



# Antenna Datasheet

**Product OC (Antenna Only):** YFCH001WWA

**Product OC (Antenna + Rectangular EVB):** YFCH001WWAEVBAA

**Version:** 1.0

**Date:** 2024-04-09

**Status:** Released

**Product Name:** 4G Bracket Mount Sheet Metal PIFA Antenna

**Key Features:**

Frequency band: 698–960 MHz, 1710–2700 MHz

Efficiency: Up to 68 %

Dimensions: 43.19 × 12.73 × 8.15 mm

RoHS & REACH Compliant

# Overview

The Quectel YFCH001WWA is a bracket mount sheet metal antenna for 4G applications. Its size is 43.19 × 12.73 × 8.15 mm, designed for antenna structure stability requirements for smart metering, remote monitoring, vehicle tracking and telematics, and many other IoT device. The YFCH001WWA is a ground-dependent monopole antenna, uses main PCB as its ground plane. It is delivered on tray.

The YFCH001WWA is a sheet metal antenna, which can be mounted on terminals with certain height in the internal space. Due to its high height, it has good performance up to 68 % efficiency in working bands. This antenna is developed on a 145 × 75 mm evaluation board. If the devices have different ground sizes, matching circuit can be used to tune the resonant frequency correctly. We also offer gerber file, 2D & 3D documents for PCB layout.

The YFCH001WWA allows high efficiency, stable signal transmission and reception for 4G working bands in 698–960 MHz, 1710–2700 MHz. This product is RoHS & REACH compliant.

Typical applications include:

- Asset Tracking
- Smart Metering
- Fleet Management
- IoT Sensors and Modules

Quectel provides comprehensive antenna design support such as simulation, testing and manufacturing for custom antenna solutions to meet your specific application needs. We have regional R & D centers to offer quick response to meet your requirements. Please contact our sales & FAEs if you have any requests.

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# 1 Specification

Test Condition: Assembled On 145 × 75 mm EVB

## 1.1. Electrical

| Electrical        |                            |
|-------------------|----------------------------|
| Frequency Range   | 698–960 MHz, 1710–2700 MHz |
| Impedance         | 50 Ω                       |
| Polarization      | Linear                     |
| Radiation Pattern | Omni-directional           |

| Electrical - Detail  |                |  |             |                     |                   |                  |               |               |               |
|----------------------|----------------|--|-------------|---------------------|-------------------|------------------|---------------|---------------|---------------|
| SPEC                 | Band           |  | B71         | B12<br>/B13<br>/B28 | B5<br>/B8<br>/B26 | B1<br>/B2<br>/B3 | B40           | Wi-Fi<br>2G   | B38<br>/B41   |
|                      | Freq.<br>(MHz) |  | 600–<br>700 | 700–<br>810         | 810–<br>960       | 1700–<br>2170    | 2300–<br>2400 | 2400–<br>2500 | 2500–<br>2690 |
| Max. VSWR            |                |  | -           | 7.8                 | 5.7               | 4.8              | 4.1           | 3.1           | 2.3           |
| Max Return Loss (dB) |                |  | -           | -2.2                | -3.1              | -3.7             | -4.3          | -5.8          | -8.1          |
| AVG Eff. (%)         |                |  | -           | 26.3                | 44.2              | 44.0             | 46.0          | 54.2          | 63.9          |
| AVG Gain (dB)        |                |  | -           | -6.4                | -3.6              | -3.6             | -3.4          | -2.7          | -2.0          |
| Max Peak Gain (dBi)  |                |  | -           | 0.3                 | 0.4               | 1.5              | 1.0           | 1.7           | 2.3           |
| Frequency (MHz)      |                |  | -           | (810)               | (860)             | (1750)           | (2360)        | (2490)        | (2620)        |
| VSWR                 |                |  | ≤ 7.8       |                     |                   |                  |               |               |               |
| Return Loss          |                |  | ≤ -2.2 dB   |                     |                   |                  |               |               |               |
| Peak Gain            |                |  | ≤ 2.3 dBi   |                     |                   |                  |               |               |               |

| Gain - Detail |                       |                |                     |
|---------------|-----------------------|----------------|---------------------|
|               | Band                  | Freq.<br>(MHz) | Max peak Gain (dBi) |
| FDD < 3 dBi   | B1                    | 1920-1980      | 0.0                 |
|               | B3                    | 1710-1785      | 1.5                 |
|               | B8                    | 880-915        | 0.0                 |
|               | B18                   | 815-830        | 0.3                 |
|               | B19                   | 830-845        | 0.3                 |
|               | B26                   | 814-849        | 0.3                 |
|               | B28                   | 703-748        | -3.1                |
| TDD < 4 dBi   | B39                   | 1888-1920      | 0.5                 |
|               | B41<br>(Disable HPUE) | 2496-2690      | 2.3                 |

## 1.2. Supported Bands

| 5G NR / LTE / LTE-Advanced / WCDMA / HSPA / HSPA+ / GPRS / GSM / NB-IoT |                 |               |                |         |
|-------------------------------------------------------------------------|-----------------|---------------|----------------|---------|
| Band                                                                    | Frequency (MHz) | Uplink (MHz)  | Downlink (MHz) | Covered |
| 1                                                                       | 2100            | 1920–1980     | 2110–2170      | √       |
| 2                                                                       | 1900            | 1850–1910     | 1930–1990      | √       |
| 3                                                                       | 1800            | 1710–1785     | 1805–1880      | √       |
| 4                                                                       | 1700            | 1710–1755     | 2110–2155      | √       |
| 5                                                                       | 850             | 824–849       | 869–894        | √       |
| 7                                                                       | 2600            | 2500–2570     | 2620–2690      | √       |
| 8                                                                       | 900             | 880–915       | 925–960        | √       |
| 9                                                                       | 1800            | 1749.9–1784.9 | 1844.9–1879.9  | √       |
| 11                                                                      | 1500            | 1427.9–1447.9 | 1475.9–1495.9  | -       |
| 12                                                                      | 700             | 699–716       | 729–746        | √       |
| 13                                                                      | 700             | 777–787       | 746–756        | √       |
| 14                                                                      | 700             | 788–798       | 758–768        | √       |
| 17                                                                      | 700             | 704–716       | 734–746        | √       |
| 18                                                                      | 850             | 815–830       | 860–875        | √       |
| 19                                                                      | 850             | 830–845       | 875–890        | √       |
| 20                                                                      | 800             | 832–862       | 791–821        | √       |
| 21                                                                      | 1500            | 1447.9–1462.9 | 1495.9–1510.9  | -       |
| 22                                                                      | 3500            | 3410–3490     | 3510–3590      | -       |
| 23                                                                      | 2100            | 2000–2020     | 2180–2200      | √       |
| 24                                                                      | 1600            | 1626.5–1660.5 | 1525–1559      | -       |
| 25                                                                      | 1900            | 1850–1915     | 1930–1995      | √       |
| 26                                                                      | 850             | 814–849       | 859–894        | √       |
| 28                                                                      | 700             | 703–748       | 758–803        | √       |
| 31                                                                      | 450             | 452.5–457.5   | 462.5–467.5    | -       |
| 34                                                                      | 2100            | 2010–2025     |                | √       |

|    |      |           |           |   |
|----|------|-----------|-----------|---|
| 38 | 2600 | 2570–2620 |           | √ |
| 39 | 1900 | 1880–1920 |           | √ |
| 40 | 2300 | 2300–2400 |           | √ |
| 41 | 2500 | 2496–2690 |           | √ |
| 42 | 3500 | 3400–3600 |           | - |
| 48 | 3500 | 3550–3700 |           | - |
| 66 | 1700 | 1710–1780 | 2110–2200 | √ |
| 71 | 600  | 663–698   | 617–652   | - |
| 74 | 1500 | 1427–1470 | 1475–1518 | - |
| 77 | 3500 | 3300–4200 |           | - |
| 78 | 3500 | 3300–3800 |           | - |
| 79 | 4500 | 4400–5000 |           | - |

