Specification

Part No. : **GWLA.05**

Description : GPS L1 & Bluetooth / 2.4GHz Wi-Fi
Embedded 2in1 Ceramic Loop Antenna

Features : 10 * 3.2 * 1.5mm
GPS L1 and Wi-Fi 2.4GHz Applications
Simplifies GPS/2.4GHz Circuits
Two Separate Feeds on one Chip Antenna
Low Profile, Small Footprint Antenna
SMD Surface-mount
RoHS & REACH Compliant

1. Introduction

The Taoglas GWLA.05, GPS L1 /2.4GHz embedded loop antenna is a high efficiency, miniature SMD, edge mounted ceramic antenna for GPS and 2.4GHz Wi-Fi, WLAN, Zigbee, Bluetooth, and 802.11 applications. Customers can use this antenna for GPS and 2.4GHz (Wi-Fi or Bluetooth) modules, rather than using two separate antennas. The GWLA.05 has two separate antenna feeds, making it the ideal choice for applications where there is limited PCB space. The GWLA.05 uses the main PCB as its ground plane, thereby maintaining good efficiency despite its small size. It can be tuned for different PCB sizes/environments by simply changing the values of the matching circuit. It is ideally mounted on the center edge of a ground-plane.

At 10*3.2*1.5mm, the GWLA.05 is one of the smallest combination embedded antennas available worldwide. This antenna is delivered on tape and reel.

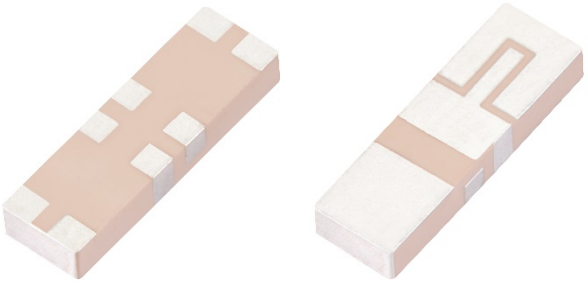
Typical Applications – where both GPS and 2.4GHz are required:

- Navigation or Position Tracking Systems
- Tablet PCs
- Gateways and Routers
- UAV Communication Systems
- Handheld Devices
- OBD Devices
- Mobile Cameras

Many module manufacturers specify peak gain limits for any antennas that are to be connected to that module. Those peak gain limits are based on free-space conditions. In practice, the peak gain of an antenna tested in free-space can degrade by at least 1 or 2 dBi when put inside a device. So ideally you should go for a slightly higher peak gain antenna than mentioned on the module specification to compensate for this effect, giving you better performance.

Upon testing of any of our antennas with your device and a selection of appropriate layout, integration technique, or cable, Taoglas can make sure any of our antennas' peak gain will be below the peak gain limits. Taoglas can then issue a specification and/or report for the selected antenna in your device that will clearly show it complying with the peak gain limits, so you can be assured you are meeting regulatory requirements for that module.

For example, a module manufacturer may state that the antenna must have less than 2 dBi peak gain, but you don't need to select an embedded antenna that has a peak gain of less than 2 dBi in free-space. This will give you a less optimized solution. It is better to go for a slightly higher free-space peak gain of 3 dBi or more if available. Once that antenna gets integrated into your device, performance will degrade below this 2 dBi peak gain due to the effects of GND plane, surrounding components, and device housing. If you want to be absolutely sure, contact Taoglas and we will test. Choosing a Taoglas antenna with a higher peak gain than what is specified by the module manufacturer and enlisting our help will ensure you are getting the best performance possible without exceeding the peak gain limits.



2. Specification

ELECTRICAL				
Application Bands	GPS L1		Wi-Fi /Bluetooth	
Frequency (MHz)	1575.42		2400-2500	
Bandwidth (MHz)	20 (RL<-10dB)		100 (RL<-5dB)	
Ground plane size (mm)	80 x 40	30 x 15	80 x 40	30 x 15
Peak Gain (dBi)	0.28	-2.17	-0.82	0.24
Efficiency (%)	45.37	27	44.16	52
Return Loss (dB)	< -10		< -5	
Isolation (dB)	< -20		< -6	
Impedance (Ω)	50			
Polarization	Linear			
Input Power	10W			
MECHANICAL				
Dimensions (mm)	10 x 3.2 x 1.5			
Ground plane (mm)	80 x 40 or 30 x 15			
Weight (g)	0.19			
ENVIRONMENTAL				
Operating Temperature	-40°C to 85°C			
Storage Temperature	-25°C to 85°C			
Relative Humidity	20% to 70%			

