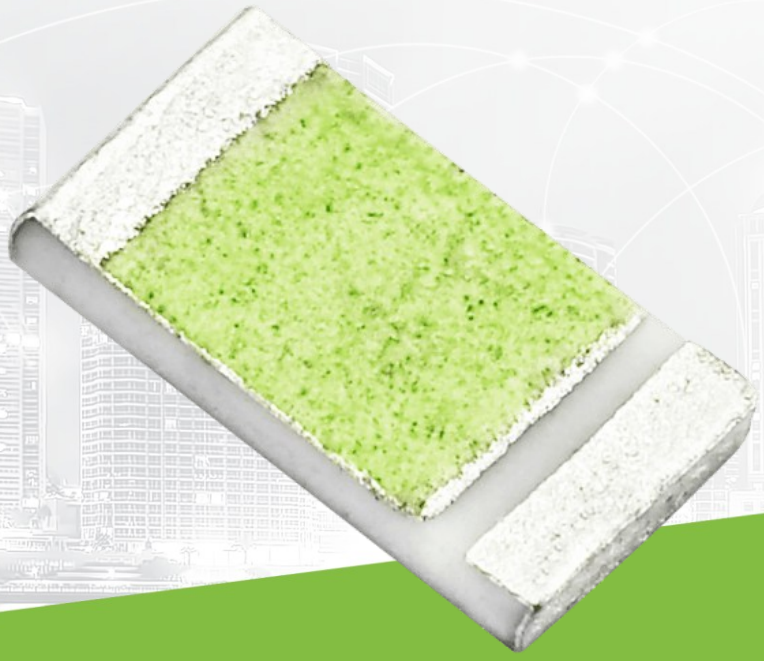


Datasheet

Unifier GPS/GLONASS/Galileo/BeiDou Ceramic SMD Antenna

Part No:
GGBLA.01.A

Description

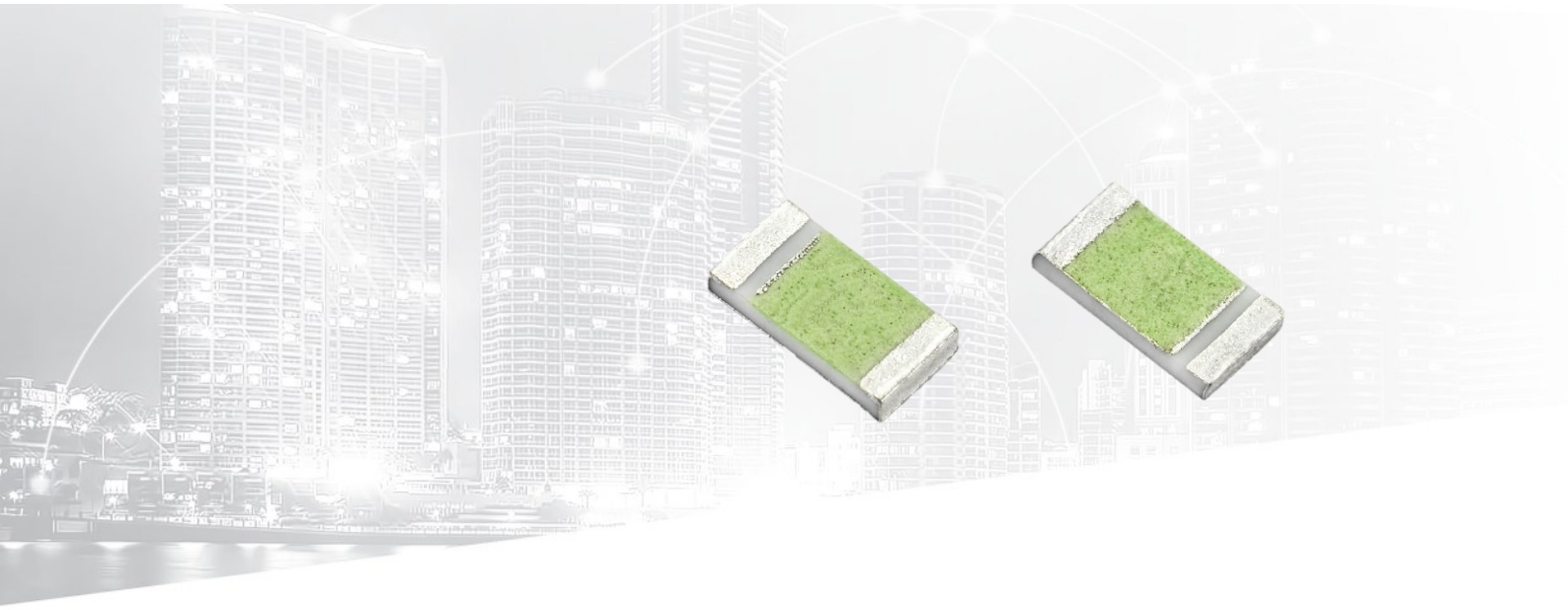
Ceramic Loop Antenna with GPS GLONASS Beidou

Features:

Covering:
- GPS L1/Galileo E1
- BeiDou B1I
- GLONASS G1

Dimensions: 3.2mm x 1.6mm x 0.5mm
Low profile Ceramic Loop antenna
Omnidirectional
CE Certified
RoHS and REACH Compliant

1. Introduction



Taoglas have developed a unique ceramic miniature loop antenna series for GPS-GLONASS-Galileo-BeiDou applications. At 3.2*1.6*0.5mm, the Unifier GGBLA.01.A Loop antenna is a miniature edge mounted SMD antenna, designed for small space requirements. Typical applications are small sized automotive navigation or position tracking systems and hand-held devices when GNSS function is needed.
The radiation pattern is more omnidirectional than traditional patch antennas. The Unifier antenna series wide bandwidth allows high efficiency, stable reception on all three GPS, GLONASS and BeiDou bands from 1555MHz to 1602MHz.

Efficiencies of 64% to 85% are achievable. Peak gain of 3.3dBi places this antenna gain performance within the range of a much larger 15mm to 18mm patch antennas.
Based on the loop effect this antenna works best when placed on the center of the edge of the board, but can still work better than traditional linear polarized chip antennas even when placed at corners as substitute.

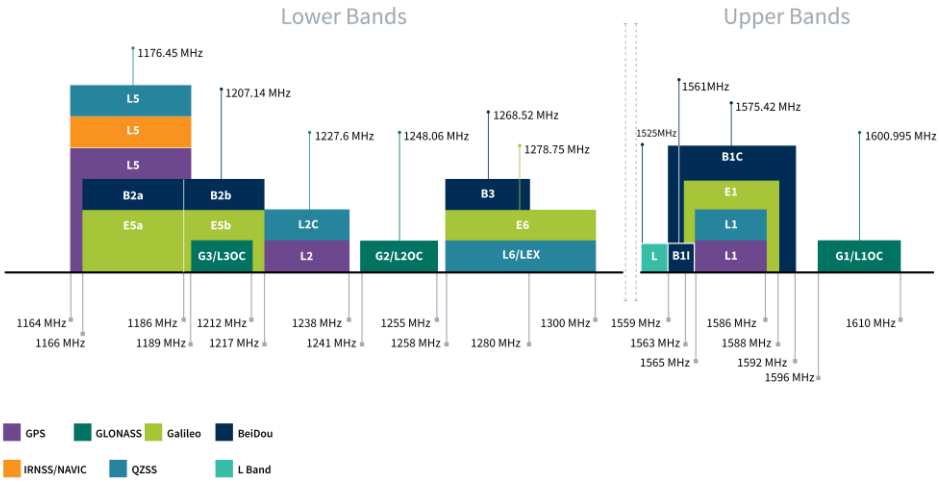
The Unifier GGBLA.01.A is delivered on tape and reel and now allows M2M customers to use an omnidirectional antenna in devices where orientation of the product is unknown. Like all small antennas, care must be taken to ensure the device ground-plane layout and antenna matching has been done correctly, Taoglas offers professional Gerber review, transmission line design, general integration support and final matching service of the GGBLA.01.A on your device board at our regional labs worldwide.

This antenna can be mounted with no performance degradation in either orientation as long as the antenna is soldered correctly via Surface mounting. Please see the integration instructions section for further detail regarding the optimum way to integrate this antenna into your device.

For further optimization to customer-specific device environments and for support to integrate and test this antennas performance in your device, contact your regional Taoglas Customer Services 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
	■	□	■	□	□



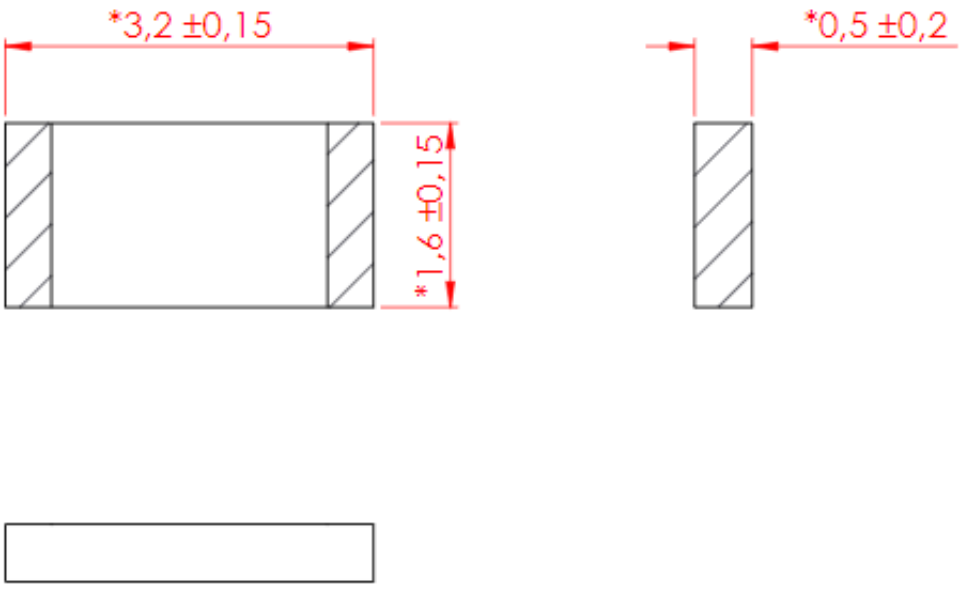
GNSS Bands and Constellations

GNSS Electrical			
Frequency (MHz)	**1561**	**1575.42**	**1603**
VSWR (max.)	2:1	2:1	2:1
Efficiency (%)	56.1	48.2	59.7
Peak Gain(dBi)	2.43	1.57	2.26
Average Gain (dB)	-2.51	-3.17	-2.24
Polarization	RHCP		
Impedance	50 Ω		
***Measured on a 80mm x 40mm Ground Plane**			

Mechanical	
Dimensions	3.2mm x 1.6mm x 0.5mm
Material	Ceramic

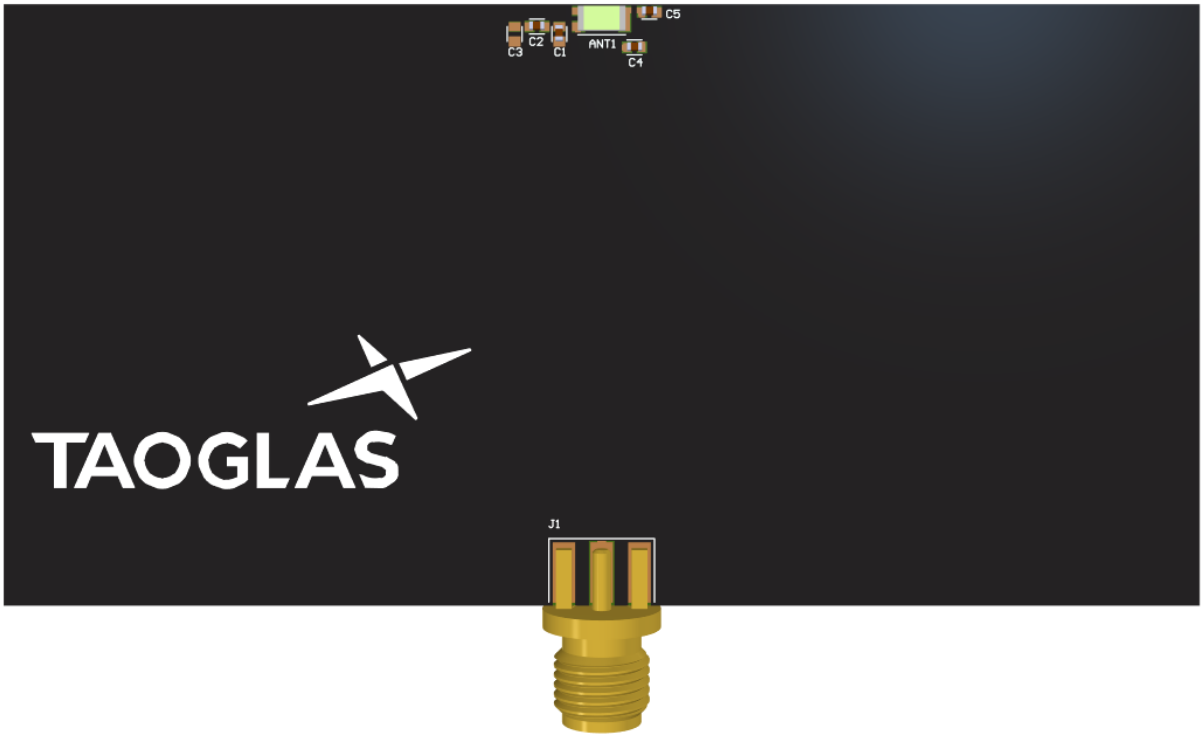
Environmental	
Operation Temperature	-40°C to 85°C
Storage Temperature	-40°C to 85°C
Humidity	20% to 70%
Moisture Sensitivity Level (MSL)	3 (168 Hours)

3. Mechanical Drawing



4. Antenna Integration Guide

The following is an example on how to integrate the GGBLA.01.A into a design. This antenna has 3 pins, where one pin is used for the RF Feed. Taoglas recommends using a minimum of 80x40mm ground plane (PCB) to ensure optimal performance.



