



# TAOGLAS®



# Datasheet

## Havok

**Part No:**  
PCS.06.A

## Description

Low Profile LTE/Cellular 4G/3G/2G SMD Dielectric Antenna

## Features:

- SMD Dielectric Antenna
- 698~960MHz/1710~2690MHz
- High Efficiency SMD antenna
- Low profile 42\*10\*3mm
- RoHS & Reach Compliant

|           |                                  |           |
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## 1. Introduction



The Havok PCS.06.A is a low profile SMD LTE/cellular 4G/3G/2G embedded antenna designed for direct SMD mount on a device PCB. It provides high efficiency in a very small factor 42\*10\*3mm. If tuning is required it can be tuned for the device environment, while there is no need for new tooling.

Its rectangular shape and small size makes it very easy to integrate – packaged in tape and reel, it can be mounted via pick and place to reflow solder directly on the edge of the PCB board. This antenna is recommended to be used with long ground-plane lengths of 120mm or more to attain its highest rated efficiency, note the return loss and efficiency graphs.

Typical Applications Include:

- Connected Health
- Handheld Devices
- Wearables

The antenna is suitable for lower cost LTE/cellular applications due to the ease of integration. Contact your regional Taoglas customer support team for quick and professional support from our senior engineering team on integration and matching of the antenna to your device.

## 2. Specification

| LTE Electrical                                       |                 |                |                   |                 |             |              |                   |                  |
|------------------------------------------------------|-----------------|----------------|-------------------|-----------------|-------------|--------------|-------------------|------------------|
| Band                                                 | Frequency (MHz) | Efficiency (%) | Average Gain (dB) | Peak Gain (dBi) | Impedance   | Polarization | Radiation Pattern | Max. input power |
| <b>5GNR/4G</b><br>Band 71                            | 617-698         | 27.3           | -5.64             | -0.22           | 50 $\Omega$ | Linear       | Omni              | 2W               |
| <b>4G/3G</b><br>Band 12,13,14,17,28,29               | 698-806         | 65.3           | -1.85             | 2.60            |             |              |                   |                  |
| <b>4G/3G/NB-IoT/Cat M</b><br>Band 5,8,18,19,20,26,27 | 824-960         | 61.5           | -2.11             | 2.22            |             |              |                   |                  |
| <b>4G/3G</b><br>Band 1,2,3,4,9,23,25,35,39,66        | 1710-2200       | 69.1           | -1.61             | 5.93            |             |              |                   |                  |
| <b>4G/3G</b><br>Band 7,30,38,40,41                   | 2300-2690       | 58.2           | -2.35             | 4.35            |             |              |                   |                  |

| Mechanical         |                   |
|--------------------|-------------------|
| Antenna Dimensions | 42mm x 10mm x 3mm |
| Material           | FR4               |
| Weight             | 2.50g             |
| Soldering Type     | SMD Reflow        |

| Environmental              |               |
|----------------------------|---------------|
| Operation Temperature      | -40°C ~ +85°C |
| Storage Temperature        | -40°C ~ +85°C |
| Moisture Sensitivity Level | 3             |

| 5G/4G Bands |                                                                    |                  |         |
|-------------|--------------------------------------------------------------------|------------------|---------|
| Band Number | 5G NR / 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       | ✗       |

