Antenna Datasheet

Product OC: YPCP003BA
Product OC (Antenna + Rectangular EVB): YPCP003BAEVB

Version: 1.0
Date: 2024-01-03
Status: Released

Product Name: 4G SMD Antenna
Key Features:
Frequency band: 698–960 MHz, 1695–2200 MHz, 2300–2700 MHz
Peak efficiency: 77.5 % (On 85 × 36 mm GND)
Dimensions: 28 mm × 8 mm × 3 mm
SMD - supplied tape and reel
RoHS and REACH compliant

Overview

Quectel internal 4G SMD antenna covers 4G LTE main bands, and is compatible with 3G/2G/LPWA frequency bands.

SMD (Surface Mounted Device) is a packaging technology that mounts electronic components directly on the surface of a printed circuit board.

Internal 4G SMD antenna usually needs two L-matching circuits reserved on the motherboard, which can be adjusted to make the antenna better fit each product.

Overall, internal 4G SMD type antenna is a high-performance antenna design for wireless communication. Due to the surface mount device and built-in design, the antenna is compact and lightweight, and is suitable for a variety of devices and applications that require efficient wireless communication.

Contents

1 Specification

Test Condition: Assembled On EVB

1.1. Electrical

Electrical	
Frequency Range	698–960 MHz, 1695–2200 MHz, 2300–2700 MHz
Impedance	50 Ω
Polarization	Linear
Radiation Pattern	Omni-directional

Electrical - Detail

Band / SPEC	Band	B71	B12 /B13 /B28	B5 /B8 /B26	B1 /B2 /B3	B40	WIFI 2G	B38 /B41
	Freq. (MHz)	600 – 700	700 – 810	820 – 960	1700 – 2170	2300 – 2400	2400 – 2500	2500 – 2690
Max VSWR	On 115 × 36 mm GND	-	6.5	2.8	3.4	1.7	1.4	2.7
	On 100 × 36 mm GND	-	6.6	3.1	3.7	1.7	1.5	2.6
	On 85 × 36 mm GND	-	8.3	4.4	4.0	1.8	1.8	2.7
	On 65 × 36 mm GND	-	8.6	5.2	2.8	2.3	1.5	2.8
	On 45 × 36 mm GND	-	8.6	4.4	2.5	1.5	1.4	2.5
Max Return Loss (dB)	On 115 × 36 mm GND	-	-2.7	-6.5	-5.3	-12.2	-16.0	-6.8
	On 100 × 36 mm GND	-	-2.6	-5.8	-4.9	-12.1	-14.5	-6.9
	On 85 × 36 mm GND	-	-2.1	-4.1	-4.5	-11.0	-10.9	-6.7

	On 65 × 36 mm GND	-	-2.0	-3.4	-6.5	-8.0	-13.7	-6.5
	On 45 × 36 mm GND	-	-2.0	-4.0	-7.3	-14.4	-14.9	-7.5
AVG Eff. (%)	**On 115 × 36 mm GND**	-	31.0	42.1	62.2	69.2	72.3	57.7
	On 100 × 36 mm GND	-	29.0	39.0	58.5	70.5	72.6	59.4
	On 85 × 36 mm GND	-	19.0	32.7	47.1	72.5	70.7	57.3
	On 65 × 36 mm GND		11.2	21.0	51.5	64.8	68.5	55.9
	On 45 × 36 mm GND		8.4	15.6	67.7	69.3	70.1	60.1
AVG Gain (dB)	**On 115 × 36 mm GND**	-	-5.4	-3.8	-2.1	-1.6	-1.4	-2.4
	On 100 × 36 mm GND	-	-5.7	-4.1	-2.4	-1.5	-1.4	-2.3
	On 85 × 36 mm GND	-	-7.7	-4.9	-3.3	-1.4	-1.5	-2.4
	On 65 × 36 mm GND		-10.0	-6.8	-2.9	-1.9	-1.6	-2.6
	On 45 × 36 mm GND		-11.2	-8.1	-1.7	-1.6	-1.5	-2.2
Max Peak Gain (dBi)	**On 115 × 36 mm GND**	-	-0.6	-0.3	3.3	3.7	3.4	3.2
	On 100 × 36 mm GND	-	-0.8	-0.6	2.8	3.3	3.1	2.9
	On 85 × 36 mm GND	-	-2.6	-1.6	2.1	2.7	2.3	1.4
	On 65 × 36 mm GND		-4.7	-3.8	1.8	2.5	2.2	1.8
	On 45 × 36 mm GND		-5.5	-4.6	2.2	2.0	1.6	1.3

VSWR	**On 115 × 36 mm GND**	≤ 6.5
	On 100 × 36 mm GND	≤ 6.6
	On 85 × 36 mm GND	≤ 8.3
	On 65 × 36 mm GND	≤ 8.6
	On 45 × 36 mm GND	≤ 8.6
Return Loss	**On 115 × 36 mm GND**	≤ -2.7 dB
	On 100 × 36 mm GND	≤ -2.6 dB
	On 85 × 36 mm GND	≤ -2.1 dB
	On 65 × 36 mm GND	≤ -2.0 dB

	On 45 × 36 mm GND	≤ -2.0 dB
Peak Gain	**On 115 × 36 mm GND**	≤ 3.7 dBi
	On 100 × 36 mm GND	≤ 3.3 dBi
	On 85 × 36 mm GND	≤ 2.7 dBi
	On 65 × 36 mm GND	≤ 2.5 dBi
	On 45 × 36 mm GND	≤ 2.2 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:

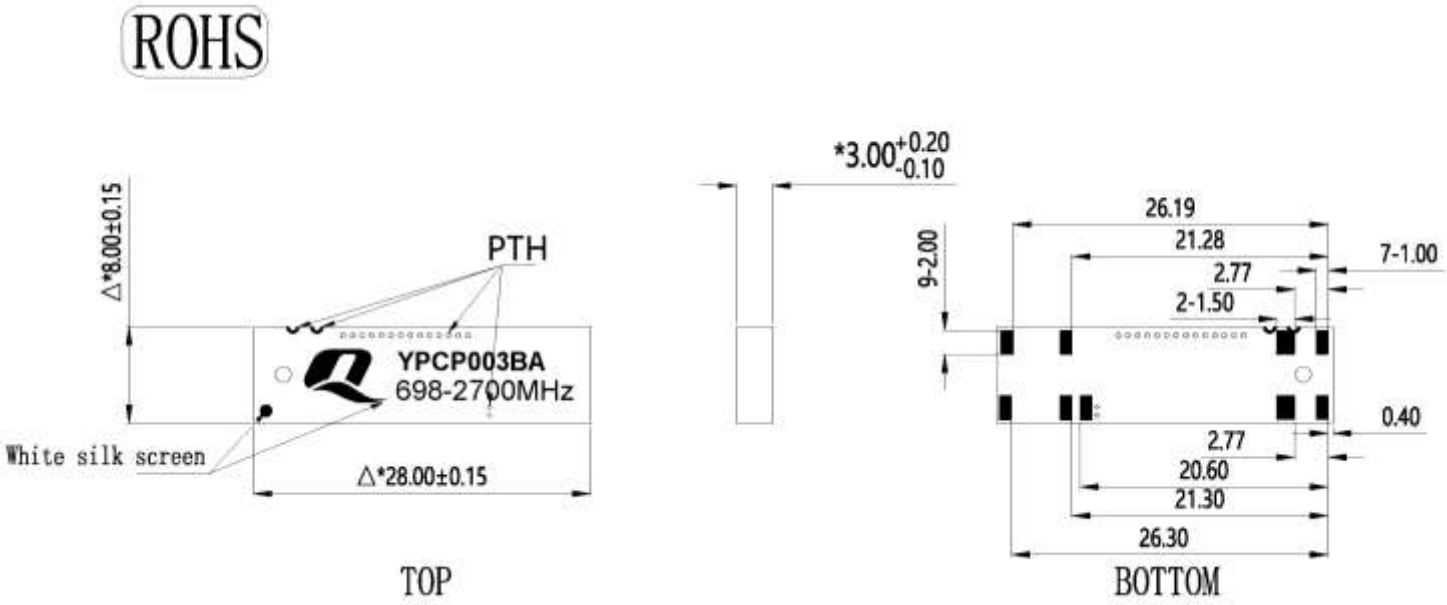
- Covered √ means efficiency > 20 %.
- Based on 115 mm × 36 mm GND.

