TAOGLAS

Datasheet

Multi-band GNSS Embedded Quad Helix Antenna

Part No:
EAHP.125.01.0100D

Description

Embedded Active Quad Helix Antenna for GNSS L1/L2/L5 with L-Band

Features:

Supports GPS L1/L2/L5, Galileo L1/E5/E5a/E5b, GLONASS G1/G2/G3, BeiDou B1/B2a/B2b, and upper L-band (1540-1555MHz)
Input voltage : 2.0 - 5.5V
Dimensions: Ø60mm * 31.52mm
Cable: 100mm RG-174
Connector: SMA(M)
Custom Cables and Connectors Available
RoHS & Reach Compliant

1. Introduction

The EAHP.125 is an embedded all-band GNSS Quadrifilar Helix antenna. It covers the full GNSS L1/L2/L5 spectrum while also covering the L-Band for correction services deployed by U-Blox and other providers. The EAHP.125 has right hand circular polarization which improves sensitivity, rejecting left hand circular polarized reflections commonly experienced in urban environments.

The EAHP.125 is a dual stage active GNSS antenna, thus saving time for the customer as they don't need to create a complicated active circuit to be used in conjunction with their GNSS receiver/module, for multiband GNSS this can be a difficult process so it will save design time for users.

The EAHP.125 is extremely compact at just 31.5mm in height and 60mm in diameter. It is also very lightweight due to its lightweight construction. The height and weight constraints of many devices often don't allow for a large ceramic antenna. For example, UAVs and other robotic applications often will have weight restrictions to maximize battery life and, so the optimum solution is the EAHP.125 at just 45g. To achieve the best performance from the EAHP.125, it is best placed on a nonmetallic surface.

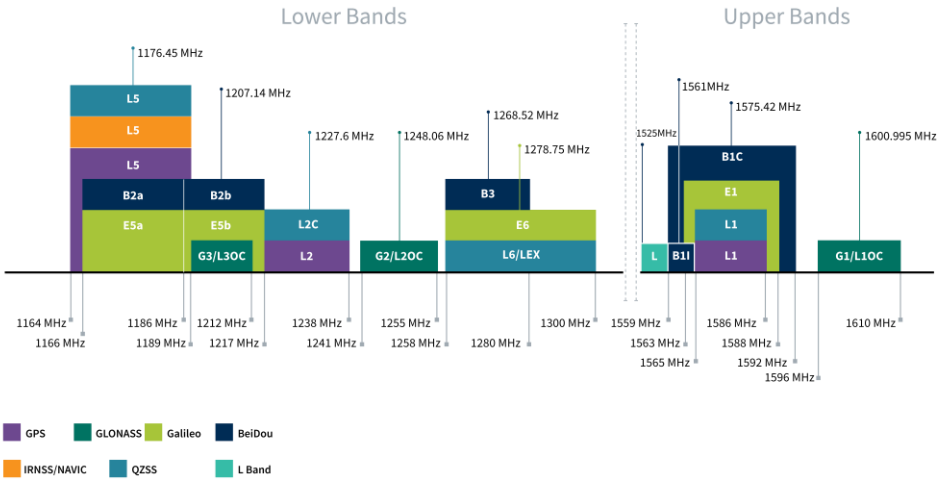
Typical Applications include:
- UAVs and Drones
- Robotics and Autonomous
- Transportation
- Aerospace
- Surveying

The EAHP.125 installation method is detailed in section 7 of this datasheet and requires an adhesive pad (supplied with the antenna) to ensure the antenna is secured in place when it is installed in a device. Any movement of the antenna within the device may cause damage to the antenna which will affect performance. Contact Taoglas if you are unsure of any installation requirements or require more details.

The cable and connector are fully customizable, for further information 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

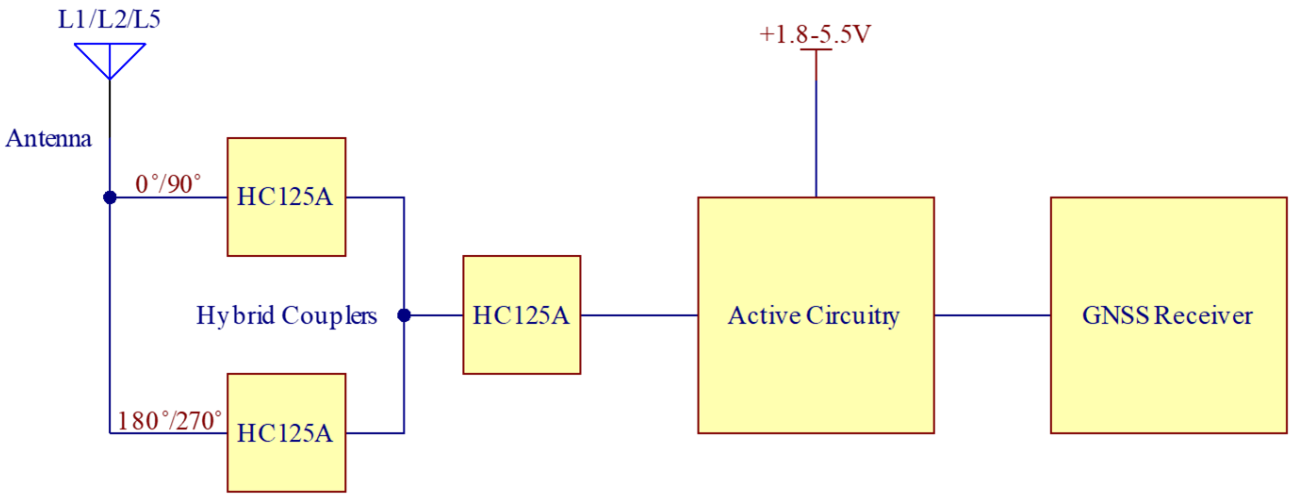
GNSS Electrical						
Frequency (MHz)	**1176.45**	**1227.6**	**1542**	**1561**	**1575.42**	**1603**
Passive Antenna Efficiency (%)	35.7	33.25	57.2	58.11	55.33	49.94
Passive Antenna Gain at Zenith (dBic)	0.0	-0.08	0.74	0.42	1.74	1.65
Axial Ratio (dB)	1.19	1.02	1.03	2.15	2.01	0.64
PCO (cm)	0.59	0.51	0.26	0.25	0.22	0.19
PCV (cm)	1.08	1.0	0.96	0.86	0.88	0.9
Group Delay Mean (ns)	-3.99	-4.12	-1.96	-4.57	-2.98	-2.43
Group Delay Variation (ns)	3	3	8	1	4	1
Noise Figure (dB)	2.28	2.08	3.20	2.78	2.96	3.15
Polarization	RHCP					
Impedance	50 Ω					
***To achieve best performance, you need to place on non metallic surface.**						

Mechanical	
Dimensions	Ø60mm x 31.52mm
Weight	45g
Material	FR4
Cable	100mm of RG-174
Connector	SMA(M)

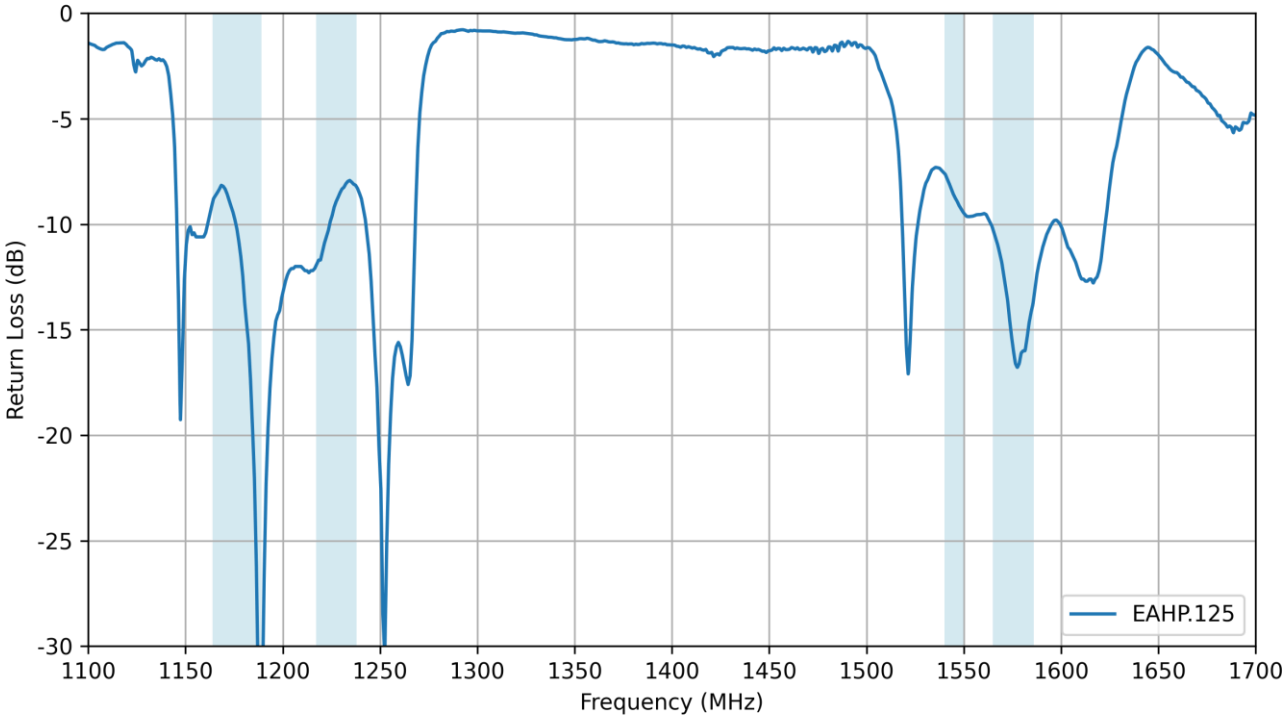
Environmental	
Operation Temperature	-40 - +85°C
Storage Temperature	-40 - +85°C
RoHs & REACH Compliant	Yes

