TAOGLAS

Datasheet

Levity Series

Part No:
HP24510A

Description

Passive High Precision GNSS L1/L2 Stacked Patch Ceramic Antenna

Features:

Bands Covered:
- BeiDou (B1/B2b)
- GPS/QZSS (L1/L2)
- GLONASS (G1/G2/G3)
- Galileo (E1/E5b)
- L Band Corrections

Dual pin, dual feed, 4-pin configuration
Dimensions: 45 x 45 x 10mm
RoHS & Reach Compliant

SPE-22-8-183-D

Ireland & USA ISO 9001:2015 Certified

Taiwan ISO 9001:2015 Certified

IATF16949

1. Introduction

The Taoglas Levity Series HP24510A is a high performance, multi-band passive GNSS antenna that has been carefully designed to provide fantastic positional accuracy on the L1/L2 GNSS spectrum. It covers GPS/QZSS L1/L2, GLONASS G1/G2/G3, Galileo E1/E5b, BeiDou B1/B2b, as well as SBAS (WAAS/EGNOS/GAGAN/SDCM/SNAS) as well as the L Band at 1525MHz.

Correct implementation of the HP24510A allows the user to achieve higher location accuracy, as well as stability of position tracking in urban environments. The stacked patch construction has excellent performance across the full bandwidth of the antenna.

Its design has an even gain across the hemisphere, giving excellent axial ratio, which in turn makes it extremely resilient to multipath rejection and provides excellent phase centre stability to ensure a location is correctly established in a navigation system.

Typical applications that benefit from high precision capabilities include:

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

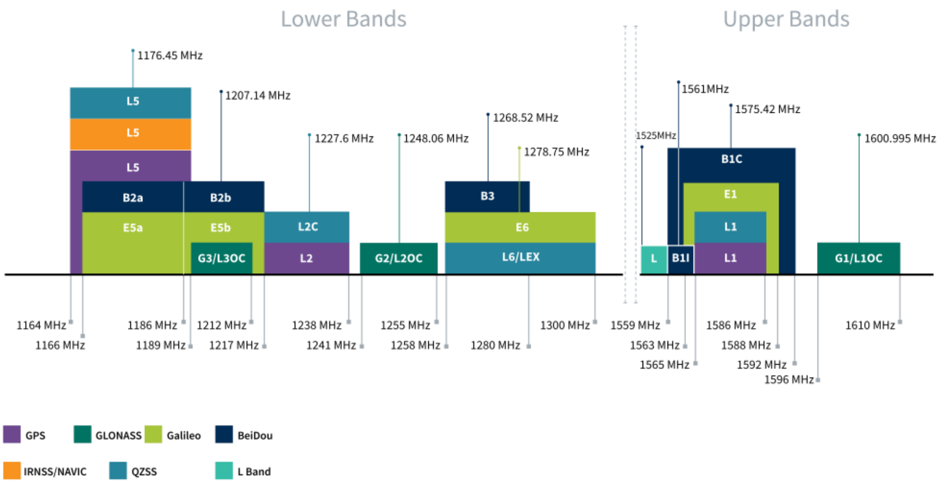
The HP24510A is the latest embedded addition to Taoglas' product portfolio of high precision GNSS antennas. When used on the base and/or the rover as part of an RTK configuration, the HP24510A can achieve genuine cm-level accuracy with proven results.

Full integration guidelines are contained in Section 7 of this datasheet including the Taoglas HC125.A hybrid coupler that will be required for use for dual pin feed patch integrations.

Contact your regional Taoglas Customer Services team for more information on any of the products listed above or for support regarding integration.

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)	**1207**	**1227.6**	**1248**	**1525-1559**	**1561**	**1575.42**	**1603**
VSWR (max.)	1:1	1:1	1:1	1:1	1:1	1:1	1:1
Passive Antenna Efficiency (%)	39.93	61.54	45.47	55.72	68.52	69.41	61.1
Passive Antenna Gain at Zenith (dBic)	1.23	3.48	2.95	4.01	4.21	4.43	4.27
Axial Ratio (dB)	1.84	0.54	1.31	0.5	0.7	0.84	0.95
PCO (cm)	3.4	3.4	3.0	1.9	1.9	2.0	2.2
PCV (cm)	0.6	0.6	0.6	0.3	0.2	0.2	0.2
Group Delay Mean (ns)	11.58	12.94	13.58	10.29	10.98	11.01	11.11
Group Delay Variation (ns)	3	6	3	0	1	2	0
Polarization	RHCP						
Radiation Pattern	Directional						
Impedance	50 Ω						

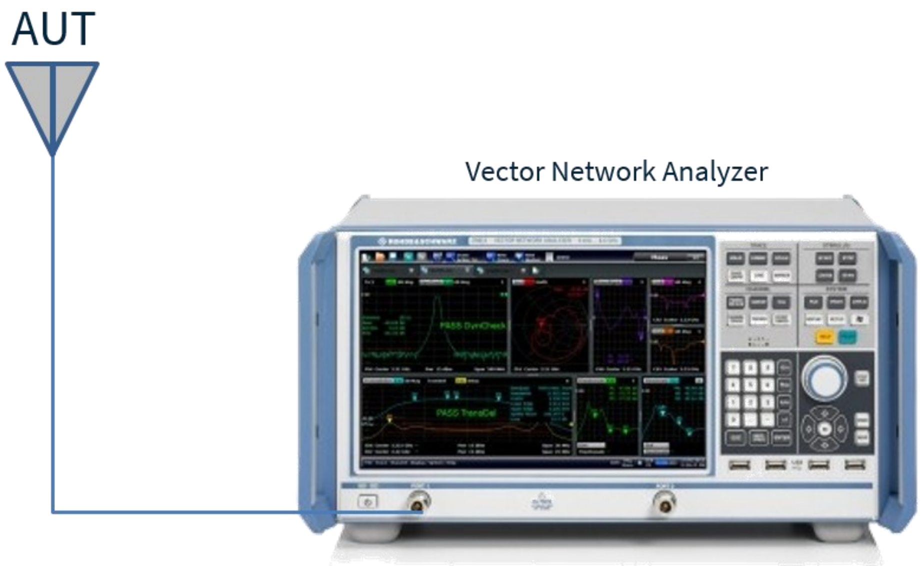
*Tested on a 70x70mm Evaluation Board.

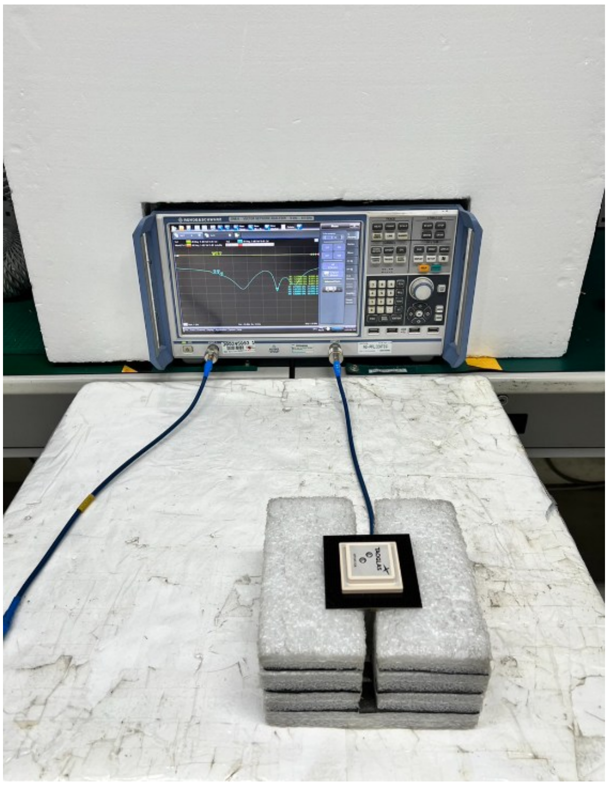
Mechanical	
Dimensions	45x45x10mm
Total Dimension (Including Shielding Case)	60x60mm
Material	Ceramic
Weight	70g

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

3. Antenna Characteristics

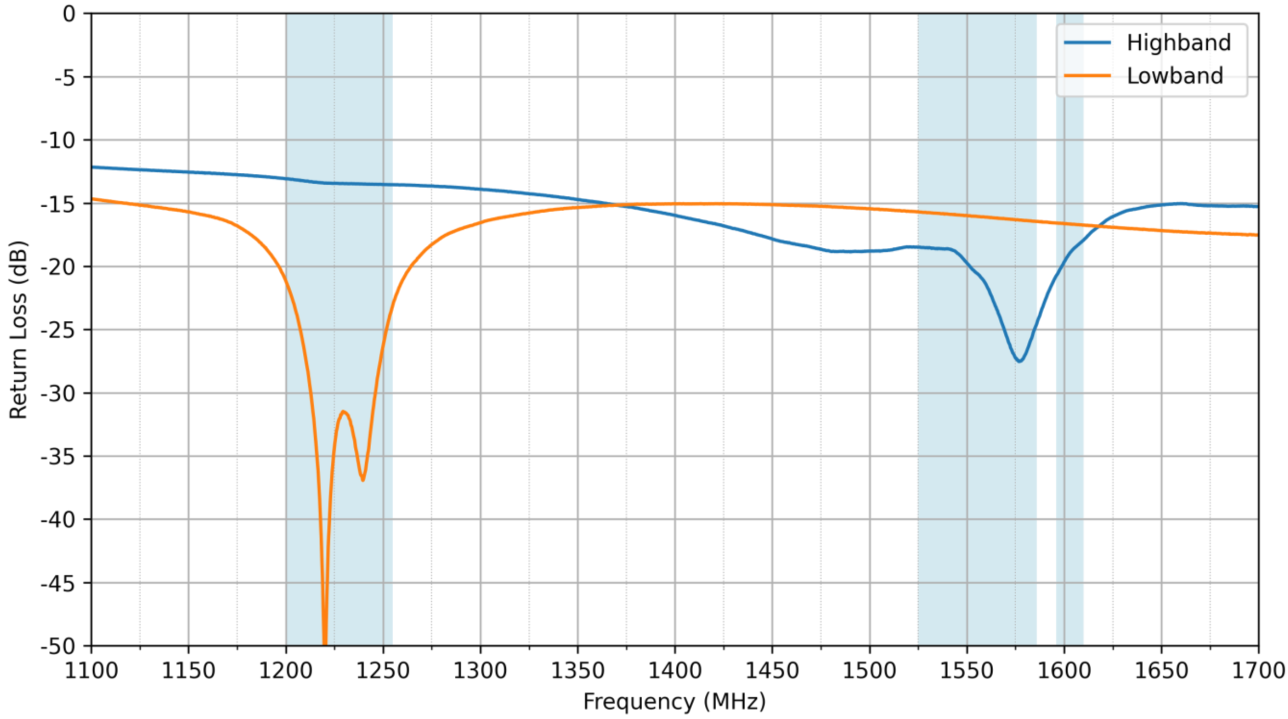
3.1 Test Setup



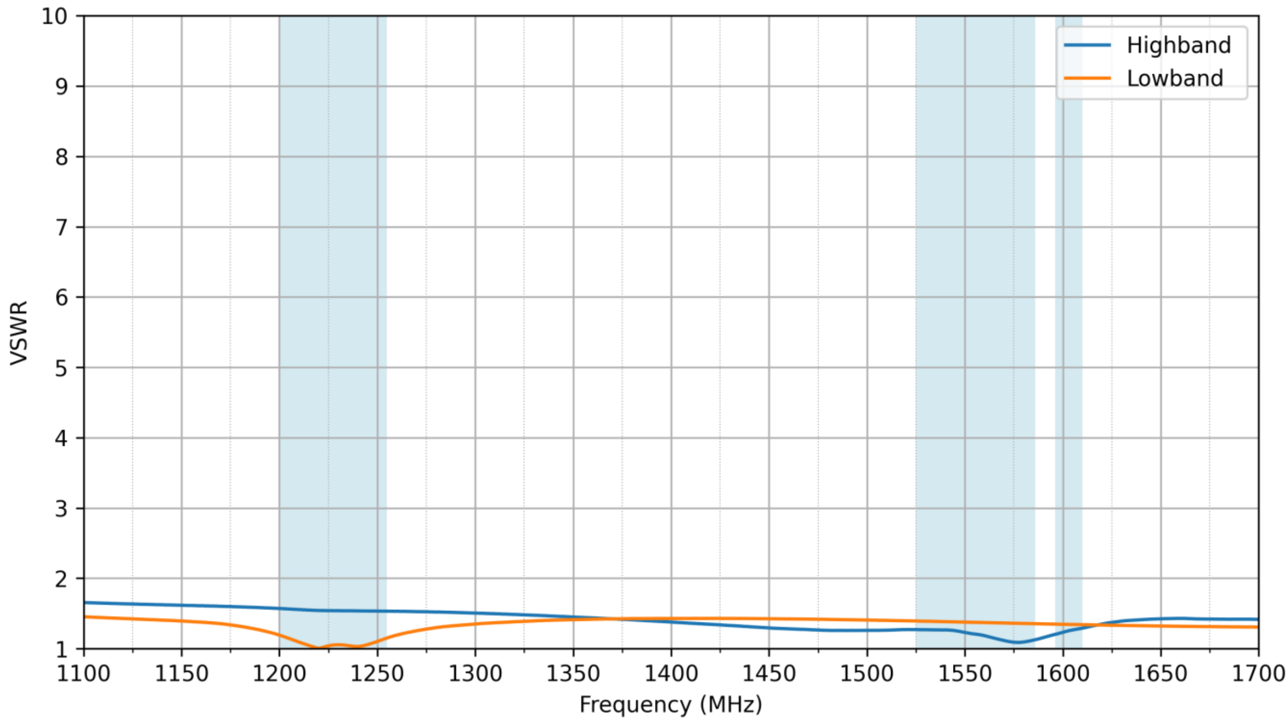


VNA Test Setup – Tested on 70x70mm Evaluation Board.