**Note:**

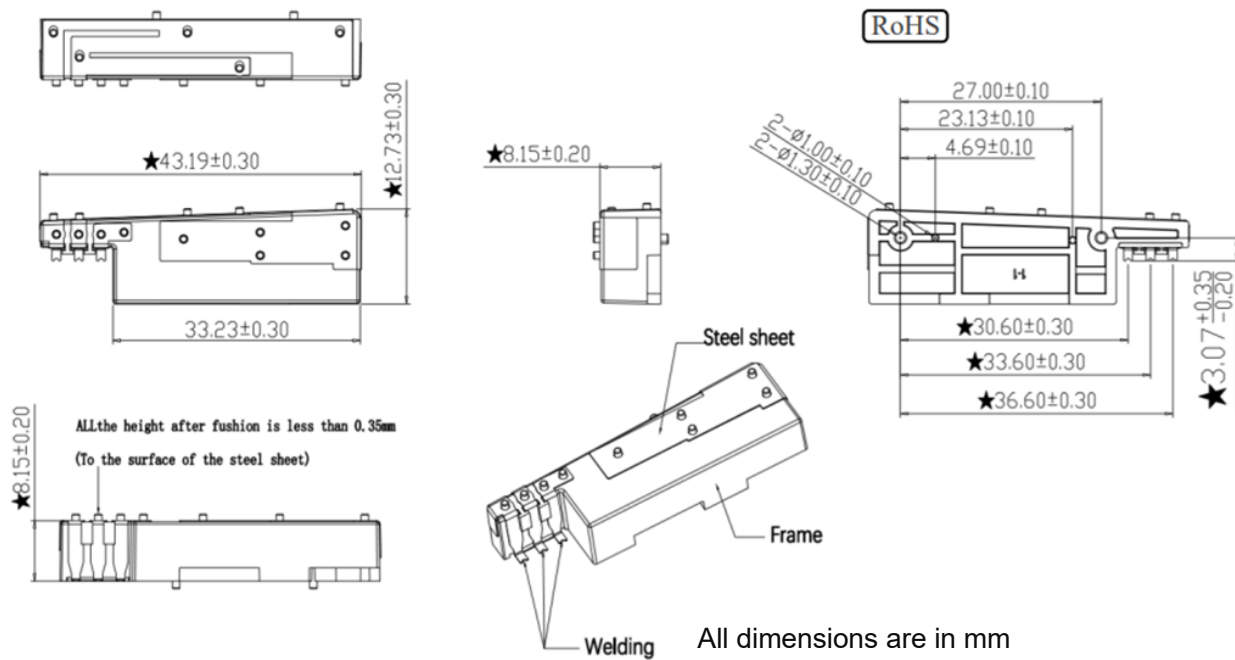
- Covered √ means efficiency > 10%.
- Based on 145 × 75 mm EVB.

### 1.3. Mechanical & Environmental

| Mechanical             |                                                  |
|------------------------|--------------------------------------------------|
| Antenna Size           | 43.19 × 12.73 × 8.15 mm                          |
| Material & Color       | Stainless Steel, Nickel-plated Surface & Natural |
| Antenna Weight         | Typ. 2.8 g                                       |
| Mounting Type          | Screw                                            |
| Recommended EVB Size   | 145 × 75 mm                                      |
| Environmental          |                                                  |
| Operation Temperature  | -40 °C to +85 °C                                 |
| Storage Temperature    | -40 °C to +85 °C                                 |
| RoHS & REACH Compliant | Yes                                              |

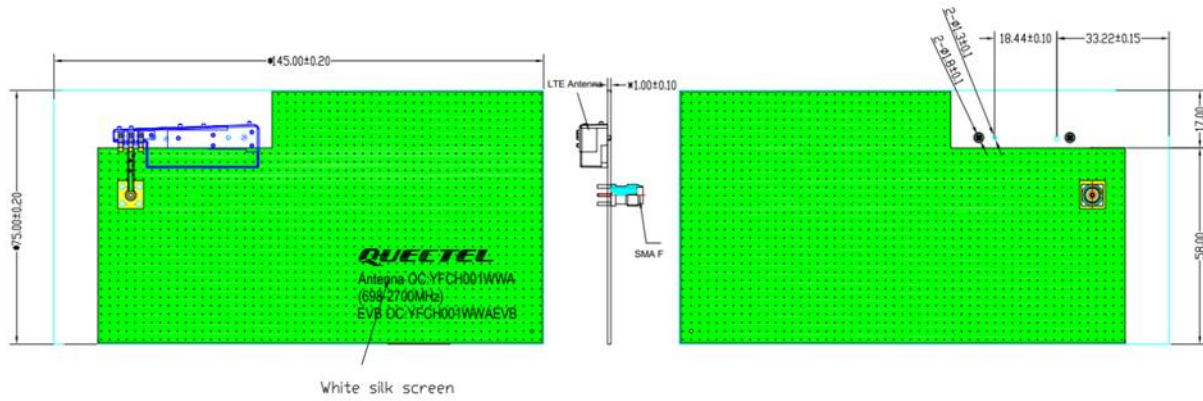
## 2 Drawing

### 2.1. Antenna



|   | Name                 | Material                               | Brand   | QTY | Model             |
|---|----------------------|----------------------------------------|---------|-----|-------------------|
| 1 | Antenna              | Stainless Steel, Nickel-plated Surface | Quectel | 1   | YFCH001WWA        |
| 2 | PCB                  | FR4 1.0t                               | Quectel | 1   | YMCP001AAEVBA     |
| 3 | Bracket              | PC                                     | Quectel | 1   | YFCH001WWABracket |
| 4 | 12nH                 | Ceramics                               | Murata  | 1   | -                 |
| 5 | 10pF                 | Ceramics                               | Murata  | 1   | -                 |
| 6 | 0 Ω                  | Ceramics                               | Murata  | 1   | -                 |
| 7 | SMA Female Connector | Brass                                  | Quectel | 1   | -                 |

## 2.2. Rectangular EVB

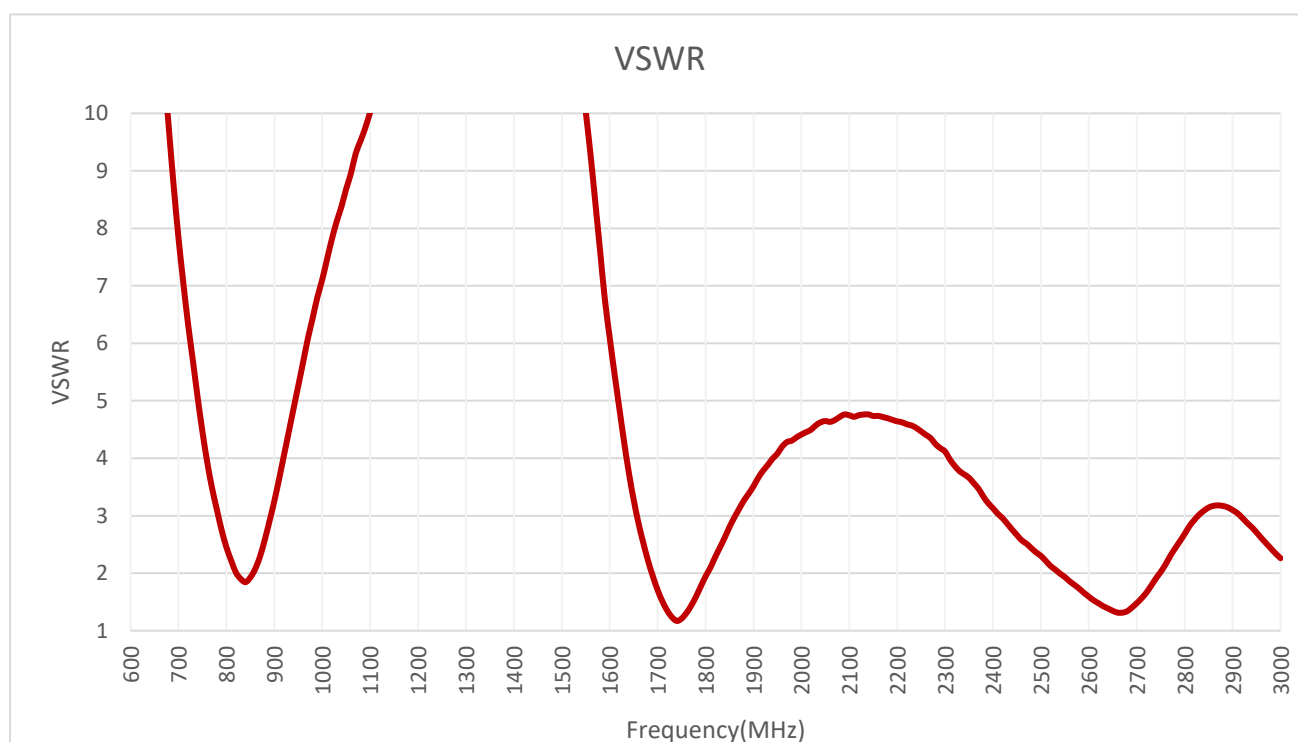


All dimensions are in mm.

