TAOGLAS

Datasheet

Taoglas Reach Series

Part No:
PCS.68.A

Description

Reach Low Profile Wideband 5G/4G PCB SMD Antenna

Features:

- Patent Pending Innovative Low Profile Design
- High Efficiency Wideband Antenna, Covering 600 to 6000 MHz
- Supporting 5G FR1 Bands
- 600 MHz 5G/4G Band 71 Support
- Surface Mount Distribution (SMD) - Supplied on Tape & Reel
- Manufactured in an IATF16949 Certified Facility
- Dimensions: 42 x 10 x 1.5 mm
- RoHS & REACH Compliant

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Ireland ISO 9001: 2015 Certified

ISO 9001 CERTIFICATION EUROPE

Taiwan ISO 9001: 2015 Certified

UKAS 046

IATF16949

1. Introduction

The Taoglas Reach Series PCS.68.A is a revolutionary 5G/4G, low profile, small footprint, patent pending, SMD mount PCB wide-band antenna. The PCS.68.A has been designed to cover all 5G and 4G bands, including all sub-6GHz deployments across the 600MHz to 6000MHz spectrum in a very small footprint of just 42 x 10mm. It also covers 3G/ 2G bands to allow for fall-back when 5G/4G is not available. The low profile size of just 1.5mm in height allows for installation where height is at a premium.

Typical applications include

- Autonomous/UAVs
- Smart Metering
- Connected Health
- Wearable Technologies
- Payment Terminals

The patent pending design uses printed circuit board material and innovative design techniques to deliver the highest efficiencies at all bands when mounted on the device's main PCB. The PCS.68.A is suitable for lower cost 5G/4G applications, especially IoT projects requiring wide bandwidth and comes supplied on tape and reel to allow it to be mounted via 'pick & place' onto the PCB.

If tuning is required, it can also be tuned specifically depending on device environment. Contact your local Taoglas customer support team for advice on integrating the PCS.68.A into your device.

1.1 Key Advantages

1. **Highest efficiency in small footprint**
   A comparative antenna to the Reach, for example, metal/ceramic/FPC, would have much-reduced efficiency in this configuration due to their high substrate loss at high frequencies. Very high efficiency antennas are critical to 5G/4G devices ability to deliver the stated data-speed rates of systems such as 5G /4G.

2. **Low profile**
   Many applications require a large mechanical size to work efficiently, which occupys the usable PCB space. The size of PCS.68 is only 42mm X 10mm (420mm²), and if accounting for the 4mm keep out area, the total area consumed on the PCB is only 42mmX14mm = 588mm². The solution allows board designers to maximize their PCB space.

3. **Adaptable**
   The high radiation efficiency of the Reach over its entire operating bandwidth means that the total efficiency is only limited by the impedance mismatch loss. As a result, this antenna has been optimized via a matching network to 600MHz – 960MHz and 1710MHz – 6000MHz with the minimum efficiencies of 30% and 50% respectively. The performance of direct feeding the antenna without a matching circuit is good from 730MHz – 960MHz and 1710MHz – 6000MHz.

4. **More resistant to detuning compared to other antenna integrations**
   If tuning is required it can be tuned for the device environment using a matching circuit, or other techniques on the main PCB itself. There is no need for new tooling, thereby saving money if customization is required.

5. **Surface Mount Device (SMD)**
   Direct mount, 'on-board' antennas save on labour, cable and connector costs, lead to higher integration yield rates and reduce losses in transmission.

6. **Minimum Transmission and Reception Losses**
   These are kept to an absolute minimum resulting in much improved OTA (over the air), i.e. TRP (Total Radiated Power) / TIS (Total Isotropic Radiation), device performance compared to similar efficiency cable and connector antenna solutions. This means it is an ideal antenna to be used for devices that This means it is an ideal antenna to be used for devices that need to pass for example USA carrier network approvals.

2. Specification

Electrical								
Band	Frequency (MHz)	Efficiency (%)	Average Gain (dB)	Peak Gain (dBi)	Impedance	Polarization	Radiation Pattern	Max. input power
4G/3G Band 12,13,14,17,28,29	698-806	52.2	-2.82	1.33	50 Ω	Linear	Omni	2W
4G/3G/NB-IoT/Cat M Band 5,8,18,19,20,26,27	824-960	48.8	-3.11	2.28				
5GNR/4G Band 21,32,74,75,76	1427-1518	27.5	-5.60	1.23				
4G/3G Band 1,2,3,4,9,23,25,35,39,66	1710-2200	73.8	-1.32	6.22				
4G/3G Band 7,30,38,40,41	2300-2690	70.5	-1.52	5.58				
5GNR/4G Band 22,42,48,77,78,79	3300-5000	71.5	-1.46	6.48				
LTE5200/Wi-Fi5800	5150-5925	76.8	-1.14	5.34				

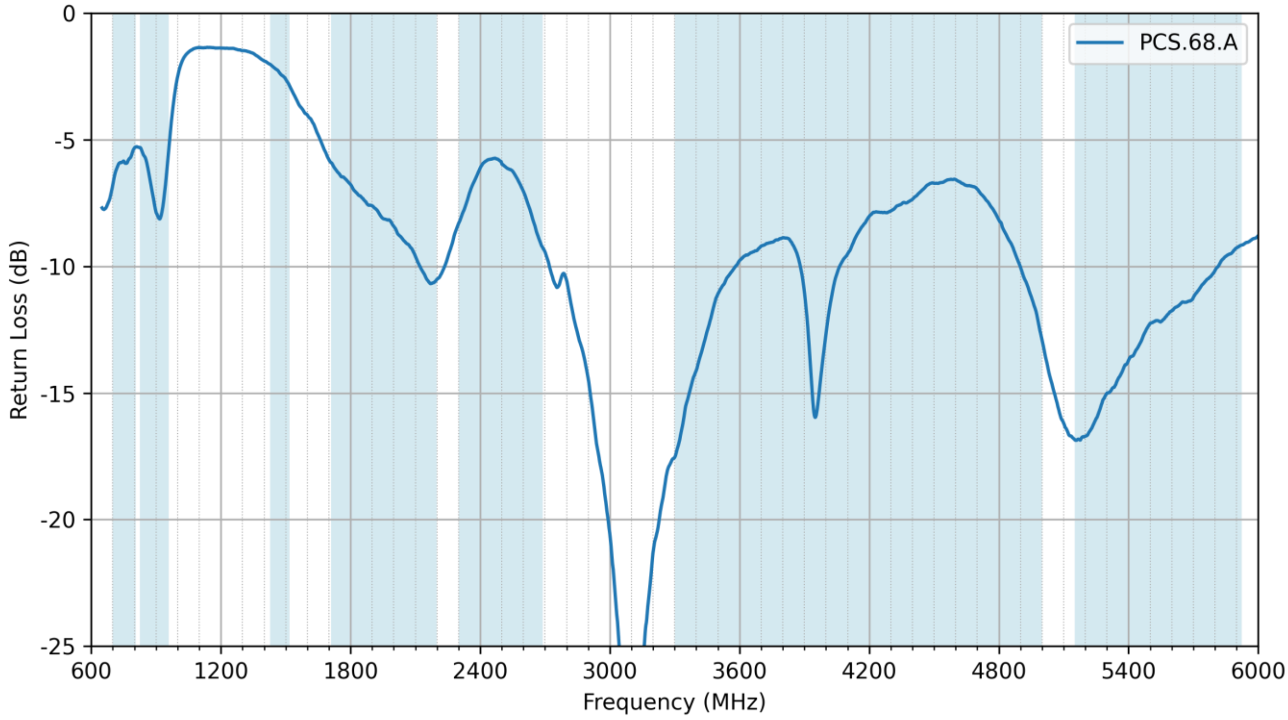
Mechanical	
Dimensions	42mm x 10mm x 1.5mm
Weight	2g
Material	PCB
Termination	Solder Pad
EVB Connector	SMA-Female

Environmental	
Operation Temperature	-40°C to 85°C
Storage Temperature	-40°C to 105°C
Moisture Sensitivity Level (MSL)	3 (168 Hours)
Relative Humidity	Non-condensing 65°C 95% RH
RoHS & REACH Compliant	Yes

