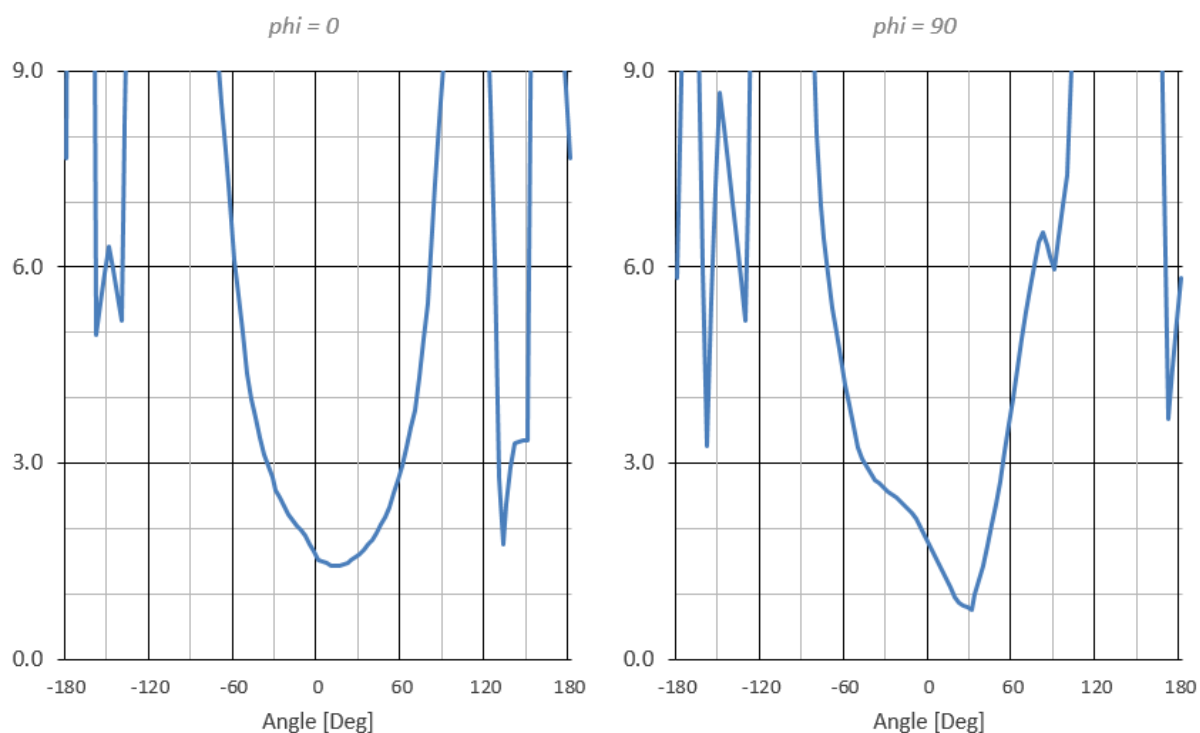
### 3.7 Axial Ratio @ 1227MHz



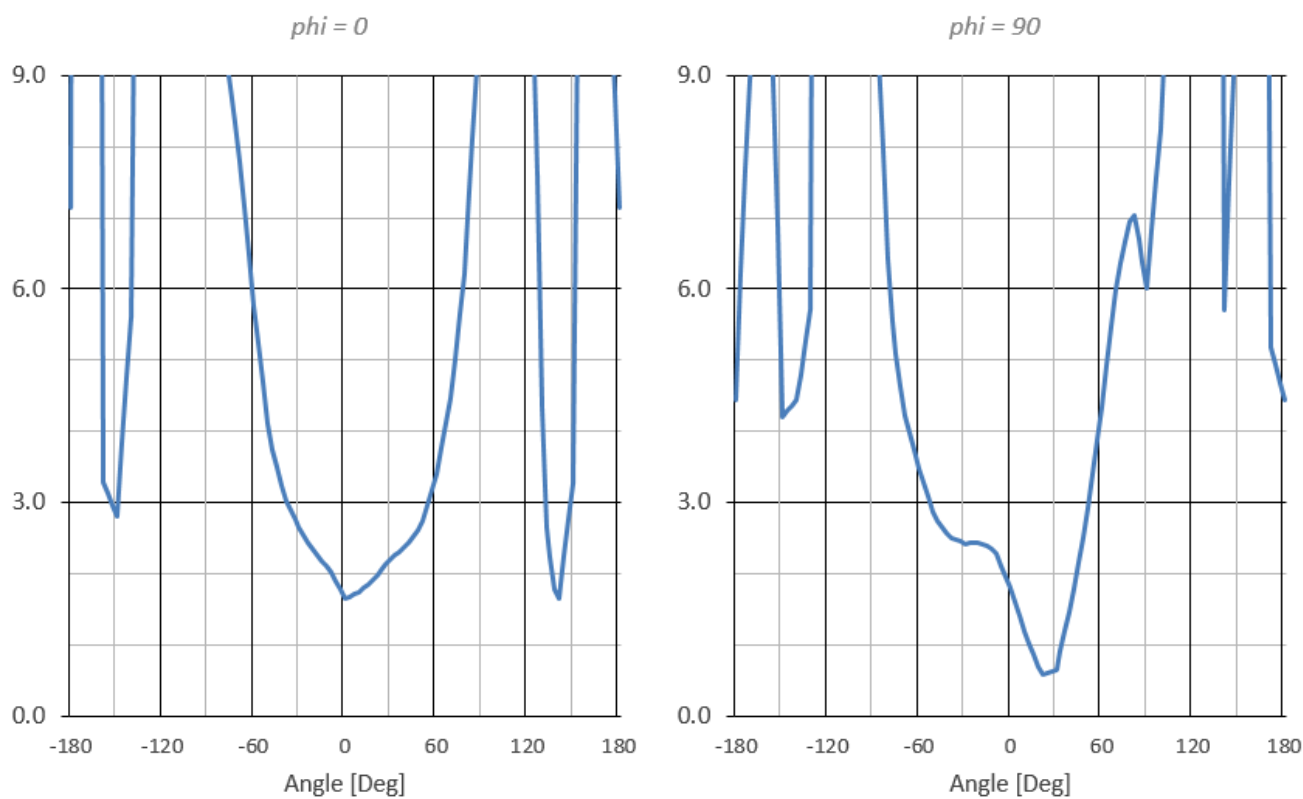
### 3.8 Axial Ratio @ 1561MHz



### 3.9 Axial Ratio @ 1575.42MHz

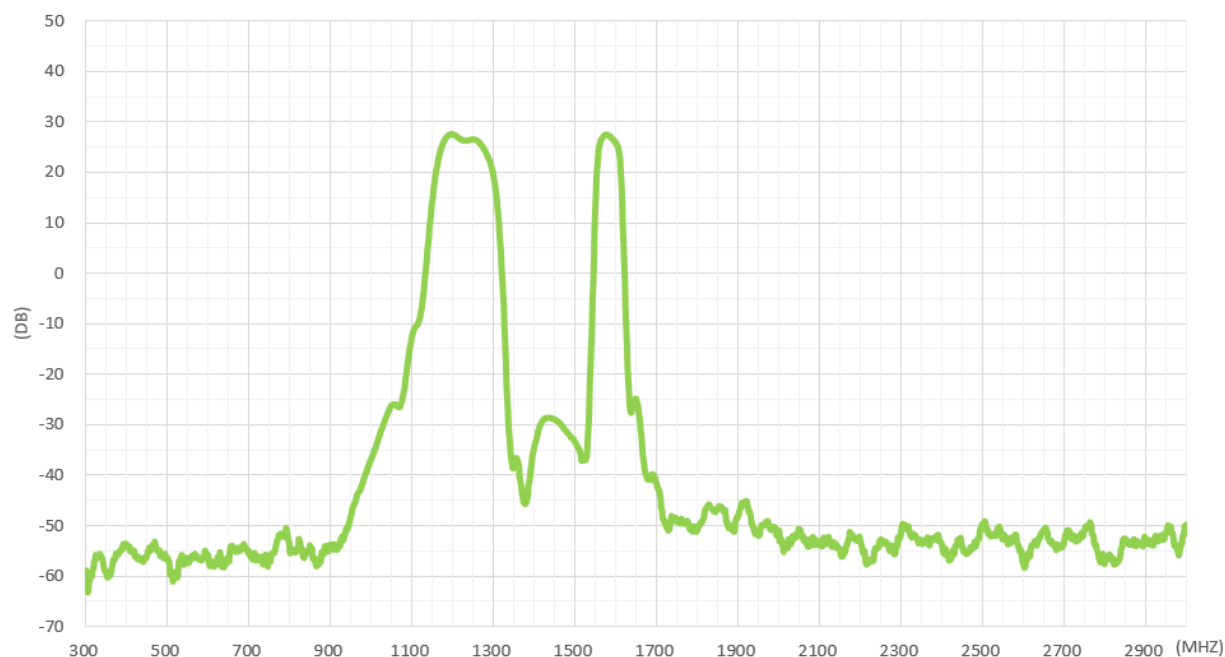