1.3. Mechanical & Environmental

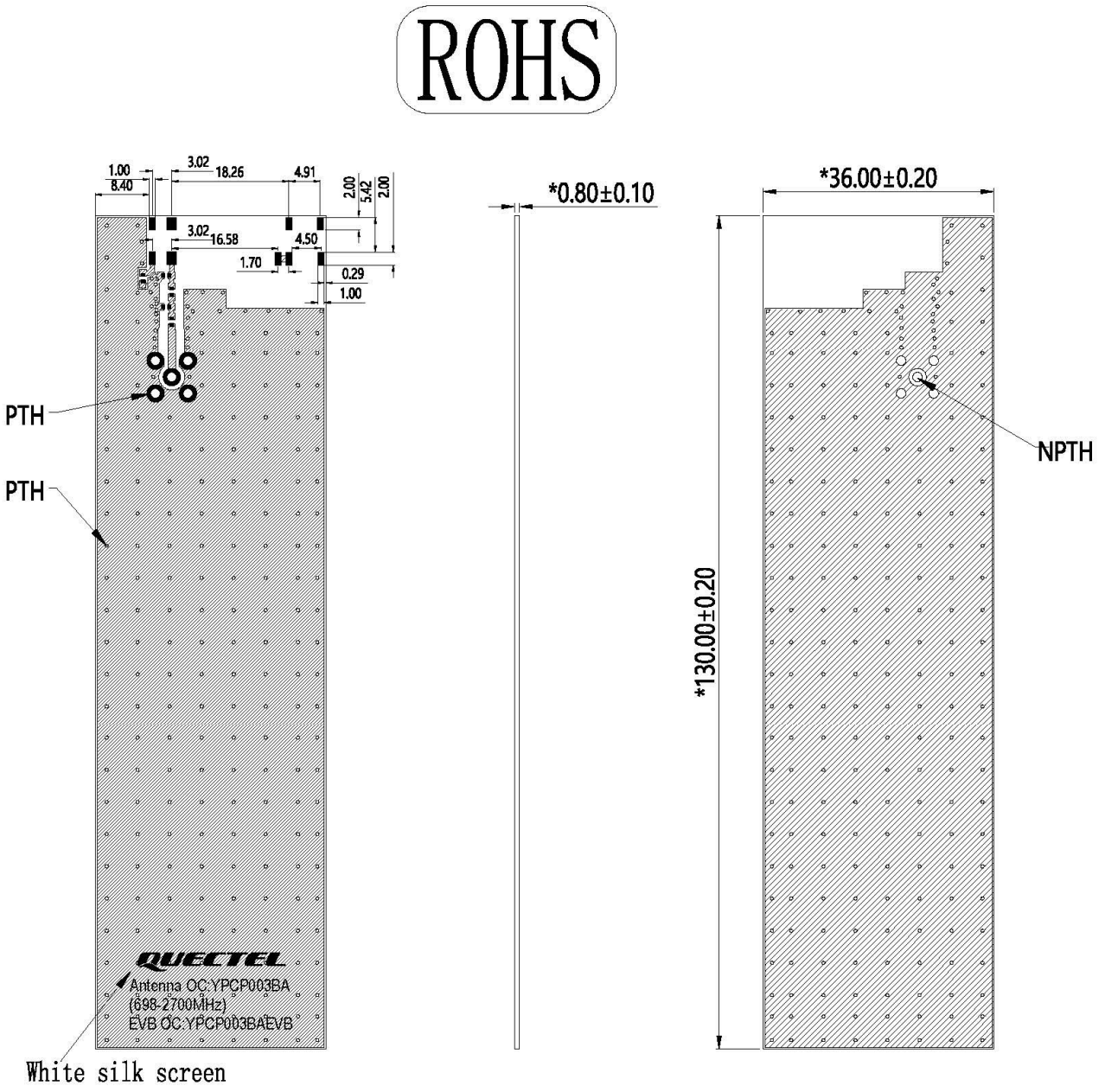
Mechanical	
Antenna Size	28 mm × 8 mm × 3 mm
Antenna Material & Color	FR4 & Black
Antenna Weight	Typ. 1.5 g
Mounting Type	SMD
Recommended EVB Size	130 mm × 36 mm
Environmental	
Operation Temperature	-40 °C to +85 °C
Storage Temperature	-40 °C to +85 °C
RoHS & REACH Compliant	Yes

