TAOGLAS®

Datasheet

Taoglas Reach Series - PCS.66.A

Description:

Reach Low Profile Wideband 5G/4G SMD Antenna

Features:

Patent Pending Innovative Design

High Efficiency Wideband Antenna, Covering 600 to 6000 MHz

Supporting 5G FR1 Bands

600 MHz 5G/4G Band 71 Support

Backwards Compatible with all 3G/2G applications

Surface Mount Distribution – Supplied on Tape & Reel

Dimensions: 32 x 25 x 1.6 mm

RoHS & REACH Compliant

1. Introduction

The Taoglas Reach series are a revolutionary, low profile, small footprint, range of patent pending SMD mount PCB wide-band antennas. The PCS.66.A has been designed to cover all 5G bands, including all sub-6GHz deployments across the 600MHz to 6000MHz spectrum on a very small footprint of just 32 x 25mm. It also covers 3G and 2G bands to allow for fall-back when 5G/4G is not available.

This 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.66.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 be mounted via 'pick & place' onto the PCB.

If tuning is required, it can also be tuned specifically depending on device environment. If PCB space is an issue, the Reach PCS.86, covering 791 – 6000MHz, could be an option with an even smaller footprint of just 32 x 16mm. Contact your local Taoglas customer support team for advice on integrating the Reach 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 4G and 5G devices ability to deliver the stated data-speed rates of systems such as 5G and 4G.

2. **Low profile**
   Many antennas require a large keep-out area in addition to the mechanical size to work correctly, which limits the usable PCB space. The Reach requires only 0.5 mm of additional keep-out, allowing 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 can be optimized via a matching network to the specific bands needed for any application. Efficiencies as high as 90% have been measured when the return loss is very high (-15 dB or more).

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 Distribution (SMD)**
   Direct mount, 'on-board' antennas save on labor, cable and connector costs, leads to higher integration yield rates and reduces 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 need to pass for example USA carrier network approvals.

2. Specifications

Electrical								
Standard	5G NR Band 71/LTE/GSM/ CDMA	5G NR Band 74,75,76	LTE/GSM/ HSPA/ CDMA	UMTS/ HSPA	Wi-Fi 2400	LTE 2600	5G NR Band 77,78,79	Wi-Fi 5800
Operation Frequency (MHz)	617-960	1427-1518	1710-1990	1920-2170	2400-2500	2500-2700	3300-5000	5150-5850
Peak Gain	1.3 dBi	2.5 dBi	3.2 dBi	3.5 dBi	3.5 dBi	5.7 dBi	5.5 dBi	3.5 dBi
Average Gain	-2.6 dB	-3.3 dB	-1.6 dB	-1.7 dB	-2 dB	-1.5 dB	-1 dB	-3.4 dB
Efficiency	55%	46%	69%	68%	63%	70%	80%	45%
Impedance	50Ω							
Polarization	Linear							
Radiation Properties	Omni-directional							
Max Input Power	5 W							

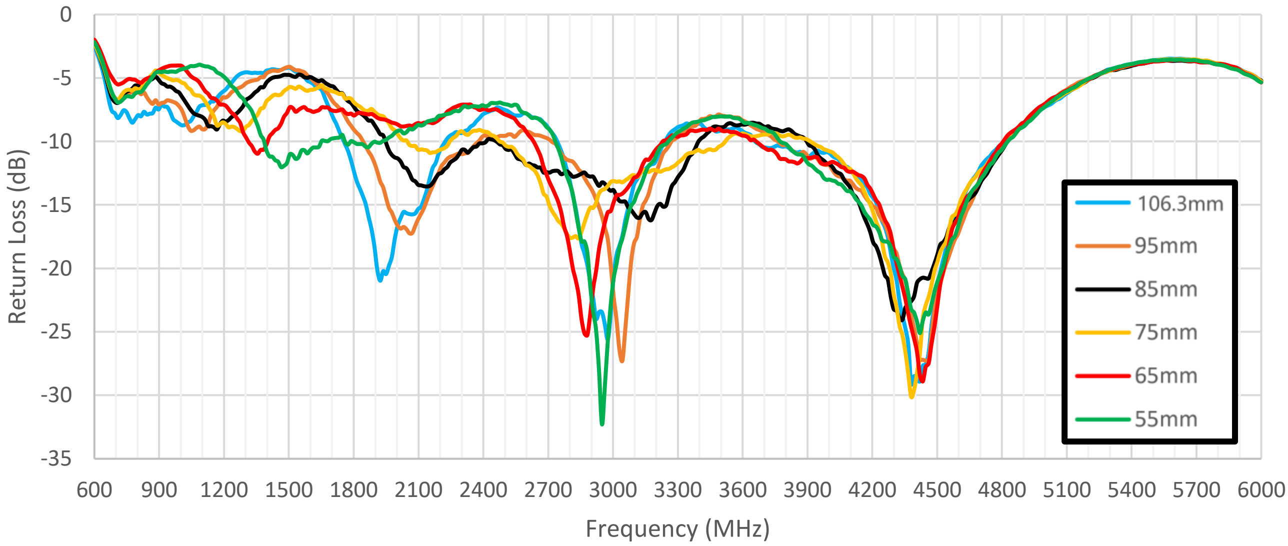
The Reach PCS.66.A antenna performance was measured on a 106.3x32mm ground plane

Mechanical	
Dimensions	32mm x 25mm x 1.6mm
Material	PCB
Termination	Solder Pad
EVB Connector	SMA-Female

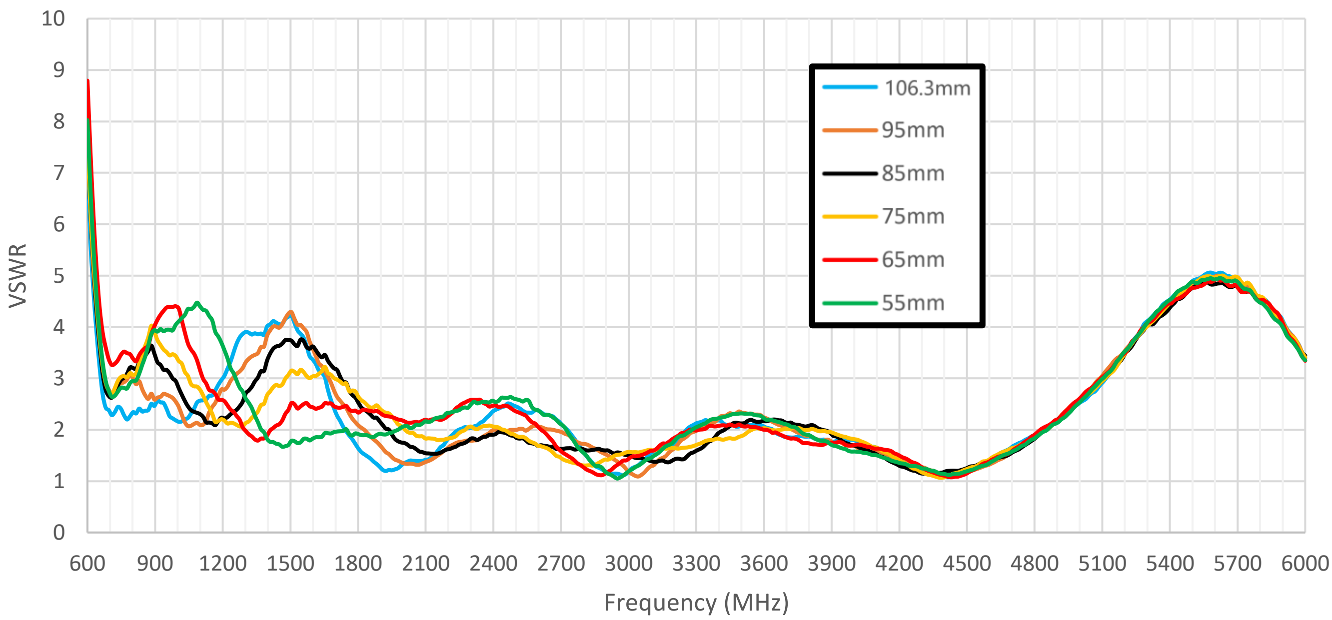
Environmental	
Operation Temperature	-40°C to 85°C
Storage Temperature	-40°C to 105°C
Relative Humidity	Non-condensing 65°C 95% RH
RoHs & REACH Compliant	Yes
Moisture Sensitivity	Level 3