### 3.10 Axial Ratio @ 1602MHz

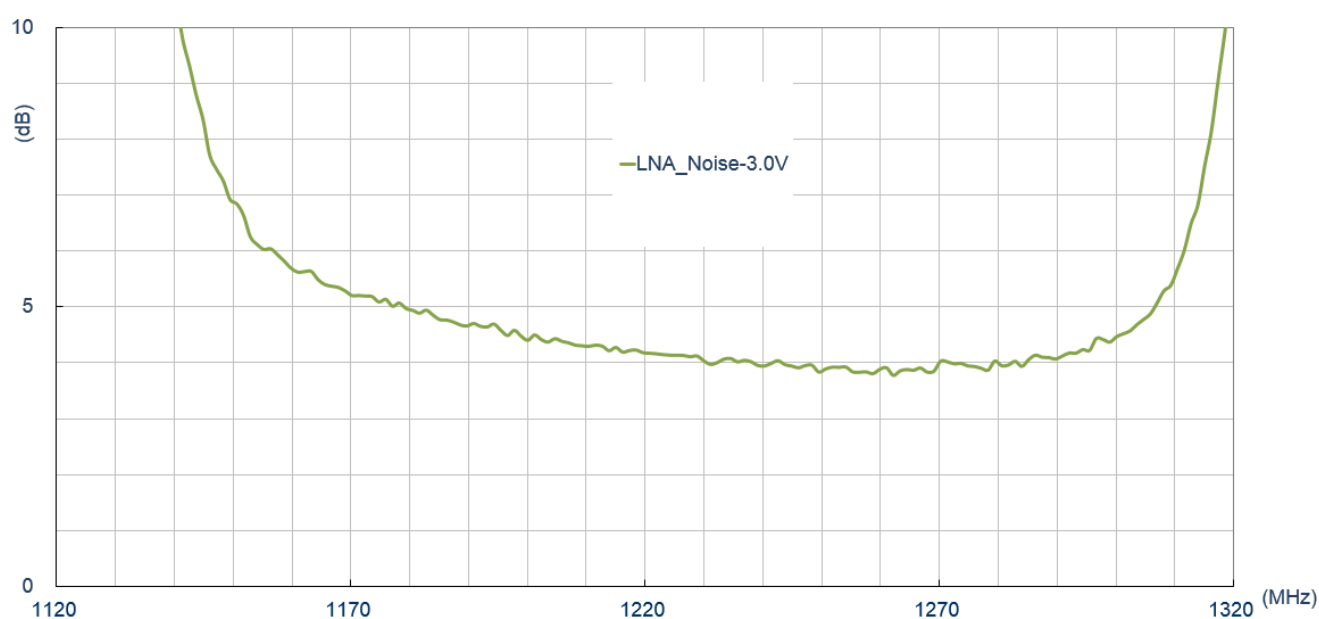


## 4. Active Antenna Characteristics

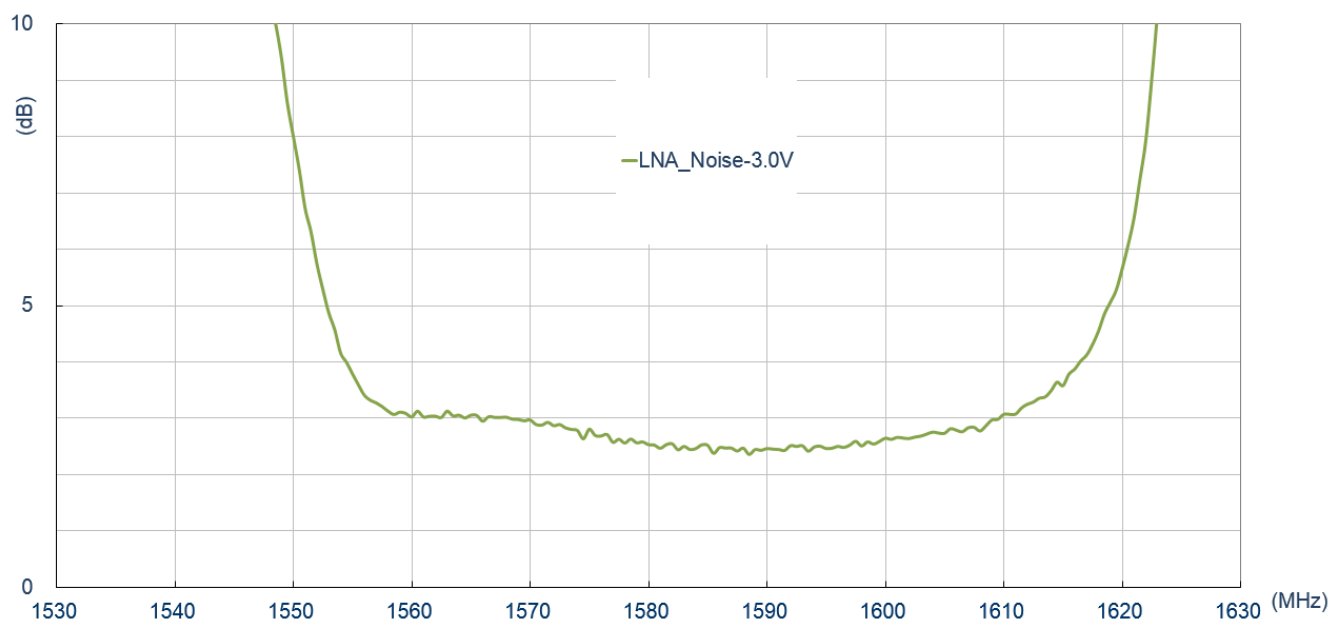
### 4.1 LNA Gain @ 3V



### 4.2 Noise Figure @ 3V (1120-1320MHz)

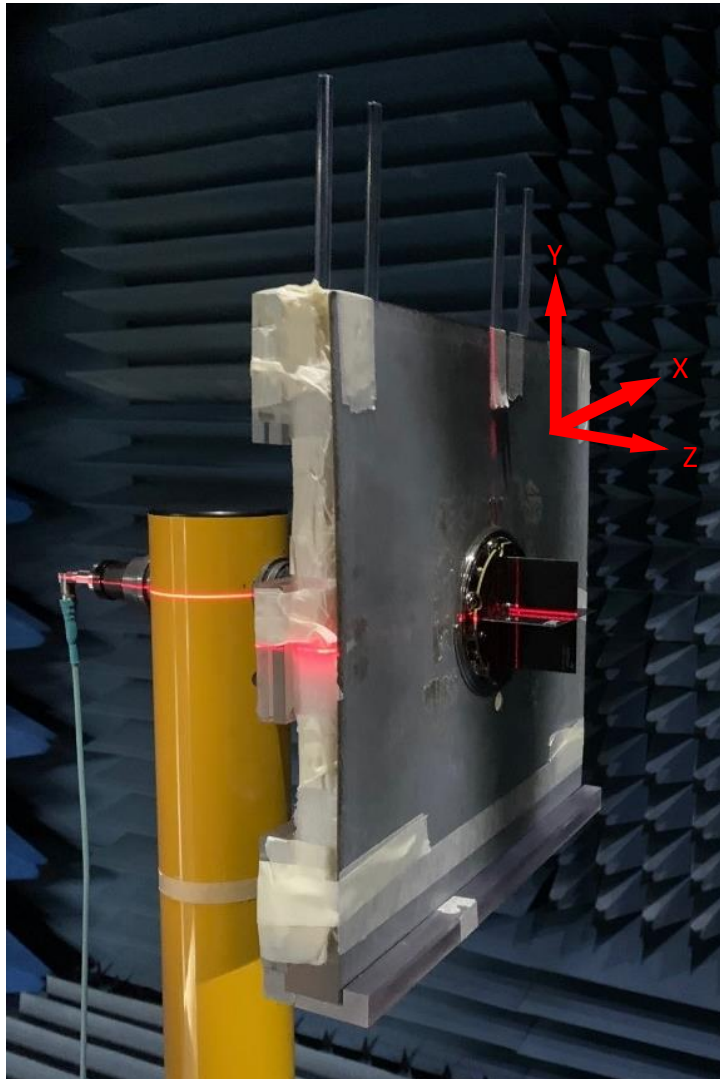


