TAOGLAS®

Datasheet

Taoglas Reach Series - PCS.86.A

Description:

Reach - Low Profile Wideband Cellular - 5G/4G SMD Antenna

Features:

Patent Pending Innovative Design

High Efficiency Wideband Antenna, Covering 791 to 6000 MHz

5G NR Frequency Band 1 Support

Backwards Compatible with all 3G/2G applications

Surface Mount Distribution - Supplied on Tape & Reel

Dimensions: 32 x 16 x 1.6 mm

RoHS & REACH Compliant

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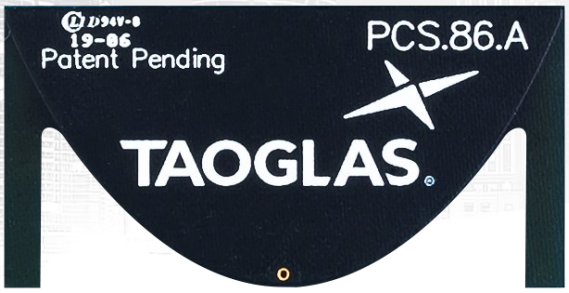
Taiwan ISO 9001:2015 Certified

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.86.A has been designed to cover 4G cellular bands and all sub-6 GHz 5G deployments across the 791MHz to 6000MHz spectrum on a very small footprint of just 32 x 16mm. It also covers 3G and 2G bands to allow for fall-back when 5G/4G is not available.

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.86.A is suitable for lower cost 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 the extended 5G/4G Band 71 is required, the Reach PCS.66, covering 600 – 6000MHz, could be an option with a slightly larger footprint of 32 x 25mm. Contact your regional 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 NR and LTE.

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 .3 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	**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)	**791-960**	**1427-1518**	**1710-1990**	**1920-2170**	**2400-2500**	**2500-2700**	**3300-5000**	**5150-5850**
Peak Gain	1.5 dBi	1.2 dBi	4.6 dBi	3.5 dBi	5.1 dBi	4.6 dBi	4.9 dBi	.728 dBi
Average Gain	-2.3 dB	-3.7 dB	-1.6 dB	-1.9 dB	-2.2 dB	-1.9 dB	-2 dB	-4.4 dB
Efficiency	60%	43%	69%	64%	60%	64%	63%	36%
VSWR	<3.0:1							
Impedance	50Ω							
Polarization	Linear							
Radiation Properties	Omni-directional							
Max Input Power	5 W							

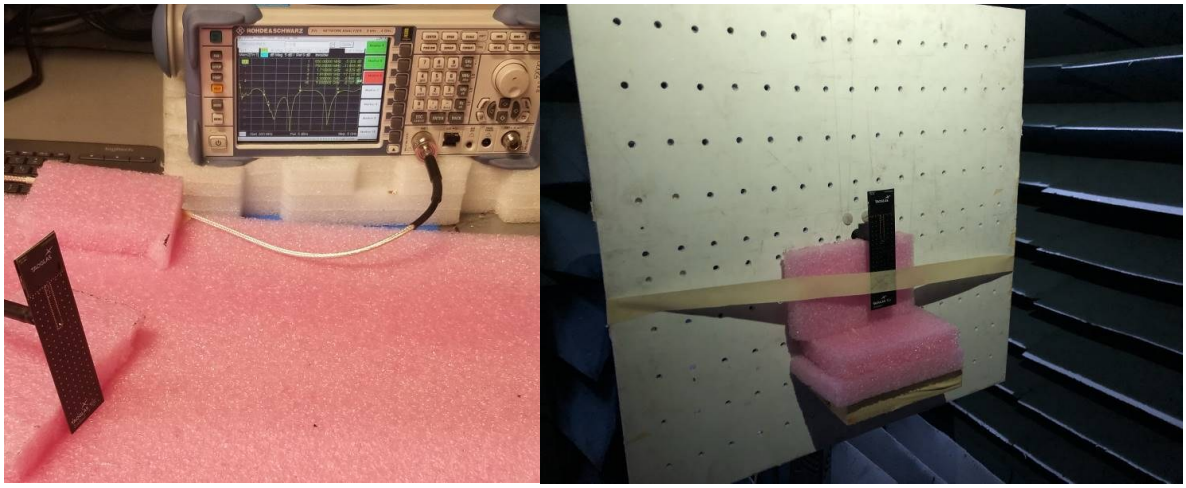
The Reach PCS.86.A antenna performance was measured on a 107x32 ground plane

Mechanical	
Dimensions	32mm x 16mm 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
Moisture Sensitivity Level (MSL)	3 (168 Hours)
Relative Humidity	Non-condensing 65°C 95% RH
RoHs Compliant	Yes

