



Antenna Datasheet

Product OC (Antenna Only): YPCS002AA

Product OC (Antenna + Rectangular EVB): YPCS002AAEVB

Version: 2.0

Date: 2024-04-08

Status: Released

Product Name: NB-IoT SMT FR4 Chip Monopole Antenna

Key Features:

High efficiency, Excellent performance

Frequency band: 791–960 MHz

Peak efficiency: 37.13 %

Dimensions: 20.00 × 11.00 × 1.60 mm

RoHS & REACH Compliant

Overview

The Quectel YPCS002AA is a compact form factor SMT mount FR4 chip antenna for NB-IoT applications. Due to the dimensions of $20.00 \times 11.00 \times 1.60$ mm, it is designed for very small space requirements for smart metering, remote monitoring, vehicle tracking and telematics, and many other IoT devices. The YPCS002AA is a ground-dependent monopole antenna, uses main PCB as its ground plane.

The YPCS002AA is a FR4 chip antenna, which can be mounted on super compact space require terminals. Despite of this small factor, it has up to 37.13 % efficiency in working bands. This antenna is developed on a 115×35 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 YPCS002AA allows high efficiency, stable signal transmission and reception for NB-IoT working bands in 791–960 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.

Contents

Overview.....	1
Contents.....	2
1 Specification.....	3
1.1. Electrical.....	3
1.2. Supported Bands	4
1.3. Mechanical & Environmental	6
2 Drawing	7
2.1. Antenna.....	7
2.2. Rectangular EVB.....	8
3 Detailed Performance	9
3.1. S-Parameter Test	9
3.1.1. VSWR.....	9
3.1.2. Return Loss	11
3.2. Radiation Performance Test.....	13
3.2.1. Efficiency	13
3.2.2. Average Gain	15
3.2.3. Peak Gain.....	17
3.2.4. 3D & 2D Radiation Pattern.....	19
4 Schematic Symbol & Pin Definition	22
5 Transmission Line	23
6 Recommended PCB Layout.....	24
7 Matching Circuit.....	25
8 Soldering Temperature.....	27
9 Reflow Profile	28
10 Packaging	29
Contact Us.....	31
Legal Notices	32
Revision History	34

1 Specification

Test Condition: Assembled On 115 × 35mm EVB

1.1. Electrical

Electrical	
Frequency Range	791–960 MHz
Impedance	50 Ω
Polarization	Linear
Radiation Pattern	Omni-directional

Electrical - Detail								
SPEC	Band	B71	B20	B5 /B8	B1 /B2 /B3	B40	Wi-Fi 2G	B38 /B41
	Freq. (MHz)	600– 700	791- 864	824– 960	1700– 2170	2300– 2400	2400– 2500	2500– 2690
Max VSWR		-	4.1	2.8	-	-	-	-
Max Return Loss (dB)		-	-4.3	-6.4	-	-	-	-
AVG Eff. (%)		-	29.6	30.8	-	-	-	-
AVG Gain (dB)		-	-5.3	-5.1	-	-	-	-
Max Peak Gain (dBi)		-	-0.1	1.2	-	-	-	-
VSWR			≤ 4.1					
Return Loss			≤ -4.3 dB					
Peak Gain			≤ 1.2 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:

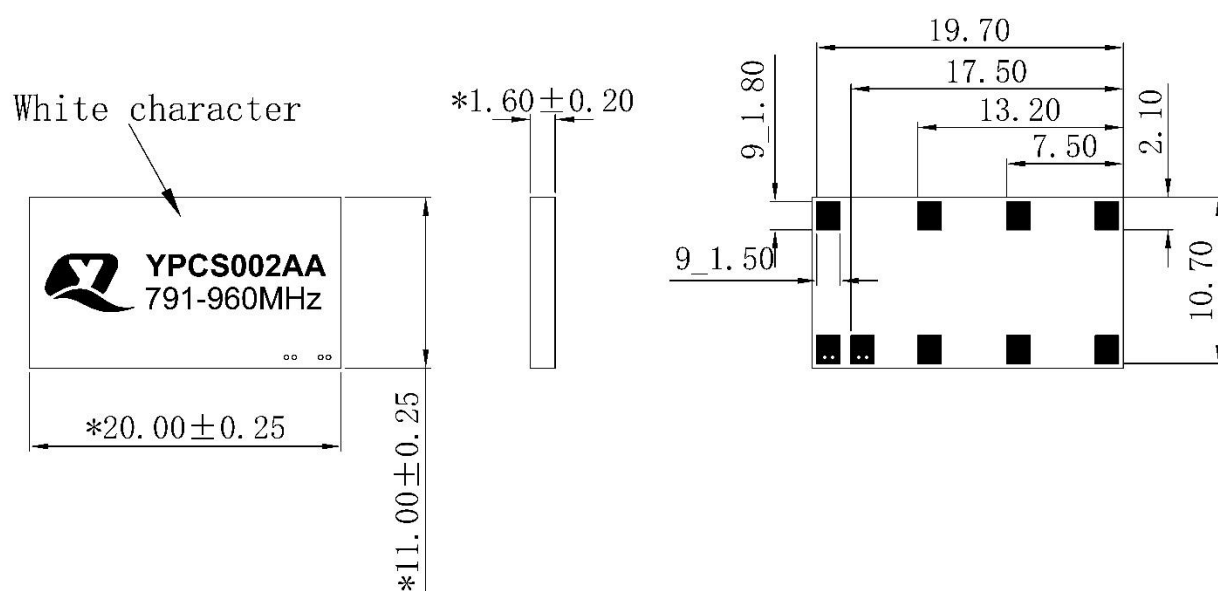
- Covered √ means efficiency > 20%.
- Based on 115 × 35 mm GND.

1.3. Mechanical & Environmental

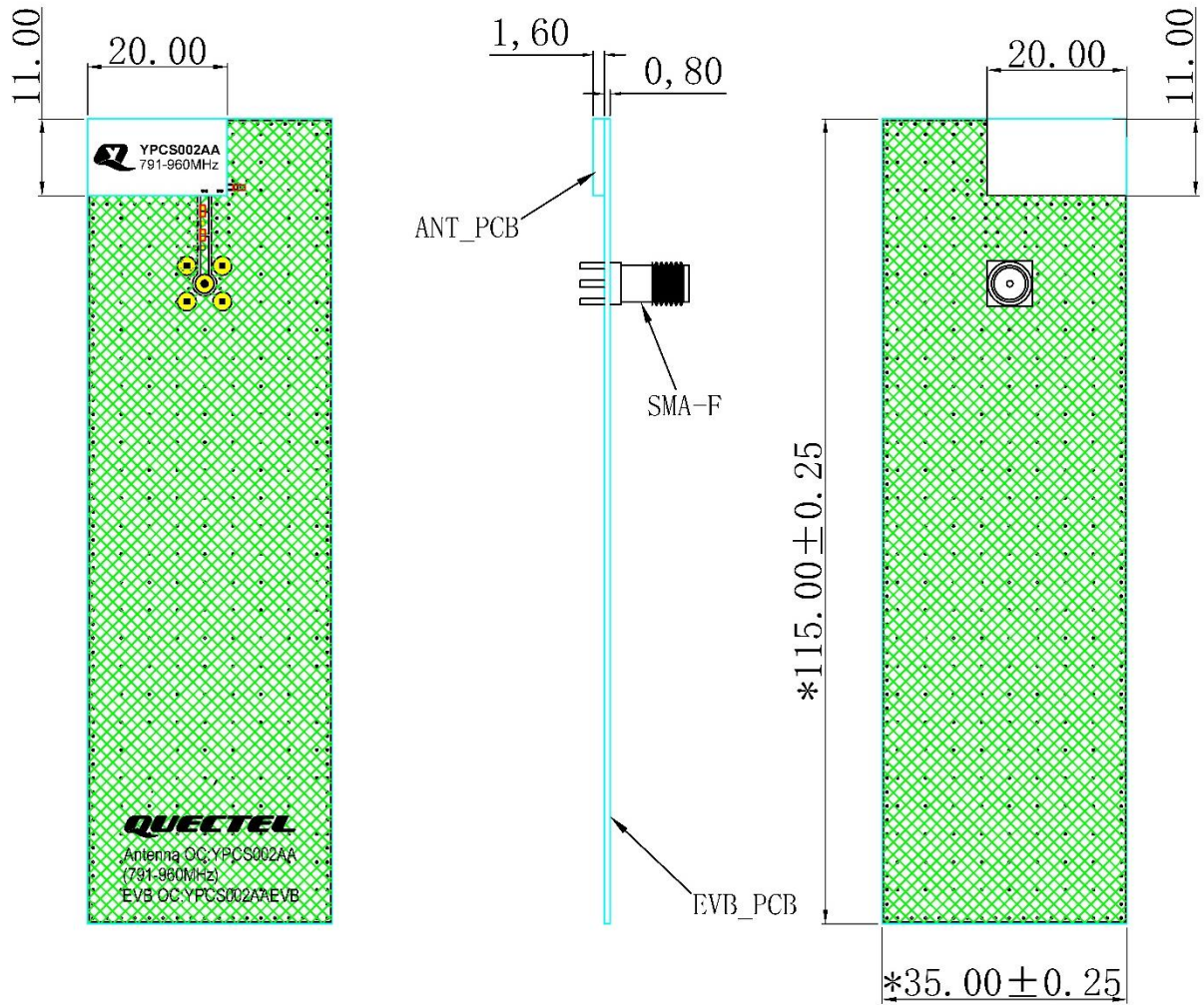
Mechanical	
Antenna Size	20.00 × 11.00 × 1.60 mm
Antenna Material & Color	PCB & Black
Antenna Weight	Typ. 0.7 g
Mounting Type	SMD
Recommended EVB Size	Rectangular EVB: 115.00 × 35.00 × 0.80 mm
Environmental	
Operation Temperature	-40 °C to +85 °C
Storage Temperature	-40 °C to +85 °C
RoHS & REACH Compliant	Yes