Top view of PCB reference design.

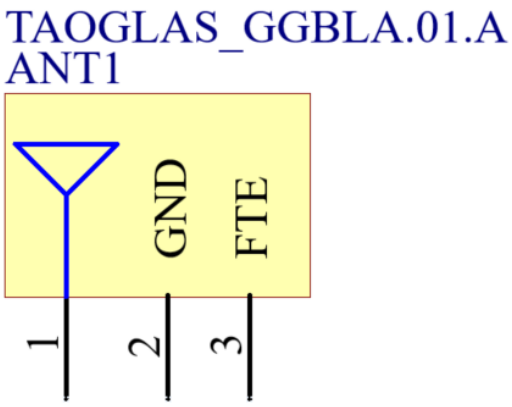
Please find the Integration files in Altium, 2D formats and the 3D model for the GGBLA.01.A here: https://www.taoglas.com/product/unifier-ggbla-01-gpsglonassbeidou-ceramic-loop-antenna-2/

4.1 Schematic and Symbol Definition

Above is a 3D model of the GGBLA.01.A on a PCB reference design.

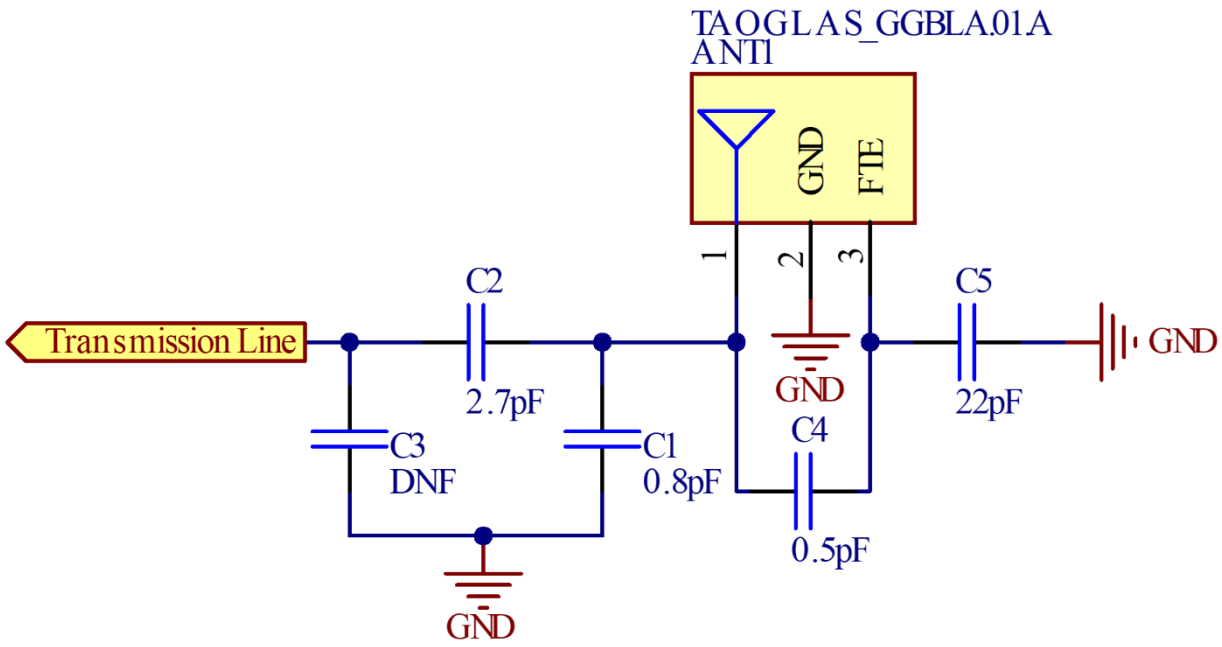
The circuit symbol for the GGBLA.01.A is shown below. The antenna has 3 pins as indicated below.

Pin	Description
1	RF Feed
2	Ground
3	Fine Tuning Element



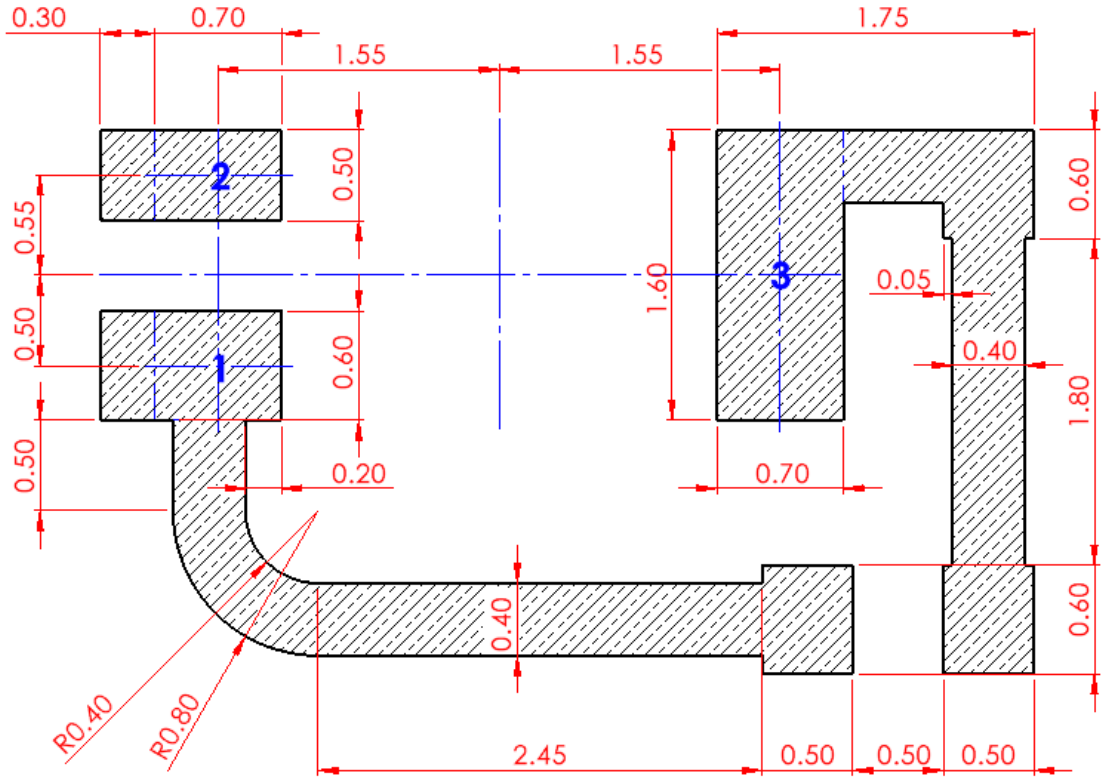
4.2 Schematic Layout

Matching components with the GGBLA.01.A are required for the antenna to have optimal performance in the spaces specified in the schematic below. Additional matching components may be necessary for your device, Taoglas recommends incorporating extra component footprints, forming a “Pi” network, for the GGBLA.01.A.



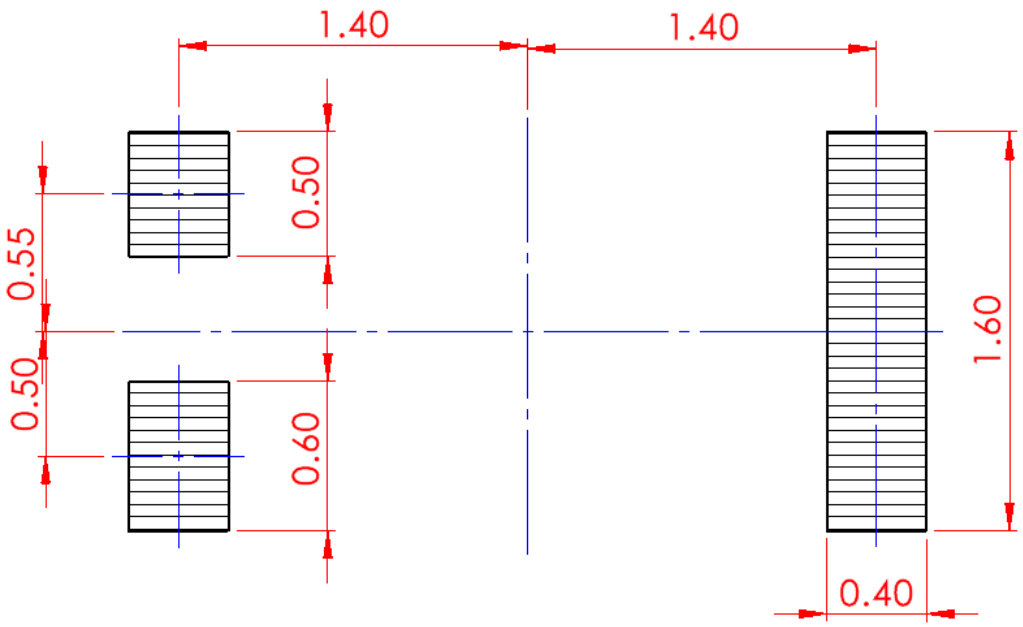
Designator	Type	Value	Manufacturer	Manufacturer Part Number
C1	Capacitor	0.8pF	Murata	GCQ1555C1HR80CB01D
C2	Capacitor	2.7pF	Murata	GRM1555C1H2R7CA01D
C3	Capacitor	Not Fitted	-	-
C4	Capacitor	0.5pF	Murata	GRM1555C1HR50WA01D
C5	Capacitor	22pF	Murata	GRM1555C1H220JA01D