### 4.3 Noise Figure @ 3V (1530-1630MHz)

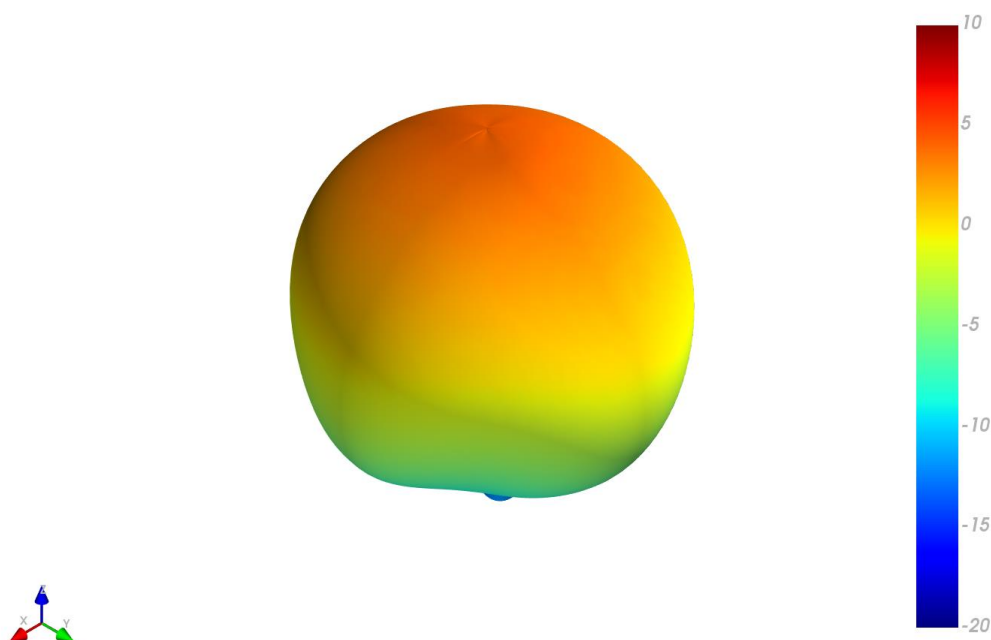


## 5. Radiation Patterns

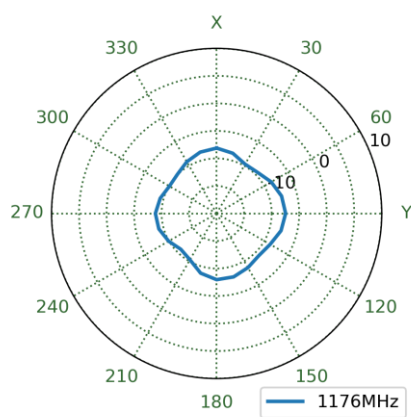
### 5.1 Test Setup



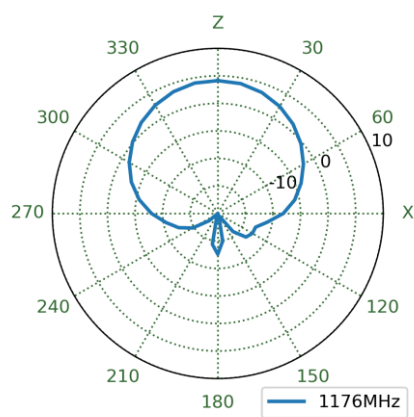
## 5.2 1176MHz 3D and 2D Radiation Patterns