2 Drawing

2.1. Antenna



2.2. Rectangular EVB

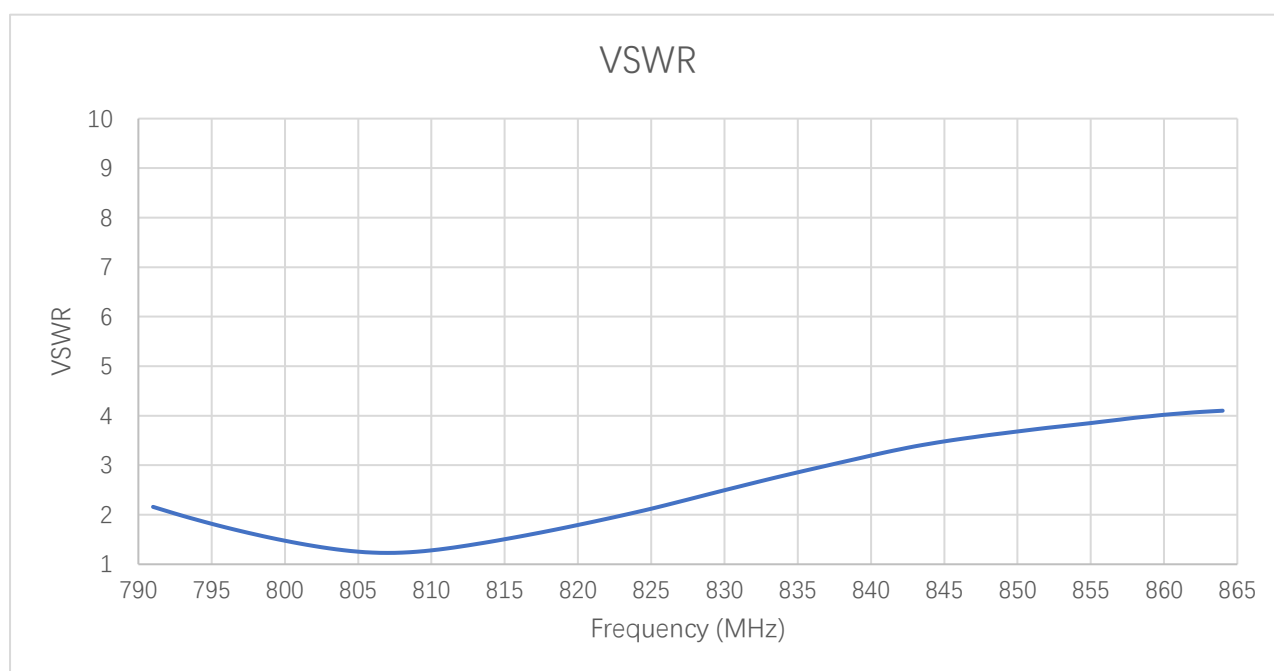


3 Detailed Performance

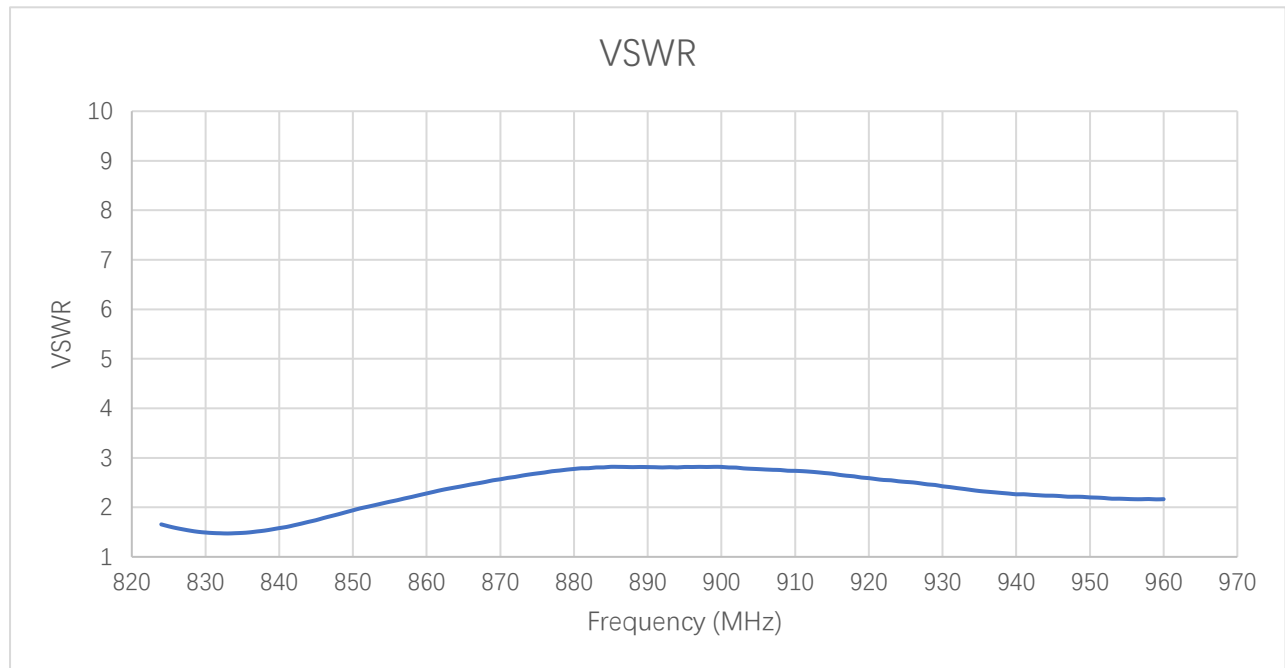
3.1. S-Parameter Test

3.1.1. VSWR

Band 20



Band 5/8

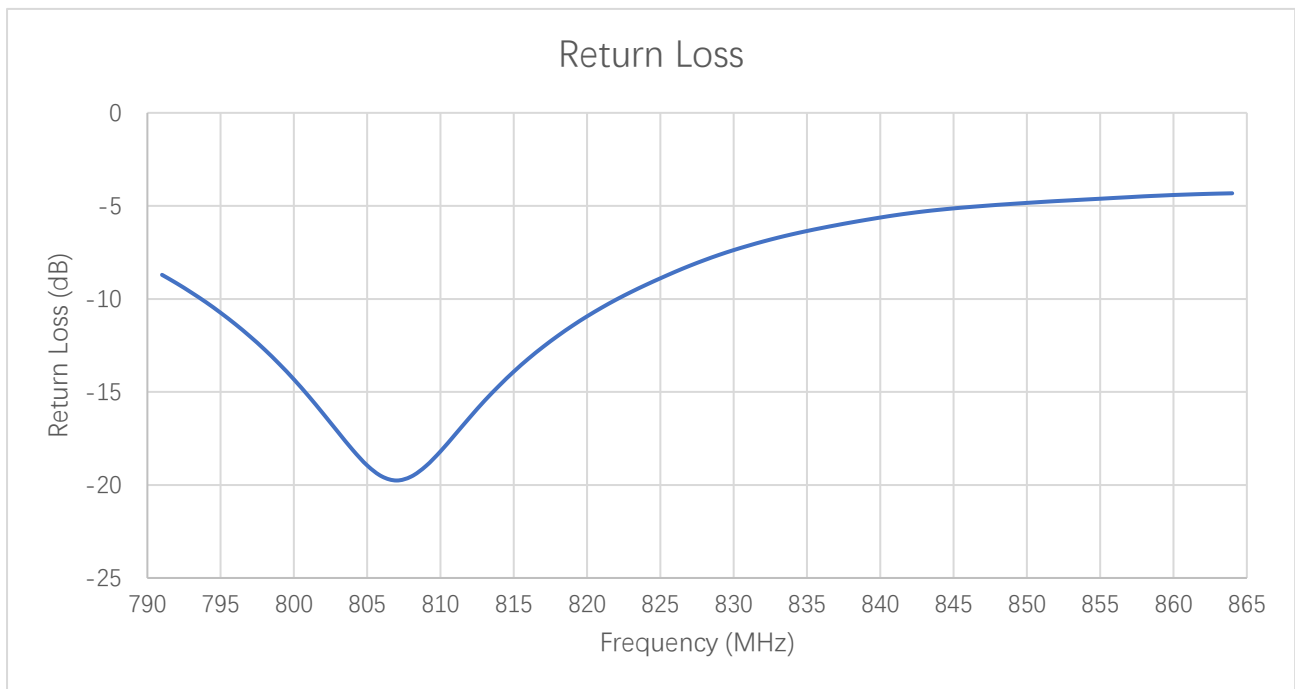


VSWR

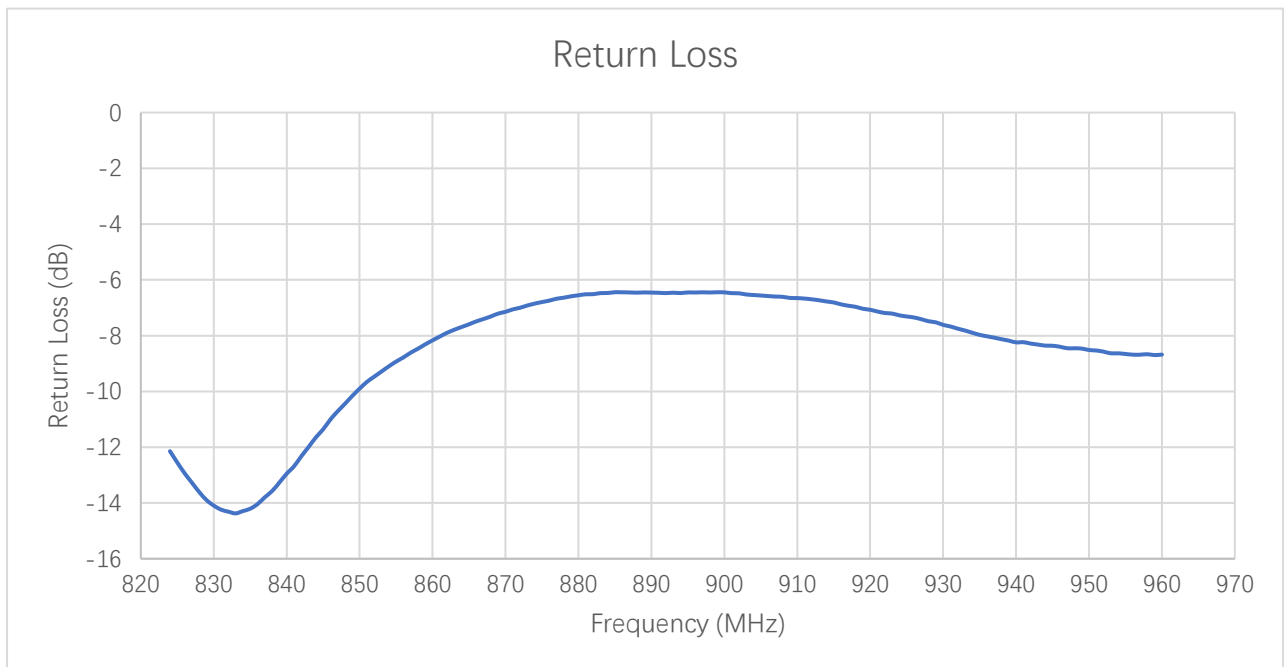
Frequency (MHz)	600	630	791	830	860	900	960	1710	1740	1880
Band 20	-	-	2.2	2.5	4.0	-	-	-	-	-
Band 5/8	-	-	-	1.5	2.3	2.8	2.2	-	-	-
