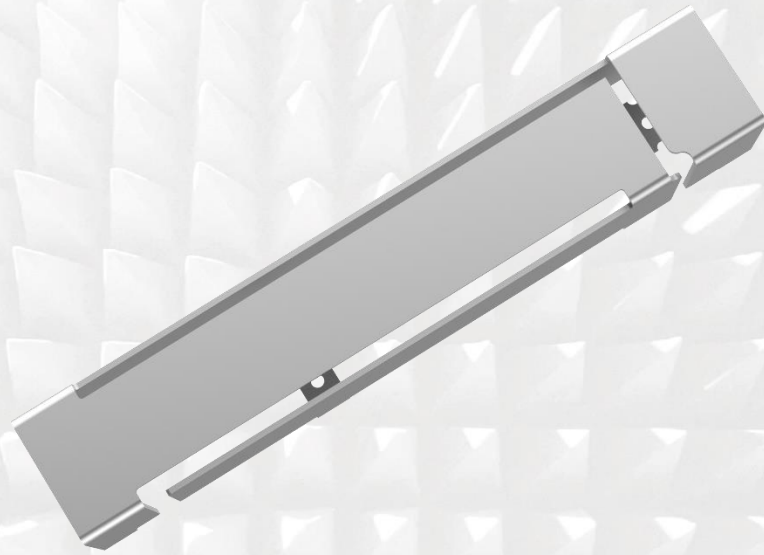




Antenna Datasheet

Product OC (Antenna Only): YFCH002WWA

Product OC (Antenna + Rectangular EVB): YFCH002WWAEVB

Version: 1.0

Date: 2024-04-25

Status: Released

Product Name: 4G SMT Mount Sheet Metal Monopole Antenna

Key Features:

High efficiency, excellent performance

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

efficiency: Up to 64%

Dimensions: 40 × 7.23 × 7.6 mm

RoHS & REACH Compliant

Overview

The Quectel YFCH002WWA is a compact form factor SMT mount sheet metal antenna for 4G applications. Due to the dimensions of $40 \times 7.23 \times 7.6$ mm, it is designed for very small space requirements for smart metering, remote monitoring, vehicle tracking and telematics, and many other IoT devices. The YFCH002WWA is a ground-dependent monopole antenna, uses main PCB as its ground plane. It is delivered on tape and reel.

The YFCH002WWA is a sheet metal antenna, which can be mounted on super compact space require terminals. Despite of this small factor, it has up to 64 % efficiency in working bands. This antenna is developed on a 136.5×43 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 YFCH002WWA allows high efficiency, stable signal transmission and reception for 4G working bands in 600–960 MHz, 1710–2690 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 136.5 × 43 mm 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	B71	B12 /B13 /B28	B5 /B8 /B26	B1 /B2 /B3	B40	Wi-Fi 2G	B38 /B41
	Freq. (MHz)	600– 700	700– 810	810– 960	1700– 2170	2300– 2400	2400– 2500	2500– 2690
Max VSWR		3.8	4.2	3.4	6.3	4.2	5.8	5.8
Max Return Loss (dB)		-4.7	-4.3	-5.3	-2.8	-4.2	-3.0	-3.0
AVG Eff. (%)		42.9	46.4	46.4	47.9	45.1	29.9	39.8
AVG Gain (dB)		-3.7	-3.3	-3.3	-3.2	-3.5	-5.2	-4.0
Max Peak Gain (dBi)		1.1	1.0	1.9	2.6	1.1	0.7	2.2
Frequency (MHz)		(650)	(810)	(835)	(1905)	(2305)	(2400)	(2690)
VSWR				≤ 6.3				
Return Loss				≤ -2.8 dB				
Peak Gain				≤ 2.6 dBi				

Gain - Detail			
	Band	Freq. (MHz)	Max peak Gain (dBi)
FDD < 3 dBi	B1	1920-1980	2.3
	B3	1710-1785	-0.8
	B8	880-915	1.5
	B18	815-830	1.7
	B19	830-845	1.9
	B26	814-849	1.9
	B28	703-748	0.4
TDD < 4 dBi	B39	1880-1920	2.6
	B41 (Disable HPUE)	2496-2690	2.2

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:

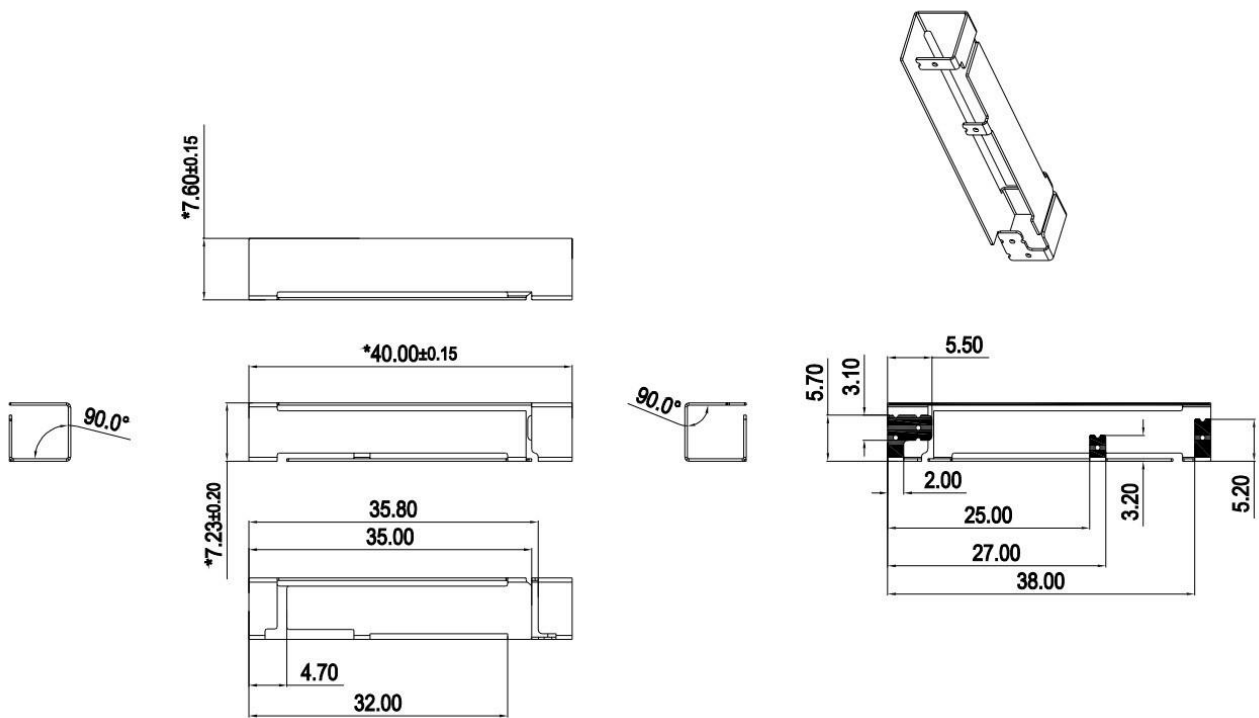
- Covered √ means efficiency > 20%.
- Based on 136.5 × 43 mm EVB.

1.3. Mechanical & Environmental

Mechanical	
Antenna Size	40 × 7.23 × 7.6 mm
Material & Color	C7701 & Silver
Antenna Weight	Typ. 1.9 g
Mounting Type	SMD
Environmental	
Operation Temperature	-40 °C to +85 °C
Storage Temperature	-40 °C to +85 °C
RoHS & REACH Compliant	Yes

