



# TAOGLAS®



# Datasheet

**Part No:**  
ADFGP.50A.07.0100C

## Description

Embedded Active GNSS Dual Stacked Patch Antenna  
with 100mm of 1.37 & IPEX MHFI

## Features:

Embedded Dual Patch, Dual Feed 4-Pin Assembly

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: 100mm of 1.37mm

Connector: IPEX MHFI (U.FL)

Dimensions: 50 x 50 x 16.8mm

RoHS & Reach Compliant

<b>1.</b>	<b>Introduction</b>	<b>3</b>
<b>2.</b>	<b>Specification</b>	<b>5</b>
<b>3.</b>	<b>Mechanical Drawing</b>	<b>7</b>
<b>4.</b>	<b>Installation Suggestion</b>	<b>8</b>
<b>5.</b>	<b>Packaging</b>	<b>9</b>
<b>6.</b>	<b>Antenna Characteristics (with hybrid coupler)</b>	<b>10</b>
<b>7.</b>	<b>Radiation Patterns</b>	<b>14</b>
<b>8.</b>	<b>Field Test Results</b>	<b>23</b>
<b>9.</b>	<b>LNA Characteristics</b>	<b>24</b>
<hr/>		
	<b>Changelog</b>	<b>29</b>

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# 1. Introduction



The ADFGP.50A, with Taoglas Sure Technology, is a precision-engineered active dual patch, dual-feed antenna for GPS (L1/L2/L5), GLONASS (G1/G2/G5), Galileo (E1/E5a/E5b) and BeiDou (B1/B2). The antenna comes mounted on a 50\*50 mm PCB (ground plane). It consists of two stacked patches, 50mm, and 40mm in width and is 16.8mm thick. It has been tuned and tested on a 50\*50mm ground plane specifically for GPS L1: 1575.42MHz, L2: 1227.6MHz and L5: 1176.45MHz as well as the GLONASS, Galileo, BeiDou and IRNSS bands shown in Section 2.

Each patch element uses two orthogonal feeds that are combined in a hybrid coupler to ensure optimal axial ratio. The antenna exhibits excellent gain and good radiation pattern stability leading to a reliable GNSS fix in areas of weaker signal strength. All these elements combined ensure the best possible positional accuracy for your device.

Both patch elements have a dual pin feed to ensure a low axial ratio and should be used in conjunction with a hybrid coupler. The ADFGP.50A 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.

## Features:

- Multi-GNSS, high-performance antenna
- Excellent signal to noise ratio (C/N0)
- Good 2DRMS and fast TTFF
- Axial ratio < 2dB typ. across all bands
- Phase stability provides excellent Phase Center Variation (PCV)

### Benefits:

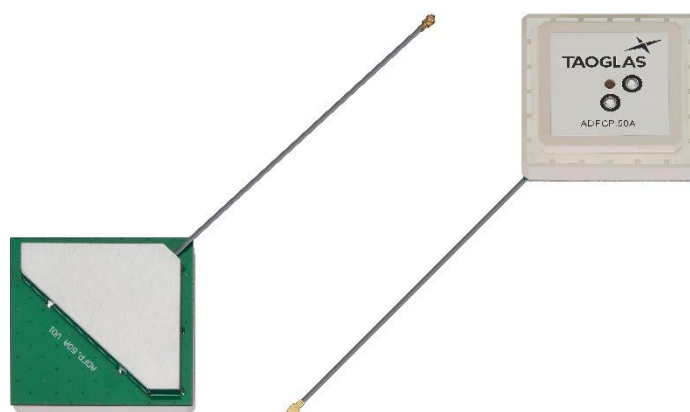
- Excellent positional accuracy
- Great for use in difficult environments
- Multiband improves the receiver's position estimation in terms of accuracy and reliability
- Ideal antenna solution for multiband RTK systems.

The ADFGP.50A is connected via an IPEX MHFI connector and works well without modifications in most environments, however, it can be tuned and optimized for different ground planes and enclosures if required. It is manufactured and tested in a TS16949 first tier automotive approved facility.

### Typical applications include:

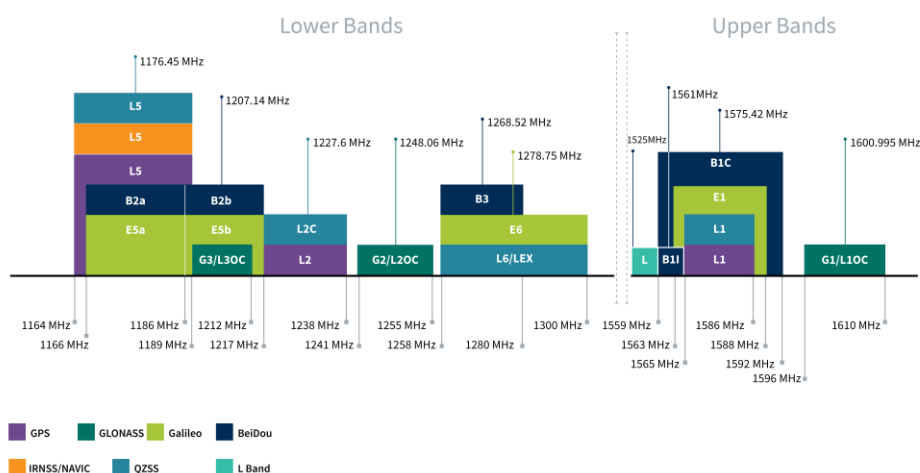
- High accuracy positioning and navigation systems
- UAVs, Robotics & Autonomous Vehicles
- Micro-Mobility Solutions
- Mapping & GIS
- Transportation & Telematics
- Precision Agriculture
- Public Safety, Search & Rescue
- RTK Systems

Custom antenna modifications are subject to possible NRE and minimum order quantity. For further information or support to test and integrate Taoglas Sure technology please contact your regional Taoglas customer support team. We recommend installing this antenna with an adhesive foam backing as shown in section 9, to configure this product with adhesive foam please contact your regional Taoglas customer support team.



## 2. Specification

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



GNSS Bands and Constellations

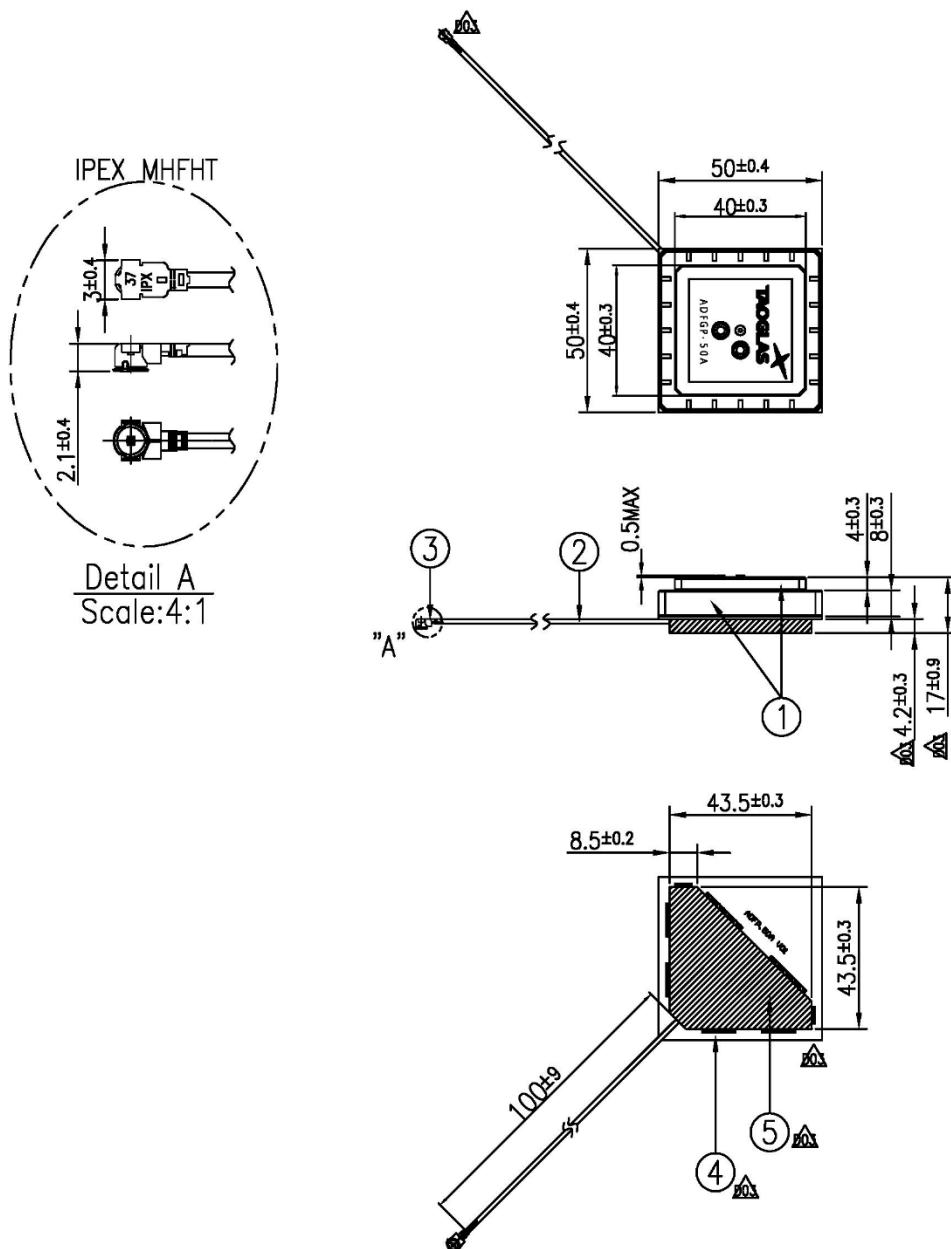
GNSS Electrical							
Frequency (MHz)	1176.45	1207.14	1227.6	1248.06	1561	1575.42	1602
VSWR (max.)	1.11:1	1.31:1	1.47:1	1.35:1	1.18:1	1.06:1	1.17:1
Efficiency (%)	41.03	80.05	50.76	28.48	54.28	67.61	68.36
Average Gain (dB)	-3.87	-0.96	-2.94	-5.45	-2.65	-1.70	-1.65
Peak Gain (dBi)	1.47	4.07	1.99	-0.49	2.66	3.54	3.48
Axial Ratio (dB)	6.80	4.44	2.21	2.31	3.59	3.87	4.64
PCO x (cm)	1.69	1.43	1.42	1.32	1.05	1.05	1.18
PCO y (cm)	0.37	0.38	0.62	0.70	0.88	0.82	0.75
PCV (cm)	0.006	0.015	0.014	0.017	0.005	0.005	0.004
Polarization	RHCP						
Impedance	50 Ω						
Note: The antenna with Hybrid coupler was tested on a 70x70 mm ground plane							

Mechanical	
Dimensions	50 x 50 x 16.8mm
Connector	IPEX MHFI (U.FL)
Cable	Coaxial Cable ø1.37: Length 100mm
Weight	95.5g

Environmental	
Operation Temperature	-40°C to 85°C
Storage Temperature	-40°C to 85°C
Humidity	Non-condensing 65°C 95% RH