3. Antenna Characteristics

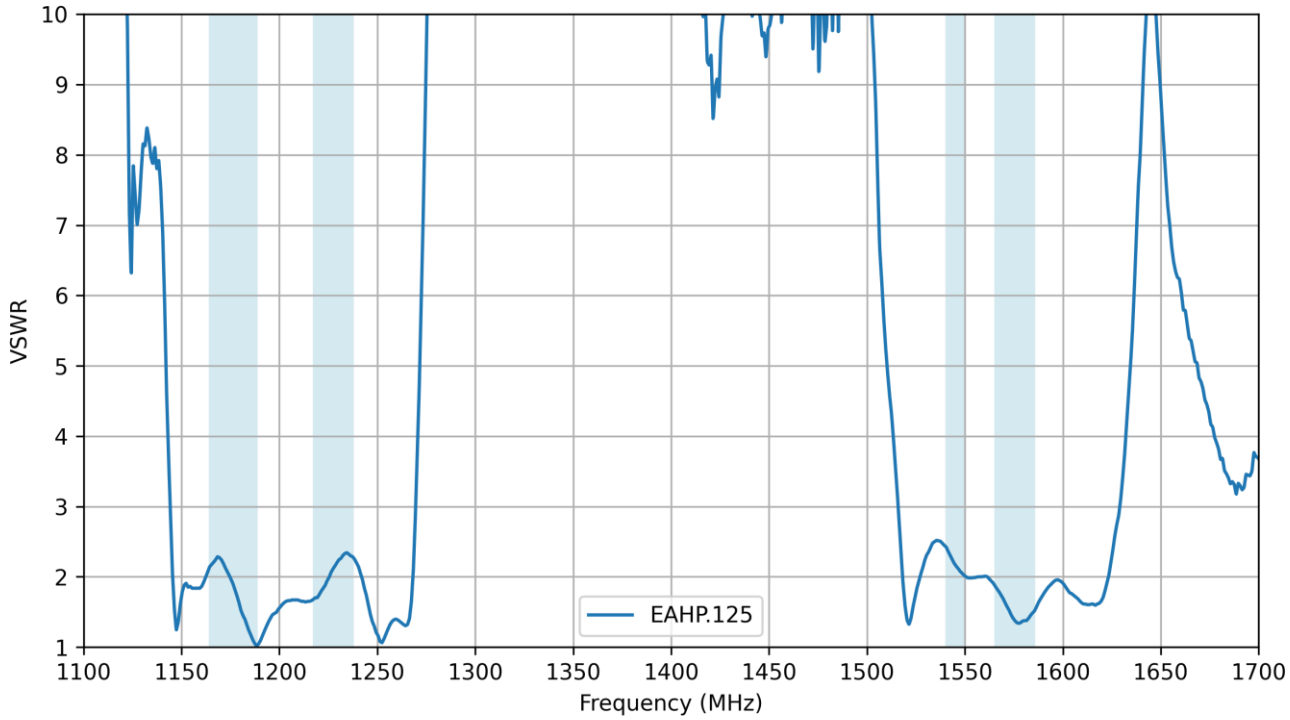
3.1 Block Diagram



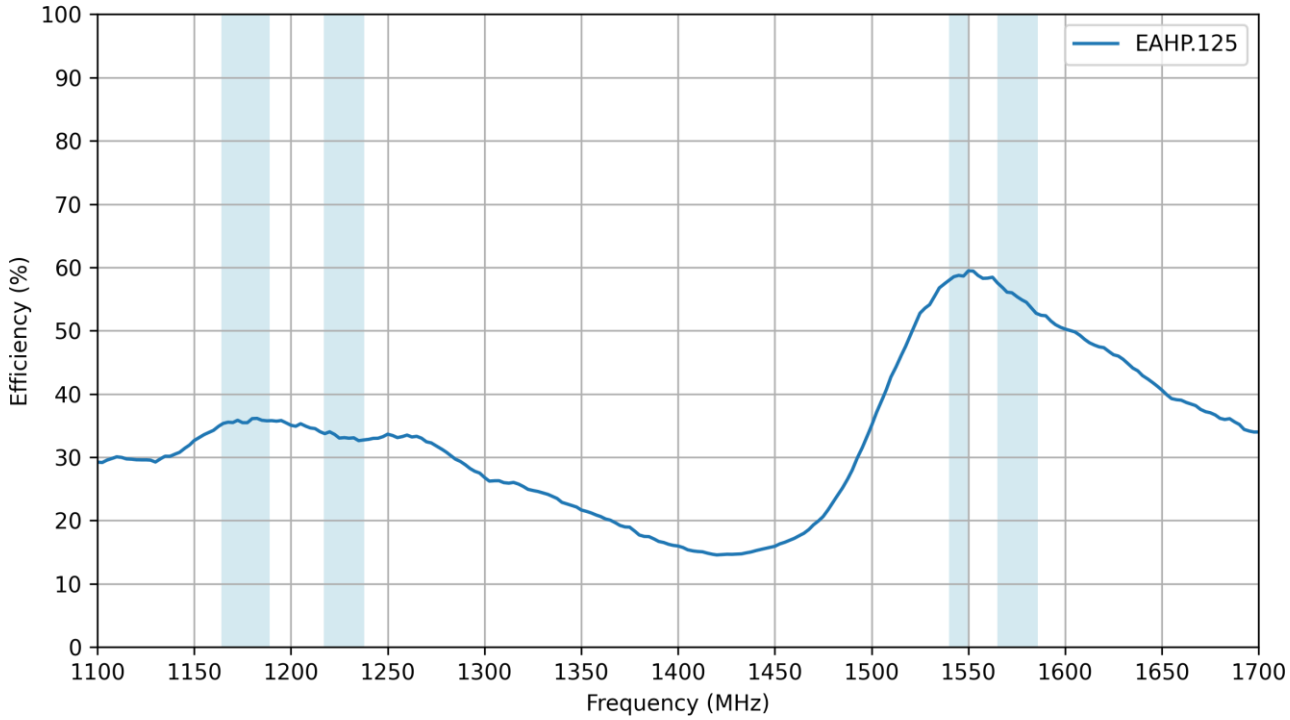
3.2 Return Loss



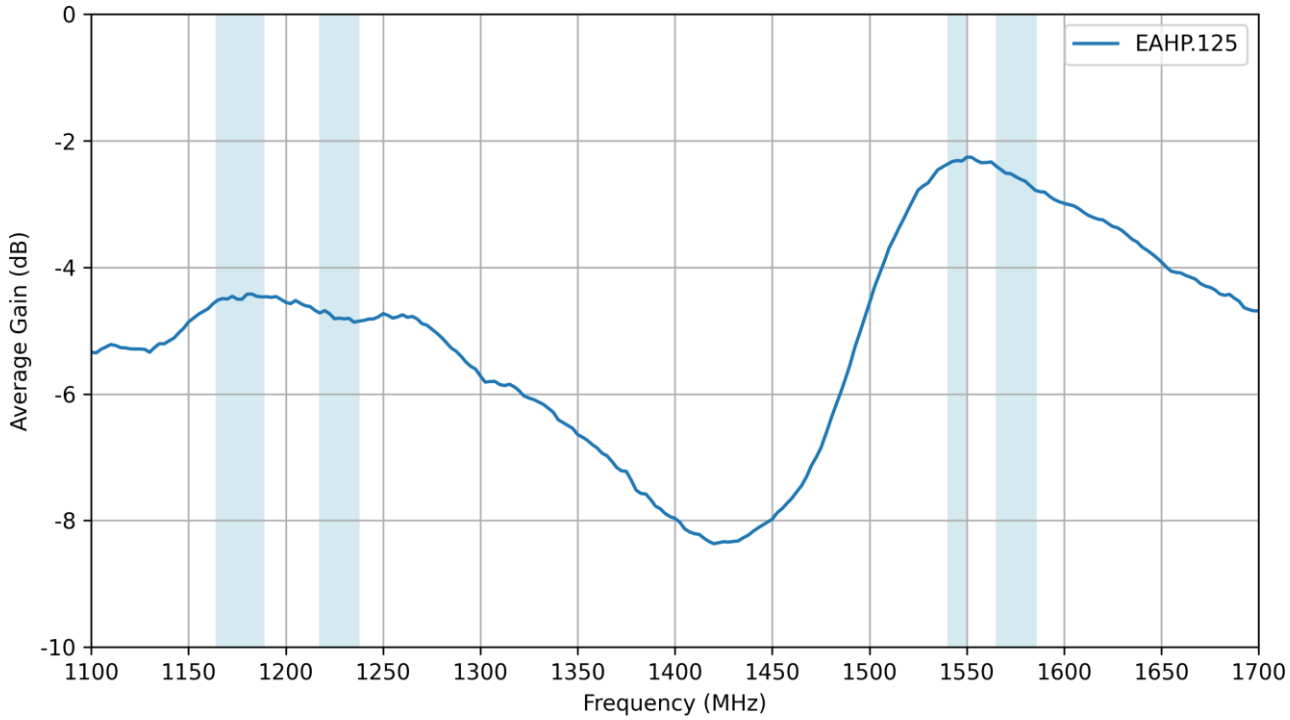
3.3 VSWR



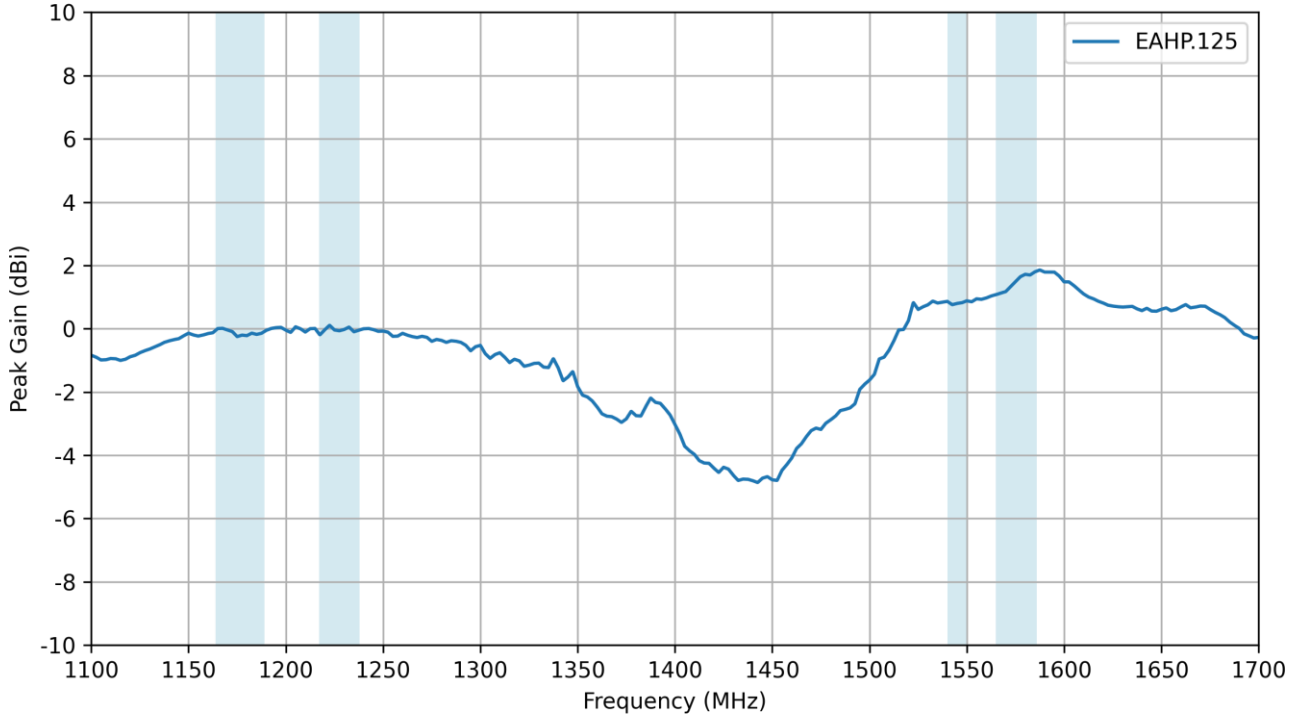
3.4 Efficiency



