TAOGLAS

Datasheet

GNSS Dual Feed Stacked Patch

Part No:
HP24510A

Description

Passive High Precision GNSS L1/L2 Stacked Patch Ceramic Antenna

Features:

Bands Covered:

- BeiDou (B1/B3)
- 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

1. Introduction

The Taoglas 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/B3, 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

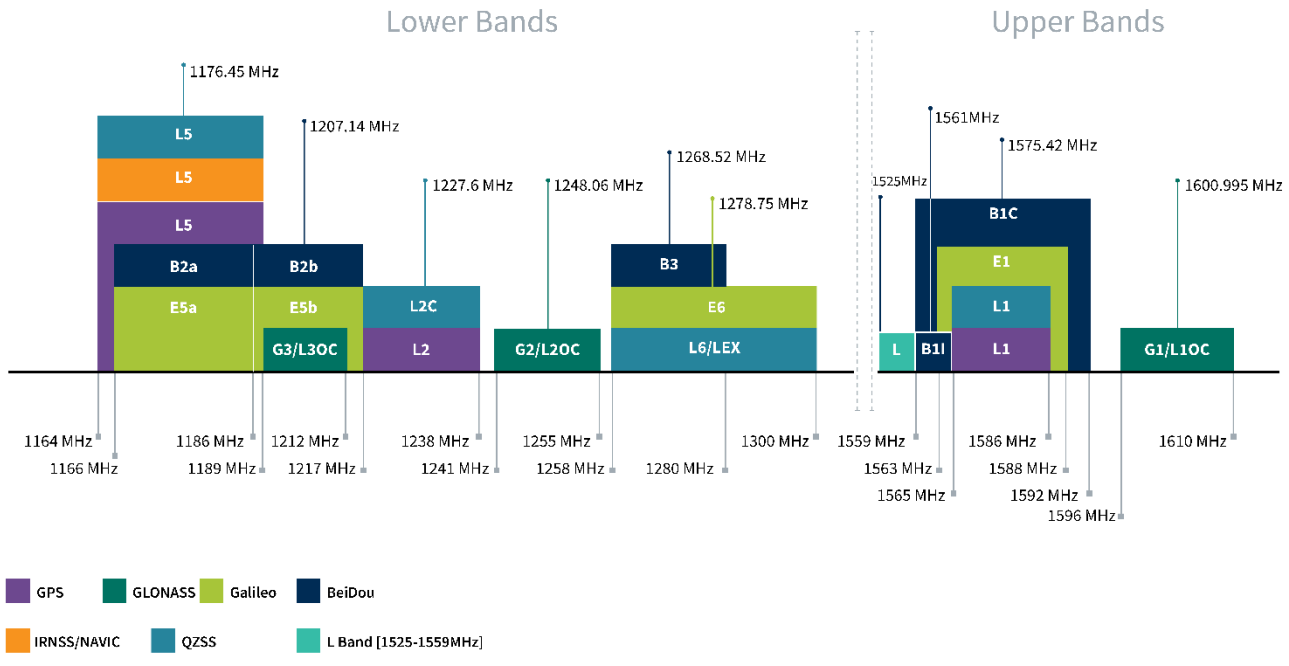
The HP24510A is the latest embedded addition to Taoglas' product portfolio of high precision GNSS antennas. When used on the base and/or the rover as part of an RTK configuration, the HP24510A can achieve genuine cm-level accuracy with proven results.

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
	■	■	□	□	■
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 Electrical						
Frequency (MHz)	BeiDou B1	L Band	GPS L1	GPS L2	GLONASS G1	GLONASS G2
	1559-1563	1525-1559	1563-1587	1215-1239	1593-1610	1237-1254
Efficiency (%)	75.8	57.5	75.8	60.5	46.0	56.6
Average Gain (dB)	-1.20	-2.41	-1.21	-2.18	-3.37	-2.47
Peak Gain (dBi)	4.48	4.33	4.50	3.05	2.46	2.86
Impedance	50 Ω					
Polarization	RHCP					
Radiation Pattern	Directional					

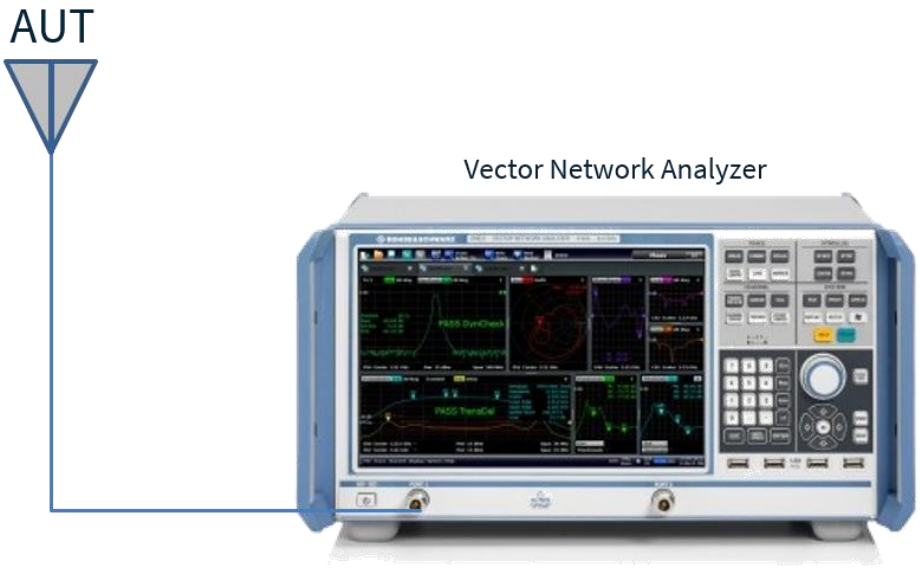
* Antenna properties were measured with the antenna mounted on 70*70mm Ground Plane.

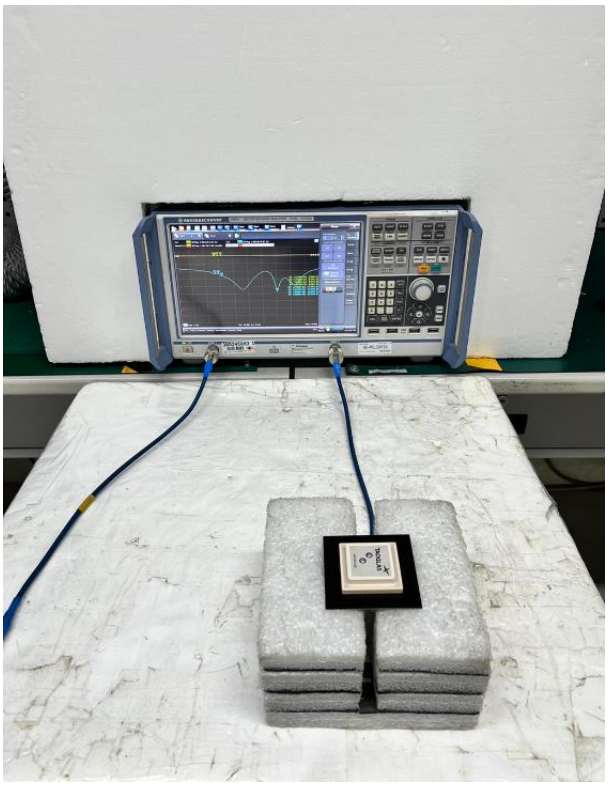
Mechanical	
Dimensions	45x45x10 mm
Weight	54.5 g
Material	Ceramic

Environmental	
Temperature Range	-40°C to 85°C
RoHS Compliant	Yes
REACH Compliant	Yes