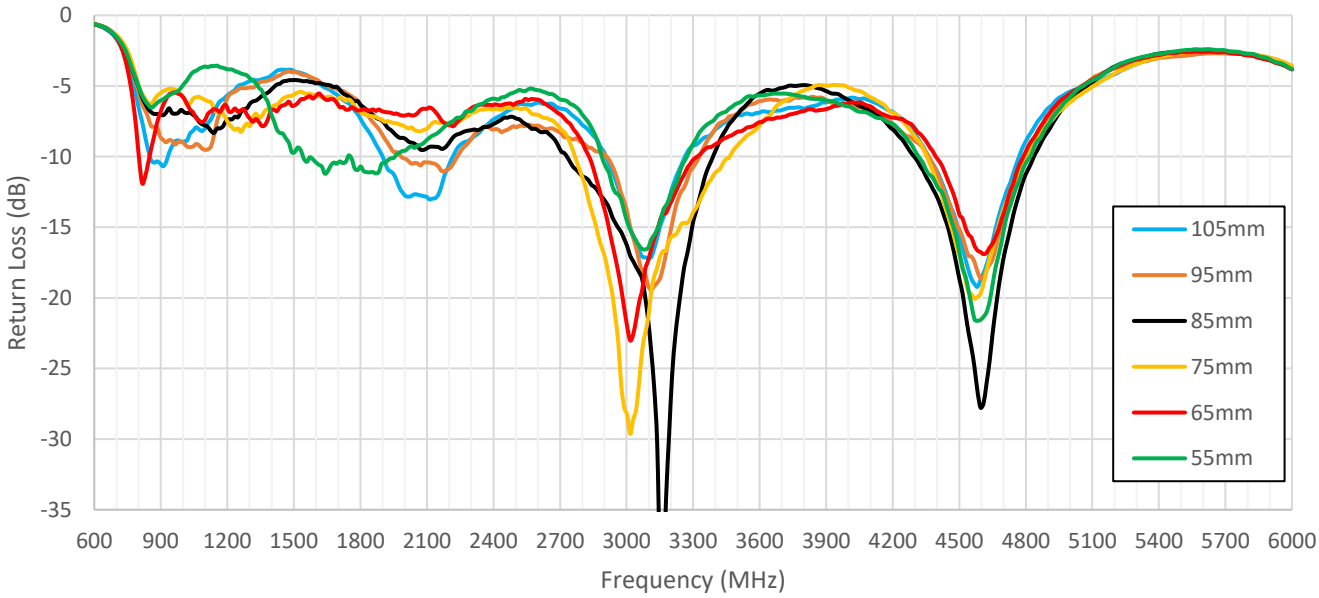
3. Antenna Characteristics

3.1 Test Setup

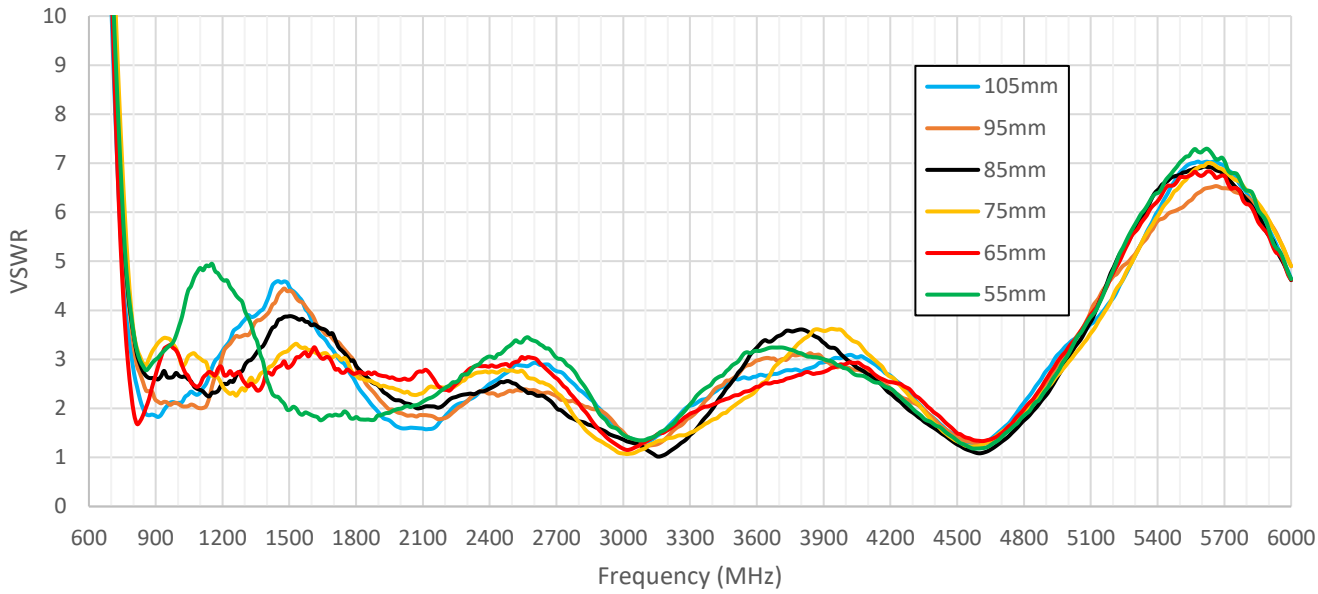


On PCSD.86.A Evaluation Board

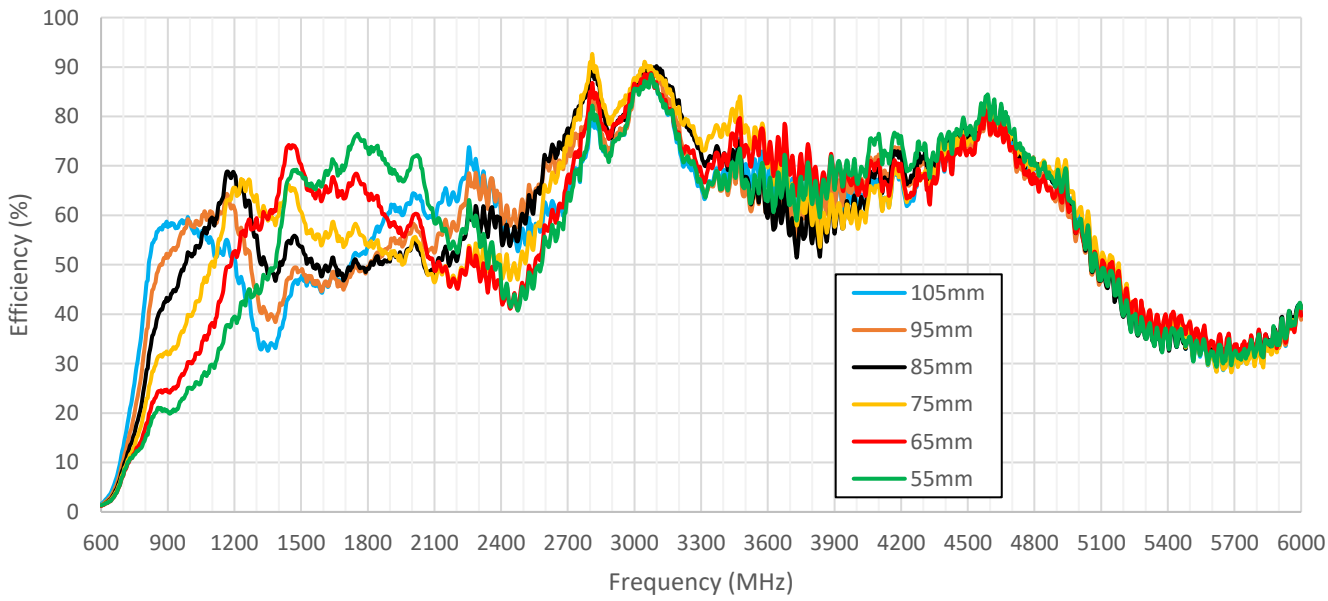
3.2 Return Loss



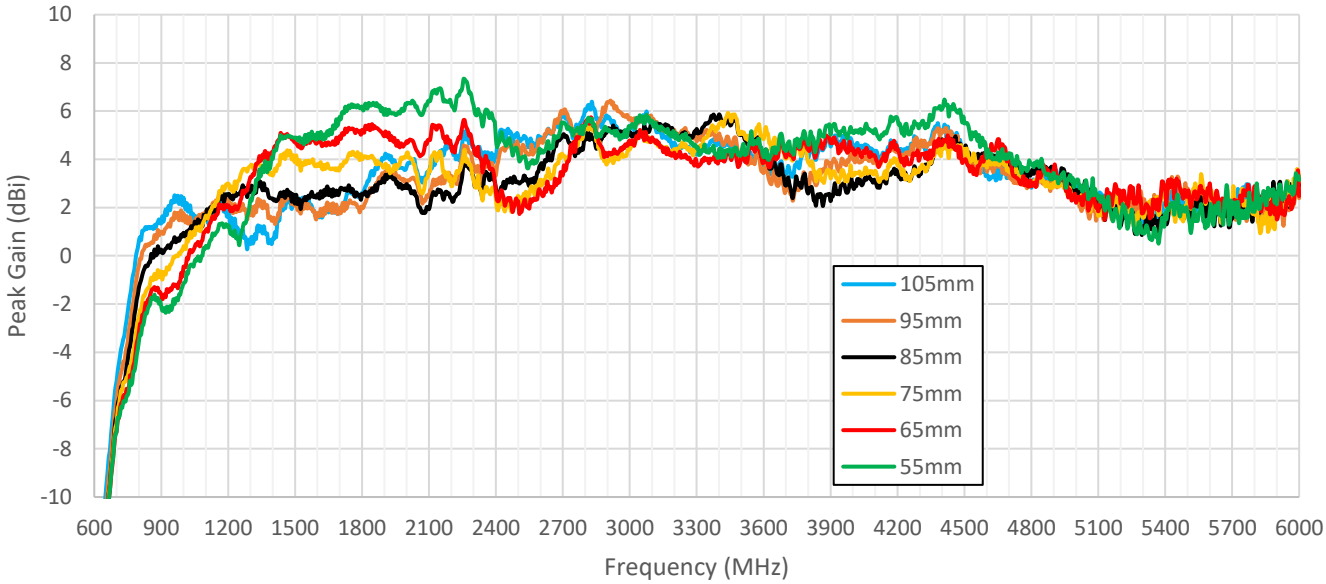
3.3 VSWR



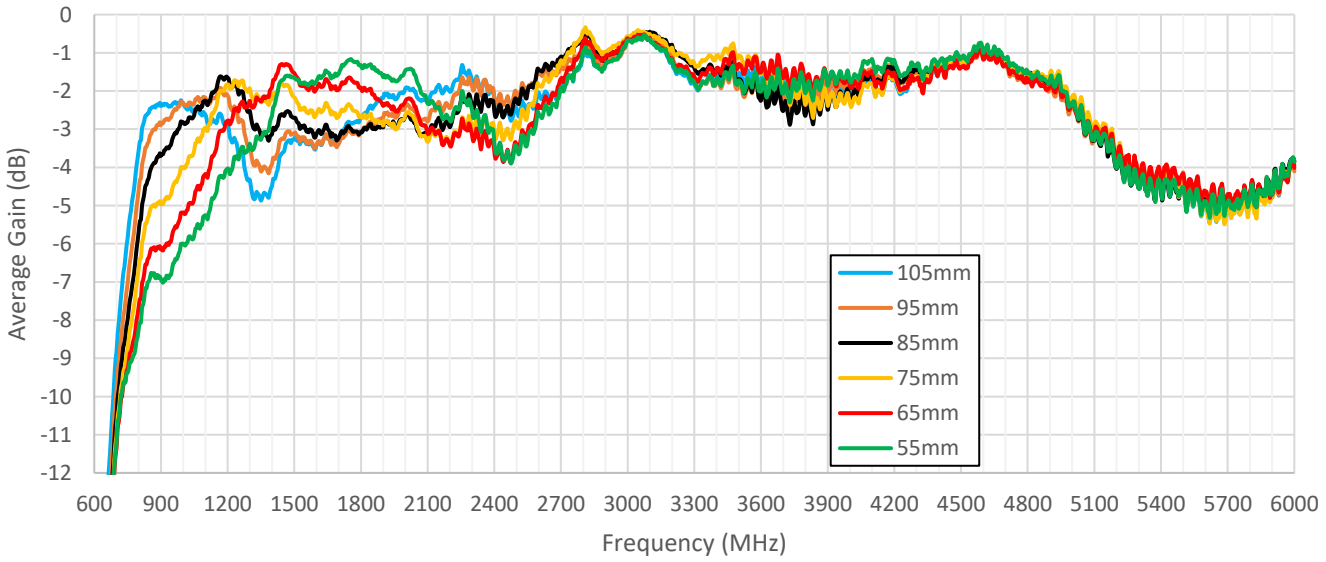
3.4 Efficiency



3.5 Peak Gain

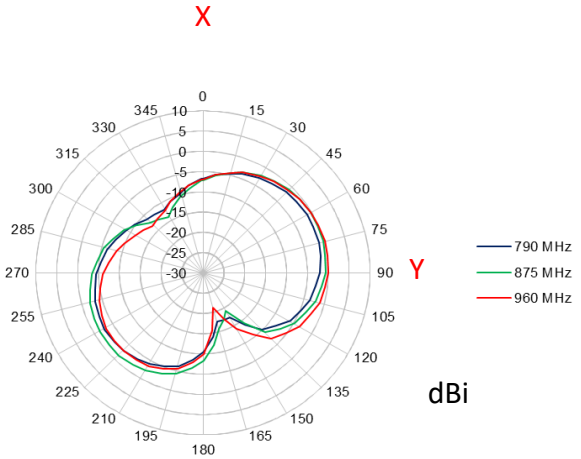


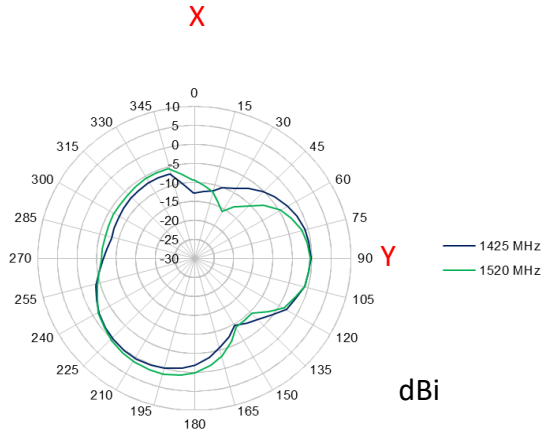
3.6 Average Gain

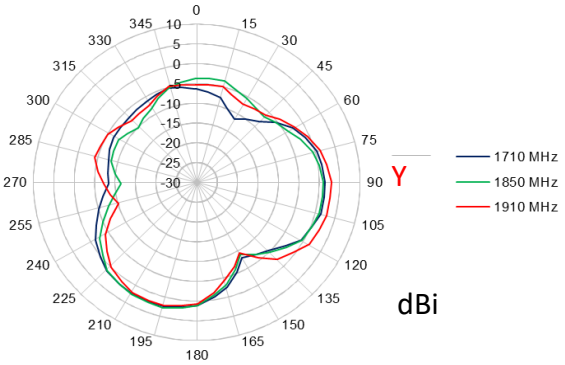


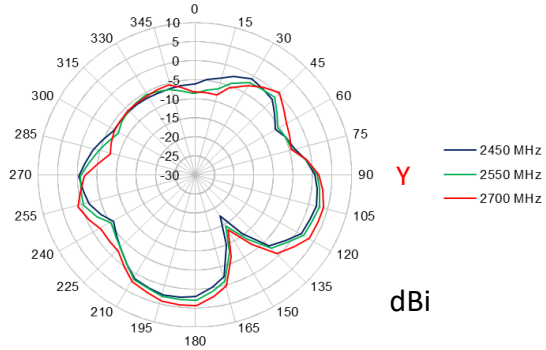
4. 2D Radiation Patterns (Measured on 123*32mm EVB)