## 3 Detailed Performance

### 3.1. S-Parameter Test

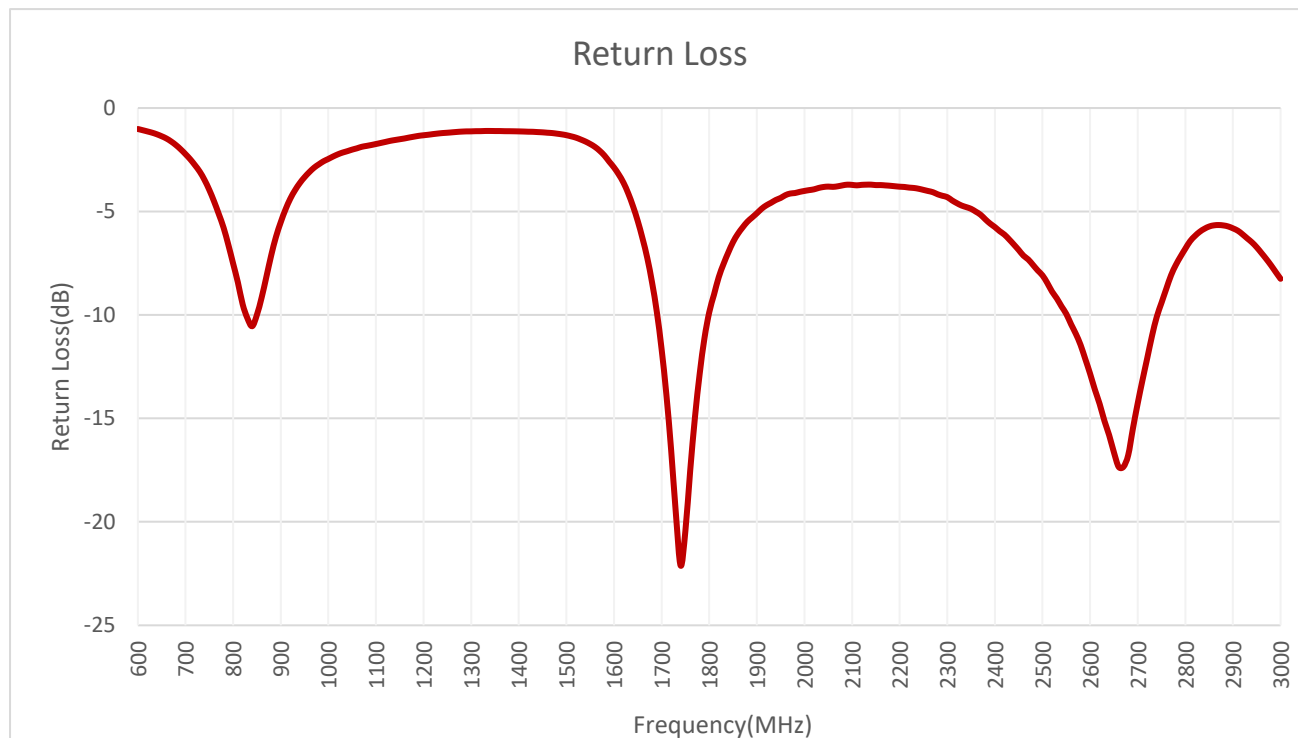
#### 3.1.1. VSWR



**VSWR**

| Frequency (MHz) | 600  | 630  | 710  | 830  | 900  | 960  | 1440 | 1710 | 1740 | 1880 |
|-----------------|------|------|------|------|------|------|------|------|------|------|
| VSWR            | -    | -    | 7.1  | 1.9  | 3.3  | 5.7  | -    | 1.5  | 1.2  | 3.3  |
| Frequency (MHz) | 1950 | 2140 | 2350 | 2450 | 2600 | 2690 | 4700 | 5000 | 5500 | 6000 |
| VSWR            | 4.1  | 4.8  | 3.7  | 2.7  | 1.6  | 1.4  | -    | -    | -    | -    |

### 3.1.2. Return Loss

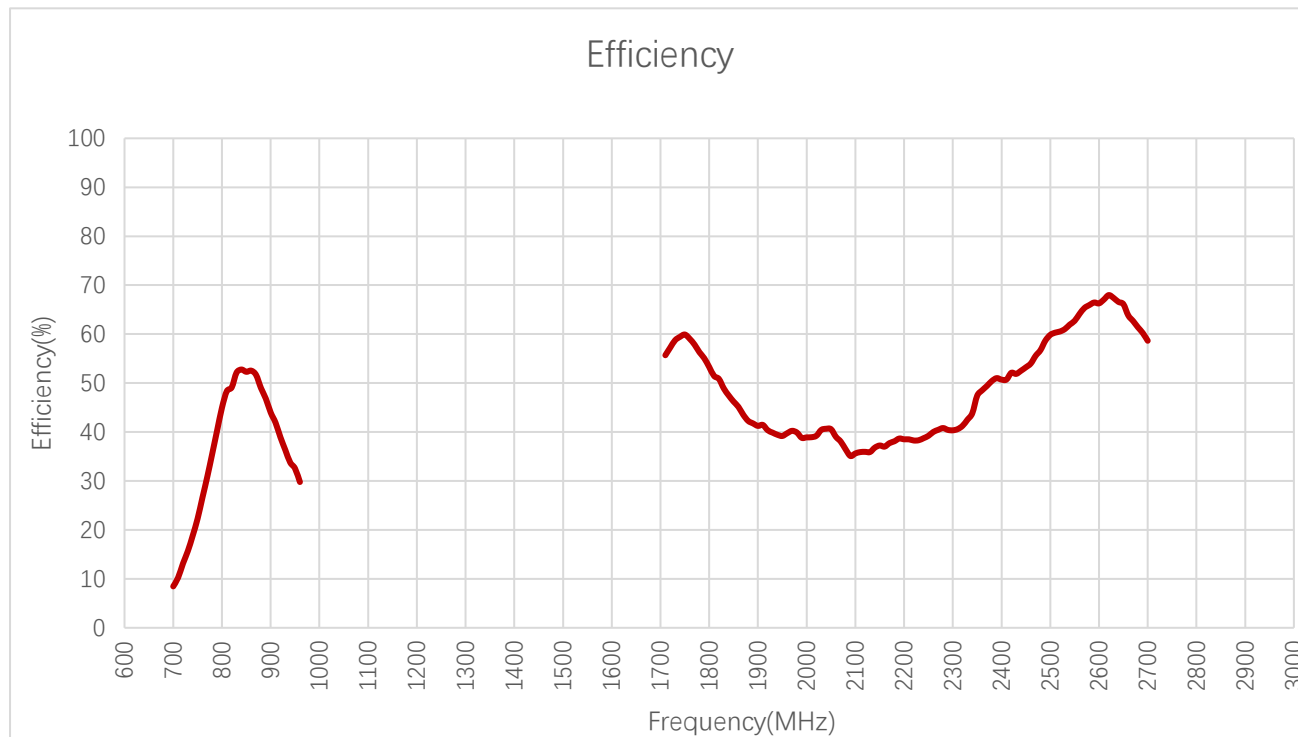


**Return Loss (dB)**

| Frequency (MHz)  | 600  | 630  | 710  | 830   | 900   | 960   | 1440 | 1710  | 1740  | 1880 |
|------------------|------|------|------|-------|-------|-------|------|-------|-------|------|
| Return Loss (dB) | -    | -    | -2.5 | -10.2 | -5.5  | -3.1  | -    | -13.8 | -22.1 | -5.5 |
| Frequency (MHz)  | 1950 | 2140 | 2350 | 2450  | 2600  | 2690  | 4700 | 5000  | 5500  | 6000 |
| Return Loss (dB) | -4.3 | -3.7 | -4.9 | -6.9  | -12.8 | -15.5 | -    | -     | -     | -    |

