



# TAOGLAS®



# Datasheet

## Neptune Series

**Part No:**  
XAHP.30.A.1L21

### Description

Multi-Mount, Multi-Band Active GNSS Marine Antenna with BNC Connector

### Features:

- Embedded Dual Patch, Dual Feed 4-Pin Assembly
- Covering L1,L2,L5 and L-Band GNSS Frequencies
- Low Axial Ratio
- Pole and Deck Mounting Options
- Robust, IP67 Rated Enclosure
- Cable: 5m of RG174
- Connector: BNC (F)
- Dimensions: Ø113 x 80mm
- RoHS & Reach Compliant

|           |                                |           |
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|--|------------------|-----------|

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# 1. Introduction



## Compact, Multiband GNSS Antenna for High Precision, Accurate Positioning Marine Applications

The Taoglas Neptune XAHP.30 is an external active multi-band GNSS antenna engineered for high-performance marine applications that demand enhanced signal filtering combined with multipath rejection. This antenna is designed to include the full sweep of GNSS bands and frequencies including GPS (L1,L2,L5), GLONASS (G1,G2,G3), Galileo (E1, E5a, E5b,) BeiDou (B1C, B1I, B2a, B2b), IRNSS (L5), QZSS (L1,L2C,L5), SBAS and L-Band (1542MHz). Including the option for all these GNSS systems ensures quick time to first fix, enhanced navigational accuracy, and the reliability you expect from a Taoglas product.

The dual-feed, dual-patch is designed for superb axial ratio, and the active electronics integrate low-loss filters and front-end SAW filters that help eliminate nearby out-of-band signals. High performance is achieved with a Gain figure of 26.8dB across bandwidth. The product is tested with a voltage rating range of 1.8 to 5.5 V for enhanced safety.

### Typical Applications:

- Marine, Boats and Water Leisure Activities
- Military Vehicle Tracking & Asset Tracking
- Fleet Telematics and Navigation
- Surveying and Mapping Systems

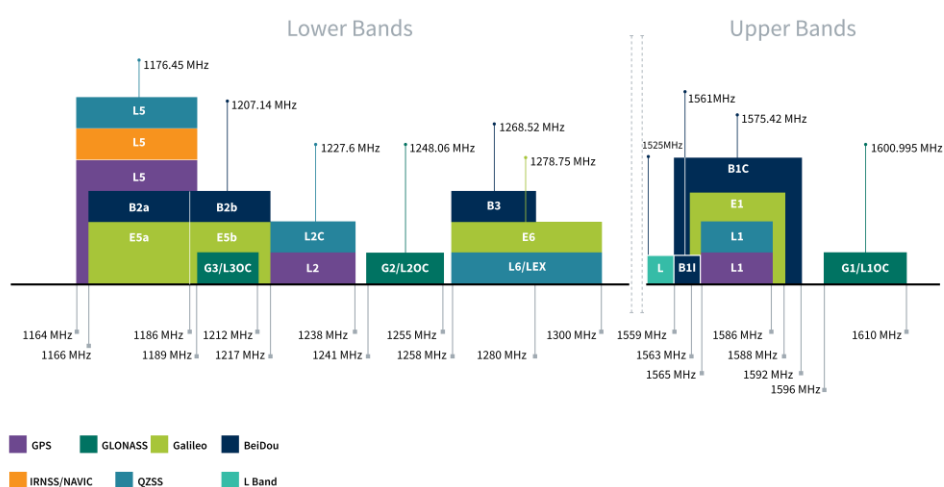
### Installation:

The Neptune antenna was designed with a ruggedised IP67-rated enclosure and mount to cope with the most demanding marine environments and weather conditions. The white ASA material is lightweight, strong and the domed enclosure prevents water ingress and birds from resting on the antenna. The XAHP.30 allows for both pole and deck mounting options, and installation is simple. The antenna is designed to operate in conditions from -40C and +85C without any effects on performance. The antenna has a BNC(F) connector as standard and comes with a 5m RG-174 cable with BNC(M) connectors to connect you to your navigational equipment. Customised cable can be configured from the Taoglas Cable Builder if you require an alternative.

For more information on the Neptune XAHP.30 or to request samples, contact your local Taoglas customer services team.

## 2. Specification

| GNSS Frequency Bands |                         |                           |                    |                    |                   |
|----------------------|-------------------------|---------------------------|--------------------|--------------------|-------------------|
| GPS                  | L1<br>1575.42 MHz       | L2<br>1227.6 MHz          | L5<br>1176.45 MHz  |                    |                   |
|                      | ■                       | ■                         | ■                  |                    |                   |
| GLONASS              | G1<br>1602 MHz          | G2<br>1248 MHz            | G3<br>1207 MHz     |                    |                   |
|                      | ■                       | ■                         | ■                  |                    |                   |
| Galileo              | E1<br>1575.24 MHz       | E5a<br>1176.45 MHz        | E5b<br>1201.5 MHz  | E6<br>1278.75 MHz  |                   |
|                      | ■                       | ■                         | ■                  | □                  |                   |
| BeiDou               | B1C<br>1575.42 MHz      | B1I<br>1561 MHz           | B2a<br>1176.45 MHz | B2b<br>1207.14 MHz | B3<br>1268.52 MHz |
|                      | ■                       | ■                         | ■                  | ■                  | □                 |
| L-Band               | L-Band<br>1542 MHz      |                           |                    |                    |                   |
|                      | ■                       |                           |                    |                    |                   |
| QZSS (Regional)      | L1<br>1575.42 MHz       | L2C<br>1227.6 MHz         | L5<br>1176.45 MHz  | L6<br>1278.75e6    |                   |
|                      | ■                       | ■                         | ■                  | □                  |                   |
| IRNSS (Regional)     | L5<br>1176.45 MHz       |                           |                    |                    |                   |
|                      | ■                       |                           |                    |                    |                   |
| SBAS                 | L1/E1/B1<br>1575.42 MHz | L5/B2a/E5a<br>1176.45 MHz | G1<br>1602 MHz     | G2<br>1248 MHz     | G3<br>1207 MHz    |
|                      | ■                       | ■                         | ■                  | ■                  | ■                 |



GNSS Bands and Constellations

| GNSS Electrical                                              |         |         |        |       |       |       |         |       |
|--------------------------------------------------------------|---------|---------|--------|-------|-------|-------|---------|-------|
| Frequency (MHz)                                              | 1176.45 | 1201.55 | 1227.6 | 1248  | 1542  | 1561  | 1575.42 | 1603  |
| Passive Antenna Efficiency (%) (Without cable loss)          | 36      | 52      | 55     | 42    | 52    | 56    | 52      | 40    |
| Passive Antenna Gain (dBi) (Without cable loss)              | 1.6     | 3.3     | 3.5    | 2.3   | 3.8   | 4.2   | 3.9     | 2.6   |
| Axial Ratio (dB)                                             | 0.7     | 0.2     | 0.3    | 0.5   | 1.4   | 1.5   | 1.6     | 1.7   |
| PCO_x (cm)                                                   | -0.13   | -0.11   | -0.06  | -0.05 | 0.41  | 0.44  | 0.45    | 0.47  |
| PCO_y (cm)                                                   | -2.25   | -2.12   | -2.0   | -1.93 | -1.84 | -1.93 | -1.97   | -2.12 |
| PCV (cm)                                                     | 0.7     | 0.9     | 1.1    | 1.2   | 1.2   | 1.2   | 1.2     | 1.3   |
| Group Delay (ns)                                             | 15.97   | 13.49   | 13.61  | 13.62 | 13.06 | 11.44 | 11.55   | 10.96 |
| Polarization                                                 |         | RHCP    |        |       |       |       |         |       |
| Impedance                                                    |         | 50 Ω    |        |       |       |       |         |       |
| Cable                                                        |         | RG174   |        |       |       |       |         |       |
| Connector                                                    |         | SMA(M)  |        |       |       |       |         |       |
| Tested in Free Space (See test set-up pictures in Section 6) |         |         |        |       |       |       |         |       |

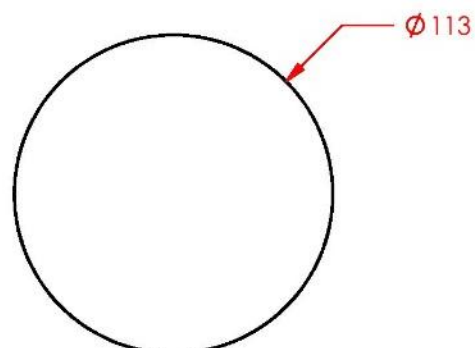
| LNA and Filter Electrical Properties    |         |         |        |      |      |      |         |      |
|-----------------------------------------|---------|---------|--------|------|------|------|---------|------|
| Frequency (MHz)                         | 1176.45 | 1201.55 | 1227.6 | 1248 | 1542 | 1561 | 1575.42 | 1603 |
| Gain (dB)                               | 25.5    | 26.8    | 26.7   | 26.4 | 26.8 | 26.8 | 26.6    | 26.2 |
| Noise (dB)                              | 3.2     | 2.8     | 2.7    | 2.7  | 1.7  | 1.6  | 1.6     | 1.5  |
| Current Consumption(mA)<br>Typ.         | 18 ± 3  |         |        |      |      |      |         |      |
| Results shown are from Vin=1.8 to 5.5 V |         |         |        |      |      |      |         |      |

| Total Specification (Through Antenna, SAW Filter and LNA) |         |         |        |      |      |      |         |      |
|-----------------------------------------------------------|---------|---------|--------|------|------|------|---------|------|
| Frequency (MHz)                                           | 1176.45 | 1201.55 | 1227.6 | 1248 | 1542 | 1561 | 1575.42 | 1603 |
| Gain (dBi)                                                | 24.0    | 25.6    | 25.9   | 24.3 | 30.5 | 30.3 | 30.1    | 28.8 |
| Total Specification Results tested on a pole              |         |         |        |      |      |      |         |      |

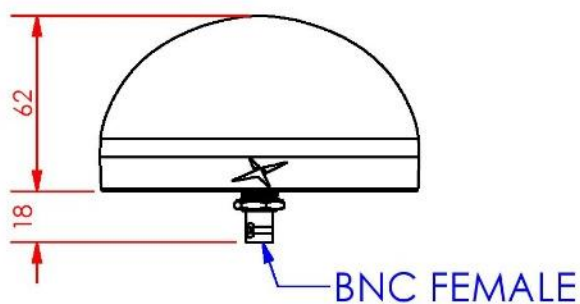
| Mechanical         |                                     |
|--------------------|-------------------------------------|
| Dimensions         | Ø113 x 62mm                         |
| Weight             | 223g                                |
| Enclosure Material | ASA                                 |
| Connector          | BNC (F)                             |
| Cable Assembly     | 5m of RG174 with BNC (M) to BNC (M) |

| Environmental          |                          |
|------------------------|--------------------------|
| Waterproof Rating      | IP67                     |
| Temperature Range      | -40°C to 85°C            |
| Relative Humidity      | 65°C, 95%RH for 96 hours |
| RoHs & REACH Compliant | Yes                      |

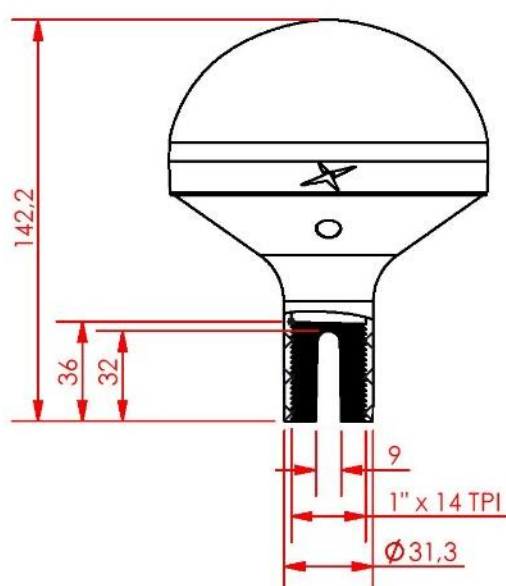
### 3. Mechanical Drawing



PLAN VIEW



DECK MOUNT CONFIGURATION  
FRONT ELEVATION VIEW



POLE MOUNT CONFIGURATION  
FRONT ELEVATION VIEW

## 4. Installation Guide

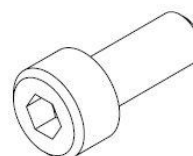
### 4.1 What's in the box



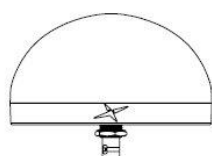
MARINE ANTENNA POLE MOUNT



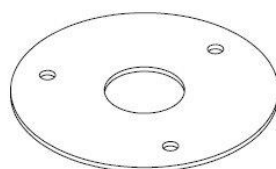
BNC CONNECTOR TO CABLE (5 m) TO BNC CONNECTOR



M4 x 10 FULL THREAD SKT HD CAP SCREW



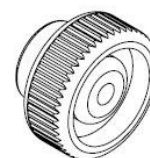
MARINE ANTENNA



DECK GASKET

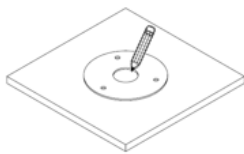
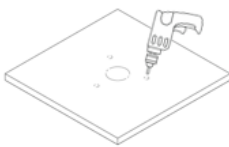
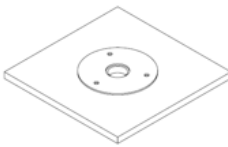
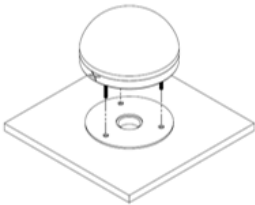