Frequency (MHz)	1950	2140	2350	2450	2600	3600	4700	5000	5500	6000
Band 20	-	-	-	-	-	-	-	-	-	-
Band 5/8	-	-	-	-	-	-	-	-	-	-

3.1.2. Return Loss

Band 20



Band 5/8



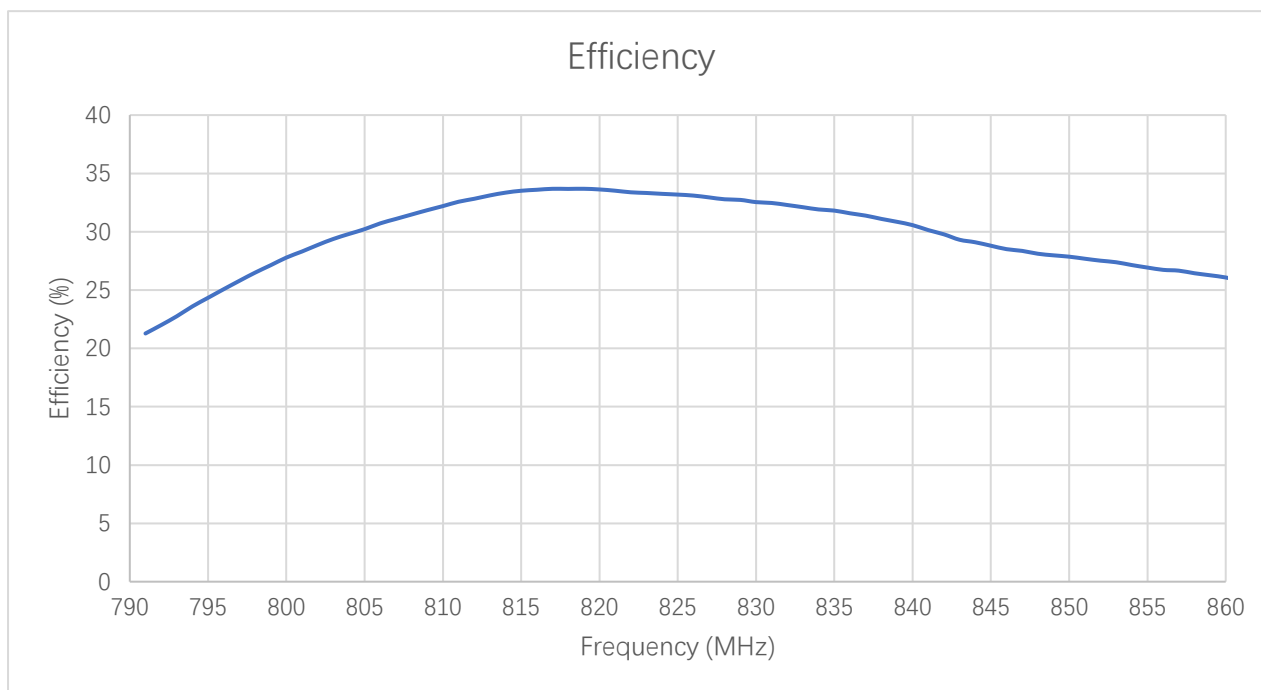
Return Loss (dB)

Frequency (MHz)	600	630	791	830	860	900	960	1710	1740	1880
Band 20	-	-	-8.7	-7.4	-4.4	-	-	-	-	-
Band 5/8	-	-	-	-14.1	-9.2	-6.4	-9.7	-	-	-
Frequency (MHz)	1950	2140	2350	2450	2600	3600	4700	5000	5500	6000
Band 20	-	-	-	-	-	-	-	-	-	-
Band 5/8	-	-	-	-	-	-	-	-	-	-