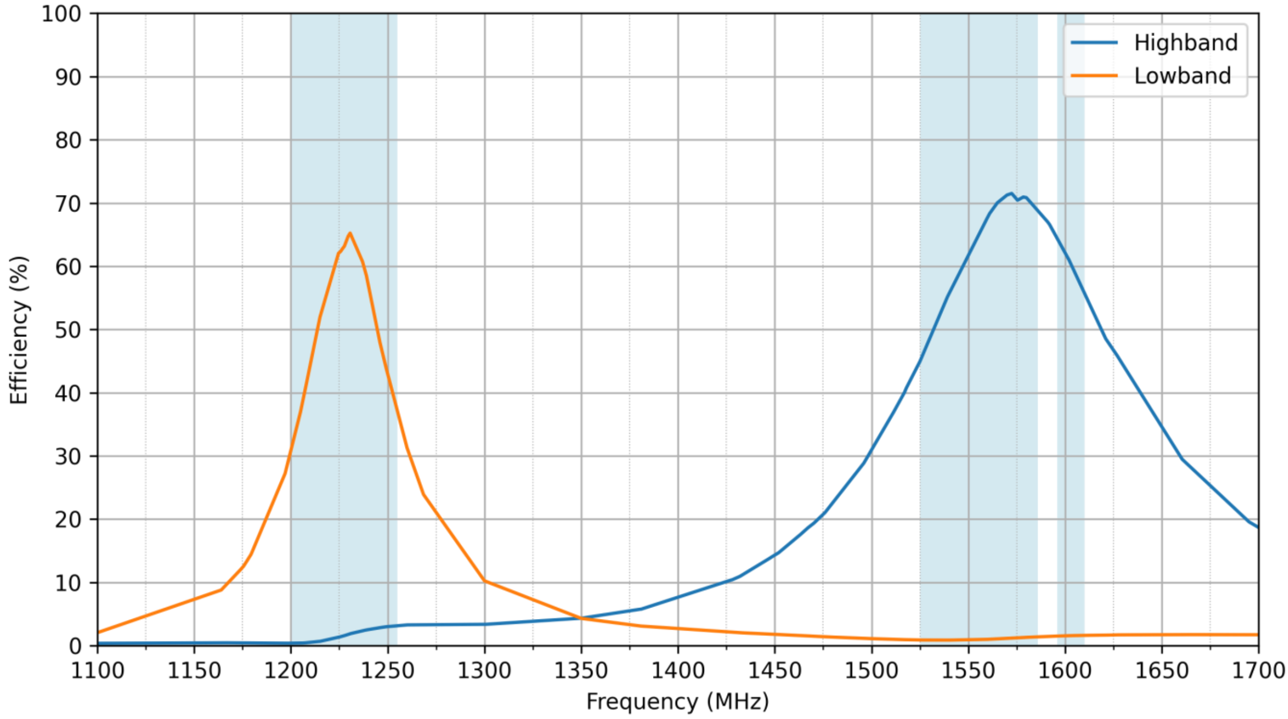
3.2 Return Loss



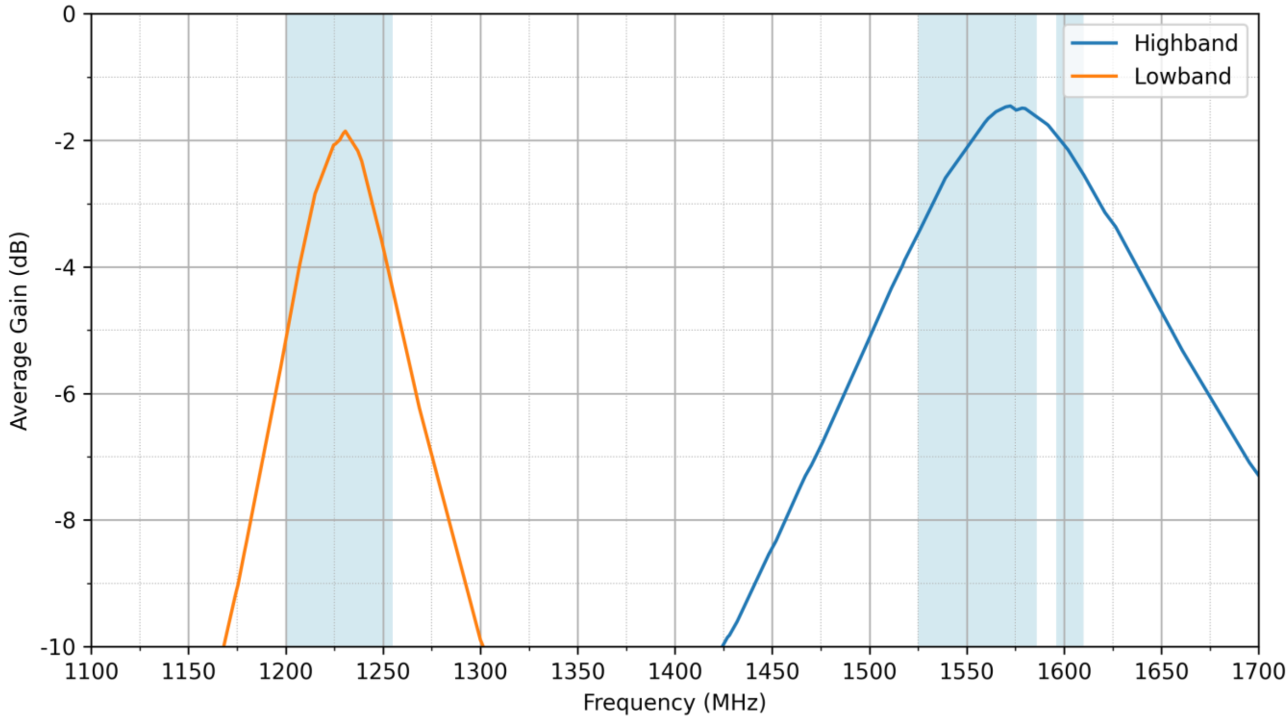
3.3 VSWR



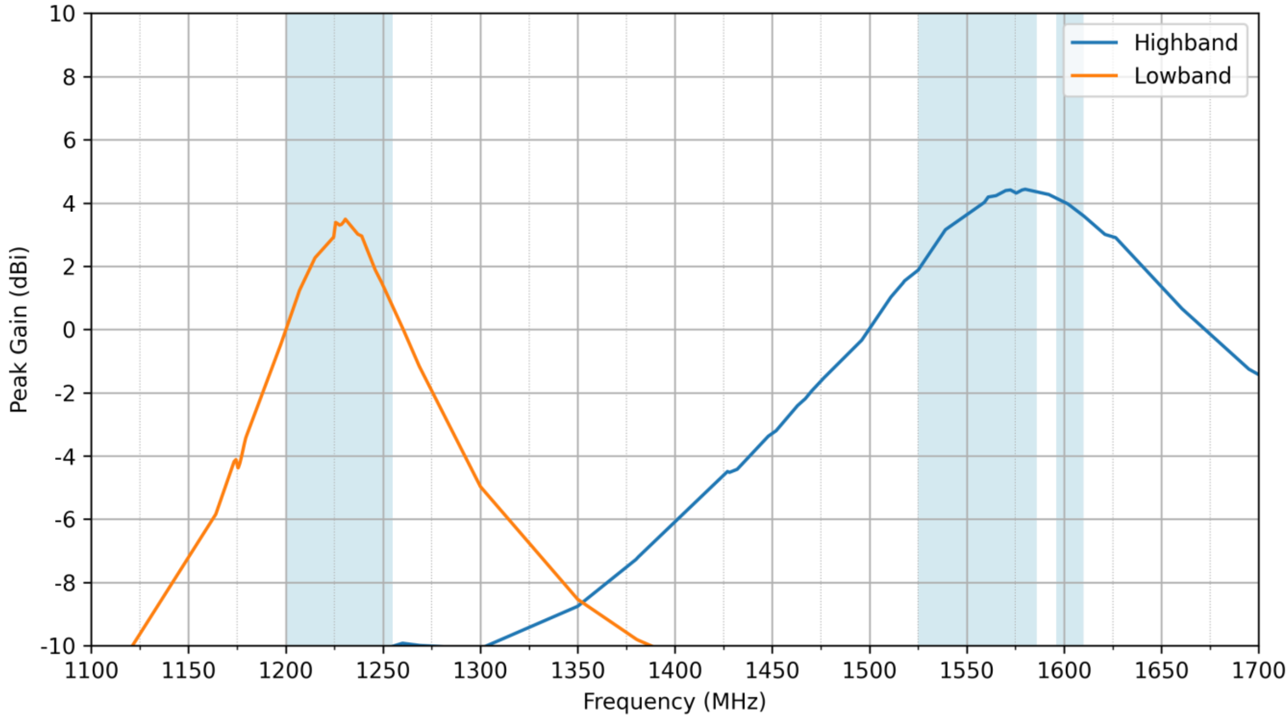
3.4 Efficiency



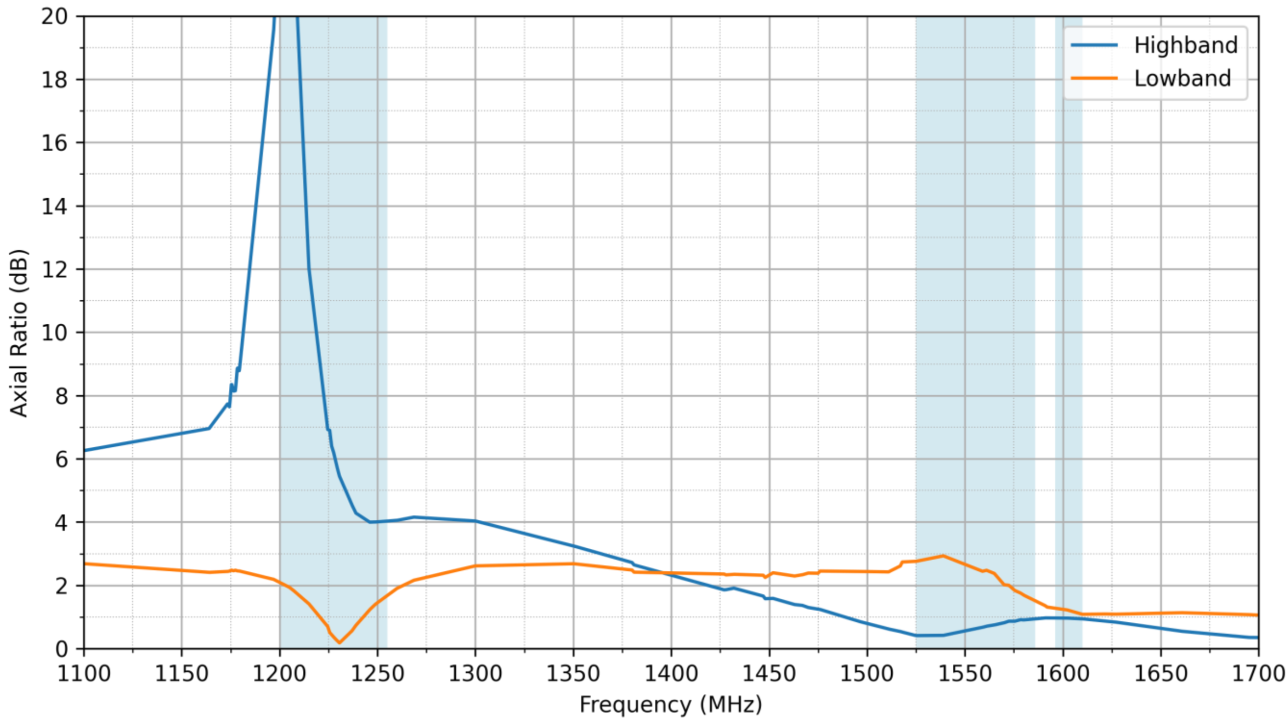
3.5 Average Gain



3.6 Peak Gain

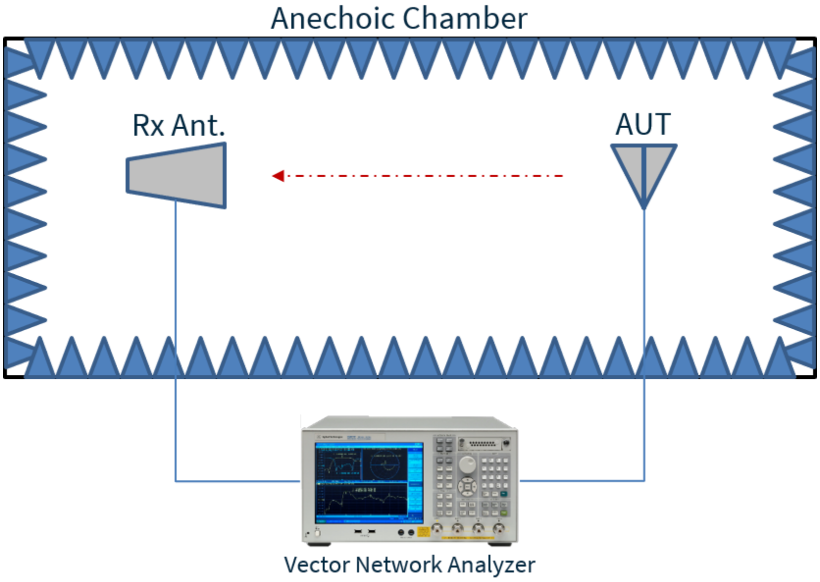