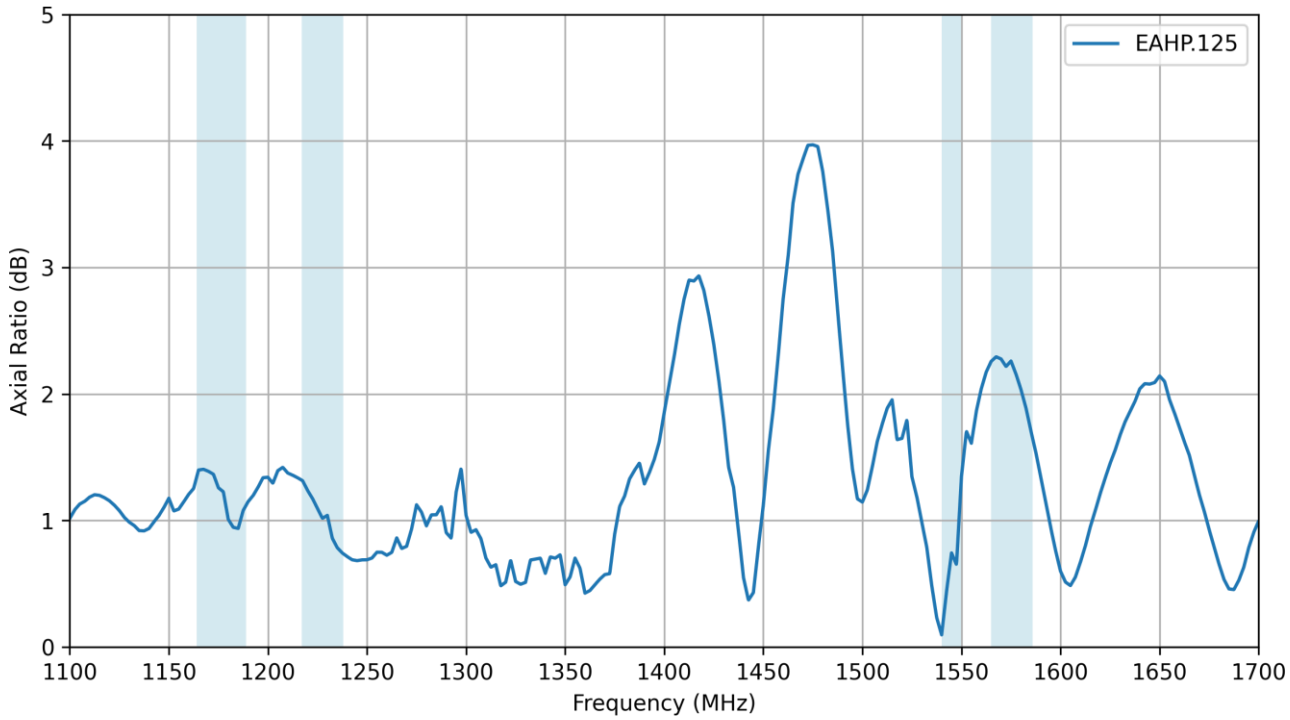
3.5 Average Gain



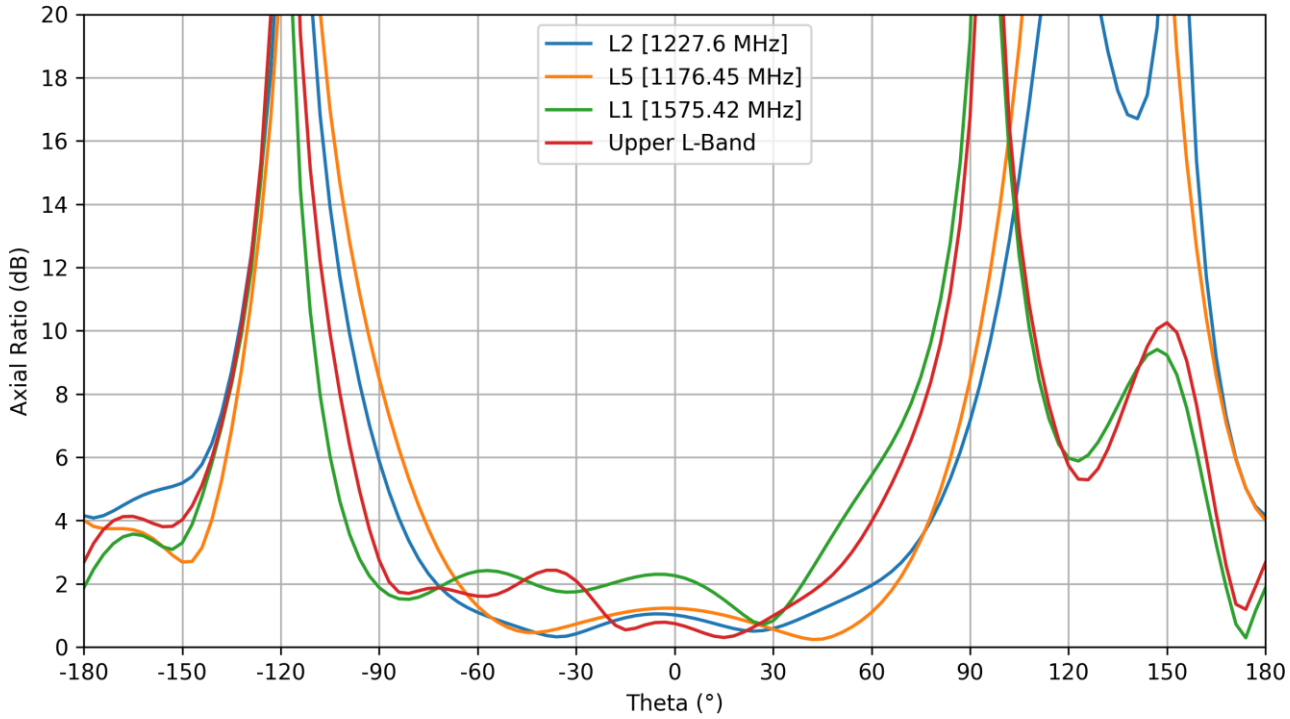
3.6 Peak Gain



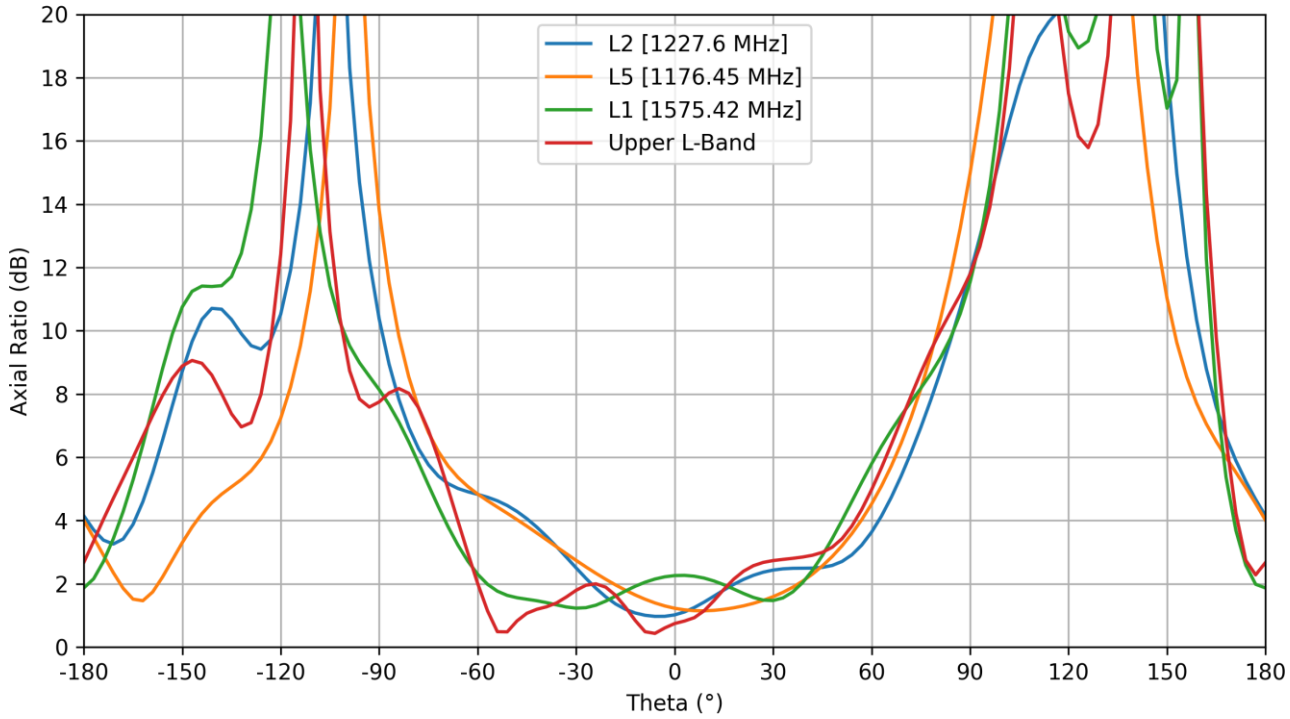
3.7 Axial Ratio



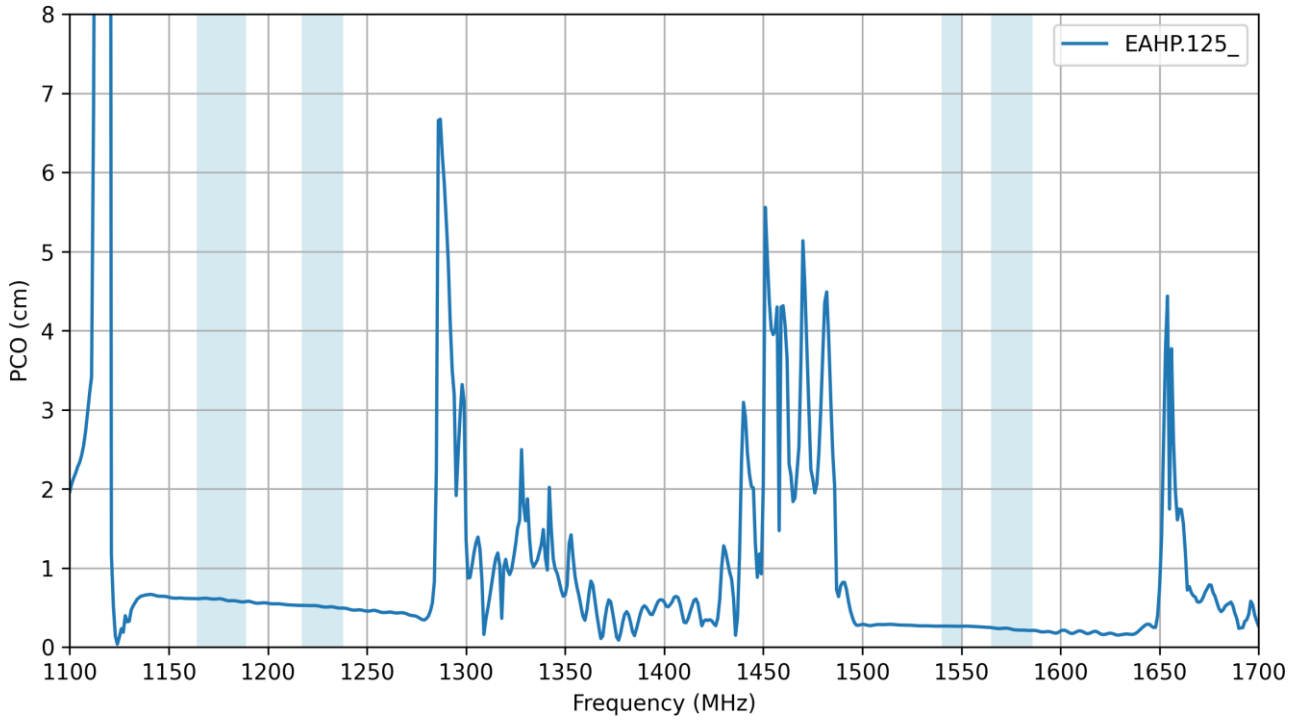
3.8 Axial Ratio vs Angle for Phi=0