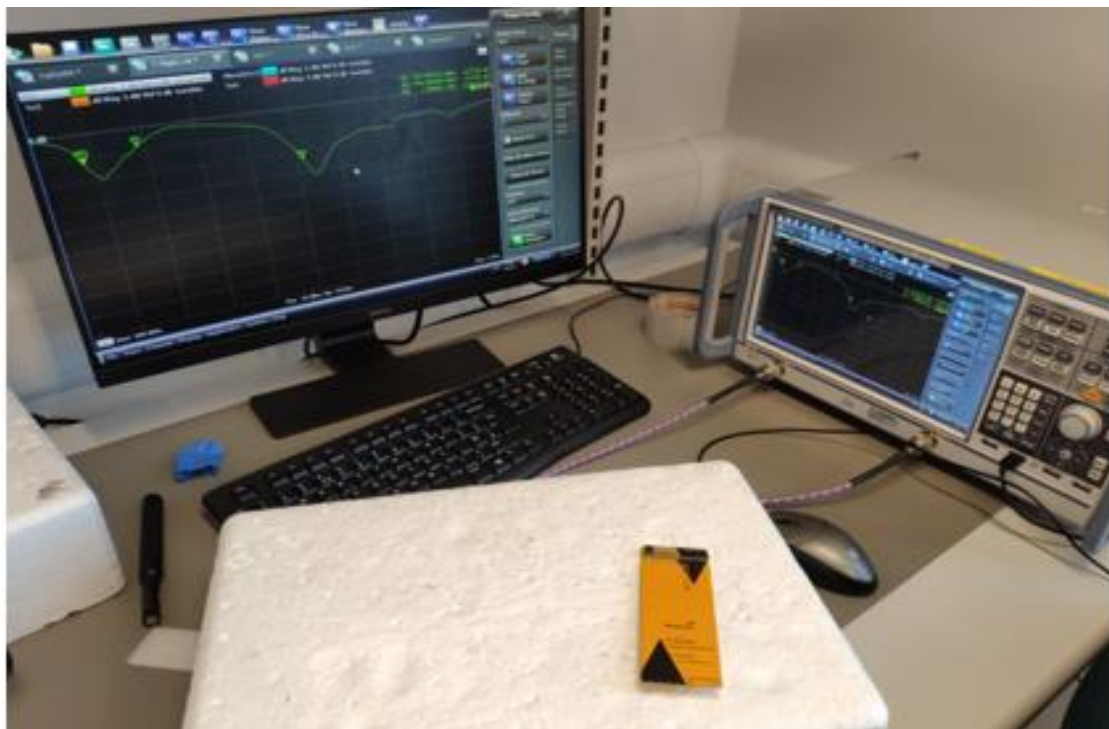
## 3. Antenna Characteristics

### 3.1 Test Setup

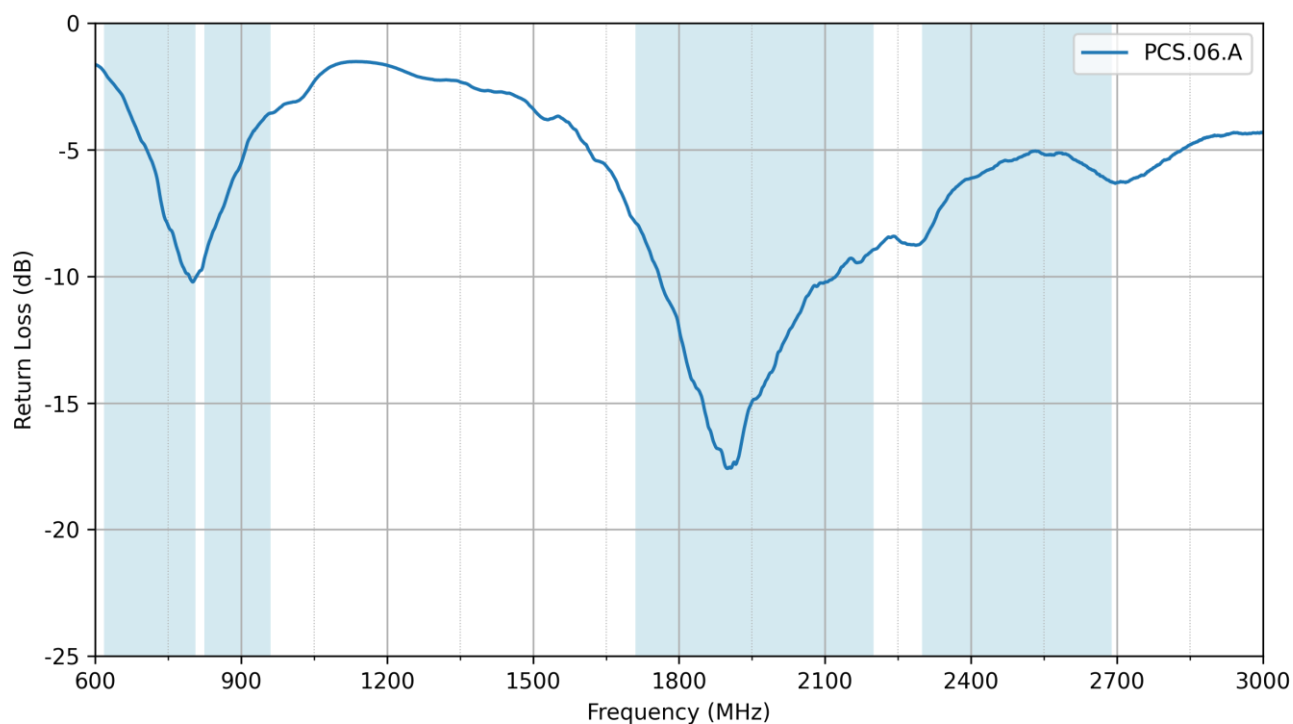
AUT



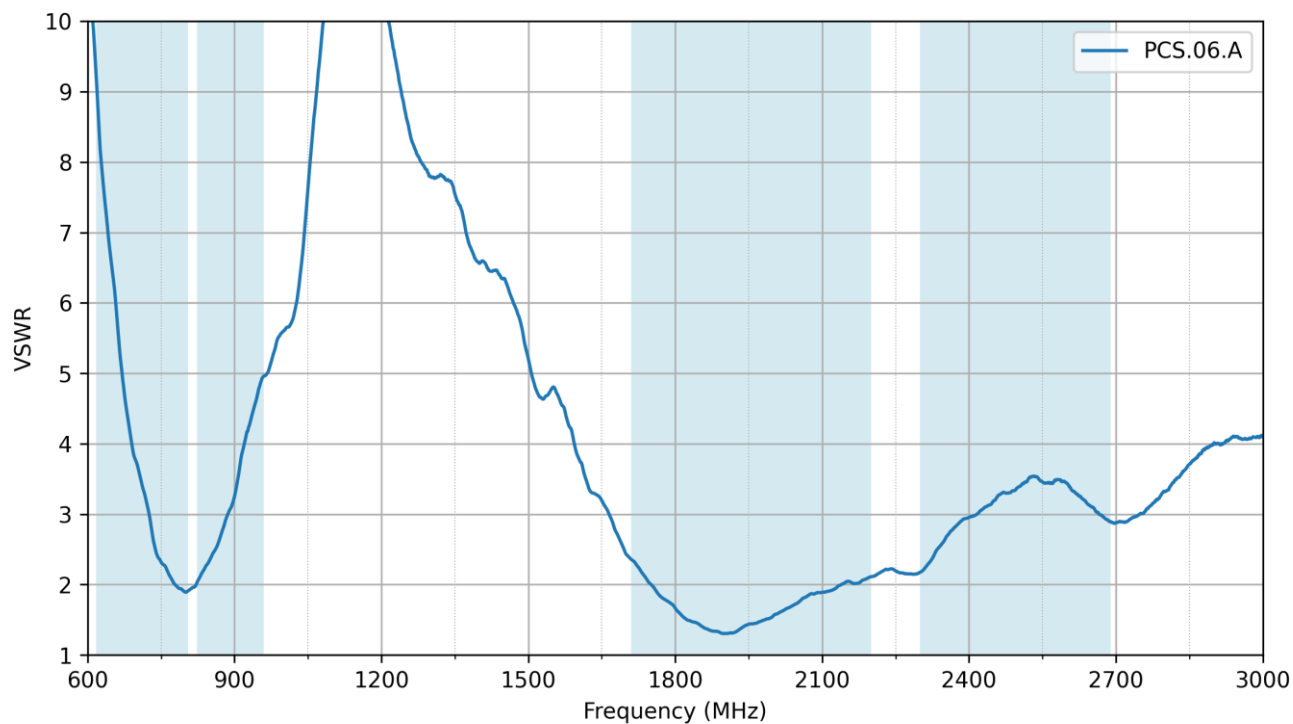
Vector Network Analyzer



### 3.2 Return Loss

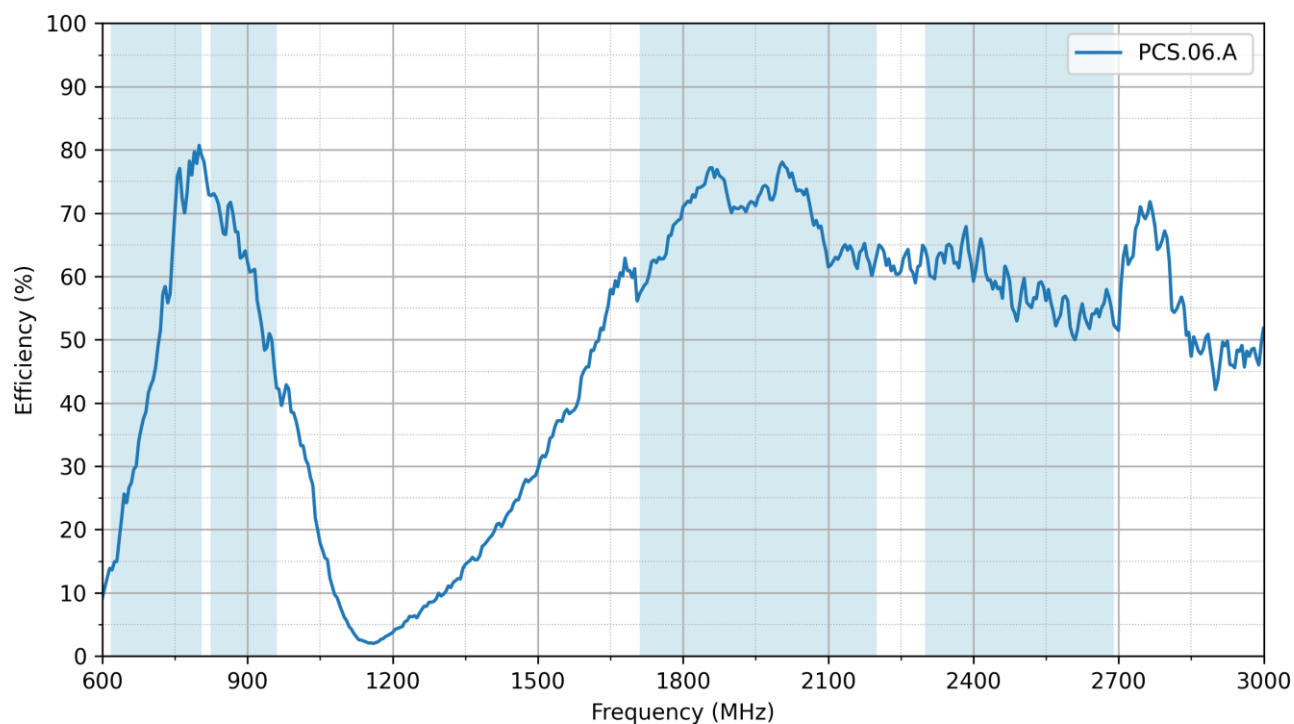


### 3.3 VSWR

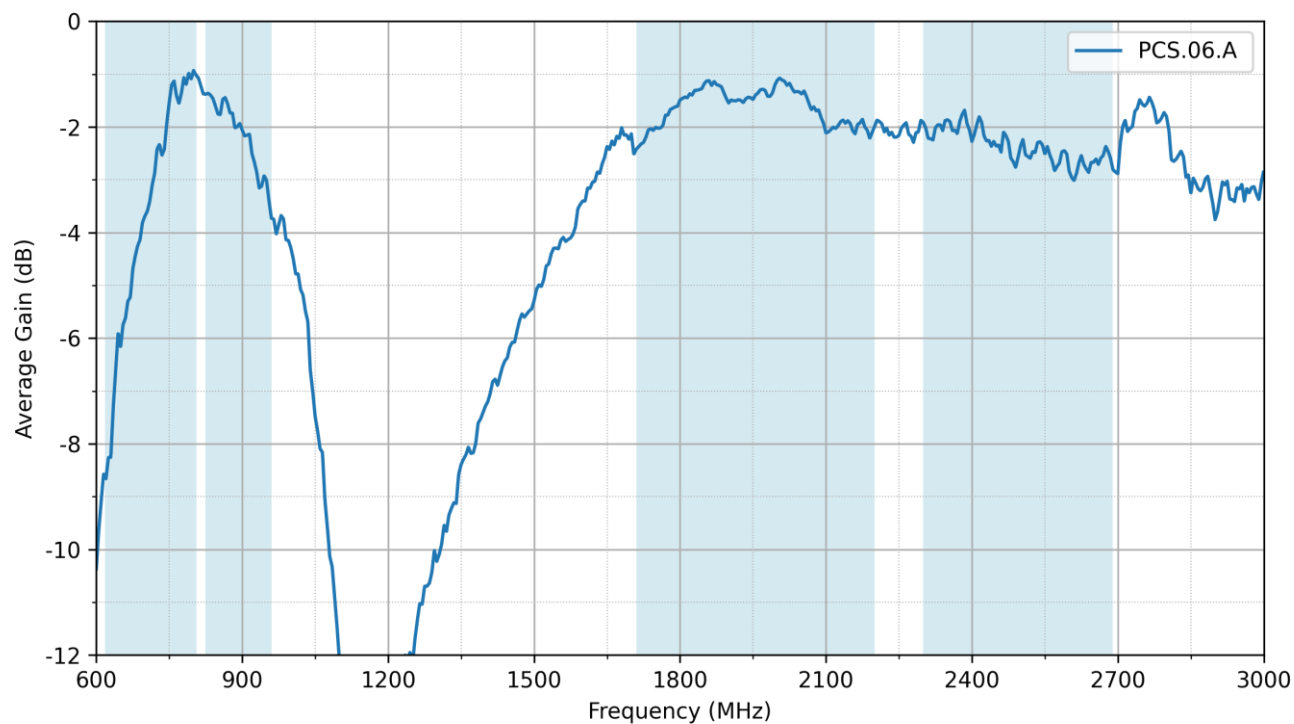




### 3.4 Efficiency

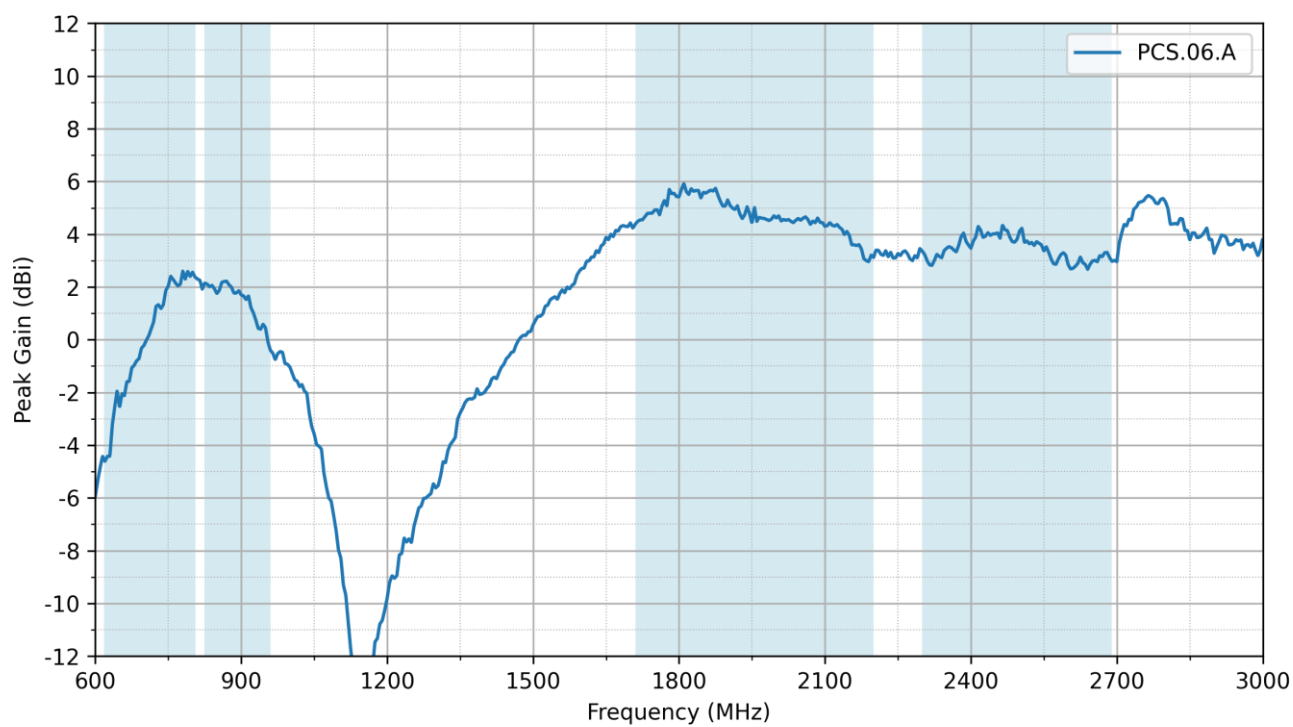


### 3.5 Average Gain



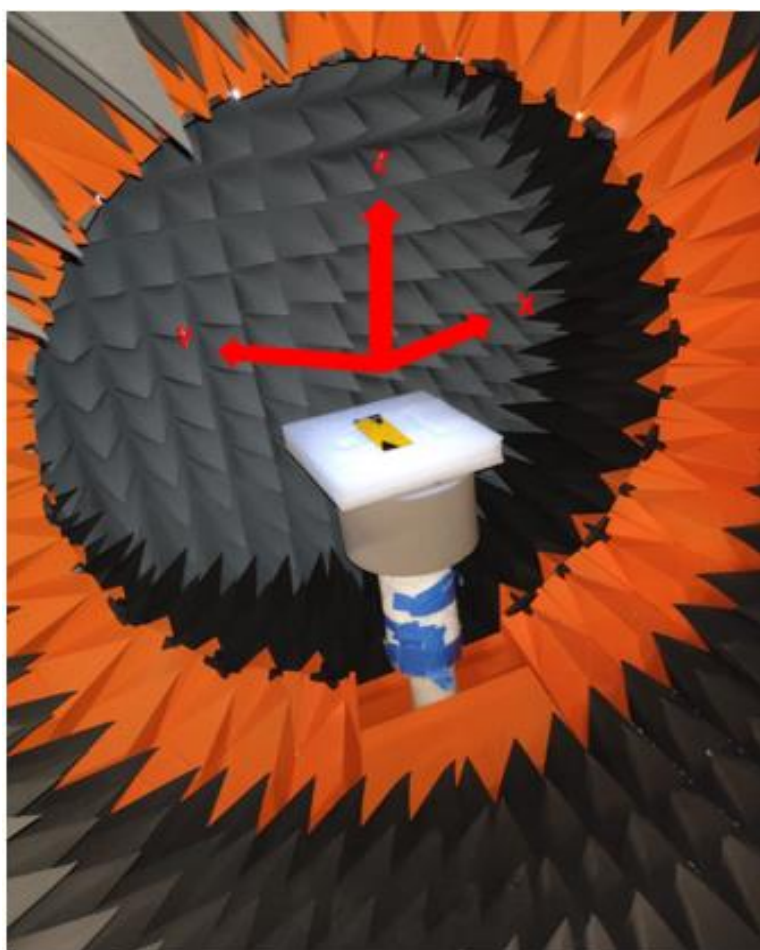
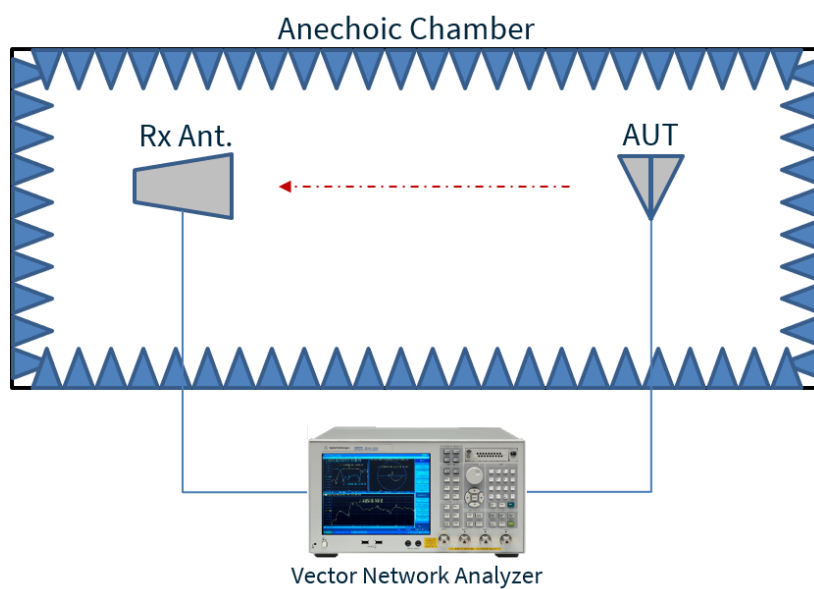