2 Drawing

2.1. Antenna



2.2. EVB

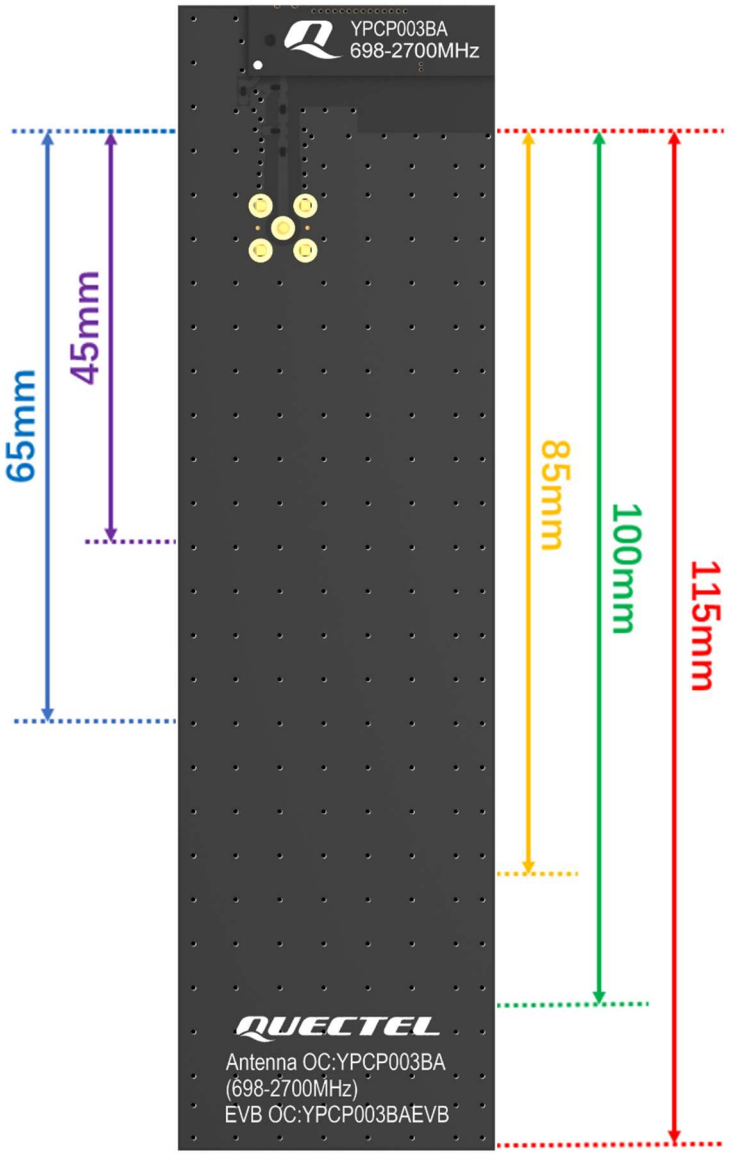


All dimensions are in mm

3 Detailed Performance

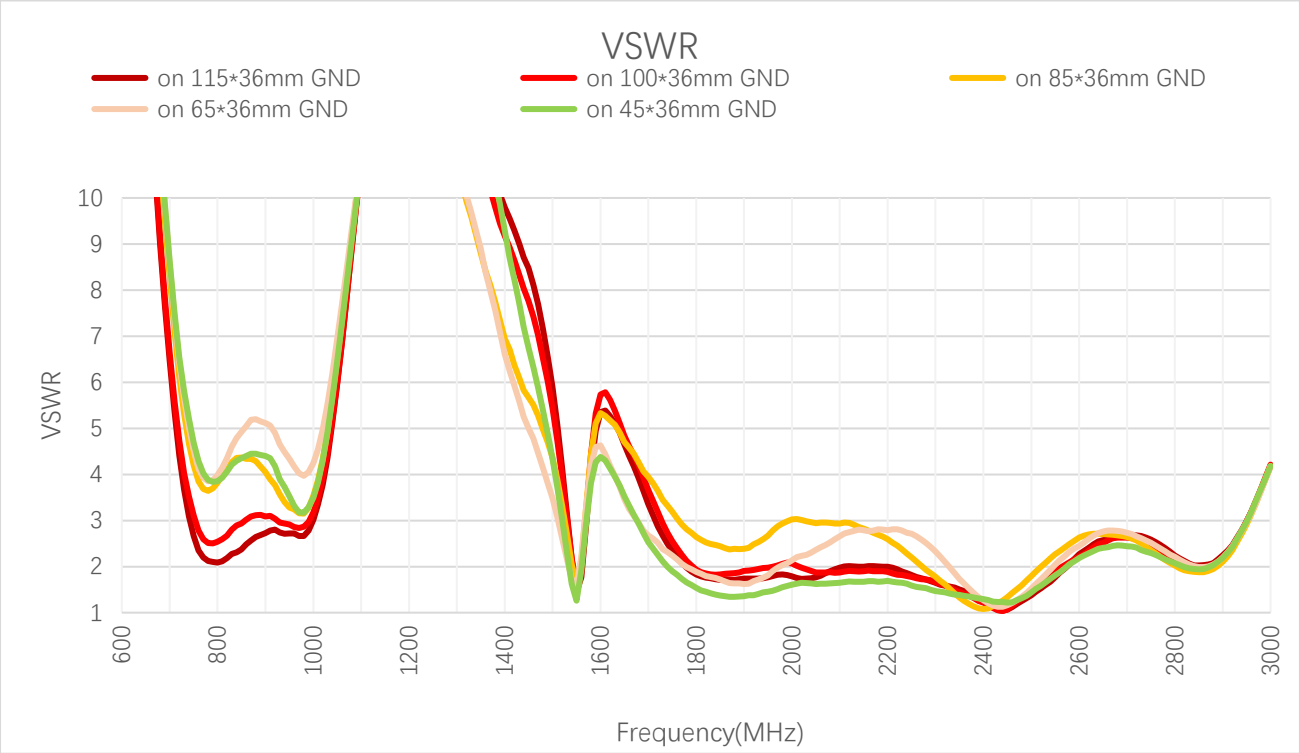
3.1. Overview

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

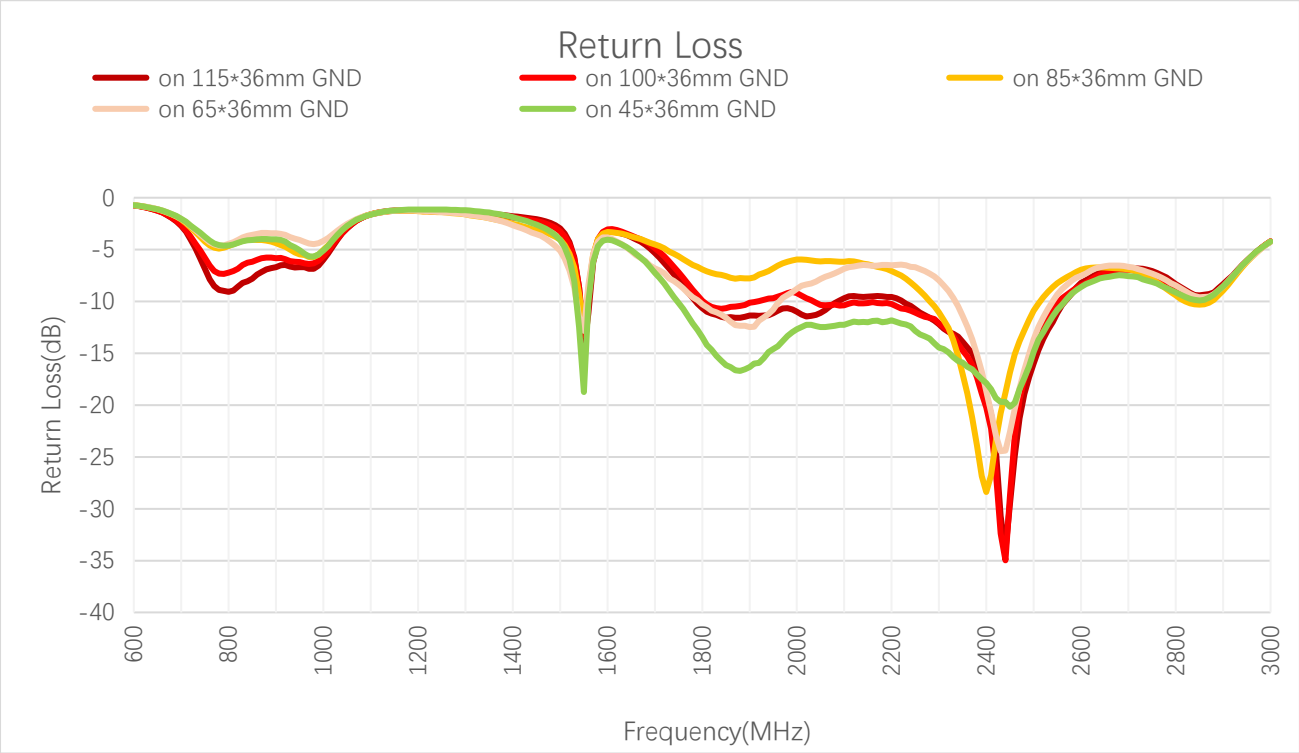
3.2.1. VSWR



VSWR

Frequency (MHz)	710	830	900	1740	1880	1950	2140	2350	2450	2600
On 115 × 36 mm GND	5.4	2.3	2.7	2.5	1.7	1.8	2.0	1.5	1.1	2.3
On 100 × 36 mm GND	5.6	2.8	3.1	2.7	1.9	2.0	1.9	1.5	1.1	2.2
On 85 × 36 mm GND	7.1	4.3	4.1	3.3	2.4	2.7	2.9	1.3	1.3	2.6
On 65 × 36 mm GND	7.4	4.6	5.1	2.3	1.6	1.8	2.8	1.7	1.2	2.5
On 45 × 36 mm GND	7.5	4.2	4.4	2.0	1.3	1.5	1.7	1.4	1.2	2.2

3.2.2. Return Loss

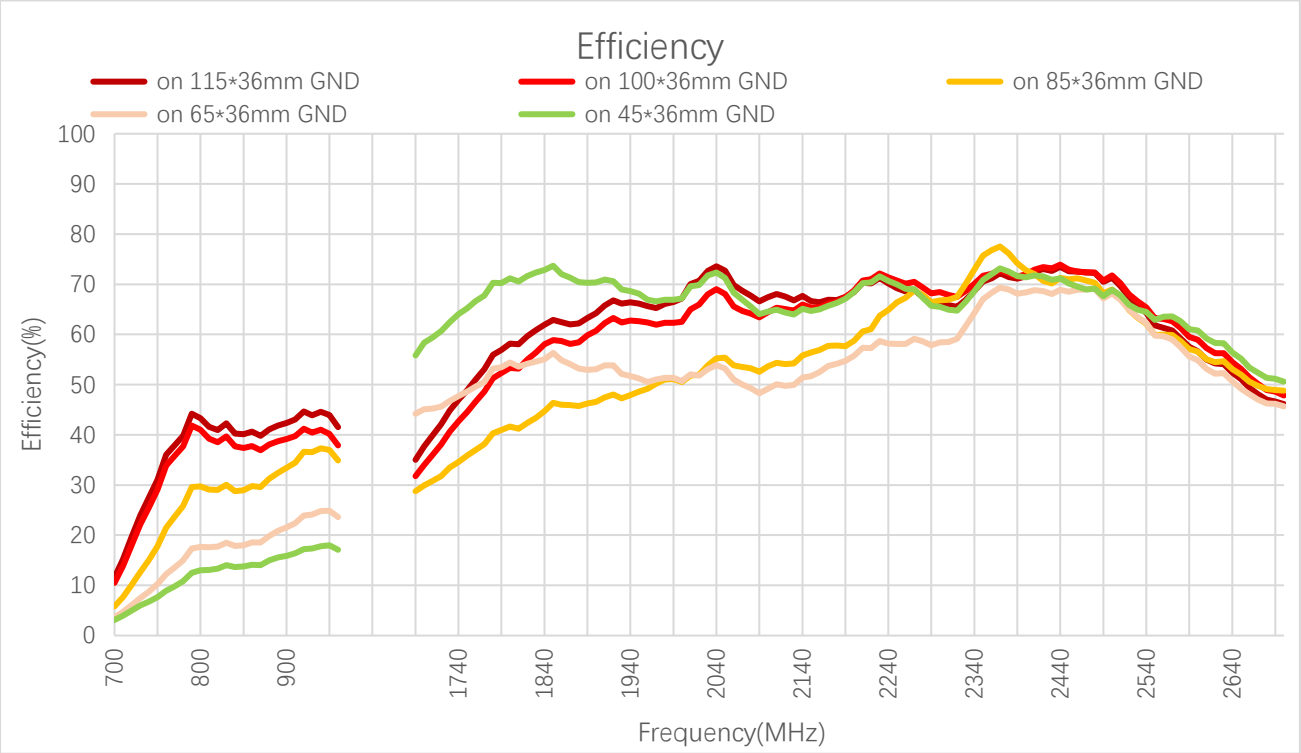


Return Loss (dB)

Frequency (MHz)	710	830	900	1740	1880	1950	2140	2350	2450	2600
On 115 × 36 mm GND	-3.3	-8.2	-6.7	-7.4	-11.6	-11.2	-9.6	-13.9	-29.6	-8.2
On 100 × 36 mm GND	-3.1	-6.5	-5.8	-6.7	-10.4	-9.7	-10.2	-14.7	-28.8	-8.5
On 85 × 36 mm GND	-2.5	-4.1	-4.4	-5.4	-7.8	-6.8	-6.4	-17.0	-16.8	-7.0
On 65 × 36 mm GND	-2.4	-3.8	-3.4	-8.0	-12.3	-10.8	-6.5	-11.4	-22.6	-7.5
On 45 × 36 mm GND	-2.3	-4.2	-4.0	-9.6	-16.7	-14.6	-12.0	-15.9	-20.2	-8.6

