



Antenna Datasheet

Product OC: YB0031AA

Version: 2.0

Date: 2023-09-07

Status: Released

Product Name: 4G + GNSS 2IN1 Combo Antenna

Key Features:

Frequency Band:

4G: 698–960 MHz; 1710–2690 MHz

GNSS: 1559–1592 MHz

Dimensions: $\Phi 84 \times 17.5$ mm

Efficiency: Up to 61 % (4G-FS)

GNSS LNA Gain: 26 ± 3 dB

RoHS Compliant

IP66

Overview

To meet customers' requirements for the high performance, high integration, and integrated appearance of their products, Quectel provides a combined antenna box series. The antenna box can integrate a variety of antennas, such as 5G, 4G, GNSS, Wi-Fi antennas, to achieve communication functions of 5G MIMO, 4G, GNSS, and Wi-Fi. These antenna boxes can be mounted on the surface of devices via screw, adhesive or other methods, supports multiple connector types and cable lengths. It is a more flexible and reliable high-performance antenna solution for outdoor applications.

Contents

Overview.....	1
Contents	2
1 Specification.....	3
1.1. Electrical.....	3
1.1.1. 4G.....	4
1.1.2. GNSS	5
1.2. Mechanical & Environmental	6
1.3. Block Diagram (Active Antenna)	7
1.4. Supported GNSS Frequency Bands.....	8
2 Drawing	10
3 Detailed Performance	11
3.1. S-Parameter Test	11
3.1.1. VSWR.....	11
3.1.2. Return Loss	13
3.1.3. Isolation	15
3.1.4. GNSS LNA Gain.....	16
3.2. Radiation Performance Test.....	17
3.2.1. Efficiency	17
3.2.2. Average Gain	19
3.2.3. Peak Gain.....	21
3.2.4. Axial Ratio	23
3.2.5. 3D & 2D Radiation Pattern.....	25
3.2.5.1. Test Condition: On 300 × 300 mm Metal Plane	25
3.2.5.2. Test Condition: In Free Space	30
4 Packaging	35
Contact Us.....	37
Legal Notices	38
Revision History	40

1 Specification

Test Condition: On 300 × 300 mm Metal Plane & In Free Space

1.1. Electrical

Electrical Specifications		
Frequency Range	4G	698–960 MHz, 1710–2690 MHz
	GNSS	1559–1592 MHz
Radiation Pattern	4G	Omni-directional
	GNSS	Directional
Polarization	4G	Linear
	GNSS	RHCP
Impedance		50 Ω
Isolation	MP	≤ -9.3 dB
	FS	≤ -13.7 dB

- MP: On 300 × 300 mm Metal Plane
- FS: In Free Space

1.1.1. 4G

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	820– 960	1700– 2170	2300– 2400	2400– 2500	2500– 2690
Max. VSWR	MP	-	2.5	2.7	5.4	4.0	4.0	3.6
	FS	-	2.5	2.0	3.0	3.4	3.3	2.9
Max. Return Loss (dB)	MP	-	-7.3	-6.8	-3.3	-4.4	-4.4	-4.9
	FS	-	-7.3	-9.4	-6.0	-5.3	-5.5	-6.2
AVG Eff. (%)	MP	-	33.1	35.4	31.4	33.5	31.0	18.0
	FS	-	45.8	48.6	49.5	33.2	41.6	42.0
AVG AVG Gain (dB)	MP	-	-4.9	-4.6	-5.2	-4.8	-5.1	-7.6
	FS	-	-3.4	-3.1	-3.1	-4.8	-3.8	-3.8
Max. Peak Gain (dBi)	MP	-	0.2	1.8	2.7	2.4	2.3	1.0
	FS	-	1.2	1.8	2.3	0.5	1.3	1.2
VSWR	MP	≤ 5.4						
	FS	≤ 3.4						
Return Loss	MP	≤ -3.3 dB						
	FS	≤ -5.3 dB						
Peak Gain	MP	≤ 2.7 dBi						
	FS	≤ 2.3 dBi						

1.1.2. GNSS

Frequency (MHz)	Band	GPS L5 GALILEO E5a BEIDOU B2a-B2I QZSS L5 IRNSS L5	GALILEO E5b BEIDOU B2b	GPS L2 QZSS L2C	GLONASS G2	BEIDOU B3	BEIDOU B1I	GPS L1 GALILEO E1 BEIDOU B1C QZSS L1	GLONASS G1
		1176	1207	1227	1248	1268	1561	1575	1602
VSWR	MP	-	-	-	-	-	1.2	1.5	-
	FS	-	-	-	-	-	1.6	1.7	-
Return Loss (dB)	MP	-	-	-	-	-	-22.4	-14.5	-
	FS	-	-	-	-	-	-12.4	-12.3	-
Efficiency (%)	MP	-	-	-	-	-	53.7	53.5	-
	FS	-	-	-	-	-	56.4	51.9	-
AVG Gain (dB)	MP	-	-	-	-	-	-2.7	-2.7	-
	FS	-	-	-	-	-	-2.5	-2.9	-
Peak Gain (dBi)	MP	-	-	-	-	-	2.4	2.1	-
	FS	-	-	-	-	-	1.7	0.4	-
Axial Ratio (dB) Theta = 0 (deg)	MP	-	-	-	-	-	5.9	11.6	-
	FS	-	-	-	-	-	17.2	5.1	-

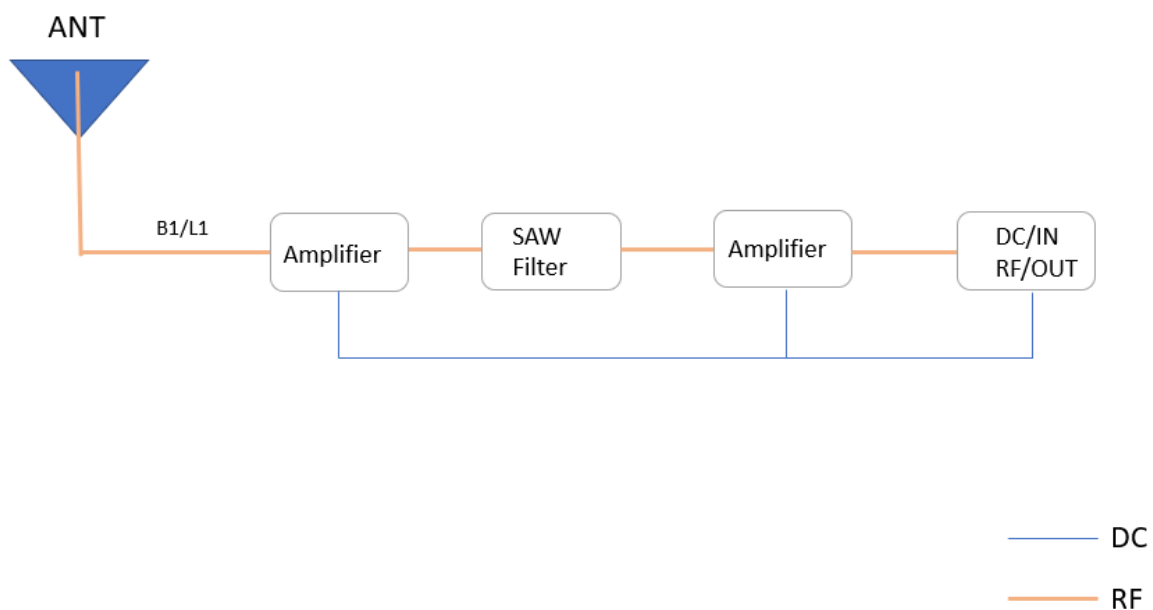
LNA Electrical

LNA Gain	26 ±3 dB
Noise Figure	≤ 1.1 dB
Output VSWR	< 2.0
Input VSWR	< 2.0
Filter Out-of-band Attenuation	45 dB f0 ±100 MHz f0 (1580 MHz)
Working Voltage	2.7–3.3 V
Working Current	10 ±1 Ma @ 3.0 V
Impedance	50 Ω

1.2. Mechanical & Environmental

Mechanical		
Antenna Dimensions		Φ 84 × 17.5 mm
Antenna Material & Color		ABS + PC & Black
Cable Type & Color & Length	4G	RG174 & Black & 300 mm
	GNSS	RG174 & Black & 300 mm
Connector Type		SMA Male
Mounting Type		Adhesive
Weight		Typ. 59.8 g
Environmental		
Operation Temperature		-40 °C to +85 °C
Storage Temperature		-40 °C to +85 °C
Ingress Protection (IP) Rating		IP66
RoHS Compliant		Yes

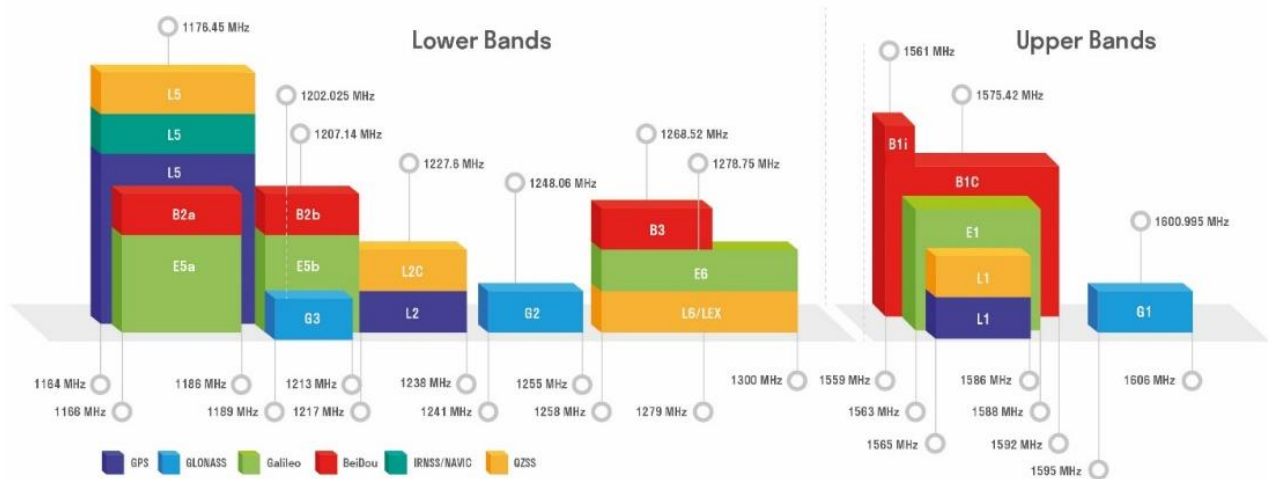
1.3. Block Diagram (Active Antenna)



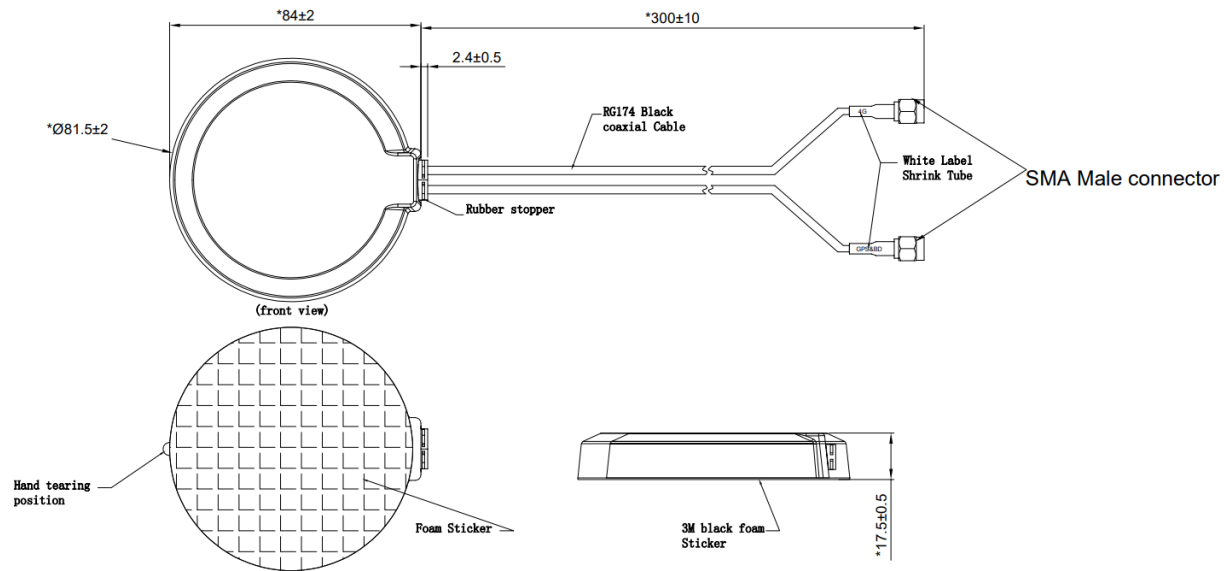
1.4. Supported GNSS Frequency Bands

GNSS Frequency Bands (MHz)					
GPS	L1 Centre 1575.42 (1565–1586)	L2 Centre 1227.6 (1217–1238)	L5 Centre 1176.45 (1164–1189)		
	√	-	-		
GLONASS	G1-L10C-L10F Centre 1601 (1595–1606)	G2-L20C-L20F Centre 1248.06 (1241–1255)	G3-L30C Centre 1202.025 (1189–1213)		
	-	-	-		
GALILEO	E1 Centre 1575.42 (1563–1588)	E5a Centre 1176.45 (1166–1187)	E5b Centre 1207.14 (1197–1218)	E6 Centre 1278.75 (1258–1300)	
	√	-	-	-	
BEIDOU	B1I Centre 1561.098 (1559–1564)	B1C (BeiDou-3) Centre 1575.42 (1559–1592)	B2a Centre 1176.45 (1166–1187)	B2b-B2I Centre 1207.14 (1197–1217)	B3 Centre 1268.52 (1258–1279)
	√	√	-	-	-
QZSS	L1 Centre 1575.42 (1573–1578)	L2C Centre 1227.6 (1226–1229)	L5 Centre 1176.45 (1166–1187)	L6 Centre 1278.75 (1257–1300)	
	√	-	-	-	
IRNSS	L5 Centre 1176.45 (1164–1189)				
	-				

