



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 $\pm$ 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.

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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	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	-

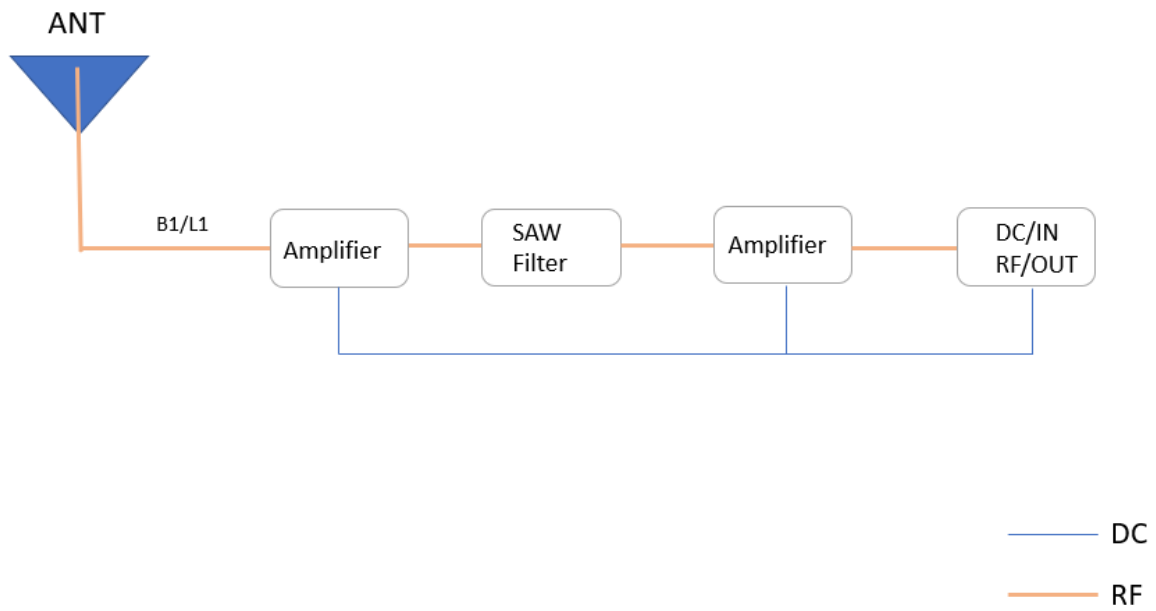
LNA Electrical

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

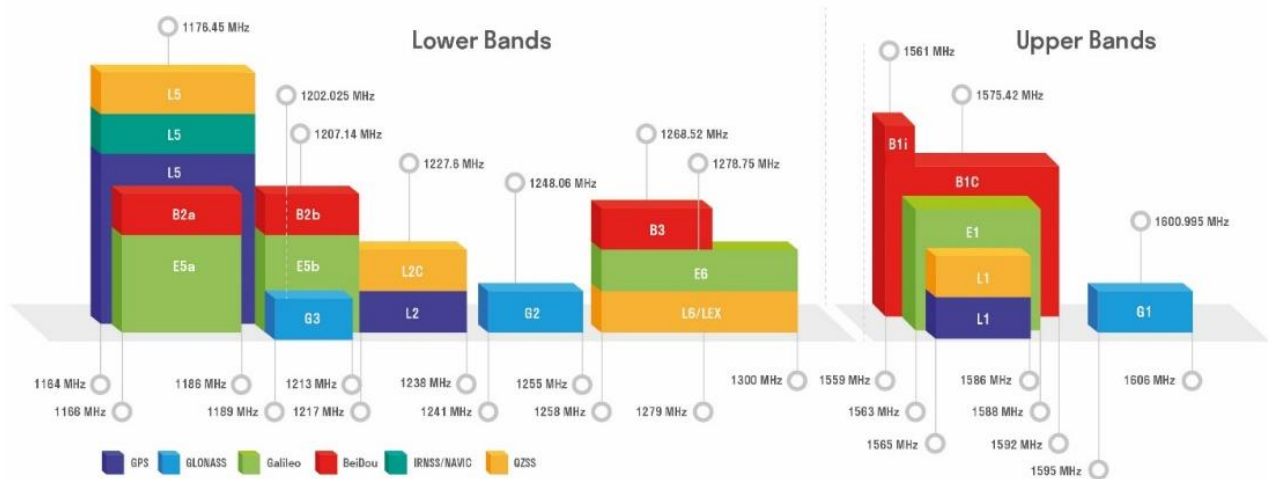
1.3. Block Diagram (Active Antenna)