3.3. Radiation Performance Test

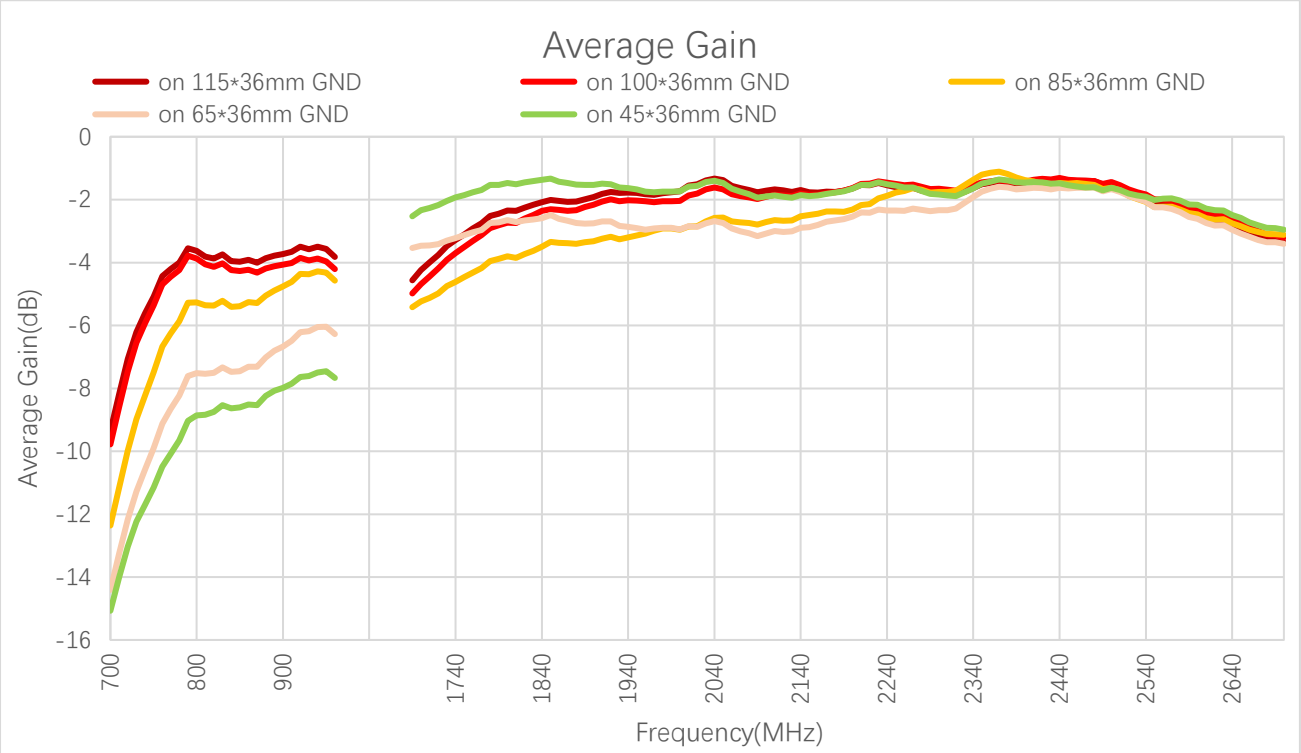
3.3.1. Efficiency



Efficiency (%)

Frequency (MHz)	710	830	900	1740	1880	1950	2140	2350	2450	2600
On 115 × 36 mm GND	15.2	42.3	42.4	47.0	62.2	66.2	67.7	70.6	72.6	56.7
On 100 × 36 mm GND	13.8	39.7	39.2	42.7	58.4	62.6	65.9	71.7	72.9	59.0
On 85 × 36 mm GND	7.7	30.1	33.4	34.6	45.7	48.6	55.8	75.7	71.0	56.6
On 65 × 36 mm GND	4.7	18.5	21.5	47.7	53.2	51.2	51.4	67.1	68.5	54.9
On 45 × 36 mm GND	4.0	14.0	15.9	64.1	70.4	68.1	65.1	70.9	70.2	60.8

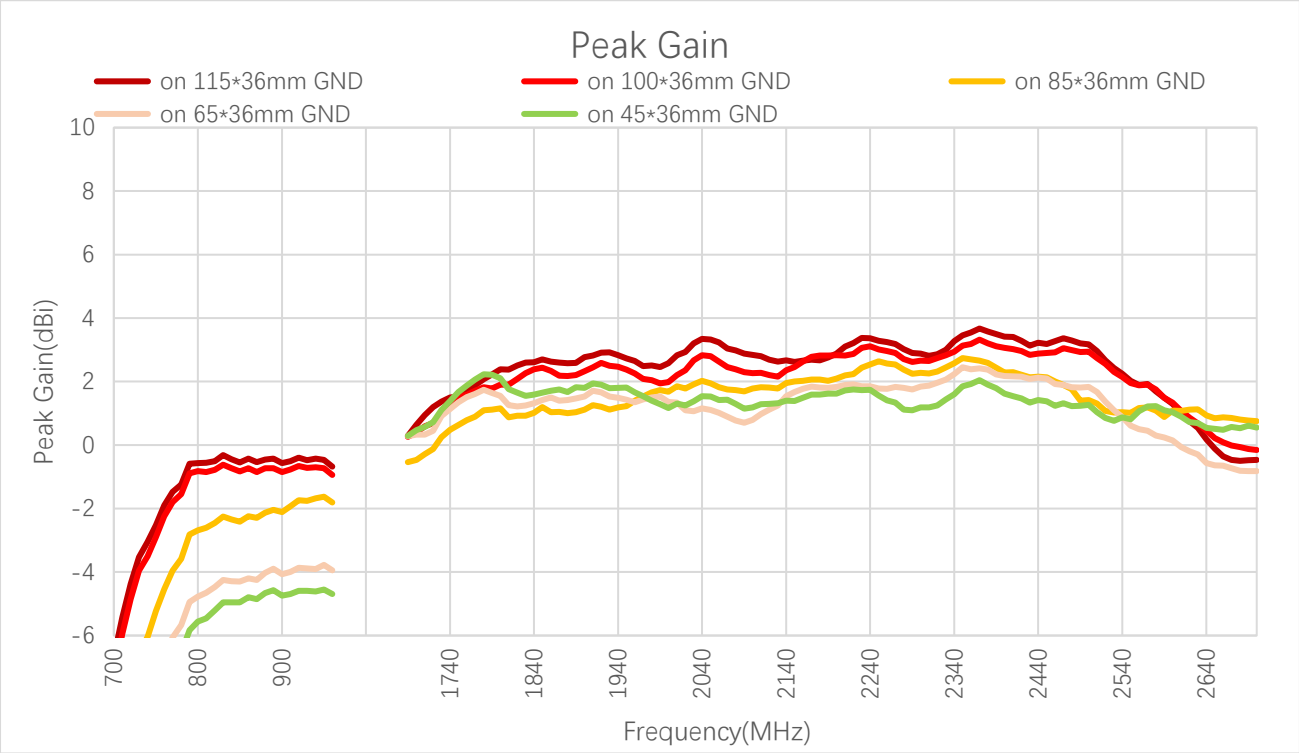
3.3.2. Average Gain



Average Gain (dB)

Frequency (MHz)	710	830	900	1740	1880	1950	2140	2350	2450	2600
On 115 × 36 mm GND	-8.2	-3.7	-3.7	-3.3	-2.1	-1.8	-1.7	-1.5	-1.4	-2.5
On 100 × 36 mm GND	-8.6	-4.0	-4.1	-3.7	-2.3	-2.0	-1.8	-1.5	-1.4	-2.3
On 85 × 36 mm GND	-11.2	-5.2	-4.8	-4.6	-3.4	-3.1	-2.5	-1.2	-1.5	-2.5
On 65 × 36 mm GND	-13.3	-7.3	-6.7	-3.2	-2.7	-2.9	-2.9	-1.7	-1.6	-2.6
On 45 × 36 mm GND	-14.0	-8.5	-8.0	-1.9	-1.5	-1.7	-1.9	-1.5	-1.5	-2.2

