



# TAOGLAS®



## Datasheet

### MagmaX2

**Part No:**  
AA.200.151111

#### Description:

MagmaX2 Multiband Active GNSS Magnetic Mount Antenna  
With 1.5m RG-174 Cable and SMA(M) Connector

#### Features:

Magnetic mount with robust IPXX Rated Enclosure

Covering Bands:

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

Low Axial Ratio

Cable: 1.5m RG-174 Cable

Connector: SMA Male Straight

CE Certified

RoHS & Reach Compliant



|    |                                |    |
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# 1. Introduction



The Taoglas MagmaX2 AA.200 is an active GNSS magnetic mount antenna for use across most major constellations including GPS (L1/L2/L5), GLONASS (G1/G2/G5), Galileo(E1/E5a/E5b) and BeiDou(B1/B2). The antenna exhibits excellent gain and good radiation pattern stability leading to a reliable GPS fix in areas of weaker signal strength. These elements combine to ensure the best possible positional accuracy in both RTK and non-RTK systems.

Typical applications include:

- UAVs and Robotics
- Autonomous Vehicles
- High Accuracy Positioning
- RTK Systems
- Precision Agriculture
- Navigation

The AA.200 provides excellent positional accuracy, this is due to outstanding signal to noise ratio(C/N0) and a low axial ratio of less than 2 thus ensuring the antenna maintains stable when a location is required. With great 2DRMS and Fast time to first fix the AA.200 is the ideal antenna solution for Multiband GNSS RTK Systems as it performs very well, with stable gains and low axial ratio values across all major GNSS bands.

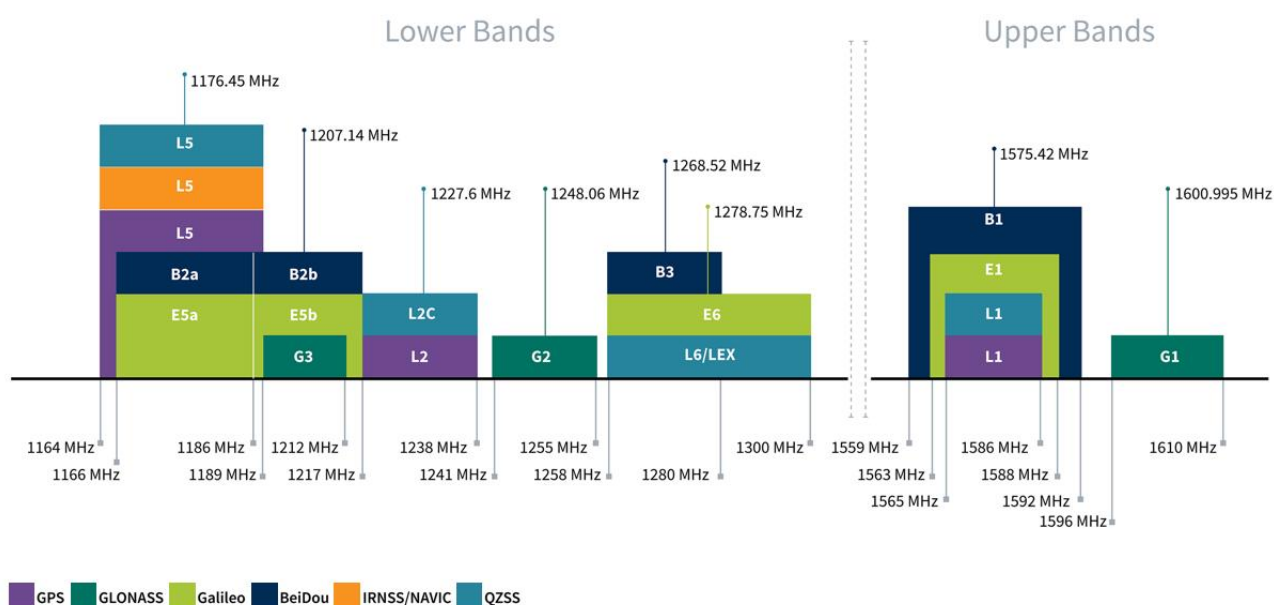
The AA.200 includes LNAs and front-end SAW filters to reduce out of band noise, such as from nearby cellular transceivers. It offers better protection from nearby radiated power surges and greatly reduces the probability of damaging your GNSS receiver from nearby transmissions. The AA.200 has 1 cable feed as the L1, L2 and L5 feeds are combined with a hybrid coupler and the antenna performance results are shown in the below sections.

The cable and connector are fully customizable, subject to NRE and MOQ. For further information please contact your regional Taoglas customer support team.

## 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 | 1561  | 1575.42 | 1602  |
| VSWR (max.)                                                  | 2.0:1           | 2.0:1  | 2.0:1 | 2.0:1   | 2.0:1 |
| Passive Antenna Efficiency (%)<br>(Without cable loss)       | 51.5            | 33.3   | 51.0  | 60.4    | 51.6  |
| Passive Antenna Gain at Zenith (dBi)<br>(Without cable loss) | 0.6             | -0.9   | 2.1   | 2.9     | 2.4   |
| Axial Ratio(dB)                                              | 1.8             | 1.2    | 1.1   | 1.1     | 1.1   |
| Group Delay                                                  | 5               | 10     | 5     | 5       | 5     |
| PCO (cm)                                                     | 1.7             | 0.9    | 1.4   | 1.2     | 1.2   |
| PCV (cm)                                                     | 2.3             | 2.2    | 0.51  | 0.51    | 0.51  |
| Polarization                                                 | RHCP            |        |       |         |       |
| Impedance                                                    | 50Ω             |        |       |         |       |
| Cable                                                        | RG-174, 1.5m    |        |       |         |       |
| Connector                                                    | SMA(M) Straight |        |       |         |       |

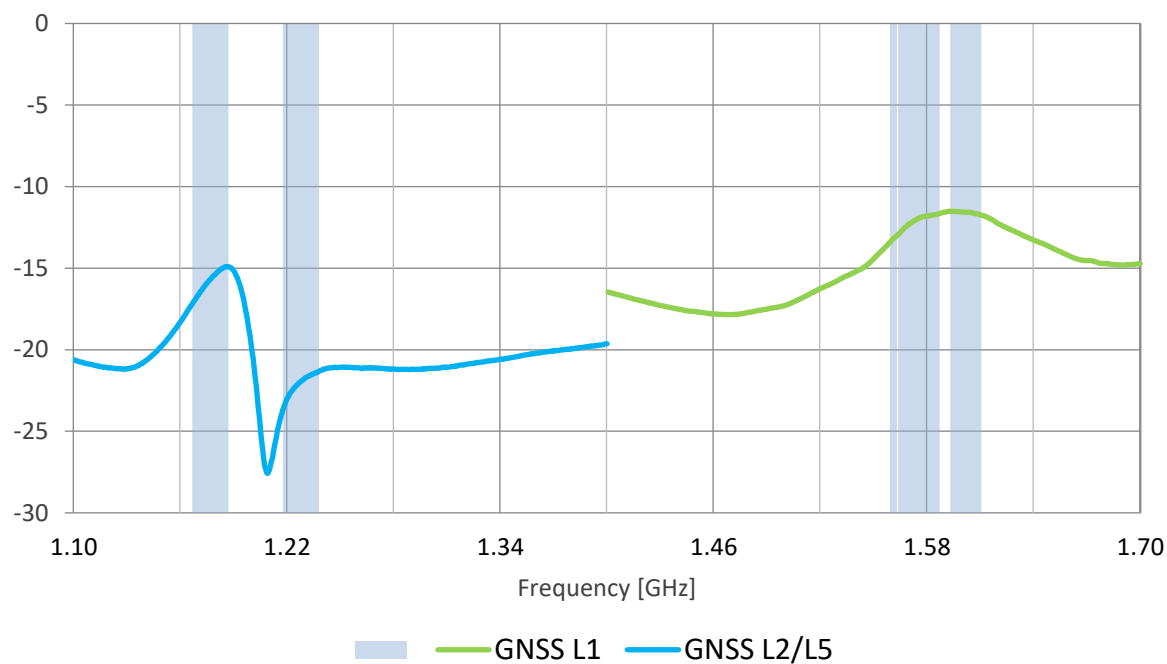
| LNA and Filter Electrical Properties |         |        |       |         |       |
|--------------------------------------|---------|--------|-------|---------|-------|
| Frequency (MHz)                      | 1176.45 | 1227.6 | 1561  | 1575.42 | 1602  |
| VSWR (max.)                          | 2.0:1   | 2.0:1  | 2.0:1 | 2.0:1   | 2.0:1 |
| Gain@1.8V (dB)                       | 25.17   | 27.81  | 27.48 | 27.76   | 26.79 |
| Gain@3.0V (dB)                       | 25.15   | 27.8   | 27.48 | 27.8    | 26.79 |
| Gain@5.5V (dB)                       | 25.2    | 27.83  | 27.48 | 27.8    | 26.8  |
| Noise@1.8V (dB)                      | 4.96    | 2.94   | 2.30  | 2.13    | 2.40  |
| Noise@3.0V (dB)                      | 4.95    | 2.94   | 2.33  | 2.15    | 2.44  |
| Noise@5.5V (dB)                      | 4.98    | 2.94   | 2.36  | 2.13    | 2.43  |
| Power consumption@1.8V (mA)          | 17.86   |        |       |         |       |
| Power consumption@3.0V (mA)          | 17.91   |        |       |         |       |
| Power consumption@5.5V (Typ.         | 17.93   |        |       |         |       |

|                  | Total Specification (Through Antenna, SAW Filter and LNA) |          |          |          |          |
|------------------|-----------------------------------------------------------|----------|----------|----------|----------|
| Frequency (MHz)  | 1176.45                                                   | 1227.6   | 1561     | 1575.42  | 1602     |
| Gain@3V (dBi)    | 24.8 dBi                                                  | 26.2 dBi | 26.1 dBi | 26.1 dBi | 26.1 dBi |
| Output Impedance | 50 $\Omega$                                               |          |          |          |          |

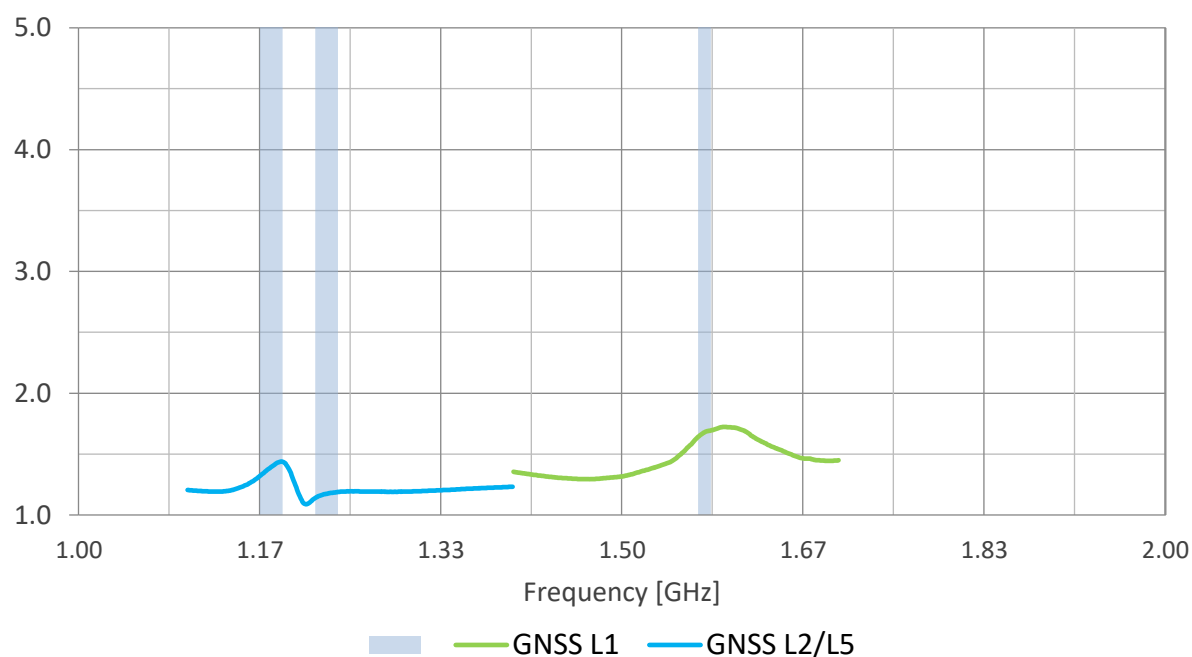
| Mechanical          |                                       |
|---------------------|---------------------------------------|
| Housing Dimensions  | 63.2*67.2*26.5 mm                     |
| Housing Material    | ABS                                   |
| Cable               | 1.5m of RG-174                        |
| Connector           | SMA(M)                                |
| Weight              | 160g                                  |
| Magnetic Pull Force | Average vertical pull force(kgf): 2.5 |
| Environmental       |                                       |
| Temperature Range   | -40°C to 85°C                         |
| Humidity            | Non-condensing 65°C 95% RH            |
| Protection          | IP67                                  |
| RoHS Compliant      | Yes                                   |
| REACH Compliant     | Yes                                   |