THREADED ROD M4



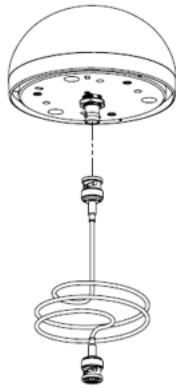
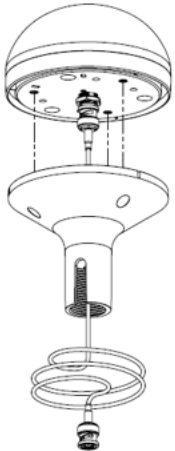
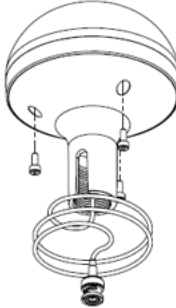
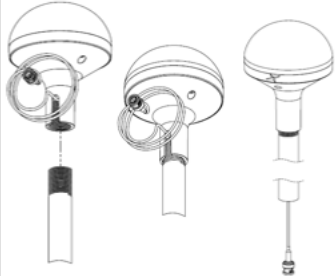
THROUGH HOLE KNOB M4

### 4.2 Deck Mount

|                                                                                                                                                                                                                                                                                                                |                                                                                                                                                                                                                                                          |                                                                                                                                                                                                                                                                                                                                                    |
|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <p>Step 1</p>  <p>Place the Gasket onto the deck to mark the positions of the holes that need to be drilled.</p>                                                                                                            | <p>Step 2</p>  <p>Remove the Gasket and drill the marked holes.</p>                                                                                                   | <p>Step 3</p>  <p>Place the Gasket back onto the deck and line it up with the drilled holes.</p>                                                                                                                                                              |
| <p>Step 4</p>  <p>Insert the M4 Threaded Rods into the base of the Marine Antenna.</p> <p><i>Optional:</i><br/>Attach one end of the 5m long BNC(M) connector cable to the BNC(F) connector on the base of the antenna.</p> | <p>Step 5</p>  <p>Place the antenna on top of the Gasket, ensuring that the Threaded Rods (and the 5m cable, if fitted in Step 4) pass through the drilled holes.</p> | <p>Step 6</p>  <p>From the underside of the deck, clamp the antenna into place by fully threading home the M4 Knobs. Attach one end of the 5m long BNC(M) connector to the BNC(F) connector on the base of the antenna, if not done previously in Step 4.</p> |

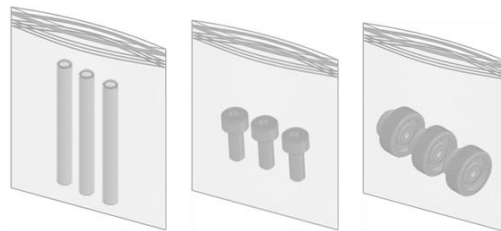


## 4.3 Pole Mount

|                                                                                                                                                                                                                 |                                                                                                                                                                                                               |                                                                                                                                                               |                                                                                                                                                                                                                                                                                                                                                                |
|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <p>Step 1</p>  <p>Attach one end of the 5m long BNC(M) connector cable to the BNC(F) connector on the base of the antenna.</p> | <p>Step 2</p>  <p>Pull the cable through the Pole Mount attachment and guide it into place on the bottom of the antenna.</p> | <p>Step 3</p>  <p>Connect the Pole Mount attachment using the M4 bolts.</p> | <p>Step 4</p>  <p>Pull the cable to the bottom of the slot on the Pole Mount attachment. Screw the attachment onto a 1" x 14 TPI mounting pole, taking care not to pinch the cable.</p> <p><i>Optional:</i><br/>Feed the cable through the centre of the mounting pole.</p> |
|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|