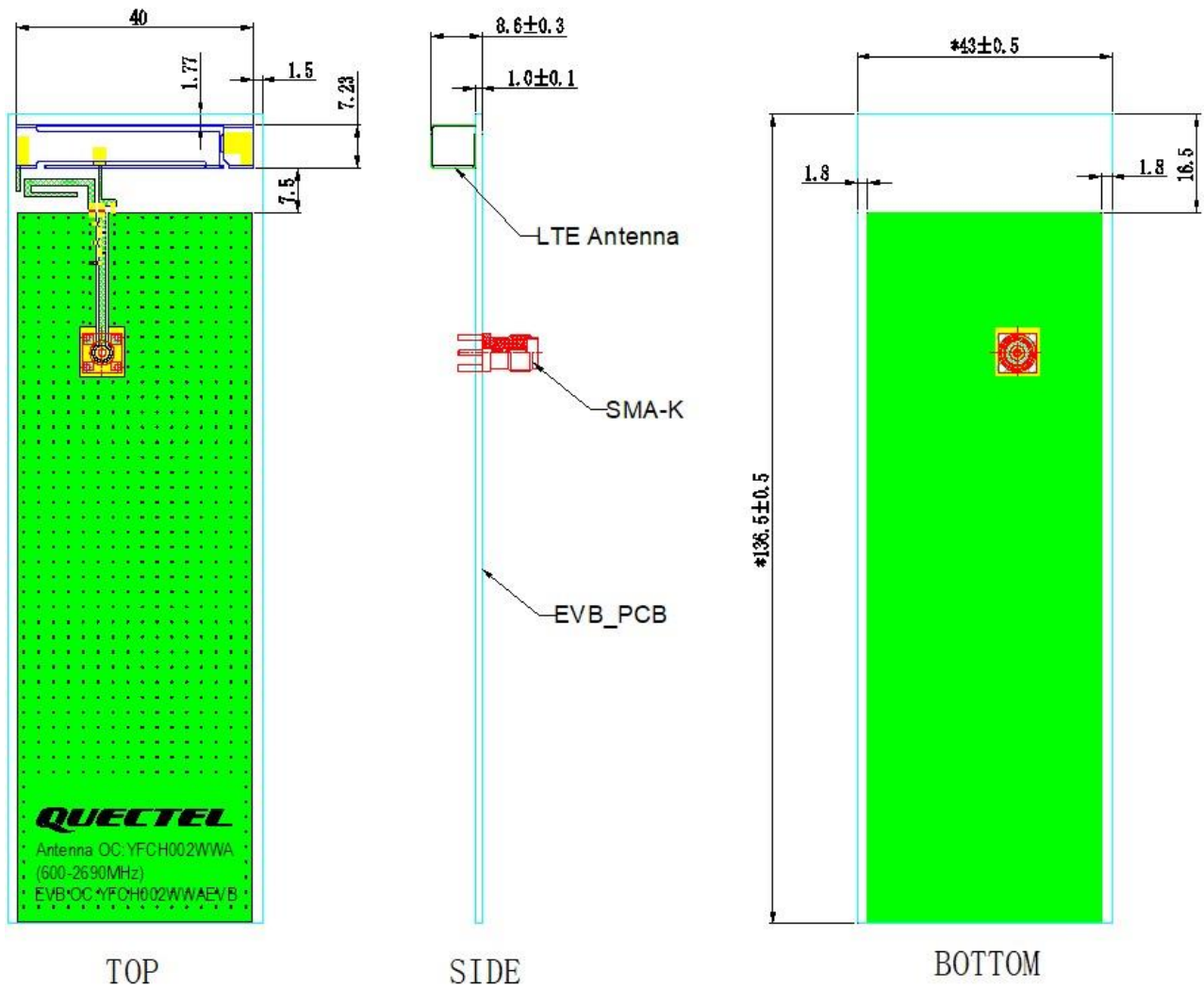
2 Drawing

2.1. Antenna



All dimensions are in mm.

2.2. EVB

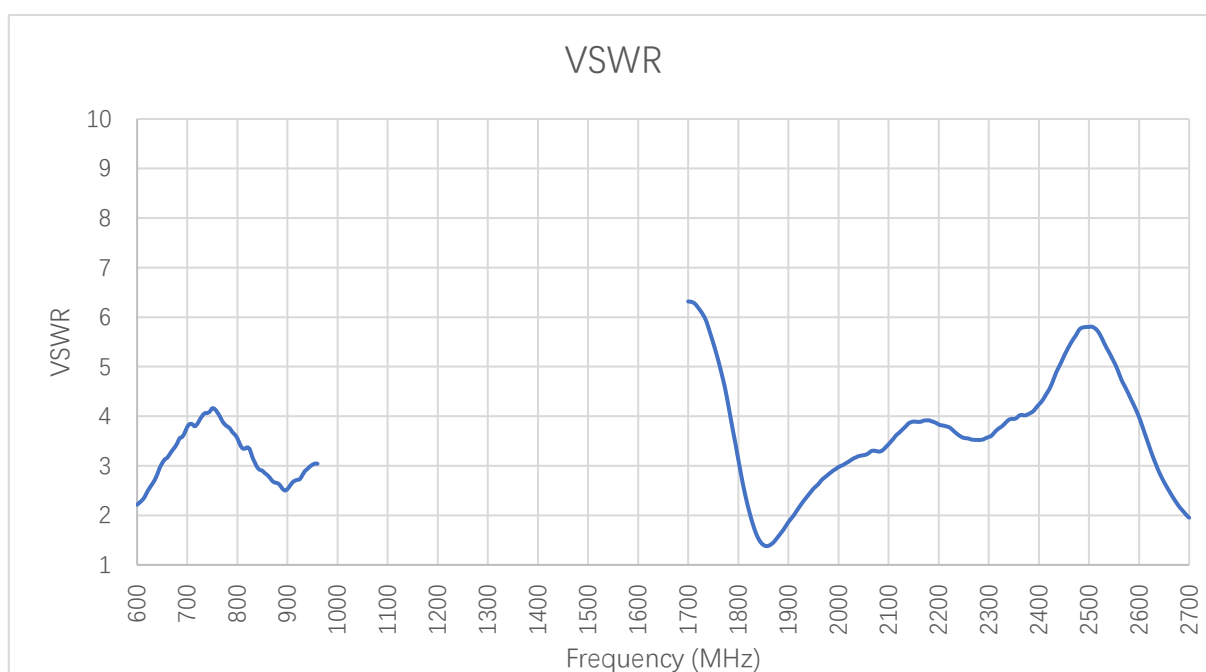


All dimensions are in mm.

3 Detailed Performance

3.1. S-Parameter Test

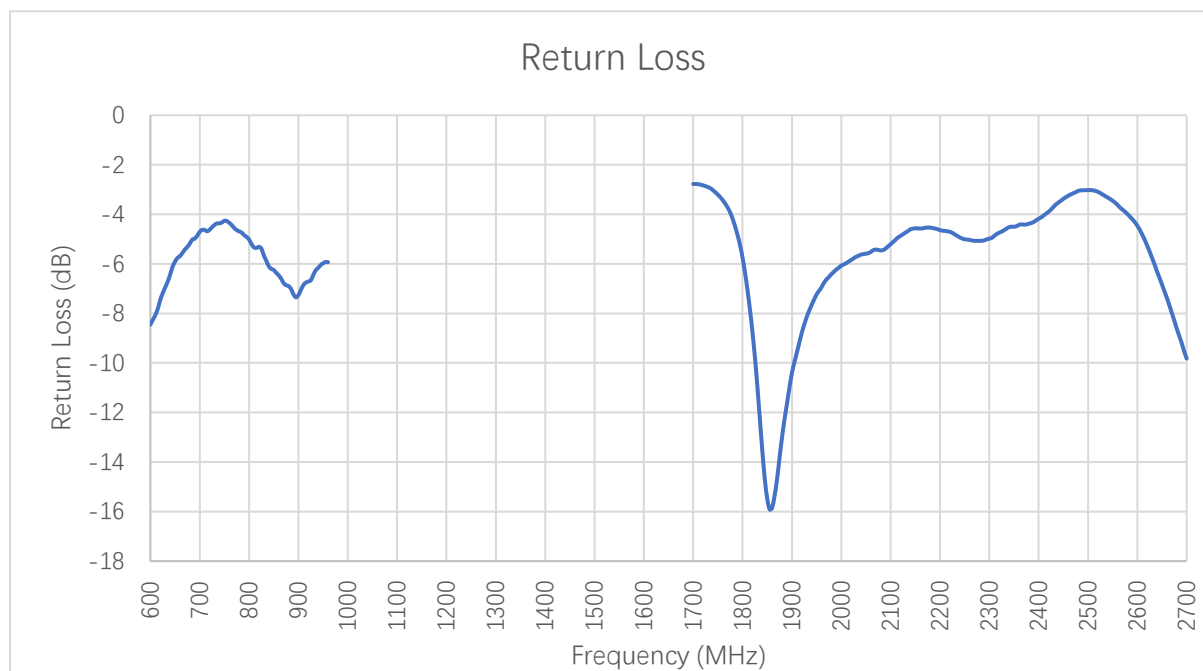
3.1.1. VSWR



VSWR

Frequency (MHz)	600	630	710	830	900	960	1440	1710	1740	1880
VSWR	2.2	2.6	3.8	3.2	2.5	3.0	-	6.3	5.8	1.6
Frequency (MHz)	1950	2140	2350	2450	2600	2690	4700	5000	5500	6000
VSWR	2.5	3.9	3.9	5.2	4.0	2.1	-	-	-	-