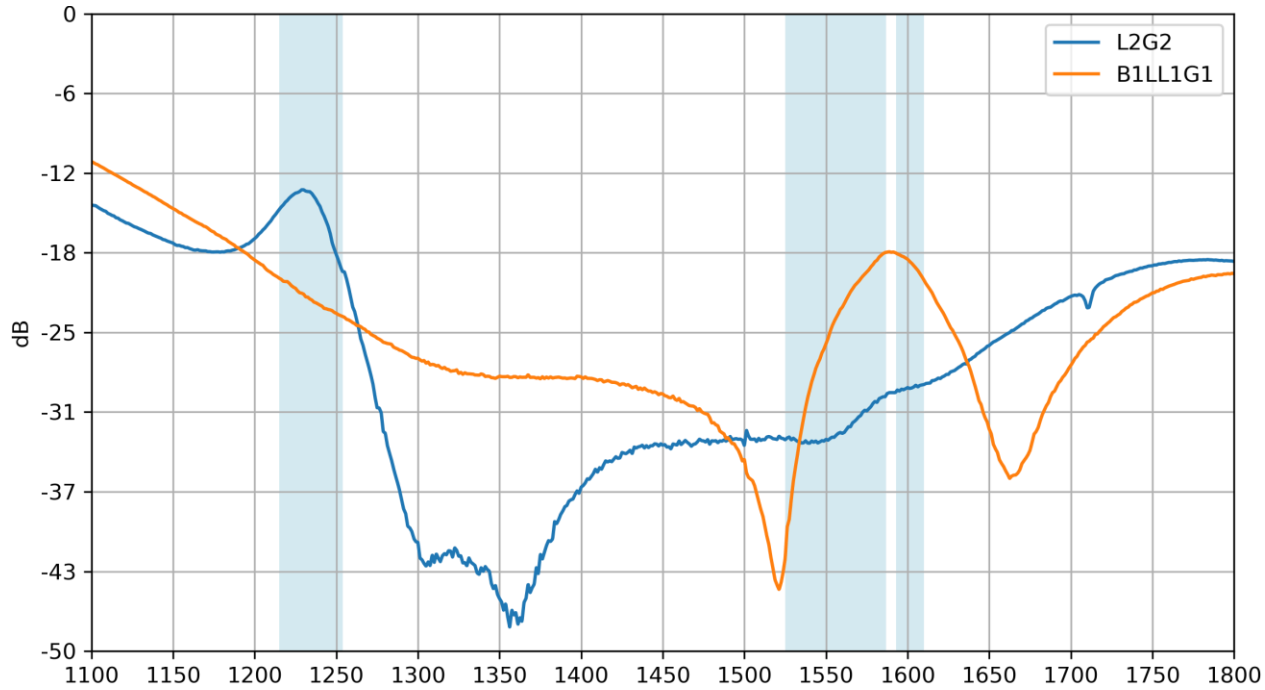
3. Antenna Characteristics

3.1 Test Setup

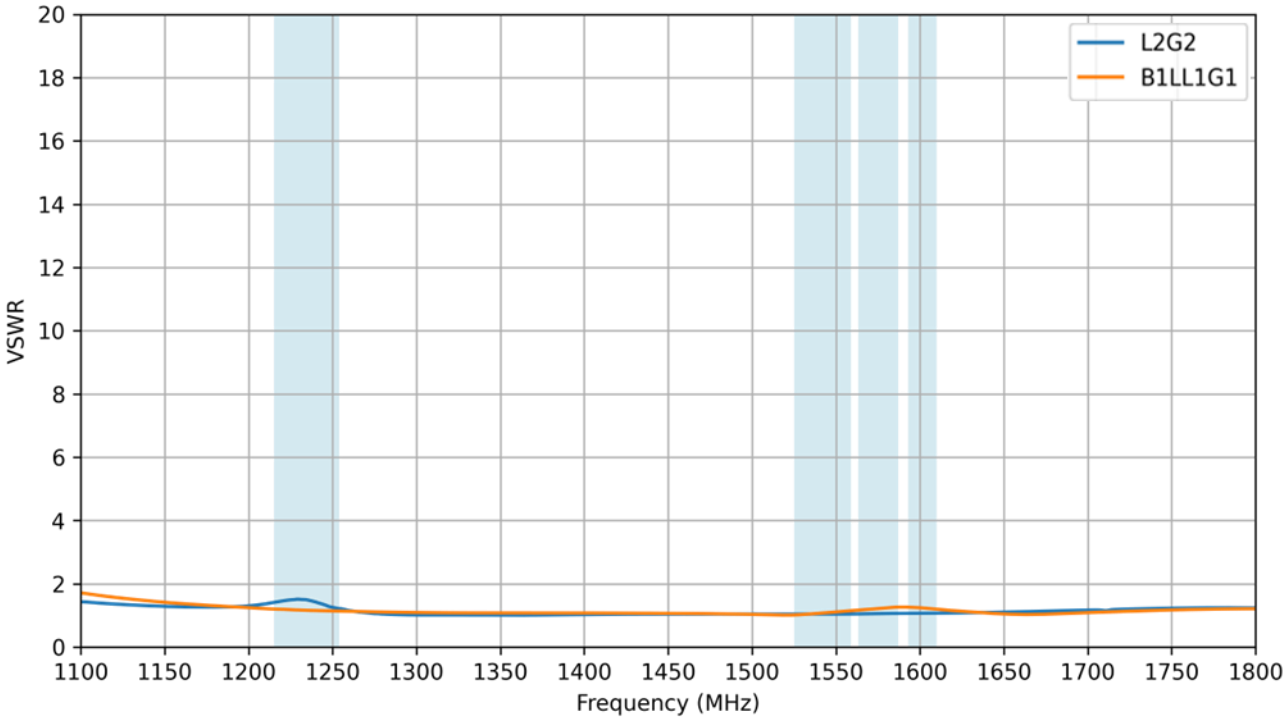




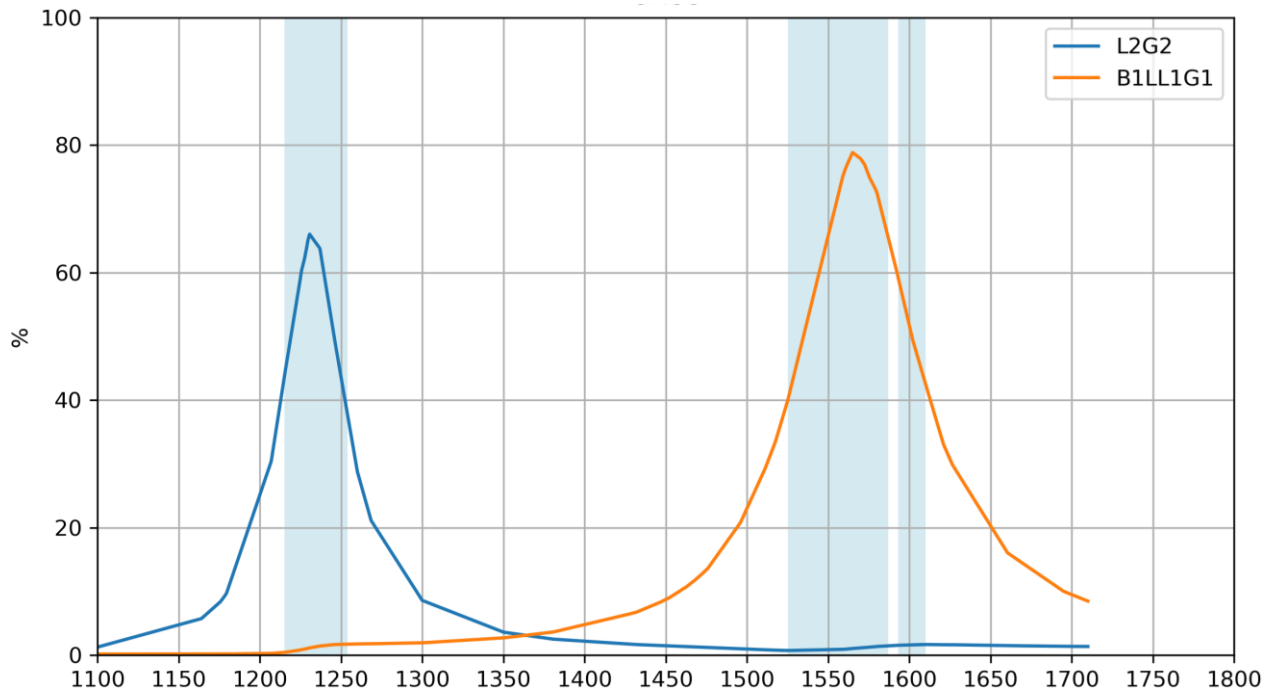
3.2 Return Loss



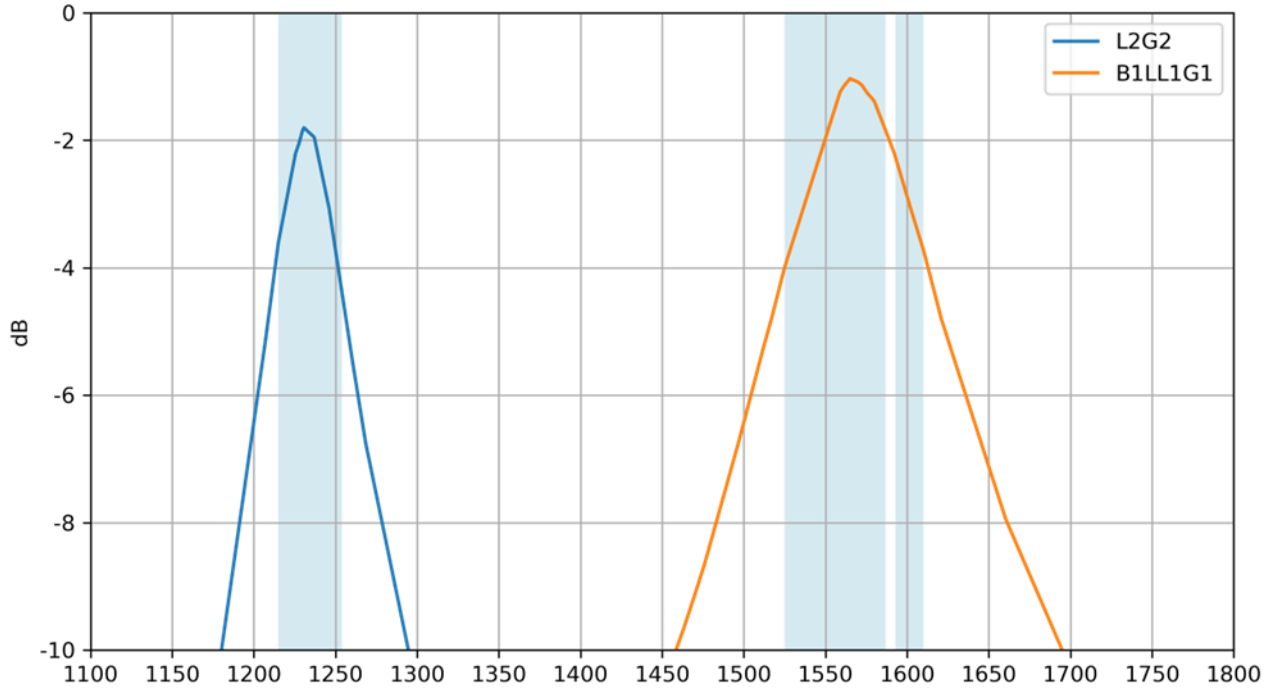
3.3 VSWR



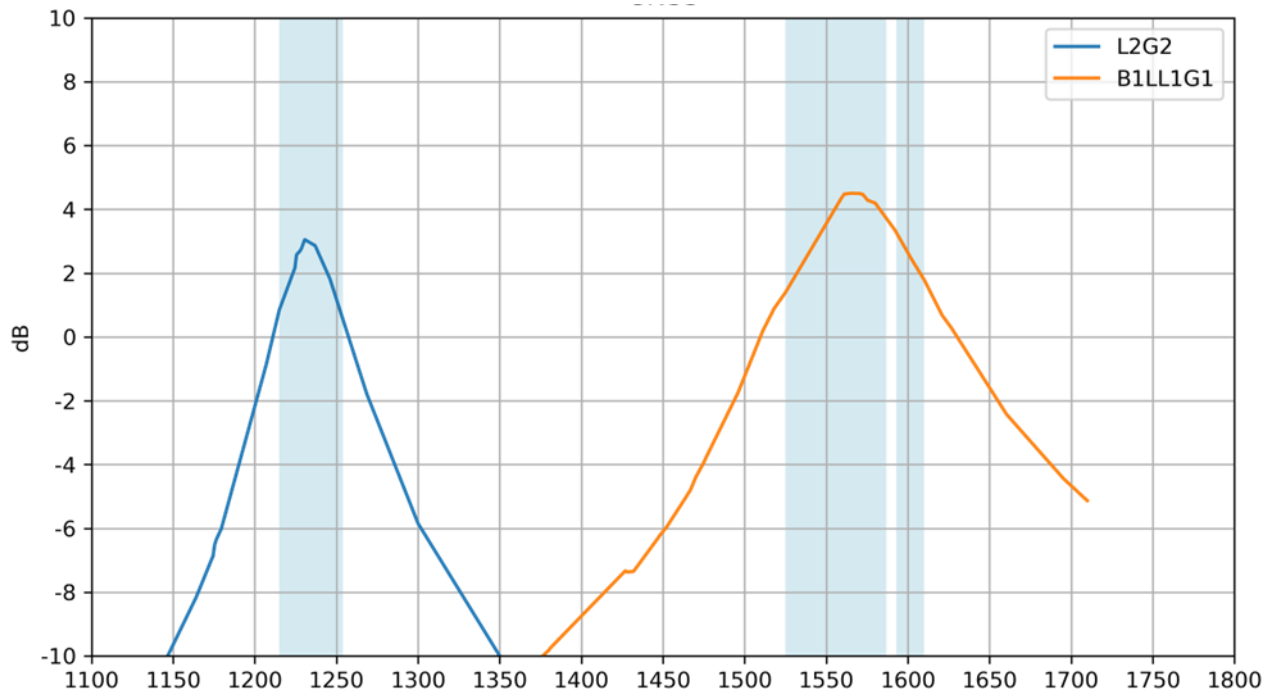
3.4 Efficiency