### 3. Mechanical Drawing

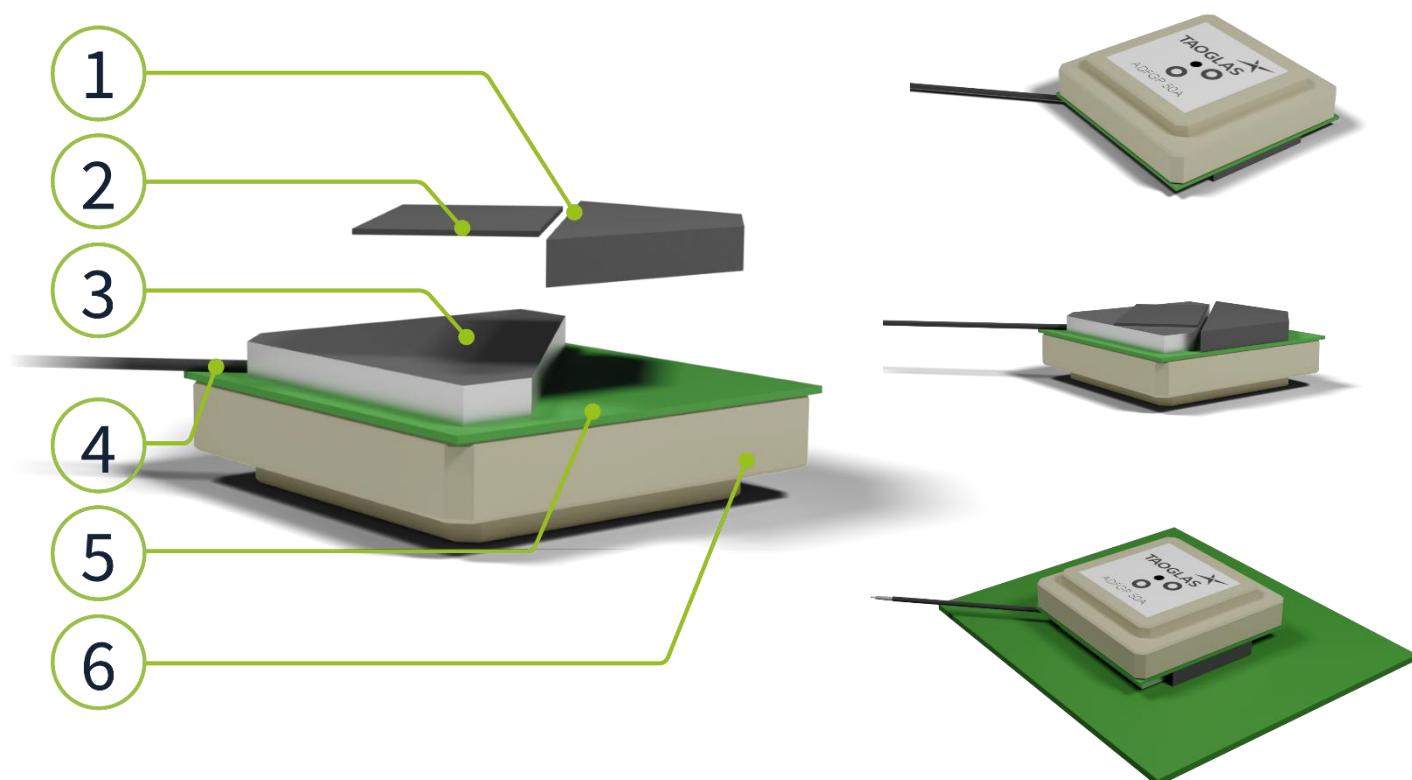
- NOTES:
1. Shielding case area
  2. Soldered Area.
  3. Soldermask Area.
  4. All material must be RoHS compliant
  5. The connector orientation is definition as per drawing:  
If the cable length is < 100mm, the connector orientation should be same as per drawing.  
If the cable length is >= 100mm, the connector orientation in the drawing only for reference.
  6. \*Refer to the application note APN-12-8-002.B. The antenna is physically tuned a number of ways, the shape of the top silver electrode can be changed, or the feed-point can be moved(excluding feed pin)."



	Name	Material	Finish	QTY
1	Patch 40x40x1mm±0.5x50x50x1mm	Ceramics	Clear	1
2	1.37 Coaxial Cable	FEP	Grey	1
3	IPEX MHFHT	Brass	Au Plated	1
4	PCB	Composite 0.8	Green	1
5	Shielding Case	SPTF	Sn Plated	1

## 4. Installation Suggestion

We do not supply our standard ADFGP.50A with adhesive backing however this can be requested via your regional Taoglas customer support team. The below details the optimum way to install the ADFGP.50A Antenna for use in conjunction with adhesive backing.



Item Number	Description	Material
1	Adhesive Mounting Pad for ADFGP.50A	Acrylic Foam
2	Small Adhesive Mounting Pad for ADFGP.50A	Acrylic Foam
3	Shielding Case	SPTE
4	1.37 Coaxial Cable	FEP
5	PCB	Composite 0.8+
6	Stacked Patch 40x40x4 mm & 50x50x8 mm	Ceramic

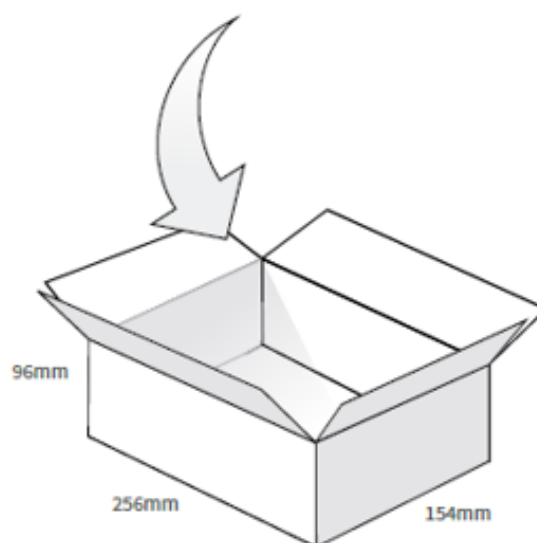


## 5. Packaging

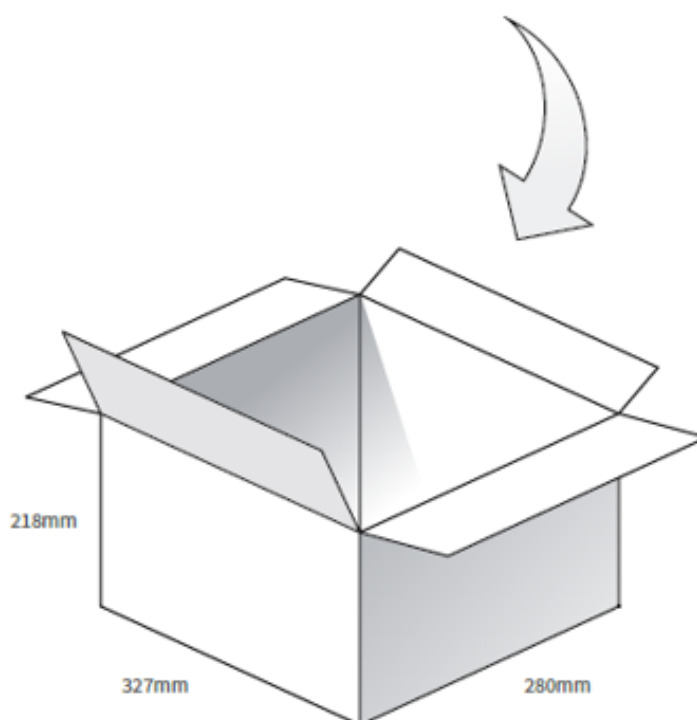
8pcs ADFGP.50A.07.0100C per PE Bag  
Weight: 800g



24pcs ADFGP.50A.07.0100C per carton  
Dimensions: 256 x 154 x 96mm  
Weight: 2600g

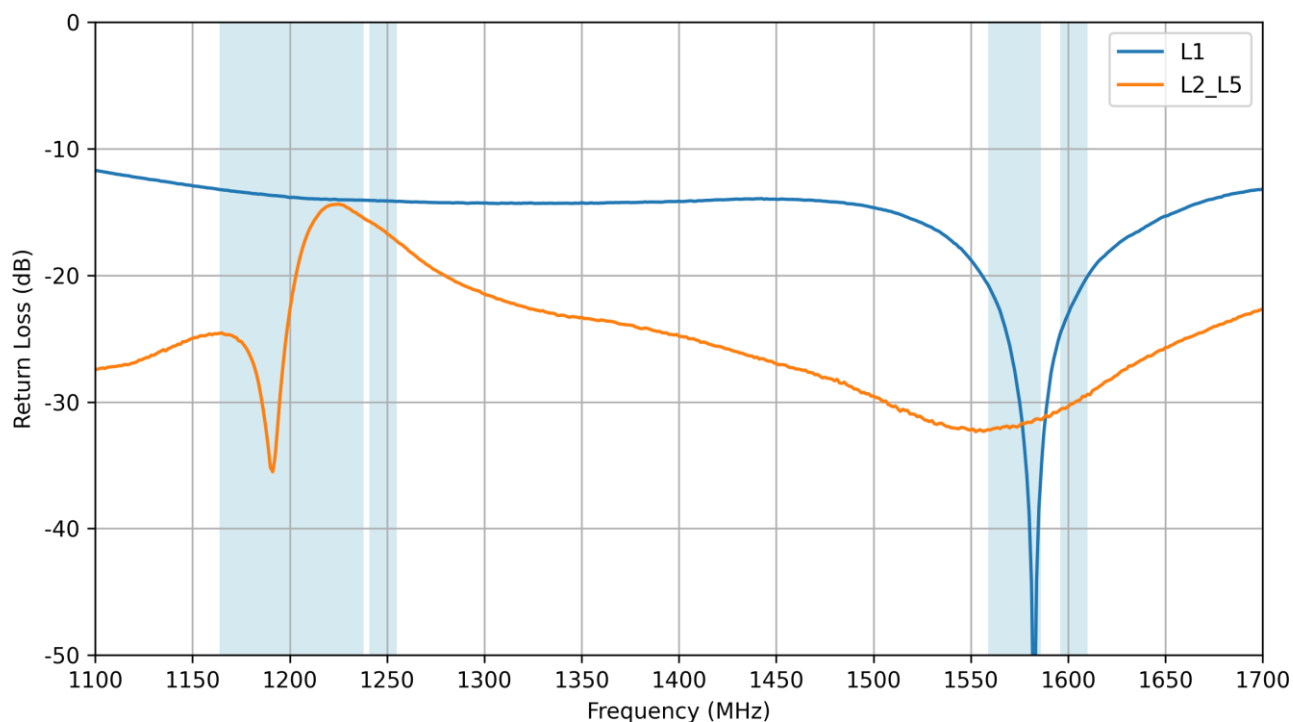


96pcs ADFGP.50A.07.0100C per large carton  
Dimensions: 327 x 280 x 218mm  
Weight: 11Kg