## 5. Packaging

3 pcs per Ziploc bag



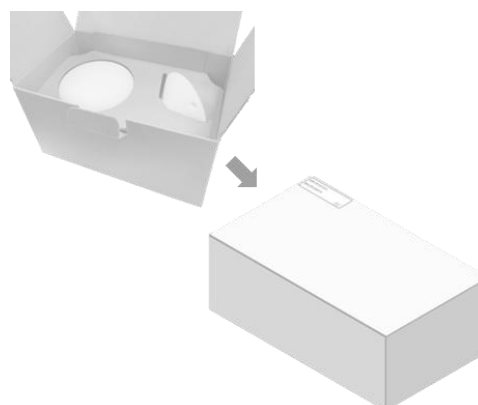
1 pcs per Ziploc bag



1 pcs per PE bag



1 Set/Box  
Box Dimensions : 248x147x135mm  
Weight : 0.58Kg



4 pcs per Carton  
 Carton Dimensions: 390x320x290mm  
 Weight: 3.1Kg



## 6. Antenna Characteristics

### 6.1 Test Setup

AUT

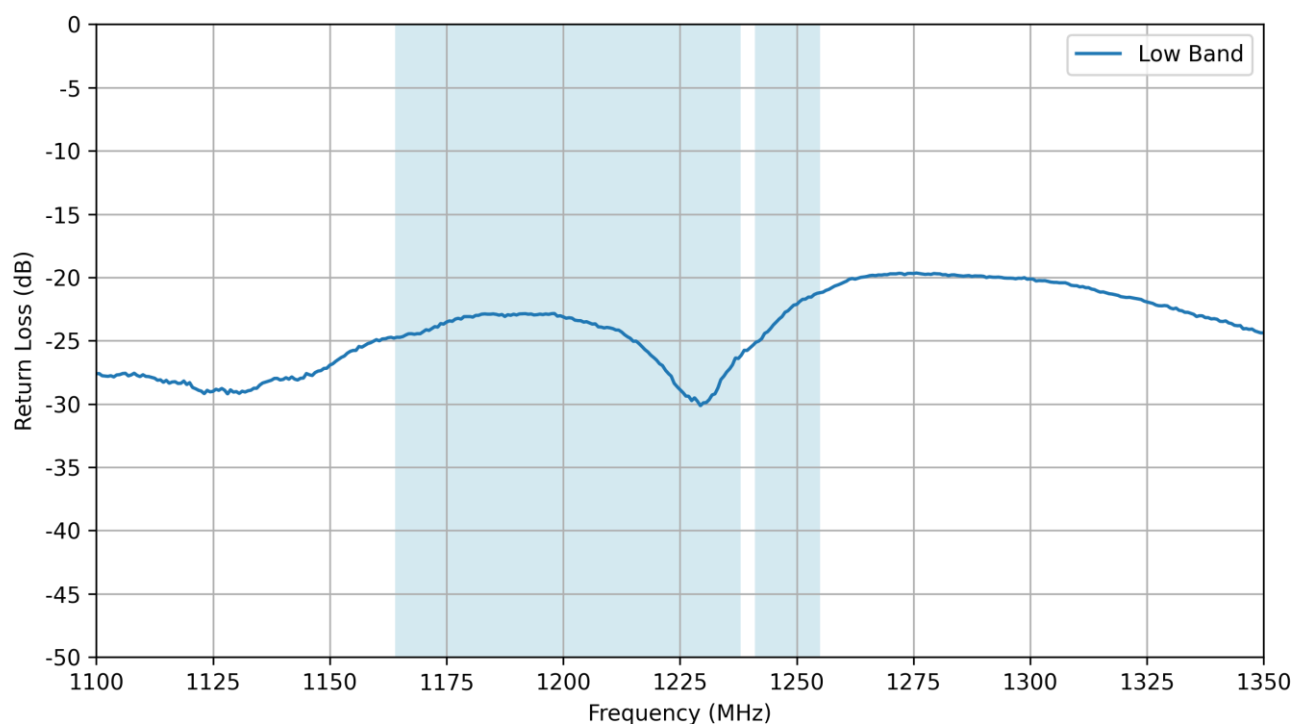


Vector Network Analyzer

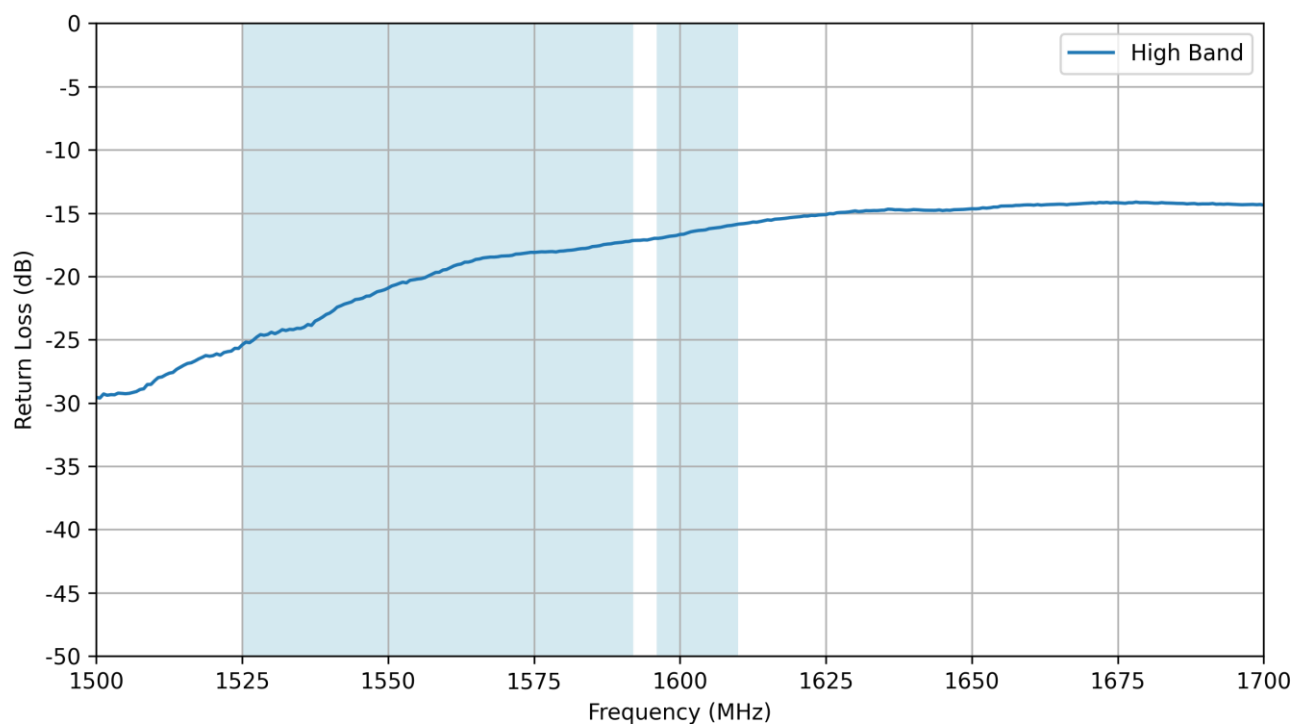


VNA Test-Setup

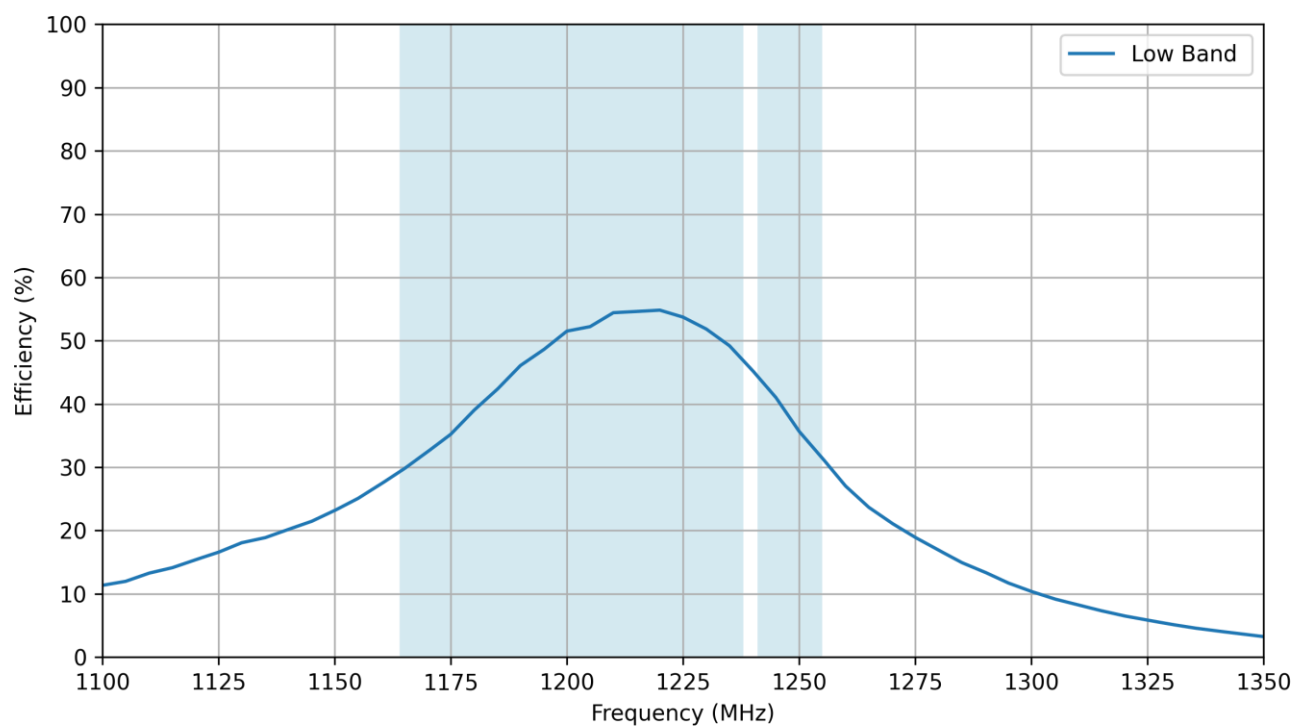
## 6.2 Return Loss – Low-Band



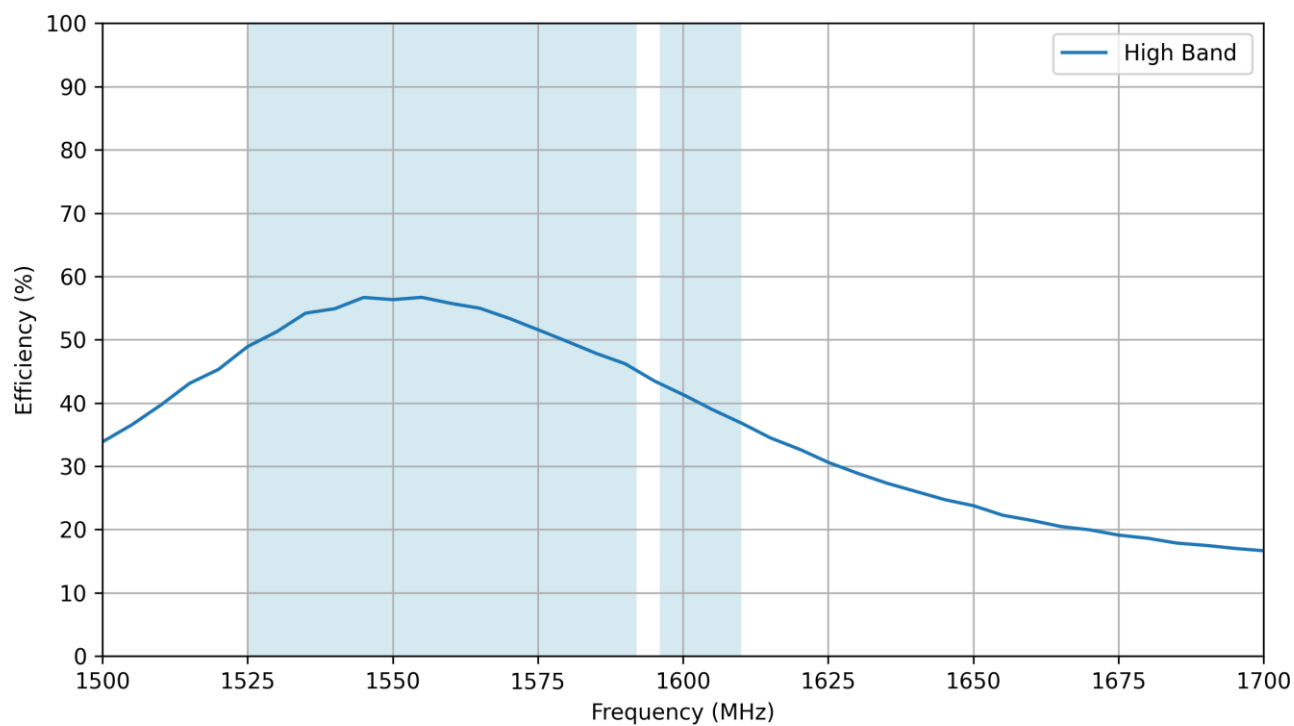
