



Quectel

T20/ Y0BQDOCA0

Antenna Debugging Report

Reporter: Charming.yang

Tel: +86 15627372864

Email: Charming.yang@quectel.com

Date: 2024.03.18

Build a Smarter World

Revision History



Revision	Date	Reporter	Reviewer	Note
V1.0	2025/03/18	Charming	/	First Prototype Debugging Antenna



Project Overview

Antenna Performance Evaluation and Debugging
Conclusion and Suggestion

Build a Smarter World



Project Overview



Prototype Schematic

- Device Dimensions: 54 × 32 x 16 mm
- Mainboard Dimensions: 43 × 27 mm
- Antenna Quantity: 5
- Network Standard and Frequency Band:
 - ✓ LTE: 698–960 MHz & 1710–2690 MHz
 - ✓ WiFi: 2400-2500 MHz
 - ✓ BT: 2400-2500 MHz
 - ✓ GNSS: L1
- Performance Requirements:
 - ✓ TBD



Project Overview

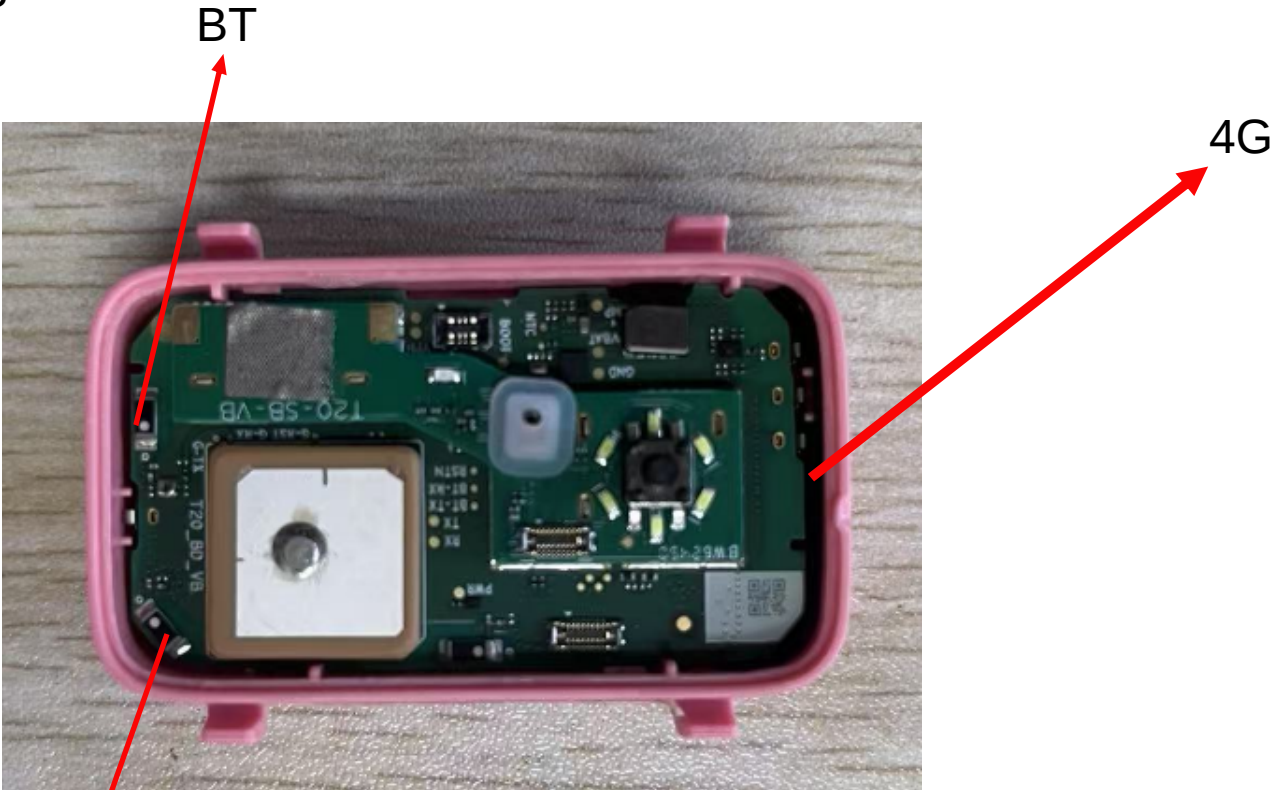
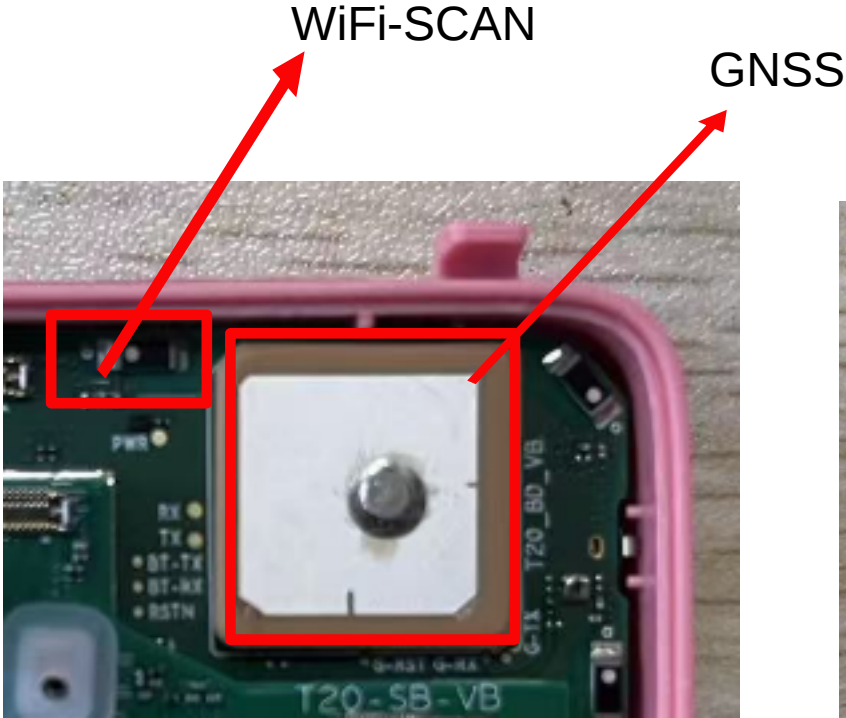
Antenna Performance Evaluation and Debugging