4.3 Antenna Footprint

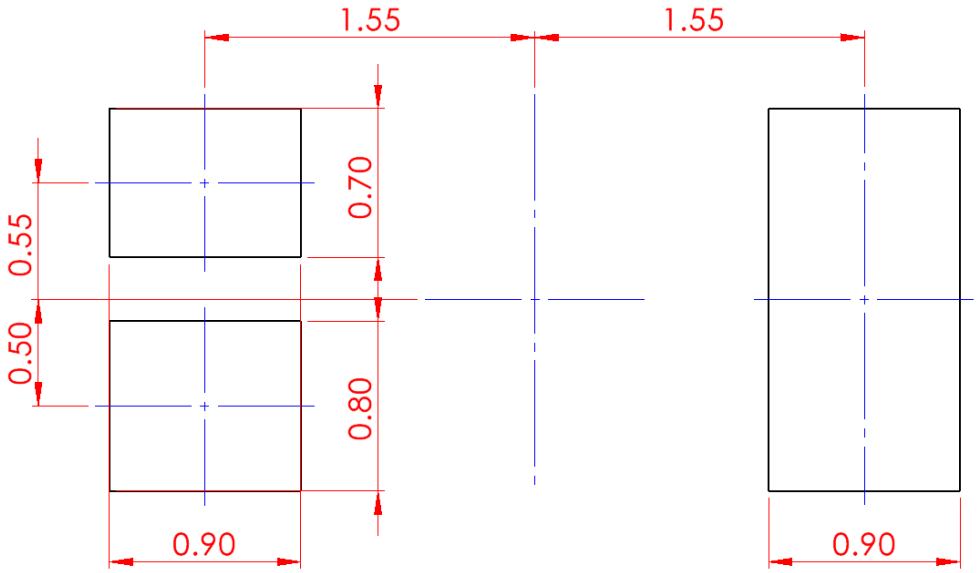


Pin	Description
1	RF Feed
2	Ground
3	Fine Tuning Element

4.4 Top Solder Mask



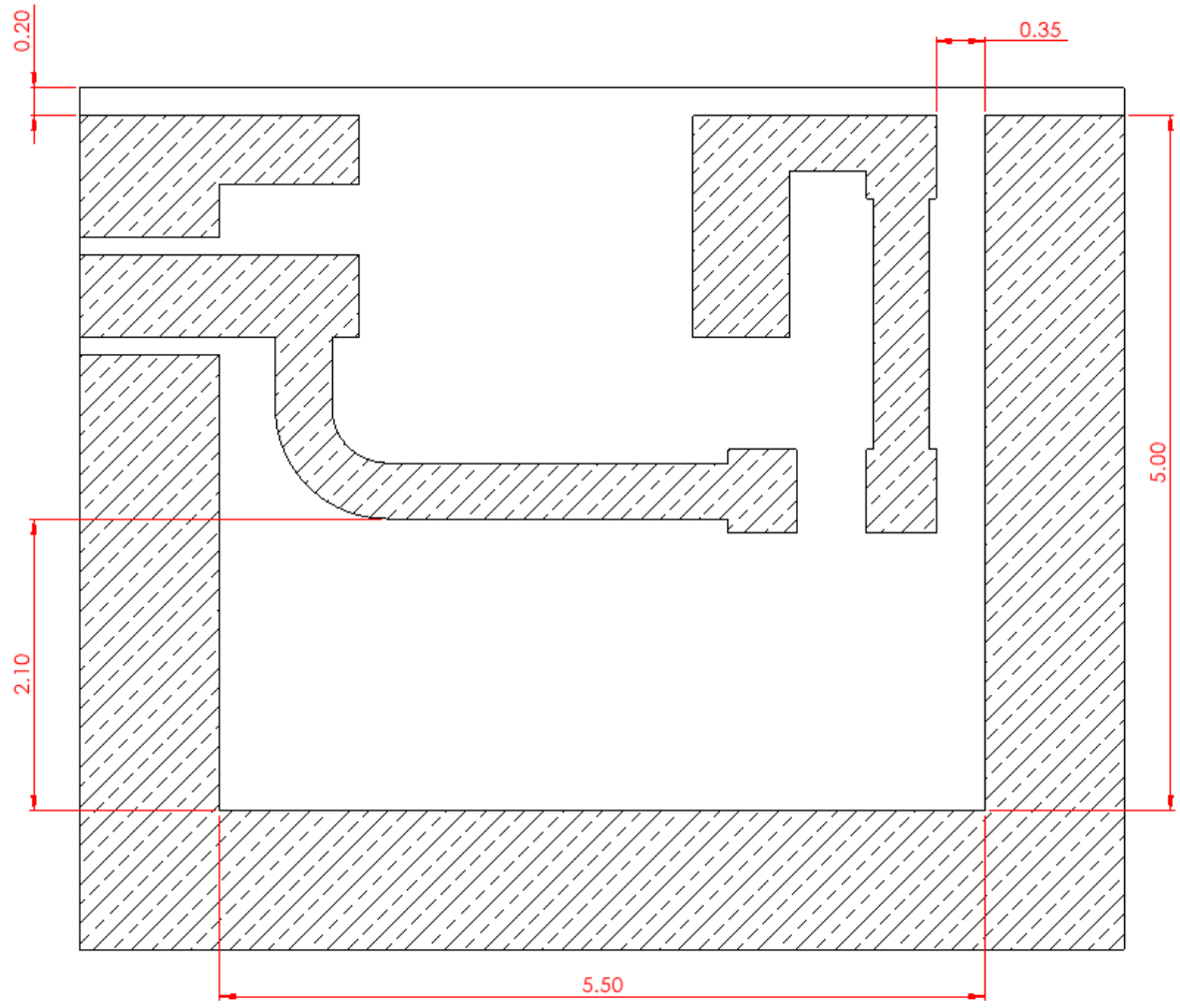
4.5 Top Solder Paste



4.6 Copper Clearance

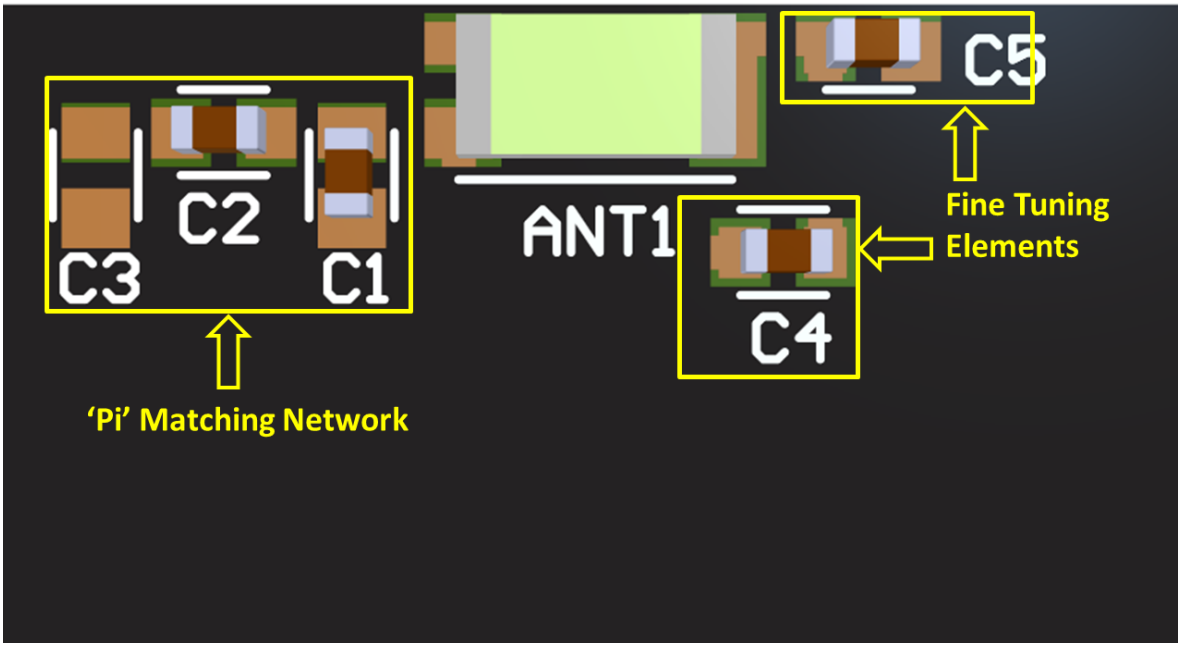
The footprint and clearance on the PCB must comply with the antenna's specification. The PCB layout shown in the diagrams below demonstrates the GGBLA.01.A clearance area. The copper keep out area applies to all layers that are below the GGBLA.01.A.

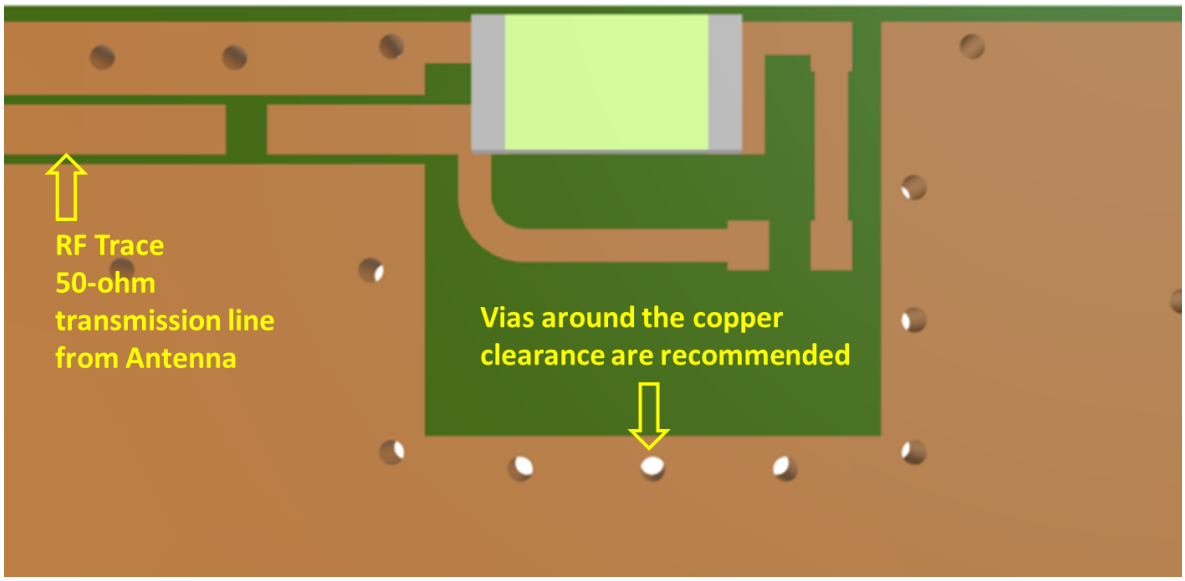
There should be a copper clearance area of 5mm in length and 5.5mm in width around the antenna. The PCB Edge Clearance should be a minimum of 0.2mm.



4.7 Antenna Integration

The GGBLA.01.A should be placed in the centre, as close to the edge on the long side of the PCB as possible, to take advantage of the ground plane. The RF trace must maintain a 50 Ohm transmission line. A “Pi” Matching Network is recommended for the RF transmission line as well, the values and components for the matching circuit will depend on the tuning needed. Ground vias should be placed around the copper clearance area.

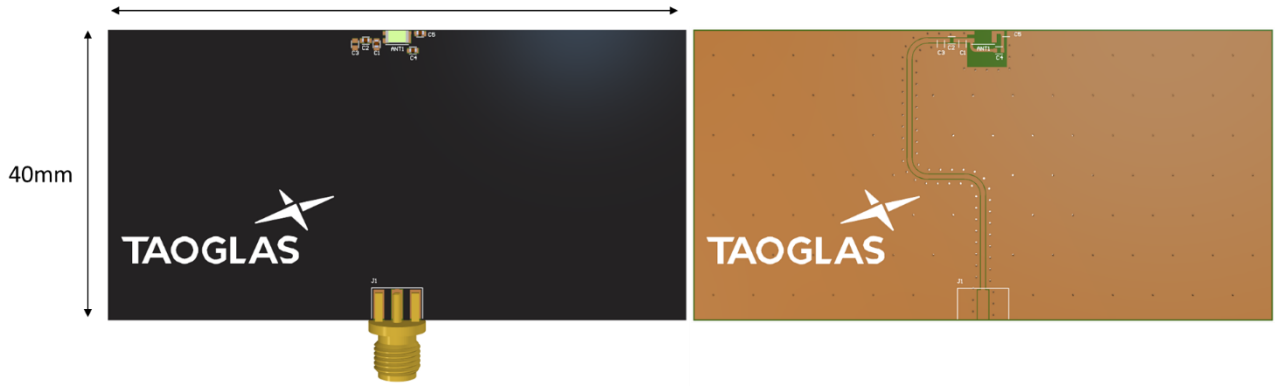




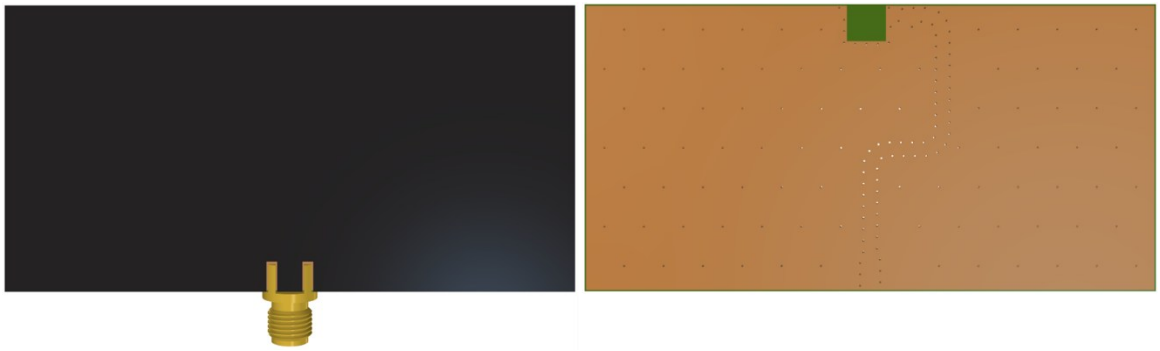
GGBLA.01.A antenna mounted on a PCB reference design, showing transmission lines and integration notes.

4.8 Final Integarion

The top side image shown below highlights the antenna transmission line. Taoglas recommends using a minimum of 80x40mm ground plane (PCB) to ensure optimal performance.



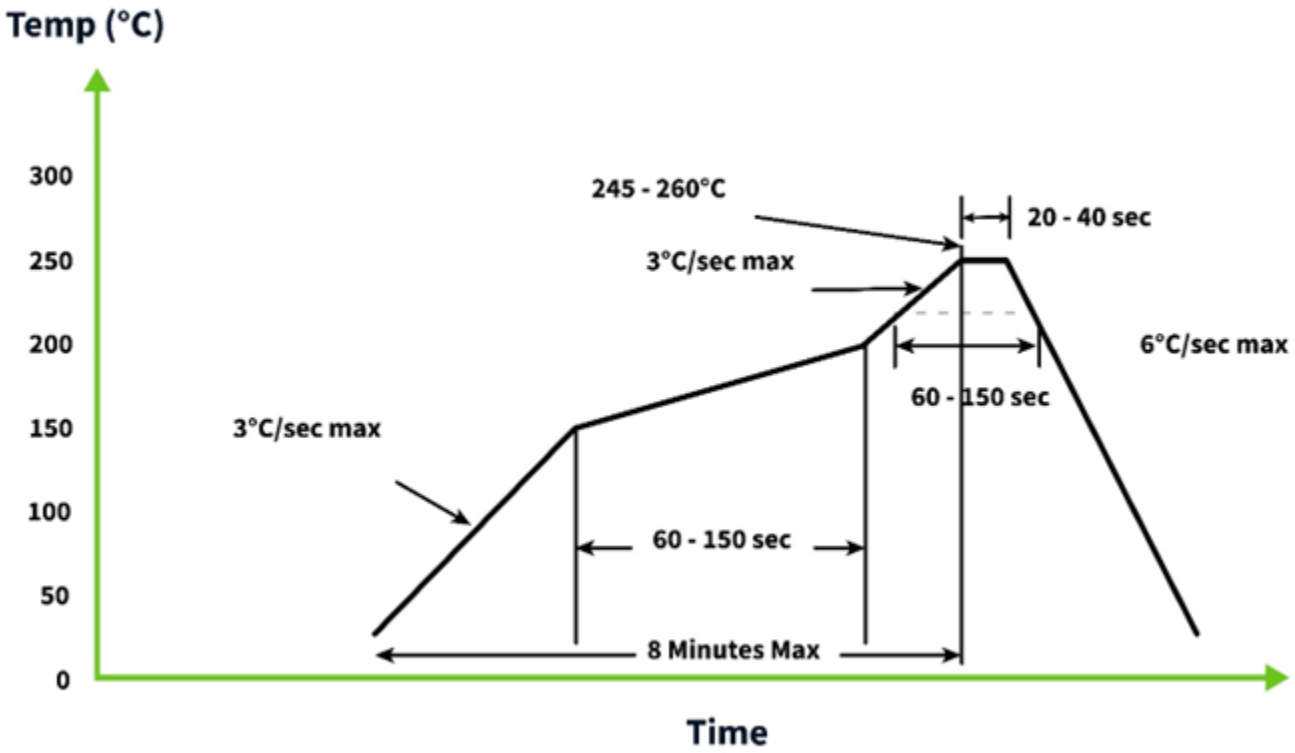
Top Side (GGBLA.01.A placement on 80x40mm PCB reference design)



Bottom Side

5. Solder Reflow Profile

The GGBLA.01.A can be assembled by following the recommended soldering temperatures are as follows:



*Temperatures listed within a tolerance of +/- 10º C

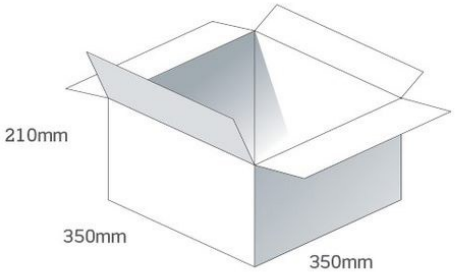
Smaller components are typically mounted on the first pass, however, we do advise mounting the GGBLA.01.A when placing larger components on the board during subsequent reflows.

Note: Soldering flux classified ROL0 under IPC J-STD-004 is recommended.

