

Antenna Datasheet

Product OC (Antenna Only): YPCP001AA
(Antenna + Rectangular EVB): YPCP001AAEVB

Version: 1.1

Date: 2023-04-10

Status: Released

Product Name: 4G SMD Antenna

Key Features:

High efficiency, excellent performance

Frequency band: 600–960 MHz, 1710–2690 MHz

Peak efficiency: 76.79%

Dimensions: 36 × 9 × 3 mm

Overview

This wideband LTE/cellular/CDMA SMT antenna is suitable for 4G/3G/2G applications. Operating at 600–960 MHz, 1710–2690 MHz, it's a high-efficiency antenna which is mounted to the device host PCB using conventional PCB reflow process. Ideal for all 4G/LTE applications, it also supports worldwide Cat M and NB-IoT frequency bands. Supplied on tape and reel for high-volume applications, it is compatible with all Quectel's 4G/3G/2G including LPWA modules. We provide comprehensive antenna design support such as simulation, testing and manufacturing for custom antenna solutions to meet your specific application needs.

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1 Specification

Test Condition: Assembled On EVB

1.1. Electrical

Electrical	
Frequency Range	600–960 MHz, 1710–2690 MHz
Impedance	50 Ω
Polarization	Linear
Radiation Pattern	Omni-directional

Electrical - Detail									
SPEC	Band	Band	B71	B12 /B13 /B28	B5 /B8 /B26	B1 /B2 /B3	B40	WIFI 2G	B38 /B41
		Freq. (MHz)	600– 700	700– 810	810– 960	1700– 2170	2300– 2400	2400– 2500	2500– 2690
Max VSWR		On 130 × 45.5 mm GND	3.4	2.9	2.9	3.3	4.1	3.3	2.3
		On 120 × 45.5 mm GND	3.9	3.3	3.3	3.1	3.3	3.3	3.0
		On 110 × 45.5 mm GND	12.7	2.8	2.0	2.5	2.6	2.5	2.5
		On 100 × 45.5 mm GND	13.1	3.7	2.6	3.4	2.8	2.6	2.5
		On 90 × 45.5 mm GND	14.6	4.1	3.0	3.7	3.4	3.1	2.9
		On 80 × 45.5 mm GND	14.7	4.5	3.1	3.5	4.0	3.6	3.3
		On 65 × 45.5 mm GND	14.4	5.5	3.6	2.8	3.3	3.2	3.0
Max Return Loss (dB)		On 130 × 45.5 mm GND	-5.2	-6.3	-6.1	-5.5	-4.4	-5.4	-8.0
		On 120 × 45.5 mm GND	-4.6	-5.5	-5.4	-5.7	-5.5	-5.4	-6.0
		On 110 × 45.5 mm GND	-1.4	-6.4	-9.5	-7.3	-7.2	-7.3	-7.2

	On 100 × 45.5 mm GND	-1.3	-4.9	-6.9	-5.3	-6.6	-7.1	-7.4	
	On 90 × 45.5 mm GND	-1.2	-4.3	-6.0	-4.9	-5.3	-5.8	-6.3	
	On 80 × 45.5 mm GND	-1.2	-3.9	-5.8	-5.1	-4.4	-5.0	-5.4	
	On 65 × 45.5 mm GND	-1.2	-3.2	-5.0	-6.4	-5.5	-5.6	-5.9	
AVG Eff. (%)	On 130 × 45.5 mm GND	37.1	50.3	46.1	60.3	49.3	56.2	72.7	
	On 120 × 45.5 mm GND	31.9	47.9	48.3	58.4	54.8	58.7	72.8	
	On 110 × 45.5 mm GND	15.4	59.8	62.5	58.5	66.2	63.6	63.6	
	On 100 × 45.5 mm GND	11.4	49.1	56.3	47.9	63.3	63.4	63.3	
	On 90 × 45.5 mm GND	8.8	41.4	53.5	46.8	58.7	59.8	62.3	
	On 80 × 45.5 mm GND	7.2	33.4	46.5	48.3	53.7	54.1	57.8	
	On 65 × 45.5 mm GND	5.6	24.2	35.8	60.6	55.1	53.7	58.2	
AVG Gain (dB)	On 130 × 45.5 mm GND	-4.5	-3.0	-3.4	-2.2	-3.1	-2.5	-1.4	
	On 120 × 45.5 mm GND	-5.2	-3.2	-3.2	-2.3	-2.6	-2.3	-1.4	
	On 110 × 45.5 mm GND	-8.9	-2.3	-2.0	-2.4	-1.8	-2.0	-2.0	
	On 100 × 45.5 mm GND	-10.1	-3.2	-2.5	-3.2	-2.0	-2.0	-2.0	
	On 90 × 45.5 mm GND	-11.2	-4.0	-2.7	-3.3	-2.3	-2.2	-2.1	
	On 80 × 45.5 mm GND	-12.1	-4.9	-3.4	-3.2	-2.7	-2.7	-2.4	
	On 65 × 45.5 mm GND	-13.1	-6.3	-4.5	-2.2	-2.6	-2.7	-2.4	
Max Peak Gain (dBi)	On 130 × 45.5 mm GND	-0.3	-0.1	0.4	2.6	2.7	2.8	3.1	
	On 120 × 45.5 mm GND	-0.8	-0.4	0.5	2.7	3.0	2.9	3.0	
	On 110 × 45.5 mm GND	-2.0	1.1	1.5	3.1	3.1	2.9	2.7	
	On 100 × 45.5 mm GND	-3.3	0.4	1.1	2.5	2.4	2.4	2.4	
	On 90 × 45.5 mm GND	-4.4	0.0	0.9	2.7	2.7	2.4	2.4	
	On 80 × 45.5 mm GND	-5.4	-0.9	0.2	2.5	2.3	1.9	1.8	
	On 65 × 45.5 mm GND	-6.6	-2.5	-1.1	2.4	2.1	1.7	1.7	
VSWR	On 130 × 45.5 mm GND							≤ 4.1	
	On 120 × 45.5 mm GND							≤ 3.3	
	On 110 × 45.5 mm GND							≤ 2.8	
	On 100 × 45.5 mm GND							≤ 3.7	

	On 90 × 45.5 mm GND	≤ 4.1
	On 80 × 45.5 mm GND	≤ 4.5
	On 65 × 45.5 mm GND	≤ 5.5
Return Loss	On 130 × 45.5 mm GND	≤ -4.4 dB
	On 120 × 45.5 mm GND	≤ -5.4 dB
	On 110 × 45.5 mm GND	≤ -6.4 dB
	On 100 × 45.5 mm GND	≤ -4.9 dB
	On 90 × 45.5 mm GND	≤ -4.3 dB
	On 80 × 45.5 mm GND	≤ -3.9 dB
	On 65 × 45.5 mm GND	≤ -3.2 dB
Peak Gain	On 130 × 45.5 mm GND	≤ 3.1 dBi
	On 120 × 45.5 mm GND	≤ 3 dBi
	On 110 × 45.5 mm GND	≤ 3.1 dBi
	On 100 × 45.5 mm GND	≤ 2.5 dBi
	On 90 × 45.5 mm GND	≤ 2.7 dBi
	On 80 × 45.5 mm GND	≤ 2.5 dBi
	On 65 × 45.5 mm GND	≤ 2.4 dBi

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:

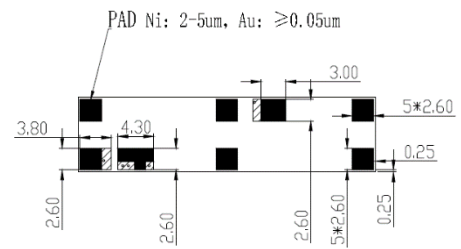
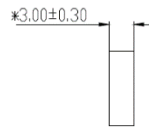
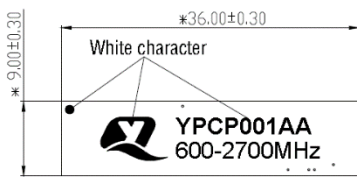
- Covered √ means efficiency > 20%.
- Based on 110 × 45.5 mm GND.