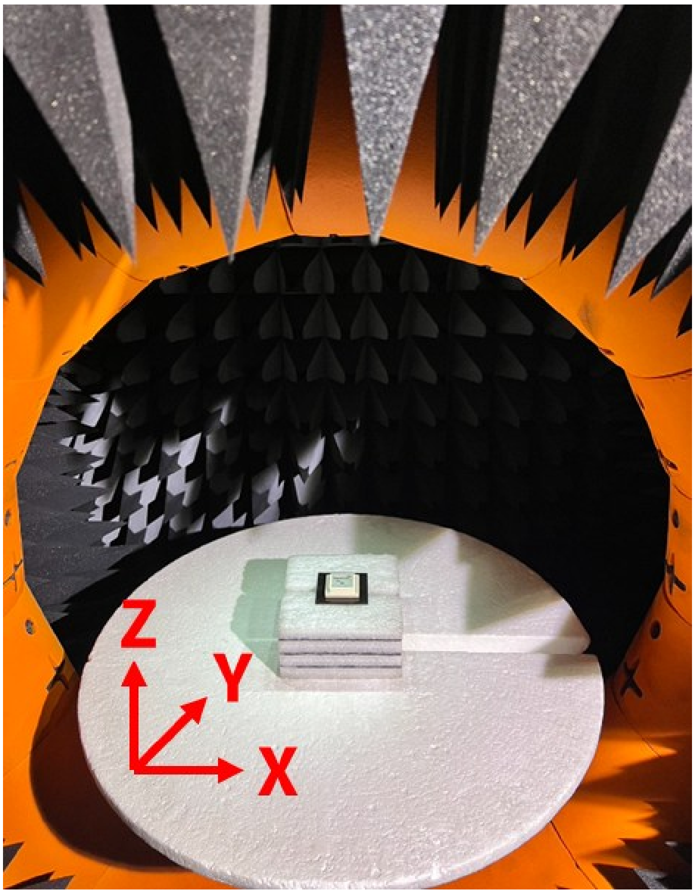
3.7 Axial Ratio



4. Radiation Patterns

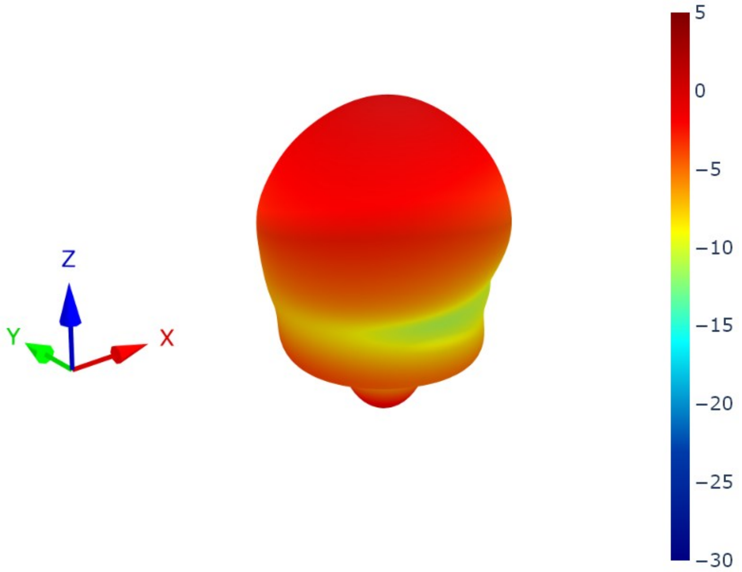
4.1 Test Setup



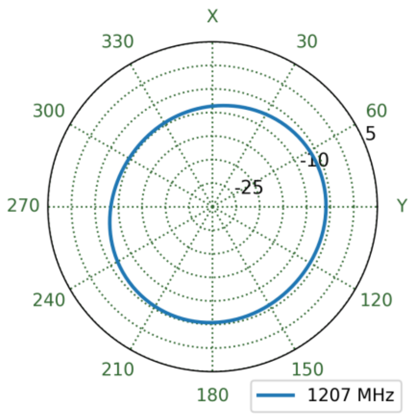


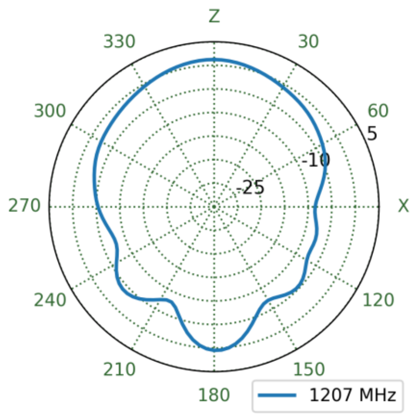
Chamber Test Setup – Tested on 70x70mm Evaluation Board.