## 3. Antenna Characteristics

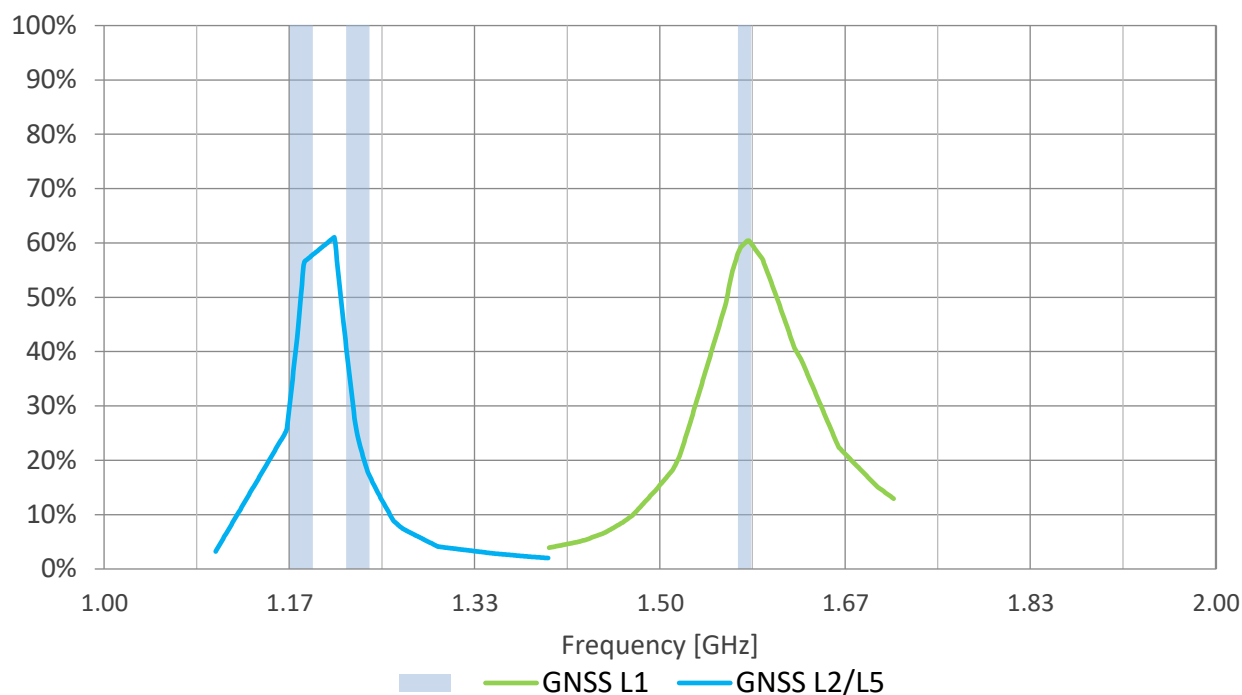
### 3.1 Return Loss (dB)



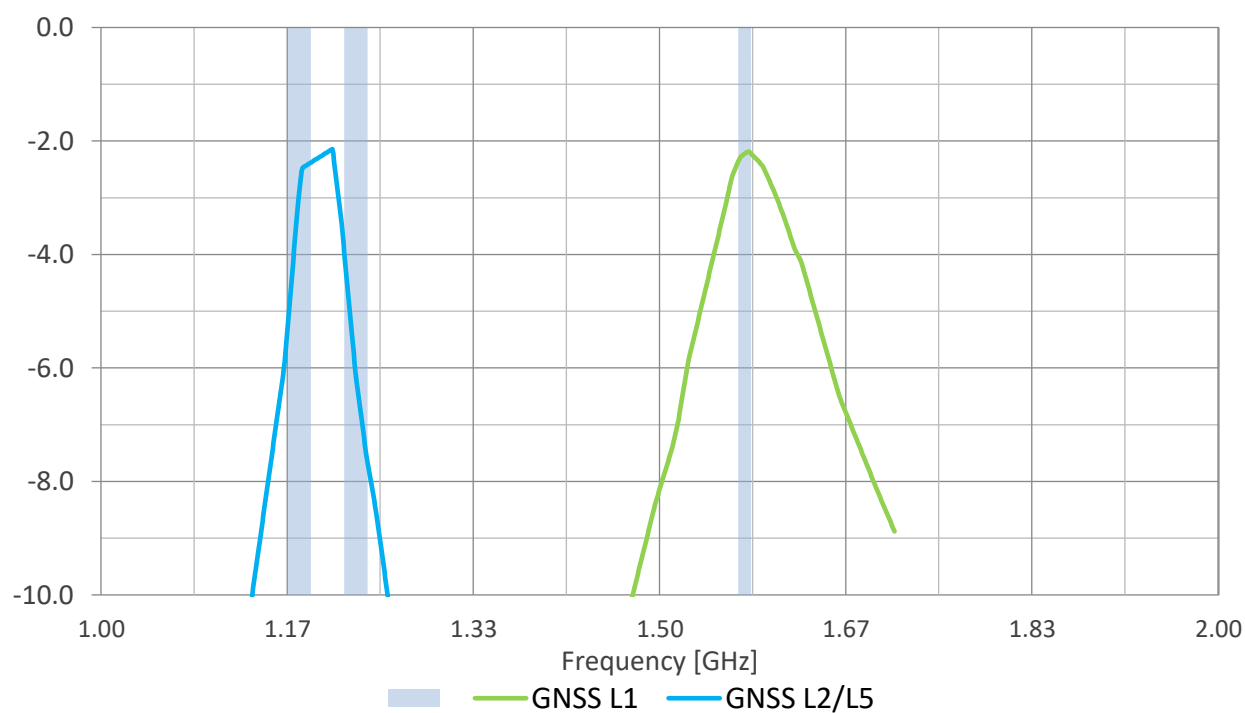
### 3.2 VSWR



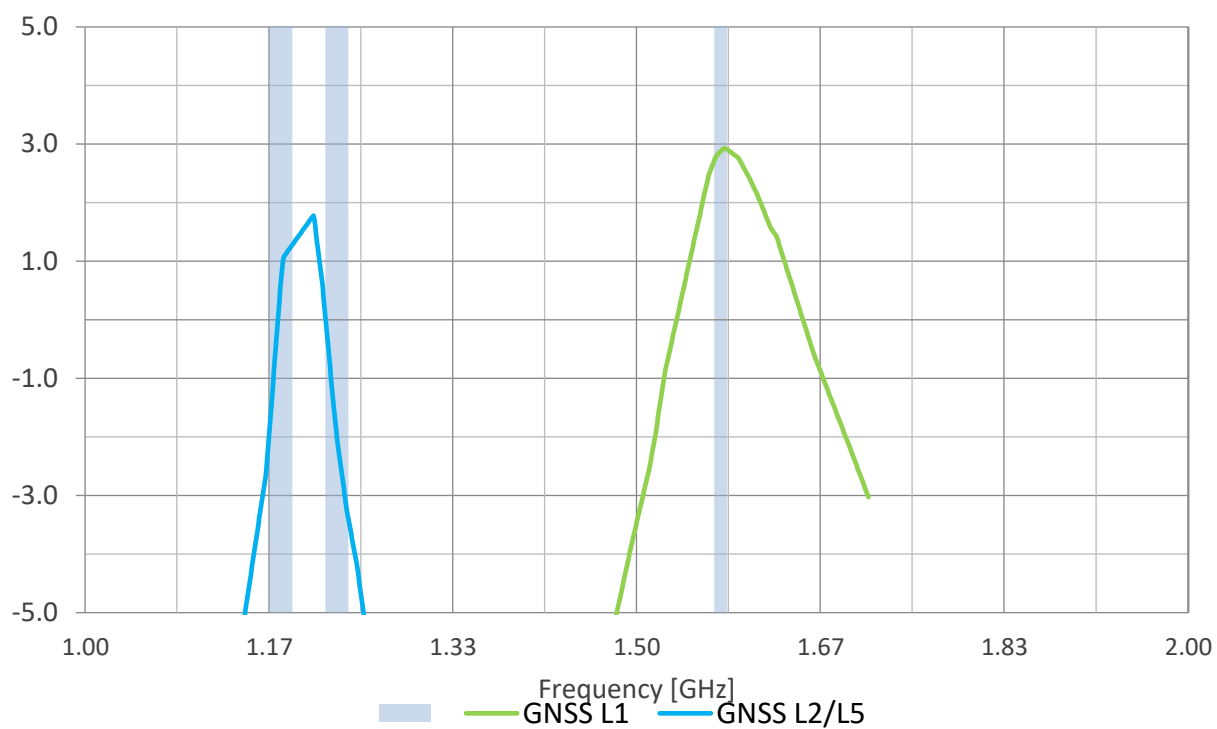
### 3.3 Efficiency (%)



### 3.4 Average Gain (dB)



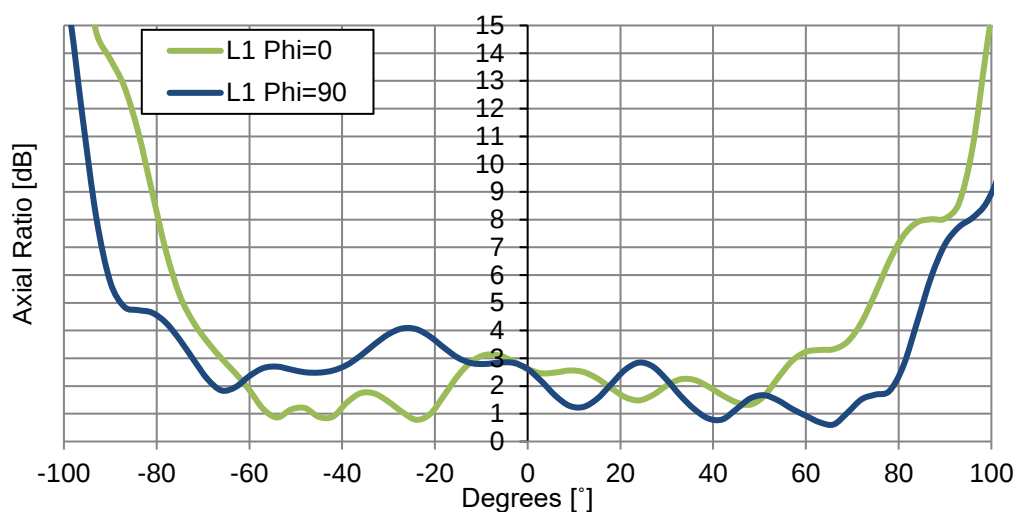
### 3.5 Peak Gain (dBi)