1.3. Mechanical, Environmental & Storage

Mechanical	
Antenna Size	36 × 9 × 3 mm
Antenna Material & Color	FR4 & BLACK
Antenna Weight	Typ. 0.8 g
Mounting Type	Soldering
Recommended EVB Size	110 × 45.5 × 0.8 mm
Environmental	
Operation Temperature	-40 °C to +85 °C
RoHS & REACH Compliant	Yes
Storage	
Storage Temperature	18 °C to 27 °C
Humidity	30–80 % RH
Storage Place	Away from corrosive gas and direct sunlight
Packing	Antennas should be stored in unopened sealed manufacturer's plastic packaging

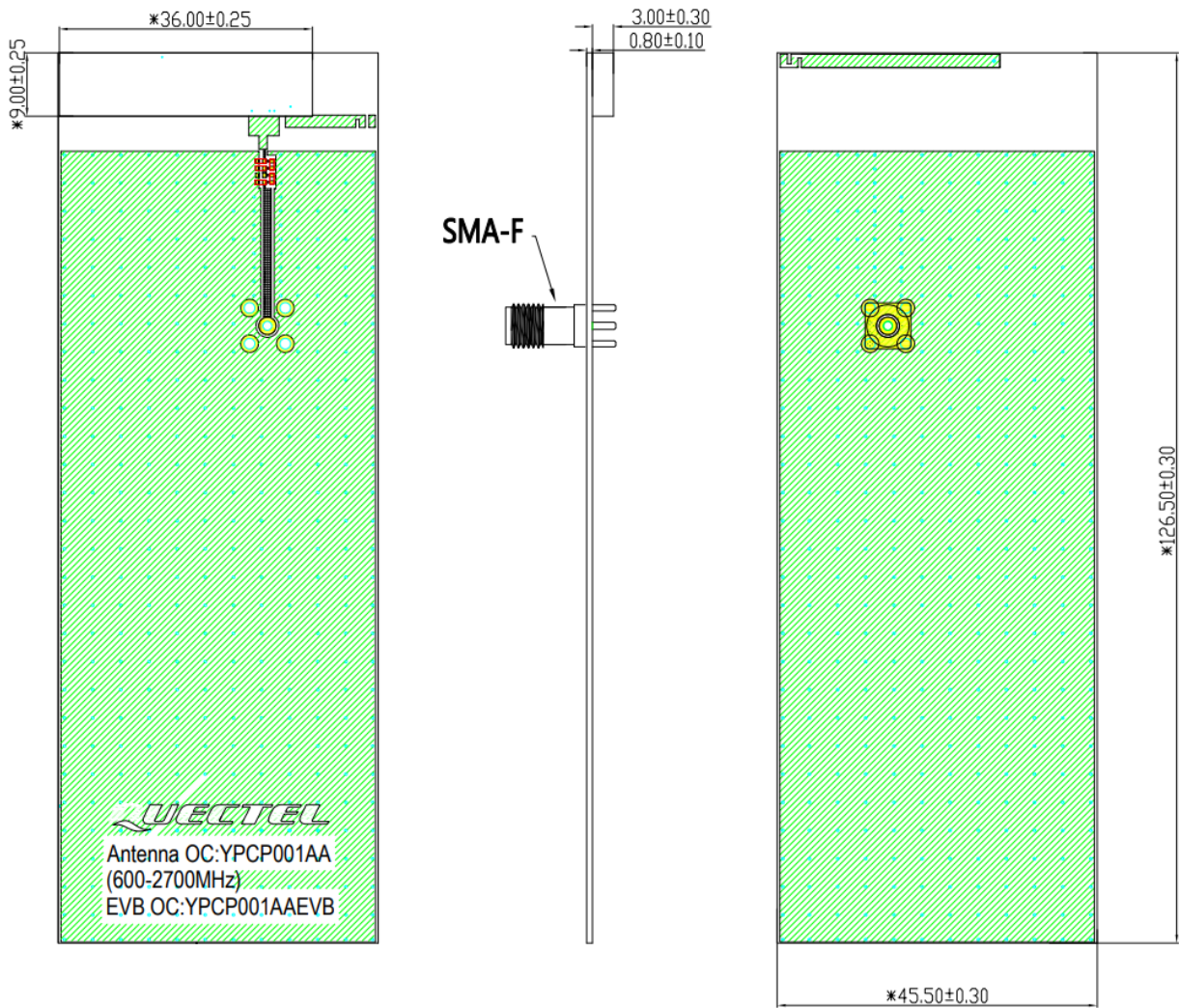
2 Drawing

2.1. Antenna



All dimensions in (mm)

2.2. EVB

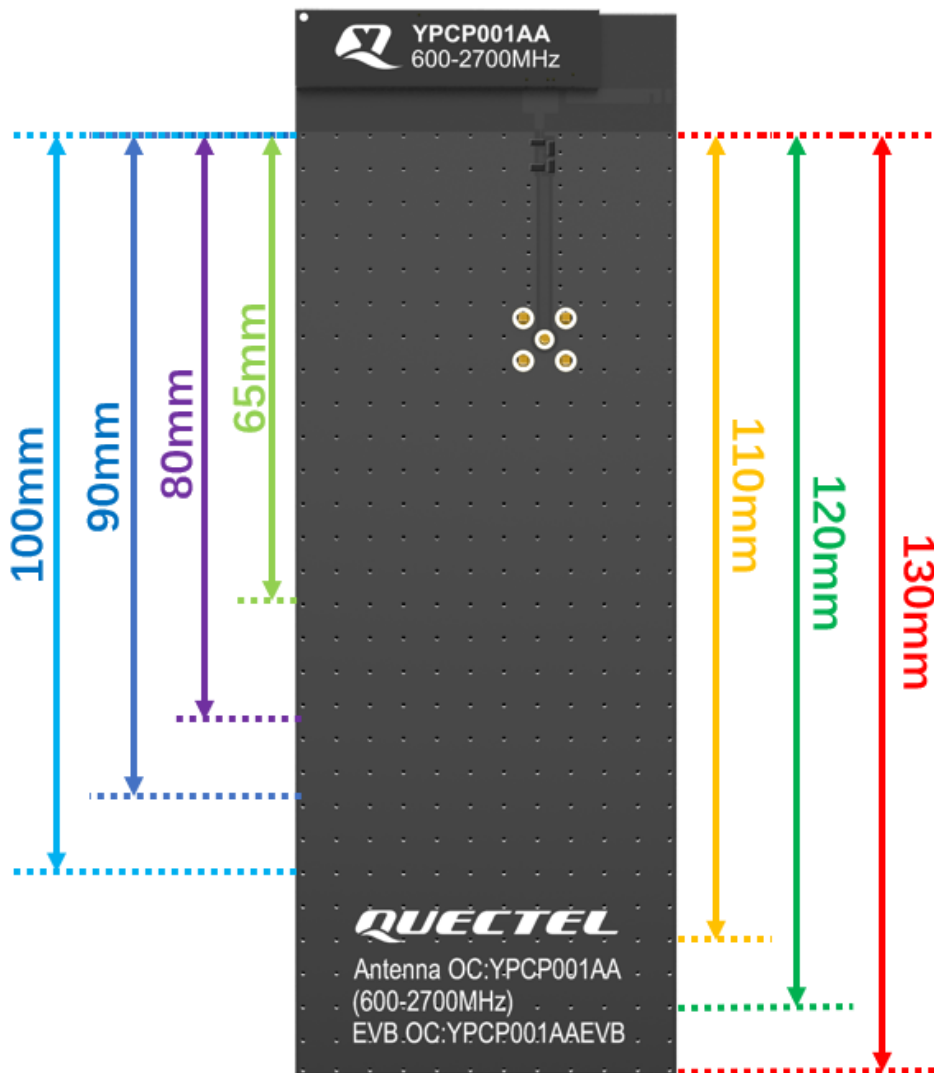


All dimensions in (mm)

3 Detailed Performance

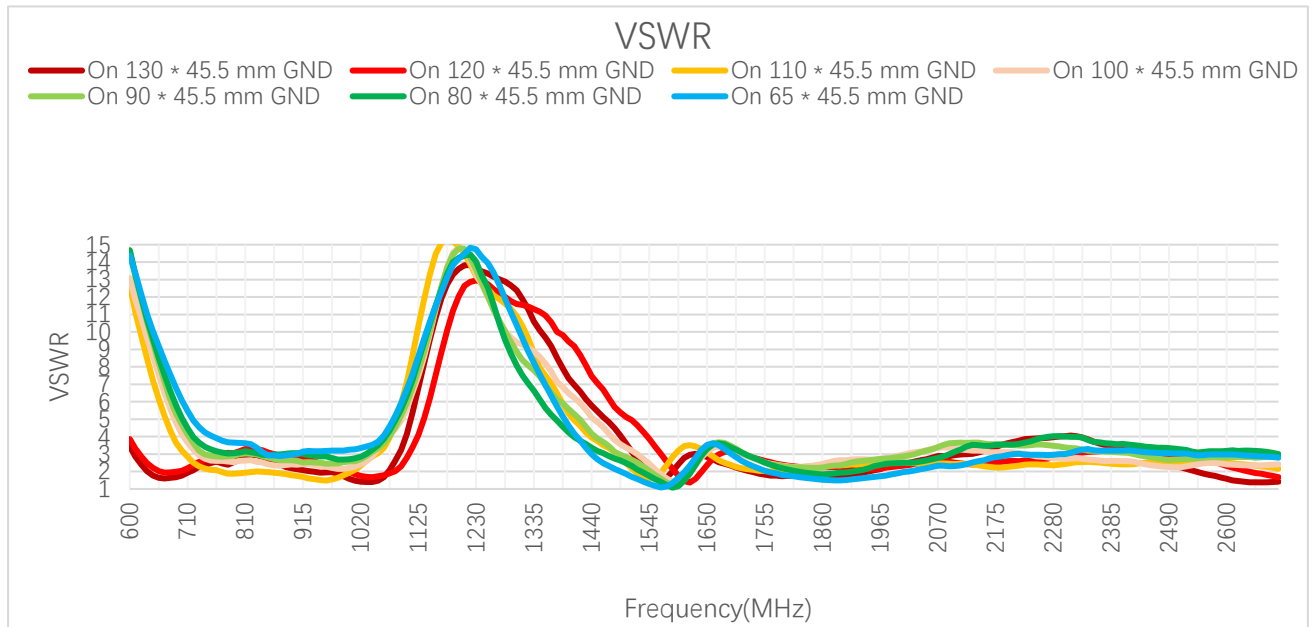
3.1. Overview

The performance of the low bands is highly dependent on the ground plane length. The host PCB ground needs to be as long as the device allows. Reducing the GND directly relates to the performance of the low bands. As shown below you can see the effect of the GND plane length vs the efficiency.