3.1.2. Return Loss

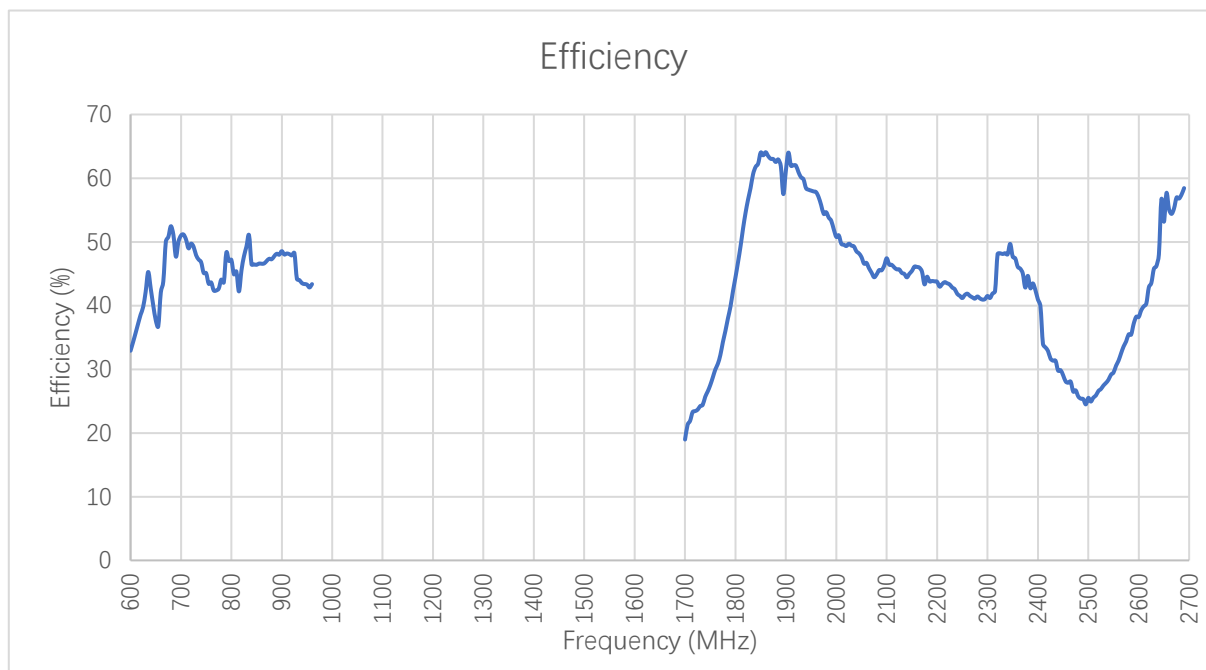


Return Loss (dB)

Frequency (MHz)	600	630	710	830	900	960	1440	1710	1740	1880
Return Loss (dB)	-8.5	-7.0	-4.6	-5.7	-7.3	-5.9	-	-2.8	-3.0	-13.0
Frequency (MHz)	1950	2140	2350	2450	2600	2690	4700	5000	5500	6000
Return Loss (dB)	-7.2	-4.6	-4.5	-3.4	-4.5	-9.2	-	-	-	-

3.2. Radiation Performance Test

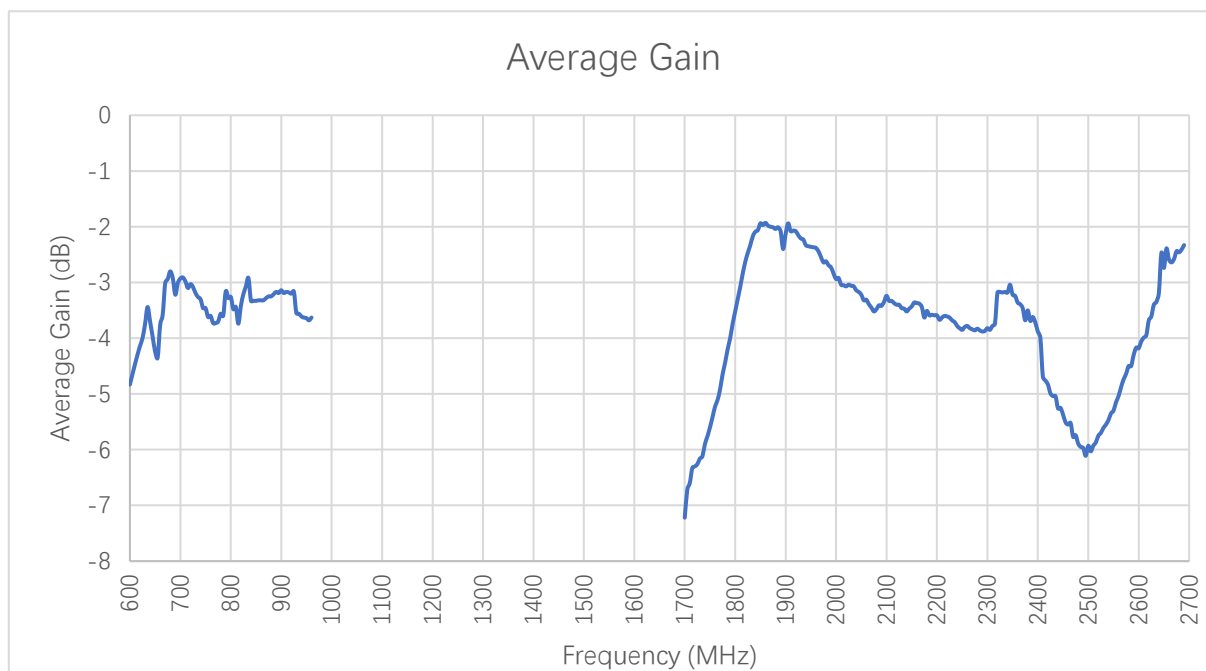
3.2.1. Efficiency



Efficiency (%)

Frequency (MHz)	600	630	710	830	900	960	1440	1710	1740	1880
Efficiency (%)	32.9	42.2	50.4	49.3	48.6	43.4	-	21.9	25.7	62.5
Frequency (MHz)	1950	2140	2350	2450	2600	2690	4700	5000	5500	6000
Efficiency (%)	58.1	44.4	47.7	29.1	38.2	58.4	-	-	-	-

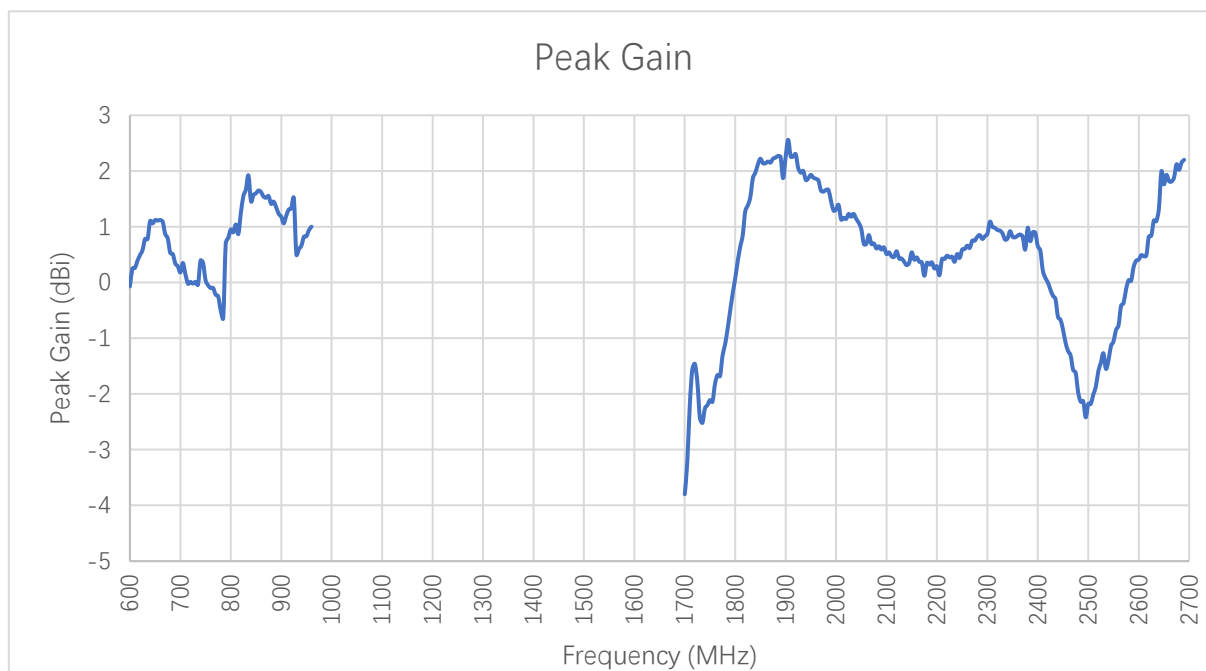
3.2.2. Average Gain



Average Gain (dB)

