



# Antenna Datasheet

**Product OC:** YEMN017AA

**Version:** 1.9

**Date:** 2025-09-05

**Status:** Released

**Product Name:** 5G & GNSS 5in1 Screw Mount Combo External Antenna

**Key Features:**

Optimized for 5G and 4G Networks

Φ 103.5 mm × 42.5 mm

4 × 4 5G/4G MIMO + GPS L1 & L5

Screw Mount-M20

SMA Male Connector

IP Rating: IP67 & IP69K

RoHS & REACH Compliant

Compatible with ECE-R118 cables under demand

# Overview

YEMN017AA is a 5G & GNSS 5-in-1 combo antenna measuring  $\Phi$  103.5 mm  $\times$  42.5 mm. This ultra-wide-band 5G & GNSS antenna provides broad coverage from 600–6,000 MHz whilst offering backward-compatibility to support 3G and 2G networks as well as LTE Cat-M and narrowband IoT (NB-IoT). The antenna is available with connection via 5 cable lengths from 300–5,000 mm, terminated with SMA Male connectors. Ideal for applications where the antenna is required to be discrete this low profile, screw mount omni-directional antenna, is easy to install with maximum durability assured thanks to its IP67 & IP69K and IK10 rated enclosure. It is compatible with Quectel's RM520x Series modules.

YEMN017AA has 2  $\times$  5G LMH antennas, 2  $\times$  5G MH/Wi-Fi antennas and 1  $\times$  GNSS L1 & L5 antenna. It allows high efficiency, stable signal transmission and reception for active GNSS from 1164–1189 MHz & 1565–1606 MHz, and 5G/4G bands from 600–960 MHz and 1400–6000 MHz. In the meantime, this product also offers high isolation between antennas to avoid self-interference. All in all, this unique product is designed to provide stable and high-speed data connection to 5G & GNSS applications. The YEMN017AA can be used in harsh environments thanks to its robust UV resistant (UL 746c f1) and flame resistant (UL 94 V-0) enclosure.

Typical Applications Include:

- Smart Utilities and Buildings
- Digital Signage
- Warehouses & Logistic systems
- Industrial factory automation, robotic machinery and other M2M systems
- Transport (Busses, Utility & Public Safety)
- Mining Vehicles & Machinery communications, telemetry and automation

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.

Below are the variants based on YEMN017AA.

- Combo variants overview

Combo variants overview							
OC	5G LMH	5G MH/Wi-Fi	GNSS L1 & L5 (28 dB)	GNSS L1 & L5 (17 dB)	Total	Mounting Type	Screw Nut
YEMN017AA	2	2	1	-	5-in-1	Screw	M20
YEMR517J1A	2	2	1	-	5-in-1	Pole	-
YEMW517J1A	2	2	1	-	5-in-1	Wall	-
YEMM517J1A	2	2	1	-	5-in-1	Magnet	-
YEMA517J1A	2	2	1	-	5-in-1	Adhesive	-
YEMN518J1A	2	2	1	-	5-in-1	Screw	M18
YEMN017BA	2	2		1	5-in-1	Screw	M20
YEMN400J1AH	2	2		-	4-in-1	Screw	M20
YEMN301J1AH	2	0	1	-	3-in-1	Screw	M20
YEMN303J1BH	2	0	--	1	3-in-1	Screw	M20
YEMN300J1CH	1	1	1	-	3-in-1	Screw	M20
YEMN302J1DH	1	1		1	3-in-1	Screw	M20
YEMN200J1AH	1	1	--	-	2-in-1	Screw	M20
YEMN203J1BH	2	0	-	-	2-in-1	Screw	M20
YEMN202J1CH	1	0	1	-	2-in-1	Screw	M20
YEMN201J1DH	1	0	-	1	2-in-1	Screw	M20
YEMN100J1AH	1	0	-	-	1	Screw	M20

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# 1 Specification

Test Condition: In Free Space & On 320 mm × 240 mm Metal Plane

## 1.1 Electrical

Electrical Specifications		
Frequency Range	LMHs	600–960 MHz, 1559–1609 MHz, 1400–6000 MHz
	MHs	1166–1187 MHz, 1400–6000 MHz
	GNSS	1164–1189 MHz, 1565–1606 MHz
Radiation Pattern	LMHs & MHs	Omni-directional
	GNSS	Directional
Polarization	LMHs & MHs	Linear
	GNSS	RHCP
Impedance		50 Ω
Isolation		≤ -6.9 dB

### 1.1.1 LMHs

SPEC	Band	B71	B12 /B13 /B28	B5 /B8 /B26	n74 /n75 /n76	L1	B1 /B2 /B3	B40	Wi-Fi 2G	B38 /B41	B42 /B48 /n77	n79	Wi-Fi 5G
	Freq. (MHz)	600–700	700–810	820–960	1420–1520	1559–1609	1700–2170	2300–2400	2400–2500	2500–2690	3300–4200	4400–5000	5150–5850
Max VSWR	FS	9.5	2.4	5.7	2.0	1.7	1.4	1.4	1.3	1.3	2.5	1.9	1.7
	MP	8.5	3.7	5.3	2.1	1.7	1.9	1.6	1.5	1.4	2.8	2.0	1.9
Max	FS	-1.8	-7.7	-3.1	-9.5	-11.7	-15.6	-15.6	-17.7	-17.7	-7.4	-10.2	-11.7

<b>Return Loss (dB)</b>	<b>MP</b>	-2.1	-4.8	-3.3	-9.0	-11.5	-10.2	-12.7	-14.0	-15.6	-6.5	-9.5	-10.2
<b>AVG Eff. (%)</b>	<b>FS</b>	20.9	37.2	28.8	55.2	58.4	69.8	73.9	73.3	66.6	60.4	55.2	46.7
	<b>MP</b>	14.0	39.0	34.7	50.0	50.1	64.7	60.4	64.9	57.4	48.0	48.2	44.2
<b>AVG AVG Gain (dB)</b>	<b>FS</b>	-7.1	-4.4	-5.6	-2.6	-2.3	-1.6	-1.3	-1.3	-1.8	-2.2	-2.6	-3.3
	<b>MP</b>	-9.0	-4.2	-4.7	-3.1	-3.0	-1.9	-2.2	-1.9	-2.4	-3.3	-3.2	-3.5
<b>Max Peak Gain (dBi)</b>	<b>FS</b>	-1.7	0.5	0.1	1.6	3.4	2.0	1.6	2.0	2.5	5.0	3.9	3.7
	<b>MP</b>	-2.5	2.7	2.3	4.6	3.9	5.9	4.8	5.5	5.5	6.2	5.3	4.6
<b>VSWR</b>	<b>FS</b>	≤ 9.2											
	<b>MP</b>	≤ 8.5											
<b>Return Loss</b>	<b>FS</b>	≤ -1.9 dB											
	<b>MP</b>	≤ -2.0 dB											
<b>Peak Gain</b>	<b>FS</b>	≤ 5.0 dBi											
	<b>MP</b>	≤ 6.2 dBi											

- LMHs: LMH antennas
- MHs: MH antennas
- FS: In Free Space
- MP: On 320 mm × 240 mm Metal Plane

### 1.1.2 MHs

Band	Band	B71	B12 /B13 /B28	B5 /B8 /B26	L5	n74 /n75 /n76	B1 /B2 /B3	B40	Wi-Fi 2G	B38 /B41	B42 /B48 /n77	n79	Wi-Fi 5G
		Freq. (MHz)	600–700	700–810	820–960	1166–1187	1420–1520	1700–2170	2300–2400	2400–2500	2500–2690	3300–4200	4400–5000
<b>Max VSWR</b>	<b>FS</b>	-	-	-	4.0	4.0	2.8	3.8	3.3	2.9	1.9	2.2	2.4
	<b>MP</b>	-	-	-	3.5	2.9	2.4	4.3	4.4	3.2	2.3	3.0	2.3
<b>Max Return Loss (dB)</b>	<b>FS</b>	-	-	-	-4.4	-4.5	-6.5	-4.7	-5.4	-6.2	-9.9	-8.3	-7.6
	<b>MP</b>	-	-	-	-5.1	-6.2	-7.6	-4.1	-4.0	-5.6	-8.3	-6.1	-8.1
<b>AVG Eff.</b>	<b>FS</b>	-	-	-	30	48.7	55.7	38.0	37.0	42.1	63.0	51.8	49.2

(%)	MP	-	-	-	30.5	39.7	60.0	36.2	34.4	39.8	64.4	45.9	53.1
AVG AVG Gain (dB)	FS	-	-	-	-5.3	-3.2	-2.6	-4.2	-4.4	-3.8	-2.0	-2.9	-3.1
	MP	-	-	-	-5.2	-4.1	-2.2	-4.4	-4.6	-4.0	-1.9	-3.4	-2.8
Max Peak Gain (dBi)	FS	-	-	-	-0.4	1.2	2.5	1.2	3.2	3.5	4.9	4.4	4.9
	MP	-	-	-	1.7	3.9	6.7	2.8	2.8	4.1	8.2	3.9	5.8
VSWR	FS	≤ 4.0											
	MP	≤ 4.4											
Return Loss	FS	≤ -4.5 dB											
	MP	≤ -4 dB											
Peak Gain	FS	≤ 4.9 dBi											
	MP	≤ 8.2 dBi											

- LMHs: LMH antennas
- MHs: MH antennas
- FS: In Free Space
- MP: On 320 mm × 240 mm Metal Plane

**1.1.3 GNSS**

Band	GPS L5 GALILEO E5a BDS B2a- B2I QZSS L5 IRNSS L5	GALILEO E5b BDS B2b	GPS L2 QZSS L2C	GLONASS G2	BDS B3	BDS B1I	GPS L1 GALILEO E1 BDS B1C QZSS L1	GLONASS G1
Frequency (MHz)	1176	1207	1227	1248	1268	1561	1575	1602
<b>VSWR</b>	1.61						1.52	1.49
<b>Return Loss (dB)</b>	-12.8						-13.6	-14
<b>Efficiency (%)</b>	47						42	40
<b>Peak Gain (dBi)</b>	-0.04						-1.49	-1.17

<b>LNA Electrical</b>	
<b>LNA Gain</b>	28 ±3 dB
<b>Noise Figure</b>	≤ 2.5 dB
<b>Output VSWR</b>	< 2.0
<b>Filter Out-of-Band Attenuation</b>	65 dB f0 ±100 MHz f0 (1176 MHz, 1588 MHz)
<b>Working Voltage</b>	DC 2–5 V
<b>Working Current</b>	< 20 mA
<b>Impedance</b>	50 Ω

## 1.2 Mechanical & Environment

Mechanical		
Antenna Size	Φ 103.5 mm × 42.5 mm	
Casing Material & Color	PC & Black	
Cable Type & Length	LMHs & MHs	RG405 Black & 300 mm
	GNSS	RG174 Black & 300 mm
Connector Type	SMA Male (The current state of the SMA connector is not waterproof. If a waterproof connector is required, it can be customized.)	
Weight	263 g Typical	
Mounting Type	Screw Mounting (M20)	
Environmental		
Operation Temperature	-40 °C to +85 °C	
Storage Temperature	-40 °C to +85 °C	
Ingress Protection (IP) Rating	IP67 (After Installation) IP69K (After Installation)	
Impact Protection (IK) Rating	IK10 (After Installation)	
RoHS & REACH Compliant	Yes	
Housing Flame Rating	UL 94 V-0	
Housing UV Resistant	UL 746c f1	

- LMHs: LMH antennas
- MHs: MH antennas
- FS: In Free Space
- MP: On 320 mm × 240 mm Metal Plane

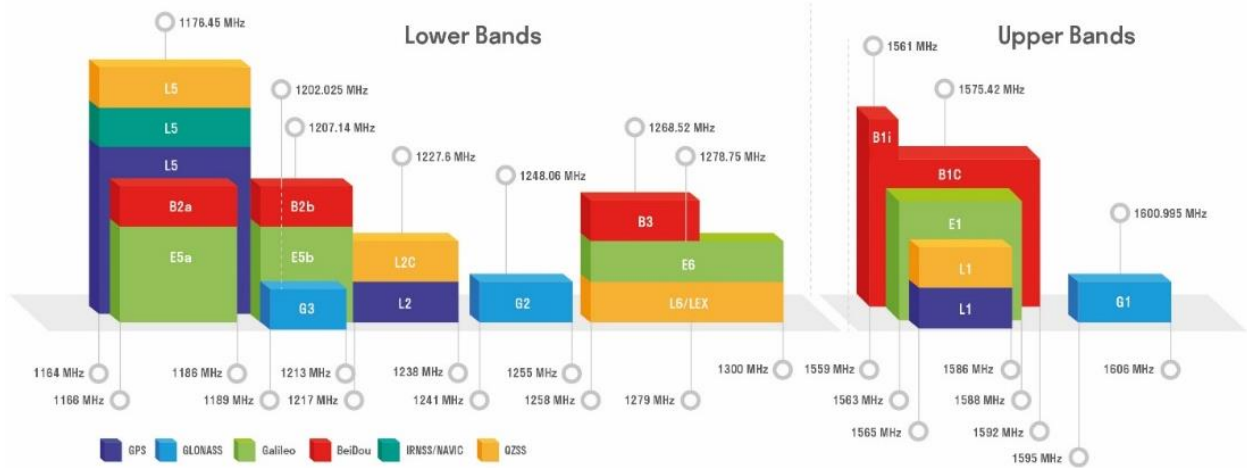
### 1.3 Supported Bands

5G NR / LTE / LTE-Advanced / WCDMA / HSPA / HSPA+ / GPRS / GSM / NB-IoT					
Band	Frequency (MHz)	Uplink (MHz)	Downlink (MHz)	LMHs	MHs
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	√	-

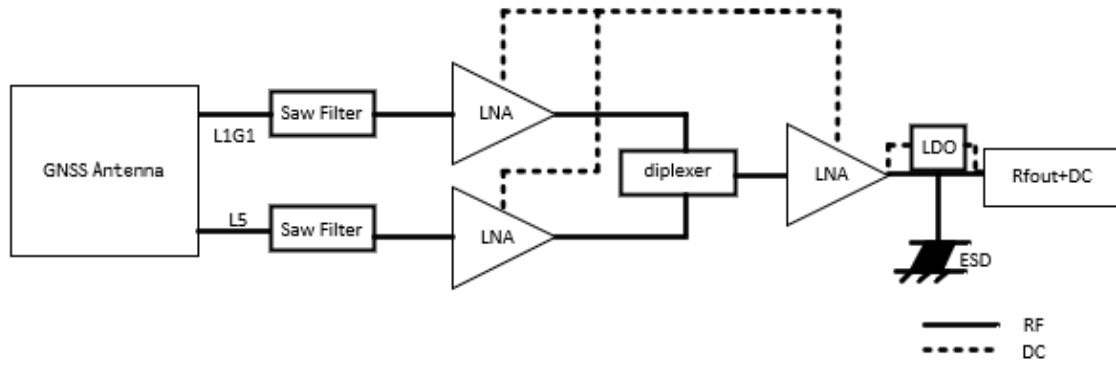
5G NR / LTE / LTE-Advanced / WCDMA / HSPA / HSPA+ / GPRS / GSM / NB-IoT					
Band	Frequency (MHz)	Uplink (MHz)	Downlink (MHz)	LMHs	MHs
28	700	703–748	758–803	√	-
31	450	452.5–457.5	462.5–467.5	-	-
34	2100	2010–2025		√	√
38	2600	2570–2620		√	√
39	1900	1880–1920		√	√
40	2300	2300–2400		√	√
41	2500	2496–2690		√	√
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		√	√
L5	1175	1166-1187		-	√
L1	1575	1559-1609		√	-

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

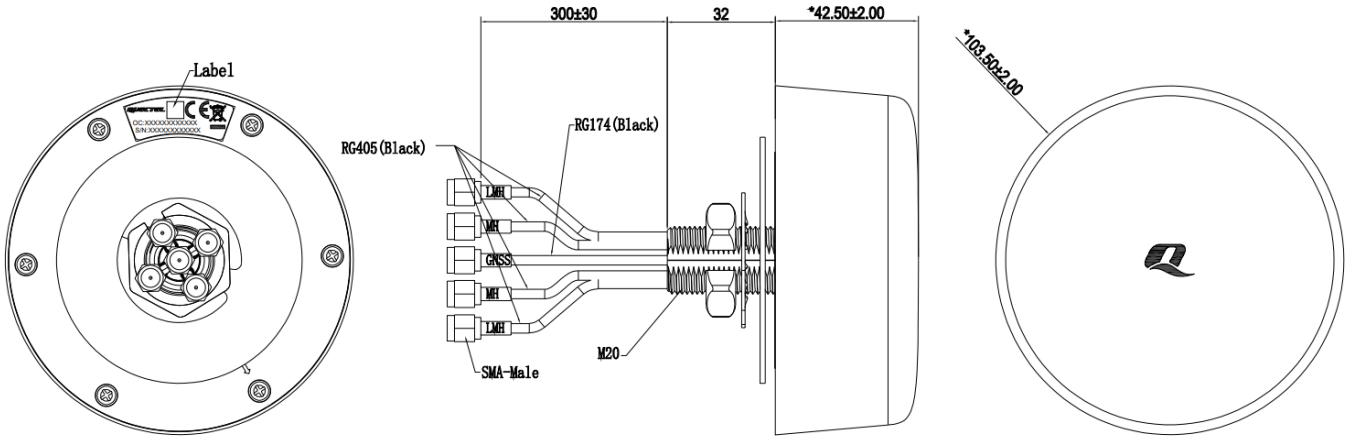
**GNSS Bands and Constellations**



### 1.4 Block Diagram (Active Antenna)



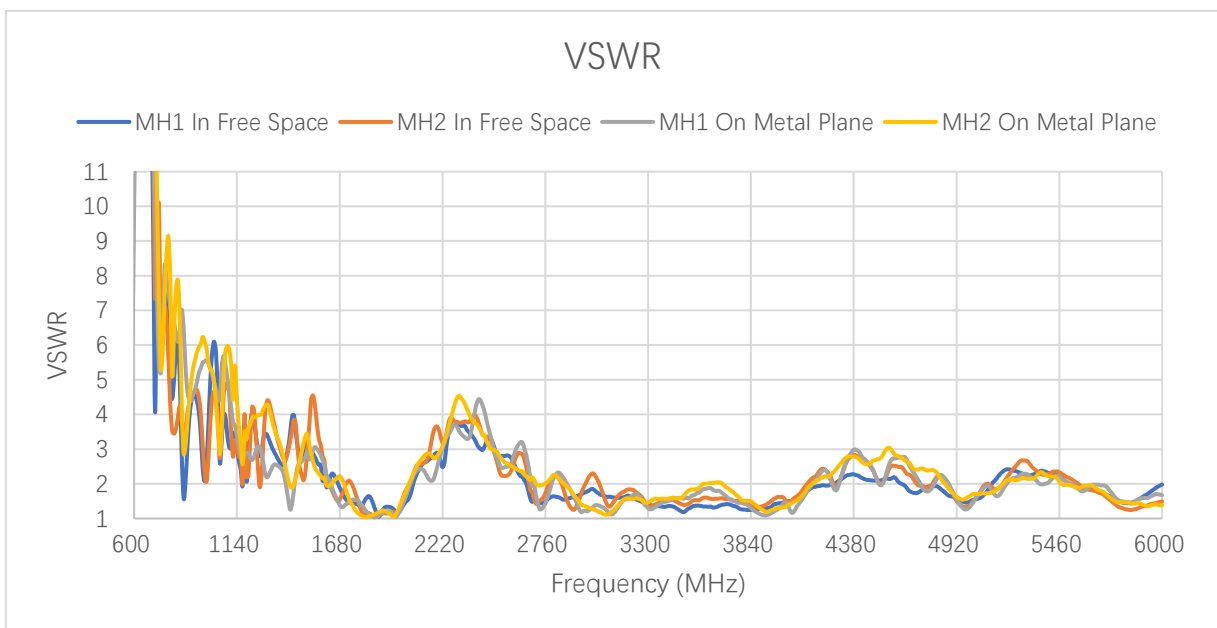
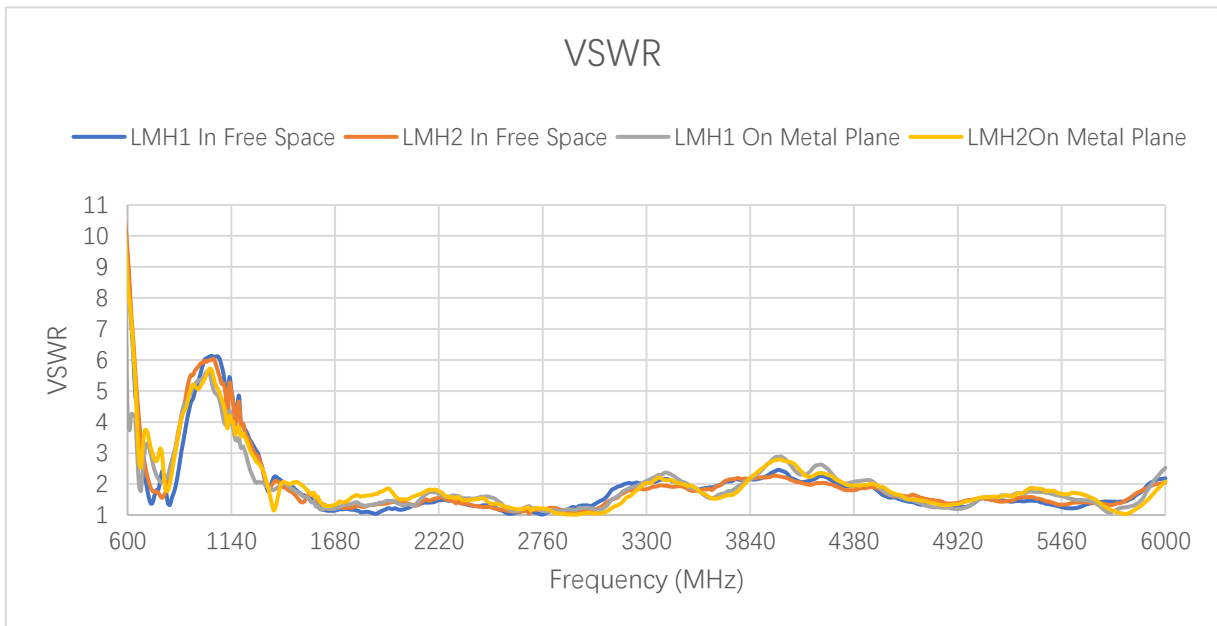
# 2 Drawing



# 3 Detailed Performance

## 3.1 S-Parameter Test

### 3.1.1 VSWR



**VSWR – LMHs**

Frequency (MHz)		600	630	710	830	900	960	1440	1710	1740	1880
LMH1	FS	9.2	6.2	1.6	1.5	3.7	5.2	2.0	1.2	1.2	1.1
	MP	4.2	4.2	3.2	2.7	4.6	5.3	1.9	1.3	1.3	1.3
LMH2	FS	9.5	6.6	2.1	2.6	4.7	5.7	1.8	1.2	1.2	1.3
	MP	8.5	6.3	3.5	2.4	4.4	5.1	2.0	1.4	1.4	1.7
Frequency (MHz)		1950	2140	2350	2450	2600	3600	4700	5000	5500	6000
LMH1	FS	1.2	1.4	1.4	1.3	1.0	1.2	1.4	1.4	1.2	2.2
	MP	1.5	1.6	1.5	1.6	1.1	1.3	1.4	1.4	1.5	2.5
LMH2	FS	1.4	1.5	1.4	1.2	1.1	1.0	1.6	1.5	1.4	2.0
	MP	1.8	1.7	1.5	1.5	1.2	1.2	1.5	1.5	1.7	2.1

**VSWR – MHs**

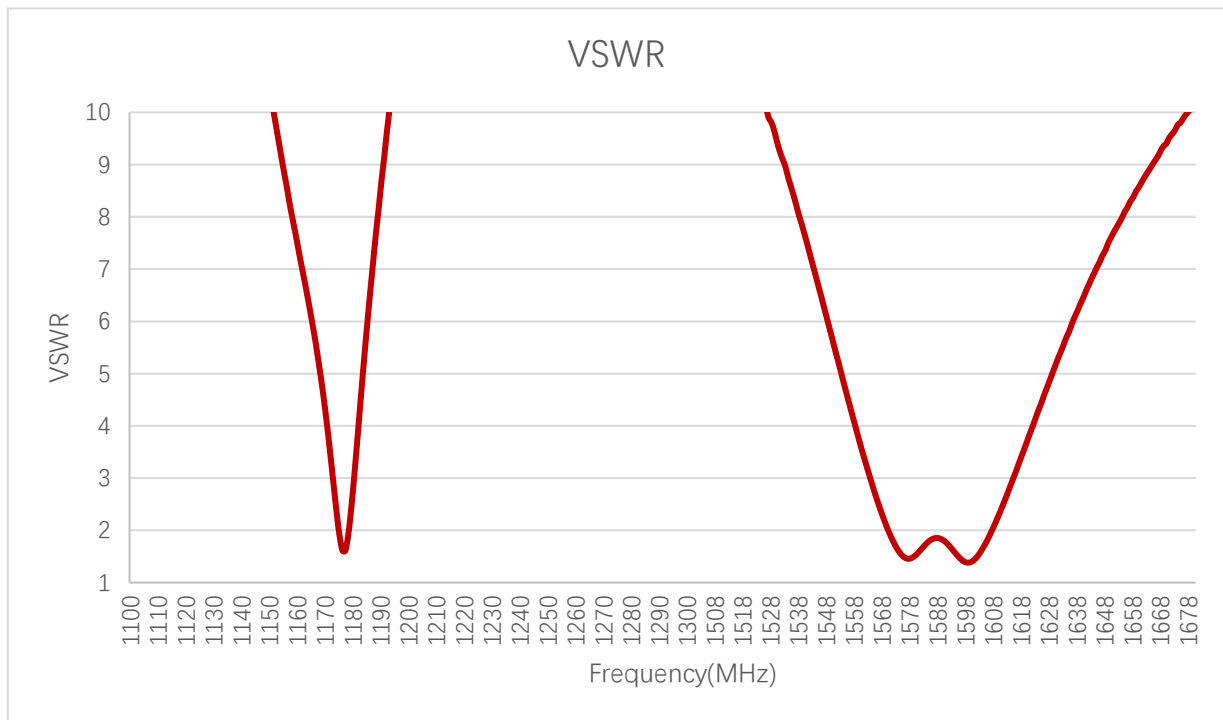
Frequency (MHz)		600	630	710	830	900	960	1440	1710	1740	1880
MH1	FS	-	-	-	-	-	-	4.0	1.6	1.4	1.1
	MP	-	-	-	-	-	-	1.9	1.4	1.5	1.1
MH2	FS	-	-	-	-	-	-	3.8	2.0	2.0	1.1
	MP	-	-	-	-	-	-	2.0	1.9	1.4	1.2
Frequency (MHz)		1950	2140	2350	2450	2600	3600	4700	5000	5500	6000
MH1	FS	1.3	2.7	3.5	3.2	2.5	1.4	1.7	1.5	2.1	2.0
	MP	1.2	2.2	3.3	3.9	2.9	1.9	2.3	1.4	2.1	1.7
MH2	FS	1.2	2.7	3.8	3.3	2.7	1.6	2.1	1.5	2.2	1.5
	MP	1.1	2.9	4.1	3.3	2.5	2.0	2.4	1.7	2.0	1.4

**VSWR – LMHs**

Frequency (MHz)		1166	1170	1180	1187	1559	1570	1580	1590	1600	1609
LMH1	FS	-	-	-	-	1.5	1.4	1.4	1.3	1.2	1.2
	MP	-	-	-	-	1.4	1.4	1.3	1.3	1.2	1.2
LMH2	FS	-	-	-	-	1.7	1.6	1.6	1.5	1.4	1.4
	MP	-	-	-	-	1.7	1.7	1.6	1.6	1.4	1.4