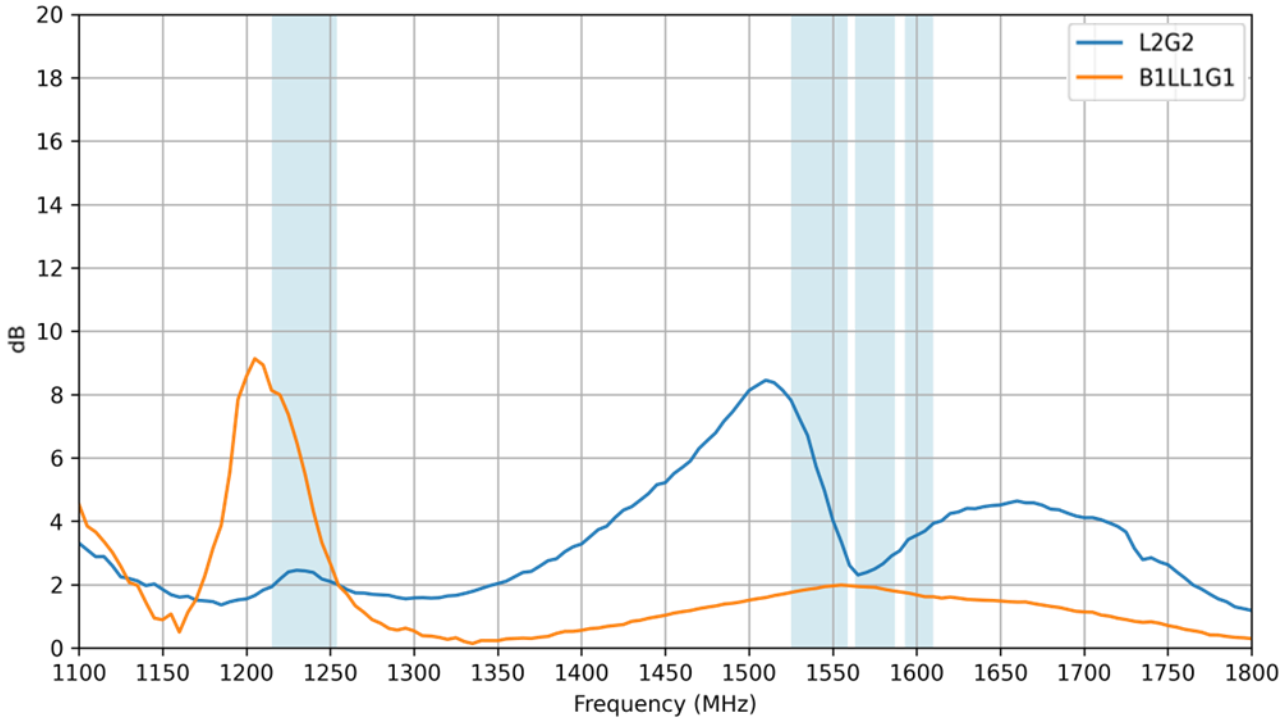
3.5 Average Gain



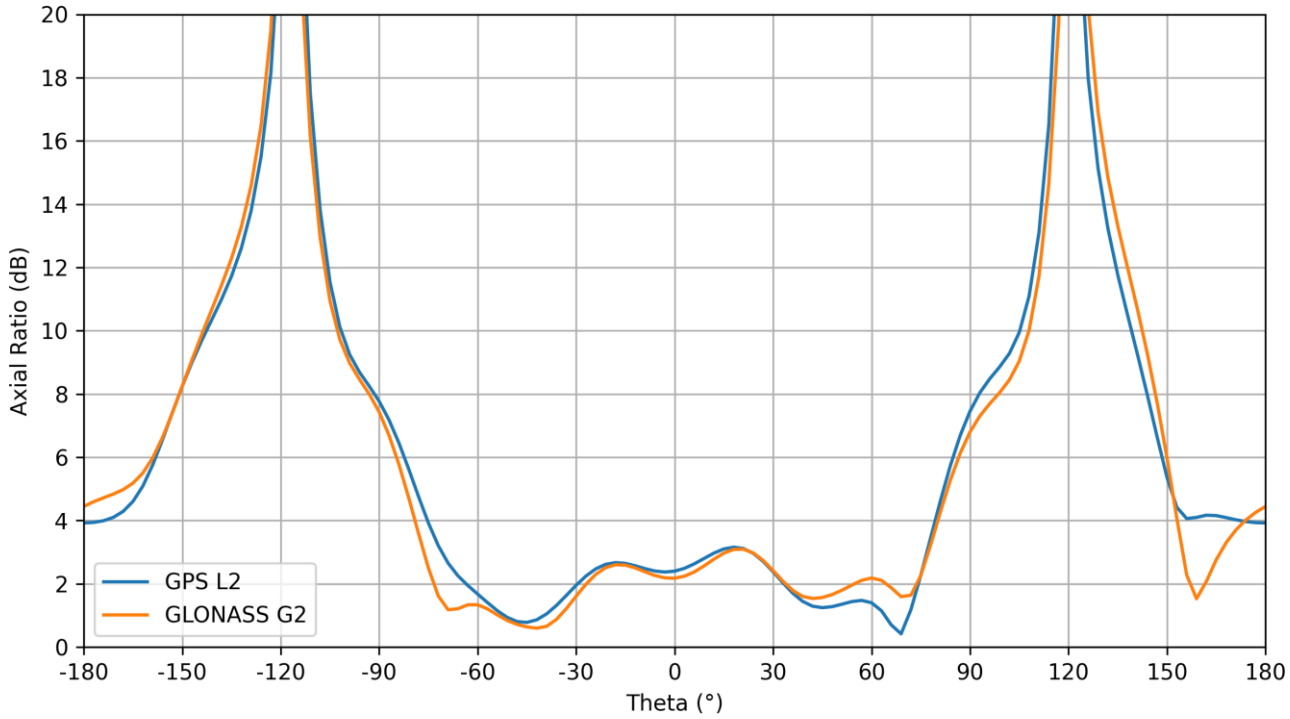
3.6 Peak Gain

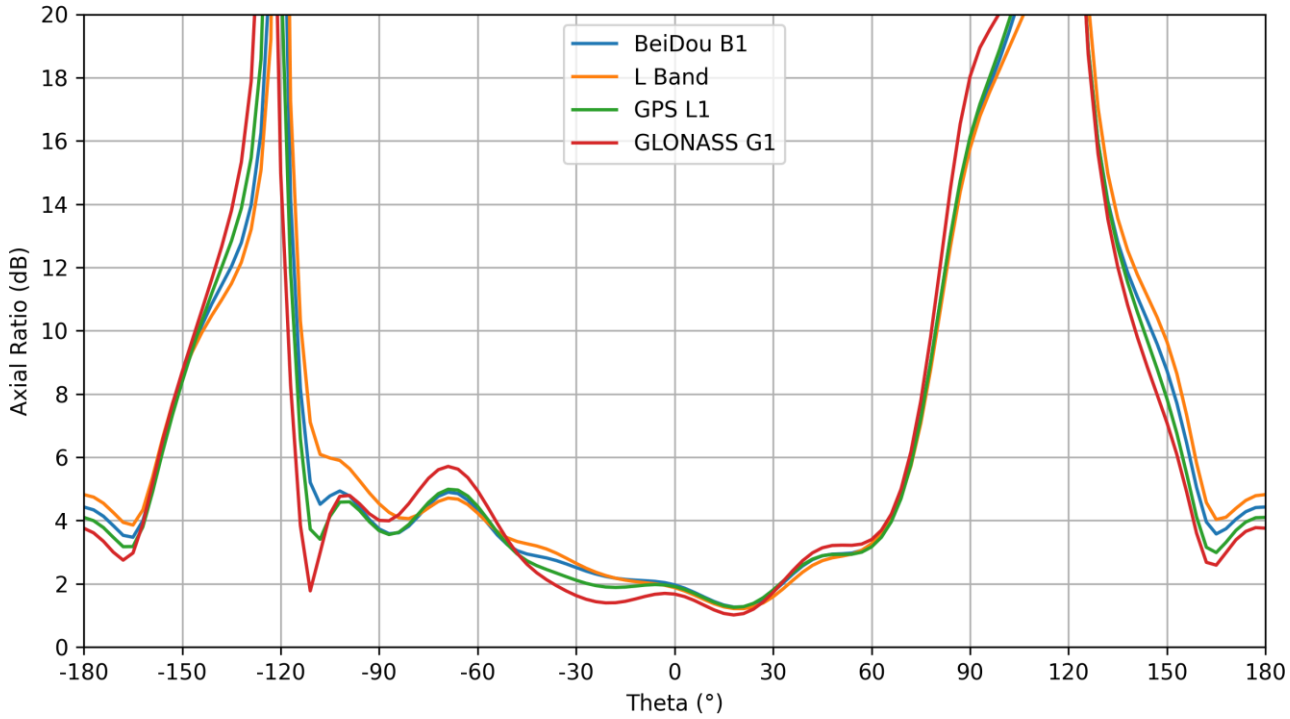


3.7 Axial Ratio

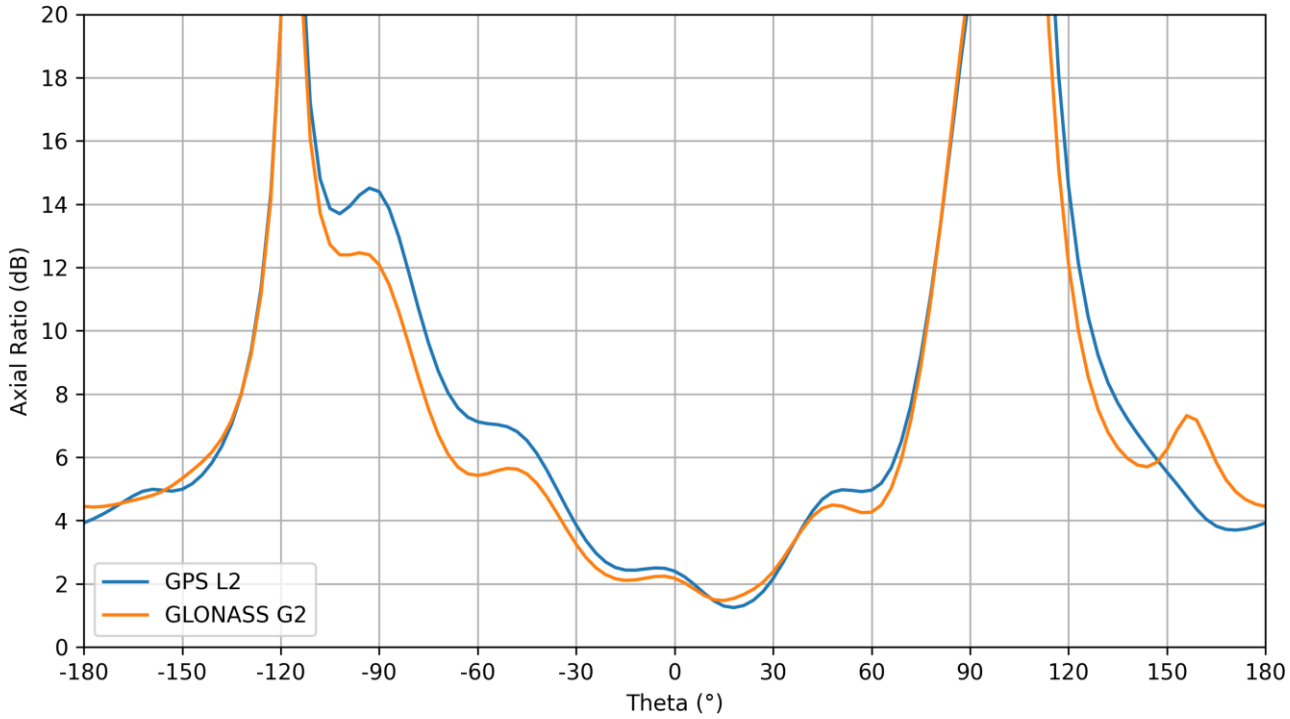


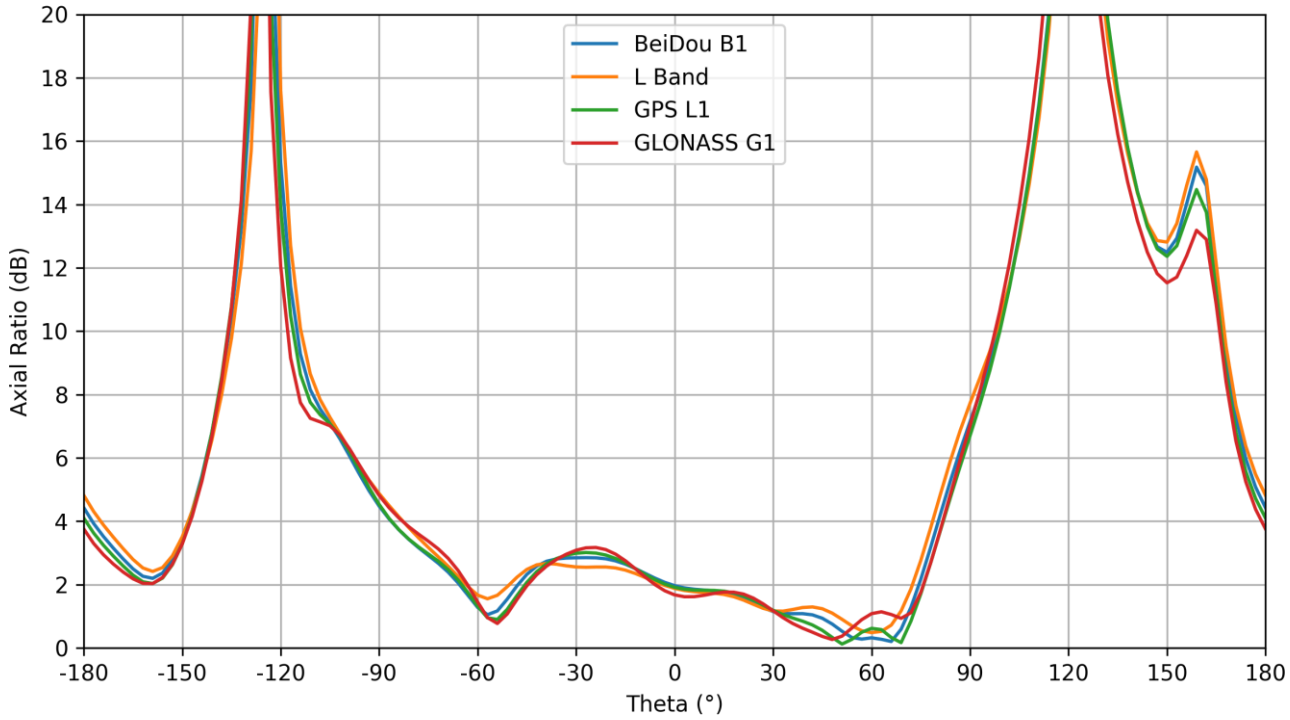
3.8 Axial Ratio vs Angle for Phi=0