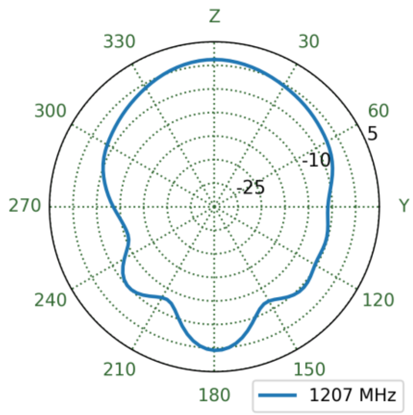
4.2 Patterns at 1207 MHz



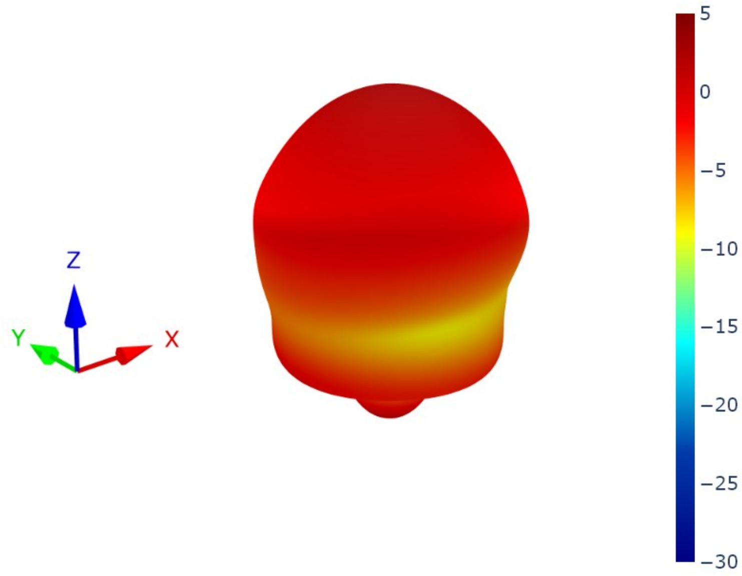
XY Plane	XZ Plane	YZ Plane

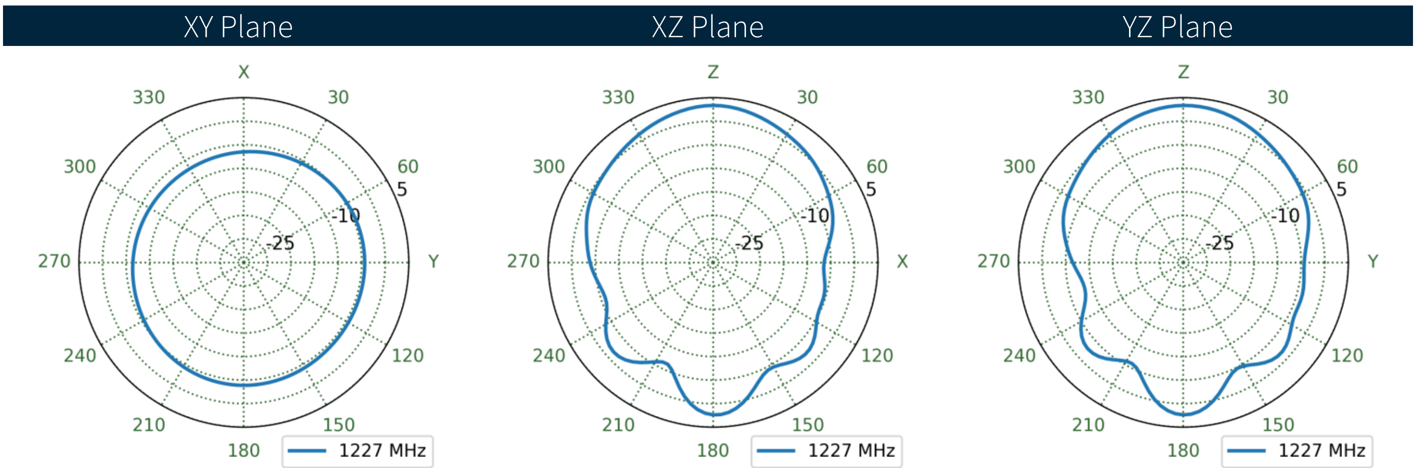




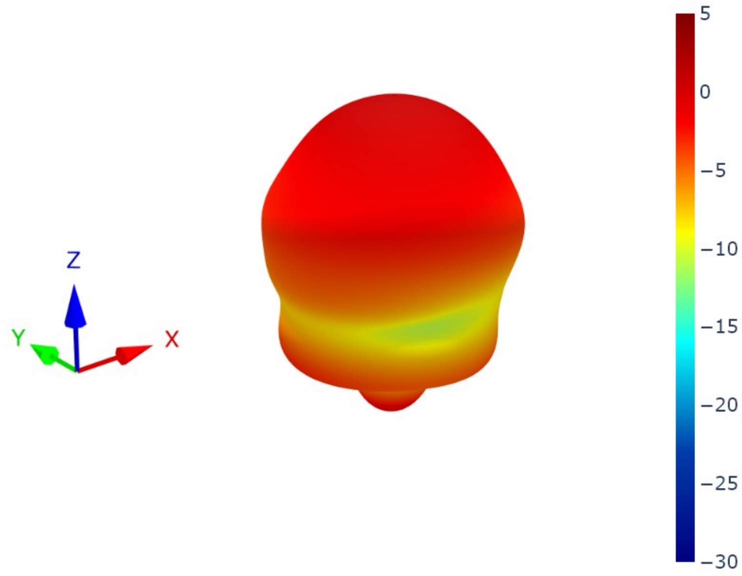


4.3 Patterns at 1227 MHz

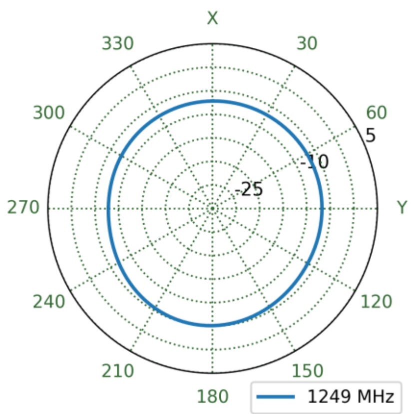


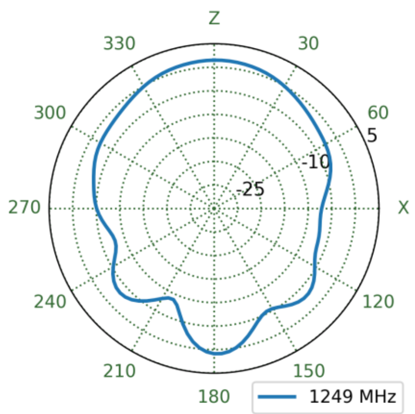


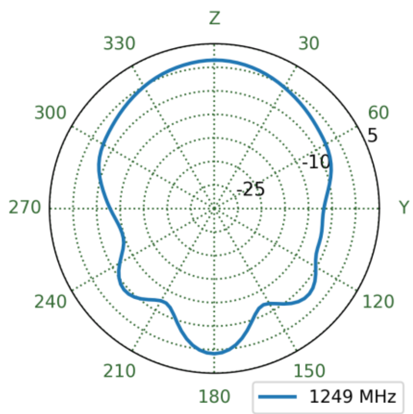
4.4 Patterns at 1249 MHz



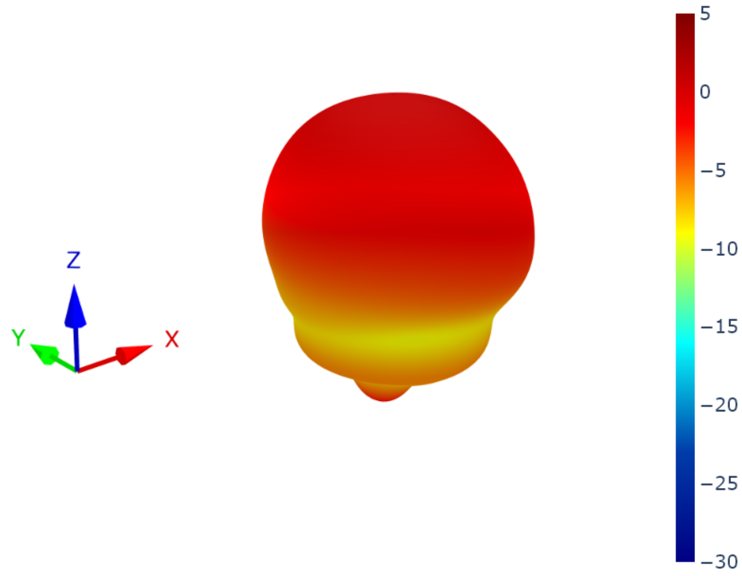
XY Plane	XZ Plane	YZ Plane



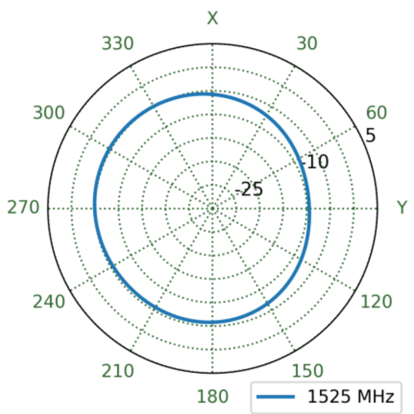


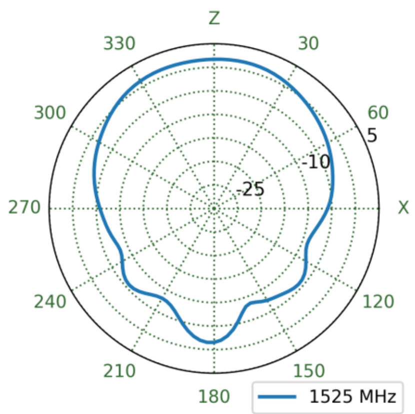


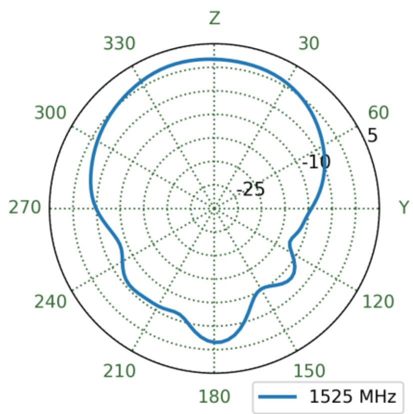
4.5 Patterns at 1525 MHz



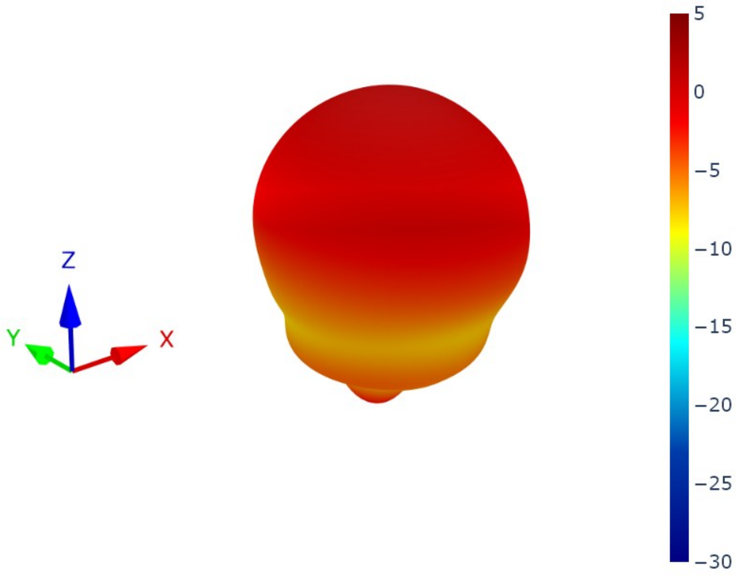
XY Plane	XZ Plane	YZ Plane

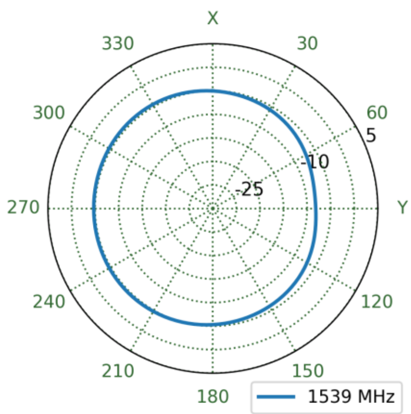
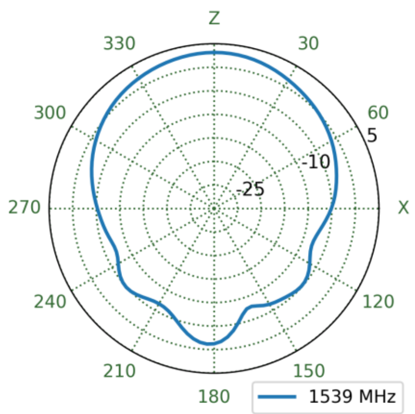
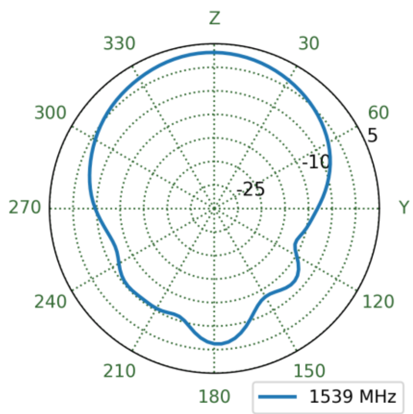