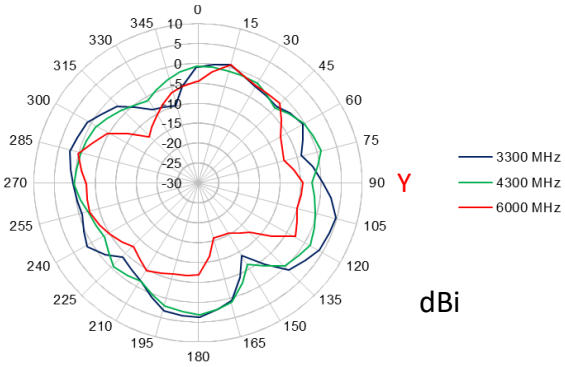
XY Plane



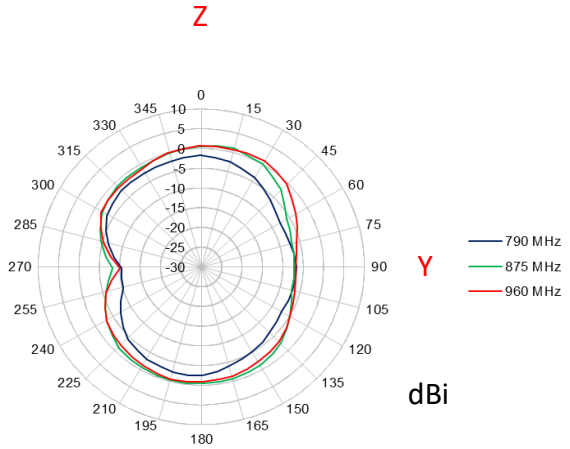


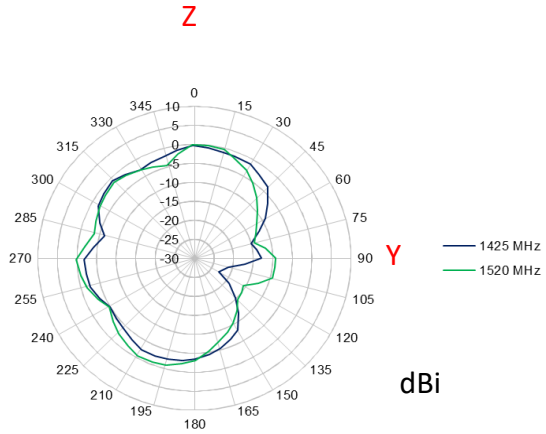


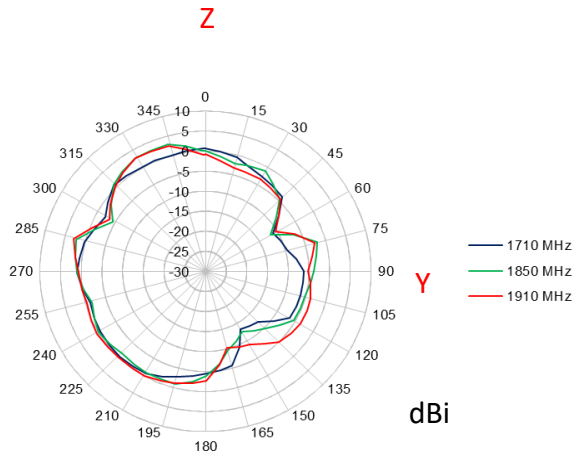


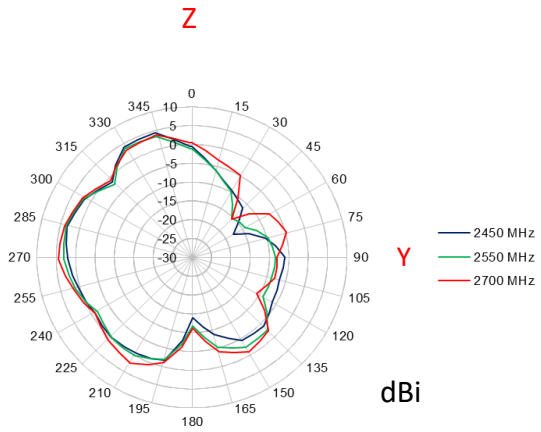


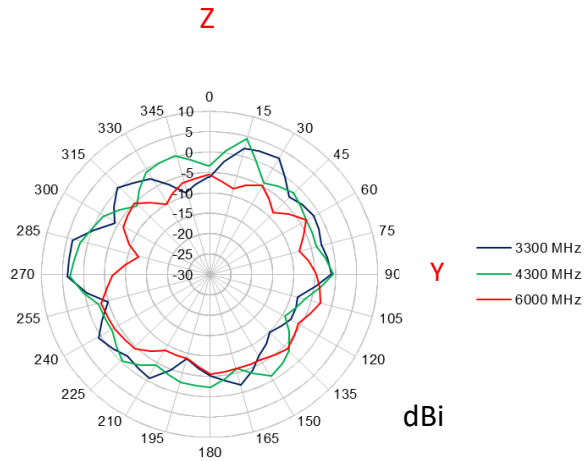
YZ Plane


Z
Y
dBi
790 MHz
875 MHz
960 MHz

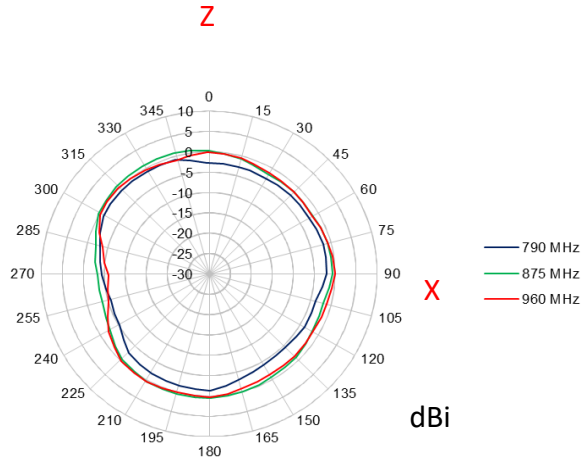

Z
Y
dBi
1425 MHz
1520 MHz

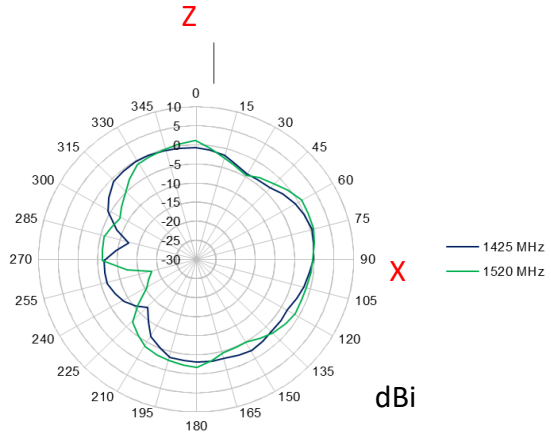

Z
Y
dBi
1710 MHz
1850 MHz
1910 MHz

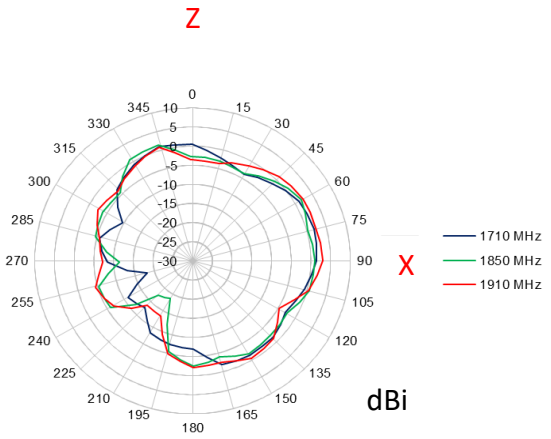

Z
Y
dBi
2450 MHz
2550 MHz
2700 MHz

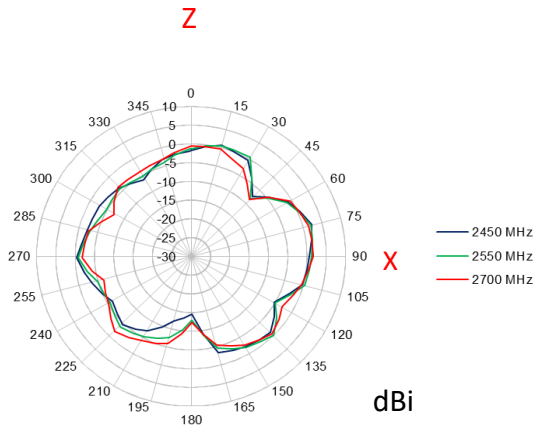

Z
Y
dBi
3300 MHz
4300 MHz
6000 MHz

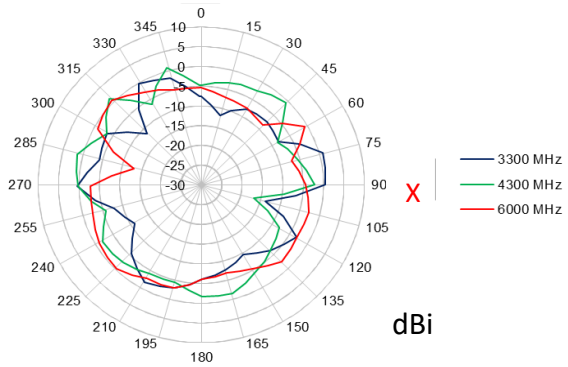
XZ Plane


Z
X
dBi
790 MHz
875 MHz
960 MHz


Z
X
dBi
1425 MHz
1520 MHz


Z
X
dBi
1710 MHz
1850 MHz
1910 MHz

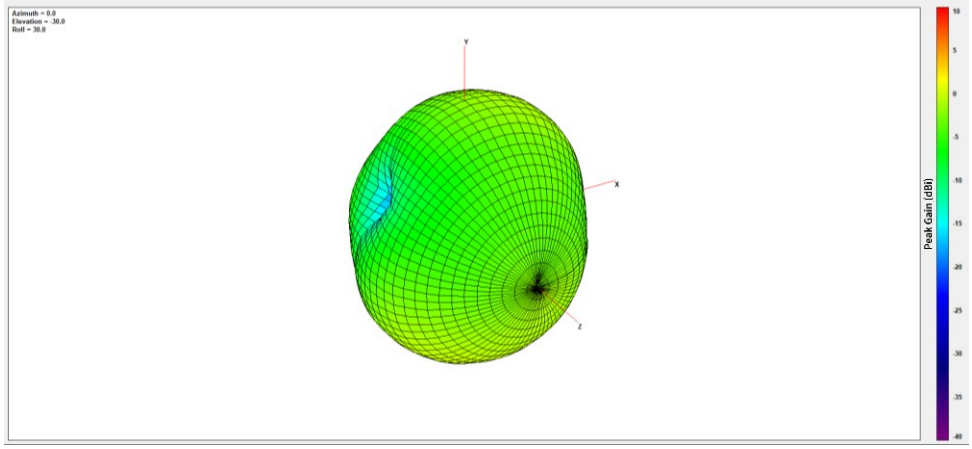

Z
X
dBi
2450 MHz
2550 MHz
2700 MHz


Z
X
dBi
3300 MHz
4300 MHz
6000 MHz