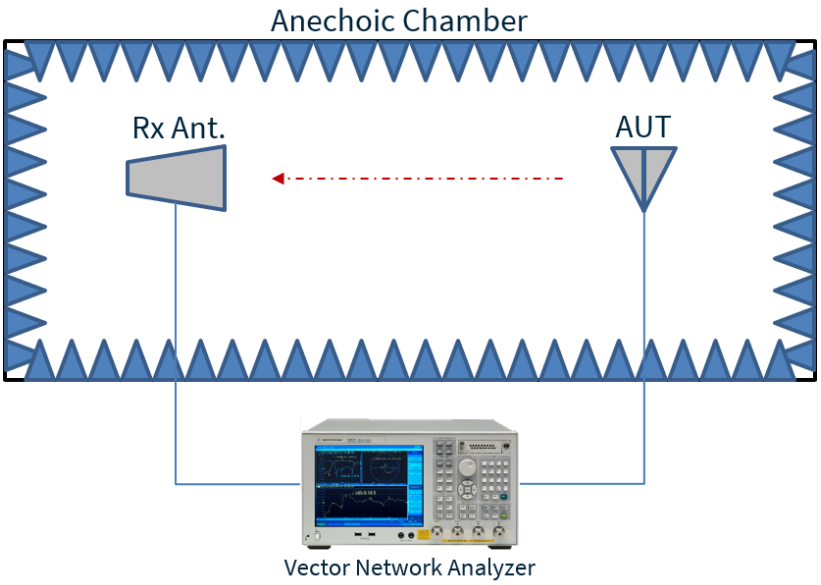
3.9 Axial Ratio vs Angle for Phi=90

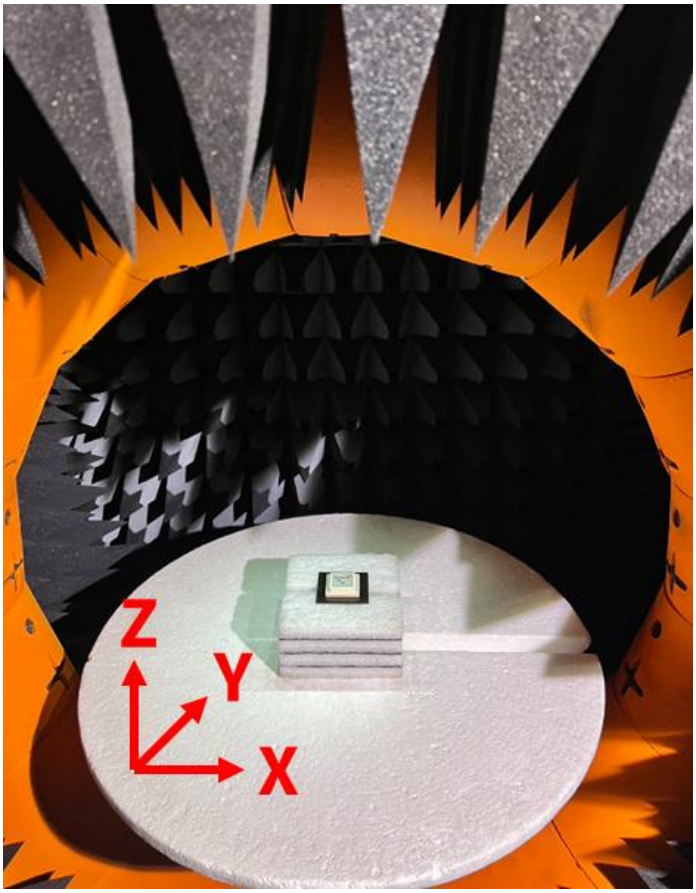




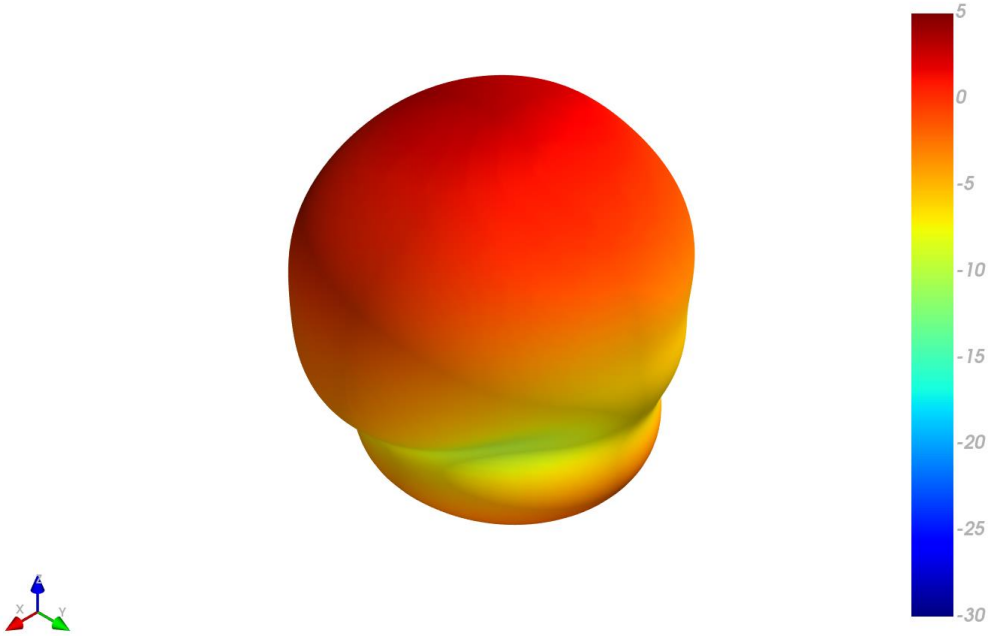
4. Radiation Patterns

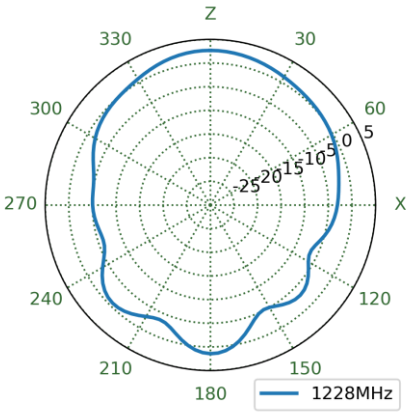
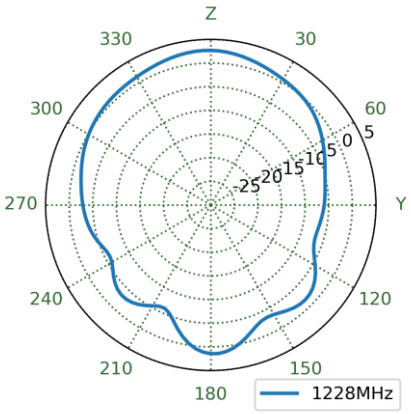
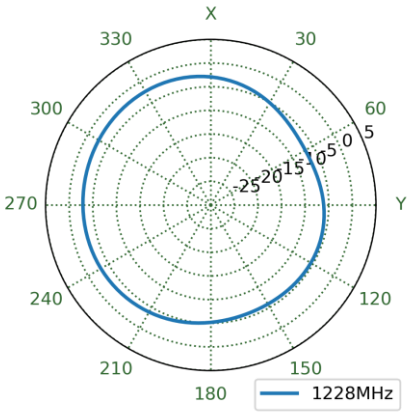
4.1 Test Setup