### 3.6 Peak Gain

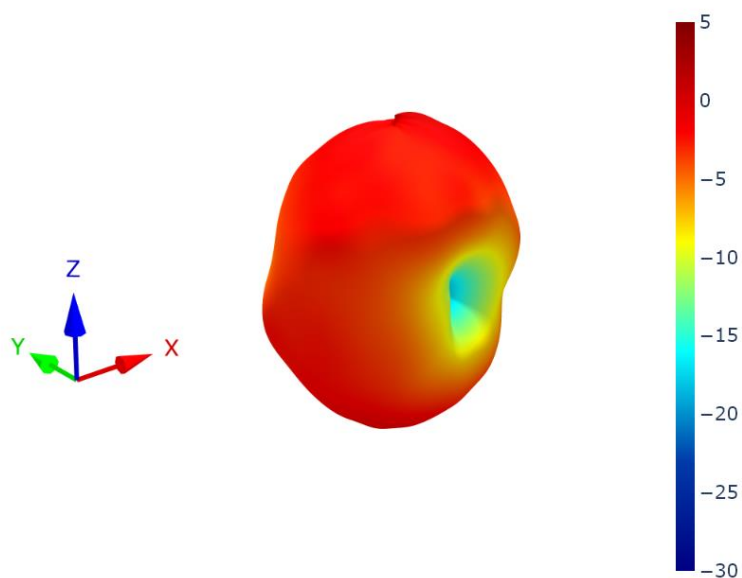


## 4. Radiation Patterns

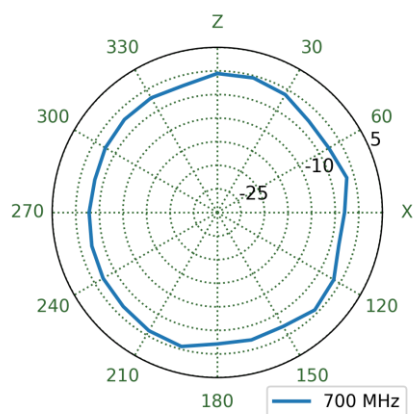
### 4.1 Test Setup



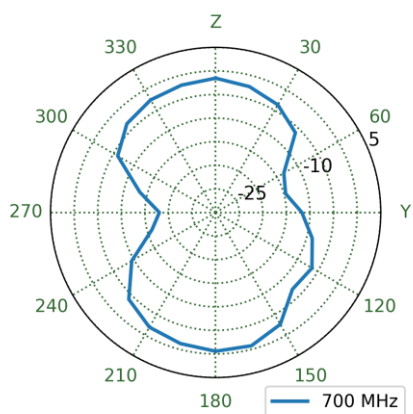
## 4.1 PCS.06.A Patterns at 700 MHz



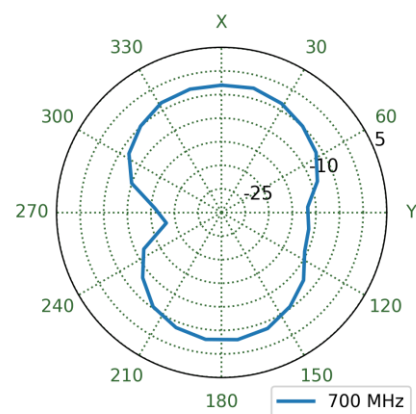
XZ Plane



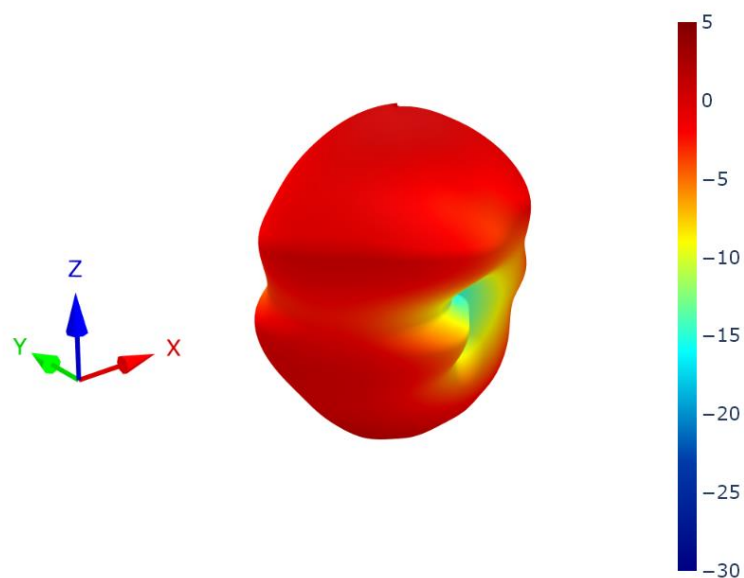
YZ Plane



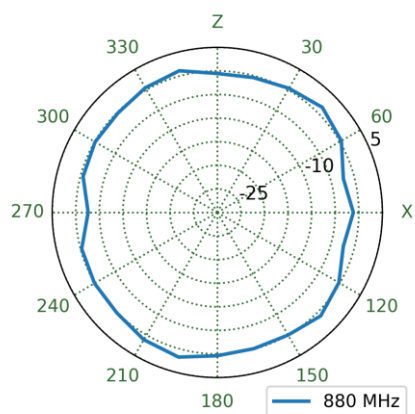
XY Plane



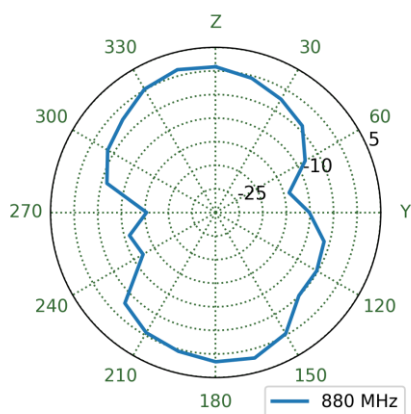
## 4.2 PCS.06.A Patterns at 880 MHz



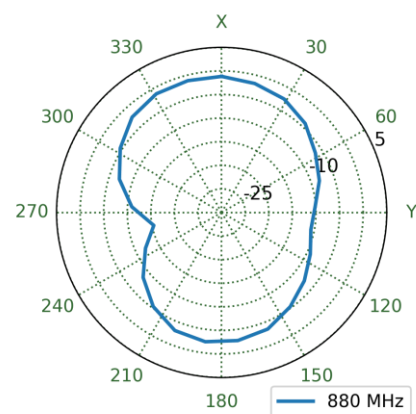
XZ Plane



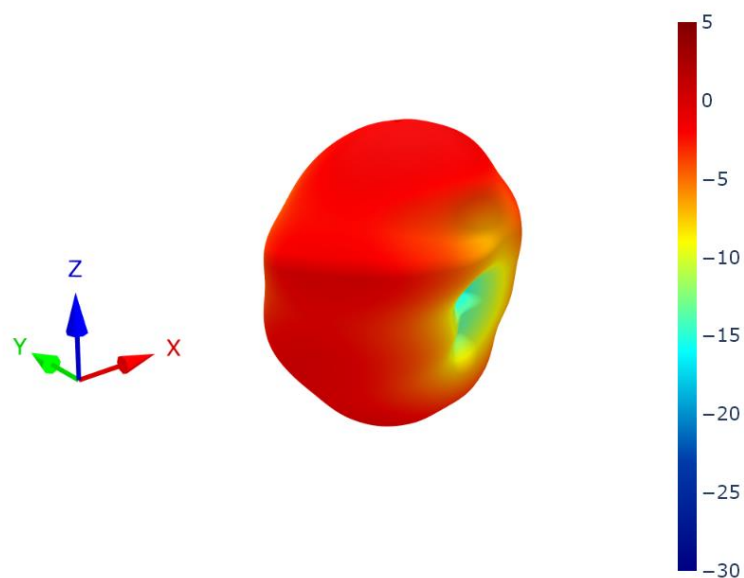
YZ Plane



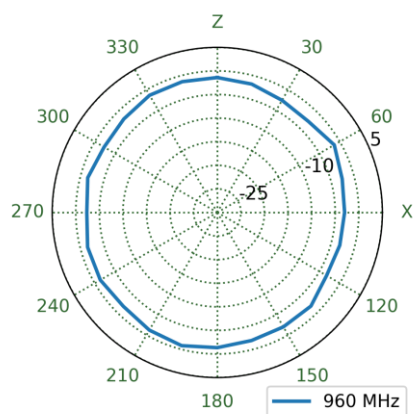
XY Plane



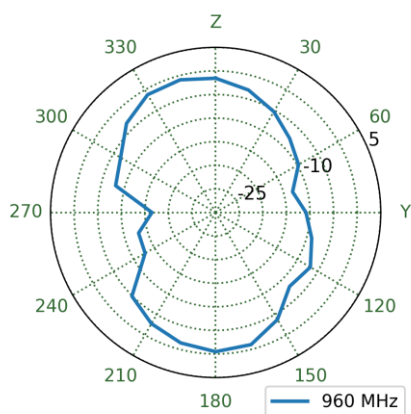
## 4.3 PCS.06.A Patterns at 960 MHz



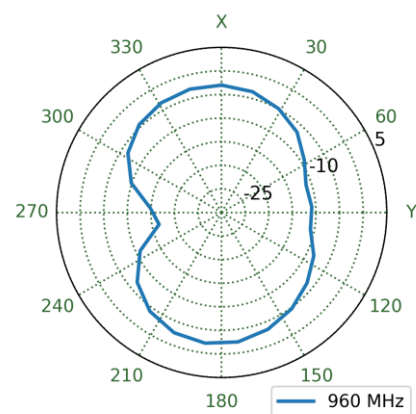
XZ Plane



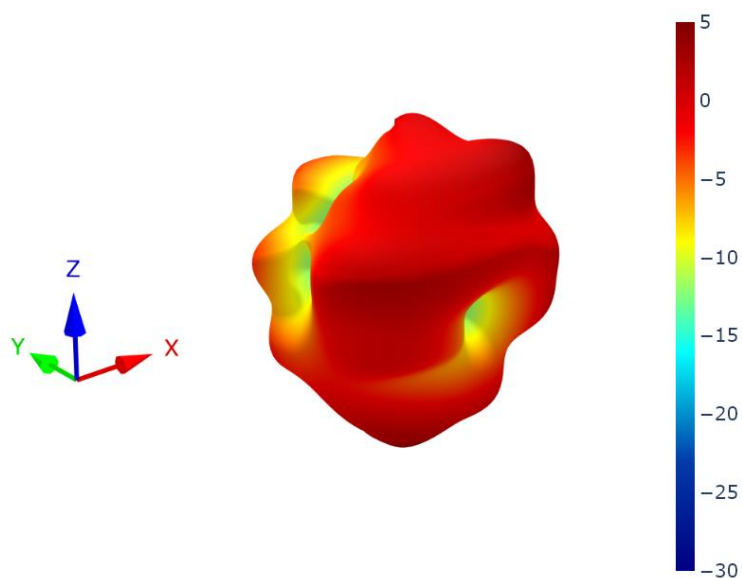
YZ Plane



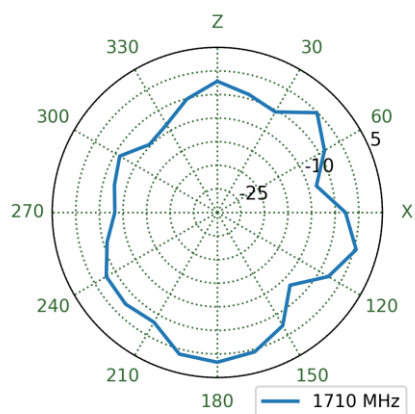
XY Plane



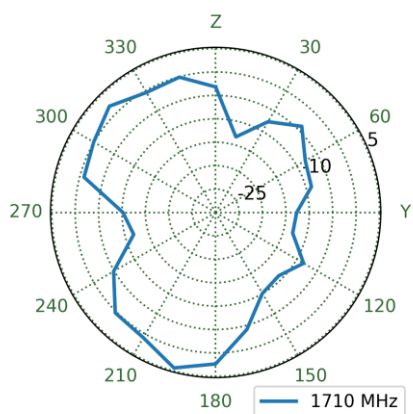
## 4.4 PCS.06.A Patterns at 1710 MHz



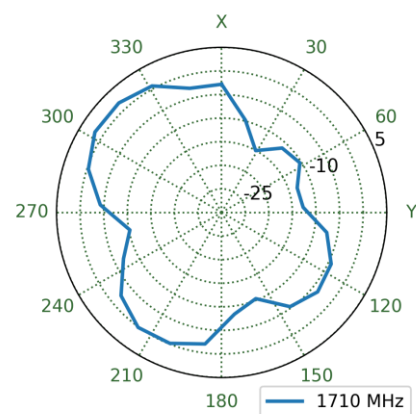