### 3.6 Axial Ratio – Free Space

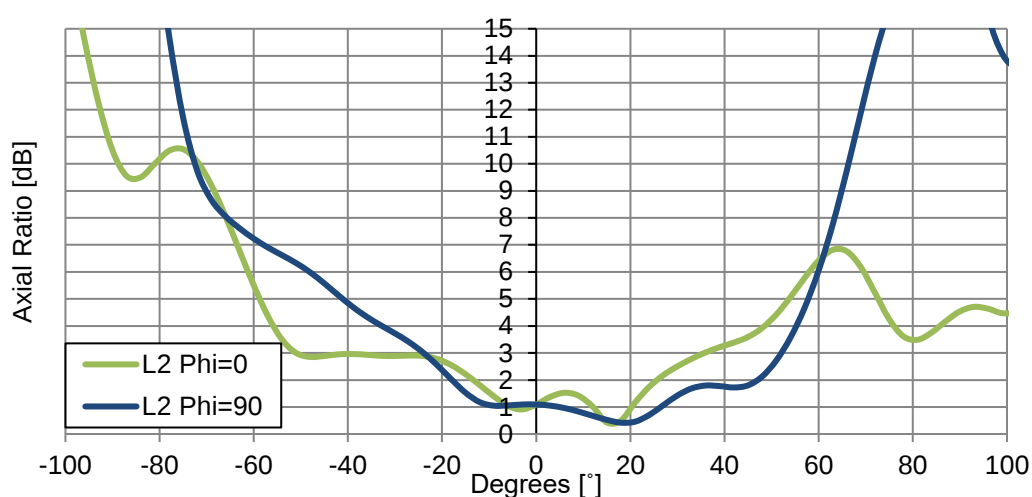
L1

Axial Ratio - L1



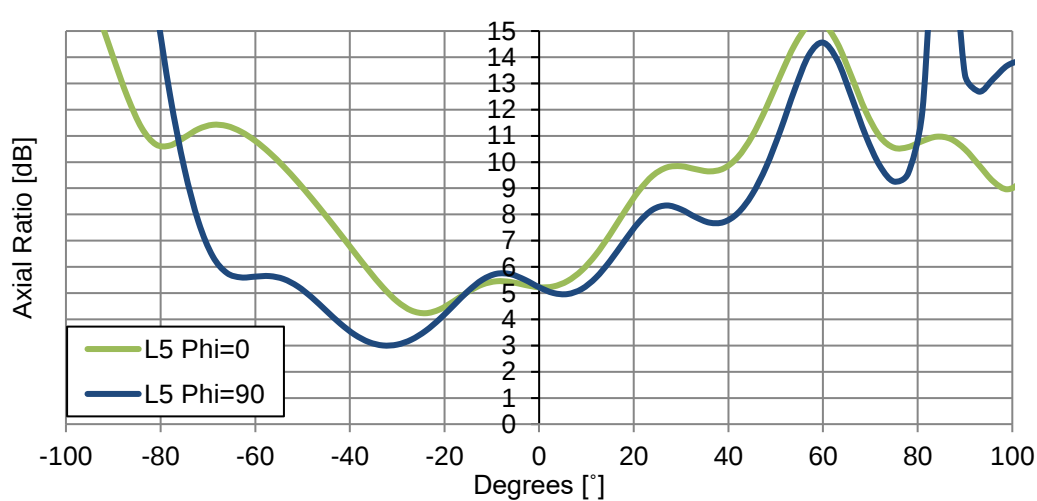
L2

Axial Ratio - L2



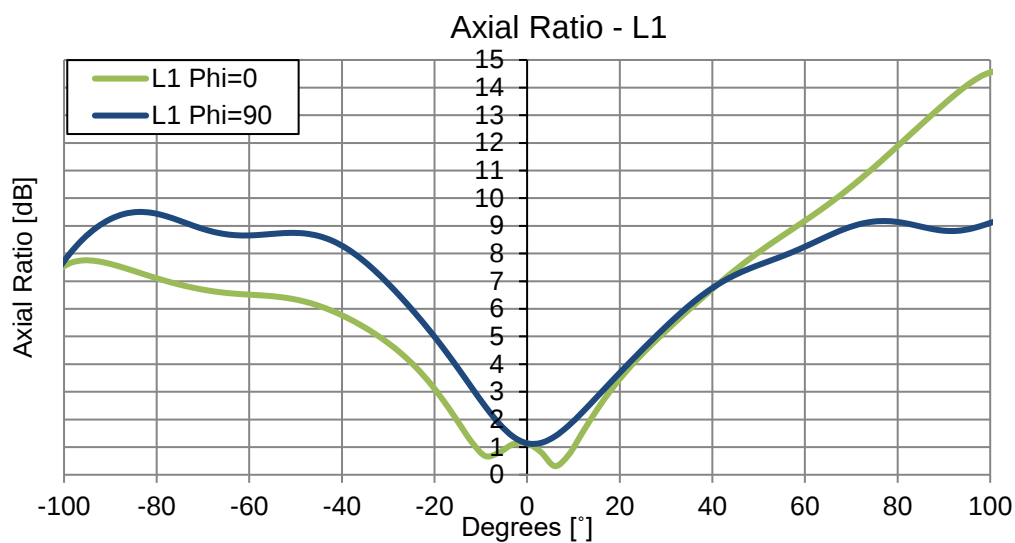
L5

Axial Ratio - L5

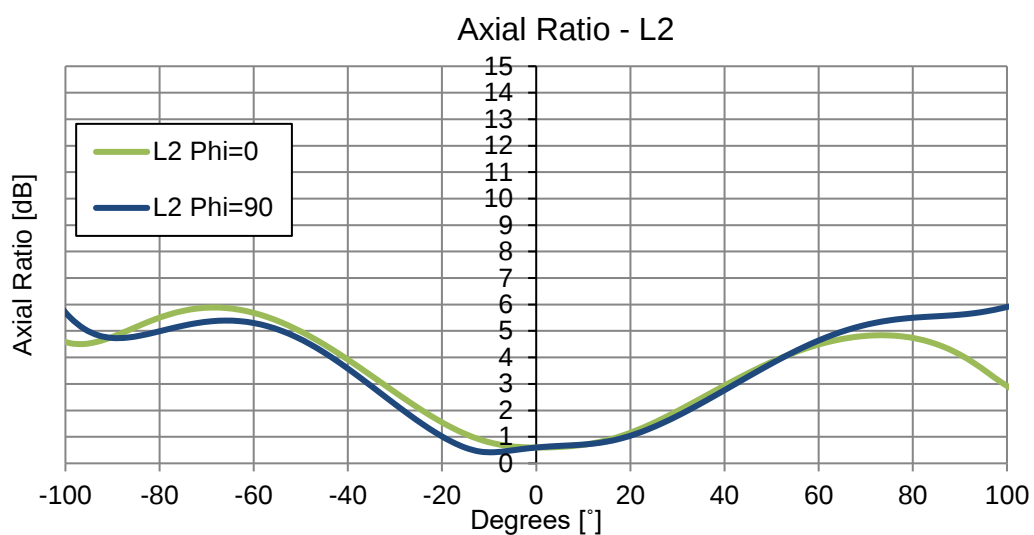


### 3.7 Axial Ratio – 30\*30cm Ground Plane

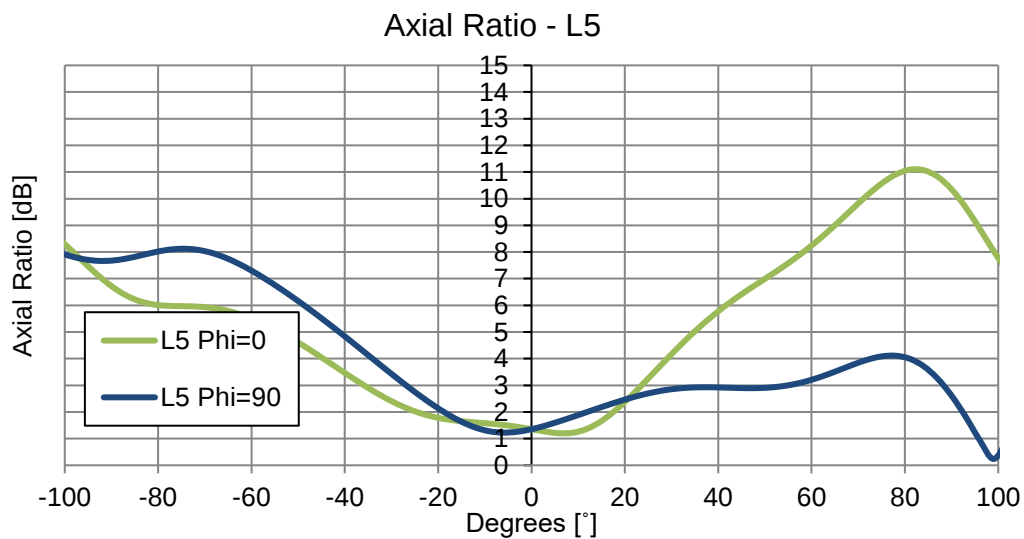
L1



L2

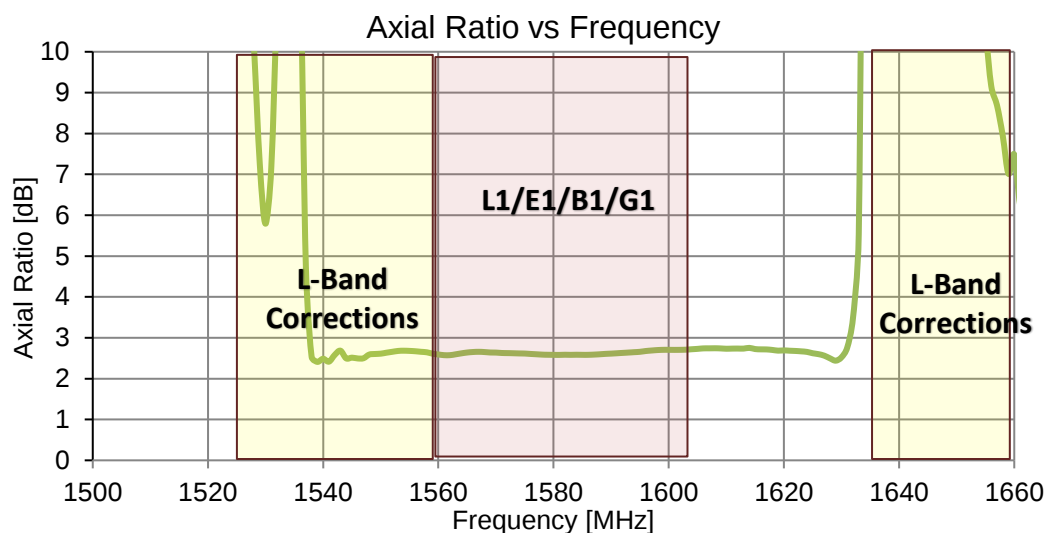


L5

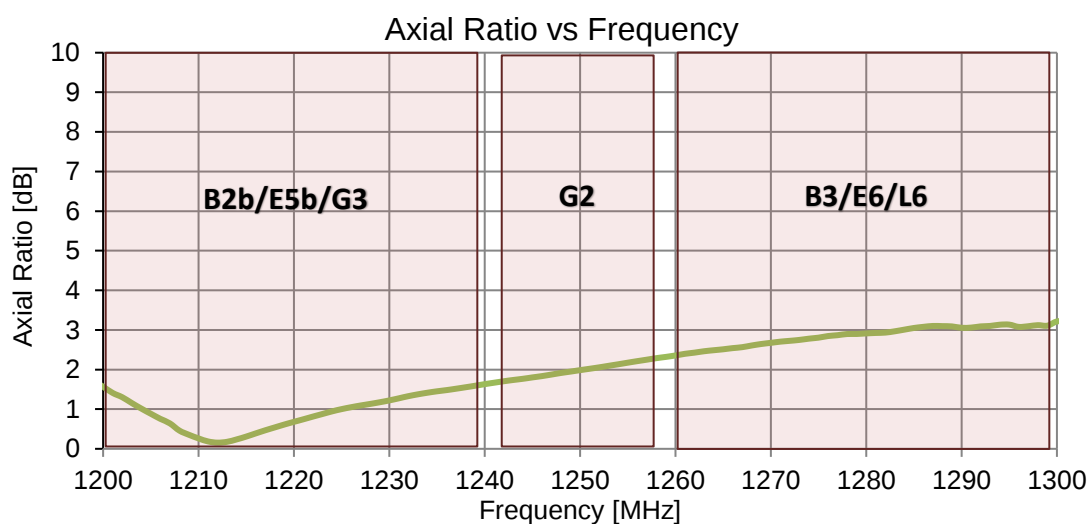


### 3.8 Axial Ratio vs Frequency – Free Space

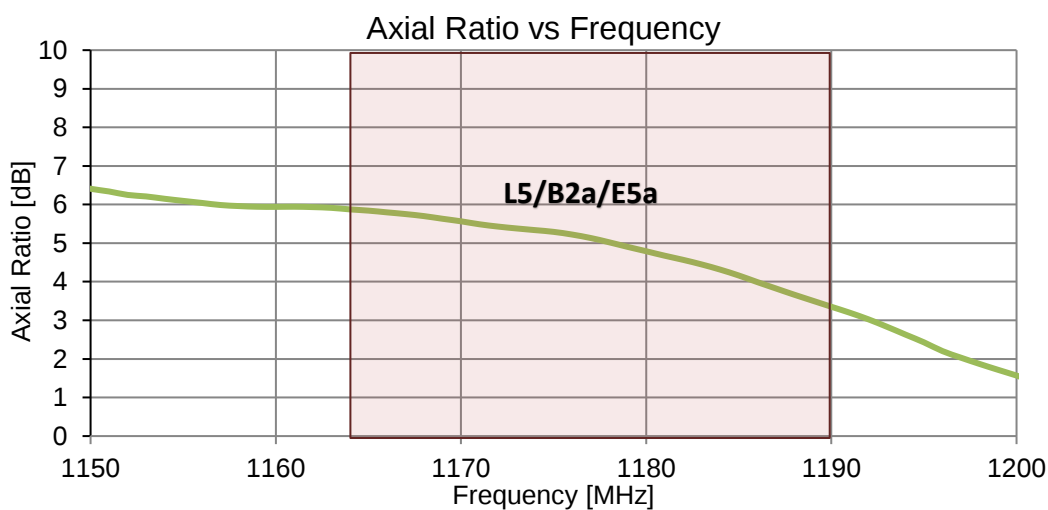