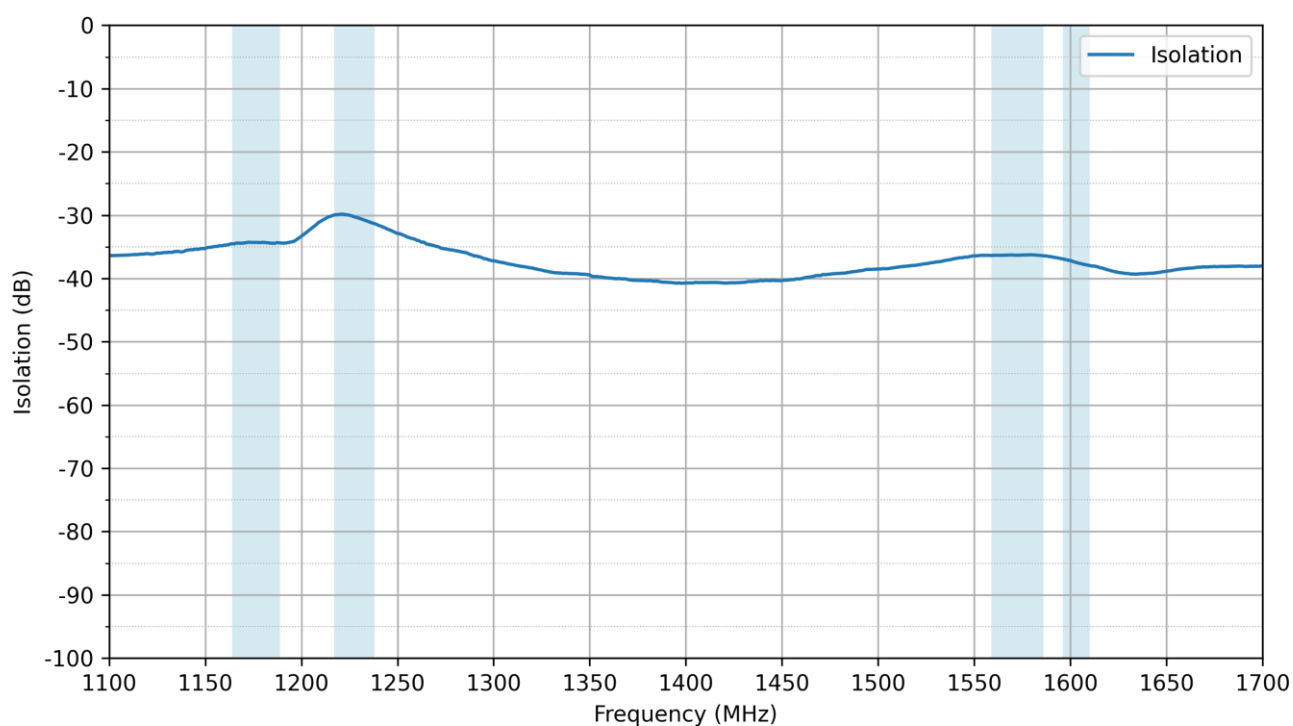


## 6. Antenna Characteristics (with hybrid coupler)

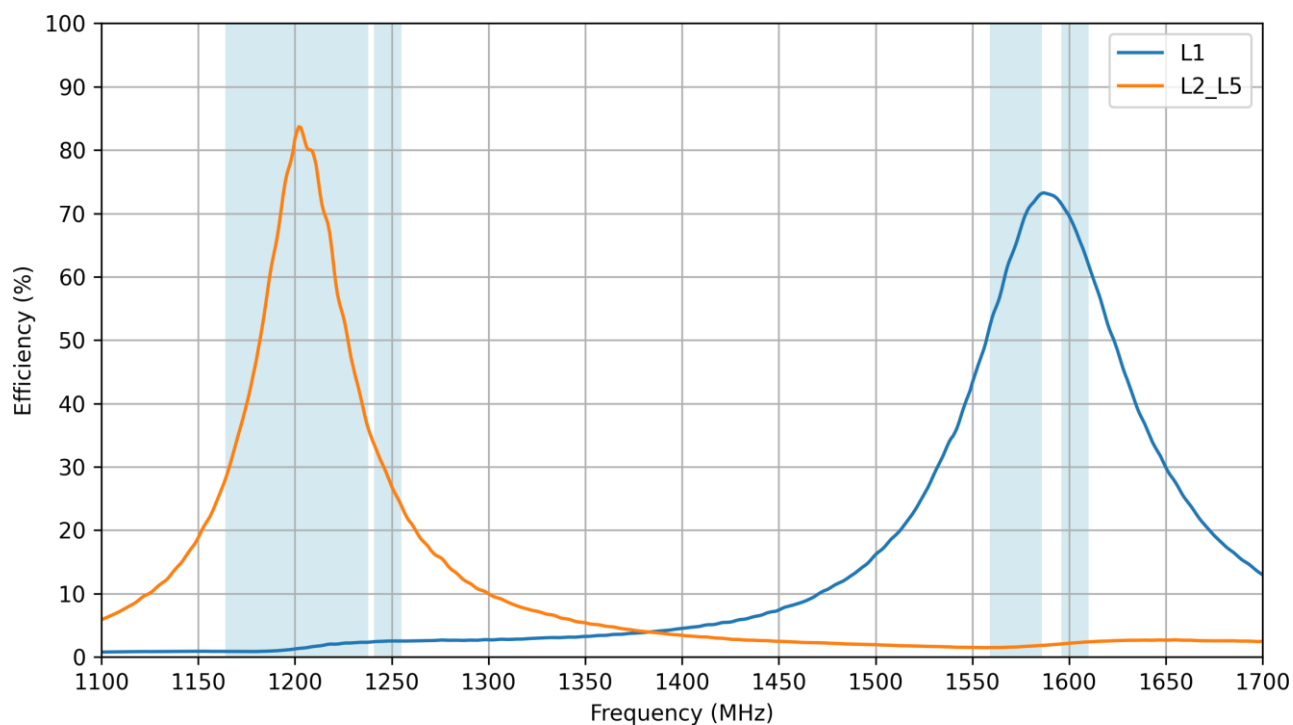
### 6.1 Return Loss (From Hybrid Couplers)



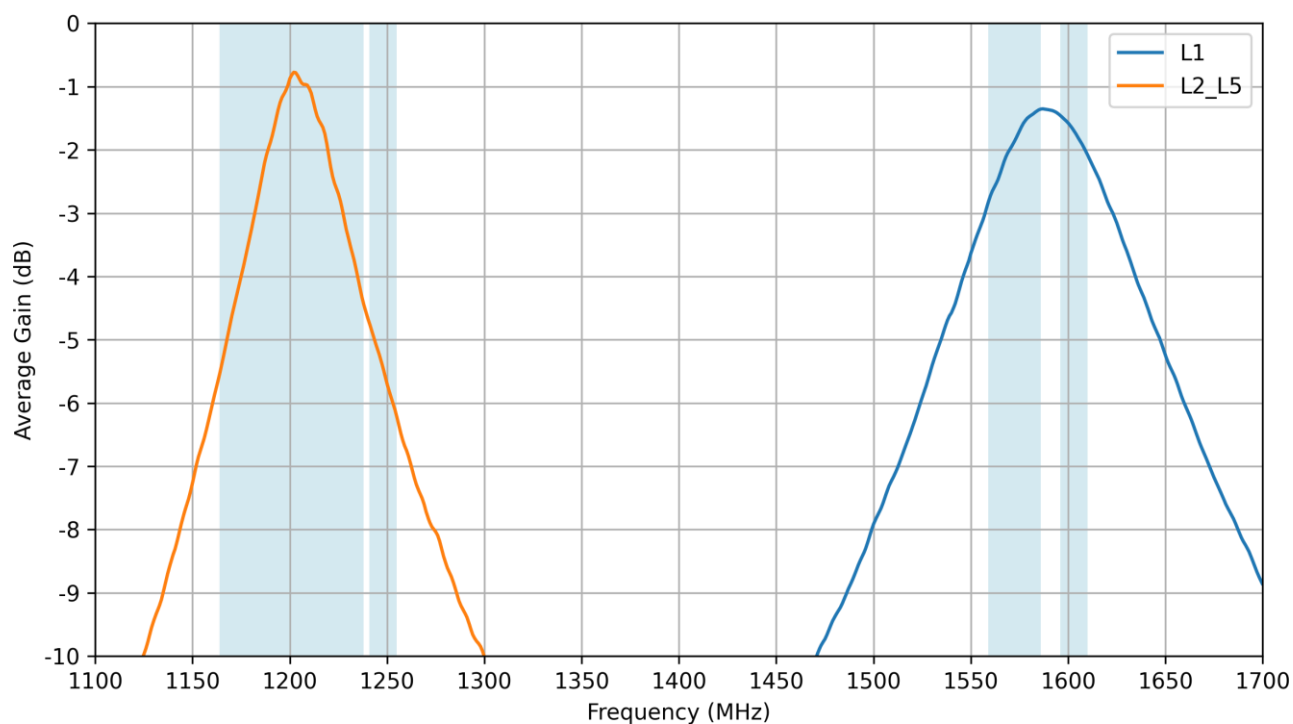
### 6.2 Isolation (From Hybrid Couplers)