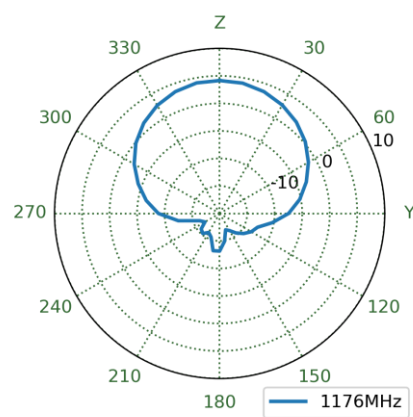
XY Plane\*



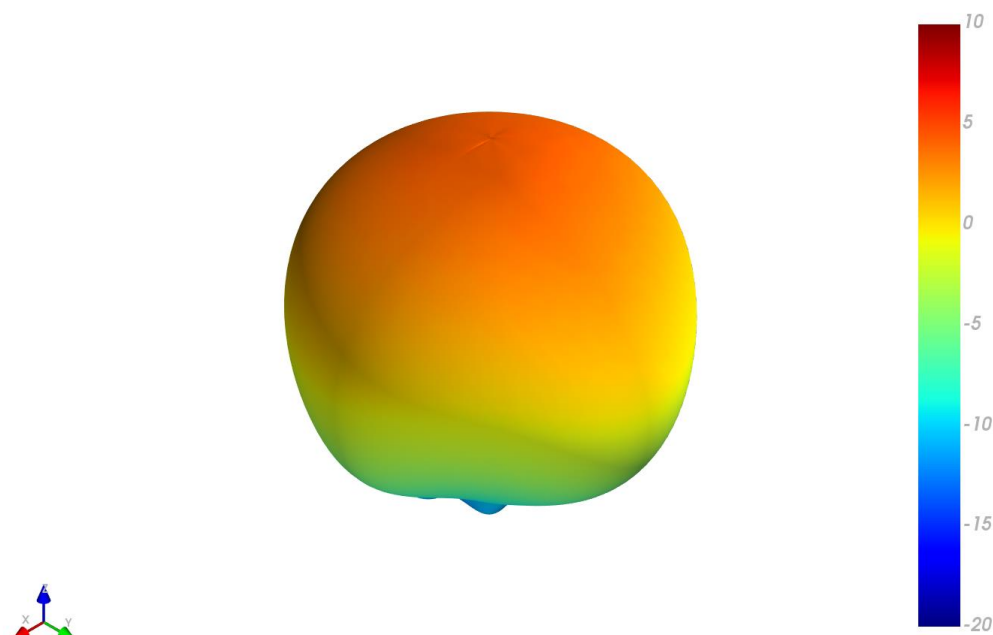
XZ Plane\*



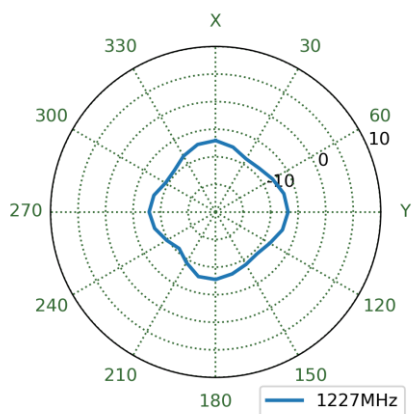
YZ Plane\*



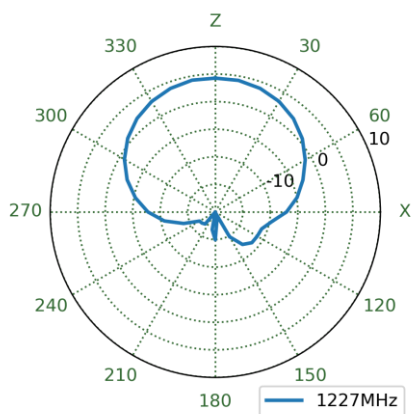
### 5.3 1227MHz 3D and 2D Radiation Patterns