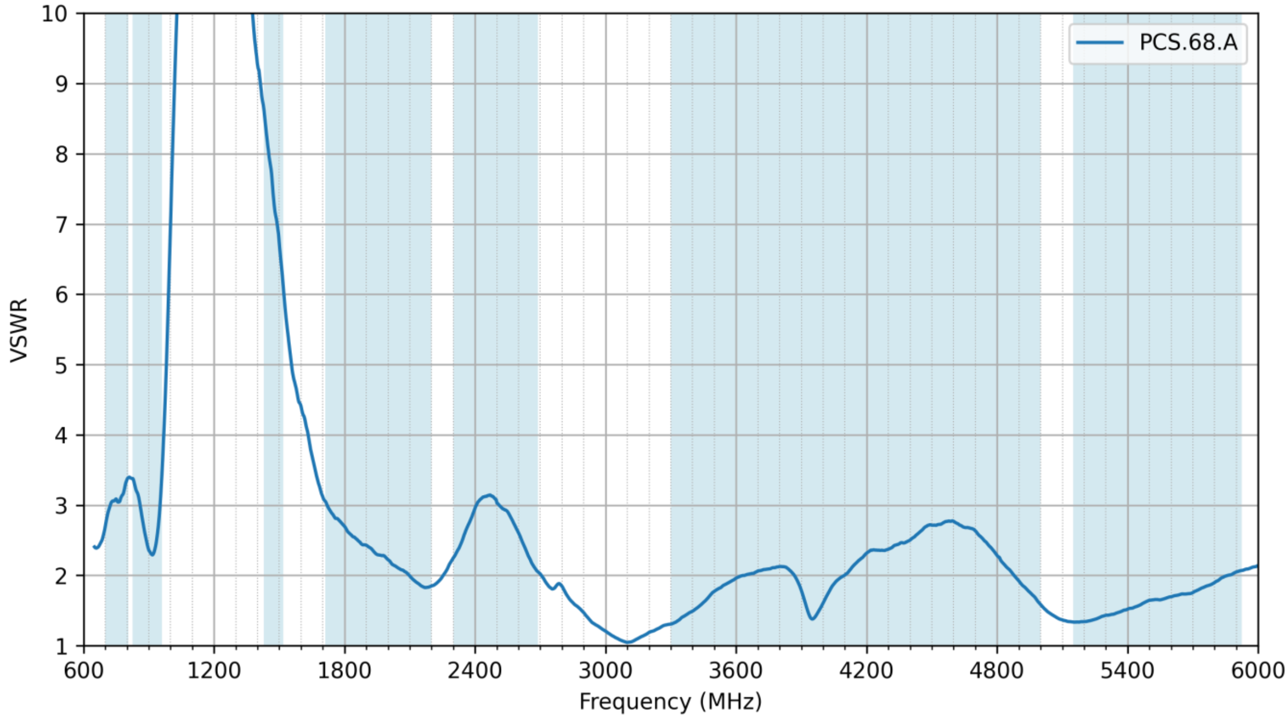
5G/4G Bands			
Band Number	**5GNR / FR1 / LTE / LTE-Advanced / WCDMA / HSPA / HSPA+ / TD-SCDMA**		
	Uplink	**Downlink**	**Covered**
B1	1920 to 1980	2110 to 2170	✓
B2	1850 to 1910	1930 to 1990	✓
B3	1710 to 1785	1805 to 1880	✓
B4	1710 to 1755	2110 to 2155	✓
B5	824 to 849	869 to 894	✓
B7	2500 to 2570	2620 to 2690	✓
B8	880 to 915	925 to 960	✓
B9*	1749.9 to 1784.9	1844.9 to 1879.9	✓
B11	1427.9 to 1447.9	1475.9 to 1495.9	✓
B12	699 to 716	729 to 746	✓
B13	777 to 787	746 to 756	✓
B14	788 to 798	758 to 768	✓
B17	704 to 716	734 to 746	✓
B18	815 to 830	860 to 875	✓
B19	830 to 845	875 to 890	✓
B20	832 to 862	791 to 821	✓
B21	1447.9 to 1462.9	1495.9 to 1510.9	✓
B22*	3410 to 3490	3510 to 3590	✓
B23*	2000 to 2020	2180 to 2200	✓
B24	1626.5 to 1660.5	1525 to 1559	✓
B25	1850 to 1915	1930 to 1995	✓
B26	814 to 849	859 to 894	✓
B27*	807 to 824	852 to 869	✓
B28	703 to 748	758 to 803	✓
B29	717 to 728		✓
B30	2305 to 2315	2350 to 2360	✓
B31	452.5 to 457.5	462.5 to 467.5	✗
B32	1452 to 1496		✓
B34	2010 to 2025		✓
B35	1850 to 1910		✓
B36	1930 to 1990		✓
B37	1910 to 1930		✓
B38	2570 to 2620		✓
B39	1880 to 1920		✓
B40	2300 to 2400		✓
B41	2496 to 2690		✓
B42	3400 to 3600		✓
B43	3600 to 3800		✓
B45	1447 to 1467		✓
B46	5150 to 5925		✓
B47	5855 to 5925		✓
B48	3550 to 3700		✓
B49	3550 to 3700		✓
B50	1432 to 1517		✓
B51	1427 to 1432		✓
B52	3300 to 3400		✓
B53	2483.5 to 2495		✓
B65	1920 to 2010	2110 to 2200	✓
B66	1710 to 1780	2110 to 2200	✓
B68	698 to 728	753 to 783	✓
B69	2570 to 2620		✓
B70	1695 to 1710	1995 to 2020	✓
B71	663 to 698	617 to 652	✗
B72	451 to 456	461 to 466	✗
B73	450 to 455	460 to 465	✗
B74	1427 to 1470	1475 to 1518	✓
B75	1432 to 1517		✓
B76	1427 to 1432		✓
B77	3300 to 4200		✓
B78	3300 to 3800		✓
B79	4400 to 5000		✓
B85	698 to 716	728 to 746	✓
B87	410 to 415	420 to 425	✗
B88	412 to 417	422 to 427	✗