3. Antenna Characteristics

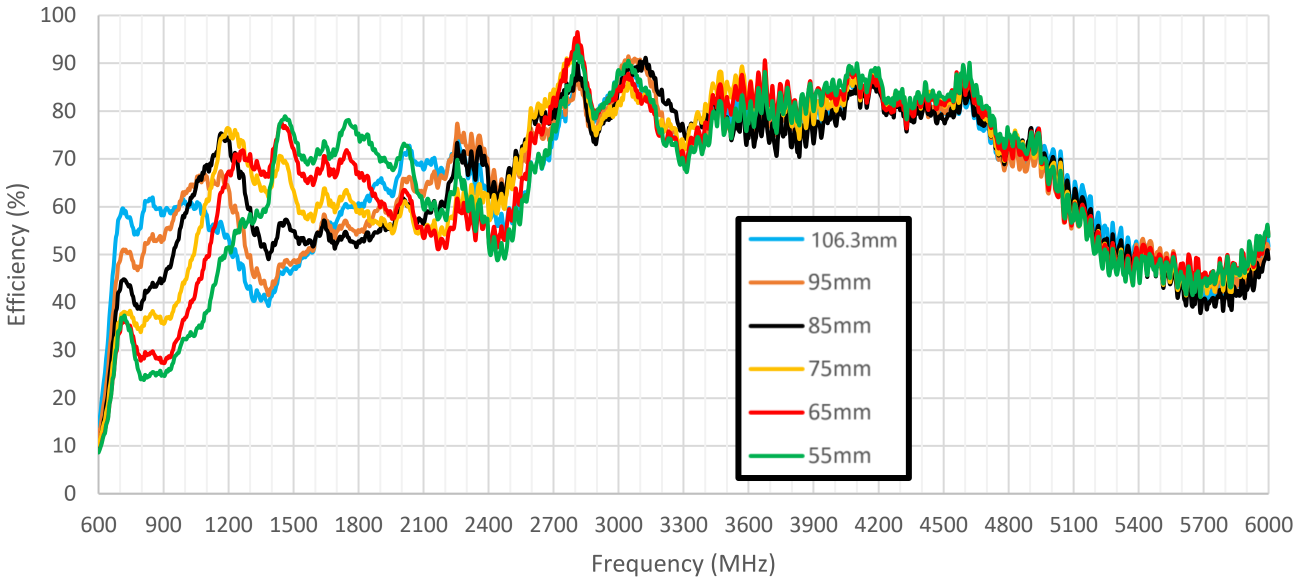
3.1 Return Loss



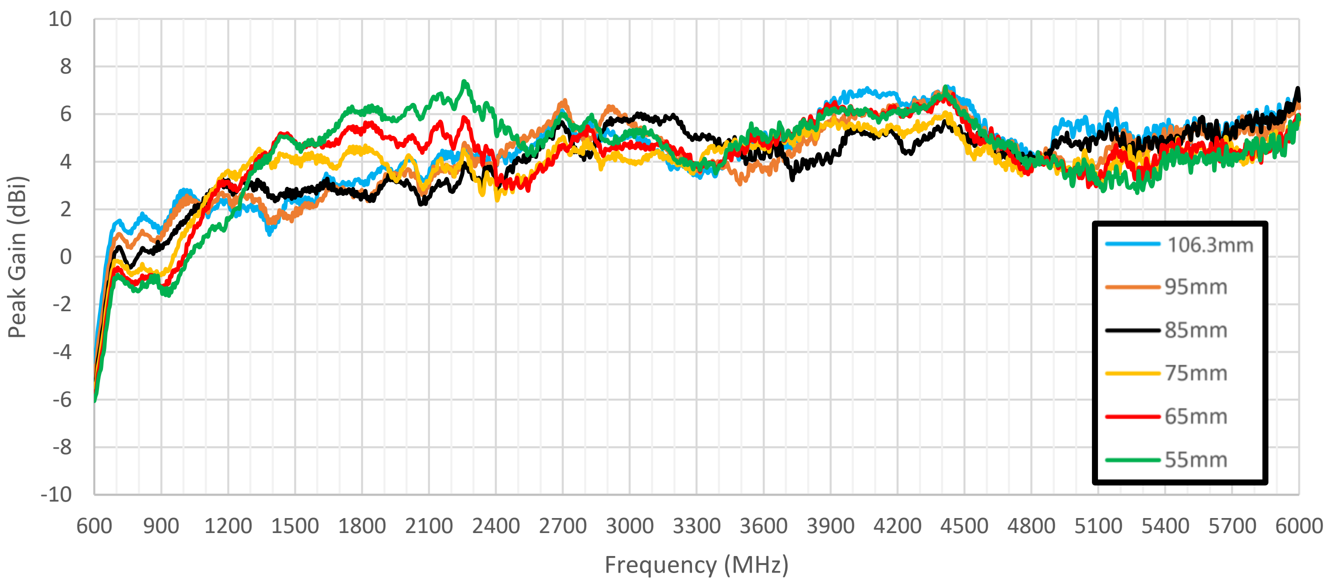
3.2 VSWR



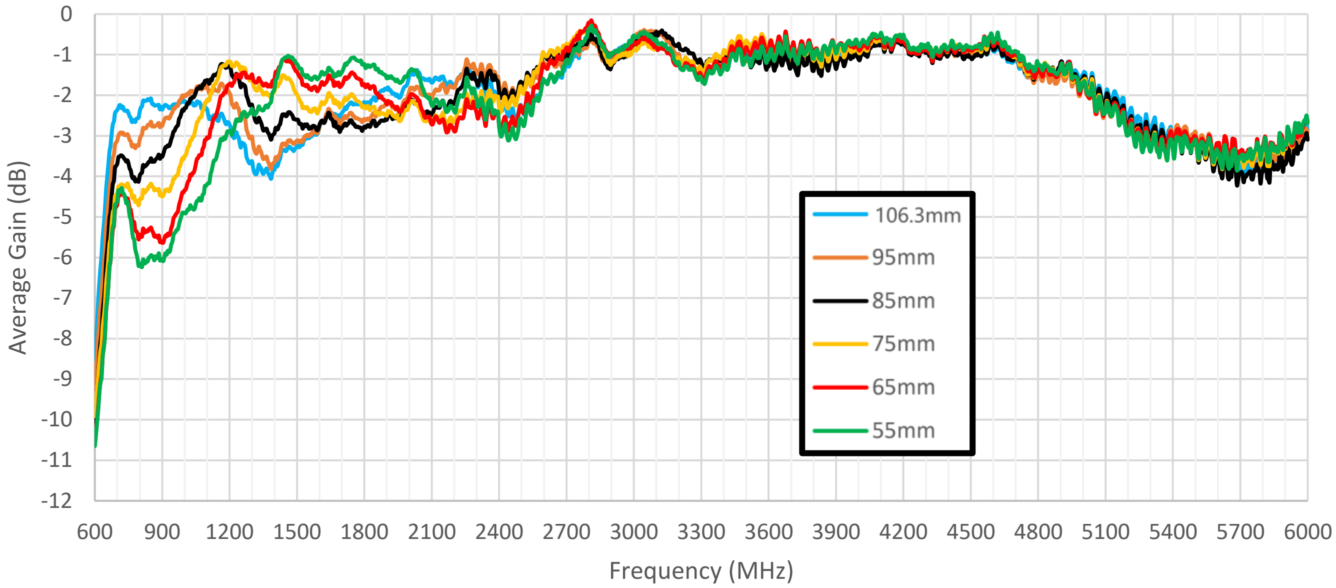
3.3 Efficiency



3.4 Peak Gain

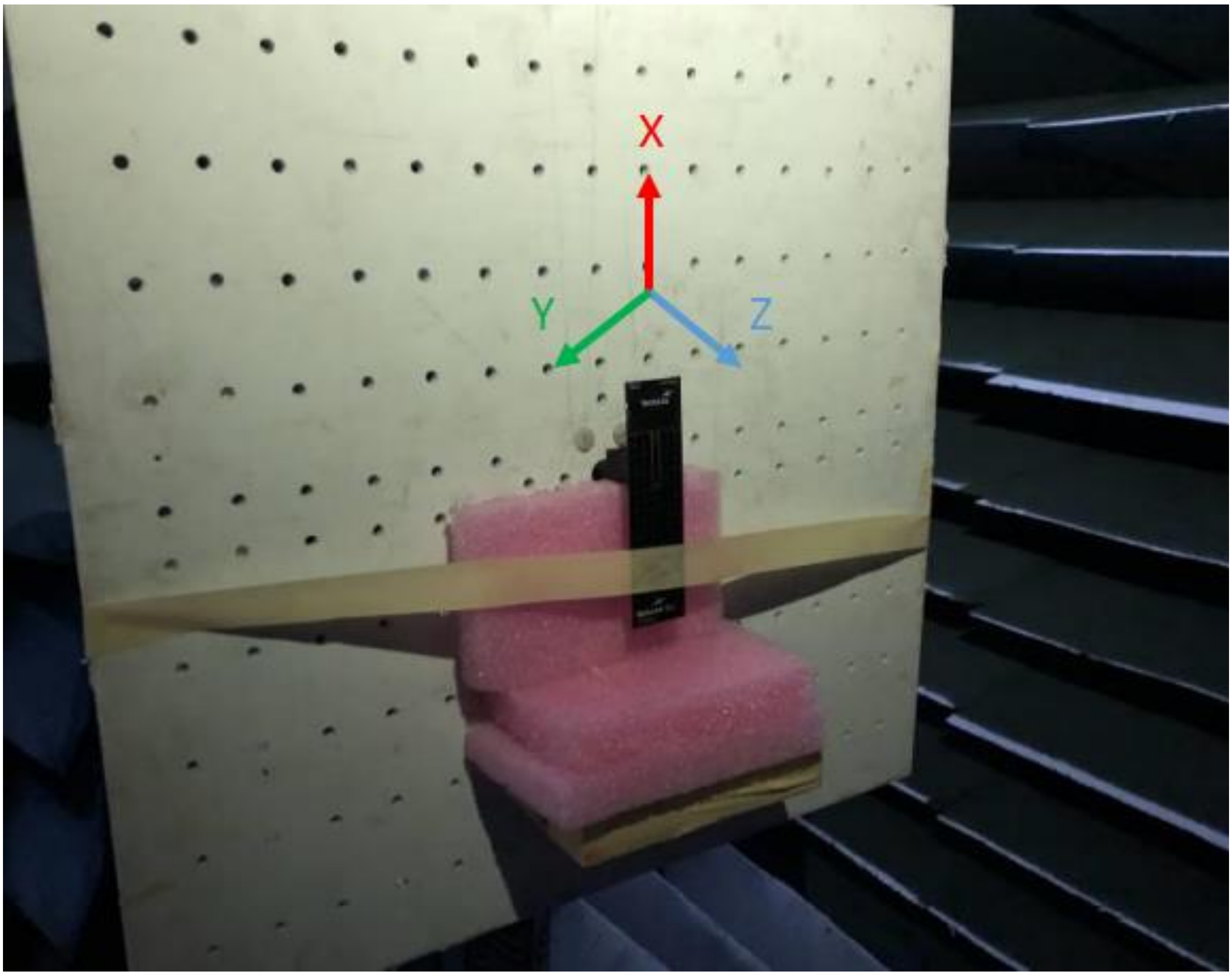


3.5 Average Gain



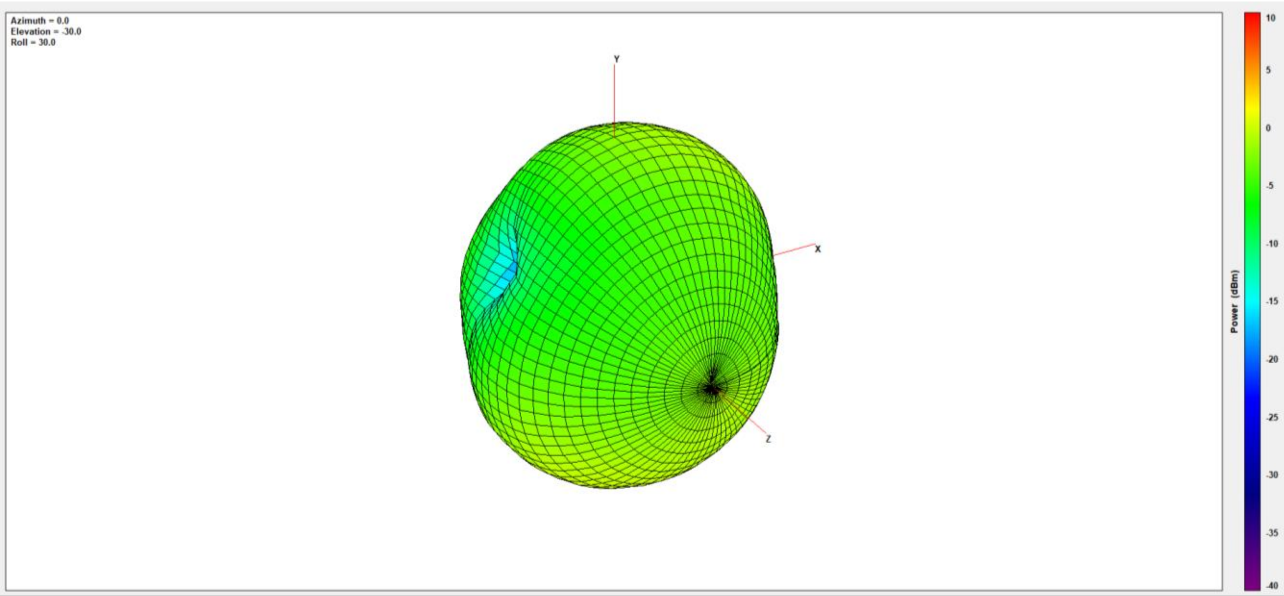
4. Radiation Patterns

4.1 Test Setup



On Evaluation Board

4.2 650MHz 2D & 3D Radiation Patterns



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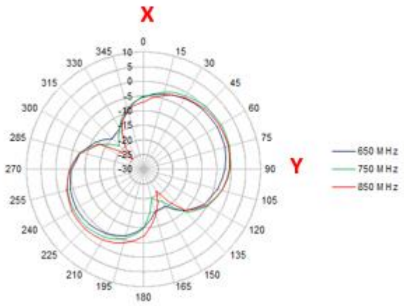
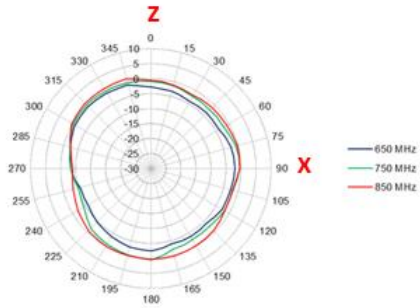
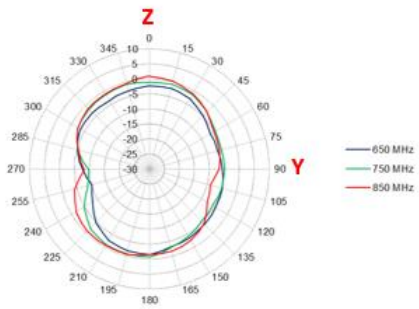
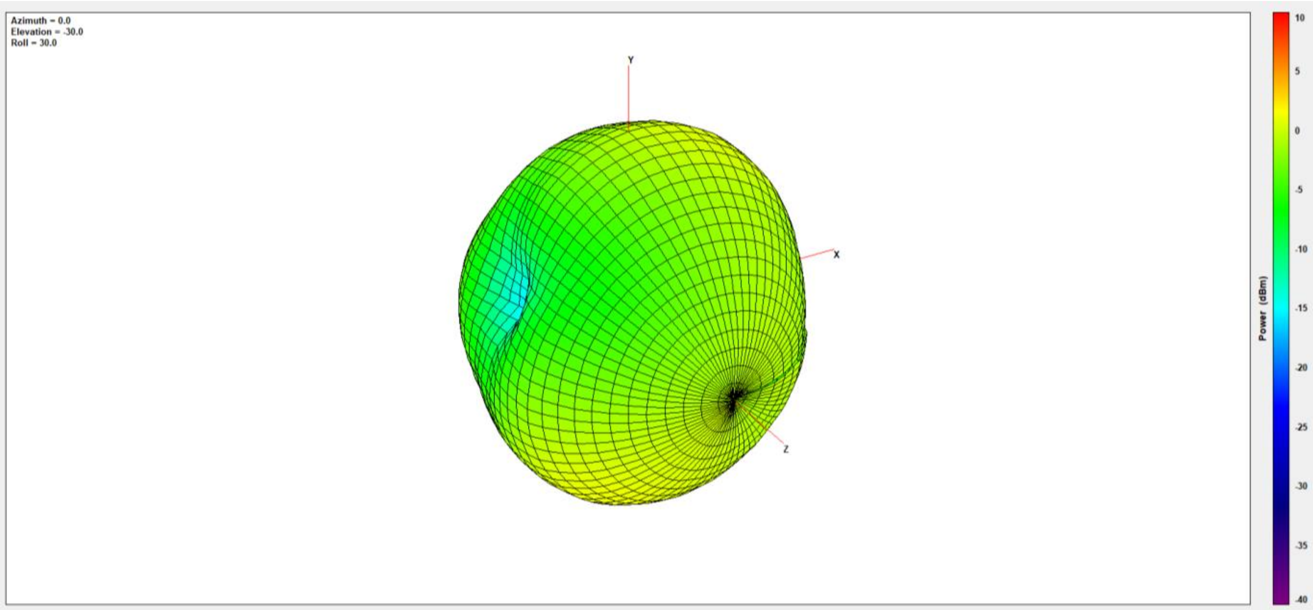