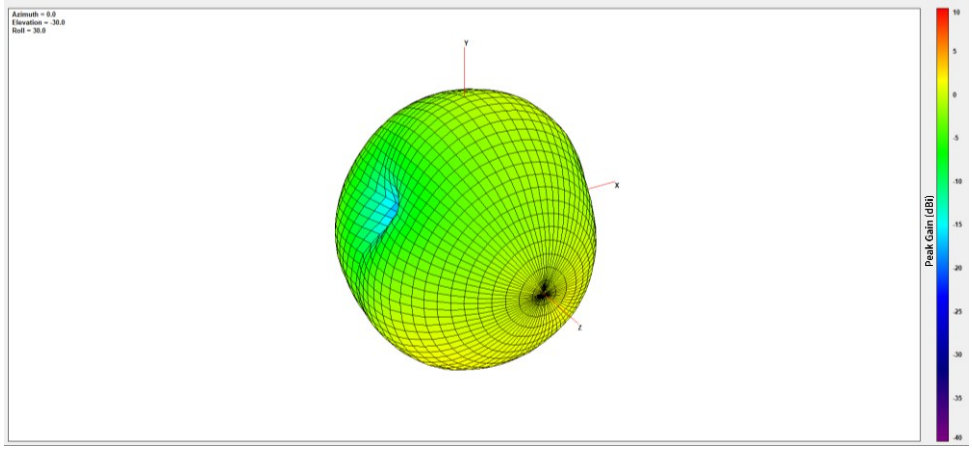
5. 3D Radiation Patterns

5.1 123*32mm EVB

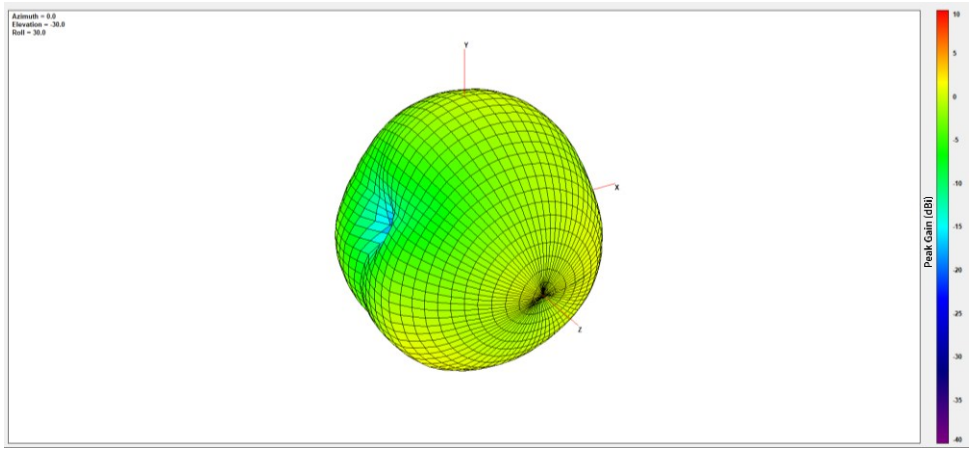
790MHz



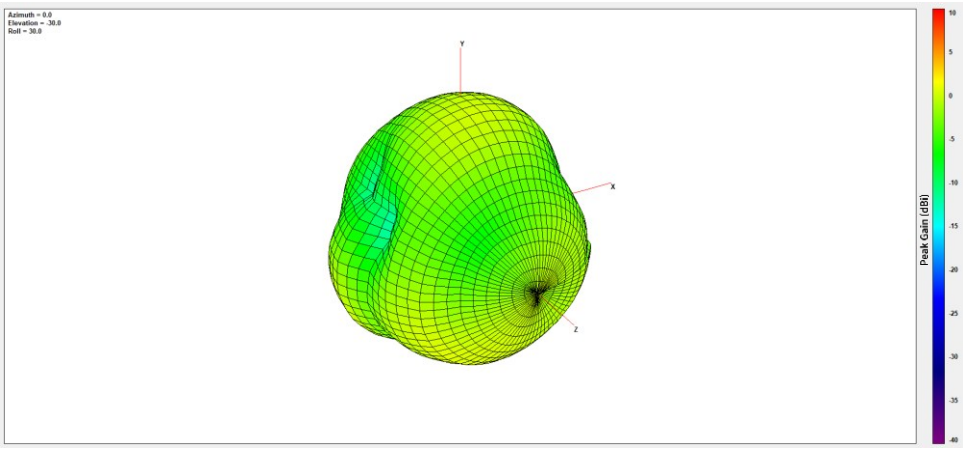
875MHz



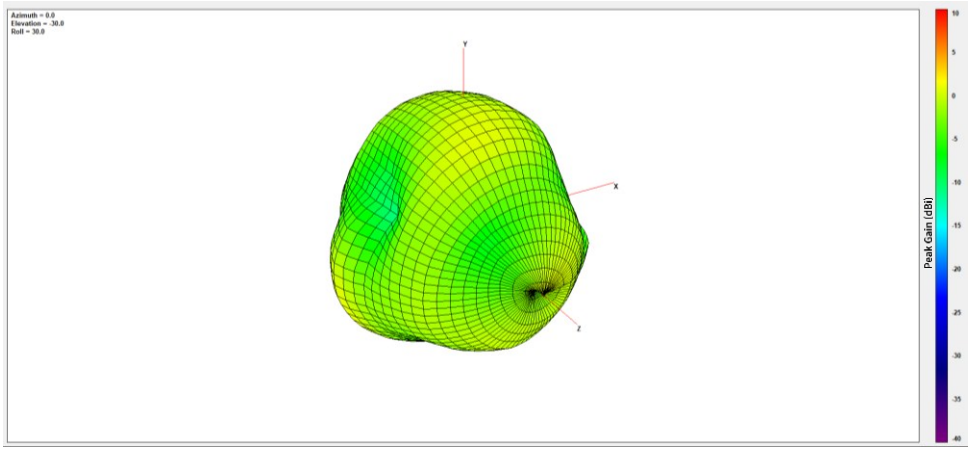
960 MHz



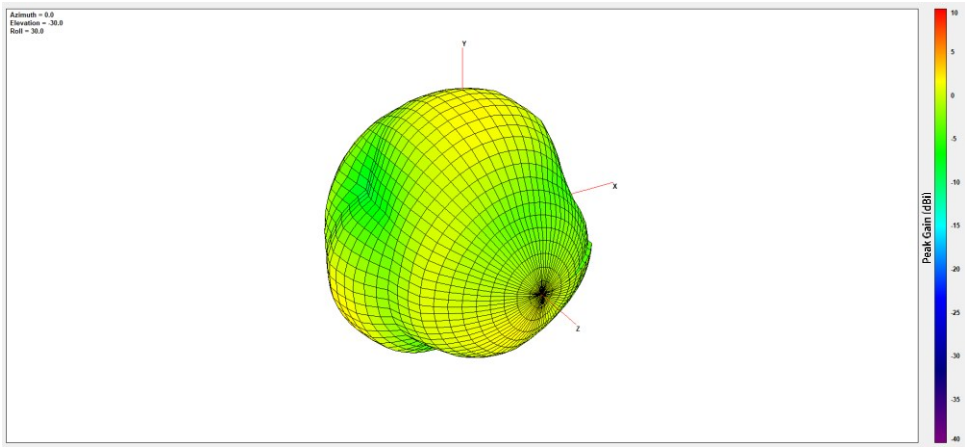
1425 MHz



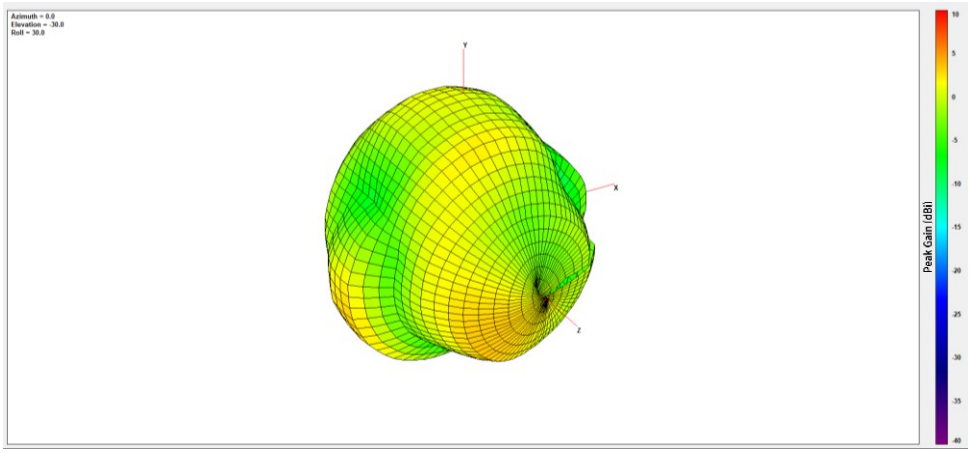
1520 MHz



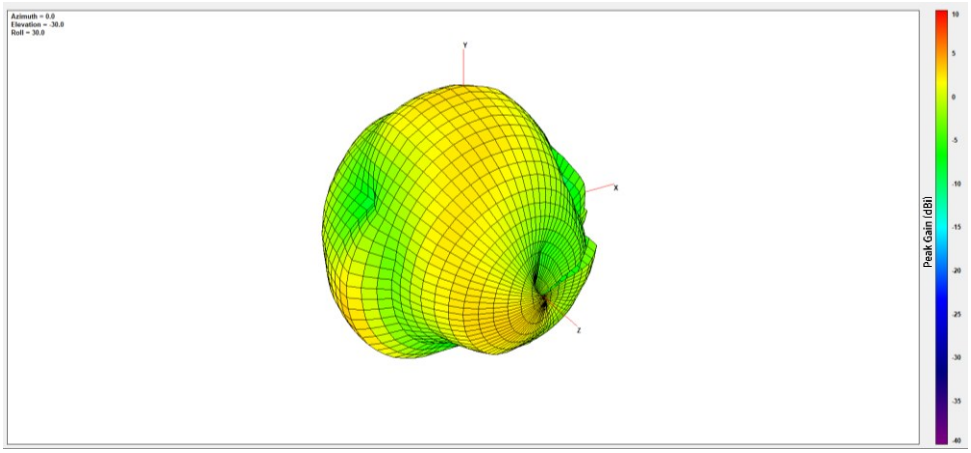
1710 MHz



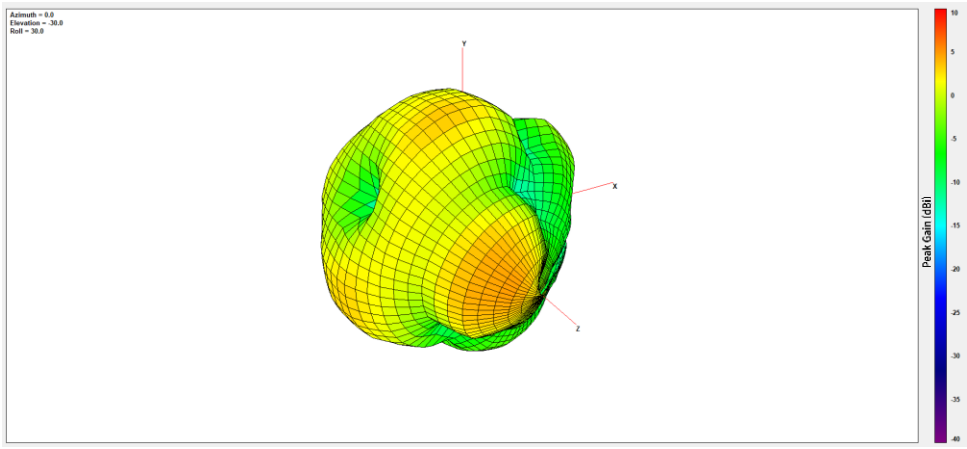
1850 MHz



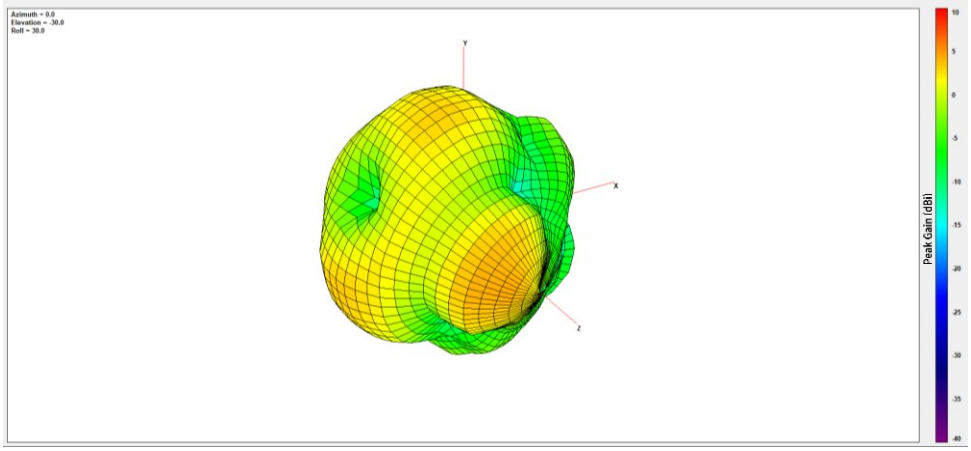
1910 MHz



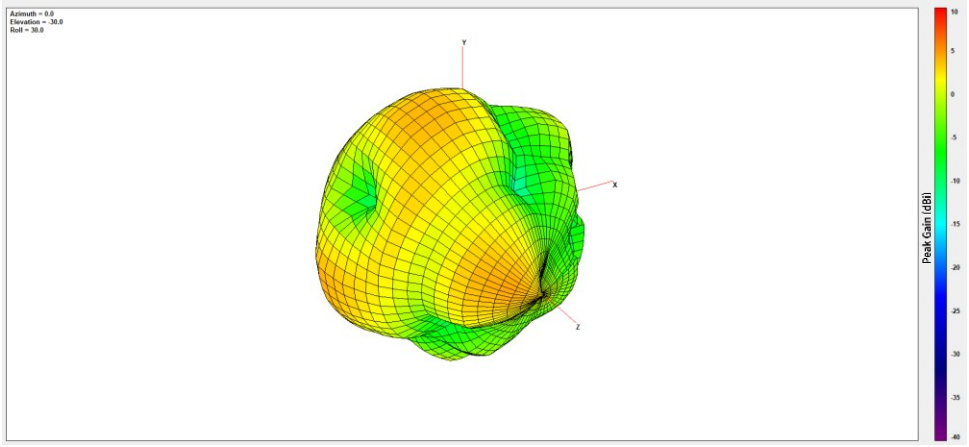
2450 MHz



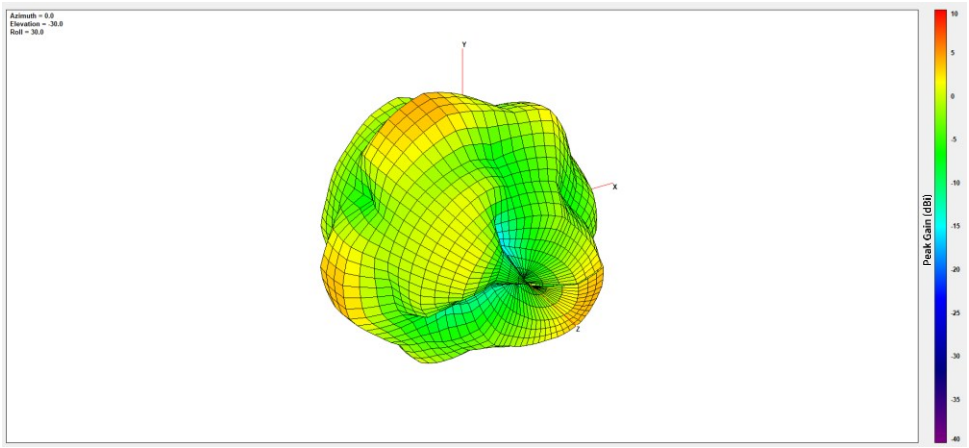
2550 MHz



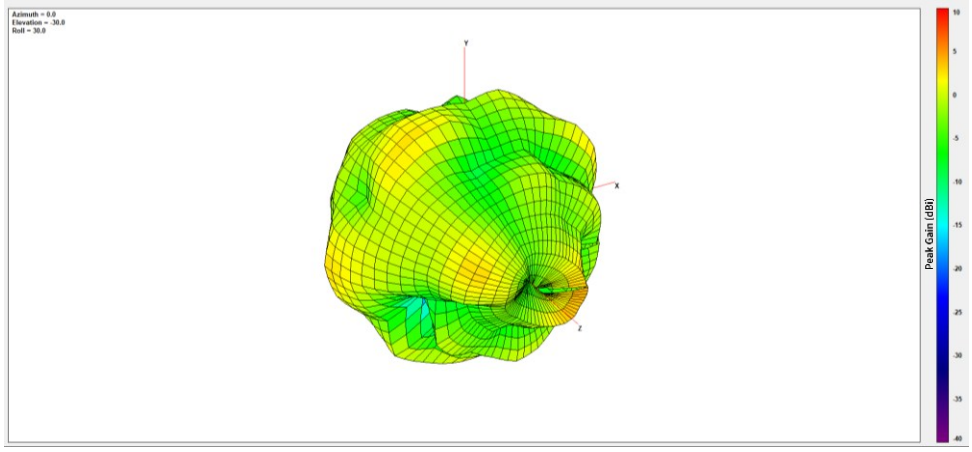
2700 MHz



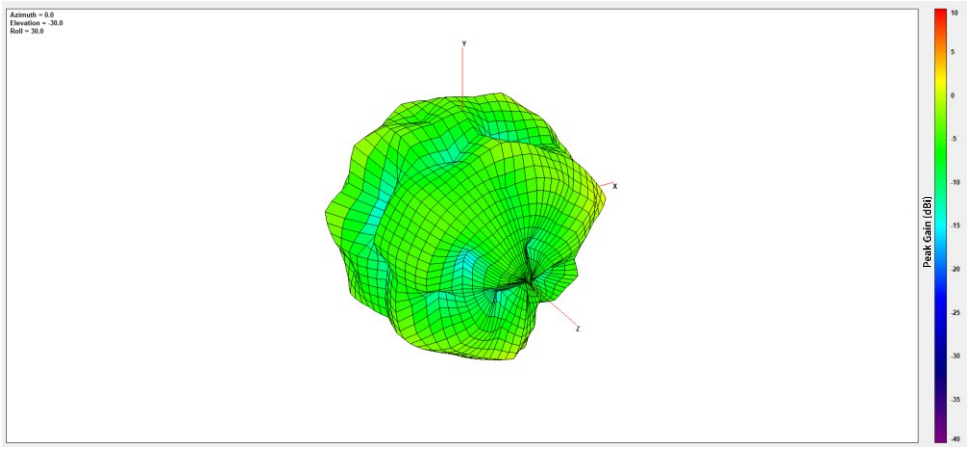
3300 MHz



4300 MHz



6000 MHz

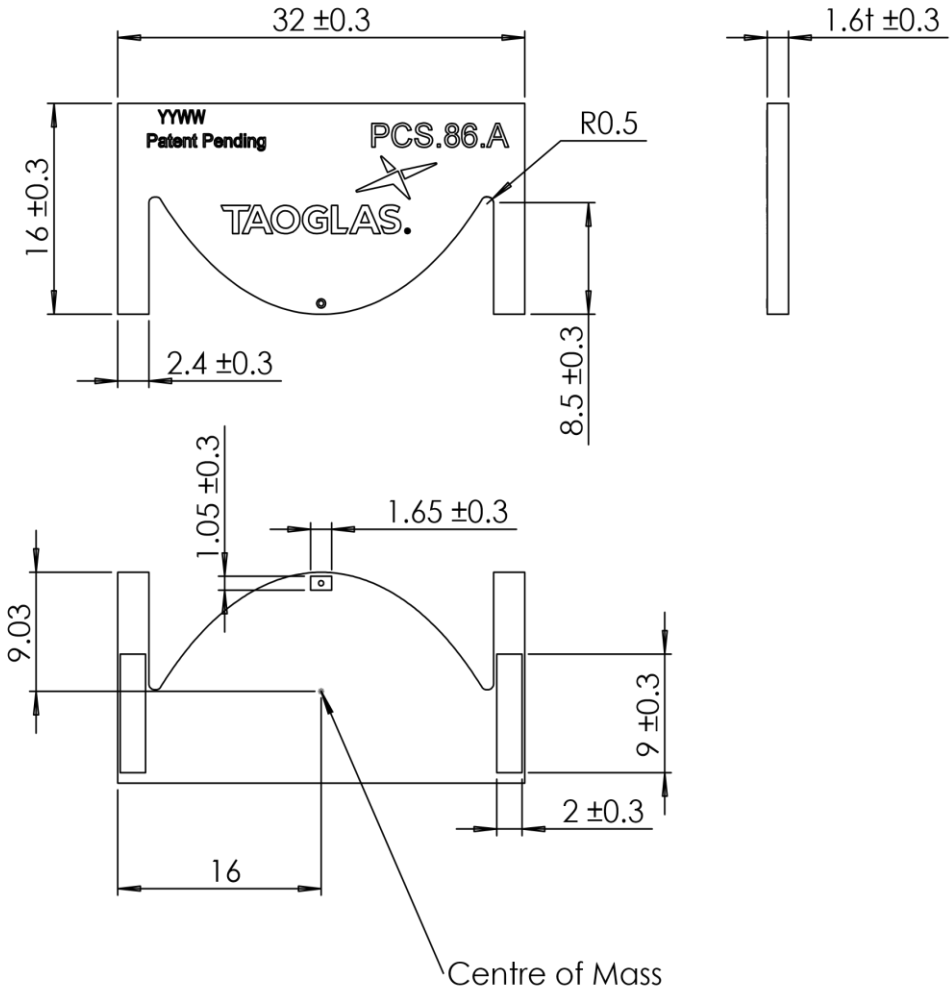


6. Mechanical Drawing - Antenna (Units: mm)

ISO NO: IDW-19-8-xxxx

<Release>

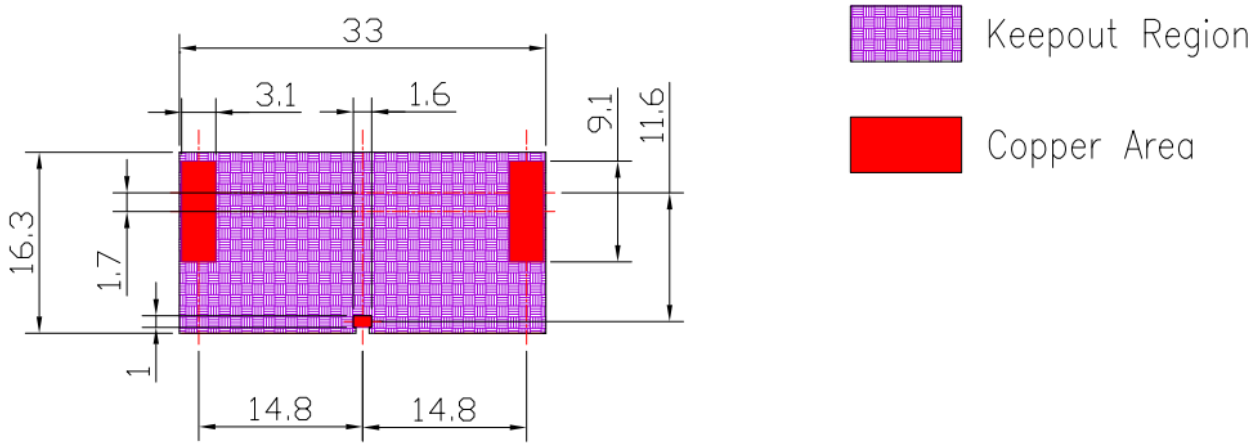