XZ Plane



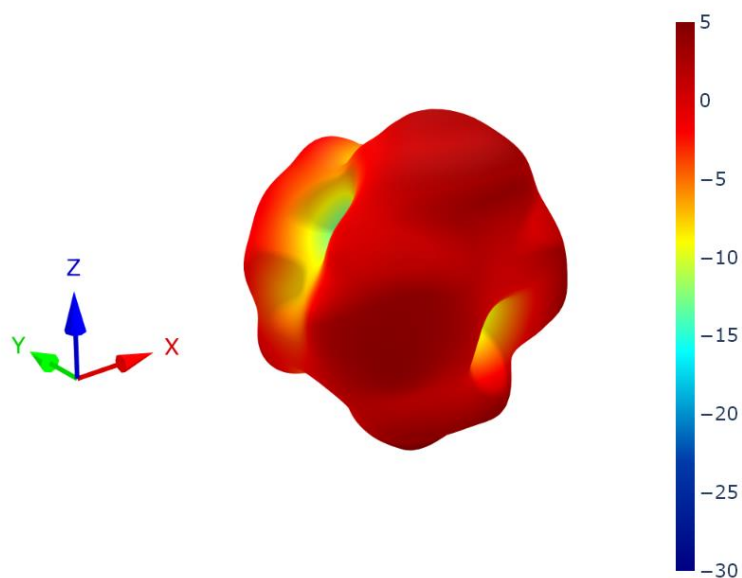
YZ Plane



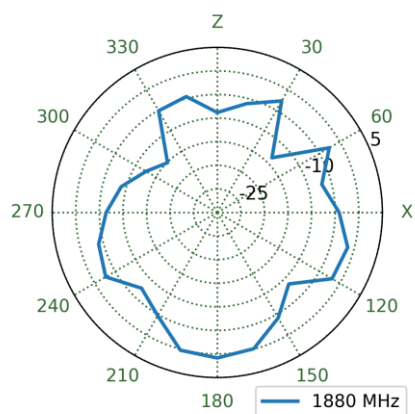
XY Plane



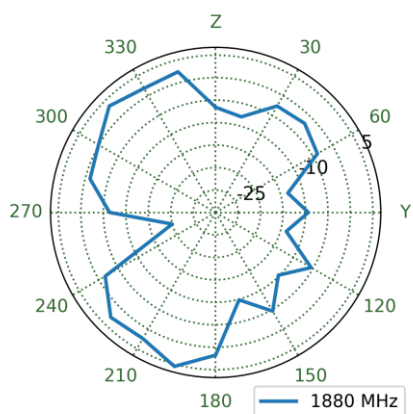
## 4.5 PCS.06.A Patterns at 1880 MHz



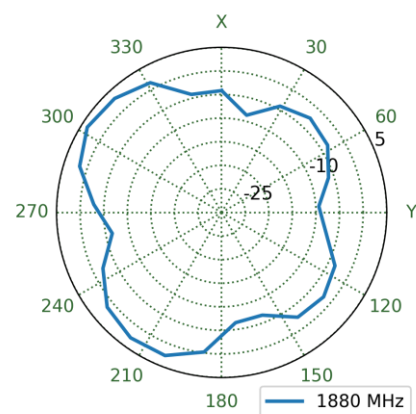
XZ Plane



YZ Plane

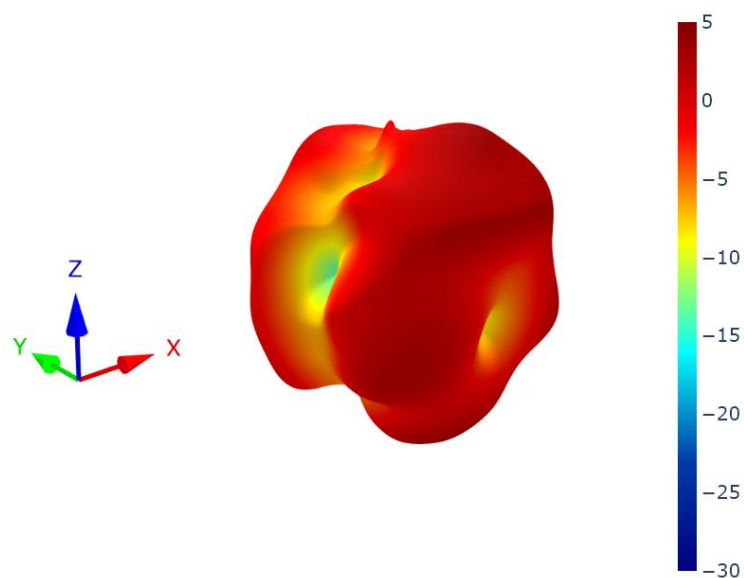


XY Plane

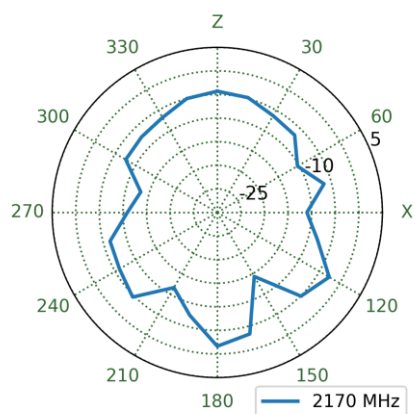




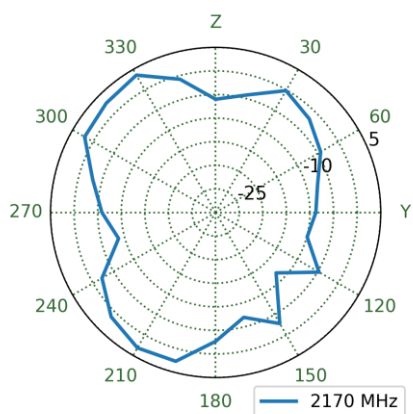
## 4.6 PCS.06.A Patterns at 2170 MHz



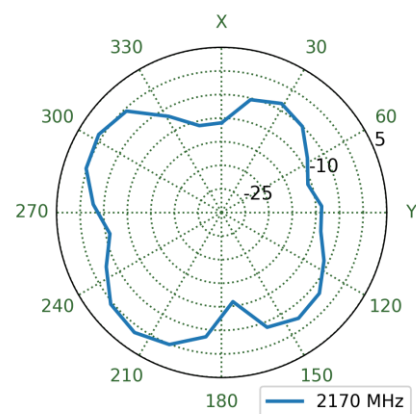
XZ Plane



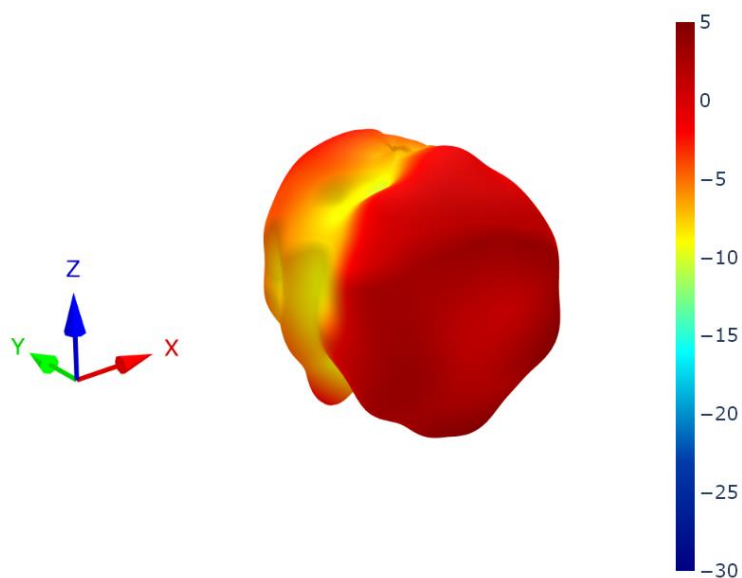
YZ Plane



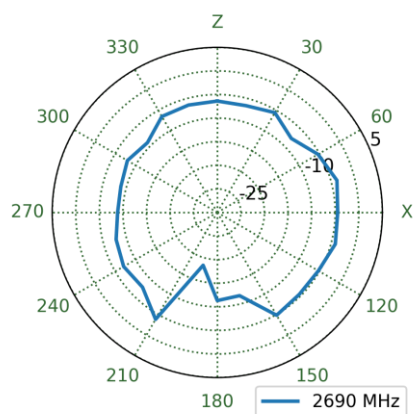
XY Plane



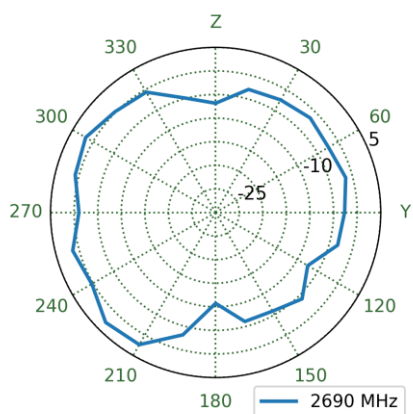
## 4.7 PCS.06.A Patterns at 2690 MHz



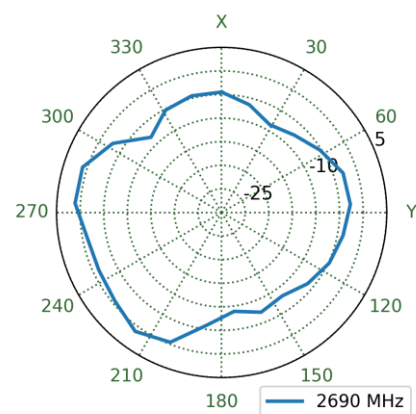
XZ Plane



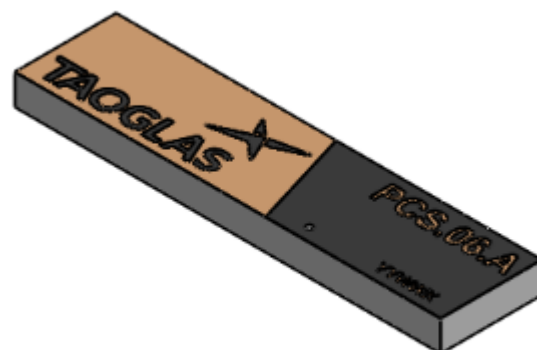
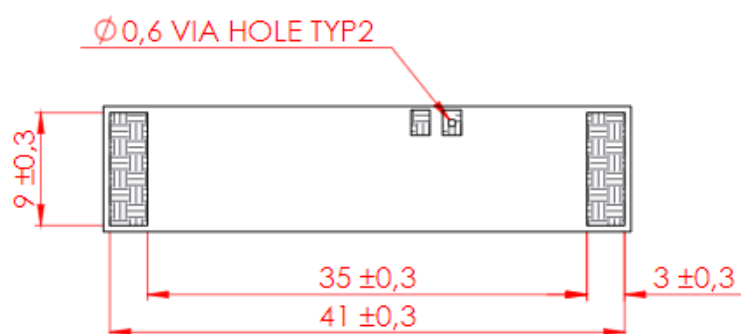
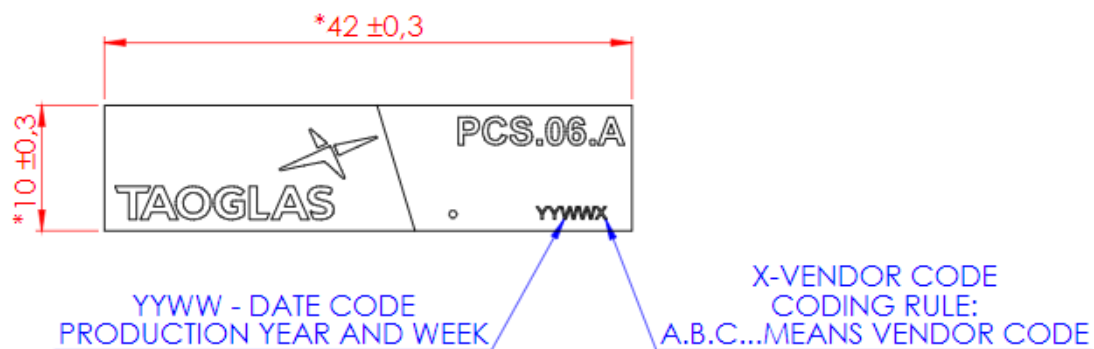
YZ Plane



XY Plane



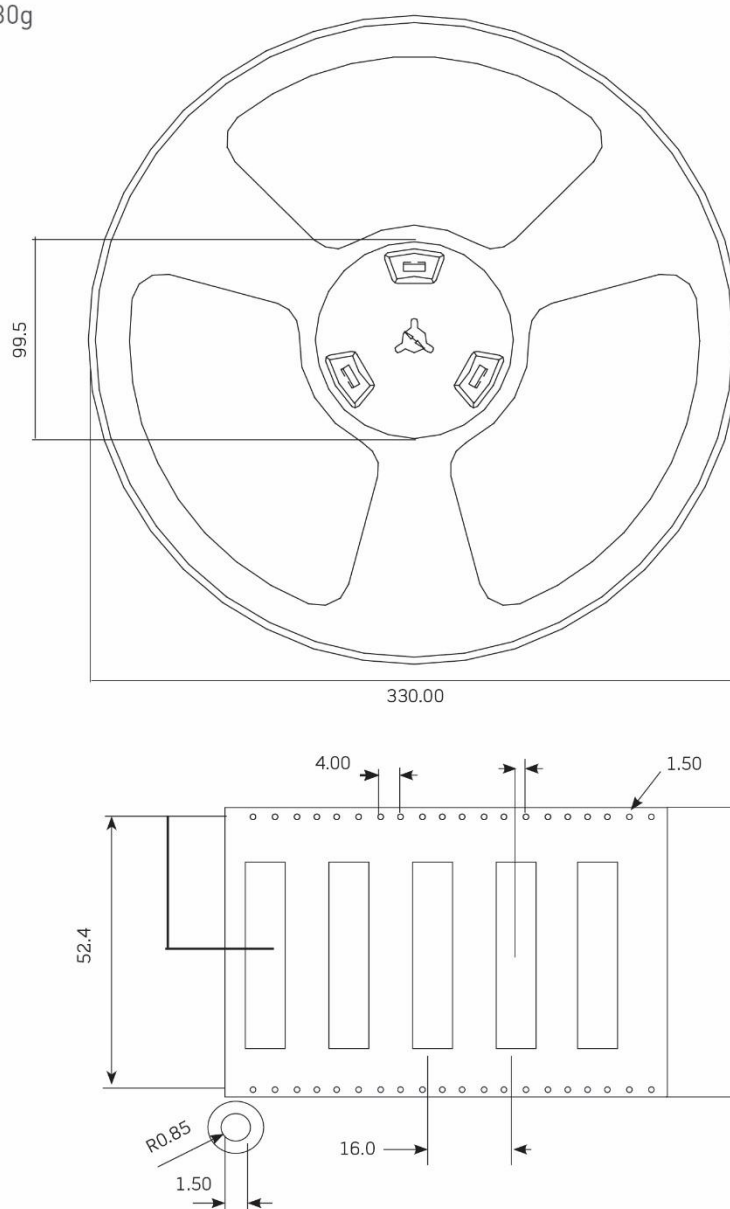
## 5. Mechanical Drawing



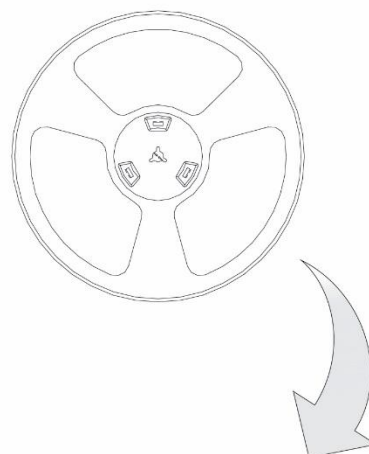