750MHz



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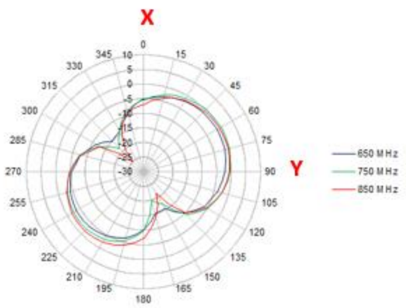
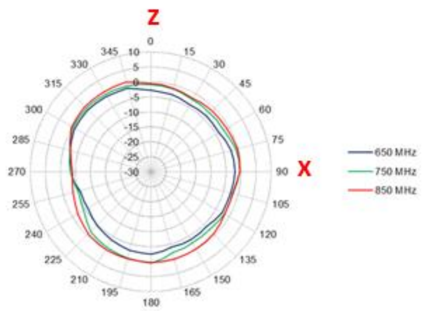
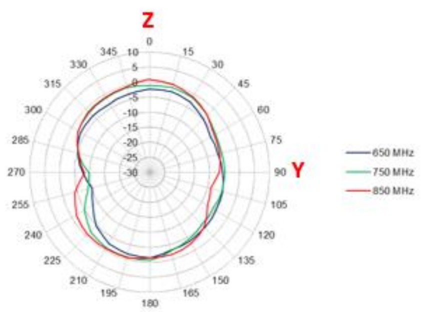
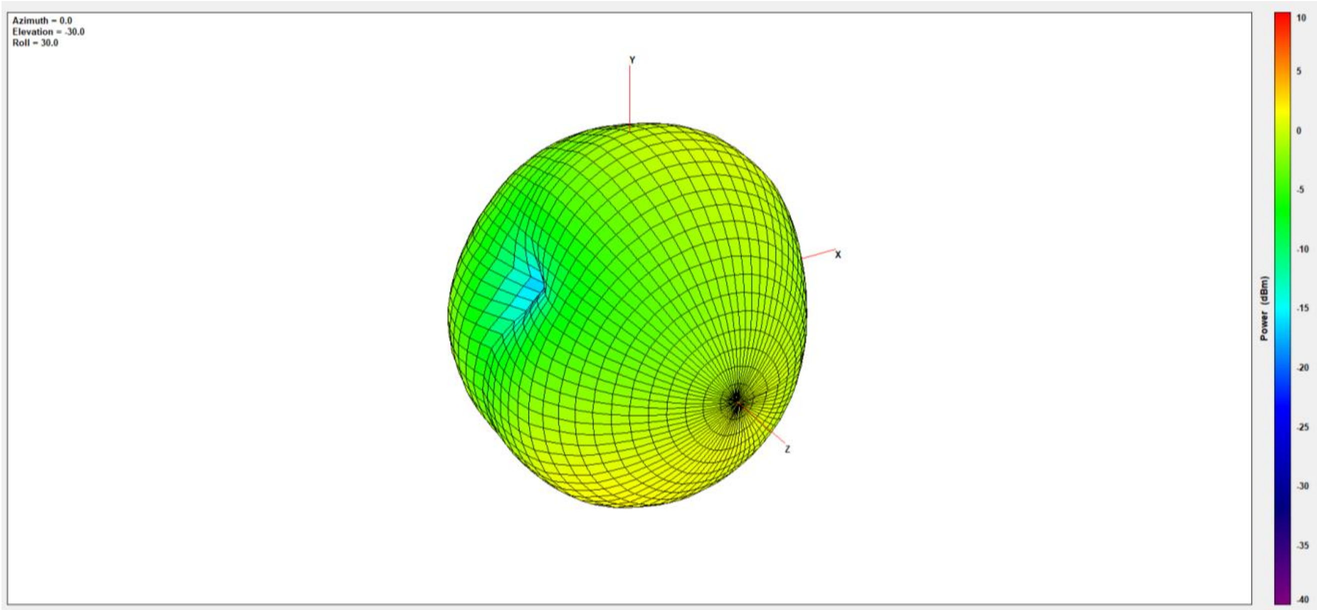






850MHz



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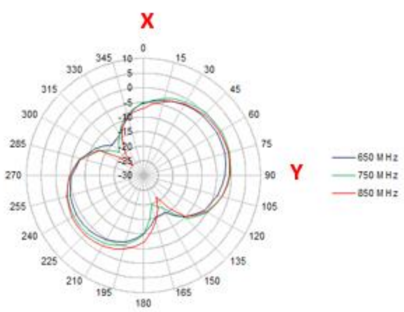	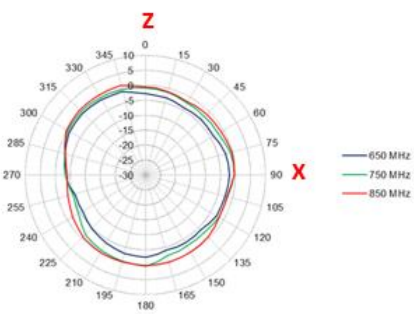	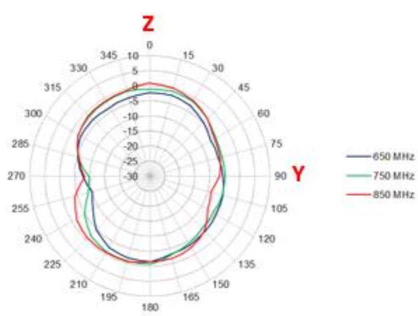

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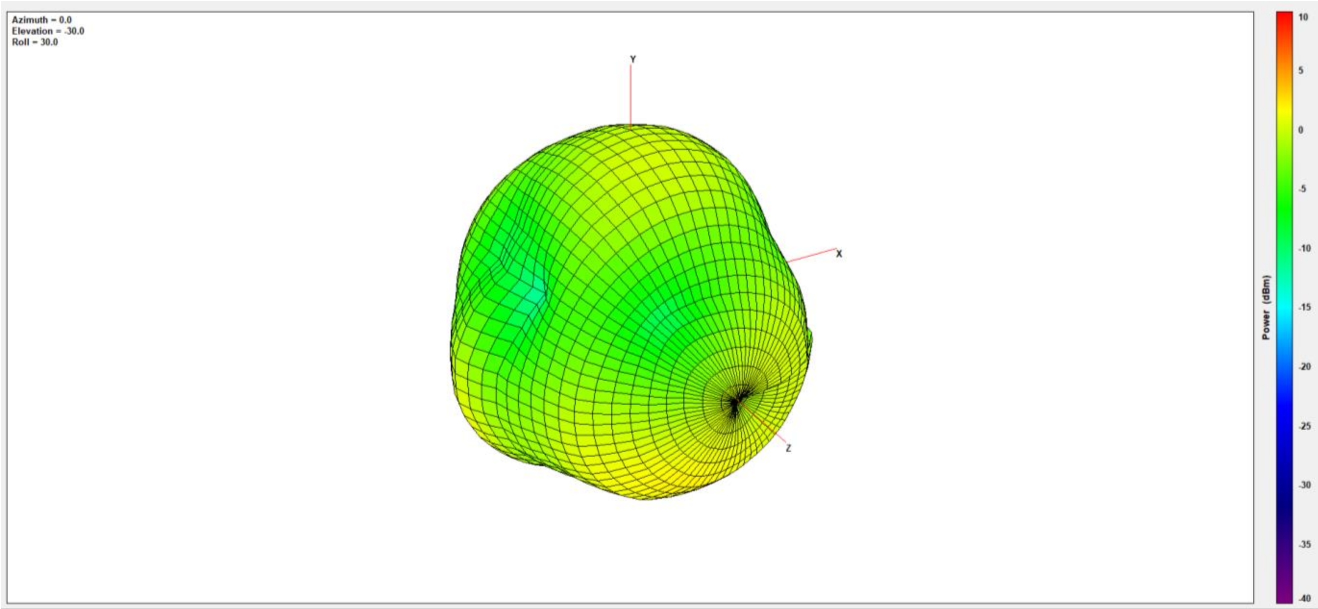
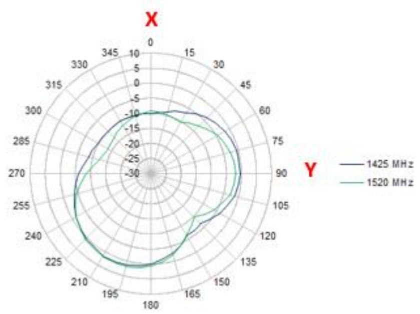
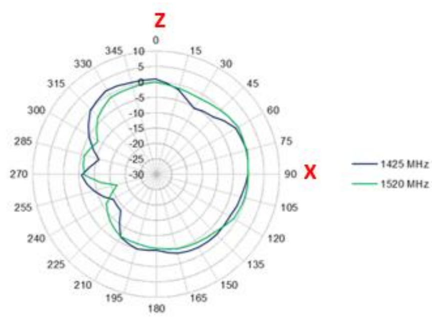
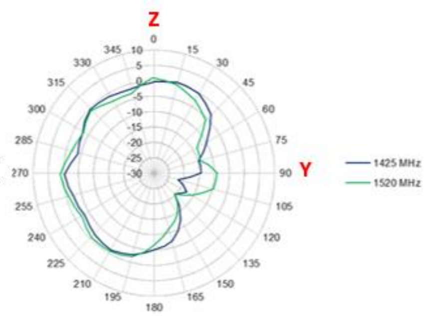