## 3.2. Radiation Performance Test

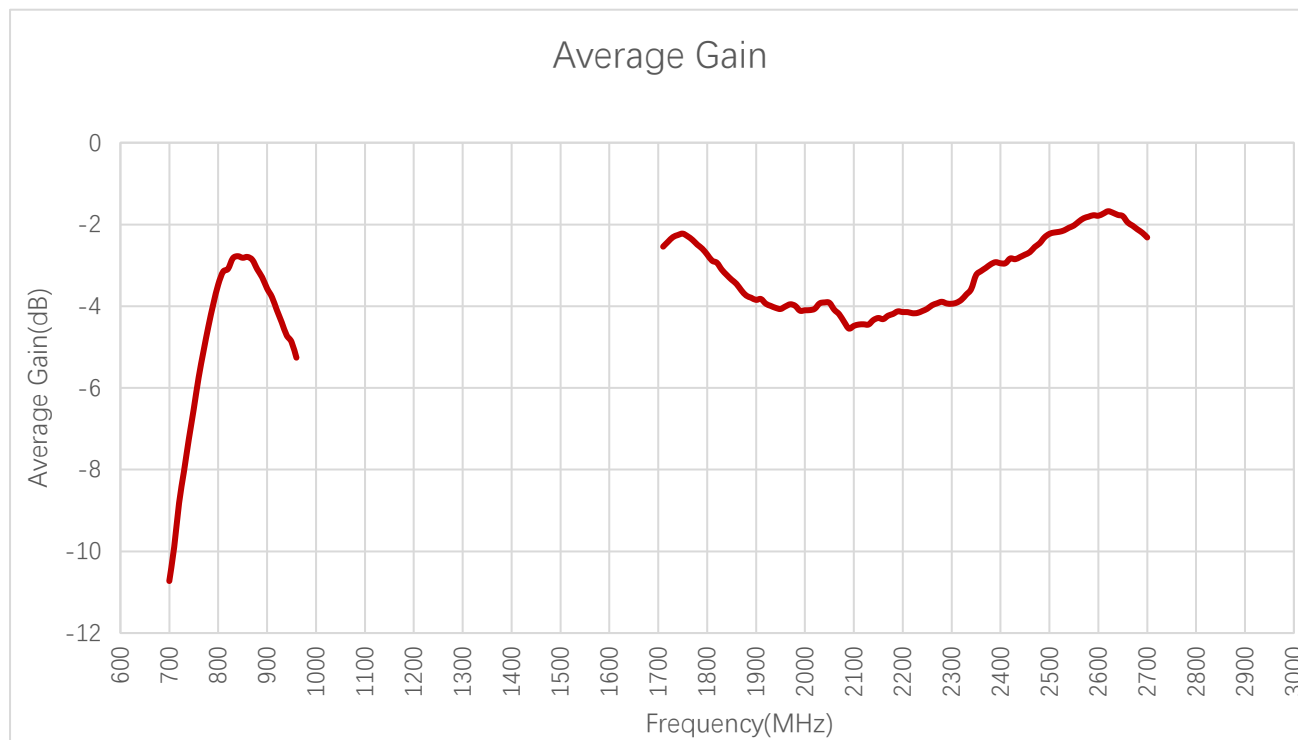
### 3.2.1. Efficiency



**Efficiency (%)**

| Frequency (MHz) | 600  | 630  | 710  | 830  | 900  | 960  | 1440 | 1710 | 1740 | 1880 |
|-----------------|------|------|------|------|------|------|------|------|------|------|
| Efficiency (%)  | -    | -    | 10.2 | 52.1 | 44.0 | 29.8 | -    | 55.7 | 59.4 | 42.3 |
| Frequency (MHz) | 1950 | 2140 | 2350 | 2450 | 2600 | 2690 | 4700 | 5000 | 5500 | 6000 |
| Efficiency (%)  | 39.2 | 36.8 | 47.4 | 53.2 | 66.3 | 60.2 | -    | -    | -    | -    |

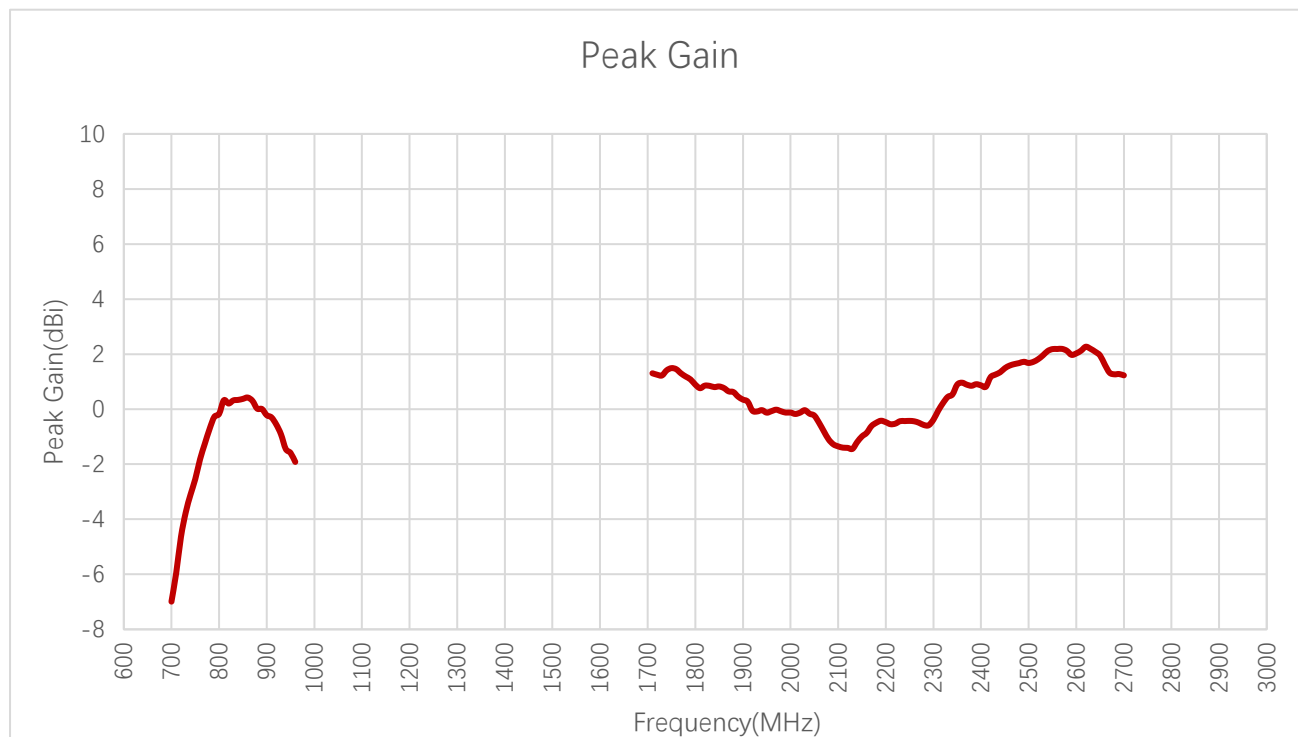
### 3.2.2. Average Gain



**Average Gain (dB)**

| Frequency (MHz)   | 600  | 630  | 710  | 830  | 900  | 960  | 1440 | 1710 | 1740 | 1880 |
|-------------------|------|------|------|------|------|------|------|------|------|------|
| Average Gain (dB) | -    | -    | -9.9 | -2.8 | -3.6 | -5.3 | -    | -2.5 | -2.3 | -3.7 |
| Frequency (MHz)   | 1950 | 2140 | 2350 | 2450 | 2600 | 2690 | 4700 | 5000 | 5500 | 6000 |
| Average Gain (dB) | -4.1 | -4.3 | -3.2 | -2.7 | -1.8 | -2.2 | -    | -    | -    | -    |

### 3.2.3. Peak Gain



**Peak Gain (dBi)**

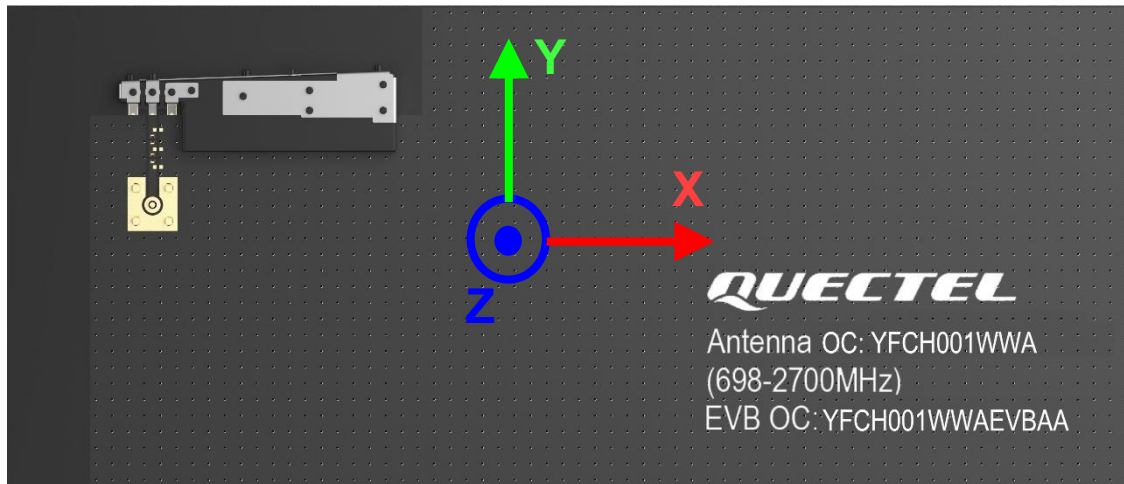
| Frequency (MHz) | 600  | 630  | 710  | 830  | 900  | 960  | 1440 | 1710 | 1740 | 1880 |
|-----------------|------|------|------|------|------|------|------|------|------|------|
| Peak Gain (dBi) | -    | -    | -5.9 | 0.3  | -0.2 | -1.9 | -    | 1.3  | 1.4  | 0.6  |
| Frequency (MHz) | 1950 | 2140 | 2350 | 2450 | 2600 | 2690 | 4700 | 5000 | 5500 | 6000 |
| Peak Gain (dBi) | -0.1 | -1.2 | 0.9  | 1.5  | 2.0  | 1.3  | -    | -    | -    | -    |