3. Antenna Characteristics

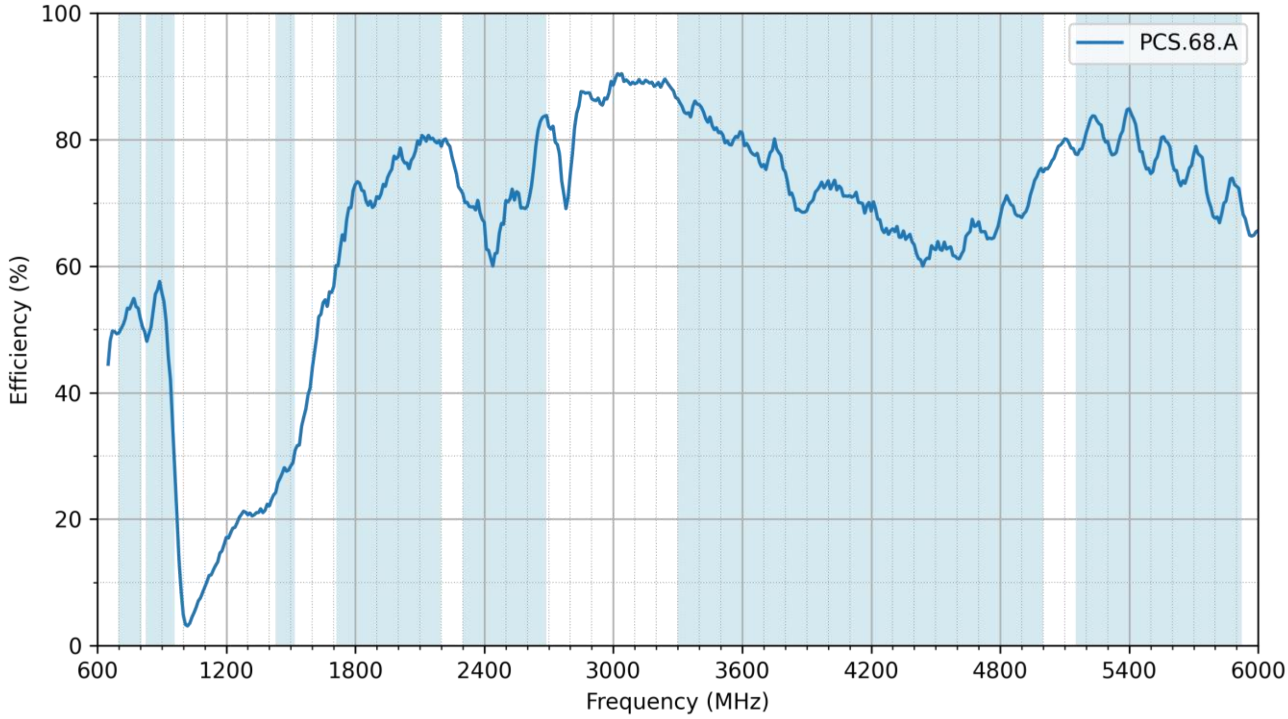
3.1 Return Loss



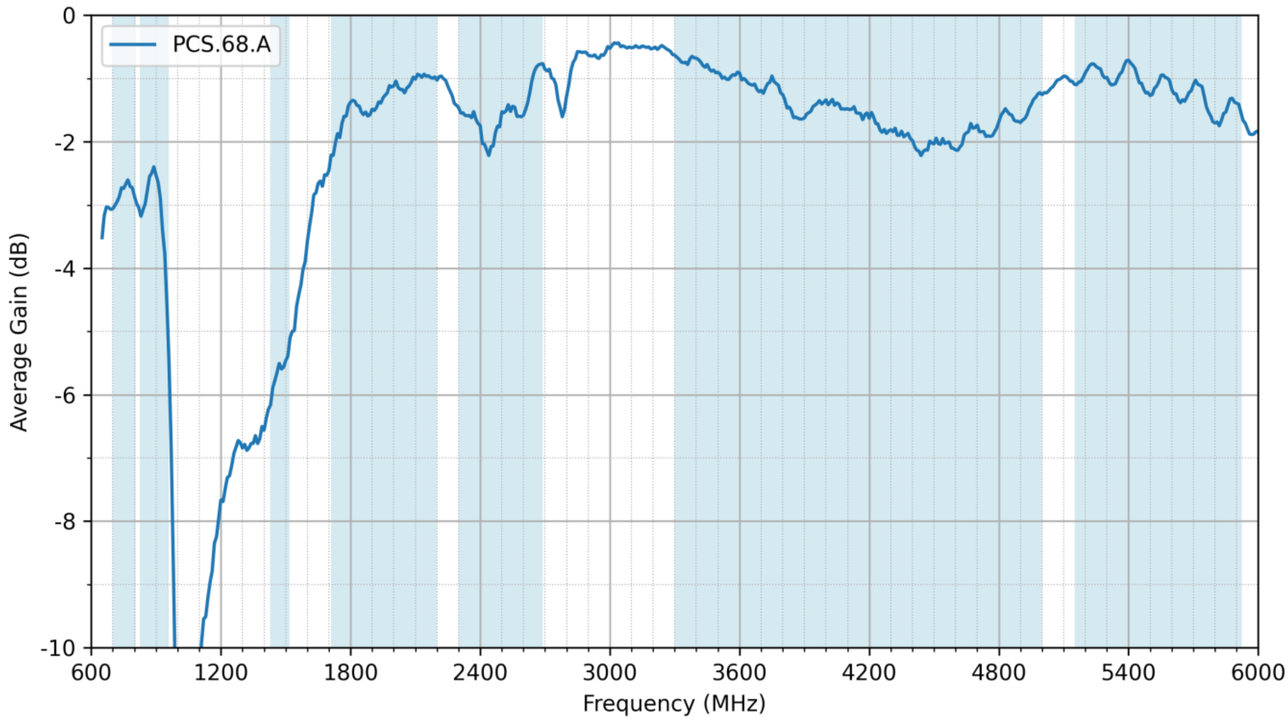
3.2 VSWR



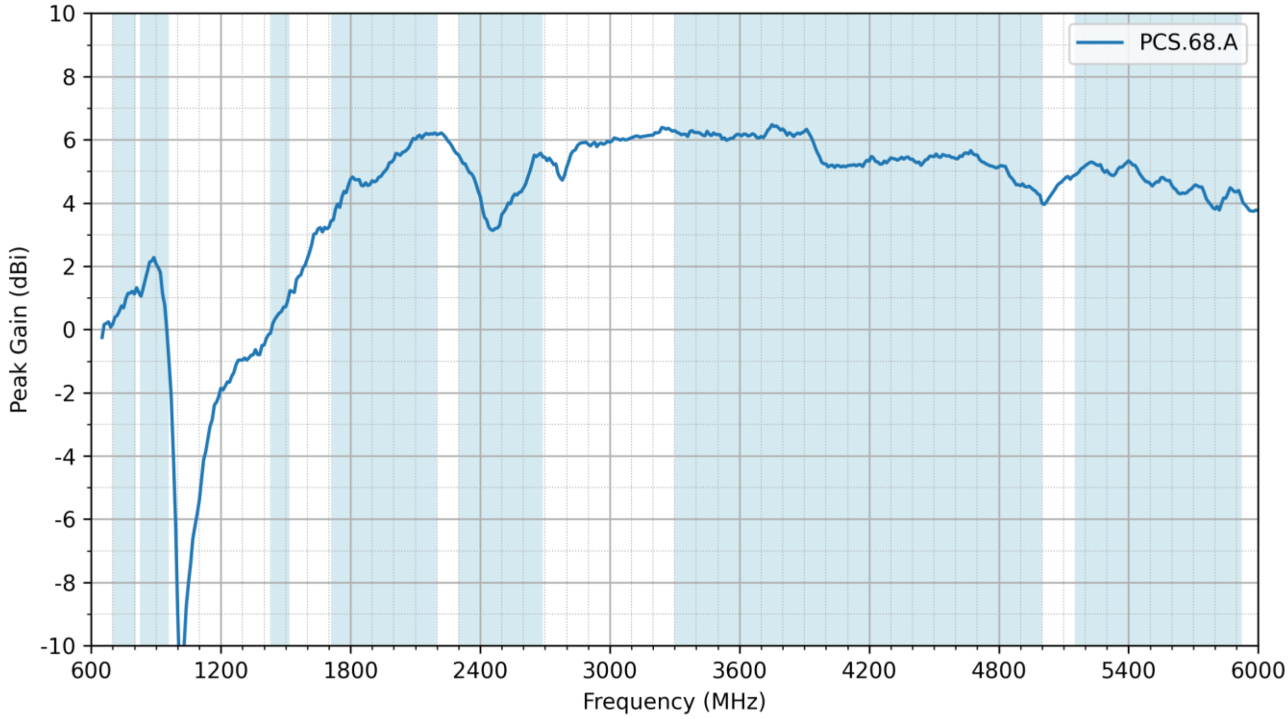
3.3 Efficiency



3.4 Average Gain



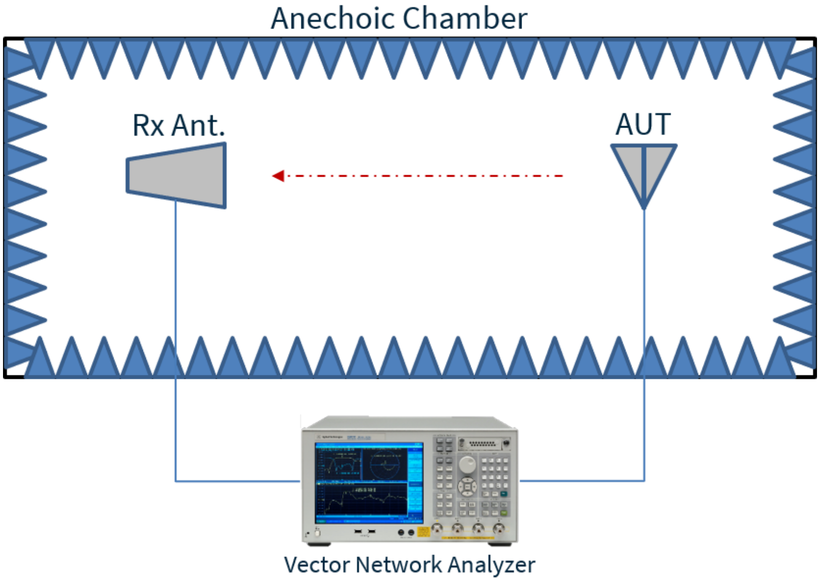
3.5 Peak Gain

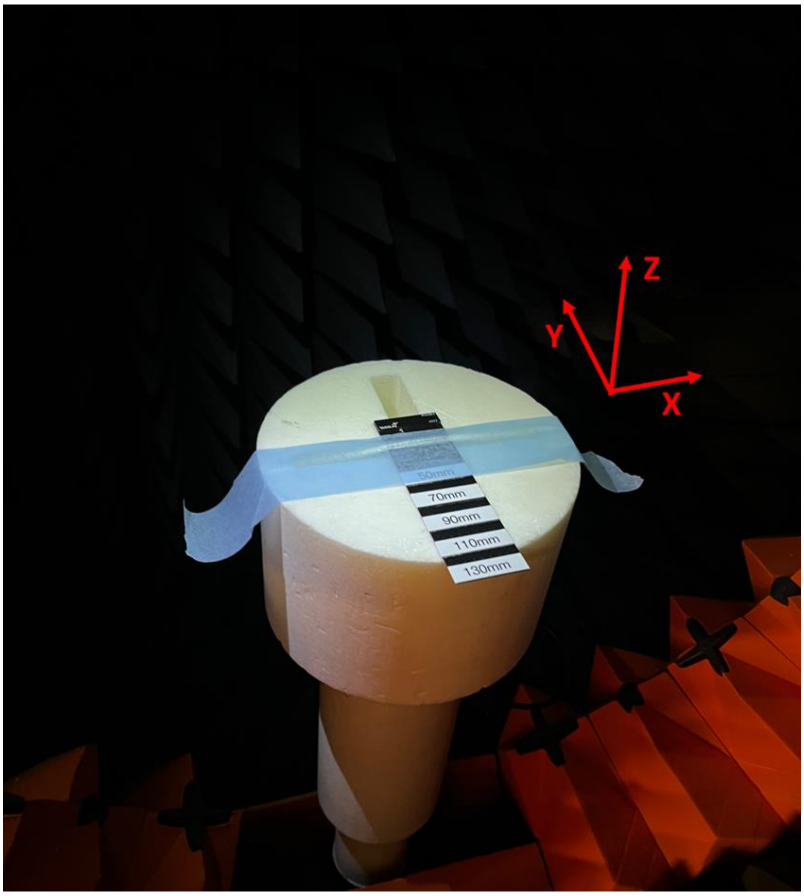


PCS.68.A
Peak Gain (dBi)
Frequency (MHz)
10
8
6
4
2
0
-2
-4
-6
-8
-10
600
1200
1800
2400
3000
3600
4200
4800
5400
6000

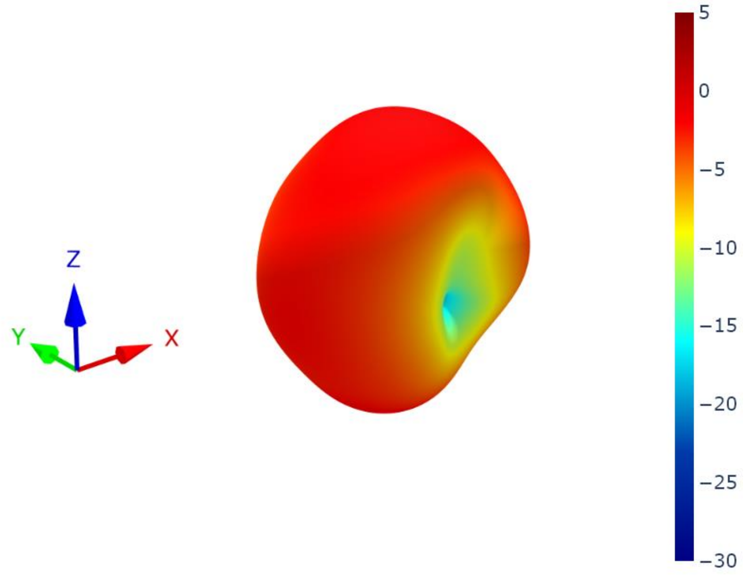
4. Radiation Patterns

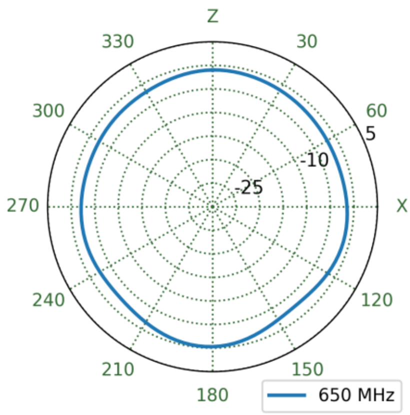
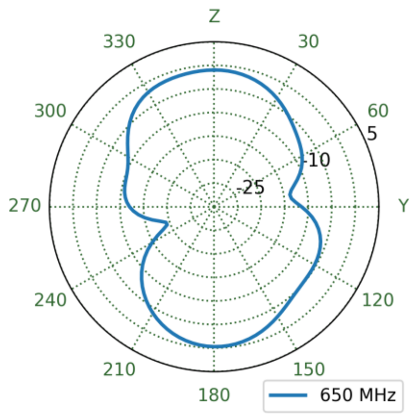
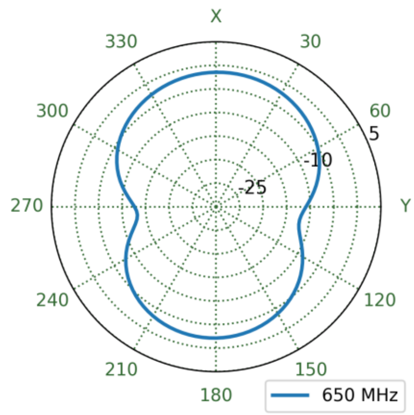
4.1 Test Setup