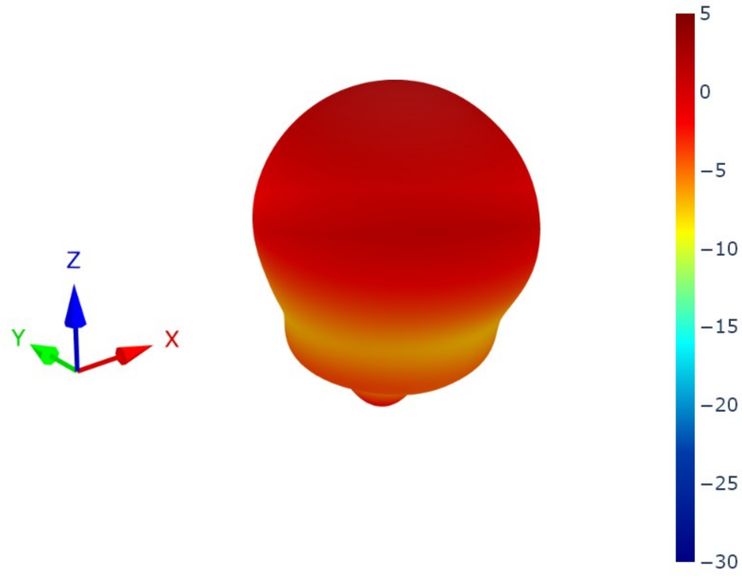


4.6 Patterns at 1539 MHz

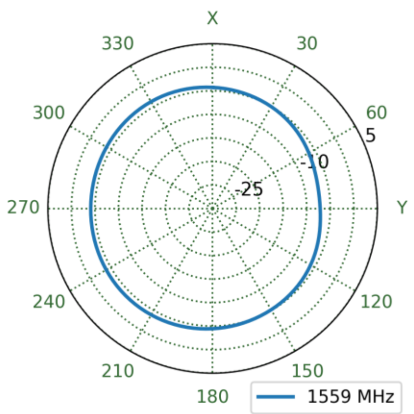


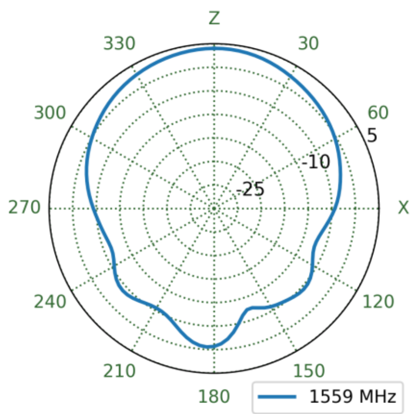
XY Plane	XZ Plane	YZ Plane
		

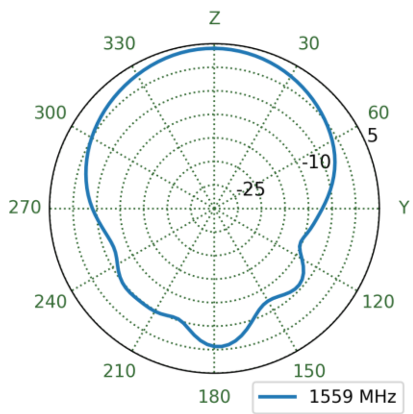
4.7 Patterns at 1559 MHz



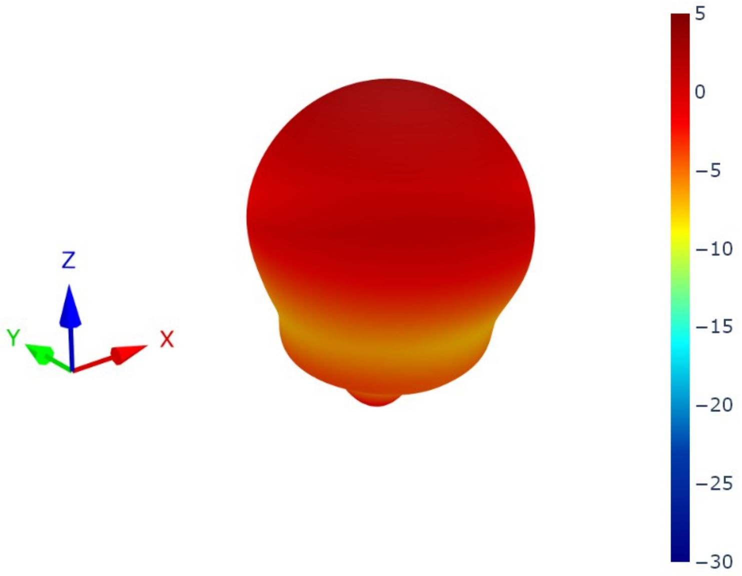
XY Plane	XZ Plane	YZ Plane



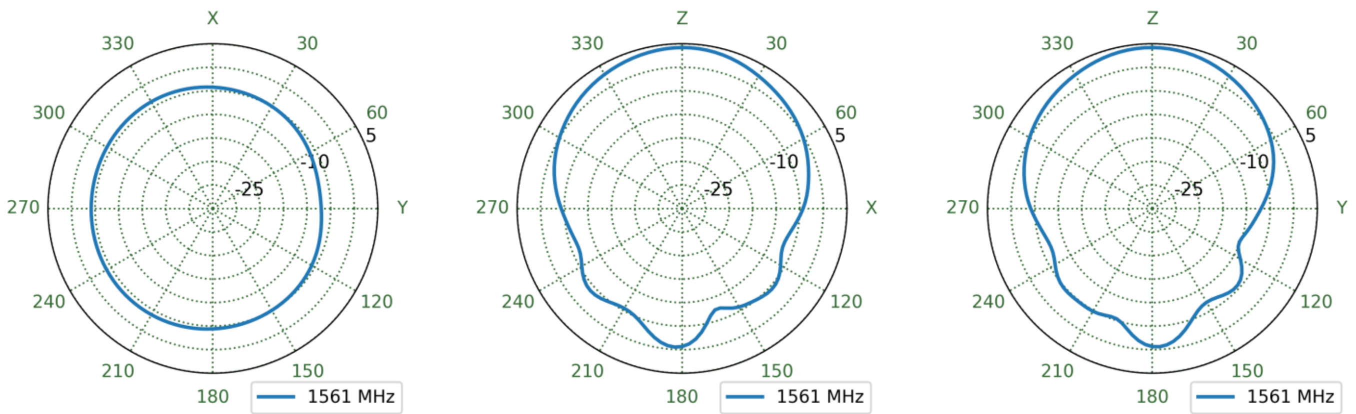




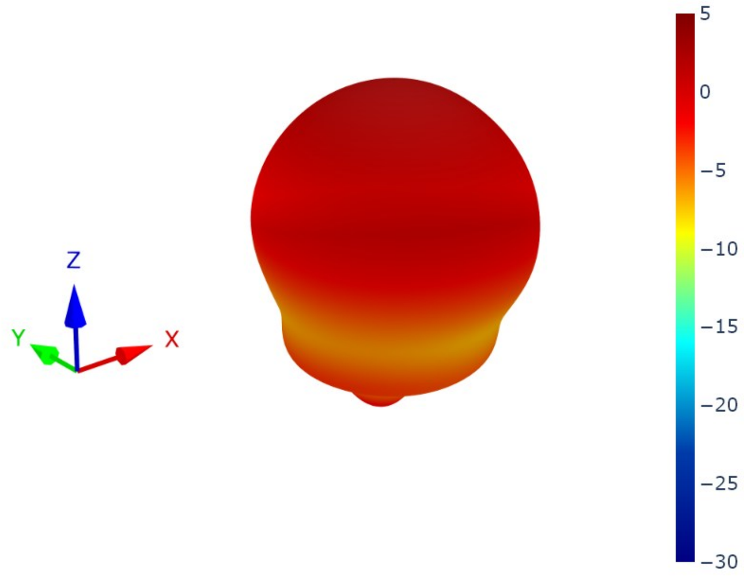
4.8 Patterns at 1561 MHz



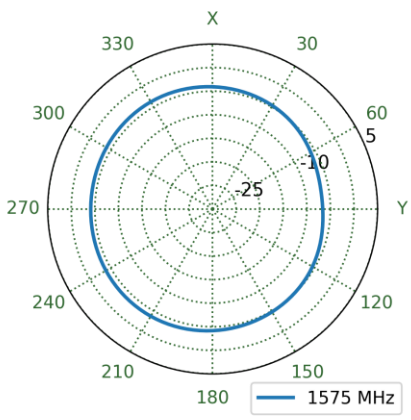
XY Plane	XZ Plane	YZ Plane

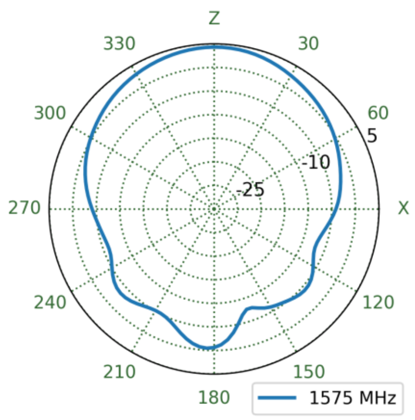


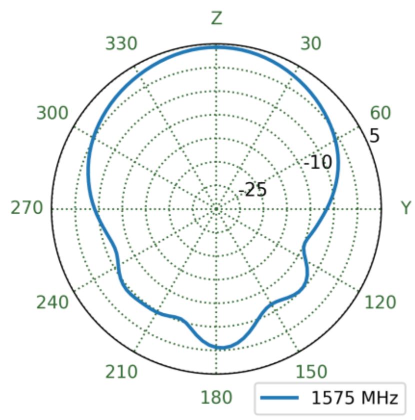
4.9 Patterns at 1575 MHz



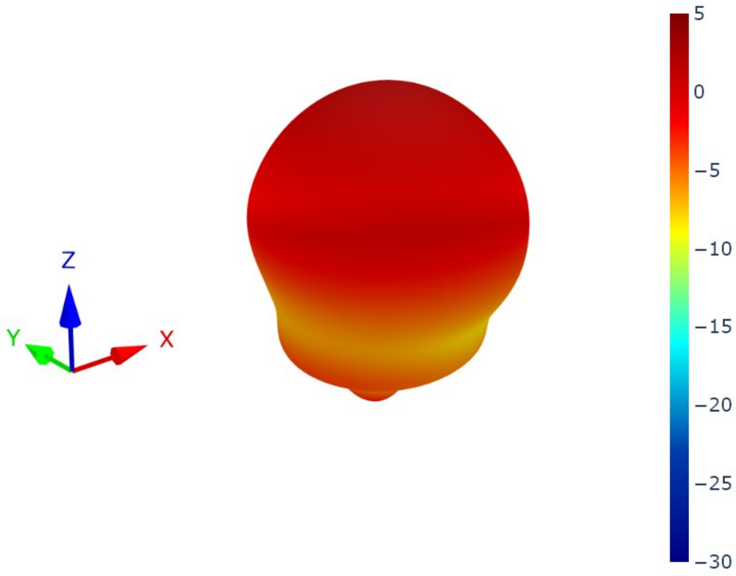
XY Plane	XZ Plane	YZ Plane



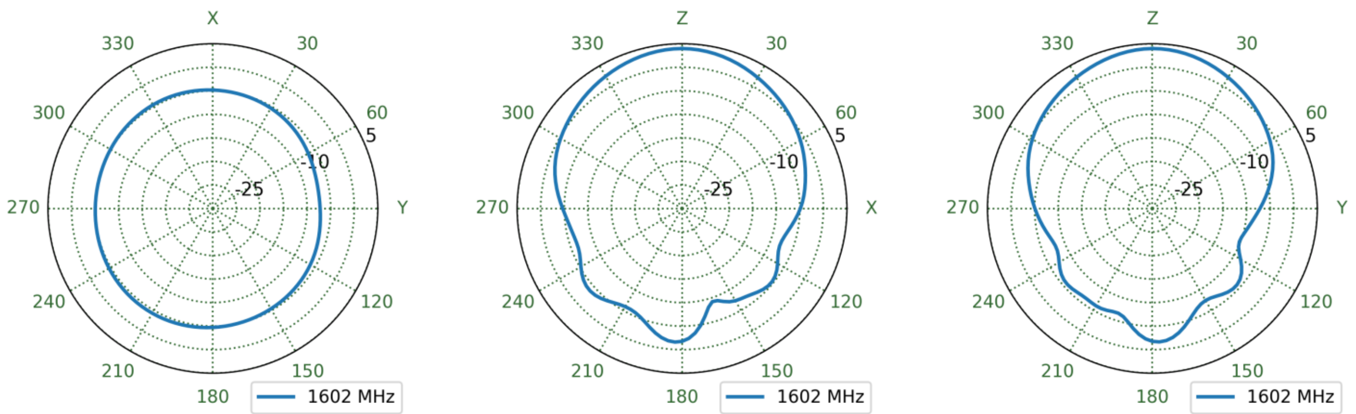




4.10 Patterns at 1602 MHz



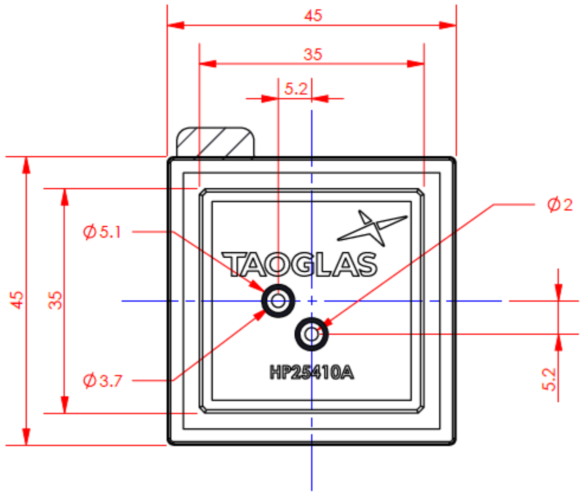
XY Plane	XZ Plane	YZ Plane



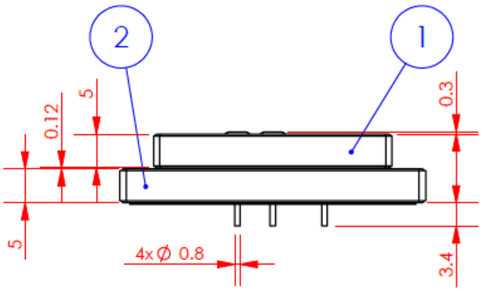
5. Mechanical Drawing

RELEASE

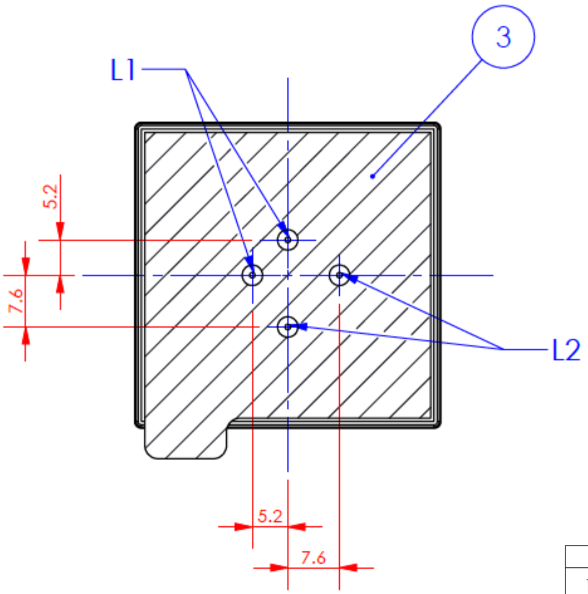
1.ALL MATERIAL MUST BE ROHS COMPLIANT.
2.USE THIS DRAWING TOGETHER WITH THE CORRESPONDING 3D CAD DATABASE FILE TO FULLY DESCRIBE THE PART.
3.THE CONNECTOR ORIENTATION HAS A FIXED POSITION TO THE ANTENNA AS PER DRAWING.
4."*" CRITICAL DIMENSIONS.
5. DOUBLE SIDED ADHESIVE:



TOP VIEW



FRONT VIEW

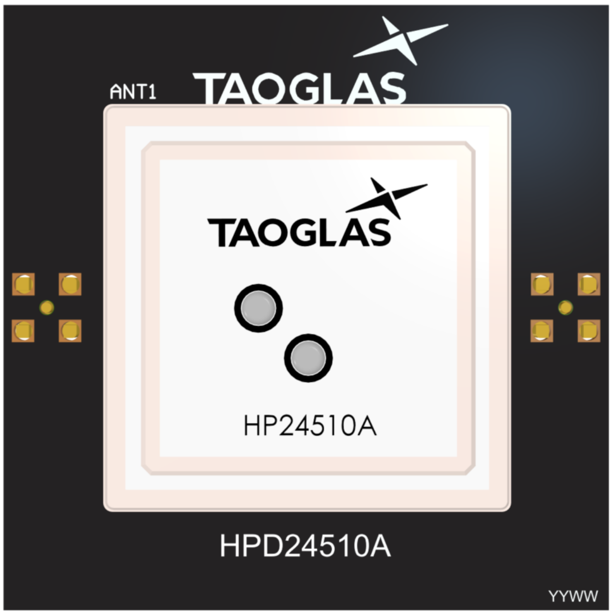


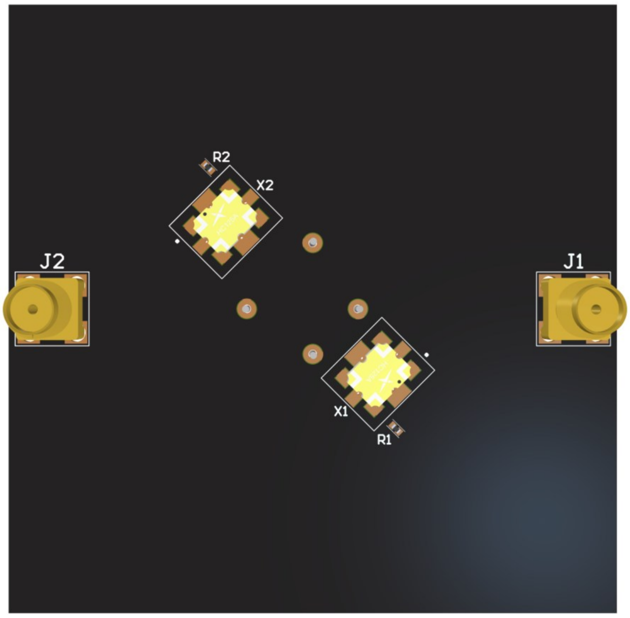
BOTTOM VIEW

	Name	Material	QTY
1	Top Patch (35x35x5mm)	Ceramic	1
2	Bottom Patch (45x45x5mm)	Ceramic	1
3	Double Sided Adhesive	NITTO 5015	1

6. Antenna Integration Guide

The following is an example on how to integrate the HP24510A into a design. This antenna has four pins, two pins are used for the L1 band, and two pins are used for the L2 band. Hybrid couplers (HC125A) are used to combine the feeds for each of the bands, to create a Right Hand Circular Polarized (RHCP) signal. Taoglas recommends using a minimum of 70x70mm ground plane (PCB) to ensure optimal performance.

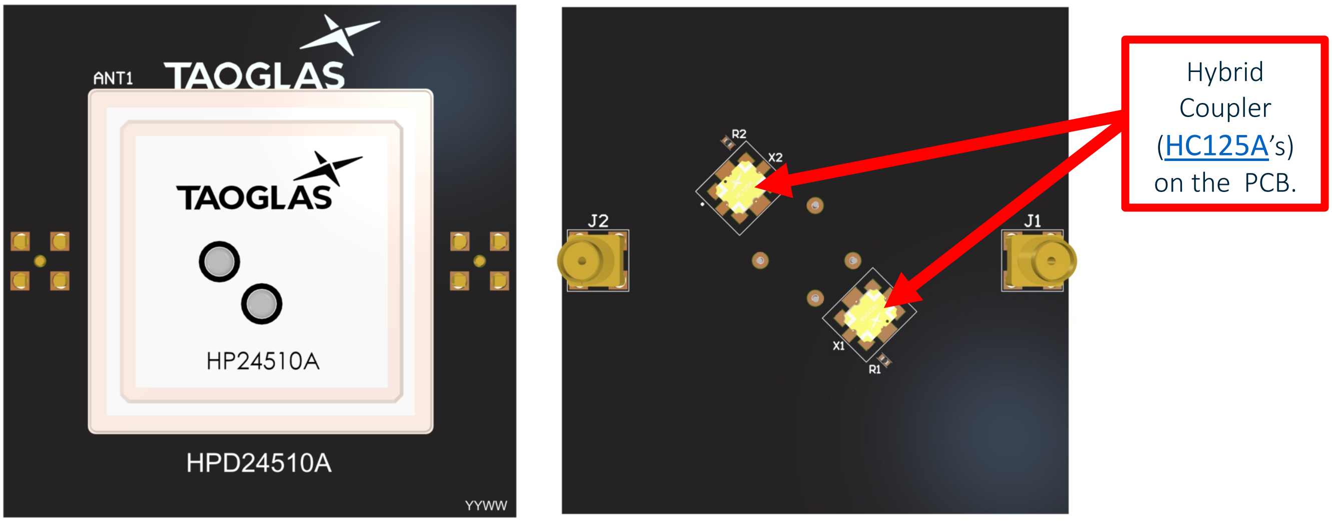




Top and bottom view of PCB.

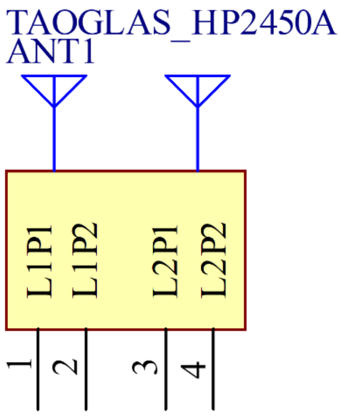
Please find the Integration files in Altium, 2D formats and the 3D model for the HP24510A here:
https://www.taoglas.com/product/dual-feed-gnss-l1-l2-stacked-patch-ceramic-antenna/

6.1 Schematic and PIN Definition



Above are the 3D models of the HP24510A and HC125A's on the PCB.

Pin	Description
1	L1P1 (0˚)
2	L1P2 (-90˚)
3	L2P1 (0˚)
4	L2P2 (-90˚)

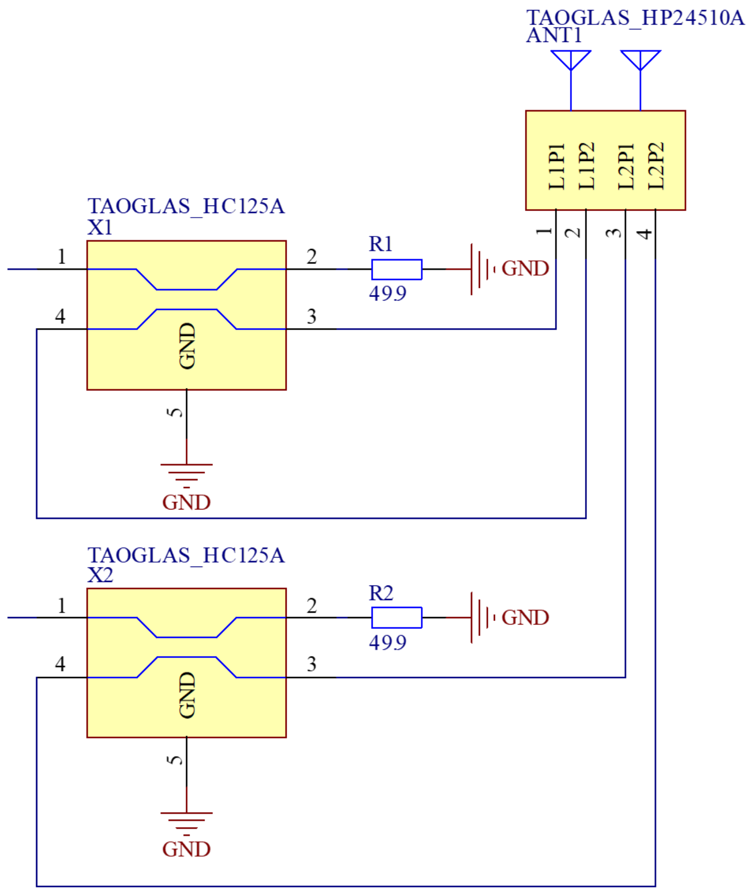


The circuit symbol for the HP24510A and pin definitions are shown above.

6.2 Schematic Layout

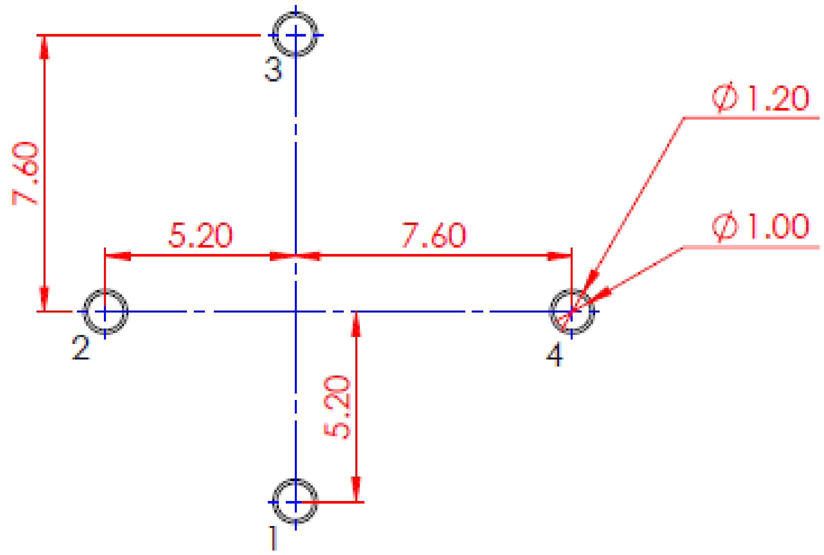
The HP24510A uses two orthogonal feeds that need to be combined in a hybrid coupler to ensure optimal axial ratio and RHCP Gain is achieved. Taoglas recommends our HC125A, a high-performance hybrid coupler specifically engineered for use with our multi feed patches.

Two HC125A's are required for this GNSS antenna, one for the high band (1559- 1610MHz) and another for the low band (1189MHz – 1254MHz). These hybrid couplers should be placed close to the antenna pins and terminated correctly using 49.9 Ohm resistors. In addition, the RF Feeds from the antenna pins for each band to the hybrid couplers must be equal in length. (Please refer to our integration files)

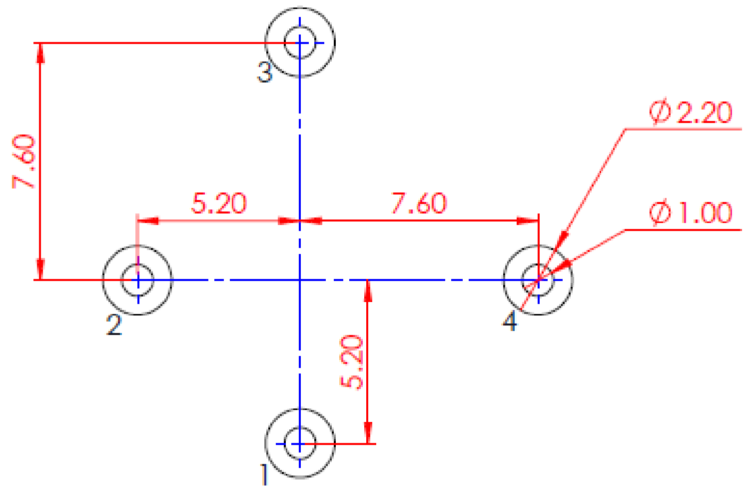


Designator	Type	Value	Manufacturer	Manufacturer Part Number
R1, R2	Resistor	49.9 Ohms	Panasonic	ERJ-2RKF49R9X