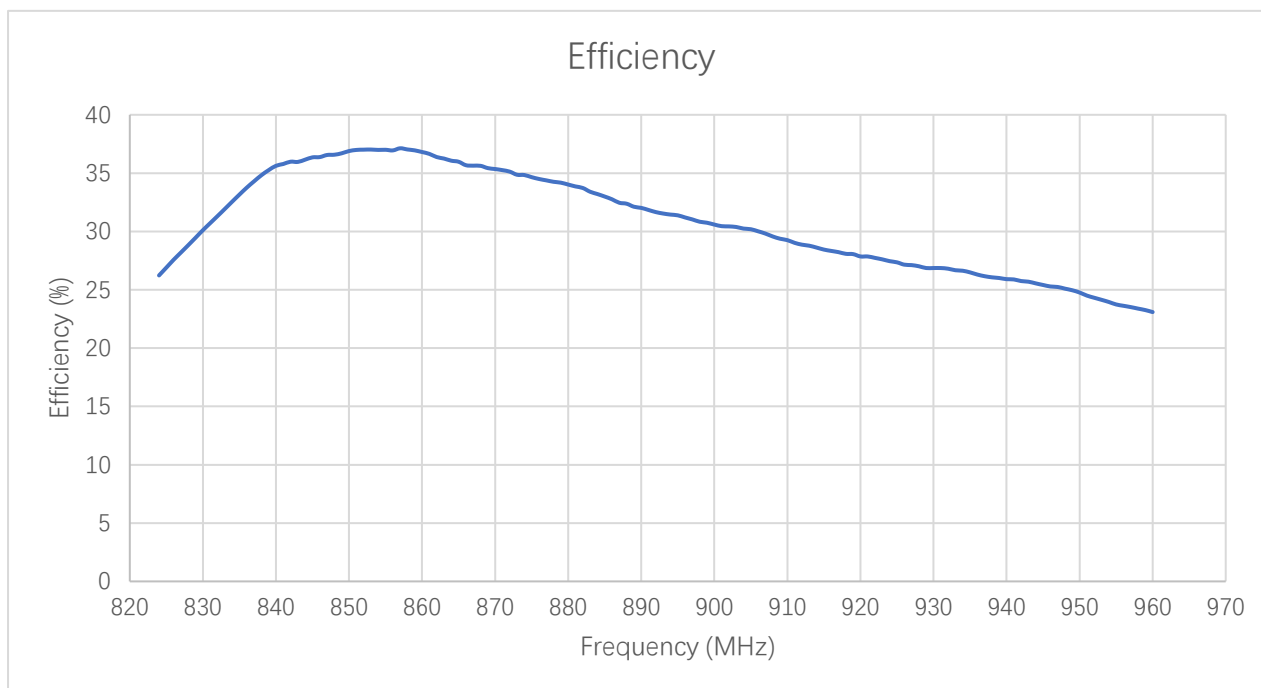
3.2. Radiation Performance Test

3.2.1. Efficiency

Band 20



Band 5/8

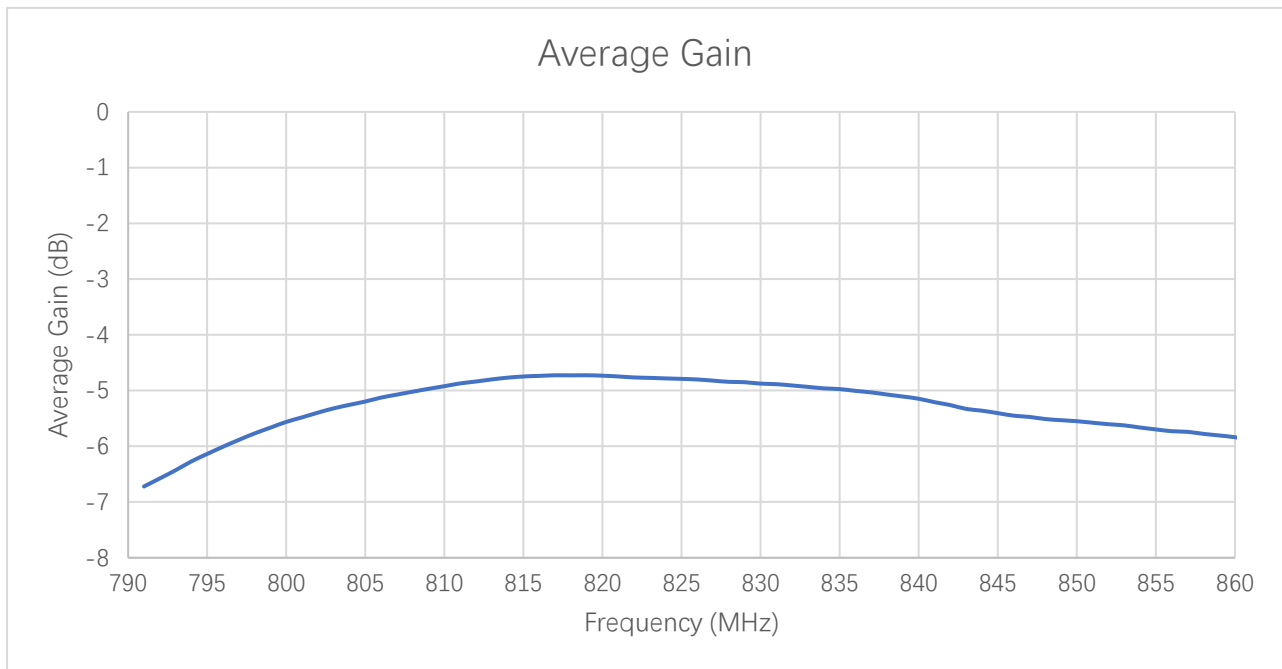


Efficiency (%)

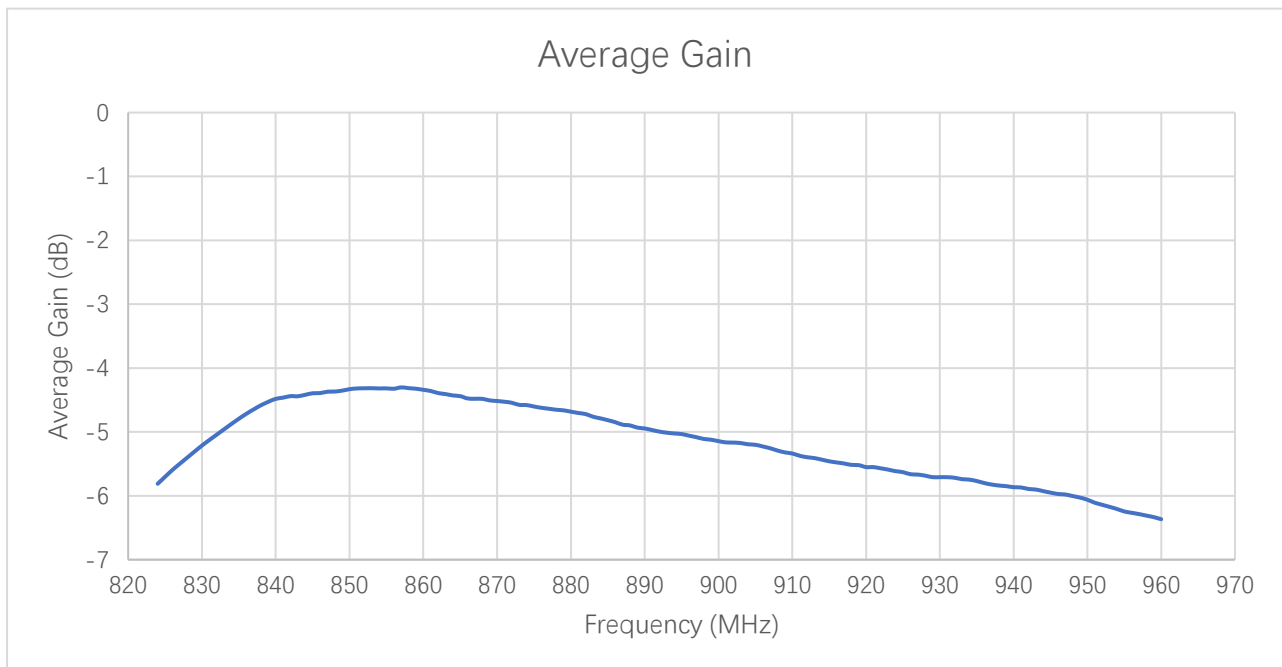
Frequency (MHz)	600	630	791	830	860	900	960	1710	1740	1880
Band 20	-	-	21.3	32.5	26.1	-	-	-	-	-
Band 5/8	-	-	-	30.1	36.8	30.6	23.1	-	-	-
Frequency (MHz)	1950	2140	2350	2450	2600	3600	4700	5000	5500	6000
Band 20	-	-	-	-	-	-	-	-	-	-
Band 5/8	-	-	-	-	-	-	-	-	-	-