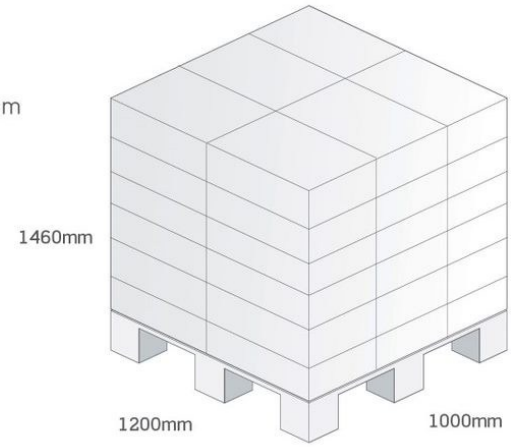
6. Packaging

6000 pc GGBLA.01.A per reel
Dimensions - Ø330*20mm
Weight - 700g

9 Reels / 54000 pcs in one carton
Carton Dimensions - 350*350*210mm
Weight - 5.6Kg



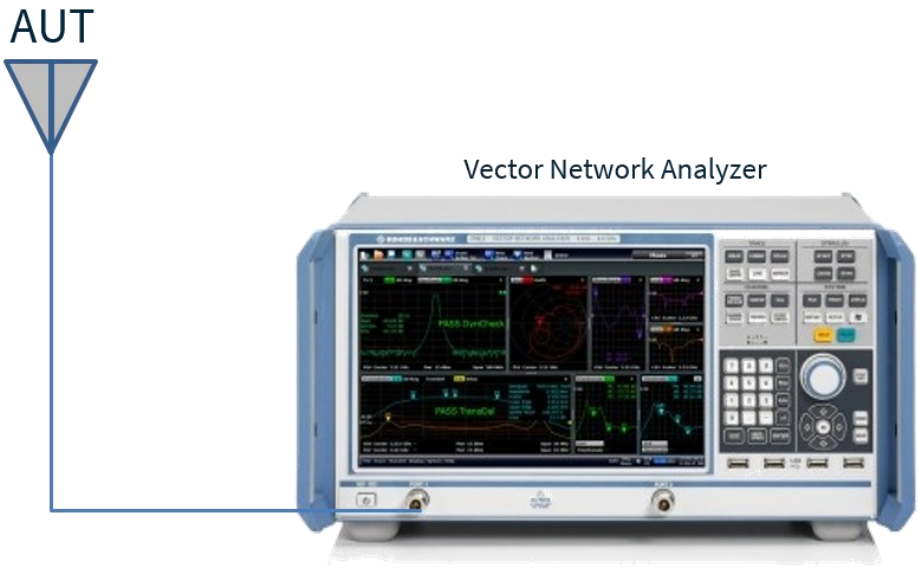
Pallet Dimensions 1200mm*1000mm*1460mm
36 Cartons per pallet
6 Cartons per layer
6 Layers

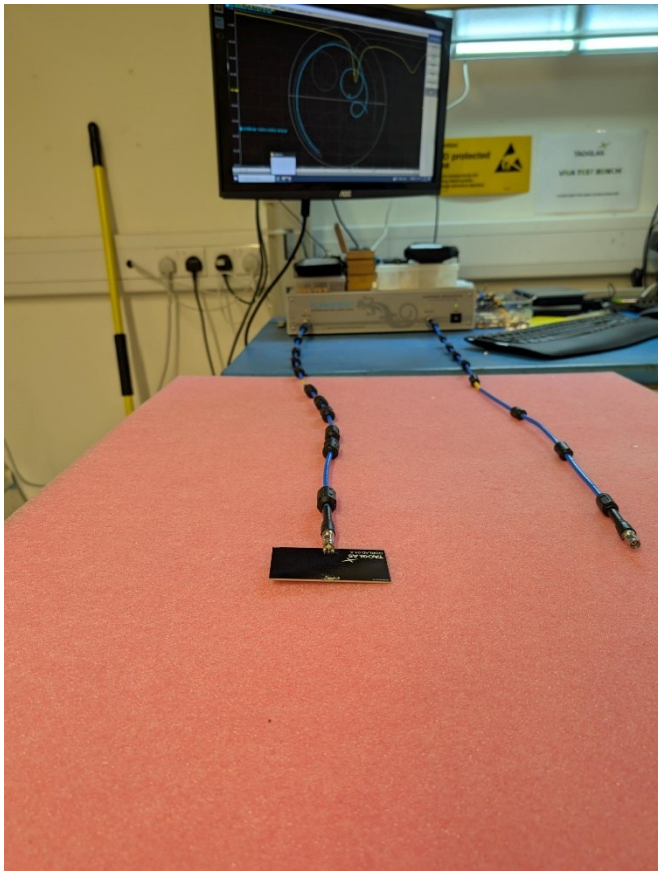


...