L1



L2

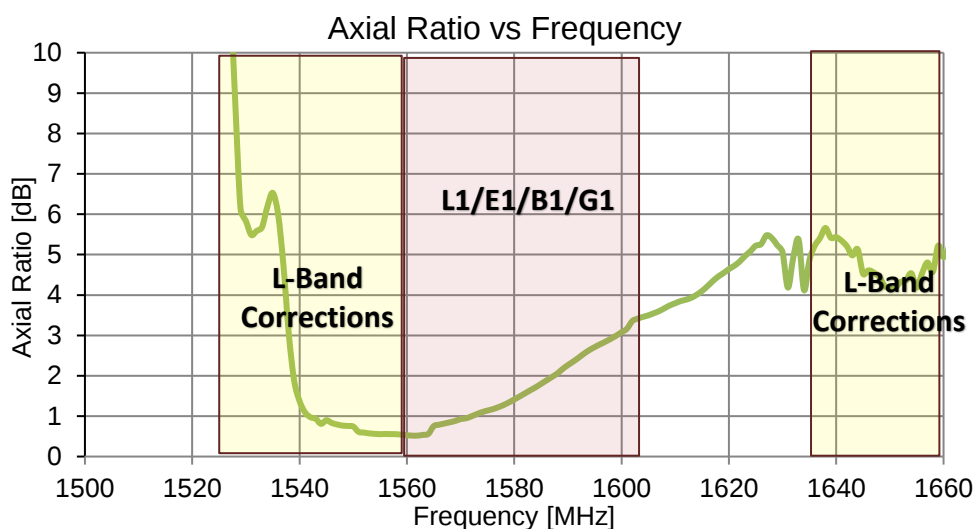


L5

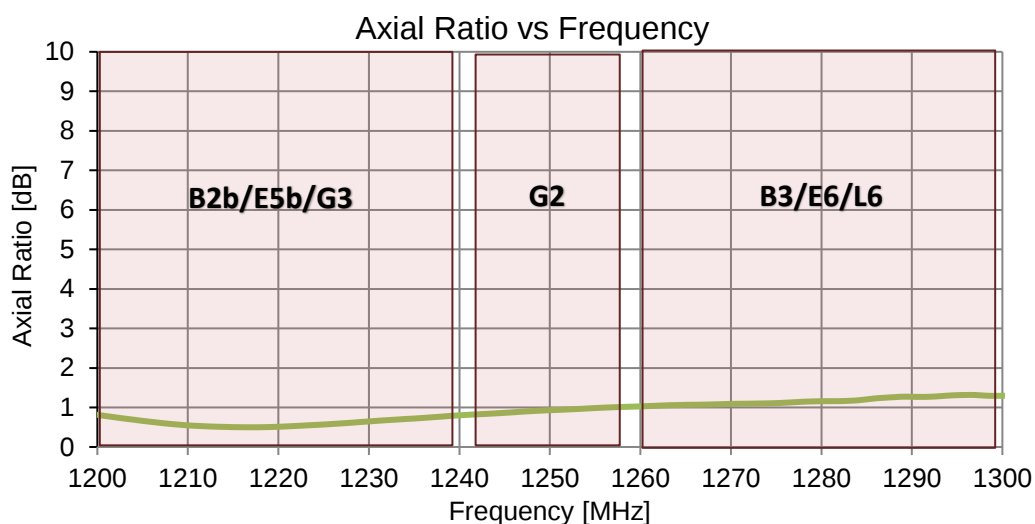


### 3.9 Axial Ratio vs Frequency – 30\*30cm Ground Plane

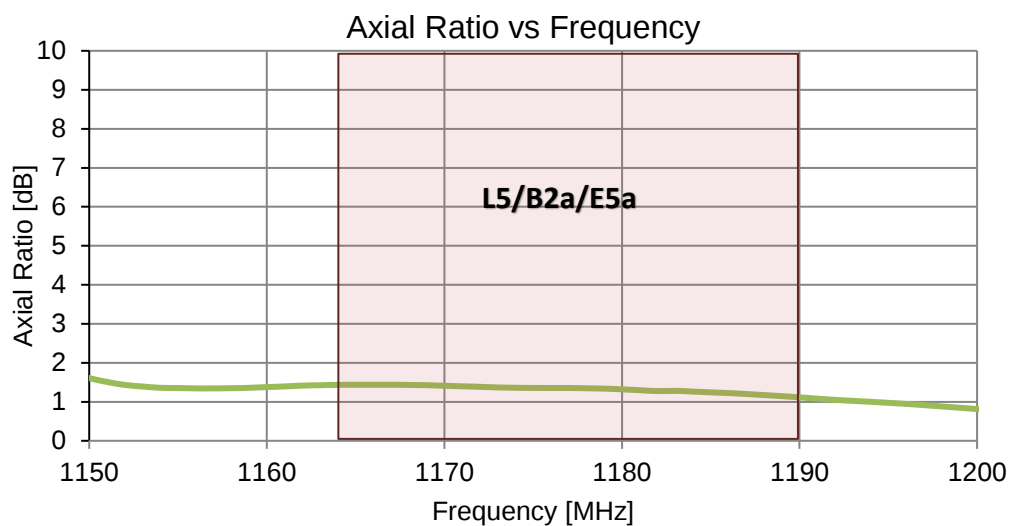
L1



L2

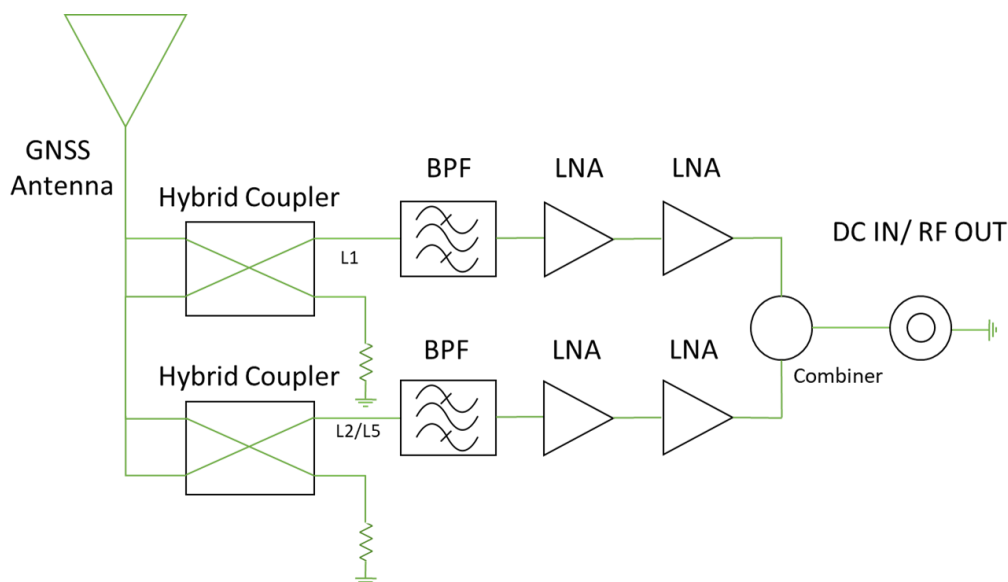


L5

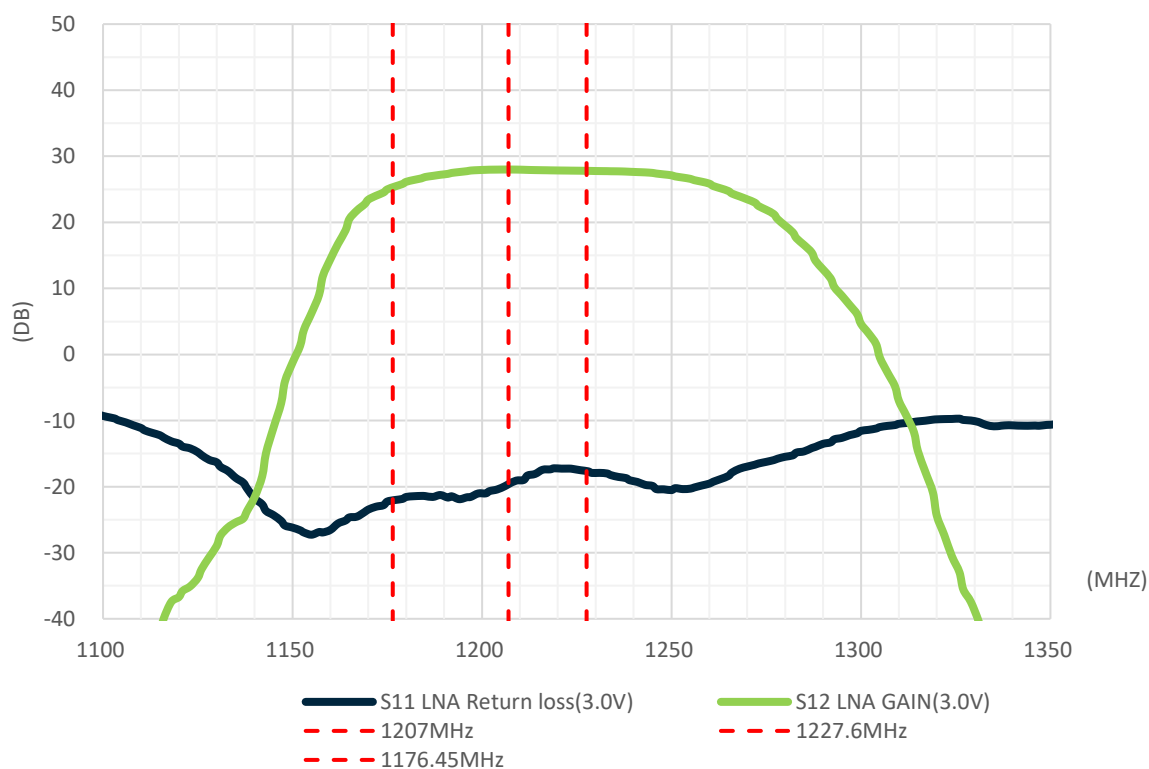


## 4. Active Antenna Characteristics

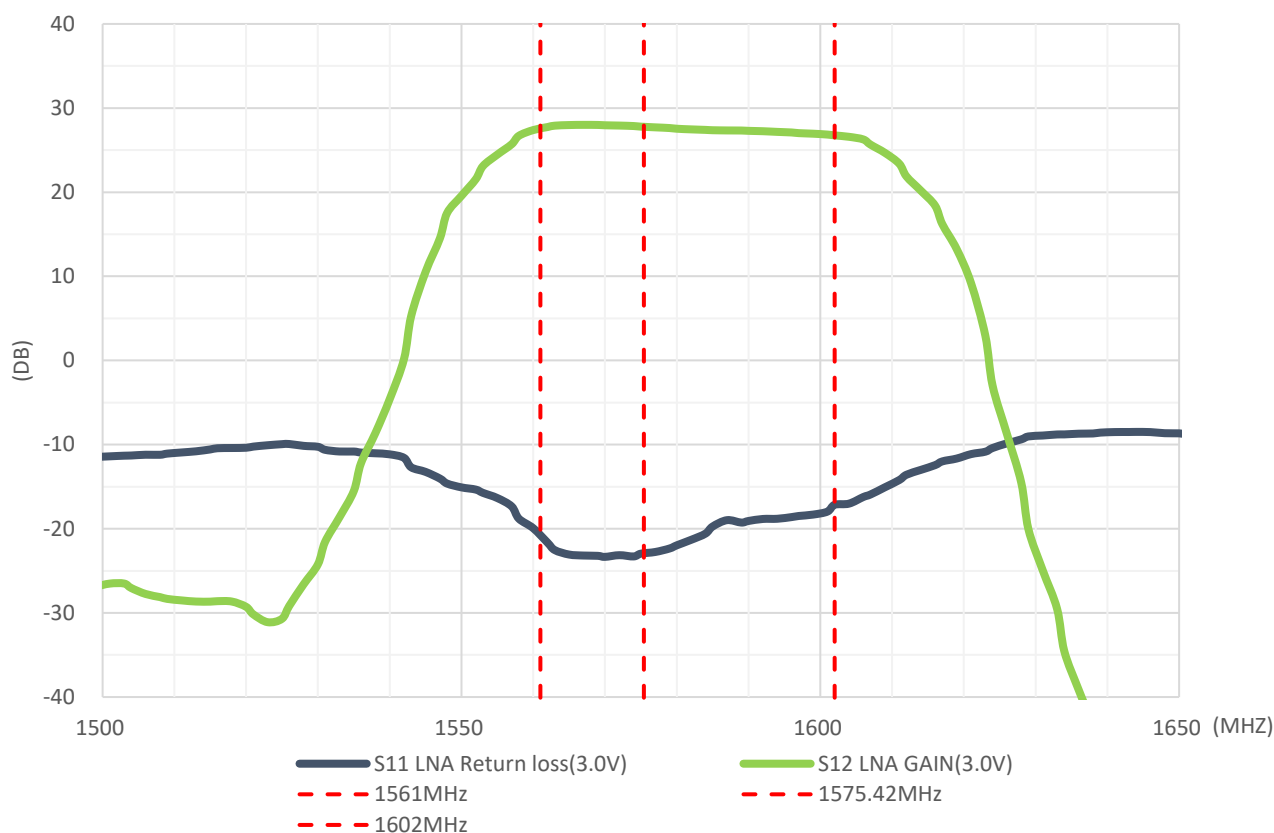
### 4.1 LNA Block Diagram



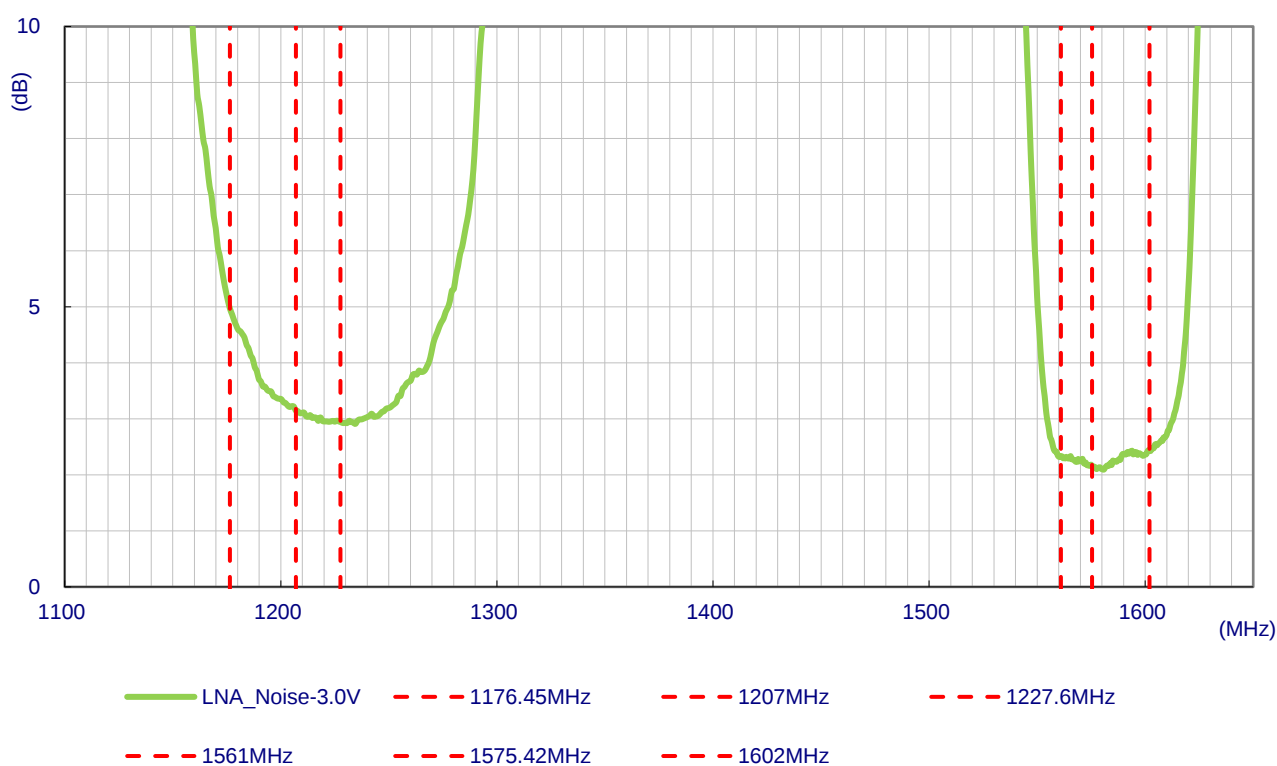