3. Antenna Characteristics

3.1 GPS Band

3.1.1 Return Loss

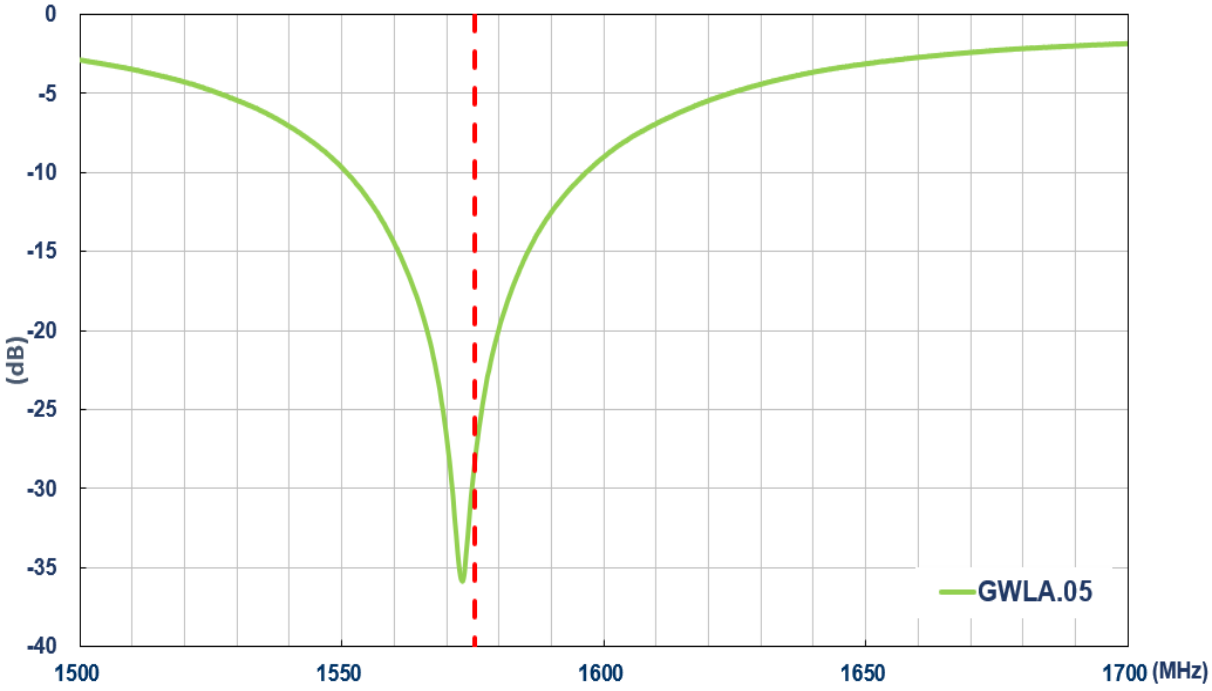


Figure 1 GPS Return Loss(dB) on 80x40mm ground plane

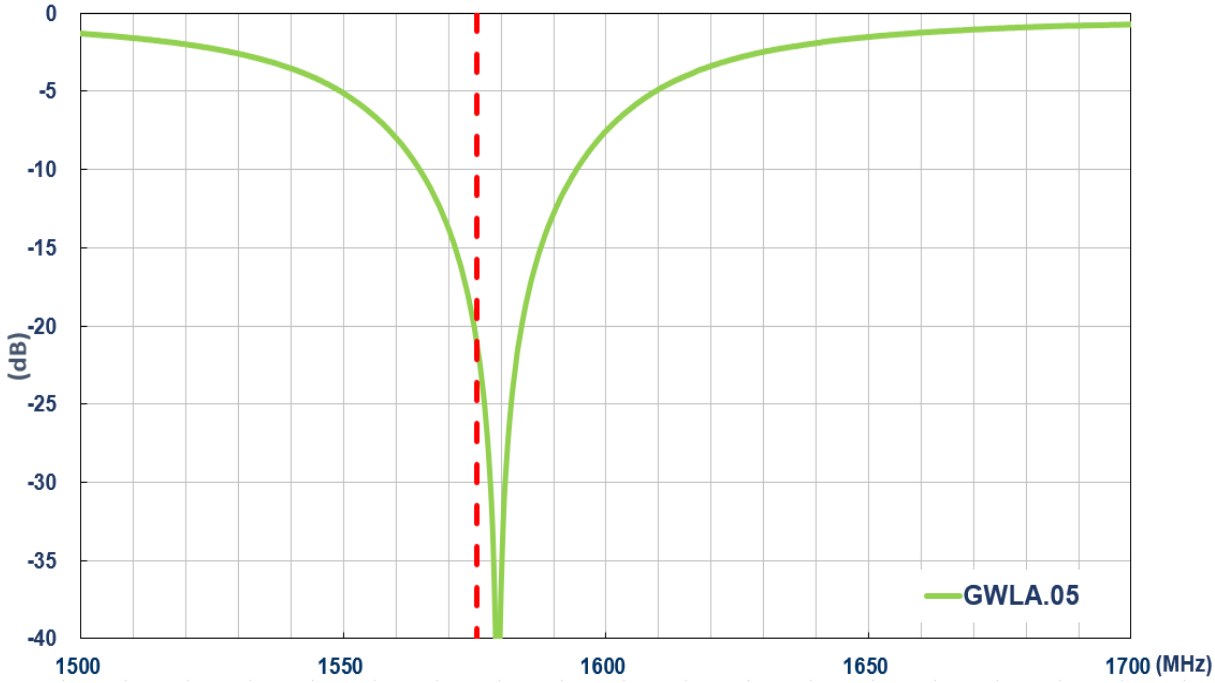


Figure 2 GPS Return Loss(dB) on 30x15mm ground plane

3.1.2 Efficiency

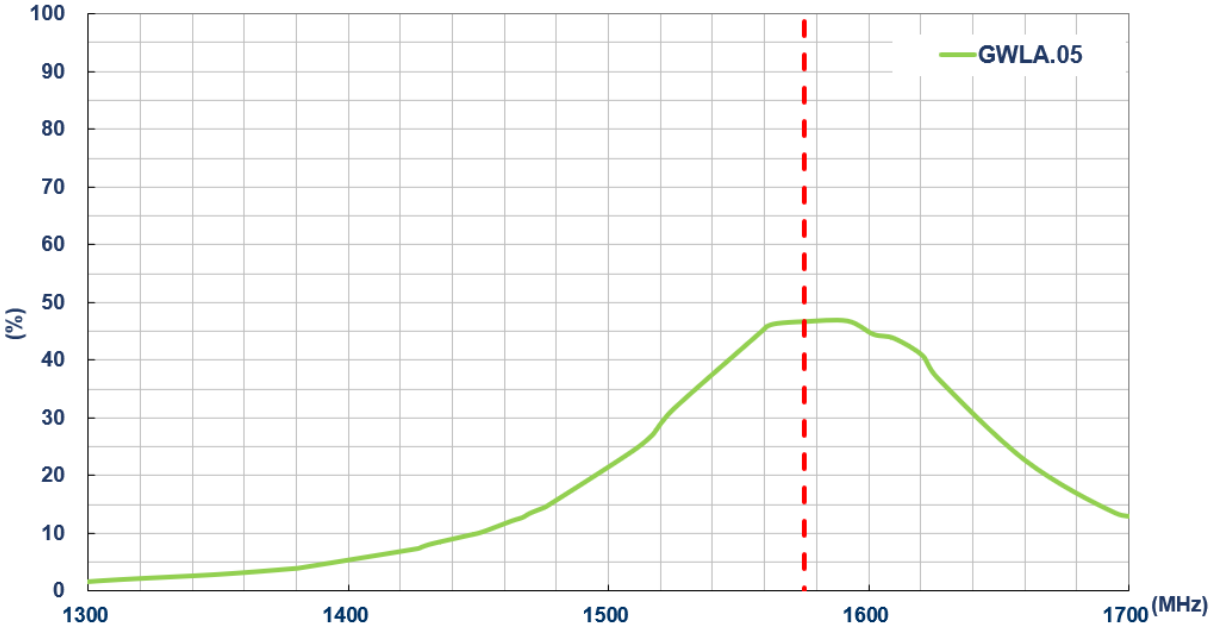


Figure 3 GPS Efficiency(%) on 80x40mm ground plane

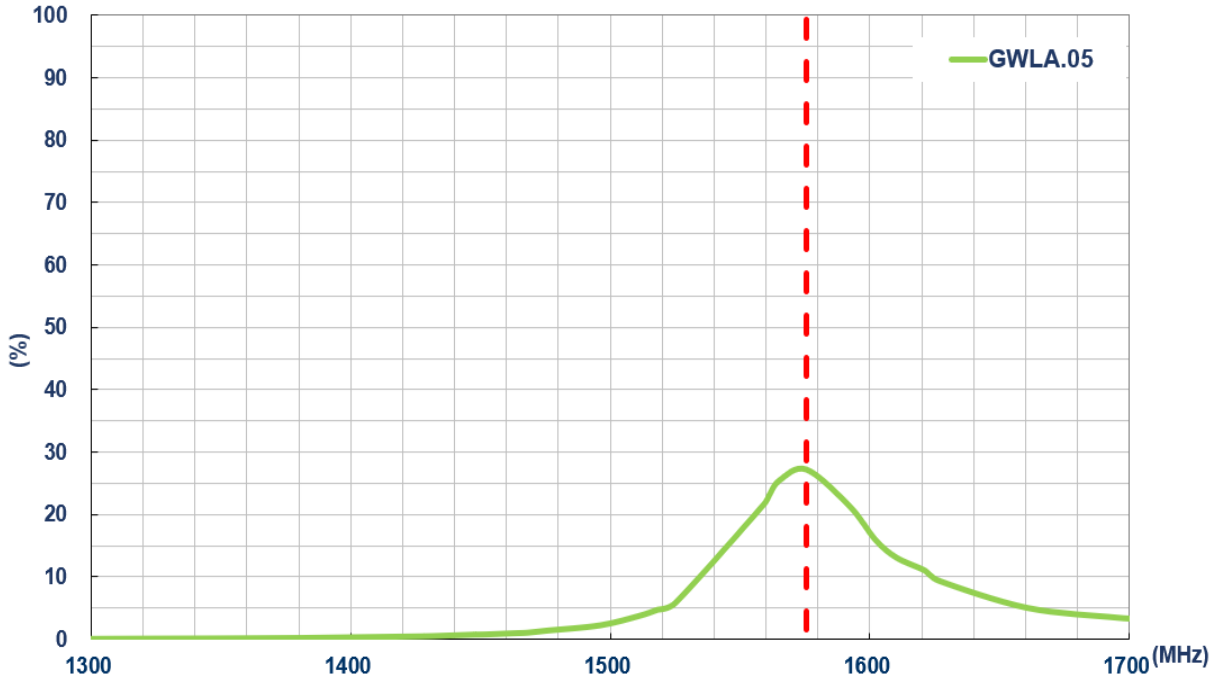


Figure 4 GPS Efficiency(%) on 30x15mm ground plane

3.1.3 Average Gain

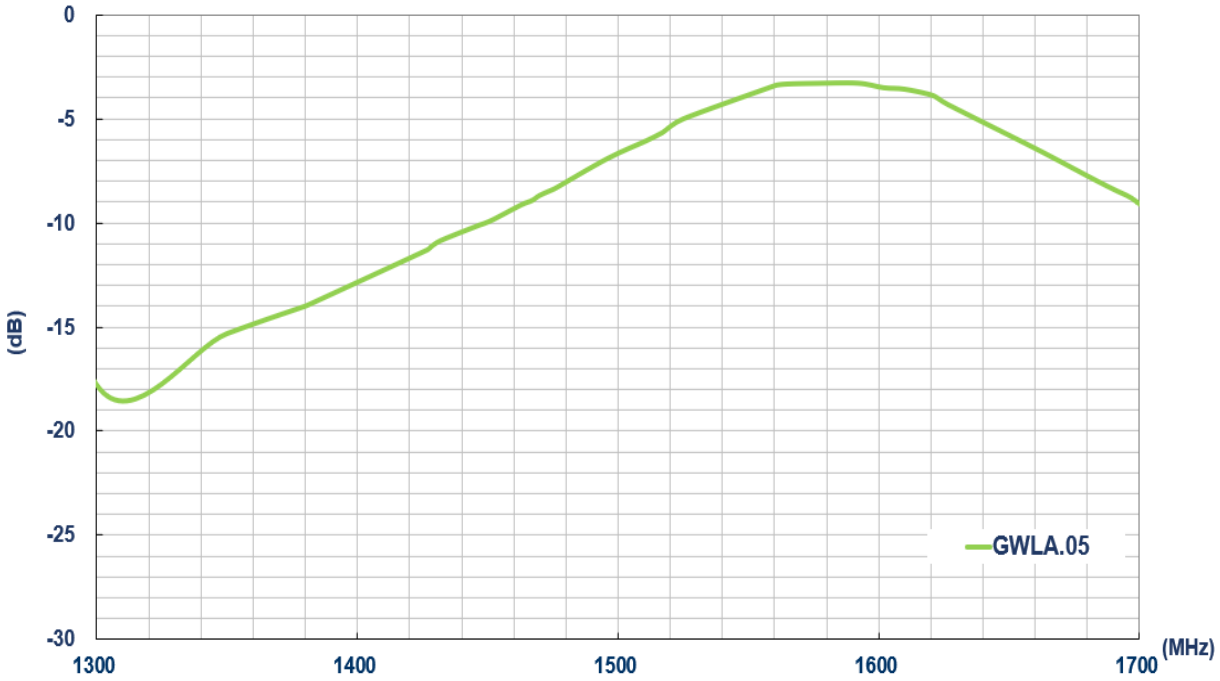


Figure 5 GPS Average Gain(dB) on 80x40mm ground plane

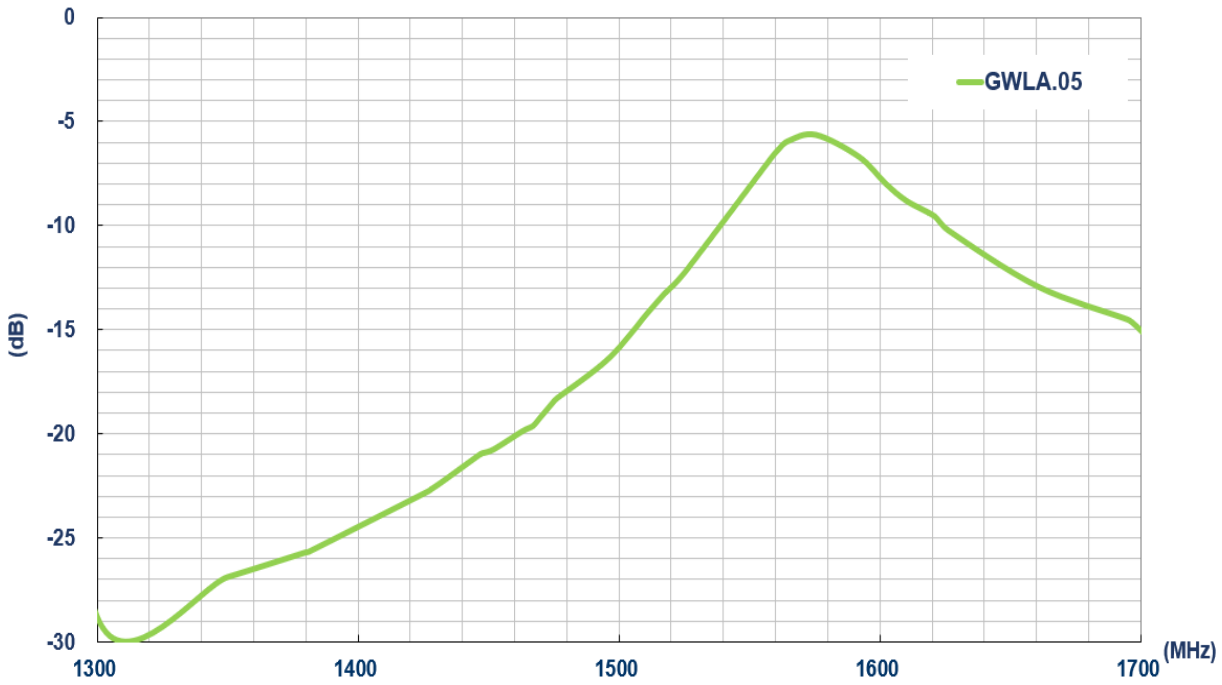


Figure 6 GPS Average Gain(dB) on 30x15mm ground plane

3.1.4 Peak Gain

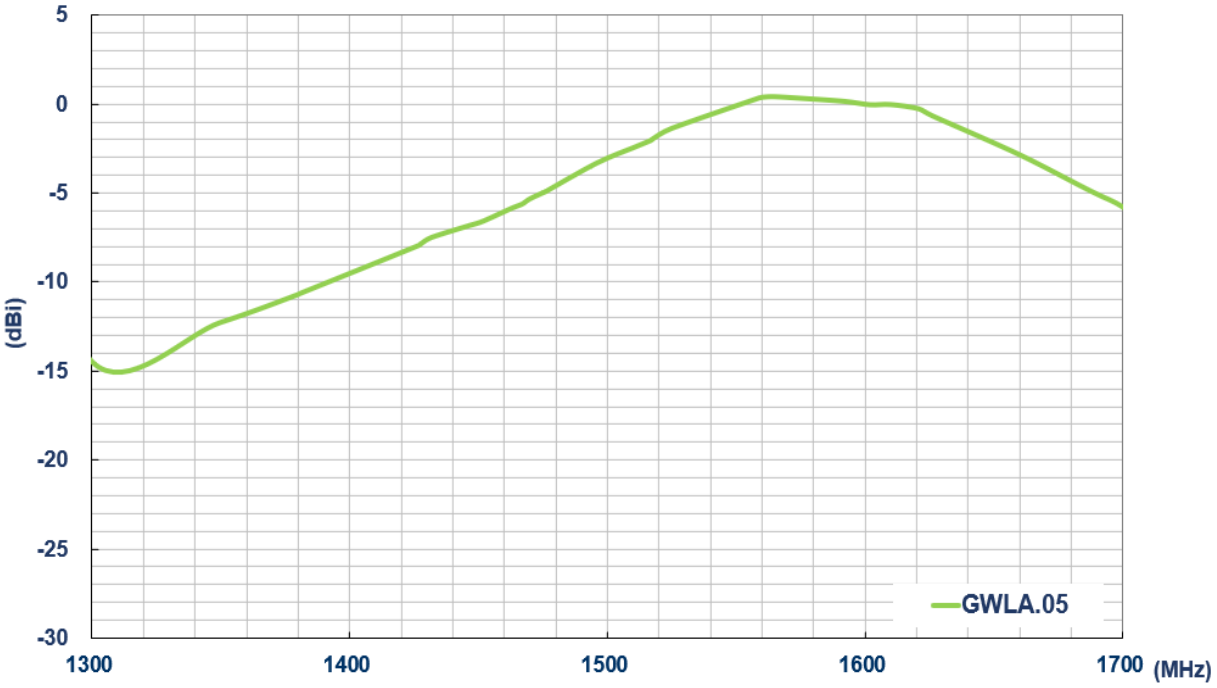


Figure 7 GPS Peak Gain(dBi) on 80x40mm ground plane

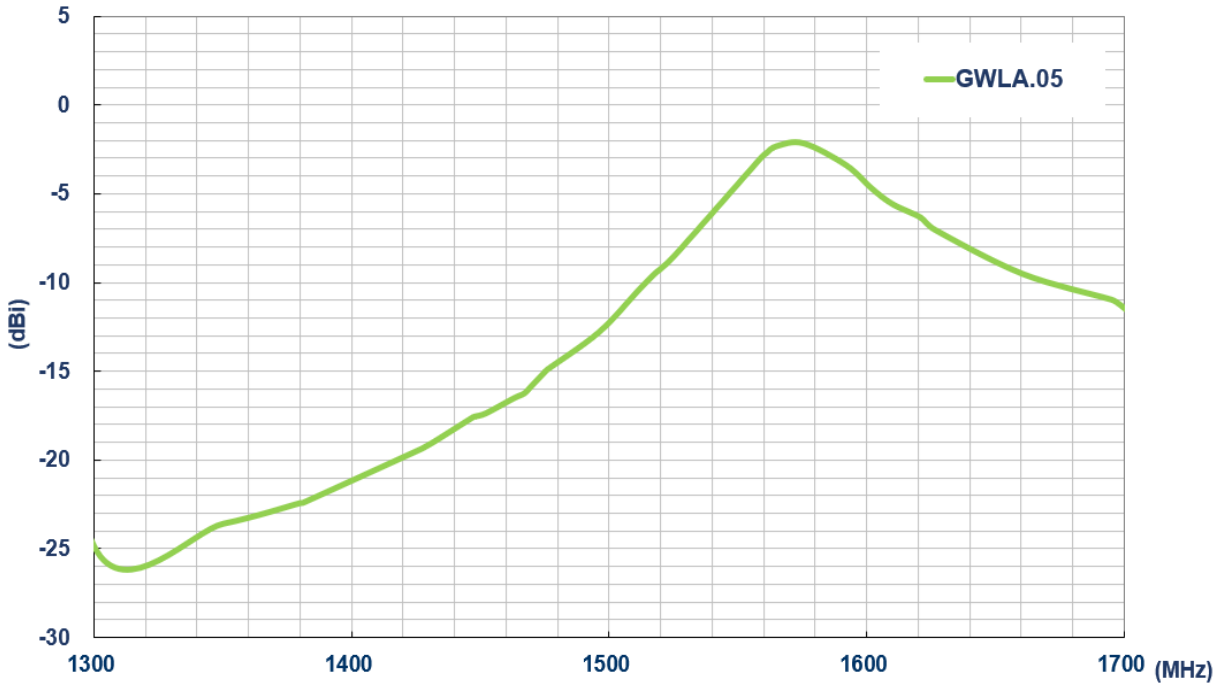


Figure 8 GPS Peak Gain(dBi) on 30x15mm ground plane