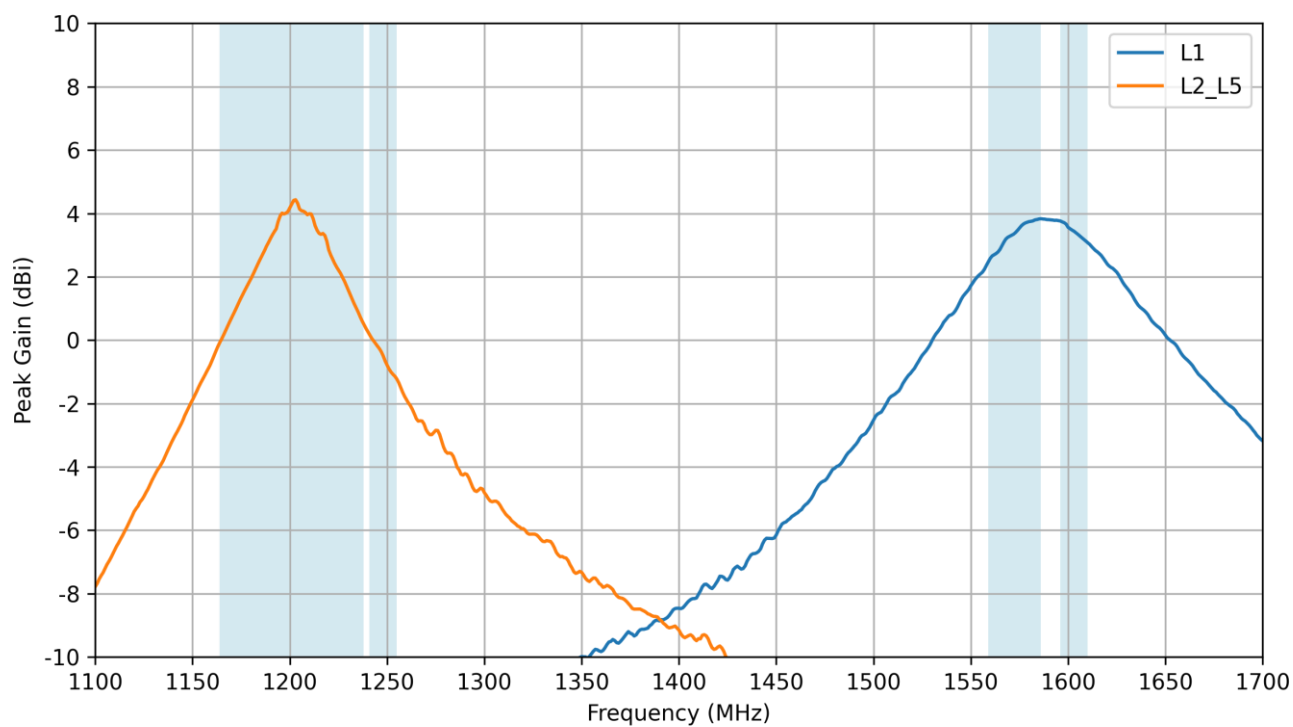
### 6.3 Efficiency



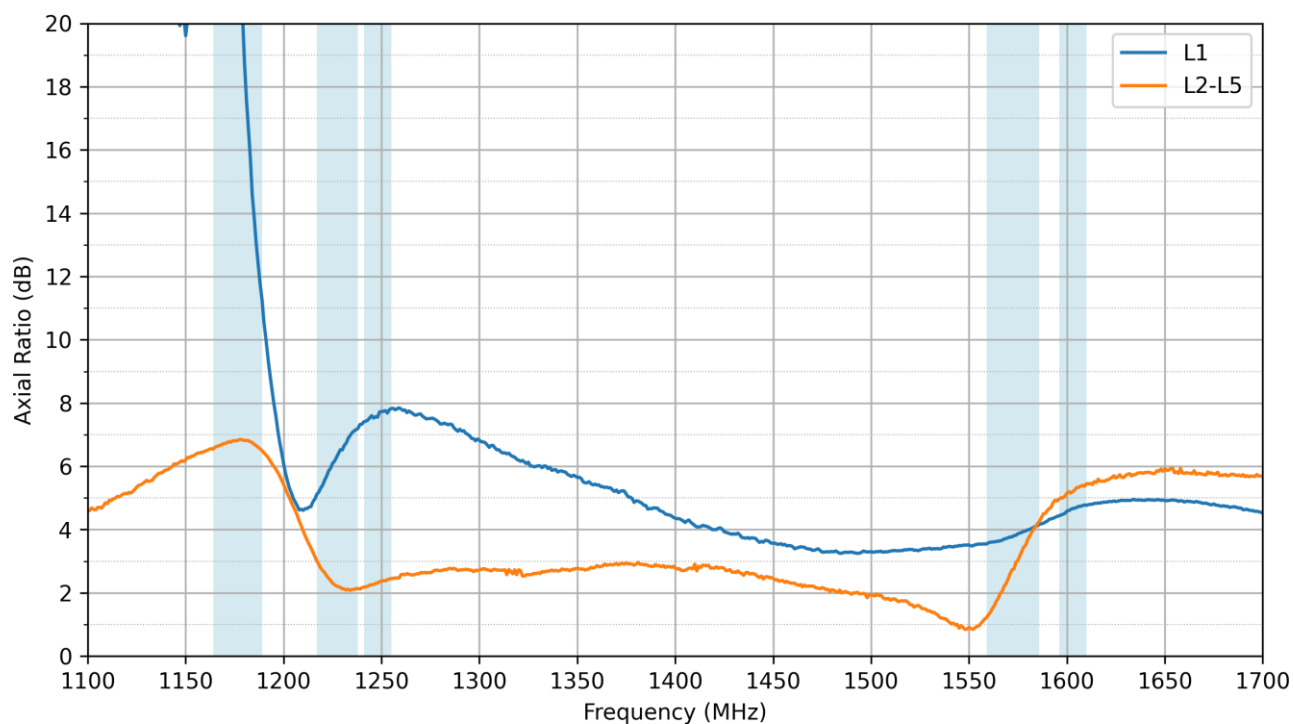
### 6.4 Average Gain



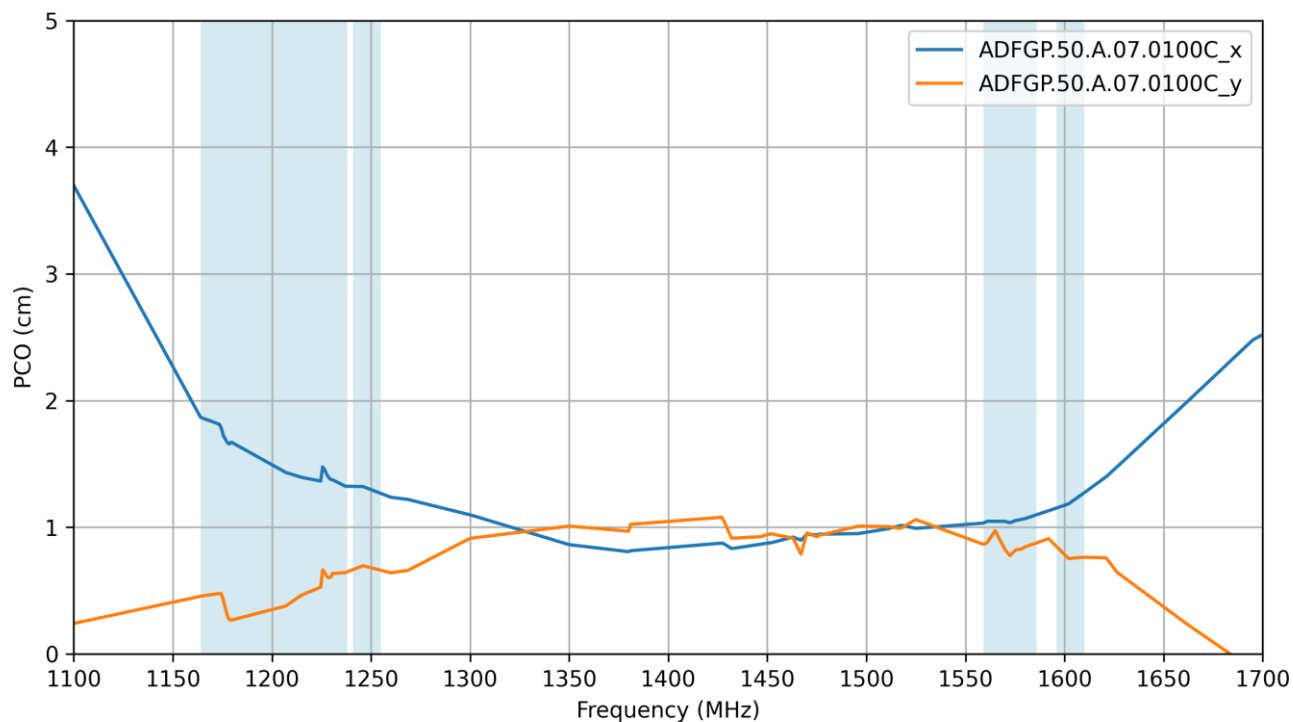
## 6.5 Peak Gain



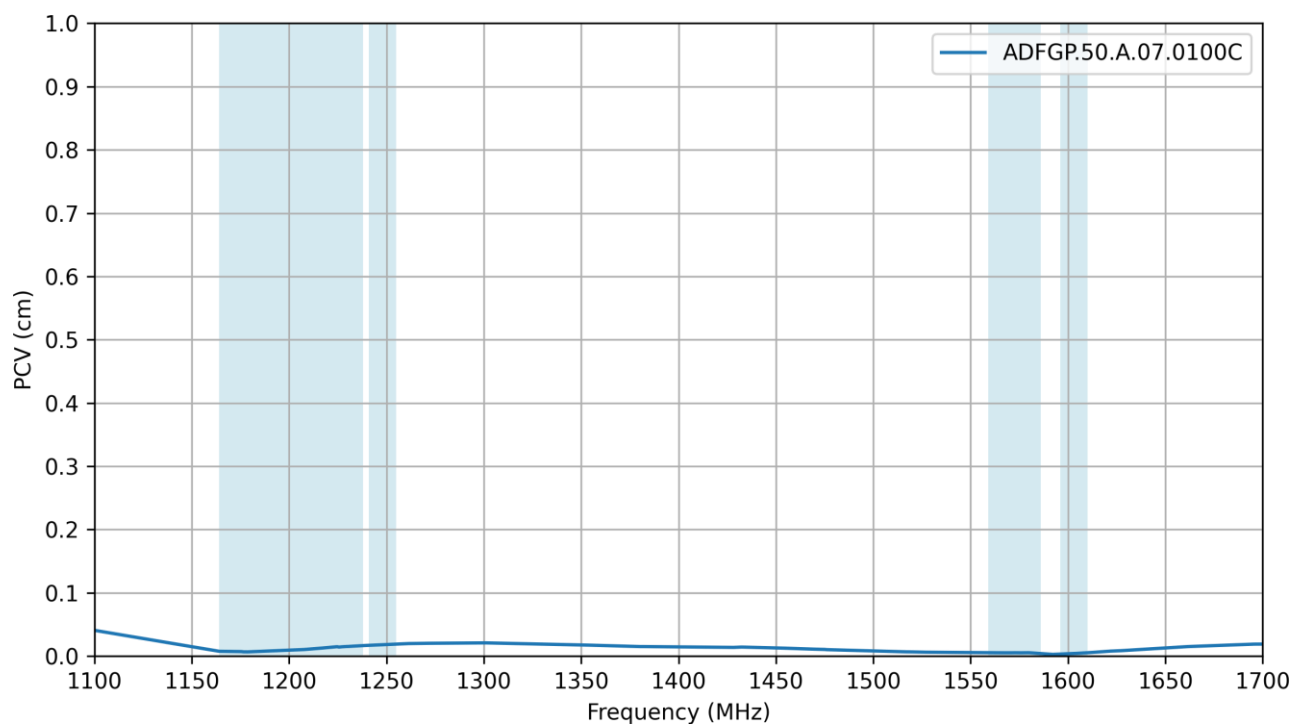
## 6.6 Axial Ratio



## 6.7 PCO

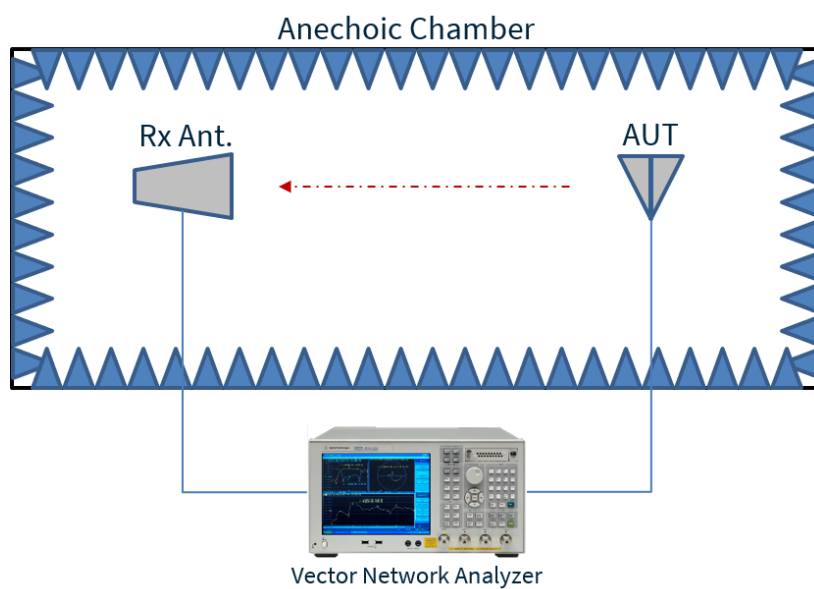


## 6.8 PCV



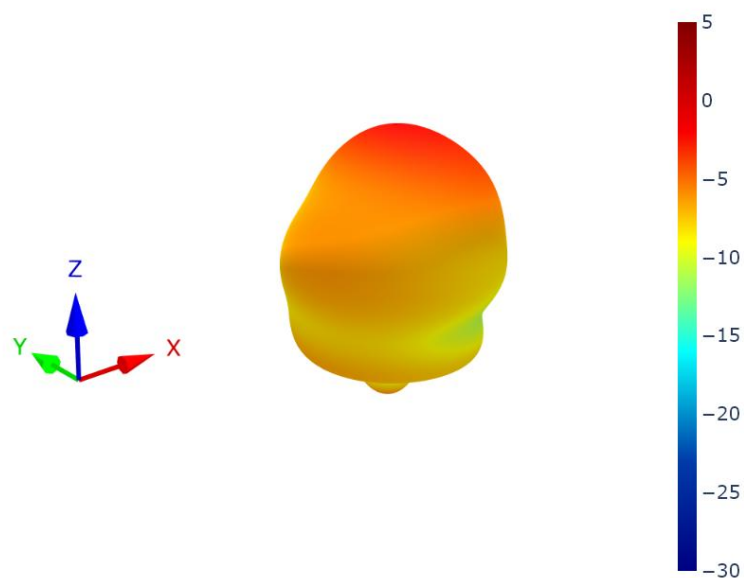
## 7. Radiation Patterns

### 7.1 Test Setup

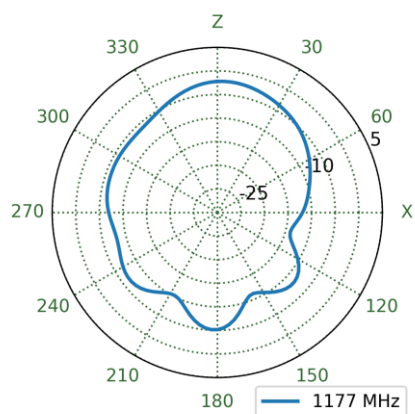


Chamber Test Set-up

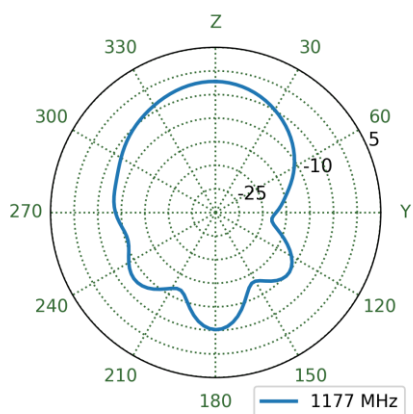
## 7.2 L2-L5 Band - Patterns at 1177 MHz