3.3.3. Peak Gain

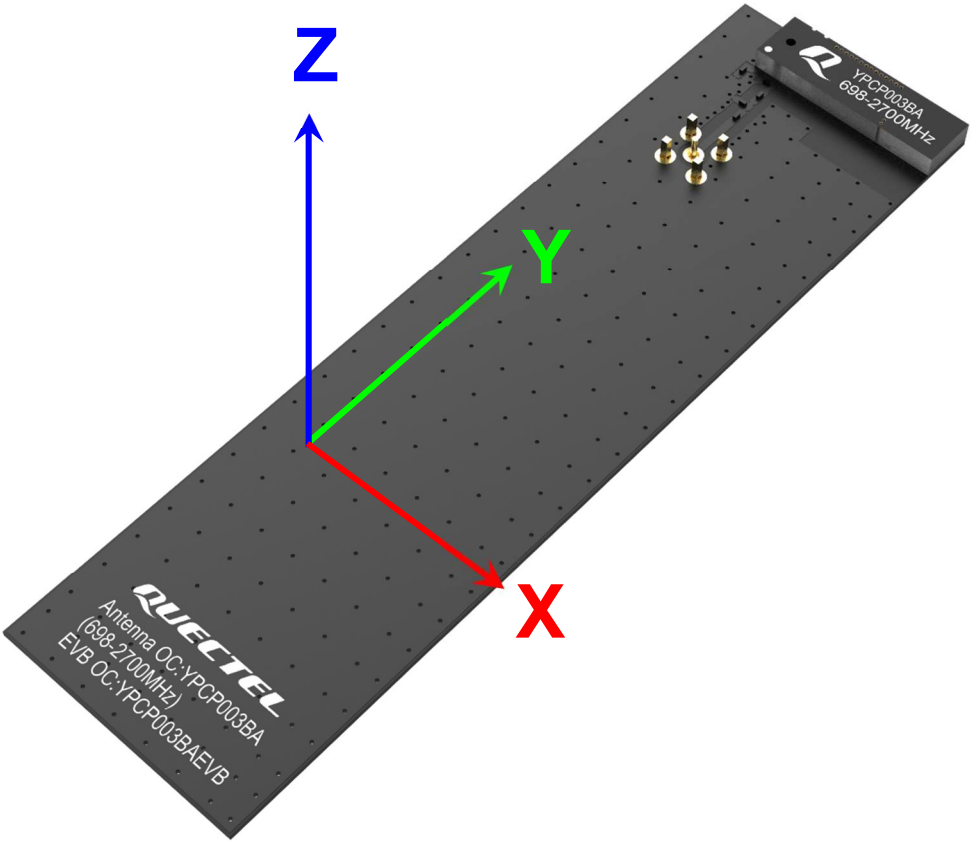


Peak Gain (dBi)

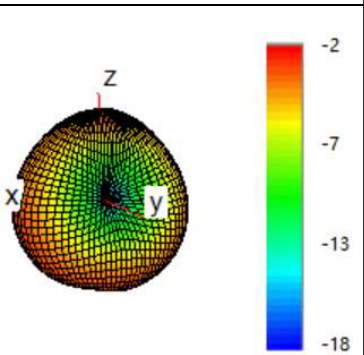
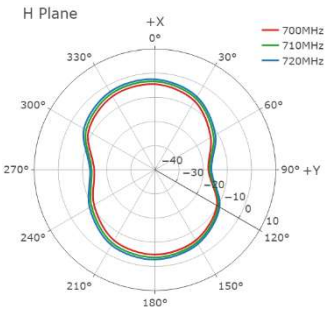
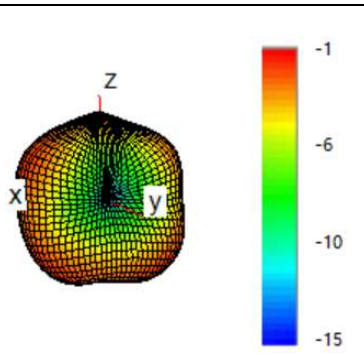
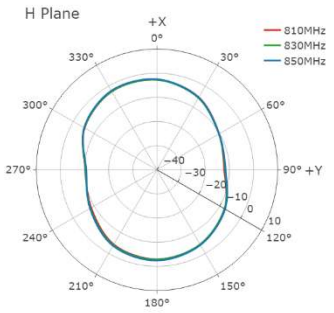
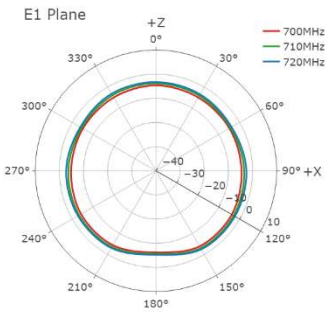
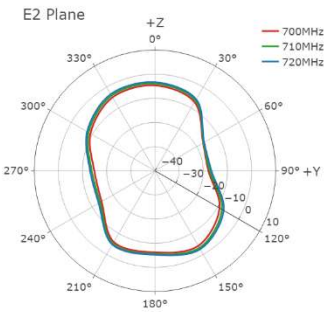
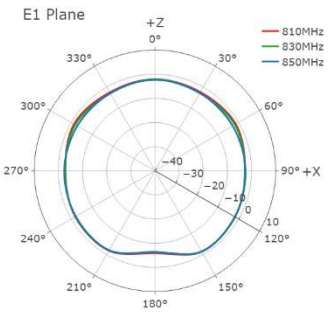
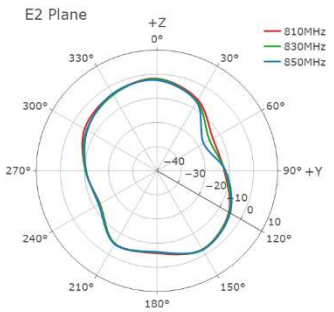
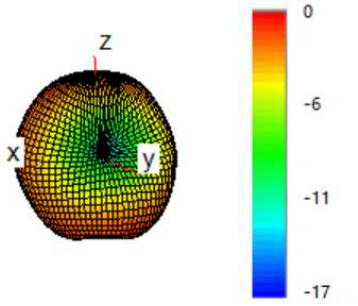
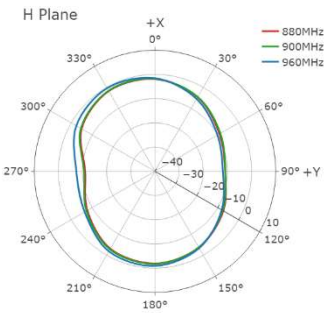
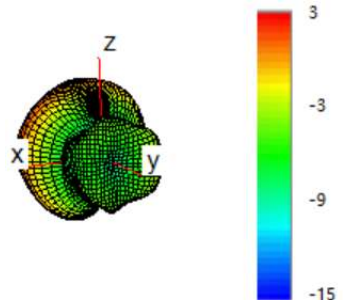
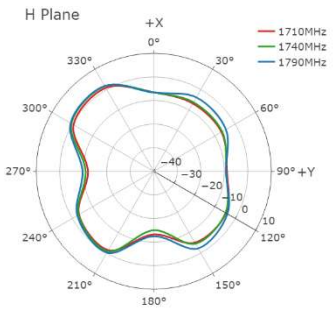
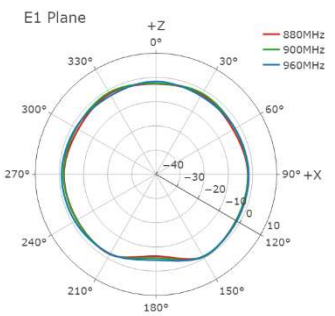
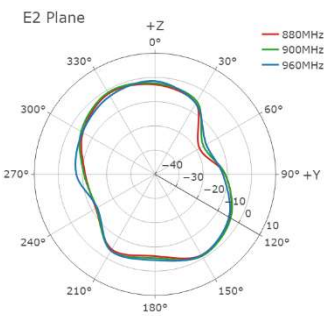
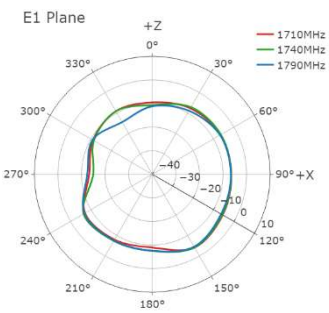
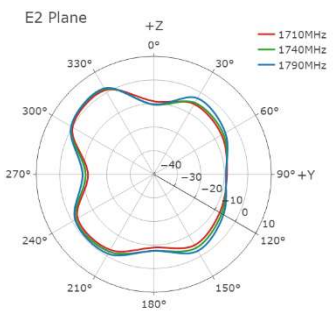
Frequency (MHz)	710	830	900	1740	1880	1950	2140	2350	2450	2600
On 115 × 36 mm GND	-5.4	-0.3	-0.6	1.5	2.6	2.7	2.7	3.5	3.2	1.3
On 100 × 36 mm GND	-5.9	-0.6	-0.9	1.3	2.2	2.4	2.4	3.1	2.9	1.3
On 85 × 36 mm GND	-8.5	-2.3	-2.1	0.5	1.0	1.2	2.0	2.7	2.1	1.1
On 65 × 36 mm GND	-10.5	-4.3	-4.1	1.1	1.4	1.4	1.5	2.5	2.1	0.2
On 45 × 36 mm GND	-10.9	-5.0	-4.7	1.4	1.7	1.8	1.4	1.9	1.4	1.0