7. Antenna Characteristics

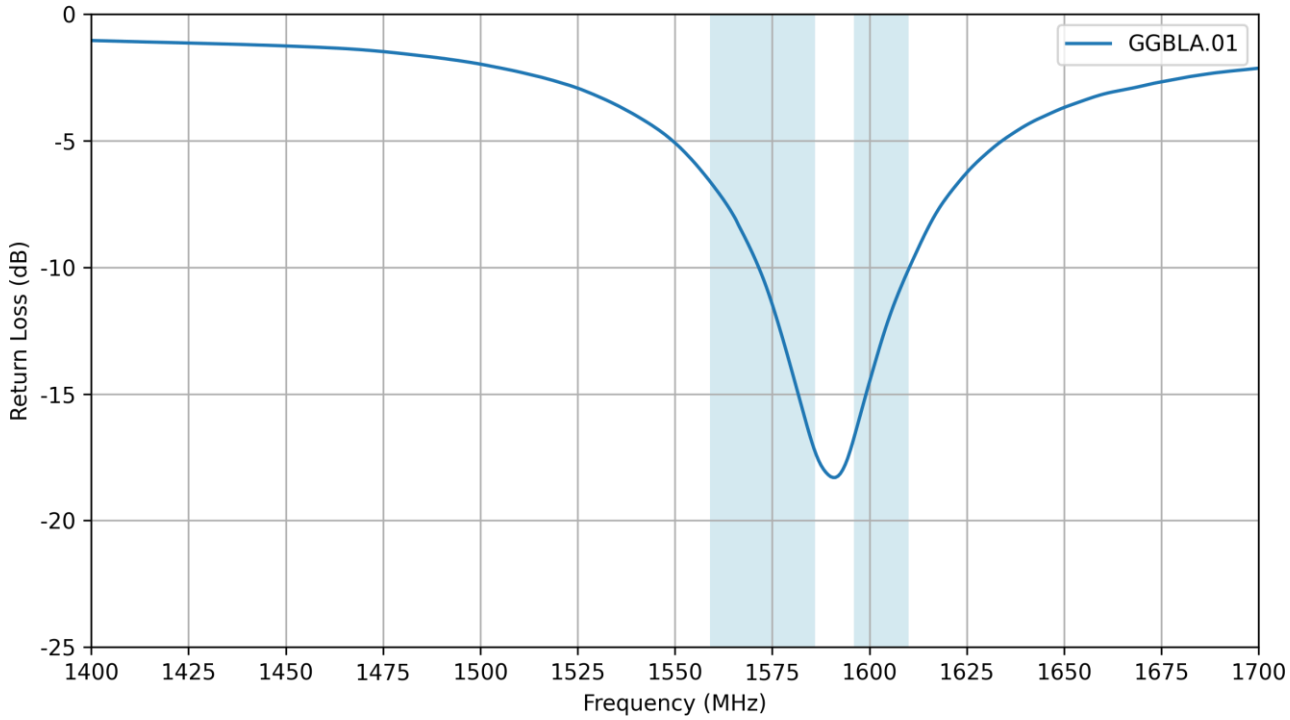
7.1 Test Setup



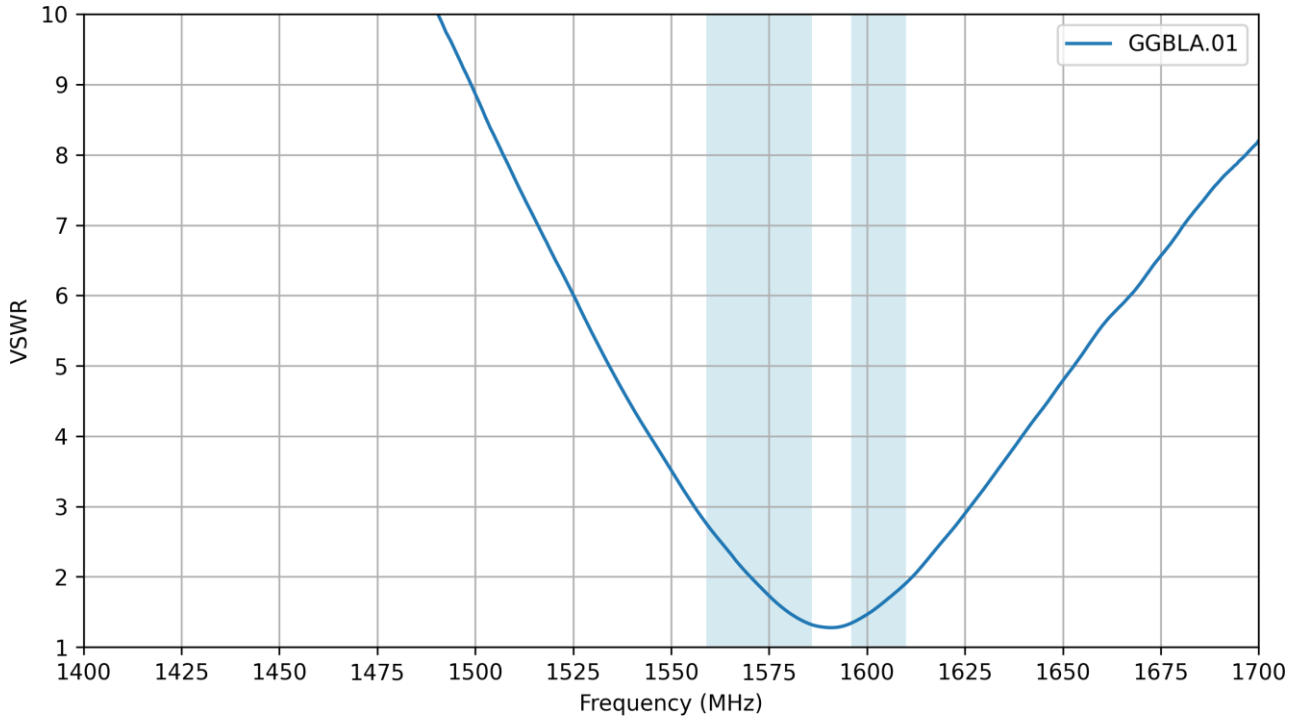


VNA Test Set-up

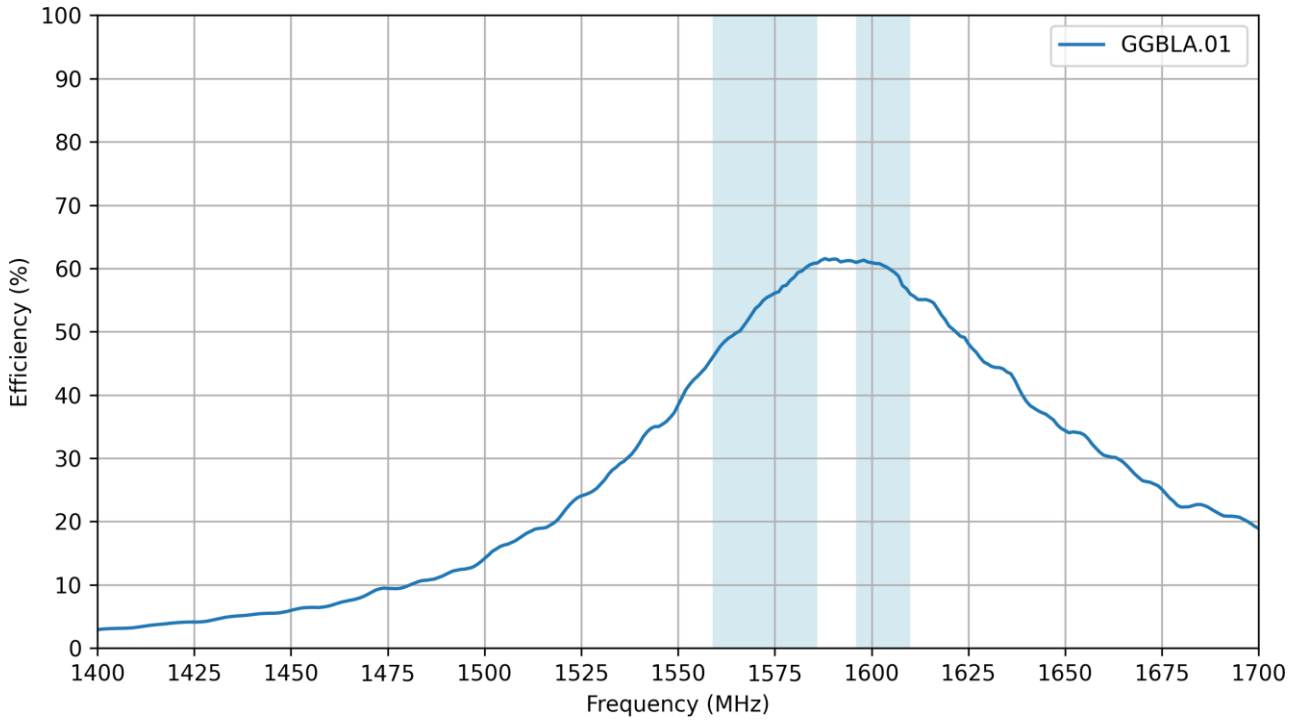
7.2 Return Loss



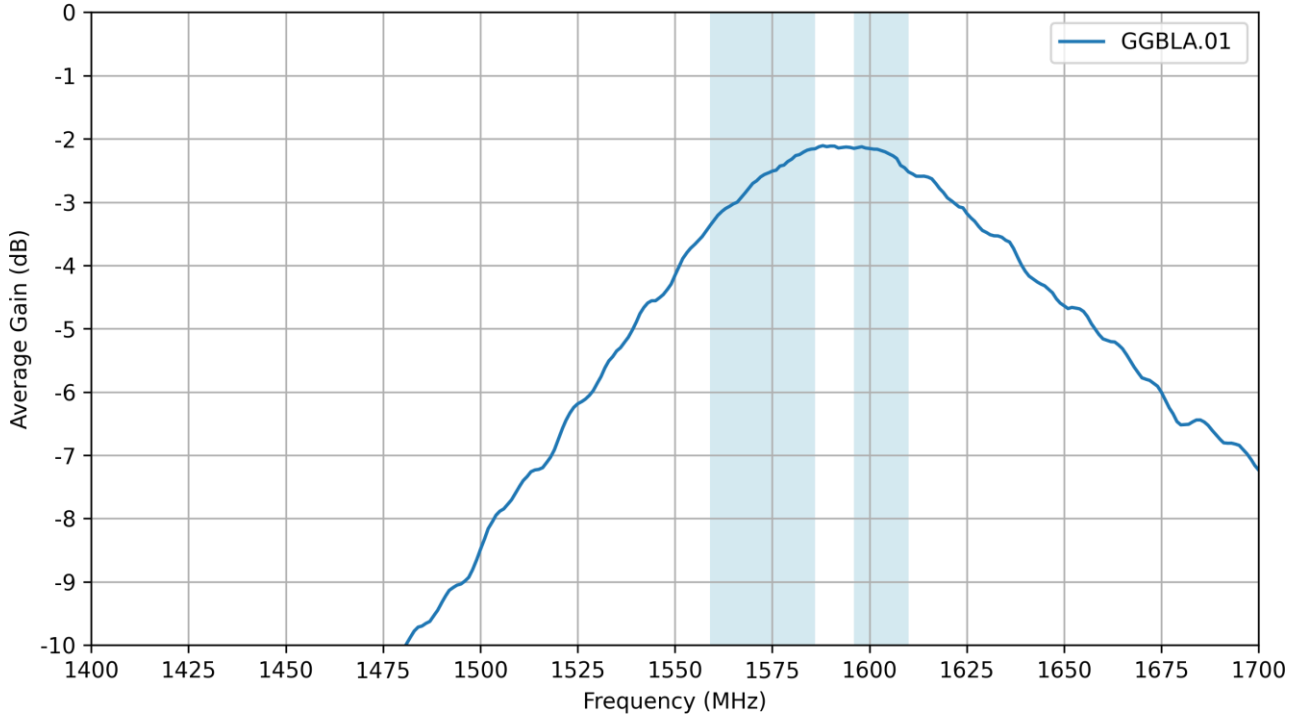
7.3 VSWR



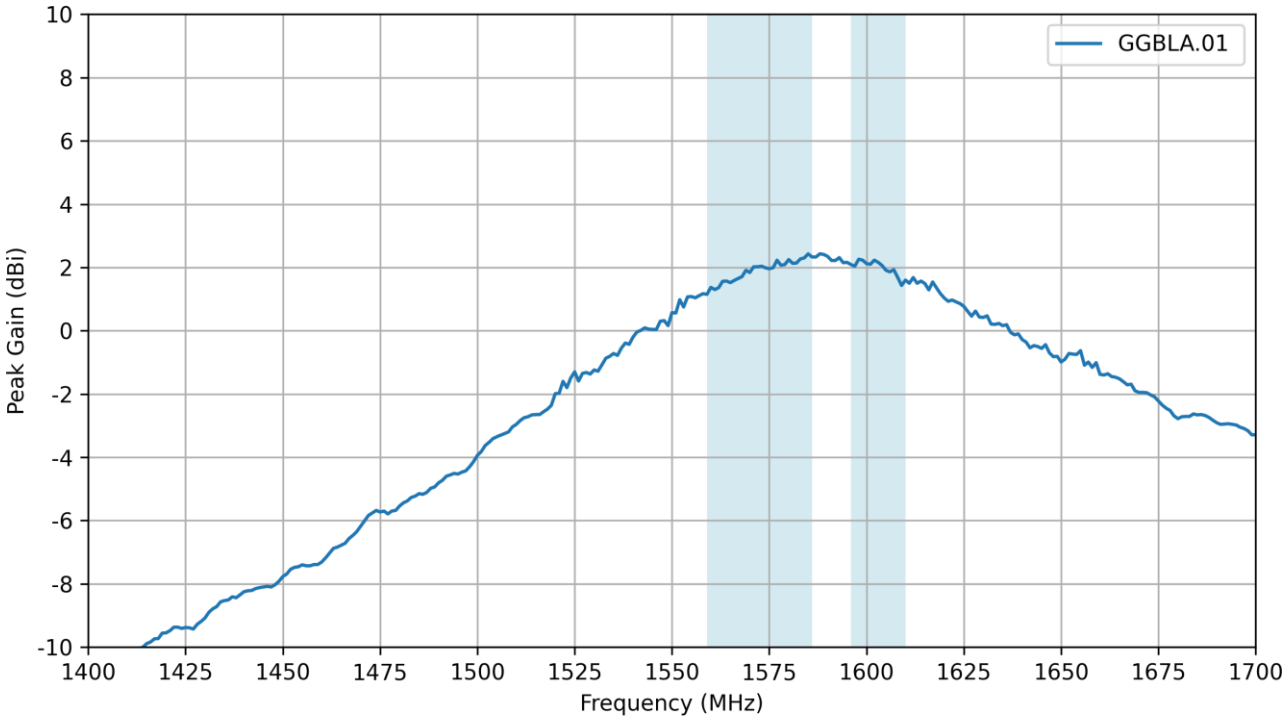
7.4 Efficiency



7.5 Average Gain

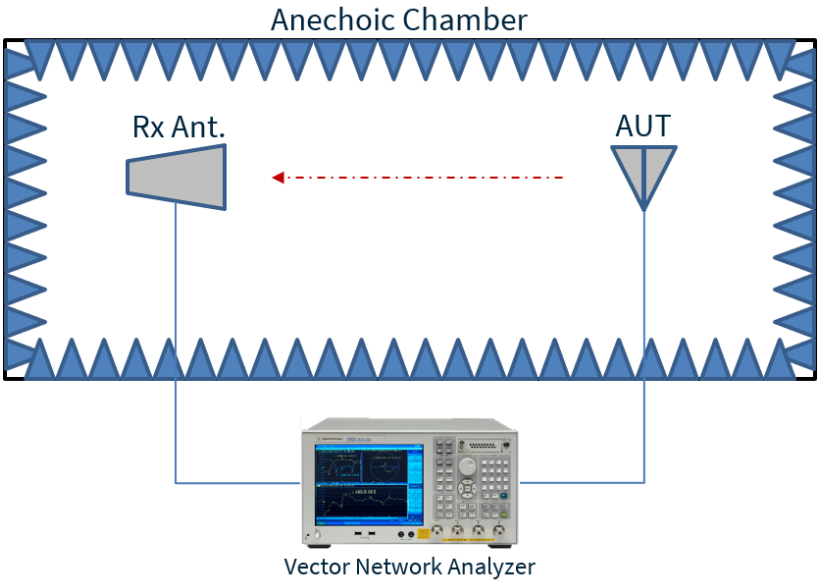


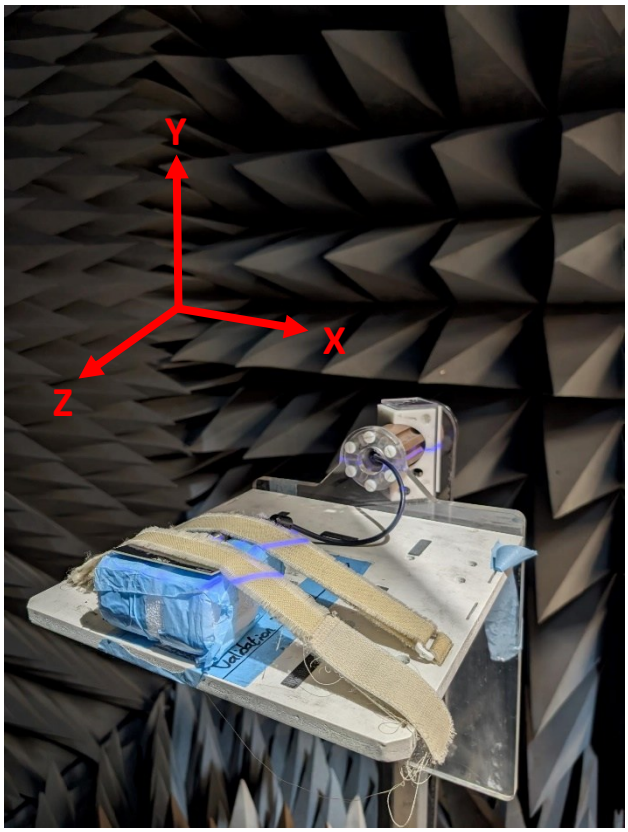
7.6 Peak Gain


GGBLA.01
Peak Gain (dBi)
Frequency (MHz)
10
8
6
4
2
0
-2
-4
-6
-8
-10
1400
1425
1450
1475
1500
1525
1550
1575
1600
1625
1650
1675
1700

8. Radiation Patterns

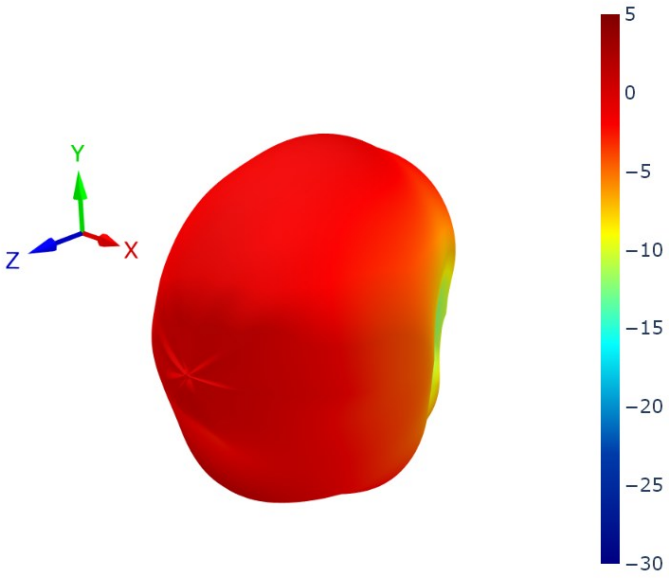
8.1 Test Setup



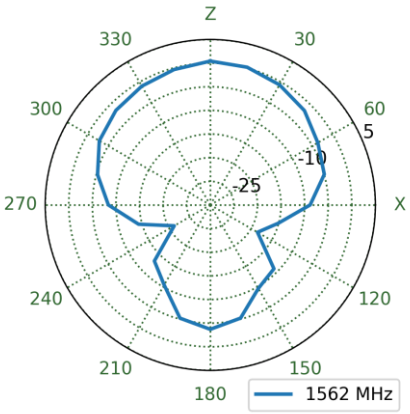


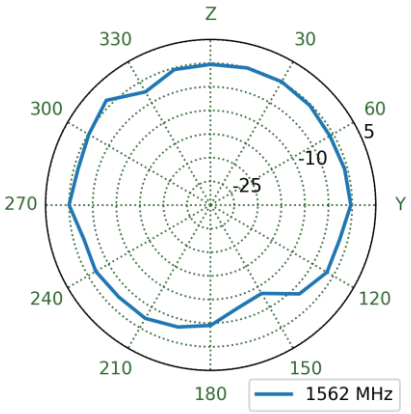
Chamber Test Set-up

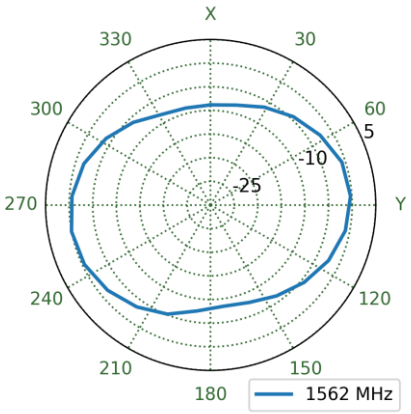
8.2 Patterns at 1562 MHz



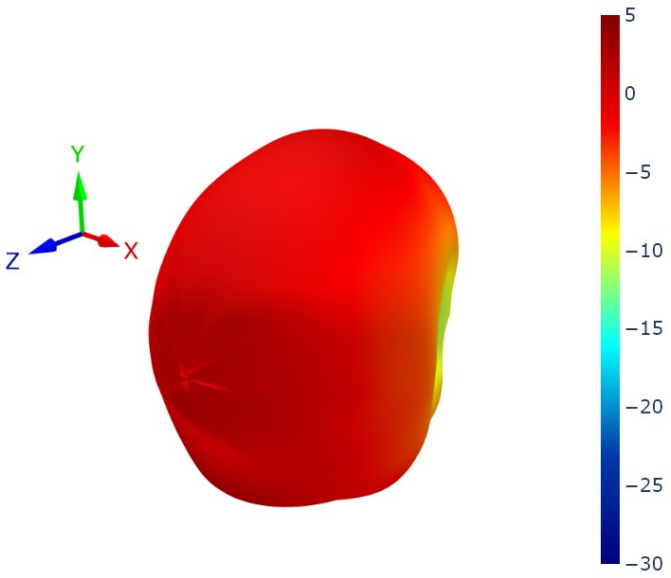
XZ Plane	YZ Plane	XY Plane

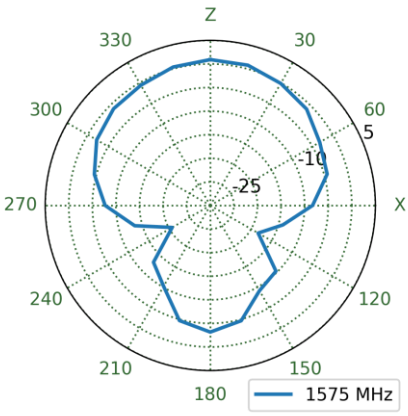
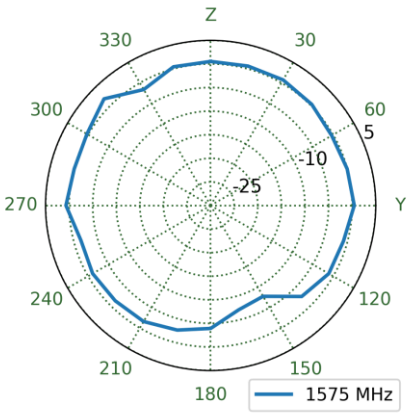
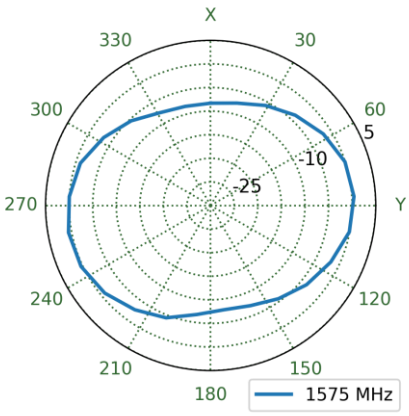