## 6.3 Return Loss – High-Band



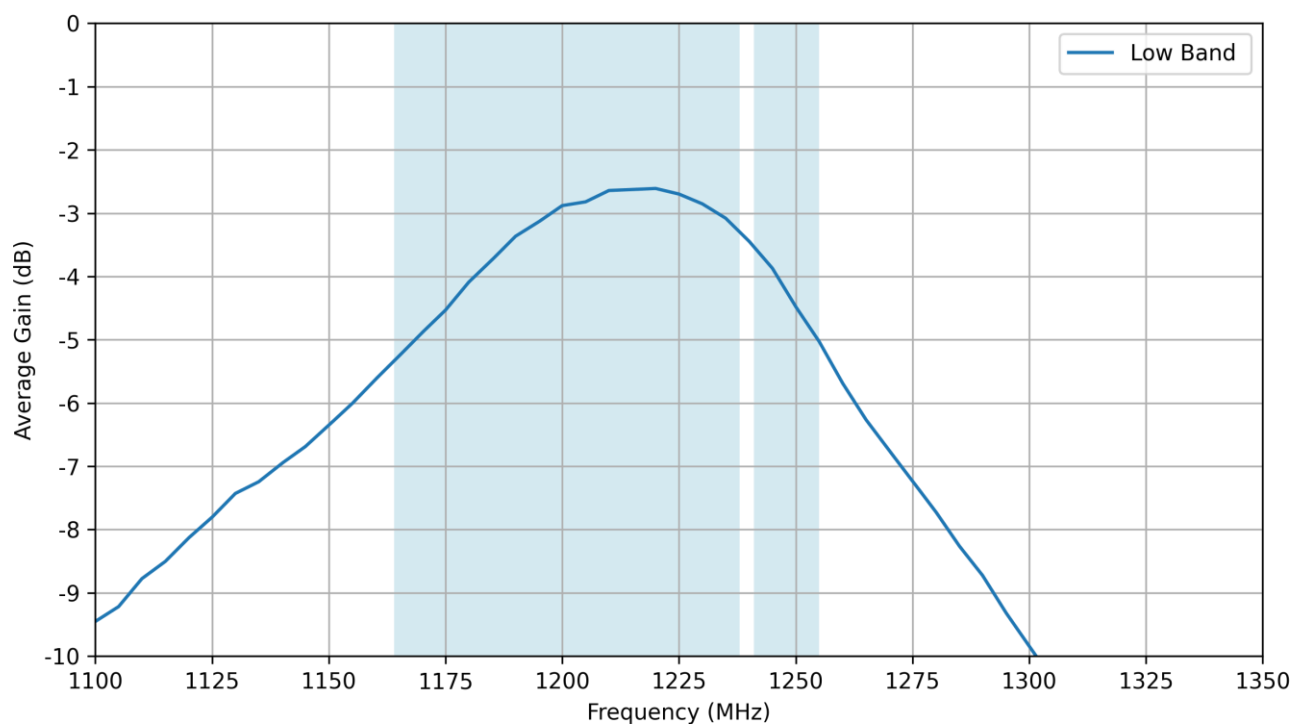
## 6.4 Efficiency – Low-Band



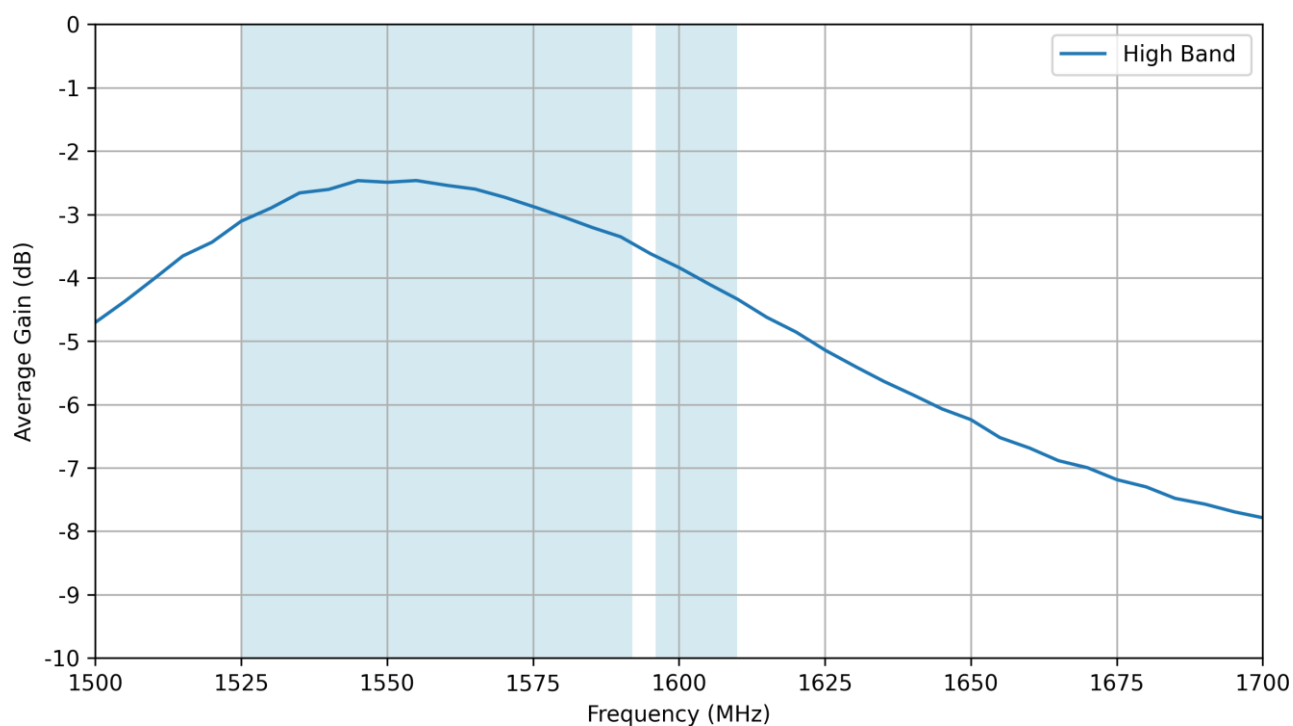
## 6.5 Efficiency – High-Band



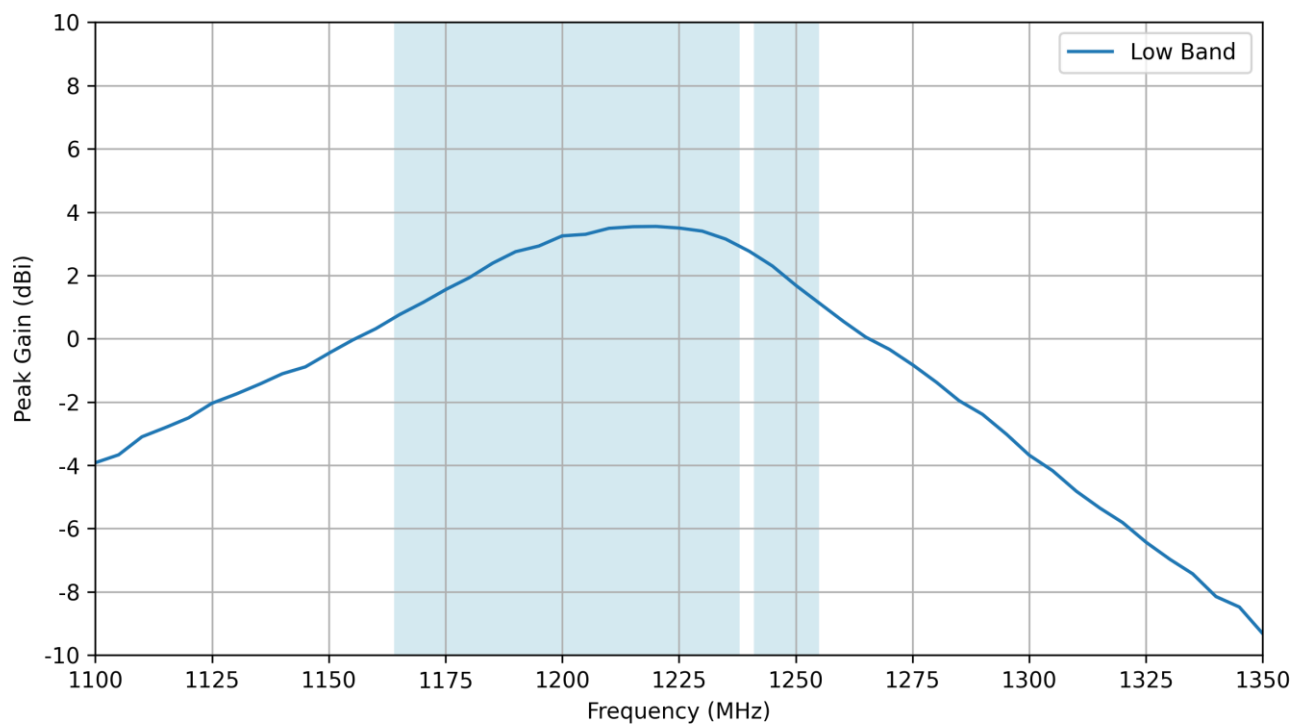
## 6.6 Average Gain – Low-Band



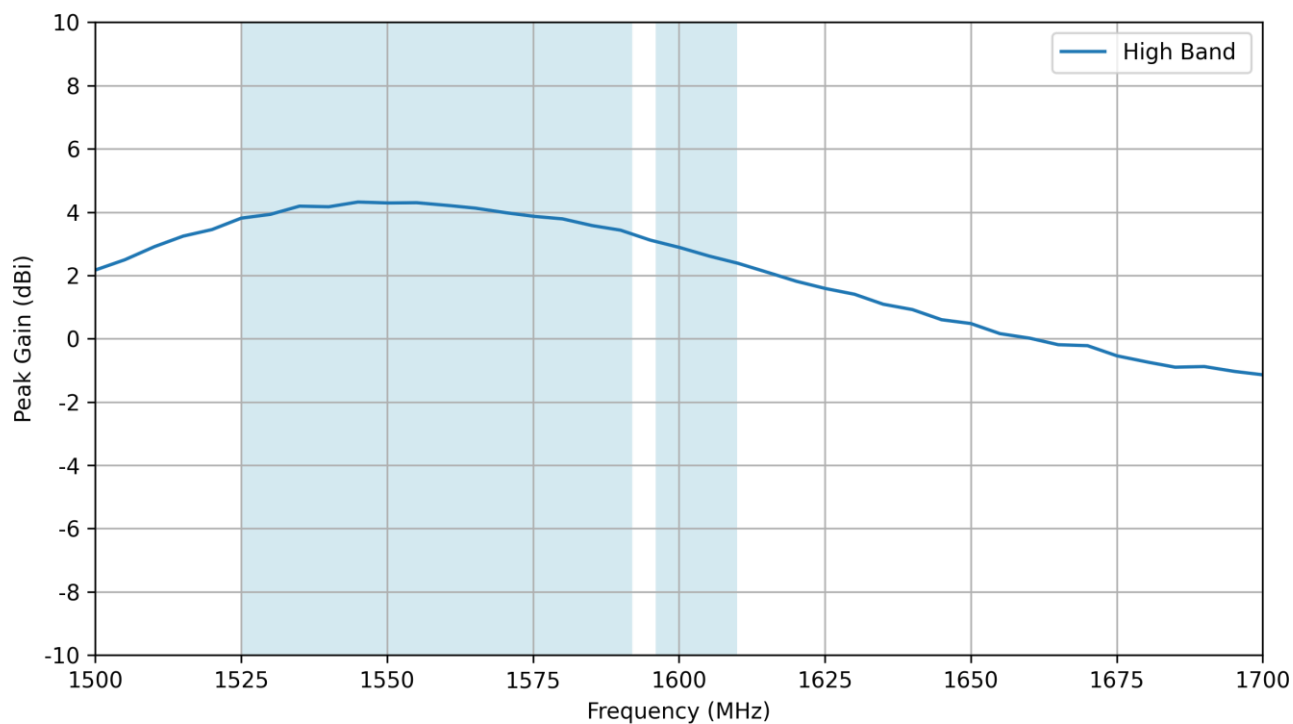
## 6.7 Average Gain – High-Band



## 6.8 Peak Gain – Low-Band

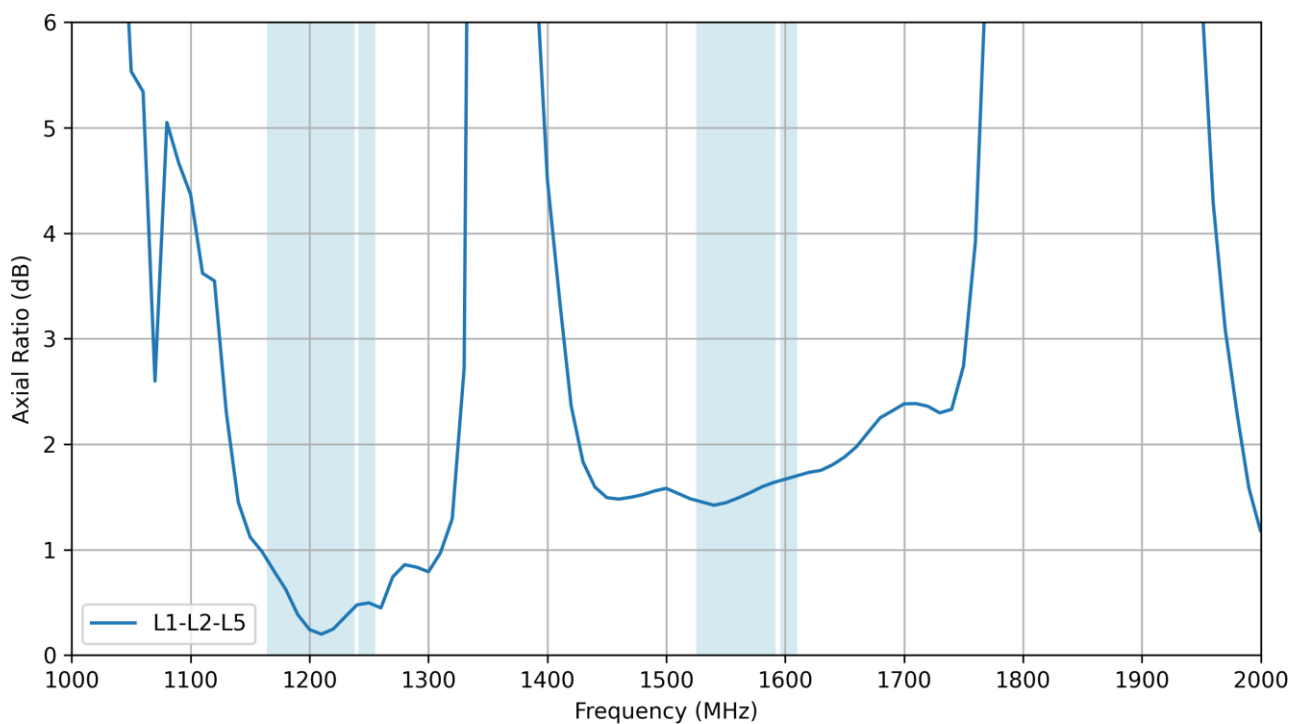


## 6.9 Peak Gain – High-Band

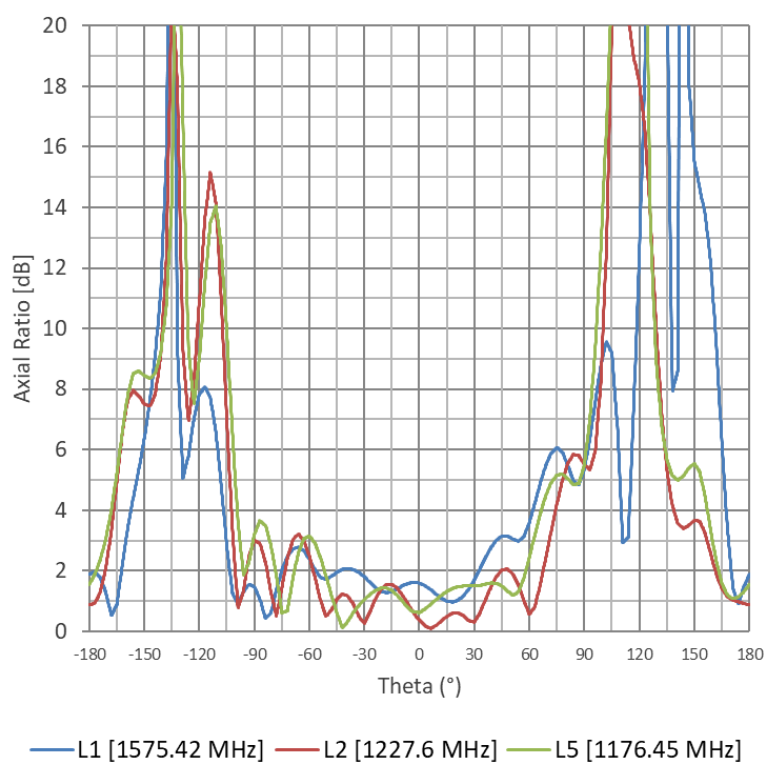




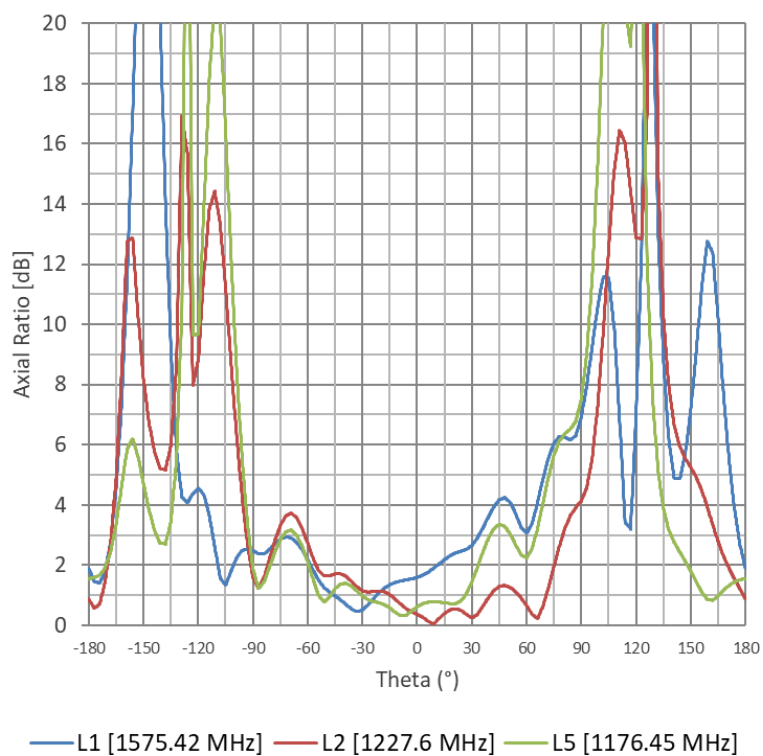
## 6.10 Axial Ratio vs Frequency



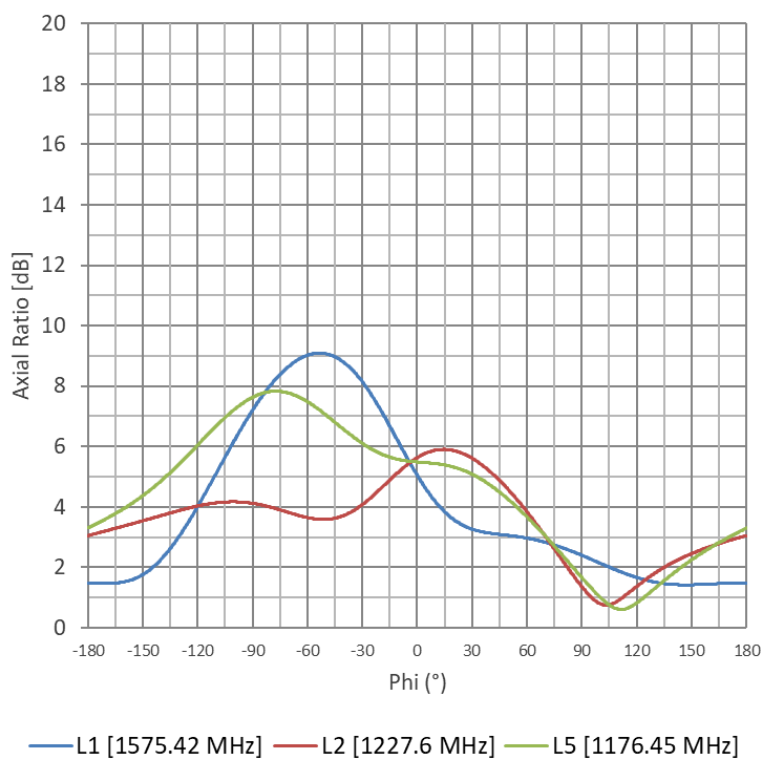