3.2. S-Parameter Test

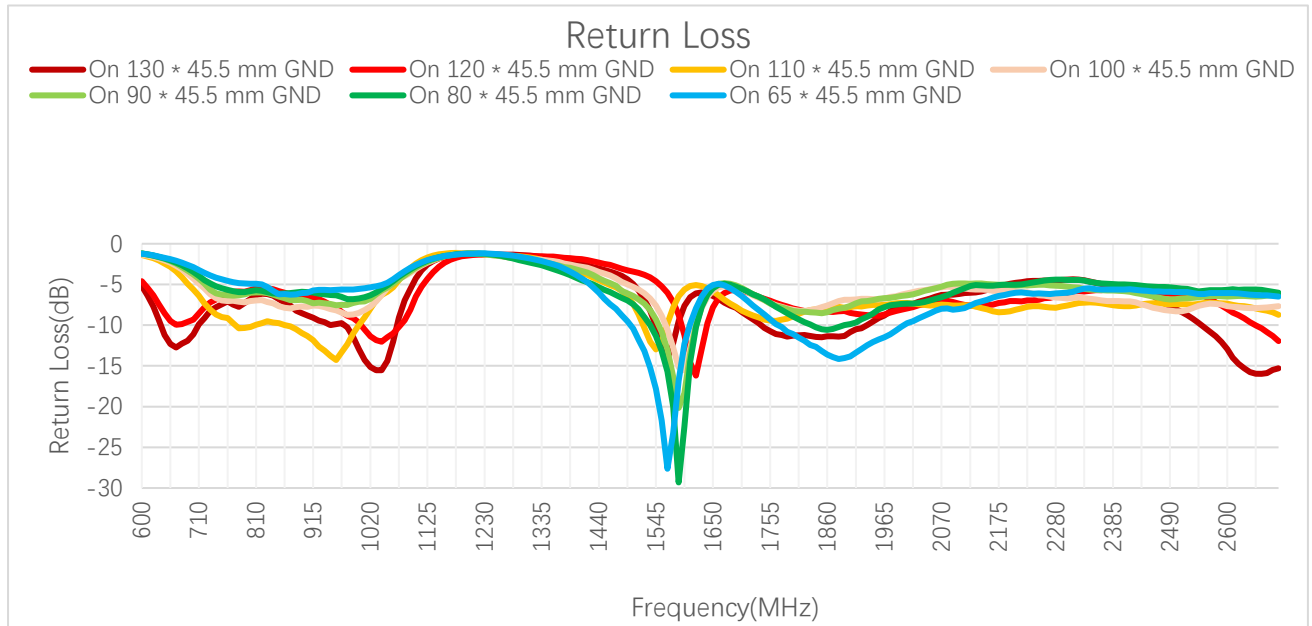
3.2.1. VSWR



VSWR

Frequency (MHz)	630	710	830	900	1740	1880	1950	2140	2450	2600
On 130 × 45.5 mm GND	2.0	1.9	2.9	2.1	1.9	1.7	2.1	3.1	3.0	1.6
On 120 × 45.5 mm GND	2.5	2.2	3.3	2.8	2.7	2.3	2.1	2.4	3.1	2.3
On 110 × 45.5 mm GND	8.5	2.8	2.0	1.7	2.0	2.4	2.5	2.3	2.5	2.5
On 100 × 45.5 mm GND	9.7	3.7	2.6	2.4	2.6	2.6	2.7	3.2	2.4	2.4
On 90 × 45.5 mm GND	10.6	4.1	3.0	2.6	2.6	2.3	2.7	3.7	2.9	2.8
On 80 × 45.5 mm GND	10.7	4.5	3.0	3.0	2.7	1.9	2.3	3.5	3.4	3.2
On 65 × 45.5 mm GND	11.0	5.5	3.4	3.0	2.2	1.5	1.7	2.6	3.1	3.0

3.2.2. Return Loss

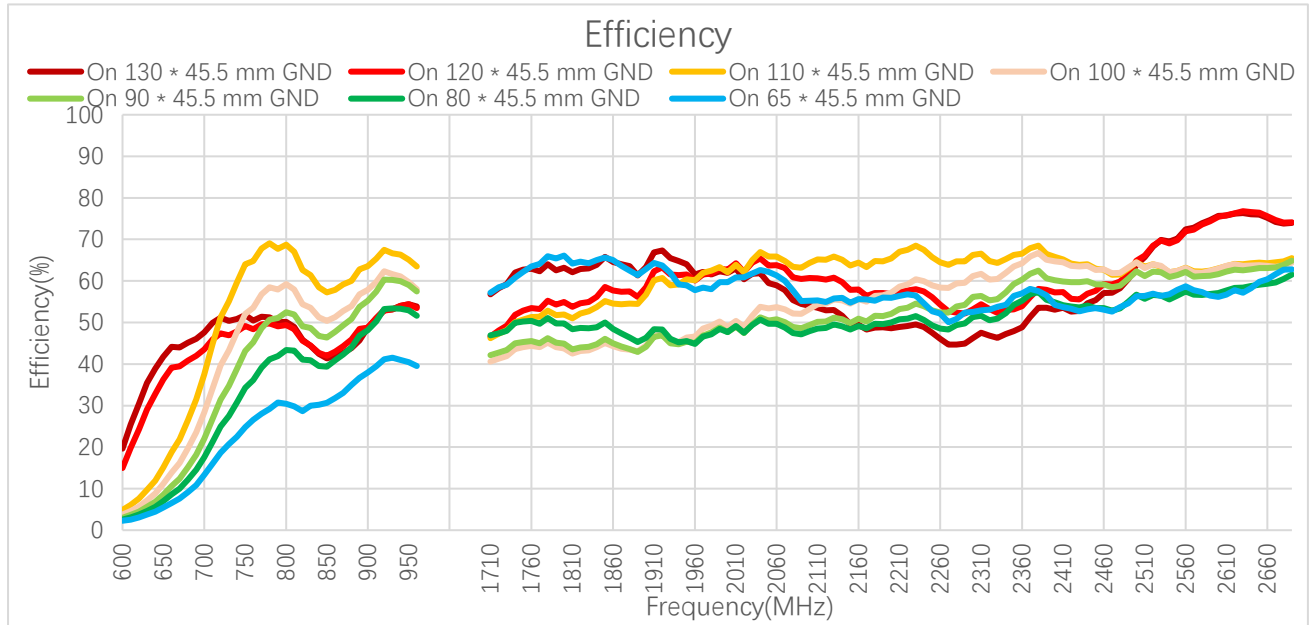


Return Loss (dB)

Frequency (MHz)	630	710	830	900	1740	1880	1950	2140	2450	2600
On 130 × 45.5 mm GND	-9.4	-9.9	-6.2	-8.8	-10.3	-11.4	-9.1	-5.9	-6.1	-12.9
On 120 × 45.5 mm GND	-7.4	-8.6	-5.5	-6.5	-6.8	-8.3	-8.8	-7.6	-5.9	-8.0
On 110 × 45.5 mm GND	-2.1	-6.4	-9.5	-11.3	-9.3	-7.8	-7.5	-7.9	-7.4	-7.3
On 100 × 45.5 mm GND	-1.8	-4.9	-7.2	-7.7	-6.9	-7.0	-6.8	-5.6	-7.6	-7.7
On 90 × 45.5 mm GND	-1.6	-4.3	-6.1	-7.0	-6.9	-8.0	-6.8	-4.9	-6.3	-6.5
On 80 × 45.5 mm GND	-1.6	-3.9	-5.9	-5.9	-6.9	-10.2	-8.1	-5.1	-5.2	-5.7
On 65 × 45.5 mm GND	-1.6	-3.2	-5.3	-6.0	-8.7	-14.2	-11.8	-7.1	-5.8	-6.1