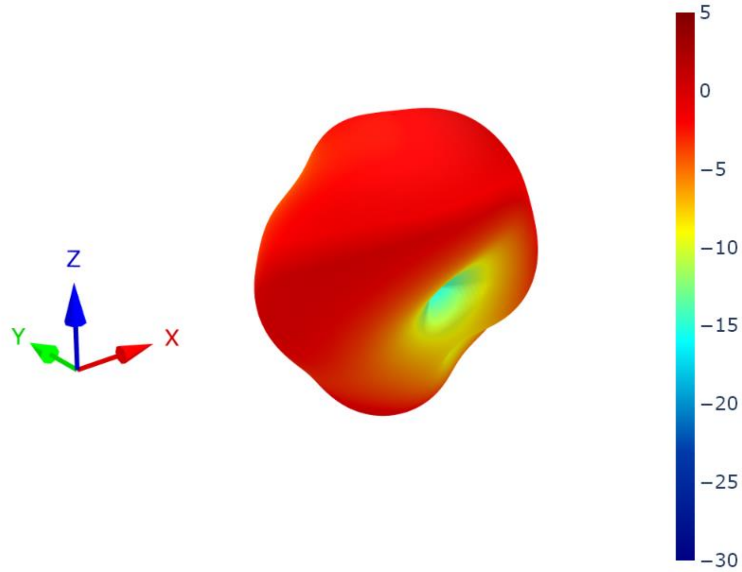


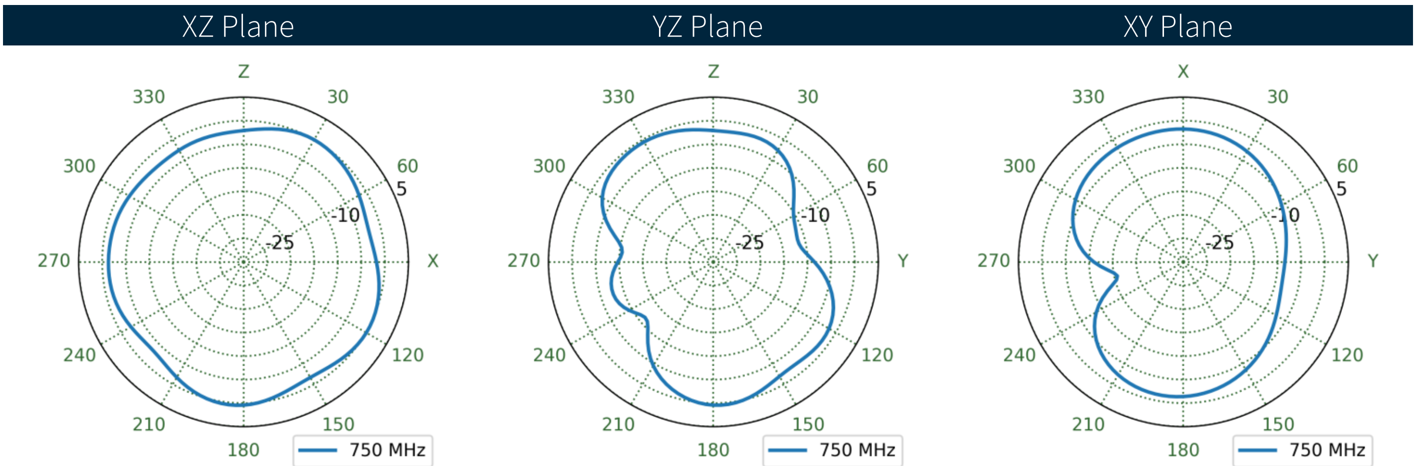
4.2 PCS.68.A Patterns at 650 MHz



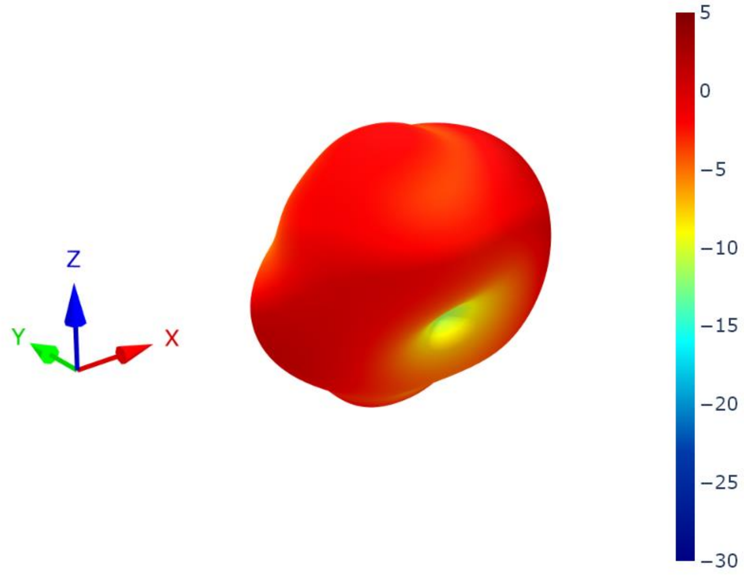
XZ Plane	YZ Plane	XY Plane
		

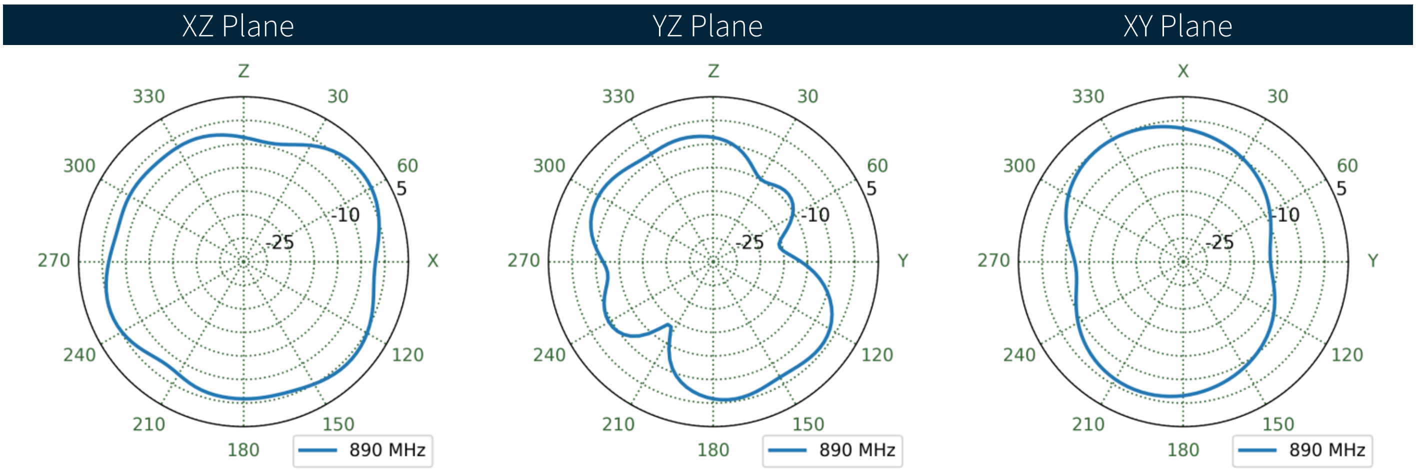
4.3 PCS.68.A Patterns at 750 MHz



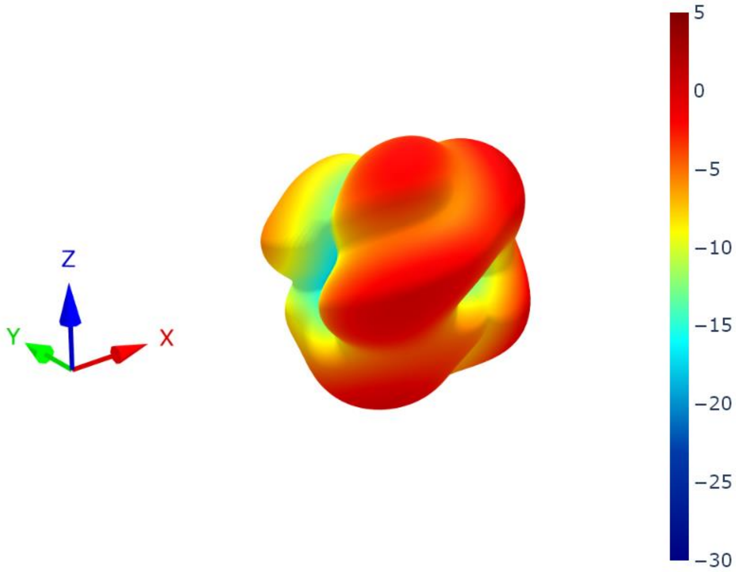


4.4 PCS.68.A Patterns at 890 MHz

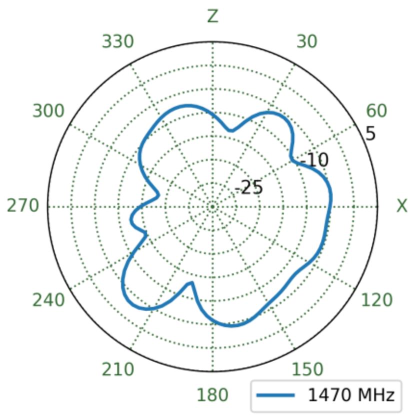


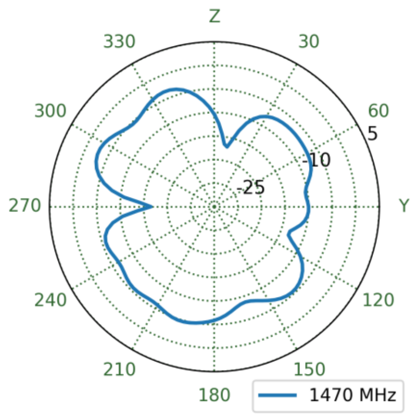


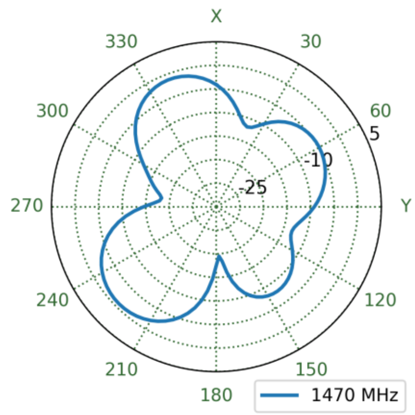
4.5 PCS.68.A Patterns at 1475 MHz



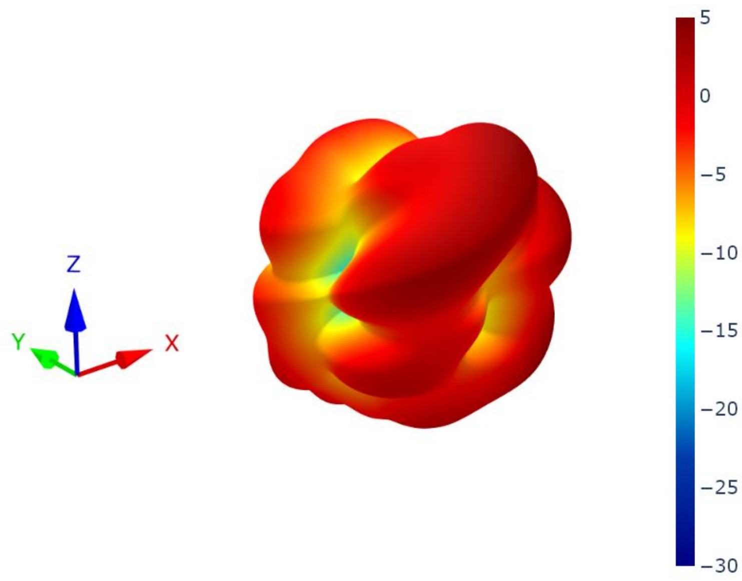
XZ Plane	YZ Plane	XY Plane

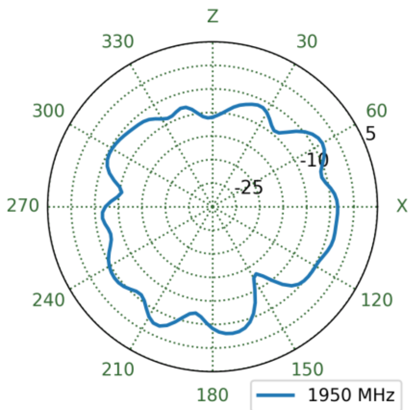
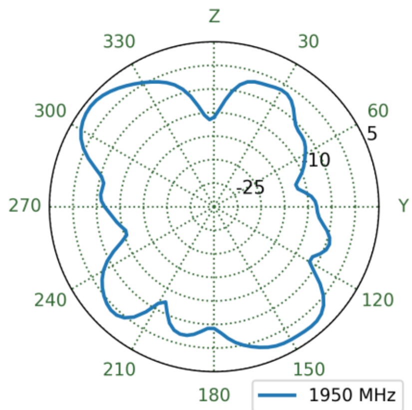
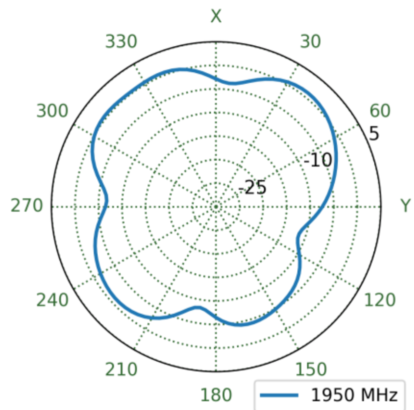