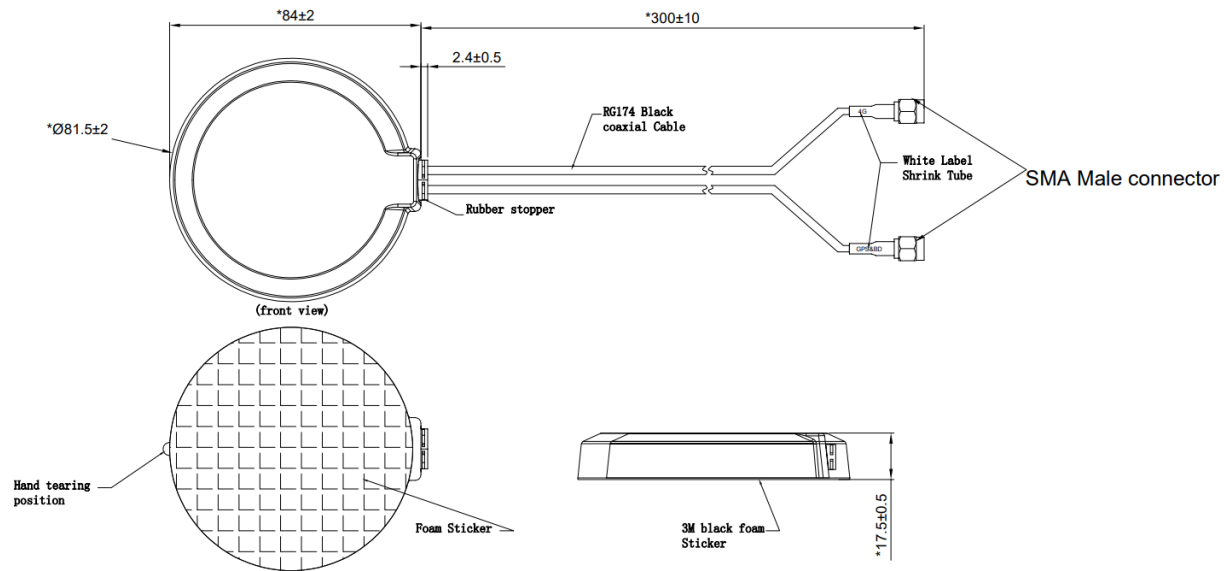
1.4. Supported GNSS Frequency Bands

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



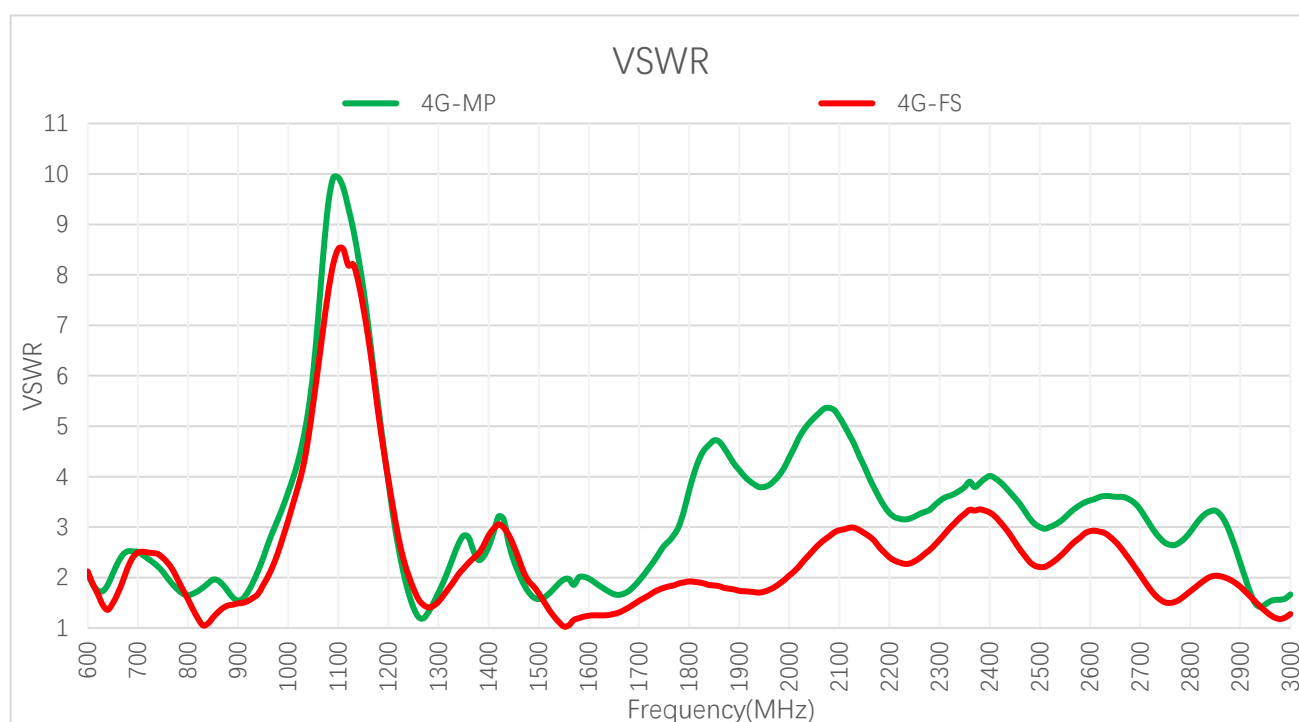
2 Drawing



3 Detailed Performance

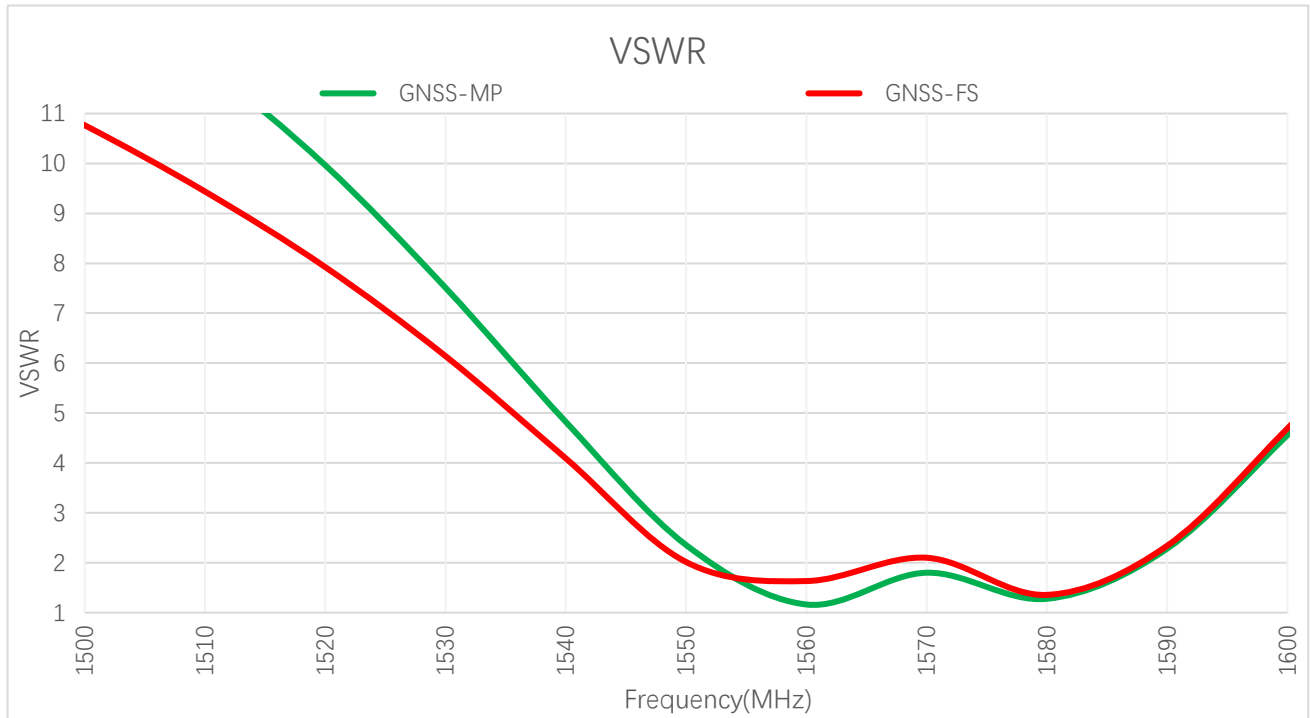
3.1. S-Parameter Test

3.1.1. VSWR



VSWR - 4G

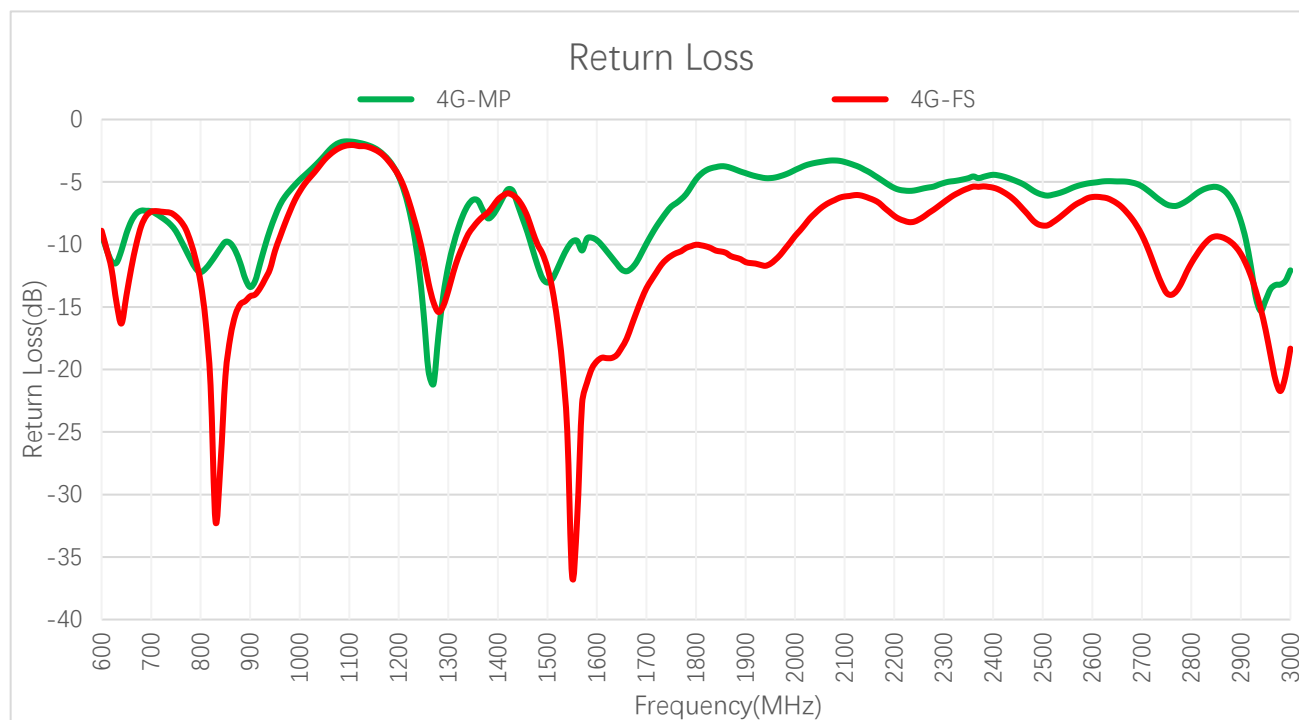
Frequency (MHz)		600	630	710	830	900	960	1440	1710	1740	1880
VSWR	MP	-	-	2.4	1.8	1.5	2.7	-	2.1	2.5	4.4
	FS	-	-	2.5	1.1	1.5	2.0	-	1.6	1.8	1.8
Frequency (MHz)		1950	2140	2350	2450	2600	2690	4700	5000	5500	6000
VSWR	MP	3.8	4.4	3.8	3.6	3.5	3.5	-	-	-	-
	FS	1.7	2.9	3.3	2.7	2.9	2.2	-	-	-	-



VSWR - GNSS

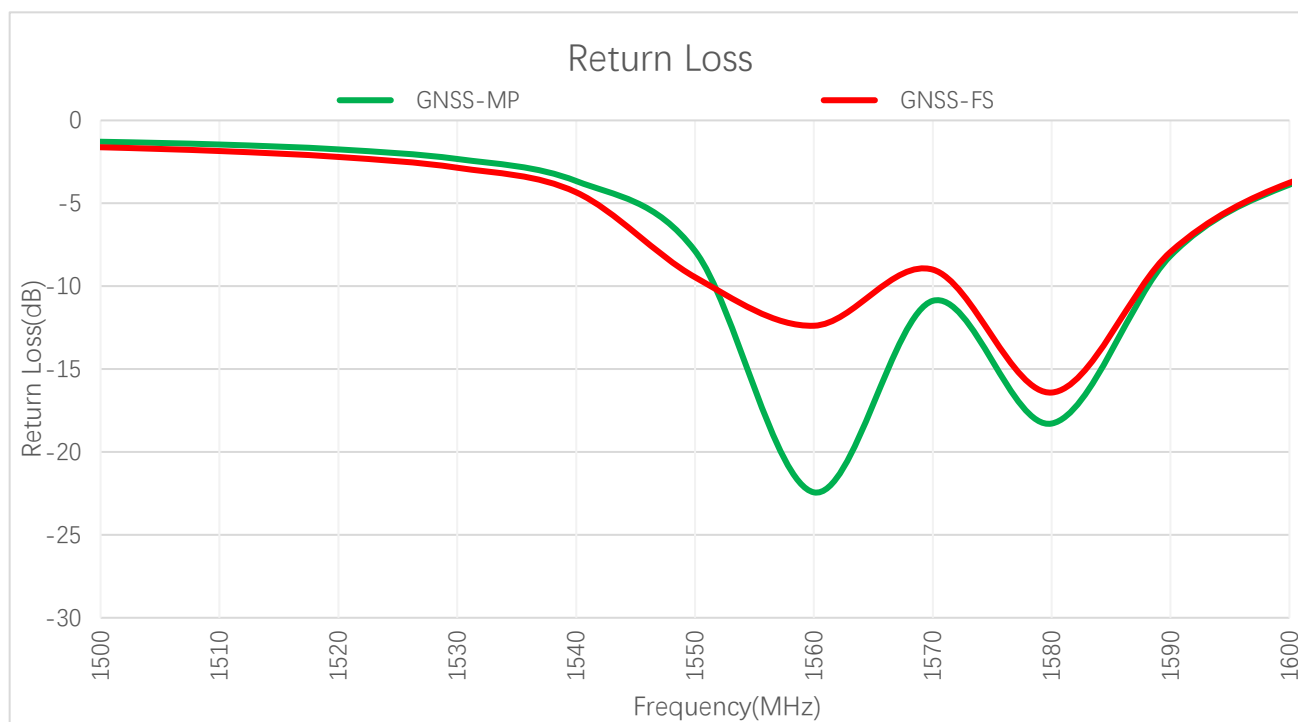
Frequency (MHz)		1176	1207	1227	1248	1268	1561	1575	1602
VSWR	MP	-	-	-	-	-	1.2	1.5	-
	FS	-	-	-	-	-	1.6	1.7	-

3.1.2. Return Loss



Return Loss (dB) - 4G

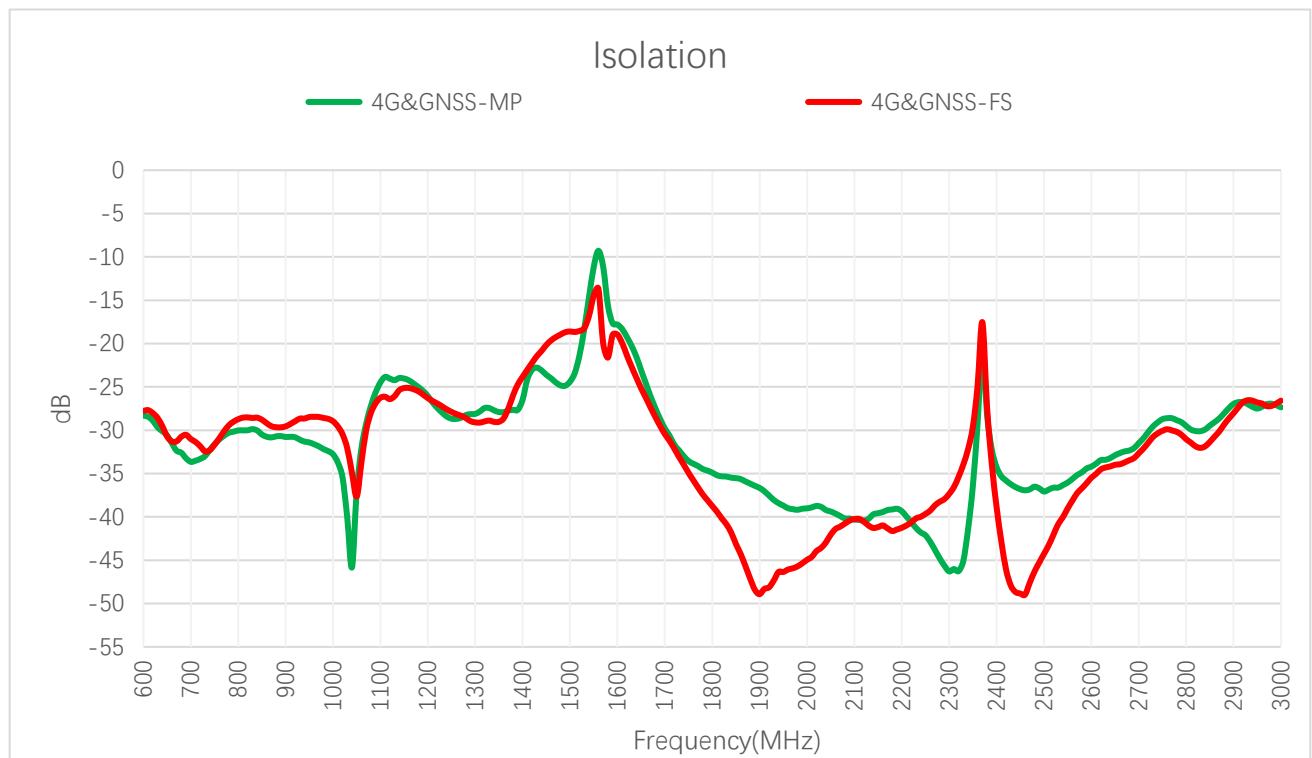
Frequency (MHz)		600	630	710	830	900	960	1440	1710	1740	1880
Return Loss (dB)	MP	-	-	-7.5	-10.9	-13.4	-6.8	-	-9.2	-7.4	-4.0
	FS	-	-	-7.3	-32.1	-14.1	-9.4	-	-12.8	-11.2	-11.1
Frequency (MHz)		1950	2140	2350	2450	2600	2690	4700	5000	5500	6000
Return Loss (dB)	MP	-4.7	-4.0	-4.7	-5.0	-5.1	-5.2	-	-	-	-
	FS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