3.3. Radiation Performance Test

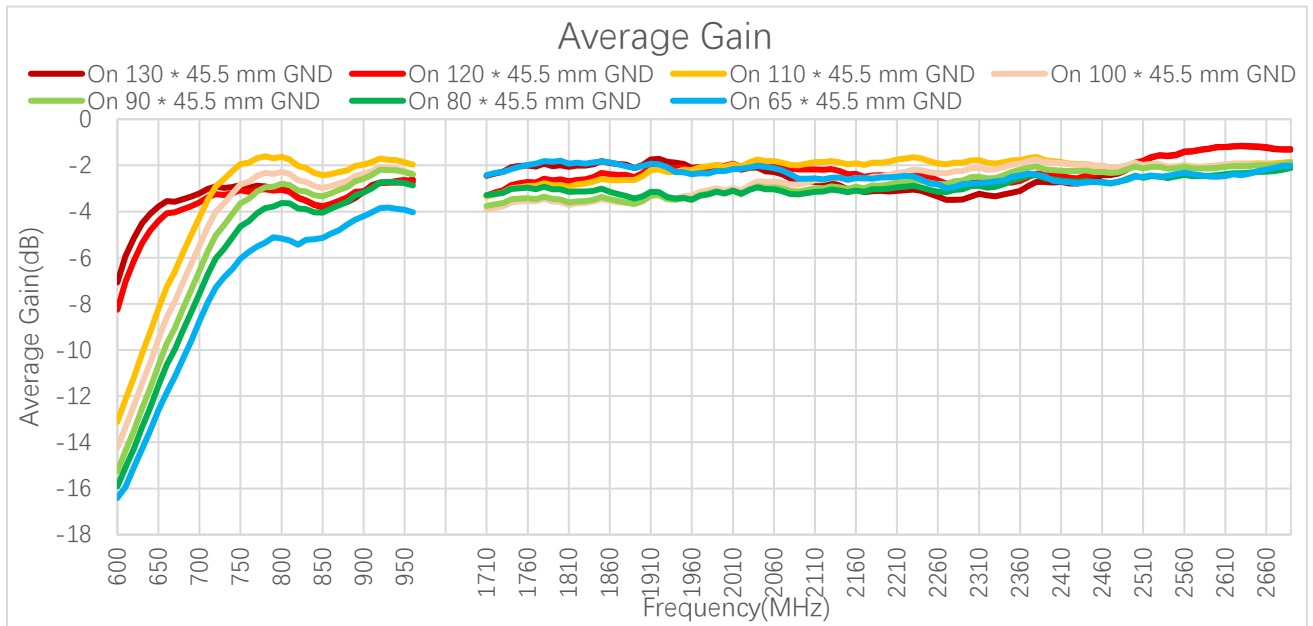
3.3.1. Efficiency



Efficiency (%)

Frequency (MHz)	630	710	830	900	1740	1880	1950	2140	2450	2600
On 130 × 45.5 mm GND	35.4	49.9	44.4	48.8	62.0	63.5	64.0	51.6	55.4	75.7
On 120 × 45.5 mm GND	29.1	46.0	44.4	48.8	51.9	57.5	61.6	59.7	57.6	75.4
On 110 × 45.5 mm GND	9.7	44.8	61.4	63.5	50.1	54.6	60.4	65.1	63.0	63.0
On 100 × 45.5 mm GND	7.2	34.2	53.6	57.9	43.6	43.4	46.4	55.3	62.6	62.9
On 90 × 45.5 mm GND	5.6	26.8	48.7	55.2	45.0	43.6	45.4	50.8	59.2	61.6
On 80 × 45.5 mm GND	4.6	21.3	40.9	48.1	49.9	46.4	45.6	49.1	53.4	57.1
On 65 × 45.5 mm GND	3.7	16.0	30.0	38.0	60.8	62.5	58.9	56.0	53.5	56.2

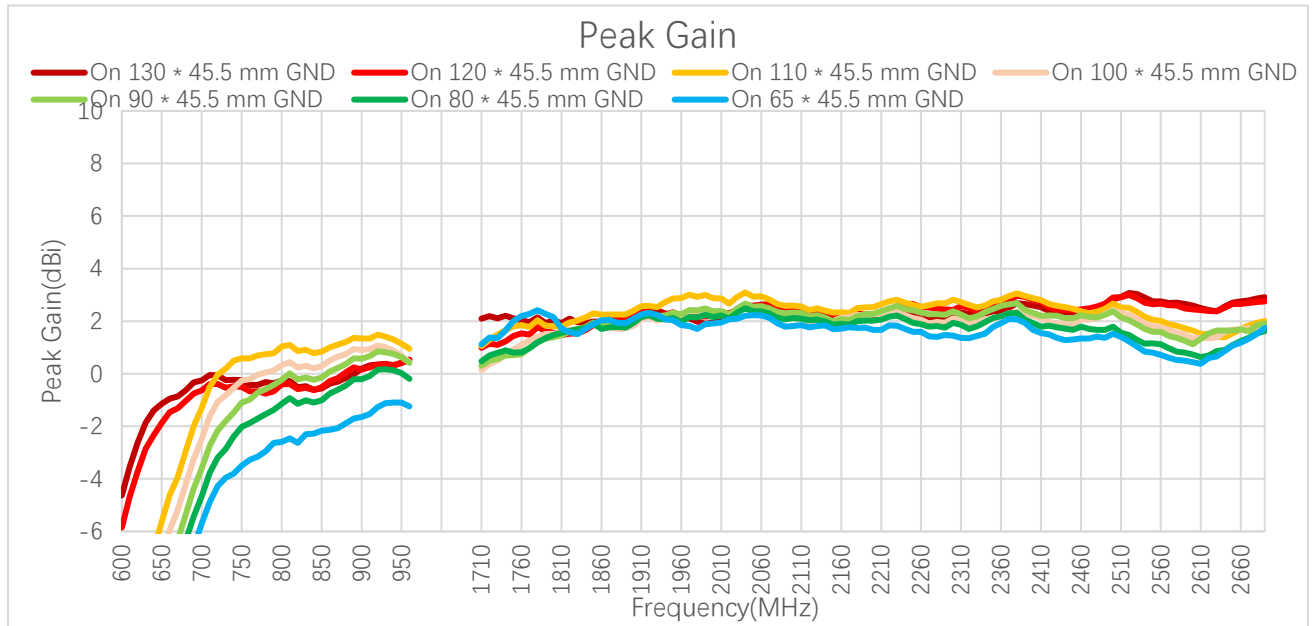
3.3.2. Average Gain



Average Gain (dB)

Frequency (MHz)	630	710	830	900	1740	1880	1950	2140	2450	2600
On 130 × 45.5 mm GND	-4.5	-3.0	-3.5	-3.1	-2.1	-2.0	-1.9	-2.9	-2.6	-1.2
On 120 × 45.5 mm GND	-5.4	-3.4	-3.5	-3.1	-2.9	-2.4	-2.1	-2.2	-2.4	-1.2
On 110 × 45.5 mm GND	-10.2	-3.5	-2.1	-2.0	-3.0	-2.6	-2.2	-1.9	-2.0	-2.0
On 100 × 45.5 mm GND	-11.4	-4.7	-2.7	-2.4	-3.6	-3.6	-3.3	-2.6	-2.0	-2.0
On 90 × 45.5 mm GND	-12.5	-5.7	-3.1	-2.6	-3.5	-3.6	-3.4	-3.0	-2.3	-2.1
On 80 × 45.5 mm GND	-13.3	-6.7	-3.9	-3.2	-3.0	-3.3	-3.4	-3.1	-2.7	-2.4
On 65 × 45.5 mm GND	-14.3	-8.0	-5.2	-4.2	-2.2	-2.0	-2.3	-2.5	-2.7	-2.5