## 6.11 AR vs Angle for Phi=0



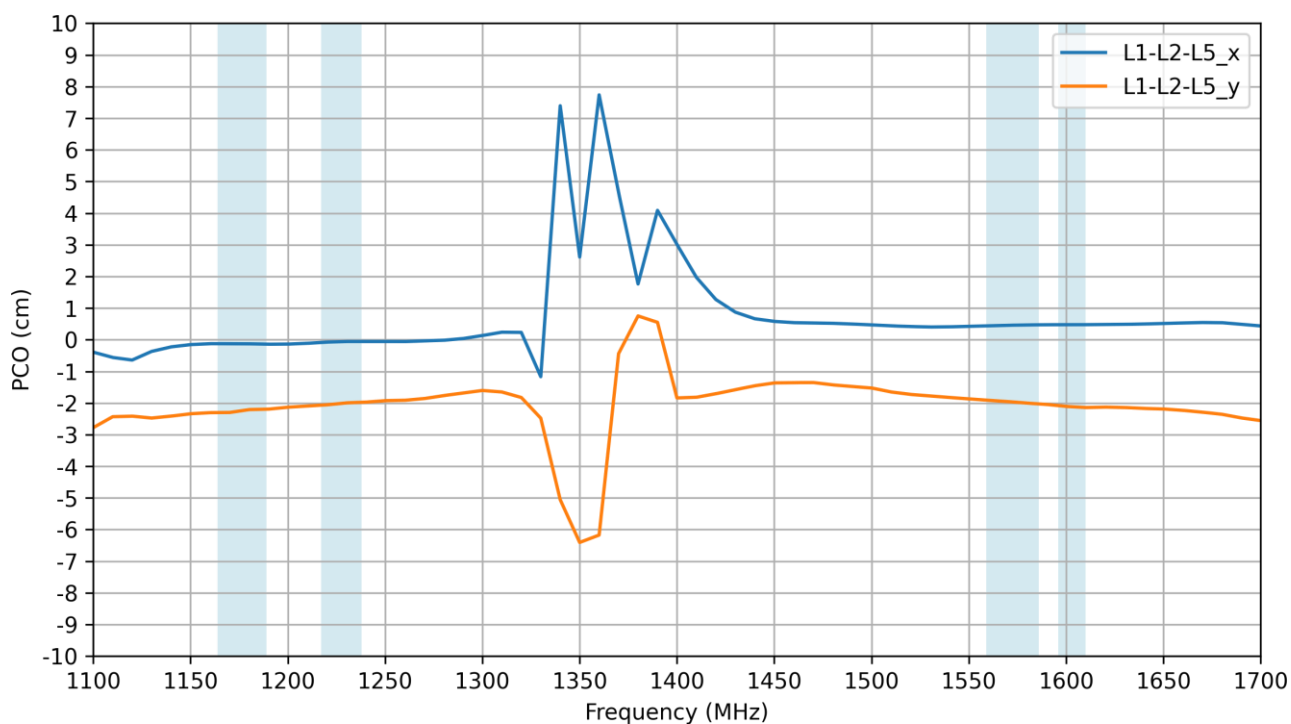
## 6.12 AR vs Angle for Phi=90



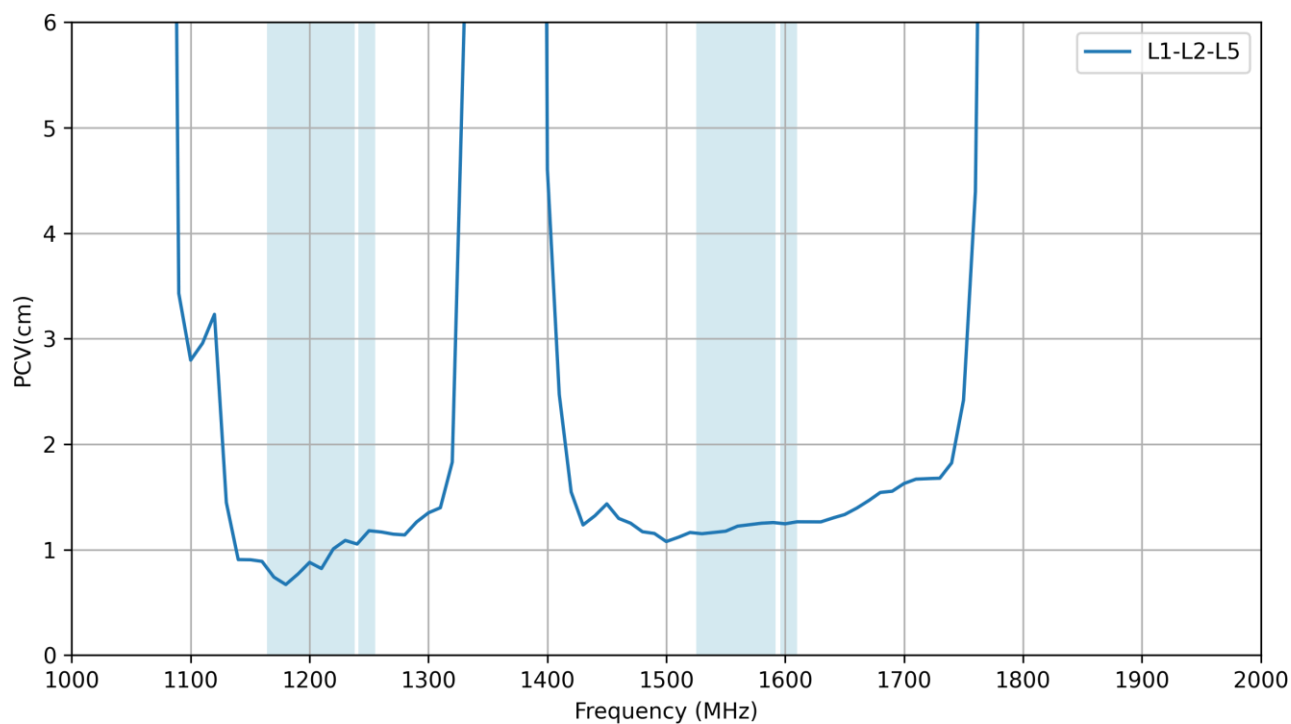
## 6.13 AR vs Angle for Theta=90



## 6.14 Phase Center Offset (PCO)



## 6.15 Phase Center Variation (PCV)

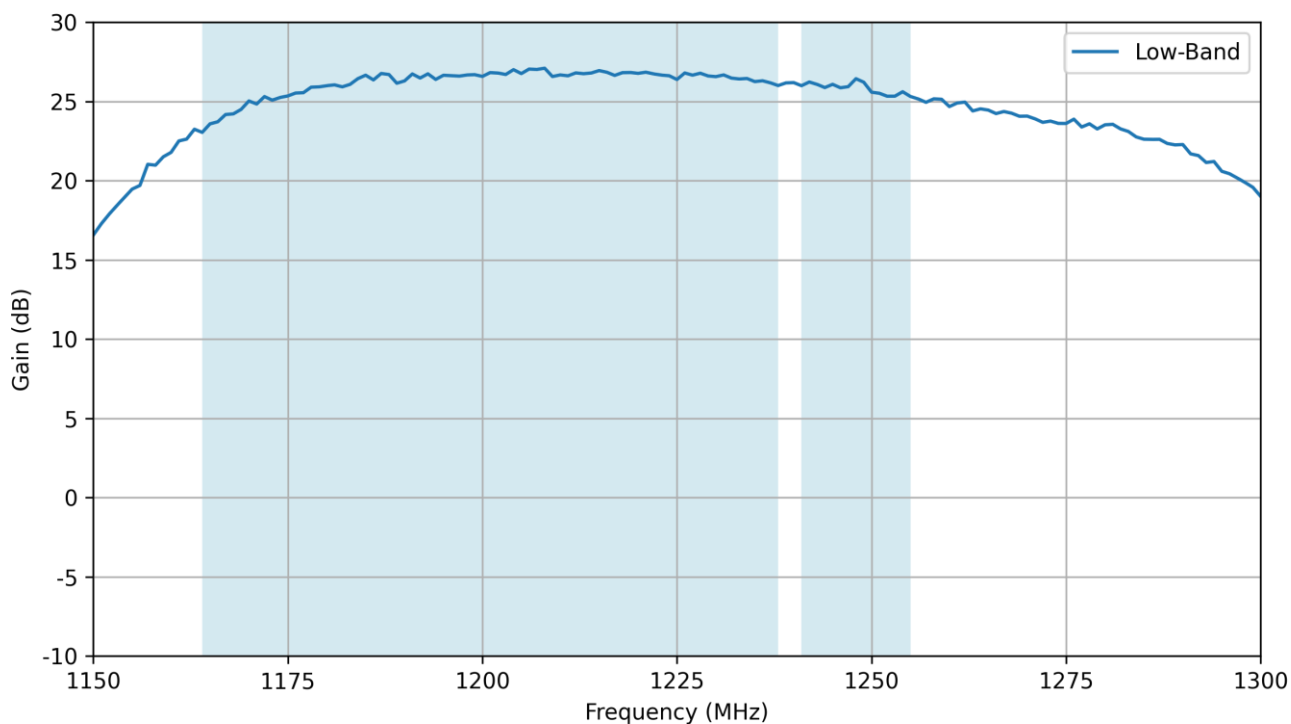


## 7. LNA Characteristics

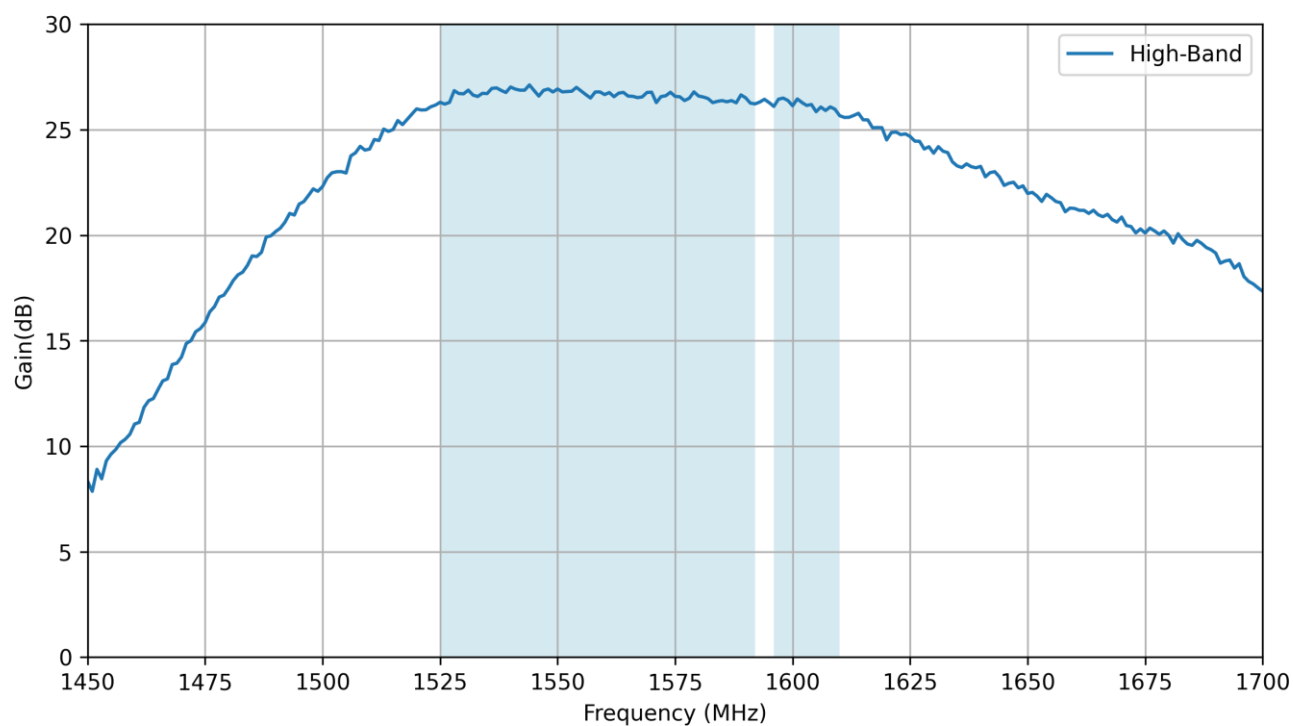
### 7.1 Block Diagram



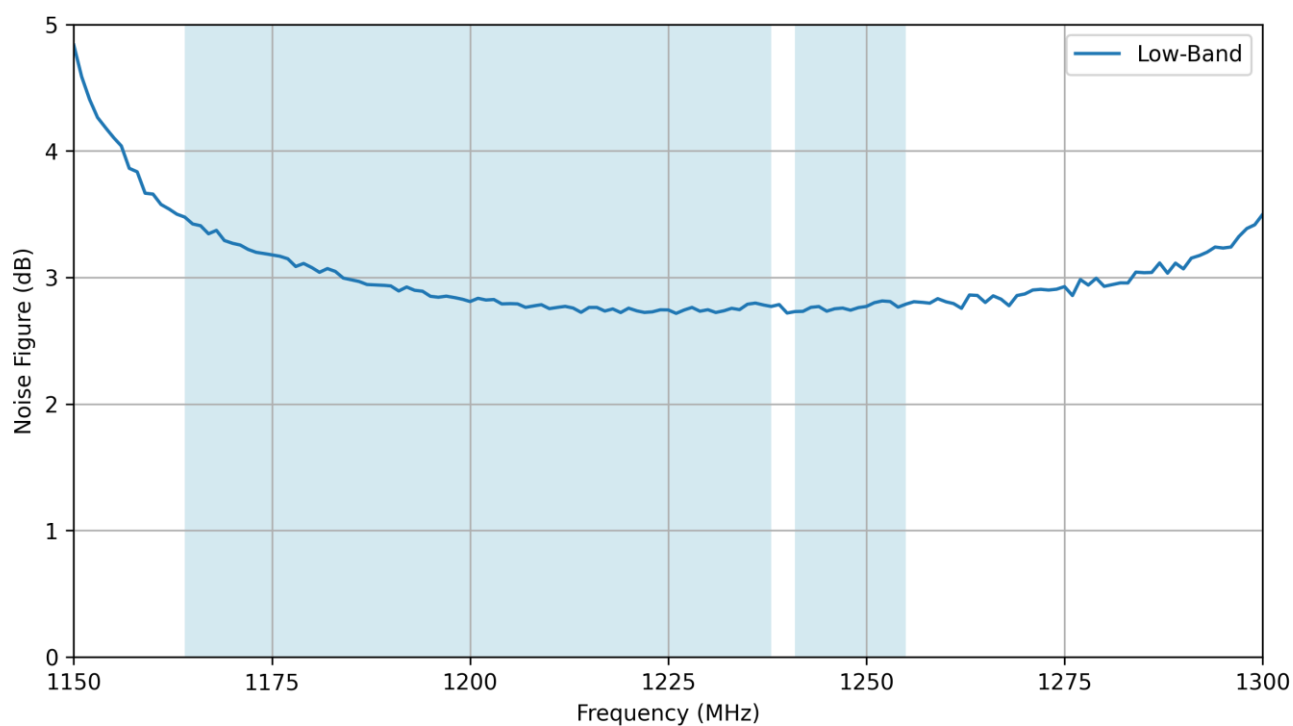
### 7.2 LNA Gain (Low-Band)



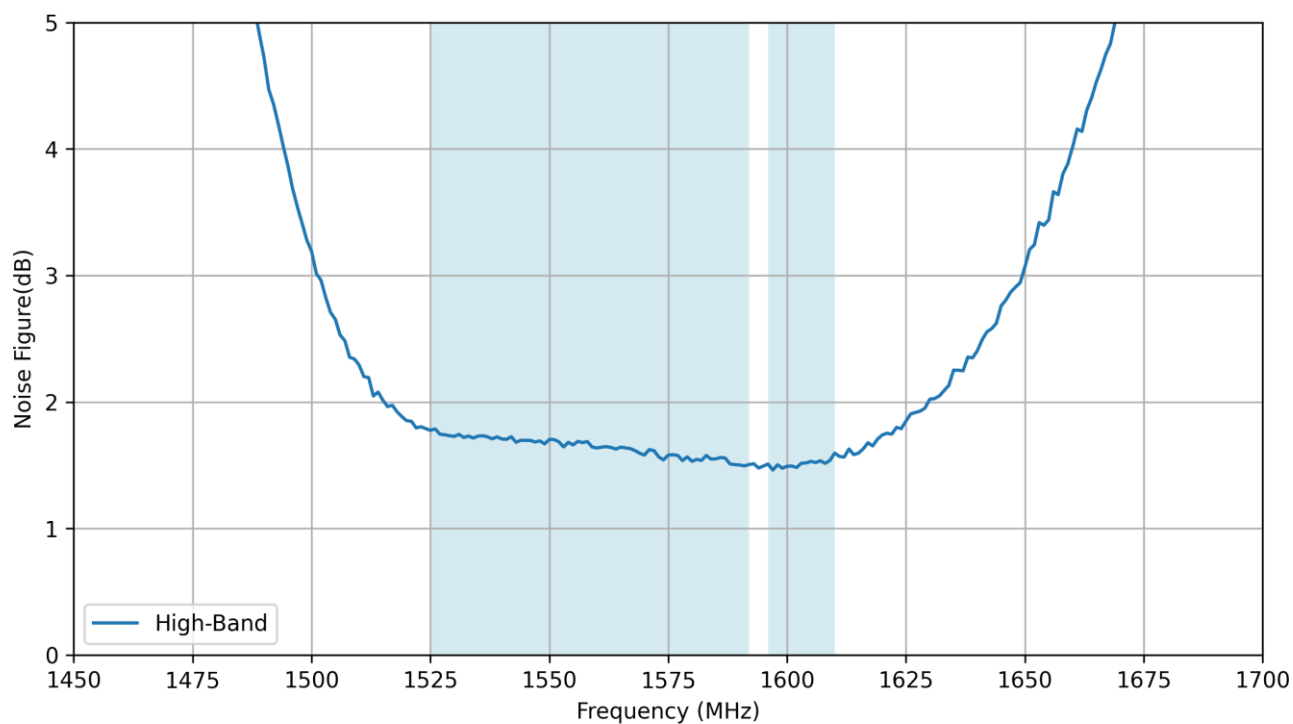
### 7.3 LNA Gain (High-Band)