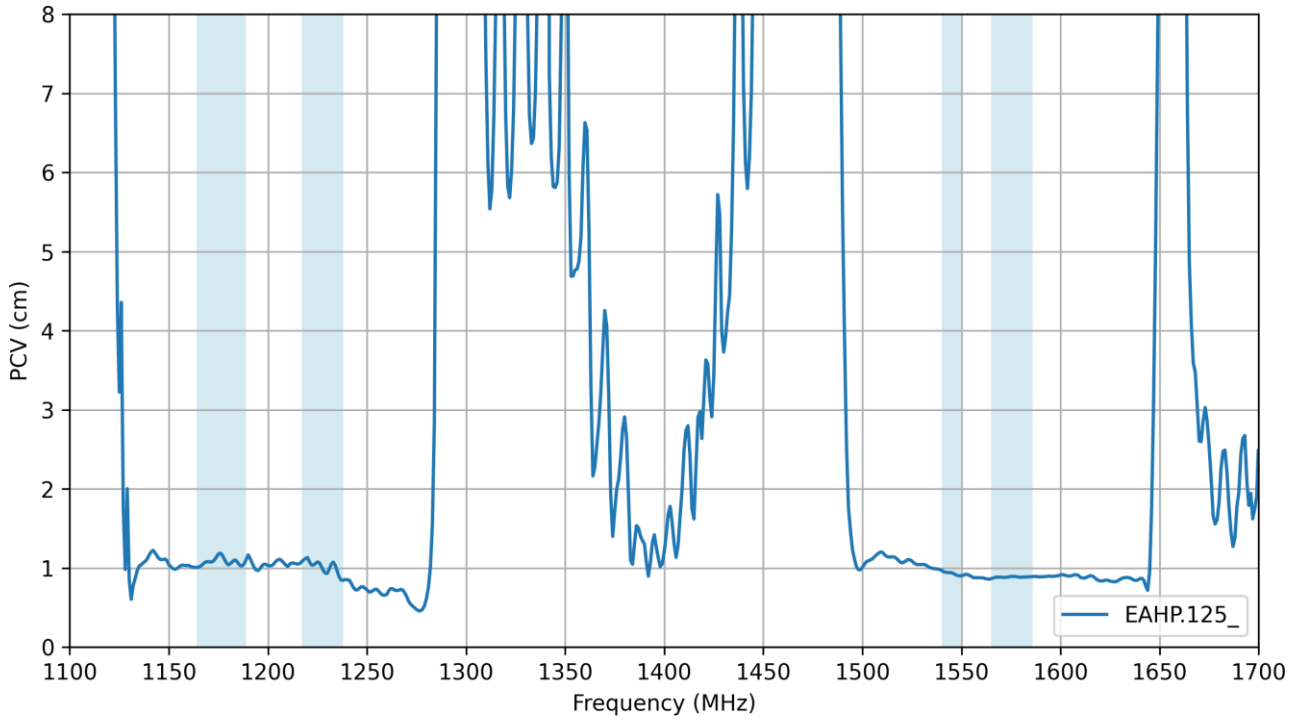
3.9 Axial Ratio vs Angle for Phi=90



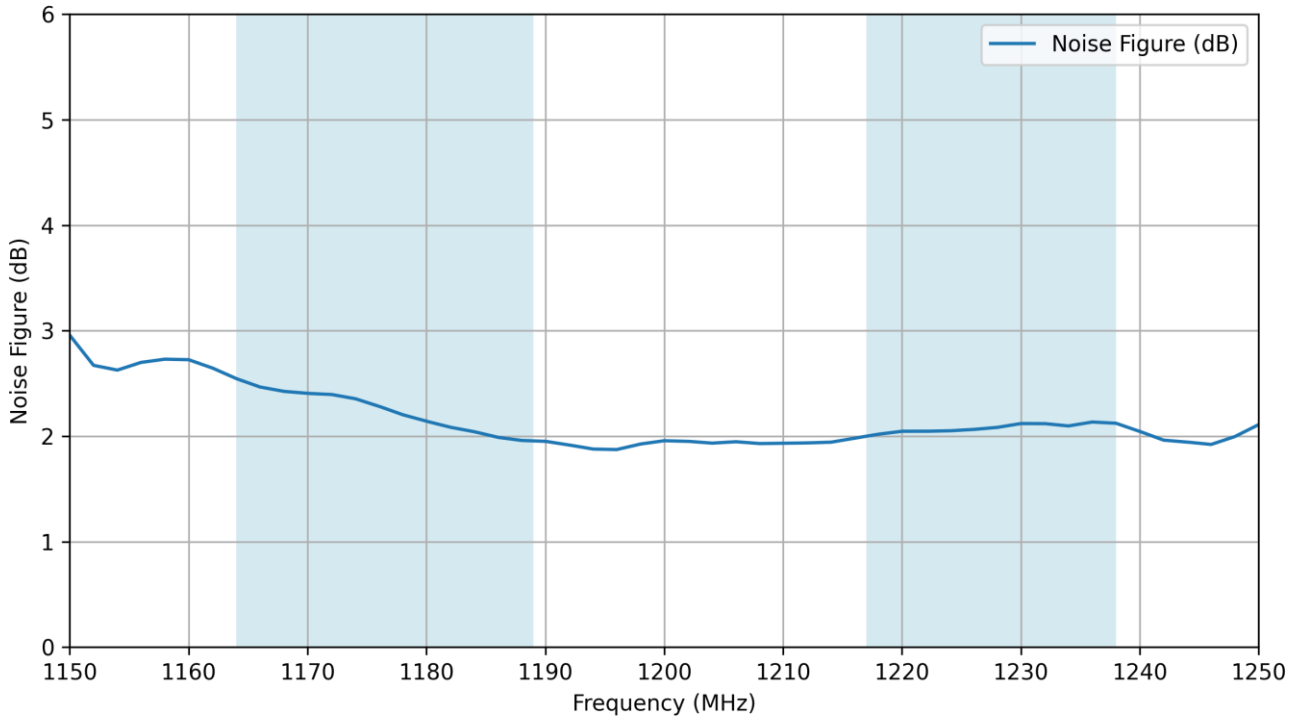
3.10 PCO



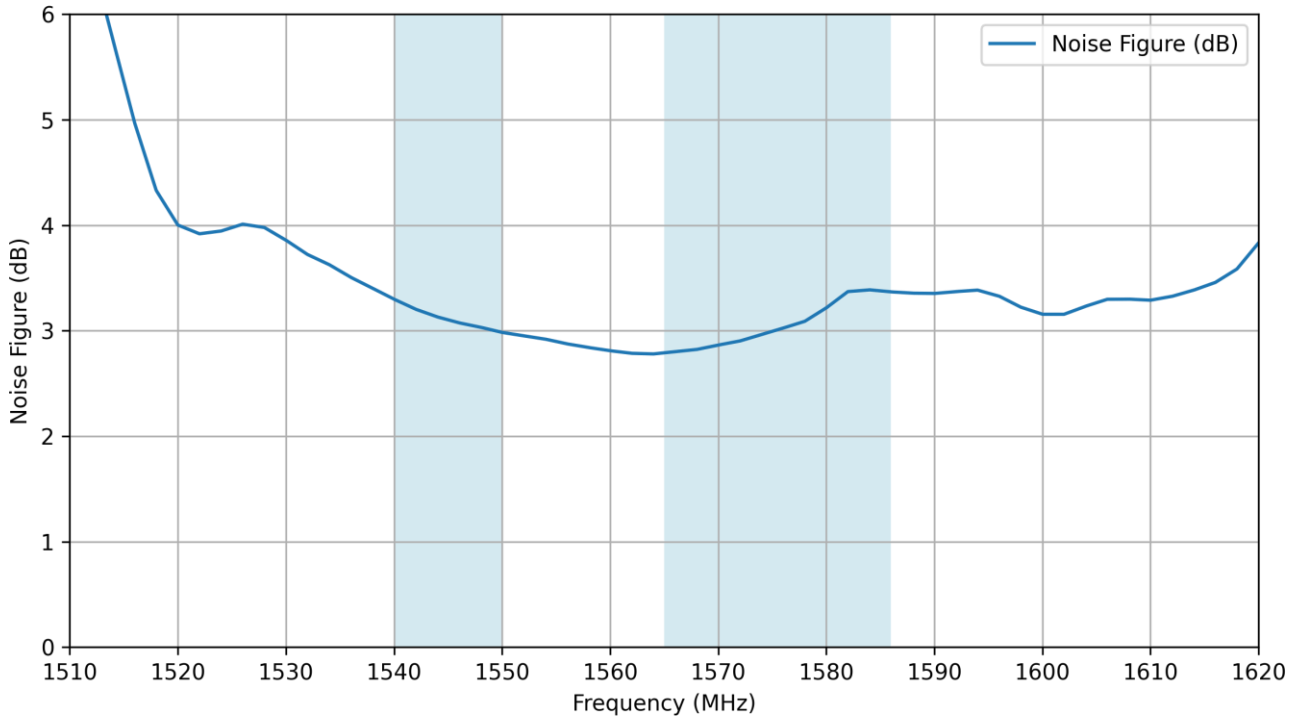
3.11 PCV



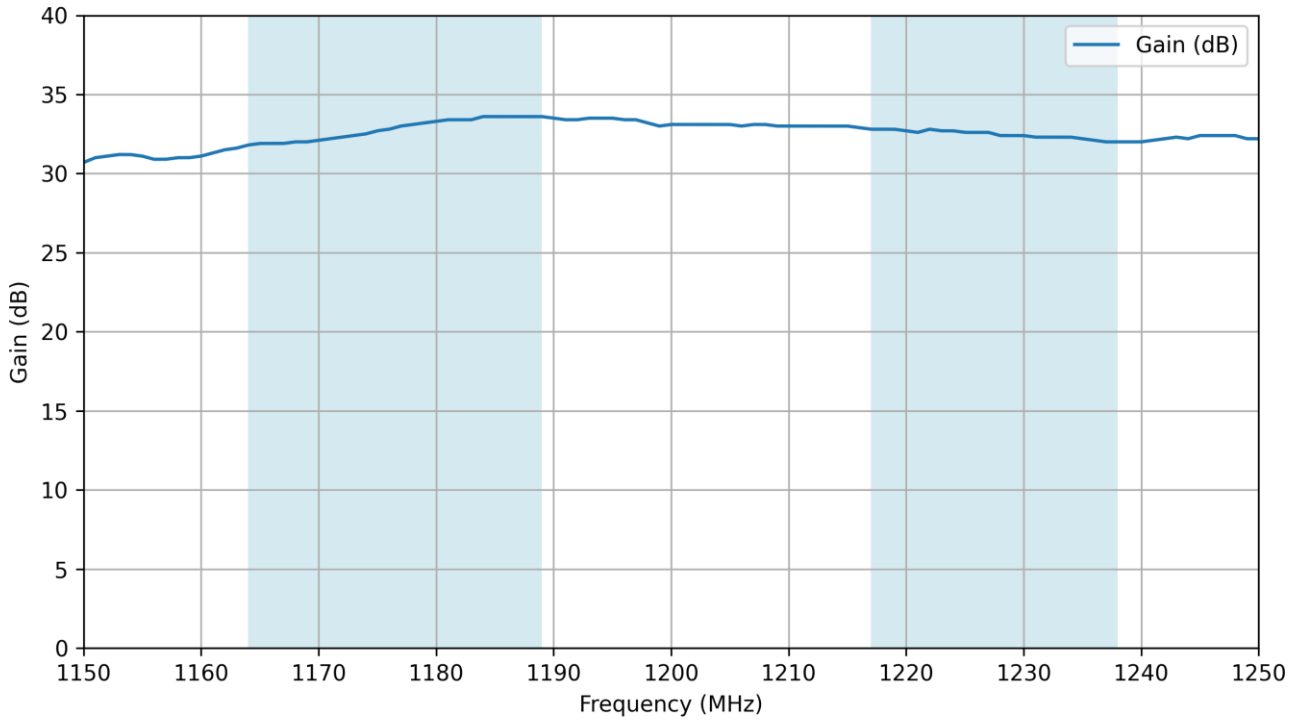
3.12 Noise Figure (Low band)