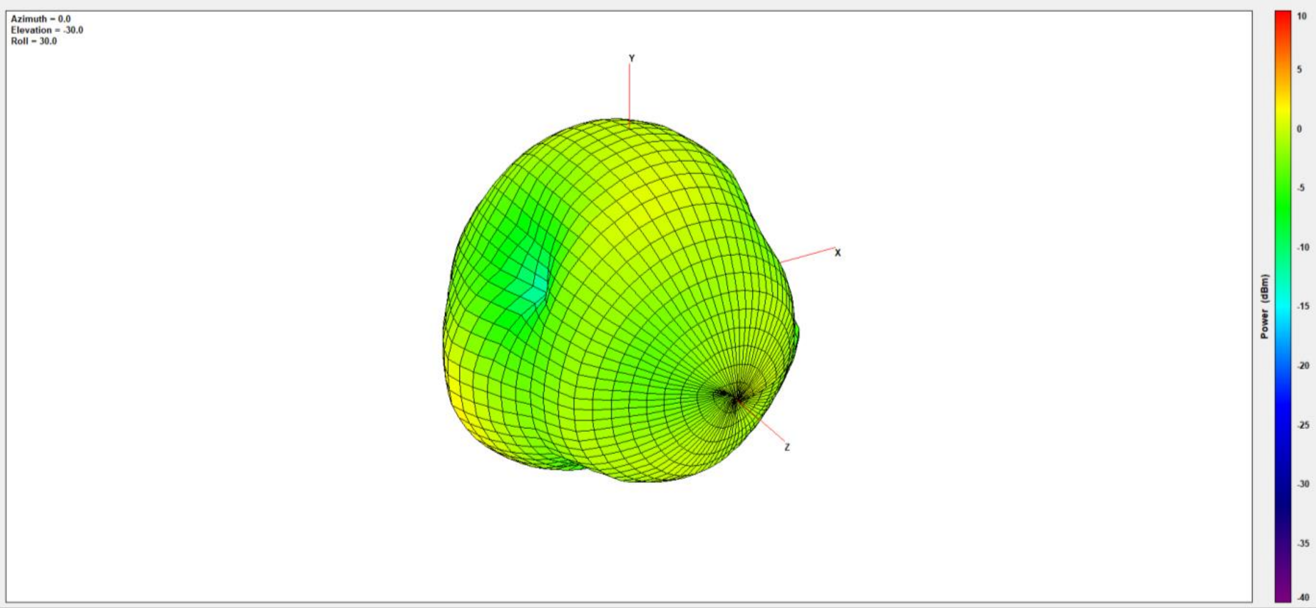
XY Plane	XZ Plane	YZ Plane



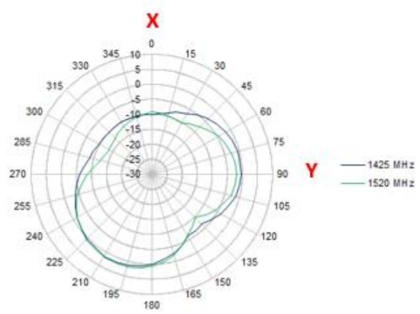


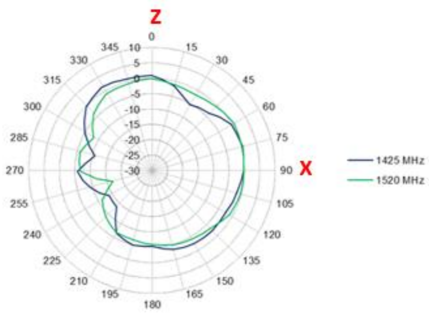


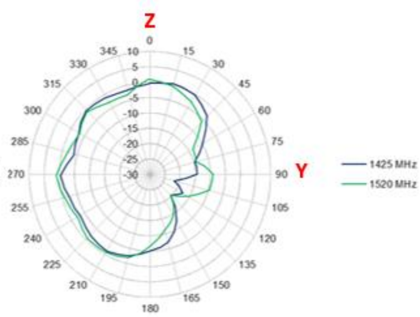
1520MHz



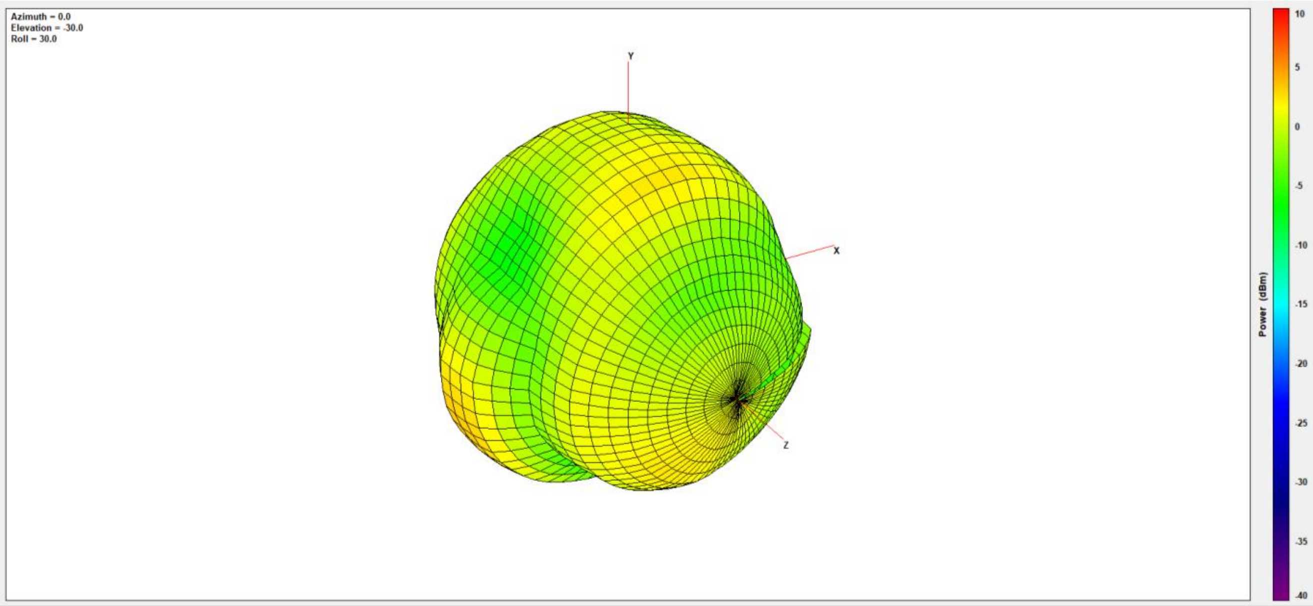
XY Plane	XZ Plane	YZ Plane







1710MHz



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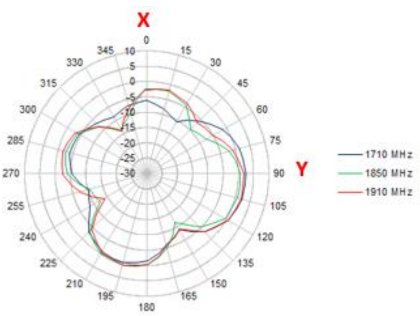
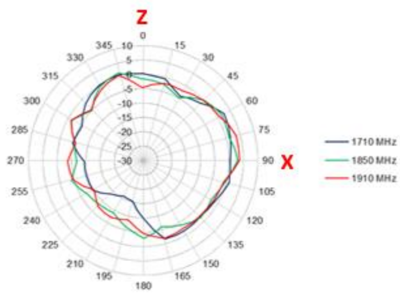
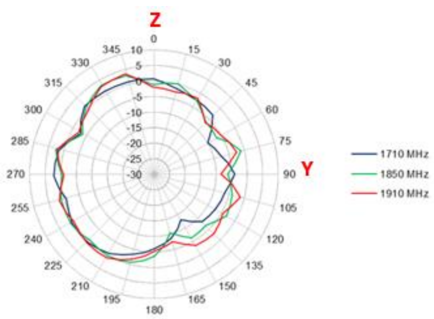
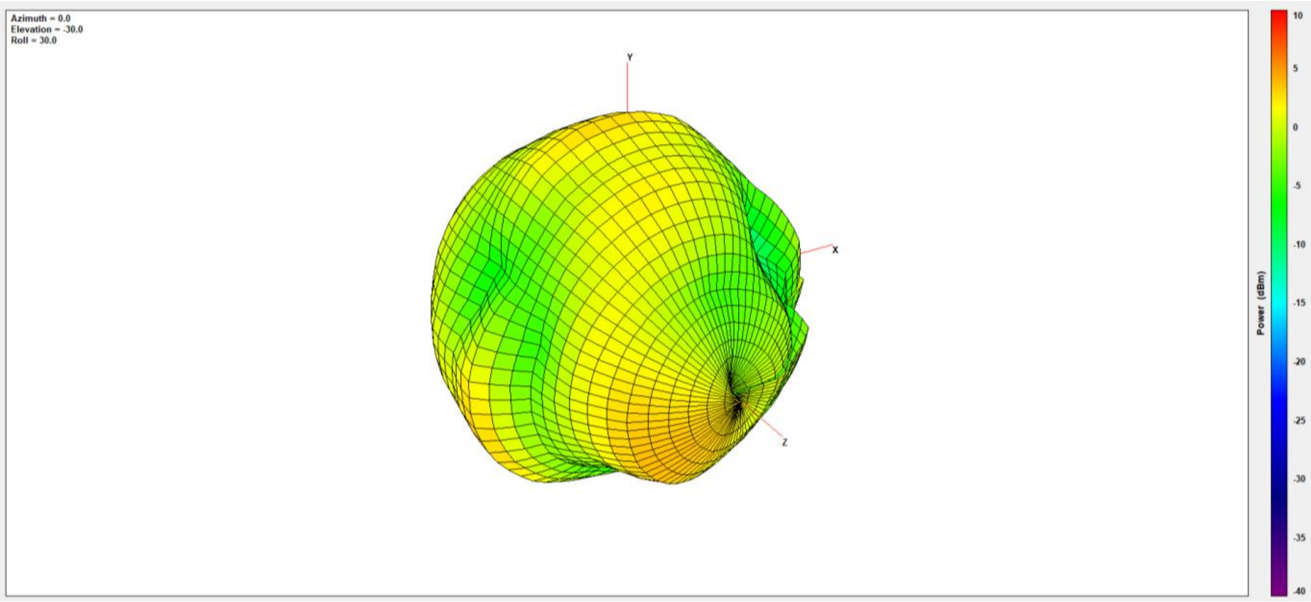