**VSWR – MHzs**

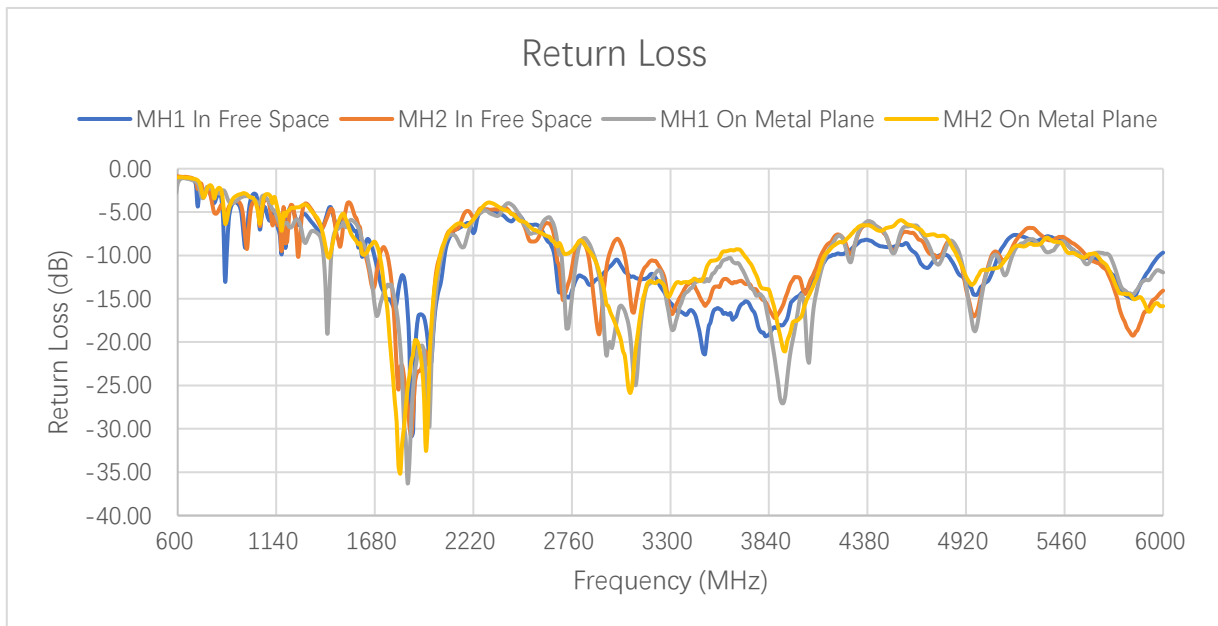
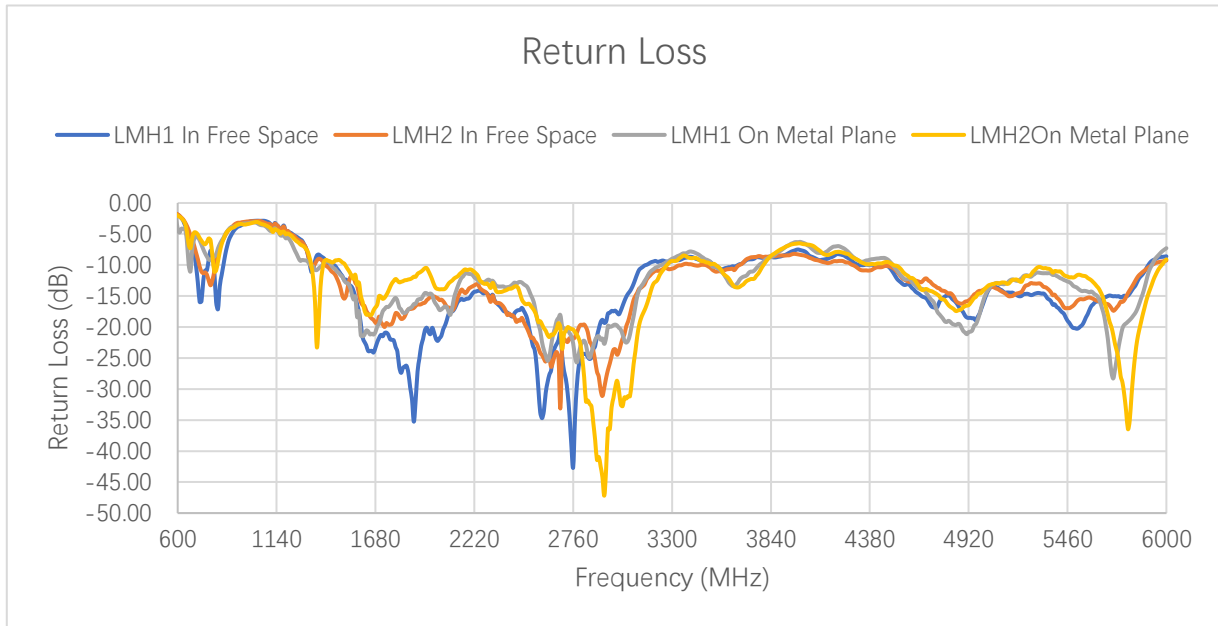
Frequency (MHz)		1166	1170	1180	1187	1559	1570	1580	1590	1600	1609
MH1	FS	2.0	2.0	3.5	2.5	-	-	-	-	-	-
	MP	2.5	2.5	3.0	3.0	-	-	-	-	-	-
MH2	FS	2.0	2.0	4.0	3.0	-	-	-	-	-	-
	MP	2.5	2.5	3.5	3.5	-	-	-	-	-	-



**VSWR – GNSS**

Frequency (MHz)	1176	1207	1227	1248	1268	1561	1575	1602
VSWR	1.61						1.52	1.49

**3.1.2 Return Loss**



**Return Loss (dB) – LMHs**

Frequency (MHz)		600	630	710	830	900	960	1440	1710	1740	1880
LMH1	FS	-1.9	-2.8	-12.8	-13.4	-4.8	-3.4	-9.8	-21.3	-20.9	-31.7
	MP	-4.2	-4.2	-5.6	-6.6	-3.9	-3.3	-10.1	-18.5	-16.8	-16.7
LMH2	FS	-1.8	-2.6	-9.0	-6.9	-3.8	-3.1	-11.0	-19.2	-19.4	-17.0
	MP	-2.0	-2.8	-5.1	-7.9	-4.0	-3.5	-9.6	-15.1	-14.8	-12.1
Frequency (MHz)		1950	2140	2350	2450	2600	3600	4700	5000	5500	6000
LMH1	FS	-20.5	-15.7	-16.4	-17.4	-33.5	-21.1	-15.9	-16.2	-20.2	-8.6
	MP	-14.5	-12.7	-13.5	-13.1	-23.7	-18.1	-14.9	-15.7	-13.5	-7.3
LMH2	FS	-16.1	-14.5	-16.1	-19.2	-25.1	-33.1	-12.5	-14.0	-16.3	-9.3
	MP	-10.5	-11.5	-14.4	-13.4	-20.2	-20.0	-14.0	-14.1	-11.9	-9.1

**Return Loss (dB) – MHs**

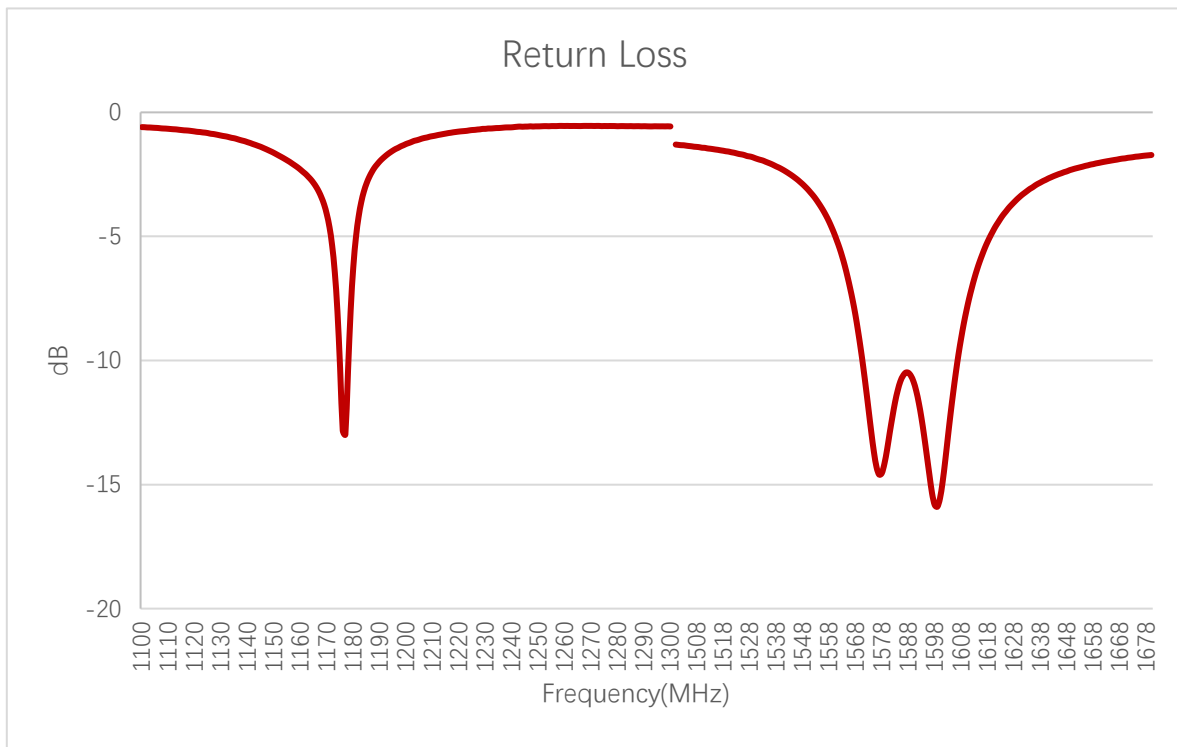
Frequency (MHz)		600	630	710	830	900	960	1440	1710	1740	1880
MH1	FS	-	-	-	-	-	-	-4.4	-12.7	-15.6	-26.4
	MP	-	-	-	-	-	-	-10.2	-15.6	-14.0	-26.4
MH2	FS	-	-	-	-	-	-	-4.7	-9.5	-9.5	-26.4
	MP	-	-	-	-	-	-	-9.5	-10.2	-15.6	-20.8
Frequency (MHz)		1950	2140	2350	2450	2600	3600	4700	5000	5500	6000
MH1	FS	-17.7	-6.8	-5.1	-5.6	-7.4	-15.6	-11.7	-14.0	-9.0	-9.5
	MP	-20.8	-8.5	-5.4	-4.6	-6.2	-10.2	-8.1	-15.6	-9.0	-11.7
MH2	FS	-20.8	-6.8	-4.7	-5.4	-6.8	-12.7	-9.0	-14.0	-8.5	-14.0
	MP	-26.4	-6.2	-4.3	-5.4	-7.4	-9.5	-7.7	-11.7	-9.5	-15.6

**Return Loss (dB) – LMHs**

Frequency (MHz)		1166	1170	1180	1187	1559	1570	1580	1590	1600	1609
LMH1	FS	-	-	-	-	-14.0	-15.0	-16.5	-17.5	-19.5	-21.5
	MP	-	-	-	-	-15.5	-15.1	-18.4	-17.5	-21.3	-21.5
LMH2	FS	-	-	-	-	-12.0	-13.0	-13.5	-14.6	-16.0	-16.4
	MP	-	-	-	-	-12.2	-11.5	-13.2	-12.7	-15.0	-16.0

**Return Loss (dB) – MHS**

Frequency (MHz)		1166	1170	1180	1187	1559	1570	1580	1590	1600	1609
MH1	FS	-9.4	-9.8	-5.3	-8.2	-	-	-	-	-	-
	MP	-6.7	-6.9	-6.4	-6.3	-	-	-	-	-	-
MH2	FS	-8.7	-9.5	-4.4	-7.4	-	-	-	-	-	-
	MP	-6.7	-7.2	-5.1	-5.3	-	-	-	-	-	-



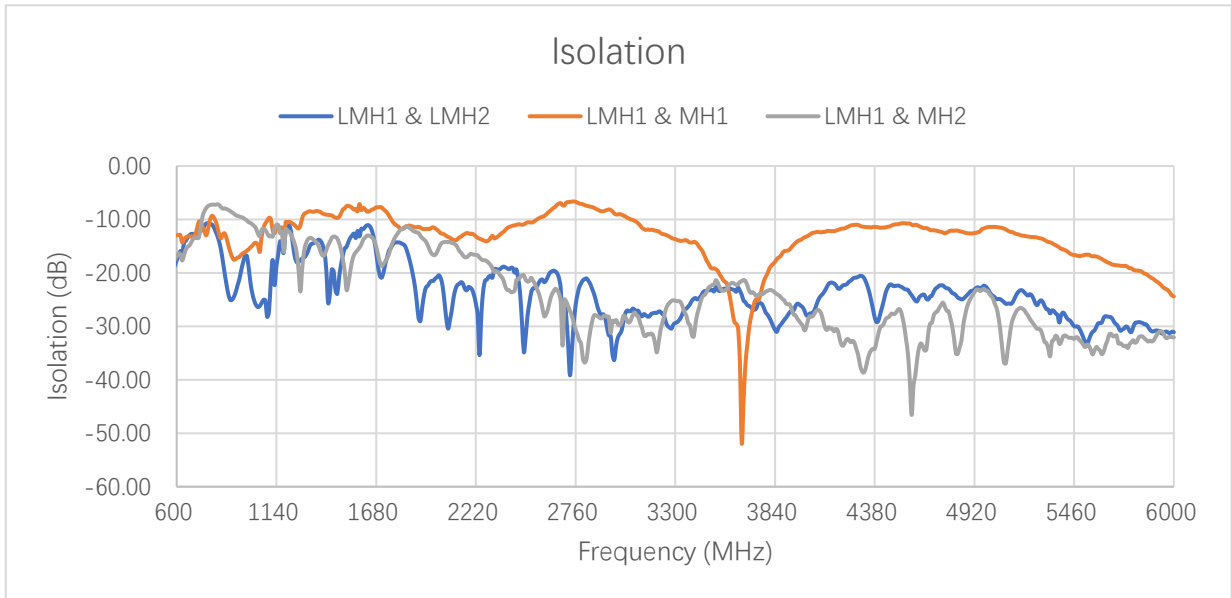
**Return Loss (dB) – GNSS**

Frequency (MHz)	1176	1207	1227	1248	1268	1561	1575	1602
Return Loss (dB)	-12.8	-	-	-	-	-	-13.6	-14

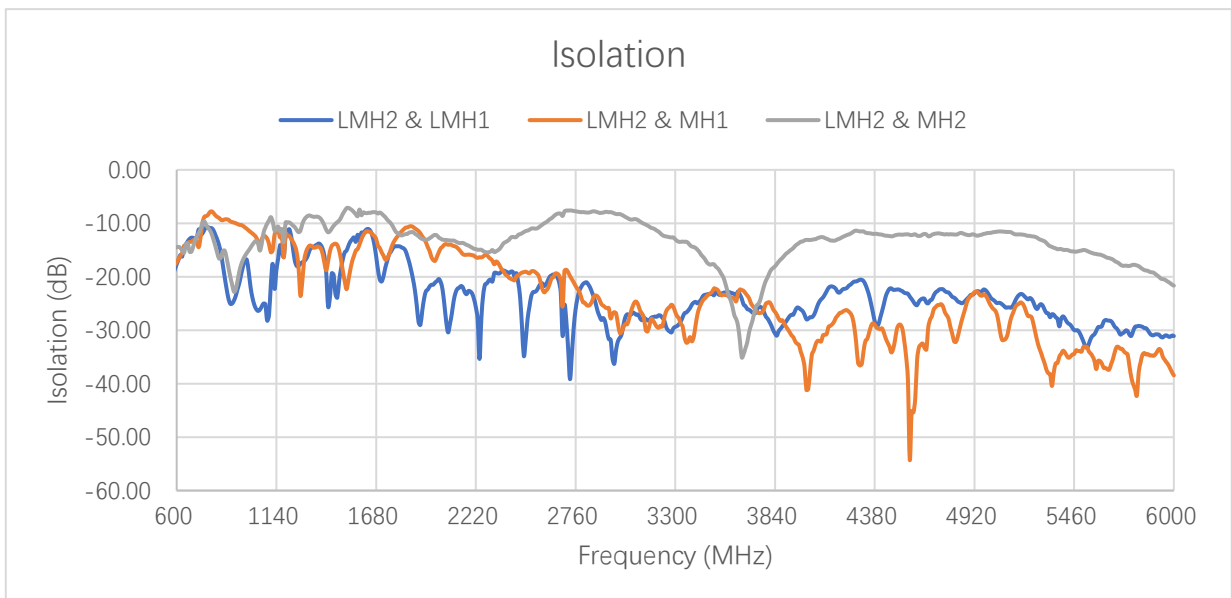
**3.1.3 Isolation**

**3.1.3.1 Test Status: In Free Space**

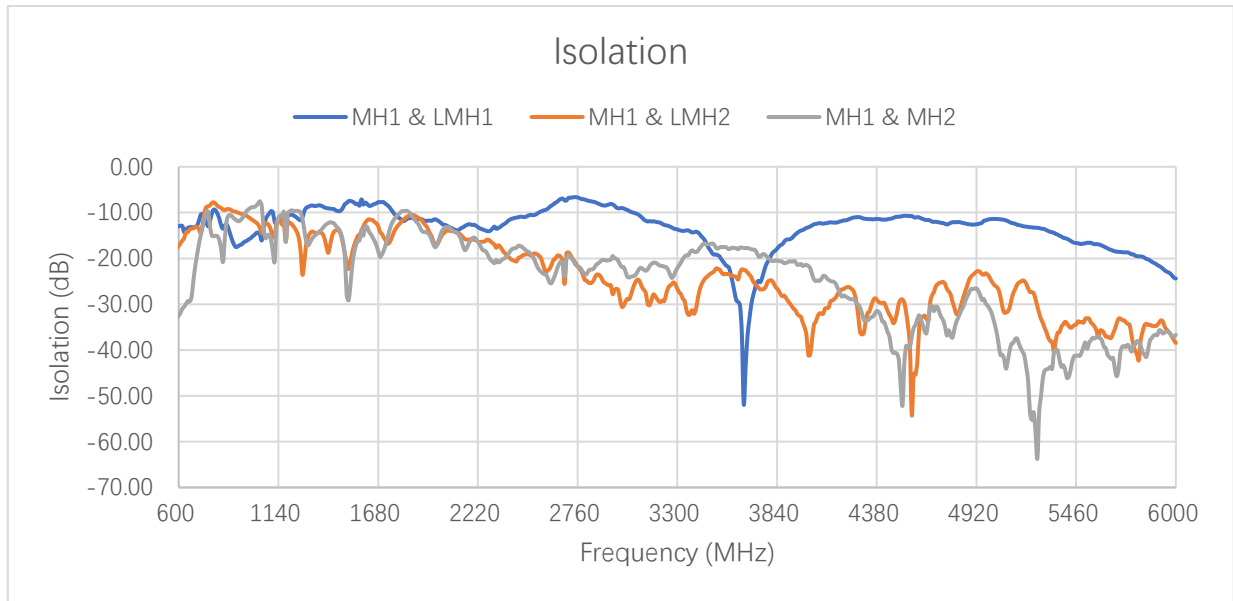
**3.1.3.1.1 LMH1**



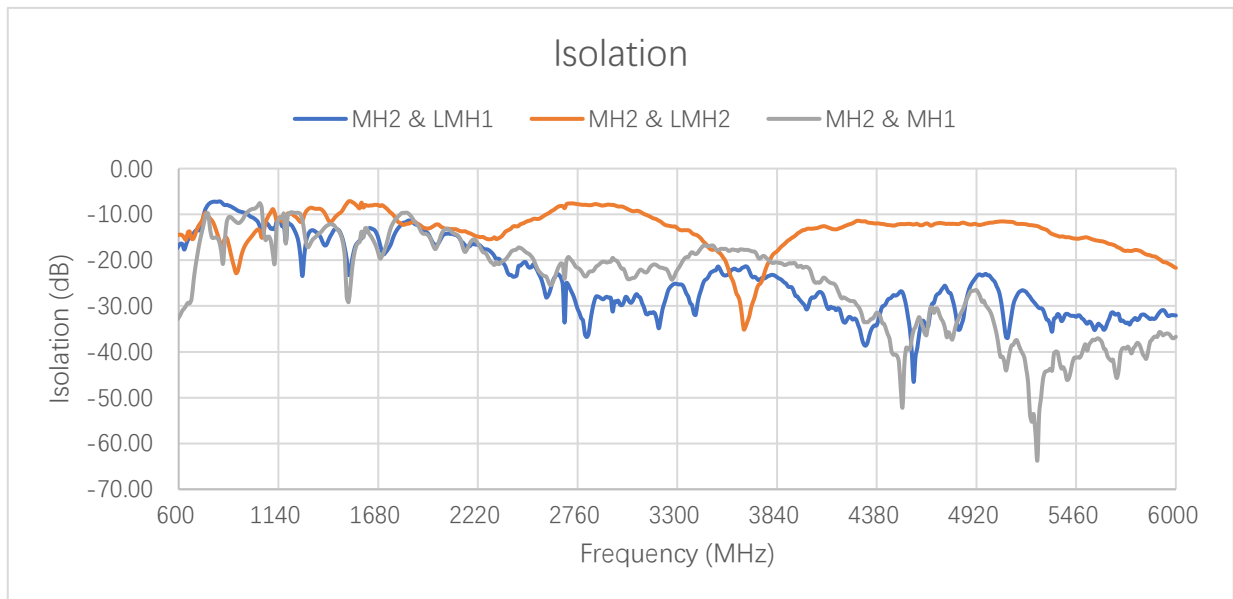
**3.1.3.1.2 LMH2**



**3.1.3.1.3 MH1**

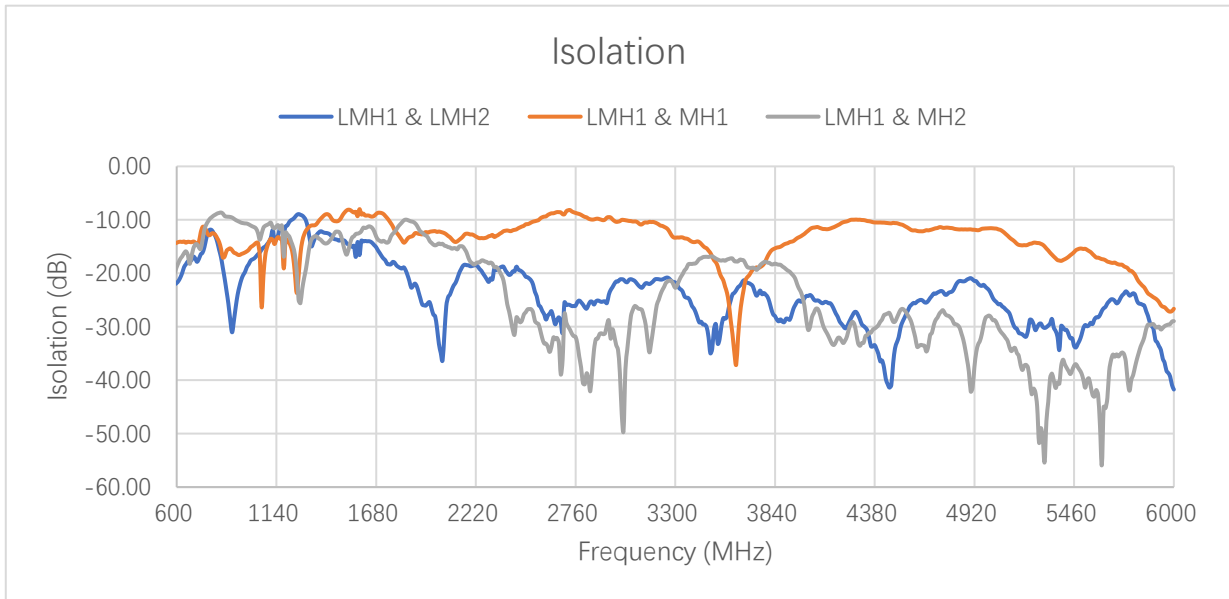


**3.1.3.1.4 MH2**

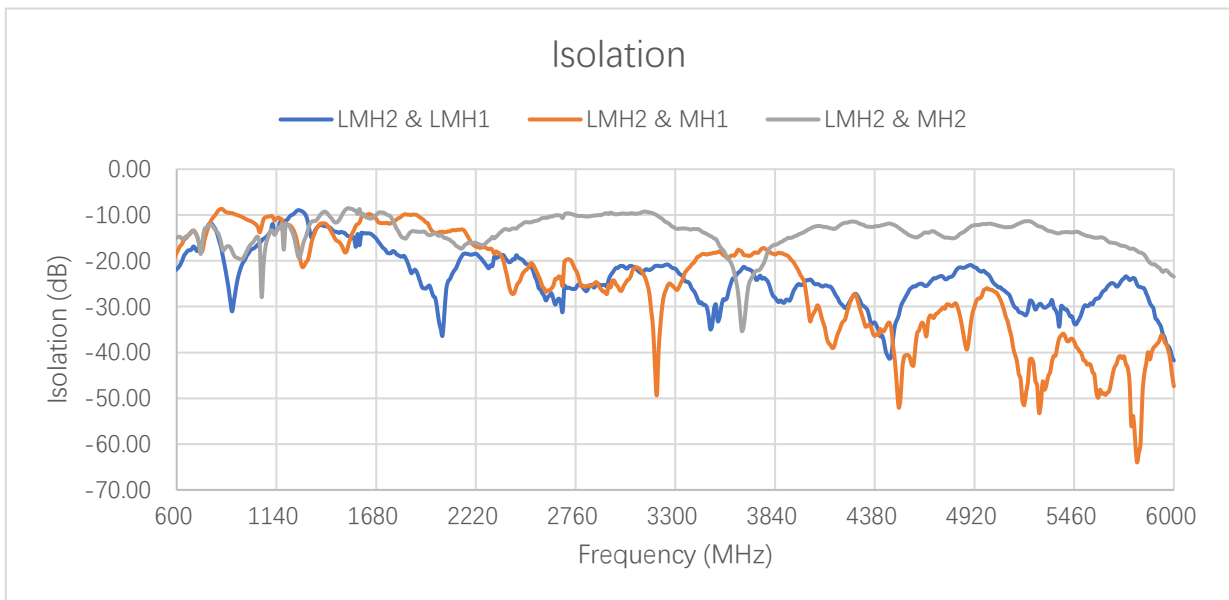


**3.1.3.2 Test Status: On 320 mm × 240 mm Metal Plane**

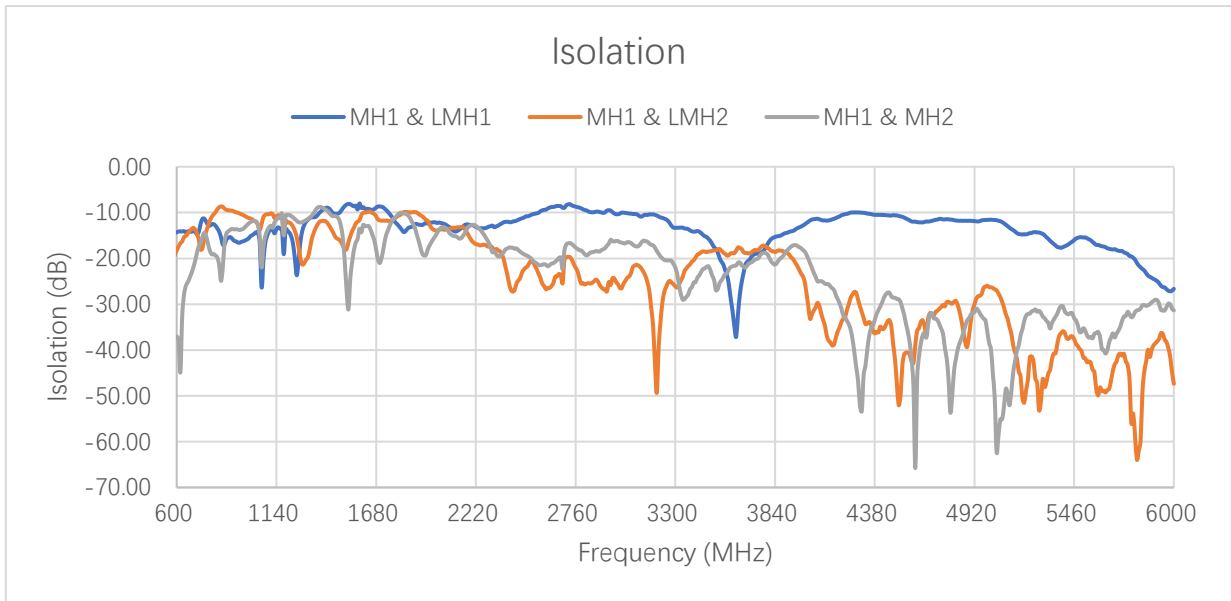
**3.1.3.2.1 LMH1**



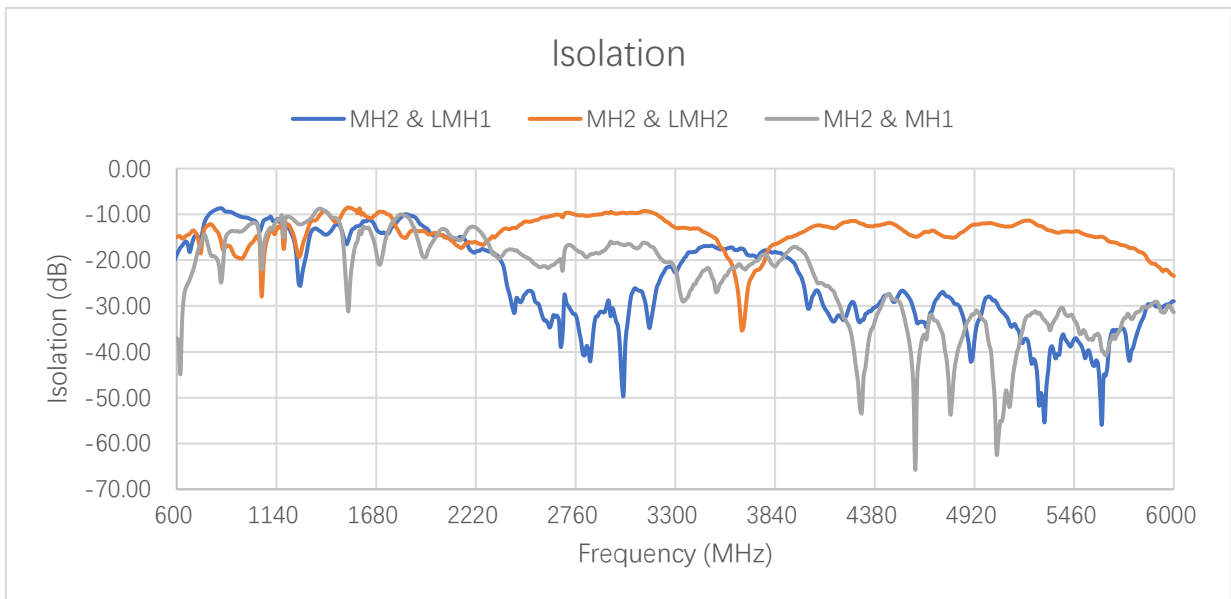
**3.1.3.2.2 LMH2**



**3.1.3.2.3 MH1**



**3.1.3.2.4 MH2**



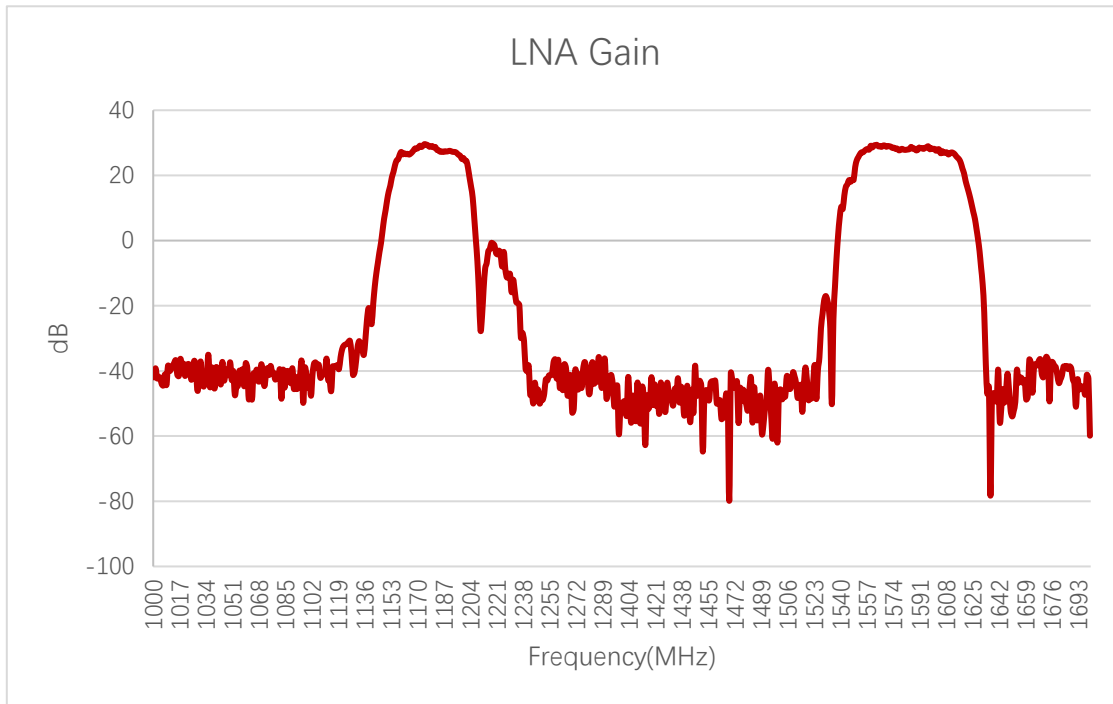
- FS: In Free Space
- MP: On 320 mm × 240 mm Metal Plane