MODEL VIEW

## 6. Packaging

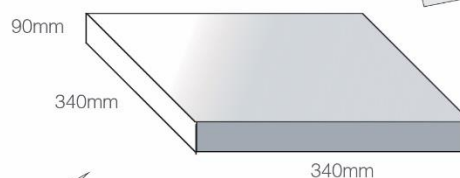
1000 pc PCS.06.A per reel  
Dimensions - Ø330\*60mm  
Weight - 3230g



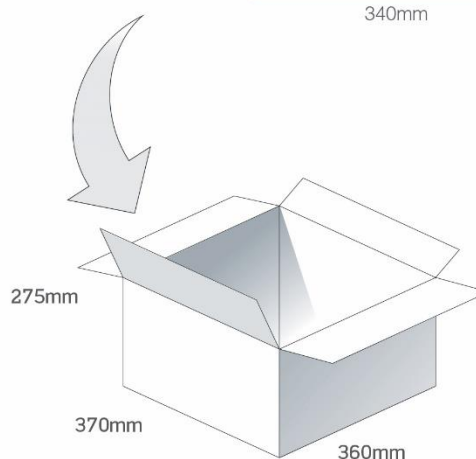
1000 pcs PCS.06.A reel  
Dimensions - 330\*330\*60mm  
Weight -3230g



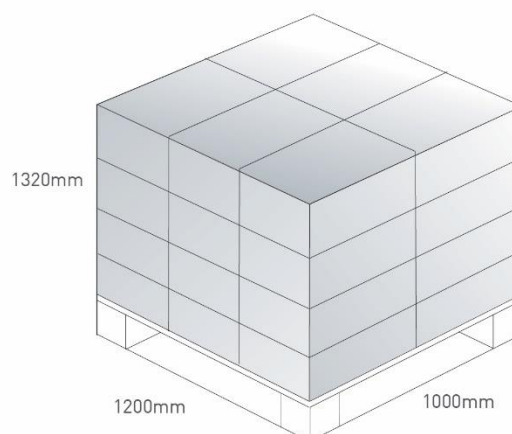
1000 pcs PCS.06.A / 1 Reel in small box  
Dimensions - 340\*340\*90mm  
Weight -3.5Kg



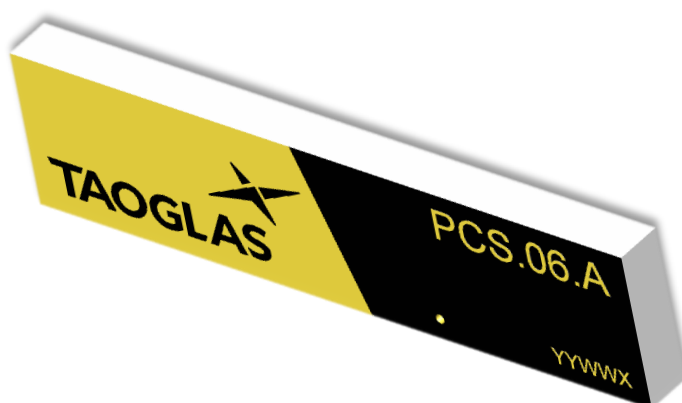
3 reels, 3000 pcs in one carton  
Carton Dimensions - 370\*360\*275mm  
Weight -11.3Kg



Pallet Dimensions 1200\*1000\*1320mm  
24 Cartons per Pallet  
6 Cartons per layer  
4 Layers



## 7. Antenna Integration Guide

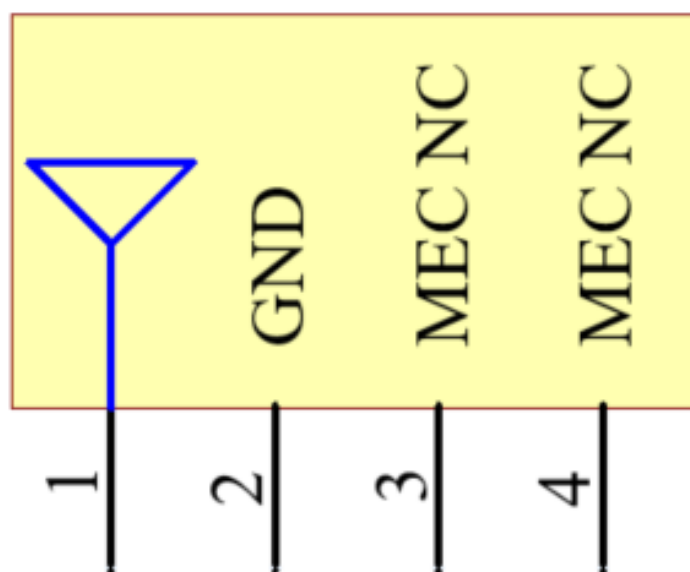


## 7.1 Schematic and Symbol Definition

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

| Pin  | Description               |
|------|---------------------------|
| 1    | RF Feed                   |
| 2    | Ground                    |
| 3, 4 | Mechanical, Not Connected |