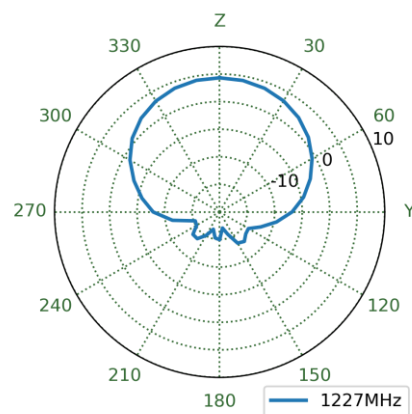
XY Plane\*



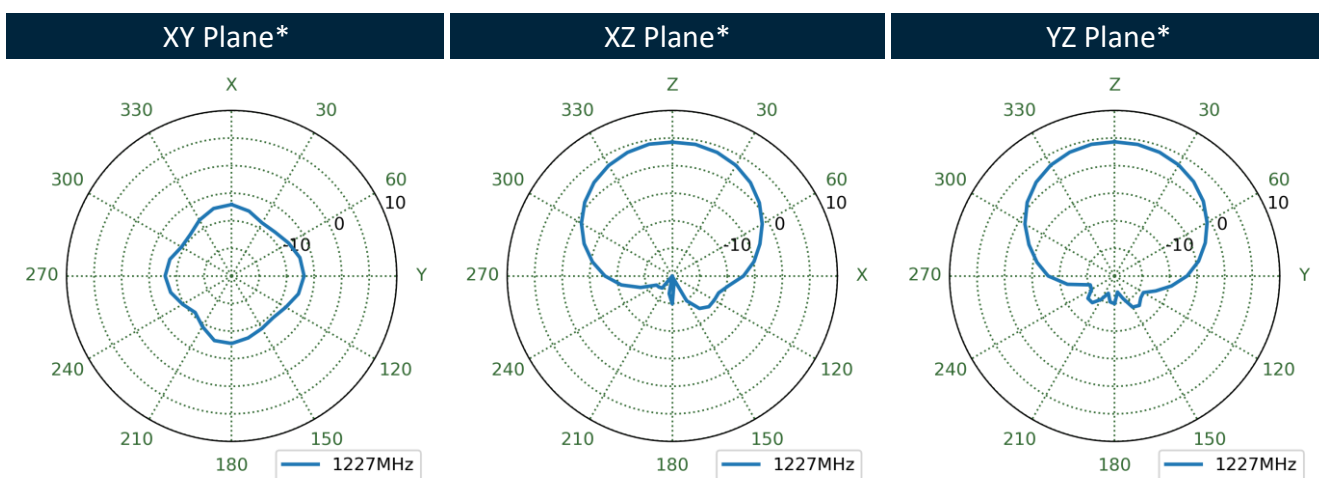
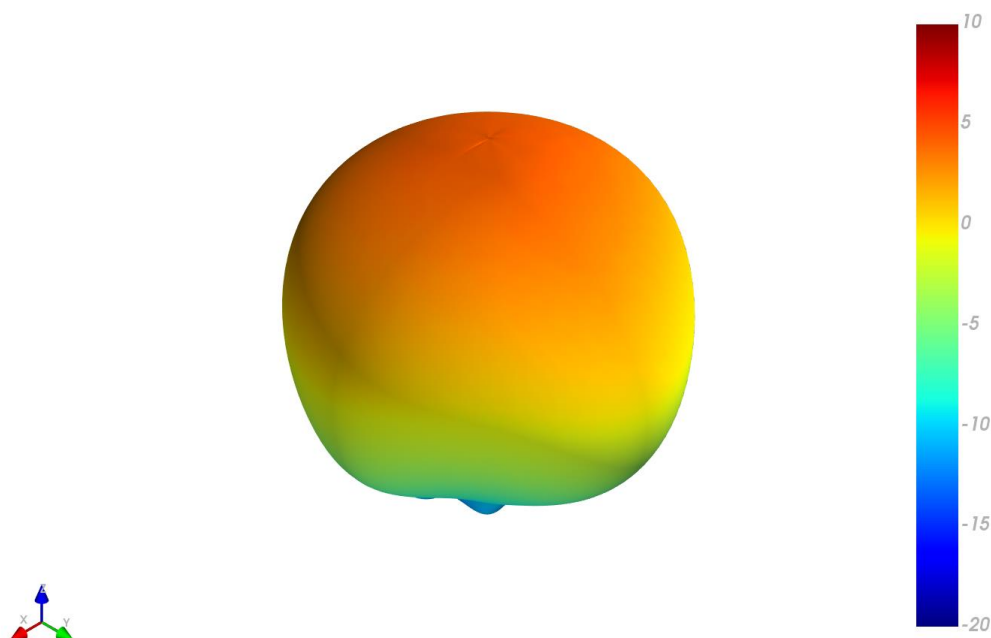
XZ Plane\*



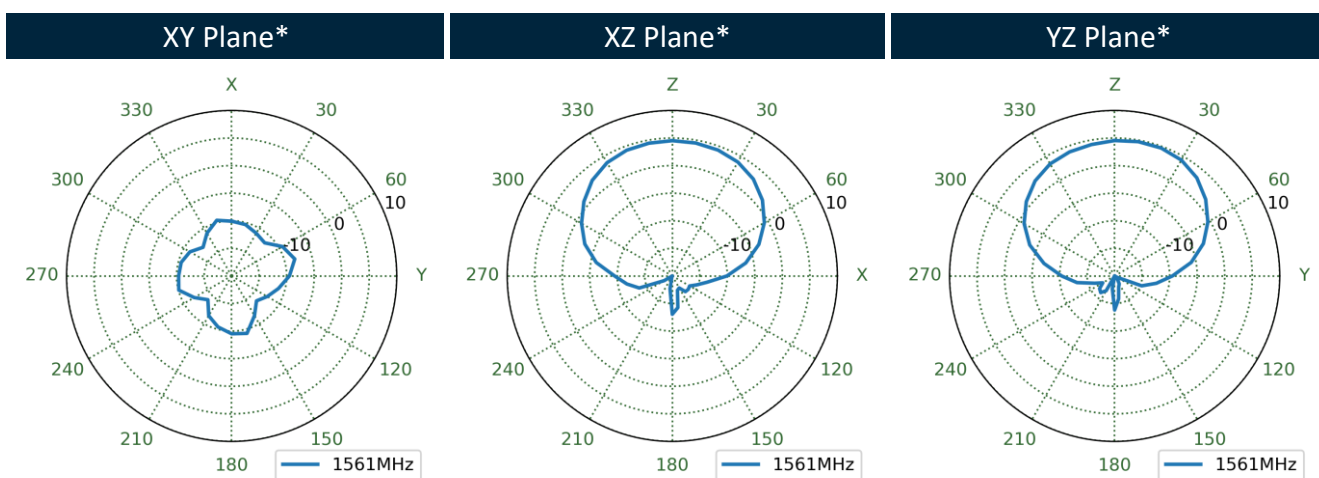
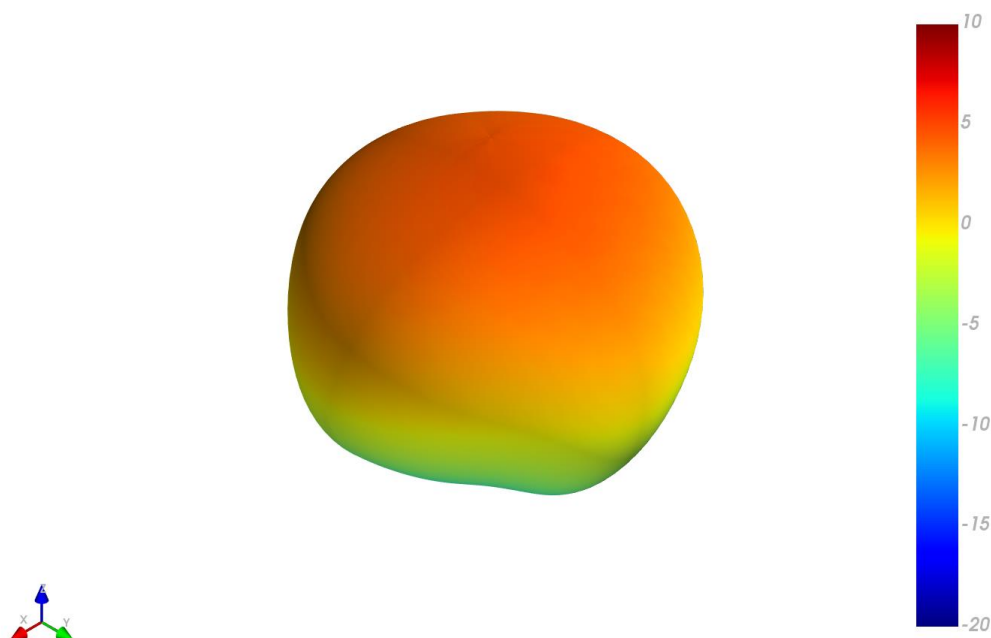
YZ Plane\*