3.2 Wi-Fi 2.4GHz
3.2.1 Return Loss

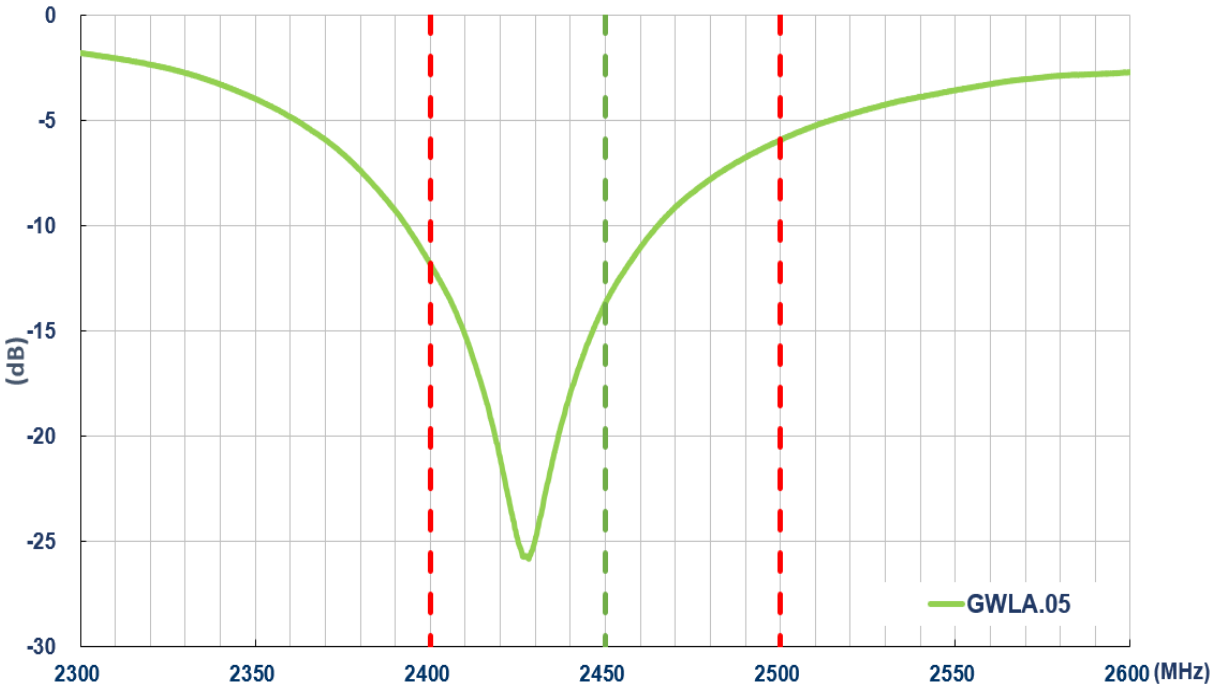


Figure 9 Wi-Fi Return Loss on 80x40mm ground plane

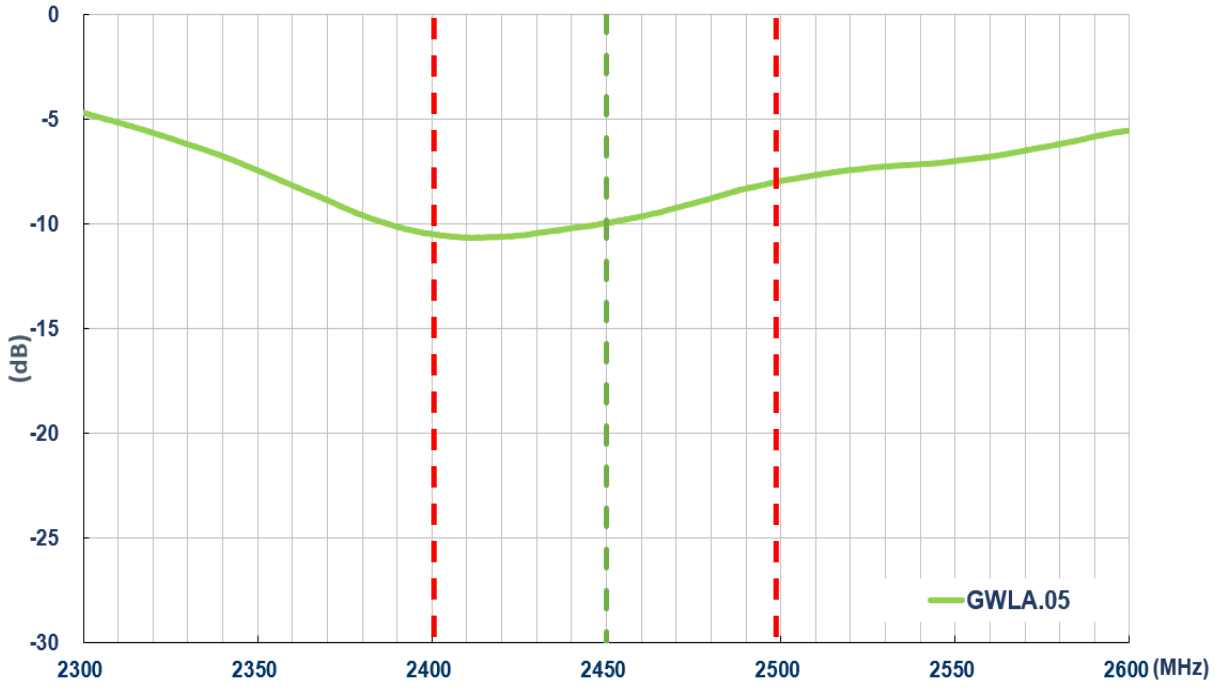


Figure 10 Wi-Fi Return Loss(dB) on 30x15mm ground plane

3.2.2 Efficiency

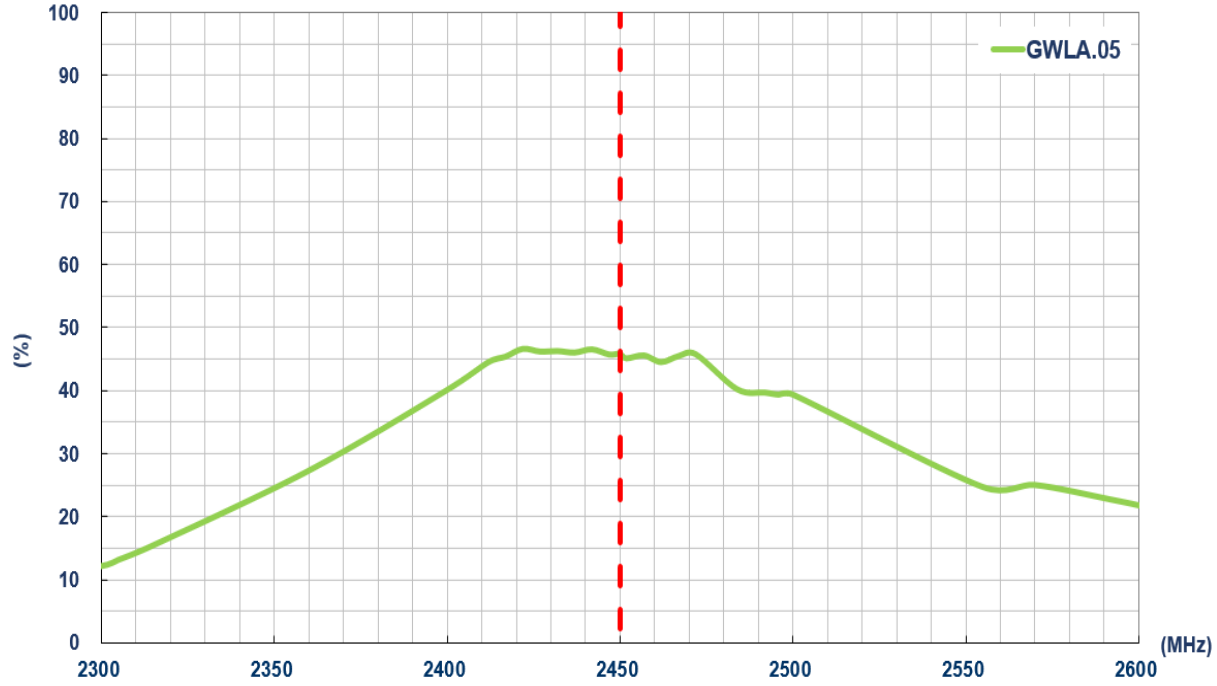


Figure 11 Wi-Fi Efficiency(%) on 80x40mm ground plane

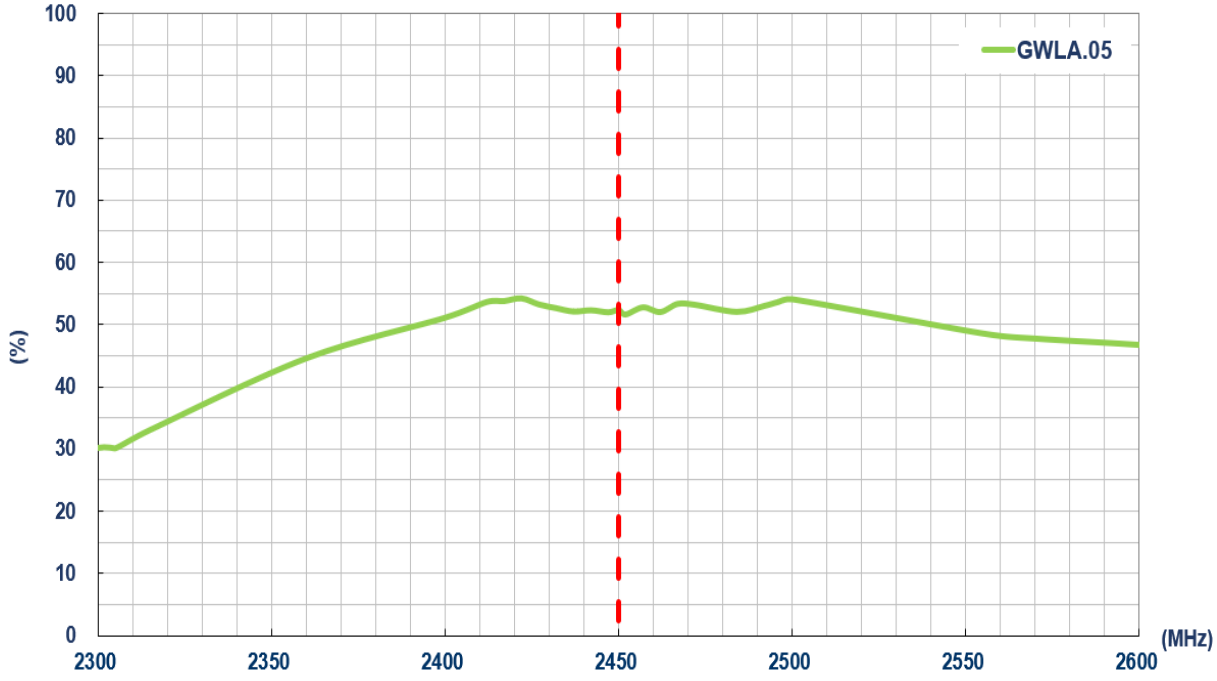


Figure 12 Wi-Fi Efficiency(%) on 30x15mm ground plane

3.2.3 Average Gain

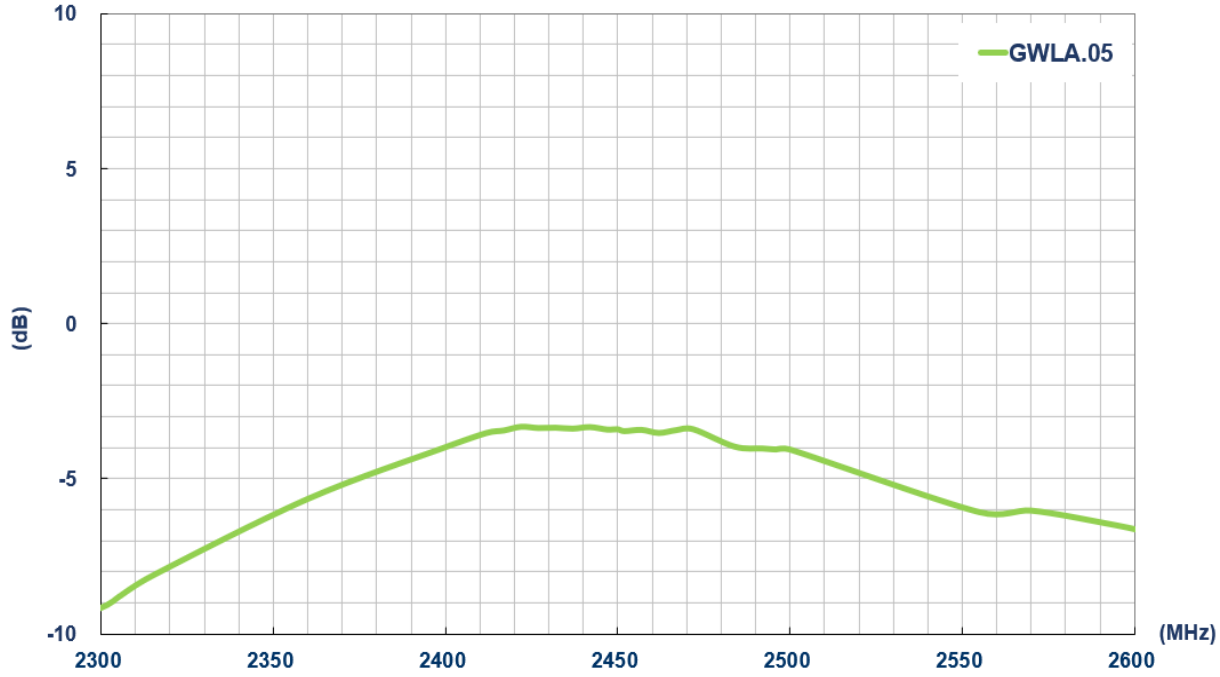


Figure 13 Wi-Fi Average Gain(dB) on 80x40mm ground plane

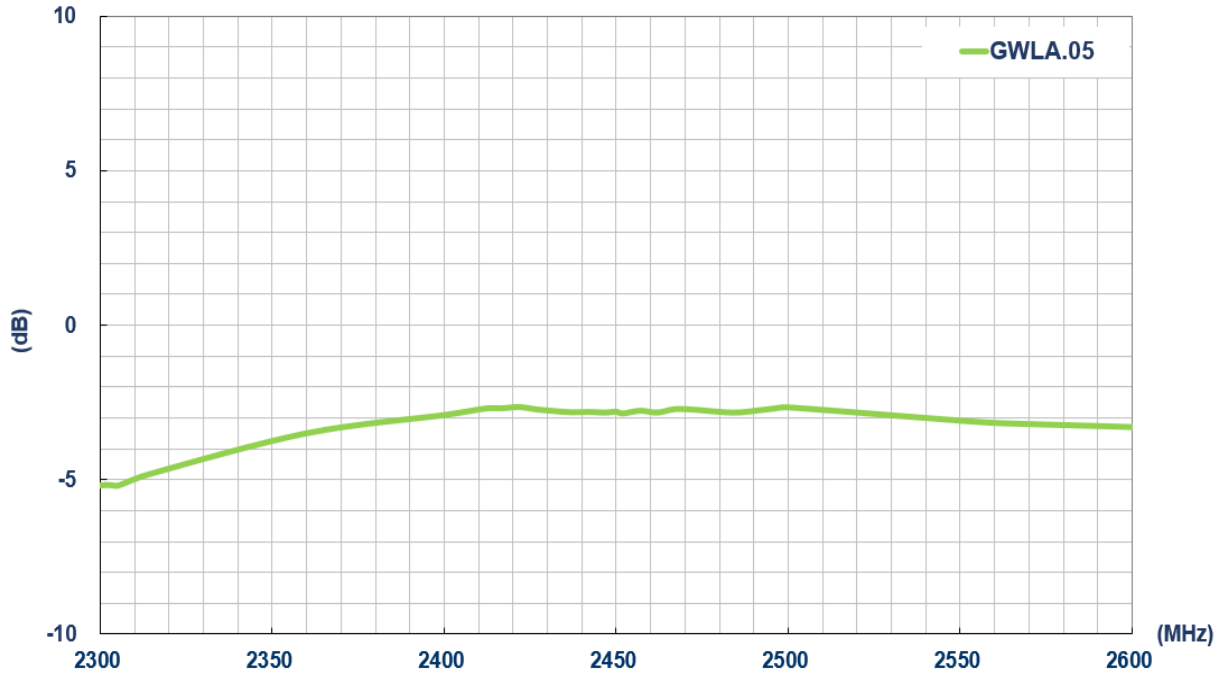


Figure 14 Wi-Fi Average Gain(dB) on 30x15mm ground plane

3.2.4 Peak Gain

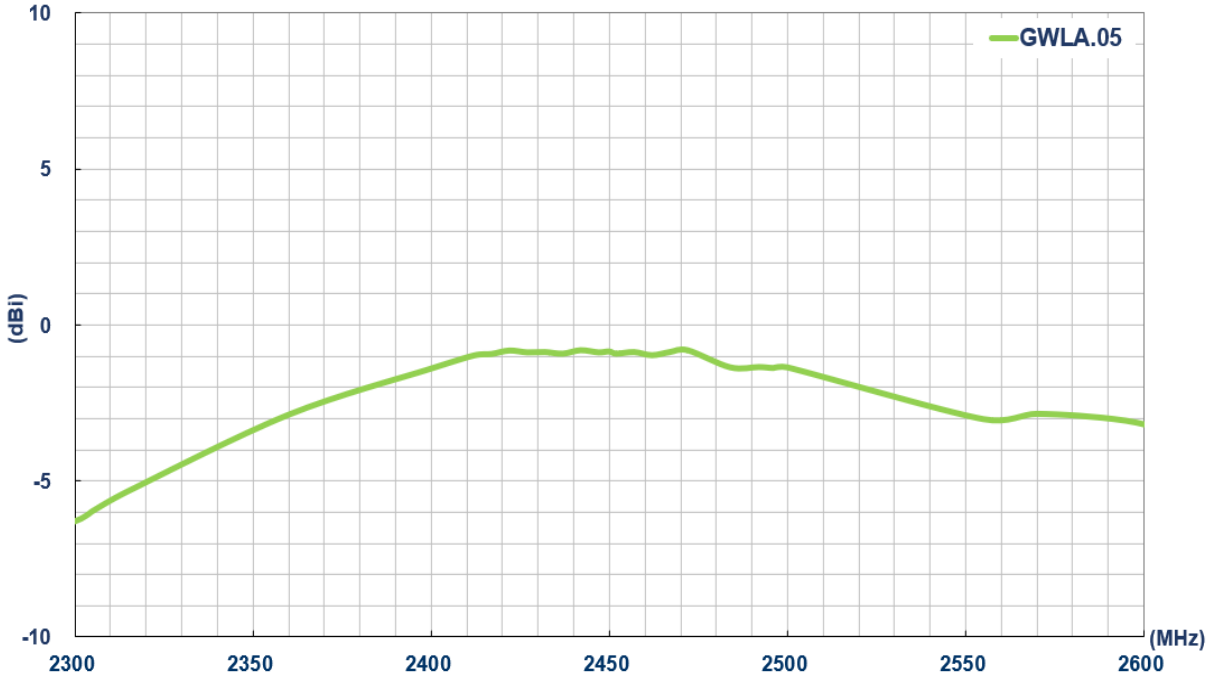


Figure 15 Wi-Fi Peak Gain on 80x40mm ground plane

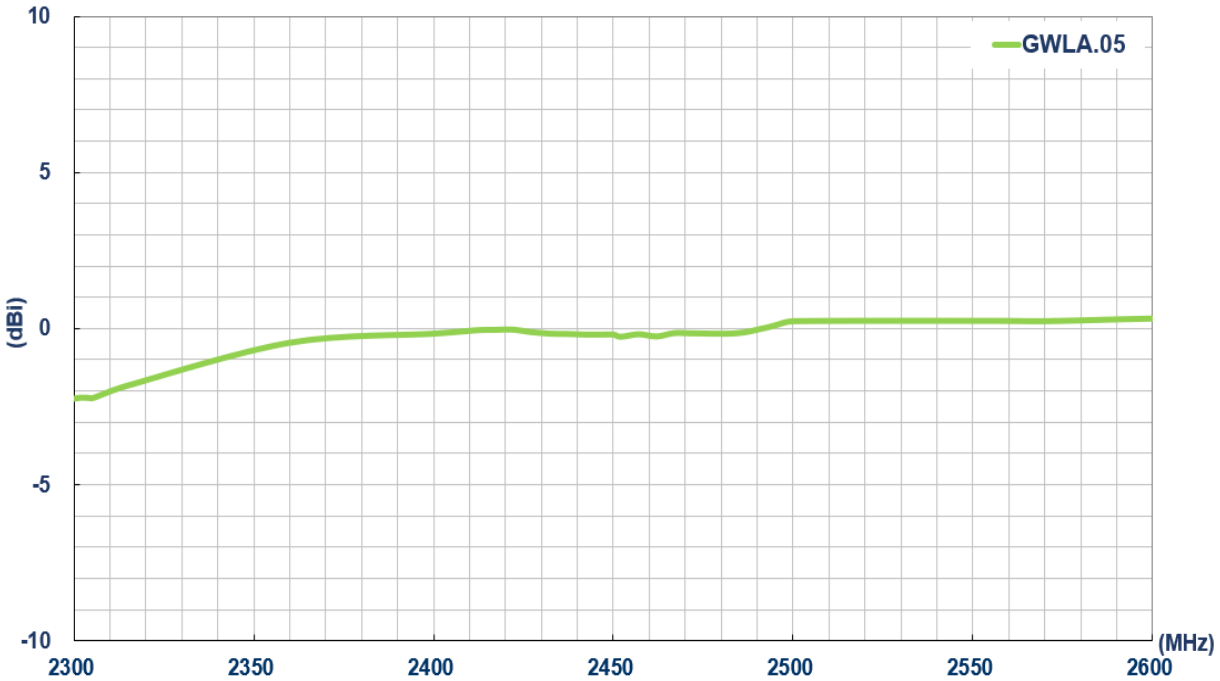


Figure 16 Wi-Fi Peak Gain(dBi) on 30x15mm ground plane