Frequency (MHz)	600	630	710	830	900	960	1440	1710	1740	1880
Average Gain (dB)	-4.8	-3.8	-3.0	-3.1	-3.1	-3.6	-	-6.6	-5.9	-2.0
Frequency (MHz)	1950	2140	2350	2450	2600	2690	4700	5000	5500	6000
Average Gain (dB)	-2.4	-3.5	-3.2	-5.4	-4.2	-2.3	-	-	-	-

3.2.3. Peak Gain



Peak Gain (dBi)

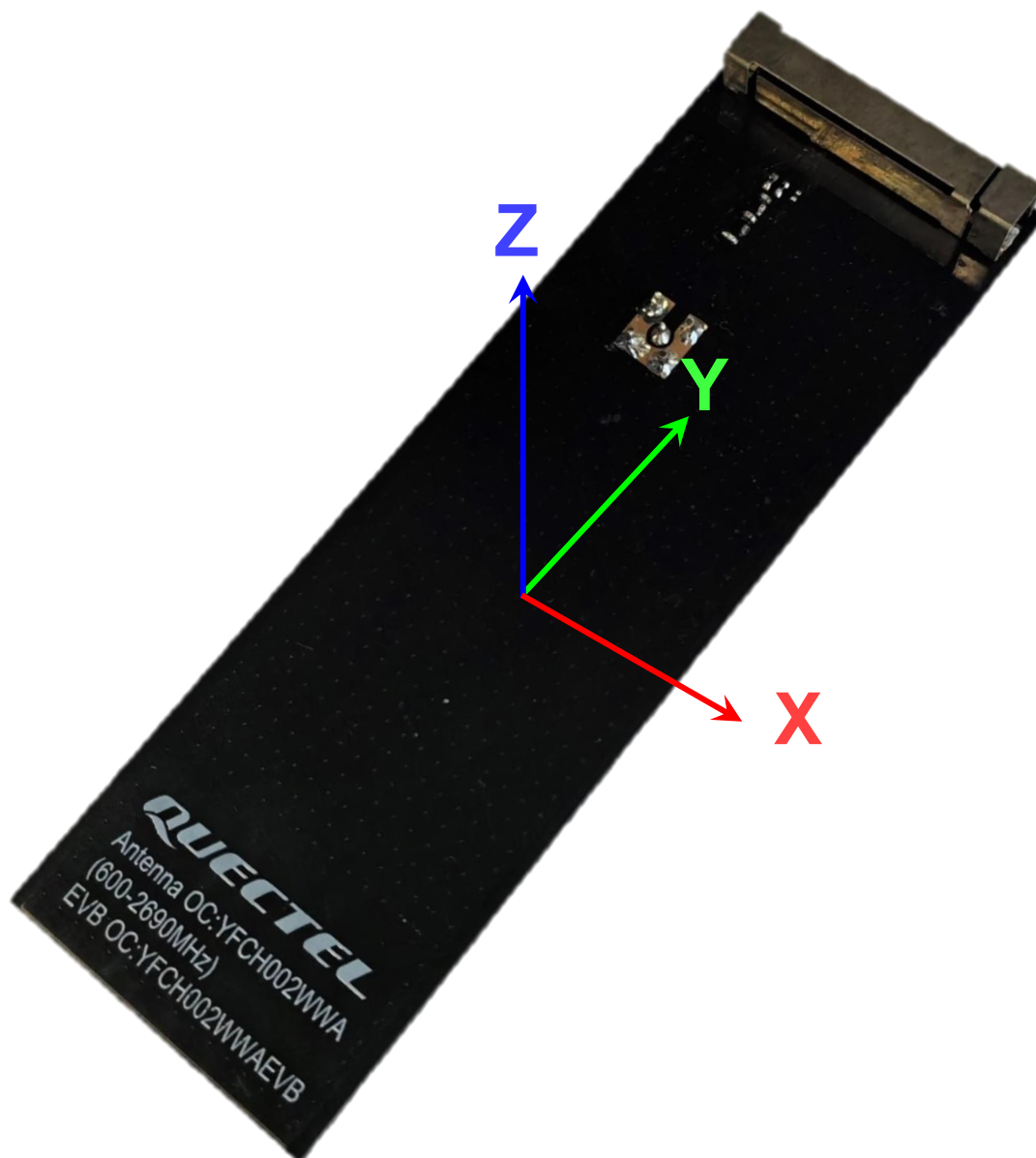
Frequency (MHz)	600	630	710	830	900	960	1440	1710	1740	1880
Peak Gain (dBi)	-0.1	0.8	0.2	1.7	1.2	1.0	-	-2.2	-2.3	2.2
Frequency (MHz)	1950	2140	2350	2450	2600	2690	4700	5000	5500	6000
Peak Gain (dBi)	1.9	0.3	0.8	-0.9	0.4	2.2	-	-	-	-

Max Peak Gain (dBi)

Band	B71	B12 /B13 /B28	B5 /B8 /B26	B1 /B2 /B3	B40	Wi-Fi 2G	B38 /B41
Frequency (MHz)	650	810	835	1905	2305	2400	2690
Peak Gain (dBi)	1.1	1.0	1.9	2.6	1.1	0.7	2.2

3.2.4. 3D & 2D Radiation Pattern

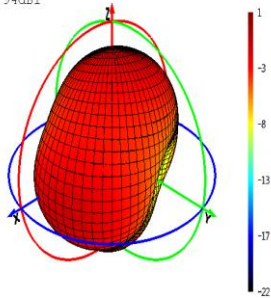
- Test Status: Assembled on 136.5 × 43 mm EVB
- Test Chamber: FS-S-1