### 4.2 LNA Gain L2 & L5 @3V



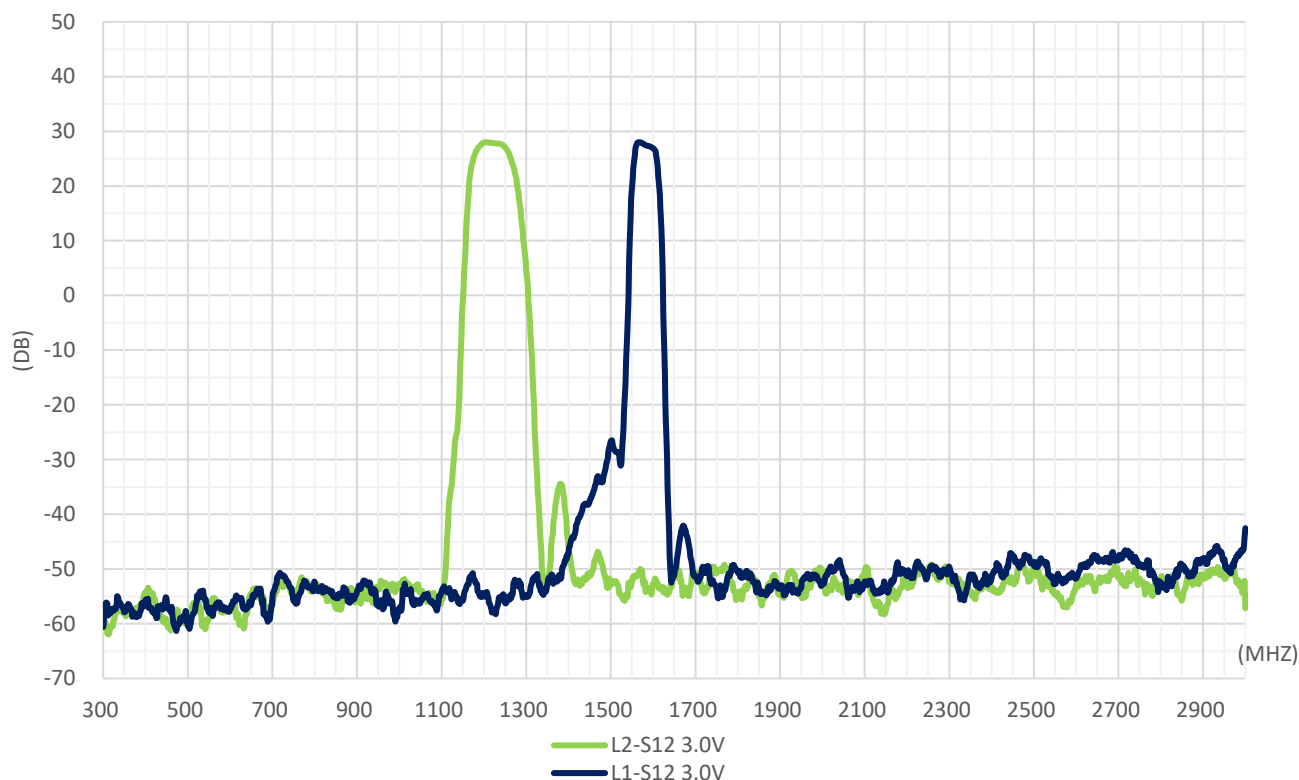
### 4.3 LNA Gain L1 Band @3V



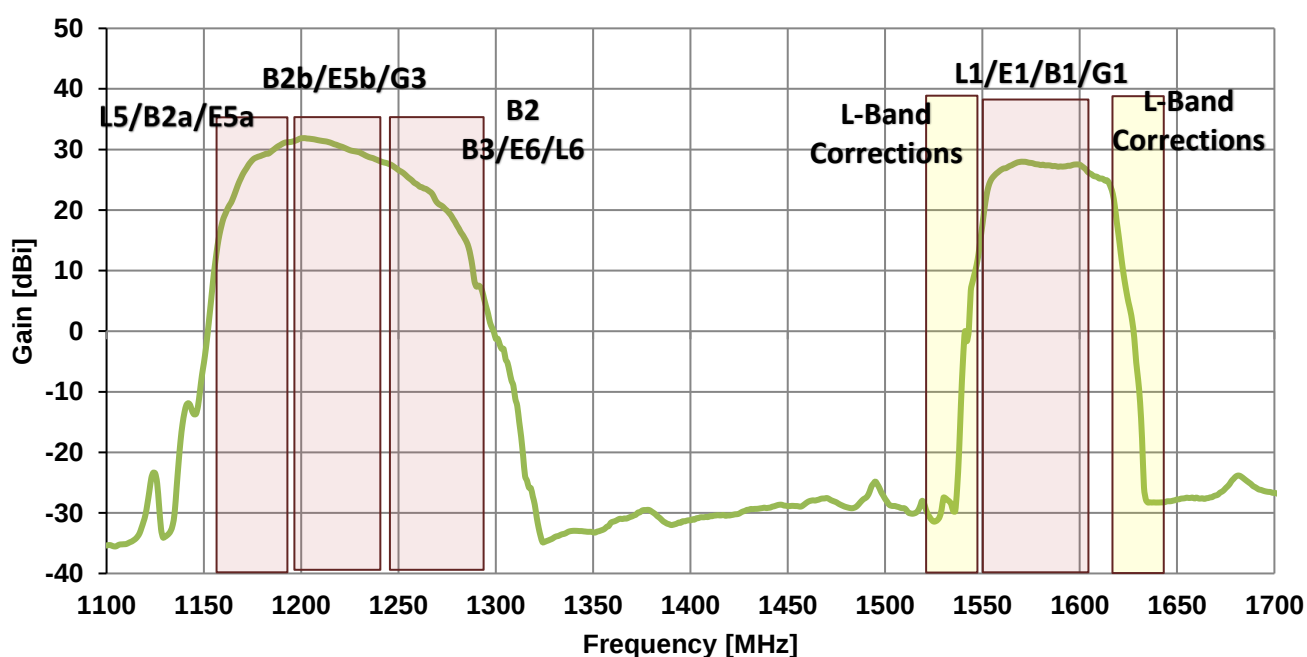
### 4.4 LNA Noise Figure @3V



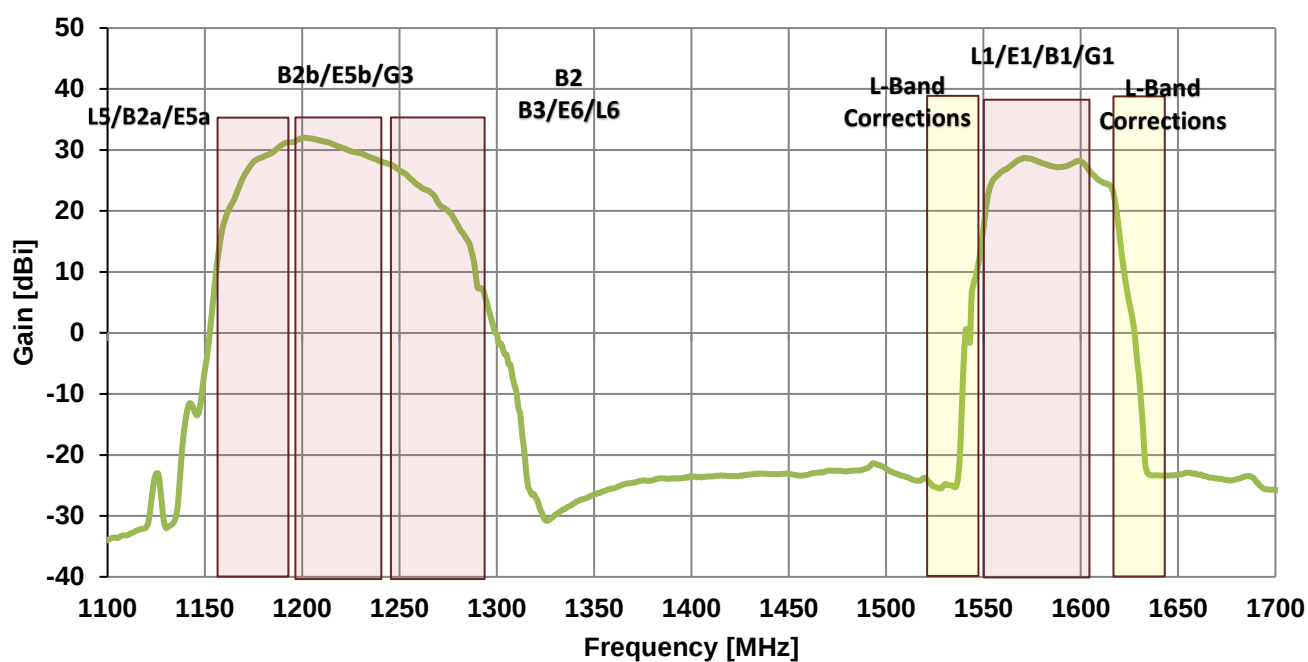
## 4.5 S12 Wide Band Plot



## 4.6 Combined Gain – 30\*30cm Ground Plane

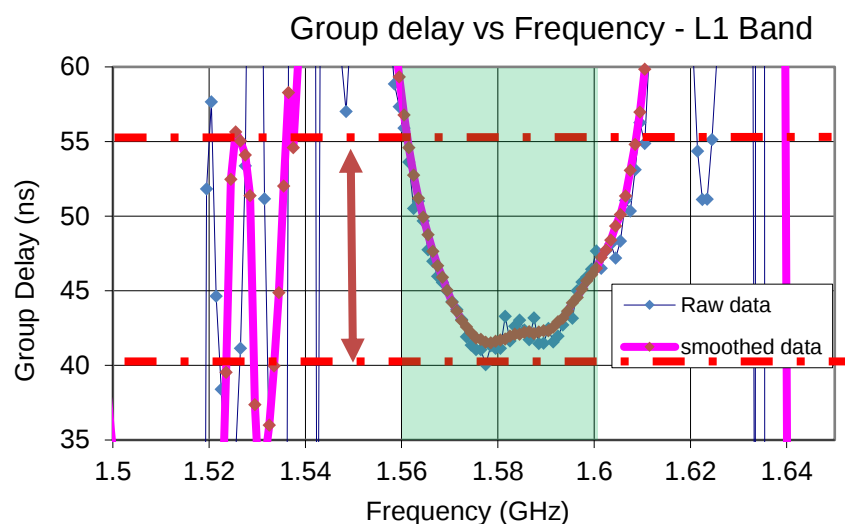


## 4.7 Combined Gain – Free Space

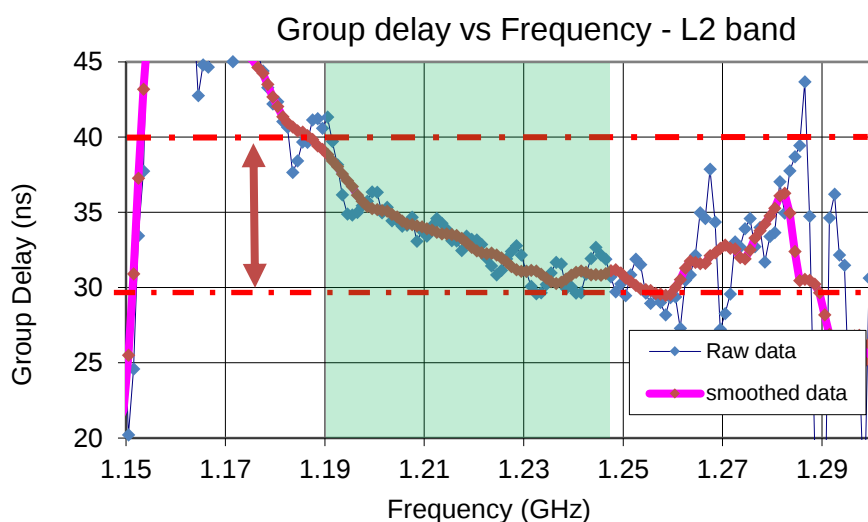


## 4.8 Group Delay vs Frequency – Free Space

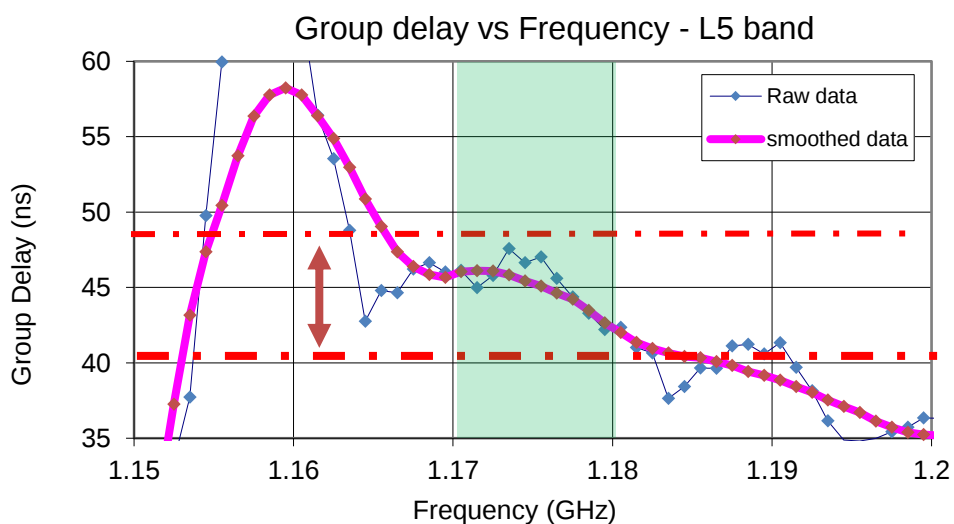
L1



L2