GNSS Bands and Constellations



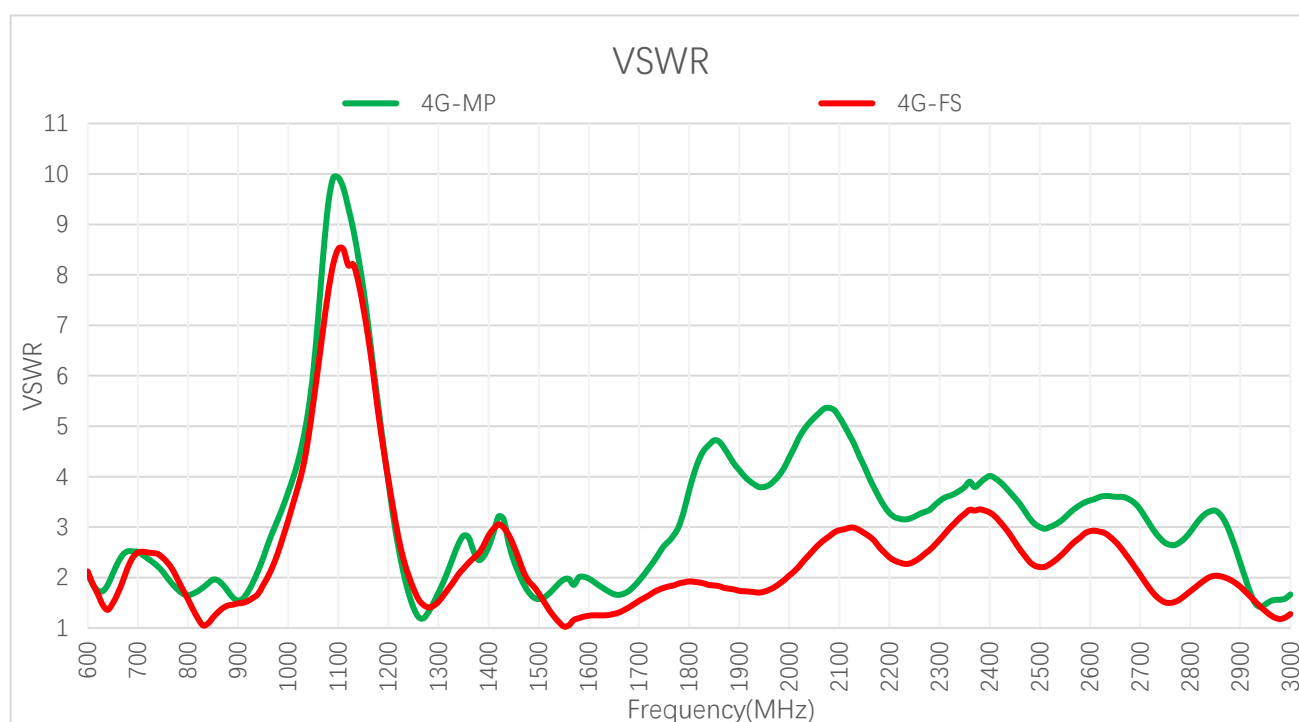
2 Drawing



3 Detailed Performance

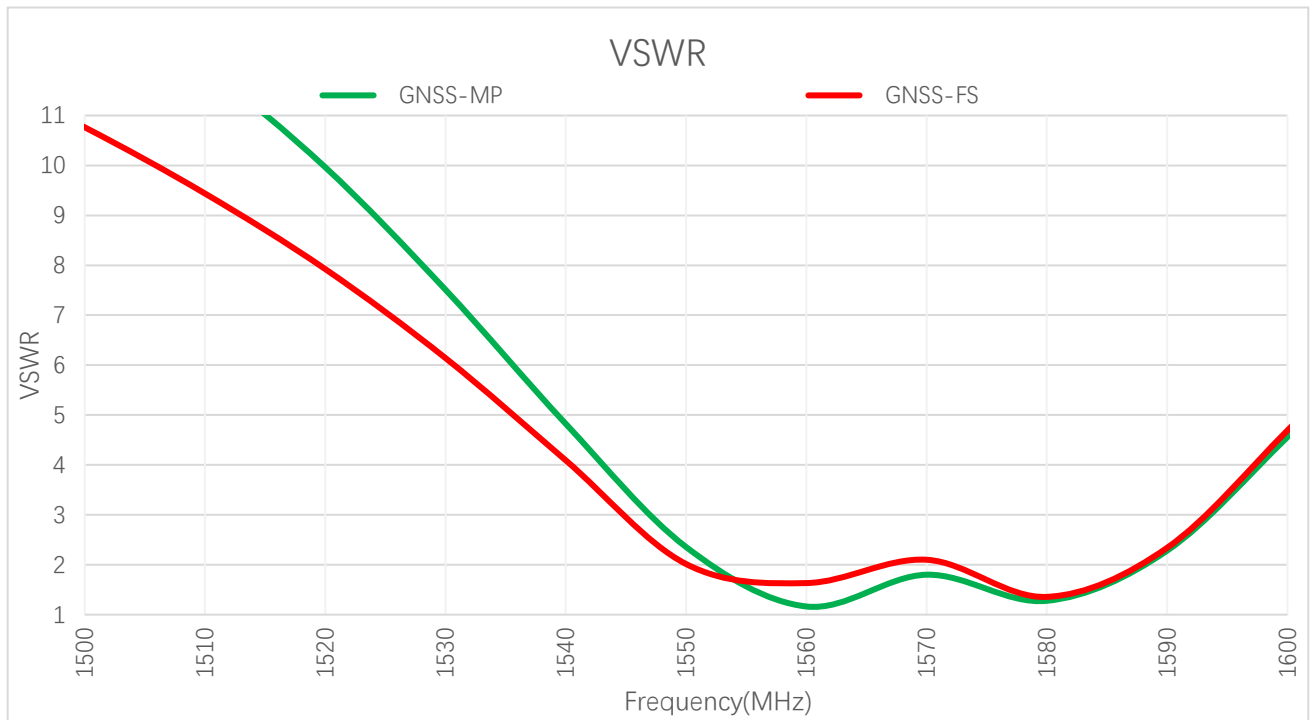
3.1. S-Parameter Test

3.1.1. VSWR



VSWR - 4G

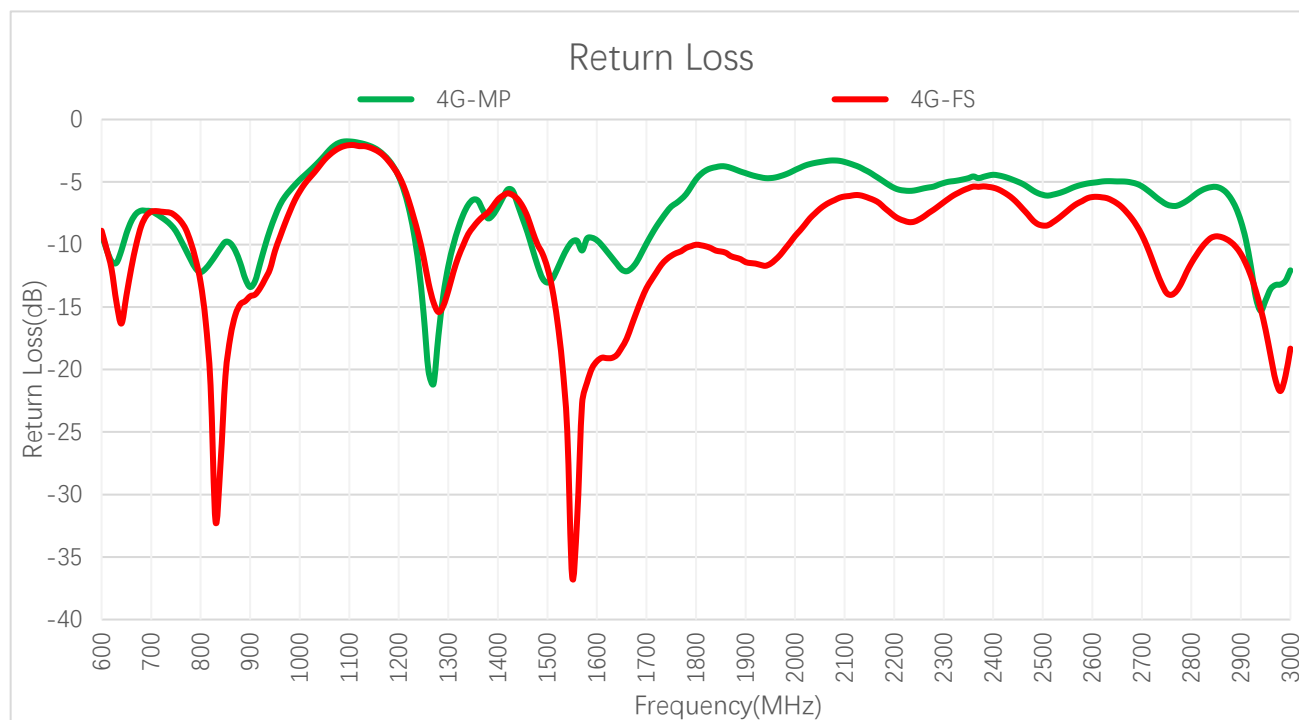
Frequency (MHz)		600	630	710	830	900	960	1440	1710	1740	1880
VSWR	MP	-	-	2.4	1.8	1.5	2.7	-	2.1	2.5	4.4
	FS	-	-	2.5	1.1	1.5	2.0	-	1.6	1.8	1.8
Frequency (MHz)		1950	2140	2350	2450	2600	2690	4700	5000	5500	6000
VSWR	MP	3.8	4.4	3.8	3.6	3.5	3.5	-	-	-	-
	FS	1.7	2.9	3.3	2.7	2.9	2.2	-	-	-	-



VSWR - GNSS

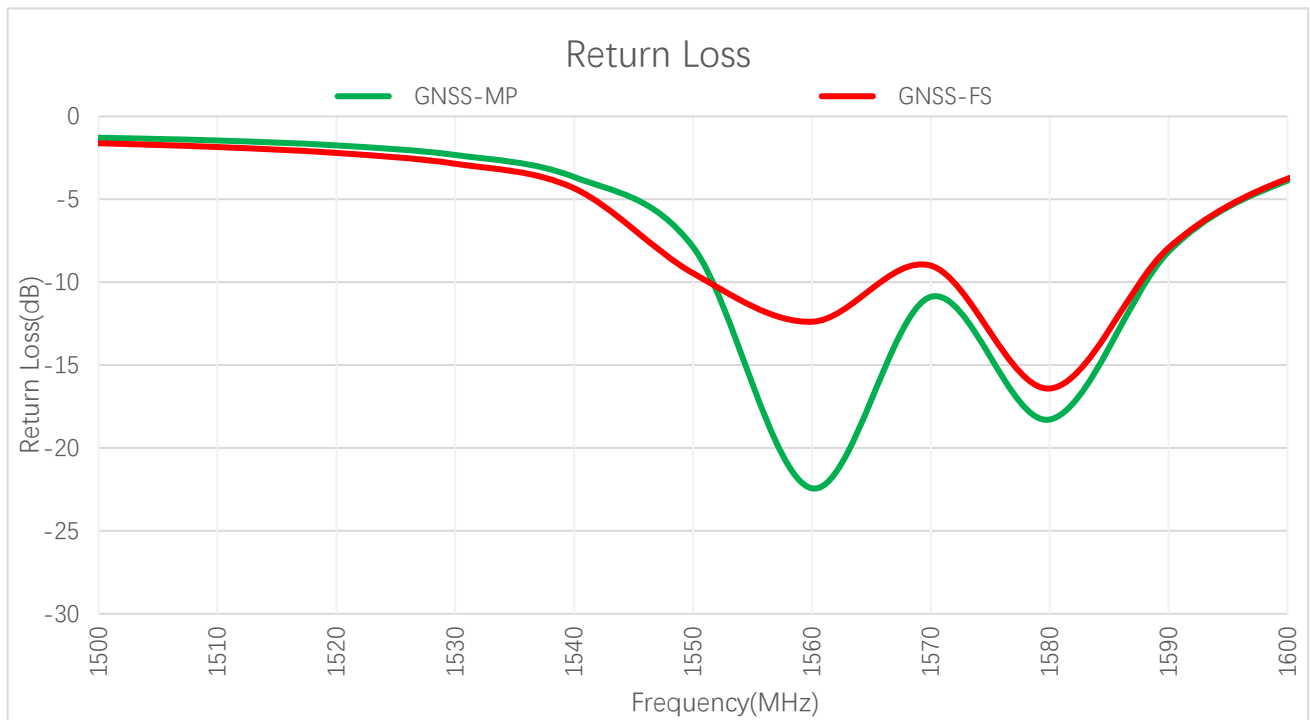
Frequency (MHz)		1176	1207	1227	1248	1268	1561	1575	1602
VSWR	MP	-	-	-	-	-	1.2	1.5	-
	FS	-	-	-	-	-	1.6	1.7	-