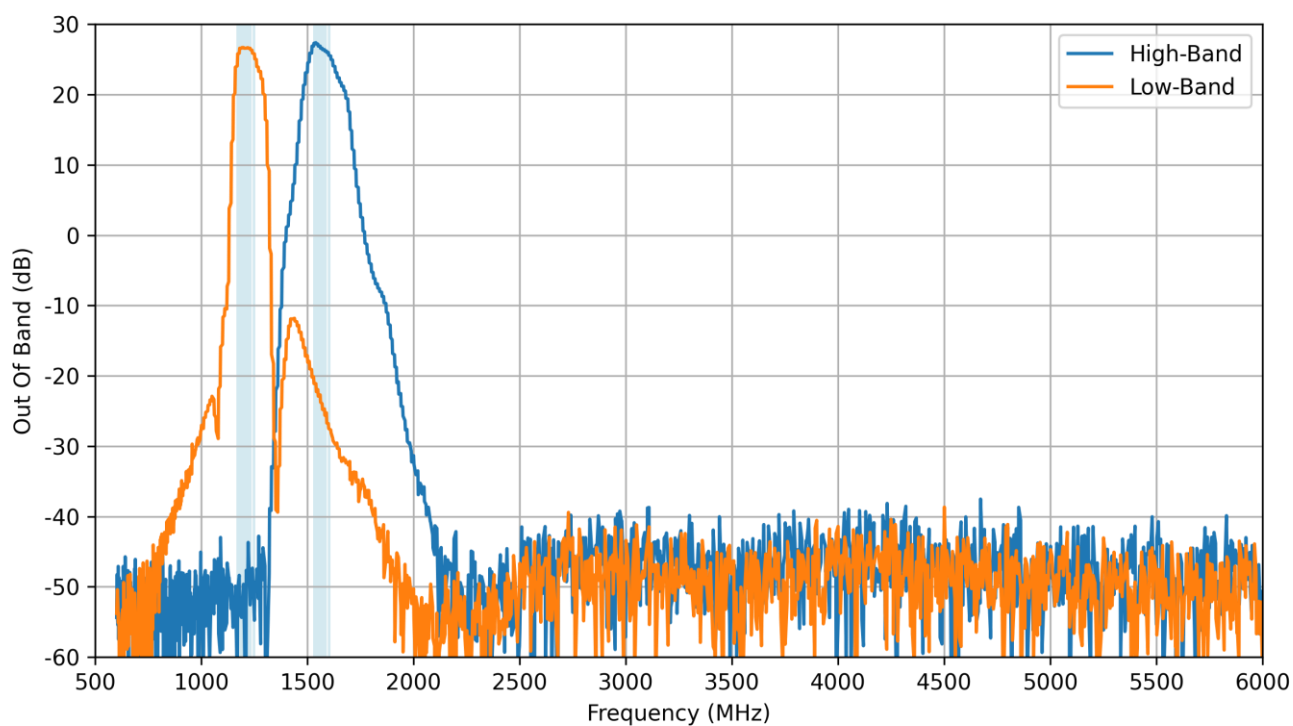
### 7.4 Noise Figure (Low-Band)



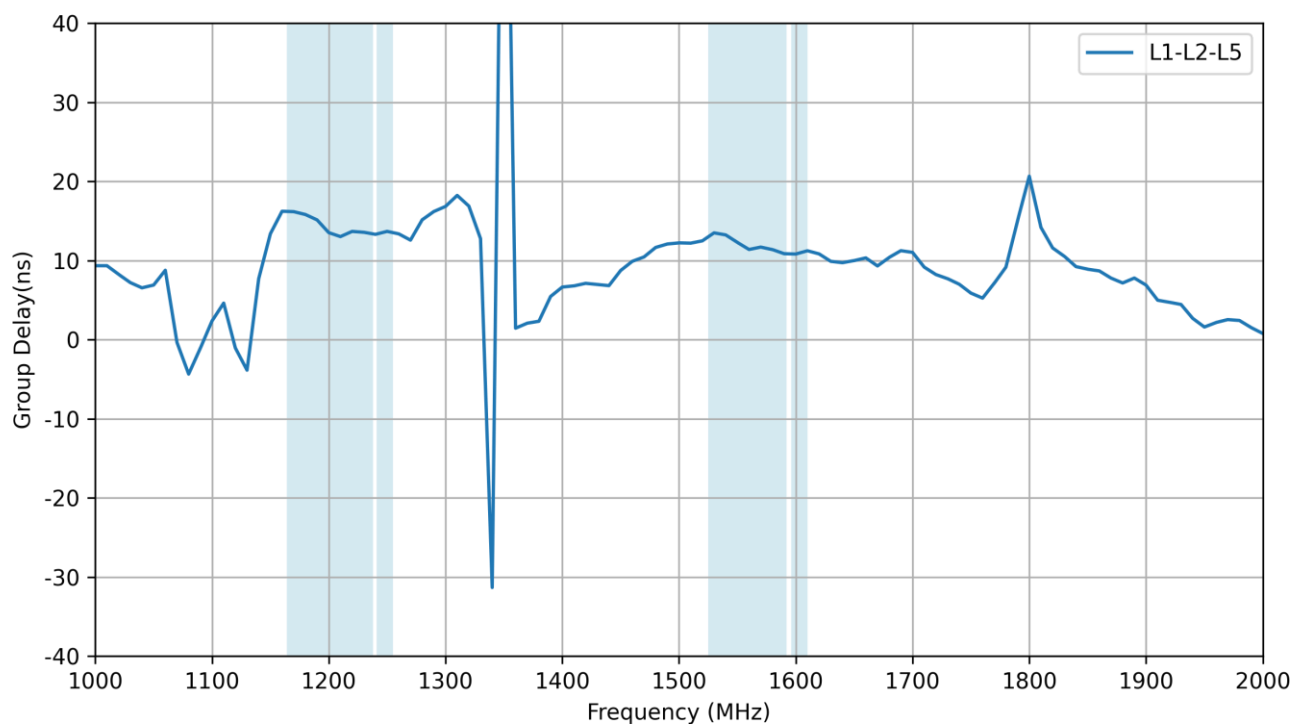
## 7.5 Noise Figure (High-Band)



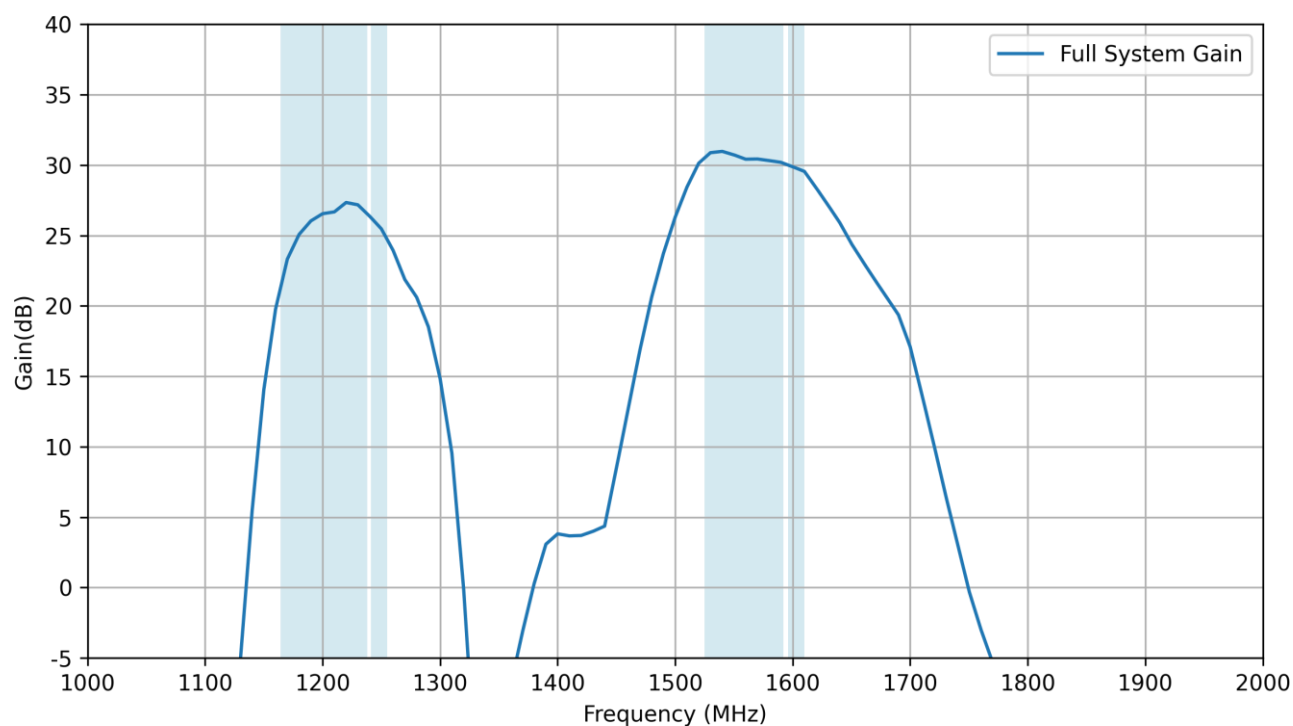
## 7.6 Out of Band



## 7.7 Group Delay



## 7.8 Full System Gain (Peak Gain)



## 8. Field Test Results

In this section Taoglas will present the field test result for XAHP.30.A.1L21 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 4 hours.

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

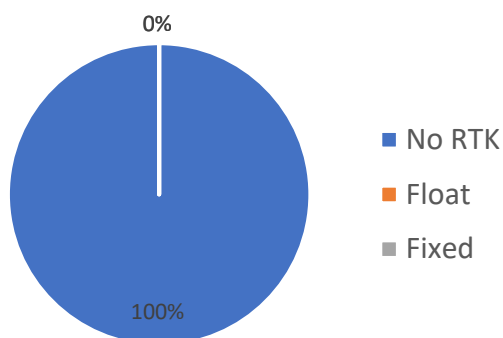
### 8.1 Septentrio - AsteRx-U

#### Receiver features:

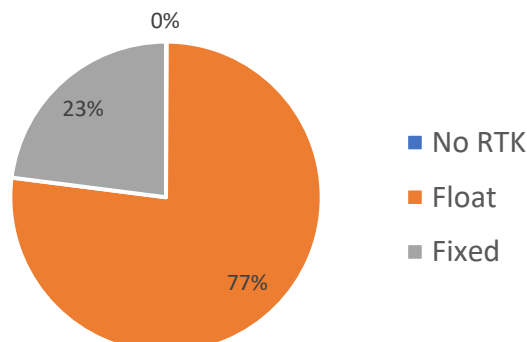
- Multi-band GNSS: 544 channels
- GPS: L1, L2, L5 GLONASS: L1, L2, L3 Galileo: E1, E5ab, AltBoc, E6 BeiDou: B1, B2, B3 NavIC: L51 QZSS: L1, L2, L5, L6
- SBAS: EGNOS, WAAS, GAGAN, MSAS, SDCM(L1, L5)
- RTK (base and rover), Integrated dual-channel L-band receiver, Support for PPP
- Nav. update rate up 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%) | TTFF (sec) |
| Free Space                               | PPP-RTK DISABLED   | 19.89 cm  | 23.82 cm   | 47.63 cm    | 49         |
|                                          | PPP-RTK ENABLED    | 5.22 cm   | 6.32 cm    | 12.64 cm    | 55         |

Signal Quality - No Correction



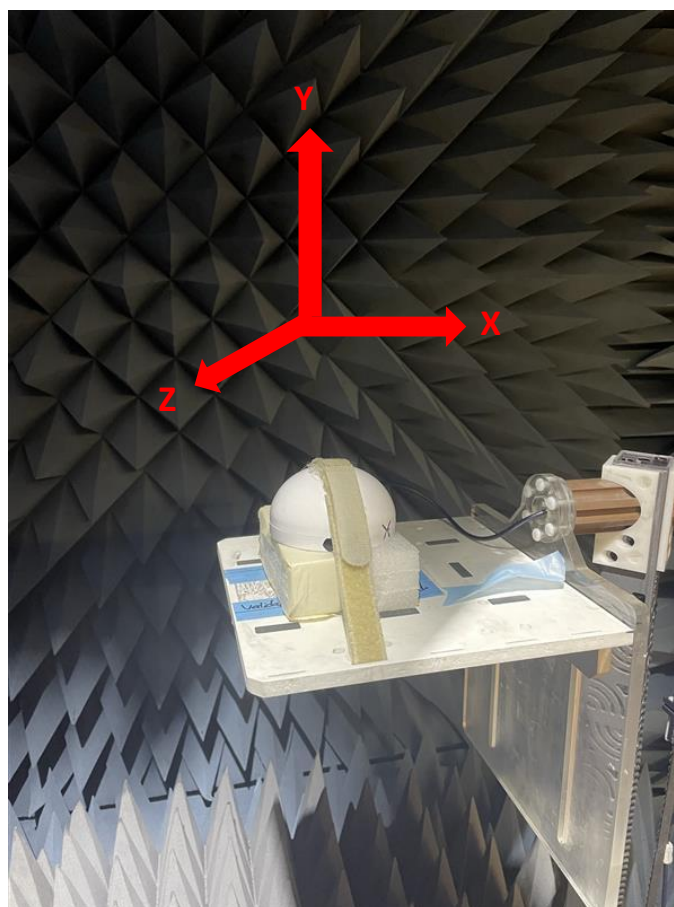
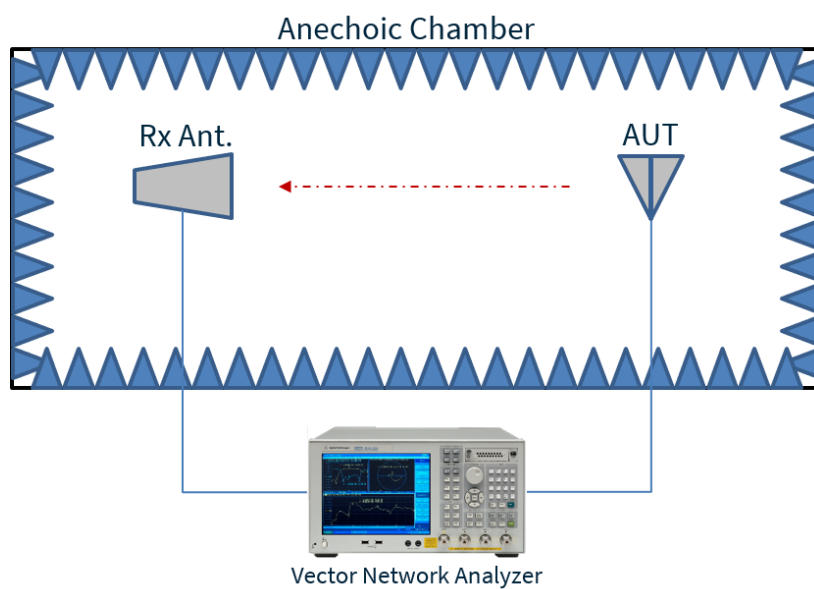
Signal Quality - With Correction