3.3 Isolation between Wi-Fi and GPS Antennas

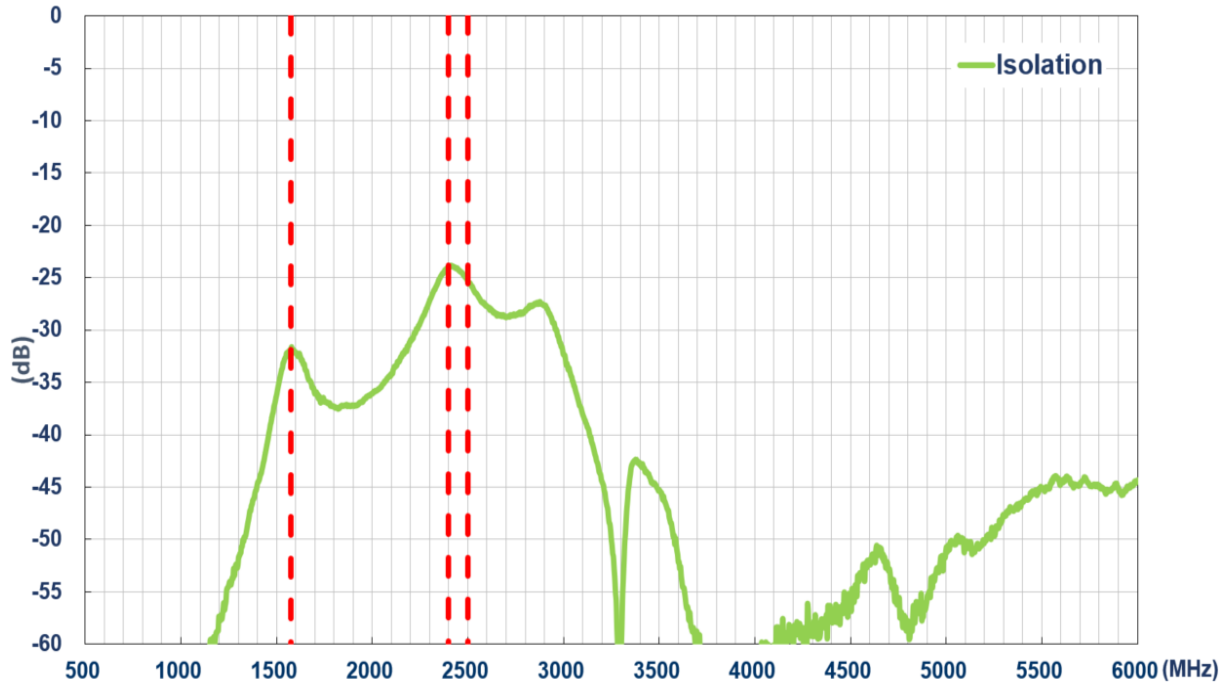


Figure 17 Isolation(dB) between GPS and Wi-Fi

4. Antenna Radiation Pattern

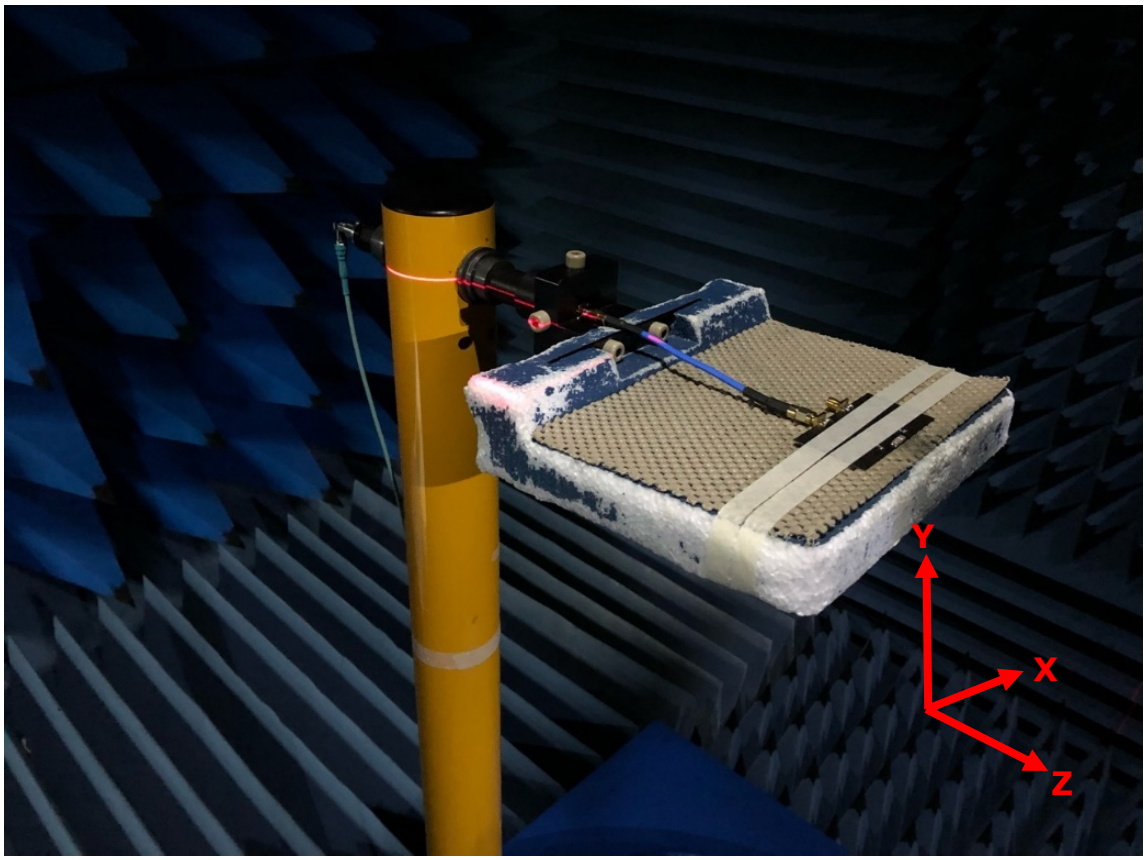


Figure 18 Anechoic Test set up

4.1 2D Radiation Pattern

4.1.1 GPS

XY Plane

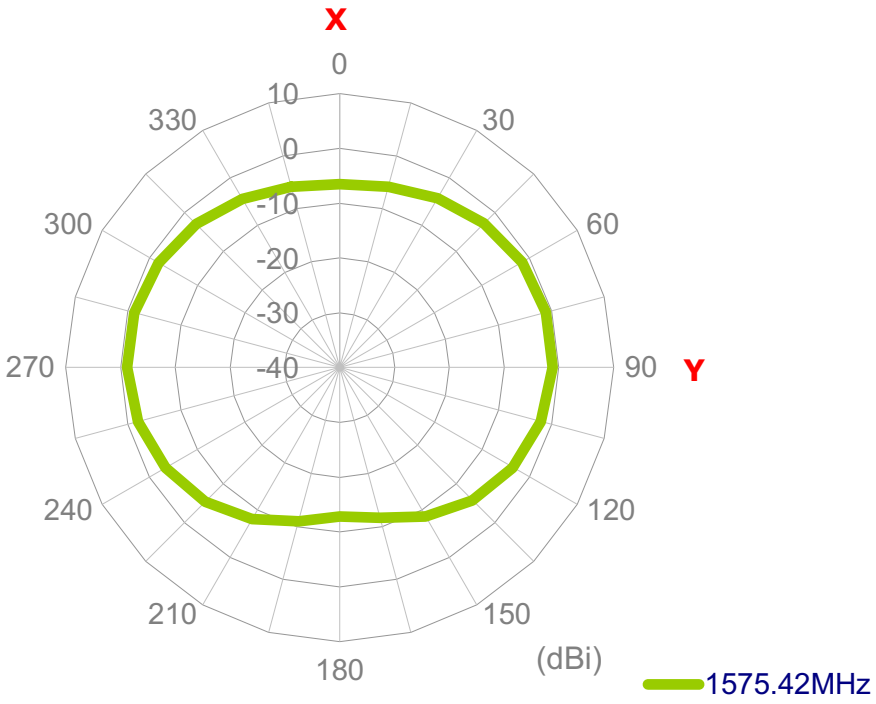


Figure 19 X-Y polar plot of GPS on 80x40mm ground plane

XZ Plane

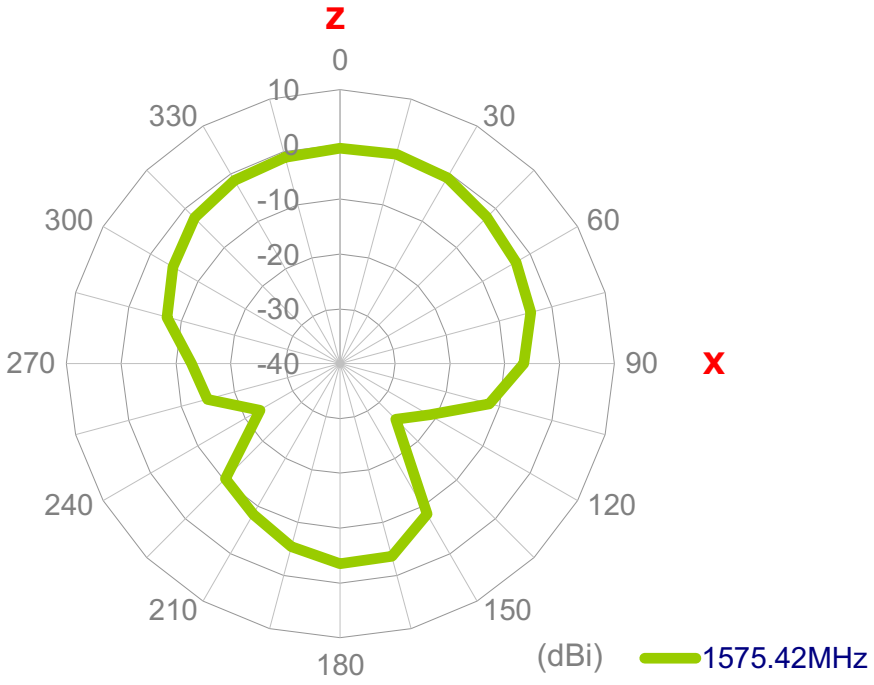


Figure 20 X-Z polar plot of GPS on 80x40mm ground plane

YZ Plane

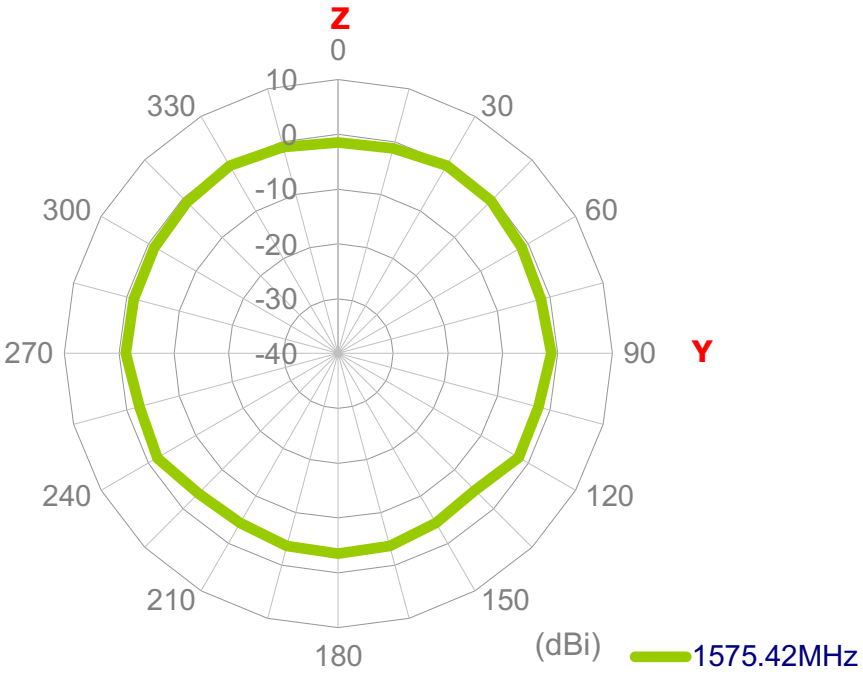


Figure 21 Y-Z polar plot of GPS on 80x40mm ground plane

XY Plane

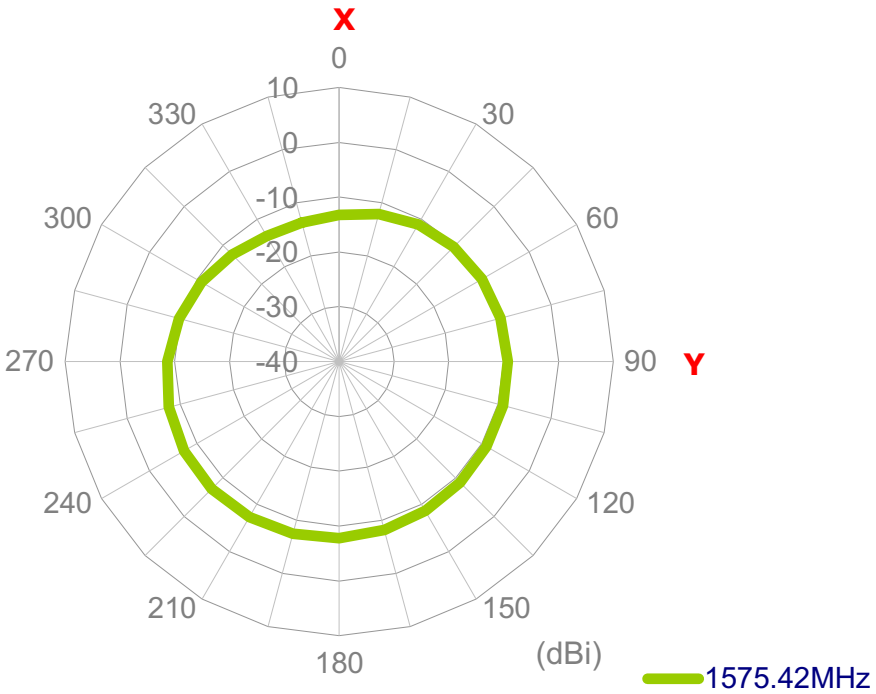


Figure 22 X-Y polar plot of GPS on 30x15mm ground plane

XZ Plane

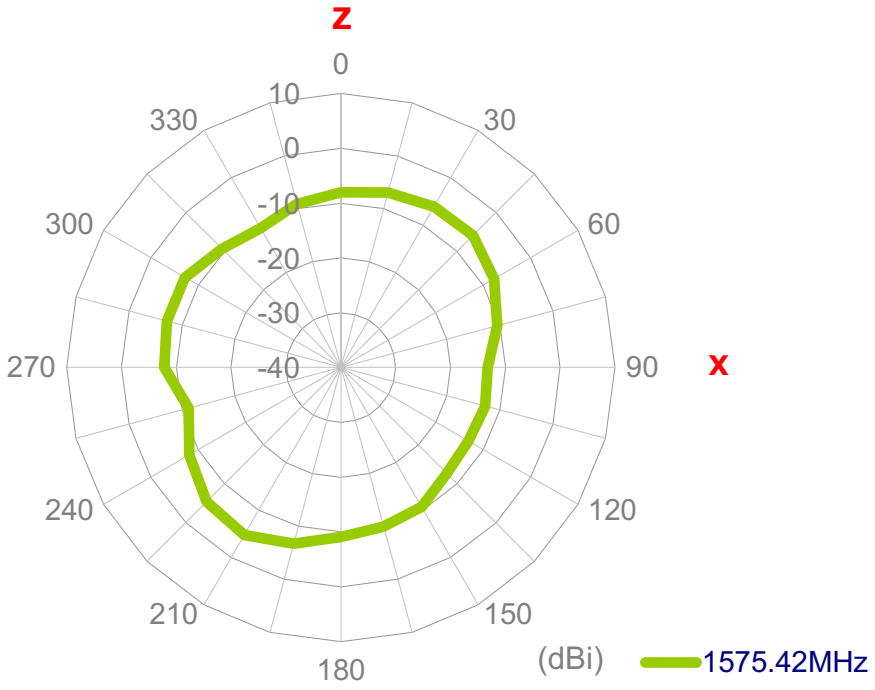


Figure 23 X-Z polar plot of GPS on 30x15mm ground plane

YZ Plane

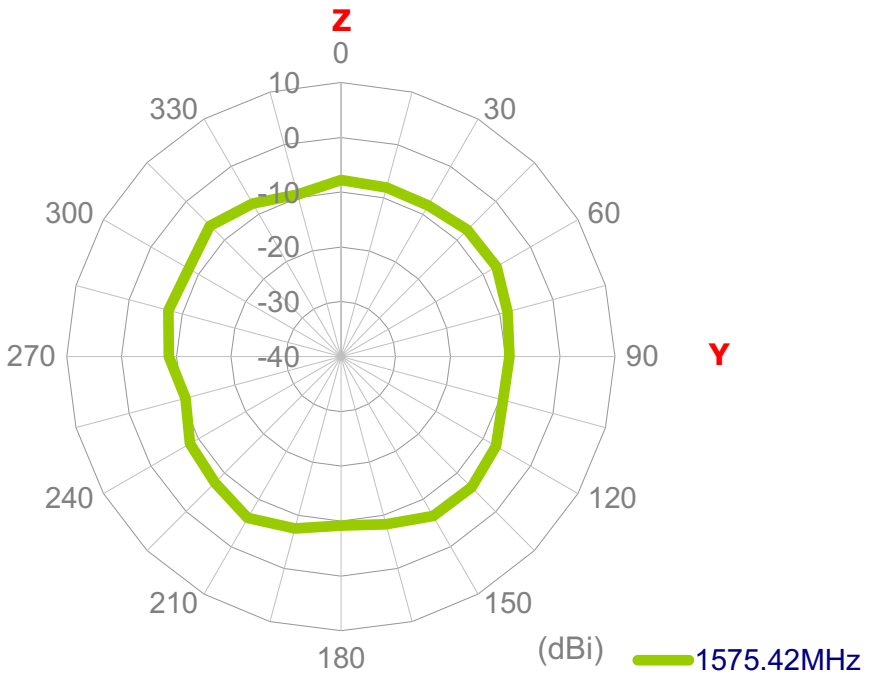