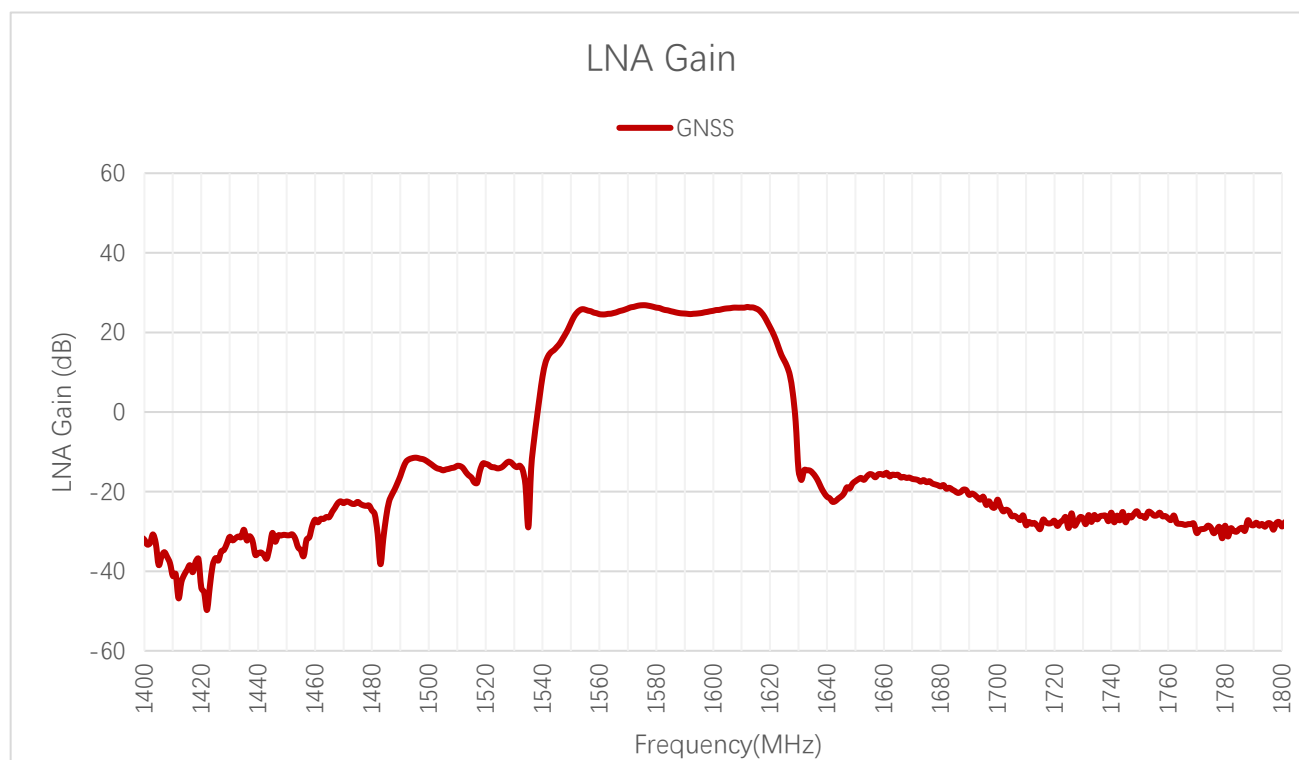
3.1.3. Isolation



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

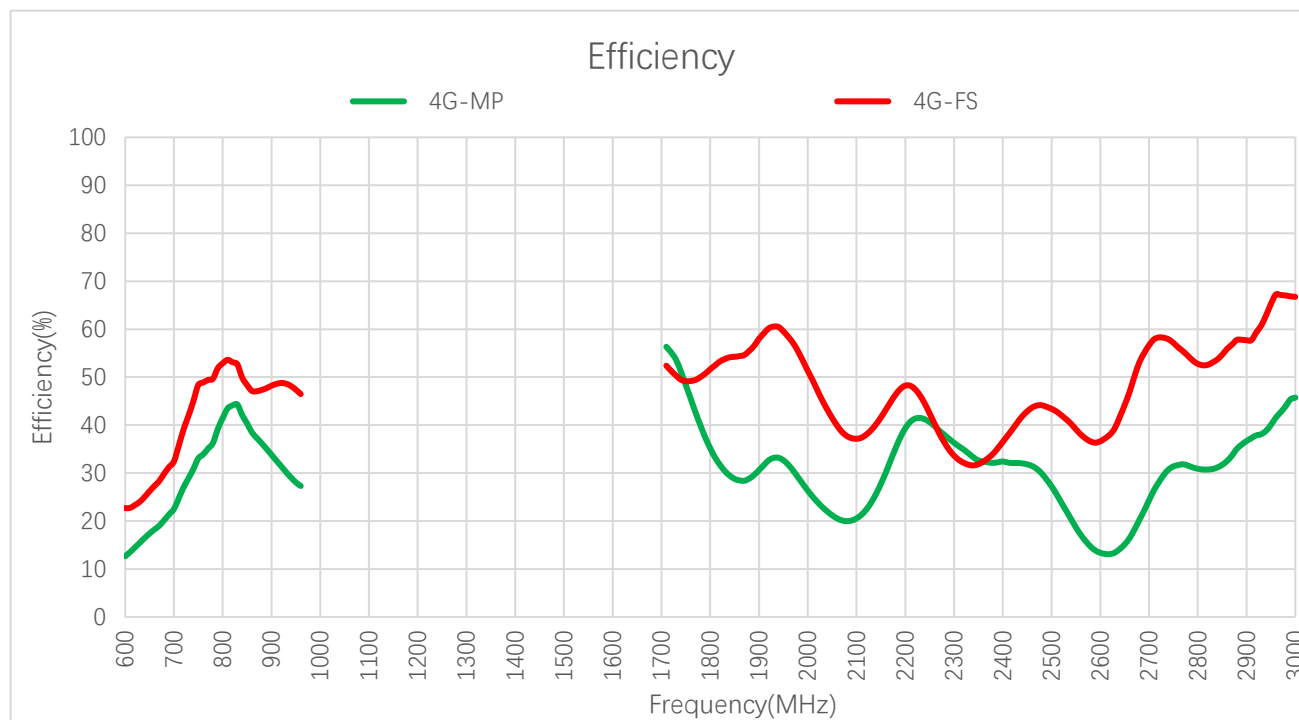


LNA Gain (dB)

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

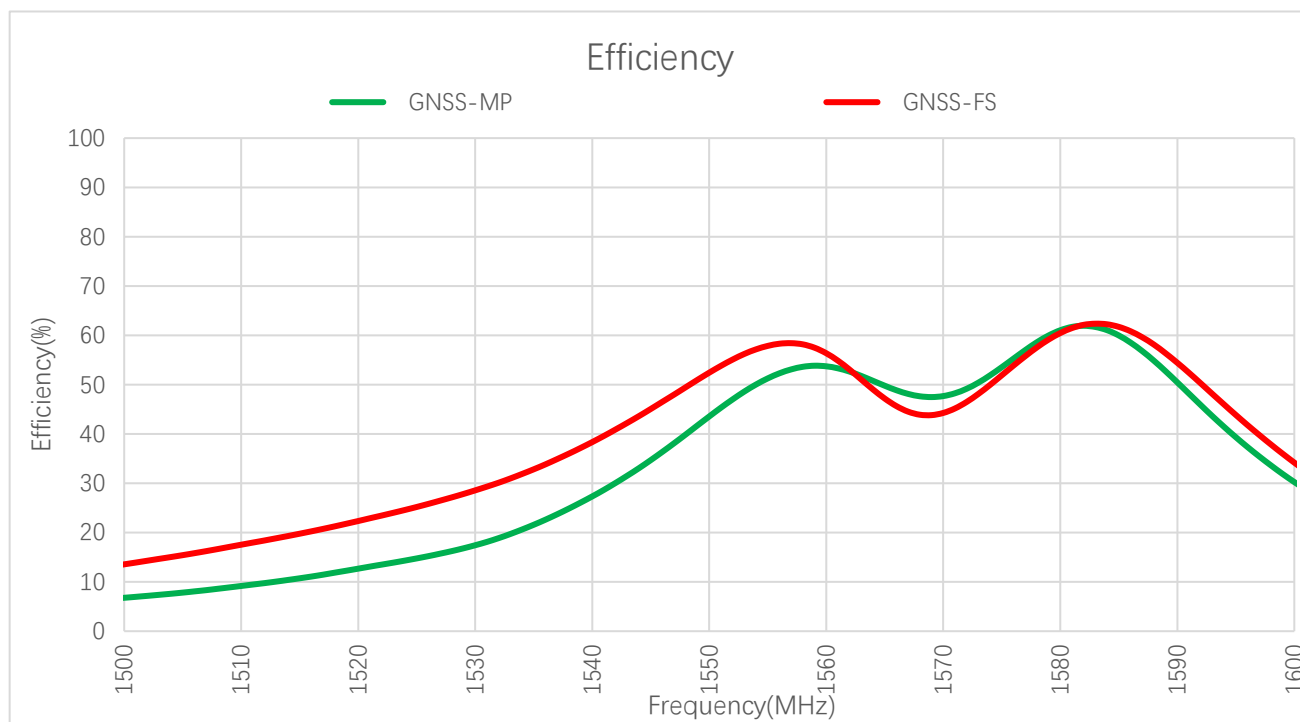
3.2. Radiation Performance Test

3.2.1. Efficiency



Efficiency (%) - 4G

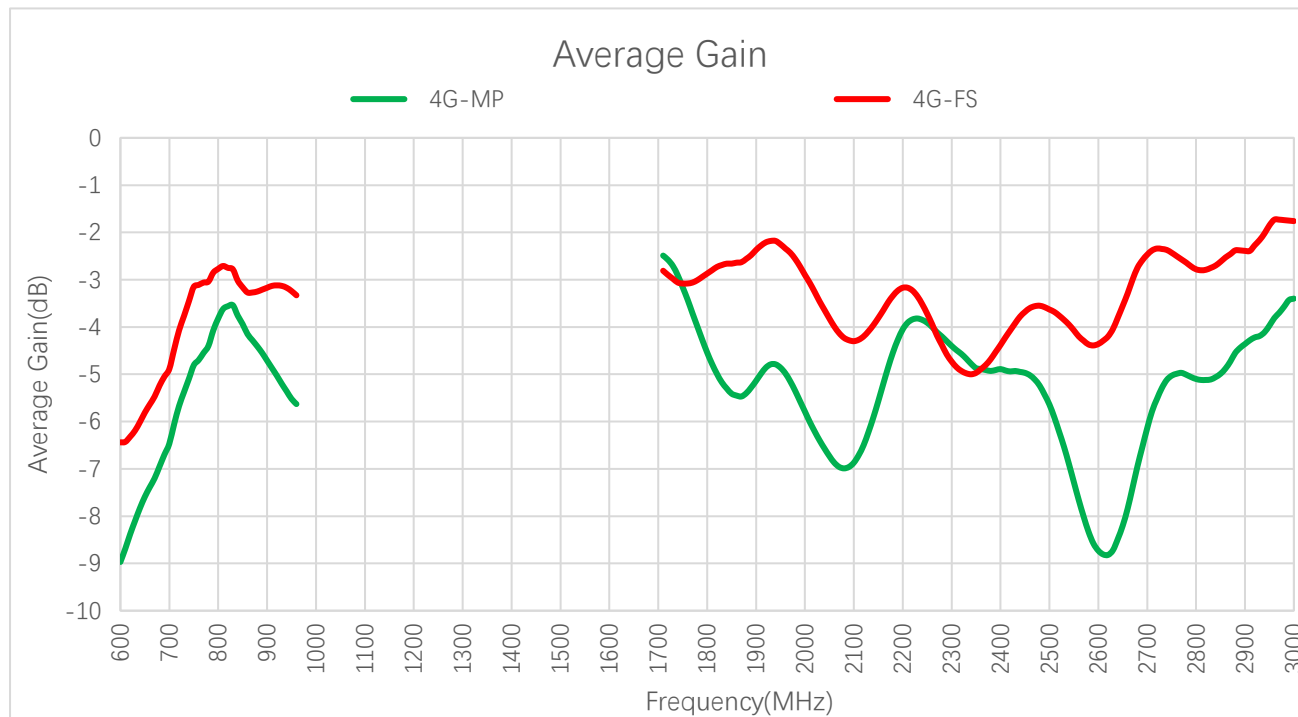
Frequency (MHz)		600	630	710	830	900	960	1440	1710	1740	1880
Efficiency (%)	MP	-	-	24.8	44.3	33.8	27.3	-	56.3	51.1	28.9
	FS	-	-	35.8	52.7	48.2	46.5	-	52.4	49.5	55.5
Frequency (MHz)		1950	2140	2350	2450	2600	2690	4700	5000	5500	6000
Efficiency (%)	MP	32.7	25.6	32.6	31.8	13.4	22.2	-	-	-	-
	FS	59.6	40.2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