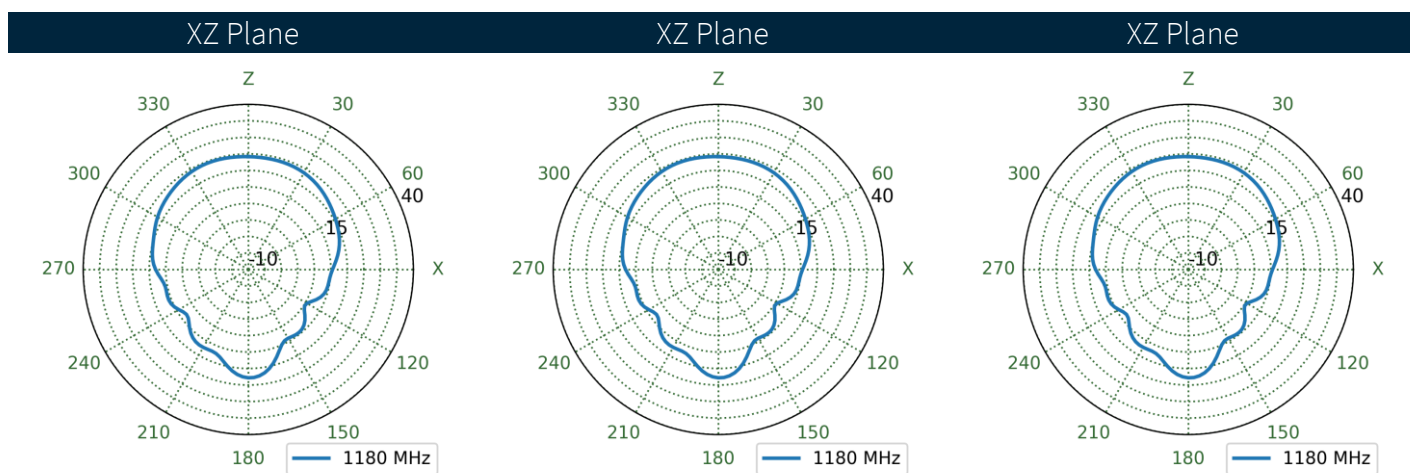
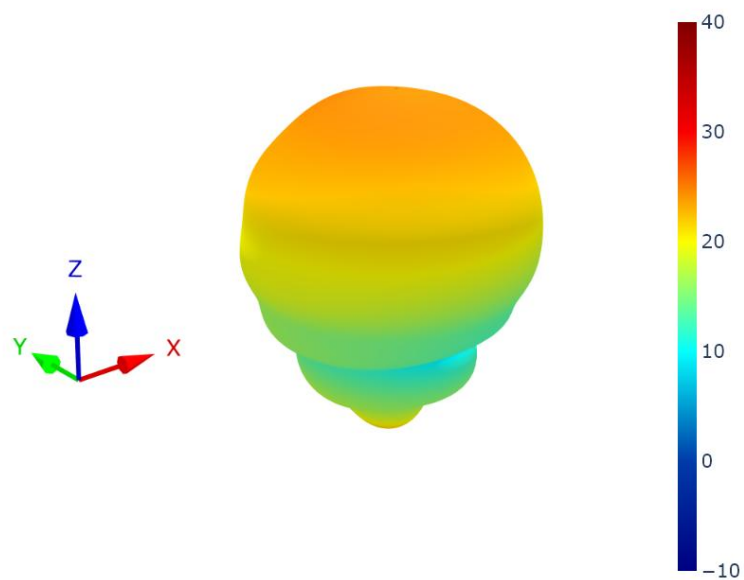
## 9. Radiation Patterns

### 9.1 Test Setup

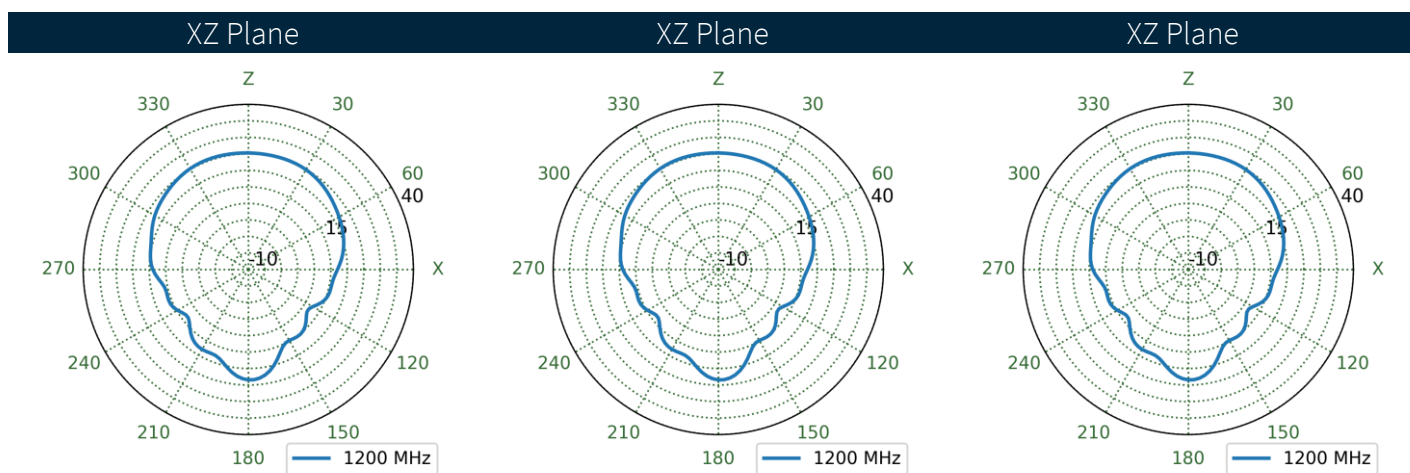
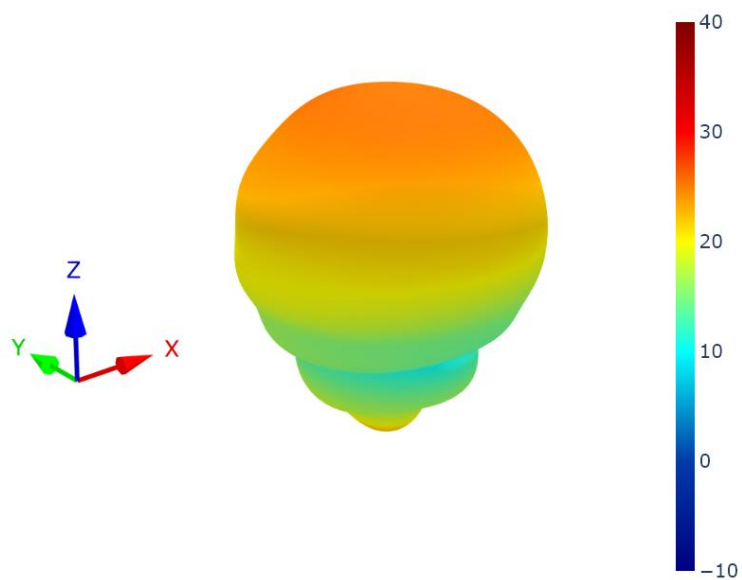