REV	ZONE	DESCRIPTION	ENG	APPROVED	ISSUED DATE
D01	ALL	Initial Design	Megan	xxx	2018/11/15
D02	ALL	Updated silkscreen	Megan	xxx	2019/01/22



Notes:
1. RMPN = 100218K070000A

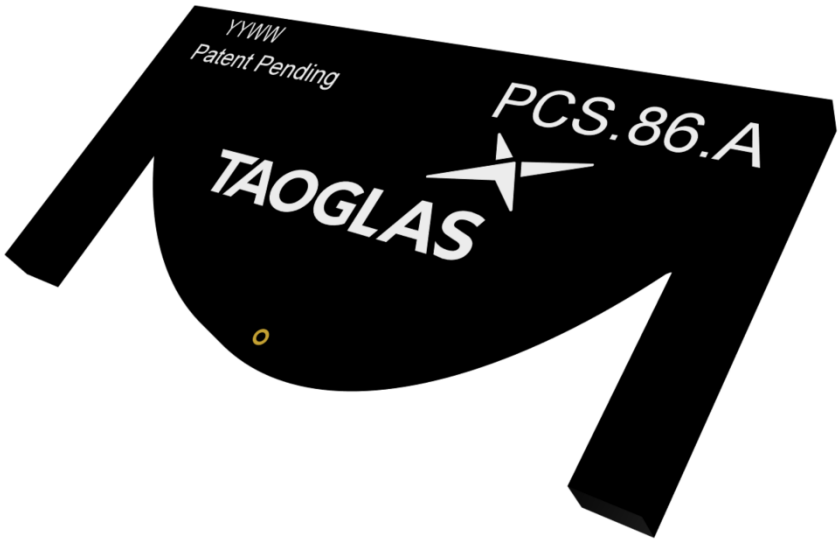
UNLESS OTHERWISE SPECFIED TOLERANCES ON: .X± 0.2 XX.± 0.5 .XX± 0.1 X.± 0.3 .XXX± 0.05	DATE: 2019/01/22	MAT'L: IT180	TAOGLAS. This drawing and its inherent design concepts are property of Taoglas. Not to be copied or given to third parties without the written consent of Taoglas.
	UNIT: mm	FINISH: Black	REV D02
	THIRD ANGLE PROJECTION	SCALE: 2/1	TITLE. : Low Profile Wideband SMD Antenna 800-6000MHz 32*15*1.6mm
APPROVED BY: / CHECKED BY:	DRAWN BY: Megan	CUSTOMERS SIGNATURE / DATE	PART NO. : PCS.86.A

7. Layout Dimensions



Please note that the center of mass is 1.16mm offset in the positive Y dimension from the geometric X-Y center of the antenna.