Efficiency (%) - GNSS

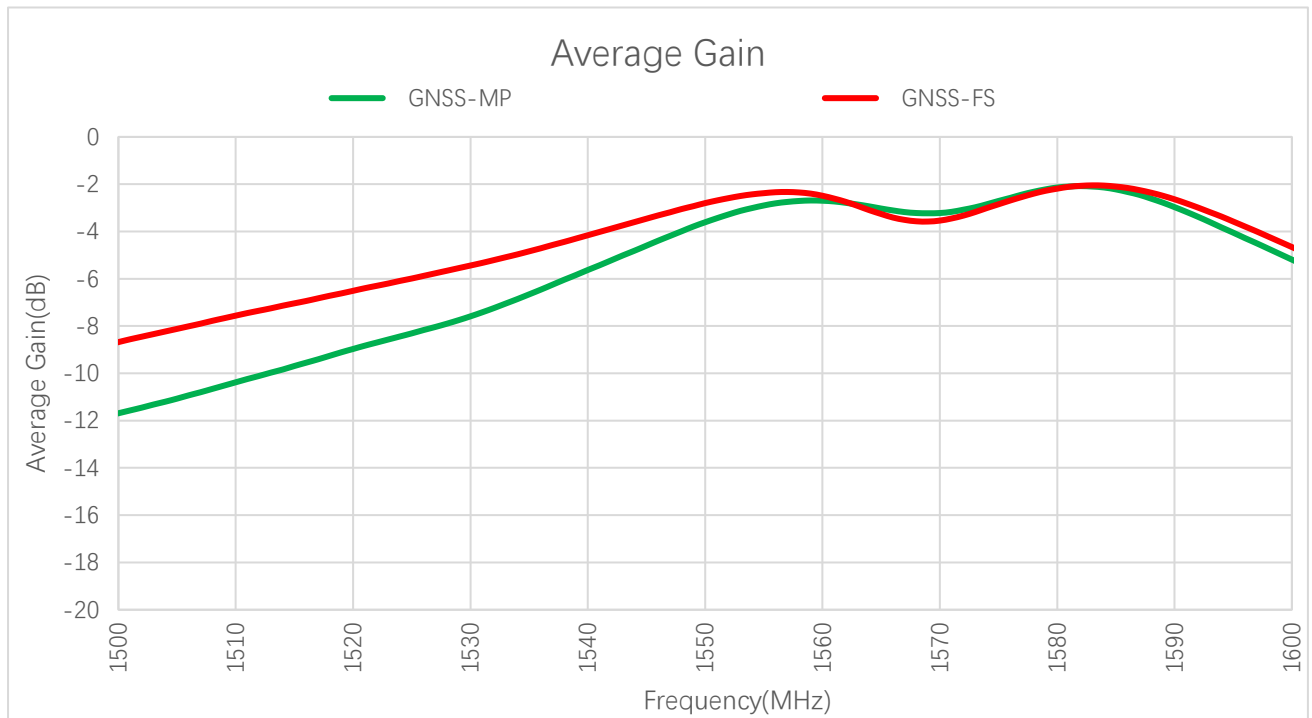
Frequency (MHz)		1176	1207	1227	1248	1268	1561	1575	1602
Efficiency (%)	MP	-	-	-	-	-	53.7	53.5	-
	FS	-	-	-	-	-	56.4	51.9	-

3.2.2. Average Gain



Average Gain (dB) - 4G

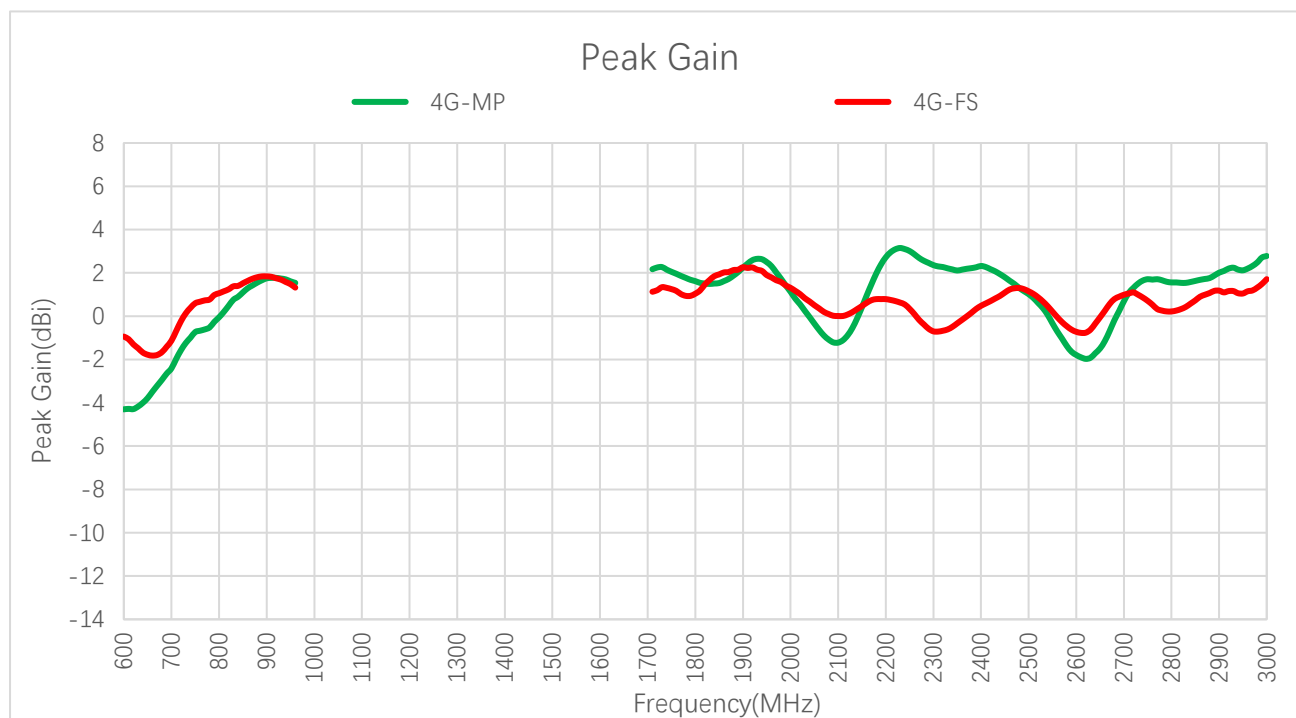
Frequency (MHz)		600	630	710	830	900	960	1440	1710	1740	1880
Average Gain (dB)	MP	-	-	-6.1	-3.5	-4.7	-5.6	-	-2.5	-2.9	-5.4
	FS	-	-	-4.5	-2.8	-3.2	-3.3	-	-2.8	-3.1	-2.6
Frequency (MHz)		1950	2140	2350	2450	2600	2690	4700	5000	5500	6000
Average Gain (dB)	MP	-4.9	-5.9	-4.9	-5.0	-8.7	-6.5	-	-	-	-
	FS	-2.3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



Average Gain (dB) - GNSS

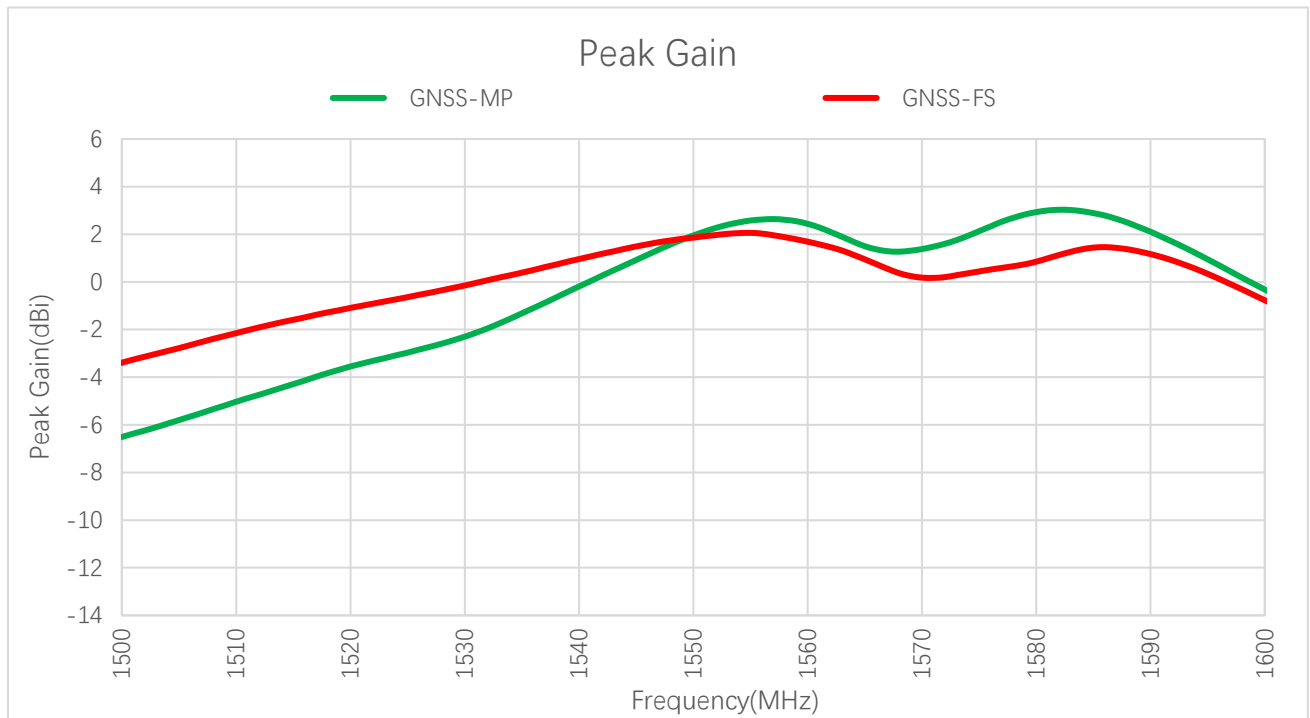
Frequency (MHz)		1176	1207	1227	1248	1268	1561	1575	1602
Average Gain (dB)	MP	-	-	-	-	-	-2.7	-2.7	-
	FS	-	-	-	-	-	-2.5	-2.9	-