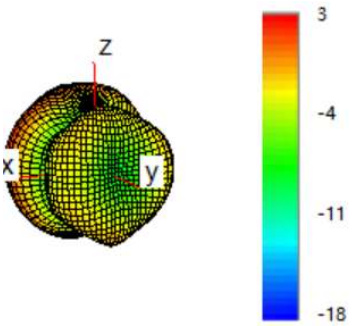
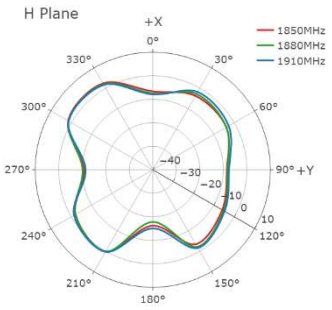
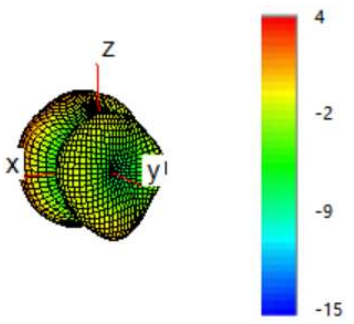
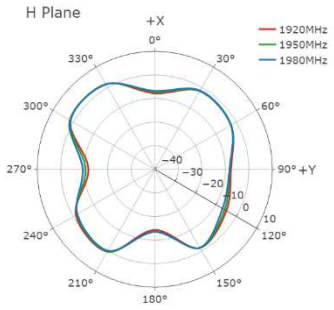
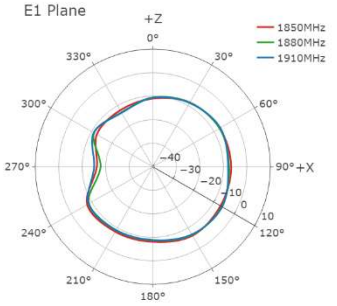
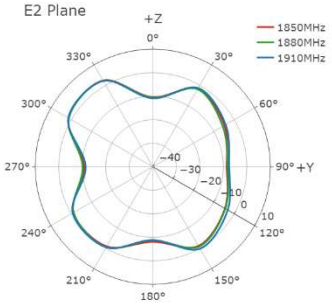
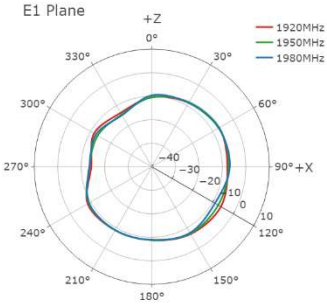
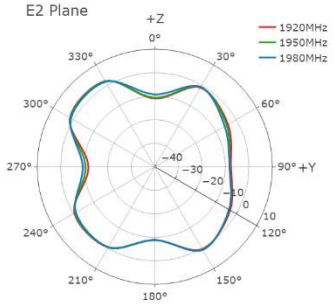
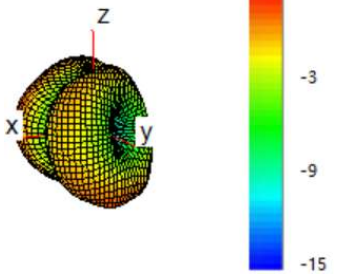
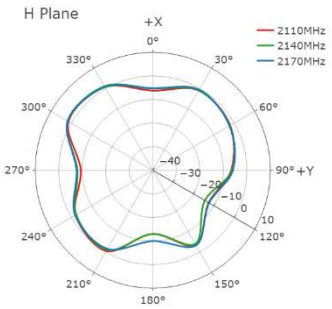
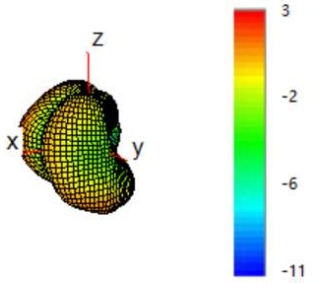
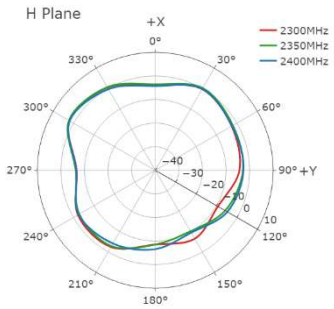
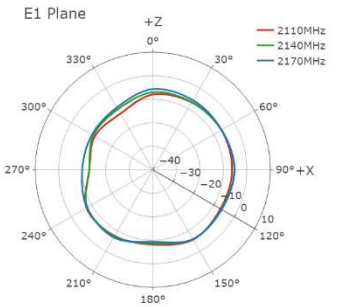
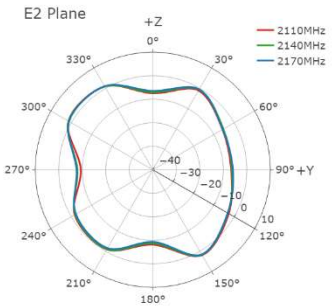
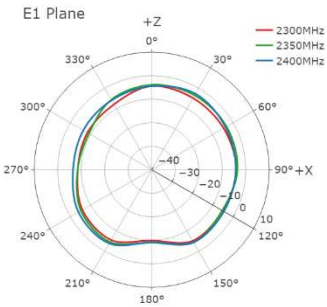
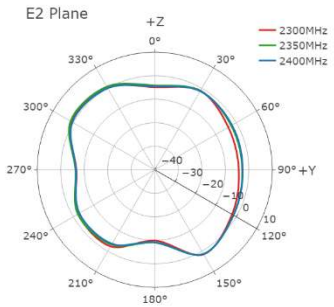
3.3.4. 3D & 2D Radiation Pattern

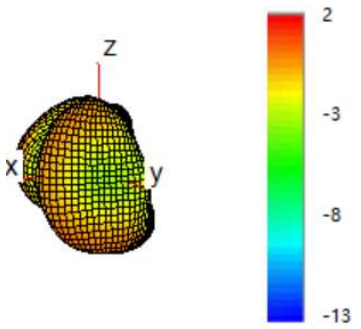
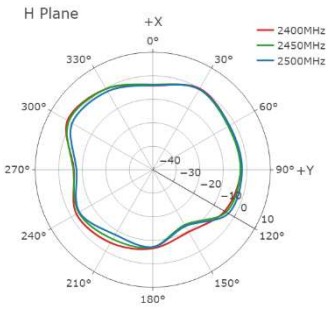
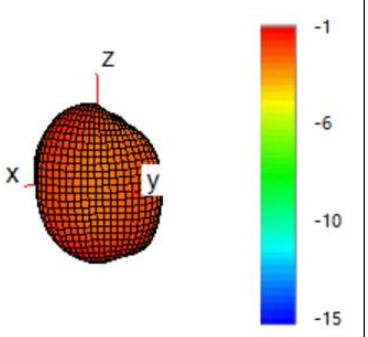
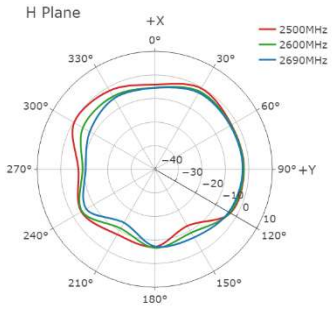
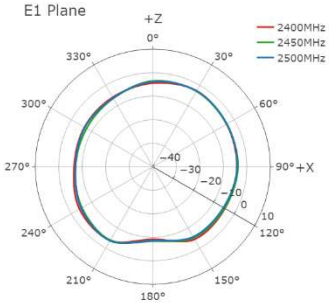
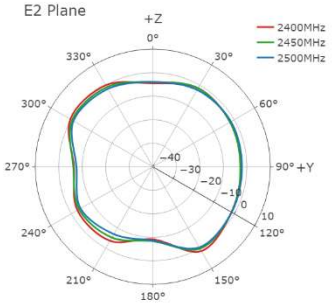
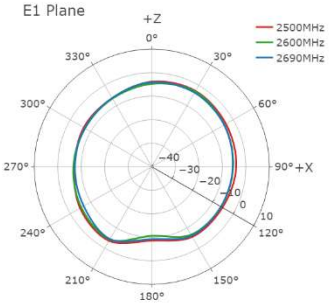
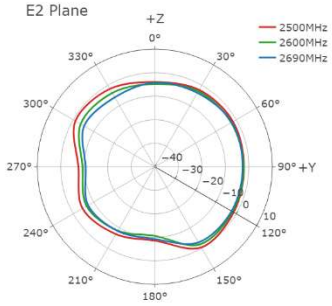
- Test Status: Assembled on 115 mm × 36 mm GND



- 4G

710 MHz		830 MHz	
			
			
900 MHz		1740 MHz	
			
			

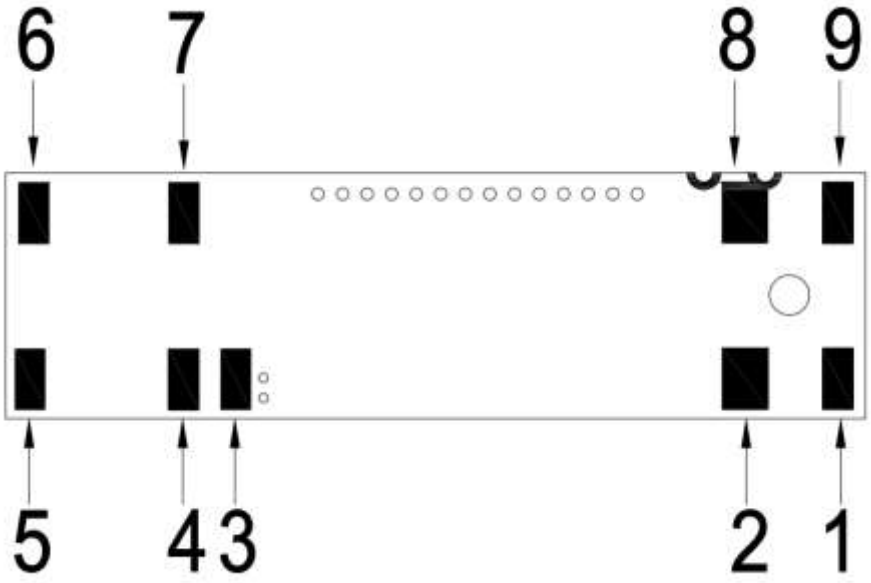
1880 MHz		1950 MHz	
			
			
2140 MHz		2350 MHz	
			
			

2450 MHz		2600 MHz	
			
			

4 Schematic Symbol and Pin Definition

- The pin assignment for the antenna is as follows.
- The antenna has 9 pins and only four work.
- All other pins are designed for mechanical strength.