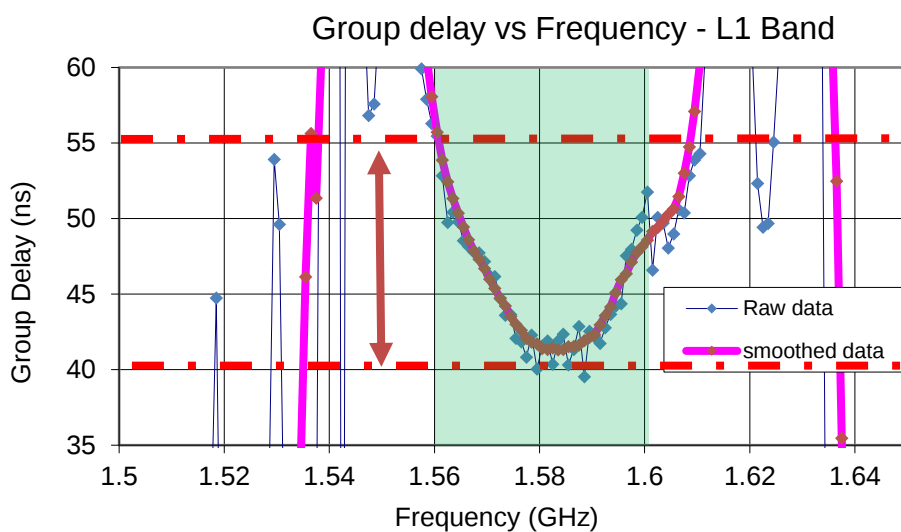


L5

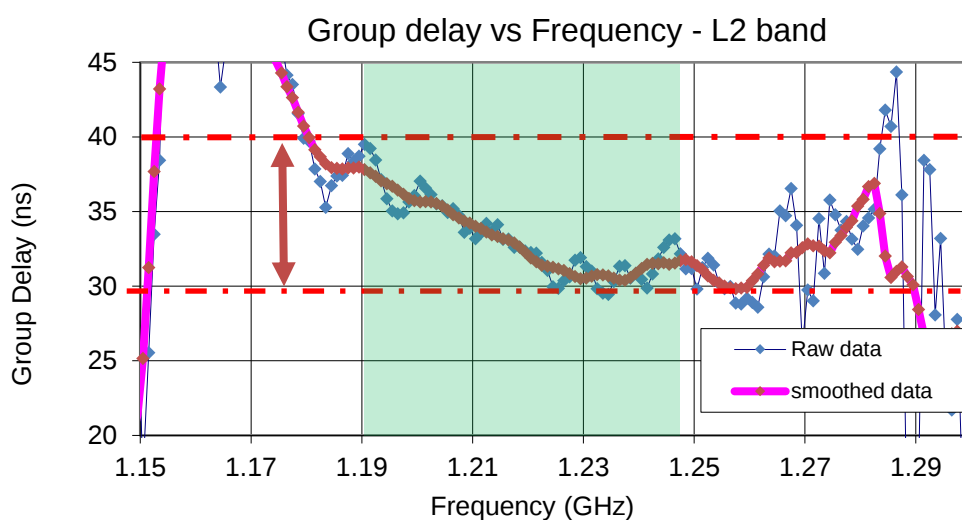


## 4.9 Group Delay vs Frequency – 30\*30cm Ground Plane

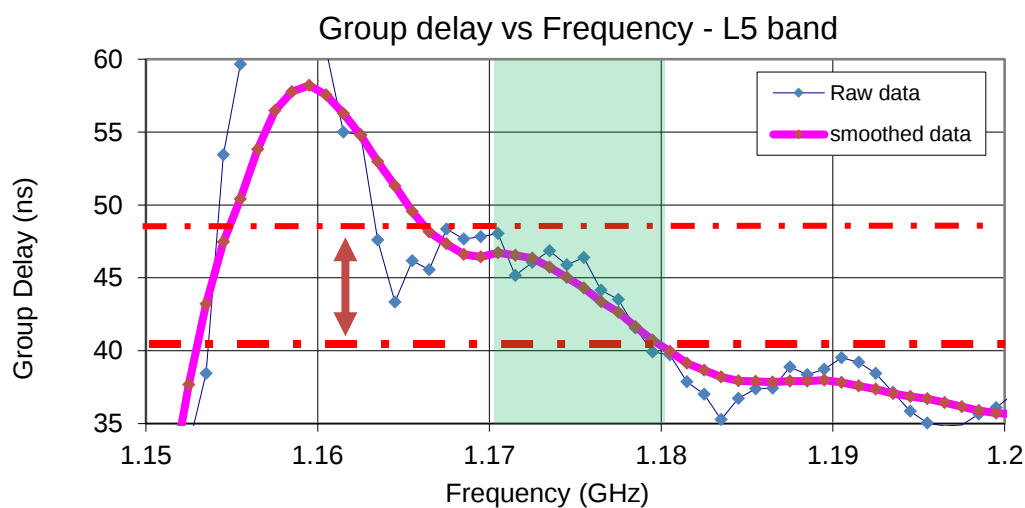
L1



L2

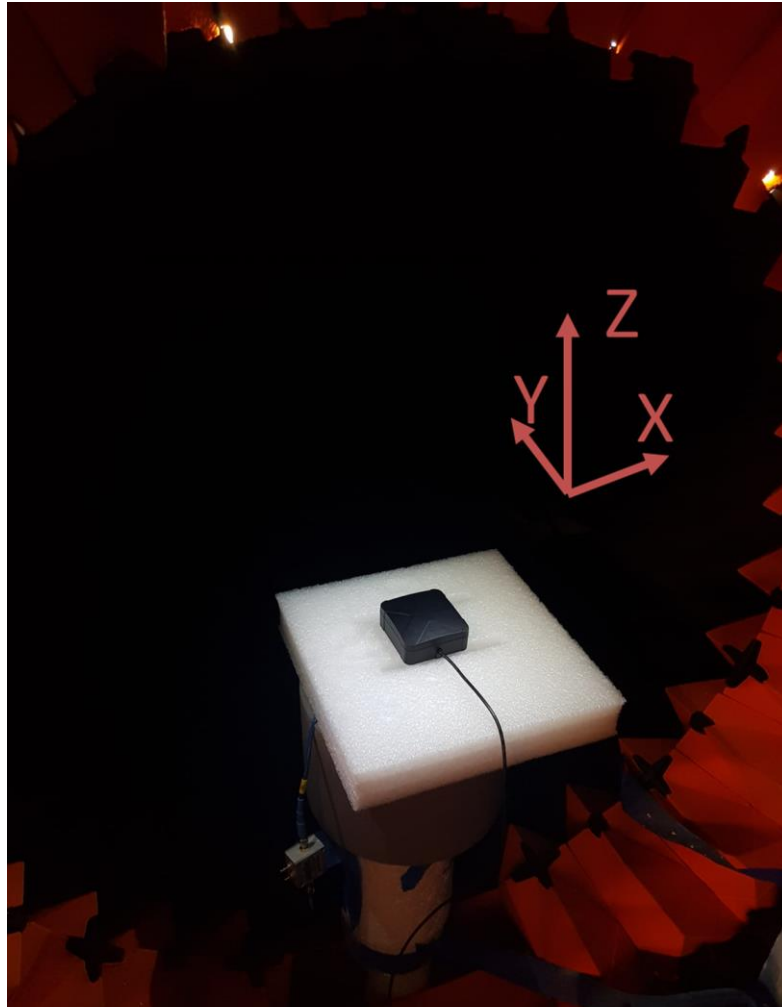


L5

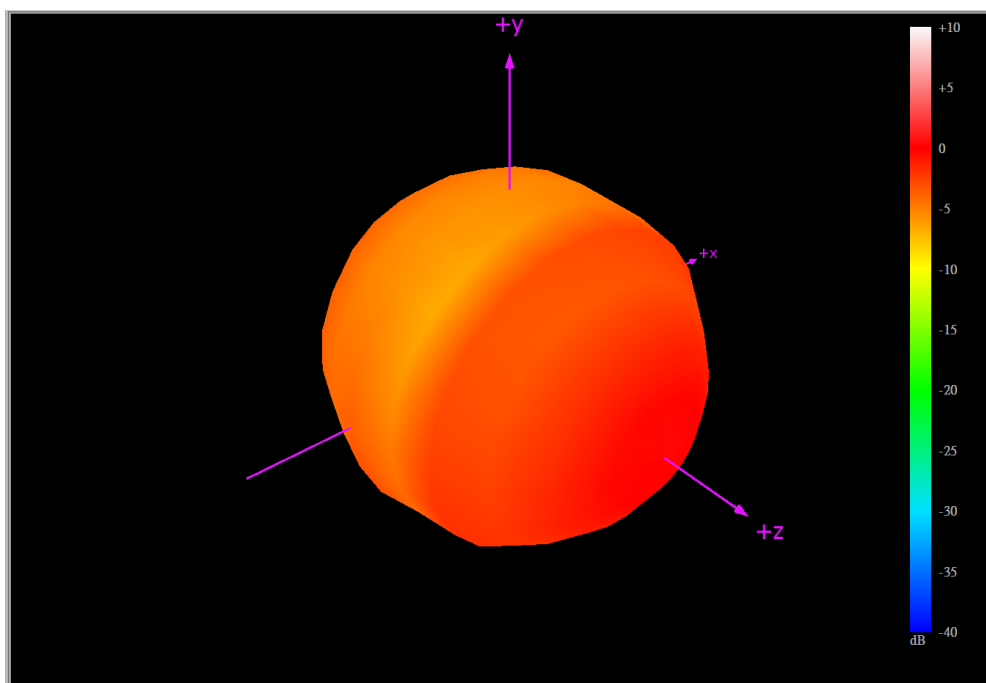


## 5. Radiation Patterns

### 5.1 Test Setup – Free Space



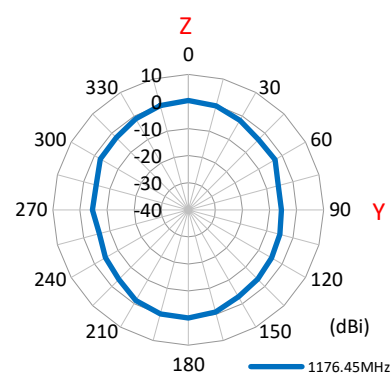
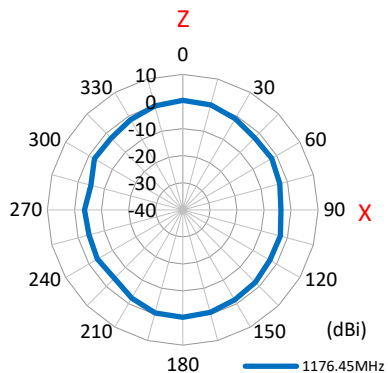
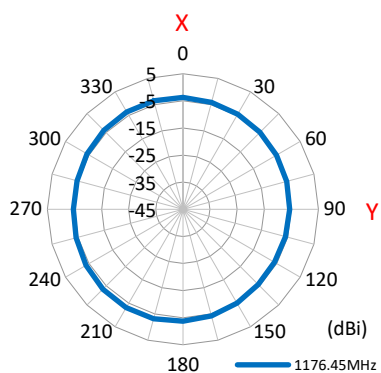
## 5.2 1176.45MHz 3D and 2D Radiation Patterns