Conclusion and Suggestion

Build a Smarter World

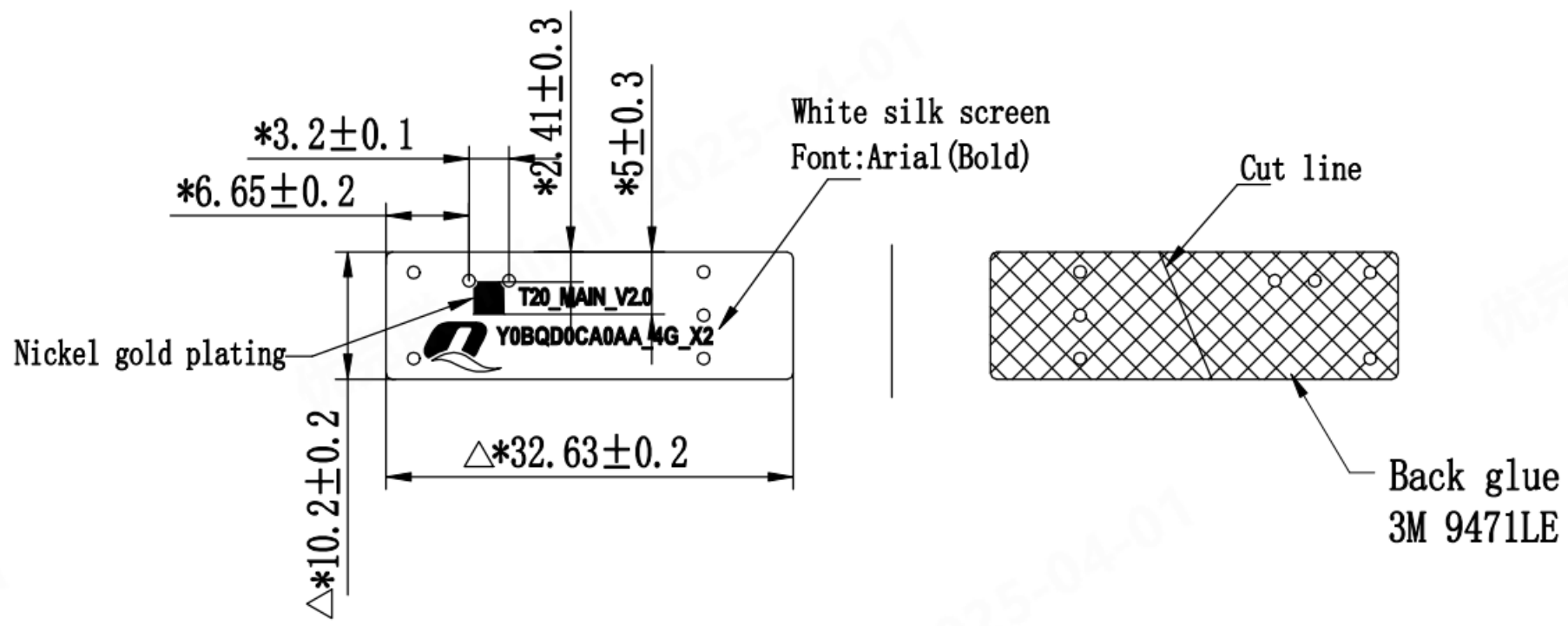


Antenna Placement Analysis

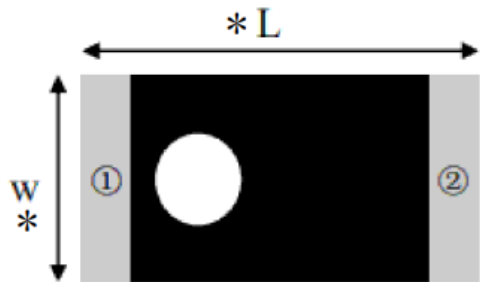


Antenna Size

a. 4G Antenna Size

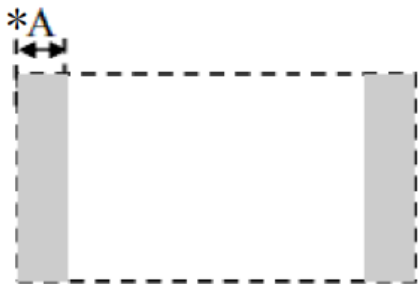


b. Wifi/BT Antenna Size



(Top View)

Number	Terminal Name
①	INPUT
②	NC



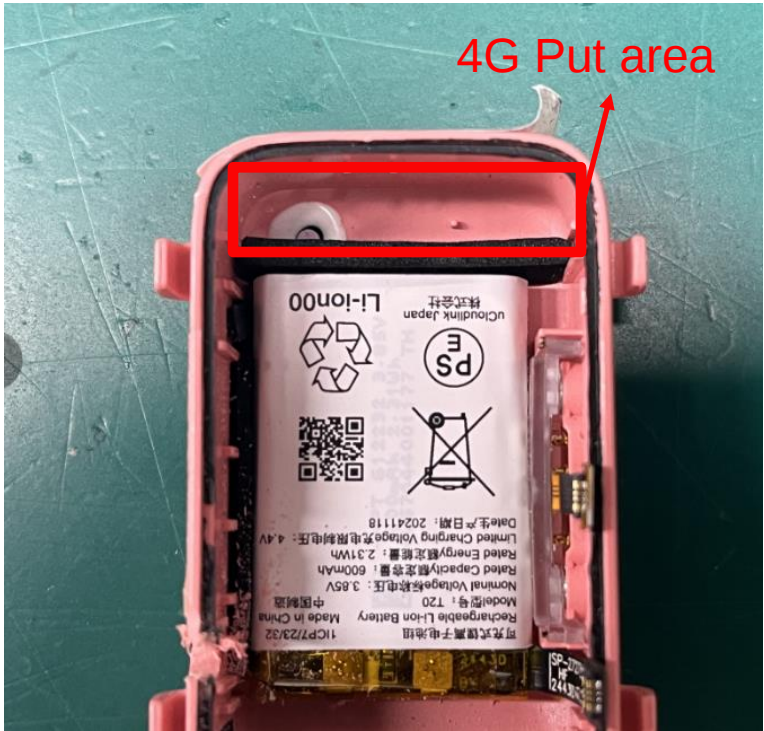
(Bottom View)



(Side View)

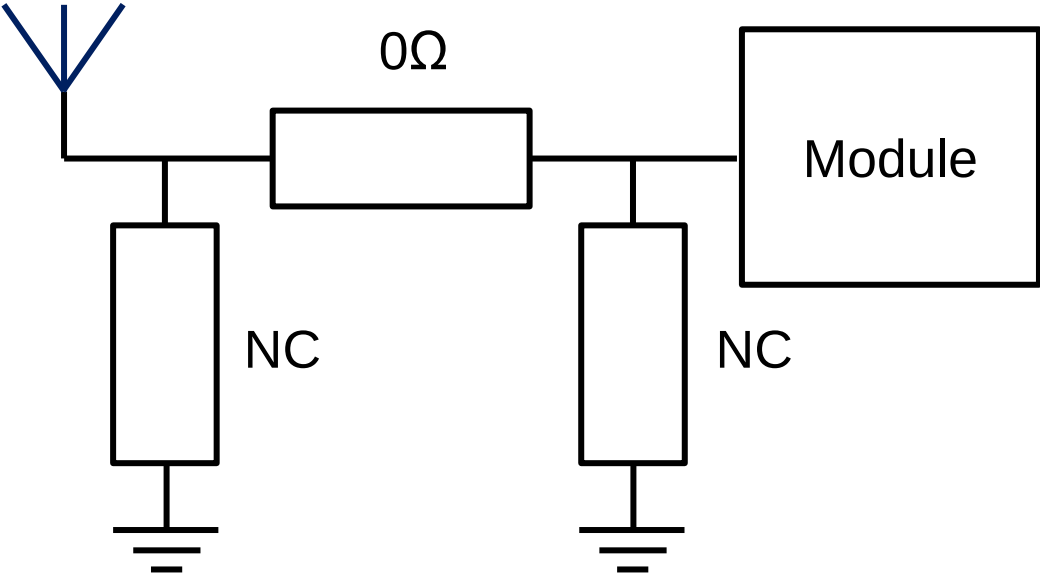
Symbols	L	W	T	A
Dimensions	3.2+/-0.2	1.6+/-0.2	0.5+/-0.1	0.4+/-0.1

Antenna Placement Analysis



- Matching Circuit Diagram

4G Antenna



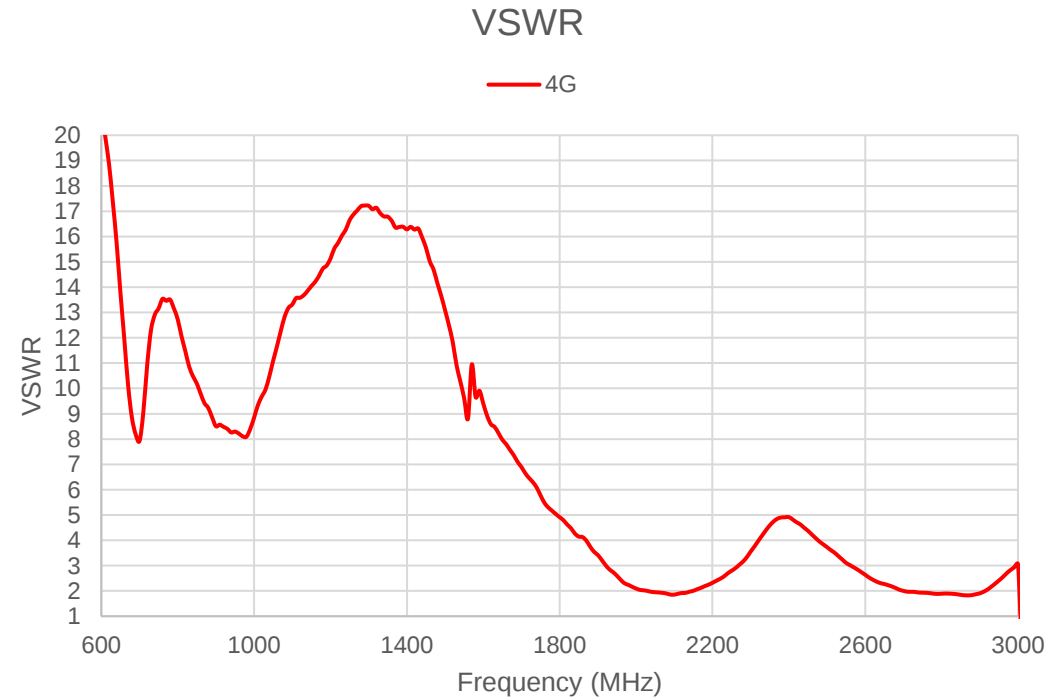
- Match Value:

No.	L/C
F1	NA
F2	0Ω
F3	NA

Passive Test--4G



- VSWR (Voltage Standing Wave Ratio)



VSWR (Voltage Standing Wave Ratio):