3.2.3. Peak Gain



Peak Gain (dBi) - 4G

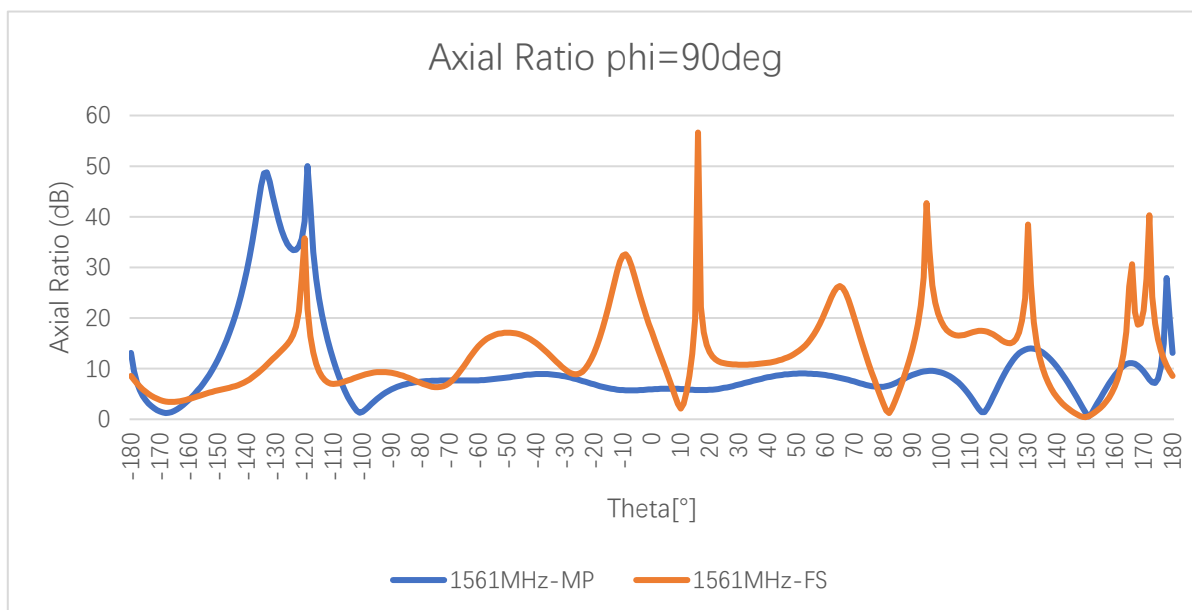
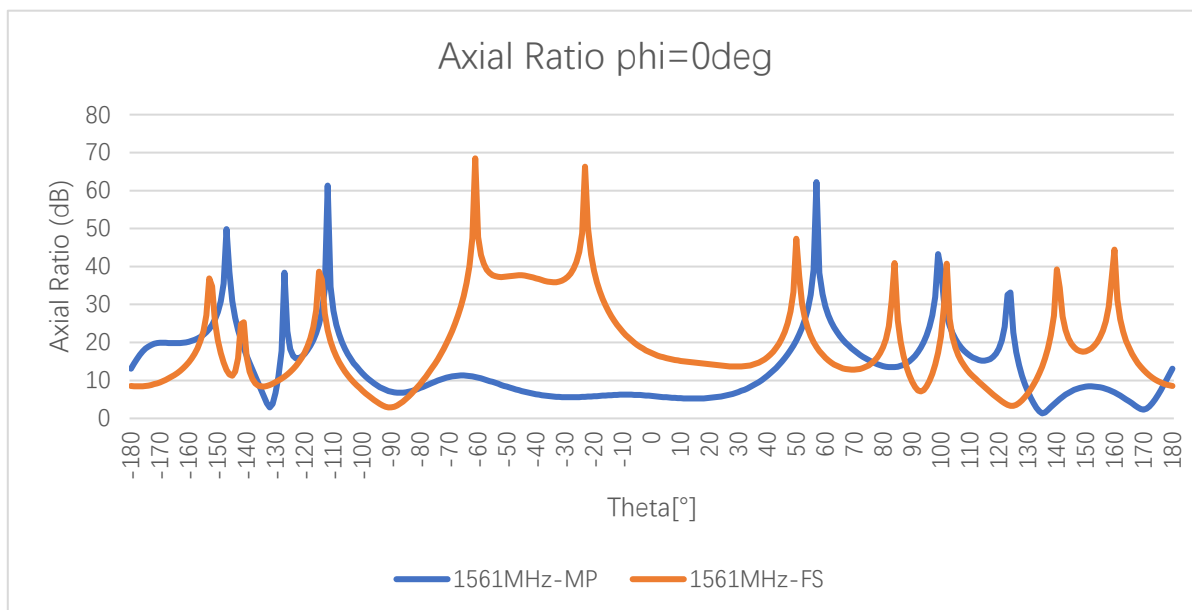
Frequency (MHz)		600	630	710	830	900	960	1440	1710	1740	1880
Peak Gain (dBi)	MP	-	-	-2.0	0.8	1.8	1.5	-	2.2	2.2	1.9
	FS	-	-	-0.7	1.4	1.8	1.3	-	1.1	1.3	2.1
Frequency (MHz)		1950	2140	2350	2450	2600	2690	4700	5000	5500	6000
Peak Gain (dBi)	MP	2.5	-0.1	2.1	1.8	-1.8	0.2	-	-	-	-
	FS	1.9	0.3	-0.3	1.1	-0.7	0.9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

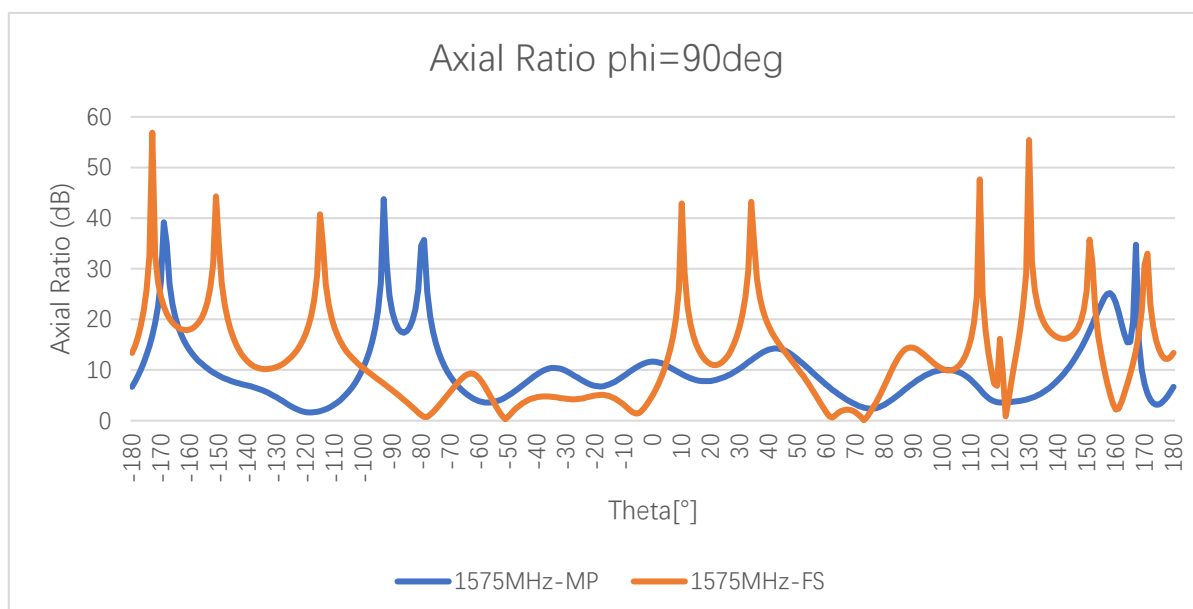
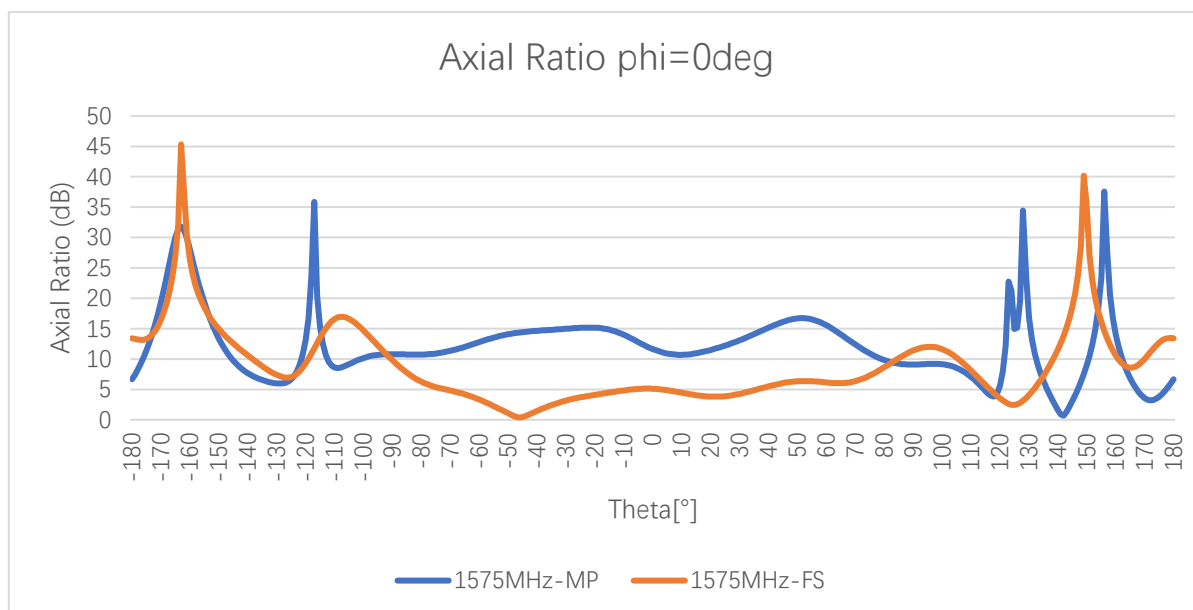


Peak Gain (dBi) - GNSS

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





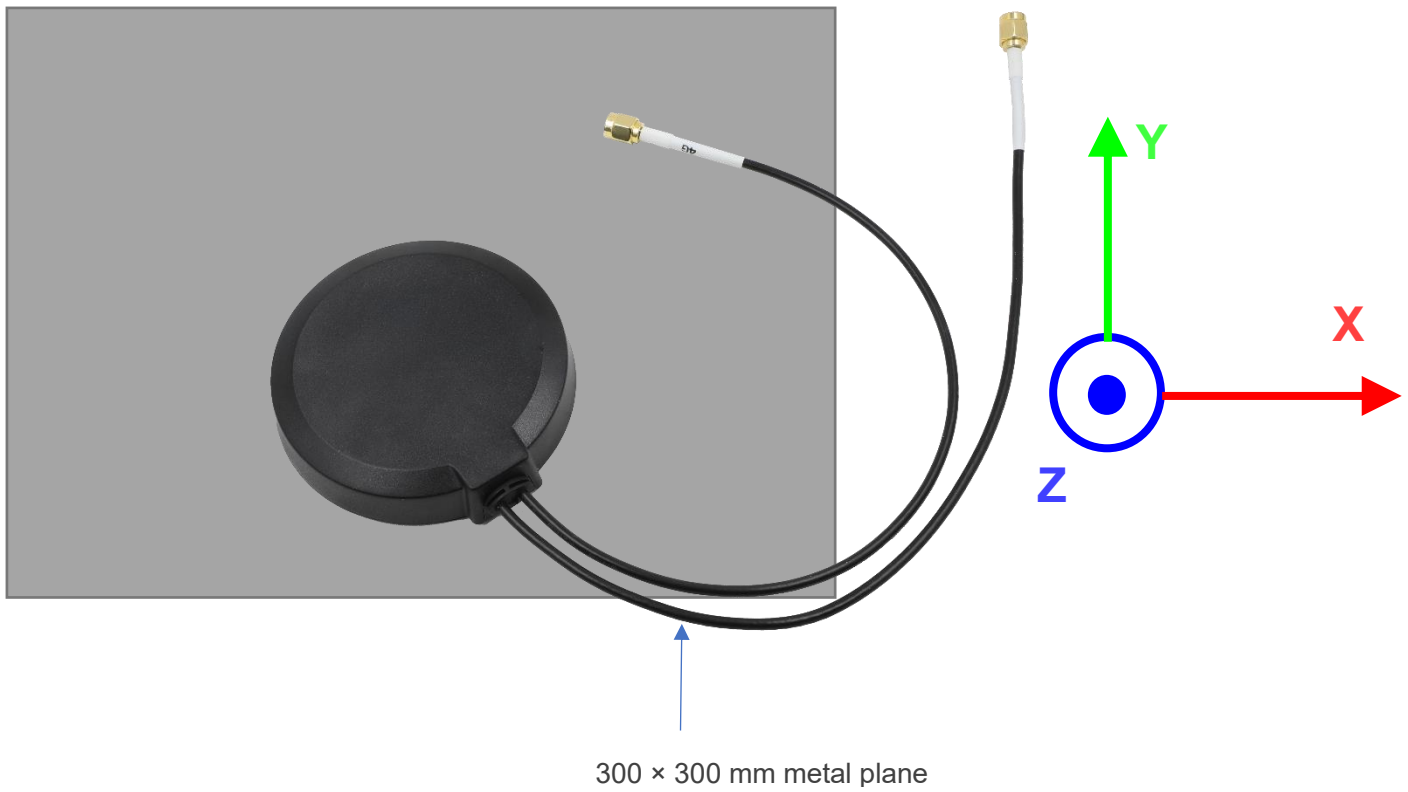
Axial Ratio (dB)