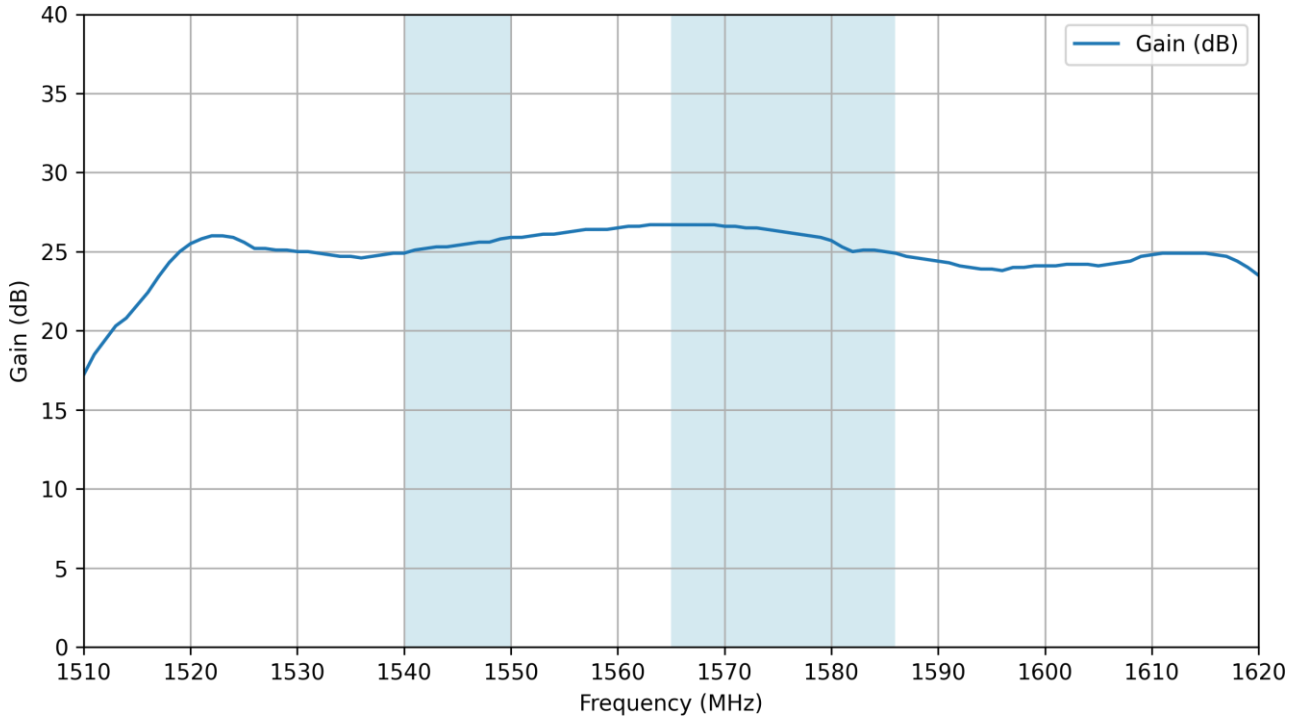
3.13 Noise Figure (High band)



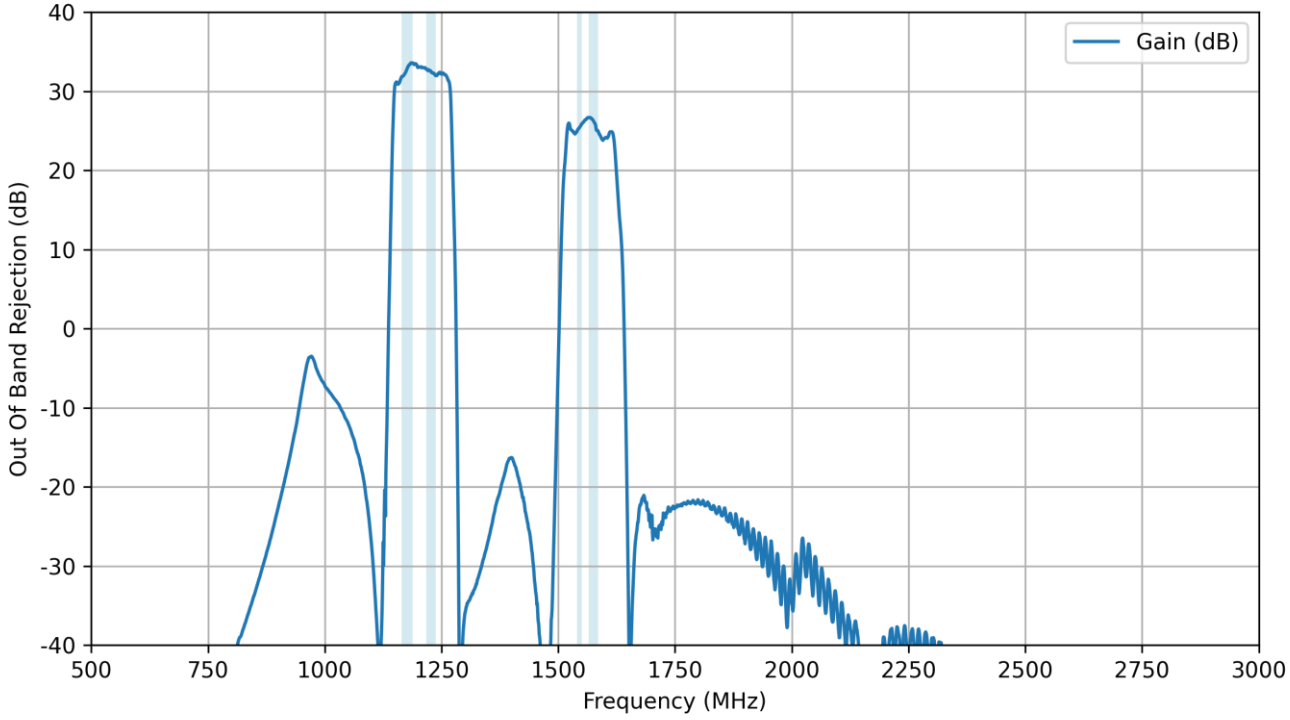
3.14 Gain (Low band)