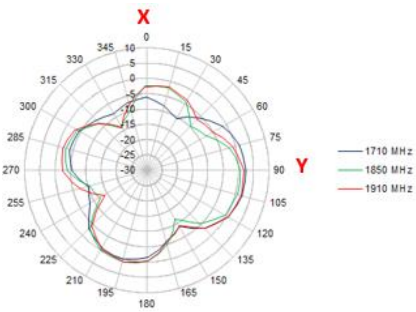


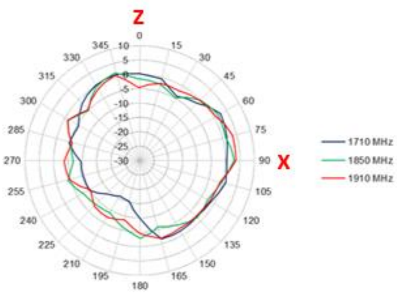


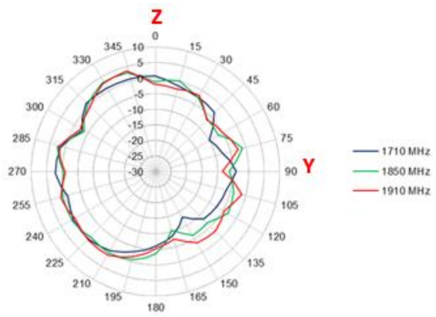
1850MHz



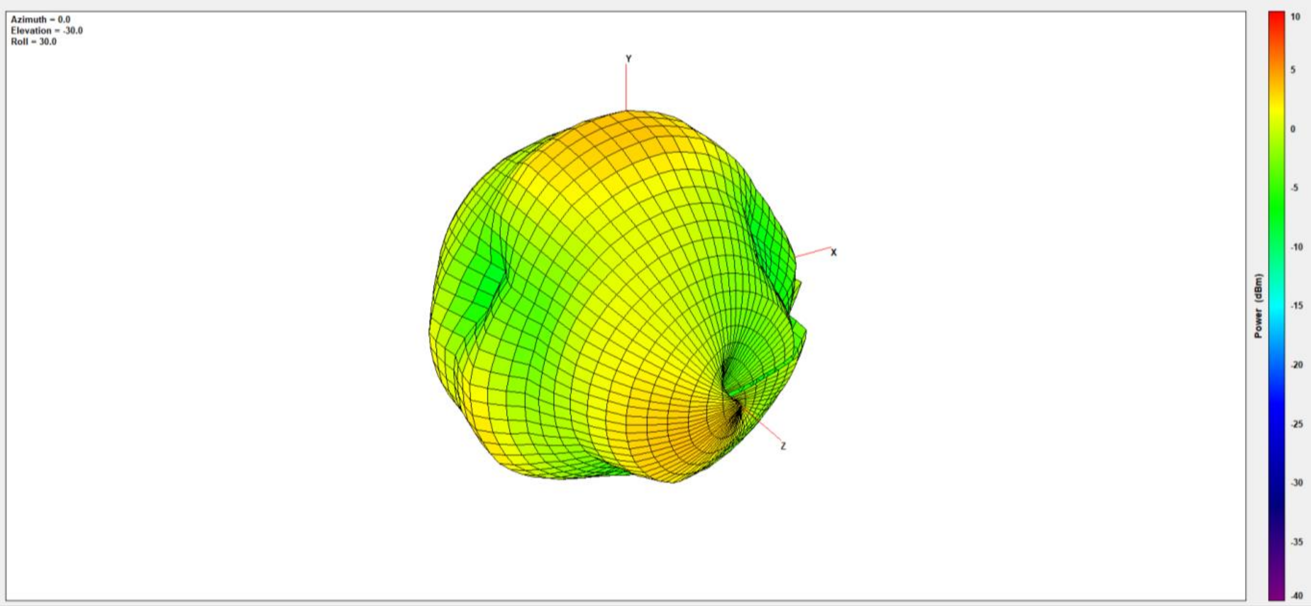
XY Plane	XZ Plane	YZ Plane



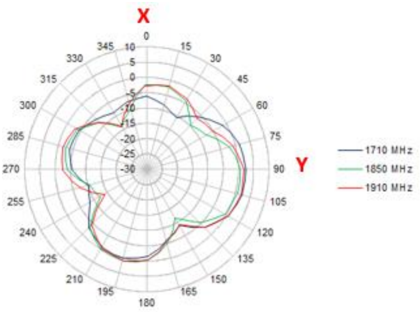


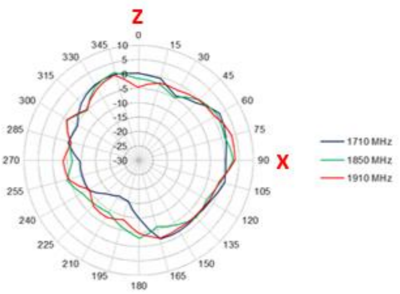


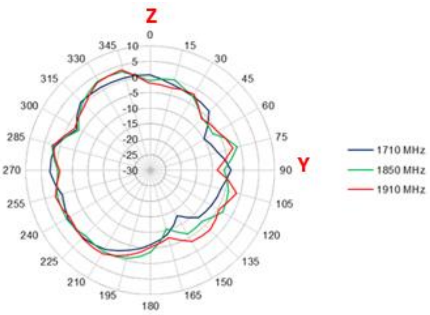
1910MHz



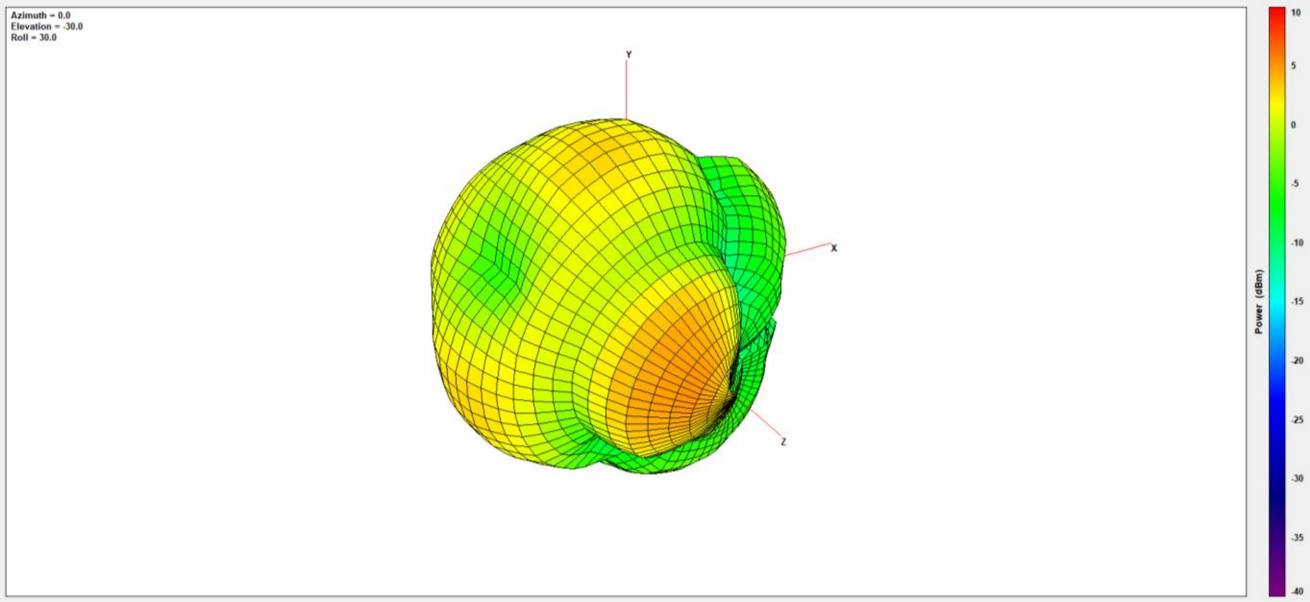
XY Plane	XZ Plane	YZ Plane



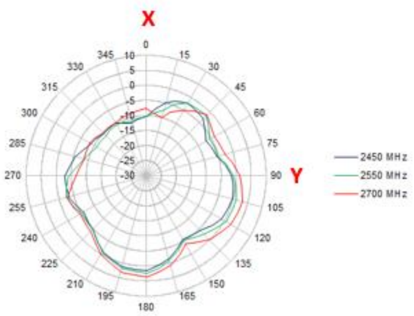


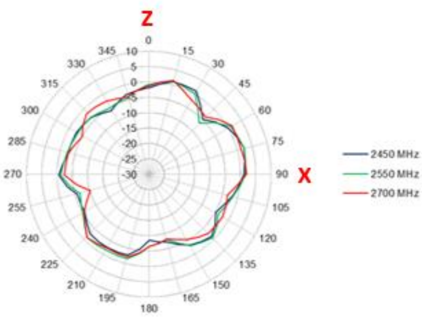


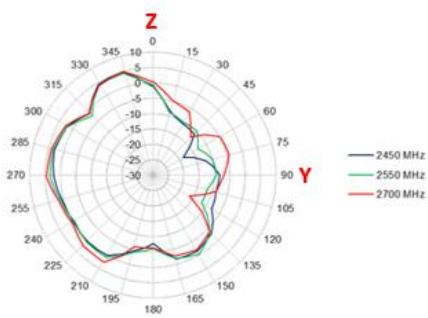
2450MHz



XY Plane	XZ Plane	YZ Plane







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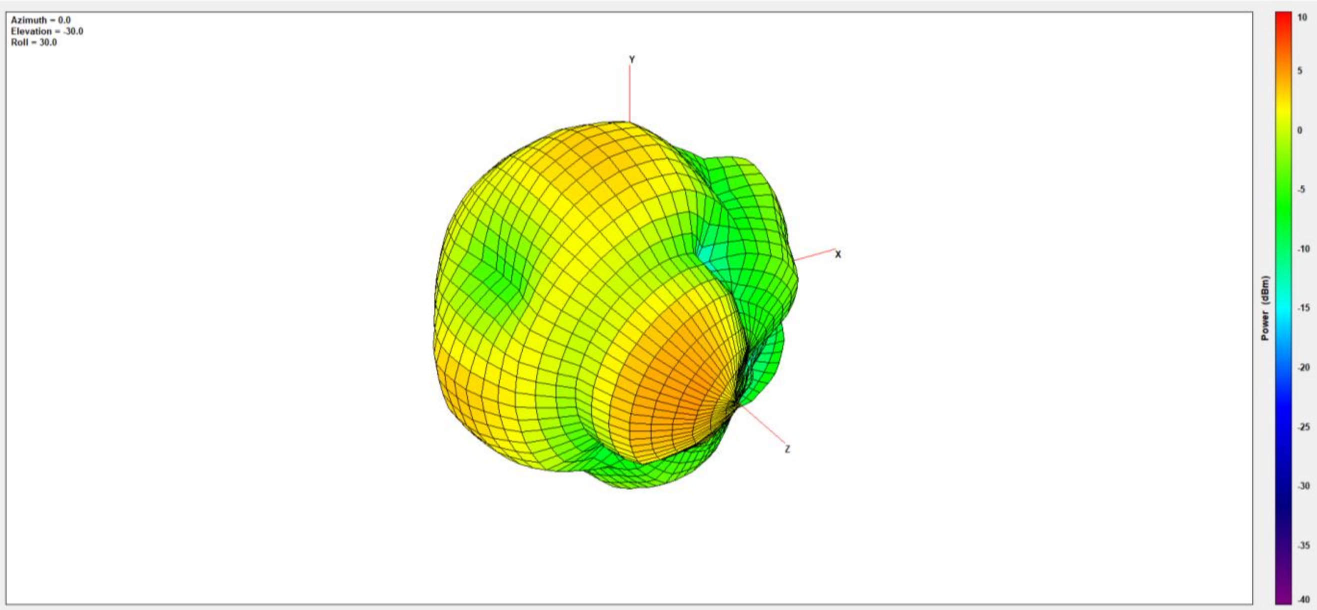
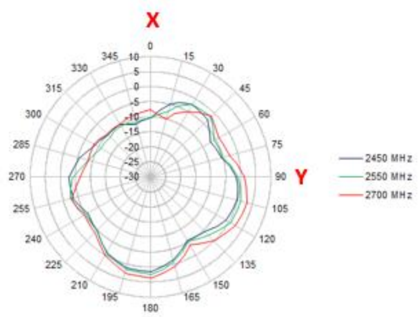
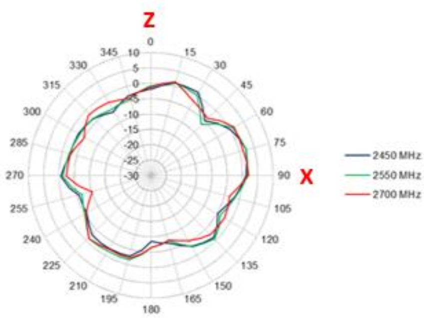
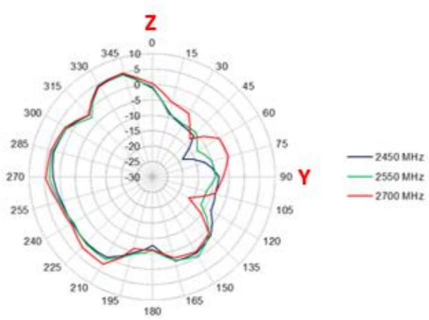


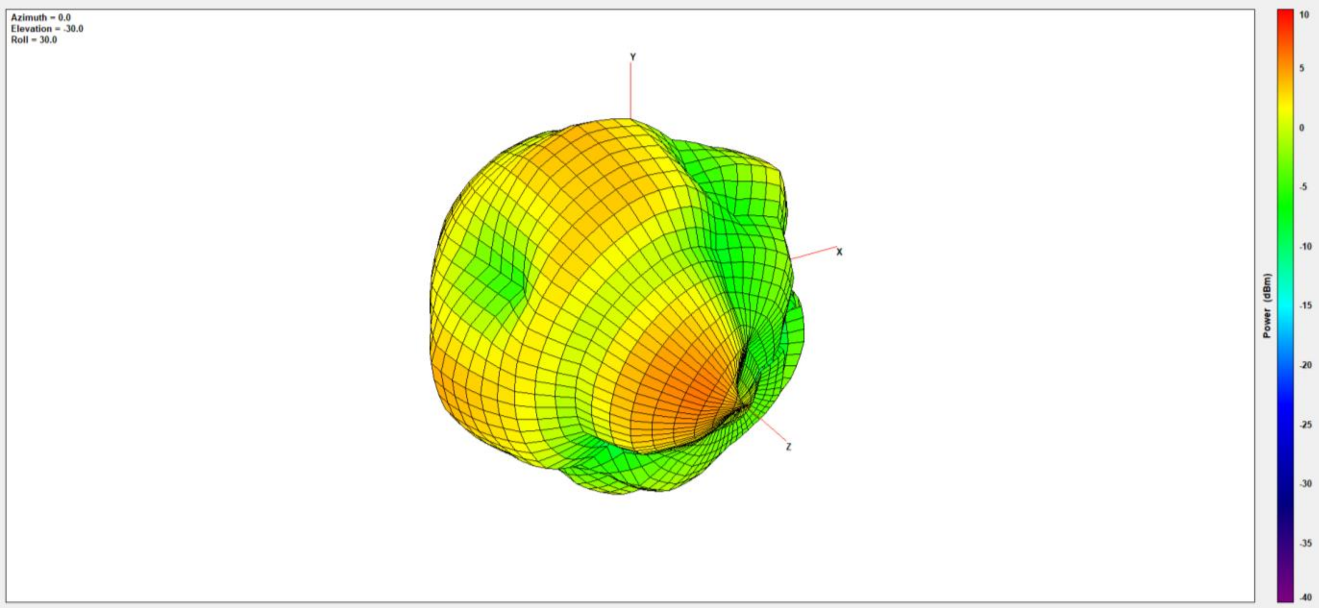
XY Plane	XZ Plane	YZ Plane



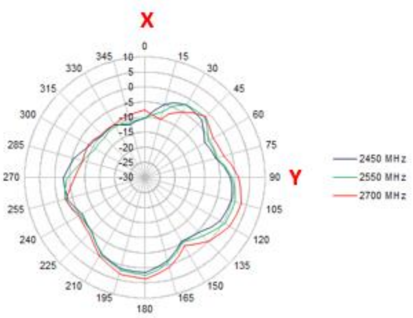


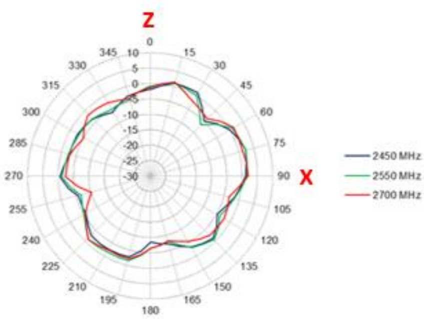


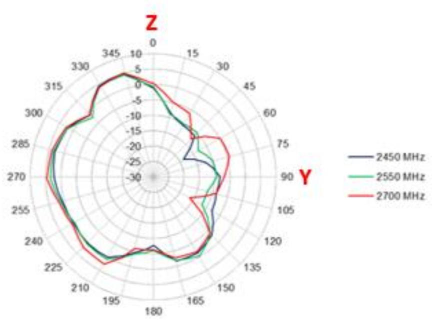
2700MHz



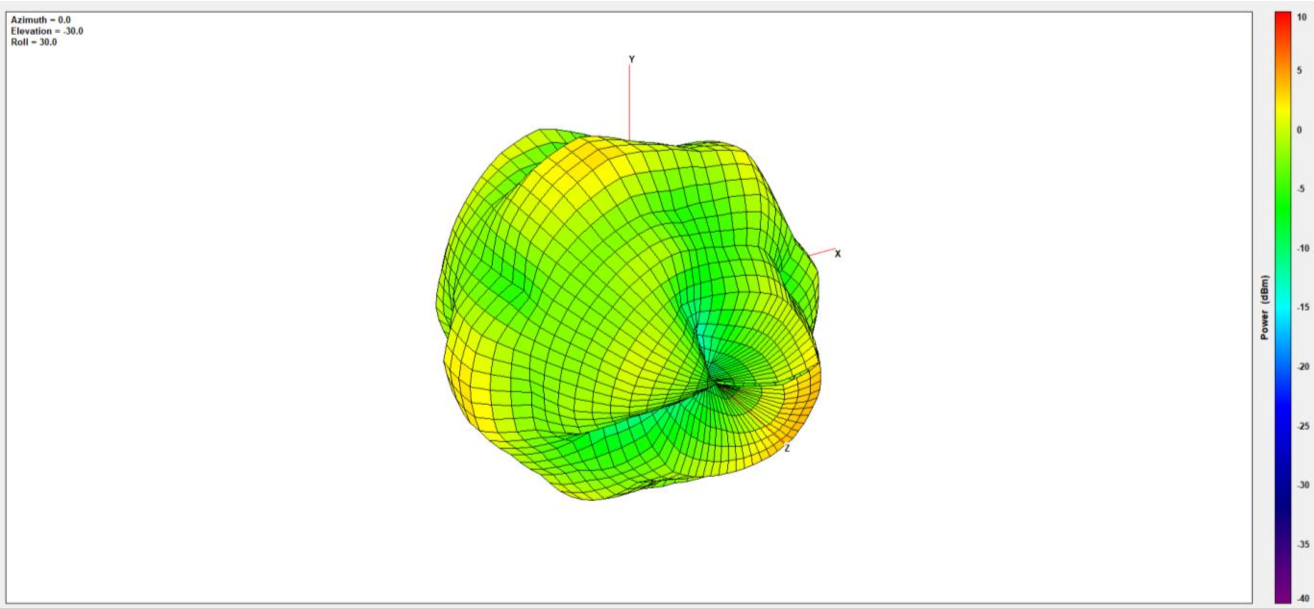
XY Plane	XZ Plane	YZ Plane

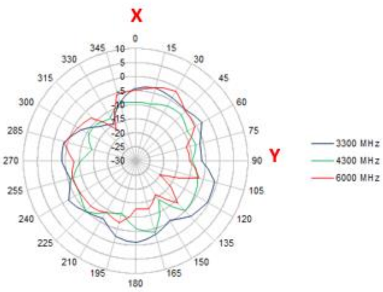
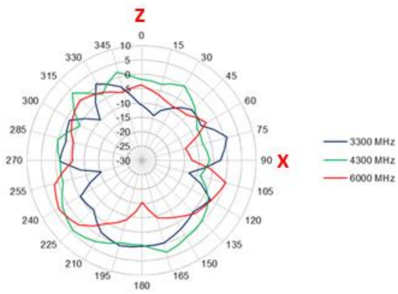
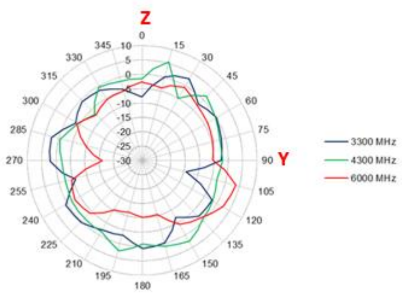