3.1.2. Return Loss



Return Loss (dB) - 4G

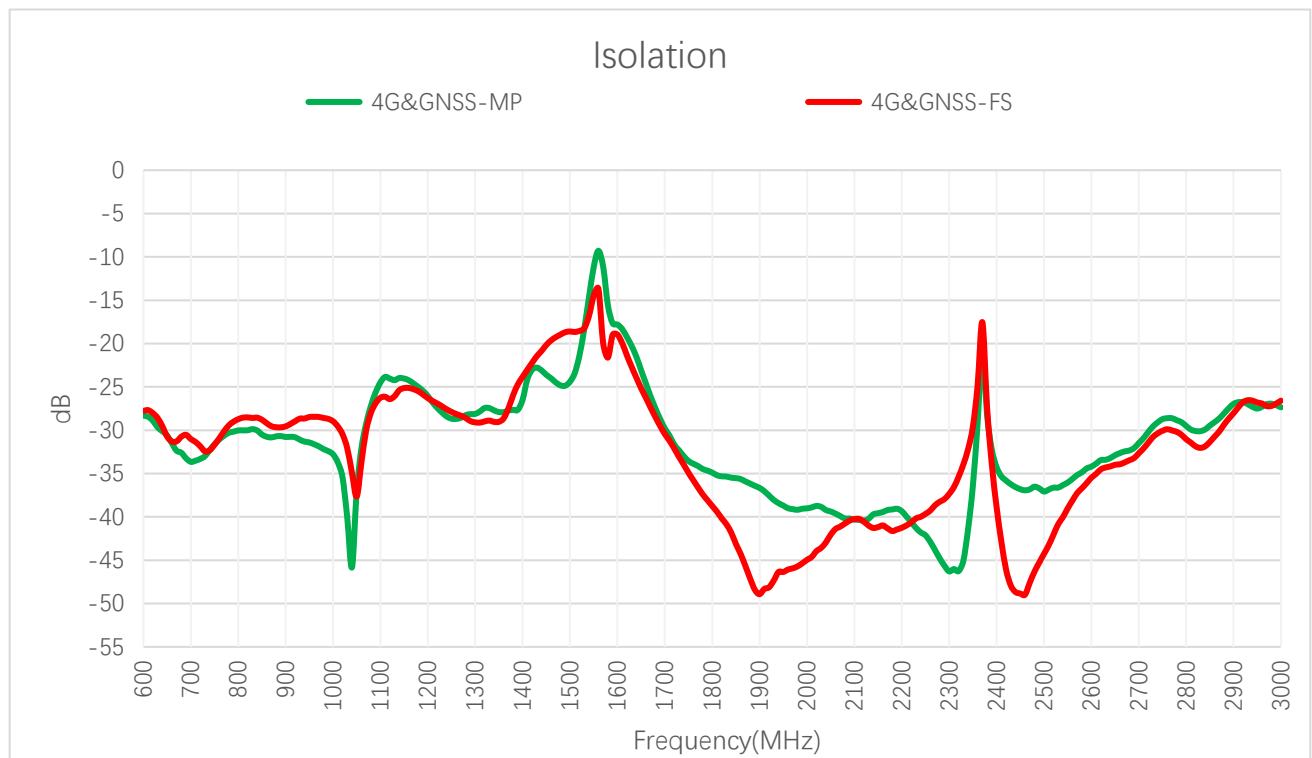
Frequency (MHz)		600	630	710	830	900	960	1440	1710	1740	1880
Return Loss (dB)	MP	-	-	-7.5	-10.9	-13.4	-6.8	-	-9.2	-7.4	-4.0
	FS	-	-	-7.3	-32.1	-14.1	-9.4	-	-12.8	-11.2	-11.1
Frequency (MHz)		1950	2140	2350	2450	2600	2690	4700	5000	5500	6000
Return Loss (dB)	MP	-4.7	-4.0	-4.7	-5.0	-5.1	-5.2	-	-	-	-
	FS	-11.5	-6.2	-5.5	-6.7	-6.2	-8.5	-	-	-	-



Return Loss (dB) - GNSS

Frequency (MHz)		1176	1207	1227	1248	1268	1561	1575	1602
Return Loss (dB)	MP	-	-	-	-	-	-22.4	-14.5	-
	FS	-	-	-	-	-	-12.4	-12.3	-

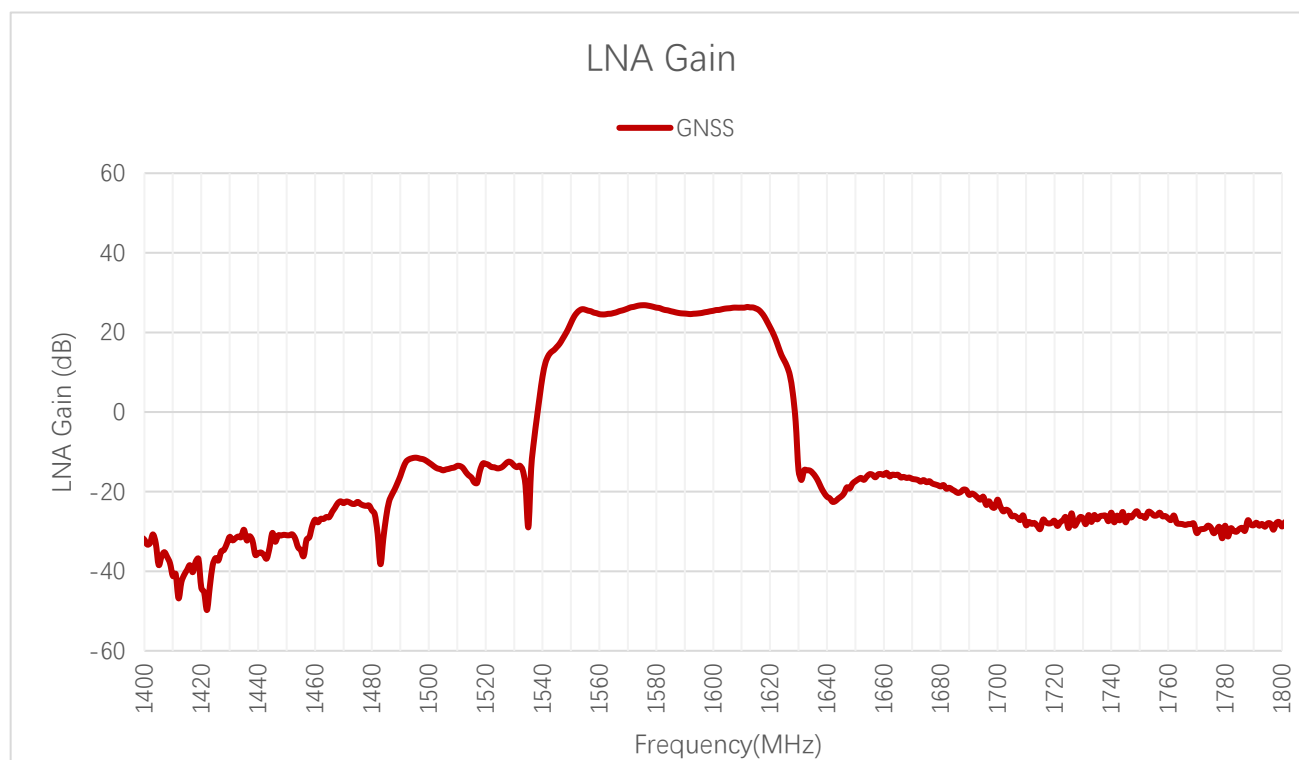
3.1.3. Isolation



Max Isolation (dB) - 4G & GNSS

Band	B71	B12/ B13/ B28	B5/ B8/ B26	B1/ B2/ B3	B40	Wi-Fi 2G	B38/ B41	BEIDOU B1I	GPS L1
Freq. (MHz)	600– 700	700– 810	820– 960	1700– 2170	2300– 2400	2400– 2500	2500– 2690	1559– 1564	1565– 1586
MP	-	-30.0	-29.9	-29.8	-20.4	-34.3	-32.1	-9.3	-11.1
FS	-	-28.6	-28.5	-30.4	-17.5	-38.9	-33.2	-13.7	-20.0

3.1.4. GNSS LNA Gain

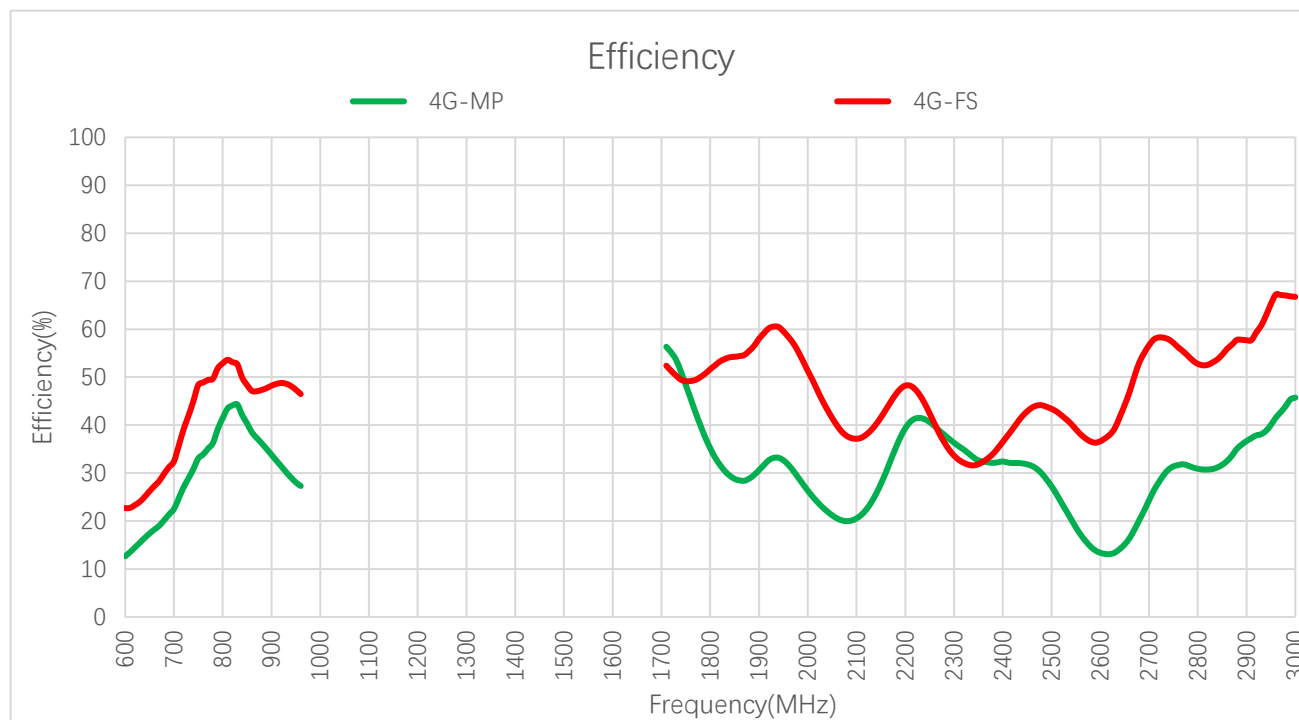


LNA Gain (dB)

Frequency (MHz)	1176	1207	1227	1248	1268	1561	1575	1602
LNA Gain (dB)	-	-	-	-	-	24.5	26.8	-