Figure 24 Y-Z polar plot of GPS on 30x15mm ground plane

4.1.2 Wi-Fi 2.4G/ Bluetooth

XY Plane

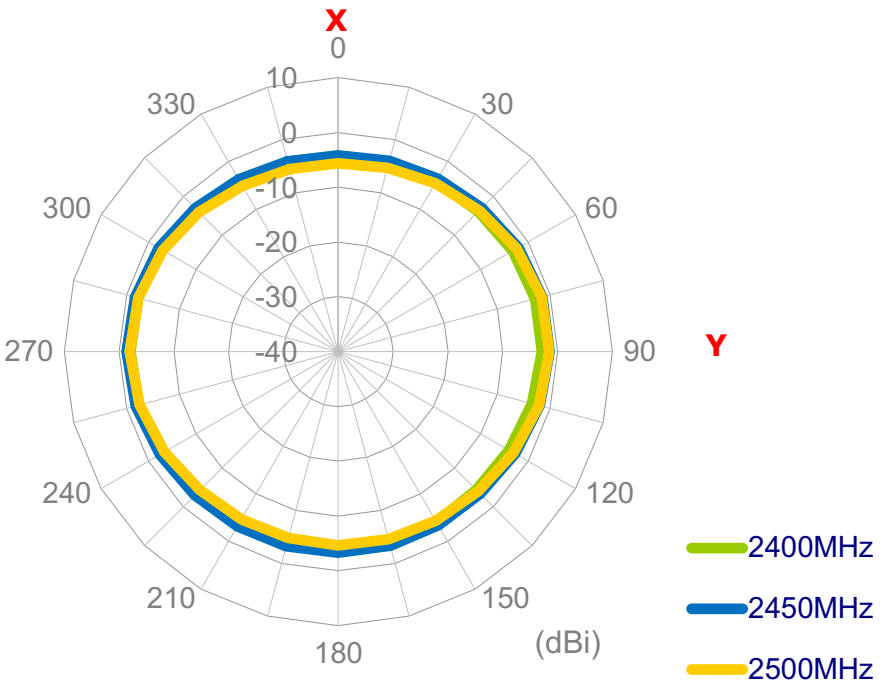


Figure 25 X-Y polar plot of Wi-Fi on 80x40mm ground plane

XZ Plane

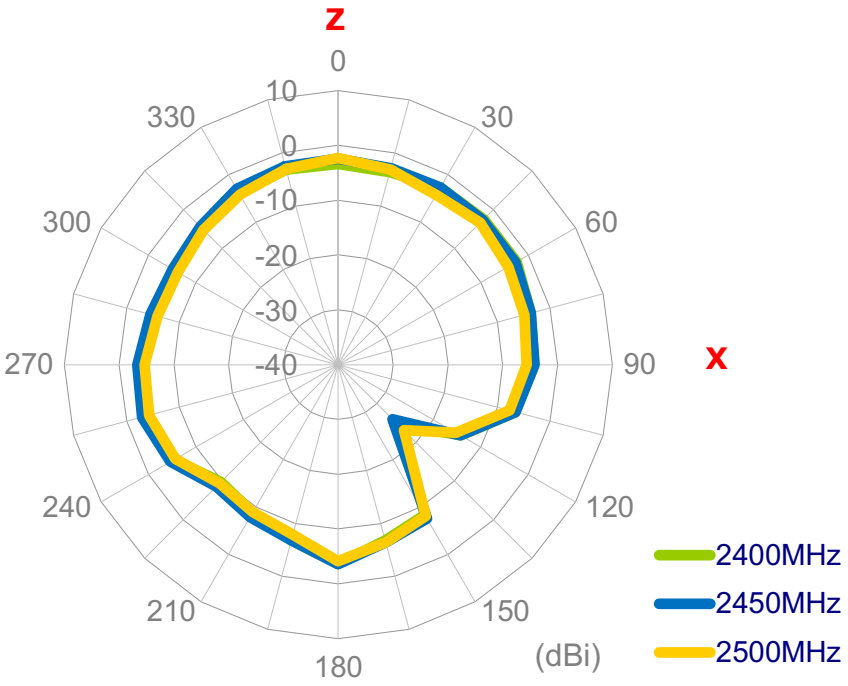


Figure 26 X-Z polar plot of Wi-Fi on 80x40mm ground plane

YZ Plane

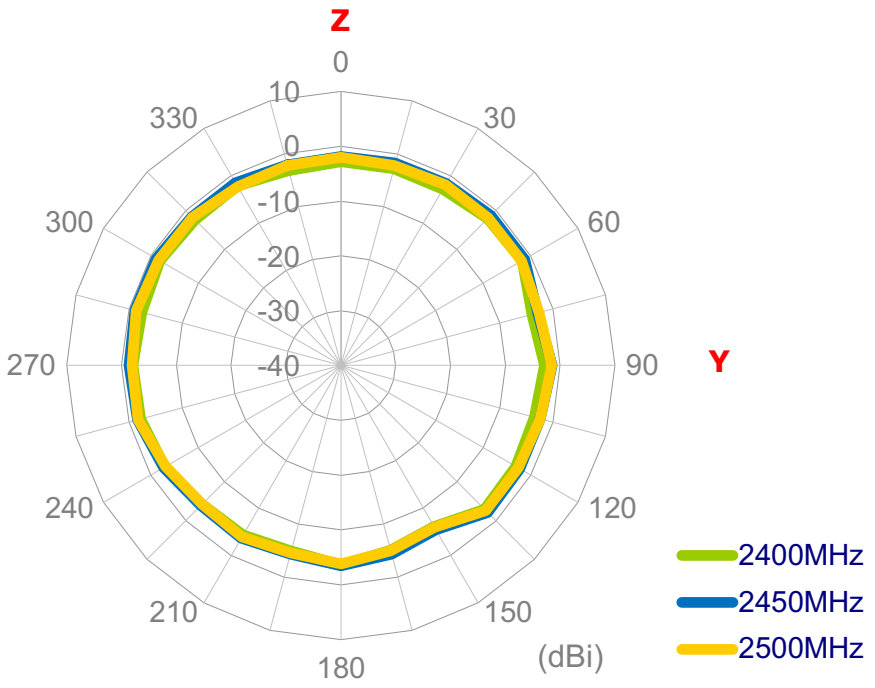


Figure 27 Y-Z polar plot of Wi-Fi on 80x40mm ground plane

XY Plane

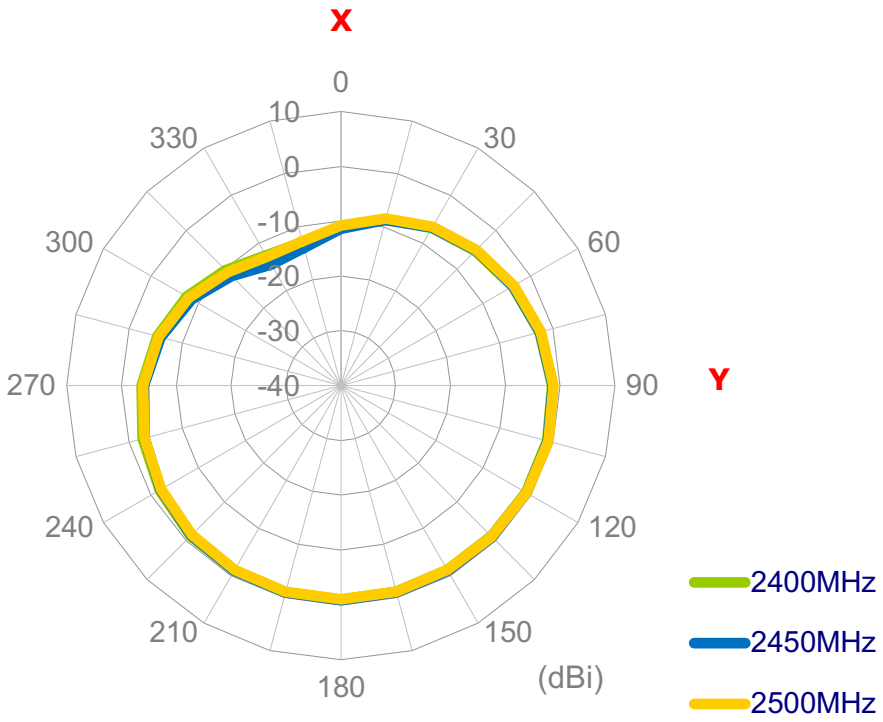


Figure 28 X-Y polar plot of Wi-Fi on 30x15mm ground plane

XZ Plane

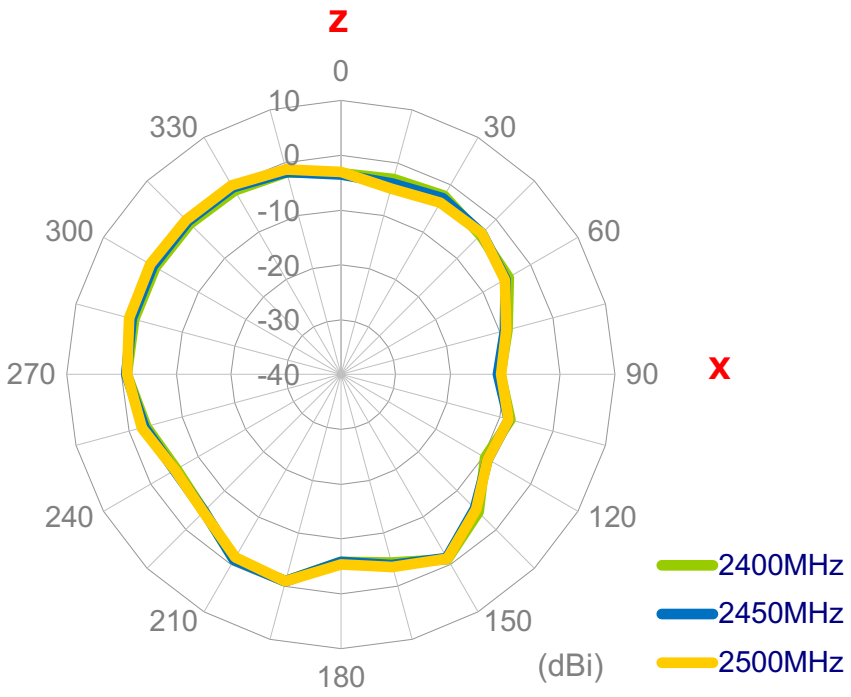


Figure 29 X-Z polar plot of Wi-Fi on 30x15mm ground plane

YZ Plane

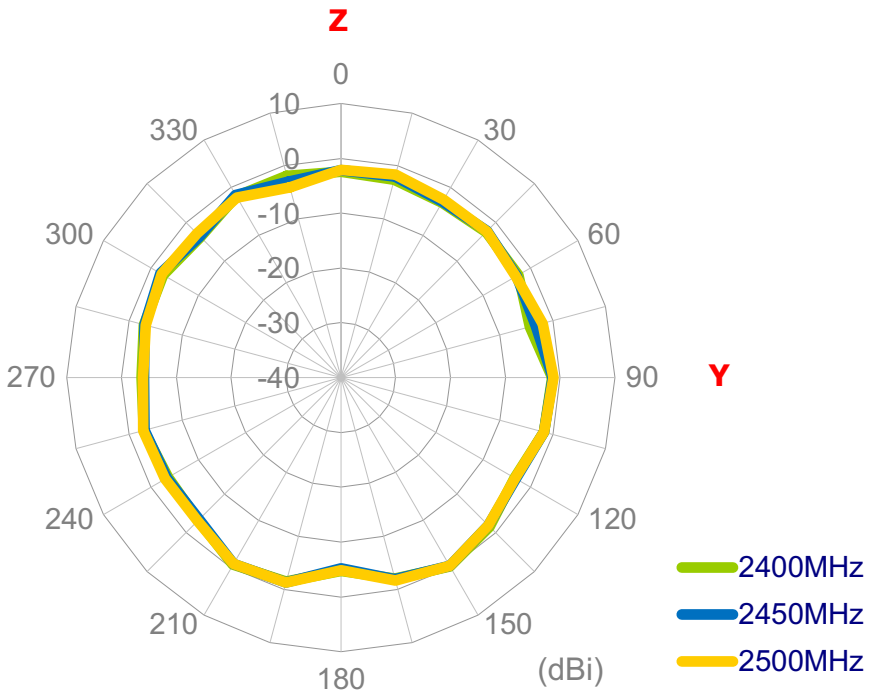


Figure 30 Y-Z polar plot of Wi-Fi on 30x15mm ground plane

4.2 3D Radiation Patterns

4.1.3 GPS

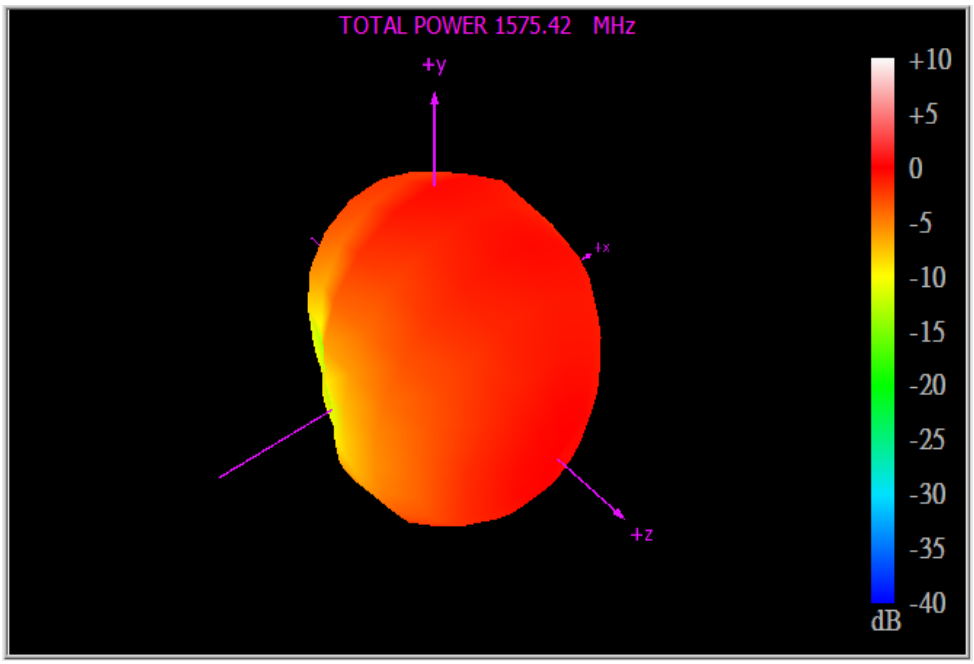


Figure 31 GPS 3D radiation pattern on 80x40mm ground plane