3.2.2. Average Gain

Band 20



Band 5/8

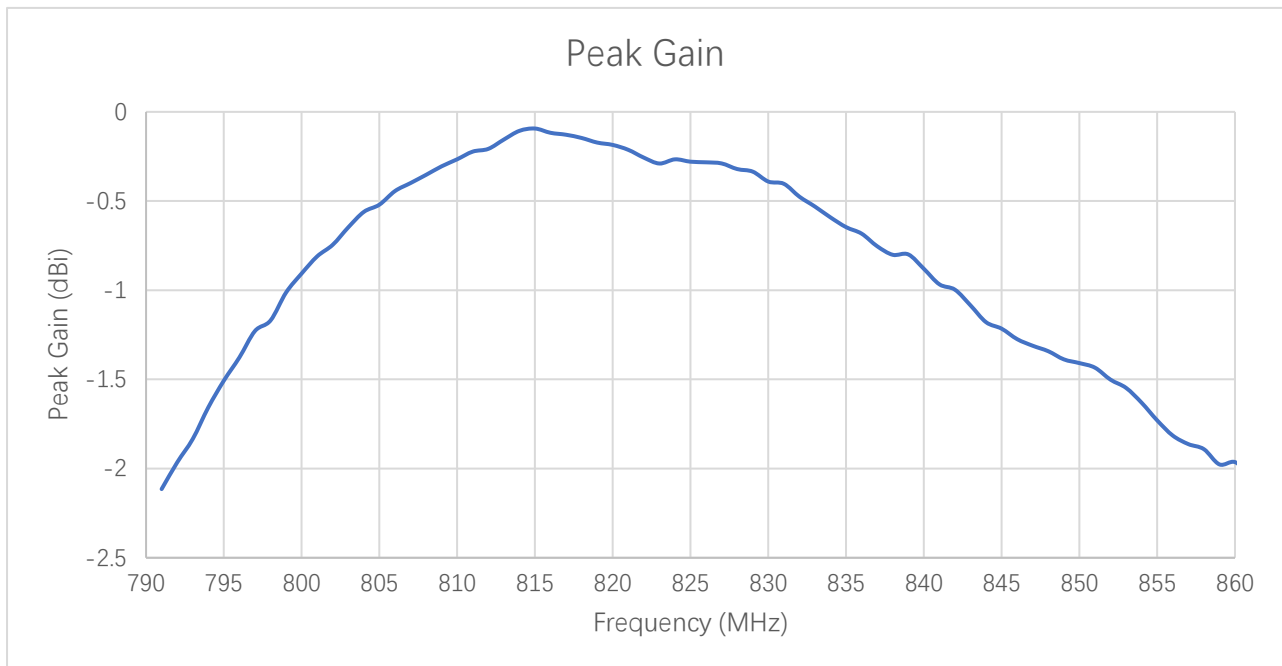


Average Gain (dB)

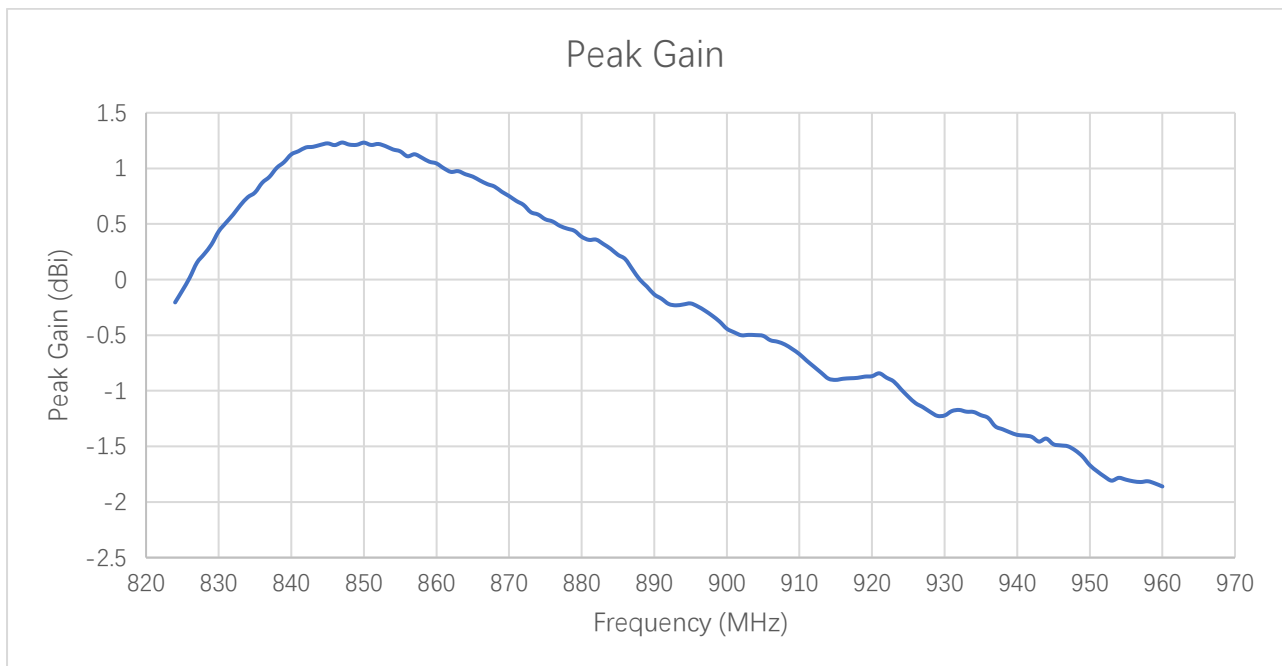
Frequency (MHz)	600	630	791	830	860	900	960	1710	1740	1880
Band 20	-	-	-6.7	-4.9	-5.8	-	-	-	-	-
Band 5/8	-	-	-	-5.2	-4.3	-5.1	-6.4	-	-	-
Frequency (MHz)	1950	2140	2350	2450	2600	3600	4700	5000	5500	6000
Band 20	-	-	-	-	-	-	-	-	-	-
Band 5/8	-	-	-	-	-	-	-	-	-	-

3.2.3. Peak Gain

Band 20



Band 5/8

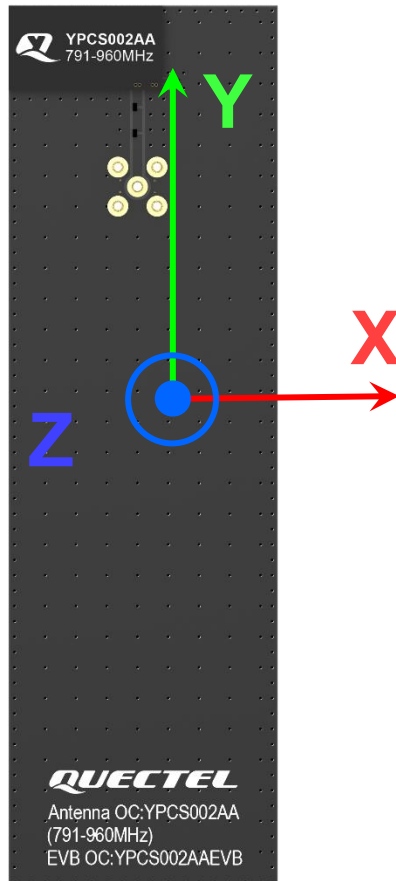


Peak Gain (dBi)

Frequency (MHz)	600	630	791	830	860	900	960	1710	1740	1880
Band 20	-	-	-2.1	-0.4	-2.0	-	-	-	-	-
Band 5/8	-	-	-	0.4	1.0	-0.4	-1.9	-	-	-
Frequency (MHz)	1950	2140	2350	2450	2600	3600	4700	5000	5500	6000
Band 20	-	-	-	-	-	-	-	-	-	-
Band 5/8	-	-	-	-	-	-	-	-	-	-

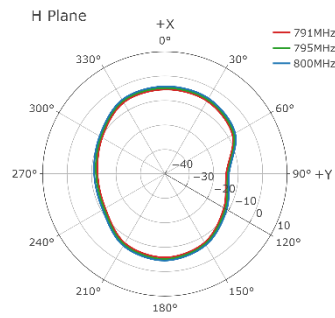
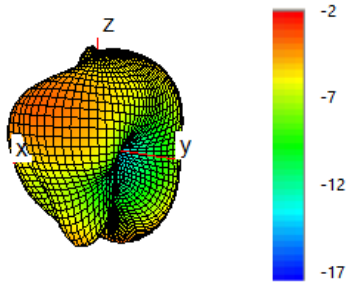
3.2.4. 3D & 2D Radiation Pattern