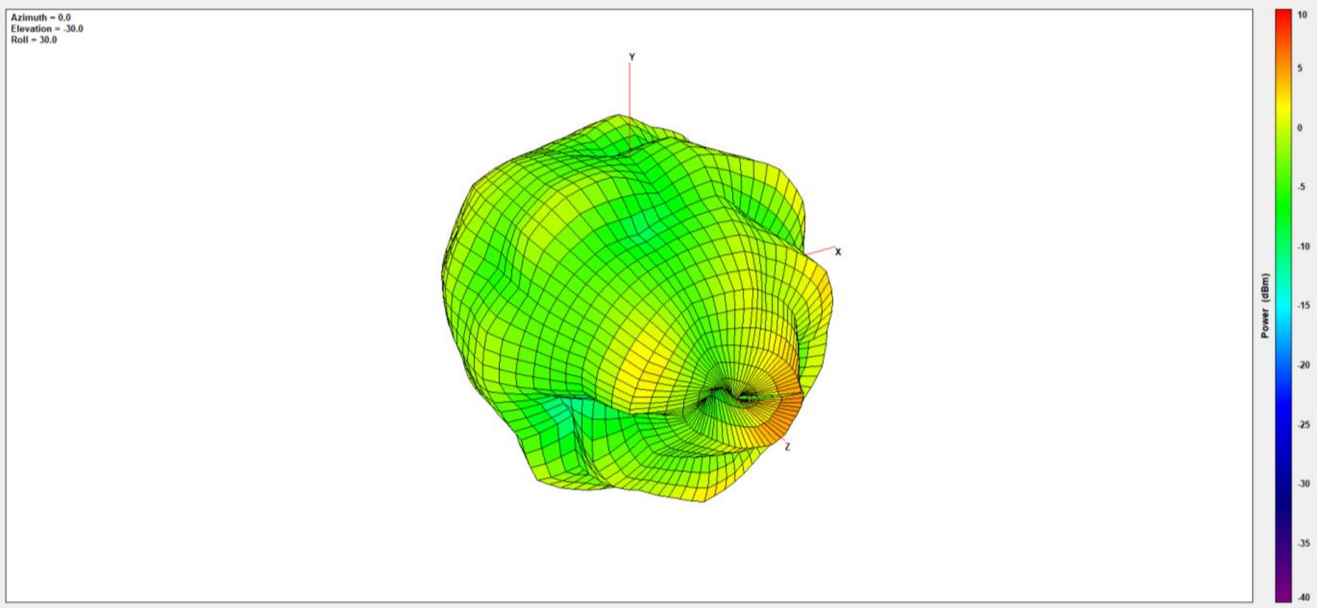


3300MHz

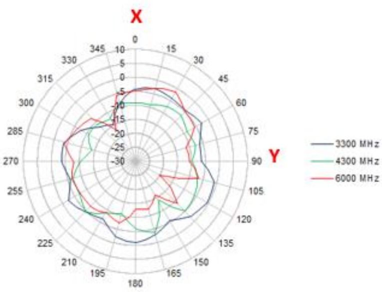


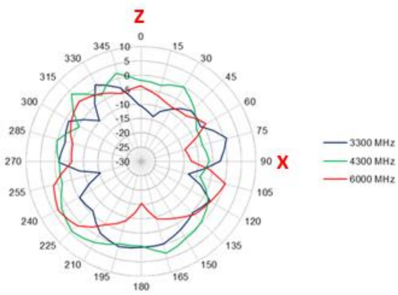
XY Plane	XZ Plane	YZ Plane
		

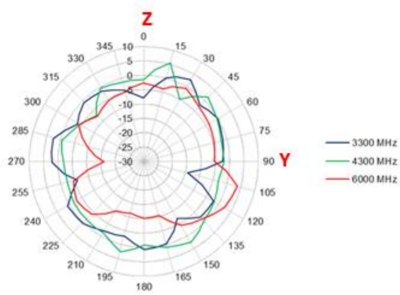
4300MHz



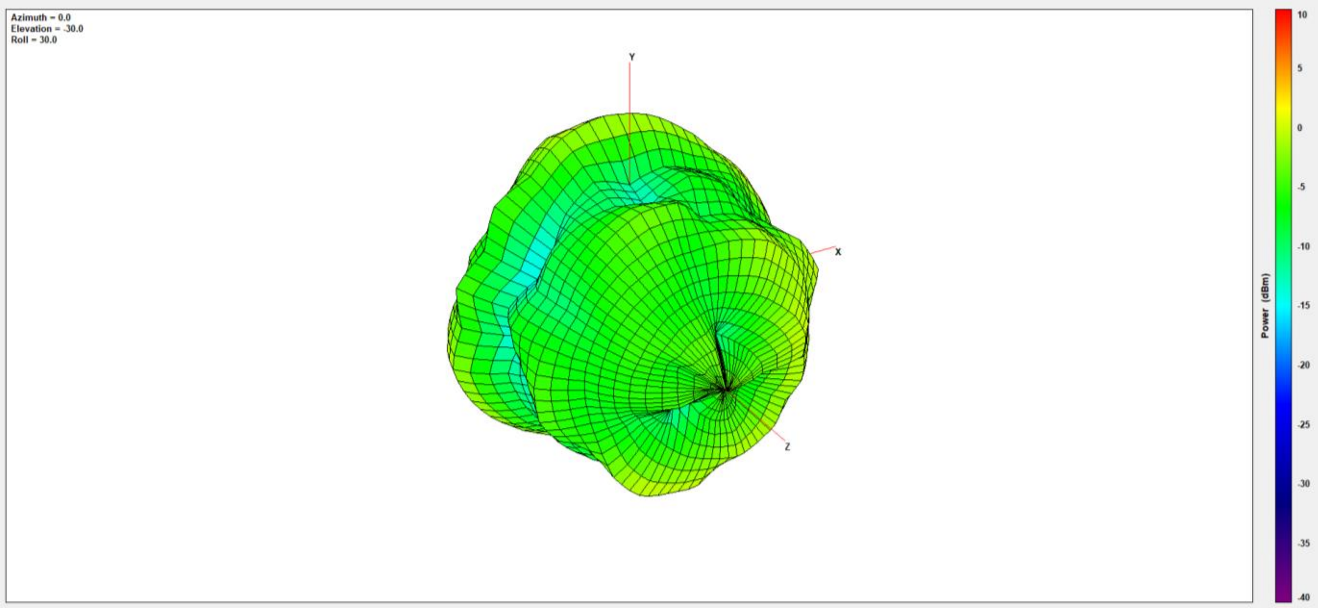
XY Plane	XZ Plane	YZ Plane



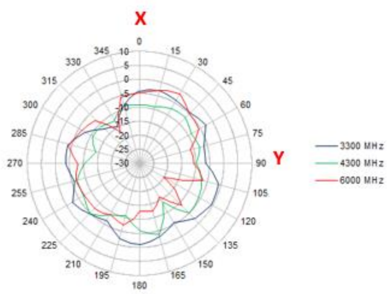


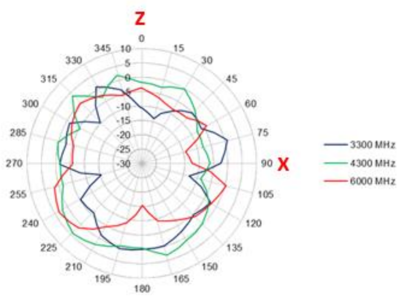


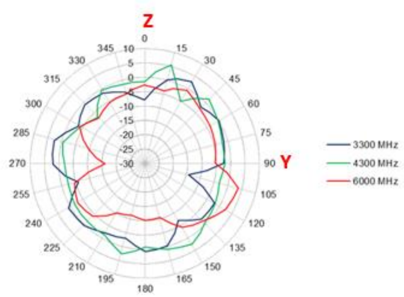
6000MHz



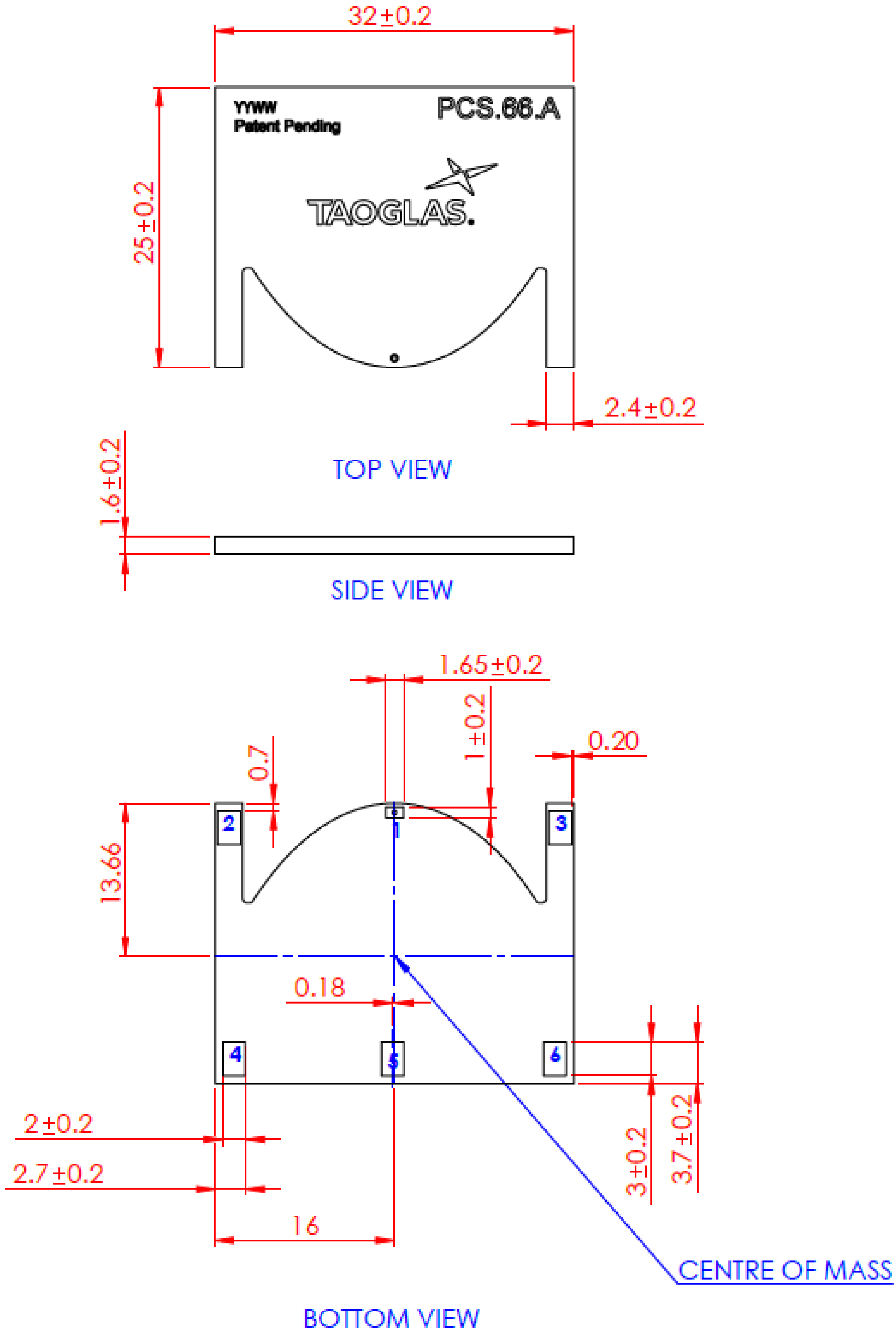
XY Plane	XZ Plane	YZ Plane







5. Mechanical Drawing (Units: mm)

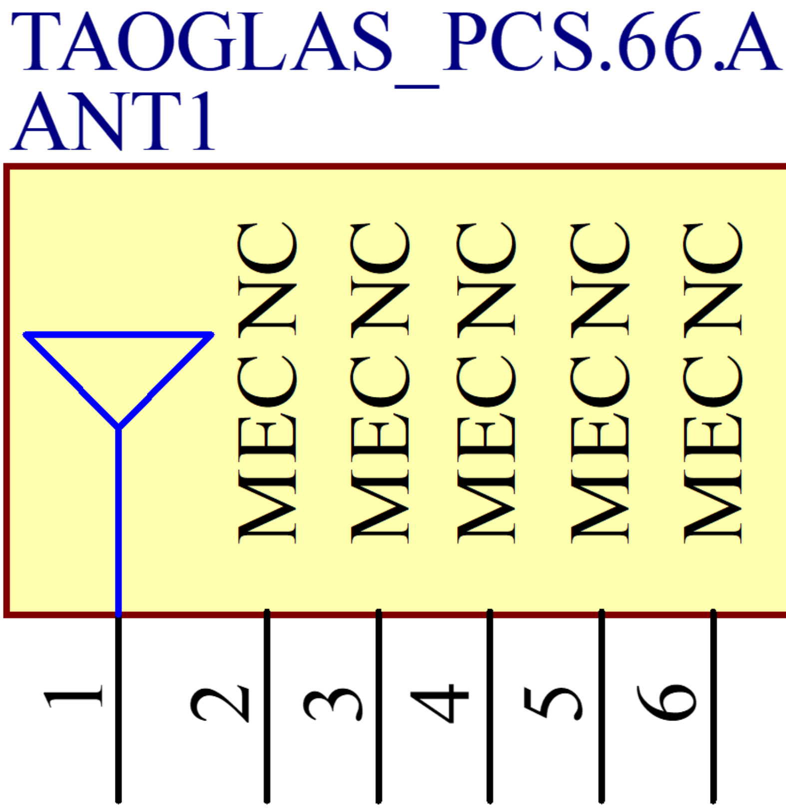


6. Antenna Integration Guide

6.1 Schematic Symbol and Pin Definition

The circuit symbol for the antenna is shown below. The antenna has 6 pins with only one pin (Pin 1) as functional. Pins 2, 3, 4, 5 and 6 are for mechanical strength.