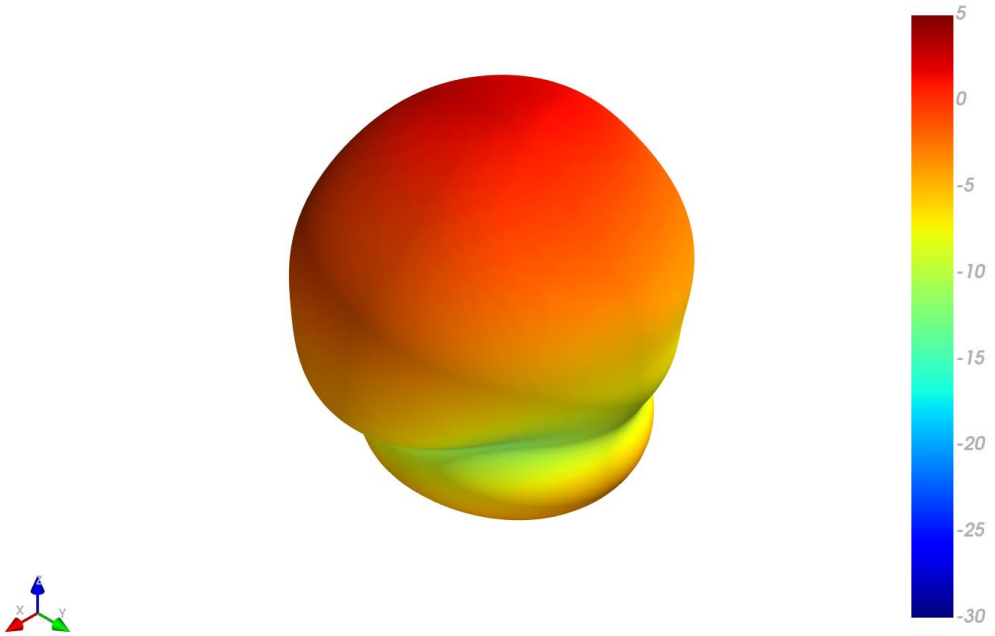


4.2 B1LL1L2G1G2 Patterns at 1227.5 MHz

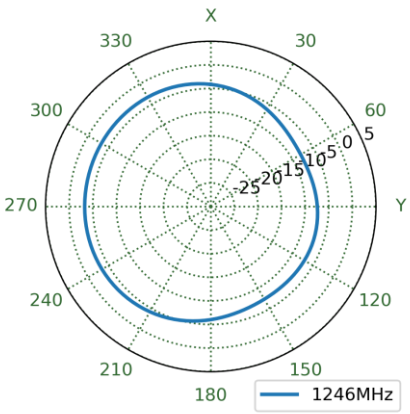


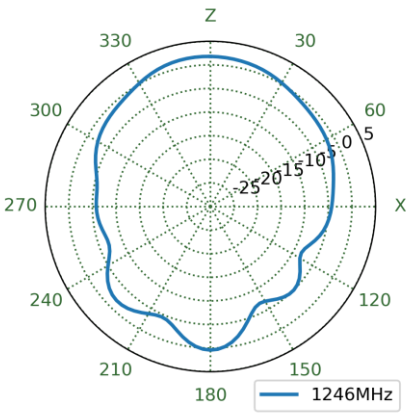
XZ Plane	YZ Plane	XY Plane
		

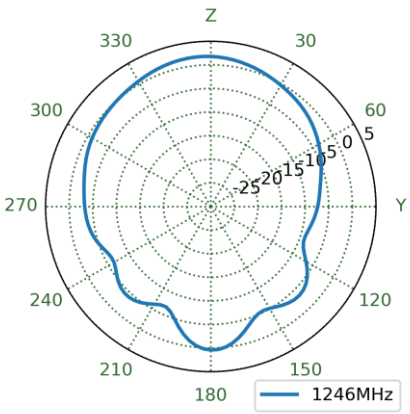
4.3 B1LL1L2G1G2 Patterns at 1246 MHz



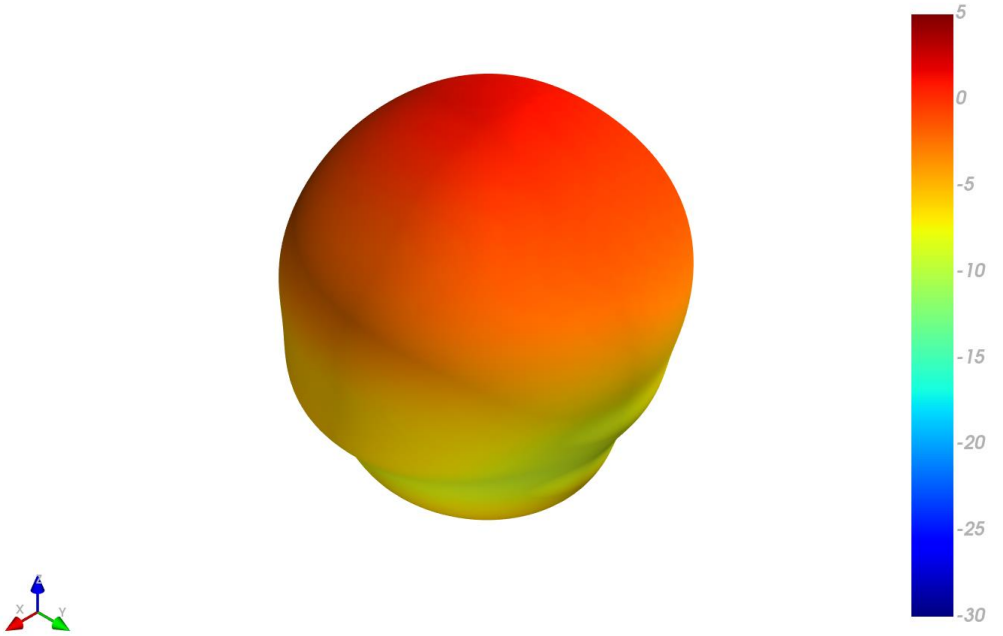
XY Plane	XZ Plane	YZ Plane

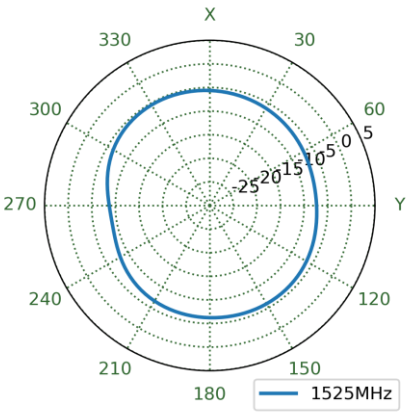
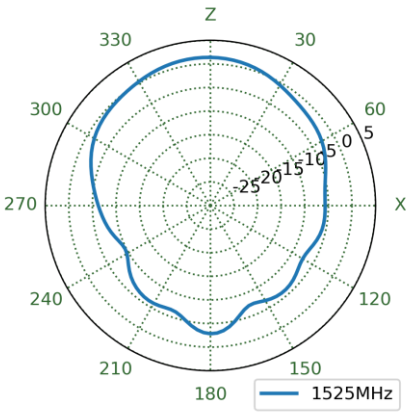
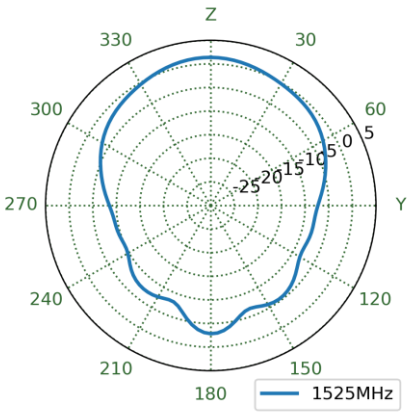




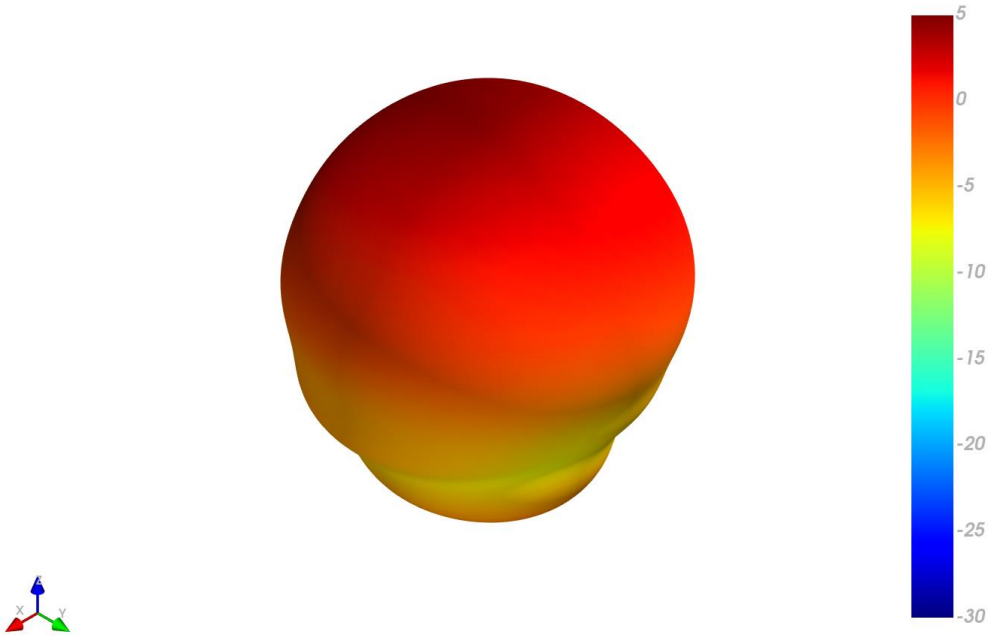


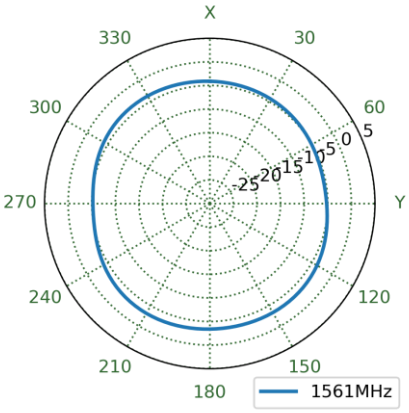
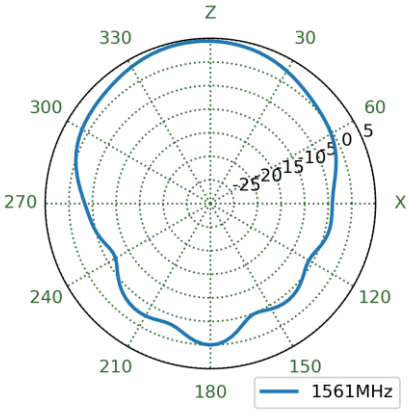
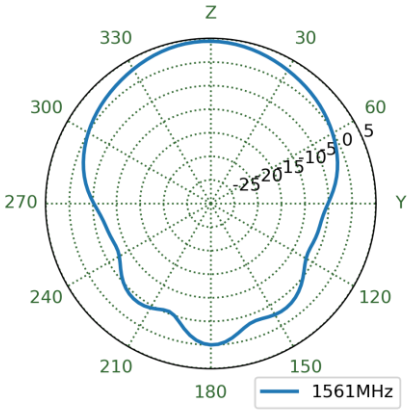
4.4 B1LL1L2G1G2 Patterns at 1525 MHz