**Max Isolation (dB)**

	Band	B71	B12/ B13/ B28	B5/ B8/ B26	n74/ n75/ n76	B1/ B2/ B3	B40	Wi-Fi 2G	B38/ B41	B42/ B48/ n77	n79	Wi-Fi 5G
	Freq. (MHz)	600– 700	700– 810	820– 960	1420– 1520	1700– 2170	2300– 2400	2400– 2500	2500– 2690	3300– 4200	4400– 5000	5150– 5850
LMH1	FS	-12.7	-7.2	-7.2	-7.5	-7.7	-11.4	-10.5	-6.9	-11.7	-10.7	-12.7
	MP	-14.1	-9.0	-8.6	-8.3	-8.7	-12.0	-10.8	-8.5	-10.6	-10.5	-14.3
LMH2	FS	-12.7	-7.8	-8.8	-7.2	-8.2	-13.1	-11.4	-8.2	-12.6	-11.8	-12.1
	MP	-13.3	-9.9	-8.7	-8.7	-9.4	-13.1	-11.6	-10.0	-12.0	-11.9	-11.3
MH1	FS	-12.8	-7.8	-8.8	-7.5	-7.7	-11.4	-10.5	-6.9	-11.7	-10.7	-12.7
	MP	-13.3	-9.9	-8.7	-8.3	-8.7	-12.0	-10.8	-8.5	-10.6	-10.5	-14.3
MH2	FS	-13.1	-7.2	-7.2	-7.2	-8.2	-13.1	-11.4	-8.2	-12.6	-11.8	-12.1
	MP	-13.5	-9.0	-8.6	-8.7	-9.4	-13.1	-11.6	-10.0	-12.0	-11.9	-11.3

- FS: In Free Space
- MP: On 320 mm × 240 mm Metal Plane

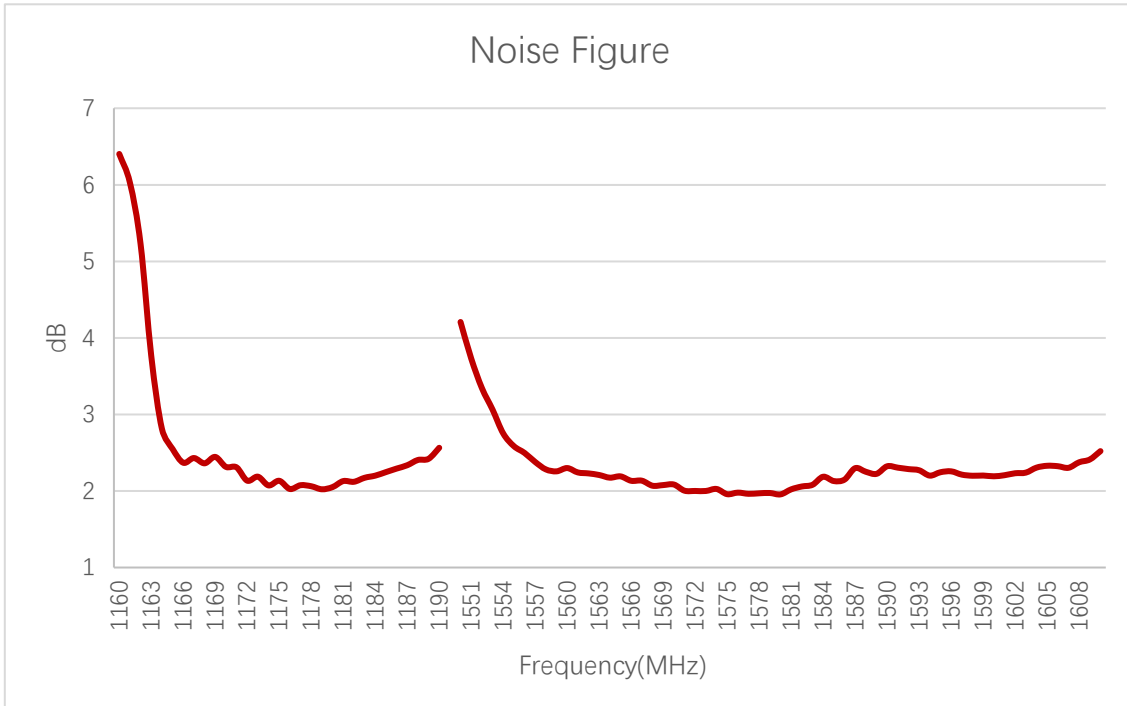
**3.1.4 GNSS LNA Gain**



**LNA Gain (dB)**

Frequency (MHz)	1176	1207	1227	1248	1268	1561	1575	1602
LNA Gain (dB)	29.3	-	-	-	-	-	28.1	27.9

**3.1.5 GNSS Noise Figure**

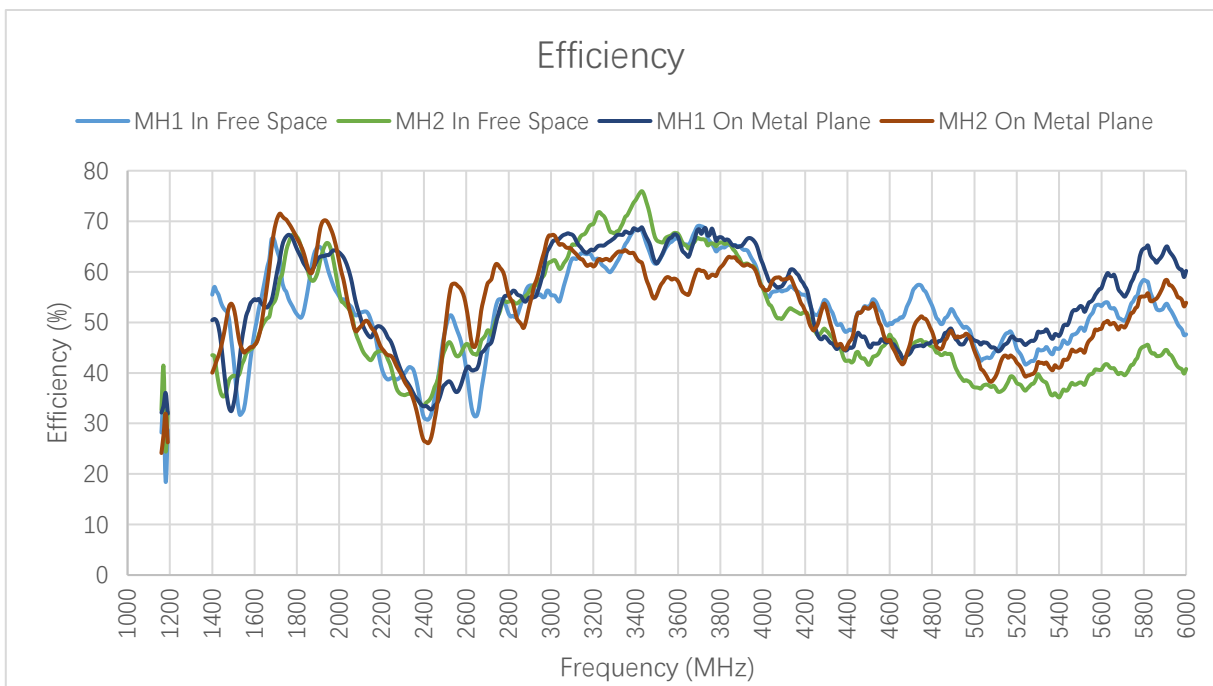
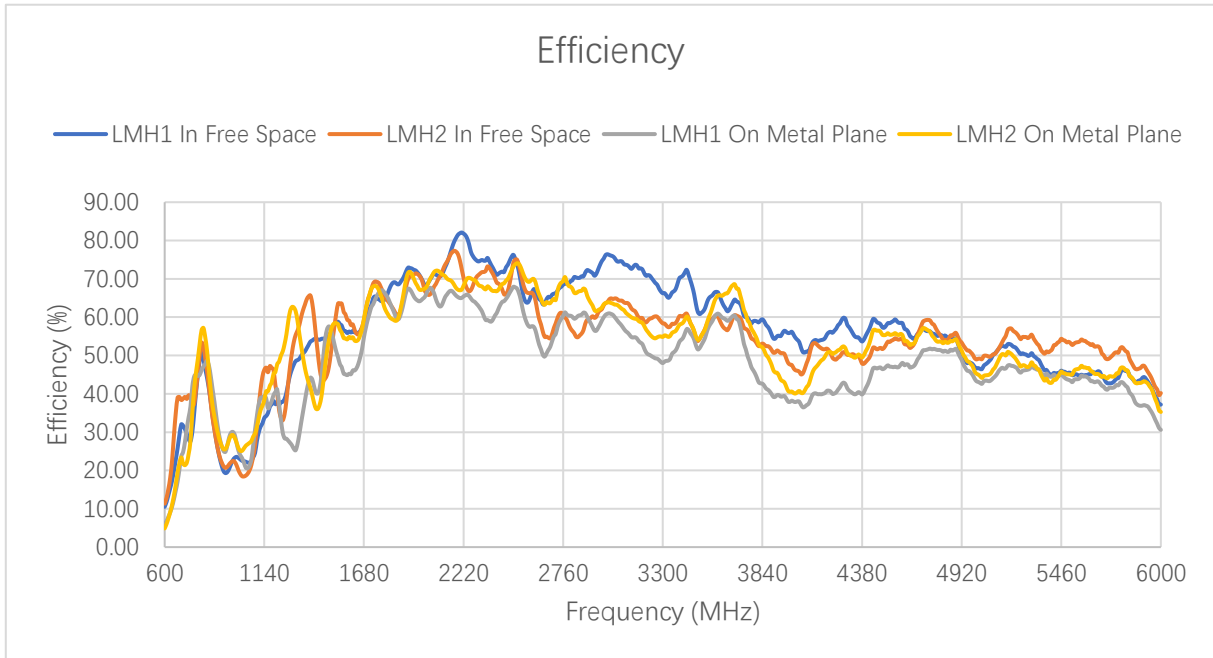


**Noise Figure (dB)**

Frequency (MHz)	1176	1207	1227	1248	1268	1561	1575	1602
Noise Figure (dB)	2.02	-	-	-	-	-	1.95	2.23

### 3.2 Radiation Performance Test

#### 3.2.1 Efficiency



**Efficiency (%) – LMHs**

Frequency (MHz)		600	630	710	830	900	960	1440	1710	1740	1880
LMH1	FS	10.5	15.4	30.8	44.1	22.9	21.7	54.1	62.2	65.4	69.3
	MP	6.1	9.1	27.5	48.6	28.1	29.9	41.5	60.9	64.5	60.9
LMH2	FS	11.3	18.1	39.2	45.9	23.3	22.2	46.6	65.7	69.3	62.1
	MP	4.9	9.1	21.4	51.1	27.6	29.1	37.2	65.8	68.2	62.5
Frequency (MHz)		1950	2140	2350	2450	2600	3600	4700	5000	5500	6000
LMH1	FS	72.4	75.4	75.5	73.0	67.3	66.4	56.4	46.7	45.5	37.2
	MP	65.5	66.6	59.3	64.8	57.5	60.9	50.4	43.3	43.7	30.6
LMH2	FS	71.1	75.4	73.3	66.1	65.8	60.1	57.6	49.0	53.6	40.2
	MP	70.1	69.8	68.0	69.5	70.0	65.7	56.3	45.3	45.1	35.3

**Efficiency (%) – MHs**

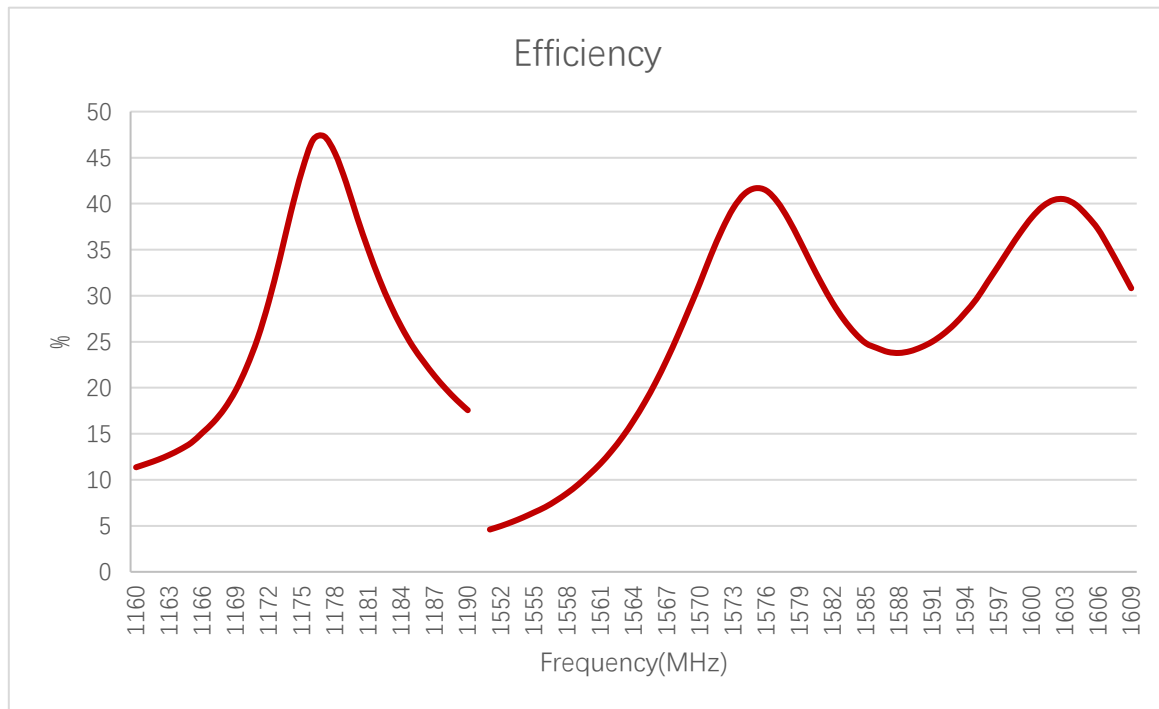
Frequency (MHz)		600	630	710	830	900	960	1440	1710	1740	1880
MH1	FS	-	-	-	-	-	-	54.1	63.7	56.6	63.4
	MP	-	-	-	-	-	-	46.4	60.7	66.3	60.9
MH2	FS	-	-	-	-	-	-	36.1	56.4	61.9	58.3
	MP	-	-	-	-	-	-	44.9	70.9	70.6	61.0
Frequency (MHz)		1950	2140	2350	2450	2600	3600	4700	5000	5500	6000
MH1	FS	59.9	51.5	40.6	35.0	40.6	66.8	54.9	45.2	48.9	47.6
	MP	63.3	47.3	36.0	33.5	40.8	66.9	44.1	46.4	53.2	60.2
MH2	FS	65.5	42.7	35.5	37.2	45.7	67.5	44.4	37.1	38.1	40.8
	MP	69.4	49.8	34.7	30.6	53.0	58.1	46.4	44.3	44.7	53.9

**Efficiency (%) – LMHs**

Frequency (MHz)		1166	1170	1180	1187	1559	1570	1580	1590	1600	1609
LMH1	FS	-	-	-	-	57.8	56.5	56.4	55.9	56.3	56.0
	MP	-	-	-	-	63.5	61.4	60.7	59.3	59.1	57.9
LMH2	FS	-	-	-	-	46.9	45.3	45.1	44.9	45.2	45.1
	MP	-	-	-	-	56.0	54.6	54.4	54.2	54.8	54.5

**Efficiency (%) – MHs**

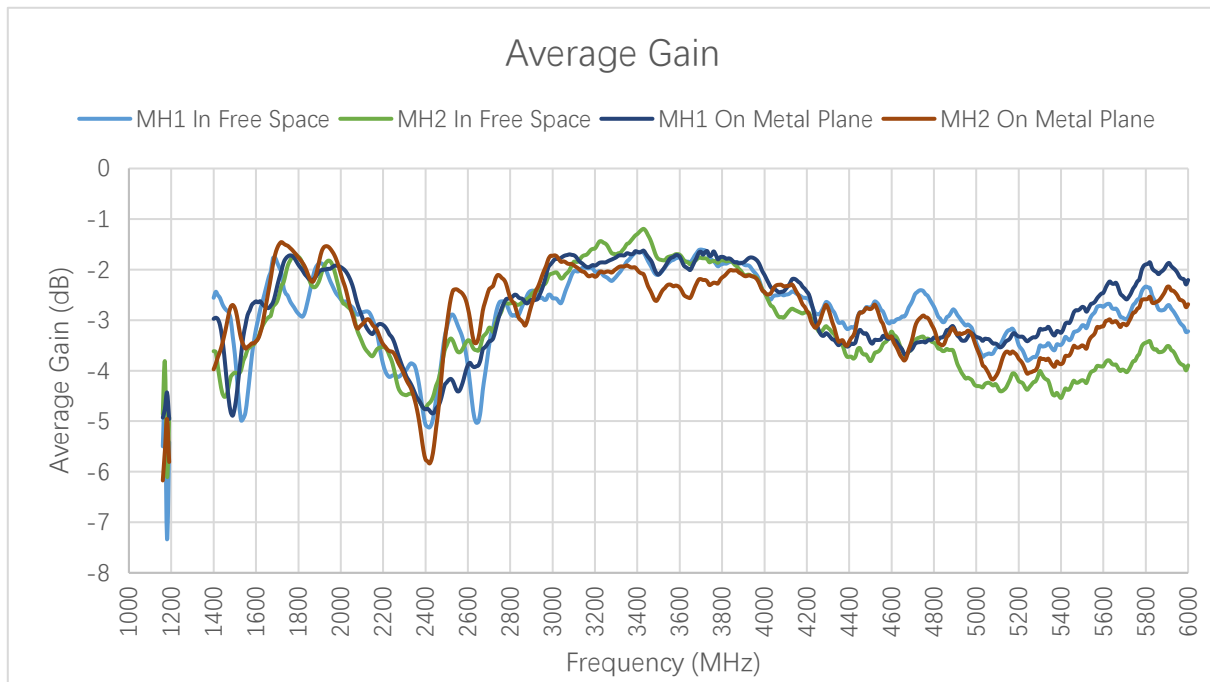
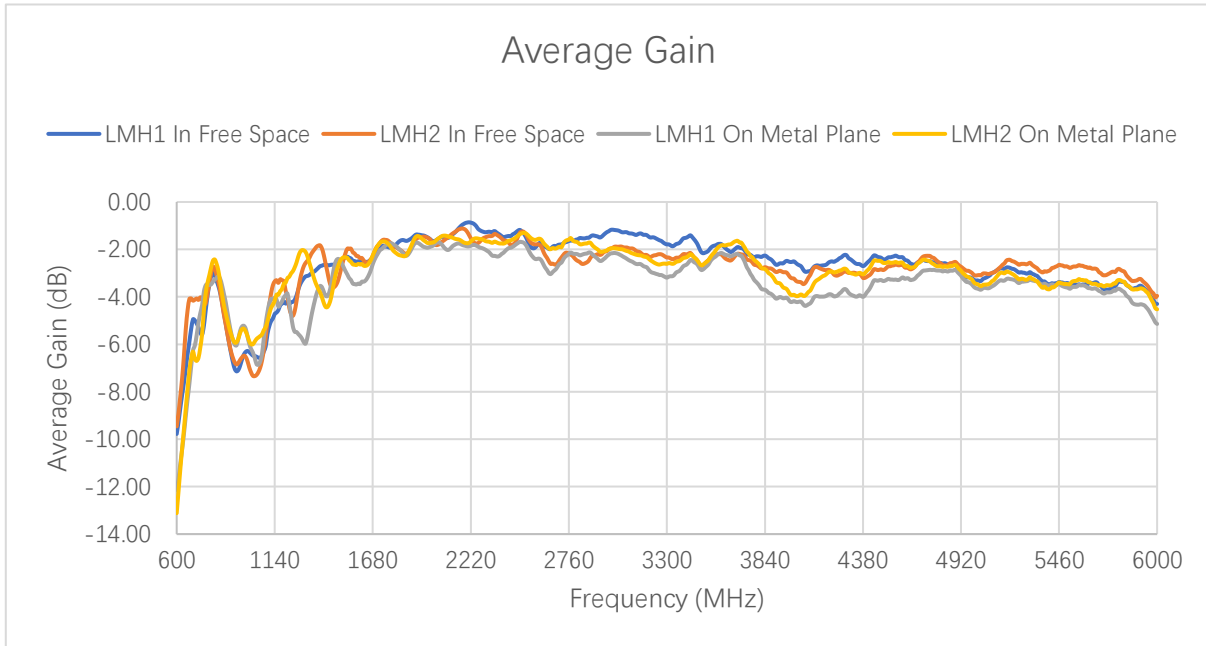
Frequency (MHz)		1166	1170	1180	1187	1559	1570	1580	1590	1600	1609
MH1	FS	28.2	34.1	18.5	28.8	-	-	-	-	-	-
	MP	32.6	41.3	24.6	32.2	-	-	-	-	-	-
MH2	FS	32.2	33.5	36.0	31.9	-	-	-	-	-	-
	MP	24.1	27.7	31.9	26.3	-	-	-	-	-	-



**Efficiency (%) – GNSS**

Frequency (MHz)	1176	1207	1227	1248	1268	1561	1575	1602
Efficiency (%)	47	-	-	-	-	-	42	40

**3.2.2 Average Gain**



**Average Gain (dB) – LMHs**

Frequency (MHz)		600	630	710	830	900	960	1440	1710	1740	1880
LMH1	FS	-9.8	-8.1	-5.1	-3.6	-6.4	-6.6	-2.7	-2.1	-1.8	-1.6
	MP	-12.1	-10.4	-5.6	-3.1	-5.5	-5.3	-3.8	-2.2	-1.9	-2.2
LMH2	FS	-9.5	-7.4	-4.1	-3.4	-6.3	-6.6	-3.3	-1.8	-1.6	-2.1
	MP	-13.1	-10.4	-6.7	-2.9	-5.6	-5.4	-4.3	-1.8	-1.7	-2.0
Frequency (MHz)		1950	2140	2350	2450	2600	3600	4700	5000	5500	6000
LMH1	FS	-1.4	-1.2	-1.2	-1.4	-1.7	-1.8	-2.5	-3.3	-3.4	-4.3
	MP	-1.8	-1.8	-2.3	-1.9	-2.4	-2.2	-3.0	-3.6	-3.6	-5.1
LMH2	FS	-1.5	-1.2	-1.4	-1.8	-1.8	-2.2	-2.4	-3.1	-2.7	-4.0
	MP	-1.5	-1.6	-1.7	-1.6	-1.6	-1.8	-2.5	-3.4	-3.5	-4.5

**Average Gain (dB) – MHs**

Frequency (MHz)		600	630	710	830	900	960	1440	1710	1740	1880
MH1	FS	-	-	-	-	-	-	-2.7	-2.0	-2.5	-2.0
	MP	-	-	-	-	-	-	-3.3	-2.2	-1.8	-2.2
MH2	FS	-	-	-	-	-	-	-4.4	-2.5	-2.1	-2.3
	MP	-	-	-	-	-	-	-3.5	-1.5	-1.5	-2.1
Frequency (MHz)		1950	2140	2350	2450	2600	3600	4700	5000	5500	6000
MH1	FS	-2.2	-2.9	-3.9	-4.6	-3.9	-1.8	-2.6	-3.5	-3.1	-3.2
	MP	-2.0	-3.3	-4.4	-4.7	-3.9	-1.7	-3.6	-3.3	-2.7	-2.2
MH2	FS	-1.8	-3.7	-4.5	-4.3	-3.4	-1.7	-3.5	-4.3	-4.2	-3.9
	MP	-1.6	-3.0	-4.6	-5.1	-2.8	-2.4	-3.3	-3.5	-3.5	-2.7

**Average Gain (dB) – LMHs**

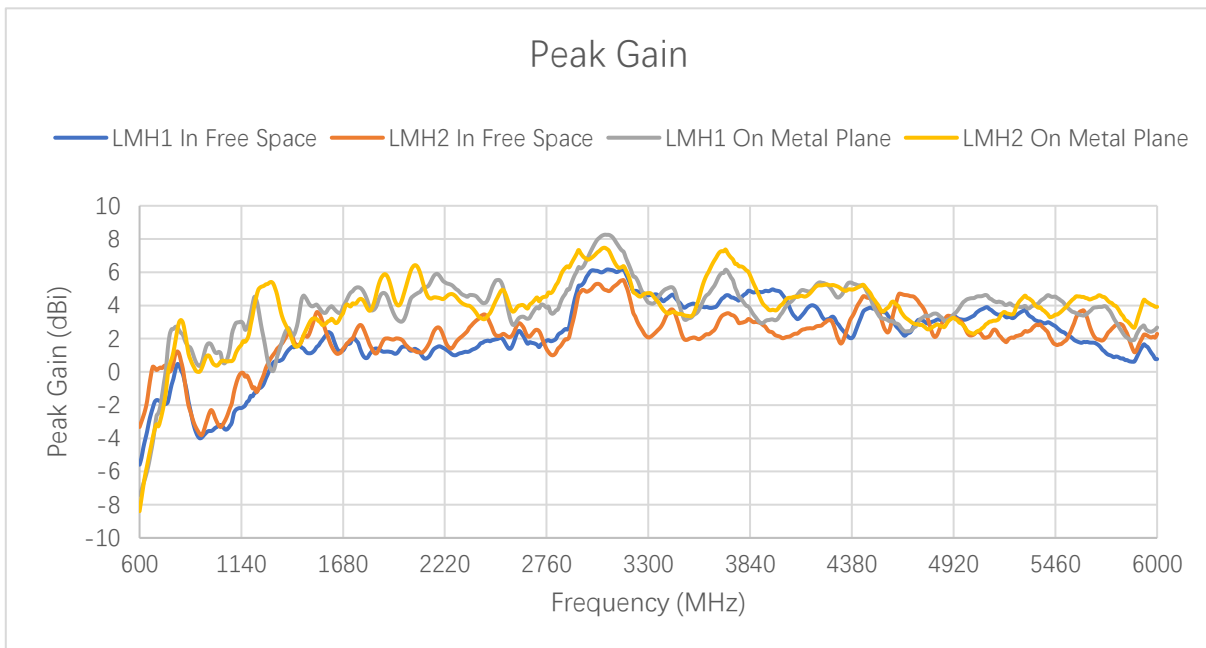
Frequency (MHz)		1166	1170	1180	1187	1559	1570	1580	1590	1600	1609
LMH1	FS	-	-	-	-	-2.4	-2.5	-2.5	-2.5	-2.5	-2.5
	MP	-	-	-	-	-2.0	-2.1	-2.2	-2.3	-2.3	-2.4