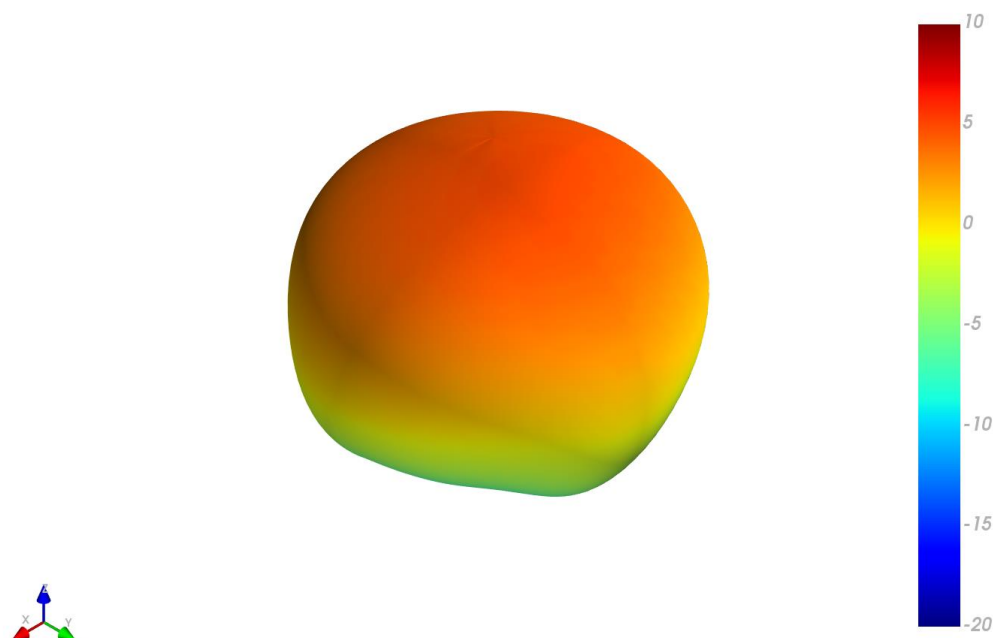
## 5.4 1278.75MHz 3D and 2D Radiation Patterns



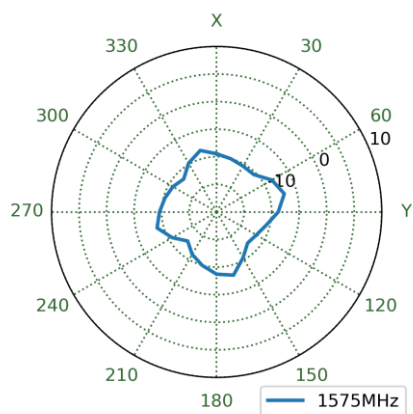
## 5.5 1561MHz 3D and 2D Radiation Patterns



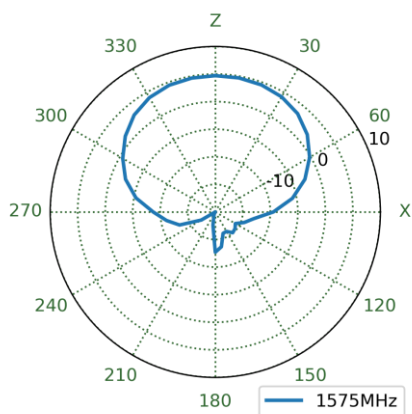
## 5.6 1575MHz 3D and 2D Radiation Patterns