PCS.06.A  
ANT1

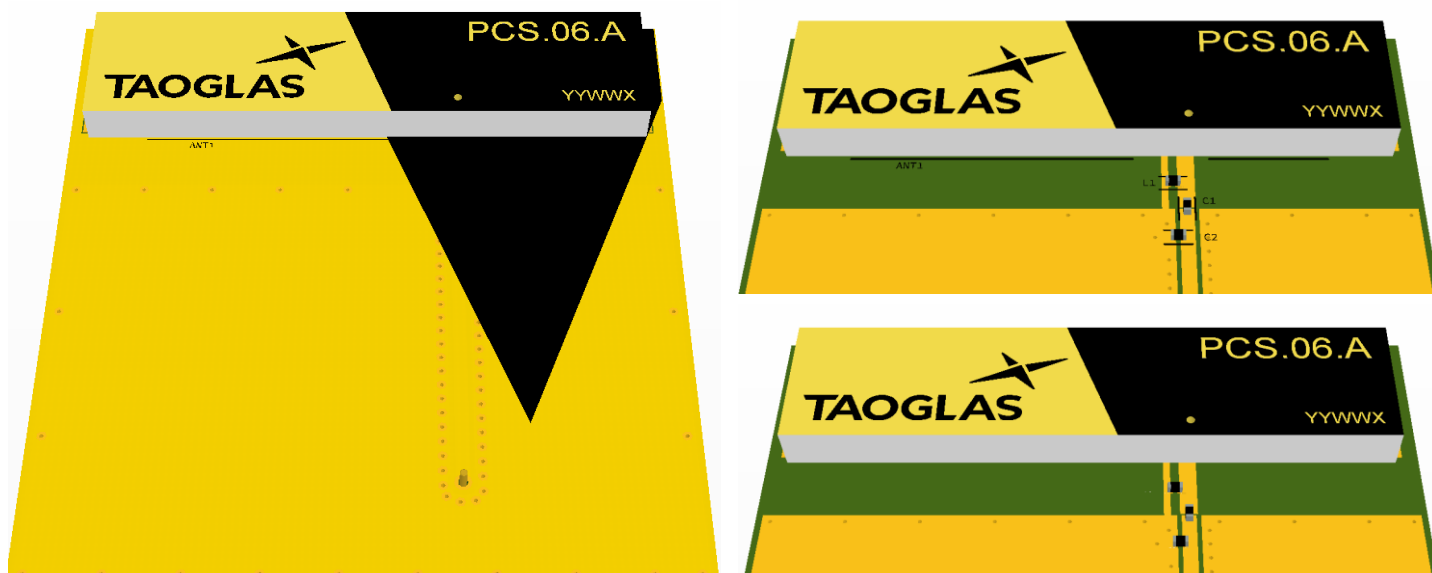


Please note you can download the design files, 3D model, 2D drawings and CST simulation files from the website here:

<https://www.taoglas.com/product/havok-pcs-06-2g3g4g-low-profile-smd-antenna-2/>

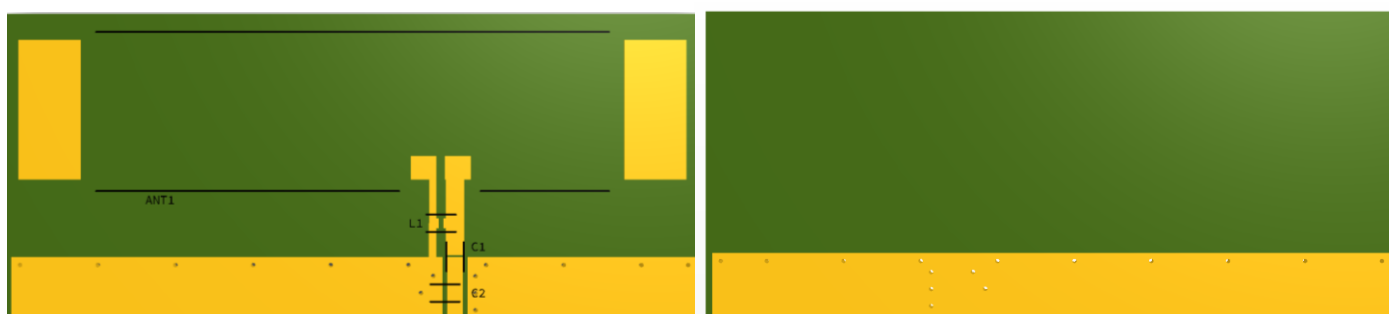
## 7.2 Antenna Integration

Whatever the size of the PCB, 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.



## 7.3 PCB Layout

The footprint and clearance on the PCB must meet the antenna specification. An example of the PCB layout shows the antenna footprint with clearance. Note the placement of the optimized components. L1 is positioned outside the ground plane and C1 is sitting across the ground plane and the copper clearance area. C2 is optional as a component but it is recommended to include these pads in case they are needed.



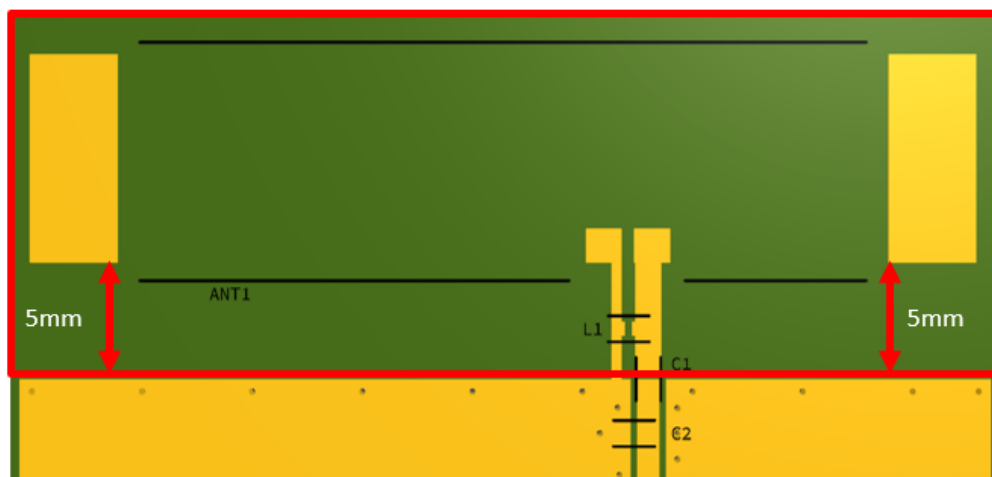
Topside

Bottom Side

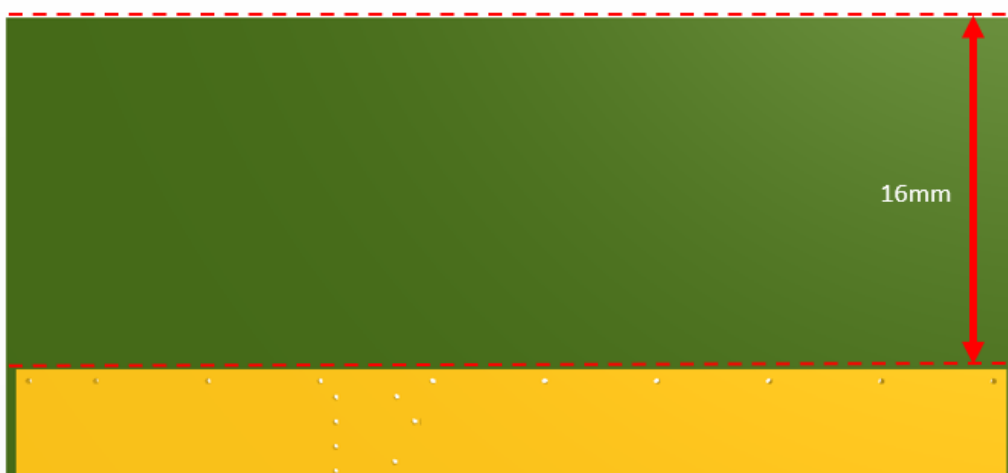


## 7.4 PCB Clearance

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 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