**Max Peak Gain (dBi)**

| Band            | B71 | B12<br>/B13<br>/B28 | B5<br>/B8<br>/B26 | B1<br>/B2<br>/B3 | B40  | WIFI<br>2G | B38<br>/B41 |
|-----------------|-----|---------------------|-------------------|------------------|------|------------|-------------|
| Frequency (MHz) | -   | 810                 | 860               | 1750             | 2360 | 2490       | 2620        |
| Peak Gain (dBi) | -   | 0.3                 | 0.4               | 1.5              | 1.0  | 1.7        | 2.3         |

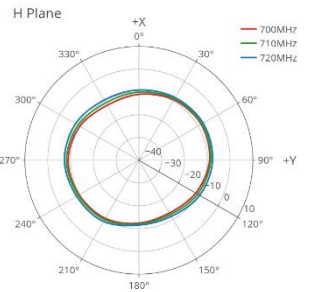
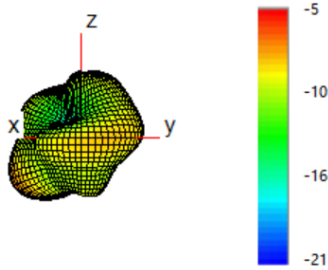
### 3.3.4. 3D & 2D Radiation Pattern

- Test Status: Assembled on 145 × 75 mm EVB
- Test Chamber: GL-G-1

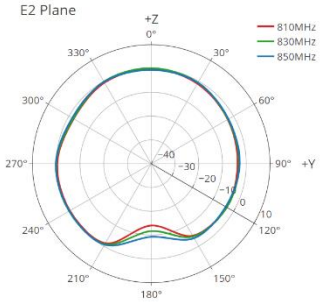
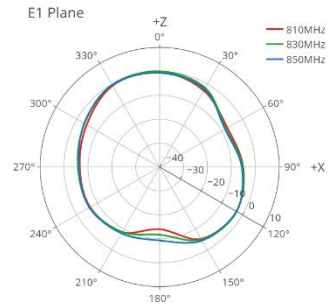
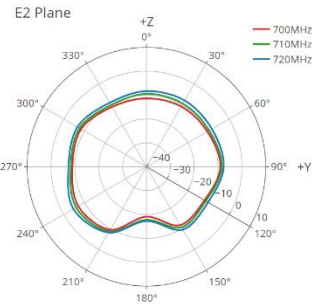
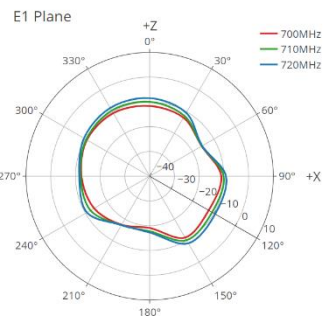
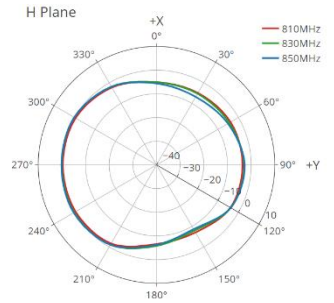
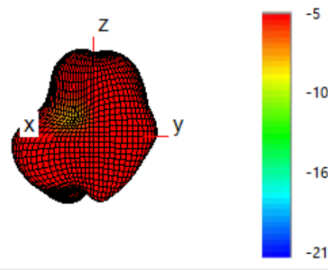


● 4G

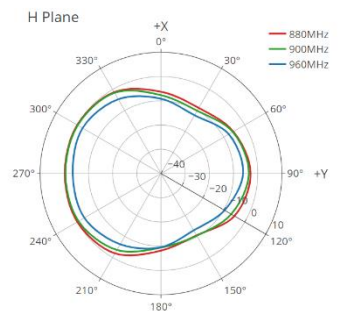
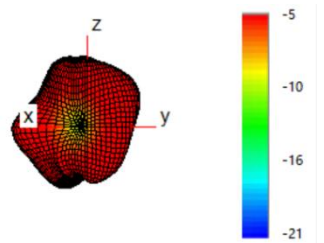
710 MHz



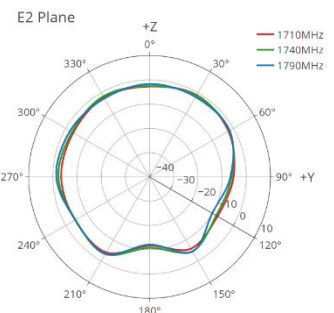
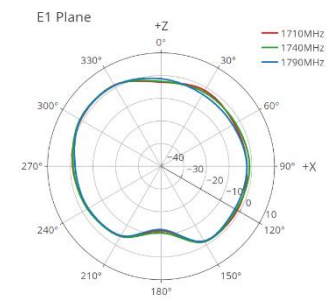
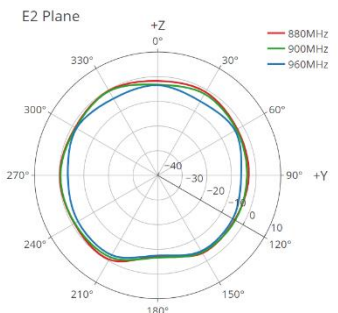
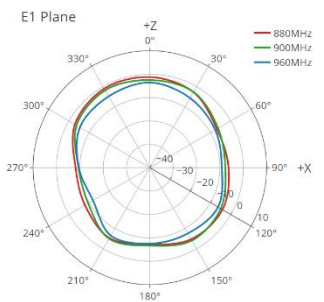
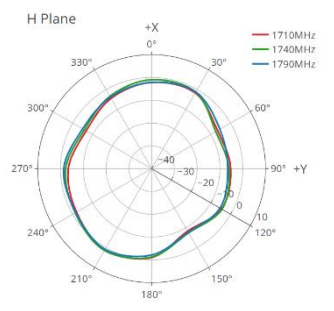
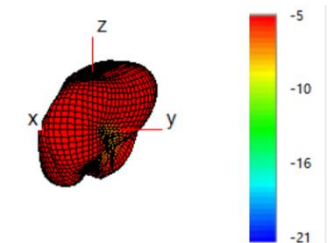
830 MHz