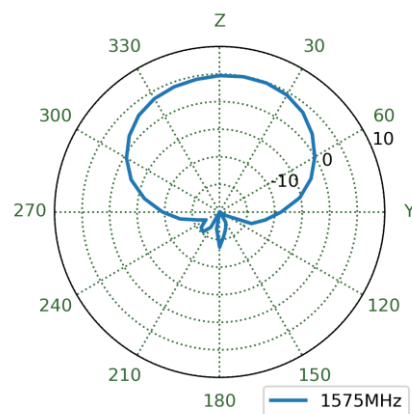
XY Plane\*



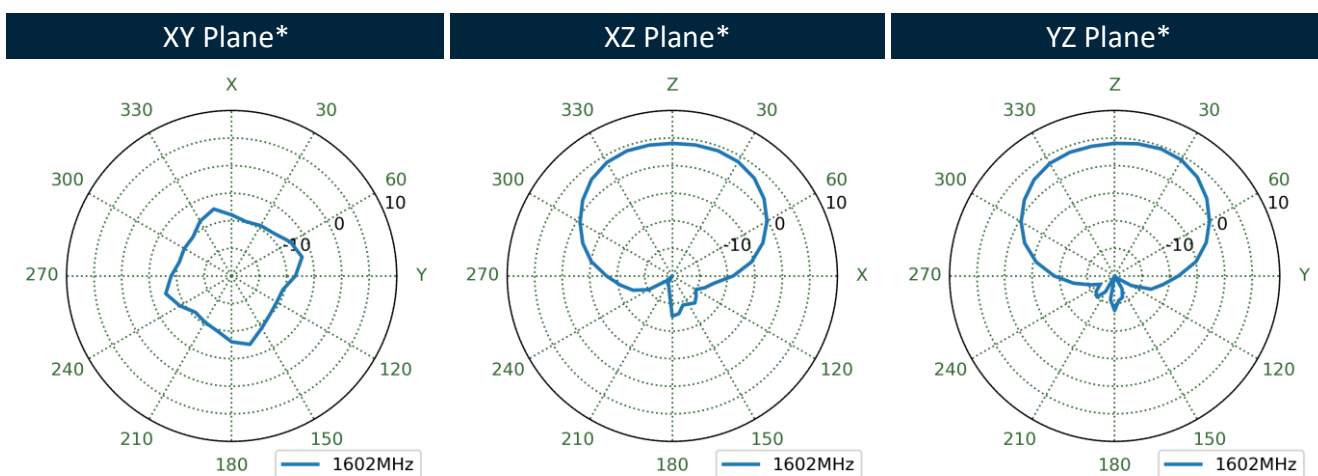
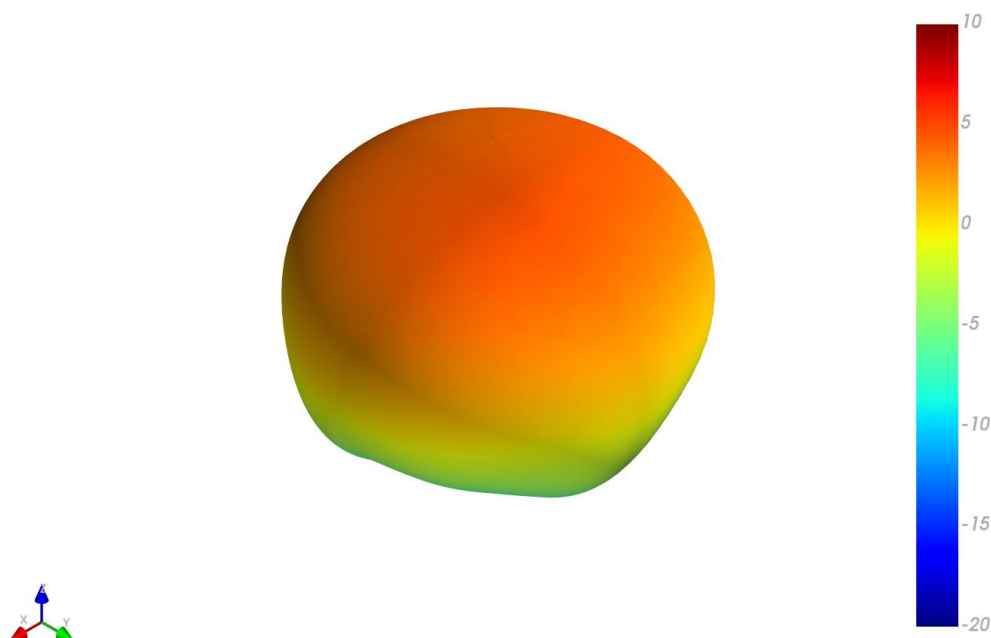
XZ Plane\*



YZ Plane\*



## 5.7 1602MHz 3D and 2D Radiation Patterns



## 6. Field Test Results

In this section Taoglas will present the field test result for EAHP.50 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 receivers:

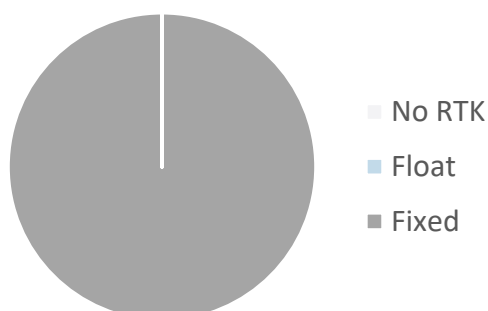
### 6.1 Ublox ZED-F9P

#### Receiver features:

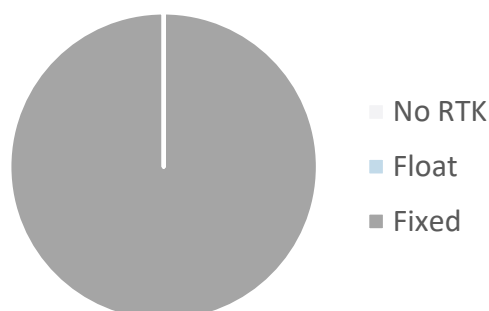
- Multi-band GNSS: 184-channel GPS L1C/A L2C, GLONASS: L1OF L2OF, Galileo: E1B/C E5b, BeiDou: B1I B2I, QZSS: L1C/A L2C
- Multi-band RTK with fast convergence times and reliable performance
- Nav. update rate RTK up to 20 Hz
- Position accuracy = RTK 0.01 m + 1 ppm CEP

| Positioning Accuracy Table (2D Accuracy) |                    |           |            |                  |            |
|------------------------------------------|--------------------|-----------|------------|------------------|------------|
| Test Condition                           | Correction Service | CEP (50%) | DRMS (68%) | 2DRMS (95-98.2%) | TTFF (sec) |
| Free Space                               | RTK DISABLED       | 47.08 cm  | 56.53 cm   | 113.06 cm        | 20         |
|                                          | RTK ENABLED        | 1.51 cm   | 1.83 cm    | 3.66 cm          | 20         |
| 30x30 cm Ground Plane                    | RTK DISABLED       | 46.69 cm  | 54.83 cm   | 110.65 cm        | 19         |
|                                          | RTK ENABLED        | 0.47 cm   | 0.57 cm    | 1.14 cm          | 19         |

RTK Availability  
Free space



RTK Availability  
30x30 cm ground plane

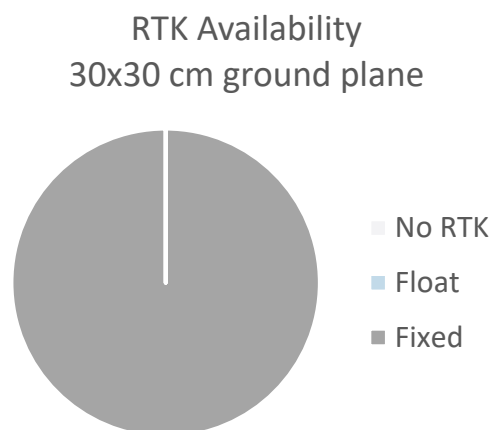
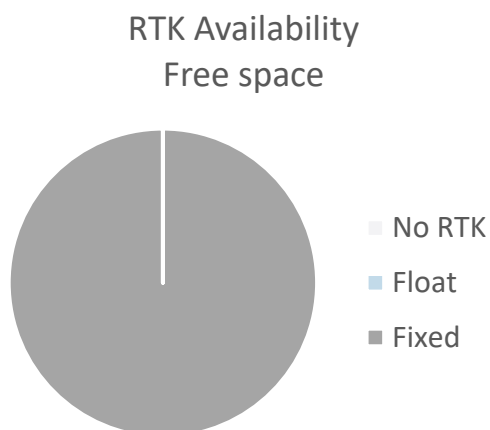