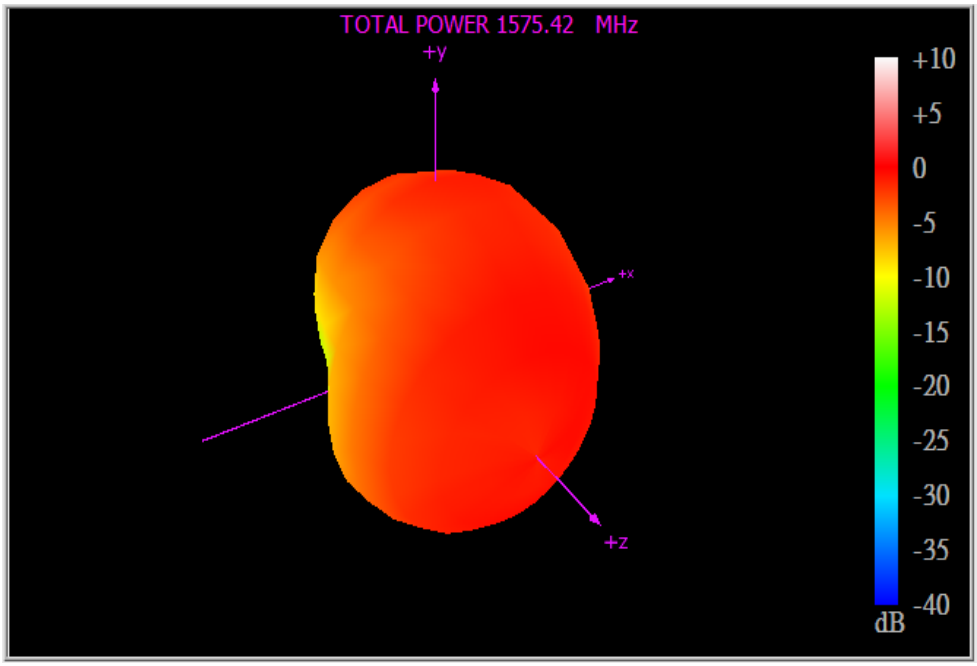


Figure 32 GPS 3D radiation pattern on 80x40mm ground plane

4.1.4 Wi-Fi and Bluetooth

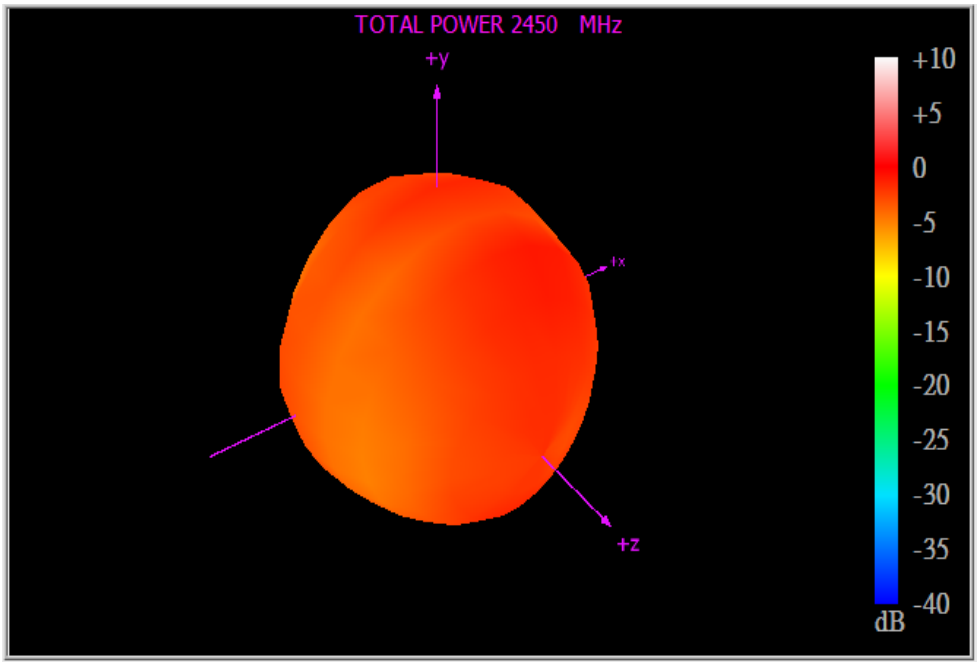


Figure 33 Wi-Fi 3D radiation pattern 80x40mm ground plane

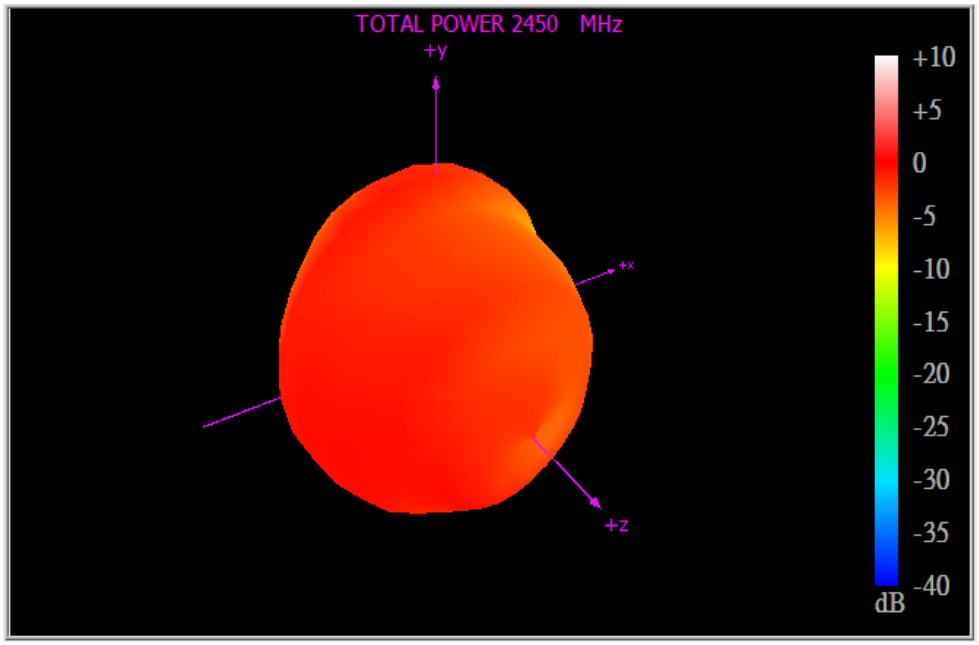
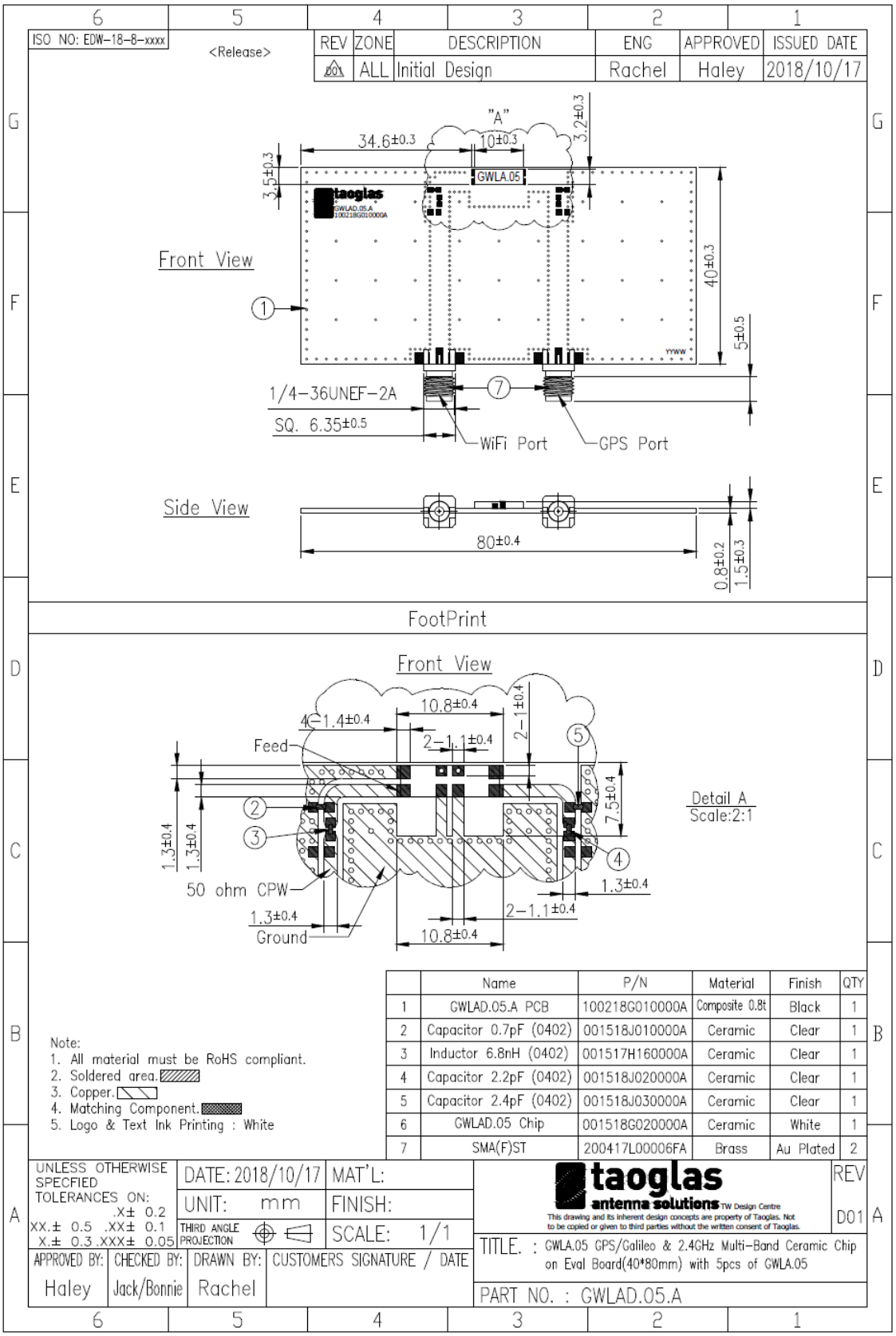


Figure 34 Wi-Fi 3D radiation pattern 30x15mm ground plane

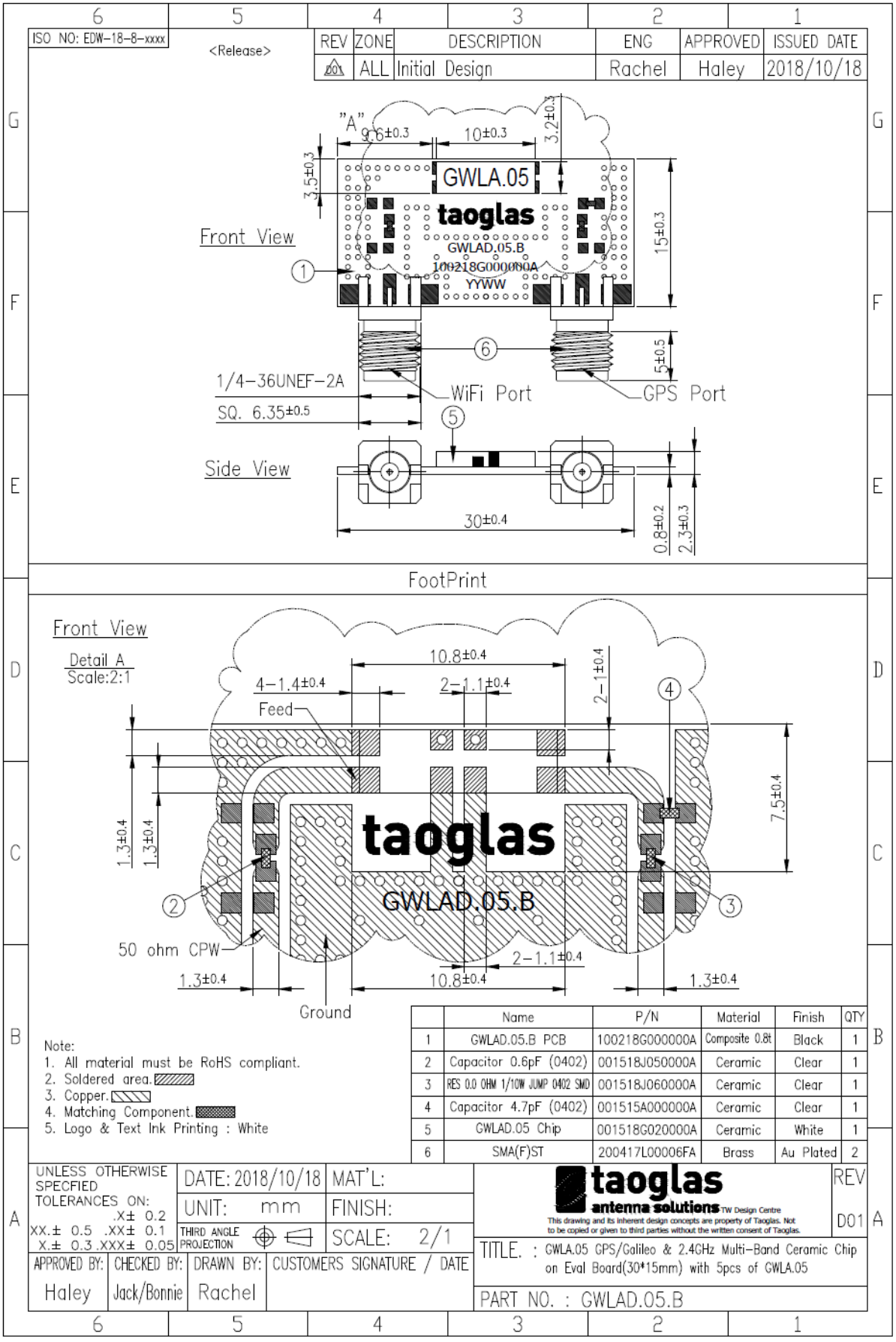
5. Mechanical Drawing

GWLAD.05.A (80 x 40mm ground plane)



	Name	P/N	Material	Finish	QTY
1	GWLAD.05.A PCB	100218G010000A	Composite 0.8t	Black	1
2	Capacitor 0.7pF (0402)	001518J010000A	Ceramic	Clear	1
3	Inductor 6.8nH (0402)	001517H160000A	Ceramic	Clear	1
4	Capacitor 2.2pF (0402)	001518J020000A	Ceramic	Clear	1
5	Capacitor 2.4pF (0402)	001518J030000A	Ceramic	Clear	1
6	GWLAD.05 Chip	001518G020000A	Ceramic	White	1
7	SMA(F)ST	200417L00006FA	Brass	Au Plated	2