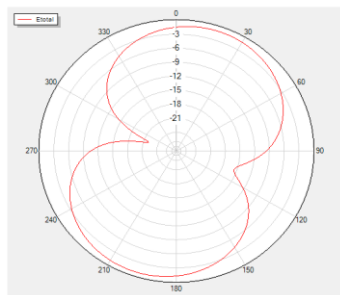
● 4G

630 MHz

MAX:0.78dBi
MIN:-22.94dBi

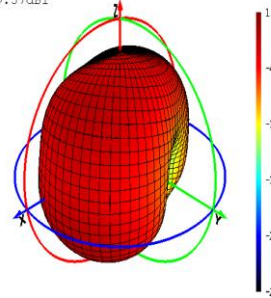


Theta=90 Freq=630MHz

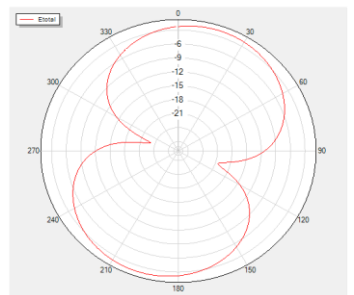


710 MHz

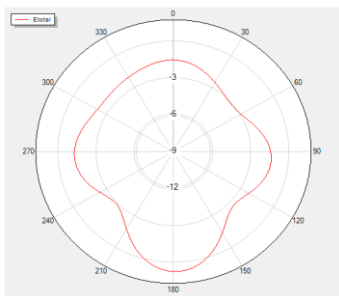
MAX:0.15dBi
MIN:-29.57dBi



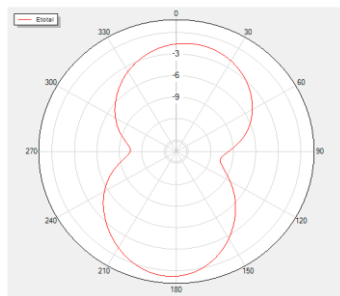
Theta=90 Freq=710MHz



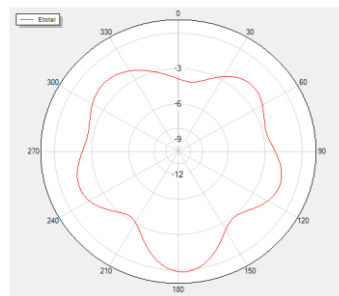
Phi=0 Freq=630MHz



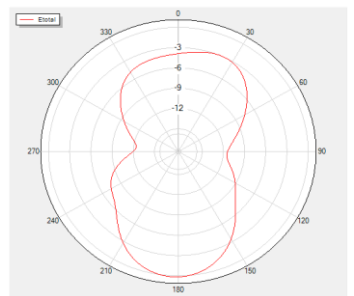
Phi=90 Freq=630MHz



Phi=0 Freq=710MHz

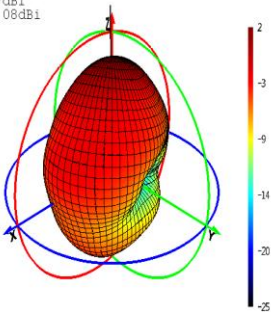


Phi=90 Freq=710MHz

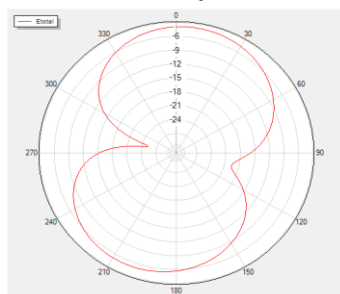


830 MHz

MAX:1.67dBi
MIN:-26.08dBi

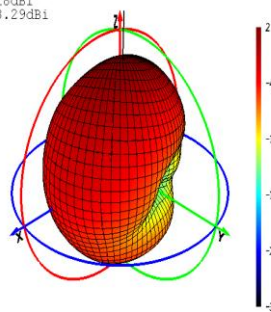


Theta=90 Freq=830MHz

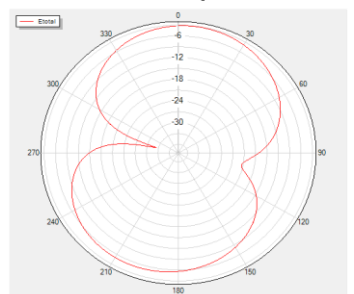


900 MHz

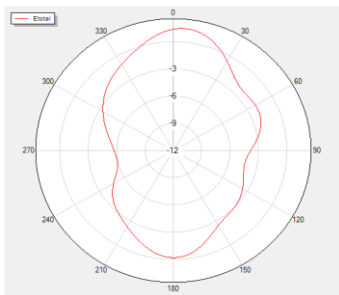
MAX:1.18dBi
MIN:-33.29dBi



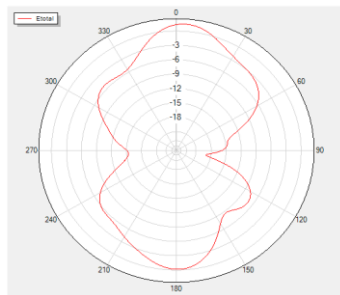
Theta=90 Freq=900MHz



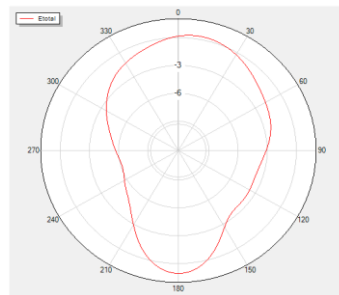
Phi=0 Freq=830MHz



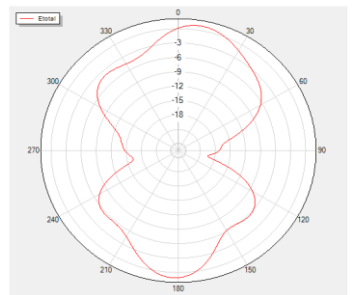
Phi=90 Freq=830MHz



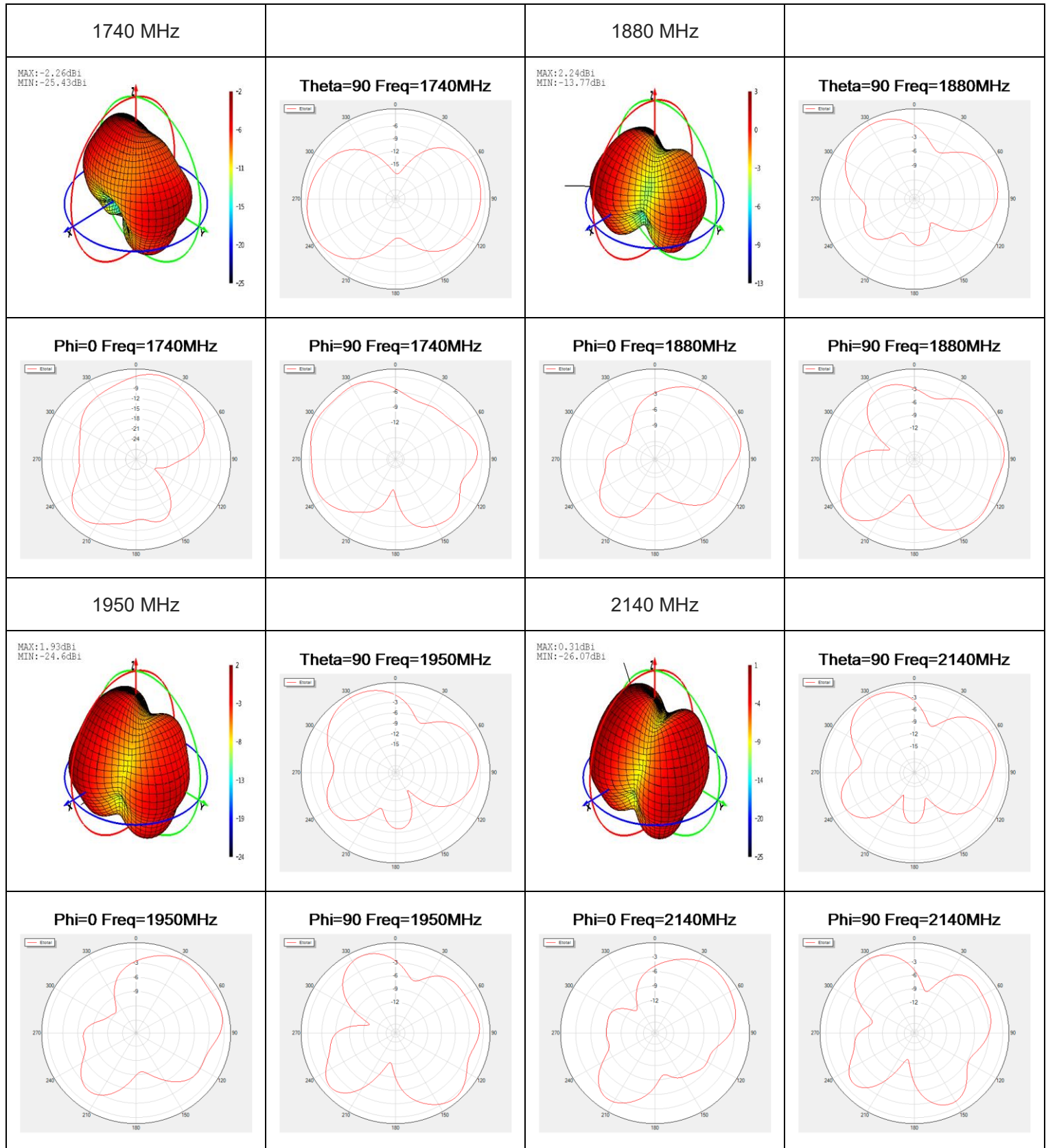
Phi=0 Freq=900MHz



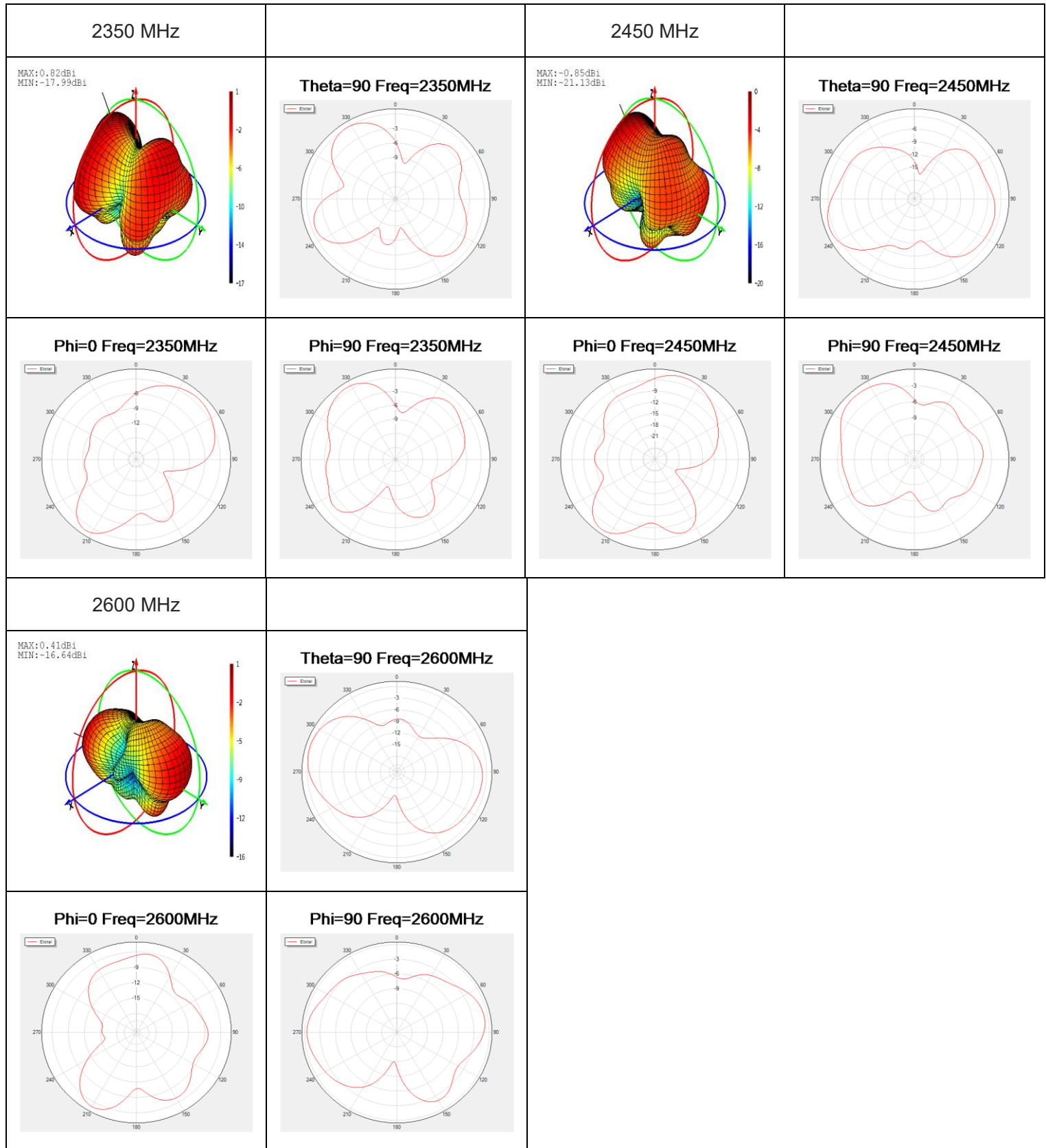
Phi=90 Freq=900MHz