## 6.2 Septentrio AsteRx-U S/N

### Receiver features:

- Multi-band GNSS: 544 channels
- GPS: L1, L2, L5 GLONASS: L1, L2, L3 Galileo: E1, E5ab, AltBoc, E6 BeiDou: B1, B2, B3 NavIC: L51 QZSS: L1, L2, L5, L6
- SBAS: EGNOS, WAAS, GAGAN, MSAS, SDCM(L1, L5)
- RTK (base and rover), Integrated dual-channel L-band receiver, Support for PPP
- Nav. update rate up to 100 Hz
- Position accuracy = RTK 0.6 cm + 0.5 ppm

| Positioning Accuracy Table (2D Accuracy) |                    |           |            |                  |
|------------------------------------------|--------------------|-----------|------------|------------------|
| Test Condition                           | Correction Service | CEP (50%) | DRMS (68%) | 2DRMS (95-98.2%) |
| Free Space                               | RTK DISABLED       | 39.22 cm  | 47.08 cm   | 94.17 cm         |
|                                          | RTK ENABLED        | 0.99 cm   | 1.2 cm     | 2.4 cm           |
| 30x30 cm Ground Plane                    | RTK DISABLED       | 37.08 cm  | 45.04 cm   | 90.08 cm         |
|                                          | RTK ENABLED        | 0.96 cm   | 1.16 cm    | 2.31 cm          |



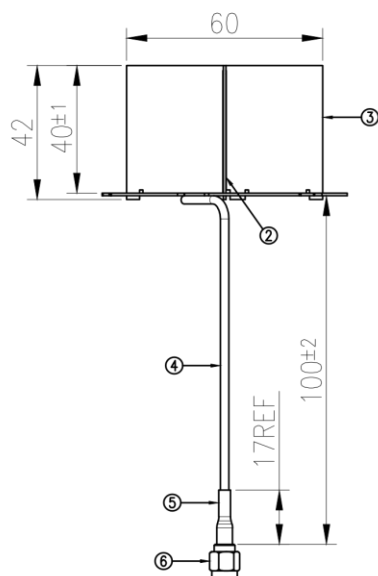
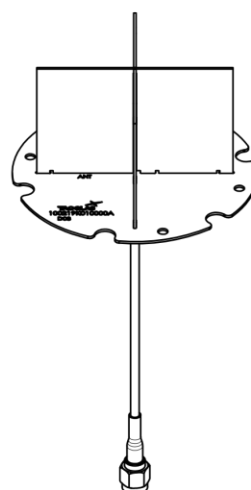
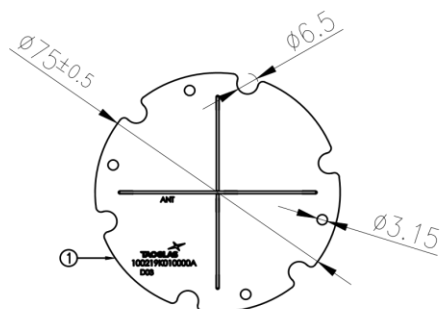
## 7. Mechanical Drawing (Units: mm)

ISO NO.: EDW-20-8-0559

STATE: Release

NOTES: 1. All material must be RoHS compliant.

| REV. | DESCRIPTION    | ENG.     | APPROVED | DATE       |
|------|----------------|----------|----------|------------|
| 001  | Initial Design | Aron Yan | Clark    | 2020/06/24 |

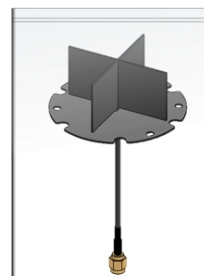


|   | Name                     | Material | Finish               | QTY |
|---|--------------------------|----------|----------------------|-----|
| 1 | XHP.50 Feed OCB          | NP175F   | Black                | 1   |
| 2 | XHP.50 Passive Antenna A | IT180    | Black                | 1   |
| 3 | XHP.50 Passive Antenna B | IT180    | Black                | 1   |
| 4 | RG-174 Coaxial Cable     | PVC      | Black                | 1   |
| 5 | Heat Shrink Tube (GNSS)  | PE       | Blue tube/White Test | 1   |
| 6 | SMA(M)                   | Brass    | Au Plated            | 1   |

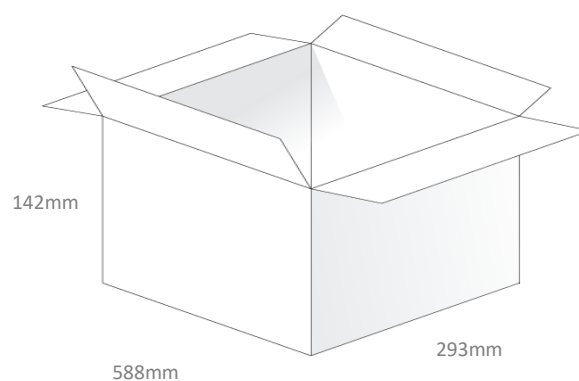
|                                           |                                                                                                                                                                                                                                                                                                      |          |            |            |
|-------------------------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|----------|------------|------------|
| APPROVED BY: Clark                        | <br><small>TW Design Centre</small><br><small>This drawing and its inherent design concepts are property of Taoglas. Not to be copied or given to third parties without the written consent of Taoglas.</small> |          |            |            |
| CHECK BY: Aaron                           |                                                                                                                                                                                                                                                                                                      |          |            |            |
| DRAWN BY: Aron Yan                        | <b>TITLE :</b> Embedded Active Antenna for GNSS L1/L2/L5 with 100mm RG-174 and SMA(M)<br><b>PART NO. :</b> EAHP.50.01.0100D                                                                                                                                                                          |          |            |            |
| DATE: 2020/06/24                          |                                                                                                                                                                                                                                                                                                      |          |            |            |
| UNLESS OTHERWISE SPECIFIED TOLERANCES ON: | XL±0.5<br>X±0.3<br>X±0.2<br>JXX±0.1<br>JXX±0.05                                                                                                                                                                                                                                                      | UNIT: mm | SCALE: 1:2 | PAGES: 1/1 |
| THIRD ANGLE PROJECTION                    |                                                                                                                                                                                                                   | REV. D01 |            |            |

## 8. Packaging

1pc EAHP.50.01.0100D per PE Bag  
Dimensions - 135\*130\*140mm  
Weight - 31g



24pcs EAHP.50.A.301111 per Carton  
Dimensions - 588\*296\*142mm  
Weight - 1.5Kg



Changelog for the datasheet

SPE-21-8-009 – EAHP.50.01.0100D

| Revision: A (Original First Release) |                 |
|--------------------------------------|-----------------|
| Date:                                | 2021-02-22      |
| Notes:                               | Initial Release |
| Author:                              | Jack Conroy     |

Previous Revisions

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