GWLAD.05.B (30 x 15mm ground plane)

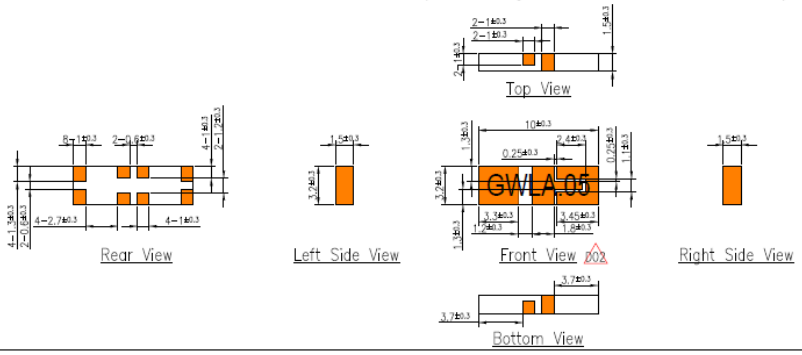


	Name	P/N	Material	Finish	QTY
1	GWLAD.05.B PCB	100218G000000A	Composite 0.8t	Black	1
2	Capacitor 0.6pF (0402)	001518J050000A	Ceramic	Clear	1
3	RES 0.0 OHM 1/10W JUMP 0402 SMD	001518J060000A	Ceramic	Clear	1
4	Capacitor 4.7pF (0402)	001515A000000A	Ceramic	Clear	1
5	GWLAD.05 Chip	001518G020000A	Ceramic	White	1
6	SMA(F)ST	200417L00006FA	Brass	Au Plated	2

6. Layout Guide

6.1 Footprint

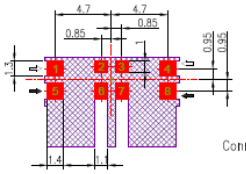
ISO NO: EDW-18-8-xxxx	<Release>				
REV	ZONE	DESCRIPTION	ENG	APPROVED	ISSUED DATE
D01	ALL	Initial Design	Cedric	Wing	2018/07/20
D02	ALL	Modify printing	Rachel	Haley	2018/10/19



Foot Print

Top Copper

Pads 1, 4, 5 and 8 are the same size,
Pads 2 and 3 are the same size, Pads 6 and 7 are the same size.
Pad 5 and 8 should be connected to a 50 ohm transmission line.