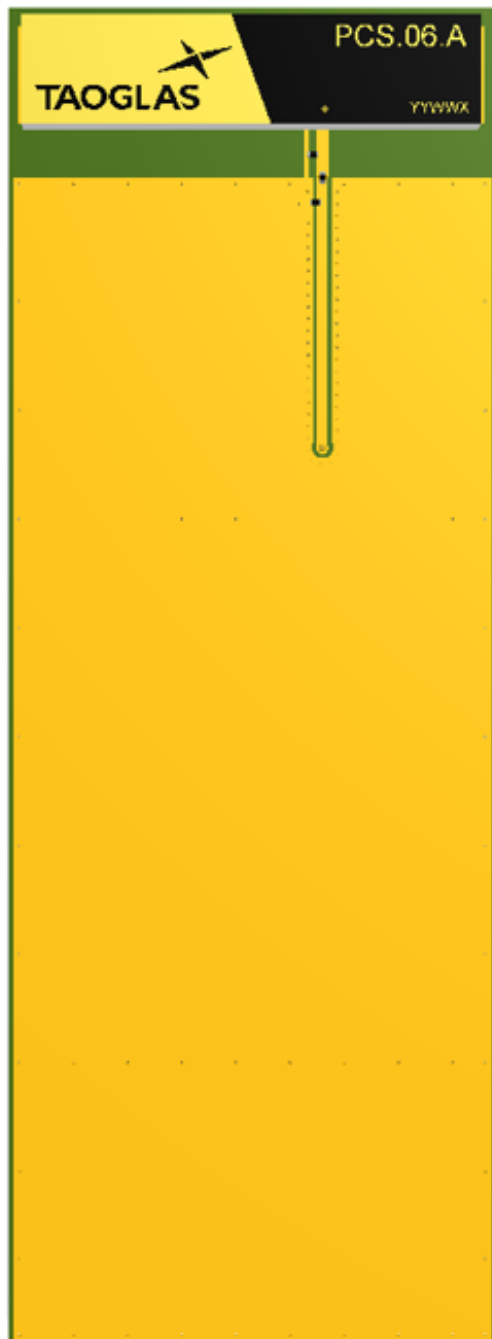


Bottom Side

## 7.5 Evaluation Board



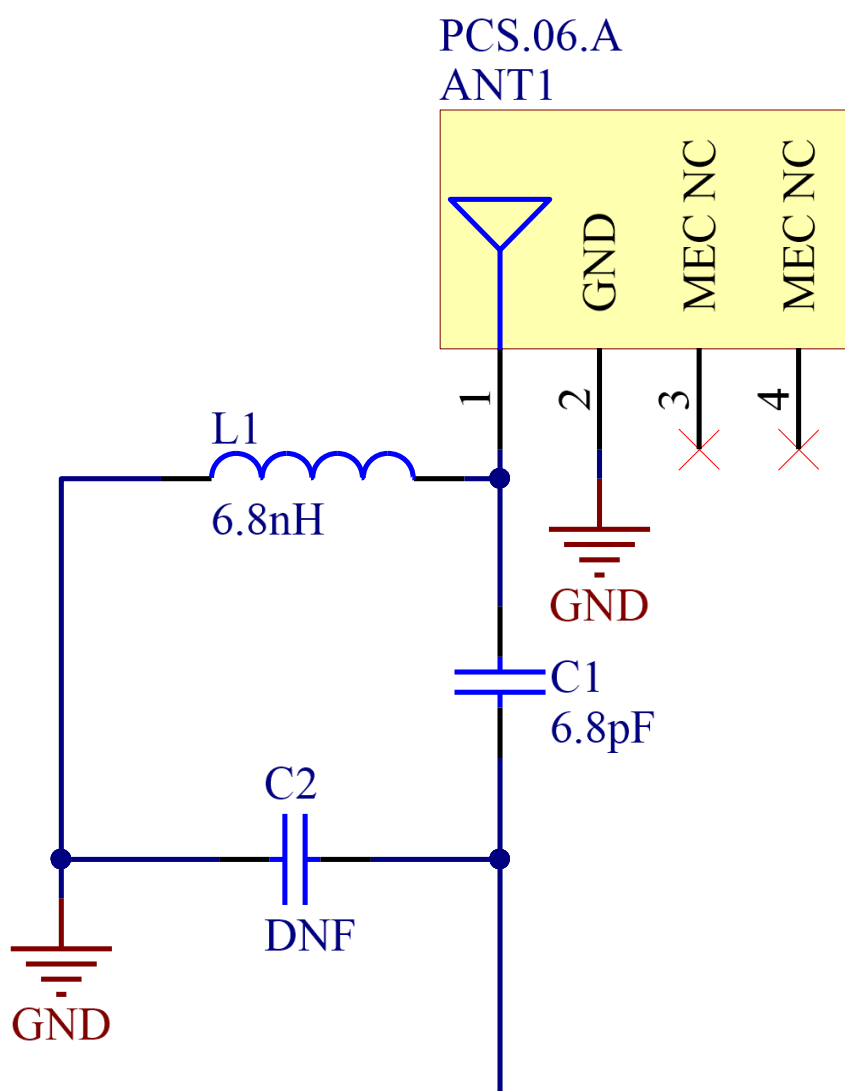
## 7.6 Evaluation Board Ground Plane Length



Ground Plane Length: 107mm

## 7.7 Evaluation Board Matching Circuit

A matching component (L1) in parallel with the PCS.06.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. C1 is also required as a matching component for this antenna. C1 is positioned sitting across the ground plane as shown 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.

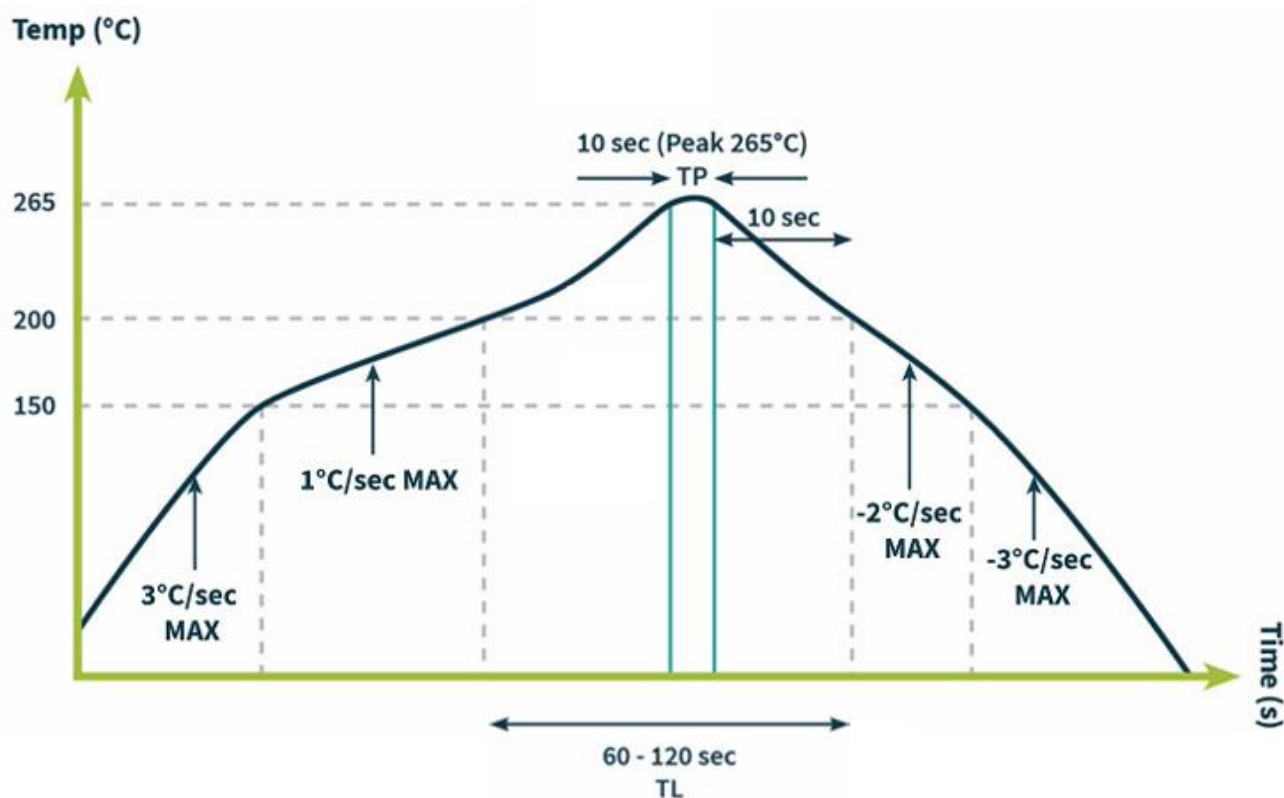


| Designator | Type      | Value      | Description        |
|------------|-----------|------------|--------------------|
| L1         | Inductor  | 6.8nH      | MHQ1005P6N8JT000   |
| C1         | Capacitor | 6.8pF      | GRM1555C1H6R8CA01D |
| C2         | Capacitor | Not Fitted |                    |



## 8. Solder Reflow Profile

The PCS.06.A can be assembled by following the recommended soldering temperatures are as follows:



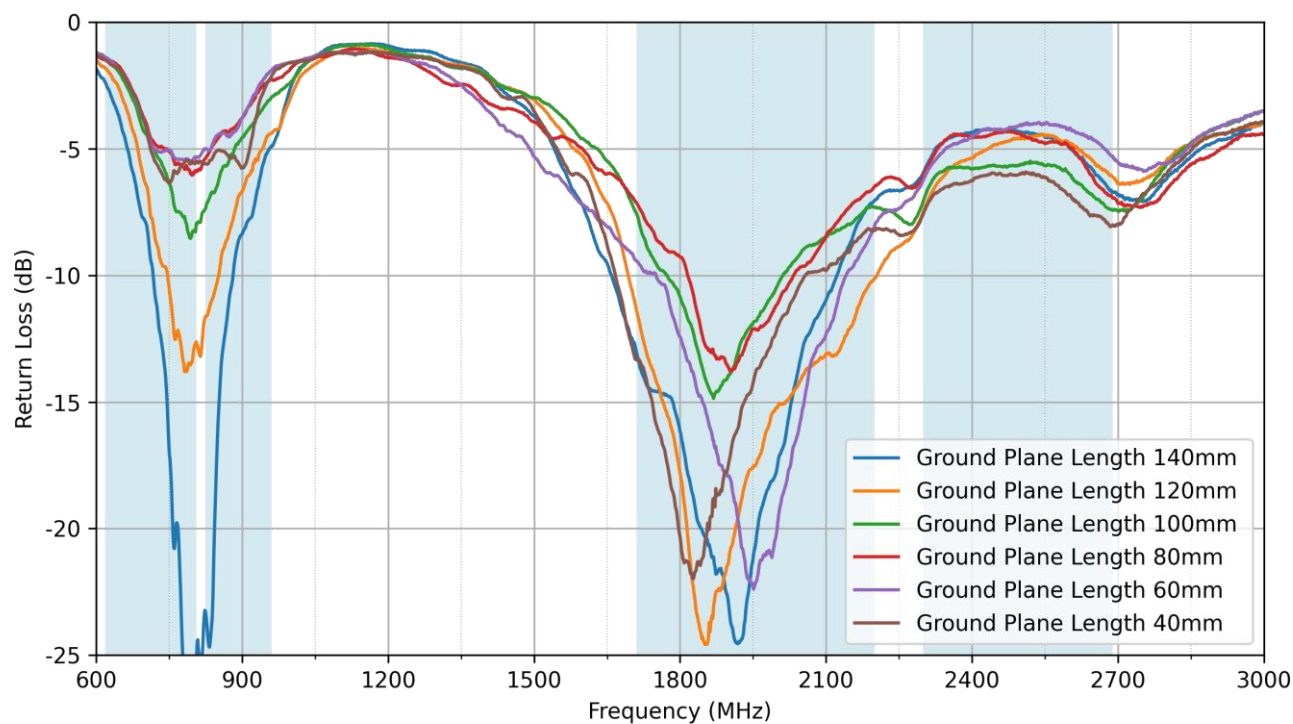
Smaller components are typically mounted on the first pass, however, we do advise mounting the PCS.06.A when placing larger components on the board during subsequent reflows.

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

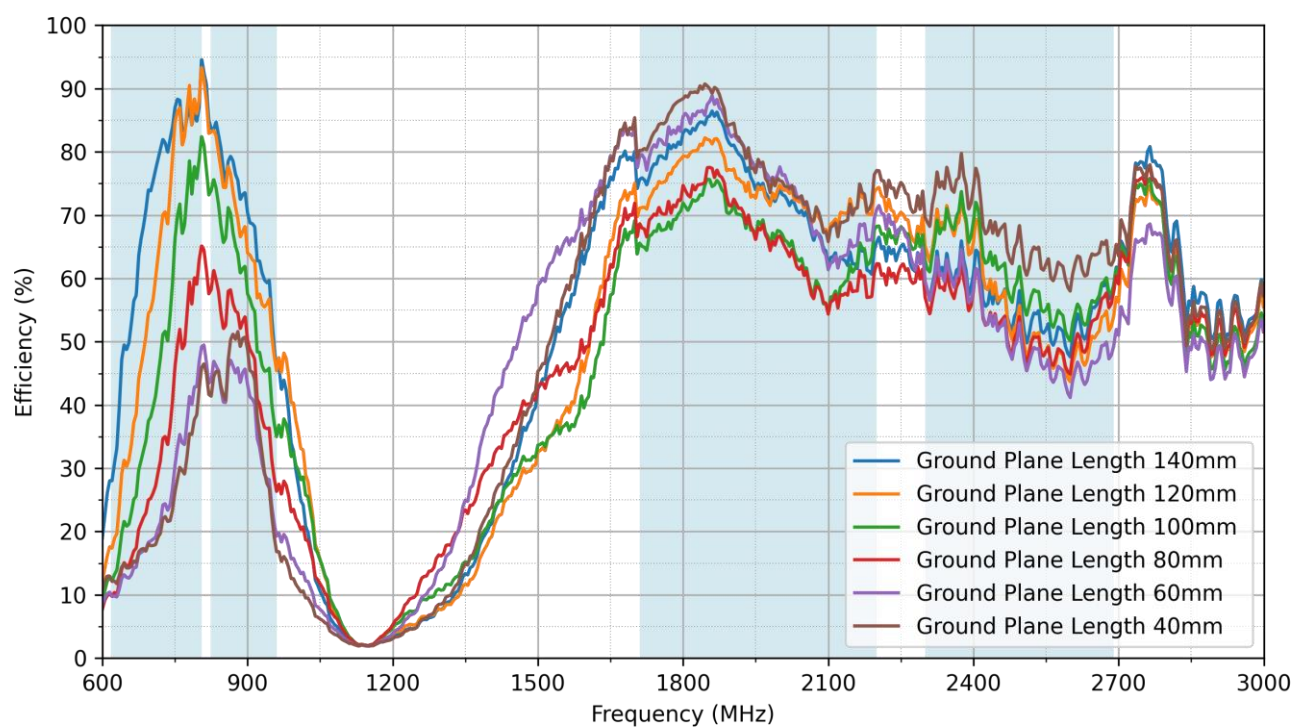
## 9. Application Note

The PCS.06.A antenna performance with different groundplane lengths.