3.15 Gain (High band)

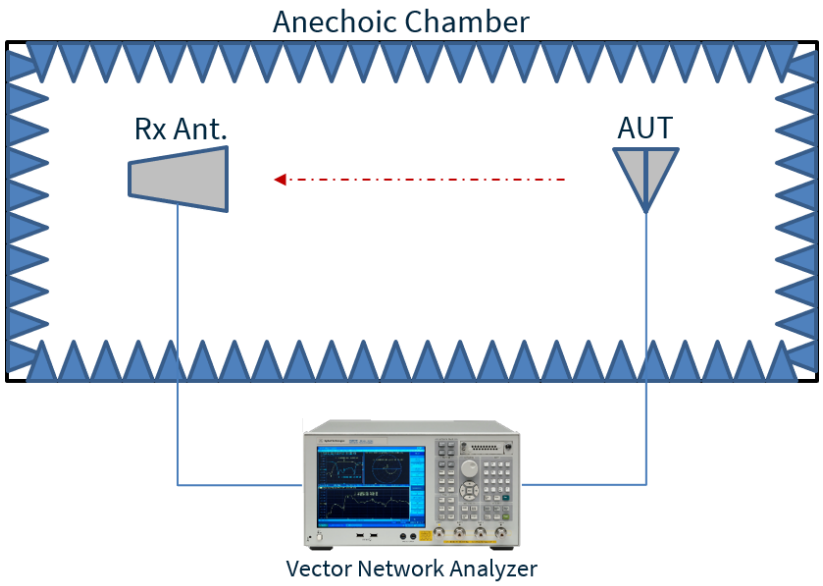


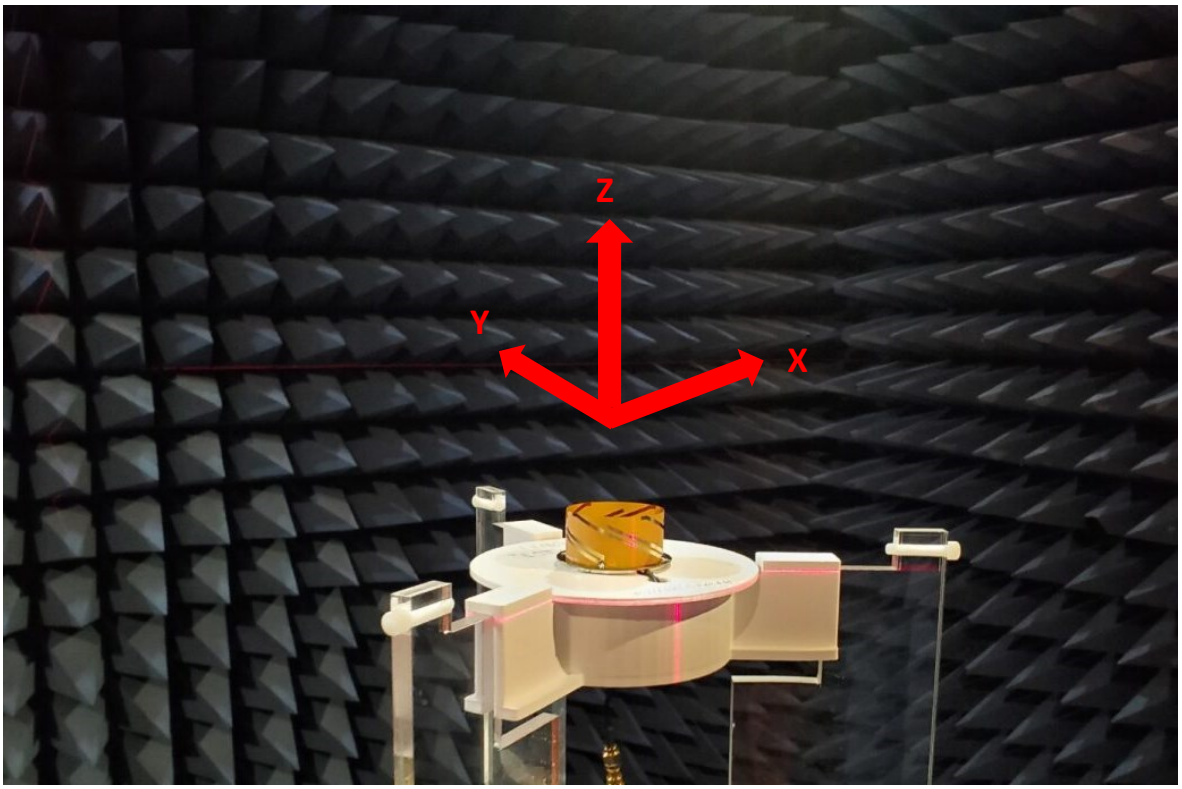
3.16 Out Of Band Rejection



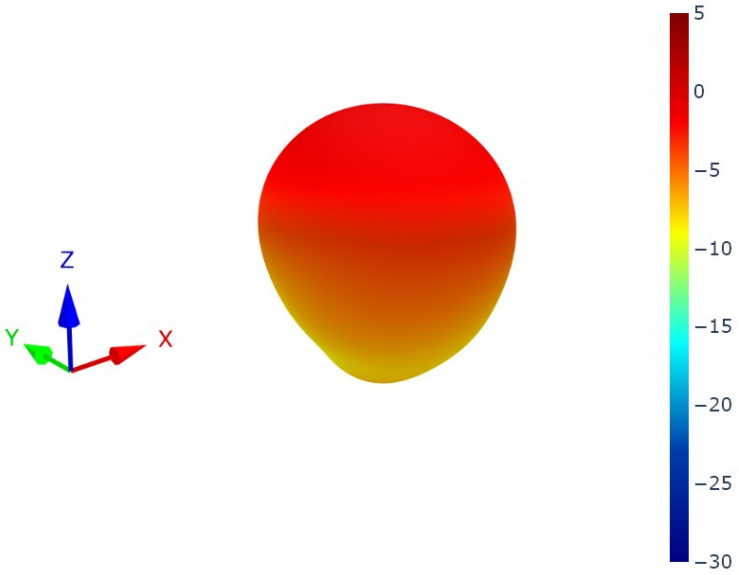
4. Radiation Patterns

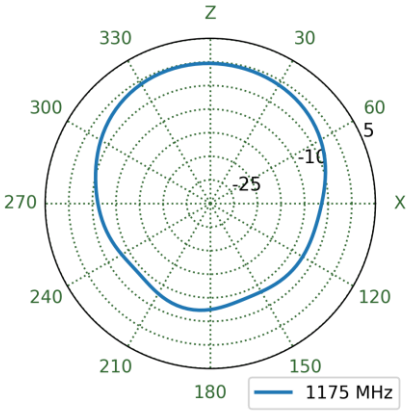
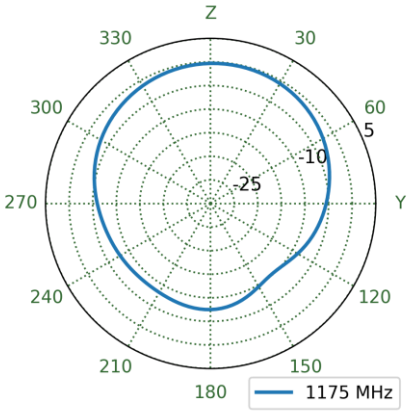
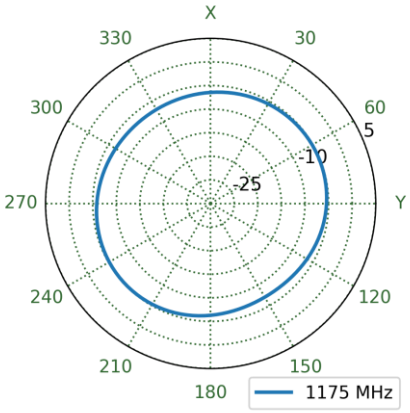
4.1 Test Setup



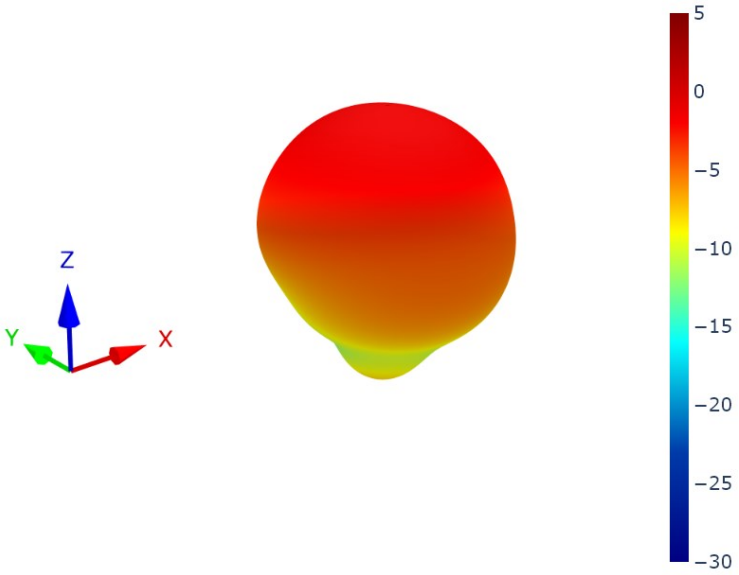


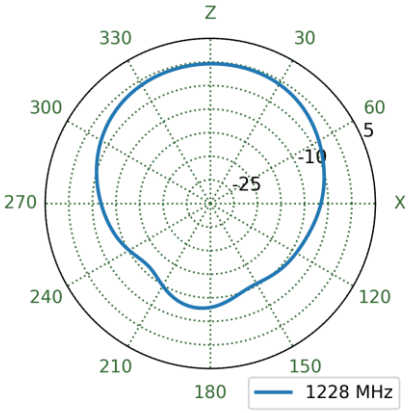
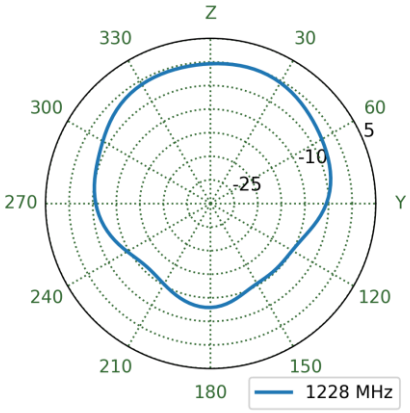
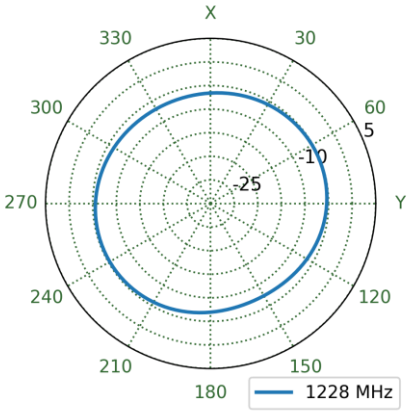
4.2 Patterns at 1176 MHz