- Test Status: Assembled on a 115 × 35 mm EVB
- Test Chamber: FS-S-1

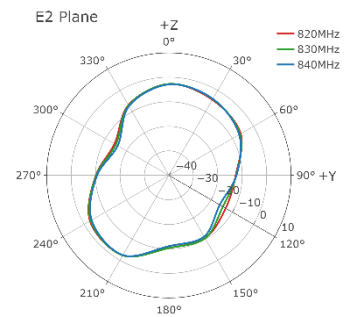
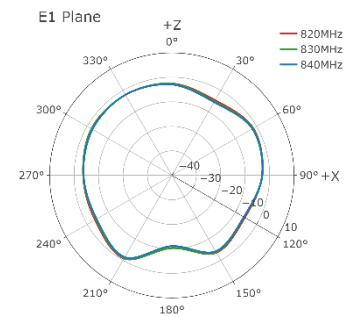
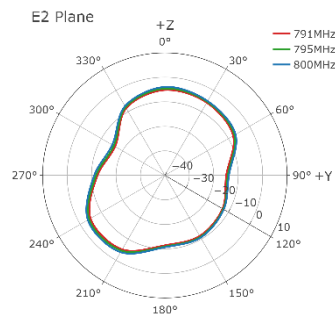
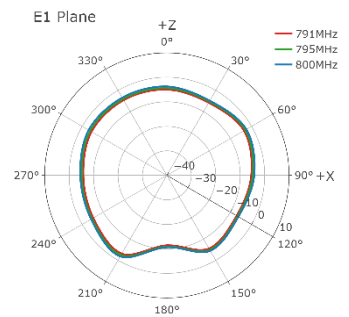
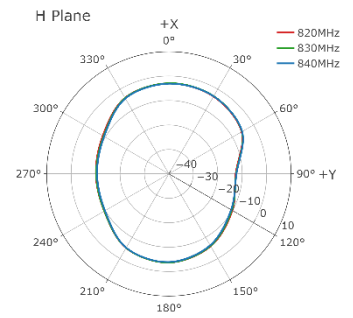
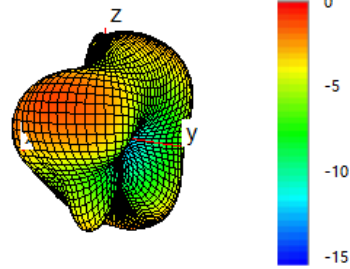


● **Band 20**

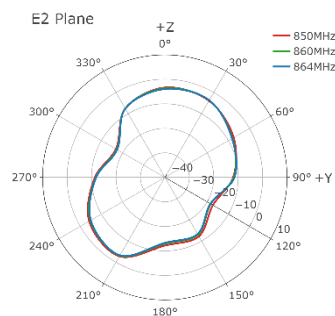
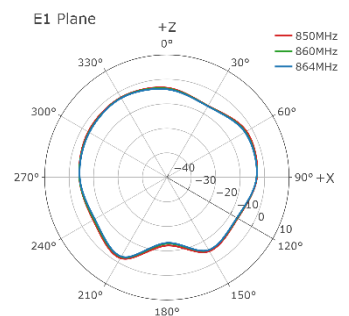
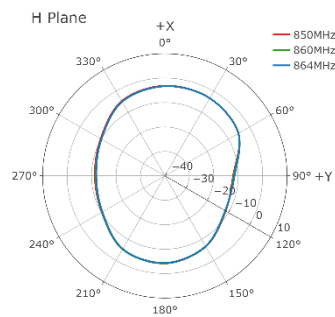
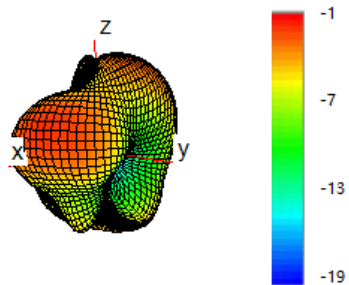
791 MHz



830 MHz

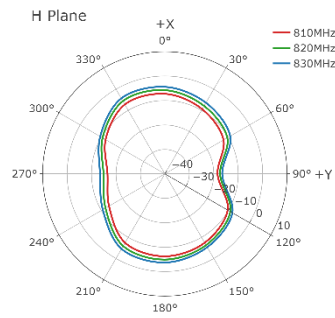
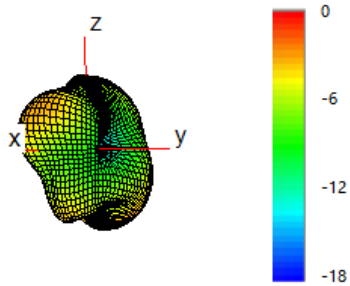


860 MHz

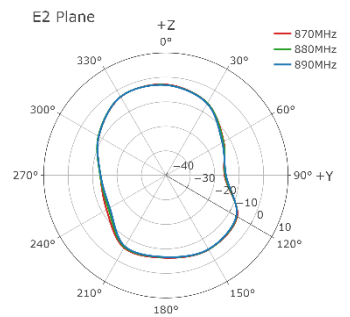
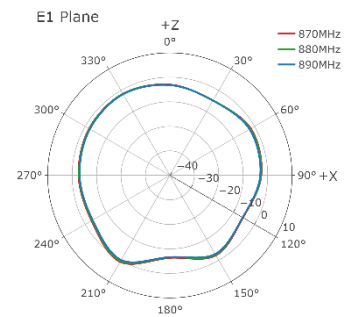
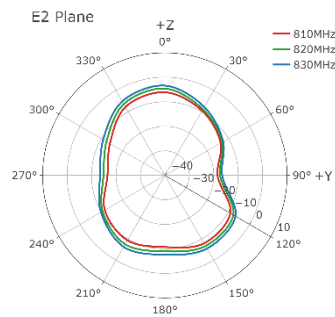
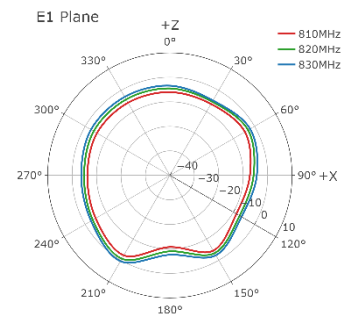
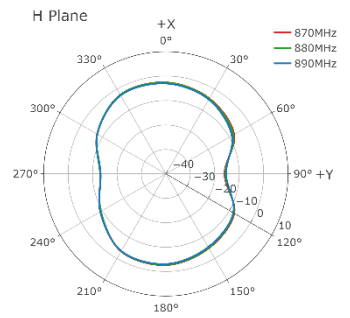
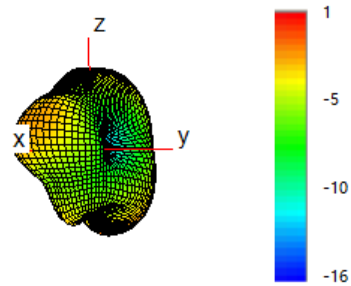


● **Band 5/8**

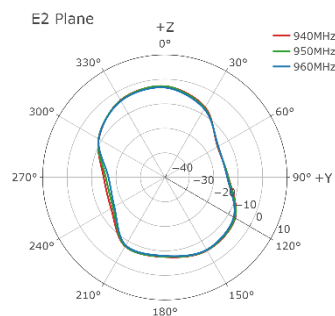
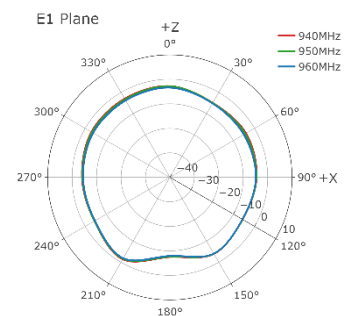
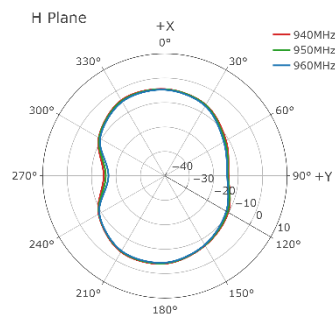
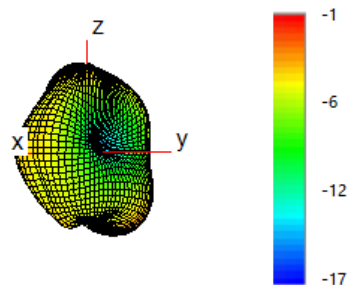
830 MHz



860 MHz



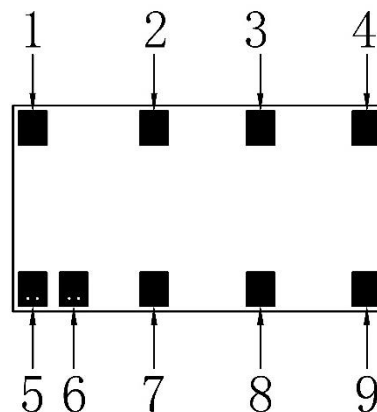
960 MHz



4 Schematic Symbol & Pin Definition

- The pin assignment for the antenna is as follows.
- The circuit symbol for the antenna is shown below. The antenna has 9 pins with only one as functional. All other pins are for mechanical strength.