Pin #.	Description
2	FEED
1	Return / GND
5, 6, 7, 8, 9	Not Used (Mechanical Only)
3, 4	Antenna Tuning



5 Transmission Line

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

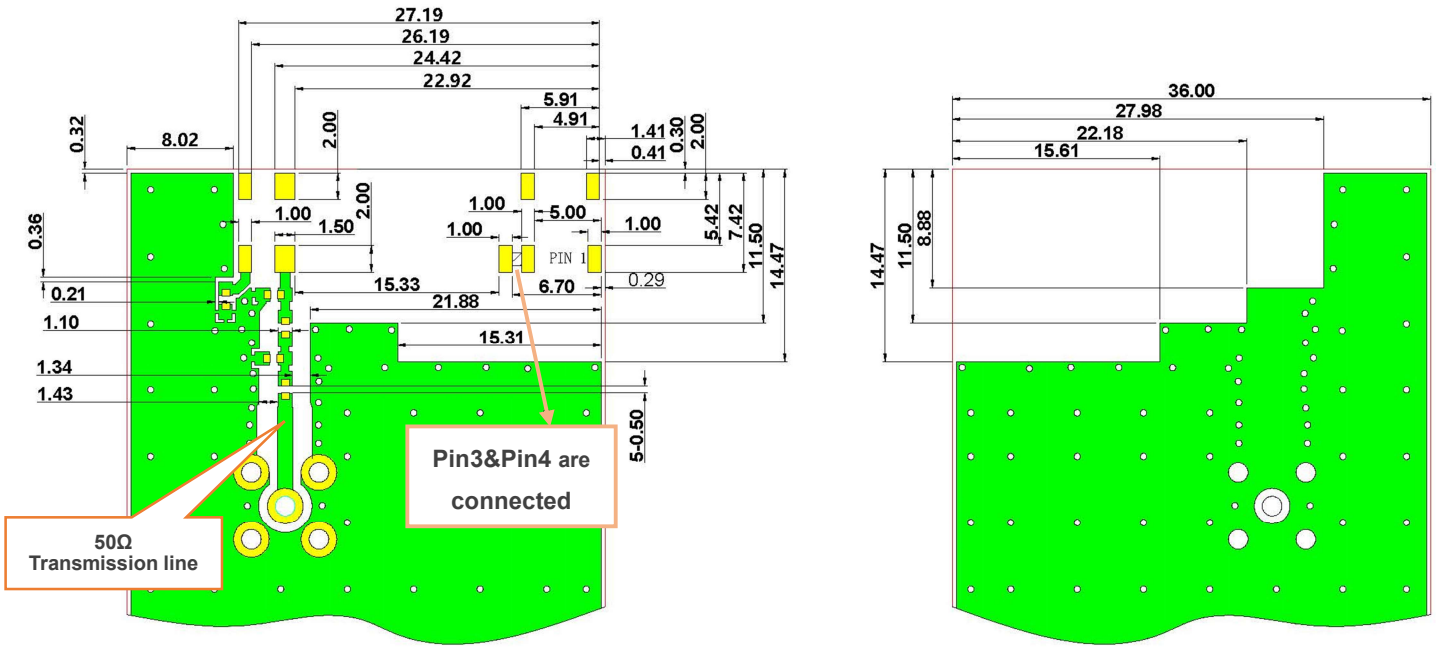
- The length of the transmission lines should be kept as short as possible.
- Any other part of the RF system, such as transceiver, power amplifiers, etc., shall also be designed with an impedance of 50 Ω.

- 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

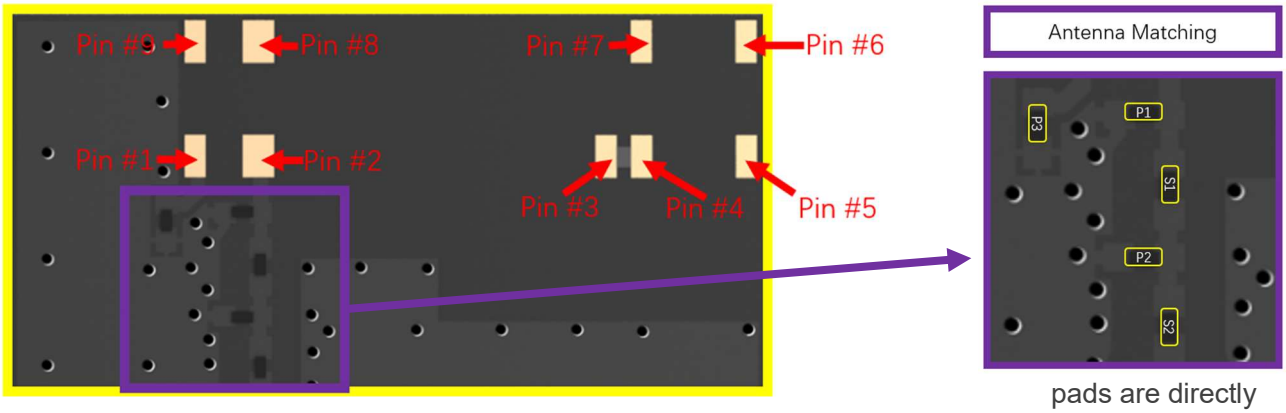
The host PCB must be designed using the PCB footprint shown with the correct clearances. An example of the PCB layout shows the antenna footprint. Please note this clearance area is critical to the performance of the antenna and must be applied through all layers of the PCB.

- Test EVB Size: 130 mm × 36 mm
- EVB Clearance Area: 14.5 mm × 28 mm



7 Matching Circuit

Demo Board Top View



pads are directly connected to the antenna feed trace.

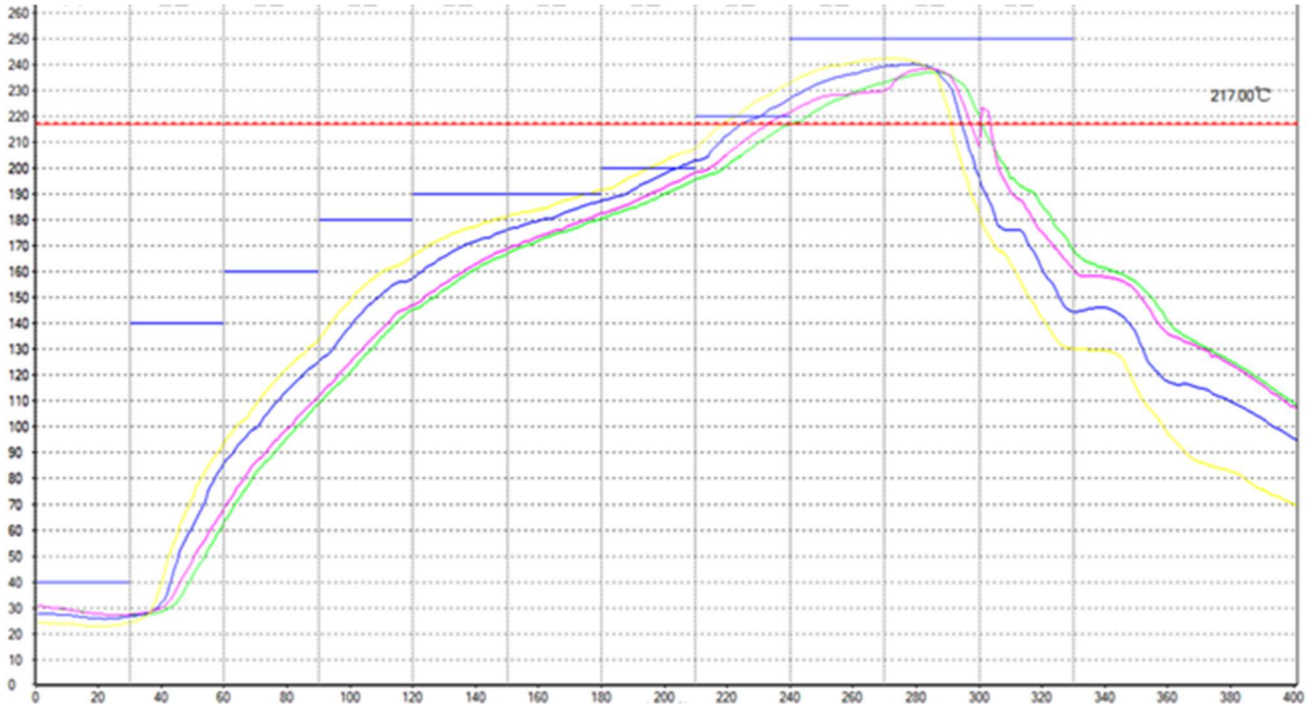
	P1	S1	P2	S2	P3
Default Matching	47nH	2.0pF	47nH	2.7nH	5.1nH
Tolerance	±5%	±5%	±5%	±5%	±5%