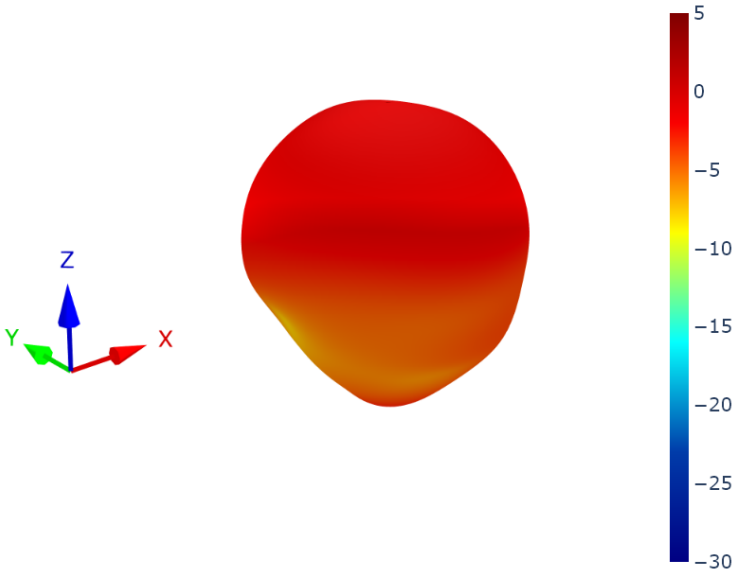
XZ Plane	YZ Plane	XY Plane
		

4.3 Patterns at 1227 MHz

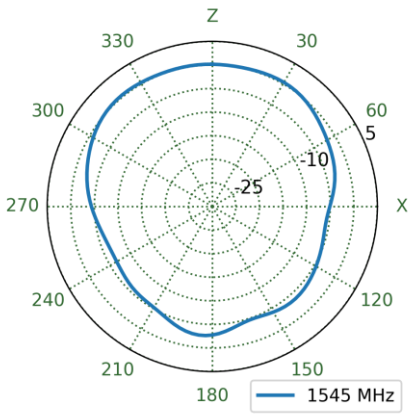


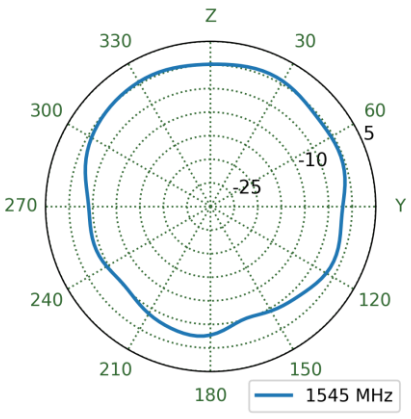
XZ Plane	YZ Plane	XY Plane
		

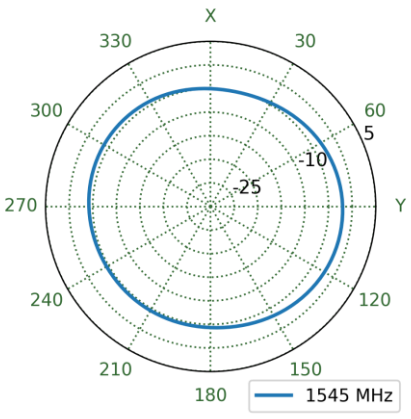
4.4 Patterns at 1545 MHz



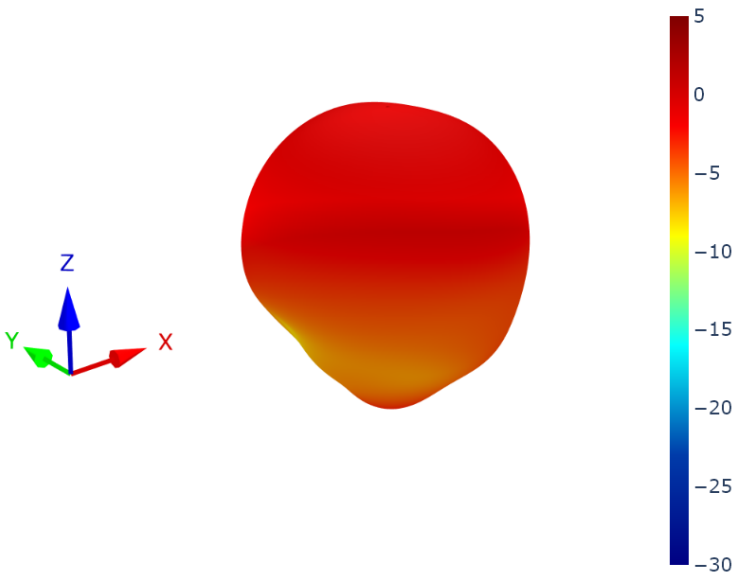
XZ Plane	YZ Plane	XY Plane



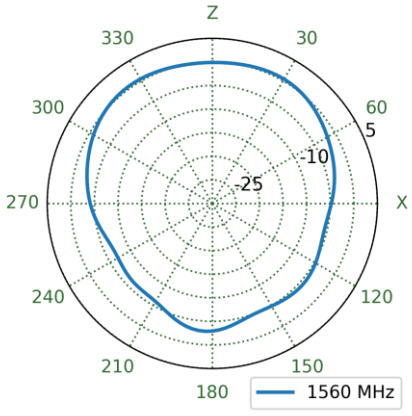


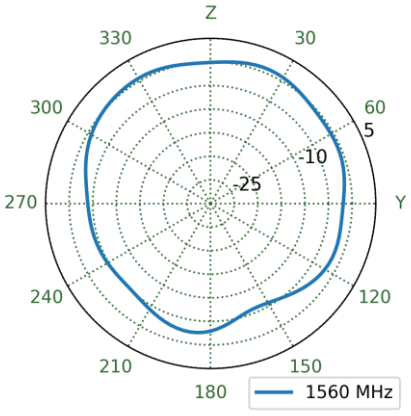


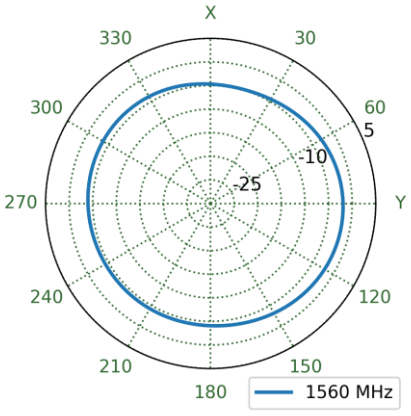
4.5 Patterns at 1561 MHz



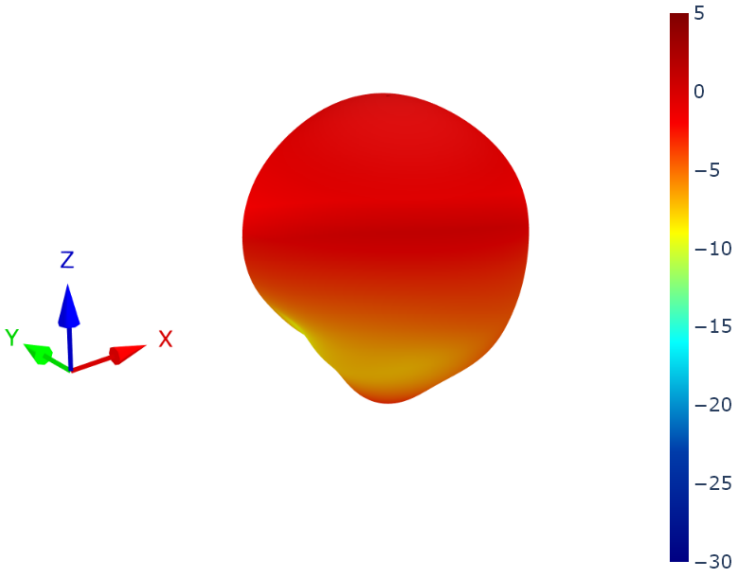
XZ Plane	YZ Plane	XY Plane



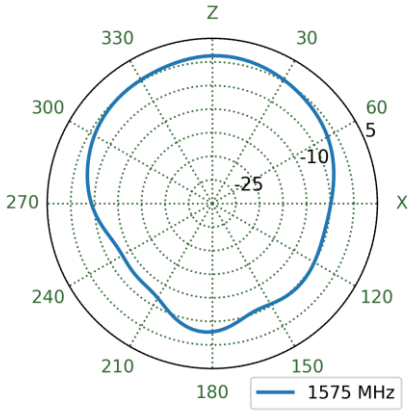


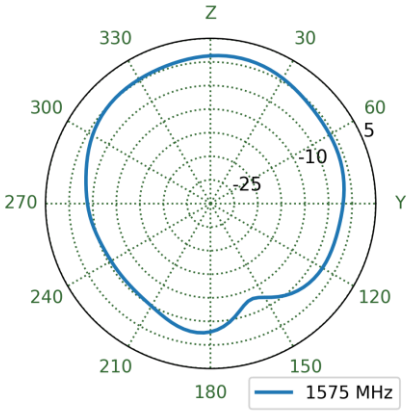


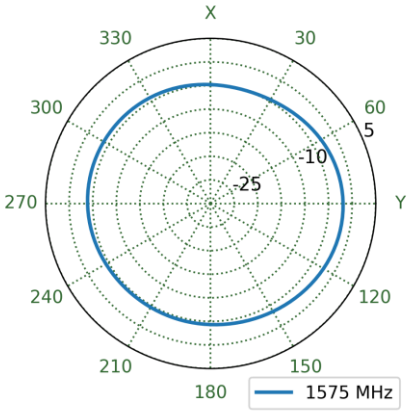
4.6 Patterns at 1575 MHz



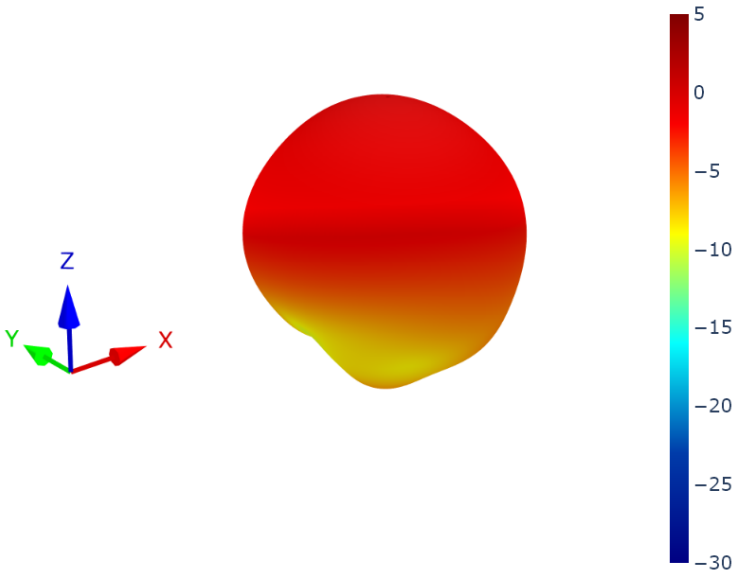
XZ Plane	YZ Plane	XY Plane



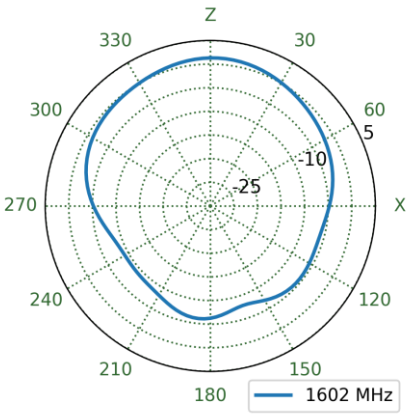


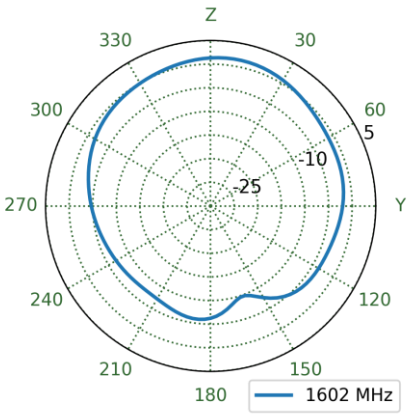


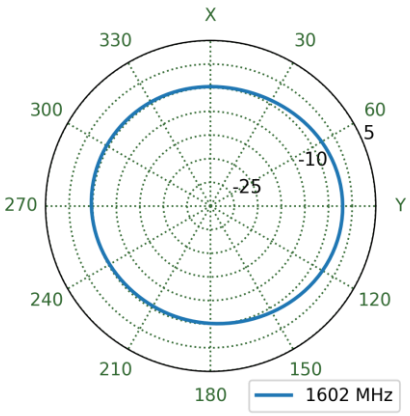
4.7 Patterns at 1602 MHz



XZ Plane	YZ Plane	XY Plane







5. Field Test Results

In this section Taoglas will present the field test result for EAHP.125 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.

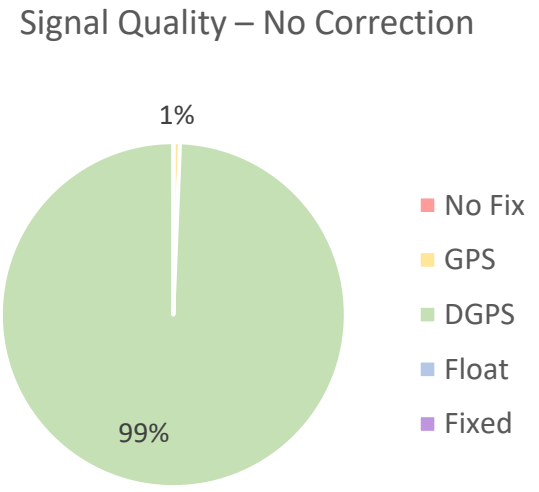
Taoglas will show the field test results using the following receivers:

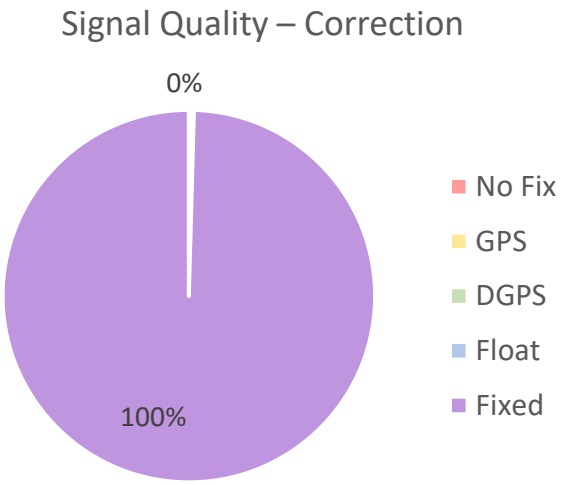
5.1 U-blox ZED-F9P

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 L1S , SBAS L1C/A
- 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%)	TTFF (sec)
Free Space	PPP-RTK DISABLED	37.61 cm	45.52 cm	91.03 cm	29
	PPP-RTK ENABLED	7.13 cm	9.26 cm	18.52 cm	25