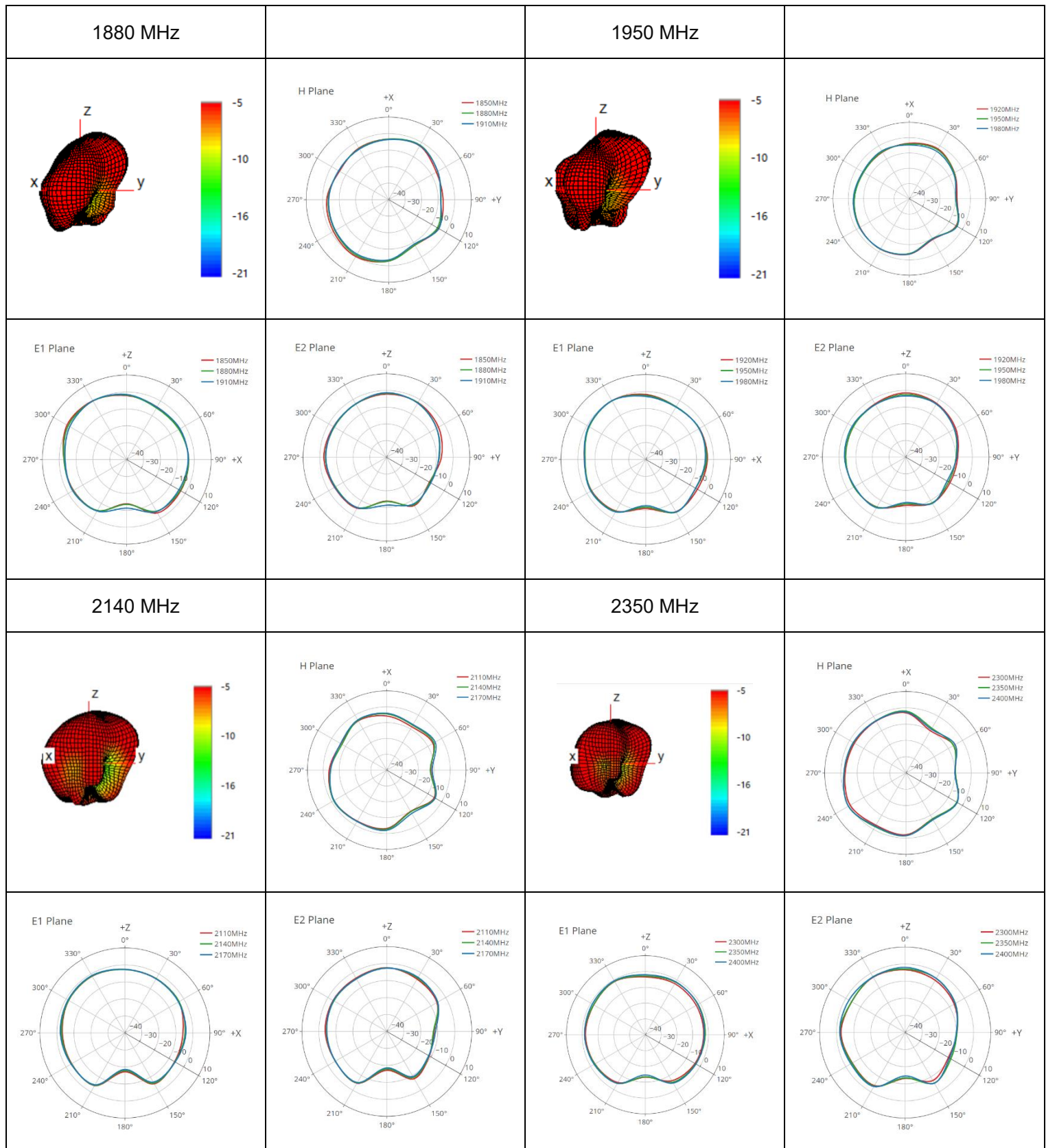
900 MHz



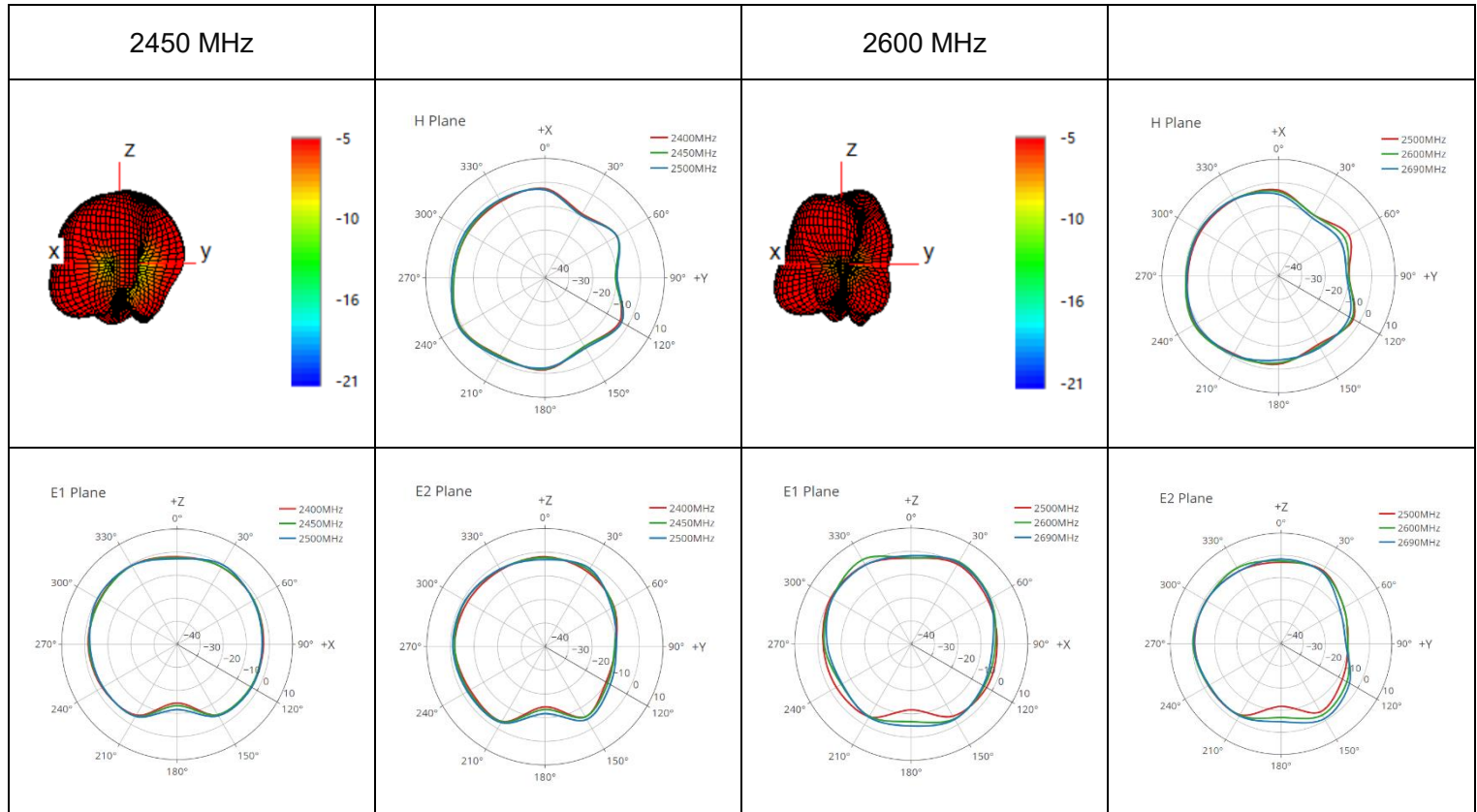
1740 MHz



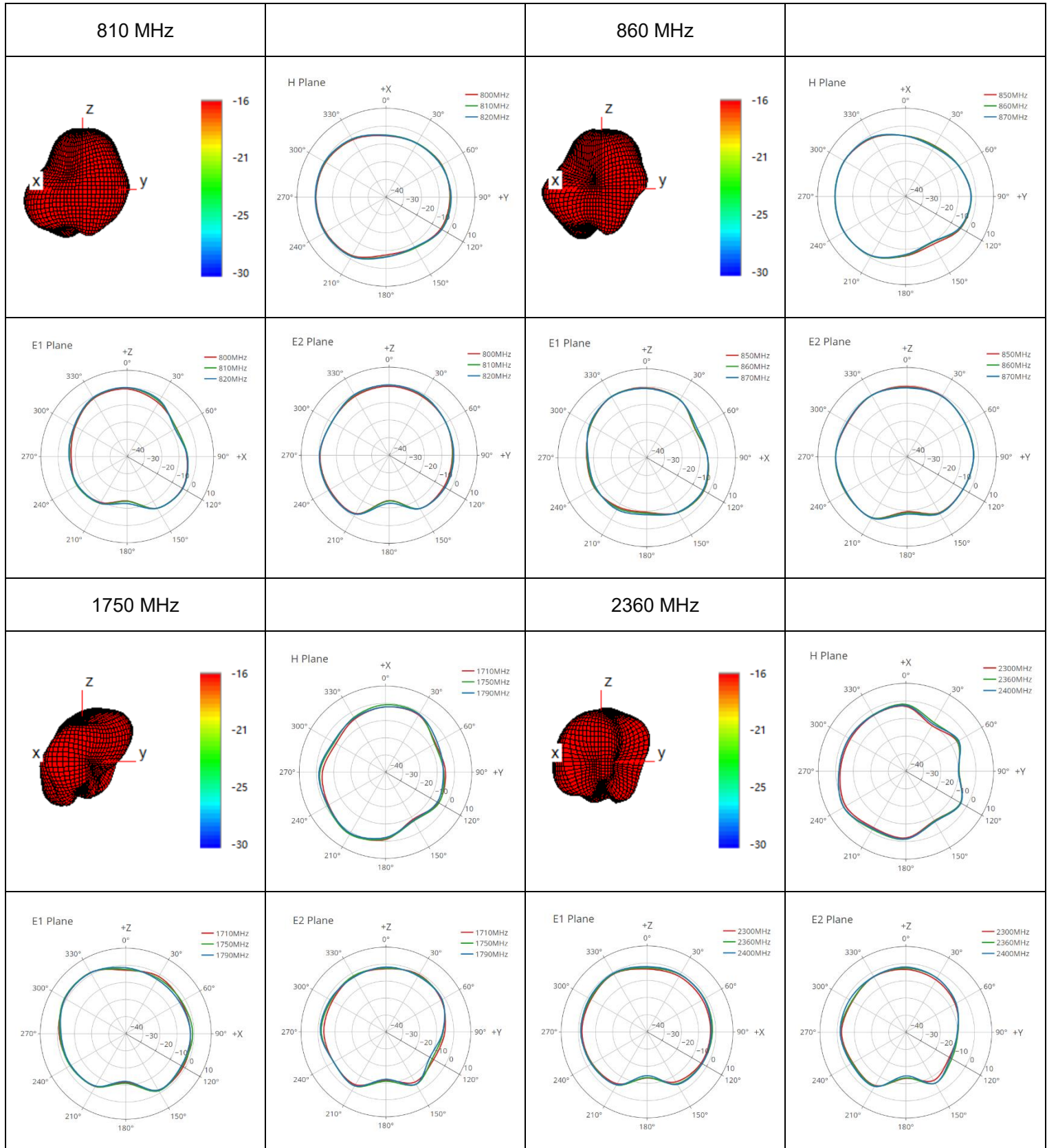
● 4G

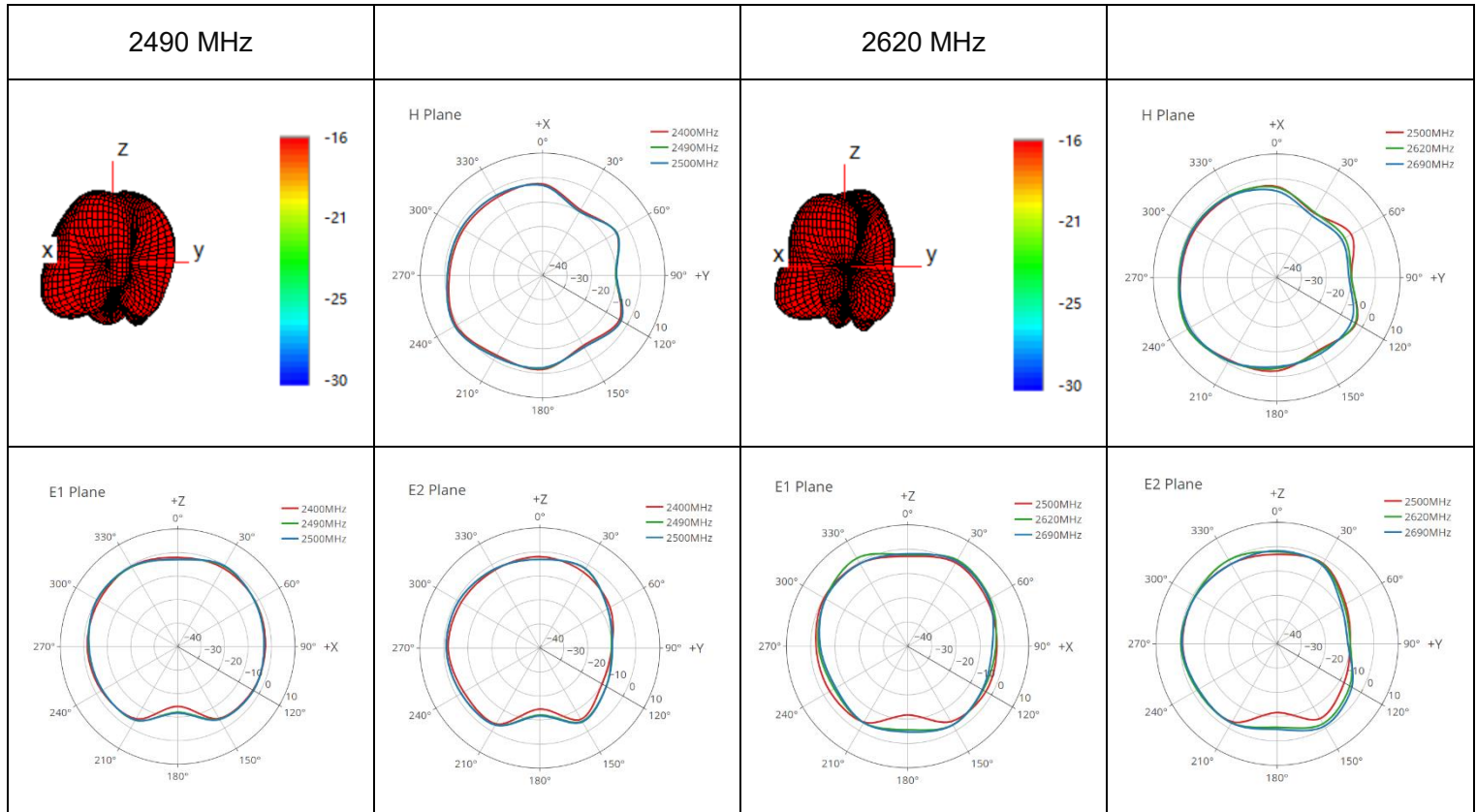


● 4G



● **Max Peak Gain**

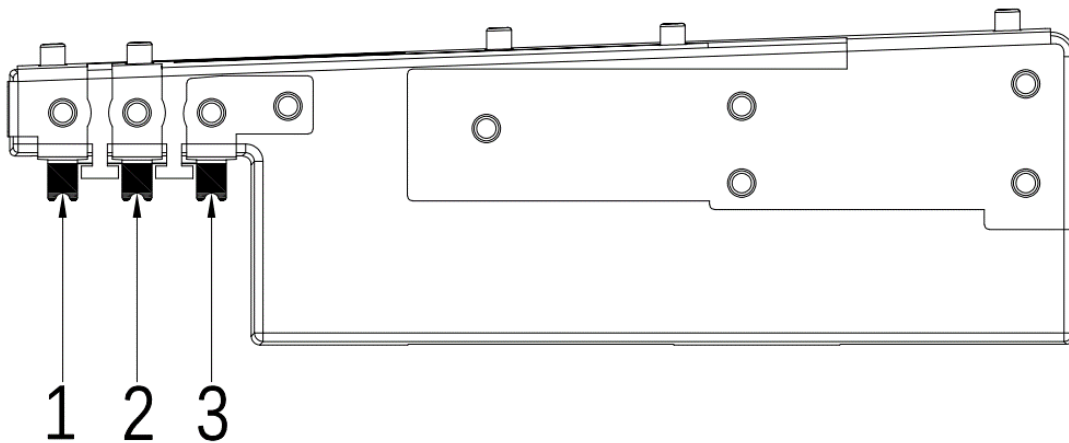




## 4 Schematic Symbol and Pin Definition

- The pin assignment for the antenna is as follows.
- The circuit symbol for the antenna is shown below. The antenna has 3 pins, only one of which works. All other pins are for mechanical strength.

| Pin | Description  |
|-----|--------------|
| 1   | Return / GND |
| 2   | Feed         |
| 3   | Parasitism   |