Pin	Description
5	Return / GND
6	Feed
1, 2, 3, 4, 7, 8, 9	Not used (Mechanical only)



5 Transmission Line

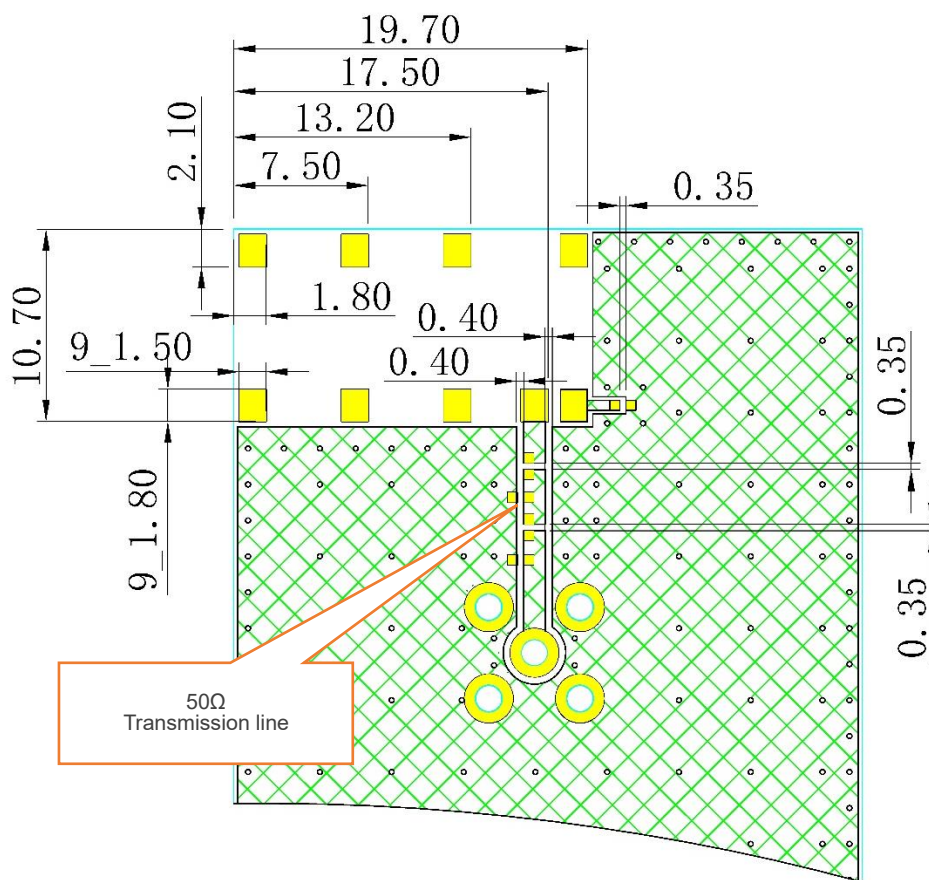
The characteristic impedance of all transmission lines shall be designed as 50 Ω .

- 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

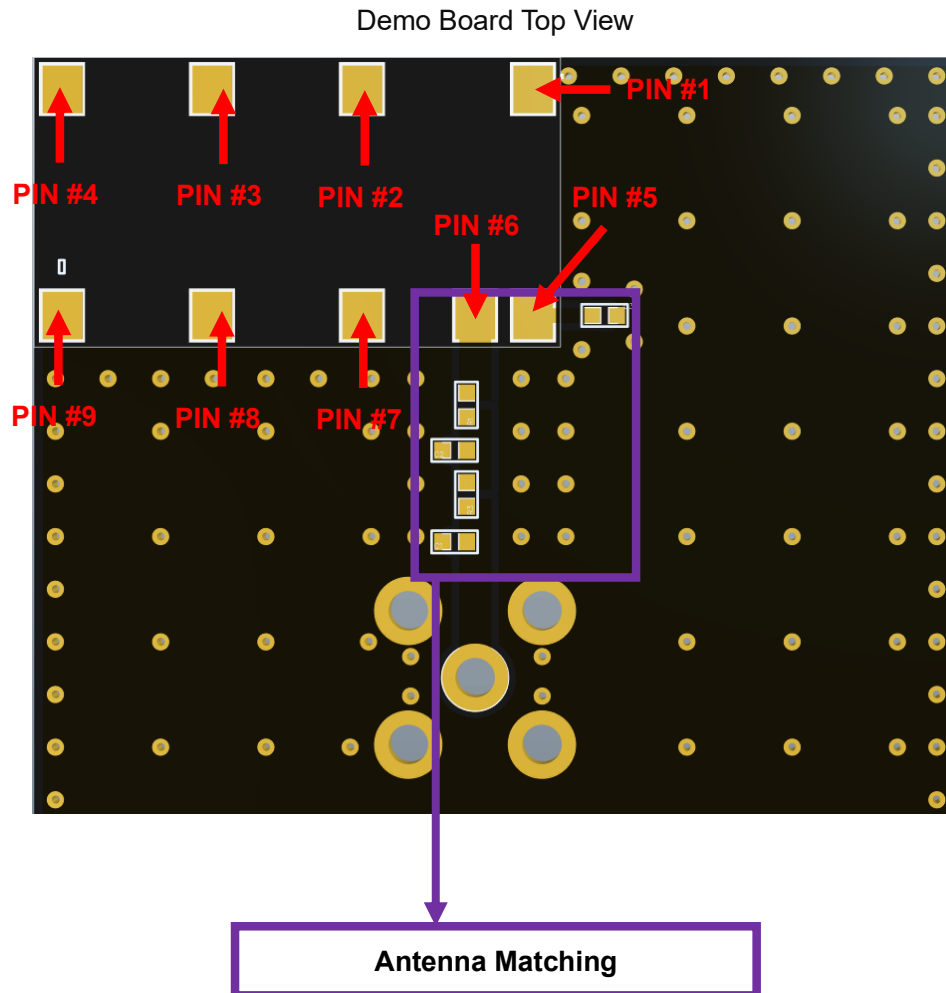
The host PCB must be designed using the PCB footprint shown with the correct clearances. An example of the PCB layout shows the antenna footprint. Please note this clearance area is critical to the performance of the antenna and must be applied through all layers of the PCB.

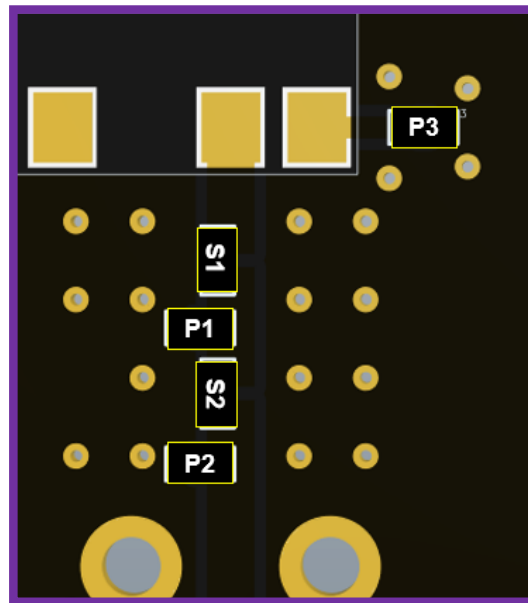


PAD: 

All dimensions in (mm)

7 Matching Circuit





Pads are directly connected to the antenna feed trace.

Band 20

	P1	S1	P2	S2	P3
Default Matching	DNI	0.75 pF	DNI	27 nH	4.3 nH
Tolerance	N/A	±5 %	N/A	±5 %	±5 %