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

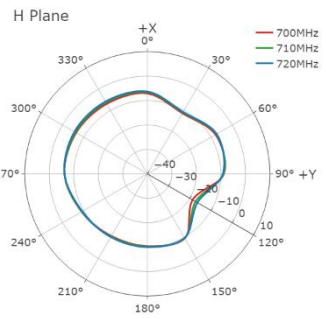
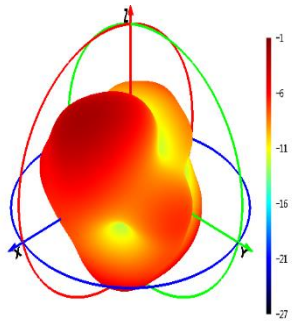
3.2.5.1. Test Condition: On 300×300 mm Metal Plane

- Test Chamber: GL-S-1

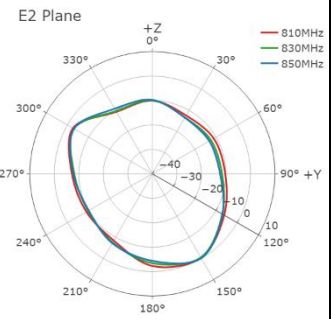
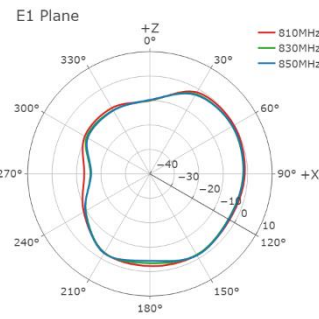
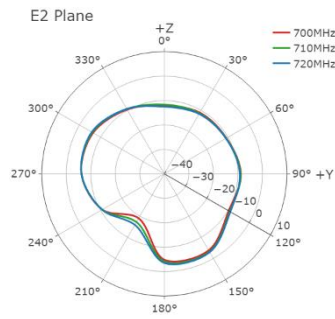
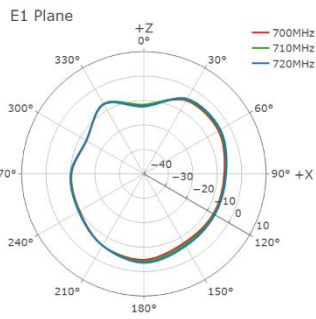
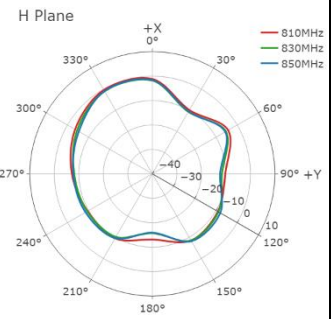
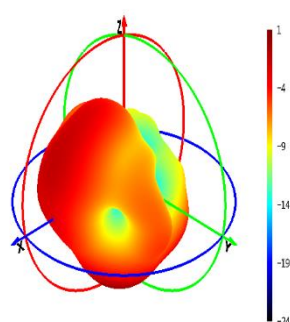


● **4G**

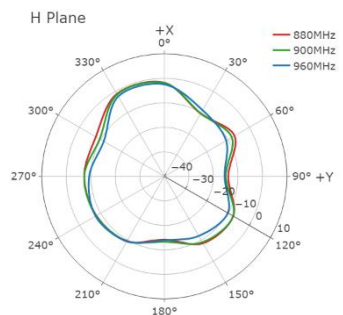
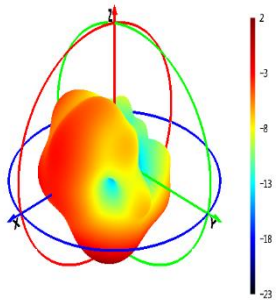
710 MHz



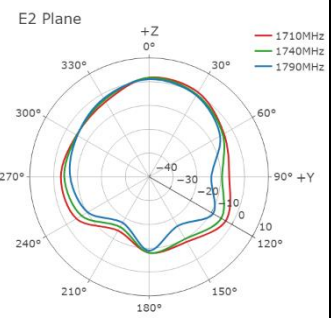
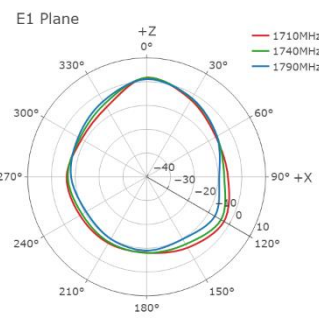
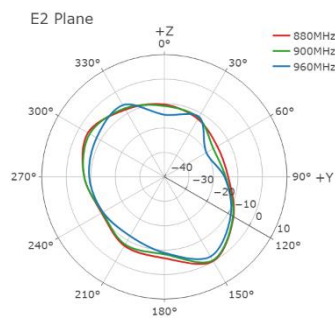
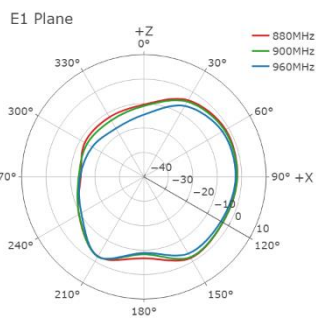
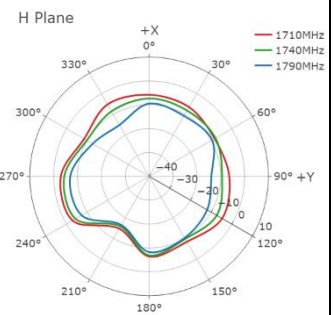
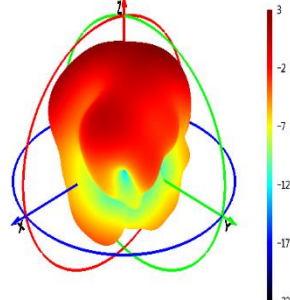
830 MHz



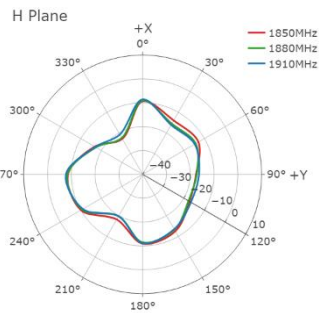
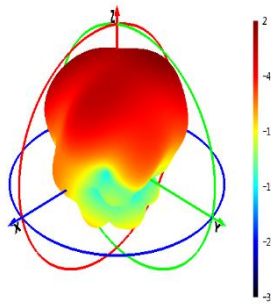
900 MHz



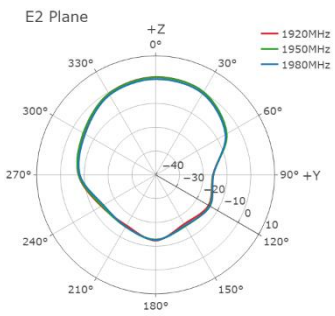
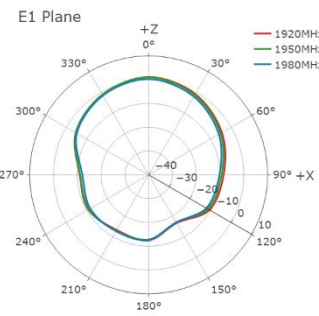
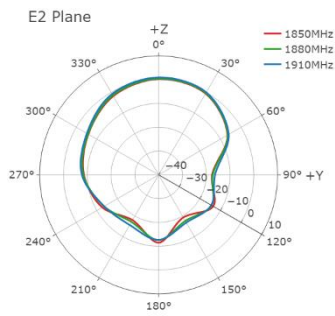
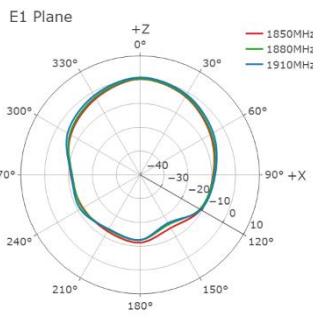
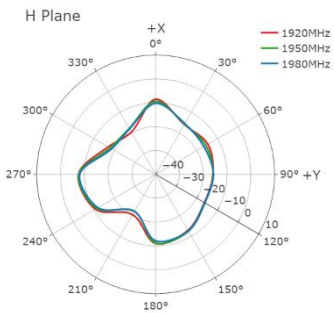
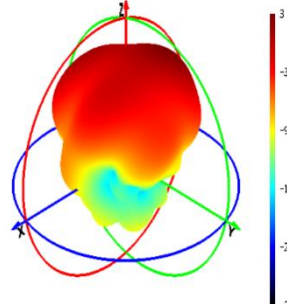
1740 MHz



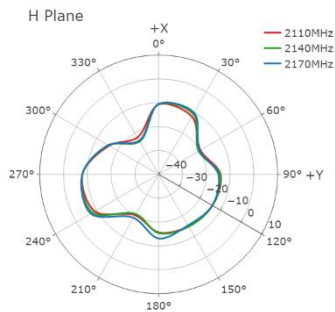
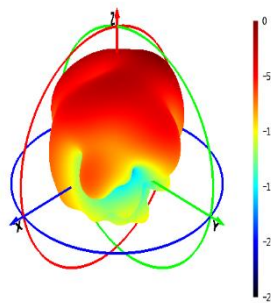
1880 MHz



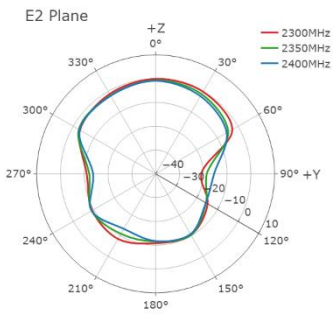
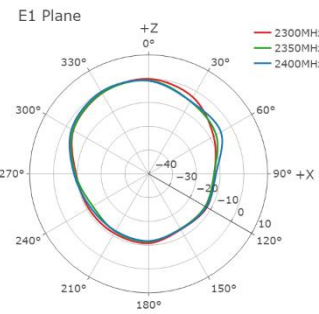
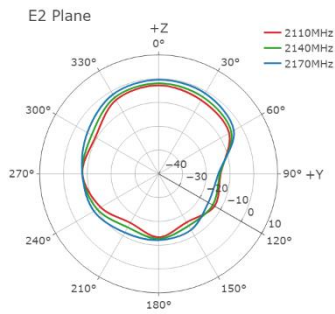
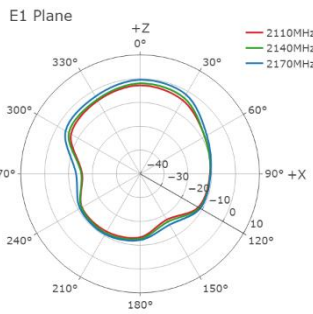
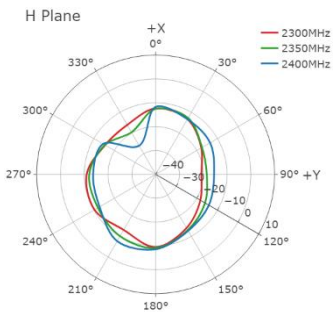
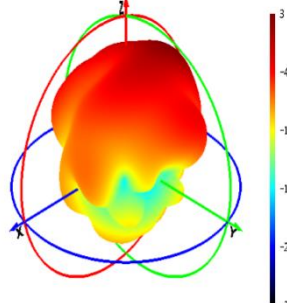
1950 MHz