Pin #.	Description
2	FEED
1	Return / GND
5, 6, 7, 8, 9	Dummy Pad
3, 4	Antenna Tuning

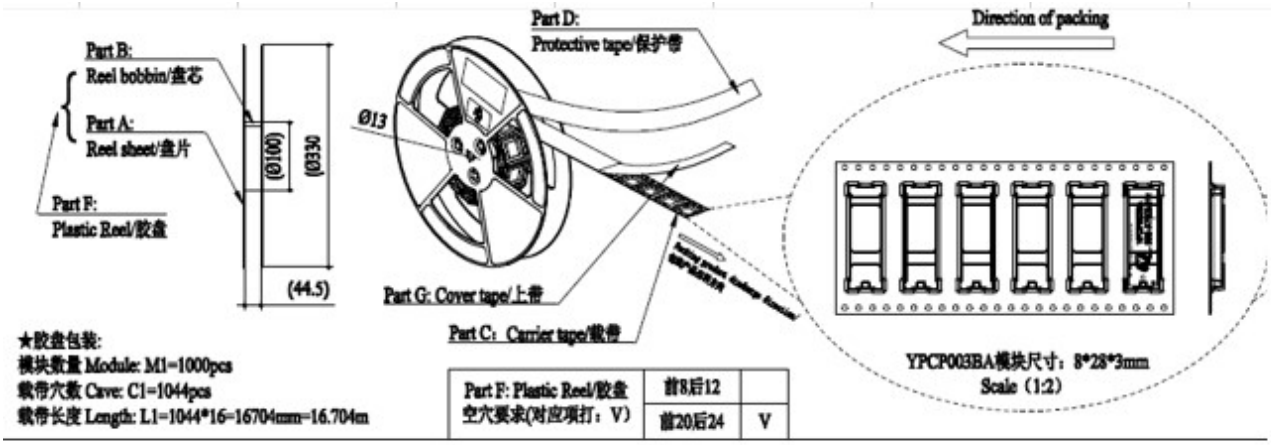
8 Soldering Temperature

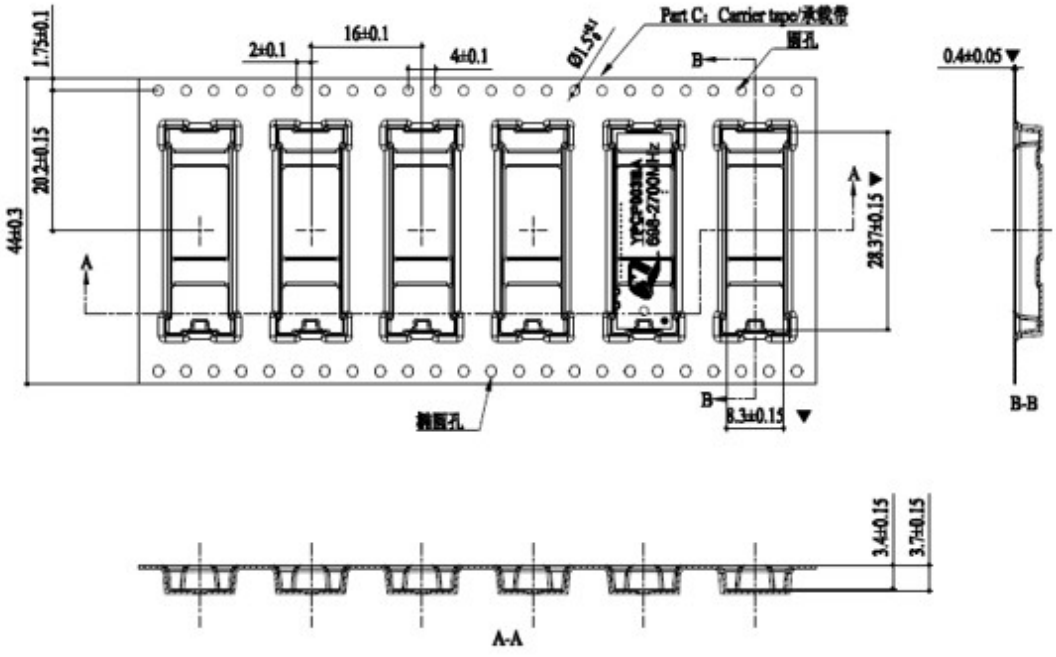
Phase	Profile Features	PB-Free Assembly
RAMP-UP	Avg. Ramp-up Rate (Tsmax to Tp)	4°C/second (Max.)
PREHEAT	Temperature Min (Tsmin) Temperature Max (Tsmax) Time (tsmin to tsmax)	150 °C 180 °C 120 seconds (Max.)
REFLOW	Temperature (TL) Total Time above TL (tl)	217 °C 90 seconds (Max.)
PEAK	Temperature (Tp)	230–250 °C
RAMP-DOWN	Rate	-4 °C/second (Max.)

9 Reflow Profile

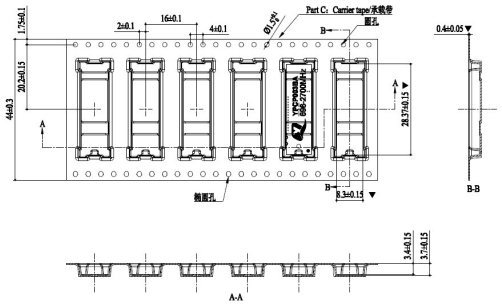
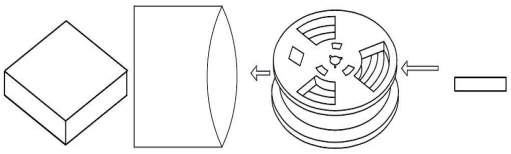
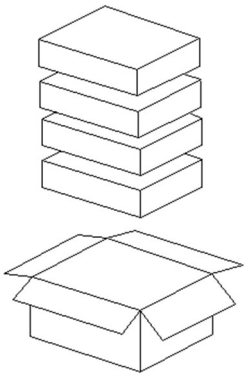
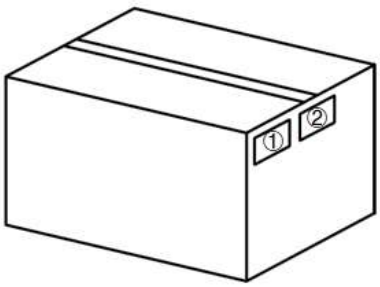


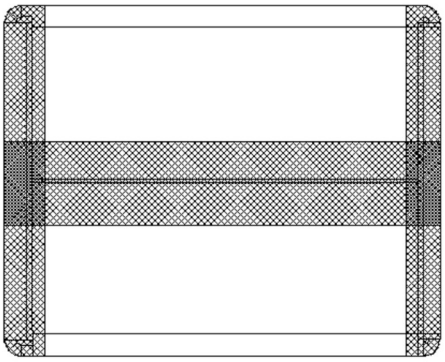
10 Packaging





ITEM	W	P	T	A0	A1	B0	B1	K0	K1	F	E	D0	D1	P0	P2
DIM.	44	16	0.40	8.30	/	28.37	/	3.40	3.70	20.20	1.75	1.50	2	4	2
TOLR.	±0.30	±0.10	±0.05	±0.15	±0.30	±0.15	±0.30	±0.15	±0.15	±0.15	±0.10	+0.10 -0.00	+0.10 -0.00	±0.10	±0.10

Step	Packaging Picture / 2D Picture	Description
1		Reel
2		(1000 PCS Antenna Products / Reel) Reel tape is vacuumed into the inner box.
3		(4 Inner Boxes / Carton Box) (4000 PCS Antennas / Carton Box) Carton Size: L × W × H = 370 × 370 × 295 mm
4		**Position for Attaching Labels** ① Carton Label ② Quality Label

5		**Sealing Cartons** “工” type sealing cartons

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

Version	Date	Author	Note
-	2024-01-03	Andy YAN/ Bailey ZHANG/ David LIU/ Vinnie LIU	Creation of the document
1.0	2024-01-03	Andy YAN/ Bailey ZHANG/ David LIU/ Vinnie LIU	First official release

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