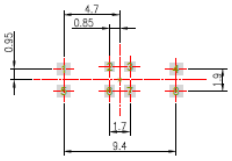


: Connected to GND

: Connected to 50 ohm transmission line.

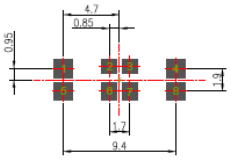
Top Solder Paste

Pads 1, 4, 5 and 8 are the same size,
Pads 2 and 3 are the same size, Pads 6 and 7 are the same size.

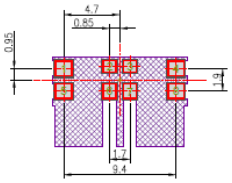


Top Solder Mask

This drawing is a negative of solder mask. Black regions are anti-mask.



Composite Diagram



NOTE:
1. Tin Plated area
2. Solder Mask area
3. Copper area
4. Paste area
5. Keepout Region
6. Ground keepout should extend through any inner PCB layers and any side around the antenna to minimize coupling from RF feed to ground, except the side facing system ground.
7. Any vias in pads should be either filled or tented to prevent solder from wicking away from the pad during reflow.
8. The dimension tolerances should follow standard PCB manufacturing guidelines

UNLESS OTHERWISE SPECFIED TOLERANCES ON: .X± 0.2 XX.± 0.5 .XX± 0.1 X.± 0.3 .XXX± 0.05	DATE: 2018/07/20	MAT'L: Ceramic	taoglas antenna solutions TW Design Centre	REV
	UNIT: mm	FINISH: White	This drawing and its inherent design concepts are property of Taoglas. Not to be copied or given to third parties without the written consent of Taoglas.	D02
	THIRD ANGLE PROJECTION	SCALE: 2/1		

APPROVED BY:	CHECKED BY:	DRAWN BY:	CUSTOMERS SIGNATURE / DATE
Wing	Jack/Paul	Rachel	

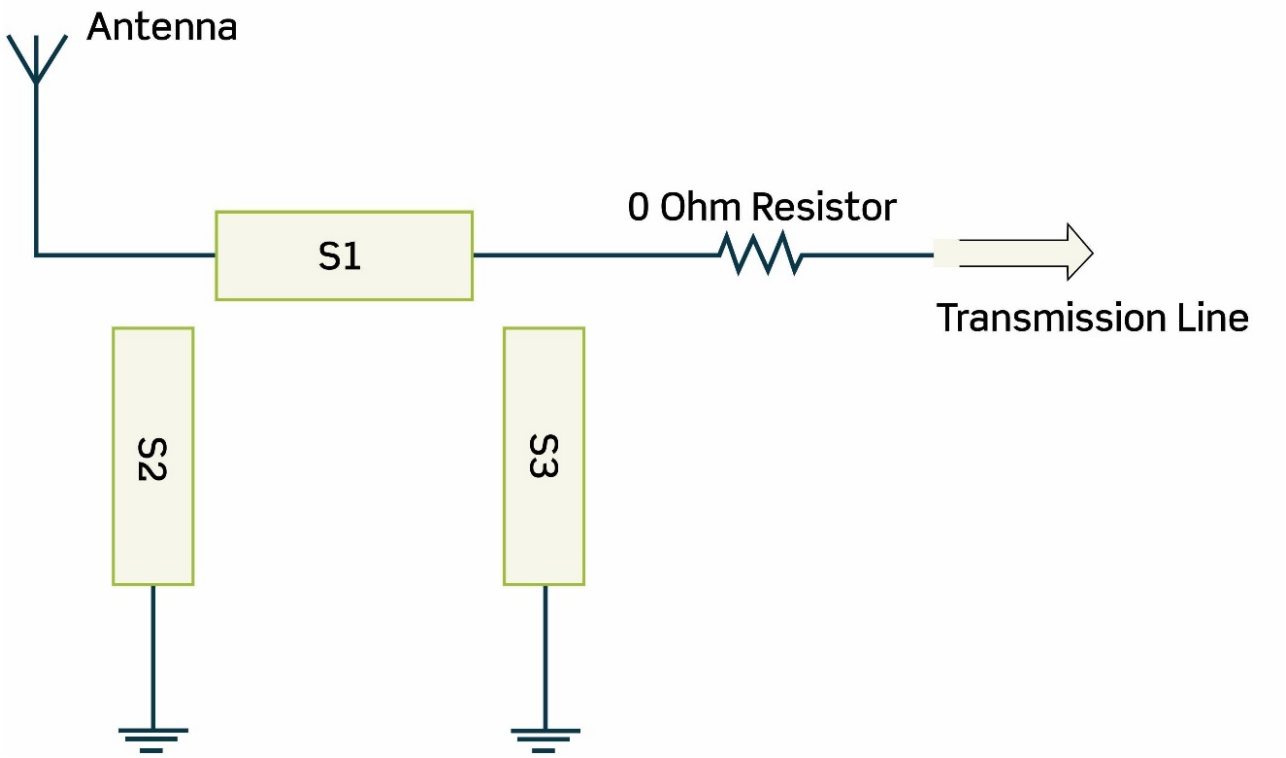
TITLE. : GPS/Galileo & 2.4GHz Multi-Band Ceramic Chip Antenna/10*3*1.5(mm)

PART NO. : GWLA.05

* Footprint drawings in .dwg format will be provided upon request.

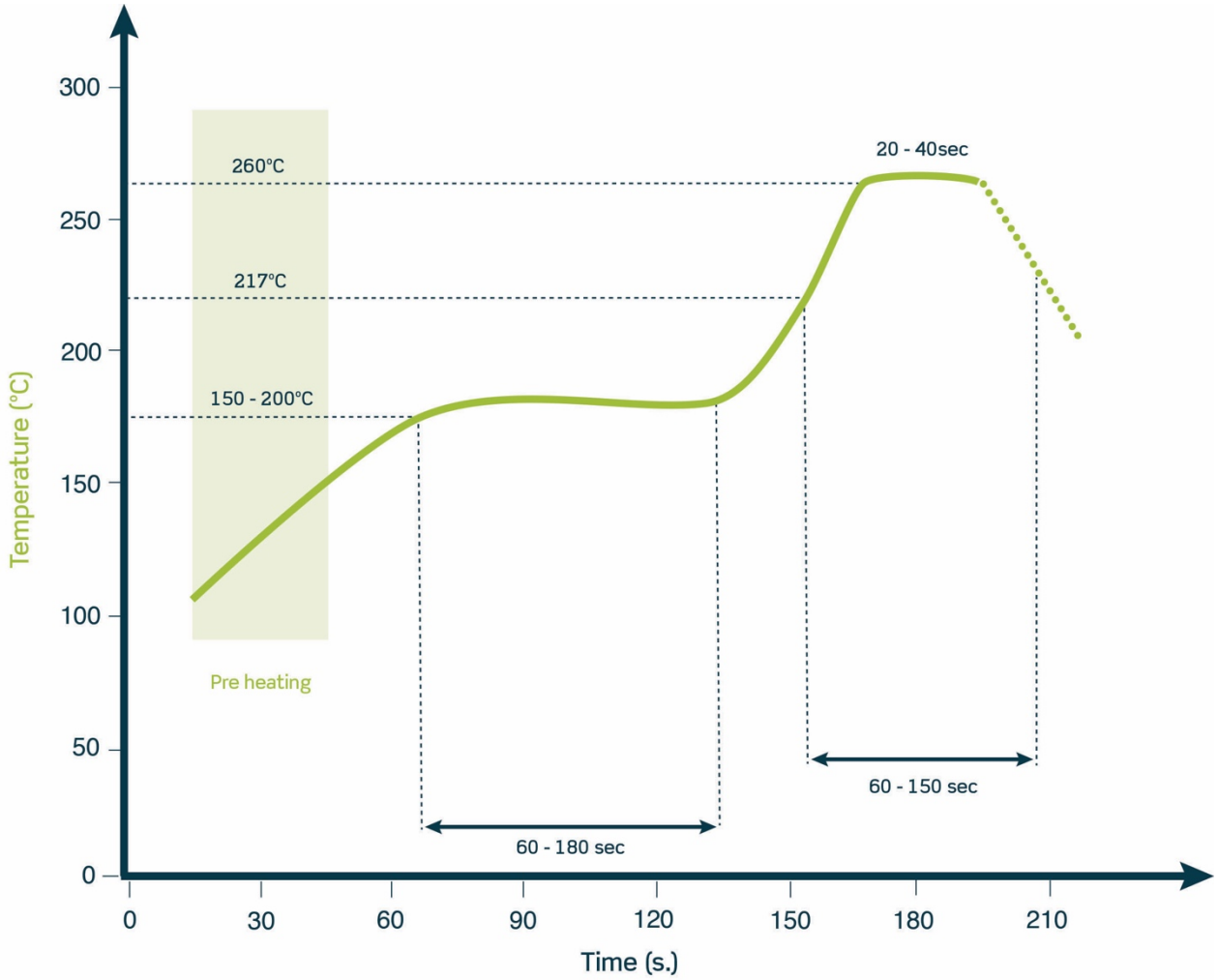
6.2 Matching Circuit

Like all antennas, surrounding components, enclosures, and changes to the GND plane dimensions can alter performance. A pi-matching network like the one shown below is required in case adjustments need to be made. The antenna EVB has a similar matching network. The components on the EVB are a good starting point for a new design, but will need to be adjusted upon integration for best performance. The zero ohm resistor is needed for the ability to solder down a coax pigtail to make measurements with a vector network analyzer.



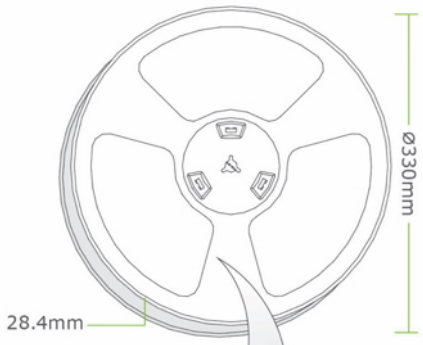
7. Solder Reflow Profile

Typical Soldering Profile for Lead-free Process:

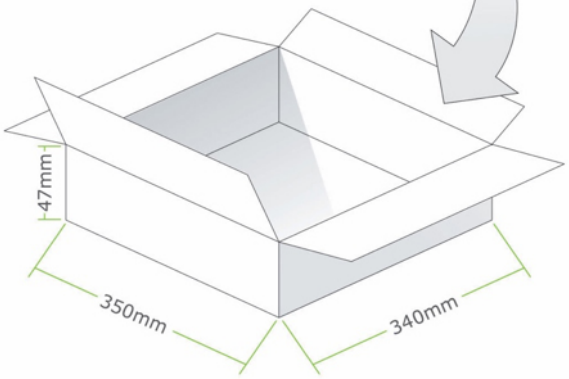


8. Packaging

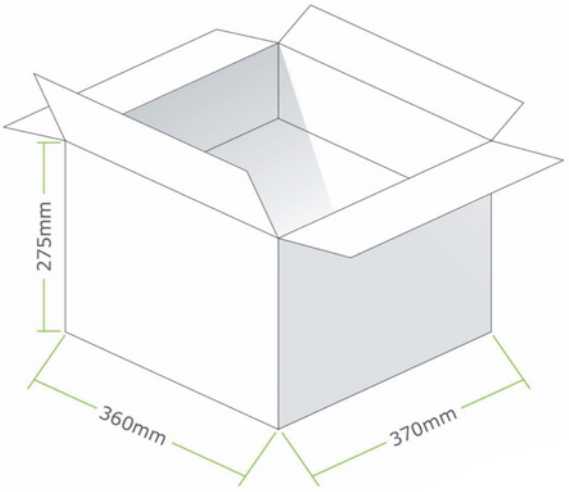
1000pcs GWLA.05 per Tape & Reel
Dimensions - ⌀330*28.4mm
Weight - 0.6Kg



1000pcs GWLA.05 per carton
Dimensions - 350*340*47mm
Weight - 0.9Kg



5000pcs GWLA.05 per carton
Dimensions - 360*370*275mm
Weight - 5.0Kg



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