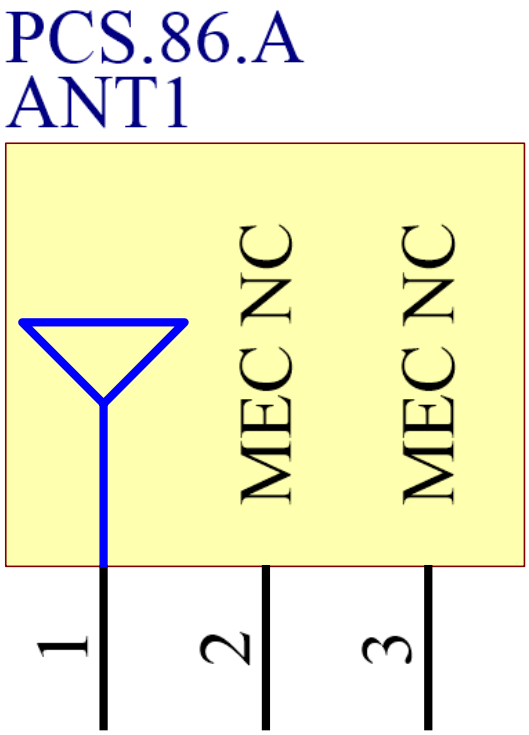
8. Antenna Integration Guide



8.1 Schematic Symbol and Pin Definition

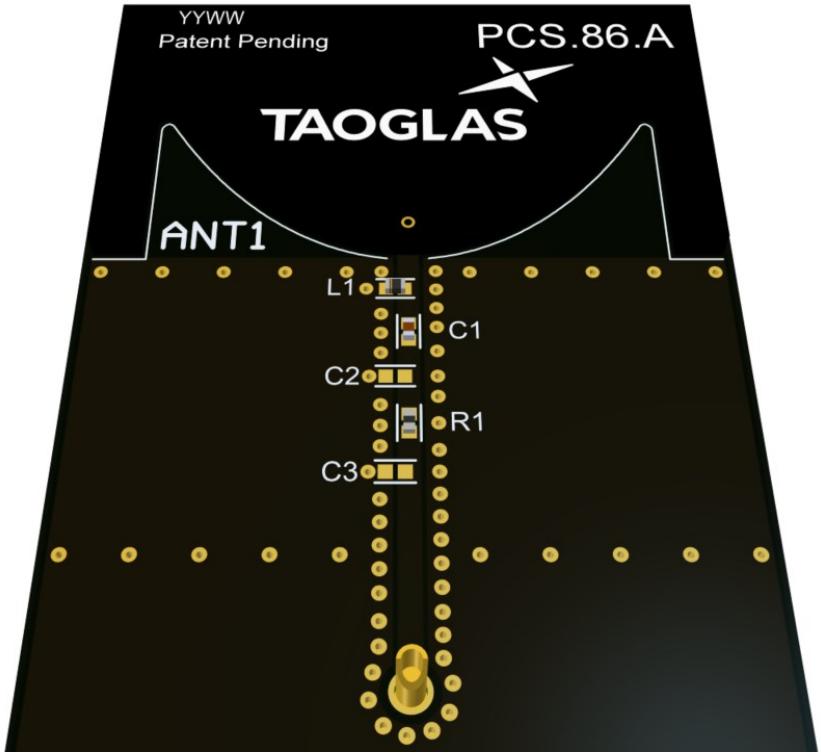
The circuit symbol for the antenna is shown below. The antenna has 4 pins with only one pin (Pin 1) as functional. Pins 2 and 3 are for mechanical strength.

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

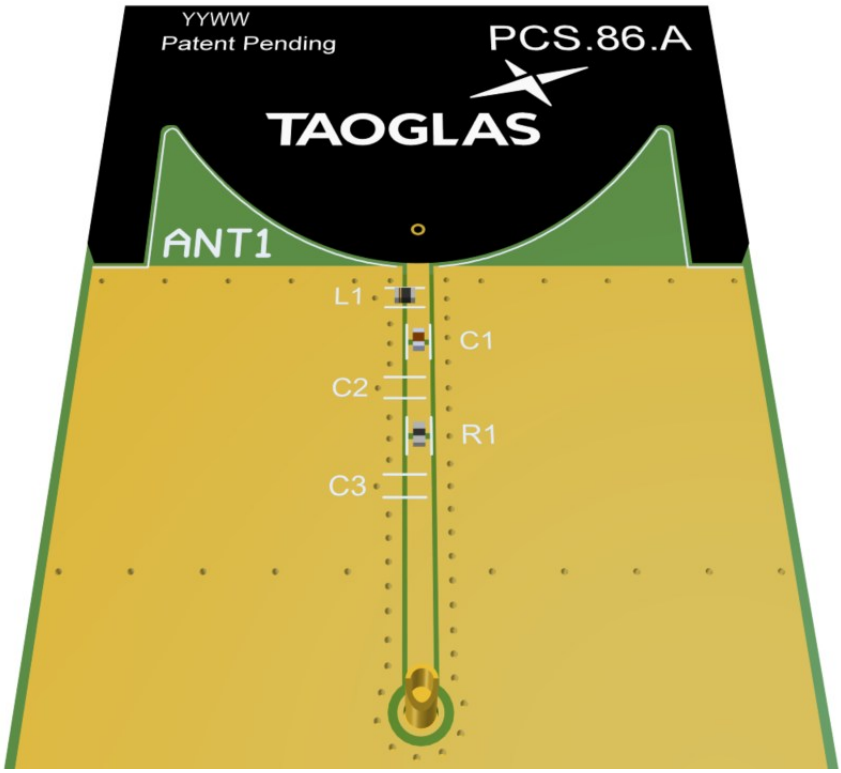


8.2 Antenna Integration

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.



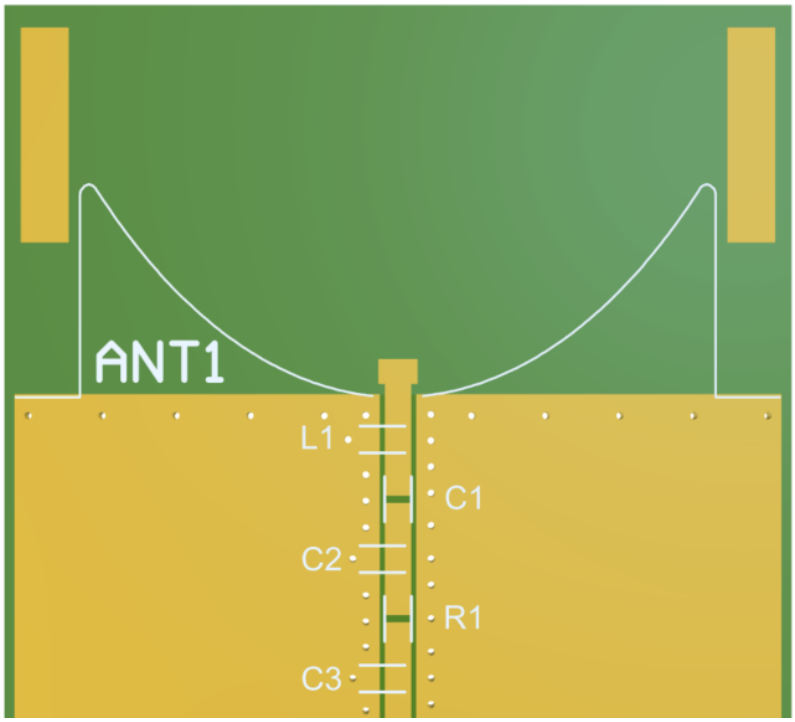
Top Side w/ Solder Mask



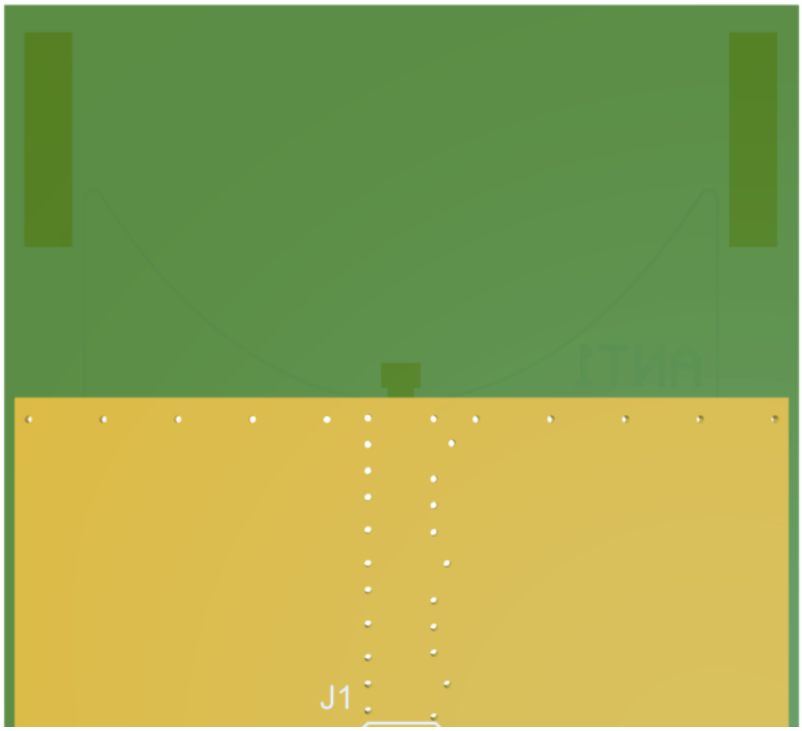
Top Side w/o Solder Mask

8.3 PCB Layout

The footprint and clearance on the PCB must meet the layout drawing in (Footprint Drawing). Note the placement of the optimized components. C1 is placed as close as possible to the RF feed (pad 1) but still within the transmission line. R1 is then placed tightly in series after that. C2 is an optional component but the footprint is recommended in case it is needed.