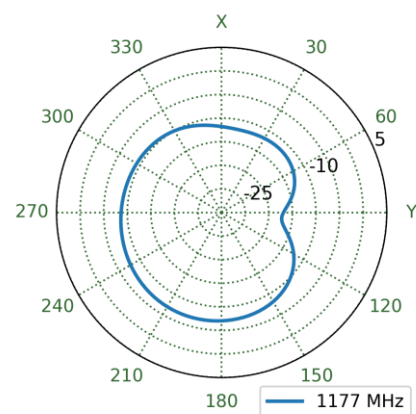
XZ Plane



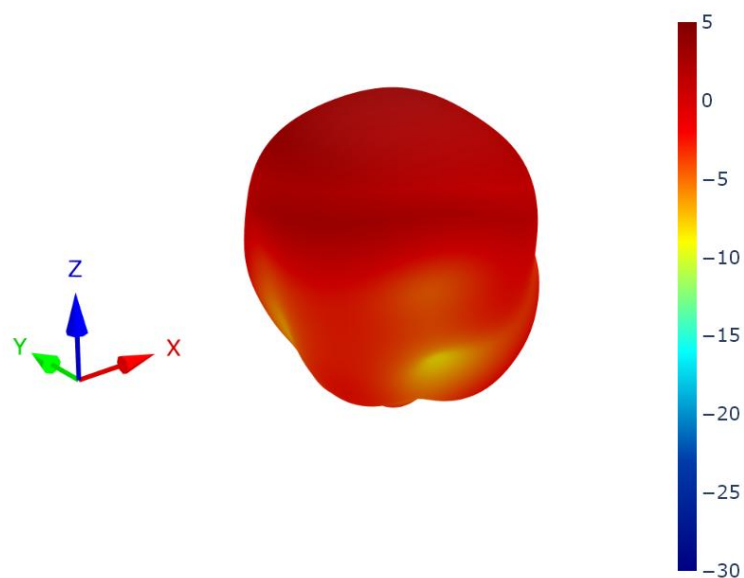
YZ Plane



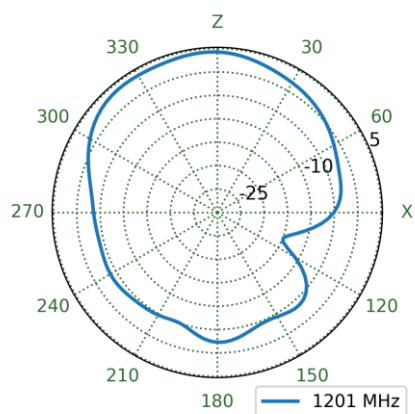
XY Plane



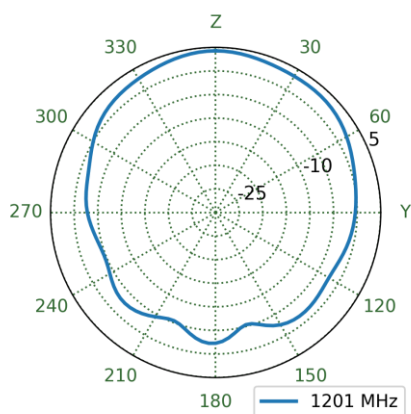
## 7.3 L2\_L5 - Patterns at 1201 MHz



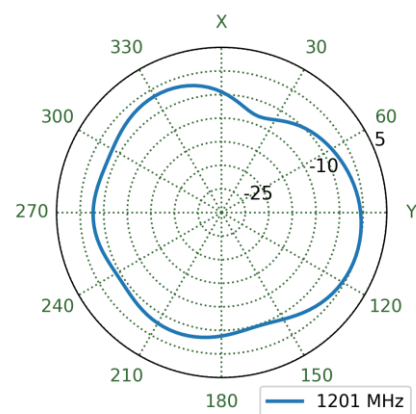
XZ Plane



YZ Plane

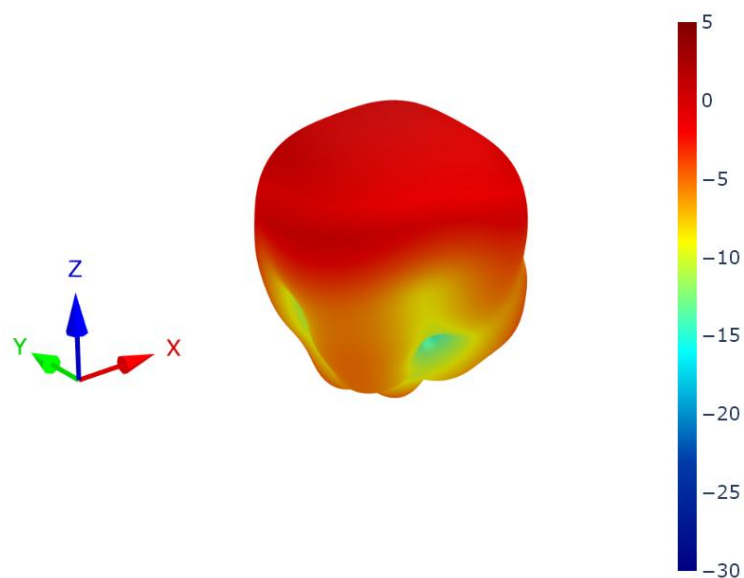


XY Plane

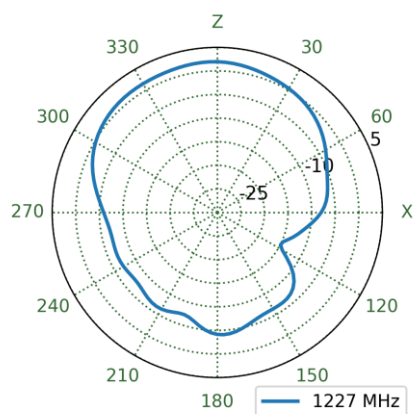




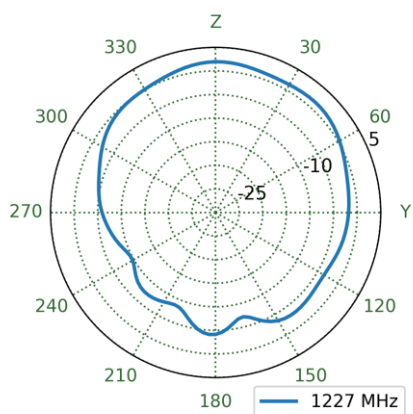
## 7.4 L2\_L5 - Patterns at 1227 MHz



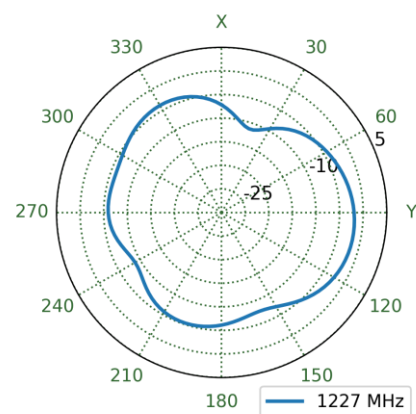
XZ Plane



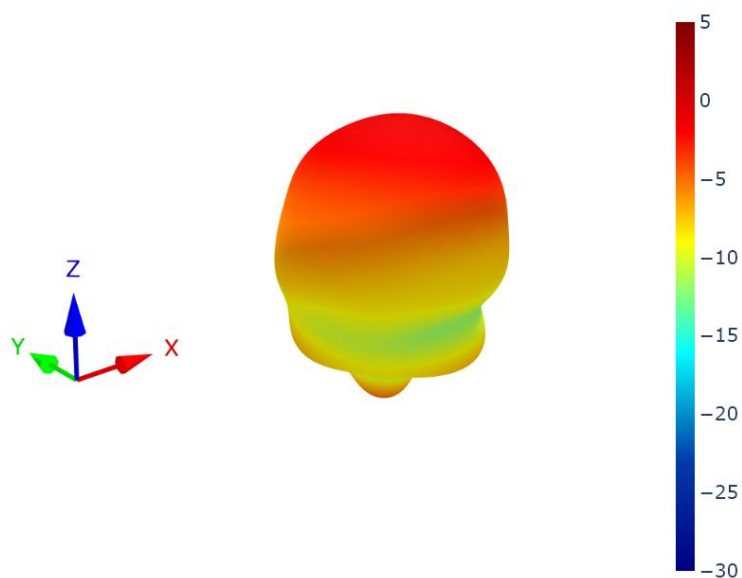
YZ Plane



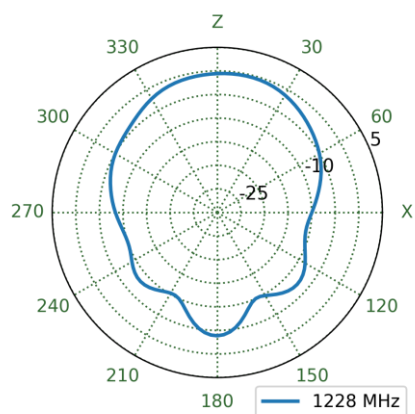
XY Plane



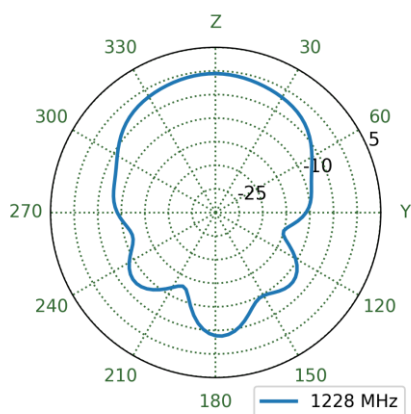
## 7.5 L2-L5 Band - Patterns at 1228 MHz