3.3.3. Peak Gain

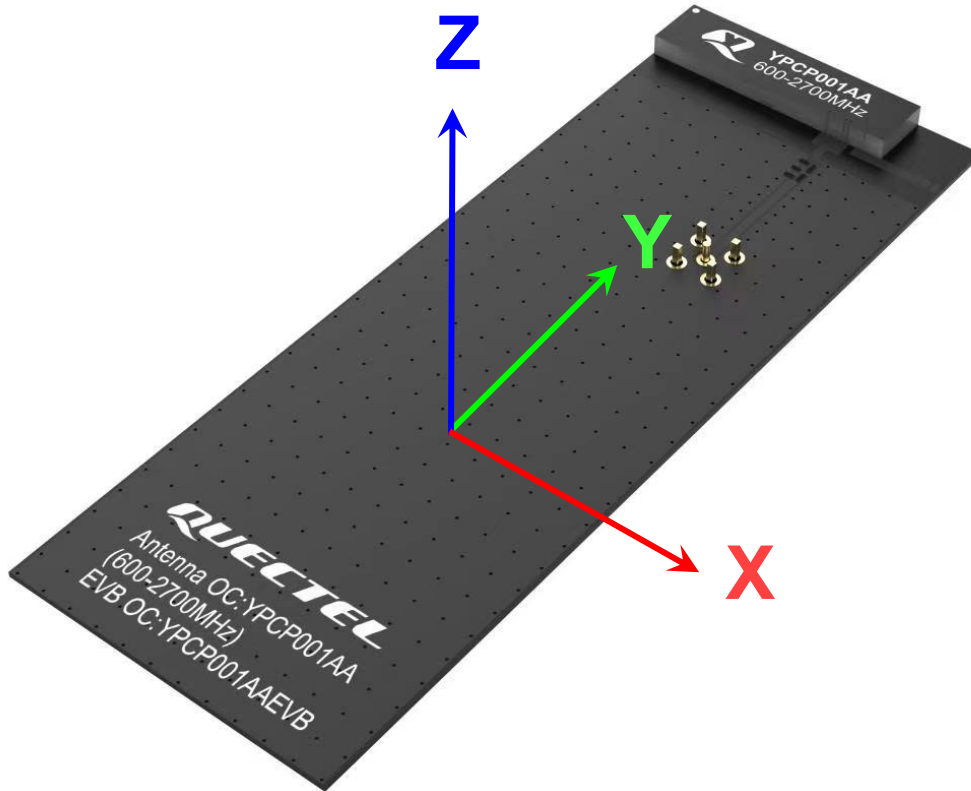


Peak Gain (dBi)

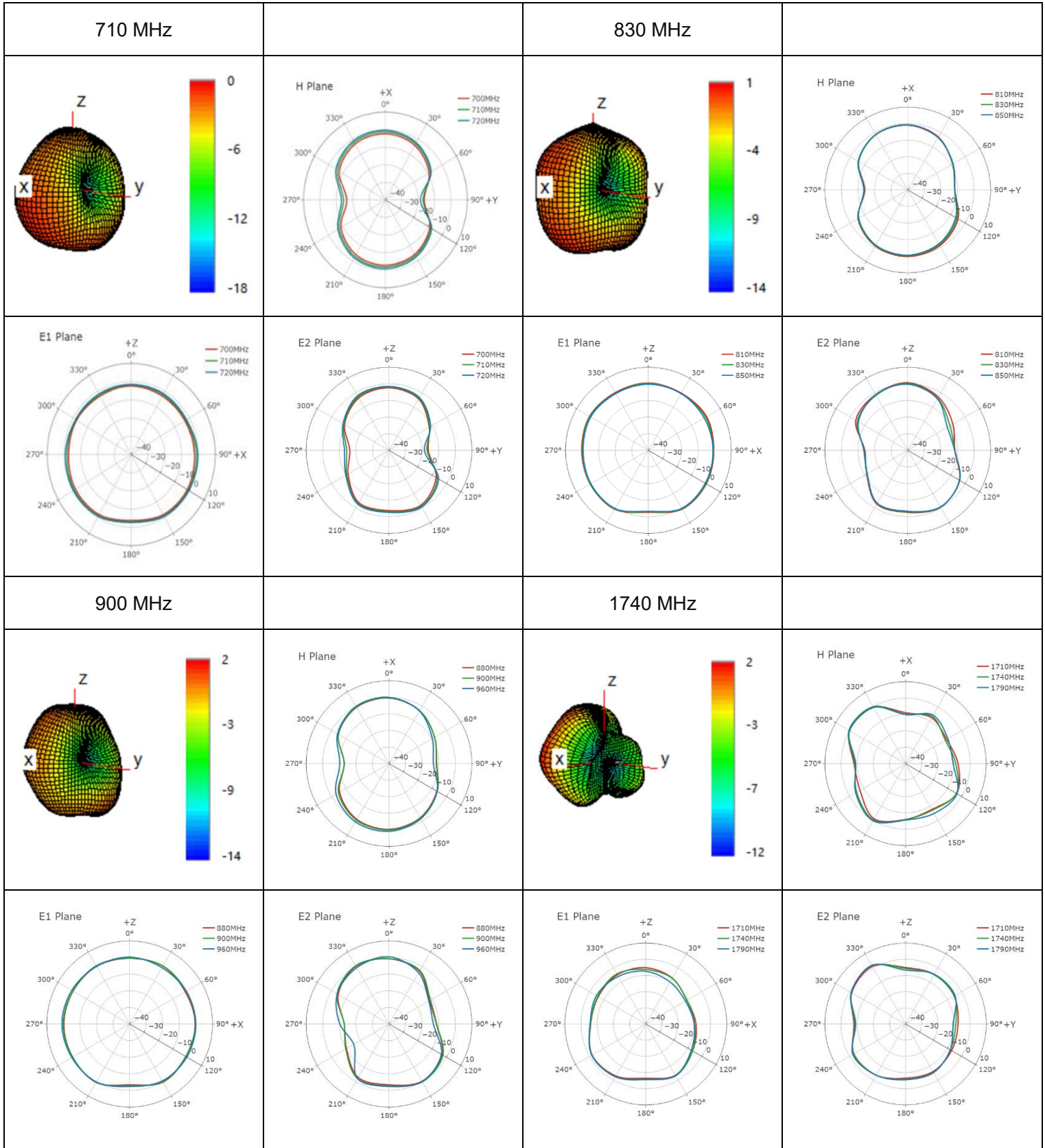
Frequency (MHz)	630	710	830	900	1740	1880	1950	2140	2450	2600
On 130 × 45.5 mm GND	-1.9	-0.1	-0.5	0.2	2.2	2.2	2.3	2.2	2.3	2.6
On 120 × 45.5 mm GND	-2.9	-0.4	-0.5	0.2	1.2	2.1	2.3	2.3	2.4	2.5
On 110 × 45.5 mm GND	-7.7	-0.5	0.9	1.3	1.7	2.3	2.9	2.4	2.5	1.6
On 100 × 45.5 mm GND	-9.1	-1.6	0.3	0.9	0.7	1.7	2.3	2.0	1.9	1.3
On 90 × 45.5 mm GND	-10.1	-2.7	-0.1	0.6	0.7	1.8	2.3	2.1	2.1	1.1
On 80 × 45.5 mm GND	-10.8	-3.8	-1.0	-0.2	0.9	1.8	2.1	2.0	1.7	0.7
On 65 × 45.5 mm GND	-11.7	-4.9	-2.3	-1.6	1.7	1.9	2.0	1.8	1.3	0.4

3.3.4. 3D & 2D Radiation Pattern

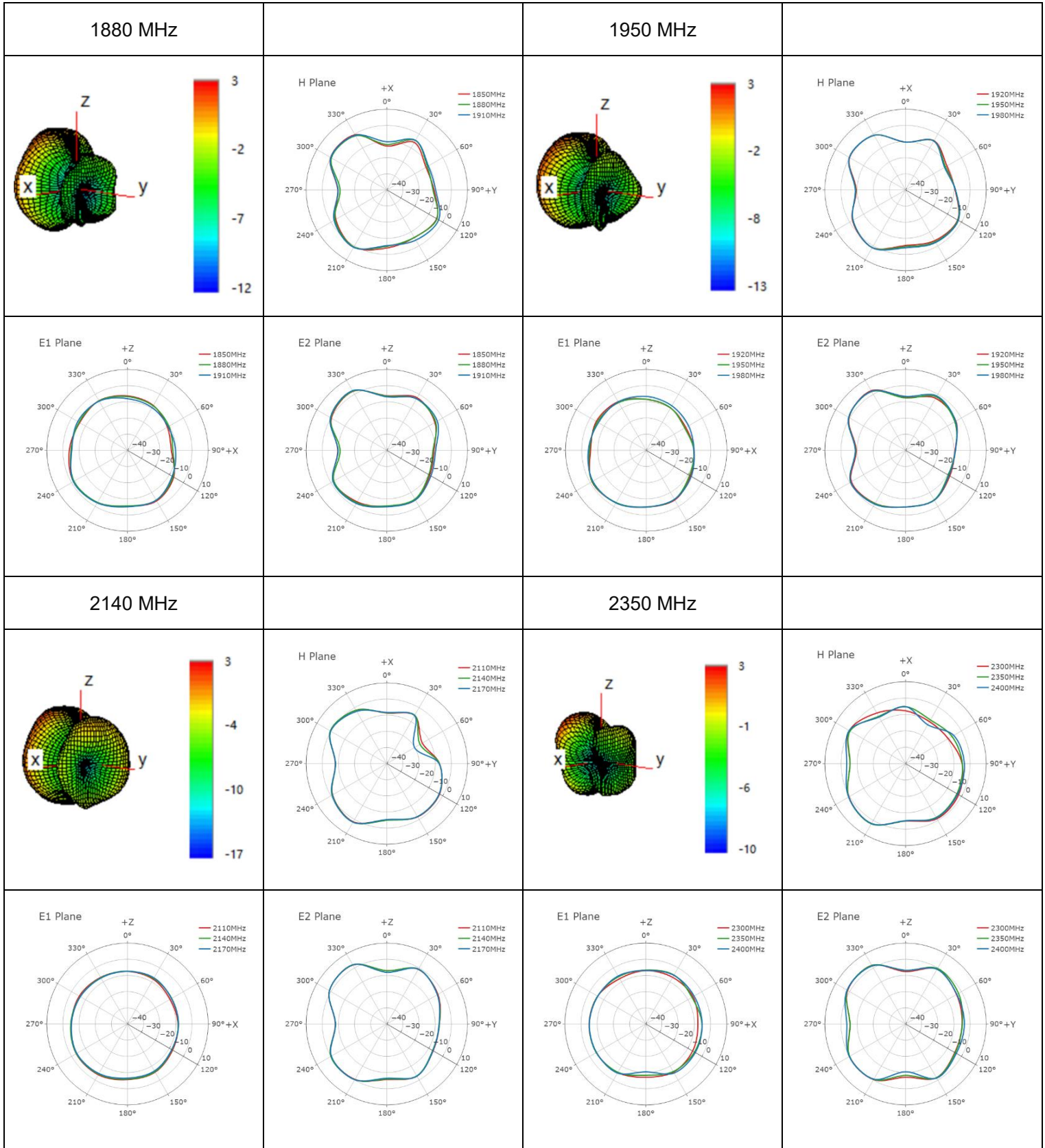
- Test Status: Assembled on 110 × 45.5 × 0.8mm GND