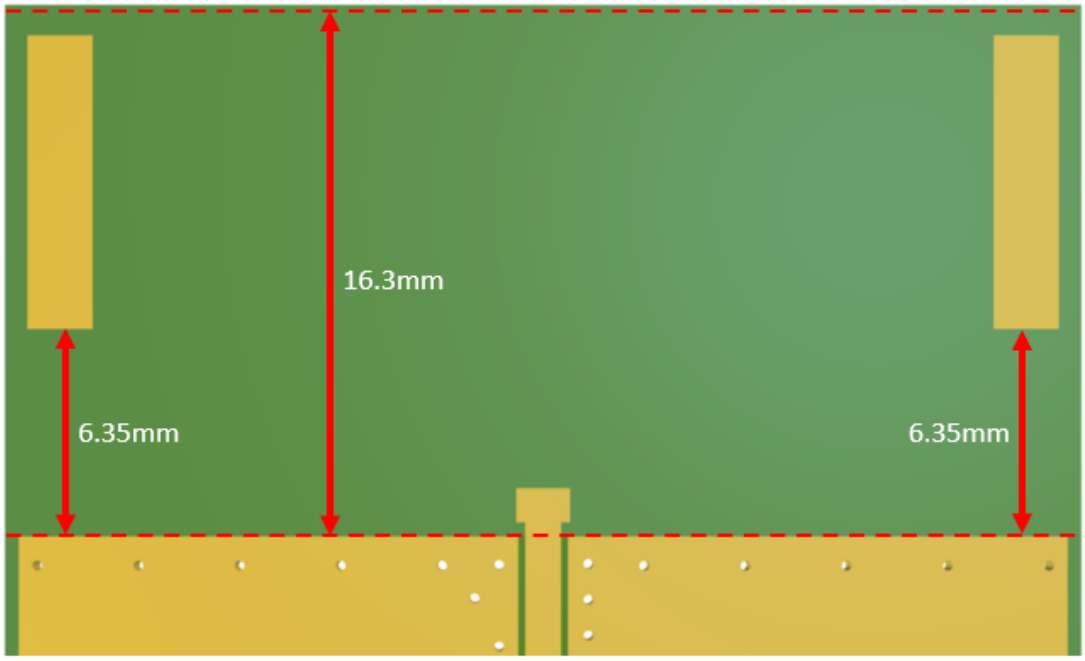
Topside



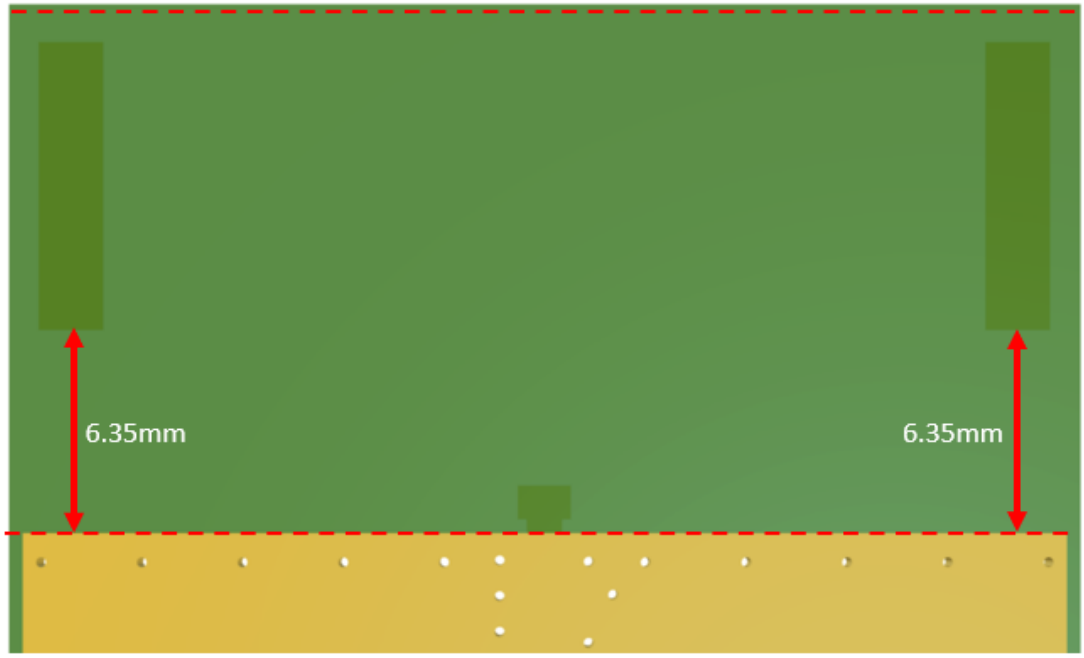
Bottom Side

8.4 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 6.35mm from the antenna mechanical pads to the ground area. This clearance area includes the bottom side and ALL internal layers on the PCB.

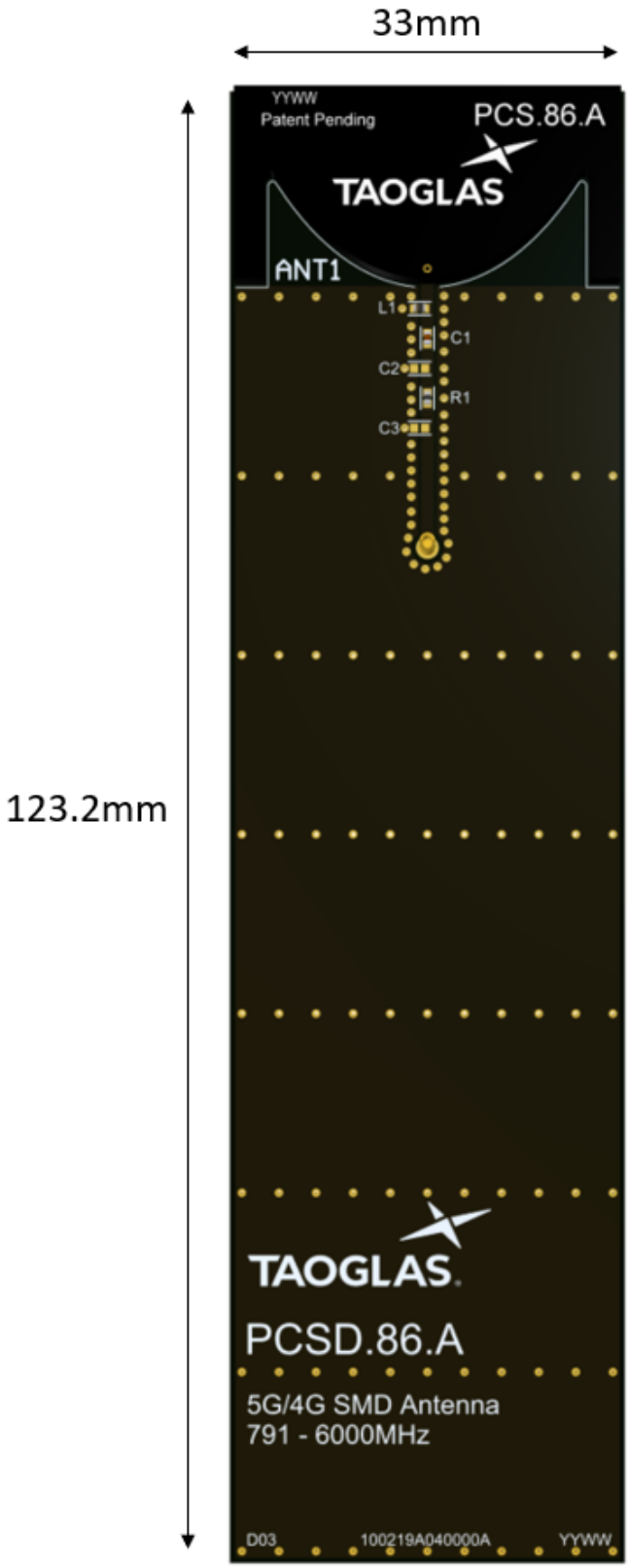


Topside

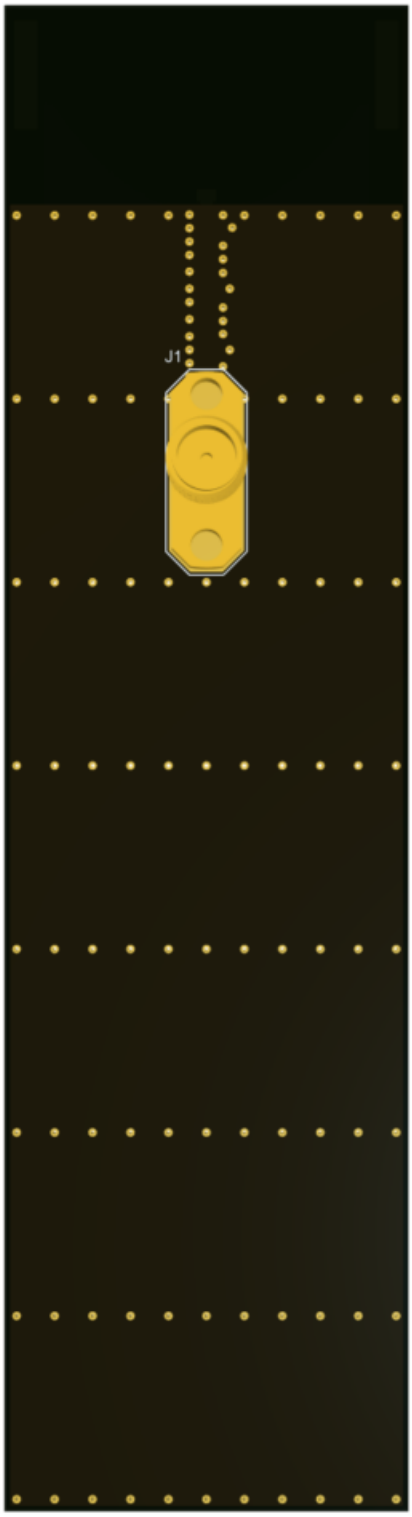


Bottom Side

8.5 Evaluation Board

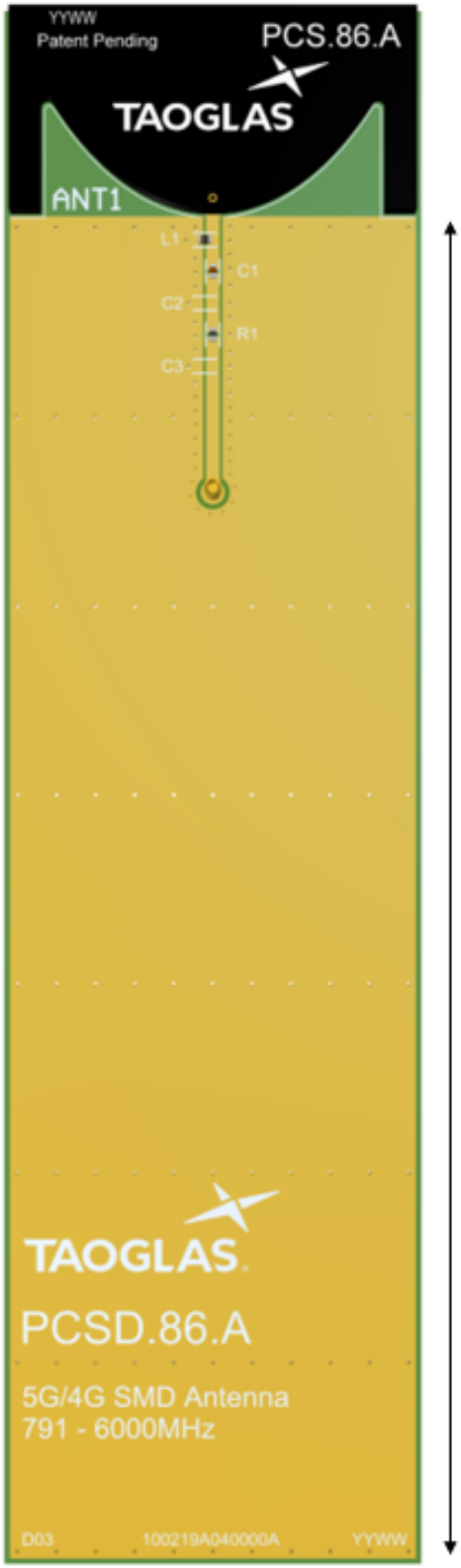


Topside



Bottom Side

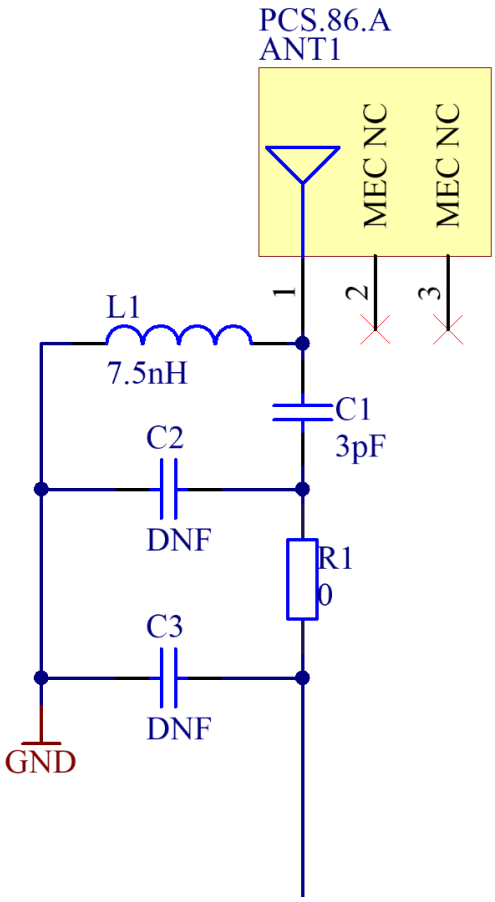
8.5 Reference Board Ground Plane Length



Ground Plane Length
106.5mm

8.6 Evaluation Board Matching Circuit

A matching component (L1) in parallel with the PCS.86.A is required for the antenna to have optimal performance on the evaluation board, located outside of the ground plane in the space 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