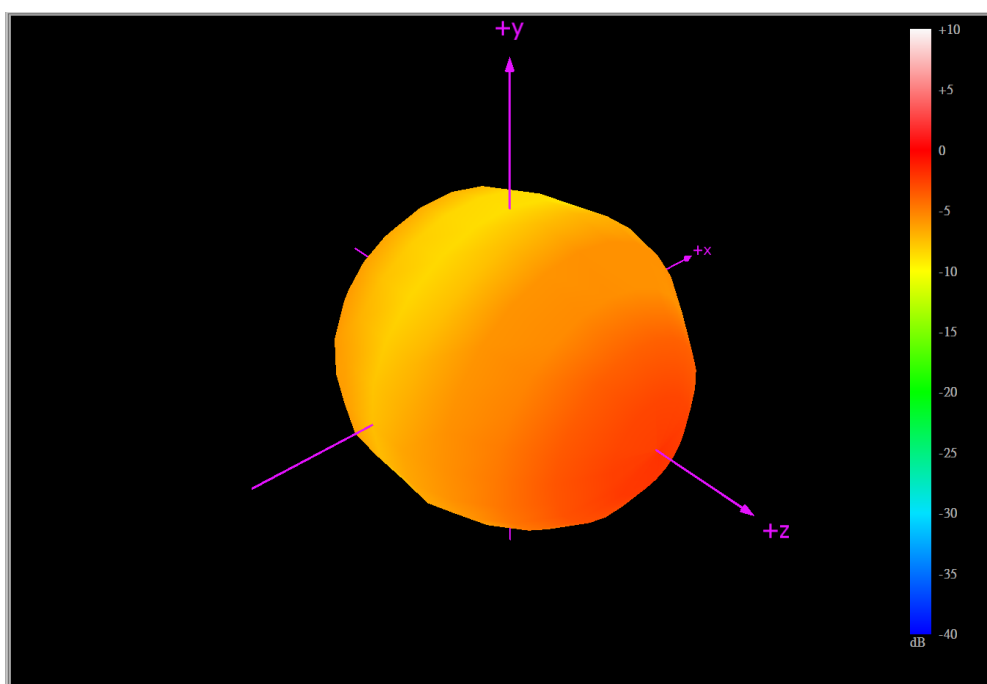
XY Plane

XZ Plane

YZ Plane



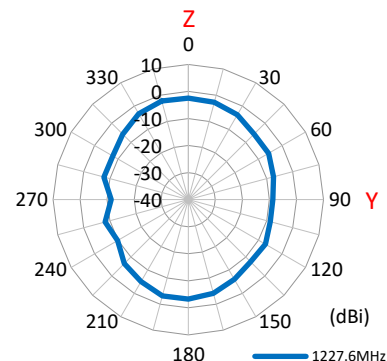
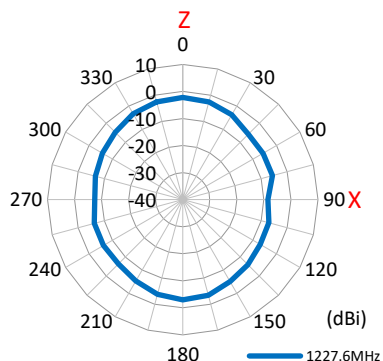
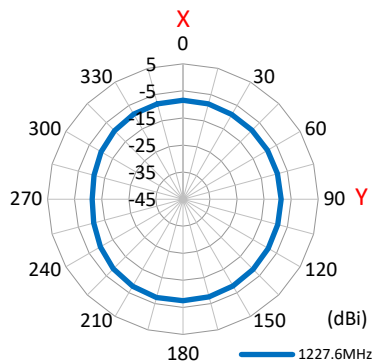
### 5.3 1227.6MHz 3D and 2D Radiation Patterns



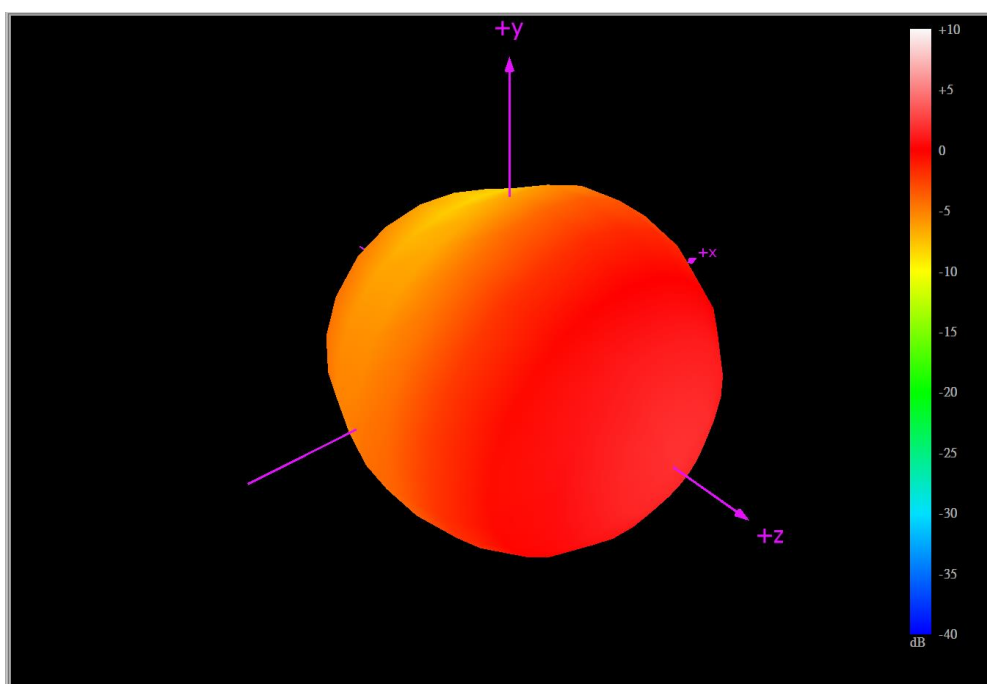
XY Plane

XZ Plane

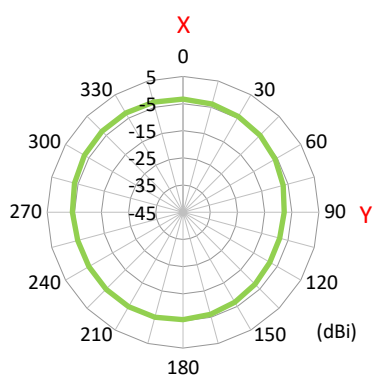
YZ Plane



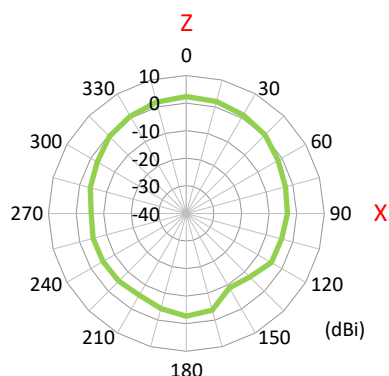
## 5.4 1561MHz 3D and 2D Radiation Patterns



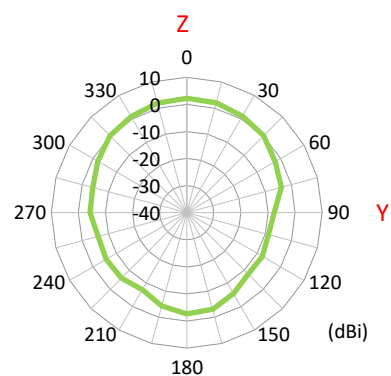
XY Plane



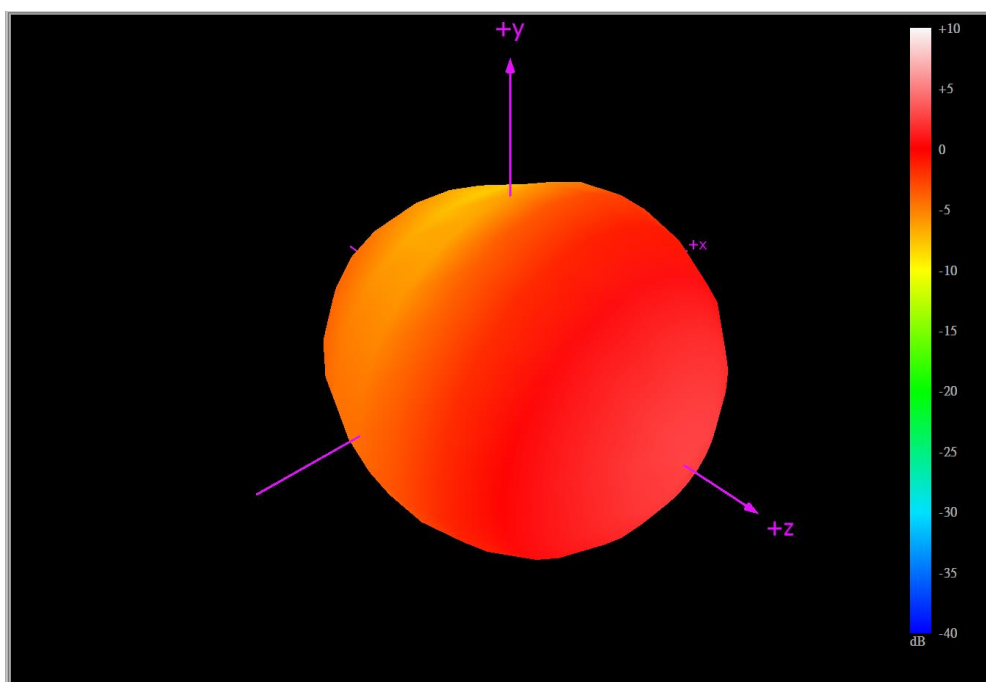
XZ Plane



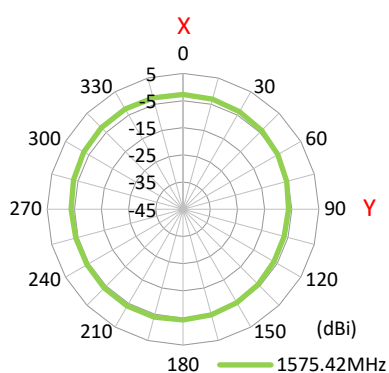
YZ Plane



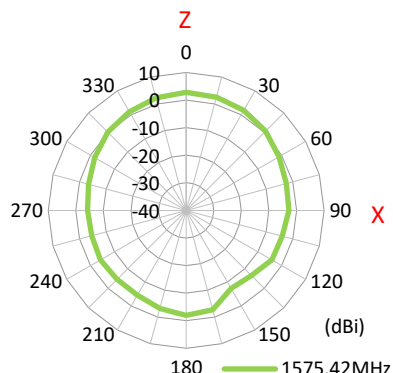
## 5.5 1575.42MHz 3D and 2D Radiation Patterns



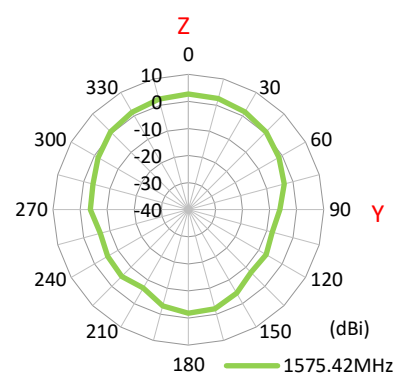
XY Plane



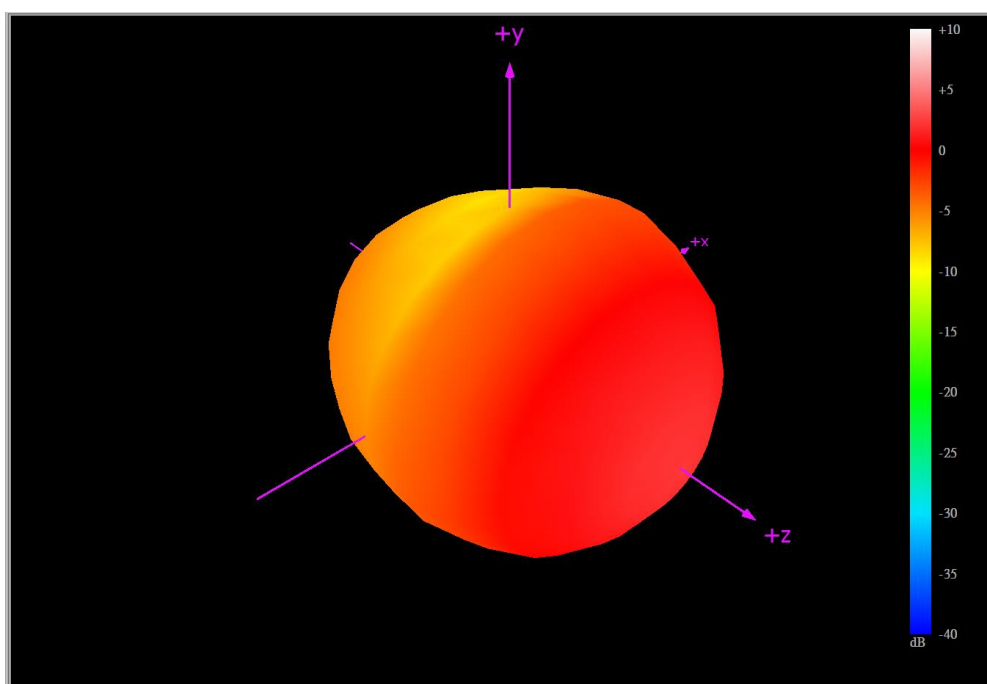
XZ Plane



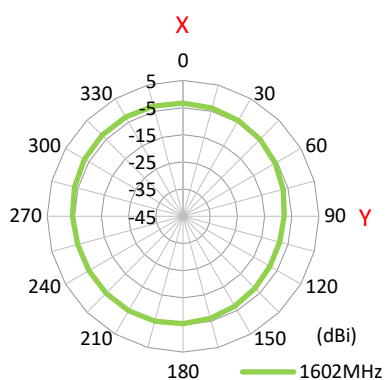
YZ Plane



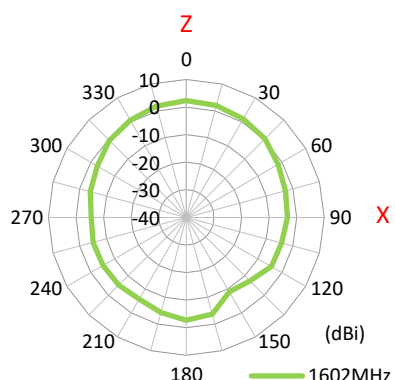
## 5.6 1602MHz 3D and 2D Radiation Patterns



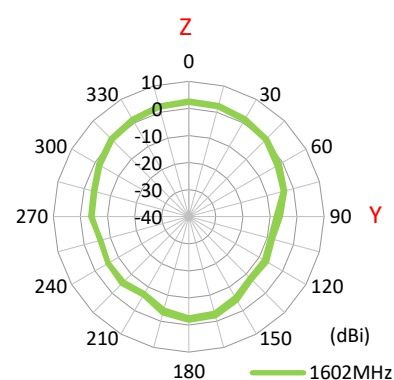
XY Plane



XZ Plane



YZ Plane



## 6. Field Test Results

### 6.1 Rooftop test

In this section Taoglas will present the field test result for AA.200 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**.