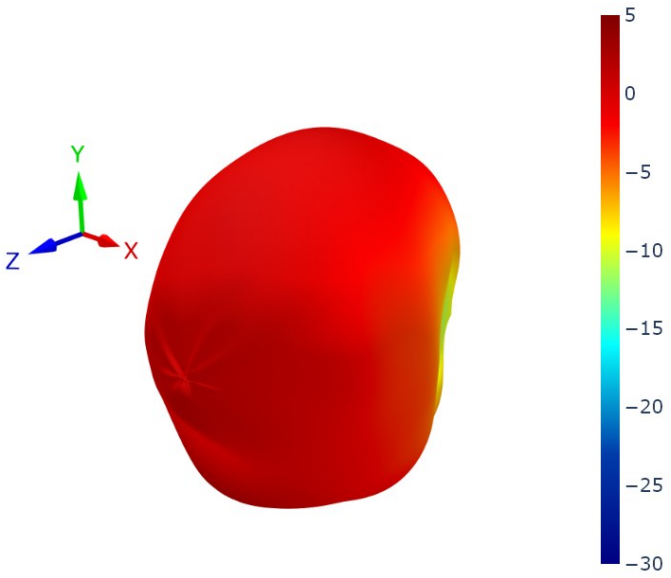


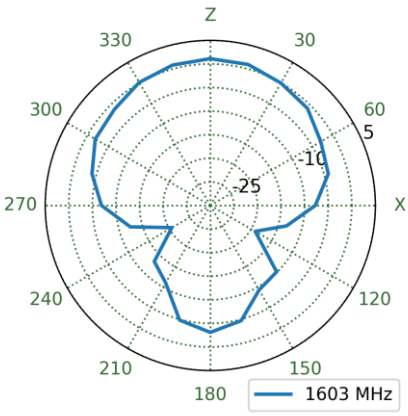
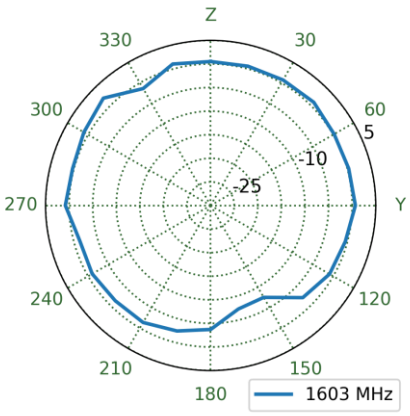
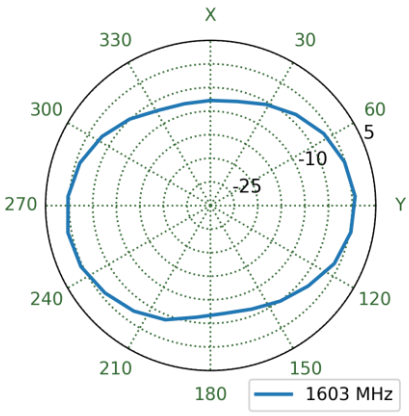
8.3 Patterns at 1575 MHz



XZ Plane	YZ Plane	XY Plane
		

8.4 Patterns at 1603 MHz

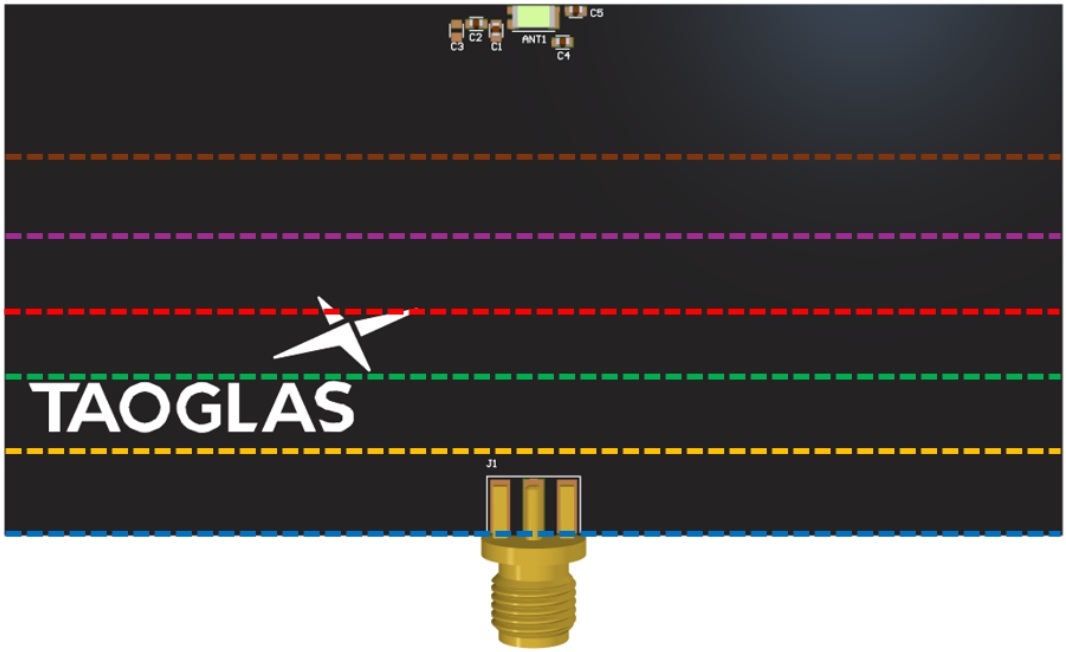


XZ Plane	YZ Plane	XY Plane
		

9. Application Note

9.1 Ground Plane Size Evaluation – Short Side

The influence of the long side of the ground plane, while the short side is constantly 40mm, is evaluated following the methodology presented below. The following lengths are tested: 40mm, 35mm, 30mm, 25mm, 20mm and 15mm. There was no change to the matching components on the PCB. Please refer to section 7.2.