### 9.1 Return Loss

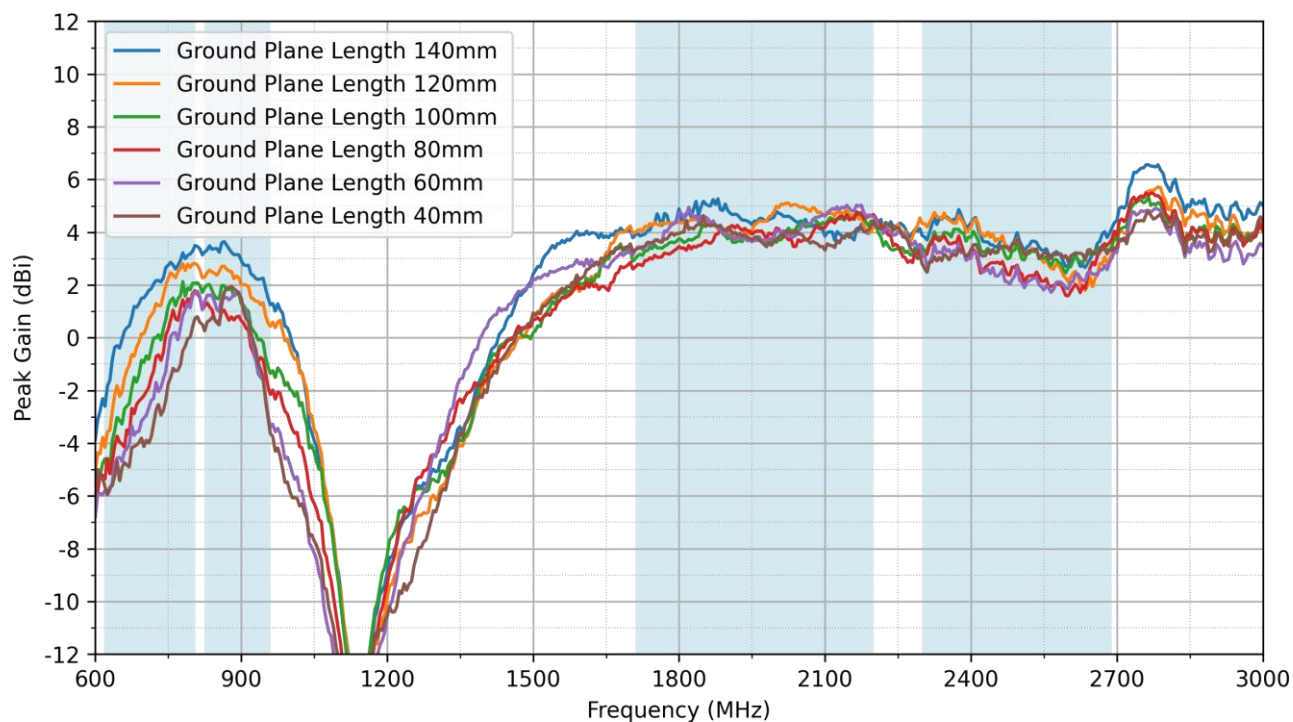


### 9.2 Efficiency

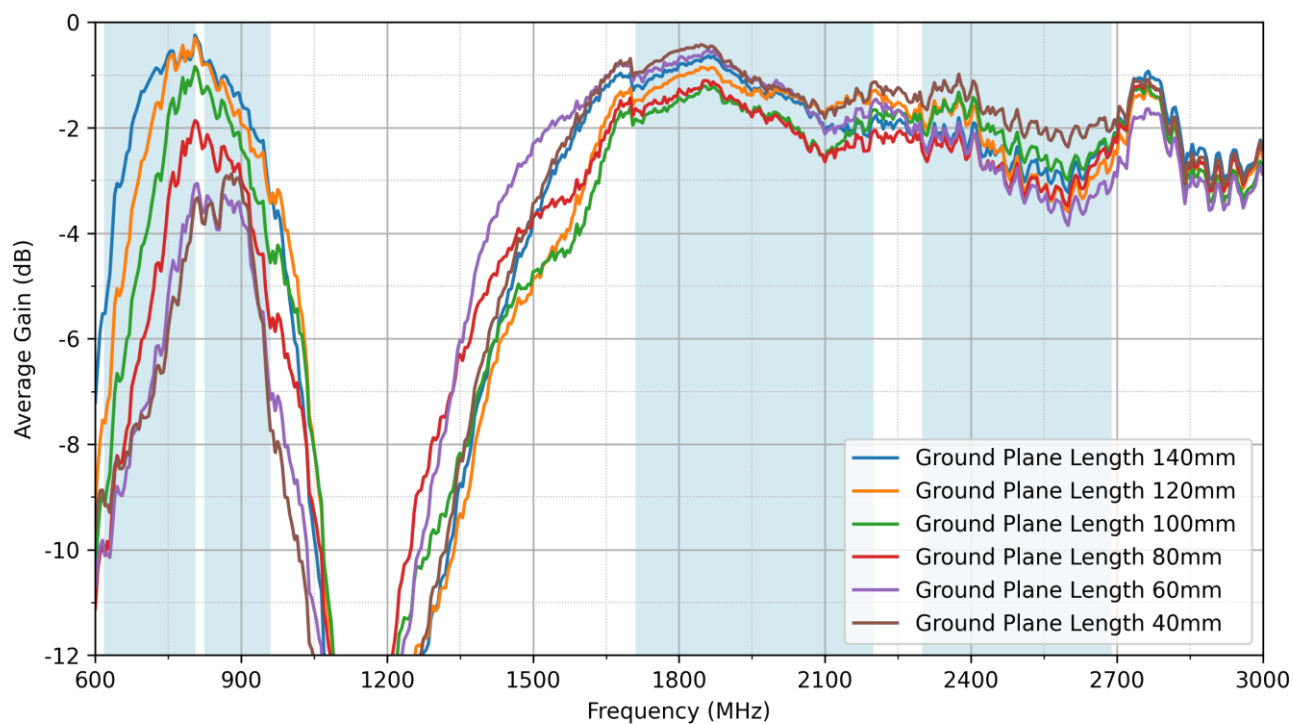




### 9.3 Peak Gain



### 9.4 Average Gain





## Changelog for the datasheet

### SPE-13-8-070 – PCS.06.A

#### Revision: U (Current Version)

|                  |                                          |
|------------------|------------------------------------------|
| Date:            | 2025-03-11                               |
| Changes:         | Updated matching component part numbers. |
| Changes Made by: | Gary West                                |

#### Previous Revisions

#### Revision: T (Current Version)

|                  |                              |
|------------------|------------------------------|
| Date:            | 2023-08-08                   |
| Changes:         | Update Solder Reflow Profile |
| Changes Made by: | Gary West                    |

#### Revision: O

|                  |                                                                 |
|------------------|-----------------------------------------------------------------|
| Date:            | 2021-02-22                                                      |
| Changes:         | Updated datasheet template and added antenna integration guide. |
| Changes Made by: | Gary West                                                       |

#### Revision: S

|                  |                       |
|------------------|-----------------------|
| Date:            | 2023-04-28            |
| Changes:         | Update all test data. |
| Changes Made by: | Gary West             |

#### Revision: N

|                  |                                           |
|------------------|-------------------------------------------|
| Date:            | 2015-11-19                                |
| Changes:         | Updated Imagery<br>Reference ECR-18-8-259 |
| Changes Made by: | Russell Meyler                            |

#### Revision: R

|                  |                           |
|------------------|---------------------------|
| Date:            | 2022-10-18                |
| Changes:         | Update Mechanical Drawing |
| Changes Made by: | Gary West                 |

#### Revision: M

|                  |                                                                                        |
|------------------|----------------------------------------------------------------------------------------|
| Date:            | 2018-10-23                                                                             |
| Changes:         | Did not have a description for the bottom pads, nor a diagram for connections. Amended |
| Changes Made by: | David Connolly                                                                         |

#### Revision: Q

|                  |                        |
|------------------|------------------------|
| Date:            | 2022-07-26             |
| Changes:         | Added application note |
| Changes Made by: | Gary West              |

#### Revision: L

|                  |                |
|------------------|----------------|
| Date:            | 2018-01-30     |
| Changes:         | PCN-17-8-181/A |
| Changes Made by: | Carol Faughnan |

#### Revision: P

|                  |                  |
|------------------|------------------|
| Date:            | 2021-07-09       |
| Changes:         | Updated RF data. |
| Changes Made by: | Gary West        |

#### Revision: K

|                  |                                           |
|------------------|-------------------------------------------|
| Date:            | 2017-06-09                                |
| Changes:         | Updated with image as per Aliss' request. |
| Changes Made by: | Andy Mahoney                              |

|                    |                       |
|--------------------|-----------------------|
| <b>Revision: J</b> |                       |
| Date:              | 2017-04-28            |
| Changes:           | Added LTE Band Table. |
| Changes Made by:   | Peter Monahan         |

|                    |                    |
|--------------------|--------------------|
| <b>Revision: C</b> |                    |
| Date:              | 2014-03-02         |
| Changes:           | Added Product Name |
| Changes Made by:   | Aine Doyle         |

|                    |                  |
|--------------------|------------------|
| <b>Revision: I</b> |                  |
| Date:              | 2017-04-14       |
| Changes:           | Ammended Drawing |
| Changes Made by:   | Jack Conroy      |

|                    |             |
|--------------------|-------------|
| <b>Revision: B</b> |             |
| Date:              | 2014-01-16  |
| Changes:           | Added Photo |
| Changes Made by:   | Aine Doyle  |

|                    |                       |
|--------------------|-----------------------|
| <b>Revision: H</b> |                       |
| Date:              | 2017-04-04            |
| Changes:           | Added LTE Band Table. |
| Changes Made by:   | Peter Monahan         |

|                                    |                  |
|------------------------------------|------------------|
| <b>Revision: A (First Release)</b> |                  |
| Date:                              |                  |
| Changes:                           | First Release    |
| Changes Made by:                   | Technical Writer |

|                    |                                                                                   |
|--------------------|-----------------------------------------------------------------------------------|
| <b>Revision: G</b> |                                                                                   |
| Date:              | 2017-03-03                                                                        |
| Changes:           | Updated to include disclaimer, revised packaging as per PCN and general cleaning. |
| Changes Made by:   | Andy Mahoney                                                                      |

|                    |                    |
|--------------------|--------------------|
| <b>Revision: F</b> |                    |
| Date:              | 2015-04-26         |
| Changes:           | Comments from John |
| Changes Made by:   | Aine Doyle         |

|                    |                 |
|--------------------|-----------------|
| <b>Revision: E</b> |                 |
| Date:              | 2015-06-30      |
| Changes:           | Added Packaging |
| Changes Made by:   | Aine Doyle      |

|                    |                   |
|--------------------|-------------------|
| <b>Revision: D</b> |                   |
| Date:              | 2015-05-19        |
| Changes:           | Updated Footprint |
| Changes Made by:   | Aine Doyle        |



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