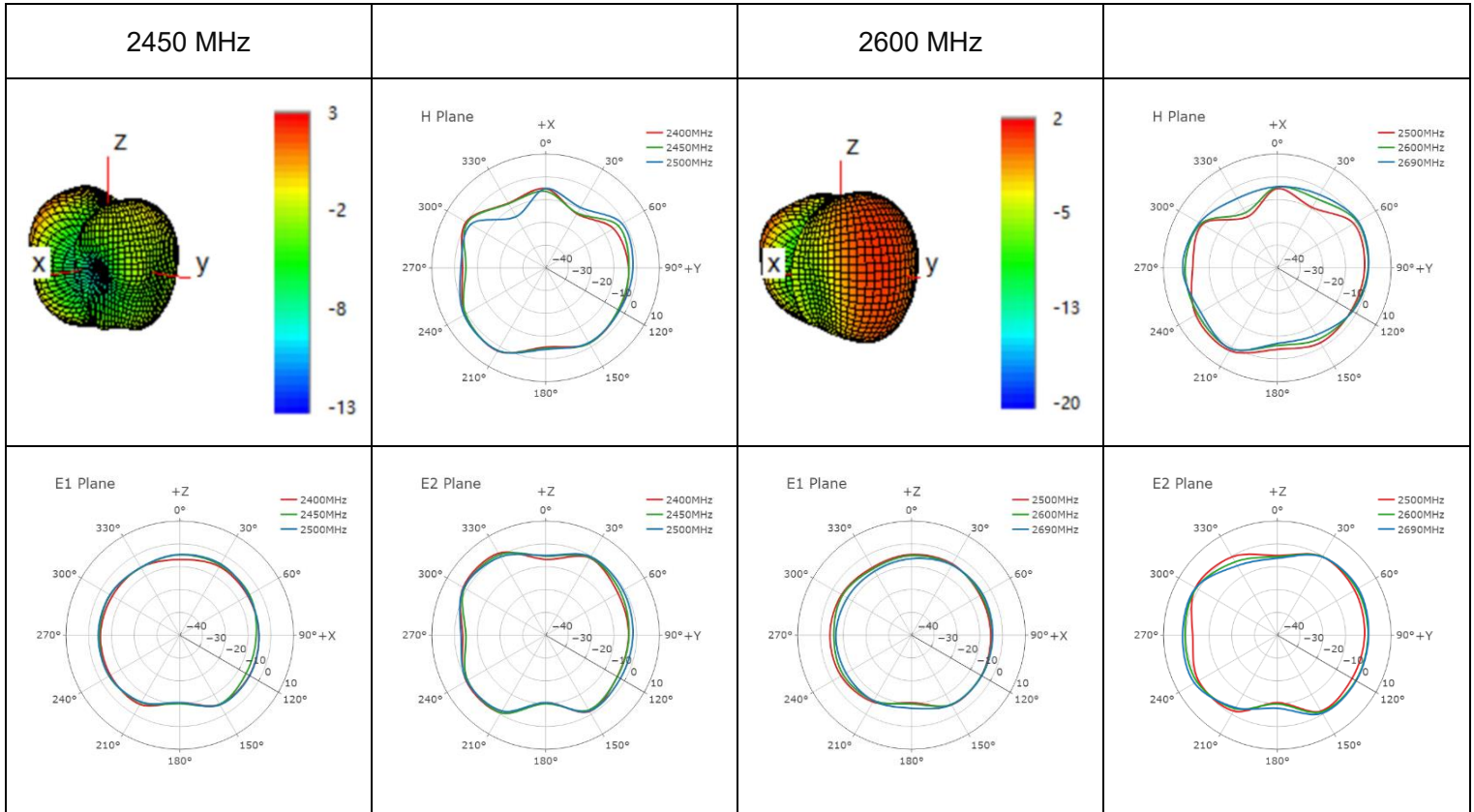
● 4G



● 4G



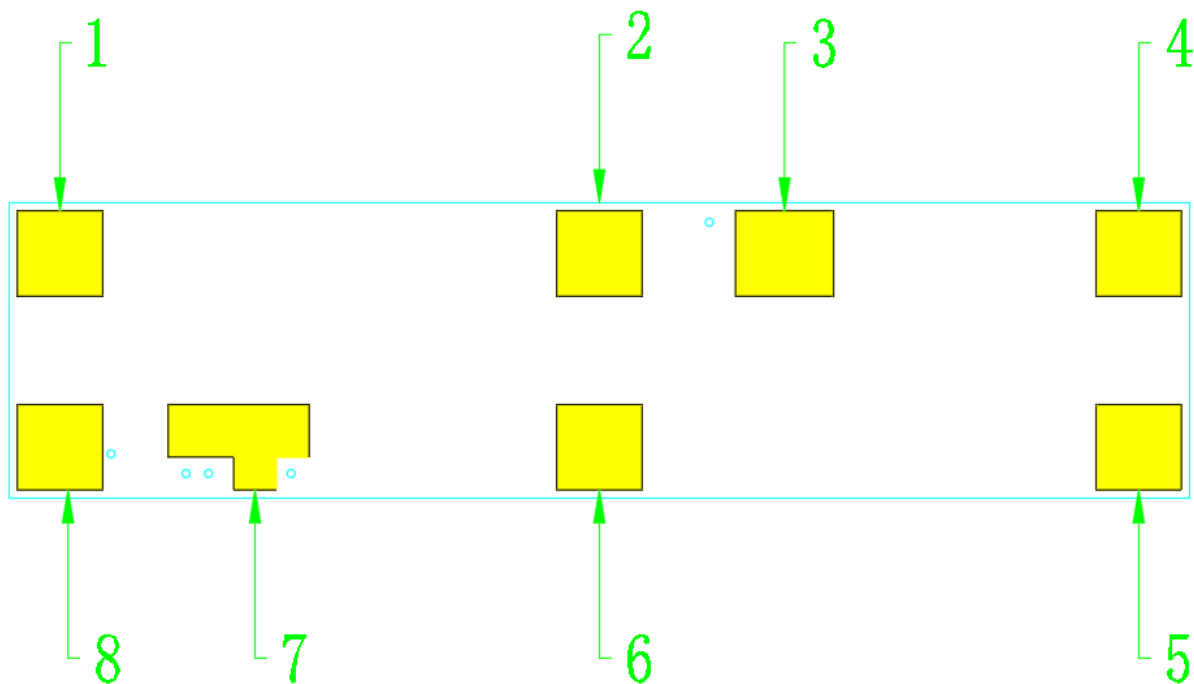
● 4G



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 8 pins, only three of which work. All other pins are for mechanical strength.