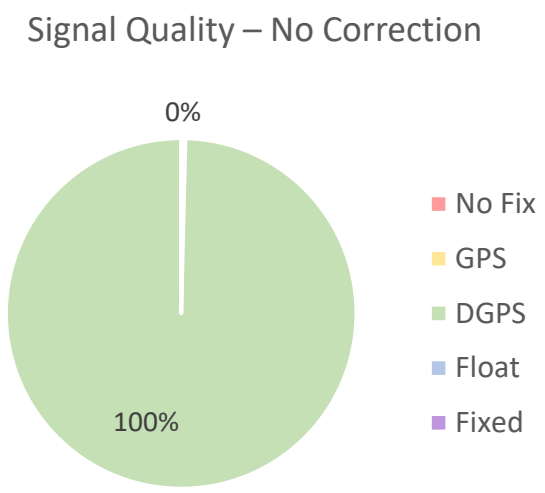


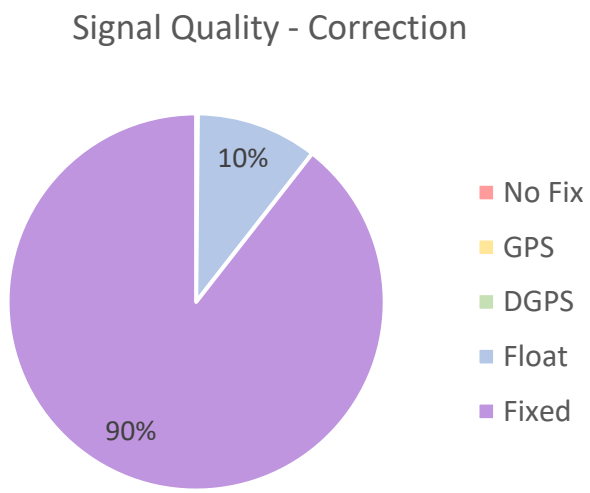
5.2 U-blox NEO-F9P

Receiver features:

- Multi-band GNSS: 184-channel GPS L1C/A L5, GLONASS L1OF, GALILEO E1B/C E5a, BeiDou B1I B2a, QZSS L1C/A L1S L5, SBAS L1C/A
- Nav. update rate: RTK up to 20 Hz
- Position accuracy = 0.01 m + 1 ppm CEP

Positioning Accuracy Table (2D Accuracy)					
Test Condition	**Correction Service**	**CEP (50%)**	**DRMS (68%)**	**2DRMS (95%)**	**TTFF (sec)**
Free Space	PPP-RTK DISABLED	44.84 cm	53.97 cm	107.95 cm	24
	PPP-RTK ENABLED	10.56 cm	12.64 cm	25.28 cm	33



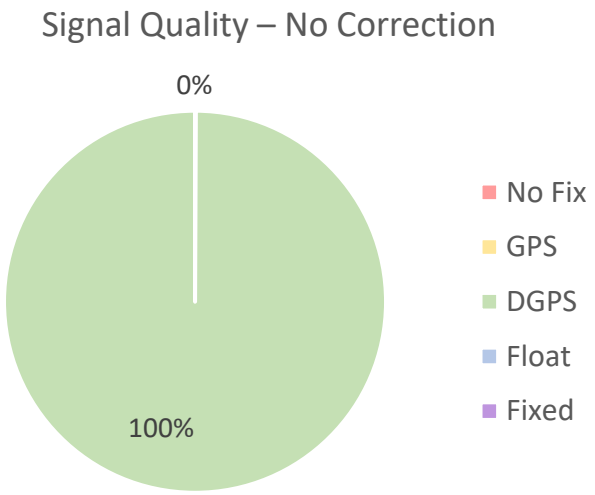


5.3 U-blox C101-D9S + ZED-F9P

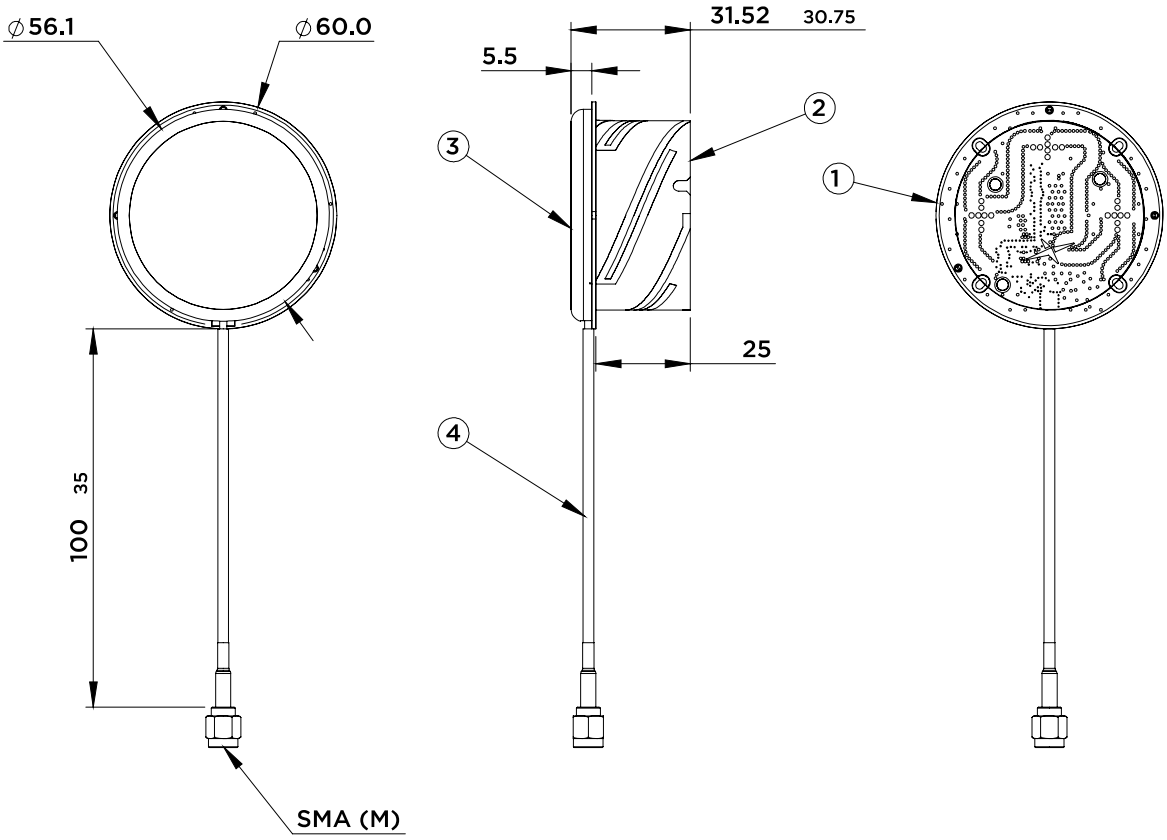
Receiver features:

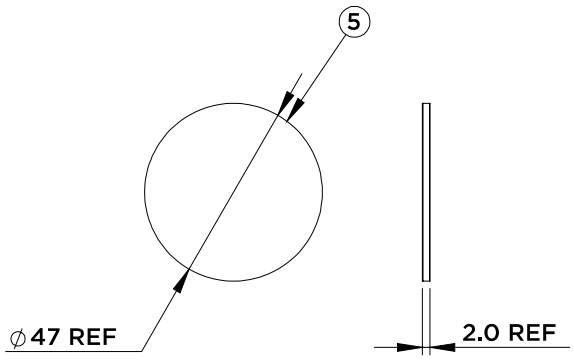
- Multi-band GNSS: 184-channel GPS L1C/A, GLONASS: L1OF, Galileo: E1B/C, BeiDou: B1I, QZSS: L1C/A, SBAS L1C/A + L-Band
- Multi-band RTK with fast convergence times and reliable performance
- Nav. update rate RTK up to 20 Hz
- Position accuracy = RTK 0.01 m + 1 ppm CEP

Positioning Accuracy Table (2D Accuracy)					
Test Condition	**Correction Service**	**CEP (50%)**	**DRMS (68%)**	**2DRMS (95%)**	**TTFF (sec)**
Free Space	L-Band Corrections	25.63cm	33.11cm	66.21cm	16



6. Mechanical Drawing



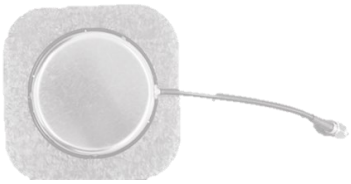


DOUBLE ADHESIVE FOAM
SUPPLIED UNASSEMBLED

FN	DESCRIPTION	MATERIAL	FINISH	QTY.
1	PCB Assy, EAHP.125	FR-4	NA	1
2	EAHP.125 Flex Antenna	POLYIMIDE	NA	1
3	Shield ADFGP	SPTE	EPT	1
4	Cable Assy, RG-174, 100 mm Lg, SMA(M)	NA	NA	1
5	Double Adhesive Foam	3M 9448HK	NA	1

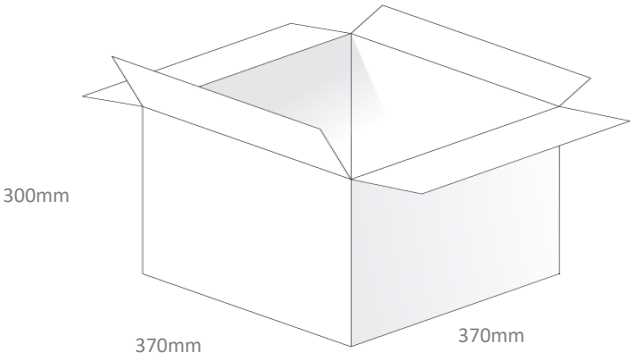
7. Packaging

1pc EAHP.125.01.0100D per Anti-static EPE foam



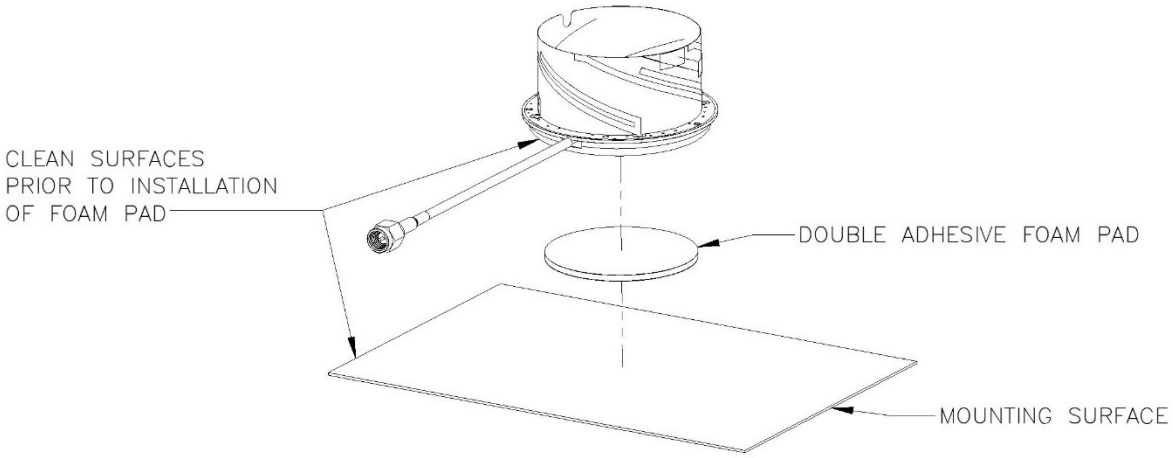
1pcs EAHP.125.01.0100D per Vacuum Package
1pcs 3M Double Foam
Weight – 45g

14pcs EAHP.125.01.0100D per Carton
Carton Dimensions: 370x370x300mm
Weight – 0.65Kg



8. Installation Guidelines

ANTENNA INSTALLATION PROCESS



Changelog for the datasheet

SPE-24-8-001 - EAHP.125.01.0100D

Revision: B (Current Version)	
Date:	2024-09-11
Notes:	Field Test Results Added.
Author:	Gary West

Previous Revisions

Revision: A (Original First Release)	
Date:	2024-01-02
Notes:	Initial release.
Author:	Gary West

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