6.3 Antenna Footprint



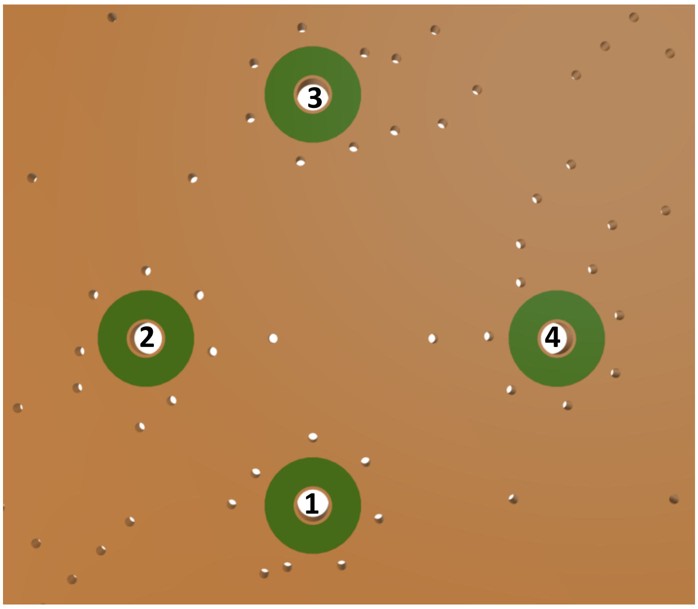
Topside



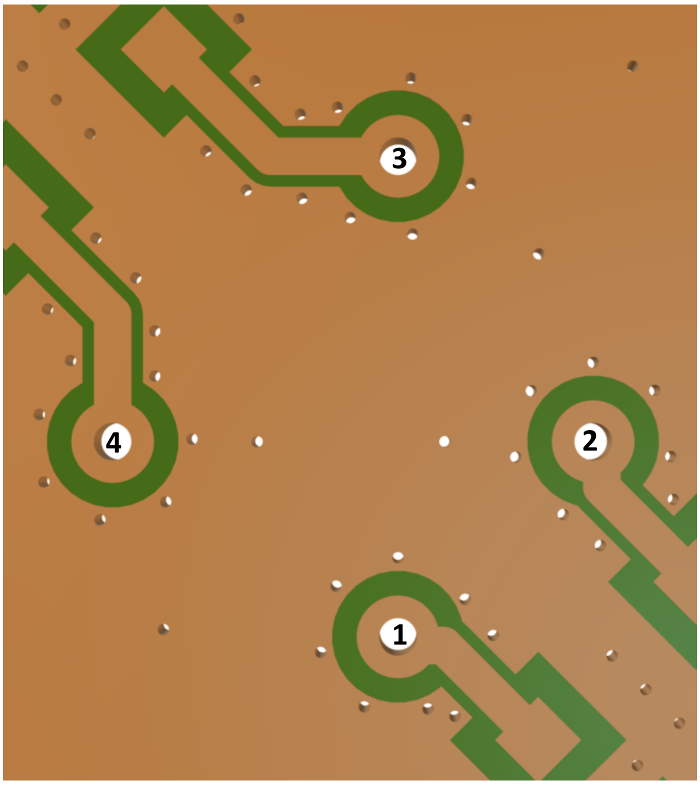
Bottom Side

6.4 Copper Clearance for HP24510A

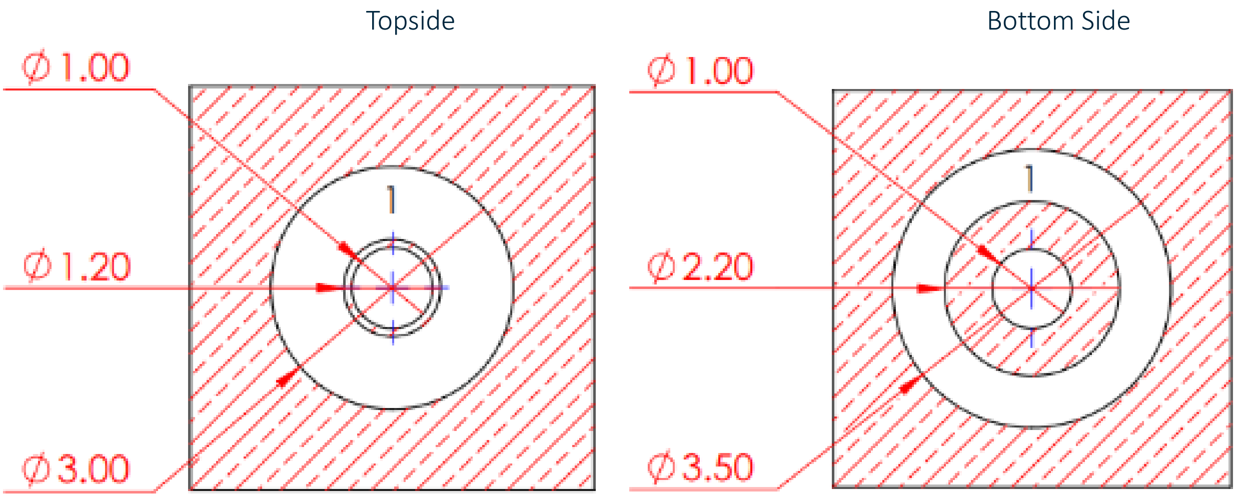
The footprint and clearance on the PCB must comply with the antenna's specification. The PCB layout shown in the diagrams below demonstrates the HP24510A clearance area for Pin 1 (L1P1(0˚) Pad), Pin 2 (L1P2(-90˚) Pad), Pin 3 (L2P1(0˚) Pad) and Pin 4 (L2P2(-90˚) Pad). The bottom copper keep out area only applies to the bottom layer and the top copper keep out area applies to all other layers.
There should be a Ø3mm copper clearance around the antenna pins on the top side of the PCB with a Ø3.5mm copper clearance around the antenna pins on the bottom side.



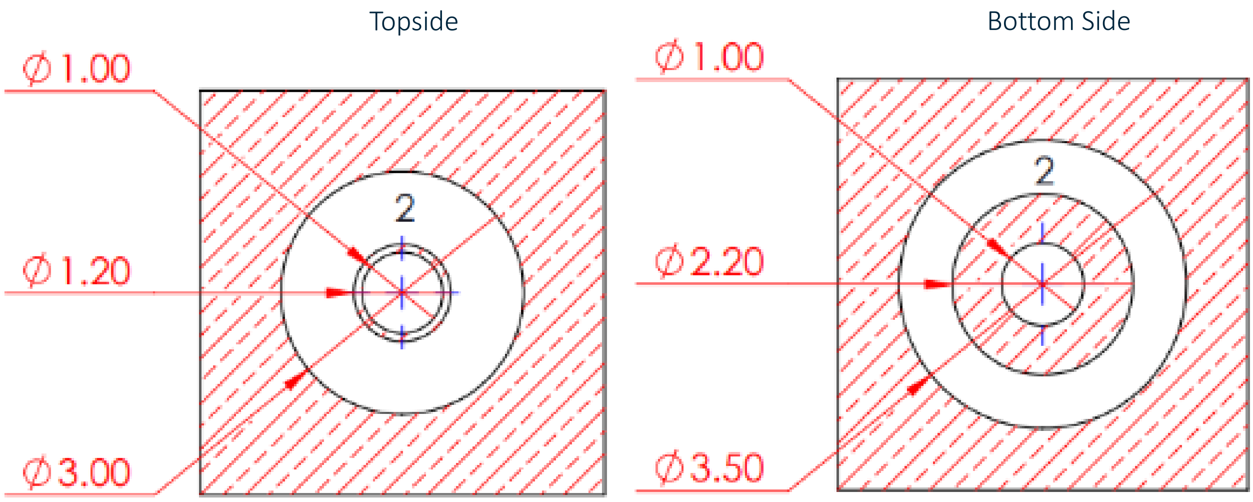
Topside



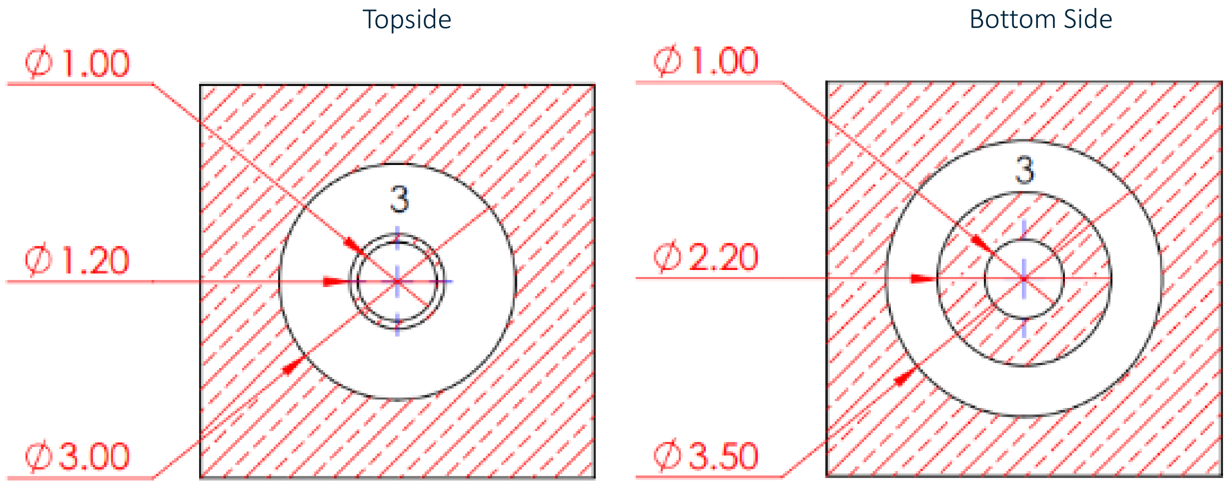
Bottom Side



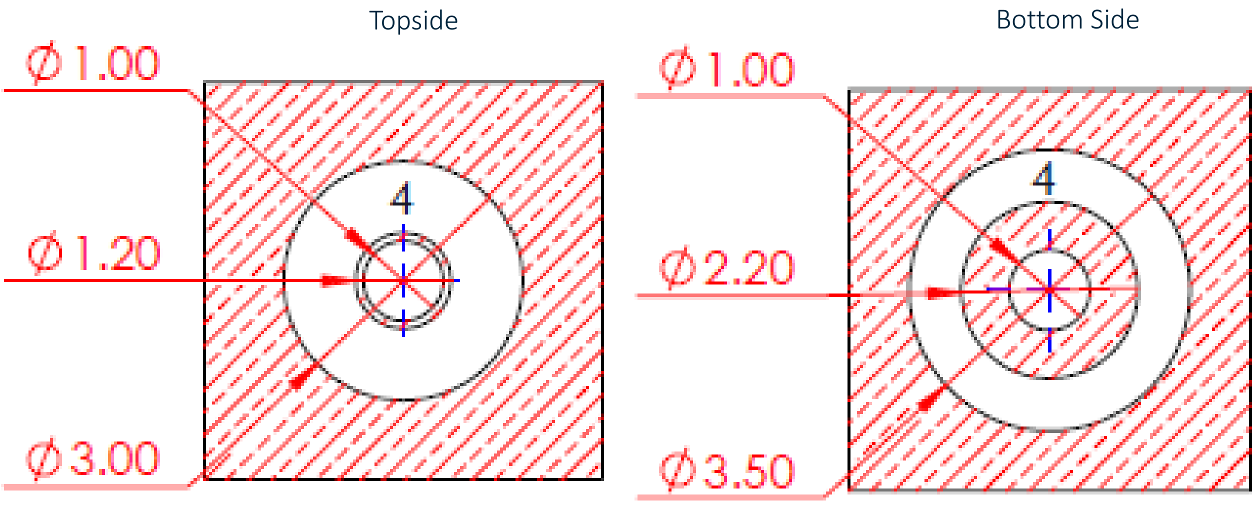
Copper Clearances for Pin 1 (L1P1(0°) Pad) of the HP24510A.



Copper Clearances for Pin 2 (L1P2(-90°) Pad) of the HP24510A.