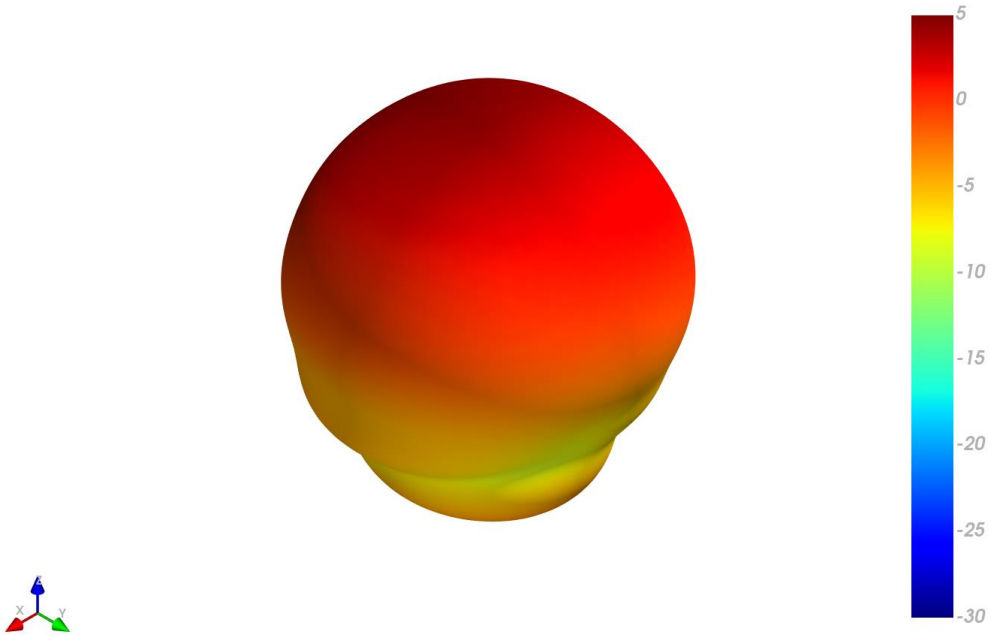
XY Plane	XZ Plane	YZ Plane
		

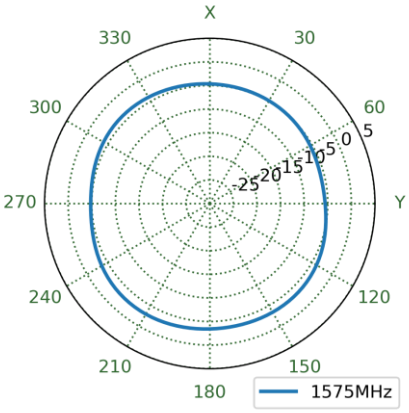
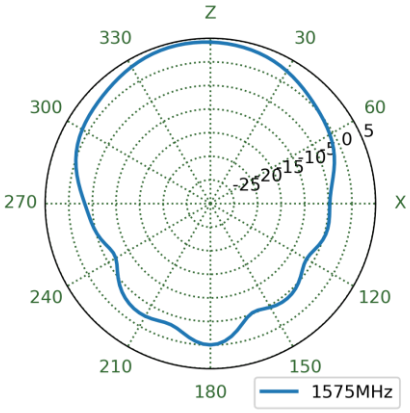
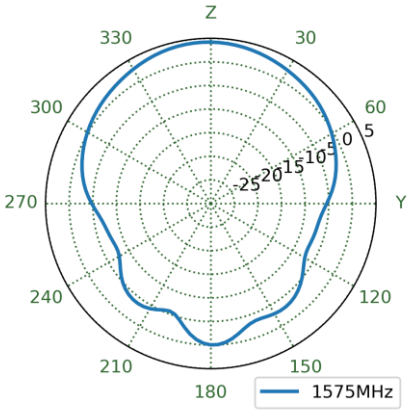
4.5 B1LL1L2G1G2 Patterns at 1561 MHz



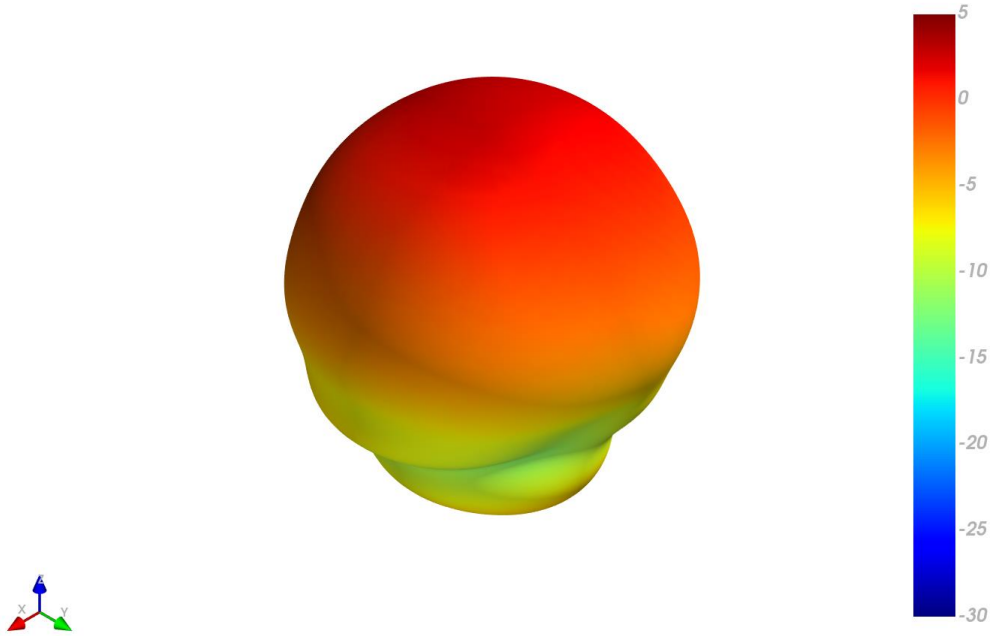
XY Plane	XZ Plane	YZ Plane
		

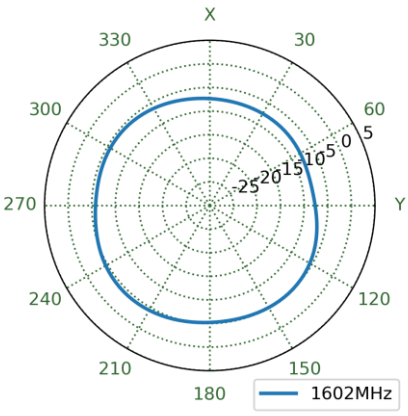
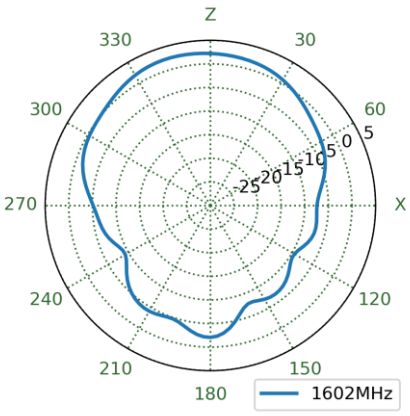
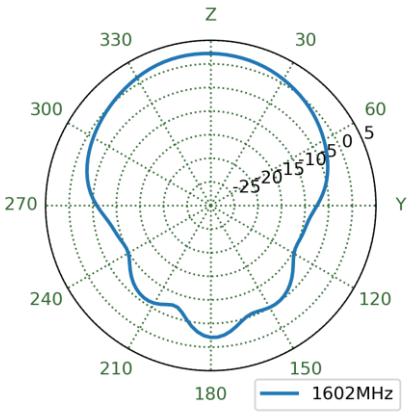
4.6 B1LL1L2G1G2 Patterns at 1575 MHz



XY Plane	XZ Plane	YZ Plane
		

4.7 B1LL1L2G1G2 Patterns at 1602 MHz

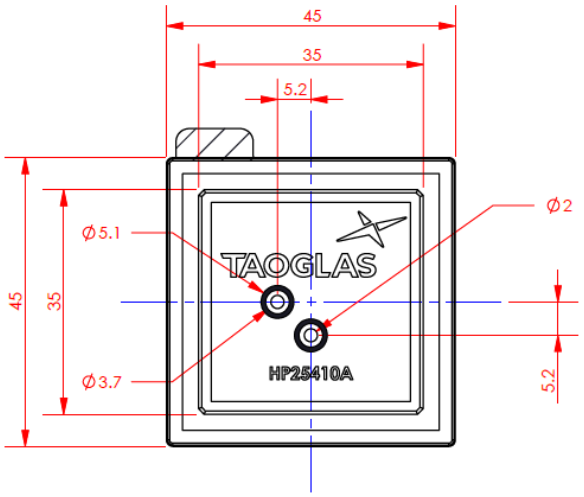


XY Plane	XZ Plane	YZ Plane
		

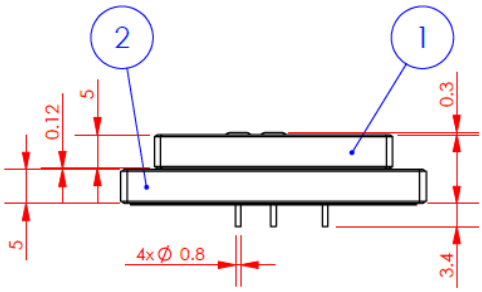
5. Mechanical Drawing

RELEASE

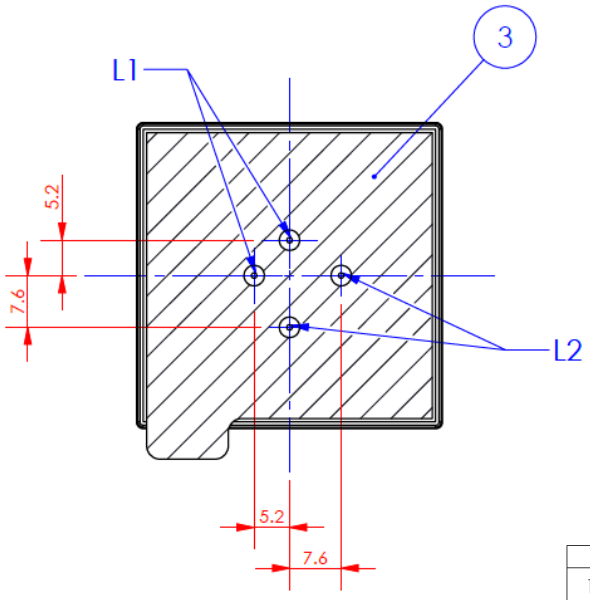
1.ALL MATERIAL MUST BE ROHS COMPLIANT.
2.USE THIS DRAWING TOGETHER WITH THE CORRESPONDING 3D CAD DATABASE FILE TO FULLY DESCRIBE THE PART.
3.THE CONNECTOR ORIENTATION HAS A FIXED POSITION TO THE ANTENNA AS PER DRAWING.
4."*" CRITICAL DIMENSIONS.
5. DOUBLE SIDED ADHESIVE:



TOP VIEW



FRONT VIEW

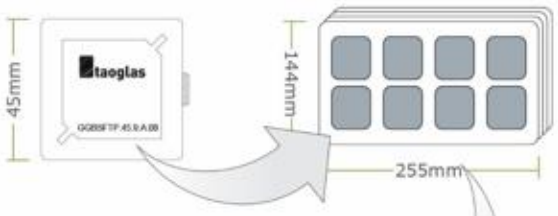


BOTTOM VIEW

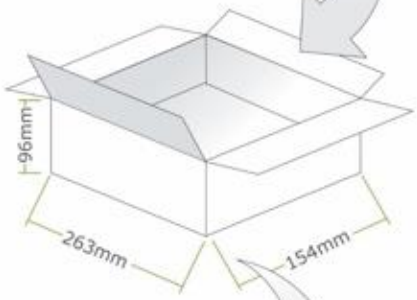
	Name	Material	QTY
1	Top Patch (35x35x5mm)	Ceramic	1
2	Bottom Patch (45x45x5mm)	Ceramic	1
3	Double Sided Adhesive	NITTO 5015	1