● 4G



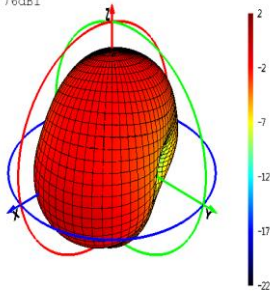
● 4G



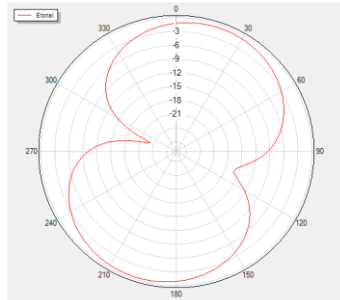
● **Max Peak Gain**

650 MHz

MAX:1.12dBi
MIN:-23.76dBi

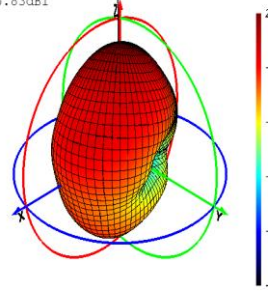


Theta=90 Freq=650MHz

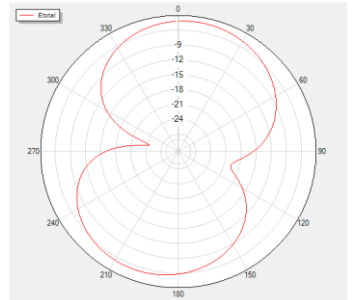


810 MHz

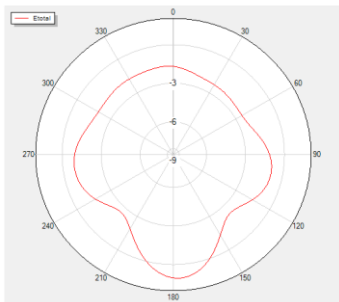
MAX:1.04dBi
MIN:-25.83dBi



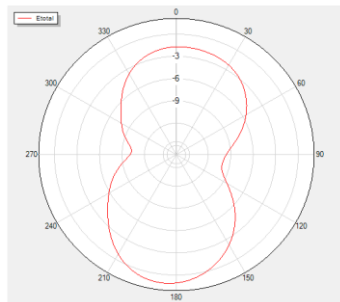
Theta=90 Freq=810MHz



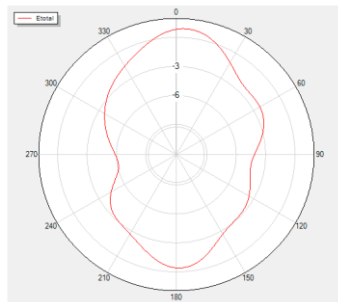
Phi=0 Freq=650MHz



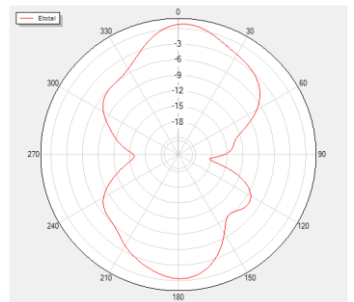
Phi=90 Freq=650MHz



Phi=0 Freq=810MHz

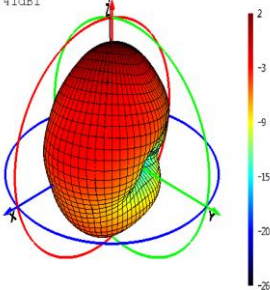


Phi=90 Freq=810MHz

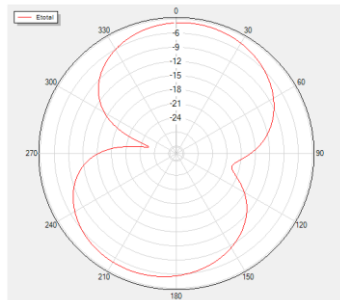


835 MHz

MAX:1.92dBi
MIN:-26.41dBi

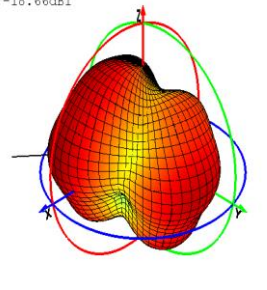


Theta=90 Freq=835MHz

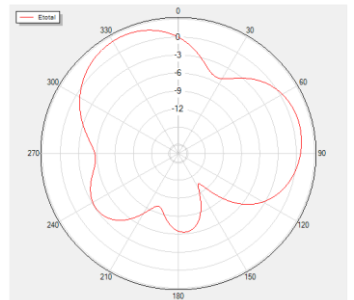


1905 MHz

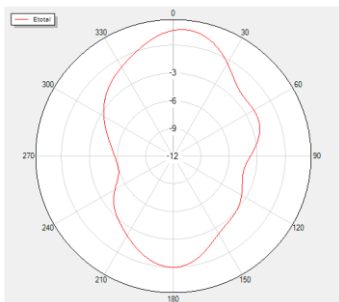
MAX:2.56dBi
MIN:-18.66dBi



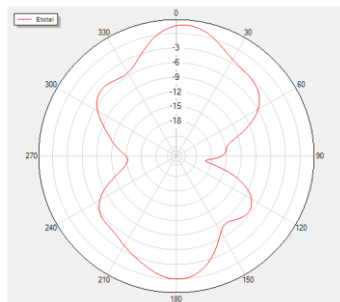
Theta=90 Freq=1905MHz



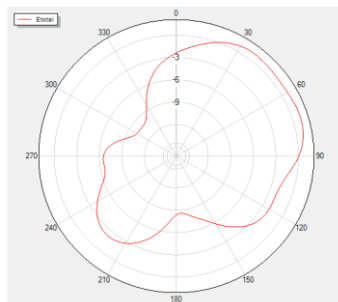
Phi=0 Freq=835MHz



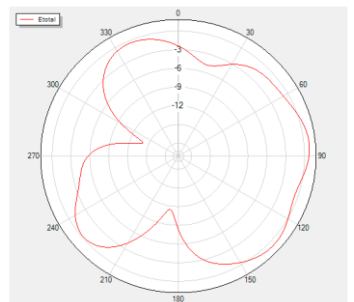
Phi=90 Freq=835MHz



Phi=0 Freq=1905MHz