Pin	Description
1	RF Feed
2,3,4,5,6	Mechanical, Not Connected

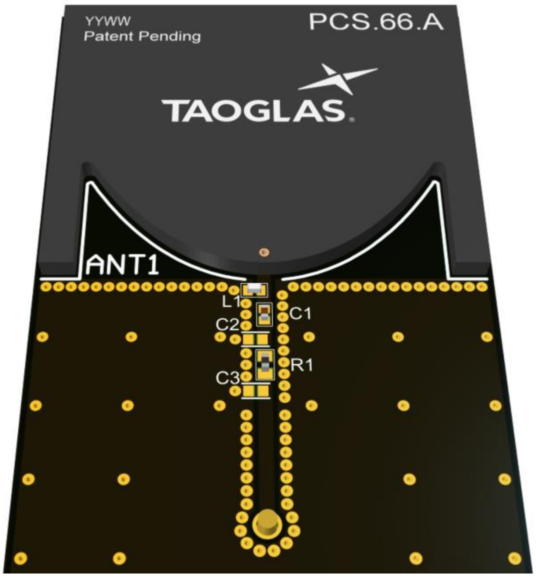


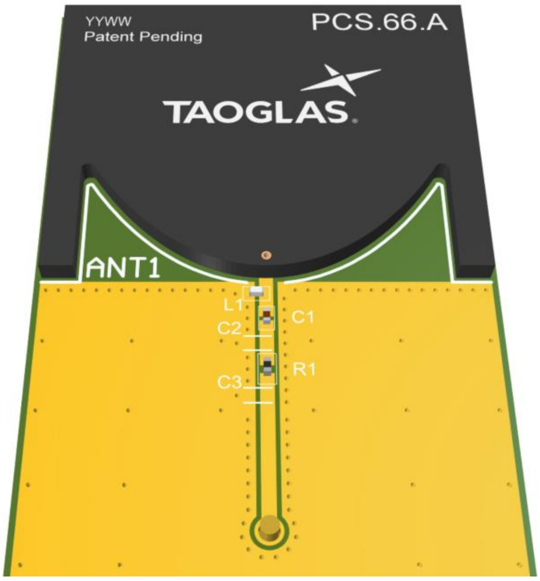
Please note you can download the design files and 3D model from the website here:

https://www.taoglas.com/product/taoglas-reach-pcs-66-a-wideband-lte-cellular-5g-smd-antenna/

6.2 Antenna Integration

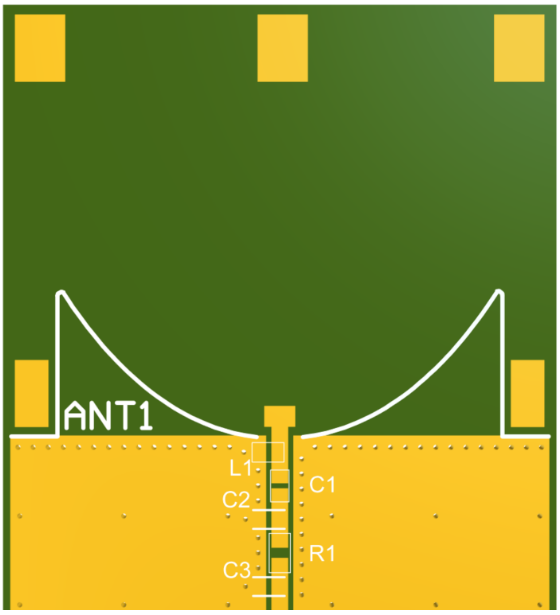
For any given PCB size, the antenna should ideally be placed on the PCB's shortest side to take advantage of the ground plane. Optimized matching components can be placed as shown.



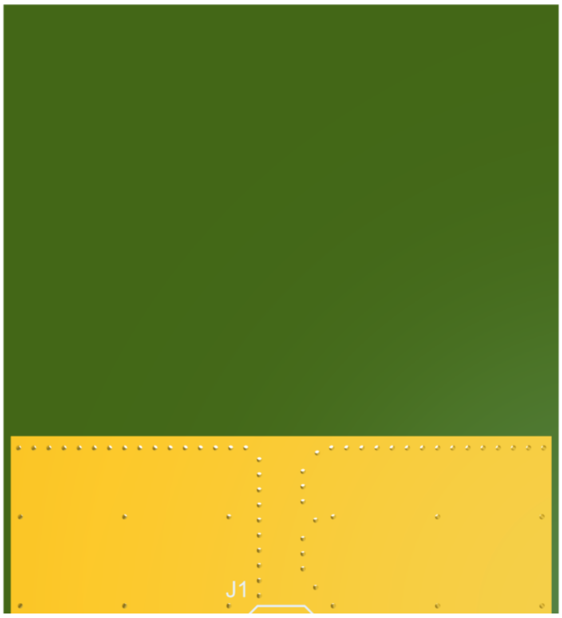


6.3 PCB Layout

The footprint and clearance on the PCB must meet the layout drawing in section 6.8. Note the placement of the optimized components. L1 is placed as close as possible to the RF feed (pad 1) but still within the transmission line. C1 is then placed tightly in series after that. C2, R1 & C3 are optional components but the footprints are recommended in case they are needed.



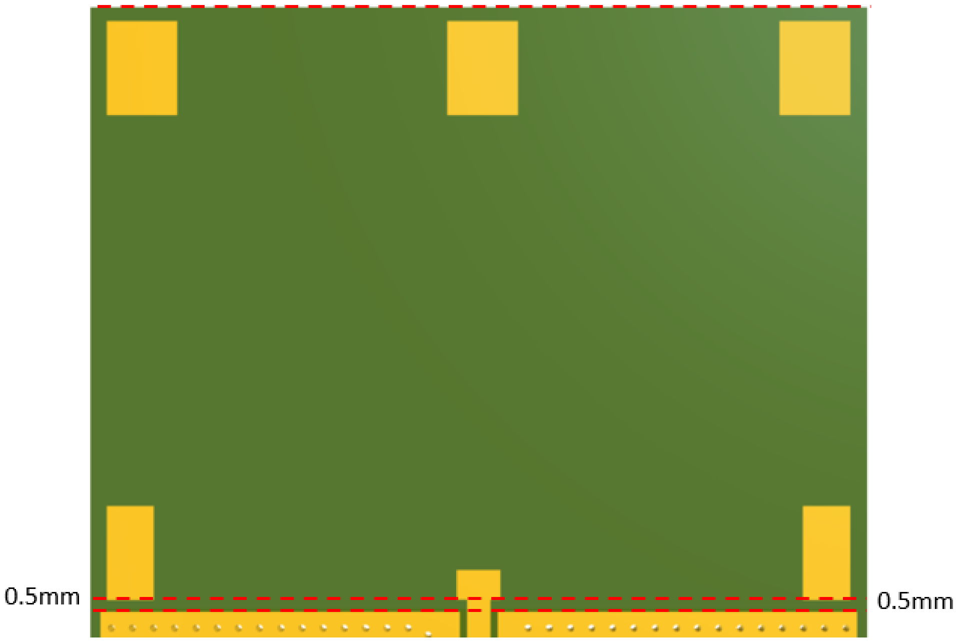
Topside



Bottom side

6.4 PCB Clearance

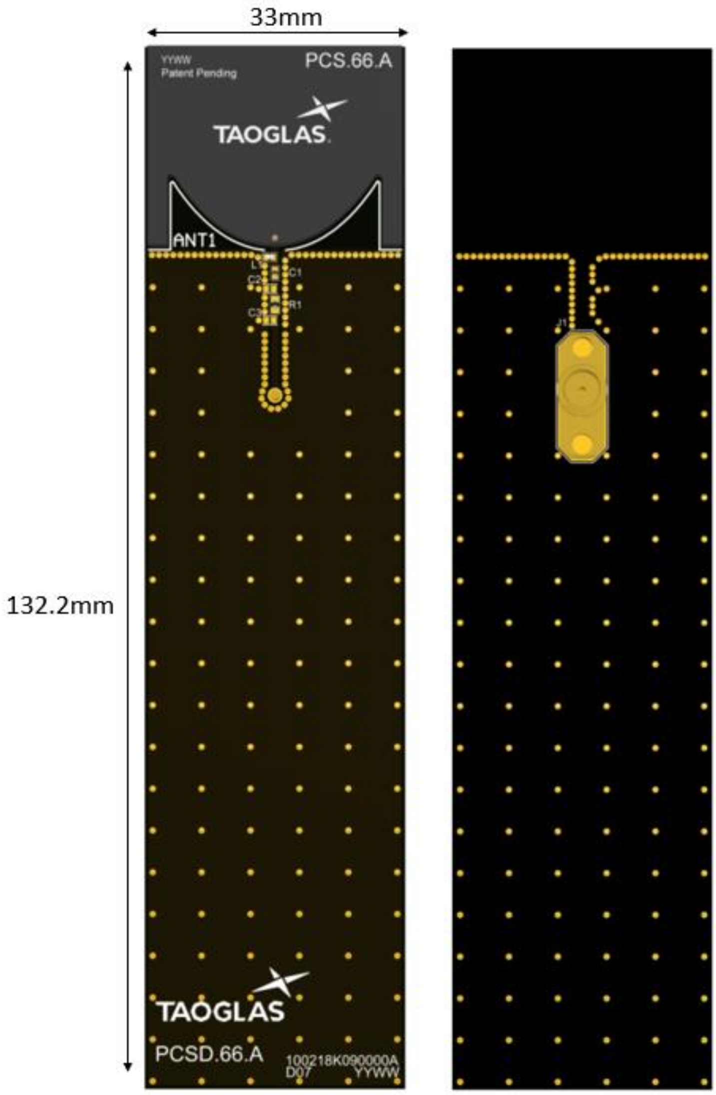
Below shows the antenna footprint and clearance through ALL layers on the PCB. Only the antenna pads and connections to feed are present within this clearance area (marked RED). The clearance area extends to 0.5mm from the antenna mechanical pads to the ground area. This clearance area includes the bottom side and ALL internal layers on the PCB.