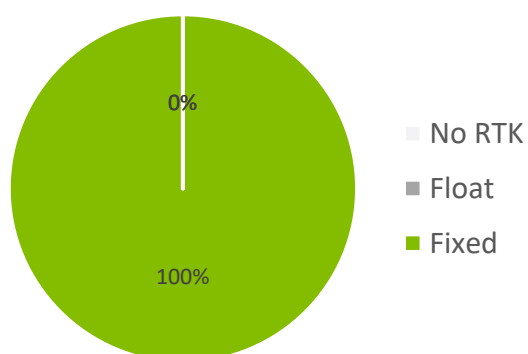
Taoglas will show the field test results using the following receiver:

#### 1. [Septentrio AsteRx-U S/N](#)

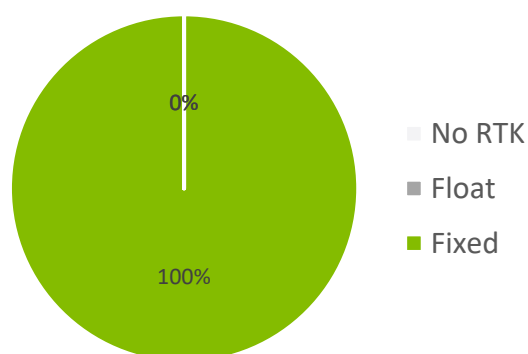
- Multi-band GNSS: 544 channels
- GPS: L1, L2, L5 GLONASS: L1, L2, L3 Galileo: E1, E5ab, AltBoc, E6 BeiDou: B1, B2, B3 NavIC: L51 QZSS: L1, L2, L5, L6
- SBAS: EGNOS, WAAS, GAGAN, MSAS, SDCM(L1, L5)
- RTK (base and rover), Integrated dual-channel L-band receiver, Support for PPP
- Nav. update rate up 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%) | TTFF (sec) |
| Free Space                               | RTK DISABLED       | 51.64 cm  | 61.89 cm   | 123.78 cm        | 22         |
|                                          | RTK ENABLED        | 1.37 cm   | 1.65 cm    | 3.29 cm          | 22         |
| 30x30 cm Ground Plane                    | RTK DISABLED       | 48.11 cm  | 57.8 cm    | 115.61 cm        | 21         |
|                                          | RTK ENABLED        | 1.17 cm   | 1.4 cm     | 2.8 cm           | 21         |

RTK Availability  
Free Space



RTK Availability  
30x30 cm GP

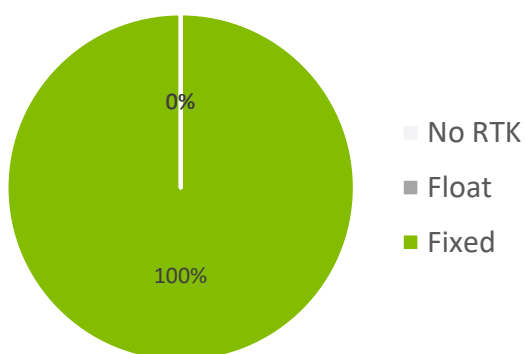


## 2. U-blox ZED F9P

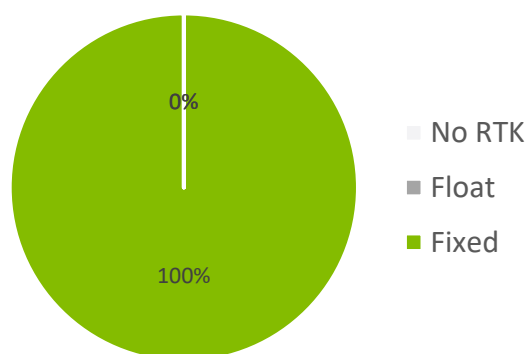
- Multi-band GNSS: 184-channel
- GPS L1C/A L2C, GLONASS: L1OF L2OF, Galileo: E1B/C E5b, BeiDou: B1I B2I, QZSS: L1C/A L2C
- Multi-band RTK with fast convergence times and reliable performance
- Nav. update rate RTK up to 20 Hz
- Position accuracy = RTK 0.01 m + 1 ppm CEP

| Positioning Accuracy Table (2D Accuracy) |                    |           |            |                  |            |
|------------------------------------------|--------------------|-----------|------------|------------------|------------|
| Test Condition                           | Correction Service | CEP (50%) | DRMS (68%) | 2DRMS (95-98.2%) | TTFF (sec) |
| Free Space                               | RTK DISABLED       | 42.78 cm  | 55.74 cm   | 111.48 cm        | 23         |
|                                          | RTK ENABLED        | 1.57 cm   | 1.9 cm     | 3.81 cm          | 23         |
| 30x30 cm Ground Plane                    | RTK DISABLED       | 30.52 cm  | 36.91 cm   | 73.83 cm         | 19         |
|                                          | RTK ENABLED        | 0.58 cm   | 0.69 cm    | 1.39 cm          | 19         |

RTK Availability  
Free Space



RTK Availability  
30x30 cm GP



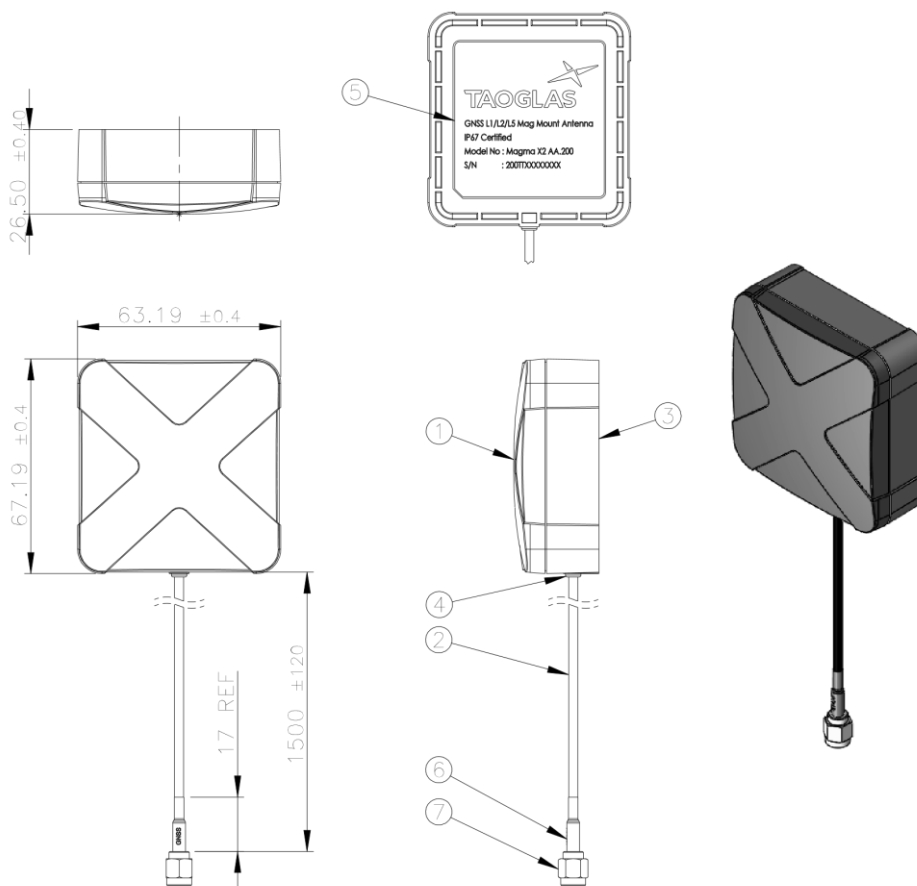
## 7. Mechanical Drawing

ISO NO.: EDW-20-8-0021

STATE: Release

NOTES:

| REV | ZONE | DESCRIPTION          | ENG      | APPROVED | DATE       |
|-----|------|----------------------|----------|----------|------------|
| D01 | ALL  | Initial design       | Joey     | Clark    | 2020/02/11 |
| D02 | ALL  | Add CE And WEEE logo | Aron Yan | Aaron    | 2020/06/29 |
| D03 | ALL  | Cancel the CE mark   | Aron Yan | Aaron    | 2020/10/14 |



|   | Name                    | Material | Finish               | QTY |
|---|-------------------------|----------|----------------------|-----|
| 1 | Top Housing             | ABS      | Black                | 1   |
| 2 | RG174 Coaxial Cable     | PVC      | Black                | 1   |
| 3 | Bottom Housing          | ABS      | Black                | 1   |
| 4 | Silicon Rubber          | Silicone | Black                | 1   |
| 5 | AA.200 Label            | PET      | Matte Silver         | 1   |
| 6 | Heat Shrink Tube (GNSS) | PE       | Blue Tube/White Text | 1   |
| 7 | SMA(M)ST                | Brass    | Au Plated            | 1   |

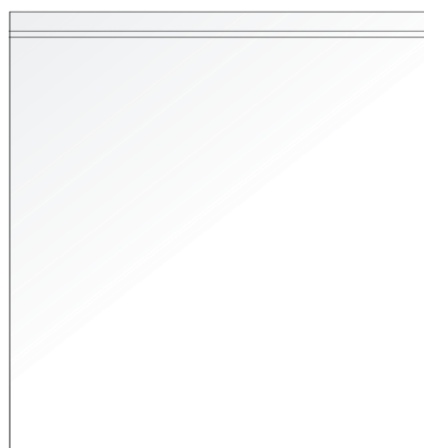
|                                                                                   |                                                                                                                                                                                                                                                                        |
|-----------------------------------------------------------------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| APPROVED BY:                                                                      | <br>TW Design Centre<br>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. |
| CHECK BY: Clark                                                                   |                                                                                                                                                                                                                                                                        |
| DRAWN BY: Joey                                                                    |                                                                                                                                                                                                                                                                        |
| DATE: 2020/2/11                                                                   |                                                                                                                                                                                                                                                                        |
| UNLESS OTHERWISE SPECIFIED TOLERANCES ON: XX±0.5, X±0.3, X±0.2, XXX±0.1, XXX±0.05 | TITLE: GNSS L1/L2/L5 External 1500mm RG-174 SMA(M)ST                                                                                                                                                                                                                   |
| THIRD ANGLE PROJECTION                                                            | PART NO.: AA.200.151111                                                                                                                                                                                                                                                |
| UNIT: mm                                                                          | SCALE: 1:2                                                                                                                                                                                                                                                             |
| PAGES: 1/1                                                                        | REV: D03                                                                                                                                                                                                                                                               |

## 8. Packaging

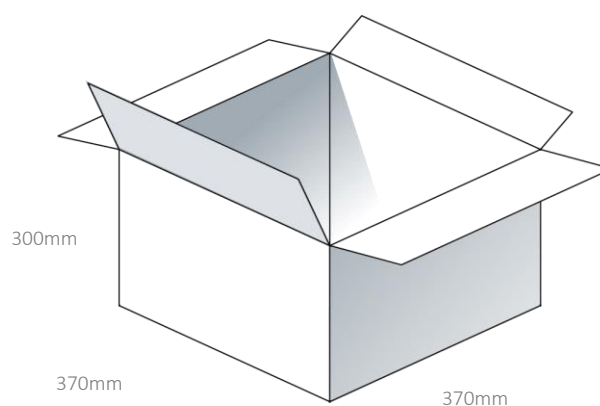
1pcs AA.200.151111 per Small PE Bag  
Weight - 165g



10pcs AA.200.151111 per Large PE Bag  
Weight – 1650g



100pcs AA.200.151111 per carton  
Dimensions - 370\*370\*300mm  
Weight – 17Kg



## Changelog for the datasheet

### SPE-20-8-002 – AA.200.151111

#### Revision: E (Current version)

|         |                            |
|---------|----------------------------|
| Date:   | 2021-09-03                 |
| Notes:  | Updated Mechanical Drawing |
| Author: | Gary West                  |

#### Previous Revisions

##### Revision: D

|         |                 |
|---------|-----------------|
| Date:   | 2021-08-13      |
| Notes:  | Updated Drawing |
| Author: | Jack Conroy     |

##### Revision: C

|         |                         |
|---------|-------------------------|
| Date:   | 2020-06-30              |
| Notes:  | Updated Data and graphs |
| Author: | Jack Conroy             |

##### Revision: B

|         |                          |
|---------|--------------------------|
| Date:   | 2020-05-28               |
| Notes:  | Added Field Test Results |
| Author: | Victor Pinazo            |

##### Revision: A (Original First Release)

|         |                 |
|---------|-----------------|
| Date:   | 2020-03-31      |
| Notes:  | Initial Release |
| Author: | Jack Conroy     |



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