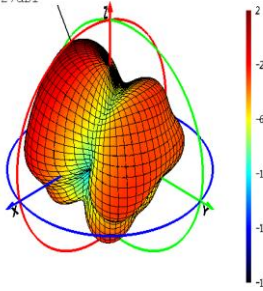


Phi=90 Freq=1905MHz

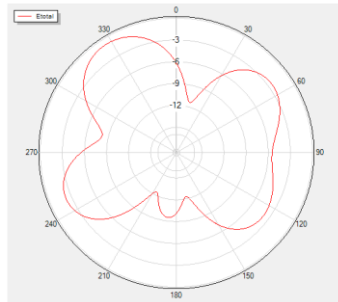


2305 MHz

MAX:1.09dBi
MIN:-20.27dBi

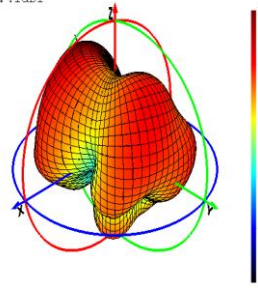


Theta=90 Freq=2305MHz

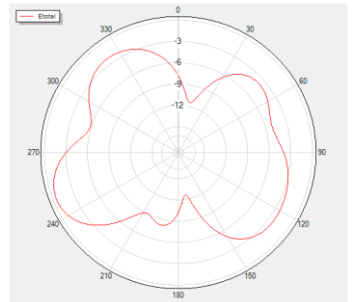


2400 MHz

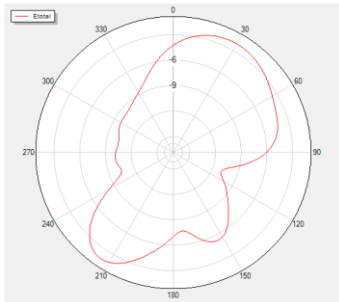
MAX:0.65dBi
MIN:-20.41dBi



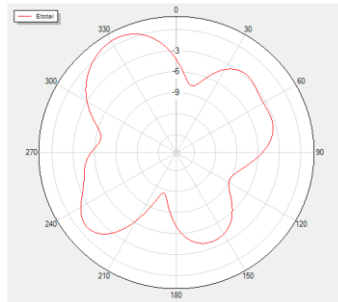
Theta=90 Freq=2400MHz



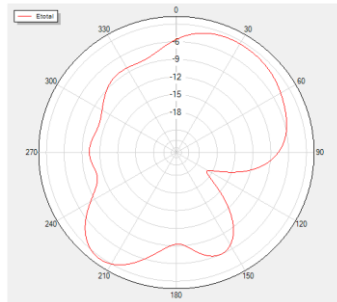
Phi=0 Freq=2305MHz



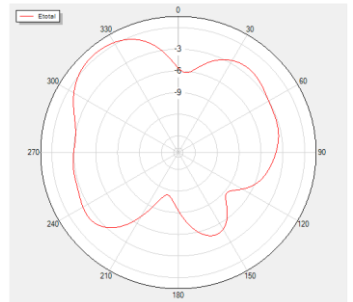
Phi=90 Freq=2305MHz



Phi=0 Freq=2400MHz

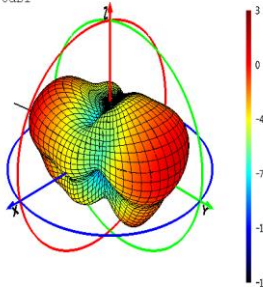


Phi=90 Freq=2400MHz

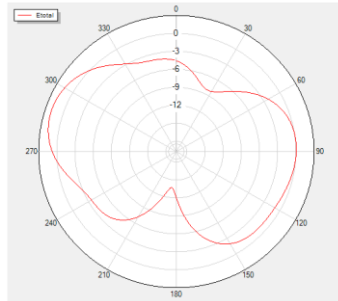


2690 MHz

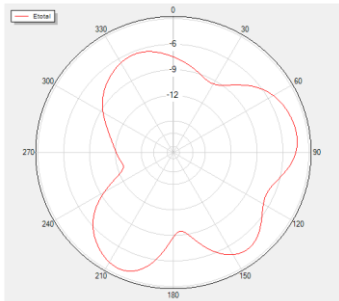
MAX:2.2dBi
MIN:-15.6dBi



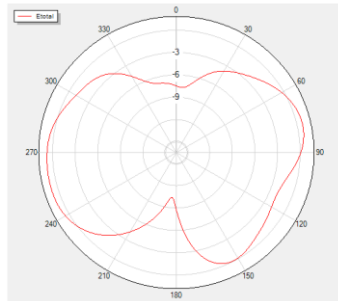
Theta=90 Freq=2690MHz



Phi=0 Freq=2690MHz



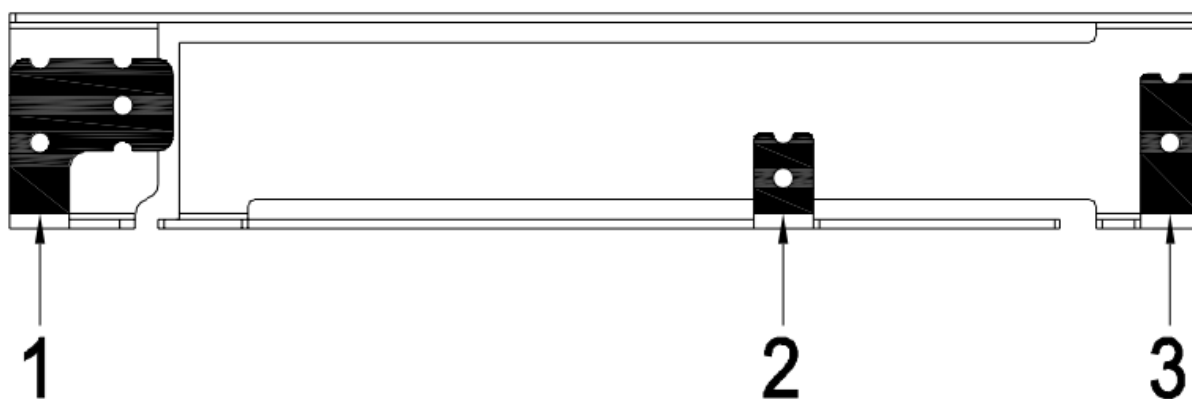
Phi=90 Freq=2690MHz



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	For mechanical use
2	Feed
3	For mechanical use



5 Transmission Line

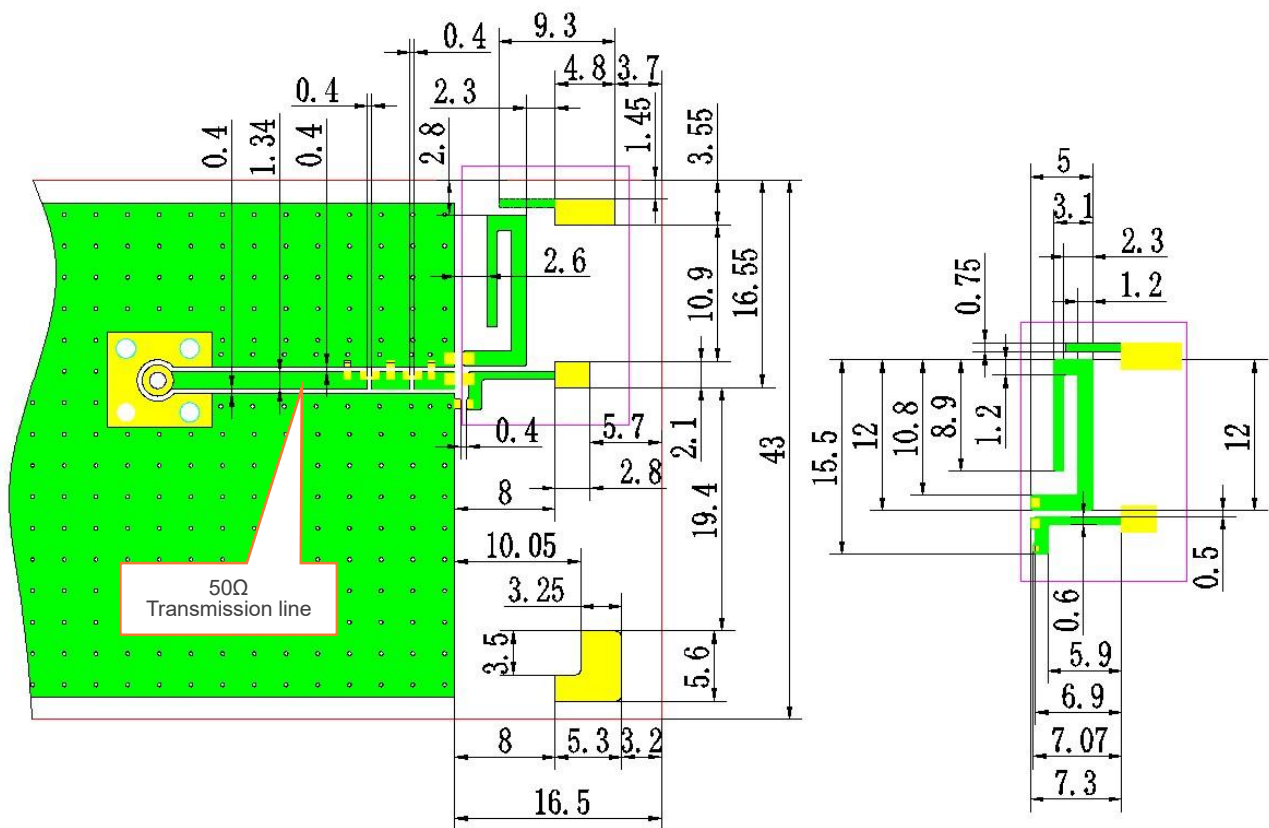
The characteristic impedance of all transmission lines shall be designed as 50 Ω .