6. Packaging

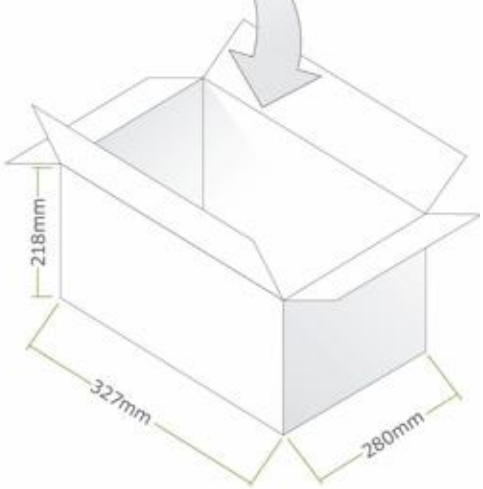
8pcs HP24510A Per Tray
Tray Dimensions – 255*144*12mm
Weight – 350g



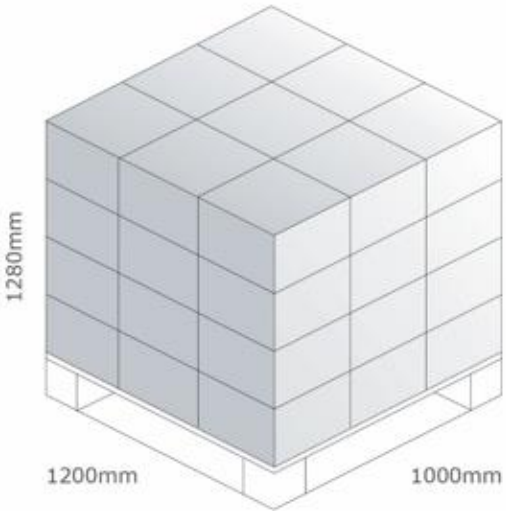
24pcs HP24510A Per S Carton
Carton Dimensions – 263*154*96mm
Weight – 1Kg



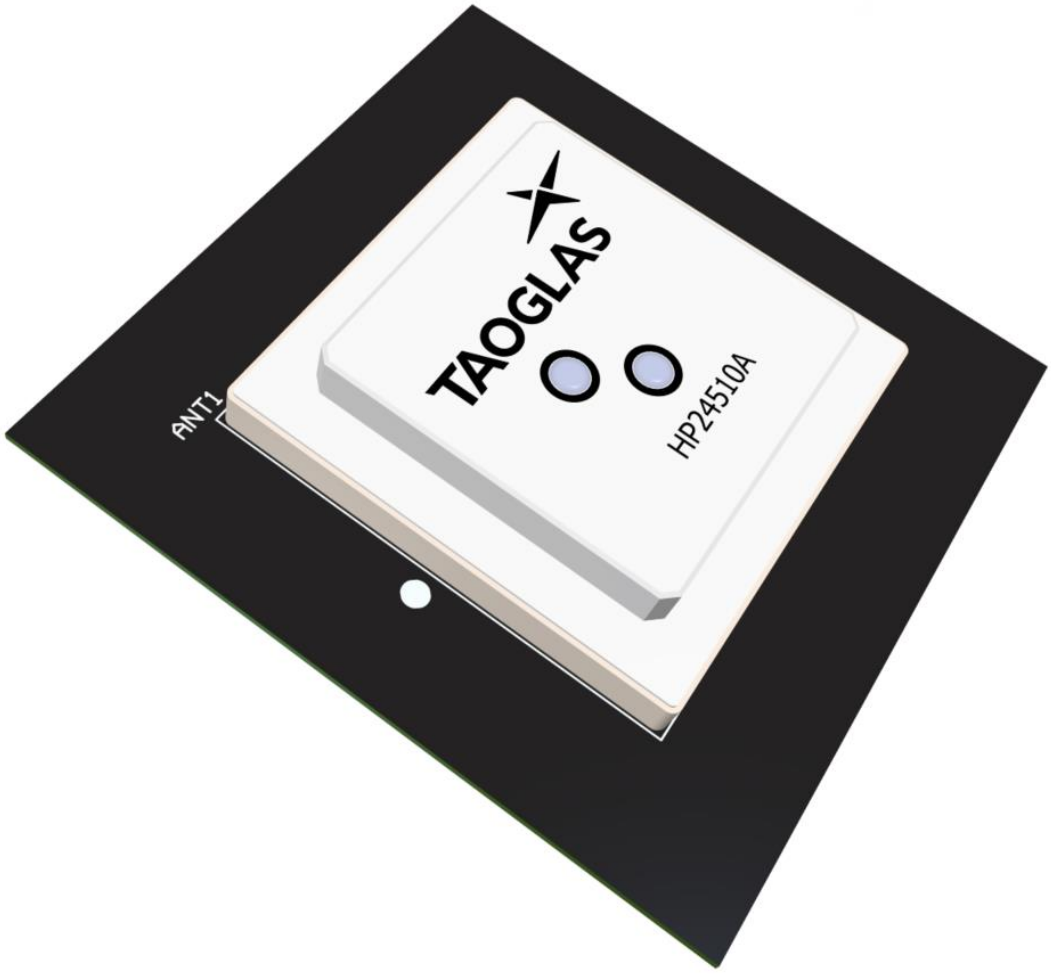
96pcs HP24510A Per Large Carton
Large Carton Dimensions – 327*280*218mm
Weight – 4Kg



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



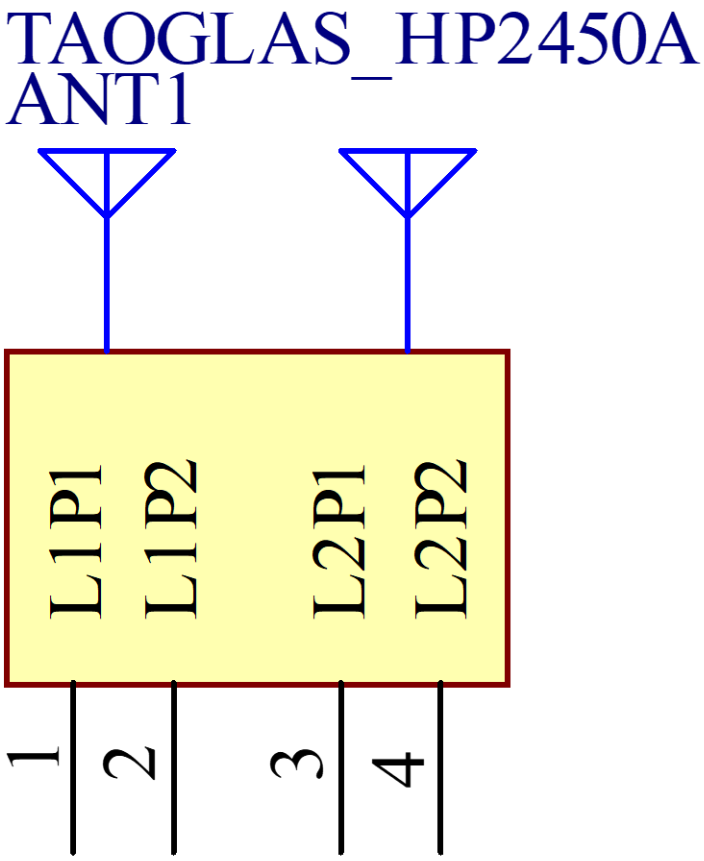
7. Antenna Integration Guide



7.1 Schematic and PIN Definition

The circuit symbol for the antenna is shown below. The antenna has 4 pins as indicated below. The L1 pin represents the higher GNSS frequency bands at 1525- 1610MHz and the L2 pin represents the lower GNSS frequency bands at 1215- 1254MHz.

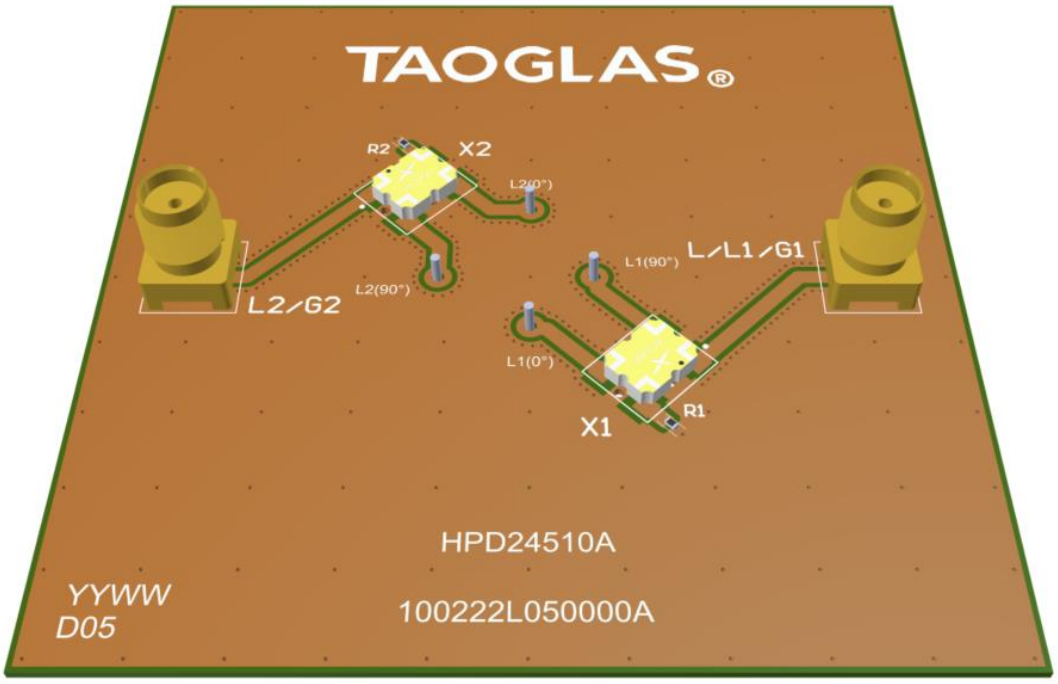
Pin	Description
1	L1P1 (0˚)
2	L1P2 (-90˚)
3	L2P1 (0˚)
4	L2P2 (-90˚)



7.2 Antenna Integration

The antenna should be placed at the center of the ground plane with a length and width of 70mm. Maintaining a square symmetric ground plane shape and symmetric environment around the antenna is critical to maintaining the excellent axial ratio and phase center performance shown in this datasheet. The opposite side of the PCB from the antenna may be used for device electronics and does not need to maintain symmetry.