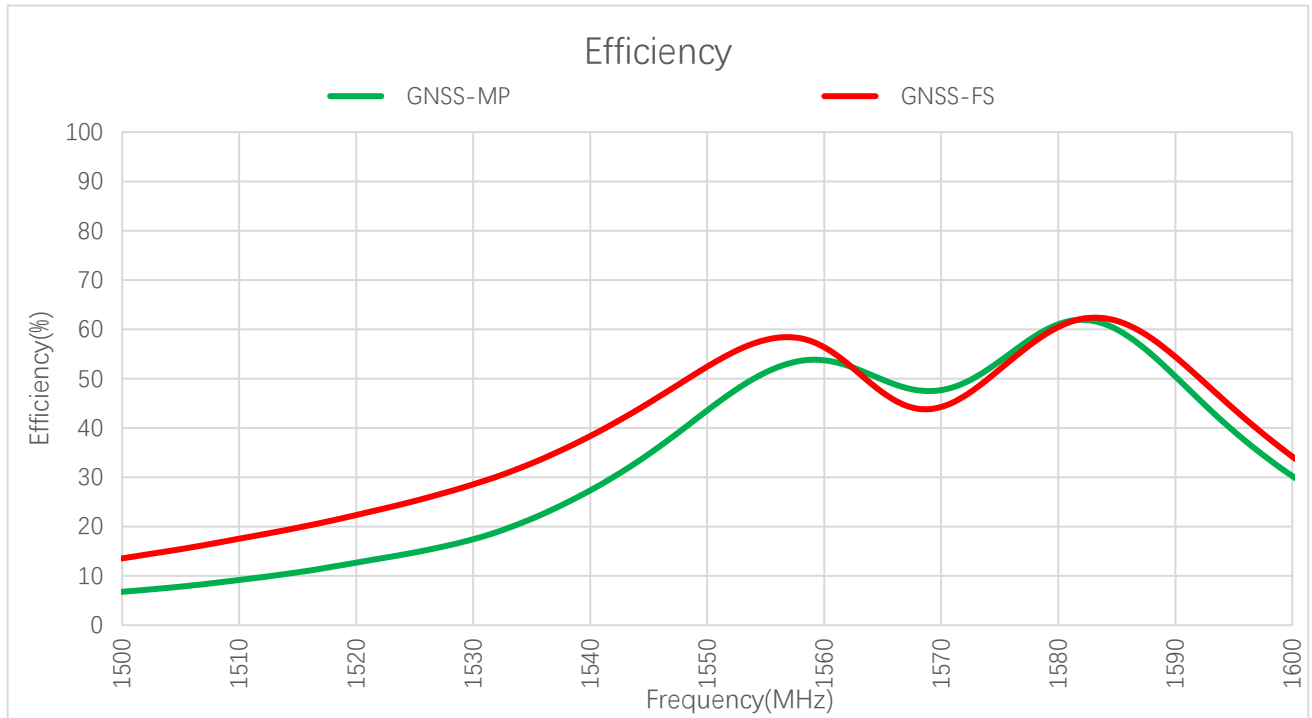
3.2. Radiation Performance Test

3.2.1. Efficiency



Efficiency (%) - 4G

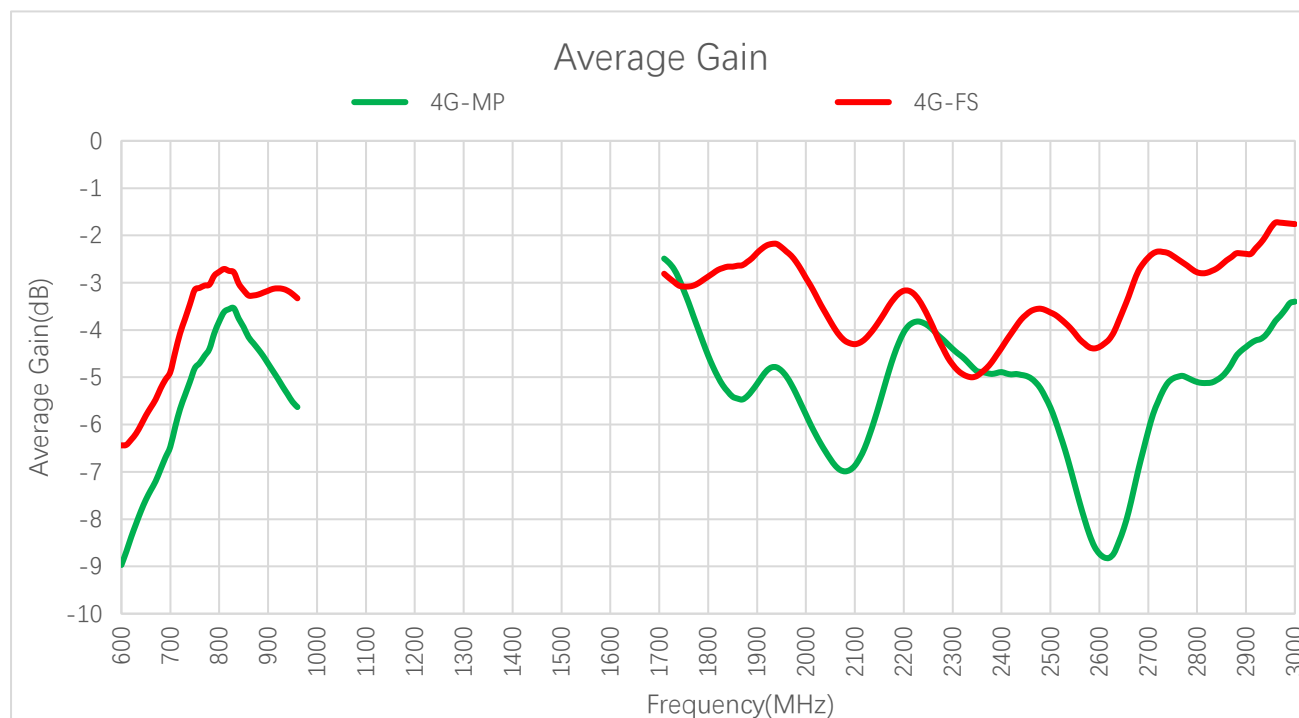
Frequency (MHz)		600	630	710	830	900	960	1440	1710	1740	1880
Efficiency (%)	MP	-	-	24.8	44.3	33.8	27.3	-	56.3	51.1	28.9
	FS	-	-	35.8	52.7	48.2	46.5	-	52.4	49.5	55.5
Frequency (MHz)		1950	2140	2350	2450	2600	2690	4700	5000	5500	6000
Efficiency (%)	MP	32.7	25.6	32.6	31.8	13.4	22.2	-	-	-	-
	FS	59.6	40.2	31.9	42.9	36.6	55.0	-	-	-	-



Efficiency (%) - GNSS

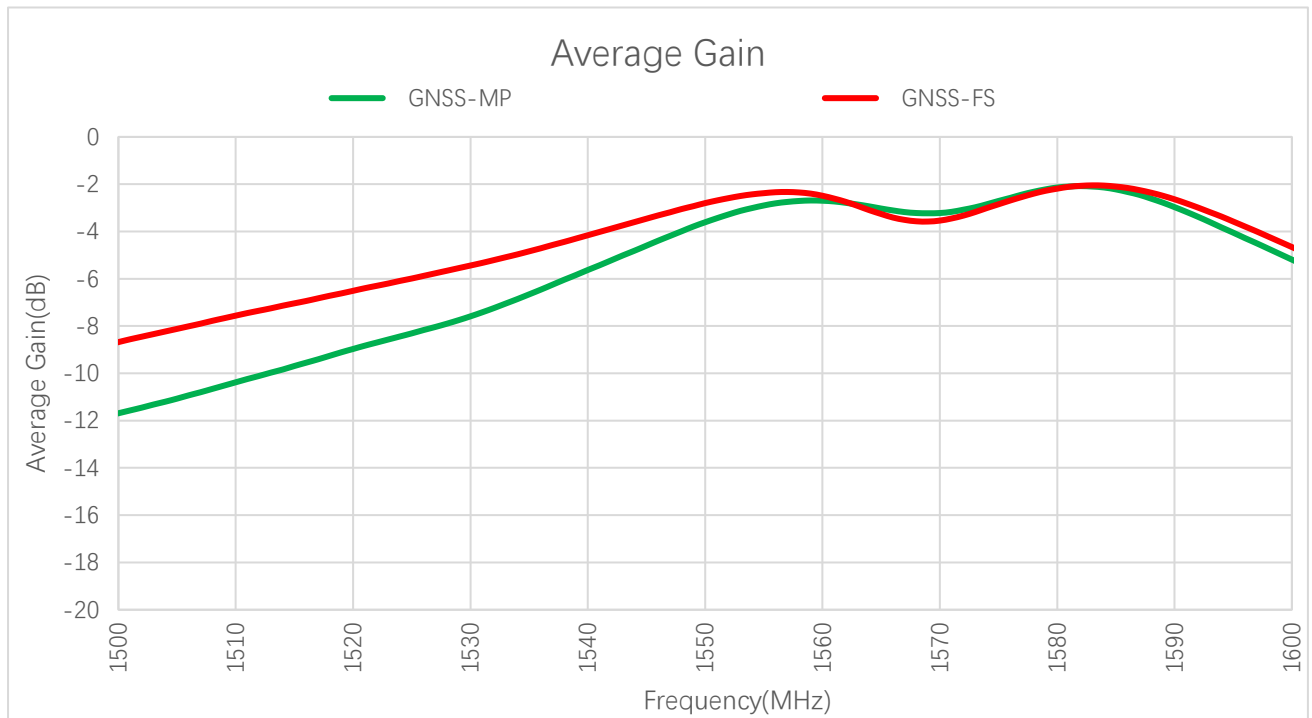
Frequency (MHz)		1176	1207	1227	1248	1268	1561	1575	1602
Efficiency (%)	MP	-	-	-	-	-	53.7	53.5	-
	FS	-	-	-	-	-	56.4	51.9	-

3.2.2. Average Gain



Average Gain (dB) - 4G

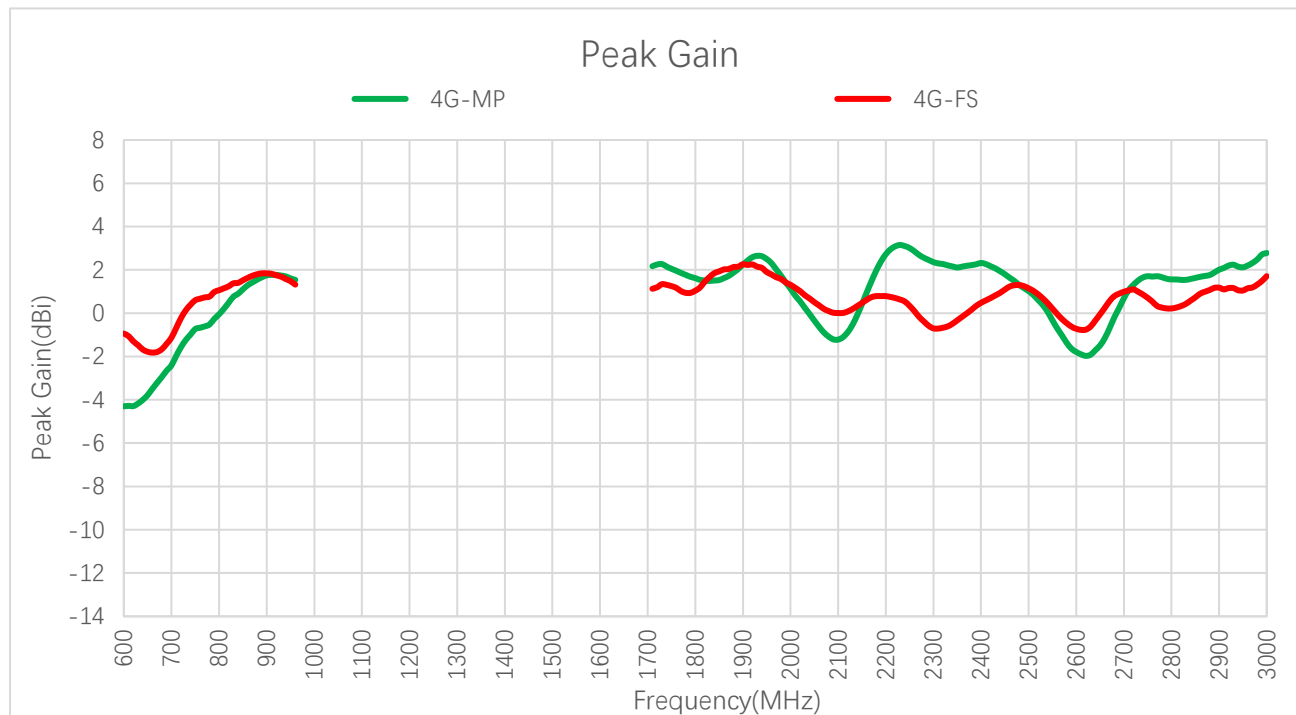
Frequency (MHz)		600	630	710	830	900	960	1440	1710	1740	1880
Average Gain (dB)	MP	-	-	-6.1	-3.5	-4.7	-5.6	-	-2.5	-2.9	-5.4
	FS	-	-	-4.5	-2.8	-3.2	-3.3	-	-2.8	-3.1	-2.6
Frequency (MHz)		1950	2140	2350	2450	2600	2690	4700	5000	5500	6000
Average Gain (dB)	MP	-4.9	-5.9	-4.9	-5.0	-8.7	-6.5	-	-	-	-
	FS	-2.3	-4.0	-5.0	-3.7	-4.4	-2.6	-	-	-	-