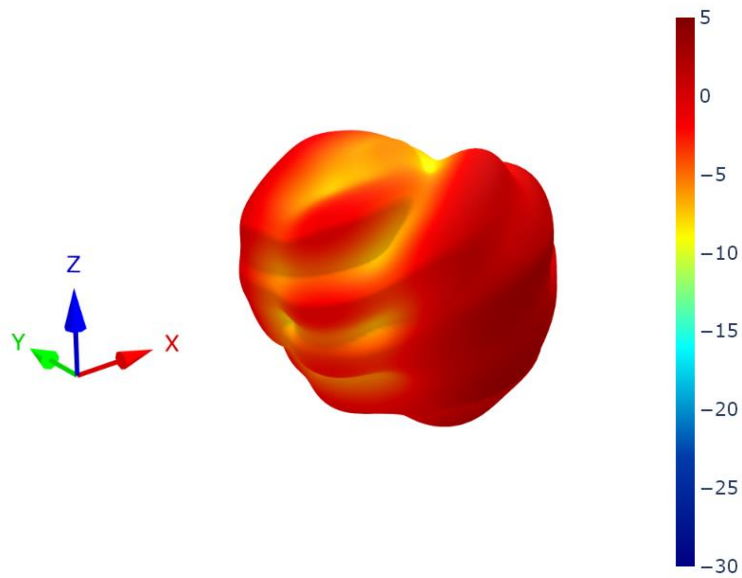


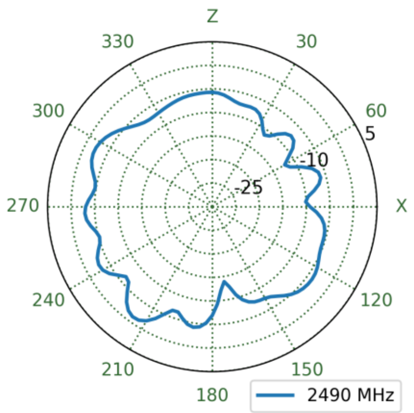
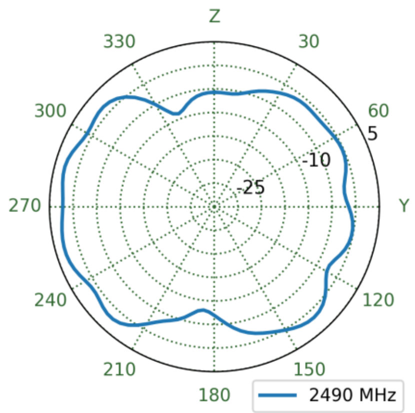
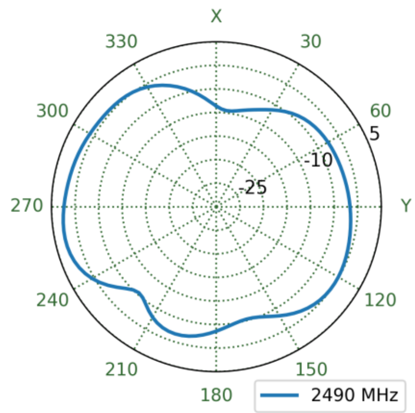
4.6 PCS.68.A Patterns at 1955 MHz