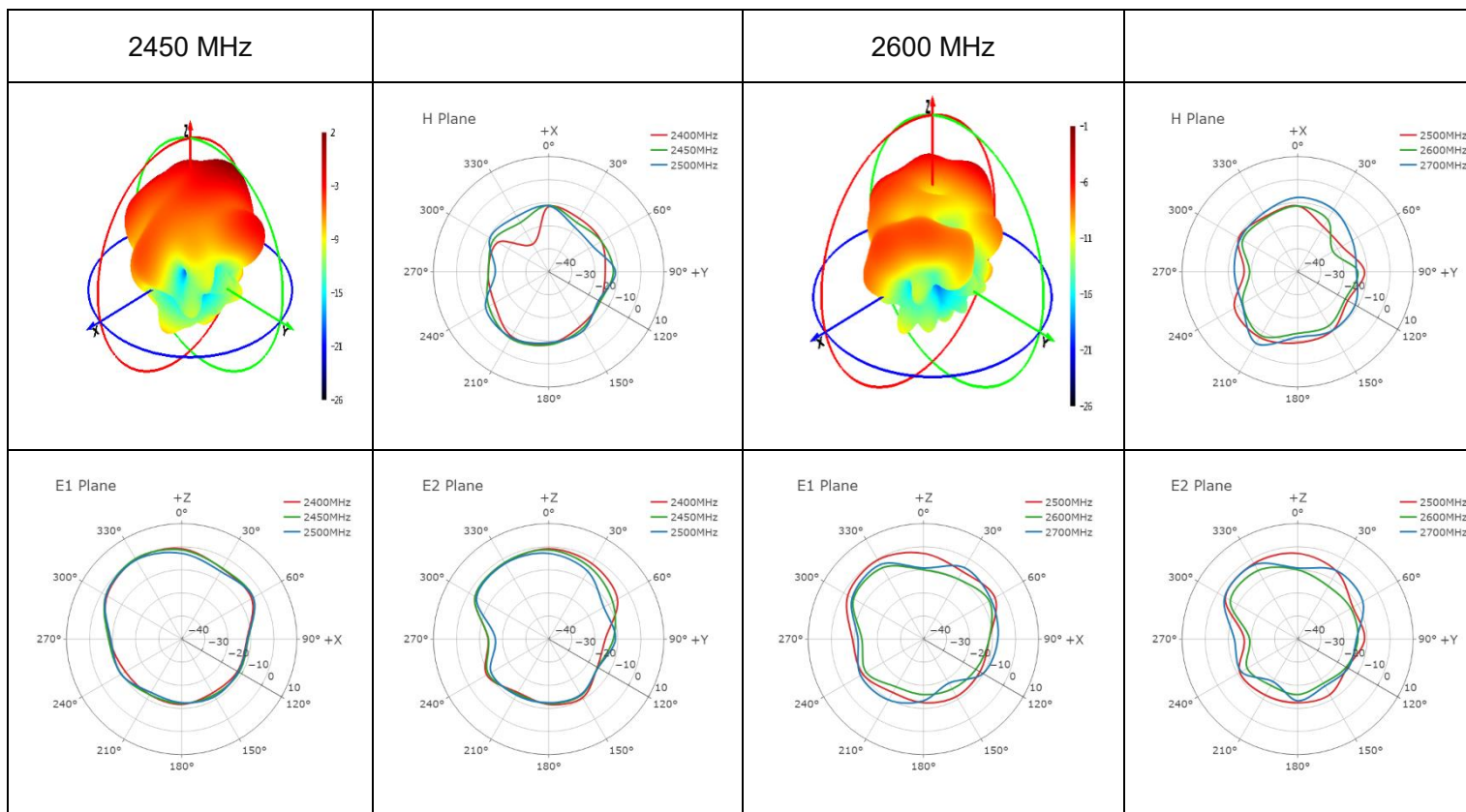


2140 MHz



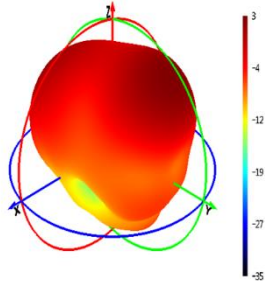
2350 MHz



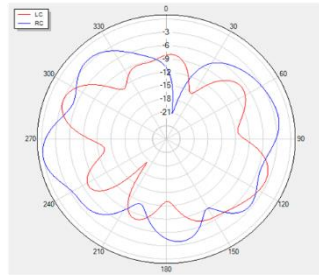


● **GNSS**

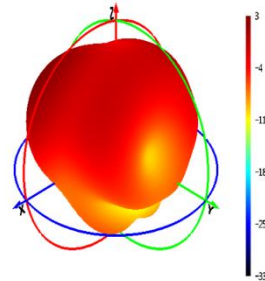
1561 MHz



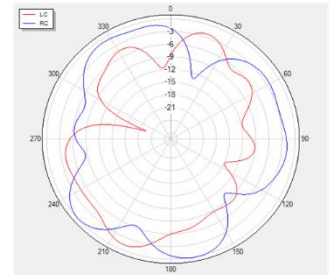
Theta=90 freq=1561MHz



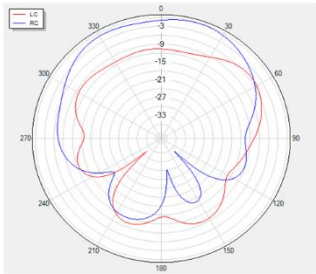
1575 MHz



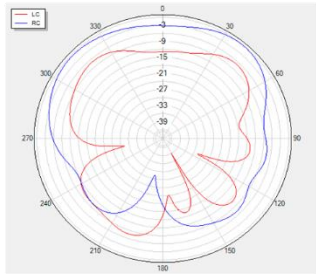
Theta=90 freq=1575MHz



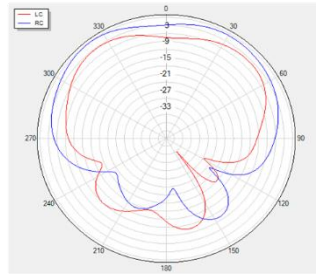
Phi=0 freq=1561MHz



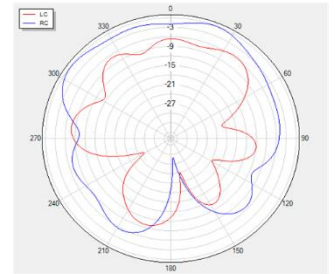
Phi=90 freq=1561MHz



Phi=0 freq=1575MHz

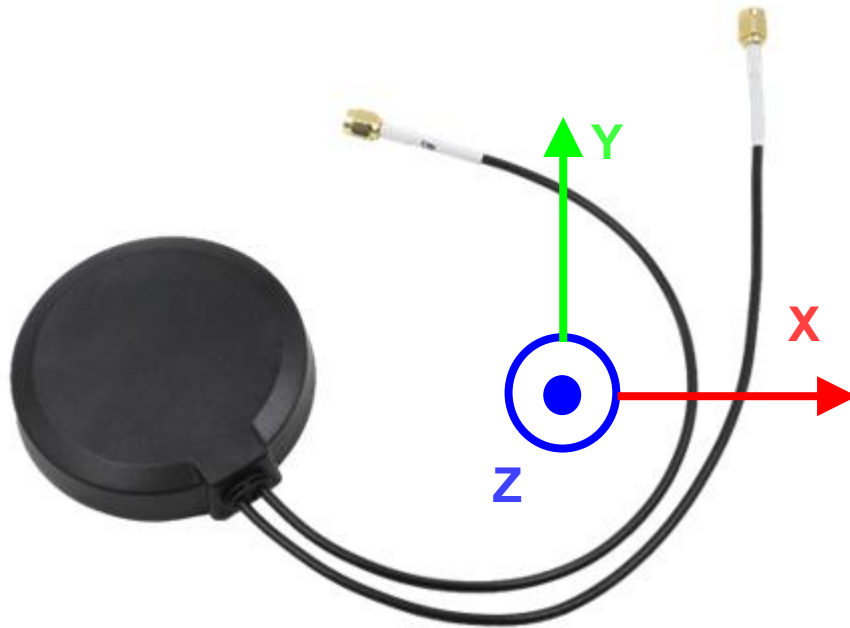


Phi=90 freq=1575MHz



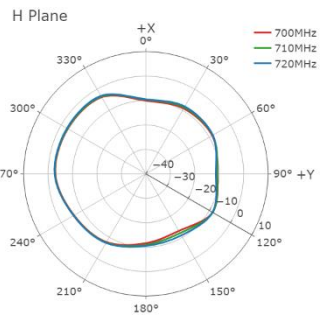
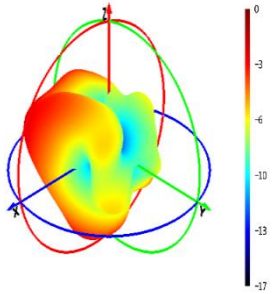
3.2.5.2. Test Condition: In Free Space

- Test Chamber: GL-S-1

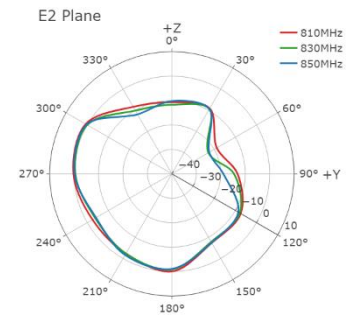
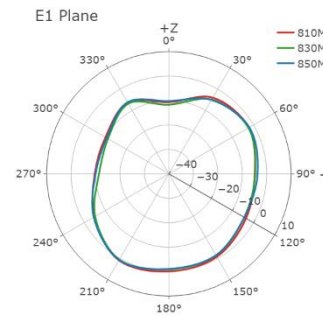
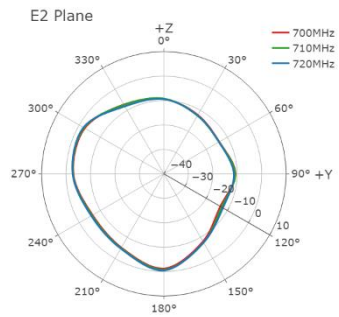
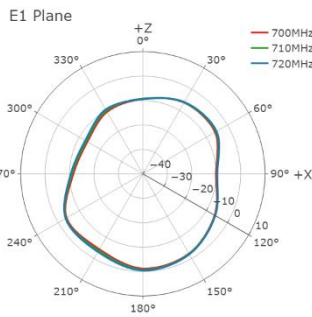
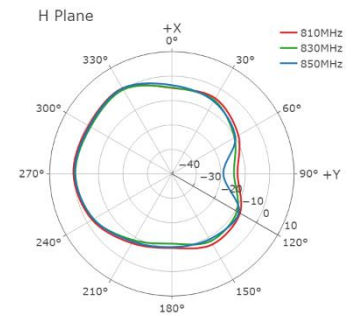
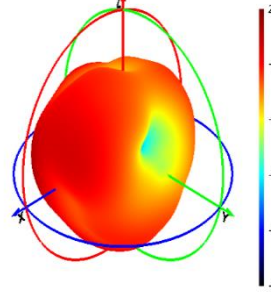


● **4G**

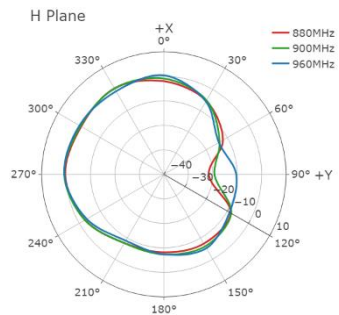
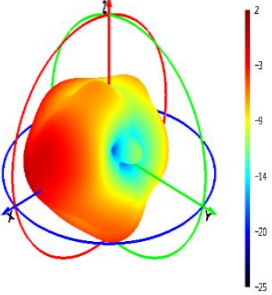
710 MHz