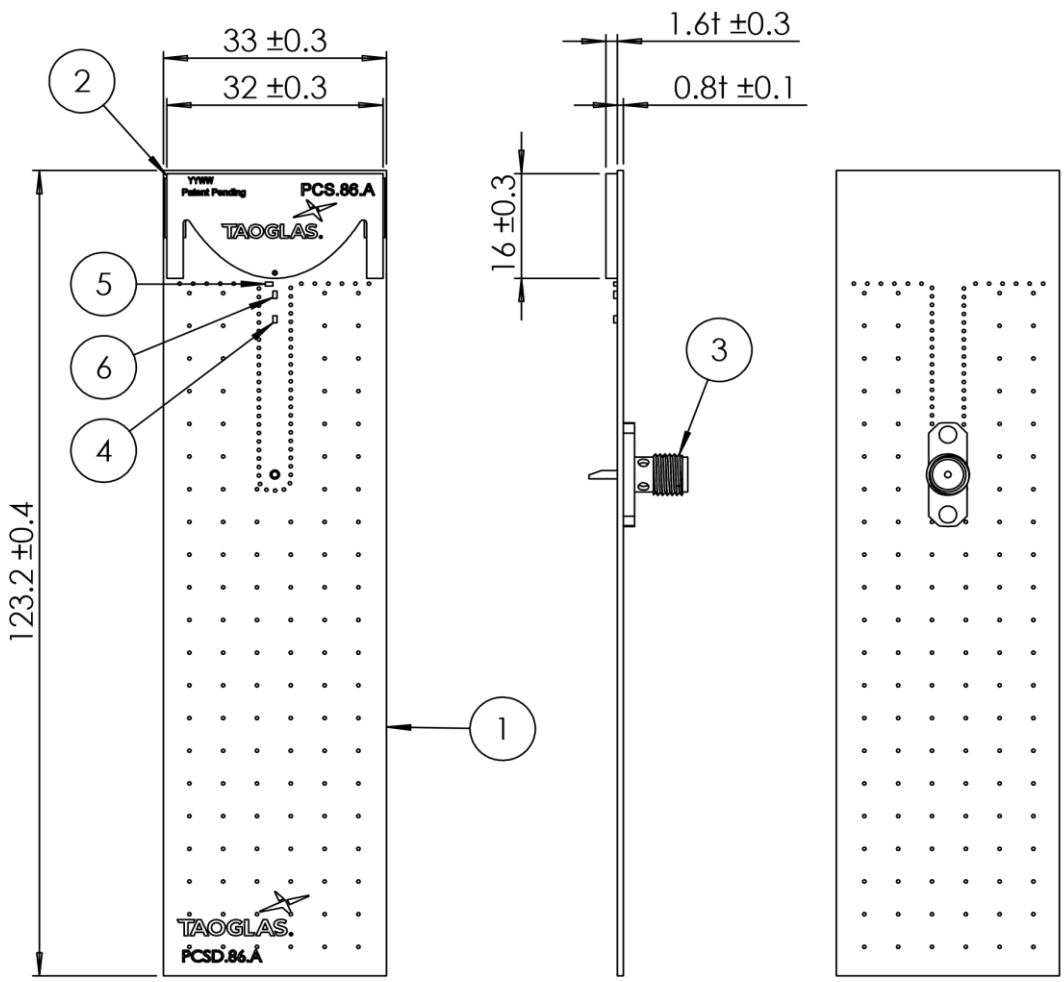
Designator	Type	Value	Manufacturer	Manufacturer Part Number
L1	Inductor	7.5nH	TDK	MLK1005S7N5JT000
R1	Resistor	0 Ohms	Yageo	RC0402JR-070RL
C1	Capacitor	3pF	Murata	GRM1555C1H3R0CA01D
C2, C3	Capacitor	Not Fitted	-	-

9. Mechanical Drawing – Evaluation Board

ISO NO: IDW-19-8-xxxx

<Release>

REV	ZONE	DESCRIPTION	ENG	APPROVED	ISSUED DATE
D01	ALL	Initial Design	Megan	xxx	2019/02/04
D02	ALL	Updated traces	Megan	xxx	2019/08/01



	Name	P/N	Material	Finish	QTY.
1	PCSD.86.A EVB PCB	100219A040000A	IT180 0.8t	Black	1
2	PCS.86.A PCB Antenna	100218K070000A	IT180 1.6t	Black	1
3	SMA ST Jack	200413B000002A	Brass	Au Plated	1
4	0Ω Resistor	021R11000D16J0	Ceramic	N/A	1
5	7.5nH Inductor	0210617520C101	Ceramic	N/A	1
6	3pF Capacitor	021C113R050C10	Ceramic	N/A	1

UNLESS OTHERWISE SPECFIED TOLERANCES ON:
.X± 0.2
XX.± 0.5 .XX± 0.1
X.± 0.3.XXX± 0.05

DATE: 2019/02/04
UNIT: mm
THIRD ANGLE PROJECTION
MAT'L:
FINISH:
SCALE: 1/1

APPROVED BY: CHECKED BY: DRAWN BY: Megan CUSTOMERS SIGNATURE / DATE

TAOGLAS.
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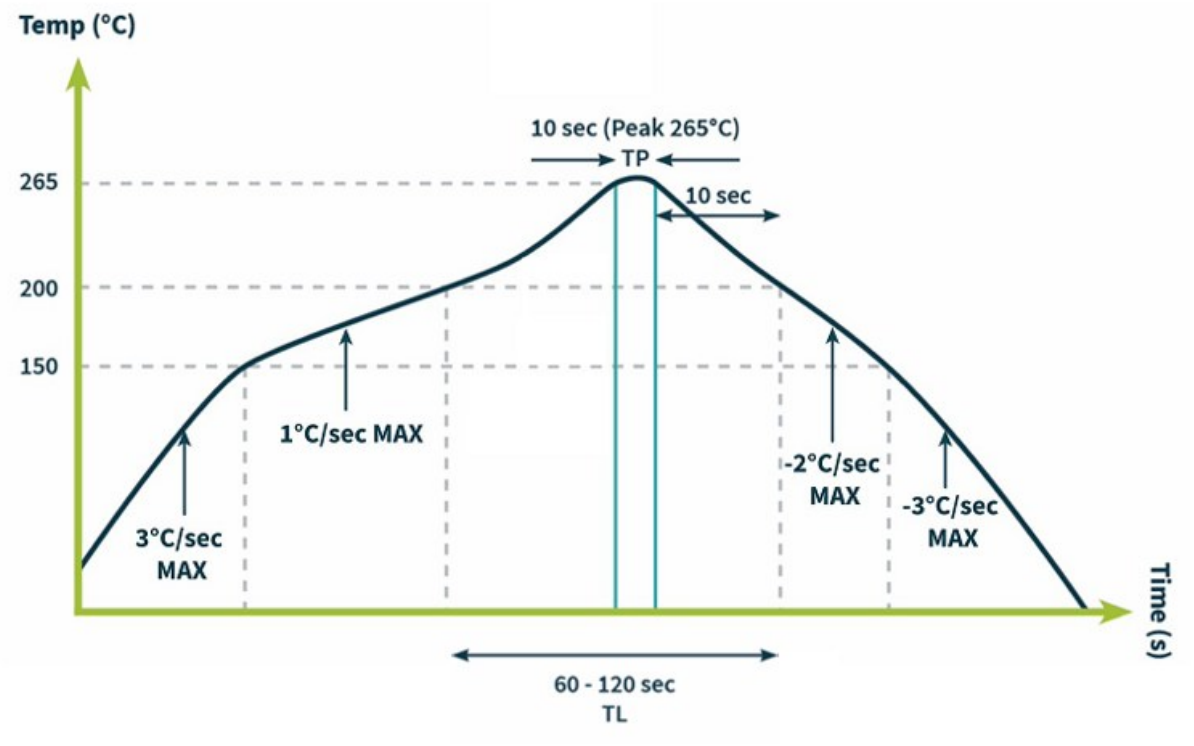
REV D02

TITLE. : PCS.86.A on Evaluation Board

PART NO. : PCSD.86.A

10. Solder Reflow Profile

The PCS.86.A can be assembled by following the recommended soldering temperatures are as follows:



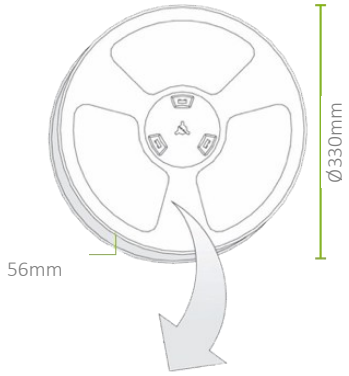
*Temperatures listed within a tolerance of +/- 10° C

Smaller components are typically mounted on the first pass, however, we do advise mounting the PCS.86.A when placing larger components on the board during subsequent reflows.

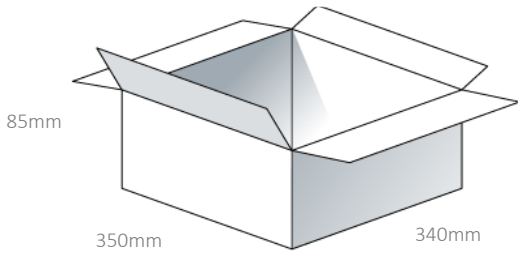
Note: Soldering flux classified ROL0 under IPC J-STD-004 is recommended.

11. Packaging

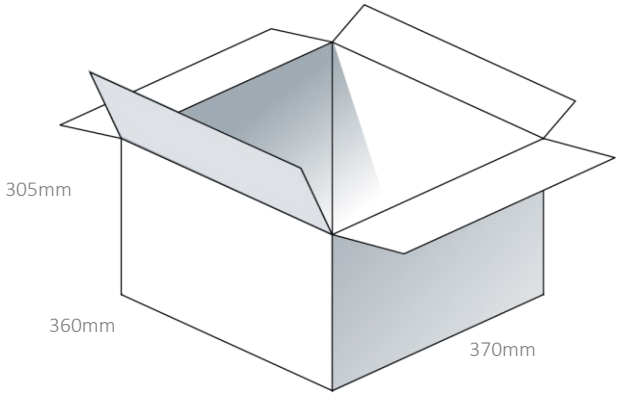
800pcs PCS.86.A per Tape & Reel
Dimensions - Ø330*56mm
Weight – 2.2Kg



1pcs PCS.86.A per Box
Dimensions - 350*340*85mm
Weight – 2.3Kg



2400pcs PCS.86.A per Carton
Dimensions - 360*370*300mm
Weight – 7Kg



Changelog for the datasheet

SPE-19-8-013 – PCS.86.A

Revision: H (Current Version)	
Date:	2023-08-08
Changes:	Updated Solder Reflow Profile
Changes Made by:	Cesar Sousa

Previous Revisions

Revision: G	
Date:	2023-08-08
Changes:	Added Solder Reflow Profile
Changes Made by:	Cesar Sousa

Revision: F	
Date:	2023-03-14
Changes:	Antenna Integration Guide Added
Changes Made by:	Cesar Sousa

Revision: E	
Date:	2022-02-24
Changes:	Updated Packaging
Changes Made by:	Paul Doyle

Revision: D	
Date:	2021-09-27
Changes:	Added MSL Updates
Changes Made by:	Erik Landi

Revision: C	
Date:	2020-01-10
Changes:	Updated drawings
Changes Made by:	Jack Conroy

Revision: B	
Date:	2019-04-26
Changes:	Added Packaging
Changes Made by:	Jack Conroy

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

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