Pin	Description
7	Feed
1, 2, 4, 5, 6	Not used (Mechanical only)
3, 8	Antenna Tuning



5 Transmission Line

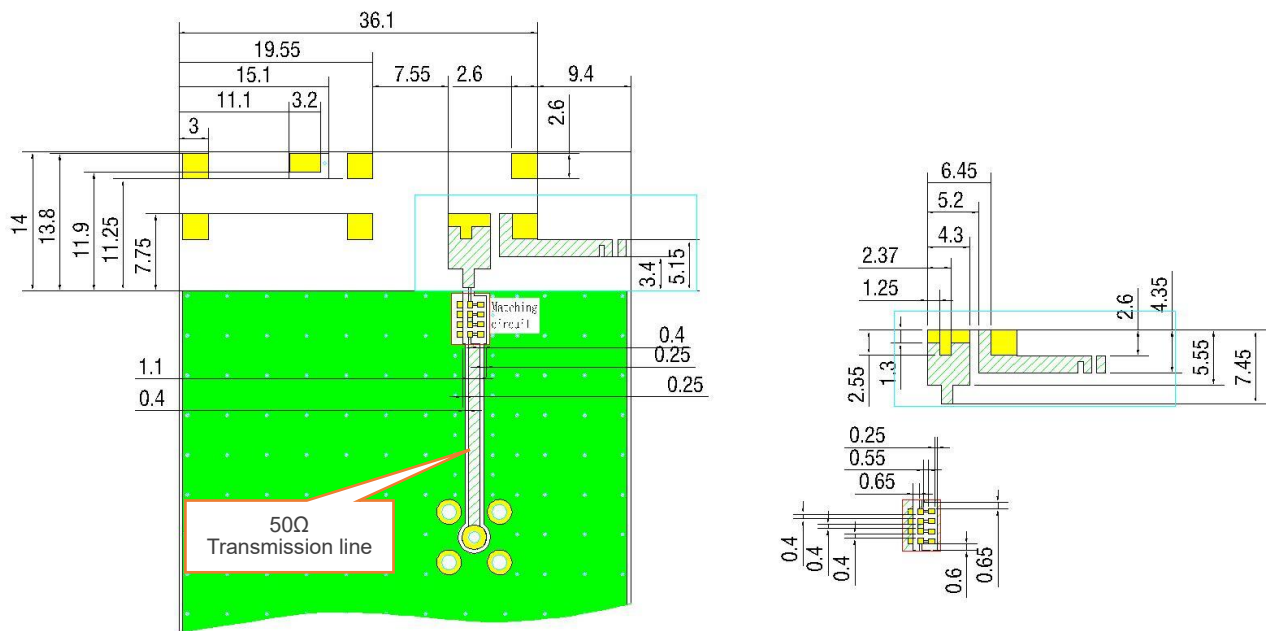
The characteristic impedance of all transmission lines shall be designed as 50 Ω .

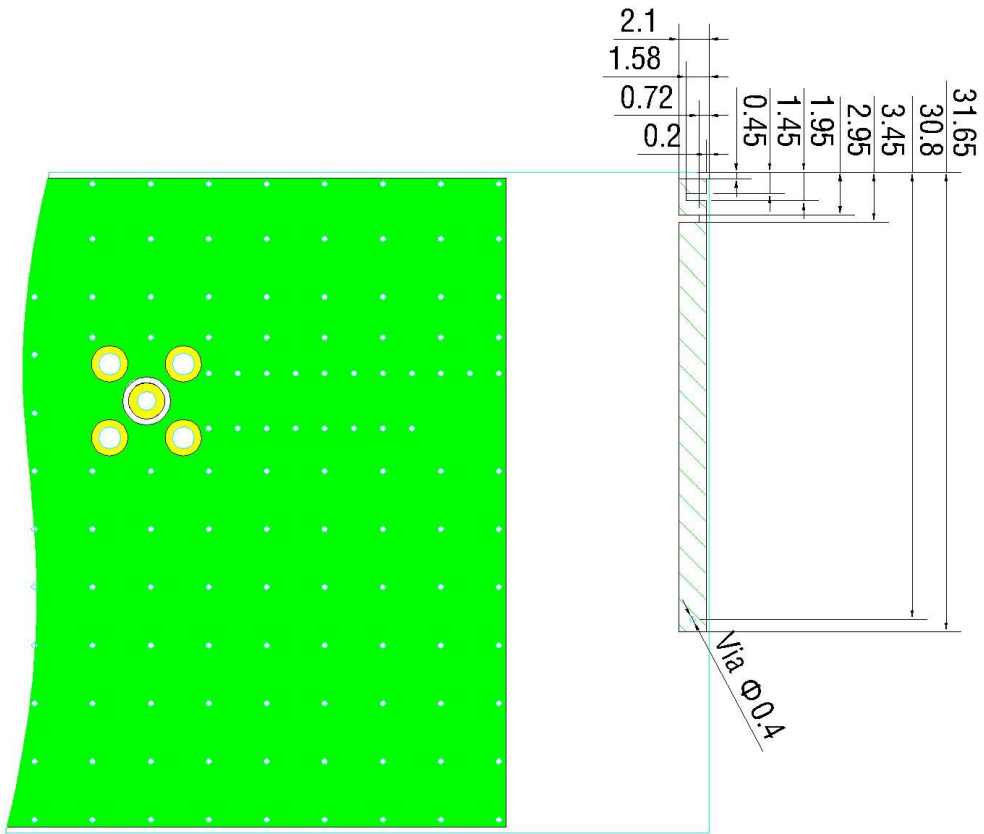
- The length of the transmission lines should be kept as short as possible.
- Any other part of the RF system, such as transceiver, power amplifiers, etc., shall also be designed with an impedance of 50 Ω .

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 Ω .

6 Recommended PCB Layout

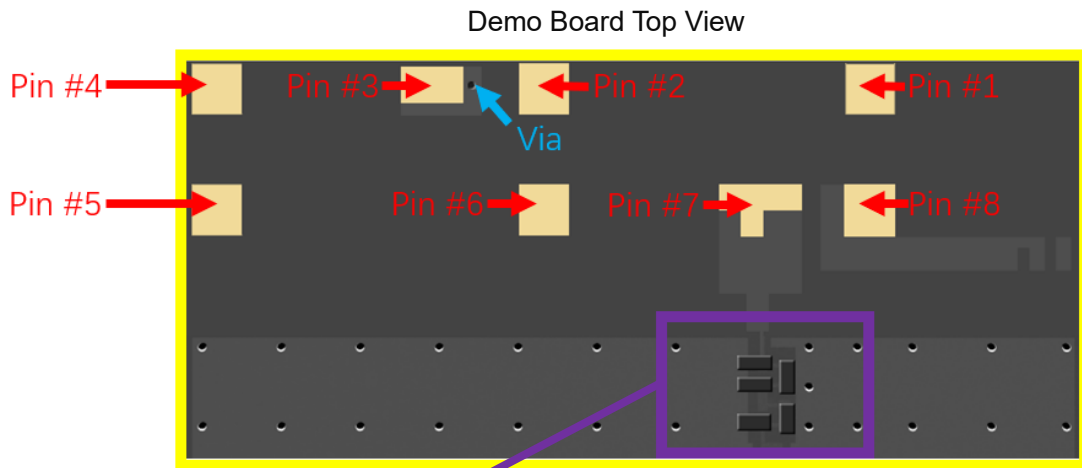
The host PCB must be designed using the PCB footprint shown with the correct clearances. An example of the PCB layout shows the antenna footprint. Please note this clearance area is critical to the performance of the antenna and must be applied through all layers of the PCB.



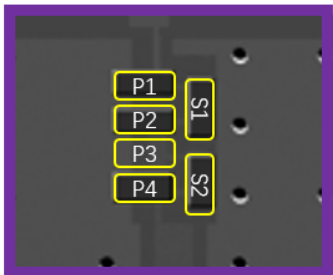


All dimensions in (mm)

7 Matching Circuit



Antenna Matching



Pads are directly connected to the antenna feed trace.

GND Length \leq 110 mm

	P1	S1	P2	P3	S2	P4
Default Matching	7.5 nH	4.7 pF	0.5 pF	DNI	0 Ohm	0.5 pF
Tolerance	$\pm 5 \%$	$\pm 5 \%$	$\pm 5 \%$	N/A		$\pm 5 \%$