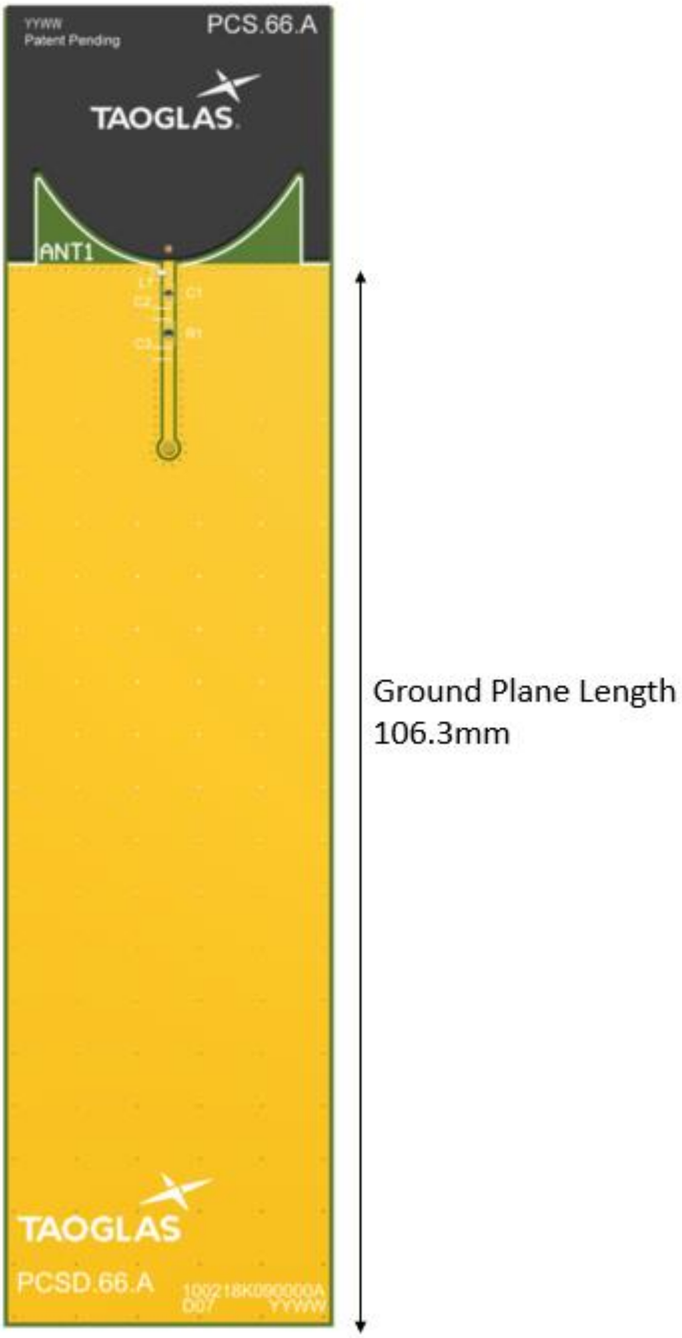
Topside

Bottom Side

6.5 Evaluation Board

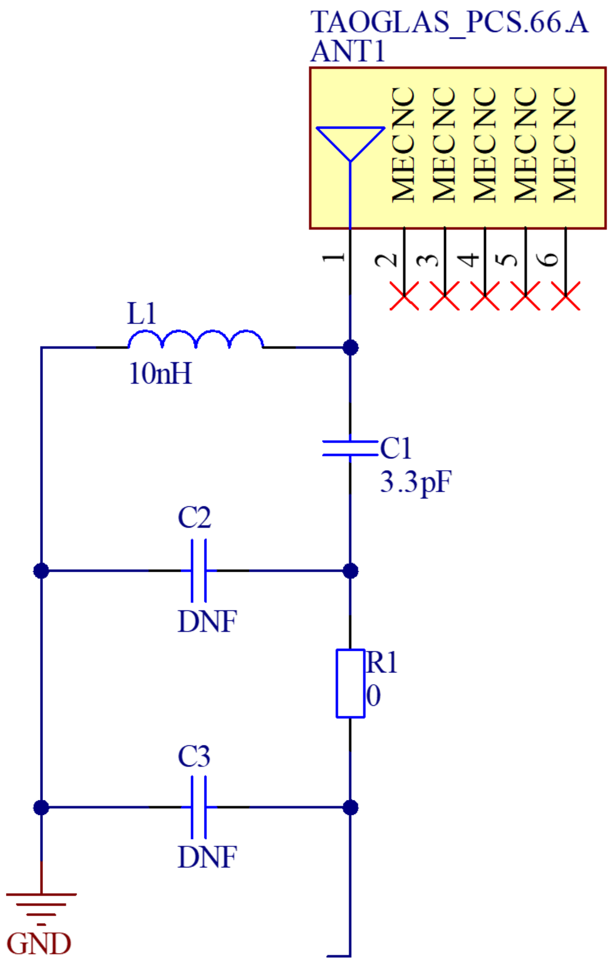


6.6 Evaluation Board Ground Plane Length



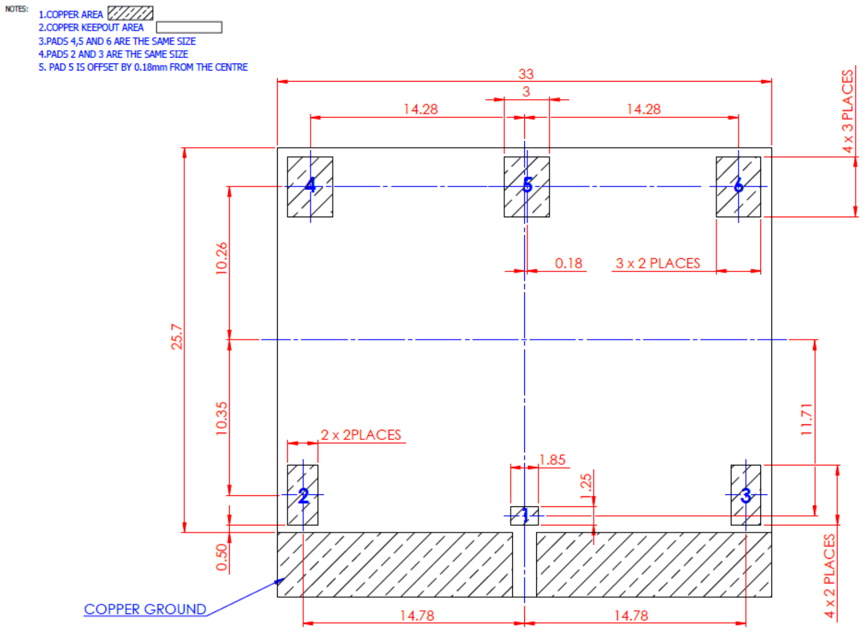
6.7 Evaluation Board Matching Circuit

A matching component (L1) in parallel with the PCS.66.A is required for the antenna to have optimal performance on the evaluation board. 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.

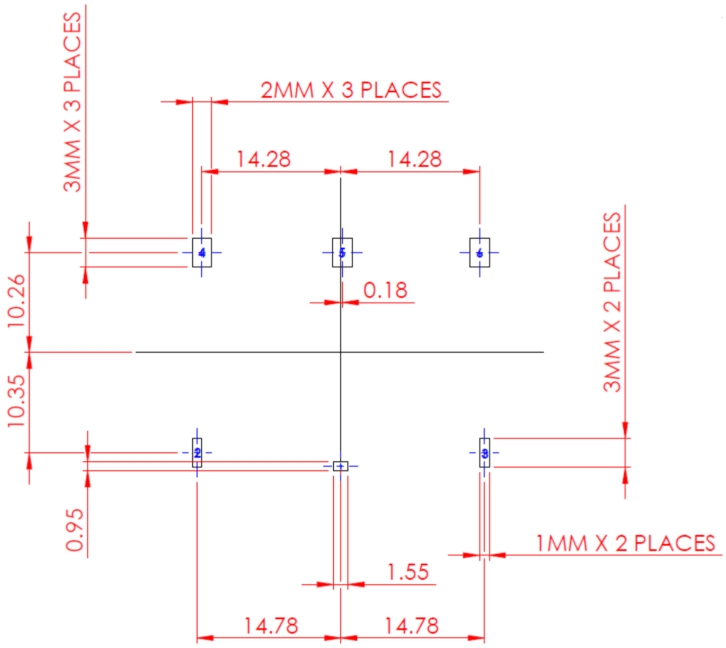


Designator	Type	Value	Manufacturer	Description
L1	Inductor	10nH	TDK	MLK1005S10NJT000
R1	Resistor	0 Ohms	Yageo	RC0402FR-070RL
C1	Capacitor	3.3pF	Murata	GRM1555C1H3R3CA01D
C2	Capacitor	DNF	-	-
C3	Capacitor	DNF	-	-

6.8 Footprint



FOOTPRINT PCB
TOP VIEW

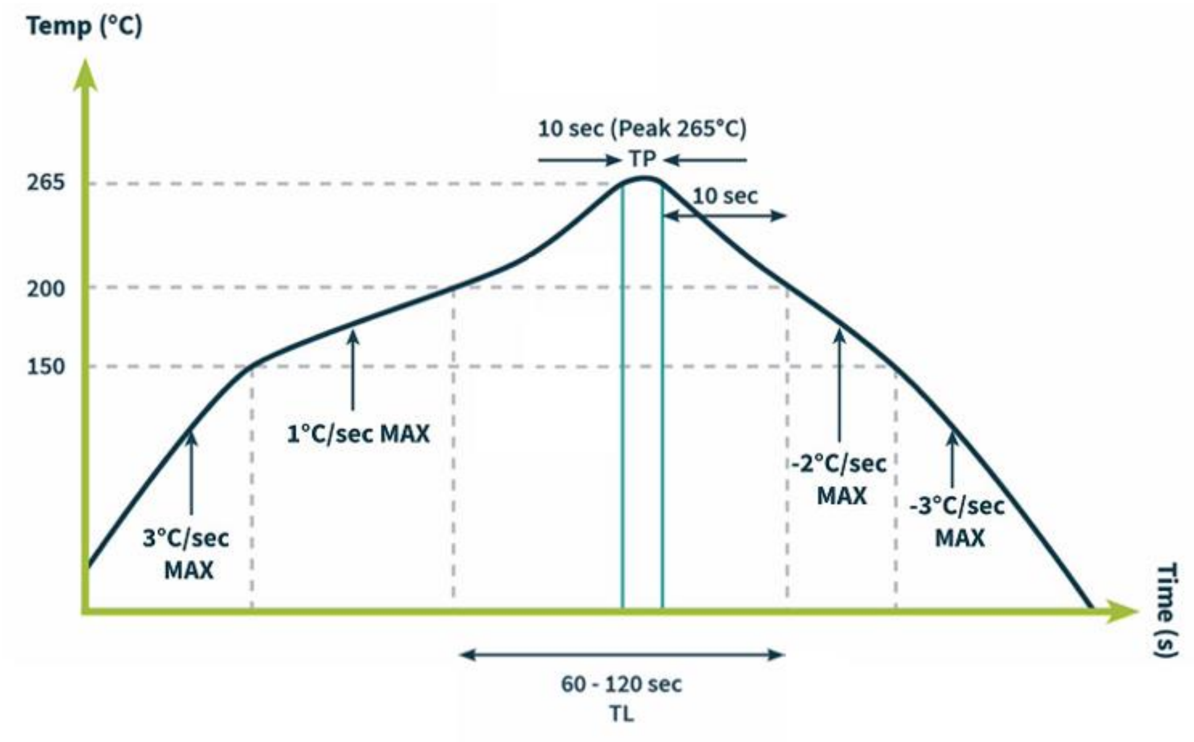


TOP SOLDER PASTE

PAD NO.	DESCRIPTION
1	RF FEED (50 Ohm)
2-6	MECH NOT CONNECTED

7. Solder Reflow Profile

The PCS.66.A can be assembled by following the recommended soldering temperatures are as follows:



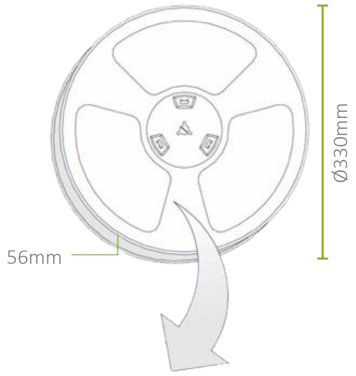
*Temperatures listed within a tolerance of +/- 10º C

Smaller components are typically mounted on the first pass, however, we do advise mounting the PCS.66.A when placing larger components on the board during subsequent reflows.

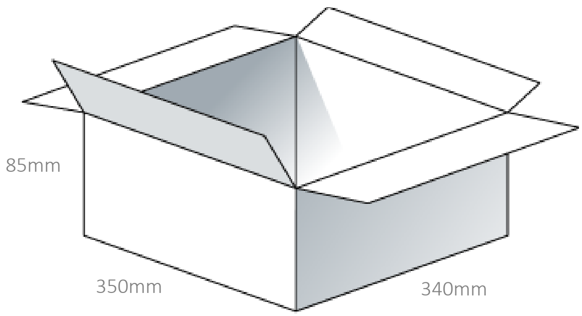
Note: Soldering flux classified ROL0 under IPC J-STD-004 is recommended.

8. Packaging

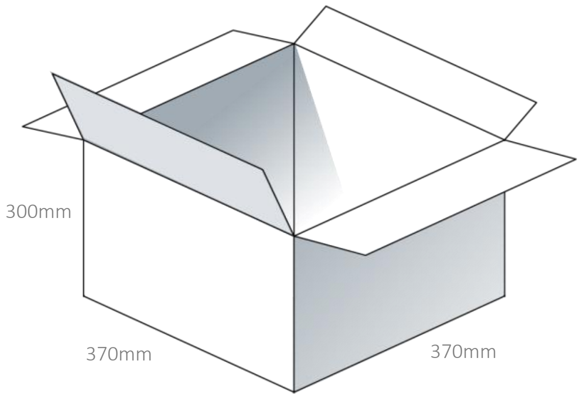
500pcs PCS.66.A per Tape & Reel
Dimensions - Ø330*56mm



500pcs PCS.66.A per Box
Dimensions - 350*340*85mm



1500pcs PCS.66.A per Carton
Dimensions - 370*370*300mm



Changelog for the datasheet

SPE-19-8-012 – PCS.66.A

Revision: K (Current Version)	
Date:	2023-09-07
Changes:	Updated Solder Reflow information
Changes Made by:	Cesar Sousa

Previous Revisions

Revision: J	
Date:	2023-08-15
Changes:	Added Top Solder Paste Drawing & Solder Reflow Profile.
Changes Made by:	Gary West

Revision: I	
Date:	2022-11-15
Changes:	Updated Antenna Integration Guide
Changes Made by:	Gary West

Revision: H	
Date:	2022-09-16
Changes:	Added antenna integration guide.
Changes Made by:	Gary West

Revision: G	
Date:	2022-03-01
Changes:	Updated Packaging
Changes Made by:	Paul Doyle

Revision: F	
Date:	2021-07-13
Changes:	Updated MSL
Changes Made by:	Jack Conroy

Revision: E	
Date:	2020-01-02
Changes:	Updated Packaging
Changes Made by:	Jack Conroy

Revision: D	
Date:	2019-08-16
Changes:	Updated Drawings and Pad Layout
Changes Made by:	Jack Conroy

Revision: C	
Date:	2019-08-02
Changes:	Updated Drawings
Changes Made by:	Jack Conroy

Revision: B	
Date:	2019-04-26
Changes:	Updated Layout Dimensions & Added Packaging
Changes Made by:	Jack Conroy

Revision: A (Original Release)	
Date:	2019-02-22
Notes:	Initial Datasheet Release
Author:	Yu Kai Yeung

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