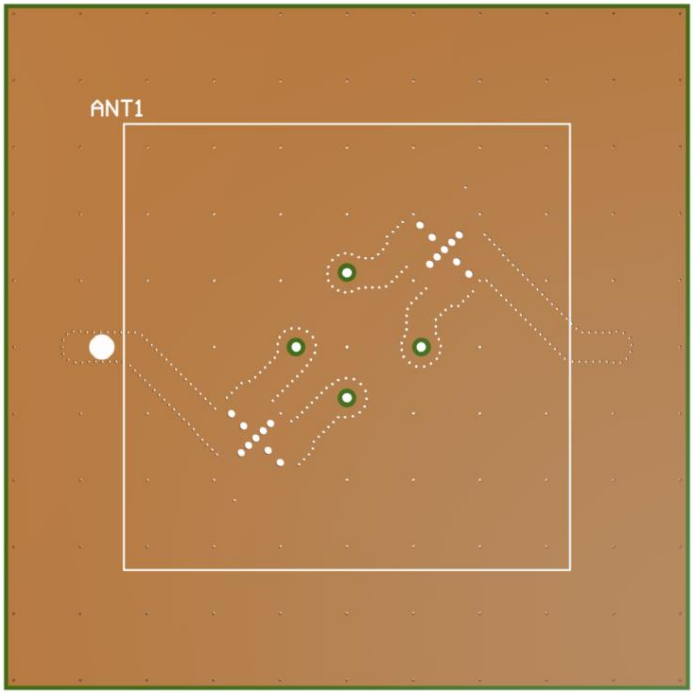
Bottom side with solder mask



Bottom side without solder mask

7.3 PCB Layout

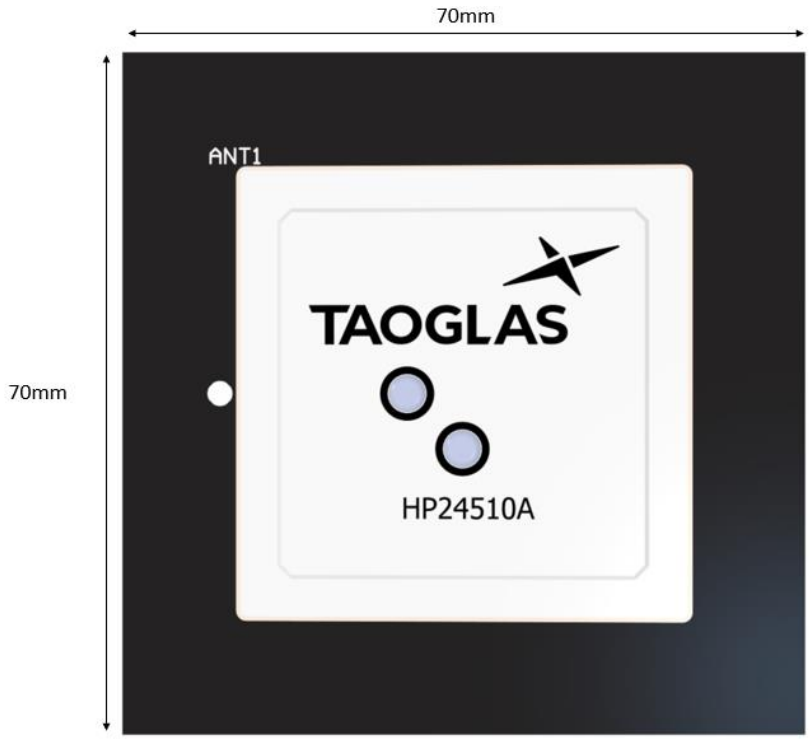
The footprint and clearance on the PCB must comply with the antenna specification. The PCB layout shown in the diagram below demonstrates the antenna footprint.



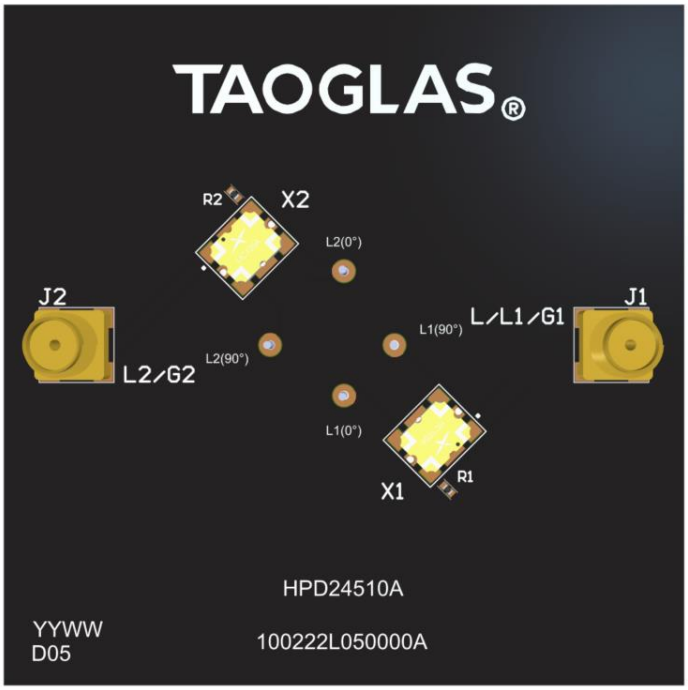
Top side

Bottom side

7.4 Evaluation Board



Top side



Bottom side

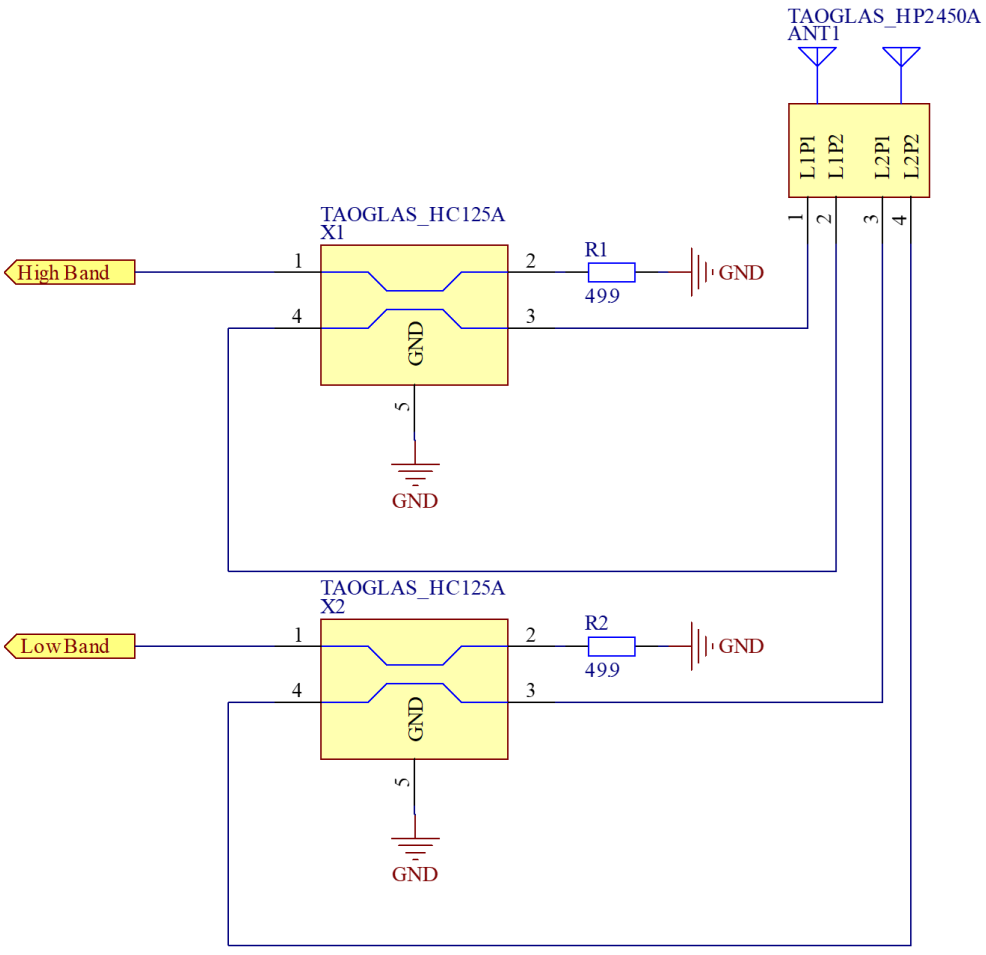
7.5 Evaluation Board Matching Circuit

Each patch element uses two orthogonal feeds that need to be combined in a hybrid coupler to ensure optimal axial ratio. Taoglas recommends our HC125.A, a high-performance hybrid coupler specifically engineered for use with our multi feed patches.

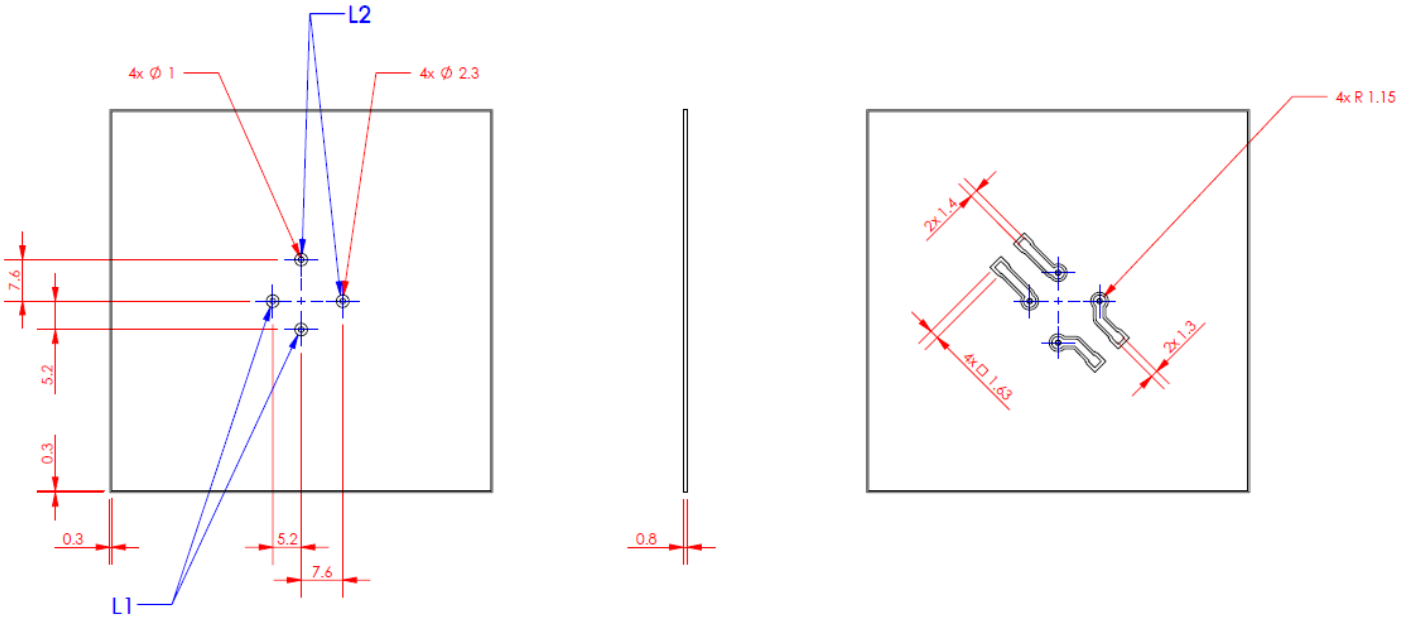
Two HC125.As are required for this antenna, one for the high GNSS band of operation (1525- 1610MHz) and another for the low GNSS band (1215- 1254MHz). These hybrid couplers should be placed close to the antenna pins and terminated correctly using 2x 49.9ohm resistors in parallel.

The output of each of the hybrid couplers can feed into separate paths for high and low band GNSS filtering and amplification.

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



7.6 Footprint



Changelog for the datasheet

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Date:	2023-03-06
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Author:	Gary West

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