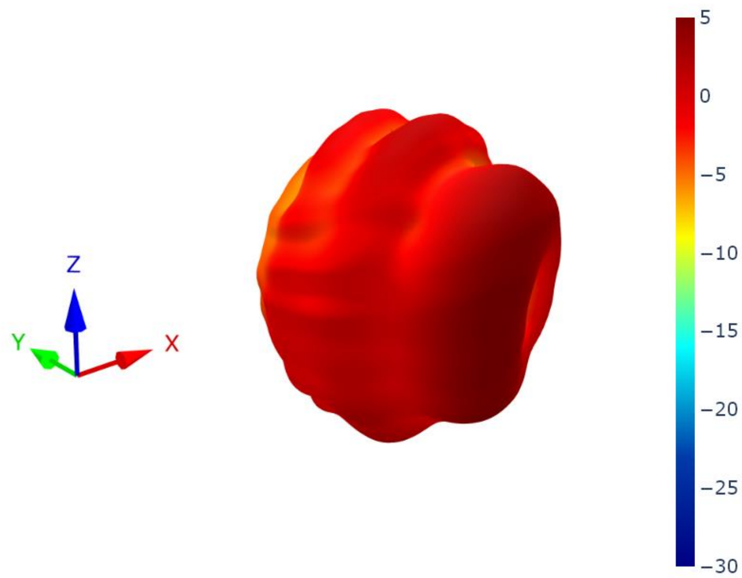
XZ Plane	YZ Plane	XY Plane
		

4.7 PCS.68.A Patterns at 2495 MHz

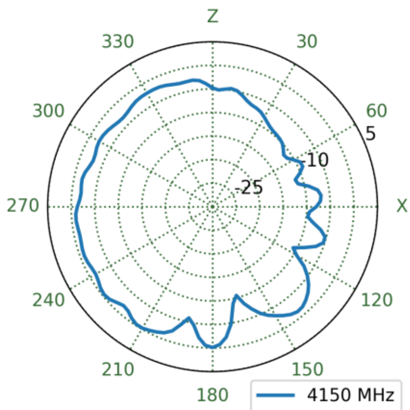


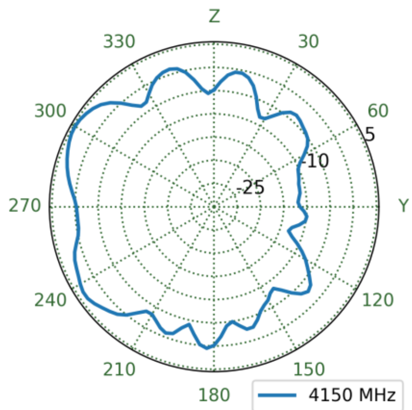
XZ Plane	YZ Plane	XY Plane
		

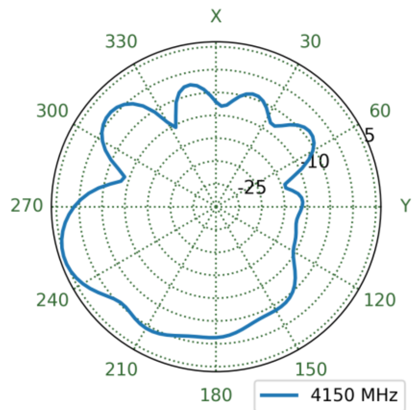
4.8 PCS.68.A Patterns at 4150 MHz



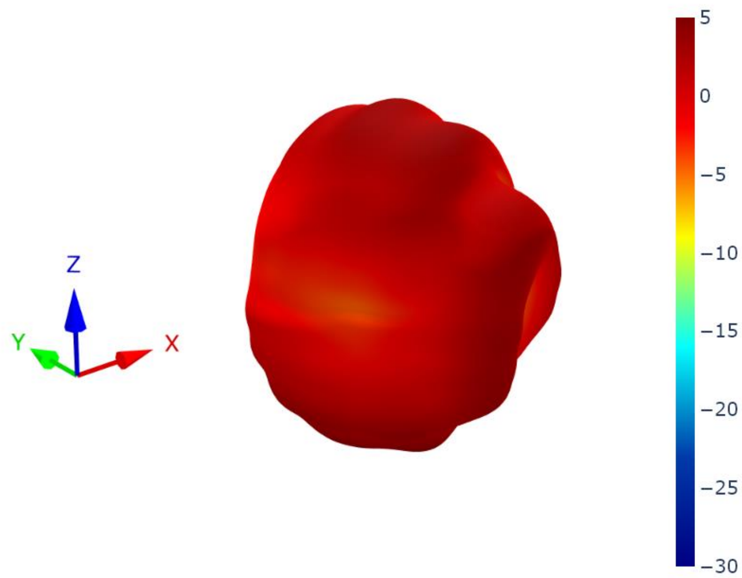
XZ Plane	YZ Plane	XY Plane



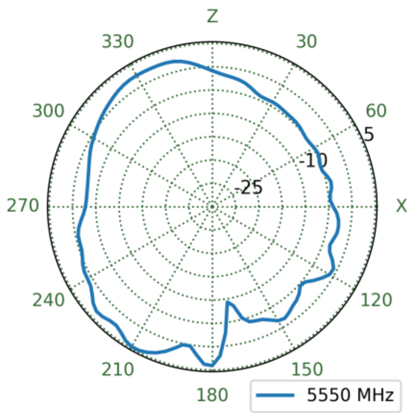


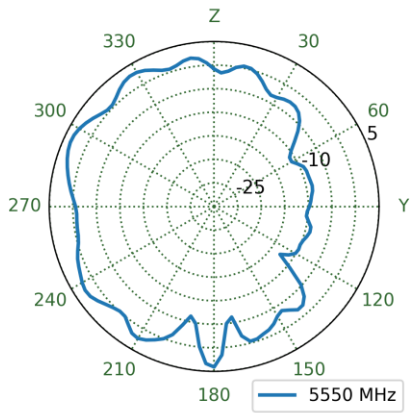


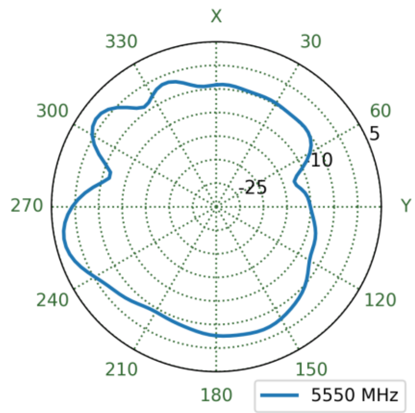
4.9 PCS.68.A Patterns at 5550 MHz



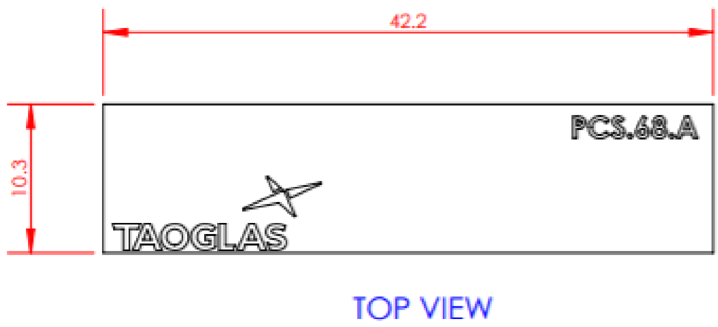
XZ Plane	YZ Plane	XY Plane

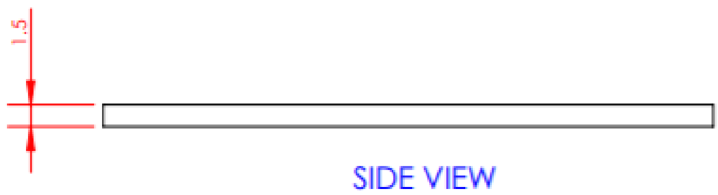


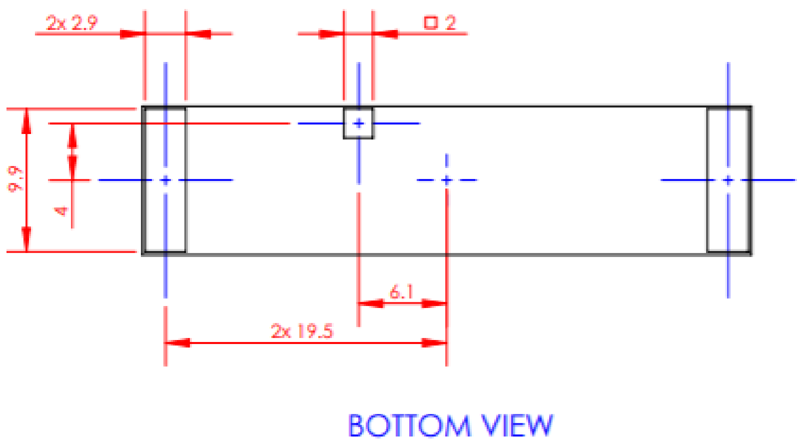




5. Mechanical Drawing



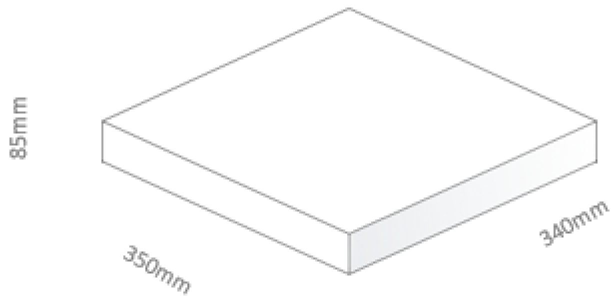




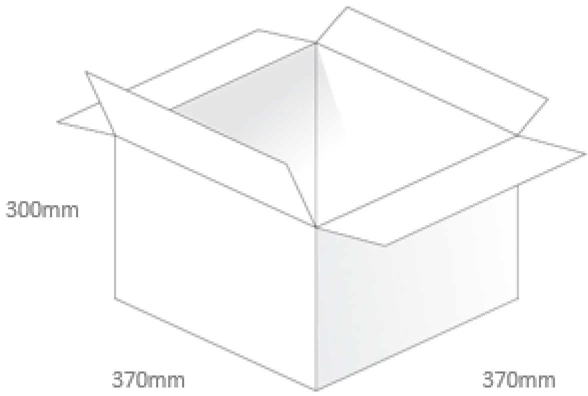
6. Packaging

1000 pcs PCS.68.A per Tape & Reel
Dimensions: 330*330*60mm
Weight: 2.6Kg

1 reel in small inner box
Dimensions: 350*350*70mm
Weight: 2.7Kg



3000 pcs in one carton
Dimensions: 370*360*275mm
Weight: 8.3Kg

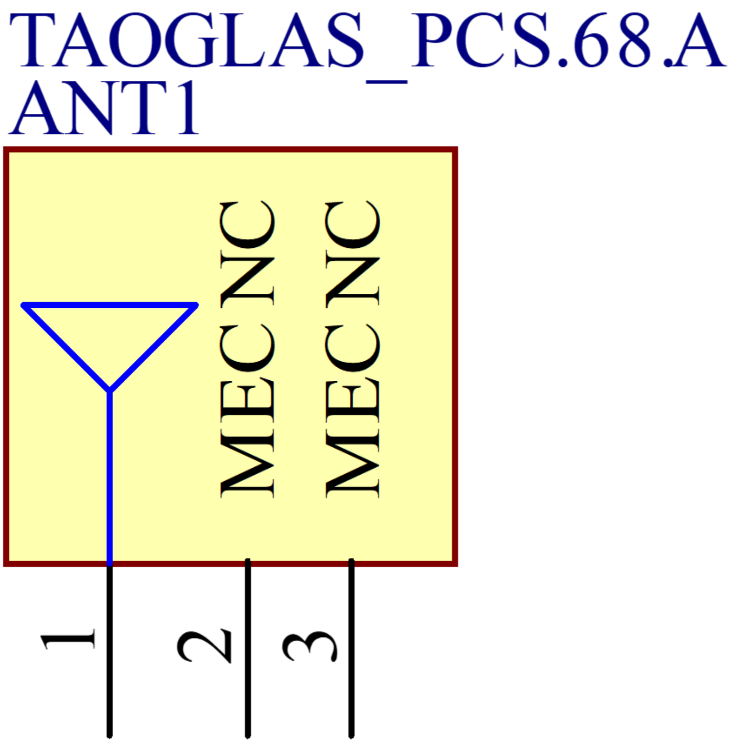


7. Antenna Integration Guide

7.1 Schematic and Symbol Definition

The circuit symbol for the antenna is shown below. The antenna has 3 pins with only one pin (Pin 1) as functional. Pins 2 and 3 are for mechanical strength.

Pin	Description
1	RF Feed
2,3	Mechanical, Not Connected

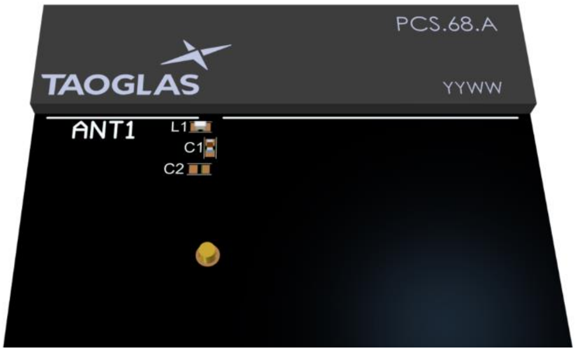


Please note you can download the CST simulation files from the website here:

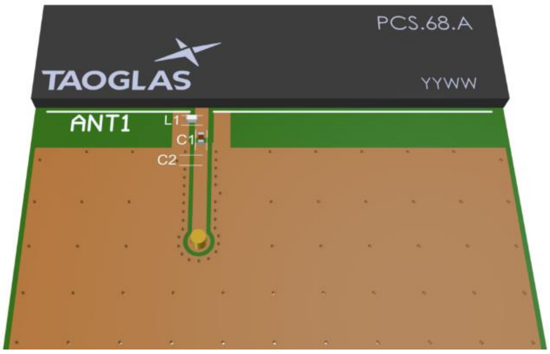
https://www.taoglas.com/product/pcs-68-a-wideband-5g-4g-pcb-smd-antenna/

7.2 Antenna Integration

For any given PCB size, the antenna should ideally be placed on the PCB's shortest side, to take advantage of the ground plane. Optimized matching components can be placed as shown.



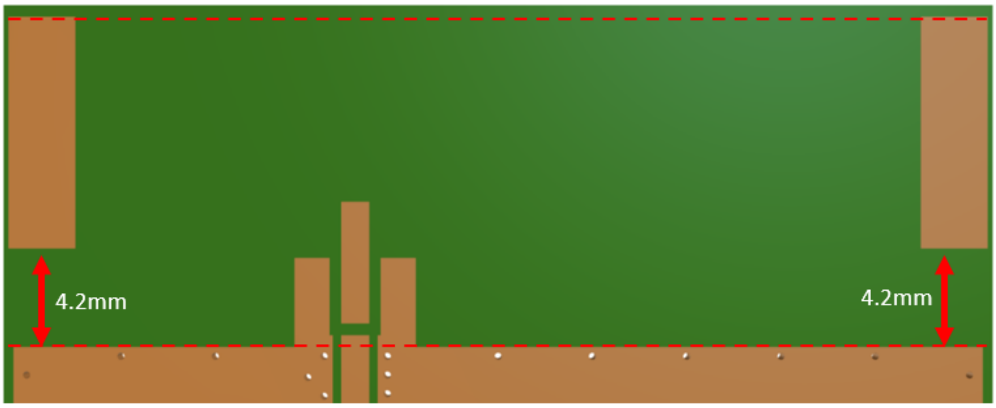
With Solder Mask



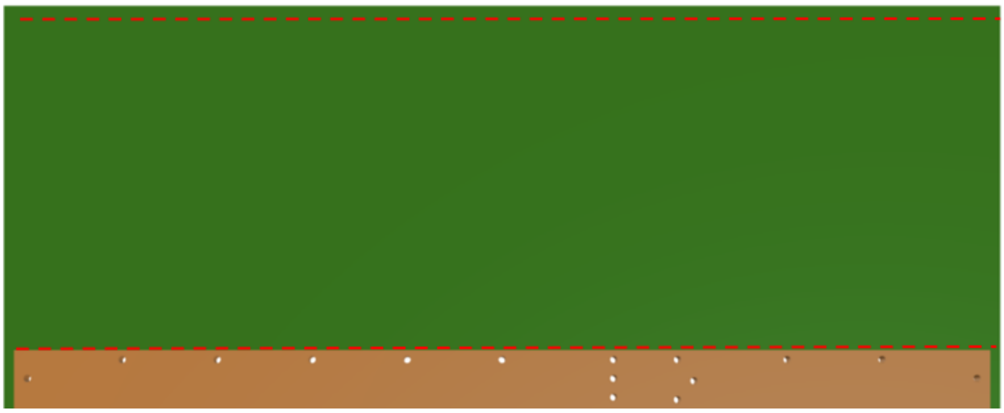
Without Solder Mask

7.3 PCB Clearance

Below shows the antenna footprint and clearance through ALL layers on the PCB. Only the antenna pads and connections to feed and GND are present within this clearance area (marked RED). The clearance area extends to 4.2mm from the antenna mechanical pads to the ground area. This clearance area includes the bottom side and ALL internal layers on the PCB.