Short Side Evaluation Methodology

80mm x 15mm

80mm x 20mm

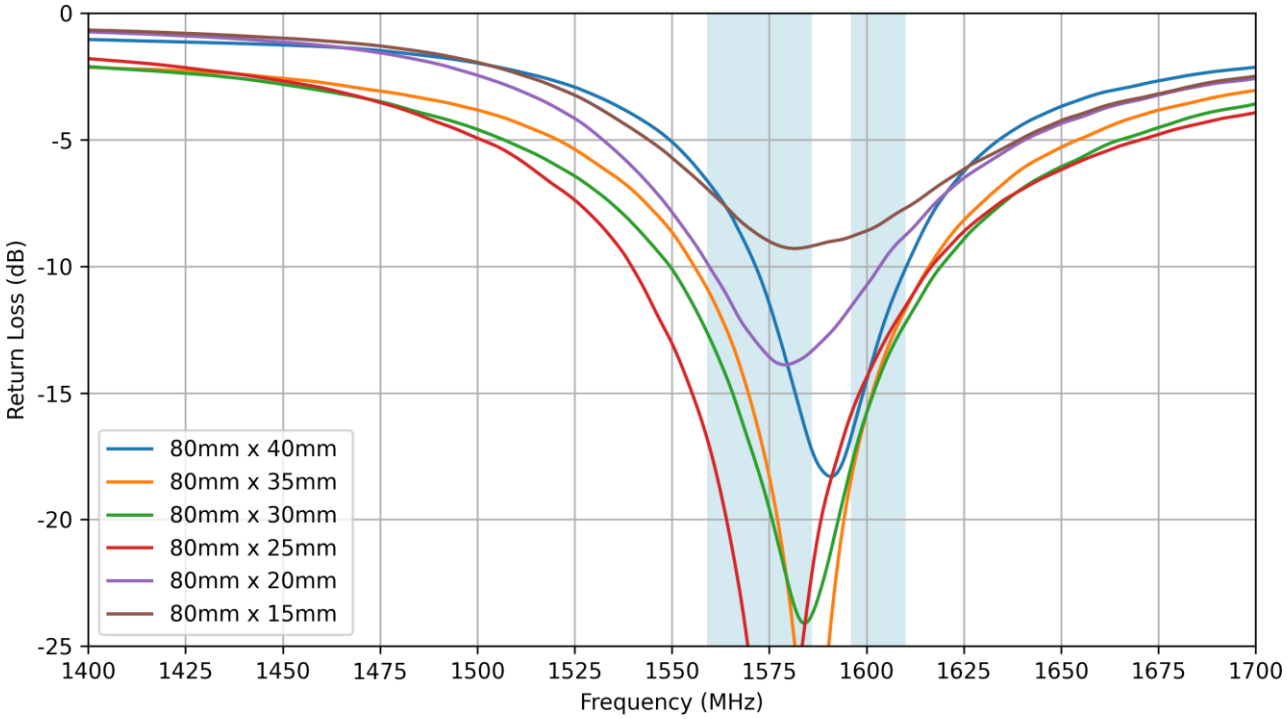
80mm x 25mm

80mm x 30mm

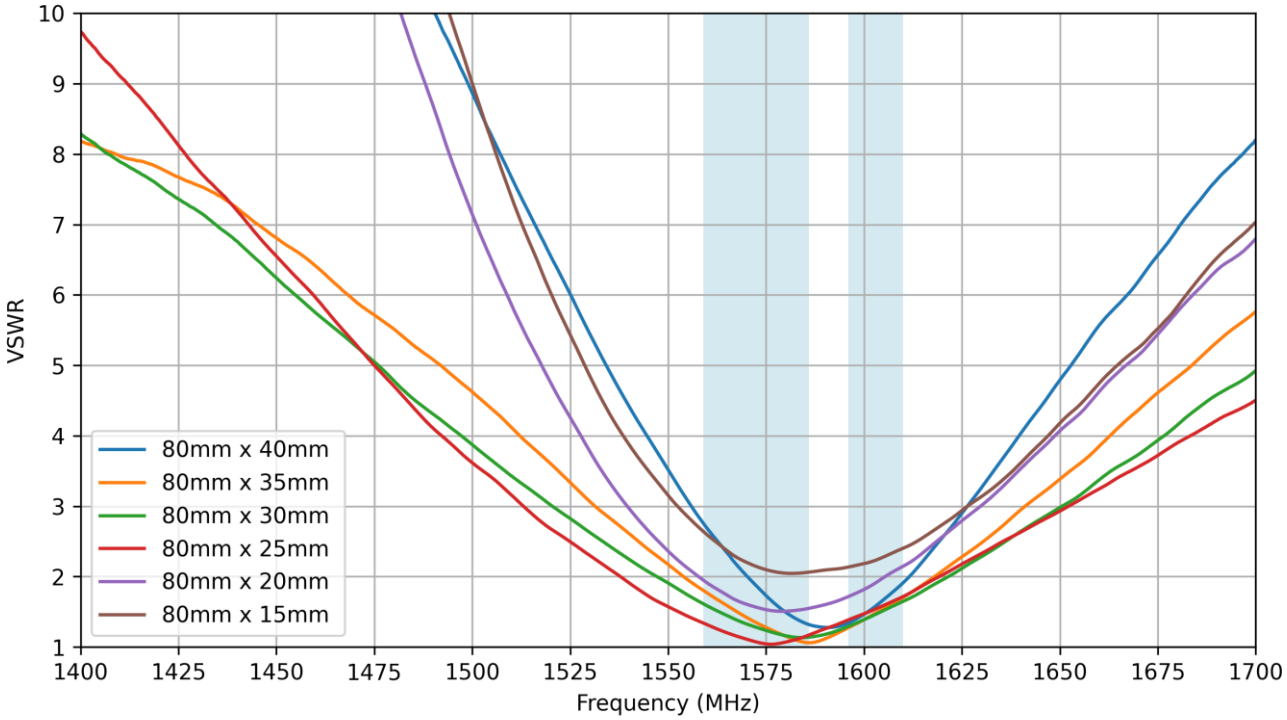
80mm x 35mm

80mm x 40mm

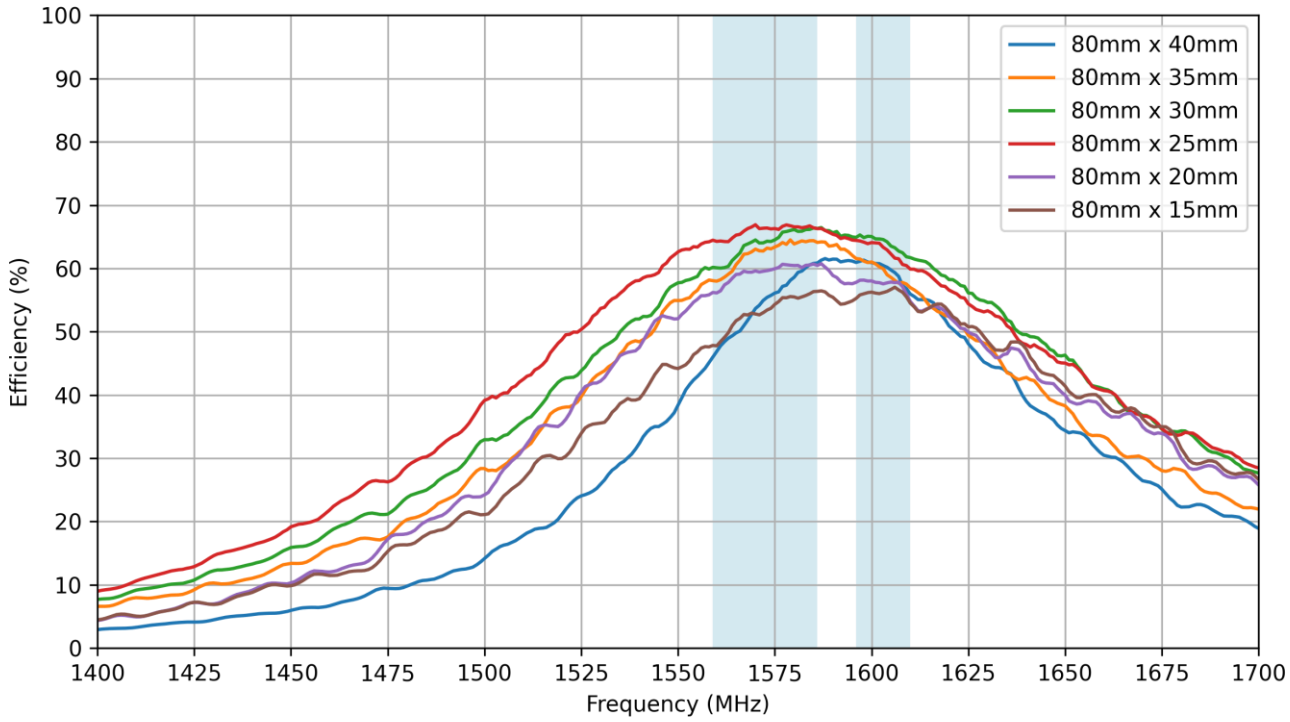
9.2 Return Loss



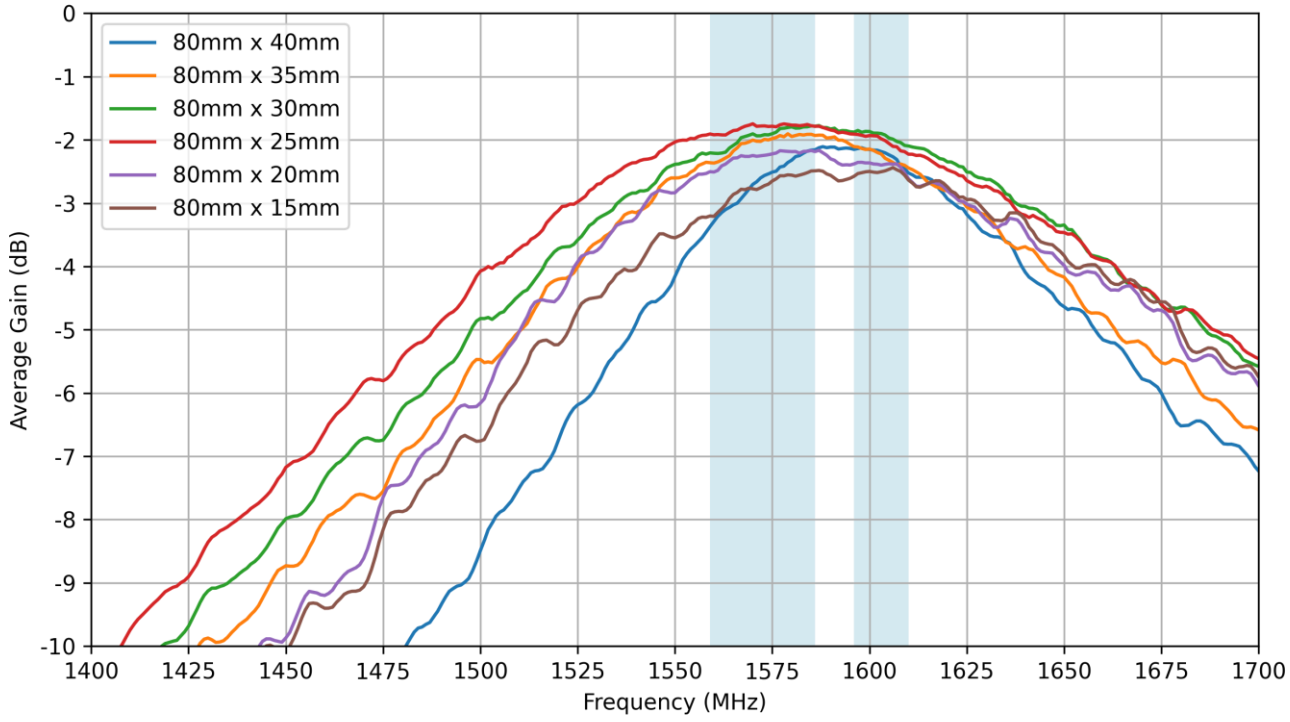
9.3 VSWR



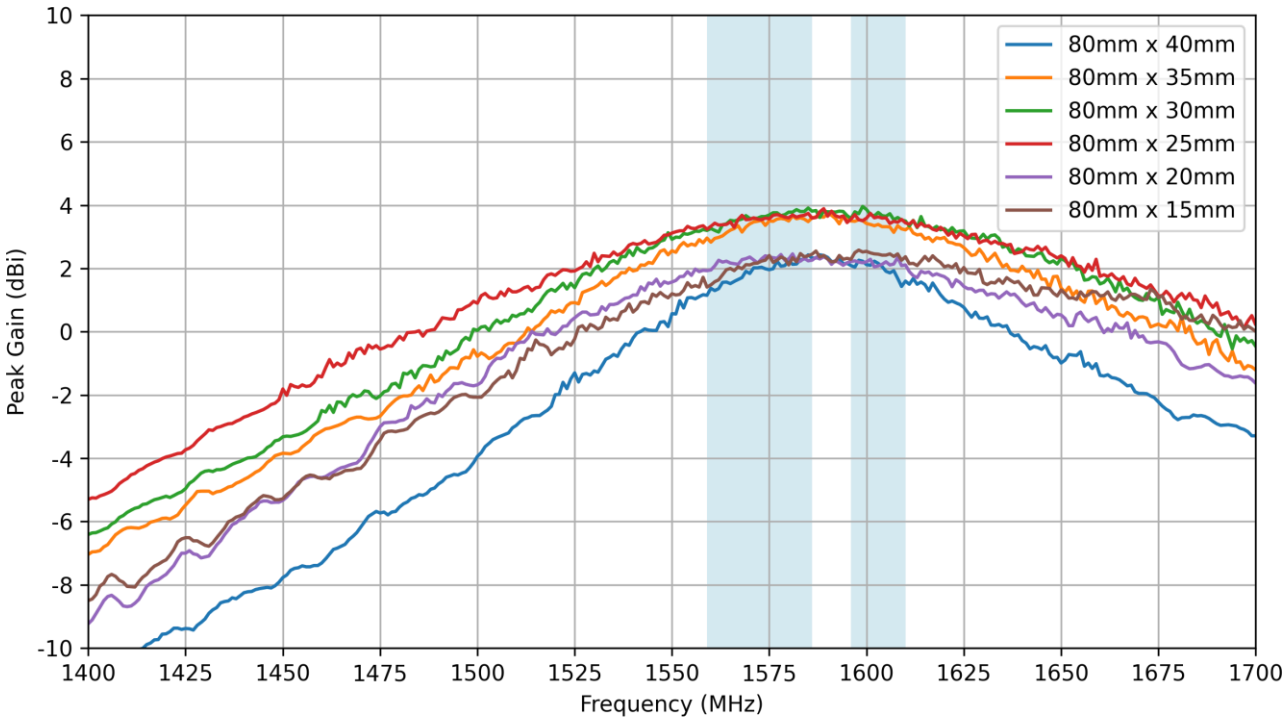
9.4 Efficiency



9.5 Average Gain

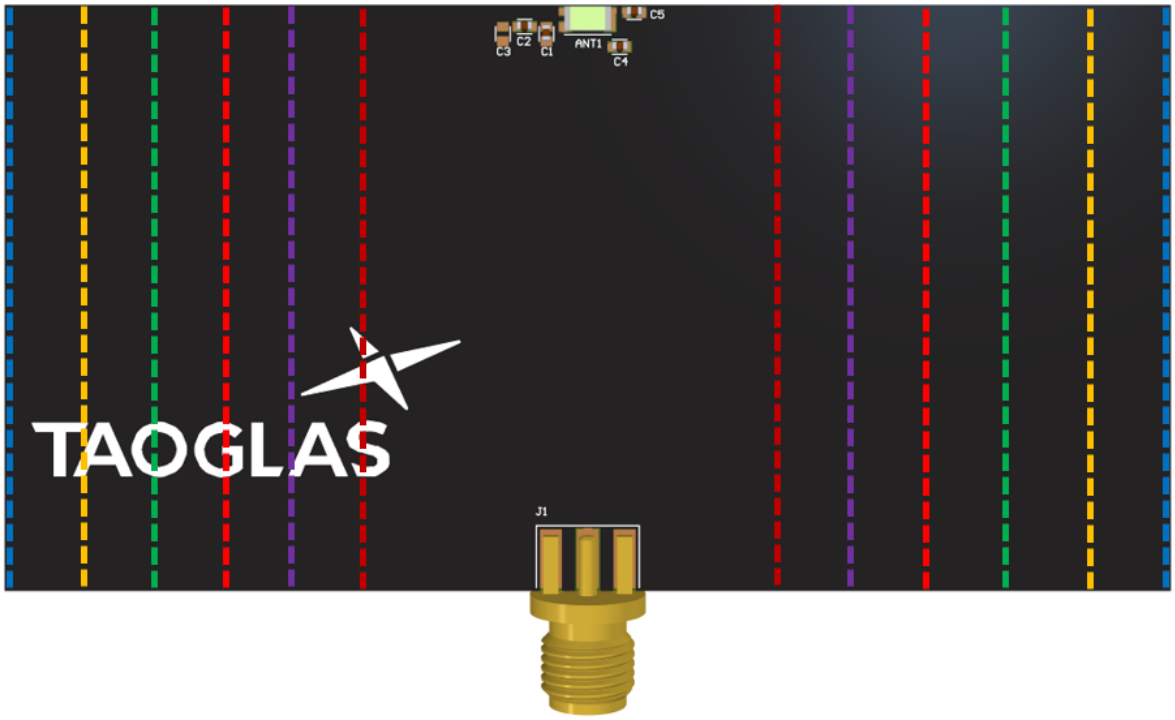


9.6 Peak Gain


80mm x 40mm
80mm x 35mm
80mm x 30mm
80mm x 25mm
80mm x 20mm
80mm x 15mm
Peak Gain (dBi)
Frequency (MHz)
10
8
6
4
2
0
-2
-4
-6
-8
-10
1400
1425
1450
1475
1500
1525
1550
1575
1600
1625
1650
1675
1700

9.7 Ground Plane Size Evaluation – Long Side

The influence of the long side of the ground plane, while the short side is constantly 40mm, is evaluated following the methodology presented below. The following widths are tested: 80mm, 70mm, 60mm, 50mm, 40mm and 30mm. There was no change to the matching components on the PCB. Please refer to section