Average Gain (dB) - GNSS

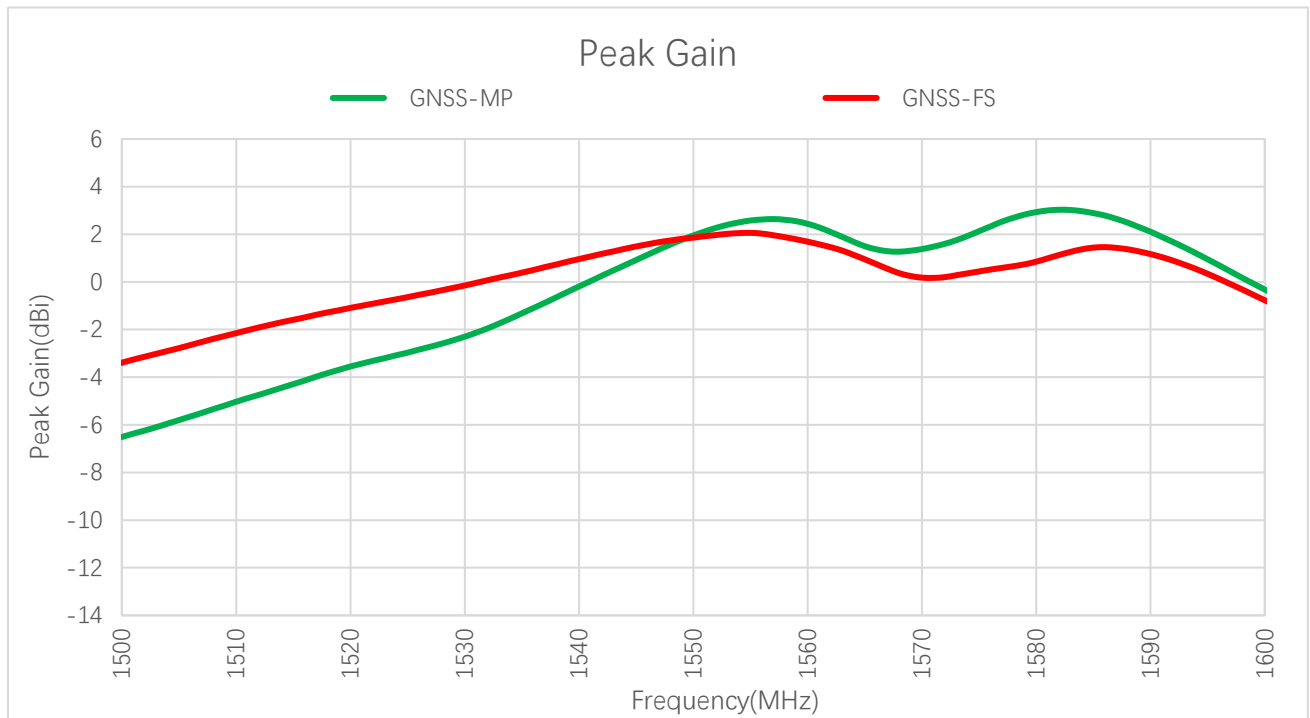
Frequency (MHz)		1176	1207	1227	1248	1268	1561	1575	1602
Average Gain (dB)	MP	-	-	-	-	-	-2.7	-2.7	-
	FS	-	-	-	-	-	-2.5	-2.9	-

3.2.3. Peak Gain



Peak Gain (dBi) - 4G

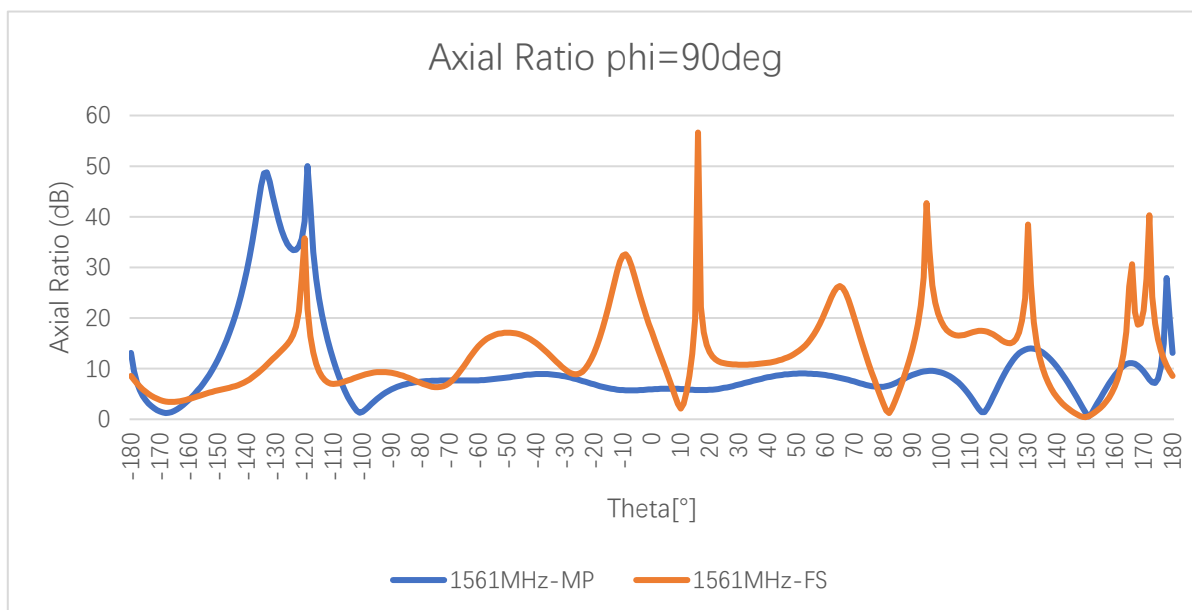
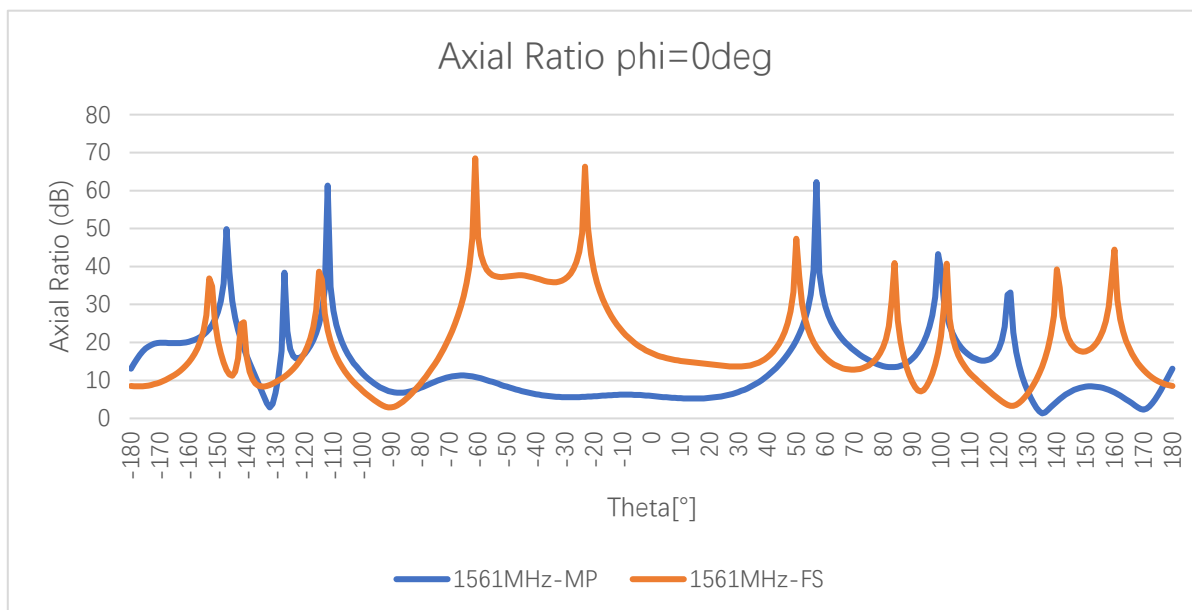
Frequency (MHz)		600	630	710	830	900	960	1440	1710	1740	1880
Peak Gain (dBi)	MP	-	-	-2.0	0.8	1.8	1.5	-	2.2	2.2	1.9
	FS	-	-	-0.7	1.4	1.8	1.3	-	1.1	1.3	2.1
Frequency (MHz)		1950	2140	2350	2450	2600	2690	4700	5000	5500	6000
Peak Gain (dBi)	MP	2.5	-0.1	2.1	1.8	-1.8	0.2	-	-	-	-
	FS	1.9	0.3	-0.3	1.1	-0.7	0.9	-	-	-	-

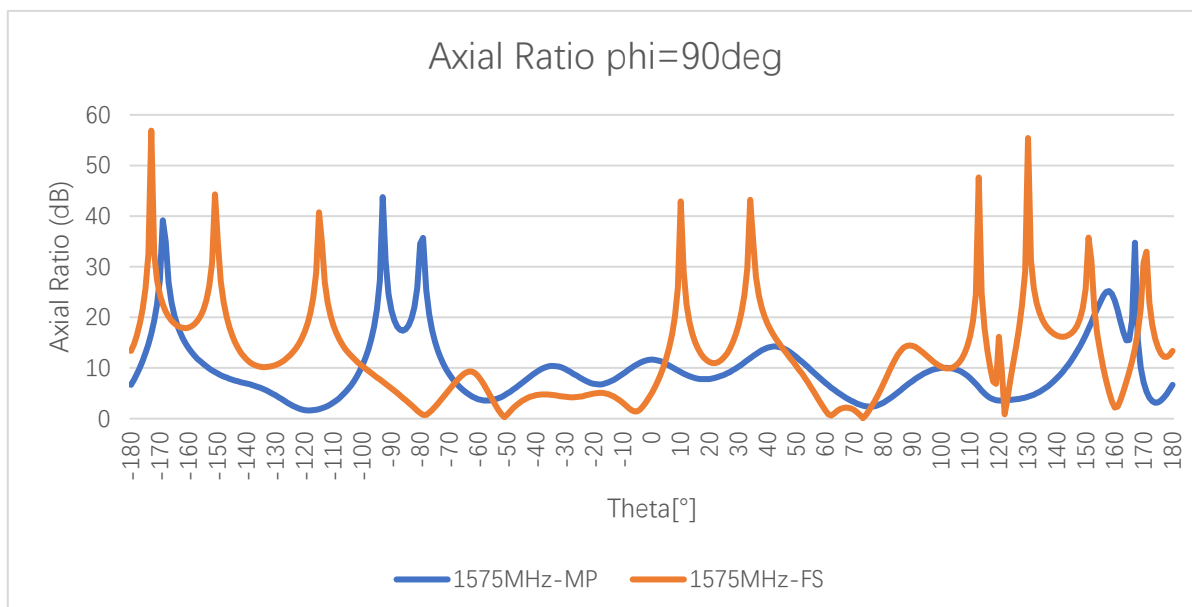
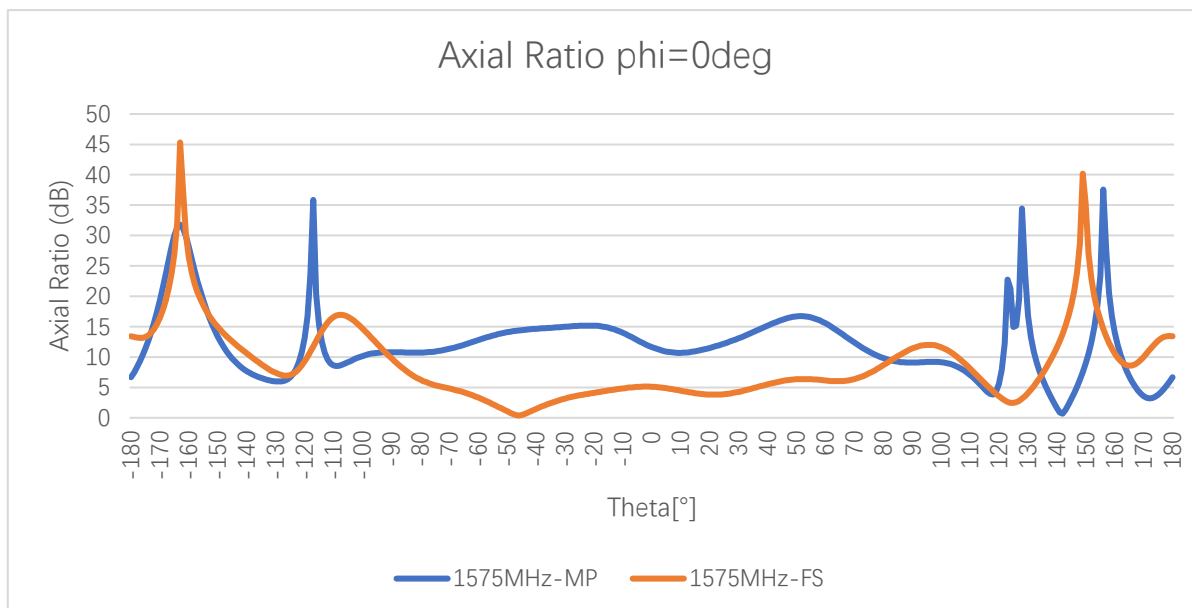


Peak Gain (dBi) - GNSS

Frequency (MHz)		1176	1207	1227	1248	1268	1561	1575	1602
Peak Gain (dBi)	MP	-	-	-	-	-	2.4	2.1	-
	FS	-	-	-	-	-	1.7	0.4	-