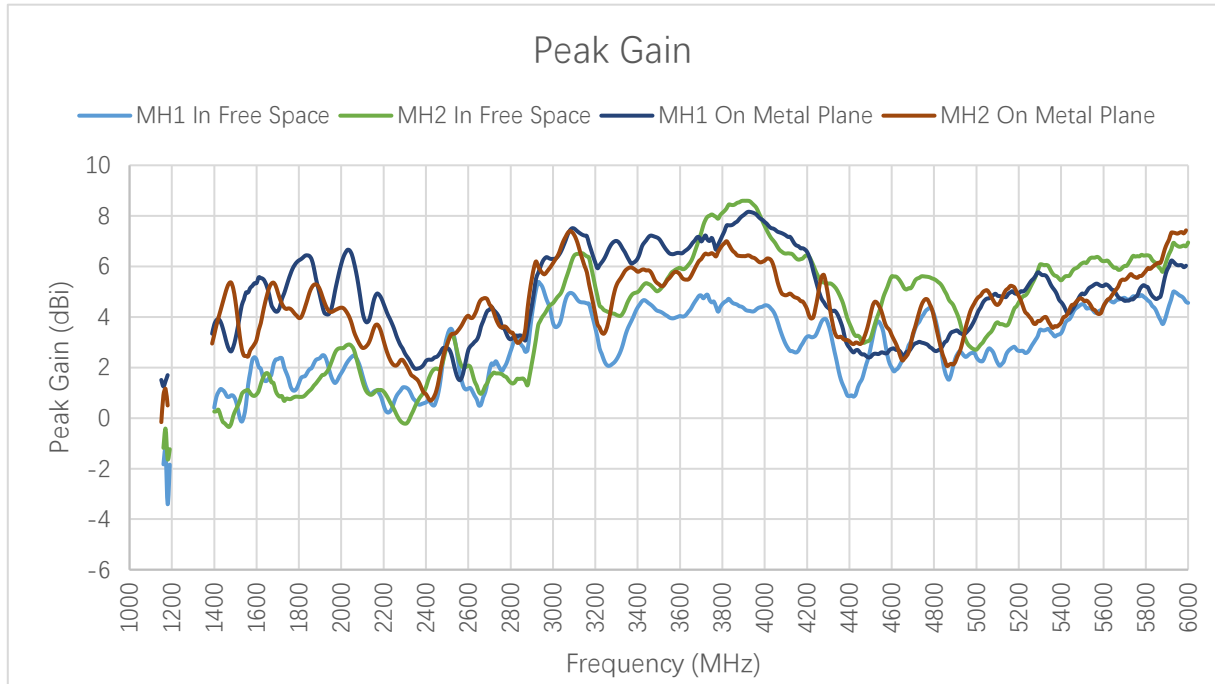
LMH2	FS	-	-	-	-	-3.3	-3.4	-3.5	-3.5	-3.4	-3.5
	MP	-	-	-	-	-2.5	-2.6	-2.6	-2.7	-2.6	-2.6

**Average Gain (dB) – MHs**

Frequency (MHz)		1166	1170	1180	1187	1559	1570	1580	1590	1600	1609
MH1	FS	-5.5	-4.7	-7.3	-5.4	-	-	-	-	-	-
	MP	-4.9	-3.8	-6.1	-4.9	-	-	-	-	-	-
MH2	FS	-4.9	-4.8	-4.4	-5.0	-	-	-	-	-	-
	MP	-6.2	-5.6	-5.0	-5.8	-	-	-	-	-	-

**3.2.3 Peak Gain**





**Peak Gain (dBi) – LMHs**

Frequency (MHz)		600	630	710	830	900	960	1440	1710	1740	1880
LMH1	FS	-5.6	-4.1	-1.8	-0.1	-3.7	-3.6	1.6	1.7	2.0	1.3
	MP	-7.4	-6.4	-2.1	2.2	0.6	1.7	3.0	4.6	5.0	4.6
LMH2	FS	-3.3	-2.3	0.3	0.2	-3.4	-2.8	1.6	1.8	2.2	1.6
	MP	-8.4	-6.2	-2.9	3.0	0.1	1.0	1.5	4.0	4.1	5.6
Frequency (MHz)		1950	2140	2350	2450	2600	3600	4700	5000	5500	6000
LMH1	FS	1.1	1.0	1.2	1.9	2.2	3.9	2.6	3.2	2.4	0.8
	MP	3.5	5.3	4.6	4.4	3.0	4.5	2.6	4.4	4.2	2.7
LMH2	FS	2.0	1.8	2.7	3.2	2.7	2.2	4.6	2.2	1.8	2.3
	MP	4.5	4.4	4.0	3.4	3.8	5.6	3.0	2.4	3.7	3.9

**Peak Gain (dBi) – MHs**

Frequency (MHz)		600	630	710	830	900	960	1440	1710	1740	1880
MH1	FS	-	-	-	-	-	-	1.1	2.4	1.8	2.3
	MP	-	-	-	-	-	-	3.8	4.2	4.9	6.0

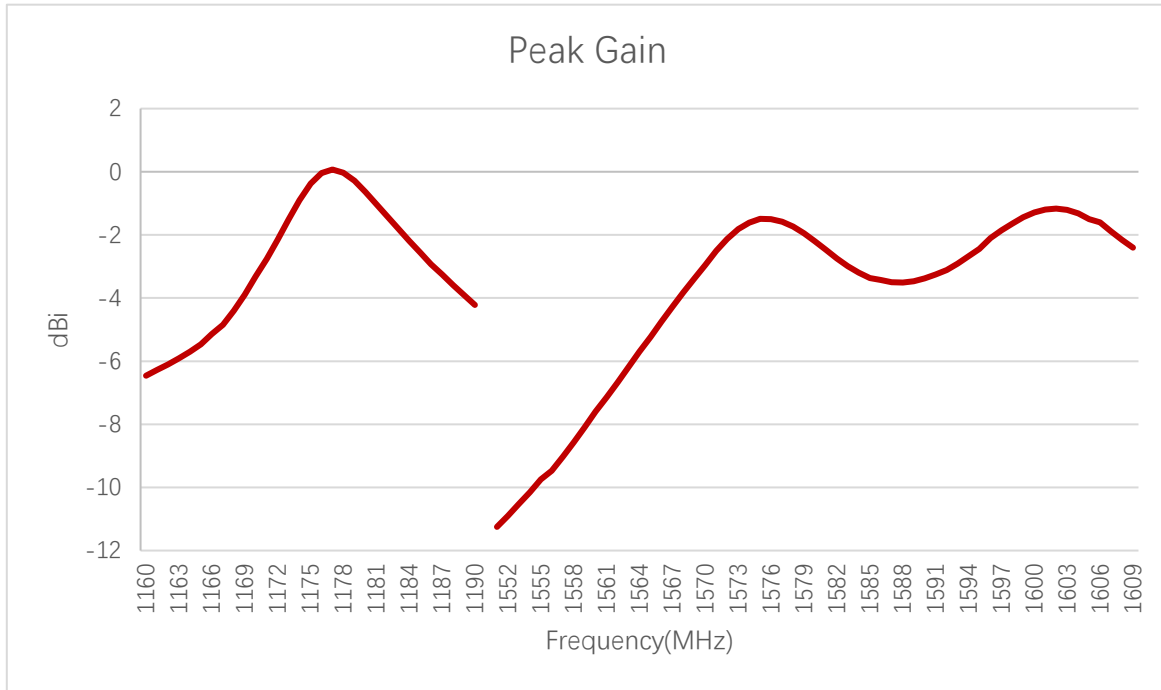
MH2	FS	-	-	-	-	-	-	-0.1	0.9	0.8	1.4
	MP	-	-	-	-	-	-	4.3	5.0	4.4	5.3
Frequency (MHz)		1950	2140	2350	2450	2600	3600	4700	5000	5500	6000
MH1	FS	1.7	1.0	0.7	0.7	1.2	4.0	3.3	2.4	4.5	4.6
	MP	4.1	3.9	2.0	2.4	2.3	6.5	2.7	3.9	4.9	6.0
MH2	FS	2.1	0.9	0.5	2.0	2.1	6.0	5.3	2.7	6.1	7.0
	MP	4.3	3.0	1.7	0.9	4.0	5.8	2.9	4.5	4.7	7.4

**Peak Gain (dBi) – LMHs**

Frequency (MHz)		1166	1170	1180	1187	1559	1570	1580	1590	1600	1609
LMH1	FS	-	-	-	-	1.8	1.9	2.1	2.2	2.4	2.4
	MP	-	-	-	-	3.4	3.1	2.7	2.4	2.1	1.8
LMH2	FS	-	-	-	-	3.8	3.6	3.6	3.6	3.8	3.9
	MP	-	-	-	-	3.0	2.8	2.9	2.9	3.0	3.1

**Peak Gain (dBi) – MHs**

Frequency (MHz)		1166	1170	1180	1187	1559	1570	1580	1590	1600	1609
MH1	FS	-1.8	-1.3	-3.4	-1.8	-	-	-	-	-	-
	MP	-1.2	-0.4	-1.6	-1.2	-	-	-	-	-	-
MH2	FS	1.5	1.3	1.5	1.7	-	-	-	-	-	-
	MP	-0.2	0.9	1.2	0.5	-	-	-	-	-	-

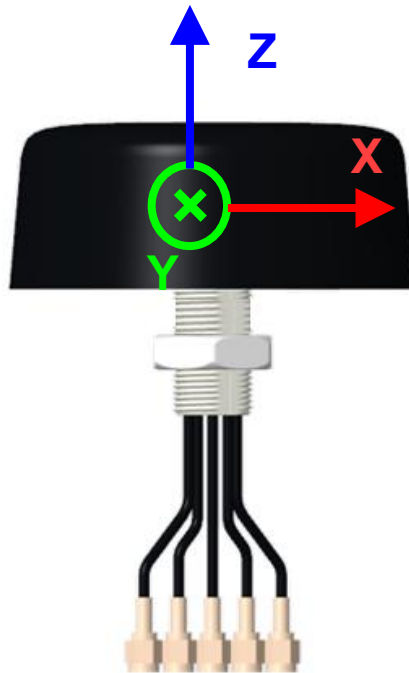


**Peak Gain (dBi)**

Frequency (MHz)	1176	1207	1227	1248	1268	1561	1575	1602
Peak Gain (dBi)	-0.04	-	-	-	-	-	-1.49	-1.17

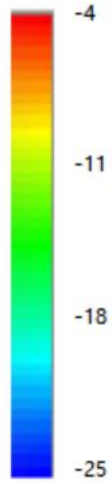
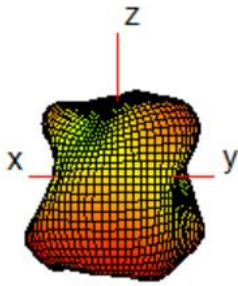
### 3.2.4 3D & 2D Radiation Pattern

#### 3.2.4.1 Test Status: In Free Space

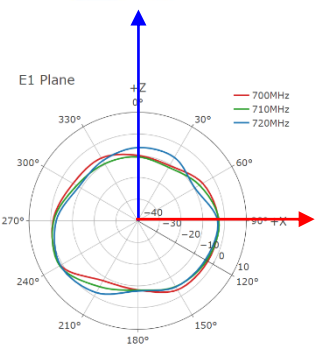
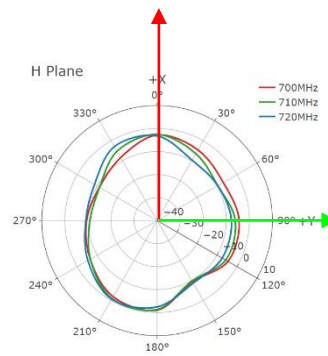
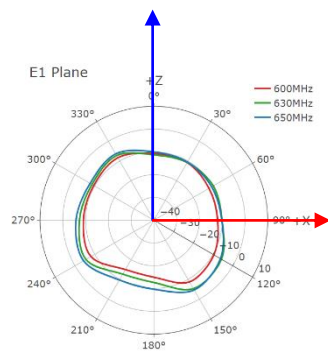
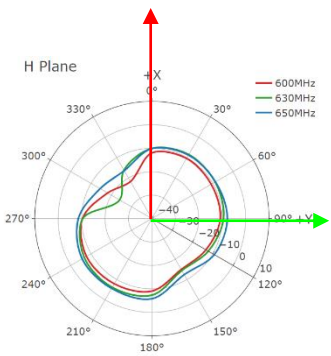
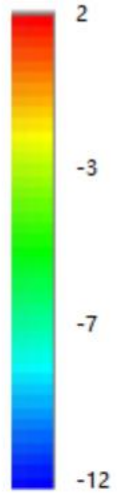
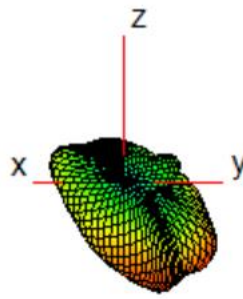


● **LMH1**

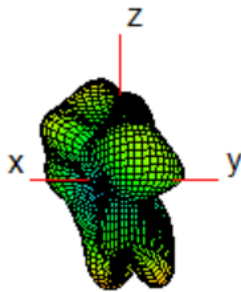
**630 MHz**



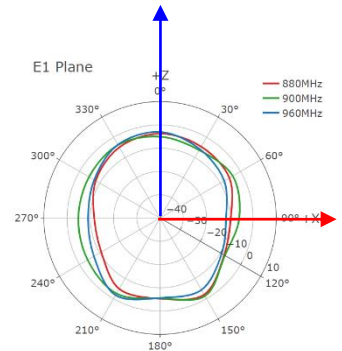
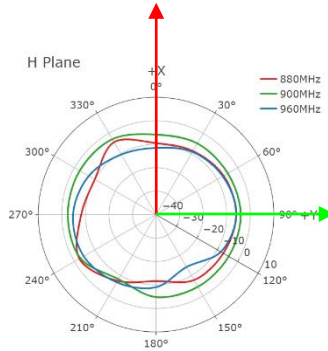
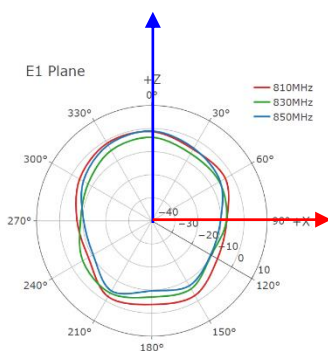
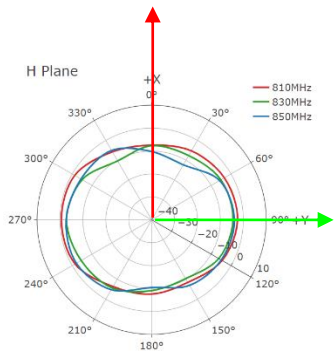
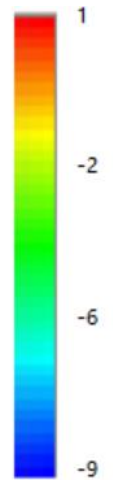
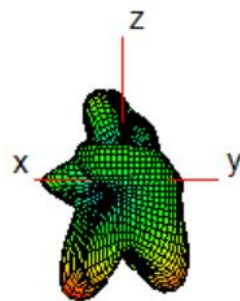
**710 MHz**



**830 MHz**

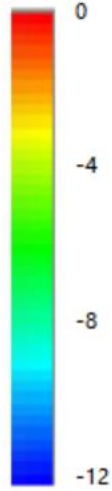
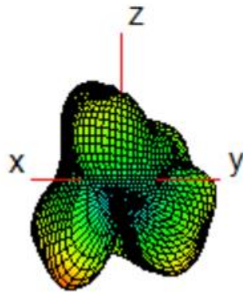


**900 MHz**

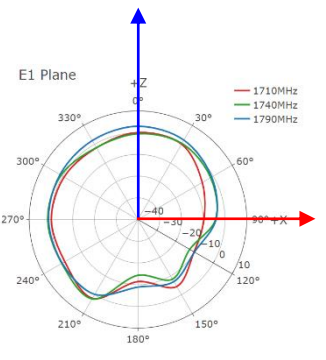
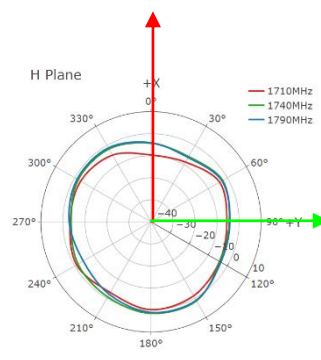
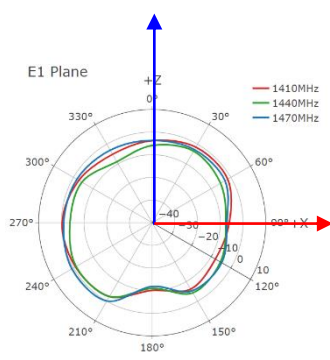
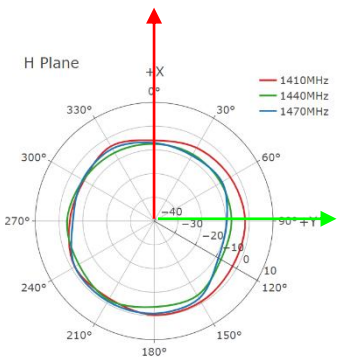
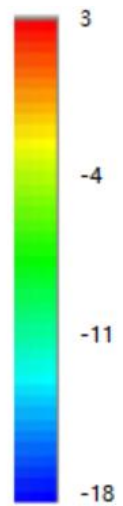
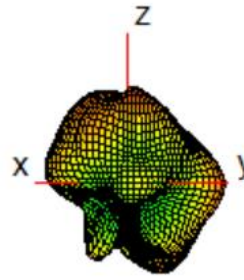


● **LMH1**

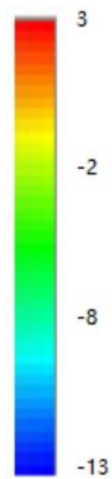
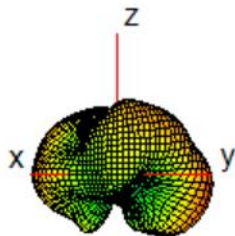
**1440 MHz**



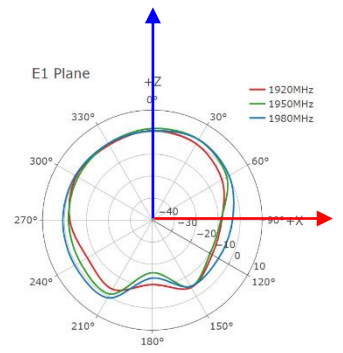
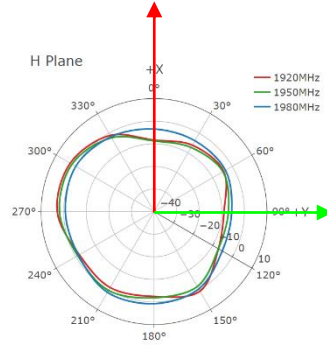
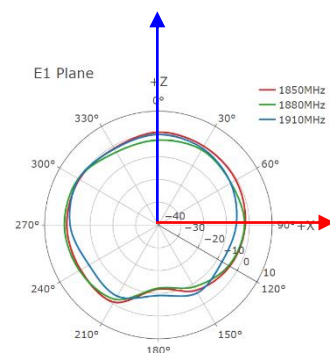
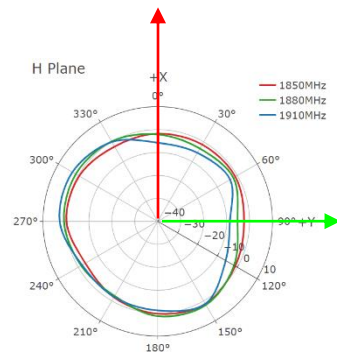
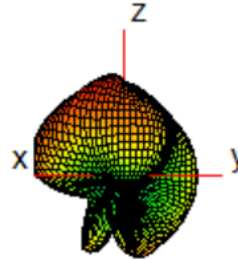
**1740 MHz**



**1880 MHz**

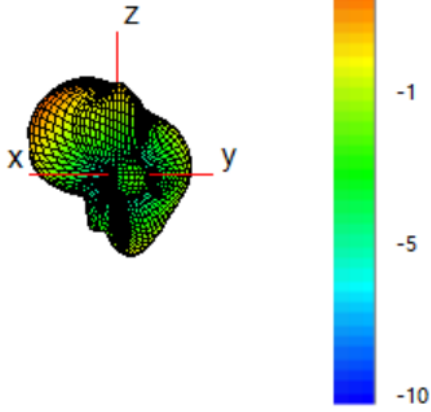


**1960 MHz**

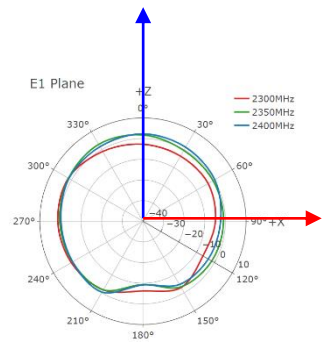
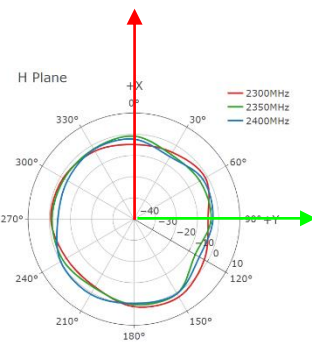
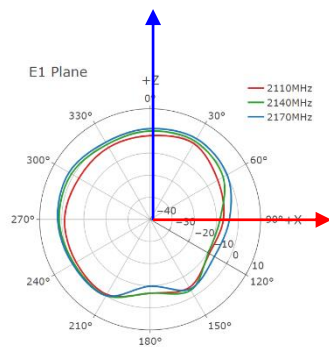
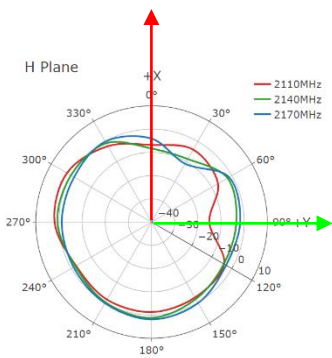
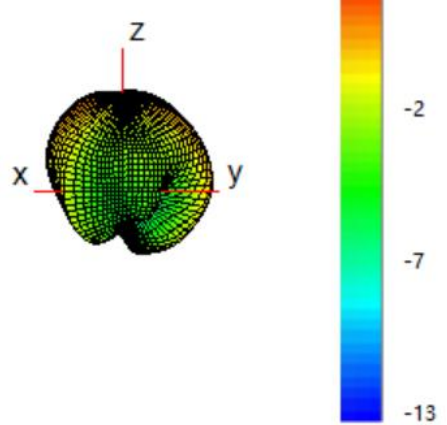


● **LMH1**

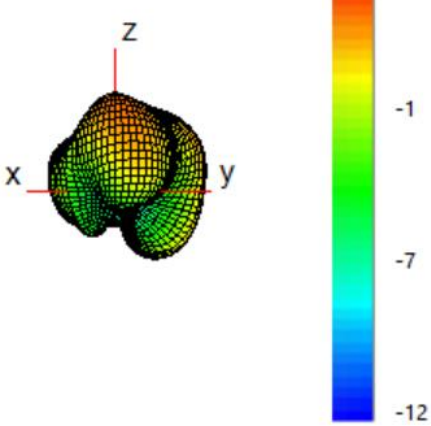
**2140 MHz**



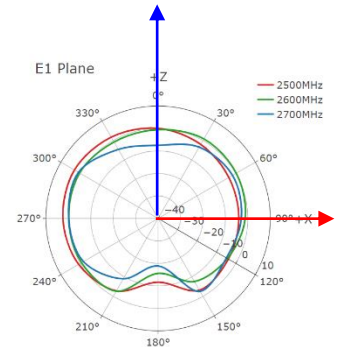
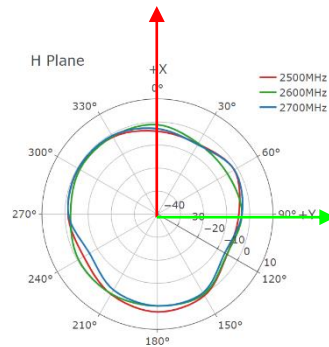
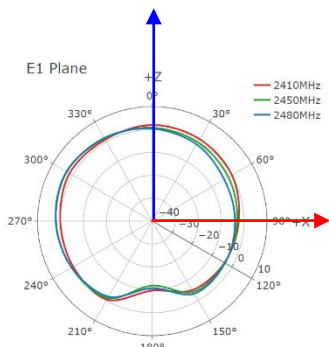
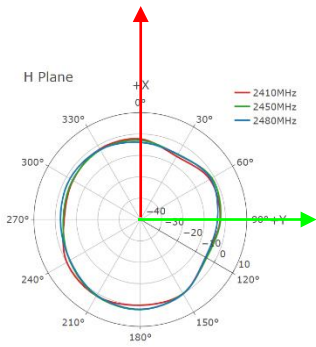
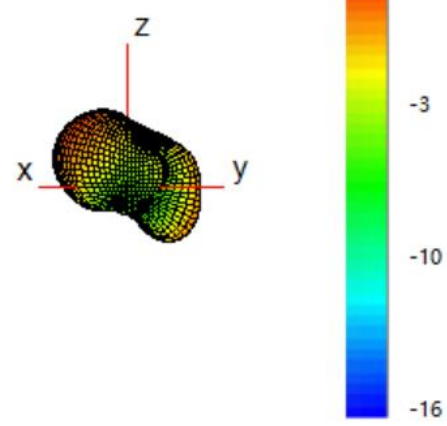
**2350 MHz**



**2450 MHz**

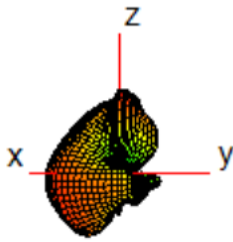


**2600 MHz**

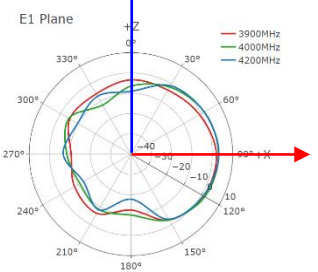
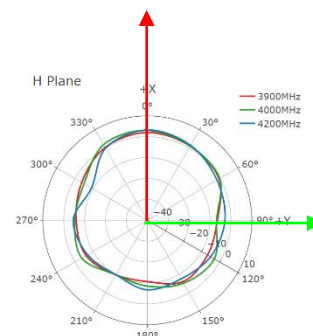
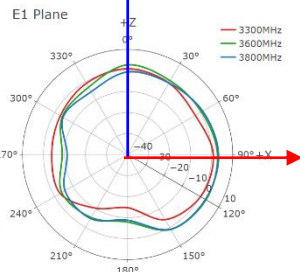
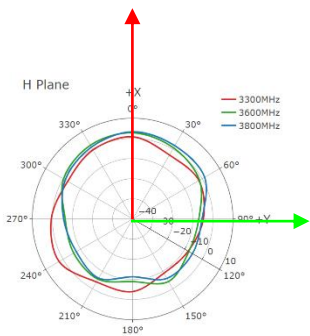
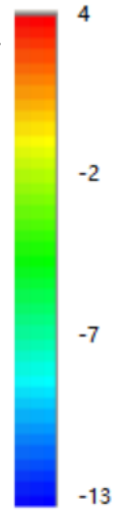
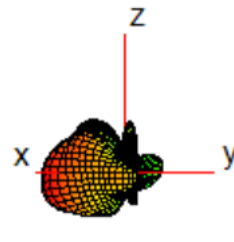


● **LMH1**

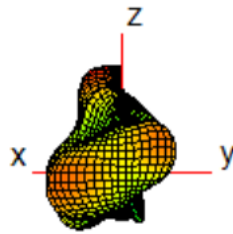
**3600 MHz**



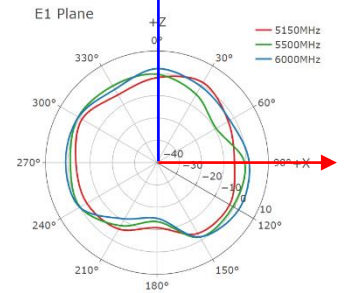
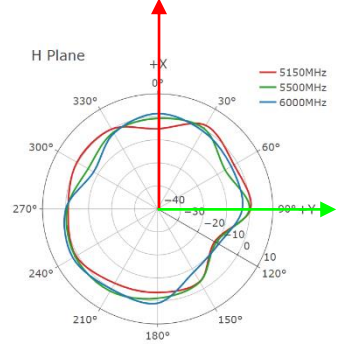
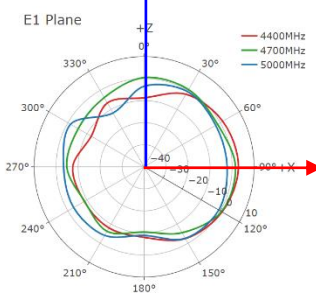
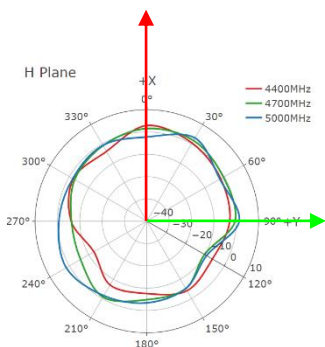
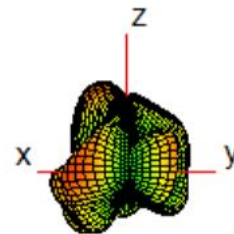
**4000 MHz**