## 5 Transmission Line

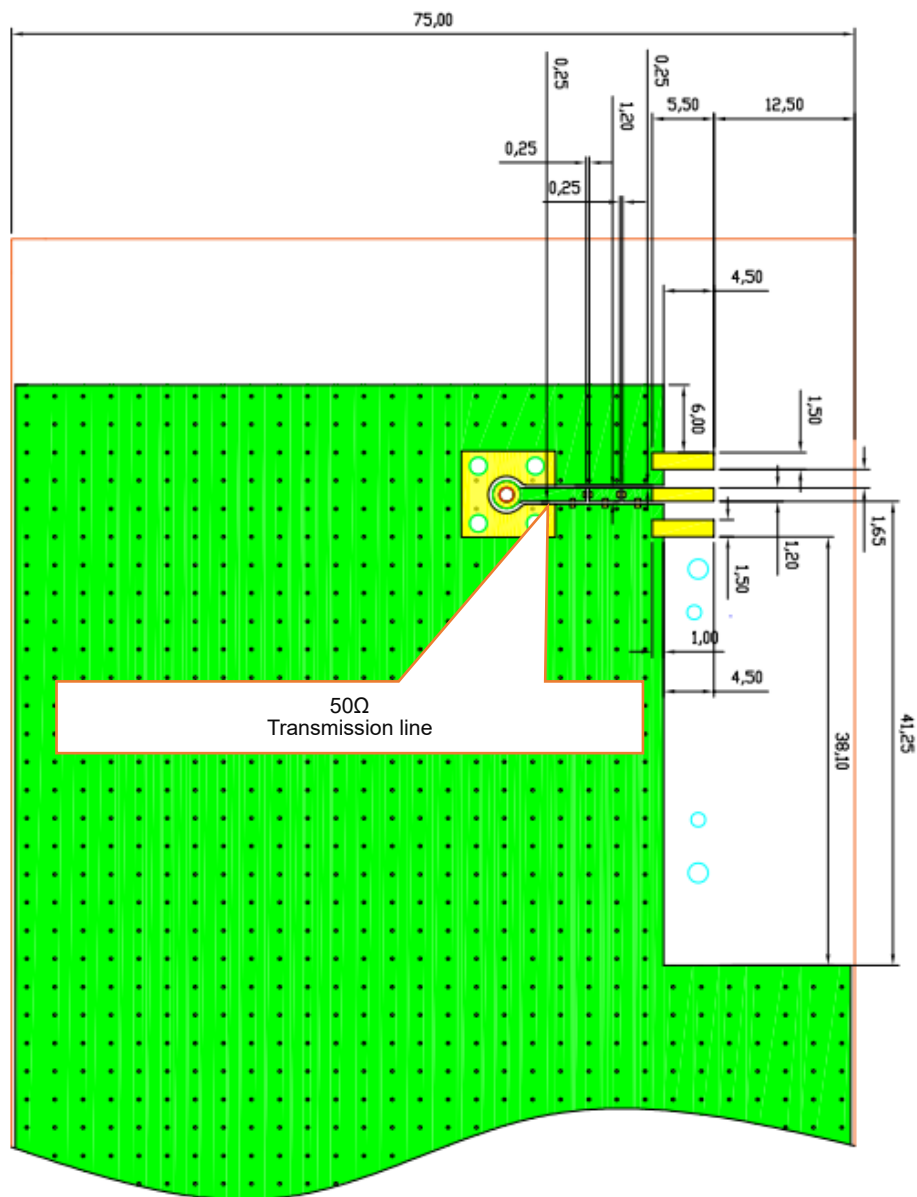
The characteristic impedance of all transmission lines shall be designed as 50  $\Omega$ .

- The length of the transmission lines should be kept as short as possible.
- Any other part of the RF system, such as transceiver, power amplifiers, etc., shall also be designed with an impedance of 50  $\Omega$ .

Once the material for the PCB has been chosen (PCB thickness and dielectric constant), a coplanar transmission line can easily be designed using any of the commercial software packages for transmission line design. For the chosen PCB thickness, copper thickness and substrate dielectric constant, the program will calculate the appropriate transmission line width and gaps on either side of the track so the characteristic impedance of the coplanar transmission is 50  $\Omega$ .

## 6 Recommended PCB Layout

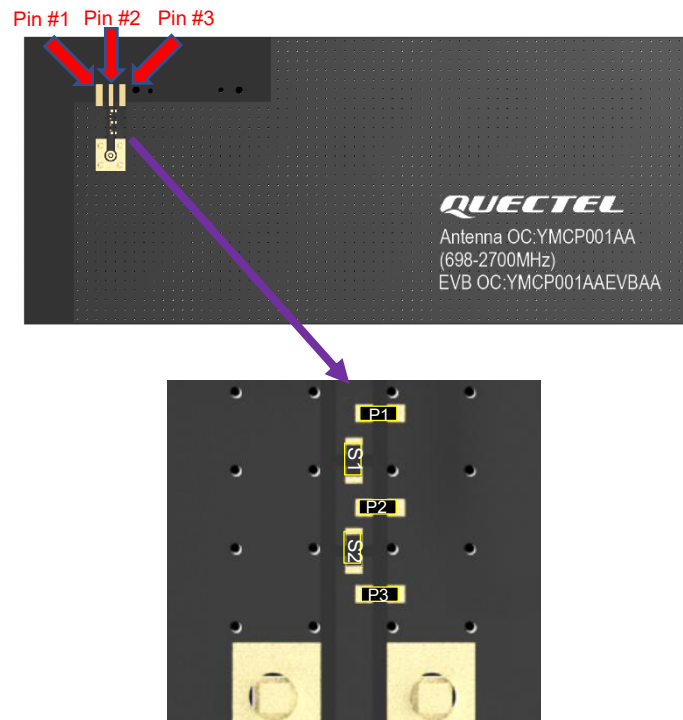
The host PCB must be designed using the PCB footprint shown with the correct clearances. An example of the PCB layout shows the antenna footprint. Please note this clearance area is critical to the performance of the antenna and must be applied through all layers of the PCB.



All dimensions are in mm.

# 7 Matching Circuit

Demo Board Top View

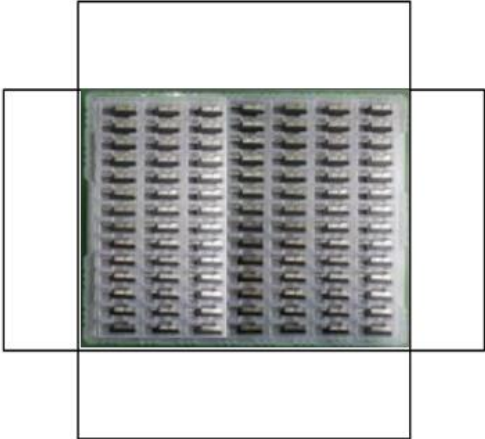
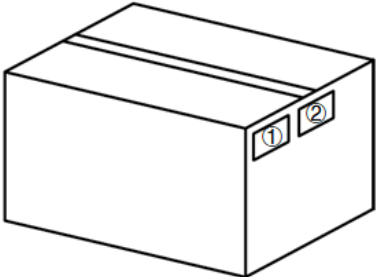
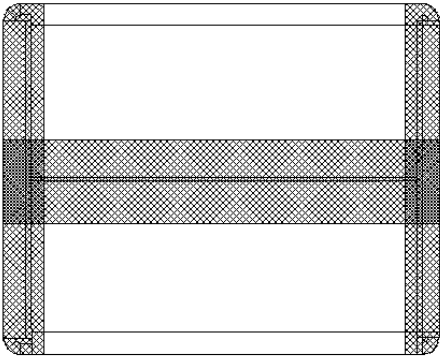


|                  | P1    | S1    | P2  | S2    | P3  |
|------------------|-------|-------|-----|-------|-----|
| Default Matching | 12 nH | 10 pF | DNI | 0 Ohm | DNI |
| Tolerance        | ±5 %  | ±5 %  | N/A | -     | N/A |

| Pin # | Description  |
|-------|--------------|
| 1     | Return / GND |
| 2     | Feed         |
| 3     | Parasitism   |

## 8 Packaging

| Step | Packaging picture / 2D picture                                                      | Description                                     |
|------|-------------------------------------------------------------------------------------|-------------------------------------------------|
| 1    |    | Product drawing                                 |
| 2    |  | Put the product into the tray.<br>98 PCS / Tray |

|   |                                                                                     |                                                                                                                      |
|---|-------------------------------------------------------------------------------------|----------------------------------------------------------------------------------------------------------------------|
| 3 |    | <p>17 trays stacked.<br/>(1666 PCS Antennas / Carton Box)<br/><u>Carton Size: L × W × H = 430 × 350 × 220 mm</u></p> |
| 4 |   | <p><b>Position for Attaching Labels</b></p> <p>① Carton Label<br/>② Quality Label</p>                                |
| 5 |  | <p><b>Sealing Cartons</b><br/>“工” type sealing cartons</p>                                                           |

## Contact Us

At Quectel, our aim is to provide timely and comprehensive services to our customers. If you require any assistance, please contact our headquarters:

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## Revision History

| Version | Date       | Author                                               | Note                     |
|---------|------------|------------------------------------------------------|--------------------------|
| -       | 2024-04-09 | Sly LIU/<br>Lucky FENG/<br>David LIU/<br>Rainey LIAO | Creation of the document |
| 1.0     | 2024-04-09 | Sly LIU/<br>Lucky FENG/<br>David LIU/<br>Rainey LIAO | First official release   |



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