3.2.4. Axial Ratio





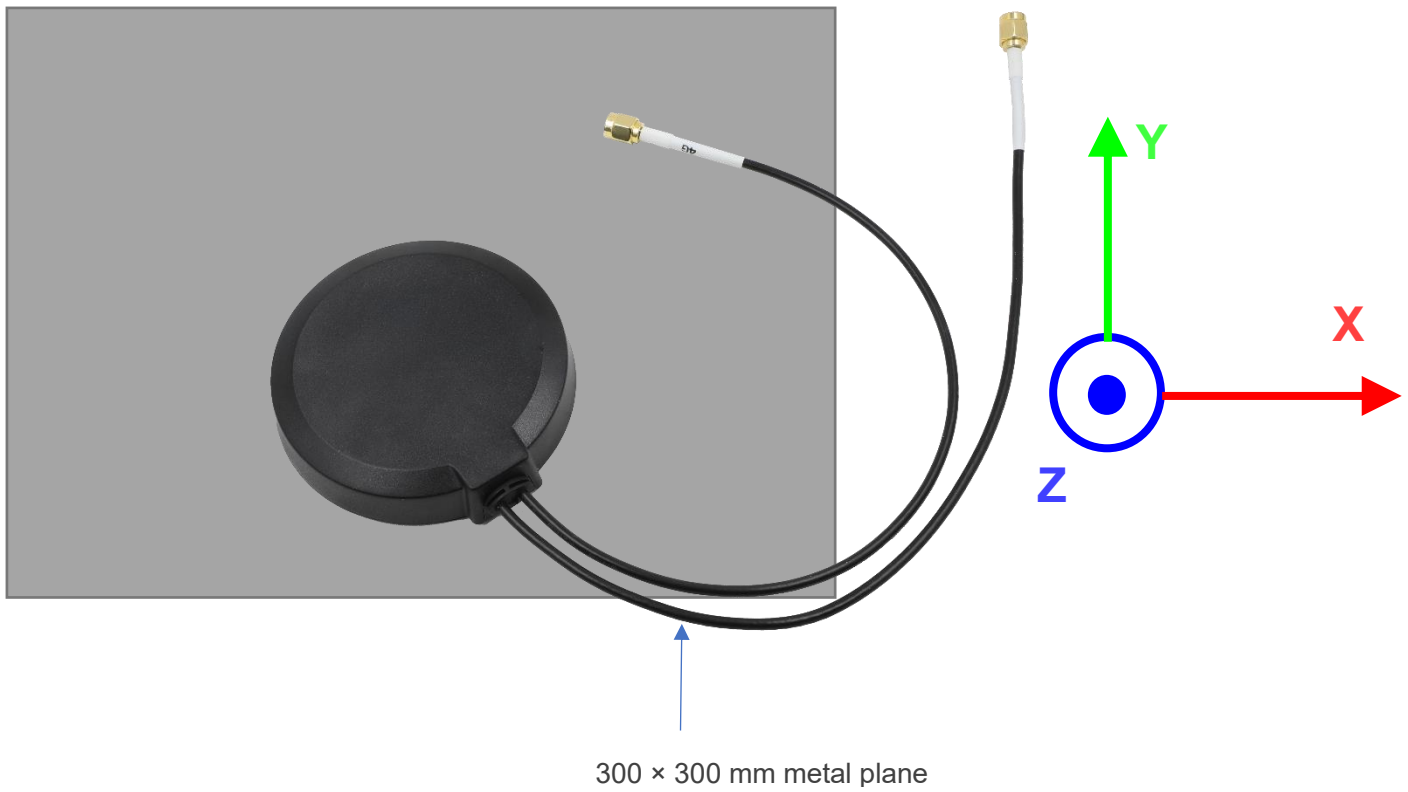
Axial Ratio (dB)

Frequency (MHz)			1176	1207	1227	1248	1268	1561	1575	1602
Axial Ratio (dB)	Phi = 0 (deg)	MP	-	-	-	-	-	5.9	11.6	-
		FS	-	-	-	-	-	17.2	5.1	-
	Phi = 90 (deg)	MP	-	-	-	-	-	5.9	11.6	-
		FS	-	-	-	-	-	17.2	5.1	-

3.2.5. 3D & 2D Radiation Pattern

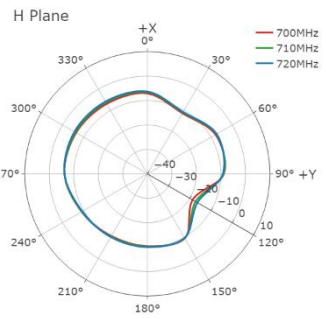
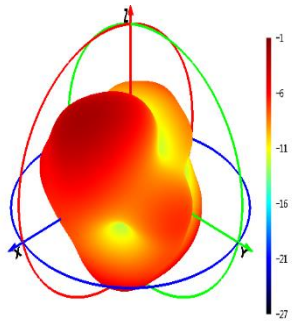
3.2.5.1. Test Condition: On 300×300 mm Metal Plane

- Test Chamber: GL-S-1

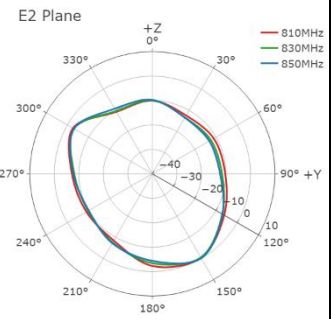
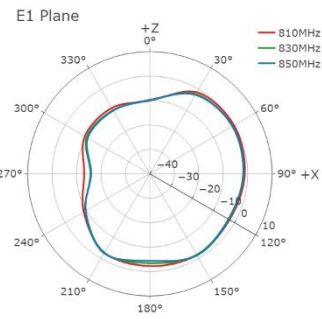
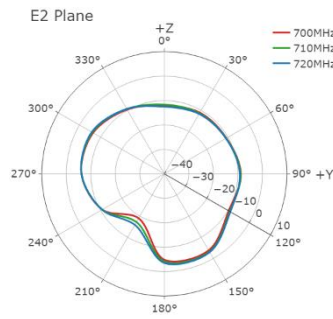
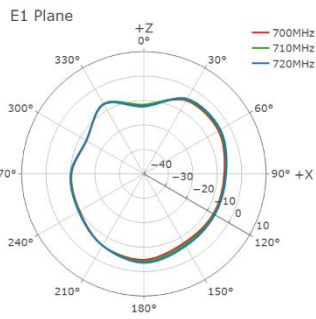
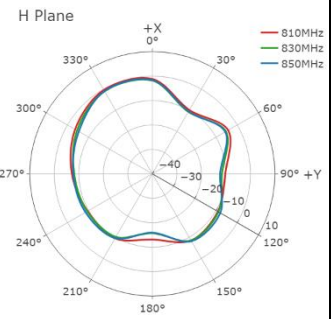
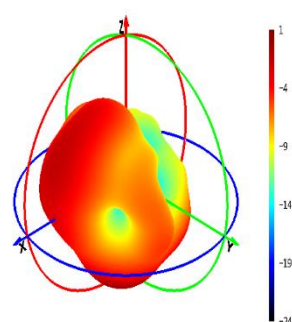


● **4G**

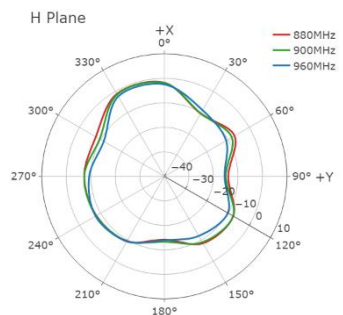
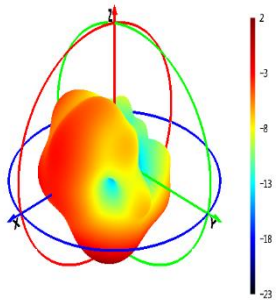
710 MHz



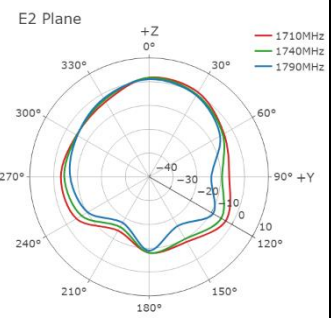
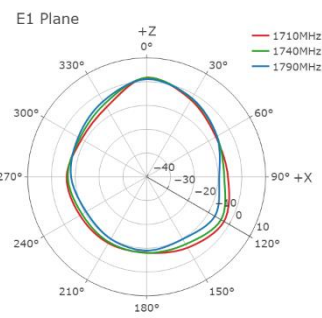
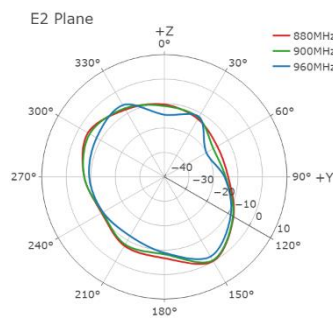
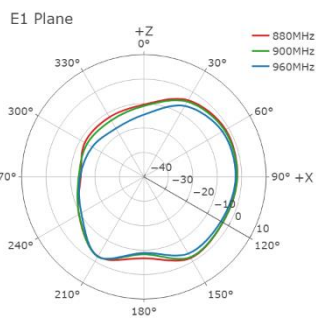
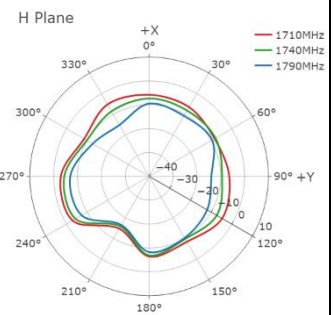
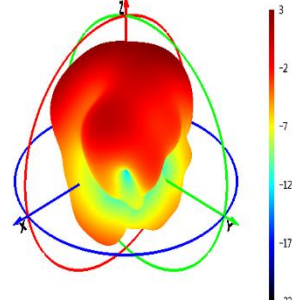
830 MHz



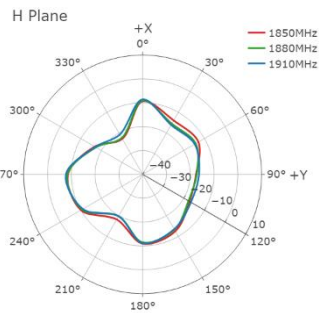
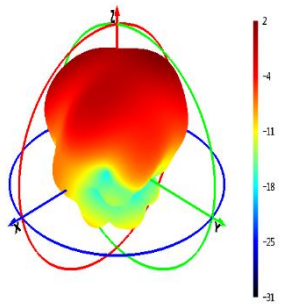
900 MHz



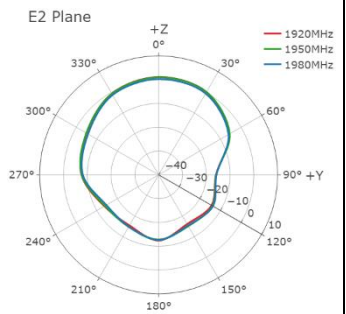
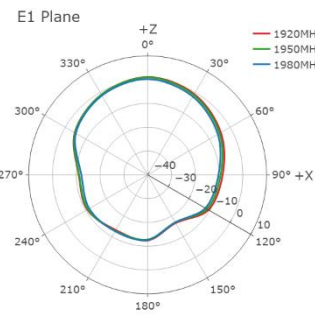
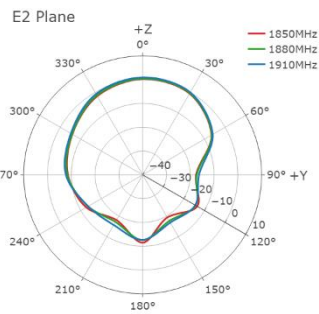
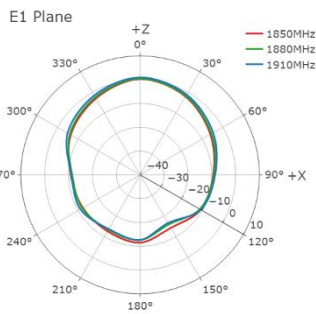
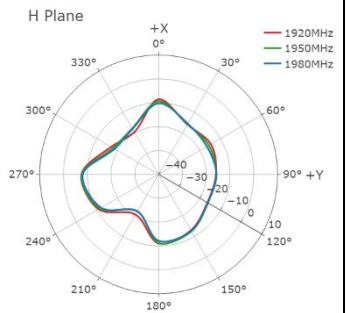
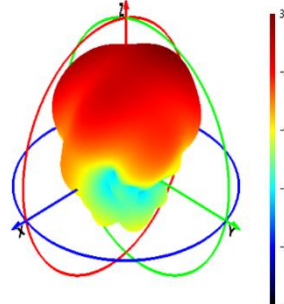
1740 MHz



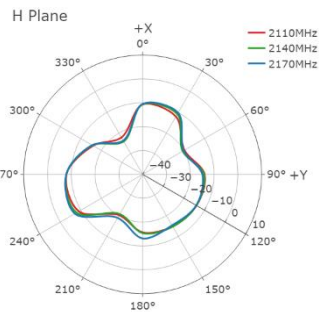
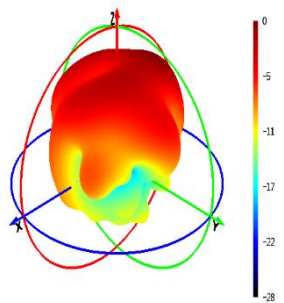
1880 MHz