Chamber Test-Setup

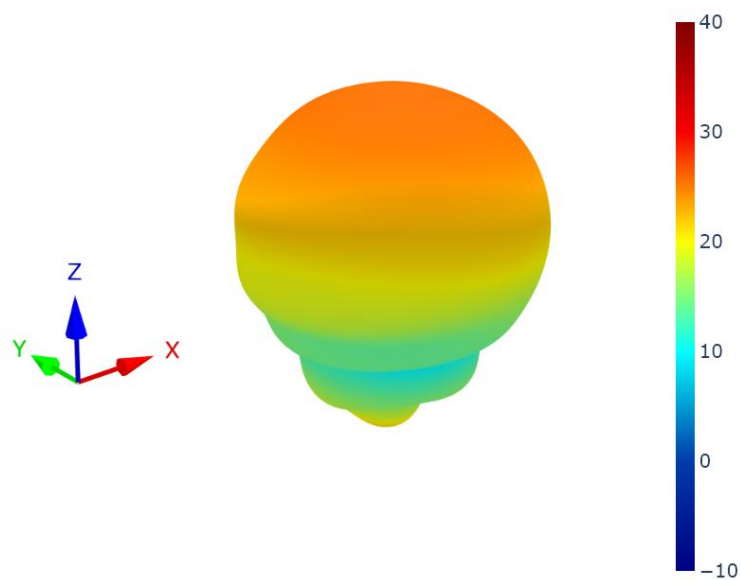
## 9.2 Low Band - Patterns at 1180 MHz



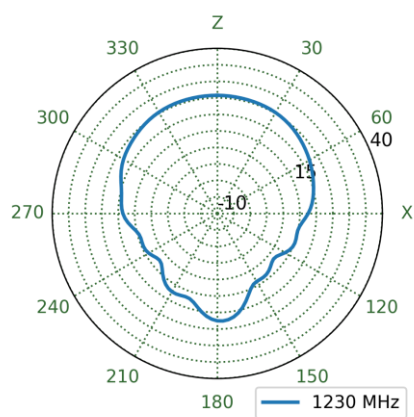
## 9.3 Low Band - Patterns at 1200 MHz



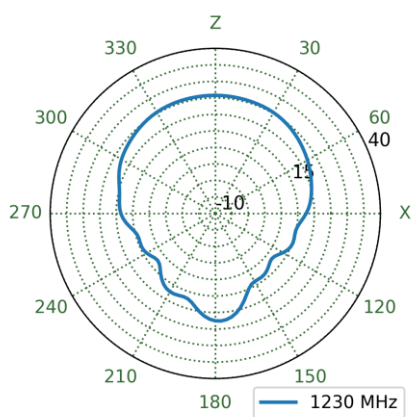
## 9.4 Low Band - Patterns at 1230 MHz



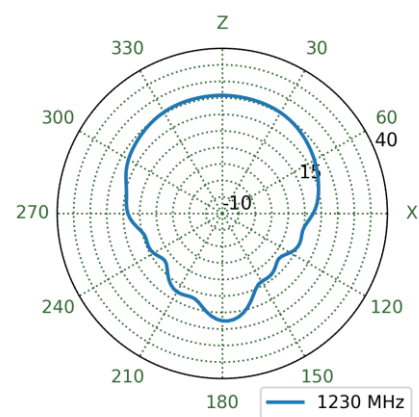
XZ Plane



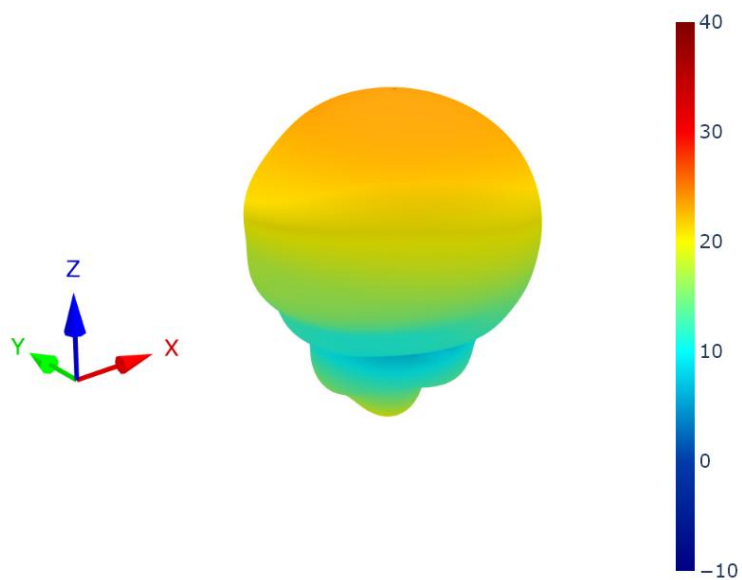
XZ Plane



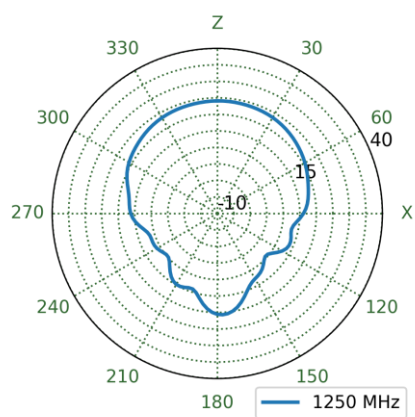
XZ Plane



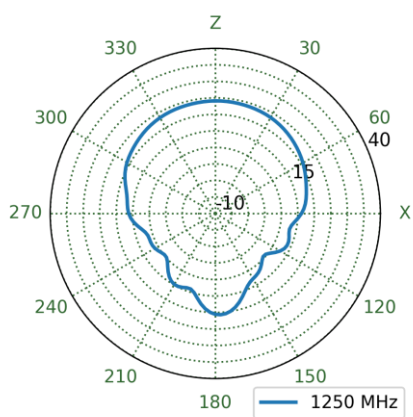
## 9.5 Low Band - Patterns at 1250 MHz



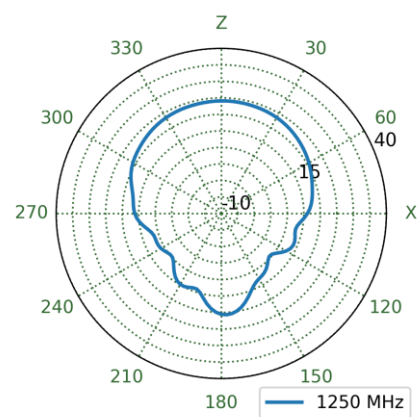
XZ Plane



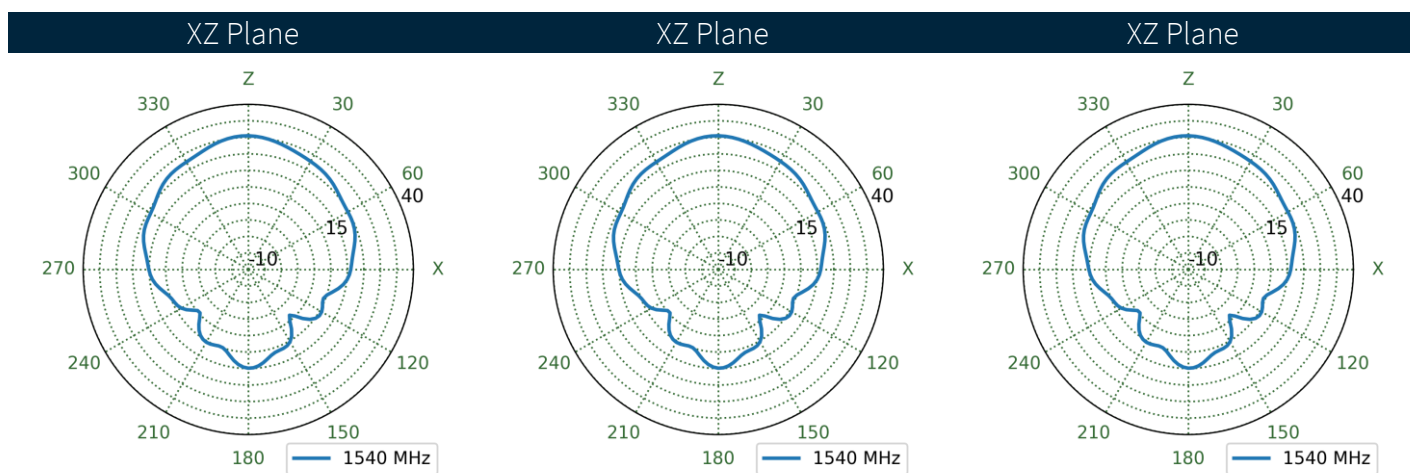
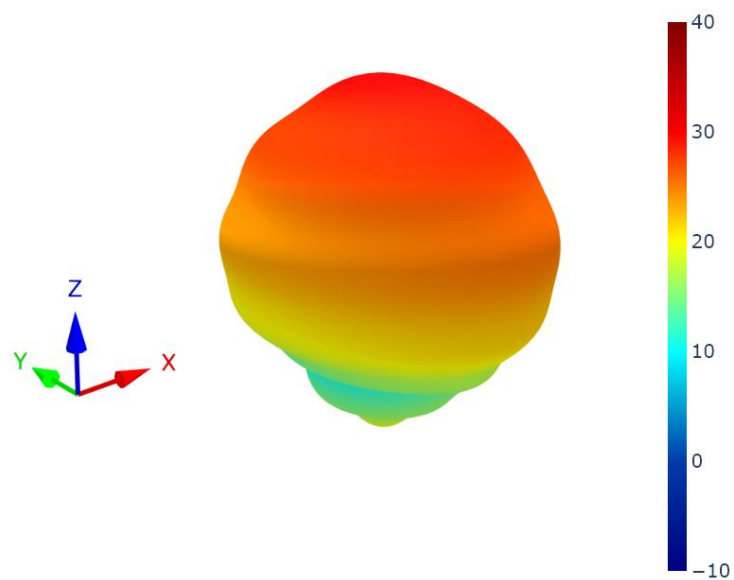
XZ Plane



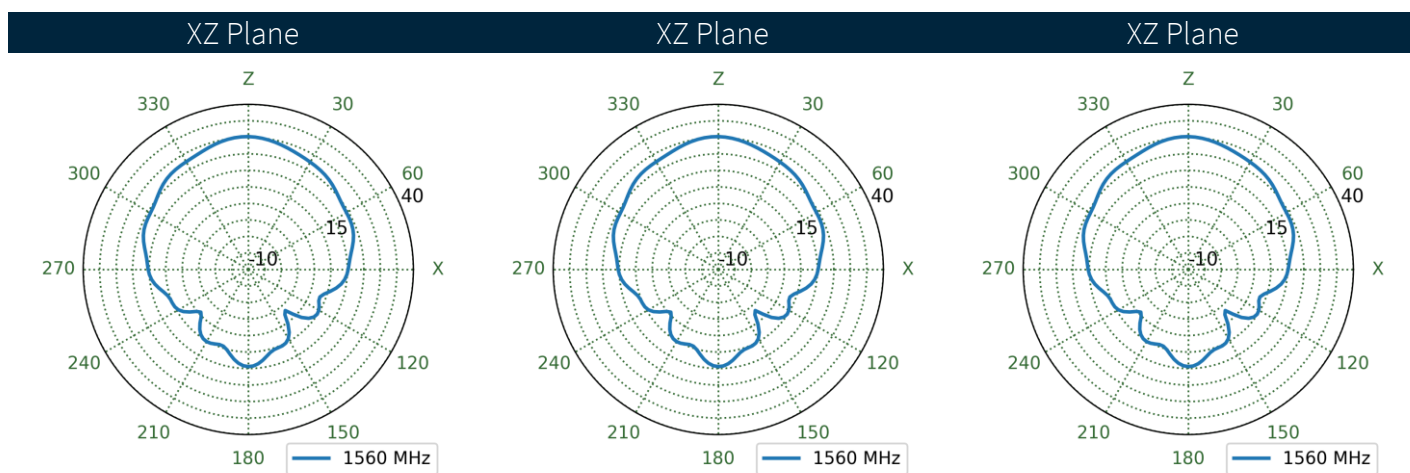
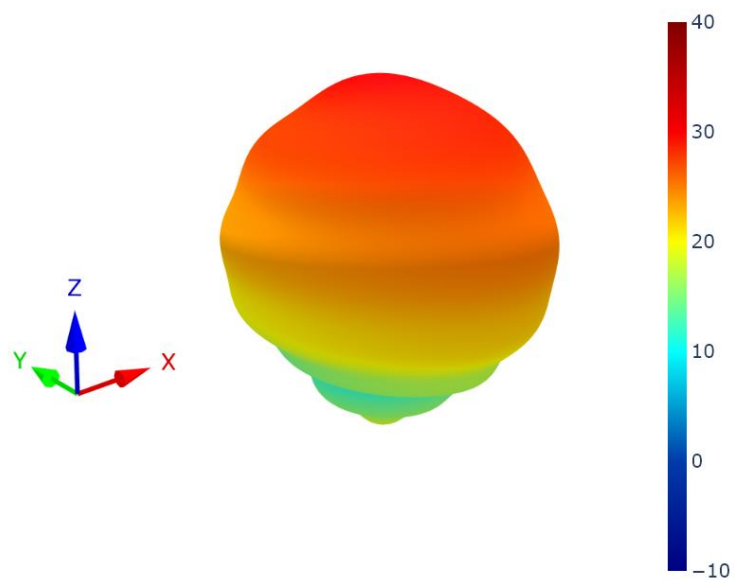
XZ Plane



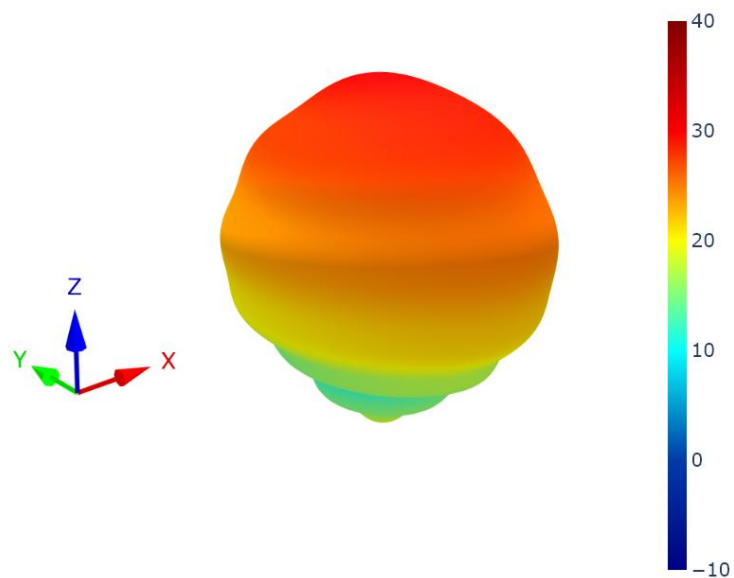
## 9.6 High Band - Patterns at 1540 MHz



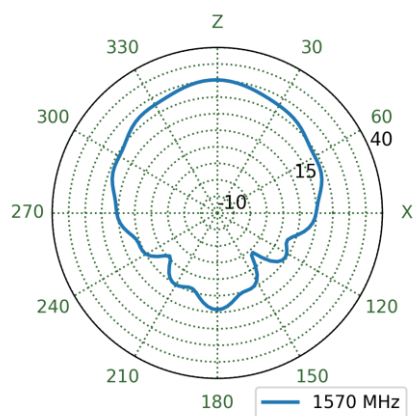
## 9.7 High Band - Patterns at 1560 MHz



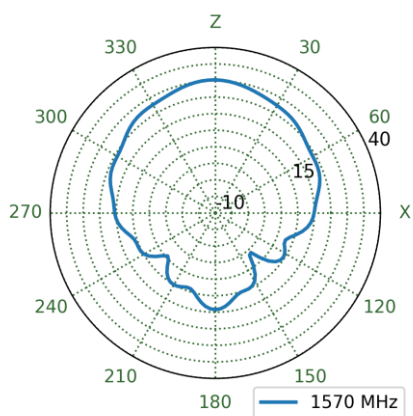
## 9.8 High Band - Patterns at 1570 MHz



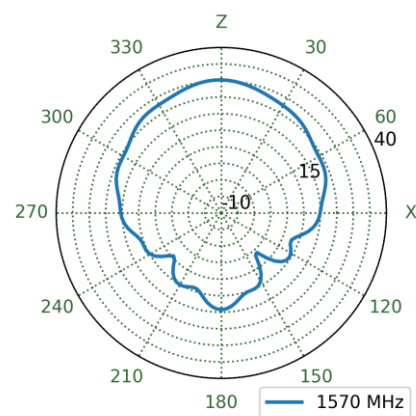
XZ Plane



XZ Plane

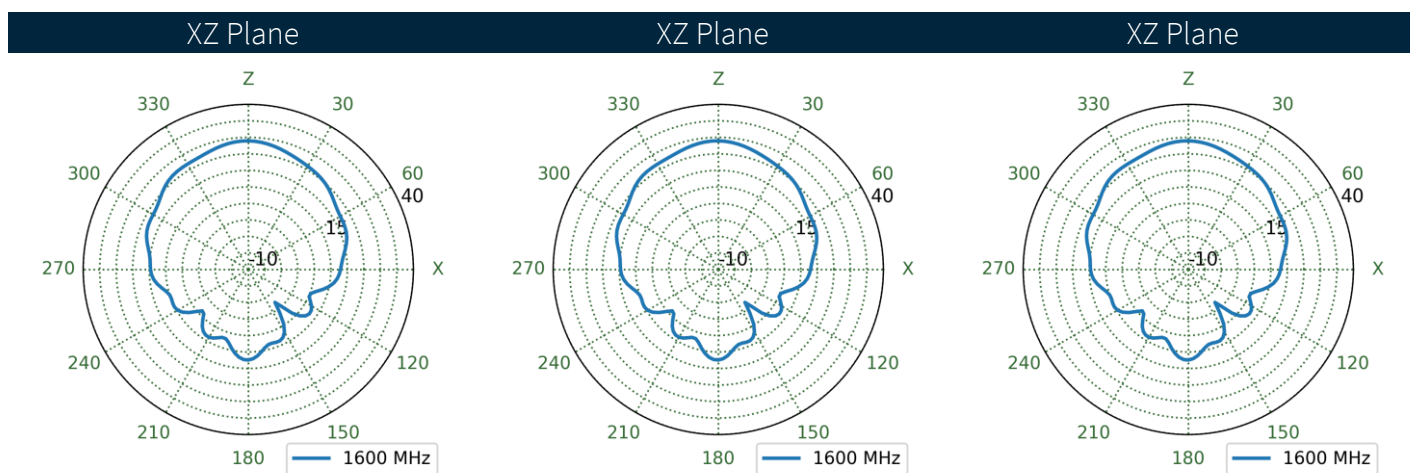
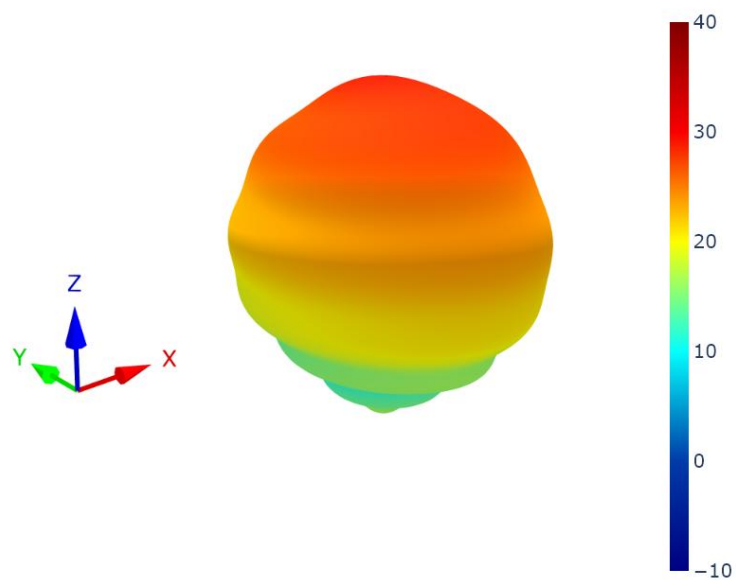


XZ Plane





## 9.9 High Band - Patterns at 1600 MHz



Changelog for the datasheet

SPE-24-8-092 - XAHP.30.A.1L21

Revision: B (Current Version)

|                  |                                                                                        |
|------------------|----------------------------------------------------------------------------------------|
| Date:            | 2025-03-26                                                                             |
| Changes:         | Added current consumption, updated the PCO graph and added updated ISO cert on page 2. |
| Changes Made by: | Gary West                                                                              |

Previous Revisions

Revision: A (Original First Release)

|         |                 |
|---------|-----------------|
| Date:   | 2024-05-15      |
| Notes:  | Initial Release |
| Author: | Gary West       |



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[BWGNSCNX9-9B1Y4L120](#) [BWGPSCNX20-20B1Y4L120](#) [DL-J023-5GB](#) [3N0101BK-017](#) [3N0301BK-003](#)