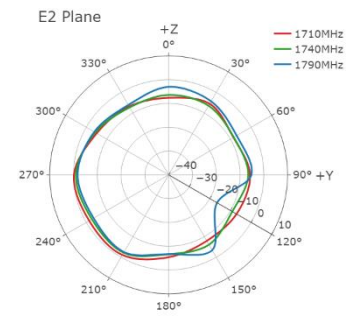
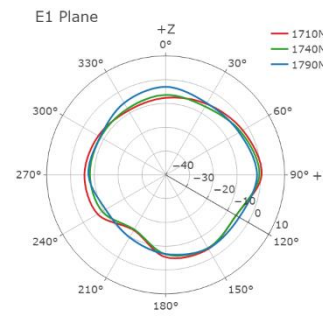
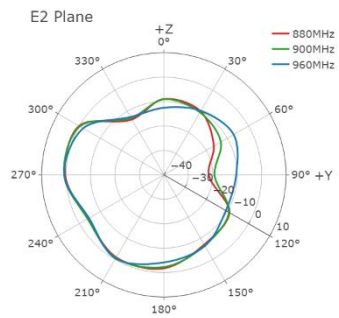
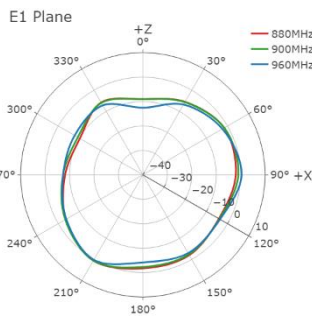
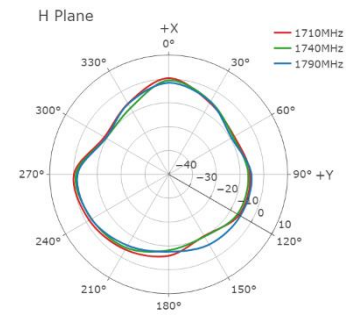
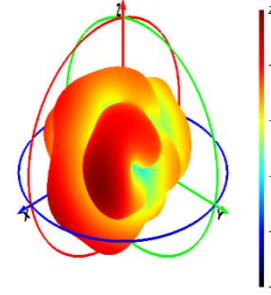
830 MHz

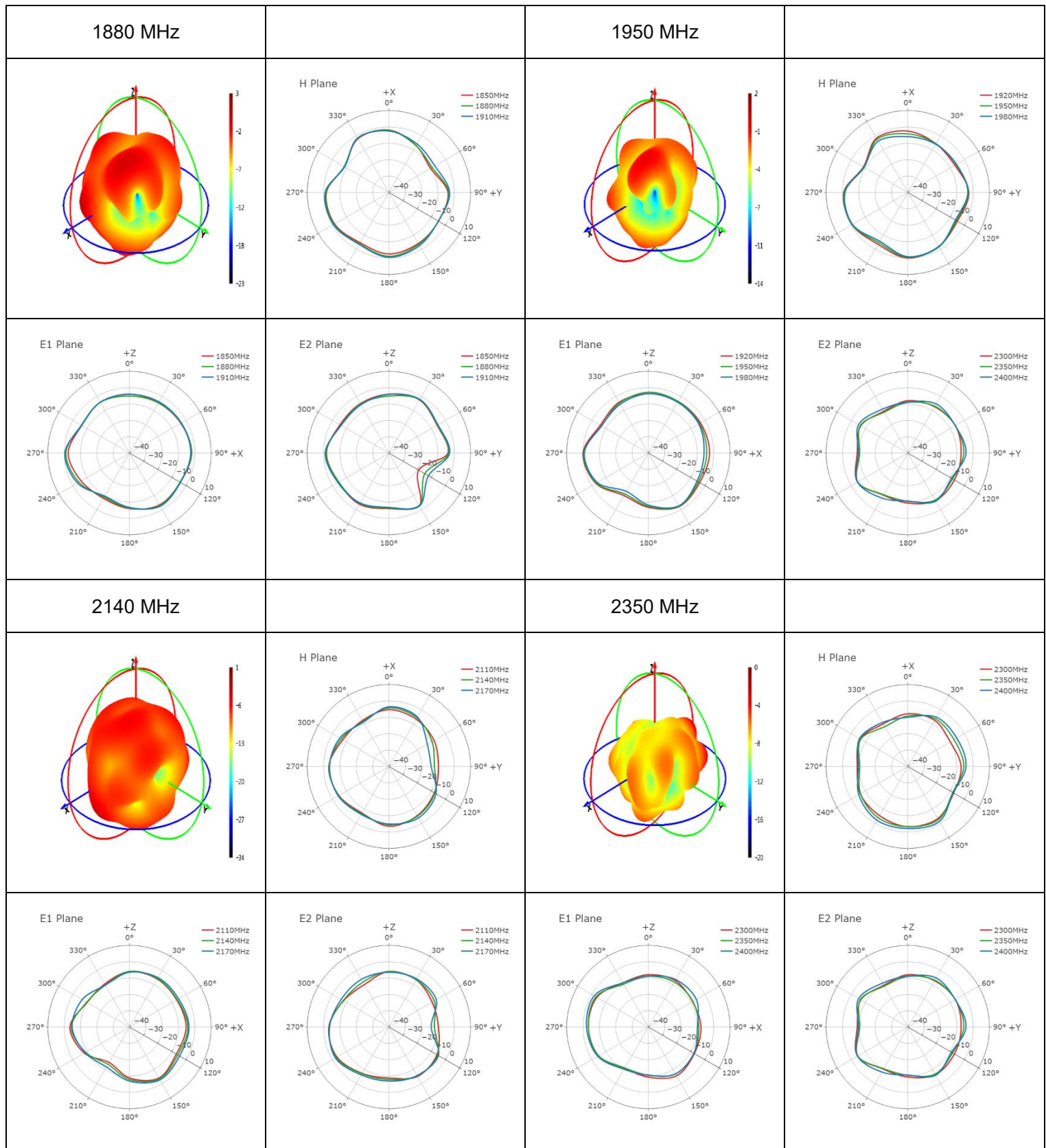


900 MHz

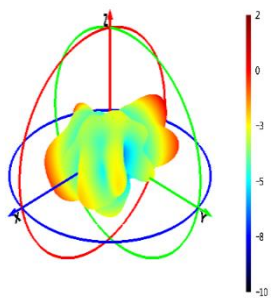


1740 MHz

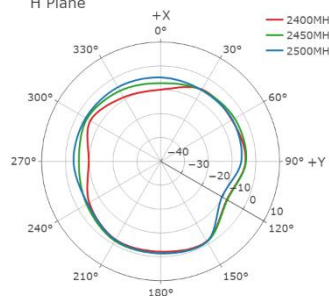




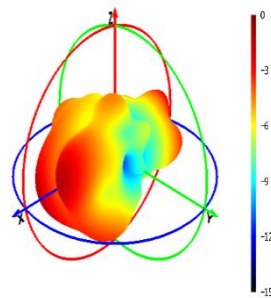
2450 MHz



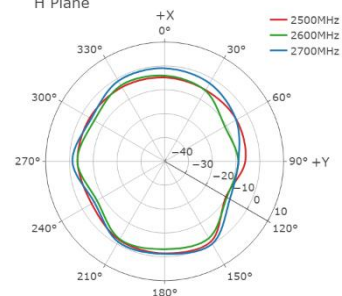
H Plane



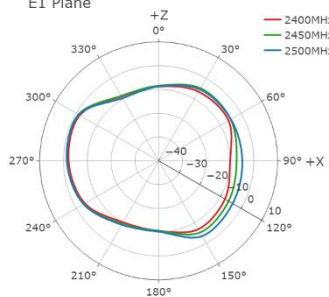
2600 MHz



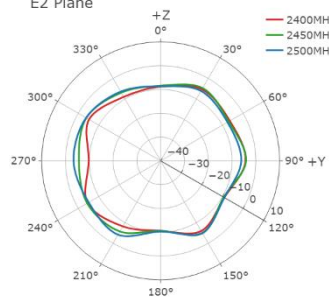
H Plane



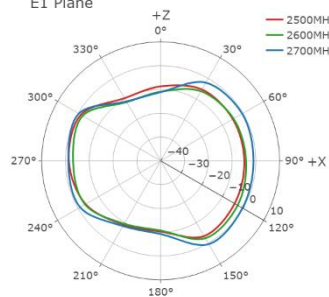
E1 Plane



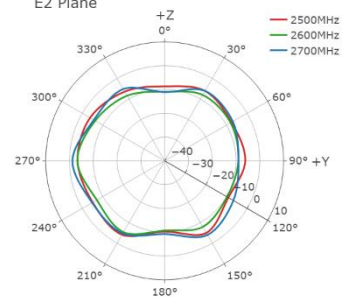
E2 Plane



E1 Plane

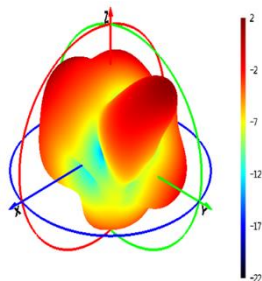


E2 Plane

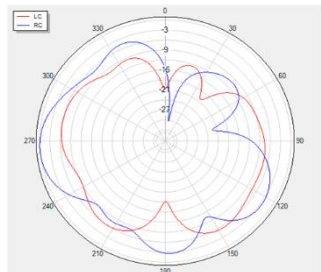


● **GNSS**

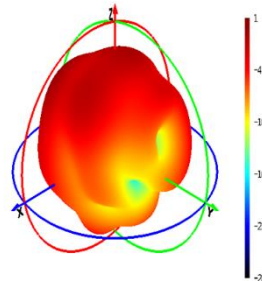
1561 MHz



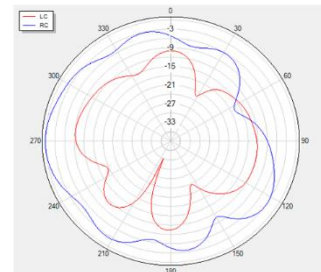
Theta=90 freq=1561MHz



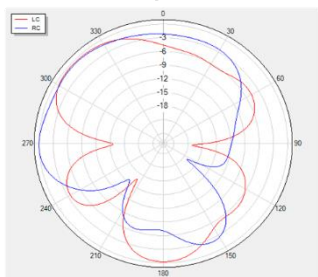
1575 MHz



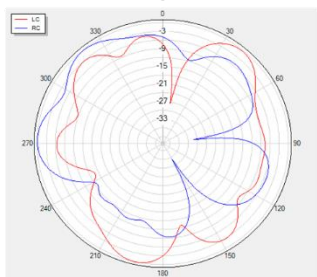
Theta=90 freq=1575MHz



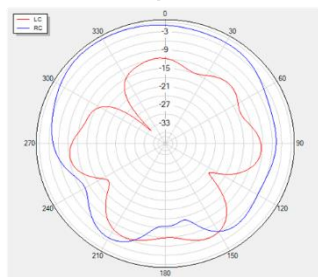
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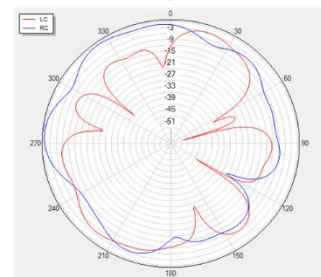
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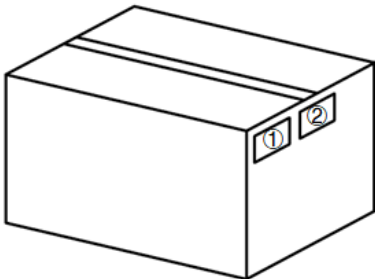
Phi=0 freq=1575MHz

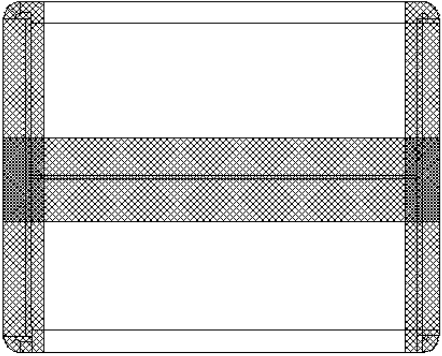


Phi=90 freq=1575MHz



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 “I” type sealing cartons
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Contact Us

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Email: info@quectel.com

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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.



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