**4700 MHz**

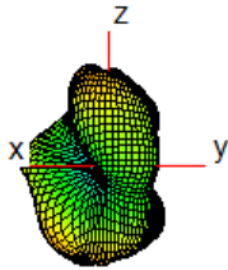


**5500 MHz**

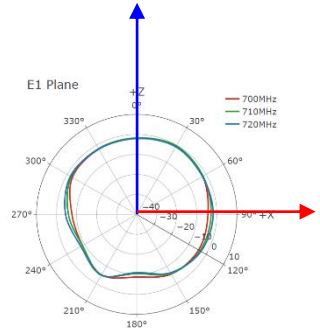
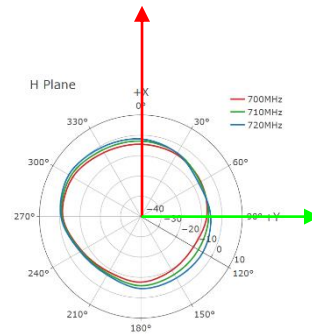
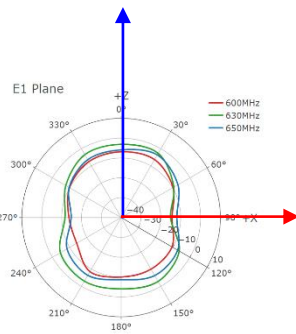
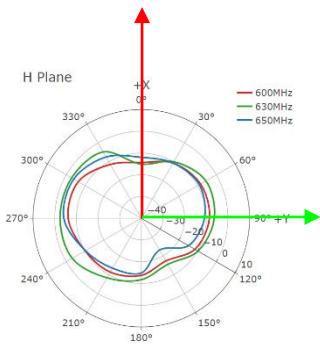
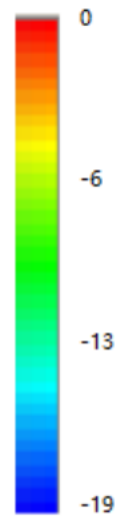
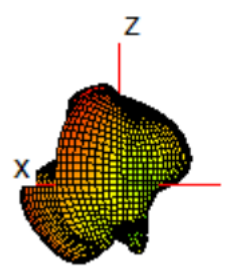


● **LMH2**

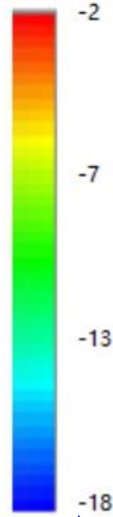
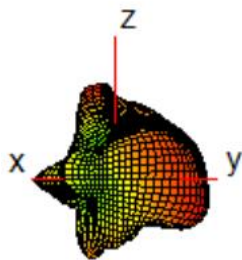
**630 MHz**



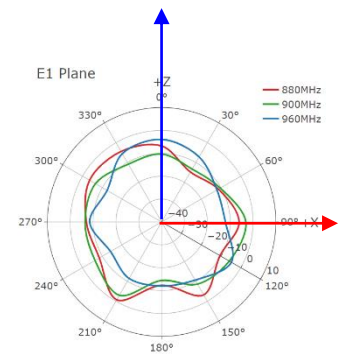
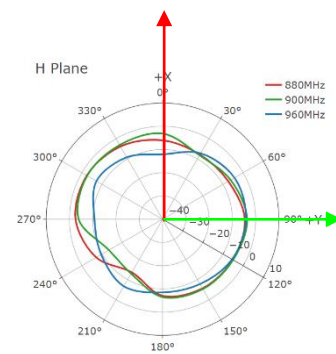
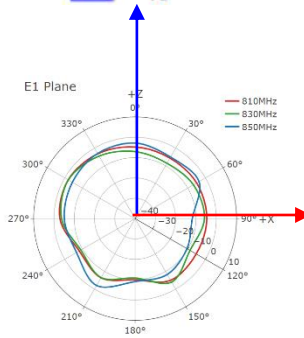
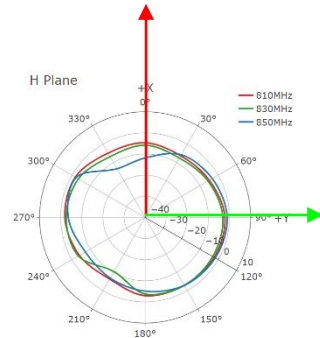
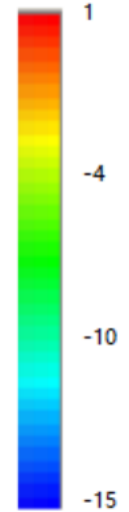
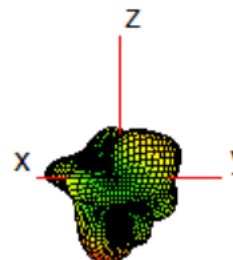
**710 MHz**



**830 MHz**

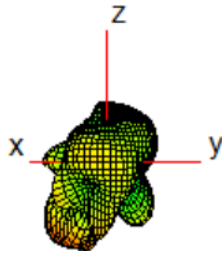


**900 MHz**

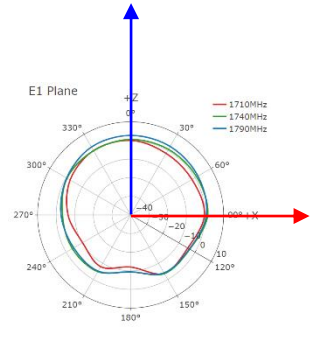
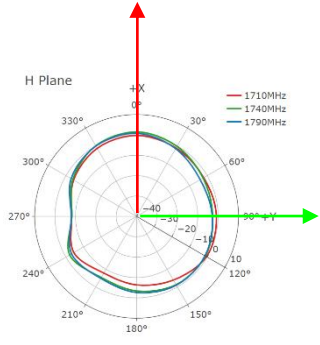
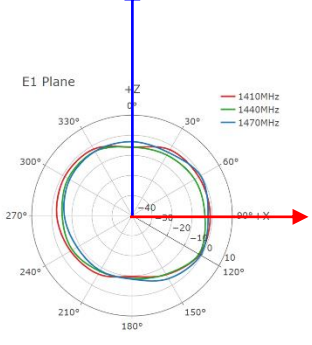
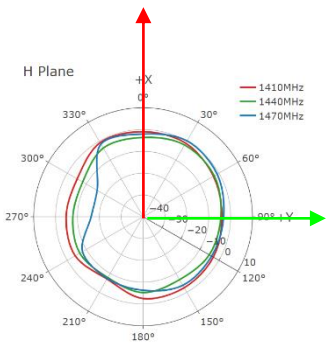
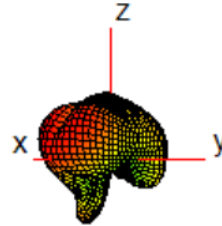


● **LMH2**

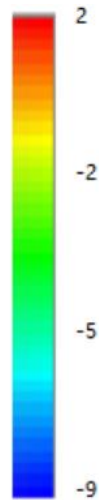
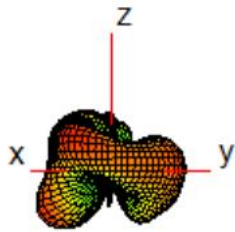
**1440 MHz**



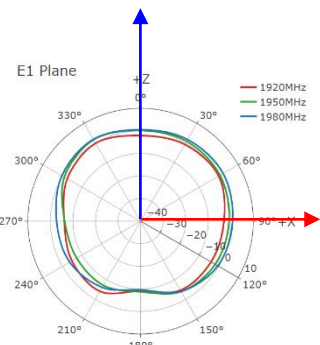
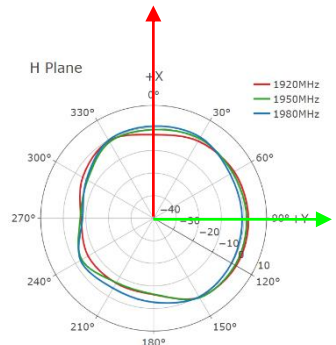
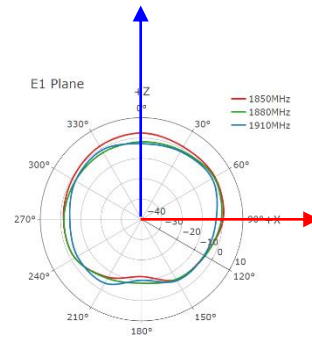
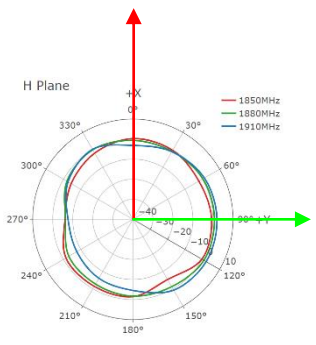
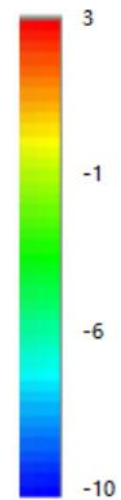
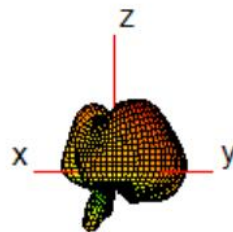
**1740 MHz**



**1880 MHz**

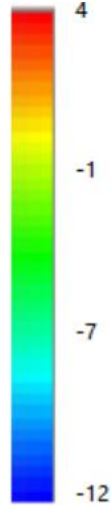
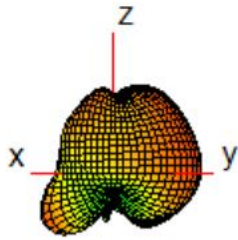


**1950 MHz**

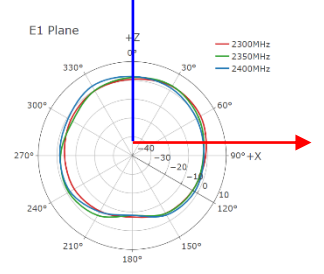
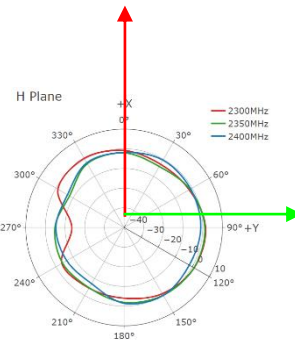
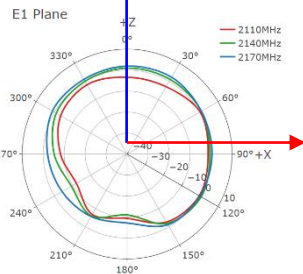
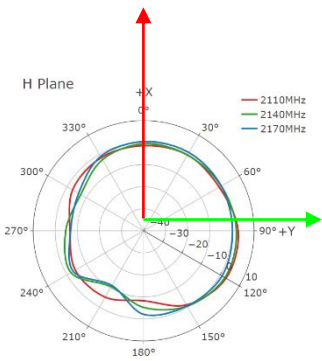
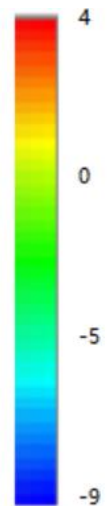
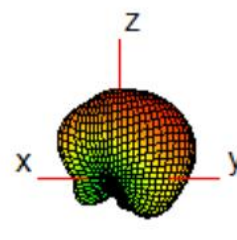


● **LMH2**

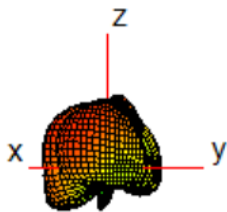
**2140 MHz**



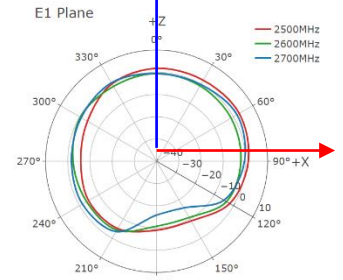
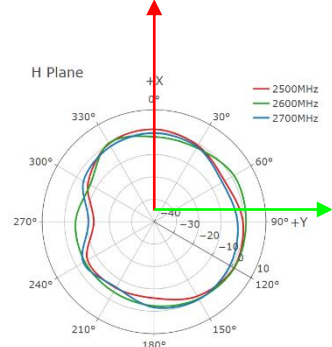
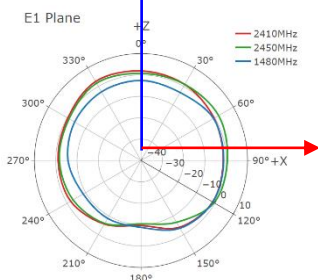
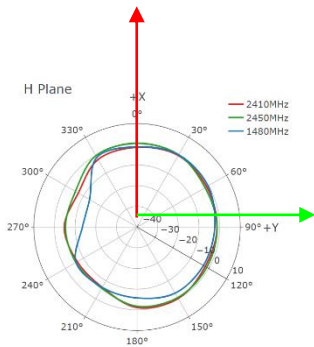
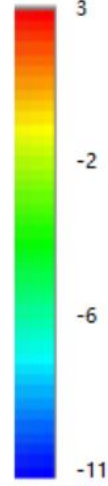
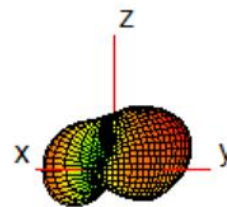
**2350 MHz**



**2450 MHz**

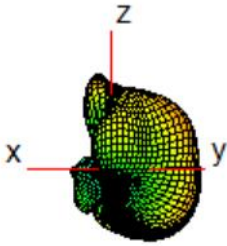


**2600 MHz**

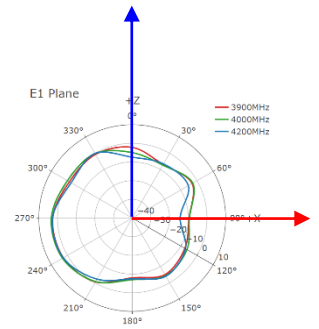
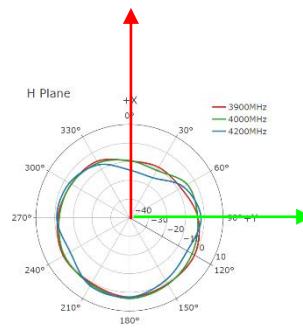
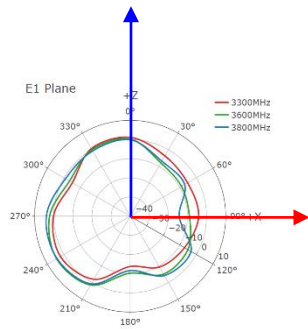
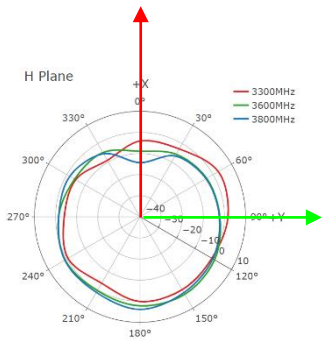
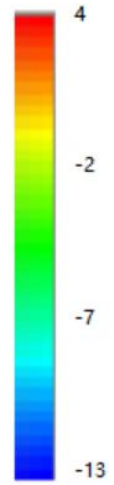
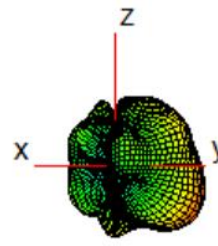


● **LMH2**

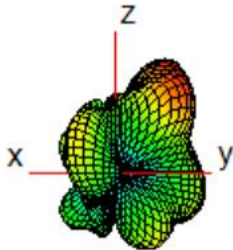
**3600 MHz**



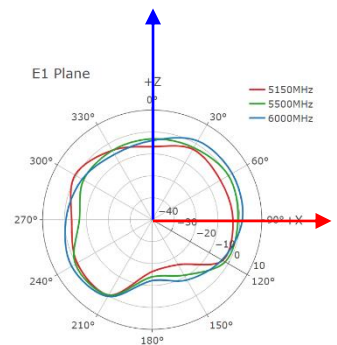
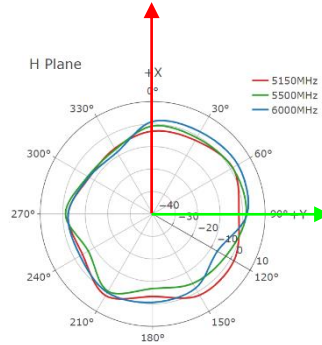
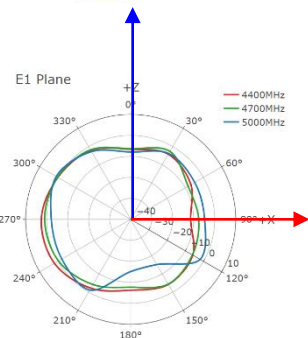
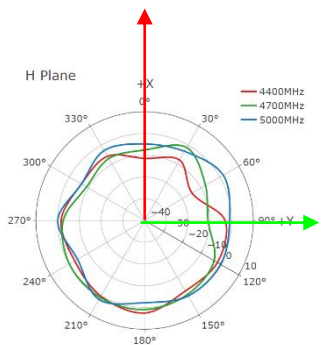
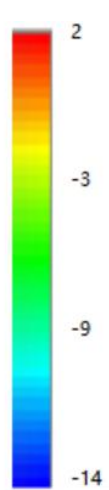
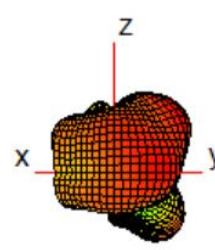
**4000 MHz**



**4700 MHz**

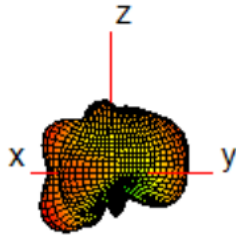


**5500 MHz**

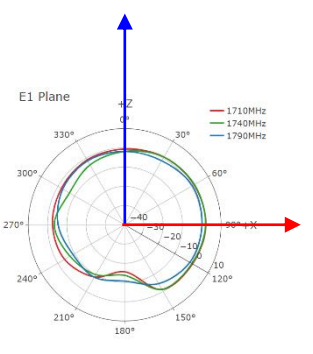
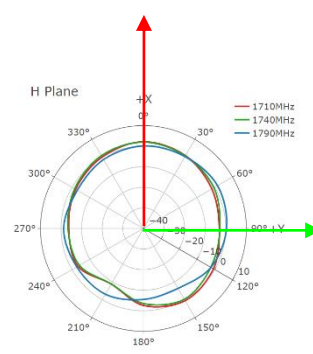
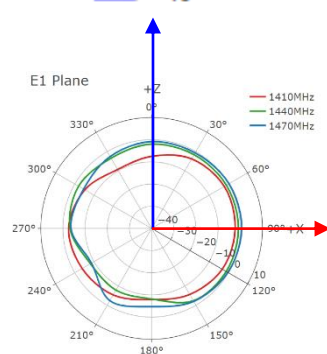
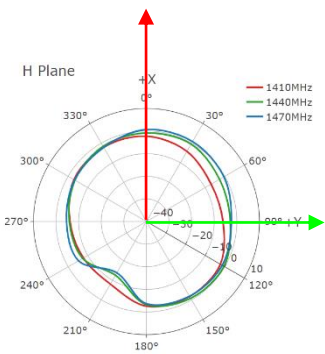
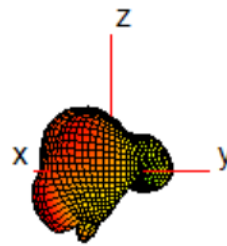


● **MH1**

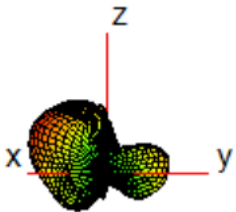
**1440 MHz**



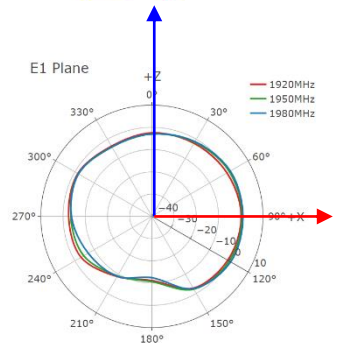
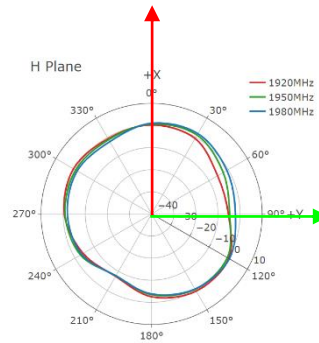
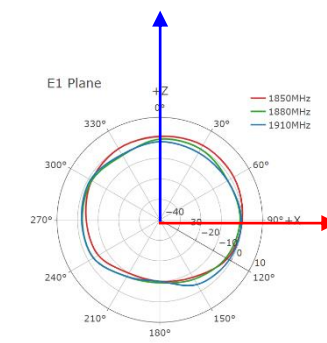
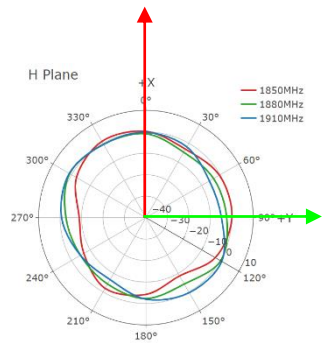
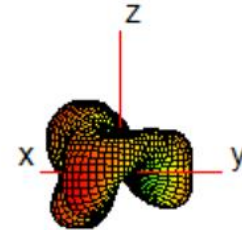
**1740 MHz**



**1880 MHz**

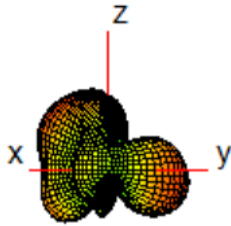


**1950 MHz**

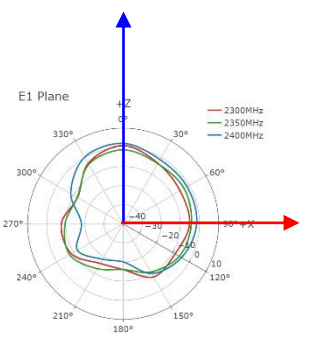
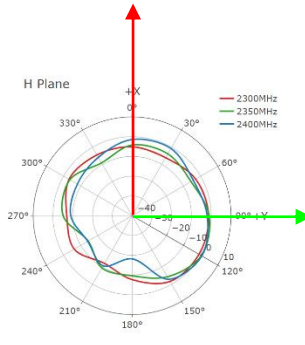
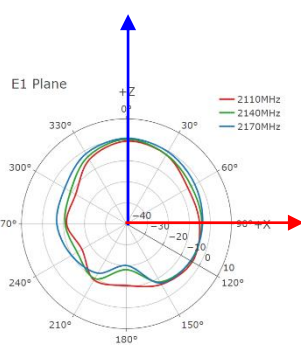
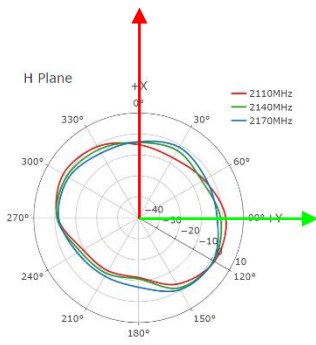
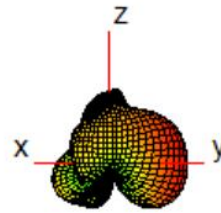


● **MH1**

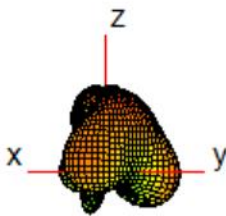
**2140 MHz**



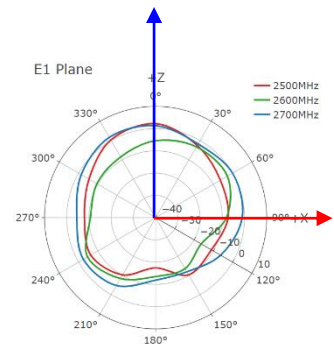
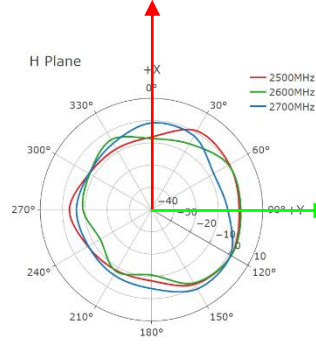
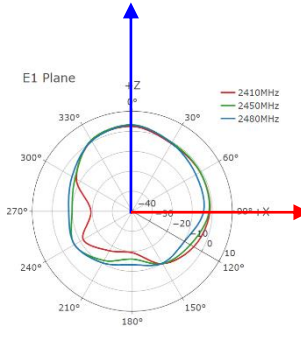
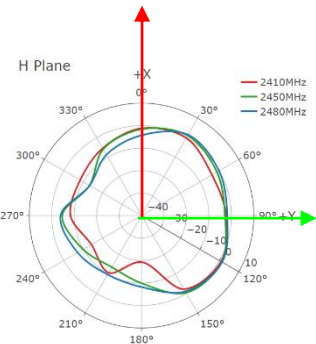
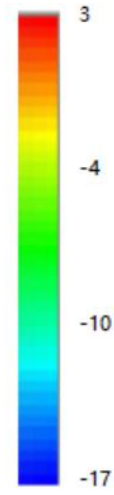
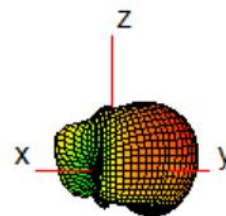
**2360 MHz**



**2450 MHz**

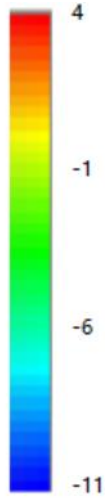
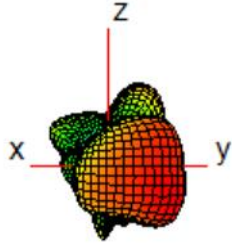


**2600 MHz**

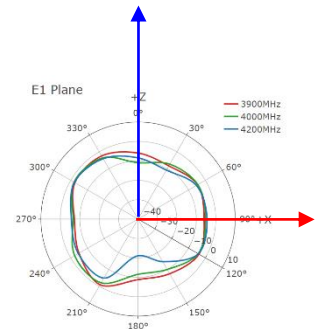
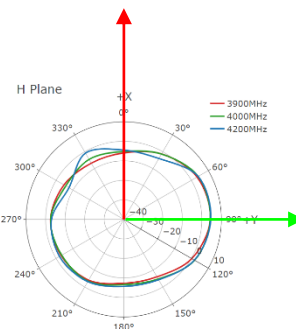
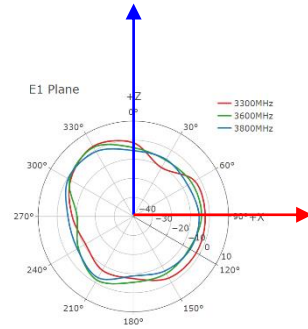
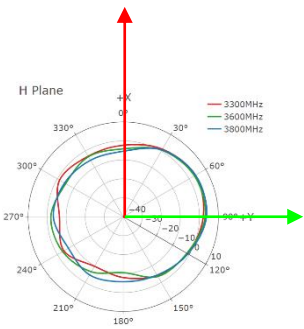
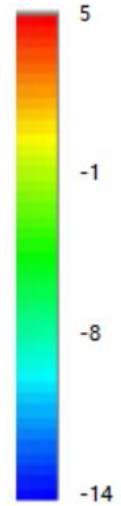
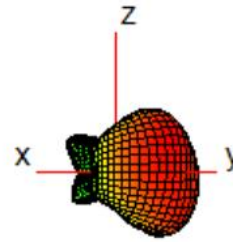


● **MH1**

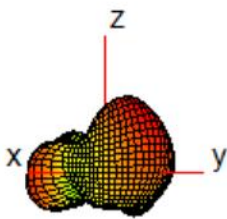
**3600 MHz**



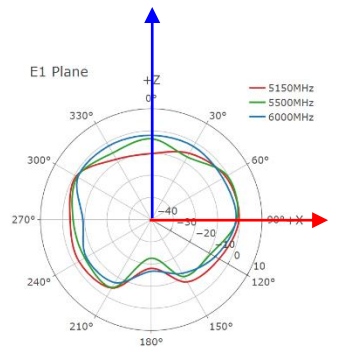
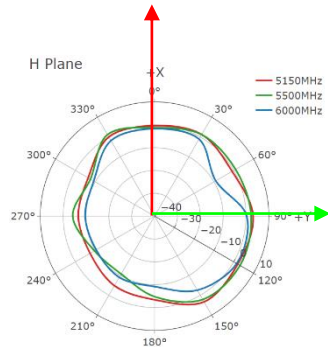
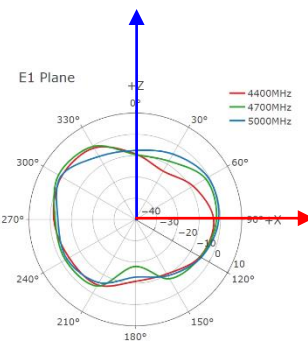
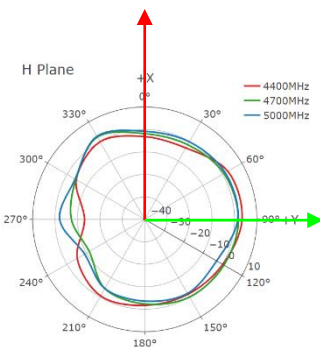
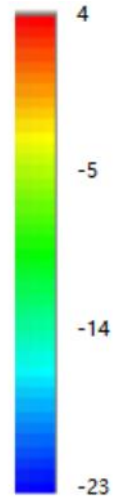
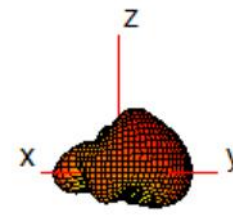
**4000 MHz**