Topside



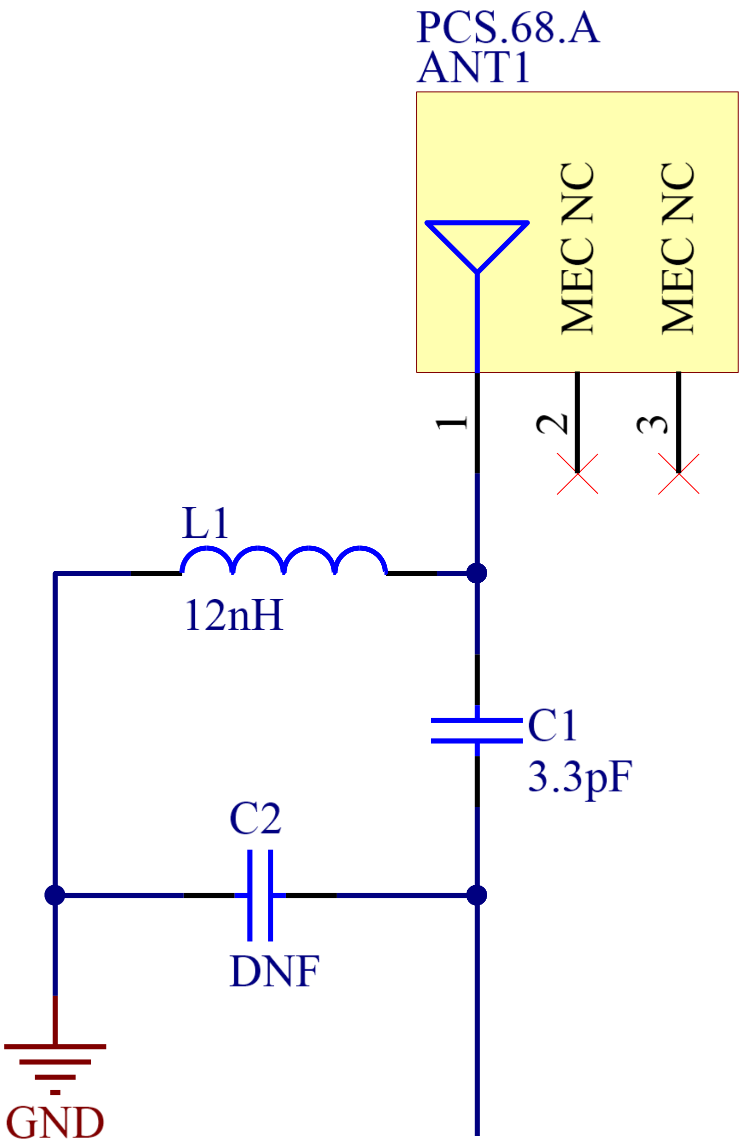
Bottom Side

7.4 Evaluation Board

7.5 Evaluation Board Ground Plane Length

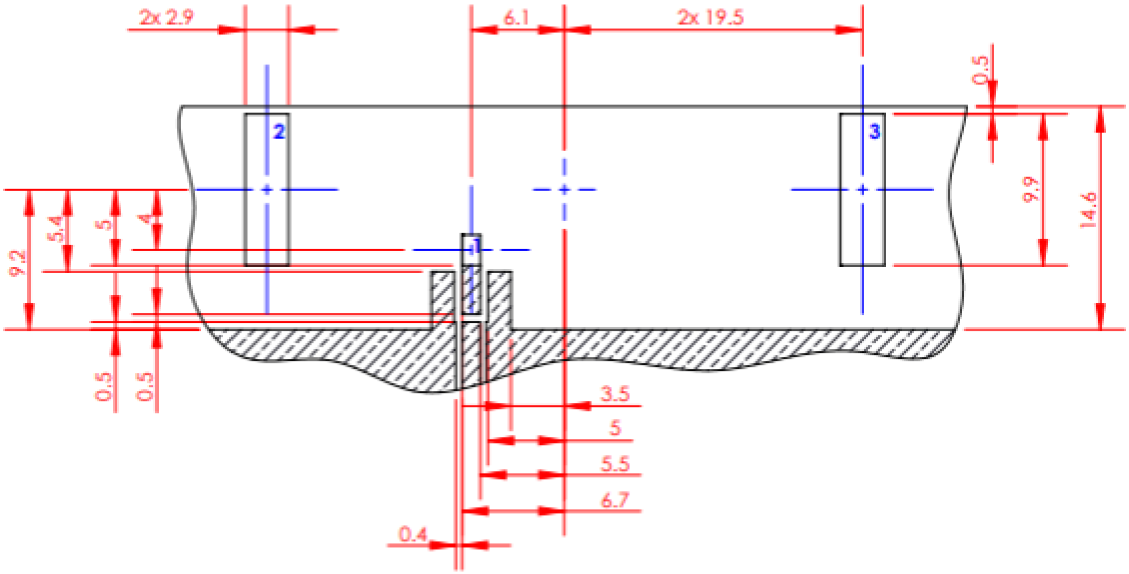
7.6 Evaluation Board Matching Circuit

Matching Components with the PCS.68.A are recommended for the antenna to have optimal performance on the evaluation board, located in the spaces specified in the above images. Additional matching components may be necessary for your device, so we recommend incorporating extra component footprints, forming a "pi" network, between the cellular module and the edge of the ground plane.

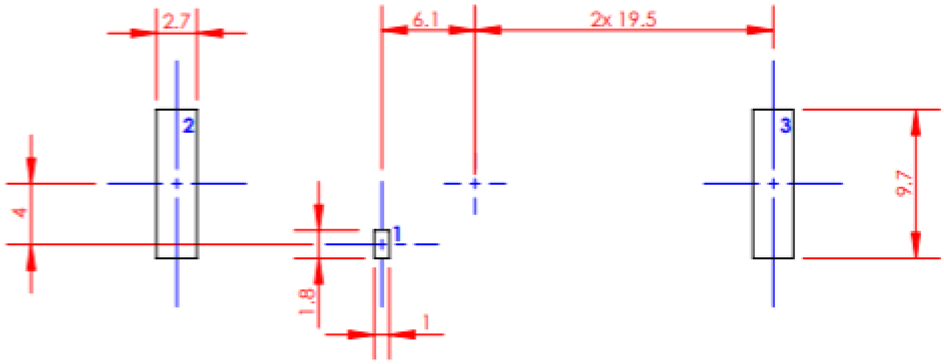


Designator	Type	Value	Description
L1	Inductor	12nH	TDK: MLK1005S Series
C1	Capacitor	3.3pF	Murata:GRM1555 Series
C2	Capacitor	Not Fitted	

7.7 Footprint



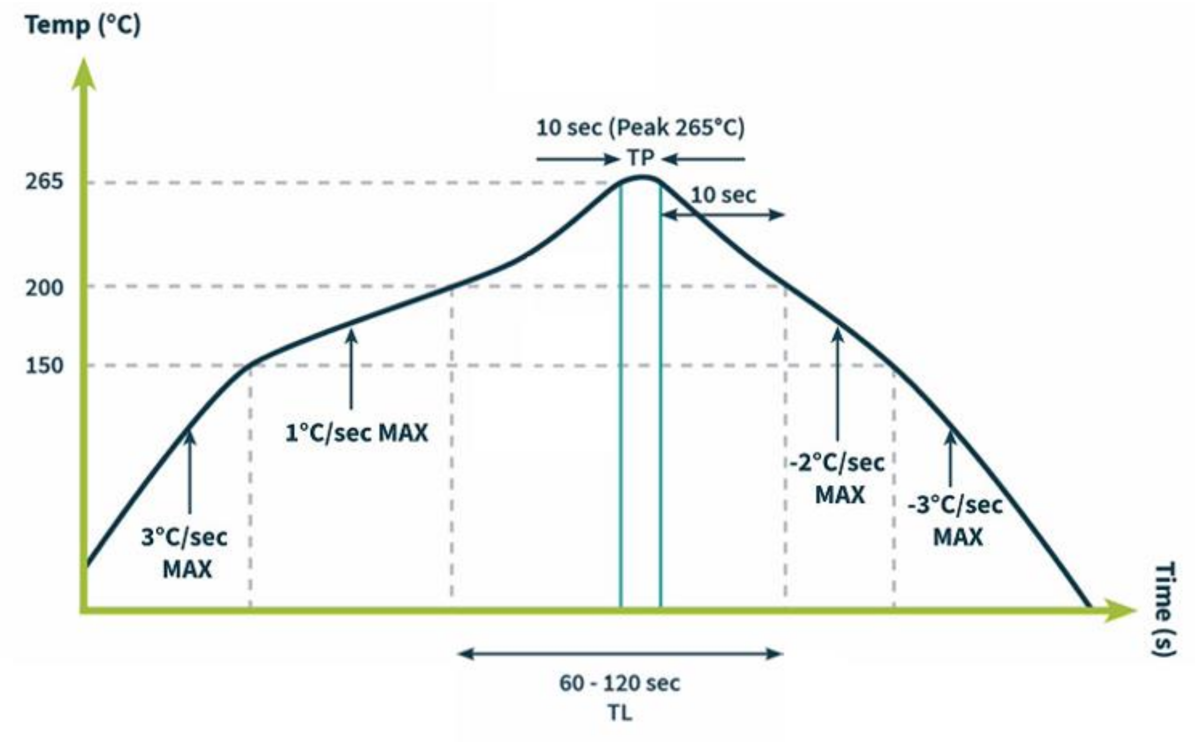
FOOTPRINT PCB



FOOTPRINT SOLDER PASTE

8. Solder Reflow Profile

The PCS.68.A can be assembled by following the recommended soldering temperatures are as follows:

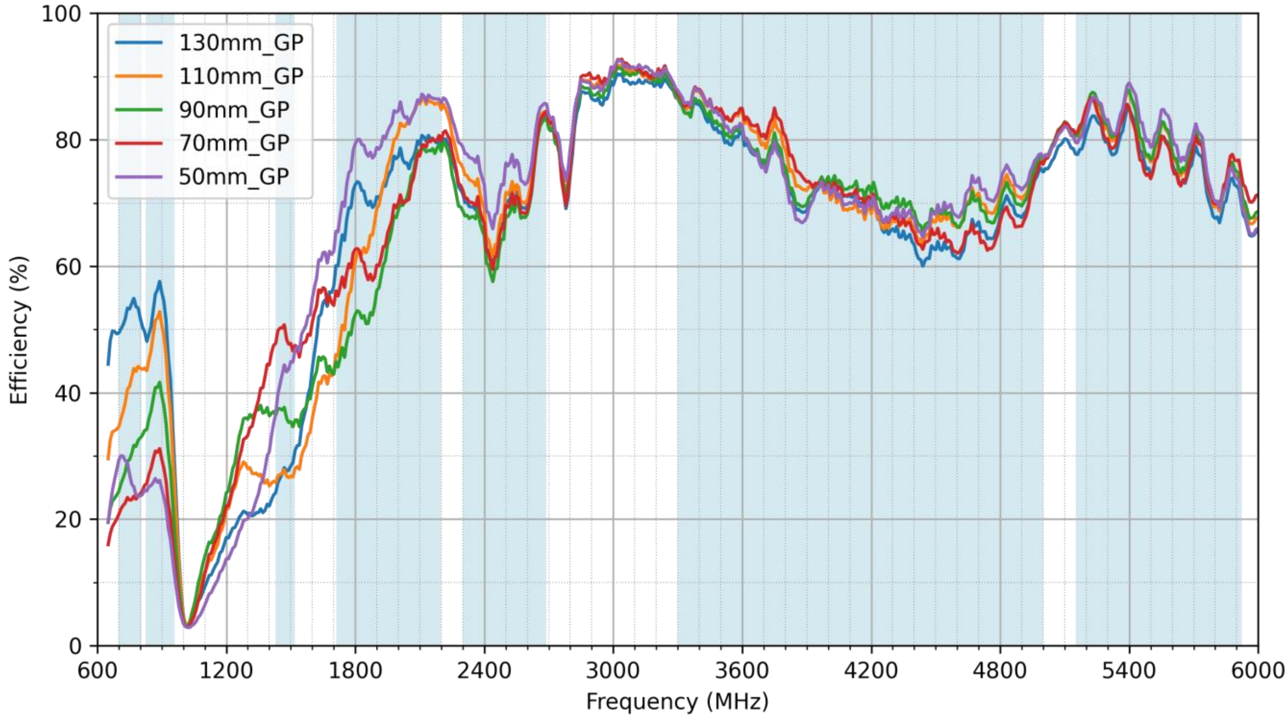


*Temperatures listed within a tolerance of +/- 10° C

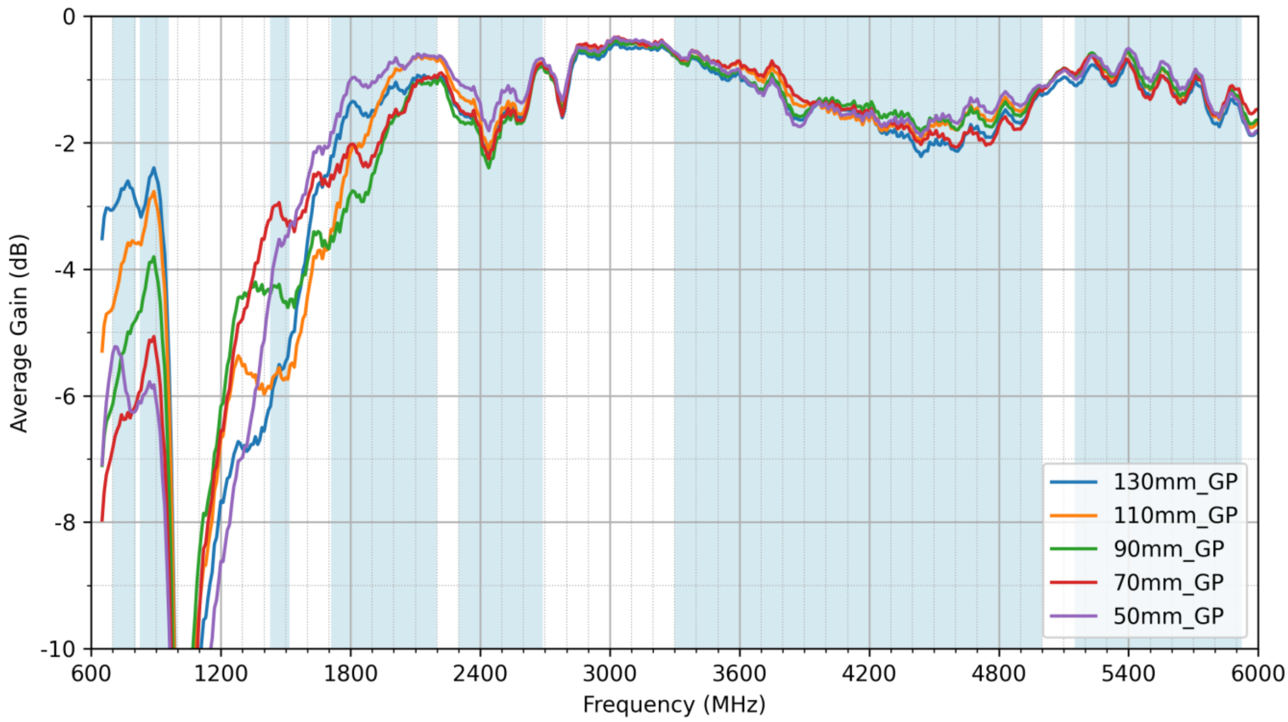
The PCS.68.A is not limited to the number of passes through the reflow process. Smaller components are typically mounted on the first pass, however, we do advise mounting the PCS.68.A when placing larger components on the board during subsequent reflows.

9. Application Note

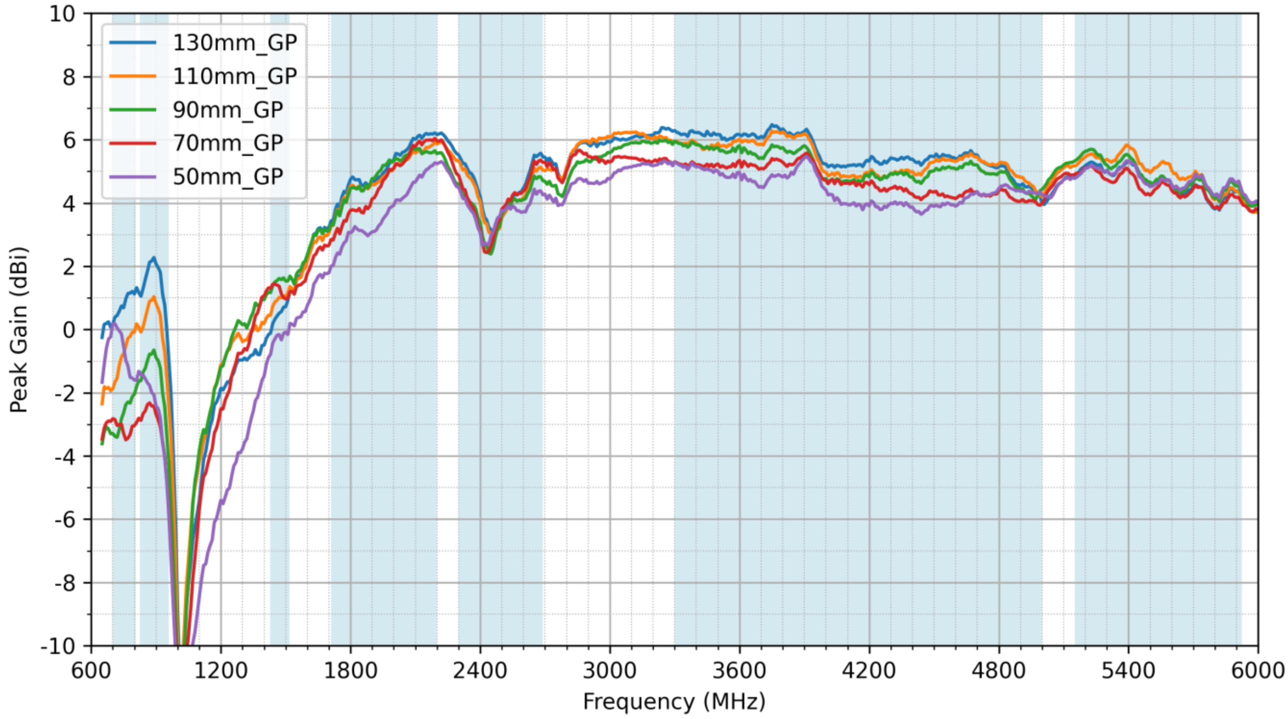
9.1 Efficiency



9.2 Average Gain



9.3 Peak Gain



130mm_GP
110mm_GP
90mm_GP
70mm_GP
50mm_GP
Peak Gain (dBi)
Frequency (MHz)
10
8
6
4
2
0
-2
-4
-6
-8
-10
600
1200
1800
2400
3000
3600
4200
4800
5400
6000

Changelog for the datasheet

SPE-19-8-129 – PCS.68.A

Revision: I (Current Version)	
Date:	2023-08-08
Notes:	Updated Solder Reflow Profile.
Author:	Gary West

Previous Revisions

Revision: H	
Date:	2023-03-03
Notes:	Updated Antenna Integration Guide.
Author:	Gary West

Revision: G	
Date:	2022-05-11
Notes:	Updated Packaging Graphics
Author:	Paul Doyle

Revision: F	
Date:	2021-11-03
Notes:	Integration Guide Added.
Author:	Gary West

Revision: E	
Date:	2021-09-27
Notes:	Updated MSL information and fixed formatting.
Author:	Erik Landi

Revision: D	
Date:	2020-03-06
Notes:	Updated drawing and pictures
Author:	Jack Conroy

Revision: C	
Date:	2020-01-02
Notes:	Updated Packaging
Author:	Jack Conroy

Revision: B	
Date:	2019-12-11
Notes:	Updated Packaging
Author:	Jack Conroy

Revision: A (Original Release)	
Date:	2019-10-17
Notes:	Initial Datasheet Release
Author:	Yu Kai Yeung