Long Side Evaluation Methodology

30mm x 40mm

40mm x 40mm

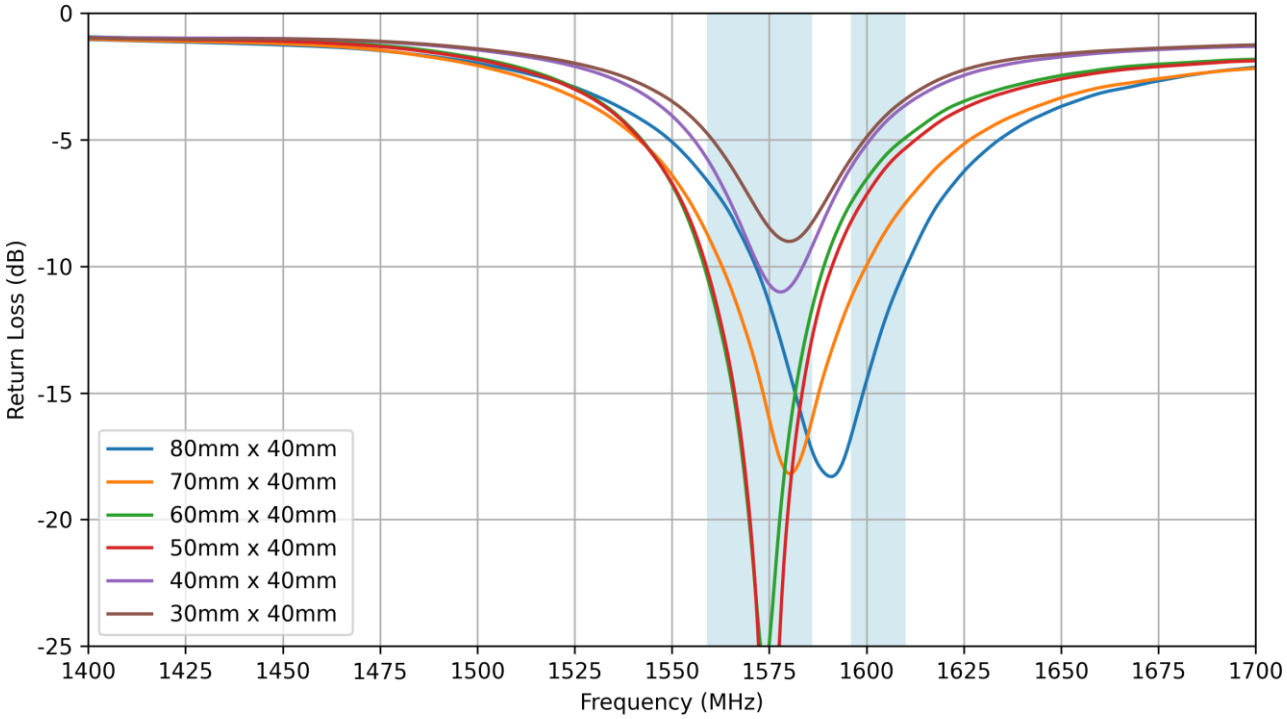
50mm x 40mm

60mm x 40mm

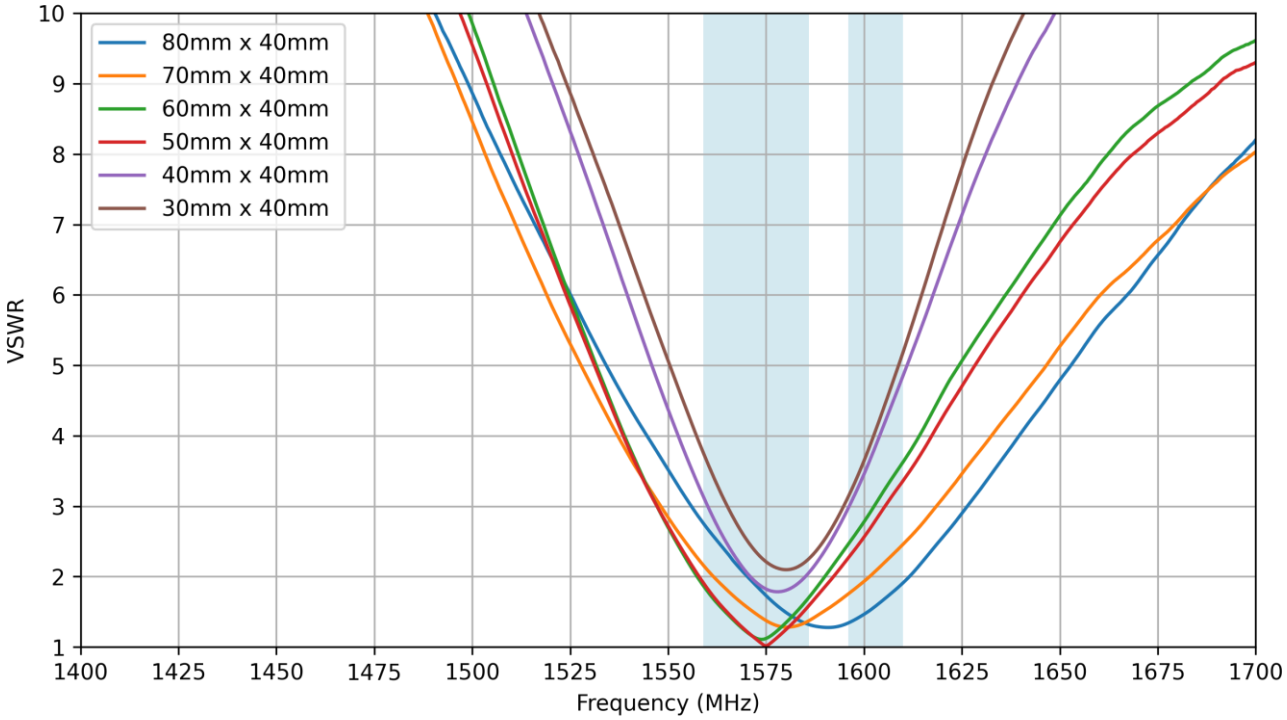
70mm x 40mm

80mm x 40mm

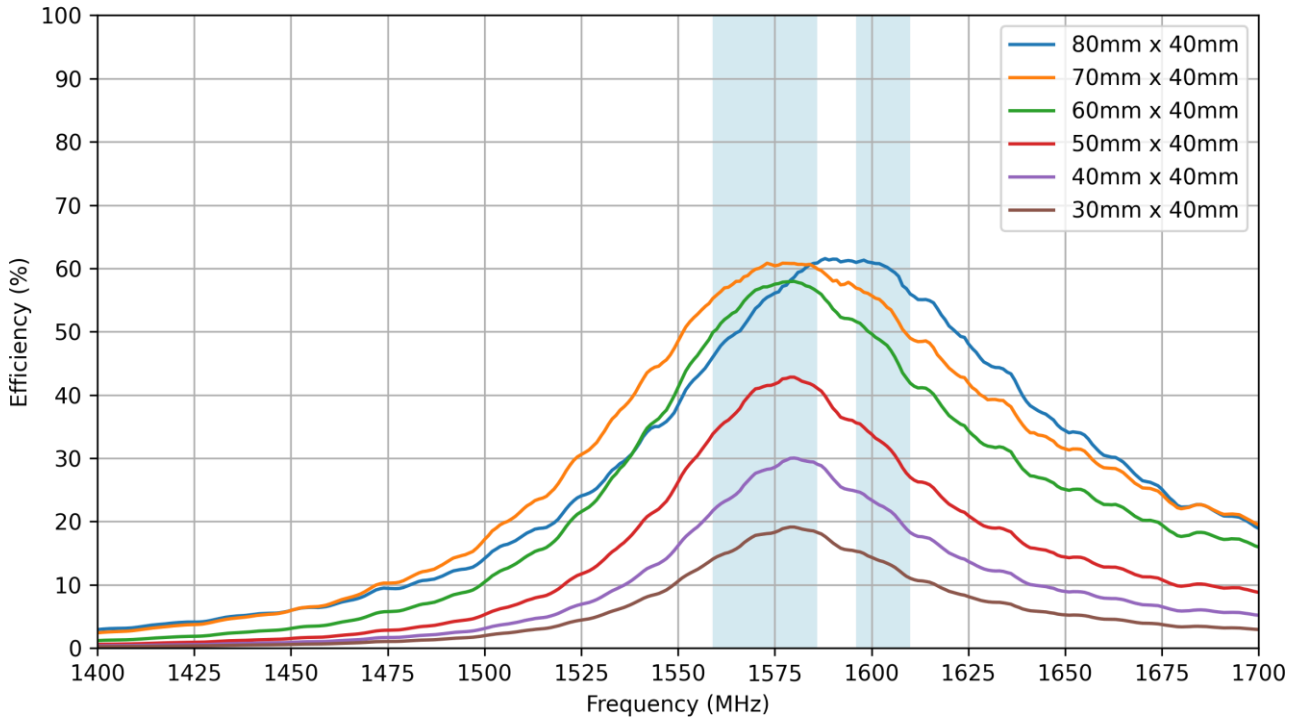
9.8 Return Loss



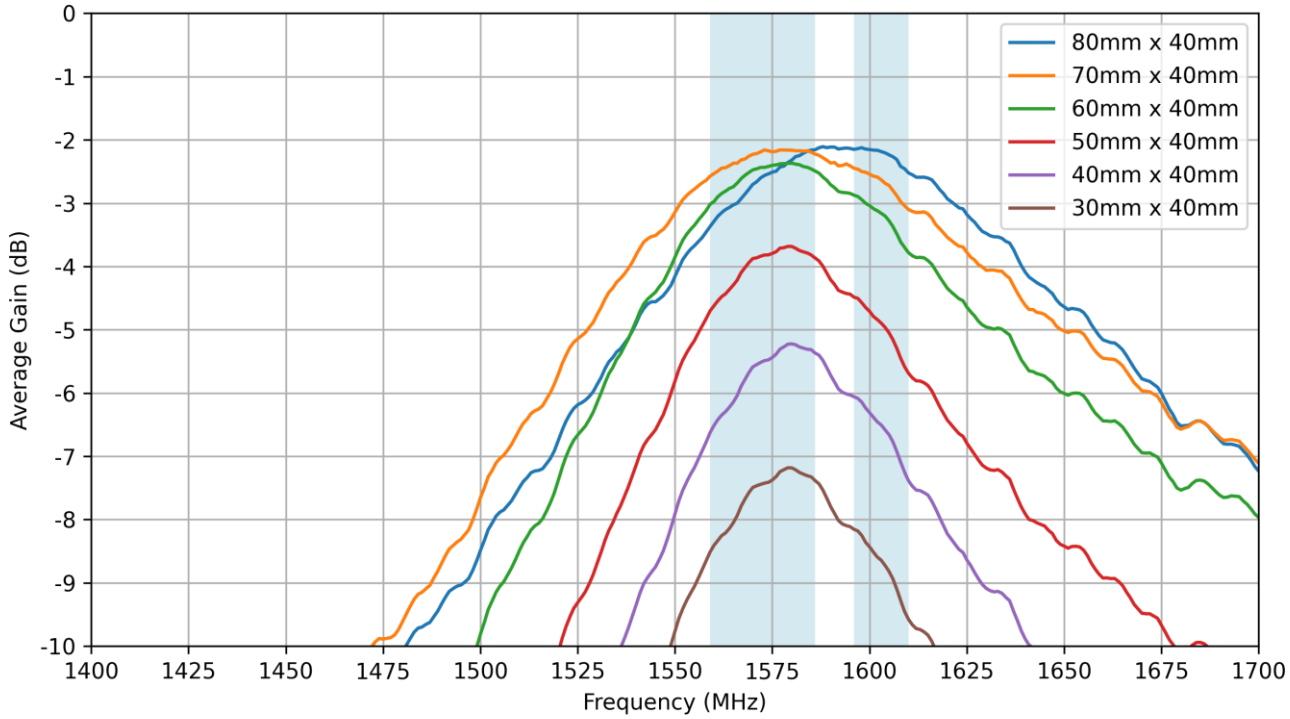
9.9 VSWR



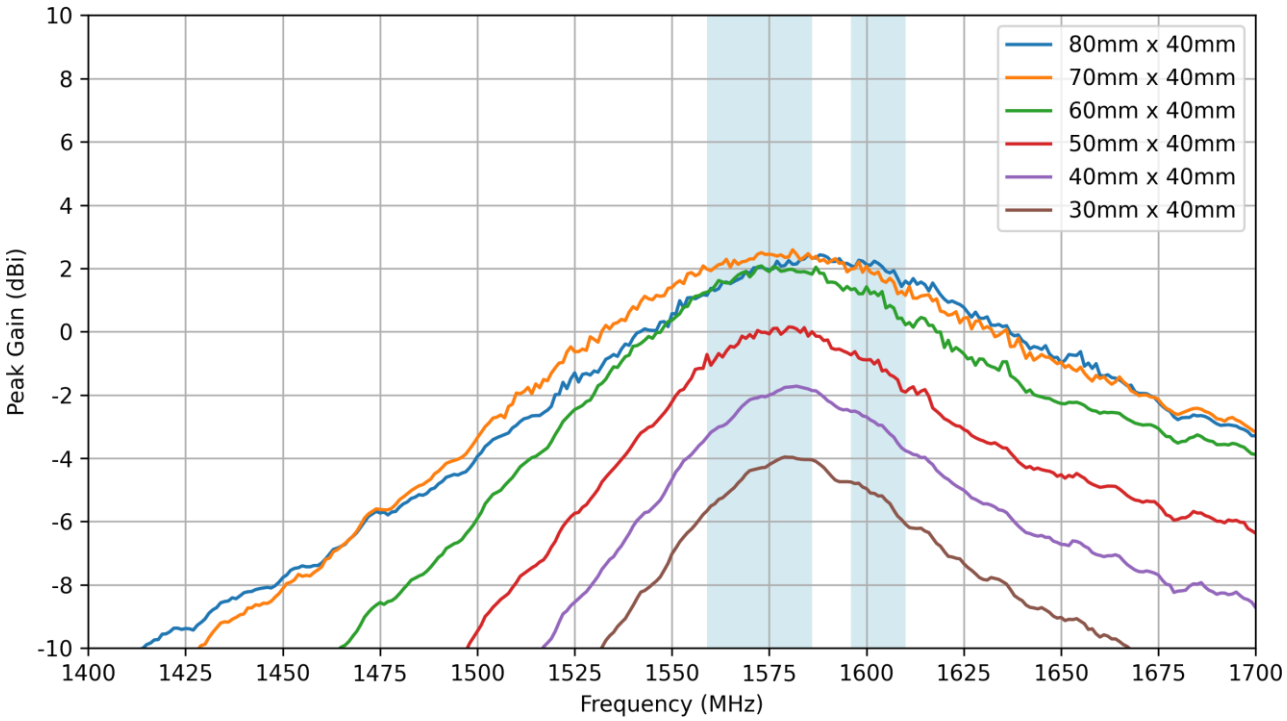
9.10 Efficiency



9.11 Average Gain



9.12 Peak Gain



Changelog for the datasheet

SPE-13-8-092 – GGBLA.01.A

Revision: P (Current Version)	
Date:	2025-04-15
Changes:	Added application note (Ground Plane Study) and updated antenna integration guide.
Changes Made by:	Gary West

Previous Revisions

Revision: O	
Date:	2024-04-26
Changes:	Updated GNSS Frequency Bands table
Changes Made by:	Cesar Sousa

Revision: J	
Date:	2020-07-31
Changes:	Packaging update.
Changes Made by:	David Connolly

Revision: N	
Date:	2023-09-06
Changes:	Updated Solder Reflow Information
Changes Made by:	Cesar Sousa

Revision: I	
Date:	2018-03-19
Changes:	Updating max storage temp to 105C.
Changes Made by:	Technical Writer

Revision: M	
Date:	2022-03-04
Changes:	Updated Mechanical & Footprint drawings.
Changes Made by:	Gary West

Revision: H	
Date:	2018-03-13
Changes:	New Packaging drawing
Changes Made by:	Carol Faughnan

Revision: L (Current Version)	
Date:	2021-09-21
Changes:	Added MSL rating.
Changes Made by:	Erik Landi

Revision: G	
Date:	2017-06-26
Changes:	
Changes Made by:	Technical Writer

Revision: K	
Date:	2021-05-20
Changes:	Template Updated & Integration Guide Added.
Changes Made by:	Gary West

Revision: F	
Date:	2017-05-12
Changes:	
Changes Made by:	Technical Writer

Previous Revisions (Continued)

Revision: E	
Date:	2017-01-06
Changes:	Updated spec as per amended drawing on PCN and added disclaimer.
Changes Made by:	Andy Mahoney

Revision: D	
Date:	2014-11-24
Changes:	
Changes Made by:	Technical Writer

Revision: C	
Date:	2014-01-31
Changes:	Removed U from antenna photo.
Changes Made by:	Aine Doyle

Revision: B	
Date:	2014-01-13
Changes:	Added in product name.
Changes Made by:	Aine Doyle

Revision: A (Original First Release)	
Date:	2017-08-10
Notes:	
Author:	

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