**4700 MHz**

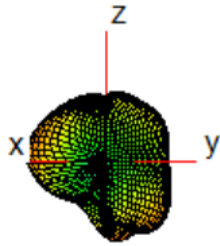


**5500 MHz**

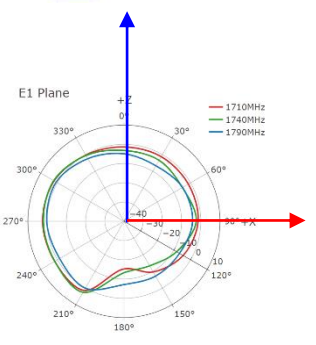
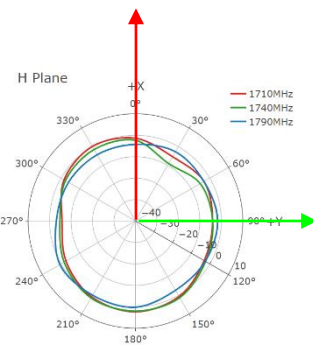
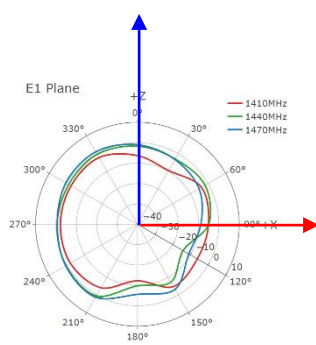
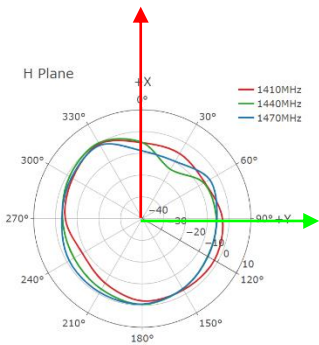
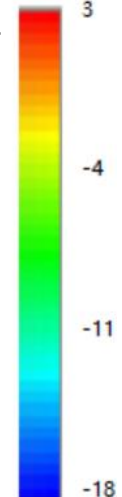
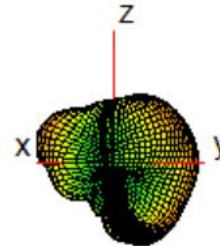


● **MH2**

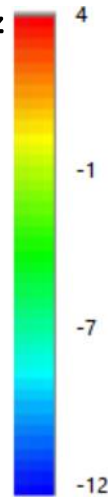
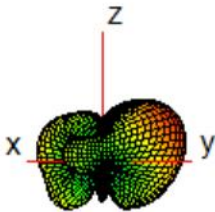
**1440 MHz**



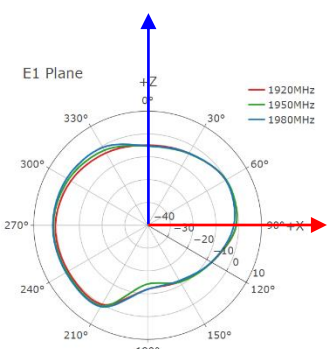
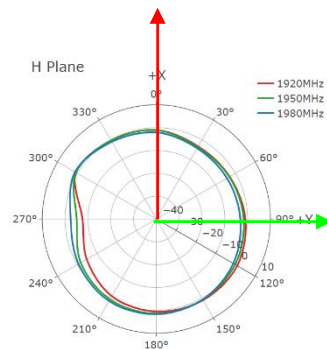
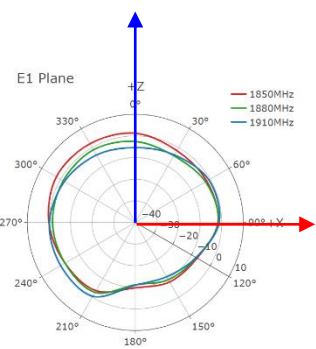
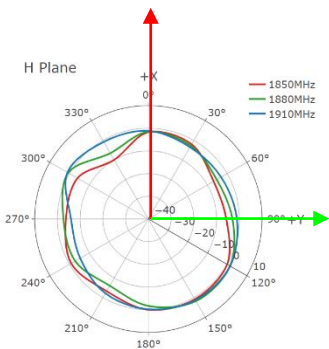
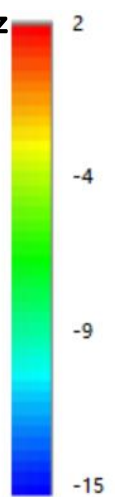
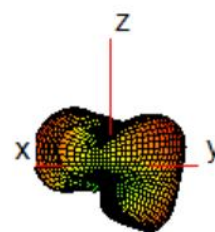
**1740 MHz**



**1880 MHz**

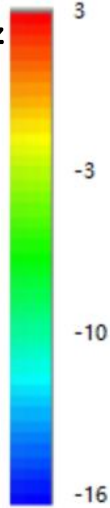
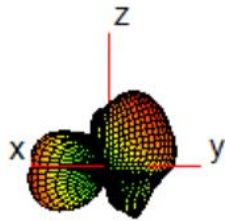


**1950 MHz**

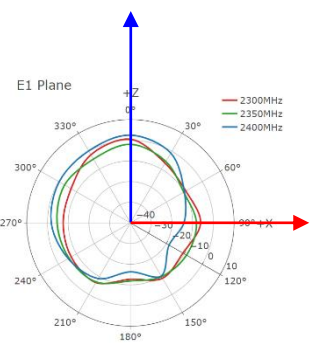
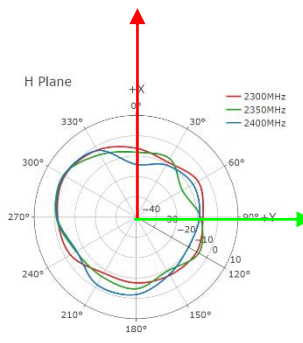
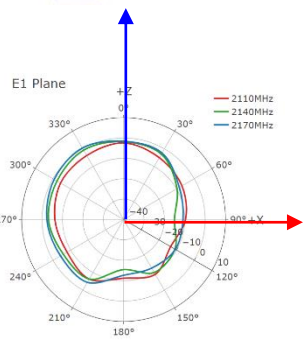
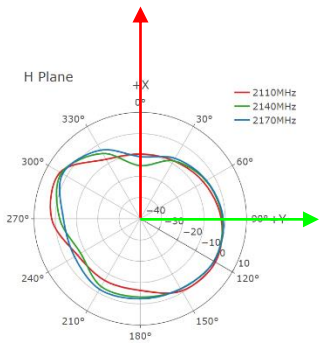
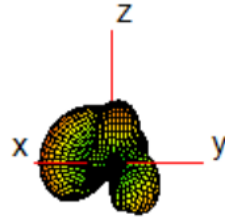


● **MH2**

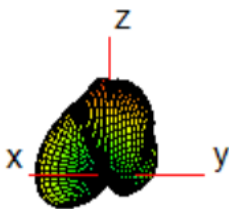
**2140 MHz**



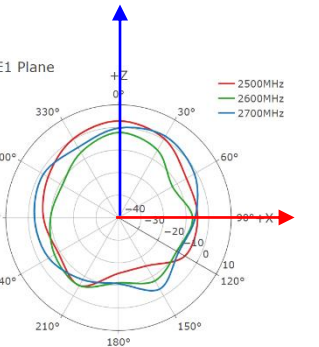
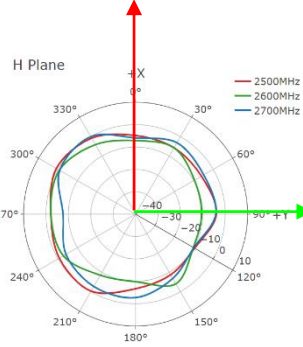
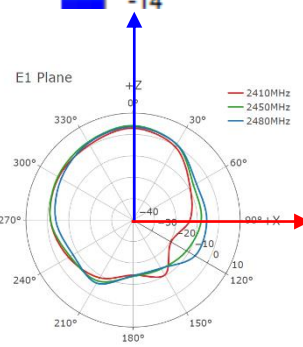
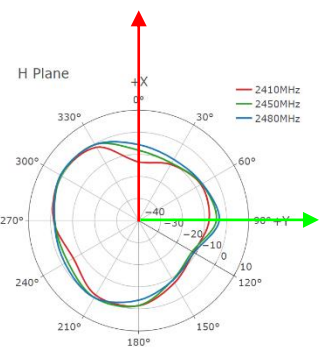
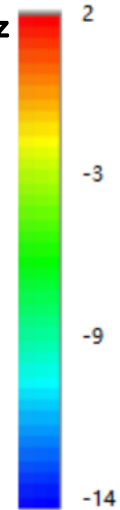
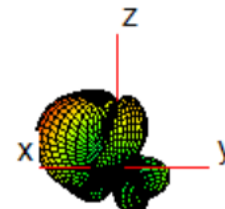
**2350 MHz**



**2450 MHz**

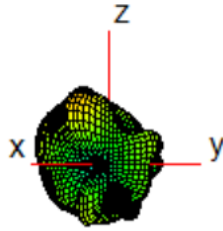


**2600 MHz**

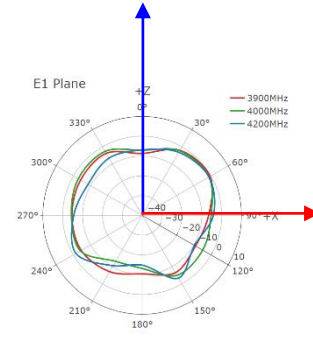
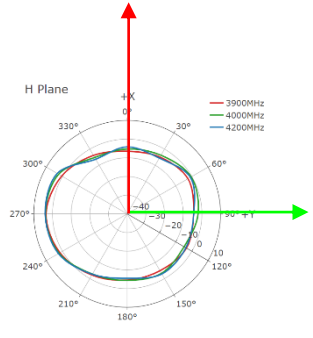
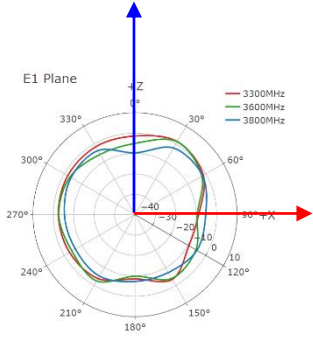
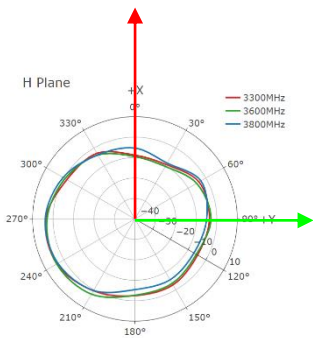
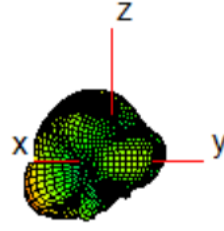


● **MH2**

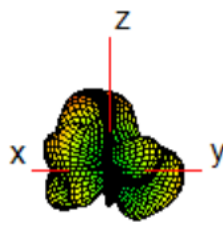
**3600 MHz**



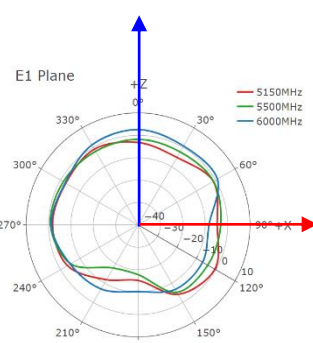
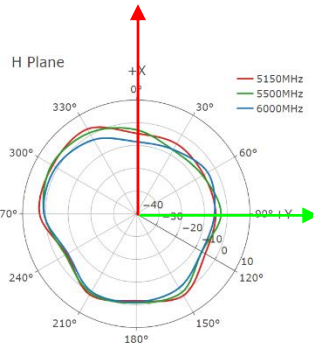
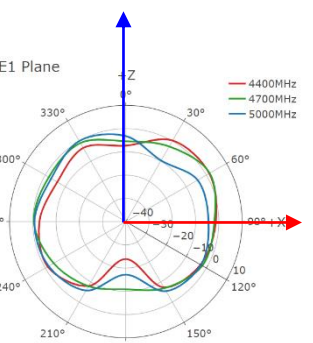
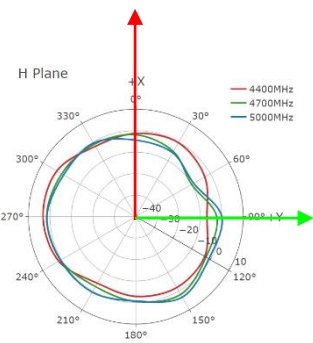
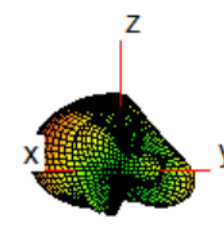
**4000 MHz**



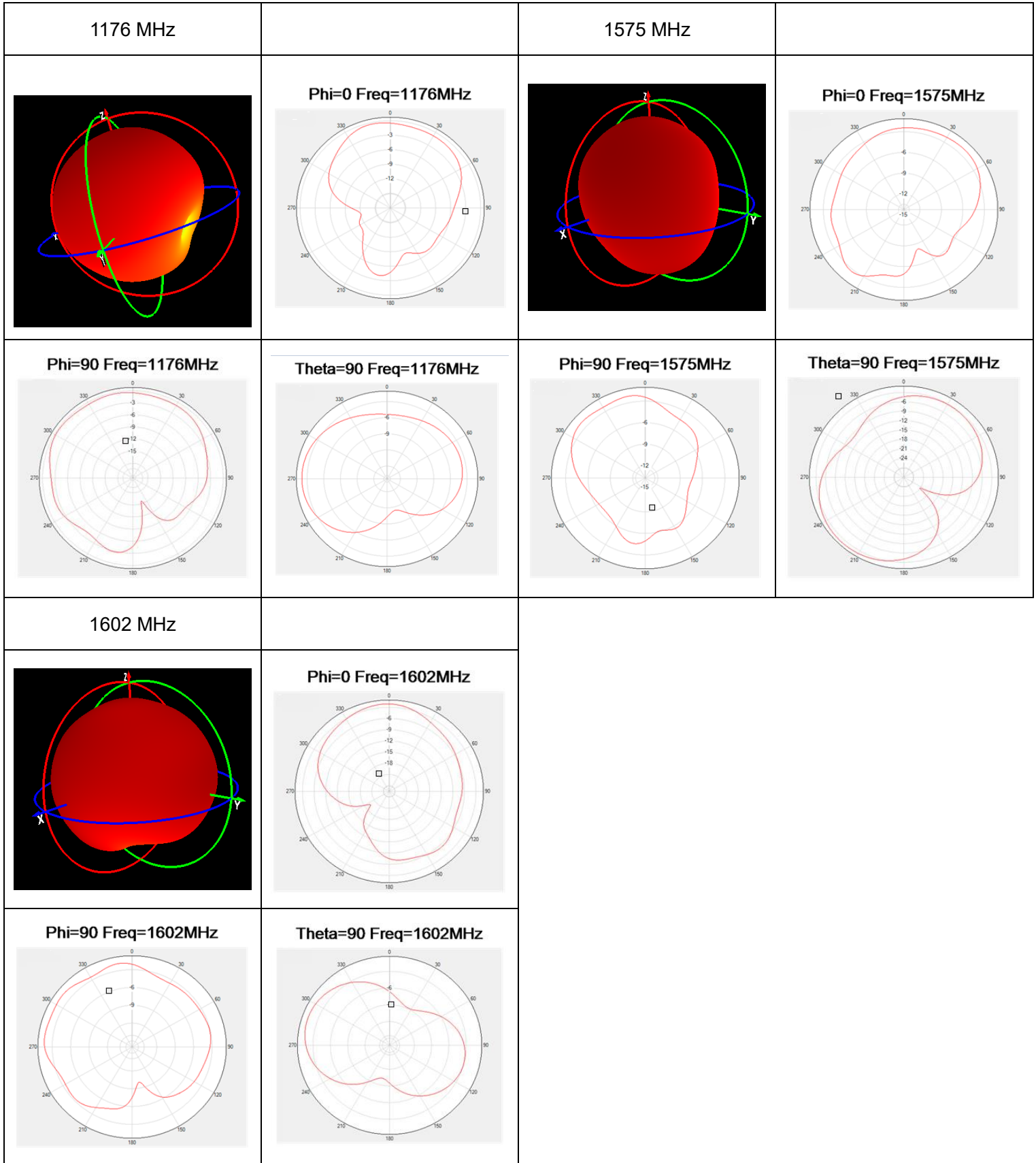
**4700 MHz**



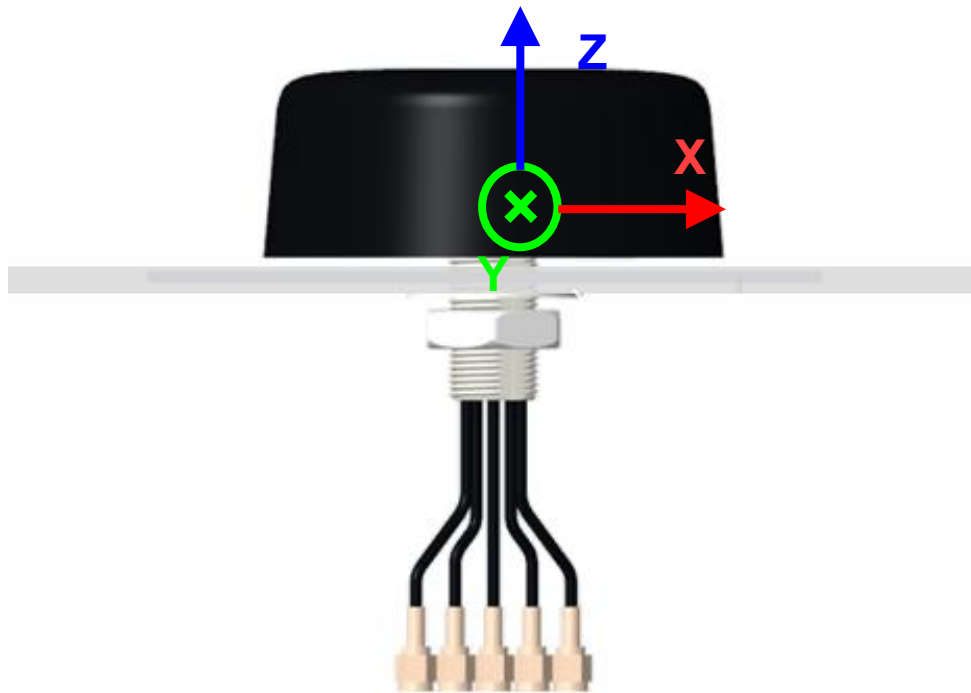
**5500 MHz**



● GNSS

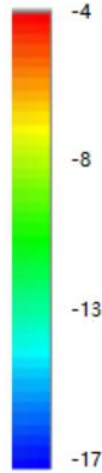
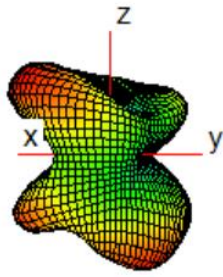


3.2.4.2 Test Status: On 320 mm × 240 mm Metal Plane

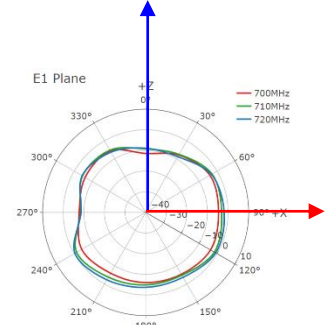
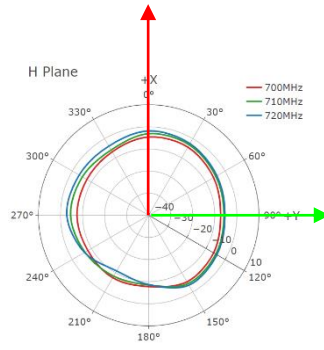
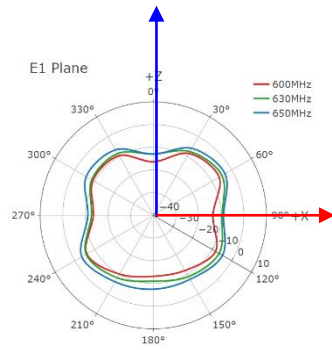
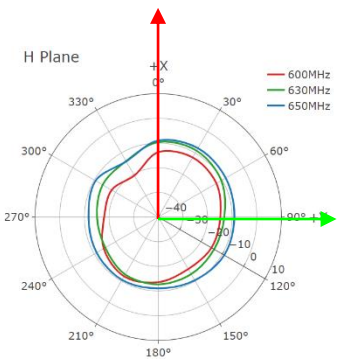
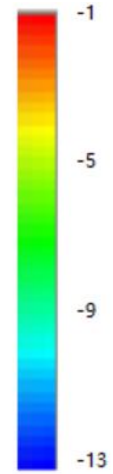
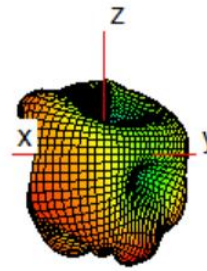


**LMH1**

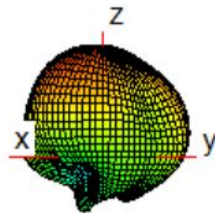
**630 MHz**



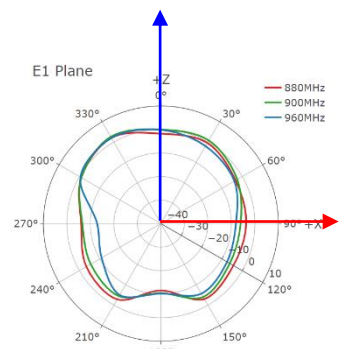
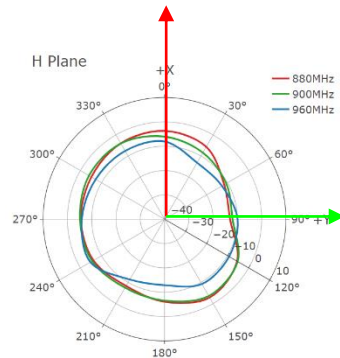
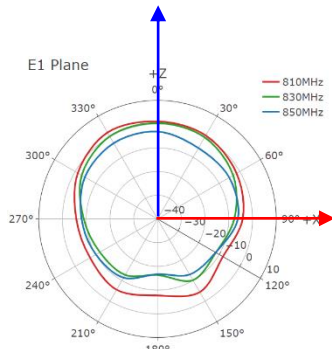
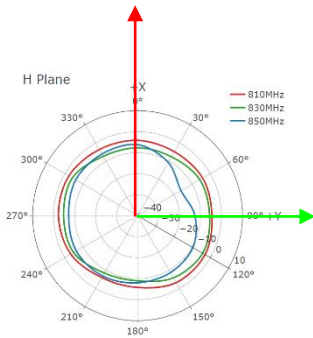
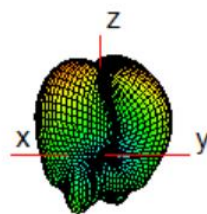
**710 MHz**



**830 MHz**

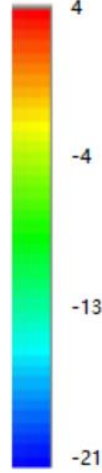
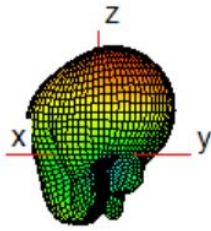


**900 MHz**

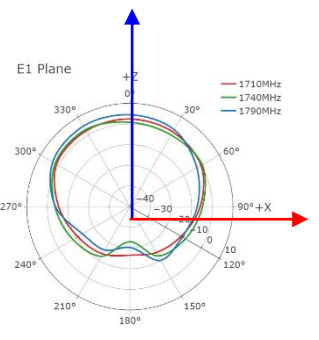
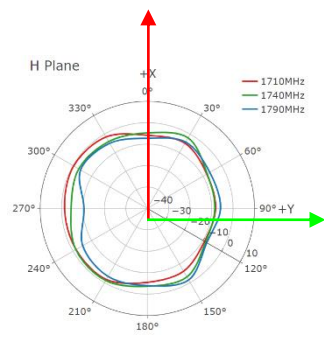
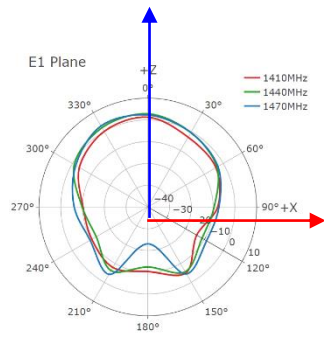
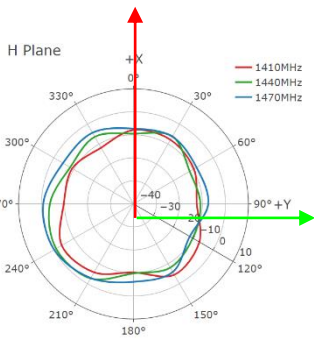
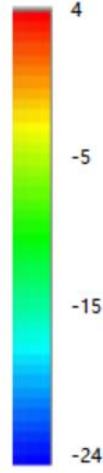
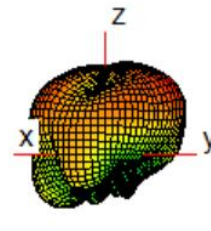


● **LMH1**

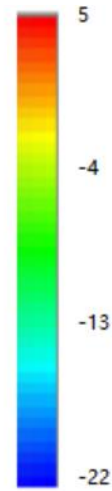
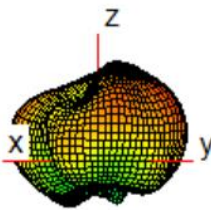
**1440 MHz**



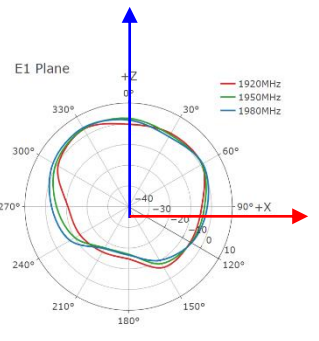
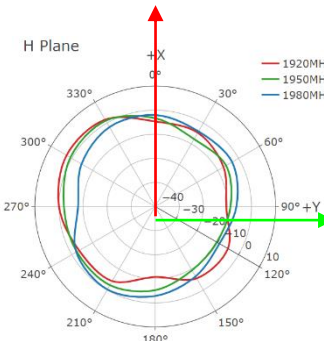
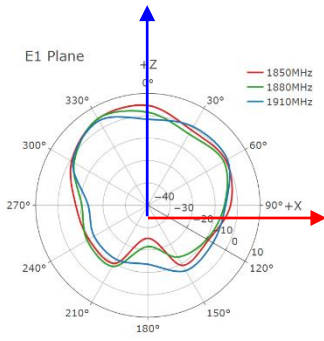
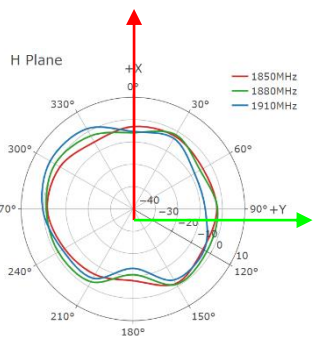
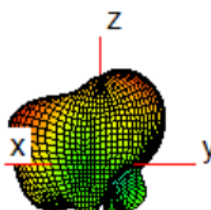
**1740 MHz**



**1880 MHz**

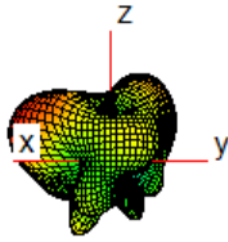


**1950 MHz**

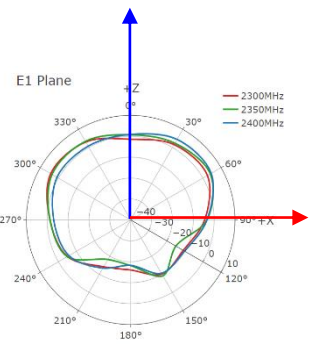
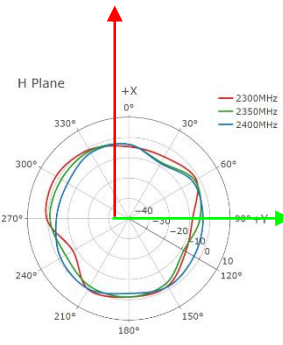
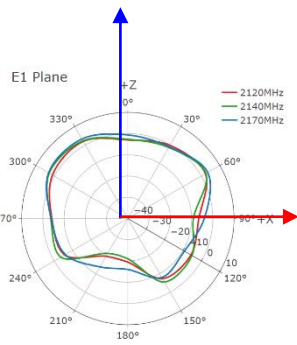
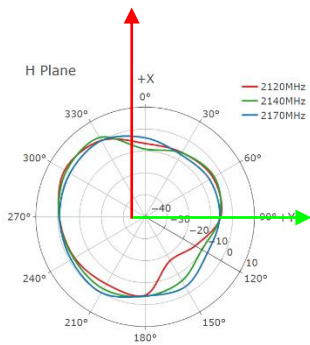
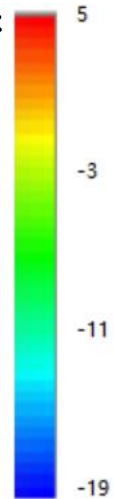
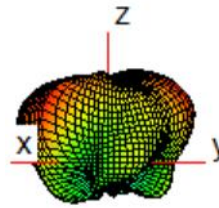


● **LMH1**

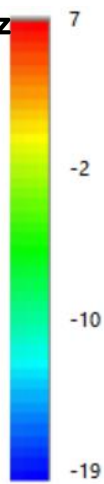
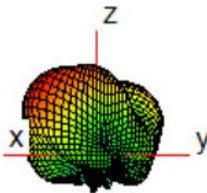
**2140 MHz**