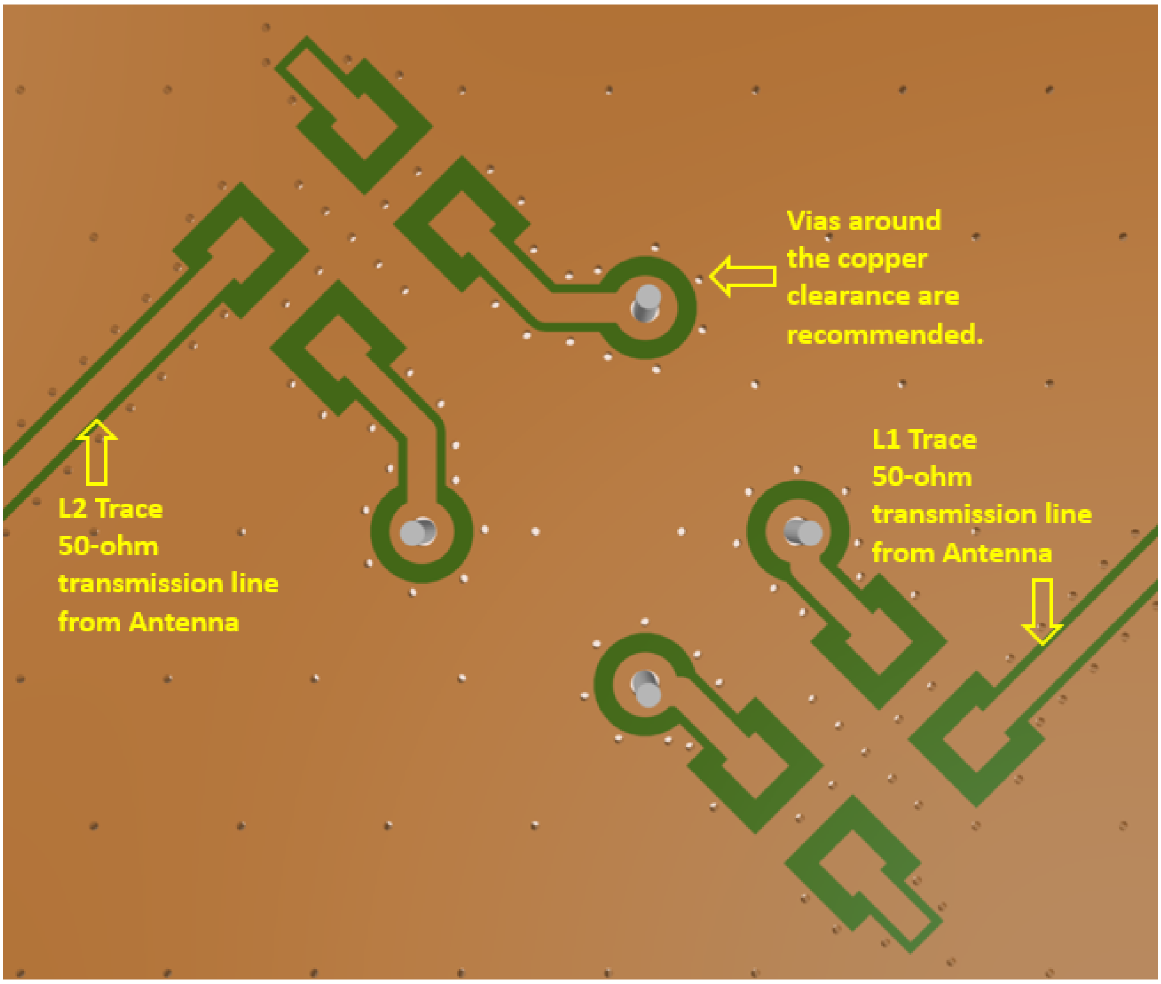
Copper Clearances for Pin 3 (L2P1(0°) Pad) of the HP24510A.



Copper Clearances for Pin 4 (L2P2(-90°) Pad) of the HP24510A.

6.5 Antenna Integration

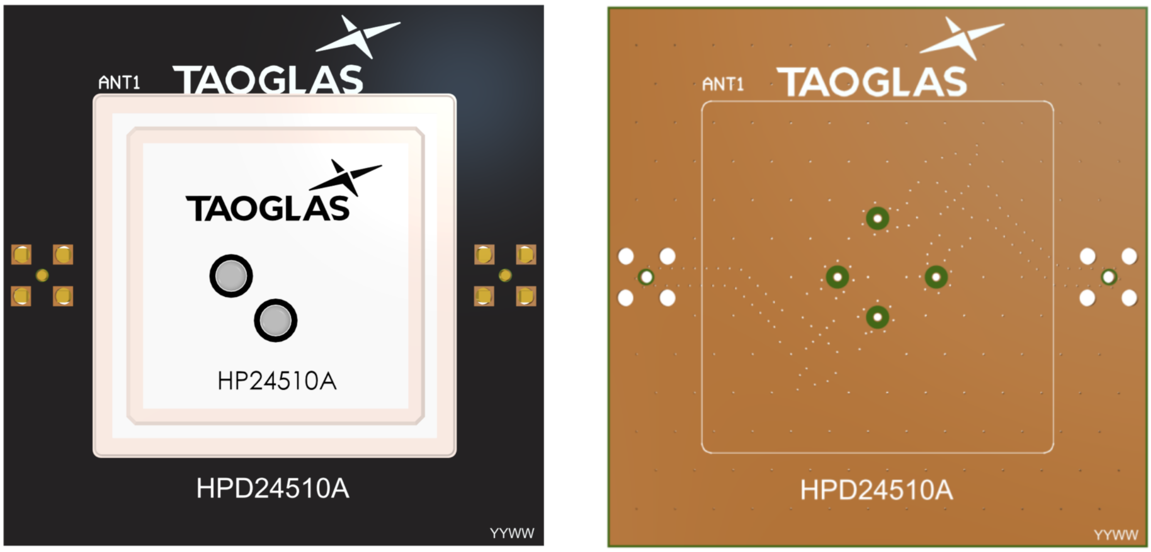
The HP24510A should be placed in the centre of the PCB to take advantage of the ground plane. The RF traces must maintain a 50 Ohm transmission line. Ground vias should be placed around the copper clearance area.



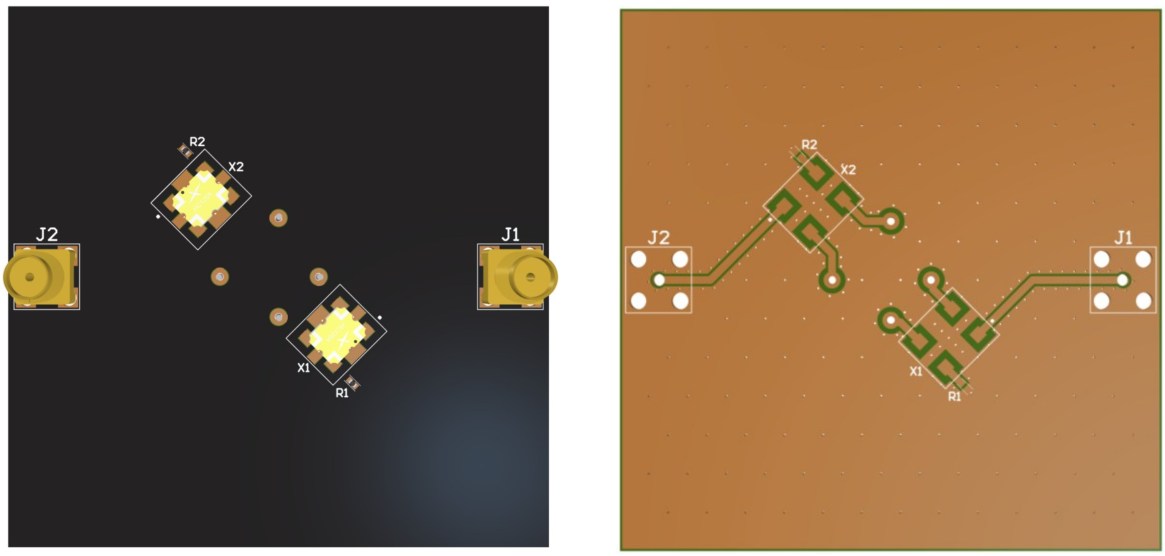
Bottom view of the PCB, showing transmission lines and integration notes.

6.6 Final Integration

The bottom side image shown below highlights the antenna connection to the hybrid couplers (HC125A's). It shows the 49.9 Ohm terminating resistors necessary for the hybrid couplers (HC125A's). Taoglas recommends using a minimum of 70x70mm ground plane (PCB) to ensure optimal performance.



Top Side (HP24510A placement on 70x70mm PCB)



Bottom Side (HC125A's placement)

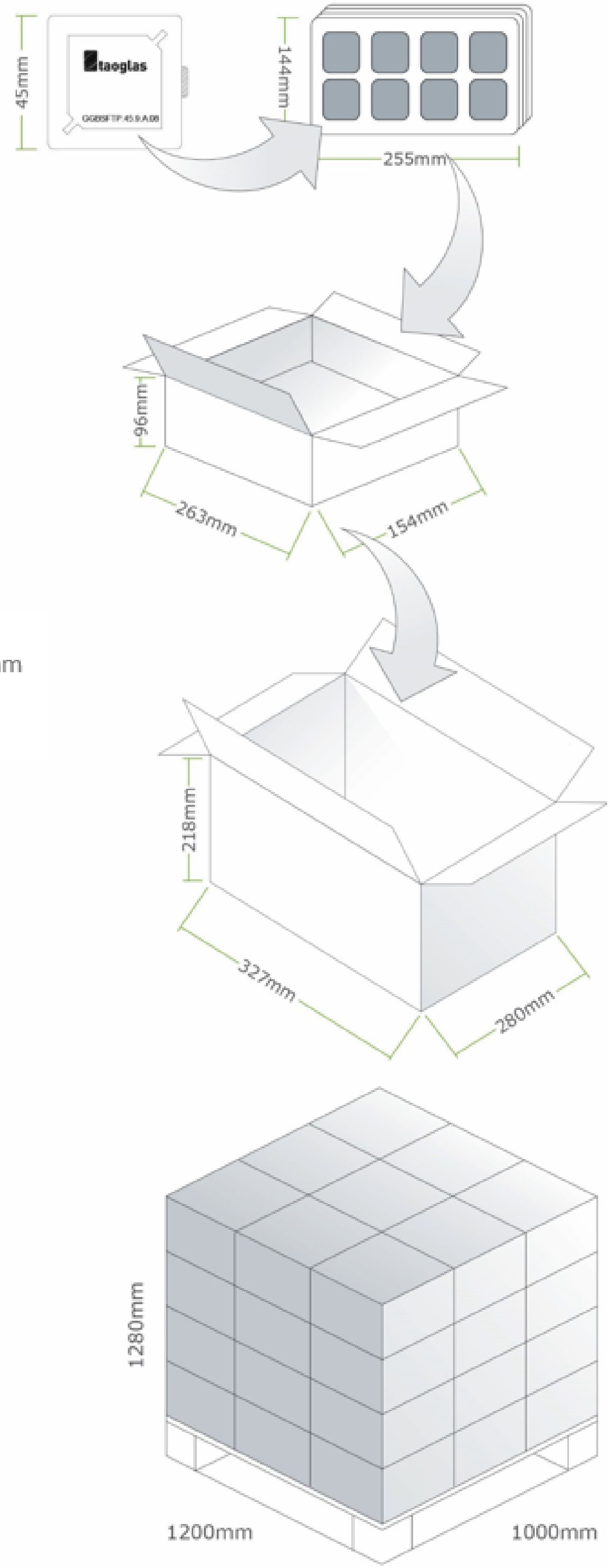
7. Packaging

8pcs HP24510A Per Tray
Tray Dimensions – 255*144*12mm
Weight – 350g

24pcs HP24510A Per S Carton
Carton Dimensions – 263*154*96mm
Weight – 1Kg

96pcs HP24510A Per Large Carton
Large Carton Dimensions – 327*280*218mm
Weight – 4Kg

Pallet Dimensions:
1200mm*1000mm*1280mm
36 Cartons Per Pallet
9 Cartons Per Layer, 4 Layers



Changelog for the datasheet

SPE-22-8-183 – HP24510A

Revision: D (Current Version)	
Date:	2024-12-11
Changes:	Added Levity Series to datasheet description.
Changes Made by:	Conor McGrath

Previous Revisions

Revision: C	
Date:	2024-08-30
Changes:	Updated spec tables.
Changes Made by:	Gary West

Revision: B	
Date:	2023-12-20
Changes:	Updated datasheet to include 1207-1248MHz
Changes Made by:	Gary West

Revision: A (Original First Release)	
Date:	2023-03-06
Notes:	Initial Release
Author:	Gary West

www.taoglas.com