- 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.

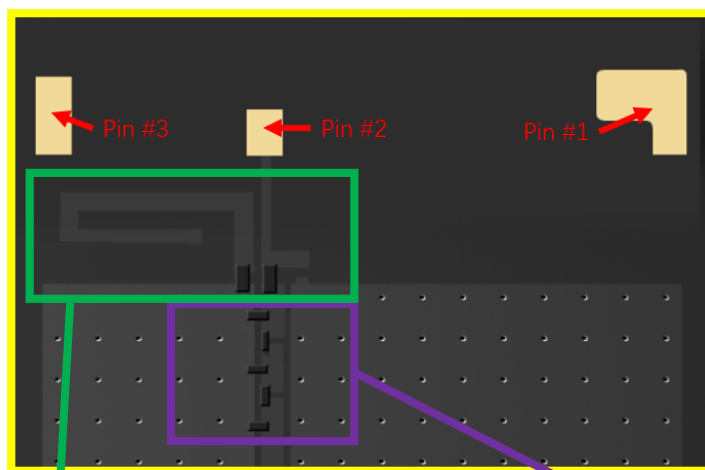


Recommended test board PCB layout for electrical characteristic measurement.
Substrate material FR4, DK (4.3-4.6).

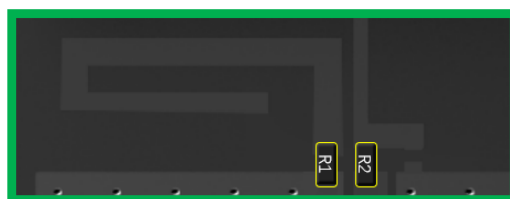
All dimensions are in mm.

7 Matching Circuit

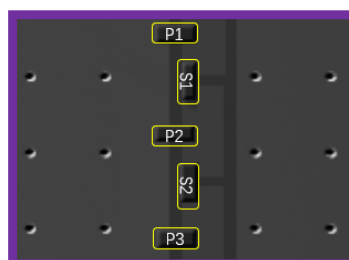
Demo Board Top View



Antenna Tuning



Antenna Matching



Pads are directly connected to the antenna feed trace.

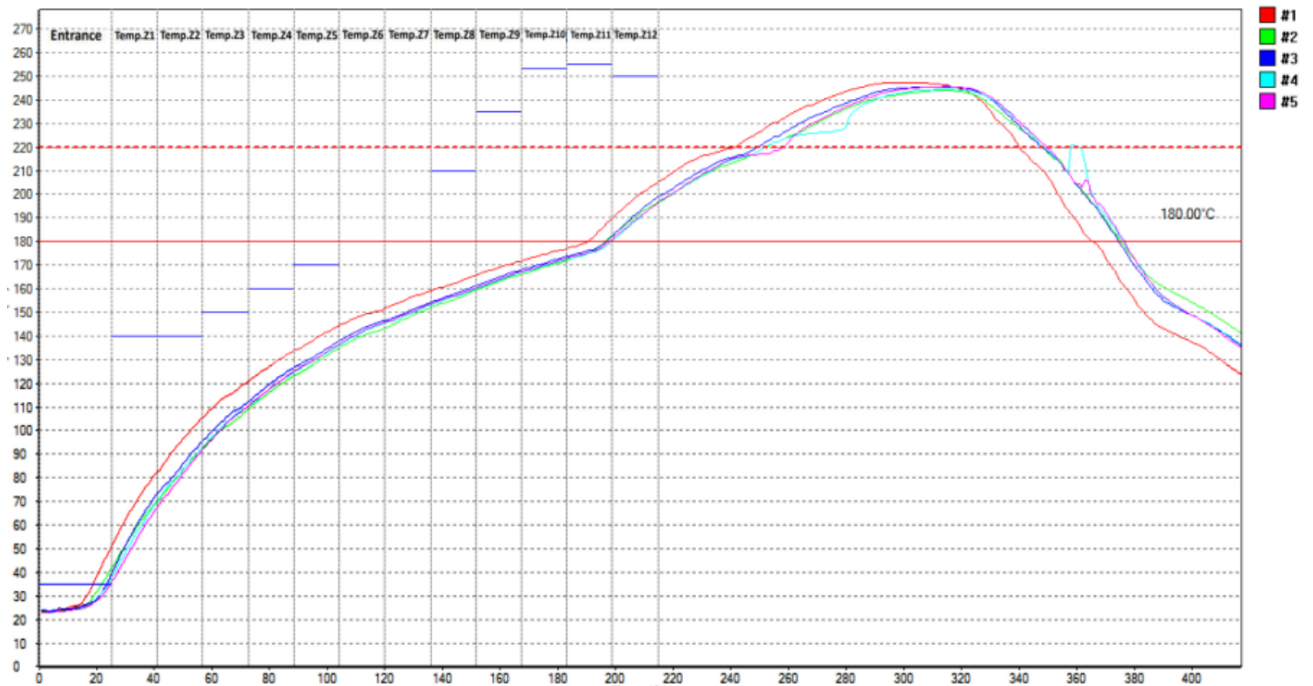
	R1	R2	P1	S1	P2	S2	P3
Default Matching	0 Ohm	0 Ohm	180 nH	5.1 nH	8.2 nH	3.9 pF	18 nH
Tolerance			±5 %	±5 %	±5 %	±5 %	±5 %

Pin #	Description
1	Dummy Pad
2	Feed
3	Dummy Pad

8 Soldering Temperature

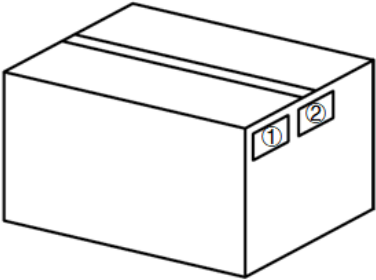
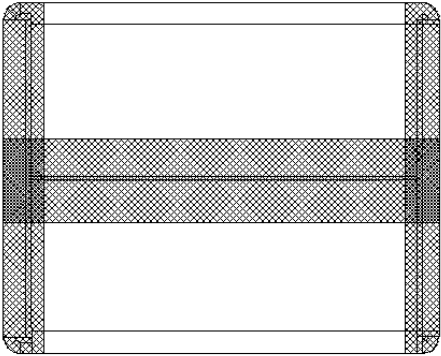
Phase	Profile Features	PB-Free Assembly
RAMP-UP	Avg. Ramp-up Rate (T _{smax} to T _p)	3 °C/second (Max.)
PREHEAT	Temperature Min (T _{smin}) Temperature Max (T _{smax}) Time (t _{smin} to t _{smax})	150 °C 190 °C 110 seconds (Max.)
REFLOW	Temperature (T _L) Total Time above T _L (t _l)	220 °C 90 seconds (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		Reel
2		500 Antenna Products / Reel The reel tape is vacuumed into the inner box.
3		4 Inner Boxes / Carton Box (2000 PCS / Carton Box) <u>Carton Size:</u> <u>L × W × H = 370 × 370 × 295 mm</u>

4		Position for Attaching Labels ① Carton Label ② Quality Label
5		Sealing Cartons “⊥” type sealing cartons

Contact Us

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

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Revision History

Version	Date	Author	Note
-	2024-04-25	Mordecai LIU/ Jason LONG/ David LIU/ Aria CHU	Creation of the document
1.0	2024-04-25	Mordecai LIU/ Jason LONG/ David LIU/ Aria CHU	First official release



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