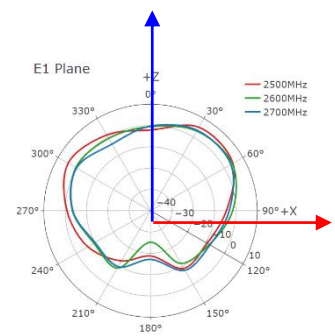
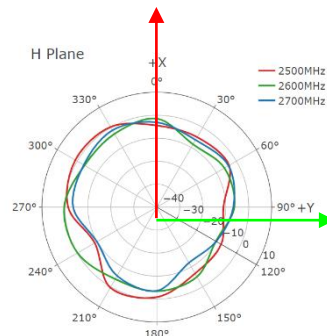
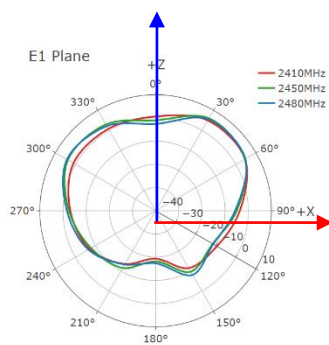
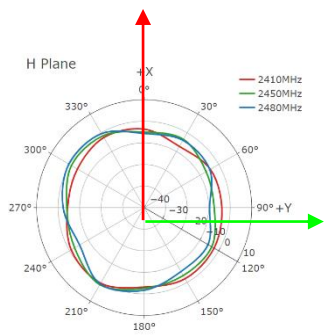
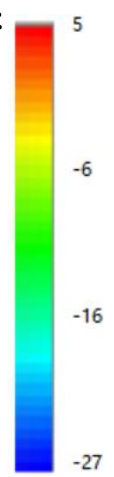
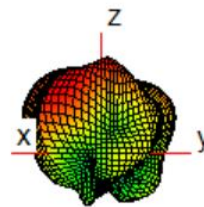
**2350 MHz**



**2450 MHz**

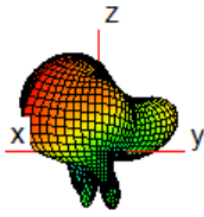


**2600 MHz**

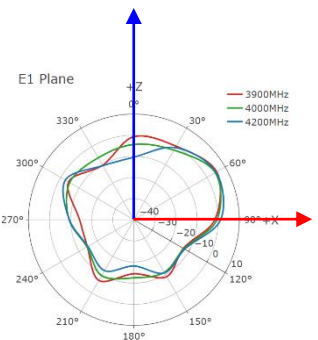
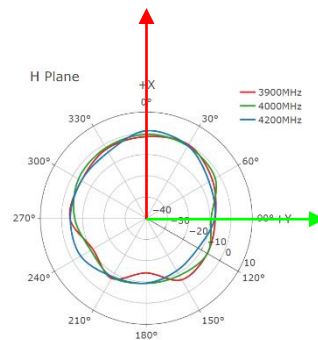
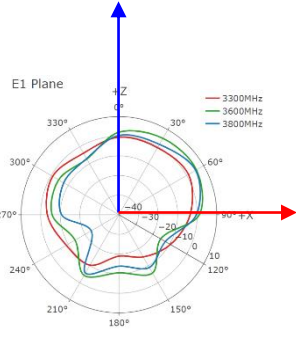
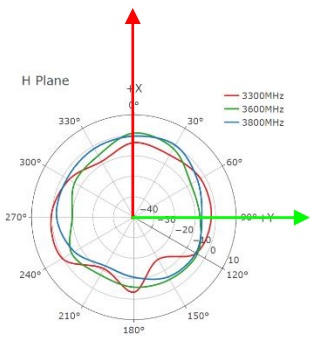
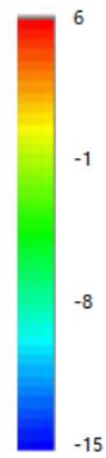
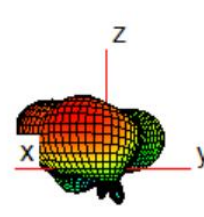


● **LMH1**

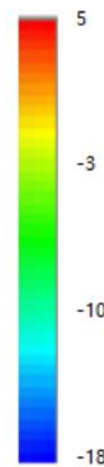
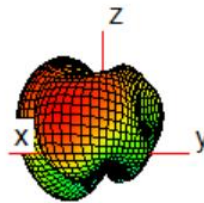
**3600 MHz**



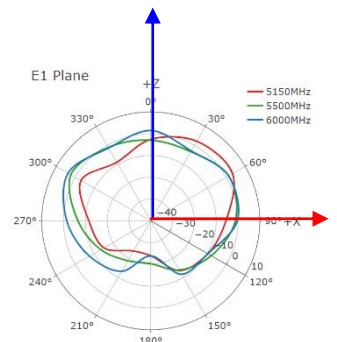
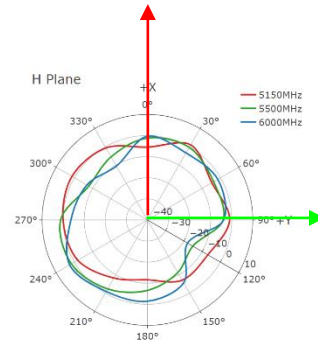
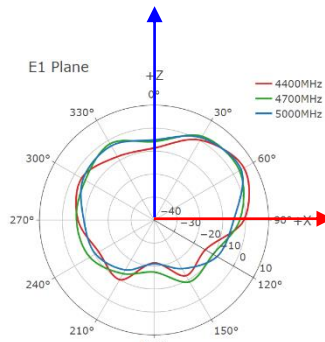
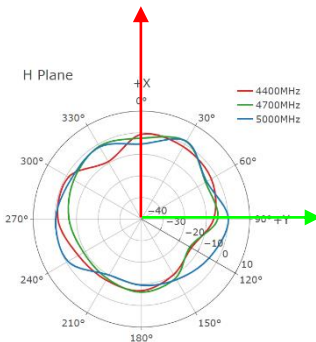
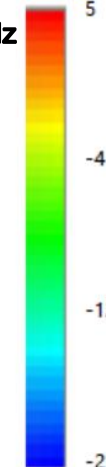
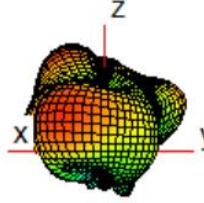
**4000 MHz**



**4700 MHz**

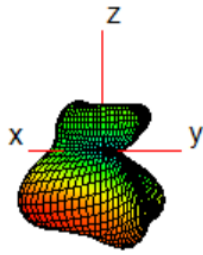


**5500 MHz**

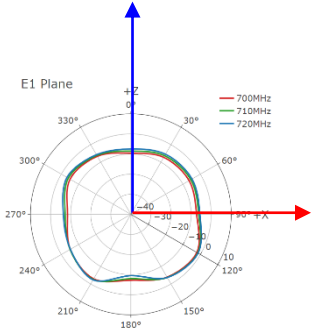
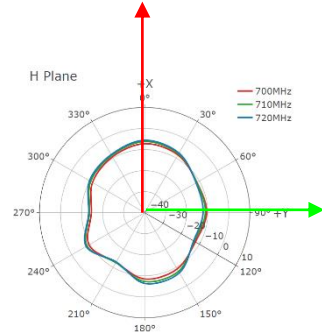
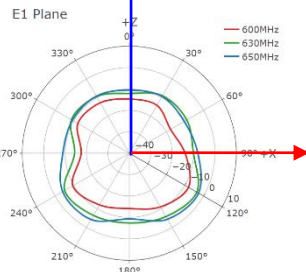
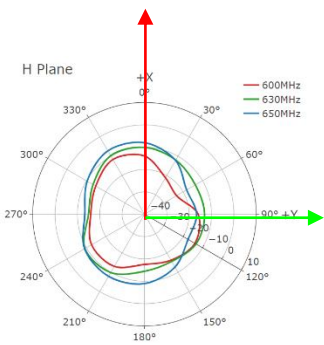
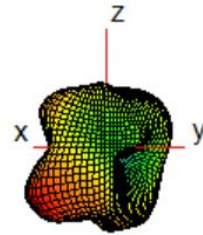


● **LMH2**

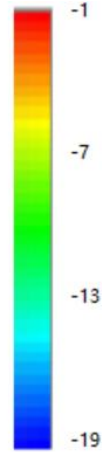
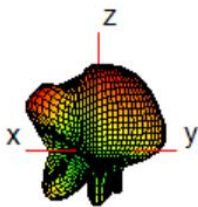
**630 MHz**



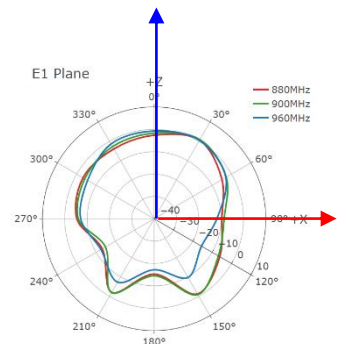
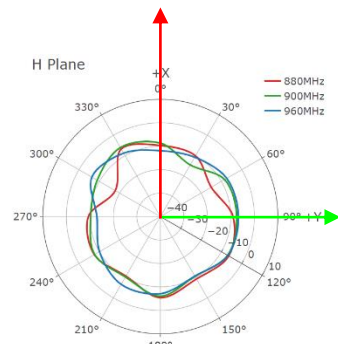
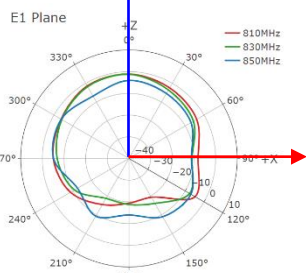
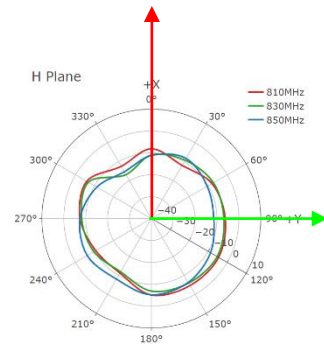
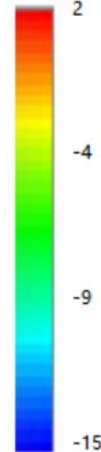
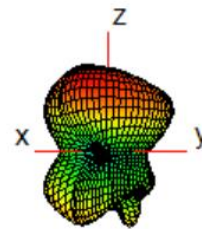
**710 MHz**



**830 MHz**

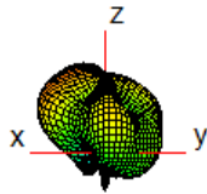


**900 MHz**

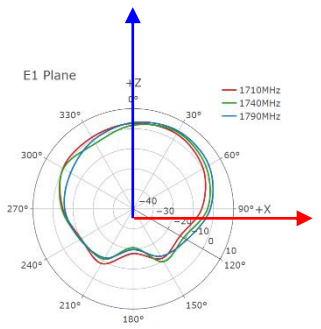
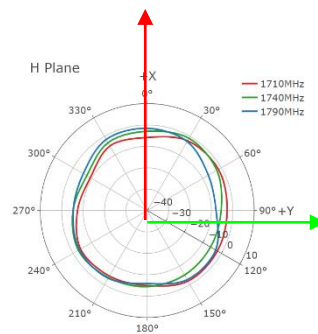
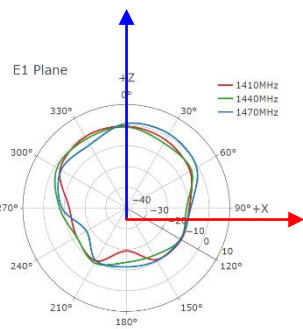
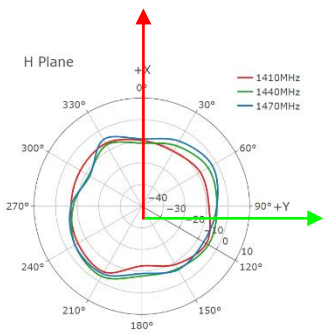
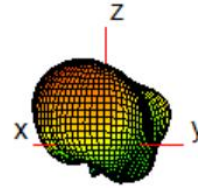


● **LMH2**

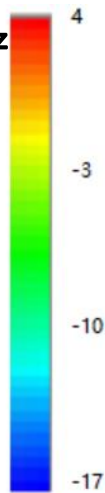
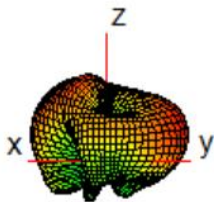
**1440 MHz**



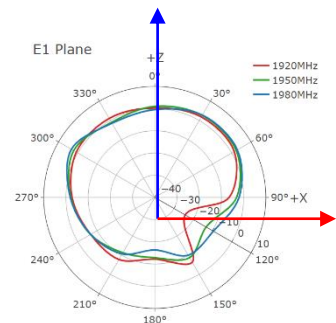
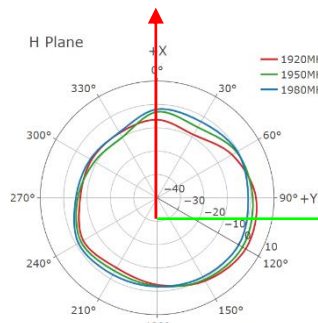
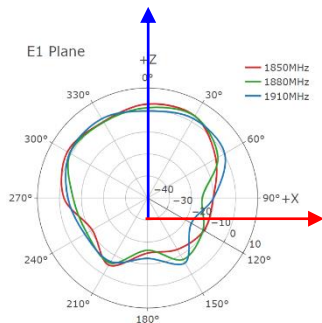
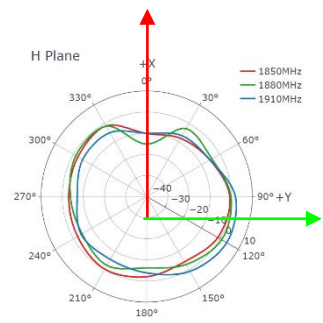
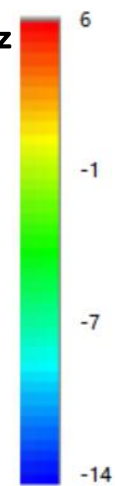
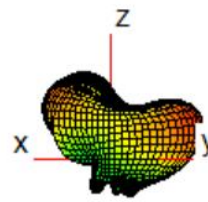
**1740 MHz**



**1880 MHz**

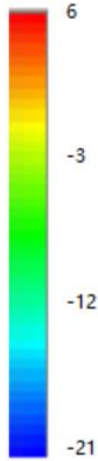
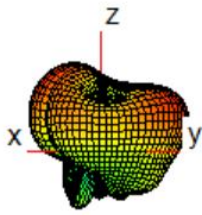


**1950 MHz**

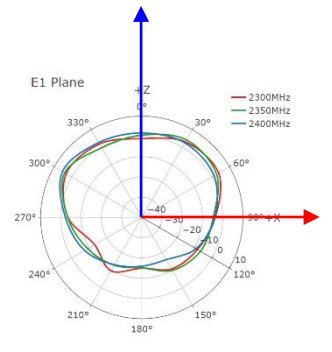
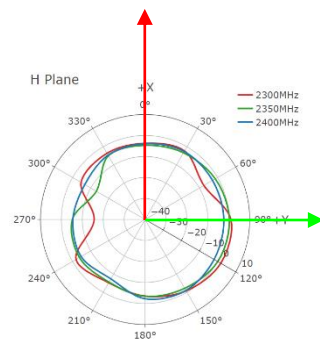
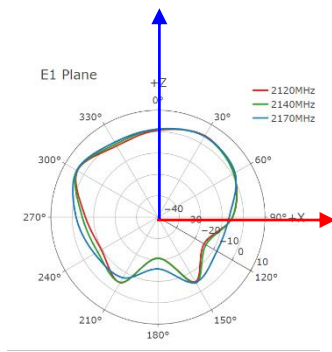
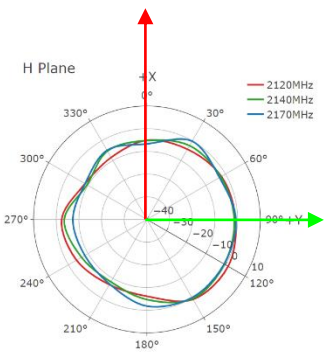
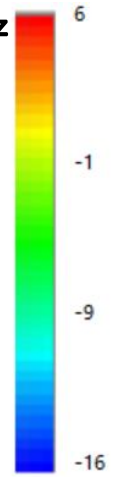
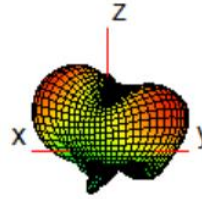


● **LMH2**

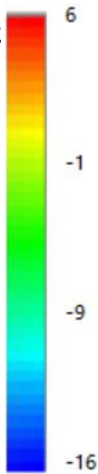
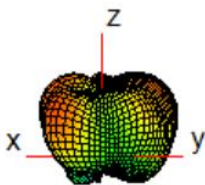
**2140 MHz**



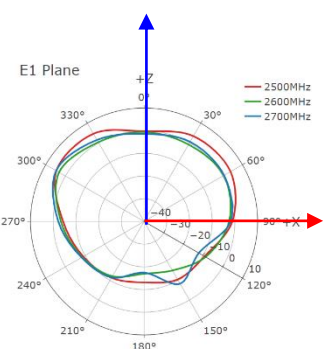
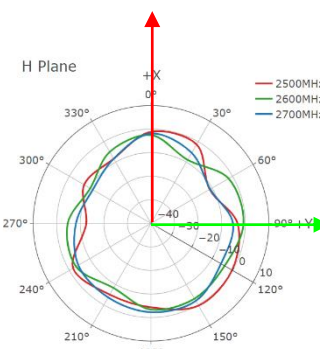
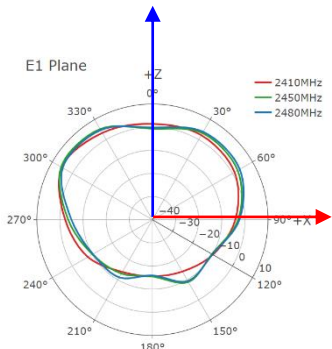
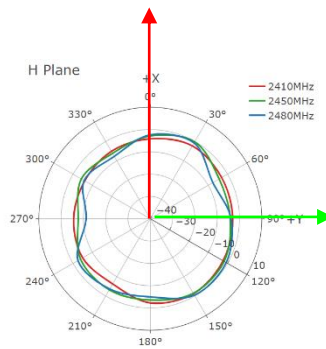
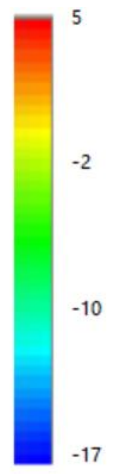
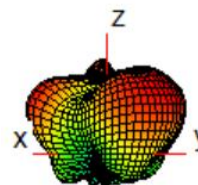
**2350 MHz**



**2460 MHz**

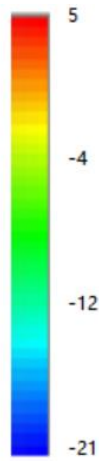
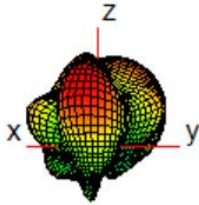


**2600 MHz**

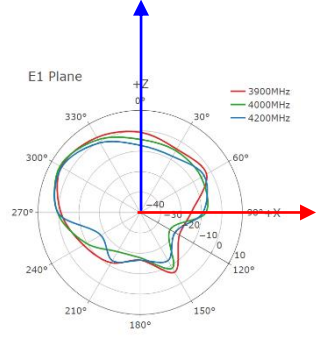
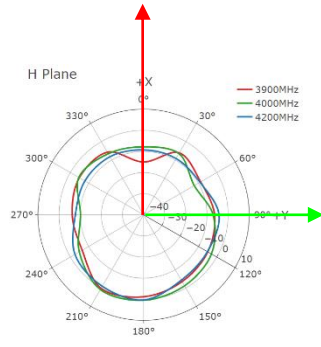
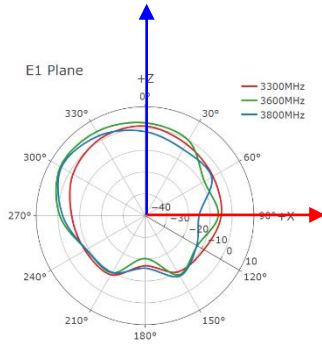
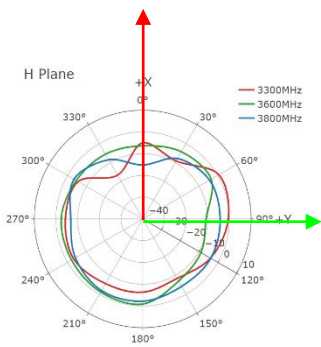
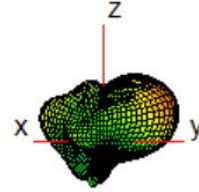


● **LMH2**

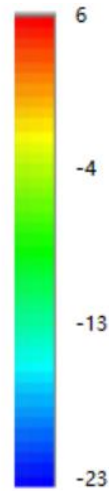
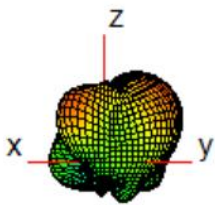
**3600 MHz**



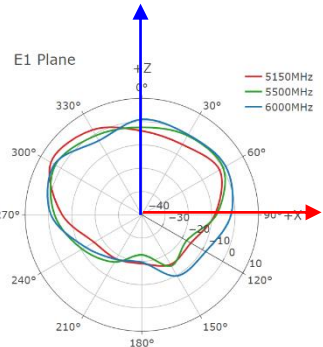
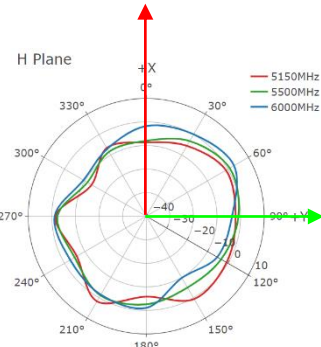
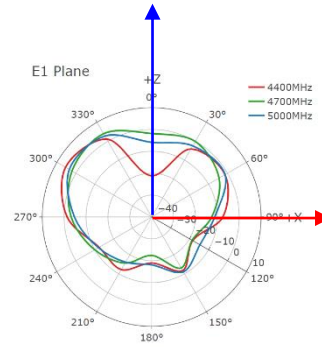
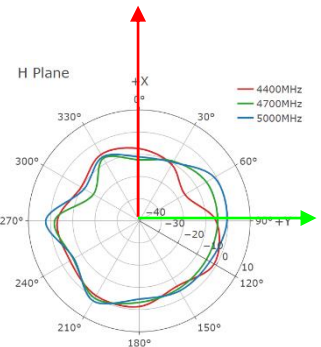
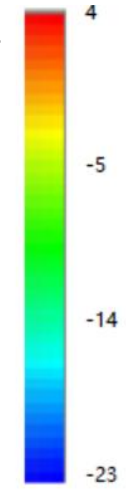
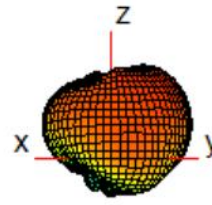
**4000 MHz**



**4700 MHz**

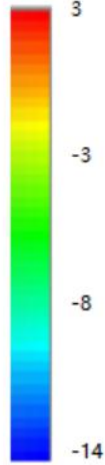
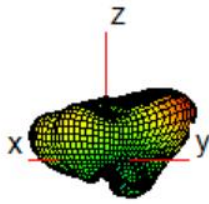


**5500 MHz**

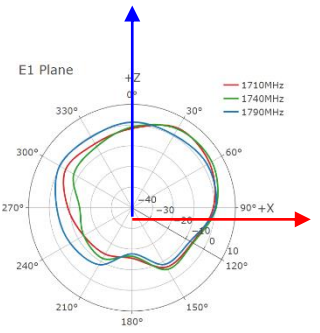
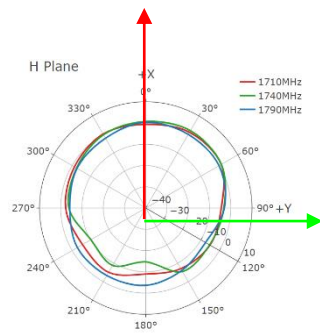
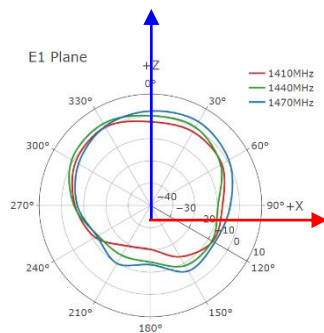
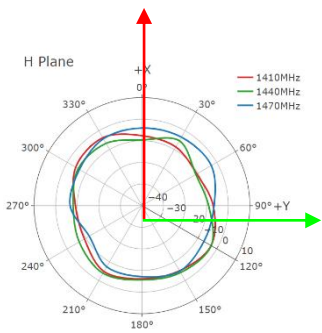
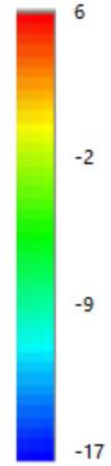
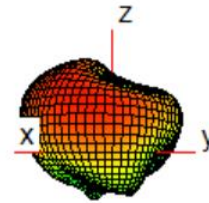


● **MH1**

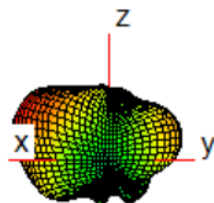
**1440 MHz**



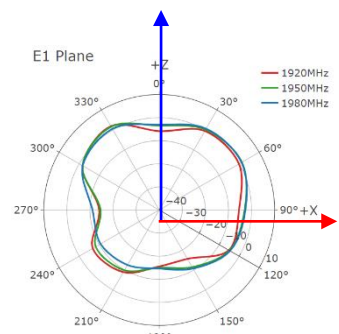
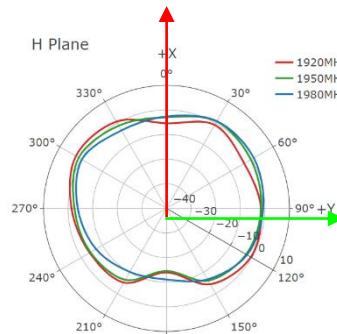
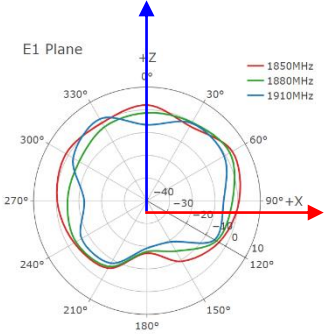
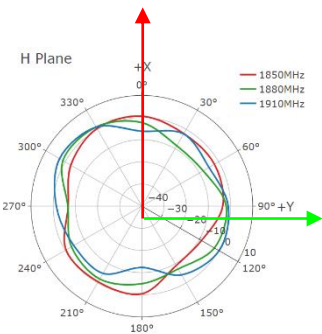
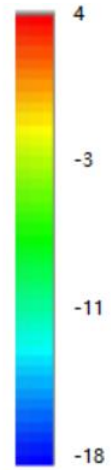
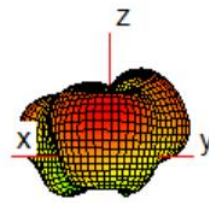
**1740 MHz**



**1880 MHz**

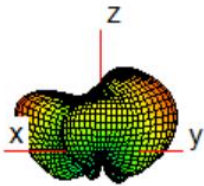


**1950 MHz**

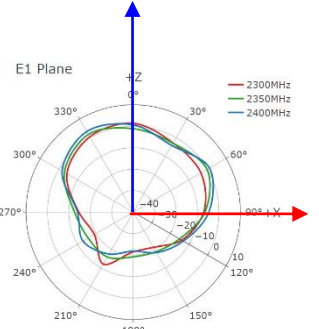
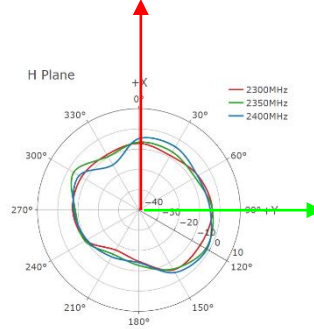
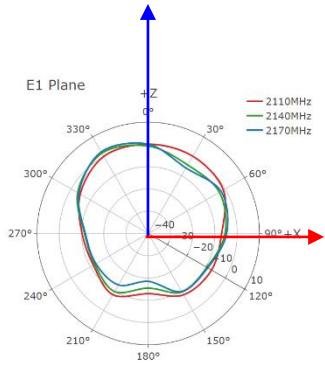
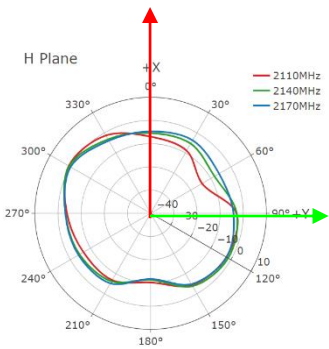
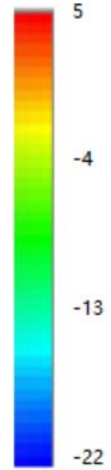
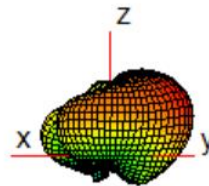