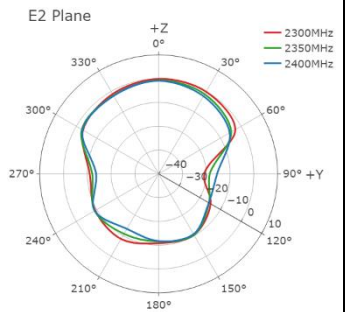
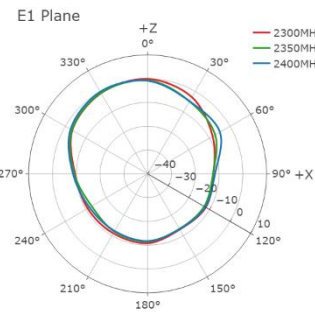
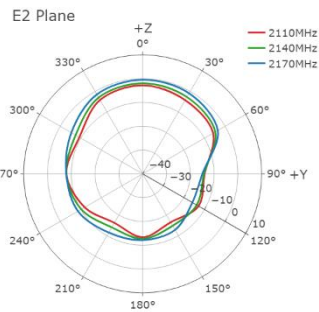
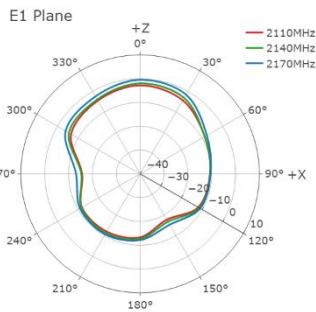
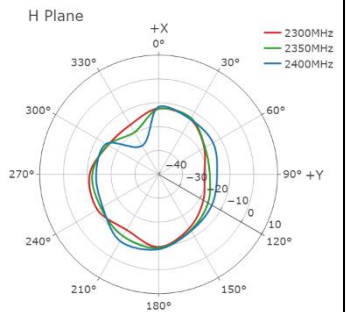
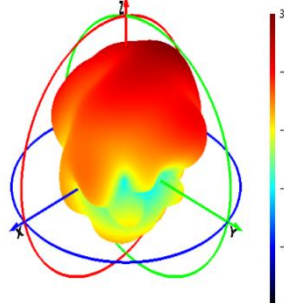
1950 MHz

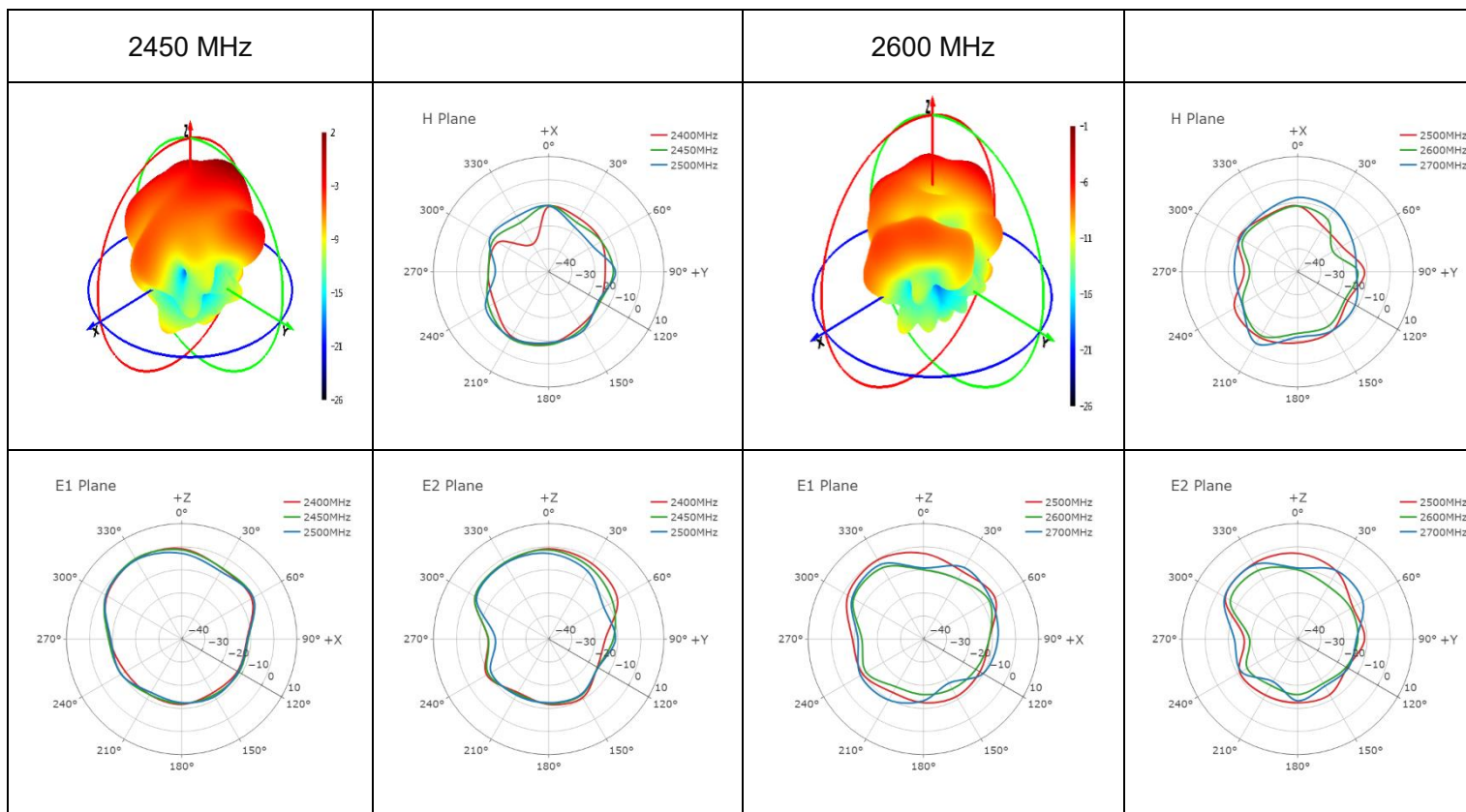


2140 MHz



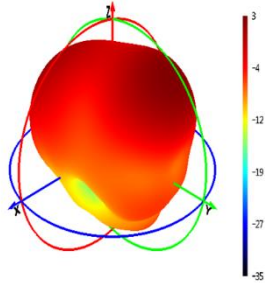
2350 MHz



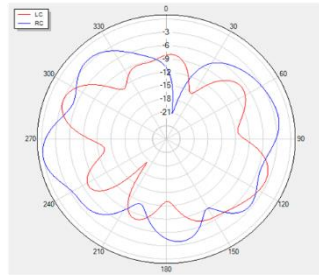


● **GNSS**

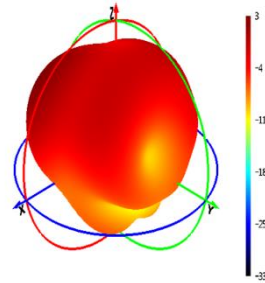
1561 MHz



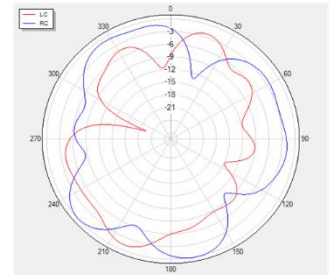
Theta=90 freq=1561MHz



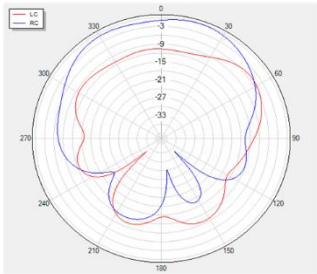
1575 MHz



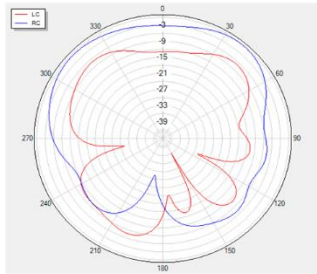
Theta=90 freq=1575MHz



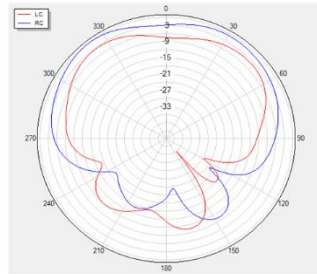
Phi=0 freq=1561MHz



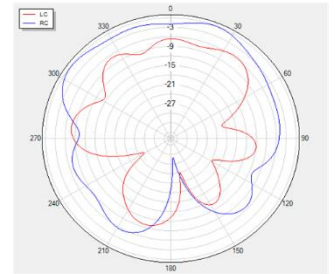
Phi=90 freq=1561MHz



Phi=0 freq=1575MHz

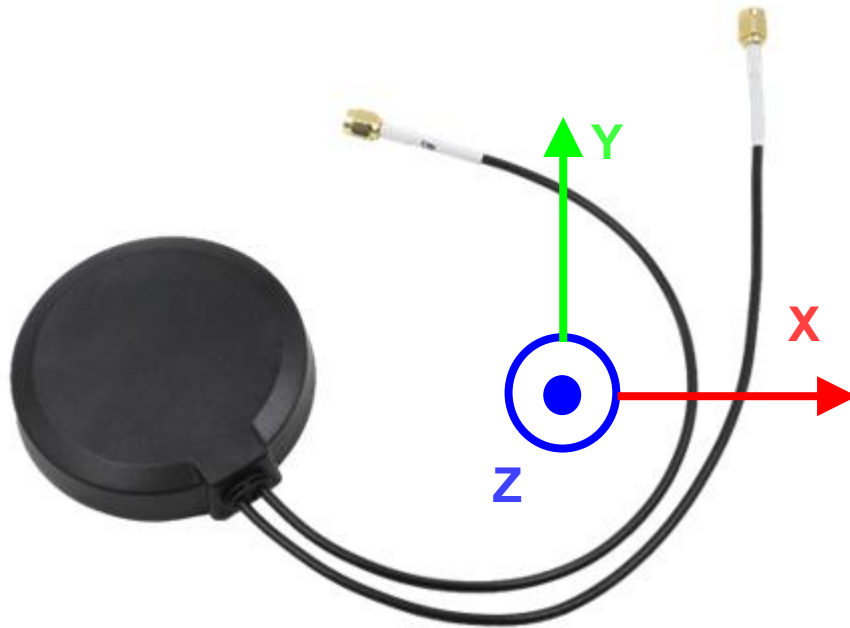


Phi=90 freq=1575MHz



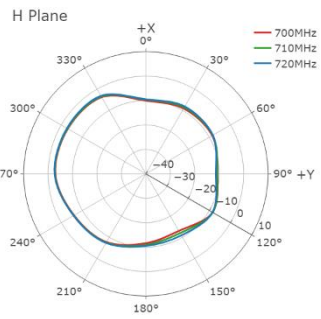
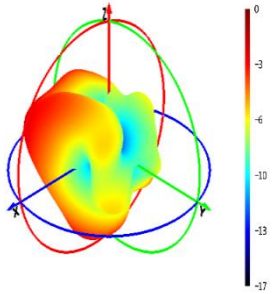
3.2.5.2. Test Condition: In Free Space

- Test Chamber: GL-S-1

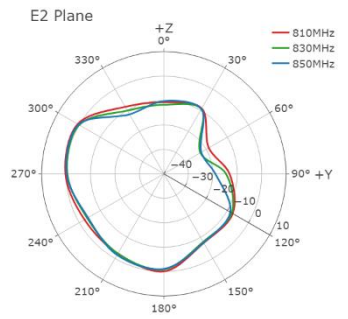
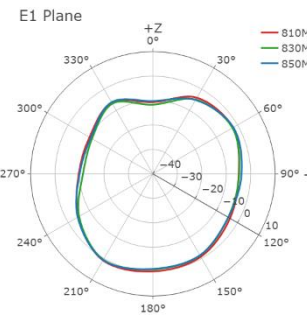
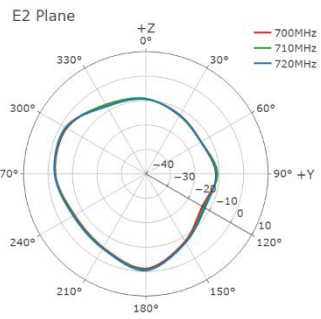
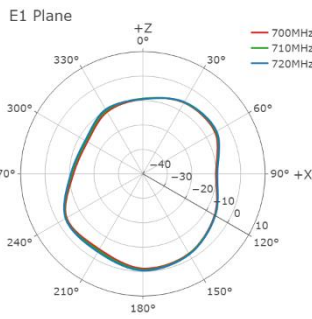
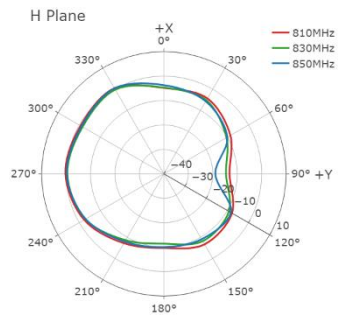
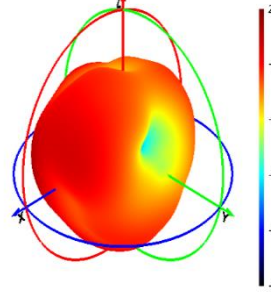


● **4G**

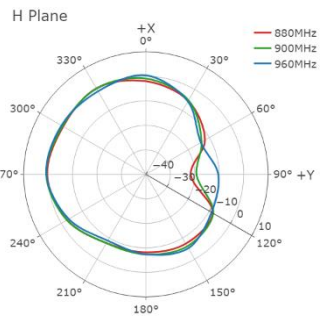
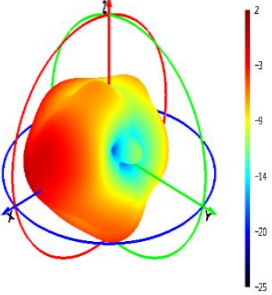
710 MHz