GND length $>$ 110 mm

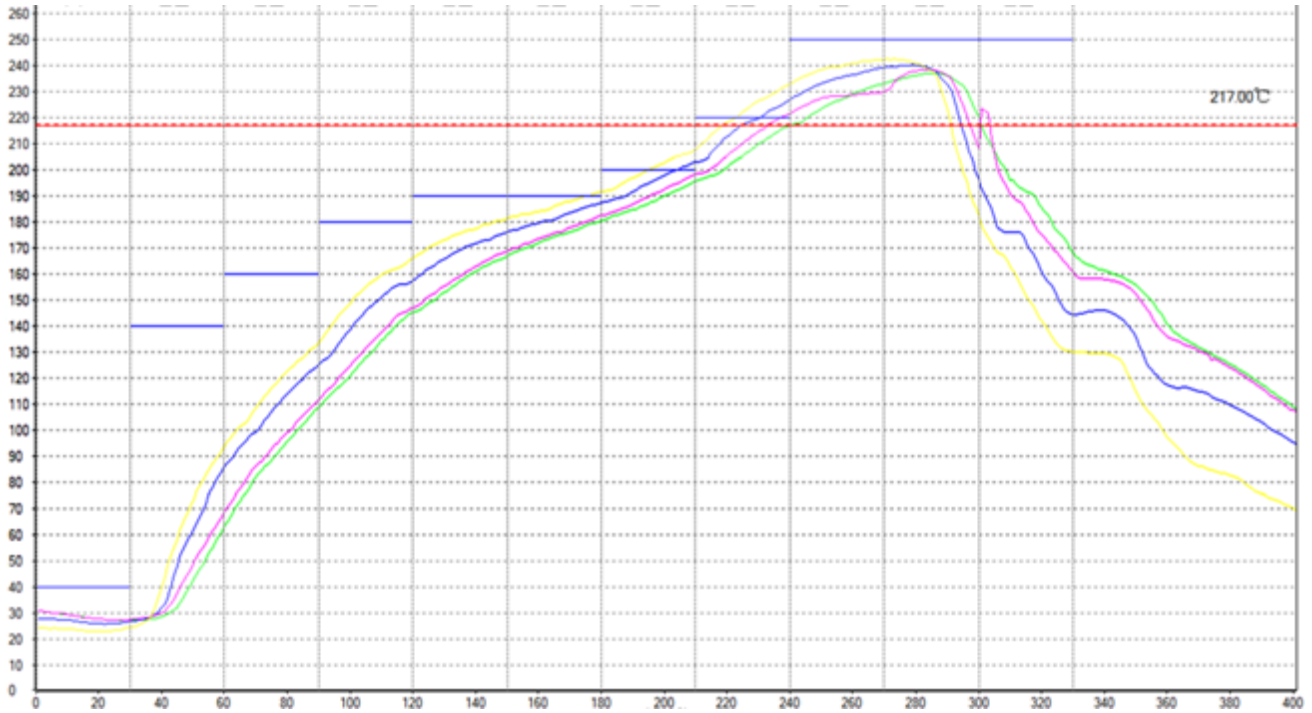
	P1	S1	P2	P3	S2	P4
Default Matching	10 nH	2.7 pF	0.5 pF	DNI	0 Ohm	12 nH
Tolerance	$\pm 5 \%$	$\pm 5 \%$	$\pm 5 \%$	N/A		$\pm 5 \%$

Pin #	Description
7	Feed
1, 2, 4, 5, 6	Dummy Pad
3, 8	Antenna Tuning

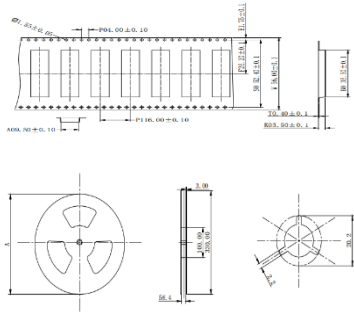
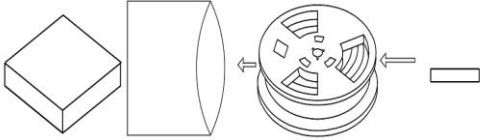
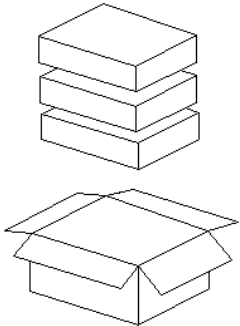
8 Soldering Temperature

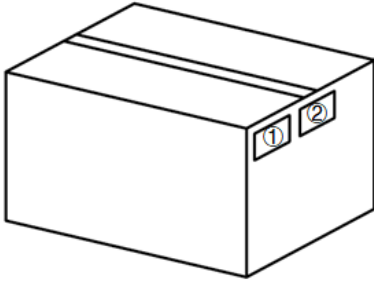
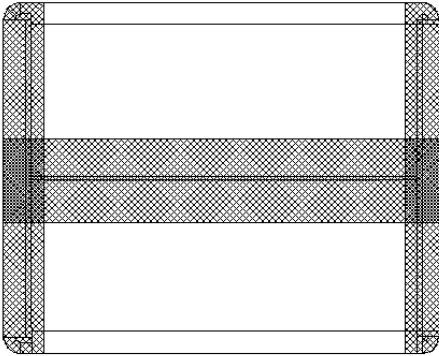
Phase	Profile Features	PB-Free Assembly
RAMP-UP	Avg. Ramp-up Rate (T _{smax} to T _p)	3 °C/second (Max.)
PREHEAT	Temperature Min (T _{smin}) Temperature Max (T _{smax}) Time (t _{smin} to t _{smax})	150 °C 190 °C 110 seconds (Max.)
REFLOW	Temperature (TL) Total Time above TL (tl)	220 °C 90 seconds (Max.)
PEAK	Temperature (T _p)	230–250 °C
RAMP-DOWN	Rate	-1 °C/second (Max.)

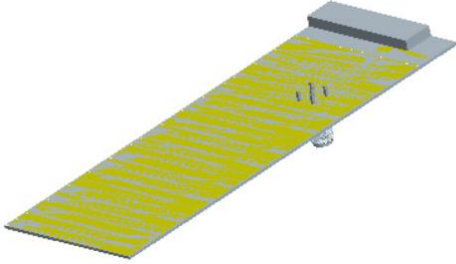
9 Reflow Profile

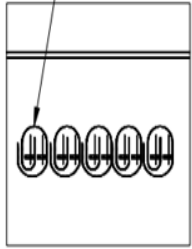
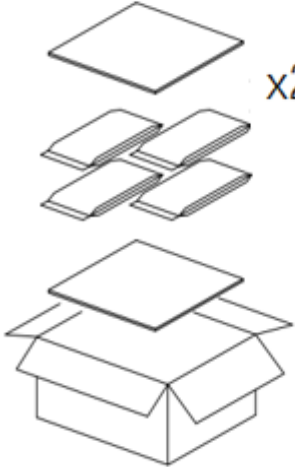
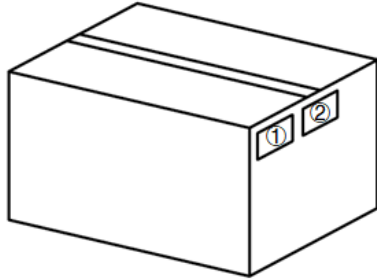
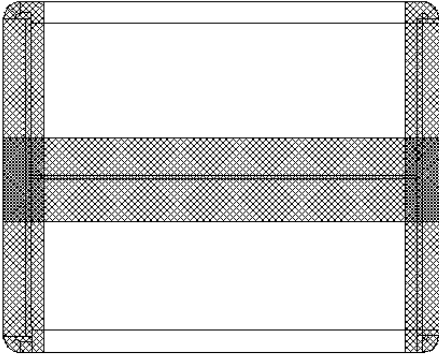


10 Packaging

Step	Packaging Picture / 2D Picture	Description
1		<p>Reel</p>
2		<p>1100 pcs Antenna Products/Reel Reel tape is vacuumed into the inner box.</p> <p><u>Inner Box Size:</u> <u>L × W × H = 340 × 340 × 70 mm</u></p>
3		<p>3 Inner Boxes Per Carton Box (3300 Antennas / Carton Box)</p> <p><u>Carton Size:</u> <u>L × W × H = 480 × 350 × 220 mm</u></p>

4		<p>Position for Attaching Labels</p> <ul style="list-style-type: none"> ① Carton Label ② Quality Label
5		<p>Sealing Cartons "I" type sealing cartons</p>

Step	Packaging Picture / 2D Picture	Description
1		Product Drawing

<p>2</p>	<p>Wrap 2 products with bubble film</p>  <p>10pcs/bag</p>	<p>Wrap Every 2 Pieces in Bubble Film 10 Antenna Products in a PE Bag</p> <p><u>PE Bag Size: L × W = 280 × 200 mm</u></p>
<p>3</p>	 <p>x20 bag</p>	<p>Place a Clapboard at the Bottom and Top (20 PE Bags Per Carton Box) (200 pcs Antennas Per Carton Box)</p> <p><u>Carton Size:</u> <u>L × W × H = 340 × 245 × 270 mm</u></p>
<p>4</p>		<p>Position for Attaching Labels</p> <p>① Carton Label ② Quality Label</p>
<p>5</p>		<p>Sealing Cartons "I" 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:

Quectel Wireless Solutions Co., Ltd.

Building 5, Shanghai Business Park Phase III (Area B), No.1016 Tianlin Road, Minhang District, Shanghai 200233, China

Tel: +86 21 5108 6236

Email: info@quectel.com

Or our local offices. For more information, please visit:

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Revision History

Version	Date	Author	Note
-	2023-01-08	Andy YAN/ Joye WANG/ David LIU/ Vinnie LIU	Creation of the document
1.0	2023-01-08	Andy YAN/ Joye WANG/ David LIU/ Vinnie LIU	First official release
1.1	2023-04-10	Andy YAN/ Joye WANG/ David LIU/ Vinnie LIU	Updated the figure style.

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