● **MH1**

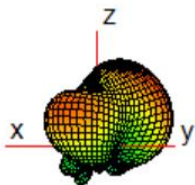
**2140 MHz**



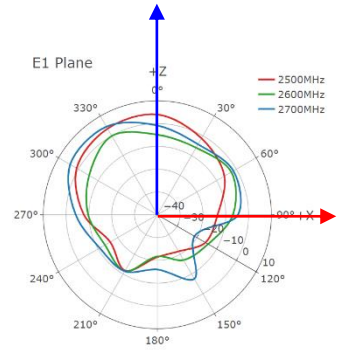
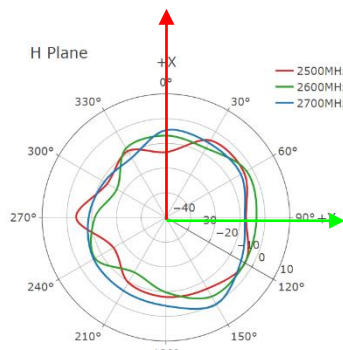
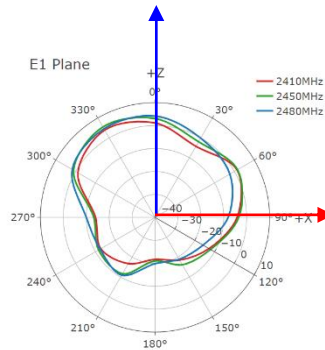
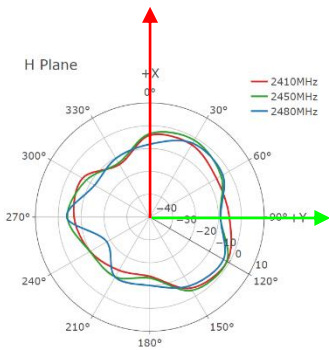
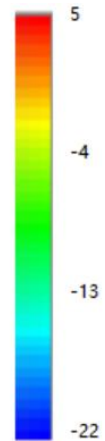
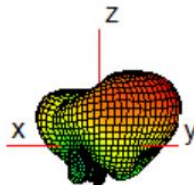
**2350 MHz**



**2450 MHz**

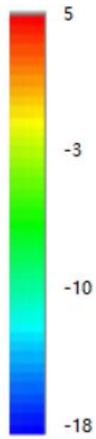
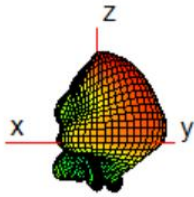


**2600 MHz**

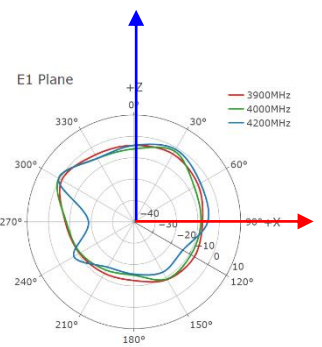
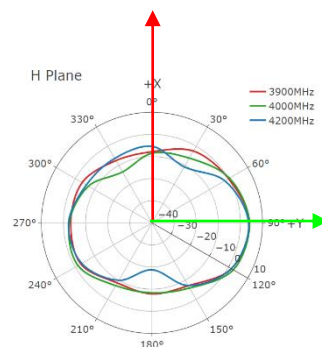
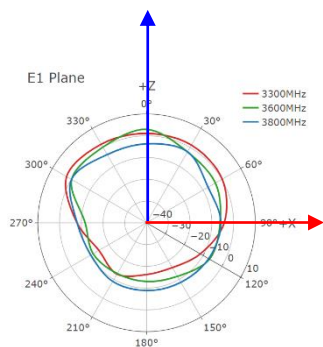
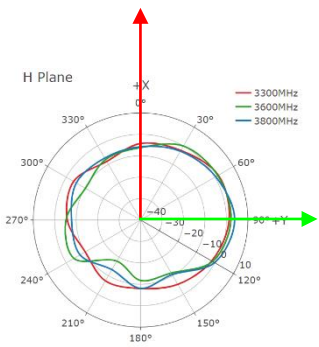
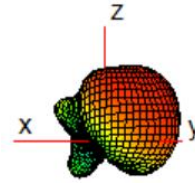


● **MH1**

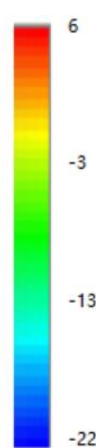
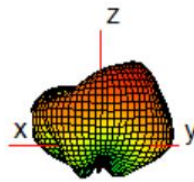
**3600 MHz**



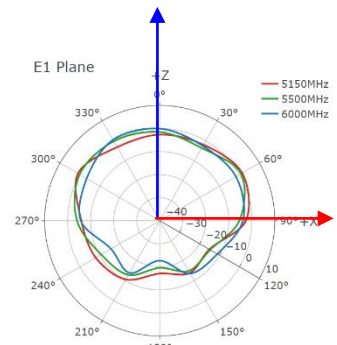
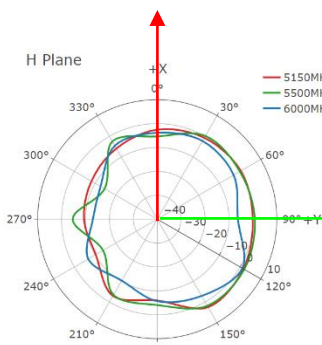
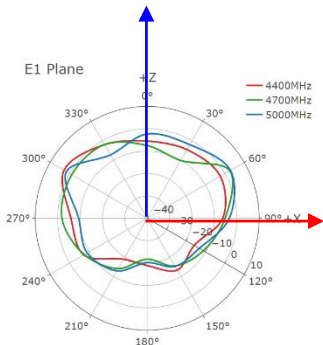
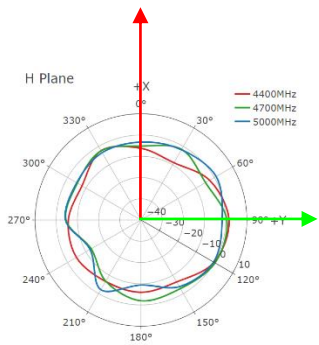
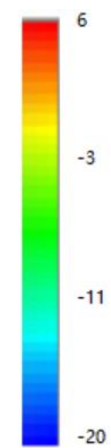
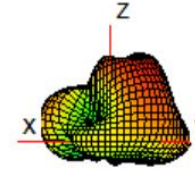
**4000 MHz**



**4700 MHz**

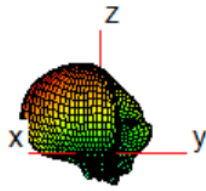


**5500 MHz**

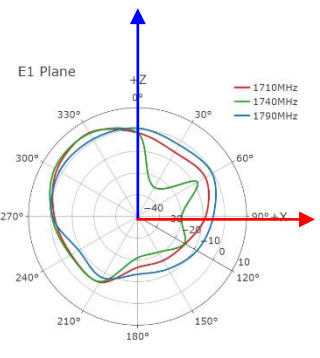
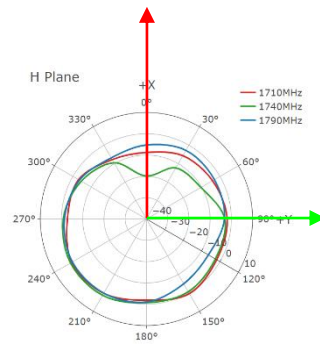
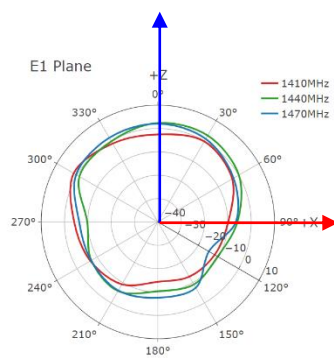
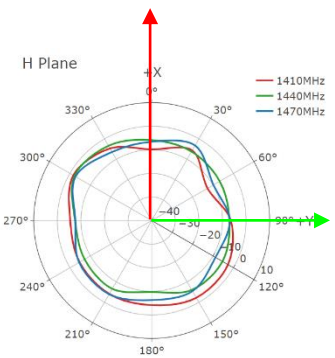
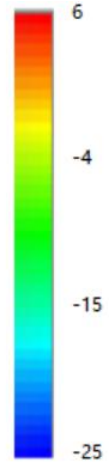
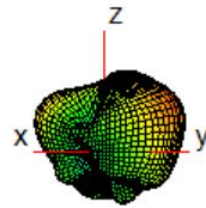


● **MH2**

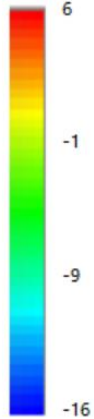
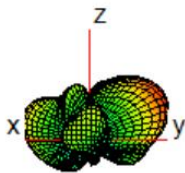
**1440 MHz**



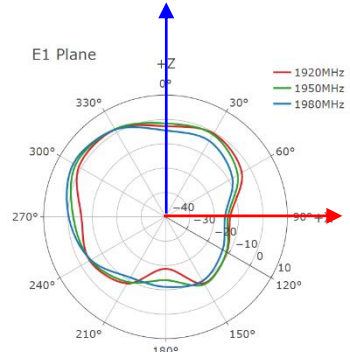
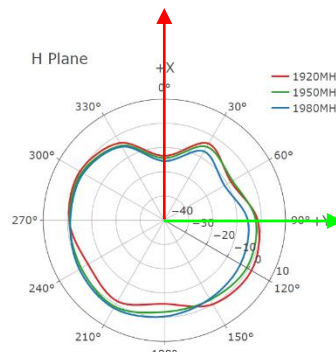
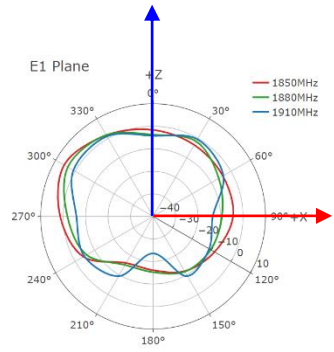
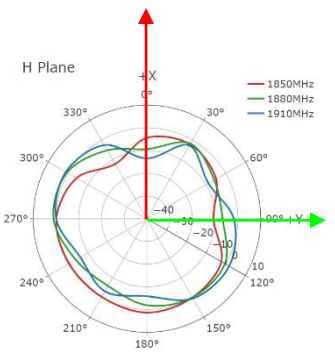
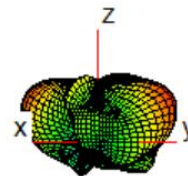
**1740 MHz**



**1880 MHz**

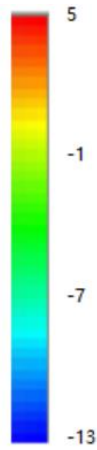
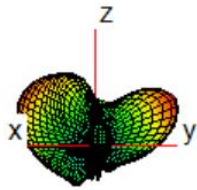


**1950 MHz**

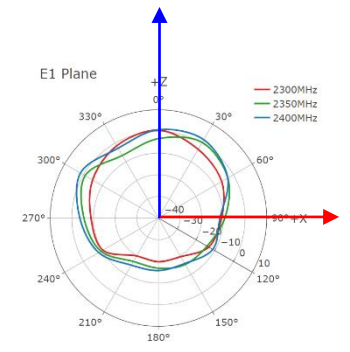
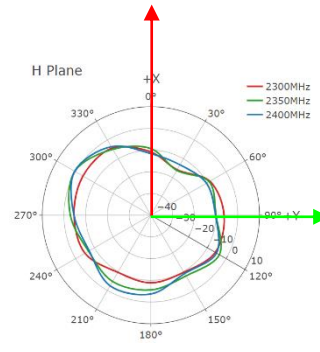
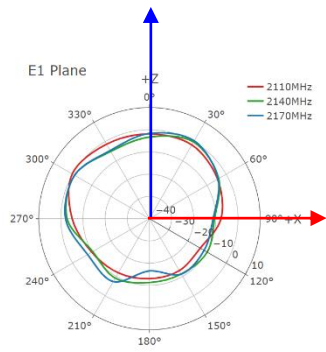
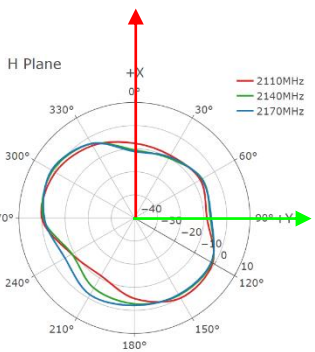
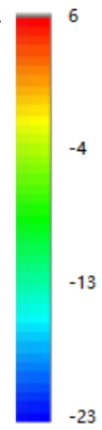
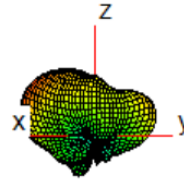


● **MH2**

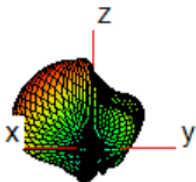
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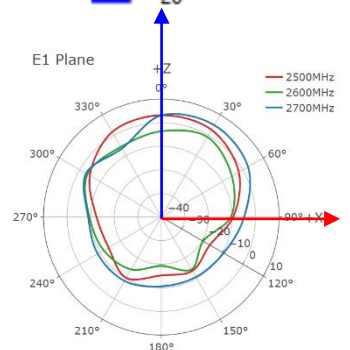
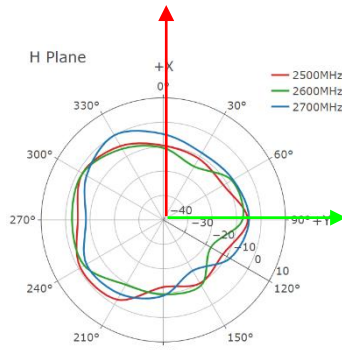
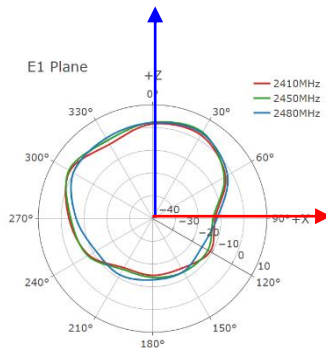
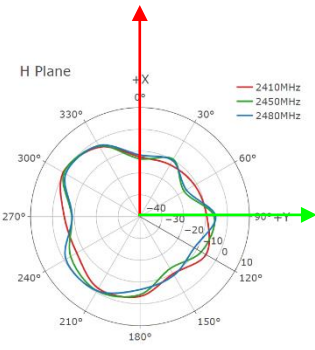
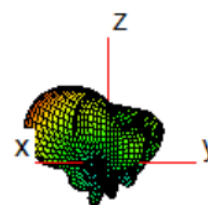
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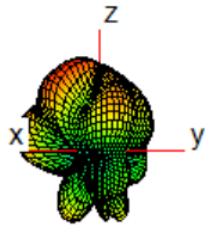
**2450 MHz**



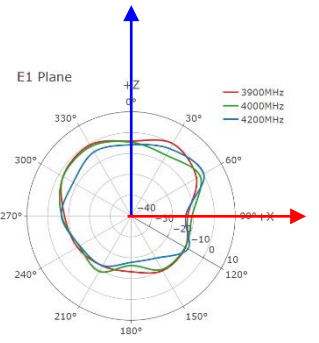
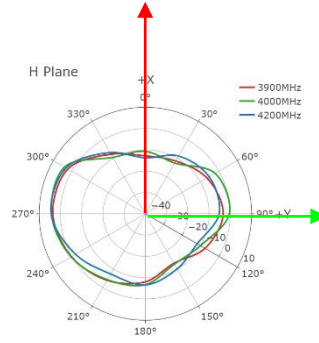
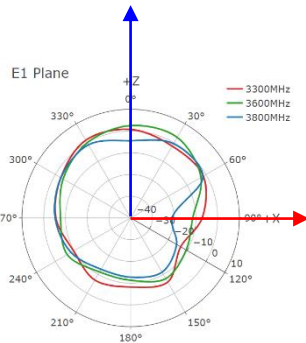
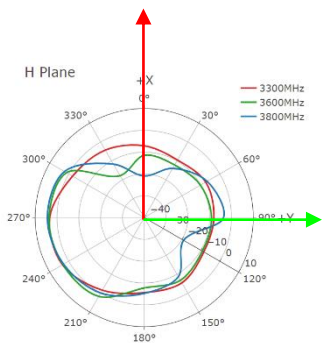
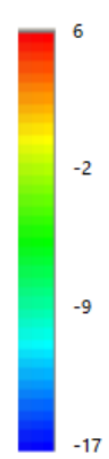
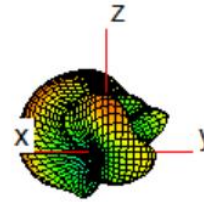
**2600 MHz**



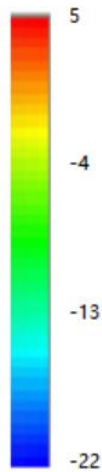
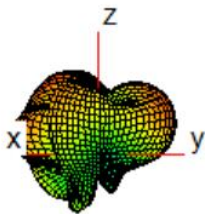
**3600 MHz**



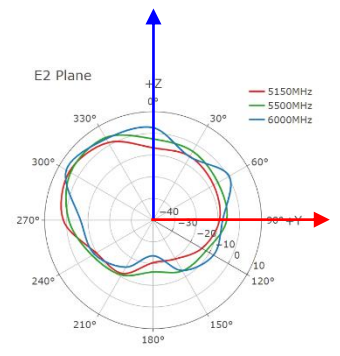
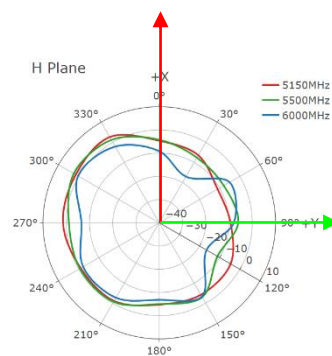
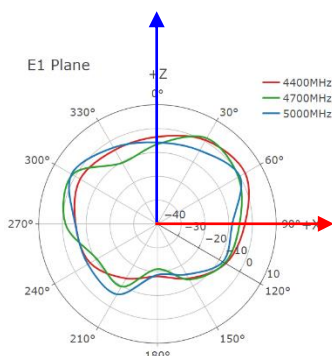
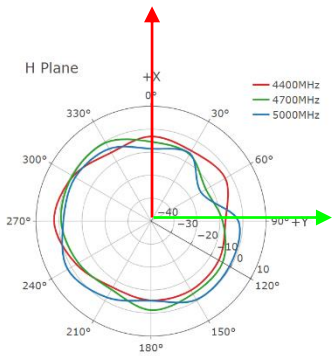
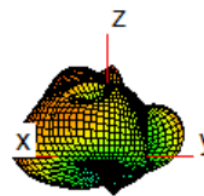
**4000 MHz**



**4700 MHz**



**5500 MHz**



### 3.3 GNSS Test Data (Open Sky)

Table 1: Static drifting test at normal temperature

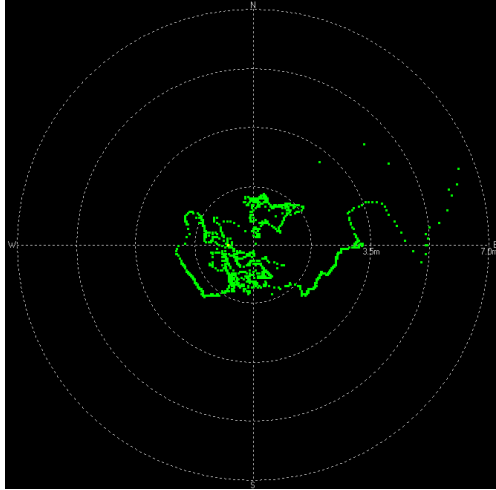
Test Module	CEP50 (m)	Maximum (m)	Static Drifting Figure
RM520N-GL	1.3347	6.506	

Table 2: GPS navigating performance

Test Module	GPS SV		GL SV		GA SV		BE SV	
	L1	L5	L1	L5	L1	L5	L1	L5
RM520N-GL	10	3	9	/	5	3	27	8

Table 3: L1 Average CNO

Test Module	GPS Cno	GL Cno	GA Cno	BE Cno
	Top4 Median (dBHz)	Top4 Median (dBHz)	Top4 Median (dBHz)	Top4 Median (dBHz)
RM520N-GL	43.068	41.800	36.716	48.238

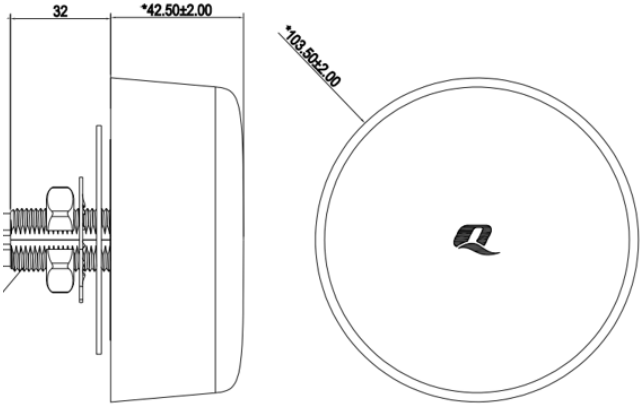
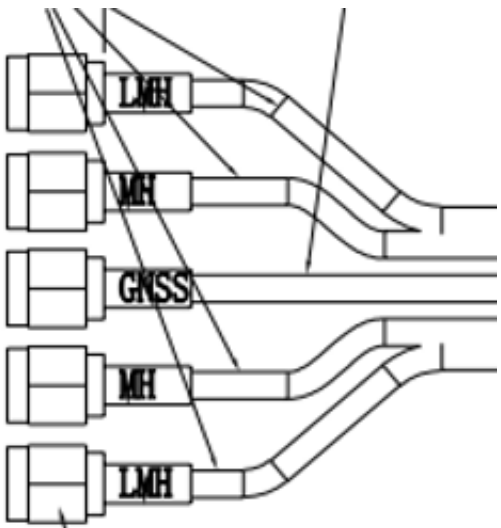
**Table 4: L5 Average CNO**

Test Module	GPS Cno	GL Cno	GA Cno	BE Cno
	Top4 Median (dBHz)	Top4 Median (dBHz)	Top4 Median (dBHz)	Top4 Median (dBHz)
RM520N-GL	40.075	/	40.33	48.0




**Table 5: TTFF Test**


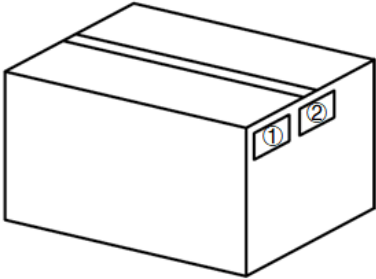
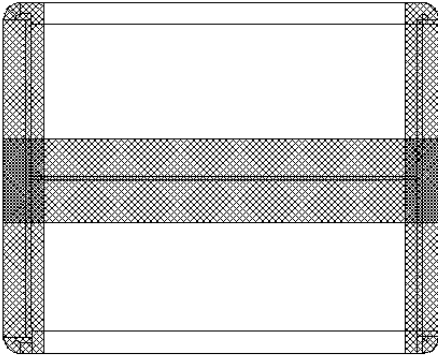
Test Module	Test Mode	Times	Time (s)
RM520N-GL	Hot start	100	0.77
	Warm start	100	23.27
	Cold start	100	33.30

Table 6: The correspondence between the module PORT and the antenna port is as follows

Module Port (RM520N-GL)	Antenna
	
	
0 (LMH1/4G Main)	LMH (1)
1 (MH2/Mimo2)	MH (2)
2 (MH1/Mimo1)	MH (1)
3 (LMH2/4G Div)	LMH (2)

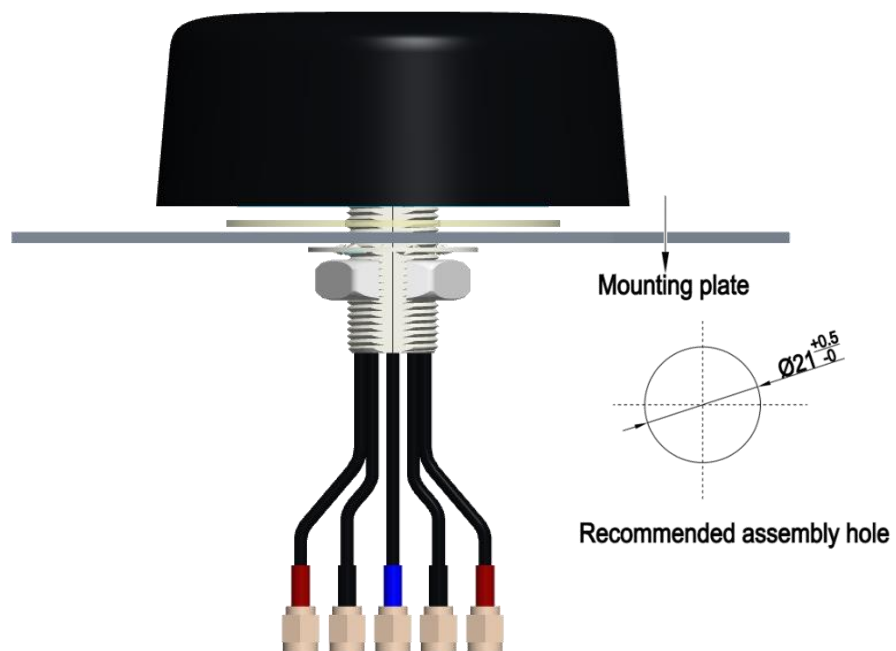
# 4 Packaging

Step	Packaging Picture / 2D Picture	Description
1		<p>Put the product wrapped with a PE bag inside the inner box.</p>
2		<p>Put the pearl cotton on the top of the product.</p>
3		<p>Inner box diagram</p> <p><u>Inner Box Size:</u> <u>L x W x H = 165 x 165 x 135 mm</u></p>

<p>4</p>		<p>(18 Inner Boxes / Carton Box) (18 Antennas / Carton Box)</p> <p><u>Carton Size:</u> <u>L × W × H = 525 × 525 × 305 mm</u></p>
<p>5</p>		<p><b>Position for Attaching Labels</b></p> <ul style="list-style-type: none"> <li>① Carton Label</li> <li>② Quality Label</li> </ul>
<p>6</p>		<p><b>Sealing Cartons</b> H-shaped sealing cartons</p>
<p>Note</p>	<p>The initial packaging method described above is for reference only, and the final actual packaging method shall be subject to the actual shipping packaging.</p>	

# 5 Installation

- LMHs and MHs can be connected arbitrarily.
- Recommended hole dimensions as below.
- Recommended mounting plate thickness: 2–10 mm.
- Recommended mounting plate size:  $\geq \Phi 85$  mm



			Installation Instructions		
Tube Mark	Tube Color	Cable	Connector	Frequency (MHz)	Technology
LMH	Red	RG405	SMA Male	600–960 MHz, 1400–6000 MHz	5G/4G/3G/2G
MH	Black	RG405	SMA Male	1400–6000 MHz	5G MIMO/Wi-Fi/BT
GNSS	Blue	RG174	SMA Male	1164–1189 MHz, 1565–1606 MHz	GPS/GLONASS/GALILEO/ BDS/QZSS/IRNSS

- Note: YEMN017AA (5IN1=2 x LMH+2 x MH+1 x GNSS)

## 6 Appendix Reference

Abbreviation	Description
5G	5th-Generation Mobile Communication Technology
4G	4th-Generation Mobile Communication Technology
3G	3rd-Generation Mobile Communication Technology
2G	2nd-Generation Mobile Communication Technology
GNSS	Global Navigation Satellite System
GLONASS	Global Navigation Satellite System (Russia)
GPS	Global Positioning System
QZSS	Quasi-Zenith Satellite System
IRNSS	Indian Regional Navigation Satellite System
LTE	Long Term Evolution
LTE-A	LTE-Advanced
NB-IoT	Narrow Band Internet of Things
LPWA	Low Power Wide Area
WCDMA	Wideband Code Division Multiple Access
GSM	Global System for Mobile Communications
Wi-Fi	Wireless Fidelity
GND	Ground
LMH	Low-Middle-High Bands
LMHs	LMH antennas
MH	Middle-High Envelope Bands

MHs	MH antennas
FS	In Free Space
MP	On Metal Plane
VSWR	Voltage Standing Wave Ratio
S-Parameter	Scatter Parameter
LNA	Low Noise Amplifier
GPRS	General Packet Radio Service
WLAN	Wireless Local Area Network
HSPA	High-Speed Packet Access
RHCP	Right Hand Circularly Polarized
RoHS	Restriction of Hazardous Substances
REACH	Registration, Evaluation, Authorisation and Restriction of Chemicals
IP	Ingress Protection
IK	Impact Protection
ECE R118	UN Regulation No. 118 (ECE R118-approved cables are flame-resistant cables)

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# Revision History

Version	Date	Author	Note
-	2023-06-09	Wilson Bao/ Lance Sun/ David Liu/ Vinnie Liu	Creation of the document
1.0	2023-06-09	Wilson Bao/ Lance Sun/ David Liu/ Vinnie Liu	First official release
1.1	2023-06-21	Wilson Bao/ Lance Sun/ David Liu/ Vinnie Liu	Updated some details of the datasheet.
1.2	2023-09-06	Lance Sun/ Vinnie Liu	<ol style="list-style-type: none"> <li>Updated the description of overview.</li> <li>Deleted antenna working humidity and added its connector type (Chapter 1.3).</li> </ol>
1.3	2023-09-19	David Liu	Updated the packaging (Chapter 4).
1.4	2023-10-18	Junsen Li	Updated the GNSS data.
1.5	2024-06-24	Lance Sun/ Aria Chu	<ol style="list-style-type: none"> <li>Updated the product name.</li> <li>Updated the overview.</li> <li>Updated the drawing (Chapter 2).</li> <li>Updated the packaging (Chapter 4).</li> <li>Added Chapters 5 and 6.</li> </ol>
1.6	2025-01-11	Aria Chu	Deleted the note below the table (Chapter 1.3).
1.7	2025-03-12	Junsen Li	Updated the Working Current (Chapter 1.1.3).
1.8	2025-07-07	Morrie Du/ Lance Sun/ Strong Qiang/ Rainey Liao	<ol style="list-style-type: none"> <li>Added test data of 1559–1609 MHz and 1166–1187 MHz.</li> <li>Updated the antenna image (Cover page).</li> <li>Updated IK Rating (Overview and Chapter 1.2).</li> <li>Added GNSS test data (Chapter 3.3).</li> <li>Updated the Packaging (Chapter 4).</li> </ol>
1.9	2025-09-05	Lance Sun	Updated the antenna weight (Chapter 1.2).

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