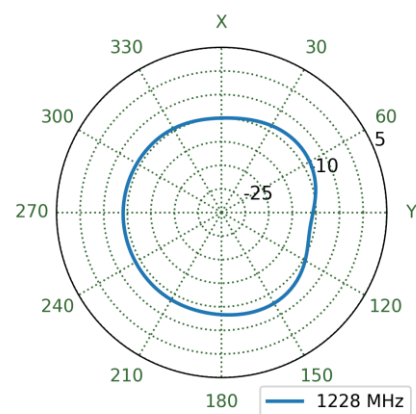
XZ Plane



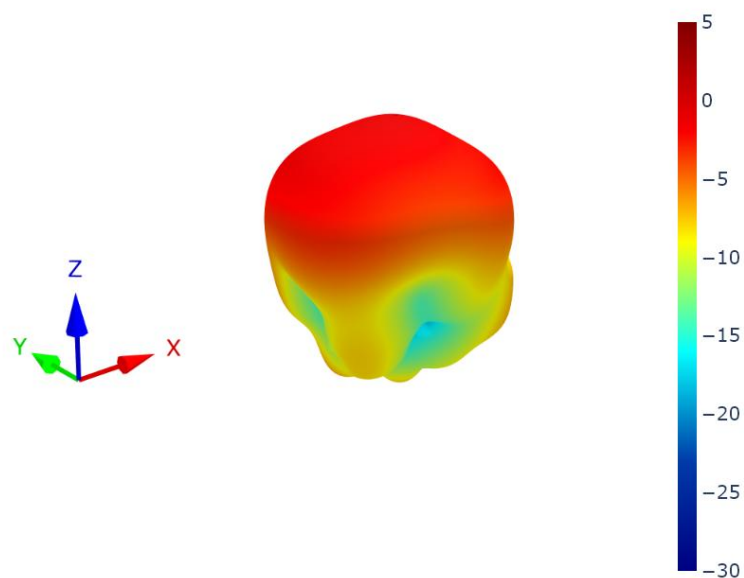
YZ Plane



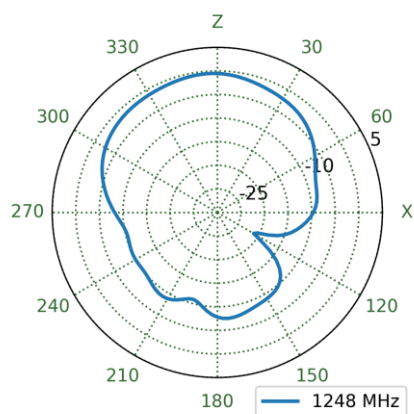
XY Plane



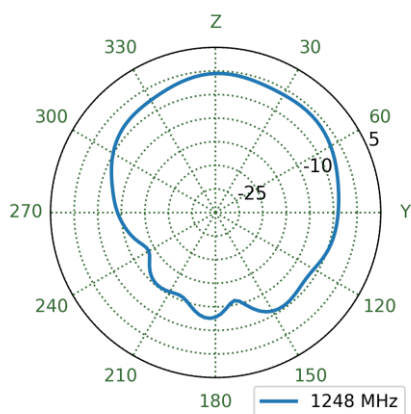
## 7.6 L2\_L5 - Patterns at 1248 MHz



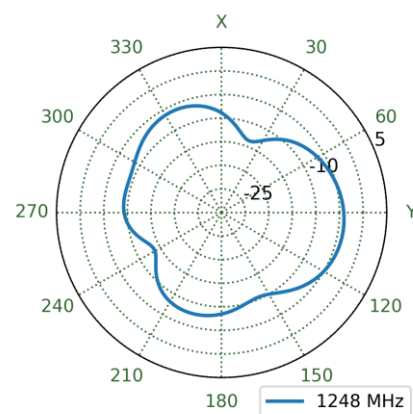
XZ Plane



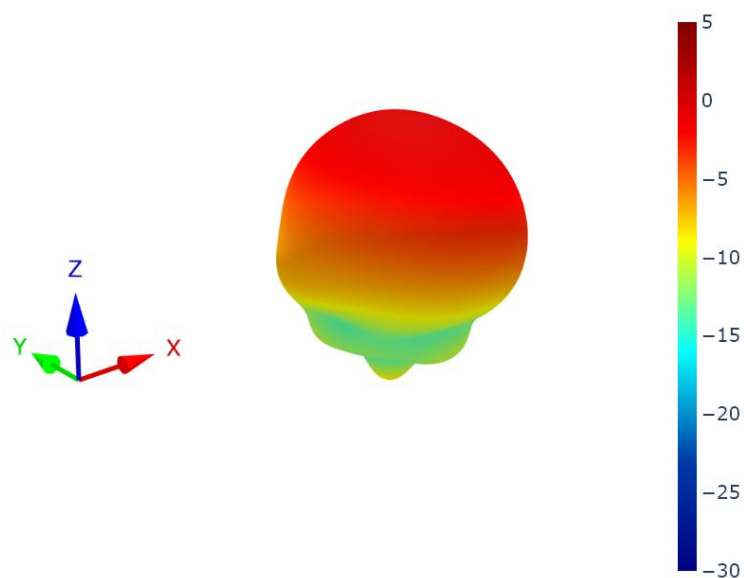
YZ Plane



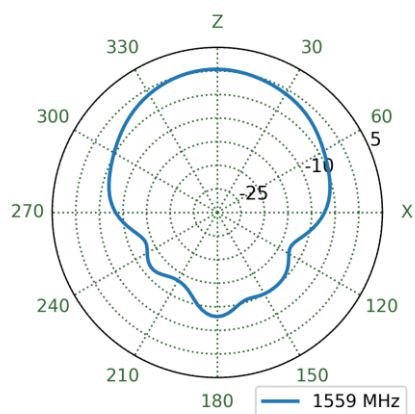
XY Plane



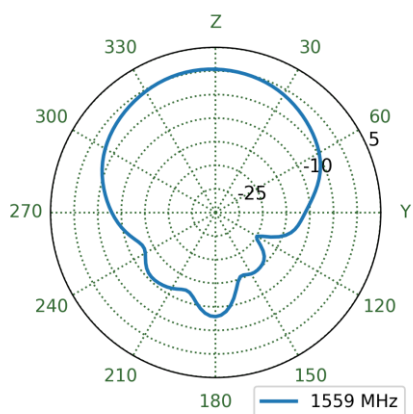
## 7.7 L1 Band - Patterns at 1559 MHz



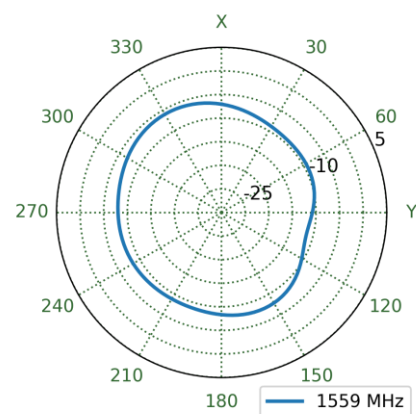
XZ Plane



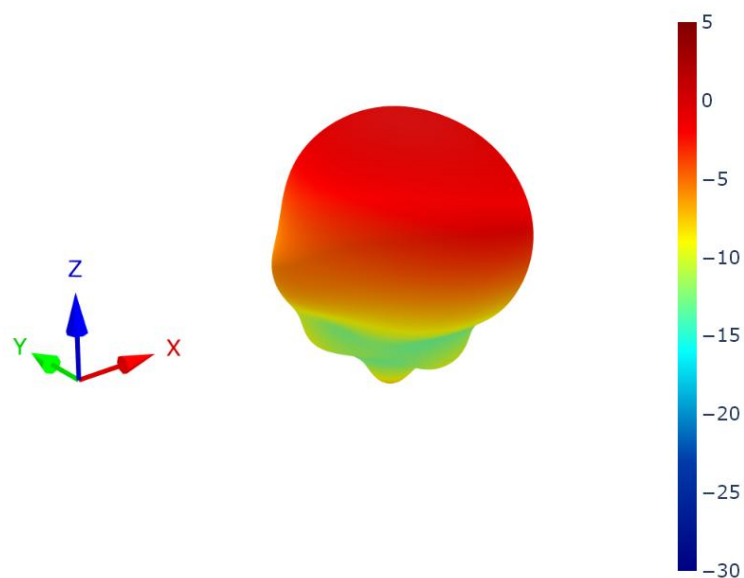
YZ Plane



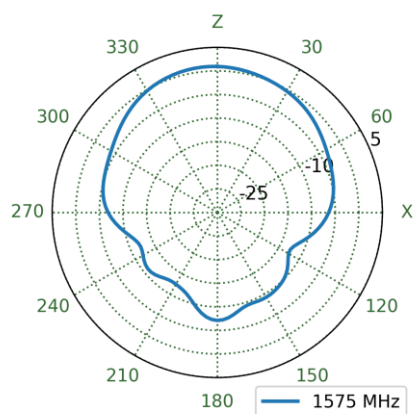
XY Plane



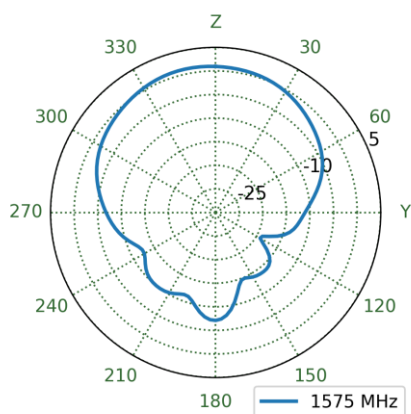
## 7.8 L1 Band - Patterns at 1575 MHz



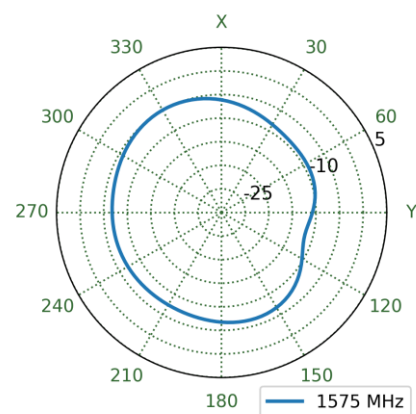
XZ Plane



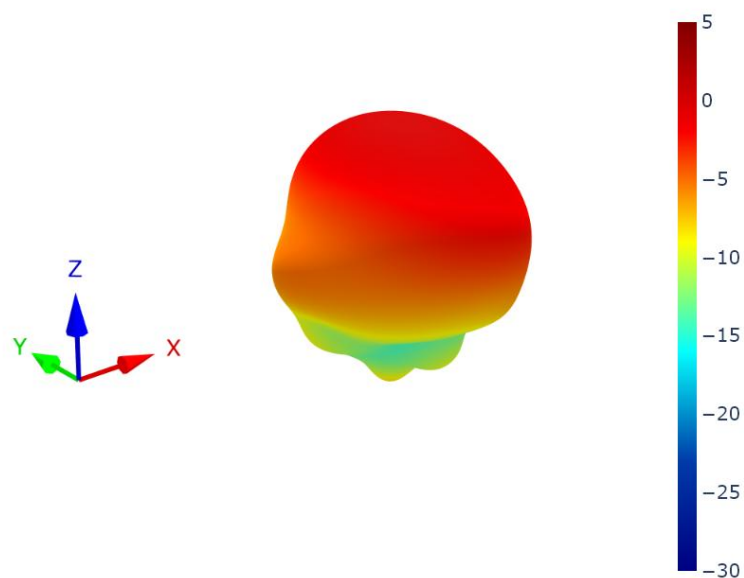
YZ Plane



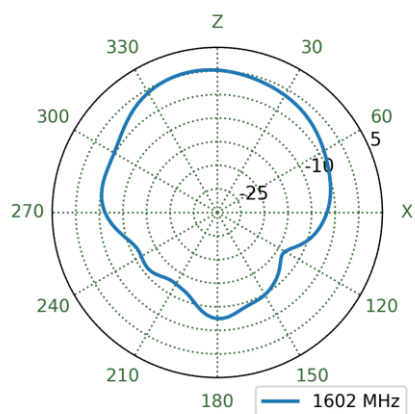
XY Plane



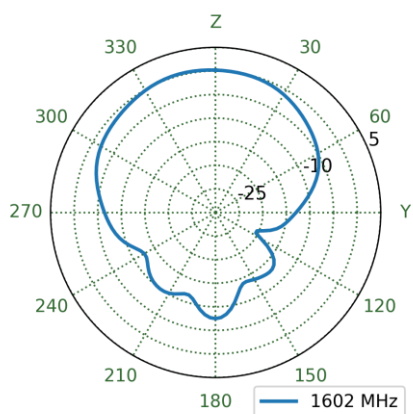
## 7.9 L1 Band - Patterns at 1602 MHz



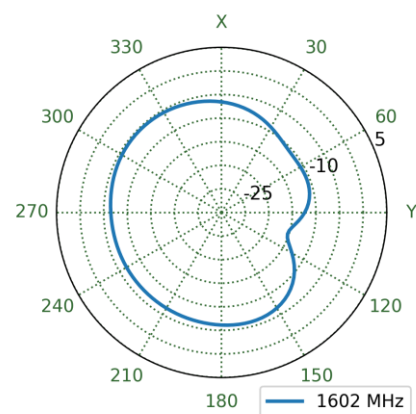
XZ Plane



YZ Plane



XY Plane



## 8. Field Test Results

In this section Taoglas will present the field test result for ADFGP.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 receiver:

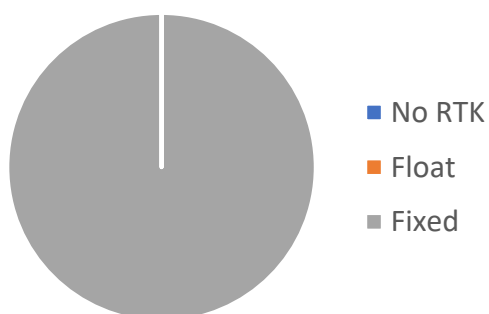
### 8.1 U-blox ZED-F9P

#### Receiver features:

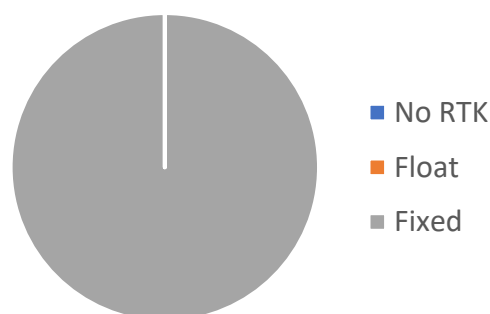
- Multi-band GNSS: 184-channel GPS L1C/A L2C, GLONASS: L1OF L2OF, Galileo: E1B/C E5b, BeiDou: B1I B2I, QZSS: L1C/A L2C
- Multi-band RTK with fast convergence times and reliable performance
- Nav. update rate RTK up to 20 Hz
- Position accuracy = RTK 0.01 m + 1 ppm CEP

Positioning Accuracy Table (2D Accuracy)					
Test Condition	Correction Service	CEP (50%)	DRMS (68%)	2DRMS (95-98.2%)	TTFF (sec)
Free Space	RTK DISABLED	56.42 cm	73.23 cm	146.46 cm	15
	RTK ENABLED	0.9 cm	1.08 cm	2.16 cm	15
30x30 cm Ground Plane	RTK DISABLED	46.69 cm	58.83 cm	117.65 cm	12
	RTK ENABLED	0.8 cm	0.96 cm	1.93 cm	12