Band 5/8

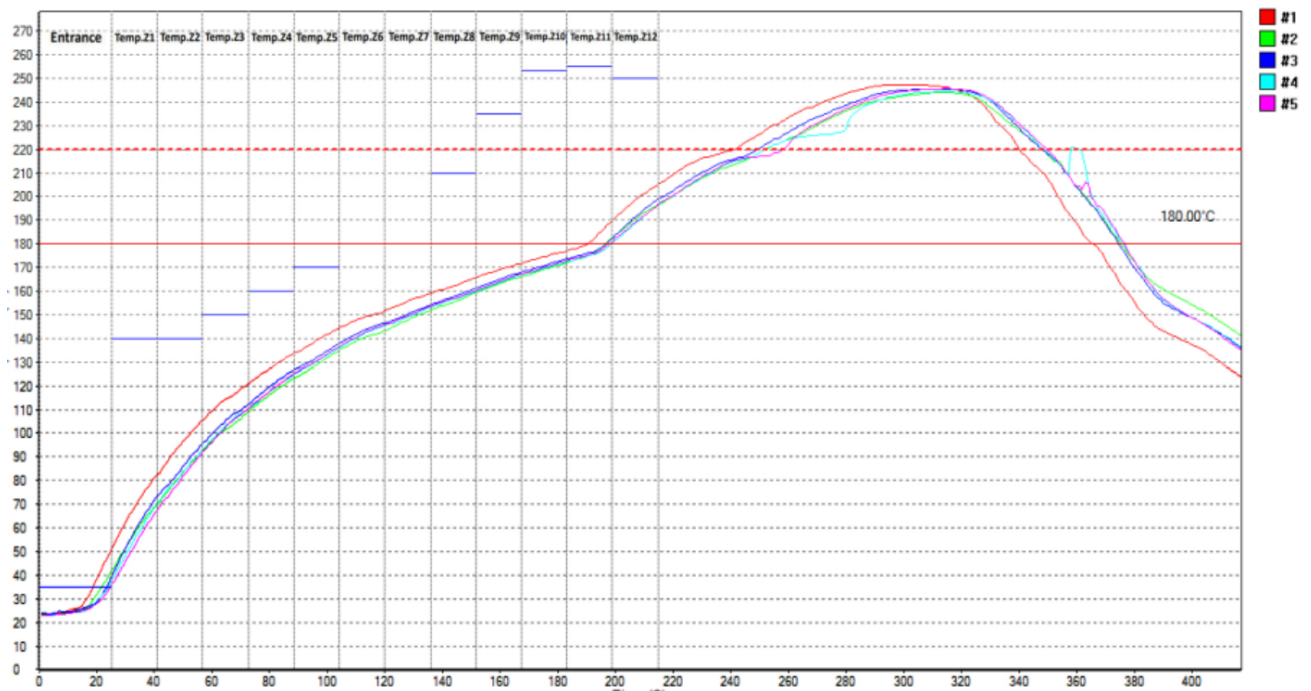
	P1	S1	P2	S2	P3
Default Matching	DNI	0.75 pF	DNI	27 nH	2.4 nH
Tolerance	N/A	±5 %	N/A	±5 %	±5 %

Pin #	Description
5	Return / GND
6	Feed
1, 2, 3, 4, 7, 8, 9	Dummy Pad

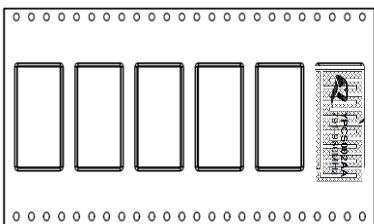
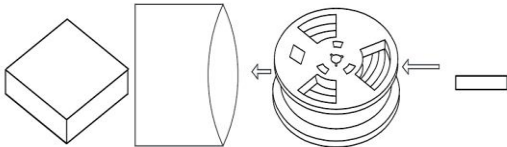
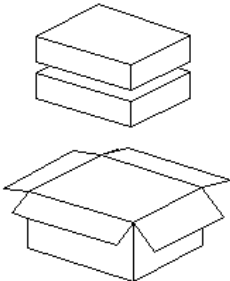
8 Soldering Temperature

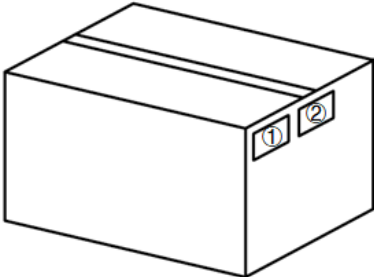
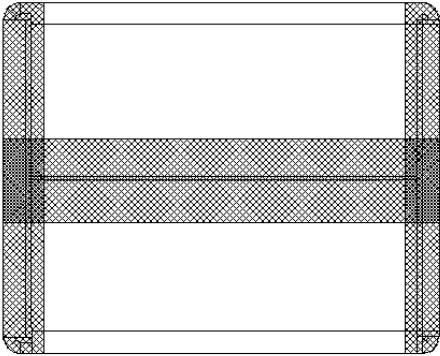
Phase	Profile Features	PB-Free Assembly
RAMP-UP	Avg. Ramp-up Rate (T _{smax} to T _p)	3 °C/second (Max.)
PREHEAT	Temperature Min (T _{smin}) Temperature Max (T _{smax}) Time (t _{smin} to t _{smax})	150 °C 190 °C 110 seconds (Max.)
REFLOW	Temperature (T _L) Total Time above T _L (t _l)	220 °C 90 seconds (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		1800 antenna products / reel Reel tape is vacuumed into the inner box.
3		2 inner boxes / carton box (3600 pcs / carton box) <u>Carton Size:</u> <u>L × W × H = 370 × 370 × 174 mm</u>

4		Position for Attaching Labels ① Carton Label ② Quality Label
5		Sealing Cartons “Γ” 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:

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:

<http://www.quectel.com/support/sales.htm>.

For technical support, or to report documentation errors, please visit:

<http://www.quectel.com/support/technical.htm>.

Or email us at: support@quectel.com.

Legal Notices

We offer information as a service to you. The provided information is based on your requirements and we make every effort to ensure its quality. You agree that you are responsible for using independent analysis and evaluation in designing intended products, and we provide reference designs for illustrative purposes only. Before using any hardware, software or service guided by this document, please read this notice carefully. Even though we employ commercially reasonable efforts to provide the best possible experience, you hereby acknowledge and agree that this document and related services hereunder are provided to you on an “as available” basis. We may revise or restate this document from time to time at our sole discretion without any prior notice to you.

Use and Disclosure Restrictions

License Agreements

Documents and information provided by us shall be kept confidential, unless specific permission is granted. They shall not be accessed or used for any purpose except as expressly provided herein.

Copyright

Our and third-party products hereunder may contain copyrighted material. Such copyrighted material shall not be copied, reproduced, distributed, merged, published, translated, or modified without prior written consent. We and the third party have exclusive rights over copyrighted material. No license shall be granted or conveyed under any patents, copyrights, trademarks, or service mark rights. To avoid ambiguities, purchasing in any form cannot be deemed as granting a license other than the normal non-exclusive, royalty-free license to use the material. We reserve the right to take legal action for noncompliance with abovementioned requirements, unauthorized use, or other illegal or malicious use of the material.

Trademarks

Except as otherwise set forth herein, nothing in this document shall be construed as conferring any rights to use any trademark, trade name or name, abbreviation, or counterfeit product thereof owned by Quectel or any third party in advertising, publicity, or other aspects.

Third-Party Rights

This document may refer to hardware, software and/or documentation owned by one or more third parties (“third-party materials”). Use of such third-party materials shall be governed by all restrictions and obligations applicable thereto.

We make no warranty or representation, either express or implied, regarding the third-party materials, including but not limited to any implied or statutory, warranties of merchantability or fitness for a particular purpose, quiet enjoyment, system integration, information accuracy, and non-infringement of any third-party intellectual property rights with regard to the licensed technology or use thereof. Nothing herein constitutes a representation or warranty by us to either develop, enhance, modify, distribute, market, sell, offer for sale, or otherwise maintain production of any our products or any other hardware, software, device, tool, information, or product. We moreover disclaim any and all warranties arising from the course of dealing or usage of trade.

Privacy Policy

To implement module functionality, certain device data are uploaded to Quectel's or third-party's servers, including carriers, chipset suppliers or customer-designated servers. Quectel, strictly abiding by the relevant laws and regulations, shall retain, use, disclose or otherwise process relevant data for the purpose of performing the service only or as permitted by applicable laws. Before data interaction with third parties, please be informed of their privacy and data security policy.

Disclaimer

- a) We acknowledge no liability for any injury or damage arising from the reliance upon the information.
- b) We shall bear no liability resulting from any inaccuracies or omissions, or from the use of the information contained herein.
- c) While we have made every effort to ensure that the functions and features under development are free from errors, it is possible that they could contain errors, inaccuracies, and omissions. Unless otherwise provided by valid agreement, we make no warranties of any kind, either implied or express, and exclude all liability for any loss or damage suffered in connection with the use of features and functions under development, to the maximum extent permitted by law, regardless of whether such loss or damage may have been foreseeable.
- d) We are not responsible for the accessibility, safety, accuracy, availability, legality, or completeness of information, advertising, commercial offers, products, services, and materials on third-party websites and third-party resources.

Copyright © Quectel Wireless Solutions Co., Ltd. 2024. All rights reserved.

Revision History

Version	Date	Author	Note
-	2022-09-23	Howard ZHANG/ Toby WANG	Creation of the document
1.0	2023-03-22	Howard ZHANG/ Toby WANG	First official release
1.1	2023-06-26	Toby WANG	Updated the drawing (Chapter 5)
2.0	2024-04-08	Mordecai LIU/ Toby WANG/ David LIU/ Rainey LIAO	Updated all test data in this datasheet.



www.quectel.com