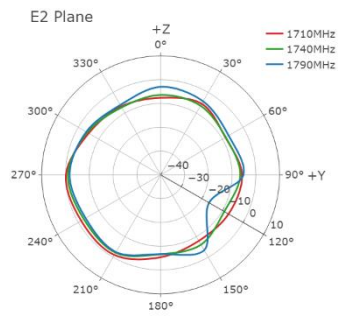
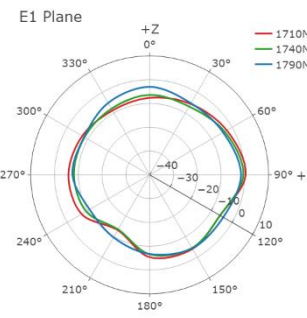
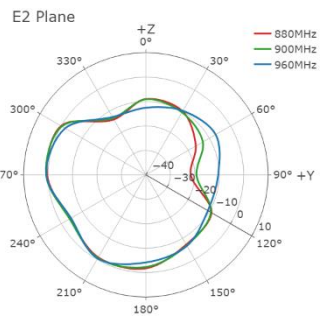
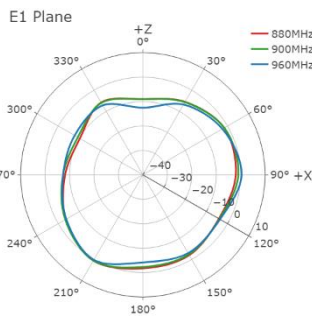
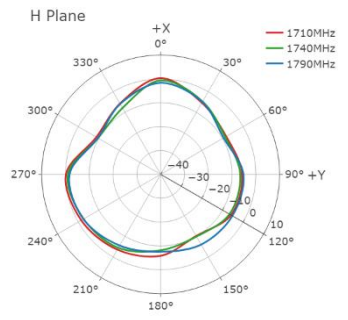
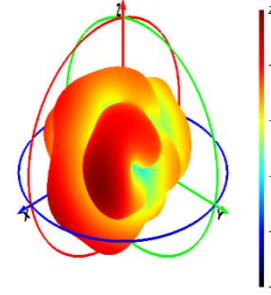
830 MHz

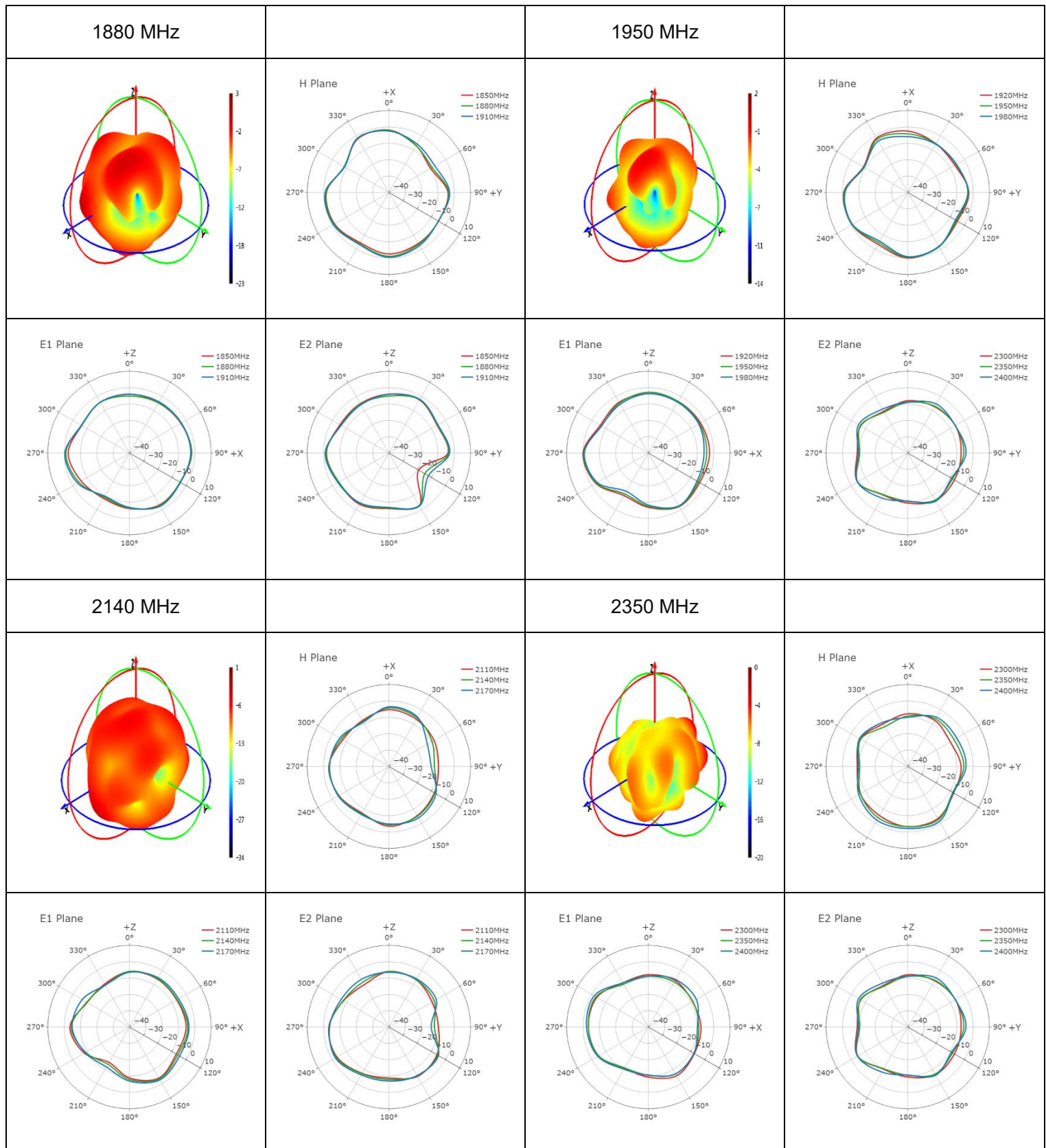


900 MHz

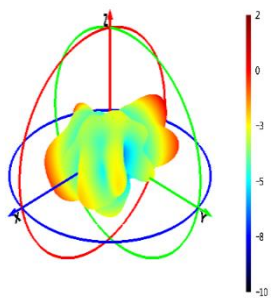


1740 MHz

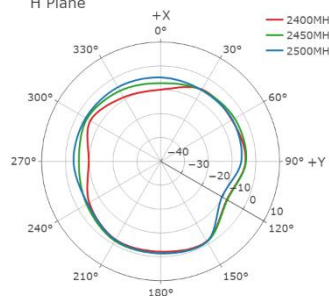




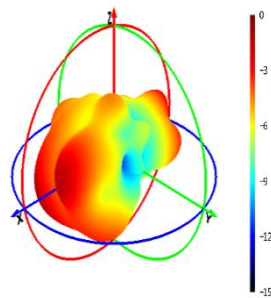
2450 MHz



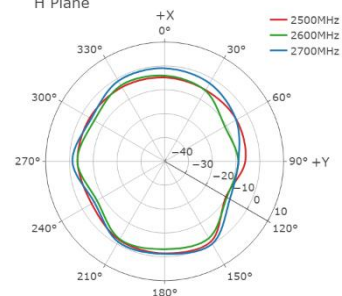
H Plane



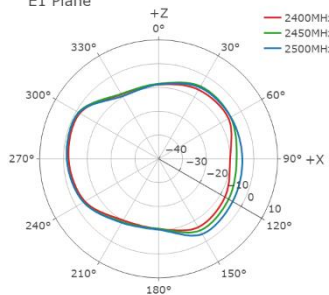
2600 MHz



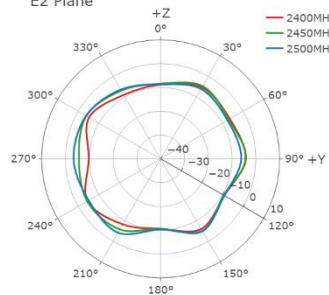
H Plane



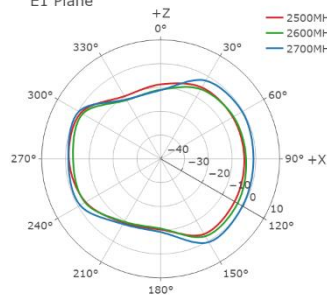
E1 Plane



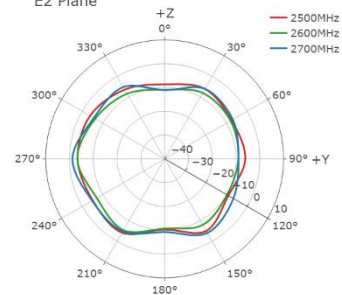
E2 Plane



E1 Plane

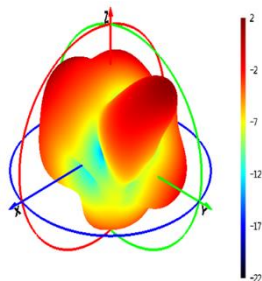


E2 Plane

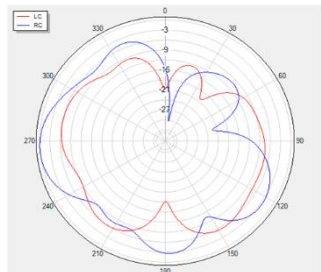


● **GNSS**

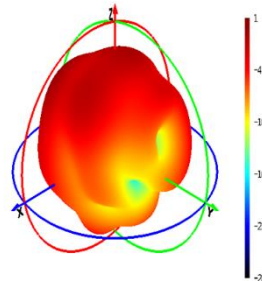
1561 MHz



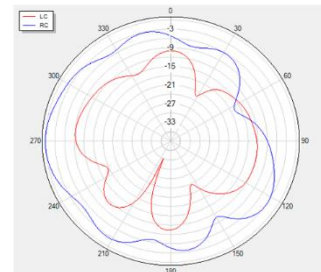
Theta=90 freq=1561MHz



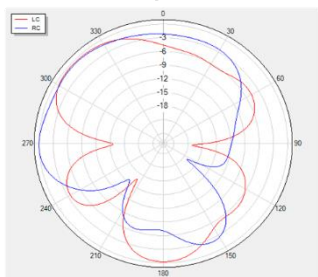
1575 MHz



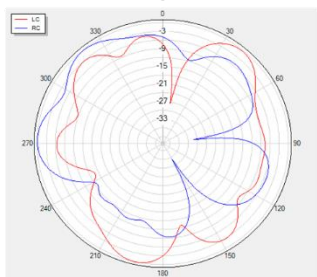
Theta=90 freq=1575MHz



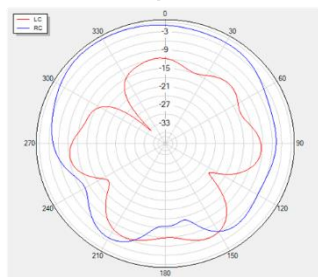
Phi=0 freq=1561MHz



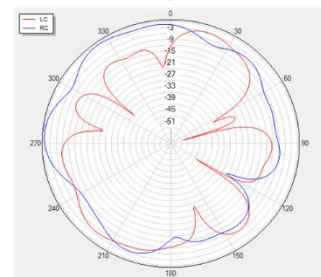
Phi=90 freq=1561MHz



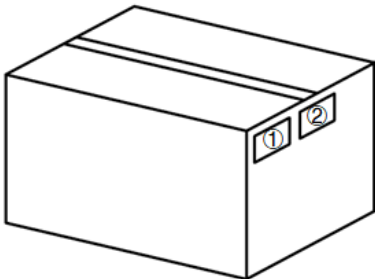
Phi=0 freq=1575MHz

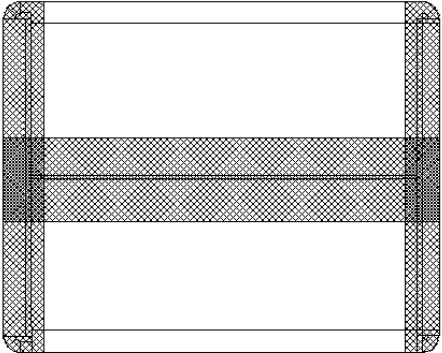


Phi=90 freq=1575MHz



4 Packaging

Step	Packaging Picture / 2D Picture	Description
1		20 pcs antenna products in a PE bag; (20 pcs antennas per PE bag)
2		(10 PE bags per carton box) (200 pcs antennas per carton box) <u>Carton Size:</u> <u>L × W × H = 370 × 370 × 295 mm</u>
3		Position for Attaching Labels ① Carton Label ② Quality Label

4		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:

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. 2023. All rights reserved.

Revision History

Version	Date	Author	Note
-	2021-01-28	Kenny YIN	Creation of the document
1.0	2021-01-28	Kenny YIN	First official release
1.1	2021-07-25	Kenny YIN	Updated working temperature. (Chapter 3)
1.2	2021-10-08	Aria CHU	1. Updated the gain for GNSS and added the low noise amplifier electrical specifications (Chapter 3) 2. Updated the data (Chapters 4.2.2, 4.3.2 and 4.4.2)
1.3	2021-12-06	Aria CHU	Updated the product description (Chapter 1).
2.0	2023-09-07	Black LI/ Lucky FENG/ Kane HUANG/ David LIU/ Vinnie LIU	Updated all data in the datasheet.



www.quectel.com