RTK Availability  
Free space

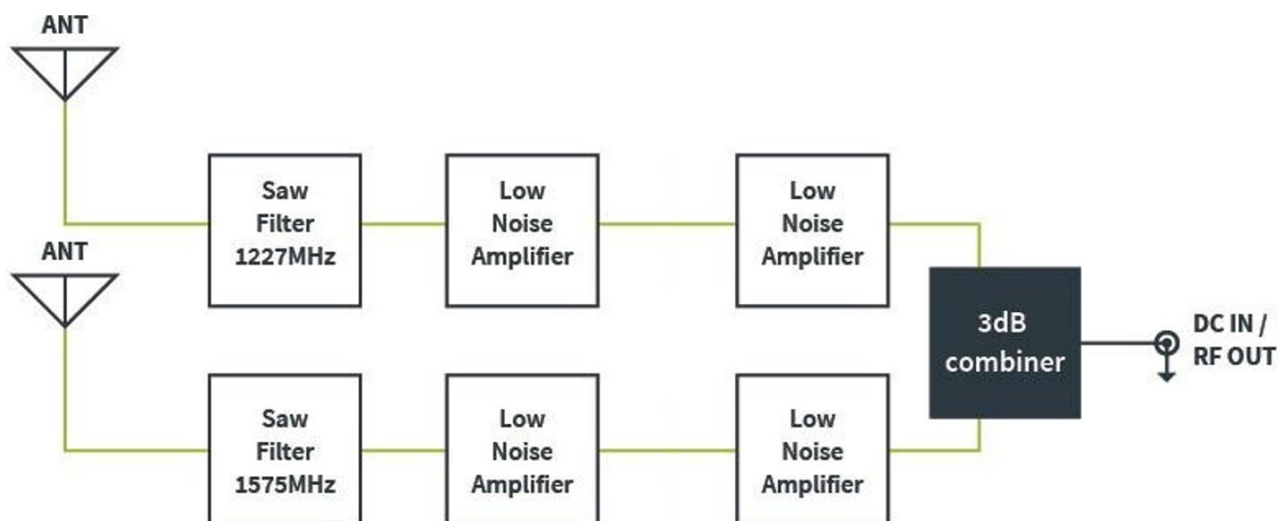


RTK Availability  
30x30 cm ground plane

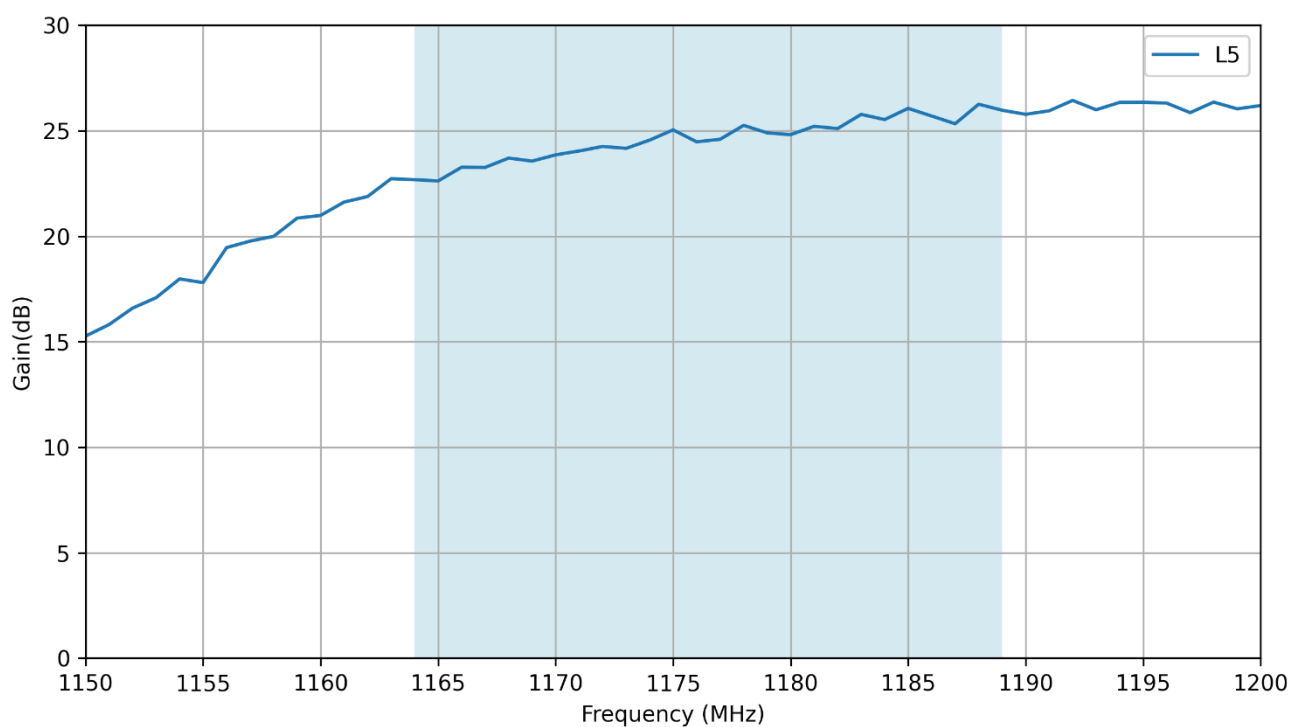


## 9. LNA Characteristics

### 9.1 Block Diagram

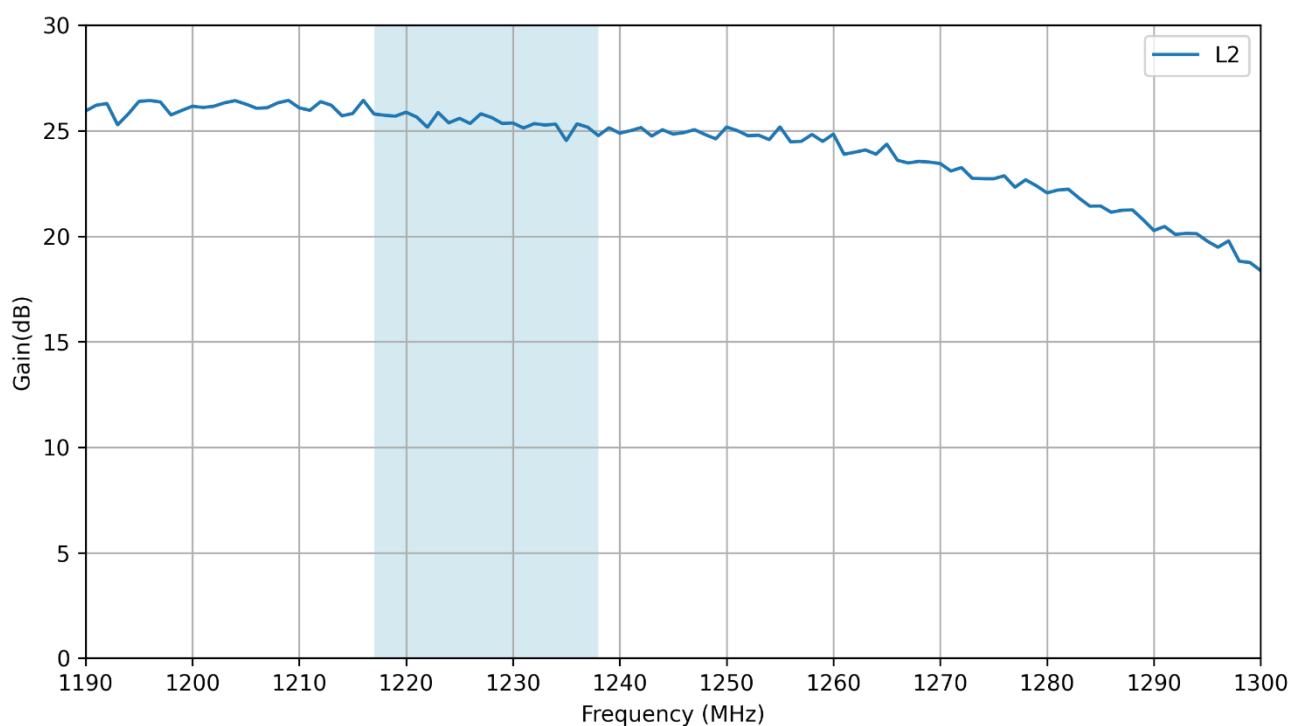


### 9.2 LNA Gain – L5

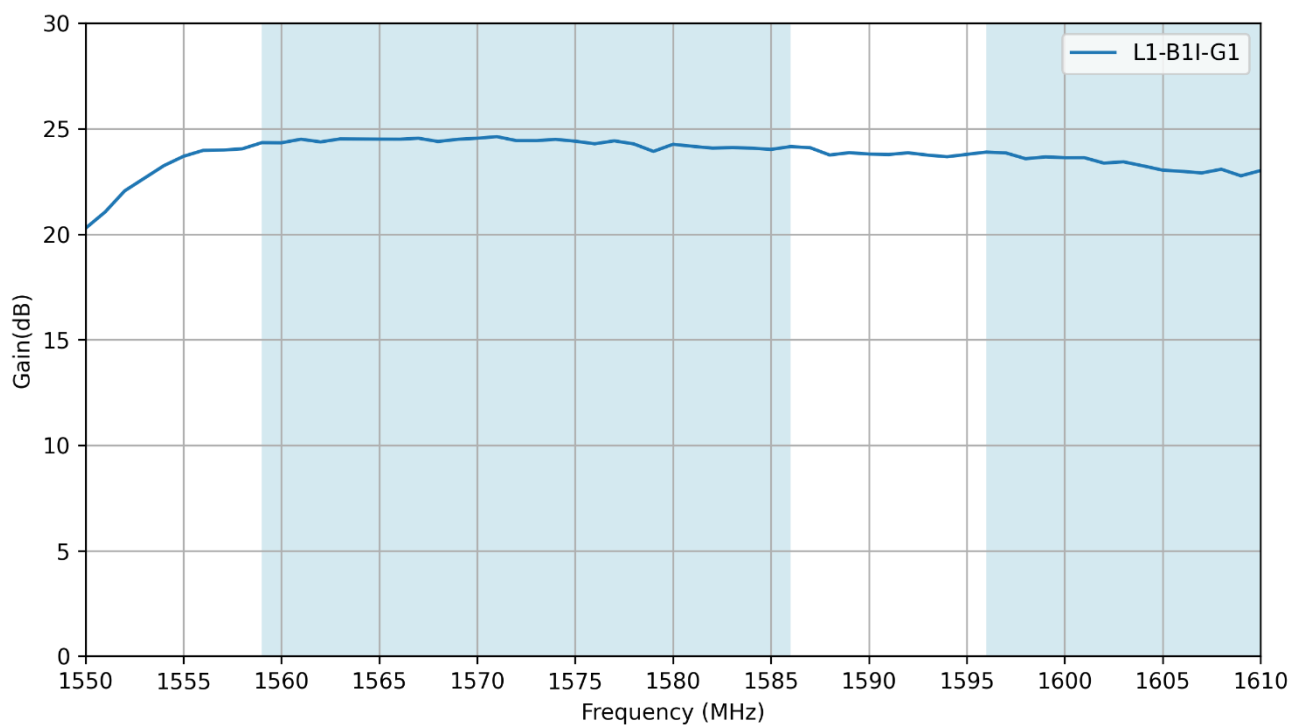




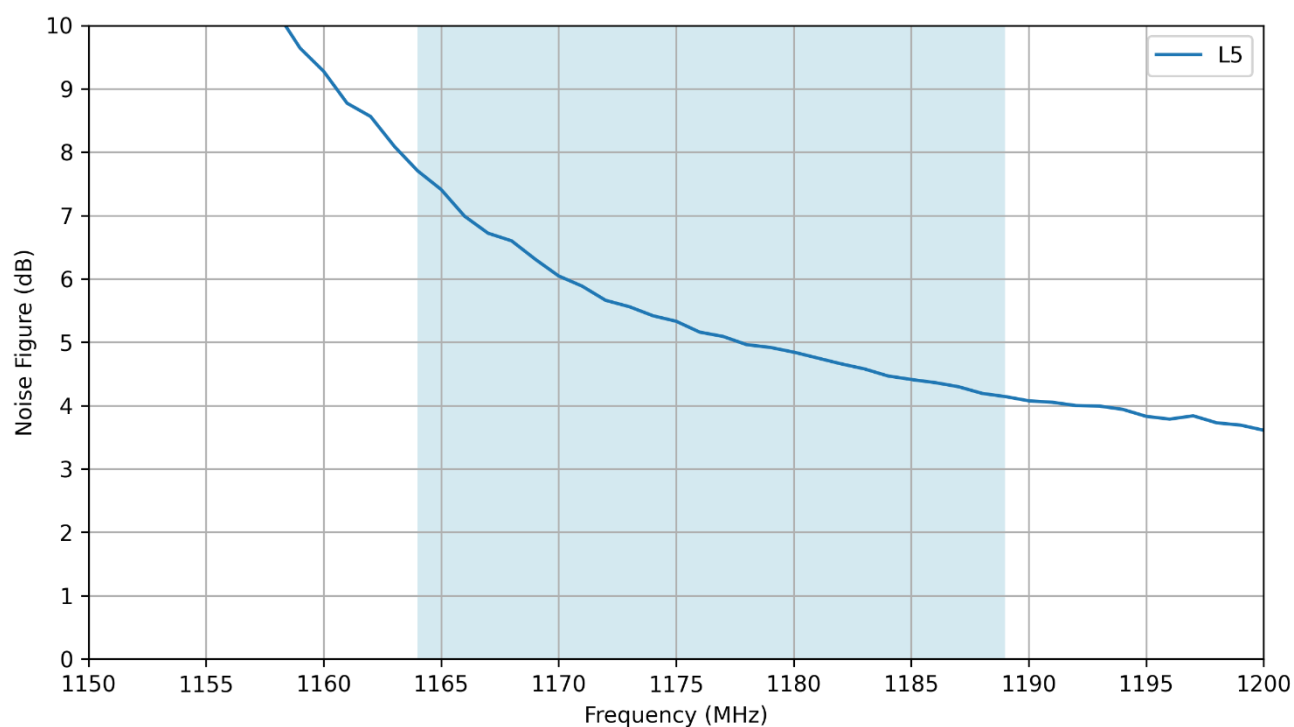
### 9.3 LNA Gain – L2



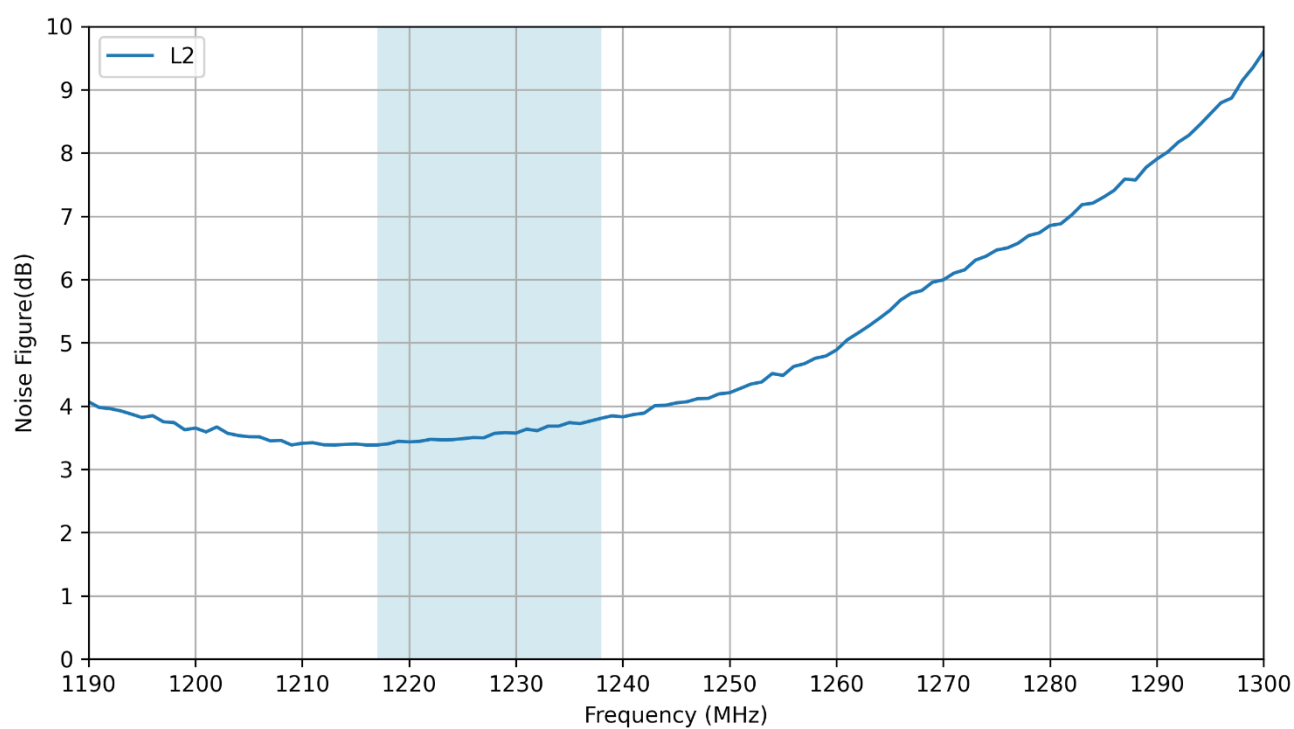
### 9.4 LNA Gain – L1-B1I-G1



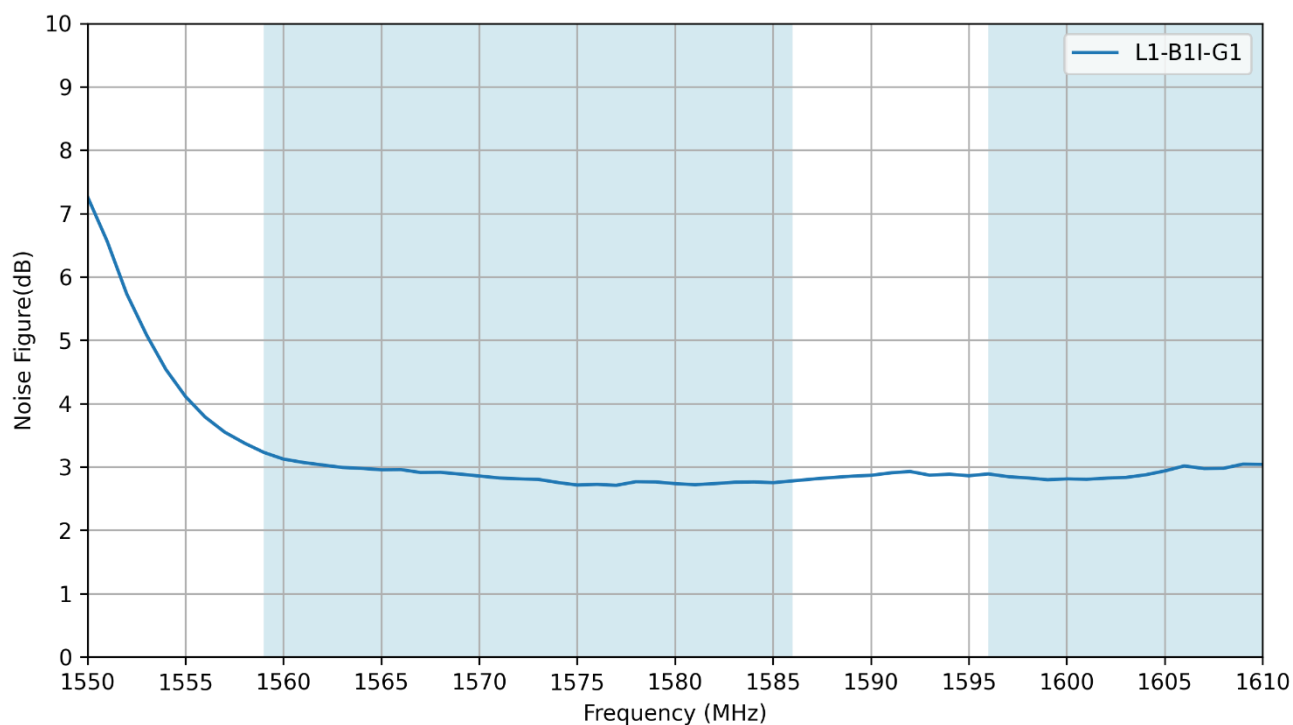
## 9.5 Noise Figure – L5



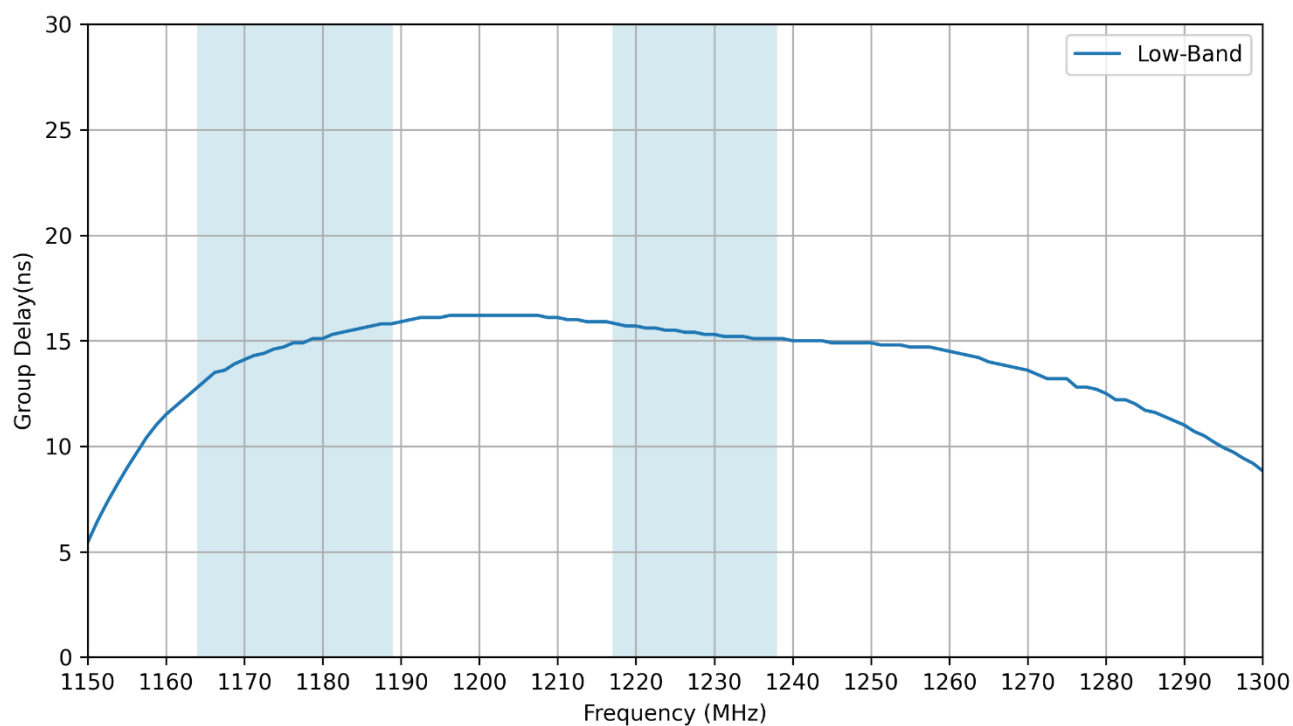
## 9.6 Noise Figure – L2



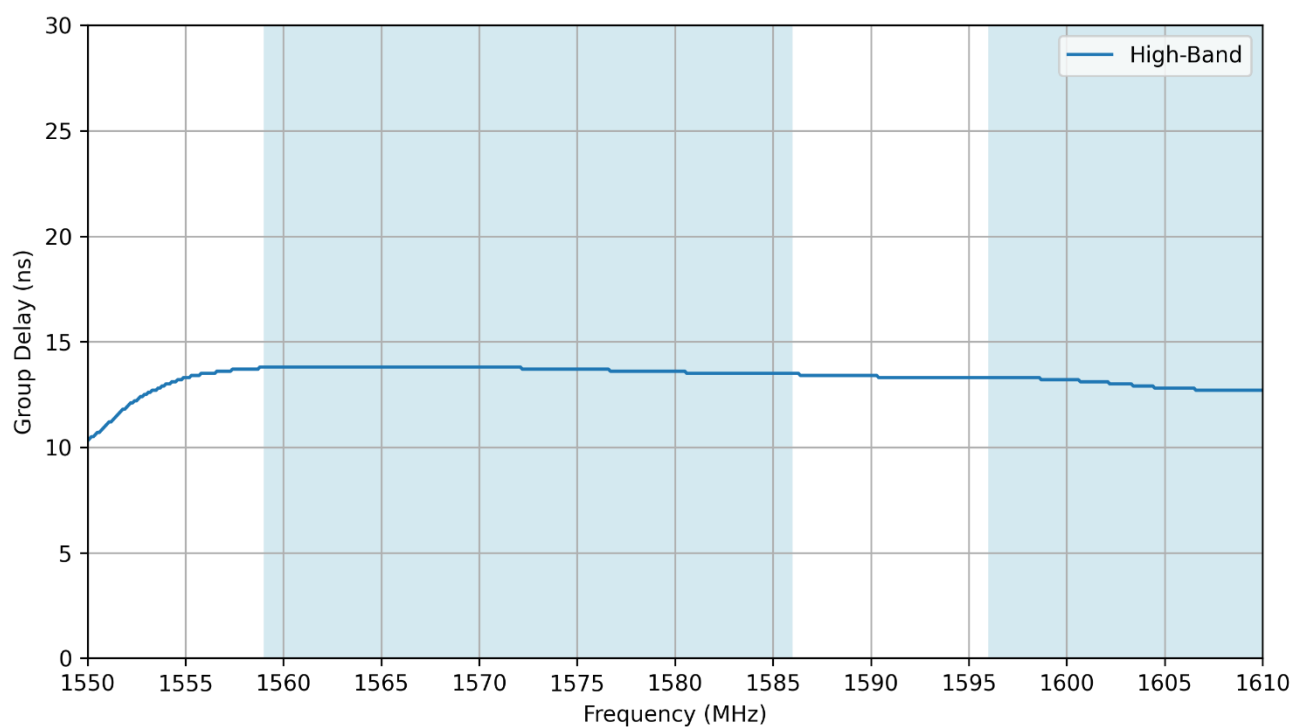
## 9.7 Noise Figure – L1-B1I-G1



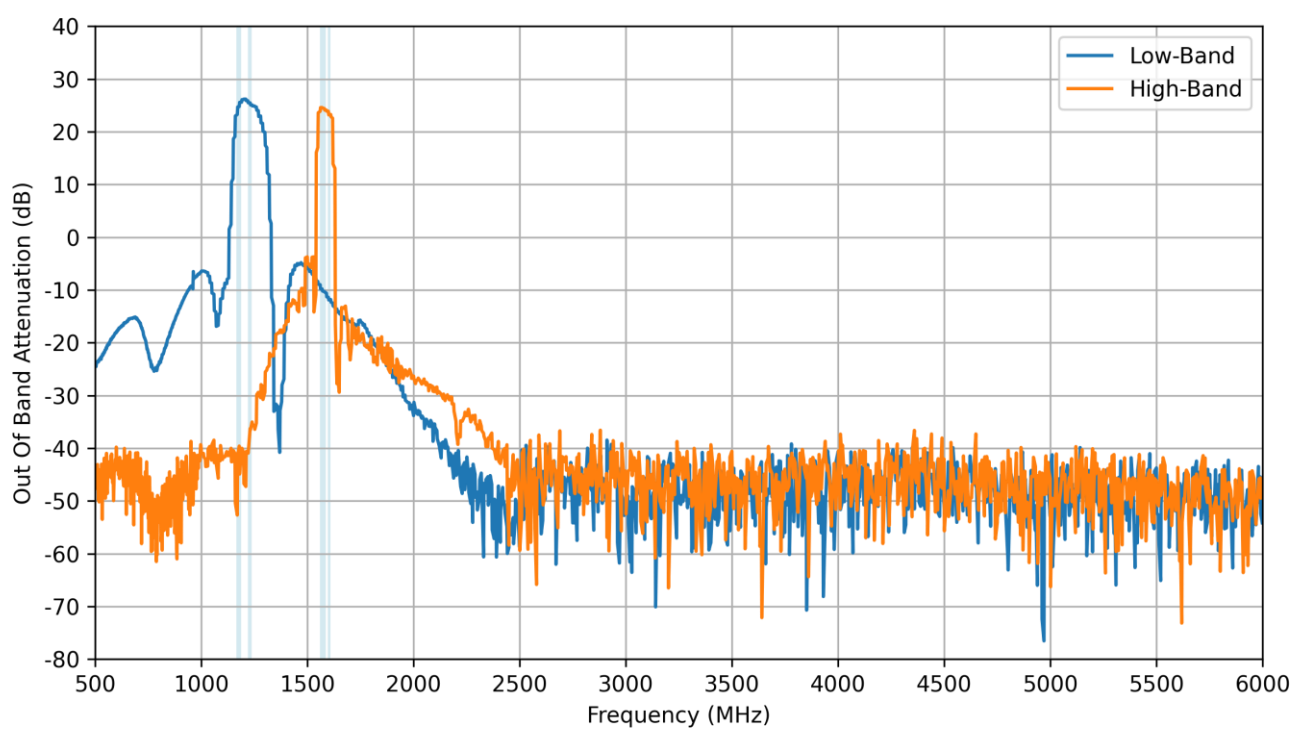
## 9.8 Group Delay – Low-Band



## 9.9 Group Delay – High-Band



## 9.10 Out Of Band Attenuation



## Changelog for the datasheet

### SPE-19-8-133 – ADFGP.50A.07.0100C

#### Revision: G (Current Version)

Date:	2025-04-30
Changes:	Full datasheet update.
Changes Made by:	Gary West

#### Previous Revisions

##### Revision: F

Date:	2022-11-17
Changes:	Updated GNSS Band and constellations.
Changes Made by:	Gary West

##### Revision: A

Date:	2019-10-17
Changes:	Initial Release
Changes Made by:	Jack Conroy

##### Revision: E

Date:	2022-07-28
Changes:	Added Installation Suggestion
Changes Made by:	Gary West

##### Revision: D

Date:	2021-12-22
Changes:	Updated packaging
Changes Made by:	Gary West

##### Revision: C

Date:	2020-05-29
Changes:	Added Field Test Section
Changes Made by:	Victor Pinazo

##### Revision: B

Date:	2020-03-02
Changes:	Updated Introduction
Changes Made by:	Yu Kai Yeung