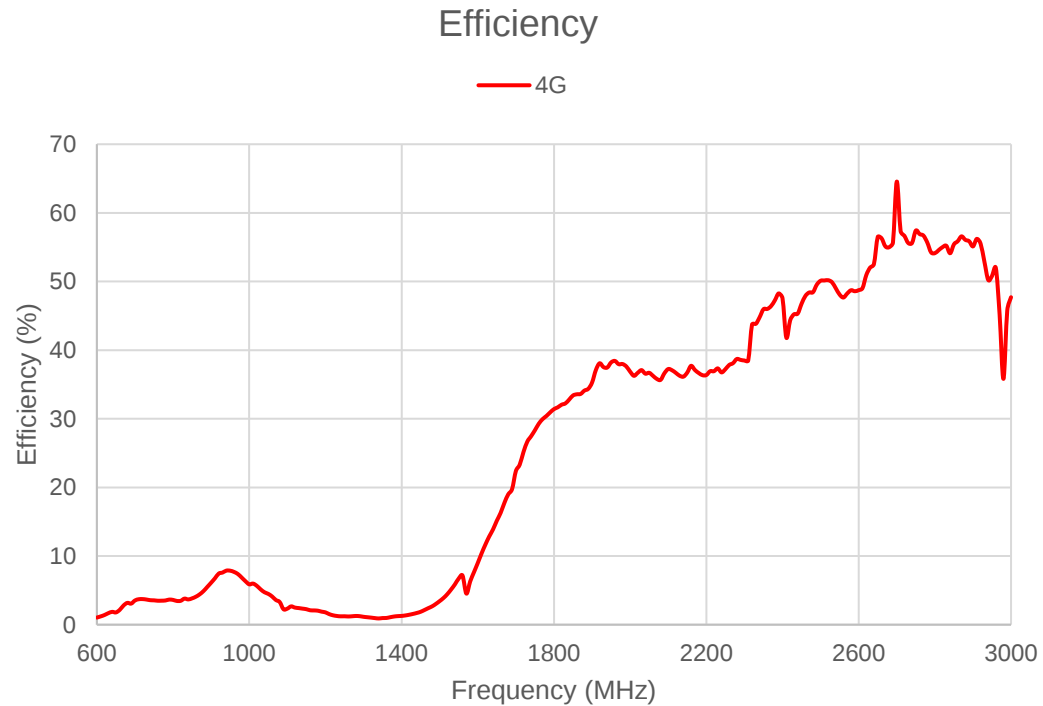
700–960 MHz < 11

1710–2690 MHz < 6.7

Passive Test--4G



- Efficiency

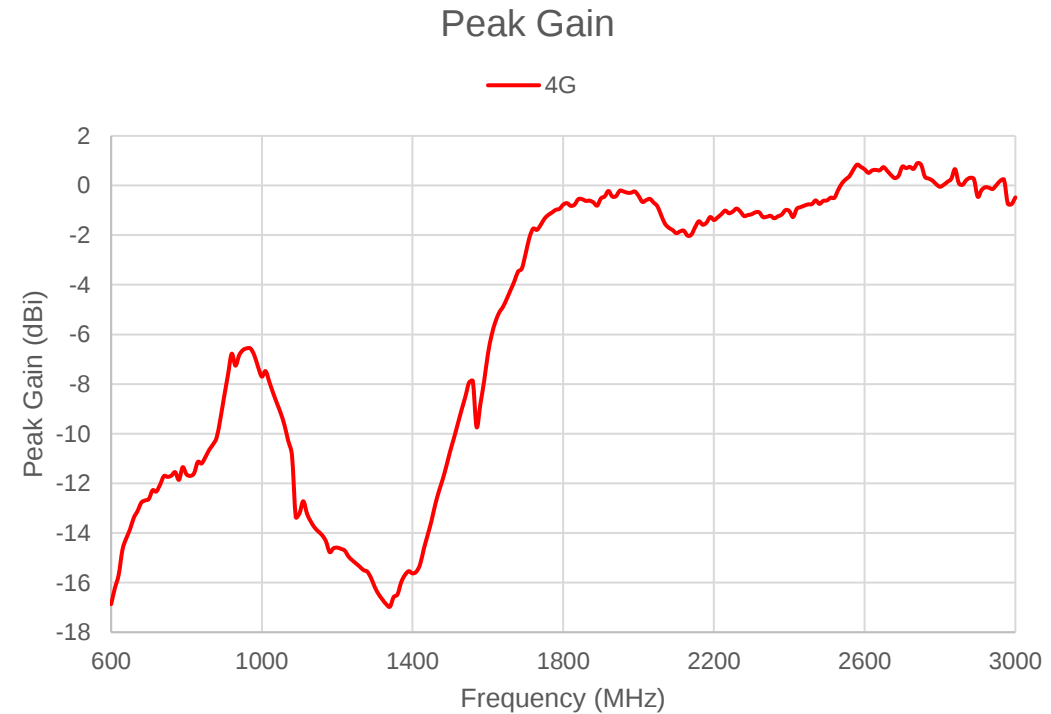


Efficiency:

700–960 MHz > 3%

1710–2690 MHz > 23%

- Peak Gain



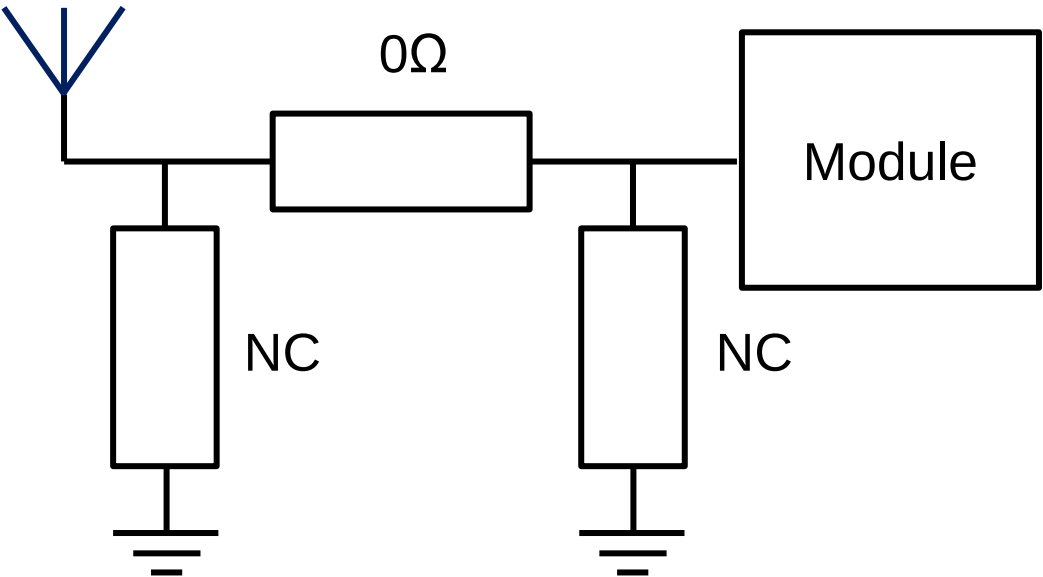
Peak Gain:

700–960 MHz: -6.56 dBi

1710–2690MHz: 0.84 dBi

- Matching Circuit Diagram

GNSS Antenna



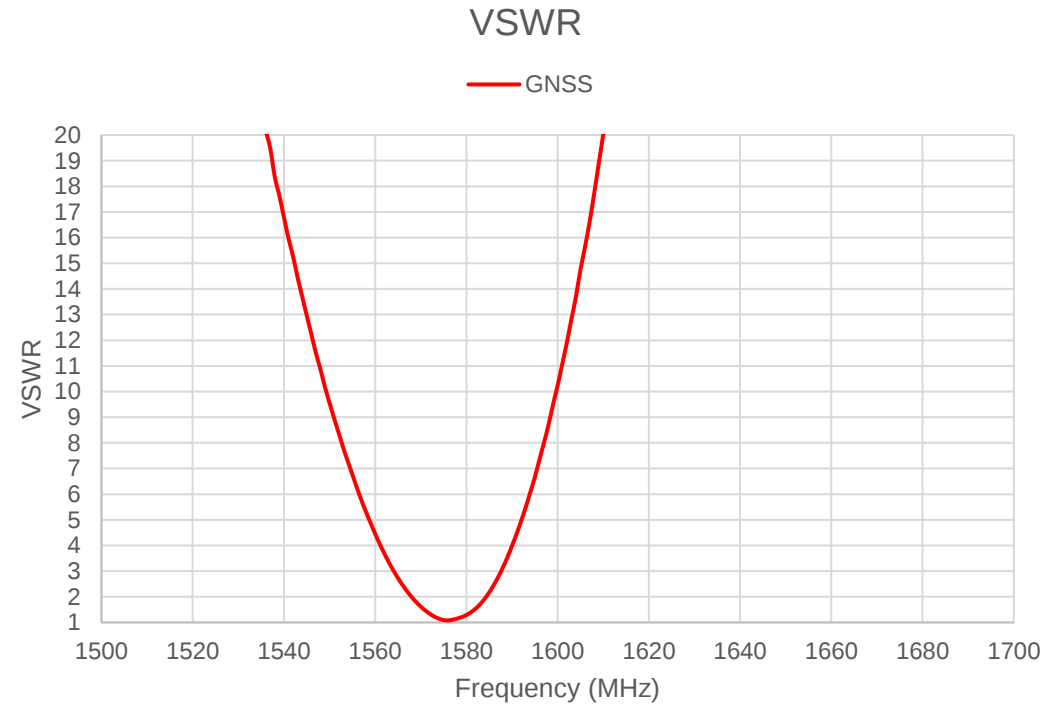
- Match Value:

No.	L/C
F1	NA
F2	0Ω
F3	NA

Passive Test--GNSS



- VSWR (Voltage Standing Wave Ratio)



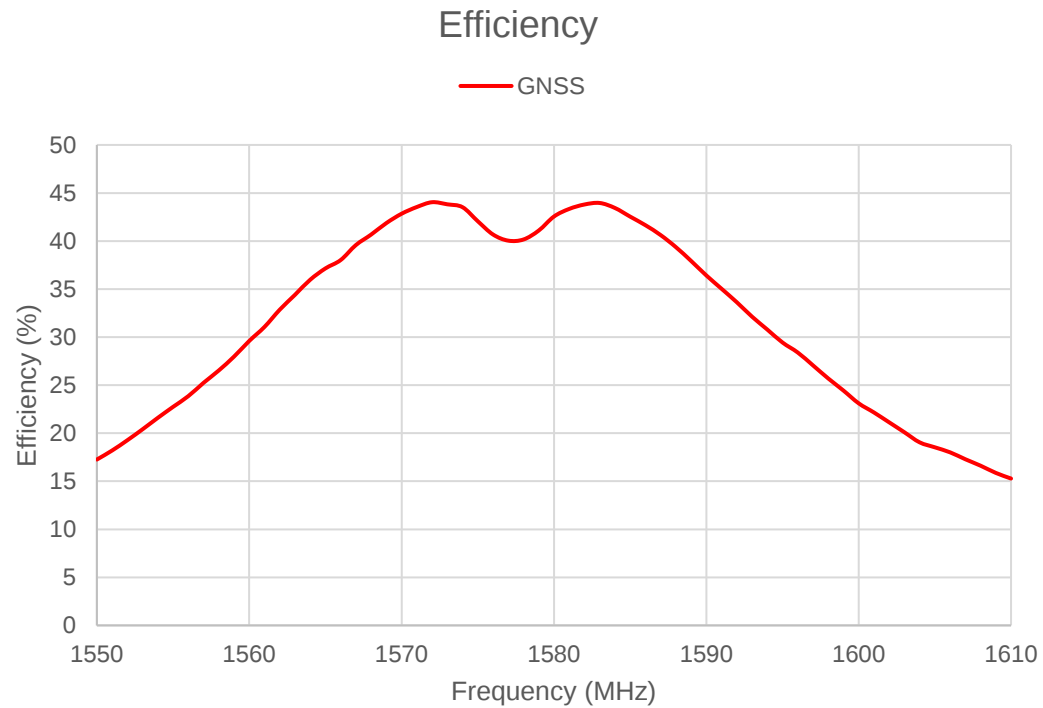
VSWR (Voltage Standing Wave Ratio):

1575MHz: 1.1

Passive Test--GNSS



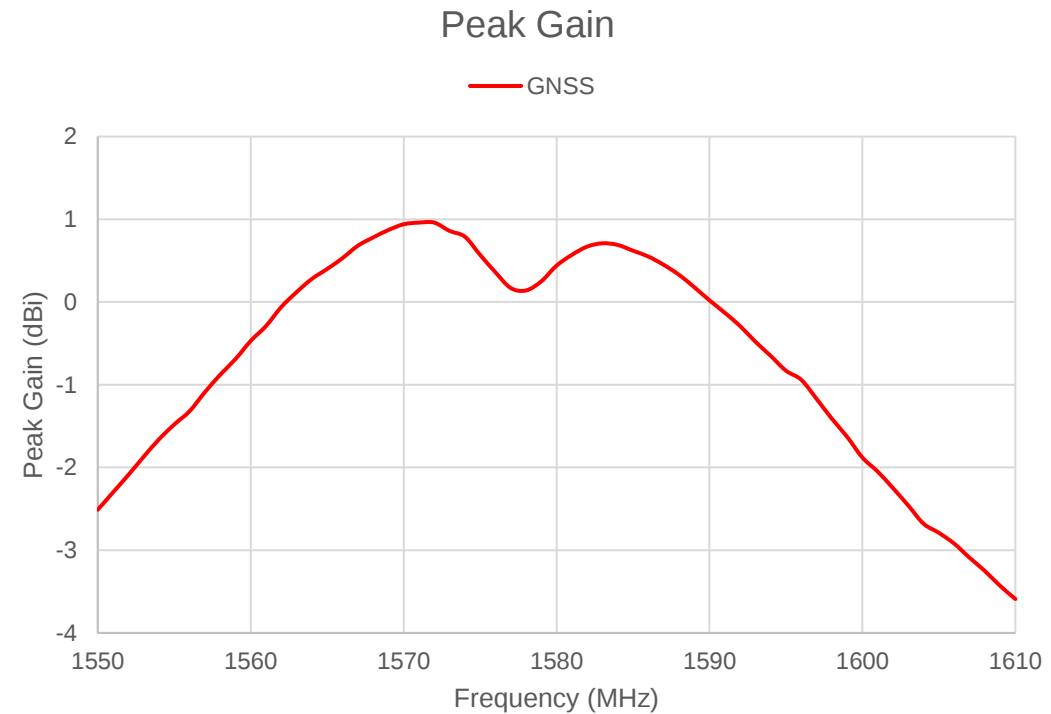
- Efficiency



Efficiency:

1575MHz: 42.06%

- Peak Gain

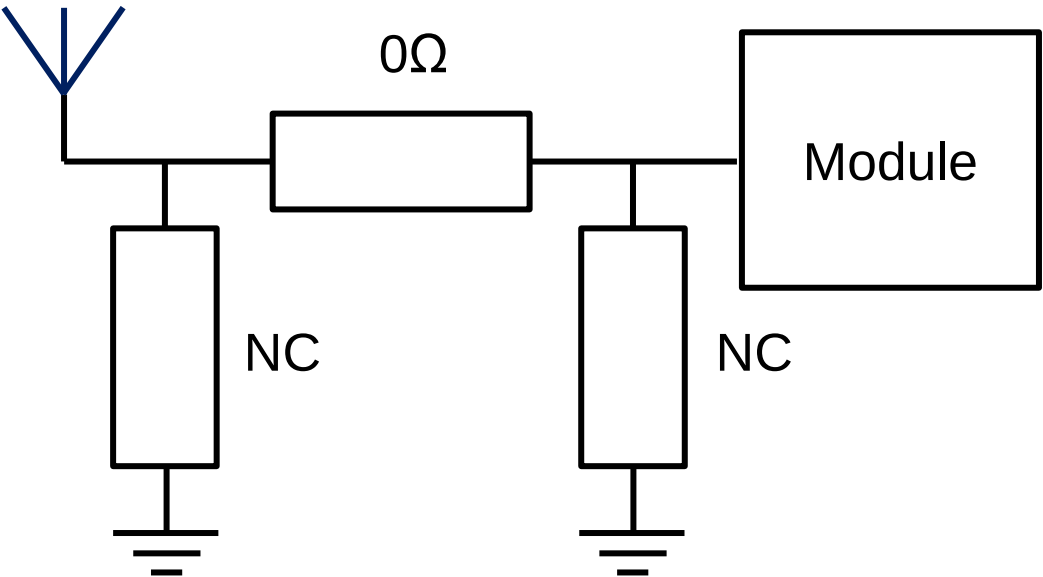


Peak Gain:

1575MHz: 0.57dBi

- Matching Circuit Diagram

WiFi-AP Antenna



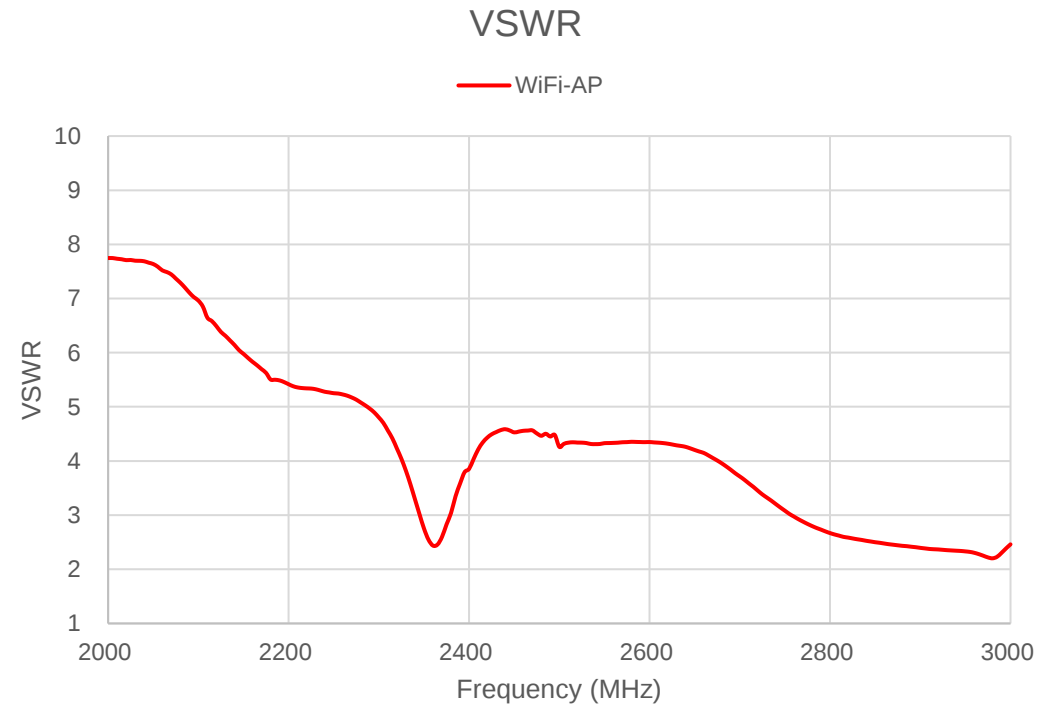
- Match Value:

No.	L/C
F1	NA
F2	0Ω
F3	NA

Passive Test—WiFi-AP



- VSWR (Voltage Standing Wave Ratio)



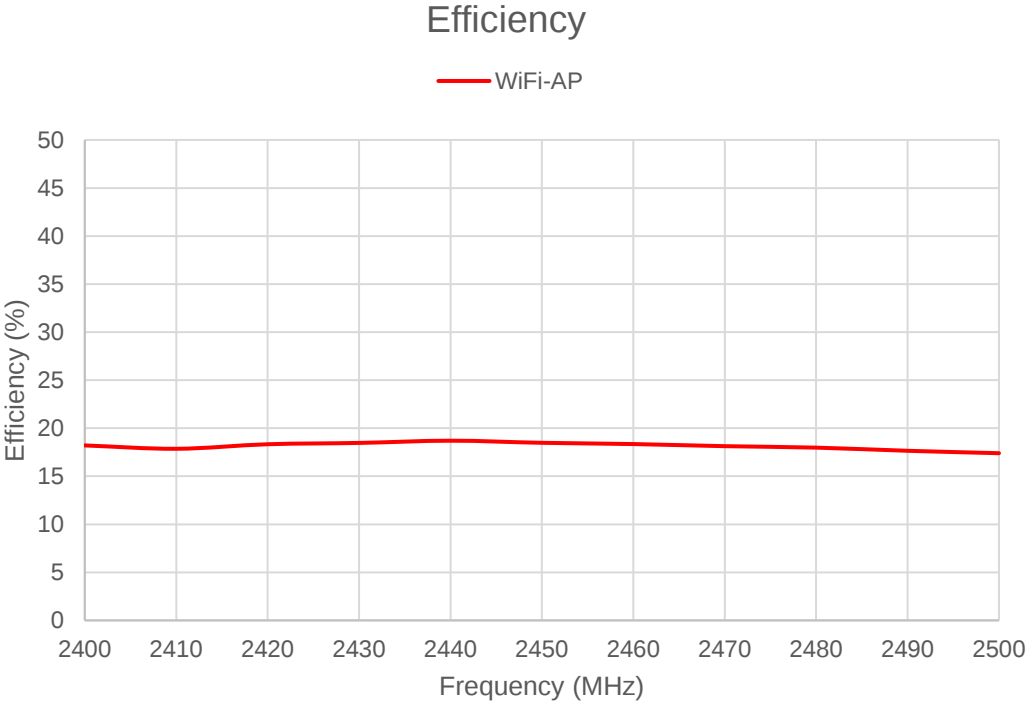
VSWR (Voltage Standing Wave Ratio):

2400-2500MHz < 5

Passive Test—WiFi-AP



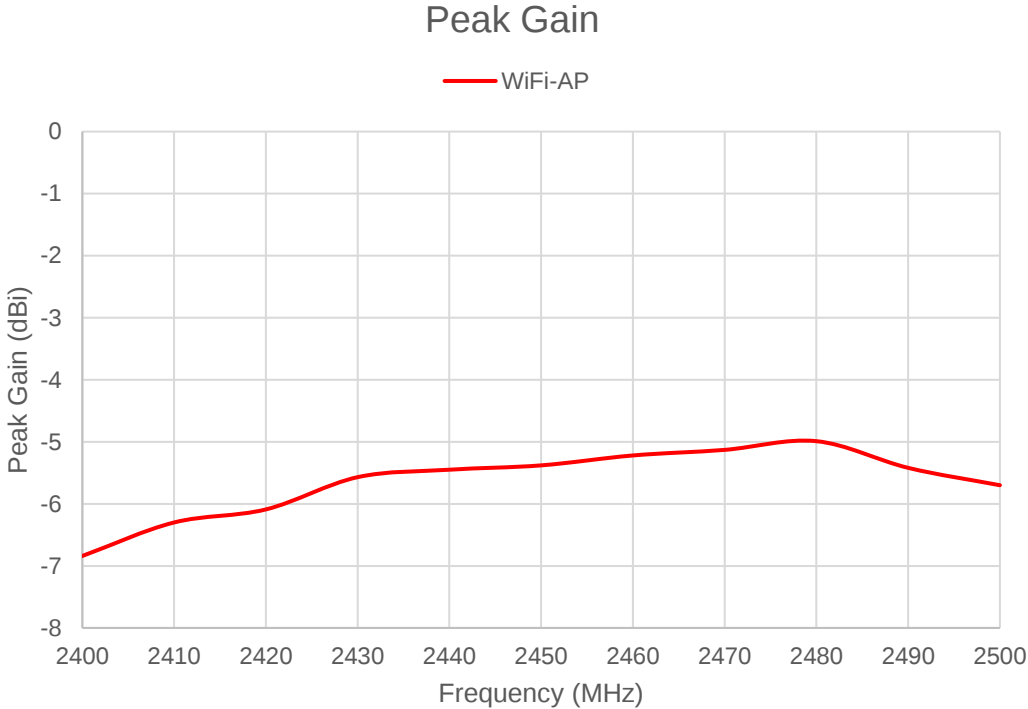
- Efficiency



Efficiency:

2400-2500MHz > 18%

- Peak Gain

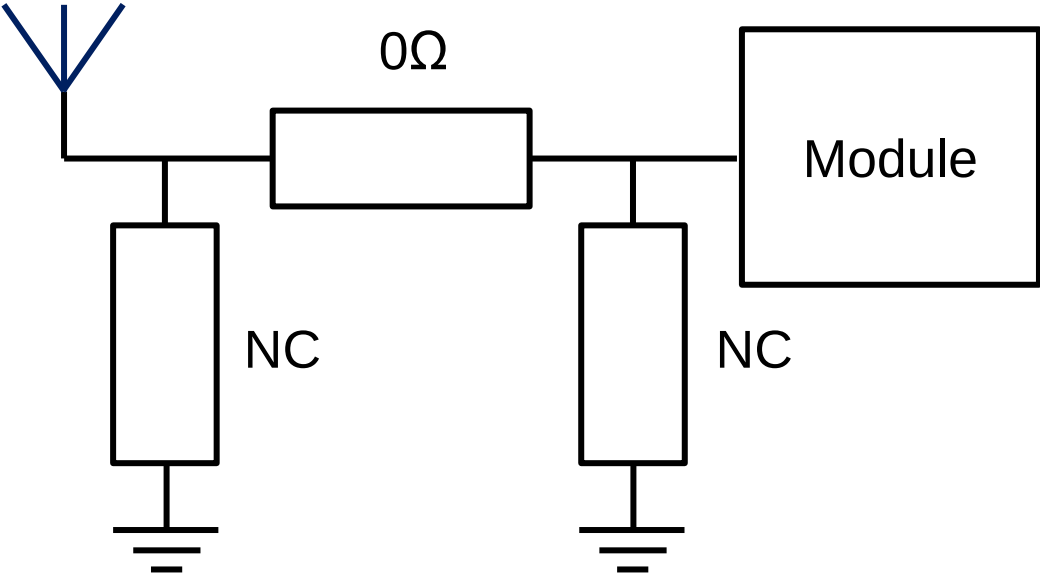


Peak Gain:

2400-2500MHz: -4.99 dBi

- Matching Circuit Diagram

BT Antenna



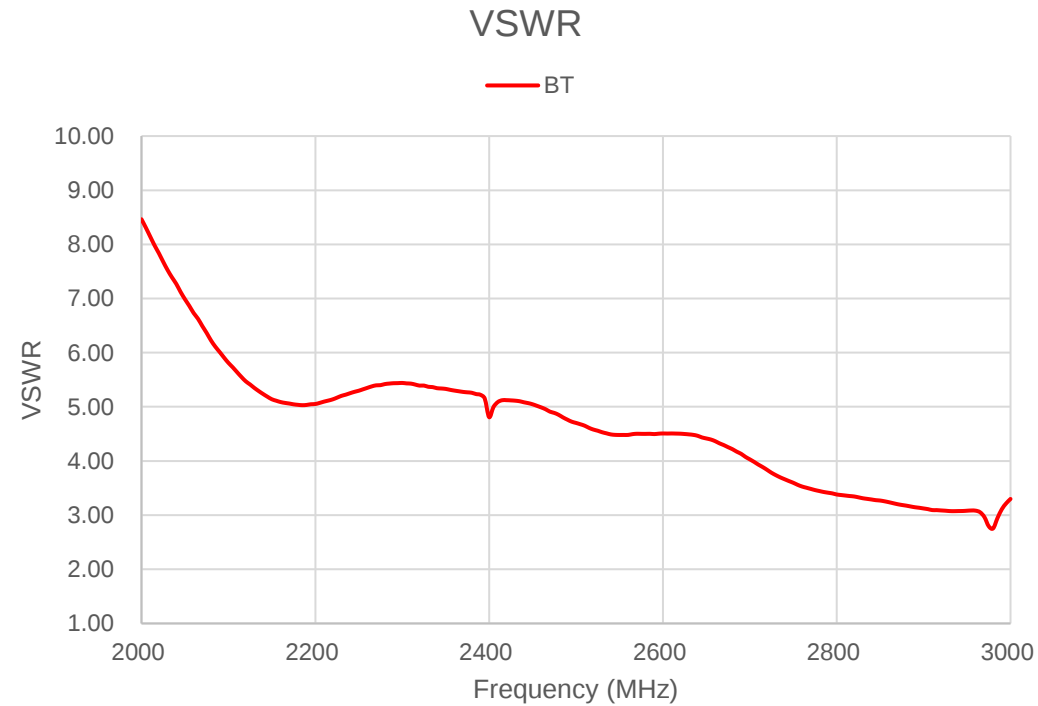
- Match Value:

No.	L/C
F1	NA
F2	0Ω
F3	NA

Passive Test—BT



- VSWR (Voltage Standing Wave Ratio)



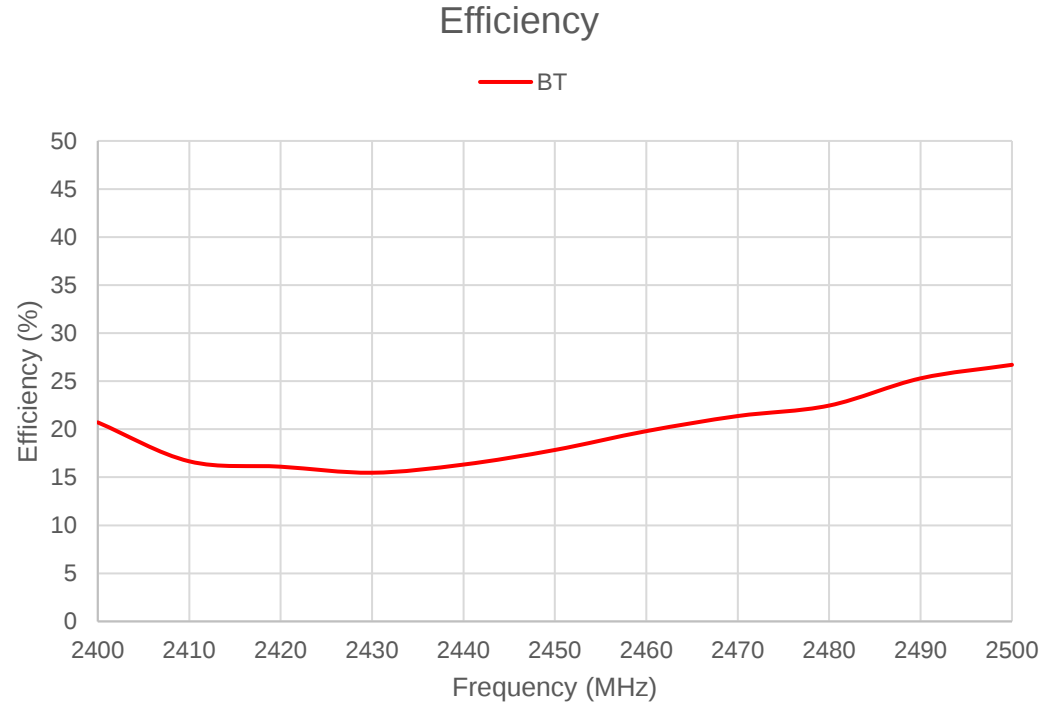
VSWR (Voltage Standing Wave Ratio):

2400-2500MHz < 5

Passive Test—BT



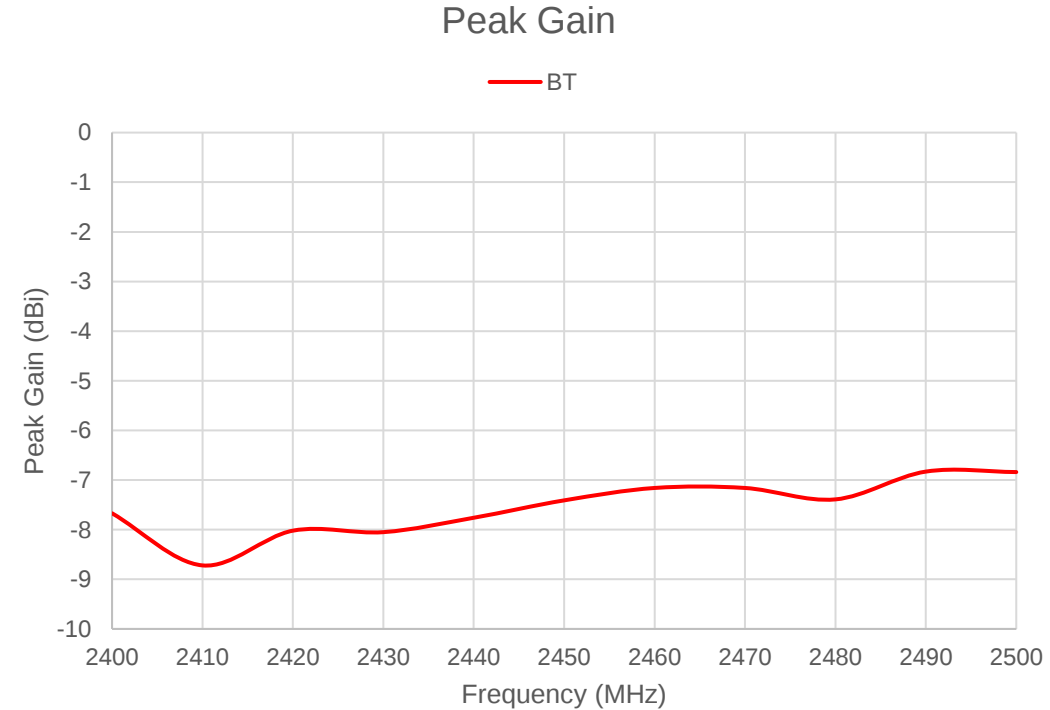
- Efficiency



Efficiency:

2400-2500MHz > 15%

- Peak Gain



Peak Gain:

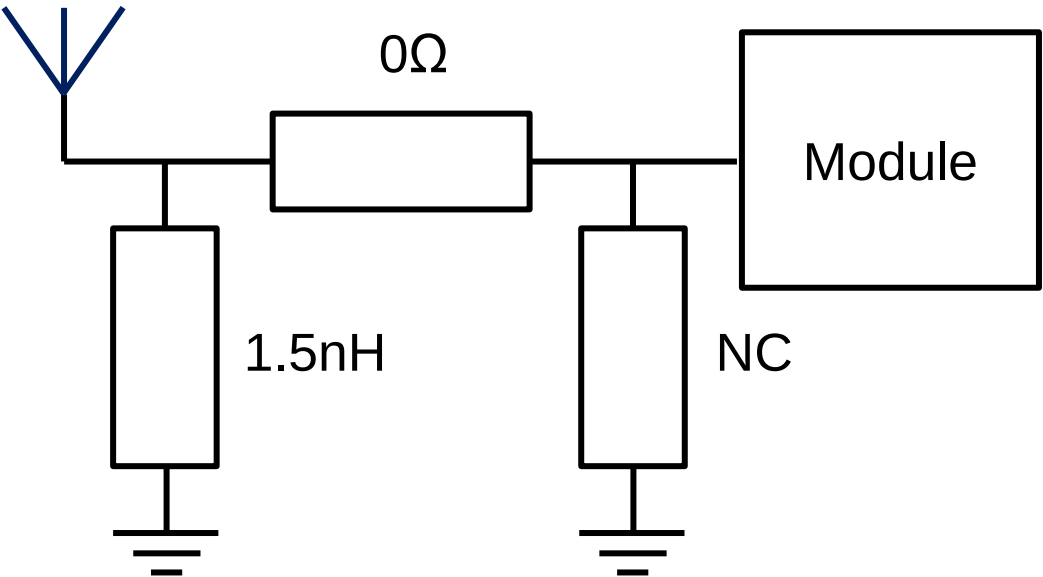
2400-2500MHz: -6.83 dBi

Antenna Matching



- Matching Circuit Diagram

WiFi-SCAN Antenna



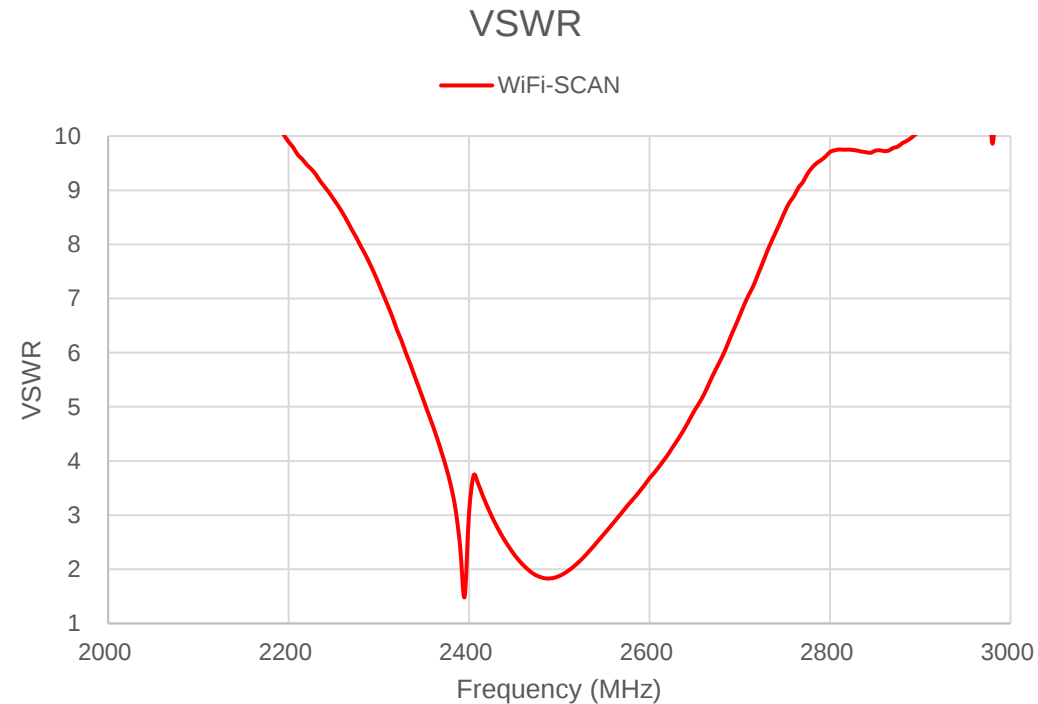
- Match Value:

No.	L/C
F1	1.5nH
F2	0Ω
F3	NA

Passive Test—WiFi-SCAN



- VSWR (Voltage Standing Wave Ratio)



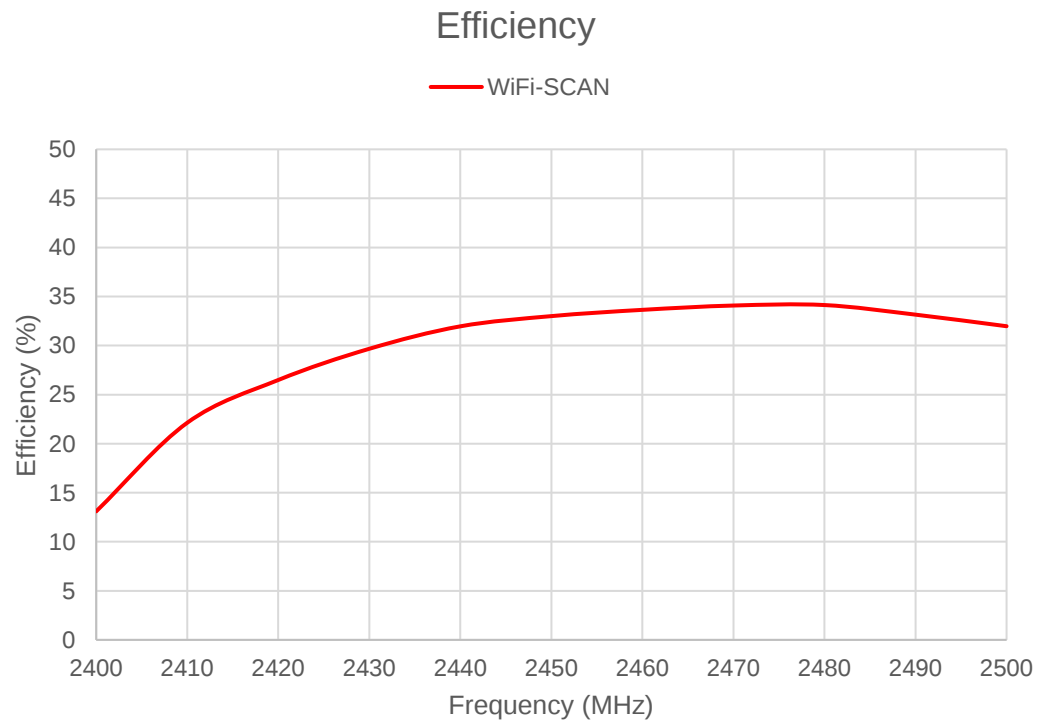
VSWR (Voltage Standing Wave Ratio):

2400-2500MHz < 4

Passive Test—WiFi-SCAN



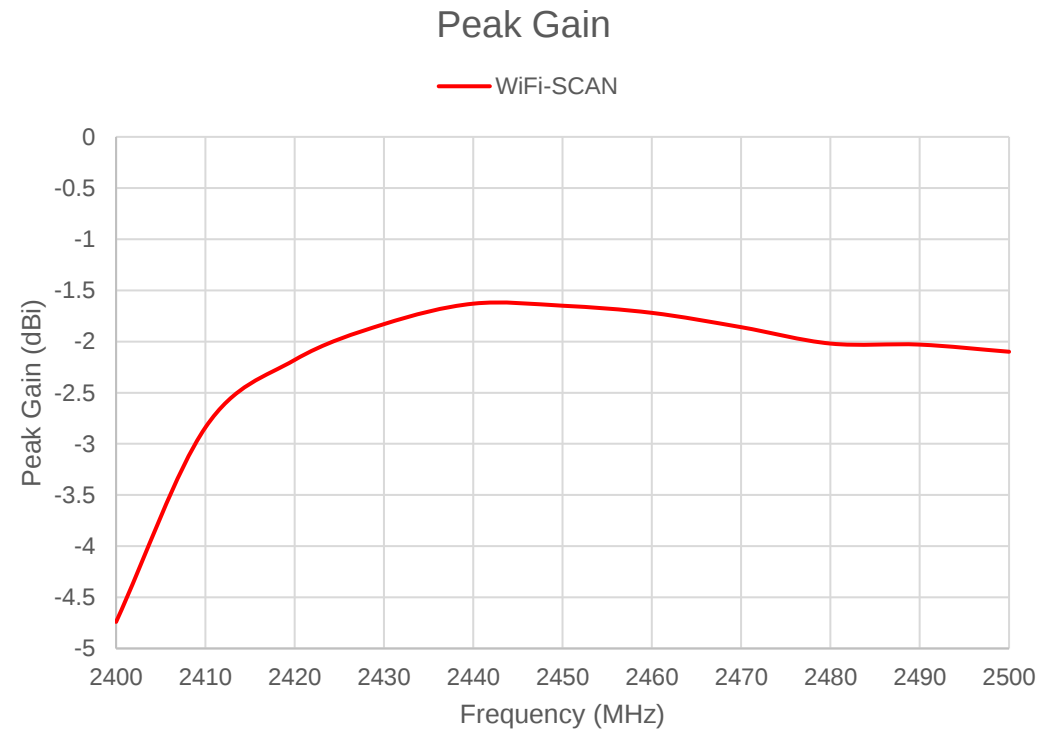
- Efficiency



Efficiency:

2400-2500MHz > 13%

- Peak Gain



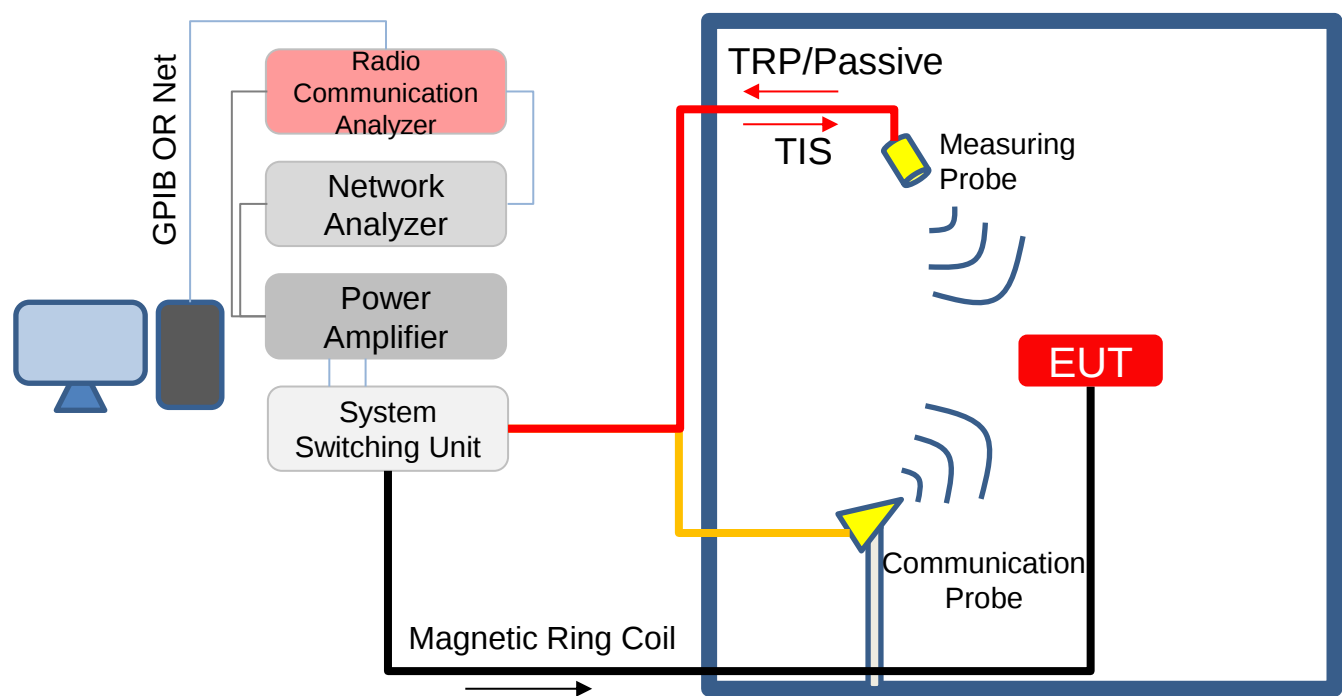
Peak Gain:

2400-2500MHz: -1.63 dBi

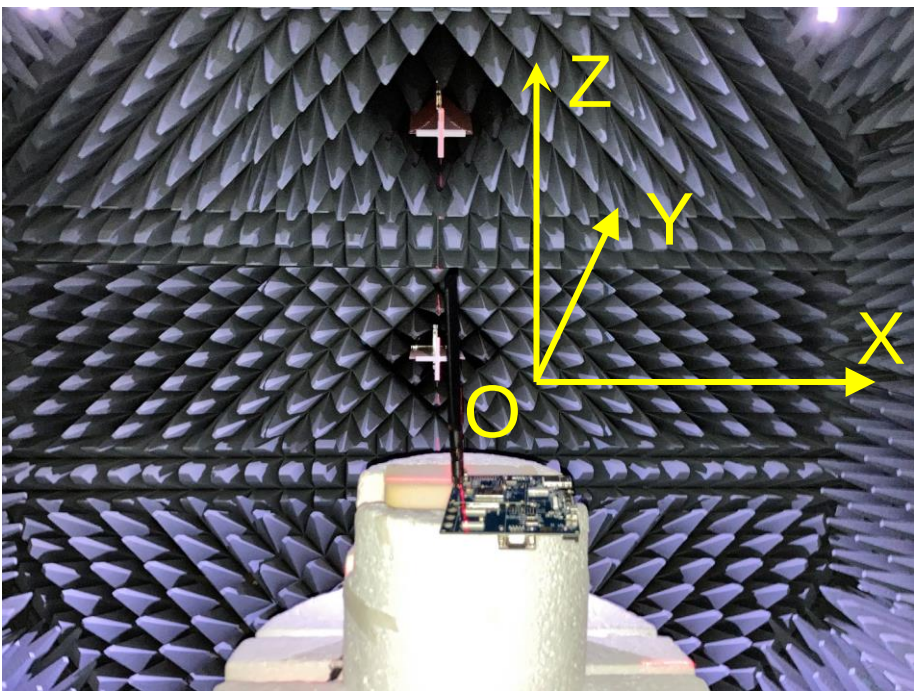
Antenna Test



- Chamber Coordinate System FS-S-1



H Plane: XY
E1 Plane: XZ
E2 Plane: YZ



Active Test

- OTA Data

Band	channel	TRP	channel	TIS
B1	18050	20. 41		
	18300	19. 63		
	18550	18. 66	550	-85. 49
B2	18650	18. 15		
	18900	19. 18		
	19150	19. 16	1150	-95. 64
B3	19250	16. 08		
	19575	16. 8		
	19900	18. 23	1900	-93. 44
B4	20000	19. 25		
	20175	17. 47		
	20350	18. 9	2350	-79. 16
B5	20450	11. 19		
	20525	8. 59		
	20600	8. 32	2600	-84. 17
B7	20800	15. 75		
	21100	17. 23		
	21400	16. 84	3400	-87. 64
B8	21500	9. 51		
	21625	10. 07		
	21750	11. 63	3750	-86. 93
B12	23060	5. 37		
	23095	5. 73		
	23130	5. 92	5130	-79. 56
B13	23230	8. 52	5230	-80. 3
B20	24200	10. 59		
	24300	9. 84		
	24400	10. 42	6400	-83. 28
B28	27260	3. 87		
	27435	4. 33		
	27610	5. 93	9610	-76. 25
B38	37800	19. 37		
	38000	17. 97		
	38200	16. 43	38200	-90. 02
B41	40340	21. 04		
	40620	18. 6		
	41140	17. 66	41140	-91. 11
B66	132022	20. 33		
	132322	19. 59		
	132622	20. 64	67086	-83. 41

Band	channel	TRP	channel	TIS
B17	23780	2. 82		
	23790	3. 67		
	23800	4. 77	5800	-79. 68
B18	23900	9. 06		
	23925	10. 54		
	23950	11. 15	5950	-84. 72
B19	24050	8. 61		
	24075	9. 19		
	24100	9. 5	6100	-84. 6
B25	26090	19. 78		
	26365	19. 24		
	26640	17. 91	8640	-80. 91
B26	26740	8. 91		
	26865	10. 17		
	26990	9. 22	8990	-83. 98



WiFi					
模式	信道	TRP	模式	信道	TIS
2. 4G-B(11M)	1	7. 59	2. 4G-B(11M)	1	-78. 09
	6	5. 97		6	-74. 43
	13	4. 33		13	-72. 29



Project Overview

Antenna Performance Evaluation and Debugging

Conclusion and Suggestion

Build a Smarter World



- **Antenna Performance**

1. 4G antenna adopts the form of FPC+ shrapnel, limited by the size of the whole machine, low frequency passive is poor, high frequency is good
2. WiFi-SCAN adopts the form of FPC welding and has good performance
3. Wifi-ap and BT adopt the form of wire, in the current environment, the performance has reached the optimal, the wire should be placed in the clearance area (refer to P7), the active data of WiFi is based on the conductor in the clearance test.

- **How to improve antenna performance**

1. WiFi and BT change form, made into FPC/ steel sheet form, can effectively improve performance

- **Next step**

1. Antenna mounting confirmation & customer measurement



**We are a global IoT solutions provider,
backed by outstanding support and
services, to deliver a smarter world.**

- Unbeatable choice from the broadest module portfolio in the world
- High quality range of off-the-shelf and customized antennas
- Superb support with the largest R&D team in the industry
- Continuous innovation – in 5G, LPWA, Automotive, Smart module technology
- A passionate, dedicated team of "Quectelers" ensures our customers always come first

Thank You

Build a Smarter World

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

Tel: +86 21 5108 6236 Sales Support: sales@quectel.com

Technical Support: support@quectel.com General: info@quectel.com